Stormwater Management Report

48 Giles Avenue
North Haven, New Haven County, Connecticut

Prepared For Submission To:
Town of North Haven

October 7, 2021

BL Project Number: 07C2352

Prepared For:
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North Haven, Connecticut

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355 Research Parkway
Meriden, Connecticut
(203) 630-1406 Fax (203) 630-26

Table of Contents

Introduction

The purpose of this report is to present the Town of North Haven Planning and Zoning Commission with sufficient information regarding the technical aspects of the proposed project to review the associated potential impacts. All work is intended to be in full compliance with the Town of North Haven and State regulations while taking prevailing site conditions and practical needs into account.

The application presented to the Town of North Haven is for the expansion of the existing facility located at 48 Giles Avenue. The existing 5.41 acre facility will be expanded to include a new 9,800 SF Phase 1 storage building, with a future 4,200 SF Phase 2 expansion, additional parking and maneuvering area, utility upgrades, a new stormwater management system, and landscaping.

Existing Site Conditions

The site is located in the IG Industrial zone east of Interstate 91 and south of Sackett Point Road. The address of the property is 48 Giles Avenue. The parcel contains 235,555 square feet or 5.41 acres of land.

The property is currently developed with an existing 11,987 SF building, a bituminous pavement access drive and parking area. The groundcover in the remainder of the parcel is comprised of separate areas of grass and gravel.

All utilities are present along the frontage of the site, and stormwater runoff is currently collected and discharged into a drainage ditch along the Interstate 91 right-of-way.

Existing Drainage

There are currently two stormwater runoff collection systems on-site. The first collects runoff from the developed portion of the site and along the western perimeter boundary and discharges runoff to the drainage ditch along the Interstate 91 right-of-way located to the southwest adjacent to the site.

The second collection system collects runoff that sheet flows across the central portion of the site into a yard drain that also discharges to the Interstate 91 drainage ditch.

Floodplain

A small portion of the site along the southwestern boundary with the Interstate 91 right-of-way is located within a Zone B Area according to FEMA Flood Insurance Rate Map Community Panel Number 090086 0005 B.

The site is also located within the Coastal Area Management Zone per the Town of North Haven Zoning Map.

Developed Site Conditions

Proposed Site Plan

The proposed improvements include the construction of a 9,800 SF building and future 4,200 SF expansion, and associated site improvements such as parking, drives and landscaping.

Site improvements include in the installation of new parking and maneuvering areas adjacent to the new building. Site utilities will also be upgraded as necessary. The expansion of the existing use will result in an increase in the amount of impervious area on site. Therefore, an underground detention/infiltration system is proposed to limit the post-development peak runoff rate to below pre-development levels and to provide for infiltration of the water quality groundwater recharge volume.

A new on-line Vortsentry water quality device is also proposed to provide for 80% total suspended solids removal from the water quality event for collected runoff from the newly renovated portion of the site.

Stormwater Management

Existing Drainage Patterns

The site is located at the end of Giles Street and slopes from northeast to southwest. A portion of the stormwater runoff from the site is collected into one of two collection systems and discharged into a drainage ditch along the Interstate 91 right-of-way. The portion of the runoff that is not collected, sheetflows to the southwest and into the drainage ditch. There are currently no stormwater quality devices located on-site.

The Existing Drainage Area Map EDA-1 is located in Appendix A.

Proposed Drainage Design

The proposed Stormwater management system has been designed per the Connecticut Department of Transportation Drainage Manual and Town of North Haven guidelines. The new proposed stormwater collection system and detention/infiltration system has been designed to safely collect and convey the stormwater runoff and to provide for the required stormwater quality and groundwater recharge volumes.

The proposed drainage areas are depicted on the enclosed Proposed Drainage Area Map (PDA-1), located in Appendix A. The stormwater runoff from the new pavement areas of the developed site will be collected by catch basins located throughout the site. Roof runoff from the new building and surrounding grass areas will be directed into an underground detention/infiltration system comprised of 36” perforated pipe bedded in 2-inch stone. The outlet to this system will convey runoff into the remainder of the

collection system which will be routed through a new on-line Vortsentry system to provide for 80% total suspended solid removal prior to discharge into the existing pipe network that eventually discharges into the drainage ditch adjacent to the Interstate 91 right-of-way.

The proposed stormwater collection system has been designed to safely convey a 10 - year storm event. See Appendix B for calculations.

Proposed Water Quality Treatment

Proposed storm water quality treatment has been designed in accordance with the Connecticut Stormwater Quality Manual. The objective of Water Quality guidelines is to capture, treat and recharge the Water Quality Volume (WQV) and Groundwater Recharge Volume (GRV) to improve the impacts caused by the proposed impervious surfaces. The WQV is the volume of water produced by a 1" storm event, which requires the treatment and removal of 80% of the Total Suspended Solids (TSS). The GRV is the volume required to infiltrate into the surrounding soil to recharge the ground water table.

The proposed water quality improvements include the installation an on-line Vortsentry system capable of removing 80% total suspended solids while bypassing larger events without resuspension of collected particles. The proposed underground detention/infiltration system will be constructed of 565 linear feet of 24" diameter perforated aluminized steel corrugated metal pipe (ASCMP) set within a bed of 2" stone that will provide infiltration.

The water quality volume for the site has been calculated to be equal to 10,323 cubic feet of water. The water quality flow rate for the site has been calculated to be 1.63 CFS. The groundwater recharge volume for this site has been calculated to be 0.026 acre-feet or 1132 CF. See Appendix B for calculations.

Pre-development versus Post-development Comparison

The following chart illustrates the comparison in expected peak rates of runoff for predevelopment and post-development rainfall events.

Predevelopment vs. Postdevelopment

	Existing Peak Flow - CFS	Prop. Peak Flow CFS	Change in Flow - CFS	% Change in Peak Flow
2 Year POI-1	4.68	4.04	-0.64	-13.7%
10 Year POI-1	8.77	7.50	-1.27	-14.5%
25 Year POI-1	10.63	8.93	-1.70	-16.0%
100 Year POI-1	14.47	11.76	-2.71	-18.7%

Analysis Methodology

The HydroCAD stormwater modeling system computer program by HydroCAD Software Solutions, LLC was used to analyze the storm system for a Type III 24-hour, 2-year, 10-year, 25-year, 100-year. The program utilizes the SCS TR20/55 method to estimate the

runoff produced within a given drainage area and routes the resulting flows through the proposed stormwater management system. Drainage areas, or subcatchments as labeled by the program, are depicted by hexagons and detention systems, or "ponds" as labeled by the program, this can be found on the drainage diagrams enclosed within Appendix B.

The proposed drainage areas used in the calculations are illustrated on the Proposed Drainage Area Maps (PD-01). This map and the corresponding HydroCAD output are located in Appendix A.

The stormwater collection system was analyzed using StormCAD Version 5.5 software created by Haestad Methods, Inc. of Waterbury, CT. The collection system was analyzed for a 10-year storm.

Conclusions

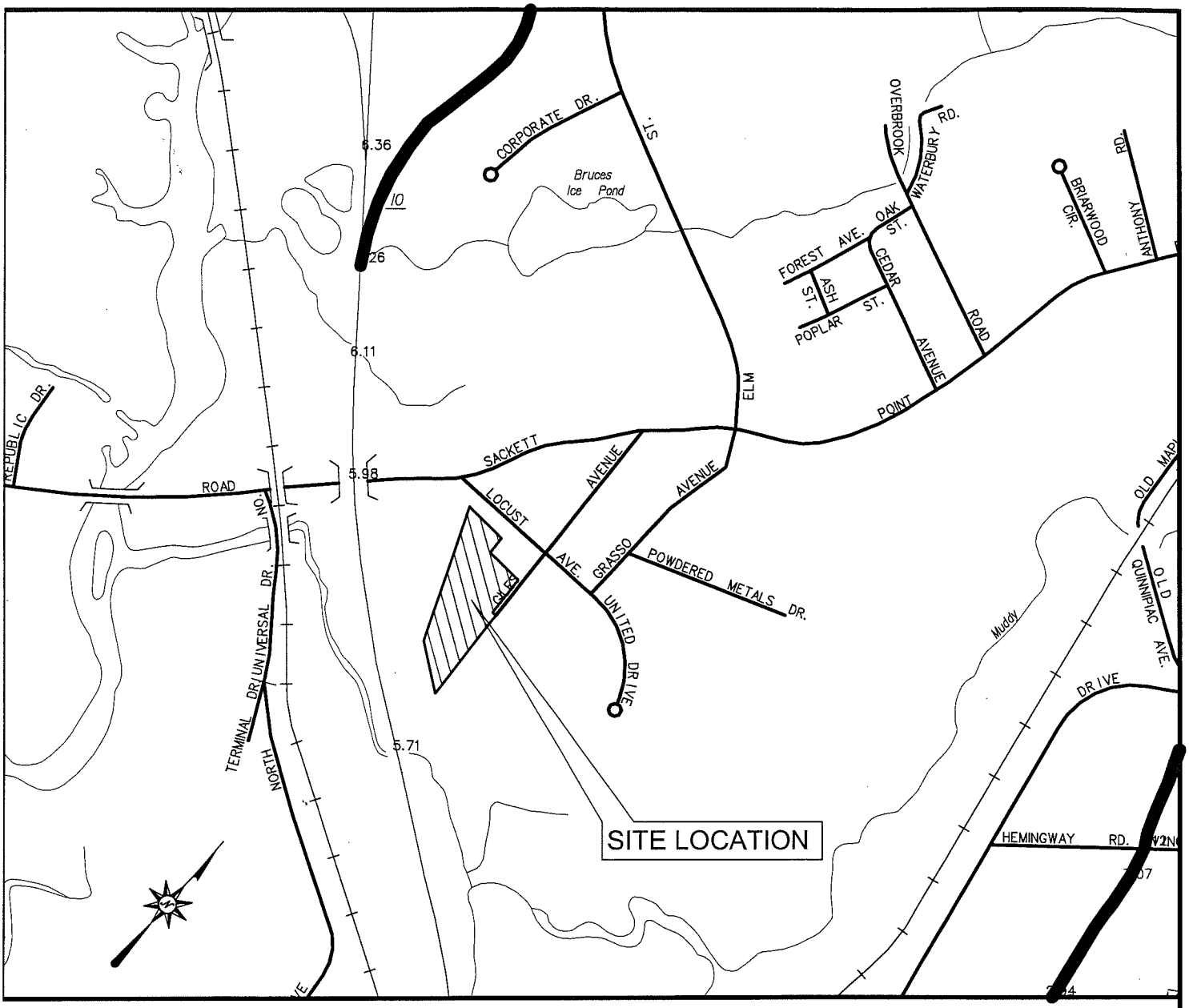
The proposed stormwater drainage system has been designed to safely collect, convey, detain, and improve the quality of the runoff being discharged from the site generated during the various storm events as required per local regulations.

Overall, there will be a reduction in peak flow rates for each design storm analyzed, and an improvement in water quality.

This report has been prepared to compliment the submitted project plans as well as to represent the technical basis for the designs presented herein. In consideration of the overall project, we conclude that all technical concerns and design parameters set forth by the Town of North Haven, and the State of Connecticut can and have been fully met.

Appendix A

Location Map
Drainage Area Maps
FEMA Maps
NRCS Soils Maps

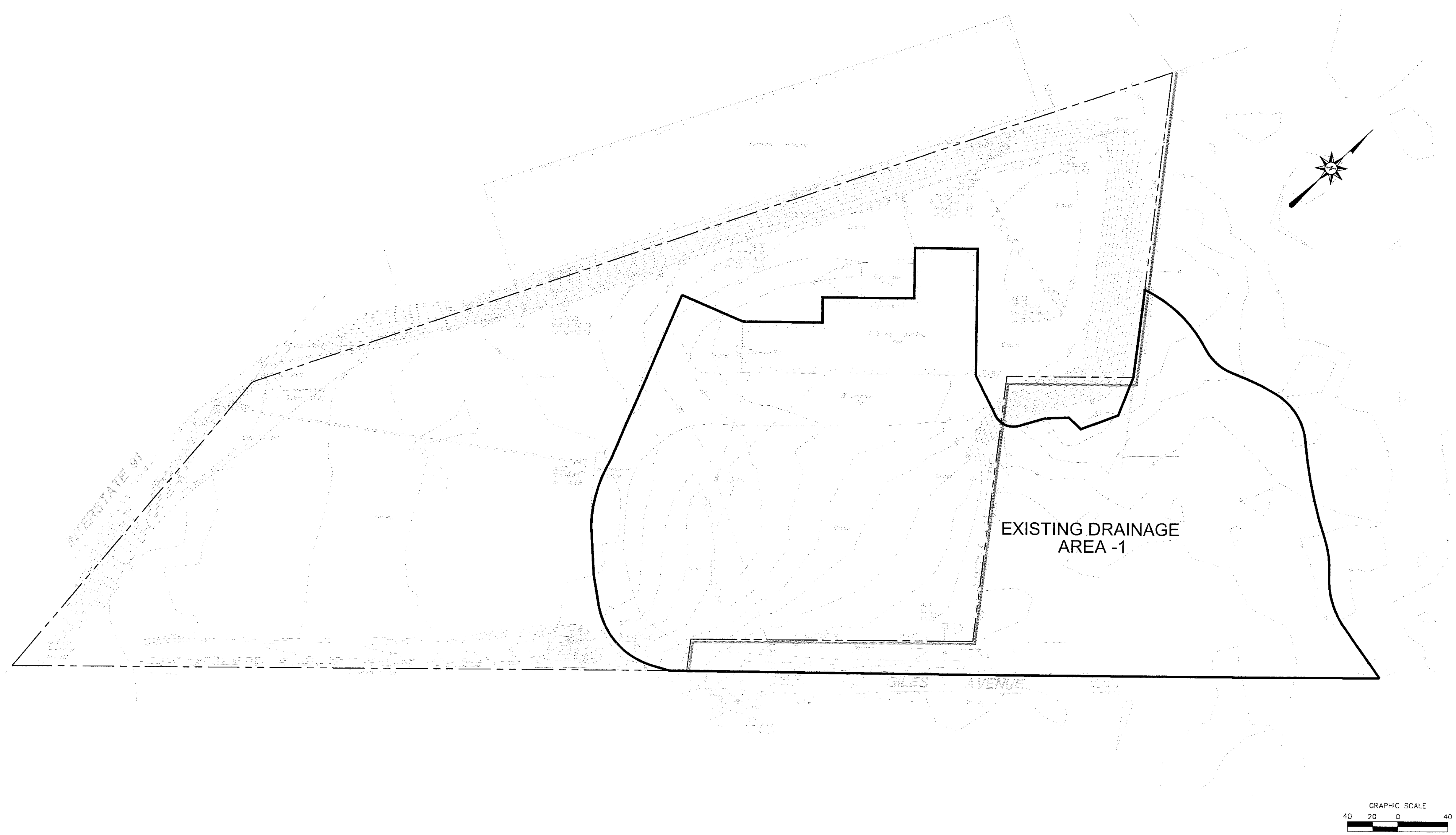


VICINITY MAP

N.T.S.

NOTE

STATE SUPPLIED CONTOUR INFORMATION USED FOR OUTSIDE PROJECT AREA.



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LANDSCAPE ARCHITECTURE
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ENVIRONMENTAL SCIENCES

355 Research Parkway
Meriden, CT 06450
(203) 630-1406
(203) 630-2615 Fax

PROPOSED BUILDING ADDITION
48 GILES AVENUE
NORTH HAVEN, CONNECTICUT

REVISIONS

No.	Date	Desc.

Designed	J.O.M.
Drawn	E.L.R.
Checked	
Approved	
Scale	1"=40'
Project No.	07C2352
Date	10/07/2021
CAD File	DA07C235201

Title

EXISTING DRAINAGE AREA PLAN

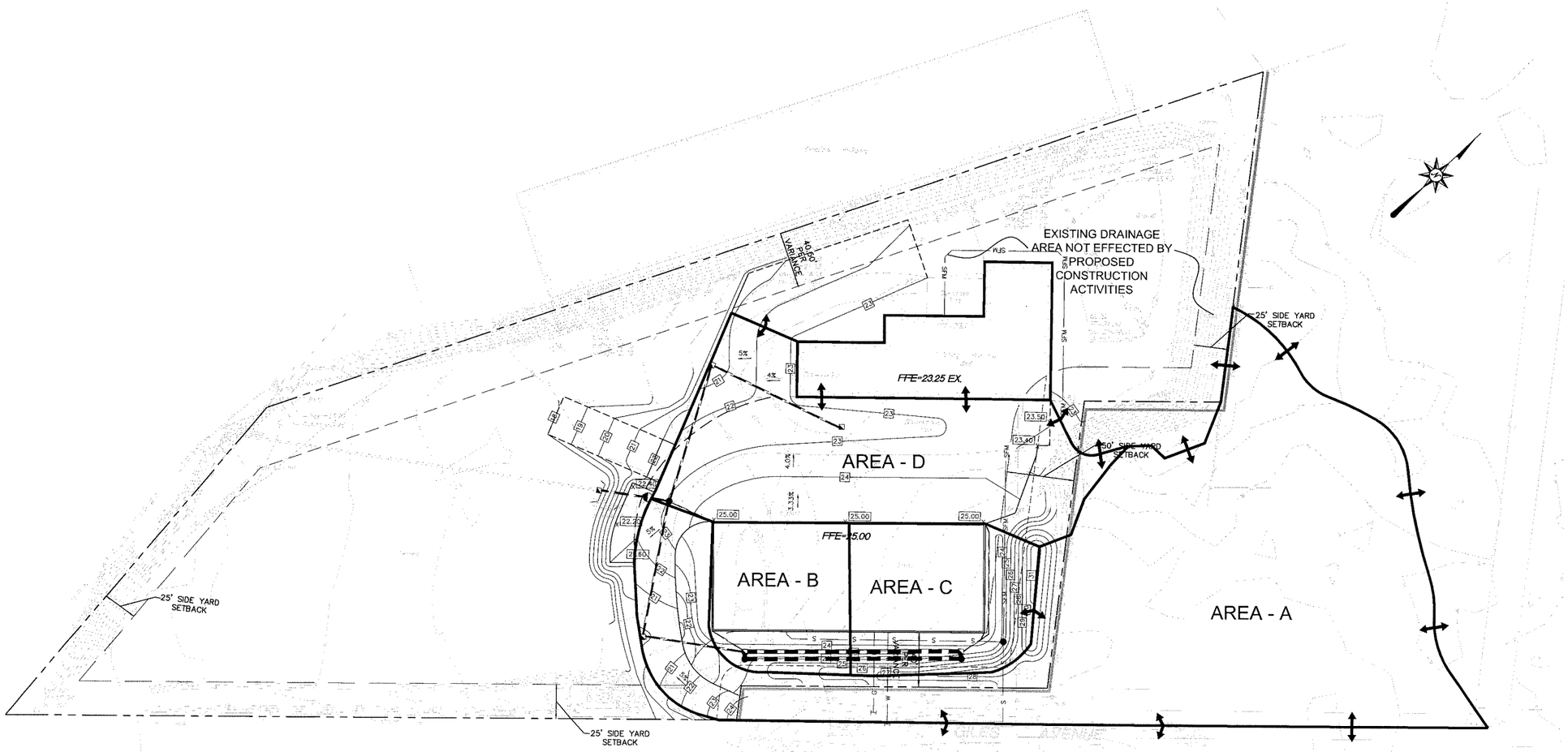
Sheet No.

EDA-1

Xref (s): : xy07c235201 ; BD07C235201 ; XC07c235201 ; XC07c235202 ; XZ06C1B2101 ; XC07c235210

NOTE

STATE SUPPLIED CONTOUR INFORMATION USED FOR OUTSIDE PROJECT AREA.



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PROPOSED DRAINAGE AREA PLAN

Sheet No.

PDA-1

Xref Ob. : xy07c235201 ; B007C235201 ; XC07c235201 ; XC07c235202 ; XC06C182101 ; XC07c235210

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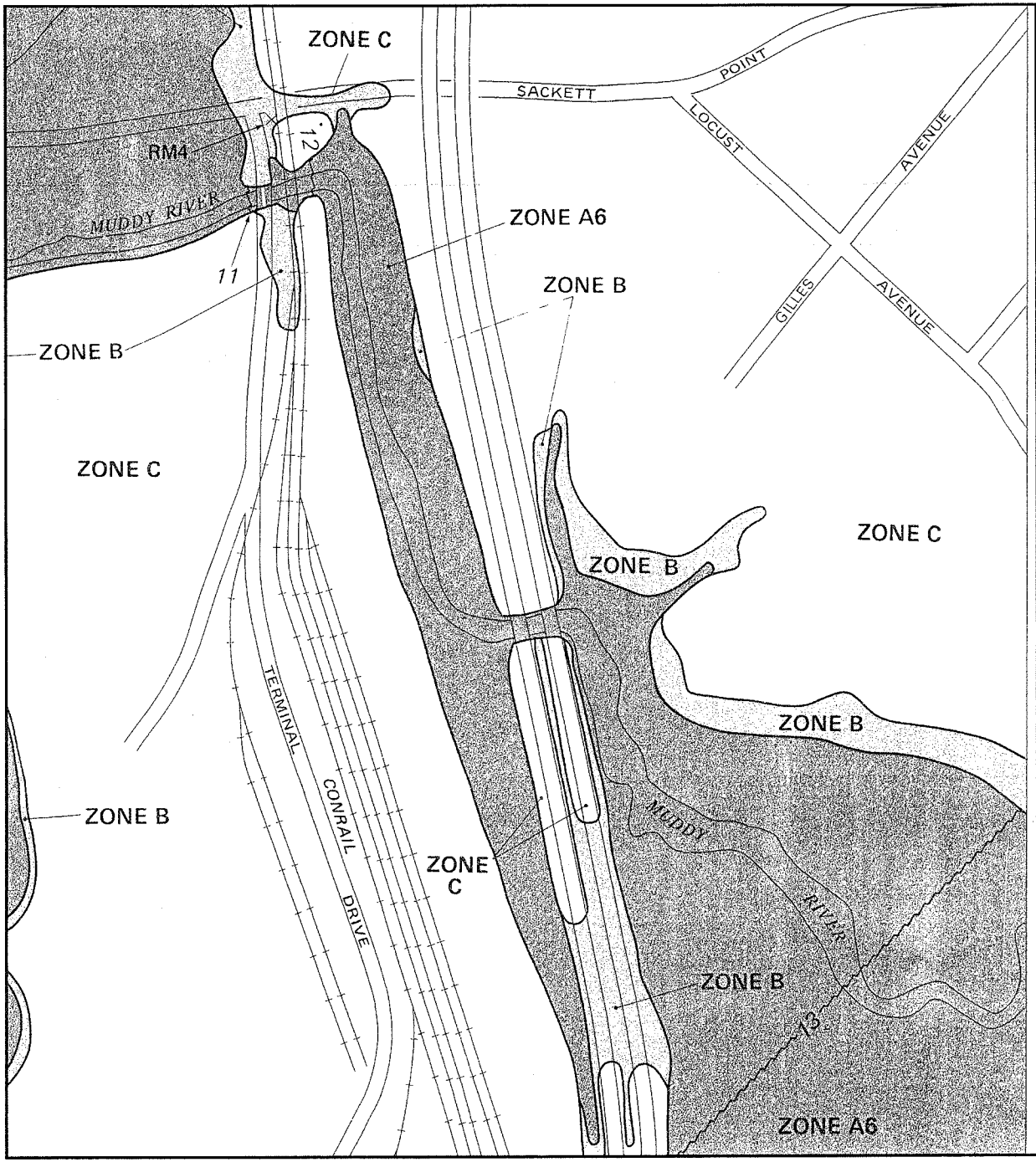


