Deming Street Multi-Family Development

240 Deming Street, South Windsor, Connecticut
Drainage Report

Prepared for:
Metro Realty

6 Executive Drive, Suite 100
Farmington, CT 06032

Prepared by:

SLR International Corporation

99 Realty Drive, Cheshire, Connecticut, 06410

SLR Project No.: 141.13571.00069

June 28, 2023

Drainage Report

Deming Street
Multi-Family Development
240 Deming Street
South Windsor, Connecticut
June 28, 2023
SLR #141.13571.00069

This Drainage Report has been prepared in support of the proposed multi-family development at 240 Deming Street in the town of South Windsor, Connecticut. The development will add multiple buildings, a new parking lot, sidewalks, and all associated site infrastructure.

Figure 1 -#240 Deming Road

Table 1 – Stormwater Data

Parcel Size Total	6.324 acres
Existing Impervious Area (Watershed Area)	0.81 acres
Proposed Impervious Area (Watershed Area)	2.63 acres
Soil Type (Hydrologic Soil Group)	"B" and "C"
Existing Land Use	Woods, open space, parking lot, sidewalk, building
Proposed Land Use	Woods, open space, parking lot, sidewalk, building
Design Storm for Stormwater Management	No increases in peak rates of runoff for the 2-, 10-, 25-, 50-, and 100-year storms; Connecticut Department of Energy & Environmental Protection (CTDEEP) water quality flow treatment (WQF), water quality volume (WQV), and groundwater recharge volume (GRV)
Water Quality Measures	Catch basins with 2-foot sumps, retention storage for WQV and GRV, hydrodynamic separator
Design Storm for Storm Drainage	10-year storm
Federal Emergency Management Agency (FEMA) Special Flood Hazard Areas	Area of Minimal Flood Hazard (Zone X)
Connecticut Department of Energy & Environmental Protection Aquifer Protection Areas	Not applicable

Stormwater Management Approach

The proposed stormwater management system for the project focuses on providing water quality management while attenuating proposed peak-flow. Water quality treatment in accordance with the CTDEEP requirements for water quality volume (WQV), groundwater recharge volume (GRV), and water quality flow (WQF) is provided. The proposed stormwater treatment train consists of catch basins with 2-foot sumps, retention storage for the WQV and GRV, and a hydrodynamic separator.

The computer program entitled *Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2023* by Autodesk, Inc. was used for designing the proposed storm drainage collection system. Storm drainage computations performed include pipe capacity and hydraulic grade line calculations. The contributing watershed to each individual catch basin inlet was delineated to determine the drainage area and land coverage. These values were used to determine the

stormwater runoff to each inlet using the Rational Method. The rainfall intensities for the site were obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 10, Precipitation Frequency Data Server (PFDS). The proposed storm drainage system is designed to provide adequate capacity to convey the 10-year storm event.

Water Quality Management

Water quality measures or Best Management Practices (BMPs) have been incorporated into the design to maintain water quality to provide protection of the areas downgradient of the proposed development. The proposed stormwater management system will include catch basins with 2-foot sumps, an underground chamber system with retention storage, and a hydrodynamic separator.

The CTDEEP *2004 Stormwater Quality Manual* (Chapter 7) recommends methods for sizing stormwater treatment measures with the WQV and GRV computations. The WQV addresses the initial stormwater runoff also commonly referred to as the “first-flush” runoff. The WQV provides adequate volume to store the initial 1-inch of runoff, which tends to contain the highest concentrations of potential pollutants. Per the *Stormwater Quality* Manual, the GRV is the post-development design recharge volume required to minimize the loss of annual pre-development groundwater recharge, determined as a function of site soils and the amount of impervious cover on the site. The GRV is a smaller volume than the WQV and is contained within the total WQV. The total WQV required for the proposed project is 0.190 acre-feet and will be provided as retention volume within the underground chamber system below the lowest orifice of the outlet control structure.

A hydrodynamic separator, such as a *Cascade*® device manufactured by Contech Engineered Solutions, will be installed in the proposed storm drainage system prior to discharging stormwater to the underground chamber system. This unit will further remove suspended solids before discharging downgradient, which will in turn remove other pollutants that tend to attach to the suspended solids and effectively remove other debris and floatables that may be present in stormwater runoff. The hydrodynamic separator has been designed to meet criteria recommended by the CTDEEP *2004 Stormwater Quality Manual*. The device was designed based on the determined WQF, which is the peak-flow rate associated with the Water Quality Volume (WQV) and sized based on the manufacturer's specifications.

Hydrologic Analysis

A hydrologic analysis was conducted to analyze the predevelopment and postdevelopment peak-flow rates from the site. Three analysis points that receive runoff from the site were selected. Analysis Point A represents the western property boundary that receives overland flow from the site. Analysis Point B represents the drainage system located on-site that receives stormwater runoff from the developed portion of the site as well as the upstream property to the east, and which discharges west of the property. Analysis Point C represents the storm drainage system located in Deming Street that receives runoff from the property via overland

flow. The total watershed area delineated is approximately 7.9 acres under both existing and proposed conditions.

The method of predicting the surface water runoff rates utilized in this analysis was a computer program titled *HydroCAD 10.20-2g* by HydroCAD Software Solutions LLC. The *HydroCAD* program is a computer model that utilizes the methodologies set forth in the *Technical Release No. 55* (TR-55) manual and *Technical Release No. 20* (TR-20) computer model, originally developed by the United States Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS). The *HydroCAD* computer modeling program is primarily used for conducting hydrology studies such as this one.

The *HydroCAD* computer program forecasts the rate of surface water runoff based upon several factors. The input data includes information on land use, hydrologic soil type, vegetation, contributing watershed area, time of concentration, rainfall data, storage volumes, and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains, and stormwater management basins. The input data for rainfalls with statistical recurrence frequencies of 2, 10, 25, 50, and 100 years was obtained from the NOAA Atlas 14, Volume 10 database. The corresponding rainfall totals are listed below.

Storm Frequency	Rainfall (inches)
2-year	3.11
10-year	4.92
25-year	6.05
50-year	6.88
100-year	7.79

Land use for the site under existing and proposed conditions was determined from field survey and aerial photogrammetry. Land use types used in the analysis included woods, grassed or open space, building, and impervious (paved) cover. Soil types in the watershed were determined from the CTDEEP Geographic Information System (GIS) database of the USDA-NRCS soil survey for Hartford County, Connecticut. For the analysis, the site was determined to contain hydrologic soil types "B" and "C" as classified by USDA-NRCS. Composite runoff Curve Numbers (CN) for each subwatershed were calculated based on the different land use and soil types. The time of concentration (Tc) was estimated for each subwatershed using the TR-55 methodology and was computed by summing all travel times through the watershed as sheet flow, shallow concentrated flow, and channel flow.

The existing conditions were modeled with the *HydroCAD* program to determine the peak-flow rates for the various storm events at each analysis point. A revised model was developed incorporating the proposed site conditions and the underground chamber system. The flows obtained with the revised model were then compared to the results of the existing conditions model. Peak-flow rates from the project site were controlled by the storage volume provided within the underground detention system. The following peak rates of runoff were obtained from the *HydroCAD* hydrology results:

Analysis Point A – Western Property Boundary					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	8.8	15.4	20.2	23.9	28.0
Proposed Conditions	7.8	11.8	17.1	21.1	25.3

Underground Chamber System 110*					
	Water Surface Elevation (feet)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Proposed Conditions	127.7	129.1	129.5	129.7	129.9

***Inner top of chamber elevation = 130.1**

Analysis Point B – On-Site Storm Drainage System					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	2.0	4.8	6.7	8.1	9.6
Proposed Conditions	1.0	3.8	6.0	7.7	9.6

Analysis Point C – Storm Drainage System in Deming Street					
	Peak Runoff Rate (cubic feet per second)				
Storm Frequency (years)	**2**	**10**	**25**	**50**	**100**
Existing Conditions	0.0	0.3	0.5	0.7	0.9
Proposed Conditions	0.0	0.3	0.5	0.7	0.9

Conclusion

The results of the hydrologic analysis demonstrate that there will be no increases in peak-flow rates from the proposed development. This was achieved for the storm events modeled through a planned stormwater management system with detention provided in the underground chamber system. The proposed development will also introduce a new stormwater treatment train

consisting of catch basins with 2-foot sumps, a hydrodynamic separator, and retention storage of the WQV and GRV within the underground chamber system.

All supporting documentation and stormwater-related computations are attached to this report along with the *HydroCAD* model results for stormwater management and *Hydraflow Storm Sewers* model results for the proposed storm drainage system. Illustrative Watershed Maps for both existing and proposed conditions are also attached to this report.

Appendices

Appendix A	United States Geological Survey Location Map
Appendix B	Federal Emergency Management Agency Flood Insurance Rate Map
Appendix C	Natural Resources Conservation Service Hydrologic Soil Group Map
Appendix D	Storm Drainage Computations
Appendix E	Water Quality Computations
Appendix F	Hydrologic Analysis – Input Computations
Appendix G	Hydrologic Analysis – Computer Model Results
Appendix H	Watershed Maps

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Appendix A
United States Geological Survey Location Map

Deming Street Multi-Family Development

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6 Executive Drive, Suite 100
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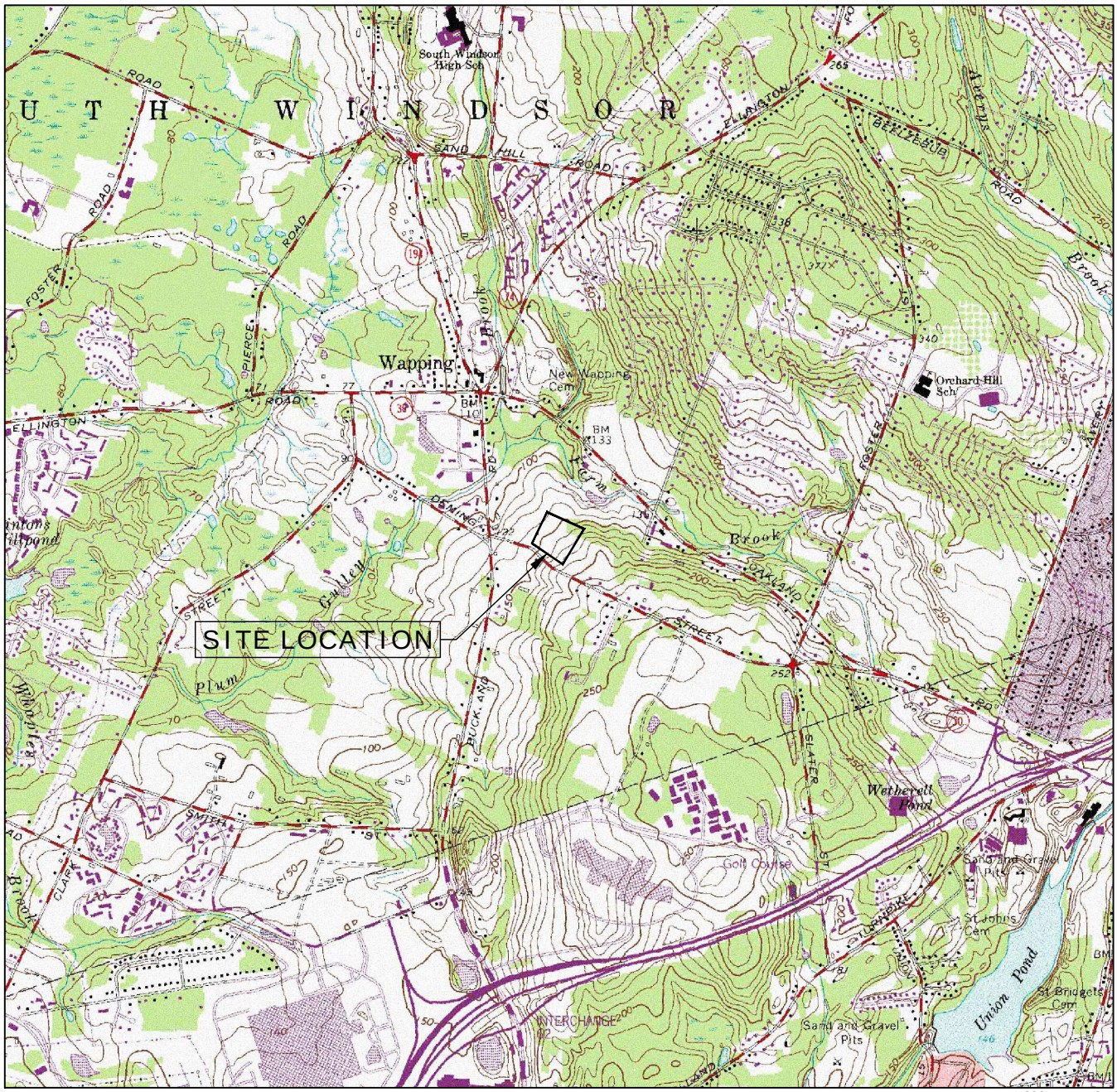
SLR Project No.: 141.13571.00069

June 28, 2023



SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

USGS QUADRANGLE MAP, QUAD NO. 38

PROPOSED MULTI-FAMILY DEVELOPMENT

240 DEMING STREET
SOUTH WINDSOR, CONNECTICUT

PROJECT PHASE:

REV: ---

DATE	JUNE 28, 2023
SCALE	1"=2,400'
PROJ. NO.	13571.00069

DESIGNED	DRAWN	CHECKED
---	MCB	---

DRAWING NAME:

LOC

Appendix B
FEMA Flood Insurance Rate Map

Deming Street Multi-Family Development

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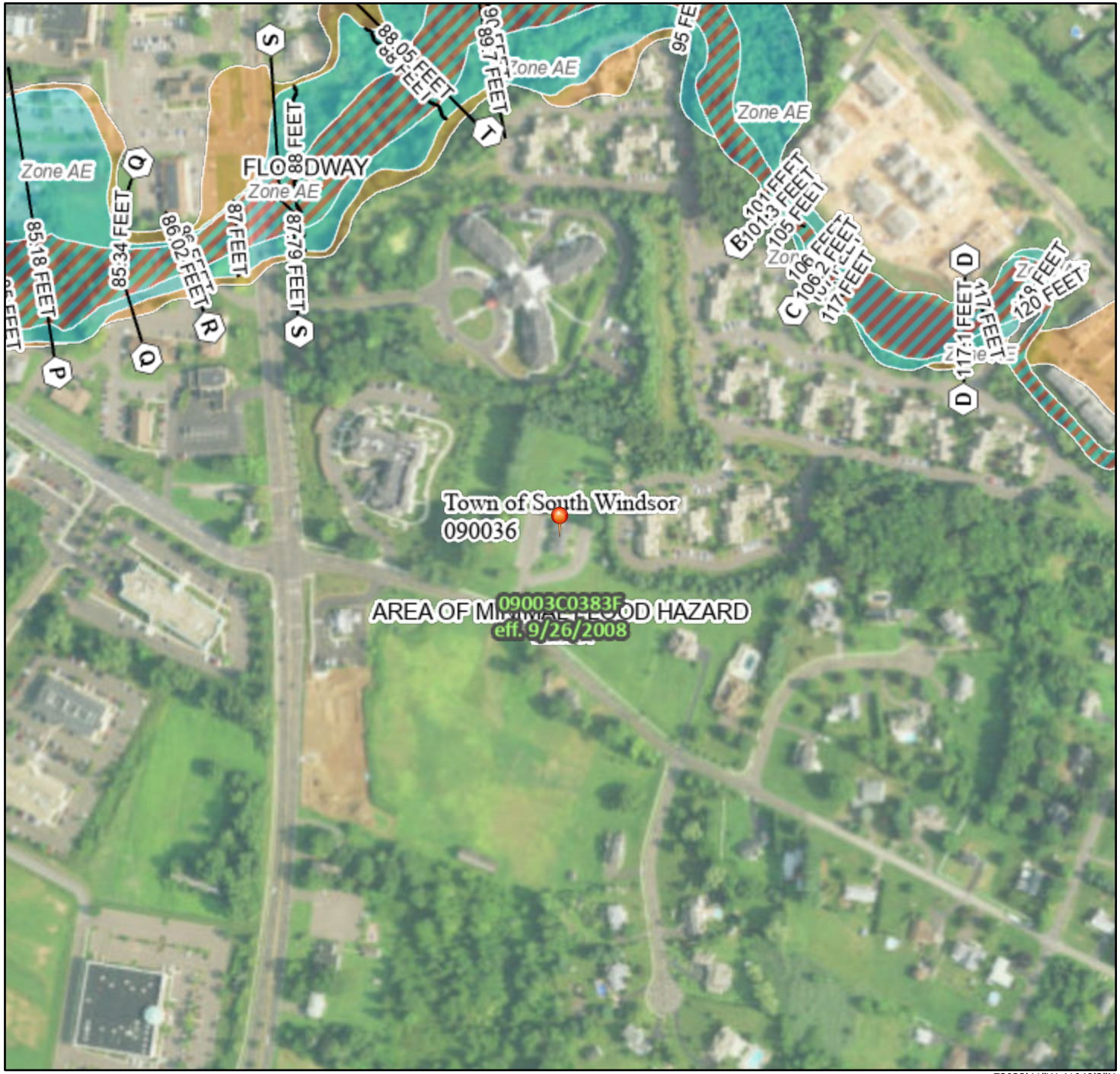
June 28, 2023

National Flood Hazard Layer FIRMette

FEMA

72°33'19"W 41°49'29"N



72°32'41"W 41°49'2"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/25/2023 at 11:53 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Appendix C
Natural Resources Conservation Service Hydrologic Soil Group Map

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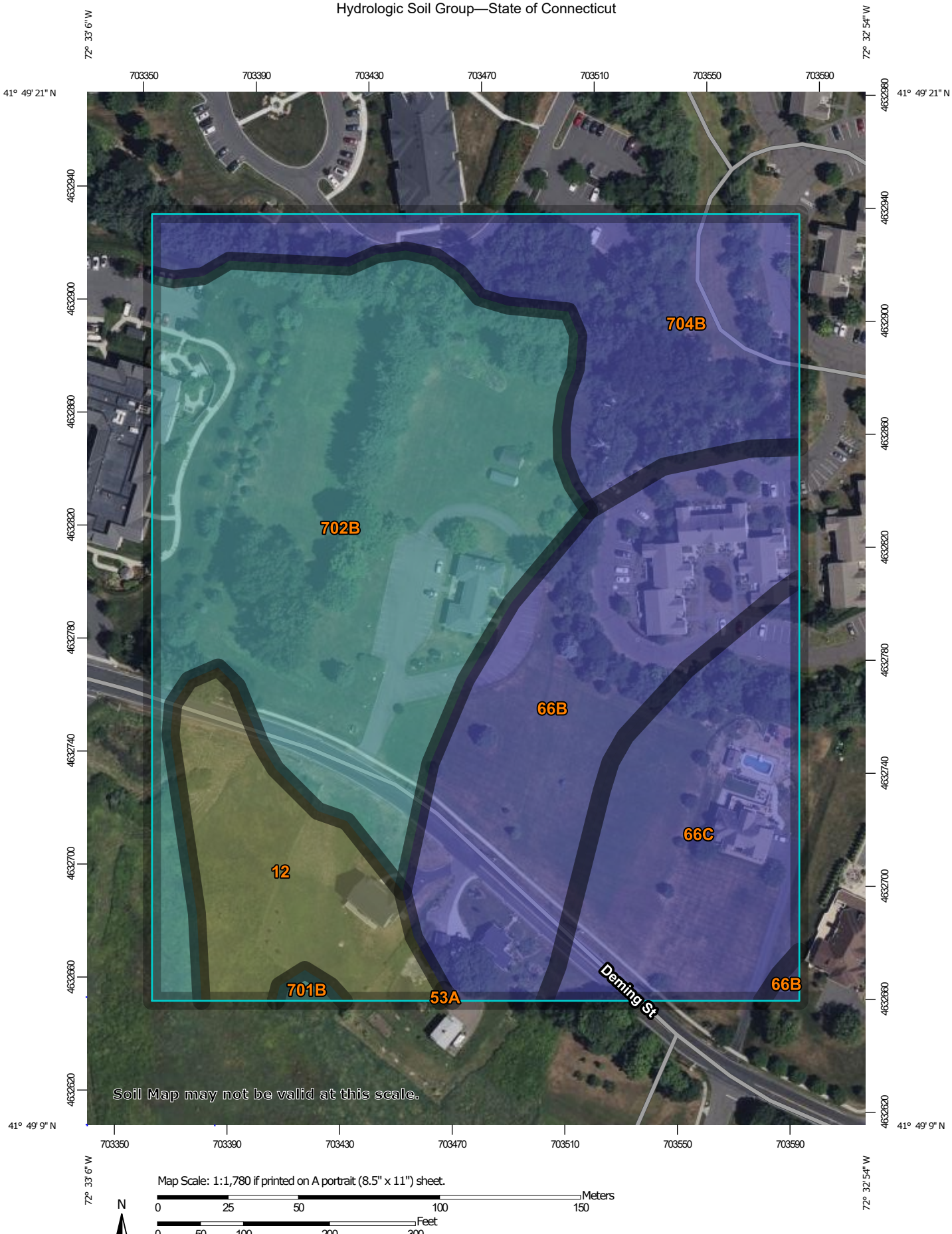
June 28, 2023

Hydrologic Soil Group—State of Connecticut



Map Scale: 1:1,780 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:12,000.

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

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

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

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

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

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

Soil Survey Area: State of Connecticut
Survey Area Data: Version 22, Sep 12, 2022

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

Date(s) aerial images were photographed: Jun 14, 2022—Oct 6, 2022

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12	Raypol silt loam	C/D	1.6	9.8%
53A	Wapping very fine sandy loam, 0 to 3 percent slopes	C	0.0	0.0%
66B	Narragansett silt loam, 2 to 8 percent slopes	B	3.3	20.6%
66C	Narragansett silt loam, 8 to 15 percent slopes	B	2.2	14.0%
701B	Ninigret fine sandy loam, 3 to 8 percent slopes	C	0.0	0.3%
702B	Tisbury silt loam, 3 to 8 percent slopes	C	6.2	39.0%
704B	Enfield silt loam, 3 to 8 percent slopes	B	2.6	16.4%
Totals for Area of Interest			**15.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix D
Storm Drainage Computations

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SLR Project No.: 141.13571.00069

June 28, 2023

Rational Method Individual Basin Calculations

Project: Multi-Family Development By: LCD Date: 6/28/23
Location: South Windsor, CT Checked: MCB Date: 6/28/23

Basin Name	Impervious Area C=0.9 (sf)	Grassed Area C=0.3 (sf)	Wooded Area C=0.2 (sf)	Total Area (sf)	Total Area (ac)	Weighted C	Tc (min)
AD 4	753	817	0	1570	0.04	0.59	5.0
CLCB 5	5417	920	0	6337	0.15	0.81	5.0
AD 6	237	242	0	479	0.01	0.60	5.0
AD 7	255	360	0	615	0.01	0.55	5.0
CLCB 8	5900	2460	0	8360	0.19	0.72	5.0
CCB 9	8003	1189	0	9192	0.21	0.82	5.0
CLCB 10	4631	3982	0	8613	0.20	0.62	5.0
CCB 11	4603	2240	0	6843	0.16	0.70	5.0
CLCB 12	11798	2390	0	14187	0.33	0.80	5.0
CCB 13	7104	166	0	7270	0.17	0.89	5.0
CCB 14	5154	798	0	5952	0.14	0.82	5.0
AD 15	160	373	0	534	0.01	0.48	5.0
AD 16	339	614	0	952	0.02	0.51	5.0
YD 17	883	120	0	1003	0.02	0.83	5.0
AD 18	898	1495	0	2392	0.05	0.53	5.0
AD 19	159	270	0	429	0.01	0.52	5.0
AD 22	851	6971	2687	10509	0.24	0.32	5.0
CLCB 23	3963	558	0	4521	0.10	0.83	5.0
AD 24	0	1494	0	1494	0.03	0.30	5.0
CLCB 25	2030	820	0	2850	0.07	0.73	5.0
CLCB 26	927	193	0	1120	0.03	0.80	5.0
AD 27	0	7566	0	7566	0.17	0.30	5.0
AD 28	329	578	0	907	0.02	0.52	5.0
AD 29	518	1067	0	1585	0.04	0.50	5.0
AD 31	0	48	0	48	0.00	0.30	5.0
AD 33	0	1254	0	1254	0.03	0.30	5.0
AD 34	974	38105	0	39079	0.90	0.31	10.0
AD 35	9105	70666	252	80023	1.84	0.37	10.0
AD 36	377	2506	1444	4326	0.10	0.32	5.0
AD 37	254	2870	738	3862	0.09	0.32	5.0

Rational Method Roof Drain System Calculations

Project: Multi-Family Development | By: LCD | Date: 6/28/23
Location: South Windsor, CT | Checked: MCB | Date: 6/28/23

Total Roof Runoff to Proposed Storm Drainage System (In Hydraflow Model)

	BLDG A TO AD 7	BLDG B TO AD 4	BLDG C TO AD 16	BLDG D TO AD 19	BLDG E TO YD 17	BLDG F TO AD 29	BLDG G TO AD 27
C	0.90	0.90	0.90	0.90	0.90	0.90	0.90
I	7.44	7.44	7.44	7.44	7.44	7.44	7.44
A	0.16	0.16	0.14	0.10	0.10	0.10	0.10
Q	1.05	1.05	0.95	0.67	0.67	0.67	0.67

NOAA Atlas 14, Volume 10, Version 3
Location name: South Windsor, Connecticut, USA*
Latitude: 41.821°, Longitude: -72.5501°
Elevation: 137 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.01** (3.11-5.18)	**4.87** (3.77-6.30)	**6.28** (4.84-8.14)	**7.44** (5.70-9.71)	**9.04** (6.71-12.3)	**10.2** (7.46-14.3)	**11.5** (8.16-16.7)	**12.9** (8.69-19.2)	**15.0** (9.70-23.0)	**16.7** (10.5-26.1)
10-min	**2.84** (2.20-3.67)	**3.45** (2.66-4.46)	**4.44** (3.42-5.76)	**5.27** (4.04-6.88)	**6.40** (4.76-8.74)	**7.25** (5.28-10.1)	**8.15** (5.78-11.8)	**9.16** (6.16-13.6)	**10.6** (6.87-16.3)	**11.8** (7.47-18.5)
15-min	**2.23** (1.72-2.88)	**2.70** (2.09-3.50)	**3.48** (2.68-4.52)	**4.13** (3.16-5.39)	**5.02** (3.73-6.86)	**5.69** (4.14-7.94)	**6.39** (4.53-9.26)	**7.18** (4.83-10.6)	**8.32** (5.39-12.8)	**9.26** (5.86-14.5)
30-min	**1.50** (1.16-1.93)	**1.82** (1.41-2.36)	**2.35** (1.81-3.05)	**2.79** (2.14-3.64)	**3.40** (2.52-4.64)	**3.85** (2.80-5.37)	**4.33** (3.07-6.27)	**4.87** (3.27-7.21)	**5.64** (3.65-8.65)	**6.27** (3.97-9.82)
60-min	**0.941** (0.728-1.22)	**1.14** (0.885-1.48)	**1.48** (1.14-1.92)	**1.76** (1.35-2.29)	**2.14** (1.59-2.92)	**2.43** (1.77-3.39)	**2.73** (1.93-3.95)	**3.07** (2.06-4.54)	**3.56** (2.30-5.46)	**3.96** (2.50-6.19)
2-hr	**0.607** (0.472-0.780)	**0.735** (0.571-0.946)	**0.944** (0.731-1.22)	**1.12** (0.861-1.45)	**1.36** (1.02-1.85)	**1.53** (1.13-2.14)	**1.72** (1.24-2.50)	**1.95** (1.31-2.87)	**2.29** (1.49-3.49)	**2.58** (1.64-4.00)
3-hr	**0.466** (0.363-0.597)	**0.563** (0.439-0.722)	**0.723** (0.561-0.930)	**0.855** (0.660-1.11)	**1.04** (0.778-1.41)	**1.17** (0.863-1.63)	**1.32** (0.948-1.91)	**1.49** (1.01-2.19)	**1.76** (1.15-2.68)	**2.00** (1.27-3.09)
6-hr	**0.293** (0.229-0.373)	**0.355** (0.278-0.453)	**0.457** (0.357-0.585)	**0.542** (0.420-0.697)	**0.658** (0.497-0.891)	**0.744** (0.552-1.03)	**0.838** (0.607-1.21)	**0.954** (0.646-1.39)	**1.13** (0.740-1.71)	**1.29** (0.823-1.99)
12-hr	**0.178** (0.140-0.225)	**0.218** (0.171-0.276)	**0.283** (0.222-0.360)	**0.337** (0.263-0.431)	**0.411** (0.312-0.554)	**0.466** (0.348-0.643)	**0.526** (0.383-0.758)	**0.601** (0.408-0.872)	**0.717** (0.469-1.08)	**0.818** (0.524-1.25)
24-hr	**0.104** (0.082-0.131)	**0.129** (0.102-0.163)	**0.170** (0.134-0.216)	**0.205** (0.160-0.261)	**0.252** (0.192-0.338)	**0.286** (0.215-0.394)	**0.324** (0.238-0.467)	**0.373** (0.254-0.537)	**0.449** (0.295-0.670)	**0.516** (0.331-0.785)
2-day	**0.058** (0.046-0.073)	**0.074** (0.059-0.093)	**0.099** (0.078-0.124)	**0.119** (0.094-0.151)	**0.148** (0.113-0.198)	**0.168** (0.127-0.232)	**0.192** (0.142-0.276)	**0.222** (0.152-0.319)	**0.272** (0.179-0.404)	**0.316** (0.204-0.478)
3-day	**0.042** (0.034-0.053)	**0.053** (0.043-0.067)	**0.072** (0.057-0.090)	**0.087** (0.069-0.110)	**0.108** (0.083-0.144)	**0.123** (0.093-0.168)	**0.140** (0.104-0.201)	**0.162** (0.111-0.232)	**0.199** (0.131-0.295)	**0.233** (0.150-0.350)
4-day	**0.034** (0.027-0.042)	**0.043** (0.034-0.054)	**0.057** (0.046-0.072)	**0.069** (0.055-0.088)	**0.086** (0.066-0.115)	**0.098** (0.075-0.134)	**0.112** (0.083-0.161)	**0.130** (0.089-0.185)	**0.159** (0.105-0.235)	**0.186** (0.120-0.279)
7-day	**0.023** (0.018-0.028)	**0.029** (0.023-0.036)	**0.038** (0.030-0.047)	**0.046** (0.036-0.057)	**0.056** (0.044-0.075)	**0.064** (0.049-0.087)	**0.073** (0.054-0.104)	**0.084** (0.058-0.119)	**0.103** (0.068-0.150)	**0.119** (0.077-0.178)
10-day	**0.018** (0.015-0.023)	**0.023** (0.018-0.028)	**0.030** (0.024-0.037)	**0.035** (0.028-0.044)	**0.043** (0.033-0.057)	**0.049** (0.037-0.066)	**0.055** (0.041-0.078)	**0.064** (0.044-0.090)	**0.077** (0.051-0.112)	**0.088** (0.057-0.131)
20-day	**0.013** (0.011-0.016)	**0.015** (0.012-0.019)	**0.019** (0.015-0.024)	**0.022** (0.018-0.028)	**0.026** (0.020-0.034)	**0.029** (0.022-0.039)	**0.033** (0.024-0.045)	**0.037** (0.025-0.052)	**0.043** (0.028-0.062)	**0.048** (0.031-0.071)
30-day	**0.011** (0.009-0.014)	**0.012** (0.010-0.015)	**0.015** (0.012-0.019)	**0.017** (0.014-0.021)	**0.020** (0.015-0.026)	**0.022** (0.017-0.029)	**0.024** (0.018-0.033)	**0.027** (0.019-0.038)	**0.030** (0.020-0.044)	**0.033** (0.022-0.049)
45-day	**0.009** (0.007-0.011)	**0.010** (0.008-0.013)	**0.012** (0.010-0.015)	**0.013** (0.011-0.017)	**0.015** (0.012-0.020)	**0.017** (0.013-0.022)	**0.018** (0.013-0.025)	**0.020** (0.014-0.028)	**0.022** (0.015-0.032)	**0.023** (0.015-0.035)
60-day	**0.008** (0.006-0.010)	**0.009** (0.007-0.011)	**0.010** (0.008-0.012)	**0.011** (0.009-0.014)	**0.013** (0.010-0.016)	**0.014** (0.010-0.018)	**0.015** (0.011-0.020)	**0.016** (0.011-0.022)	**0.018** (0.012-0.025)	**0.018** (0.012-0.027)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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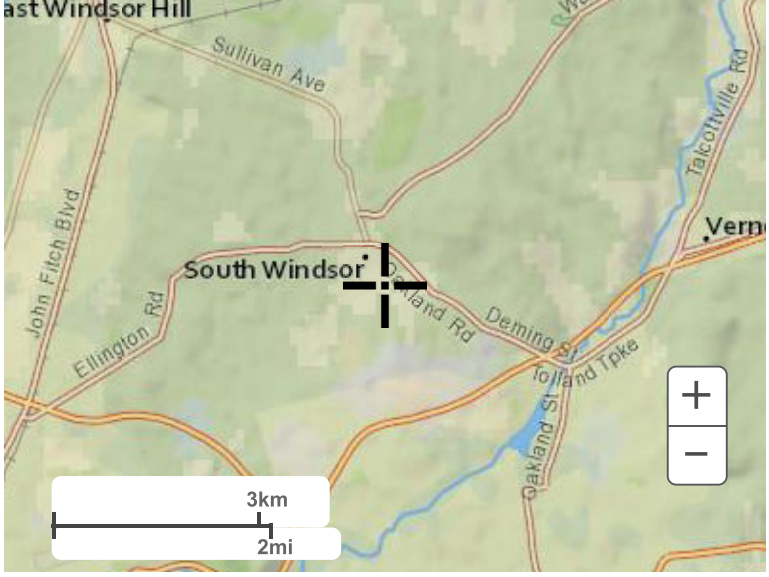
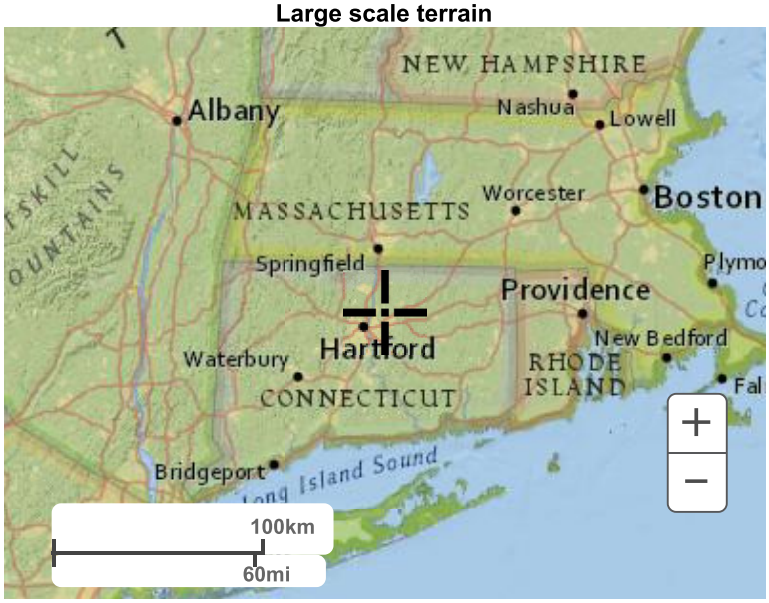
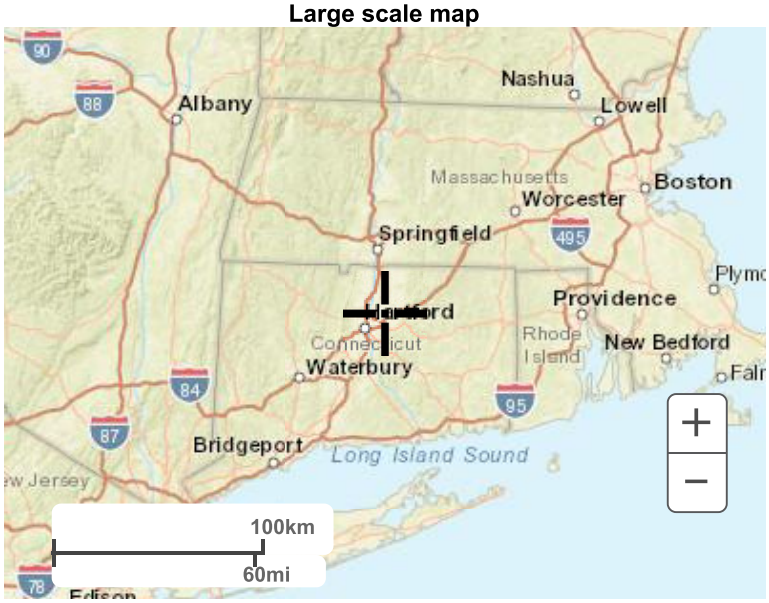
PF graphical



