



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 (**Rev: August 30, 2023**)

Drainage Report

Deming Street
Multi-Family Development
240 Deming Street
South Windsor, Connecticut
June 28, 2023 (**Revised August 30, 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) | 2.25 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 (T_c) 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 | 8.4 | 13.5 | 19.3 | 23.3 | 27.6 |

| Underground Chamber System 110* | | | | | |
|---------------------------------|--------------------------------|-------|-------|-------|-------|
| | Water Surface Elevation (feet) | | | | |
| Storm Frequency (years) | 2 | 10 | 25 | 50 | 100 |
| Proposed Conditions | 127.8 | 129.2 | 129.6 | 129.8 | 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 | 3.7 | 5.8 | 7.5 | 9.3 |

| 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.

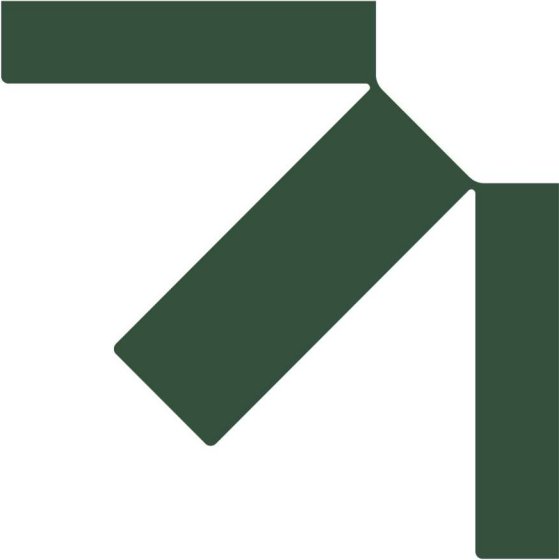
All supporting documentation and stormwater-related computations are attached to this report along with the *HydroCAD* model results for stormwater management and *Hydraflow Storm Sewers* model results for the proposed storm drainage system. Illustrative Watershed Maps for both existing and proposed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

240 Deming Street, South Windsor, Connecticut

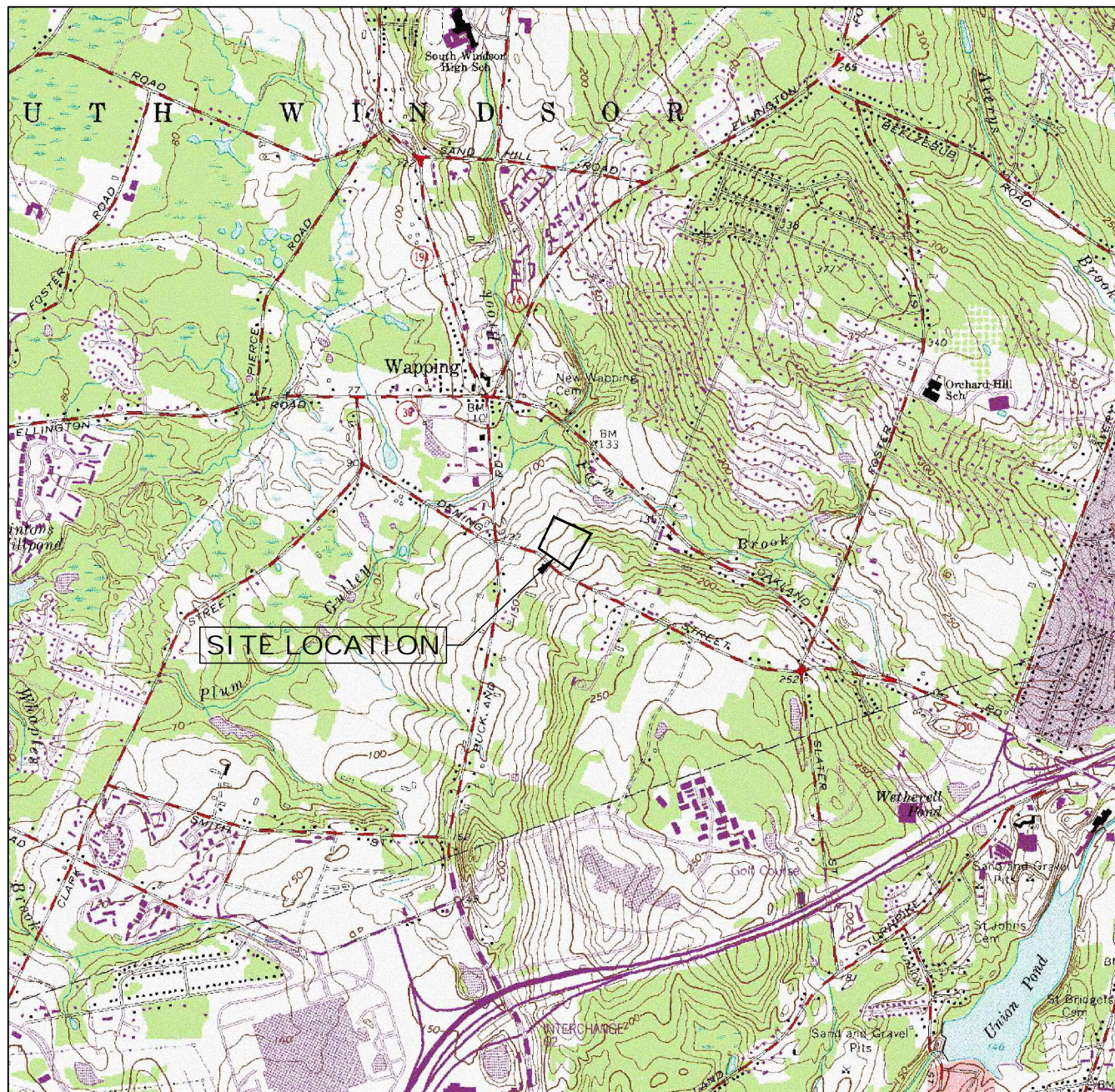
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99 REALTY DRIVE
CHESHIRE, CT 06410
203.271.1773
SLRCONSULTING.COM

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 MCB | CHECKED --- |
| DRAWING NAME: LOC | | |



Appendix B

FEMA Flood Insurance Rate Map

Deming Street Multi-Family Development

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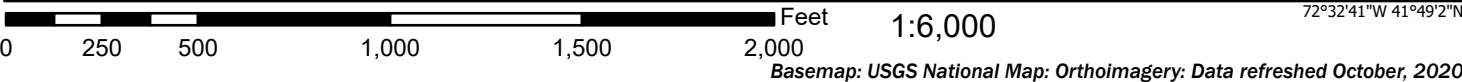
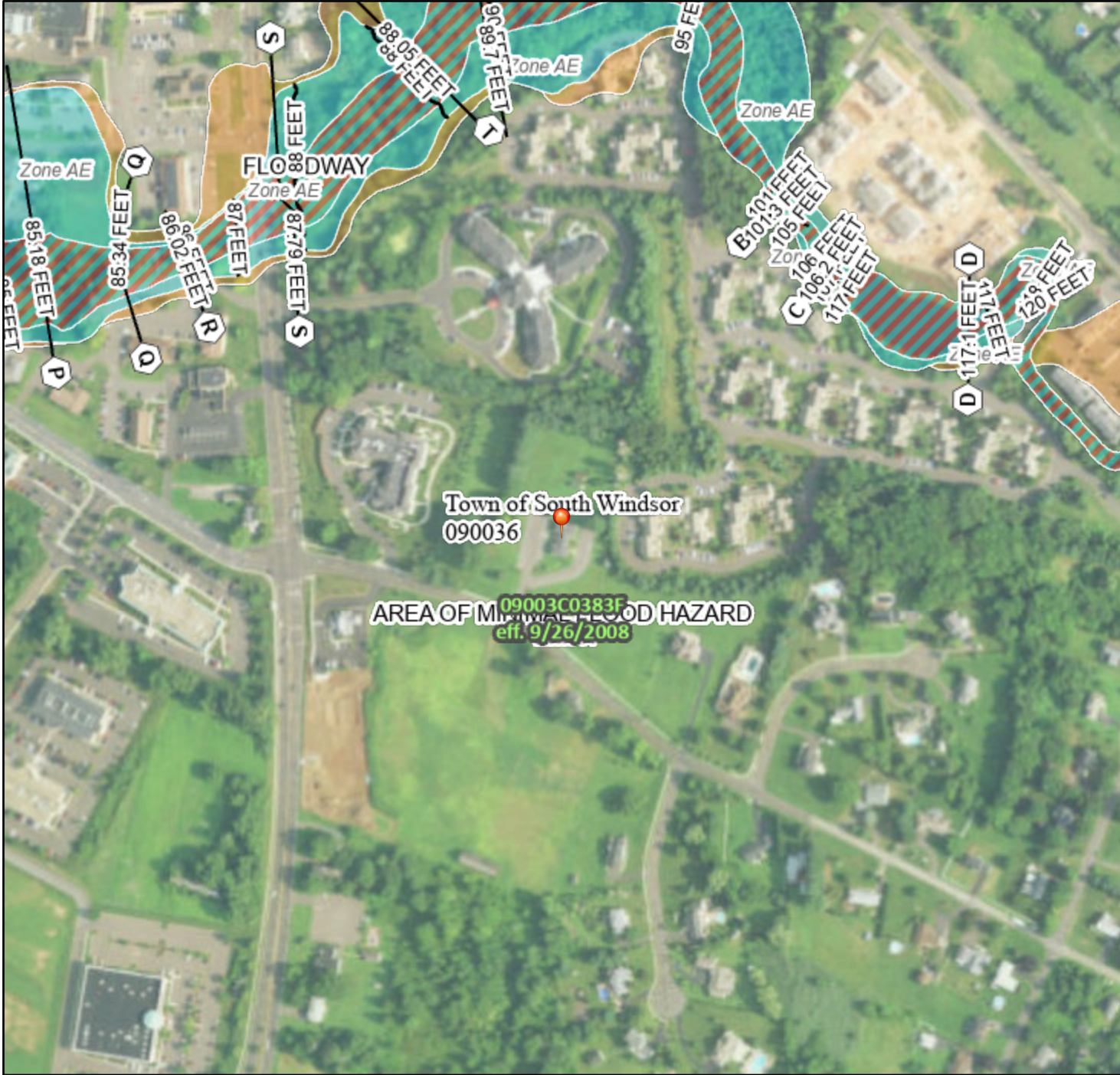
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National Flood Hazard Layer FIRMMette



72°33'19"W 41°49'29"N



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 Water Surface Elevation |
| | | 17.5 Coastal Transect |
| | | Base Flood Elevation Line (BFE) |
| | | Limit of Study |
| | | Jurisdiction Boundary |
| | | Coastal Transect Baseline |
| | | Profile Baseline |
| MAP PANELS | | Digital Data Available |
| | | No Digital Data Available |
| | | Unmapped |



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

Deming Street Multi-Family Development

240 Deming Street, South Windsor, Connecticut

Drainage Report

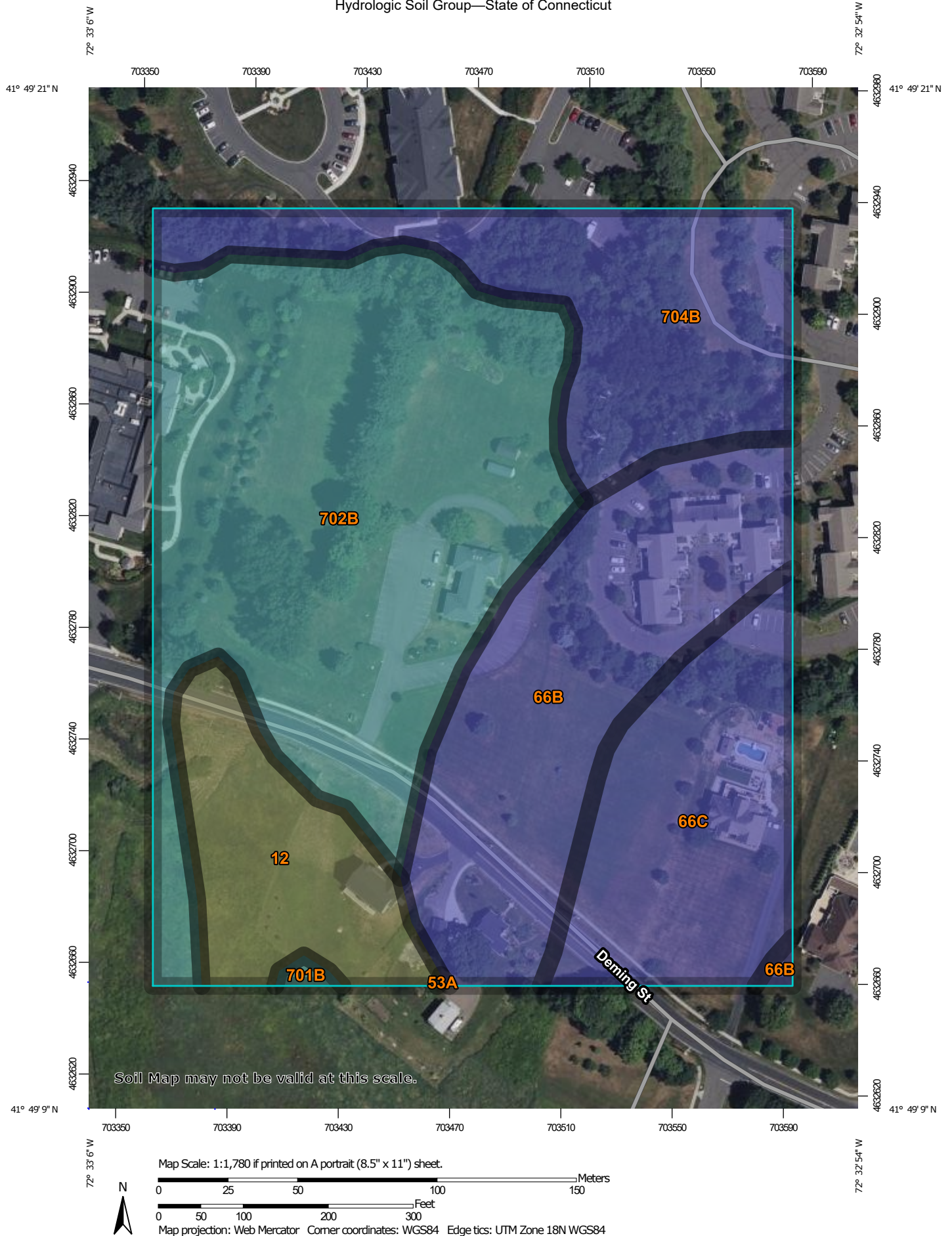
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Hydrologic Soil Group—State of Connecticut



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

Deming Street Multi-Family Development

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SLR Project No.: 141.13571.00069

June 28, 2023 (Rev: August 30, 2023) (**Revised August 30, 2023**)



Rational Method Individual Basin Calculations

Project: Multi-Family Development
 Location: South Windsor, CT

By: LCD
 Checked: MCB

Date: 8/28/23
 Date: 8/28/23

| 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 | 123 | 373 | 0 | 496 | 0.01 | 0.45 | 5.0 |
| CLCB 5 | 6992 | 712 | 0 | 7703 | 0.18 | 0.84 | 5.0 |
| AD 6 | 119 | 373 | 0 | 491 | 0.01 | 0.44 | 5.0 |
| AD 7 | 133 | 241 | 0 | 374 | 0.01 | 0.51 | 5.0 |
| CLCB 8 | 4789 | 5357 | 0 | 10146 | 0.23 | 0.58 | 5.0 |
| CCB 9 | 5396 | 3811 | 0 | 9208 | 0.21 | 0.65 | 5.0 |
| CLCB 10 | 2478 | 2461 | 0 | 4938 | 0.11 | 0.60 | 5.0 |
| CCB 11 | 4274 | 3823 | 0 | 8098 | 0.19 | 0.62 | 5.0 |
| CLCB 12 | 12115 | 4218 | 0 | 16333 | 0.37 | 0.75 | 5.0 |
| CCB 13 | 4769 | 0 | 0 | 4769 | 0.11 | 0.90 | 5.0 |
| CCB 14 | 4937 | 3236 | 0 | 8172 | 0.19 | 0.66 | 5.0 |
| AD 15 | 123 | 241 | 0 | 364 | 0.01 | 0.50 | 5.0 |
| AD 16 | 162 | 373 | 0 | 535 | 0.01 | 0.48 | 5.0 |
| YD 17 | 0 | 2159 | 0 | 2159 | 0.05 | 0.30 | 5.0 |
| AD 18 | 154 | 487 | 0 | 641 | 0.01 | 0.44 | 5.0 |
| AD 19 | 316 | 4328 | 1214 | 5858 | 0.13 | 0.31 | 5.0 |
| CLCB 23 | 4478 | 486 | 0 | 4964 | 0.11 | 0.84 | 5.0 |
| AD 24 | 195 | 404 | 0 | 599 | 0.01 | 0.50 | 5.0 |
| CLCB 25 | 1691 | 425 | 0 | 2116 | 0.05 | 0.78 | 5.0 |
| CLCB 26 | 565 | 0 | 0 | 565 | 0.01 | 0.90 | 5.0 |
| AD 28 | 155 | 527 | 0 | 682 | 0.02 | 0.44 | 5.0 |
| AD 29 | 286 | 562 | 0 | 848 | 0.02 | 0.50 | 5.0 |
| AD 31 | 0 | 6034 | 0 | 6034 | 0.14 | 0.30 | 5.0 |
| AD 33 | 0 | 10800 | 0 | 10800 | 0.25 | 0.30 | 5.0 |
| AD 34 | 660 | 36677 | 0 | 37337 | 0.86 | 0.31 | 10.0 |
| AD 35 | 3483 | 44390 | 0 | 47872 | 1.10 | 0.34 | 10.0 |
| AD 36 | 5774 | 28234 | 1881 | 35890 | 0.82 | 0.39 | 5.0 |
| AD 37 | 314 | 2600 | 871 | 3785 | 0.09 | 0.33 | 5.0 |

Rational Method Roof Drain System Calculations

Project: Multi-Family Development
 Location: South Windsor, CT

By: LCD
 Checked: MCB

Date: 8/28/23
 Date: 8/28/23

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

| | BLDG A TO AD 6 | BLDG B TO AD 4 | BLDG C TO AD 16 | BLDG D TO AD 17 | BLDG E TO YD 29 | | |
|---|----------------|-------------------|--------------------|--------------------|--------------------|--|--|
| C | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | | |
| I | 7.44 | 7.44 | 7.44 | 7.44 | 7.44 | | |
| A | 0.14 | 0.16 | 0.16 | 0.10 | 0.16 | | |
| Q | 0.95 | 1.05 | 1.05 | 0.67 | 1.05 | | |



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 & aeriels](#)