N

APPROXIMATE SCALE

400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

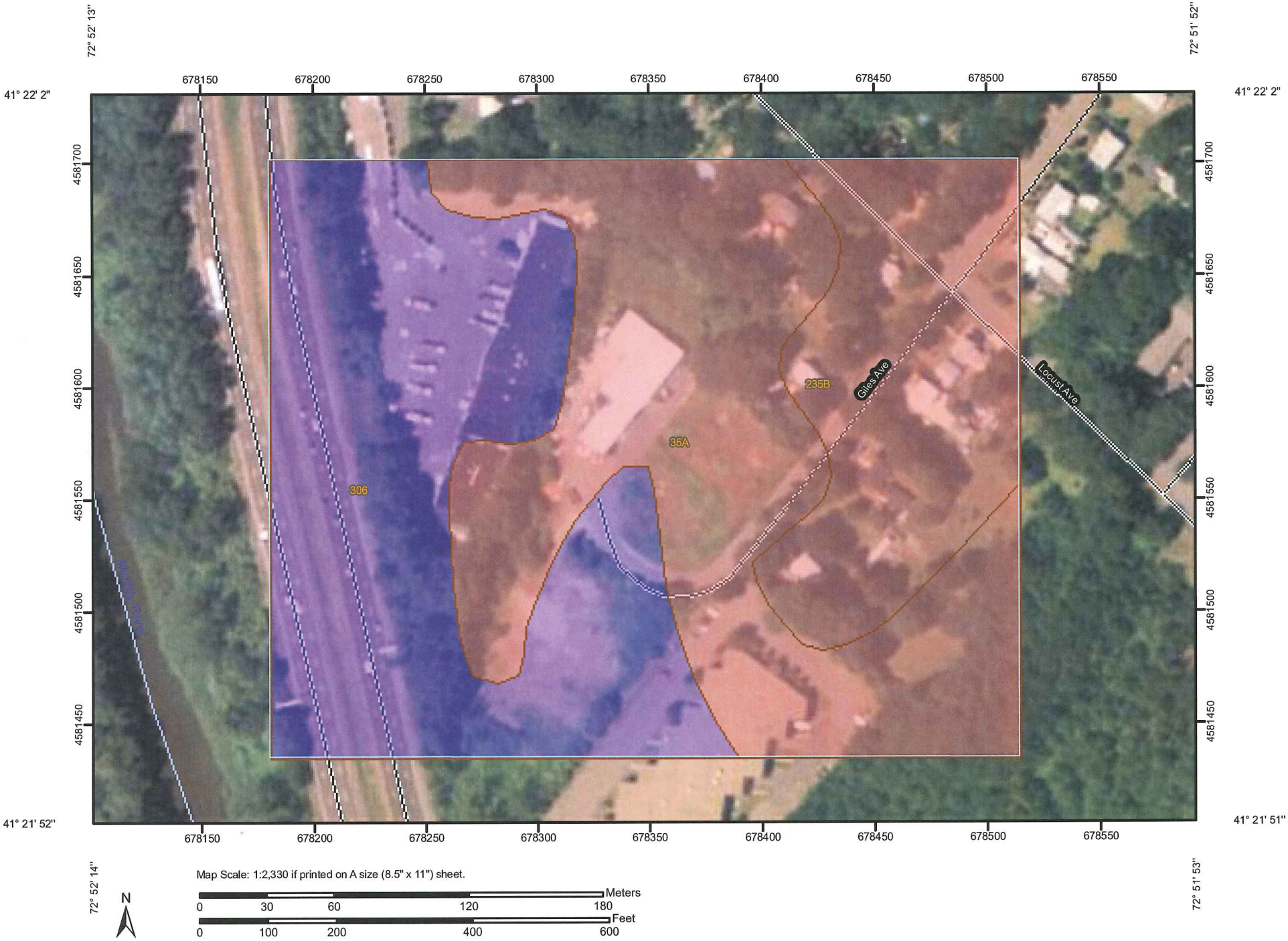
TOWN OF
NORTH HAVEN,
CONNECTICUT
NEW HAVEN COUNTY

PANEL 5 OF 8
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
090086 0005 B

MAP REVISED:
MAY 1, 1985

Federal Emergency Management Agency


72° 52' 13"
72° 51' 52"
41° 22' 2"
678150
678200
678250
678300
678350
678400
678450
678500
678550
4581700
4581650
4581600
4581550
4581500
4581450
306
35A
235B
Giles Ave
Locust Ave
41° 21' 52"
41° 21' 51"
72° 52' 14"
72° 51' 53"
N
Map Scale: 1:2,330 if printed on A size (8.5" x 11") sheet.
Meters
0 30 60 120 180
Feet
0 100 200 400 600

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Units

Soil Ratings

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

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

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

MAP INFORMATION

Map Scale: 1:2,330 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 7, Dec 3, 2009

Date(s) aerial images were photographed: 8/13/2006

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 — State of Connecticut				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
35A	Penwood loamy sand, 0 to 3 percent slopes	A	8.6	39.2%
235B	Penwood-Urban land complex, 0 to 8 percent slopes	A	4.5	20.7%
306	Udorthents-Urban land complex	B	8.8	40.1%
Totals for Area of Interest			**22.0**	**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

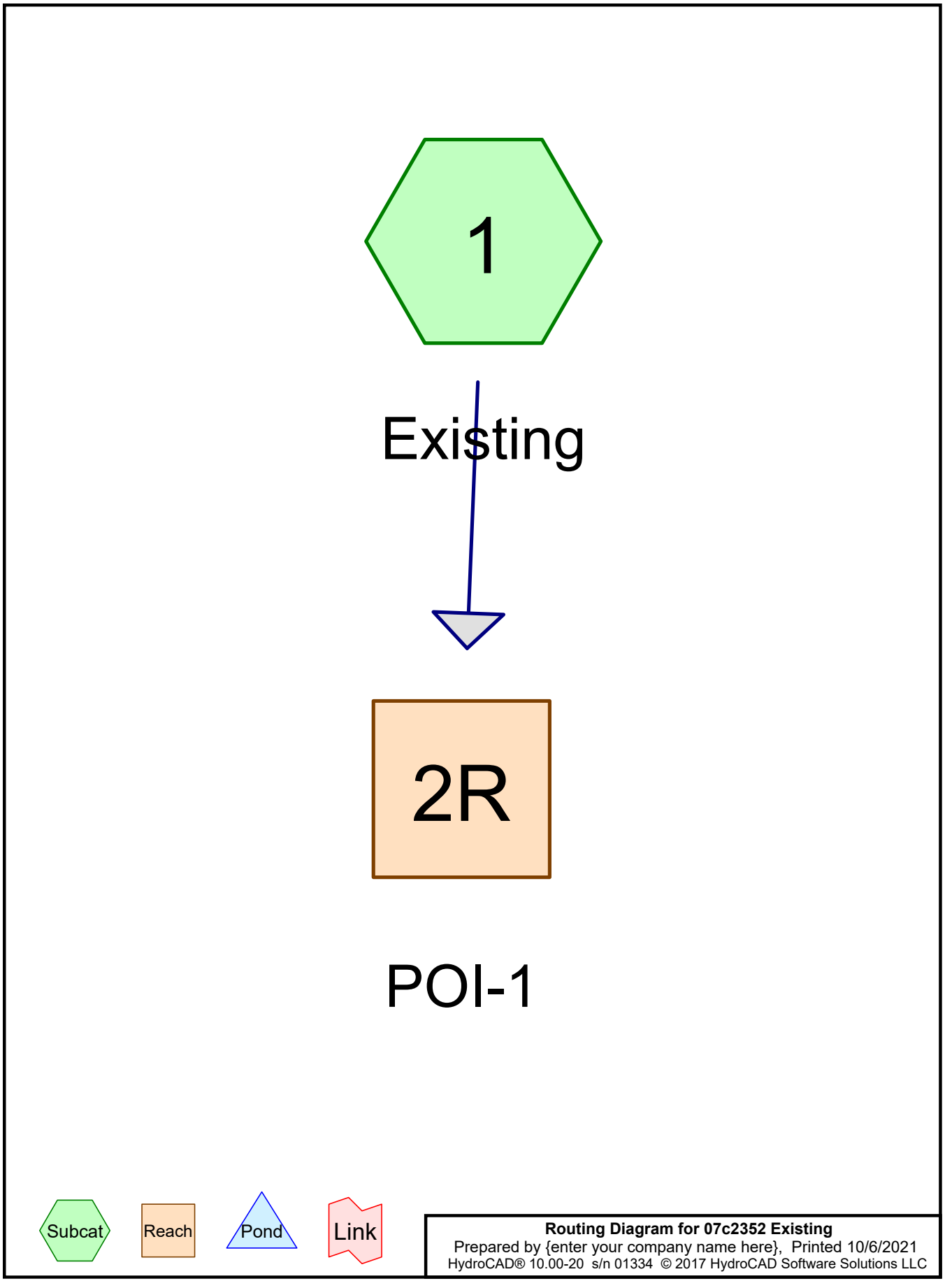
Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

Appendix B

Water Quality Calculations
Pre & Post-development Drainage Calculations



Routing Diagram for 07c2352 Existing
Prepared by {enter your company name here}, Printed 10/6/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.483	74	>75% Grass cover, Good, HSG C (1)
0.774	98	Paved parking & roofs (1)
3.257	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
2.483	HSG C	1
0.000	HSG D	
0.774	Other	1
3.257		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	2.483	0.000	0.000	2.483	>75% Grass cover, Good	1
0.000	0.000	0.000	0.000	0.774	0.774	Paved parking & roofs	1
0.000	**0.000**	**2.483**	**0.000**	**0.774**	**3.257**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Existing Runoff Area=141,872 sf 23.77% Impervious Runoff Depth>1.44"
Flow Length=369' Tc=12.8 min CN=80 Runoff=4.68 cfs 0.390 af

Reach 2R: POI-1 Inflow=4.68 cfs 0.390 af
Outflow=4.68 cfs 0.390 af

Total Runoff Area = 3.257 ac Runoff Volume = 0.390 af Average Runoff Depth = 1.44"
76.23% Pervious = 2.483 ac 23.77% Impervious = 0.774 ac

Summary for Subcatchment 1: Existing

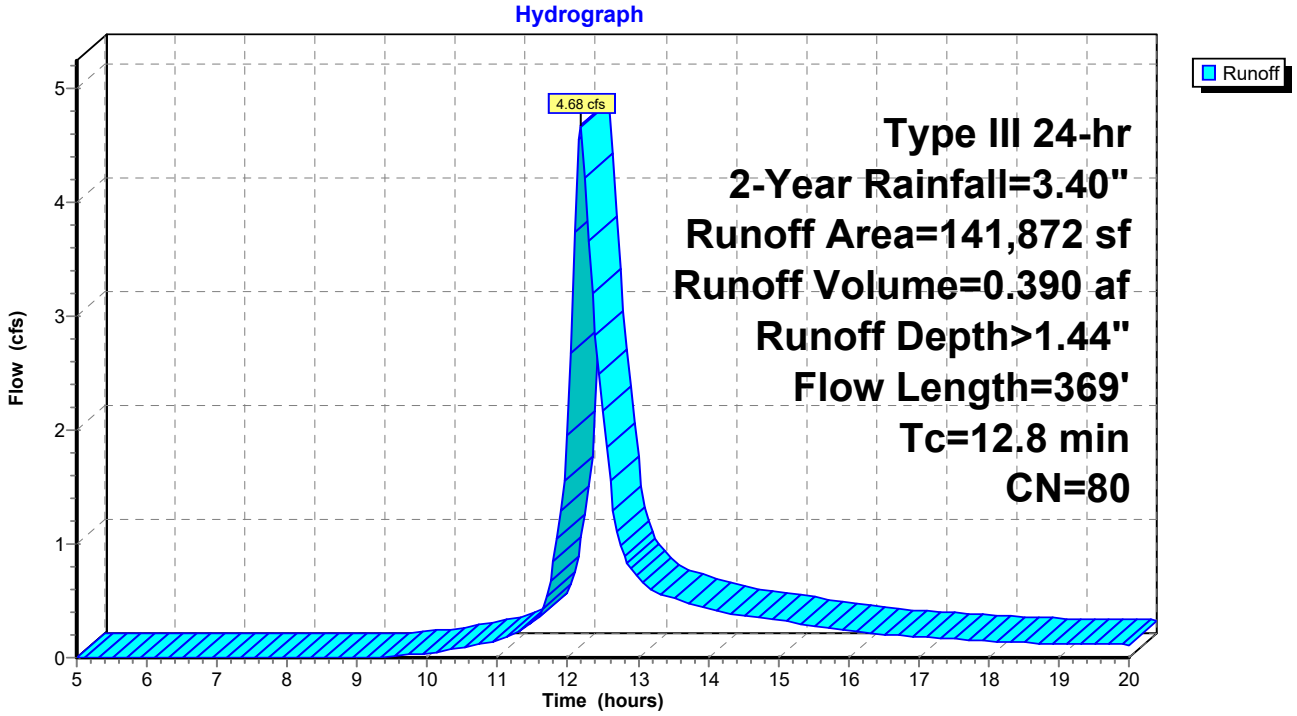
Runoff = 4.68 cfs @ 12.18 hrs, Volume= 0.390 af, Depth> 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
33,724	98	Paved parking & roofs
108,148	74	>75% Grass cover, Good, HSG C
141,872	80	Weighted Average
108,148		76.23% Pervious Area
33,724		23.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	160	0.0312	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	151	0.0265	2.62		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.2	58	0.0369	3.90		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.8	369	Total			

Subcatchment 1: Existing



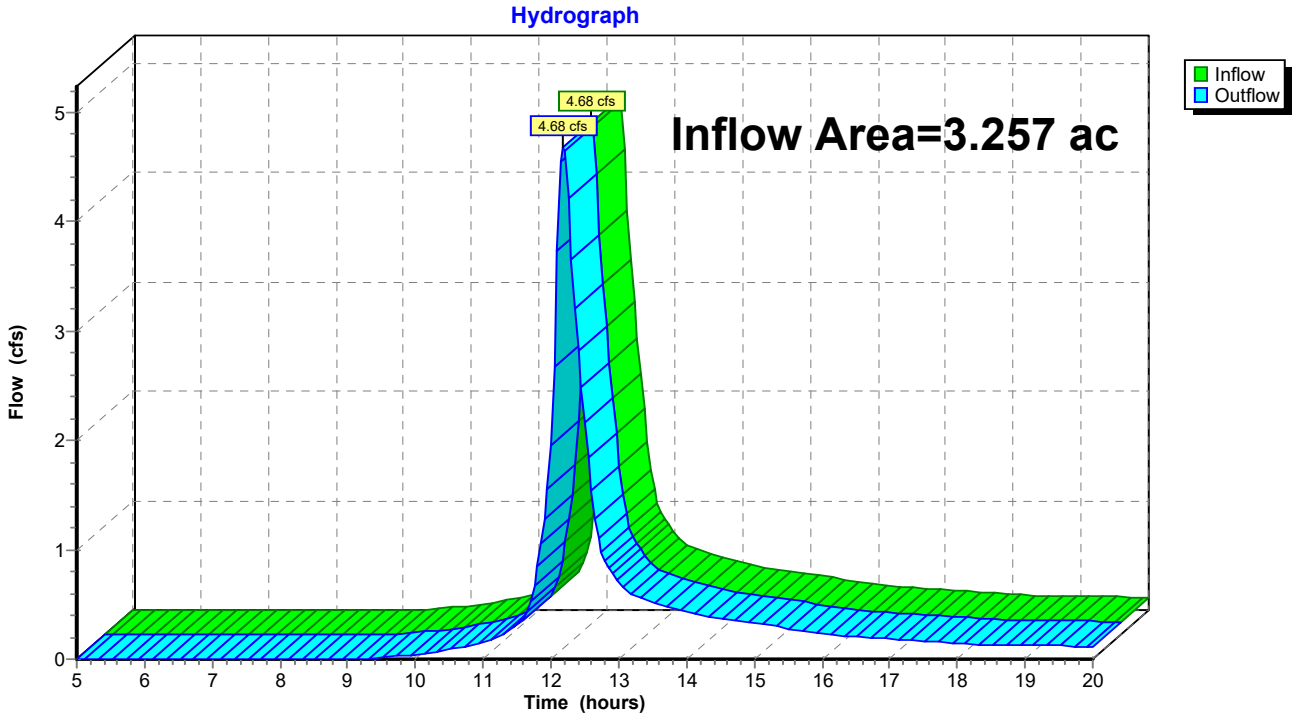
Summary for Reach 2R: POI-1

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

Inflow Area = 3.257 ac, 23.77% Impervious, Inflow Depth > 1.44" for 2-Year event
Inflow = 4.68 cfs @ 12.18 hrs, Volume= 0.390 af
Outflow = 4.68 cfs @ 12.18 hrs, Volume= 0.390 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Existing Runoff Area=141,872 sf 23.77% Impervious Runoff Depth>2.13"
Flow Length=369' Tc=12.8 min CN=80 Runoff=6.94 cfs 0.578 af

Reach 2R: POI-1 Inflow=6.94 cfs 0.578 af
Outflow=6.94 cfs 0.578 af

Total Runoff Area = 3.257 ac Runoff Volume = 0.578 af Average Runoff Depth = 2.13"
76.23% Pervious = 2.483 ac 23.77% Impervious = 0.774 ac

Summary for Subcatchment 1: Existing

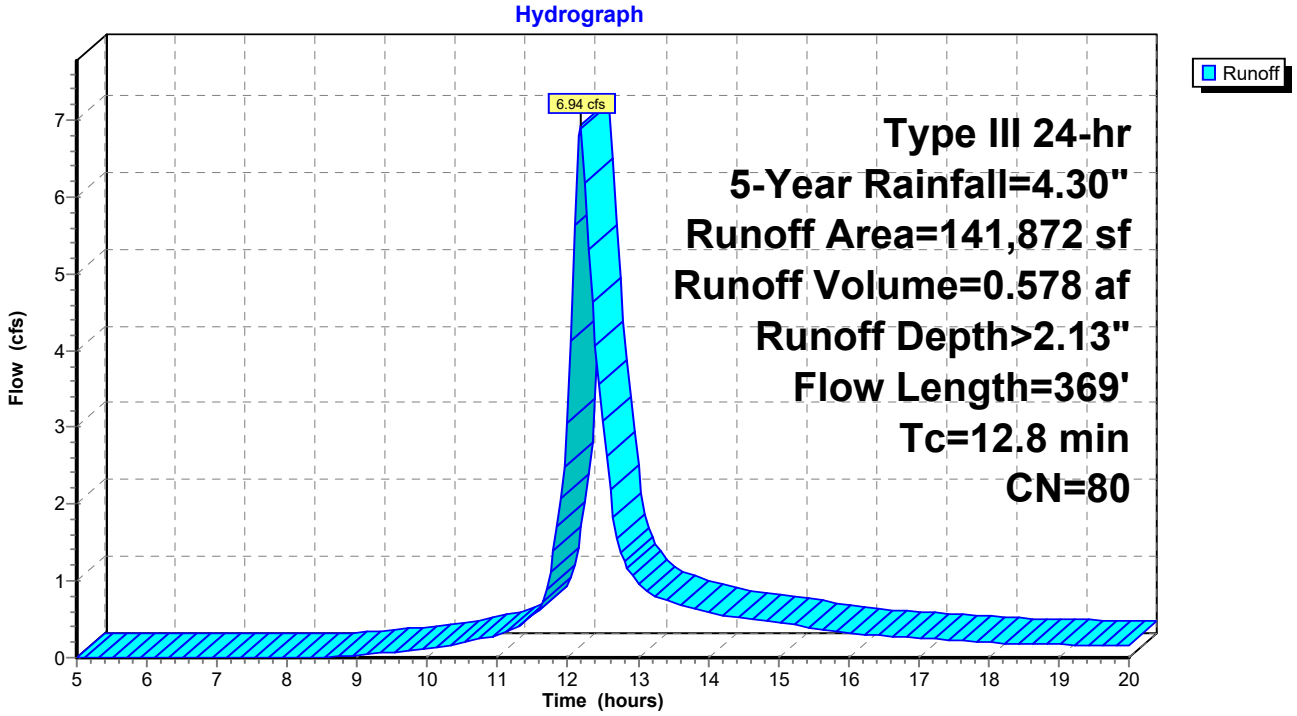
Runoff = 6.94 cfs @ 12.18 hrs, Volume= 0.578 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 5-Year Rainfall=4.30"

Area (sf)	CN	Description
33,724	98	Paved parking & roofs
108,148	74	>75% Grass cover, Good, HSG C
141,872	80	Weighted Average
108,148		76.23% Pervious Area
33,724		23.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	160	0.0312	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	151	0.0265	2.62		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.2	58	0.0369	3.90		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.8	369	Total			

Subcatchment 1: Existing



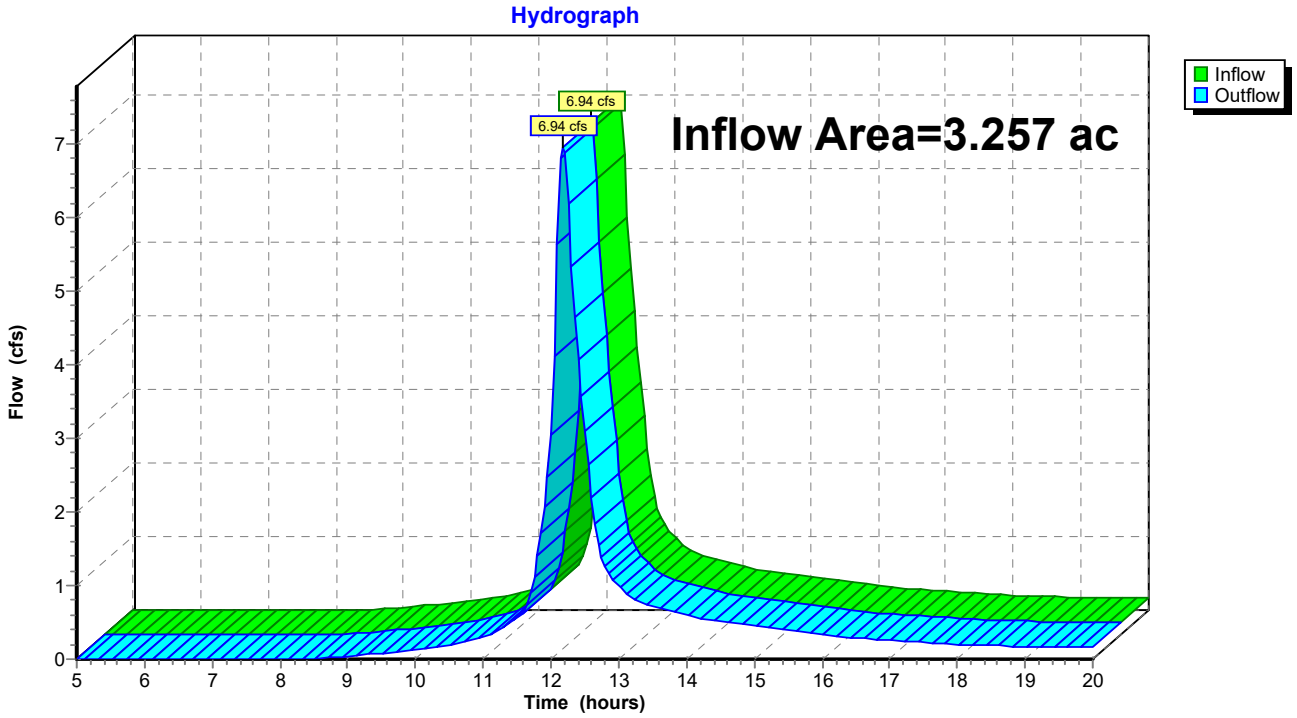
Summary for Reach 2R: POI-1

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

Inflow Area = 3.257 ac, 23.77% Impervious, Inflow Depth > 2.13" for 5-Year event
Inflow = 6.94 cfs @ 12.18 hrs, Volume= 0.578 af
Outflow = 6.94 cfs @ 12.18 hrs, Volume= 0.578 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



