Storm Water Management Report

Project ID 3670-01-01/71
C. Columbus, Farnham Street
Avalon Road – Park Ave
STH 89
Columbia County

Prepared By:
Steven Porter
Wisconsin Department of Transportation
Southwest Region
Date: May 29, 2019

Executive Summary

The existing and proposed stormwater drainage system for WIS 89 have been evaluated in accordance with the Wisconsin Department of Transportation (WisDOT) Facilities Development Manual (FDM) Chapter 13 requirements. The existing roadway has both a rural and an urban cross section. The existing rural section currently has three outfall locations that discharge into small drainage ditches which ultimately discharge into the Craw Fish River. The proposed drainage system will not significantly change the existing drainage pattern. The proposed drainage section in the rural portion will simplify the existing drainage by eliminating two of the cross pipe culverts and replace them with storm sewer outfalls. These outfalls are in the same location as the existing outfalls that discharge into a small drainage ditches that carry the water to the Craw Fish River. The rural section that is being converted to an urban section from Avalon Road to the high school left and Waterloo Street to the Frontage Road right. These areas will collect the water in a new proposed storm sewer system and discharge into a small drainage ditch at the location of existing culvert outfalls. The urban section from the Frontage Road to Park Avenue will continue to collect water in a proposed storm sewer system and discharge into the 2nd Ward Creek as it currently does. The existing roadway has five cross culvert pipes and two storm sewer systems. The proposed project will have three cross culvert pipes and four storm sewer systems. The analysis of the existing and proposed culvert pipes was completed using the software HY8. The storm sewer system was analyzed using SSA. The ditches were analyzed using the Hydraulic Toolbox. The existing and proposed culvert crossings at 2nd Ward Creek were analyzed by the consultant Storm Water Solutions. Their report can be found within this report as Exhibit 7. The following report outlines the methods used and provides the results of the drainage study.

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General Hydrology

The roadway section of WIS 89, between Avalon Road and Park Avenue is in the municipality of Columbus, WI in Columbia County. This developed area consists of both urban and rural cross sections. This section of roadway crosses the 2nd Ward Creek. This roadway is classified as a major collector, and carries approximately 13.4% truck traffic by volume. See Exhibit 1, Project Location Map.

The section between Folsom Street and Park Ave received an asphalt overlay in 2011. The roadway section between Avalon Road and Folsom Street has not received significant improvements since being constructed in 1961.

The project will reconstruct approximately 0.89 miles of WIS 89 between Avalon Road and Park Avenue. The existing pavement structure and underlying base layers will be removed and replaced with new material. New asphalt pavement will be placed. The existing roadway cross section will be modified from Avalon Road to Park Avenue. The roadway pavement cross section from Avalon Road to the Columbus High School will adjust the 11-foot lane width to 12-foot and will add five feet of additional paved shoulder pavement on each side of the roadway. The project will be also cutting a ditch on the west side of the roadway from Avalon Road to Waterloo Street. The pavement cross section from the Waterloo Street to Park Avenue, WIS 73, will be decreased by one foot on both side of the roadway to allow for a uniform five-foot terrace, reduce the amount of impacts to adjacent property owners, and accommodate maintenance area behind the sidewalks. See Exhibit 2, Typical Cross Sections.

The existing cross culverts at STA 12+80 and STA 16+28 will be replaced at the same location as the existing pipes with storm sewer outfalls. The existing triple culvert at the 2nd Ward Creek crossing will be replaced with three elliptical pipes.

The subbasin that encompasses the Saint Jerome School consists of a large area outside of the right-of-way, generating large flow values contributing to the storm water system. The location of the school being in the lowest parts of this subbasin is a direct result of this. The rest of the subbasins are much smaller in size and generate much smaller flow values. During periods where the 2nd Ward Creek experiences heavy rainfall and “cresting” events, the local municipality reports flooding downstream of the 2nd Ward Creek outfall pipes. Storm water trunk line pipes outfall into the Northern and Southern culvert pipes at 2nd Ward Creek crossing currently. The municipality expressed concern that the existing storm water system is to sparse and is not functioning properly allowing water to pond in the gutter line of the roadway. For existing subbasin data, See Exhibit 3 Existing Basin Hydrology.

The WIS 89 storm water trunkline begins at the Folsom Street intersection. At this location, the intersection inlets connect in. The WIS 89 trunkline runs north towards 2nd Ward Creek and outfalls into the southern culvert pipe at 2nd Ward Creek. A second trunkline runs from about Kiwanis Park to 2nd Ward Creek and outfalls into the northern culvert pipe at 2nd Ward Creek. These trunklines consist of 12-inch, 15-inch and 21-inch pipes (based on state as-builts). The inlet spacing along this system is spaced at a range of 250 to 380 feet. The existing storm system does not meet the current WisDOT standard of a 24-inch trunkline and additional inlets will be needed to meet the WisDOT standard for inlet spacing of 300 feet

The watershed consists of 52 subbasins contributing to the storm water runoff. The runoff from Avalon Road to the Columbus High School Parking lot outfalls to a small drainage ditch at STA

12+80 and STA 16+28. The drainage ditch eventually empties into the Craw Fish River The runoff from the Columbus High School Parking lot to Park Avenue outfalls to 2nd Ward Creek. See Exhibit 4 Proposed Basin Hydrology

.

Soil Investigation

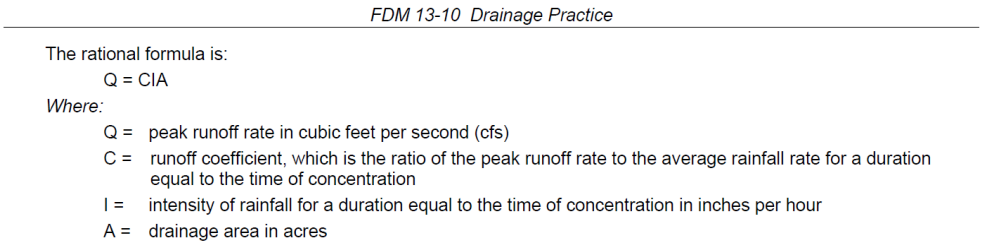
Most of the soil in the project area is Hydraulic Soil Group (SOB) Type 2. There are also two areas of (OSA) at 2nd Ward Creek and the Golf Course. The last soil type within the project area is a small area of soil (KNC) Type 2 between Waterloo Street and the Frontage Road. The ratings were taken from the WisDOT Soils Report that was completed by the WisDOT Soils Engineer. See Exhibit 5 Hydraulic Soil Data.

Rainfall Data

Rainfall data for Columbia County was used in this project from NOAA Atlas 14, Volume 8 from November of 2014. See Exhibit 6 Rainfall Intensity Curve

Basin Analysis

Due to the relatively small drainage areas of all the basins, less than 200 acres, the Rational Method was used to estimate the proposed peak flows for all the basins. The rational method is defined by the following equation below in Figure 1. The runoff coefficient was determined by using FDM 13-10 Attachment 5.2 – Runoff Coefficients (C), Rational Formula; and Runoff Coefficients for Specific Land Uses.



FDM 13-10 Drainage Practice

The rational formula is:

$$Q = CIA$$

Where:

- Q = peak runoff rate in cubic feet per second (cfs)
- C = runoff coefficient, which is the ratio of the peak runoff rate to the average rainfall rate for a duration equal to the time of concentration
- I = intensity of rainfall for a duration equal to the time of concentration in inches per hour
- A = drainage area in acres

Figure 1. Rational Method Equation

The time of concentration was estimated using FDM 13-10 Attachment 5.3, Time of Concentration of Small Drainage Basins. See Figure 2 below for the attachment. If the time of concentration was calculated to be less than five minutes from Attachment 5.3 then the time was rounded up to the WisDOT minimum of five minutes.

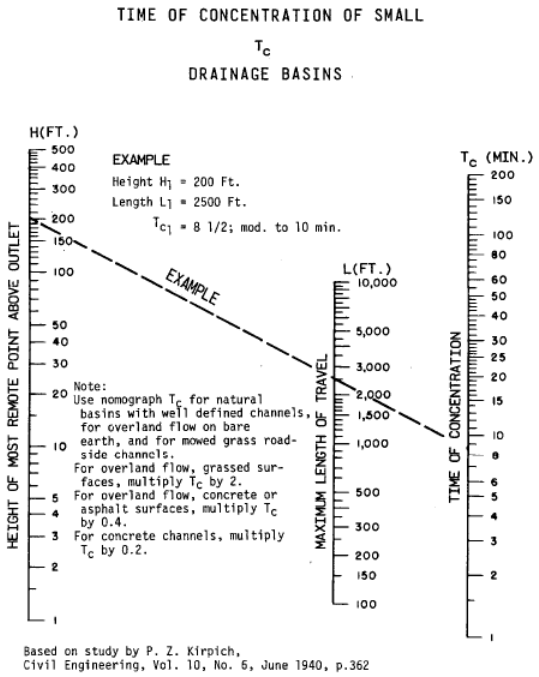


Figure 2. Time of Concentration Estimate

System Analysis

HY8 was utilized to analyze the culvert hydraulics. The program utilizes flow, invert elevations, and tail water configuration to evaluate the existing and proposed culvert pipes. The culverts were designed to have a headwater to diameter ratio of less than 1.5. Cross culverts and driveway culverts were designed for a 25 year flood event. Manning's equation, seen in Figure 3 below, was utilized to determine the shear stress for determining the required end treatment.

AutoCAD SSA was utilized to analyze the existing and proposed storm sewer systems. The proposed storm sewer system was designed for a 10 year flood event, but checked to see if the system could safely pass the 25 year flood event. Manning's equation, seen in Figure 3 below, was utilized to determine the shear stress for determining the required end treatment.

Hydraulic Toolbox was utilized to analyze the proposed ditches. The ditches were designed for a 25 year flood event.

HY8 was used to design the external energy dissipation if required. If outlet velocities were below 6 feet per second then erosion mat is all that is required.

Manning Equation

$$V = \frac{R^{2/3} S^{1/2}}{n}$$

V = average velocity, m/sec
S = slope of the water surface, m/m
R = hydraulic radius (R = area/WP), m^2/m
n = roughness coefficient (Manning n)

Figure 3. Manning's Equation

Other Design Considerations:

Design Frequency: FDM 13-10 Attachment 1.1 Flood Design Frequency Selection Chart

HWY	ADT	Cross Drains	Ditches	Storm Sewer
WIS 89	1,500	25	25	10

Material Selection: FDM 13-1 Table 15.2 Culvert Material Selection Criteria

HWY	ADT	Cross Drains Material
WIS 89	1,500	Reinforced Concrete

2nd Ward Creek Outfall:

A hydraulic analysis was conducted for the triple culvert pipes at the 2nd Ward Creek outfall and the final report can be seen in Exhibit 7, 2nd Ward Creek Analysis.

Summary

In total, there are four storm sewer systems discharging water off the project site. The project has 4 total culvert pipes. One of the pipes is a driveway pipe and the others are cross culverts across WIS 89 at 2nd Ward Creek. The storm sewer outfalls at 2nd Ward Creek were moved from blind connections to the downstream side of the 2nd Ward Creek crossing. The project did not significantly change the existing drainage basins but did change how the water reached the outfalls with the conversion of rural to urban cross sections from Avalon Road to Columbus High School left and from Waterloo Street to the Frontage Road right.

EXHIBIT 1, PROJECT LOCATION MAP

PROJECT ID: **3670-01-71/72**

WITH:

COUNTY: **COLUMBIA**

ORDER OF SHEETS

Section No.	1	Title
Section No.	2	Typical Sections and Details
Section No.	3	Estimate of Quantities
Section No.	3	Miscellaneous Quantities
Section No.	4	Right of Way Plat
Section No.	5	Plan and Profile
Section No.	6	Standard Detail Drawings
Section No.	7	Sign Plates
~~Section No.~~	~~8~~	~~Structure Plans~~
Section No.	9	Computer Earthwork Data
Section No.	9	Cross Sections

TOTAL SHEETS =

N

DESIGN DESIGNATION

A.A.D.T.	(2022)	=	1500
A.A.D.T.	(2042)	=	1850
D.H.V.		=	250
D.D.		=	60/40
T.		=	13.4%
DESIGN SPEED		=	30 MPH
ESALS		=	400,000

CONVENTIONAL SYMBOLS

PLAN

- CORPORATE LIMITS
- PROPERTY LINE
- LOT LINE
- LIMITED HIGHWAY EASEMENT
- EXISTING RIGHT OF WAY
- PROPOSED OR NEW R/W LINE
- SLOPE INTERCEPT
- REFERENCE LINE (300'EB')
- EXISTING CULVERT
- PROPOSED CULVERT (Box or Pipe)
- COMBUSTIBLE FLUIDS (CAUTION)
- MARSH AREA
- WOODED OR SHRUB AREA

PROFILE

- GRADE LINE
- ORIGINAL GROUND
- MARSH OR ROCK PROFILE (To be noted as such) (ROCK)
- SPECIAL DITCH (LABEL)
- GRADE ELEVATION (95.36)
- CULVERT (Profile View)

UTILITIES

- ELECTRIC (E)
- FIBER OPTIC (FO)
- GAS (G)
- SANITARY SEWER (SAN)
- STORM SEWER (SS)
- TELEPHONE (T)
- WATER (W)
- UTILITY PEDESTAL
- POWER POLE
- TELEPHONE POLE

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

PLAN OF PROPOSED IMPROVEMENT

C. COLUMBUS, FARNHAM STREET

AVALON ROAD - PARK AVE

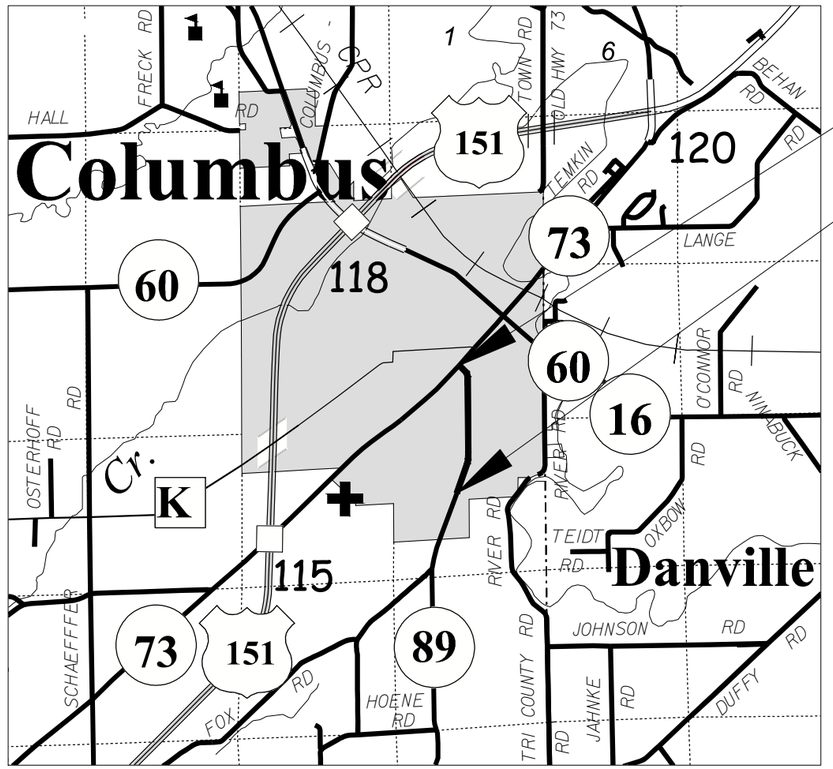
STH 89

COLUMBIA COUNTY

STATE PROJECT NUMBER	STATE PROJECT NUMBER
3670-01-71	3670-01-72

R-12-E | R-13-E

T-10-N



END PROJECT 3670-01-71/72
STA 50+00.99' NB'

BEGIN PROJECT 3670-01-71/72
STA 2+93.03' NB'
X=654435.76
Y=314716.70

LAYOUT
SCALE 0 1 MI

TOTAL NET LENGTH OF CENTERLINE = 0.893 MILES

HORIZONTAL POSITIONS SHOWN ON THIS PLAN ARE WISCONSIN COUNTY COORDINATES, COLUMBIA COUNTY, NAD83 (2011), IN U.S. SURVEY FEET. VALUES ARE GRID COORDINATES, GRID BEARINGS, AND GRID DISTANCES. GRID DISTANCES MAY BE USED AS GROUND DISTANCES.

ELEVATION SHOWN ON THIS PLAN ARE REFERENCE TO THE NORTH AMERICAN VERTICAL DATUM OF 1988, NAVD (2012).

STATE PROJECT	FEDERAL PROJECT	
	PROJECT	CONTRACT
3670-01-71		
3670-01-72		

ORIGINAL PLANS DEVELOPED BY WISDOT SW REGION

WISCONSIN DEPARTMENT OF TRANSPORTATION

STATE OF WISCONSIN
DEPARTMENT OF TRANSPORTATION

PREPARED BY

Surveyor	SW REGION
Designer	STEVEN PORTER, PE
Project Manager	BRAD SCHULTZ, PE
Regional Examiner	
Regional Supervisor	KARLA KNORR, PE

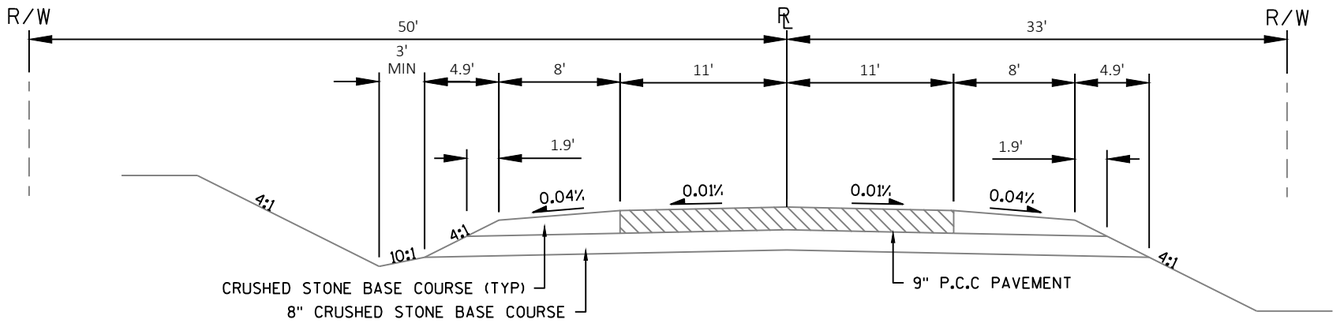
APPROVED FOR THE DEPARTMENT

DATE: _____ _____ (Signature)

E

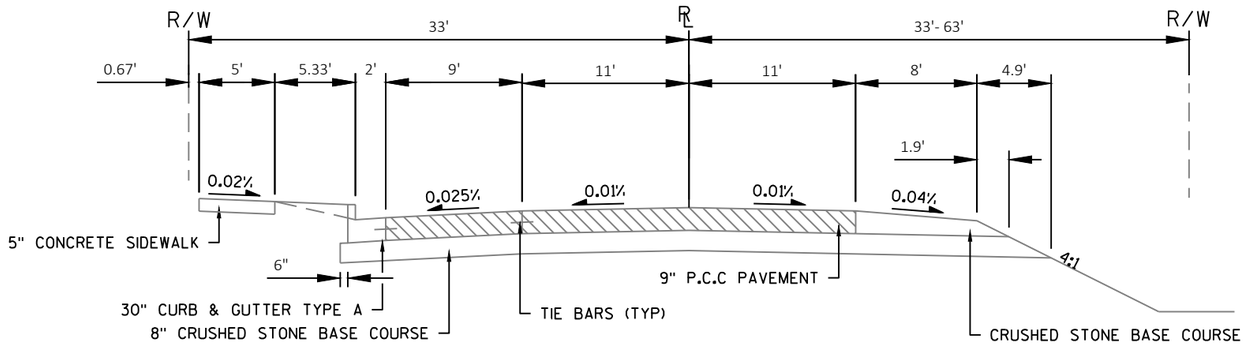
FILE NAME : N:\PDS\C3D\36700101\SHEETSPLAN\3670-01-01_NOBIKE\010101_TI.DWG PLOT DATE : 5/23/2019 9:42 AM PLOT BY : PORTER, STEVEN J PLOT NAME :

EXHIBIT 2, TYPICAL SECTIONS



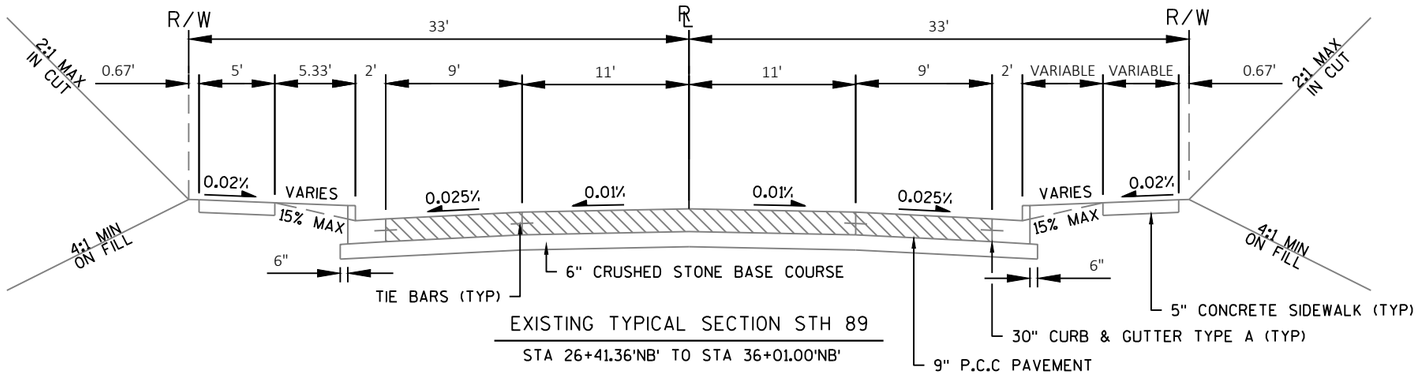
EXISTING TYPICAL SECTION STH 89

STA 2+75.60'NB' TO STA 21+98.59'NB'



EXISTING TYPICAL SECTION STH 89

STA 21+98.59'NB' TO STA 26+41.36'NB'



EXISTING TYPICAL SECTION STH 89

STA 26+41.36'NB' TO STA 36+01.00'NB'

PROJECT NO: 3670-01-71	HWY: STH 89	COUNTY: COLUMBIA	EXISTING TYPICAL SECTIONS	SHEET	E

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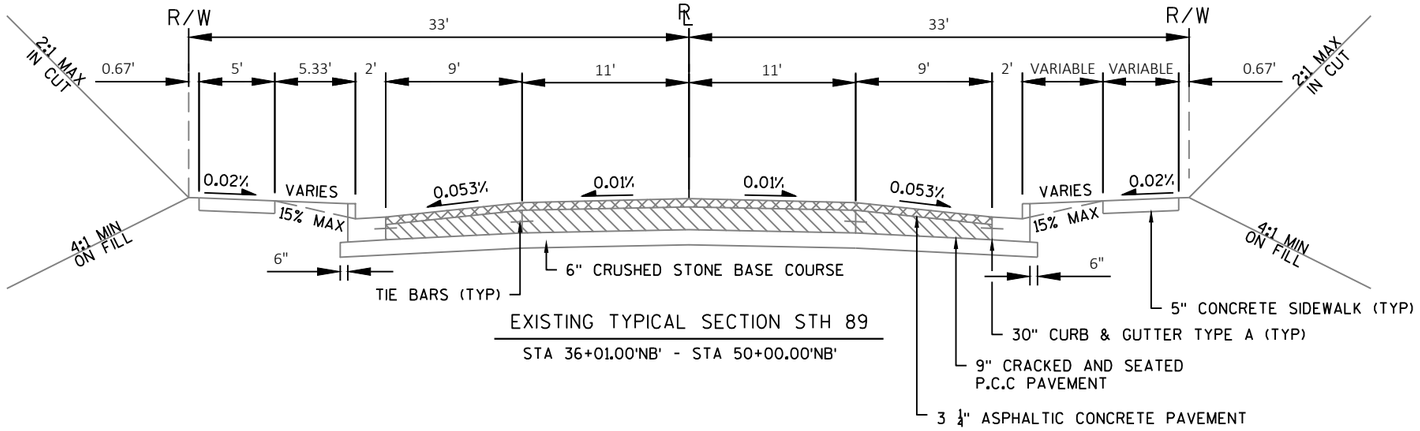
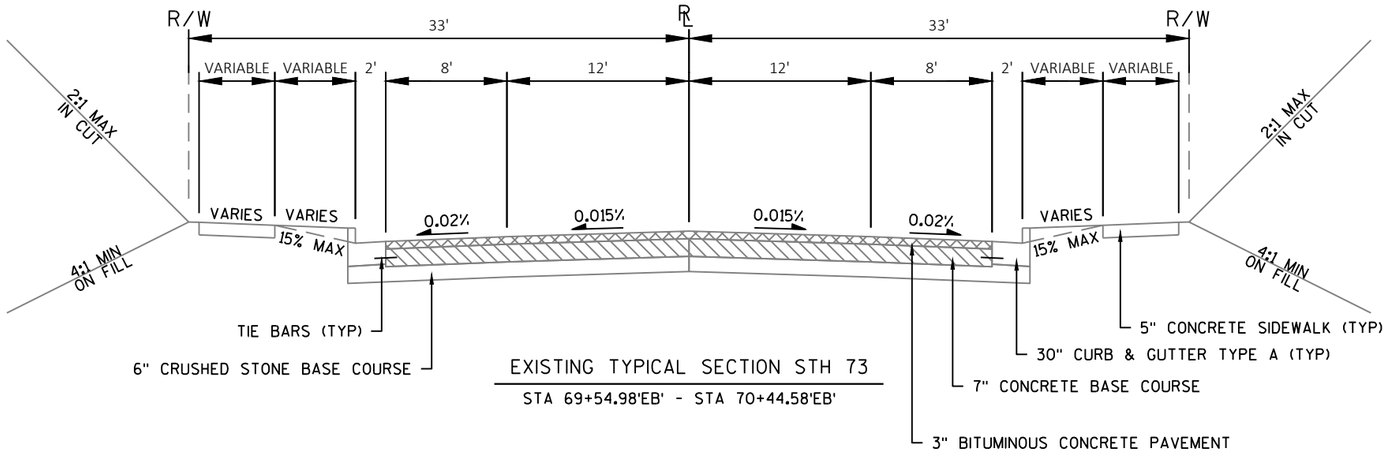
PLOT BY : PORTER, STEVEN J
PLOT NAME :
PLOT SCALE : 1 IN:10 FT
WISDOT/CADDS SHEET 42

2



EXISTING TYPICAL SECTION STH 89

STA 36+01.00'NB' - STA 50+00.00'NB'



EXISTING TYPICAL SECTION STH 73

STA 69+54.98'EB' - STA 70+44.58'EB'

PROJECT NO: 3670-01-71	HWY: STH 89	COUNTY: COLUMBIA	EXISTING TYPICAL SECTIONS	SHEET	E

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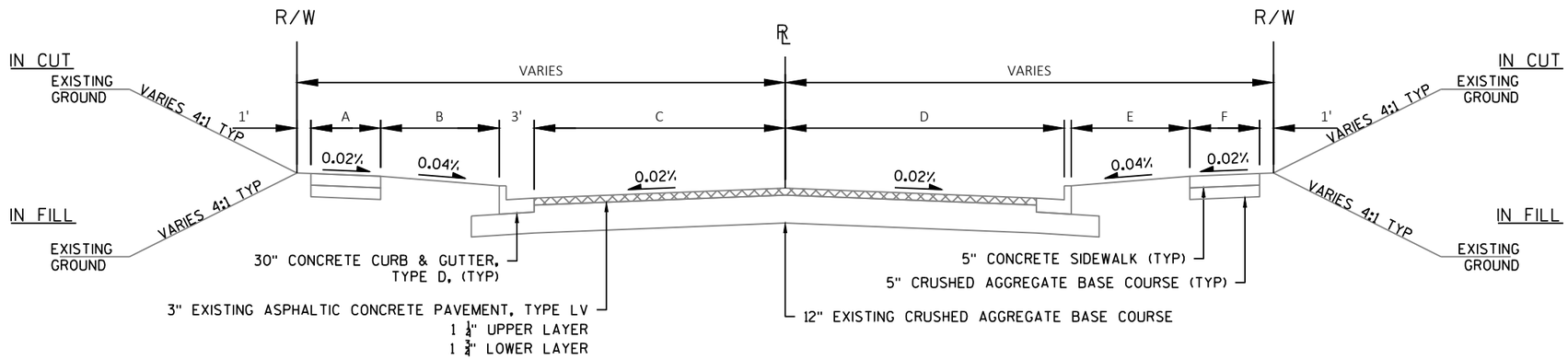
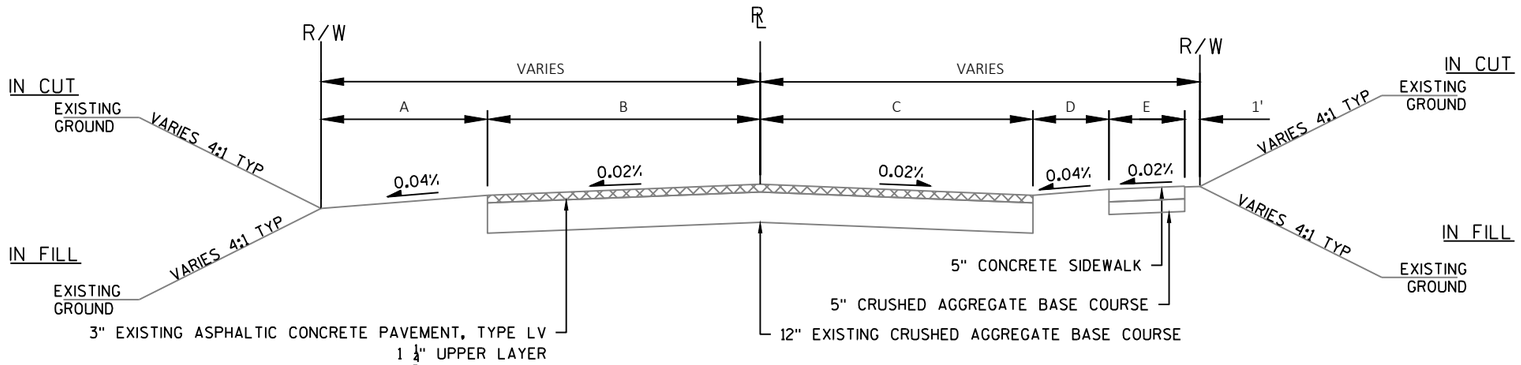


EXISTING TYPICAL SECTION SIDEROADS

(SEE TABLE)
AVALON ROAD
WATERLOO STREET
EAST FOLSOM STREET
EAST POET STREET

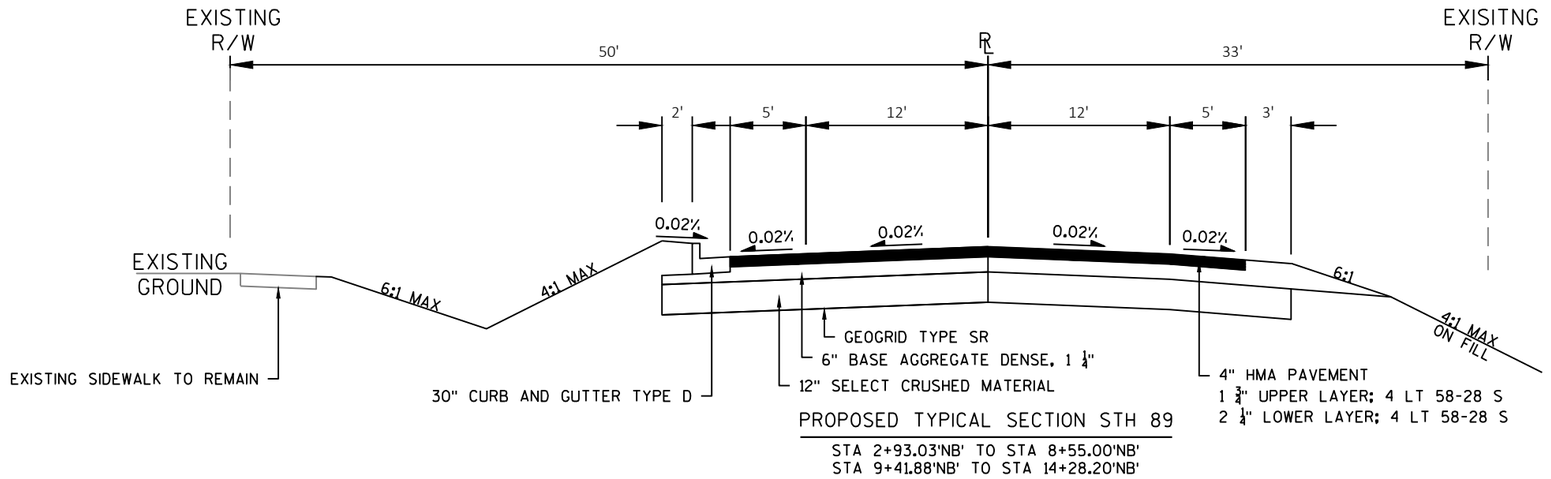


EXISTING TYPICAL SECTION SIDEROADS

(SEE TABLE)
FRONTAGE ROAD
WEST FOLSOM STREET
WEST POET STREET

SIDEROADS						
	A (FT)	B (FT)	C (FT)	D (FT)	E (FT)	F (FT)
AVALON ROAD	5.0	8.5	18.0	18.0	N/A	N/A
WATERLOO STREET	N/A	N/A	13.5	13.5	N/A	N/A
FRONTAGE ROAD	VARIES	10.5	10.5	N/A	N/A	N/A
FOLSOM STREET WEST	VARIES	15.0	15.0	3.0	4.0	N/A
FOLSOM STREET EAST	4.0	10.0	16.0	16.0	VARIES	N/A
POET STREET WEST	VARIES	10.0	10.0	3.0	4.0	N/A
POET STREET EAST	4.0	9.5	15.0	15.0	8.5	4.0

PROJECT NO: 3670-01-71	HWY: STH 89	COUNTY: COLUMBIA	EXISTING TYPICAL SECTIONS	SHEET	E

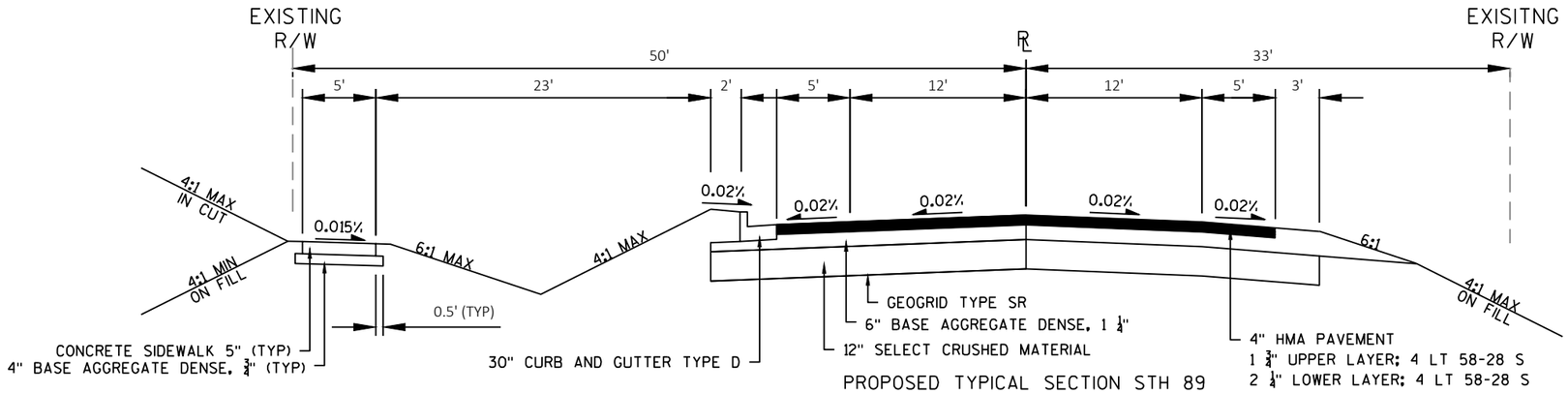


PROPOSED TYPICAL SECTION STH 89

STA 2+93.03'NB' TO STA 8+55.00'NB'
STA 9+41.88'NB' TO STA 14+28.20'NB'

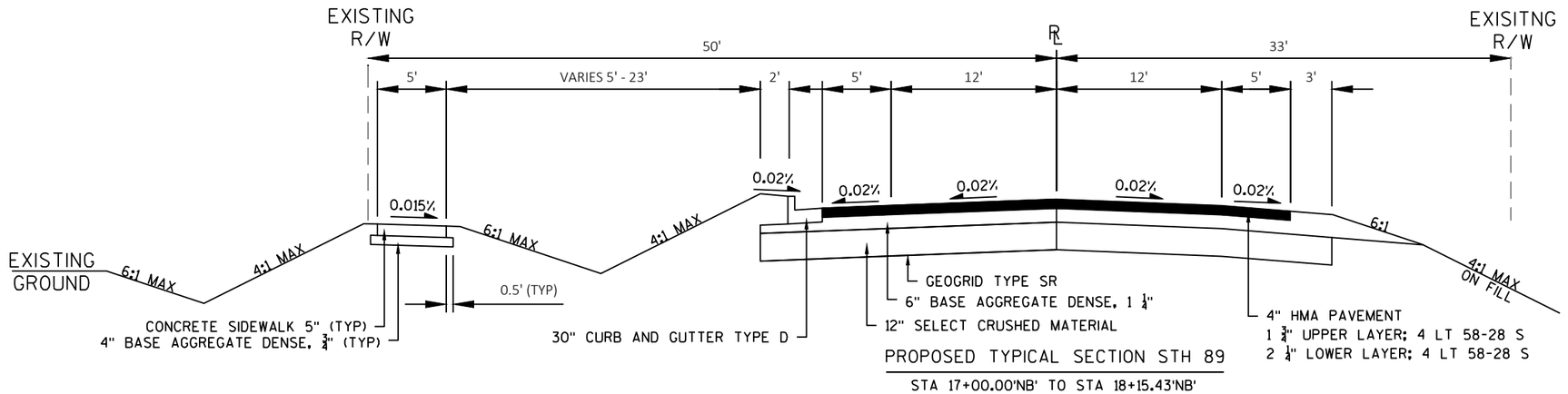
NOTES
STH 89 IS A DESIGNATED OVERSIZE OVERWEIGHT (OSOW) HIGH CLEARANCE ROUTE FOR TALL LOADS

ALL SECTIONS REQUIRE A 20 FOOT VERTICAL CLEARANCE



PROPOSED TYPICAL SECTION STH 89

STA 8+55.00'NB' TO STA 9+41.88'NB'
STA 14+28.20'NB' TO STA 17+00'NB'



PROPOSED TYPICAL SECTION STH 89

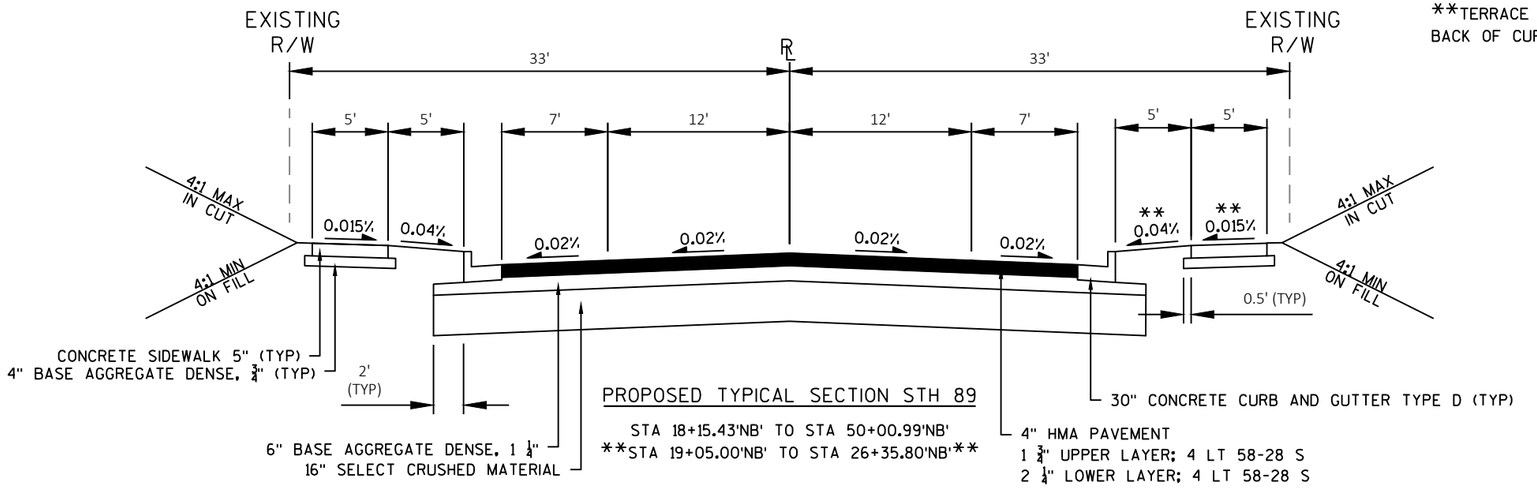
STA 17+00.00'NB' TO STA 18+15.43'NB'

PROJECT NO: 3670-01-71	HWY: STH 89	COUNTY: COLUMBIA	PROPOSED TYPICAL SECTIONS	SHEET	E

NOTES
STH 89 IS A DESIGNATED OVERSIZE OVERWEIGHT (OSOW) HIGH CLEARANCE ROUTE FOR TALL LOADS

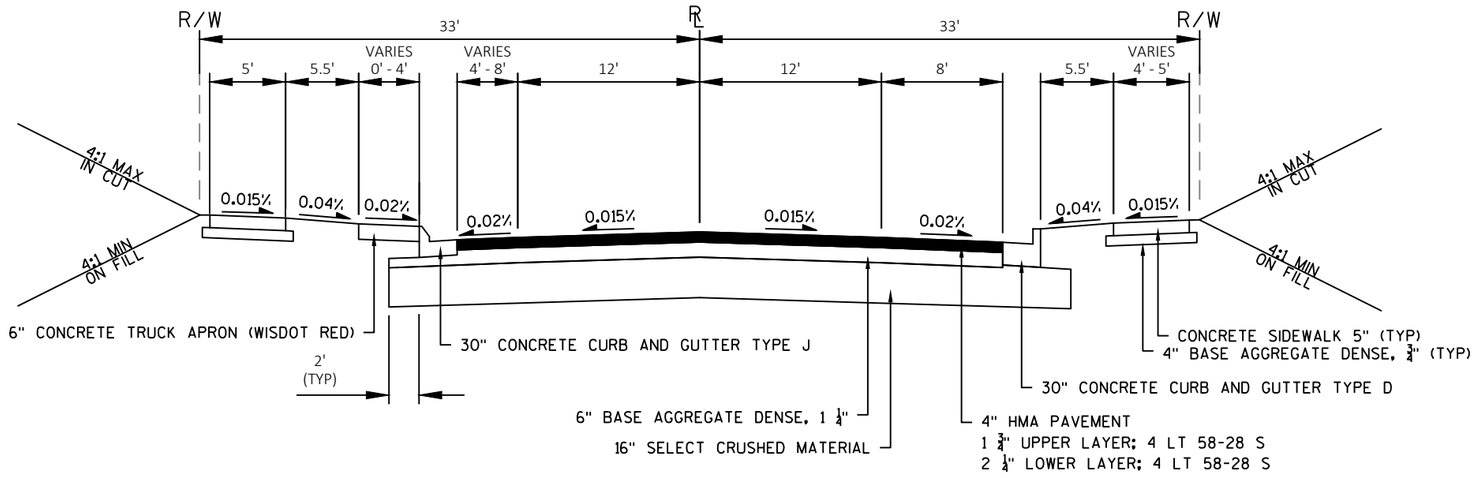
ALL SECTIONS REQUIRE A 20 FOOT VERTICAL CLEARANCE

TERRACE (4%) AND SIDEWALK (1.5%) SLOPE AWAY FROM THE BACK OF CURB



PROPOSED TYPICAL SECTION STH 89

STA 18+15.43'NB' TO STA 50+00.99'NB'
STA 19+05.00'NB' TO STA 26+35.80'NB'

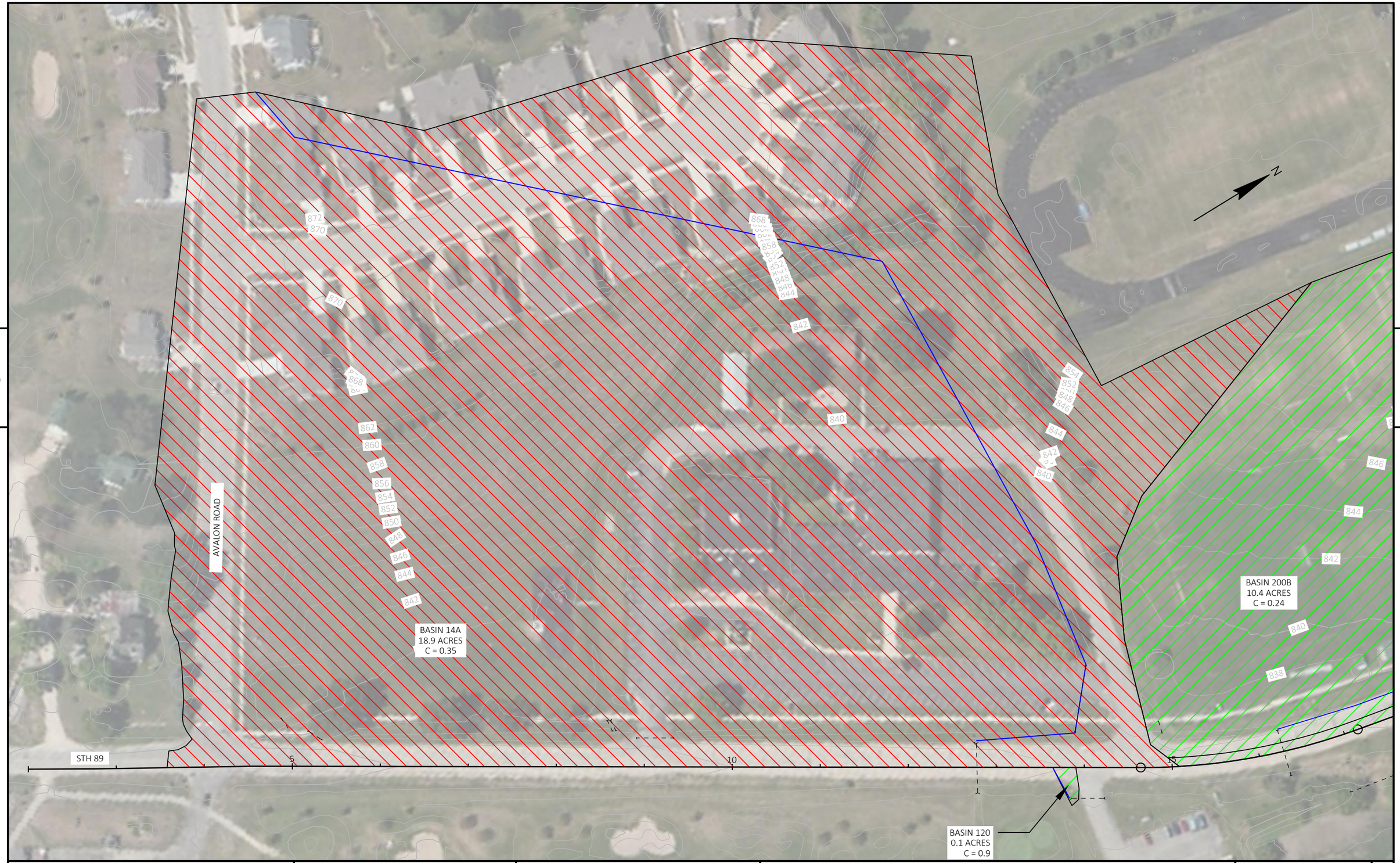


PROPOSED TYPICAL SECTION STH 73/PARK AVE

STA 69+54.98'EB' - STA 70+44.58'EB'

PROJECT NO: 3670-01-71	HWY: STH 89	COUNTY: COLUMBIA	PROPOSED TYPICAL SECTIONS	SHEET	E

EXHIBIT 3, EXISTING BASIN HYDROLOGY



PROJECT NO: 3670-01-01	HWY: WIS 89	COUNTY: COLUMBIA	PROPOSED DRAINAGE AREAS	SHEET	E

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LAYOUT NAME - Plan 1 IN 100 FT

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PROJECT NO: 3670-01-01	HWY: WIS 89	COUNTY: COLUMBIA	PROPOSED DRAINAGE AREAS	SHEET	E

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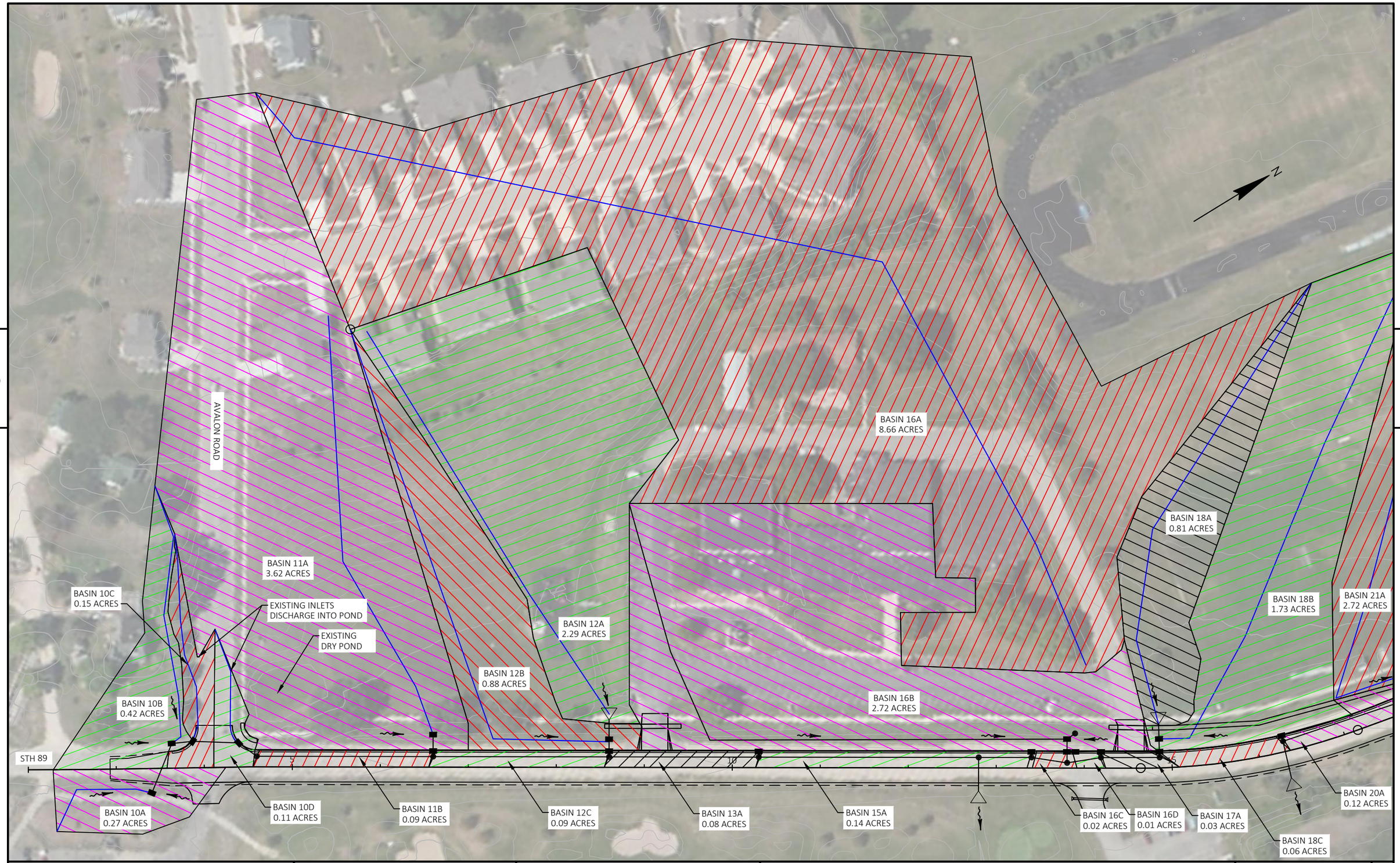
PLOT DATE : 5/24/2019 11:38 AM PLOT BY : PORTER, STEVEN J PLOT NAME : PLOT SCALE : 1 IN:100 FT

WISDOT/CADDS SHEET 44

EXHIBIT 4, PROPOSED BASIN HYDROLOGY



PROJECT NO: 3670-01-01	HWY: WIS 89	COUNTY: COLUMBIA	PROPOSED DRAINAGE AREAS	SHEET E

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LAYOUT NAME - Plan 1 IN 100 FT

PLOT DATE : 5/24/2019 11:43 AM PLOT BY : PORTER, STEVEN J PLOT NAME : PLOT SCALE : 1 IN:100 FT

5

5

PROJECT NO: 3670-01-01	HWY: WIS 89	COUNTY: COLUMBIA	PROPOSED DRAINAGE AREAS	SHEET	E

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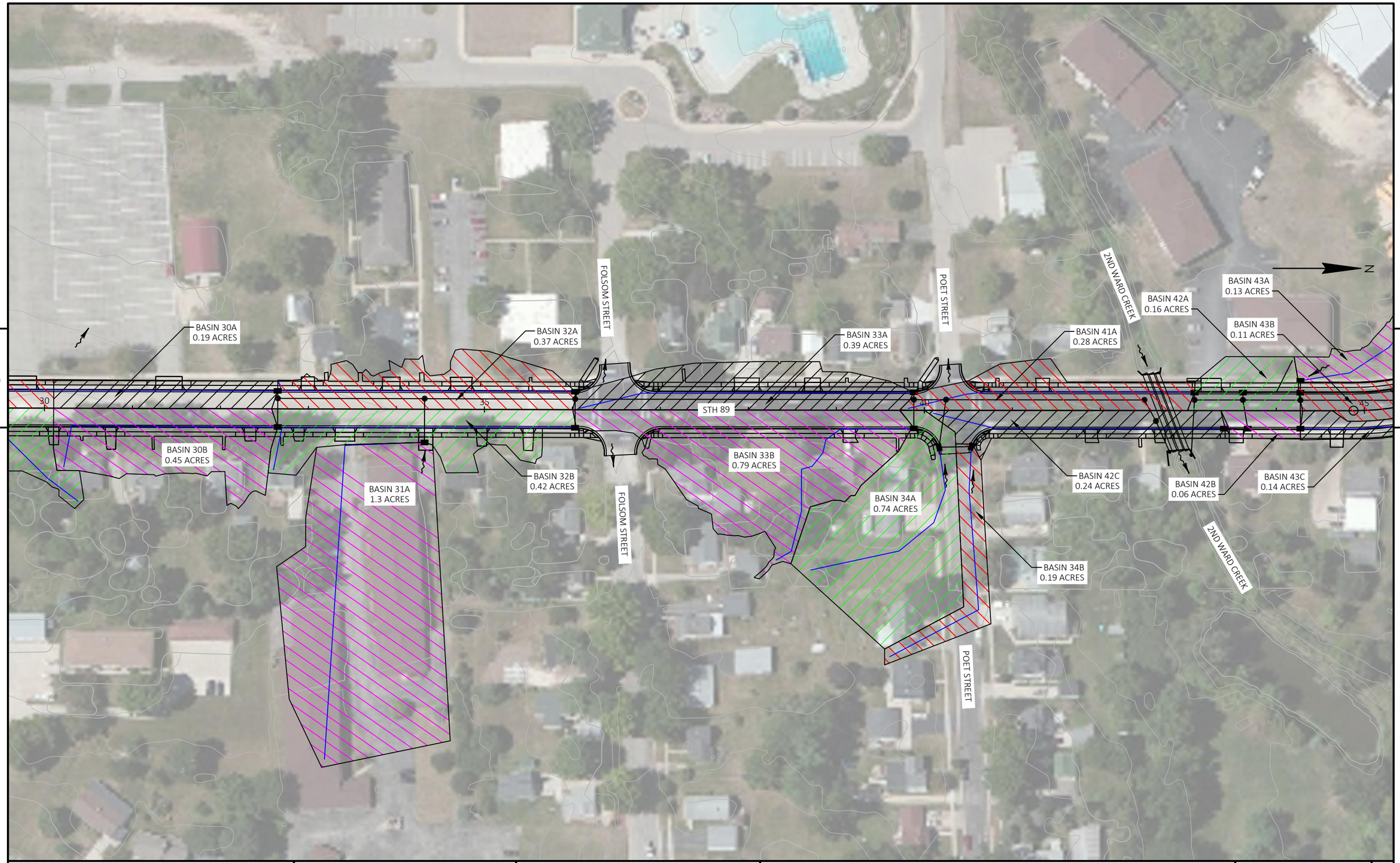
LAYOUT NAME - Layout2-Plan 1 IN 100 FT

PLOT DATE : 5/24/2019 11:43 AM PLOT BY : PORTER, STEVEN J PLOT NAME : PLOT SCALE : 1 IN:100 FT

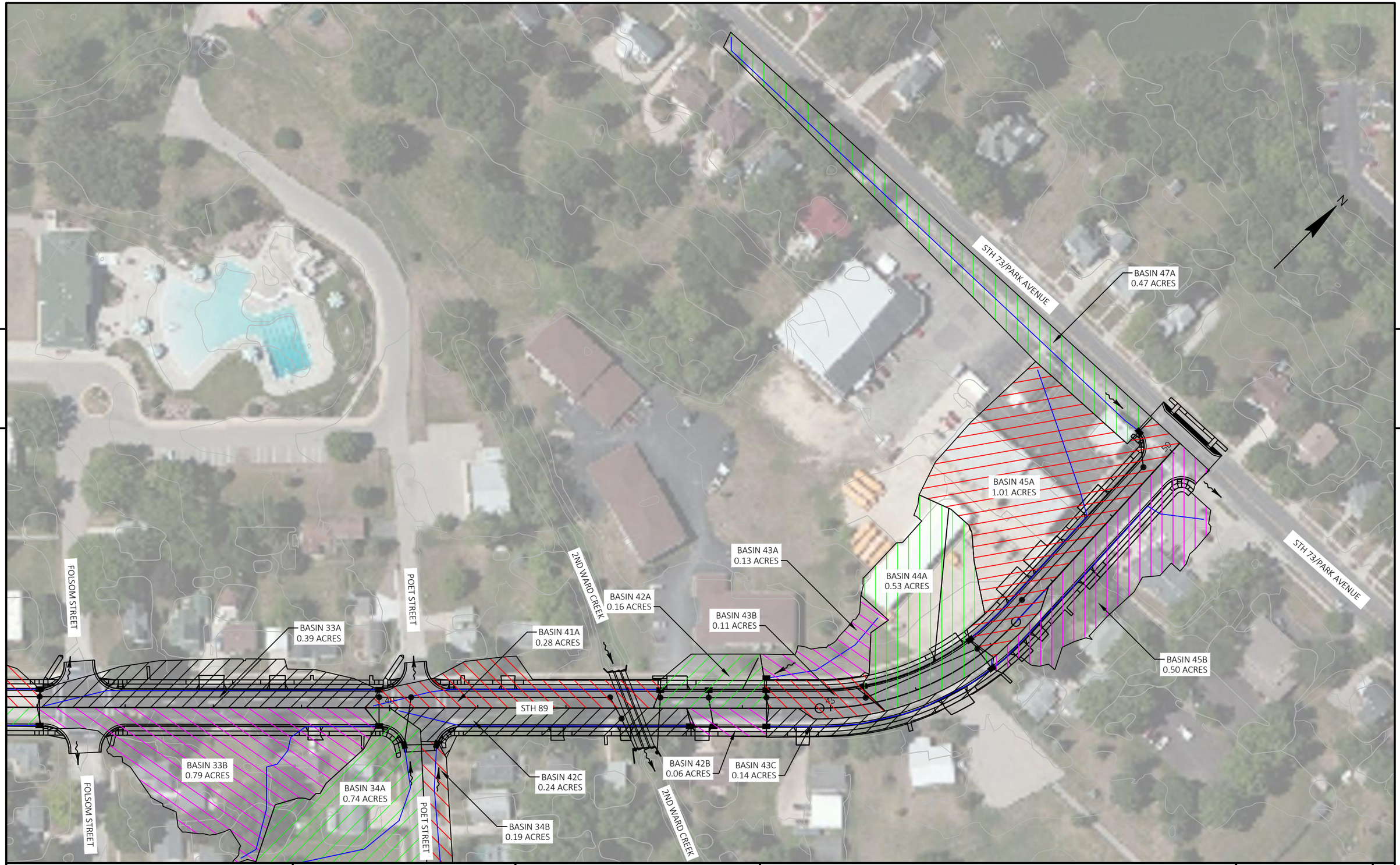


PROJECT NO: 3670-01-01	HWY: WIS 89	COUNTY: COLUMBIA	PROPOSED DRAINAGE AREAS	SHEET	E

FILE NAME : N:\PDS\C3D\36700101\SHEETSOTHER\2018\PROPOSED DRAINAGE AREAS.DWG
LAYOUT NAME - Layout2-Plan 1 IN 100 FT (2)

PLOT DATE : 5/24/2019 11:43 AM PLOT BY : PORTER, STEVEN J PLOT NAME : PLOT SCALE : 1 IN:100 FT

WISDOT/CADDS SHEET 44



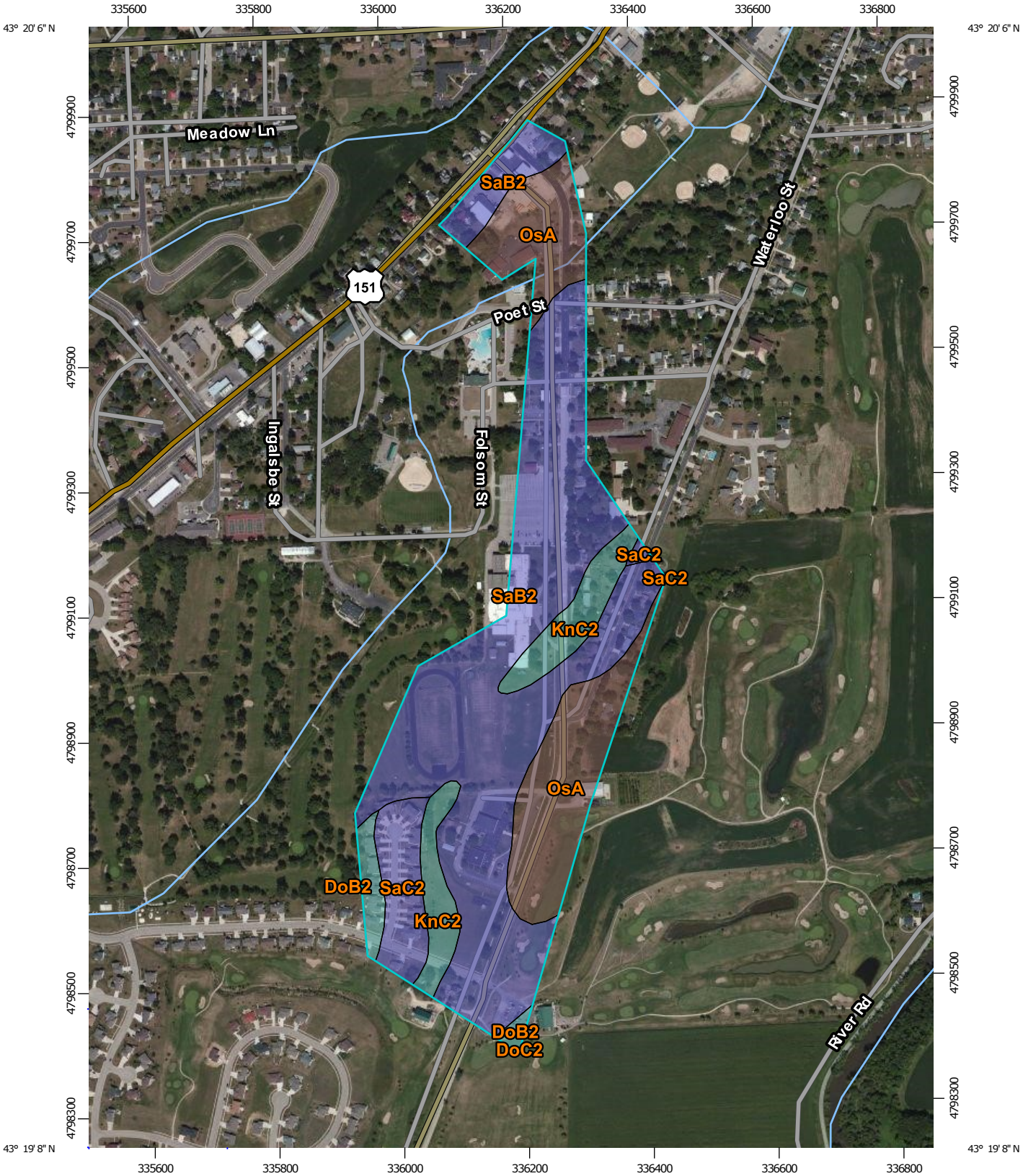
PROJECT NO: 3670-01-01	HWY: WIS 89	COUNTY: COLUMBIA	PROPOSED DRAINAGE AREAS	SHEET	E

FILE NAME : N:\PDS\C3D\36700101\SHEETSOTHER\2018\PROPOSED DRAINAGE AREAS.DWG
LAYOUT NAME - Layout2-Plan 1 IN 100 FT (3)

PLOT DATE : 5/24/2019 11:43 AM PLOT BY : PORTER, STEVEN J PLOT NAME : PLOT SCALE : 1 IN:100 FT

EXHIBIT 5, HYDRAULIC SOIL DATA

Hydrologic Soil Group—Columbia County, Wisconsin
(STH 89 Soil Group Data)



Map Scale: 1:8,720 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 400 800 1600 2400

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Columbia County, Wisconsin
Survey Area Data: Version 12, Sep 17, 2015

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

Date(s) aerial images were photographed: Apr 29, 2011—Sep 10, 2011

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

Hydrologic Soil Group— Summary by Map Unit — Columbia County, Wisconsin (WI021)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
DoB2	Dodge silt loam, 2 to 6 percent slopes, eroded	C	2.1	2.6%
DoC2	Dodge silt loam, 6 to 12 percent slopes, eroded	C	0.0	0.0%
KnC2	Knowles silt loam, 6 to 12 percent slopes, eroded	C	7.2	9.1%
OsA	Ossian silt loam, 0 to 3 percent slopes	B/D	17.5	22.0%
SaB2	St. Charles silt loam, 2 to 6 percent slopes, eroded	B	47.5	59.8%
SaC2	St. Charles silt loam, 6 to 12 percent slopes, eroded	B	5.1	6.4%
Totals for Area of Interest			**79.4**	**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 6, RAINFALL INTENSITY CURVE (IDF CURVE)

Columbia County Rainfall Intensity-Duration-Frequency- NOAA Atlas 14, Volume 8

	Duration (min)									
RI (yr)	5	10	15	30	60	120	180	360	720	1440
1-yr	4.32	3.18	2.56	1.80	1.15	0.70	0.51	0.30	0.18	0.10
2-yr	4.92	3.60	2.92	2.04	1.32	0.81	0.60	0.35	0.20	0.12
5-yr	6.00	4.38	3.56	2.50	1.63	1.01	0.75	0.44	0.25	0.14
10-yr	6.96	5.10	4.12	2.88	1.91	1.19	0.89	0.52	0.29	0.17
25-yr	8.28	6.06	4.96	3.46	2.31	1.45	1.09	0.64	0.36	0.20
50-yr	9.48	6.90	5.60	3.94	2.65	1.67	1.27	0.75	0.42	0.24
100-yr	10.56	7.74	6.32	4.42	3.00	1.90	1.45	0.86	0.48	0.27

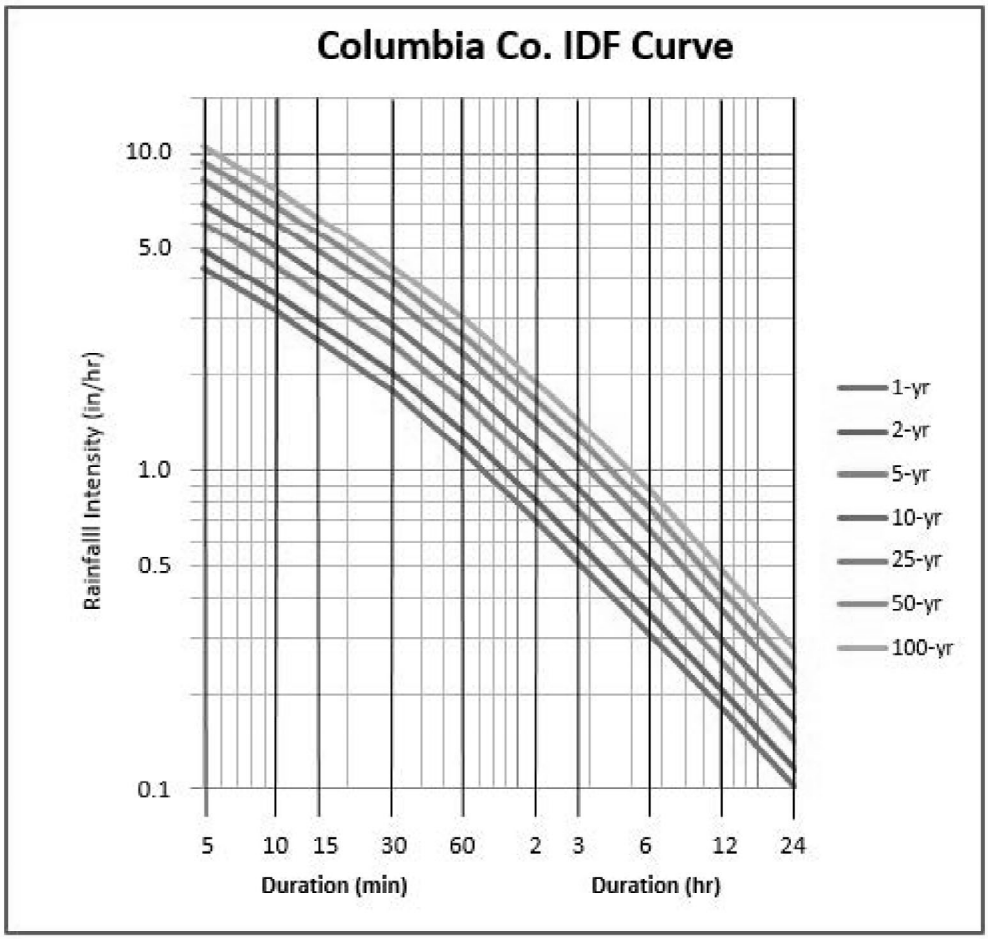


EXHIBIT 7, 2ND WARD CREEK ANALYSIS

STATE HIGHWAY 89
HYDRAULIC ANALYSIS REPORT

2nd WARD CREEK CROSSING AT STH 89
CITY OF COLUMBUS
COLUMBIA COUNTY

PROJECT ID: 3670-01-01

APRIL 17, 2017

PREPARED FOR:

WISCONSIN DEPARTMENT OF TRANSPORTATION

STH 89 2nd Ward Creek Crossing

PREPARED BY:

Stormwater Solutions Engineering, LLC
247 Freshwater Way, Suite 410
Milwaukee, WI 53204
414-810-1245

www.stormwater-solutions-engineering.com

STORMWATER SOLUTIONS ENGINEERING LLC

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3.3 Structure Selection and Sizing 9
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1 INTRODUCTION

1.1 Introduction and Purpose

Stormwater Solutions Engineering, LLC (SSE) has been contracted by the Wisconsin Department of Transportation (WisDOT), as a sub-consultant to EMCS, Inc., to provide hydraulic analysis for the design of the stream crossing of 2nd Ward Creek at STH 89 in the City of Columbus, Columbia County, Wisconsin.

The Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for 2nd Ward Creek was updated in May 2016, which included an updated hydrologic analysis of the 10-, 25-, 50, 100-, and 500-year annual recurrence intervals (ARI). SSE reviewed the hydrology calculations, calibration with past flood elevations, and confirmed the accuracy of the model at the 2nd Ward Creek Crossing. The existing FEMA model was updated to include surveyed cross sections near the crossing, and included 2- and 5-year ARI to model the existing and proposed STH 89 culvert crossing for low flow events and for sizing a temporary diversion during construction.

The project's 1,664 acre watershed is located in the Lower Crawfish River priority watershed, per the Wisconsin Department of Natural Resources (WDNR) Surface Water Data Viewer (SWDV).

1.2 Location

The 1.93 mile long 2nd Ward Creek enters the City of Columbus, running southwest to northeast between Park Avenue and STH 89. The Creek turns north at Kestrel Ridge Golf Club, and then is buried in an underground culvert beneath the majority of the City of Columbus Fireman's Park. 2nd Ward Creek daylights again, approximately 425 feet southwest of the STH 89 creek crossing, and continues for approximately 1,415 feet to the confluence of the 2nd Ward Creek tributary. The creek continues for an additional 2,726 feet to the Columbus Mill Pond and the confluence of the Lower Crawfish River on the northeast side of the City of Columbus. 2nd Ward Creek falls within the highway improvement project along STH 89.

1.3 Available Data

The information presented in this report is based upon available information and/or procedures found in the following publications or sources:

i. WisDOT "Facilities Development Manual," Chapter 13, Drainage.
ii. WDNR "Upper Crawfish River Hydrologic Model", Revised 6/6/12.
iii. NOAA National Weather Service Precipitation Frequency Data Server (PFDS) for data in Columbus, WI.
iv. HEC-RAS v. 5.0.1 Hydraulic Reference Manual, U.S. Army Corps of Engineers, February 2016.
v. Columbia County Topographic Data from Columbia County GIS Map Server.
vi. FEMA Flood Insurance Study for Columbia County, WI and Incorporated Areas (55021CV001C), revised 5/16/2016.
vii. Updated Flood HEC-RAS Flood Model, revised 5/16/16.
viii. Surveyed cross sections at STH 89 crossing, provided by EMCS, Inc.

1.4 Existing Drainage Area

The total area contributing runoff to 2nd Ward Creek at STH 89 (approximately 0.2 miles upstream of the confluence with the 2nd Ward Creek Tributary) is 2.6 square miles (1,664 acres). Land use outside of the City of Columbus, and within the watershed, is predominantly agricultural. Land use within the City is predominantly residential. The 2.6 square miles of contributing watershed drains to 2nd Ward Creek through a series of underground culverts, and eventually three 48-inch corrugated metal pipe (CMP) circular culverts beneath STH 89. The CMP culverts have a total barrel length of 95 feet (Figure 1.1).

Figure 1.1 Upstream view of existing STH 89 crossing at 2nd Ward Creek

2 MAGNITUDE AND FREQUENCY OF FLOODS

2.1 Hydrologic Analysis

2.1.1 Existing Hydrology

A detailed hydrologic analysis of the Upper Crawfish River Watershed, including 2nd Ward Creek, was published in 2012. TR-55 analysis was used in HEC-HMS to estimate peak flows in three sub-basins contributing to 2nd Ward Creek at STH 89. Average curve numbers associated with each sub-basin are provided in Table 2.1.

The model used a WDNR-developed dimensionless rainfall distribution curve, based on observed large storms in the State of Wisconsin. Critical storm duration for the 2nd Ward Creek was calculated to be 12 hours. Rainfall depths were obtained from the TP-40/49 rainfall

frequency atlas, and were extracted at each sub-basin for the 10%, 4%, 2%, 1%, and 0.2% flood frequency.

Table 2.1 Sub-basin input from DNR HEC-HMS Hydrologic Model

Sub-Basin Name	Location	Area (sq mi)	CN
W2120	Directly upstream of STH 73	0.654	73.989
W2100	Directly upstream of USH 151	1.347	76.604
W2060	Directly upstream of STH 89	0.580	76.930

2.1.2 Additional Hydrologic Analysis

SSE provided additional hydrologic analysis to ensure low flow and temporary flow capacities for the proposed culvert installation and ultimate performance. Precipitation depths from the NOAA PFDS for the 2- and 5-yr, 12-hour storm events were run in the existing WDNR HEC-HMS model. A summary of the final hydrologic results for the 2.6 square miles watershed are presented in Table 2.2.

Table 2.2 Summary of hydrologic results for the STH 89 crossing of 2nd Ward Creek

Recurrence Interval	Associated Precipitation Depth (in)	Modelled Peak Flow (cfs)[2]
2 Years	2.41[1]	190
5 Years	2.93[1]	300
10 Years	3.50	430
25 Years	4.00	560
50 Years	4.40	660
100 Years	5.04	840

[1] Depths from NOAA PFDS 12-hr storm duration
[2] Flows taken at UserPoint3 (STH 89 crossing of 2nd Ward Creek) in HEC-HMS model

3 HYDRAULIC ANALYSIS

STH 89 crosses 2nd Ward Creek approximately 0.2 miles upstream of its confluence with 2nd Ward Creek Tributary, and approximately 0.52 miles upstream of its confluence with the Columbus Mill Pond and the Lower Crawfish River (Figure 3.1). A FEMA FIS and a HEC-RAS hydraulic model were updated in May 2016 for this portion of the Creek. Results from this hydraulic model were compared with flood elevation recorded by the City of Columbus over the past 30 years. Modeled flood elevations along 2nd Ward Creek were within 0.5 feet of observed 2008 flood elevations (considered the 100-year storm event). Modeled elevations were within 0.3 feet of the observed 2008 flood elevation at the STH 89 crossing. The existing model was used as the effective model for the STH 89 hydraulic analysis.

Flood modeling of the existing and proposed 2nd Ward Creek conditions were performed in HEC-RAS 5.0.1, using the existing FIS flows for 10-year and greater ARIs. 2- and 5-yr ARI flows from Table 2.2 were added to the corrected effective model to evaluate culvert performance during low flow events. Cross section geometry data was updated near the STH 89 crossing, per a survey perfromed by EMCS, Inc. in November 2016.

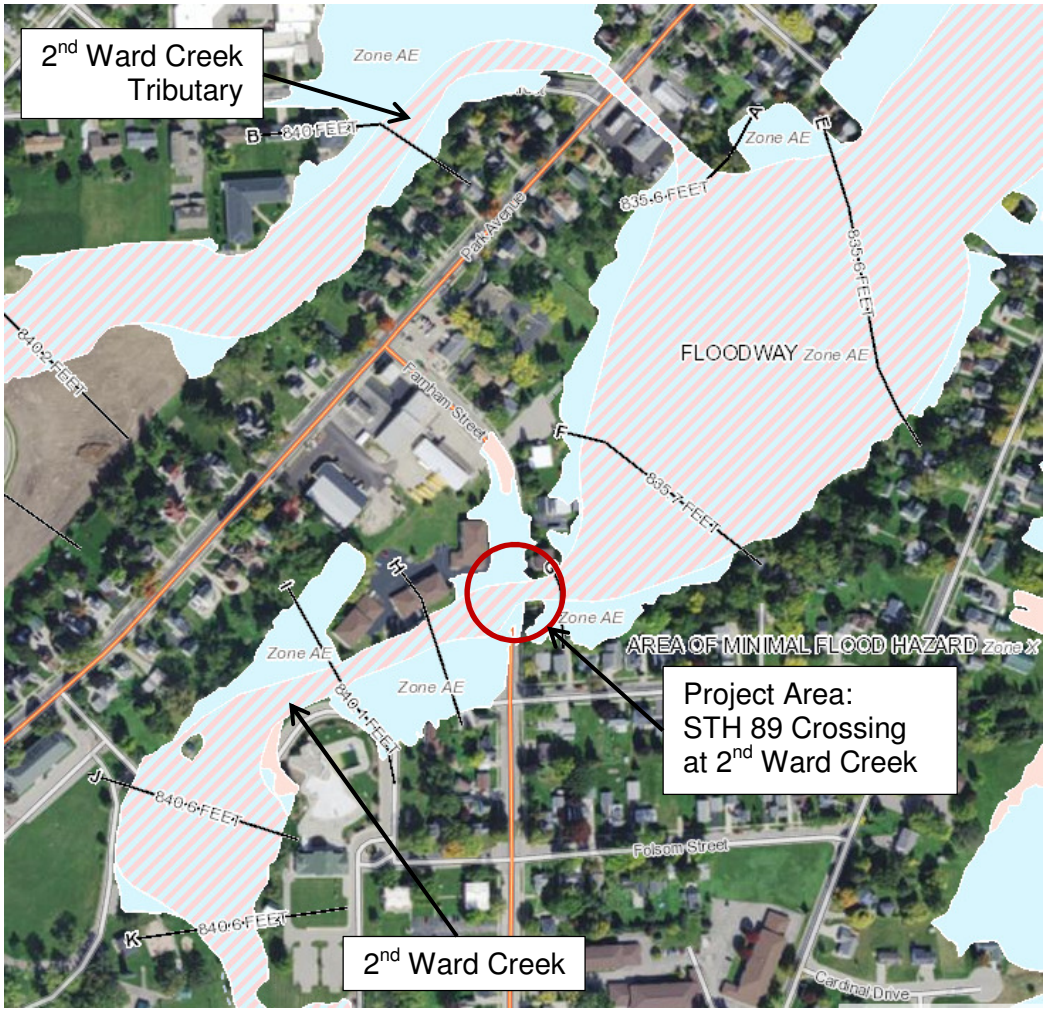


Figure 3.1 FEMA regulatory flood hazard area (per Wisconsin DNR SWDV)

3.1 Geometric Data

Effective FEMA HEC-RAS geometric data was updated for the existing and proposed model, based on a survey of several cross sections near the STH 89 culvert. Elevation data was taken at the existing culvert face, 15 feet, and 30 feet, up- and downstream of the culvert, within 30 feet on both sides of the thalweg. Additional point data was taken for roadway construction purposes. Cross sections at the face of the culverts were updated based on the survey data, and cross sections were added at stations 3755 and 3806.2 upstream of the culvert, and station 3610.1 downstream of the culvert (Figure 3.2). The floodplain at the added cross-sections was extrapolated using Columbia County GIS interactive mapping topographic data. Elevations and dimensions were also taken for the existing STH 89 culverts. Table 3.1 describes the existing STH 89 culvert system in more detail, with Culvert 1 being the south-most culvert. Note that

invert elevations were updated from the FEMA effective model based on the survey performed by EMCS, Inc. in November 2016. Manning's n values for the channel and floodplain at the added cross sections were consistent with effective model up- and downstream cross sections, and confirmed by aerial imagery to determine consistent land use. The updated model was considered the corrected effective model, and was used to establish baseline (existing) conditions and evaluate proposed conditions.

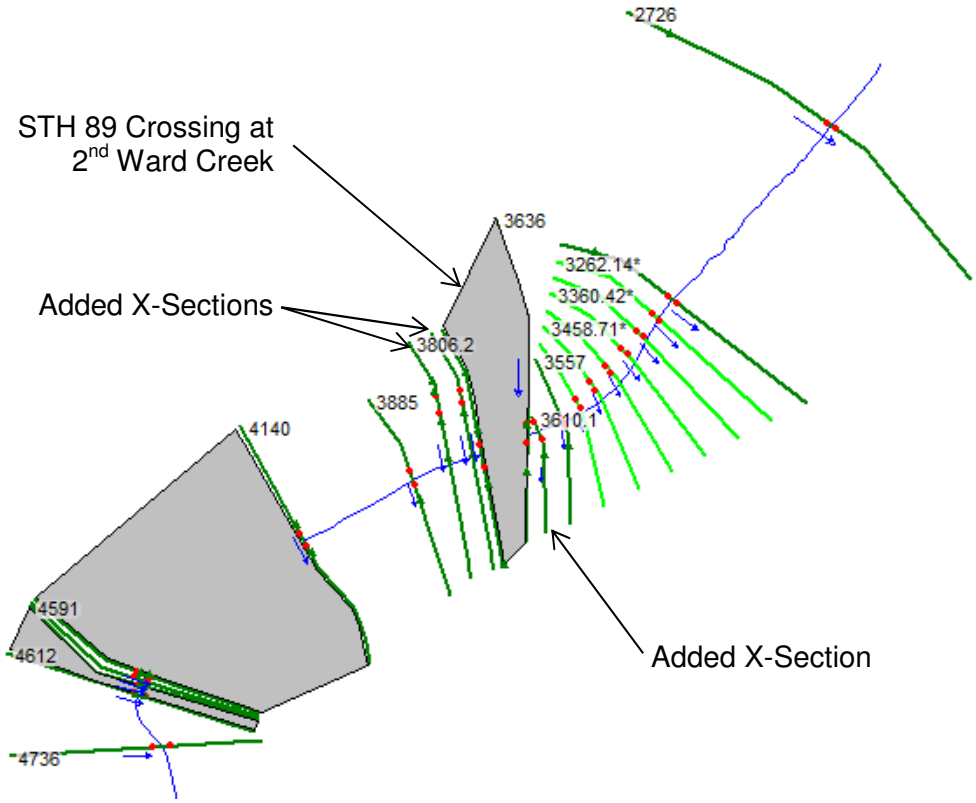


Figure 3.2 Corrected effective model at STH 89 crossing

Table 3.1 Summary of existing culverts

	Culvert 1	**Culvert 2**	**Culvert 3**
Pipe Size	48-inch, Circular		
Pipe Material	Corrugated Metal		
Barrel Length	95 feet		
Inlet Invert	832.29	832.18	832.14
Outlet Invert	831.04	831.58	831.78
U.S. High Chord Elevation	837.47		
D.S. High Chord Elevation	837.47		

Proposed changes to the STH 89 crossing over 2nd Ward Creek include

i. Repairing the road surface
ii. Raising the road elevation to ensure no overtopping during the 25-yr event

The new culvert system to be installed at the STH 89 2nd Ward Creek crossing was designed to fully convey the 25-year storm event, per WisDOT drainage requirements for STH with average traffic density (ADT) under 1,500. Note that STH 89 has an ADT of 990 (Figure 3.3) based on the most updated values, per WisDOT monitoring. The culvert configuration was then checked to ensure no additional backwater (<0.01 foot) during the 1% Annual Chance Flood Discharge, per NR 116.03(28). Due to nearby driveways and structures, final STH 89 grade is restricted to an elevation of 838 ft, or 8.65 feet above stream bed. The proposed STH 89 culvert configuration consists of two 66-inchby 51-inch smooth core corrugated metal pipe arches (Manning's n of 0.12, as specified by Contech Engineered Solutions, Spec sheets found in Attachment 2) 90 feet long, at a longitudinal slope of 2% along the centerline of the existing culverts (Table 3.2). An additional 53-inch by 41-inch smooth core corrugated metal pipe arch 90 feet long, at a longitudinal slope of 1.5% will also be installed in the channel to help convey larger flows. Pipe inlets will have a corrugated metal mitered multiple inlet end section, as recommended by the manufacturer. The entire culvert configuration is less than 20 feet wide, meeting the criteria of a drainage culvert.

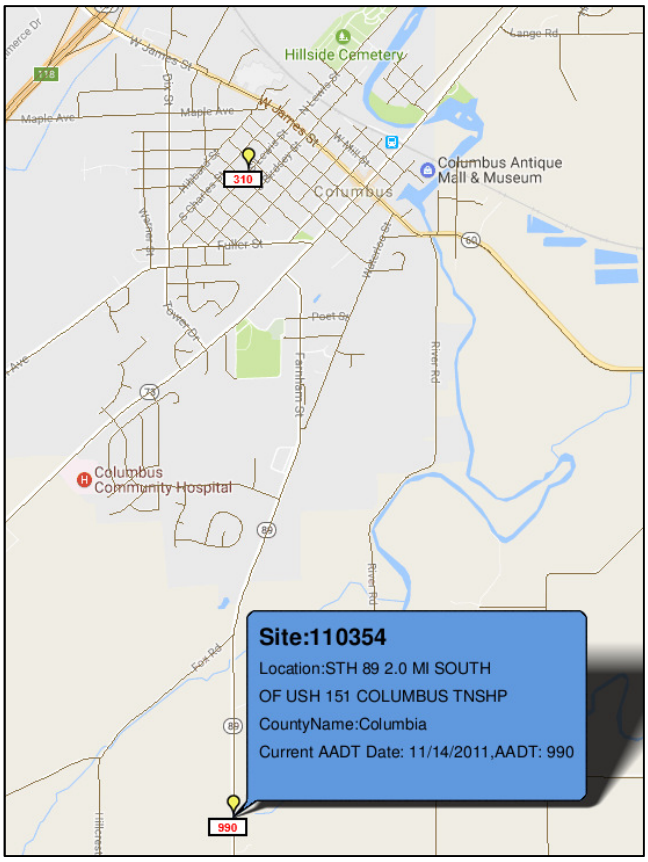


Figure 3.3 WisDOT traffic count data for STH 89 entering Columbus

Table 3.2 Summary of proposed culverts

	Culvert 1	Culvert 2	Culvert 3
Pipe Size	66-in x 51-in pipe arch	66-in x 51-in pipe arch	53-in x 41-in pipe arch
Pipe Material	Smooth Core, Corrugated Metal		
Barrel Length	95 feet		
Inlet Invert	830.85	830.85	831.60
Outlet Invert	829.00	829.00	830.00
U.S. High Chord Elevation	Over Culvert = 837.48, Min = 837.20		
D.S. High Chord Elevation	Over Culvert = 837.48, Min = 837.20		

3.2 Steady Flow Data

Hydrology data described in Section 2 were used to model existing and proposed steady subcritical flow regime analysis.

3.3 Structure Selection and Sizing

Several culvert iterations were used to minimize road grade increase, meet drainage culvert criteria (i.e. less than 20 feet wide, including space between culverts and not a box culvert), and contain the 25-yr flow without overtopping STH 89. The proposed culverts will be spaced a WisDOT minimum of 18 inches apart, resulting in a total culvert configuration width of 19.9 feet. Engineering oversight during construction will need to include carefully measuring placement distance, to ensure the culvert configuration does not exceed 20 feet wide. The 25-yr water surface elevation (WSE) is reduced to 837.13 feet, or 0.09 feet higher than the low point in the existing road profile. Given the recommended manufacturer cover, the minimal final road grade over the culverts is 837.43. The proposed roadway profile has been adjusted to ensure recommended minimum cover over the culvert, and to eliminate overtopping during the 25-year storm. In addition to fully conveying the 25-yr event, the proposed culvert configuration does not negatively impact the upstream or downstream properties outside of the WisDOT right of way (ROW), in regards to FEMA base flood elevations (Table 3.3).

The proposed culverts are also designed to allow for safe fish passage in the creek. The existing culverts were perched, making fish passage difficult. The larger two proposed culverts will be buried six inches below the stream bed.. UW-Extension and WDNR recommend that for safe Northern Pike passage through a culvert longer than 30 feet, velocities should remain less than 3 feet per second during swimmable storm events. Velocities in the proposed culvert are modeled as 1.67 feet per second during the 2-year storm (Table 3.4).

Table 3.3 Summary of water surface elevations and channel velocities for the 25% and 1% Annual Chance Flood Discharge under existing and proposed conditions.

River Station	Description	25-Year Water Surface Elevation (ft)			100-Year Water Surface Elevation (ft)		
		Existing	Proposed	Δ Elev	Existing	Proposed	Δ Elev
4140		839.11	838.82	-0.29	839.6	839.54	-0.06
3885		838.84	838.26	-0.58	839.26	839.15	-0.11
3806.2	Surveyed X-section	838.56	837.39	-1.17	838.94	838.48	-0.46
3755.65	Surved X-section	838.47	837.1	-1.37	838.79	838.16	-0.63
3735	Existing X-section, updated based on survey	838.47	837.13	-1.34	838.8	838.2	-0.6
3677	STH 89/2nd Ward Creek culvert crossing						
3636	Existing X-section, updated based on survey	836.4	836.46	0.06	836.86	836.94	0.08
3610.1	Surveyed X-section	836.3	836.3	0	836.78	836.77	-0.01
3557		835.64	835.64	0	836.2	836.2	0

Table 3.4 Summary of hydraulic conditions during the 2-, 5-, and 100-yr storms for the existing and proposed culverts.

	Existing	**Proposed**
Drainage Area (sq. mi.)	2.6	2.6
Design 100-yr Discharge (cfs)	840	840
Design 100-yr High Water (ft)[1]	838.80	838.20
Flow through Culvert (cfs)	78.6	478
Velocity through Culvert (cfs)[2]	6.25	6.27
Waterway Open Area (sq. ft.)	401	114
Flow over Roadway (cfs)	604	118
Overflow Frequency (yr)	2	50
Design 5-yr Discharge (cfs)	300	300
Design 5-yr High Water (ft)[1]	837.96	836.25
Design 5-yr Velocity (fps)[2]	6.05	2.63
Waterway Open Area (sq. ft.)	119	122
Design 2-yr Discharge (cfs)	190	190
Design 2-yr High Water (ft)[1]	837.26	836.02
Design 2-yr Velocity (fps)[2]	5.01	1.67

[1] Measured at cross section located at upstream face of culvert
[2] Measured in upstream portion of culvert

3.4 Summary

The hydraulic model can be found in Attachment 1. Overall, the proposed culvert meets FEMA, DNR, and WisDOT requirements, by fully conveying the 25-year storm event, while keeping FEMA base flood elevations at or below the corrected effective model outside of WisDOT ROW.

4 ATTACHMENTS

1. HEC-RAS Hydraulic Model (electronic)
2. Contech Engineered Solutions, Pipe Arch Spec Sheets

ATTACHMENT 1 – HEC-RAS HYDRAULIC MODEL (electronic)

ATTACHMENT 2 – CONTECH ENGINEERED SOLUTIONS, PIPE ARCH SPECIFICATION SHEETS

CONTECH®
ENGINEERED SOLUTIONS

Corrugated Metal Pipe Design Guide

3" x 1" Pipe-Arch Height of Cover Limits for Corrugated Steel Pipe-Arch

H 20 and H 25 Live Loads

Size		Minimum Structural Thickness, Inches	Minimum Cover, Inches	Maximum[8] Cover, Feet
Round Equivalent, Inches	Span x Rise, Inches			2 Tons/Ft.² Corner Bearing Pressure
48	53 x 41	0.079	12	25
54	60 x 46	0.079	15	25
60	66 x 51	0.079	15	25
66	73 x 55	0.079	18	24
72	81 x 59	0.079	18	21
78	87 x 63	0.079	18	20
84	95 x 67	0.079	18	20
90	103 x 71	0.079	18	20
96	112 x 75	0.079	21	20
102	117 x 79	0.109	21	19
108	128 x 83	0.109	24	19
114	137 x 87	0.109	24	19
120	142 x 91	0.138	24	19

Larger sizes are available in some areas of the United States. Check with your local Contech Sales Representative.

Some minimum heights of cover for pipe-arches have been increased to take into account allowable "plus" tolerances on the manufactured rise.