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) |

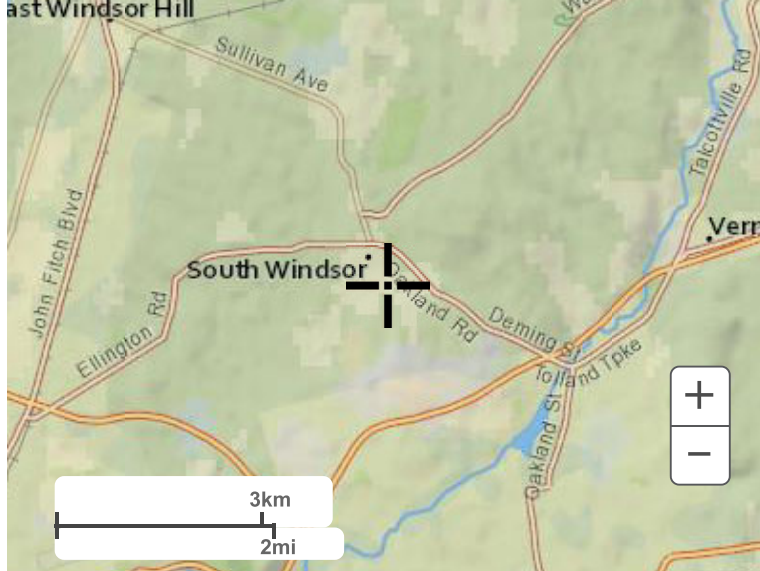
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

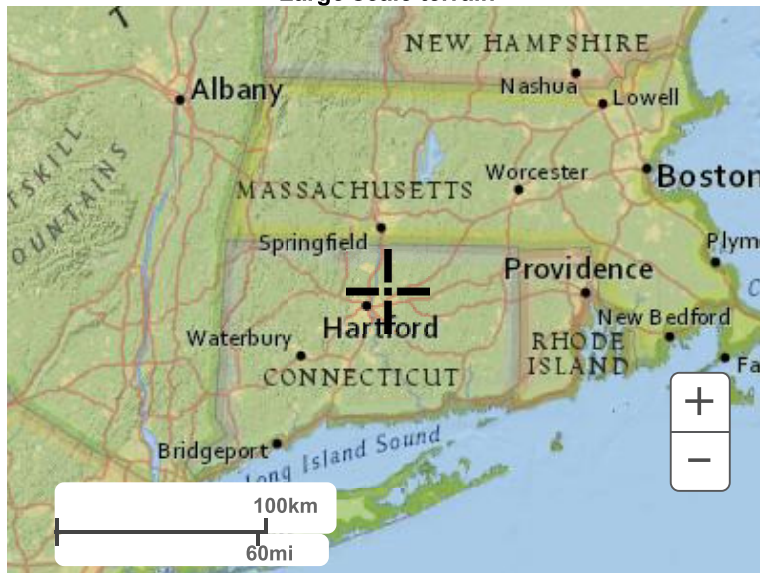
Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical



Large scale terrain



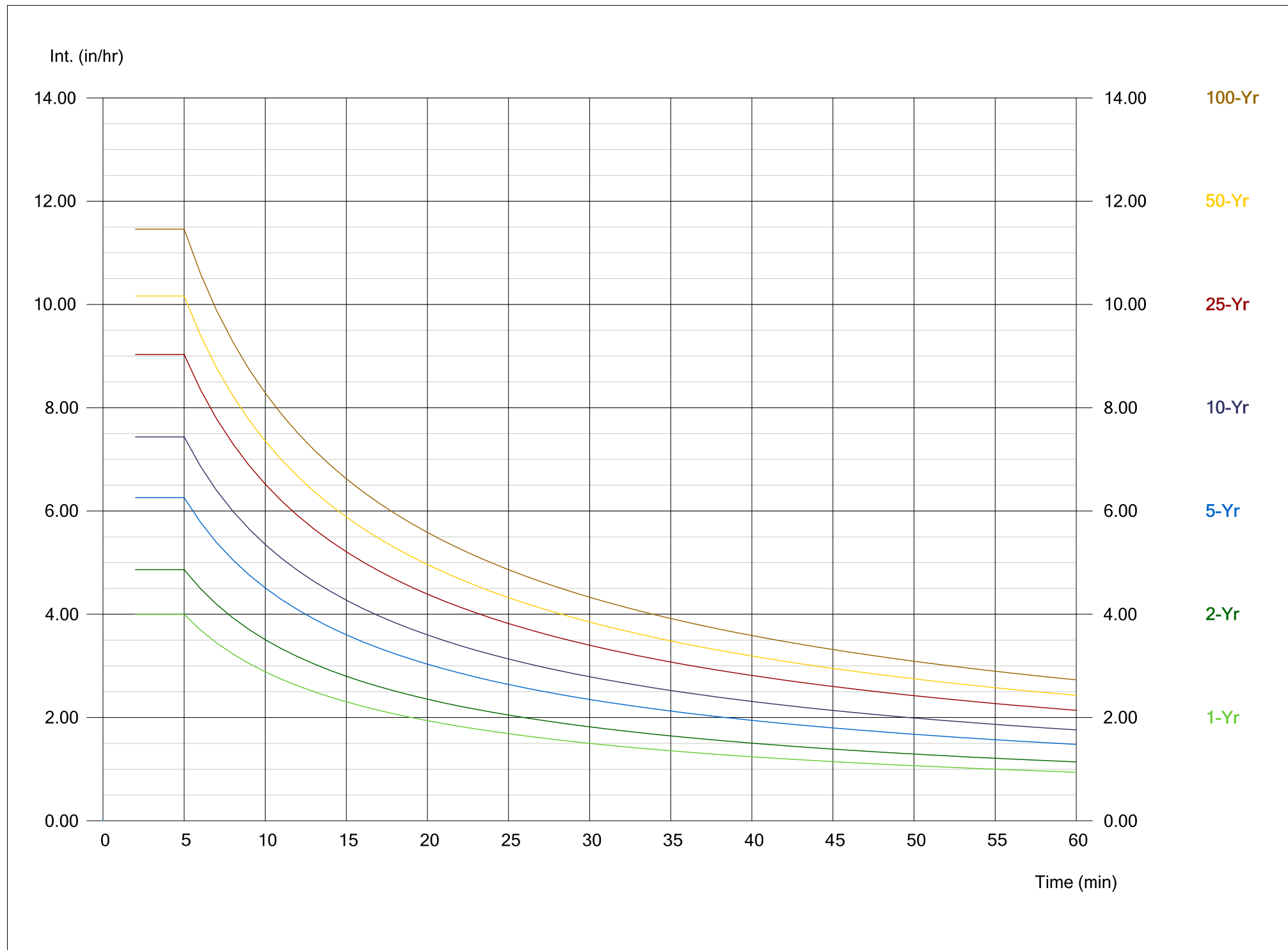
Large scale map



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

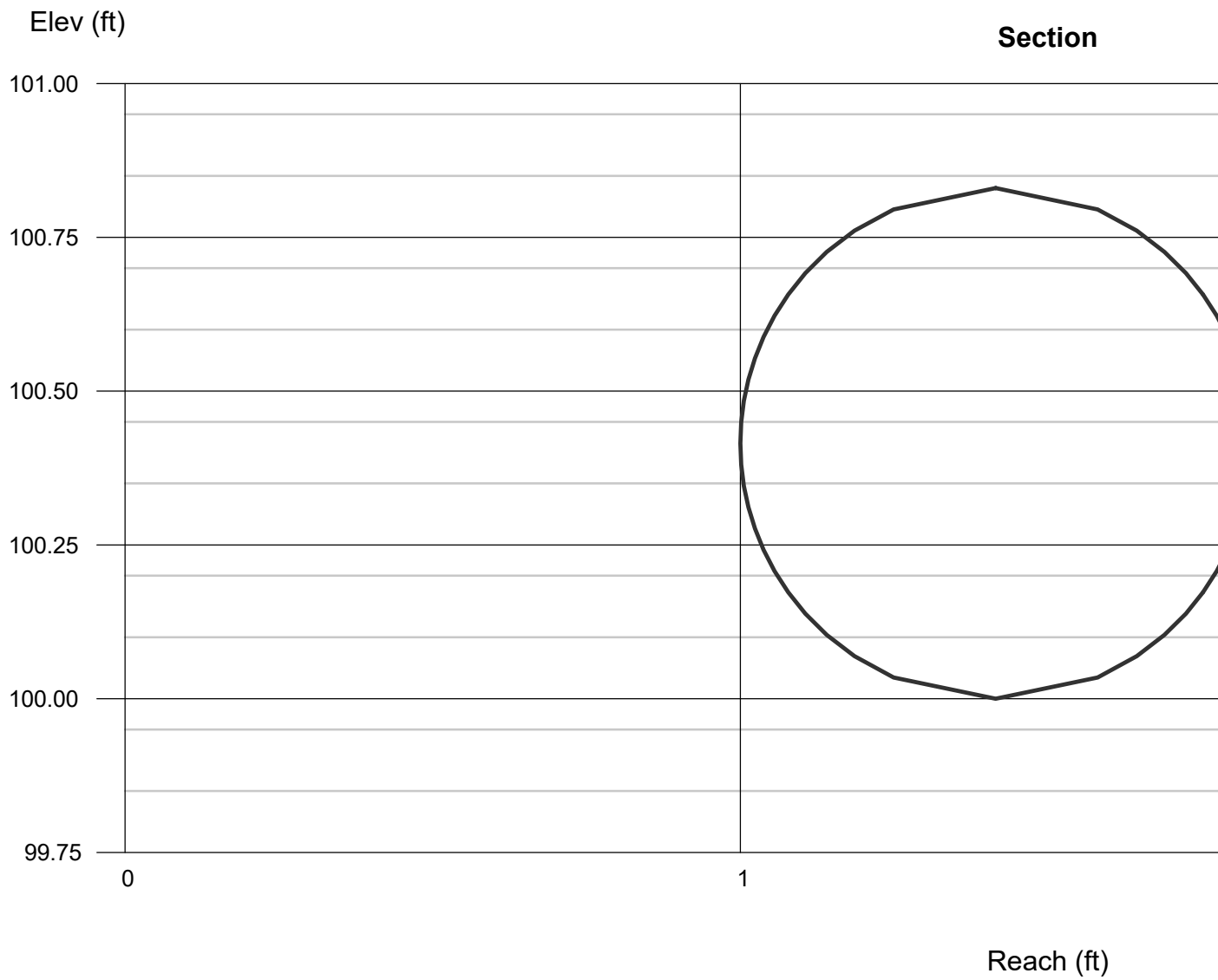
Calculations

Compute by: Q vs Depth
No. Increments = 10

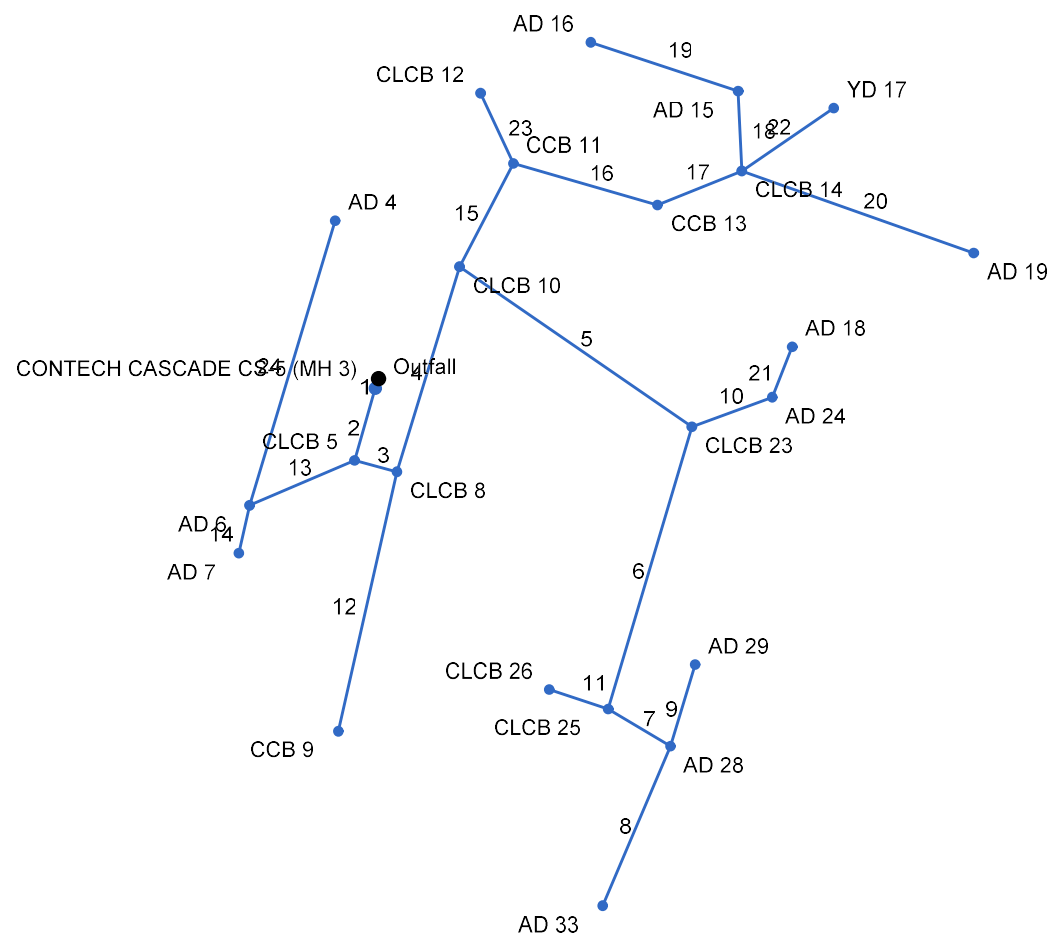
Q = 1.05 cfs <

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



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 | 106.720 | 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 | 29.000 | -0.466 | Grate | 0.00 | 0.18 | 0.84 | 5.0 | 125.40 | 2.07 | 126.00 | 24 | Cir | 0.012 | 1.82 | 135.00 | MH 3-CLCB 5 |
| 3 | 2 | 17.000 | -91.306 | Grate | 0.00 | 0.23 | 0.58 | 5.0 | 126.00 | 1.76 | 126.30 | 24 | Cir | 0.012 | 2.25 | 135.00 | CLCB 5-CLCB 8 |
| 4 | 3 | 83.000 | -88.026 | Grate | 0.00 | 0.11 | 0.60 | 5.0 | 126.30 | 1.45 | 127.50 | 24 | Cir | 0.012 | 1.66 | 133.70 | CLCB 8-CLCB 10 |
| 5 | 4 | 109.000 | 107.747 | Grate | 0.00 | 0.11 | 0.84 | 5.0 | 128.70 | 2.29 | 131.20 | 12 | Cir | 0.012 | 1.91 | 136.00 | CLCB 10-CLCB 23 |
| 6 | 5 | 114.000 | 71.798 | Grate | 0.00 | 0.05 | 0.78 | 5.0 | 131.20 | 0.53 | 131.80 | 12 | Cir | 0.012 | 1.50 | 137.90 | CLCB 23-CLCB 25 |
| 7 | 6 | 28.000 | -75.477 | DrGrt | 0.00 | 0.02 | 0.44 | 5.0 | 131.80 | 0.71 | 132.00 | 12 | Cir | 0.012 | 1.50 | 138.50 | CLCB 25-AD 28 |
| 8 | 7 | 67.000 | 81.904 | DrGrt | 0.00 | 0.25 | 0.30 | 5.0 | 132.00 | 1.49 | 133.00 | 12 | Cir | 0.012 | 1.00 | 139.00 | AD 28-AD 33 |
| 9 | 7 | 33.000 | -104.305 | DrGrt | 1.05 | 0.02 | 0.50 | 5.0 | 132.00 | 6.97 | 134.30 | 12 | Cir | 0.012 | 1.00 | 137.80 | AD 28-AD 29 |
| 10 | 5 | 33.000 | -54.962 | DrGrt | 0.00 | 0.01 | 0.50 | 5.0 | 131.20 | 0.61 | 131.40 | 12 | Cir | 0.012 | 1.17 | 136.30 | CLCB 23-AD 24 |
| 11 | 6 | 24.000 | 91.854 | Grate | 0.00 | 0.01 | 0.90 | 5.0 | 131.80 | 9.17 | 134.00 | 15 | Cir | 0.012 | 1.00 | 137.90 | CLCB 25-CLCB 26 |
| 12 | 3 | 103.000 | 87.738 | Curb | 0.00 | 0.21 | 0.65 | 5.0 | 131.00 | 3.11 | 134.20 | 12 | Cir | 0.012 | 1.00 | 137.00 | CLCB 8-CCB 9 |
| 13 | 2 | 44.000 | 50.491 | DrGrt | 0.95 | 0.01 | 0.44 | 5.0 | 126.60 | 1.82 | 127.40 | 12 | Cir | 0.012 | 1.50 | 135.90 | CLCB 5-AD 6 |
| 14 | 13 | 19.000 | -54.127 | DrGrt | 0.00 | 0.01 | 0.51 | 5.0 | 130.00 | 1.05 | 130.20 | 12 | Cir | 0.012 | 1.00 | 136.30 | AD 6-AD 7 |
| 15 | 4 | 45.000 | 10.436 | Comb | 0.00 | 0.19 | 0.62 | 5.0 | 127.50 | 1.11 | 128.00 | 18 | Cir | 0.012 | 1.85 | 133.00 | CLCB 10-CLCB 11 |
| 16 | 15 | 58.000 | 78.737 | Comb | 0.00 | 0.11 | 0.90 | 5.0 | 128.00 | 0.69 | 128.40 | 15 | Cir | 0.012 | 1.00 | 134.30 | CLCB 11-CCB 13 |
| 17 | 16 | 35.000 | -38.234 | Grate | 0.00 | 0.19 | 0.66 | 5.0 | 128.40 | 0.57 | 128.60 | 15 | Cir | 0.012 | 1.60 | 134.50 | CCB 13-CLCB 14 |
| 18 | 17 | 31.000 | -70.267 | DrGrt | 0.00 | 0.01 | 0.50 | 5.0 | 128.60 | 3.23 | 129.60 | 12 | Cir | 0.012 | 1.42 | 134.30 | CLCB 14-AD 15 |
| 19 | 18 | 60.000 | -69.262 | DrGrt | 1.05 | 0.01 | 0.48 | 5.0 | 129.60 | 0.83 | 130.10 | 12 | Cir | 0.012 | 1.00 | 133.70 | AD 15- AD 16 |
| 20 | 17 | 95.000 | 41.672 | DrGrt | 0.00 | 0.13 | 0.31 | 5.0 | 128.60 | 0.53 | 129.10 | 12 | Cir | 0.012 | 1.00 | 134.80 | CLCB 14-AD 19 |
| 21 | 10 | 21.000 | -47.885 | DrGrt | 0.00 | 0.01 | 0.44 | 5.0 | 131.40 | 0.95 | 131.60 | 12 | Cir | 0.012 | 1.00 | 135.30 | AD 24-AD 18 |
| 22 | 17 | 43.000 | -12.283 | DrGrt | 0.67 | 0.05 | 0.30 | 5.0 | 128.60 | 0.70 | 128.90 | 15 | Cir | 0.012 | 1.00 | 135.00 | CLCB 14-YD 17 |
| 23 | 15 | 30.000 | -52.122 | Grate | 0.00 | 0.37 | 0.75 | 5.0 | 128.00 | 2.67 | 128.80 | 12 | Cir | 0.012 | 1.00 | 132.20 | CCB 11-CLCB 12 |
| Project File: Storm 110.stm | | | | | | | | | | | | Number of lines: 24 | | | | Date: 8/30/2023 | |