Large scale terrain



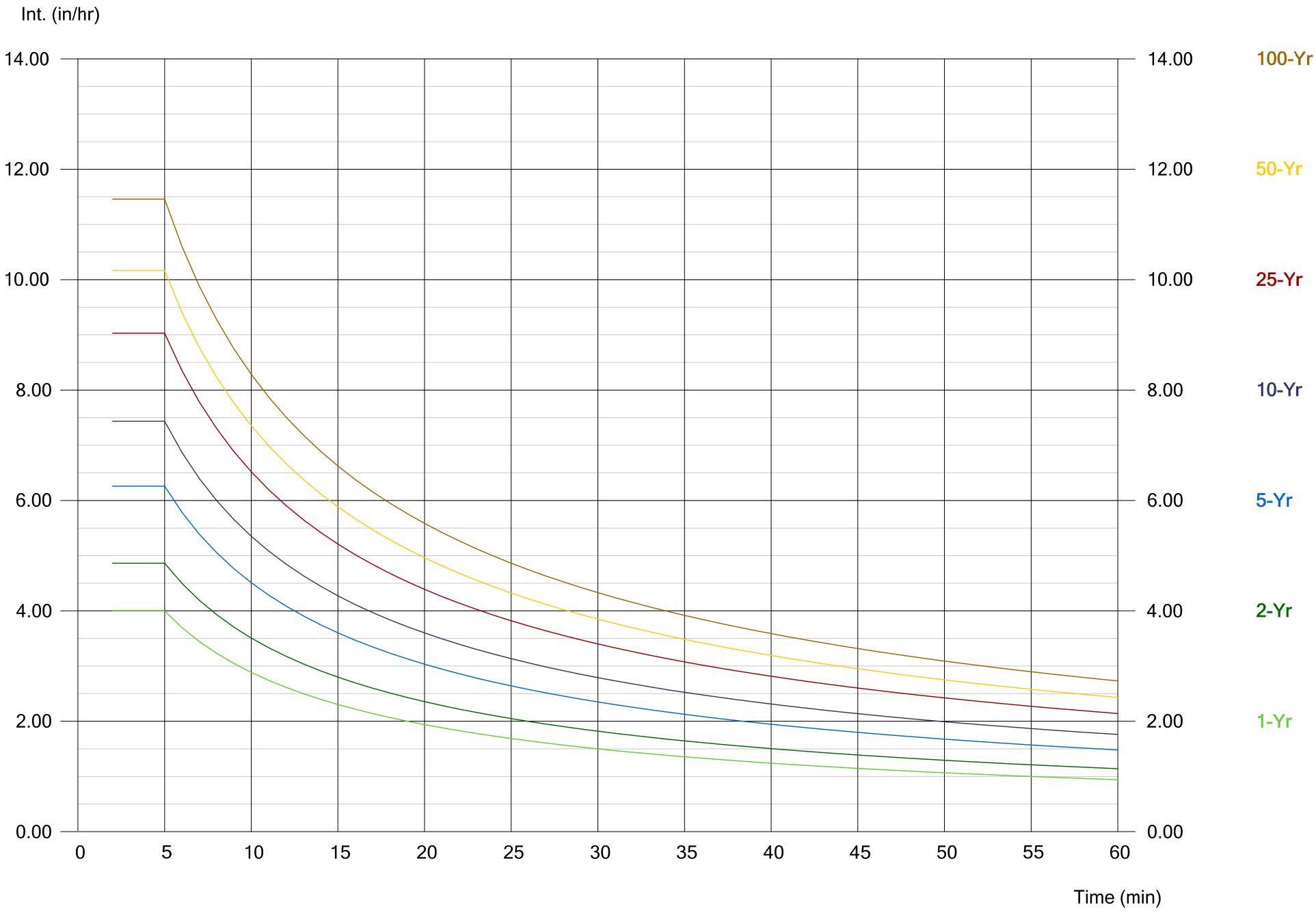
Large scale map



Large scale aerial

Storm Sewer IDF Curves

IDF file: SW IDF.IDF



Channel Report

10-IN HDPE 0.5%

Circular

Diameter (ft)	= 0.83
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.012

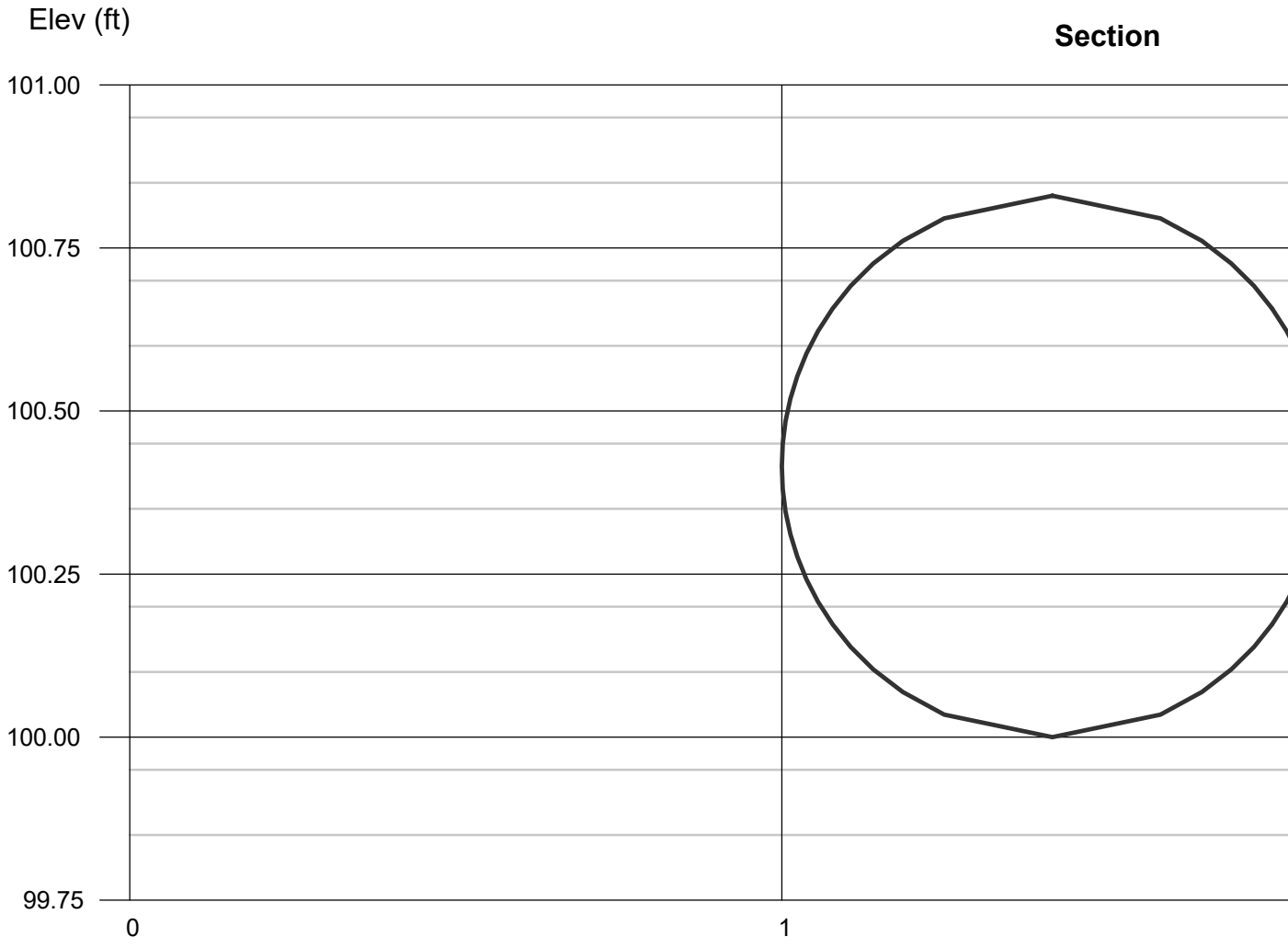
Q = 1.05 cfs <

Calculations

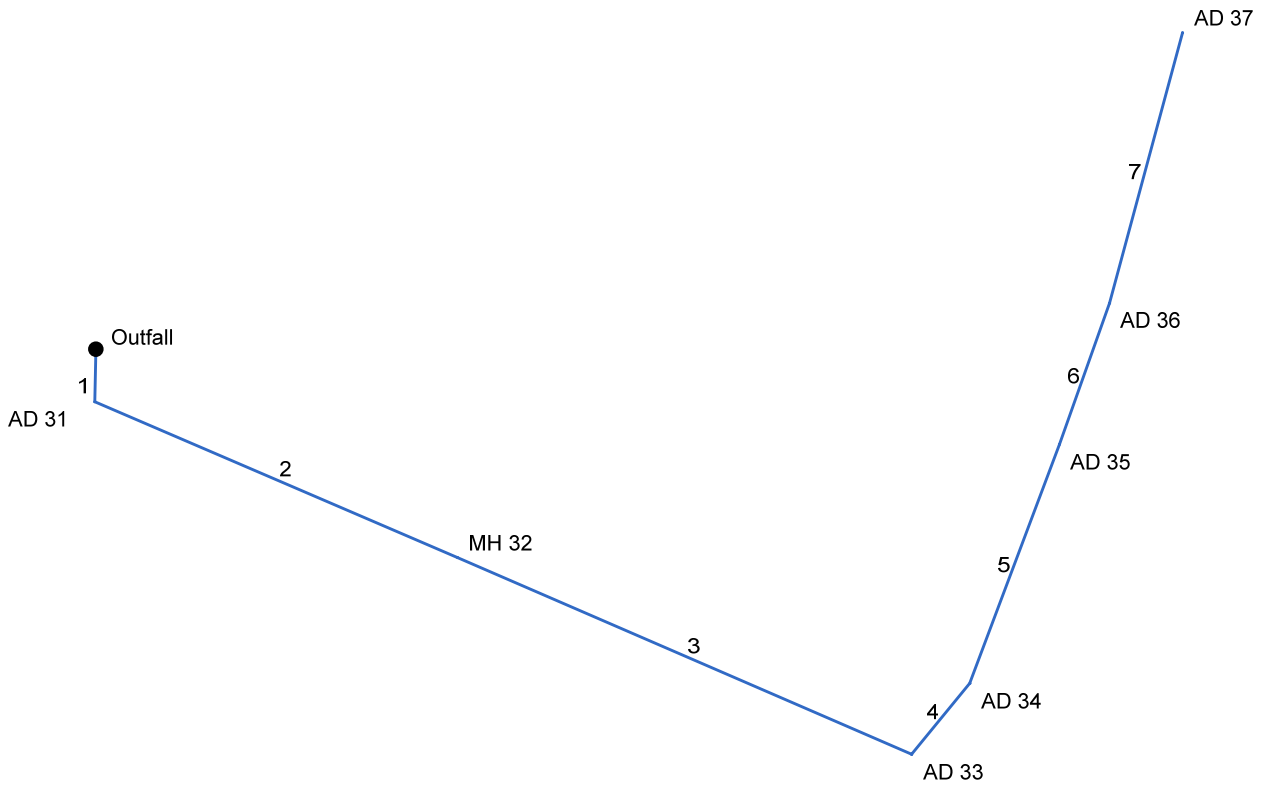
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.83
Q (cfs)	= 1.660
Area (sqft)	= 0.54
Velocity (ft/s)	= 3.07
Wetted Perim (ft)	= 2.61
Crit Depth, Yc (ft)	= 0.58
Top Width (ft)	= 0.00
EGL (ft)	= 0.98



Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm 100.stm	Number of lines: 7	Date: 6/27/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	19.000	91.189	DrGrt	0.00	0.01	0.30	5.0	126.80	1.05	127.00	15	Cir	0.012	1.41	130.80	MH 30 - AD 31
2	1	142.000	-67.864	MH	0.00	0.00	0.00	0.0	127.00	0.63	127.90	15	Cir	0.012	0.15	139.60	AD 31 - MH 32
3	2	178.000	0.155	DrGrt	0.00	0.03	0.30	5.0	127.90	1.01	129.70	15	Cir	0.012	1.45	139.60	MH 32 - AD 33
4	3	33.000	-74.235	DrGrt	0.00	0.90	0.31	10.0	129.70	0.91	130.00	15	Cir	0.012	0.56	139.00	AD 33 - AD 34
5	4	92.000	-18.761	DrGrt	0.00	1.84	0.37	10.0	130.00	1.09	131.00	15	Cir	0.012	0.50	136.00	AD 34 - AD 35
6	5	54.000	-1.081	DrGrt	0.00	0.10	0.32	5.0	131.00	0.93	131.50	12	Cir	0.012	0.50	136.00	AD 35 - AD 36
7	6	101.000	-4.300	DrGrt	0.00	0.09	0.32	5.0	131.50	0.79	132.30	12	Cir	0.012	1.00	135.30	AD 36 - A D 37

Project File: Storm 100.stm

Number of lines: 7

Date: 6/27/2023

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	19.000	0.01	2.97	0.30	0.00	1.03	5.0	11.5	5.0	5.13	7.18	5.05	15	1.05	126.80	127.00	127.82	127.92	131.30	130.80	MH 30 - AD 31
2	1	142.000	0.00	2.96	0.00	0.00	1.03	0.0	11.0	5.1	5.23	5.57	5.16	15	0.63	127.00	127.90	127.96	128.86	130.80	139.60	AD 31 - MH 32
3	2	178.000	0.03	2.96	0.30	0.01	1.03	5.0	10.5	5.2	5.38	7.03	5.22	15	1.01	127.90	129.70	128.92	130.64	139.60	139.60	MH 32 - AD 33
4	3	33.000	0.90	2.93	0.31	0.28	1.02	10.0	10.3	5.3	5.36	6.67	5.43	15	0.91	129.70	130.00	130.64	130.94	139.60	139.00	AD 33 - AD 34
5	4	92.000	1.84	2.03	0.37	0.68	0.74	10.0	10.0	5.4	3.97	7.29	4.38	15	1.09	130.00	131.00	130.94	131.81	139.00	136.00	AD 34 - AD 35
6	5	54.000	0.10	0.19	0.32	0.03	0.06	5.0	6.0	6.9	0.42	3.71	1.55	12	0.93	131.00	131.50	131.81	131.77	136.00	136.00	AD 35 - AD 36
7	6	101.000	0.09	0.09	0.32	0.03	0.03	5.0	5.0	7.4	0.21	3.43	1.67	12	0.79	131.50	132.30	131.77	132.49	136.00	135.30	AD 36 - A D 37

Project File: Storm 100.stm

Number of lines: 7

Run Date: 6/27/2023

NOTES:Intensity = 35.57 / (Inlet time + 3.70) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

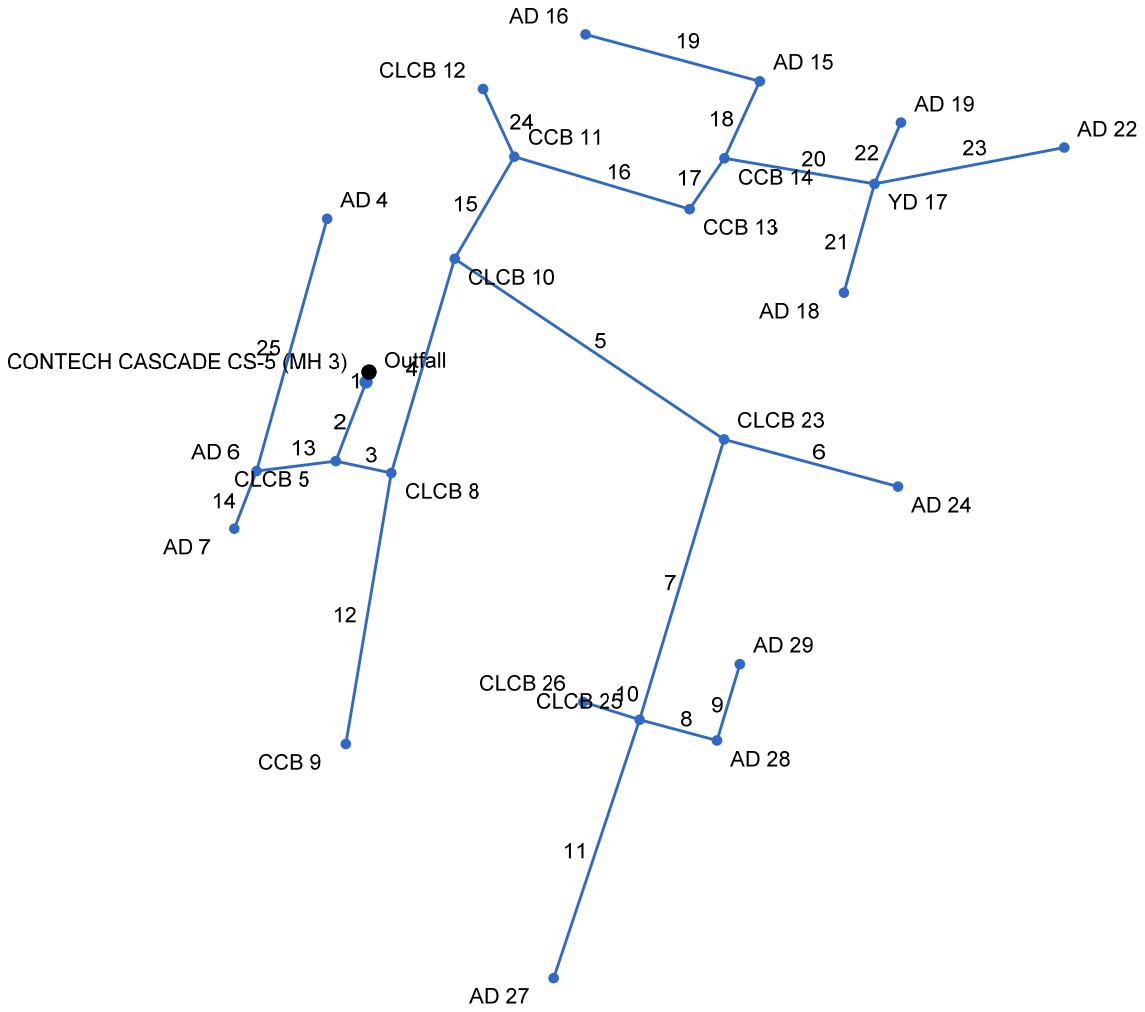
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	15	5.13	126.80	127.82	1.02	0.97	4.79	0.44	128.26	0.000	19.000	127.00	127.92 j	0.92**	0.97	5.31	0.44	128.36	0.000	0.000	n/a	1.41	n/a
2	15	5.23	127.00	127.96	0.96*	1.01	5.16	0.41	128.38	0.633	142.000	127.90	128.86	0.96	1.01	5.17	0.41	129.28	0.635	0.634	0.901	0.15	0.06
3	15	5.38	127.90	128.92	1.02	0.99	5.00	0.46	129.38	0.000	178.000	129.70	130.64 j	0.94**	0.99	5.44	0.46	131.10	0.000	0.000	n/a	1.45	0.67
4	15	5.36	129.70	130.64	0.94	0.99	5.42	0.46	131.10	0.000	33.000	130.00	130.94 j	0.94**	0.99	5.43	0.46	131.40	0.000	0.000	n/a	0.56	n/a
5	15	3.97	130.00	130.94	0.94	0.84	4.02	0.35	131.29	0.000	92.000	131.00	131.81 j	0.81**	0.84	4.75	0.35	132.16	0.000	0.000	n/a	0.50	0.18
6	12	0.42	131.00	131.81	0.81	0.17	0.62	0.10	131.90	0.000	54.000	131.50	131.77	0.27**	0.17	2.48	0.10	131.86	0.000	0.000	n/a	0.50	0.05
7	12	0.21	131.50	131.77	0.27	0.10	1.27	0.07	131.83	0.000	101.000	132.30	132.49 j	0.19**	0.10	2.06	0.07	132.56	0.000	0.000	n/a	1.00	0.07

Project File: Storm 100.stm | Number of lines: 7 | Run Date: 6/27/2023

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Storm 110.stm	Number of lines: 25	Date: 6/27/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	4.000	105.164	MH	0.00	0.00	0.00	5.0	125.30	2.50	125.40	24	Cir	0.012	0.15	133.70	UG-MH 3
2	1	33.000	5.840	Grate	0.00	0.15	0.81	5.0	125.40	1.82	126.00	24	Cir	0.012	2.03	135.00	MH 3-CLCB 5
3	2	22.000	-98.762	Grate	0.00	0.19	0.72	5.0	126.00	1.36	126.30	24	Cir	0.012	1.50	135.00	CLCB 5-CLCB 8
4	3	87.000	-85.778	Grate	0.00	0.20	0.62	5.0	126.30	1.38	127.50	24	Cir	0.012	2.13	133.70	CLCB 8-CLCB 10
5	4	126.000	107.490	Grate	0.00	0.10	0.83	5.0	128.70	1.98	131.20	12	Cir	0.012	1.44	136.00	CLCB 10-CLCB 23
6	5	70.000	-18.732	DrGrt	0.00	0.03	0.30	5.0	132.00	0.71	132.50	12	Cir	0.012	1.00	135.50	CLCB 23-AD 24
7	5	114.000	72.730	Grate	0.00	0.07	0.73	5.0	131.20	0.53	131.80	12	Cir	0.012	2.10	137.90	CLCB 23-CLCB 25
8	7	31.000	-91.666	DrGrt	0.00	0.02	0.52	5.0	131.80	0.65	132.00	12	Cir	0.012	1.50	137.90	CLCB 25-AD 28
9	8	31.000	-88.333	DrGrt	0.67	0.04	0.50	5.0	132.00	7.42	134.30	12	Cir	0.012	1.00	137.60	AD 28-AD 29
10	7	23.000	90.880	Grate	0.00	0.03	0.80	5.0	131.80	9.57	134.00	12	Cir	0.012	1.00	137.90	CLCB 25-CLCB 26
11	7	106.000	1.653	DrGrt	0.67	0.17	0.30	5.0	131.80	3.49	135.50	12	Cir	0.012	1.00	138.80	CLCB 25-AD 27
12	3	107.000	87.189	Comb	0.00	0.21	0.82	5.0	131.00	2.99	134.20	12	Cir	0.012	1.00	137.20	CLCB 8-CCB 9
13	2	31.000	61.775	DrGrt	0.00	0.01	0.60	5.0	126.60	2.58	127.40	12	Cir	0.012	1.50	135.50	CLCB 5-AD 6
14	13	24.000	-61.925	DrGrt	1.05	0.01	0.55	5.0	130.00	0.83	130.20	12	Cir	0.012	1.00	135.50	AD 6-AD 7
15	4	46.000	13.677	Comb	0.00	0.16	0.70	5.0	127.50	1.09	128.00	18	Cir	0.012	1.91	132.60	CLCB 10-CCB 11
16	15	71.000	76.587	Comb	0.00	0.17	0.89	5.0	128.00	0.56	128.40	15	Cir	0.012	1.44	134.30	CCB 11-CCB 13
17	16	24.000	-72.210	Comb	0.00	0.14	0.82	5.0	128.40	0.83	128.60	15	Cir	0.012	1.39	134.20	CCB 13-CLCB 14
18	17	33.000	-10.016	DrGrt	0.00	0.01	0.48	5.0	128.60	3.03	129.60	12	Cir	0.012	1.50	133.90	CLCB 14-AD 15
19	18	70.000	-99.386	DrGrt	0.95	0.02	0.51	5.0	129.60	0.71	130.10	12	Cir	0.012	1.00	133.40	AD 15-AD 16
20	17	59.000	65.153	DrGrt	0.67	0.02	0.83	5.0	128.60	0.51	128.90	15	Cir	0.012	1.50	134.80	CLCB 14-YD 17
21	20	44.000	95.992	DrGrt	0.00	0.05	0.53	5.0	128.90	5.91	131.50	12	Cir	0.012	1.00	135.30	YD 17-AD 18
22	20	26.000	-76.344	DrGrt	0.67	0.01	0.52	5.0	128.90	0.77	129.10	12	Cir	0.012	1.00	135.10	YD 17-AD 19
23	20	75.000	-20.537	DrGrt	0.00	0.24	0.32	5.0	128.90	2.80	131.00	12	Cir	0.012	1.00	133.00	YD 17-AD 22

Project File: Storm 110.stm

Number of lines: 25

Date: 6/27/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	15	29.000	-54.828	Grate	0.00	0.33	0.80	5.0	128.00	2.76	128.80	12	Cir	0.012	1.00	132.20	CCB 11-CLCB 12
25	13	102.000	112.820	DrGrt	1.05	0.04	0.59	5.0	127.40	2.75	130.20	12	Cir	0.012	1.00	133.50	AD 6-AD 4

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	4.000	0.00	2.42	0.00	0.00	1.62	5.0	9.8	5.4	14.50	38.74	4.62	24	2.50	125.30	125.40	129.10	129.11	0.00	133.70	UG-MH 3
2	1	33.000	0.15	2.42	0.81	0.12	1.62	5.0	9.7	5.4	14.56	33.04	4.63	24	1.82	125.40	126.00	129.16	129.28	133.70	135.00	MH 3-CLCB 5
3	2	22.000	0.19	2.21	0.72	0.14	1.46	5.0	9.6	5.5	11.65	28.61	3.71	24	1.36	126.00	126.30	129.96	130.01	135.00	135.00	CLCB 5-CLCB 8
4	3	87.000	0.20	1.81	0.62	0.12	1.15	5.0	9.1	5.6	10.11	28.78	3.22	24	1.38	126.30	127.50	130.33	130.48	135.00	133.70	CLCB 8-CLCB 10
5	4	126.000	0.10	0.46	0.83	0.08	0.25	5.0	6.2	6.7	3.02	5.43	4.33	12	1.98	128.70	131.20	130.82	131.94	133.70	136.00	CLCB 10-CLCB 2
6	5	70.000	0.03	0.03	0.30	0.01	0.01	5.0	5.0	7.4	0.07	3.26	1.59	12	0.71	132.00	132.50	132.10	132.61	136.00	135.50	CLCB 23-AD 24
7	5	114.000	0.07	0.33	0.73	0.05	0.16	5.0	5.8	7.0	2.43	2.80	3.99	12	0.53	131.20	131.80	131.94	132.51	136.00	137.90	CLCB 23-CLCB 2
8	7	31.000	0.02	0.06	0.52	0.01	0.03	5.0	5.3	7.3	0.89	3.10	1.13	12	0.65	131.80	132.00	133.05	133.07	137.90	137.90	CLCB 25-AD 28
9	8	31.000	0.04	0.04	0.50	0.02	0.02	5.0	5.0	7.4	0.82	10.51	2.03	12	7.42	132.00	134.30	133.10	134.68	137.90	137.60	AD 28-AD 29
10	7	23.000	0.03	0.03	0.80	0.02	0.02	5.0	5.0	7.4	0.18	11.93	1.10	12	9.57	131.80	134.00	133.05	134.17	137.90	137.90	CLCB 25-CLCB 2
11	7	106.000	0.17	0.17	0.30	0.05	0.05	5.0	5.0	7.4	1.05	7.21	2.29	12	3.49	131.80	135.50	133.05	135.93	137.90	138.80	CLCB 25-AD 27
12	3	107.000	0.21	0.21	0.82	0.17	0.17	5.0	5.0	7.4	1.28	6.67	5.01	12	2.99	131.00	134.20	131.30	134.68	135.00	137.20	CLCB 8-CCB 9
13	2	31.000	0.01	0.06	0.60	0.01	0.04	5.0	5.7	7.0	2.35	6.20	2.99	12	2.58	126.60	127.40	129.96	130.07	135.00	135.50	CLCB 5-AD 6
14	13	24.000	0.01	0.01	0.55	0.01	0.01	5.0	5.0	7.4	1.09	3.52	3.62	12	0.83	130.00	130.20	130.38	130.64	135.50	135.50	AD 6-AD 7
15	4	46.000	0.16	1.15	0.70	0.11	0.78	5.0	8.9	5.7	6.73	11.86	3.81	18	1.09	127.50	128.00	130.82	130.98	133.70	132.60	CLCB 10-CCB 11
16	15	71.000	0.17	0.66	0.89	0.15	0.41	5.0	8.6	5.8	4.64	5.25	3.78	15	0.56	128.00	128.40	131.41	131.72	132.60	134.30	CCB 11-CCB 13
17	16	24.000	0.14	0.49	0.82	0.11	0.25	5.0	8.5	5.8	3.78	6.39	3.08	15	0.83	128.40	128.60	132.04	132.11	134.30	134.20	CCB 13-CLCB 14
18	17	33.000	0.01	0.03	0.48	0.00	0.02	5.0	5.9	6.9	1.05	6.72	1.34	12	3.03	128.60	129.60	132.32	132.34	134.20	133.90	CLCB 14-AD 15
19	18	70.000	0.02	0.02	0.51	0.01	0.01	5.0	5.0	7.4	1.03	3.26	1.31	12	0.71	129.60	130.10	132.39	132.43	133.90	133.40	AD 15-AD 16
20	17	59.000	0.02	0.32	0.83	0.02	0.13	5.0	7.9	6.0	2.10	4.99	1.71	15	0.51	128.60	128.90	132.32	132.37	134.20	134.80	CLCB 14-YD 17
21	20	44.000	0.05	0.05	0.53	0.03	0.03	5.0	5.0	7.4	0.20	9.38	0.25	12	5.91	128.90	131.50	132.44	132.44	134.80	135.30	YD 17-AD 18
22	20	26.000	0.01	0.01	0.52	0.01	0.01	5.0	5.0	7.4	0.71	3.38	0.90	12	0.77	128.90	129.10	132.44	132.45	134.80	135.10	YD 17-AD 19

Project File: Storm 110.stm

Number of lines: 25

Run Date: 6/27/2023

NOTES:Intensity = 35.57 / (Inlet time + 3.70) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	20	75.000	0.24	0.24	0.32	0.08	0.08	5.0	5.0	7.4	0.57	6.46	0.73	12	2.80	128.90	131.00	132.44	132.46	134.80	133.00	YD 17-AD 22
24	15	29.000	0.33	0.33	0.80	0.26	0.26	5.0	5.0	7.4	1.96	6.41	2.50	12	2.76	128.00	128.80	131.41	131.49	132.60	132.20	CCB 11-CLCB 12
25	13	102.000	0.04	0.04	0.59	0.02	0.02	5.0	5.0	7.4	1.23	6.39	2.49	12	2.75	127.40	130.20	130.28	130.67	135.50	133.50	AD 6-AD 4

Project File: Storm 110.stm

Number of lines: 25

Run Date: 6/27/2023

NOTES:Intensity = 35.57 / (Inlet time + 3.70) ^ 0.72; Return period =Yrs. 10 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	24	14.50	125.30	129.10	2.00	3.14	4.62	0.33	129.43	0.350	4.000	125.40	129.11	2.00	3.14	4.62	0.33	129.45	0.350	0.350	0.014	0.15	0.05
2	24	14.56	125.40	129.16	2.00	3.14	4.63	0.33	129.50	0.353	33.000	126.00	129.28	2.00	3.14	4.63	0.33	129.61	0.353	0.353	0.116	2.03	0.68
3	24	11.65	126.00	129.96	2.00	3.14	3.71	0.21	130.17	0.226	22.000	126.30	130.01	2.00	3.14	3.71	0.21	130.22	0.226	0.226	0.050	1.50	0.32
4	24	10.11	126.30	130.33	2.00	3.14	3.22	0.16	130.49	0.170	87.000	127.50	130.48	2.00	3.14	3.22	0.16	130.64	0.170	0.170	0.148	2.13	0.34
5	12	3.02	128.70	130.82	1.00	0.63	3.84	0.23	131.05	0.612	126.000	131.20	131.94 j	0.74**	0.63	4.81	0.36	132.30	0.749	0.680	n/a	1.44	n/a
6	12	0.07	132.00	132.10	0.10*	0.04	1.65	0.04	132.14	0.000	70.000	132.50	132.61	0.11**	0.04	1.52	0.04	132.64	0.000	0.000	n/a	1.00	0.04
7	12	2.43	131.20	131.94	0.74	0.63	3.88	0.23	132.18	0.488	114.000	131.80	132.51	0.71	0.60	4.09	0.26	132.77	0.549	0.518	0.591	2.10	0.55
8	12	0.89	131.80	133.05	1.00	0.79	1.14	0.02	133.07	0.053	31.000	132.00	133.07	1.00	0.79	1.13	0.02	133.09	0.053	0.053	0.017	1.50	0.03
9	12	0.82	132.00	133.10	1.00	0.27	1.04	0.02	133.12	0.045	31.000	134.30	134.68 j	0.38**	0.27	3.01	0.14	134.82	0.488	0.267	n/a	1.00	0.14
10	12	0.18	131.80	133.05	1.00	0.09	0.23	0.00	133.06	0.002	23.000	134.00	134.17 j	0.17**	0.09	1.97	0.06	134.23	0.506	0.254	n/a	1.00	n/a
11	12	1.05	131.80	133.05	1.00	0.32	1.34	0.03	133.08	0.074	106.000	135.50	135.93 j	0.43**	0.32	3.25	0.16	136.09	0.500	0.287	n/a	1.00	0.16
12	12	1.28	131.00	131.30	0.30*	0.20	6.55	0.19	131.48	0.000	107.000	134.20	134.68	0.48**	0.37	3.46	0.19	134.86	0.000	0.000	n/a	1.00	0.19
13	12	2.35	126.60	129.96	1.00	0.79	2.99	0.14	130.10	0.370	31.000	127.40	130.07	1.00	0.79	2.99	0.14	130.21	0.370	0.370	0.115	1.50	0.21
14	12	1.09	130.00	130.38	0.38*	0.28	3.95	0.17	130.55	0.000	24.000	130.20	130.64	0.44**	0.33	3.28	0.17	130.81	0.000	0.000	n/a	1.00	n/a
15	18	6.73	127.50	130.82	1.50	1.77	3.81	0.23	131.05	0.350	46.000	128.00	130.98	1.50	1.77	3.81	0.23	131.21	0.350	0.350	0.161	1.91	0.43
16	15	4.64	128.00	131.41	1.25	1.23	3.78	0.22	131.63	0.440	71.000	128.40	131.72	1.25	1.23	3.78	0.22	131.95	0.440	0.440	0.312	1.44	0.32
17	15	3.78	128.40	132.04	1.25	1.23	3.08	0.15	132.19	0.291	24.000	128.60	132.11	1.25	1.23	3.08	0.15	132.26	0.291	0.291	0.070	1.39	0.20
18	12	1.05	128.60	132.32	1.00	0.79	1.34	0.03	132.35	0.075	33.000	129.60	132.34	1.00	0.79	1.34	0.03	132.37	0.075	0.075	0.025	1.50	0.04
19	12	1.03	129.60	132.39	1.00	0.79	1.31	0.03	132.41	0.071	70.000	130.10	132.43	1.00	0.79	1.31	0.03	132.46	0.071	0.071	0.050	1.00	0.03
20	15	2.10	128.60	132.32	1.25	1.23	1.71	0.05	132.36	0.090	59.000	128.90	132.37	1.25	1.23	1.71	0.05	132.42	0.090	0.090	0.053	1.50	0.07
21	12	0.20	128.90	132.44	1.00	0.79	0.25	0.00	132.44	0.003	44.000	131.50	132.44	0.94	0.77	0.26	0.00	132.44	0.002	0.002	0.001	1.00	0.00
22	12	0.71	128.90	132.44	1.00	0.79	0.90	0.01	132.45	0.034	26.000	129.10	132.45	1.00	0.79	0.90	0.01	132.46	0.034	0.034	0.009	1.00	0.01

Project File: Storm 110.stm | Number of lines: 25 | Run Date: 6/27/2023

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

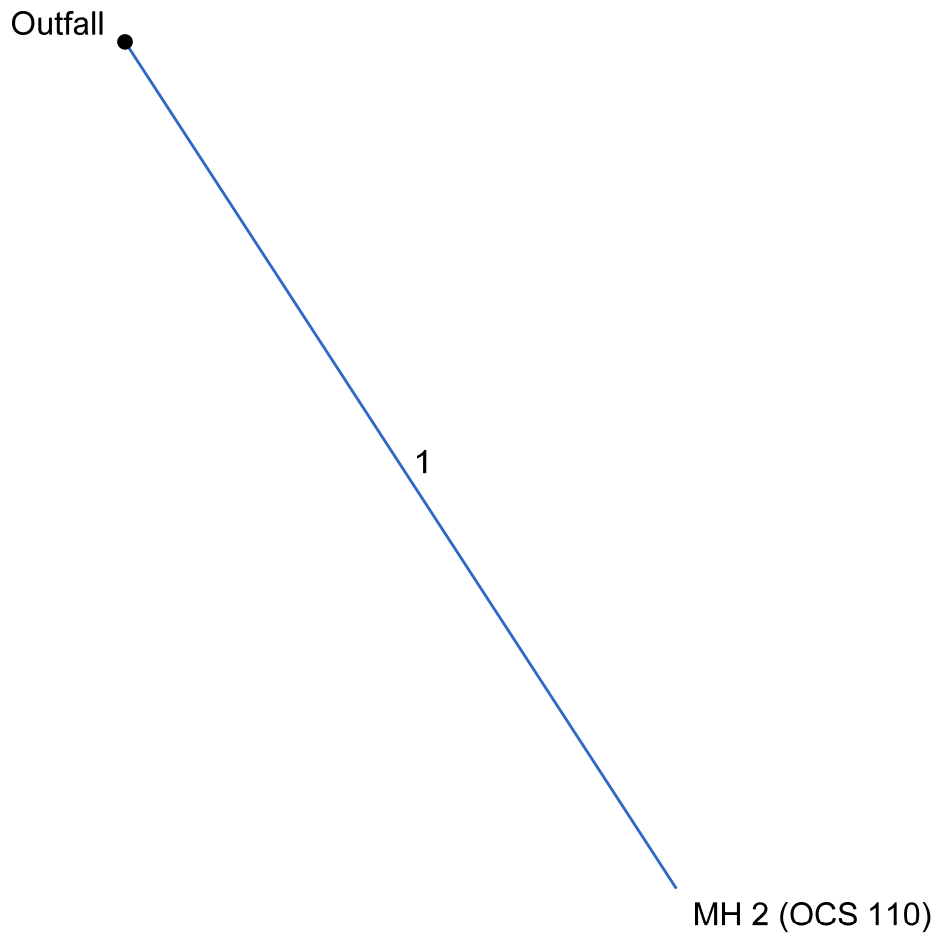
Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
23	12	0.57	128.90	132.44	1.00	0.79	0.73	0.01	132.45	0.022	75.000	131.00	132.46	1.00	0.79	0.73	0.01	132.46	0.022	0.022	0.016	1.00	0.01
24	12	1.96	128.00	131.41	1.00	0.79	2.50	0.10	131.51	0.259	29.000	128.80	131.49	1.00	0.79	2.50	0.10	131.58	0.259	0.259	0.075	1.00	0.10
25	12	1.23	127.40	130.28	1.00	0.36	1.56	0.04	130.32	0.101	102.000	130.20	130.67 j	0.47**	0.36	3.41	0.18	130.85	0.512	0.306	n/a	1.00	n/a

Project File: Storm 110.stm | Number of lines: 25 | Run Date: 6/27/2023

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Outlet 110.stm	Number of lines: 1	Date: 6/27/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	51.000	56.911	None	15.75	0.00	0.00	0.0	121.90	2.16	123.00	18	Cir	0.012	1.00	133.80	FES 1 - OCS 110

Project File: Outlet 110.stm | Number of lines: 1 | Date: 6/27/2023

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	51.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	15.75	16.71	8.91	18	2.16	121.90	123.00	123.50	124.50	123.29	133.80	FES 1 - OCS 110

Project File: Outlet 110.stm

Number of lines: 1

Run Date: 6/27/2023

NOTES:Intensity = 56.23 / (Inlet time + 3.90) ^ 0.73; Return period =Yrs. 100 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	15.75	121.90	123.50	1.50	1.77	8.91	1.24	124.74	1.918	51.000	123.00	124.50	1.50	1.77	8.91	1.24	125.74	1.920	1.919	0.978	1.00	1.24

Project File: Outlet 110.stm | Number of lines: 1 | Run Date: 6/27/2023

; c = cir e = ellip b = box

Outlet Protection Calculations

Project:	Multi-Family Development		By: MCB	Date:	6/28/2023
Location:	Deming Street, South Windsor, CT		Checked:	Date:	
Outlet I.D.	**FES 1**				

*Based on Connecticut DOT Drainage Manual, Section 11.13

Description:

FES 1

Design Criteria (100-yr Storm Event):

Q (cfs) =	15.75	R_p (ft)=	1.5
D (in) =	18	S_p (ft) =	1.5
V (fps) =	8.91	Tw (ft)=	1.5

Q= Flow rate at discharge point in cubic feet per second (cfs)
D= Outlet pipe diameter (in)
V= Flow velocity at discharge point (ft/s)
R_p= Maximum inside pipe rise (ft)
S_p= inside diametere for circular sections of maximum inside pipe span for non-circular sections (ft)
T_w= Tailwater depth (ft)

Based on **Table 11.13.1,** A *Preformed Scour Hole* is used *One Half Pipe Rise Depression (Type I)*

Rip Rap Stone Size:

D_{50} Computed (ft)	Rip Rap Specification	D_{50} Stone Size Required
0.190	Modified	5 inches

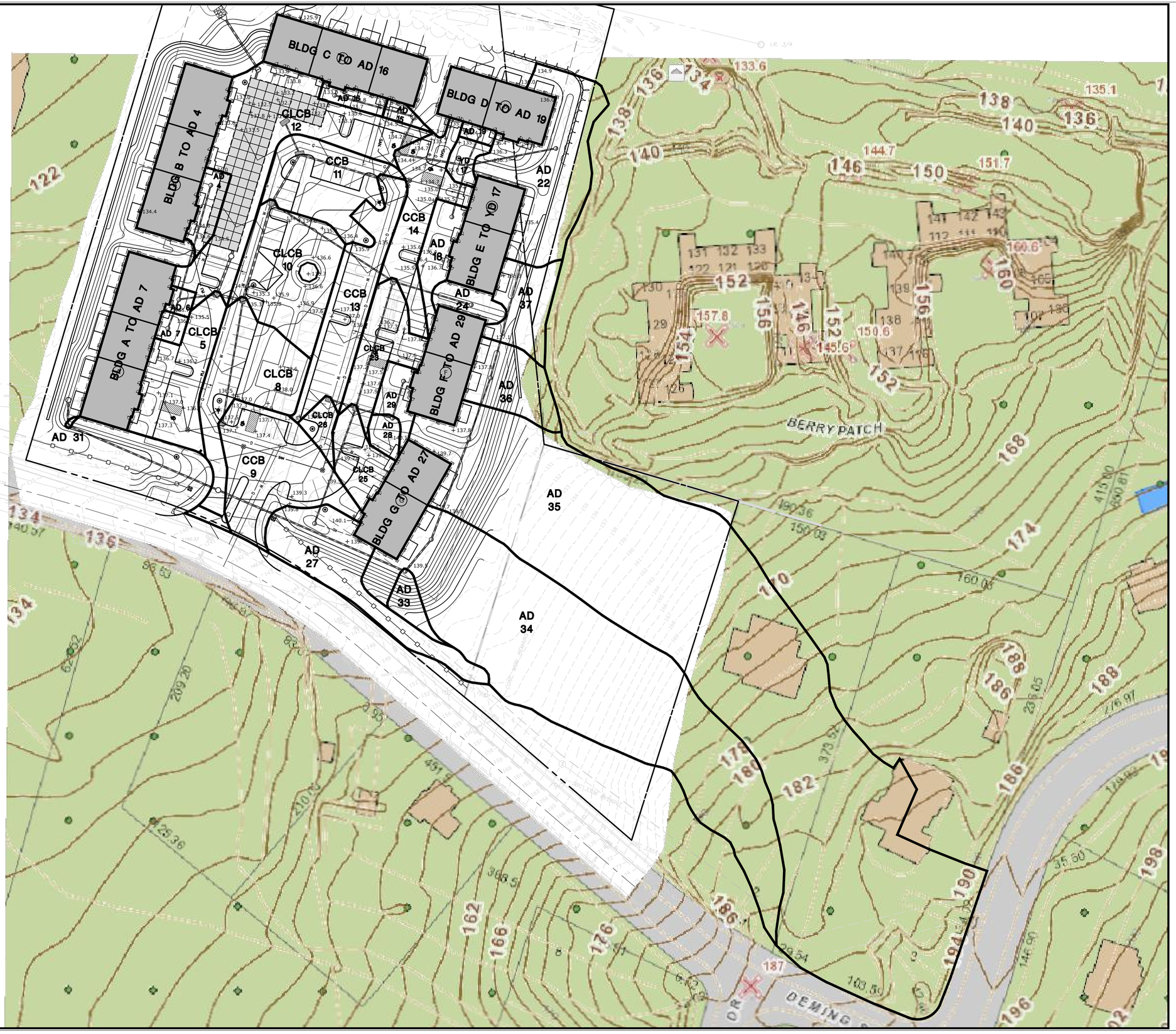
Preformed Scour Hole Dimensions:

$F = 0.5(R_p)$	=	0.75 ft
$C = 3.0(S_p)+6.0(F)$	=	9ft
$B = 2.0(S_p)+6.0(F)$	=	8ft
d (Depth of Stone)	=	12 inches

LEGEND

DRAINAGE AREA BOUNDARY

CCB 10 DRAINAGE AREA LABEL



99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

DRAINAGE AREA MAP - STORM DRAINAGE SYSTEM

PROPOSED MULTI-FAMILY DEVELOPMENT

240 DEMING STREET
SOUTH WINDSOR, CONNECTICUT

MCB	MCB	TD
DESIGNED	DRAWN	CHECKED

SCALE	1"=40'
DATE	JUNE 28, 2023
PROJECT NO.	13571.00069
SHEET NO.	1 OF 1
SHEET NAME	CB

Appendix E
Water Quality Computations

Deming Street Multi-Family Development

240 Deming Street, South Windsor, Connecticut Drainage Report

Prepared for:
Metro Realty
6 Executive Drive, Suite 100
Farmington, CT 06032

SLR Project No.: 141.13571.00069

June 28, 2023

STORMWATER QUALITY CALCULATIONS
Water Quality Volume (WQV)

Basin ID	Total Area (ac.)	Impervious Area (ac.)	Percent Impervious	Volumetric Runoff Coeff., R	WQV (ac-ft)	Total Volume Required (ac-ft)	Total Volume Provided[1.] (ac-ft)
110	3.27	2.35	72%	0.70	0.190	0.190	***0.194***

1. - Volume provided below lowest orifice

$$\textbf{WQV} = \frac{(1.0 \text{ inches}) \times A \times R}{12}$$

Where:
WQV = Water Quality Volume in acre-feet
A = Contributing Area in acres
R = 0.05 + 0.009 (I)
I = Site Imperviousness as percent

STORMWATER QUALITY CALCULATIONS
Water Quality Volume (WQV)

Groundwater Recharge Volume (GRV)

GRV = F x I

Where: GRV = Groundwater Recharge in cubic feet
F = target depth factor per Hydrologic Soil Group in feet
I = net increase in impervious area (redevelopment projects)

Site: (Contains HSG B & C)

Surface	Existing	Proposed	Difference
Impv. (HSG B)	13,723	11,104	-2,619
Impv. (HSG C)	21,481	103,638	82,157
Total	*35,204*	*114,742*	*79,538*

GRV =	0.021	x	-2,619	=	-55.00		
	0.008	x	82,157	=	657.26		
					602	CF	
			Total GRV Required	=	***602***	CF	
			Total GRV Provided	=	***8,472***	CF	***OK***

Table 7-4
Groundwater Recharge Depth

NRCS Hydrologic Soil Group	Average Annual Recharge	Groundwater Recharge Depth (D)
A	18 inches/year	0.4 inches
B	12 inches/year	0.25 inches
C	6 inches/year	0.10 inches
D	3 inches/year	0 inches (waived)

Table 7-4 from CTDEEP Stormwater Quality Manual, 2004

	SLR Consulting						Project	**13571.00069**
	COMPUTATION SHEET - WATER QUALITY FLOW (WQF)						Made By:	MCB
Subject:	**Multi-Family Development**						Date:	6/28/2023
							Chkd by:	
							Date:	

MH 3								
Contributing Basins			Imperv. Area (acres)	Total Area (acres)				
Total			2.35	3.27				
Table 4.1: WQV = (P)(R_v)(A)/12 =				0.190	acre-feet			
Where:								
I = % of Impervious Cover =				72%				
R_v = volumetric runoff coeff. 0.05 + 0.009(I) =				0.697				
P = design precipitation (1.0" for water quality storm) =					1	inch		
A = site area (acres) =				3.27	acres =	0.0051	$miles^2$	
Q = runoff depth (in watershed inches) = [WQV(acrefeet)]*[12(inches/foot)]/drainage area (acres)								
			Q =	0.697				
CN = 1000 / [10+ 5P + 10Q -10(Q^2 + 1.25QP)$^{0.5}$] =					97			
Where:								
Q = runoff depth (in watershed inches)								
			t_c =	0.17	hours			
Type III Rainfall Distribution:								
From Table 4-1, Ia =	0.062			Ia/P =	0.062			
(TR-55)								
From Exhibit 4-III, q_u =	650	csm/in.						
(TR-55)								
WQF = (qu)(A)(Q) =	2.31	cfs		**Cascade CS-5 Flow = 3.5 cfs**				

2. Compute the time of concentration (t_c) based on the methods described in Chapter 3 of TR-55. A minimum value of 0.167 hours (10 minutes) should be used. For sheet flow, the flow path should not be longer than 300 feet.