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Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Existing Runoff Area=141,872 sf 23.77% Impervious Runoff Depth>2.70"
Flow Length=369' Tc=12.8 min CN=80 Runoff=8.77 cfs 0.732 af

Reach 2R: POI-1 Inflow=8.77 cfs 0.732 af
Outflow=8.77 cfs 0.732 af

Total Runoff Area = 3.257 ac Runoff Volume = 0.732 af Average Runoff Depth = 2.70"
76.23% Pervious = 2.483 ac 23.77% Impervious = 0.774 ac

Summary for Subcatchment 1: Existing

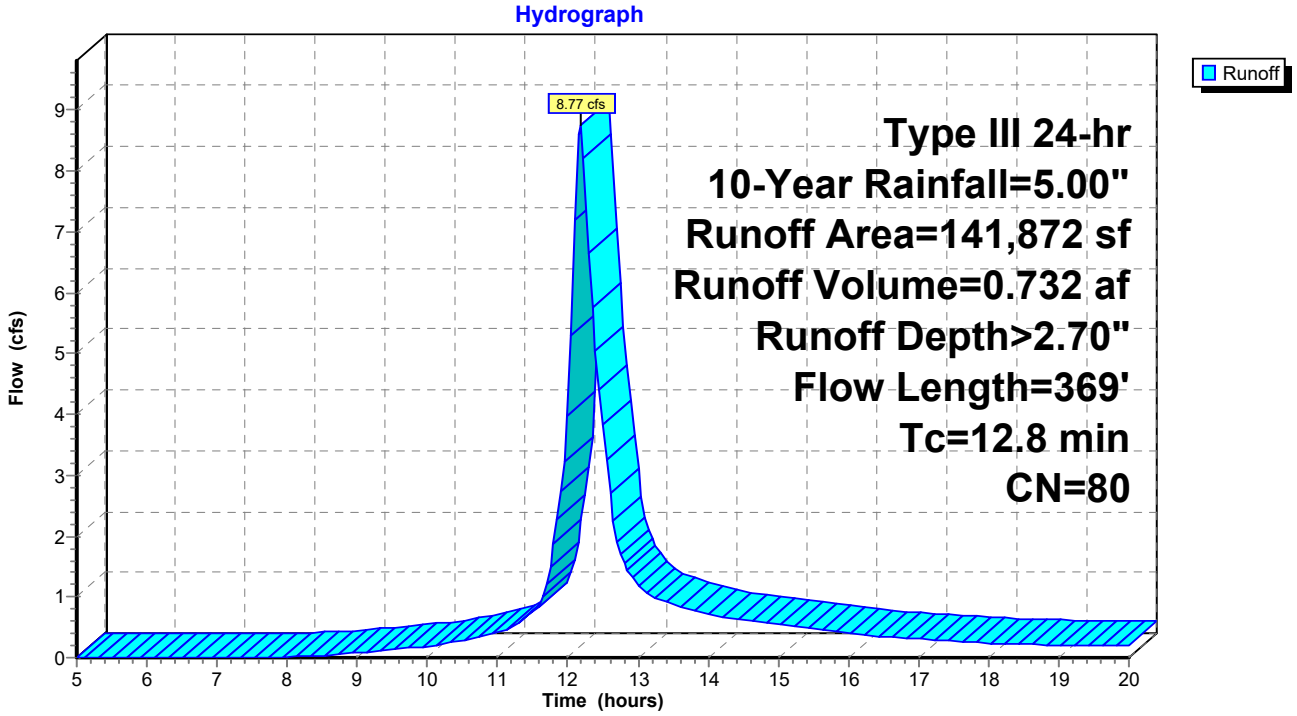
Runoff = 8.77 cfs @ 12.18 hrs, Volume= 0.732 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.00"

Area (sf)	CN	Description
33,724	98	Paved parking & roofs
108,148	74	>75% Grass cover, Good, HSG C
141,872	80	Weighted Average
108,148		76.23% Pervious Area
33,724		23.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	160	0.0312	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	151	0.0265	2.62		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.2	58	0.0369	3.90		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.8	369	Total			

Subcatchment 1: Existing



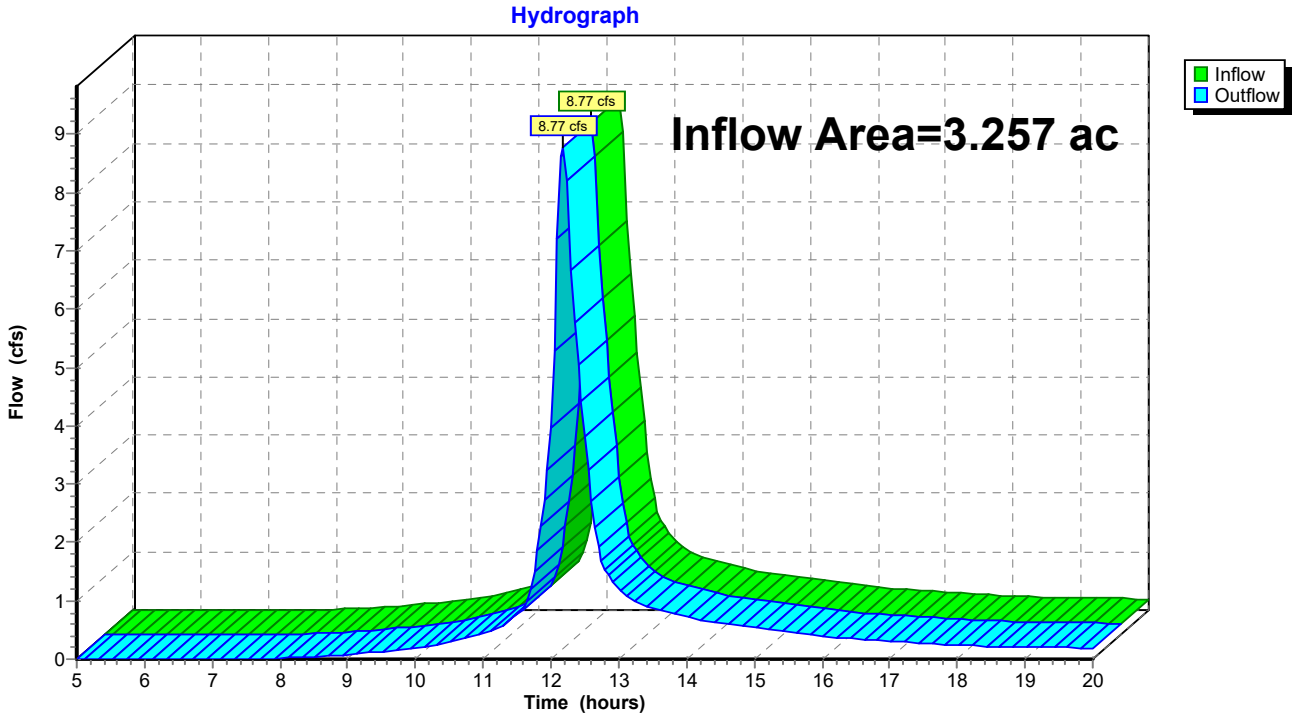
Summary for Reach 2R: POI-1

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

Inflow Area = 3.257 ac, 23.77% Impervious, Inflow Depth > 2.70" for 10-Year event
Inflow = 8.77 cfs @ 12.18 hrs, Volume= 0.732 af
Outflow = 8.77 cfs @ 12.18 hrs, Volume= 0.732 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Existing Runoff Area=141,872 sf 23.77% Impervious Runoff Depth>3.28"
Flow Length=369' Tc=12.8 min CN=80 Runoff=10.63 cfs 0.891 af

Reach 2R: POI-1 Inflow=10.63 cfs 0.891 af
Outflow=10.63 cfs 0.891 af

Total Runoff Area = 3.257 ac Runoff Volume = 0.891 af Average Runoff Depth = 3.28"
76.23% Pervious = 2.483 ac 23.77% Impervious = 0.774 ac

Summary for Subcatchment 1: Existing

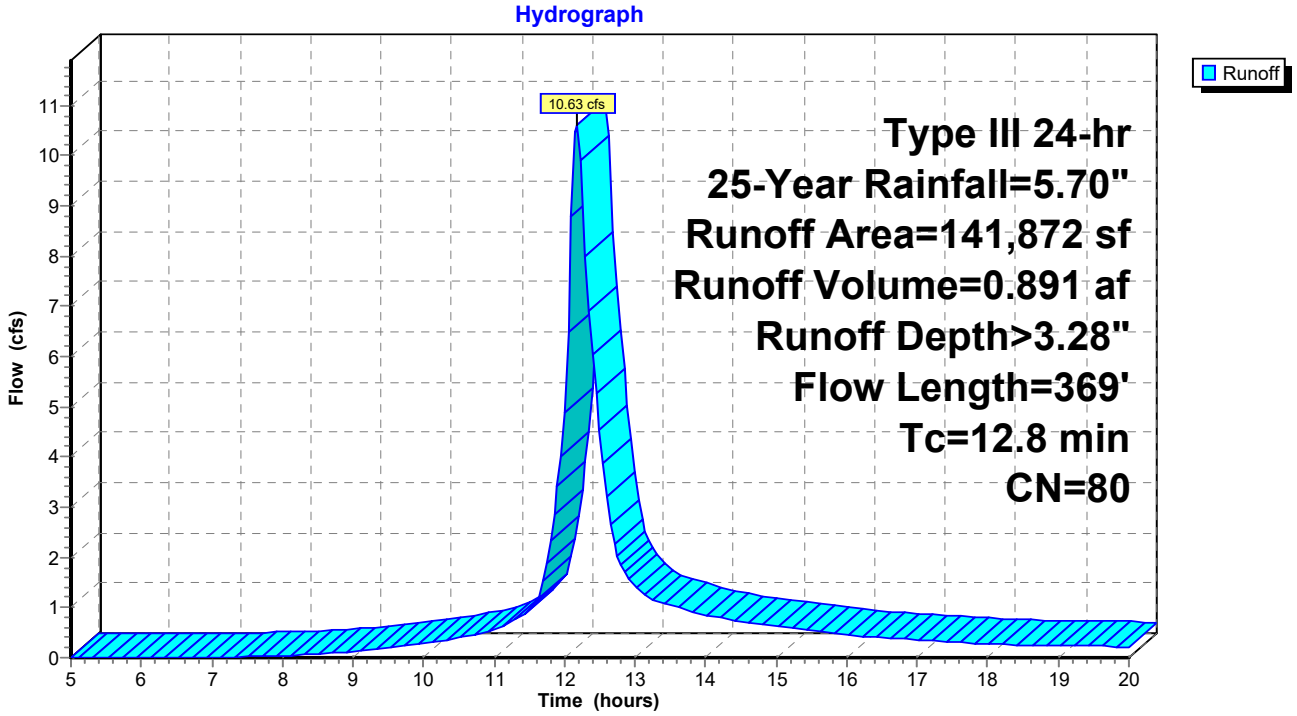
Runoff = 10.63 cfs @ 12.18 hrs, Volume= 0.891 af, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.70"

Area (sf)	CN	Description
33,724	98	Paved parking & roofs
108,148	74	>75% Grass cover, Good, HSG C
141,872	80	Weighted Average
108,148		76.23% Pervious Area
33,724		23.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	160	0.0312	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	151	0.0265	2.62		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.2	58	0.0369	3.90		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.8	369	Total			

Subcatchment 1: Existing



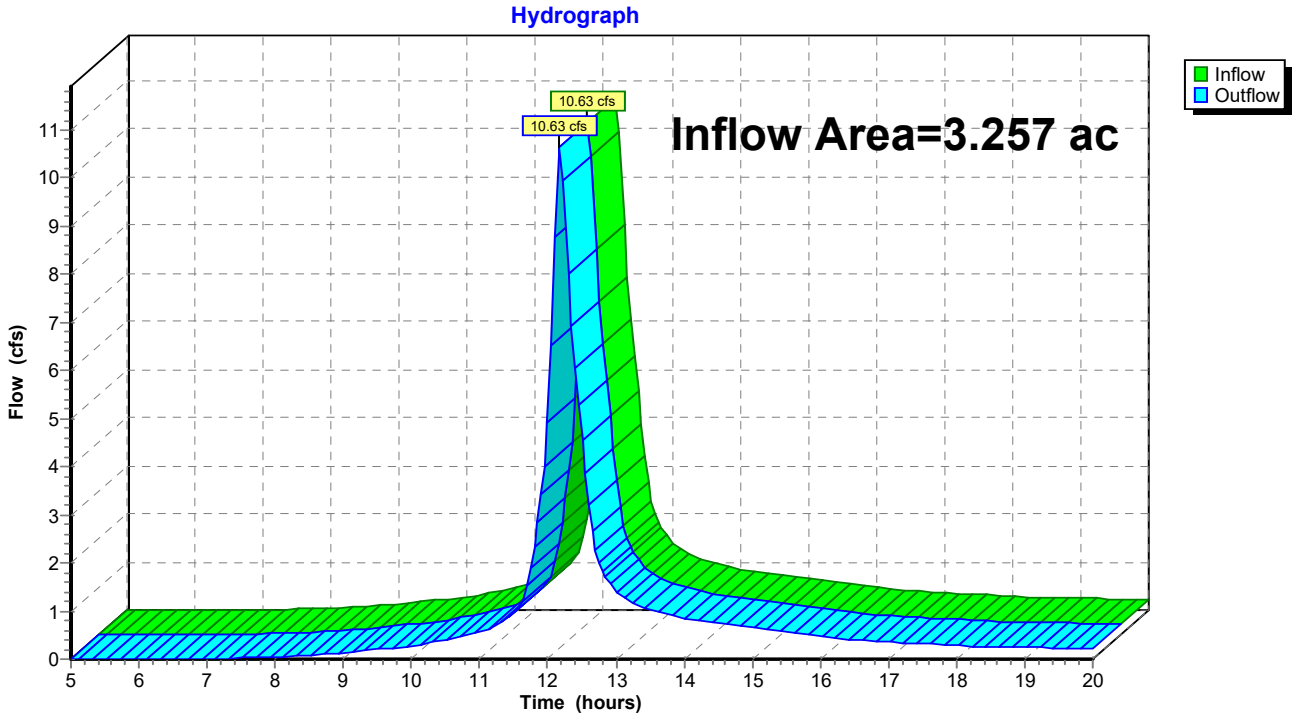
Summary for Reach 2R: POI-1

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

Inflow Area = 3.257 ac, 23.77% Impervious, Inflow Depth > 3.28" for 25-Year event
Inflow = 10.63 cfs @ 12.18 hrs, Volume= 0.891 af
Outflow = 10.63 cfs @ 12.18 hrs, Volume= 0.891 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Existing Runoff Area=141,872 sf 23.77% Impervious Runoff Depth>3.79"
Flow Length=369' Tc=12.8 min CN=80 Runoff=12.23 cfs 1.030 af

Reach 2R: POI-1 Inflow=12.23 cfs 1.030 af
Outflow=12.23 cfs 1.030 af

Total Runoff Area = 3.257 ac Runoff Volume = 1.030 af Average Runoff Depth = 3.79"
76.23% Pervious = 2.483 ac 23.77% Impervious = 0.774 ac

Summary for Subcatchment 1: Existing

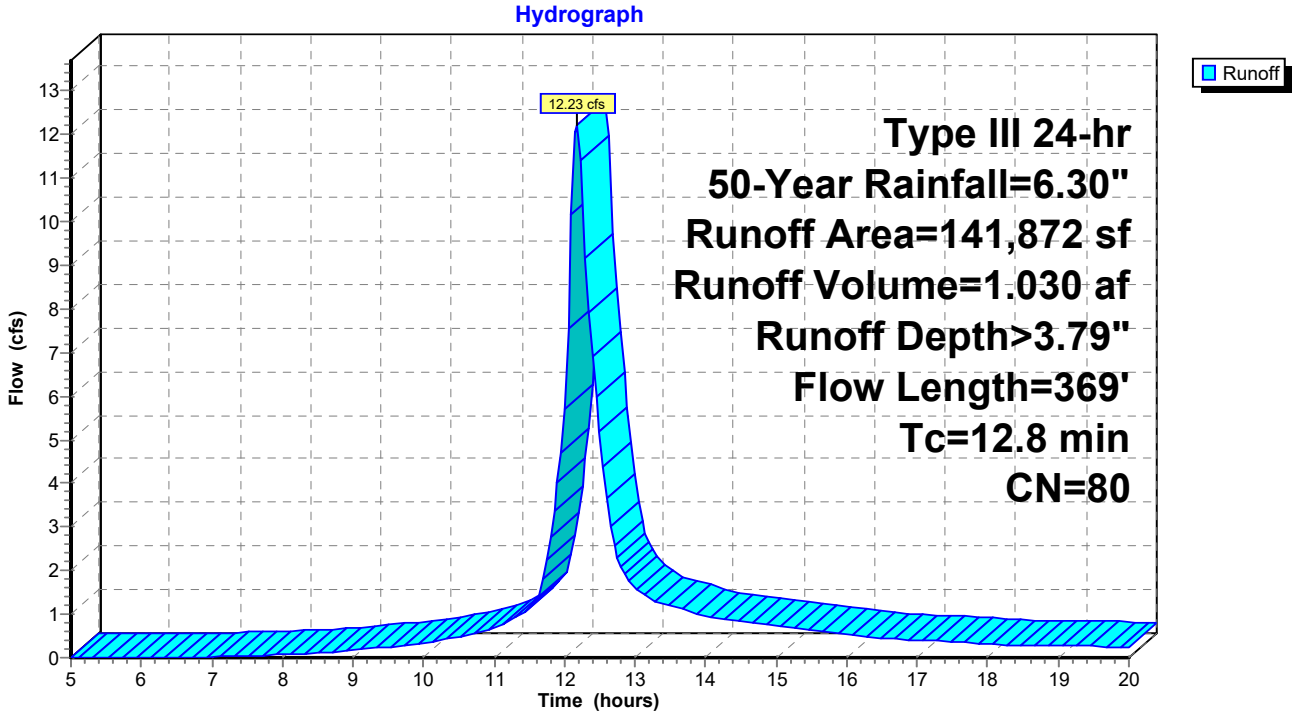
Runoff = 12.23 cfs @ 12.18 hrs, Volume= 1.030 af, Depth> 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Rainfall=6.30"

Area (sf)	CN	Description
33,724	98	Paved parking & roofs
108,148	74	>75% Grass cover, Good, HSG C
141,872	80	Weighted Average
108,148		76.23% Pervious Area
33,724		23.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	160	0.0312	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	151	0.0265	2.62		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.2	58	0.0369	3.90		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.8	369	Total			

Subcatchment 1: Existing



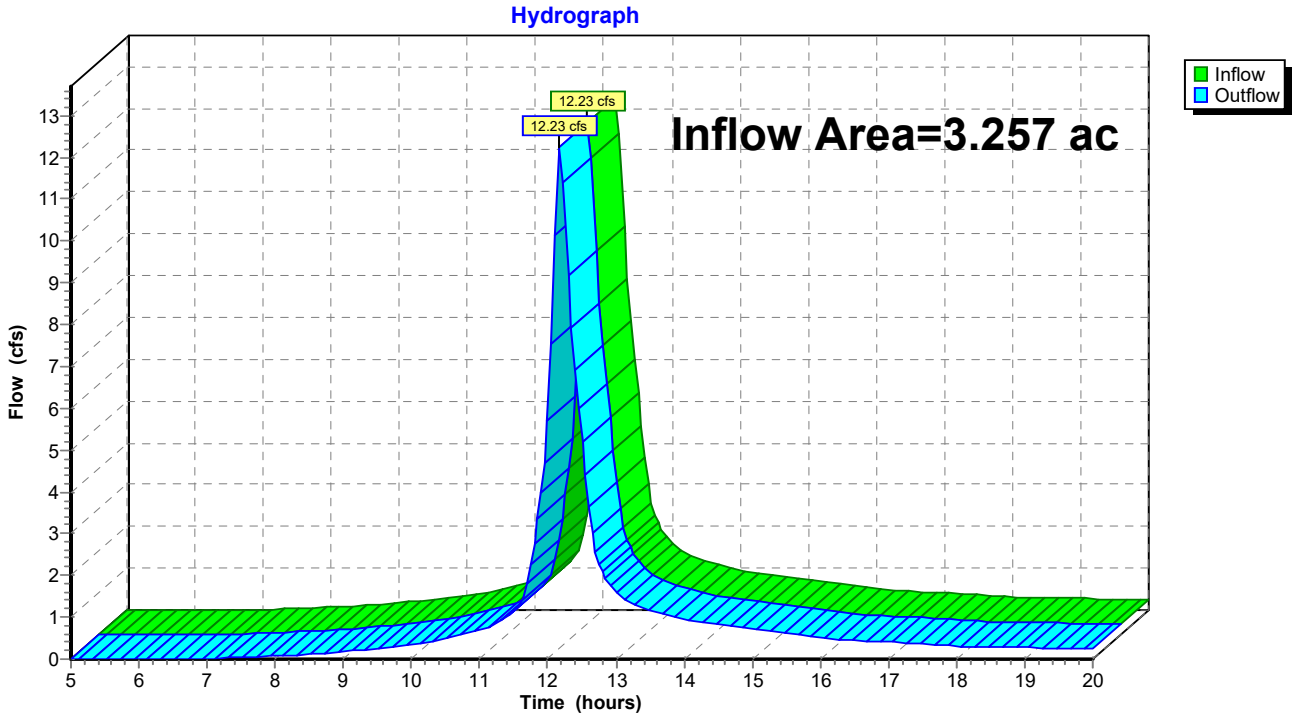
Summary for Reach 2R: POI-1

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

Inflow Area = 3.257 ac, 23.77% Impervious, Inflow Depth > 3.79" for 50-Year event
Inflow = 12.23 cfs @ 12.18 hrs, Volume= 1.030 af
Outflow = 12.23 cfs @ 12.18 hrs, Volume= 1.030 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Existing Runoff Area=141,872 sf 23.77% Impervious Runoff Depth>4.49"
Flow Length=369' Tc=12.8 min CN=80 Runoff=14.47 cfs 1.219 af

Reach 2R: POI-1 Inflow=14.47 cfs 1.219 af
Outflow=14.47 cfs 1.219 af

Total Runoff Area = 3.257 ac Runoff Volume = 1.219 af Average Runoff Depth = 4.49"
76.23% Pervious = 2.483 ac 23.77% Impervious = 0.774 ac