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 | 13 | 115.000 | 129.944 | DrGrt | 1.05 | 0.01 | 0.45 | 5.0 | 127.40 | 2.43 | 130.20 | 12 | Cir | 0.012 | 1.00 | 133.90 | AD 6-AD 4 |
| Project File: Storm 110.stm | | | | | | | | | | | | Number of lines: 24 | | | Date: 8/30/2023 | | |

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 | | Incr | Total | | Incr | Total | Inlet | Syst | | | | | Size | Slope | Dn | Up | Dn | Up | Dn | Up | |
| | | (ft) | (ac) | (ac) | (C) | | | (min) | (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 4.000 | 0.00 | 2.30 | 0.00 | 0.00 | 1.43 | 5.0 | 10.8 | 5.1 | 12.13 | 38.74 | 3.86 | 24 | 2.50 | 125.30 | 125.40 | 129.20 | 129.21 | 0.00 | 133.70 | UG-MH 3 |
| 2 | 1 | 29.000 | 0.18 | 2.30 | 0.84 | 0.15 | 1.43 | 5.0 | 10.6 | 5.2 | 12.17 | 35.24 | 3.87 | 24 | 2.07 | 125.40 | 126.00 | 129.24 | 129.32 | 133.70 | 135.00 | MH 3-CLCB 5 |
| 3 | 2 | 17.000 | 0.23 | 2.09 | 0.58 | 0.13 | 1.26 | 5.0 | 10.5 | 5.2 | 9.35 | 32.55 | 2.98 | 24 | 1.76 | 126.00 | 126.30 | 129.74 | 129.77 | 135.00 | 135.00 | CLCB 5-CLCB 8 |
| 4 | 3 | 83.000 | 0.11 | 1.65 | 0.60 | 0.07 | 0.99 | 5.0 | 10.0 | 5.3 | 8.09 | 29.46 | 2.58 | 24 | 1.45 | 126.30 | 127.50 | 130.08 | 130.17 | 135.00 | 133.70 | CLCB 8-CLCB 10 |
| 5 | 4 | 109.000 | 0.11 | 0.48 | 0.84 | 0.09 | 0.24 | 5.0 | 6.2 | 6.8 | 2.70 | 5.84 | 4.00 | 12 | 2.29 | 128.70 | 131.20 | 130.34 | 131.90 | 133.70 | 136.00 | CLCB 10-CLCB 2 |
| 6 | 5 | 114.000 | 0.05 | 0.35 | 0.78 | 0.04 | 0.14 | 5.0 | 5.7 | 7.0 | 2.04 | 2.80 | 3.76 | 12 | 0.53 | 131.20 | 131.80 | 131.90 | 132.41 | 136.00 | 137.90 | CLCB 23-CLCB 2 |
| 7 | 6 | 28.000 | 0.02 | 0.29 | 0.44 | 0.01 | 0.09 | 5.0 | 5.6 | 7.1 | 1.72 | 3.26 | 3.00 | 12 | 0.71 | 131.80 | 132.00 | 132.80 | 132.56 | 137.90 | 138.50 | CLCB 25-AD 28 |
| 8 | 7 | 67.000 | 0.25 | 0.25 | 0.30 | 0.08 | 0.08 | 5.0 | 5.0 | 7.4 | 0.56 | 4.71 | 1.96 | 12 | 1.49 | 132.00 | 133.00 | 132.56 | 133.31 | 138.50 | 139.00 | AD 28-AD 33 |
| 9 | 7 | 33.000 | 0.02 | 0.02 | 0.50 | 0.01 | 0.01 | 5.0 | 5.0 | 7.4 | 1.12 | 10.19 | 2.91 | 12 | 6.97 | 132.00 | 134.30 | 132.56 | 134.75 | 138.50 | 137.80 | AD 28-AD 29 |
| 10 | 5 | 33.000 | 0.01 | 0.02 | 0.50 | 0.01 | 0.01 | 5.0 | 5.4 | 7.2 | 0.07 | 3.00 | 0.82 | 12 | 0.61 | 131.20 | 131.40 | 131.90 | 131.51 | 136.00 | 136.30 | CLCB 23-AD 24 |
| 11 | 6 | 24.000 | 0.01 | 0.01 | 0.90 | 0.01 | 0.01 | 5.0 | 5.0 | 7.4 | 0.07 | 21.18 | 0.77 | 15 | 9.17 | 131.80 | 134.00 | 132.80 | 134.10 | 137.90 | 137.90 | CLCB 25-CLCB 2 |
| 12 | 3 | 103.000 | 0.21 | 0.21 | 0.65 | 0.14 | 0.14 | 5.0 | 5.0 | 7.4 | 1.01 | 6.80 | 4.71 | 12 | 3.11 | 131.00 | 134.20 | 131.26 | 134.62 | 135.00 | 137.00 | CLCB 8-CCB 9 |
| 13 | 2 | 44.000 | 0.01 | 0.03 | 0.44 | 0.00 | 0.01 | 5.0 | 5.8 | 7.0 | 2.10 | 5.20 | 2.67 | 12 | 1.82 | 126.60 | 127.40 | 129.74 | 129.87 | 135.00 | 135.90 | CLCB 5-AD 6 |
| 14 | 13 | 19.000 | 0.01 | 0.01 | 0.51 | 0.01 | 0.01 | 5.0 | 5.0 | 7.4 | 0.04 | 3.96 | 1.45 | 12 | 1.05 | 130.00 | 130.20 | 130.07 | 130.28 | 135.90 | 136.30 | AD 6-AD 7 |
| 15 | 4 | 45.000 | 0.19 | 1.06 | 0.62 | 0.12 | 0.68 | 5.0 | 9.8 | 5.4 | 5.43 | 11.99 | 3.07 | 18 | 1.11 | 127.50 | 128.00 | 130.34 | 130.44 | 133.70 | 133.00 | CLCB 10-CLCB 1 |
| 16 | 15 | 58.000 | 0.11 | 0.50 | 0.90 | 0.10 | 0.29 | 5.0 | 9.4 | 5.5 | 3.32 | 5.81 | 2.71 | 15 | 0.69 | 128.00 | 128.40 | 130.71 | 130.84 | 133.00 | 134.30 | CLCB 11-CCB 13 |
| 17 | 16 | 35.000 | 0.19 | 0.39 | 0.66 | 0.13 | 0.19 | 5.0 | 9.2 | 5.6 | 2.79 | 5.29 | 2.27 | 15 | 0.57 | 128.40 | 128.60 | 130.96 | 131.01 | 134.30 | 134.50 | CCB 13-CLCB 14 |
| 18 | 17 | 31.000 | 0.01 | 0.02 | 0.50 | 0.01 | 0.01 | 5.0 | 5.7 | 7.0 | 1.12 | 6.93 | 1.42 | 12 | 3.23 | 128.60 | 129.60 | 131.14 | 131.17 | 134.50 | 134.30 | CLCB 14-AD 15 |
| 19 | 18 | 60.000 | 0.01 | 0.01 | 0.48 | 0.00 | 0.00 | 5.0 | 5.0 | 7.4 | 1.09 | 3.52 | 1.38 | 12 | 0.83 | 129.60 | 130.10 | 131.21 | 131.26 | 134.30 | 133.70 | AD 15- AD 16 |
| 20 | 17 | 95.000 | 0.13 | 0.13 | 0.31 | 0.04 | 0.04 | 5.0 | 5.0 | 7.4 | 0.30 | 2.80 | 0.38 | 12 | 0.53 | 128.60 | 129.10 | 131.14 | 131.15 | 134.50 | 134.80 | CLCB 14-AD 19 |
| 21 | 10 | 21.000 | 0.01 | 0.01 | 0.44 | 0.00 | 0.00 | 5.0 | 5.0 | 7.4 | 0.03 | 3.77 | 1.00 | 12 | 0.95 | 131.40 | 131.60 | 131.51 | 131.67 | 136.30 | 135.30 | AD 24-AD 18 |
| 22 | 17 | 43.000 | 0.05 | 0.05 | 0.30 | 0.02 | 0.02 | 5.0 | 5.0 | 7.4 | 0.78 | 5.84 | 0.64 | 15 | 0.70 | 128.60 | 128.90 | 131.14 | 131.15 | 134.50 | 135.00 | CLCB 14-YD 17 |
| Project File: Storm 110.stm | | | | | | | | | | | | | | | | Number of lines: 24 | | | | Run Date: 8/30/2023 | | |
| 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 | | Incr | Total | | Incr | Total | Inlet | Syst | | | | | Size | Slope | Dn | Up | Dn | Up | Dn | Up | |
| | | (ft) | (ac) | (ac) | (C) | | | (min) | (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 23 | 15 | 30.000 | 0.37 | 0.37 | 0.75 | 0.28 | 0.28 | 5.0 | 5.0 | 7.4 | 2.06 | 6.30 | 2.63 | 12 | 2.67 | 128.00 | 128.80 | 130.71 | 130.80 | 133.00 | 132.20 | CCB 11-CLCB 12 |
| 24 | 13 | 115.000 | 0.01 | 0.01 | 0.45 | 0.00 | 0.00 | 5.0 | 5.0 | 7.4 | 1.08 | 6.02 | 2.33 | 12 | 2.43 | 127.40 | 130.20 | 130.04 | 130.64 | 135.90 | 133.90 | AD 6-AD 4 |
| Project File: Storm 110.stm | | | | | | | | | | | | | | | | Number of lines: 24 | | | | Run Date: 8/30/2023 | | |
| 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 (in) | Q (cfs) | Downstream | | | | | | | | Len (ft) | Upstream | | | | | | | | Check | | JL coeff (K) | Minor loss (ft) |
|------|------------------|----------------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|-----------------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|------------------|-----------------------|------------------------|---------------------------|
| | | | Invert elev (ft) | HGL elev (ft) | Depth (ft) | Area (sqft) | Vel (ft/s) | Vel head (ft) | EGL elev (ft) | Sf (%) | | Invert elev (ft) | HGL elev (ft) | Depth (ft) | Area (sqft) | Vel (ft/s) | Vel head (ft) | EGL elev (ft) | Sf (%) | Ave Sf (%) | Enrgy loss (ft) | | |
| 1 | 24 | 12.13 | 125.30 | 129.20 | 2.00 | 3.14 | 3.86 | 0.23 | 129.43 | 0.245 | 4.000 | 125.40 | 129.21 | 2.00 | 3.14 | 3.86 | 0.23 | 129.44 | 0.245 | 0.245 | 0.010 | 0.15 | 0.03 |
| 2 | 24 | 12.17 | 125.40 | 129.24 | 2.00 | 3.14 | 3.88 | 0.23 | 129.48 | 0.247 | 29.000 | 126.00 | 129.32 | 2.00 | 3.14 | 3.87 | 0.23 | 129.55 | 0.247 | 0.247 | 0.072 | 1.82 | 0.42 |
| 3 | 24 | 9.35 | 126.00 | 129.74 | 2.00 | 3.14 | 2.98 | 0.14 | 129.88 | 0.146 | 17.000 | 126.30 | 129.77 | 2.00 | 3.14 | 2.98 | 0.14 | 129.90 | 0.146 | 0.146 | 0.025 | 2.25 | 0.31 |
| 4 | 24 | 8.09 | 126.30 | 130.08 | 2.00 | 3.14 | 2.58 | 0.10 | 130.18 | 0.109 | 83.000 | 127.50 | 130.17 | 2.00 | 3.14 | 2.57 | 0.10 | 130.27 | 0.109 | 0.109 | 0.090 | 1.66 | 0.17 |
| 5 | 12 | 2.70 | 128.70 | 130.34 | 1.00 | 0.59 | 3.43 | 0.18 | 130.52 | 0.488 | 109.000 | 131.20 | 131.90 j | 0.70** | 0.59 | 4.57 | 0.32 | 132.23 | 0.688 | 0.588 | n/a | 1.91 | n/a |
| 6 | 12 | 2.04 | 131.20 | 131.90 | 0.70 | 0.50 | 3.46 | 0.19 | 132.09 | 0.396 | 114.000 | 131.80 | 132.41 j | 0.61** | 0.50 | 4.06 | 0.26 | 132.67 | 0.585 | 0.490 | 0.559 | 1.50 | 0.38 |
| 7 | 12 | 1.72 | 131.80 | 132.80 | 1.00 | 0.45 | 2.19 | 0.23 | 133.02 | 0.200 | 28.000 | 132.00 | 132.56 | 0.56** | 0.45 | 3.82 | 0.23 | 132.78 | 0.194 | 0.197 | n/a | 1.50 | 0.34 |
| 8 | 12 | 0.56 | 132.00 | 132.56 | 0.56 | 0.21 | 1.24 | 0.11 | 132.67 | 0.000 | 67.000 | 133.00 | 133.31 j | 0.31** | 0.21 | 2.69 | 0.11 | 133.42 | 0.000 | 0.000 | n/a | 1.00 | n/a |
| 9 | 12 | 1.12 | 132.00 | 132.56 | 0.56 | 0.34 | 2.50 | 0.17 | 132.73 | 0.000 | 33.000 | 134.30 | 134.75 j | 0.45** | 0.34 | 3.32 | 0.17 | 134.92 | 0.000 | 0.000 | n/a | 1.00 | n/a |
| 10 | 12 | 0.07 | 131.20 | 131.90 | 0.70 | 0.04 | 0.12 | 0.04 | 131.94 | 0.000 | 33.000 | 131.40 | 131.51 | 0.11** | 0.04 | 1.53 | 0.04 | 131.54 | 0.000 | 0.000 | n/a | 1.17 | 0.04 |
| 11 | 15 | 0.07 | 131.80 | 132.80 | 1.00 | 0.05 | 0.06 | 0.03 | 132.83 | 0.000 | 24.000 | 134.00 | 134.10 j | 0.10** | 0.05 | 1.47 | 0.03 | 134.13 | 0.000 | 0.000 | n/a | 1.00 | 0.03 |
| 12 | 12 | 1.01 | 131.00 | 131.26 | 0.26* | 0.16 | 6.21 | 0.16 | 131.42 | 0.000 | 103.000 | 134.20 | 134.62 | 0.42** | 0.32 | 3.21 | 0.16 | 134.78 | 0.000 | 0.000 | n/a | 1.00 | n/a |
| 13 | 12 | 2.10 | 126.60 | 129.74 | 1.00 | 0.79 | 2.67 | 0.11 | 129.85 | 0.296 | 44.000 | 127.40 | 129.87 | 1.00 | 0.79 | 2.67 | 0.11 | 129.98 | 0.296 | 0.296 | 0.130 | 1.50 | 0.17 |
| 14 | 12 | 0.04 | 130.00 | 130.07 | 0.07* | 0.02 | 1.59 | 0.03 | 130.10 | 0.000 | 19.000 | 130.20 | 130.28 | 0.08** | 0.03 | 1.31 | 0.03 | 130.31 | 0.000 | 0.000 | n/a | 1.00 | 0.03 |
| 15 | 18 | 5.43 | 127.50 | 130.34 | 1.50 | 1.77 | 3.07 | 0.15 | 130.48 | 0.228 | 45.000 | 128.00 | 130.44 | 1.50 | 1.77 | 3.07 | 0.15 | 130.59 | 0.228 | 0.228 | 0.103 | 1.85 | 0.27 |
| 16 | 15 | 3.32 | 128.00 | 130.71 | 1.25 | 1.23 | 2.71 | 0.11 | 130.83 | 0.225 | 58.000 | 128.40 | 130.84 | 1.25 | 1.23 | 2.71 | 0.11 | 130.96 | 0.225 | 0.225 | 0.131 | 1.00 | 0.11 |
| 17 | 15 | 2.79 | 128.40 | 130.96 | 1.25 | 1.23 | 2.27 | 0.08 | 131.04 | 0.159 | 35.000 | 128.60 | 131.01 | 1.25 | 1.23 | 2.27 | 0.08 | 131.09 | 0.159 | 0.159 | 0.056 | 1.60 | 0.13 |
| 18 | 12 | 1.12 | 128.60 | 131.14 | 1.00 | 0.79 | 1.42 | 0.03 | 131.17 | 0.084 | 31.000 | 129.60 | 131.17 | 1.00 | 0.79 | 1.42 | 0.03 | 131.20 | 0.084 | 0.084 | 0.026 | 1.42 | 0.04 |
| 19 | 12 | 1.09 | 129.60 | 131.21 | 1.00 | 0.79 | 1.38 | 0.03 | 131.24 | 0.079 | 60.000 | 130.10 | 131.26 | 1.00 | 0.79 | 1.38 | 0.03 | 131.29 | 0.079 | 0.079 | 0.048 | 1.00 | 0.03 |
| 20 | 12 | 0.30 | 128.60 | 131.14 | 1.00 | 0.79 | 0.38 | 0.00 | 131.14 | 0.006 | 95.000 | 129.10 | 131.15 | 1.00 | 0.79 | 0.38 | 0.00 | 131.15 | 0.006 | 0.006 | 0.006 | 1.00 | 0.00 |
| 21 | 12 | 0.03 | 131.40 | 131.51 | 0.11 | 0.03 | 0.74 | 0.02 | 131.53 | 0.000 | 21.000 | 131.60 | 131.67 j | 0.07** | 0.03 | 1.26 | 0.02 | 131.70 | 0.000 | 0.000 | n/a | 1.00 | 0.02 |
| 22 | 15 | 0.78 | 128.60 | 131.14 | 1.25 | 1.23 | 0.64 | 0.01 | 131.15 | 0.012 | 43.000 | 128.90 | 131.15 | 1.25 | 1.23 | 0.64 | 0.01 | 131.15 | 0.012 | 0.012 | 0.005 | 1.00 | 0.01 |