3. Using the computed CN, t_c, and drainage area (A) in acres, compute the peak discharge for the water quality storm (i.e., the water quality flow [WQF]), based on the procedures described in Chapter 4 of TR-55.

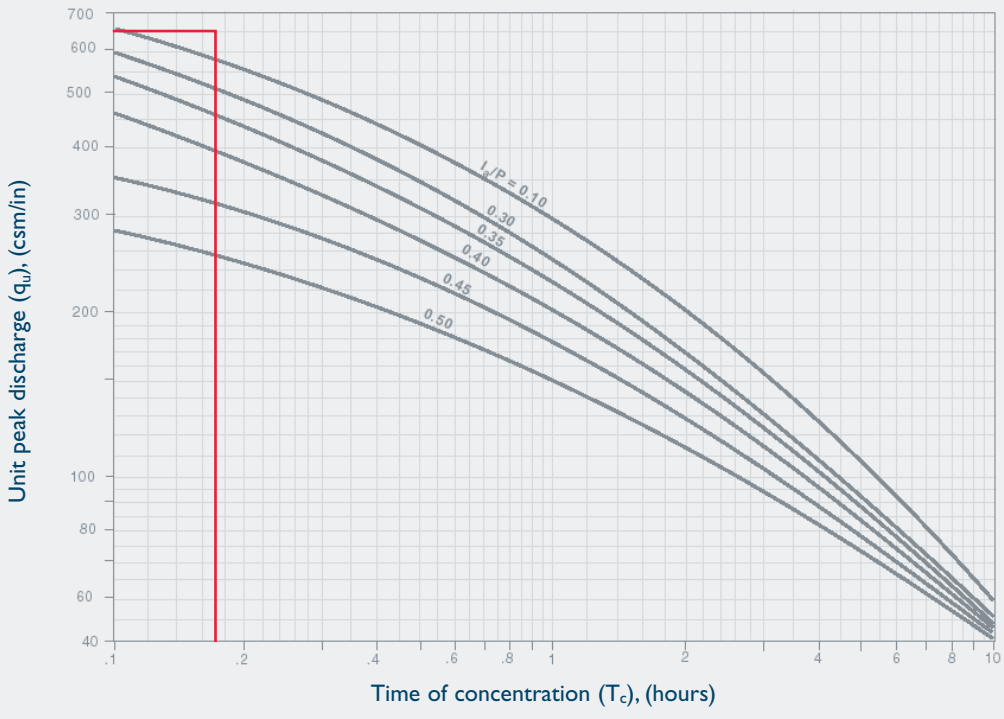
   ❍ *Read initial abstraction (I_a) from Table 4-1 in Chapter 4 of TR-55 (reproduced below); compute I_a/P*

Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)	Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	55	1.636	70	0.857	85	0.353
41	2.878	56	1.571	71	0.817	86	0.326
42	2.762	57	1.509	72	0.778	87	0.299
43	2.651	58	1.448	73	0.740	88	0.273
44	2.545	59	1.390	74	0.703	89	0.247
45	2.444	60	1.333	75	0.667	90	0.222
46	2.348	61	1.279	76	0.632	91	0.198
47	2.255	62	1.226	77	0.597	92	0.174
48	2.167	63	1.175	78	0.564	93	0.151
49	2.082	64	1.125	79	0.532	94	0.128
50	2.000	65	1.077	80	0.500	95	0.105
51	1.922	66	1.030	81	0.469	96	0.083
52	1.846	67	0.985	82	0.439	97	0.062
53	1.774	68	0.941	83	0.410	98	0.041
54	1.704	69	0.899	84	0.381		

❍ *Read the unit peak discharge (q_u) from Exhibit 4-III in Chapter 4 of TR-55 (reproduced below) for appropriate t_c*

Exhibit 4-111 Unit peak discharge (q_u) for NRCS (SCS) type III rainfall distribution



Product Flow Rates

CASCADE

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

CDS

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

VORTECHS

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

STORMCEPTOR STC

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

1 Additional sediment storage capacity available – Check with your local representative for information.

2 Treatment Capacity is based on laboratory testing using OK-110 (average D50 particle size of approximately 100 microns) and a 2400 micron screen.

3 Maintenance recommended when sediment depth has accumulated to within 12-18 inches of the dry weather water surface elevation.

STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

CONTECH® ENGINEERED SOLUTIONS

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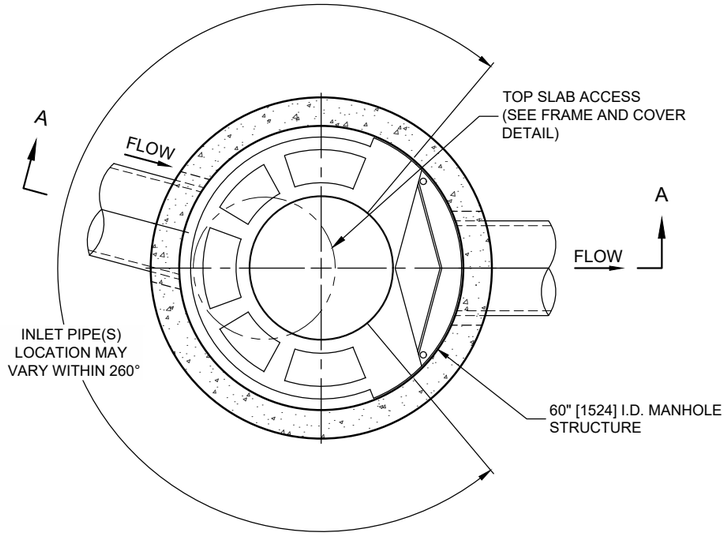
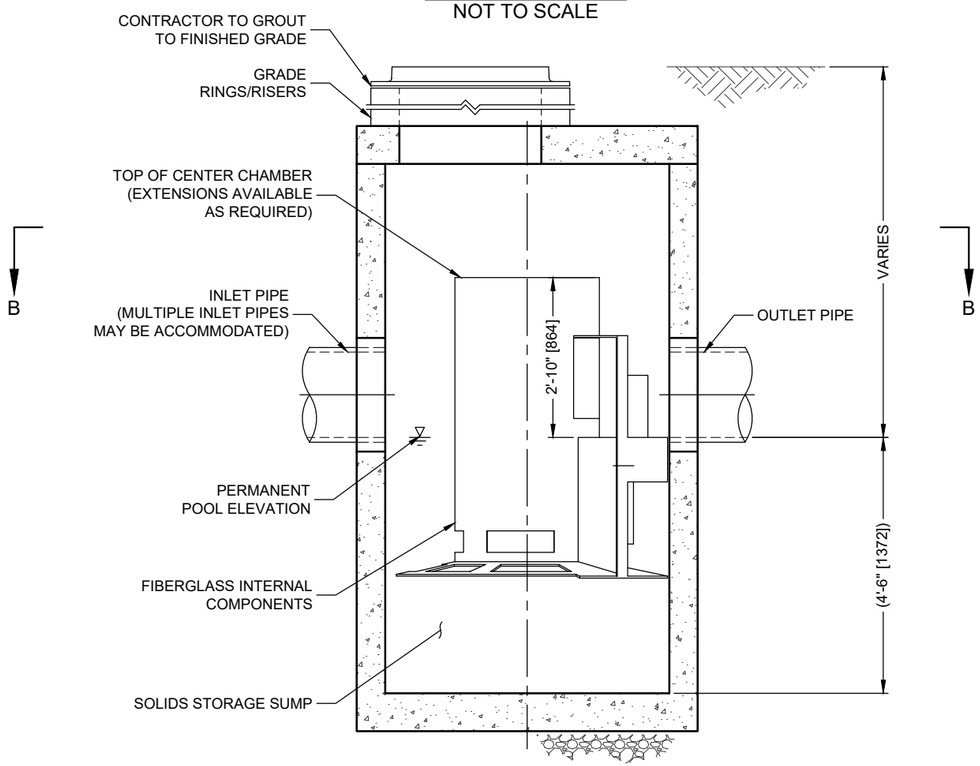


PLAN VIEW B-B
NOT TO SCALE



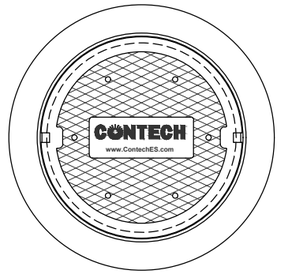
ELEVATION A-A
NOT TO SCALE

CASCADE
separator™

CASCADE SEPARATOR DESIGN NOTES

THE STANDARD CS-5 CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH
ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CS-5
CASCADE SEPARATOR
STANDARD DETAIL

CONTECH®
ENGINEERED SOLUTIONS

Cascade Separator™ Inspection and Maintenance Guide

CASCADE
separator™

Maintenance

The Cascade Separator™ system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects sediment and debris will depend upon on-site activities and site pollutant characteristics. For example, unstable soils or heavy winter sanding will cause the sediment storage sump to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall). However, more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment wash-down areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

A visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet chamber, flumes or outlet channel. The inspection should also quantify the accumulation of hydrocarbons, trash and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided in this Inspection and Maintenance Guide.

Access to the Cascade Separator unit is typically achieved through one manhole access cover. The opening allows for inspection and cleanout of the center chamber (cylinder) and sediment storage sump, as well as inspection of the inlet chamber and slanted skirt. For large units, multiple manhole covers allow access to the chambers and sump.

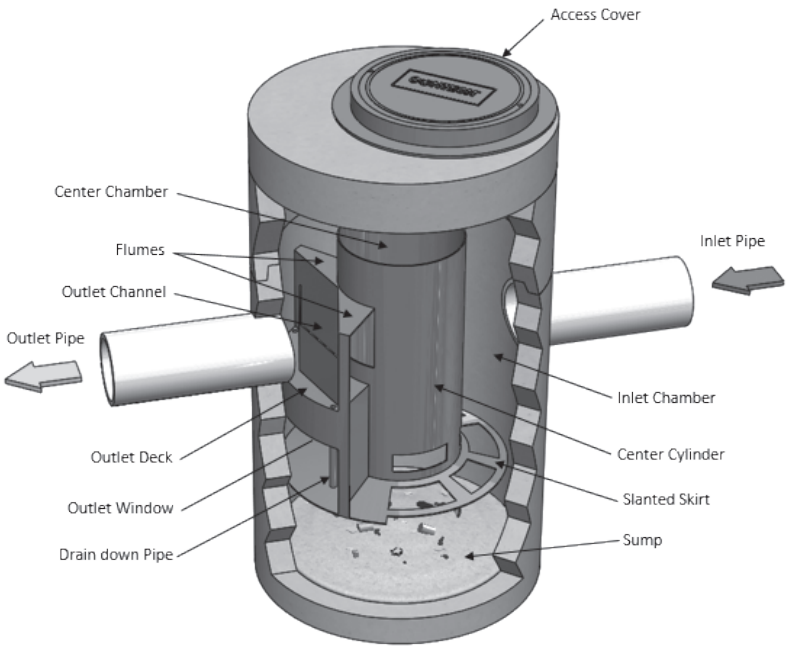
The Cascade Separator system should be cleaned before the level of sediment in the sump reaches the maximum sediment depth and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it must be replaced when significant discoloration has occurred. Performance may be impacted when maximum sediment storage capacity is exceeded. Contech recommends maintaining the system when sediment level reaches 50% of maximum storage volume. The level of sediment is easily determined by measuring the distance from the system outlet invert (standing water level) to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the chart in this document to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage.

Cleaning

Cleaning of a Cascade Separator system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole cover and insert the vacuum tube down through the center chamber and into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The areas outside the center chamber and the slanted skirt should also be washed off if pollutant build-up exists in these areas.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. Then the system should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and to ensure proper safety precautions. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the Cascade Separator system must be done in accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal. If any components are damaged, replacement parts can be ordered from the manufacturer.



Cascade Separator™ Maintenance Indicators and Sediment Storage Capacities

Model Number	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CS-4	4	1.2	1.5	0.5	0.7	0.5
CS-5	5	1.3	1.5	0.5	1.1	0.8
CS-6	6	1.8	1.5	0.5	1.6	1.2
CS-8	8	2.4	1.5	0.5	2.8	2.1
CS-10	10	3.0	1.5	0.5	4.4	3.3
CS-12	12	3.6	1.5	0.5	6.3	4.8

Note: The information in the chart is for standard units. Units may have been designed with non-standard sediment storage depth.

A Cascade Separator unit can be easily cleaned in less than 30 minutes.

A vacuum truck excavates pollutants from the systems.

Cascade Separator™ Inspection & Maintenance Log

Cascade Model:			Location:		
Date	Depth Below Invert to Top of Sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The depth to sediment is determined by taking a measurement from the manhole outlet invert (standing water level) to the top of the sediment pile. Once this measurement is recorded, it should be compared to the chart in the maintenance guide to determine if the height of the sediment pile off the bottom of the sump floor exceeds 50% of the maximum sediment storage. Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.
2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, and earth stabilization products. For information, visit www.ContechES.com or call 800.338.1122

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Appendix F
Hydrologic Analysis-Imput Computations

Deming Street Multi-Family Development

240 Deming Street, South Windsor, Connecticut Drainage Report

Prepared for:
Metro Realty
6 Executive Drive, Suite 100
Farmington, CT 06032

SLR Project No.: 141.13571.00069

June 28, 2023

Curve Number Calculations

Project: Metro South Windsor
Location: 240 Deming Street
South Windsor, CT
By: LCD Date: 6/2/23 Checked: MCB Date: 6/6/23
Circle one: ***Present*** Developed Watershed: EXWS-10

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres / Sq. Ft. / %	Product of CN x Area
N/A	Existing Building	98			0.15	14.67
N/A	Paved/Impervious	98			0.13	12.70
B Soil	Woods - Good Condition	55			0.28	15.44
B Soil	Open Space - Good Condition	61			2.30	140.26
C Soil	Woods - Good Condition	70			0.39	27.12
C Soil	Open Space - Good Condition	74			2.40	177.66
				Totals =	5.65	387.84
					(0.00882 sq mi)	

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{387.84}{5.65}$ Use CN = 69

SLR

Curve Number Calculations

Project: Metro South Windsor
Location: 240 Deming Street
South Windsor, CT
By: LCD Date: 6/2/23 Checked: MCB Date: 6/6/23
Circle one: ***Present*** Developed Watershed: EXWS-20

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres / Sq. Ft. / %	Product of CN x Area
N/A	Existing Building	98			0.07	6.77
N/A	Paved/Impervious	98			0.46	45.53
B Soil	Open Space - Good Condition	61			0.72	44.16
C Soil	Open Space - Good Condition	74			0.69	50.86
				Totals =	1.94	147.32
					(0.00304	sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{147.32}{1.94}$ Use CN = **76**

SLR

Curve Number Calculations

Project: Metro South Windsor
Location: 240 Deming Street
South Windsor, CT
By: LCD Date: 6/2/23 Checked: MCB Date: 6/6/23
Circle one: ***Present*** Developed Watershed: EXWS-30

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres / Sq. Ft. / %	Product of CN x Area
B Soil	Open Space - Good Condition	61			0.27	16.67
C Soil	Open Space - Good Condition	74			0.0004	0.03
Totals =					0.27	16.70
					(0.00043	sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{16.70}{0.27}$ Use CN = 61

SLR

Curve Number Calculations

Project: Metro South Windsor
Location: 240 Deming Street
South Windsor, CT
By: MCB Date: 6/28/23 Checked: _____ Date: _____
Circle one: Present ***Developed*** Watershed: PRWS-10

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres / Sq. Ft. / %	Product of CN x Area
B Soil	Woods - Good Condition	55			0.08	4.42
B Soil	Open Space - Good Condition	61			0.06	3.40
C Soil	Woods - Good Condition	70			0.05	3.78
C Soil	Open Space - Good Condition	74			1.13	83.89
N/A	Paved/Impervious	98			0.04	4.25
				Totals =	1.37	99.73
					(0.00214 sq mi)	

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{99.73}{1.37}$ Use CN = **73**

SLR

Curve Number Calculations

Project: Metro South Windsor
Location: 240 Deming Street
South Windsor, CT
By: MCB Date: 6/28/23 Checked: Date:
Circle one: Present ***Developed*** Watershed: PRWS-11

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
B Soil	Woods - Good Condition	55			0.06	3.32
B Soil	Open Space - Good Condition	61			0.09	5.71
C Soil	Woods - Good Condition	70			0.00	0.10
C Soil	Open Space - Good Condition	74			0.77	56.87
N/A	Paved/Impervious	98			1.49	145.85
N/A	Proposed Building	98			0.86	84.52
				Totals =	3.27	296.36
					(0.00512 sq mi)	

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{296.36}{3.27}$ Use CN = 91

SLR

Curve Number Calculations

Project: Metro South Windsor
Location: 240 Deming Street
South Windsor, CT
By: MCB Date: 6/28/23 Checked: _____ Date: _____
Circle one: Present ***Developed*** Watershed: PRWS-20

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres / Sq. Ft. / %	Product of CN x Area
B Soil	Woods - Good Condition	55			0.06	3.47
B Soil	Open Space - Good Condition	61			2.63	160.31
C Soil	Open Space - Good Condition	74			0.02	1.21
N/A	Paved/Impervious	98			0.11	10.50
N/A	Existing Building	98			0.13	13.03
				Totals =	2.95	188.52
					(0.00461	sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{188.52}{2.95}$ Use CN = **64**

SLR

Curve Number Calculations

Project: Metro South Windsor
Location: 240 Deming Street
South Windsor, CT
By: LCD Date: 6/28/23 Checked: MCB Date: 6/6/23
Circle one: Present ***Developed*** Watershed: PRWS-30

Soil Name and Hydrologic Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres / Sq. Ft. / %	Product of CN x Area
B Soil	Open Space - Good Condition	61			0.27	16.67
C Soil	Open Space - Good Condition	74			0.0004	0.03
Totals =					0.27	16.70
					(0.00043	sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{16.70}{0.27}$ Use CN = 61

SLR

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Deming Street Multi-Family Dvlpt. By: MCB Date: 06/28/23
Location: 240 Deming Street, South Windsor, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: EXWS-10
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

		Segment ID	A-B				
1. Surface description (Table 3-1)			GRASS				
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.240				
3. Flow Length, L (< 300ft)	ft.		100.0				
4. Two-year 24-hr rainfall, P_2	in.		3.11				
5. Land slope, s	ft./ft.		0.040				
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.		0.183	=	0.183		

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID	B-C				
7. Surface description			GRASS				
8. Manning's roughness coeff., n			0.080				
9. Paved or unpaved			UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.		0.40				
11. Flow Length, L	ft.		149.0				
12. Watercourse slope, s	ft./ft.		0.060				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.		2.48				
14. $T_t = \frac{L}{3600 * V}$	hr.		0.017				= 0.017

Channel flow

		Segment ID					
15. Channel Bottom width, b	ft.						
16. Horizontal side slope component, z (z horiz:1 vert)	ft.						
17. Depth of flow, d	ft.						
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$						
19. Wetted perimeter, P_w	ft.						
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.						
21. Channel slope, s	ft./ft.						
22. Manning's roughness coeff., n							
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.						
24. Flow length, L	ft.						
25. $T_t = \frac{L}{3600 * V}$	hr.			+			= 0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)						hr.	0.200

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Deming Street Multi-Family Dvlpt. By: MCB Date: 06/28/23
Location: 240 Deming Street, South Windsor, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: EXWS-20
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

		Segment ID	A-B			
1. Surface description (Table 3-1)			GRASS			
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.240			
3. Flow Length, L (< 300ft)	ft.		100.0			
4. Two-year 24-hr rainfall, P_2	in.		3.11			
5. Land slope, s	ft./ft.		0.130			
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.		0.114	=	0.114	

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID	B-C	C-D			
7. Surface description			GRASS	BIT			
8. Manning's roughness coeff., n			0.080	0.015			
9. Paved or unpaved			UNPVD	PVD			
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.		0.40	0.20			
11. Flow Length, L	ft.		291.0	162.0			
12. Watercourse slope, s	ft./ft.		0.072	0.043			
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.		2.71	7.04			
14. $T_t = \frac{L}{3600 * V}$	hr.		0.030	+ 0.006			= 0.036

Channel flow

		Segment ID	D-E				
15. Channel Bottom width, b	ft.		15" CMP				
16. Horizontal side slope component, z (z horiz:1 vert)	ft.		--				
17. Depth of flow, d	ft.		FULL				
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$		1.23				
19. Wetted perimeter, P_w	ft.		3.93				
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.		0.31				
21. Channel slope, s	ft./ft.		0.014				
22. Manning's roughness coeff., n			0.024				
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.		3.39				
24. Flow length, L	ft.		248.0				
25. $T_t = \frac{L}{3600 * V}$	hr.		0.020	+			= 0.020

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.171

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Deming Street Multi-Family Dvlpt. By: MCB Date: 06/28/23
Location: 240 Deming Street, South Windsor, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: EXWS-30
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

		Segment ID	A-B				
1. Surface description (Table 3-1)			GRASS				
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.240				
3. Flow Length, L (< 300ft)	ft.		100.0				
4. Two-year 24-hr rainfall, P_2	in.		3.11				
5. Land slope, s	ft./ft.		0.060				
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.		0.155	=	0.155		

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID	B-C				
7. Surface description			GRASS				
8. Manning's roughness coeff., n			0.080				
9. Paved or unpaved			UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.		0.40				
11. Flow Length, L	ft.		53.0				
12. Watercourse slope, s	ft./ft.		0.113				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.		3.40				
14. $T_t = \frac{L}{3600 * V}$	hr.		0.004			=	0.004

Channel flow

		Segment ID					
15. Channel Bottom width, b	ft.						
16. Horizontal side slope component, z (z horiz:1 vert)	ft.						
17. Depth of flow, d	ft.						
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$						
19. Wetted perimeter, P_w	ft.						
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.						
21. Channel slope, s	ft./ft.						
22. Manning's roughness coeff., n							
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.						
24. Flow length, L	ft.						
25. $T_t = \frac{L}{3600 * V}$	hr.			+		=	0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)					hr.		0.160

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Deming Street Multi-Family Dvlpt. By: MCB Date: 06/28/23
Location: 240 Deming Street, South Windsor, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: PRWS-10
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

Segment ID		A-B		
1. Surface description (Table 3-1)		GRASS		
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)		0.240		
3. Flow Length, L (< 300ft)	ft.	69.0		
4. Two-year 24-hr rainfall, P_2	in.	3.11		
5. Land slope, s	ft./ft.	0.072		
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.	0.107	=	0.107

Shallow concentrated flow (assume hyd. radius = depth of flow)

Segment ID						
7. Surface description						
8. Manning's roughness coeff., n						
9. Paved or unpaved						
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.					
11. Flow Length, L	ft.					
12. Watercourse slope, s	ft./ft.					
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.					
14. $T_t = \frac{L}{3600 * V}$	hr.				=	0.000

Channel flow

Segment ID		B-C				
15. Channel Bottom width, b	ft.	3.00				
16. Horizontal side slope component, z (z horiz:1 vert)	ft.	2.00				
17. Depth of flow, d	ft.	0.50				
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$	2.00				
19. Wetted perimeter, P_w	ft.	5.24				
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.	0.38				
21. Channel slope, s	ft./ft.	0.04				
22. Manning's roughness coeff., n		0.024				
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.	6.54				
24. Flow length, L	ft.	380.0				
25. $T_t = \frac{L}{3600 * V}$	hr.	0.016			=	0.016

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.124

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Deming Street Multi-Family Dvlpt. By: MCB Date: 06/28/23
Location: 240 Deming Street, South Windsor, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: PRWS-11
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

		Segment ID	A-B				
1. Surface description (Table 3-1)			GRASS				
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.240				
3. Flow Length, L (< 300ft)	ft.		100.0				
4. Two-year 24-hr rainfall, P_2	in.		3.11				
5. Land slope, s	ft./ft.		0.080				
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$	hr.		0.139			=	0.139

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID	B-C				
7. Surface description			GRASS				
8. Manning's roughness coeff., n			0.080				
9. Paved or unpaved			UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.		0.40				
11. Flow Length, L	ft.		131.0				
12. Watercourse slope, s	ft./ft.		0.084				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.		2.93				
14. $T_t = \frac{L}{3600 * V}$	hr.		0.012				= 0.012

Channel flow

		Segment ID	C-D				
15. Channel Bottom width, b	ft.		15" HDPE				
16. Horizontal side slope component, z (z horiz:1 vert)	ft.		--				
17. Depth of flow, d	ft.		FULL				
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$		1.23				
19. Wetted perimeter, P_w	ft.		3.93				
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.		0.31				
21. Channel slope, s	ft./ft.		0.010				
22. Manning's roughness coeff., n			0.012				
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.		5.72				
24. Flow length, L	ft.		509.0				
25. $T_t = \frac{L}{3600 * V}$	hr.		0.025				= 0.025

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.176

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Deming Street Multi-Family Dvlpt. By: MCB Date: 06/28/23
Location: 240 Deming Street, South Windsor, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: PRWS-20
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

		Segment ID	A-B				
1. Surface description (Table 3-1)			GRASS				
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.240				
3. Flow Length, L (< 300ft)	ft.		100.0				
4. Two-year 24-hr rainfall, P_2	in.		3.11				
5. Land slope, s	ft./ft.		0.050				
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.		0.167	=	0.167		

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID	B-C				
7. Surface description			GRASS				
8. Manning's roughness coeff., n			0.080				
9. Paved or unpaved			UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.		0.40				
11. Flow Length, L	ft.		425.0				
12. Watercourse slope, s	ft./ft.		0.100				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.		3.20				
14. $T_t = \frac{L}{3600 * V}$	hr.		0.037			=	0.037

Channel flow

		Segment ID	C-D				
15. Channel Bottom width, b	ft.		15" HDPE				
16. Horizontal side slope component, z (z horiz:1 vert)	ft.		--				
17. Depth of flow, d	ft.		FULL				
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$		1.23				
19. Wetted perimeter, P_w	ft.		3.93				
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.		0.31				
21. Channel slope, s	ft./ft.		0.005				
22. Manning's roughness coeff., n			0.012				
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.		4.05				
24. Flow length, L	ft.		482.0				
25. $T_t = \frac{L}{3600 * V}$	hr.		0.033			=	0.033

26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25) hr. 0.237

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

Project: Deming Street Multi-Family Dvlpt. By: MCB Date: 06/28/23
Location: 240 Deming Street, South Windsor, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: PRWS-30
Circle one: ***T_c*** T_t Subwatershed:

Sheet flow (applicable to T_c only)

		Segment ID	A-B				
1. Surface description (Table 3-1)			GRASS				
2. Manning's roughness coeff. for sheet flow, n (Table 3-1)			0.240				
3. Flow Length, L (< 300ft)	ft.		100.0				
4. Two-year 24-hr rainfall, P_2	in.		3.11				
5. Land slope, s	ft./ft.		0.060				
6. $T_t = \frac{0.007\,(nL)^{0.8}}{P_2^{0.5}\,(s^{0.4})}$	hr.		0.155	=	0.155		

Shallow concentrated flow (assume hyd. radius = depth of flow)

		Segment ID	B-C				
7. Surface description			GRASS				
8. Manning's roughness coeff., n			0.080				
9. Paved or unpaved			UNPVD				
10. Depth of flow, d (default values: d=.4 unpaved, d=.2 paved)	ft.		0.40				
11. Flow Length, L	ft.		53.0				
12. Watercourse slope, s	ft./ft.		0.113				
13. Average velocity, $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	fps.		3.40				
14. $T_t = \frac{L}{3600 * V}$	hr.		0.004			=	0.004

Channel flow

		Segment ID					
15. Channel Bottom width, b	ft.						
16. Horizontal side slope component, z (z horiz:1 vert)	ft.						
17. Depth of flow, d	ft.						
18. Cross sectional flow area, A (assume trapazoidal)	$ft.^2$						
19. Wetted perimeter, P_w	ft.						
20. Hydraulic Radius, $R = \frac{A}{P_w}$	ft.						
21. Channel slope, s	ft./ft.						
22. Manning's roughness coeff., n							
23. $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	fps.						
24. Flow length, L	ft.						
25. $T_t = \frac{L}{3600 * V}$	hr.			+		=	0.000
26. Watershed or subarea T_c or T_t (add T_t in steps 6, 14 & 25)					hr.		0.160

NOAA Atlas 14, Volume 10, Version 3
Location name: South Windsor, Connecticut, USA*
Latitude: 41.821°, Longitude: -72.5501°
Elevation: 137 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.334** (0.259-0.432)	**0.406** (0.314-0.525)	**0.523** (0.403-0.678)	**0.620** (0.475-0.809)	**0.753** (0.559-1.03)	**0.853** (0.622-1.19)	**0.959** (0.680-1.39)	**1.08** (0.724-1.60)	**1.25** (0.808-1.92)	**1.39** (0.879-2.17)
10-min	**0.474** (0.366-0.612)	**0.575** (0.444-0.744)	**0.740** (0.570-0.960)	**0.878** (0.673-1.15)	**1.07** (0.793-1.46)	**1.21** (0.880-1.69)	**1.36** (0.963-1.97)	**1.53** (1.03-2.26)	**1.77** (1.14-2.71)	**1.97** (1.24-3.08)
15-min	**0.557** (0.431-0.720)	**0.676** (0.523-0.875)	**0.871** (0.671-1.13)	**1.03** (0.791-1.35)	**1.26** (0.932-1.71)	**1.42** (1.04-1.98)	**1.60** (1.13-2.32)	**1.80** (1.21-2.66)	**2.08** (1.35-3.19)	**2.32** (1.46-3.62)
30-min	**0.749** (0.579-0.967)	**0.911** (0.704-1.18)	**1.18** (0.906-1.53)	**1.40** (1.07-1.82)	**1.70** (1.26-2.32)	**1.92** (1.40-2.69)	**2.16** (1.53-3.13)	**2.43** (1.63-3.60)	**2.82** (1.82-4.32)	**3.14** (1.98-4.91)
60-min	**0.941** (0.728-1.22)	**1.14** (0.885-1.48)	**1.48** (1.14-1.92)	**1.76** (1.35-2.29)	**2.14** (1.59-2.92)	**2.43** (1.77-3.39)	**2.73** (1.93-3.95)	**3.07** (2.06-4.54)	**3.56** (2.30-5.46)	**3.96** (2.50-6.19)
2-hr	**1.22** (0.945-1.56)	**1.47** (1.14-1.89)	**1.89** (1.46-2.44)	**2.24** (1.72-2.90)	**2.71** (2.03-3.69)	**3.07** (2.25-4.28)	**3.45** (2.47-5.00)	**3.90** (2.63-5.74)	**4.58** (2.97-6.98)	**5.15** (3.27-8.01)
3-hr	**1.40** (1.09-1.79)	**1.69** (1.32-2.17)	**2.17** (1.69-2.79)	**2.57** (1.98-3.32)	**3.12** (2.34-4.23)	**3.52** (2.59-4.90)	**3.96** (2.85-5.74)	**4.49** (3.03-6.59)	**5.30** (3.45-8.06)	**6.00** (3.81-9.29)
6-hr	**1.76** (1.38-2.24)	**2.13** (1.67-2.72)	**2.74** (2.14-3.50)	**3.25** (2.52-4.18)	**3.94** (2.98-5.34)	**4.46** (3.31-6.18)	**5.02** (3.64-7.27)	**5.72** (3.87-8.34)	**6.80** (4.43-10.3)	**7.73** (4.93-11.9)
12-hr	**2.15** (1.69-2.72)	**2.63** (2.07-3.33)	**3.41** (2.68-4.34)	**4.07** (3.17-5.20)	**4.96** (3.77-6.68)	**5.62** (4.19-7.76)	**6.35** (4.63-9.14)	**7.25** (4.92-10.5)	**8.65** (5.66-13.0)	**9.87** (6.31-15.1)
24-hr	**2.51** (1.99-3.16)	**3.11** (2.46-3.93)	**4.10** (3.24-5.19)	**4.92** (3.86-6.27)	**6.05** (4.62-8.12)	**6.88** (5.16-9.46)	**7.79** (5.72-11.2)	**8.95** (6.10-12.9)	**10.8** (7.08-16.1)	**12.4** (7.96-18.8)
2-day	**2.83** (2.26-3.55)	**3.56** (2.84-4.47)	**4.76** (3.77-5.99)	**5.75** (4.54-7.28)	**7.12** (5.47-9.52)	**8.11** (6.13-11.1)	**9.22** (6.85-13.3)	**10.7** (7.31-15.3)	**13.1** (8.61-19.4)	**15.2** (9.80-23.0)
3-day	**3.08** (2.46-3.85)	**3.88** (3.10-4.86)	**5.20** (4.13-6.52)	**6.28** (4.97-7.93)	**7.78** (6.00-10.4)	**8.87** (6.73-12.2)	**10.1** (7.52-14.5)	**11.7** (8.03-16.7)	**14.4** (9.49-21.3)	**16.8** (10.8-25.2)
4-day	**3.31** (2.65-4.12)	**4.16** (3.33-5.19)	**5.56** (4.43-6.96)	**6.72** (5.32-8.45)	**8.31** (6.42-11.1)	**9.47** (7.20-12.9)	**10.8** (8.04-15.5)	**12.5** (8.58-17.8)	**15.4** (10.1-22.6)	**17.9** (11.6-26.8)
7-day	**3.92** (3.16-4.86)	**4.88** (3.92-6.06)	**6.45** (5.16-8.04)	**7.75** (6.17-9.71)	**9.54** (7.40-12.6)	**10.8** (8.27-14.7)	**12.3** (9.19-17.5)	**14.2** (9.79-20.1)	**17.3** (11.5-25.4)	**20.1** (13.0-29.9)
10-day	**4.54** (3.67-5.62)	**5.56** (4.48-6.88)	**7.22** (5.80-8.97)	**8.59** (6.86-10.7)	**10.5** (8.14-13.8)	**11.9** (9.05-16.0)	**13.4** (10.0-18.9)	**15.4** (10.6-21.7)	**18.5** (12.3-27.0)	**21.3** (13.8-31.7)
20-day	**6.53** (5.30-8.04)	**7.61** (6.17-9.37)	**9.37** (7.57-11.6)	**10.8** (8.70-13.5)	**12.8** (9.99-16.7)	**14.3** (10.9-19.0)	**15.9** (11.8-22.0)	**17.9** (12.4-25.0)	**20.8** (13.8-30.0)	**23.2** (15.1-34.2)
30-day	**8.24** (6.71-10.1)	**9.34** (7.60-11.5)	**11.1** (9.03-13.7)	**12.6** (10.2-15.7)	**14.7** (11.4-18.9)	**16.3** (12.4-21.3)	**17.9** (13.2-24.3)	**19.7** (13.7-27.4)	**22.3** (14.9-32.0)	**24.4** (15.9-35.8)
45-day	**10.4** (8.48-12.7)	**11.5** (9.40-14.1)	**13.4** (10.9-16.4)	**14.9** (12.1-18.4)	**17.0** (13.3-21.8)	**18.7** (14.2-24.3)	**20.3** (14.9-27.2)	**22.0** (15.4-30.4)	**24.2** (16.2-34.7)	**25.9** (16.9-37.8)
60-day	**12.2** (9.98-14.9)	**13.4** (10.9-16.3)	**15.3** (12.4-18.7)	**16.9** (13.7-20.8)	**19.1** (14.9-24.2)	**20.8** (15.8-26.8)	**22.4** (16.4-29.8)	**24.0** (16.8-33.1)	**25.9** (17.4-37.0)	**27.3** (17.8-39.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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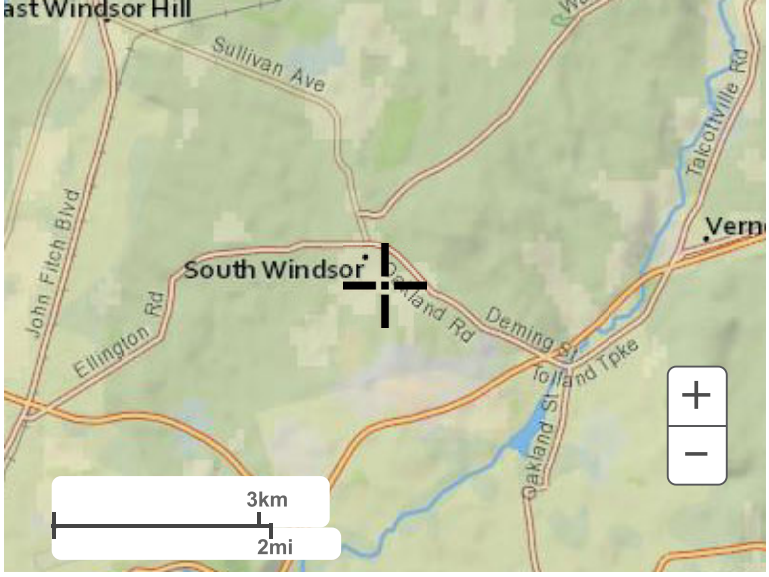
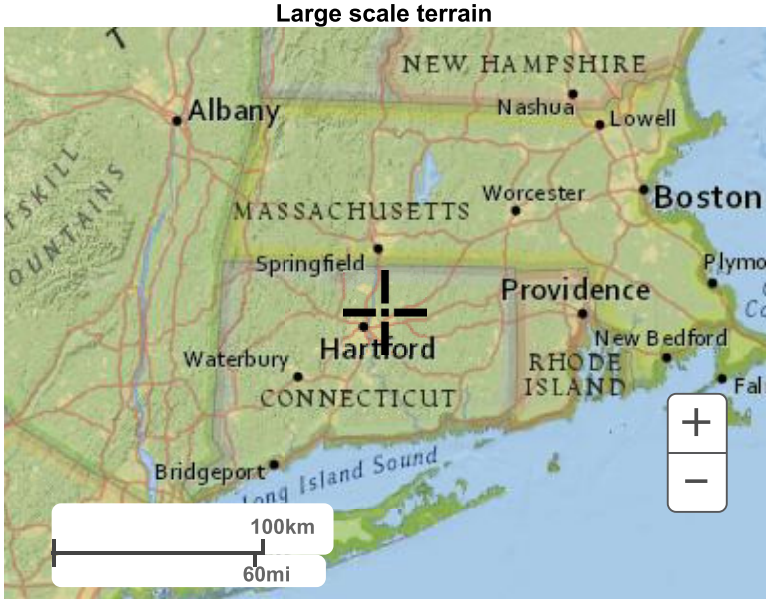
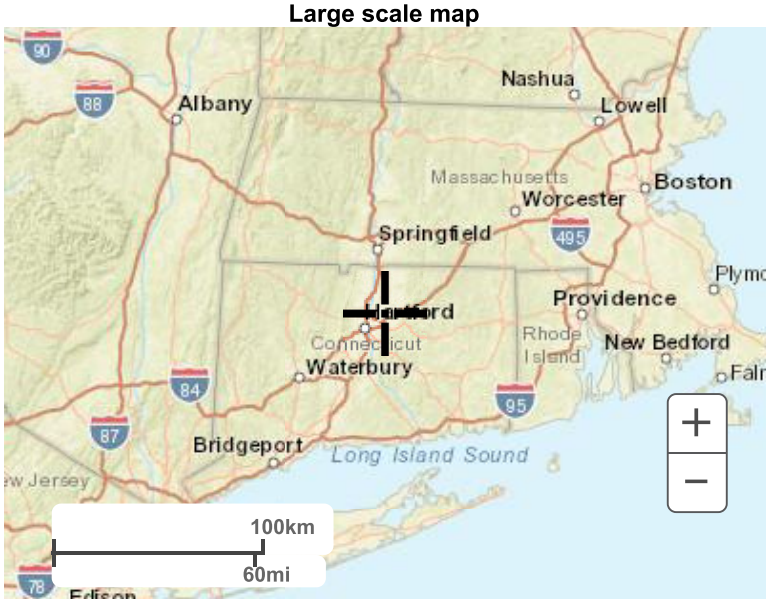
PF graphical