Summary for Subcatchment 1: Existing

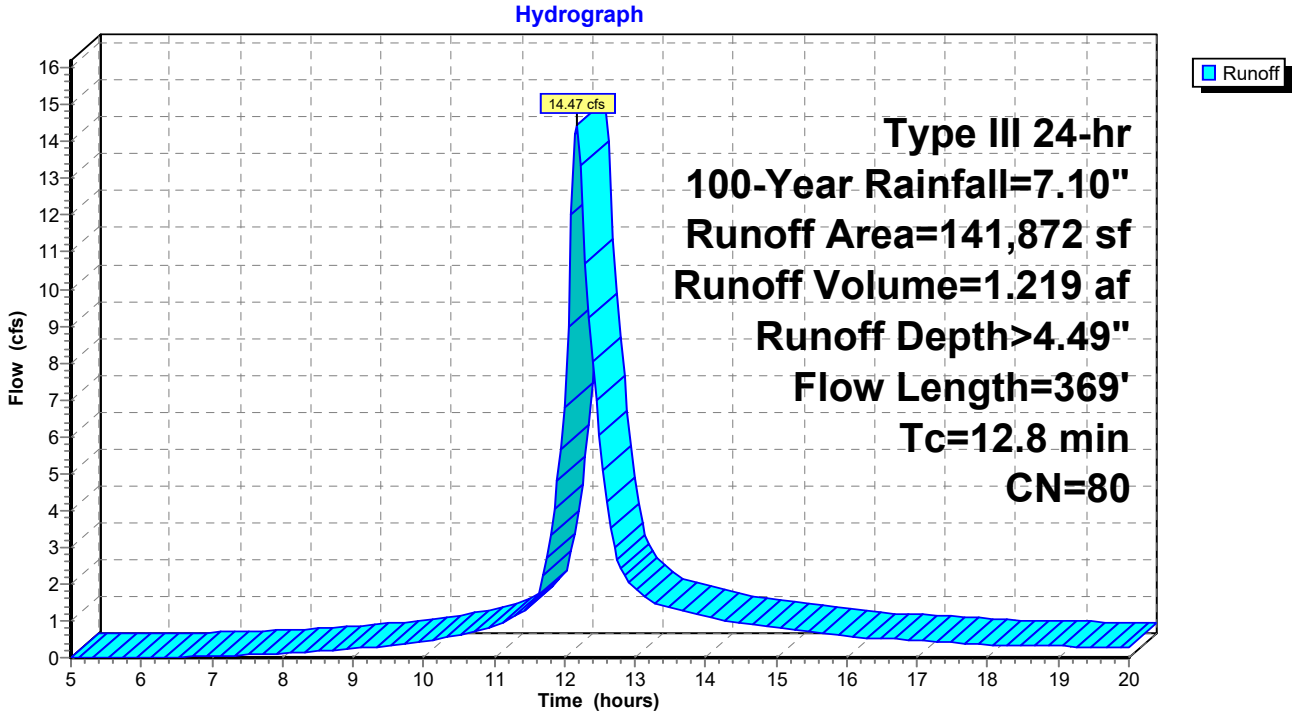
Runoff = 14.47 cfs @ 12.17 hrs, Volume= 1.219 af, Depth> 4.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.10"

Area (sf)	CN	Description
33,724	98	Paved parking & roofs
108,148	74	>75% Grass cover, Good, HSG C
141,872	80	Weighted Average
108,148		76.23% Pervious Area
33,724		23.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	160	0.0312	0.23		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
1.0	151	0.0265	2.62		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.2	58	0.0369	3.90		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.8	369	Total			

Subcatchment 1: Existing



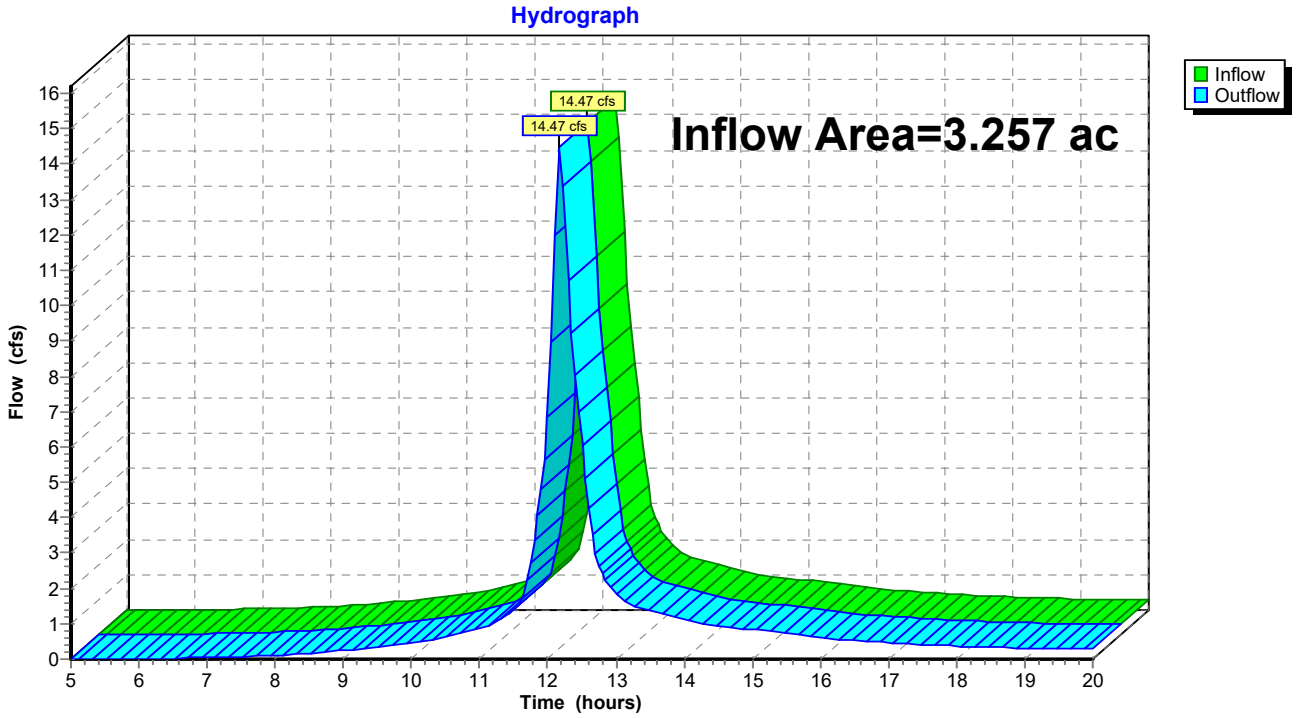
Summary for Reach 2R: POI-1

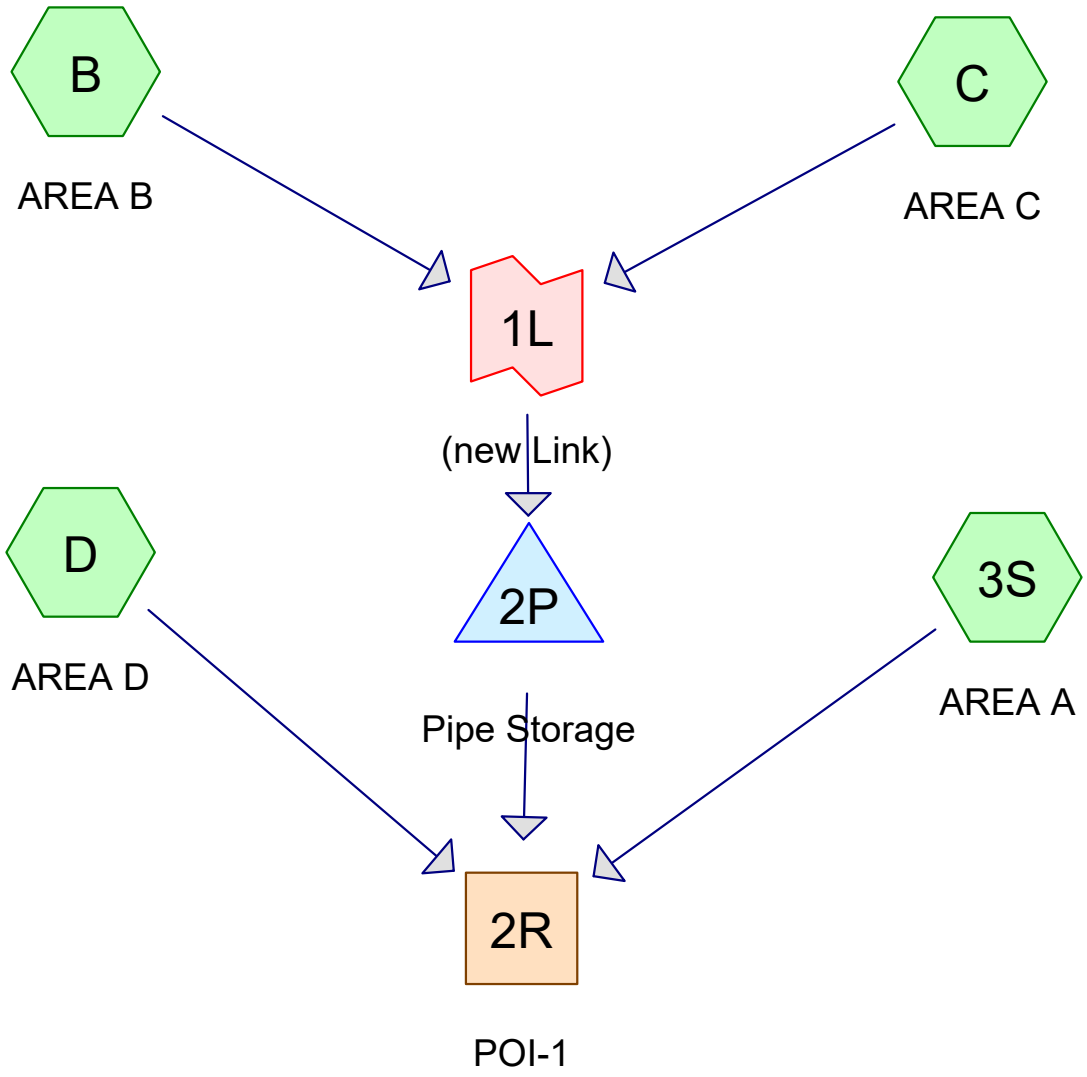
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.257 ac, 23.77% Impervious, Inflow Depth > 4.49" for 100-Year event
Inflow = 14.47 cfs @ 12.17 hrs, Volume= 1.219 af
Outflow = 14.47 cfs @ 12.17 hrs, Volume= 1.219 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1





Subcat Reach Pond Link

Routing Diagram for 07c2352 Proposed 2021-10-06
Prepared by {enter your company name here}, Printed 10/6/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.582	98	(3S, B, C, D)
1.769	74	>75% Grass cover, Good, HSG C (3S, B, C, D)
3.351	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
1.769	HSG C	3S, B, C, D
0.000	HSG D	
1.582	Other	3S, B, C, D
3.351		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	1.582	1.582		3S, B, C, D
0.000	0.000	1.769	0.000	0.000	1.769	>75% Grass cover, Good	3S, B, C, D
0.000	**0.000**	**1.769**	**0.000**	**1.582**	**3.351**	**TOTAL AREA**	

Time span=0.00-20.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: AREA A Runoff Area=89,620 sf 28.40% Impervious Runoff Depth>1.50"
Flow Length=711' Tc=17.8 min CN=81 Runoff=2.75 cfs 0.258 af

SubcatchmentB: AREA B Runoff Area=10,575 sf 75.61% Impervious Runoff Depth>2.40"
Tc=5.0 min CN=92 Runoff=0.71 cfs 0.049 af

SubcatchmentC: AREA C Runoff Area=14,414 sf 55.43% Impervious Runoff Depth>1.96"
Tc=5.0 min CN=87 Runoff=0.81 cfs 0.054 af

SubcatchmentD: AREA D Runoff Area=31,369 sf 87.60% Impervious Runoff Depth>2.70"
Tc=5.0 min CN=95 Runoff=2.27 cfs 0.162 af

Reach 2R: POI-1 Inflow=4.04 cfs 0.478 af
Outflow=4.04 cfs 0.478 af

Pond 2P: Pipe Storage Peak Elev=17.93' Storage=2,375 cf Inflow=1.52 cfs 0.103 af
Outflow=0.40 cfs 0.059 af

Link 1L: (new Link) Inflow=1.52 cfs 0.103 af
Primary=1.52 cfs 0.103 af

Total Runoff Area = 3.351 ac Runoff Volume = 0.522 af Average Runoff Depth = 1.87"
52.79% Pervious = 1.769 ac 47.21% Impervious = 1.582 ac

Summary for Subcatchment 3S: AREA A

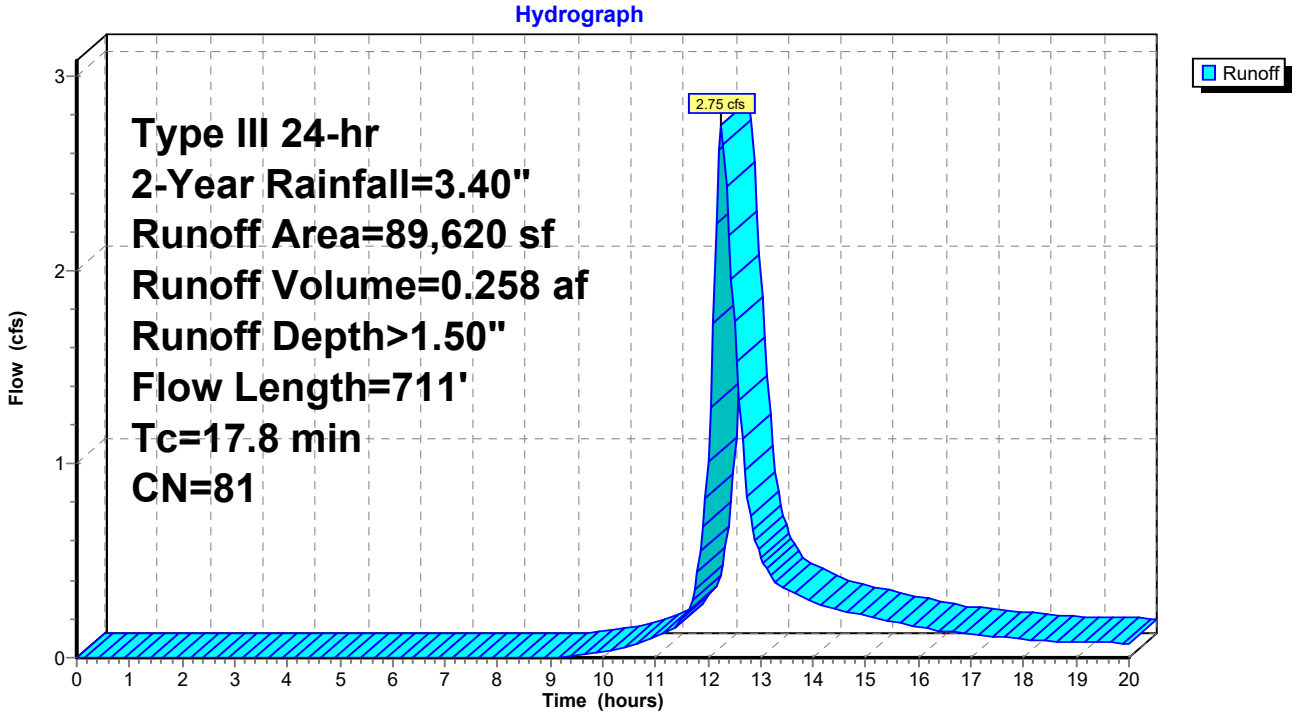
Runoff = 2.75 cfs @ 12.25 hrs, Volume= 0.258 af, Depth> 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
	64,169	74	>75% Grass cover, Good, HSG C
*	25,451	98	
	89,620	81	Weighted Average
	64,169		71.60% Pervious Area
	25,451		28.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	153	0.0163	0.18		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.7	129	0.0388	3.17		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
2.6	429	0.0179	2.72		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
17.8	711	Total			

Subcatchment 3S: AREA A



Summary for Subcatchment B: AREA B

[49] Hint: Tc<2dt may require smaller dt

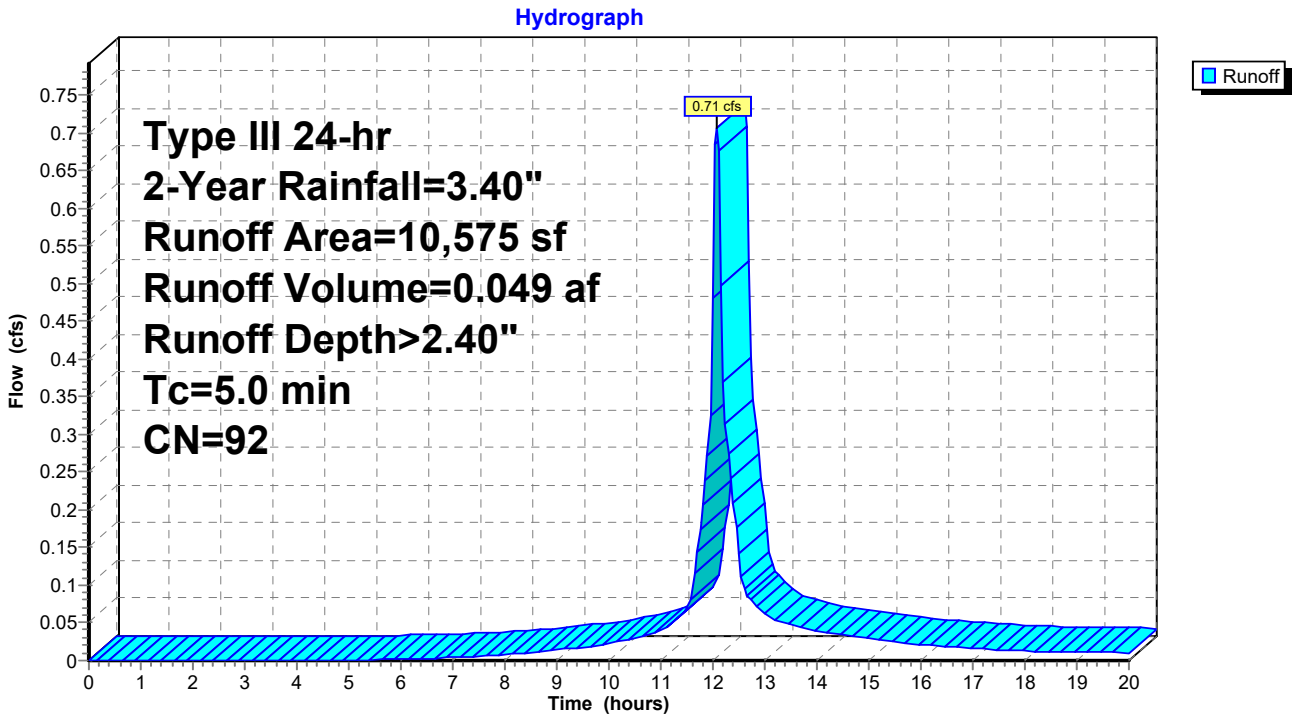
Runoff = 0.71 cfs @ 12.07 hrs, Volume= 0.049 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
*	7,996	98	
	2,579	74	>75% Grass cover, Good, HSG C
	10,575	92	Weighted Average
	2,579		24.39% Pervious Area
	7,996		75.61% Impervious Area

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

Subcatchment B: AREA B



Summary for Subcatchment C: AREA C

[49] Hint: Tc<2dt may require smaller dt

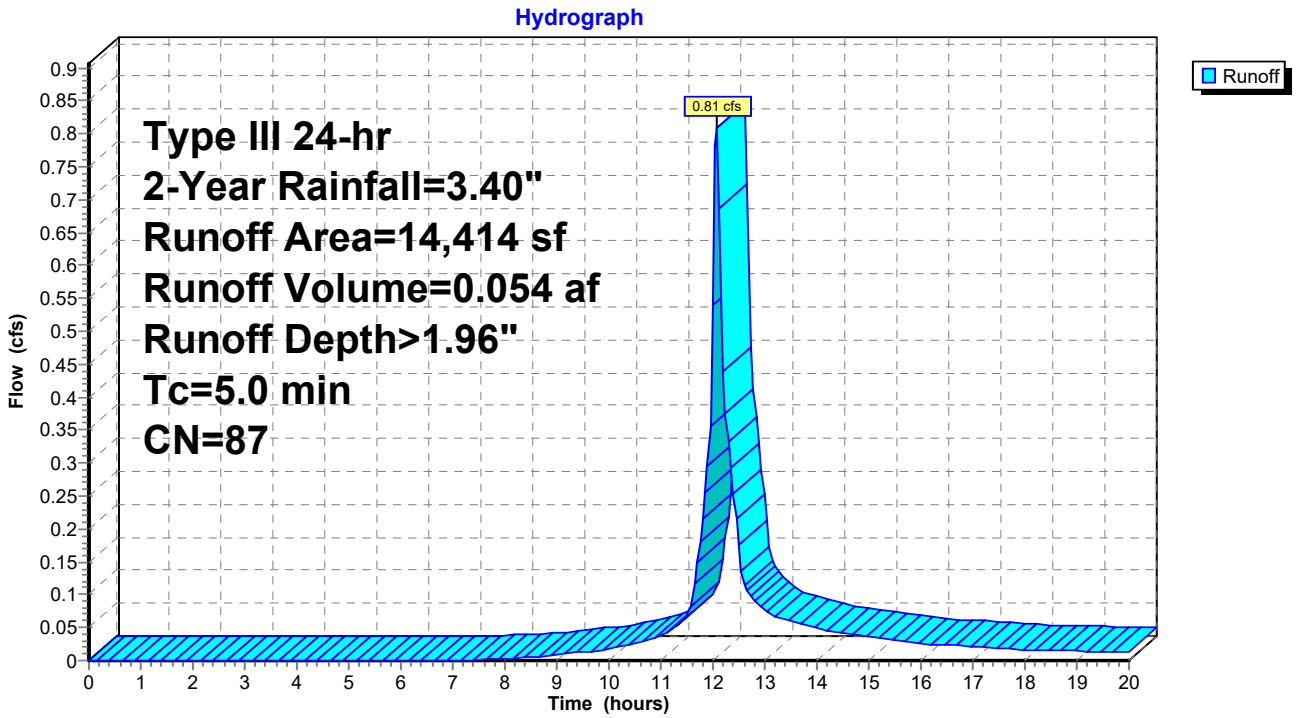
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.054 af, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
*	7,989	98	
	6,425	74	>75% Grass cover, Good, HSG C
	14,414	87	Weighted Average
	6,425		44.57% Pervious Area
	7,989		55.43% Impervious Area