Project File: Storm 110.stm

Number of lines: 24

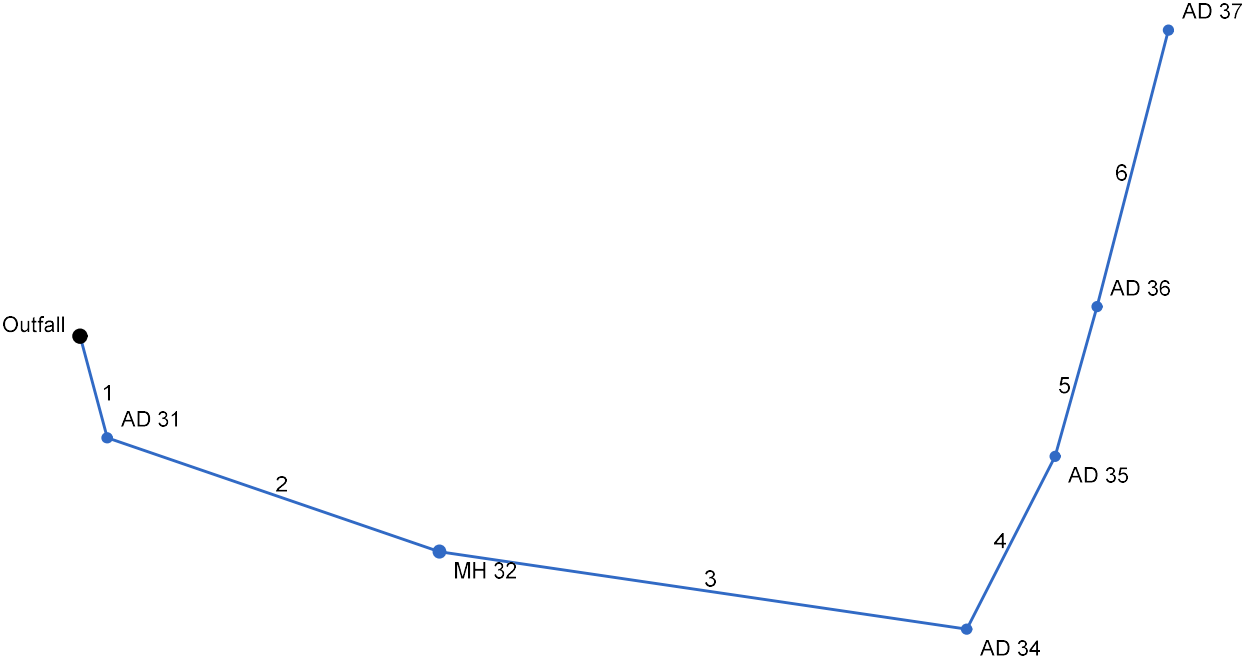
Run Date: 8/30/2023

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 (ft) | HGL elev (ft) | Depth (ft) | Area (sqft) | Vel (ft/s) | Vel head (ft) | EGL elev (ft) | Sf (%) | | Invert elev (ft) | HGL elev (ft) | Depth (ft) | Area (sqft) | Vel (ft/s) | Vel head (ft) | EGL elev (ft) | Sf (%) | Ave Sf (%) | Enrgy loss (ft) | | |
| 23 | 12 | 2.06 | 128.00 | 130.71 | 1.00 | 0.79 | 2.63 | 0.11 | 130.82 | 0.286 | 30.000 | 128.80 | 130.80 | 1.00 | 0.79 | 2.63 | 0.11 | 130.90 | 0.286 | 0.286 | 0.086 | 1.00 | 0.11 |
| 24 | 12 | 1.08 | 127.40 | 130.04 | 1.00 | 0.33 | 1.38 | 0.03 | 130.07 | 0.079 | 115.000 | 130.20 | 130.64 j | 0.44** | 0.33 | 3.28 | 0.17 | 130.80 | 0.502 | 0.291 | n/a | 1.00 | 0.17 |
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Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



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 | 38.000 | 75.151 | DrGrt | 0.00 | 0.14 | 0.30 | 5.0 | 126.80 | 0.79 | 127.10 | 15 | Cir | 0.012 | 1.29 | 133.80 | MH 30-AD 31 |
| 2 | 1 | 126.000 | -56.168 | MH | 0.00 | 0.00 | 0.00 | 5.0 | 127.10 | 0.63 | 127.90 | 15 | Cir | 0.012 | 0.22 | 139.60 | AD 31-MH 32 |
| 3 | 2 | 191.000 | -10.547 | DrGrt | 0.00 | 0.86 | 0.31 | 10.0 | 127.90 | 1.10 | 130.00 | 15 | Cir | 0.012 | 1.44 | 139.00 | MH 32-AD 34 |
| 4 | 3 | 70.000 | -71.460 | DrGrt | 0.00 | 1.10 | 0.34 | 10.0 | 130.00 | 1.43 | 131.00 | 15 | Cir | 0.012 | 0.50 | 137.60 | AD 34-AD 35 |
| 5 | 4 | 56.000 | -11.390 | DrGrt | 0.00 | 0.82 | 0.39 | 5.0 | 131.00 | 0.89 | 131.50 | 12 | Cir | 0.012 | 0.50 | 136.90 | AD 35-AD 36 |
| 6 | 5 | 103.000 | -1.169 | DrGrt | 0.00 | 0.09 | 0.33 | 5.0 | 131.50 | 0.78 | 132.30 | 12 | Cir | 0.012 | 1.00 | 135.50 | AD 36-AD 37 |
| Project File: Storm 120.stm | | | | | | | | | | | | Number of lines: 6 | | | | Date: 8/30/2023 | |

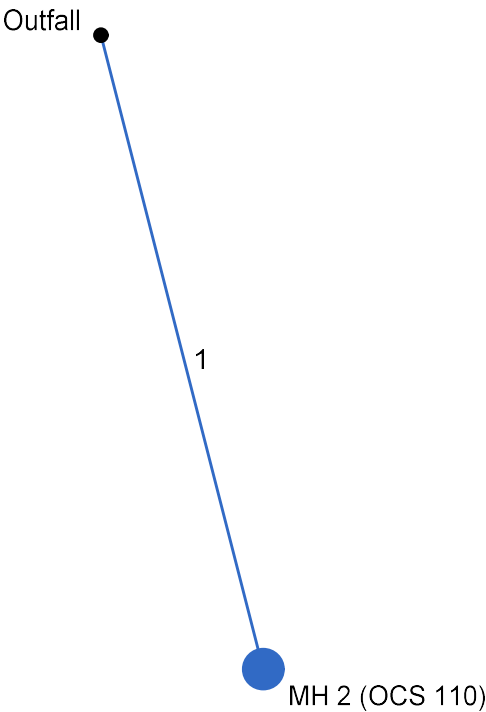
Storm Sewer Tabulation

| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (l) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|--|------------|---------|-----------|-------|----------------|----------|-------|-------|-------|-------------|---------------|-------------|--------|------|-------|--------------------|--------|----------|--------|---------------------|--------|-------------|
| Line | To Line | | Incr | Total | | Incr | Total | Inlet | Syst | | | | | Size | Slope | Dn | Up | Dn | Up | Dn | Up | |
| | | (ft) | (ac) | (ac) | (C) | | | (min) | (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 38.000 | 0.14 | 3.01 | 0.30 | 0.04 | 1.03 | 5.0 | 11.3 | 5.0 | 5.17 | 6.22 | 5.34 | 15 | 0.79 | 126.80 | 127.10 | 127.72 | 128.02 | 136.00 | 133.80 | MH 30-AD 31 |
| 2 | 1 | 126.000 | 0.00 | 2.87 | 0.00 | 0.00 | 0.99 | 5.0 | 10.9 | 5.1 | 5.06 | 5.57 | 5.15 | 15 | 0.63 | 127.10 | 127.90 | 128.03 | 128.83 | 133.80 | 139.60 | AD 31-MH 32 |
| 3 | 2 | 191.000 | 0.86 | 2.87 | 0.31 | 0.27 | 0.99 | 10.0 | 10.3 | 5.3 | 5.22 | 7.34 | 5.11 | 15 | 1.10 | 127.90 | 130.00 | 128.92 | 130.93 | 139.60 | 139.00 | MH 32-AD 34 |
| 4 | 3 | 70.000 | 1.10 | 2.01 | 0.34 | 0.37 | 0.72 | 10.0 | 10.0 | 5.4 | 3.87 | 8.36 | 4.34 | 15 | 1.43 | 130.00 | 131.00 | 130.93 | 131.80 | 139.00 | 137.60 | AD 34-AD 35 |
| 5 | 4 | 56.000 | 0.82 | 0.91 | 0.39 | 0.32 | 0.35 | 5.0 | 6.4 | 6.7 | 2.34 | 3.65 | 3.89 | 12 | 0.89 | 131.00 | 131.50 | 131.80 | 132.15 | 137.60 | 136.90 | AD 35-AD 36 |
| 6 | 5 | 103.000 | 0.09 | 0.09 | 0.33 | 0.03 | 0.03 | 5.0 | 5.0 | 7.4 | 0.22 | 3.40 | 1.24 | 12 | 0.78 | 131.50 | 132.30 | 132.15 | 132.49 | 136.90 | 135.50 | AD 36-AD 37 |
| Project File: Storm 120.stm | | | | | | | | | | | | | | | | Number of lines: 6 | | | | Run Date: 8/30/2023 | | |
| 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 (in) | Q (cfs) | Downstream | | | | | | | | Len (ft) | Upstream | | | | | | | | Check | | JL coeff (K) | Minor loss (ft) |
|---|------------------|----------------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|-----------------|------------------------|---------------------|--------------------|----------------|---------------|---------------------|---------------------|---------------------|------------------|-----------------------|------------------------|---------------------------|
| | | | Invert elev (ft) | HGL elev (ft) | Depth (ft) | Area (sqft) | Vel (ft/s) | Vel head (ft) | EGL elev (ft) | Sf (%) | | Invert elev (ft) | HGL elev (ft) | Depth (ft) | Area (sqft) | Vel (ft/s) | Vel head (ft) | EGL elev (ft) | Sf (%) | Ave Sf (%) | Enrgy loss (ft) | | |
| 1 | 15 | 5.17 | 126.80 | 127.72 | 0.92 | 0.97 | 5.34 | 0.44 | 128.16 | 0.000 | 38.000 | 127.10 | 128.02 | 0.92** | 0.97 | 5.33 | 0.44 | 128.46 | 0.000 | 0.000 | n/a | 1.29 | 0.57 |
| 2 | 15 | 5.06 | 127.10 | 128.03 | 0.93* | 0.98 | 5.15 | 0.41 | 128.45 | 0.635 | 126.000 | 127.90 | 128.83 | 0.93 | 0.98 | 5.15 | 0.41 | 129.25 | 0.636 | 0.635 | 0.801 | 0.22 | 0.09 |
| 3 | 15 | 5.22 | 127.90 | 128.92 | 1.02 | 0.97 | 4.85 | 0.45 | 129.37 | 0.000 | 191.000 | 130.00 | 130.93 j | 0.93** | 0.97 | 5.36 | 0.45 | 131.37 | 0.000 | 0.000 | n/a | 1.44 | n/a |
| 4 | 15 | 3.87 | 130.00 | 130.93 | 0.93 | 0.82 | 3.97 | 0.34 | 131.27 | 0.000 | 70.000 | 131.00 | 131.80 j | 0.80** | 0.82 | 4.70 | 0.34 | 132.14 | 0.000 | 0.000 | n/a | 0.50 | 0.17 |
| 5 | 12 | 2.34 | 131.00 | 131.80 | 0.80 | 0.54 | 3.49 | 0.29 | 132.08 | 0.000 | 56.000 | 131.50 | 132.15 j | 0.65** | 0.54 | 4.30 | 0.29 | 132.44 | 0.000 | 0.000 | n/a | 0.50 | 0.14 |
| 6 | 12 | 0.22 | 131.50 | 132.15 | 0.65 | 0.11 | 0.41 | 0.07 | 132.22 | 0.000 | 103.000 | 132.30 | 132.49 j | 0.19** | 0.11 | 2.08 | 0.07 | 132.56 | 0.000 | 0.000 | n/a | 1.00 | n/a |
| Project File: Storm 120.stm | | | | | | | | | | | | | | Number of lines: 6 | | | | | Run Date: 8/30/2023 | | | | |
| 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 100.stm | Number of lines: 1 | Date: 8/30/2023 |
|------------------------------|--------------------|-----------------|

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 | 66.000 | 75.647 | MH | 16.34 | 0.00 | 0.00 | 5.0 | 122.00 | 2.27 | 123.50 | 18 | Cir | 0.012 | 1.00 | 133.80 | LS-MH 2 |
| Project File: Outlet 100.stm | | | | | | | | | | | | Number of lines: 1 | | | Date: 8/30/2023 | | |

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 | | Incr | Total | | Incr | Total | Inlet | Syst | | | | | Size | Slope | Dn | Up | Dn | Up | Dn | Up | |
| | | (ft) | (ac) | (ac) | (C) | | | (min) | (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | (in) | (%) | (ft) | (ft) | (ft) | (ft) | (ft) | (ft) | |
| 1 | End | 66.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.0 | 5.0 | 0.0 | 16.34 | 17.15 | 9.51 | 18 | 2.27 | 122.00 | 123.50 | 123.38 | 124.93 | 123.50 | 133.80 | LS-MH 2 |
| Project File: Outlet 100.stm | | | | | | | | | | | | | | | | Number of lines: 1 | | | | Run Date: 8/30/2023 | | |
| 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 (in) | Q (cfs) | Downstream | | | | | | | | Len (ft) | Upstream | | | | | | | | Check | | JL coeff (K) | Minor loss (ft) |
|---|------------------|----------------|------------------------|---------------------|---------------|----------------|---------------|---------------------|---------------------|-----------|-----------------|------------------------|---------------------|--------------------|----------------|---------------|---------------------|---------------------|---------------------|------------------|-----------------------|------------------------|---------------------------|
| | | | Invert elev (ft) | HGL elev (ft) | Depth (ft) | Area (sqft) | Vel (ft/s) | Vel head (ft) | EGL elev (ft) | Sf (%) | | Invert elev (ft) | HGL elev (ft) | Depth (ft) | Area (sqft) | Vel (ft/s) | Vel head (ft) | EGL elev (ft) | Sf (%) | Ave Sf (%) | Enrgy loss (ft) | | |
| 1 | 18 | 16.34 | 122.00 | 123.38 | 1.38 | 1.70 | 9.61 | 1.38 | 124.76 | 0.000 | 66.000 | 123.50 | 124.93 | 1.43** | 1.74 | 9.41 | 1.38 | 126.31 | 0.000 | 0.000 | n/a | 1.00 | n/a |
| Project File: Outlet 100.stm | | | | | | | | | | | | | | Number of lines: 1 | | | | | Run Date: 8/30/2023 | | | | |
| Notes: ; ** Critical depth. ; c = cir e = ellip b = box | | | | | | | | | | | | | | | | | | | | | | | |

Level Spreader Design

The top row of openings is to be at grade to provide a free-flowing, unobstructed overflow from the concrete galleries. Each opening was treated as an orifice with dimensions of 2 inches wide by 5 inches high with 4 inches of head measured from the centroid of the opening. Each 4-foot gallery unit has five (5) openings total in the top row.

To determine the number of units required to pass the 100-year storm discharge from the basin:

Discharge Capacity per Unit: (CT DOT Manual – Section 10.8.2)

$$Q = C_o A_o (2gH_o)^{0.5}$$

Where: Q = discharge capacity in cfs

C_o = coefficient of discharge = 0.6

A_o = opening area = 10 in² = 0.069 ft²

g = gravitational acceleration = 32.2 ft/s²

H_o = head on the orifice measured from the centroid of the opening = 4 in = 0.333 ft

$$Q = (0.6)(0.069)[2 \times 32.2 \times 0.333]^{0.5} = 0.192 \text{ cfs per opening}$$

$$Q_{\text{unit}} = \frac{1.92 \text{ cfs}}{\text{opening}} \times 5 \text{ openings} = 0.96 \text{ cfs per unit}$$

Number of Units Required:

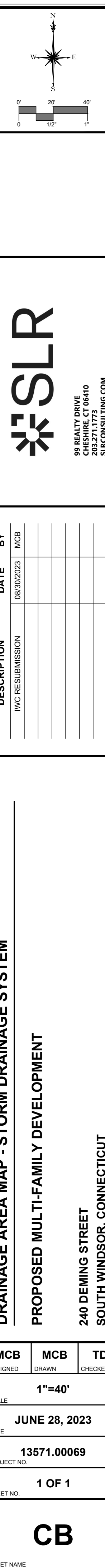
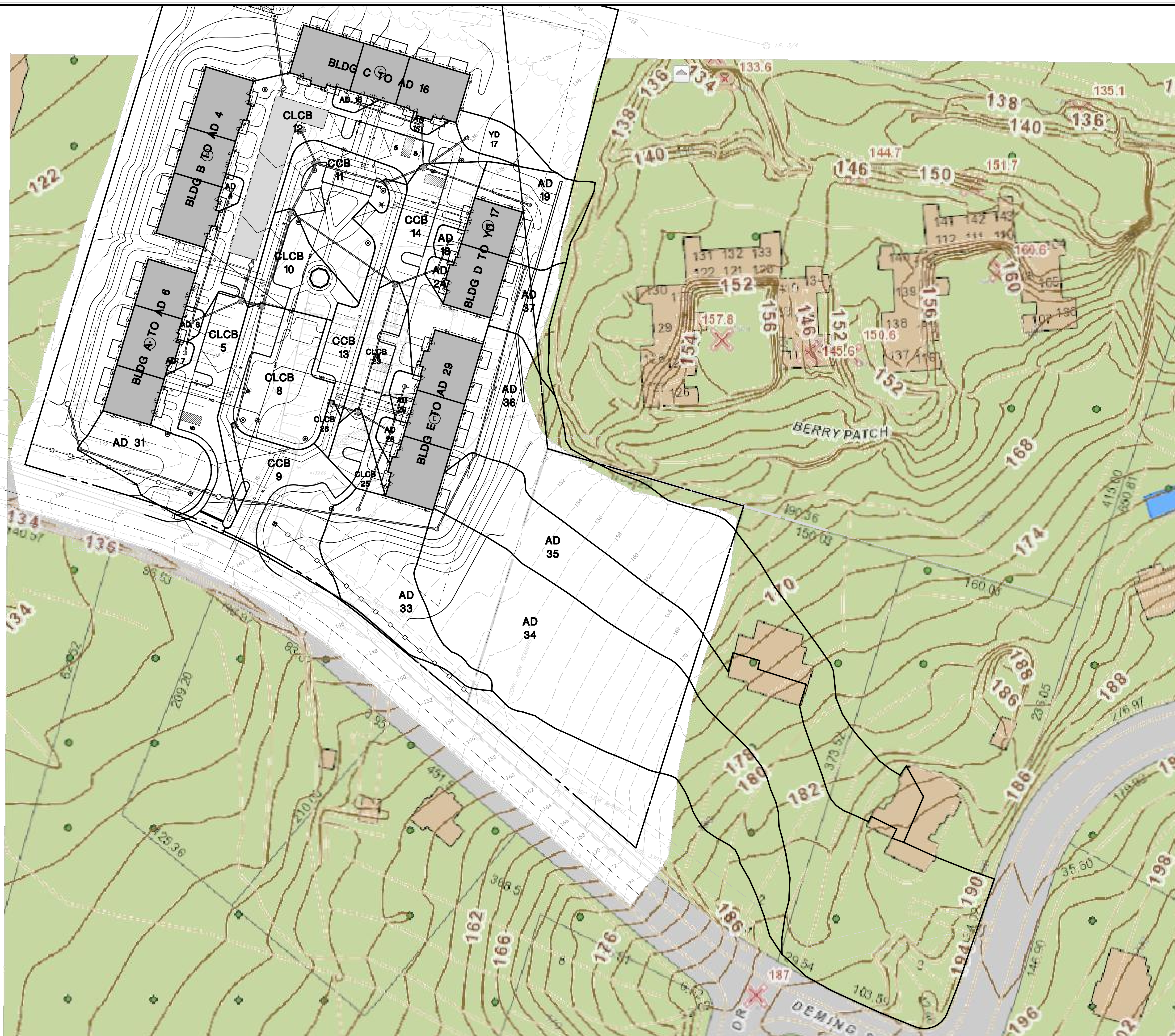
Detention Basin 110 100-Year Discharge = 16.3 cfs

$$16.3 \text{ cfs} \times \frac{\text{unit}}{0.96 \text{ cfs}} = 15.6 \text{ units} = \mathbf{16 \text{ units}}$$