Large scale terrain



Large scale map



Large scale aerial

Appendix G
Hydrologic Analysis-Computer Model Results

Deming Street Multi-Family Development

240 Deming Street, South Windsor, Connecticut Drainage Report

Prepared for:
Metro Realty
6 Executive Drive, Suite 100
Farmington, CT 06032

SLR Project No.: 141.13571.00069

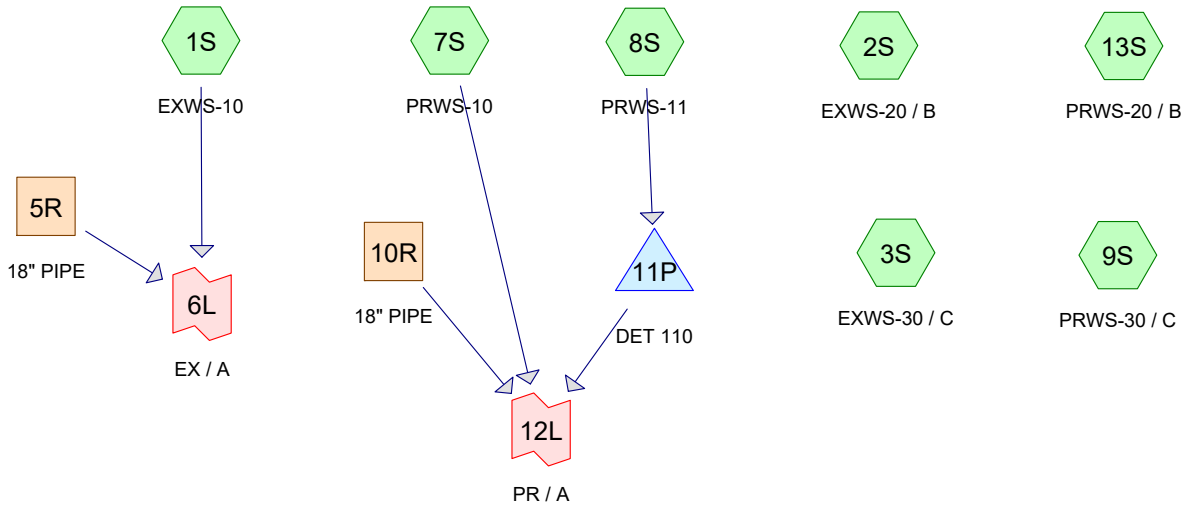
June 28, 2023

SLR

Hydrographs Peak Flowrate Summary (cfs)
Existing vs. Proposed

Storm Event	2yr		10yr		25yr		50yr		100yr	
	Exist	**Prop**	**Exist**	**Prop**	**Exist**	**Prop**	**Exist**	**Prop**	**Exist**	**Prop**
Point of Analysis A	8.8	7.8	15.4	11.8	20.2	17.1	23.9	21.1	28.0	25.3
DET 110 W.S. Elev. (ft.) Top of Chamber Elev. = 130.1	-	127.7	-	129.1	-	129.5	-	129.7	-	129.9
Point of Analysis B	2.0	1.0	4.8	3.8	6.7	6.0	8.1	7.7	9.6	9.6
Point of Analysis C	0.0	0.0	0.3	0.3	0.5	0.5	0.7	0.7	0.9	0.9

Study Area	**Description**
A	Western Property Boundary
B	On-Site Storm Drainage System
C	Storm Drainage System in Deming Street



Subcat Reach Pond Link

Routing Diagram for MR-SW-Model01-Retain-it
Prepared by SLR International Corporation, Printed 6/27/2023

Summary for Subcatchment 1S: EXWS-10

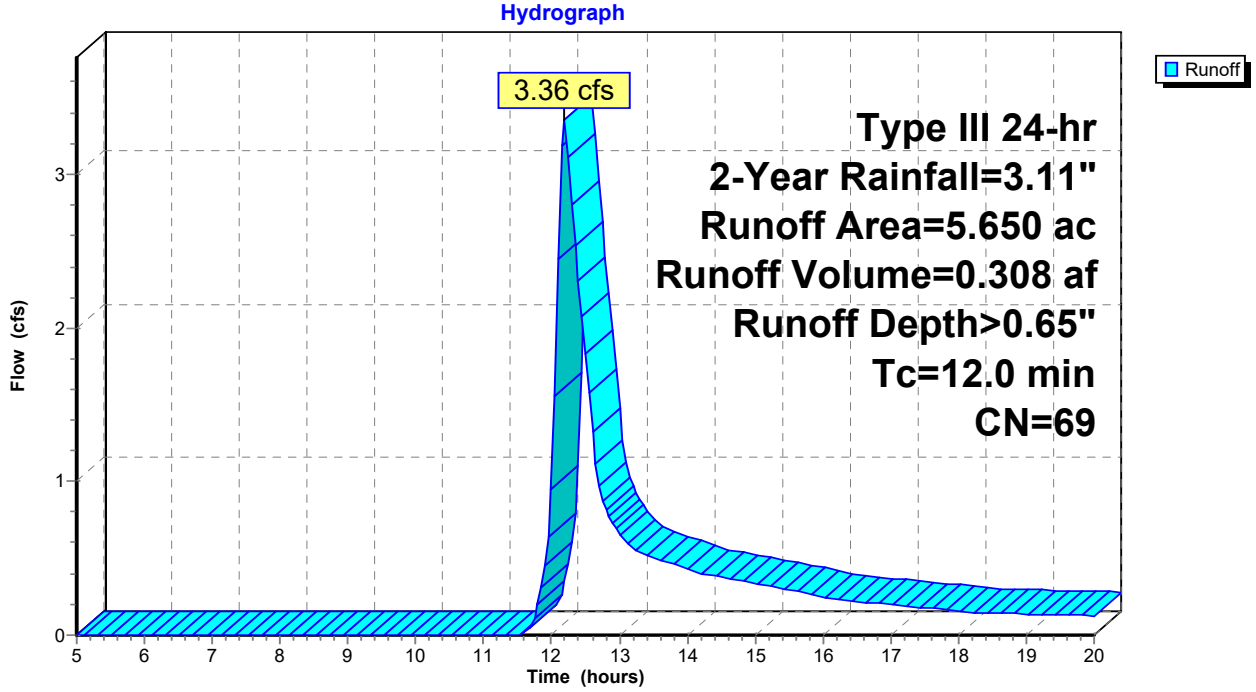
Runoff = 3.36 cfs @ 12.20 hrs, Volume= 0.308 af, Depth> 0.65"
Routed to Link 6L : EX / A

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=3.11"

	Area (ac)	CN	Description
*	5.650	69	
	5.650		100.00% Pervious Area

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

Subcatchment 1S: EXWS-10



Summary for Subcatchment 2S: EXWS-20 / B

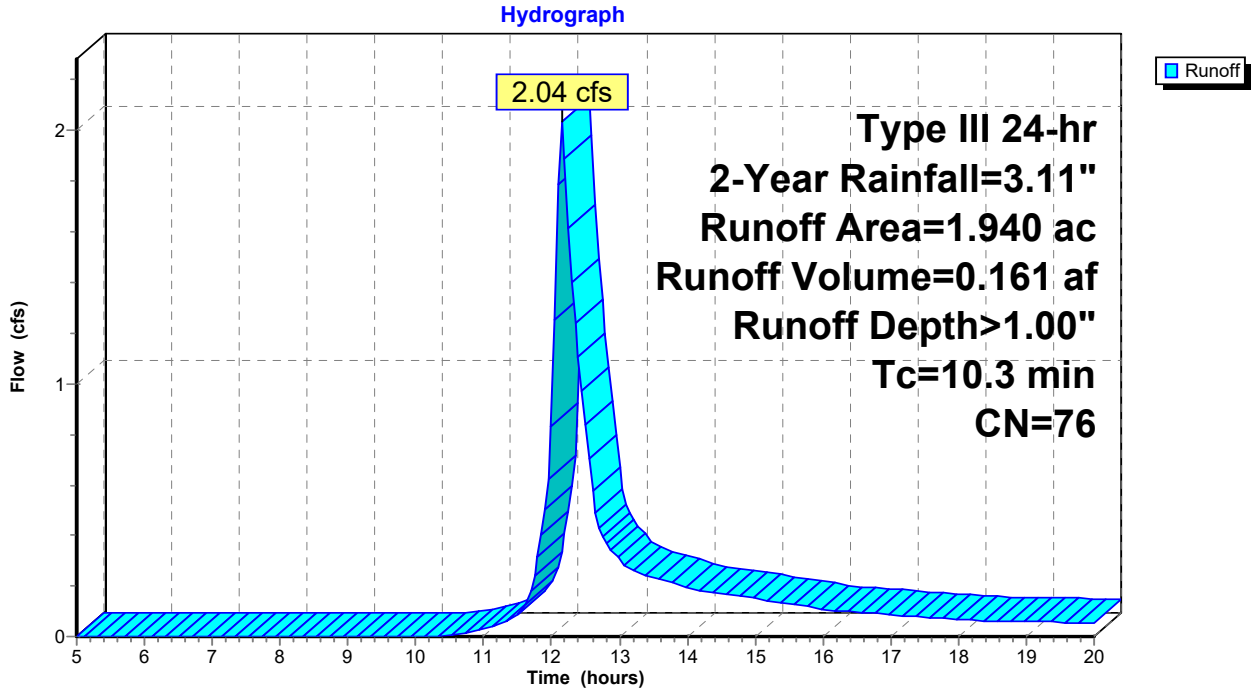
Runoff = 2.04 cfs @ 12.16 hrs, Volume= 0.161 af, Depth> 1.00"

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=3.11"

	Area (ac)	CN	Description
*	1.940	76	
	1.940		100.00% Pervious Area

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

Subcatchment 2S: EXWS-20 / B



Summary for Subcatchment 3S: EXWS-30 / C

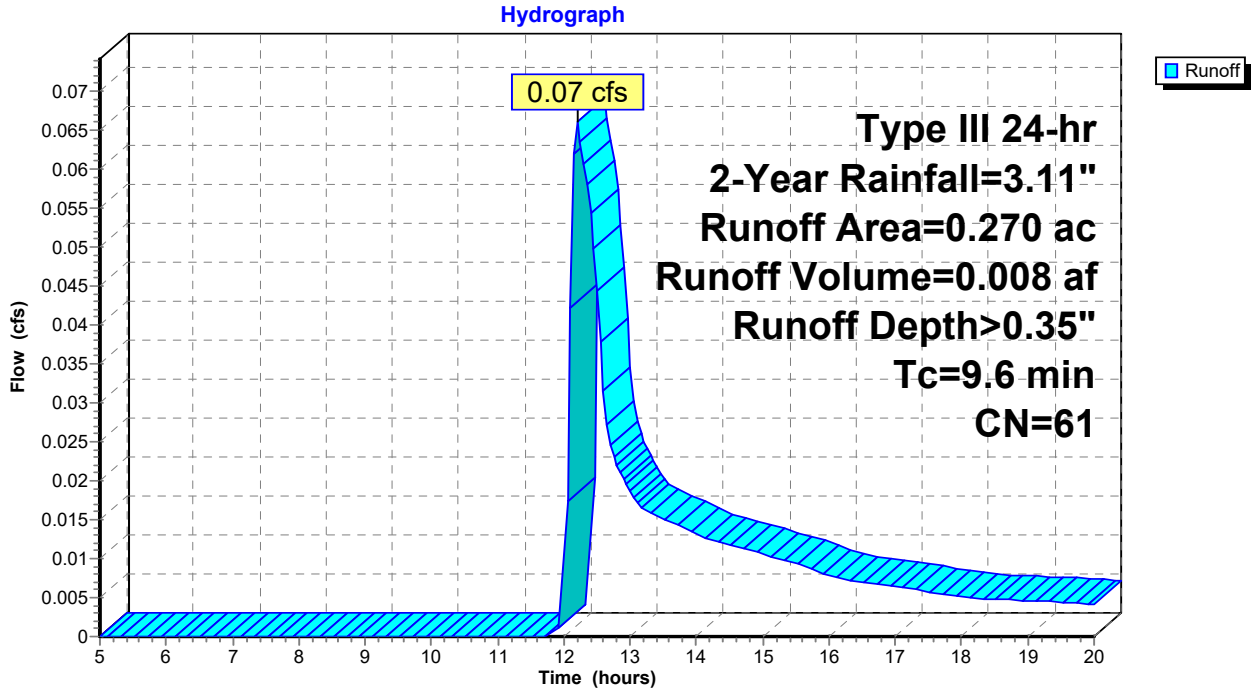
Runoff = 0.07 cfs @ 12.21 hrs, Volume= 0.008 af, Depth> 0.35"

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=3.11"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 3S: EXWS-30 / C



Summary for Subcatchment 7S: PRWS-10

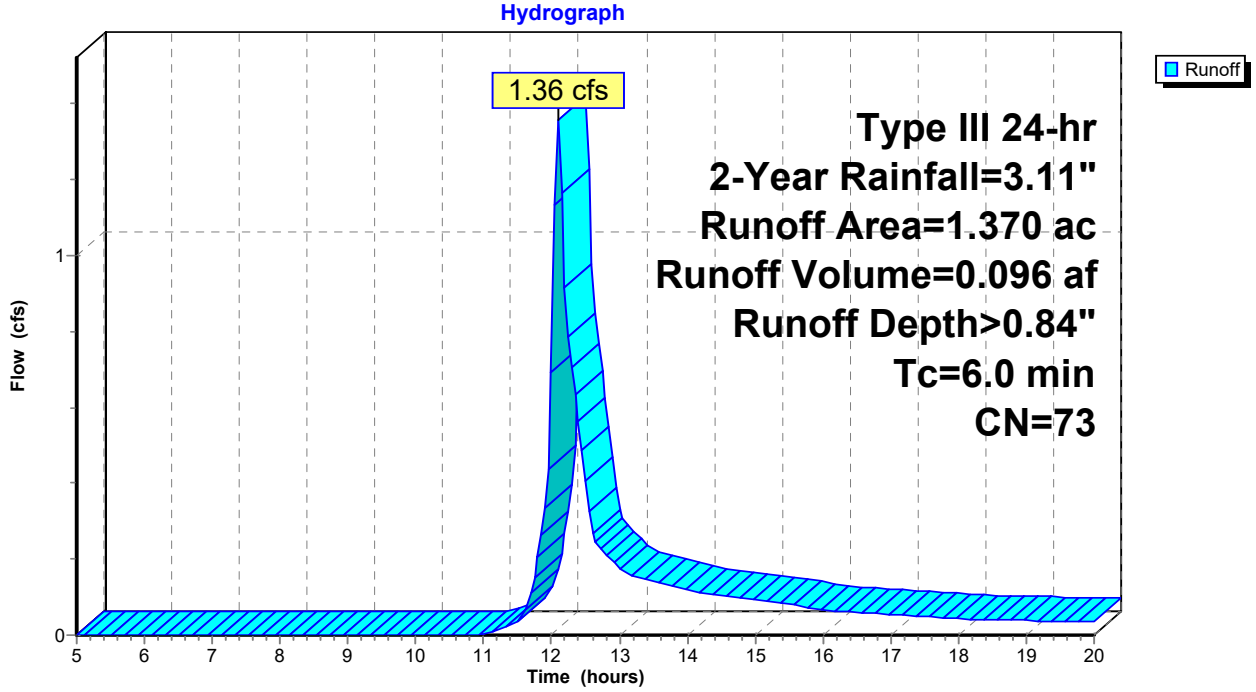
Runoff = 1.36 cfs @ 12.10 hrs, Volume= 0.096 af, Depth> 0.84"
Routed to Link 12L : PR / A

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=3.11"

	Area (ac)	CN	Description
*	1.370	73	
	1.370		100.00% Pervious Area

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

Subcatchment 7S: PRWS-10



Summary for Subcatchment 8S: PRWS-11

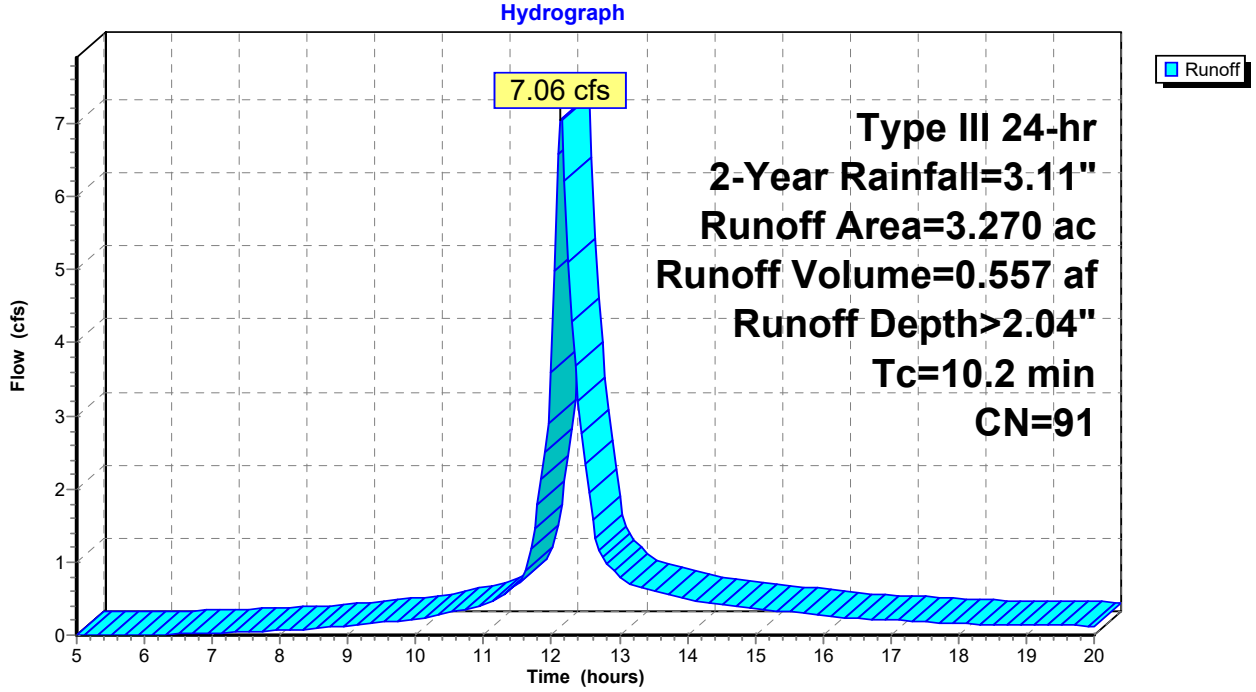
Runoff = 7.06 cfs @ 12.14 hrs, Volume= 0.557 af, Depth> 2.04"
Routed to Pond 11P : DET 110

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=3.11"

	Area (ac)	CN	Description
*	3.270	91	
	3.270		100.00% Pervious Area

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

Subcatchment 8S: PRWS-11



Summary for Subcatchment 9S: PRWS-30 / C

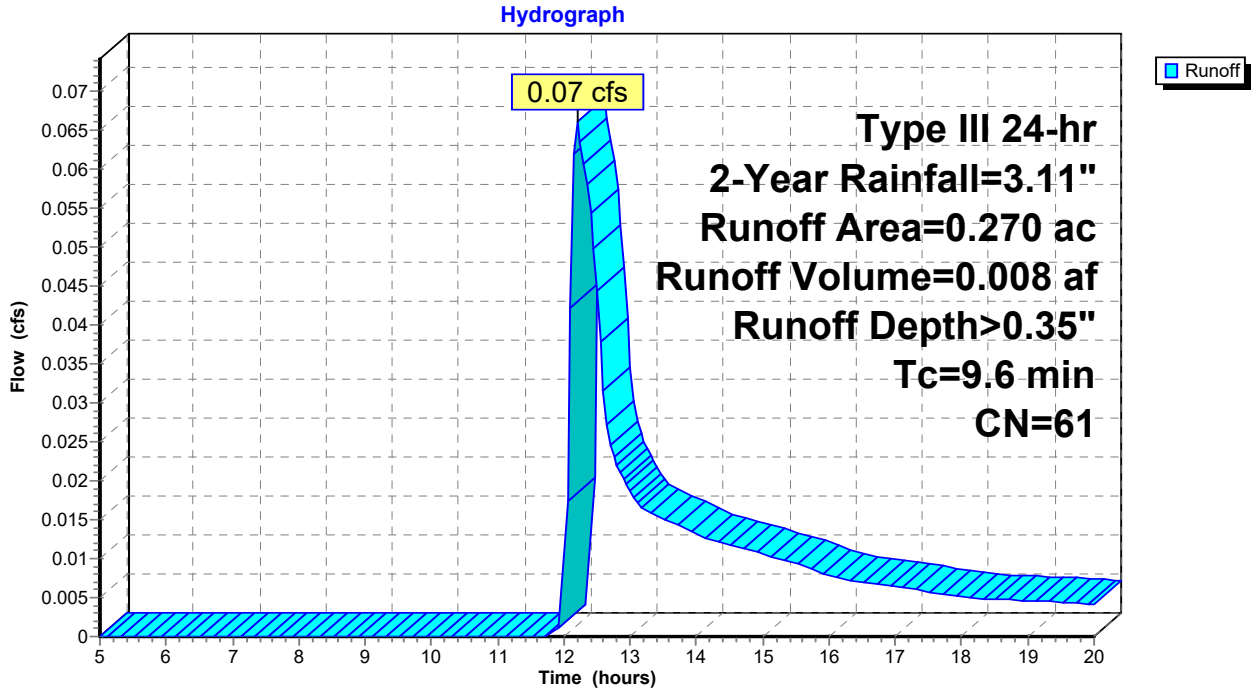
Runoff = 0.07 cfs @ 12.21 hrs, Volume= 0.008 af, Depth> 0.35"

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=3.11"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 9S: PRWS-30 / C



Summary for Subcatchment 13S: PRWS-20 / B

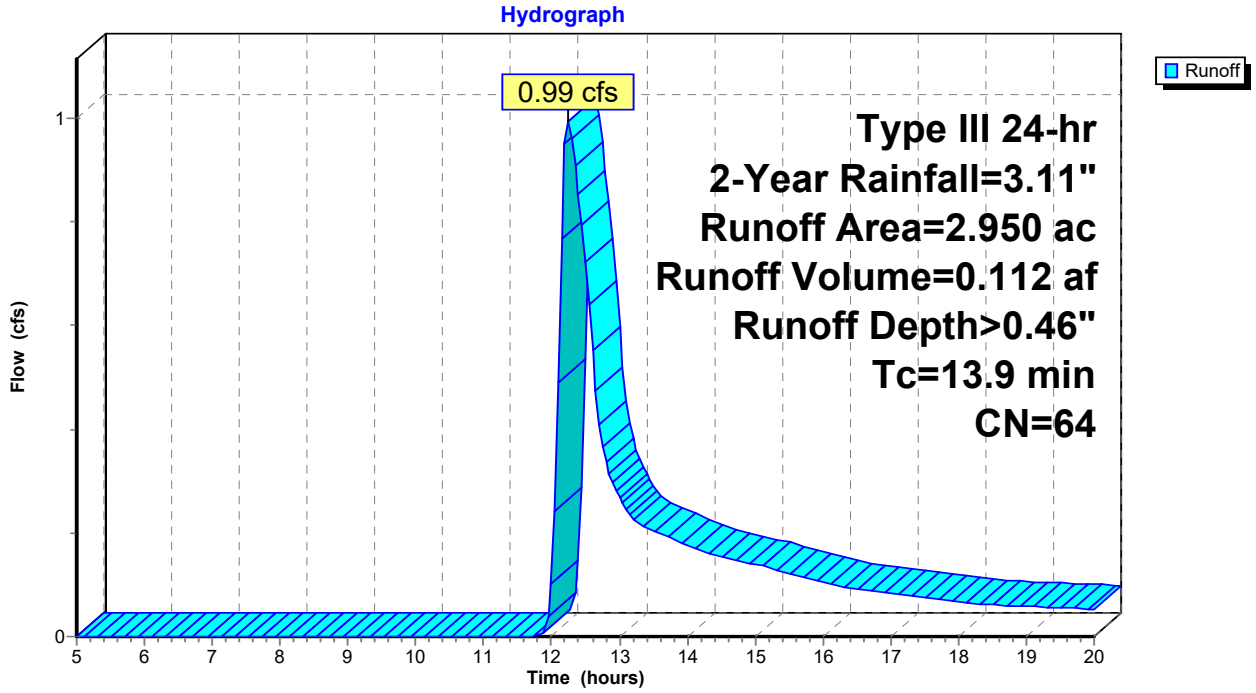
Runoff = 0.99 cfs @ 12.25 hrs, Volume= 0.112 af, Depth> 0.46"

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=3.11"

	Area (ac)	CN	Description
*	2.950	64	
	2.950		100.00% Pervious Area

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

Subcatchment 13S: PRWS-20 / B



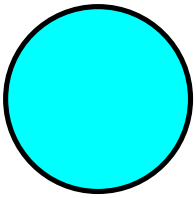
Summary for Reach 5R: 18" PIPE

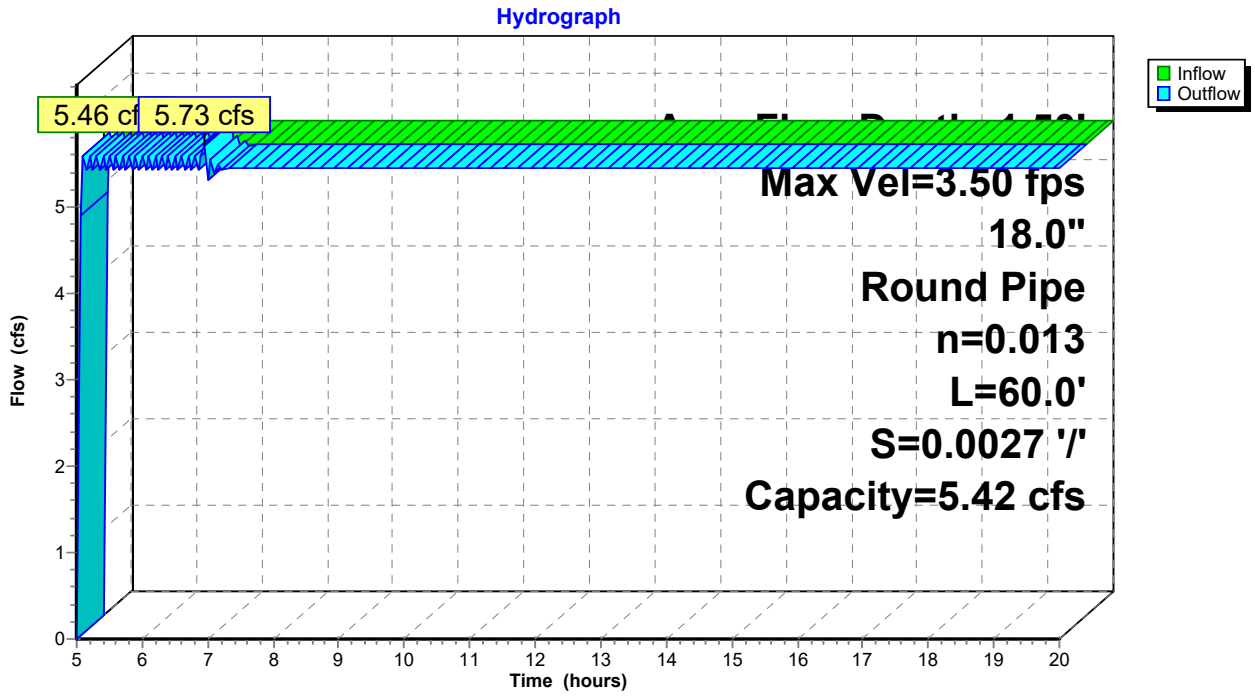
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 6L : EX / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





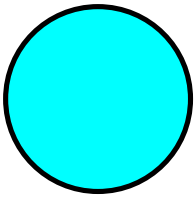
Summary for Reach 10R: 18" PIPE

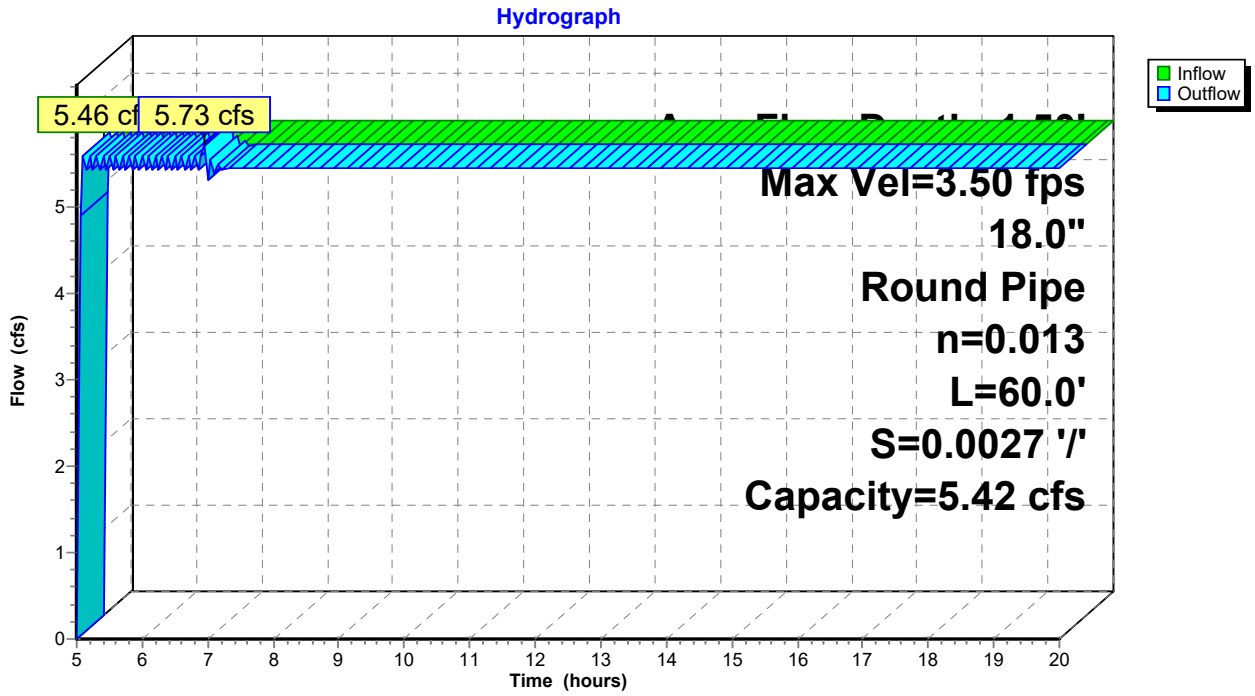
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 12L : PR / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





Summary for Pond 11P: DET 110

Inflow Area = 3.270 ac, 0.00% Impervious, Inflow Depth > 2.04" for 2-Year event
Inflow = 7.06 cfs @ 12.14 hrs, Volume= 0.557 af
Outflow = 1.93 cfs @ 12.56 hrs, Volume= 0.313 af, Atten= 73%, Lag= 24.7 min
Primary = 1.93 cfs @ 12.56 hrs, Volume= 0.313 af
Routed to Link 12L : PR / A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 127.66' @ 12.56 hrs Surf.Area= 0.134 ac Storage= 0.306 af

Plug-Flow detention time= 168.3 min calculated for 0.313 af (56% of inflow)
Center-of-Mass det. time= 90.9 min (866.0 - 775.1)

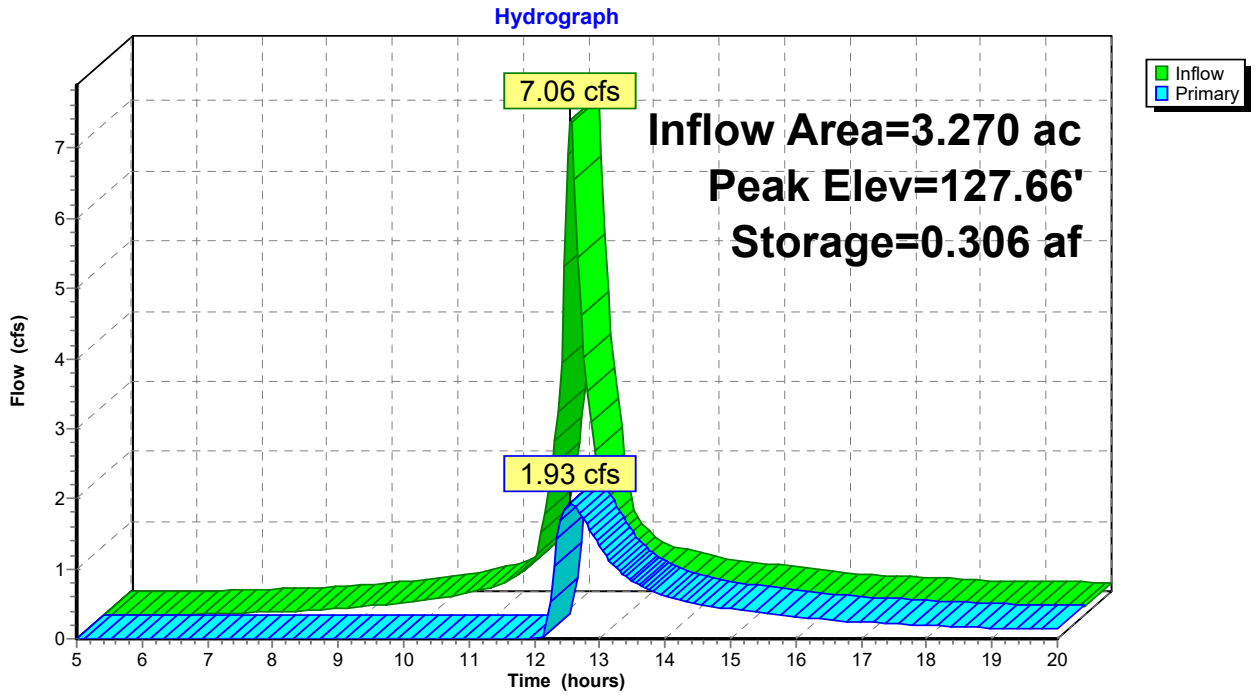
Volume	Invert	Avail.Storage	Storage Description
#1A	125.10'	0.000 af	**56.00'W x 104.00'L x 5.67'H Field A** 0.758 af Overall - 0.758 af Embedded = 0.000 af x 40.0% Voids
#2A	125.10'	0.599 af	**retain_it retain_it 5.0'** x 91 Inside #1 Inside= 84.0"W x 60.0"H => 36.41 sf x 8.00'L = 291.3 cf Outside= 96.0"W x 68.0"H => 45.33 sf x 8.00'L = 362.7 cf 7 Rows adjusted for 415.6 cf perimeter wall
		0.599 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.00' / 122.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	129.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.92 cfs @ 12.56 hrs HW=127.66' (Free Discharge)
└**1=Culvert** (Passes 1.92 cfs of 13.28 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.92 cfs @ 2.76 fps)
└**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: DET 110

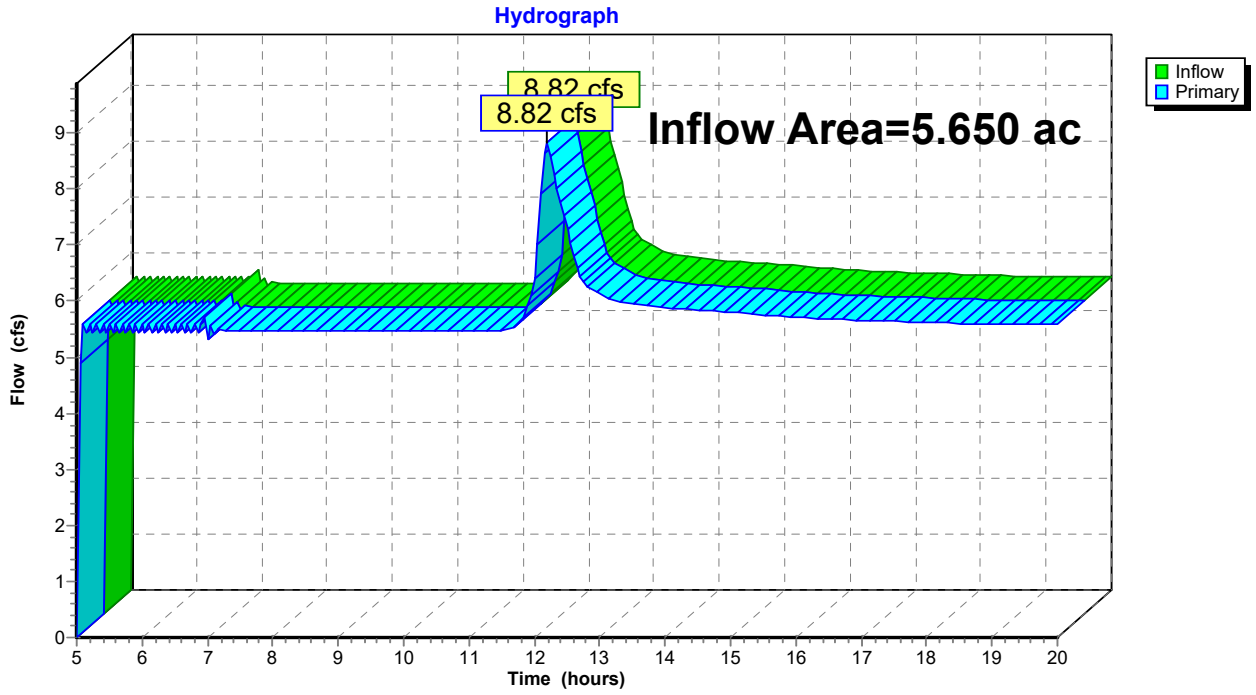


Summary for Link 6L: EX / A

Inflow Area = 5.650 ac, 0.00% Impervious, Inflow Depth > 15.04" for 2-Year event
Inflow = 8.82 cfs @ 12.20 hrs, Volume= 7.083 af
Primary = 8.82 cfs @ 12.20 hrs, Volume= 7.083 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: EX / A