E 80 Live Loads, Pipe-Arch

Size		Minimum Structural Thickness, Inches	Minimum Cover, Inches	Maximum[8] Cover, Feet
Round Equivalent, Inches	Span x Rise, Inches			2 Tons/Ft.² Corner Bearing Pressure
48	53 x 41	0.079	24	25
54	60 x 46	0.079	24	25
60	66 x 51	0.079	24	25
66	73 x 55	0.079	30	24
72	81 x 59	0.079	30	21
78	87 x 63	0.079	30	18
84	95 x 67	0.079	30	18
90	103 x 71	0.079	36	18
96	112 x 75	0.079	36	18
102	117 x 79	0.109	36	17
108	128 x 83	0.109	42	17
114	137 x 87	0.109	42	17
120	142 x 91	0.138	42	17

* *Some 3" x 1" and 5" x 1" minimum gages shown for pipe-arch are due to manufacturing limitations.*

Heights of Cover Notes:

1. *These tables are for lock-seam or welded-seam construction. They are not for riveted construction. Consult your Contech Sales Representative for Height of Cover tables on riveted pipe.*
2. *These values, where applicable, were calculated using K=0.86 as adopted in the NCSPA CSP Design Manual, 2008.*
3. *The span and rise shown in these tables are nominal. Typically the actual rise that forms is greater than the specified nominal. This actual rise is within the tolerances as allowed by the AASHTO & ASTM specifications. The minimum covers shown are more conservative than required by the AASHTO and ASTM specifications to account for this anticipated increase in rise. Less cover height may be tolerated depending upon actual rise of supplied pipe arch.*
4. *The haunch areas of a pipe-arch are the most critical zone for backfilling. Extra care should be taken to provide good material and compaction to a point above the spring line.*
5. *E 80 minimum cover is measured from top of pipe to bottom of tie.*
6. *H 20 and H 25 minimum cover is measured from top of pipe to bottom of flexible pavement or top of rigid pavement.*
7. *The H 20 and H 25 pipe-arch tables are based on 2 tons per square foot corner bearing pressures.*
8. *The E 80 pipe-arch tables minimum and maximum covers are based on the corner bearing pressures shown. These values may increase or decrease with changes in allowable corner bearing pressures.*
9. *0.052" is 18 gage.*
   0.064" is 16 gage.
   0.079" is 14 gage.
   0.109" is 12 gage.
   0.138" is 10 gage.
   0.168" is 8 gage.
10. *For construction loads, see Page 15.*
11. *Smooth Cor™ has same Height of Cover properties as corrugated steel pipe. The exterior shell of Smooth Cor™ is manufactured in either 2 2/3" x 1/2" or 3" x 1" corrugations; maximum exterior shell gage is 15.*
12. *Sewer gage (trench conditions) tables for corrugated steel pipe can be found in the AISI book "Modern Sewer Design," 4th Edition, 1999. These tables may reduce the minimum gage due to a higher flexibility factor allowed for a trench condition.*

Approximate Weight (Pounds/Foot) Contech Corrugated Steel Pipe

(Estimated Average Weights—Not for Specification Use)

1 1/2" x 1/4" Corrugation			
Inside Diameter, Inches	**Specified Thickness, Inches**	**Galvanized & ALT2**	**Full Coated**
6	0.052	4	5
	0.064	5	6
8	0.052	5	6
	0.064	6	7
10	0.052	6	7
	0.064	7	8

Steel Thicknesses by Gage						
Gage	18	16	14	12	10	8
Thickness	.052	.064	.079	.109	.138	.168

2 2/3" x 1/2" Corrugation					
Inside Diameter, Inches	Specified Thickness	Galvanized & ALUMINIZED	Full Coated	Coated & PAVED-INVERT	Smooth Cor™
12	0.052	8	10	13	
	0.064	10	12	15	
	0.079	12	14	17	
15	0.052	10	13	16	
	0.064	12	15	18	
	0.079	15	18	21	
18	0.052	12	16	19	
	0.064	15	19	22	25
	0.079	18	22	25	28
21	0.052	14	18	23	
	0.064	17	21	26	29
	0.079	21	25	30	33
	0.109	29	33	33	41
24	0.052	15	20	26	
	0.064	19	24	30	30
	0.079	24	29	35	38
	0.109	33	38	44	47
30	0.064	24	30	36	42
	0.079	30	36	42	48
	0.109	41	47	53	59
36	0.064	29	36	44	51
	0.079	36	43	51	58
	0.109	49	56	64	71
	0.138	62	69	77	
42	0.064	34	42	51	60
	0.079	42	50	59	68
	0.109	57	65	74	82
	0.138	72	80	89	
	0.168	88	96	105	
48	0.064	38	48	57	67
	0.079	48	58	67	77
	0.109	65	75	84	94
	0.138	82	92	101	
	0.168	100	110	119	
54	0.079	54	65	76	87
	0.109	73	84	95	106
	0.138	92	103	114	
	0.168	112	123	134	
60	0.109	81	92	106	117
	0.138	103	114	128	
	0.168	124	135	149	
66	0.109	89	101	117	129
	0.138	113	125	141	
	0.168	137	149	165	
72	0.138	123	137	154	(2)
	0.168	149	163	180	
78	0.168	161	177	194	(2)
84	0.168	173	190	208	(2)

3" x 1" or 5" x 1" Corrugation					
Inside Diameter, Inches	Specified Thickness	Galvanized & ALUMINIZED	Full Coated	Coated & PAVED-INVERT	Smooth Cor™
54	0.064	50	66	84	84
	0.079	61	77	95	95
	0.109	83	100	118	118
	0.138	106	123	140	
	0.168	129	146	163	
60	0.064	55	73	93	93
	0.079	67	86	105	105
	0.109	92	110	130	130
	0.138	118	136	156	
	0.168	143	161	181	
66	0.064	60	80	102	102
	0.079	74	94	116	116
	0.109	101	121	143	145
	0.138	129	149	171	
	0.168	157	177	199	
72	0.064	66	88	111	112
	0.079	81	102	126	127
	0.109	110	132	156	157
	0.138	140	162	186	
	0.168	171	193	217	
78	0.064	71	95	121	120
	0.079	87	111	137	136
	0.109	119	143	169	168
	0.138	152	176	202	
	0.168	185	209	235	
84	0.064	77	102	130	130
	0.079	94	119	147	147
	0.109	128	154	182	181
	0.138	164	189	217	
	0.168	199	224	253	
90	0.064	82	109	140	139
	0.079	100	127	158	157
	0.109	137	164	195	194
	0.138	175	202	233	
	0.168	213	240	271	
96	0.064	87	116	149	148
	0.079	107	136	169	168
	0.109	147	176	209	208
	0.138	188	217	250	
	0.168	228	257	290	
102	0.064	93	124	158	158
	0.079	114	145	179	179
	0.109	155	186	220	222
	0.138	198	229	263	
	0.168	241	272	306	
108	0.079	120	153	188	189
	0.109	165	198	233	235
	0.138	211	244	279	
	0.168	256	289	324	
114	0.079	127	162	199	200
	0.109	174	209	246	248
	0.138	222	257	294	
	0.168	271	306	343	
120	0.079	134	171	210	211
	0.109	183	220	259	260
	0.138	234	271	310	
	0.168	284	321	360	
126	0.109	195	233	274	276
	0.138	247	285	326	
	0.168	299	338	378	
132	0.109	204	244	287	289
	0.138	259	299	342	
	0.168	314	354	397	
138	0.109	213	255	300	300
	0.138	270	312	357	
	0.168	328	370	415	
144	0.138	282	326	373	
	0.168	344	388	435	(2)

1. *Weights for polymer coated pipe are 1% to 4% higher, varying by gage.*
2. *Please contact your Contech Sales Representative.*
3. *Weights listed in the 3" x 1" or 5" x 1" table are for 3" x 1" pipe. Weights for 5" x 1" are approximately 12% less than those used in this table, for metallic coated pipe.*

Installation Corrugated Metal Pipe

Overview
Satisfactory site preparation, trench excavation, bedding and backfill operations are essential to develop the strength of any flexible conduit. In order to obtain proper strength while preventing settlement, it is necessary that the soil envelope around the pipe be of good granular material, properly placed and carefully compacted.

Bedding
Bedding preparation is critical to both pipe performance and service life. The bed should be constructed to uniform line and grade to avoid distortions that may create undesirable stresses in the pipe and/or rapid deterioration of the roadway. The bed should be free of rock formations, protruding stones, frozen lumps, roots and other foreign matter that may cause unequal settlement.

Placing the pipe
Corrugated metal pipe weighs much less than other commonly used drainage structures. This is due to the efficient strength of the metal, further improved with carefully designed and formed corrugations. Even the heaviest sections of Contech pipe can be handled with relatively light equipment compared with equipment required for much heavier reinforced concrete pipe.

Backfill
Satisfactory backfill material, proper placement and compaction are key factors in obtaining maximum strength and stability. Backfill should be a well-graded granular material and should be free of large stones, frozen lumps and other debris.

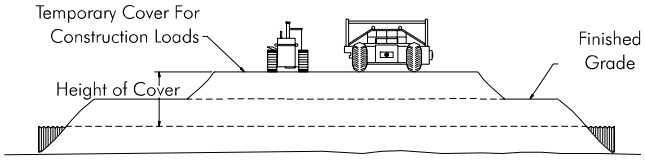
Backfill materials should be placed in layers about six inches deep, deposited alternately on opposite sides of the pipe. Each layer should be compacted carefully. Select backfill is placed and compacted until minimum cover height is reached, at which point, standard road embankment backfill procedures are used.

Installation References
For more information, see AASHTO Bridge Construction Specification Section 26, the Installation Manual of the National Corrugated Steel Pipe Association, ASTM A798 for steel and ASTM B788 for aluminum ULTRA FLO®.

Additional Considerations for ULTRA FLO® Installations
Bedding and Backfill
Typical ULTRA FLO® installation requirements are the same as for any other corrugated metal pipe installed in a trench. Bedding and backfill materials for ULTRA FLO® follow the requirements of the CMP installation specifications mentioned above, and must be free from stones, frozen lumps or other debris. When ASTM A796 (steel) or B790 (aluminum) designs are to be followed for condition III requirements, indicated by asterisk (*) in the tables on page 13 and 14, use clean, easily compacted granular backfill materials.

Embankment Conditions
ULTRA FLO® is a superior CMP storm sewer product that is normally installed in a trench condition. In those unusual embankment installation conditions, pipe sizes and gages may be restricted. Your Contech Sales Representative can provide you with further guidance.

Construction Loads
For temporary construction vehicle loads, an extra amount of compacted cover may be required over the top of the pipe. The Height of Cover shall meet minimum requirements shown in the table below. The use of heavy construction equipment necessitates greater protection for the pipe than finished grade cover minimums for normal highway traffic.



Min. Height of Cover Requirements for Construction Loads On Corrugated Steel Pipe*				
Diameter/ Span, (Inches)	Minimum Cover (feet) for Indicated Axle Loads (kips)			
	18-50	50-75	75-110	110-150
12-42	2.0'	2.5'	3.0'	3.0'
48-72	3.0'	3.0'	3.5'	4.0'
78-120	3.0'	3.5'	4.0'	4.0'
126-144	3.5'	4.0'	4.5'	4.5'

Min. Height of Cover Requirements for Construction Loads On Corrugated Aluminum Pipe*				
Diameter/ Span, (Inches)	Axle Load (Kips)			
	18-50	50-75	75-110	110-150
12-42	3.0′	3.5′	4.0′	4.0′
48-72	4.0′	4.0′	5.0′	5.5′
78-120	4.0′	5.0′	5.5′	5.5′

Min. Height of Cover Requirements for Construction Loads On ULTRA FLO® Pipe*				
Diameter/ Span, (Inches)	Axle Load (Kips)			
	18-50	50-75	75-110	110-150
	Steel 3/4" x 3/4" x 7-1/2"			
15-42	2.0'	2.5'	3.0'	3.0'
48-72	3.0'	3.0'	3.5'	4.0'
78-108	3.0'	3.5'	4.0'	4.5'
	Aluminum 3/4" x 3/4" x 7-1/2"			
15-42	3.0'	3.5'	4.0'	4.0'

* *Minimum cover may vary depending on local conditions. The contractor must provide the additional cover required to avoid damage to the pipe. Minimum cover is measured from the top of the pipe to the top of the maintained construction roadway surface.*

Smooth Cor™ Pipe

Excellent Hydraulics, Long Lengths and Easy Installation

Corrugated Steel Shell

Smooth Cor™ pipe has a smooth interior steel liner that provides a Manning's "n" of 0.012. Its rugged, corrugated steel shell supplies the structural strength to outperform rigid pipe. Smooth Cor™ pipe is both the economical and performance alternate to concrete.

Superior hydraulics

Smooth Cor™, with its smooth interior surface, is hydraulically superior to conventional corrugated steel pipe and with fewer joints and better interior surface, outperforms reinforced concrete pipe.

Smooth Cor™, with its long lengths, light weight and beam strength, is superior to concrete pipe in many difficult situations such as poor soils, poor subsurface drainage conditions, steep slopes and high fills. Smooth Cor™ should be specified as an alternate under normal site conditions, and specified exclusively under very difficult situations that demand the strength of CSP with positive joints and a hydraulically efficient smooth liner.

Two Pipe Shapes

In addition to full-round pipe, Smooth Cor™ comes in a pipe-arch shape for limited headroom conditions. The low, wide pipe-arch design distributes the flow area horizontally, enabling it to be installed with lower head room than a round pipe.

Reference specifications

Material	Polymer Coated	ASTM A 929 AASHTO M246 ASTM A 742
Pipe	Polymer	AASHTO M245 ASTM A 762 & A 760
Design	Steel Pipe	AASHTO Section 12 ASTM A 796
Installation	Steel Pipe	AASHTO Section 26 ASTM A 798

Structural Design

Smooth Cor™ is lined with either 18 or 20 gage steel. Contech has taken a conservative approach to the Height of Cover. The maximum heights of cover are based on the shell thickness with no additional structural allowance for the liner as provided for in the AASHTO and ASTM design specifications. Using this approach, the Height of Cover tables for 2 2/3" x 1/2" and 3"x1" steel corrugations can be used for Smooth Cor™.

Diameters

Smooth Cor™ is available in diameters ranging from 18 inches to 66 inches in 2 2/3" x 1/2" corrugation. The 3" x 1" corrugation is available in diameters of 48 inches to 126 inches.

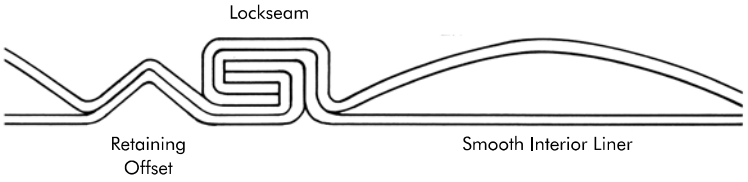
Pipe-arch sizes range from 21" x 15" through 77" x 52" for 2 2/3" x 1/2" corrugations, and 53" x 41" through 137" x 87" for 3"x1" corrugations.

Materials

Smooth Cor™ is available with a heavy-gage polymer coating that allows the engineer to design for long service life. This coating is a tough, heavy-gage polymer film laminated to both sides of the steel coil, providing a barrier to corrosion and mild abrasion which is particularly effective for protection in corrosive soils.

Fittings

Smooth Cor™ can be fabricated into any type of structure including tees, elbows, laterals, catch basins, manifolds and reducers. Pre-fabricated fittings are more economical and have superior hydraulic characteristics when compared to concrete structures.



CONTECH®
ENGINEERED SOLUTIONS

Contech Multiple-Inlet End Sections

ECONOMICAL, DURABLE CULVERT END FINISHES

Contech® Multiple-Inlet Steel End Sections have been especially developed as a dependable end treatment for parallel runs of corrugated metal or reinforced concrete pipe culverts. Since they are prefabricated for each job, field installation is fast and economical.

These strong, durable and light weight end sections provide the same proven features and benefits available with Contech's standard End Sections – such as improved hydraulics and appearance – while eliminating the typical problems associated with building improved entrance and outlet end treatments for multiple-barrel culvert installations.

Proven Performance and Less Maintenance
Since 1939, Contech End Sections have proven to be practical components wherever improved hydraulic performance or soil erosion prevention at culvert ends are a concern.
Contech Multiple-Inlet Steel End Sections greatly improve the appearance of culvert ends while promoting maintenance efficiency. Time and expense normally involved with snow removal, grass moving, weed control, and managing debris accumulations are greatly reduced. The strength and durability of Contech End Sections provide extended service life in normal culvert conditions, even allowing salvage and relocation if necessary.

Multiple-Inlet End Sections greatly improve appearance of culverts for an aesthetic, finished look.

STEEL END TREATMENT FOR CORRUGATED METAL PIPES

Fits Most Round Pipe and Pipe-Arch Shapes

Contech Multiple-Inlet Steel End Sections accommodate round pipe sizes from 12″ through 84″ diameters and are also available for most popular pipe-arch sizes. Because these end sections are completely shop-fabricated and connect to culvert ends using bolted straps, minimal field attachment time is needed. Single-piece combined invert and side elements prevent leakage, while improving inlet and outlet flow efficiency.

Proven Durability and Long-Term Protection

Corrosion-resistant galvanized steel sheets and fasteners result in longer service lift for Contech End Sections. Maintenance requirements are minimized.

Optional tow plate extensions protect underlying supporting soil against washout to maintain structure stability of the culvert ends.

Dispersed outlet flow from Contech End Sections prevents scour underneath the pipe and minimizes downstream soil erosion.

Additional information is available from your local Contech Sales Engineer.

For more information, call one of Contech's Regional Offices located in the following cities:

Ohio (Corporate Office)	**513-645-7000**
California (Roseville)	800-548-4667
Colorado (Denver)	720-587-2700
Florida (Orlando)	321-348-3520
Maine (Scarborough)	207-885-9830
Maryland (Baltimore)	410-740-8490
Oregon (Portland)	503-258-3180
Texas (Dallas)	972-590-2000

Toll Free: 1-800-338-1122
Visit our web site: www.ContechES.com

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MI-End Sections (replaces CP-2000) PDF 3/16

CONTECH® ENGINEERED SOLUTIONS

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EXHIBIT 8, WISDOT SUMMARY SPREADSHEET

Basic Project Information

Project ID: 3670-01-01
Title: C. Columbus, Farnham Street, Avalon Road - Park Ave
Designer/Checker: Steven Porter/Brad Schultz
DOT Region/Firm Name: SW Region
Date:5/24/19

HIGHWAY:	STH 89
LIMITS:	Avalon Road - Park Ave
COUNTY:	Columbia
DESCRIPTION OF WORK:	Reconstruction
PROJECT MANAGER:	Brad Schultz
PS&E DATE:	5/1/2021
DESIGN STAGE	☐ **Planning** ☐ **30%** ☑ **60%** ☐ **90%** ☐ **Final**

Drainage Summary

IS THERE A SIGNIFICANT FLOW INCREASE OR DECREASE WITHIN ANY SUB BASIN OF THE PROJECT? IF YES, DESCRIBE THE CAUSE OF THE CHANGE AND WHY IT IS NECESSARY.

Basin 18A and 18B were removed from outlet 20B and now flow into Outlet 14A. This change was made because of the removal of the culvert pipe and addition of storm sewer system. Basin 14A and 20B both drain into the same drainage ditch which ultimately discharges into the Craw Fish River.

IS THERE A SIGNIFICANT IMPERVIOUS AREA CHANGE TO ANY SUB BASIN OF THE PROJECT? IF YES, DESCRIBE THE CAUSE OF THE CHANGE AND WHY IT IS NECESSARY.

The project will add a 5-foot paved shoulser to the section of roadway from Avalon Road to Waterloo Street. This change will improve the safety and driver comfort level within this section of roadway. The project is also adding a 7-foot parking lane and curb and gutter from Waterloo Street to the Frontatge Road.

HAVE THE DRAINAGE SUB BASIN AREAS OR FLOW PATHS CHANGED SIGNIFICANTLY? IF YES, DESCRIBE THE CAUSE OF THE CHANGE AND WHY IT IS NECESSARY.

The basins from Waterloo Street to the Frontage Road on the right and from Avalon Road to the High School have changed by the addition of the storm sewer system and curb and gutter there were a couple of smaller basins created from a larger one.

DESCRIBE THE PROPOSED DRAINAGE CONVEYANCE AND CONTROL SYSTEMS FOR THE PROJECT.

The proposed conveyance systems to be implemented with this project include new storm sewer systems and culvert replacements.

DESCRIBE THE AQUATIC ORGANISM PASSAGE ISSUES FOR THE PROJECT, IF ANY.

The project will be replacing the triple 48-inch culverts at the 2nd Ward Creek Crossing. 2nd Ward Creek is a warm water fishery and the DNR initial comments required no work to occur in the stream between March 1 and June 15. However after additional coordination the DNR removed the in stream restrictions from this project because the project is improving a perched pipe situation.

IF THE DESIGN DOES NOT MEET THE DOT FDM CHAPTER 13 DRAINAGE REQUIREMENTS, EXPLAIN HOW AND WHY.

There are several instances where the storm sewer pipe does not meet the 1 foot of cover below subgrade. This was not achieved in these locations because the pipes had to be raised to avoid conflicts with the City of Columbus watermain

DESCRIBE WDNR COORDINATION. PROVIDE NAME OF WDNR CONTACT AND DATE, AND ATTACH ANY CORRESPONDENCE.

DNR gave initial comments on July 6th, 2016. Correspondence is attached.

IF THE DRAINAGE DESIGN MEETS LOCAL, MUNICIPAL OR REGIONAL GUIDELINES THAT EXCEED FDM CHAPTER 13 DRAINAGE REQUIREMENTS, EXPLAIN HOW AND WHY.

N/A

IF A SIGNIFICANT IMPACT TO THE PROJECT OCCURS DUE TO DRAINAGE, PROJECT MANAGER CONCURRENCE IS REQUIRED. (PM SIGN AND DATE)

Drainage Data

Project ID: 3670-01-01
Title: C. Columbus, Farnham Street, Avalon Road - Park Ave
Designer/Checker: Steven Porter/Brad Schultz
DOT Region/Firm Name:
Date:5/24/19

Section 1: OUTFALL INFORMATION (all projects)

Outfall number	14A	65A	20B	37	40
Outfall discharges to:	Ditch	Ditch	Ditch	Creek	Creek
Waterway crossing type	Storm Sewer	Culvert	Storm Sewer	Storm Sewer	Storm Sewer
Previous flooding issues or flow restrictions?	No	No	No	No	No
Is the drainageway a navigable waterway?	No	No	No	No	No
Waterway designation, if any	N/A	N/A	N/A	N/A	N/A

Section 2: BASIC SUB BASIN DRAINAGE INFORMATION (all projects)

Outfall number	14A	65A	20B	37	40
Outfall station	12+80	13+87.88	16+93	42+79	43+03
Flood design frequency (yrs)	10	25	10	10	10
Check design frequency (yrs)	25	N/A	25	25	25
Drainage area (acres)	22.17	0.1	8.83	4.83	3.64
Hydrologic Method	Rational	Rational	Rational	Rational	Rational
Time of Concentration (min)	16	5	10	5	5
C or CN	0.31	0.9	0.40	0.46	0.5
Rainfall intensity (in/hr) (rational method only)	4.04	8.28	5.1	6.96	6.96
Rainfall depth for design storm (in)	N/A	N/A	N/A	N/A	N/A
Design peak flow rate (cfs)	22.39	0.75	16.84	10.03	10.64
Check peak flow rate (cfs)	27.01	N/A	19.56	11.59	12.36
Hydraulic Design software	SSA	HY8	SSA	SSA	SSA

Section 3: URBAN/TRANS 401 PROJECTS

Section 4: CULVERT DESIGN

Existing Culvert

Outfall number	14A	65A	20B	37	40
Culvert present? (Yes or No)	N/A	Yes	N/A	N/A	N/A
Shape	N/A	Circular	N/A	N/A	N/A
Material	N/A	CMP	N/A	N/A	N/A
Diameter/span (ft)	N/A	18"	N/A	N/A	N/A
Number of barrels	N/A	1	N/A	N/A	N/A
Manning's n	N/A	0.024	N/A	N/A	N/A
Inlet entrance type	N/A	AEW	N/A	N/A	N/A
Upstream invert (ft)	N/A	833.06	N/A	N/A	N/A
Downstream invert (ft)	N/A	832.95	N/A	N/A	N/A
Length (ft)	N/A	37	N/A	N/A	N/A
Slope (%)	N/A	0.30%	N/A	N/A	N/A
Computed Upstream Water Surface Elevation (ft)	N/A	834.13	N/A	N/A	N/A
Tailwater elevation	N/A	833.136	N/A	N/A	N/A
Outlet velocity (ft/s)	N/A	4.44	N/A	N/A	N/A
Proposed Culvert Design					
Design ADT	N/A	1500	N/A	N/A	N/A
Shape	N/A	Elliptical	N/A	N/A	N/A
Material	N/A	CMP	N/A	N/A	N/A
Diameter/span (ft)	N/A	17"x13"	N/A	N/A	N/A
Number of barrels	N/A	1	N/A	N/A	N/A
Manning's n	N/A	0.024	N/A	N/A	N/A
Inlet entrance type	N/A	AEW	N/A	N/A	N/A
Upstream invert (ft)	N/A	833.06	N/A	N/A	N/A
Downstream invert (ft)	N/A	832.95	N/A	N/A	N/A
Length (ft)	N/A	37	N/A	N/A	N/A
Slope (%)	N/A	0.30%	N/A	N/A	N/A
Computed Upstream Water Surface Elevation (ft)	N/A	833.83	N/A	N/A	N/A
Tailwater elevation	N/A	833.564	N/A	N/A	N/A
Outlet velocity (ft/s)	N/A	2.086	N/A	N/A	N/A
Change in Upstream Water Surface Elevation (ft)	N/A	-0.3	N/A	N/A	N/A
Riprap outfall (Size riprap or None)	N/A	N/A	N/A	N/A	N/A
Maximum allowable headwater	N/A	834.935	N/A	N/A	N/A
Maximum allowable headwater design criteria	N/A	1.5xHw/Di a	N/A	N/A	N/A
Station of lowest subgrade shoulder point (0+00)	N/A	N/A	N/A	N/A	N/A
Elevation of lowest subgrade shoulder point (ft)	N/A	N/A	N/A	N/A	N/A
Headwater to pipe diameter ratio	N/A	0.616	N/A	N/A	N/A
Floodplain Management					
Mapped floodplain	N/A	No	N/A	N/A	N/A
Increase in headwater	N/A	No	N/A	N/A	N/A
Drainage District Issues					
Is culvert in a drainage district?	N/A	No	N/A	N/A	N/A
Drainage District Name	N/A		N/A	N/A	N/A
Increase in headwater	N/A	No	N/A	N/A	N/A
Drainage board approval?	N/A		N/A	N/A	N/A
Aquatic Organism Passage					
Is aquatic organism passage a concern?	N/A	No	N/A	N/A	N/A
Does WDNR concur with design?	N/A	Yes	N/A	N/A	N/A
Embedment depth (ft)	N/A	N/A	N/A	N/A	N/A
Embedment material	N/A	N/A	N/A	N/A	N/A

Section 5: CULVERT LINER DESIGN

EXHIBIT 9, HY8 EXISTING CULVERT ANALYSIS

HY-8 Culvert Analysis Report

114A Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 30.78 cfs

Maximum Flow: 1000 cfs

Table 1 - Summary of Culvert Flows at Crossing: 114A

Headwater Elevation (ft)	Total Discharge (cfs)	114A Discharge (cfs)	Roadway Discharge (cfs)	Iterations
832.34	0.00	0.00	0.00	1
836.02	30.78	30.78	0.00	1
839.42	200.00	47.19	152.74	6
840.62	300.00	51.88	248.09	4
841.68	400.00	55.80	344.17	4
842.61	500.00	60.21	439.81	2
843.51	600.00	61.90	538.11	3
844.34	700.00	64.49	635.51	3
845.14	800.00	66.89	733.11	3
845.91	900.00	69.13	830.87	3
846.64	1000.00	71.21	928.78	3
836.27	32.12	32.12	0.00	Overtopping

Table 2 - Culvert Summary Table: 114A

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	832.34	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
30.78	30.78	836.02	3.052	3.684	7-M2c	2.000	1.542	1.542	1.297	7.752	3.662
200.00	47.19	839.42	5.425	7.758	4-FFf	2.000	1.845	2.000	2.616	10.149	5.847
300.00	51.88	840.62	6.303	9.359	4-FFf	2.000	1.884	2.000	3.045	11.158	6.470
400.00	55.80	841.68	7.134	10.768	4-FFf	2.000	1.907	2.000	3.392	12.000	6.953
500.00	60.21	842.61	8.141	12.352	4-FFf	2.000	1.897	2.000	3.688	12.948	7.352
600.00	61.90	843.51	8.549	13.134	4-FFf	2.000	1.938	2.000	3.949	13.312	7.695
700.00	64.49	844.34	9.193	14.193	4-FFf	2.000	2.000	2.000	4.184	13.868	7.997
800.00	66.89	845.14	9.814	15.203	4-FFf	2.000	2.000	2.000	4.399	14.385	8.269
900.00	69.13	845.91	10.414	16.168	4-FFf	2.000	2.000	2.000	4.598	14.866	8.516
1000.00	71.21	846.64	10.990	17.090	4-FFf	2.000	2.000	2.000	4.783	15.314	8.743

****

Straight Culvert

Inlet Elevation (invert): 832.34 ft, Outlet Elevation (invert): 831.87 ft

Culvert Length: 54.50 ft, Culvert Slope: 0.0086

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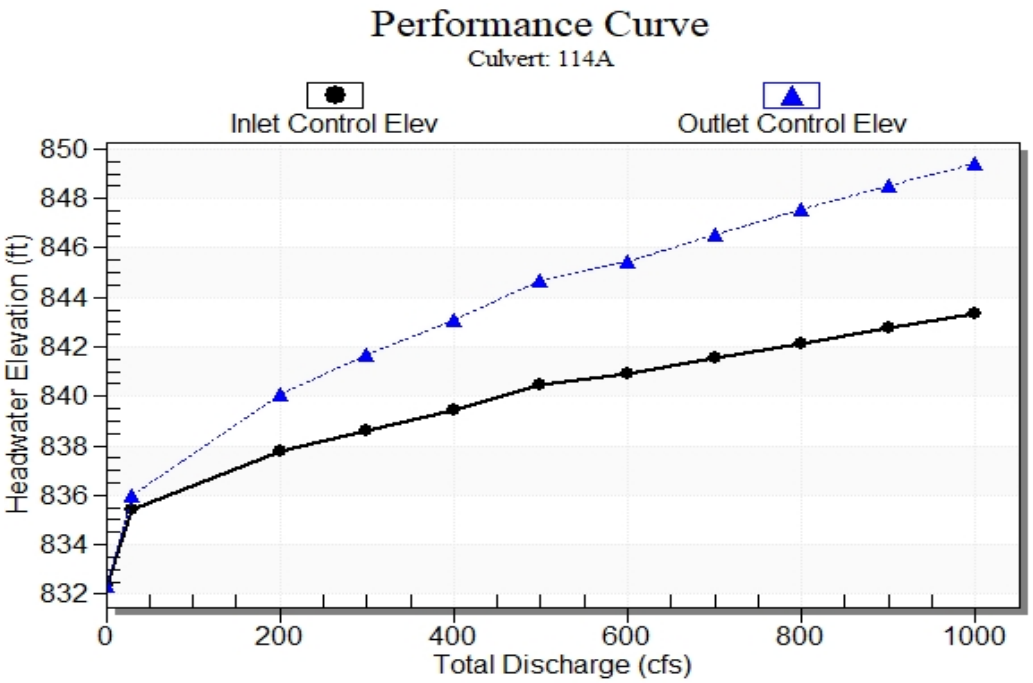
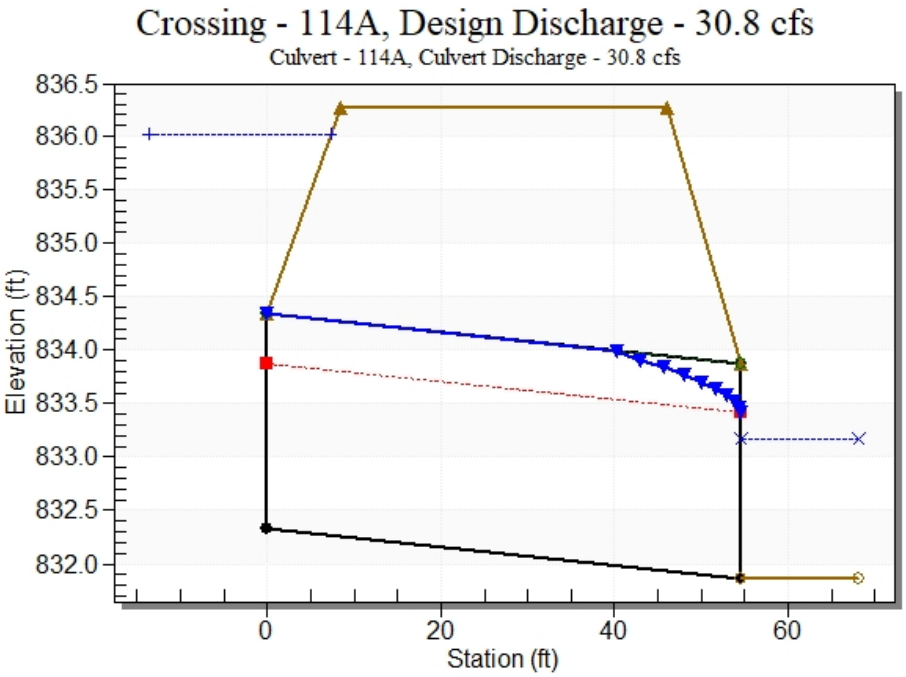
Culvert Performance Curve Plot: 114A



Water Surface Profile Plot for Culvert: 114A



Site Data - 114A

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 832.34 ft
Outlet Station: 54.50 ft
Outlet Elevation: 831.87 ft
Number of Barrels: 1

Culvert Data Summary - 114A

Barrel Shape: Pipe Arch
Barrel Span: 35.00 in
Barrel Rise: 24.00 in
Barrel Material: Steel or Aluminum
Embedment: 0.00 in
Barrel Manning's n: 0.0250
Culvert Type: Straight
Inlet Configuration: Headwall
Inlet Depression: None

120 Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 0.75 cfs

Maximum Flow: 4.07 cfs

Table 3 - Summary of Culvert Flows at Crossing: 120

Headwater Elevation (ft)	Total Discharge (cfs)	120 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
832.82	0.00	0.00	0.00	1
833.19	0.41	0.41	0.00	1
833.33	0.75	0.75	0.00	1
833.48	1.22	1.22	0.00	1
833.59	1.63	1.63	0.00	1
833.69	2.04	2.04	0.00	1
833.79	2.44	2.44	0.00	1
833.88	2.85	2.85	0.00	1
833.96	3.26	3.26	0.00	1
834.04	3.66	3.66	0.00	1
834.13	4.07	4.07	0.00	1
834.78	7.15	7.15	0.00	Overtopping

Table 4 - Culvert Summary Table: 120

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	832.82	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
0.41	0.41	833.19	0.348	0.374	3-M2t	0.278	0.232	0.251	0.251	2.086	1.074
0.75	0.75	833.33	0.475	0.514	3-M2t	0.378	0.316	0.316	0.316	2.766	1.251
1.22	1.22	833.48	0.608	0.665	2-M2c	0.486	0.410	0.410	0.380	3.116	1.413
1.63	1.63	833.59	0.709	0.776	2-M2c	0.566	0.474	0.474	0.423	3.394	1.518
2.04	2.04	833.69	0.801	0.876	2-M2c	0.640	0.535	0.535	0.460	3.595	1.605
2.44	2.44	833.79	0.889	0.970	2-M2c	0.711	0.588	0.588	0.492	3.800	1.680
2.85	2.85	833.88	0.973	1.058	2-M2c	0.779	0.640	0.640	0.521	3.962	1.746
3.26	3.26	833.96	1.054	1.143	2-M2c	0.846	0.687	0.687	0.548	4.123	1.806
3.66	3.66	834.04	1.134	1.226	2-M2c	0.914	0.731	0.731	0.573	4.283	1.860
4.07	4.07	834.13	1.213	1.307	2-M2c	0.984	0.772	0.772	0.596	4.441	1.909

****

Straight Culvert

Inlet Elevation (invert): 832.82 ft, Outlet Elevation (invert): 832.54 ft

Culvert Length: 34.60 ft, Culvert Slope: 0.0081

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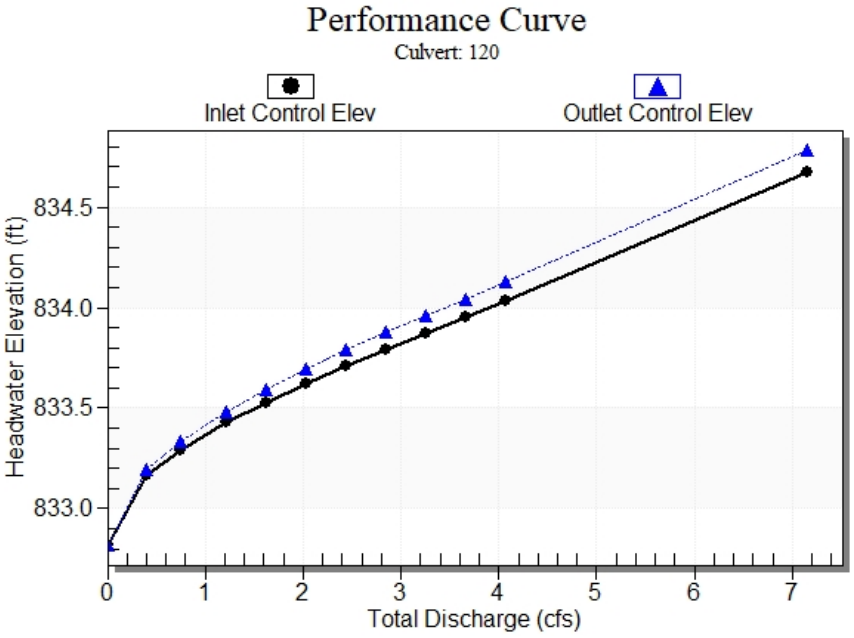
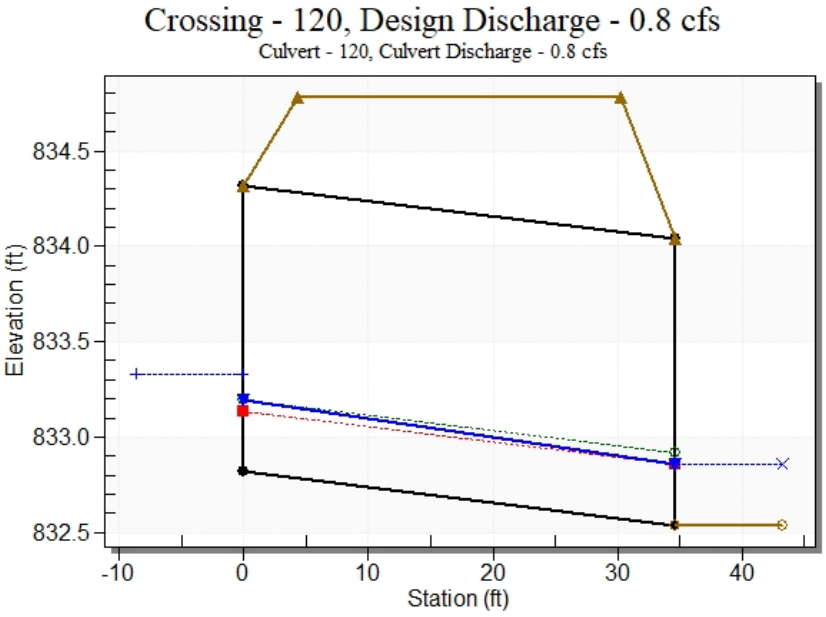
Culvert Performance Curve Plot: 120



Water Surface Profile Plot for Culvert: 120



Site Data - 120

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 832.82 ft
Outlet Station: 34.60 ft
Outlet Elevation: 832.54 ft
Number of Barrels: 1

Culvert Data Summary - 120

Barrel Shape: Circular
Barrel Diameter: 1.50 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

200B Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 12.56 cfs

Maximum Flow: 1000 cfs

Table 5 - Summary of Culvert Flows at Crossing: 200B

Headwater Elevation (ft)	Total Discharge (cfs)	200B Discharge (cfs)	Roadway Discharge (cfs)	Iterations
834.16	0.00	0.00	0.00	1
836.42	12.56	12.56	0.00	1
839.19	200.00	24.43	175.50	5
839.99	300.00	26.72	273.25	3
840.71	400.00	28.62	371.35	3
841.37	500.00	30.27	469.69	3
841.98	600.00	31.71	568.25	3
842.54	700.00	33.04	666.93	3
843.09	800.00	34.24	765.65	3
843.60	900.00	36.91	863.30	4
844.10	1000.00	36.86	963.06	3
836.83	15.91	15.91	0.00	Overtopping

Table 6 - Culvert Summary Table: 200B

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	834.16	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
12.56	12.56	836.42	2.159	2.259	7-M2c	1.363	1.272	1.272	0.679	5.959	1.702
200.00	24.43	839.19	4.505	5.072	7-M2t	2.000	1.747	1.917	1.917	7.888	3.401
300.00	26.72	839.99	5.160	6.143	4-FFf	2.000	1.802	2.000	2.232	8.504	3.764
400.00	28.62	840.71	5.760	7.095	4-FFf	2.000	1.840	2.000	2.486	9.110	4.044
500.00	30.27	841.37	6.326	7.959	4-FFf	2.000	1.868	2.000	2.703	9.637	4.276
600.00	31.71	841.98	6.844	8.741	4-FFf	2.000	1.883	2.000	2.895	10.094	4.476
700.00	33.04	842.54	7.344	9.483	4-FFf	2.000	1.905	2.000	3.067	10.517	4.652
800.00	34.24	843.09	7.811	10.174	4-FFf	2.000	1.896	2.000	3.224	10.897	4.809
900.00	36.91	843.60	8.916	11.581	4-FFf	2.000	1.849	2.000	3.370	11.748	4.953
1000.00	36.86	844.10	8.895	11.693	4-FFf	2.000	1.898	2.000	3.506	11.732	5.085

****

Straight Culvert

Inlet Elevation (invert): 834.16 ft, Outlet Elevation (invert): 833.34 ft

Culvert Length: 55.01 ft, Culvert Slope: 0.0150

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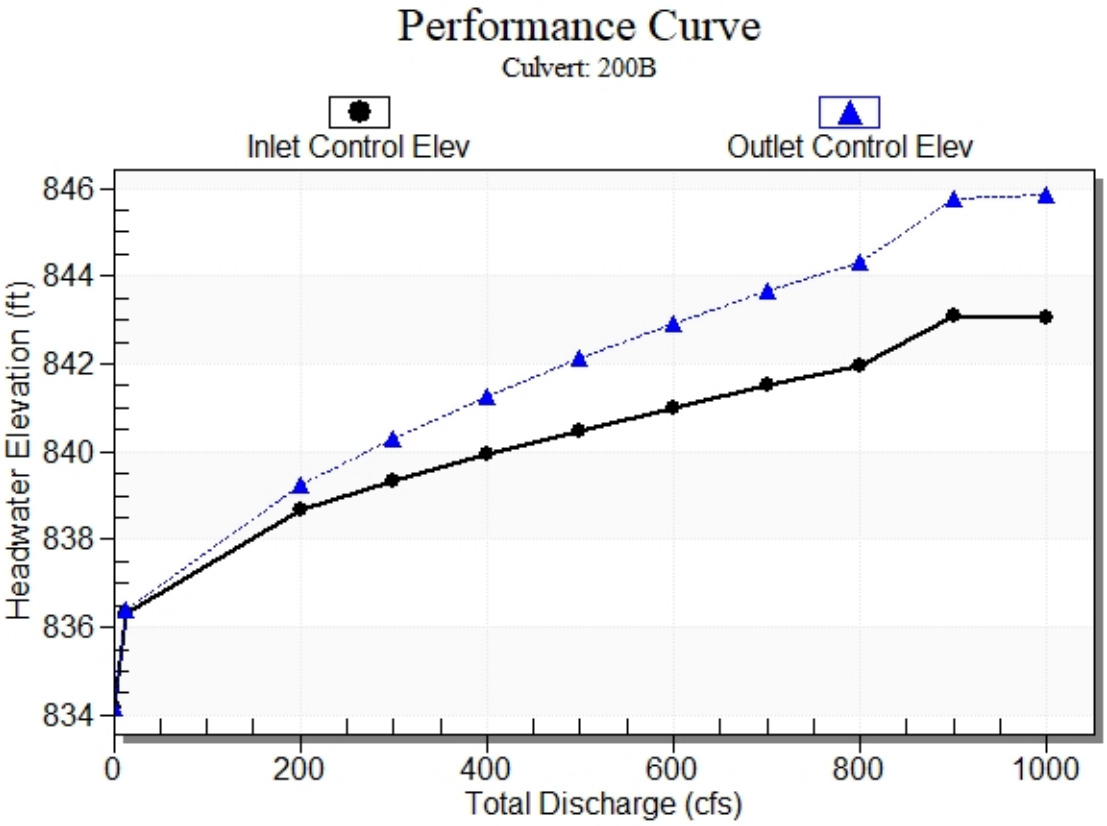
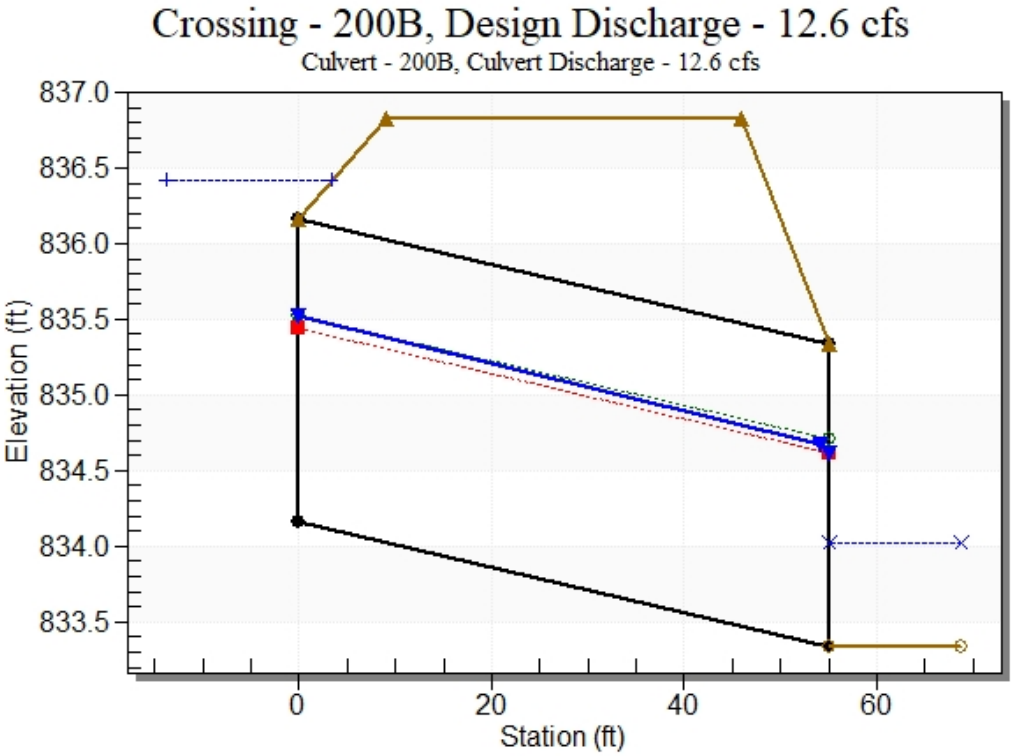
Culvert Performance Curve Plot: 200B



Water Surface Profile Plot for Culvert: 200B



Site Data - 200B

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 834.16 ft
Outlet Station: 55.00 ft
Outlet Elevation: 833.34 ft
Number of Barrels: 1

Culvert Data Summary - 200B

Barrel Shape: Circular
Barrel Diameter: 2.00 ft
Barrel Material: Corrugated Steel
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Thin Edge Projecting
Inlet Depression: None

EXHIBIT 10, HY8 PROPOSED CULVERT ANALYSIS

HY-8 Culvert Analysis Report

65A-65B Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0 cfs

Design Flow: 0.75 cfs

Maximum Flow: 1.6 cfs

Table 1 - Summary of Culvert Flows at Crossing: 65A

Headwater Elevation (ft)	Total Discharge (cfs)	65A Discharge (cfs)	Roadway Discharge (cfs)	Iterations
833.06	0.00	0.00	0.00	1
833.28	0.16	0.16	0.00	1
833.37	0.32	0.32	0.00	1
833.45	0.48	0.48	0.00	1
833.52	0.64	0.64	0.00	1
833.56	0.75	0.75	0.00	1
833.63	0.96	0.96	0.00	1
833.68	1.12	1.12	0.00	1
833.73	1.28	1.28	0.00	1
833.78	1.44	1.44	0.00	1
833.83	1.60	1.60	0.00	1
834.67	4.11	4.11	0.00	Overtopping

Table 2 - Culvert Summary Table: 65A

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00	0.00	833.06	0.000	0.000	0-NF	0.000	0.000	0.000	0.000	0.000	0.000
0.16	0.16	833.28	0.180	0.217	3-M1t	0.181	0.111	0.259	0.259	0.573	0.397
0.32	0.32	833.37	0.259	0.314	3-M1t	0.260	0.162	0.336	0.336	0.829	0.473
0.48	0.48	833.45	0.323	0.393	3-M1t	0.325	0.205	0.391	0.391	1.058	0.523
0.64	0.64	833.52	0.380	0.460	3-M1t	0.392	0.238	0.436	0.436	1.237	0.562
0.75	0.75	833.56	0.414	0.501	3-M1t	0.429	0.261	0.462	0.462	1.350	0.585
0.96	0.96	833.63	0.478	0.565	3-M1t	0.499	0.298	0.507	0.507	1.551	0.622
1.12	1.12	833.68	0.520	0.623	3-M2t	0.552	0.328	0.537	0.537	1.693	0.646
1.28	1.28	833.73	0.561	0.673	3-M2t	0.605	0.356	0.565	0.565	1.829	0.668
1.44	1.44	833.78	0.600	0.720	3-M2t	0.660	0.388	0.591	0.591	1.960	0.688
1.60	1.60	833.83	0.636	0.766	3-M2t	0.719	0.412	0.614	0.614	2.086	0.707

****

Straight Culvert

Inlet Elevation (invert): 833.06 ft, Outlet Elevation (invert): 832.95 ft

Culvert Length: 37.00 ft, Culvert Slope: 0.0030

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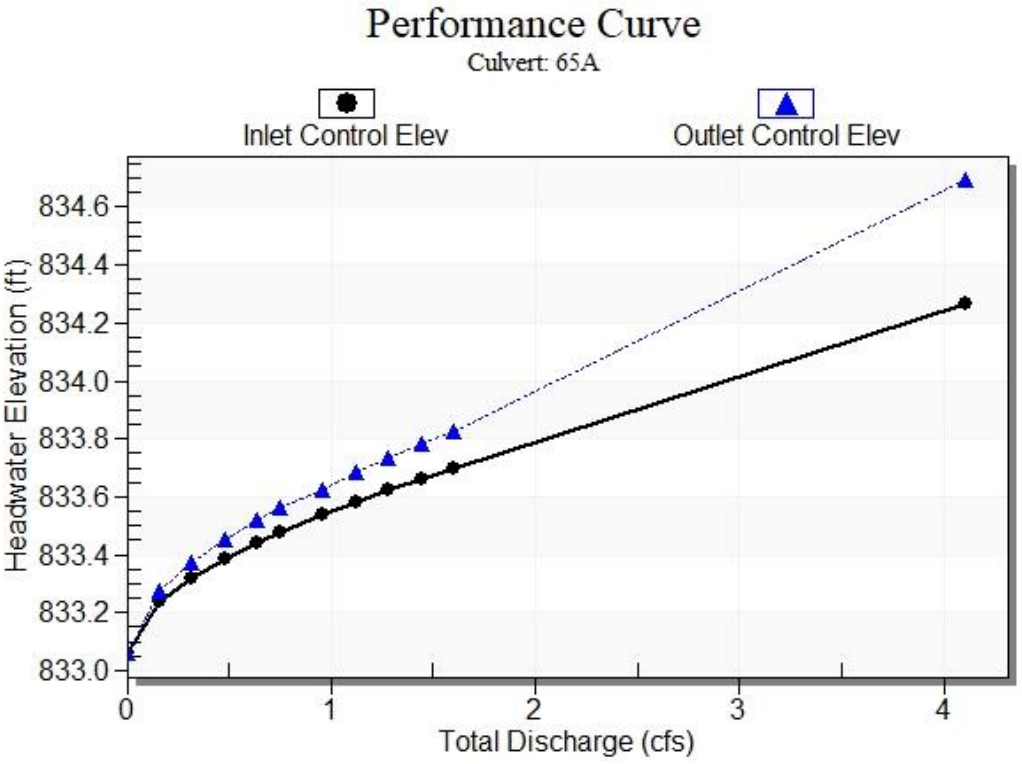
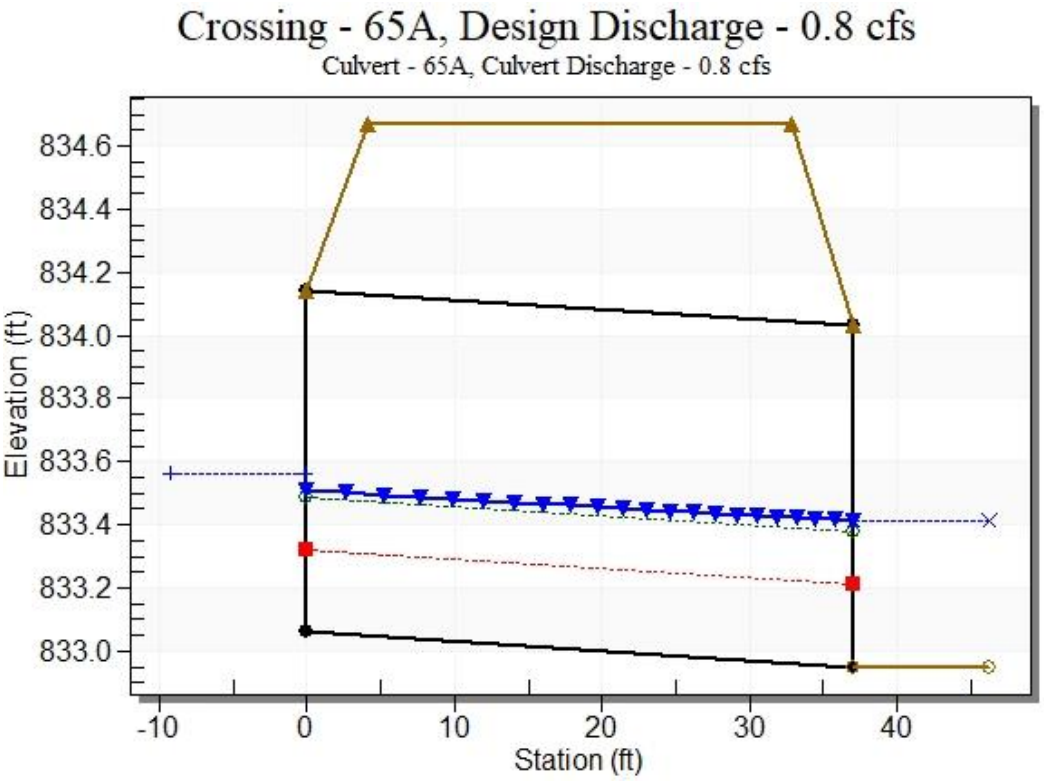
Culvert Performance Curve Plot: 65A



Water Surface Profile Plot for Culvert: 65A



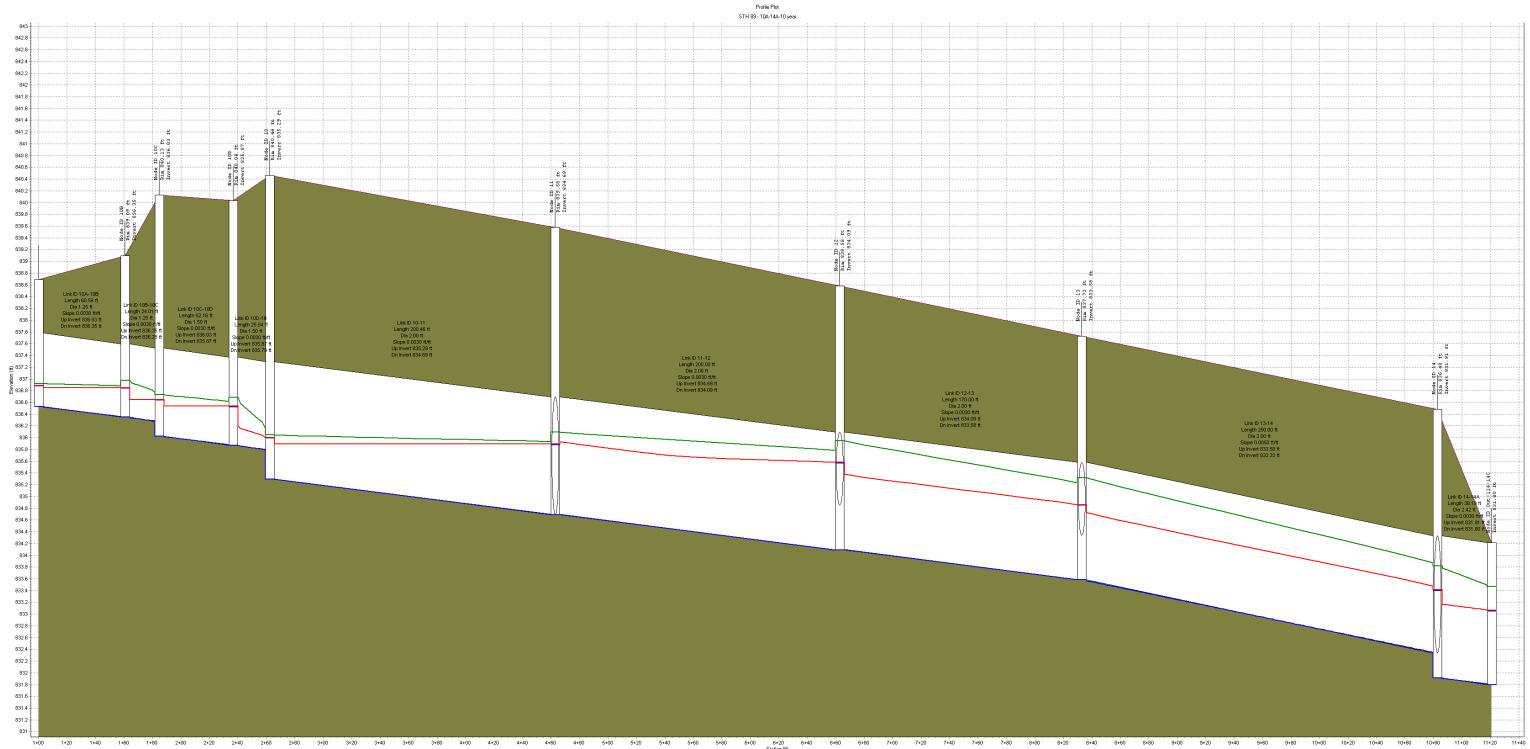
Site Data - 65A

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 833.06 ft
Outlet Station: 37.00 ft
Outlet Elevation: 832.95 ft
Number of Barrels: 1

Culvert Data Summary - 65A

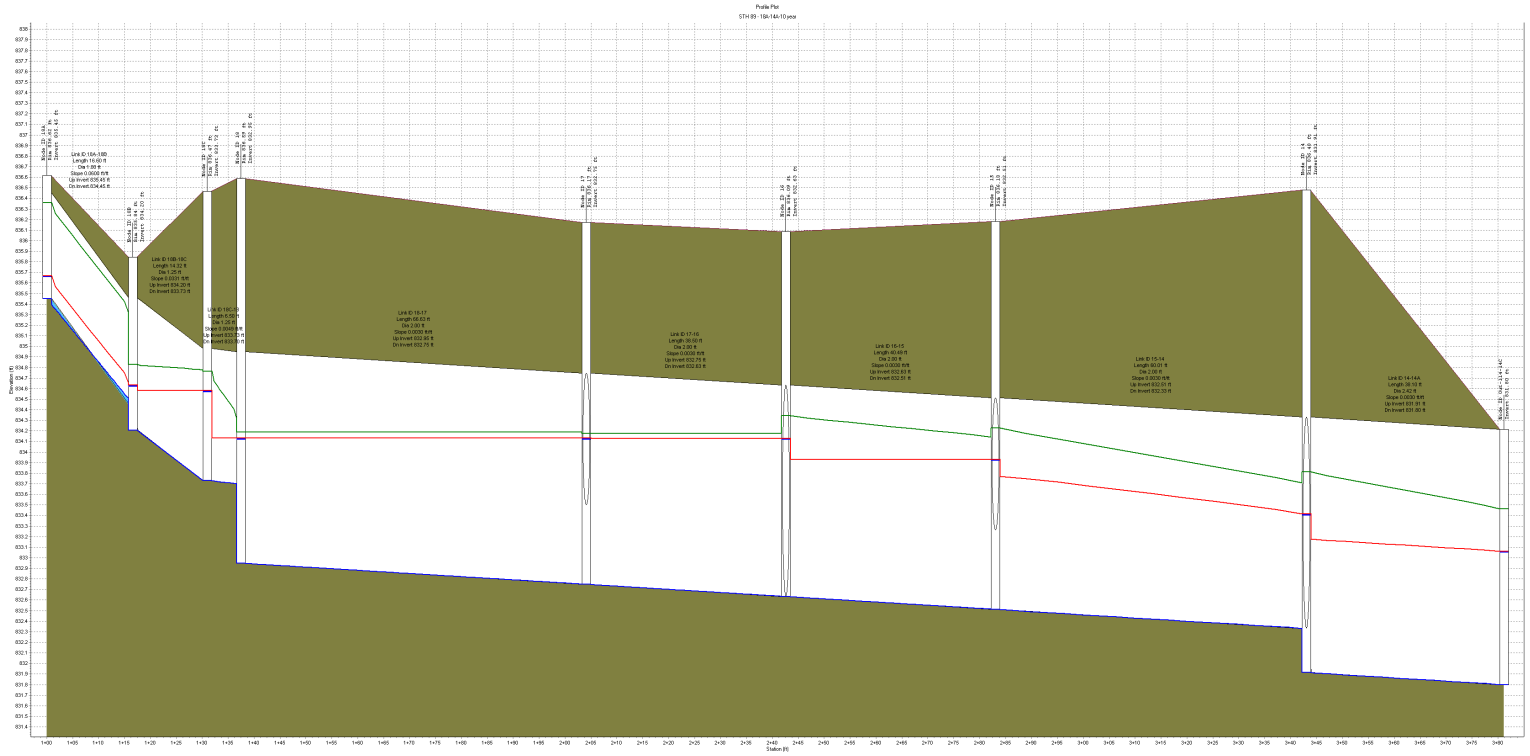
Barrel Shape: Pipe Arch
Barrel Span: 17.00 in
Barrel Rise: 13.00 in
Barrel Material: Steel or Aluminum
Embedment: 0.00 in
Barrel Manning's n: 0.0240
Culvert Type: Straight
Inlet Configuration: Mitered
Inlet Depression: None

EXHIBIT 11, AUTOCAD SSA PROPOSED STORM SEWER ANALYSIS



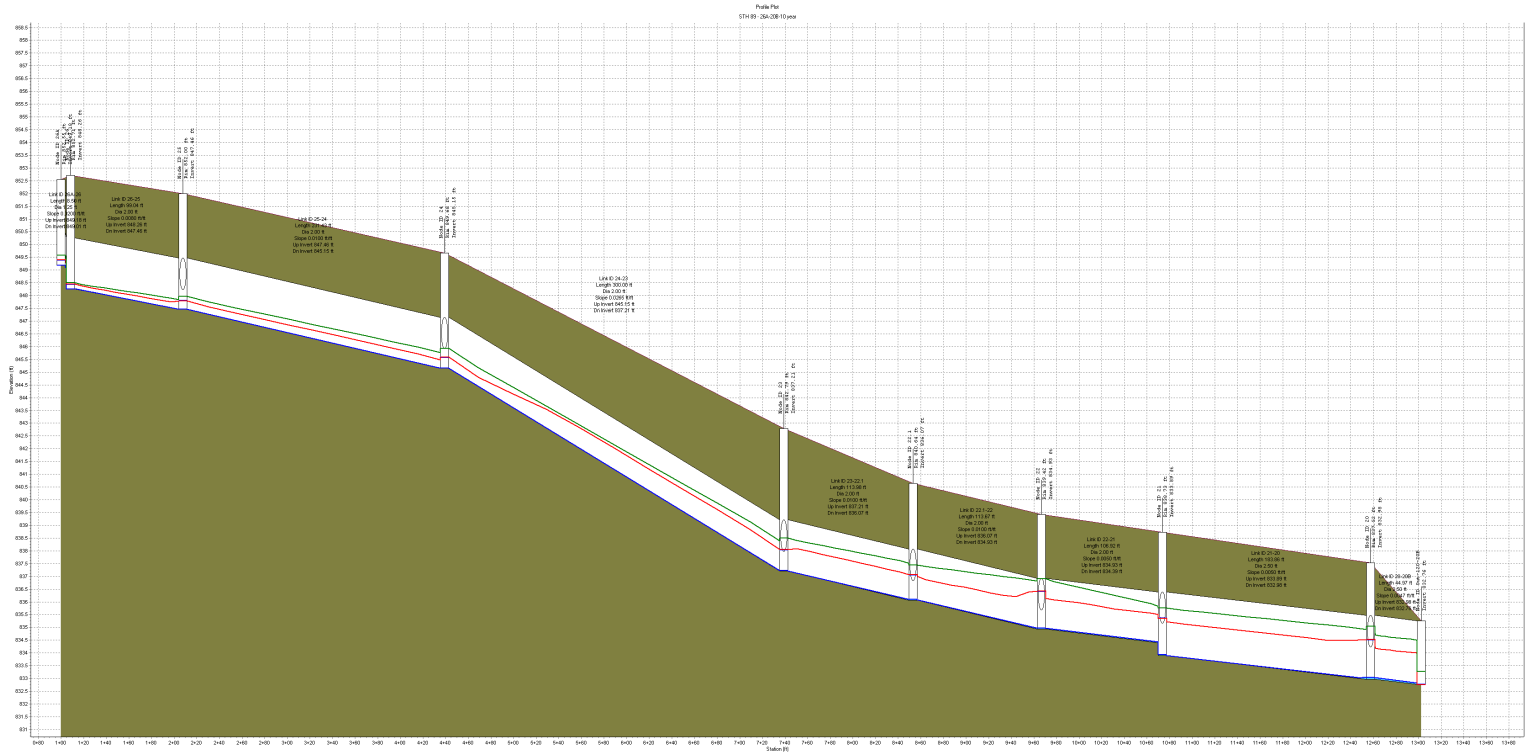
Node ID	19A	10B	10C	10D	10	11	12	13	14	0-it:114.14C
Rim (ft)	839.65	839.05	840.13	840.04	840.46	839.58	838.56	837.73	836.48	
Invert (ft)	836.53	836.25	836.03	835.97	835.29	834.69	834.09	833.58	831.91	831.68
Min Pipe Cover (ft)					3.17	2.89	2.49	2.15	2.15	
Max HGL (ft)	836.69	836.05	836.05	836.53	836.00	835.89	835.58	834.98	833.42	833.06

Link ID	19A-10B	10B-10E	10C-10D	10D-10	10-11	11-12	12-13	13-14	14-14A
Length (ft)	60.59	24.01	52.16	25.54	280.46	200.06	170.06	250.06	35.10
Dia (ft)	1.25	1.25	1.50	1.50	2.00	2.00	2.00	2.00	2.42
Slope (ft/ft)	0.0030	0.0000	0.0030	0.0030	0.0030	0.0030	0.0030	0.0050	0.0030
Up Invert (ft)	836.53	836.25	836.03	835.97	835.29	834.69	834.09	833.58	831.91
Dn Invert (ft)	836.35	836.28	835.87	835.79	834.69	834.09	833.58	832.33	831.68
Max Q (cfs)	0.52	1.16	1.69	2.14	2.35	7.78	10.83	10.75	22.39
Max Vel (ft/s)	1.29	2.62	2.33	3.16	1.69	3.62	4.66	5.44	5.10
Max Depth (ft)	0.67	0.46	0.64	0.61	0.99	1.04	1.37	1.21	1.39

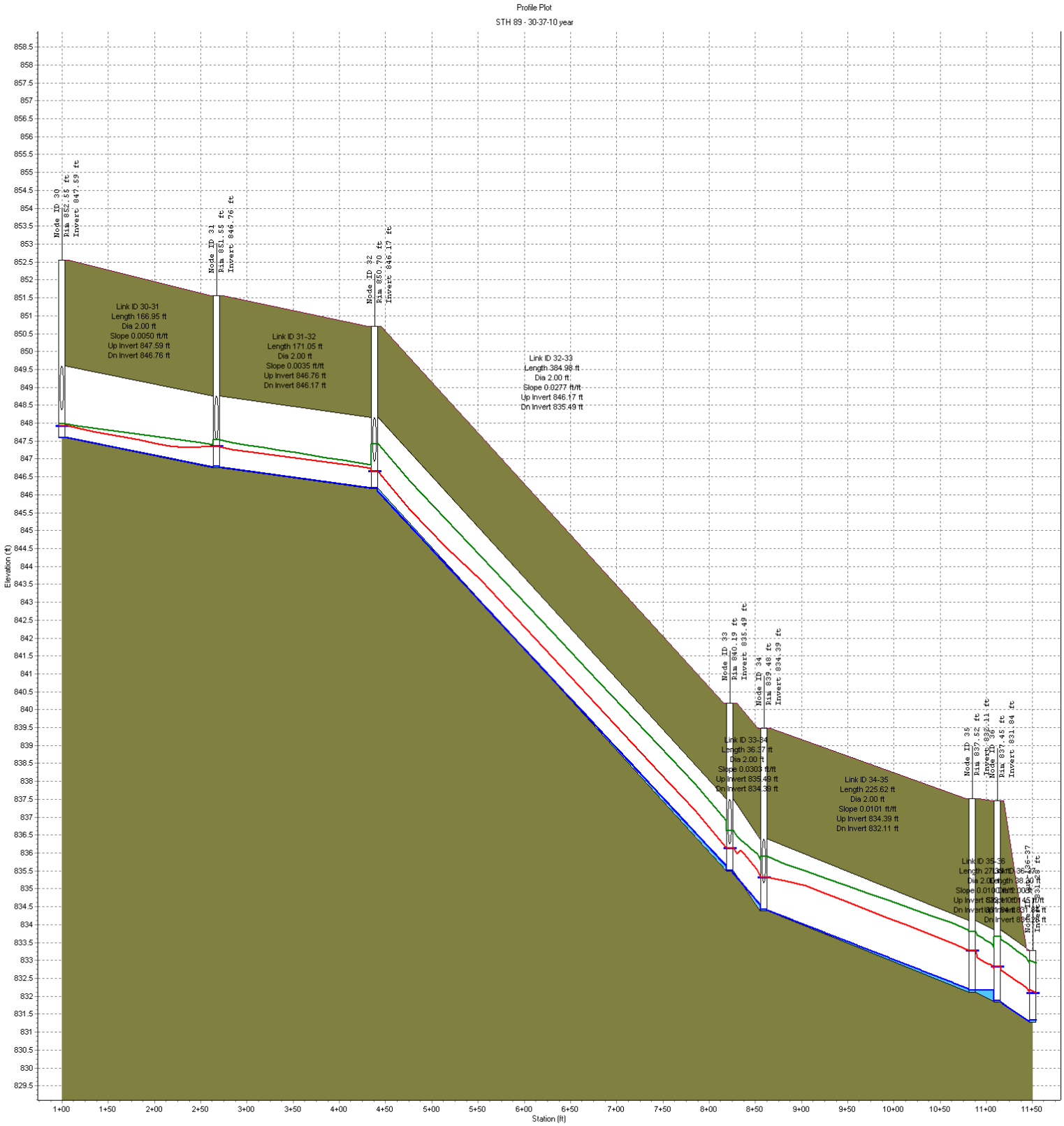


Node ID	19A	18	18C	19	17	16	15	14	Out114-14C
Rim (ft)	836.62	835.84	836.47	836.59	836.17	836.05	836.18	836.49	
Invert (ft)	835.45	834.20	833.73	832.95	832.75	832.63	832.51	831.91	831.80
Min Pipe Cover (ft)	0.17			1.64	1.42	1.45	1.67	2.78	
Max HGL (ft)	835.67	834.63	834.58	834.13	834.13	834.13	833.93	833.42	833.06

Link ID	19A-18B	18B-18C	18C-19	19-17	17-16	16-15	15-14	14-14A
Length (ft)	16.60	14.32	6.50	66.63	39.50	40.49	60.01	39.10
Dia (ft)	1.00	1.25	1.25	2.00	2.00	2.00	2.00	2.42
Slope (ft/ft)	0.0600	0.0311	0.0569	0.0030	0.0030	0.0030	0.0030	0.0030
Up Invert (ft)	835.45	834.20	833.73	832.95	832.75	832.63	832.51	831.91
Dn Invert (ft)	834.45	833.73	833.70	832.75	832.63	832.51	832.33	831.80
Max Q (cfs)	0.77	2.03	2.86	2.60	3.32	15.10	15.09	22.39
Max Vel (ft/s)	0.98	1.56	3.44	1.95	1.73	3.70	4.36	5.10
Max Depth (ft)	0.30	0.61	0.75	1.38	1.44	1.46	1.26	1.39



Node ID	25A-26	26	25	24	23	22.1	22	21	20	Out-120-20B
Rim (ft)	852.71	852.00	849.68	842.75	840.04	839.42	838.73		837.52	
Invert (ft)	845.26	847.46	845.15	837.21	836.07	834.93	833.89		832.98	832.76
Min Pipe Cover (ft)	2.45	2.54	2.53	3.99	2.57	2.46	2.33		2.05	
Max HGL (ft)	845.45	847.75	845.58	838.05	837.06	836.42	835.35		834.52	832.76
Link ID	25A-26	26-25	25-24	24-23	23-22.1	22.1-22	22-21	21-20	20-20B	
Length (ft)	8.50	39.04	231.43	300.00	113.96	113.67	106.92	193.86	44.97	
Dia (ft)	1.25	2.00	2.00	2.00	2.00	2.00	2.00	2.50	2.50	
Slope (ft/ft)	0.0706	0.0000	0.0100	0.0265	0.0100	0.0100	0.0095	0.0050	0.0047	
Up Invert (ft)	845.19	848.26	847.46	845.15	837.21	836.07	834.93	833.89	832.98	
Dn Invert (ft)	845.19	847.46	845.15	837.21	836.07	834.93	834.28	832.98	832.76	
Max Q (cfs)	0.42	0.41	1.39	4.03	7.53	10.22	12.92	15.72	16.84	
Max Vel (ft/s)	0.34	1.75	3.39	4.70	5.42	4.99	5.57	5.12	5.78	
Max Depth (ft)	0.33	0.26	0.38	0.63	0.92	1.14	1.39	1.50	1.43	

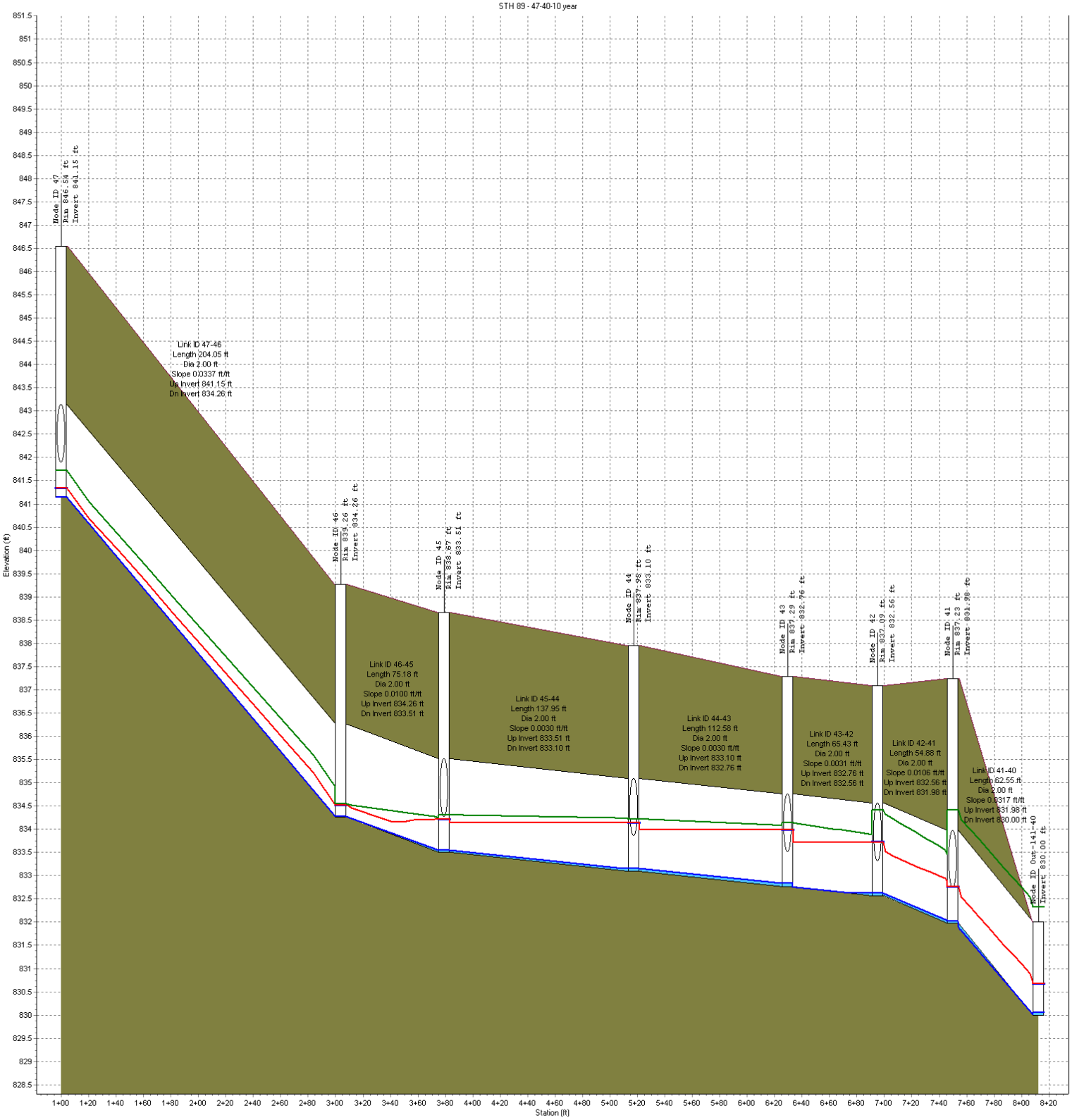


Node ID:	30	31	32	33	34	35	36	Out-136-37
Rim (ft):	852.55	851.55	850.70	840.19	839.48	837.52	837.45	
Invert (ft):	847.59	846.76	846.17	835.49	834.39	832.11	831.84	831.28
Min Pipe Cover (ft):	2.96	2.80	2.53	2.70	3.09	3.41	3.62	
Max HGL (ft):	847.92	847.34	846.64	836.13	835.32	833.27	832.82	832.09

Link ID:	30-31	31-32	32-33	33-34	34-35	35-36	36-37	
Length (ft):	166.95	171.05	384.98	36.37	225.62	27.33	38.30	
Dia (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00	
Slope (ft/ft):	0.0050	0.0035	0.0277	0.0303	0.0101	0.0100	0.0145	
Up Invert (ft):			846.17	835.49	834.39	832.11	831.84	
Dn Invert (ft):			835.49	834.39	832.11	831.84	831.28	
Max Q (cfs):	1.03	2.27	4.97	6.29	10.10	10.02	10.03	
Max Vel (ft/s):	1.96	3.48	7.05	5.63	6.11	5.85	7.38	
Max Depth (ft):	0.45	0.53	0.56	0.79	1.04	1.07	0.89	

Profile Plot

STH 89 - 47-40-10 year



Node ID:	47	46	45	44	43	42	41	Out-141-40
Rim (ft):	846.54	839.26	838.67	837.95	837.29	837.09	837.23	
Invert (ft):	841.15	834.26	833.51	833.10	832.76	832.56	831.98	830.00
Min Pipe Cover (ft):	3.40	3.00	3.16	2.85	2.53	2.53	3.25	
Max HGL (ft):	841.34	834.52	834.21	834.13	833.99	833.72	832.76	830.67

Link ID:	47-46	46-45	45-44	44-43	43-42	42-41	41-40
Length (ft):	204.05	75.18	137.95	112.58	65.43	54.88	62.55
Dia (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Slope (ft/ft):	0.0337	0.0100	0.0030	0.0030	0.0031	0.0106	0.0317
Up Invert (ft):		834.26	833.51	833.10	832.76	832.56	831.98
Dn Invert (ft):		833.51	833.10	832.76	832.56	831.98	830.00
Max Q (cfs):	0.90	0.87	3.10	4.40	6.17	10.08	10.64
Max Vel (ft/s):	4.98	1.50	2.58	2.44	3.17	6.71	10.32
Max Depth (ft):	0.23	0.48	0.87	1.13	1.19	0.97	0.73

Project Description

File Name	3670-01-01_Pipe Analysis_SSA-NoBike_Alt3.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	May 08, 2019	00:00:00
End Analysis On	May 09, 2019	00:00:00
Start Reporting On	May 08, 2019	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	32
Nodes	53
Junctions	21
Outfalls	3
Flow Diversions	0
Inlets	29
Storage Nodes	0
Links	69
Channels	19
Pipes	50
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	10 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ft²)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-10A	11791.00	0.2900	0.58	0.17	0.05	0.55	0 00:05:00
2	Sub-10B	18457.98	0.2300	0.58	0.13	0.06	0.68	0 00:05:00
3	Sub-10C	7075.02	0.5100	0.58	0.30	0.05	0.58	0 00:05:00
4	Sub-10D	4467.99	0.7000	0.58	0.41	0.04	0.50	0 00:05:00
5	Sub-11A	157738.99	0.2700	0.58	0.16	0.57	6.81	0 00:05:00
6	Sub-11B	3939.00	0.9000	0.58	0.52	0.05	0.57	0 00:05:00
7	Sub-12A	99805.02	0.1600	0.64	0.10	0.24	2.35	0 00:06:00
8	Sub-12B	38139.00	0.1600	0.70	0.11	0.10	0.84	0 00:07:00
9	Sub-12C	3918.00	0.9000	0.58	0.52	0.05	0.56	0 00:05:00
10	Sub-13A	3355.99	0.9000	0.58	0.52	0.04	0.48	0 00:05:00
11	Sub-15A	6010.02	0.9000	0.58	0.52	0.07	0.86	0 00:05:00
12	Sub-16A	377111.99	0.2500	1.06	0.27	2.30	8.63	0 00:16:00
13	Sub-16B	118416.99	0.7400	1.03	0.76	2.07	8.29	0 00:15:00
14	Sub-16C	997.00	0.9000	0.58	0.52	0.01	0.14	0 00:05:00
15	Sub-16D	630.01	0.9000	0.58	0.52	0.01	0.09	0 00:05:00
16	Sub-17A	1471.98	0.9000	0.58	0.52	0.02	0.21	0 00:05:00
17	Sub-18A	35208.98	0.1600	0.70	0.11	0.09	0.77	0 00:07:00
18	Sub-18B	75226.99	0.1600	0.80	0.13	0.22	1.48	0 00:09:00
19	Sub-18C	2574.00	0.9000	0.58	0.52	0.03	0.37	0 00:05:00
20	Sub-20A	5346.99	0.6700	0.58	0.39	0.05	0.57	0 00:05:00
21	Sub-21A	118347.99	0.1600	0.85	0.14	0.37	2.22	0 00:10:00
22	Sub-21B	3417.02	0.6700	0.58	0.39	0.03	0.37	0 00:05:00
23	Sub-22.1A	20080.00	0.2300	0.58	0.13	0.06	0.74	0 00:05:00
24	Sub-22A	26385.99	0.2900	0.58	0.17	0.10	1.22	0 00:05:00
25	Sub-22B	5039.98	0.9000	0.58	0.52	0.06	0.73	0 00:05:00
26	Sub-23A	86498.05	0.4300	0.58	0.25	0.49	5.94	0 00:05:00
27	Sub-23B	6274.99	0.9000	0.58	0.52	0.08	0.90	0 00:05:00
28	Sub-24A	60415.50	0.7800	0.58	0.45	0.63	7.53	0 00:05:00
29	Sub-24B	7233.01	0.9000	0.58	0.52	0.09	1.04	0 00:05:00
30	Sub-25A	9368.01	0.3300	0.58	0.19	0.04	0.49	0 00:05:00
31	Sub-25B	28858.98	0.2700	0.58	0.16	0.10	1.25	0 00:05:00
32	Sub-26A	7316.34	0.6800	0.58	0.39	0.07	0.80	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	10	Junction	835.29	840.46	835.29	840.46	0.00	2.14	836.00	0.00	4.46	0 00:00	0.00	0.00
2	11	Junction	834.69	839.58	834.69	839.58	0.00	8.34	835.89	0.00	3.69	0 00:00	0.00	0.00
3	12	Junction	834.09	838.58	834.09	838.58	0.00	11.09	835.58	0.00	3.00	0 00:00	0.00	0.00
4	12A	Junction	836.75	838.19	836.75	838.19	0.00	2.35	837.09	0.00	1.10	0 00:00	0.00	0.00
5	13	Junction	833.58	837.73	833.58	837.73	0.00	11.21	834.86	0.00	2.87	0 00:00	0.00	0.00
6	14	Junction	831.91	836.48	831.91	836.48	0.00	22.38	833.41	0.00	3.06	0 00:00	0.00	0.00
7	15	Junction	832.51	836.18	832.51	836.18	0.00	15.10	833.93	0.00	2.25	0 00:00	0.00	0.00
8	16	Junction	832.63	836.09	832.63	836.09	0.00	15.11	834.13	0.00	1.96	0 00:00	0.00	0.00
9	16A	Junction	833.35	835.51	833.35	835.51	0.00	6.54	834.60	0.00	0.91	0 00:00	0.00	0.00
10	17	Junction	832.75	836.17	832.75	836.17	0.00	3.46	834.13	0.00	2.04	0 00:00	0.00	0.00
11	18	Junction	832.95	836.59	832.95	836.59	0.00	2.67	834.13	0.00	2.46	0 00:00	0.00	0.00
12	18A	Junction	835.45	836.62	835.45	836.62	0.00	0.77	835.67	0.00	0.95	0 00:00	0.00	0.00
13	20	Junction	832.98	837.52	832.98	837.52	0.00	16.91	834.52	0.00	3.00	0 00:00	0.00	0.00
14	21	Junction	833.89	838.73	833.89	838.73	0.00	15.67	835.35	0.00	3.38	0 00:00	0.00	0.00
15	22	Junction	834.93	839.42	834.93	839.42	0.00	13.07	836.42	0.00	3.00	0 00:00	0.00	0.00
16	22.1	Junction	836.07	840.64	836.07	840.64	0.00	10.18	837.06	0.00	3.58	0 00:00	0.00	0.00
17	23	Junction	837.21	842.79	837.21	842.79	0.00	7.63	838.05	0.00	4.74	0 00:00	0.00	0.00
18	24	Junction	845.15	849.68	845.15	849.68	0.00	4.16	845.58	0.00	4.10	0 00:00	0.00	0.00
19	25	Junction	847.46	852.00	847.46	852.00	0.00	1.46	847.79	0.00	4.21	0 00:00	0.00	0.00
20	26	Junction	848.26	852.71	848.26	852.71	0.00	0.42	848.45	0.00	4.26	0 00:00	0.00	0.00
21	Jun-16Exist	Junction	834.19	835.69	834.19	835.69	0.00	8.62	835.69	0.00	0.00	0 00:16	0.14	8.00
22	OFFSITE-8	Outfall	826.33					0.74	826.46					
23	Out-114-14C	Outfall	831.80					22.39	833.06					
24	Out-120-20B	Outfall	832.76					16.84	832.76					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	10-11	Pipe	10	11	200.46	835.29	834.69	0.3000	24.000	0.0120	2.35	13.42	0.18	1.69	0.95	0.48	0.00	Calculated
2	10A-10B	Pipe	10A	10B	60.59	836.53	836.35	0.3000	15.000	0.0120	0.52	3.82	0.13	1.39	0.43	0.34	0.00	Calculated
3	10B-10C	Pipe	10B	10C	24.01	836.35	836.28	0.3000	15.000	0.0120	1.16	3.83	0.30	2.82	0.46	0.37	0.00	Calculated
4	10C-10D	Pipe	10C	10D	52.16	836.03	835.87	0.3000	18.000	0.0120	1.69	6.24	0.27	2.33	0.64	0.43	0.00	Calculated
5	10D-10	Pipe	10D	10	25.54	835.87	835.79	0.3000	18.000	0.0120	2.14	6.25	0.34	3.18	0.61	0.41	0.00	Calculated
6	11-12	Pipe	11	12	200.00	834.69	834.09	0.3000	24.000	0.0120	7.78	13.42	0.58	3.62	1.34	0.67	0.00	Calculated
7	11A-11B	Pipe	11A	11B	18.50	834.82	834.72	0.5000	24.000	0.0120	6.73	17.38	0.39	3.13	1.30	0.65	0.00	Calculated
8	11B-11	Pipe	11B	11	6.50	834.72	834.69	0.4900	24.000	0.0120	6.98	17.20	0.41	4.65	1.25	0.62	0.00	Calculated
9	12-13	Pipe	12	13	170.00	834.09	833.58	0.3000	24.000	0.0120	10.83	13.42	0.81	4.88	1.37	0.69	0.00	Calculated
10	12A-12B	Pipe	12A	12B	22.00	836.75	835.04	7.7600	15.000	0.0120	2.35	19.49	0.12	4.08	0.59	0.48	0.00	Calculated
11	12B-12C	Pipe	12B	12C	13.50	835.04	834.87	1.2600	15.000	0.0120	3.05	7.85	0.39	3.27	0.89	0.71	0.00	Calculated
12	12C-12	Pipe	12C	12	6.50	834.87	834.84	0.4900	15.000	0.0120	3.39	4.91	0.69	3.89	0.84	0.67	0.00	Calculated
13	13-14	Pipe	13	14	250.00	833.58	832.33	0.5000	24.000	0.0120	10.75	17.33	0.62	5.44	1.21	0.60	0.00	Calculated
14	13A-13	Pipe	13A	13	6.50	834.46	834.33	2.0000	15.000	0.0120	0.46	9.90	0.05	3.46	0.47	0.38	0.00	Calculated
15	14-14A	Pipe	14	Out-114-14C	38.10	831.91	831.80	0.3000	29.000	0.0120	22.39	41.07	0.55	5.10	1.38	0.57	0.00	Calculated
16	15-14	Pipe	15	14	60.01	832.51	832.33	0.3000	24.000	0.0120	15.09	24.82	0.61	4.38	1.25	0.62	0.00	Calculated
17	15A-15	Pipe	15A	15	6.55	833.29	833.26	0.4900	15.000	0.0120	0.67	4.89	0.14	2.46	0.65	0.52	0.00	Calculated
18	16-15	Pipe	16	15	40.49	832.63	832.51	0.3000	24.000	0.0120	15.10	24.78	0.61	3.70	1.46	0.73	0.00	Calculated
19	16A-16B	Pipe	16A	16B	6.29	833.35	833.20	2.4500	18.000	0.0120	6.57	17.80	0.37	5.62	1.23	0.82	0.00	Calculated
20	16B-16C	Pipe	16B	16C	16.62	832.70	832.65	0.2600	24.000	0.0120	14.71	23.06	0.64	3.23	1.66	0.83	0.00	Calculated
21	16C-16	Pipe	16C	16	6.50	832.65	832.63	0.3100	24.000	0.0120	14.71	25.14	0.59	3.40	1.56	0.78	0.00	Calculated
22	16D-16C	Pipe	16D	16C	6.58	835.97	835.97	0.0800	12.000	0.0120	1.15	1.73	0.66	2.82	0.51	0.51	0.00	Calculated
23	17-16	Pipe	17	16	38.50	832.75	832.63	0.3000	24.000	0.0120	3.32	13.45	0.25	1.73	1.44	0.72	0.00	Calculated
24	17A-17	Pipe	17A	17	6.50	833.53	833.50	0.4900	15.000	0.0120	1.03	4.91	0.21	2.79	0.62	0.49	0.00	Calculated
25	18-17	Pipe	18	17	66.63	832.95	832.75	0.3000	24.000	0.0120	2.60	13.43	0.19	1.95	1.28	0.64	0.00	Calculated
26	18A-18B	Pipe	18A	18B	16.60	835.45	834.45	6.0000	12.000	0.0120	0.77	9.45	0.08	6.66	0.20	0.21	0.00	Calculated
27	18B-18C	Pipe	18B	18C	14.32	834.20	833.73	3.3100	15.000	0.0120	2.03	12.73	0.16	3.56	0.61	0.49	0.00	Calculated
28	18C-18	Pipe	18C	18	6.50	833.73	833.70	0.4900	15.000	0.0120	2.67	4.91	0.54	3.45	0.75	0.60	0.00	Calculated
29	20-20B	Pipe	20	Out-120-20B	44.97	832.98	832.76	0.4700	30.000	0.0120	16.84	30.58	0.55	5.78	1.43	0.57	0.00	Calculated
30	20A-20	Pipe	20A	20	6.50	834.35	834.22	2.0000	15.000	0.0120	1.62	9.90	0.16	4.42	0.42	0.34	0.00	Calculated
31	21-20	Pipe	21	20	183.86	833.89	832.98	0.5000	30.000	0.0120	15.72	31.42	0.50	5.12	1.50	0.60	0.00	Calculated
32	21A-21B	Pipe	21A	21B	20.31	835.29	835.19	0.5000	15.000	0.0120	2.21	4.95	0.45	2.98	0.79	0.63	0.00	Calculated
33	21B-21	Pipe	21B	21	8.50	835.19	835.14	0.5000	15.000	0.0120	2.84	4.95	0.57	3.68	0.75	0.60	0.00	Calculated
34	22.1-22	Pipe	22.1	22	113.67	836.07	834.93	1.0000	24.000	0.0120	10.22	24.50	0.42	4.99	1.24	0.62	0.00	Calculated
35	22.1A-22.1	Pipe	22.1A	22.1	8.75	836.86	836.82	0.4900	15.000	0.0120	2.97	27.08	0.11	10.58	0.35	0.28	0.00	Calculated
36	22-21	Pipe	22	21	106.92	834.93	834.39	0.5000	24.000	0.0120	12.92	17.33	0.75	5.57	1.39	0.69	0.00	Calculated
37	22A-22	Pipe	22A	22	8.50	835.85	835.68	2.0000	15.000	0.0120	2.34	9.90	0.24	4.45	0.72	0.57	0.00	Calculated
38	22B-22	Pipe	22B	22	32.50	836.33	835.68	2.0000	15.000	0.0120	0.86	9.90	0.09	3.88	0.48	0.39	0.00	Calculated
39	23-22.1	Pipe	23	22.1	113.98	837.21	836.07	1.0000	24.000	0.0120	7.53	24.51	0.31	5.42	0.92	0.46	0.00	Calculated
40	23A-23	Pipe	23A	23	8.50	838.13	837.96	2.0000	15.000	0.0120	2.93	9.90	0.30	4.94	0.61	0.49	0.00	Calculated
41	23B-23	Pipe	23B	23	32.50	838.61	837.96	2.0000	15.000	0.0120	0.82	9.90	0.08	4.38	0.26	0.21	0.00	Calculated
42	24-23	Pipe	24	23	300.00	845.15	837.21	2.6500	24.000	0.0120	4.03	39.88	0.10	4.70	0.63	0.32	0.00	Calculated
43	24A-24	Pipe	24A	24	8.50	846.07	845.90	2.0000	15.000	0.0120	1.99	9.90	0.20	4.51	0.49	0.39	0.00	Calculated
44	24B-24	Pipe	24B	24	32.50	846.55	845.90	2.0000	15.000	0.0120	0.84	9.90	0.08	4.39	0.27	0.21	0.00	Calculated
45	25-24	Pipe	25	24	231.43	847.46	845.15	1.0000	24.000	0.0120	1.39	24.51	0.06	3.39	0.38	0.19	0.00	Calculated
46	25A-25	Pipe	25A	25	8.50	848.38	848.21	2.0000	15.000	0.0120	0.46	9.90	0.05	3.27	0.21	0.17	0.00	Calculated
47	25B-25	Pipe	25B	25	32.50	848.86	848.21	2.0000	15.000	0.0120	0.60	9.90	0.06	4.04	0.22	0.18	0.00	Calculated
48	26-25	Pipe	26	25	99.04	848.26	847.46	0.8000	24.000	0.0120	0.41	21.97	0.02	1.75	0.26	0.13	0.00	Calculated
49	26A-26	Pipe	26A	26	8.50	849.18	849.01	2.0000	15.000	0.0120	0.42	9.90	0.04	3.34	0.20	0.16	0.00	Calculated
50	Link-08	Pipe	Jun-16Exist	16A	78.95	834.19	833.35	1.0700	18.000	0.0240	6.54	5.89	1.11	3.98	1.37	0.92	0.00	> CAPACITY
51	L-11B-12C	Channel	11B	12C	242.41	839.46	838.46	0.4100	6.000	0.0150	0.26	12.28	0.02	0.73	0.15	0.31	0.00	
52	L-12C-13A	Channel	12C	13A	242.41	838.46	837.61	0.3500	6.000	0.0150	0.37	11.32	0.03	1.02	0.16	0.31	0.00	
53	L-13A-15A	Channel	13A	15A	214.40	837.61	836.08	0.7100	6.000	0.0150	0.39	16.46	0.02	0.84	0.18	0.35	0.00	
54	L15A-16C	Channel	15A	16C	28.00	836.08	835.97	0.4100	6.000	0.0150	0.57	8.55	0.07	1.09	0.18	0.37	0.00	
55	L16D-16C	Channel	16D	16C	6.58	832.80	832.65	2.2500	6.000	0.0320	0.37	8.55	0.04	1.03	0.15	0.31	0.00	
56	L-17A-16D	Channel	17A	16D	31.92	836.05	835.97	0.2500	6.000	0.0320	1.52	9.67	0.16	2.22	0.20	0.43	0.00	
57	L18C-17A	Channel	18C	17A	66.46	836.47	836.05	0.6300	6.000	0.0320	2.32	15.13	0.15	2.02	0.27	0.54	0.00	
58	L-20A-18C	Channel	20A	18C	242.41	837.40	836.47	0.3800	6.000	0.0150	3.18	11.87	0.27	2.12	0.30	0.62	0.00	