LEGEND

 DRAINAGE AREA BOUNDARY

CCB 10 DRAINAGE AREA LABEL





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 (Rev: August 30, 2023) (**Revised August 30, 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 | 3.03 | 1.95 | 64% | 0.63 | 0.159 | 0.159 | <i>0.169</i> |

1.- Volume provided below lowest orifice

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

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 |
| <i>Total</i> | <i>35,204</i> | <i>114,742</i> | <i>79,538</i> |

| | | | | | | |
|--------------|-------|---|--------|---|------------|----|
| 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: | Rev. 8/30/23 |
| | | | | | | Chkd by: | |
| | | | | | | Date: | |
| | | | | | | | |
| <u>MH 3</u> | | | | | | | |
| | | | | | | | |
| Contributing Basins | | | Imperv. Area (acres) | Total Area (acres) | | | |
| Total | | | 1.95 | 3.03 | | | |
| Table 4.1: WQV = (P)(R _v)(A)/12 = | | | | 0.159 | acre-feet | | |
| Where: | | | | | | | |
| I = % of Impervious Cover = | | | | 64% | | | |
| R _v = volumetric runoff coeff. 0.05 + 0.009(I) = | | | | 0.629 | | | |
| P = design precipitation (1.0" for water quality storm) = | | | | 1 | inch | | |
| A = site area (acres) = | | | | 3.03 | acres = | 0.0047 | miles ² |
| Q = runoff depth (in watershed inches) = [WQV(acrefeet)]*[12(inches/foot)]/drainage area (acres) | | | | | | | |
| | | | | Q = | 0.629 | | |
| CN = 1000 / [10+ 5P + 10Q -10(Q ² + 1.25QP) ^{0.5}] = | | | | 96 | | | |
| Where: | | | | | | | |
| Q = runoff depth (in watershed inches) | | | | | | | |
| | | | | t _c = | 0.17 | hours | |
| Type III Rainfall Distribution: | | | | | | | |
| From Table 4-1, I _a = | | 0.083 | I _a /P = | | 0.083 | | |
| (TR-55) | | | | | | | |
| From Exhibit 4-III, q _u = | | 650 | csm/in. | | | | |
| (TR-55) | | | | | | | |
| WQF = (q _u)(A)(Q) = | | 1.94 | cfs | | | | |
| Cascade CS-5 Flow = 3.5 cfs | | | | | | | |



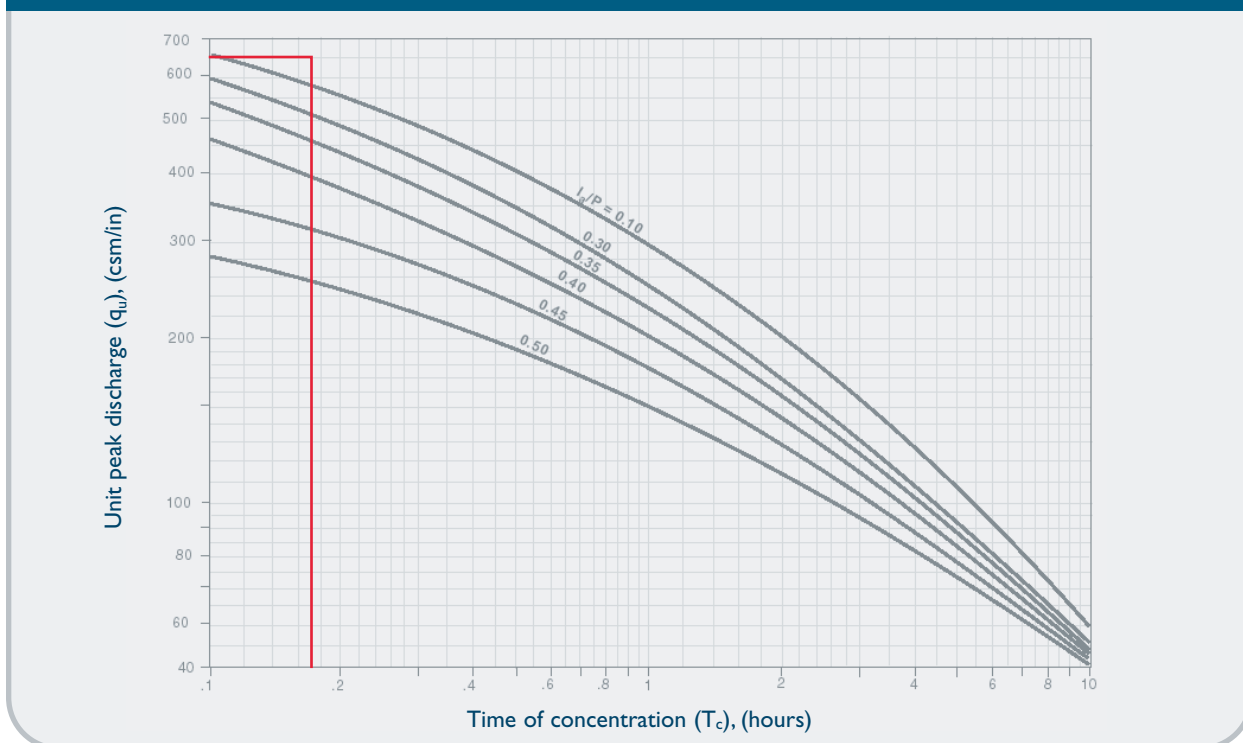
2. Compute the time of concentration (t_c) based on the methods described in Chapter 3 of TR-55. A minimum value of 0.167 hours (10 minutes) should be used. For sheet flow, the flow path should not be longer than 300 feet.
3. Using the computed CN, t_c , and drainage area (A) in acres, compute the peak discharge for the water quality storm (i.e., the water quality flow [WQFI]), 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-III 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.



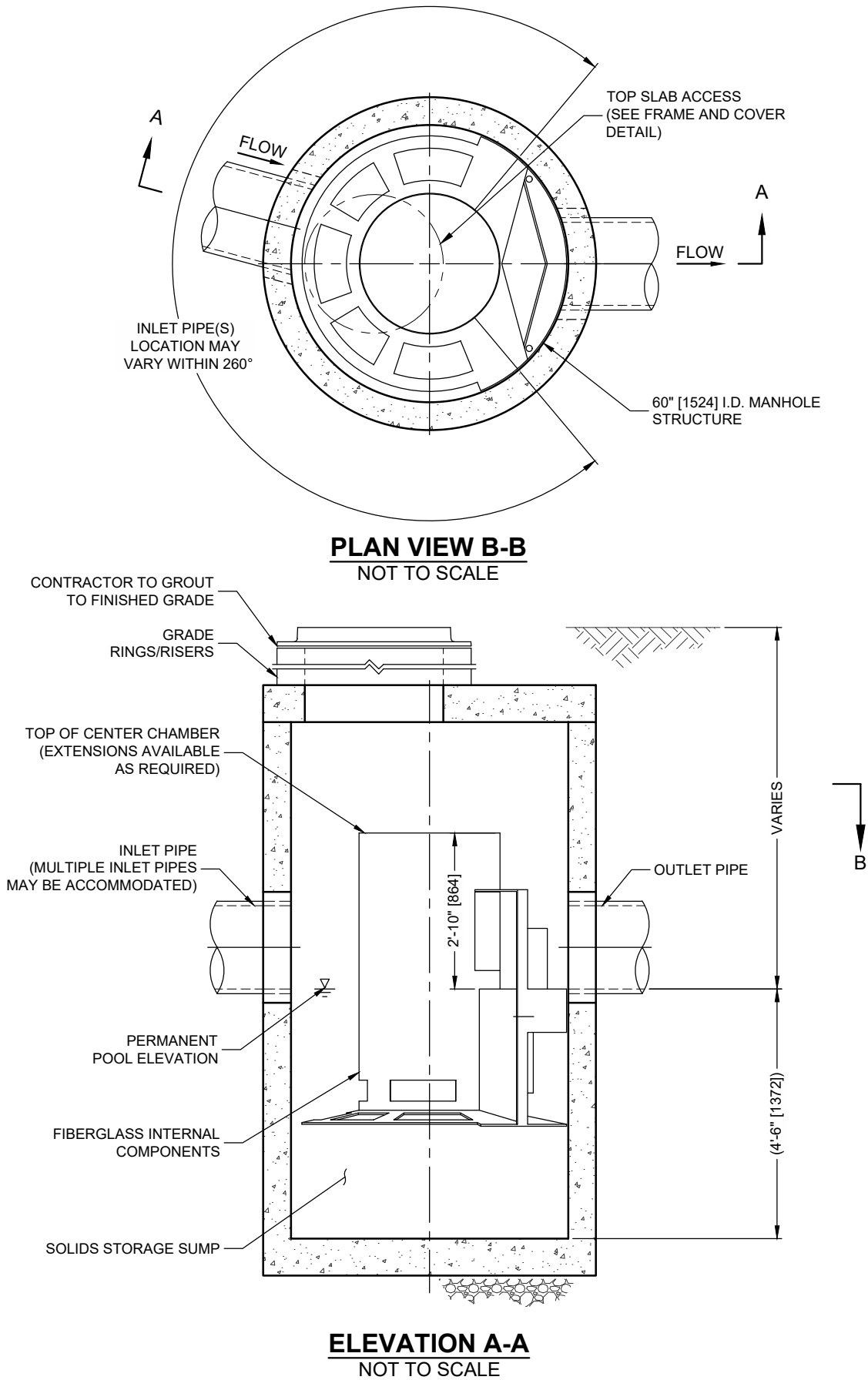
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I:\COMMON\CAD\TREATMENT\21 CASCADE\40 STANDARD DRAWINGS\DWG\CS-5-DTL.DWG 1/22/2019 9:35 AM



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.

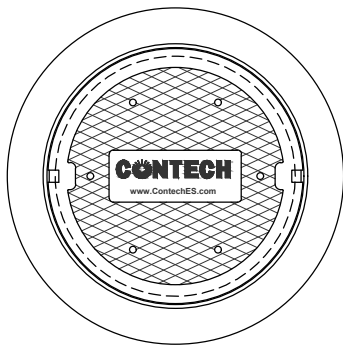
CONFIGURATION DESCRIPTION

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

Cascade Separator™ Inspection and Maintenance Guide



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.

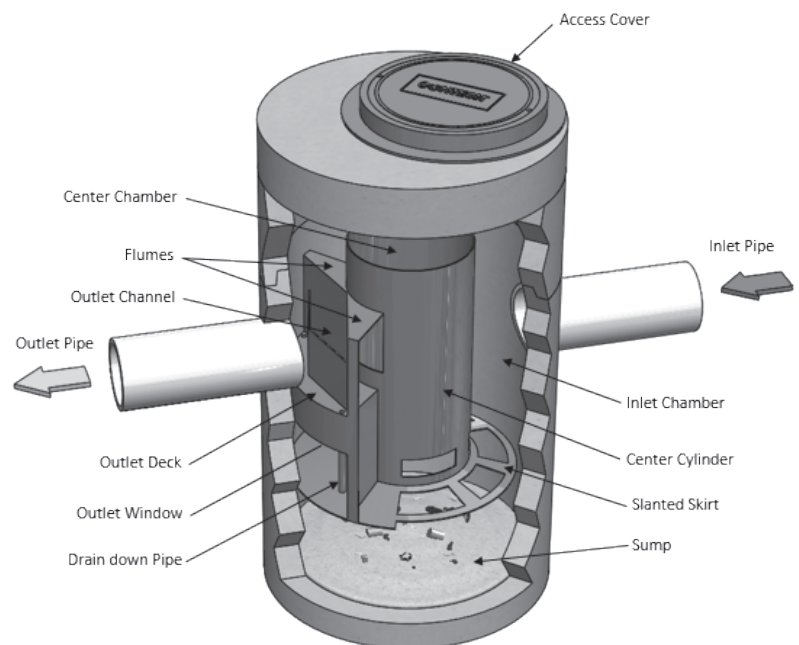
The Cascade Separator system should be cleaned before the level of sediment in the sump reaches the maximum sediment depth and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it must be replaced when significant discoloration has occurred. Performance 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

[illegible]

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.

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Appendix F

Hydrologic Analysis-Input 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 (Rev: August 30, 2023) (**Revised August 30, 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.} | | | Area <div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">Acres</div> Sq. Ft. % | Product of CN x Area |
|--|---|------------------------|------------|------------|--|----------------------|
| | | Table 2-2 | Figure 2-3 | Figure 2-4 | | |
| 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 |
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| | | | | | | |
| | | | | | | |
| Totals = | | | | | 5.65 | 387.84 |

(0.00882 sq mi)

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

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.} | | | Area <div>Acres Sq. Ft. %</div> | Product of CN x Area |
|--|---|------------------------|------------|------------|--|----------------------|
| | | Table 2-2 | Figure 2-3 | Figure 2-4 | | |
| 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 |
| | | | | | | |
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| | | | | | | |
| Totals = | | | | | 1.94 | 147.32 |

(0.00304 sq mi)

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

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.} | | | Area <div>Acres Sq. Ft. %</div> | Product of CN x Area |
|--|---|------------------------|------------|------------|--|-------------------------|
| | | Table 2-2 | Figure 2-3 | Figure 2-4 | | |
| B Soil | Open Space - Good Condition | 61 | | | 0.27 | 16.67 |
| C Soil | Open Space - Good Condition | 74 | | | 0.0004 | 0.03 |
| | | | | | | |
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| | | | | | | |
| Totals = | | | | | 0.27 | 16.70 |

(0.00043 sq mi)

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

Curve Number Calculations

Project: Metro South Windsor

Location: 240 Deming Street

South Windsor, CT

By: JLS

Date: Rev. 8/30/23

Checked: MCB

Date: 8/30/23

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.} | | | Area Acres Sq. Ft. % | Product of CN x Area |
|--|---|------------------------|------------|------------|-----------------------------------|-------------------------|
| | | Table 2-2 | Figure 2-3 | Figure 2-4 | | |
| B Soil | Woods - Good Condition | 55 | | | 0.11 | 6.28 |
| B Soil | Open Space - Good Condition | 61 | | | 0.14 | 8.56 |
| C Soil | Woods - Good Condition | 70 | | | 0.05 | 3.78 |
| C Soil | Open Space - Good Condition | 74 | | | 1.32 | 97.85 |
| N/A | Paved/Impervious | 98 | | | 0.07 | 6.38 |
| | | | | | | |
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| | | | | | | |
| Totals = | | | | | 1.70 | 122.85 |

(0.00265 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{122.85}{1.70} \quad \text{Use CN} = \boxed{72}$$

Curve Number Calculations

Project: Metro South Windsor

Location: 240 Deming Street

South Windsor, CT

By: JLS

Date: Rev. 8/30/23

Checked: MCB

Date: 8/30/23

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.} | | | Area <div style="border: 1px solid black; border-radius: 50%; padding: 2px; display: inline-block;">Acres</div> Sq. Ft. % | Product of CN x Area |
|--|---|------------------------|------------|------------|--|----------------------|
| | | Table 2-2 | Figure 2-3 | Figure 2-4 | | |
| B Soil | Woods - Good Condition | 55 | | | 0.03 | 1.45 |
| B Soil | Open Space - Good Condition | 61 | | | 0.21 | 12.52 |
| C Soil | Woods - Good Condition | 70 | | | 0.00 | 0.10 |
| C Soil | Open Space - Good Condition | 74 | | | 0.85 | 62.90 |
| N/A | Paved/Impervious | 98 | | | 1.23 | 120.66 |
| N/A | Proposed Building | 98 | | | 0.72 | 70.08 |
| | | | | | | |
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| | | | | | | |
| Totals = | | | | | 3.03 | 267.72 |

(0.00473 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{267.72}{3.03} \quad \text{Use CN} = \boxed{88}$$

Curve Number Calculations

Project: Metro South Windsor

Location: 240 Deming Street

South Windsor, CT

By: JLS

Date: Rev. 8/30/23

Checked: MCB

Date: 8/30/23

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.} | | | Area <div>Acres Sq. Ft. %</div> | Product of CN x Area |
|--|---|------------------------|------------|------------|--|----------------------|
| | | Table 2-2 | Figure 2-3 | Figure 2-4 | | |
| B Soil | Woods - Good Condition | 55 | | | 0.06 | 3.47 |
| B Soil | Open Space - Good Condition | 61 | | | 2.55 | 155.79 |
| C Soil | Open Space - Good Condition | 74 | | | 0.01 | 1.10 |
| N/A | Paved/Impervious | 98 | | | 0.10 | 9.97 |
| N/A | Existing Building | 98 | | | 0.13 | 13.05 |
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| | | | | | | |
| Totals = | | | | | 2.87 | 183.39 |

(0.00448 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{183.39}{2.87} \quad \text{Use CN} = \boxed{64}$$

Curve Number Calculations

Project: Metro South Windsor

Location: 240 Deming Street

South Windsor, CT

By: JLS

Date: Rev. 8/30/23

Checked: MCB

Date: 8/30/23

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.} | | | Area <div>Acres Sq. Ft. %</div> | Product of CN x Area |
|--|---|------------------------|------------|------------|--|----------------------|
| | | Table 2-2 | Figure 2-3 | Figure 2-4 | | |
| B Soil | Open Space - Good Condition | 61 | | | 0.27 | 16.69 |
| | | | | | 0.0000 | 0.00 |
| | | | | | | |
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| | | | | | | |
| Totals = | | | | | 0.27 | 16.69 |

(0.00043 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{16.69}{0.27} \quad \text{Use CN} = \boxed{61}$$

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

Project: Deming Street Multi-Family Dvlpt.
 Location: 240 Deming Street, South Windsor, CT
 Circle one: **Present** Developed
 Circle one: **T_c** T_t

By: MCB
 Checked: _____
 Watershed: EXWS-10
 Subwatershed: _____

Date: 06/28/23
 Date: _____

Sheet flow (applicable to T_c only)

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

| Segment ID | A-B |
|------------|------------|
| | GRASS |
| | 0.240 |
| ft. | 100.0 |
| in. | 3.11 |
| ft./ft. | 0.040 |
| hr. | 0.183 |

= 0.183

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

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
12. Watercourse slope, s
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14. $T_t = \frac{L}{3600 * V}$

| Segment ID | B-C | | | |
|------------|------------|--|--|--|
| | GRASS | | | |
| | 0.080 | | | |
| | UNPVD | | | |
| | 0.40 | | | |
| ft. | 149.0 | | | |
| ft./ft. | 0.060 | | | |
| | | | | |
| fps. | 2.48 | | | |
| hr. | 0.017 | | | |

= 0.017

Channel flow

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

| Segment ID | | | | |
|----------------|--|--|--|--|
| ft. | | | | |
| ft. | | | | |
| ft. | | | | |
| ft.^2 | | | | |
| ft. | | | | |
| ft. | | | | |
| ft./ft. | | | | |
| | | | | |
| fps. | | | | |
| ft. | | | | |
| hr. | | | | |

+ = 0.000
 hr. 0.200

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

Project: Deming Street Multi-Family Dvlpt.
 Location: 240 Deming Street, South Windsor, CT
 Circle one: Present Developed
 Circle one: T_c T_t

By: MCB
 Checked: _____
 Watershed: EXWS-20
 Subwatershed: _____

Date: 06/28/23
 Date: _____

Sheet flow (applicable to T_c only)

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

| Segment ID | A-B |
|------------|---------|
| | GRASS |
| | 0.240 |
| ft. | 100.0 |
| in. | 3.11 |
| ft./ft. | 0.130 |
| hr. | 0.114 |
| | = 0.114 |

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

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
12. Watercourse slope, s
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14. $T_t = \frac{L}{3600 * V}$

| Segment ID | B-C | C-D | | |
|------------|-------|-------|--|---------|
| | GRASS | BIT | | |
| | 0.080 | 0.015 | | |
| | UNPVD | PVD | | |
| | 0.40 | 0.20 | | |
| ft. | 291.0 | 162.0 | | |
| ft./ft. | 0.072 | 0.043 | | |
| | | | | |
| fps. | 2.71 | 7.04 | | |
| hr. | 0.030 | 0.006 | | |
| | | | | = 0.036 |

Channel flow

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

| Segment ID | D-E | | | |
|------------------|---------|--|--|---------|
| ft. | 15" CMP | | | |
| ft. | -- | | | |
| ft. | FULL | | | |
| ft. ² | 1.23 | | | |
| ft. | 3.93 | | | |
| ft. | 0.31 | | | |
| ft./ft. | 0.014 | | | |
| | 0.024 | | | |
| | | | | |
| fps. | 3.39 | | | |
| ft. | 248.0 | | | |
| hr. | 0.020 | | | |
| | | | | = 0.020 |
| | | | | 0.171 |

hr.