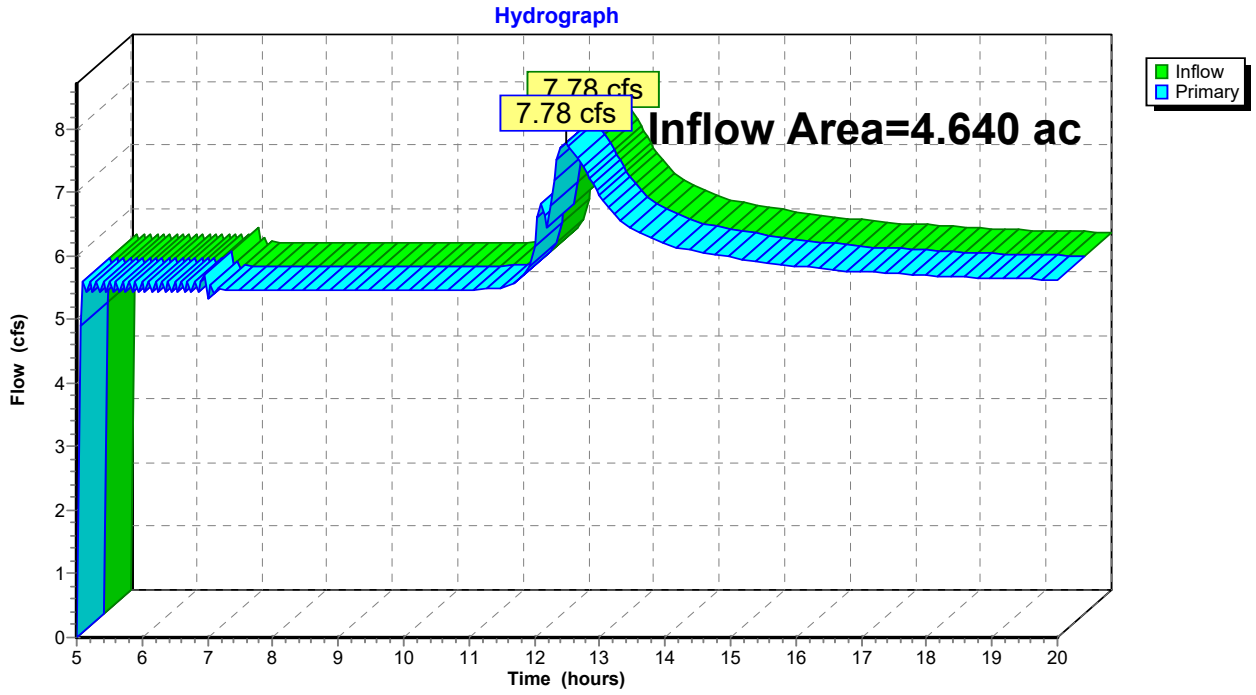


Summary for Link 12L: PR / A

Inflow Area = 4.640 ac, 0.00% Impervious, Inflow Depth > 18.58" for 2-Year event
Inflow = 7.78 cfs @ 12.47 hrs, Volume= 7.184 af
Primary = 7.78 cfs @ 12.47 hrs, Volume= 7.184 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 12L: PR / A



Summary for Subcatchment 1S: EXWS-10

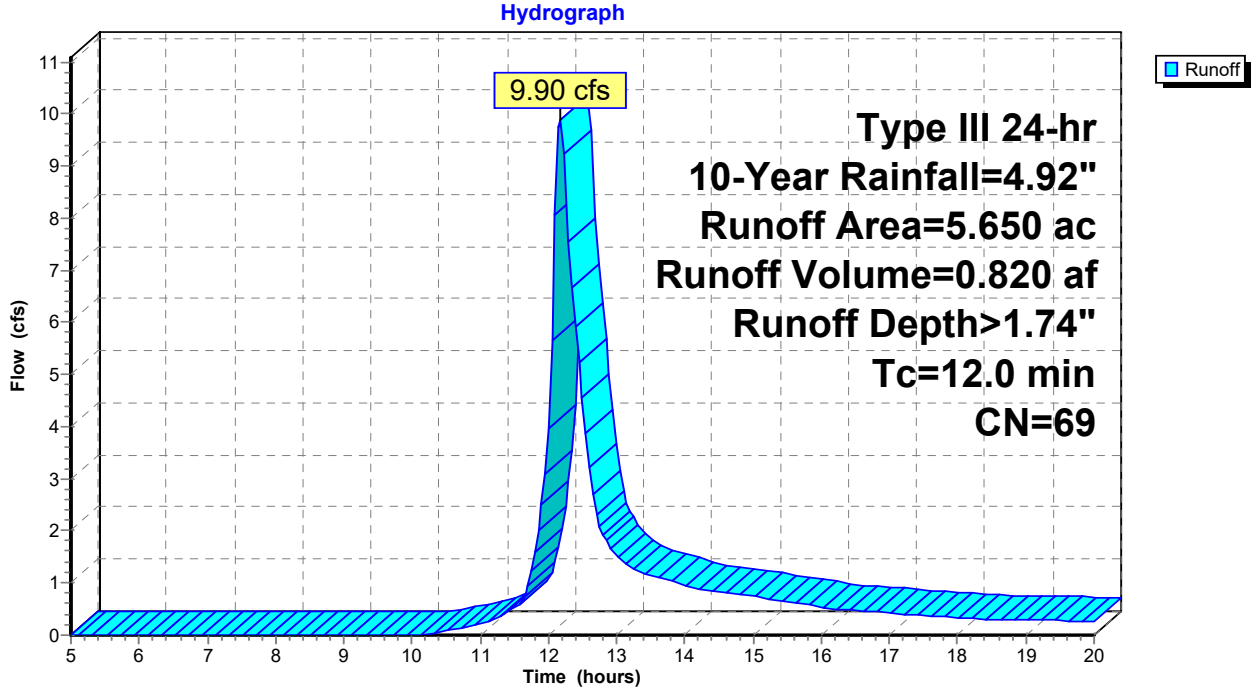
Runoff = 9.90 cfs @ 12.18 hrs, Volume= 0.820 af, Depth> 1.74"
Routed to Link 6L : EX / A

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=4.92"

	Area (ac)	CN	Description
*	5.650	69	
	5.650		100.00% Pervious Area

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

Subcatchment 1S: EXWS-10



Summary for Subcatchment 2S: EXWS-20 / B

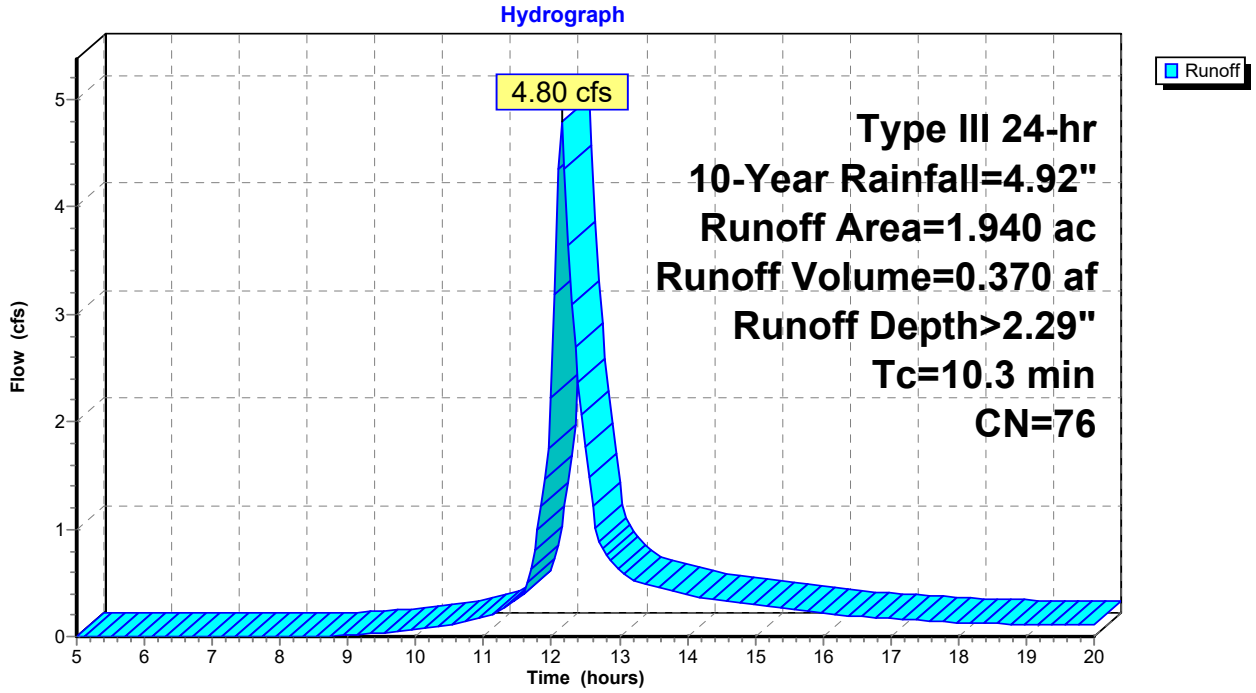
Runoff = 4.80 cfs @ 12.15 hrs, Volume= 0.370 af, Depth> 2.29"

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=4.92"

	Area (ac)	CN	Description
*	1.940	76	
	1.940		100.00% Pervious Area

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

Subcatchment 2S: EXWS-20 / B



Summary for Subcatchment 3S: EXWS-30 / C

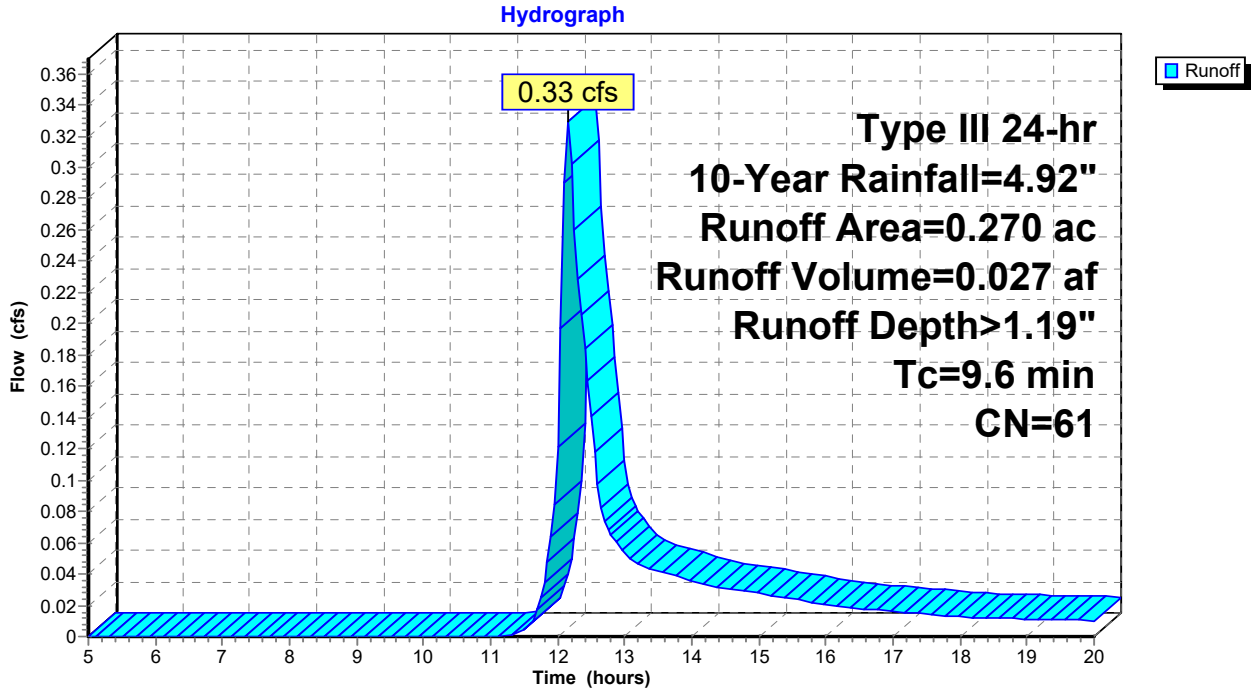
Runoff = 0.33 cfs @ 12.15 hrs, Volume= 0.027 af, Depth> 1.19"

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=4.92"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 3S: EXWS-30 / C



Summary for Subcatchment 7S: PRWS-10

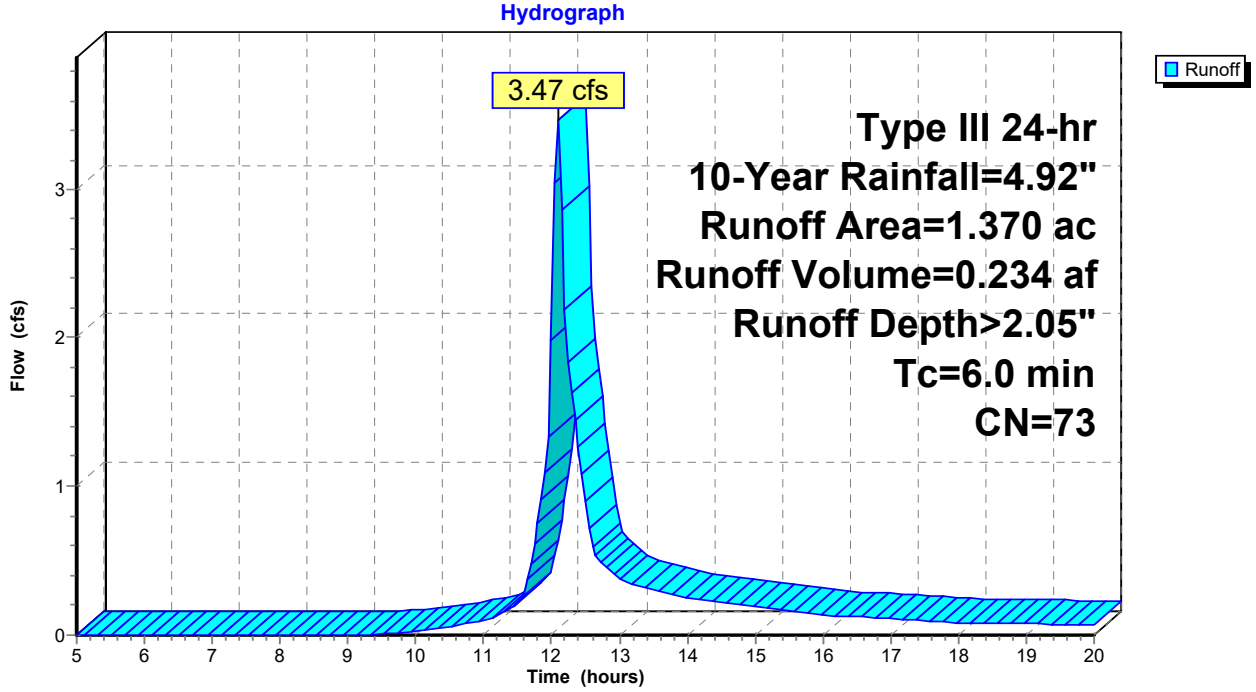
Runoff = 3.47 cfs @ 12.10 hrs, Volume= 0.234 af, Depth> 2.05"
Routed to Link 12L : PR / A

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=4.92"

	Area (ac)	CN	Description
*	1.370	73	
	1.370		100.00% Pervious Area

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

Subcatchment 7S: PRWS-10



Summary for Subcatchment 8S: PRWS-11

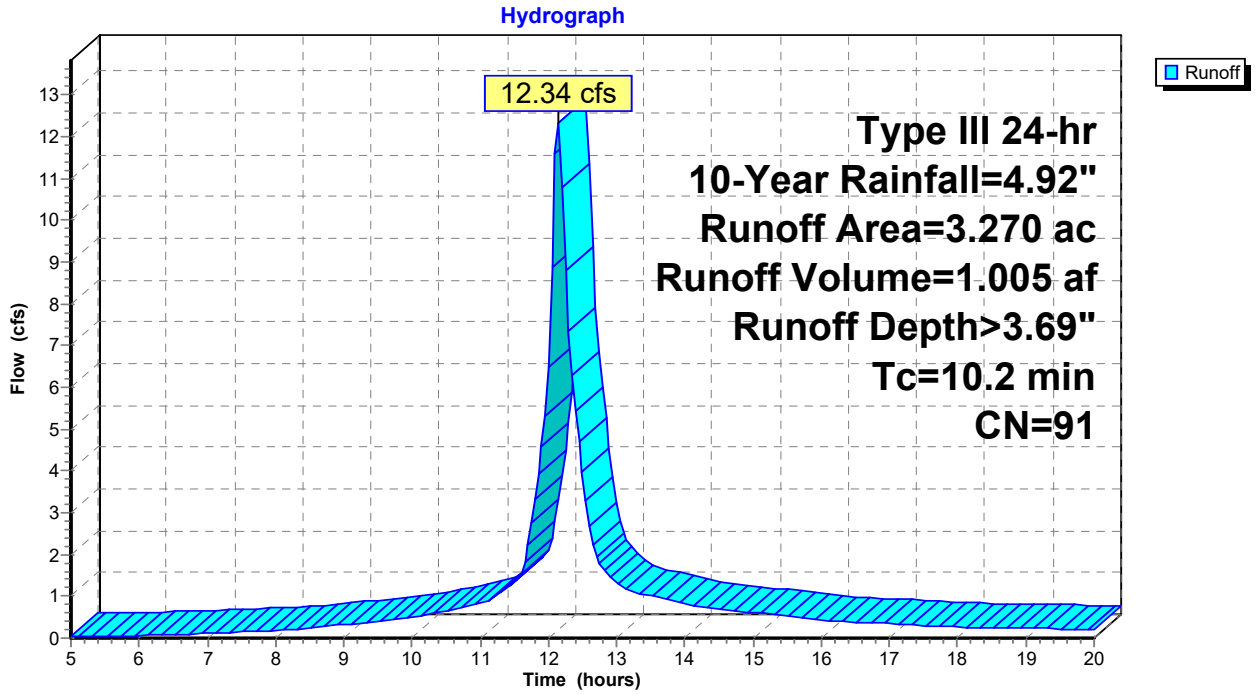
Runoff = 12.34 cfs @ 12.14 hrs, Volume= 1.005 af, Depth> 3.69"
Routed to Pond 11P : DET 110

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=4.92"

	Area (ac)	CN	Description
*	3.270	91	
	3.270		100.00% Pervious Area

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

Subcatchment 8S: PRWS-11



Summary for Subcatchment 9S: PRWS-30 / C

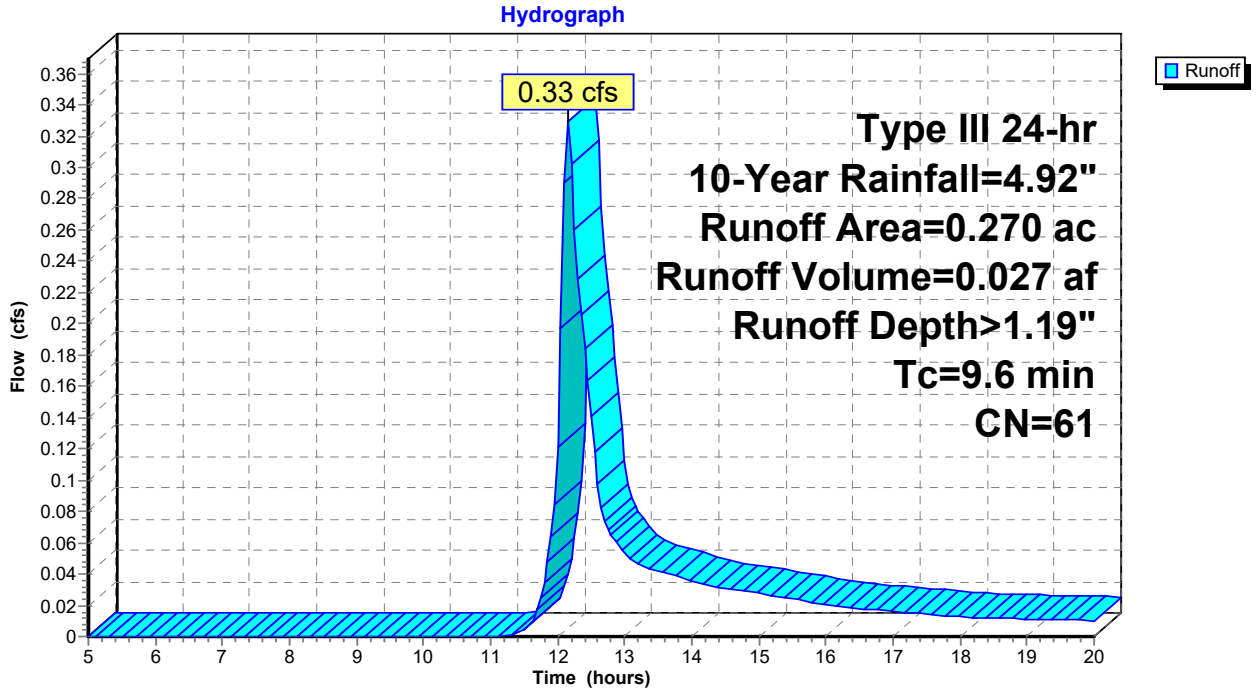
Runoff = 0.33 cfs @ 12.15 hrs, Volume= 0.027 af, Depth> 1.19"

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=4.92"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 9S: PRWS-30 / C



Summary for Subcatchment 13S: PRWS-20 / B

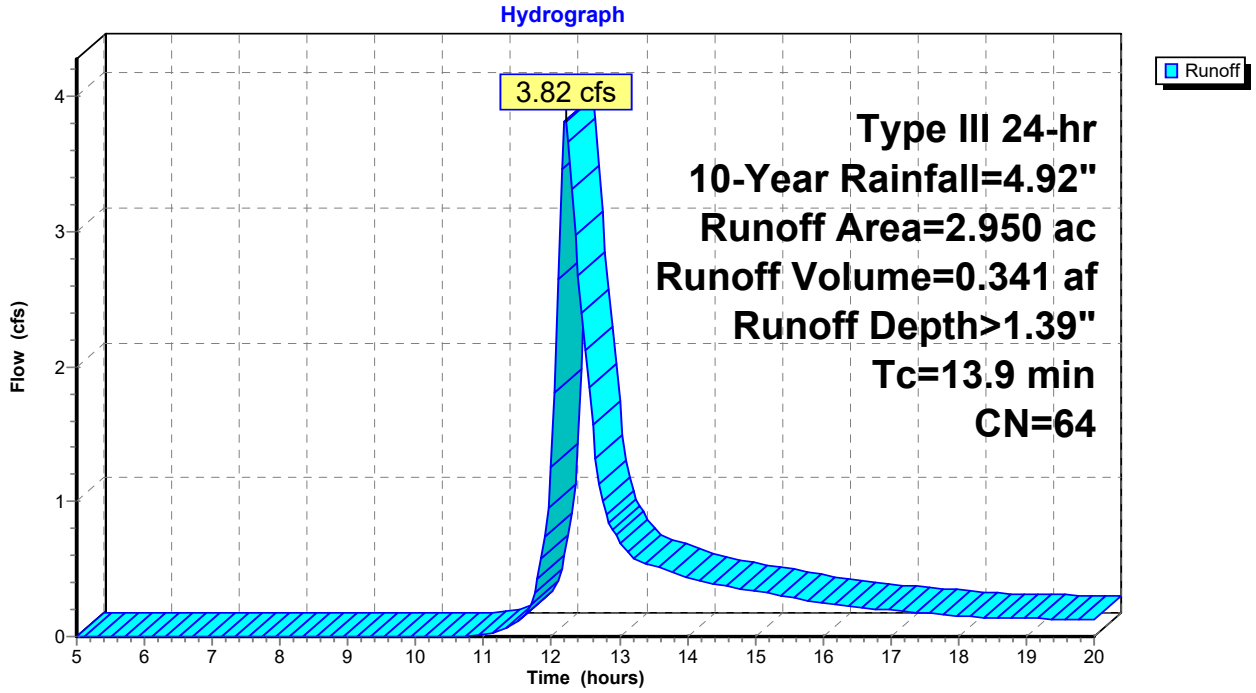
Runoff = 3.82 cfs @ 12.21 hrs, Volume= 0.341 af, Depth> 1.39"

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=4.92"

	Area (ac)	CN	Description
*	2.950	64	
	2.950		100.00% Pervious Area

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

Subcatchment 13S: PRWS-20 / B



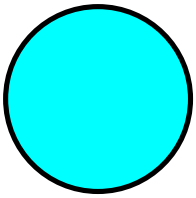
Summary for Reach 5R: 18" PIPE

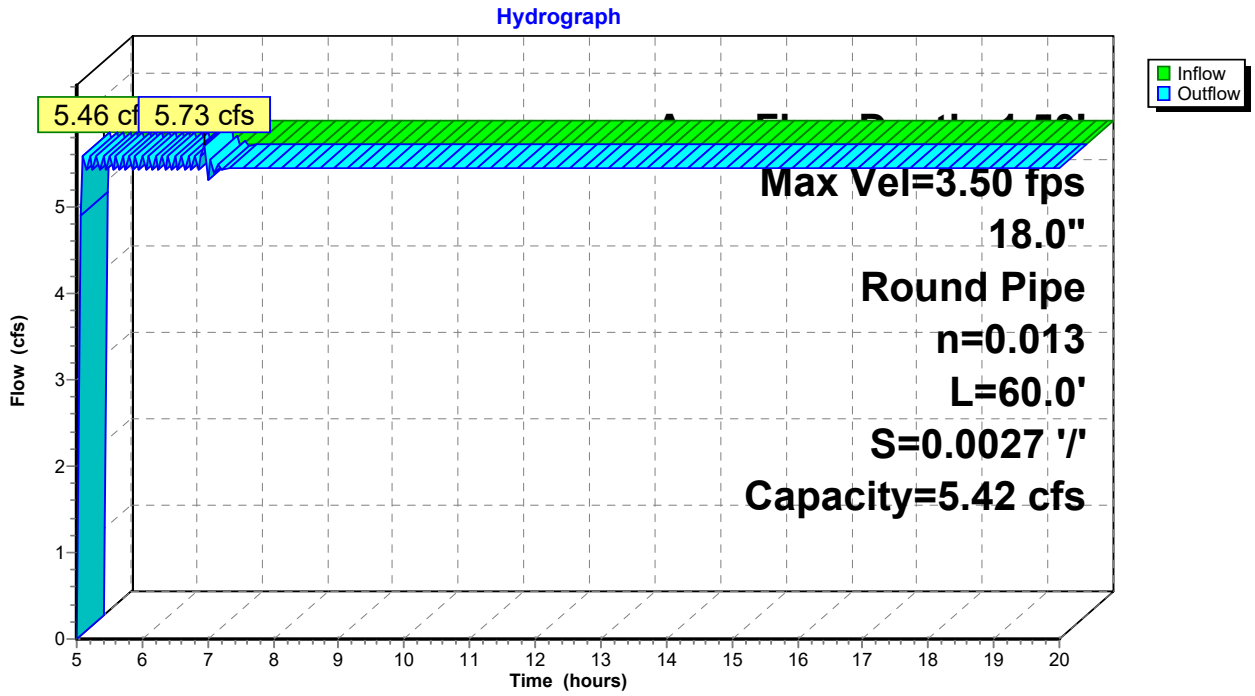
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 6L : EX / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





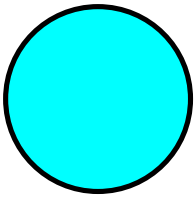
Summary for Reach 10R: 18" PIPE

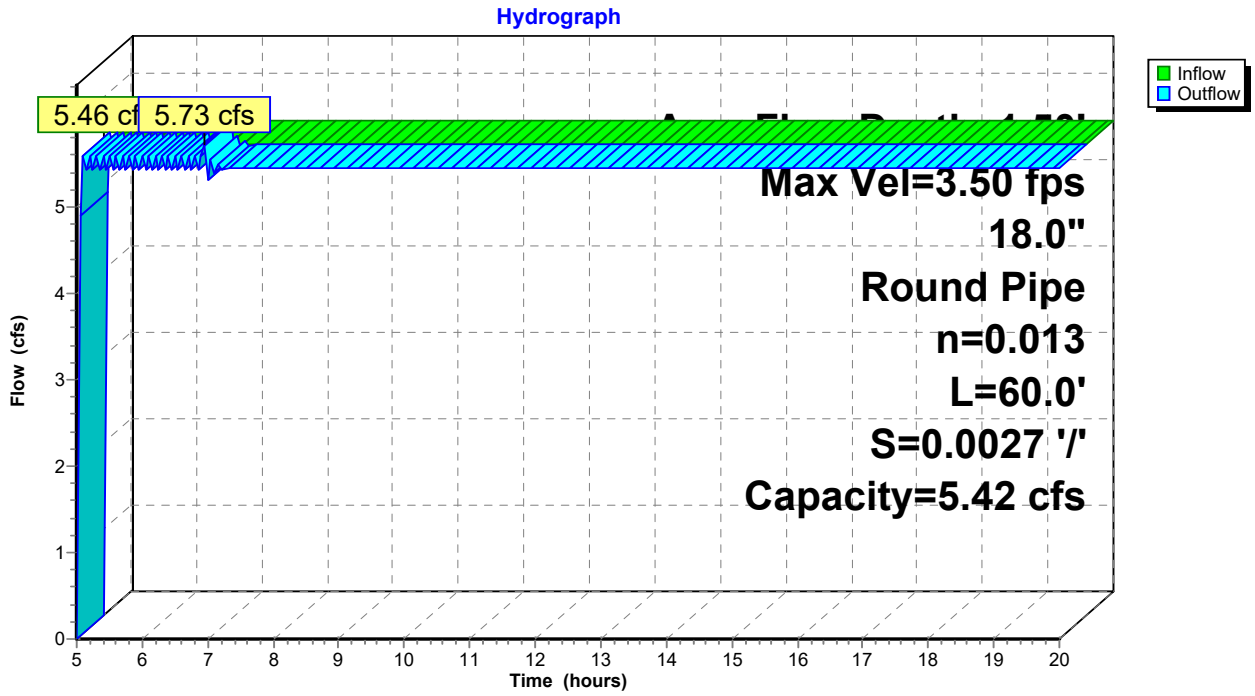
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 12L : PR / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





Summary for Pond 11P: DET 110

Inflow Area = 3.270 ac, 0.00% Impervious, Inflow Depth > 3.69" for 10-Year event
Inflow = 12.34 cfs @ 12.14 hrs, Volume= 1.005 af
Outflow = 4.74 cfs @ 12.45 hrs, Volume= 0.755 af, Atten= 62%, Lag= 18.5 min
Primary = 4.74 cfs @ 12.45 hrs, Volume= 0.755 af
Routed to Link 12L : PR / A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.08' @ 12.45 hrs Surf.Area= 0.134 ac Storage= 0.477 af

Plug-Flow detention time= 131.1 min calculated for 0.755 af (75% of inflow)
Center-of-Mass det. time= 71.0 min (832.5 - 761.5)

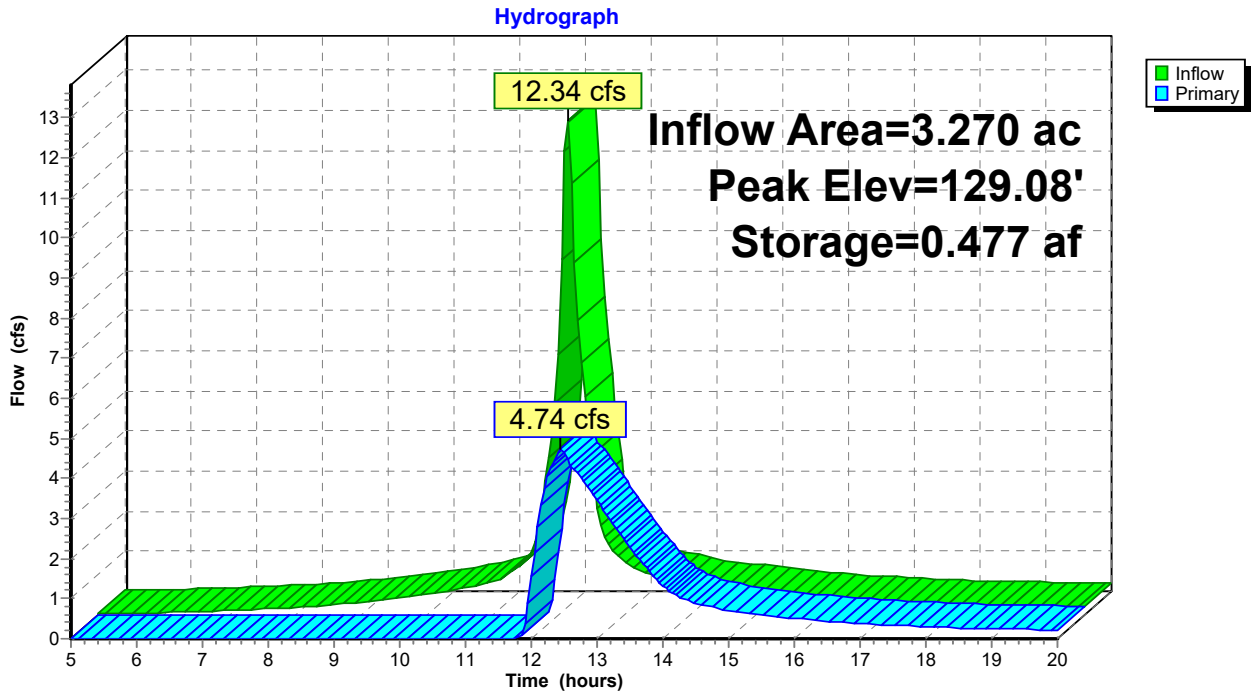
Volume	Invert	Avail.Storage	Storage Description
#1A	125.10'	0.000 af	**56.00'W x 104.00'L x 5.67'H Field A** 0.758 af Overall - 0.758 af Embedded = 0.000 af x 40.0% Voids
#2A	125.10'	0.599 af	**retain_it retain_it 5.0'** x 91 Inside #1 Inside= 84.0"W x 60.0"H => 36.41 sf x 8.00'L = 291.3 cf Outside= 96.0"W x 68.0"H => 45.33 sf x 8.00'L = 362.7 cf 7 Rows adjusted for 415.6 cf perimeter wall
		0.599 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.00' / 122.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	129.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=4.73 cfs @ 12.45 hrs HW=129.08' (Free Discharge)
↑└**1=Culvert** (Passes 4.73 cfs of 15.51 cfs potential flow)
↑└**2=Orifice/Grate** (Orifice Controls 4.44 cfs @ 6.36 fps)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.29 cfs @ 0.92 fps)

Pond 11P: DET 110

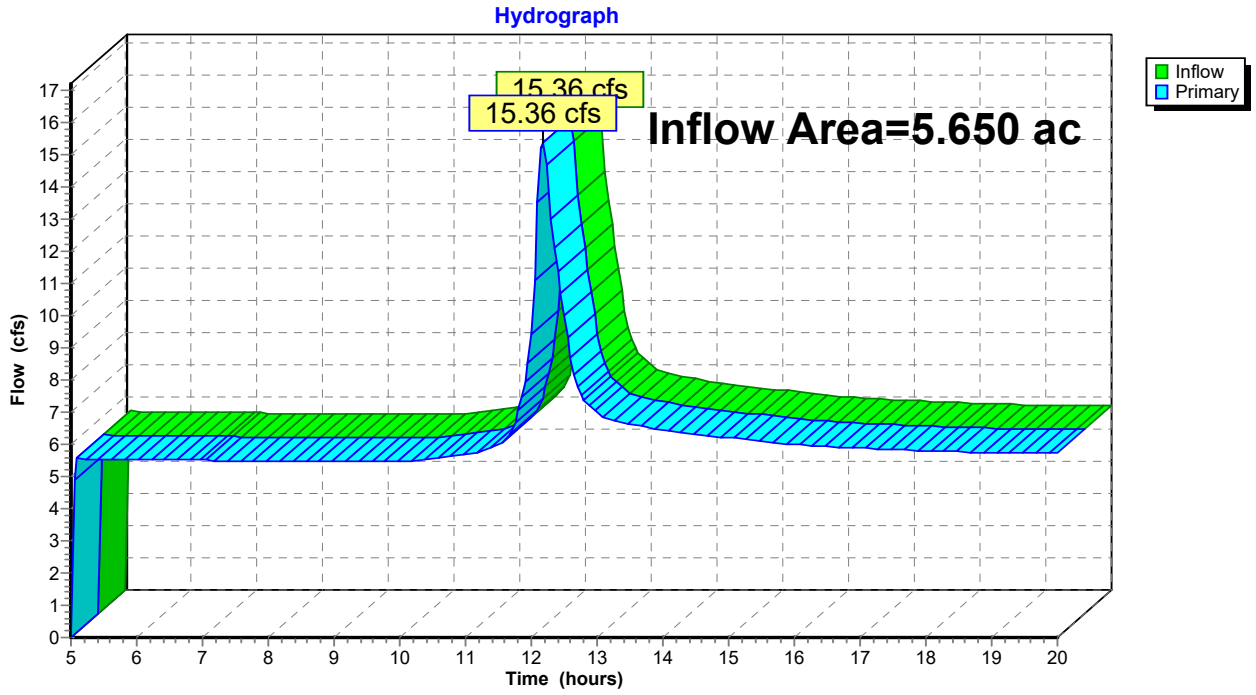


Summary for Link 6L: EX / A

Inflow Area = 5.650 ac, 0.00% Impervious, Inflow Depth > 16.13" for 10-Year event
Inflow = 15.36 cfs @ 12.18 hrs, Volume= 7.595 af
Primary = 15.36 cfs @ 12.18 hrs, Volume= 7.595 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: EX / A

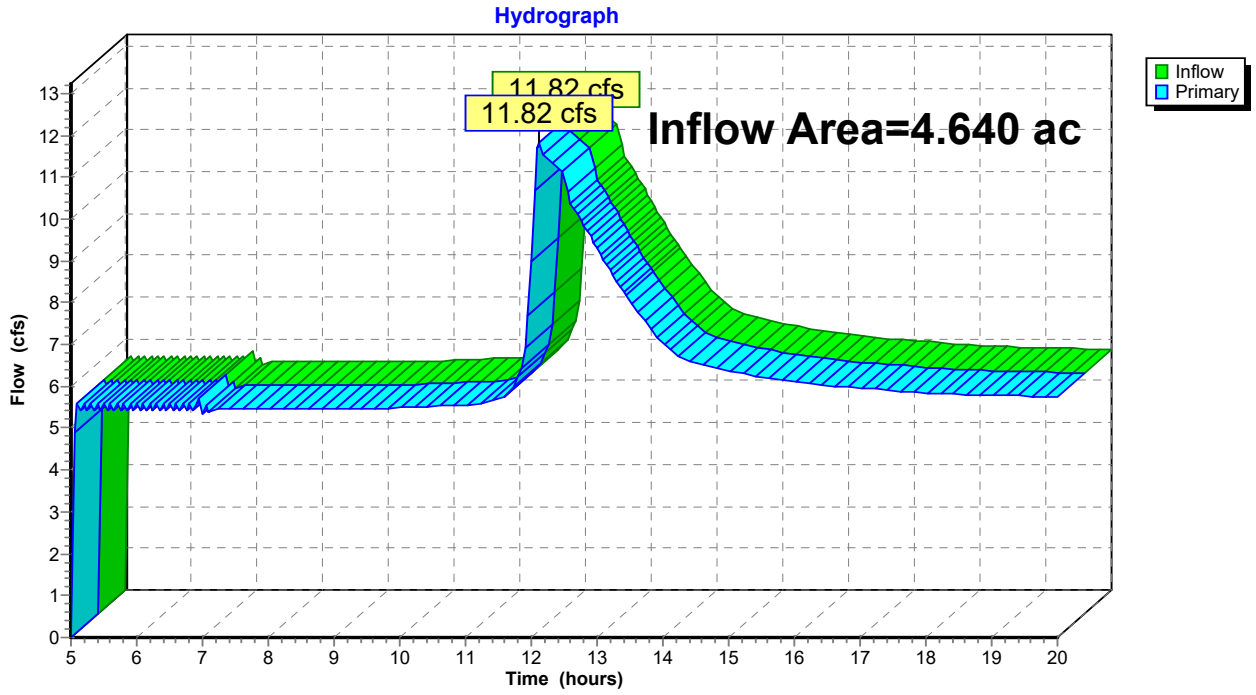


Summary for Link 12L: PR / A

Inflow Area = 4.640 ac, 0.00% Impervious, Inflow Depth > 20.08" for 10-Year event
Inflow = 11.82 cfs @ 12.12 hrs, Volume= 7.765 af
Primary = 11.82 cfs @ 12.12 hrs, Volume= 7.765 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 12L: PR / A