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
59	L-21B-20A	Channel	21B	20A	242.41	838.57	837.40	0.4800	6.000	0.0150	4.32	13.04	0.33	2.10	0.34	0.70	0.00	
60	L22.1A-22A	Channel	22.1A	22A	113.68	840.48	839.26	1.0700	6.000	0.0320	6.68	32.37	0.21	2.82	0.37	0.75	0.00	
61	L-22A-21B	Channel	22A	21B	242.41	839.26	838.57	0.2800	6.000	0.0150	5.61	10.07	0.56	1.99	0.39	0.79	0.00	
62	L-22B-OFF	Channel	22B	OFFSITE-8	242.41	839.26	826.33	5.3300	6.000	0.0150	0.74	43.45	0.02	3.76	0.13	0.26	0.00	
63	L23A-22.1A	Channel	23A	22.1A	222.03	842.63	840.48	0.9700	6.000	0.0320	8.92	8.41	1.06	3.01	0.40	0.86	0.00	
64	L-23B-22B	Channel	23B	22B	242.41	842.63	839.26	1.3900	6.000	0.0150	0.89	22.17	0.04	2.52	0.15	0.31	0.00	
65	L-24A-23A	Channel	24A	23A	242.41	849.52	842.63	2.8400	6.000	0.0150	5.92	31.70	0.19	2.05	0.39	0.78	0.00	
66	L-24B-23B	Channel	24B	23B	242.41	849.52	842.63	2.8400	6.000	0.0150	0.82	31.70	0.03	2.03	0.16	0.33	0.00	
67	L-25A-24A	Channel	25A	24A	242.41	851.84	849.52	0.9600	6.000	0.0150	0.40	18.42	0.02	0.73	0.21	0.42	0.00	
68	L25B-24B	Channel	25B	24B	231.43	851.84	849.52	1.0000	6.000	0.0320	0.64	18.85	0.03	1.77	0.16	0.31	0.00	
69	L-26A-25A	Channel	26A	25A	242.41	852.55	851.84	0.2900	6.000	0.0150	0.37	10.14	0.04	0.96	0.16	0.32	0.00	

Inlet Summary

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Initial Water Elevation (ft)	Ponded Area (ft^2)	Peak Flow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
1	10A	NEENAH FOUNDRY	R-4882	On Sag	1	836.53	838.69	836.53	8.12	0.55	N/A	N/A	N/A	13.00	0.92	838.75
2	10B	NEENAH FOUNDRY	R-4882	On Sag	1	836.35	839.09	836.35	16.25	0.68	N/A	N/A	N/A	13.00	1.36	839.16
3	10C	NEENAH FOUNDRY	R-3067	On Sag	1	836.03	840.13	836.03	6.00	0.58	N/A	N/A	N/A	13.00	2.79	840.22
4	10D	NEENAH FOUNDRY	R-3067	On Sag	1	835.87	840.04	835.87	6.00	0.50	N/A	N/A	N/A	13.00	2.23	840.12
5	11A	NEENAH FOUNDRY	R-4882	On Sag	1	834.82	837.44	834.82	16.25	6.80	N/A	N/A	N/A	13.00	22.97	837.94
6	11B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.72	839.46	834.72	N/A	0.57	0.31	0.26	53.99	13.00	3.17	839.55
7	12B	NEENAH FOUNDRY	R-4882	On Sag	1	835.04	836.73	835.04	8.12	0.84	N/A	N/A	N/A	13.00	1.88	836.80
8	12C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.87	838.46	834.87	N/A	0.82	0.44	0.37	54.25	13.00	4.58	838.58
9	13A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.46	837.61	834.46	N/A	0.85	0.46	0.39	53.78	13.00	4.77	837.74
10	15A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.29	836.02	832.90	N/A	1.25	0.62	0.63	49.68	13.00	6.18	836.18
11	16B	NEENAH FOUNDRY	R-3508-B	On Sag	1	832.70	835.20	832.70	3.70	8.29	N/A	N/A	N/A	13.00	180.87	838.79
12	16C	NEENAH FOUNDRY	R-3067	On Sag	1	832.65	835.97	832.65	6.00	1.07	N/A	N/A	N/A	13.00	5.20	836.11
13	16D	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.67	835.97	833.67	N/A	1.61	1.18	0.44	72.95	13.00	10.66	836.22
14	17A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.53	836.05	833.53	N/A	2.53	1.00	1.53	39.61	13.00	8.97	836.27
15	18B	NEENAH FOUNDRY	R-4882	On Sag	1	834.20	835.85	834.20	8.12	1.48	N/A	N/A	N/A	13.00	3.75	835.96
16	18C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.73	836.47	833.83	N/A	3.54	1.18	2.35	33.46	13.00	9.59	836.70
17	20A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.35	837.40	834.35	N/A	4.88	1.45	3.43	29.70	13.00	11.10	837.67
18	21A	NEENAH FOUNDRY	R-4882	On Sag	1	835.29	837.40	835.29	8.12	2.22	N/A	N/A	N/A	13.00	5.61	837.55
19	21B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.19	838.57	835.19	N/A	5.98	1.65	4.33	27.54	13.00	12.15	838.85
20	22.1A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.13	842.63	838.13	N/A	9.66	2.63	7.03	27.26	13.00	14.93	842.97
21	22A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.85	839.26	835.85	N/A	7.90	1.96	5.94	24.80	13.00	13.71	839.58
22	22B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.33	839.26	836.33	N/A	1.60	0.71	0.89	44.58	13.00	6.53	839.43
23	23A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.13	842.63	838.13	N/A	11.86	2.27	9.59	19.13	13.00	12.43	842.92
24	23B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.61	842.63	838.61	N/A	1.72	0.67	1.05	39.10	13.00	4.93	842.77
25	24A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.07	849.52	846.07	N/A	7.93	1.86	6.07	23.44	13.00	11.13	849.78
26	24B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.55	849.52	846.55	N/A	1.67	0.69	0.98	41.60	13.00	5.24	849.66
27	25A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.38	851.84	848.38	N/A	0.86	0.46	0.40	53.36	13.00	4.41	851.96
28	25B	NEENAH FOUNDRY	R 3067 Diagonal Reversible	On Grade	1	848.86	851.84	848.86	N/A	1.24	0.60	0.64	48.55	13.00	5.63	851.99
29	26A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	849.18	852.55	849.18	N/A	0.79	0.42	0.37	53.36	13.00	4.07	852.66

Subbasin Hydrology

Subbasin : Sub-10A

Input Data

Area (ft²) 11791.00
Weighted Runoff Coefficient 0.2900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	11791.00	-	0.29
Composite Area & Weighted Runoff Coeff.	11791.00		0.29

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

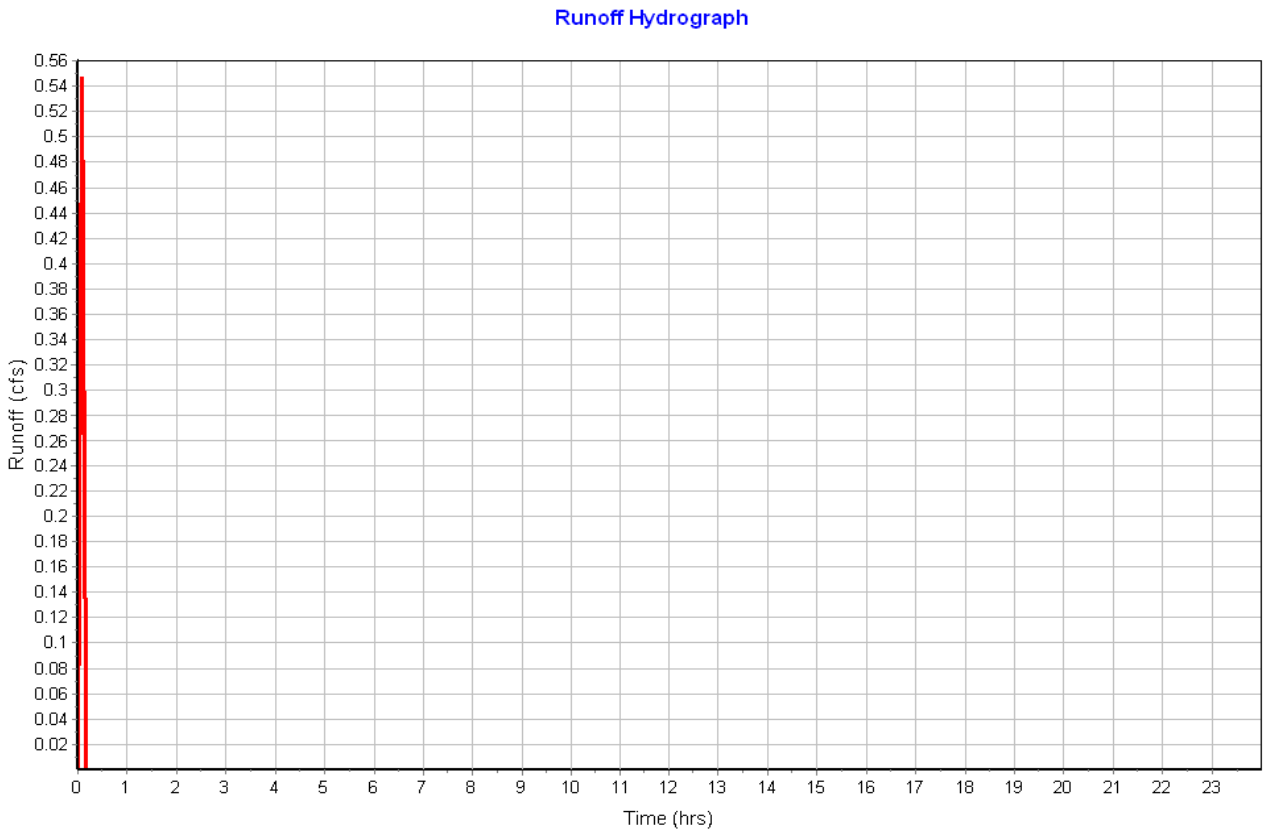
Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.17
Peak Runoff (cfs) 0.55
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.2900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-10A



Subbasin : Sub-10B

Input Data

Area (ft²) 18457.98
Weighted Runoff Coefficient 0.2300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	13.50	-	0.23
Composite Area & Weighted Runoff Coeff.	13.50		0.23

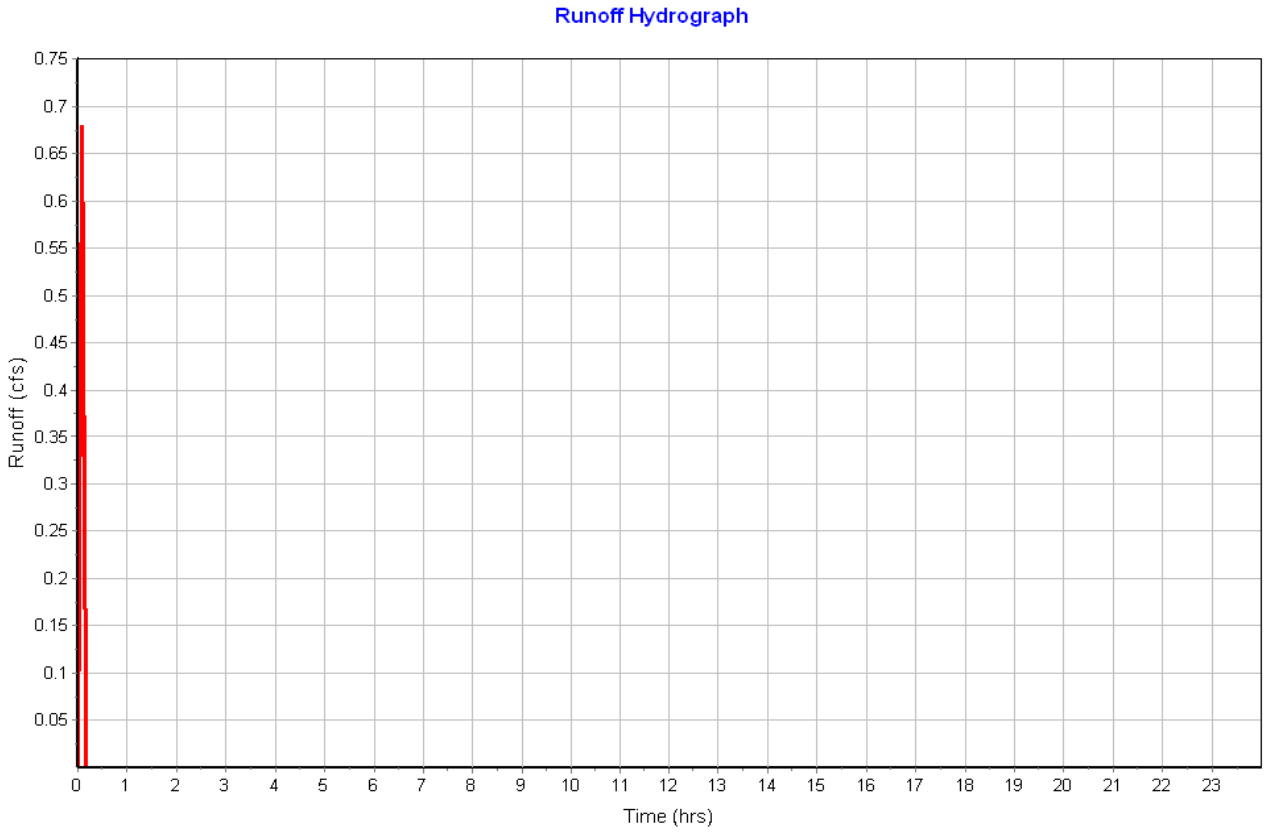
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.13
Peak Runoff (cfs) 0.68
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.2300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-10B



Subbasin : Sub-10C

Input Data

Area (ft²) 7075.02
Weighted Runoff Coefficient 0.5100

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	7075.02	-	0.51
Composite Area & Weighted Runoff Coeff.	7075.02		0.51

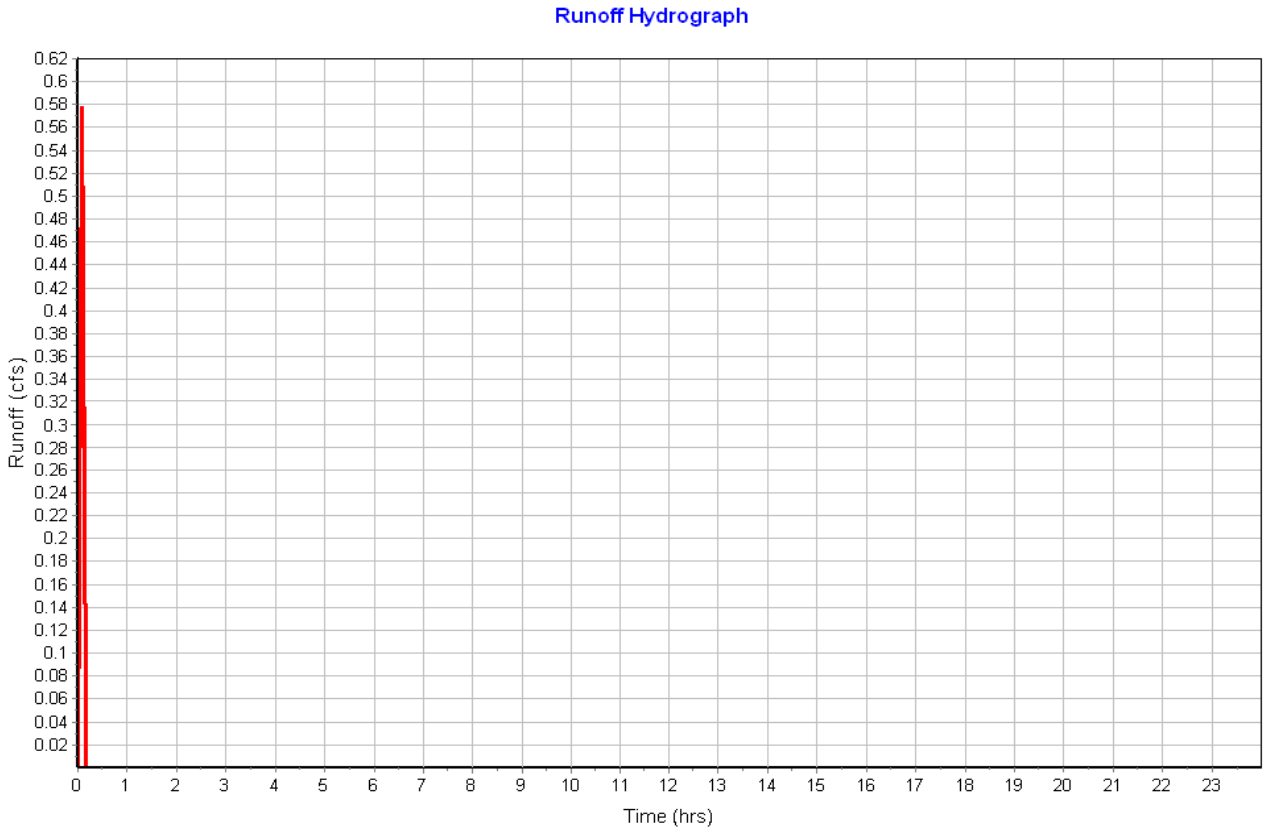
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.30
Peak Runoff (cfs) 0.58
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.5100
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-10C



Subbasin : Sub-10D

Input Data

Area (ft²) 4467.99
Weighted Runoff Coefficient 0.7000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	4467.99	-	0.70
Composite Area & Weighted Runoff Coeff.	4467.99		0.70

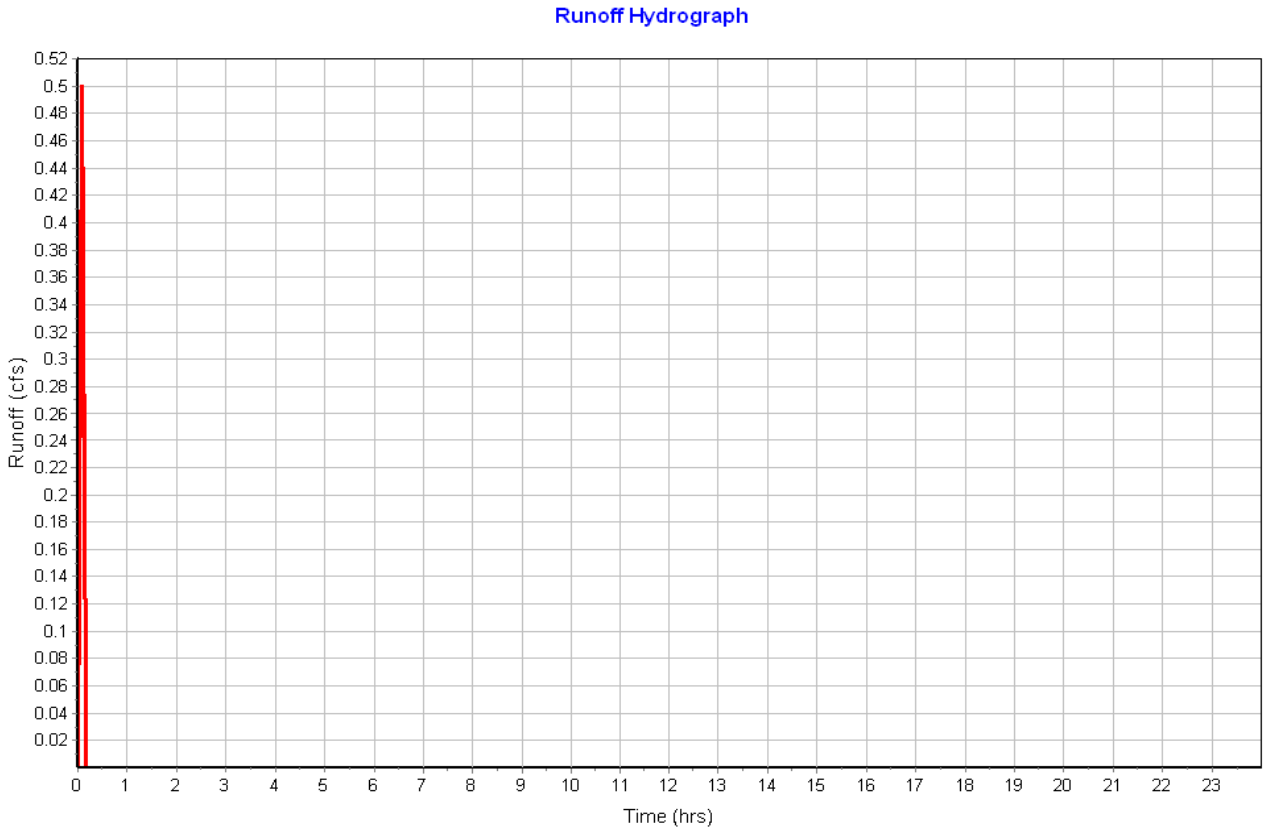
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.41
Peak Runoff (cfs) 0.50
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.7000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-10D



Subbasin : Sub-11A

Input Data

Area (ft²) 157738.99
Weighted Runoff Coefficient 0.2700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	157738.99	-	0.27
Composite Area & Weighted Runoff Coeff.	157738.99		0.27

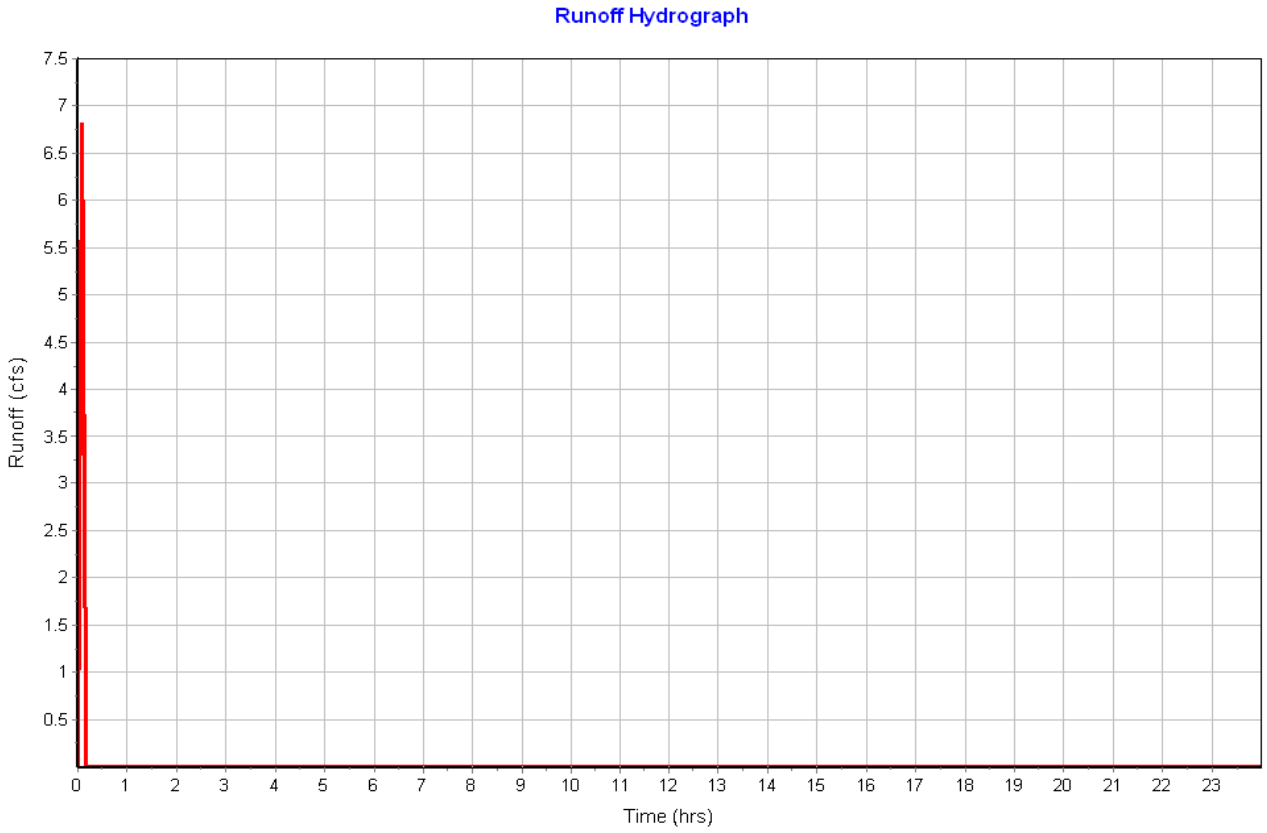
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.16
Peak Runoff (cfs) 6.81
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.2700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-11A



Subbasin : Sub-11B

Input Data

Area (ft²) 3939.00
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	3939.00	-	0.90
Composite Area & Weighted Runoff Coeff.	3939.00		0.90

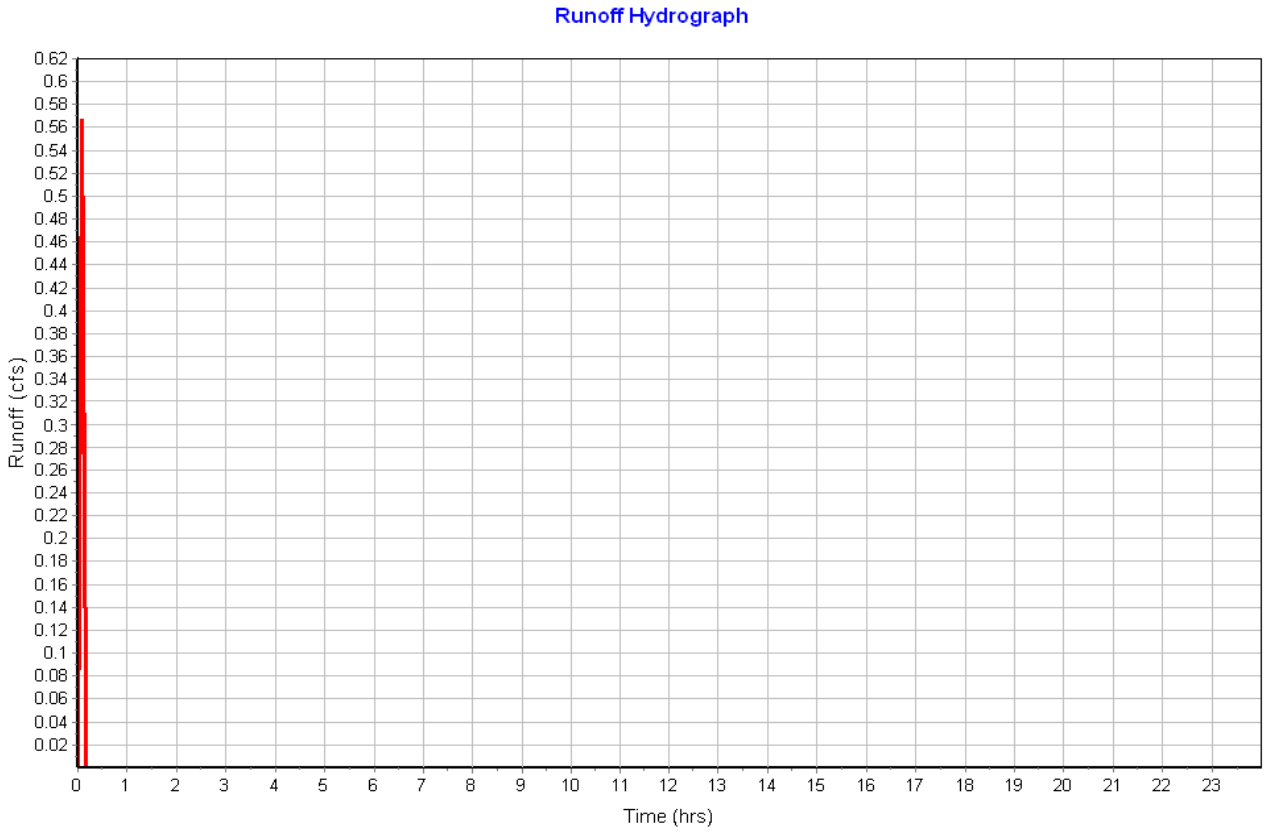
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.57
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-11B



Subbasin : Sub-12A

Input Data

Area (ft²) 99805.02
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	99805.02	-	0.16
Composite Area & Weighted Runoff Coeff.	99805.02		0.16

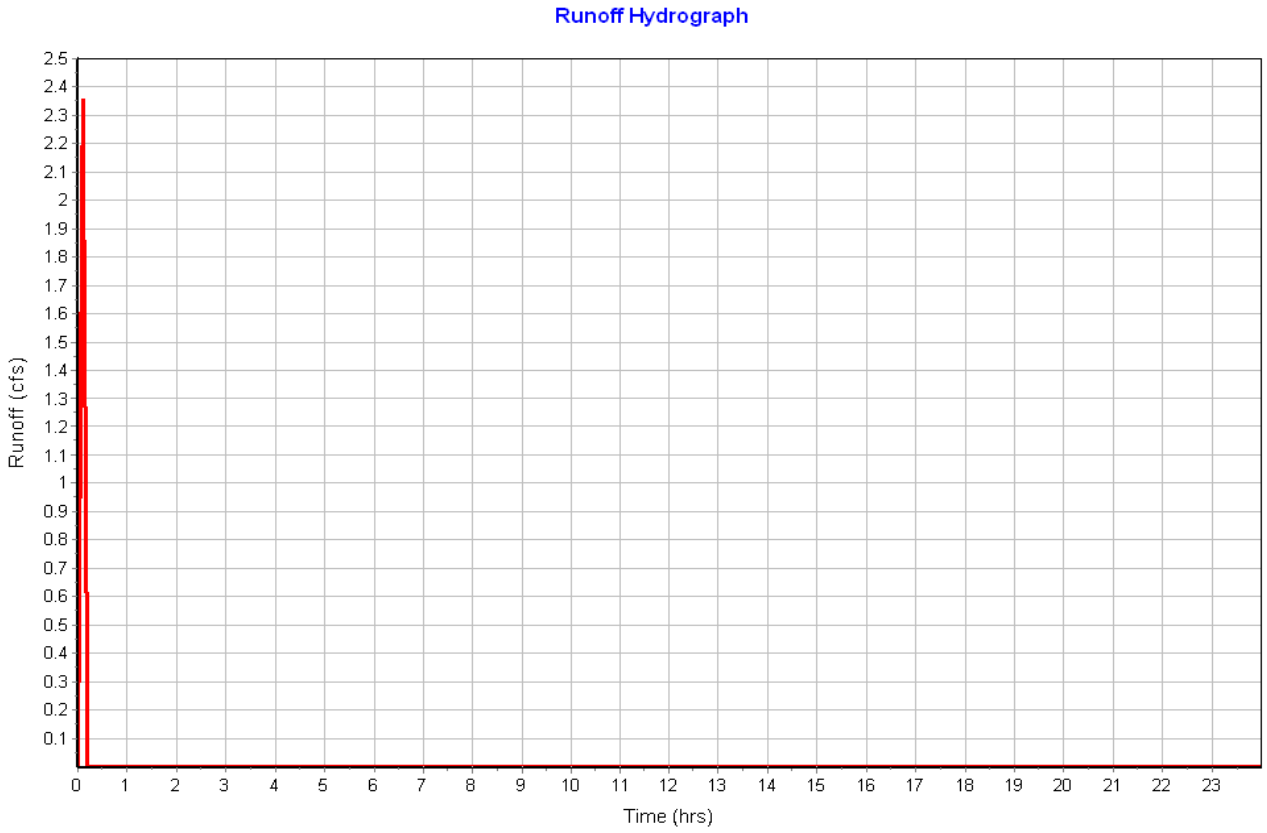
Time of Concentration

User-Defined TOC override (minutes): 6

Subbasin Runoff Results

Total Rainfall (in) 0.64
Total Runoff (in) 0.10
Peak Runoff (cfs) 2.35
Rainfall Intensity 6.413
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:06:00

Subbasin : Sub-12A



Subbasin : Sub-12B

Input Data

Area (ft²) 38139.00
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	38139.00	-	0.16
Composite Area & Weighted Runoff Coeff.	38139.00		0.16

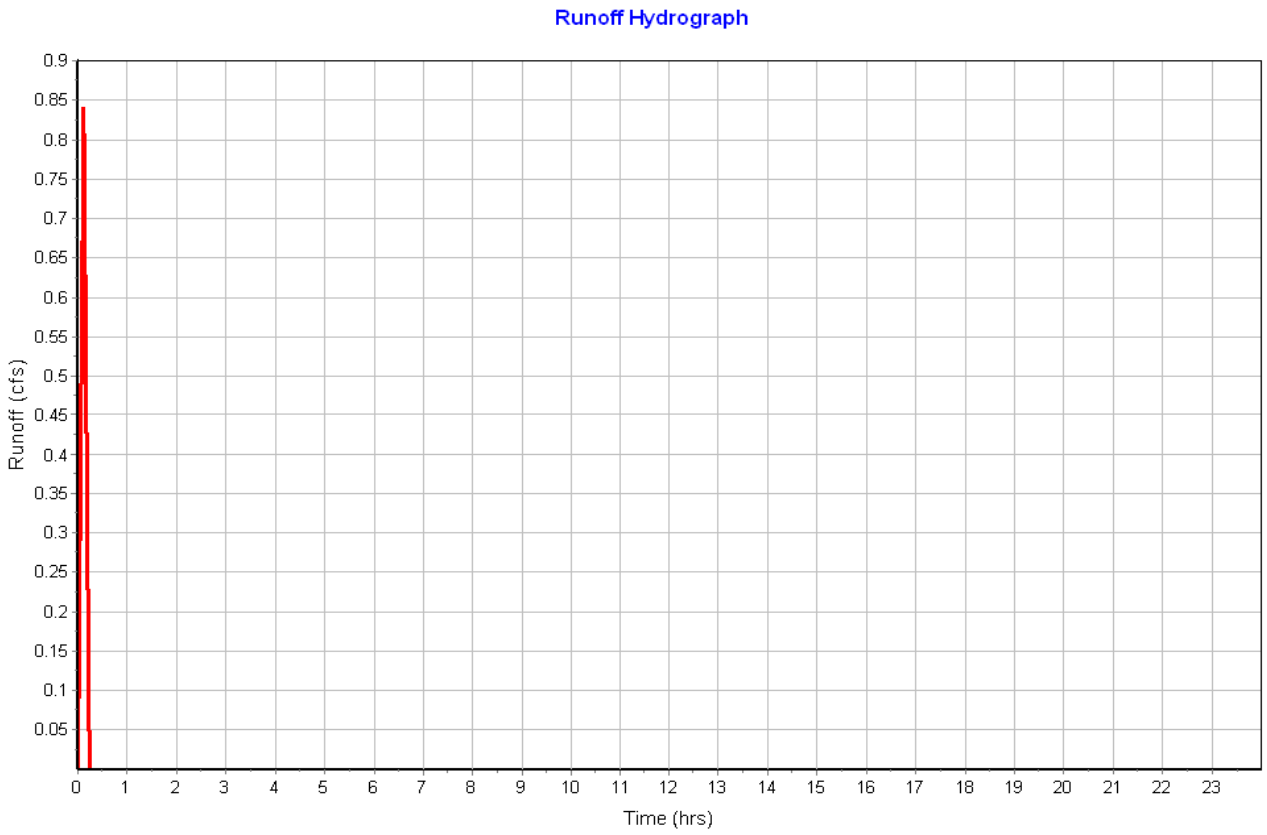
Time of Concentration

User-Defined TOC override (minutes): 7

Subbasin Runoff Results

Total Rainfall (in) 0.70
Total Runoff (in) 0.11
Peak Runoff (cfs) 0.84
Rainfall Intensity 5.985
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:07:00

Subbasin : Sub-12B



Subbasin : Sub-12C

Input Data

Area (ft²) 3918.00
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	3918.00	-	0.90
Composite Area & Weighted Runoff Coeff.	3918.00		0.90

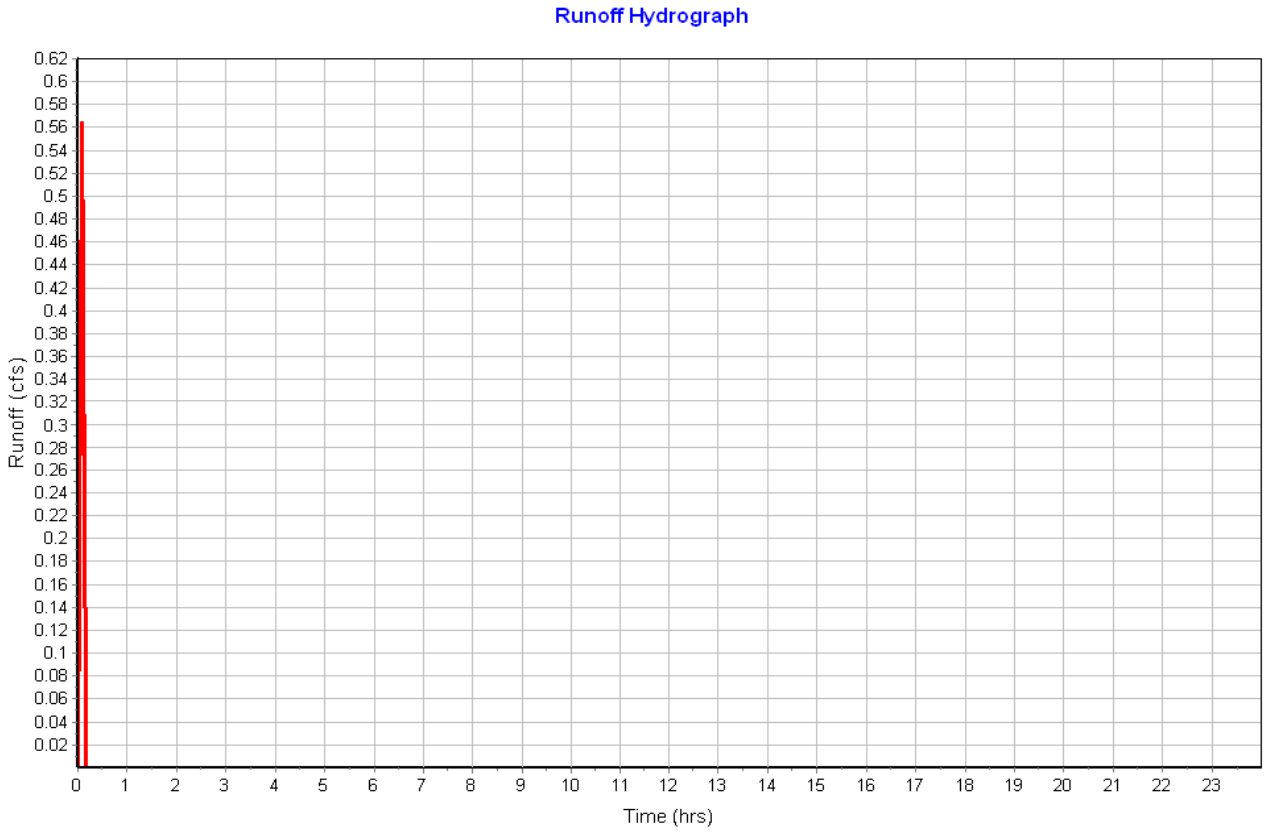
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.56
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-12C



Subbasin : Sub-13A

Input Data

Area (ft²) 3355.99
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	3355.99	-	0.90
Composite Area & Weighted Runoff Coeff.	3355.99		0.90

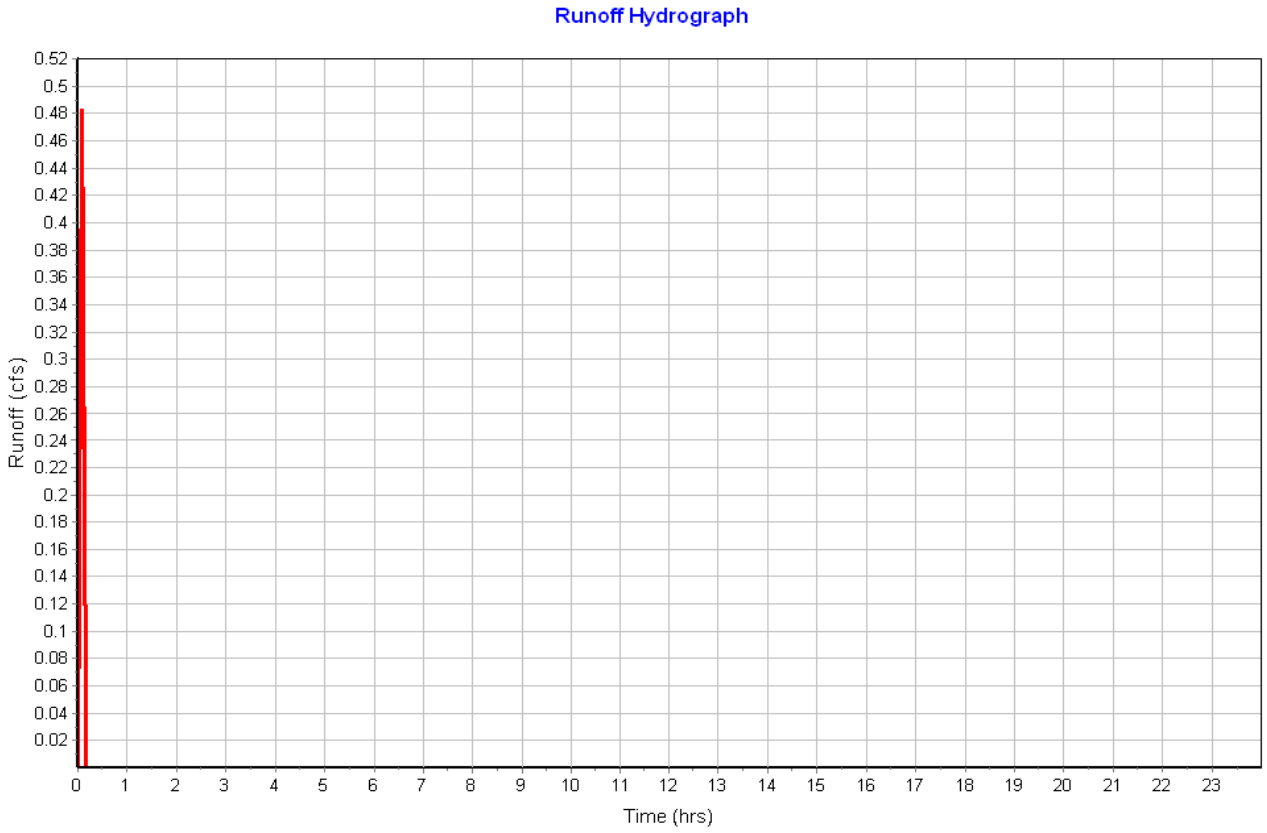
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.48
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-13A



Subbasin : Sub-15A

Input Data

Area (ft²) 6010.02
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	6010.02	-	0.90
Composite Area & Weighted Runoff Coeff.	6010.02		0.90

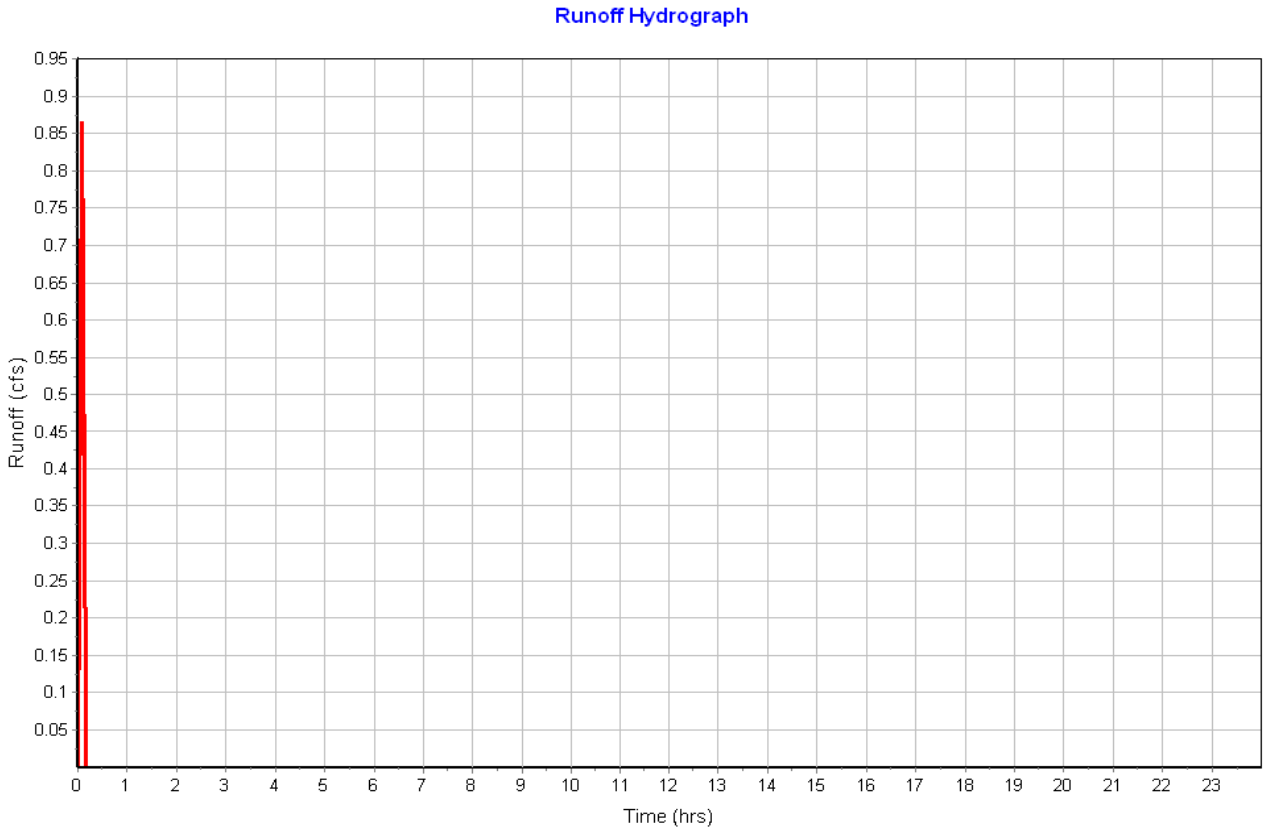
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.86
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-15A



Subbasin : Sub-16A

Input Data

Area (ft²) 377111.99
Weighted Runoff Coefficient 0.2500

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	377111.99	-	0.25
Composite Area & Weighted Runoff Coeff.	377111.99		0.25

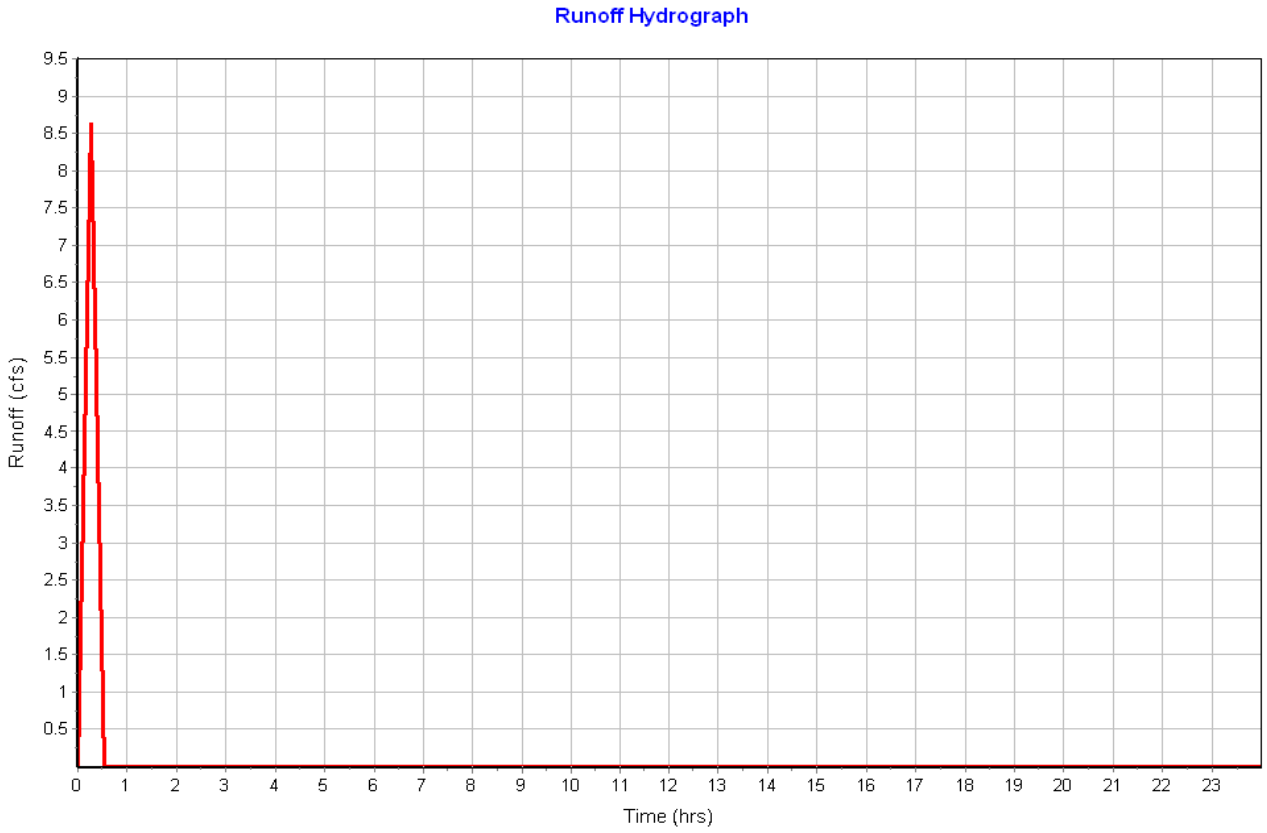
Time of Concentration

User-Defined TOC override (minutes): 16

Subbasin Runoff Results

Total Rainfall (in) 1.06
Total Runoff (in) 0.27
Peak Runoff (cfs) 8.63
Rainfall Intensity 3.985
Weighted Runoff Coefficient 0.2500
Time of Concentration (days hh:mm:ss) 0 00:16:00

Subbasin : Sub-16A



Subbasin : Sub-16B

Input Data

Area (ft²) 118416.99
Weighted Runoff Coefficient 0.7400

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	118416.99	-	0.74
Composite Area & Weighted Runoff Coeff.	118416.99		0.74

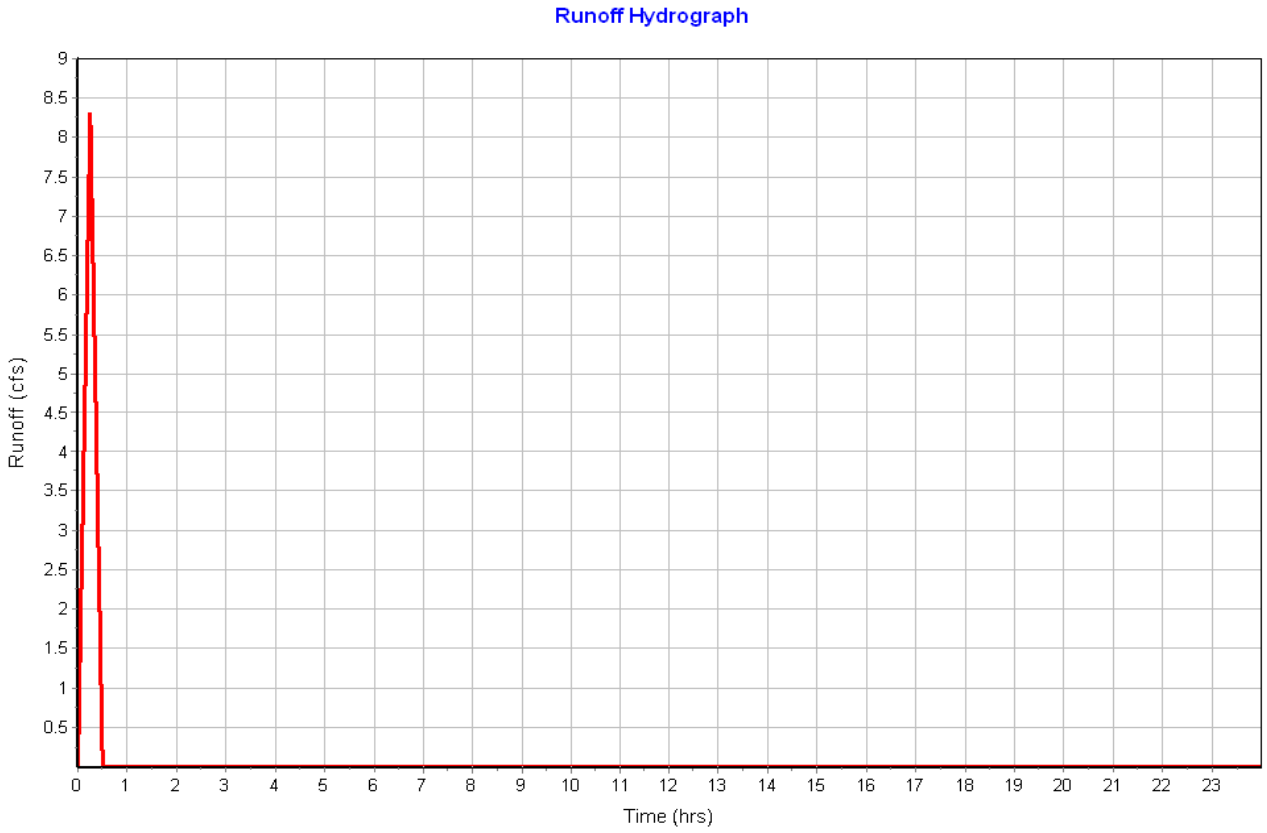
Time of Concentration

User-Defined TOC override (minutes): 15

Subbasin Runoff Results

Total Rainfall (in) 1.03
Total Runoff (in) 0.76
Peak Runoff (cfs) 8.29
Rainfall Intensity 4.120
Weighted Runoff Coefficient 0.7400
Time of Concentration (days hh:mm:ss) 0 00:15:00

Subbasin : Sub-16B



Subbasin : Sub-16C

Input Data

Area (ft²) 997.00
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	997.00	-	0.90
Composite Area & Weighted Runoff Coeff.	997.00		0.90

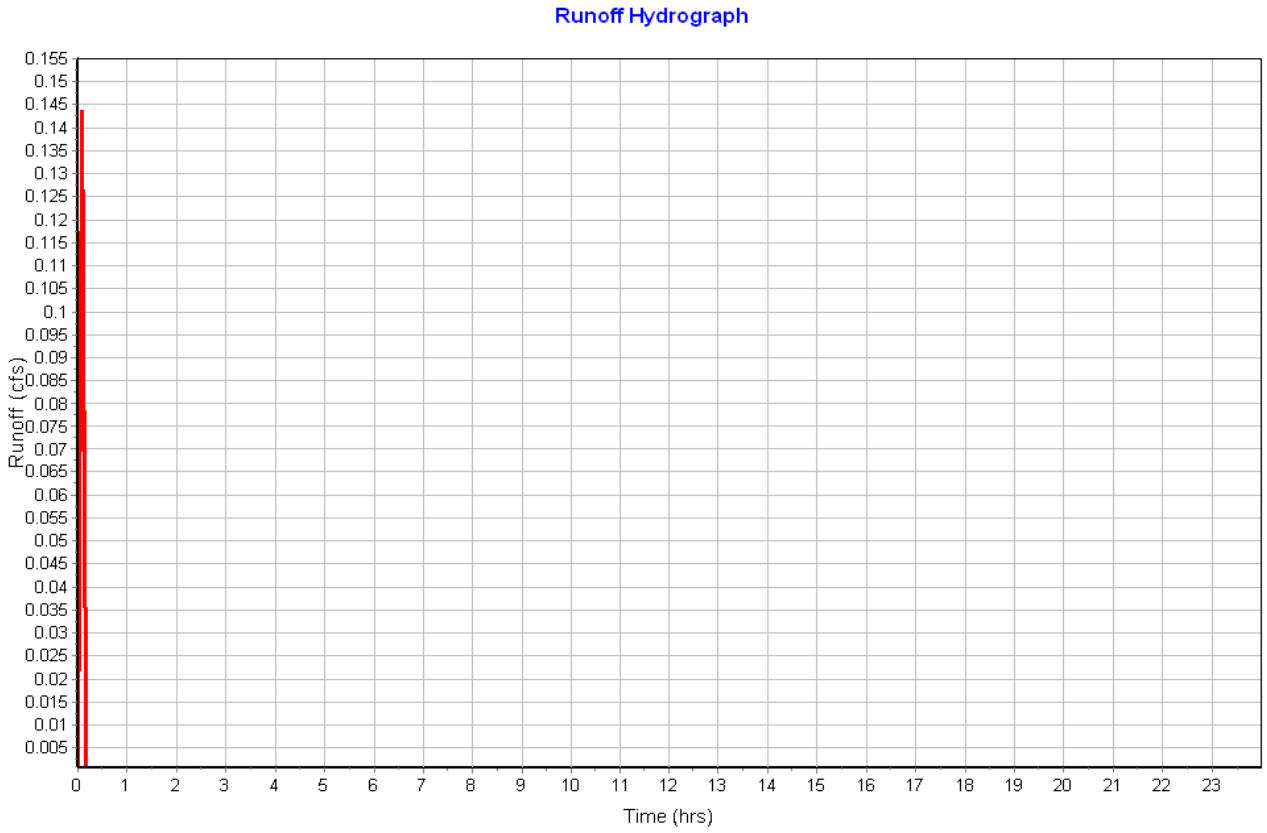
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.14
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-16C



Subbasin : Sub-16D

Input Data

Area (ft²) 630.01
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	630.01	-	0.90
Composite Area & Weighted Runoff Coeff.	630.01		0.90

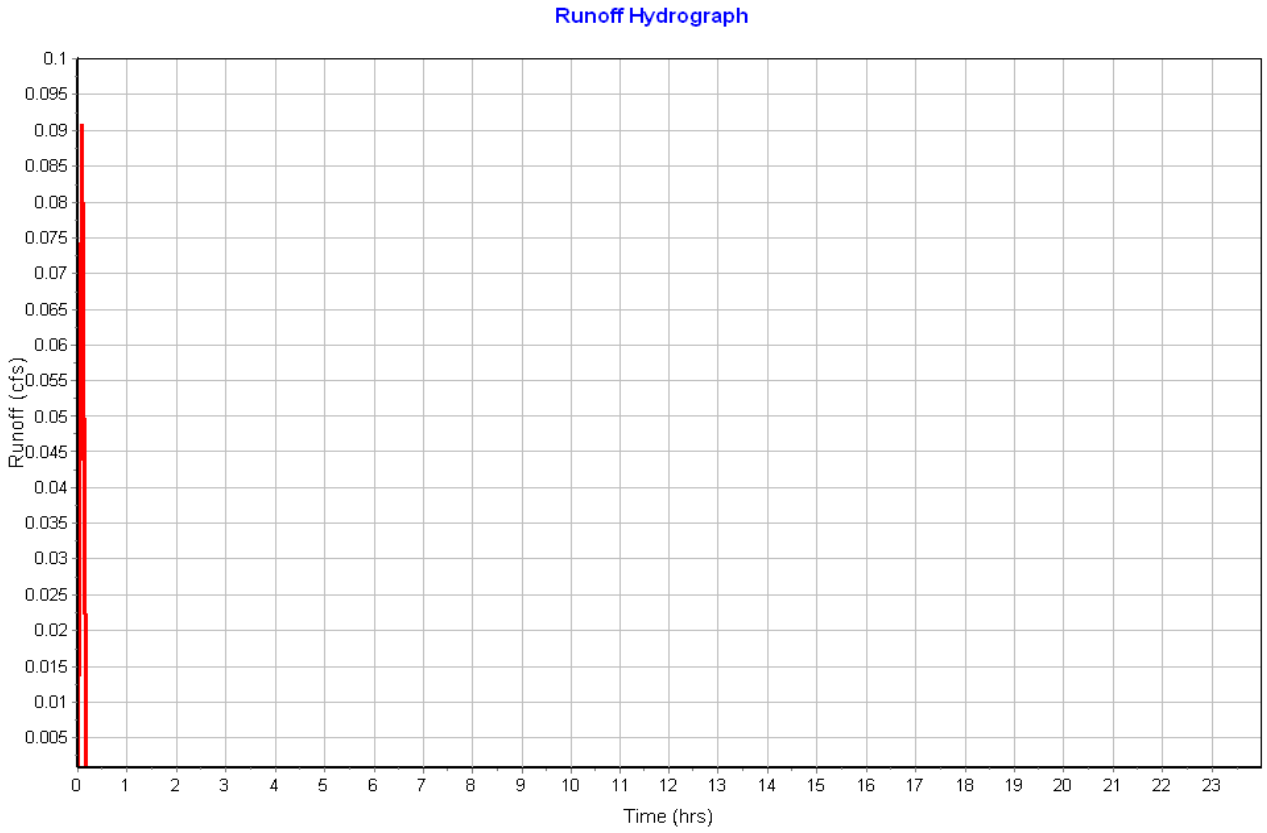
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.09
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-16D



Subbasin : Sub-17A

Input Data

Area (ft²) 1471.98
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	1471.98	-	0.90
Composite Area & Weighted Runoff Coeff.	1471.98		0.90

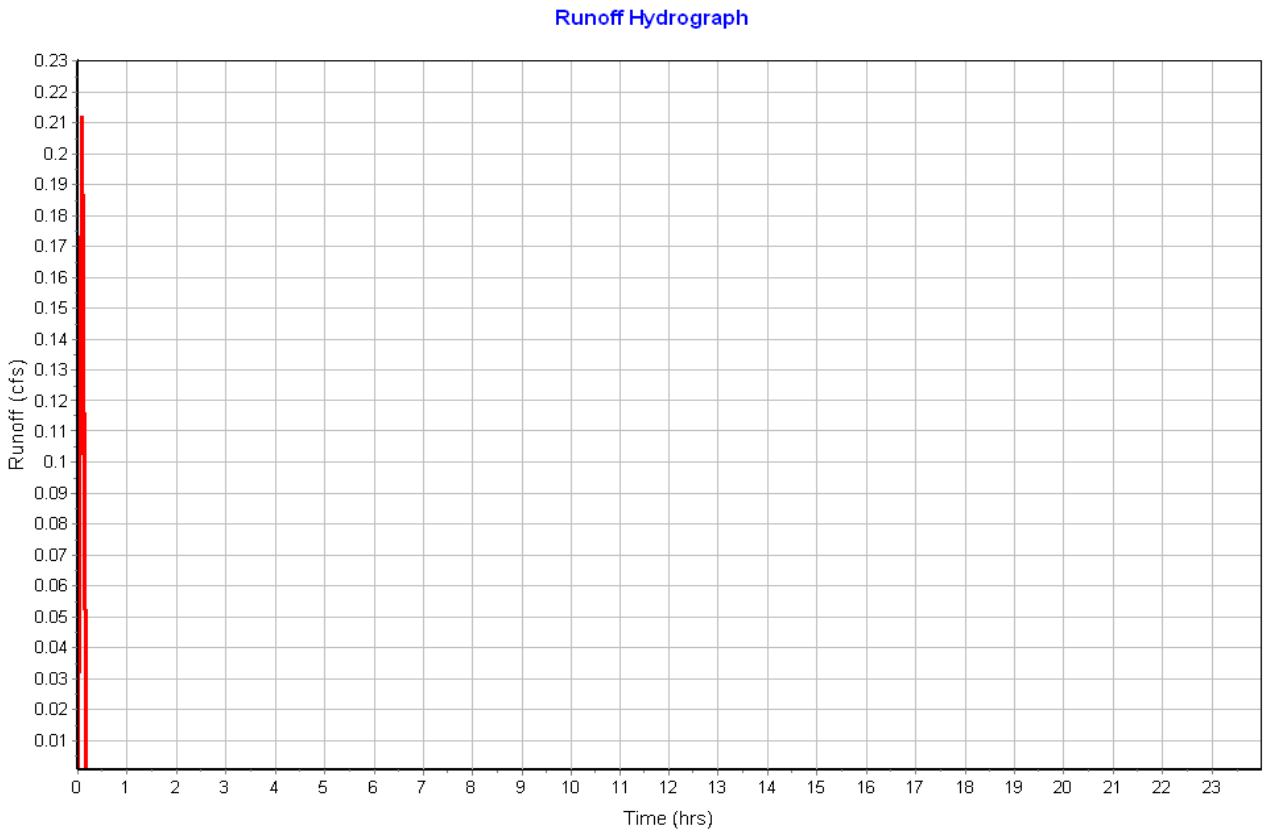
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.21
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-17A



Subbasin : Sub-18A

Input Data

Area (ft²) 35208.98
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	35208.98	-	0.16
Composite Area & Weighted Runoff Coeff.	35208.98		0.16

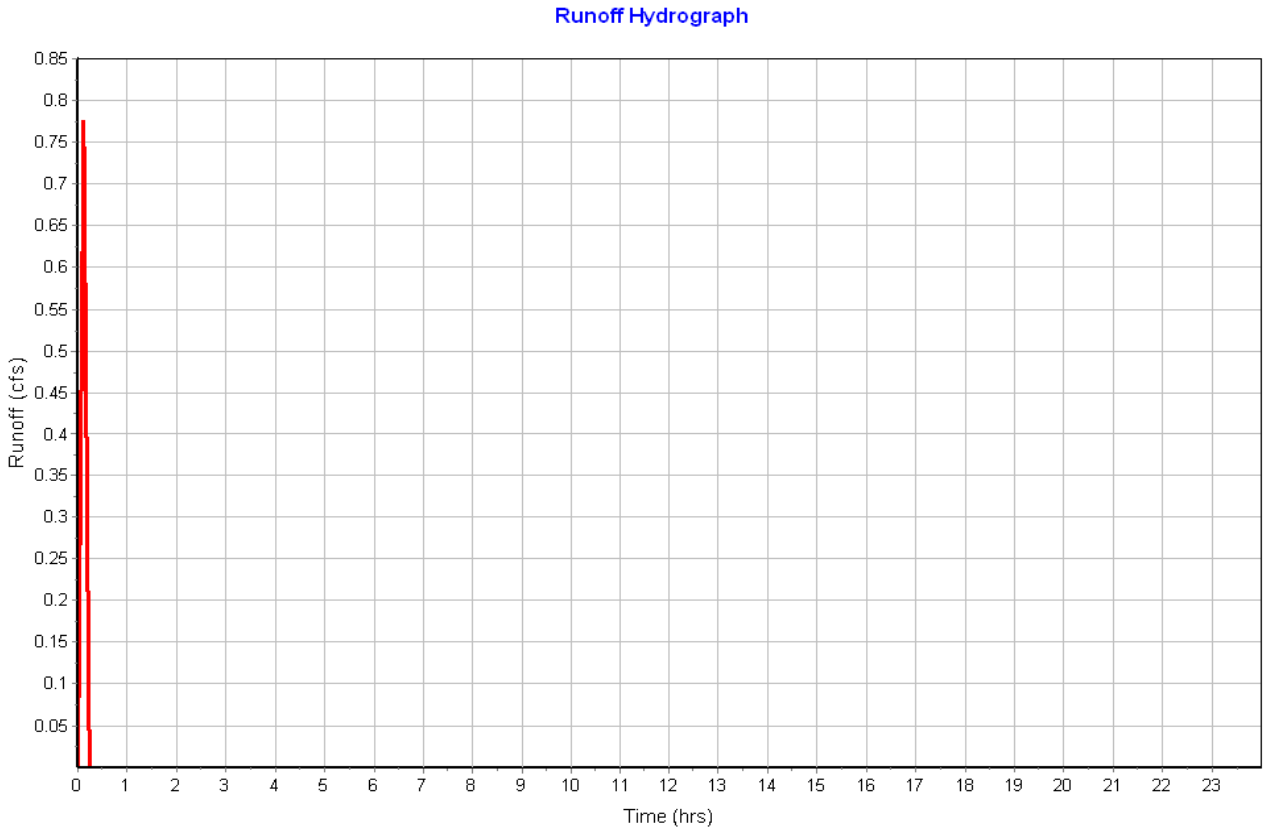
Time of Concentration

User-Defined TOC override (minutes): 7

Subbasin Runoff Results

Total Rainfall (in) 0.70
Total Runoff (in) 0.11
Peak Runoff (cfs) 0.77
Rainfall Intensity 5.985
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:07:00

Subbasin : Sub-18A



Subbasin : Sub-18B

Input Data

Area (ft²) 75226.99
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	217800.00	-	0.16
Composite Area & Weighted Runoff Coeff.	217800.00		0.16

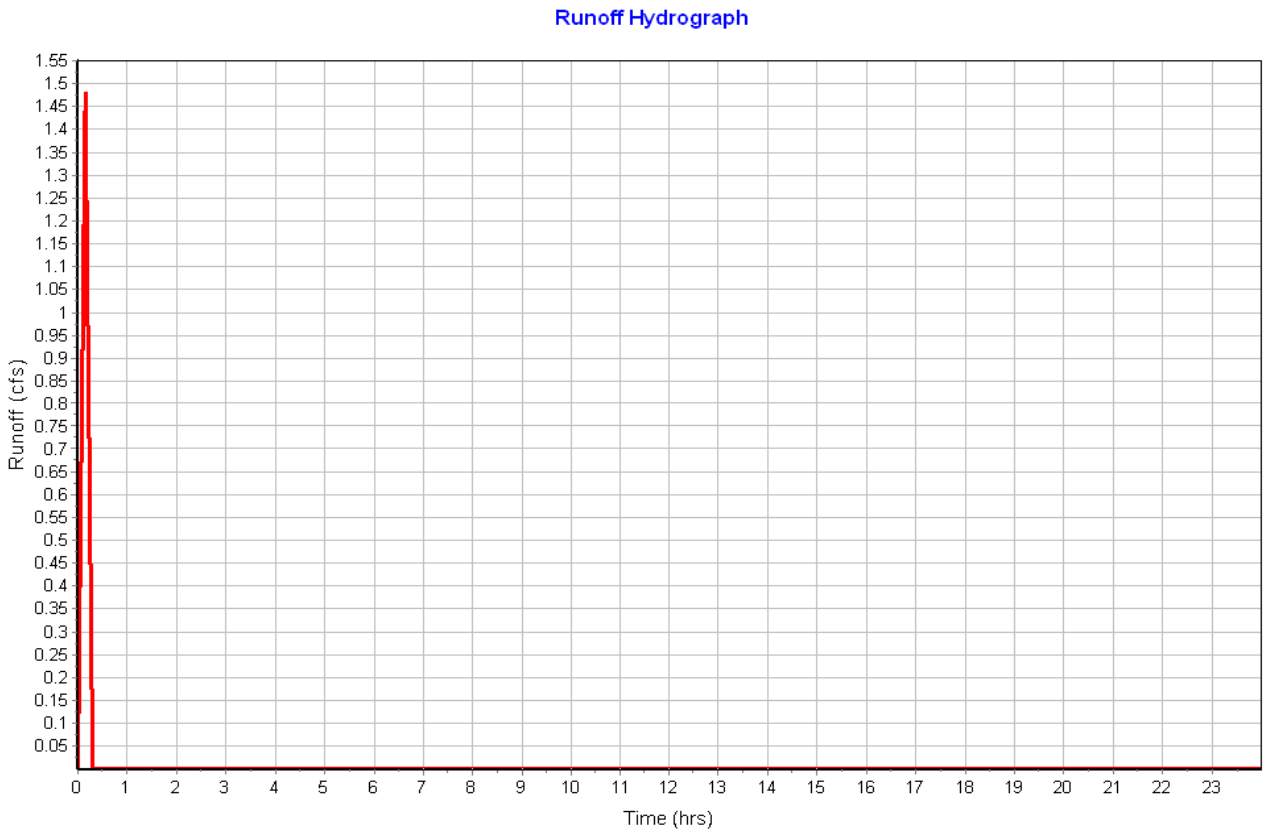
Time of Concentration

User-Defined TOC override (minutes): 9

Subbasin Runoff Results

Total Rainfall (in) 0.80
Total Runoff (in) 0.13
Peak Runoff (cfs) 1.48
Rainfall Intensity 5.347
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:09:00

Subbasin : Sub-18B



Subbasin : Sub-18C

Input Data

Area (ft²) 2574.00
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	2574.00	-	0.90
Composite Area & Weighted Runoff Coeff.	2574.00		0.90

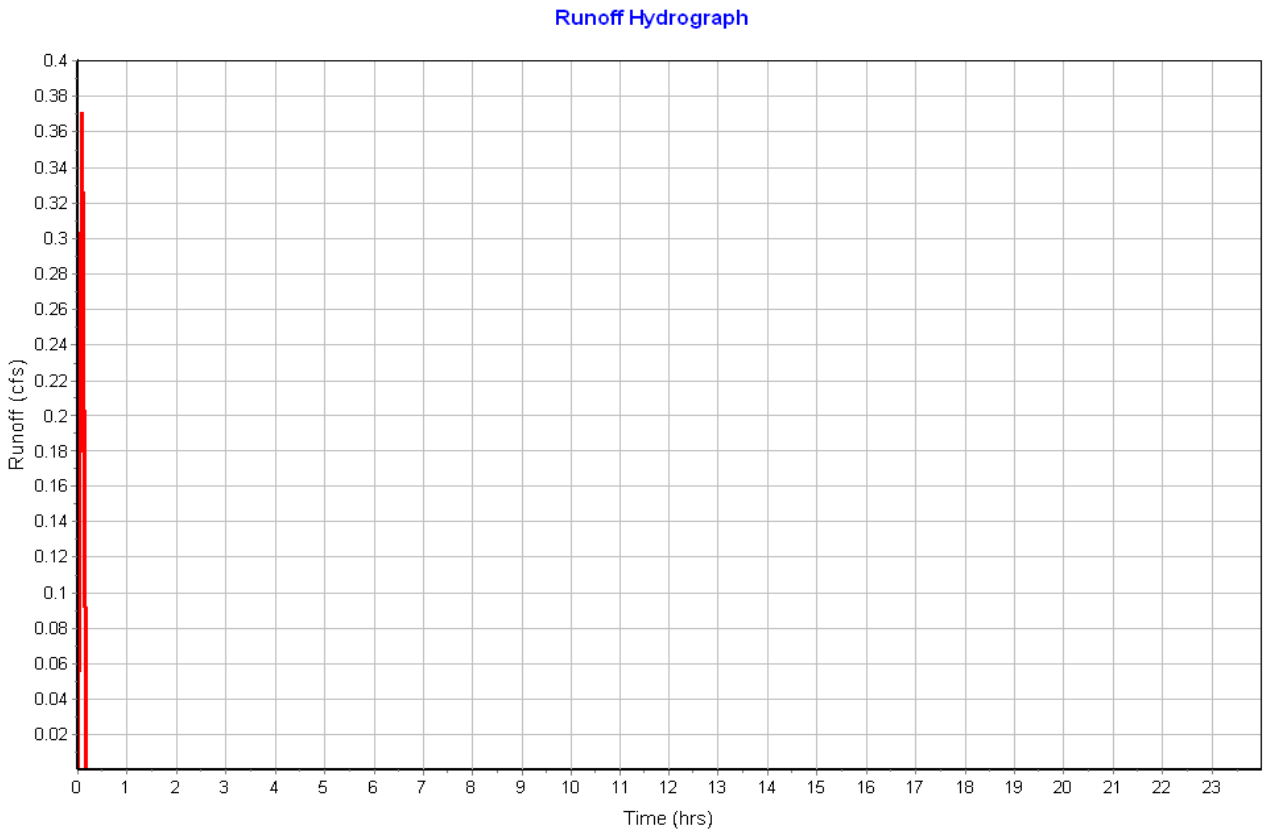
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.37
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-18C



Subbasin : Sub-20A

Input Data

Area (ft²) 5346.99
Weighted Runoff Coefficient 0.6700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	5346.99	-	0.67
Composite Area & Weighted Runoff Coeff.	5346.99		0.67

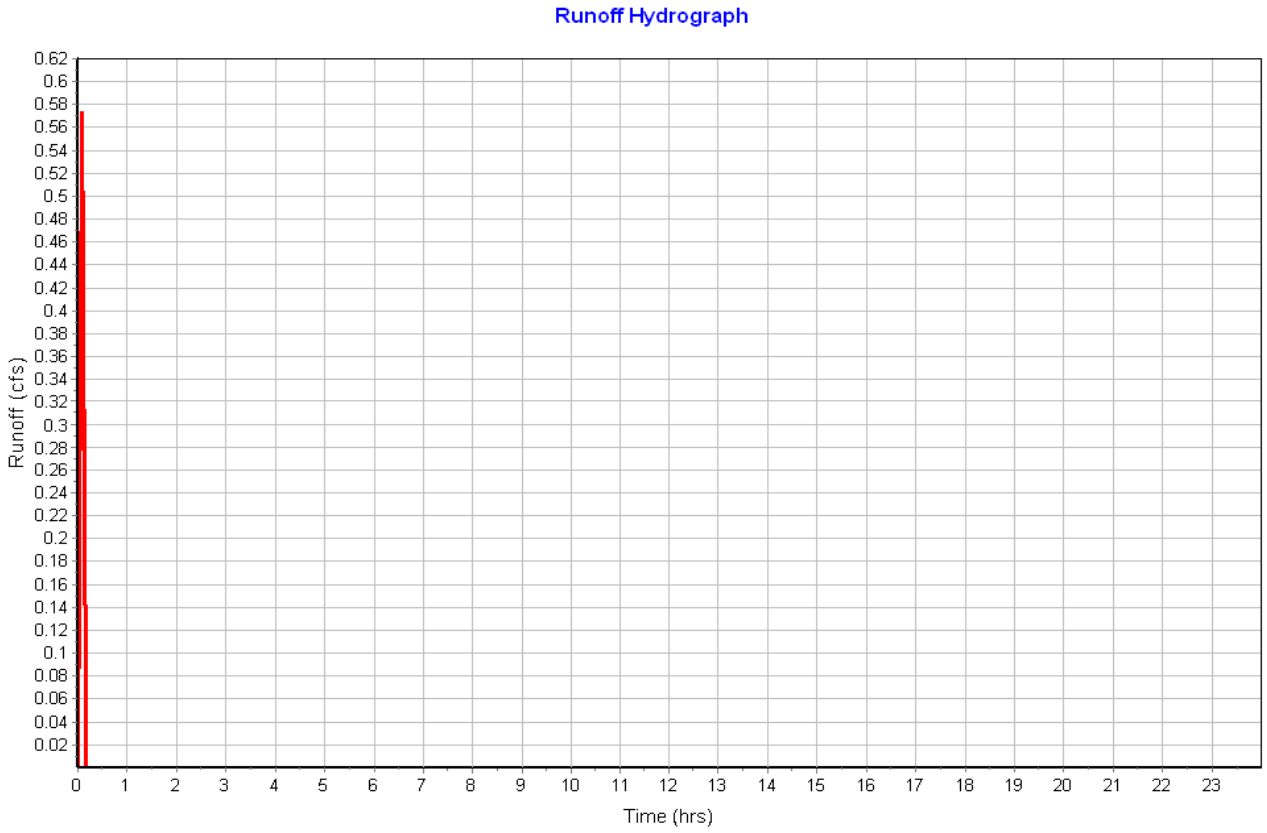
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.39
Peak Runoff (cfs) 0.57
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.6700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-20A



Subbasin : Sub-21A

Input Data

Area (ft²) 118347.99
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	118347.99	-	0.16
Composite Area & Weighted Runoff Coeff.	118347.99		0.16

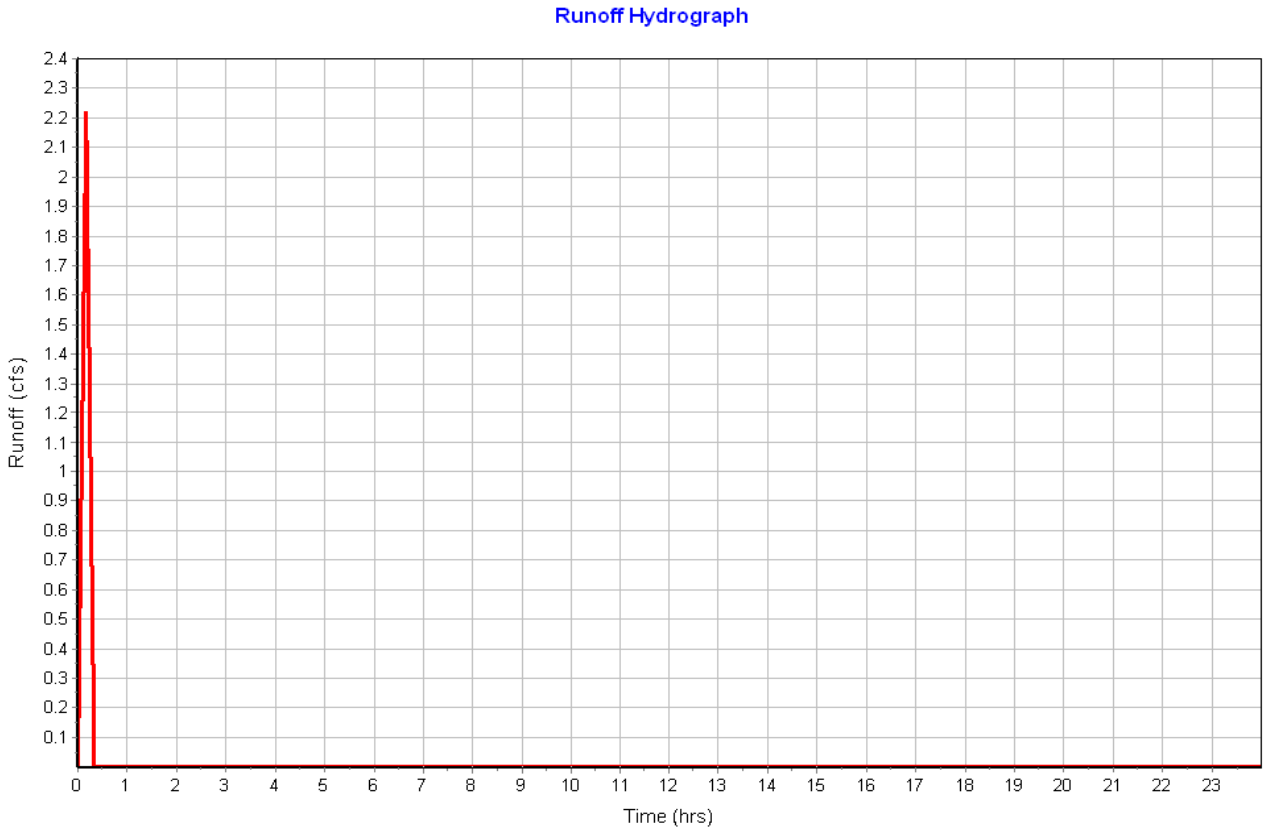
Time of Concentration

User-Defined TOC override (minutes): 10

Subbasin Runoff Results

Total Rainfall (in) 0.85
Total Runoff (in) 0.14
Peak Runoff (cfs) 2.22
Rainfall Intensity 5.100
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:10:00

Subbasin : Sub-21A



Subbasin : Sub-21B

Input Data

Area (ft²) 3417.02
Weighted Runoff Coefficient 0.6700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	3417.02	-	0.67
Composite Area & Weighted Runoff Coeff.	3417.02		0.67

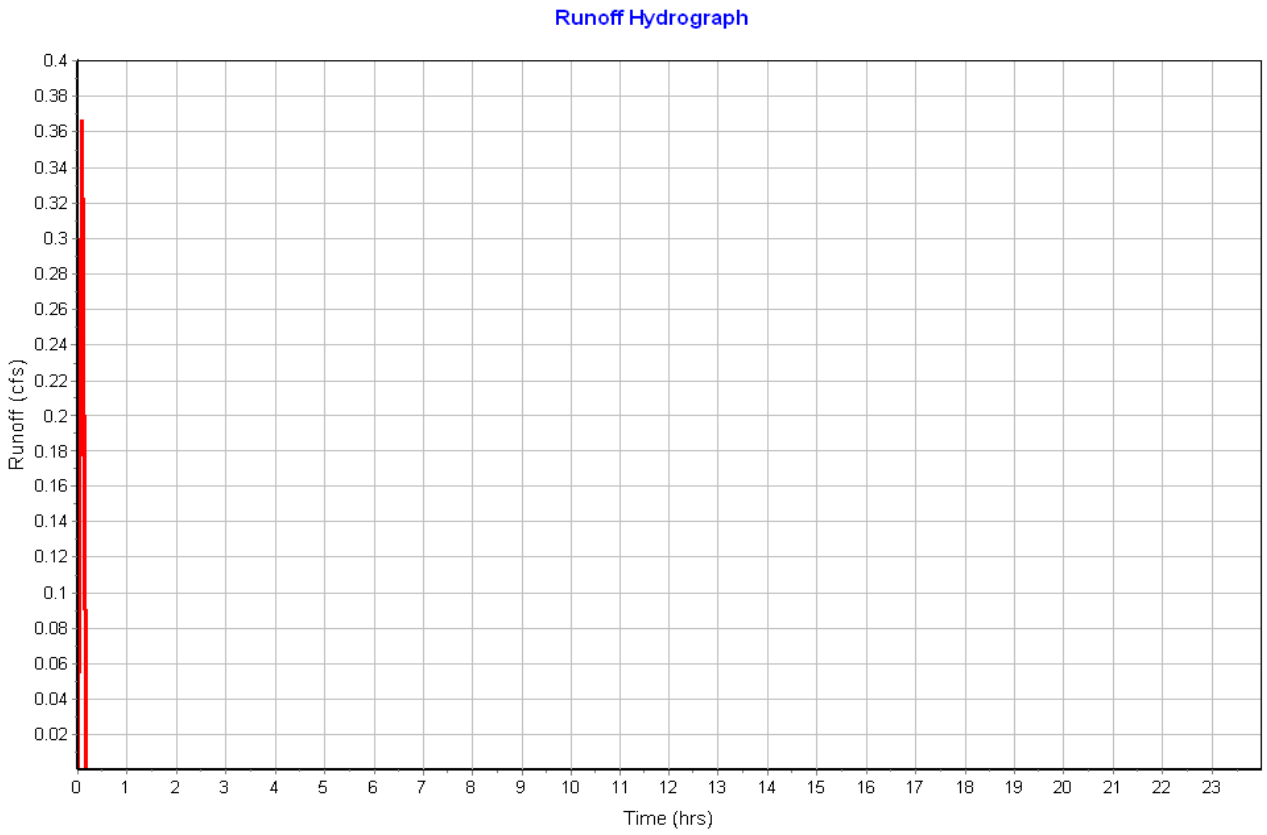
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.39
Peak Runoff (cfs) 0.37
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.6700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-21B



Subbasin : Sub-22.1A

Input Data

Area (ft²) 20080.00
Weighted Runoff Coefficient 0.2300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	20079.98	-	0.23
Composite Area & Weighted Runoff Coeff.	20079.98		0.23

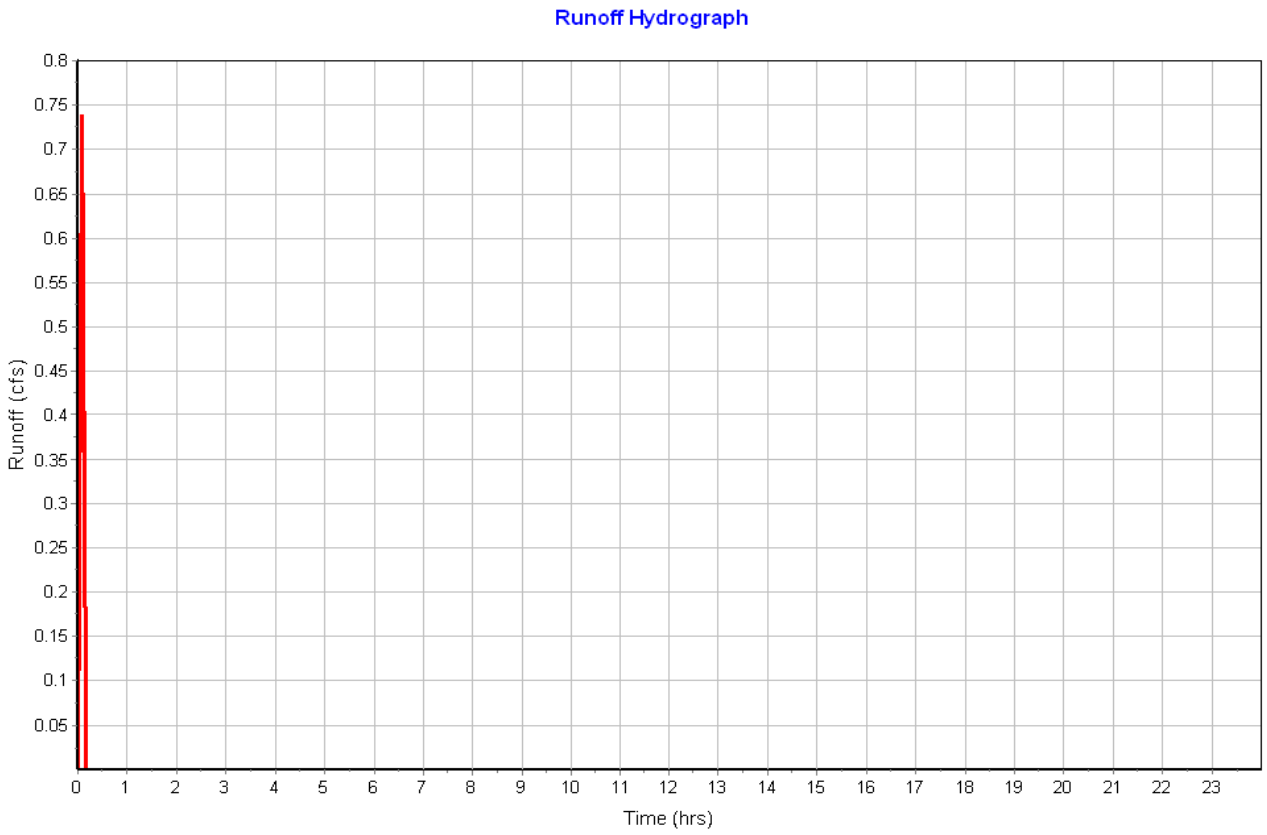
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.13
Peak Runoff (cfs) 0.74
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.2300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-22.1A



Subbasin : Sub-22A

Input Data

Area (ft²) 26385.99
Weighted Runoff Coefficient 0.2900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	26385.99	-	0.29
Composite Area & Weighted Runoff Coeff.	26385.99		0.29

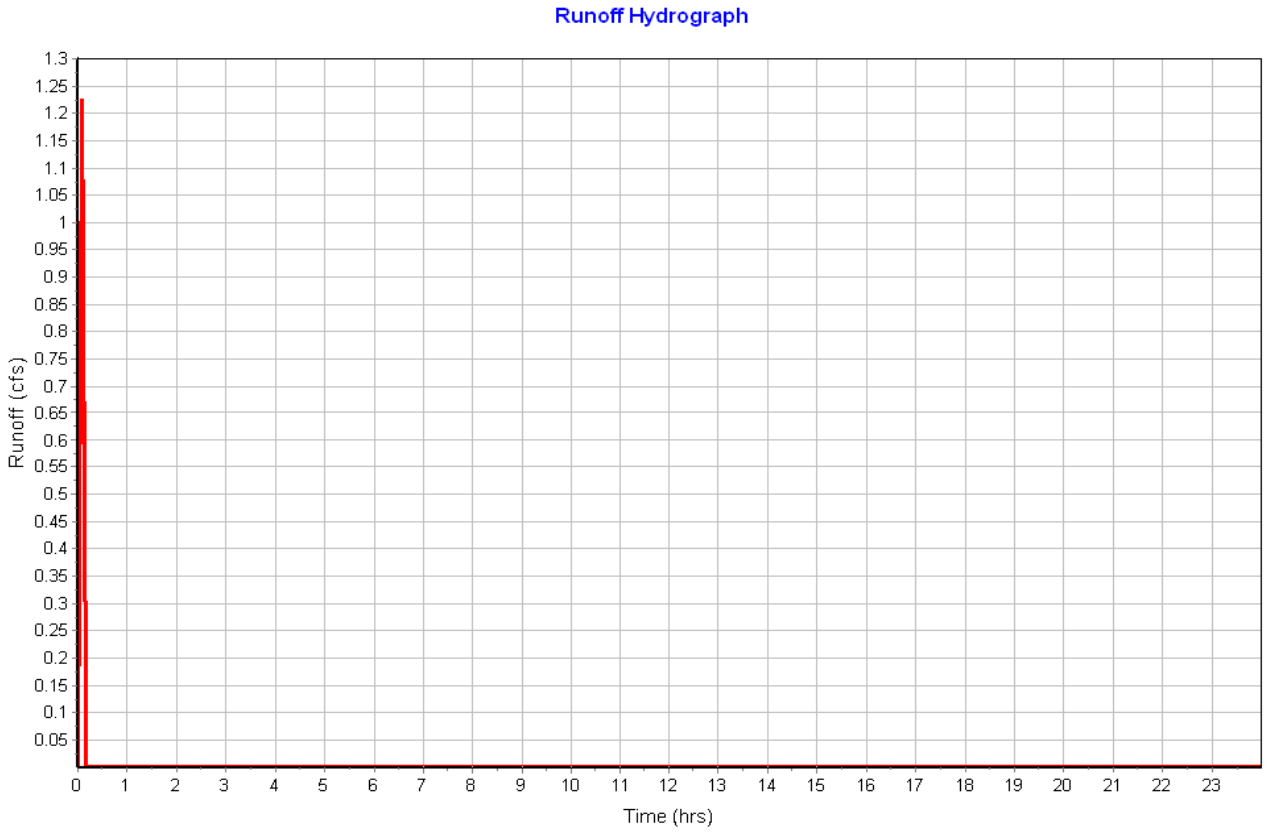
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.17
Peak Runoff (cfs) 1.22
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.2900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-22A



Subbasin : Sub-22B

Input Data

Area (ft²) 5039.98
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	5039.98	-	0.90
Composite Area & Weighted Runoff Coeff.	5039.98		0.90

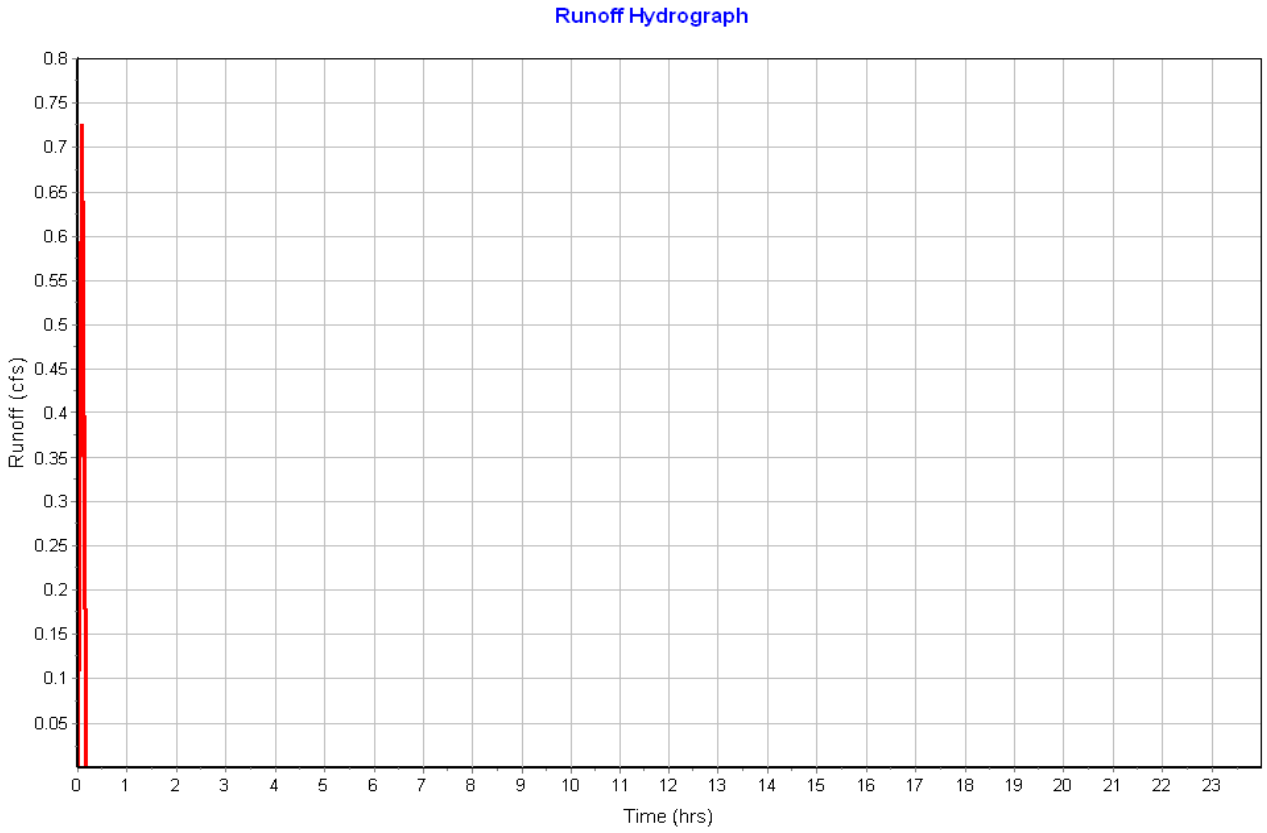
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.73
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-22B