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.
 Location: 240 Deming Street, South Windsor, CT
 Circle one: Present Developed
 Circle one: T_c T_t

By: MCB
 Checked: _____
 Watershed: PRWS-11
 Subwatershed: _____

Date: 06/28/23
 Date: _____

Sheet flow (applicable to T_c only)

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

| Segment ID | A-B |
|------------|---------|
| | GRASS |
| | 0.240 |
| ft. | 100.0 |
| in. | 3.11 |
| ft./ft. | 0.080 |
| hr. | 0.139 |
| | = 0.139 |

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

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
12. Watercourse slope, s
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14. $T_t = \frac{L}{3600 * V}$

| Segment ID | B-C | | | |
|------------|-------|--|--|---------|
| | GRASS | | | |
| | 0.080 | | | |
| | UNPVD | | | |
| | 0.40 | | | |
| ft. | 131.0 | | | |
| ft./ft. | 0.084 | | | |
| | | | | |
| fps. | 2.93 | | | |
| hr. | 0.012 | | | = 0.012 |

Channel flow

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

| Segment ID | C-D | | | |
|------------------|----------|--|--|---------|
| ft. | 15" HDPE | | | |
| | -- | | | |
| ft. | FULL | | | |
| ft. ² | 1.23 | | | |
| ft. | 3.93 | | | |
| | | | | |
| ft. | 0.31 | | | |
| ft./ft. | 0.010 | | | |
| | 0.012 | | | |
| | | | | |
| fps. | 5.72 | | | |
| ft. | 509.0 | | | |
| hr. | 0.025 | | | = 0.025 |
| | | | | 0.176 |

hr.

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)

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

| Segment ID | A-B |
|------------|-------|
| | GRASS |
| | 0.240 |
| ft. | 100.0 |
| in. | 3.11 |
| ft./ft. | 0.050 |
| hr. | 0.167 |

= 0.167

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

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
12. Watercourse slope, s
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14. $T_t = \frac{L}{3600 * V}$

| Segment ID | B-C | | | |
|------------|-------|--|--|--|
| | GRASS | | | |
| | 0.080 | | | |
| | UNPVD | | | |
| | 0.40 | | | |
| ft. | 425.0 | | | |
| ft./ft. | 0.100 | | | |
| | | | | |
| fps. | 3.20 | | | |
| hr. | 0.037 | | | |

= 0.037

Channel flow

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

| Segment ID | C-D | | | |
|------------------|----------|--|--|--|
| ft. | 15" HDPE | | | |
| | -- | | | |
| ft. | FULL | | | |
| ft. ² | 1.23 | | | |
| ft. | 3.93 | | | |
| | | | | |
| ft. | 0.31 | | | |
| ft./ft. | 0.005 | | | |
| | 0.012 | | | |
| | | | | |
| fps. | 4.05 | | | |
| ft. | 482.0 | | | |
| hr. | 0.033 | | | |

= 0.033

hr. 0.237

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

Project: Deming Street Multi-Family Dvlpt.
 Location: 240 Deming Street, South Windsor, CT
 Circle one: Present Developed
 Circle one: T_c T_t

By: MCB
 Checked: _____
 Watershed: PRWS-30
 Subwatershed: _____

Date: 06/28/23
 Date: _____

Sheet flow (applicable to T_c only)

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

| Segment ID | A-B |
|------------|---------|
| | GRASS |
| | 0.240 |
| ft. | 100.0 |
| in. | 3.11 |
| ft./ft. | 0.060 |
| hr. | 0.155 |
| | = 0.155 |

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

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
12. Watercourse slope, s
13. Average velocity, $V = \frac{1.49}{n} (d^{2/3}) (s^{1/2})$
14. $T_t = \frac{L}{3600 * V}$

| Segment ID | B-C | | | |
|------------|-------|--|--|---------|
| | GRASS | | | |
| | 0.080 | | | |
| | UNPVD | | | |
| | 0.40 | | | |
| ft. | 53.0 | | | |
| ft./ft. | 0.113 | | | |
| | | | | |
| fps. | 3.40 | | | |
| hr. | 0.004 | | | = 0.004 |

Channel flow

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

| Segment ID | | | | |
|------------|--|---|--|---------|
| ft. | | | | |
| ft. | | | | |
| ft. | | | | |
| $ft.^2$ | | | | |
| ft. | | | | |
| ft. | | | | |
| ft./ft. | | | | |
| | | | | |
| fps. | | | | |
| ft. | | | | |
| hr. | | + | | = 0.000 |
| | | | | 0.160 |

hr.



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 & aeriels](#)

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) |

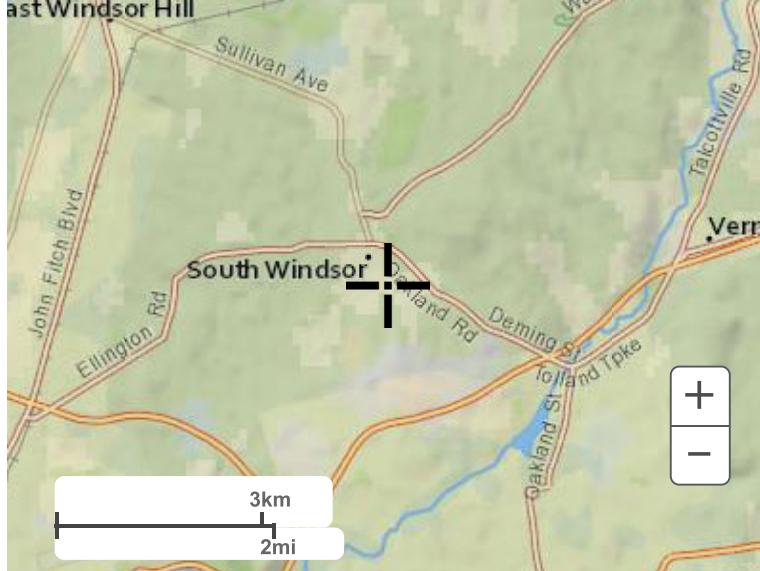
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

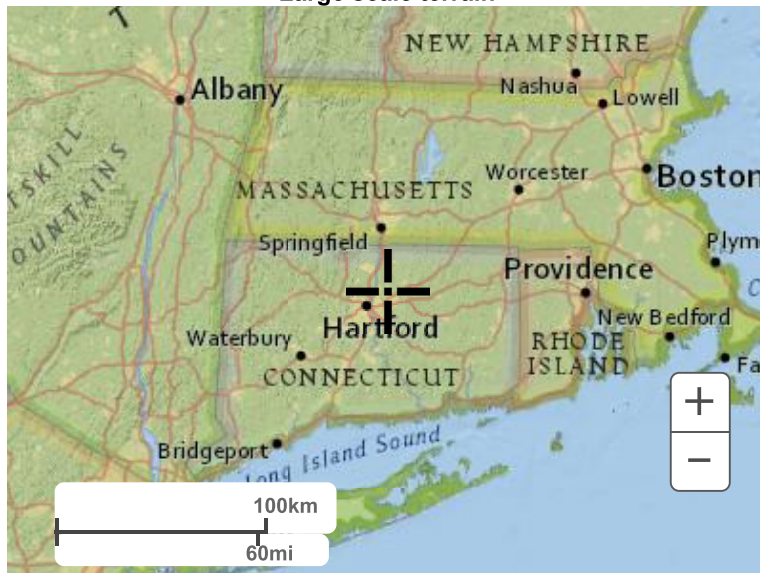
Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

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 (Rev: August 30, 2023) (**Revised August 30, 2023**)



Hydrographs Peak Flowrate Summary (cfs)

Existing vs. Proposed

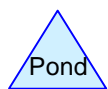
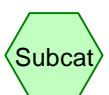
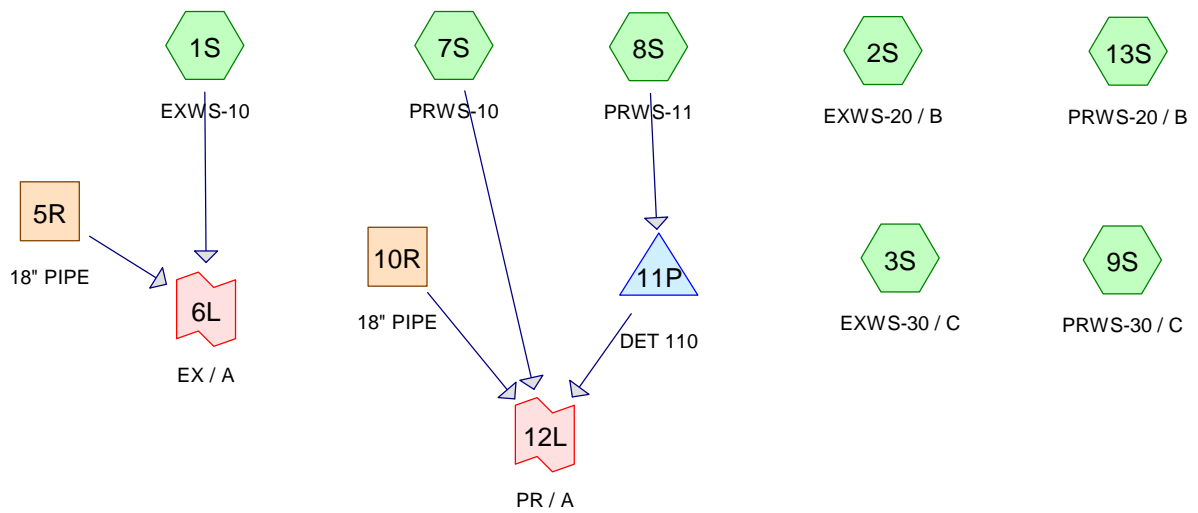
| <i>Storm Event</i> | 2yr | | 10yr | | 25yr | | 50yr | | 100yr | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | Exist | Prop | Exist | Prop | Exist | Prop | Exist | Prop | Exist | Prop |
| Point of Analysis A | 8.8 | 8.4 | 15.4 | 13.5 | 20.2 | 19.3 | 23.9 | 23.3 | 28.0 | 27.6 |
| DET 110 W.S. Elev. (ft.) Top of Chamber Elev. = 130.1 | - | 127.8 | - | 129.2 | - | 129.6 | - | 129.8 | - | 129.9 |
| Point of Analysis B | 2.0 | 1.0 | 4.8 | 3.7 | 6.7 | 5.8 | 8.1 | 7.5 | 9.6 | 9.3 |
| 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

A
B
C

Description

Western Property Boundary
On-Site Storm Drainage System
Storm Drainage System in Deming Street



Routing Diagram for MR-SW-Model02-Retain-it
 Prepared by SLR International Corporation, Printed 8/15/2023
 HydroCAD® 10.20-3c s/n 08105 © 2023 HydroCAD Software Solutions LLC

MR-SW-Model02-Retain-it

Prepared by SLR International Corporation

HydroCAD® 10.20-3c s/n 08105 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.11"

Printed 8/15/2023

Page 2

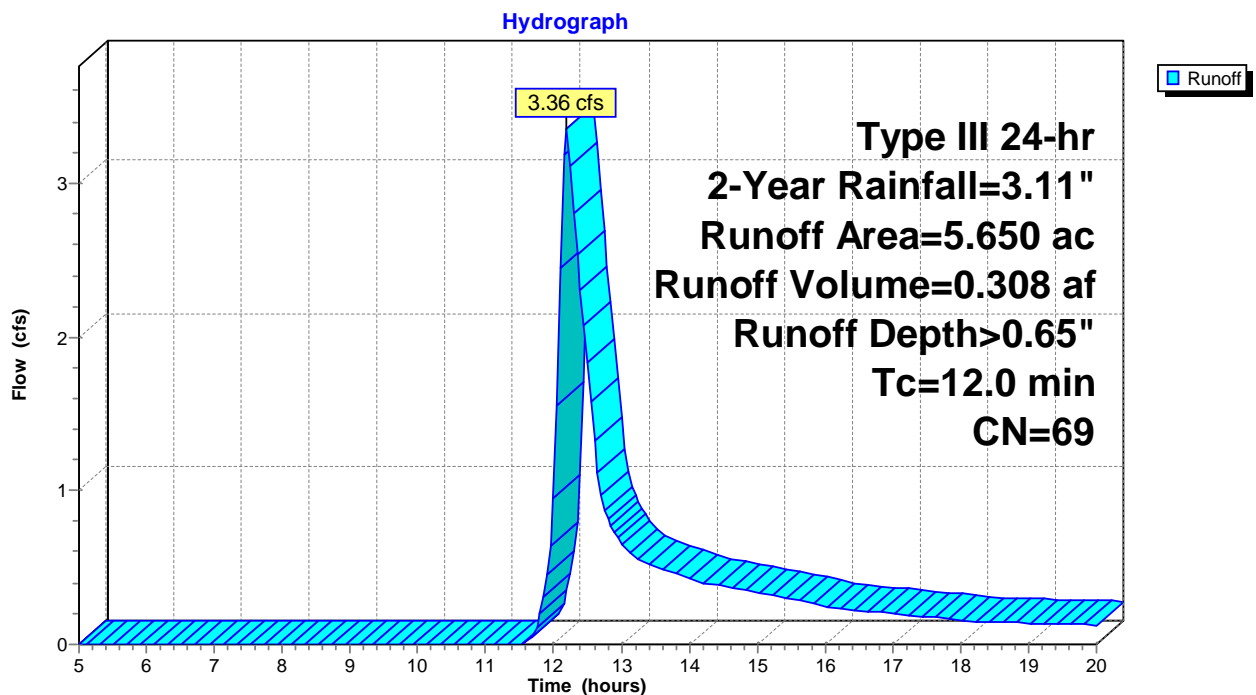
Summary for Subcatchment 1S: EXWS-10

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

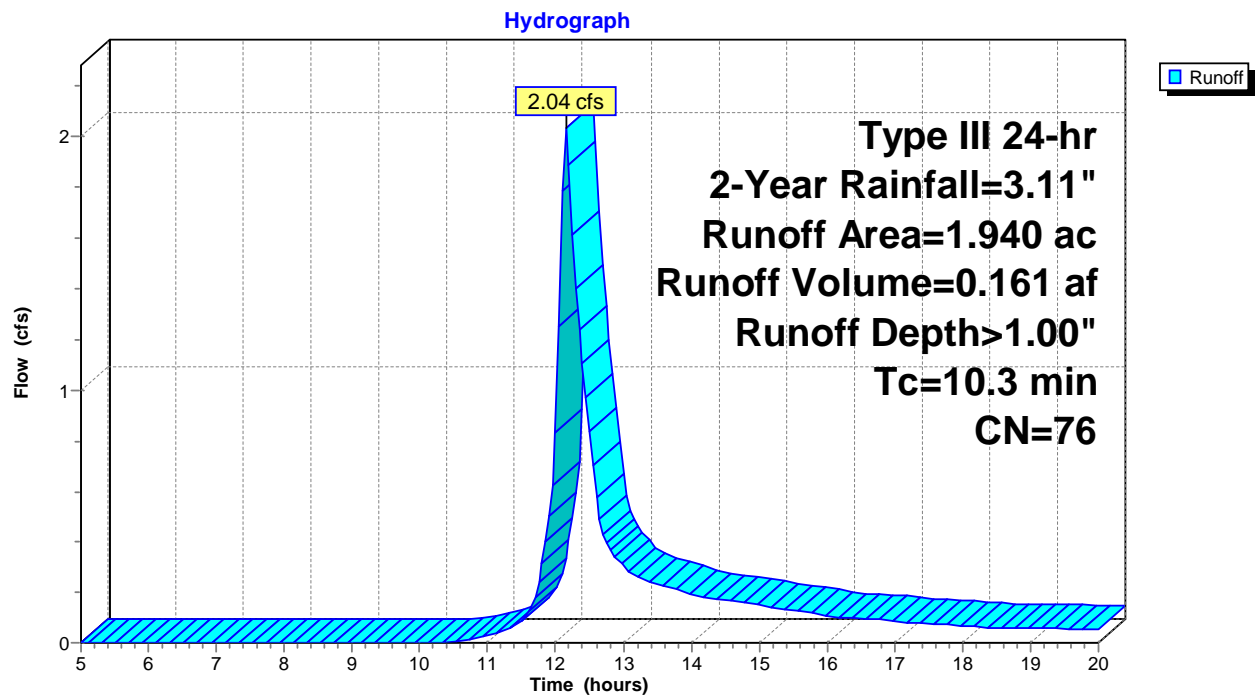
Summary for Subcatchment 2S: EXWS-20 / B