Summary for Subcatchment 1S: EXWS-10

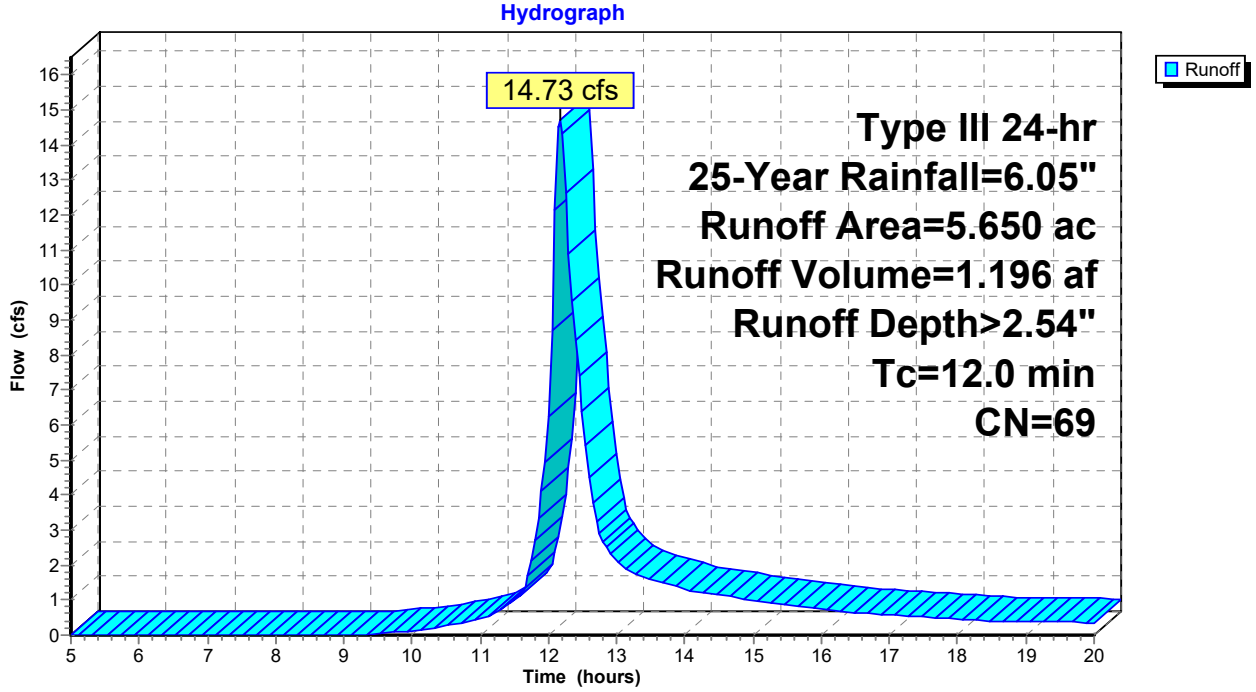
Runoff = 14.73 cfs @ 12.17 hrs, Volume= 1.196 af, Depth> 2.54"
Routed to Link 6L : EX / A

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=6.05"

	Area (ac)	CN	Description
*	5.650	69	
	5.650		100.00% Pervious Area

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

Subcatchment 1S: EXWS-10



Summary for Subcatchment 2S: EXWS-20 / B

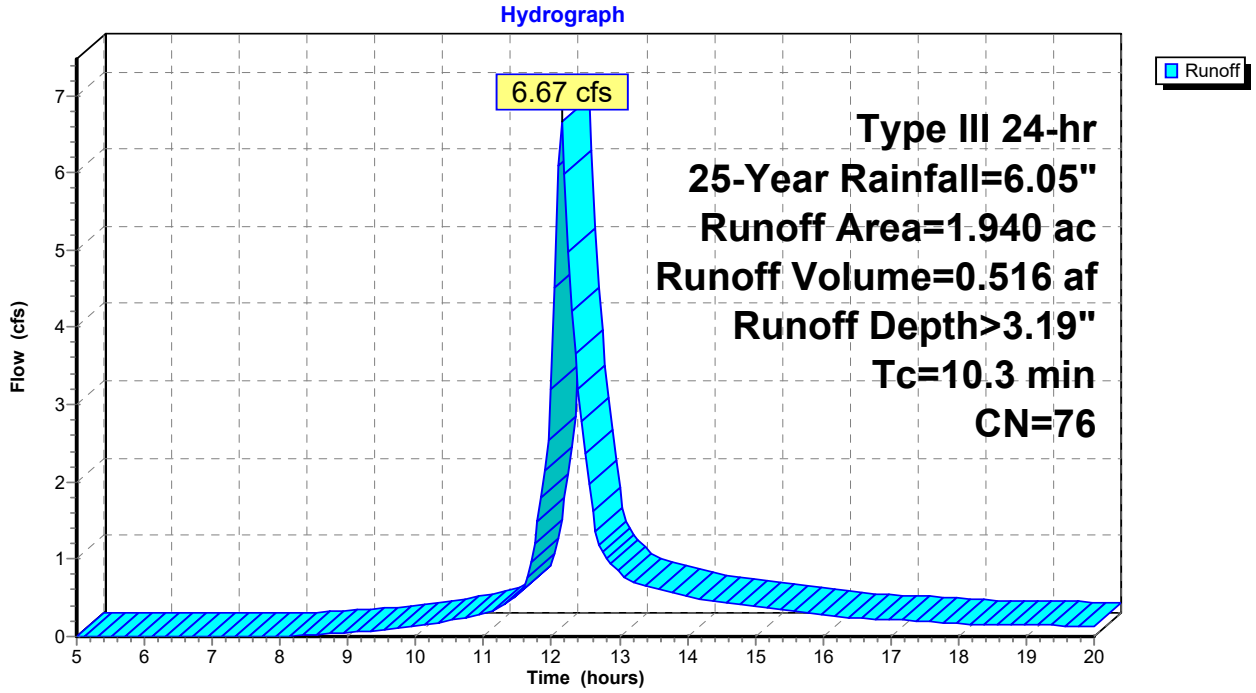
Runoff = 6.67 cfs @ 12.15 hrs, Volume= 0.516 af, Depth> 3.19"

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=6.05"

	Area (ac)	CN	Description
*	1.940	76	
	1.940		100.00% Pervious Area

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

Subcatchment 2S: EXWS-20 / B



Summary for Subcatchment 3S: EXWS-30 / C

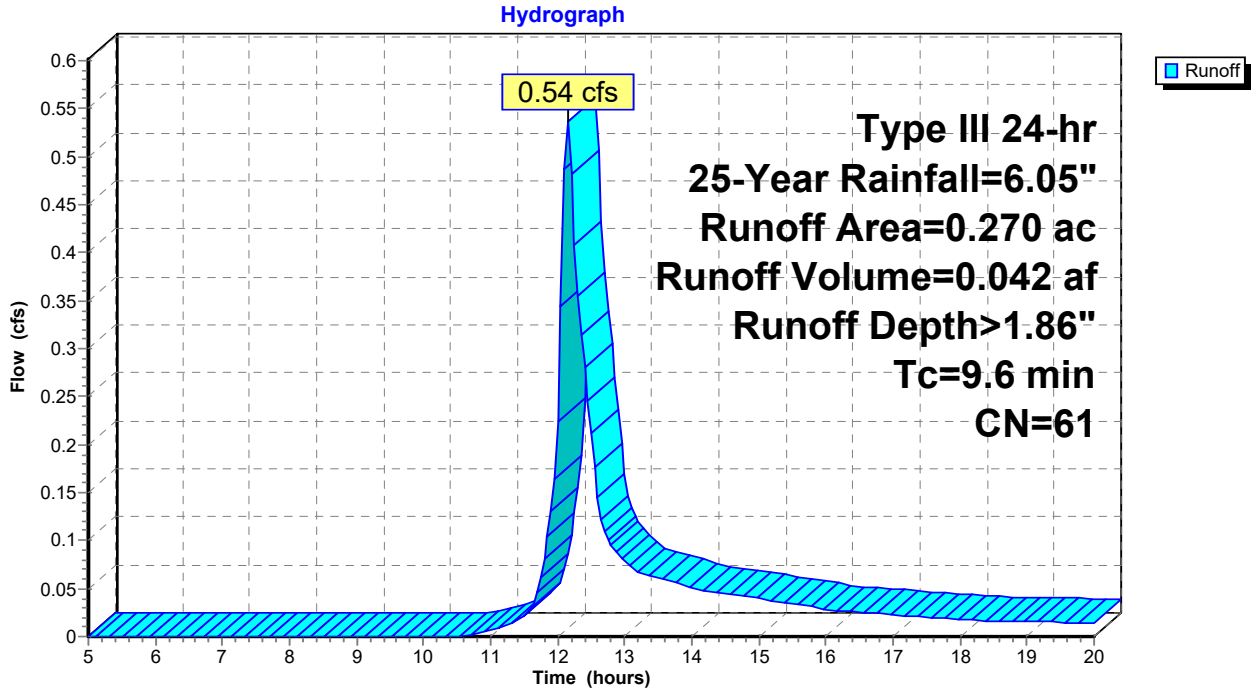
Runoff = 0.54 cfs @ 12.15 hrs, Volume= 0.042 af, Depth> 1.86"

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=6.05"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 3S: EXWS-30 / C



Summary for Subcatchment 7S: PRWS-10

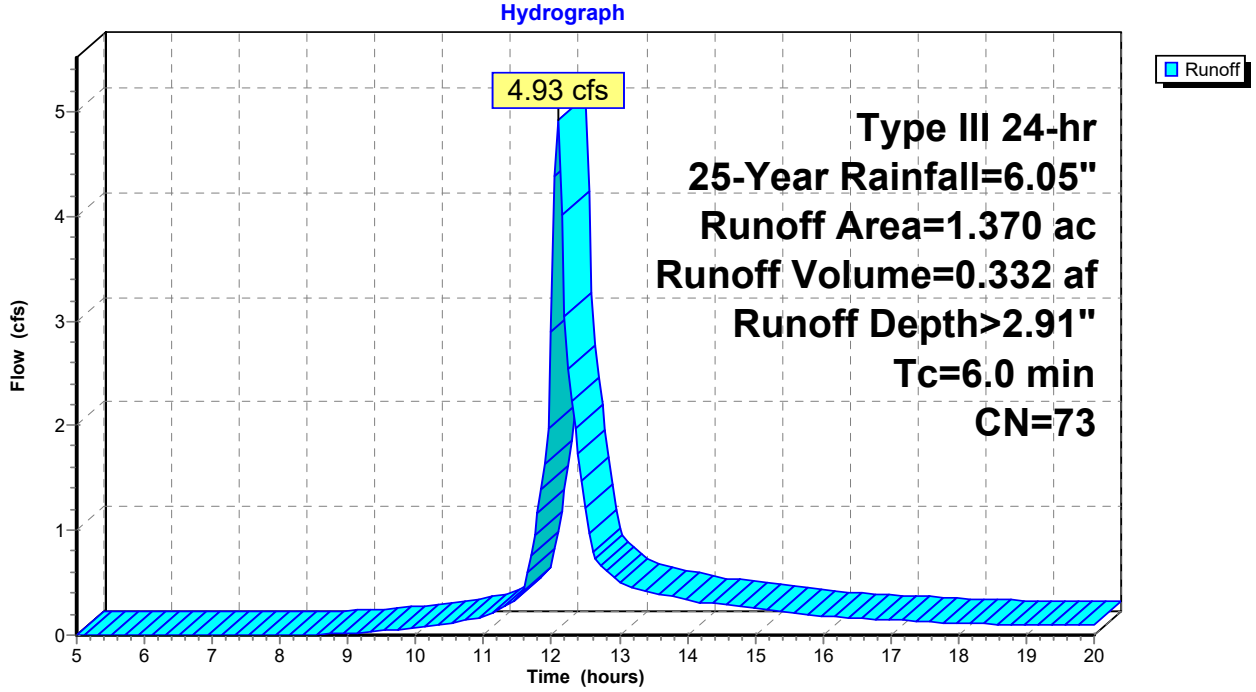
Runoff = 4.93 cfs @ 12.09 hrs, Volume= 0.332 af, Depth> 2.91"
Routed to Link 12L : PR / A

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=6.05"

	Area (ac)	CN	Description
*	1.370	73	
	1.370		100.00% Pervious Area

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

Subcatchment 7S: PRWS-10



Summary for Subcatchment 8S: PRWS-11

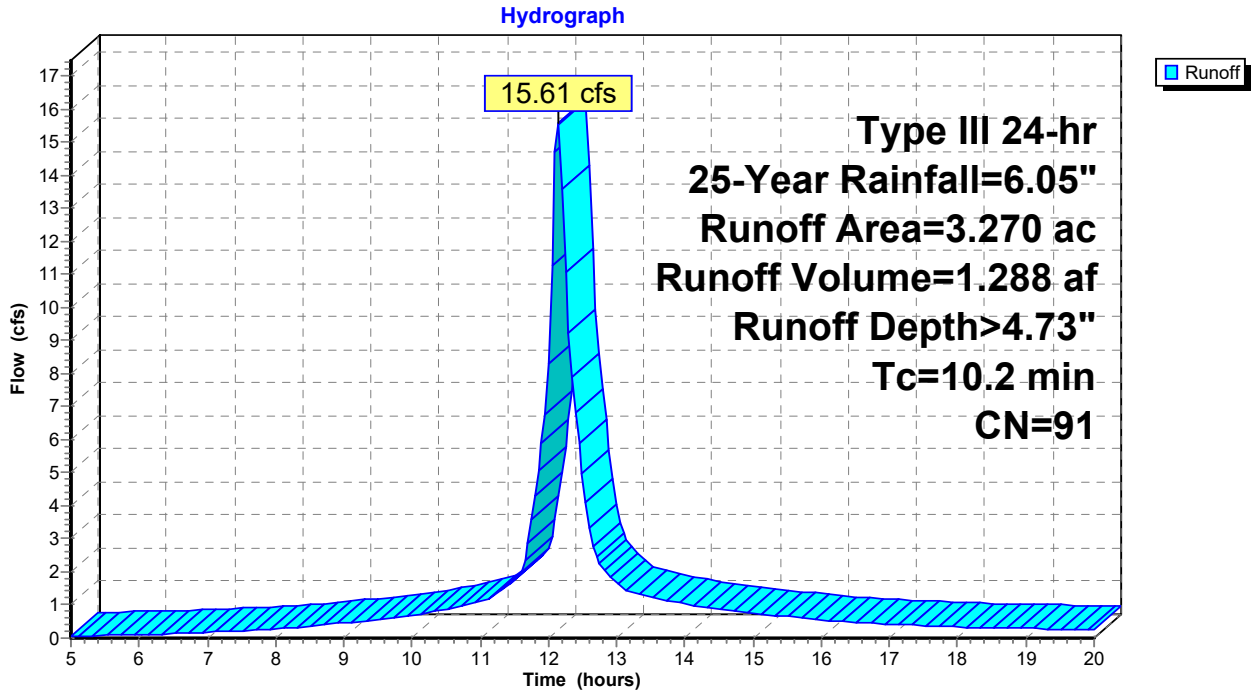
Runoff = 15.61 cfs @ 12.14 hrs, Volume= 1.288 af, Depth> 4.73"
Routed to Pond 11P : DET 110

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=6.05"

	Area (ac)	CN	Description
*	3.270	91	
	3.270		100.00% Pervious Area

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

Subcatchment 8S: PRWS-11



Summary for Subcatchment 9S: PRWS-30 / C

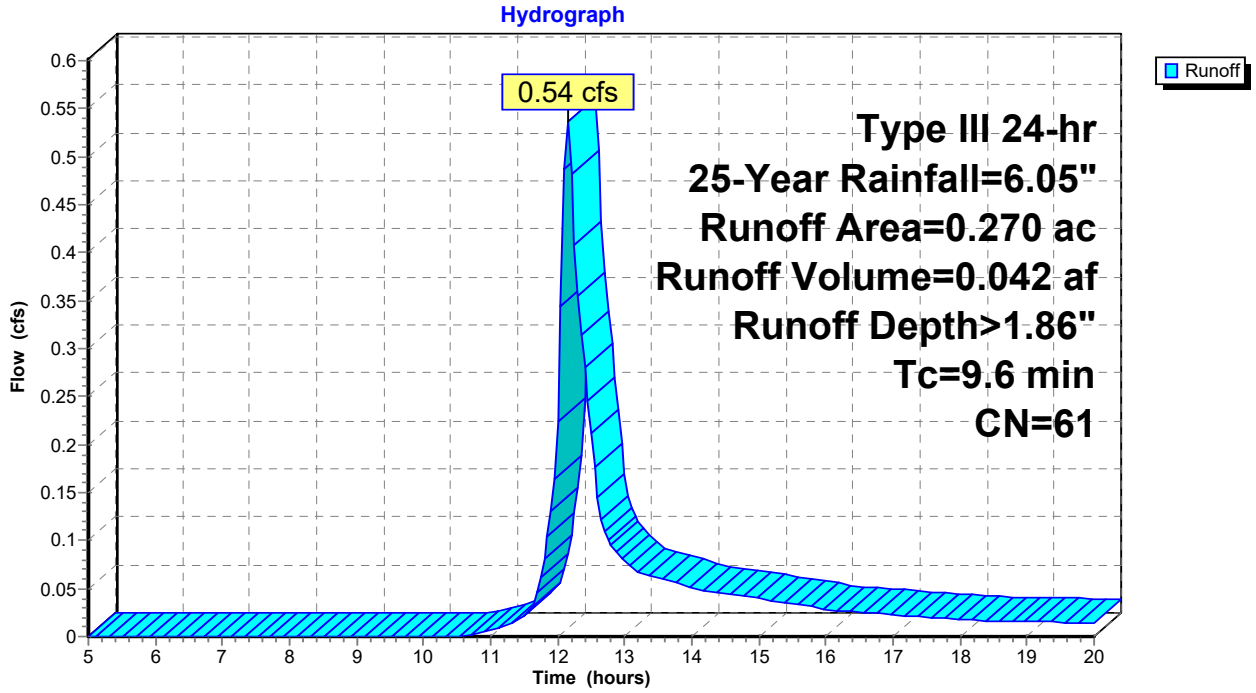
Runoff = 0.54 cfs @ 12.15 hrs, Volume= 0.042 af, Depth> 1.86"

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=6.05"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 9S: PRWS-30 / C



Summary for Subcatchment 13S: PRWS-20 / B

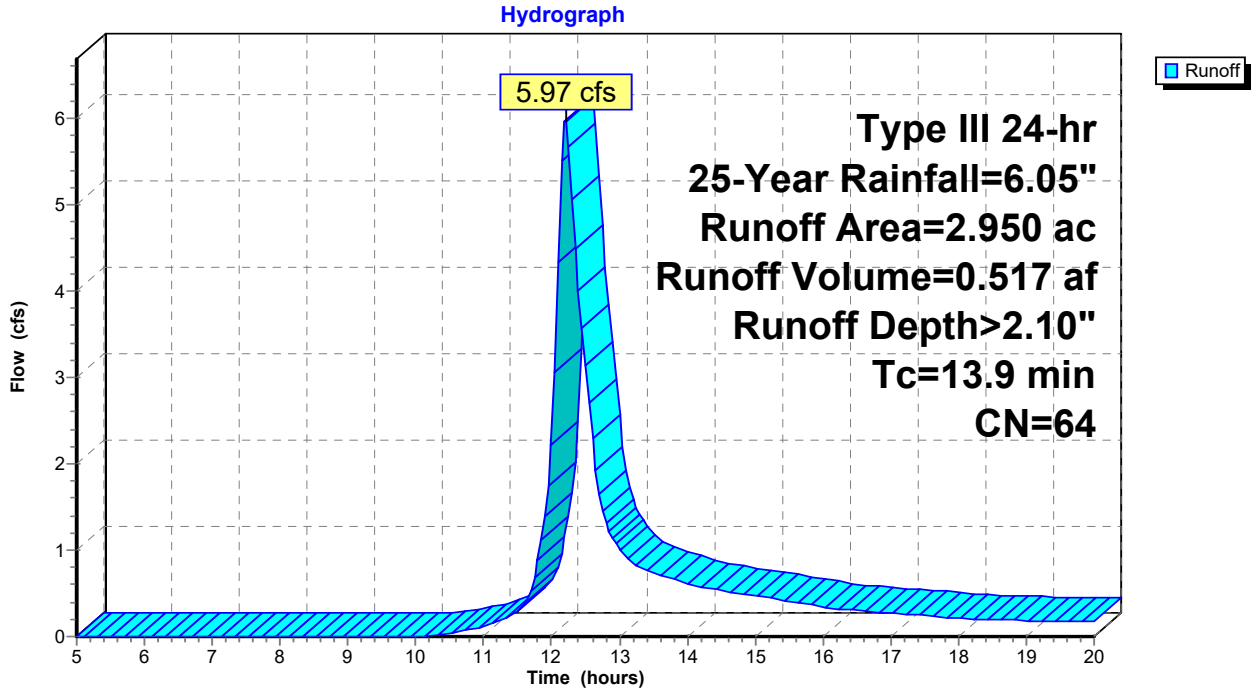
Runoff = 5.97 cfs @ 12.20 hrs, Volume= 0.517 af, Depth> 2.10"

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=6.05"

	Area (ac)	CN	Description
*	2.950	64	
	2.950		100.00% Pervious Area

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

Subcatchment 13S: PRWS-20 / B



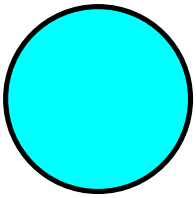
Summary for Reach 5R: 18" PIPE

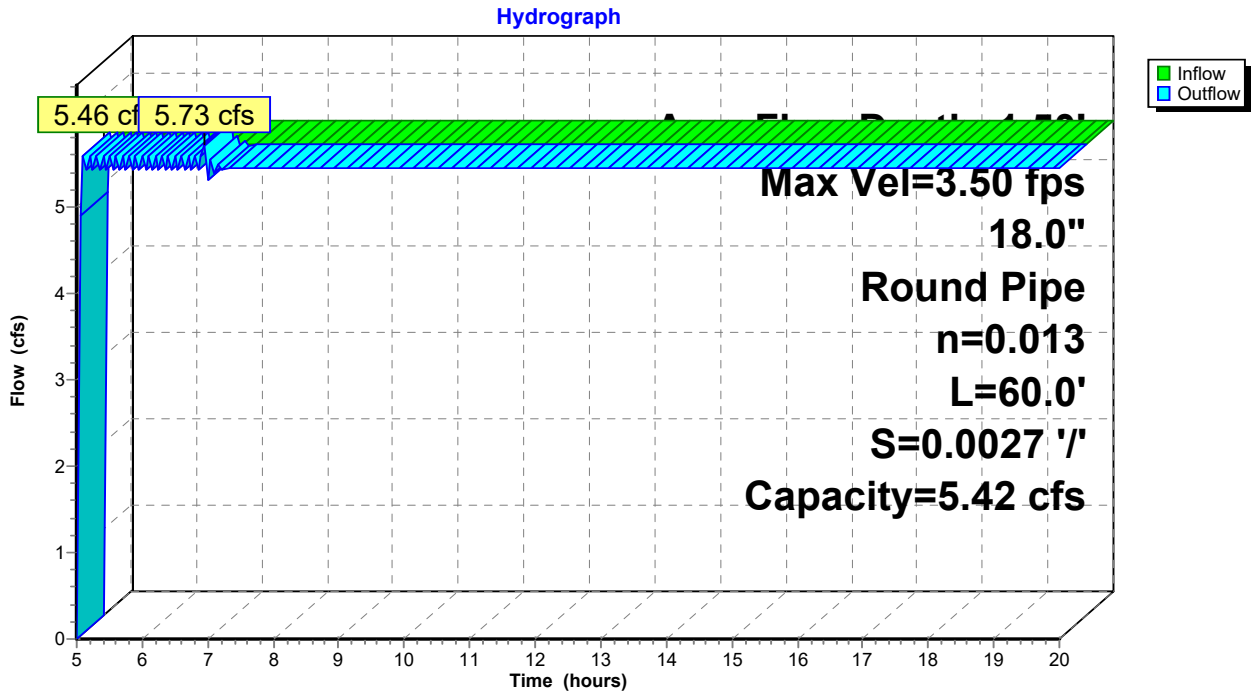
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 6L : EX / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





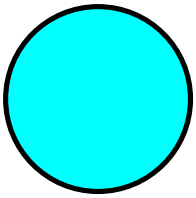
Summary for Reach 10R: 18" PIPE

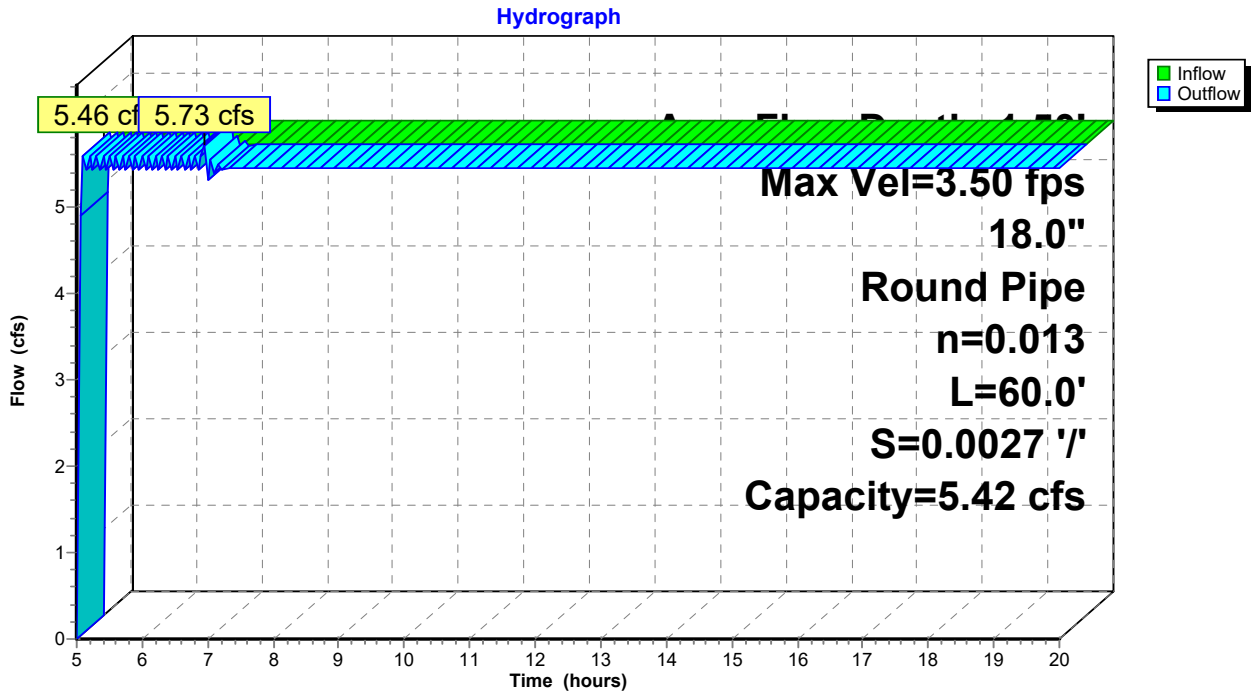
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 12L : PR / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





Summary for Pond 11P: DET 110

Inflow Area = 3.270 ac, 0.00% Impervious, Inflow Depth > 4.73" for 25-Year event
Inflow = 15.61 cfs @ 12.14 hrs, Volume= 1.288 af
Outflow = 9.40 cfs @ 12.31 hrs, Volume= 1.036 af, Atten= 40%, Lag= 9.9 min
Primary = 9.40 cfs @ 12.31 hrs, Volume= 1.036 af
Routed to Link 12L : PR / A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.50' @ 12.31 hrs Surf.Area= 0.134 ac Storage= 0.527 af

Plug-Flow detention time= 116.3 min calculated for 1.033 af (80% of inflow)
Center-of-Mass det. time= 64.5 min (821.1 - 756.5)

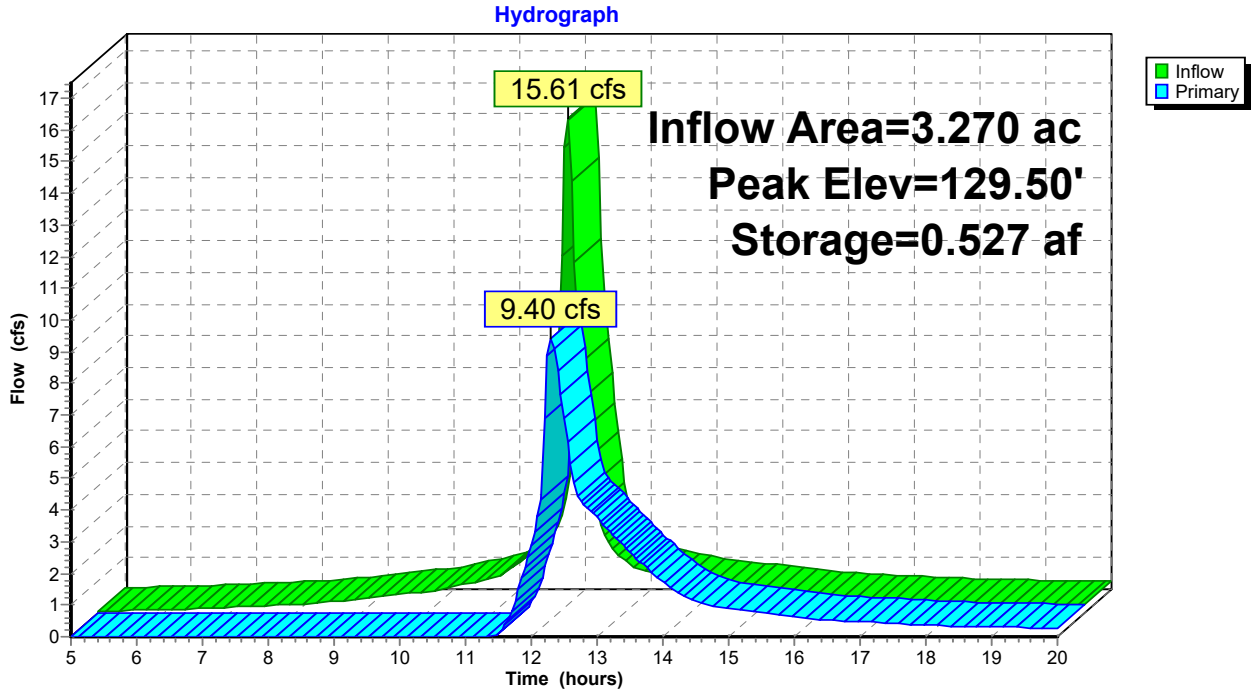
Volume	Invert	Avail.Storage	Storage Description
#1A	125.10'	0.000 af	**56.00'W x 104.00'L x 5.67'H Field A** 0.758 af Overall - 0.758 af Embedded = 0.000 af x 40.0% Voids
#2A	125.10'	0.599 af	**retain_it retain_it 5.0'** x 91 Inside #1 Inside= 84.0"W x 60.0"H => 36.41 sf x 8.00'L = 291.3 cf Outside= 96.0"W x 68.0"H => 45.33 sf x 8.00'L = 362.7 cf 7 Rows adjusted for 415.6 cf perimeter wall
		0.599 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.00' / 122.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	129.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=9.36 cfs @ 12.31 hrs HW=129.49' (Free Discharge)
↑└**1=Culvert** (Passes 9.36 cfs of 16.10 cfs potential flow)
↑└**2=Orifice/Grate** (Orifice Controls 4.94 cfs @ 7.08 fps)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 4.42 cfs @ 2.30 fps)

Pond 11P: DET 110

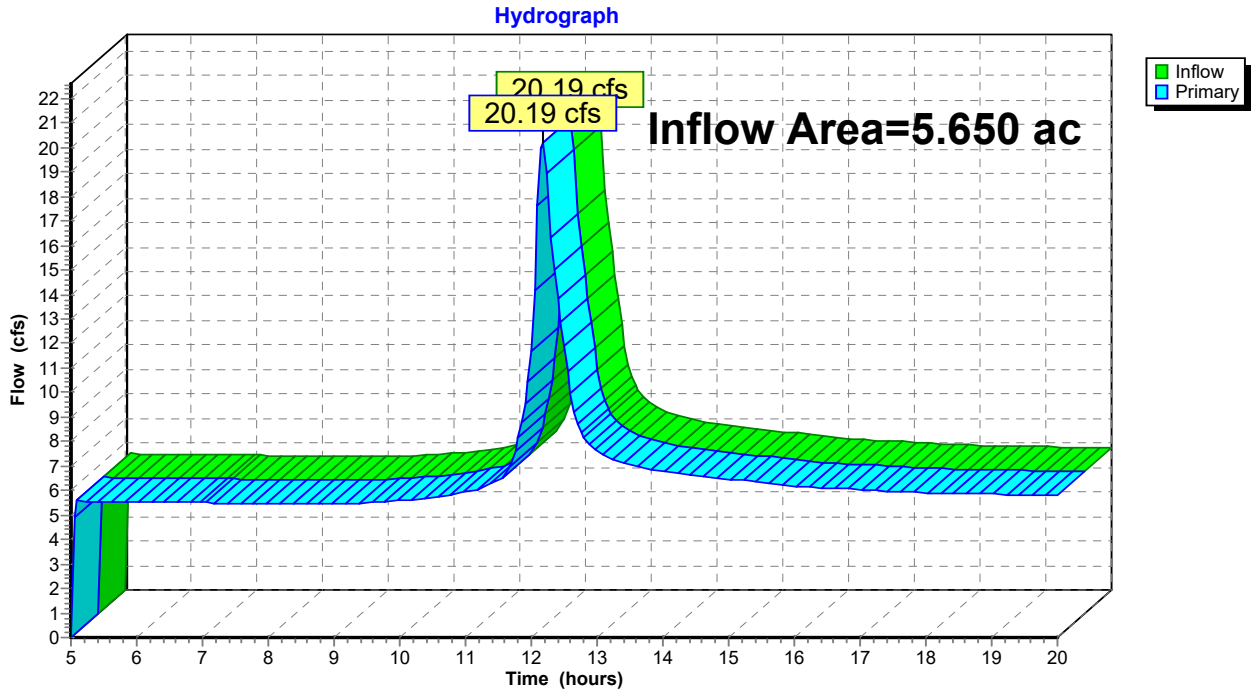


Summary for Link 6L: EX / A

Inflow Area = 5.650 ac, 0.00% Impervious, Inflow Depth > 16.93" for 25-Year event
Inflow = 20.19 cfs @ 12.17 hrs, Volume= 7.971 af
Primary = 20.19 cfs @ 12.17 hrs, Volume= 7.971 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: EX / A

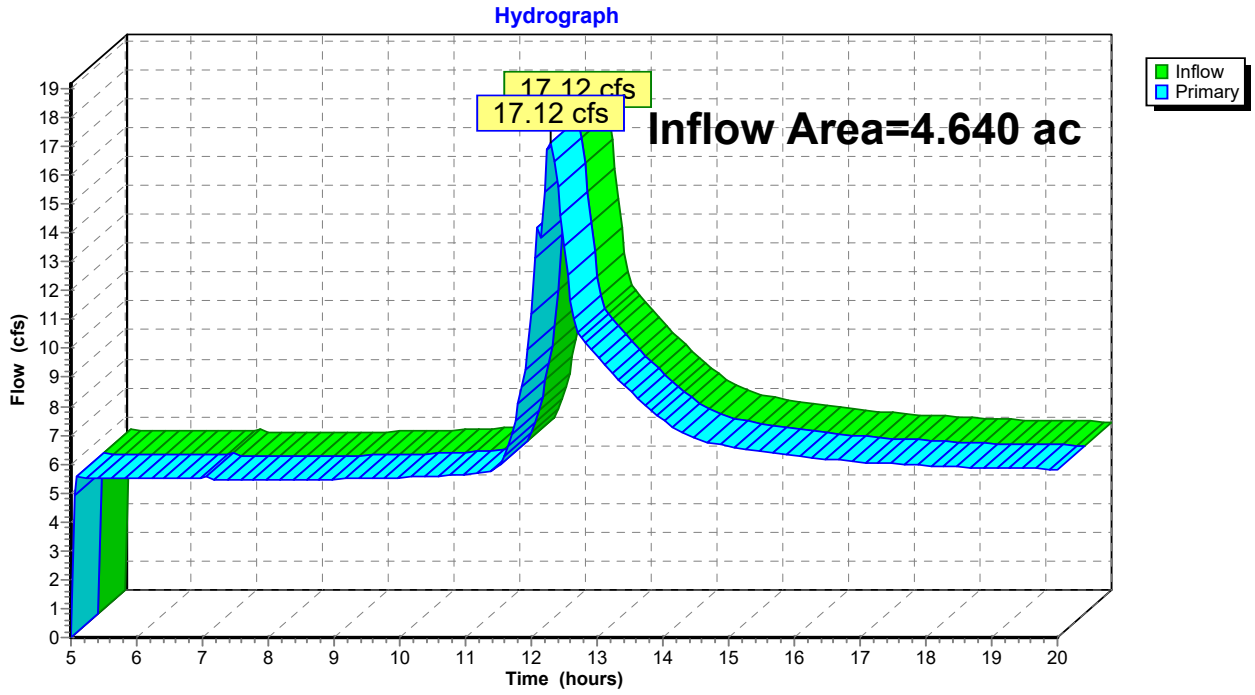


Summary for Link 12L: PR / A

Inflow Area = 4.640 ac, 0.00% Impervious, Inflow Depth > 21.06" for 25-Year event
Inflow = 17.12 cfs @ 12.29 hrs, Volume= 8.144 af
Primary = 17.12 cfs @ 12.29 hrs, Volume= 8.144 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 12L: PR / A



Summary for Subcatchment 1S: EXWS-10

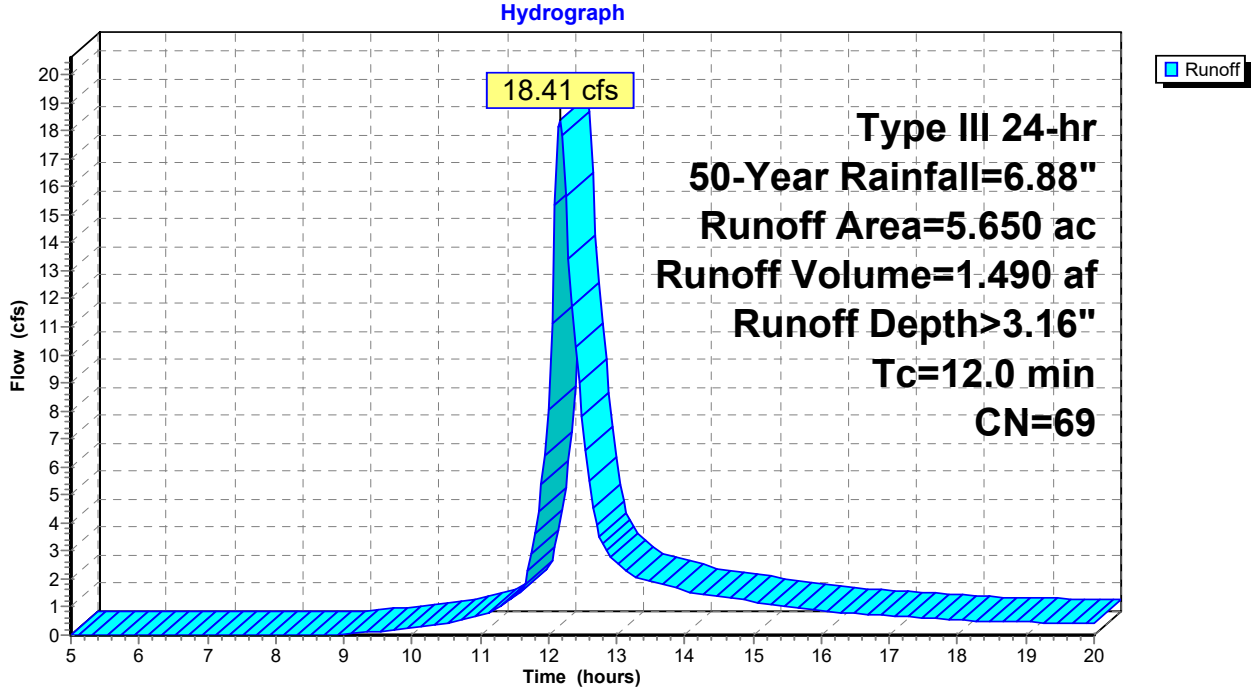
Runoff = 18.41 cfs @ 12.17 hrs, Volume= 1.490 af, Depth> 3.16"
Routed to Link 6L : EX / A