Subbasin : Sub-23A

Input Data

Area (ft²) 86498.05
Weighted Runoff Coefficient 0.4300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	86498.05	-	0.43
Composite Area & Weighted Runoff Coeff.	86498.05		0.43

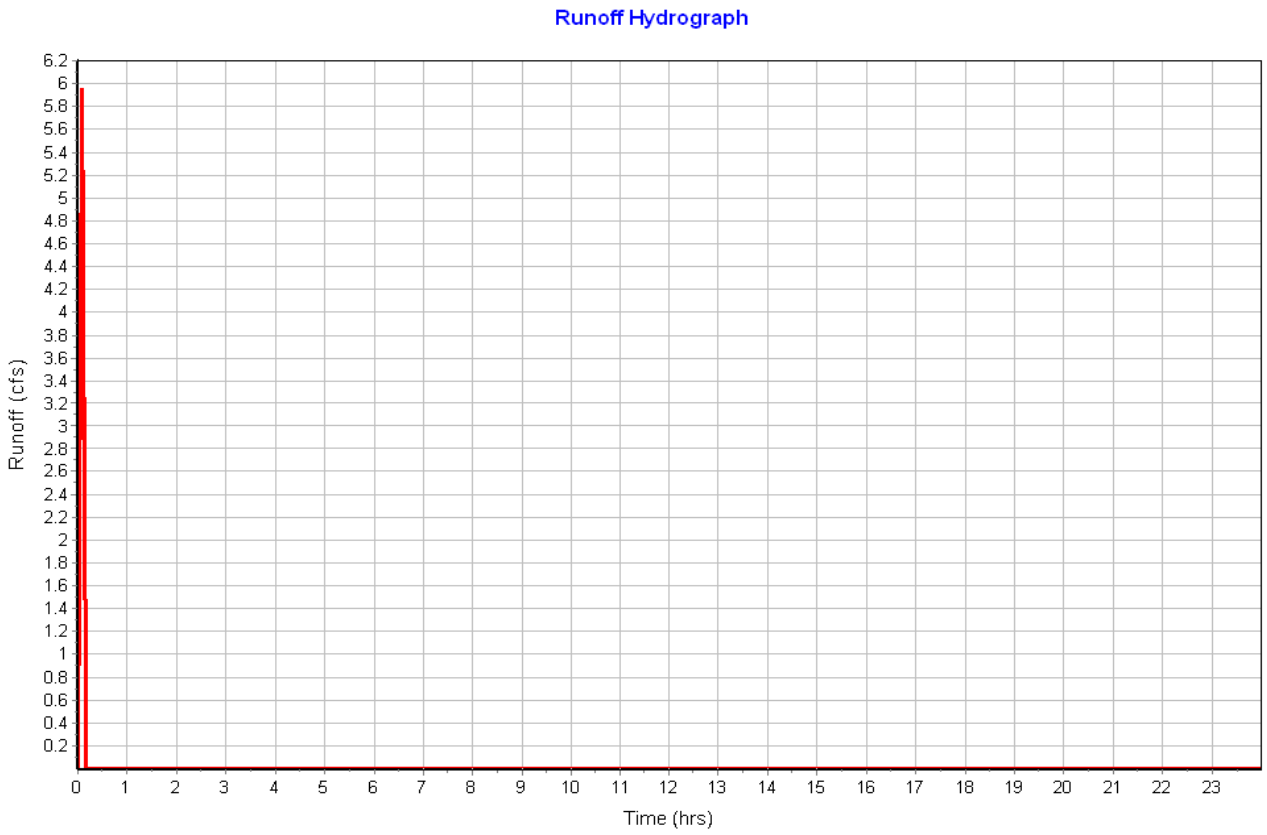
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.25
Peak Runoff (cfs) 5.94
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.4300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-23A



Subbasin : Sub-23B

Input Data

Area (ft²) 6274.99
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	6274.99	-	0.90
Composite Area & Weighted Runoff Coeff.	6274.99		0.90

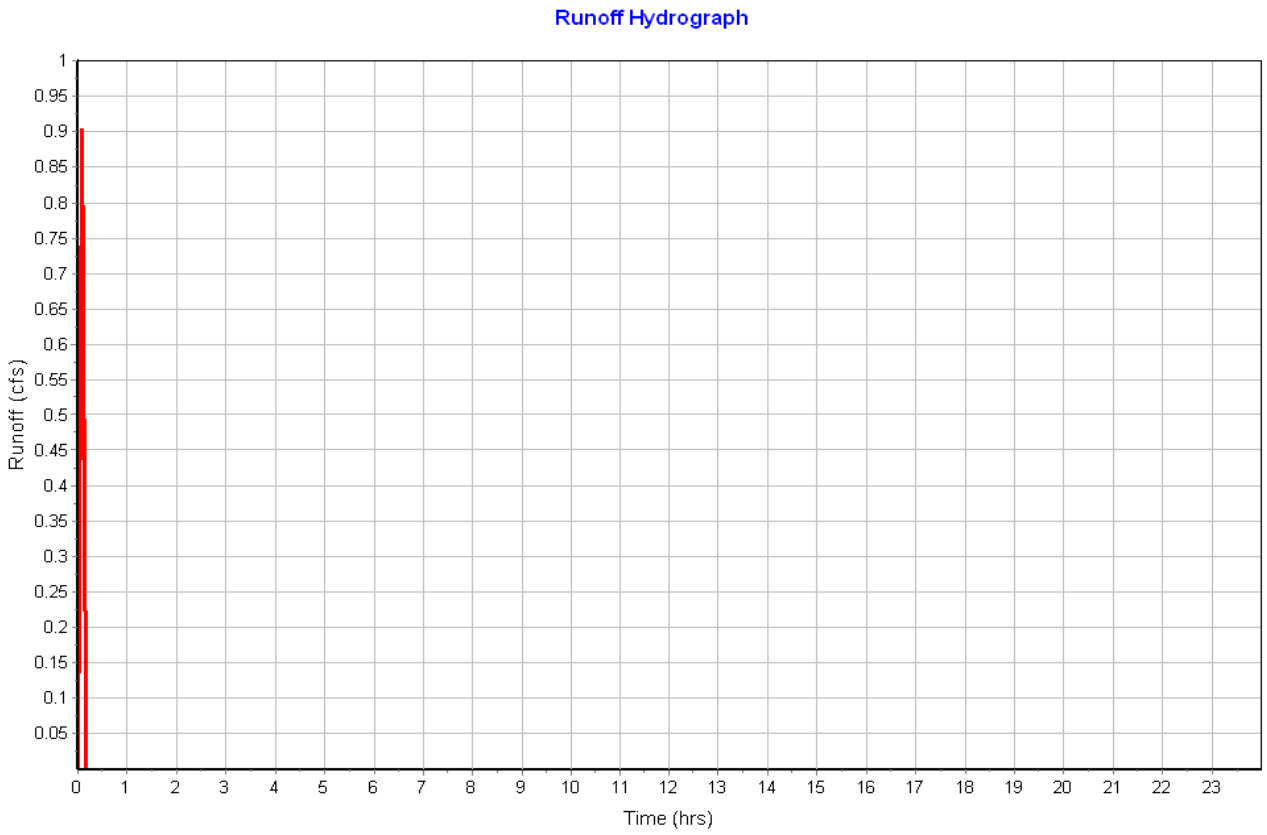
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 0.90
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-23B



Subbasin : Sub-24A

Input Data

Area (ft²) 60415.50
Weighted Runoff Coefficient 0.7800

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	60415.50	-	0.78
Composite Area & Weighted Runoff Coeff.	60415.50		0.78

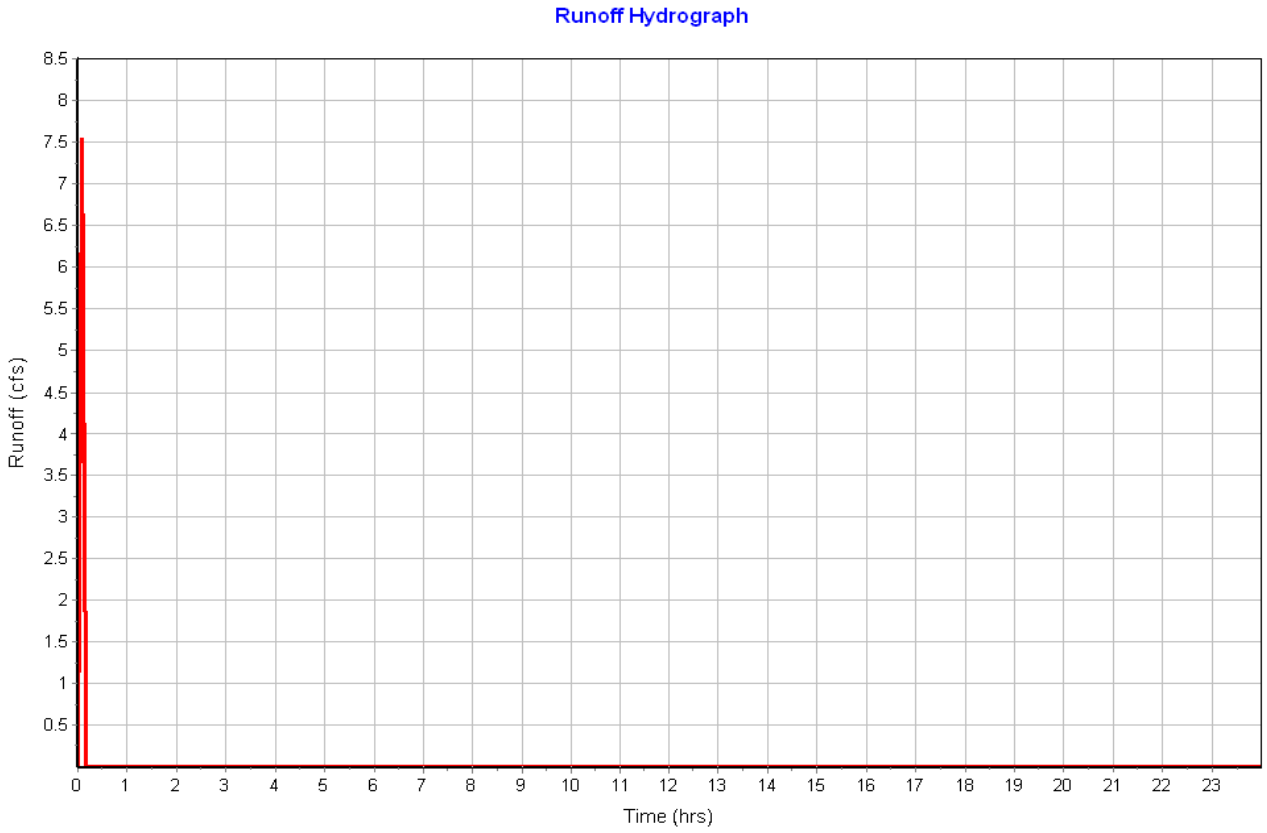
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.45
Peak Runoff (cfs) 7.53
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.7800
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-24A



Subbasin : Sub-24B

Input Data

Area (ft²) 7233.01
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	7233.01	-	0.90
Composite Area & Weighted Runoff Coeff.	7233.01		0.90

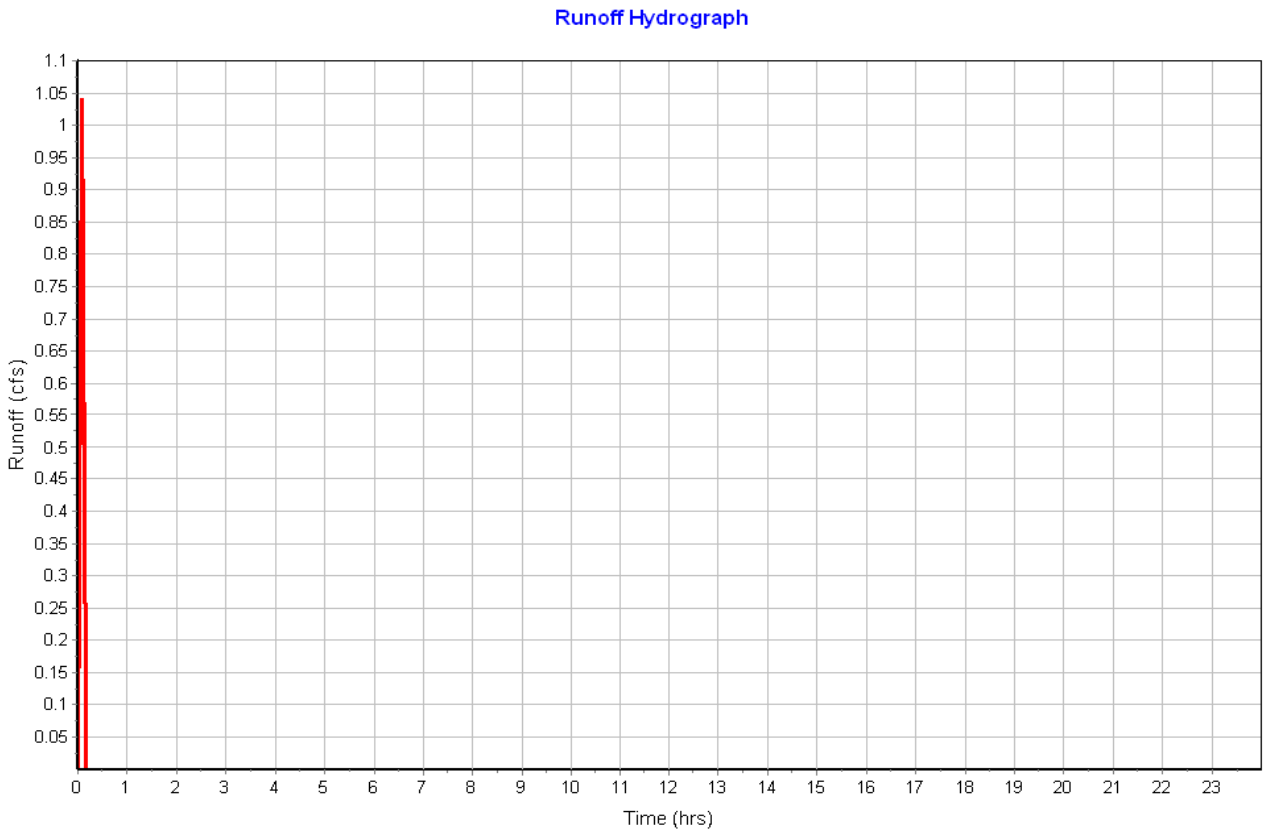
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.52
Peak Runoff (cfs) 1.04
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-24B



Subbasin : Sub-25A

Input Data

Area (ft²) 9368.01
Weighted Runoff Coefficient 0.3300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	9368.01	-	0.33
Composite Area & Weighted Runoff Coeff.	9368.01		0.33

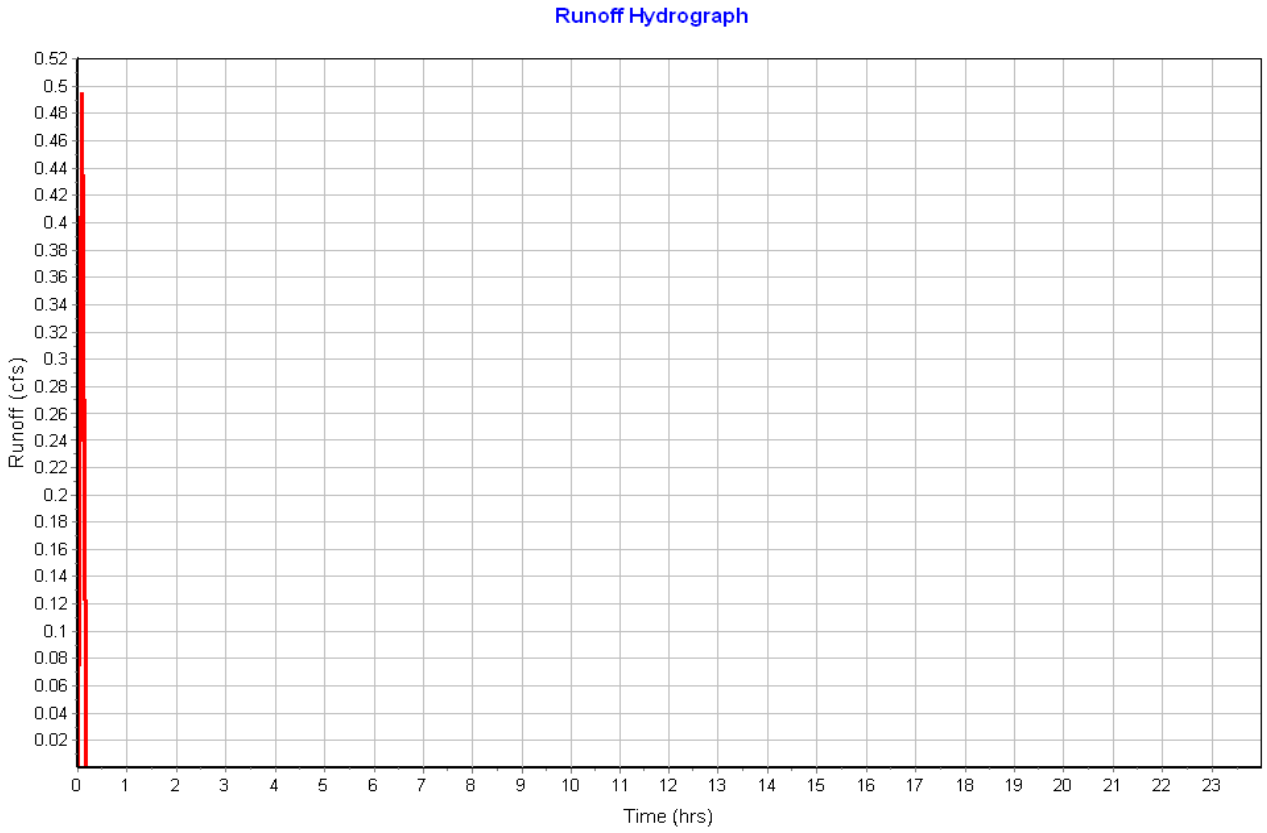
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.19
Peak Runoff (cfs) 0.49
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.3300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-25A



Subbasin : Sub-25B

Input Data

Area (ft²) 28858.98
Weighted Runoff Coefficient 0.2700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	28858.98	-	0.27
Composite Area & Weighted Runoff Coeff.	28858.98		0.27

Time of Concentration

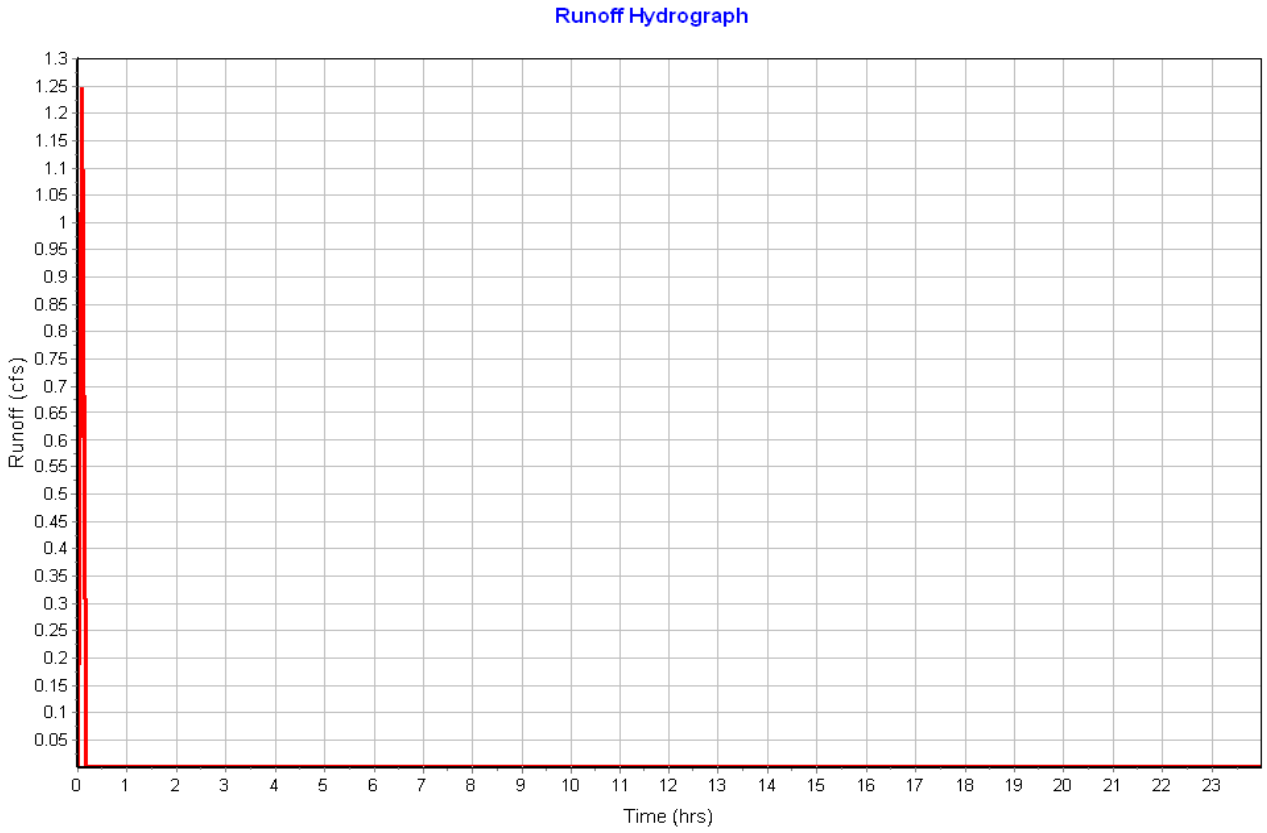
Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	392.518198	0.00	0.00
Slope (%) :	1.00551492	0.00	0.00
Surface Type :	Unpaved	Paved	Paved
Velocity (ft/sec) :	1.62	0.00	0.00
Computed Flow Time (min) :	4.04	0.00	0.00

Total TOC (min) 4.04

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.16
Peak Runoff (cfs) 1.25
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.2700
Time of Concentration (days hh:mm:ss) 0 00:04:02

Subbasin : Sub-25B



Subbasin : Sub-26A

Input Data

Area (ft²) 7316.34
Weighted Runoff Coefficient 0.6800

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	7316.34	-	0.68
Composite Area & Weighted Runoff Coeff.	7316.34		0.68

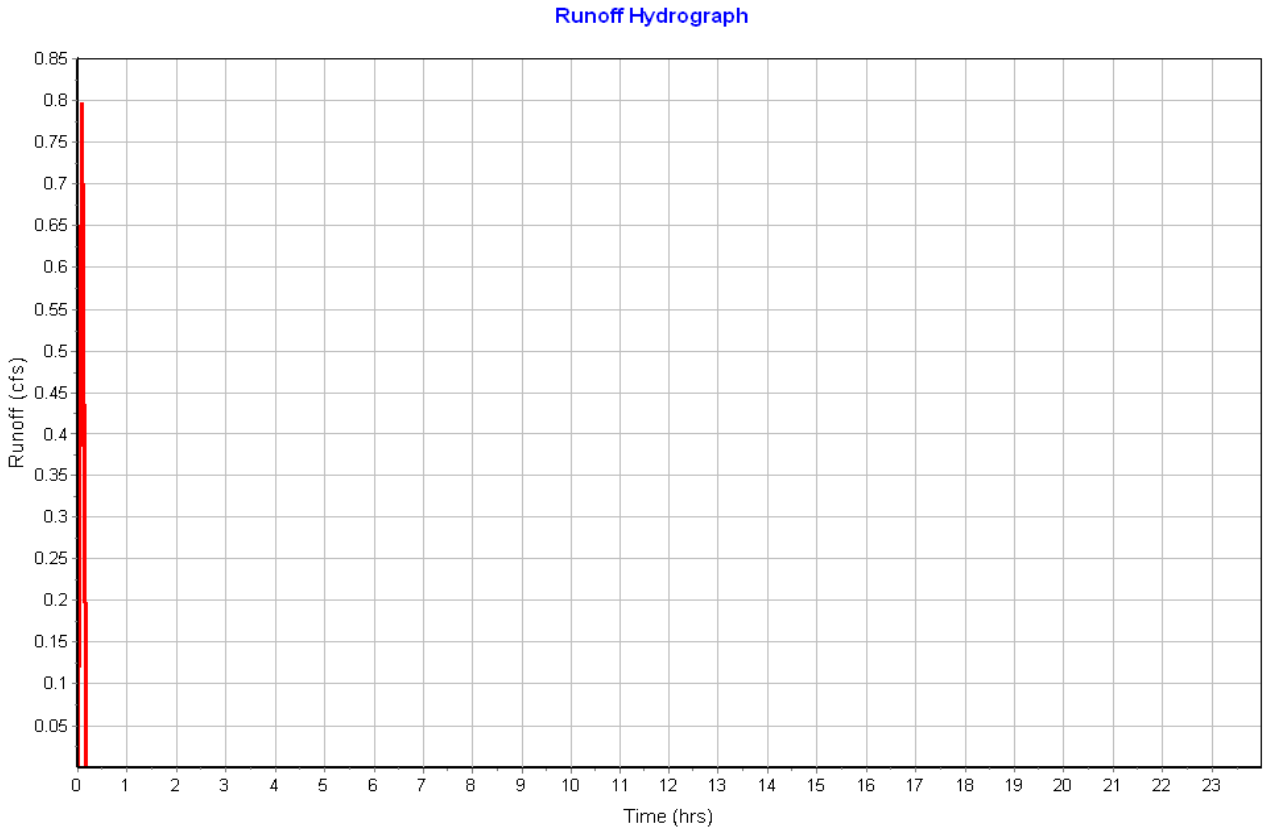
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.39
Peak Runoff (cfs) 0.80
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.6800
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-26A



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	10	835.29	840.46	5.17	835.29	0.00	840.46	0.00	0.00	38.03
2	11	834.69	839.58	4.89	834.69	0.00	839.58	0.00	0.00	34.67
3	12	834.09	838.58	4.49	834.09	0.00	838.58	0.00	0.00	29.87
4	12A	836.75	838.19	1.44	836.75	0.00	838.19	0.00	0.00	2.25
5	13	833.58	837.73	4.15	833.58	0.00	837.73	0.00	0.00	25.79
6	14	831.91	836.48	4.57	831.91	0.00	836.48	0.00	0.00	25.79
7	15	832.51	836.18	3.67	832.51	0.00	836.18	0.00	0.00	20.03
8	16	832.63	836.09	3.45	832.63	0.00	836.09	0.00	0.00	17.45
9	16A	833.35	835.51	2.16	833.35	0.00	835.51	0.00	0.00	7.97
10	17	832.75	836.17	3.42	832.75	0.00	836.17	0.00	0.00	17.08
11	18	832.95	836.59	3.64	832.95	0.00	836.59	0.00	0.00	19.68
12	18A	835.45	836.62	1.17	835.45	0.00	836.62	0.00	0.00	2.00
13	20	832.98	837.52	4.55	832.98	0.00	837.52	0.00	0.00	24.58
14	21	833.89	838.73	4.83	833.89	0.00	838.73	0.00	0.00	28.00
15	22	834.93	839.42	4.49	834.93	0.00	839.42	0.00	0.00	29.92
16	22.1	836.07	840.64	4.57	836.07	0.00	840.64	0.00	0.00	30.89
17	23	837.21	842.79	5.58	837.21	0.00	842.79	0.00	0.00	43.01
18	24	845.15	849.68	4.53	845.15	0.00	849.68	0.00	0.00	30.31
19	25	847.46	852.00	4.54	847.46	0.00	852.00	0.00	0.00	30.44
20	26	848.26	852.71	4.45	848.26	0.00	852.71	0.00	0.00	29.34
21	Jun-16Exist	834.19	835.69	1.50	834.19	0.00	835.69	0.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	10	2.14	0.00	836.00	0.71	0.00	4.46	835.30	0.01	0 00:06	0 00:00	0.00	0.00
2	11	8.34	0.00	835.89	1.20	0.00	3.69	834.71	0.02	0 00:05	0 00:00	0.00	0.00
3	12	11.09	0.00	835.58	1.49	0.00	3.00	834.11	0.02	0 00:06	0 00:00	0.00	0.00
4	12A	2.35	2.35	837.09	0.34	0.00	1.10	836.75	0.00	0 00:06	0 00:00	0.00	0.00
5	13	11.21	0.00	834.86	1.28	0.00	2.87	833.60	0.02	0 00:07	0 00:00	0.00	0.00
6	14	22.38	0.00	833.41	1.50	0.00	3.06	831.96	0.05	0 00:07	0 00:00	0.00	0.00
7	15	15.10	0.00	833.93	1.42	0.00	2.25	832.55	0.04	0 00:15	0 00:00	0.00	0.00
8	16	15.11	0.00	834.13	1.50	0.00	1.96	832.68	0.05	0 00:15	0 00:00	0.00	0.00
9	16A	6.54	0.00	834.60	1.25	0.00	0.91	833.38	0.03	0 00:15	0 00:00	0.00	0.00
10	17	3.46	0.00	834.13	1.38	0.00	2.04	832.79	0.04	0 00:15	0 00:00	0.00	0.00
11	18	2.67	0.00	834.13	1.18	0.00	2.46	832.98	0.03	0 00:15	0 00:00	0.00	0.00
12	18A	0.77	0.77	835.67	0.22	0.00	0.95	835.45	0.00	0 00:07	0 00:00	0.00	0.00
13	20	16.91	0.00	834.52	1.54	0.00	3.00	833.00	0.02	0 00:06	0 00:00	0.00	0.00
14	21	15.67	0.00	835.35	1.46	0.00	3.38	833.91	0.02	0 00:06	0 00:00	0.00	0.00
15	22	13.07	0.00	836.42	1.49	0.00	3.00	834.95	0.02	0 00:06	0 00:00	0.00	0.00
16	22.1	10.18	0.00	837.06	0.99	0.00	3.58	836.08	0.01	0 00:05	0 00:00	0.00	0.00
17	23	7.63	0.00	838.05	0.84	0.00	4.74	837.22	0.01	0 00:05	0 00:00	0.00	0.00
18	24	4.16	0.00	845.58	0.43	0.00	4.10	845.16	0.01	0 00:05	0 00:00	0.00	0.00
19	25	1.46	0.00	847.79	0.33	0.00	4.21	847.47	0.01	0 00:05	0 00:00	0.00	0.00
20	26	0.42	0.00	848.45	0.19	0.00	4.26	848.26	0.00	0 00:05	0 00:00	0.00	0.00
21	Jun-16Exist	8.62	8.62	835.69	1.50	0.00	0.00	834.24	0.05	0 00:12	0 00:16	0.14	8.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	L-11B-12C	242.41	839.46	4.74	838.46	3.59	1.00	0.4100	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
2	L-12C-13A	242.41	838.46	3.59	837.61	3.15	0.85	0.3500	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
3	L-13A-15A	214.40	837.61	3.15	836.08	2.79	1.53	0.7100	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
4	L15A-16C	28.00	836.08	2.79	835.97	3.31	0.11	0.4100	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
5	L16D-16C	6.58	832.80	-0.87	832.65	0.00	0.15	2.2500	User-Defined	0.500	17.000	0.0320	0.0000	0.0000	0.0000	0.00	No
6	L-17A-16D	31.92	836.05	2.52	835.97	2.30	0.08	0.2500	User-Defined	0.500	17.000	0.0320	0.0000	0.0000	0.0000	0.00	No
7	L18C-17A	66.46	836.47	2.74	836.05	2.52	0.42	0.6300	User-Defined	0.500	17.000	0.0320	0.0000	0.0000	0.0000	0.00	No
8	L-20A-18C	242.41	837.40	3.05	836.47	2.74	0.93	0.3800	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
9	L-21B-20A	242.41	838.57	3.38	837.40	3.05	1.17	0.4800	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
10	L22.1A-22A	113.68	840.48	2.36	839.26	3.41	1.22	1.0700	User-Defined	0.500	19.000	0.0320	0.0000	0.0000	0.0000	0.00	No
11	L-22A-21B	242.41	839.26	3.41	838.57	3.38	0.69	0.2800	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
12	L-22B-OFF	242.41	839.26	2.93	826.33	0.00	12.93	5.3300	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
13	L23A-22.1A	222.03	842.63	4.50	840.48	2.36	2.15	0.9700	User-Defined	0.500	19.000	0.0320	0.0000	0.0000	0.0000	0.00	No
14	L-23B-22B	242.41	842.63	4.02	839.26	2.93	3.37	1.3900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
15	L-24A-23A	242.41	849.52	3.45	842.63	4.50	6.89	2.8400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
16	L-24B-23B	242.41	849.52	2.97	842.63	4.02	6.89	2.8400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
17	L-25A-24A	242.41	851.84	3.46	849.52	3.45	2.32	0.9600	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
18	L25B-24B	231.43	851.84	2.98	849.52	2.97	2.32	1.0000	User-Defined	0.500	19.000	0.0320	0.0000	0.0000	0.0000	0.00	No
19	L-26A-25A	242.41	852.55	3.37	851.84	3.46	0.71	0.2900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	L-11B-12C	0.26	0 00:05	12.28	0.02	0.73	5.53	0.15	0.31	0.00		
2	L-12C-13A	0.37	0 00:05	11.32	0.03	1.02	3.96	0.16	0.31	0.00		
3	L-13A-15A	0.39	0 00:05	16.46	0.02	0.84	4.25	0.18	0.35	0.00		
4	L15A-16C	0.57	0 00:05	8.55	0.07	1.09	0.43	0.18	0.37	0.00		
5	L16D-16C	0.37	0 00:05	8.55	0.04	1.03	0.11	0.15	0.31	0.00		
6	L-17A-16D	1.52	0 00:05	9.67	0.16	2.22	0.24	0.20	0.43	0.00		
7	L18C-17A	2.32	0 00:05	15.13	0.15	2.02	0.55	0.27	0.54	0.00		
8	L-20A-18C	3.18	0 00:05	11.87	0.27	2.12	1.91	0.30	0.62	0.00		
9	L-21B-20A	4.32	0 00:05	13.04	0.33	2.10	1.92	0.34	0.70	0.00		
10	L22.1A-22A	6.68	0 00:05	32.37	0.21	2.82	0.67	0.37	0.75	0.00		
11	L-22A-21B	5.61	0 00:05	10.07	0.56	1.99	2.03	0.39	0.79	0.00		
12	L-22B-OFF	0.74	0 00:05	43.45	0.02	3.76	1.07	0.13	0.26	0.00		
13	L23A-22.1A	8.92	0 00:05	8.41	1.06	3.01	1.23	0.40	0.86	0.00		
14	L-23B-22B	0.89	0 00:05	22.17	0.04	2.52	1.60	0.15	0.31	0.00		
15	L-24A-23A	5.92	0 00:05	31.70	0.19	2.05	1.97	0.39	0.78	0.00		
16	L-24B-23B	0.82	0 00:05	31.70	0.03	2.03	1.99	0.16	0.33	0.00		
17	L-25A-24A	0.40	0 00:05	18.42	0.02	0.73	5.53	0.21	0.42	0.00		
18	L25B-24B	0.64	0 00:05	18.85	0.03	1.77	2.18	0.16	0.31	0.00		
19	L-26A-25A	0.37	0 00:05	10.14	0.04	0.96	4.21	0.16	0.32	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	10-11	200.46	835.29	0.00	834.69	0.00	0.60	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
2	10A-10B	60.59	836.53	0.00	836.35	0.00	0.18	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
3	10B-10C	24.01	836.35	0.00	836.28	0.25	0.07	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No
4	10C-10D	52.16	836.03	0.00	835.87	0.00	0.16	0.3000	CIRCULAR	18.000	18.000	0.0120	0.0000	0.6000	0.0000	0.00	No
5	10D-10	25.54	835.87	0.00	835.79	0.50	0.08	0.3000	CIRCULAR	18.000	18.000	0.0120	0.0000	0.6000	0.0000	0.00	No
6	11-12	200.00	834.69	0.00	834.09	0.00	0.60	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
7	11A-11B	18.50	834.82	0.00	834.72	0.00	0.09	0.5000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.5000	0.0000	0.00	No
8	11B-11	6.50	834.72	0.00	834.69	0.00	0.03	0.4900	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
9	12-13	170.00	834.09	0.00	833.58	0.00	0.51	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
10	12A-12B	22.00	836.75	0.00	835.04	0.00	1.71	7.7600	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No
11	12B-12C	13.50	835.04	0.00	834.87	0.00	0.17	1.2600	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No
12	12C-12	6.50	834.87	0.00	834.84	0.75	0.03	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
13	13-14	250.00	833.58	0.00	832.33	0.42	1.25	0.5000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.9000	0.0000	0.00	No
14	13A-13	6.50	834.46	0.00	834.33	0.75	0.13	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
15	14-14A	38.10	831.91	0.00	831.80	0.00	0.11	0.3000	Horizontal Ellipse	29.040	45.000	0.0120	0.0000	0.5000	0.0000	0.00	No
16	15-14	60.01	832.51	0.00	832.33	0.42	0.18	0.3000	Horizontal Ellipse	24.000	38.040	0.0120	0.0000	0.9000	0.0000	0.00	No
17	15A-15	6.55	833.29	0.00	833.26	0.75	0.03	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
18	16-15	40.49	832.63	0.00	832.51	0.00	0.12	0.3000	Horizontal Ellipse	24.000	38.040	0.0120	0.0000	0.6000	0.0000	0.00	No
19	16A-16B	6.29	833.35	0.00	833.20	0.50	0.15	2.4500	CIRCULAR	18.000	18.000	0.0120	0.0000	0.6000	0.0000	0.00	No
20	16B-16C	16.62	832.70	0.00	832.65	0.00	0.04	0.2600	Horizontal Ellipse	24.000	38.040	0.0120	0.0000	0.6000	0.0000	0.00	No
21	16C-16	6.50	832.65	0.00	832.63	0.00	0.02	0.3100	Horizontal Ellipse	24.000	38.040	0.0120	0.0000	0.6000	0.0000	0.00	No
22	16D-16C	6.58	835.97	2.30	835.97	3.31	0.00	0.0800	CIRCULAR	12.000	12.000	0.0120	0.0000	0.6000	0.0000	0.00	No
23	17-16	38.50	832.75	0.00	832.63	0.00	0.12	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
24	17A-17	6.50	833.53	0.00	833.50	0.75	0.03	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
25	18-17	66.63	832.95	0.00	832.75	0.00	0.20	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
26	18A-18B	16.60	835.45	0.00	834.45	0.25	1.00	6.0000	CIRCULAR	12.000	12.000	0.0120	0.0000	0.5000	0.0000	0.00	No
27	18B-18C	14.32	834.20	0.00	833.73	0.00	0.47	3.3100	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No
28	18C-18	6.50	833.73	0.00	833.70	0.75	0.03	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.8000	0.0000	0.00	No
29	20-20B	44.97	832.98	0.00	832.76	0.00	0.21	0.4700	CIRCULAR	30.000	30.000	0.0120	0.0000	0.5000	0.0000	0.00	No
30	20A-20	6.50	834.35	0.00	834.22	1.25	0.13	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.8000	0.0000	0.00	No
31	21-20	183.86	833.89	0.00	832.98	0.00	0.92	0.5000	CIRCULAR	30.000	30.000	0.0120	0.0000	0.8000	0.0000	0.00	No
32	21A-21B	20.31	835.29	0.00	835.19	0.00	0.10	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No
33	21B-21	8.50	835.19	0.00	835.14	1.25	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
34	22.1-22	113.67	836.07	0.00	834.93	0.00	1.14	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
35	22.1A-22.1	8.75	836.86	-1.27	836.82	0.75	0.04	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
36	22-21	106.92	834.93	0.00	834.39	0.50	0.53	0.5000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
37	22A-22	8.50	835.85	0.00	835.68	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
38	22B-22	32.50	836.33	0.00	835.68	0.75	0.65	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
39	23-22.1	113.98	837.21	0.00	836.07	0.00	1.14	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
40	23A-23	8.50	838.13	0.00	837.96	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
41	23B-23	32.50	838.61	0.00	837.96	0.75	0.65	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
42	24-23	300.00	845.15	0.00	837.21	0.00	7.94	2.6500	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No
43	24A-24	8.50	846.07	0.00	845.90	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
44	24B-24	32.50	846.55	0.00	845.90	0.75	0.65	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
45	25-24	231.43	847.46	0.00	845.15	0.00	2.31	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No
46	25A-25	8.50	848.38	0.00	848.21	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
47	25B-25	32.50	848.86	0.00	848.21	0.75	0.65	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
48	26-25	99.04	848.26	0.00	847.46	0.00	0.80	0.8000	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No
49	26A-26	8.50	849.18	0.00	849.01	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.8000	0.0000	0.00	No
50	Link-08	78.95	834.19	0.00	833.35	0.00	0.84	1.0700	CIRCULAR	18.000	18.000	0.0240	0.0000	0.6000	0.0000	0.00	No

No. of Barrels
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Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	10-11	2.35	0 00:06	13.42	0.18	1.69	1.98	0.95	0.48	0.00		Calculated
2	10A-10B	0.52	0 00:05	3.82	0.13	1.39	0.73	0.43	0.34	0.00		Calculated
3	10B-10C	1.16	0 00:05	3.83	0.30	2.82	0.14	0.46	0.37	0.00		Calculated
4	10C-10D	1.69	0 00:05	6.24	0.27	2.33	0.37	0.64	0.43	0.00		Calculated
5	10D-10	2.14	0 00:05	6.25	0.34	3.18	0.13	0.61	0.41	0.00		Calculated
6	11-12	7.78	0 00:05	13.42	0.58	3.62	0.92	1.34	0.67	0.00		Calculated
7	11A-11B	6.73	0 00:05	17.38	0.39	3.13	0.10	1.30	0.65	0.00		Calculated
8	11B-11	6.98	0 00:05	17.20	0.41	4.65	0.02	1.25	0.62	0.00		Calculated
9	12-13	10.83	0 00:06	13.42	0.81	4.88	0.58	1.37	0.69	0.00		Calculated
10	12A-12B	2.35	0 00:06	19.49	0.12	4.08	0.09	0.59	0.48	0.00		Calculated
11	12B-12C	3.05	0 00:06	7.85	0.39	3.27	0.07	0.89	0.71	0.00		Calculated
12	12C-12	3.39	0 00:06	4.91	0.69	3.89	0.03	0.84	0.67	0.00		Calculated
13	13-14	10.75	0 00:07	17.33	0.62	5.44	0.77	1.21	0.60	0.00		Calculated
14	13A-13	0.46	0 00:05	9.90	0.05	3.46	0.03	0.47	0.38	0.00		Calculated
15	14-14A	22.39	0 00:08	41.07	0.55	5.10	0.12	1.38	0.57	0.00		Calculated
16	15-14	15.09	0 00:15	24.82	0.61	4.38	0.23	1.25	0.62	0.00		Calculated
17	15A-15	0.67	0 00:05	4.89	0.14	2.46	0.04	0.65	0.52	0.00		Calculated
18	16-15	15.10	0 00:15	24.78	0.61	3.70	0.18	1.46	0.73	0.00		Calculated
19	16A-16B	6.57	0 00:20	17.80	0.37	5.62	0.02	1.23	0.82	0.00		Calculated
20	16B-16C	14.71	0 00:15	23.06	0.64	3.23	0.09	1.66	0.83	0.00		Calculated
21	16C-16	14.71	0 00:15	25.14	0.59	3.40	0.03	1.56	0.78	0.00		Calculated
22	16D-16C	1.15	0 00:05	1.73	0.66	2.82	0.04	0.51	0.51	0.00		Calculated
23	17-16	3.32	0 00:05	13.45	0.25	1.73	0.37	1.44	0.72	0.00		Calculated
24	17A-17	1.03	0 00:05	4.91	0.21	2.79	0.04	0.62	0.49	0.00		Calculated
25	18-17	2.60	0 00:06	13.43	0.19	1.95	0.57	1.28	0.64	0.00		Calculated
26	18A-18B	0.77	0 00:07	9.45	0.08	6.66	0.04	0.20	0.21	0.00		Calculated
27	18B-18C	2.03	0 00:09	12.73	0.16	3.56	0.07	0.61	0.49	0.00		Calculated
28	18C-18	2.67	0 00:05	4.91	0.54	3.45	0.03	0.75	0.60	0.00		Calculated
29	20-20B	16.84	0 00:06	30.58	0.55	5.78	0.13	1.43	0.57	0.00		Calculated
30	20A-20	1.62	0 00:05	9.90	0.16	4.42	0.02	0.42	0.34	0.00		Calculated
31	21-20	15.72	0 00:06	31.42	0.50	5.12	0.60	1.50	0.60	0.00		Calculated
32	21A-21B	2.21	0 00:10	4.95	0.45	2.98	0.11	0.79	0.63	0.00		Calculated
33	21B-21	2.84	0 00:05	4.95	0.57	3.68	0.04	0.75	0.60	0.00		Calculated
34	22.1-22	10.22	0 00:06	24.50	0.42	4.99	0.38	1.24	0.62	0.00		Calculated
35	22.1A-22.1	2.97	0 00:05	27.08	0.11	10.58	0.01	0.35	0.28	0.00		Calculated
36	22-21	12.92	0 00:06	17.33	0.75	5.57	0.32	1.39	0.69	0.00		Calculated
37	22A-22	2.34	0 00:05	9.90	0.24	4.45	0.03	0.72	0.57	0.00		Calculated
38	22B-22	0.86	0 00:05	9.90	0.09	3.88	0.14	0.48	0.39	0.00		Calculated
39	23-22.1	7.53	0 00:06	24.51	0.31	5.42	0.35	0.92	0.46	0.00		Calculated
40	23A-23	2.93	0 00:05	9.90	0.30	4.94	0.03	0.61	0.49	0.00		Calculated
41	23B-23	0.82	0 00:05	9.90	0.08	4.38	0.12	0.26	0.21	0.00		Calculated
42	24-23	4.03	0 00:05	39.88	0.10	4.70	1.06	0.63	0.32	0.00		Calculated
43	24A-24	1.99	0 00:05	9.90	0.20	4.51	0.03	0.49	0.39	0.00		Calculated
44	24B-24	0.84	0 00:05	9.90	0.08	4.39	0.12	0.27	0.21	0.00		Calculated
45	25-24	1.39	0 00:05	24.51	0.06	3.39	1.14	0.38	0.19	0.00		Calculated
46	25A-25	0.46	0 00:05	9.90	0.05	3.27	0.04	0.21	0.17	0.00		Calculated
47	25B-25	0.60	0 00:05	9.90	0.06	4.04	0.13	0.22	0.18	0.00		Calculated
48	26-25	0.41	0 00:05	21.97	0.02	1.75	0.94	0.26	0.13	0.00		Calculated
49	26A-26	0.42	0 00:05	9.90	0.04	3.34	0.04	0.20	0.16	0.00		Calculated
50	Link-08	6.54	0 00:12	5.89	1.11	3.98	0.33	1.37	0.92	0.00		> CAPACITY

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft^2)	Grate Clogging Factor (%)
1	10A	NEENAH FOUNDRY	R-4882	On Sag	1	836.53	838.69	2.16	836.53	0.00	8.12	50.00
2	10B	NEENAH FOUNDRY	R-4882	On Sag	1	836.35	839.09	2.75	836.35	0.00	16.25	50.00
3	10C	NEENAH FOUNDRY	R-3067	On Sag	1	836.03	840.13	4.10	836.03	0.00	6.00	35.00
4	10D	NEENAH FOUNDRY	R-3067	On Sag	1	835.87	840.04	4.17	835.87	0.00	6.00	35.00
5	11A	NEENAH FOUNDRY	R-4882	On Sag	1	834.82	837.44	2.63	834.82	0.00	16.25	50.00
6	11B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.72	839.46	4.74	834.72	0.00	N/A	0.00
7	12B	NEENAH FOUNDRY	R-4882	On Sag	1	835.04	836.73	1.68	835.04	0.00	8.12	50.00
8	12C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.87	838.46	3.59	834.87	0.00	N/A	0.00
9	13A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.46	837.61	3.15	834.46	0.00	N/A	0.00
10	15A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.29	836.02	2.73	832.90	-0.39	N/A	0.00
11	16B	NEENAH FOUNDRY	R-3508-B	On Sag	1	832.70	835.20	2.50	832.70	0.00	3.70	50.00
12	16C	NEENAH FOUNDRY	R-3067	On Sag	1	832.65	835.97	3.31	832.65	0.00	6.00	50.00
13	16D	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.67	835.97	2.30	833.67	0.00	N/A	0.00
14	17A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.53	836.05	2.52	833.53	0.00	N/A	0.00
15	18B	NEENAH FOUNDRY	R-4882	On Sag	1	834.20	835.85	1.64	834.20	0.00	8.12	50.00
16	18C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.73	836.47	2.74	833.83	0.10	N/A	0.00
17	20A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.35	837.40	3.05	834.35	0.00	N/A	0.00
18	21A	NEENAH FOUNDRY	R-4882	On Sag	1	835.29	837.40	2.11	835.29	0.00	8.12	50.00
19	21B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.19	838.57	3.38	835.19	0.00	N/A	0.00
20	22.1A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.13	842.63	4.50	838.13	0.00	N/A	0.00
21	22A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.85	839.26	3.41	835.85	0.00	N/A	0.00
22	22B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.33	839.26	2.93	836.33	0.00	N/A	0.00
23	23A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.13	842.63	4.50	838.13	0.00	N/A	0.00
24	23B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.61	842.63	4.02	838.61	0.00	N/A	0.00
25	24A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.07	849.52	3.45	846.07	0.00	N/A	0.00
26	24B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.55	849.52	2.97	846.55	0.00	N/A	0.00
27	25A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.38	851.84	3.46	848.38	0.00	N/A	0.00
28	25B	NEENAH FOUNDRY	R 3067 Diagonal Reversible	On Grade	1	848.86	851.84	2.98	848.86	0.00	N/A	35.00
29	26A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	849.18	852.55	3.37	849.18	0.00	N/A	0.00

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	10A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
2	10B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
3	10C	N/A	0.0190	0.0130	0.0400	2.00	0.0000	13.00
4	10D	N/A	0.0240	0.0130	0.0400	2.00	0.0000	13.00
5	11A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
6	11B	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	13.00
7	12B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
8	12C	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	13.00
9	13A	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	13.00
10	15A	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	13.00
11	16B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
12	16C	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
13	16D	0.0008	0.0200	0.0130	0.0400	2.00	0.0000	13.00
14	17A	0.0044	0.0200	0.0130	0.0400	2.00	0.0000	13.00
15	18B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
16	18C	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
17	20A	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
18	21A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
19	21B	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
20	22.1A	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
21	22A	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
22	22B	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
23	23A	0.0230	0.0200	0.0130	0.0400	2.00	0.0000	13.00
24	23B	0.0230	0.0200	0.0130	0.0400	2.00	0.0000	13.00
25	24A	0.0170	0.0200	0.0130	0.0400	2.00	0.0000	13.00
26	24B	0.0170	0.0200	0.0130	0.0400	2.00	0.0000	13.00
27	25A	0.0071	0.0200	0.0130	0.0400	2.00	0.0000	13.00
28	25B	0.0071	0.0200	0.0130	0.0400	2.00	0.0000	13.00
29	26A	0.0071	0.0200	0.0130	0.0400	2.00	0.0000	13.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	10A	0.55	0.55	N/A	N/A	N/A	0.92	838.75	0.06	0 00:05	0.00	0.00
2	10B	0.68	0.68	N/A	N/A	N/A	1.36	839.16	0.07	0 00:05	0.00	0.00
3	10C	0.58	0.58	N/A	N/A	N/A	2.79	840.22	0.09	0 00:05	0.00	0.00
4	10D	0.50	0.50	N/A	N/A	N/A	2.23	840.12	0.09	0 00:05	0.00	0.00
5	11A	6.80	6.80	N/A	N/A	N/A	22.97	837.94	0.49	0 00:05	0.00	0.00
6	11B	0.57	0.57	0.31	0.26	53.99	3.17	839.55	0.09	0 00:05	0.00	0.00
7	12B	0.84	0.84	N/A	N/A	N/A	1.88	836.80	0.08	0 00:06	0.00	0.00
8	12C	0.82	0.56	0.44	0.37	54.25	4.58	838.58	0.12	0 00:06	0.00	0.00
9	13A	0.85	0.48	0.46	0.39	53.78	4.77	837.74	0.13	0 00:07	0.00	0.00
10	15A	1.25	0.86	0.62	0.63	49.68	6.18	836.18	0.16	0 00:15	0.00	0.00
11	16B	8.29	8.29	N/A	N/A	N/A	180.87	838.79	3.60	0 00:15	0.00	0.00
12	16C	1.07	0.14	N/A	N/A	N/A	5.20	836.11	0.14	0 00:15	0.00	0.00
13	16D	1.61	0.09	1.18	0.44	72.95	10.66	836.22	0.25	0 00:05	0.00	0.00
14	17A	2.53	0.21	1.00	1.53	39.61	8.97	836.27	0.22	0 00:15	0.00	0.00
15	18B	1.48	1.48	N/A	N/A	N/A	3.75	835.96	0.12	0 00:09	0.00	0.00
16	18C	3.54	0.37	1.18	2.35	33.46	9.59	836.70	0.23	0 00:05	0.00	0.00
17	20A	4.88	0.57	1.45	3.43	29.70	11.10	837.67	0.26	0 00:05	0.00	0.00
18	21A	2.22	2.22	N/A	N/A	N/A	5.61	837.55	0.15	0 00:05	0.00	0.00
19	21B	5.98	0.37	1.65	4.33	27.54	12.15	838.85	0.28	0 00:05	0.00	0.00
20	22.1A	9.66	0.74	2.63	7.03	27.26	14.93	842.97	0.34	0 00:05	0.00	0.00
21	22A	7.90	1.22	1.96	5.94	24.80	13.71	839.58	0.31	0 00:05	0.00	0.00
22	22B	1.60	0.72	0.71	0.89	44.58	6.53	839.43	0.17	0 00:05	0.00	0.00
23	23A	11.86	5.94	2.27	9.59	19.13	12.43	842.92	0.29	0 00:05	0.00	0.00
24	23B	1.72	0.90	0.67	1.05	39.10	4.93	842.77	0.14	0 00:05	0.00	0.00
25	24A	7.93	7.53	1.86	6.07	23.44	11.13	849.78	0.26	0 00:05	0.00	0.00
26	24B	1.67	1.04	0.69	0.98	41.60	5.24	849.66	0.14	0 00:05	0.00	0.00
27	25A	0.86	0.49	0.46	0.40	53.36	4.41	851.96	0.12	0 00:05	0.00	0.00
28	25B	1.24	1.24	0.60	0.64	48.55	5.63	851.99	0.15	0 00:05	0.00	0.00
29	26A	0.79	0.79	0.42	0.37	53.36	4.07	852.66	0.11	0 00:05	0.00	0.00

Project Description

File Name	3670-01-01_Pipe Analysis_SSA-NoBike_Urban.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	May 21, 2019	00:00:00
End Analysis On	May 22, 2019	00:00:00
Start Reporting On	May 21, 2019	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	20
Nodes	40
Junctions	15
Outfalls	5
Flow Diversions	0
Inlets	20
Storage Nodes	0
Links	50
Channels	15
Pipes	35
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	10 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ft²)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-30A	8127.77	0.6800	0.58	0.39	0.07	0.88	0 00:05:00
2	Sub-30B	19732.98	0.4500	0.58	0.26	0.12	1.42	0 00:05:00
3	Sub-31A	56666.99	0.4100	0.58	0.24	0.31	3.71	0 00:05:00
4	Sub-32A	16279.94	0.5600	0.58	0.33	0.12	1.46	0 00:05:00
5	Sub-32B	18227.46	0.5300	0.58	0.31	0.13	1.54	0 00:05:00
6	Sub-33A	16834.02	0.5800	0.58	0.34	0.13	1.56	0 00:05:00
7	Sub-33B	34363.00	0.4400	0.58	0.26	0.20	2.42	0 00:05:00
8	Sub-34A	8205.18	0.5600	0.58	0.33	0.06	0.73	0 00:05:00
9	Sub-34B	32104.98	0.3700	0.58	0.22	0.16	1.90	0 00:05:00
10	Sub-41A	12095.00	0.6300	0.58	0.37	0.10	1.22	0 00:05:00
11	Sub-42A	6791.00	0.5300	0.58	0.31	0.05	0.58	0 00:05:00
12	Sub-42B	2798.99	0.6900	0.58	0.40	0.03	0.31	0 00:05:00
13	Sub-42C	10483.02	0.5600	0.58	0.33	0.08	0.94	0 00:05:00
14	Sub-43A	5678.48	0.1600	0.58	0.09	0.01	0.15	0 00:05:00
15	Sub-43B	4797.00	0.7400	0.58	0.43	0.05	0.57	0 00:05:00
16	Sub-43C	6107.98	0.5900	0.58	0.34	0.05	0.58	0 00:05:00
17	Sub-44A	23215.00	0.4100	0.58	0.24	0.13	1.52	0 00:05:00
18	Sub-45A	44108.90	0.3900	0.58	0.23	0.23	2.75	0 00:05:00
19	Sub-45B	21768.85	0.4700	0.58	0.27	0.14	1.64	0 00:05:00
20	Sub-47A	20500.82	0.7500	0.58	0.44	0.20	2.46	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	30	Junction	847.59	852.55	847.59	852.55	0.00	1.07	847.92	0.00	4.63	0 00:00	0.00	0.00
2	31	Junction	846.76	851.55	846.76	851.55	0.00	2.32	847.34	0.00	4.22	0 00:00	0.00	0.00
3	32	Junction	846.17	850.70	846.17	850.70	0.00	5.06	846.64	0.00	4.06	0 00:00	0.00	0.00
4	33	Junction	835.49	840.19	835.49	840.19	0.00	6.38	836.13	0.00	4.06	0 00:00	0.00	0.00
5	34	Junction	834.39	839.48	834.39	839.48	0.00	10.01	835.32	0.00	4.15	0 00:00	0.00	0.00
6	35	Junction	832.11	837.52	832.11	837.52	0.00	10.10	833.27	0.00	4.25	0 00:00	0.00	0.00
7	36	Junction	831.84	837.45	831.84	837.45	0.00	10.02	832.82	0.00	4.63	0 00:00	0.00	0.00
8	41	Junction	831.98	837.23	831.98	837.23	0.00	10.62	832.76	0.00	4.47	0 00:00	0.00	0.00
9	42	Junction	832.56	837.09	832.56	837.09	0.00	10.08	833.72	0.00	3.37	0 00:00	0.00	0.00
10	43	Junction	832.76	837.29	832.76	837.29	0.00	6.30	833.99	0.00	3.30	0 00:00	0.00	0.00
11	44	Junction	833.10	837.95	833.10	837.95	0.00	4.69	834.13	0.00	3.82	0 00:00	0.00	0.00
12	45	Junction	833.51	838.67	833.51	838.67	0.00	3.24	834.21	0.00	4.45	0 00:00	0.00	0.00
13	46	Junction	834.26	839.26	834.26	839.26	0.00	0.90	834.52	0.00	4.74	0 00:00	0.00	0.00
14	47	Junction	841.15	846.54	841.15	846.54	0.00	0.91	841.34	0.00	5.20	0 00:00	0.00	0.00
15	79	Junction	848.35	849.41	848.35	849.41	0.00	0.00	848.35	0.00	1.05	0 00:00	0.00	0.00
16	OFFSITE-4	Outfall	837.01					3.24	837.19					
17	OFFSITE-5	Outfall	836.96					1.04	837.08					
18	OFFSITE-7	Outfall	826.28					0.90	826.40					
19	Out-136-37	Outfall	831.28					10.03	832.09					
20	Out-141-40	Outfall	830.00					10.64	830.67					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	14 (81)	Pipe	79	31A	89.66	848.35	847.91	0.5000	12.000	0.0120	0.00	2.73	0.00	0.00	0.14	0.14	0.00	Calculated
2	30-31	Pipe	30	31	166.95	847.59	846.76	0.5000	24.000	0.0120	1.03	17.33	0.06	1.96	0.45	0.23	0.00	Calculated
3	30A-30	Pipe	30A	30	8.50	848.38	848.34	0.5000	15.000	0.0120	0.45	4.95	0.09	2.13	0.28	0.23	0.00	Calculated
4	30B-30	Pipe	30B	30	32.50	848.78	848.34	1.3400	15.000	0.0120	0.62	8.11	0.08	3.58	0.25	0.20	0.00	Calculated
5	31-32	Pipe	31	32	171.05	846.76	846.17	0.3500	24.000	0.0120	2.27	14.41	0.16	3.48	0.53	0.26	0.00	Calculated
6	31A-31	Pipe	31A	31	49.59	847.66	847.51	0.3000	15.000	0.0120	1.29	3.83	0.34	2.88	0.49	0.39	0.00	Calculated
7	32-33	Pipe	32	33	384.98	846.17	835.49	2.7700	24.000	0.0120	4.97	40.81	0.12	7.05	0.56	0.28	0.00	Calculated
8	32A-32	Pipe	32A	32	8.50	846.96	846.92	0.5000	15.000	0.0120	0.95	4.95	0.19	2.55	0.43	0.34	0.00	Calculated
9	32B-32	Pipe	32B	32	32.50	847.01	846.92	0.3000	15.000	0.0120	2.06	3.84	0.54	3.08	0.67	0.54	0.00	Calculated
10	33-34	Pipe	33	34	36.37	835.49	834.39	3.0300	24.000	0.0120	6.29	42.68	0.15	5.63	0.79	0.39	0.00	Calculated
11	33A-33	Pipe	33A	33	8.50	836.28	836.24	0.5000	15.000	0.0120	0.65	4.95	0.13	2.32	0.35	0.28	0.00	Calculated
12	33B-33	Pipe	33B	33	32.50	836.40	836.24	0.5000	15.000	0.0120	0.86	4.95	0.17	2.69	0.38	0.31	0.00	Calculated
13	34-35	Pipe	34	35	225.62	834.39	832.11	1.0100	24.000	0.0120	10.10	24.62	0.41	6.11	1.04	0.52	0.00	Calculated
14	34A-34	Pipe	34A	34	54.54	835.41	835.14	0.5000	15.000	0.0120	3.84	4.95	0.78	4.02	0.91	0.73	0.00	Calculated
15	34B-34A	Pipe	34B	34A	36.74	835.59	835.41	0.5000	15.000	0.0120	1.83	4.95	0.37	2.06	0.95	0.76	0.00	Calculated
16	35-36	Pipe	35	36	27.33	832.11	831.84	1.0000	24.000	0.0120	10.02	24.50	0.41	5.85	1.07	0.54	0.00	Calculated
17	36-37	Pipe	36	Out-136-37	38.30	831.84	831.28	1.4500	24.000	0.0120	10.03	29.52	0.34	7.38	0.89	0.45	0.00	Calculated
18	41-40	Pipe	41	Out-141-40	62.55	831.98	830.00	3.1700	24.000	0.0120	10.64	43.60	0.24	10.32	0.73	0.36	0.00	Calculated
19	41A-41	Pipe	41A	41	8.50	832.90	832.73	2.0000	15.000	0.0120	0.61	9.90	0.06	3.55	0.25	0.20	0.00	Calculated
20	42-41	Pipe	42	41	54.88	832.56	831.98	1.0600	24.000	0.0120	10.08	25.19	0.40	6.71	0.97	0.48	0.00	Calculated
21	42A-42	Pipe	42A	42	8.50	833.48	833.31	2.0000	15.000	0.0120	2.37	9.90	0.24	4.69	0.54	0.43	0.00	Calculated
22	42B-42	Pipe	42B	42	32.97	833.41	833.31	0.3000	15.000	0.0120	1.58	3.85	0.41	2.86	0.58	0.46	0.00	Calculated
23	42C-42B	Pipe	42C	42B	26.92	833.74	833.66	0.3000	12.000	0.0120	0.63	2.11	0.30	2.22	0.41	0.41	0.00	Calculated
24	43-42	Pipe	43	42	65.43	832.76	832.56	0.3100	24.000	0.0120	6.17	13.55	0.46	3.17	1.19	0.60	0.00	Calculated
25	43A-43B	Pipe	43A	43B	13.59	833.62	833.55	0.5000	15.000	0.0120	0.16	4.95	0.03	0.69	0.57	0.45	0.00	Calculated
26	43B-43	Pipe	43B	43	8.50	833.55	833.51	0.5000	15.000	0.0120	1.38	4.95	0.28	2.81	0.53	0.42	0.00	Calculated
27	43C-43	Pipe	43C	43	32.50	833.67	833.51	0.5000	15.000	0.0120	0.80	4.95	0.16	2.52	0.43	0.34	0.00	Calculated
28	44-43	Pipe	44	43	112.58	833.10	832.76	0.3000	24.000	0.0120	4.40	13.42	0.33	2.44	1.13	0.57	0.00	Calculated
29	44A-44	Pipe	44A	44	13.26	834.11	833.85	1.9800	15.000	0.0120	1.67	9.86	0.17	5.00	0.39	0.32	0.00	Calculated
30	45-44	Pipe	45	44	137.95	833.51	833.10	0.3000	24.000	0.0120	3.10	13.42	0.23	2.58	0.87	0.43	0.00	Calculated
31	45A-45	Pipe	45A	45	13.19	834.52	834.26	2.0000	15.000	0.0120	1.70	9.90	0.17	4.56	0.43	0.34	0.00	Calculated
32	45B-45	Pipe	45B	45	27.81	835.09	834.26	3.0000	15.000	0.0120	0.72	12.12	0.06	4.84	0.22	0.18	0.00	Calculated
33	46-45	Pipe	46	45	75.18	834.26	833.51	1.0000	24.000	0.0120	0.87	24.51	0.04	1.50	0.48	0.24	0.00	Calculated
34	47-46	Pipe	47	46	204.05	841.15	834.26	3.3700	24.000	0.0120	0.90	45.02	0.02	4.98	0.23	0.11	0.00	Calculated
35	47A-47	Pipe	47A	47	40.35	843.26	841.88	3.4000	15.000	0.0120	0.91	12.90	0.07	5.77	0.23	0.19	0.00	Calculated
36	L-30A-32A	Channel	30A	32A	163.10	852.39	850.56	1.1200	6.000	0.0150	0.43	24.93	0.02	2.01	0.13	0.25	0.00	
37	L-30B-32B	Channel	30B	32B	163.10	852.39	850.54	1.1400	6.000	0.0150	0.79	25.08	0.03	1.98	0.16	0.33	0.00	
38	L-31A-32B	Channel	31A	32B	163.10	851.89	850.54	0.8300	6.000	0.0150	2.38	21.40	0.11	2.49	0.24	0.48	0.00	
39	L-32A-OFF	Channel	32A	OFFSITE-5	163.10	850.56	836.96	8.3400	6.000	0.0150	1.04	67.89	0.02	5.78	0.12	0.24	0.00	
40	L-32B-OFF	Channel	32B	OFFSITE-4	163.10	850.54	837.01	8.2900	6.000	0.0150	3.24	67.70	0.05	6.93	0.17	0.35	0.00	
41	L-33A-OFF	Channel	33A	OFFSITE-7	163.10	839.96	826.28	8.3900	6.000	0.0150	0.90	68.09	0.01	5.89	0.12	0.24	0.00	
42	L-33B-34A	Channel	33B	34A	163.10	840.03	838.90	0.7000	6.000	0.0150	1.54	19.61	0.08	2.00	0.22	0.44	0.00	
43	L-41A-42A	Channel	41A	42A	163.10	837.07	836.93	0.0900	6.000	0.0150	0.60	12.88	0.05	0.73	0.22	0.45	0.00	
44	L-42C-42B	Channel	42C	42B	163.10	836.95	846.60	-5.9200	6.000	0.0150	0.29	12.88	0.02	0.57	0.18	0.36	0.00	
45	L-43B-42A	Channel	43B	42A	163.10	837.13	836.93	0.1200	6.000	0.0150	1.73	12.88	0.13	1.29	0.28	0.56	0.00	
46	L-43C-42B	Channel	43C	42B	163.10	837.13	836.93	0.1200	6.000	0.0150	0.66	12.88	0.05	1.89	0.18	0.37	0.00	
47	L-44A-43B	Channel	44A	43B	110.22	837.70	837.13	0.5200	6.000	0.0320	2.42	16.92	0.14	1.71	0.29	0.58	0.00	
48	L-45A-44A	Channel	45A	44A	163.10	838.41	837.70	0.4400	6.000	0.0150	2.59	15.56	0.17	2.09	0.27	0.54	0.00	
49	L-45B-43C	Channel	45B	43C	163.10	838.89	837.13	1.0800	6.000	0.0150	0.91	24.45	0.04	1.40	0.20	0.40	0.00	
50	L-47A-45A	Channel	47A	45A	163.10	847.74	838.41	5.7200	6.000	0.0150	1.53	56.35	0.03	2.10	0.21	0.43	0.00	

Inlet Summary

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Initial Water Elevation (ft)	Ponded Area (ft^2)	Peak Flow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
1	30A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.38	852.39	848.38	N/A	0.88	0.45	0.43	51.13	15.00	4.57	852.52
2	30B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.78	852.39	848.78	N/A	1.42	0.63	0.79	44.22	15.00	6.07	852.55
3	31A	NEENAH FOUNDRY	R 3250A Special Diagonal	On Grade	1	847.66	851.89	847.66	N/A	3.71	1.33	2.38	35.85	15.00	6.31	852.10
4	32A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.96	850.56	846.96	N/A	1.89	0.84	1.04	44.79	15.00	7.79	850.75
5	32B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	847.01	850.54	847.01	N/A	4.68	1.45	3.24	30.90	15.00	11.55	850.81
6	33A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.28	839.96	836.28	N/A	1.56	0.66	0.90	42.23	15.00	4.84	840.10
7	33B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.40	840.03	836.40	N/A	2.42	0.87	1.54	36.13	15.00	6.12	840.19
8	34A	NEENAH FOUNDRY	R-3067	On Sag	1	835.41	838.90	835.41	6.00	2.27	N/A	N/A	N/A	15.00	9.92	839.13
9	34B	NEENAH FOUNDRY	R-3067	On Sag	1	835.59	838.71	835.59	6.00	1.90	N/A	N/A	N/A	15.00	8.56	838.92
10	41A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	832.90	837.07	832.90	N/A	1.22	0.62	0.60	50.69	15.00	6.09	837.24
11	42A	NEENAH FOUNDRY	R-3067	On Sag	1	833.48	836.93	833.48	6.00	2.89	N/A	N/A	N/A	15.00	11.98	837.17
12	42B	NEENAH FOUNDRY	R-3067	On Sag	1	833.41	836.93	833.41	6.00	1.26	N/A	N/A	N/A	15.00	6.01	837.07
13	42C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.74	836.95	833.74	N/A	0.94	0.65	0.29	69.18	15.00	6.59	837.12
14	43A	NEENAH FOUNDRY	R-3508-B	On Sag	1	833.62	837.59	833.62	4.00	0.15	N/A	N/A	N/A	15.00	0.55	837.64
15	43B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.55	837.13	833.55	N/A	2.99	1.09	1.89	36.62	15.00	9.45	837.36
16	43C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.67	837.13	833.67	N/A	1.48	0.70	0.78	47.03	15.00	6.68	837.30
17	44A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.11	837.70	834.11	N/A	4.09	1.31	2.79	31.94	15.00	10.75	837.95
18	45A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.52	838.41	834.52	N/A	4.28	1.33	2.94	31.21	15.00	10.90	838.67
19	45B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.09	838.89	835.09	N/A	1.63	0.72	0.91	44.31	15.00	6.90	839.07
20	47A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	843.26	847.78	843.26	N/A	2.46	0.92	1.54	37.39	15.00	8.18	847.98

Subbasin Hydrology

Subbasin : Sub-30A

Input Data

Area (ft²) 8127.77
Weighted Runoff Coefficient 0.6800

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	8127.77	-	0.68
Composite Area & Weighted Runoff Coeff.	8127.77		0.68

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

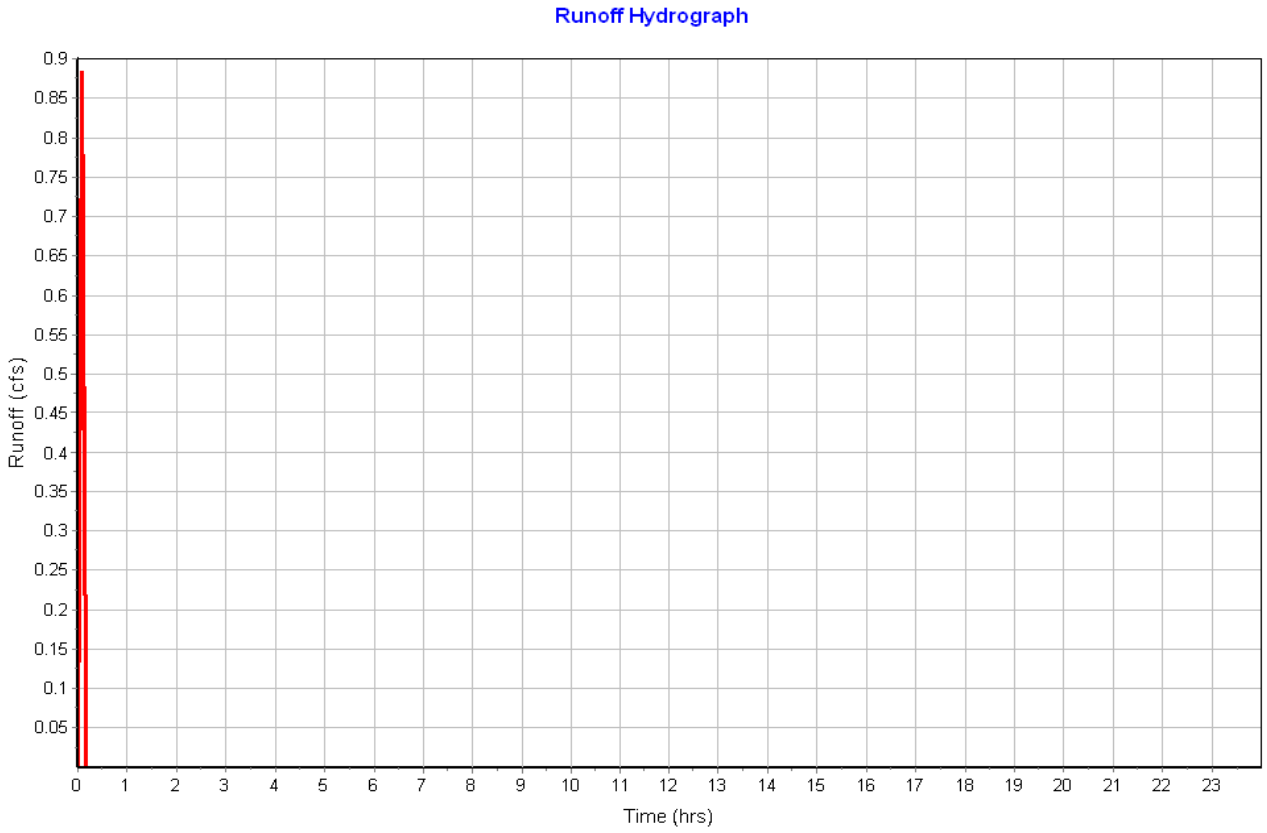
Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.39
Peak Runoff (cfs) 0.88
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.6800
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-30A



Subbasin : Sub-30B

Input Data

Area (ft²) 19732.98
Weighted Runoff Coefficient 0.4500

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	19732.98	-	0.45
Composite Area & Weighted Runoff Coeff.	19732.98		0.45

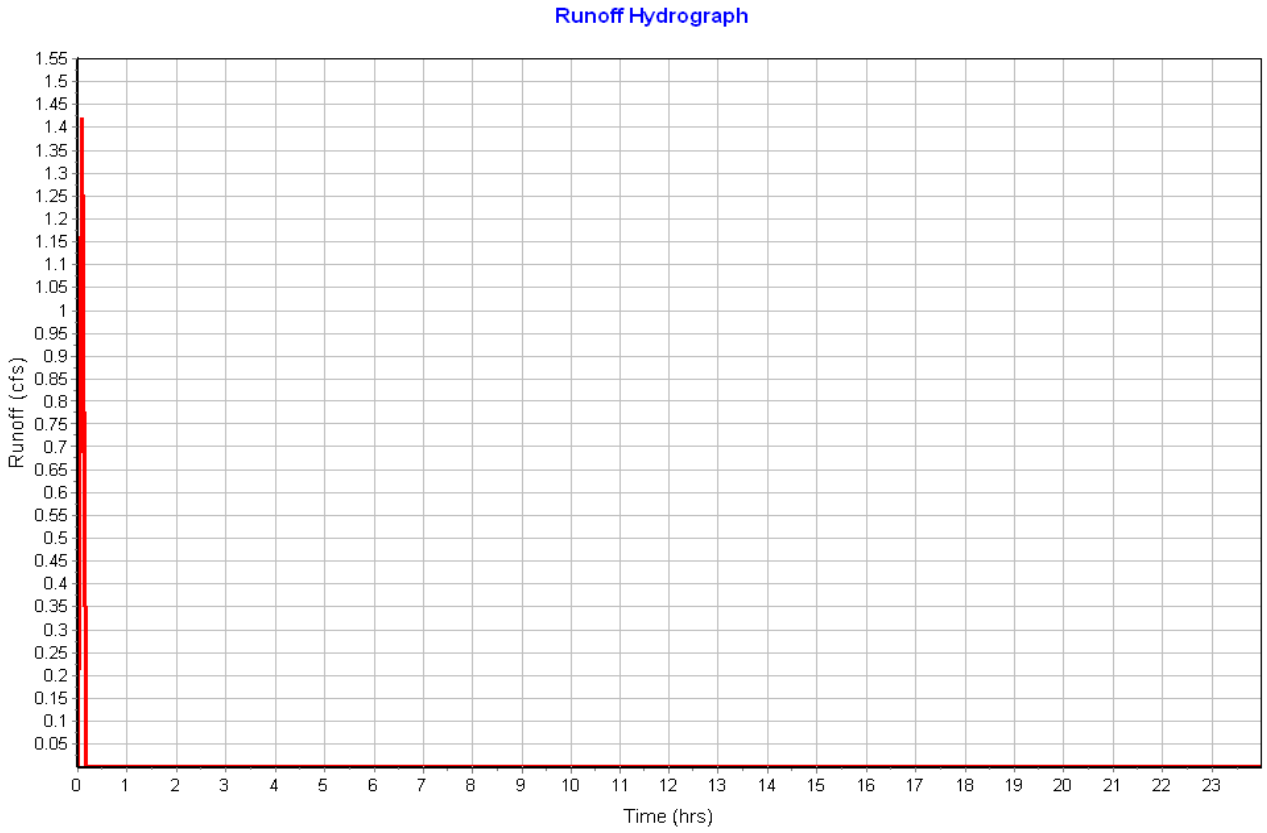
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.26
Peak Runoff (cfs) 1.42
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.4500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-30B



Subbasin : Sub-31A

Input Data

Area (ft²) 56666.99
Weighted Runoff Coefficient 0.4100

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	56666.99	-	0.41
Composite Area & Weighted Runoff Coeff.	56666.99		0.41

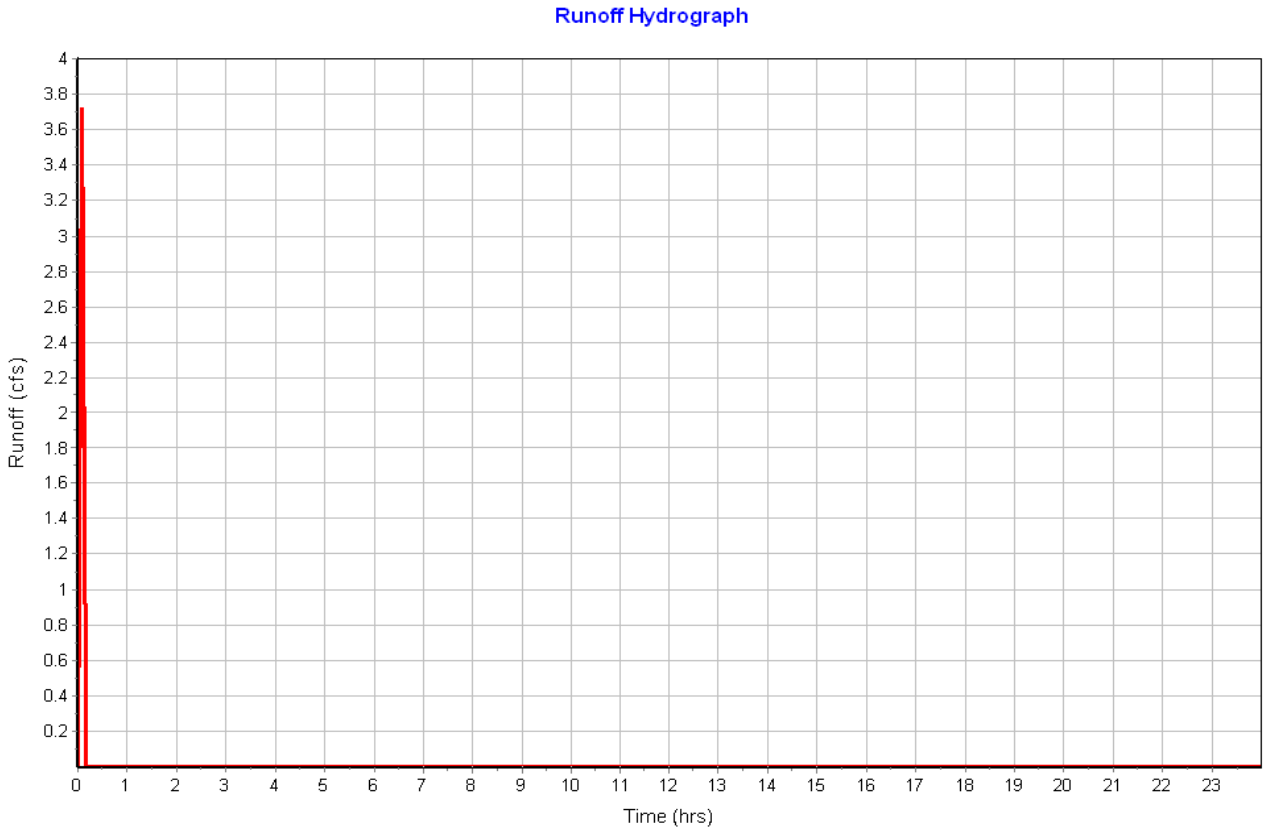
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.24
Peak Runoff (cfs) 3.71
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.4100
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-31A



Subbasin : Sub-32A

Input Data

Area (ft²) 16279.94
Weighted Runoff Coefficient 0.5600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	16279.94	-	0.56
Composite Area & Weighted Runoff Coeff.	16279.94		0.56

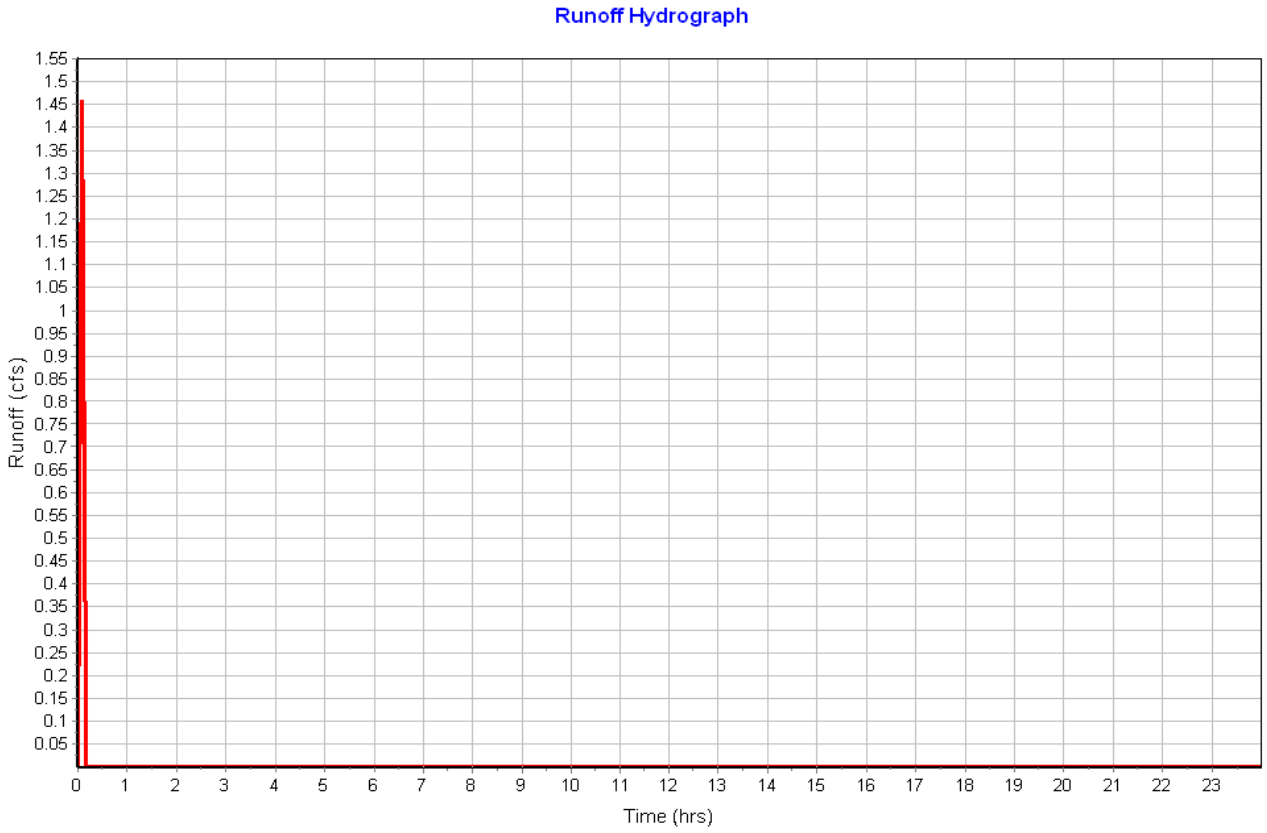
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.33
Peak Runoff (cfs) 1.46
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.5600
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-32A



Subbasin : Sub-32B

Input Data

Area (ft²) 18227.46
Weighted Runoff Coefficient 0.5300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	18227.46	-	0.53
Composite Area & Weighted Runoff Coeff.	18227.46		0.53

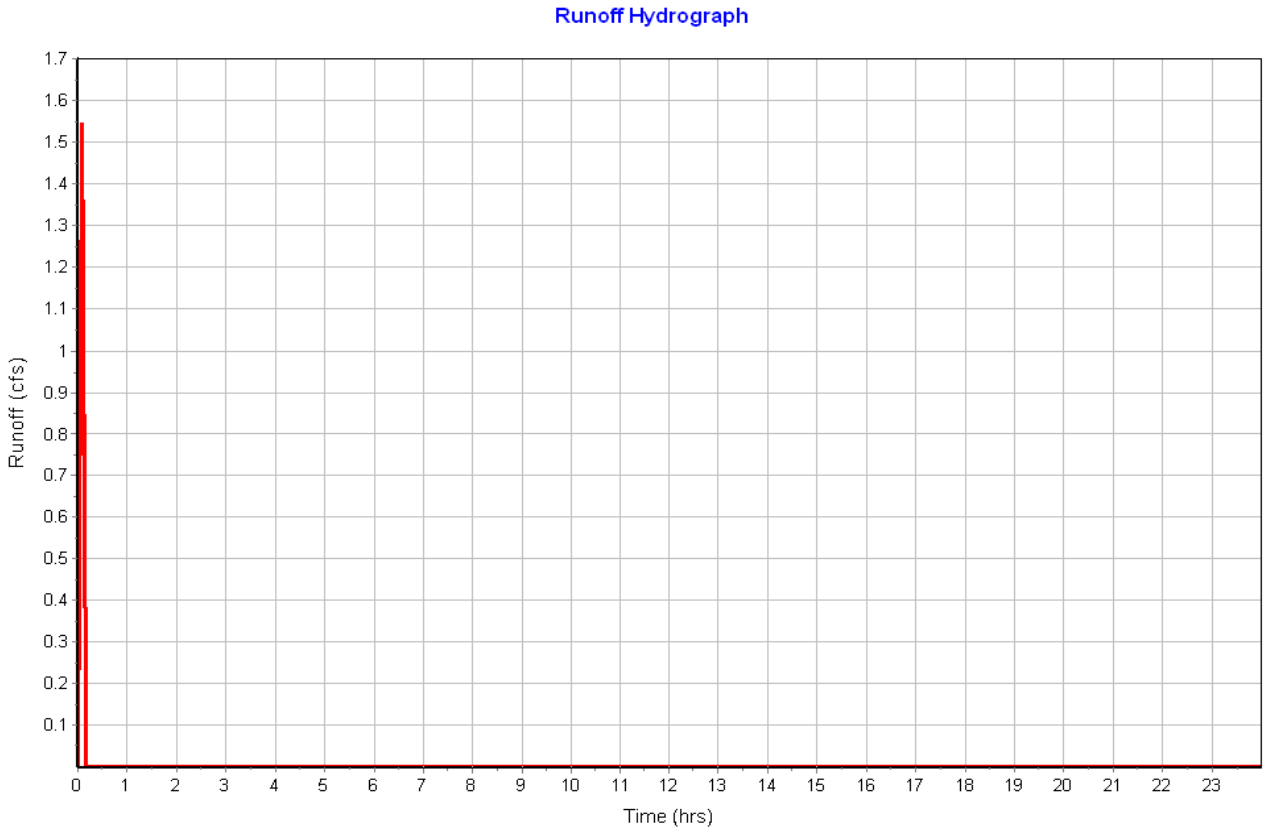
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.31
Peak Runoff (cfs) 1.54
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.5300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-32B



Subbasin : Sub-33A

Input Data

Area (ft²) 16834.02
Weighted Runoff Coefficient 0.5800

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	16834.02	-	0.58
Composite Area & Weighted Runoff Coeff.	16834.02		0.58

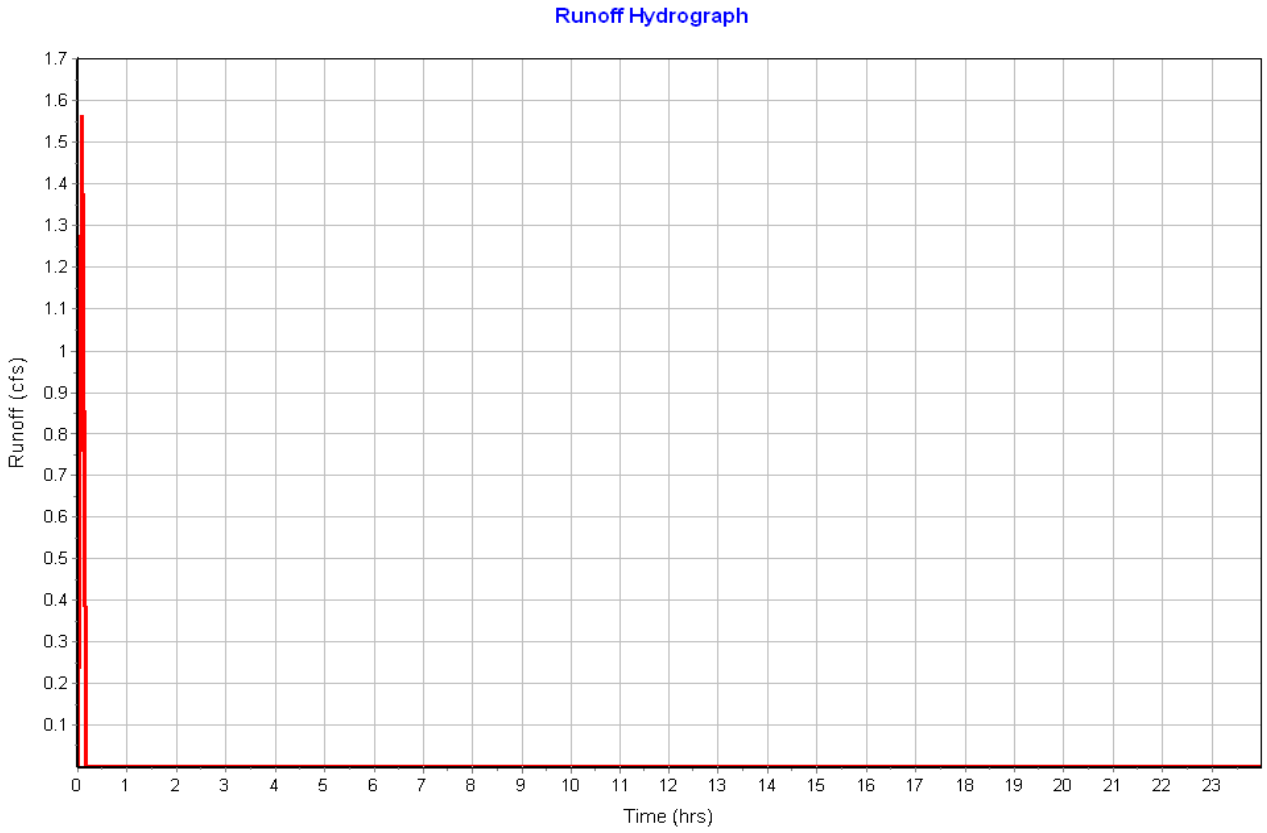
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.34
Peak Runoff (cfs) 1.56
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.5800
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-33A



Subbasin : Sub-33B

Input Data

Area (ft²) 34363.00
Weighted Runoff Coefficient 0.4400

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	34363.00	-	0.44
Composite Area & Weighted Runoff Coeff.	34363.00		0.44

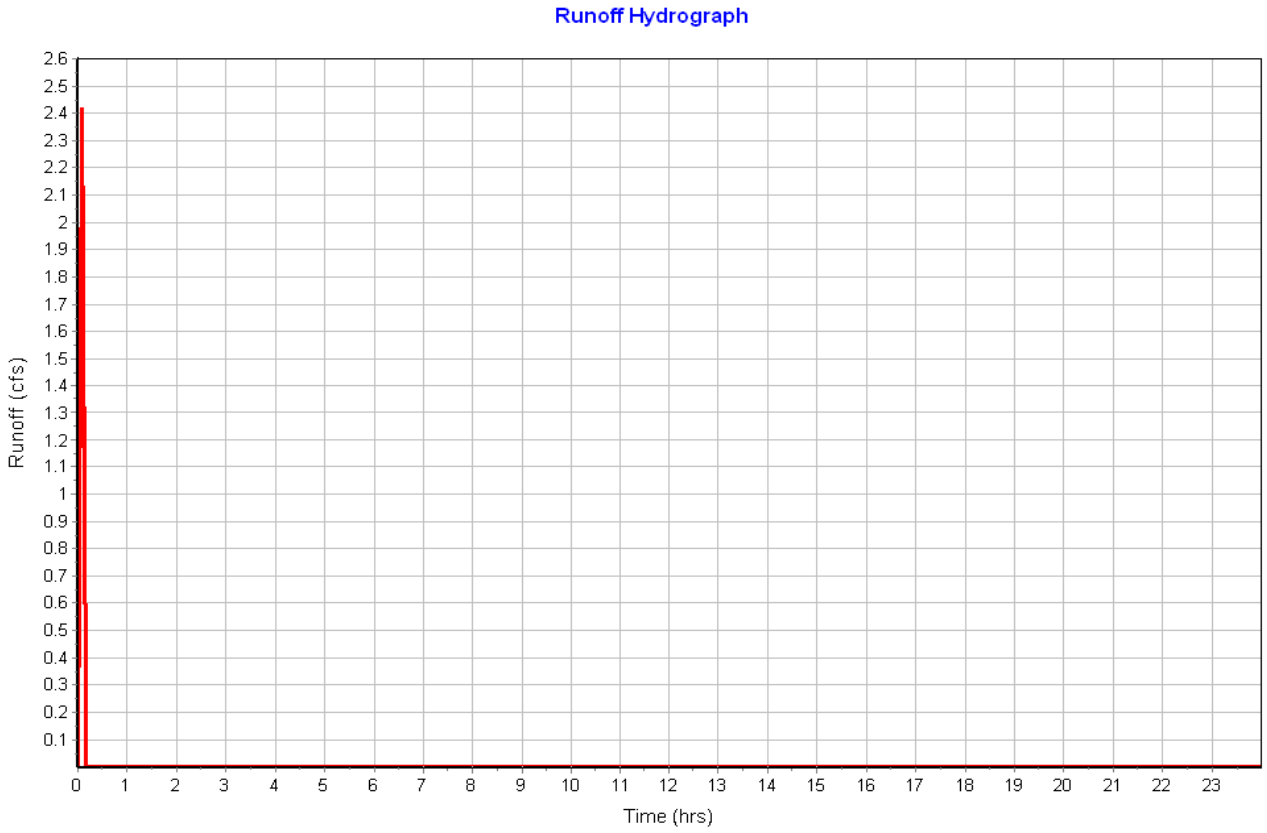
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.26
Peak Runoff (cfs) 2.42
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.4400
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-33B