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

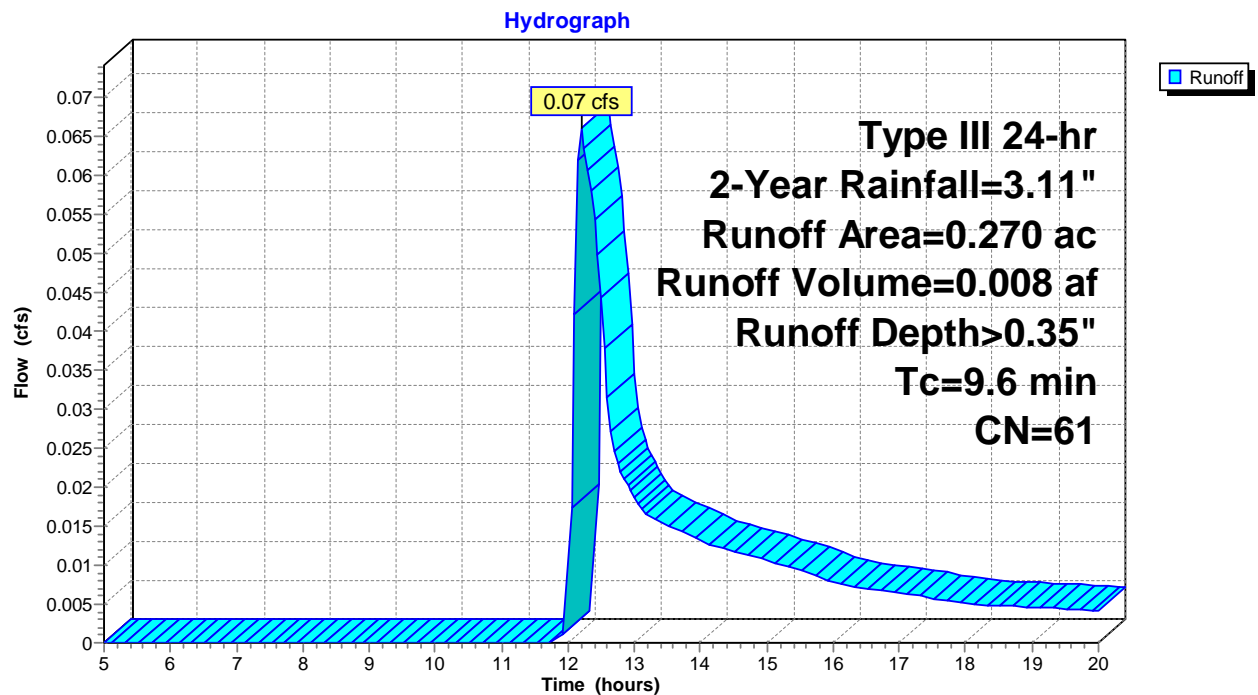
Summary for Subcatchment 3S: EXWS-30 / C

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

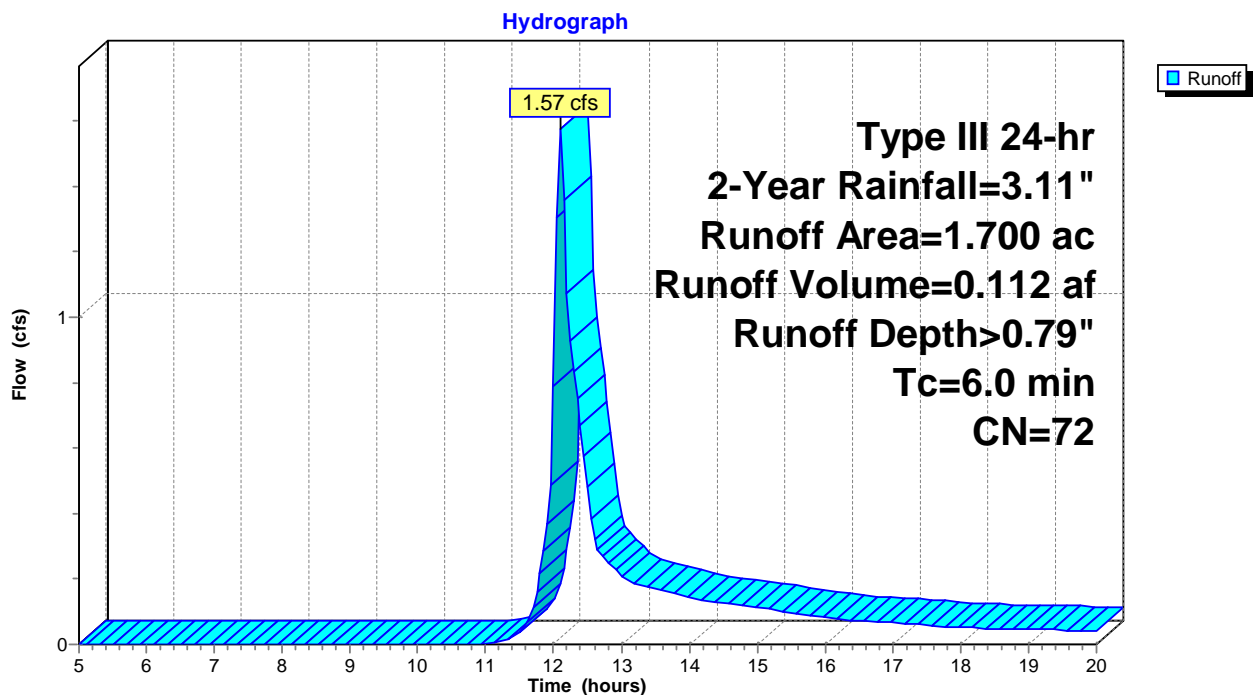
Summary for Subcatchment 7S: PRWS-10

Runoff = 1.57 cfs @ 12.10 hrs, Volume= 0.112 af, Depth> 0.79"
 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 |
|-----------|----|-----------------------|
| * 1.700 | 72 | |
| 1.700 | | 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

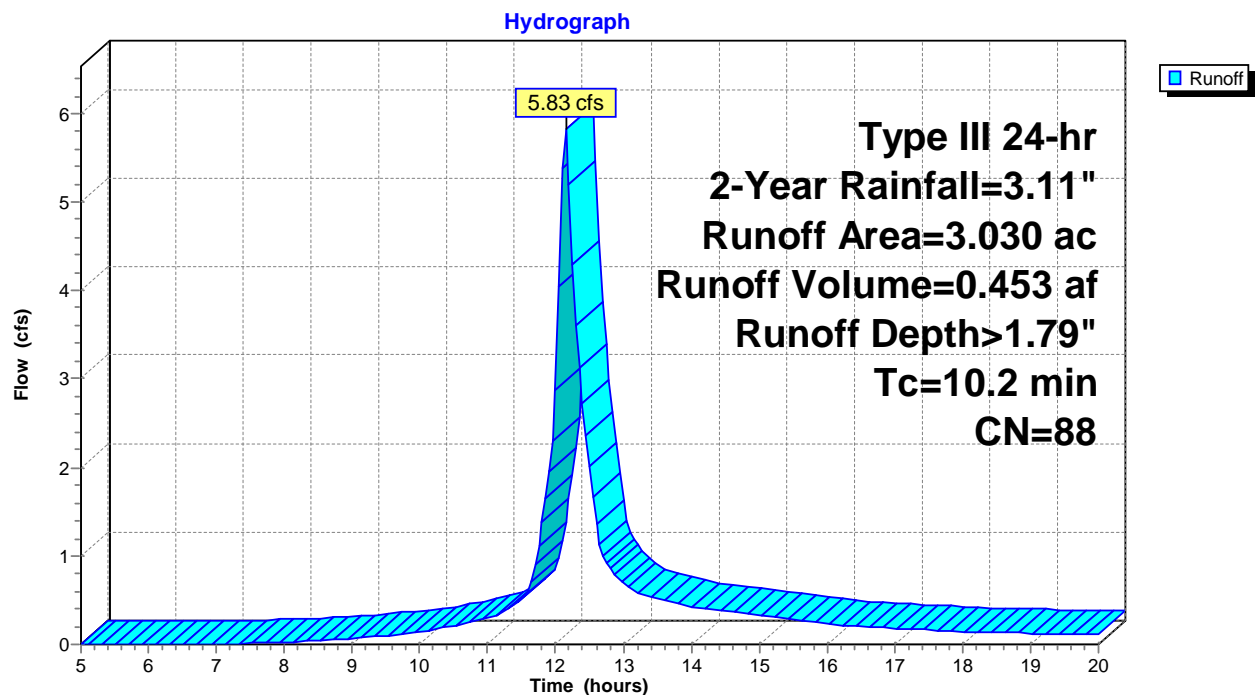
Summary for Subcatchment 8S: PRWS-11

Runoff = 5.83 cfs @ 12.15 hrs, Volume= 0.453 af, Depth> 1.79"
 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 |
|-----------|----|-----------------------|
| * 3.030 | 88 | |
| 3.030 | | 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

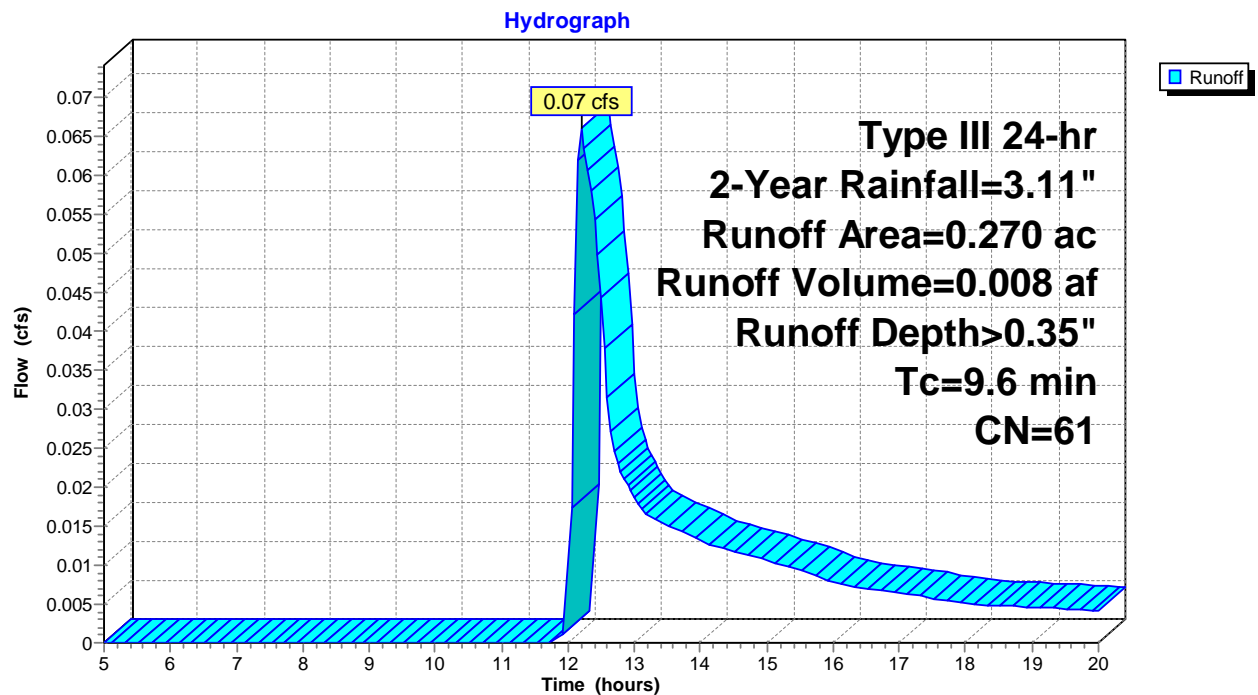
Summary for Subcatchment 9S: PRWS-30 / C

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

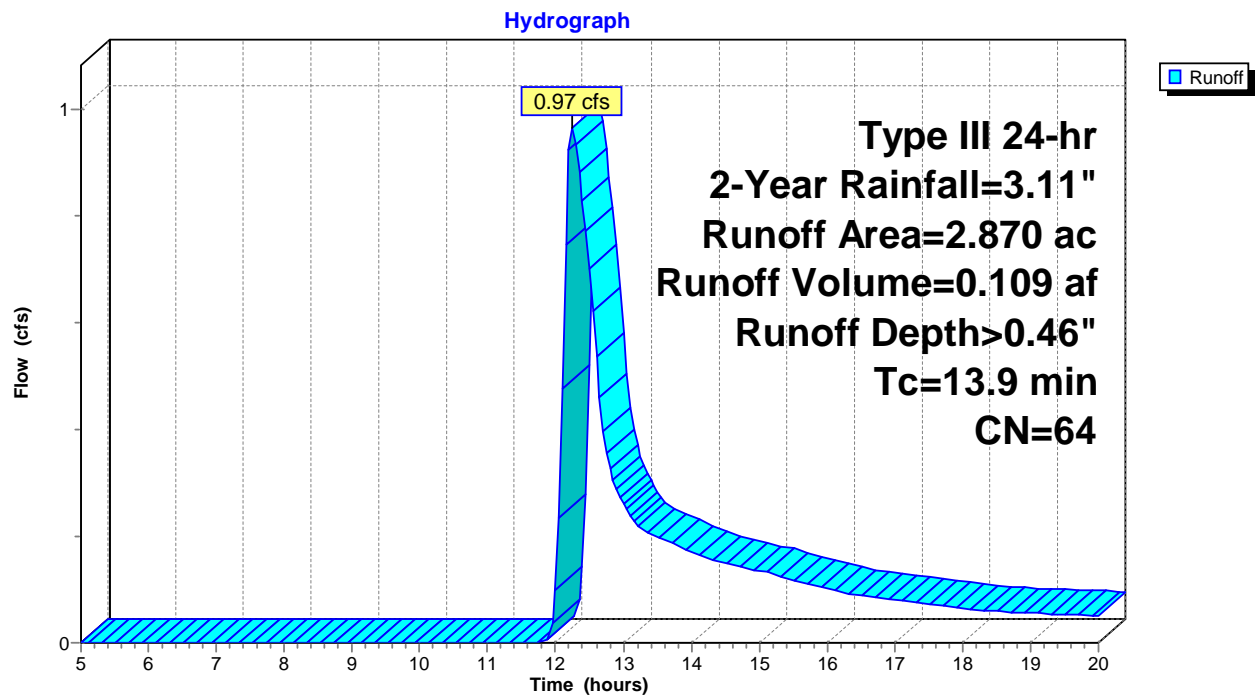
Summary for Subcatchment 13S: PRWS-20 / B

Runoff = 0.97 cfs @ 12.25 hrs, Volume= 0.109 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 |
|-----------|----|-----------------------|
| * 2.870 | 64 | |
| 2.870 | | 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

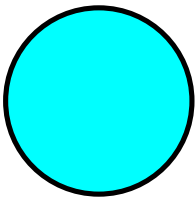
Summary for Reach 5R: 18" PIPE

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

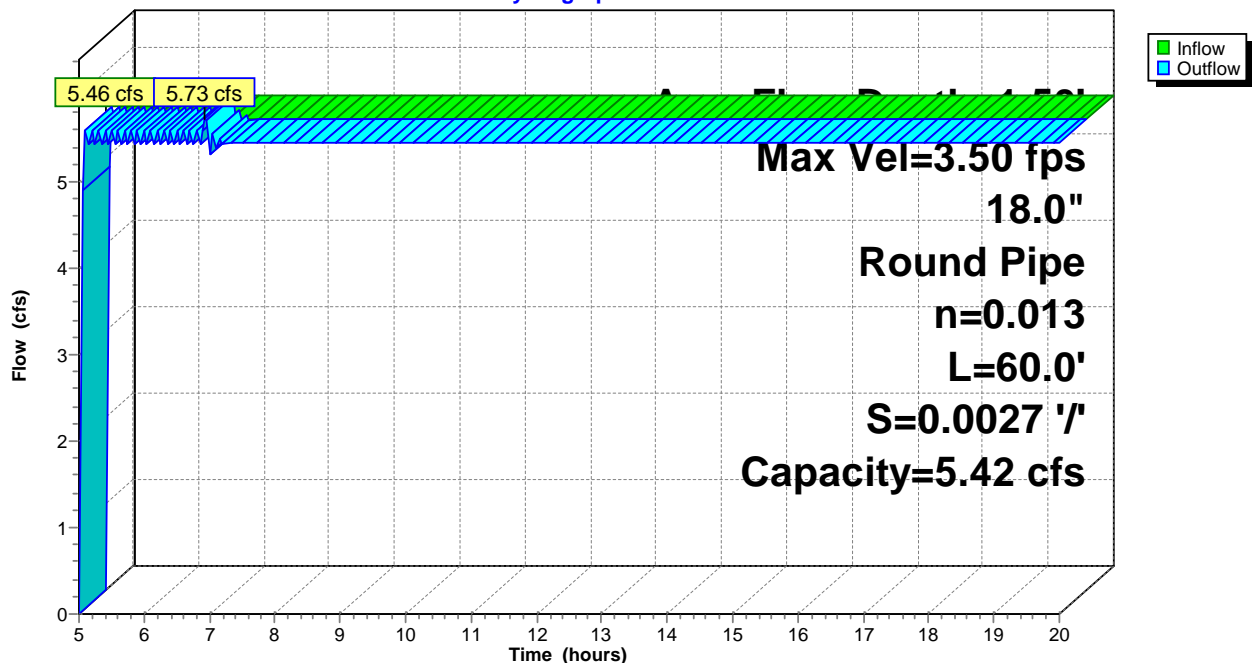
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

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'

**Reach 5R: 18" PIPE**

Hydrograph



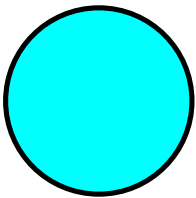
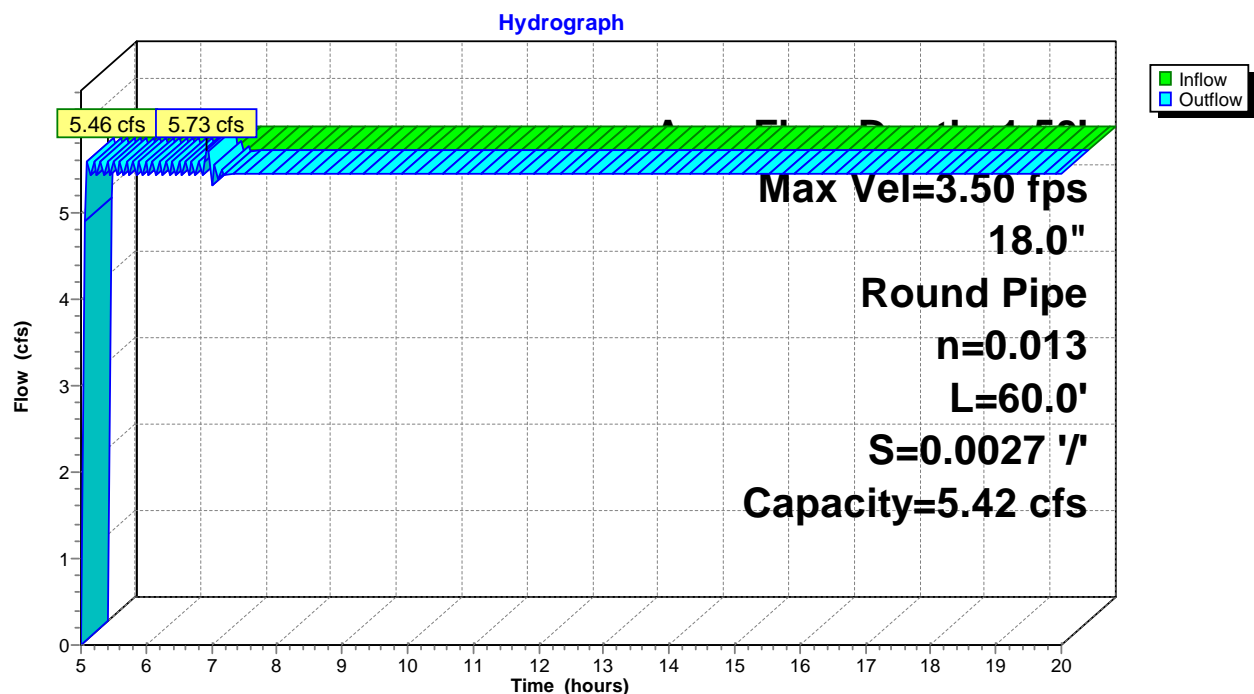
Summary for Reach 10R: 18" PIPE