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=6.88"

	Area (ac)	CN	Description
*	5.650	69	
	5.650		100.00% Pervious Area

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

Subcatchment 1S: EXWS-10



Summary for Subcatchment 2S: EXWS-20 / B

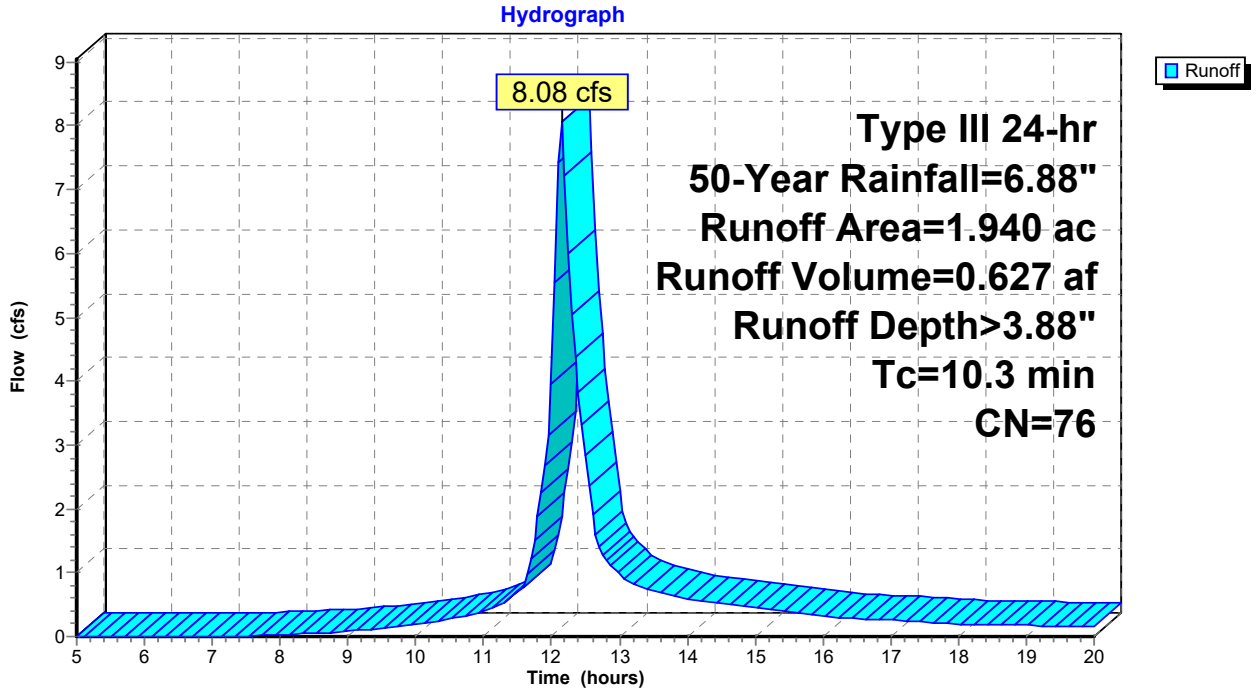
Runoff = 8.08 cfs @ 12.15 hrs, Volume= 0.627 af, Depth> 3.88"

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=6.88"

	Area (ac)	CN	Description
*	1.940	76	
	1.940		100.00% Pervious Area

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

Subcatchment 2S: EXWS-20 / B



Summary for Subcatchment 3S: EXWS-30 / C

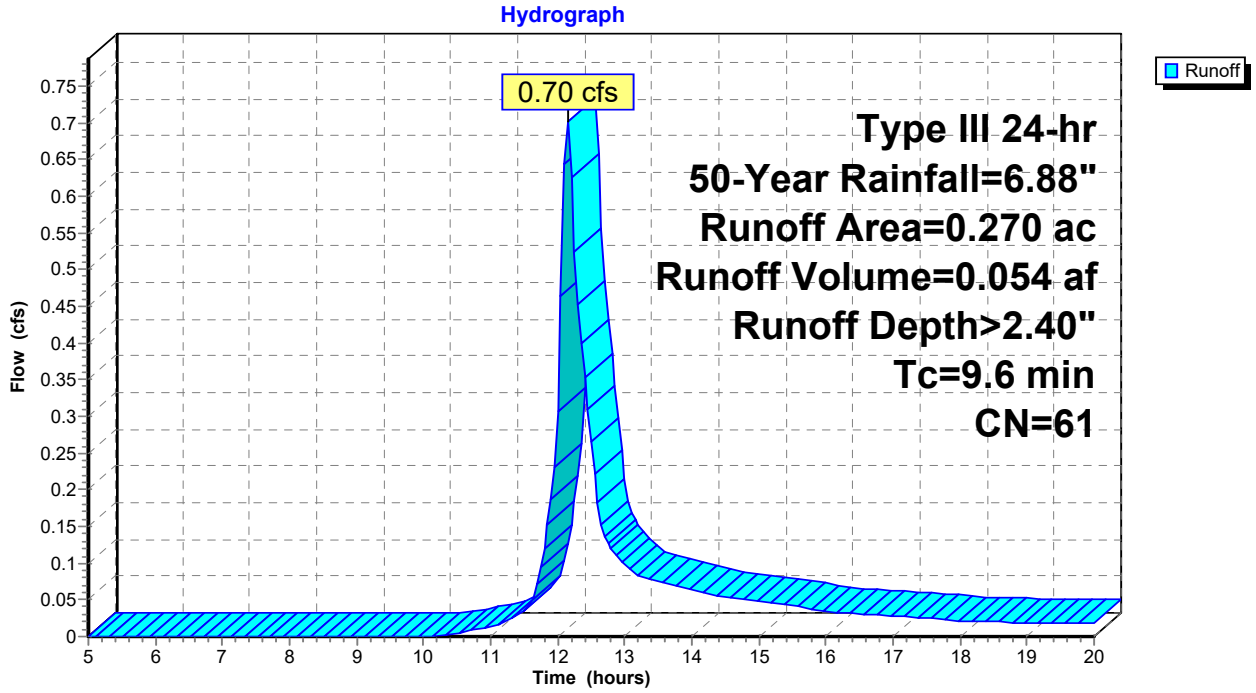
Runoff = 0.70 cfs @ 12.15 hrs, Volume= 0.054 af, Depth> 2.40"

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=6.88"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 3S: EXWS-30 / C



Summary for Subcatchment 7S: PRWS-10

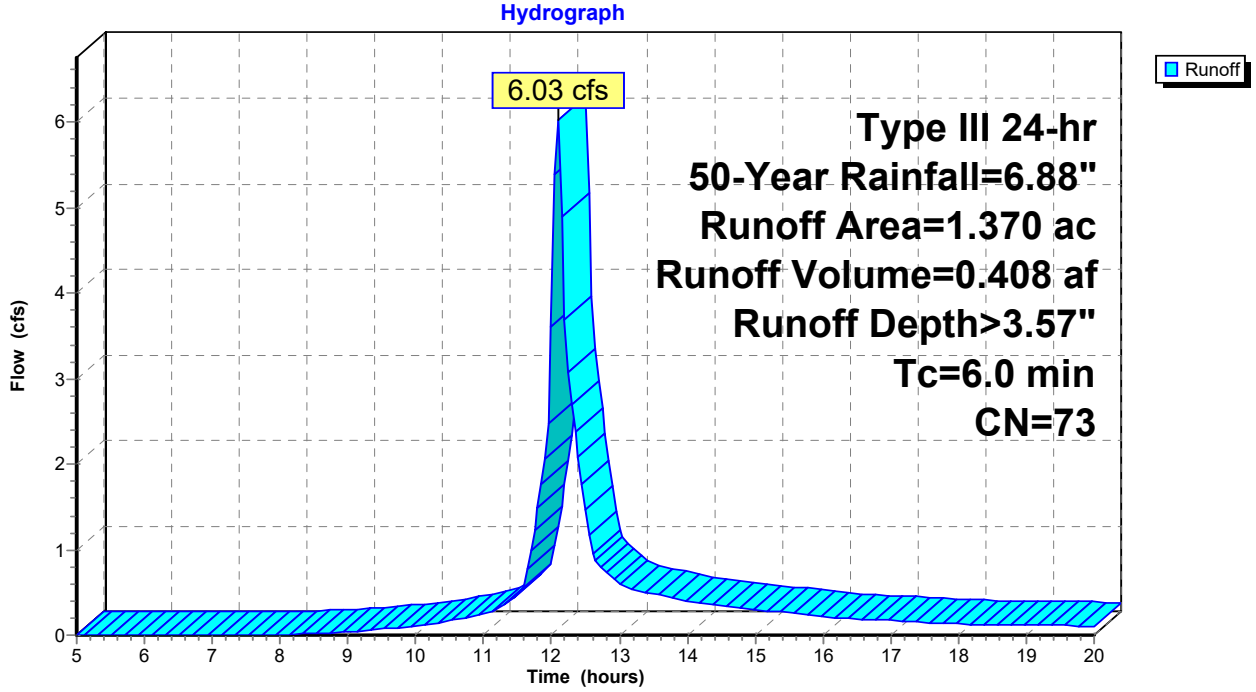
Runoff = 6.03 cfs @ 12.09 hrs, Volume= 0.408 af, Depth> 3.57"
Routed to Link 12L : PR / A

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=6.88"

	Area (ac)	CN	Description
*	1.370	73	
	1.370		100.00% Pervious Area

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

Subcatchment 7S: PRWS-10



Summary for Subcatchment 8S: PRWS-11

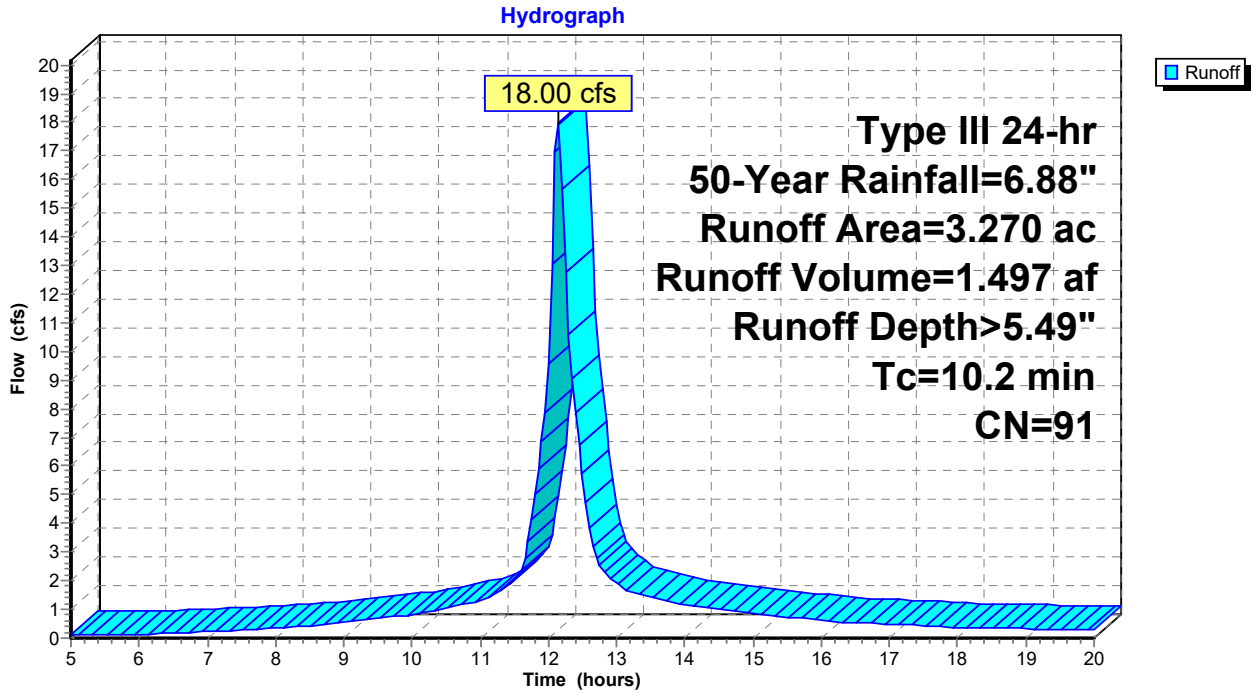
Runoff = 18.00 cfs @ 12.14 hrs, Volume= 1.497 af, Depth> 5.49"
Routed to Pond 11P : DET 110

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=6.88"

	Area (ac)	CN	Description
*	3.270	91	
	3.270		100.00% Pervious Area

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

Subcatchment 8S: PRWS-11



Summary for Subcatchment 9S: PRWS-30 / C

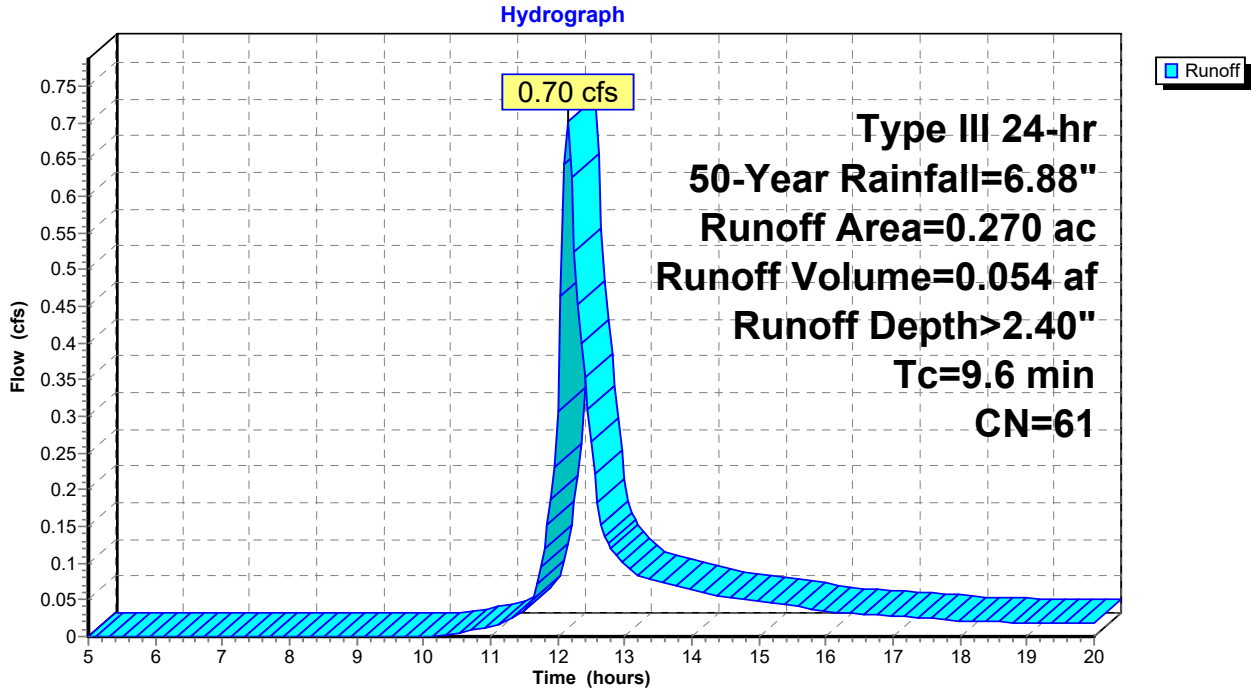
Runoff = 0.70 cfs @ 12.15 hrs, Volume= 0.054 af, Depth> 2.40"

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=6.88"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 9S: PRWS-30 / C



Summary for Subcatchment 13S: PRWS-20 / B

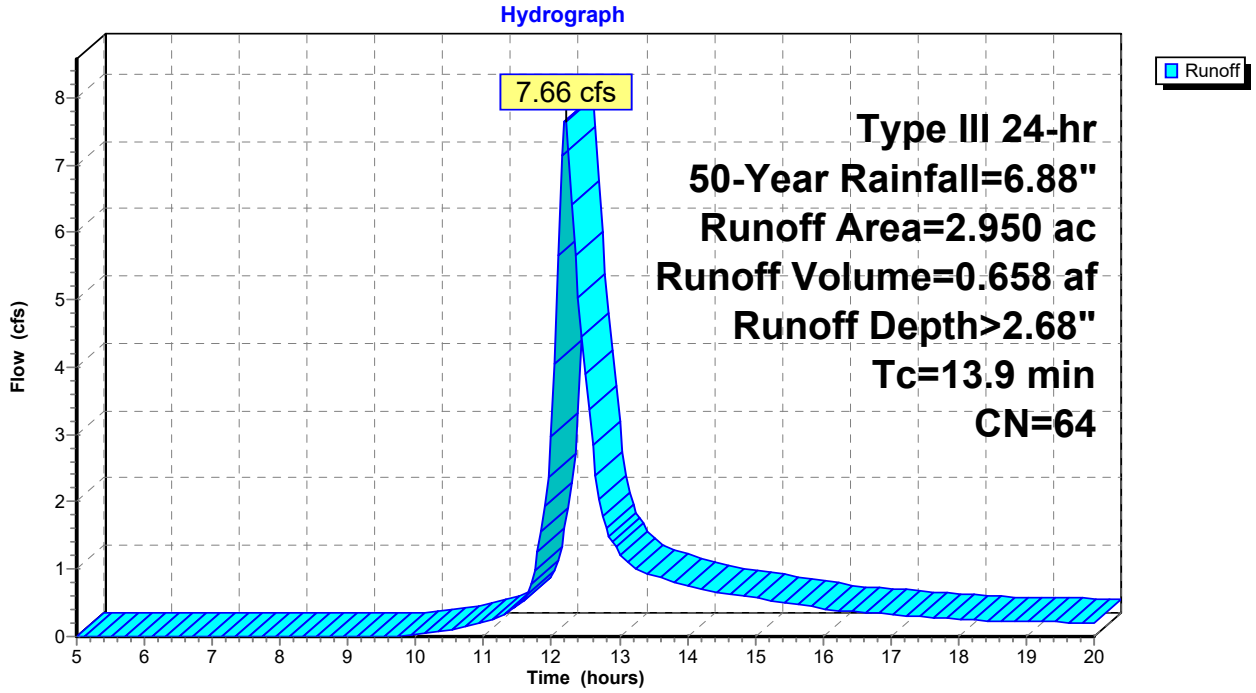
Runoff = 7.66 cfs @ 12.20 hrs, Volume= 0.658 af, Depth> 2.68"

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=6.88"

	Area (ac)	CN	Description
*	2.950	64	
	2.950		100.00% Pervious Area

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

Subcatchment 13S: PRWS-20 / B



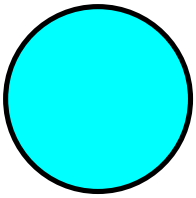
Summary for Reach 5R: 18" PIPE

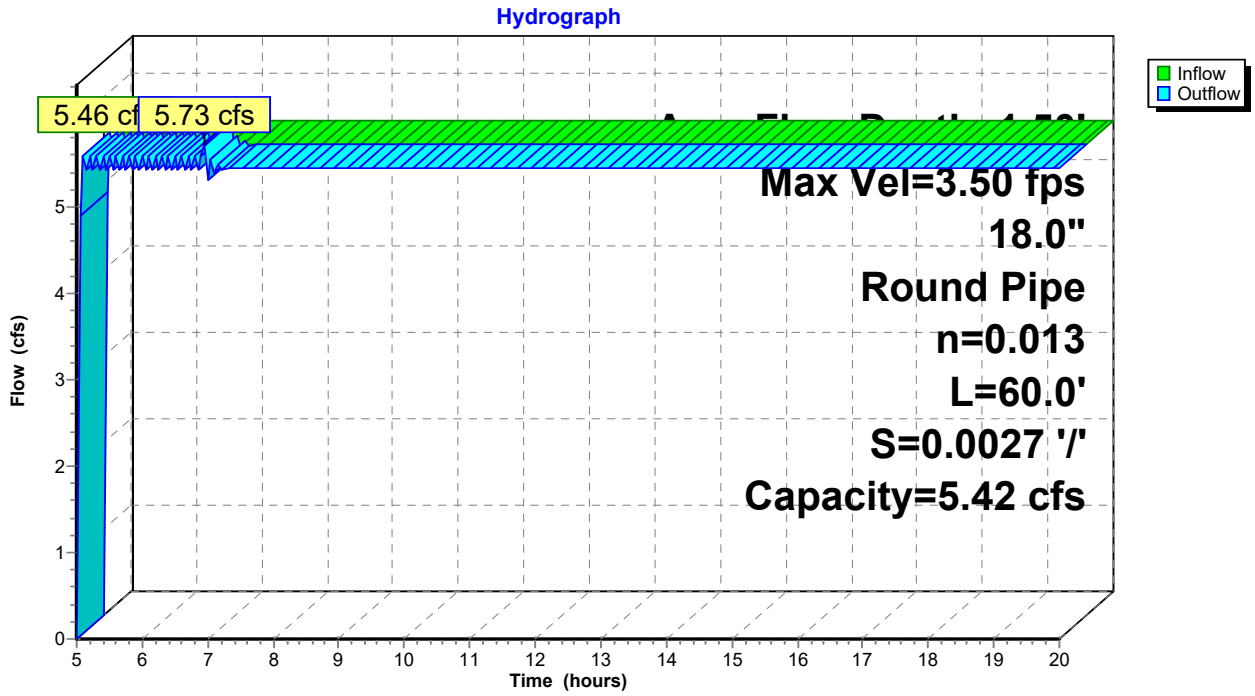
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 6L : EX / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





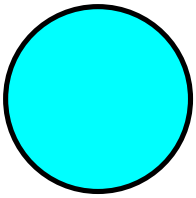
Summary for Reach 10R: 18" PIPE

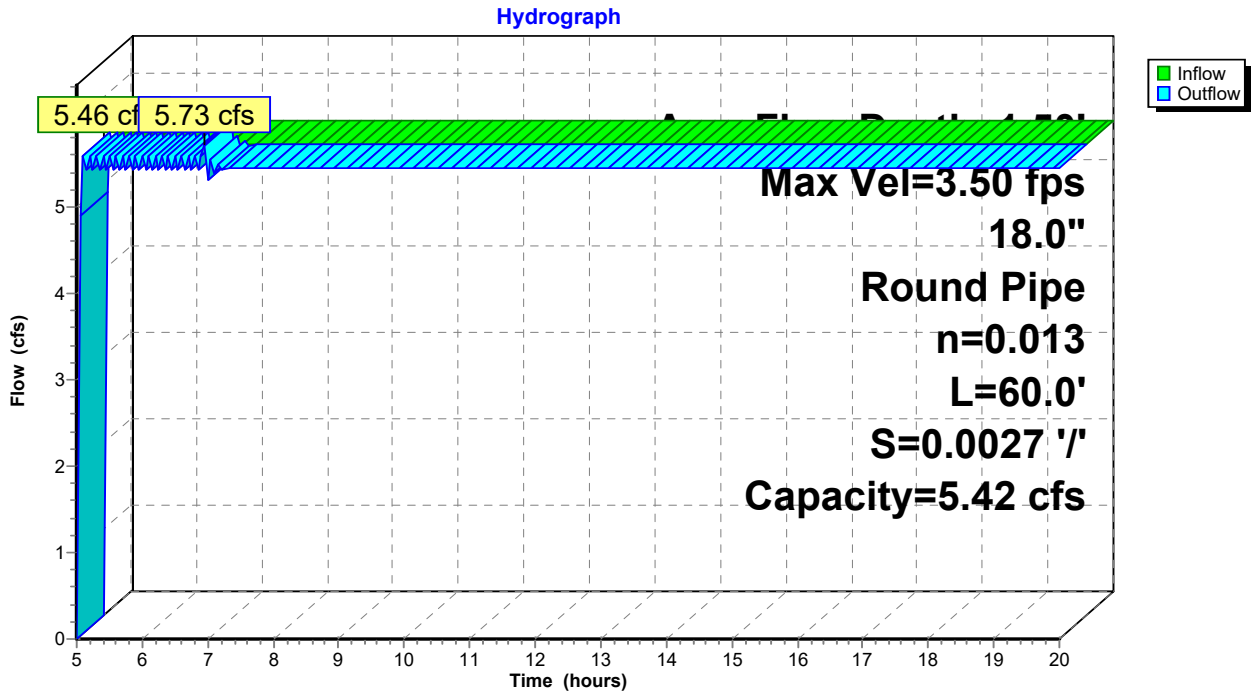
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 12L : PR / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





Summary for Pond 11P: DET 110

Inflow Area = 3.270 ac, 0.00% Impervious, Inflow Depth > 5.49" for 50-Year event
Inflow = 18.00 cfs @ 12.14 hrs, Volume= 1.497 af
Outflow = 12.62 cfs @ 12.26 hrs, Volume= 1.243 af, Atten= 30%, Lag= 7.4 min
Primary = 12.62 cfs @ 12.26 hrs, Volume= 1.243 af
Routed to Link 12L : PR / A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.70' @ 12.26 hrs Surf.Area= 0.134 ac Storage= 0.551 af

Plug-Flow detention time= 109.0 min calculated for 1.243 af (83% of inflow)
Center-of-Mass det. time= 60.7 min (814.5 - 753.8)

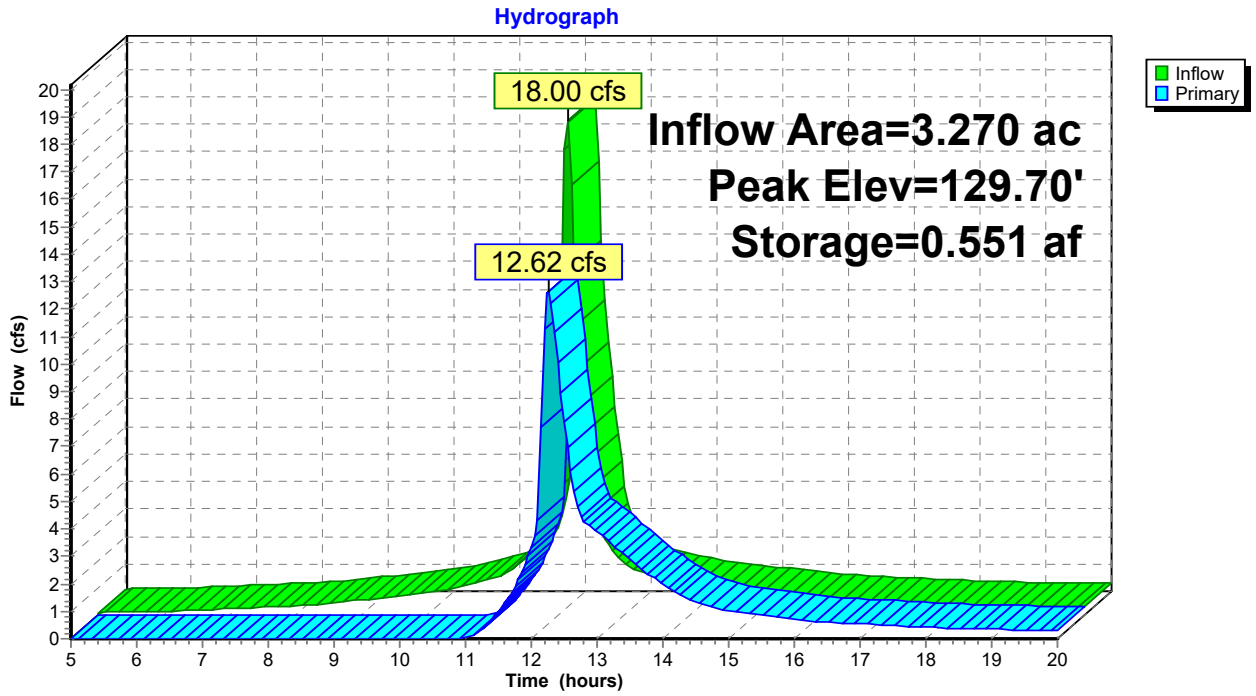
Volume	Invert	Avail.Storage	Storage Description
#1A	125.10'	0.000 af	**56.00'W x 104.00'L x 5.67'H Field A** 0.758 af Overall - 0.758 af Embedded = 0.000 af x 40.0% Voids
#2A	125.10'	0.599 af	**retain_it retain_it 5.0'** x 91 Inside #1 Inside= 84.0"W x 60.0"H => 36.41 sf x 8.00'L = 291.3 cf Outside= 96.0"W x 68.0"H => 45.33 sf x 8.00'L = 362.7 cf 7 Rows adjusted for 415.6 cf perimeter wall
		0.599 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.00' / 122.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	129.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=12.46 cfs @ 12.26 hrs HW=129.69' (Free Discharge)
└**1=Culvert** (Passes 12.46 cfs of 16.38 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 5.16 cfs @ 7.40 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 7.29 cfs @ 2.72 fps)

Pond 11P: DET 110

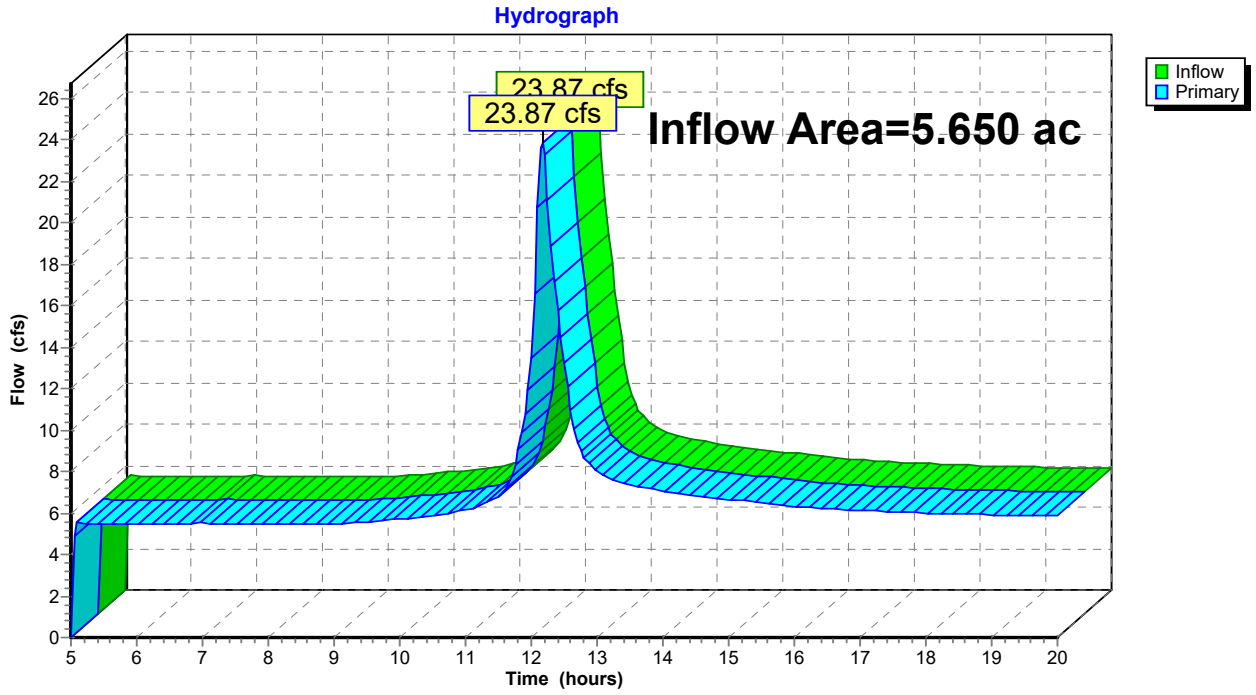


Summary for Link 6L: EX / A

Inflow Area = 5.650 ac, 0.00% Impervious, Inflow Depth > 17.55" for 50-Year event
Inflow = 23.87 cfs @ 12.17 hrs, Volume= 8.265 af
Primary = 23.87 cfs @ 12.17 hrs, Volume= 8.265 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: EX / A

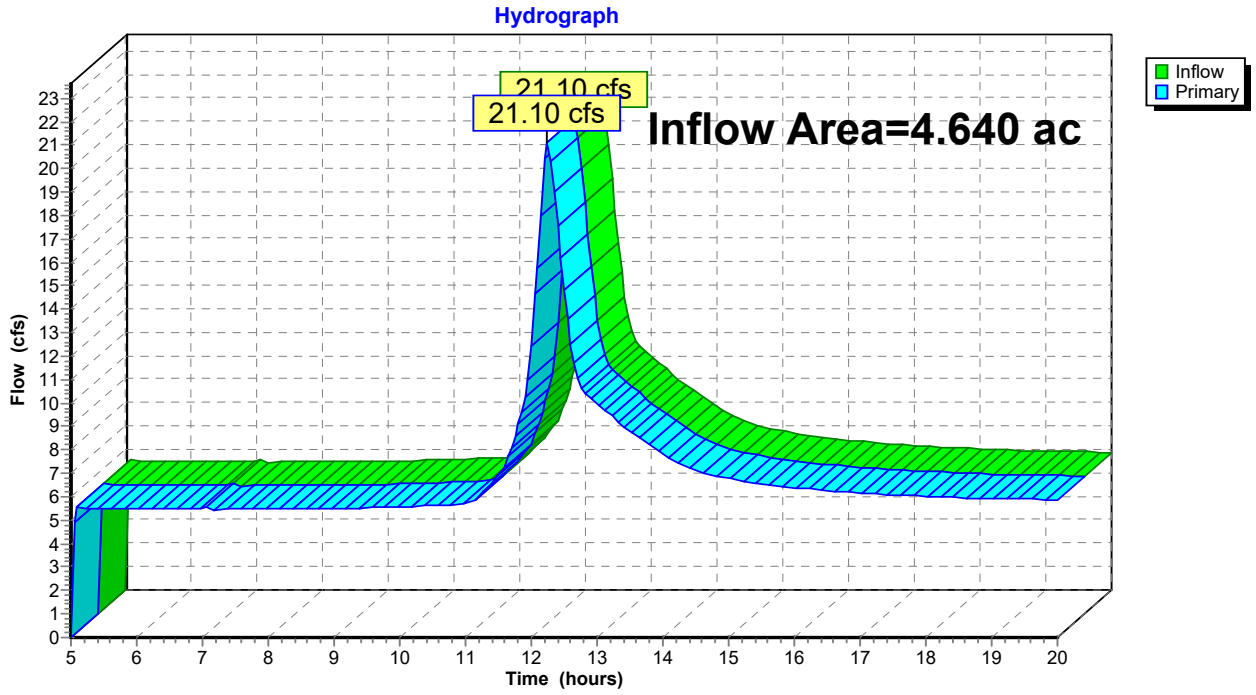


Summary for Link 12L: PR / A

Inflow Area = 4.640 ac, 0.00% Impervious, Inflow Depth > 21.79" for 50-Year event
Inflow = 21.10 cfs @ 12.25 hrs, Volume= 8.427 af
Primary = 21.10 cfs @ 12.25 hrs, Volume= 8.427 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 12L: PR / A



Summary for Subcatchment 1S: EXWS-10

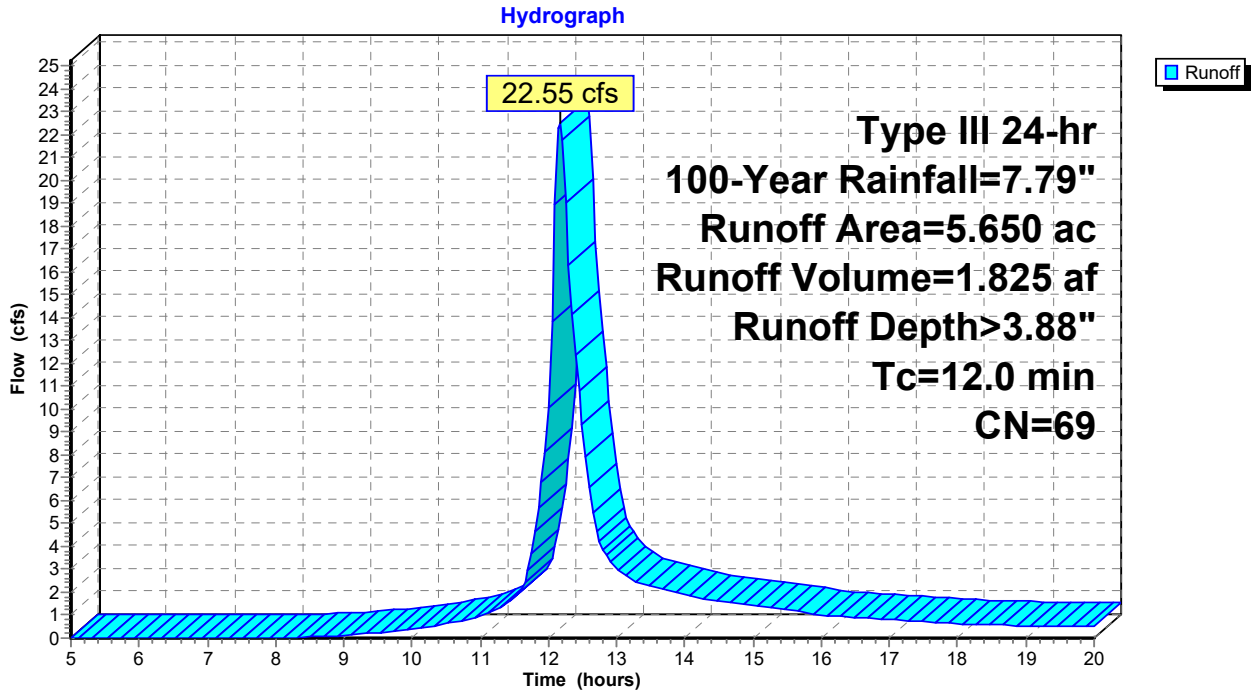
Runoff = 22.55 cfs @ 12.17 hrs, Volume= 1.825 af, Depth> 3.88"
Routed to Link 6L : EX / A

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=7.79"

	Area (ac)	CN	Description
*	5.650	69	
	5.650		100.00% Pervious Area

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

Subcatchment 1S: EXWS-10



Summary for Subcatchment 2S: EXWS-20 / B

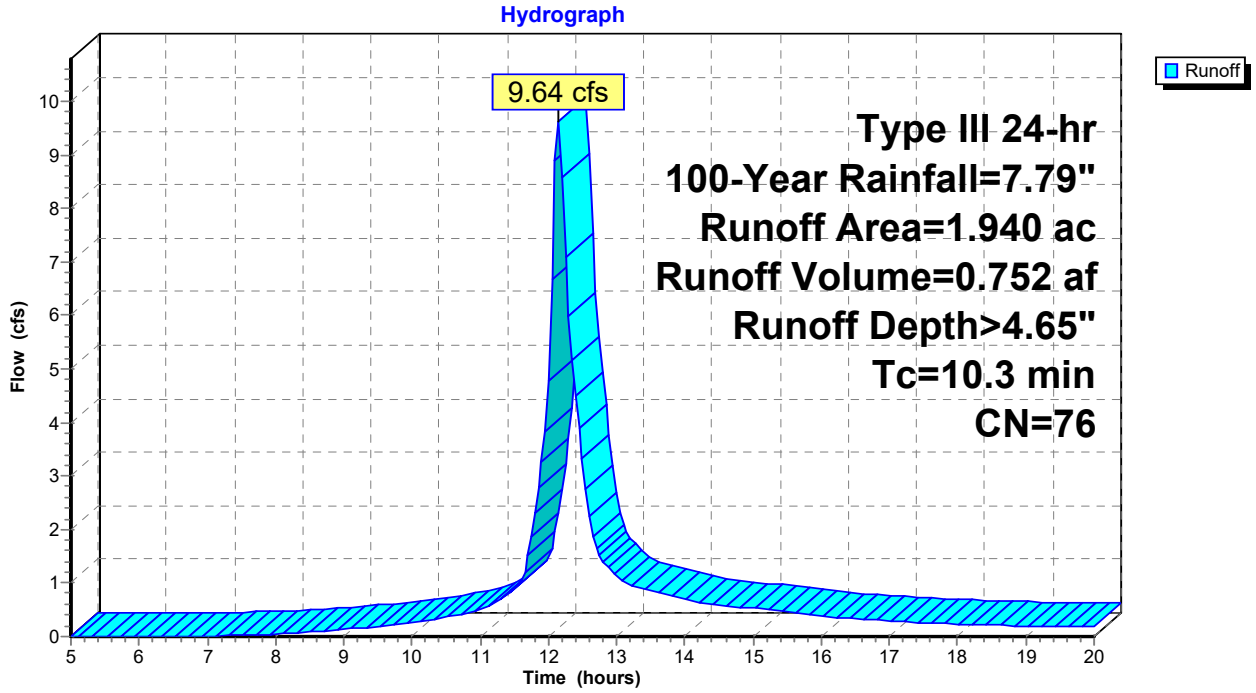
Runoff = 9.64 cfs @ 12.15 hrs, Volume= 0.752 af, Depth> 4.65"

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=7.79"