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

Subcatchment C: AREA C



Summary for Subcatchment D: AREA D

[49] Hint: Tc<2dt may require smaller dt

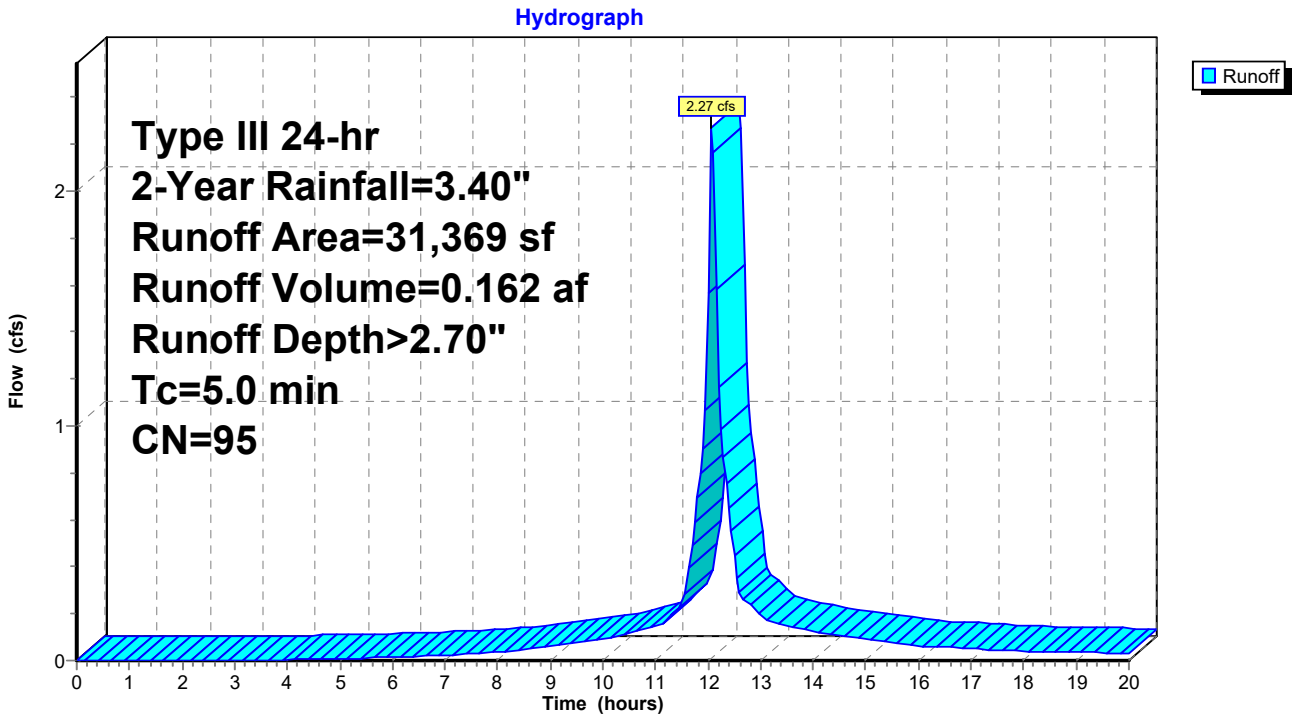
Runoff = 2.27 cfs @ 12.07 hrs, Volume= 0.162 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
*	27,479	98	
	3,890	74	>75% Grass cover, Good, HSG C
	31,369	95	Weighted Average
	3,890		12.40% Pervious Area
	27,479		87.60% Impervious Area

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

Subcatchment D: AREA D



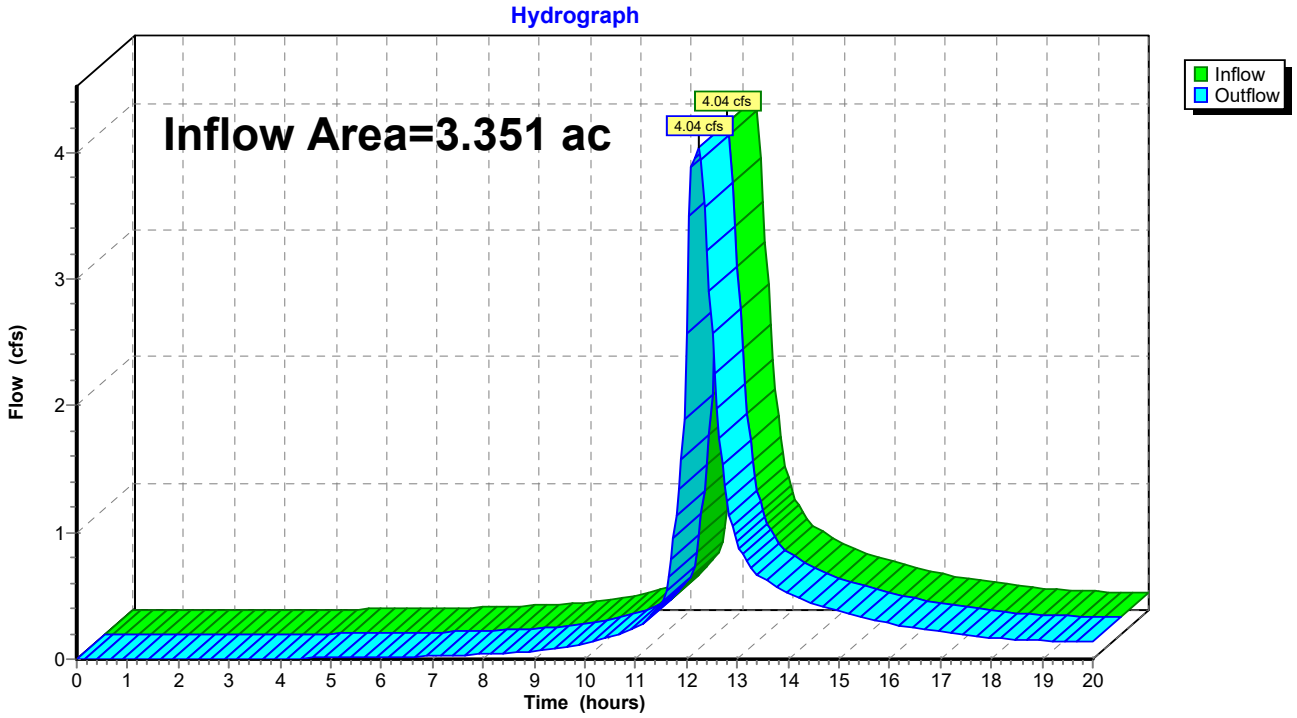
Summary for Reach 2R: POI-1

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

Inflow Area = 3.351 ac, 47.21% Impervious, Inflow Depth > 1.71" for 2-Year event
Inflow = 4.04 cfs @ 12.23 hrs, Volume= 0.478 af
Outflow = 4.04 cfs @ 12.23 hrs, Volume= 0.478 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



Summary for Pond 2P: Pipe Storage

Inflow Area = 0.574 ac, 63.97% Impervious, Inflow Depth > 2.15" for 2-Year event
Inflow = 1.52 cfs @ 12.07 hrs, Volume= 0.103 af
Outflow = 0.40 cfs @ 12.44 hrs, Volume= 0.059 af, Atten= 74%, Lag= 22.2 min
Primary = 0.40 cfs @ 12.44 hrs, Volume= 0.059 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 17.93' @ 12.44 hrs Surf.Area= 2,268 sf Storage= 2,375 cf

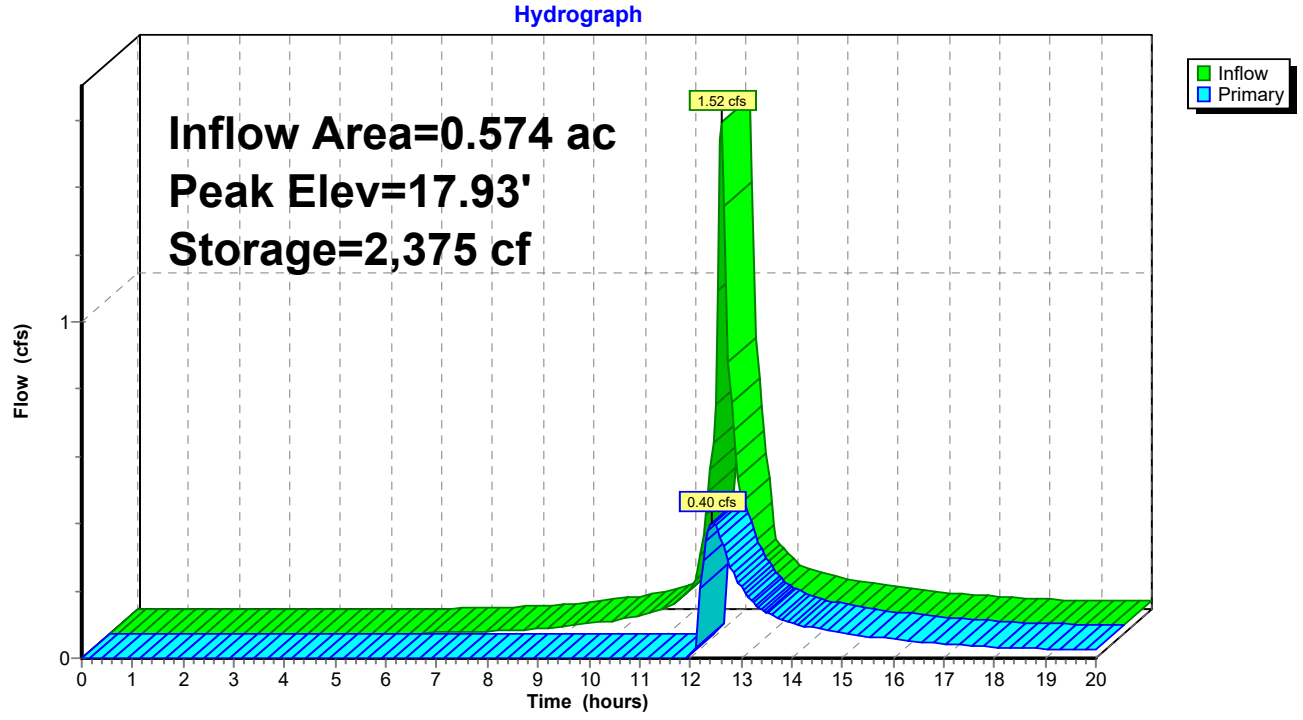
Plug-Flow detention time= 162.9 min calculated for 0.059 af (57% of inflow)
Center-of-Mass det. time= 85.5 min (858.8 - 773.3)

Volume	Invert	Avail.Storage	Storage Description
#1	17.50'	1,775 cf	**24.0" Round Pipe Storage** Inside #2 L= 565.0'
#2	15.50'	3,826 cf	**4.00'W x 567.00'L x 5.00'H Prismatoid** 11,340 cf Overall - 1,775 cf Embedded = 9,565 cf x 40.0% Voids
		5,601 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	17.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.40 cfs @ 12.44 hrs HW=17.93' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.40 cfs @ 2.24 fps)

Pond 2P: Pipe Storage

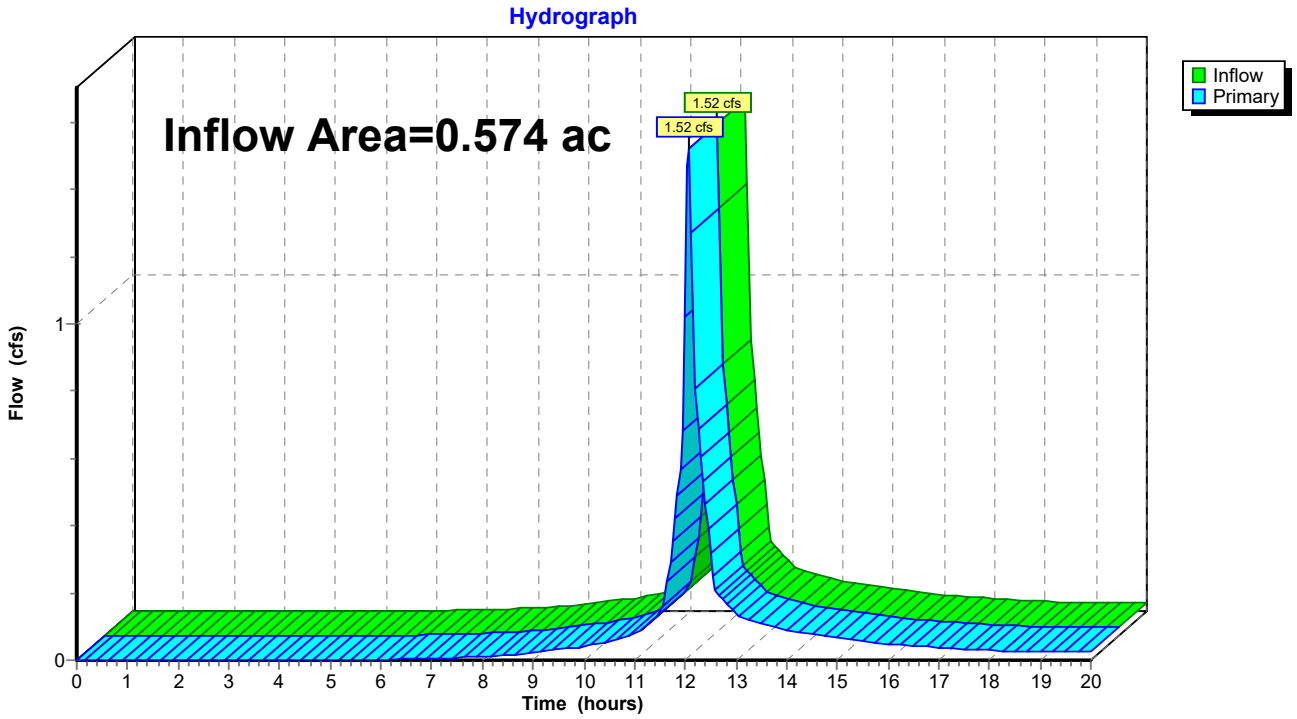


Summary for Link 1L: (new Link)

Inflow Area = 0.574 ac, 63.97% Impervious, Inflow Depth > 2.15" for 2-Year event
Inflow = 1.52 cfs @ 12.07 hrs, Volume= 0.103 af
Primary = 1.52 cfs @ 12.07 hrs, Volume= 0.103 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Link 1L: (new Link)



Time span=0.00-20.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: AREA A Runoff Area=89,620 sf 28.40% Impervious Runoff Depth>2.78"
Flow Length=711' Tc=17.8 min CN=81 Runoff=5.07 cfs 0.477 af

SubcatchmentB: AREA B Runoff Area=10,575 sf 75.61% Impervious Runoff Depth>3.88"
Tc=5.0 min CN=92 Runoff=1.11 cfs 0.078 af

SubcatchmentC: AREA C Runoff Area=14,414 sf 55.43% Impervious Runoff Depth>3.36"
Tc=5.0 min CN=87 Runoff=1.37 cfs 0.093 af

SubcatchmentD: AREA D Runoff Area=31,369 sf 87.60% Impervious Runoff Depth>4.20"
Tc=5.0 min CN=95 Runoff=3.45 cfs 0.252 af

Reach 2R: POI-1 Inflow=7.50 cfs 0.856 af
Outflow=7.50 cfs 0.856 af

Pond 2P: Pipe Storage Peak Elev=18.61' Storage=3,427 cf Inflow=2.48 cfs 0.171 af
Outflow=0.88 cfs 0.127 af

Link 1L: (new Link) Inflow=2.48 cfs 0.171 af
Primary=2.48 cfs 0.171 af

Total Runoff Area = 3.351 ac Runoff Volume = 0.900 af Average Runoff Depth = 3.22"
52.79% Pervious = 1.769 ac 47.21% Impervious = 1.582 ac

Summary for Subcatchment 3S: AREA A

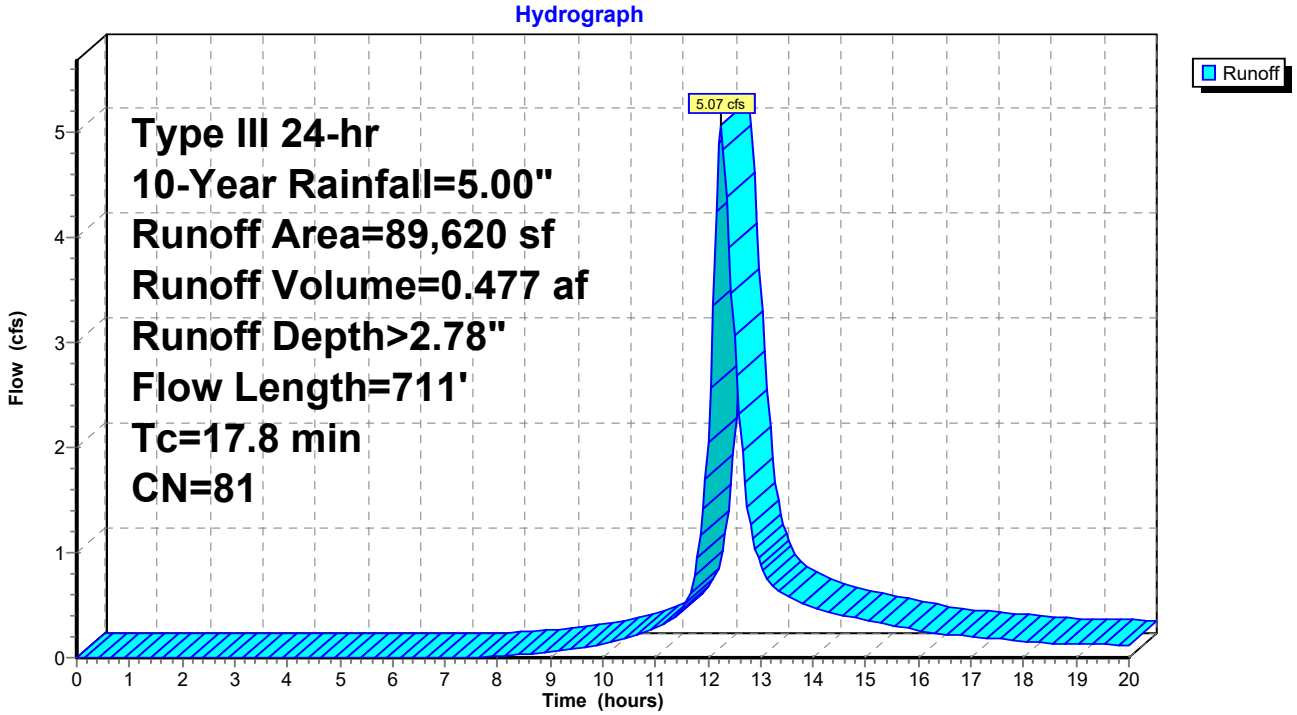
Runoff = 5.07 cfs @ 12.25 hrs, Volume= 0.477 af, Depth> 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (sf)	CN	Description
	64,169	74	>75% Grass cover, Good, HSG C
*	25,451	98	
	89,620	81	Weighted Average
	64,169		71.60% Pervious Area
	25,451		28.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	153	0.0163	0.18		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.7	129	0.0388	3.17		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
2.6	429	0.0179	2.72		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
17.8	711	Total			

Subcatchment 3S: AREA A



Summary for Subcatchment B: AREA B

[49] Hint: Tc<2dt may require smaller dt

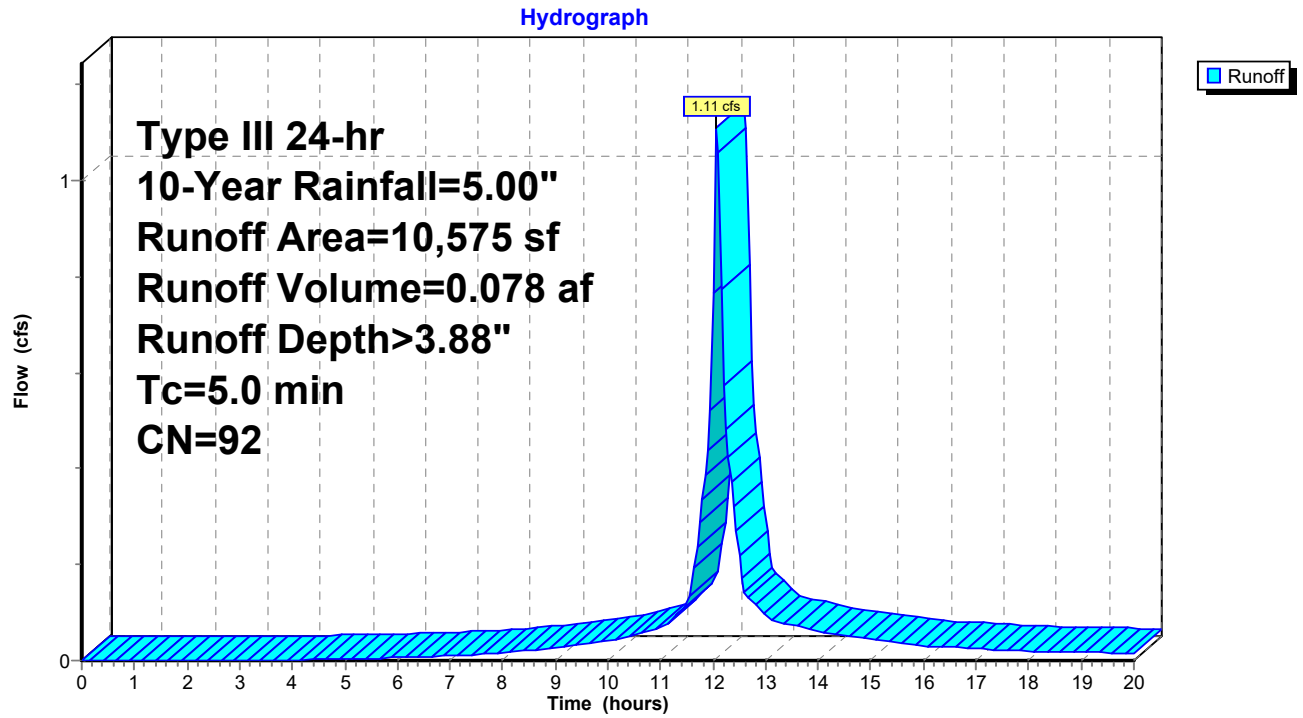
Runoff = 1.11 cfs @ 12.07 hrs, Volume= 0.078 af, Depth> 3.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (sf)	CN	Description
*	7,996	98	
	2,579	74	>75% Grass cover, Good, HSG C
	10,575	92	Weighted Average
	2,579		24.39% Pervious Area
	7,996		75.61% Impervious Area

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

Subcatchment B: AREA B



Summary for Subcatchment C: AREA C

[49] Hint: Tc<2dt may require smaller dt

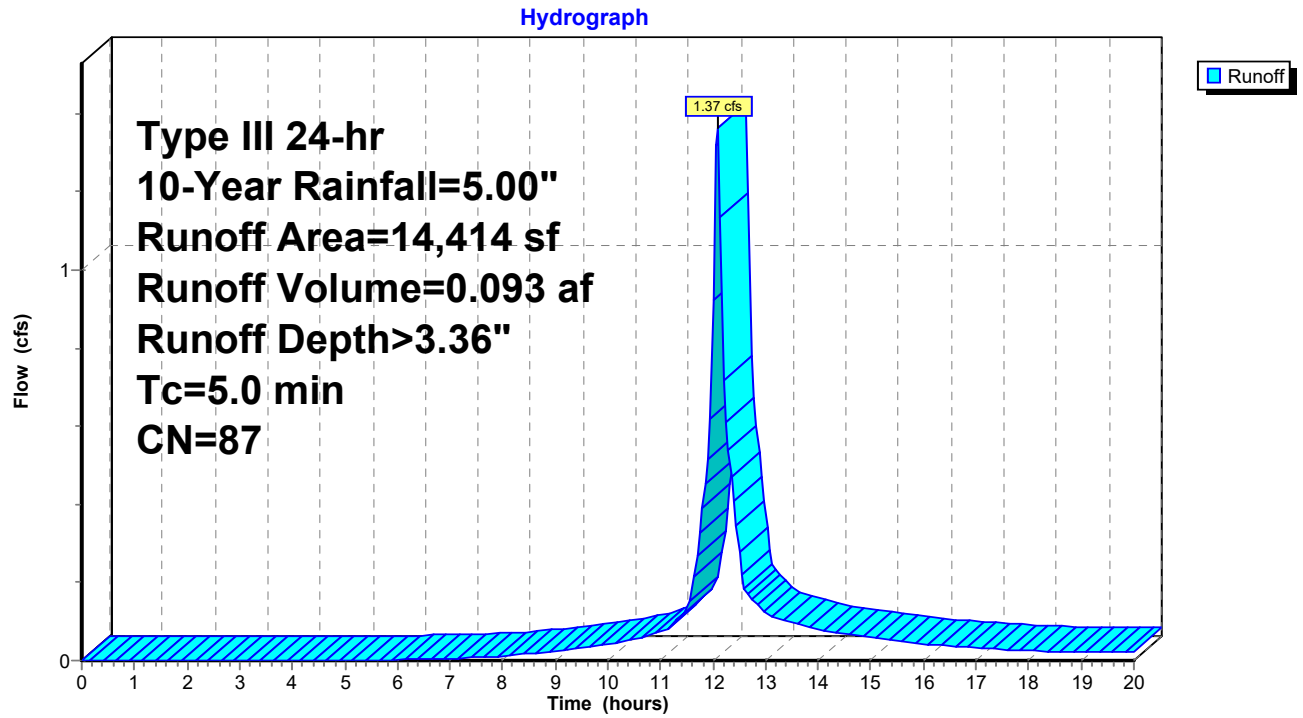
Runoff = 1.37 cfs @ 12.07 hrs, Volume= 0.093 af, Depth> 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (sf)	CN	Description
*	7,989	98	
	6,425	74	>75% Grass cover, Good, HSG C
	14,414	87	Weighted Average
	6,425		44.57% Pervious Area
	7,989		55.43% Impervious Area