Subbasin : Sub-34A

Input Data

Area (ft²) 8205.18
Weighted Runoff Coefficient 0.5600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	8205.18	-	0.56
Composite Area & Weighted Runoff Coeff.	8205.18		0.56

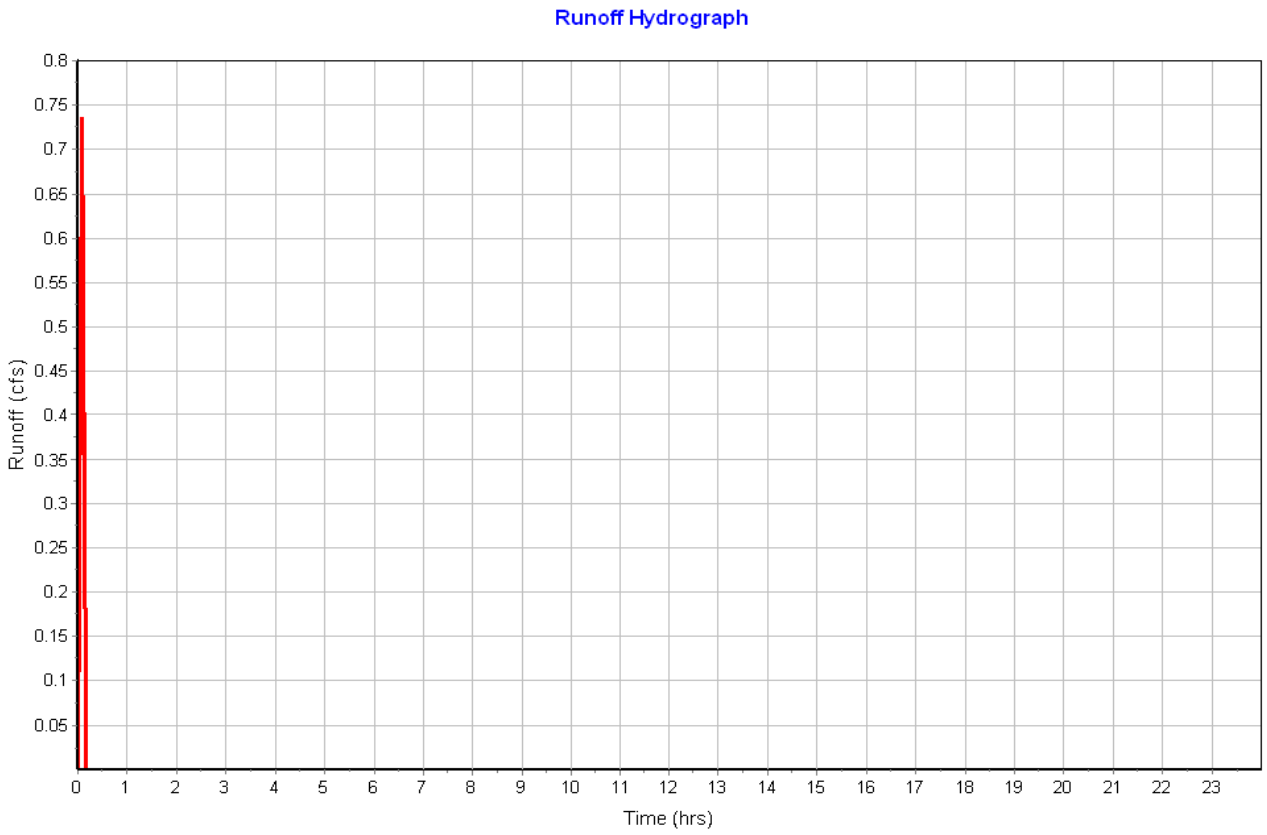
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.33
Peak Runoff (cfs) 0.73
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.5600
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-34A



Subbasin : Sub-34B

Input Data

Area (ft²) 32104.98
Weighted Runoff Coefficient 0.3700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	32104.98	-	0.37
Composite Area & Weighted Runoff Coeff.	32104.98		0.37

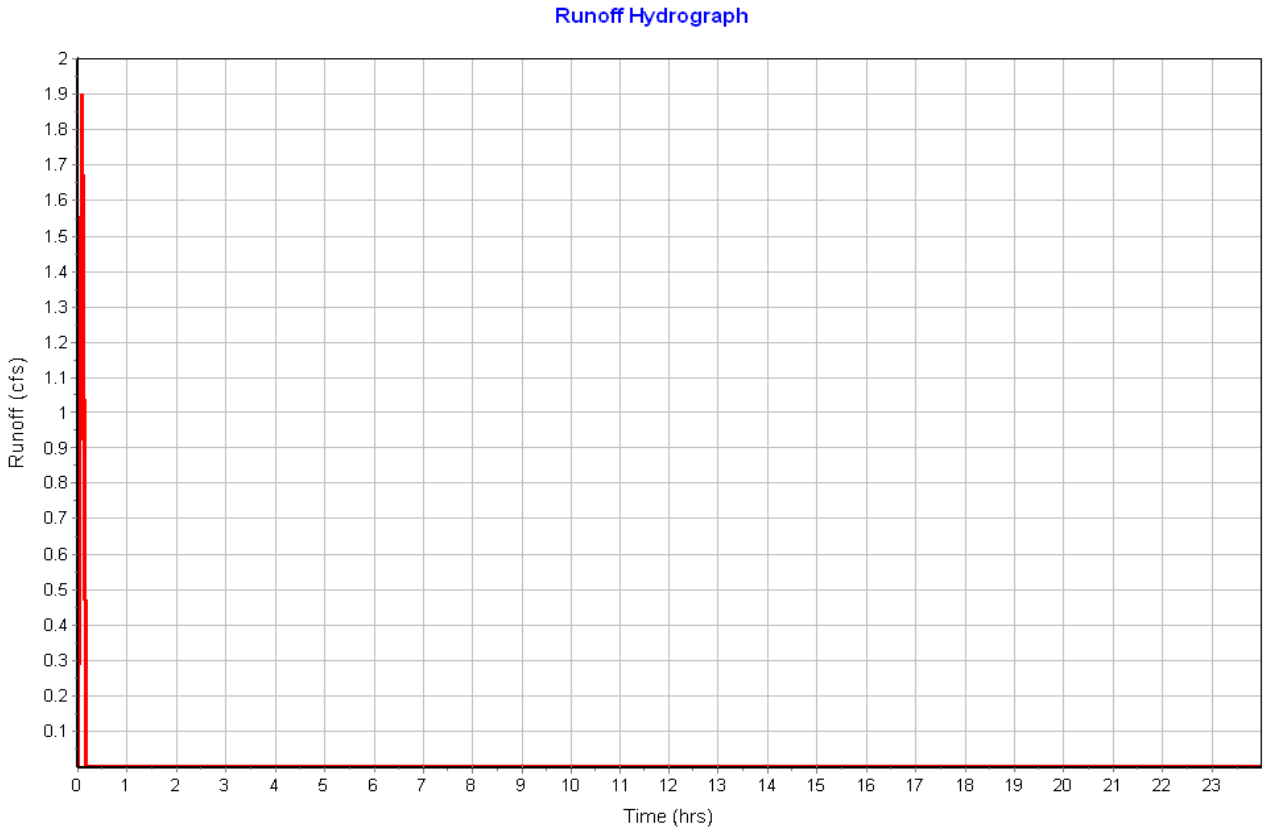
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.22
Peak Runoff (cfs) 1.90
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.3700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-34B



Subbasin : Sub-41A

Input Data

Area (ft²) 12095.00
Weighted Runoff Coefficient 0.6300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	12095.00	-	0.63
Composite Area & Weighted Runoff Coeff.	12095.00		0.63

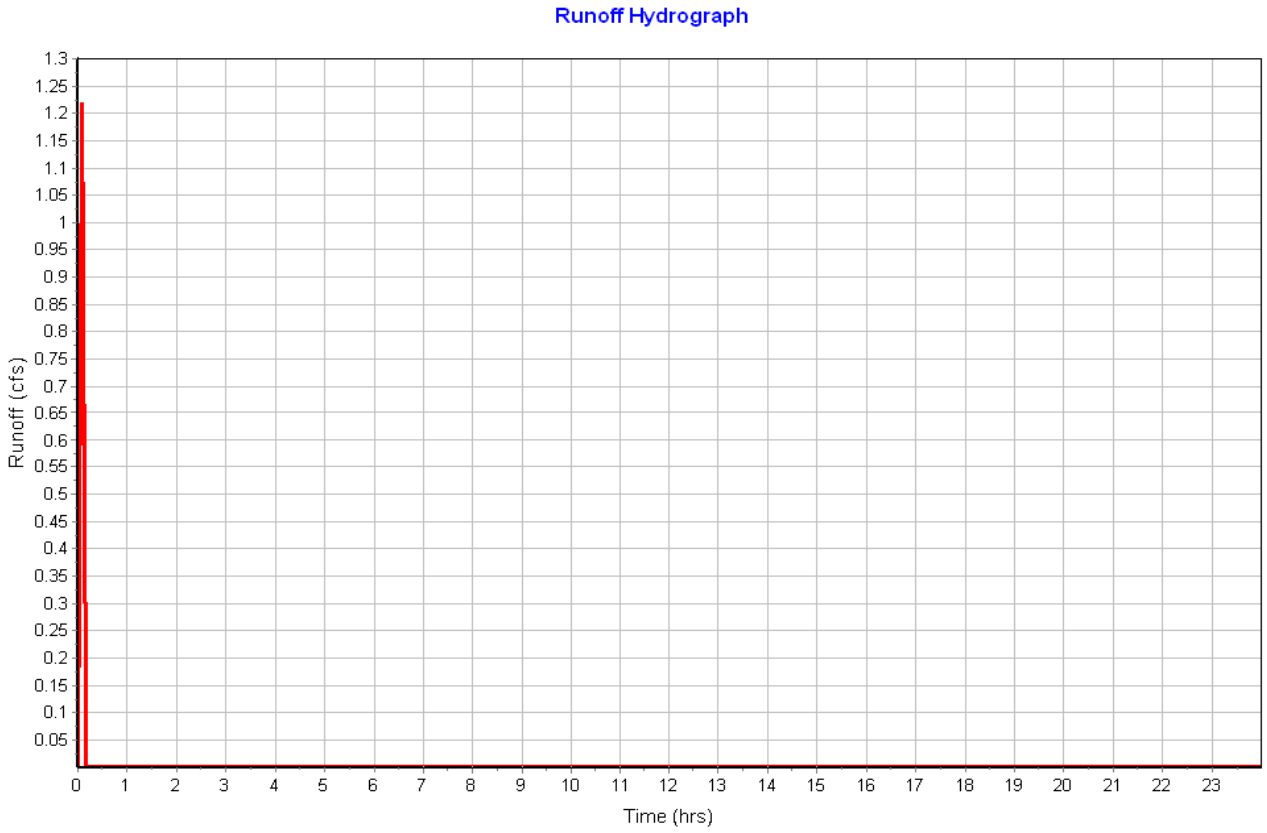
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.37
Peak Runoff (cfs) 1.22
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.6300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-41A



Subbasin : Sub-42A

Input Data

Area (ft²) 6791.00
Weighted Runoff Coefficient 0.5300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	6791.00	-	0.53
Composite Area & Weighted Runoff Coeff.	6791.00		0.53

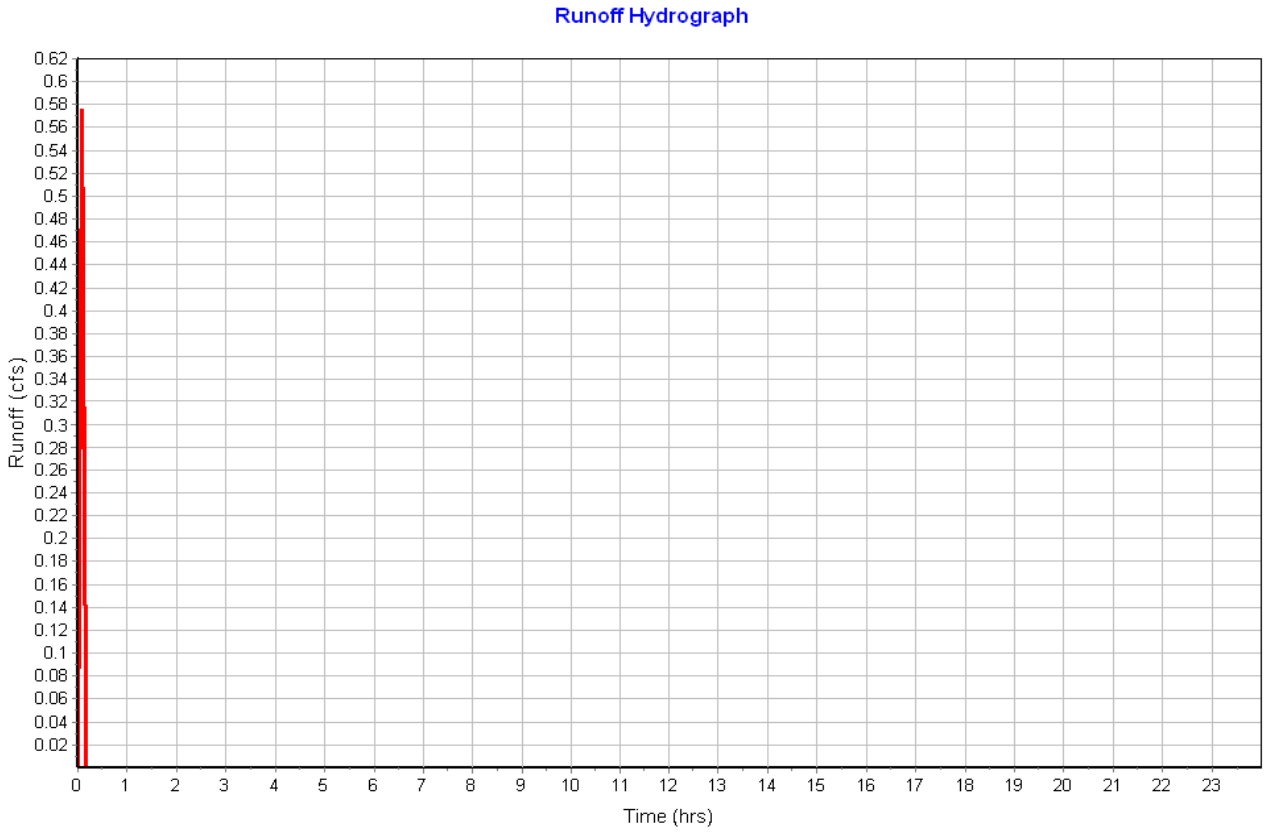
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.31
Peak Runoff (cfs) 0.58
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.5300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-42A



Subbasin : Sub-42B

Input Data

Area (ft²) 2798.99
Weighted Runoff Coefficient 0.6900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	2798.99	-	0.69
Composite Area & Weighted Runoff Coeff.	2798.99		0.69

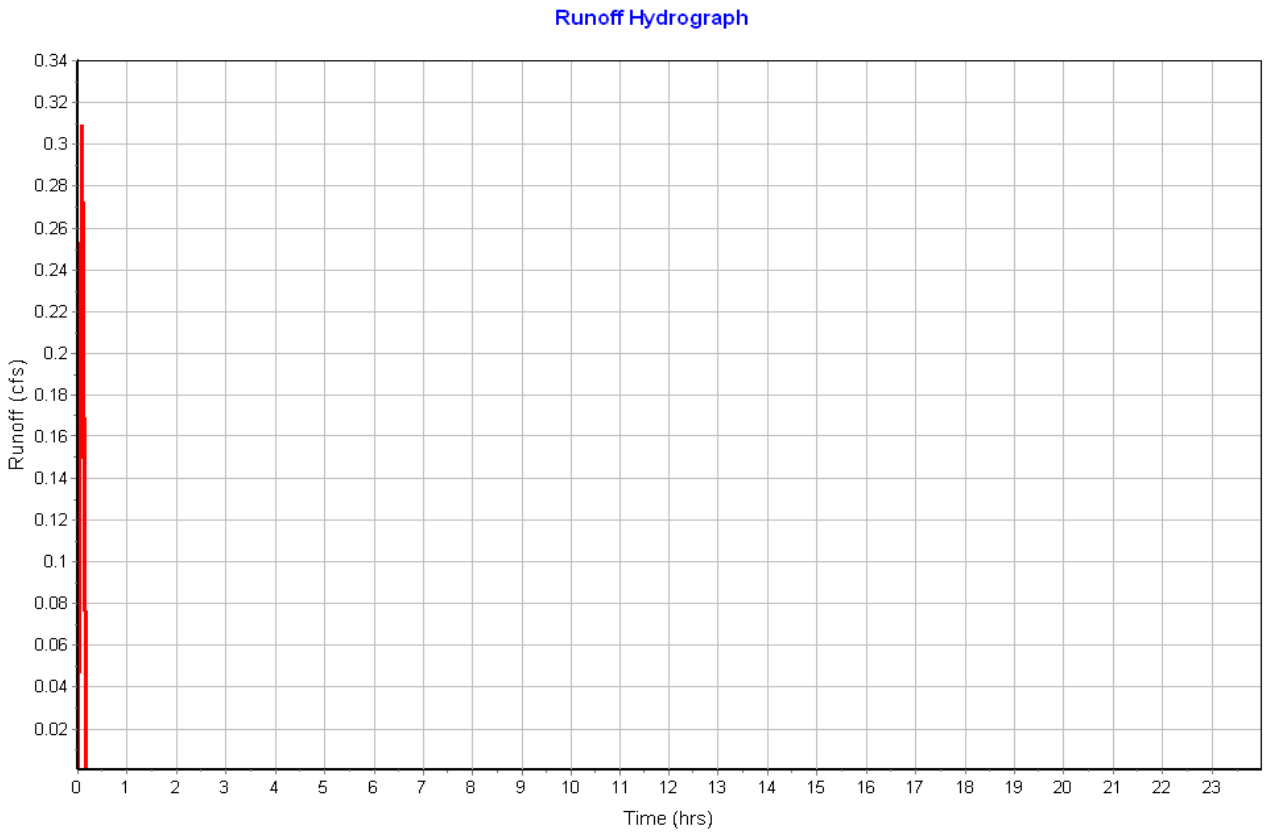
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.40
Peak Runoff (cfs) 0.31
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.6900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-42B



Subbasin : Sub-42C

Input Data

Area (ft²) 10483.02
Weighted Runoff Coefficient 0.5600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	10483.02	-	0.56
Composite Area & Weighted Runoff Coeff.	10483.02		0.56

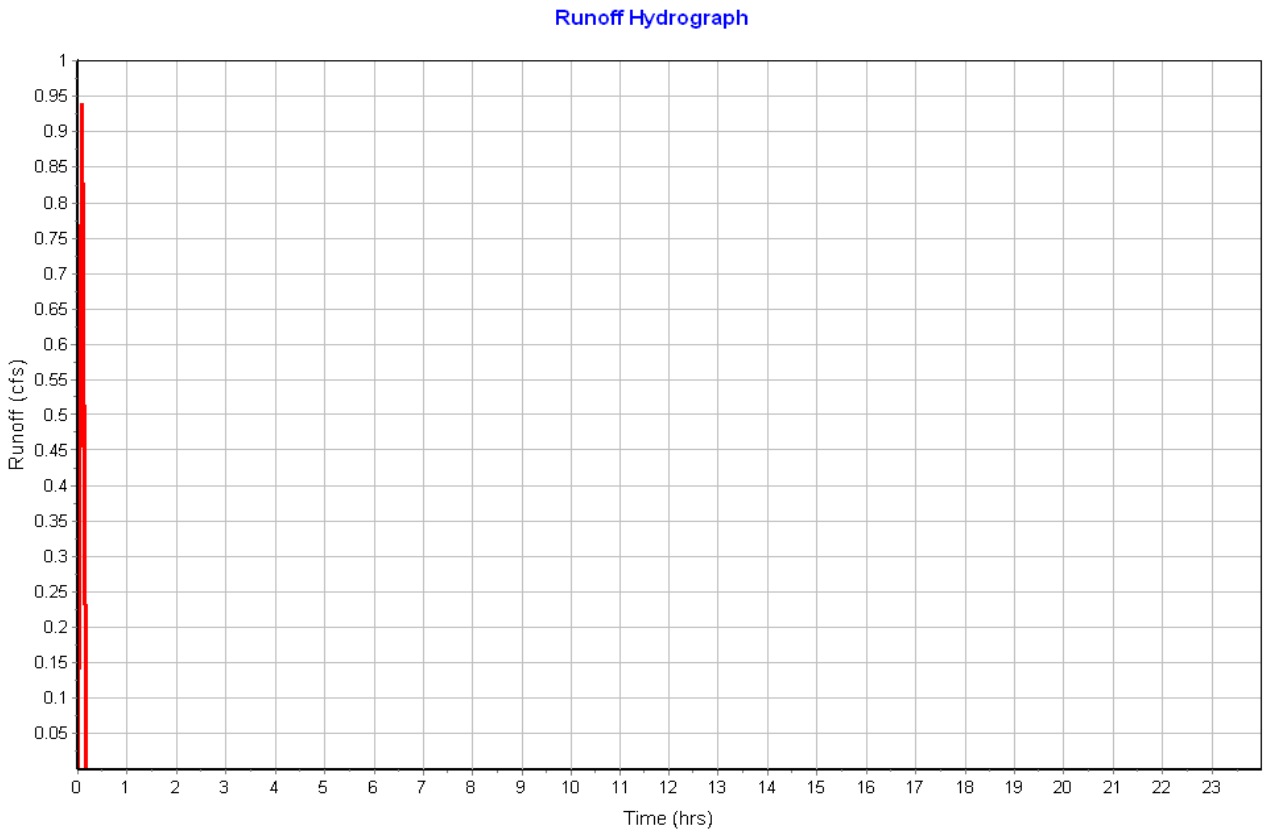
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.33
Peak Runoff (cfs) 0.94
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.5600
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-42C



Subbasin : Sub-43A

Input Data

Area (ft²) 5678.48
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	5678.48	-	0.16
Composite Area & Weighted Runoff Coeff.	5678.48		0.16

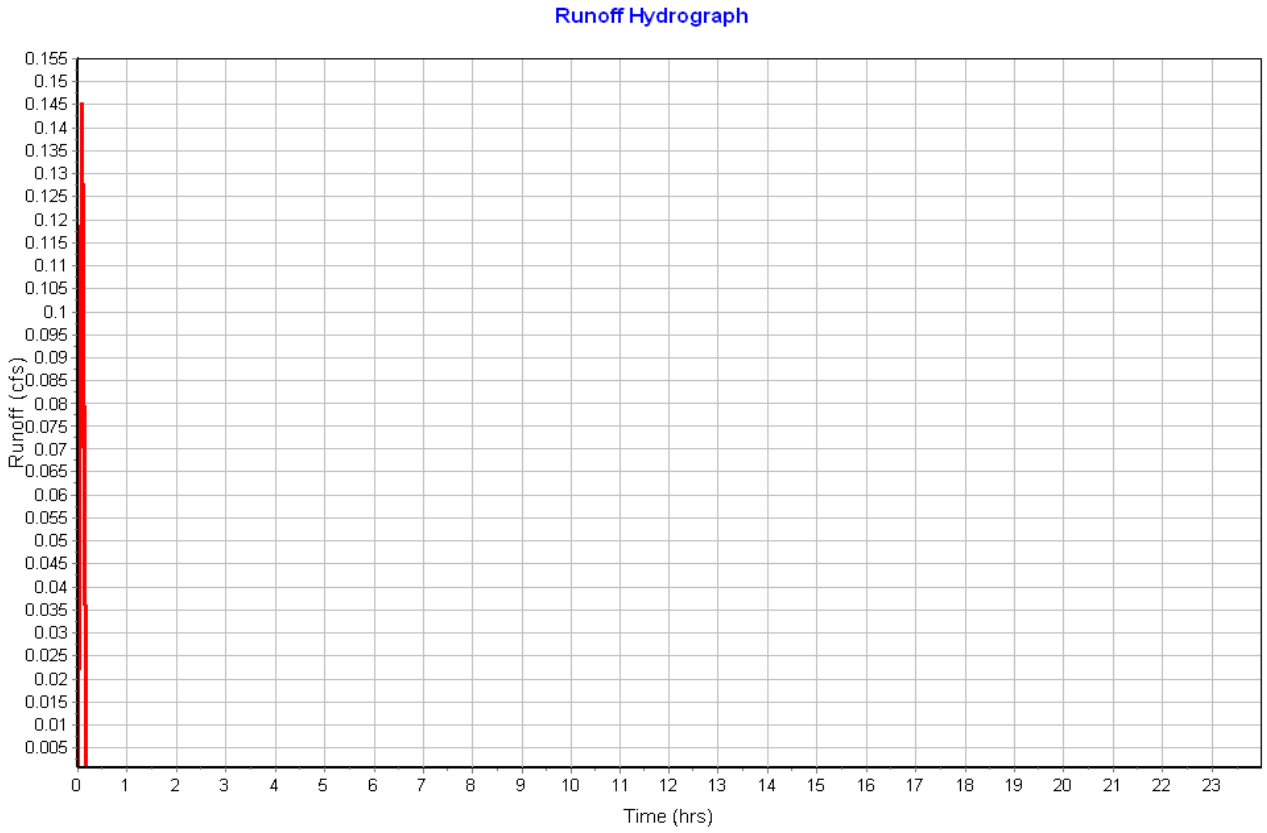
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.09
Peak Runoff (cfs) 0.15
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-43A



Subbasin : Sub-43B

Input Data

Area (ft²) 4797.00
Weighted Runoff Coefficient 0.7400

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	4797.00	-	0.74
Composite Area & Weighted Runoff Coeff.	4797.00		0.74

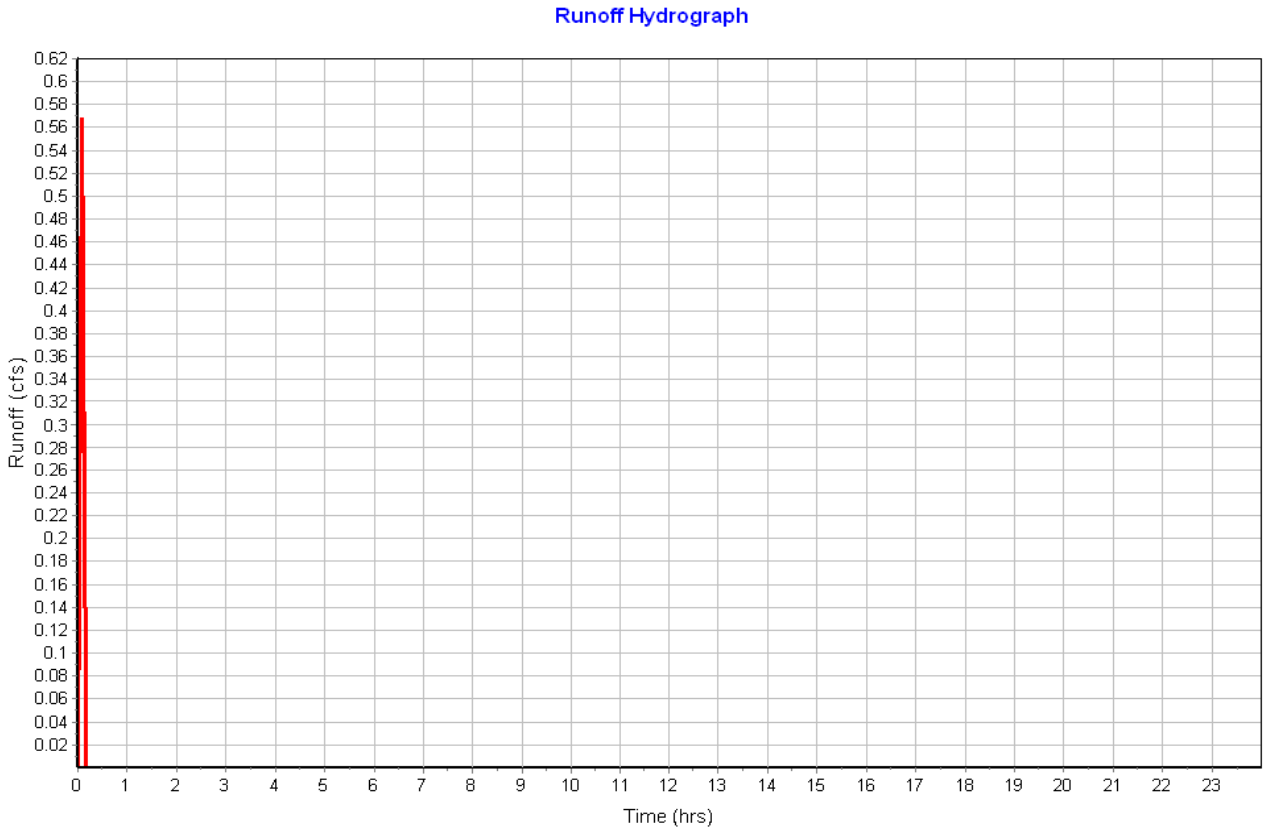
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.43
Peak Runoff (cfs) 0.57
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.7400
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-43B



Subbasin : Sub-43C

Input Data

Area (ft²) 6107.98
Weighted Runoff Coefficient 0.5900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	6107.98	-	0.59
Composite Area & Weighted Runoff Coeff.	6107.98		0.59

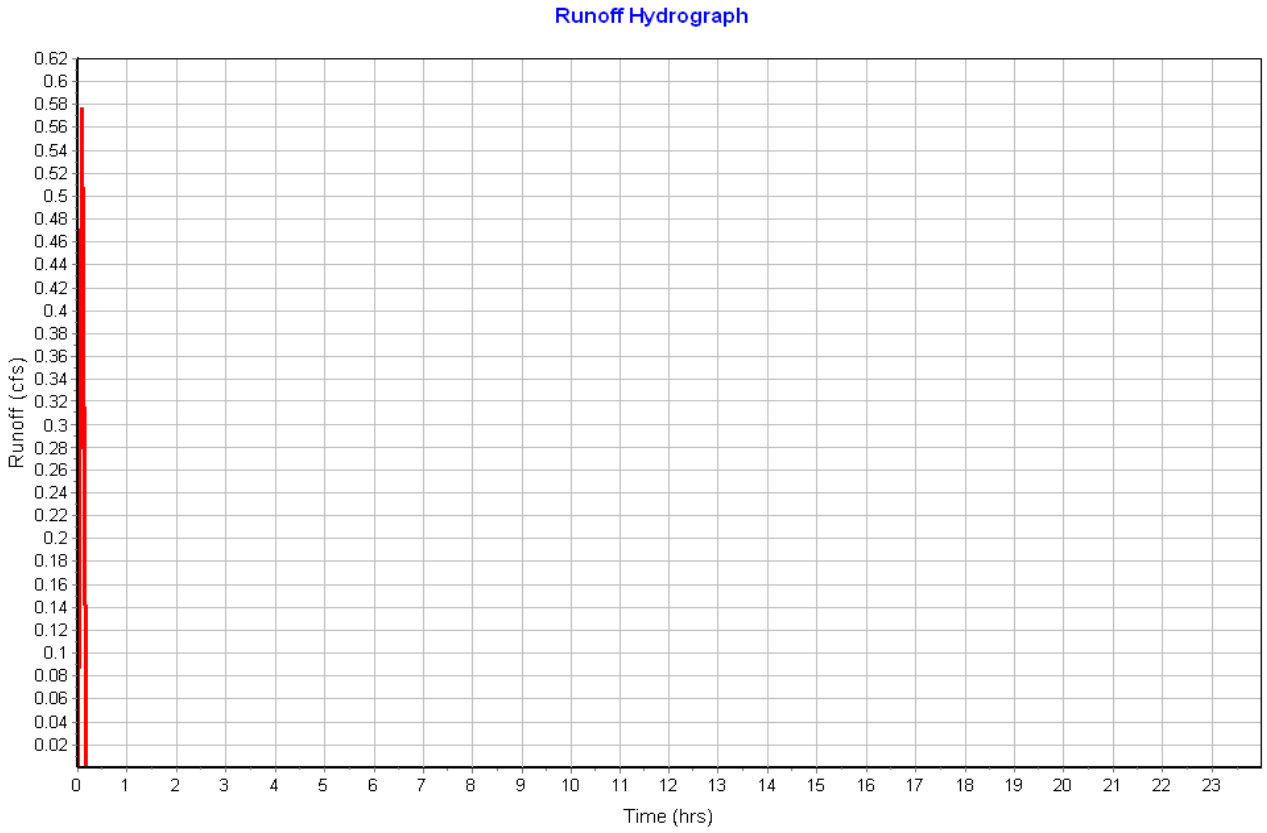
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.34
Peak Runoff (cfs) 0.58
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.5900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-43C



Subbasin : Sub-44A

Input Data

Area (ft²) 23215.00
Weighted Runoff Coefficient 0.4100

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	23215.00	-	0.41
Composite Area & Weighted Runoff Coeff.	23215.00		0.41

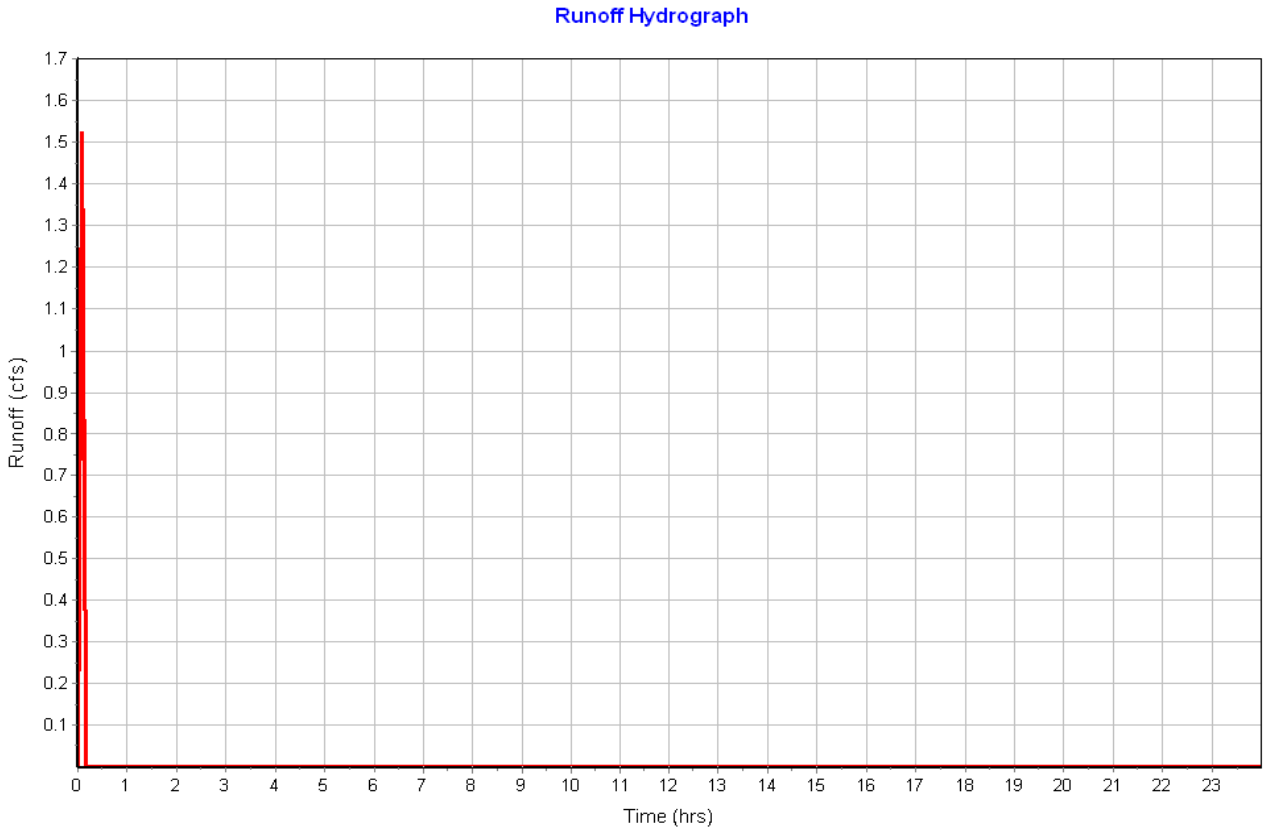
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.24
Peak Runoff (cfs) 1.52
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.4100
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-44A



Subbasin : Sub-45A

Input Data

Area (ft²) 44108.90
Weighted Runoff Coefficient 0.3900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	44108.90	-	0.39
Composite Area & Weighted Runoff Coeff.	44108.90		0.39

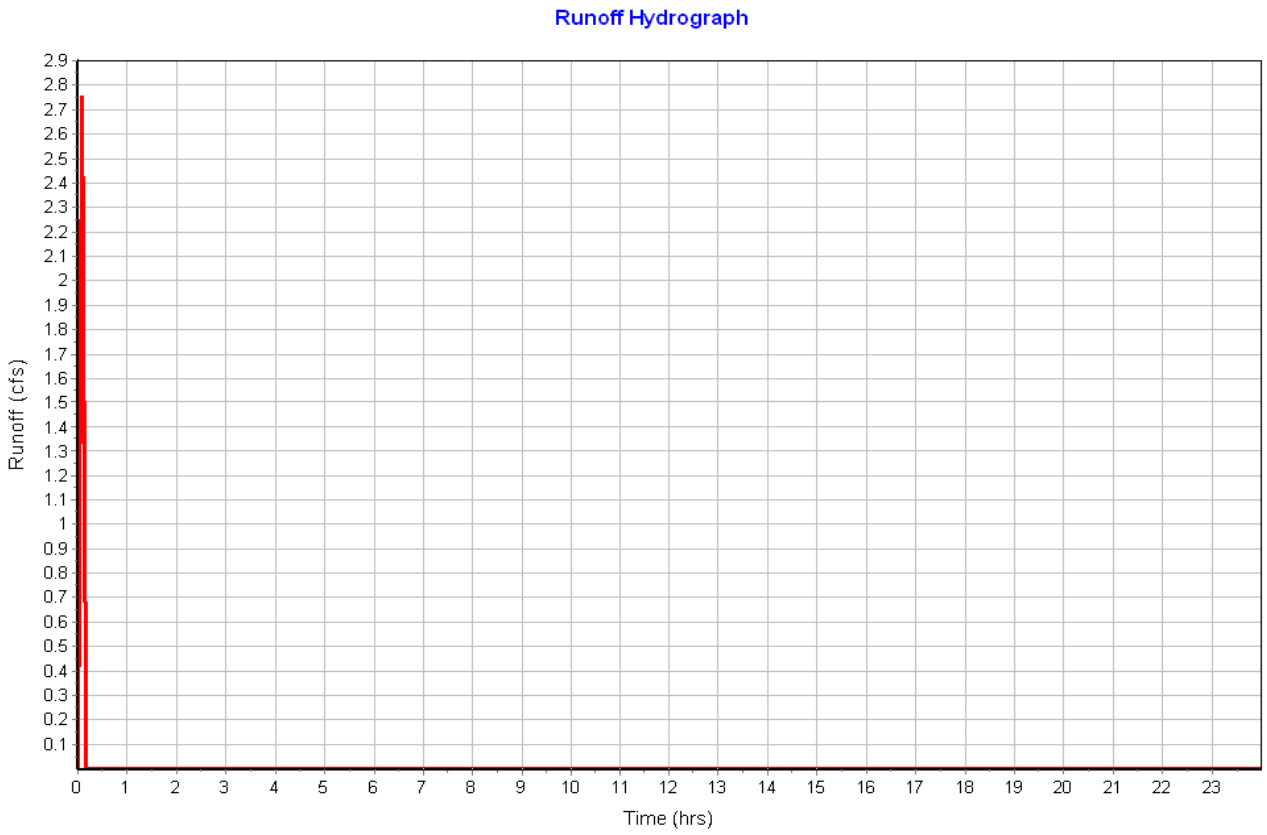
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.23
Peak Runoff (cfs) 2.75
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.3900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-45A



Subbasin : Sub-45B

Input Data

Area (ft²) 21768.85
Weighted Runoff Coefficient 0.4700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	21768.85	-	0.47
Composite Area & Weighted Runoff Coeff.	21768.85		0.47

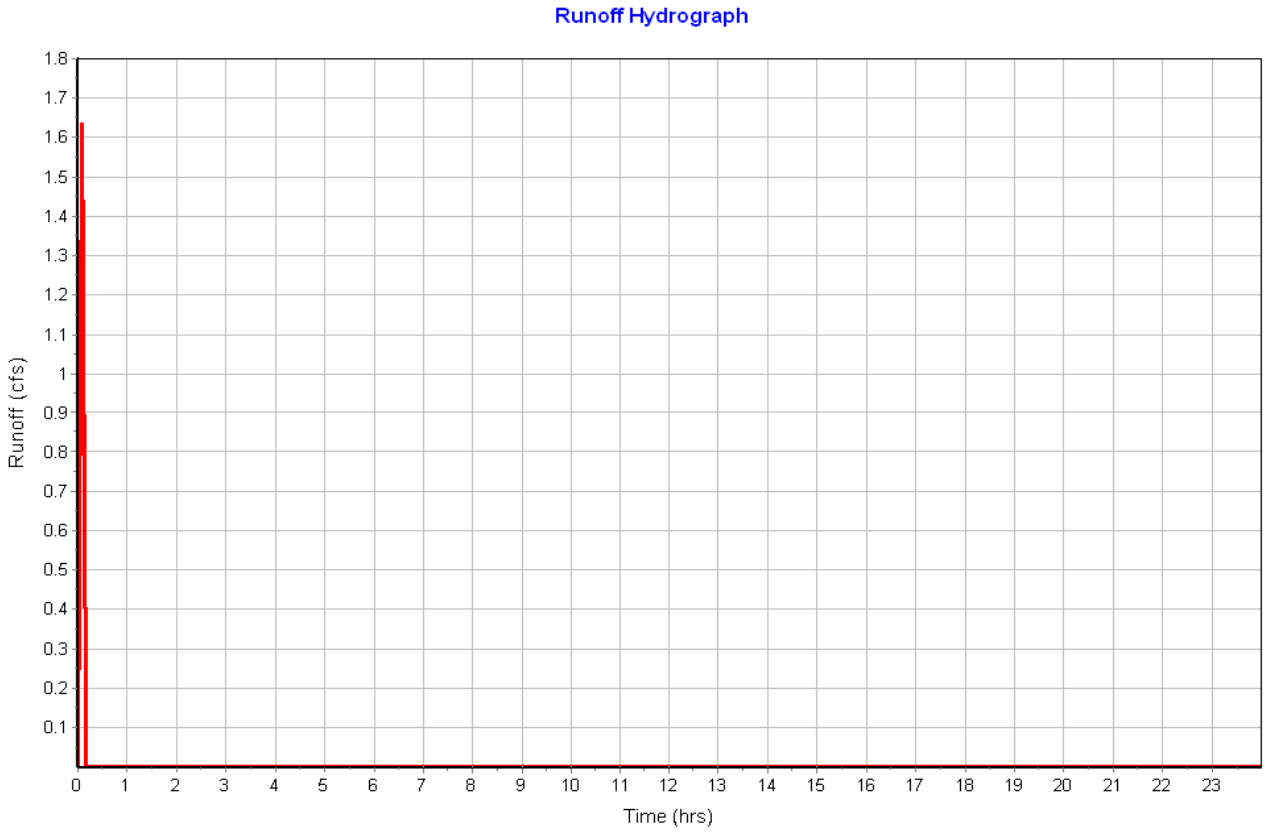
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.27
Peak Runoff (cfs) 1.64
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.4700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-45B



Subbasin : Sub-47A

Input Data

Area (ft²) 20500.82
Weighted Runoff Coefficient 0.7500

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	20500.82	-	0.75
Composite Area & Weighted Runoff Coeff.	20500.82		0.75

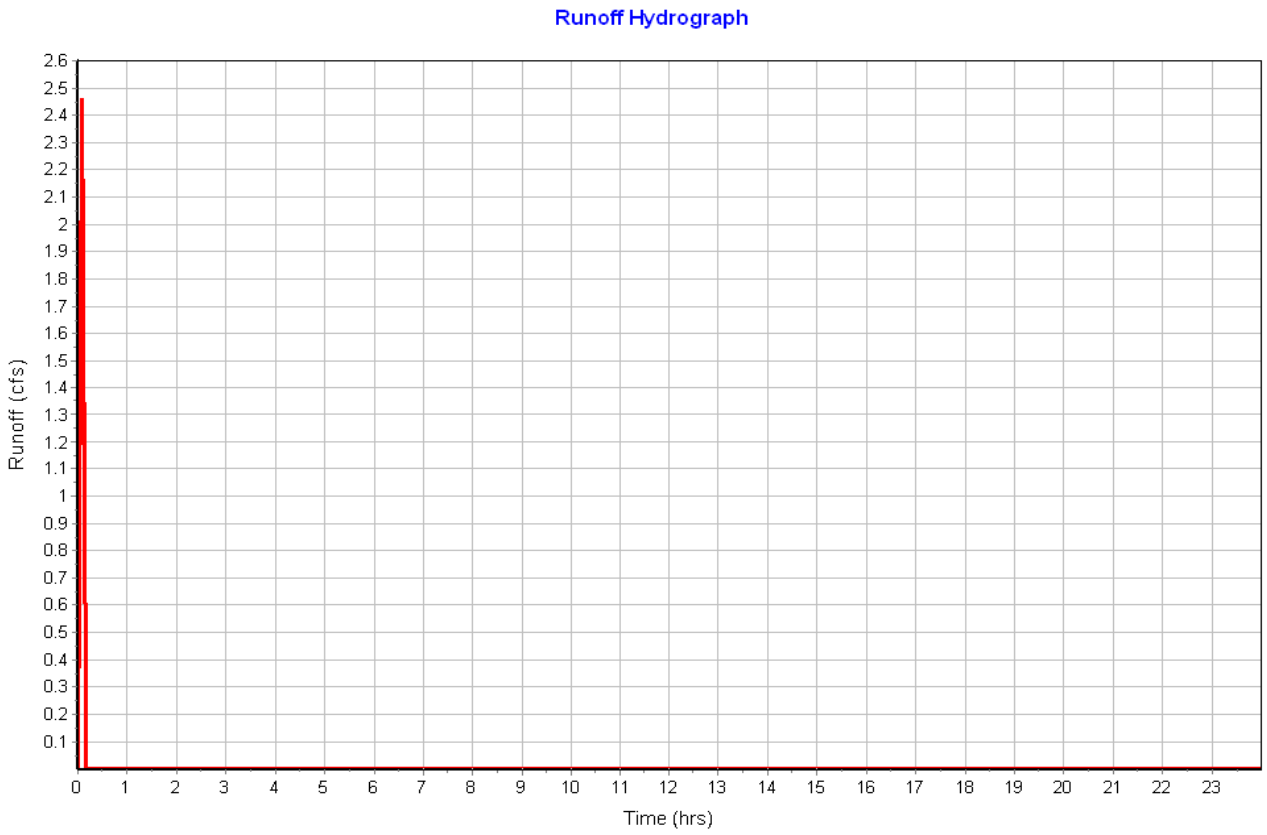
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.58
Total Runoff (in) 0.44
Peak Runoff (cfs) 2.46
Rainfall Intensity 6.960
Weighted Runoff Coefficient 0.7500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-47A



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	30	847.59	852.55	4.96	847.59	0.00	852.55	0.00	0.00	35.50
2	31	846.76	851.55	4.80	846.76	0.00	851.55	0.00	0.00	33.54
3	32	846.17	850.70	4.53	846.17	0.00	850.70	0.00	0.00	30.36
4	33	835.49	840.19	4.70	835.49	0.00	840.19	0.00	0.00	32.41
5	34	834.39	839.48	5.09	834.39	0.00	839.48	0.00	0.00	37.08
6	35	832.11	837.52	5.41	832.11	0.00	837.52	0.00	0.00	40.91
7	36	831.84	837.45	5.62	831.84	0.00	837.45	0.00	0.00	43.40
8	41	831.98	837.23	5.25	831.98	0.00	837.23	0.00	0.00	39.05
9	42	832.56	837.09	4.53	832.56	0.00	837.09	0.00	0.00	30.33
10	43	832.76	837.29	4.53	832.76	0.00	837.29	0.00	0.00	30.33
11	44	833.10	837.95	4.85	833.10	0.00	837.95	0.00	0.00	34.24
12	45	833.51	838.67	5.16	833.51	0.00	838.67	0.00	0.00	37.86
13	46	834.26	839.26	5.00	834.26	0.00	839.26	0.00	0.00	36.03
14	47	841.15	846.54	5.40	841.15	0.00	846.54	0.00	0.00	40.75
15	79	848.35	849.41	1.05	848.35	0.00	849.41	0.00	0.00	0.66

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	30	1.07	0.00	847.92	0.33	0.00	4.63	847.59	0.00	0 00:05	0 00:00	0.00	0.00
2	31	2.32	0.00	847.34	0.58	0.00	4.22	846.76	0.00	0 00:06	0 00:00	0.00	0.00
3	32	5.06	0.00	846.64	0.47	0.00	4.06	846.17	0.00	0 00:06	0 00:00	0.00	0.00
4	33	6.38	0.00	836.13	0.64	0.00	4.06	835.50	0.01	0 00:06	0 00:00	0.00	0.00
5	34	10.01	0.00	835.32	0.93	0.00	4.15	834.39	0.00	0 00:06	0 00:00	0.00	0.00
6	35	10.10	0.00	833.27	1.16	0.00	4.25	832.12	0.01	0 00:06	0 00:00	0.00	0.00
7	36	10.02	0.00	832.82	0.98	0.00	4.63	831.84	0.00	0 00:06	0 00:00	0.00	0.00
8	41	10.62	0.00	832.76	0.78	0.00	4.47	831.99	0.01	0 00:06	0 00:00	0.00	0.00
9	42	10.08	0.00	833.72	1.16	0.00	3.37	832.57	0.01	0 00:06	0 00:00	0.00	0.00
10	43	6.30	0.00	833.99	1.23	0.00	3.30	832.77	0.01	0 00:06	0 00:00	0.00	0.00
11	44	4.69	0.00	834.13	1.03	0.00	3.82	833.10	0.00	0 00:06	0 00:00	0.00	0.00
12	45	3.24	0.00	834.21	0.70	0.00	4.45	833.51	0.00	0 00:05	0 00:00	0.00	0.00
13	46	0.90	0.00	834.52	0.26	0.00	4.74	834.26	0.00	0 00:05	0 00:00	0.00	0.00
14	47	0.91	0.00	841.34	0.19	0.00	5.20	841.15	0.00	0 00:05	0 00:00	0.00	0.00
15	79	0.00	0.00	848.35	0.00	0.00	1.05	848.35	0.00	0 00:00	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	L-30A-32A	163.10	852.39	4.01	850.56	3.60	1.83	1.1200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
2	L-30B-32B	163.10	852.39	3.61	850.54	3.52	1.86	1.1400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
3	L-31A-32B	163.10	851.89	4.23	850.54	3.52	1.35	0.8300	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
4	L-32A-OFF	163.10	850.56	3.60	836.96	0.00	13.60	8.3400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
5	L-32B-OFF	163.10	850.54	3.52	837.01	0.00	13.52	8.2900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
6	L-33A-OFF	163.10	839.96	3.68	826.28	0.00	13.68	8.3900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
7	L-33B-34A	163.10	840.03	3.63	838.90	3.49	1.13	0.7000	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
8	L-41A-42A	163.10	837.07	4.17	836.93	3.45	0.15	0.0900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
9	L-42C-42B	163.10	836.95	3.21	846.60	13.19	-9.65	-5.9200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
10	L-43B-42A	163.10	837.13	3.57	836.93	3.45	0.20	0.1200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
11	L-43C-42B	163.10	837.13	3.45	836.93	3.52	0.20	0.1200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
12	L-44A-43B	110.22	837.70	3.59	837.13	3.57	0.57	0.5200	User-Defined	0.500	19.000	0.0320	0.0000	0.0000	0.0000	0.00	No
13	L-45A-44A	163.10	838.41	3.89	837.70	3.59	0.71	0.4400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
14	L-45B-43C	163.10	838.89	3.80	837.13	3.45	1.76	1.0800	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
15	L-47A-45A	163.10	847.74	4.48	838.41	3.89	9.33	5.7200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	L-30A-32A	0.43	0 00:05	24.93	0.02	2.01	1.35	0.13	0.25	0.00		
2	L-30B-32B	0.79	0 00:05	25.08	0.03	1.98	1.37	0.16	0.33	0.00		
3	L-31A-32B	2.38	0 00:05	21.40	0.11	2.49	1.09	0.24	0.48	0.00		
4	L-32A-OFF	1.04	0 00:05	67.89	0.02	5.78	0.47	0.12	0.24	0.00		
5	L-32B-OFF	3.24	0 00:05	67.70	0.05	6.93	0.39	0.17	0.35	0.00		
6	L-33A-OFF	0.90	0 00:05	68.09	0.01	5.89	0.46	0.12	0.24	0.00		
7	L-33B-34A	1.54	0 00:05	19.61	0.08	2.00	1.36	0.22	0.44	0.00		
8	L-41A-42A	0.60	0 00:05	12.88	0.05	0.73	3.72	0.22	0.45	0.00		
9	L-42C-42B	0.29	0 00:05	12.88	0.02	0.57	4.77	0.18	0.36	0.00		
10	L-43B-42A	1.73	0 00:05	12.88	0.13	1.29	2.11	0.28	0.56	0.00		
11	L-43C-42B	0.66	0 00:05	12.88	0.05	1.89	1.44	0.18	0.37	0.00		
12	L-44A-43B	2.42	0 00:05	16.92	0.14	1.71	1.07	0.29	0.58	0.00		
13	L-45A-44A	2.59	0 00:05	15.56	0.17	2.09	1.30	0.27	0.54	0.00		
14	L-45B-43C	0.91	0 00:05	24.45	0.04	1.40	1.94	0.20	0.40	0.00		
15	L-47A-45A	1.53	0 00:05	56.35	0.03	2.10	1.29	0.21	0.43	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	14 (81)	89.66	848.35	0.00	847.91	0.25	0.45	0.5000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
2	30-31	166.95	847.59	0.00	846.76	0.00	0.83	0.5000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
3	30A-30	8.50	848.38	0.00	848.34	0.75	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
4	30B-30	32.50	848.78	0.00	848.34	0.75	0.44	1.3400	CIRCULAR	15.000	15.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
5	31-32	171.05	846.76	0.00	846.17	0.00	0.59	0.3500	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
6	31A-31	49.59	847.66	0.00	847.51	0.75	0.15	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
7	32-33	384.98	846.17	0.00	835.49	0.00	10.68	2.7700	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
8	32A-32	8.50	846.96	0.00	846.92	0.75	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
9	32B-32	32.50	847.01	0.00	846.92	0.75	0.10	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
10	33-34	36.37	835.49	0.00	834.39	0.00	1.10	3.0300	CIRCULAR	24.000	24.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
11	33A-33	8.50	836.28	0.00	836.24	0.75	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
12	33B-33	32.50	836.40	0.00	836.24	0.75	0.16	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
13	34-35	225.62	834.39	0.00	832.11	0.00	2.28	1.0100	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
14	34A-34	54.54	835.41	0.00	835.14	0.75	0.27	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
15	34B-34A	36.74	835.59	0.00	835.41	0.00	0.18	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.8000	0.0000	0.00	No	1
16	35-36	27.33	832.11	0.00	831.84	0.00	0.27	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
17	36-37	38.30	831.84	0.00	831.28	0.00	0.56	1.4500	CIRCULAR	24.000	24.000	0.0120	0.0000	0.5000	0.0000	0.00	No	1
18	41-40	62.55	831.98	0.00	830.00	0.00	1.98	3.1700	CIRCULAR	24.000	24.000	0.0120	0.0000	0.5000	0.0000	0.00	No	1
19	41A-41	8.50	832.90	0.00	832.73	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
20	42-41	54.88	832.56	0.00	831.98	0.00	0.58	1.0600	CIRCULAR	24.000	24.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
21	42A-42	8.50	833.48	0.00	833.31	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
22	42B-42	32.97	833.41	0.00	833.31	0.75	0.10	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
23	42C-42B	26.92	833.74	0.00	833.66	0.25	0.08	0.3000	CIRCULAR	12.000	12.000	0.0120	0.0000	0.8000	0.0000	0.00	No	1
24	43-42	65.43	832.76	0.00	832.56	0.00	0.20	0.3100	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
25	43A-43B	13.59	833.62	0.00	833.55	0.00	0.07	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No	1
26	43B-43	8.50	833.55	0.00	833.51	0.75	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
27	43C-43	32.50	833.67	0.00	833.51	0.75	0.16	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
28	44-43	112.58	833.10	0.00	832.76	0.00	0.34	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
29	44A-44	13.26	834.11	0.00	833.85	0.75	0.26	1.9800	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
30	45-44	137.95	833.51	0.00	833.10	0.00	0.41	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
31	45A-45	13.19	834.52	0.00	834.26	0.75	0.26	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
32	45B-45	27.81	835.09	0.00	834.26	0.75	0.83	3.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
33	46-45	75.18	834.26	0.00	833.51	0.00	0.75	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
34	47-46	204.05	841.15	0.00	834.26	0.00	6.89	3.3700	CIRCULAR	24.000	24.000	0.0120	0.0000	0.5000	0.0000	0.00	No	1
35	47A-47	40.35	843.26	0.00	841.88	0.74	1.37	3.4000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1

Pipe Results

SN	Element ID	Peak Flow	Time of Peak Flow Occurrence	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Travel Time	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Froude Number	Reported Condition
		(cfs)	(days hh:mm)	(cfs)		(ft/sec)	(min)	(ft)		(min)		
1	14 (81)	0.00	0 00:00	2.73	0.00	0.00		0.14	0.14	0.00		Calculated
2	30-31	1.03	0 00:05	17.33	0.06	1.96	1.42	0.45	0.23	0.00		Calculated
3	30A-30	0.45	0 00:05	4.95	0.09	2.13	0.07	0.28	0.23	0.00		Calculated
4	30B-30	0.62	0 00:05	8.11	0.08	3.58	0.15	0.25	0.20	0.00		Calculated
5	31-32	2.27	0 00:06	14.41	0.16	3.48	0.82	0.53	0.26	0.00		Calculated
6	31A-31	1.29	0 00:05	3.83	0.34	2.88	0.29	0.49	0.39	0.00		Calculated
7	32-33	4.97	0 00:06	40.81	0.12	7.05	0.91	0.56	0.28	0.00		Calculated
8	32A-32	0.95	0 00:05	4.95	0.19	2.55	0.06	0.43	0.34	0.00		Calculated
9	32B-32	2.06	0 00:05	3.84	0.54	3.08	0.18	0.67	0.54	0.00		Calculated
10	33-34	6.29	0 00:06	42.68	0.15	5.63	0.11	0.79	0.39	0.00		Calculated
11	33A-33	0.65	0 00:05	4.95	0.13	2.32	0.06	0.35	0.28	0.00		Calculated
12	33B-33	0.86	0 00:05	4.95	0.17	2.69	0.20	0.38	0.31	0.00		Calculated
13	34-35	10.10	0 00:06	24.62	0.41	6.11	0.62	1.04	0.52	0.00		Calculated
14	34A-34	3.84	0 00:05	4.95	0.78	4.02	0.23	0.91	0.73	0.00		Calculated
15	34B-34A	1.83	0 00:05	4.95	0.37	2.06	0.30	0.95	0.76	0.00		Calculated
16	35-36	10.02	0 00:06	24.50	0.41	5.85	0.08	1.07	0.54	0.00		Calculated
17	36-37	10.03	0 00:06	29.52	0.34	7.38	0.09	0.89	0.45	0.00		Calculated
18	41-40	10.64	0 00:06	43.60	0.24	10.32	0.10	0.73	0.36	0.00		Calculated
19	41A-41	0.61	0 00:05	9.90	0.06	3.55	0.04	0.25	0.20	0.00		Calculated
20	42-41	10.08	0 00:06	25.19	0.40	6.71	0.14	0.97	0.48	0.00		Calculated
21	42A-42	2.37	0 00:05	9.90	0.24	4.69	0.03	0.54	0.43	0.00		Calculated
22	42B-42	1.58	0 00:05	3.85	0.41	2.86	0.19	0.58	0.46	0.00		Calculated
23	42C-42B	0.63	0 00:05	2.11	0.30	2.22	0.20	0.41	0.41	0.00		Calculated
24	43-42	6.17	0 00:06	13.55	0.46	3.17	0.34	1.19	0.60	0.00		Calculated
25	43A-43B	0.16	0 00:05	4.95	0.03	0.69	0.33	0.57	0.45	0.00		Calculated
26	43B-43	1.38	0 00:05	4.95	0.28	2.81	0.05	0.53	0.42	0.00		Calculated
27	43C-43	0.80	0 00:05	4.95	0.16	2.52	0.21	0.43	0.34	0.00		Calculated
28	44-43	4.40	0 00:06	13.42	0.33	2.44	0.77	1.13	0.57	0.00		Calculated
29	44A-44	1.67	0 00:05	9.86	0.17	5.00	0.04	0.39	0.32	0.00		Calculated
30	45-44	3.10	0 00:05	13.42	0.23	2.58	0.89	0.87	0.43	0.00		Calculated
31	45A-45	1.70	0 00:05	9.90	0.17	4.56	0.05	0.43	0.34	0.00		Calculated
32	45B-45	0.72	0 00:05	12.12	0.06	4.84	0.10	0.22	0.18	0.00		Calculated
33	46-45	0.87	0 00:05	24.51	0.04	1.50	0.84	0.48	0.24	0.00		Calculated
34	47-46	0.90	0 00:05	45.02	0.02	4.98	0.68	0.23	0.11	0.00		Calculated
35	47A-47	0.91	0 00:05	12.90	0.07	5.77	0.12	0.23	0.19	0.00		Calculated

Inlet Input

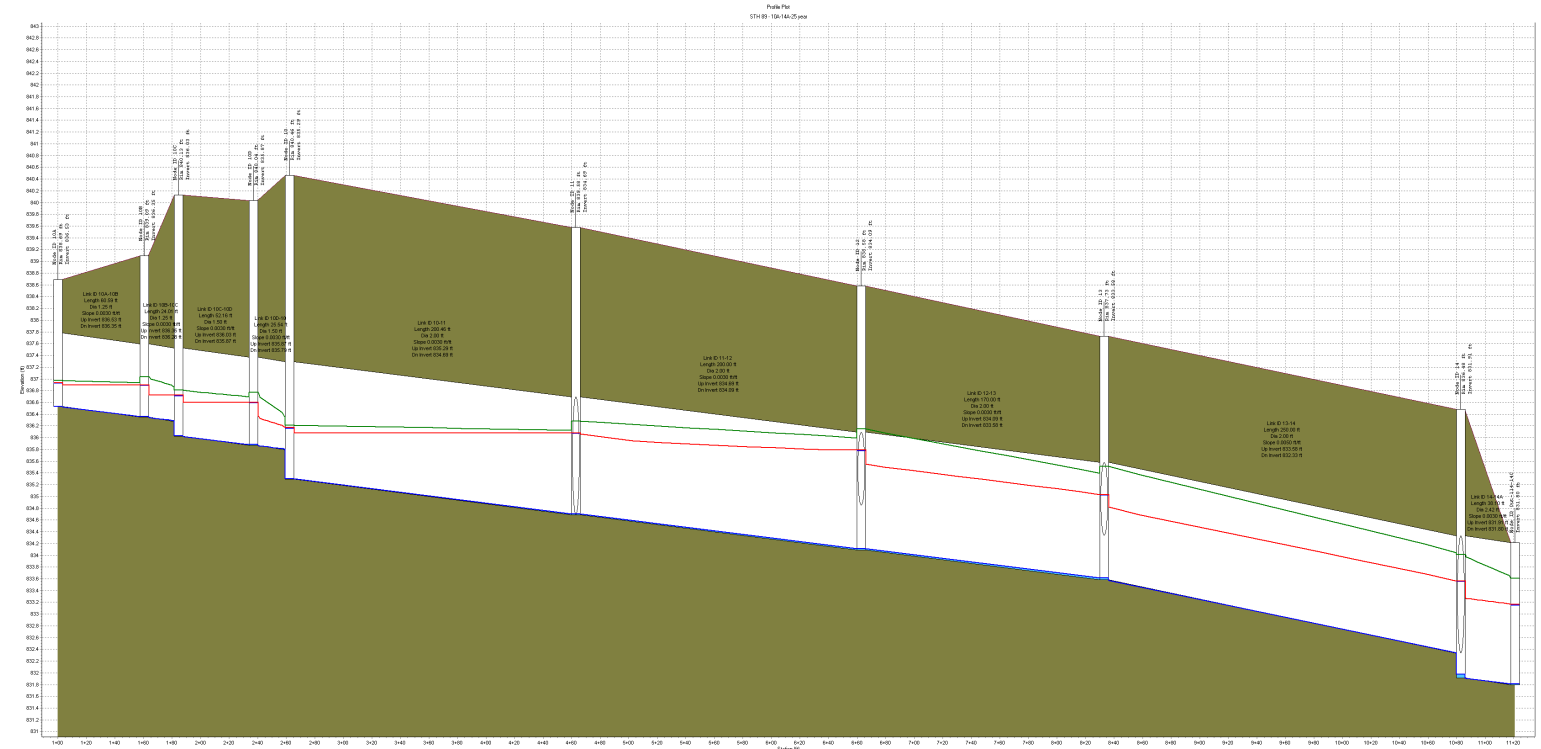
SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft^2)	Grate Clogging Factor (%)
1	30A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.38	852.39	4.01	848.38	0.00	N/A	0.00
2	30B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.78	852.39	3.61	848.78	0.00	N/A	0.00
3	31A	NEENAH FOUNDRY	R 3250A Special Diagonal	On Grade	1	847.66	851.89	4.23	847.66	0.00	N/A	0.00
4	32A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.96	850.56	3.60	846.96	0.00	N/A	0.00
5	32B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	847.01	850.54	3.52	847.01	0.00	N/A	0.00
6	33A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.28	839.96	3.68	836.28	0.00	N/A	0.00
7	33B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.40	840.03	3.63	836.40	0.00	N/A	0.00
8	34A	NEENAH FOUNDRY	R-3067	On Sag	1	835.41	838.90	3.49	835.41	0.00	6.00	35.00
9	34B	NEENAH FOUNDRY	R-3067	On Sag	1	835.59	838.71	3.11	835.59	0.00	6.00	35.00
10	41A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	832.90	837.07	4.17	832.90	0.00	N/A	0.00
11	42A	NEENAH FOUNDRY	R-3067	On Sag	1	833.48	836.93	3.45	833.48	0.00	6.00	35.00
12	42B	NEENAH FOUNDRY	R-3067	On Sag	1	833.41	836.93	3.52	833.41	0.00	6.00	35.00
13	42C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.74	836.95	3.21	833.74	0.00	N/A	0.00
14	43A	NEENAH FOUNDRY	R-3508-B	On Sag	1	833.62	837.59	3.97	833.62	0.00	4.00	50.00
15	43B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.55	837.13	3.57	833.55	0.00	N/A	0.00
16	43C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.67	837.13	3.45	833.67	0.00	N/A	0.00
17	44A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.11	837.70	3.59	834.11	0.00	N/A	0.00
18	45A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.52	838.41	3.89	834.52	0.00	N/A	0.00
19	45B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.09	838.89	3.80	835.09	0.00	N/A	0.00
20	47A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	843.26	847.78	4.52	843.26	0.00	N/A	0.00

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	30A	0.0068	0.0200	0.0130	0.0400	2.00	0.0000	15.00
2	30B	0.0068	0.0200	0.0130	0.0400	2.00	0.0000	15.00
3	31A	0.0278	0.0300	0.0130	0.0400	2.00	0.0000	15.00
4	32A	0.0045	0.0200	0.0130	0.0400	2.00	0.0000	15.00
5	32B	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	15.00
6	33A	0.0200	0.0200	0.0130	0.0400	2.00	0.0000	15.00
7	33B	0.0200	0.0200	0.0130	0.0400	2.00	0.0000	15.00
8	34A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
9	34B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
10	41A	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	15.00
11	42A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
12	42B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
13	42C	0.0020	0.0200	0.0130	0.0400	2.00	0.0000	15.00
14	43A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
15	43B	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	15.00
16	43C	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	15.00
17	44A	0.0053	0.0200	0.0130	0.0400	2.00	0.0000	15.00
18	45A	0.0054	0.0200	0.0130	0.0400	2.00	0.0000	15.00
19	45B	0.0054	0.0200	0.0130	0.0400	2.00	0.0000	15.00
20	47A	0.0062	0.0200	0.0130	0.0400	2.00	0.0000	15.00

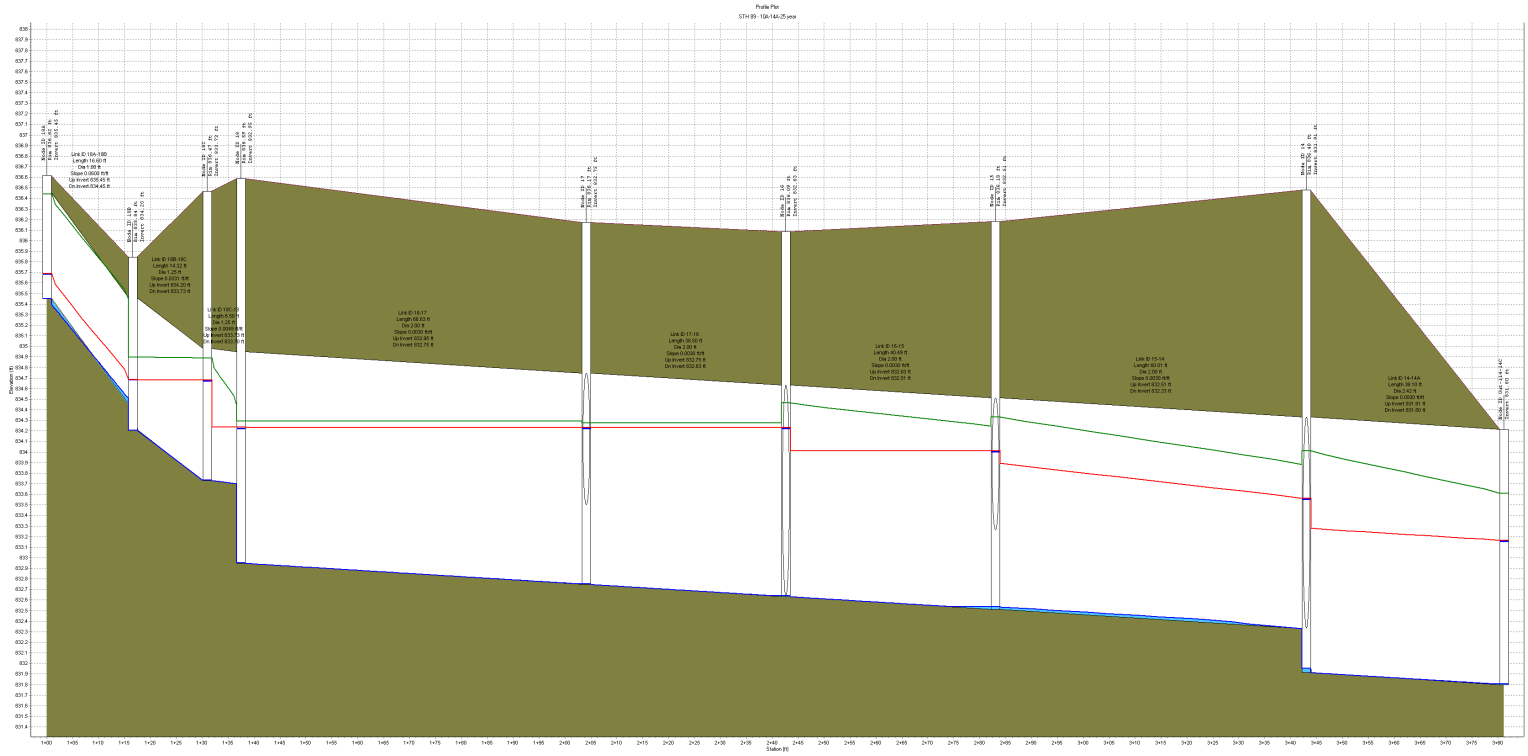
Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	30A	0.88	0.88	0.45	0.43	51.13	4.57	852.52	0.13	0 00:05	0.00	0.00
2	30B	1.42	1.42	0.63	0.79	44.22	6.07	852.55	0.16	0 00:05	0.00	0.00
3	31A	3.71	3.71	1.33	2.38	35.85	6.31	852.10	0.21	0 00:05	0.00	0.00
4	32A	1.89	1.46	0.84	1.04	44.79	7.79	850.75	0.20	0 00:05	0.00	0.00
5	32B	4.68	1.54	1.45	3.24	30.90	11.55	850.81	0.27	0 00:05	0.00	0.00
6	33A	1.56	1.56	0.66	0.90	42.23	4.84	840.10	0.14	0 00:05	0.00	0.00
7	33B	2.42	2.42	0.87	1.54	36.13	6.12	840.19	0.16	0 00:05	0.00	0.00
8	34A	2.27	0.73	N/A	N/A	N/A	9.92	839.13	0.23	0 00:05	0.00	0.00
9	34B	1.90	1.90	N/A	N/A	N/A	8.56	838.92	0.21	0 00:05	0.00	0.00
10	41A	1.22	1.22	0.62	0.60	50.69	6.09	837.24	0.16	0 00:05	0.00	0.00
11	42A	2.89	0.58	N/A	N/A	N/A	11.98	837.17	0.25	0 00:05	0.00	0.00
12	42B	1.26	0.31	N/A	N/A	N/A	6.01	837.07	0.14	0 00:05	0.00	0.00
13	42C	0.94	0.94	0.65	0.29	69.18	6.59	837.12	0.17	0 00:05	0.00	0.00
14	43A	0.15	0.15	N/A	N/A	N/A	0.55	837.64	0.05	0 00:05	0.00	0.00
15	43B	2.99	0.57	1.09	1.89	36.62	9.45	837.36	0.23	0 00:05	0.00	0.00
16	43C	1.48	0.58	0.70	0.78	47.03	6.68	837.30	0.17	0 00:05	0.00	0.00
17	44A	4.09	1.52	1.31	2.79	31.94	10.75	837.95	0.25	0 00:05	0.00	0.00
18	45A	4.28	2.75	1.33	2.94	31.21	10.90	838.67	0.26	0 00:05	0.00	0.00
19	45B	1.63	1.63	0.72	0.91	44.31	6.90	839.07	0.18	0 00:05	0.00	0.00
20	47A	2.46	2.46	0.92	1.54	37.39	8.18	847.98	0.20	0 00:05	0.00	0.00



Node ID	10A	10B	10C	10D	10	11	12	13	14	Out114-14C
Rim (ft)	838.69	839.69	840.13	840.94	842.46	839.56	839.58	837.72	836.48	
Invert (ft)	836.53	836.35	836.03	835.97	835.29	834.69	834.09	833.59	831.91	831.80
Min Pipe Cover (ft)				3.17		2.69	2.49	2.16	2.15	
Max HGL (ft)	836.94	836.90	836.72	836.80	836.17	836.08	835.79	835.03	833.56	833.16

Link ID	10A-10B	10B-10C	10C-10D	10D-10	10-11	11-12	12-13	13-14	14-14A
Length (ft)	60.59	24.01	52.16	25.54	200.46	280.00	170.00	250.00	38.10
Dia (ft)	1.25	1.25	1.50	1.50	2.00	2.00	2.00	2.00	2.42
Slope (ft/ft)	0.0030	0.0038	0.0030	0.0038	0.0030	0.0030	0.0038	0.0050	0.0030
Up Invert (ft)	836.53	836.35	836.03	835.97	835.29	834.69	834.09	833.59	831.91
Dn Invert (ft)	836.35	836.26	835.97	835.79	834.69	834.09	833.59	832.33	831.80
Max Q (cfs)	0.61	1.38	2.01	2.55	2.72	8.96	12.61	12.67	27.91
Max Vel (ft/s)	1.42	2.96	2.42	3.25	1.70	3.63	4.93	5.59	5.39
Max Depth (ft)	0.48	0.51	0.71	0.67	1.13	1.59	1.97	1.56	1.50

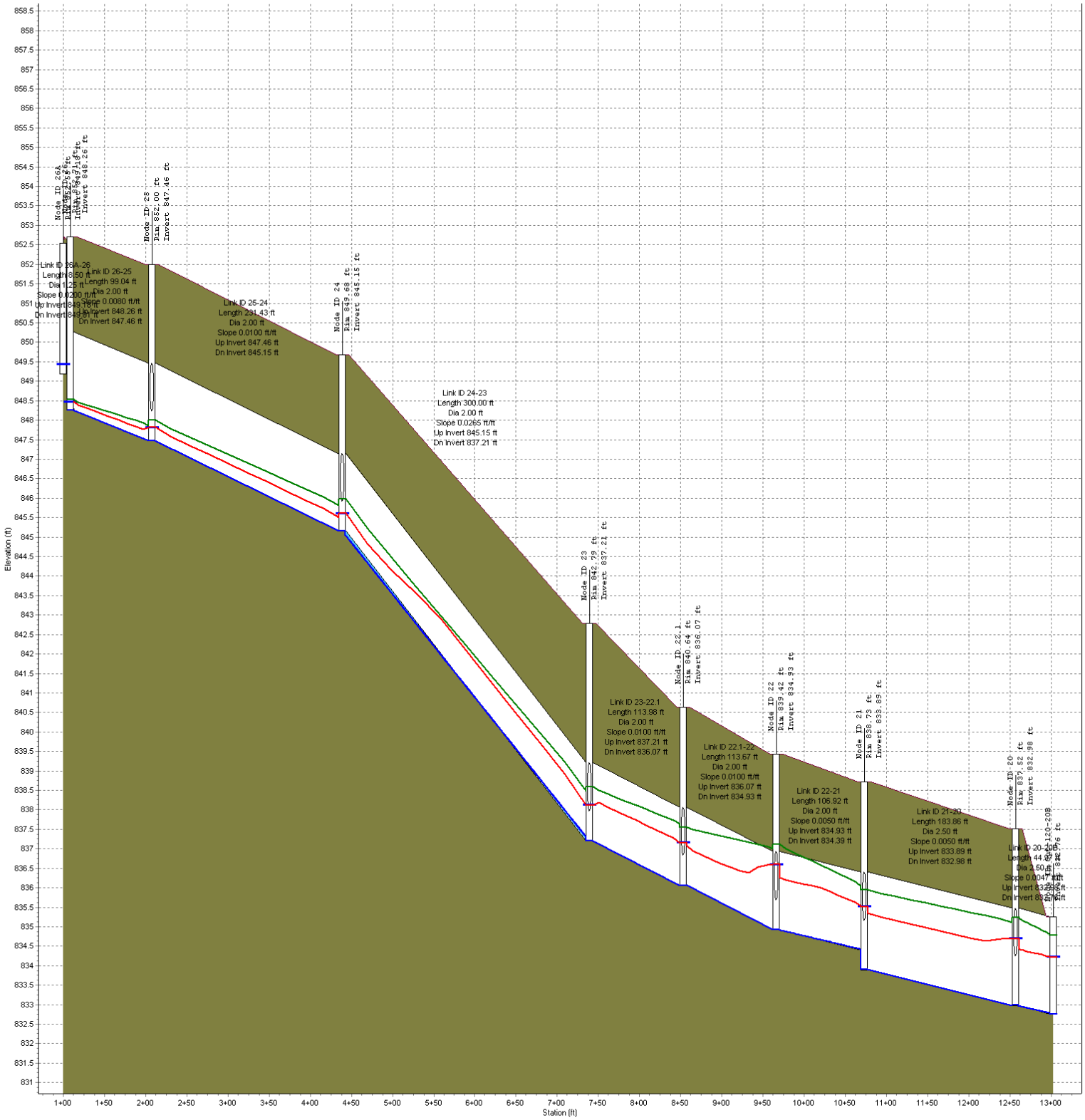


Node ID	19A	18B	18C	18	17	16	15	14	Out114-14C
Rim (ft)	836.62	835.84	836.47	836.59	836.17	836.05	836.18	836.49	
Invert (ft)	835.45	834.20	833.73	832.95	832.75	832.63	832.51	831.91	831.80
Min Pipe Cover (ft)	0.17			1.64	1.42	1.45	1.67	2.78	
Max HGL (ft)	835.69	834.69	834.68	834.23	834.23	834.22	834.01	833.56	833.16

Link ID	19A-18B	18B-18C	18C-18	18-17	17-16	16-15	15-14	14-14A
Length (ft)	16.60	14.32	6.50	66.63	39.50	40.49	80.01	39.10
Dia (ft)	1.00	1.25	1.25	2.00	2.00	2.00	2.00	2.42
Slope (ft/ft)	0.0600	0.0331	0.0569	0.0030	0.0030	0.0030	0.0030	0.0030
Up Invert (ft)	835.45	834.20	833.73	832.95	832.75	832.63	832.51	831.91
Dn Invert (ft)	834.45	833.73	833.70	832.75	832.63	832.51	832.33	831.80
Max Q (cfs)	0.92	2.41	3.20	3.14	4.00	16.72	16.70	27.01
Max Vel (ft/s)	5.95	7.67	3.67	1.99	1.74	3.80	4.56	5.39
Max Depth (ft)	0.92	0.88	0.83	1.39	1.54	1.99	1.32	1.90

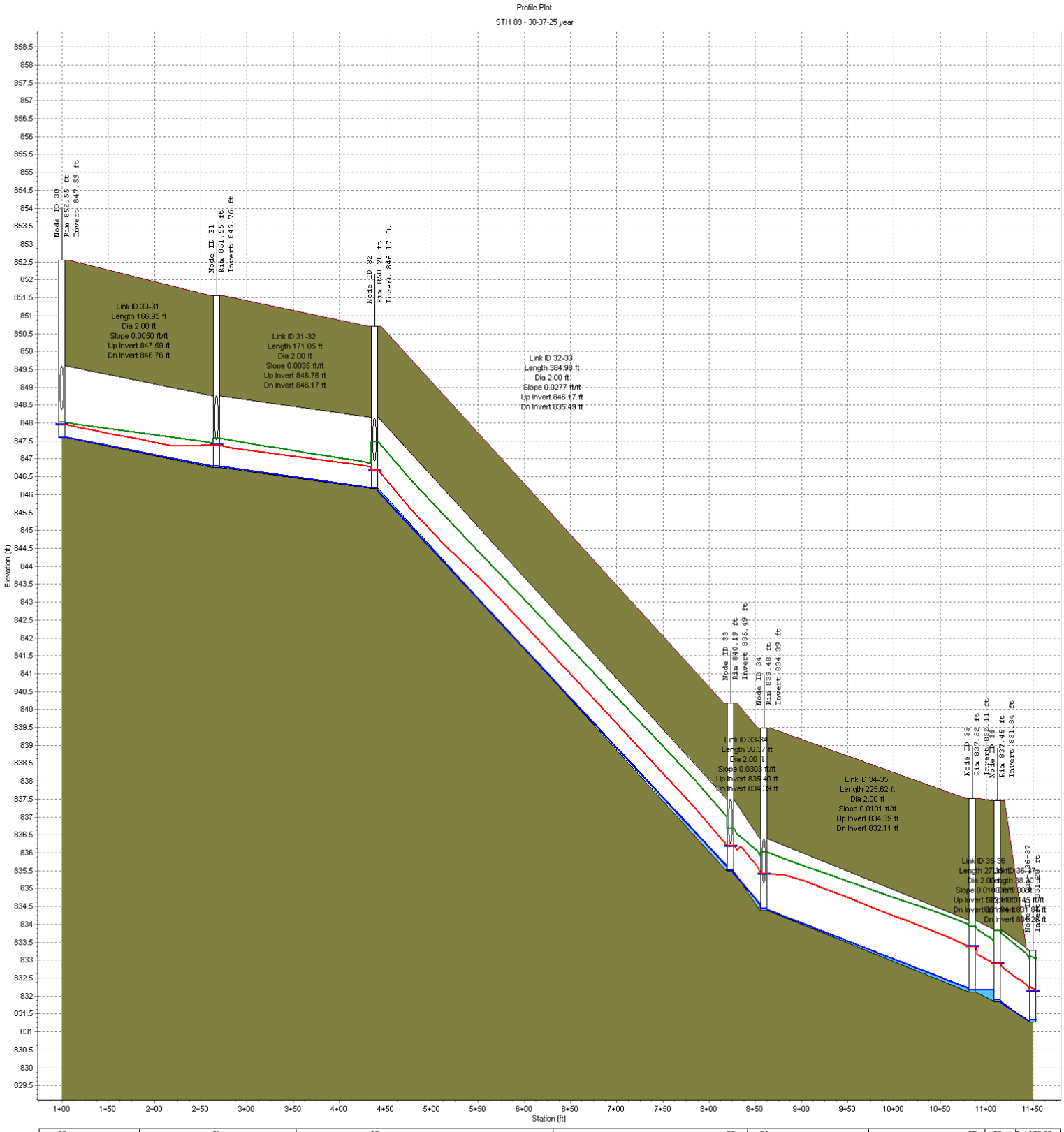
Profile Plot

STH 89 - 26A-20B-25 year



Node ID:	26A	26	25	24	23	22.1	22	21	20	Out-120-20B
Rim (ft):	852.25	852.25	852.00	849.68	842.79	840.64	839.42	838.73	837.52	
Invert (ft):	848.18	848.26	847.46	845.15	837.21	836.07	834.93	833.89	832.98	832.76
Min Pipe Cover (ft):	4.45		2.54	2.53	3.58	2.57	2.49	2.33	2.05	
Max HGL (ft):	847.97	847.97	847.81	845.61	838.12	837.16	836.60	835.52	834.69	834.22

Link ID:	26A-26	26-25	25-24	24-23	23-22.1	22.1-22	22-21	21-20	20-20B
Length (ft):	8.50	99.04	231.43	300.00	113.98	113.67	106.92	183.86	44.97
Dia (ft):	1.25	2.00	2.00	2.00	2.00	2.00	2.00	2.50	2.50
Slope (ft/ft):	0.0200	0.0080	0.0100	0.0265	0.0100	0.0100	0.0050	0.0050	0.0047
Up Invert (ft):	848.18			845.15	837.21	836.07	834.93	833.89	832.98
Dn Invert (ft):	848.01			837.21	836.07	834.93	834.39	832.98	832.76
Max Q (cfs):	0.50	0.49	1.62	4.63	8.65	11.72	14.88	18.18	19.56
Max Vel (ft/s):	3.48	1.87	3.56	4.82	5.54	5.07	5.78	5.24	5.97
Max Depth (ft):	0.22	0.28	0.40	0.69	1.01	1.38	1.53	1.67	1.58

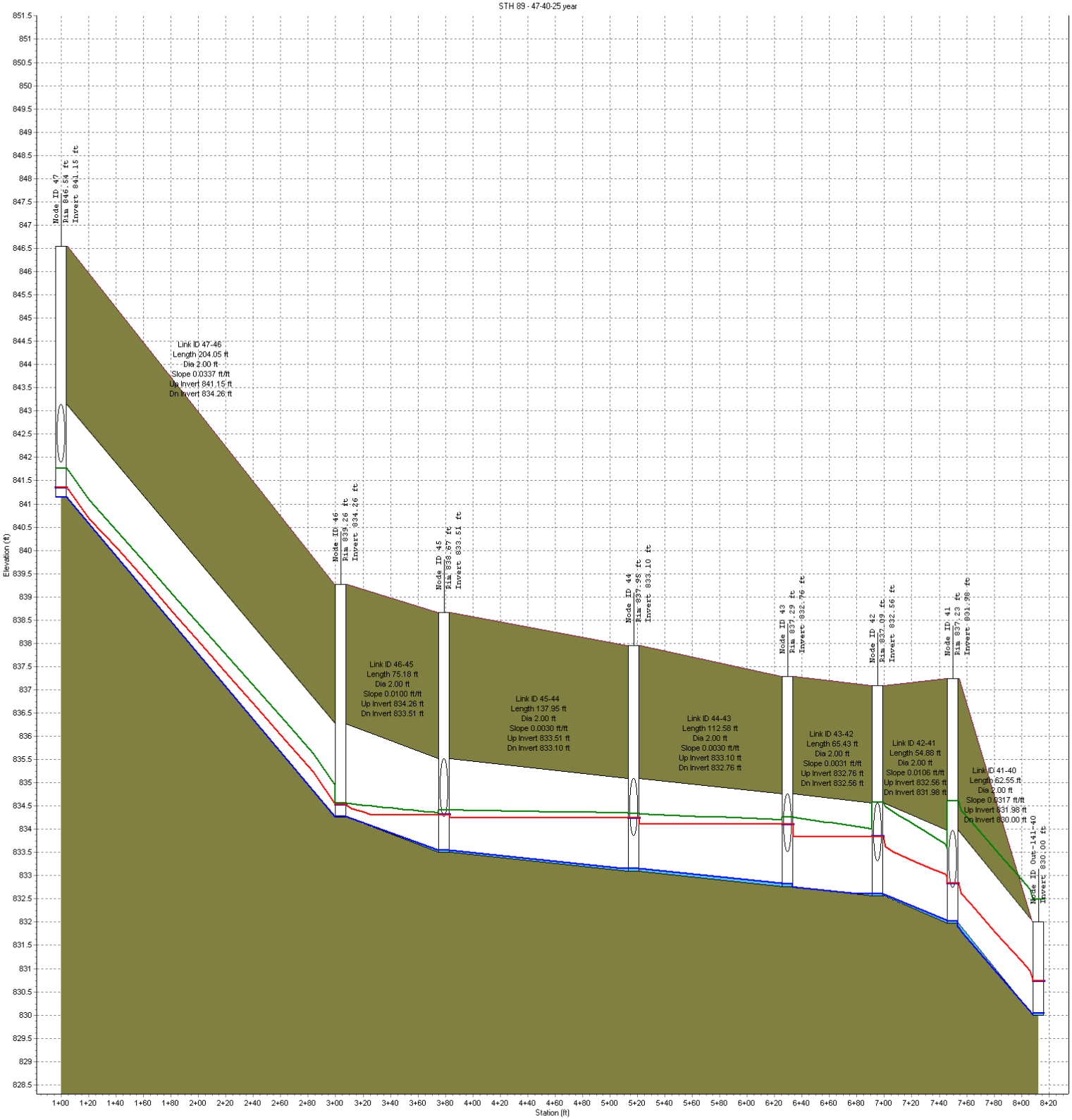


Node ID:	30	31	32	33	34	35	36	Out-136-37
Rim (ft):	852.55	851.55	850.70	840.19	839.48	837.52	837.45	
Invert (ft):	847.59	846.76	846.17	835.49	834.39	832.11	831.84	831.28
Min Pipe Cover (ft):	2.96	2.80	2.53	2.70	3.09	3.41	3.62	
Max HGL (ft):	847.95	847.38	846.67	836.19	835.41	833.38	832.92	832.15

Link ID:	30-31	31-32	32-33	33-34	34-35	35-36	36-37
Length (ft):	166.95	171.05	384.98	36.37	225.62	27.33	38.30
Dia (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Slope (ft/ft):	0.0050	0.0035	0.0277	0.0303	0.0101	0.0100	0.0145
Up Invert (ft):			846.17	835.49	834.39	832.11	831.84
Dn Invert (ft):			835.49	834.39	832.11	831.84	831.28
Max Q (cfs):	1.18	2.57	5.68	7.16	11.66	11.58	11.59
Max Vel (ft/s):	2.04	3.59	7.21	5.67	6.28	6.03	7.63
Max Depth (ft):	0.49	0.56	0.60	0.86	1.14	1.18	0.97

Profile Plot

STH 89 - 47-40-25 year



Node ID:	47	46	45	44	43	42	41	Out-141-40
Rim (ft):	846.54	839.26	838.67	837.95	837.29	837.09	837.23	
Invert (ft):	841.15	834.26	833.51	833.10	832.76	832.56	831.98	830.00
Min Pipe Cover (ft):	3.40	3.00	3.16	2.85	2.53	2.53	3.25	
Max HGL (ft):	841.35	834.53	834.31	834.24	834.11	833.84	832.84	830.73

Link ID:	47-46	46-45	45-44	44-43	43-42	42-41	41-40
Length (ft):	204.05	75.18	137.95	112.58	65.43	54.88	62.55
Dia (ft):	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Slope (ft/ft):	0.0337	0.0100	0.0030	0.0030	0.0031	0.0106	0.0317
Up Invert (ft):	841.15	834.26	833.51	833.10	832.76	832.56	831.98
Dn Invert (ft):	834.26	833.51	833.10	832.76	832.56	831.98	830.00
Max Q (cfs):	1.01	0.97	3.38	4.84	6.96	11.75	12.36
Max Vel (ft/s):	5.18	1.49	2.61	2.45	3.19	6.91	10.67
Max Depth (ft):	0.24	0.53	0.97	1.25	1.31	1.07	0.79