	Area (ac)	CN	Description
*	1.940	76	
	1.940		100.00% Pervious Area

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

Subcatchment 2S: EXWS-20 / B



Summary for Subcatchment 3S: EXWS-30 / C

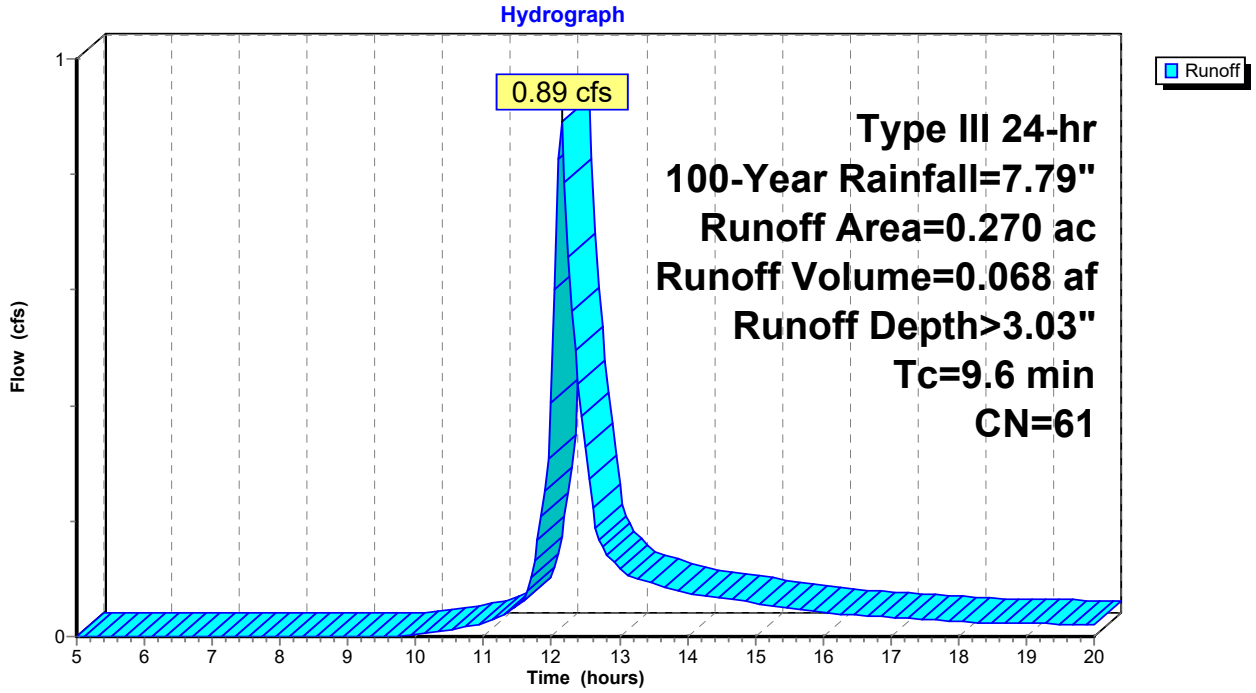
Runoff = 0.89 cfs @ 12.14 hrs, Volume= 0.068 af, Depth> 3.03"

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=7.79"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 3S: EXWS-30 / C



Summary for Subcatchment 7S: PRWS-10

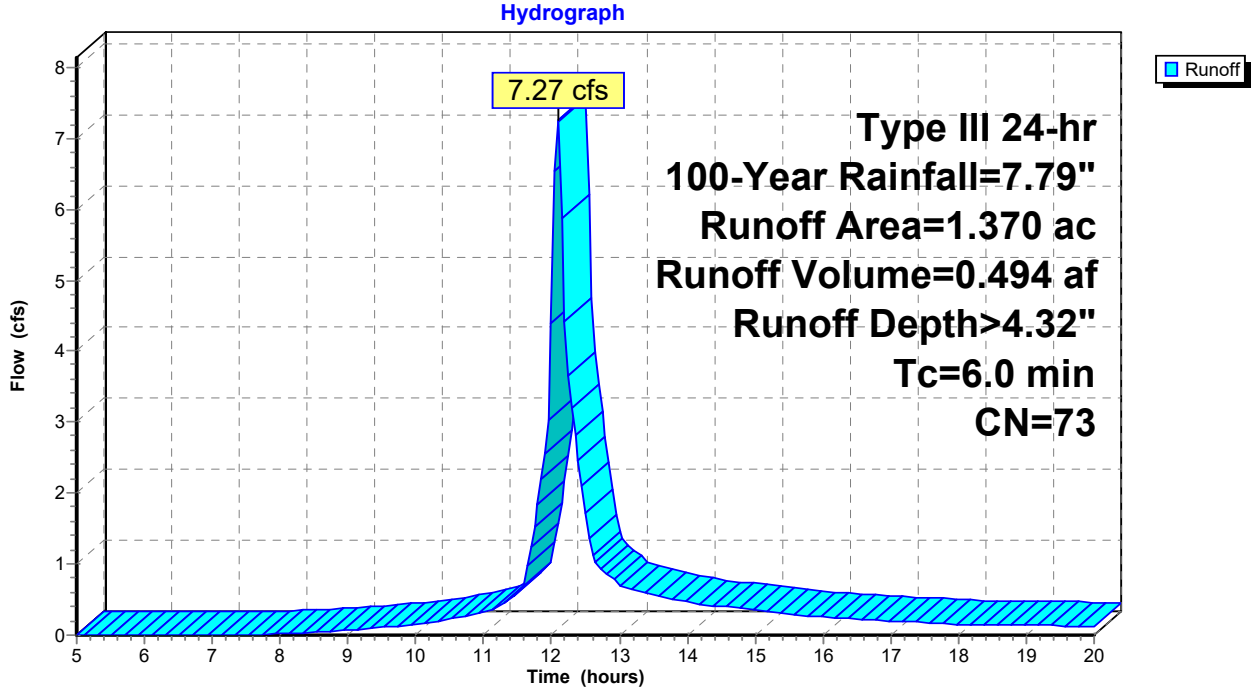
Runoff = 7.27 cfs @ 12.09 hrs, Volume= 0.494 af, Depth> 4.32"
Routed to Link 12L : PR / A

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=7.79"

	Area (ac)	CN	Description
*	1.370	73	
	1.370		100.00% Pervious Area

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

Subcatchment 7S: PRWS-10



Summary for Subcatchment 8S: PRWS-11

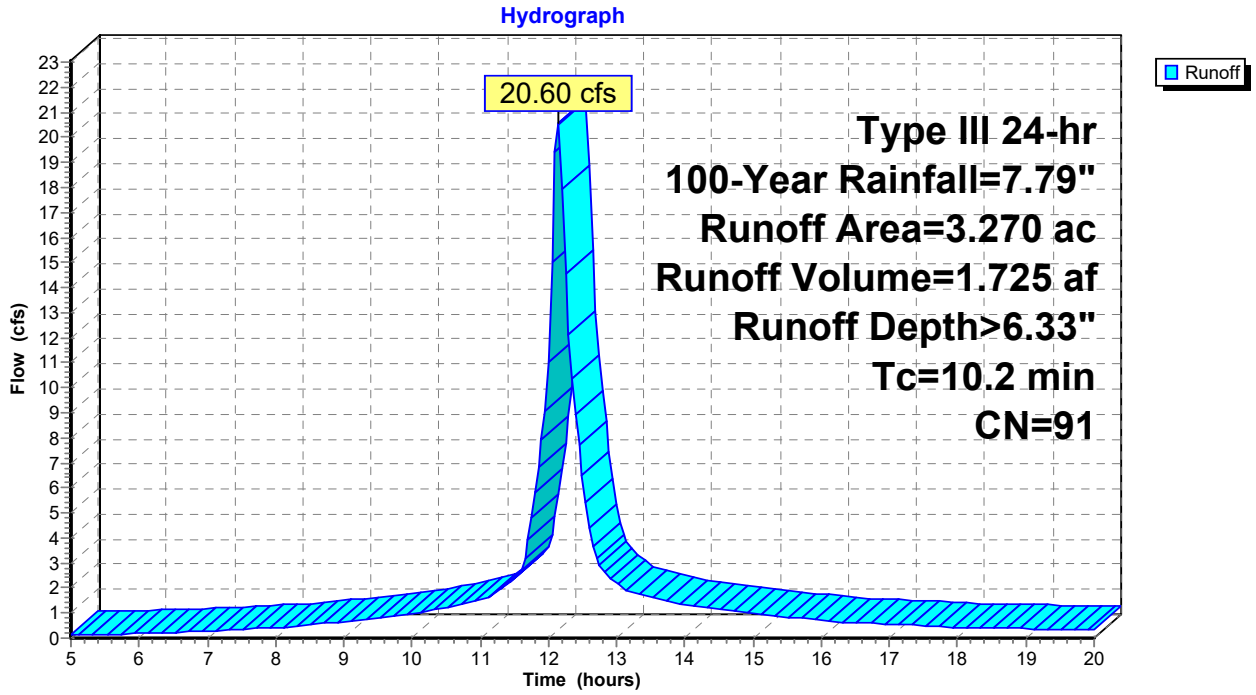
Runoff = 20.60 cfs @ 12.14 hrs, Volume= 1.725 af, Depth> 6.33"
Routed to Pond 11P : DET 110

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=7.79"

	Area (ac)	CN	Description
*	3.270	91	
	3.270		100.00% Pervious Area

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

Subcatchment 8S: PRWS-11



Summary for Subcatchment 9S: PRWS-30 / C

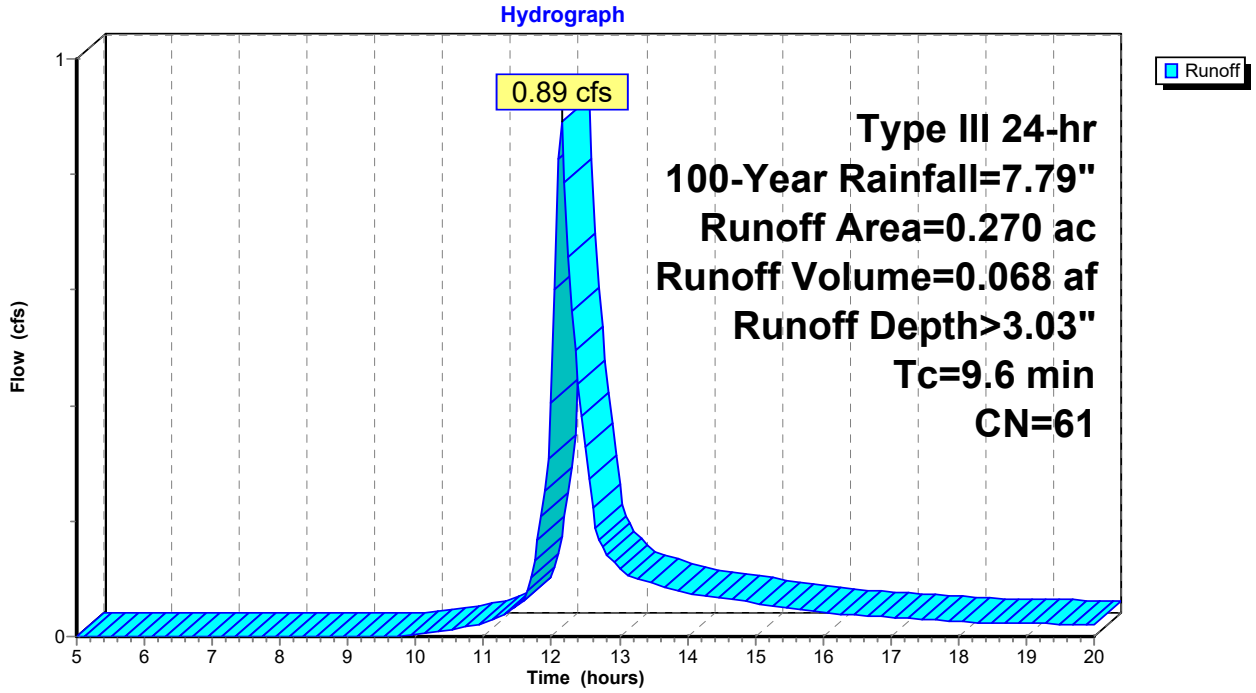
Runoff = 0.89 cfs @ 12.14 hrs, Volume= 0.068 af, Depth> 3.03"

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=7.79"

	Area (ac)	CN	Description
*	0.270	61	
	0.270		100.00% Pervious Area

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

Subcatchment 9S: PRWS-30 / C



Summary for Subcatchment 13S: PRWS-20 / B

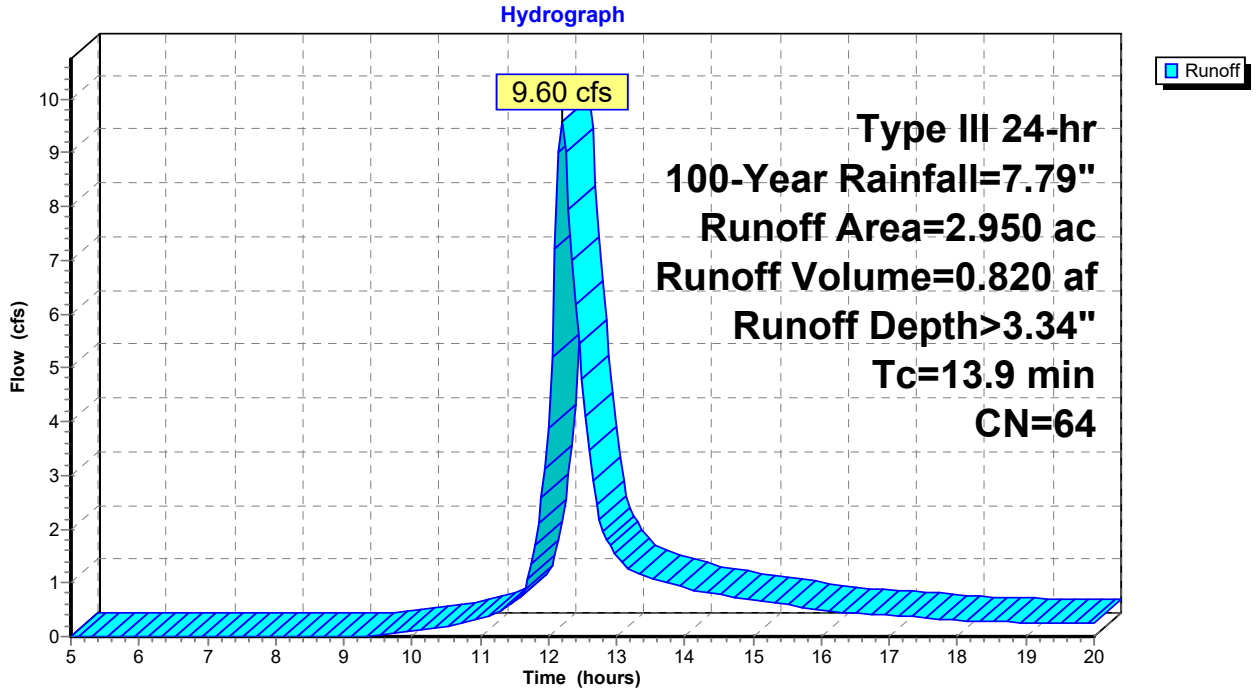
Runoff = 9.60 cfs @ 12.20 hrs, Volume= 0.820 af, Depth> 3.34"

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=7.79"

	Area (ac)	CN	Description
*	2.950	64	
	2.950		100.00% Pervious Area

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

Subcatchment 13S: PRWS-20 / B



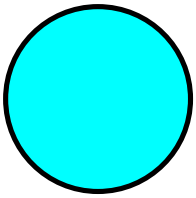
Summary for Reach 5R: 18" PIPE

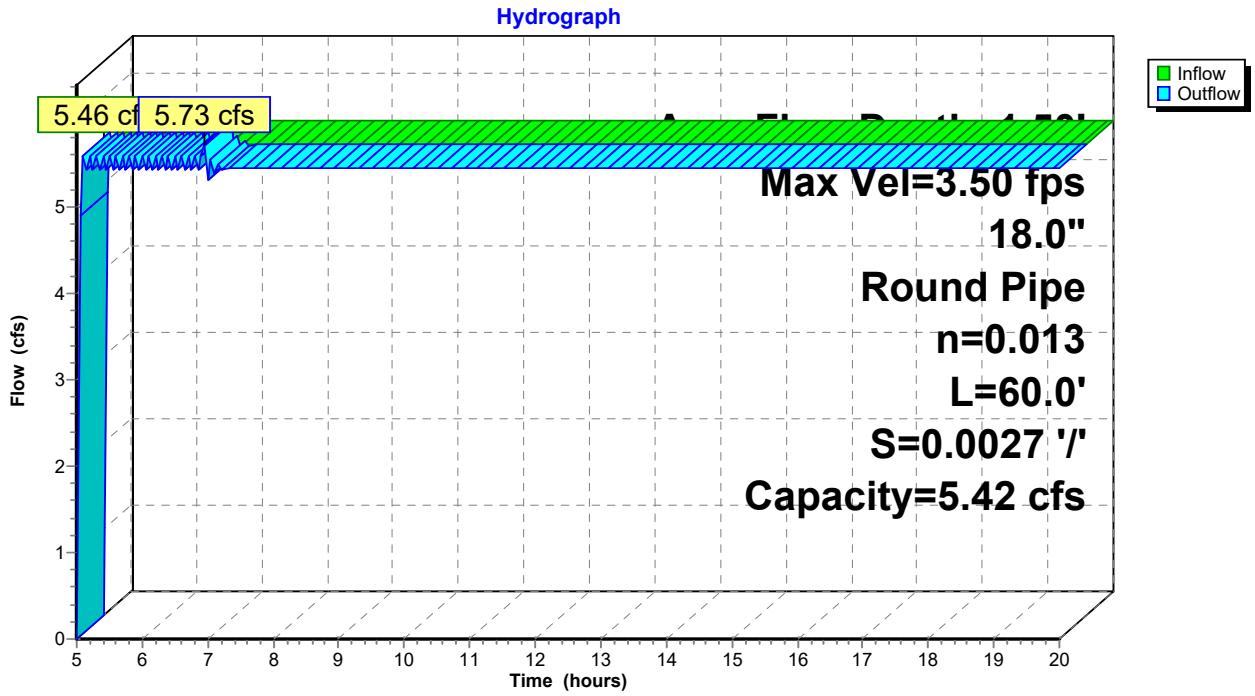
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 6L : EX / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





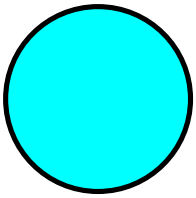
Summary for Reach 10R: 18" PIPE

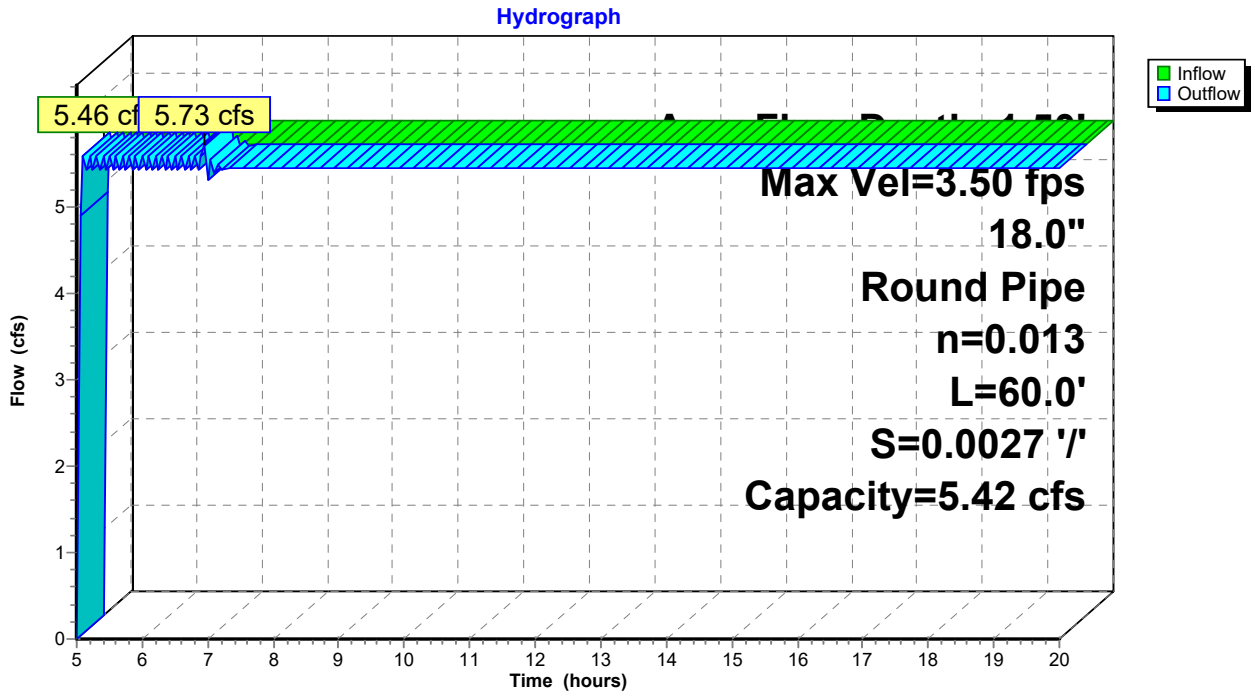
Inflow = 5.46 cfs @ 5.00 hrs, Volume= 6.791 af, Incl. 5.46 cfs Base Flow
Outflow = 5.73 cfs @ 6.94 hrs, Volume= 6.776 af, Atten= 0%, Lag= 116.2 min
Routed to Link 12L : PR / A

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

Peak Storage= 106 cf @ 5.05 hrs
Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe
n= 0.013
Length= 60.0' Slope= 0.0027 '/'
Inlet Invert= 134.70', Outlet Invert= 134.54'





Summary for Pond 11P: DET 110

Inflow Area = 3.270 ac, 0.00% Impervious, Inflow Depth > 6.33" for 100-Year event
Inflow = 20.60 cfs @ 12.14 hrs, Volume= 1.725 af
Outflow = 15.75 cfs @ 12.24 hrs, Volume= 1.470 af, Atten= 24%, Lag= 6.0 min
Primary = 15.75 cfs @ 12.24 hrs, Volume= 1.470 af
Routed to Link 12L : PR / A

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.88' @ 12.24 hrs Surf.Area= 0.134 ac Storage= 0.573 af

Plug-Flow detention time= 101.4 min calculated for 1.470 af (85% of inflow)
Center-of-Mass det. time= 57.2 min (808.5 - 751.4)

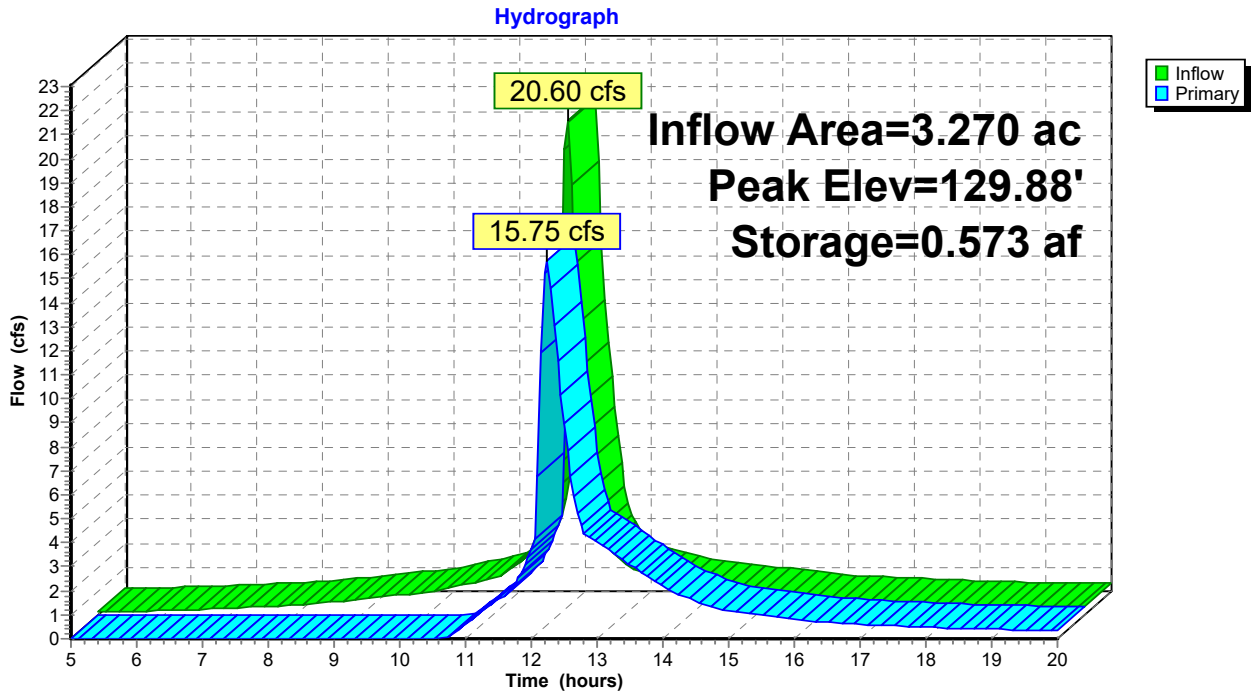
Volume	Invert	Avail.Storage	Storage Description
#1A	125.10'	0.000 af	**56.00'W x 104.00'L x 5.67'H Field A** 0.758 af Overall - 0.758 af Embedded = 0.000 af x 40.0% Voids
#2A	125.10'	0.599 af	**retain_it retain_it 5.0'** x 91 Inside #1 Inside= 84.0"W x 60.0"H => 36.41 sf x 8.00'L = 291.3 cf Outside= 96.0"W x 68.0"H => 45.33 sf x 8.00'L = 362.7 cf 7 Rows adjusted for 415.6 cf perimeter wall
		0.599 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	123.00'	**18.0" Round Culvert** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.00' / 122.00' S= 0.0200 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf
#2	Device 1	127.00'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	129.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=15.62 cfs @ 12.24 hrs HW=129.88' (Free Discharge)
└**1=Culvert** (Passes 15.62 cfs of 16.63 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 5.36 cfs @ 7.68 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 10.26 cfs @ 3.06 fps)

Pond 11P: DET 110

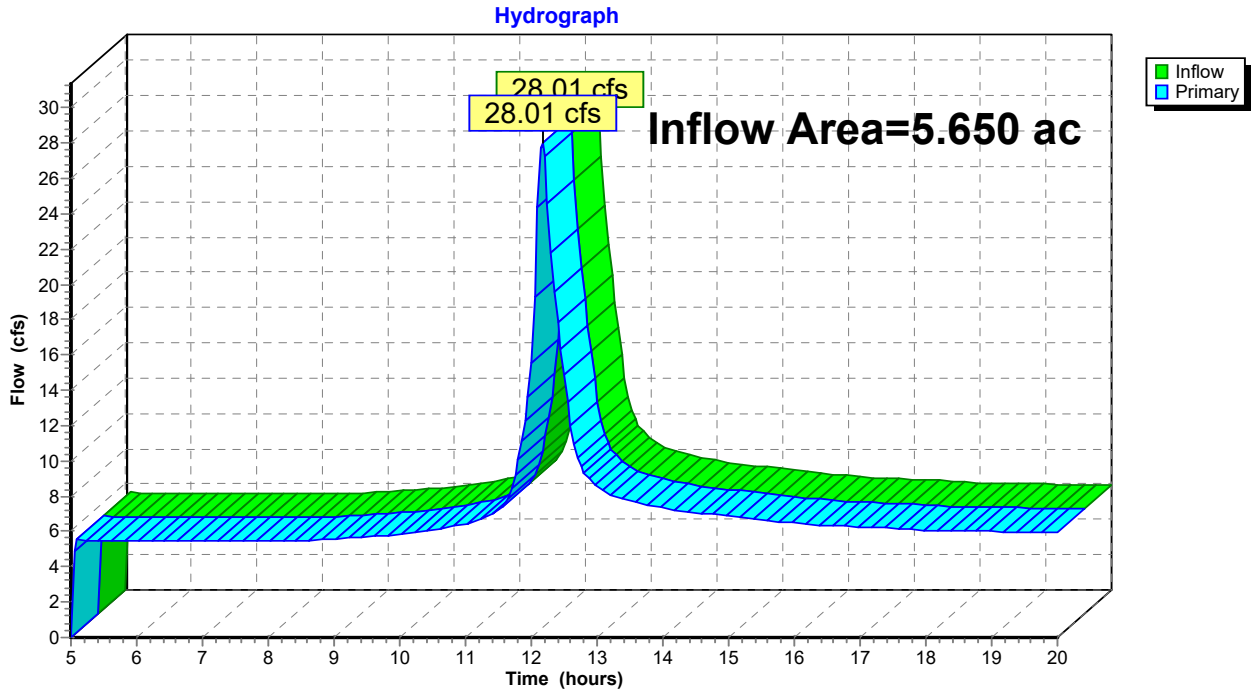


Summary for Link 6L: EX / A

Inflow Area = 5.650 ac, 0.00% Impervious, Inflow Depth > 18.27" for 100-Year event
Inflow = 28.01 cfs @ 12.17 hrs, Volume= 8.601 af
Primary = 28.01 cfs @ 12.17 hrs, Volume= 8.601 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 6L: EX / A

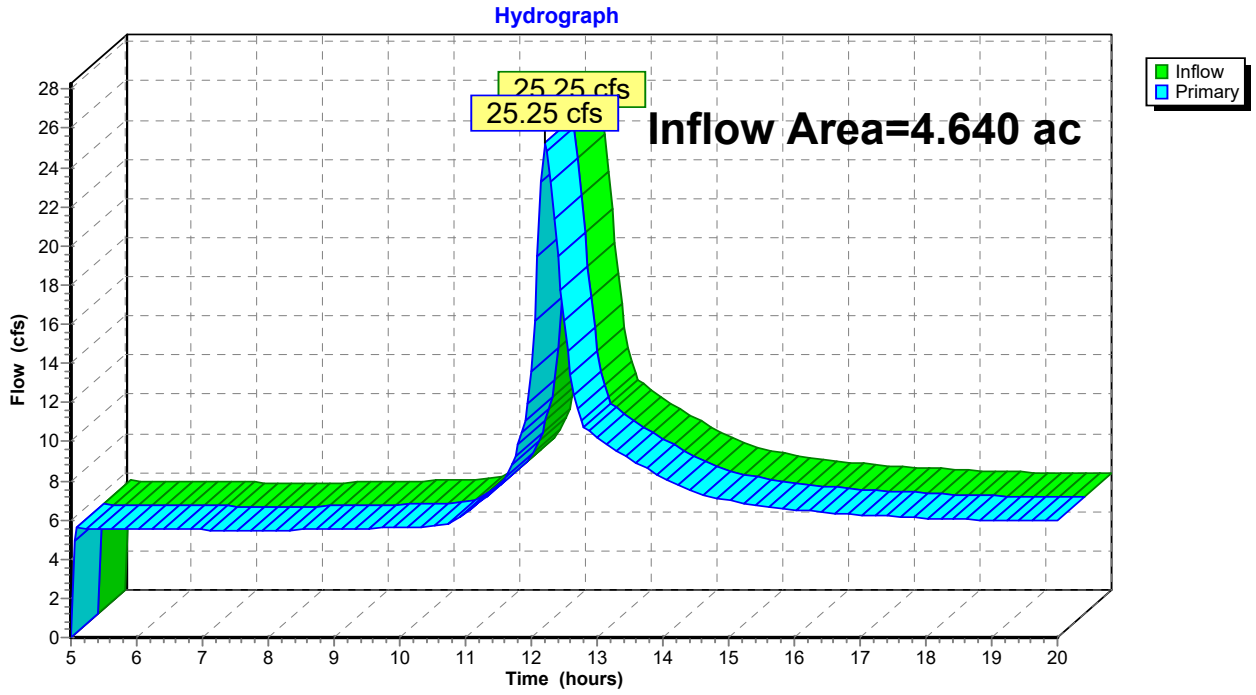


Summary for Link 12L: PR / A

Inflow Area = 4.640 ac, 0.00% Impervious, Inflow Depth > 22.60" for 100-Year event
Inflow = 25.25 cfs @ 12.22 hrs, Volume= 8.740 af
Primary = 25.25 cfs @ 12.22 hrs, Volume= 8.740 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link 12L: PR / A



Appendix H
Watershed Maps

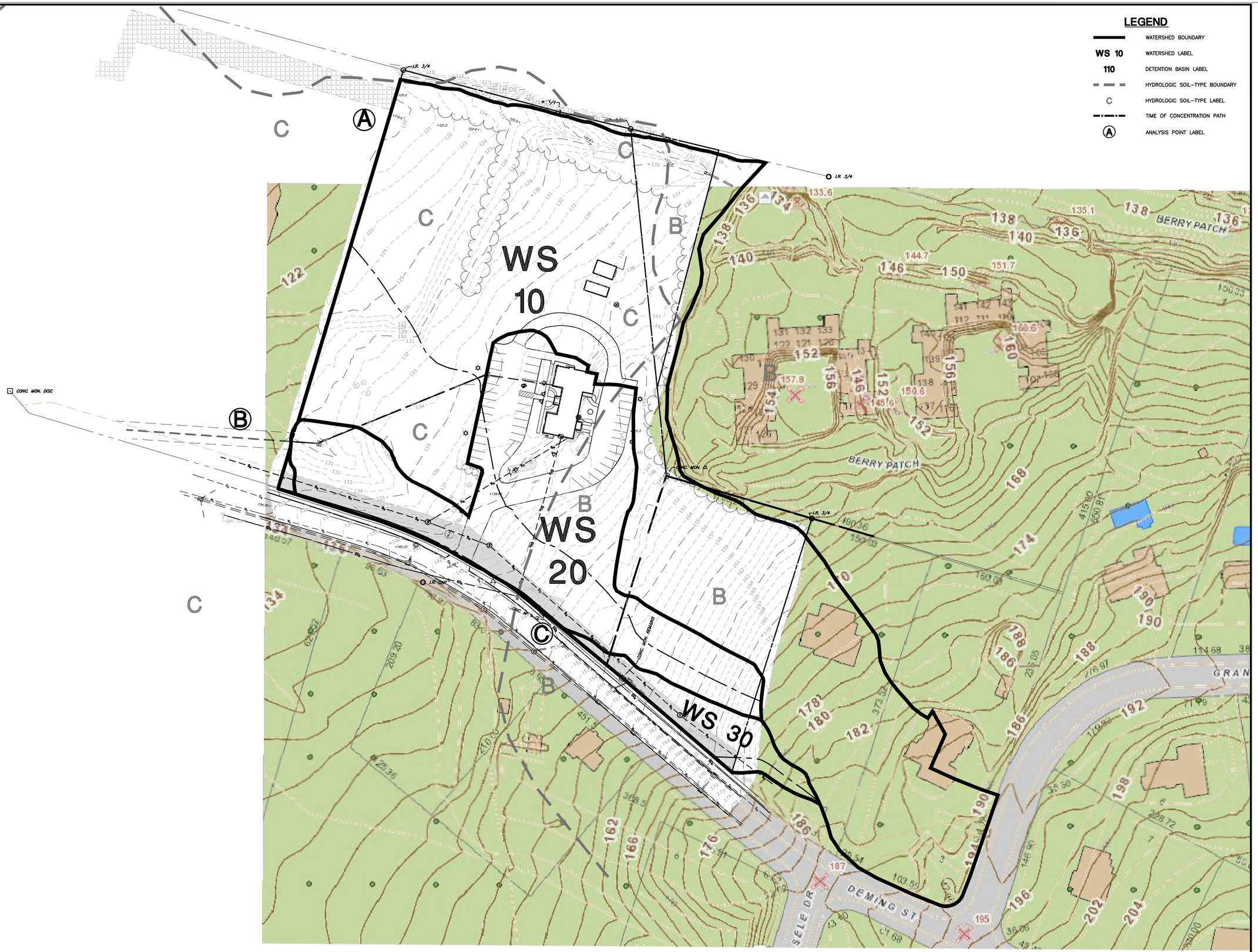
Deming Street Multi-Family Development

240 Deming Street, South Windsor, Connecticut Drainage Report

Prepared for:
Metro Realty
6 Executive Drive, Suite 100
Farmington, CT 06032

SLR Project No.: 141.13571.00069

June 28, 2023



SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

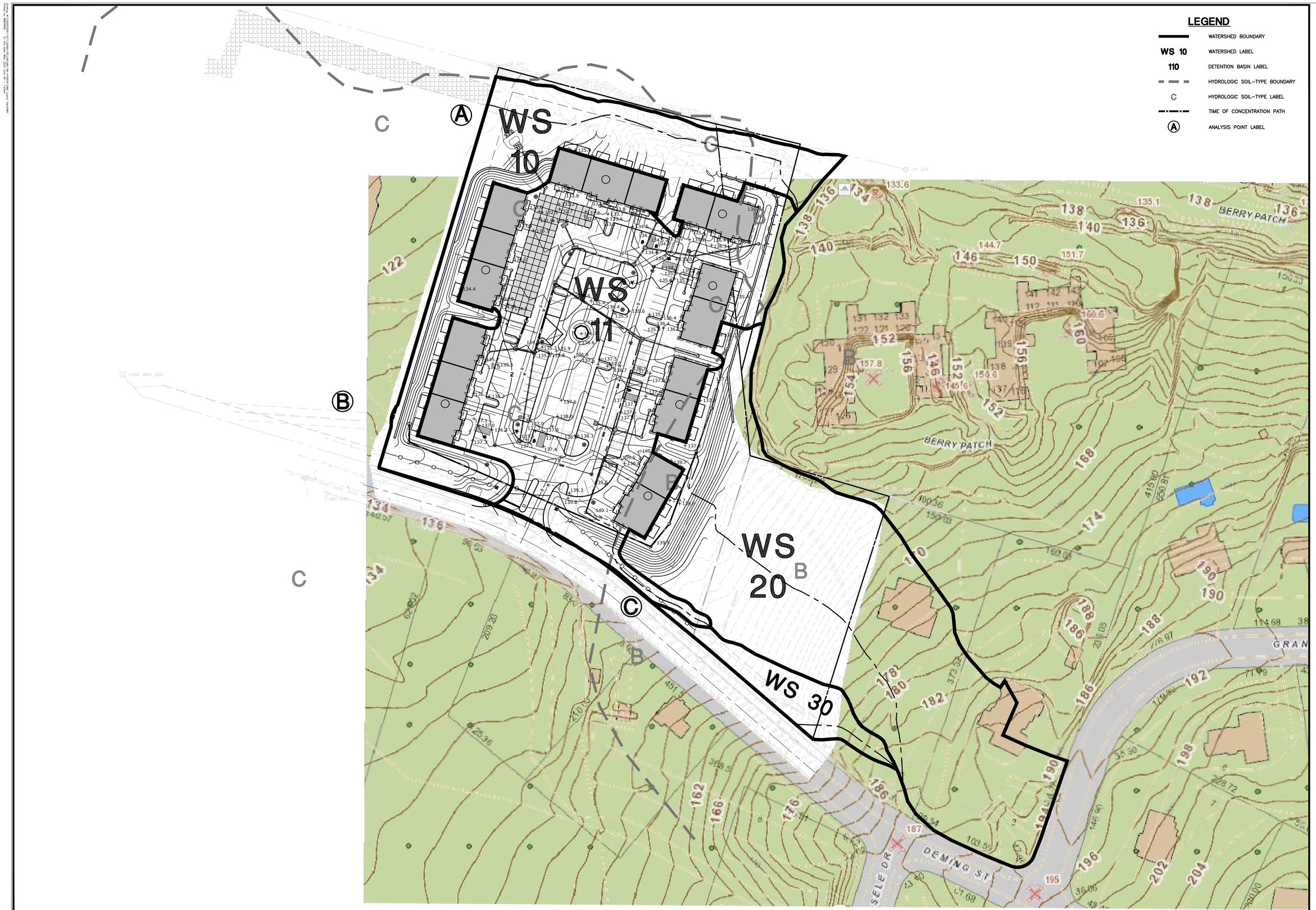
WATERSHED MAP - EXISTING CONDITIONS

PROPOSED MULTI-FAMILY DEVELOPMENT

240 DEMING STREET
SOUTH WINDSOR, CONNECTICUT

MCB	MCB	TD
DESIGNED	DRAWN	CHECKED

SCALE	1"=50'
DATE	JUNE 28, 2023
PROJECT NO.	13571.00069
SHEET NO.	1 OF 2
SHEET NAME	EXWS



SLR
99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

DESCRIPTION	DATE	BY

WATERSHED MAP - PROPOSED CONDITIONS

PROPOSED MULTI-FAMILY DEVELOPMENT

240 DEMING STREET
SOUTH WINDSOR, CONNECTICUT

MCB	MCB	TD
DESIGNED	DRAWN	CHECKED

SCALE	1"=50'
DATE	JUNE 28, 2023
PROJECT NO.	13571.00069
SHEET NO.	2 OF 2

SHEET NAME: **PRWS**