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

Subcatchment C: AREA C



Summary for Subcatchment D: AREA D

[49] Hint: Tc<2dt may require smaller dt

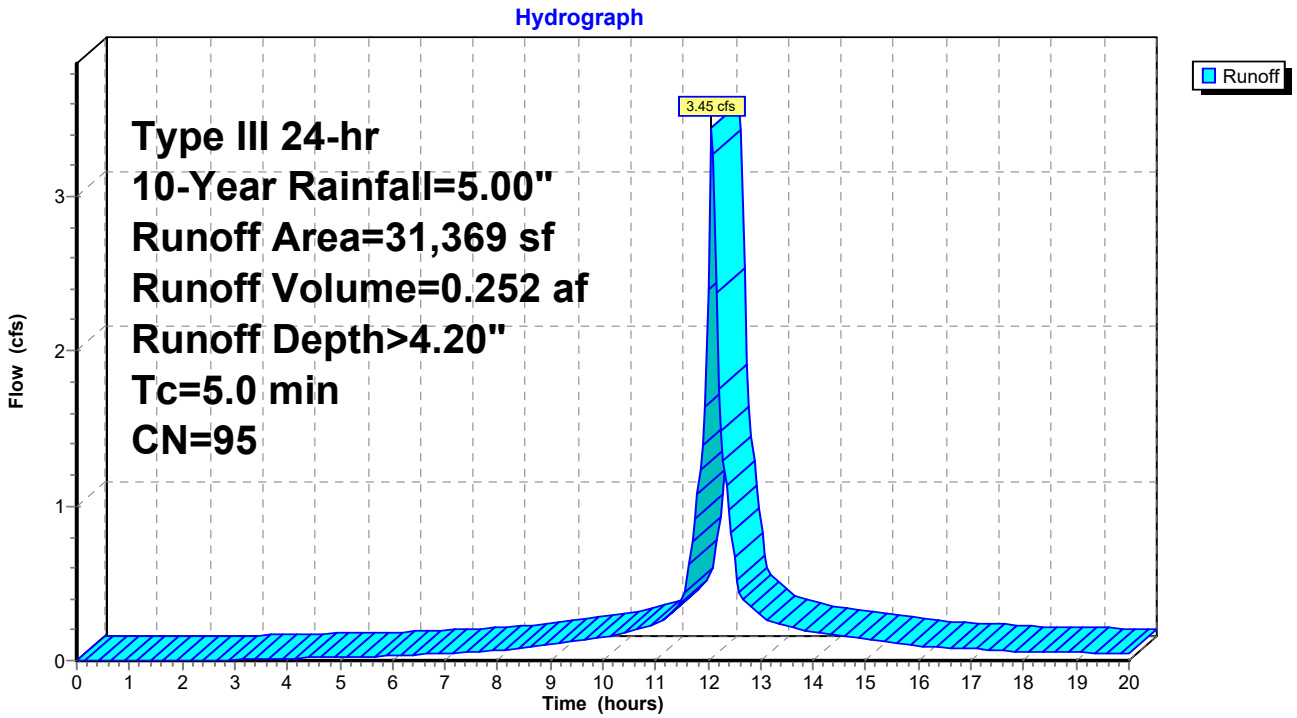
Runoff = 3.45 cfs @ 12.07 hrs, Volume= 0.252 af, Depth> 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.00"

	Area (sf)	CN	Description
*	27,479	98	
	3,890	74	>75% Grass cover, Good, HSG C
	31,369	95	Weighted Average
	3,890		12.40% Pervious Area
	27,479		87.60% Impervious Area

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

Subcatchment D: AREA D



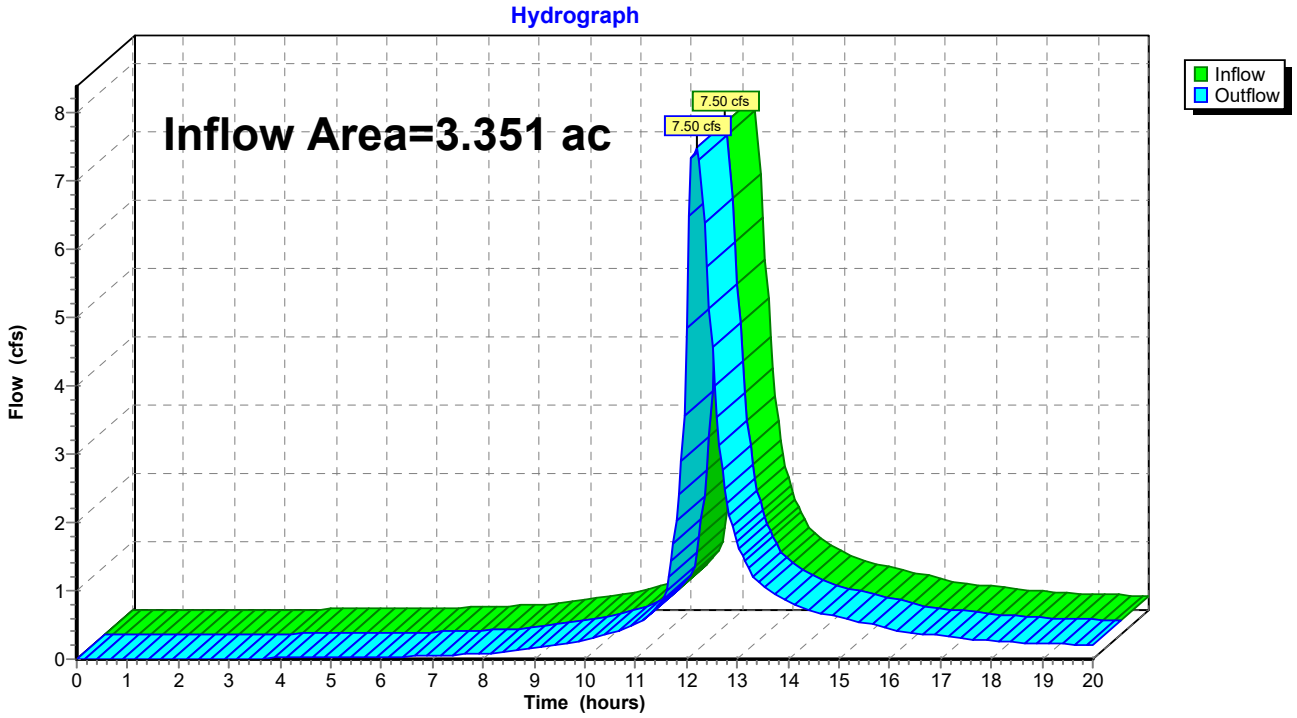
Summary for Reach 2R: POI-1

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

Inflow Area = 3.351 ac, 47.21% Impervious, Inflow Depth > 3.06" for 10-Year event
Inflow = 7.50 cfs @ 12.20 hrs, Volume= 0.856 af
Outflow = 7.50 cfs @ 12.20 hrs, Volume= 0.856 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



Summary for Pond 2P: Pipe Storage

Inflow Area = 0.574 ac, 63.97% Impervious, Inflow Depth > 3.58" for 10-Year event
Inflow = 2.48 cfs @ 12.07 hrs, Volume= 0.171 af
Outflow = 0.88 cfs @ 12.34 hrs, Volume= 0.127 af, Atten= 65%, Lag= 15.9 min
Primary = 0.88 cfs @ 12.34 hrs, Volume= 0.127 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 18.61' @ 12.34 hrs Surf.Area= 2,268 sf Storage= 3,427 cf

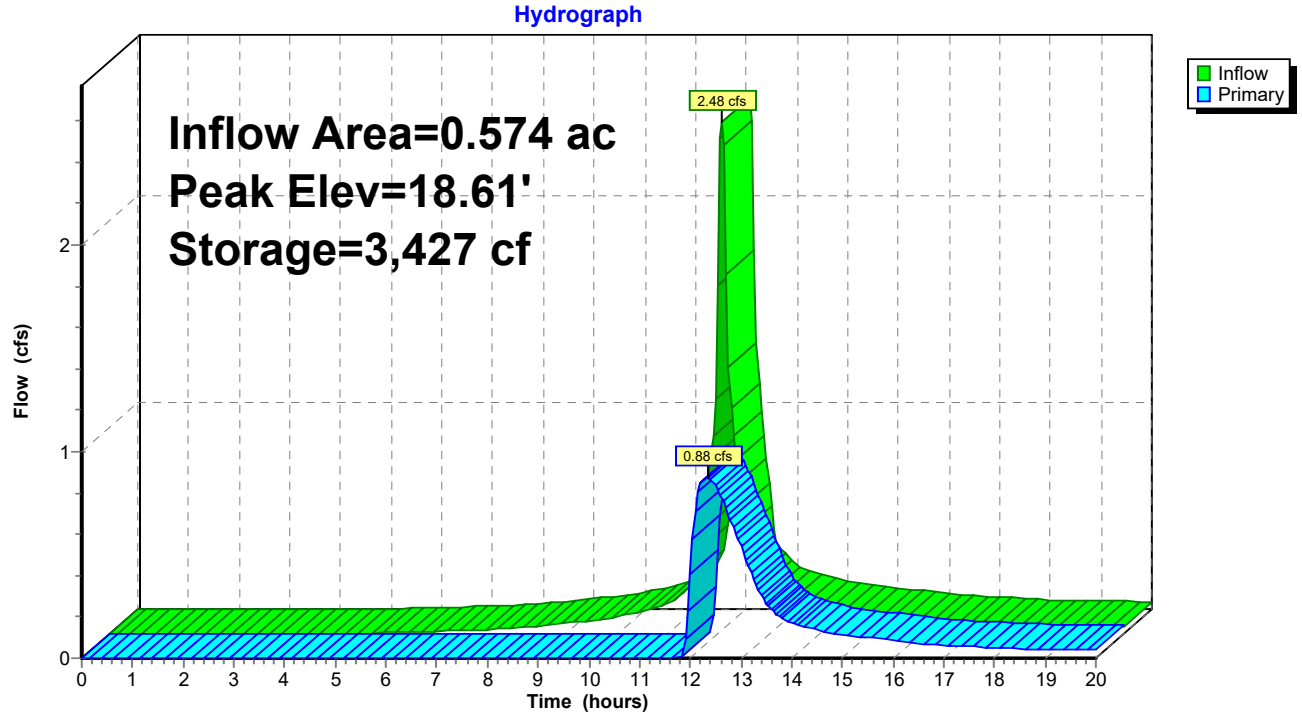
Plug-Flow detention time= 127.5 min calculated for 0.127 af (74% of inflow)
Center-of-Mass det. time= 65.8 min (827.2 - 761.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.50'	1,775 cf	**24.0" Round Pipe Storage** Inside #2 L= 565.0'
#2	15.50'	3,826 cf	**4.00'W x 567.00'L x 5.00'H Prismatoid** 11,340 cf Overall - 1,775 cf Embedded = 9,565 cf x 40.0% Voids
		5,601 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	17.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.88 cfs @ 12.34 hrs HW=18.61' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.88 cfs @ 4.46 fps)

Pond 2P: Pipe Storage

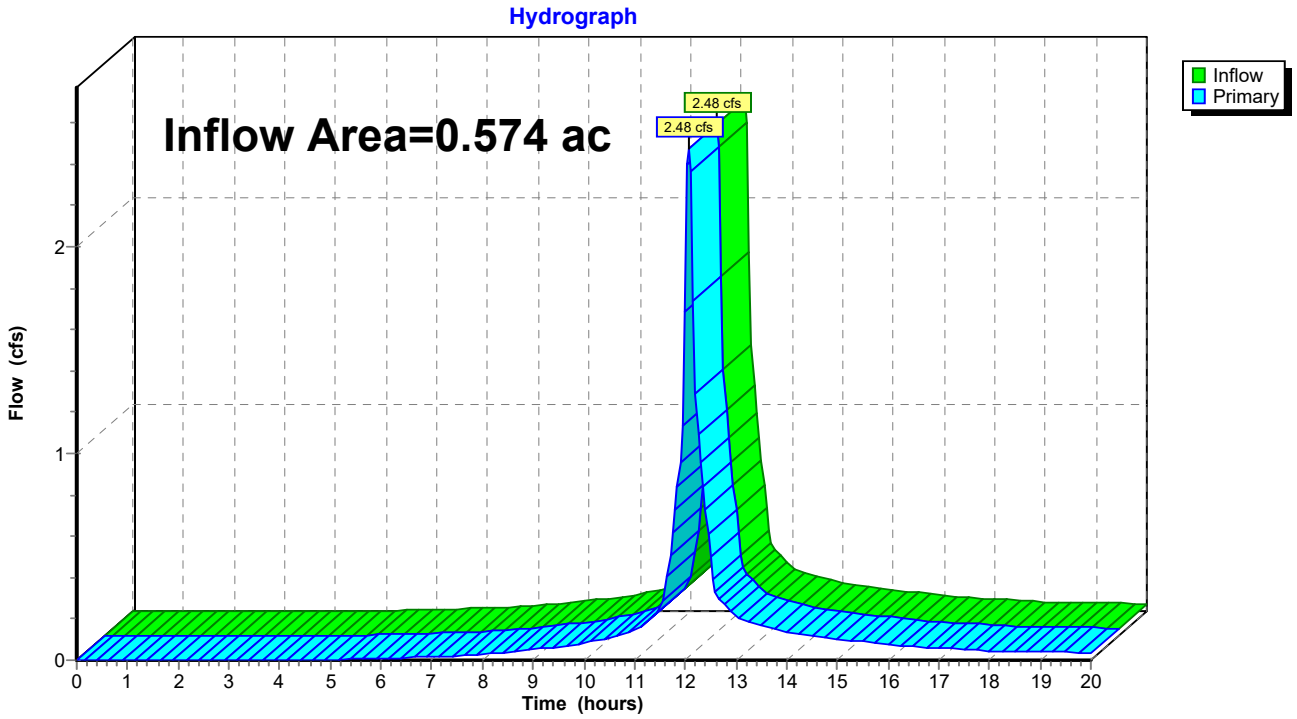


Summary for Link 1L: (new Link)

Inflow Area = 0.574 ac, 63.97% Impervious, Inflow Depth > 3.58" for 10-Year event
Inflow = 2.48 cfs @ 12.07 hrs, Volume= 0.171 af
Primary = 2.48 cfs @ 12.07 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Link 1L: (new Link)



Time span=0.00-20.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: AREA A Runoff Area=89,620 sf 28.40% Impervious Runoff Depth>3.37"
Flow Length=711' Tc=17.8 min CN=81 Runoff=6.12 cfs 0.578 af

SubcatchmentB: AREA B Runoff Area=10,575 sf 75.61% Impervious Runoff Depth>4.53"
Tc=5.0 min CN=92 Runoff=1.29 cfs 0.092 af

SubcatchmentC: AREA C Runoff Area=14,414 sf 55.43% Impervious Runoff Depth>3.99"
Tc=5.0 min CN=87 Runoff=1.61 cfs 0.110 af

SubcatchmentD: AREA D Runoff Area=31,369 sf 87.60% Impervious Runoff Depth>4.87"
Tc=5.0 min CN=95 Runoff=3.96 cfs 0.292 af

Reach 2R: POI-1 Inflow=8.93 cfs 1.027 af
Outflow=8.93 cfs 1.027 af

Pond 2P: Pipe Storage Peak Elev=18.91' Storage=3,901 cf Inflow=2.90 cfs 0.202 af
Outflow=1.02 cfs 0.157 af

Link 1L: (new Link) Inflow=2.90 cfs 0.202 af
Primary=2.90 cfs 0.202 af

Total Runoff Area = 3.351 ac Runoff Volume = 1.072 af Average Runoff Depth = 3.84"
52.79% Pervious = 1.769 ac 47.21% Impervious = 1.582 ac

Summary for Subcatchment 3S: AREA A

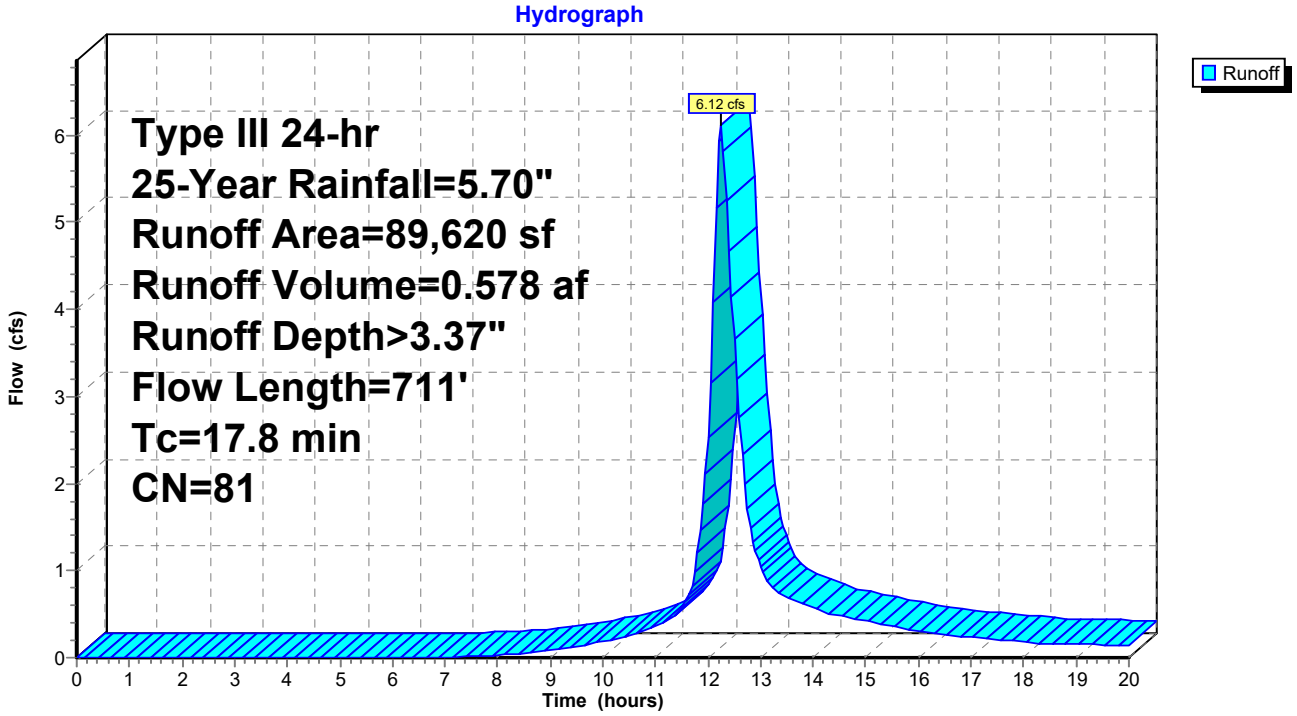
Runoff = 6.12 cfs @ 12.24 hrs, Volume= 0.578 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
	64,169	74	>75% Grass cover, Good, HSG C
*	25,451	98	
	89,620	81	Weighted Average
	64,169		71.60% Pervious Area
	25,451		28.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	153	0.0163	0.18		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.7	129	0.0388	3.17		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
2.6	429	0.0179	2.72		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
17.8	711	Total			

Subcatchment 3S: AREA A



Summary for Subcatchment B: AREA B

[49] Hint: Tc<2dt may require smaller dt

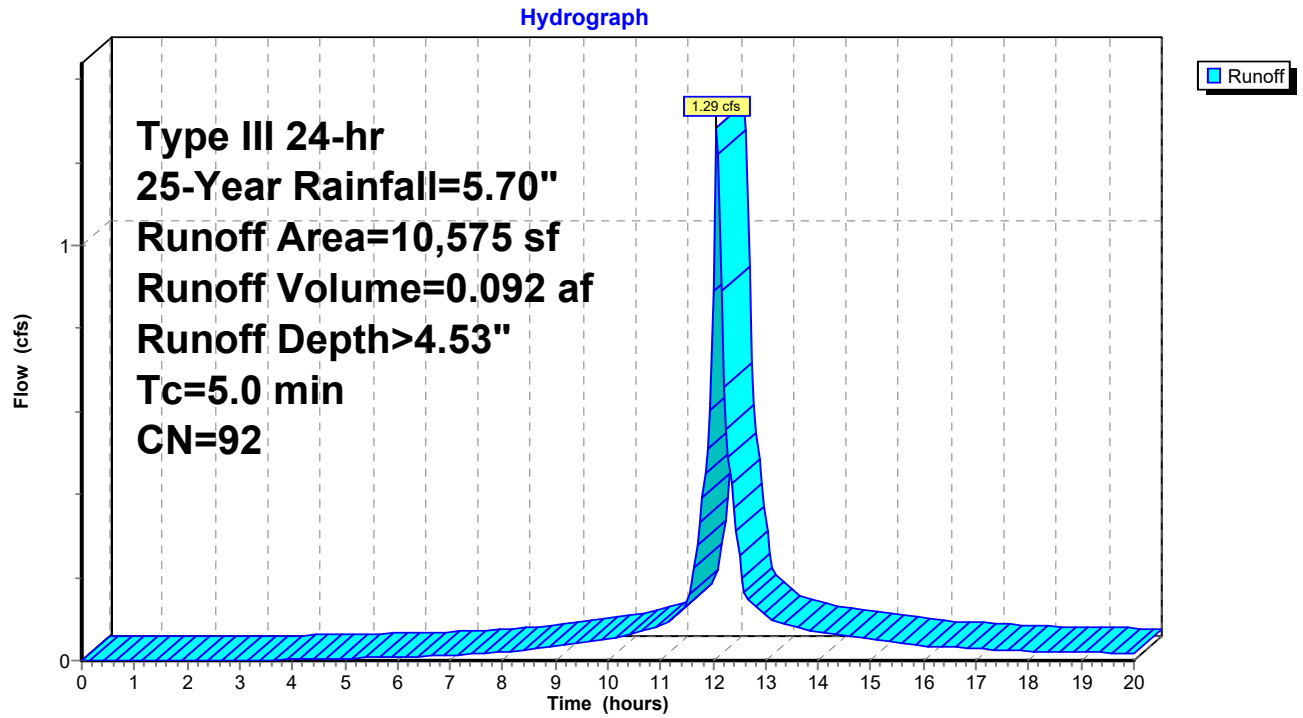
Runoff = 1.29 cfs @ 12.07 hrs, Volume= 0.092 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	7,996	98	
	2,579	74	>75% Grass cover, Good, HSG C
	10,575	92	Weighted Average
	2,579		24.39% Pervious Area
	7,996		75.61% Impervious Area