Project Description

File Name	3670-01-01_Pipe Analysis_SSA-NoBike_Alt3.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	May 08, 2019	00:00:00
End Analysis On	May 09, 2019	00:00:00
Start Reporting On	May 08, 2019	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	32
Nodes	53
Junctions	21
Outfalls	3
Flow Diversions	0
Inlets	29
Storage Nodes	0
Links	69
Channels	19
Pipes	50
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	25 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ft²)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-10A	11791.00	0.2900	0.69	0.20	0.05	0.65	0 00:05:00
2	Sub-10B	18457.98	0.2300	0.69	0.16	0.07	0.81	0 00:05:00
3	Sub-10C	7075.02	0.5100	0.69	0.35	0.06	0.69	0 00:05:00
4	Sub-10D	4467.99	0.7000	0.69	0.48	0.05	0.60	0 00:05:00
5	Sub-11A	157738.99	0.2700	0.69	0.19	0.67	8.10	0 00:05:00
6	Sub-11B	3939.00	0.9000	0.69	0.62	0.06	0.67	0 00:05:00
7	Sub-12A	99805.02	0.1600	0.76	0.12	0.28	2.80	0 00:06:00
8	Sub-12B	38139.00	0.1600	0.83	0.13	0.12	1.00	0 00:07:00
9	Sub-12C	3918.00	0.9000	0.69	0.62	0.06	0.67	0 00:05:00
10	Sub-13A	3355.99	0.9000	0.69	0.62	0.05	0.57	0 00:05:00
11	Sub-15A	6010.02	0.9000	0.69	0.62	0.09	1.03	0 00:05:00
12	Sub-16A	377111.99	0.2500	1.28	0.32	2.77	10.38	0 00:16:00
13	Sub-16B	118416.99	0.7400	1.24	0.92	2.50	9.98	0 00:15:00
14	Sub-16C	997.00	0.9000	0.69	0.62	0.01	0.17	0 00:05:00
15	Sub-16D	630.01	0.9000	0.69	0.62	0.01	0.11	0 00:05:00
16	Sub-17A	1471.98	0.9000	0.69	0.62	0.02	0.25	0 00:05:00
17	Sub-18A	35208.98	0.1600	0.83	0.13	0.11	0.92	0 00:07:00
18	Sub-18B	75226.99	0.1600	0.95	0.15	0.26	1.76	0 00:09:00
19	Sub-18C	2574.00	0.9000	0.69	0.62	0.04	0.44	0 00:05:00
20	Sub-20A	5346.99	0.6700	0.69	0.46	0.06	0.68	0 00:05:00
21	Sub-21A	118347.99	0.1600	1.01	0.16	0.44	2.63	0 00:10:00
22	Sub-21B	3417.02	0.6700	0.69	0.46	0.04	0.44	0 00:05:00
23	Sub-22.1A	20079.98	0.2300	0.69	0.16	0.07	0.88	0 00:05:00
24	Sub-22A	26385.99	0.2900	0.69	0.20	0.12	1.46	0 00:05:00
25	Sub-22B	5039.98	0.9000	0.69	0.62	0.07	0.86	0 00:05:00
26	Sub-23A	86498.05	0.4300	0.69	0.30	0.59	7.07	0 00:05:00
27	Sub-23B	6274.99	0.9000	0.69	0.62	0.09	1.07	0 00:05:00
28	Sub-24A	60415.50	0.7800	0.69	0.54	0.75	8.96	0 00:05:00
29	Sub-24B	7233.01	0.9000	0.69	0.62	0.10	1.24	0 00:05:00
30	Sub-25A	9368.01	0.3300	0.69	0.23	0.05	0.59	0 00:05:00
31	Sub-25B	28858.98	0.2700	0.69	0.19	0.12	1.48	0 00:05:00
32	Sub-26A	7316.34	0.6800	0.69	0.47	0.08	0.95	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	10	Junction	835.29	840.46	835.29	840.46	0.00	2.55	836.17	0.00	4.29	0 00:00	0.00	0.00
2	11	Junction	834.69	839.58	834.69	839.58	0.00	9.75	836.08	0.00	3.50	0 00:00	0.00	0.00
3	12	Junction	834.09	838.58	834.09	838.58	0.00	12.95	835.79	0.00	2.79	0 00:00	0.00	0.00
4	12A	Junction	836.75	838.19	836.75	838.19	0.00	2.79	837.12	0.00	1.07	0 00:00	0.00	0.00
5	13	Junction	833.58	837.73	833.58	837.73	0.00	13.00	835.03	0.00	2.70	0 00:00	0.00	0.00
6	14	Junction	831.91	836.48	831.91	836.48	0.00	27.00	833.56	0.00	2.92	0 00:00	0.00	0.00
7	15	Junction	832.51	836.18	832.51	836.18	0.00	16.72	834.01	0.00	2.17	0 00:00	0.00	0.00
8	16	Junction	832.63	836.09	832.63	836.09	0.00	16.72	834.23	0.00	1.85	0 00:00	0.00	0.00
9	16A	Junction	833.35	835.51	833.35	835.51	0.00	6.53	834.68	0.00	0.83	0 00:00	0.00	0.00
10	17	Junction	832.75	836.17	832.75	836.17	0.00	4.18	834.23	0.00	1.94	0 00:00	0.00	0.00
11	18	Junction	832.95	836.59	832.95	836.59	0.00	3.20	834.23	0.00	2.35	0 00:00	0.00	0.00
12	18A	Junction	835.45	836.62	835.45	836.62	0.00	0.92	835.69	0.00	0.93	0 00:00	0.00	0.00
13	20	Junction	832.98	837.52	832.98	837.52	0.00	19.62	834.69	0.00	2.84	0 00:00	0.00	0.00
14	21	Junction	833.89	838.73	833.89	838.73	0.00	18.14	835.52	0.00	3.21	0 00:00	0.00	0.00
15	22	Junction	834.93	839.42	834.93	839.42	0.00	15.03	836.60	0.00	2.82	0 00:00	0.00	0.00
16	22.1	Junction	836.07	840.64	836.07	840.64	0.00	11.69	837.16	0.00	3.48	0 00:00	0.00	0.00
17	23	Junction	837.21	842.79	837.21	842.79	0.00	8.75	838.12	0.00	4.66	0 00:00	0.00	0.00
18	24	Junction	845.15	849.68	845.15	849.68	0.00	4.76	845.61	0.00	4.07	0 00:00	0.00	0.00
19	25	Junction	847.46	852.00	847.46	852.00	0.00	1.69	847.81	0.00	4.19	0 00:00	0.00	0.00
20	26	Junction	848.26	852.71	848.26	852.71	0.00	0.50	848.47	0.00	4.24	0 00:00	0.00	0.00
21	Jun-16Exist	Junction	834.19	835.69	834.19	835.69	0.00	10.38	835.69	0.00	0.00	0 00:16	0.39	12.00
22	OFFSITE-8	Outfall	826.33					0.94	826.47					
23	Out-114-14C	Outfall	831.80					27.01	833.16					
24	Out-120-20B	Outfall	832.76					19.56	834.22					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	10-11	Pipe	10	11	200.46	835.29	834.69	0.3000	24.000	0.0120	2.72	13.42	0.20	1.70	1.13	0.57	0.00	Calculated
2	10A-10B	Pipe	10A	10B	60.59	836.53	836.35	0.3000	15.000	0.0120	0.61	3.82	0.16	1.42	0.48	0.38	0.00	Calculated
3	10B-10C	Pipe	10B	10C	24.01	836.35	836.28	0.3000	15.000	0.0120	1.38	3.83	0.36	2.96	0.51	0.41	0.00	Calculated
4	10C-10D	Pipe	10C	10D	52.16	836.03	835.87	0.3000	18.000	0.0120	2.01	6.24	0.32	2.42	0.71	0.48	0.00	Calculated
5	10D-10	Pipe	10D	10	25.54	835.87	835.79	0.3000	18.000	0.0120	2.55	6.25	0.41	3.35	0.67	0.45	0.00	Calculated
6	11-12	Pipe	11	12	200.00	834.69	834.09	0.3000	24.000	0.0120	8.96	13.42	0.67	3.63	1.55	0.77	0.00	Calculated
7	11A-11B	Pipe	11A	11B	18.50	834.82	834.72	0.5000	24.000	0.0120	8.01	17.38	0.46	3.29	1.45	0.72	0.00	Calculated
8	11B-11	Pipe	11B	11	6.50	834.72	834.69	0.4900	24.000	0.0120	8.30	17.20	0.48	4.86	1.41	0.71	0.00	Calculated
9	12-13	Pipe	12	13	170.00	834.09	833.58	0.3000	24.000	0.0120	12.61	13.42	0.94	4.79	1.57	0.79	0.00	Calculated
10	12A-12B	Pipe	12A	12B	22.00	836.75	835.04	7.7600	15.000	0.0120	2.81	19.49	0.14	4.04	0.69	0.55	0.00	Calculated
11	12B-12C	Pipe	12B	12C	13.50	835.04	834.87	1.2600	15.000	0.0120	3.63	7.85	0.46	3.25	1.07	0.86	0.00	Calculated
12	12C-12	Pipe	12C	12	6.50	834.87	834.84	0.4900	15.000	0.0120	4.02	4.91	0.82	3.98	1.03	0.83	0.00	Calculated
13	13-14	Pipe	13	14	250.00	833.58	832.33	0.5000	24.000	0.0120	12.67	17.33	0.73	5.59	1.36	0.68	0.00	Calculated
14	13A-13	Pipe	13A	13	6.50	834.46	834.33	2.0000	15.000	0.0120	0.54	9.90	0.05	3.49	0.64	0.51	0.00	Calculated
15	14-14A	Pipe	14	Out-114-14C	38.10	831.91	831.80	0.3000	29.000	0.0120	27.01	41.07	0.66	5.39	1.50	0.62	0.00	Calculated
16	15-14	Pipe	15	14	60.01	832.51	832.33	0.3000	24.000	0.0120	16.70	24.82	0.67	4.56	1.32	0.66	0.00	Calculated
17	15A-15	Pipe	15A	15	6.55	833.29	833.26	0.4900	15.000	0.0120	0.77	4.89	0.16	2.48	0.73	0.59	0.00	Calculated
18	16-15	Pipe	16	15	40.49	832.63	832.51	0.3000	24.000	0.0120	16.72	24.78	0.67	3.88	1.55	0.78	0.00	Calculated
19	16A-16B	Pipe	16A	16B	6.29	833.35	833.20	2.4500	18.000	0.0120	6.57	17.80	0.37	5.68	1.33	0.89	0.00	Calculated
20	16B-16C	Pipe	16B	16C	16.62	832.70	832.65	0.2600	24.000	0.0120	16.24	23.06	0.70	3.40	1.78	0.89	0.00	Calculated
21	16C-16	Pipe	16C	16	6.50	832.65	832.63	0.3100	24.000	0.0120	16.24	25.14	0.65	3.56	1.67	0.83	0.00	Calculated
22	16D-16C	Pipe	16D	16C	6.58	835.97	835.97	0.0800	12.000	0.0120	1.51	1.73	0.88	3.10	0.59	0.60	0.00	Calculated
23	17-16	Pipe	17	16	38.50	832.75	832.63	0.3000	24.000	0.0120	4.01	13.45	0.30	1.74	1.54	0.77	0.00	Calculated
24	17A-17	Pipe	17A	17	6.50	833.53	833.50	0.4900	15.000	0.0120	1.27	4.91	0.26	2.89	0.72	0.58	0.00	Calculated
25	18-17	Pipe	18	17	66.63	832.95	832.75	0.3000	24.000	0.0120	3.14	13.43	0.23	1.99	1.39	0.69	0.00	Calculated
26	18A-18B	Pipe	18A	18B	16.60	835.45	834.45	6.0000	12.000	0.0120	0.92	9.45	0.10	6.95	0.22	0.22	0.00	Calculated
27	18B-18C	Pipe	18B	18C	14.32	834.20	833.73	3.3100	15.000	0.0120	2.41	12.73	0.19	3.67	0.69	0.55	0.00	Calculated
28	18C-18	Pipe	18C	18	6.50	833.73	833.70	0.4900	15.000	0.0120	3.20	4.91	0.65	3.67	0.83	0.67	0.00	Calculated
29	20-20B	Pipe	20	Out-120-20B	44.97	832.98	832.76	0.4700	30.000	0.0120	19.56	30.58	0.64	5.97	1.58	0.63	0.00	Calculated
30	20A-20	Pipe	20A	20	6.50	834.35	834.22	2.0000	15.000	0.0120	1.93	9.90	0.20	4.61	0.48	0.38	0.00	Calculated
31	21-20	Pipe	21	20	183.86	833.89	832.98	0.5000	30.000	0.0120	18.18	31.42	0.58	5.24	1.67	0.67	0.00	Calculated
32	21A-21B	Pipe	21A	21B	20.31	835.29	835.19	0.5000	15.000	0.0120	2.63	4.95	0.53	3.11	0.88	0.70	0.00	Calculated
33	21B-21	Pipe	21B	21	8.50	835.19	835.14	0.5000	15.000	0.0120	3.36	4.95	0.68	3.89	0.83	0.66	0.00	Calculated
34	22.1-22	Pipe	22.1	22	113.67	836.07	834.93	1.0000	24.000	0.0120	11.72	24.50	0.48	5.07	1.38	0.69	0.00	Calculated
35	22.1A-22.1	Pipe	22.1A	22.1	8.75	836.86	836.82	0.4900	15.000	0.0120	3.42	27.08	0.13	10.99	0.38	0.31	0.00	Calculated
36	22-21	Pipe	22	21	106.92	834.93	834.39	0.5000	24.000	0.0120	14.88	17.33	0.86	5.78	1.53	0.77	0.00	Calculated
37	22A-22	Pipe	22A	22	8.50	835.85	835.68	2.0000	15.000	0.0120	2.67	9.90	0.27	4.53	0.88	0.70	0.00	Calculated
38	22B-22	Pipe	22B	22	32.50	836.33	835.68	2.0000	15.000	0.0120	1.03	9.90	0.10	3.94	0.59	0.47	0.00	Calculated
39	23-22.1	Pipe	23	22.1	113.98	837.21	836.07	1.0000	24.000	0.0120	8.65	24.51	0.35	5.54	1.01	0.50	0.00	Calculated
40	23A-23	Pipe	23A	23	8.50	838.13	837.96	2.0000	15.000	0.0120	3.29	9.90	0.33	5.07	0.65	0.52	0.00	Calculated
41	23B-23	Pipe	23B	23	32.50	838.61	837.96	2.0000	15.000	0.0120	0.99	9.90	0.10	4.57	0.29	0.23	0.00	Calculated
42	24-23	Pipe	24	23	300.00	845.15	837.21	2.6500	24.000	0.0120	4.63	39.88	0.12	4.82	0.69	0.34	0.00	Calculated
43	24A-24	Pipe	24A	24	8.50	846.07	845.90	2.0000	15.000	0.0120	2.24	9.90	0.23	4.63	0.52	0.42	0.00	Calculated
44	24B-24	Pipe	24B	24	32.50	846.55	845.90	2.0000	15.000	0.0120	0.98	9.90	0.10	4.55	0.29	0.23	0.00	Calculated
45	25-24	Pipe	25	24	231.43	847.46	845.15	1.0000	24.000	0.0120	1.62	24.51	0.07	3.56	0.40	0.20	0.00	Calculated
46	25A-25	Pipe	25A	25	8.50	848.38	848.21	2.0000	15.000	0.0120	0.54	9.90	0.05	3.39	0.23	0.19	0.00	Calculated
47	25B-25	Pipe	25B	25	32.50	848.86	848.21	2.0000	15.000	0.0120	0.67	9.90	0.07	4.14	0.24	0.19	0.00	Calculated
48	26-25	Pipe	26	25	99.04	848.26	847.46	0.8000	24.000	0.0120	0.49	21.97	0.02	1.87	0.28	0.14	0.00	Calculated
49	26A-26	Pipe	26A	26	8.50	849.18	849.01	2.0000	15.000	0.0120	0.50	9.90	0.05	3.48	0.22	0.17	0.00	Calculated
50	Link-08	Pipe	Jun-16Exist	16A	78.95	834.19	833.35	1.0700	18.000	0.0240	6.53	5.89	1.11	4.00	1.42	0.94	0.00	> CAPACITY
51	L-11B-12C	Channel	11B	12C	242.41	839.46	838.46	0.4100	6.000	0.0150	0.31	12.28	0.02	0.77	0.16	0.33	0.00	
52	L-12C-13A	Channel	12C	13A	242.41	838.46	837.61	0.3500	6.000	0.0150	0.44	11.32	0.04	1.07	0.17	0.33	0.00	
53	L-13A-15A	Channel	13A	15A	214.40	837.61	836.08	0.7100	6.000	0.0150	0.47	16.46	0.03	0.90	0.19	0.37	0.00	
54	L15A-16C	Channel	15A	16C	28.00	836.08	835.97	0.4100	6.000	0.0150	0.68	8.55	0.08	1.12	0.20	0.40	0.00	
55	L16D-16C	Channel	16D	16C	6.58	832.80	832.65	2.2500	6.000	0.0320	0.91	8.55	0.11	1.51	0.18	0.42	0.00	
56	L-17A-16D	Channel	17A	16D	31.92	836.05	835.97	0.2500	6.000	0.0320	2.60	9.67	0.27	2.75	0.25	0.53	0.00	
57	L18C-17A	Channel	18C	17A	66.46	836.47	836.05	0.6300	6.000	0.0320	3.40	15.13	0.22	2.30	0.32	0.65	0.00	
58	L-20A-18C	Channel	20A	18C	242.41	837.40	836.47	0.3800	6.000	0.0150	4.36	11.87	0.37	2.29	0.35	0.74	0.00	

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
59	L-21B-20A	Channel	21B	20A	242.41	838.57	837.40	0.4800	6.000	0.0150	5.70	13.04	0.44	2.23	0.38	0.87	0.00	
60	L22.1A-22A	Channel	22.1A	22A	113.68	840.48	839.26	1.0700	6.000	0.0320	8.42	32.37	0.26	3.01	0.40	0.88	0.00	
61	L-22A-21B	Channel	22A	21B	242.41	839.26	838.57	0.2800	6.000	0.0150	7.98	10.07	0.79	2.13	0.43	0.91	0.00	
62	L-22B-OFF	Channel	22B	OFFSITE-8	242.41	839.26	826.33	5.3300	6.000	0.0150	0.94	43.45	0.02	3.78	0.14	0.28	0.00	
63	L23A-22.1A	Channel	23A	22.1A	222.03	842.63	840.48	0.9700	6.000	0.0320	10.95	8.41	1.30	3.46	0.41	0.89	0.00	
64	L-23B-22B	Channel	23B	22B	242.41	842.63	839.26	1.3900	6.000	0.0150	1.12	22.17	0.05	2.66	0.17	0.33	0.00	
65	L-24A-23A	Channel	24A	23A	242.41	849.52	842.63	2.8400	6.000	0.0150	7.18	31.70	0.23	2.36	0.40	0.85	0.00	
66	L-24B-23B	Channel	24B	23B	242.41	849.52	842.63	2.8400	6.000	0.0150	1.05	31.70	0.03	2.16	0.18	0.35	0.00	
67	L-25A-24A	Channel	25A	24A	242.41	851.84	849.52	0.9600	6.000	0.0150	0.48	18.42	0.03	0.76	0.23	0.48	0.00	
68	L25B-24B	Channel	25B	24B	231.43	851.84	849.52	1.0000	6.000	0.0320	0.81	18.85	0.04	1.87	0.17	0.34	0.00	
69	L-26A-25A	Channel	26A	25A	242.41	852.55	851.84	0.2900	6.000	0.0150	0.44	10.14	0.04	1.01	0.17	0.34	0.00	

Inlet Summary

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Initial Water Elevation (ft)	Ponded Area (ft^2)	Peak Flow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
1	10A	NEENAH FOUNDRY	R-4882	On Sag	1	836.53	838.69	836.53	8.12	0.65	N/A	N/A	N/A	13.00	1.26	838.76
2	10B	NEENAH FOUNDRY	R-4882	On Sag	1	836.35	839.09	836.35	16.25	0.81	N/A	N/A	N/A	13.00	1.78	839.17
3	10C	NEENAH FOUNDRY	R-3067	On Sag	1	836.03	840.13	836.03	6.00	0.69	N/A	N/A	N/A	13.00	3.41	840.24
4	10D	NEENAH FOUNDRY	R-3067	On Sag	1	835.87	840.04	835.87	6.00	0.59	N/A	N/A	N/A	13.00	2.72	840.13
5	11A	NEENAH FOUNDRY	R-4882	On Sag	1	834.82	837.44	834.82	16.25	8.09	N/A	N/A	N/A	13.00	33.31	838.14
6	11B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.72	839.46	834.72	N/A	0.67	0.36	0.31	53.99	13.00	3.77	839.56
7	12B	NEENAH FOUNDRY	R-4882	On Sag	1	835.04	836.73	835.04	8.12	1.00	N/A	N/A	N/A	13.00	2.40	836.81
8	12C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.87	838.46	834.87	N/A	0.97	0.53	0.45	54.25	13.00	5.46	838.61
9	13A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.46	837.61	834.46	N/A	1.01	0.54	0.47	53.43	13.00	5.63	837.76
10	15A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.29	836.02	832.90	N/A	1.49	0.69	0.80	46.48	13.00	6.72	836.19
11	16B	NEENAH FOUNDRY	R-3508-B	On Sag	1	832.70	835.20	832.70	3.70	9.98	N/A	N/A	N/A	13.00	262.70	840.39
12	16C	NEENAH FOUNDRY	R-3067	On Sag	1	832.65	835.97	832.65	6.00	1.76	N/A	N/A	N/A	13.00	8.08	836.15
13	16D	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.67	835.97	833.67	N/A	2.71	1.64	1.07	60.54	13.00	13.52	836.28
14	17A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.53	836.05	833.53	N/A	3.65	1.26	2.38	34.60	13.00	10.62	836.30
15	18B	NEENAH FOUNDRY	R-4882	On Sag	1	834.20	835.85	834.20	8.12	1.76	N/A	N/A	N/A	13.00	4.46	835.97
16	18C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.73	836.47	833.83	N/A	4.80	1.43	3.37	29.87	13.00	11.02	836.73
17	20A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.35	837.40	834.35	N/A	6.36	1.71	4.65	26.89	13.00	12.47	837.69
18	21A	NEENAH FOUNDRY	R-4882	On Sag	1	835.29	837.40	835.29	8.12	2.63	N/A	N/A	N/A	13.00	6.50	837.57
19	21B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.19	838.57	835.19	N/A	8.21	2.01	6.20	24.45	13.00	13.93	838.89
20	22.1A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.13	842.63	838.13	N/A	11.82	2.99	8.84	25.27	13.00	16.27	842.99
21	22A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.85	839.26	835.85	N/A	9.88	2.25	7.63	22.81	13.00	15.08	839.60
22	22B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.33	839.26	836.33	N/A	1.97	0.82	1.15	41.71	13.00	7.32	839.45
23	23A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.13	842.63	838.13	N/A	14.25	2.54	11.70	17.86	13.00	13.46	842.94
24	23B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.61	842.63	838.61	N/A	2.12	0.77	1.34	36.44	13.00	5.54	842.78
25	24A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.07	849.52	846.07	N/A	9.43	2.07	7.36	21.96	13.00	12.01	849.80
26	24B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.55	849.52	846.55	N/A	2.03	0.79	1.24	39.01	13.00	5.88	849.67
27	25A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.38	851.84	848.38	N/A	1.02	0.54	0.48	52.77	13.00	5.17	851.98
28	25B	NEENAH FOUNDRY	R 3067 Diagonal Reversible	On Grade	1	848.86	851.84	848.86	N/A	1.48	0.67	0.81	45.43	13.00	6.13	852.00
29	26A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	849.18	852.55	849.18	N/A	0.95	0.50	0.44	53.36	13.00	4.84	852.68

Subbasin Hydrology

Subbasin : Sub-10A

Input Data

Area (ft²) 11791.00
Weighted Runoff Coefficient 0.2900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	11791.00	-	0.29
Composite Area & Weighted Runoff Coeff.	11791.00		0.29

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

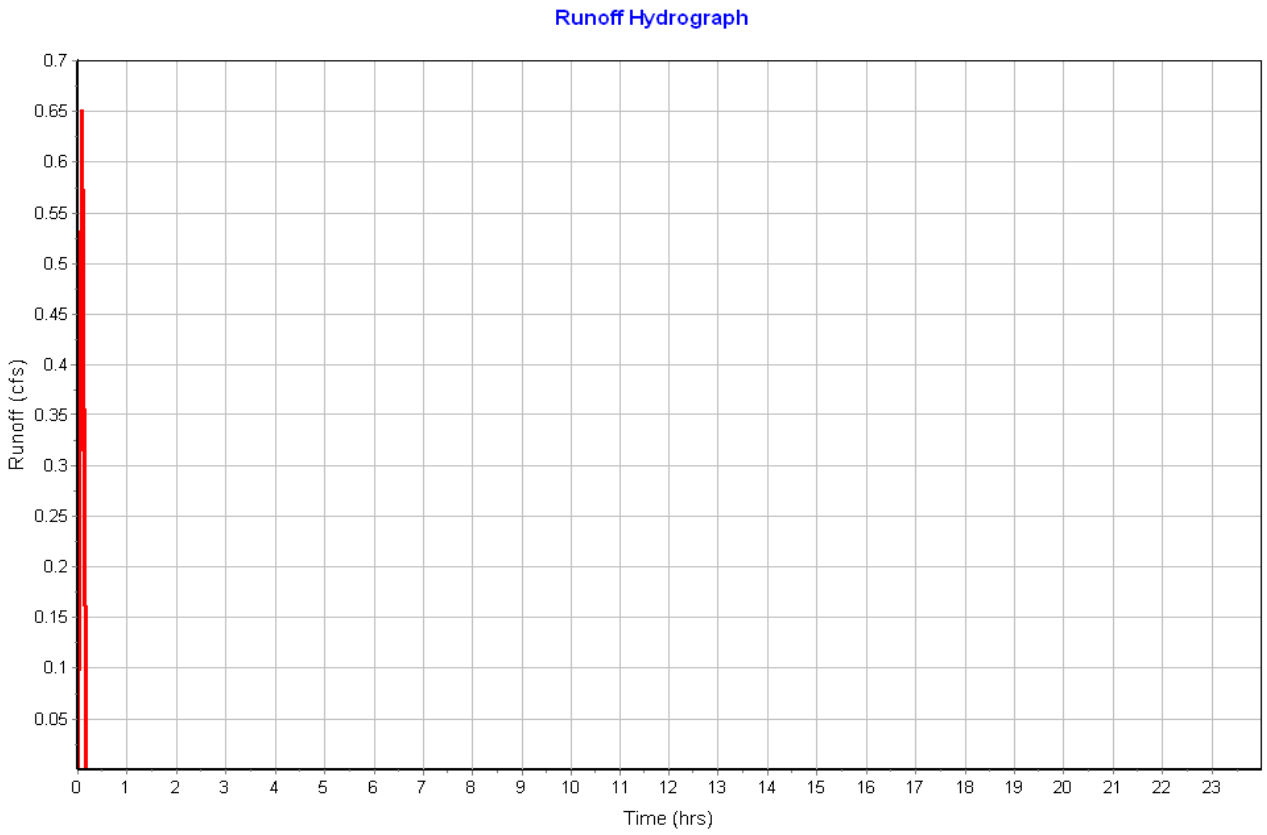
Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.20
Peak Runoff (cfs) 0.65
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.2900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-10A



Subbasin : Sub-10B

Input Data

Area (ft²) 18457.98
Weighted Runoff Coefficient 0.2300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	13.50	-	0.23
Composite Area & Weighted Runoff Coeff.	13.50		0.23

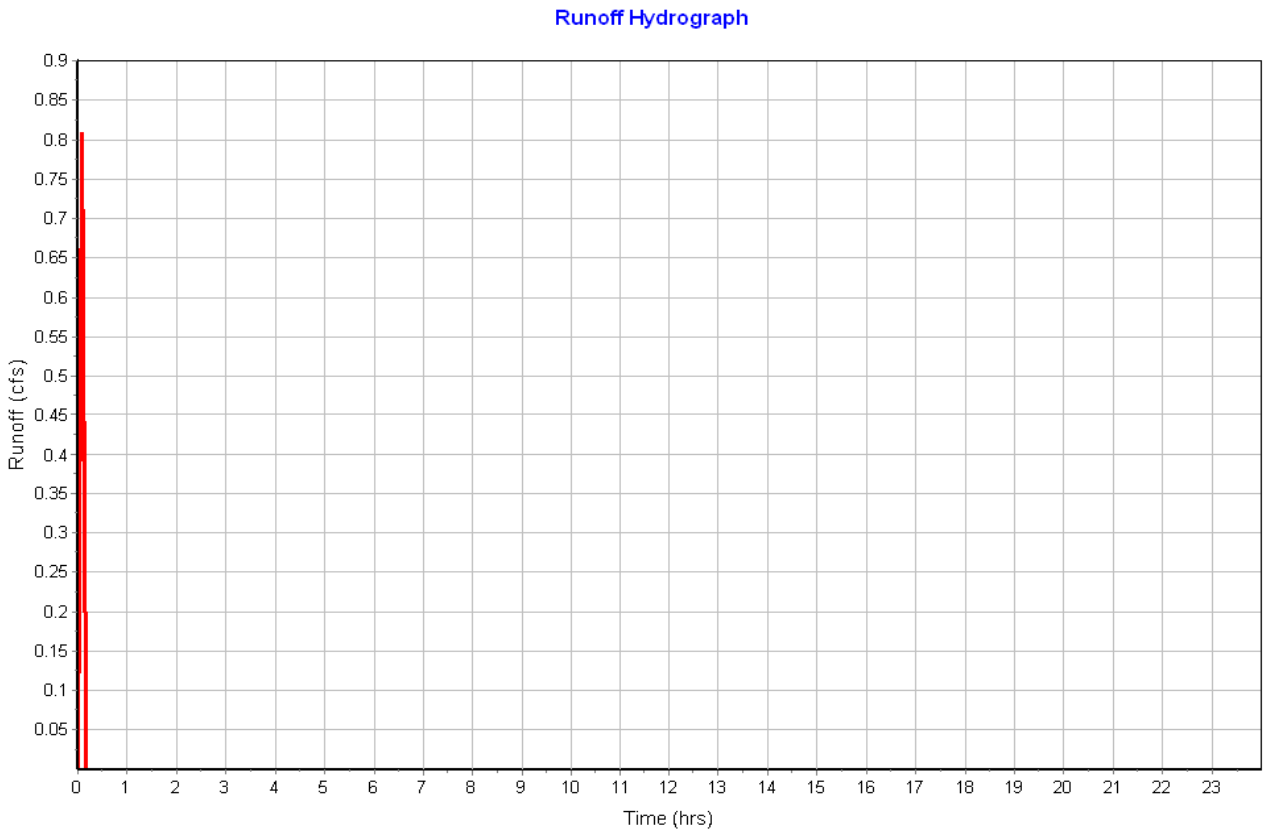
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.16
Peak Runoff (cfs) 0.81
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.2300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-10B



Subbasin : Sub-10C

Input Data

Area (ft²) 7075.02
Weighted Runoff Coefficient 0.5100

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	7075.02	-	0.51
Composite Area & Weighted Runoff Coeff.	7075.02		0.51

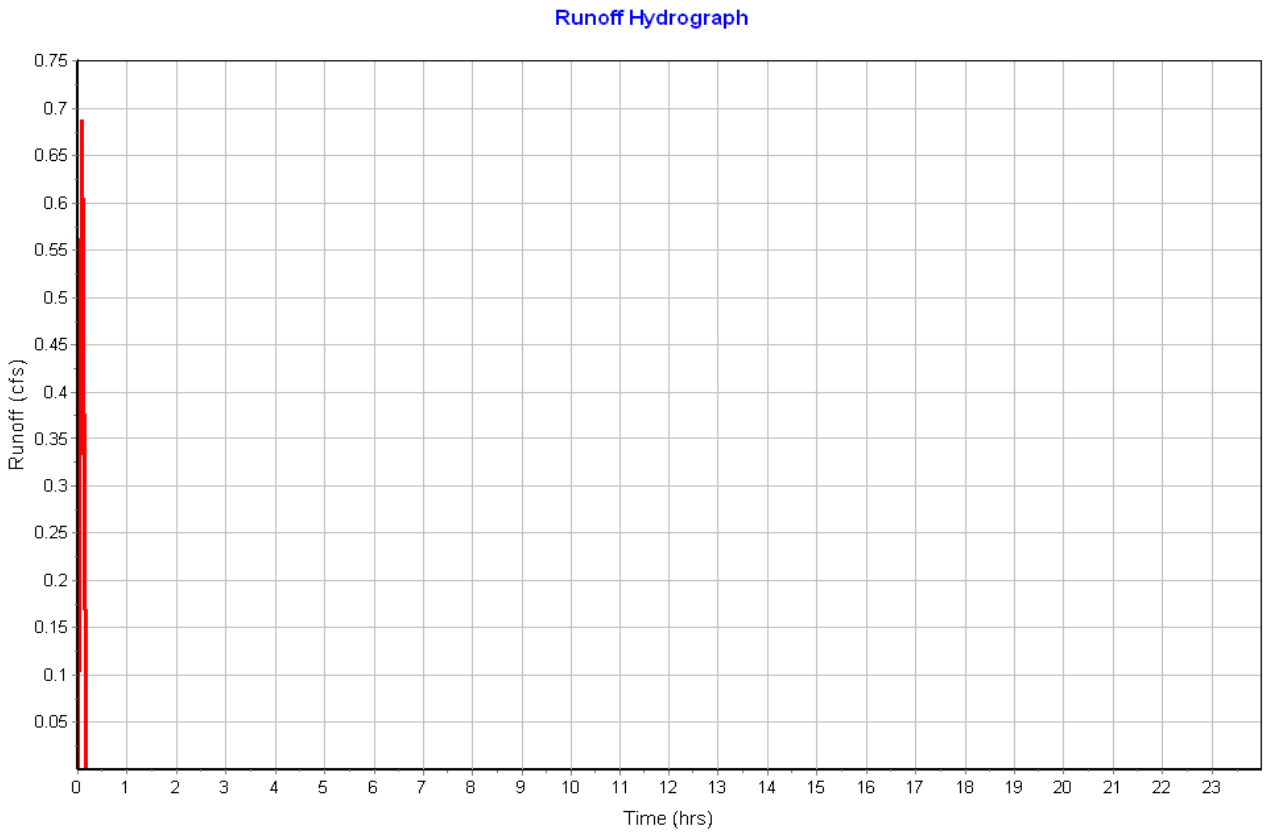
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.35
Peak Runoff (cfs) 0.69
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.5100
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-10C



Subbasin : Sub-10D

Input Data

Area (ft²) 4467.99
Weighted Runoff Coefficient 0.7000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	4467.99	-	0.70
Composite Area & Weighted Runoff Coeff.	4467.99		0.70

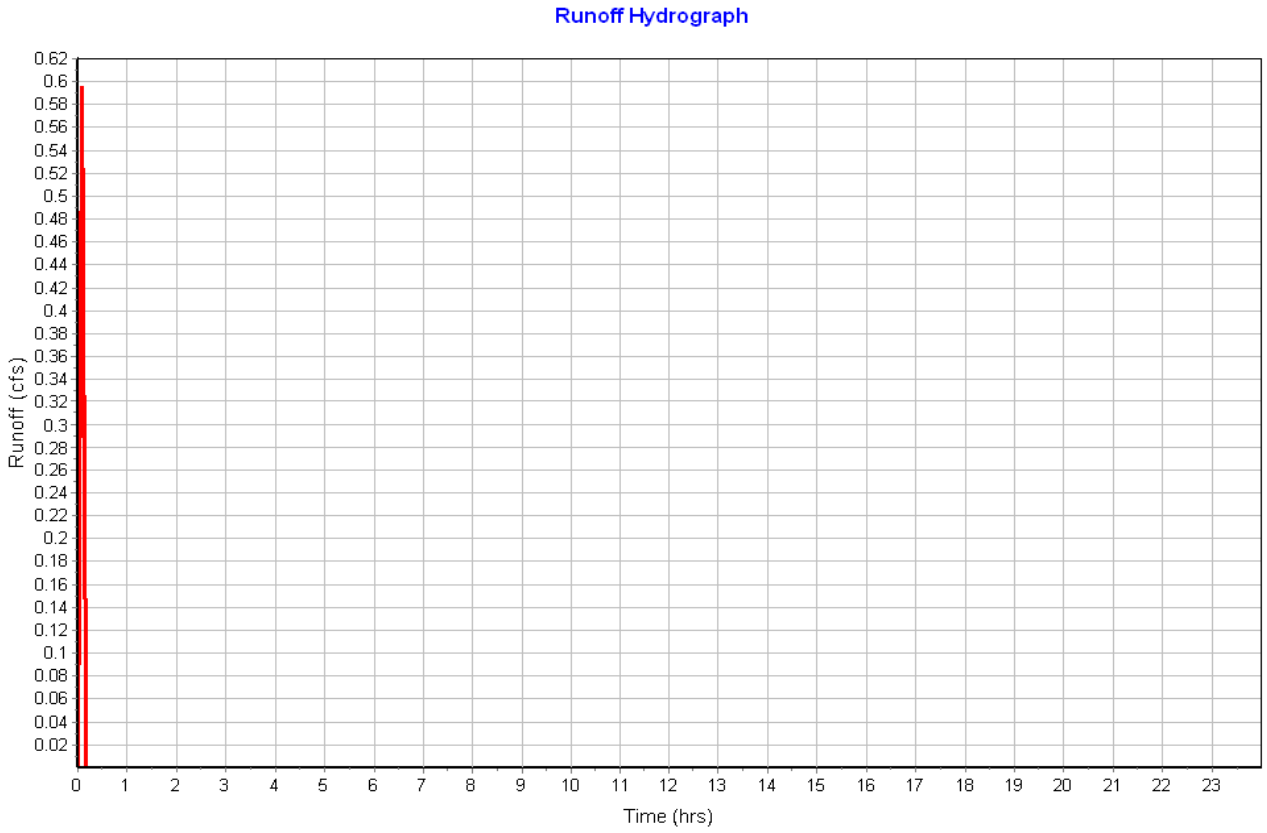
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.48
Peak Runoff (cfs) 0.60
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.7000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-10D



Subbasin : Sub-11A

Input Data

Area (ft²) 157738.99
Weighted Runoff Coefficient 0.2700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	157738.99	-	0.27
Composite Area & Weighted Runoff Coeff.	157738.99		0.27

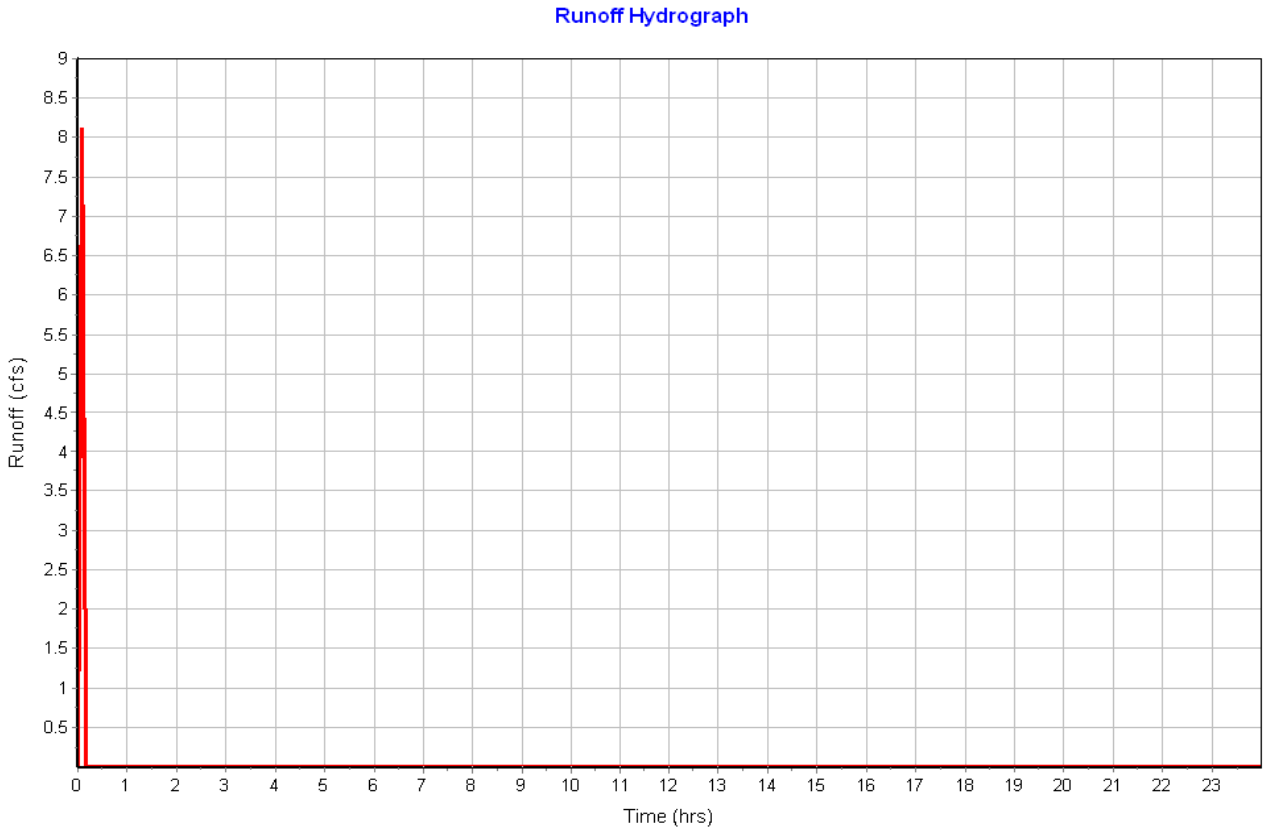
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.19
Peak Runoff (cfs) 8.10
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.2700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-11A



Subbasin : Sub-11B

Input Data

Area (ft²) 3939.00
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	3939.00	-	0.90
Composite Area & Weighted Runoff Coeff.	3939.00		0.90

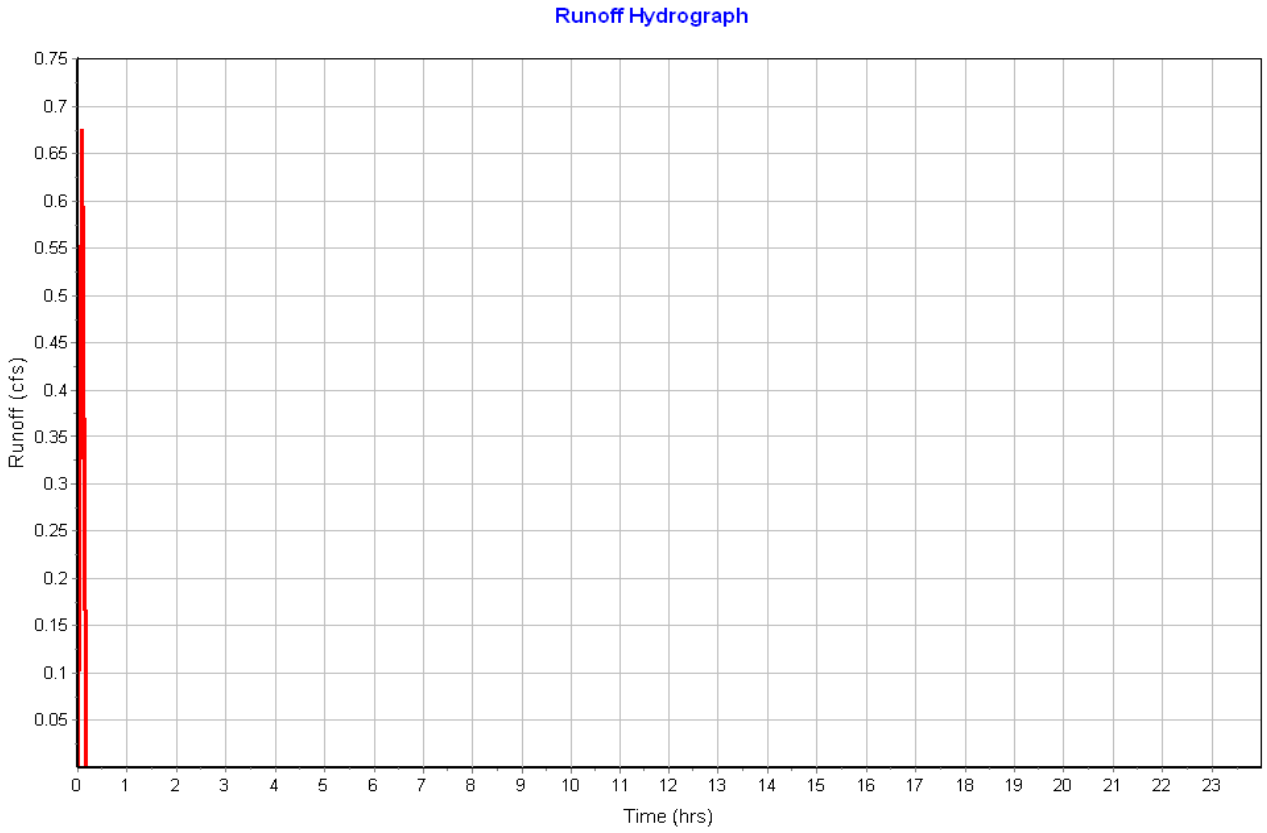
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 0.67
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-11B



Subbasin : Sub-12A

Input Data

Area (ft²) 99805.02
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	99805.02	-	0.16
Composite Area & Weighted Runoff Coeff.	99805.02		0.16

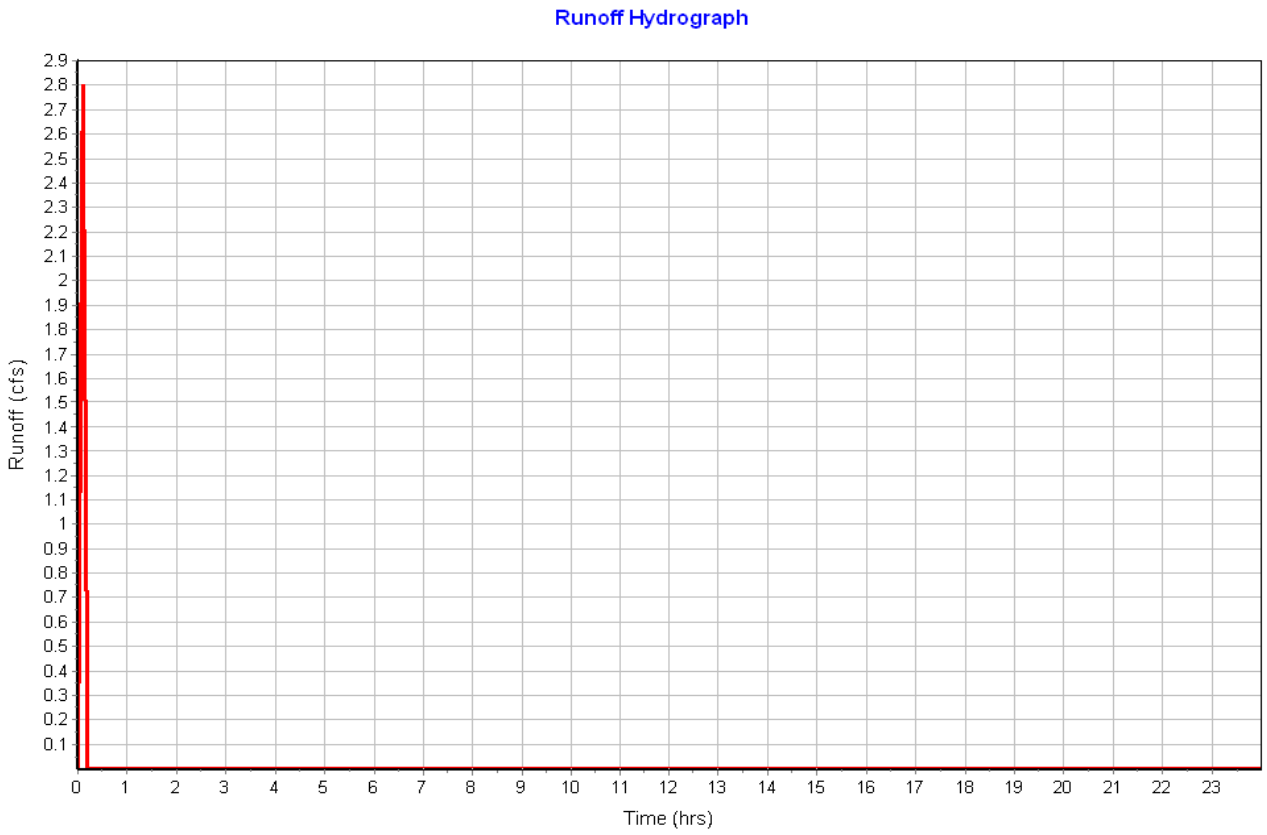
Time of Concentration

User-Defined TOC override (minutes): 6

Subbasin Runoff Results

Total Rainfall (in) 0.76
Total Runoff (in) 0.12
Peak Runoff (cfs) 2.80
Rainfall Intensity 7.627
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:06:00

Subbasin : Sub-12A



Subbasin : Sub-12B

Input Data

Area (ft²) 38139.00
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	38139.00	-	0.16
Composite Area & Weighted Runoff Coeff.	38139.00		0.16

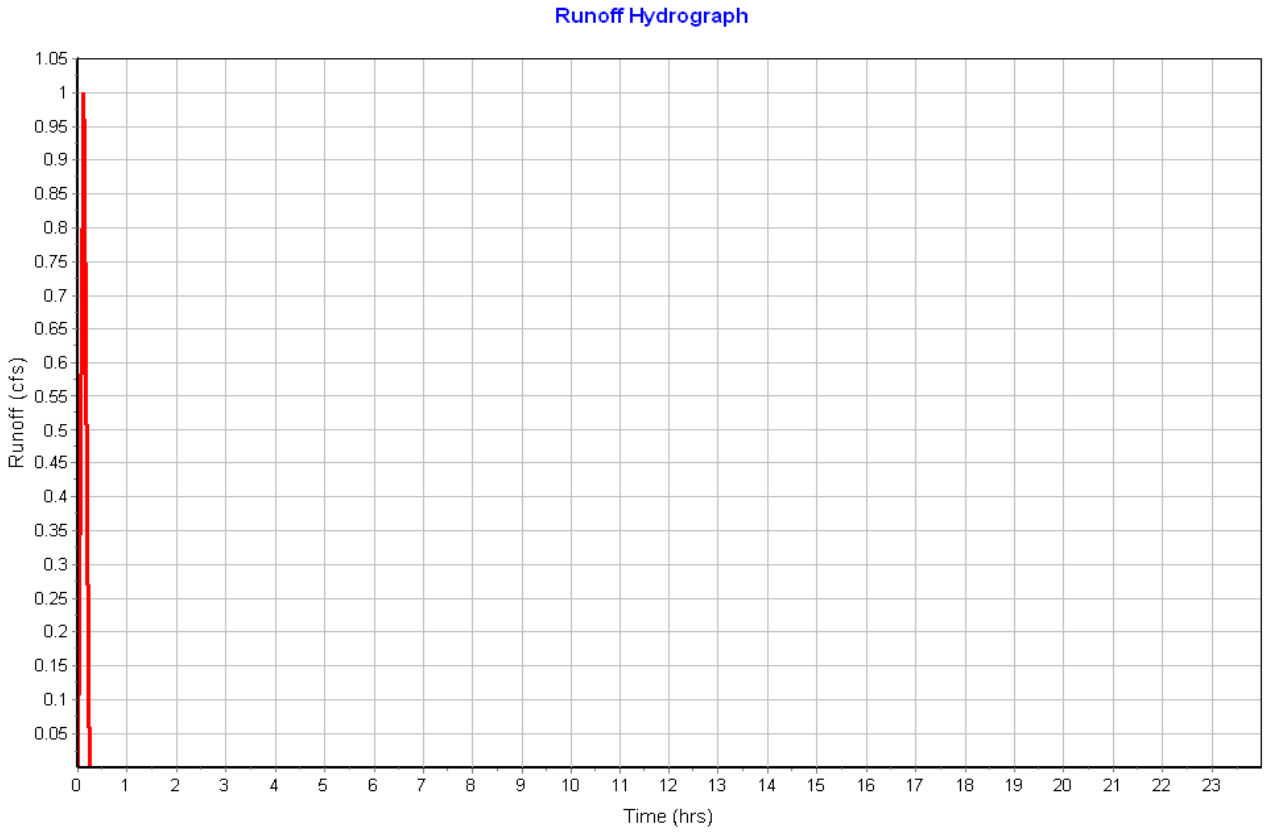
Time of Concentration

User-Defined TOC override (minutes): 7

Subbasin Runoff Results

Total Rainfall (in) 0.83
Total Runoff (in) 0.13
Peak Runoff (cfs) 1.00
Rainfall Intensity 7.116
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:07:00

Subbasin : Sub-12B



Subbasin : Sub-12C

Input Data

Area (ft²) 3918.00
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	3918.00	-	0.90
Composite Area & Weighted Runoff Coeff.	3918.00		0.90

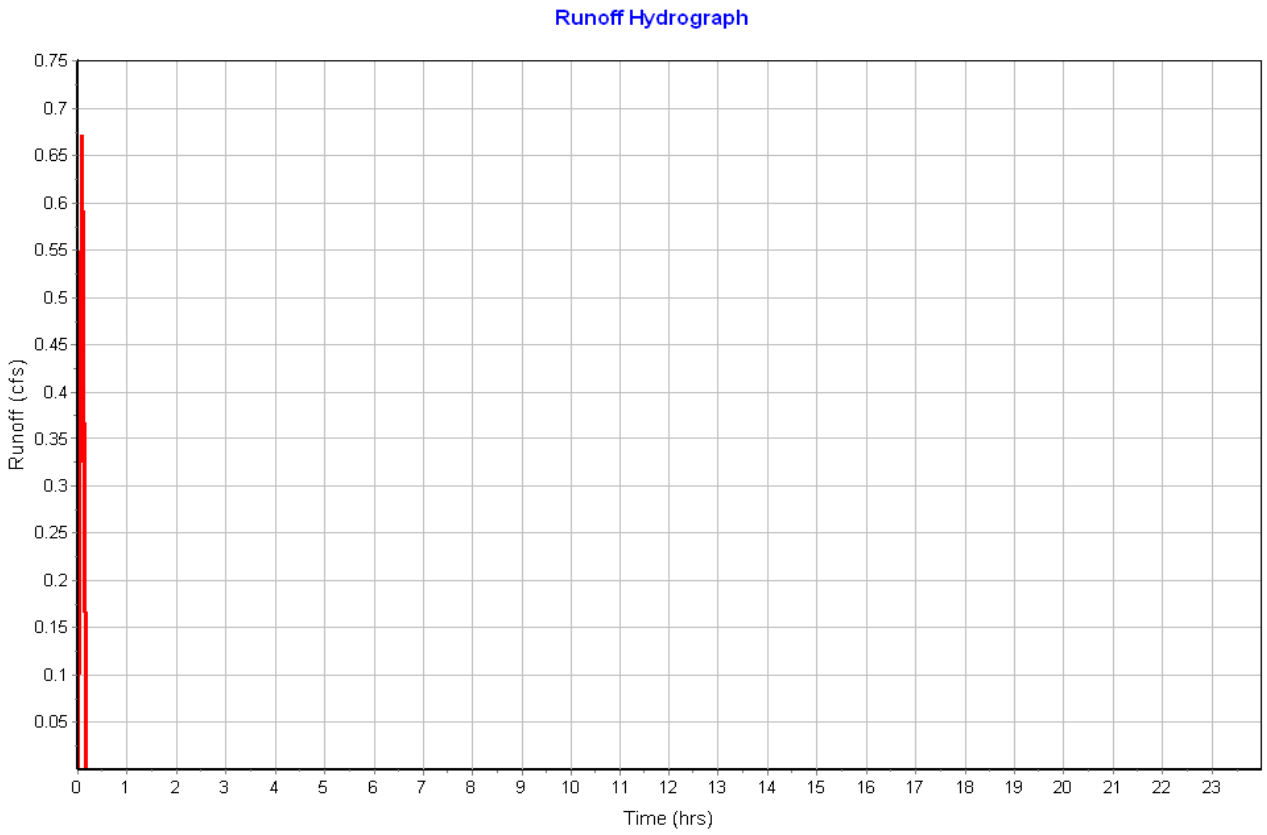
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 0.67
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-12C



Subbasin : Sub-13A

Input Data

Area (ft²) 3355.99
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	3355.99	-	0.90
Composite Area & Weighted Runoff Coeff.	3355.99		0.90

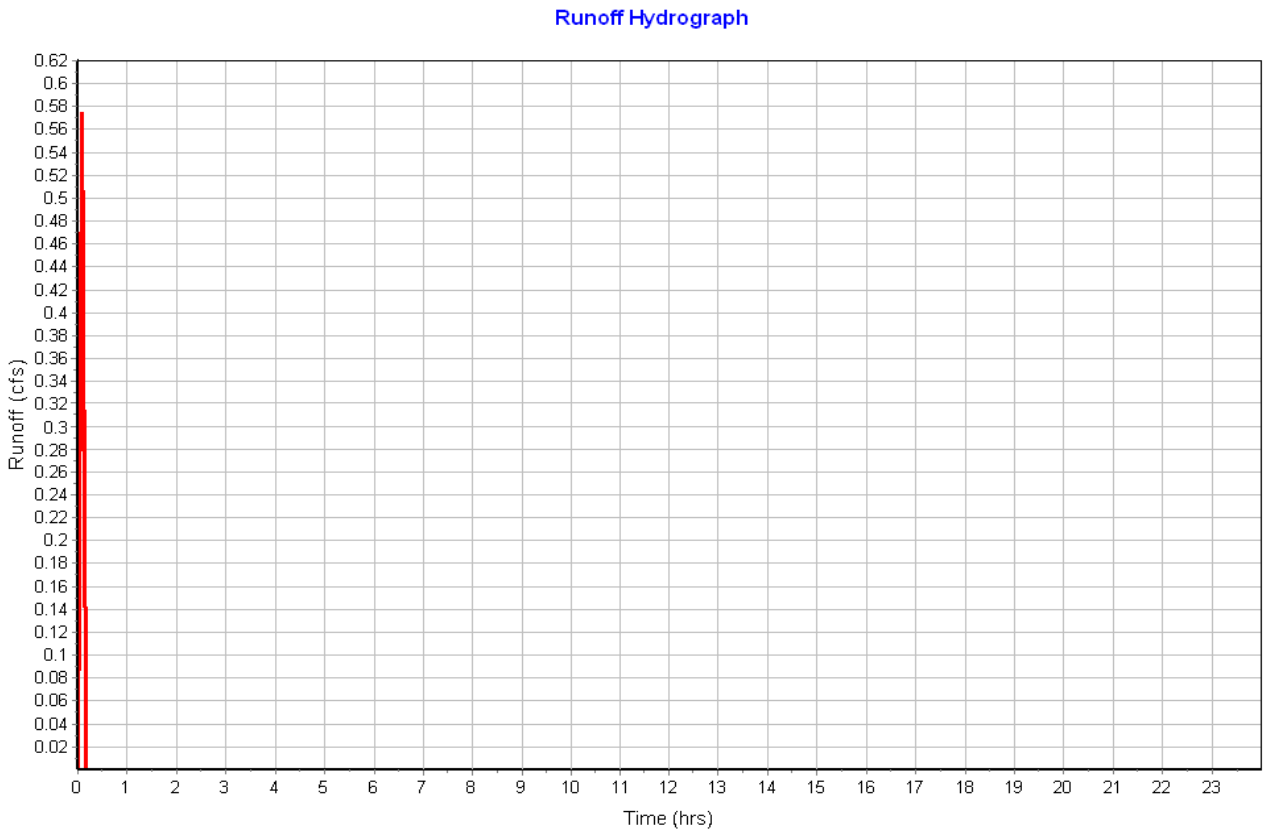
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 0.57
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-13A



Subbasin : Sub-15A

Input Data

Area (ft²) 6010.02
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	6010.02	-	0.90
Composite Area & Weighted Runoff Coeff.	6010.02		0.90

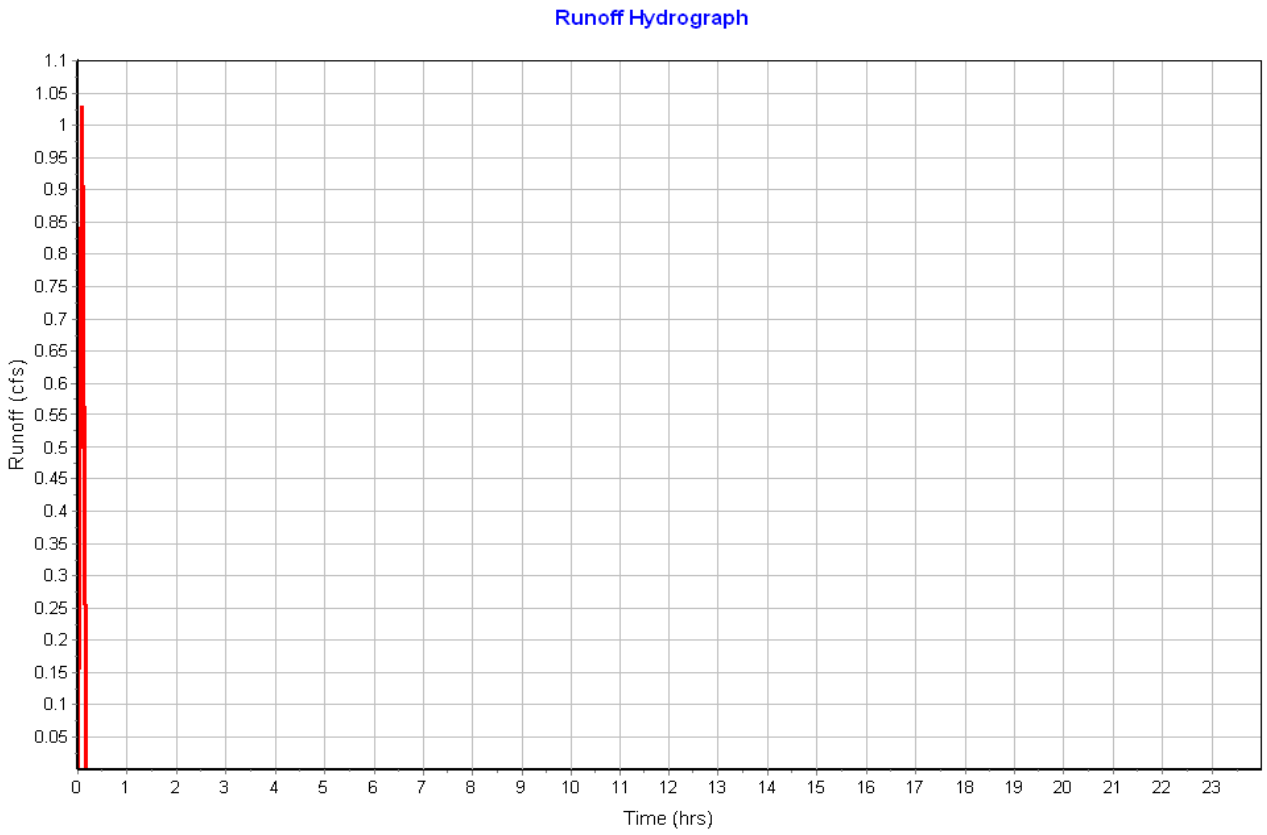
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 1.03
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-15A



Subbasin : Sub-16A

Input Data

Area (ft²) 377111.99
Weighted Runoff Coefficient 0.2500

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	377111.99	-	0.25
Composite Area & Weighted Runoff Coeff.	377111.99		0.25

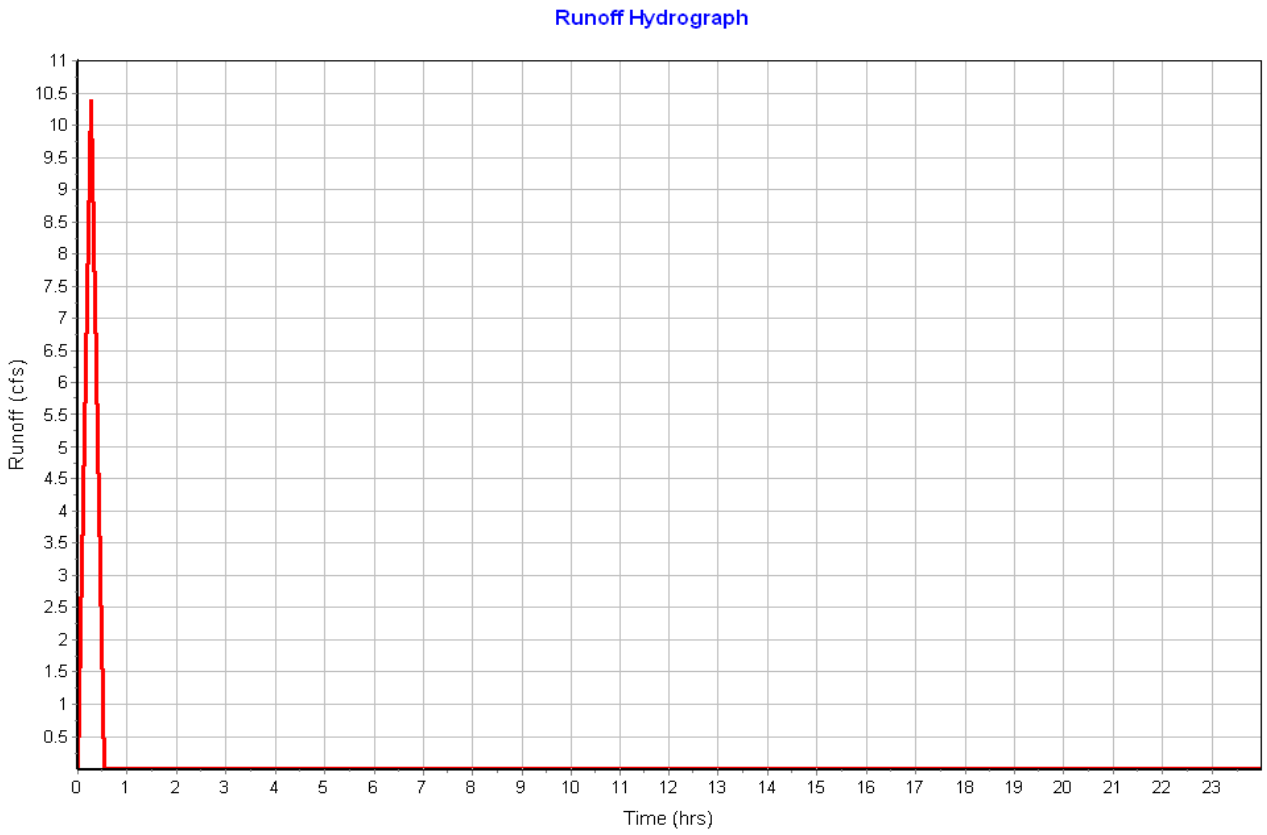
Time of Concentration

User-Defined TOC override (minutes): 16

Subbasin Runoff Results

Total Rainfall (in) 1.28
Total Runoff (in) 0.32
Peak Runoff (cfs) 10.38
Rainfall Intensity 4.796
Weighted Runoff Coefficient 0.2500
Time of Concentration (days hh:mm:ss) 0 00:16:00

Subbasin : Sub-16A



Subbasin : Sub-16B

Input Data

Area (ft²) 118416.99
Weighted Runoff Coefficient 0.7400

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	118416.99	-	0.74
Composite Area & Weighted Runoff Coeff.	118416.99		0.74

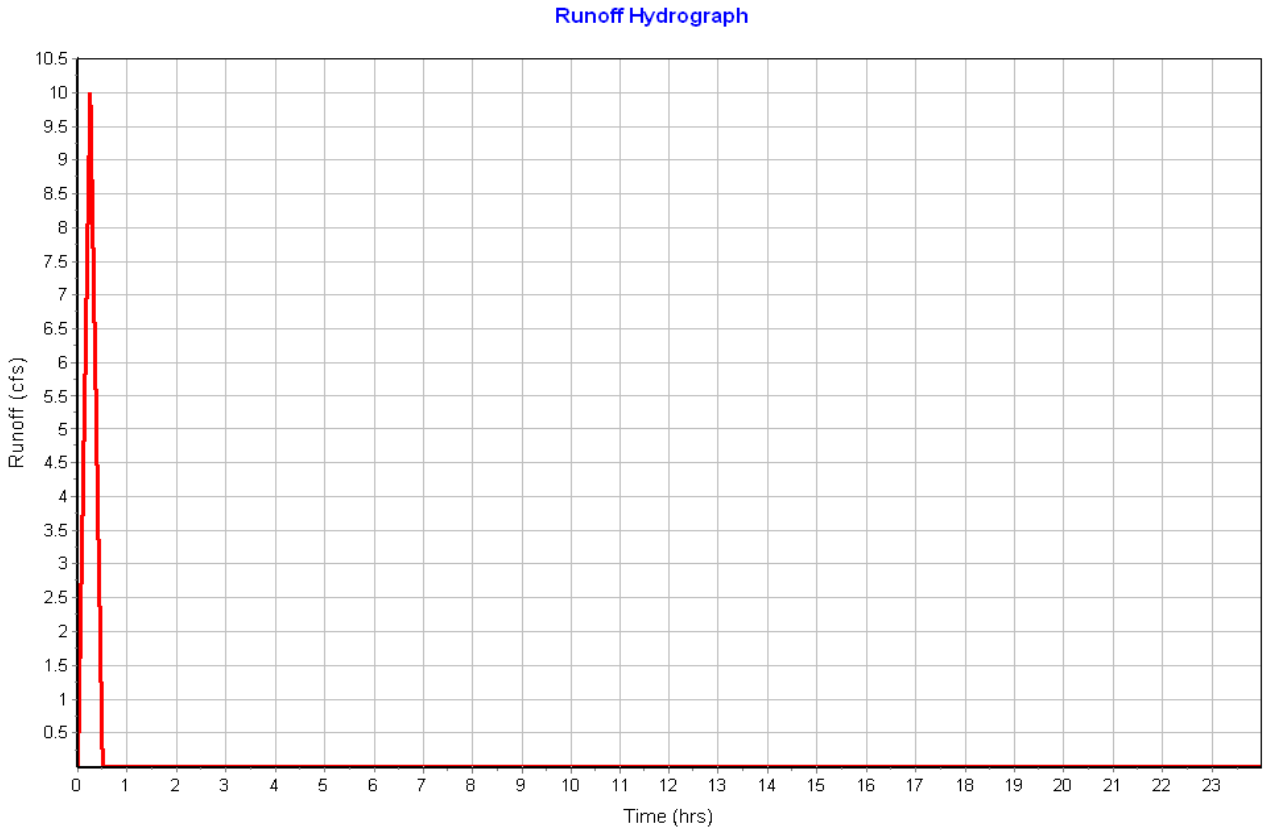
Time of Concentration

User-Defined TOC override (minutes): 15

Subbasin Runoff Results

Total Rainfall (in) 1.24
Total Runoff (in) 0.92
Peak Runoff (cfs) 9.98
Rainfall Intensity 4.960
Weighted Runoff Coefficient 0.7400
Time of Concentration (days hh:mm:ss) 0 00:15:00

Subbasin : Sub-16B



Subbasin : Sub-16C

Input Data

Area (ft²) 997.00
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	997.00	-	0.90
Composite Area & Weighted Runoff Coeff.	997.00		0.90

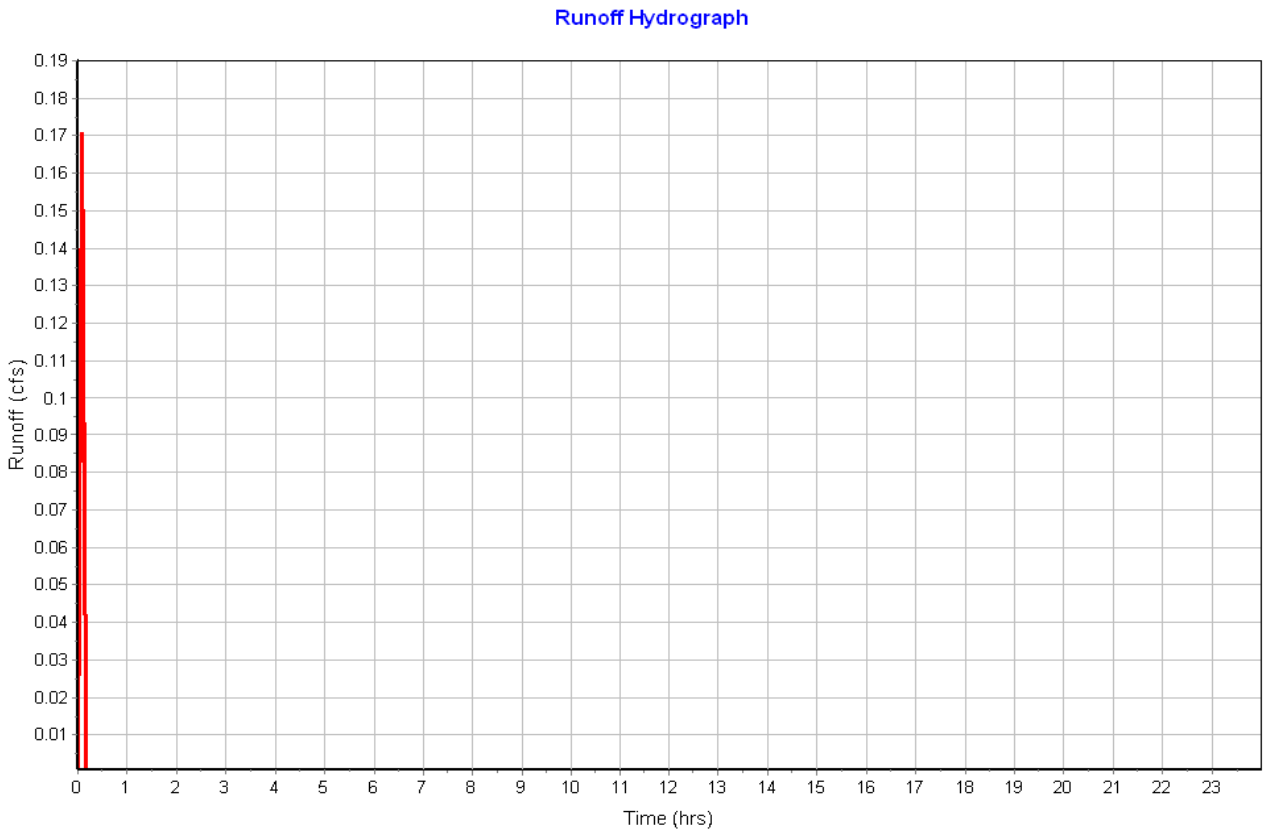
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 0.17
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-16C



Subbasin : Sub-16D

Input Data

Area (ft²) 630.01
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	630.01	-	0.90
Composite Area & Weighted Runoff Coeff.	630.01		0.90

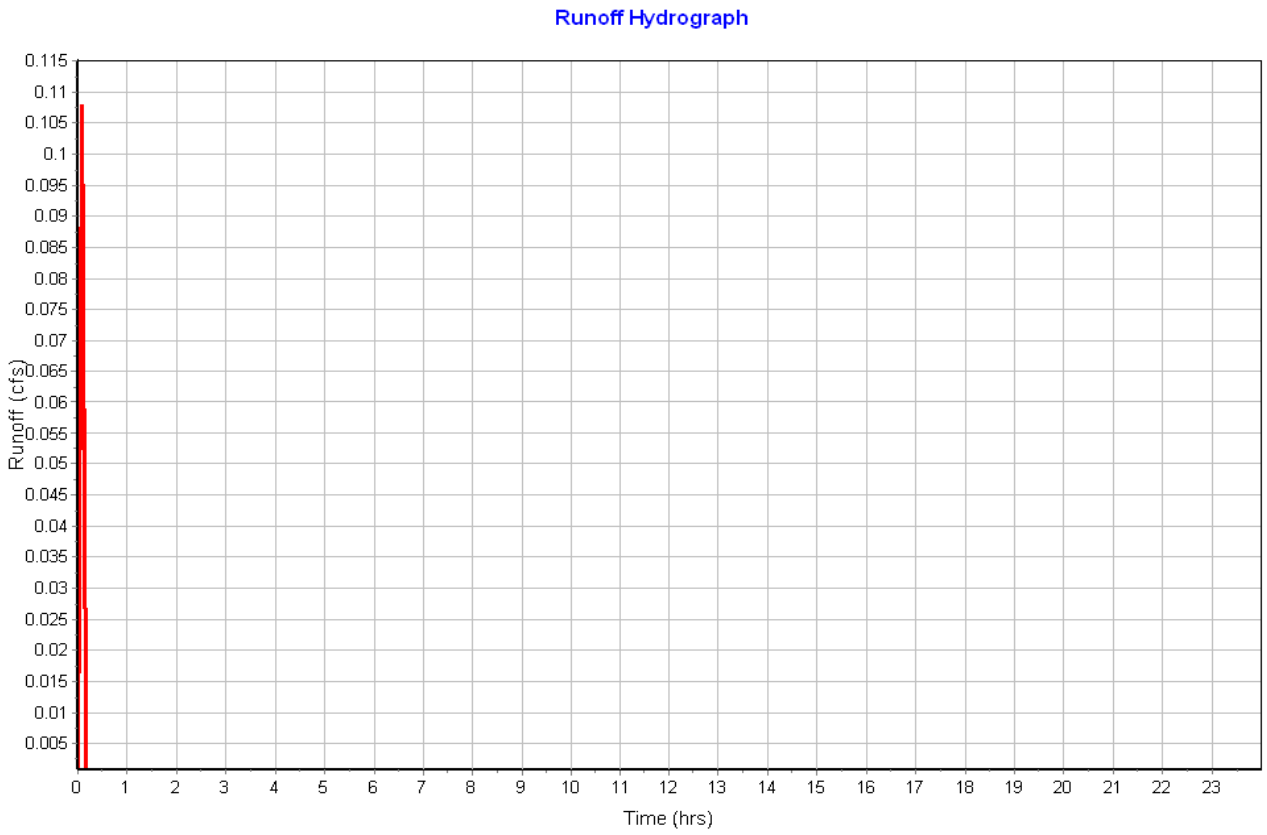
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 0.11
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-16D



Subbasin : Sub-17A

Input Data

Area (ft²) 1471.98
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	1471.98	-	0.90
Composite Area & Weighted Runoff Coeff.	1471.98		0.90

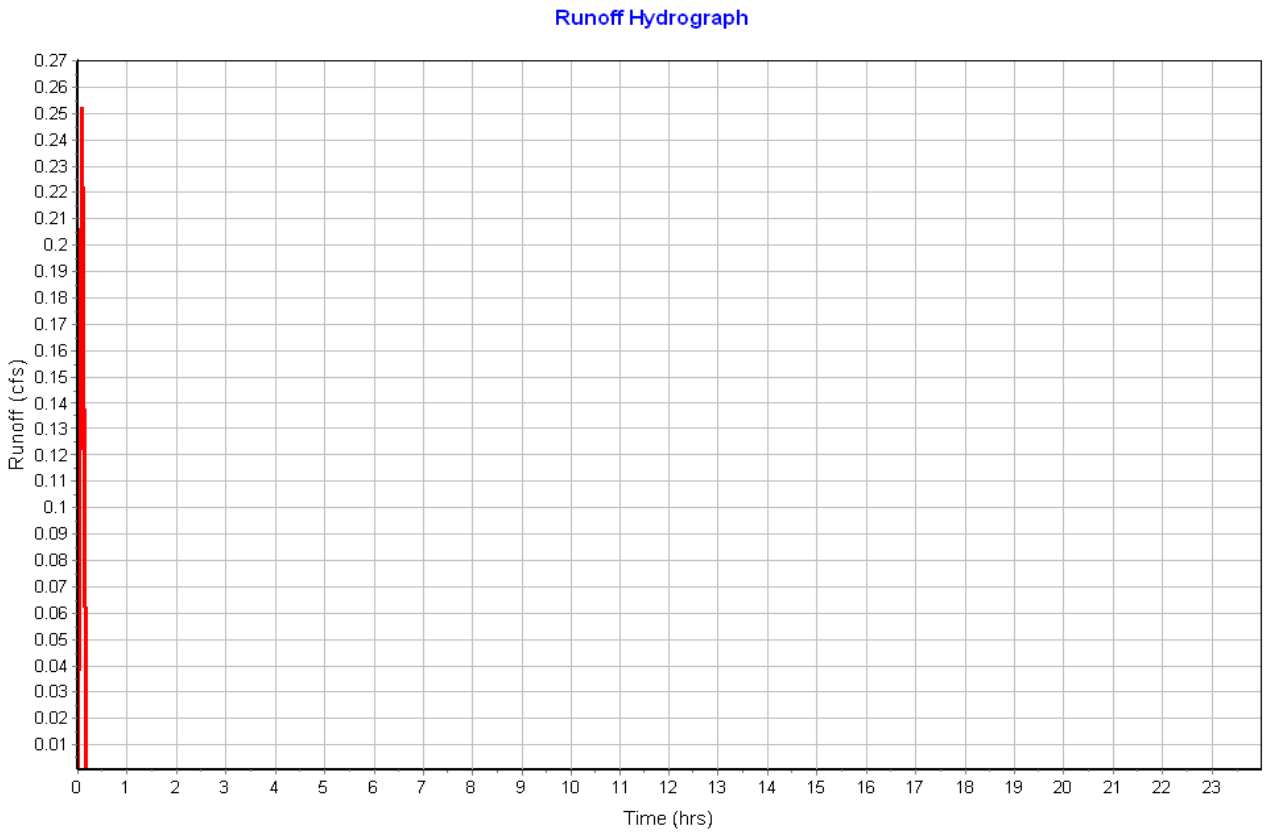
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 0.25
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-17A



Subbasin : Sub-18A

Input Data

Area (ft²) 35208.98
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	35208.98	-	0.16
Composite Area & Weighted Runoff Coeff.	35208.98		0.16

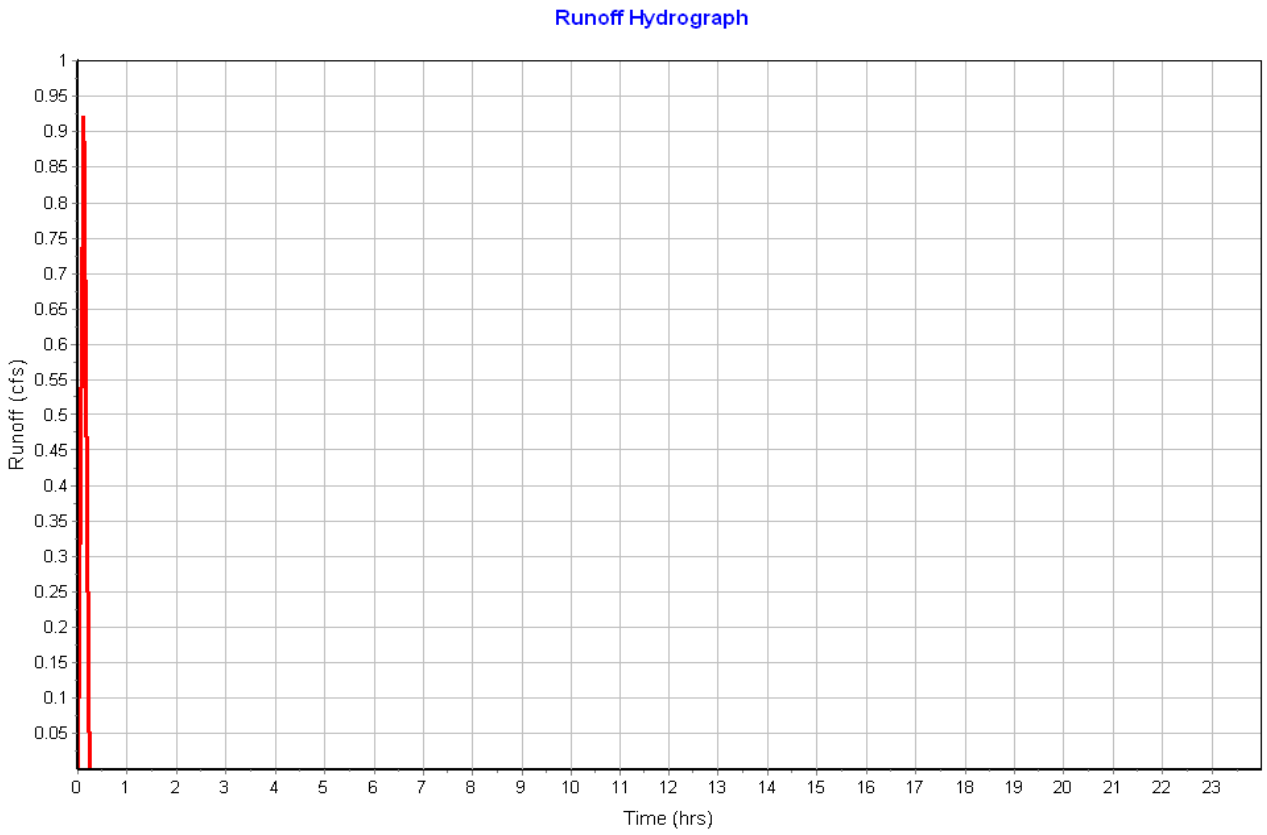
Time of Concentration

User-Defined TOC override (minutes): 7

Subbasin Runoff Results

Total Rainfall (in) 0.83
Total Runoff (in) 0.13
Peak Runoff (cfs) 0.92
Rainfall Intensity 7.116
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:07:00

Subbasin : Sub-18A



Subbasin : Sub-18B

Input Data

Area (ft²) 75226.99
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	217800.00	-	0.16
Composite Area & Weighted Runoff Coeff.	217800.00		0.16

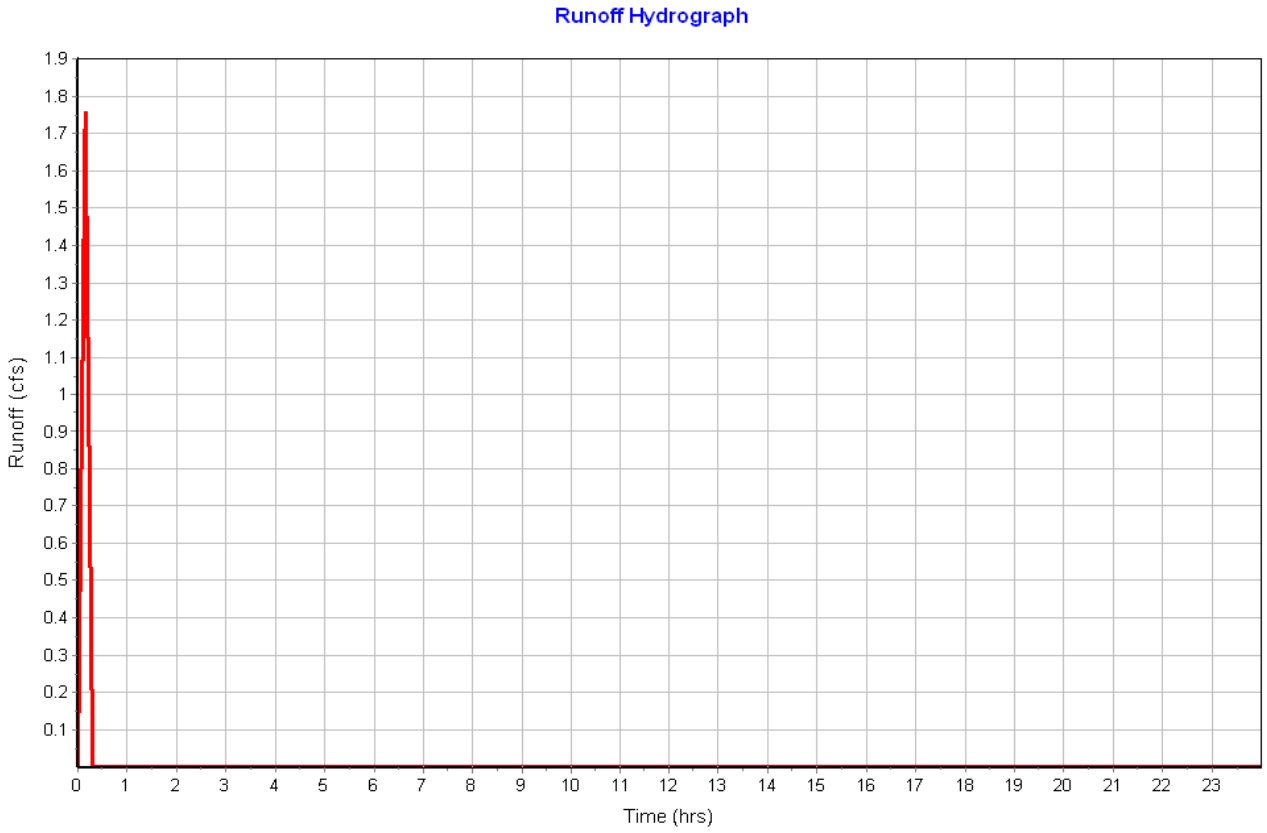
Time of Concentration

User-Defined TOC override (minutes): 9

Subbasin Runoff Results

Total Rainfall (in) 0.95
Total Runoff (in) 0.15
Peak Runoff (cfs) 1.76
Rainfall Intensity 6.354
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:09:00

Subbasin : Sub-18B



Subbasin : Sub-18C

Input Data

Area (ft²) 2574.00
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	2574.00	-	0.90
Composite Area & Weighted Runoff Coeff.	2574.00		0.90

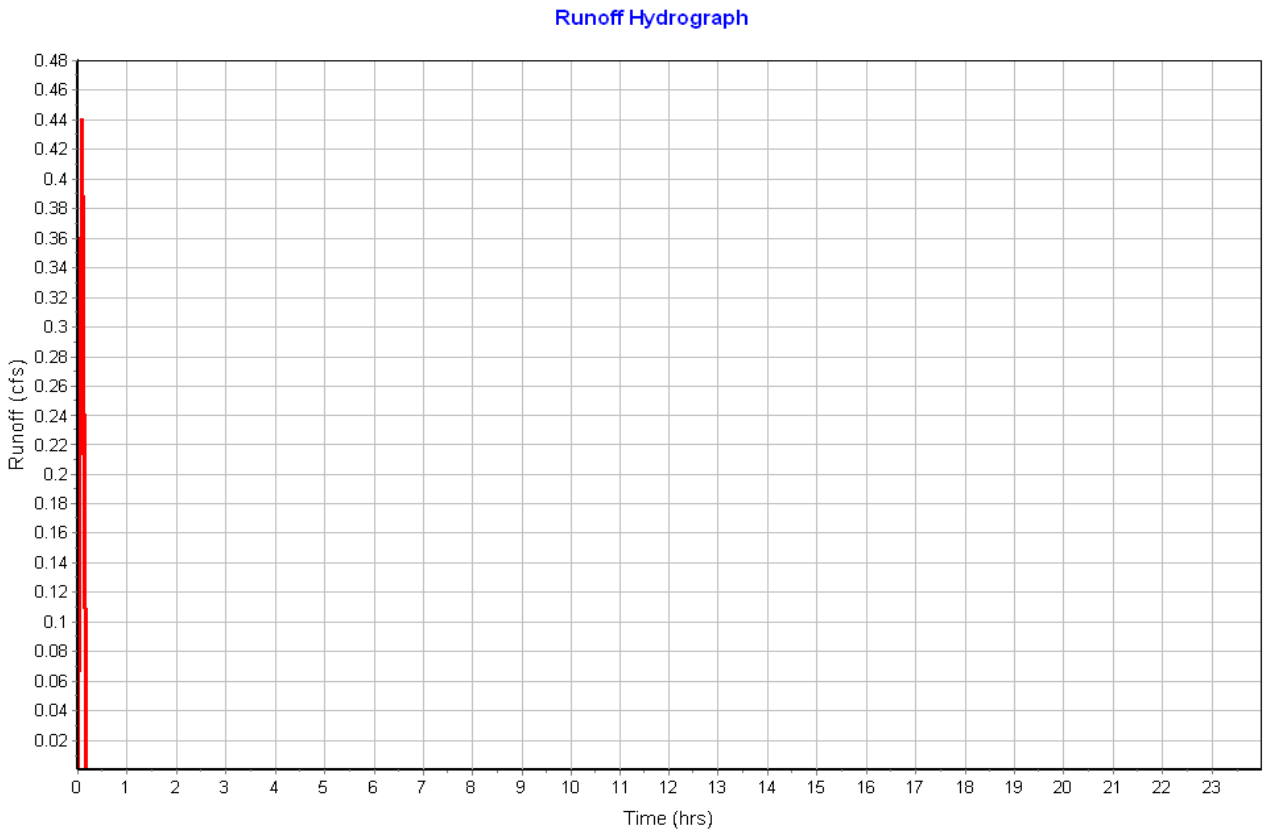
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 0.44
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-18C



Subbasin : Sub-20A

Input Data

Area (ft²) 5346.99
Weighted Runoff Coefficient 0.6700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	5346.99	-	0.67
Composite Area & Weighted Runoff Coeff.	5346.99		0.67

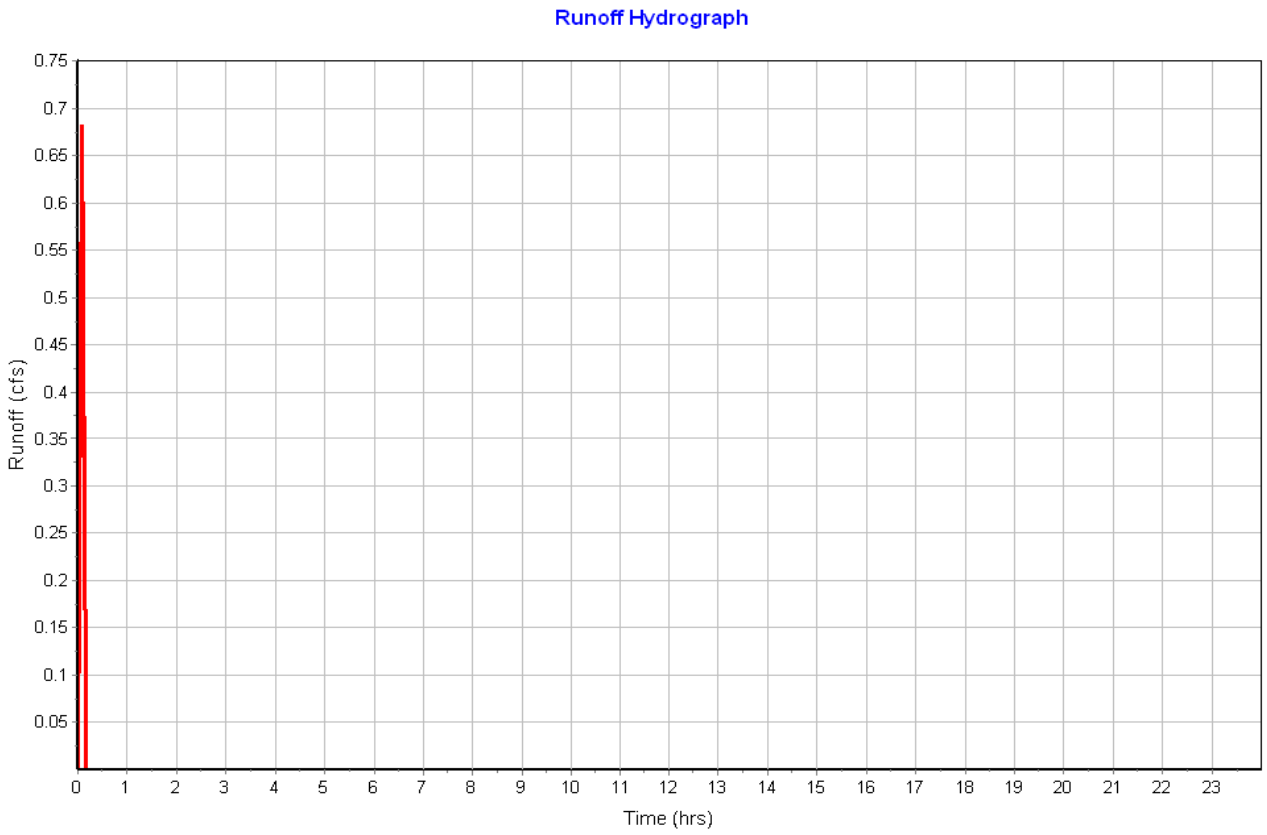
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.46
Peak Runoff (cfs) 0.68
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.6700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-20A



Subbasin : Sub-21A

Input Data

Area (ft²) 118347.99
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	118347.99	-	0.16
Composite Area & Weighted Runoff Coeff.	118347.99		0.16

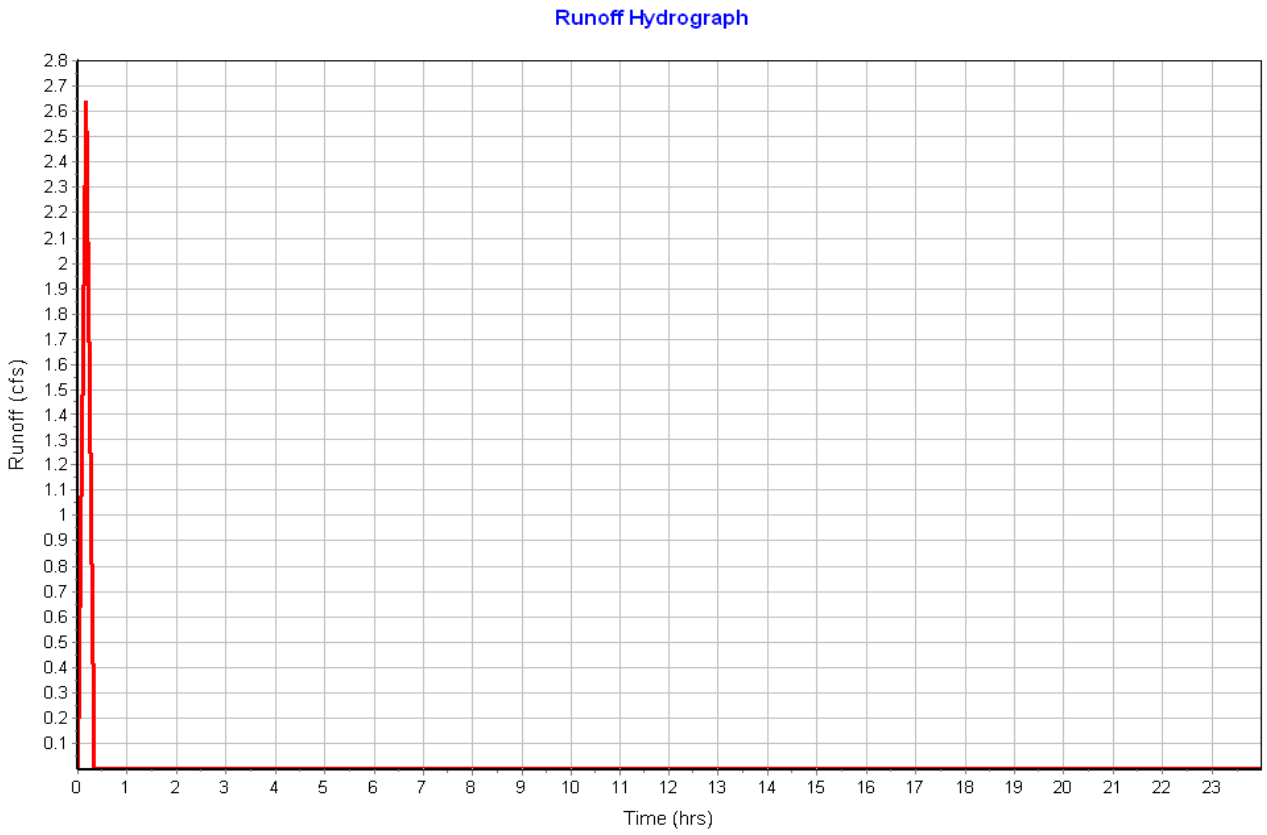
Time of Concentration

User-Defined TOC override (minutes): 10

Subbasin Runoff Results

Total Rainfall (in) 1.01
Total Runoff (in) 0.16
Peak Runoff (cfs) 2.63
Rainfall Intensity 6.060
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:10:00