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

Subcatchment B: AREA B



Summary for Subcatchment C: AREA C

[49] Hint: Tc<2dt may require smaller dt

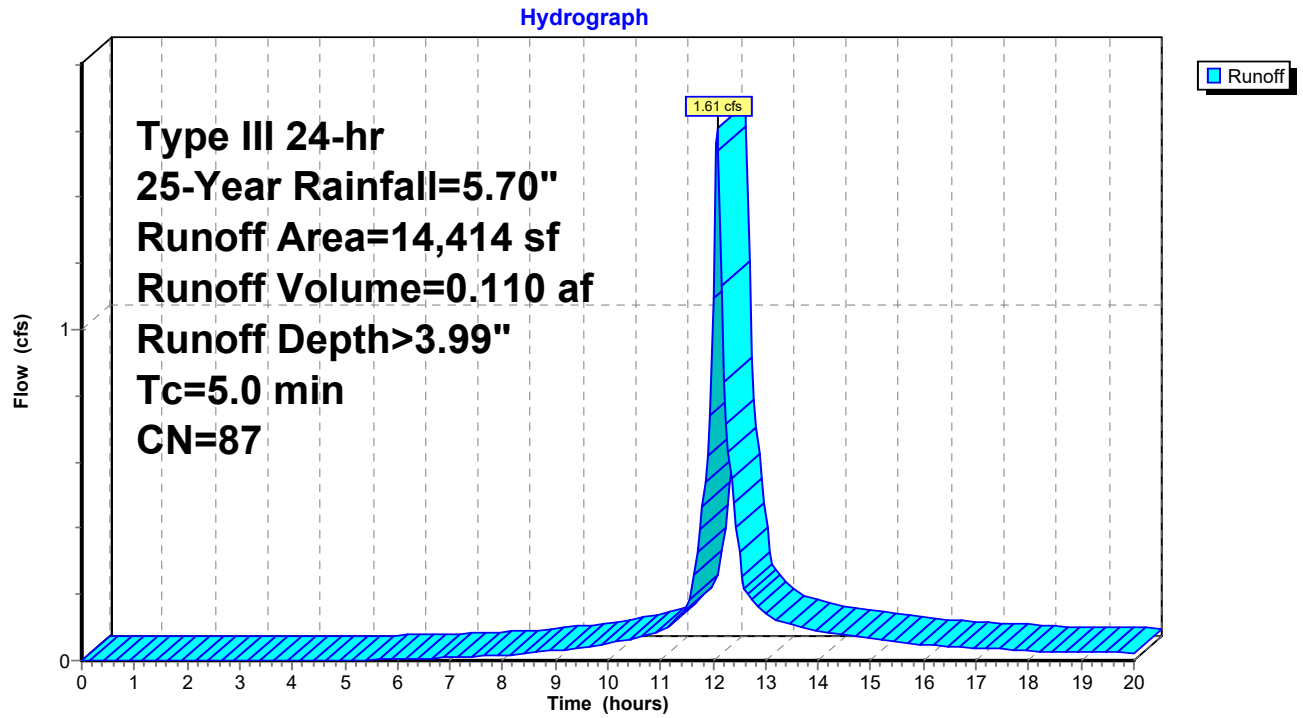
Runoff = 1.61 cfs @ 12.07 hrs, Volume= 0.110 af, Depth> 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	7,989	98	
	6,425	74	>75% Grass cover, Good, HSG C
	14,414	87	Weighted Average
	6,425		44.57% Pervious Area
	7,989		55.43% Impervious Area

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

Subcatchment C: AREA C



Summary for Subcatchment D: AREA D

[49] Hint: Tc<2dt may require smaller dt

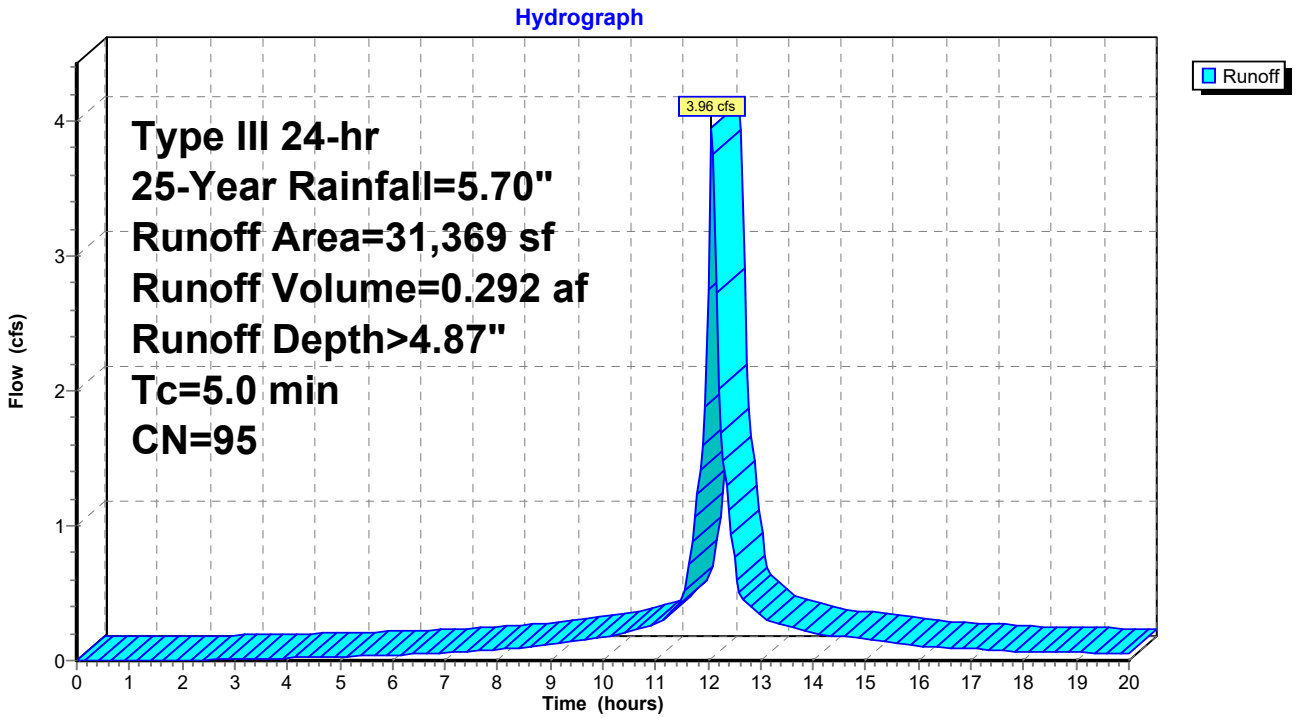
Runoff = 3.96 cfs @ 12.07 hrs, Volume= 0.292 af, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.70"

	Area (sf)	CN	Description
*	27,479	98	
	3,890	74	>75% Grass cover, Good, HSG C
	31,369	95	Weighted Average
	3,890		12.40% Pervious Area
	27,479		87.60% Impervious Area

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

Subcatchment D: AREA D



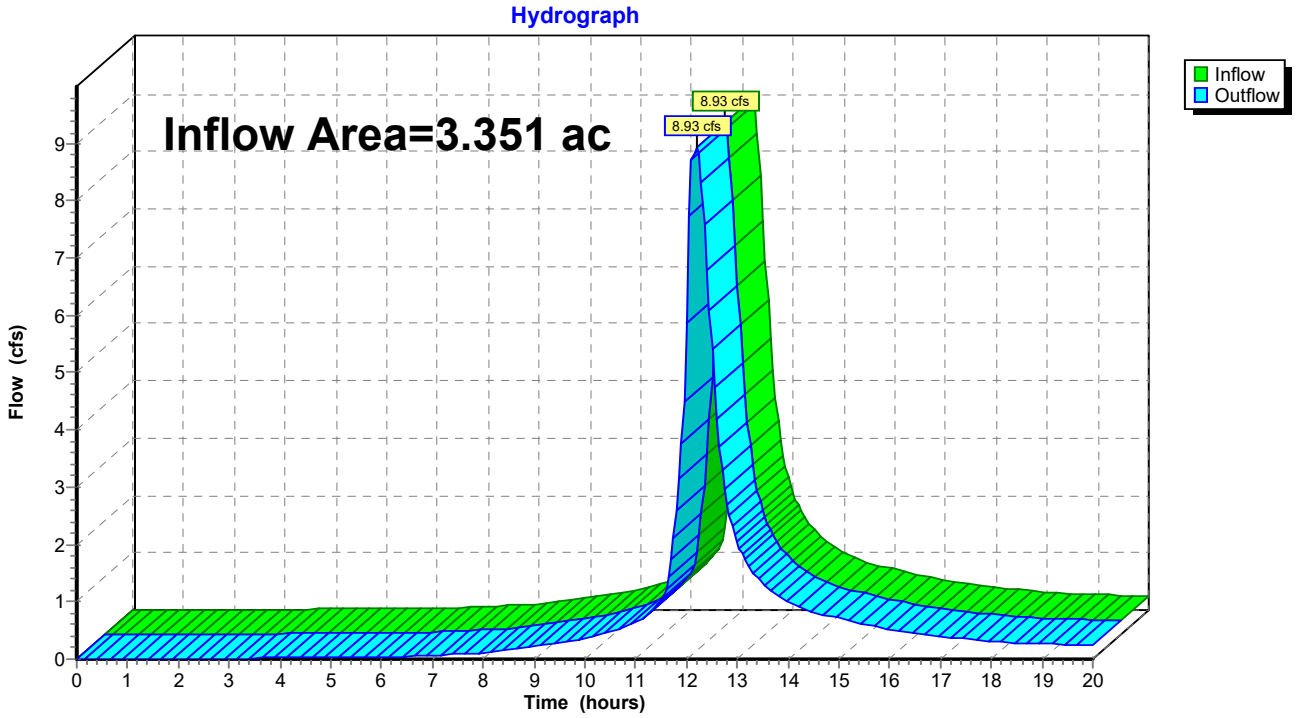
Summary for Reach 2R: POI-1

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

Inflow Area = 3.351 ac, 47.21% Impervious, Inflow Depth > 3.68" for 25-Year event
Inflow = 8.93 cfs @ 12.20 hrs, Volume= 1.027 af
Outflow = 8.93 cfs @ 12.20 hrs, Volume= 1.027 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



Summary for Pond 2P: Pipe Storage

Inflow Area = 0.574 ac, 63.97% Impervious, Inflow Depth > 4.22" for 25-Year event
Inflow = 2.90 cfs @ 12.07 hrs, Volume= 0.202 af
Outflow = 1.02 cfs @ 12.34 hrs, Volume= 0.157 af, Atten= 65%, Lag= 15.8 min
Primary = 1.02 cfs @ 12.34 hrs, Volume= 0.157 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 18.91' @ 12.34 hrs Surf.Area= 2,268 sf Storage= 3,901 cf

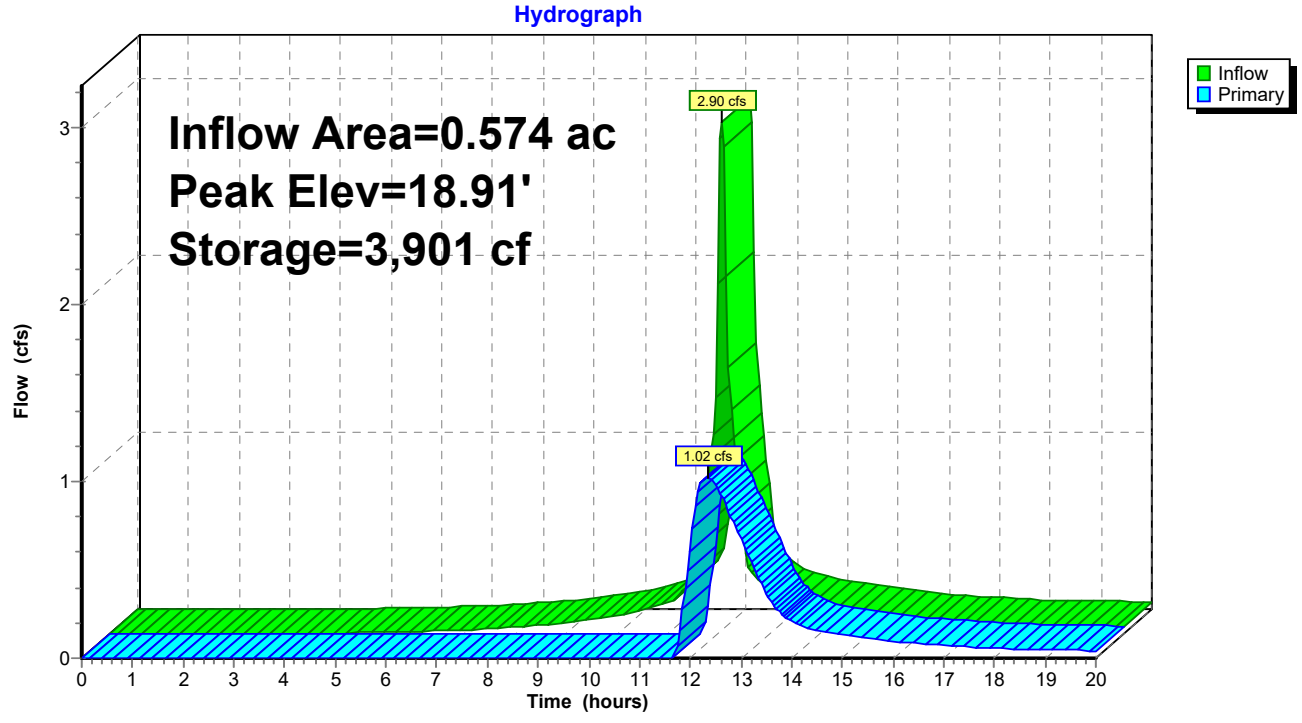
Plug-Flow detention time= 120.3 min calculated for 0.157 af (78% of inflow)
Center-of-Mass det. time= 64.4 min (821.9 - 757.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.50'	1,775 cf	**24.0" Round Pipe Storage** Inside #2 L= 565.0'
#2	15.50'	3,826 cf	**4.00'W x 567.00'L x 5.00'H Prismatoid** 11,340 cf Overall - 1,775 cf Embedded = 9,565 cf x 40.0% Voids
		5,601 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	17.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.02 cfs @ 12.34 hrs HW=18.91' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.02 cfs @ 5.19 fps)

Pond 2P: Pipe Storage

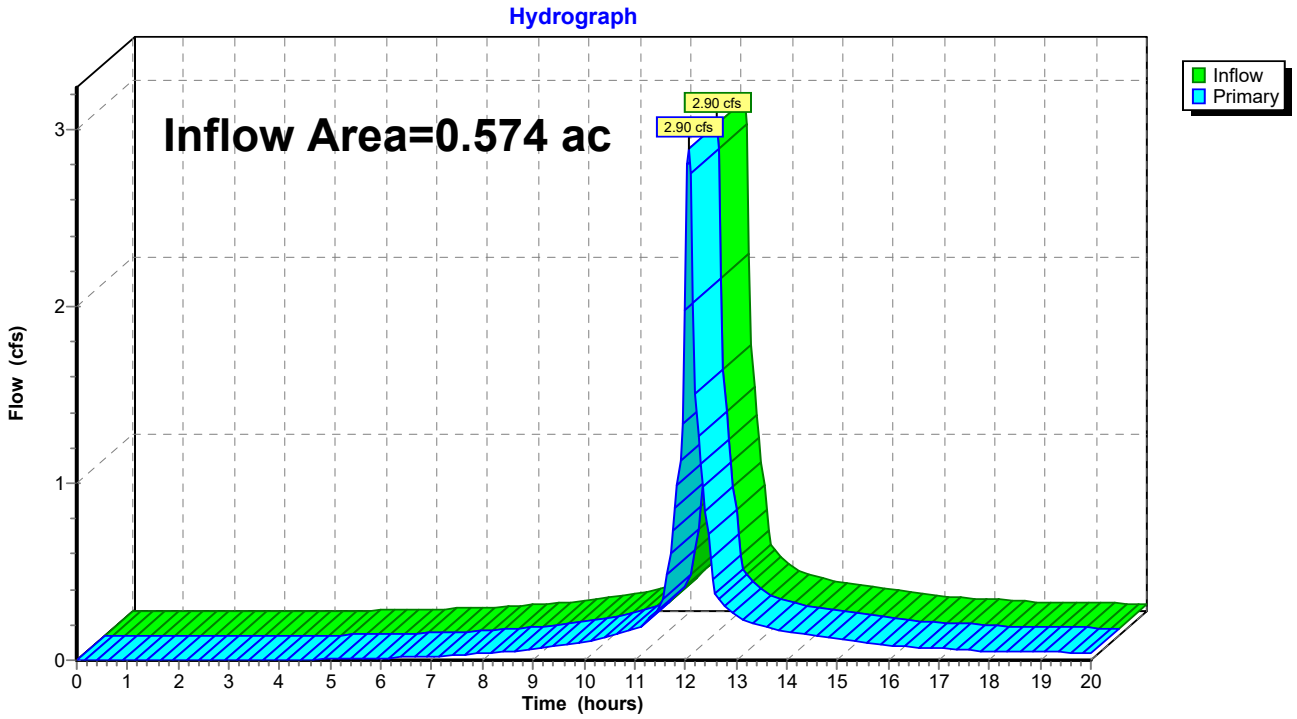


Summary for Link 1L: (new Link)

Inflow Area = 0.574 ac, 63.97% Impervious, Inflow Depth > 4.22" for 25-Year event
Inflow = 2.90 cfs @ 12.07 hrs, Volume= 0.202 af
Primary = 2.90 cfs @ 12.07 hrs, Volume= 0.202 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Link 1L: (new Link)



Time span=0.00-20.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment3S: AREA A Runoff Area=89,620 sf 28.40% Impervious Runoff Depth>4.59"
Flow Length=711' Tc=17.8 min CN=81 Runoff=8.24 cfs 0.787 af

SubcatchmentB: AREA B Runoff Area=10,575 sf 75.61% Impervious Runoff Depth>5.85"
Tc=5.0 min CN=92 Runoff=1.63 cfs 0.118 af

SubcatchmentC: AREA C Runoff Area=14,414 sf 55.43% Impervious Runoff Depth>5.28"
Tc=5.0 min CN=87 Runoff=2.09 cfs 0.145 af

SubcatchmentD: AREA D Runoff Area=31,369 sf 87.60% Impervious Runoff Depth>6.20"
Tc=5.0 min CN=95 Runoff=4.97 cfs 0.372 af

Reach 2R: POI-1 Inflow=11.76 cfs 1.378 af
Outflow=11.76 cfs 1.378 af

Pond 2P: Pipe Storage Peak Elev=19.58' Storage=4,771 cf Inflow=3.73 cfs 0.264 af
Outflow=1.28 cfs 0.219 af

Link 1L: (new Link) Inflow=3.73 cfs 0.264 af
Primary=3.73 cfs 0.264 af

Total Runoff Area = 3.351 ac Runoff Volume = 1.423 af Average Runoff Depth = 5.10"
52.79% Pervious = 1.769 ac 47.21% Impervious = 1.582 ac

Summary for Subcatchment 3S: AREA A

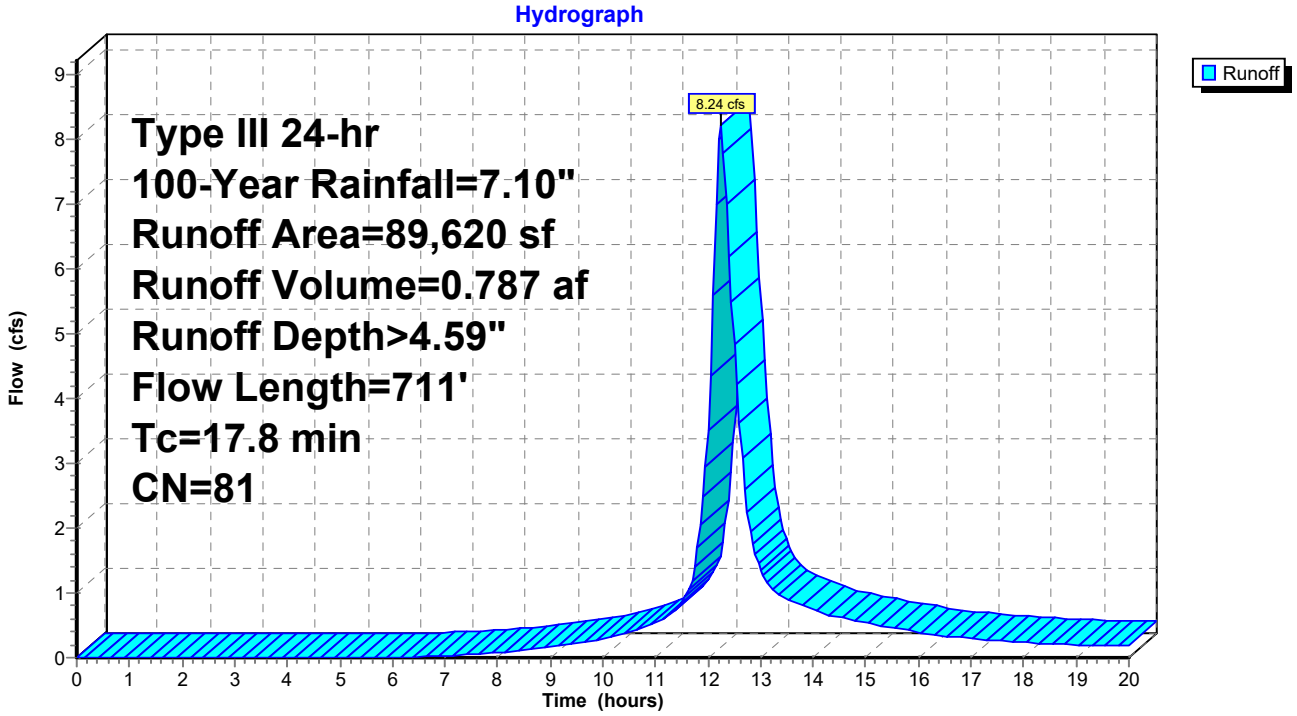
Runoff = 8.24 cfs @ 12.24 hrs, Volume= 0.787 af, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
	64,169	74	>75% Grass cover, Good, HSG C
*	25,451	98	
	89,620	81	Weighted Average
	64,169		71.60% Pervious Area
	25,451		28.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	153	0.0163	0.18		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.40"
0.7	129	0.0388	3.17		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
2.6	429	0.0179	2.72		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
17.8	711	Total			

Subcatchment 3S: AREA A



Summary for Subcatchment B: AREA B

[49] Hint: Tc<2dt may require smaller dt

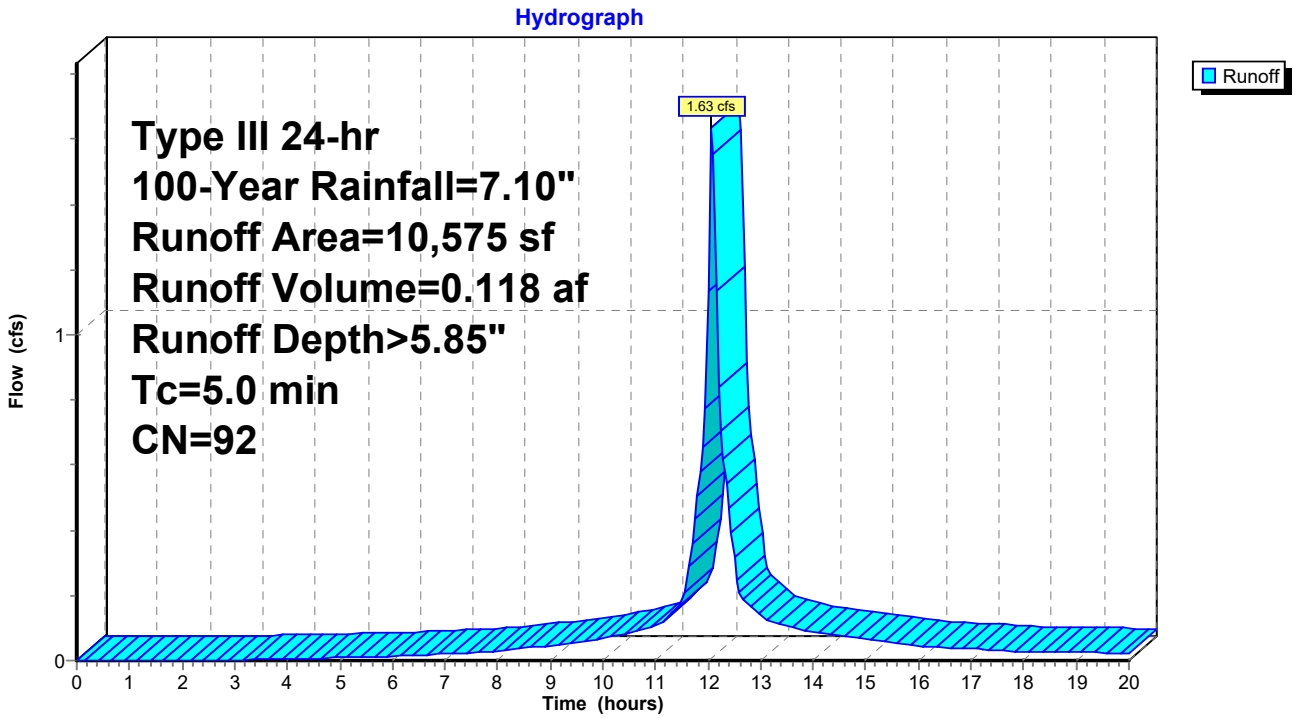
Runoff = 1.63 cfs @ 12.07 hrs, Volume= 0.118 af, Depth> 5.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	7,996	98	
	2,579	74	>75% Grass cover, Good, HSG C
	10,575	92	Weighted Average
	2,579		24.39% Pervious Area
	7,996		75.61% Impervious Area

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

Subcatchment B: AREA B



Summary for Subcatchment C: AREA C

[49] Hint: Tc<2dt may require smaller dt

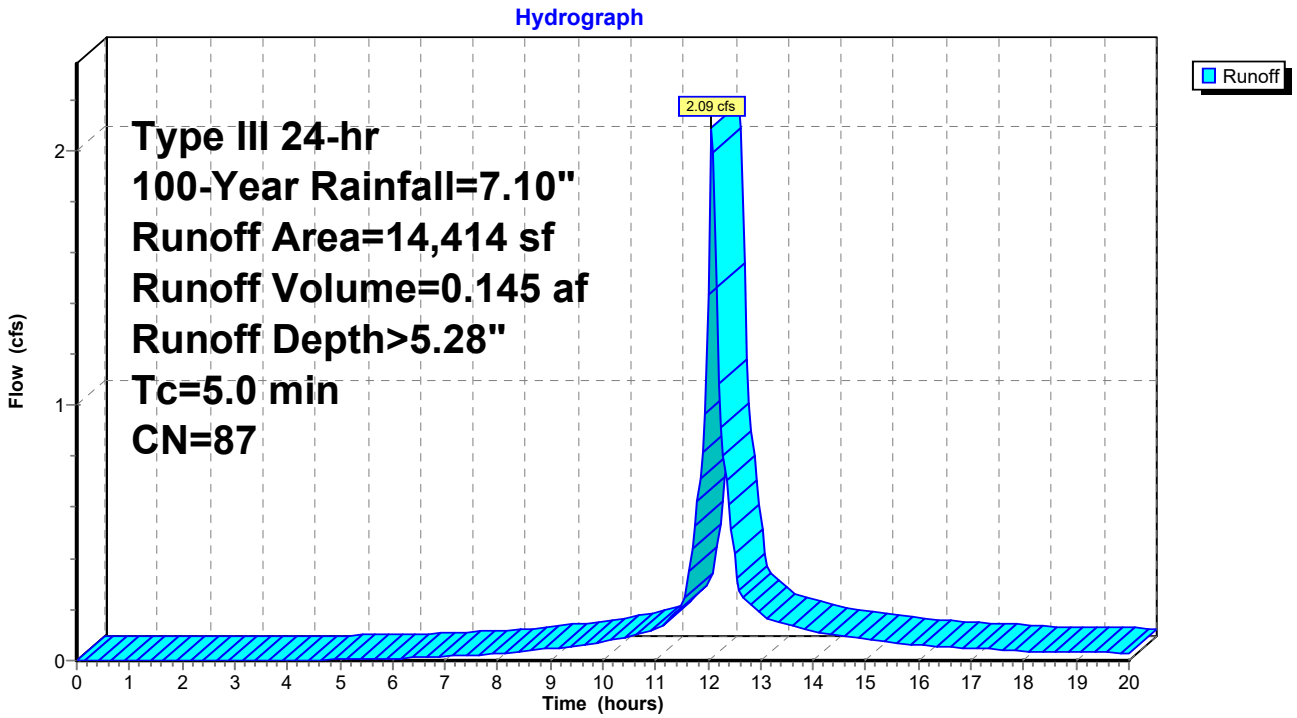
Runoff = 2.09 cfs @ 12.07 hrs, Volume= 0.145 af, Depth> 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	7,989	98	
	6,425	74	>75% Grass cover, Good, HSG C
	14,414	87	Weighted Average
	6,425		44.57% Pervious Area
	7,989		55.43% Impervious Area

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

Subcatchment C: AREA C



Summary for Subcatchment D: AREA D

[49] Hint: Tc<2dt may require smaller dt

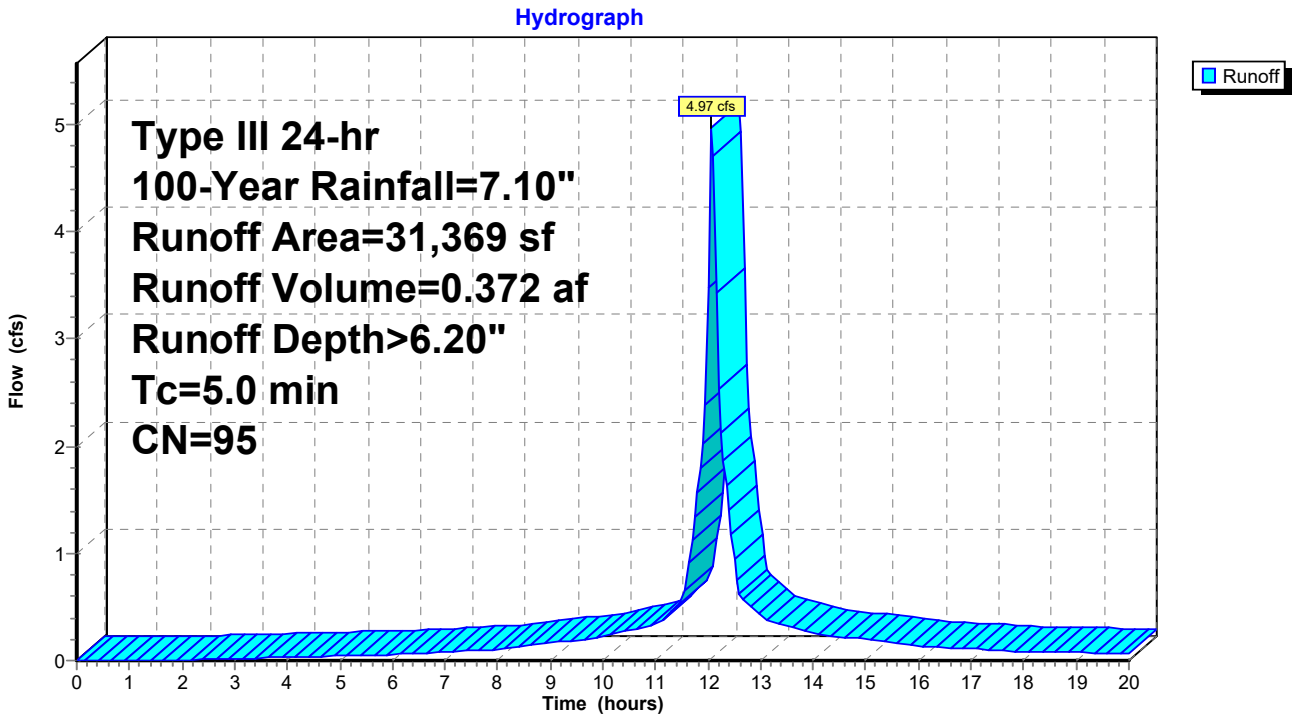
Runoff = 4.97 cfs @ 12.07 hrs, Volume= 0.372 af, Depth> 6.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.10"

	Area (sf)	CN	Description
*	27,479	98	
	3,890	74	>75% Grass cover, Good, HSG C
	31,369	95	Weighted Average
	3,890		12.40% Pervious Area
	27,479		87.60% Impervious Area

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

Subcatchment D: AREA D



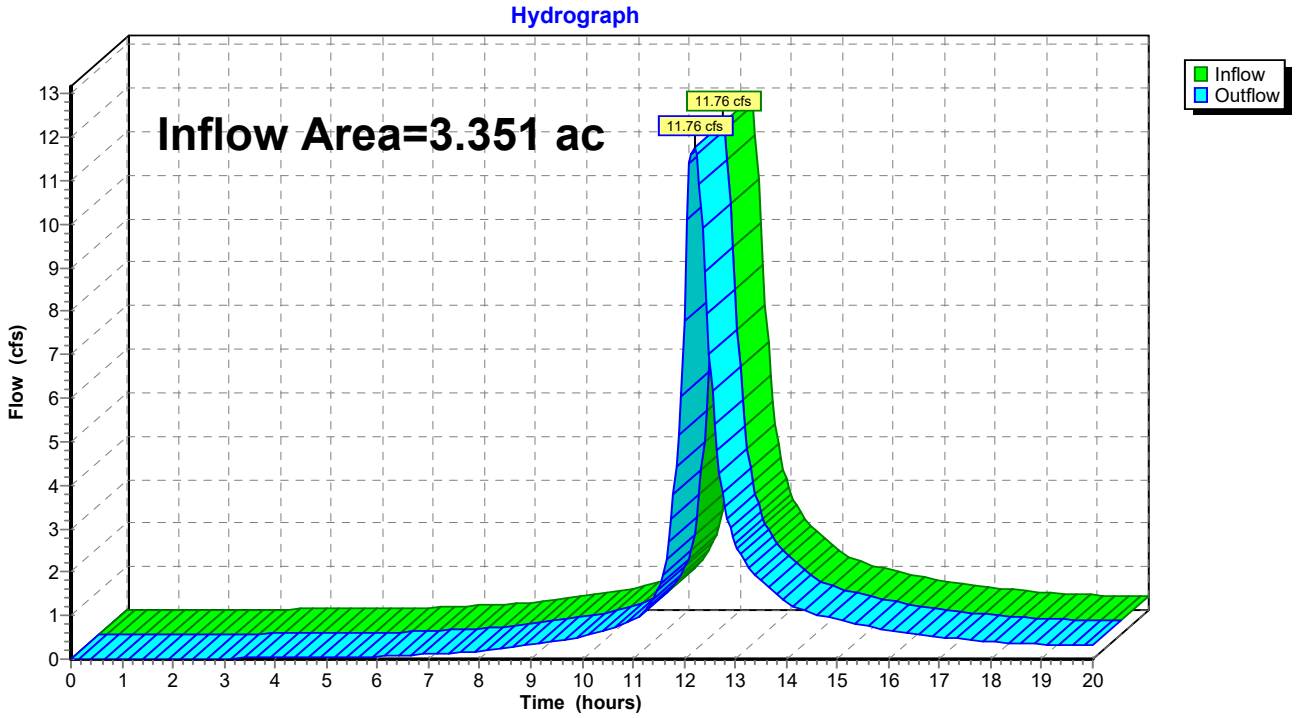
Summary for Reach 2R: POI-1

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

Inflow Area = 3.351 ac, 47.21% Impervious, Inflow Depth > 4.93" for 100-Year event
Inflow = 11.76 cfs @ 12.20 hrs, Volume= 1.378 af
Outflow = 11.76 cfs @ 12.20 hrs, Volume= 1.378 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: POI-1



Summary for Pond 2P: Pipe Storage

Inflow Area = 0.574 ac, 63.97% Impervious, Inflow Depth > 5.52" for 100-Year event
Inflow = 3.73 cfs @ 12.07 hrs, Volume= 0.264 af
Outflow = 1.28 cfs @ 12.34 hrs, Volume= 0.219 af, Atten= 66%, Lag= 16.2 min
Primary = 1.28 cfs @ 12.34 hrs, Volume= 0.219 af

Routing by Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 19.58' @ 12.34 hrs Surf.Area= 2,268 sf Storage= 4,771 cf

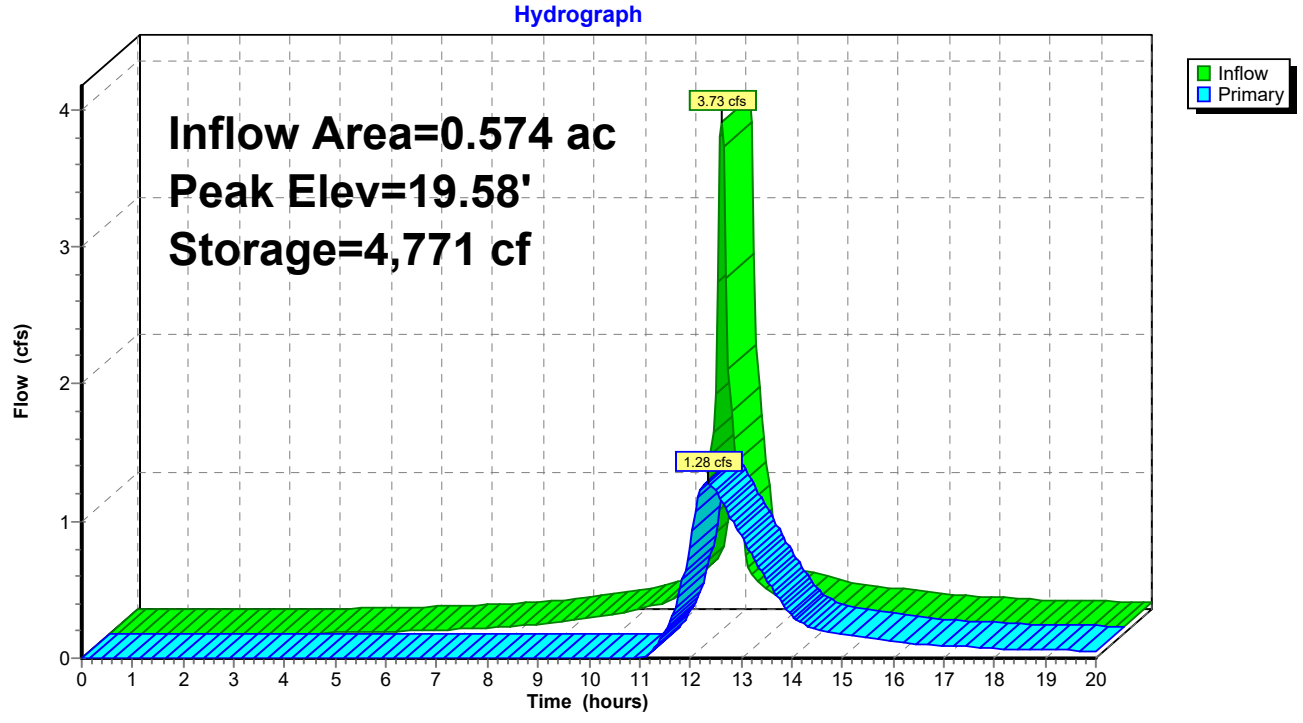
Plug-Flow detention time= 111.7 min calculated for 0.219 af (83% of inflow)
Center-of-Mass det. time= 63.2 min (814.5 - 751.3)

Volume	Invert	Avail.Storage	Storage Description
#1	17.50'	1,775 cf	**24.0" Round Pipe Storage** Inside #2 L= 565.0'
#2	15.50'	3,826 cf	**4.00'W x 567.00'L x 5.00'H Prismatoid** 11,340 cf Overall - 1,775 cf Embedded = 9,565 cf x 40.0% Voids
		5,601 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	17.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.28 cfs @ 12.34 hrs HW=19.58' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 1.28 cfs @ 6.52 fps)

Pond 2P: Pipe Storage

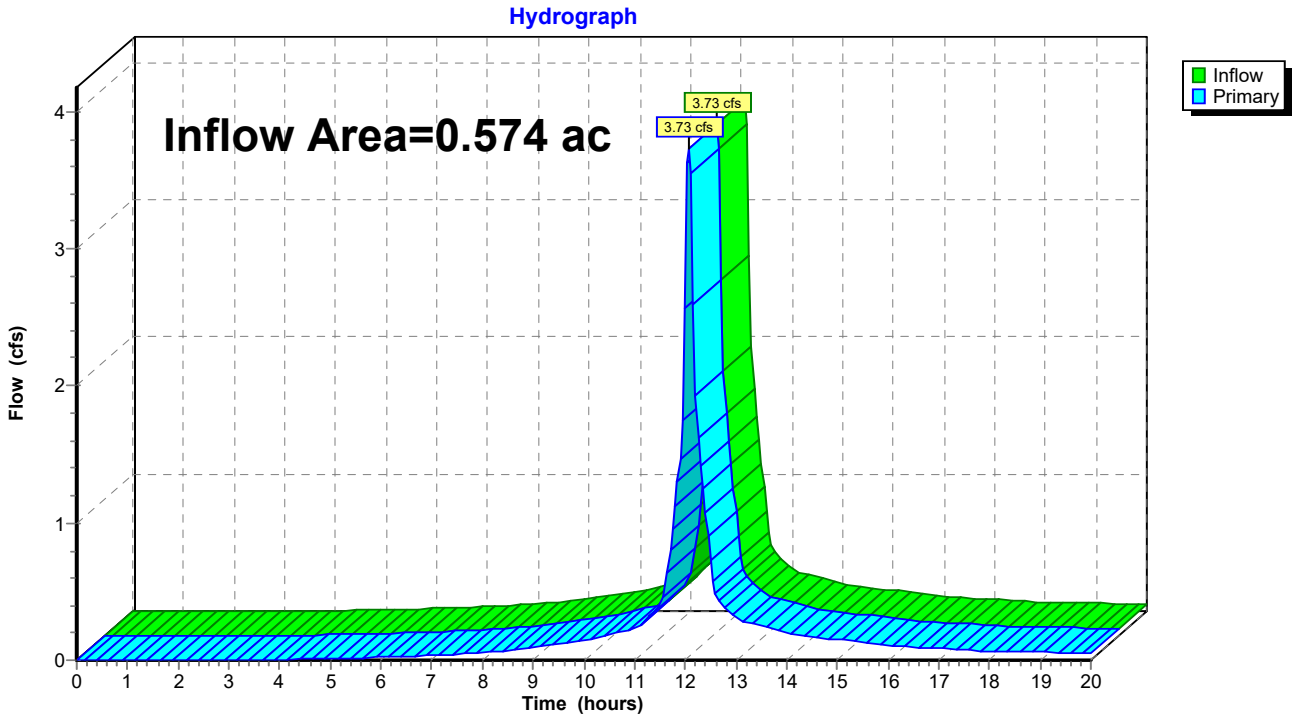


Summary for Link 1L: (new Link)

Inflow Area = 0.574 ac, 63.97% Impervious, Inflow Depth > 5.52" for 100-Year event
Inflow = 3.73 cfs @ 12.07 hrs, Volume= 0.264 af
Primary = 3.73 cfs @ 12.07 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Link 1L: (new Link)



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JOB WATER QUALITY CALCULATIONS PROJECT NO. ____ SHEET 1 OF ____

DESCRIPTION 48 GILES AVENUE COMPUTED BY JJS DATE ____

CHECKED BY ____ DATE ____

WATER QUALITY VOLUME

$$WQV = \frac{(1")(R)(A)}{12}$$

R = VOLUMETRIC RUNOFF COEFFICIENT

$R = 0.05 + 0.009(I)$

I - PERCENT IMPERVIOUS COVERAGE

$I = 71,256 / 235,555 = 0.303$

$R = (0.05) + 0.009(0.303) = 0.527$

A - SITE AREA IN ACRES - 5.41 AC.

$$WQV = \frac{(1")(0.527)(5.41)}{12} = 0.237 \text{ AC-FT OR } 10,323 \text{ CF}$$

BL Companies

JOB WATER QUALITY CALCULATIONS PROJECT NO. _____ PAGE _____ OF _____

DESCRIPTION 48 GILES AVENUE COMPUTED BY JJS DATE _____ SHEET 2 OF _____

CHECKED BY _____ DATE _____

WATER QUALITY FLOW

$$WQF = q_u(A)(Q)$$

A - SITE AREA IN SQUARE MILES

$$A = 5.41\,ac\left(\frac{1\,sq\,mile}{640\,ac}\right) = 0.00845\,sq\,mi.$$

Q - RUNOFF DEPTH IN WATERSHED INCHES

$$Q = \frac{(WQV)x(12)}{DA}$$

DA - CONTRIBUTING DRAINAGE AREA/SITE AREA

$$Q = \frac{(0.237)(12)}{7.02} = 0.405$$

q_u - UNIT PEAK DISCHARGE

TIME of CONCENTRATION - 17.8 MINUTES

P - DESIGN PRECIPITATION (1" FOR WQ STORM)

CN - RUNOFF CURVE NUMBER

$$CN = \frac{1000}{[10+5P+10Q-10(Q^2+1.25QP)^{1/2}]}$$

$$CN = \frac{1000}{[10+5(1)+10(.405)-10(0.405^2+1.25(405)(1))^{1/2}]}$$

$$CN = 92$$

BL Companies

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JOB WATER QUALITY CALCULATIONS PROJECT NO. ____ SHEET 3 OF ____

DESCRIPTION 48 GILES AVENUE COMPUTED BY JJS DATE ____

CHECKED BY ____ DATE ____

COMPUTE PEAK DISCHARGE TR-55

TABLE 4-1 I_a (INITIAL ABSTRACTION)

$I_a = 0.174$

EXHIBIT 4.III UNIT PEAK DISCHARGE FOR NRCS TYPE III STORM

$I_a/P = (0.174)/1 = 0.174$

UNIT PEAK DISCHARGE (q_u) FROM EXH. 4.III ≈> 475 csm/in

WQF = $q_u(A)(Q)$

WQF = 475 (0.00845)(0.405) = 1.63 CFS PEAK FLOW

GROUNDWATER RECHARGE VOLUME

$$GRV = \frac{(D)(A)(I)}{12}$$

D - DEPTH OF RUNOFF TO BE RECHARGED
SOIL GROUP A (18 IN/YR - AVG. ANNUAL RECHARGE)
GROUNDWATER RECHARGE DEPTH - 0.4 INCHES

A - SITE AREA (ACRES) - 5.41 ACRES
I - NET INCREASE IN IMPERVIOUS COVER

EXISTING COVERAGE - 37,279 / 235,555 = 0.158
PROPOSED COVERAGE - 71,256 / 235,555 = 0.303
$\Delta = 0.145$

$$GRV = \frac{(0.4)(5.41)(0.145)}{12} = 0.026 \text{ ACFT} = 1132 \text{ CF}$$

STONE TRENCH UNDER INFILTRATION SYSTEM

2' DEEP × 5' WIDE × 323' LONG = 3230 CF

3230 × 0.40 VOIDS = 1292 CF AVAILABLE STORAGE