Subbasin : Sub-21A



Subbasin : Sub-21B

Input Data

Area (ft²) 3417.02
Weighted Runoff Coefficient 0.6700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	3417.02	-	0.67
Composite Area & Weighted Runoff Coeff.	3417.02		0.67

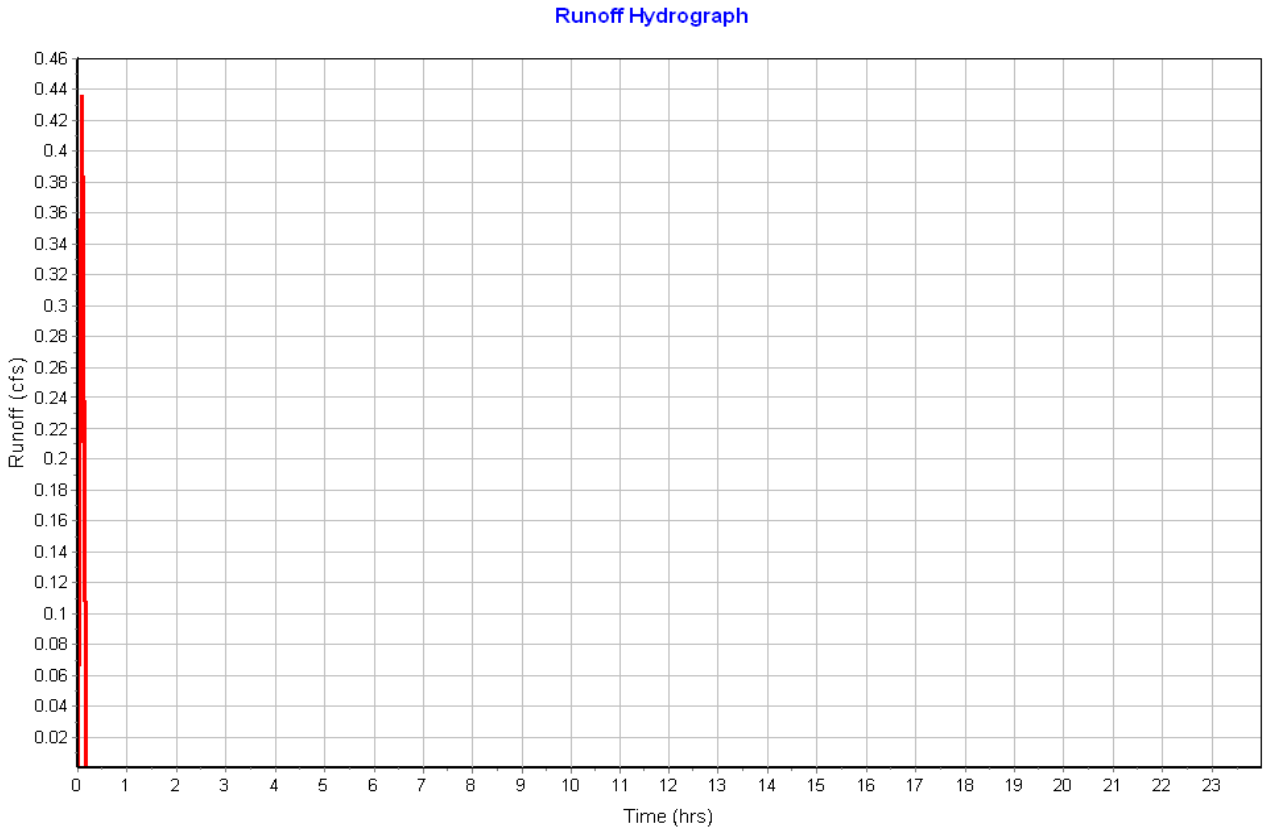
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.46
Peak Runoff (cfs) 0.44
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.6700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-21B



Subbasin : Sub-22.1A

Input Data

Area (ft²) 20079.98
Weighted Runoff Coefficient 0.2300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	20079.98	-	0.23
Composite Area & Weighted Runoff Coeff.	20079.98		0.23

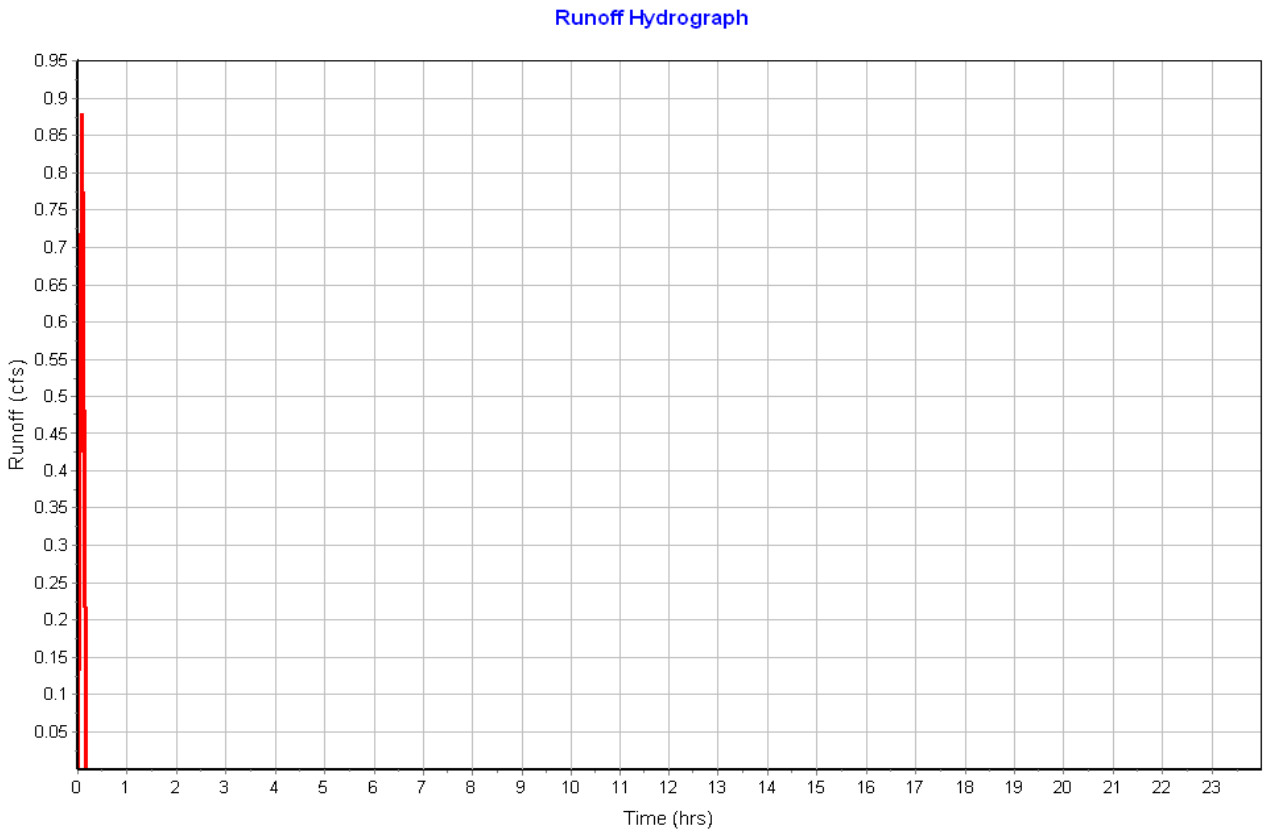
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.16
Peak Runoff (cfs) 0.88
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.2300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-22.1A



Subbasin : Sub-22A

Input Data

Area (ft²) 26385.99
Weighted Runoff Coefficient 0.2900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	26385.99	-	0.29
Composite Area & Weighted Runoff Coeff.	26385.99		0.29

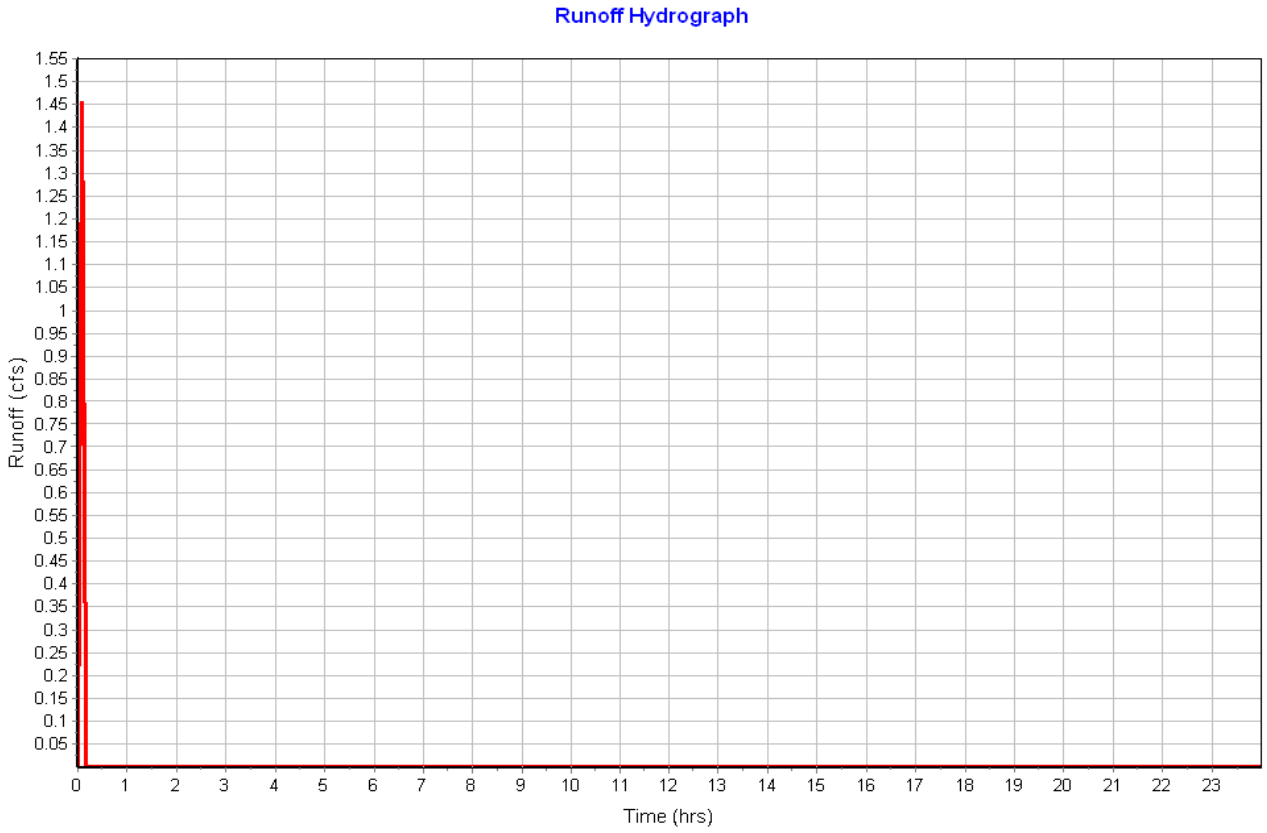
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.20
Peak Runoff (cfs) 1.46
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.2900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-22A



Subbasin : Sub-22B

Input Data

Area (ft²) 5039.98
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	5039.98	-	0.90
Composite Area & Weighted Runoff Coeff.	5039.98		0.90

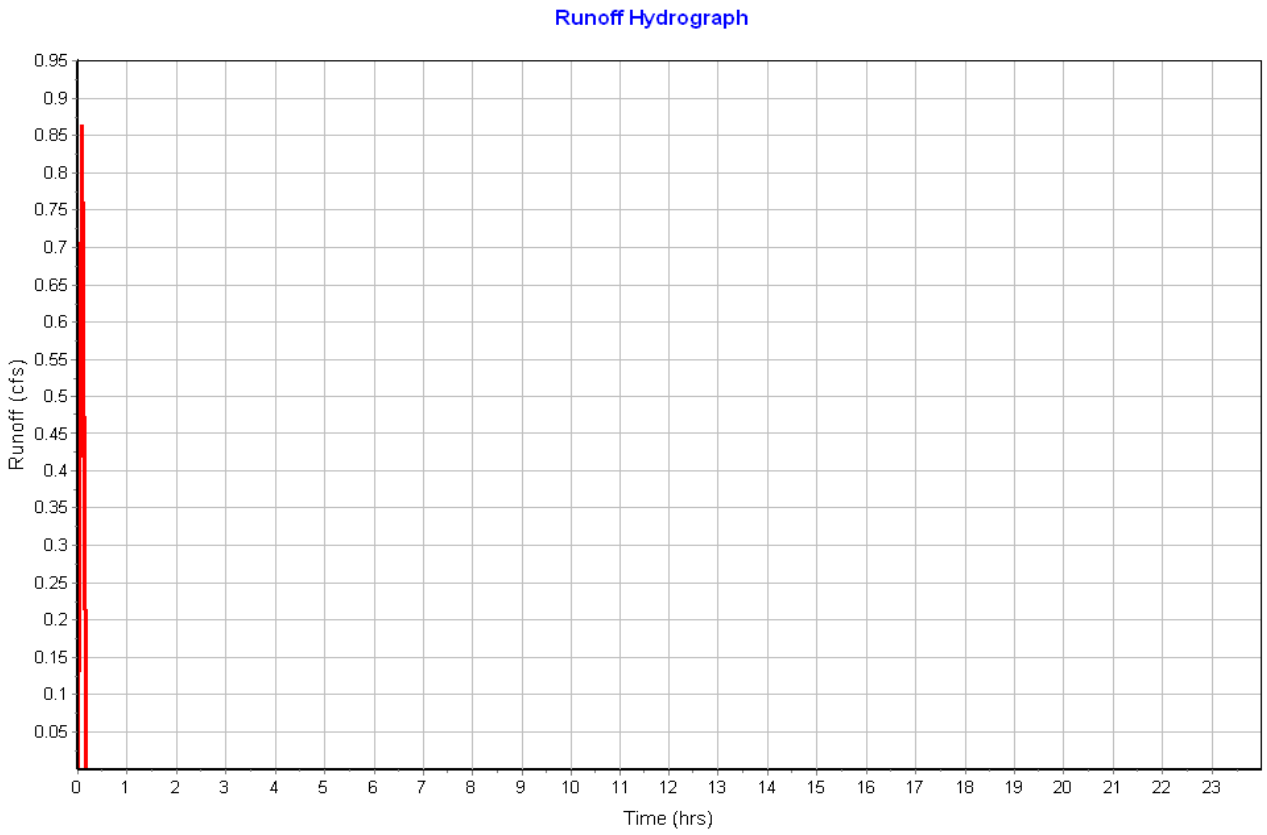
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 0.86
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-22B



Subbasin : Sub-23A

Input Data

Area (ft²) 86498.05
Weighted Runoff Coefficient 0.4300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	86498.05	-	0.43
Composite Area & Weighted Runoff Coeff.	86498.05		0.43

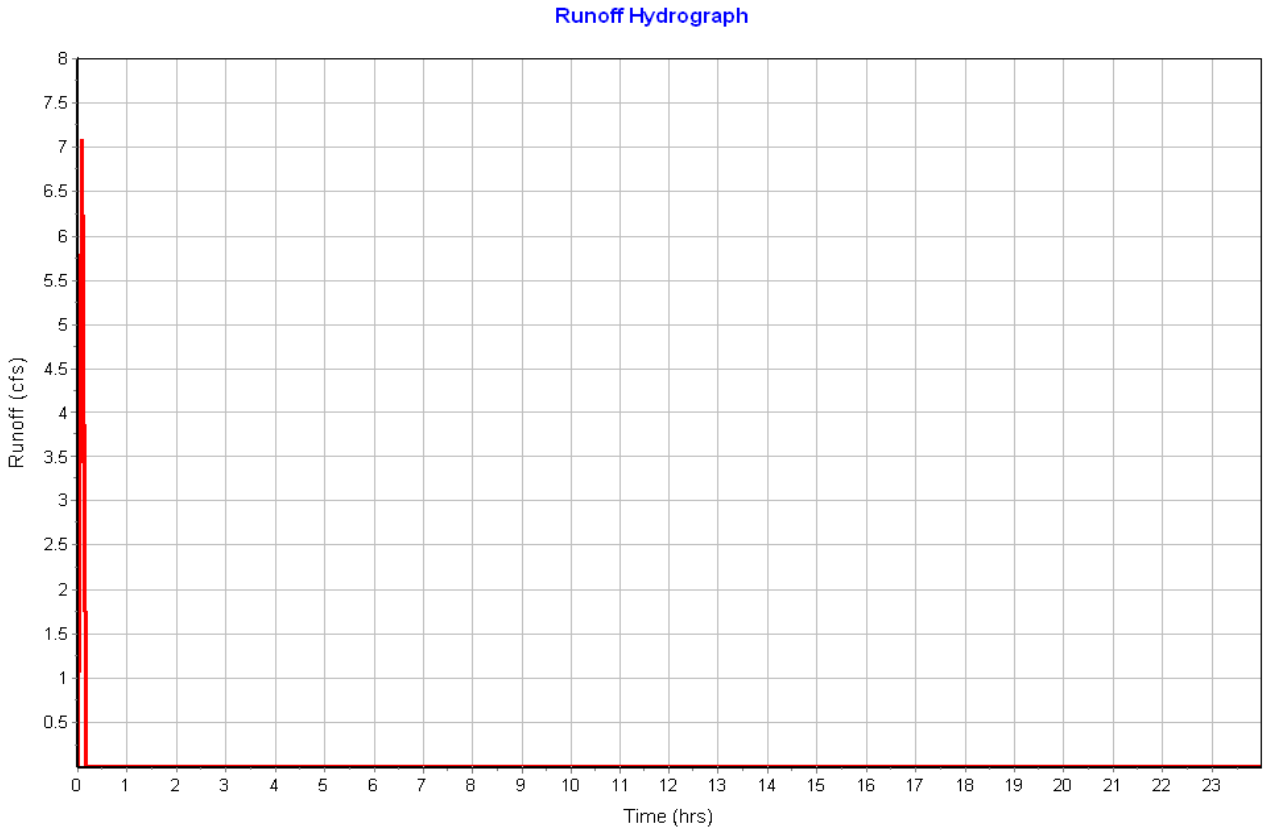
Time of Concentration

User-Defined TOC override (minutes): 5.00

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.30
Peak Runoff (cfs) 7.07
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.4300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-23A



Subbasin : Sub-23B

Input Data

Area (ft²) 6274.99
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	6274.99	-	0.90
Composite Area & Weighted Runoff Coeff.	6274.99		0.90

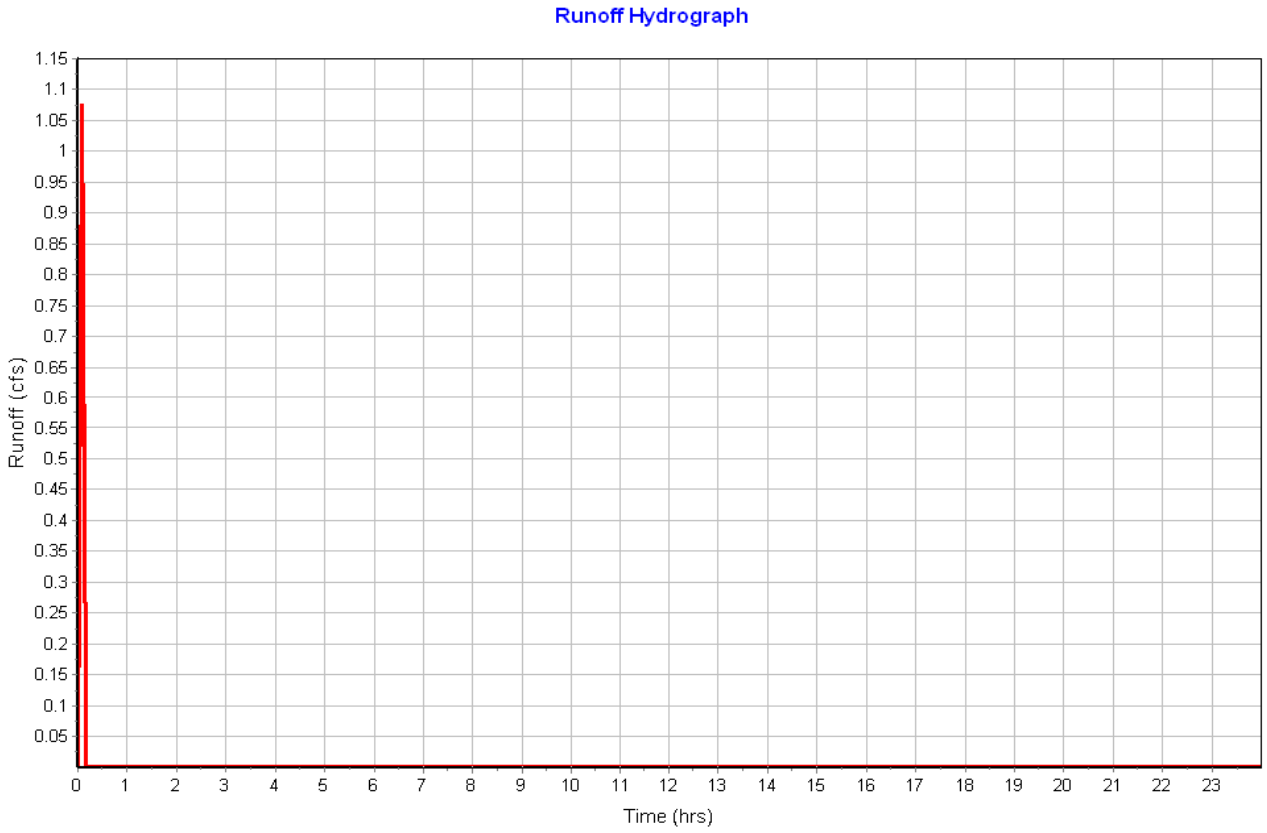
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 1.07
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-23B



Subbasin : Sub-24A

Input Data

Area (ft²) 60415.50
Weighted Runoff Coefficient 0.7800

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	60415.50	-	0.78
Composite Area & Weighted Runoff Coeff.	60415.50		0.78

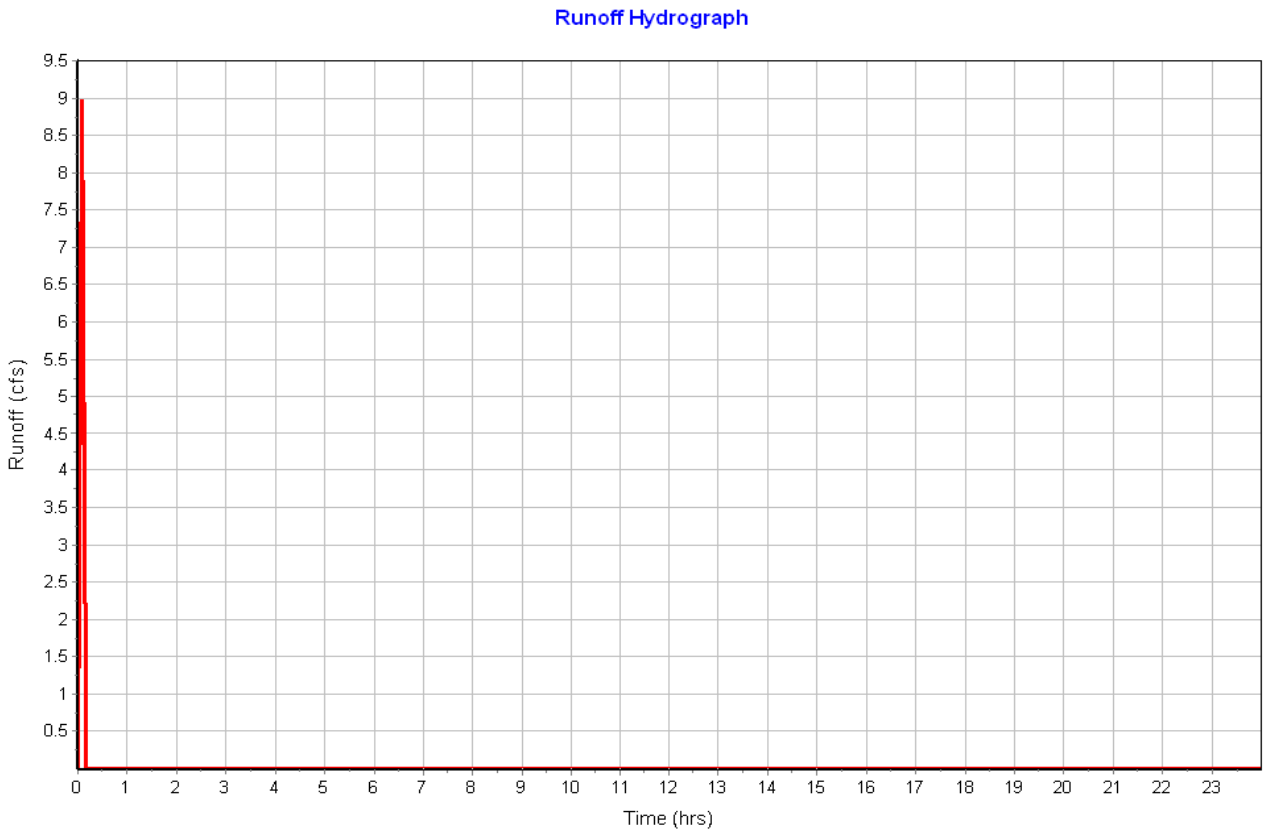
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.54
Peak Runoff (cfs) 8.96
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.7800
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-24A



Subbasin : Sub-24B

Input Data

Area (ft²) 7233.01
Weighted Runoff Coefficient 0.9000

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	7233.01	-	0.90
Composite Area & Weighted Runoff Coeff.	7233.01		0.90

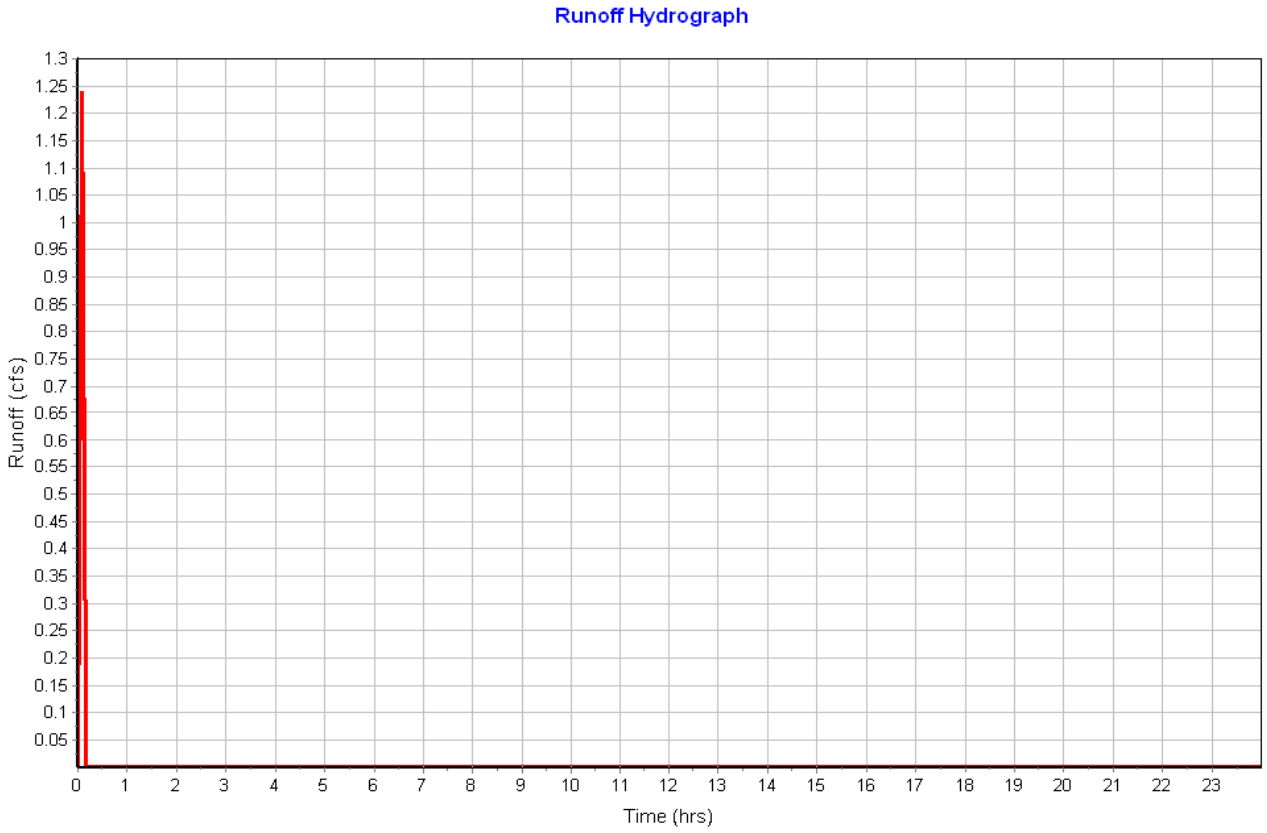
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.62
Peak Runoff (cfs) 1.24
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.9000
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-24B



Subbasin : Sub-25A

Input Data

Area (ft²) 9368.01
Weighted Runoff Coefficient 0.3300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	9368.01	-	0.33
Composite Area & Weighted Runoff Coeff.	9368.01		0.33

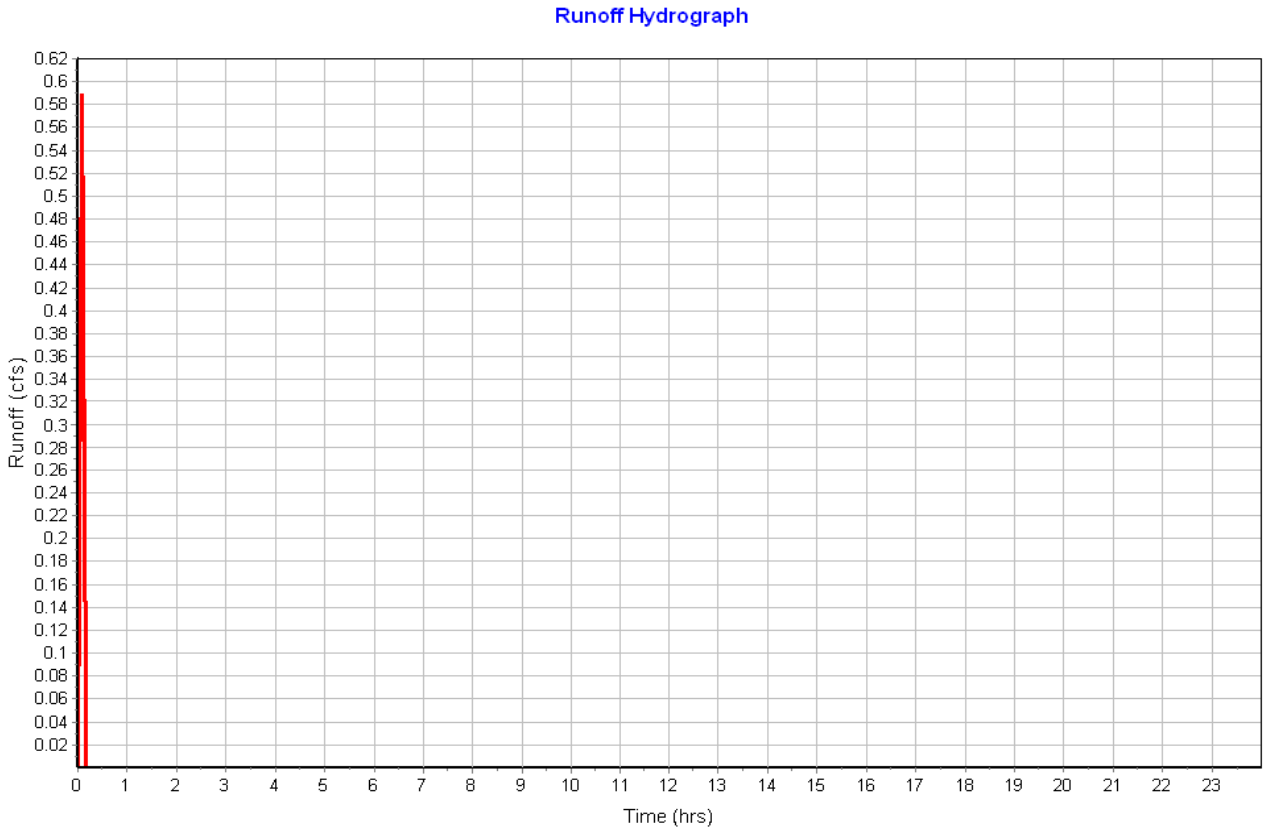
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.23
Peak Runoff (cfs) 0.59
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.3300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-25A



Subbasin : Sub-25B

Input Data

Area (ft²) 28858.98
Weighted Runoff Coefficient 0.2700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	28858.98	-	0.27
Composite Area & Weighted Runoff Coeff.	28858.98		0.27

Time of Concentration

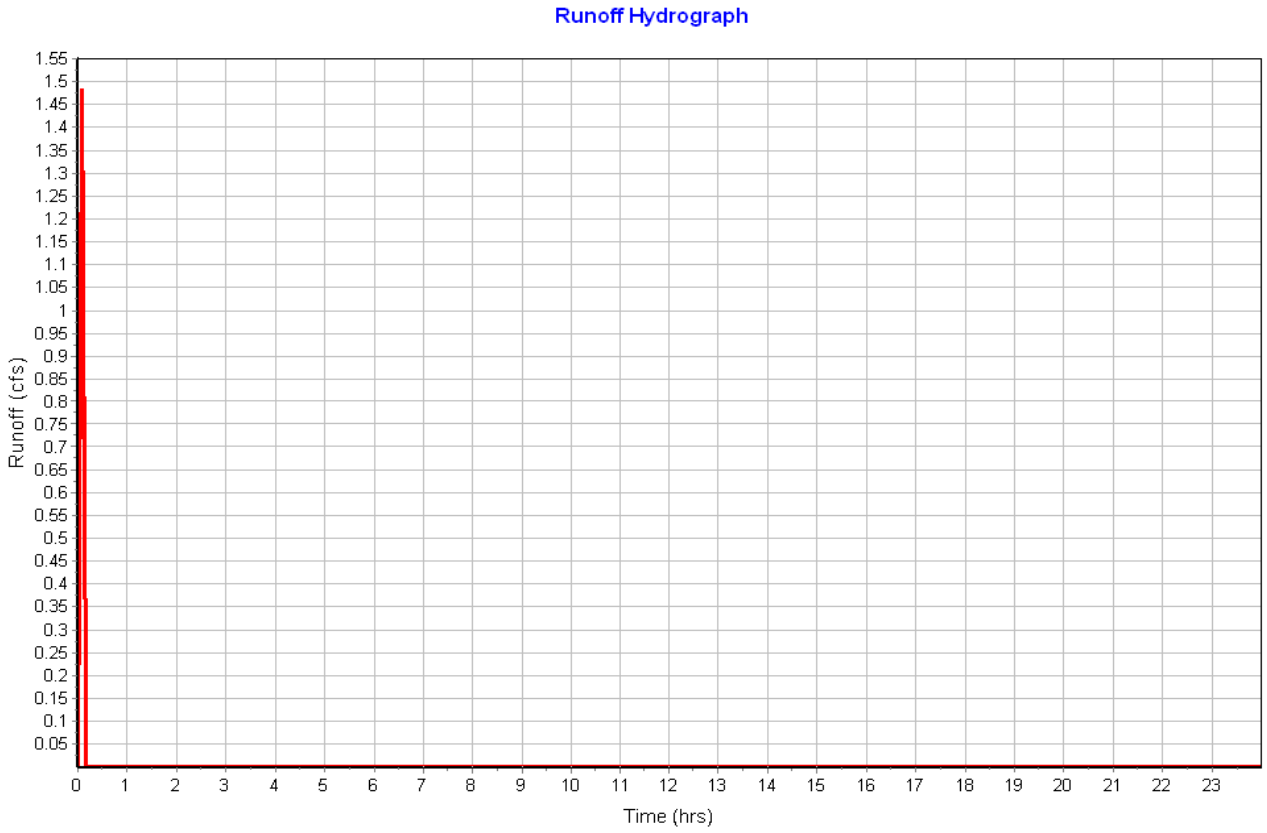
Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	392.518198	0.00	0.00
Slope (%) :	1.00551492	0.00	0.00
Surface Type :	Unpaved	Paved	Paved
Velocity (ft/sec) :	1.62	0.00	0.00
Computed Flow Time (min) :	4.04	0.00	0.00

Total TOC (min) 4.04

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.19
Peak Runoff (cfs) 1.48
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.2700
Time of Concentration (days hh:mm:ss) 0 00:04:02

Subbasin : Sub-25B



Subbasin : Sub-26A

Input Data

Area (ft²) 7316.34
Weighted Runoff Coefficient 0.6800

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	7316.34	-	0.68
Composite Area & Weighted Runoff Coeff.	7316.34		0.68

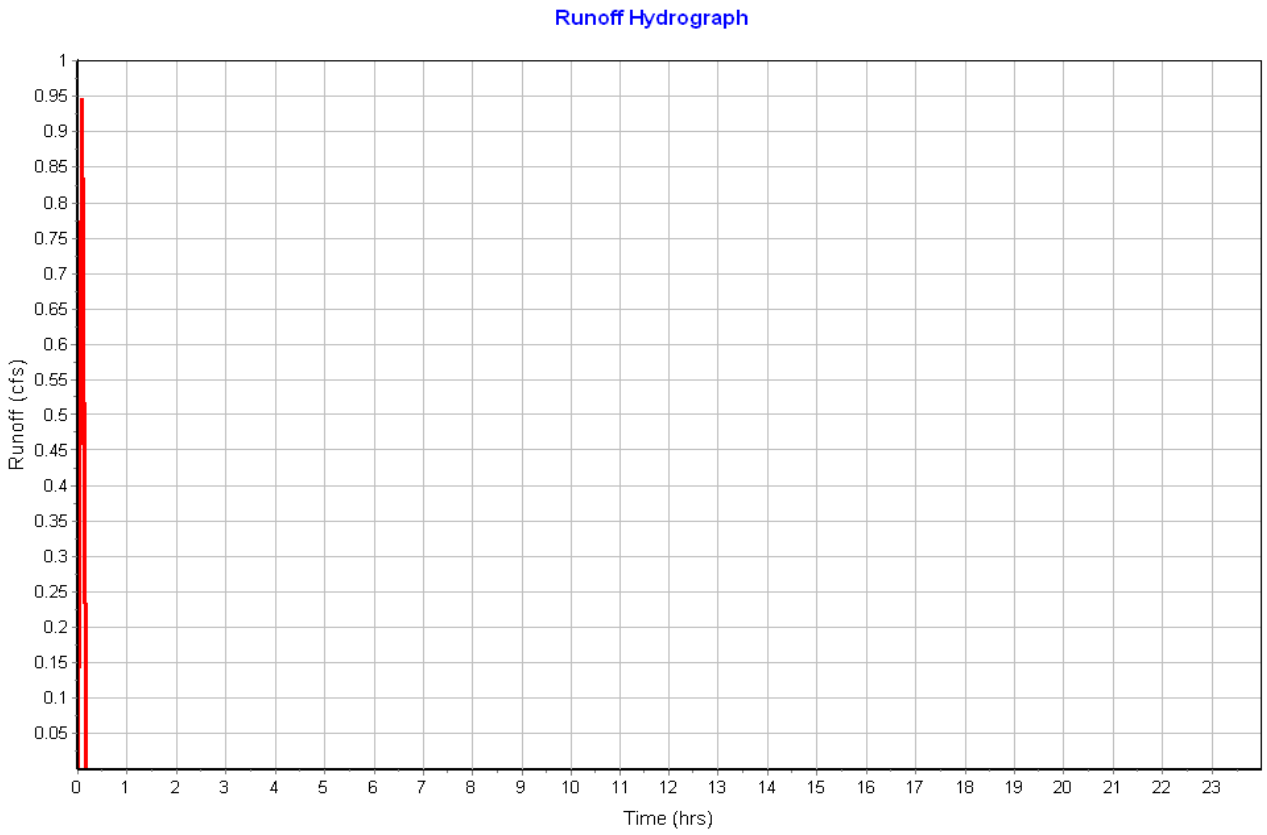
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.47
Peak Runoff (cfs) 0.95
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.6800
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-26A



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	10	835.29	840.46	5.17	835.29	0.00	840.46	0.00	0.00	38.03
2	11	834.69	839.58	4.89	834.69	0.00	839.58	0.00	0.00	34.67
3	12	834.09	838.58	4.49	834.09	0.00	838.58	0.00	0.00	29.87
4	12A	836.75	838.19	1.44	836.75	0.00	838.19	0.00	0.00	2.25
5	13	833.58	837.73	4.15	833.58	0.00	837.73	0.00	0.00	25.79
6	14	831.91	836.48	4.57	831.91	0.00	836.48	0.00	0.00	25.79
7	15	832.51	836.18	3.67	832.51	0.00	836.18	0.00	0.00	20.03
8	16	832.63	836.09	3.45	832.63	0.00	836.09	0.00	0.00	17.45
9	16A	833.35	835.51	2.16	833.35	0.00	835.51	0.00	0.00	7.97
10	17	832.75	836.17	3.42	832.75	0.00	836.17	0.00	0.00	17.08
11	18	832.95	836.59	3.64	832.95	0.00	836.59	0.00	0.00	19.68
12	18A	835.45	836.62	1.17	835.45	0.00	836.62	0.00	0.00	2.00
13	20	832.98	837.52	4.55	832.98	0.00	837.52	0.00	0.00	24.58
14	21	833.89	838.73	4.83	833.89	0.00	838.73	0.00	0.00	28.00
15	22	834.93	839.42	4.49	834.93	0.00	839.42	0.00	0.00	29.92
16	22.1	836.07	840.64	4.57	836.07	0.00	840.64	0.00	0.00	30.89
17	23	837.21	842.79	5.58	837.21	0.00	842.79	0.00	0.00	43.01
18	24	845.15	849.68	4.53	845.15	0.00	849.68	0.00	0.00	30.31
19	25	847.46	852.00	4.54	847.46	0.00	852.00	0.00	0.00	30.44
20	26	848.26	852.71	4.45	848.26	0.00	852.71	0.00	0.00	29.34
21	Jun-16Exist	834.19	835.69	1.50	834.19	0.00	835.69	0.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	10	2.55	0.00	836.17	0.88	0.00	4.29	835.30	0.01	0 00:06	0 00:00	0.00	0.00
2	11	9.75	0.00	836.08	1.39	0.00	3.50	834.71	0.02	0 00:06	0 00:00	0.00	0.00
3	12	12.95	0.00	835.79	1.70	0.00	2.79	834.11	0.02	0 00:06	0 00:00	0.00	0.00
4	12A	2.79	2.79	837.12	0.37	0.00	1.07	836.75	0.00	0 00:05	0 00:00	0.00	0.00
5	13	13.00	0.00	835.03	1.45	0.00	2.70	833.60	0.02	0 00:07	0 00:00	0.00	0.00
6	14	27.00	0.00	833.56	1.65	0.00	2.92	831.96	0.05	0 00:07	0 00:00	0.00	0.00
7	15	16.72	0.00	834.01	1.50	0.00	2.17	832.56	0.05	0 00:15	0 00:00	0.00	0.00
8	16	16.72	0.00	834.23	1.60	0.00	1.85	832.68	0.05	0 00:15	0 00:00	0.00	0.00
9	16A	6.53	0.00	834.68	1.33	0.00	0.83	833.39	0.04	0 00:15	0 00:00	0.00	0.00
10	17	4.18	0.00	834.23	1.48	0.00	1.94	832.79	0.04	0 00:15	0 00:00	0.00	0.00
11	18	3.20	0.00	834.23	1.28	0.00	2.35	832.99	0.04	0 00:15	0 00:00	0.00	0.00
12	18A	0.92	0.92	835.69	0.24	0.00	0.93	835.45	0.00	0 00:07	0 00:00	0.00	0.00
13	20	19.62	0.00	834.69	1.71	0.00	2.84	833.00	0.02	0 00:06	0 00:00	0.00	0.00
14	21	18.14	0.00	835.52	1.63	0.00	3.21	833.92	0.03	0 00:06	0 00:00	0.00	0.00
15	22	15.03	0.00	836.60	1.67	0.00	2.82	834.95	0.02	0 00:06	0 00:00	0.00	0.00
16	22.1	11.69	0.00	837.16	1.09	0.00	3.48	836.08	0.01	0 00:05	0 00:00	0.00	0.00
17	23	8.75	0.00	838.12	0.91	0.00	4.66	837.22	0.01	0 00:05	0 00:00	0.00	0.00
18	24	4.76	0.00	845.61	0.46	0.00	4.07	845.16	0.01	0 00:05	0 00:00	0.00	0.00
19	25	1.69	0.00	847.81	0.35	0.00	4.19	847.47	0.01	0 00:05	0 00:00	0.00	0.00
20	26	0.50	0.00	848.47	0.21	0.00	4.24	848.26	0.00	0 00:05	0 00:00	0.00	0.00
21	Jun-16Exist	10.38	10.38	835.69	1.50	0.00	0.00	834.24	0.05	0 00:10	0 00:16	0.39	12.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	L-11B-12C	242.41	839.46	4.74	838.46	3.59	1.00	0.4100	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
2	L-12C-13A	242.41	838.46	3.59	837.61	3.15	0.85	0.3500	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
3	L-13A-15A	214.40	837.61	3.15	836.08	2.79	1.53	0.7100	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
4	L15A-16C	28.00	836.08	2.79	835.97	3.31	0.11	0.4100	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
5	L16D-16C	6.58	832.80	-0.87	832.65	0.00	0.15	2.2500	User-Defined	0.500	17.000	0.0320	0.0000	0.0000	0.0000	0.00	No
6	L-17A-16D	31.92	836.05	2.52	835.97	2.30	0.08	0.2500	User-Defined	0.500	17.000	0.0320	0.0000	0.0000	0.0000	0.00	No
7	L18C-17A	66.46	836.47	2.74	836.05	2.52	0.42	0.6300	User-Defined	0.500	17.000	0.0320	0.0000	0.0000	0.0000	0.00	No
8	L-20A-18C	242.41	837.40	3.05	836.47	2.74	0.93	0.3800	User-Defined	0.500	17.000	0.0150	0.0000	0.0000	0.0000	0.00	No
9	L-21B-20A	242.41	838.57	3.38	837.40	3.05	1.17	0.4800	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
10	L22.1A-22A	113.68	840.48	2.36	839.26	3.41	1.22	1.0700	User-Defined	0.500	19.000	0.0320	0.0000	0.0000	0.0000	0.00	No
11	L-22A-21B	242.41	839.26	3.41	838.57	3.38	0.69	0.2800	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
12	L-22B-OFF	242.41	839.26	2.93	826.33	0.00	12.93	5.3300	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
13	L23A-22.1A	222.03	842.63	4.50	840.48	2.36	2.15	0.9700	User-Defined	0.500	19.000	0.0320	0.0000	0.0000	0.0000	0.00	No
14	L-23B-22B	242.41	842.63	4.02	839.26	2.93	3.37	1.3900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
15	L-24A-23A	242.41	849.52	3.45	842.63	4.50	6.89	2.8400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
16	L-24B-23B	242.41	849.52	2.97	842.63	4.02	6.89	2.8400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
17	L-25A-24A	242.41	851.84	3.46	849.52	3.45	2.32	0.9600	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
18	L25B-24B	231.43	851.84	2.98	849.52	2.97	2.32	1.0000	User-Defined	0.500	19.000	0.0320	0.0000	0.0000	0.0000	0.00	No
19	L-26A-25A	242.41	852.55	3.37	851.84	3.46	0.71	0.2900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	L-11B-12C	0.31	0 00:05	12.28	0.02	0.77	5.25	0.16	0.33	0.00		
2	L-12C-13A	0.44	0 00:05	11.32	0.04	1.07	3.78	0.17	0.33	0.00		
3	L-13A-15A	0.47	0 00:05	16.46	0.03	0.90	3.97	0.19	0.37	0.00		
4	L15A-16C	0.68	0 00:05	8.55	0.08	1.12	0.42	0.20	0.40	0.00		
5	L16D-16C	0.91	0 00:05	8.55	0.11	1.51	0.07	0.18	0.42	0.00		
6	L-17A-16D	2.60	0 00:05	9.67	0.27	2.75	0.19	0.25	0.53	0.00		
7	L18C-17A	3.40	0 00:05	15.13	0.22	2.30	0.48	0.32	0.65	0.00		
8	L-20A-18C	4.36	0 00:05	11.87	0.37	2.29	1.76	0.35	0.74	0.00		
9	L-21B-20A	5.70	0 00:05	13.04	0.44	2.23	1.81	0.38	0.87	0.00		
10	L22.1A-22A	8.42	0 00:05	32.37	0.26	3.01	0.63	0.40	0.88	0.00		
11	L-22A-21B	7.98	0 00:02	10.07	0.79	2.13	1.90	0.43	0.91	0.00		
12	L-22B-OFF	0.94	0 00:05	43.45	0.02	3.78	1.07	0.14	0.28	0.00		
13	L23A-22.1A	10.95	0 00:05	8.41	1.30	3.46	1.07	0.41	0.89	0.00		
14	L-23B-22B	1.12	0 00:05	22.17	0.05	2.66	1.52	0.17	0.33	0.00		
15	L-24A-23A	7.18	0 00:05	31.70	0.23	2.36	1.71	0.40	0.85	0.00		
16	L-24B-23B	1.05	0 00:05	31.70	0.03	2.16	1.87	0.18	0.35	0.00		
17	L-25A-24A	0.48	0 00:05	18.42	0.03	0.76	5.32	0.23	0.48	0.00		
18	L25B-24B	0.81	0 00:05	18.85	0.04	1.87	2.06	0.17	0.34	0.00		
19	L-26A-25A	0.44	0 00:05	10.14	0.04	1.01	4.00	0.17	0.34	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	10-11	200.46	835.29	0.00	834.69	0.00	0.60	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
2	10A-10B	60.59	836.53	0.00	836.35	0.00	0.18	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
3	10B-10C	24.01	836.35	0.00	836.28	0.25	0.07	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No
4	10C-10D	52.16	836.03	0.00	835.87	0.00	0.16	0.3000	CIRCULAR	18.000	18.000	0.0120	0.0000	0.6000	0.0000	0.00	No
5	10D-10	25.54	835.87	0.00	835.79	0.50	0.08	0.3000	CIRCULAR	18.000	18.000	0.0120	0.0000	0.6000	0.0000	0.00	No
6	11-12	200.00	834.69	0.00	834.09	0.00	0.60	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
7	11A-11B	18.50	834.82	0.00	834.72	0.00	0.09	0.5000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.5000	0.0000	0.00	No
8	11B-11	6.50	834.72	0.00	834.69	0.00	0.03	0.4900	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
9	12-13	170.00	834.09	0.00	833.58	0.00	0.51	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
10	12A-12B	22.00	836.75	0.00	835.04	0.00	1.71	7.7600	CIRCULAR	15.000	15.000	0.0120	0.5000	0.5000	0.0000	0.00	No
11	12B-12C	13.50	835.04	0.00	834.87	0.00	0.17	1.2600	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No
12	12C-12	6.50	834.87	0.00	834.84	0.75	0.03	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
13	13-14	250.00	833.58	0.00	832.33	0.42	1.25	0.5000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.9000	0.0000	0.00	No
14	13A-13	6.50	834.46	0.00	834.33	0.75	0.13	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
15	14-14A	38.10	831.91	0.00	831.80	0.00	0.11	0.3000	Horizontal Ellipse	29.040	45.000	0.0120	0.0000	0.5000	0.0000	0.00	No
16	15-14	60.01	832.51	0.00	832.33	0.42	0.18	0.3000	Horizontal Ellipse	24.000	38.040	0.0120	0.0000	0.9000	0.0000	0.00	No
17	15A-15	6.55	833.29	0.00	833.26	0.75	0.03	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
18	16-15	40.49	832.63	0.00	832.51	0.00	0.12	0.3000	Horizontal Ellipse	24.000	38.040	0.0120	0.0000	0.6000	0.0000	0.00	No
19	16A-16B	6.29	833.35	0.00	833.20	0.50	0.15	2.4500	CIRCULAR	18.000	18.000	0.0120	0.0000	0.6000	0.0000	0.00	No
20	16B-16C	16.62	832.70	0.00	832.65	0.00	0.04	0.2600	Horizontal Ellipse	24.000	38.040	0.0120	0.0000	0.6000	0.0000	0.00	No
21	16C-16	6.50	832.65	0.00	832.63	0.00	0.02	0.3100	Horizontal Ellipse	24.000	38.040	0.0120	0.0000	0.6000	0.0000	0.00	No
22	16D-16C	6.58	835.97	2.30	835.97	3.31	0.00	0.0800	CIRCULAR	12.000	12.000	0.0120	0.0000	0.6000	0.0000	0.00	No
23	17-16	38.50	832.75	0.00	832.63	0.00	0.12	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
24	17A-17	6.50	833.53	0.00	833.50	0.75	0.03	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
25	18-17	66.63	832.95	0.00	832.75	0.00	0.20	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
26	18A-18B	16.60	835.45	0.00	834.45	0.25	1.00	6.0000	CIRCULAR	12.000	12.000	0.0120	0.0000	0.5000	0.0000	0.00	No
27	18B-18C	14.32	834.20	0.00	833.73	0.00	0.47	3.3100	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No
28	18C-18	6.50	833.73	0.00	833.70	0.75	0.03	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.8000	0.0000	0.00	No
29	20-20B	44.97	832.98	0.00	832.76	0.00	0.21	0.4700	CIRCULAR	30.000	30.000	0.0120	0.0000	0.5000	0.0000	0.00	No
30	20A-20	6.50	834.35	0.00	834.22	1.25	0.13	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.8000	0.0000	0.00	No
31	21-20	183.86	833.89	0.00	832.98	0.00	0.92	0.5000	CIRCULAR	30.000	30.000	0.0120	0.0000	0.8000	0.0000	0.00	No
32	21A-21B	20.31	835.29	0.00	835.19	0.00	0.10	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No
33	21B-21	8.50	835.19	0.00	835.14	1.25	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
34	22.1-22	113.67	836.07	0.00	834.93	0.00	1.14	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
35	22.1A-22.1	8.75	836.86	-1.27	836.82	0.75	0.04	0.4900	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No
36	22-21	106.92	834.93	0.00	834.39	0.50	0.53	0.5000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
37	22A-22	8.50	835.85	0.00	835.68	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
38	22B-22	32.50	836.33	0.00	835.68	0.75	0.65	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
39	23-22.1	113.98	837.21	0.00	836.07	0.00	1.14	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No
40	23A-23	8.50	838.13	0.00	837.96	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
41	23B-23	32.50	838.61	0.00	837.96	0.75	0.65	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
42	24-23	300.00	845.15	0.00	837.21	0.00	7.94	2.6500	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No
43	24A-24	8.50	846.07	0.00	845.90	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
44	24B-24	32.50	846.55	0.00	845.90	0.75	0.65	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
45	25-24	231.43	847.46	0.00	845.15	0.00	2.31	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No
46	25A-25	8.50	848.38	0.00	848.21	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
47	25B-25	32.50	848.86	0.00	848.21	0.75	0.65	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No
48	26-25	99.04	848.26	0.00	847.46	0.00	0.80	0.8000	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No
49	26A-26	8.50	849.18	0.00	849.01	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.8000	0.0000	0.00	No
50	Link-08	78.95	834.19	0.00	833.35	0.00	0.84	1.0700	CIRCULAR	18.000	18.000	0.0240	0.0000	0.6000	0.0000	0.00	No

No. of Barrels
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Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	10-11	2.72	0 00:06	13.42	0.20	1.70	1.97	1.13	0.57	0.00		Calculated
2	10A-10B	0.61	0 00:05	3.82	0.16	1.42	0.71	0.48	0.38	0.00		Calculated
3	10B-10C	1.38	0 00:05	3.83	0.36	2.96	0.14	0.51	0.41	0.00		Calculated
4	10C-10D	2.01	0 00:05	6.24	0.32	2.42	0.36	0.71	0.48	0.00		Calculated
5	10D-10	2.55	0 00:05	6.25	0.41	3.35	0.13	0.67	0.45	0.00		Calculated
6	11-12	8.96	0 00:06	13.42	0.67	3.63	0.92	1.55	0.77	0.00		Calculated
7	11A-11B	8.01	0 00:05	17.38	0.46	3.29	0.09	1.45	0.72	0.00		Calculated
8	11B-11	8.30	0 00:05	17.20	0.48	4.86	0.02	1.41	0.71	0.00		Calculated
9	12-13	12.61	0 00:06	13.42	0.94	4.79	0.59	1.57	0.79	0.00		Calculated
10	12A-12B	2.81	0 00:06	19.49	0.14	4.04	0.09	0.69	0.55	0.00		Calculated
11	12B-12C	3.63	0 00:06	7.85	0.46	3.25	0.07	1.07	0.86	0.00		Calculated
12	12C-12	4.02	0 00:06	4.91	0.82	3.98	0.03	1.03	0.83	0.00		Calculated
13	13-14	12.67	0 00:07	17.33	0.73	5.59	0.75	1.36	0.68	0.00		Calculated
14	13A-13	0.54	0 00:05	9.90	0.05	3.49	0.03	0.64	0.51	0.00		Calculated
15	14-14A	27.01	0 00:07	41.07	0.66	5.39	0.12	1.50	0.62	0.00		Calculated
16	15-14	16.70	0 00:15	24.82	0.67	4.56	0.22	1.32	0.66	0.00		Calculated
17	15A-15	0.77	0 00:05	4.89	0.16	2.48	0.04	0.73	0.59	0.00		Calculated
18	16-15	16.72	0 00:15	24.78	0.67	3.88	0.17	1.55	0.78	0.00		Calculated
19	16A-16B	6.57	0 00:22	17.80	0.37	5.68	0.02	1.33	0.89	0.00		Calculated
20	16B-16C	16.24	0 00:15	23.06	0.70	3.40	0.08	1.78	0.89	0.00		Calculated
21	16C-16	16.24	0 00:15	25.14	0.65	3.56	0.03	1.67	0.83	0.00		Calculated
22	16D-16C	1.51	0 00:05	1.73	0.88	3.10	0.04	0.59	0.60	0.00		Calculated
23	17-16	4.01	0 00:06	13.45	0.30	1.74	0.37	1.54	0.77	0.00		Calculated
24	17A-17	1.27	0 00:05	4.91	0.26	2.89	0.04	0.72	0.58	0.00		Calculated
25	18-17	3.14	0 00:06	13.43	0.23	1.99	0.56	1.39	0.69	0.00		Calculated
26	18A-18B	0.92	0 00:07	9.45	0.10	6.95	0.04	0.22	0.22	0.00		Calculated
27	18B-18C	2.41	0 00:09	12.73	0.19	3.67	0.07	0.69	0.55	0.00		Calculated
28	18C-18	3.20	0 00:05	4.91	0.65	3.67	0.03	0.83	0.67	0.00		Calculated
29	20-20B	19.56	0 00:06	30.58	0.64	5.97	0.13	1.58	0.63	0.00		Calculated
30	20A-20	1.93	0 00:05	9.90	0.20	4.61	0.02	0.48	0.38	0.00		Calculated
31	21-20	18.18	0 00:06	31.42	0.58	5.24	0.58	1.67	0.67	0.00		Calculated
32	21A-21B	2.63	0 00:10	4.95	0.53	3.11	0.11	0.88	0.70	0.00		Calculated
33	21B-21	3.36	0 00:05	4.95	0.68	3.89	0.04	0.83	0.66	0.00		Calculated
34	22.1-22	11.72	0 00:06	24.50	0.48	5.07	0.37	1.38	0.69	0.00		Calculated
35	22.1A-22.1	3.42	0 00:05	27.08	0.13	10.99	0.01	0.38	0.31	0.00		Calculated
36	22-21	14.88	0 00:06	17.33	0.86	5.78	0.31	1.53	0.77	0.00		Calculated
37	22A-22	2.67	0 00:05	9.90	0.27	4.53	0.03	0.88	0.70	0.00		Calculated
38	22B-22	1.03	0 00:05	9.90	0.10	3.94	0.14	0.59	0.47	0.00		Calculated
39	23-22.1	8.65	0 00:06	24.51	0.35	5.54	0.34	1.01	0.50	0.00		Calculated
40	23A-23	3.29	0 00:05	9.90	0.33	5.07	0.03	0.65	0.52	0.00		Calculated
41	23B-23	0.99	0 00:05	9.90	0.10	4.57	0.12	0.29	0.23	0.00		Calculated
42	24-23	4.63	0 00:05	39.88	0.12	4.82	1.04	0.69	0.34	0.00		Calculated
43	24A-24	2.24	0 00:05	9.90	0.23	4.63	0.03	0.52	0.42	0.00		Calculated
44	24B-24	0.98	0 00:05	9.90	0.10	4.55	0.12	0.29	0.23	0.00		Calculated
45	25-24	1.62	0 00:05	24.51	0.07	3.56	1.08	0.40	0.20	0.00		Calculated
46	25A-25	0.54	0 00:05	9.90	0.05	3.39	0.04	0.23	0.19	0.00		Calculated
47	25B-25	0.67	0 00:05	9.90	0.07	4.14	0.13	0.24	0.19	0.00		Calculated
48	26-25	0.49	0 00:05	21.97	0.02	1.87	0.88	0.28	0.14	0.00		Calculated
49	26A-26	0.50	0 00:05	9.90	0.05	3.48	0.04	0.22	0.17	0.00		Calculated
50	Link-08	6.53	0 00:21	5.89	1.11	4.00	0.33	1.42	0.94	0.00		> CAPACITY

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft^2)	Grate Clogging Factor (%)
1	10A	NEENAH FOUNDRY	R-4882	On Sag	1	836.53	838.69	2.16	836.53	0.00	8.12	50.00
2	10B	NEENAH FOUNDRY	R-4882	On Sag	1	836.35	839.09	2.75	836.35	0.00	16.25	50.00
3	10C	NEENAH FOUNDRY	R-3067	On Sag	1	836.03	840.13	4.10	836.03	0.00	6.00	35.00
4	10D	NEENAH FOUNDRY	R-3067	On Sag	1	835.87	840.04	4.17	835.87	0.00	6.00	35.00
5	11A	NEENAH FOUNDRY	R-4882	On Sag	1	834.82	837.44	2.63	834.82	0.00	16.25	50.00
6	11B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.72	839.46	4.74	834.72	0.00	N/A	0.00
7	12B	NEENAH FOUNDRY	R-4882	On Sag	1	835.04	836.73	1.68	835.04	0.00	8.12	50.00
8	12C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.87	838.46	3.59	834.87	0.00	N/A	0.00
9	13A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.46	837.61	3.15	834.46	0.00	N/A	0.00
10	15A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.29	836.02	2.73	832.90	-0.39	N/A	0.00
11	16B	NEENAH FOUNDRY	R-3508-B	On Sag	1	832.70	835.20	2.50	832.70	0.00	3.70	50.00
12	16C	NEENAH FOUNDRY	R-3067	On Sag	1	832.65	835.97	3.31	832.65	0.00	6.00	50.00
13	16D	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.67	835.97	2.30	833.67	0.00	N/A	0.00
14	17A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.53	836.05	2.52	833.53	0.00	N/A	0.00
15	18B	NEENAH FOUNDRY	R-4882	On Sag	1	834.20	835.85	1.64	834.20	0.00	8.12	50.00
16	18C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.73	836.47	2.74	833.83	0.10	N/A	0.00
17	20A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.35	837.40	3.05	834.35	0.00	N/A	0.00
18	21A	NEENAH FOUNDRY	R-4882	On Sag	1	835.29	837.40	2.11	835.29	0.00	8.12	50.00
19	21B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.19	838.57	3.38	835.19	0.00	N/A	0.00
20	22.1A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.13	842.63	4.50	838.13	0.00	N/A	0.00
21	22A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.85	839.26	3.41	835.85	0.00	N/A	0.00
22	22B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.33	839.26	2.93	836.33	0.00	N/A	0.00
23	23A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.13	842.63	4.50	838.13	0.00	N/A	0.00
24	23B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	838.61	842.63	4.02	838.61	0.00	N/A	0.00
25	24A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.07	849.52	3.45	846.07	0.00	N/A	0.00
26	24B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.55	849.52	2.97	846.55	0.00	N/A	0.00
27	25A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.38	851.84	3.46	848.38	0.00	N/A	0.00
28	25B	NEENAH FOUNDRY	R 3067 Diagonal Reversible	On Grade	1	848.86	851.84	2.98	848.86	0.00	N/A	35.00
29	26A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	849.18	852.55	3.37	849.18	0.00	N/A	0.00

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	10A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
2	10B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
3	10C	N/A	0.0190	0.0130	0.0400	2.00	0.0000	13.00
4	10D	N/A	0.0240	0.0130	0.0400	2.00	0.0000	13.00
5	11A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
6	11B	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	13.00
7	12B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
8	12C	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	13.00
9	13A	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	13.00
10	15A	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	13.00
11	16B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
12	16C	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
13	16D	0.0008	0.0200	0.0130	0.0400	2.00	0.0000	13.00
14	17A	0.0044	0.0200	0.0130	0.0400	2.00	0.0000	13.00
15	18B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
16	18C	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
17	20A	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
18	21A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	13.00
19	21B	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
20	22.1A	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
21	22A	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
22	22B	0.0065	0.0200	0.0130	0.0400	2.00	0.0000	13.00
23	23A	0.0230	0.0200	0.0130	0.0400	2.00	0.0000	13.00
24	23B	0.0230	0.0200	0.0130	0.0400	2.00	0.0000	13.00
25	24A	0.0170	0.0200	0.0130	0.0400	2.00	0.0000	13.00
26	24B	0.0170	0.0200	0.0130	0.0400	2.00	0.0000	13.00
27	25A	0.0071	0.0200	0.0130	0.0400	2.00	0.0000	13.00
28	25B	0.0071	0.0200	0.0130	0.0400	2.00	0.0000	13.00
29	26A	0.0071	0.0200	0.0130	0.0400	2.00	0.0000	13.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	10A	0.65	0.65	N/A	N/A	N/A	1.26	838.76	0.07	0 00:05	0.00	0.00
2	10B	0.81	0.81	N/A	N/A	N/A	1.78	839.17	0.08	0 00:05	0.00	0.00
3	10C	0.69	0.69	N/A	N/A	N/A	3.41	840.24	0.11	0 00:05	0.00	0.00
4	10D	0.59	0.59	N/A	N/A	N/A	2.72	840.13	0.10	0 00:05	0.00	0.00
5	11A	8.09	8.09	N/A	N/A	N/A	33.31	838.14	0.70	0 00:05	0.00	0.00
6	11B	0.67	0.67	0.36	0.31	53.99	3.77	839.56	0.10	0 00:05	0.00	0.00
7	12B	1.00	1.00	N/A	N/A	N/A	2.40	836.81	0.09	0 00:06	0.00	0.00
8	12C	0.97	0.67	0.53	0.45	54.25	5.46	838.61	0.15	0 00:06	0.00	0.00
9	13A	1.01	0.57	0.54	0.47	53.43	5.63	837.76	0.15	0 00:07	0.00	0.00
10	15A	1.49	1.03	0.69	0.80	46.48	6.72	836.19	0.17	0 00:15	0.00	0.00
11	16B	9.98	9.98	N/A	N/A	N/A	262.70	840.39	5.20	0 00:15	0.00	0.00
12	16C	1.76	0.17	N/A	N/A	N/A	8.08	836.15	0.18	0 00:15	0.00	0.00
13	16D	2.71	0.11	1.64	1.07	60.54	13.52	836.28	0.31	0 00:05	0.00	0.00
14	17A	3.65	0.25	1.26	2.38	34.60	10.62	836.30	0.25	0 00:15	0.00	0.00
15	18B	1.76	1.76	N/A	N/A	N/A	4.46	835.97	0.13	0 00:09	0.00	0.00
16	18C	4.80	0.44	1.43	3.37	29.87	11.02	836.73	0.26	0 00:05	0.00	0.00
17	20A	6.36	0.68	1.71	4.65	26.89	12.47	837.69	0.29	0 00:05	0.00	0.00
18	21A	2.63	2.63	N/A	N/A	N/A	6.50	837.57	0.17	0 00:05	0.00	0.00
19	21B	8.21	0.43	2.01	6.20	24.45	13.93	838.89	0.32	0 00:05	0.00	0.00
20	22.1A	11.82	0.88	2.99	8.84	25.27	16.27	842.99	0.37	0 00:05	0.00	0.00
21	22A	9.88	1.45	2.25	7.63	22.81	15.08	839.60	0.34	0 00:06	0.00	0.00
22	22B	1.97	0.86	0.82	1.15	41.71	7.32	839.45	0.19	0 00:05	0.00	0.00
23	23A	14.25	7.07	2.54	11.70	17.86	13.46	842.94	0.31	0 00:05	0.00	0.00
24	23B	2.12	1.07	0.77	1.34	36.44	5.54	842.78	0.15	0 00:05	0.00	0.00
25	24A	9.43	8.95	2.07	7.36	21.96	12.01	849.80	0.28	0 00:05	0.00	0.00
26	24B	2.03	1.24	0.79	1.24	39.01	5.88	849.67	0.16	0 00:05	0.00	0.00
27	25A	1.02	0.59	0.54	0.48	52.77	5.17	851.98	0.14	0 00:05	0.00	0.00
28	25B	1.48	1.48	0.67	0.81	45.43	6.13	852.00	0.16	0 00:05	0.00	0.00
29	26A	0.95	0.95	0.50	0.44	53.36	4.84	852.68	0.13	0 00:05	0.00	0.00

Project Description

File Name	3670-01-01_Pipe Analysis_SSA-NoBike_Urban.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Hydrodynamic
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	May 21, 2019	00:00:00
End Analysis On	May 22, 2019	00:00:00
Start Reporting On	May 21, 2019	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	20
Nodes	40
Junctions	15
Outfalls	5
Flow Diversions	0
Inlets	20
Storage Nodes	0
Links	50
Channels	15
Pipes	35
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	25 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ft²)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-30A	8127.77	0.6800	0.69	0.47	0.09	1.05	0 00:05:00
2	Sub-30B	19732.98	0.4500	0.69	0.31	0.14	1.69	0 00:05:00
3	Sub-31A	56666.99	0.4100	0.69	0.28	0.37	4.42	0 00:05:00
4	Sub-32A	16279.94	0.5600	0.69	0.39	0.14	1.73	0 00:05:00
5	Sub-32B	18227.46	0.5300	0.69	0.37	0.15	1.84	0 00:05:00
6	Sub-33A	16834.02	0.5800	0.69	0.40	0.15	1.86	0 00:05:00
7	Sub-33B	34363.00	0.4400	0.69	0.30	0.24	2.87	0 00:05:00
8	Sub-34A	8205.18	0.5600	0.69	0.39	0.07	0.87	0 00:05:00
9	Sub-34B	32104.98	0.3700	0.69	0.26	0.19	2.26	0 00:05:00
10	Sub-41A	12095.00	0.6300	0.69	0.44	0.12	1.45	0 00:05:00
11	Sub-42A	6791.00	0.5300	0.69	0.37	0.06	0.68	0 00:05:00
12	Sub-42B	2798.99	0.6900	0.69	0.48	0.03	0.37	0 00:05:00
13	Sub-42C	10483.02	0.5600	0.69	0.39	0.09	1.12	0 00:05:00
14	Sub-43A	5678.48	0.1600	0.69	0.11	0.01	0.17	0 00:05:00
15	Sub-43B	4797.00	0.7400	0.69	0.51	0.06	0.68	0 00:05:00
16	Sub-43C	6107.98	0.5900	0.69	0.41	0.06	0.69	0 00:05:00
17	Sub-44A	23215.00	0.4100	0.69	0.28	0.15	1.81	0 00:05:00
18	Sub-45A	44108.90	0.3900	0.69	0.27	0.27	3.27	0 00:05:00
19	Sub-45B	21768.85	0.4700	0.69	0.32	0.16	1.95	0 00:05:00
20	Sub-47A	20500.82	0.7500	0.69	0.52	0.24	2.92	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	30	Junction	847.59	852.55	847.59	852.55	0.00	1.22	847.95	0.00	4.60	0 00:00	0.00	0.00
2	31	Junction	846.76	851.55	846.76	851.55	0.00	2.63	847.38	0.00	4.17	0 00:00	0.00	0.00
3	32	Junction	846.17	850.70	846.17	850.70	0.00	5.80	846.67	0.00	4.03	0 00:00	0.00	0.00
4	33	Junction	835.49	840.19	835.49	840.19	0.00	7.27	836.19	0.00	4.00	0 00:00	0.00	0.00
5	34	Junction	834.39	839.48	834.39	839.48	0.00	11.57	835.41	0.00	4.06	0 00:00	0.00	0.00
6	35	Junction	832.11	837.52	832.11	837.52	0.00	11.66	833.38	0.00	4.14	0 00:00	0.00	0.00
7	36	Junction	831.84	837.45	831.84	837.45	0.00	11.58	832.92	0.00	4.54	0 00:00	0.00	0.00
8	41	Junction	831.98	837.23	831.98	837.23	0.00	12.35	832.84	0.00	4.40	0 00:00	0.00	0.00
9	42	Junction	832.56	837.09	832.56	837.09	0.00	11.75	833.84	0.00	3.25	0 00:00	0.00	0.00
10	43	Junction	832.76	837.29	832.76	837.29	0.00	7.11	834.11	0.00	3.18	0 00:00	0.00	0.00
11	44	Junction	833.10	837.95	833.10	837.95	0.00	5.23	834.24	0.00	3.71	0 00:00	0.00	0.00
12	45	Junction	833.51	838.67	833.51	838.67	0.00	3.65	834.31	0.00	4.36	0 00:00	0.00	0.00
13	46	Junction	834.26	839.26	834.26	839.26	0.00	1.01	834.53	0.00	4.73	0 00:00	0.00	0.00
14	47	Junction	841.15	846.54	841.15	846.54	0.00	1.02	841.35	0.00	5.19	0 00:00	0.00	0.00
15	79	Junction	848.35	849.41	848.35	849.41	0.00	0.00	848.35	0.00	1.05	0 00:00	0.00	0.00
16	OFFSITE-4	Outfall	837.01					4.08	837.21					
17	OFFSITE-5	Outfall	836.96					1.31	837.09					
18	OFFSITE-7	Outfall	826.28					1.11	826.41					
19	Out-136-37	Outfall	831.28					11.59	832.15					
20	Out-141-40	Outfall	830.00					12.36	830.73					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	14 (81)	Pipe	79	31A	89.66	848.35	847.91	0.5000	12.000	0.0120	0.00	2.73	0.00	0.00	0.16	0.16	0.00	Calculated
2	30-31	Pipe	30	31	166.95	847.59	846.76	0.5000	24.000	0.0120	1.18	17.33	0.07	2.04	0.49	0.24	0.00	Calculated
3	30A-30	Pipe	30A	30	8.50	848.38	848.34	0.5000	15.000	0.0120	0.52	4.95	0.11	2.22	0.31	0.25	0.00	Calculated
4	30B-30	Pipe	30B	30	32.50	848.78	848.34	1.3400	15.000	0.0120	0.69	8.11	0.09	3.67	0.26	0.21	0.00	Calculated
5	31-32	Pipe	31	32	171.05	846.76	846.17	0.3500	24.000	0.0120	2.57	14.41	0.18	3.59	0.56	0.28	0.00	Calculated
6	31A-31	Pipe	31A	31	49.59	847.66	847.51	0.3000	15.000	0.0120	1.44	3.83	0.38	2.97	0.52	0.42	0.00	Calculated
7	32-33	Pipe	32	33	384.98	846.17	835.49	2.7700	24.000	0.0120	5.68	40.81	0.14	7.21	0.60	0.30	0.00	Calculated
8	32A-32	Pipe	32A	32	8.50	846.96	846.92	0.5000	15.000	0.0120	1.09	4.95	0.22	2.64	0.46	0.37	0.00	Calculated
9	32B-32	Pipe	32B	32	32.50	847.01	846.92	0.3000	15.000	0.0120	2.39	3.84	0.62	3.21	0.73	0.58	0.00	Calculated
10	33-34	Pipe	33	34	36.37	835.49	834.39	3.0300	24.000	0.0120	7.16	42.68	0.17	5.67	0.86	0.43	0.00	Calculated
11	33A-33	Pipe	33A	33	8.50	836.28	836.24	0.5000	15.000	0.0120	0.73	4.95	0.15	2.39	0.37	0.30	0.00	Calculated
12	33B-33	Pipe	33B	33	32.50	836.40	836.24	0.5000	15.000	0.0120	0.96	4.95	0.19	2.77	0.41	0.33	0.00	Calculated
13	34-35	Pipe	34	35	225.62	834.39	832.11	1.0100	24.000	0.0120	11.66	24.62	0.47	6.28	1.14	0.57	0.00	Calculated
14	34A-34	Pipe	34A	34	54.54	835.41	835.14	0.5000	15.000	0.0120	4.53	4.95	0.92	4.21	1.02	0.82	0.00	Calculated
15	34B-34A	Pipe	34B	34A	36.74	835.59	835.41	0.5000	15.000	0.0120	2.17	4.95	0.44	2.13	1.12	0.90	0.00	Calculated
16	35-36	Pipe	35	36	27.33	832.11	831.84	1.0000	24.000	0.0120	11.58	24.50	0.47	6.03	1.18	0.59	0.00	Calculated
17	36-37	Pipe	36	Out-136-37	38.30	831.84	831.28	1.4500	24.000	0.0120	11.59	29.52	0.39	7.63	0.97	0.49	0.00	Calculated
18	41-40	Pipe	41	Out-141-40	62.55	831.98	830.00	3.1700	24.000	0.0120	12.36	43.60	0.28	10.67	0.79	0.40	0.00	Calculated
19	41A-41	Pipe	41A	41	8.50	832.90	832.73	2.0000	15.000	0.0120	0.68	9.90	0.07	3.64	0.26	0.21	0.00	Calculated
20	42-41	Pipe	42	41	54.88	832.56	831.98	1.0600	24.000	0.0120	11.75	25.19	0.47	6.91	1.07	0.53	0.00	Calculated
21	42A-42	Pipe	42A	42	8.50	833.48	833.31	2.0000	15.000	0.0120	2.92	9.90	0.29	4.81	0.64	0.51	0.00	Calculated
22	42B-42	Pipe	42B	42	32.97	833.41	833.31	0.3000	15.000	0.0120	1.89	3.85	0.49	3.00	0.64	0.51	0.00	Calculated
23	42C-42B	Pipe	42C	42B	26.92	833.74	833.66	0.3000	12.000	0.0120	0.72	2.11	0.34	2.25	0.47	0.47	0.00	Calculated
24	43-42	Pipe	43	42	65.43	832.76	832.56	0.3100	24.000	0.0120	6.96	13.55	0.51	3.19	1.31	0.66	0.00	Calculated
25	43A-43B	Pipe	43A	43B	13.59	833.62	833.55	0.5000	15.000	0.0120	0.17	4.95	0.03	0.75	0.64	0.51	0.00	Calculated
26	43B-43	Pipe	43B	43	8.50	833.55	833.51	0.5000	15.000	0.0120	1.60	4.95	0.32	2.90	0.63	0.51	0.00	Calculated
27	43C-43	Pipe	43C	43	32.50	833.67	833.51	0.5000	15.000	0.0120	0.94	4.95	0.19	2.56	0.53	0.43	0.00	Calculated
28	44-43	Pipe	44	43	112.58	833.10	832.76	0.3000	24.000	0.0120	4.84	13.42	0.36	2.45	1.25	0.62	0.00	Calculated
29	44A-44	Pipe	44A	44	13.26	834.11	833.85	1.9800	15.000	0.0120	1.90	9.86	0.19	5.16	0.42	0.34	0.00	Calculated
30	45-44	Pipe	45	44	137.95	833.51	833.10	0.3000	24.000	0.0120	3.38	13.42	0.25	2.61	0.97	0.48	0.00	Calculated
31	45A-45	Pipe	45A	45	13.19	834.52	834.26	2.0000	15.000	0.0120	1.92	9.90	0.19	4.68	0.46	0.37	0.00	Calculated
32	45B-45	Pipe	45B	45	27.81	835.09	834.26	3.0000	15.000	0.0120	0.81	12.12	0.07	4.96	0.24	0.19	0.00	Calculated
33	46-45	Pipe	46	45	75.18	834.26	833.51	1.0000	24.000	0.0120	0.97	24.51	0.04	1.49	0.53	0.27	0.00	Calculated
34	47-46	Pipe	47	46	204.05	841.15	834.26	3.3700	24.000	0.0120	1.01	45.02	0.02	5.18	0.24	0.12	0.00	Calculated
35	47A-47	Pipe	47A	47	40.35	843.26	841.88	3.4000	15.000	0.0120	1.02	12.90	0.08	5.95	0.25	0.20	0.00	Calculated
36	L-30A-32A	Channel	30A	32A	163.10	852.39	850.56	1.1200	6.000	0.0150	0.52	24.93	0.02	2.08	0.13	0.27	0.00	
37	L-30B-32B	Channel	30B	32B	163.10	852.39	850.54	1.1400	6.000	0.0150	0.98	25.08	0.04	2.06	0.18	0.35	0.00	
38	L-31A-32B	Channel	31A	32B	163.10	851.89	850.54	0.8300	6.000	0.0150	2.93	21.40	0.14	2.62	0.26	0.51	0.00	
39	L-32A-OFF	Channel	32A	OFFSITE-5	163.10	850.56	836.96	8.3400	6.000	0.0150	1.31	67.89	0.02	5.94	0.13	0.26	0.00	
40	L-32B-OFF	Channel	32B	OFFSITE-4	163.10	850.54	837.01	8.2900	6.000	0.0150	4.08	67.70	0.06	7.29	0.19	0.38	0.00	
41	L-33A-OFF	Channel	33A	OFFSITE-7	163.10	839.96	826.28	8.3900	6.000	0.0150	1.11	68.09	0.02	6.04	0.13	0.25	0.00	
42	L-33B-34A	Channel	33B	34A	163.10	840.03	838.90	0.7000	6.000	0.0150	1.89	19.61	0.10	2.01	0.24	0.48	0.00	
43	L-41A-42A	Channel	41A	42A	163.10	837.07	836.93	0.0900	6.000	0.0150	0.76	12.88	0.06	0.74	0.25	0.49	0.00	
44	L-42C-42B	Channel	42C	42B	163.10	836.95	846.60	-5.9200	6.000	0.0150	0.38	12.88	0.03	0.61	0.20	0.40	0.00	
45	L-43B-42A	Channel	43B	42A	163.10	837.13	836.93	0.1200	6.000	0.0150	2.32	12.88	0.18	1.38	0.31	0.62	0.00	
46	L-43C-42B	Channel	43C	42B	163.10	837.13	836.93	0.1200	6.000	0.0150	0.85	12.88	0.07	1.94	0.20	0.40	0.00	
47	L-44A-43B	Channel	44A	43B	110.22	837.70	837.13	0.5200	6.000	0.0320	3.13	16.92	0.19	1.83	0.32	0.63	0.00	
48	L-45A-44A	Channel	45A	44A	163.10	838.41	837.70	0.4400	6.000	0.0150	3.25	15.56	0.21	2.19	0.29	0.58	0.00	
49	L-45B-43C	Channel	45B	43C	163.10	838.89	837.13	1.0800	6.000	0.0150	1.12	24.45	0.05	1.49	0.22	0.44	0.00	
50	L-47A-45A	Channel	47A	45A	163.10	847.74	838.41	5.7200	6.000	0.0150	1.89	56.35	0.03	2.18	0.23	0.46	0.00	

Inlet Summary

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Initial Water Elevation (ft)	Ponded Area (ft^2)	Peak Flow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)
1	30A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.38	852.39	848.38	N/A	1.05	0.52	0.52	50.03	15.00	5.28	852.54
2	30B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.78	852.39	848.78	N/A	1.69	0.70	0.98	41.61	15.00	6.64	852.56
3	31A	NEENAH FOUNDRY	R 3250A Special Diagonal	On Grade	1	847.66	851.89	847.66	N/A	4.41	1.48	2.93	33.62	15.00	6.78	852.11
4	32A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.96	850.56	846.96	N/A	2.25	0.94	1.31	41.91	15.00	8.47	850.77
5	32B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	847.01	850.54	847.01	N/A	5.72	1.64	4.08	28.68	15.00	12.61	850.83
6	33A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.28	839.96	836.28	N/A	1.85	0.74	1.11	39.88	15.00	5.35	840.11
7	33B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.40	840.03	836.40	N/A	2.87	0.98	1.90	33.97	15.00	6.69	840.21
8	34A	NEENAH FOUNDRY	R-3067	On Sag	1	835.41	838.90	835.41	6.00	2.76	N/A	N/A	N/A	15.00	11.56	839.15
9	34B	NEENAH FOUNDRY	R-3067	On Sag	1	835.59	838.71	835.59	6.00	2.26	N/A	N/A	N/A	15.00	9.86	838.94
10	41A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	832.90	837.07	832.90	N/A	1.45	0.69	0.76	47.40	15.00	6.61	837.25
11	42A	NEENAH FOUNDRY	R-3067	On Sag	1	833.48	836.93	833.48	6.00	3.76	N/A	N/A	N/A	15.00	17.98	837.21
12	42B	NEENAH FOUNDRY	R-3067	On Sag	1	833.41	836.93	833.41	6.00	1.58	N/A	N/A	N/A	15.00	7.35	837.09
13	42C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.74	836.95	833.74	N/A	1.11	0.73	0.38	65.93	15.00	7.33	837.14
14	43A	NEENAH FOUNDRY	R-3508-B	On Sag	1	833.62	837.59	833.62	4.00	0.17	N/A	N/A	N/A	15.00	0.82	837.65
15	43B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.55	837.13	833.55	N/A	3.80	1.27	2.53	33.41	15.00	10.52	837.38
16	43C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.67	837.13	833.67	N/A	1.81	0.79	1.01	43.92	15.00	7.42	837.32
17	44A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.11	837.70	834.11	N/A	5.04	1.49	3.55	29.55	15.00	11.79	837.97
18	45A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.52	838.41	834.52	N/A	5.15	1.50	3.65	29.13	15.00	11.85	838.69
19	45B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.09	838.89	835.09	N/A	1.94	0.81	1.13	41.92	15.00	7.59	839.08
20	47A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	843.26	847.78	843.26	N/A	2.92	1.03	1.89	35.17	15.00	8.90	848.00

Subbasin Hydrology

Subbasin : Sub-30A

Input Data

Area (ft²) 8127.77
Weighted Runoff Coefficient 0.6800

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	8127.77	-	0.68
Composite Area & Weighted Runoff Coeff.	8127.77		0.68

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

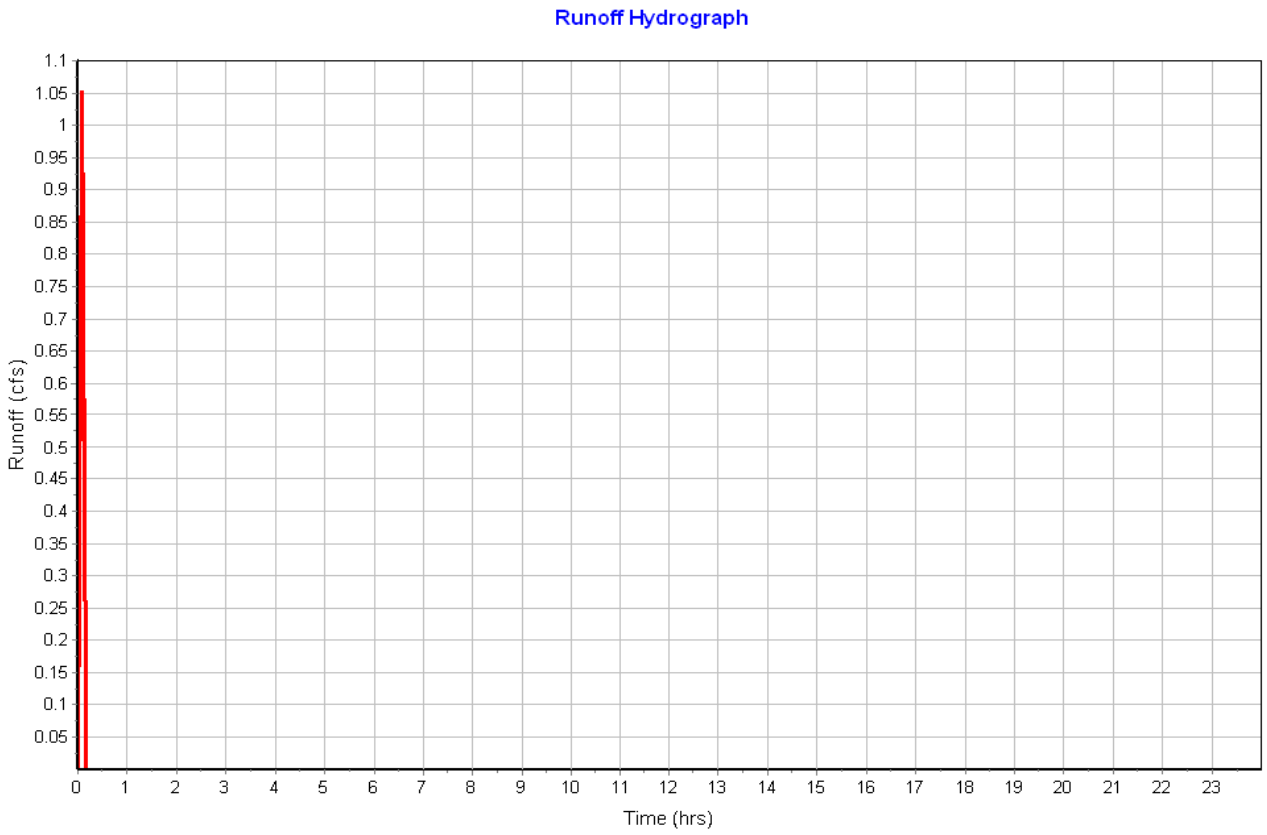
Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft²)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.47
Peak Runoff (cfs) 1.05
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.6800
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-30A



Subbasin : Sub-30B

Input Data

Area (ft²) 19732.98
Weighted Runoff Coefficient 0.4500

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	19732.98	-	0.45
Composite Area & Weighted Runoff Coeff.	19732.98		0.45

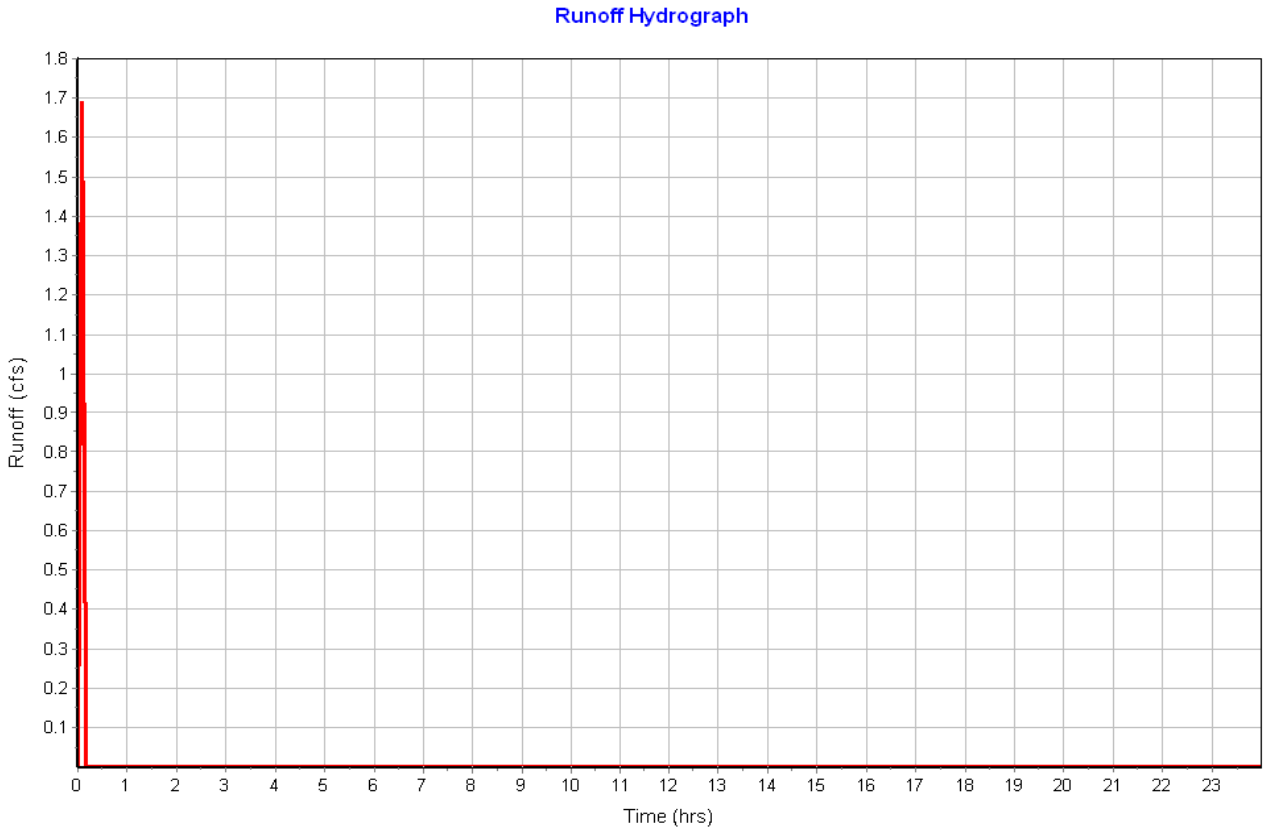
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.31
Peak Runoff (cfs) 1.69
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.4500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-30B



Subbasin : Sub-31A

Input Data

Area (ft²) 56666.99
Weighted Runoff Coefficient 0.4100

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	56666.99	-	0.41
Composite Area & Weighted Runoff Coeff.	56666.99		0.41

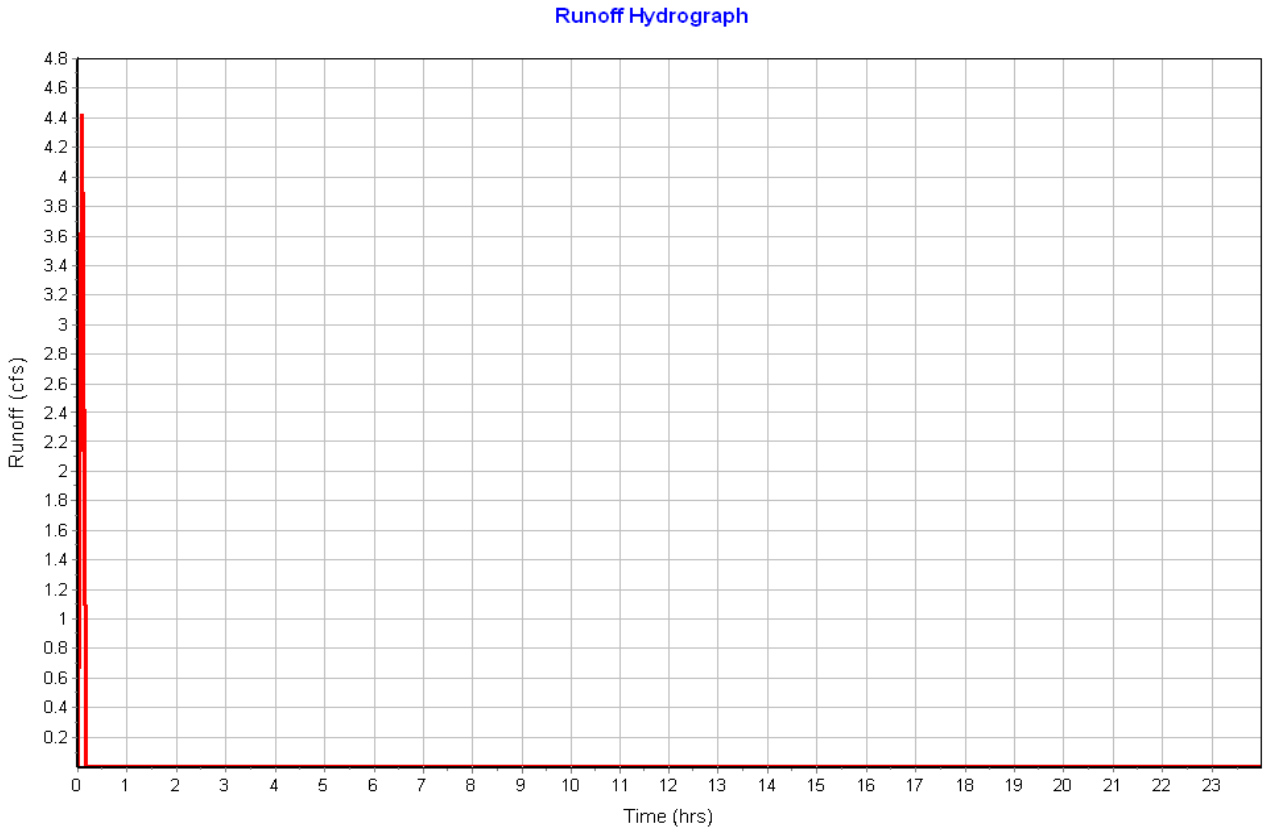
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.28
Peak Runoff (cfs) 4.42
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.4100
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-31A



Subbasin : Sub-32A

Input Data

Area (ft²) 16279.94
Weighted Runoff Coefficient 0.5600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	16279.94	-	0.56
Composite Area & Weighted Runoff Coeff.	16279.94		0.56

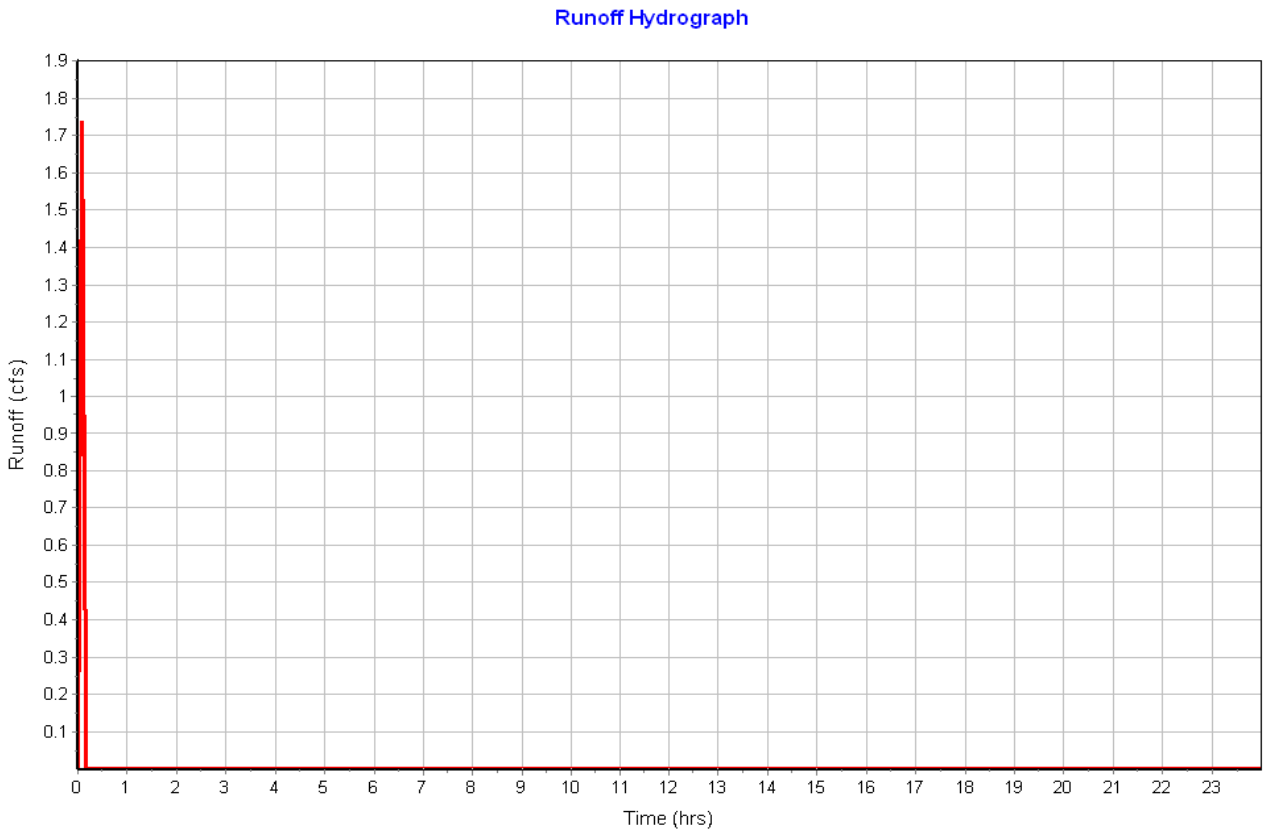
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.39
Peak Runoff (cfs) 1.73
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.5600
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-32A



Subbasin : Sub-32B

Input Data

Area (ft²) 18227.46
Weighted Runoff Coefficient 0.5300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	18227.46	-	0.53
Composite Area & Weighted Runoff Coeff.	18227.46		0.53

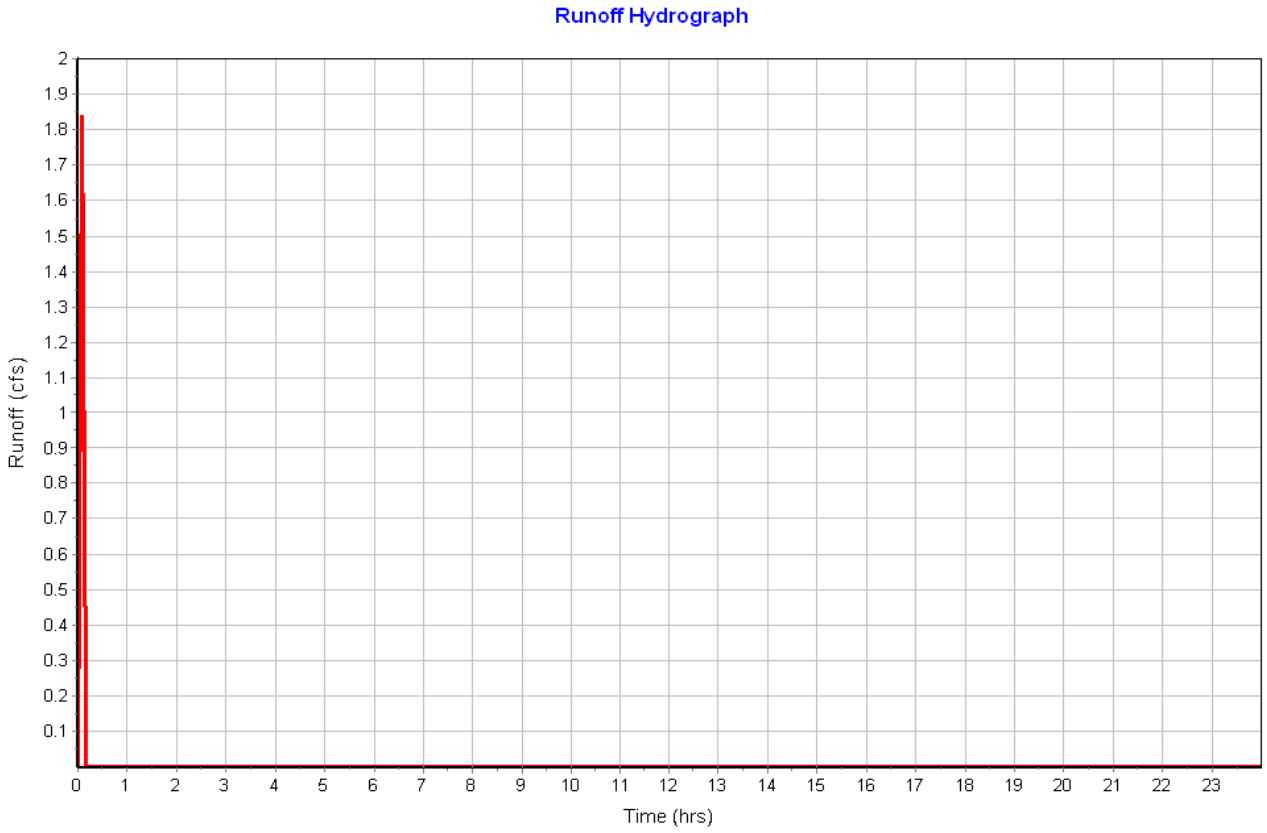
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.37
Peak Runoff (cfs) 1.84
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.5300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-32B



Subbasin : Sub-33A

Input Data

Area (ft²) 16834.02
Weighted Runoff Coefficient 0.5800

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	16834.02	-	0.58
Composite Area & Weighted Runoff Coeff.	16834.02		0.58

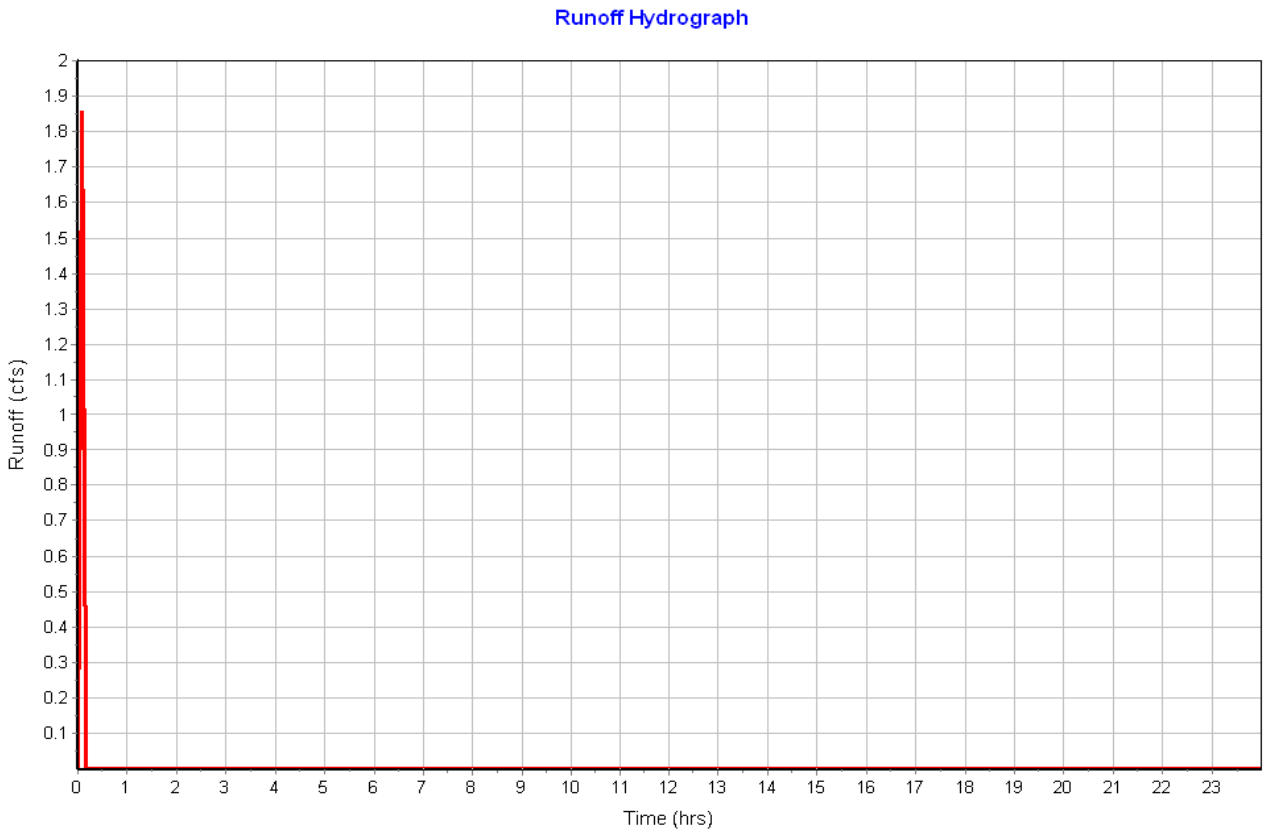
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.40
Peak Runoff (cfs) 1.86
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.5800
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-33A



Subbasin : Sub-33B

Input Data

Area (ft²) 34363.00
Weighted Runoff Coefficient 0.4400

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	34363.00	-	0.44
Composite Area & Weighted Runoff Coeff.	34363.00		0.44

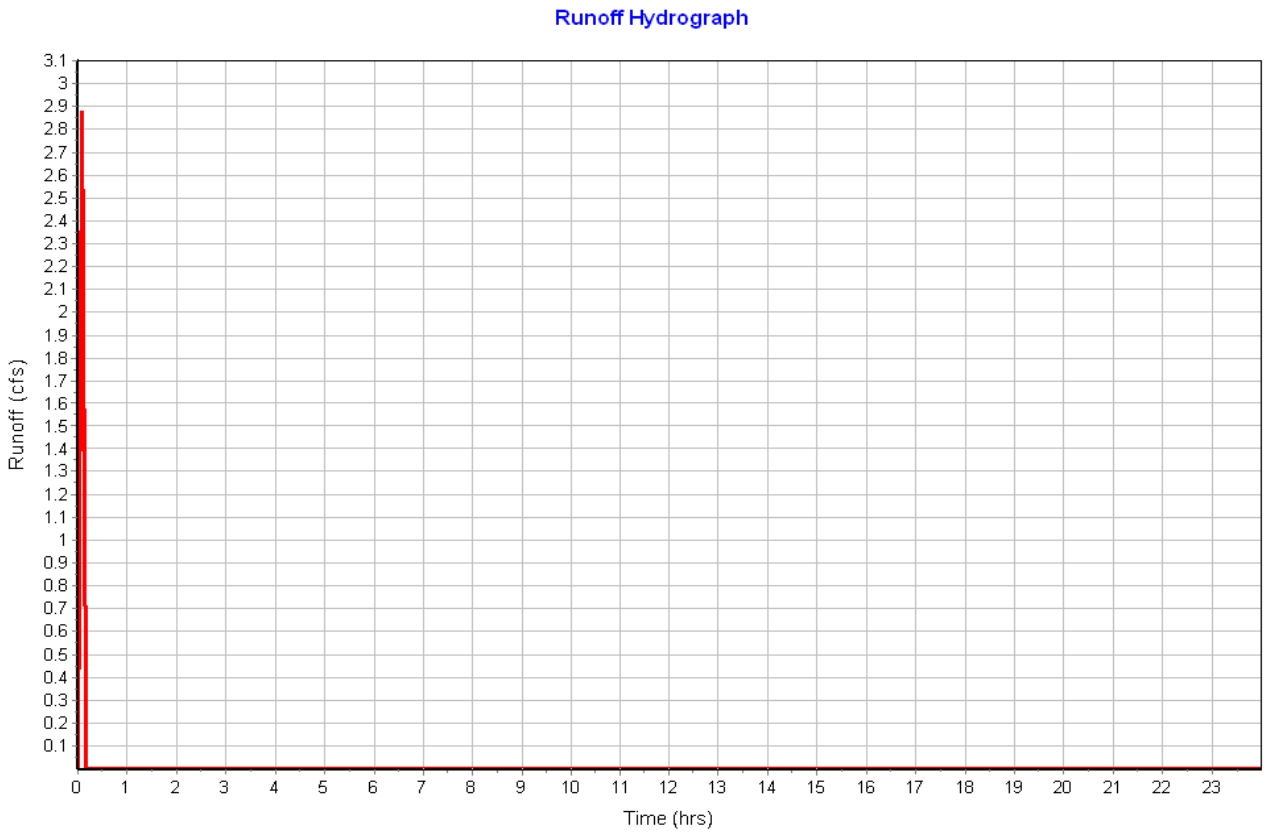
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.30
Peak Runoff (cfs) 2.87
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.4400
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-33B



Subbasin : Sub-34A

Input Data

Area (ft²) 8205.18
Weighted Runoff Coefficient 0.5600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	8205.18	-	0.56
Composite Area & Weighted Runoff Coeff.	8205.18		0.56

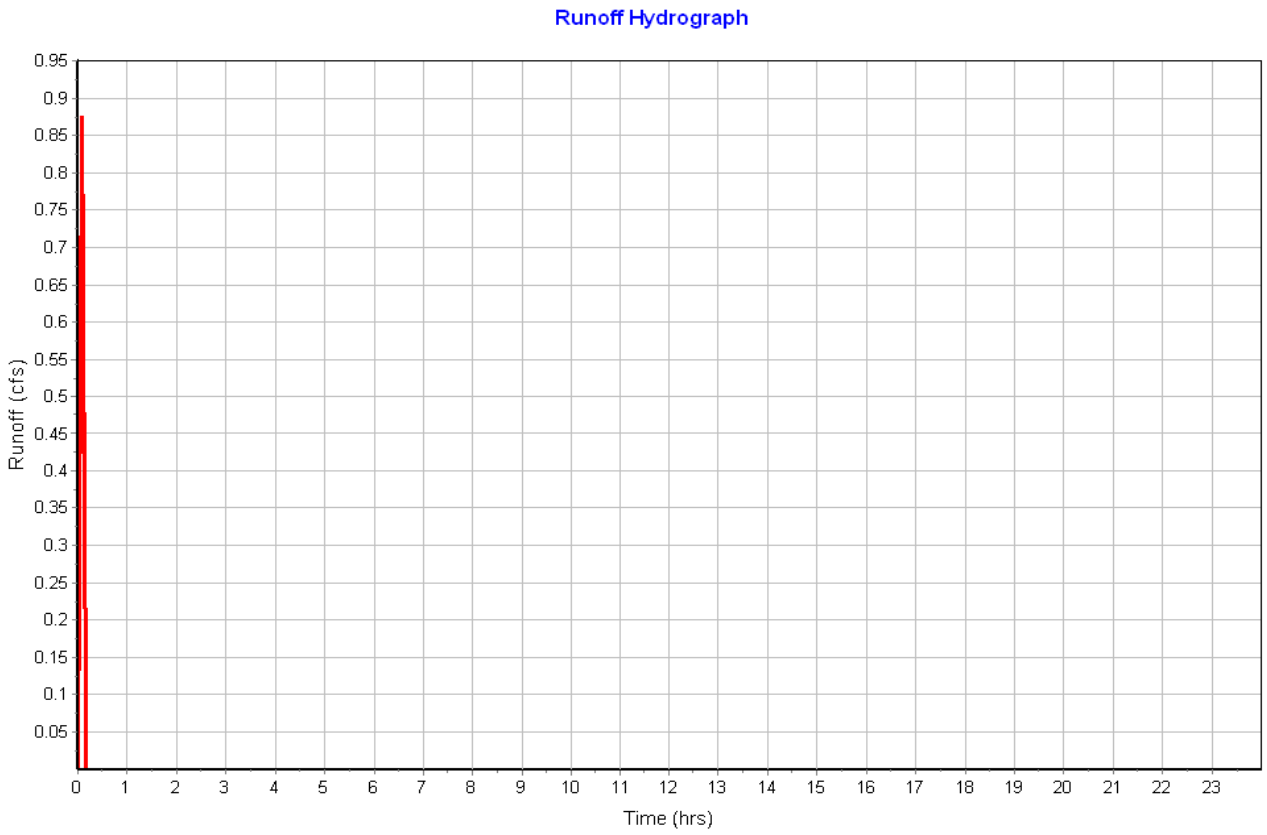
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.39
Peak Runoff (cfs) 0.87
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.5600
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-34A



Subbasin : Sub-34B

Input Data

Area (ft²) 32104.98
Weighted Runoff Coefficient 0.3700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	32104.98	-	0.37
Composite Area & Weighted Runoff Coeff.	32104.98		0.37

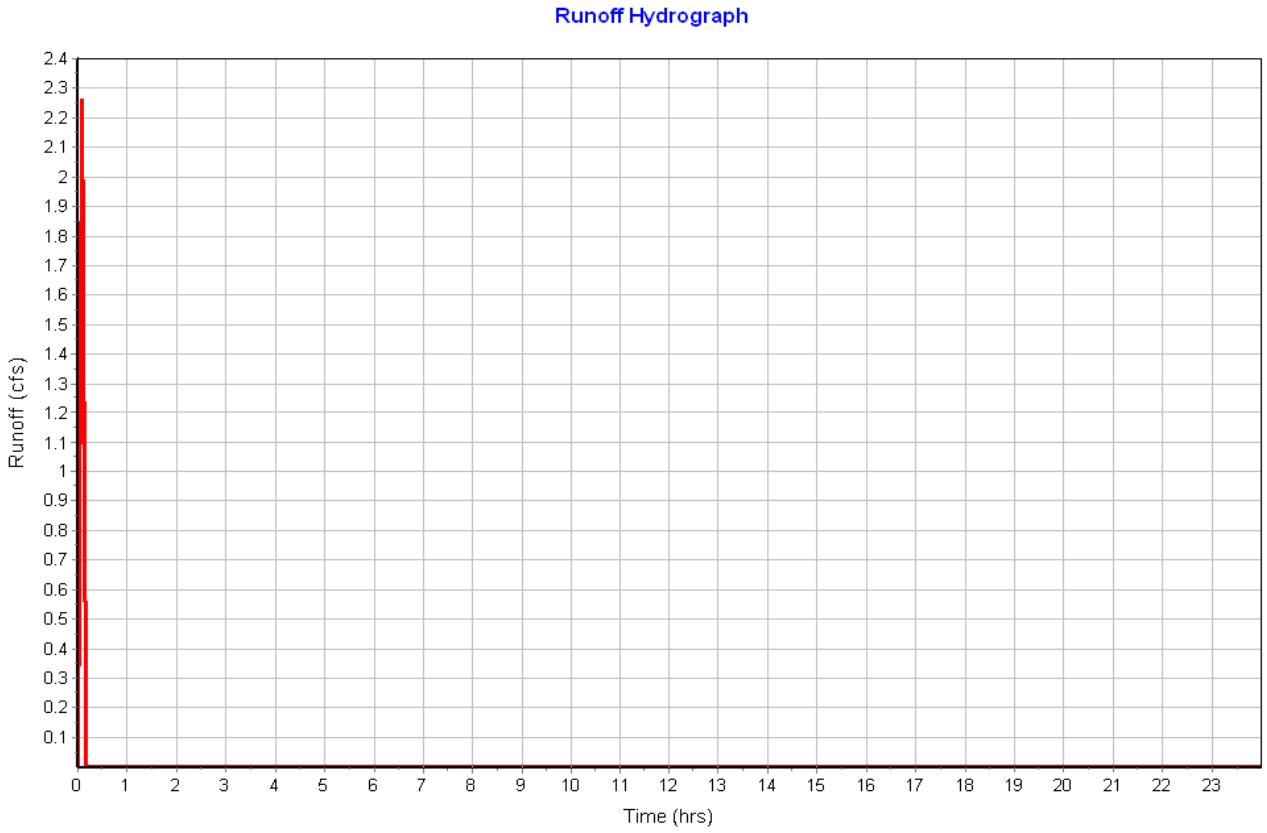
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.26
Peak Runoff (cfs) 2.26
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.3700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-34B



Subbasin : Sub-41A

Input Data

Area (ft²) 12095.00
Weighted Runoff Coefficient 0.6300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	12095.00	-	0.63
Composite Area & Weighted Runoff Coeff.	12095.00		0.63

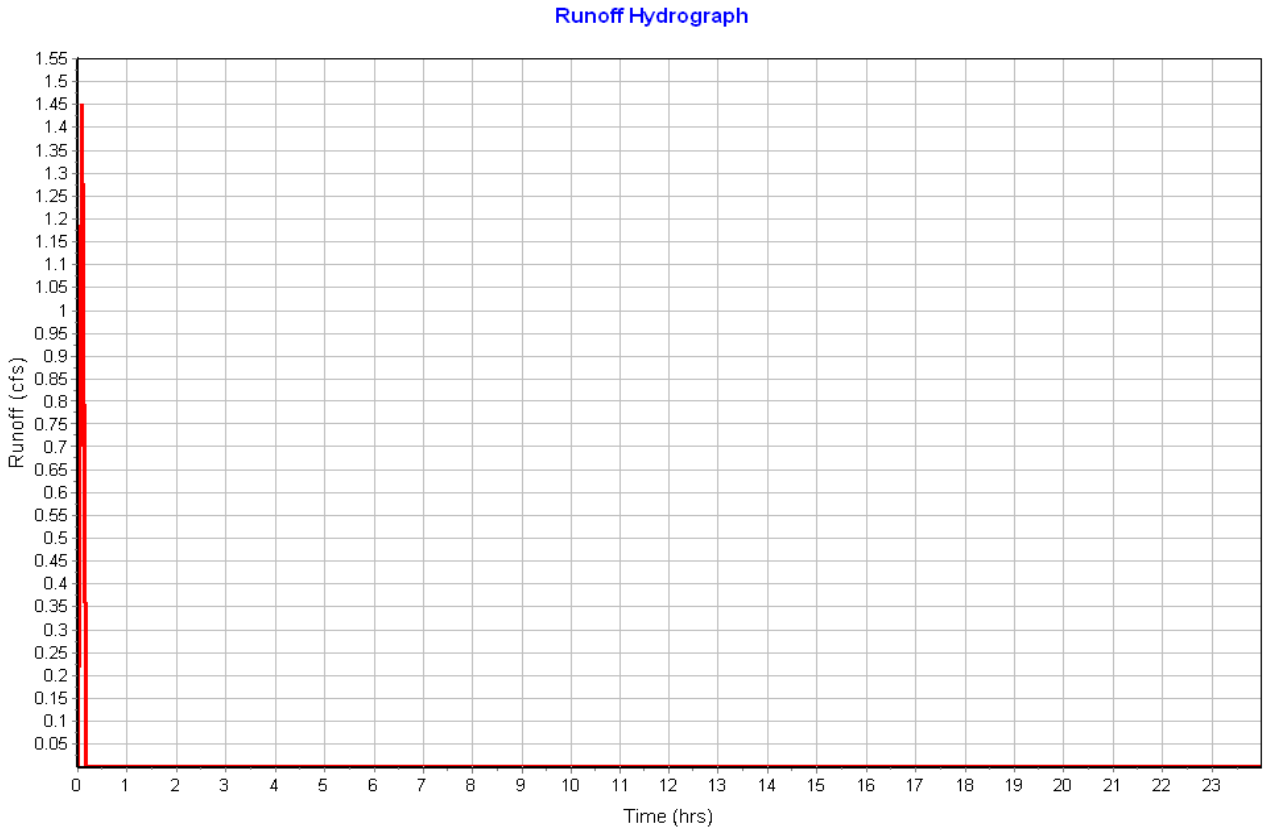
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.44
Peak Runoff (cfs) 1.45
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.6300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-41A



Subbasin : Sub-42A

Input Data

Area (ft²) 6791.00
Weighted Runoff Coefficient 0.5300

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	6791.00	-	0.53
Composite Area & Weighted Runoff Coeff.	6791.00		0.53

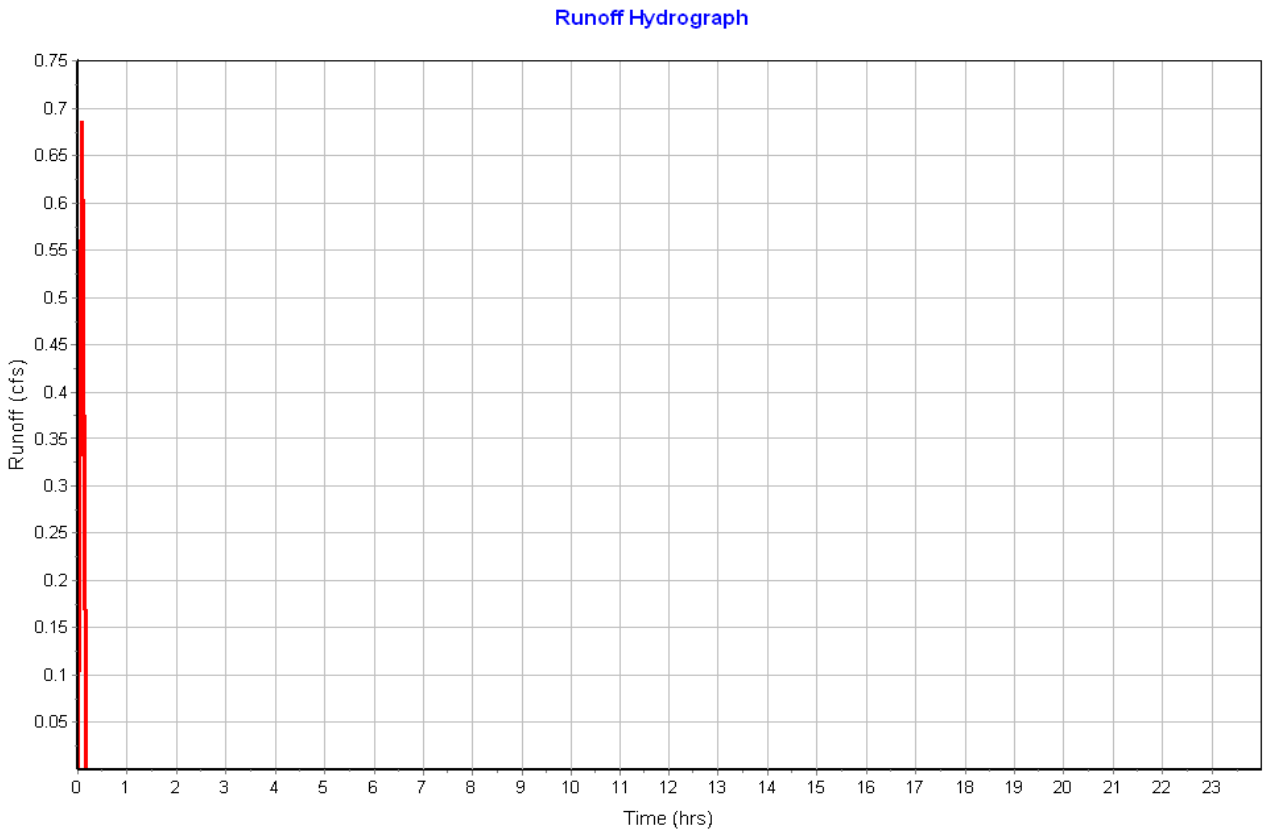
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.37
Peak Runoff (cfs) 0.68
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.5300
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-42A



Subbasin : Sub-42B

Input Data

Area (ft²) 2798.99
Weighted Runoff Coefficient 0.6900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	2798.99	-	0.69
Composite Area & Weighted Runoff Coeff.	2798.99		0.69

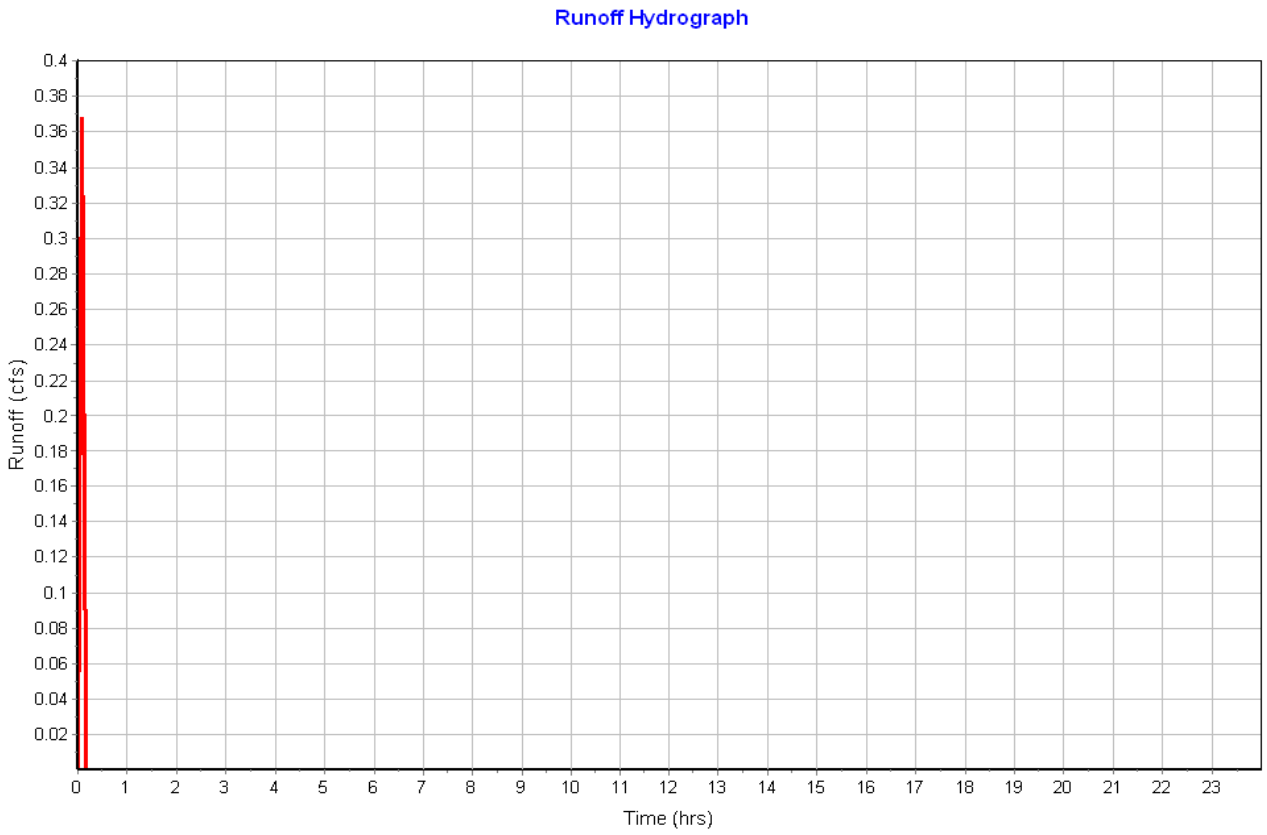
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.48
Peak Runoff (cfs) 0.37
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.6900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-42B



Subbasin : Sub-42C

Input Data

Area (ft²) 10483.02
Weighted Runoff Coefficient 0.5600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	10483.02	-	0.56
Composite Area & Weighted Runoff Coeff.	10483.02		0.56

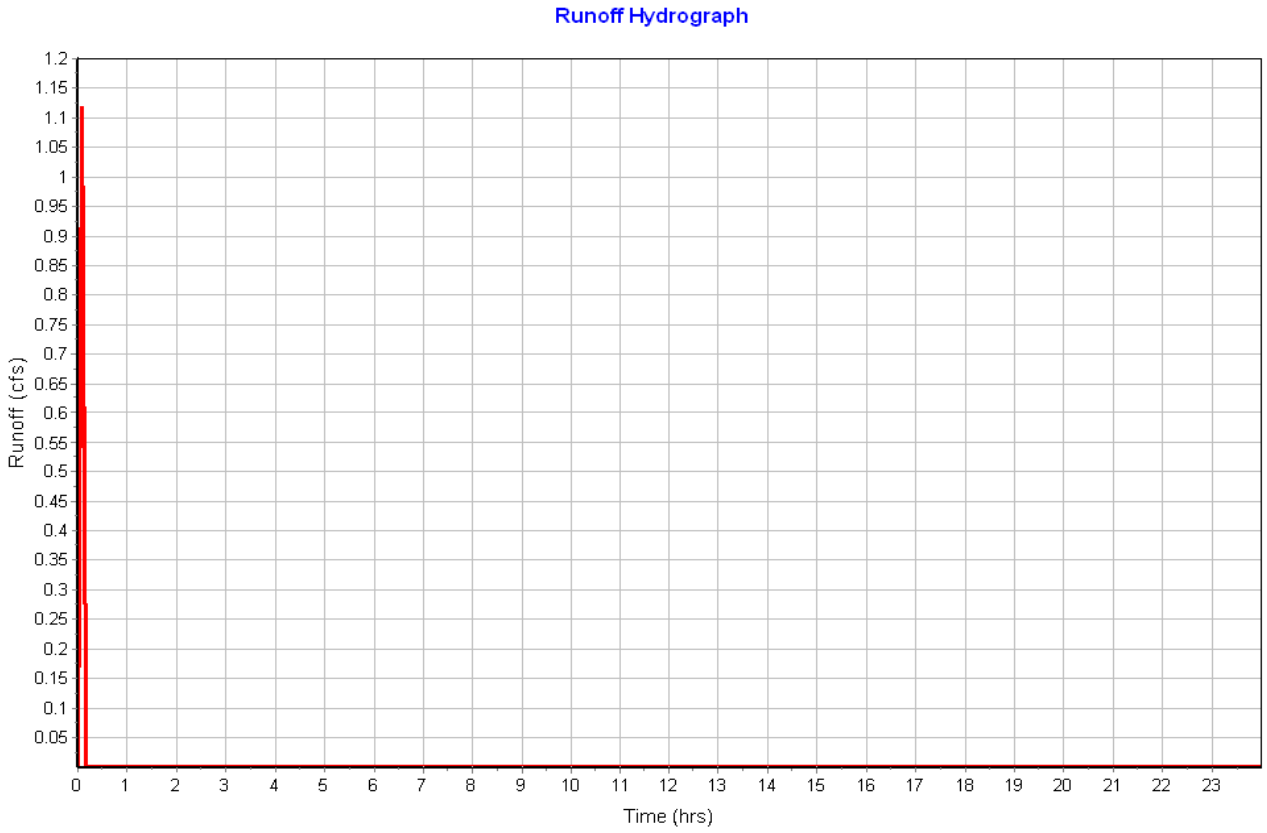
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.39
Peak Runoff (cfs) 1.12
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.5600
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-42C



Subbasin : Sub-43A

Input Data

Area (ft²) 5678.48
Weighted Runoff Coefficient 0.1600

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	5678.48	-	0.16
Composite Area & Weighted Runoff Coeff.	5678.48		0.16

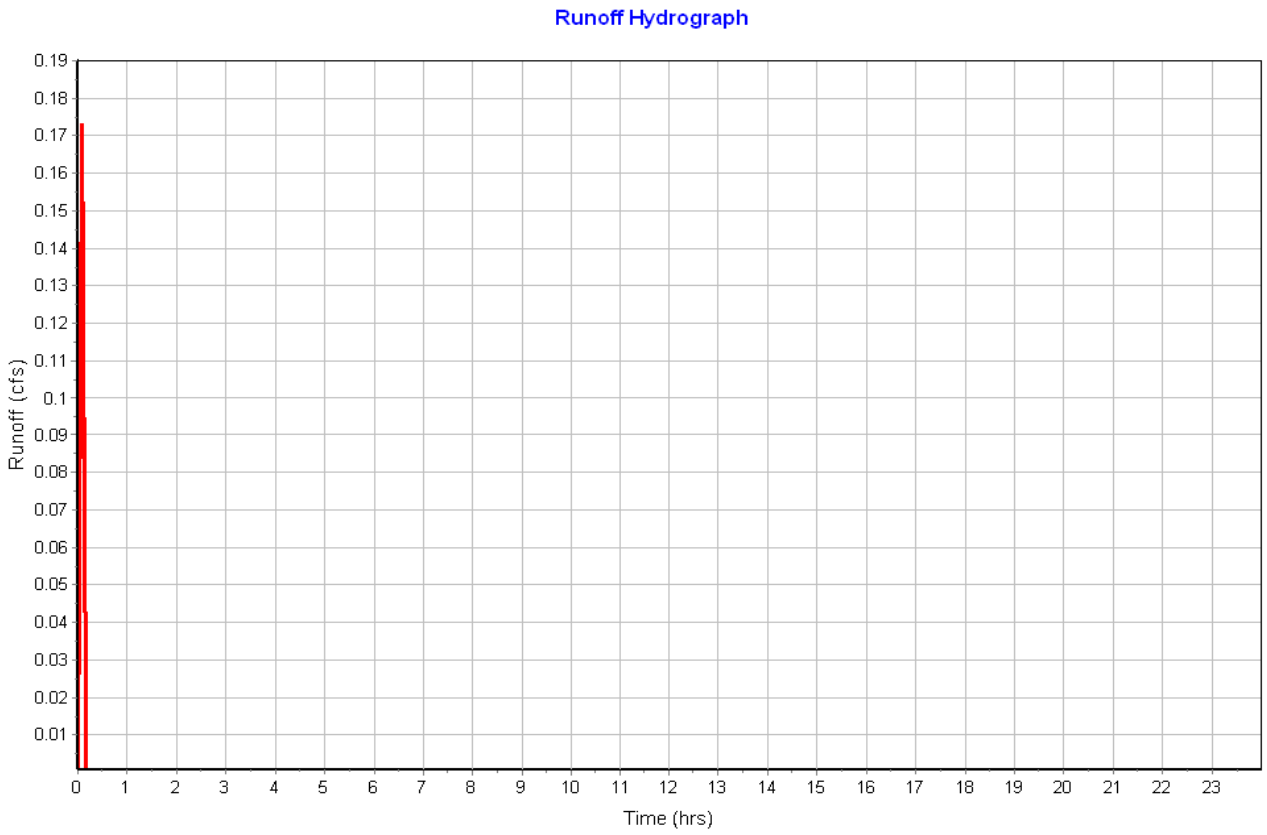
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.11
Peak Runoff (cfs) 0.17
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.1600
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-43A



Subbasin : Sub-43B

Input Data

Area (ft²) 4797.00
Weighted Runoff Coefficient 0.7400

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	4797.00	-	0.74
Composite Area & Weighted Runoff Coeff.	4797.00		0.74

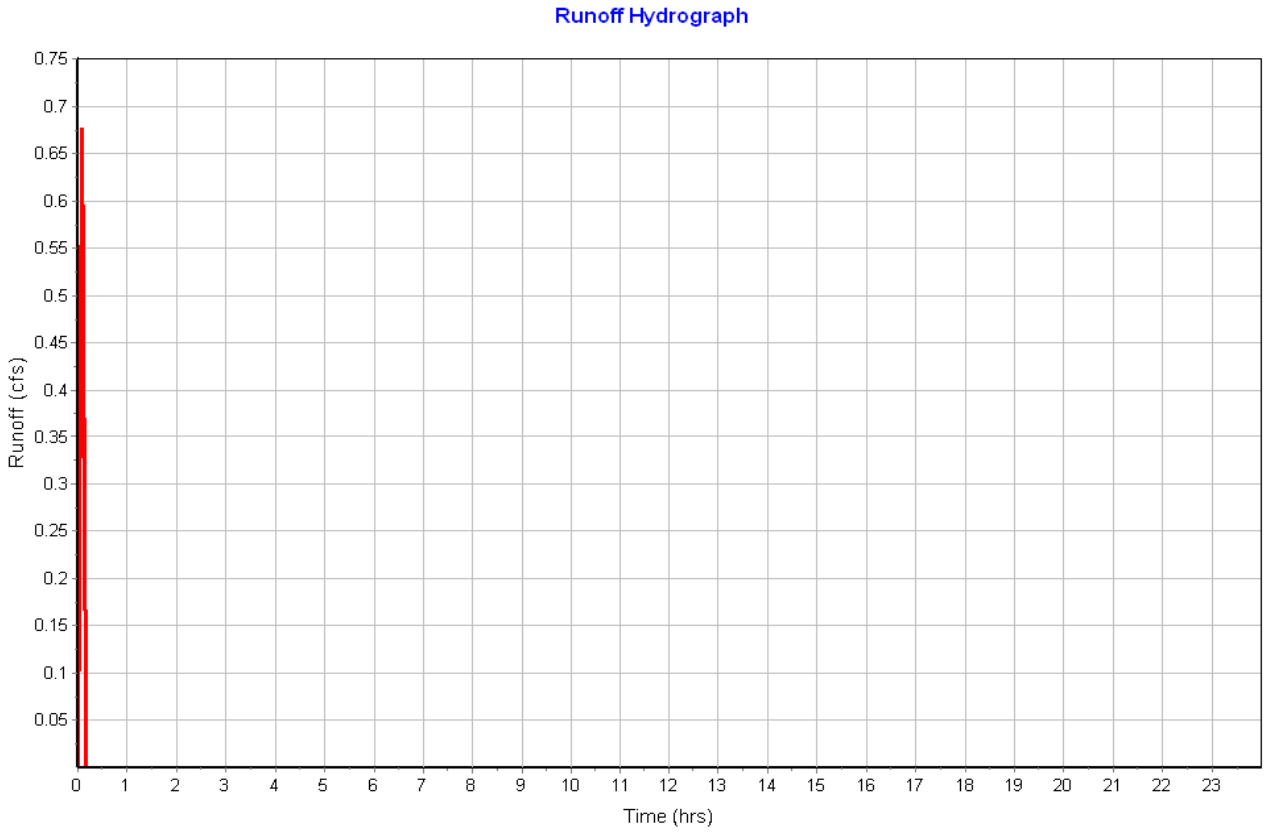
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.51
Peak Runoff (cfs) 0.68
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.7400
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-43B



Subbasin : Sub-43C

Input Data

Area (ft²) 6107.98
Weighted Runoff Coefficient 0.5900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	6107.98	-	0.59
Composite Area & Weighted Runoff Coeff.	6107.98		0.59

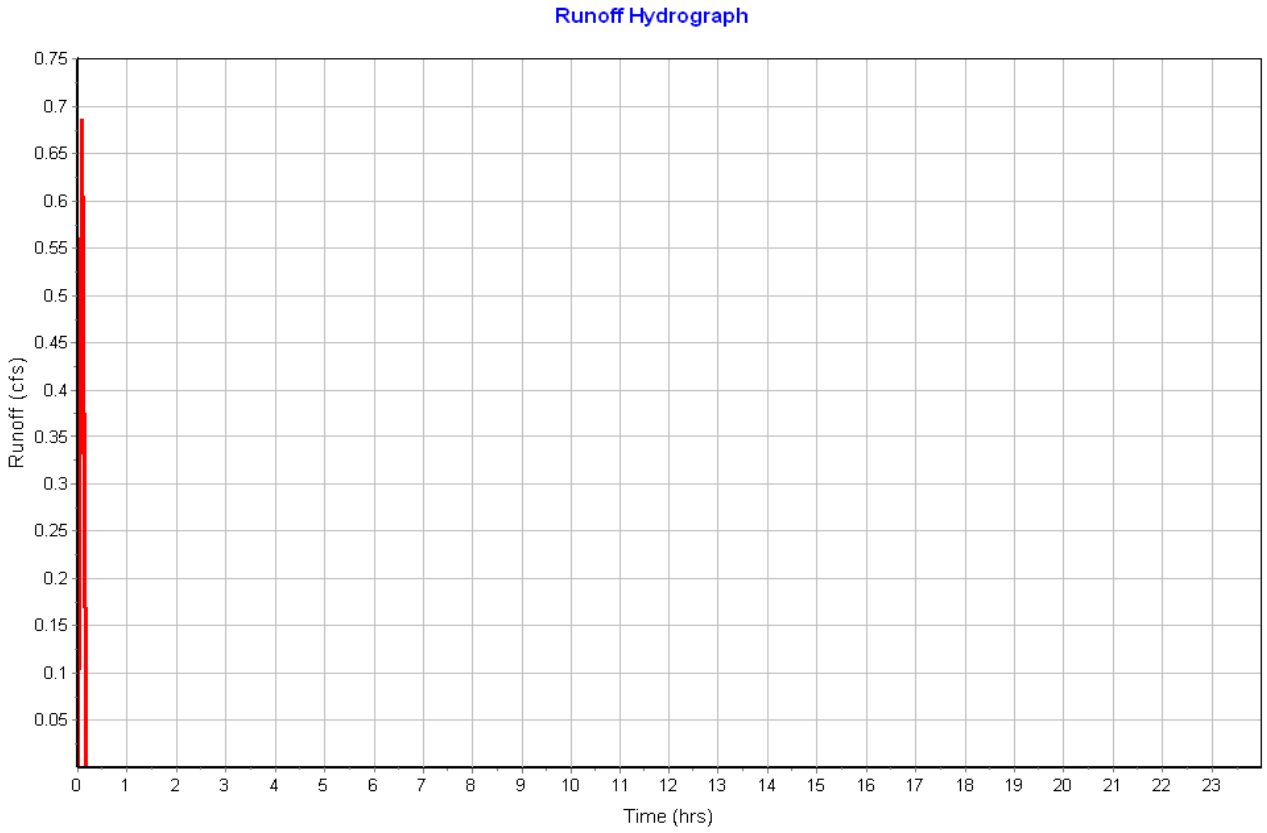
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.41
Peak Runoff (cfs) 0.69
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.5900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-43C



Subbasin : Sub-44A

Input Data

Area (ft²) 23215.00
Weighted Runoff Coefficient 0.4100

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	23215.00	-	0.41
Composite Area & Weighted Runoff Coeff.	23215.00		0.41

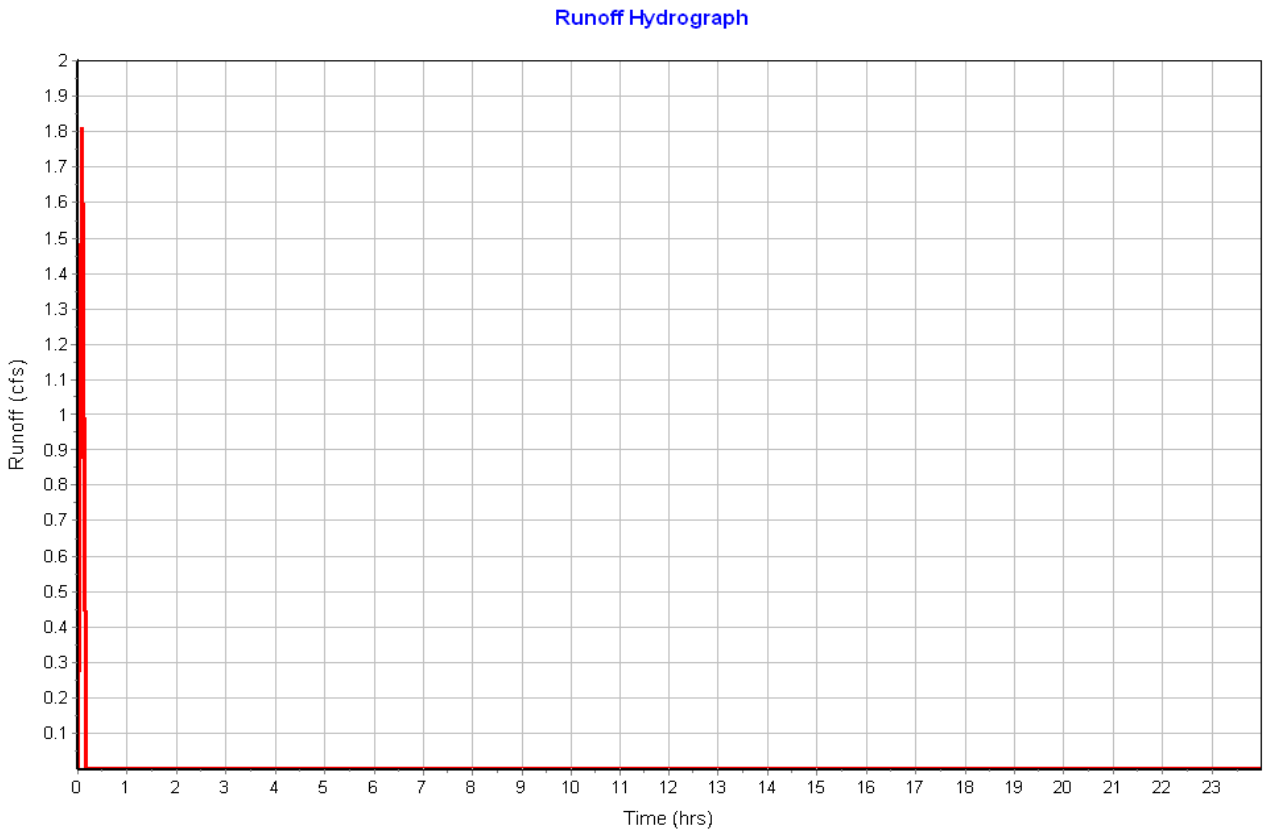
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.28
Peak Runoff (cfs) 1.81
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.4100
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-44A



Subbasin : Sub-45A

Input Data

Area (ft²) 44108.90
Weighted Runoff Coefficient 0.3900

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	44108.90	-	0.39
Composite Area & Weighted Runoff Coeff.	44108.90		0.39

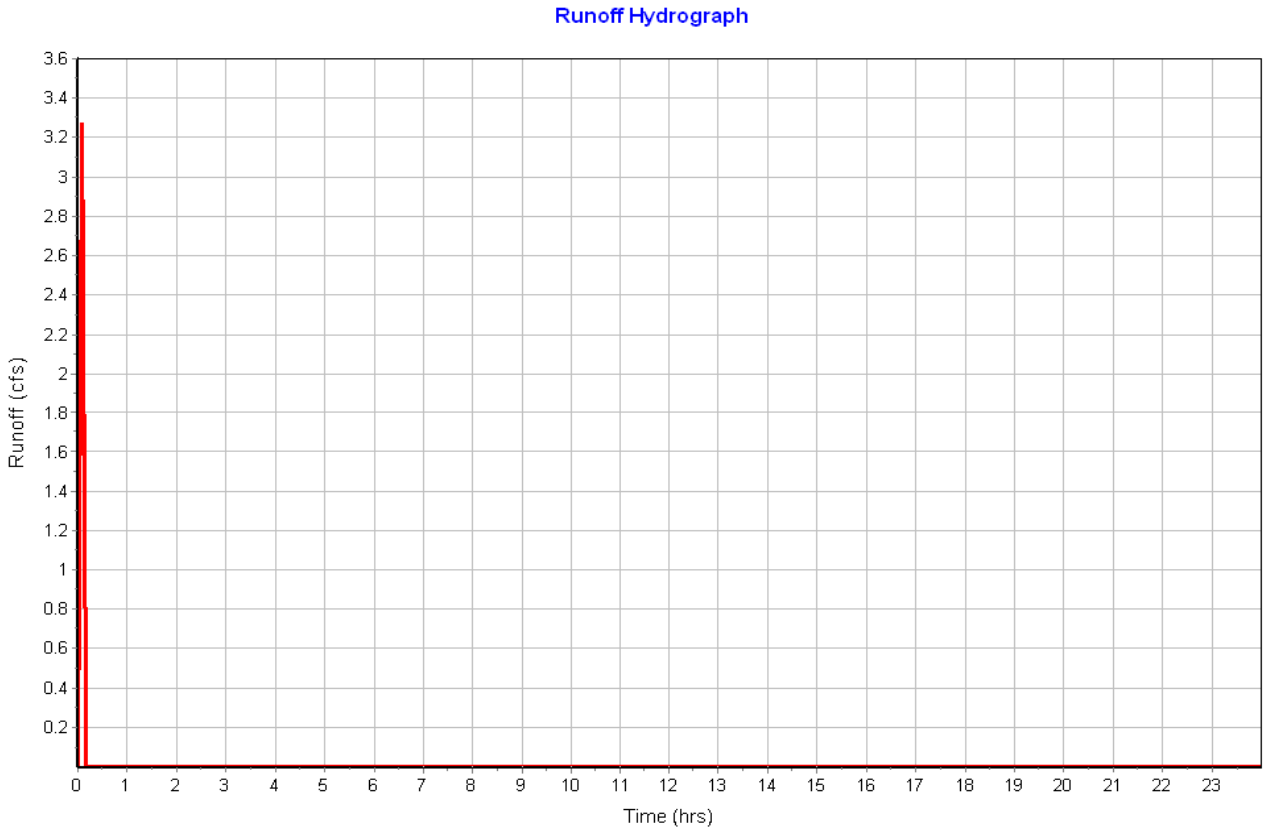
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.27
Peak Runoff (cfs) 3.27
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.3900
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-45A



Subbasin : Sub-45B

Input Data

Area (ft²) 21768.85
Weighted Runoff Coefficient 0.4700

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	21768.85	-	0.47
Composite Area & Weighted Runoff Coeff.	21768.85		0.47

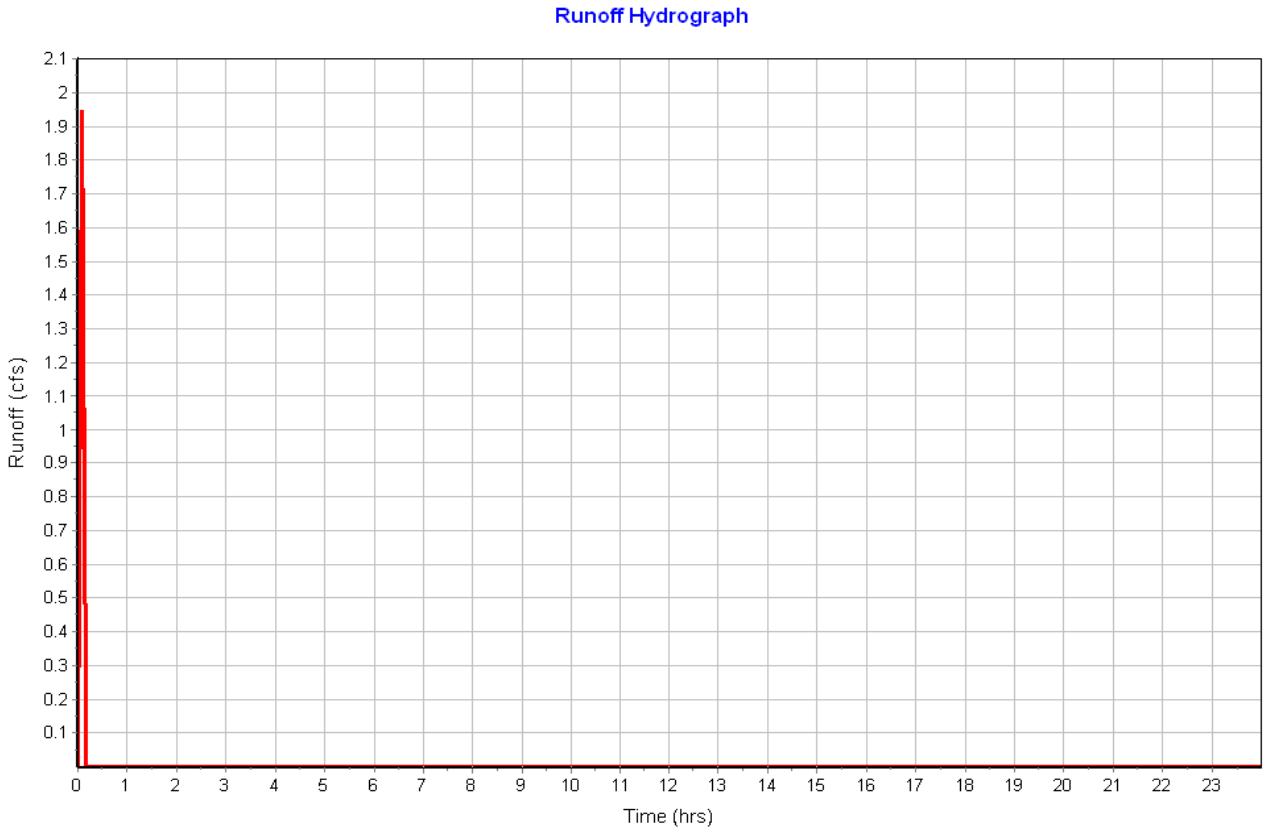
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.32
Peak Runoff (cfs) 1.95
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.4700
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-45B



Subbasin : Sub-47A

Input Data

Area (ft²) 20500.82
Weighted Runoff Coefficient 0.7500

Runoff Coefficient

Soil/Surface Description	Area (ft²)	Soil Group	Runoff Coeff.
-	20500.82	-	0.75
Composite Area & Weighted Runoff Coeff.	20500.82		0.75

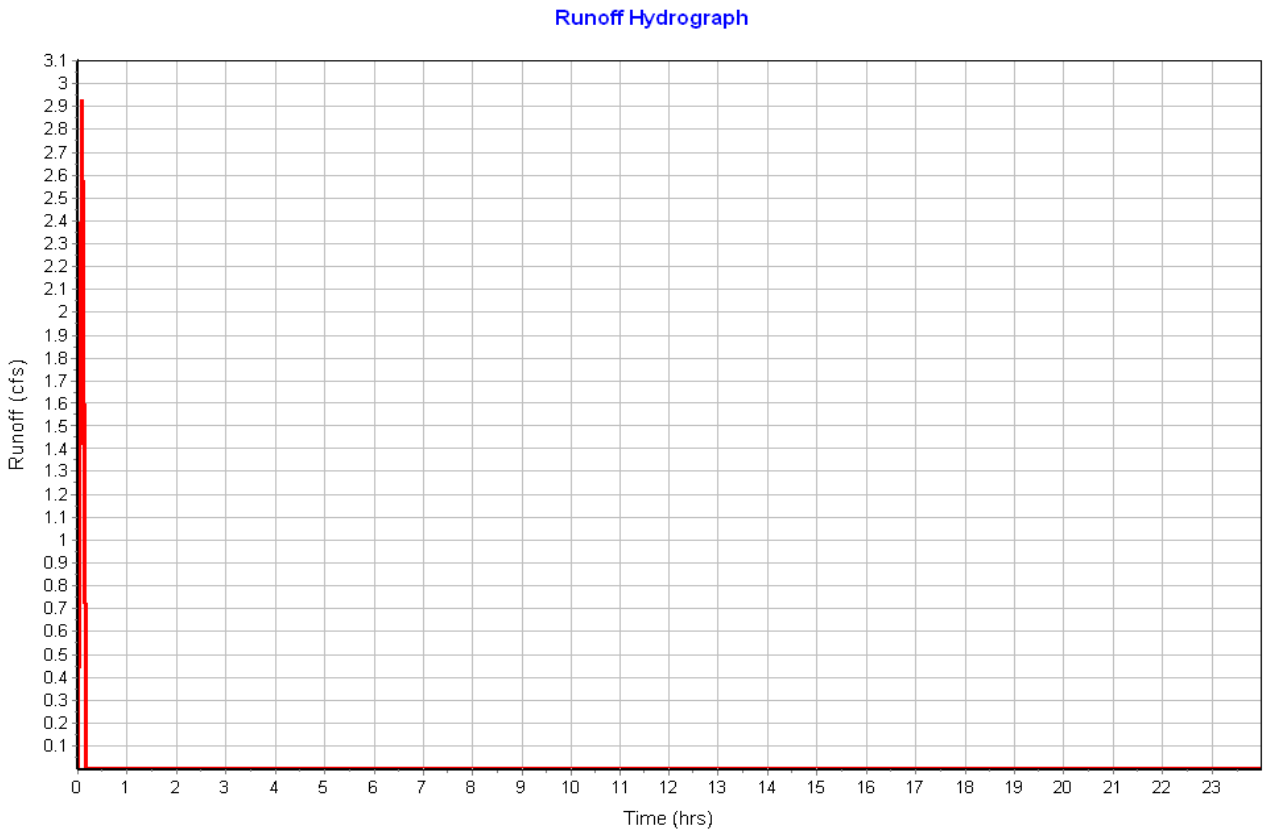
Time of Concentration

User-Defined TOC override (minutes): 5

Subbasin Runoff Results

Total Rainfall (in) 0.69
Total Runoff (in) 0.52
Peak Runoff (cfs) 2.92
Rainfall Intensity 8.280
Weighted Runoff Coefficient 0.7500
Time of Concentration (days hh:mm:ss) 0 00:05:00

Subbasin : Sub-47A



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	30	847.59	852.55	4.96	847.59	0.00	852.55	0.00	0.00	35.50
2	31	846.76	851.55	4.80	846.76	0.00	851.55	0.00	0.00	33.54
3	32	846.17	850.70	4.53	846.17	0.00	850.70	0.00	0.00	30.36
4	33	835.49	840.19	4.70	835.49	0.00	840.19	0.00	0.00	32.41
5	34	834.39	839.48	5.09	834.39	0.00	839.48	0.00	0.00	37.08
6	35	832.11	837.52	5.41	832.11	0.00	837.52	0.00	0.00	40.91
7	36	831.84	837.45	5.62	831.84	0.00	837.45	0.00	0.00	43.40
8	41	831.98	837.23	5.25	831.98	0.00	837.23	0.00	0.00	39.05
9	42	832.56	837.09	4.53	832.56	0.00	837.09	0.00	0.00	30.33
10	43	832.76	837.29	4.53	832.76	0.00	837.29	0.00	0.00	30.33
11	44	833.10	837.95	4.85	833.10	0.00	837.95	0.00	0.00	34.24
12	45	833.51	838.67	5.16	833.51	0.00	838.67	0.00	0.00	37.86
13	46	834.26	839.26	5.00	834.26	0.00	839.26	0.00	0.00	36.03
14	47	841.15	846.54	5.40	841.15	0.00	846.54	0.00	0.00	40.75
15	79	848.35	849.41	1.05	848.35	0.00	849.41	0.00	0.00	0.66

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	30	1.22	0.00	847.95	0.36	0.00	4.60	847.59	0.00	0 00:05	0 00:00	0.00	0.00
2	31	2.63	0.00	847.38	0.62	0.00	4.17	846.76	0.00	0 00:06	0 00:00	0.00	0.00
3	32	5.80	0.00	846.67	0.50	0.00	4.03	846.17	0.00	0 00:06	0 00:00	0.00	0.00
4	33	7.27	0.00	836.19	0.70	0.00	4.00	835.50	0.01	0 00:06	0 00:00	0.00	0.00
5	34	11.57	0.00	835.41	1.02	0.00	4.06	834.40	0.01	0 00:06	0 00:00	0.00	0.00
6	35	11.66	0.00	833.38	1.27	0.00	4.14	832.12	0.01	0 00:06	0 00:00	0.00	0.00
7	36	11.58	0.00	832.92	1.08	0.00	4.54	831.85	0.01	0 00:06	0 00:00	0.00	0.00
8	41	12.35	0.00	832.84	0.86	0.00	4.40	831.99	0.01	0 00:06	0 00:00	0.00	0.00
9	42	11.75	0.00	833.84	1.28	0.00	3.25	832.57	0.01	0 00:06	0 00:00	0.00	0.00
10	43	7.11	0.00	834.11	1.35	0.00	3.18	832.77	0.01	0 00:06	0 00:00	0.00	0.00
11	44	5.23	0.00	834.24	1.14	0.00	3.71	833.11	0.01	0 00:06	0 00:00	0.00	0.00
12	45	3.65	0.00	834.31	0.80	0.00	4.36	833.52	0.01	0 00:06	0 00:00	0.00	0.00
13	46	1.01	0.00	834.53	0.27	0.00	4.73	834.26	0.00	0 00:05	0 00:00	0.00	0.00
14	47	1.02	0.00	841.35	0.20	0.00	5.19	841.15	0.00	0 00:05	0 00:00	0.00	0.00
15	79	0.00	0.00	848.35	0.00	0.00	1.05	848.35	0.00	0 00:00	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	L-30A-32A	163.10	852.39	4.01	850.56	3.60	1.83	1.1200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
2	L-30B-32B	163.10	852.39	3.61	850.54	3.52	1.86	1.1400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
3	L-31A-32B	163.10	851.89	4.23	850.54	3.52	1.35	0.8300	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
4	L-32A-OFF	163.10	850.56	3.60	836.96	0.00	13.60	8.3400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
5	L-32B-OFF	163.10	850.54	3.52	837.01	0.00	13.52	8.2900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
6	L-33A-OFF	163.10	839.96	3.68	826.28	0.00	13.68	8.3900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
7	L-33B-34A	163.10	840.03	3.63	838.90	3.49	1.13	0.7000	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
8	L-41A-42A	163.10	837.07	4.17	836.93	3.45	0.15	0.0900	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
9	L-42C-42B	163.10	836.95	3.21	846.60	13.19	-9.65	-5.9200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
10	L-43B-42A	163.10	837.13	3.57	836.93	3.45	0.20	0.1200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
11	L-43C-42B	163.10	837.13	3.45	836.93	3.52	0.20	0.1200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
12	L-44A-43B	110.22	837.70	3.59	837.13	3.57	0.57	0.5200	User-Defined	0.500	19.000	0.0320	0.0000	0.0000	0.0000	0.00	No
13	L-45A-44A	163.10	838.41	3.89	837.70	3.59	0.71	0.4400	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
14	L-45B-43C	163.10	838.89	3.80	837.13	3.45	1.76	1.0800	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No
15	L-47A-45A	163.10	847.74	4.48	838.41	3.89	9.33	5.7200	User-Defined	0.500	19.000	0.0150	0.0000	0.0000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	L-30A-32A	0.52	0 00:05	24.93	0.02	2.08	1.31	0.13	0.27	0.00		
2	L-30B-32B	0.98	0 00:05	25.08	0.04	2.06	1.32	0.18	0.35	0.00		
3	L-31A-32B	2.93	0 00:05	21.40	0.14	2.62	1.04	0.26	0.51	0.00		
4	L-32A-OFF	1.31	0 00:05	67.89	0.02	5.94	0.46	0.13	0.26	0.00		
5	L-32B-OFF	4.08	0 00:05	67.70	0.06	7.29	0.37	0.19	0.38	0.00		
6	L-33A-OFF	1.11	0 00:05	68.09	0.02	6.04	0.45	0.13	0.25	0.00		
7	L-33B-34A	1.89	0 00:05	19.61	0.10	2.01	1.35	0.24	0.48	0.00		
8	L-41A-42A	0.76	0 00:05	12.88	0.06	0.74	3.67	0.25	0.49	0.00		
9	L-42C-42B	0.38	0 00:05	12.88	0.03	0.61	4.46	0.20	0.40	0.00		
10	L-43B-42A	2.32	0 00:05	12.88	0.18	1.38	1.97	0.31	0.62	0.00		
11	L-43C-42B	0.85	0 00:05	12.88	0.07	1.94	1.40	0.20	0.40	0.00		
12	L-44A-43B	3.13	0 00:05	16.92	0.19	1.83	1.00	0.32	0.63	0.00		
13	L-45A-44A	3.25	0 00:05	15.56	0.21	2.19	1.24	0.29	0.58	0.00		
14	L-45B-43C	1.12	0 00:05	24.45	0.05	1.49	1.82	0.22	0.44	0.00		
15	L-47A-45A	1.89	0 00:05	56.35	0.03	2.18	1.25	0.23	0.46	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	14 (81)	89.66	848.35	0.00	847.91	0.25	0.45	0.5000	CIRCULAR	12.000	12.000	0.0120	0.5000	0.5000	0.0000	0.00	No	1
2	30-31	166.95	847.59	0.00	846.76	0.00	0.83	0.5000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
3	30A-30	8.50	848.38	0.00	848.34	0.75	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
4	30B-30	32.50	848.78	0.00	848.34	0.75	0.44	1.3400	CIRCULAR	15.000	15.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
5	31-32	171.05	846.76	0.00	846.17	0.00	0.59	0.3500	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
6	31A-31	49.59	847.66	0.00	847.51	0.75	0.15	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
7	32-33	384.98	846.17	0.00	835.49	0.00	10.68	2.7700	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
8	32A-32	8.50	846.96	0.00	846.92	0.75	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
9	32B-32	32.50	847.01	0.00	846.92	0.75	0.10	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
10	33-34	36.37	835.49	0.00	834.39	0.00	1.10	3.0300	CIRCULAR	24.000	24.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
11	33A-33	8.50	836.28	0.00	836.24	0.75	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
12	33B-33	32.50	836.40	0.00	836.24	0.75	0.16	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
13	34-35	225.62	834.39	0.00	832.11	0.00	2.28	1.0100	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
14	34A-34	54.54	835.41	0.00	835.14	0.75	0.27	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
15	34B-34A	36.74	835.59	0.00	835.41	0.00	0.18	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.8000	0.0000	0.00	No	1
16	35-36	27.33	832.11	0.00	831.84	0.00	0.27	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
17	36-37	38.30	831.84	0.00	831.28	0.00	0.56	1.4500	CIRCULAR	24.000	24.000	0.0120	0.0000	0.5000	0.0000	0.00	No	1
18	41-40	62.55	831.98	0.00	830.00	0.00	1.98	3.1700	CIRCULAR	24.000	24.000	0.0120	0.0000	0.5000	0.0000	0.00	No	1
19	41A-41	8.50	832.90	0.00	832.73	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
20	42-41	54.88	832.56	0.00	831.98	0.00	0.58	1.0600	CIRCULAR	24.000	24.000	0.0120	0.0000	0.9000	0.0000	0.00	No	1
21	42A-42	8.50	833.48	0.00	833.31	0.75	0.17	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
22	42B-42	32.97	833.41	0.00	833.31	0.75	0.10	0.3000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
23	42C-42B	26.92	833.74	0.00	833.66	0.25	0.08	0.3000	CIRCULAR	12.000	12.000	0.0120	0.0000	0.8000	0.0000	0.00	No	1
24	43-42	65.43	832.76	0.00	832.56	0.00	0.20	0.3100	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
25	43A-43B	13.59	833.62	0.00	833.55	0.00	0.07	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.5000	0.0000	0.00	No	1
26	43B-43	8.50	833.55	0.00	833.51	0.75	0.04	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
27	43C-43	32.50	833.67	0.00	833.51	0.75	0.16	0.5000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
28	44-43	112.58	833.10	0.00	832.76	0.00	0.34	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
29	44A-44	13.26	834.11	0.00	833.85	0.75	0.26	1.9800	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
30	45-44	137.95	833.51	0.00	833.10	0.00	0.41	0.3000	CIRCULAR	24.000	24.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1
31	45A-45	13.19	834.52	0.00	834.26	0.75	0.26	2.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
32	45B-45	27.81	835.09	0.00	834.26	0.75	0.83	3.0000	CIRCULAR	15.000	15.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
33	46-45	75.18	834.26	0.00	833.51	0.00	0.75	1.0000	CIRCULAR	24.000	24.000	0.0120	0.0000	1.0000	0.0000	0.00	No	1
34	47-46	204.05	841.15	0.00	834.26	0.00	6.89	3.3700	CIRCULAR	24.000	24.000	0.0120	0.0000	0.5000	0.0000	0.00	No	1
35	47A-47	40.35	843.26	0.00	841.88	0.74	1.37	3.4000	CIRCULAR	15.000	15.000	0.0120	0.0000	0.6000	0.0000	0.00	No	1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	14 (81)	0.00	0 00:00	2.73	0.00	0.00		0.16	0.16	0.00		Calculated
2	30-31	1.18	0 00:05	17.33	0.07	2.04	1.36	0.49	0.24	0.00		Calculated
3	30A-30	0.52	0 00:05	4.95	0.11	2.22	0.06	0.31	0.25	0.00		Calculated
4	30B-30	0.69	0 00:05	8.11	0.09	3.67	0.15	0.26	0.21	0.00		Calculated
5	31-32	2.57	0 00:06	14.41	0.18	3.59	0.79	0.56	0.28	0.00		Calculated
6	31A-31	1.44	0 00:05	3.83	0.38	2.97	0.28	0.52	0.42	0.00		Calculated
7	32-33	5.68	0 00:06	40.81	0.14	7.21	0.89	0.60	0.30	0.00		Calculated
8	32A-32	1.09	0 00:05	4.95	0.22	2.64	0.05	0.46	0.37	0.00		Calculated
9	32B-32	2.39	0 00:05	3.84	0.62	3.21	0.17	0.73	0.58	0.00		Calculated
10	33-34	7.16	0 00:06	42.68	0.17	5.67	0.11	0.86	0.43	0.00		Calculated
11	33A-33	0.73	0 00:05	4.95	0.15	2.39	0.06	0.37	0.30	0.00		Calculated
12	33B-33	0.96	0 00:05	4.95	0.19	2.77	0.20	0.41	0.33	0.00		Calculated
13	34-35	11.66	0 00:06	24.62	0.47	6.28	0.60	1.14	0.57	0.00		Calculated
14	34A-34	4.53	0 00:05	4.95	0.92	4.21	0.22	1.02	0.82	0.00		Calculated
15	34B-34A	2.17	0 00:05	4.95	0.44	2.13	0.29	1.12	0.90	0.00		Calculated
16	35-36	11.58	0 00:06	24.50	0.47	6.03	0.08	1.18	0.59	0.00		Calculated
17	36-37	11.59	0 00:06	29.52	0.39	7.63	0.08	0.97	0.49	0.00		Calculated
18	41-40	12.36	0 00:06	43.60	0.28	10.67	0.10	0.79	0.40	0.00		Calculated
19	41A-41	0.68	0 00:05	9.90	0.07	3.64	0.04	0.26	0.21	0.00		Calculated
20	42-41	11.75	0 00:06	25.19	0.47	6.91	0.13	1.07	0.53	0.00		Calculated
21	42A-42	2.92	0 00:06	9.90	0.29	4.81	0.03	0.64	0.51	0.00		Calculated
22	42B-42	1.89	0 00:06	3.85	0.49	3.00	0.18	0.64	0.51	0.00		Calculated
23	42C-42B	0.72	0 00:05	2.11	0.34	2.25	0.20	0.47	0.47	0.00		Calculated
24	43-42	6.96	0 00:06	13.55	0.51	3.19	0.34	1.31	0.66	0.00		Calculated
25	43A-43B	0.17	0 00:05	4.95	0.03	0.75	0.30	0.64	0.51	0.00		Calculated
26	43B-43	1.60	0 00:05	4.95	0.32	2.90	0.05	0.63	0.51	0.00		Calculated
27	43C-43	0.94	0 00:05	4.95	0.19	2.56	0.21	0.53	0.43	0.00		Calculated
28	44-43	4.84	0 00:06	13.42	0.36	2.45	0.77	1.25	0.62	0.00		Calculated
29	44A-44	1.90	0 00:05	9.86	0.19	5.16	0.04	0.42	0.34	0.00		Calculated
30	45-44	3.38	0 00:05	13.42	0.25	2.61	0.88	0.97	0.48	0.00		Calculated
31	45A-45	1.92	0 00:05	9.90	0.19	4.68	0.05	0.46	0.37	0.00		Calculated
32	45B-45	0.81	0 00:05	12.12	0.07	4.96	0.09	0.24	0.19	0.00		Calculated
33	46-45	0.97	0 00:05	24.51	0.04	1.49	0.84	0.53	0.27	0.00		Calculated
34	47-46	1.01	0 00:05	45.02	0.02	5.18	0.66	0.24	0.12	0.00		Calculated
35	47A-47	1.02	0 00:05	12.90	0.08	5.95	0.11	0.25	0.20	0.00		Calculated

Inlet Input

SN	Element ID	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Inlet Depth (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft^2)	Grate Clogging Factor (%)
1	30A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.38	852.39	4.01	848.38	0.00	N/A	0.00
2	30B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	848.78	852.39	3.61	848.78	0.00	N/A	0.00
3	31A	NEENAH FOUNDRY	R 3250A Special Diagonal	On Grade	1	847.66	851.89	4.23	847.66	0.00	N/A	0.00
4	32A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	846.96	850.56	3.60	846.96	0.00	N/A	0.00
5	32B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	847.01	850.54	3.52	847.01	0.00	N/A	0.00
6	33A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.28	839.96	3.68	836.28	0.00	N/A	0.00
7	33B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	836.40	840.03	3.63	836.40	0.00	N/A	0.00
8	34A	NEENAH FOUNDRY	R-3067	On Sag	1	835.41	838.90	3.49	835.41	0.00	6.00	35.00
9	34B	NEENAH FOUNDRY	R-3067	On Sag	1	835.59	838.71	3.11	835.59	0.00	6.00	35.00
10	41A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	832.90	837.07	4.17	832.90	0.00	N/A	0.00
11	42A	NEENAH FOUNDRY	R-3067	On Sag	1	833.48	836.93	3.45	833.48	0.00	6.00	35.00
12	42B	NEENAH FOUNDRY	R-3067	On Sag	1	833.41	836.93	3.52	833.41	0.00	6.00	35.00
13	42C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.74	836.95	3.21	833.74	0.00	N/A	0.00
14	43A	NEENAH FOUNDRY	R-3508-B	On Sag	1	833.62	837.59	3.97	833.62	0.00	4.00	50.00
15	43B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.55	837.13	3.57	833.55	0.00	N/A	0.00
16	43C	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	833.67	837.13	3.45	833.67	0.00	N/A	0.00
17	44A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.11	837.70	3.59	834.11	0.00	N/A	0.00
18	45A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	834.52	838.41	3.89	834.52	0.00	N/A	0.00
19	45B	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	835.09	838.89	3.80	835.09	0.00	N/A	0.00
20	47A	NEENAH FOUNDRY	R 3067 L Type L	On Grade	1	843.26	847.78	4.52	843.26	0.00	N/A	0.00

Roadway & Gutter Input

SN	Element ID	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)	Gutter Width (ft)	Gutter Depression (in)	Allowable Spread (ft)
1	30A	0.0068	0.0200	0.0130	0.0400	2.00	0.0000	15.00
2	30B	0.0068	0.0200	0.0130	0.0400	2.00	0.0000	15.00
3	31A	0.0278	0.0300	0.0130	0.0400	2.00	0.0000	15.00
4	32A	0.0045	0.0200	0.0130	0.0400	2.00	0.0000	15.00
5	32B	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	15.00
6	33A	0.0200	0.0200	0.0130	0.0400	2.00	0.0000	15.00
7	33B	0.0200	0.0200	0.0130	0.0400	2.00	0.0000	15.00
8	34A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
9	34B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
10	41A	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	15.00
11	42A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
12	42B	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
13	42C	0.0020	0.0200	0.0130	0.0400	2.00	0.0000	15.00
14	43A	N/A	0.0200	0.0130	0.0400	2.00	0.0000	15.00
15	43B	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	15.00
16	43C	0.0050	0.0200	0.0130	0.0400	2.00	0.0000	15.00
17	44A	0.0053	0.0200	0.0130	0.0400	2.00	0.0000	15.00
18	45A	0.0054	0.0200	0.0130	0.0400	2.00	0.0000	15.00
19	45B	0.0054	0.0200	0.0130	0.0400	2.00	0.0000	15.00
20	47A	0.0062	0.0200	0.0130	0.0400	2.00	0.0000	15.00

Inlet Results

SN	Element ID	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Max Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	30A	1.05	1.05	0.52	0.52	50.03	5.28	852.54	0.15	0 00:05	0.00	0.00
2	30B	1.69	1.69	0.70	0.98	41.61	6.64	852.56	0.17	0 00:05	0.00	0.00
3	31A	4.41	4.41	1.48	2.93	33.62	6.78	852.11	0.22	0 00:05	0.00	0.00
4	32A	2.25	1.73	0.94	1.31	41.91	8.47	850.77	0.21	0 00:05	0.00	0.00
5	32B	5.72	1.83	1.64	4.08	28.68	12.61	850.83	0.29	0 00:05	0.00	0.00
6	33A	1.85	1.85	0.74	1.11	39.88	5.35	840.11	0.15	0 00:05	0.00	0.00
7	33B	2.87	2.87	0.98	1.90	33.97	6.69	840.21	0.17	0 00:05	0.00	0.00
8	34A	2.76	0.87	N/A	N/A	N/A	11.56	839.15	0.25	0 00:05	0.00	0.00
9	34B	2.26	2.26	N/A	N/A	N/A	9.86	838.94	0.24	0 00:05	0.00	0.00
10	41A	1.45	1.45	0.69	0.76	47.40	6.61	837.25	0.17	0 00:05	0.00	0.00
11	42A	3.76	0.68	N/A	N/A	N/A	17.98	837.21	0.28	0 00:06	0.00	0.00
12	42B	1.58	0.37	N/A	N/A	N/A	7.35	837.09	0.16	0 00:05	0.00	0.00
13	42C	1.11	1.11	0.73	0.38	65.93	7.33	837.14	0.19	0 00:05	0.00	0.00
14	43A	0.17	0.17	N/A	N/A	N/A	0.82	837.65	0.06	0 00:05	0.00	0.00
15	43B	3.80	0.67	1.27	2.53	33.41	10.52	837.38	0.25	0 00:05	0.00	0.00
16	43C	1.81	0.68	0.79	1.01	43.92	7.42	837.32	0.19	0 00:06	0.00	0.00
17	44A	5.04	1.81	1.49	3.55	29.55	11.79	837.97	0.28	0 00:05	0.00	0.00
18	45A	5.15	3.27	1.50	3.65	29.13	11.85	838.69	0.28	0 00:05	0.00	0.00
19	45B	1.94	1.94	0.81	1.13	41.92	7.59	839.08	0.19	0 00:05	0.00	0.00
20	47A	2.92	2.92	1.03	1.89	35.17	8.90	848.00	0.22	0 00:05	0.00	0.00

EXHIBIT 12, DITCH CAPACITY ANALYSIS

Hydraulic Analysis Report

Project Data

Project Title: 3670-01-01 Ditch Analysis
Designer:
Project Date: Wednesday, January 16, 2019
Project Units: U.S. Customary Units
Notes:

Channel Analysis: Avalon Rd to Inlet 11A

Notes:

Input Parameters

Channel Type: Triangular
Side Slope 1 (Z1): 6.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Longitudinal Slope: 0.0096 ft/ft
Manning's n: 0.0300
Flow: 6.8100 cfs

Result Parameters

Depth: 0.6204 ft
Area of Flow: 3.0790 ft^2
Wetted Perimeter: 10.0085 ft
Hydraulic Radius: 0.3076 ft
Average Velocity: 2.2117 ft/s
Top Width: 9.9262 ft
Froude Number: 0.6998
Critical Depth: 0.5448 ft
Critical Velocity: 2.8677 ft/s
Critical Slope: 0.0192 ft/ft
Critical Top Width: 9.30 ft
Calculated Max Shear Stress: 0.3716 lb/ft^2
Calculated Avg Shear Stress: 0.1843 lb/ft^2

Channel Analysis: Inlet 11A to Inlet 12B

Notes:

Input Parameters

Channel Type: Triangular
Side Slope 1 (Z1): 4.7000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Longitudinal Slope: 0.0060 ft/ft
Manning's n: 0.0300
Flow: 0.8700 cfs

Result Parameters

Depth: 0.3235 ft
Area of Flow: 0.7692 ft^2
Wetted Perimeter: 4.8056 ft
Hydraulic Radius: 0.1601 ft
Average Velocity: 1.1311 ft/s
Top Width: 4.7554 ft
Froude Number: 0.4956
Critical Depth: 0.2512 ft
Critical Velocity: 1.8758 ft/s
Critical Slope: 0.0231 ft/ft
Critical Top Width: 4.24 ft
Calculated Max Shear Stress: 0.1211 lb/ft^2
Calculated Avg Shear Stress: 0.0599 lb/ft^2

Channel Analysis: Inlet 12B to Inlet 16B

Notes:

Input Parameters

Channel Type: Triangular
Side Slope 1 (Z1): 7.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Longitudinal Slope: 0.0030 ft/ft
Manning's n: 0.0300
Flow: 8.3000 cfs

Result Parameters

Depth: 0.8121 ft
Area of Flow: 5.6056 ft^2
Wetted Perimeter: 13.9037 ft
Hydraulic Radius: 0.4032 ft
Average Velocity: 1.4807 ft/s
Top Width: 13.8055 ft
Froude Number: 0.4095
Critical Depth: 0.5718 ft
Critical Velocity: 2.9865 ft/s
Critical Slope: 0.0195 ft/ft
Critical Top Width: 10.03 ft
Calculated Max Shear Stress: 0.1520 lb/ft^2
Calculated Avg Shear Stress: 0.0755 lb/ft^2

Channel Analysis: Inlet 18A to Inlet 20A

Notes:

Input Parameters

Channel Type: Triangular
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 11.0000 ft/ft
Longitudinal Slope: 0.0057 ft/ft
Manning's n: 0.0300
Flow: 1.5100 cfs

Result Parameters

Depth: 0.3508 ft
Area of Flow: 1.2924 ft^2
Wetted Perimeter: 7.4010 ft
Hydraulic Radius: 0.1746 ft
Average Velocity: 1.1684 ft/s
Top Width: 7.3676 ft
Froude Number: 0.4916
Critical Depth: 0.2642 ft
Critical Velocity: 2.0601 ft/s
Critical Slope: 0.0259 ft/ft
Critical Top Width: 5.56 ft
Calculated Max Shear Stress: 0.1248 lb/ft^2
Calculated Avg Shear Stress: 0.0621 lb/ft^2

Channel Analysis: Inlet 21A Behind Sidewalk

Notes:

Input Parameters

Channel Type: Triangular
Side Slope 1 (Z1): 4.4000 ft/ft
Side Slope 2 (Z2): 9.8000 ft/ft
Longitudinal Slope: 0.0019 ft/ft
Manning's n: 0.0300
Flow: 2.2200 cfs

Result Parameters

Depth: 0.5778 ft
Area of Flow: 2.3707 ft^2
Wetted Perimeter: 8.2995 ft
Hydraulic Radius: 0.2856 ft
Average Velocity: 0.9365 ft/s
Top Width: 8.2053 ft
Froude Number: 0.3070
Critical Depth: 0.3717 ft
Critical Velocity: 2.2626 ft/s
Critical Slope: 0.0200 ft/ft
Critical Top Width: 6.17 ft
Calculated Max Shear Stress: 0.0685 lb/ft^2
Calculated Avg Shear Stress: 0.0339 lb/ft^2

EXHIBIT 13, DNR INITIAL REVIEW

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
South Central Region Headquarters
3911 Fish Hatchery Road
Fitchburg, WI 53711-5397

Scott Walker, Governor
Cathy Stepp, Secretary
Telephone 608-275-3266
FAX 608-275-3338

July 6, 2016

Chris Hodges, P.E.
WisDOT Project Manager
2101 Wright Street
Madison, WI 53704

Subject: **DNR Initial Project Review**
Project I.D. 3670-01-01
City of Columbus, Farnham Street
STH 89
(Avalon Road – Park Ave/STH 73)
Columbia County

Dear Mr. Hodges:

The Wisconsin Department of Natural Resources (DNR) has received the information you provided for the proposed above-referenced project on June 22, 2016. According to your proposal, the purpose of this project is to reconstruct 0.86 miles of STH 89 from Avalon Road to Park Ave (STH 73) within the City of Columbus. The project includes storm sewer installation, water and sanitary sewer replacement, widening of the roadway up to 10-feet to add bike lanes, tree removal along the roadway, and pavement and aggregate removal and replacement. The project will convert 2,320 feet of the highway, from Avalon Road to the north circle entrance of the High School, from a rural to an urban cross-section.

Preliminary information has been reviewed by DNR staff for the project under the DNR/DOT (Wisconsin Department of Transportation) Cooperative Agreement. Initial comments on the project as proposed are included below, and assume that additional information will be provided that addresses all resource concerns identified. In addition to the project specific resource concerns highlighted below, it is DNR's expectation that the full range of DOT roadway standards will be applied throughout the design process.

A. Project-Specific Resource Concerns

Public Lands:
There are no public natural areas within the project limits.

Wetlands:
There are no wetland concerns within the project limits of Avalon Road to STH 73, based on the information provided. On June 10, the DNR performed a wetland determination and identified wetland areas on both side of the highway approximately 1,000 feet south of the project limits. The DOT surveyed the boundaries during that investigation. DNR requests further coordination and opportunity to provide additional comments if the project limits are changed to include areas approximately 1,000 feet south of Avalon Road.

Fisheries/Stream Work:
2nd Ward Creek is a warm water fishery. In order to protect developing fish eggs and substrate for aquatic organisms, all instream work that could adversely impact water quality should be avoided between March 1 and June 15.

Endangered Resources:
Based upon a review of the Natural Heritage Inventory (NHI) and other DNR records dated June 30, 2016, no Endangered Resources or suitable habitat that could be impacted by this project are known or likely to occur in the project area or its vicinity. There is a State Threatened fish species located in the Crawfish River downstream of the project area. This project should not impact this species provided good erosion control and construction practices are followed during construction, especially in the work near the 2nd Ward Creek or in other areas that could discharge pollutants to the Crawfish River.

Storm Water:
The project would replace a segment of rural cross section highway in the City of Columbus with urban curb and gutter. In order to protect the water quality and in accordance with the FDM post construction water quality management goals, the project should be designed to remove 40% of Total Suspended Solids (TSS) to the maximum extent practicable where curb and gutter will replace a rural cross section. We ask that WisDOT consider providing additional storm water treatment throughout the corridor where practical.

Migratory Birds:
Based on the information provided, it is unlikely that there is migratory bird nesting on the 2nd Ward Creek structure.

Invasive Species and Viral Hemorrhagic Septicemia (VHS):
Any equipment coming into contact with surface waters must be properly cleaned and disinfected to address the spread of invasive species and viruses. Special provisions must require contractors to implement the following measures before and after mobilizing in-water equipment to prevent the spread of VHS, Zebra Mussel, and other invasive species. Contractors should follow ***STSP 107-055*** *Environmental Protection, Aquatic Exotic Species Control*, or protocol found here: http://dnr.wi.gov/topic/fishing/documents/vhs/disinfection_protocols.pdf .

Additional information on invasive species and infested waters can be found at:
http://dnr.wi.gov/lakes/invasives/AISByWaterbody.aspx

Floodplains:
A determination must be made as to whether or not the project lies within a mapped/zoned floodplain. Floodplain impacts should be assessed and/or quantified and appropriate coordination must be carried out in accordance with the DOT/DNR Cooperative Agreement. Coordination must also occur with the Columbia County Zoning Program.

B. Project Specific Construction Site Considerations

The following issues should be addressed in the Special Provisions, and the contractor will be required to outline their construction methods in the Erosion Control Implementation Plan (ECIP). An adequate ECIP for the project must be developed by the contractor and submitted to this office for review at least 14 days prior to the preconstruction conference. Erosion control and stormwater measures must adhere to the DNR/DOT Cooperative Agreement, Trans 401, and applicable federal laws.

Erosion Control and Storm Water Management:

- Erosion control devices should be specified on the construction plans. All disturbed bank areas should be adequately protected and restored as soon as feasible.

- If erosion mat is used along stream banks, DNR recommends that biodegradable non-netted mat be used (e.g. Class I Type A Urban, Class I Type B Urban, or Class II Type C). Long-term netted mats may cause animals to become entrapped while moving in and out of the stream. Avoid the use of fine mesh matting that is tied or bonded at the mesh intersection such that the openings in the mesh are fixed in size.

- If dewatering is required for any reason, the water must be pumped into a properly selected and sized dewatering basin before the clean/filtered water is allowed to enter any waterway or wetland. The basin must remove suspended solids and contaminants to the maximum extent practicable. A properly designed and constructed dewatering basin must take into consideration maximum pumping volume (gpm or cfs) and the sedimentation rate for soils to be encountered. Do not house any dewatering technique in a wetland.

- The contractor should restrict the removal of vegetative cover and exposure of bare ground to the minimum amounts necessary to complete construction. Restoration of disturbed soils should take place as soon as conditions permit. If sufficient vegetative cover will not be achieved because of late season construction, the site must be properly winterized.

- All temporary stock piles must be in an upland location and protected with erosion control measures (e.g. silt fence, rock filter-bag berm, etc.). Do not stockpile materials in wetlands, waterways, or floodplains.

- **Oak Wilt:** This project involves work that may involve cutting or wounding of oak trees. To prevent the spread of oak wilt disease, please avoid cutting or pruning of oaks from April through September. See the DNR webpage at: http://dnr.wi.gov/topic/foresthealth/oakwilt.html .

- **Emerald Ash Borer:** This project has the potential for spreading the Emerald Ash Borer (EAB) beetle. It is illegal to move or transport ash material, the emerald ash borer, and hardwood debris (i.e. firewood) from EAB quarantined areas to a non-quarantined area without a compliance agreement issued by WI Department of Agriculture, Trade and Consumer Protection. Regulated items include cut hardwood (non-coniferous) firewood, ash logs, ash mulch or bark fragments larger than on inch in diameter, or ash nursery stock (DATCP statute 21).
  - For more information regarding the EAB and quarantine areas please click on the following link: http://datcpservices.wisconsin.gov/eab/article.jsp?topicid=20
  - Recommendations to reduce the spread of EAB in potentially infested Ash wood: http://datcpservices.wisconsin.gov/eab/articleassets/Recommendations%20to%20reduce%20the%20spread%20of%20EAB.pdf

The above comments represent the DNR's initial concerns for the proposed project and do not constitute final concurrence. Final concurrence will be granted after further review of refined project plans, and additional consultation if necessary. If any of the concerns or information provided in this letter requires further clarification, please contact this office at (608) 275-3301, or email at eric.heggelund@wisconsin.gov.

Sincerely,

Eric Heggelund

Eric Heggelund
Environmental Analysis & Review Specialist

cc: Brian Taylor, WisDOT
Steve Porter, WisDOT

EXHIBIT 14, EXISTING PHOTOGRAPHS