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'

**Reach 10R: 18" PIPE**

Summary for Pond 11P: DET 110

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth > 1.79" for 2-Year event
 Inflow = 5.83 cfs @ 12.15 hrs, Volume= 0.453 af
 Outflow = 2.26 cfs @ 12.47 hrs, Volume= 0.293 af, Atten= 61%, Lag= 19.2 min
 Primary = 2.26 cfs @ 12.47 hrs, Volume= 0.293 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= 127.79' @ 12.47 hrs Surf.Area= 0.088 ac Storage= 0.211 af

Plug-Flow detention time= 136.3 min calculated for 0.292 af (65% of inflow)
 Center-of-Mass det. time= 66.5 min (852.3 - 785.8)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|--|
| #1A | 125.10' | 0.000 af | 40.00'W x 96.00'L x 5.67'H Field A 0.500 af Overall - 0.500 af Embedded = 0.000 af x 40.0% Voids |
| #2A | 125.10' | 0.393 af | retain_it retain_it 5.0' x 60 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 5 Rows adjusted for 353.3 cf perimeter wall |
| | | 0.393 af | Total Available Storage |

Storage Group A created with Chamber Wizard

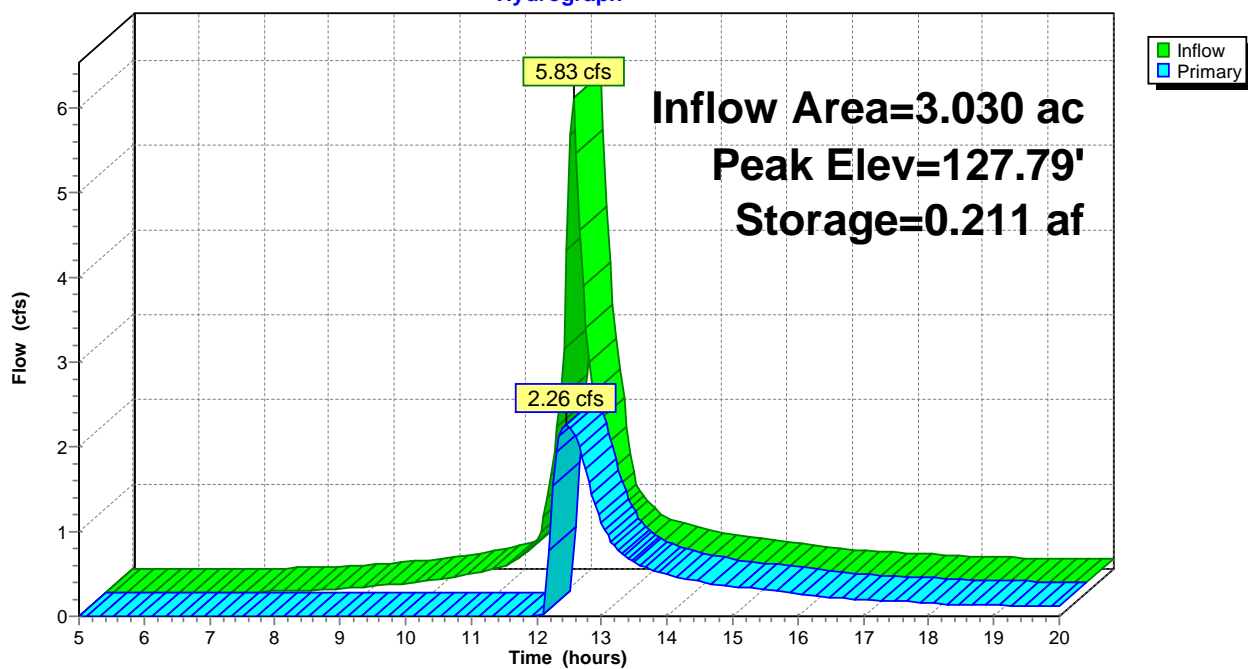
| Device | Routing | Invert | Outlet Devices |
|--------|----------|---------|---|
| #1 | Primary | 123.20' | 18.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.20' / 122.00' S= 0.0240 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf |
| #2 | Device 1 | 127.00' | 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=2.26 cfs @ 12.47 hrs HW=127.78' (Free Discharge)

↑ **1=Culvert** (Passes 2.26 cfs of 13.15 cfs potential flow)
 ↑ **2=Orifice/Grate** (Orifice Controls 2.26 cfs @ 3.24 fps)
 ↑ **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 11P: DET 110

Hydrograph



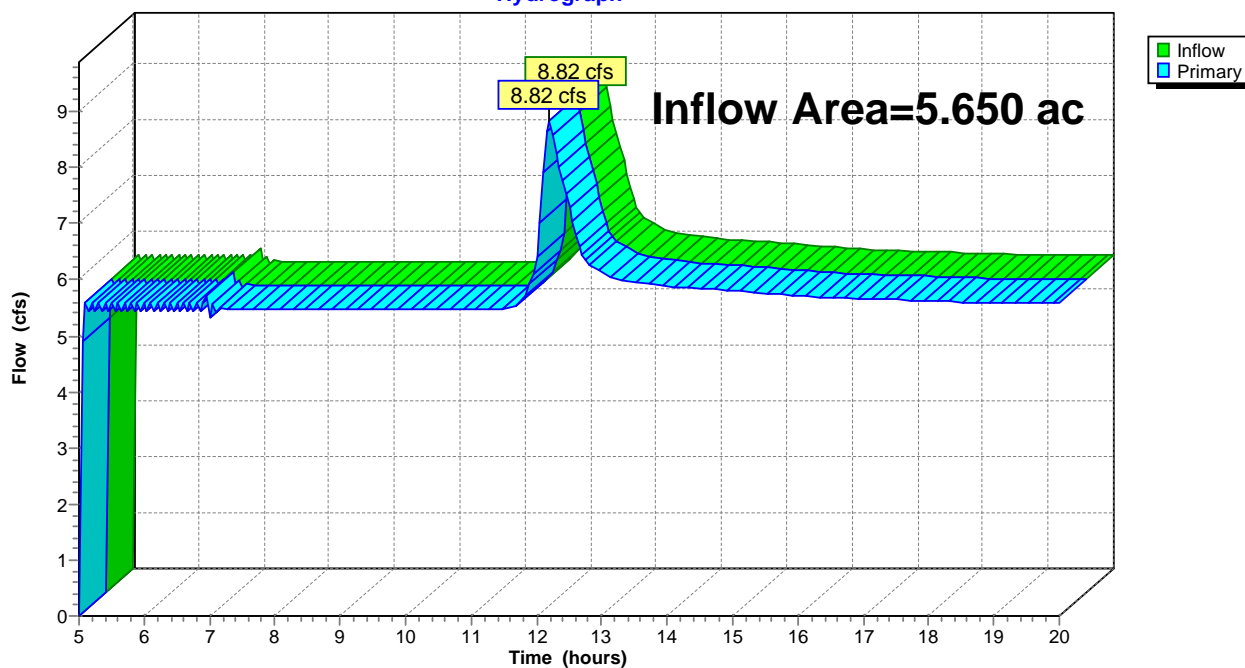
Summary for Link 6L: EX / A

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

Hydrograph



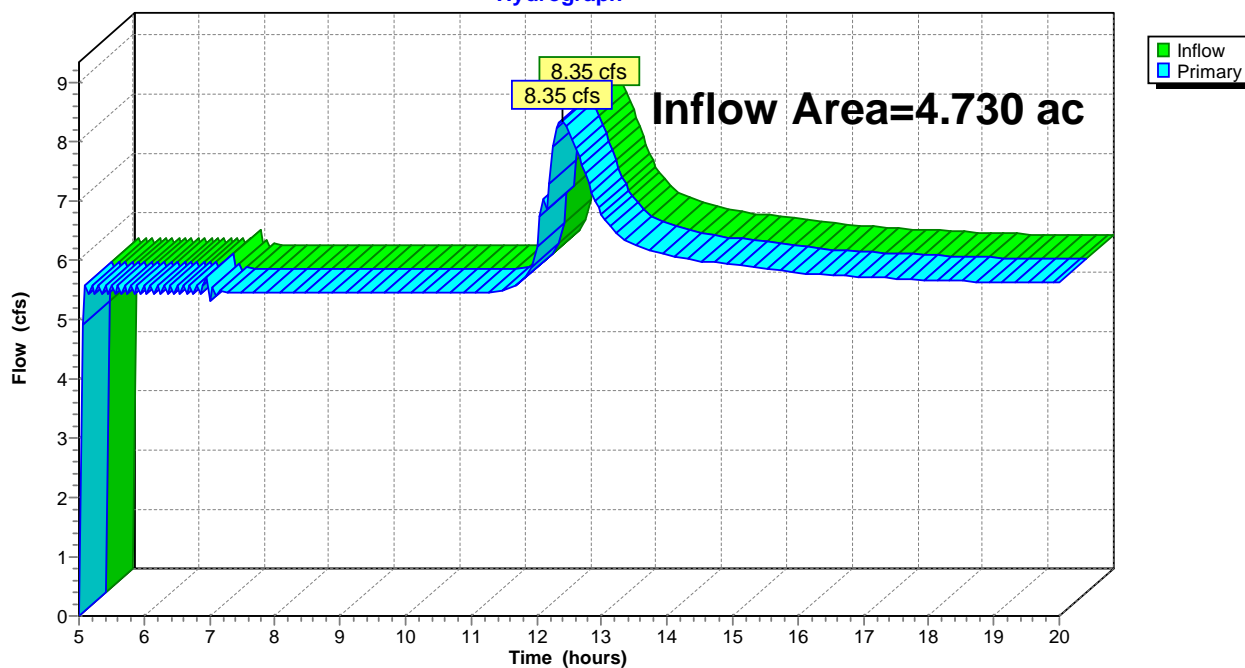
Summary for Link 12L: PR / A

Inflow Area = 4.730 ac, 0.00% Impervious, Inflow Depth > 18.22" for 2-Year event
Inflow = 8.35 cfs @ 12.39 hrs, Volume= 7.181 af
Primary = 8.35 cfs @ 12.39 hrs, Volume= 7.181 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

Hydrograph



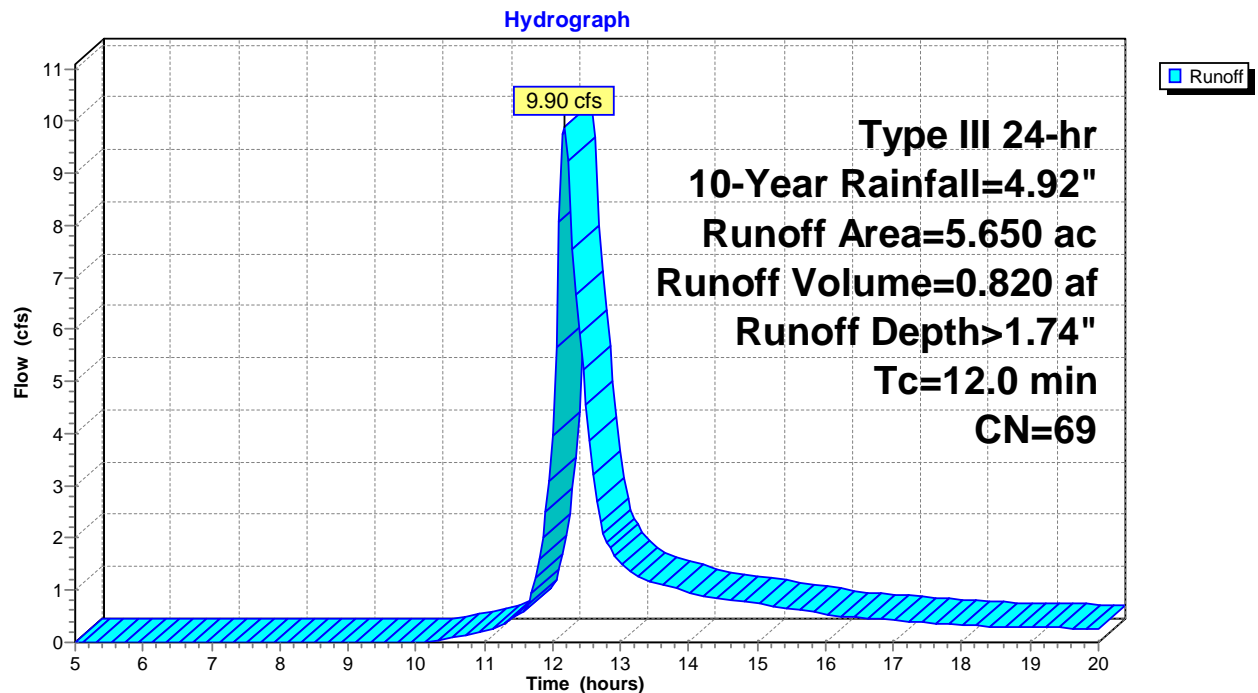
Summary for Subcatchment 1S: EXWS-10

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

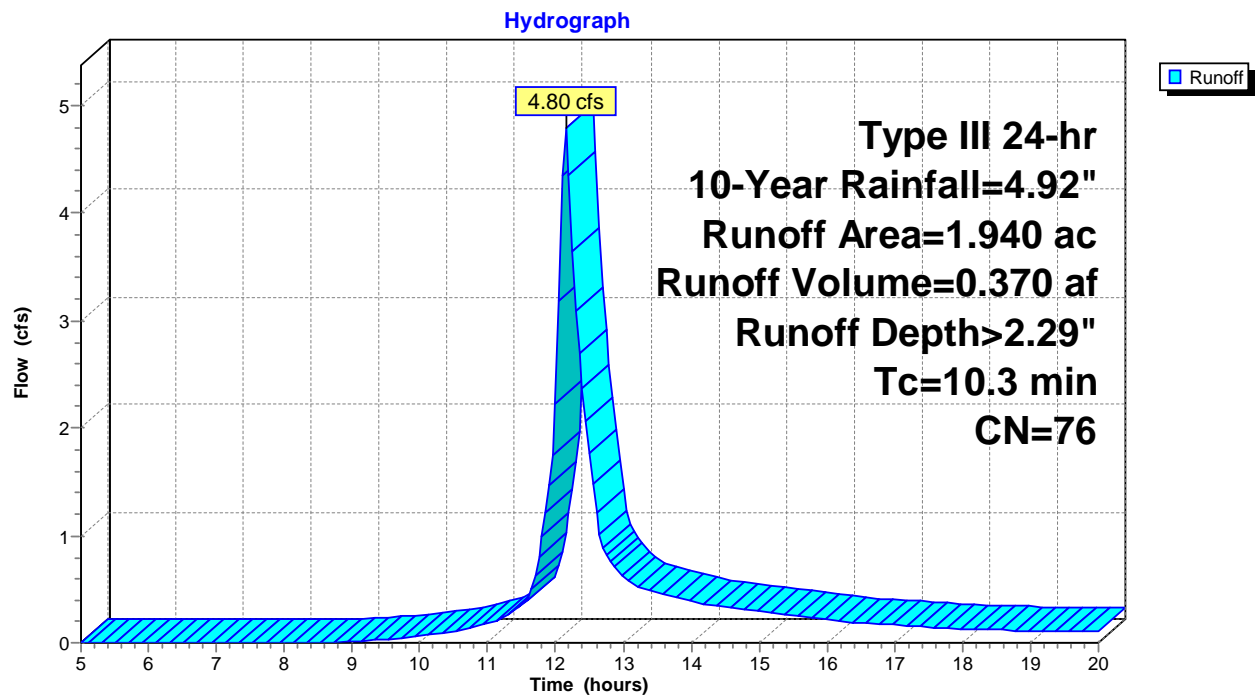
Summary for Subcatchment 2S: EXWS-20 / B

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

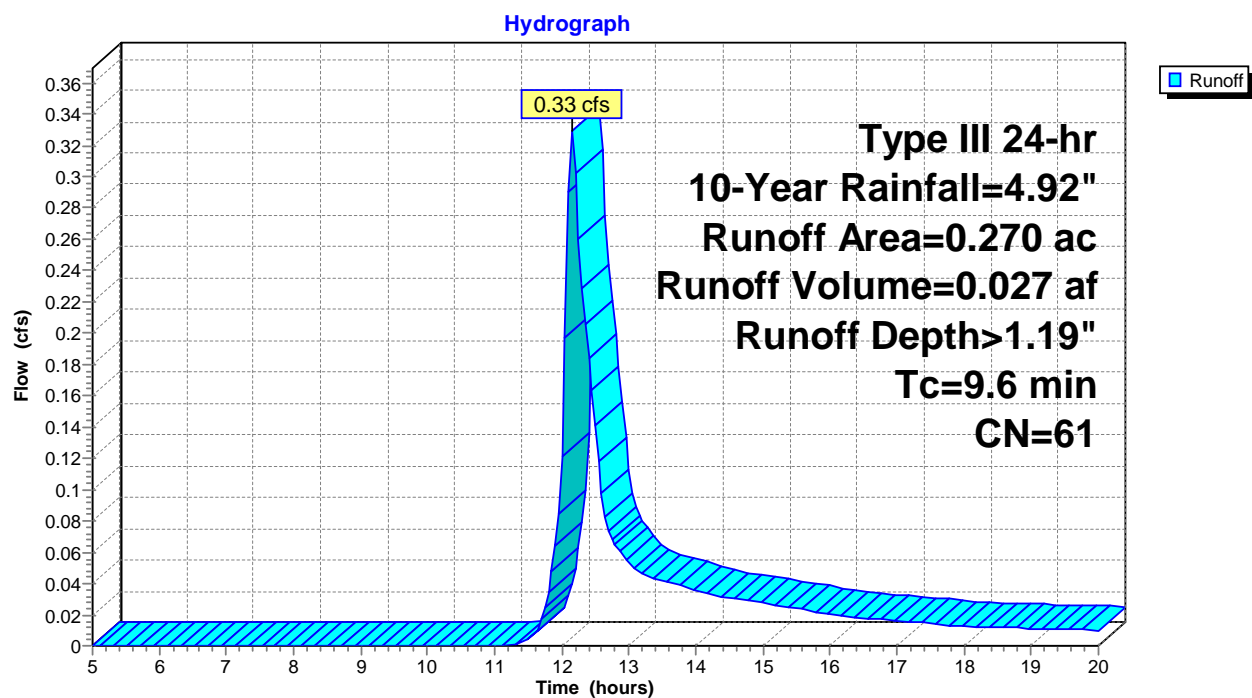
Summary for Subcatchment 3S: EXWS-30 / C

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

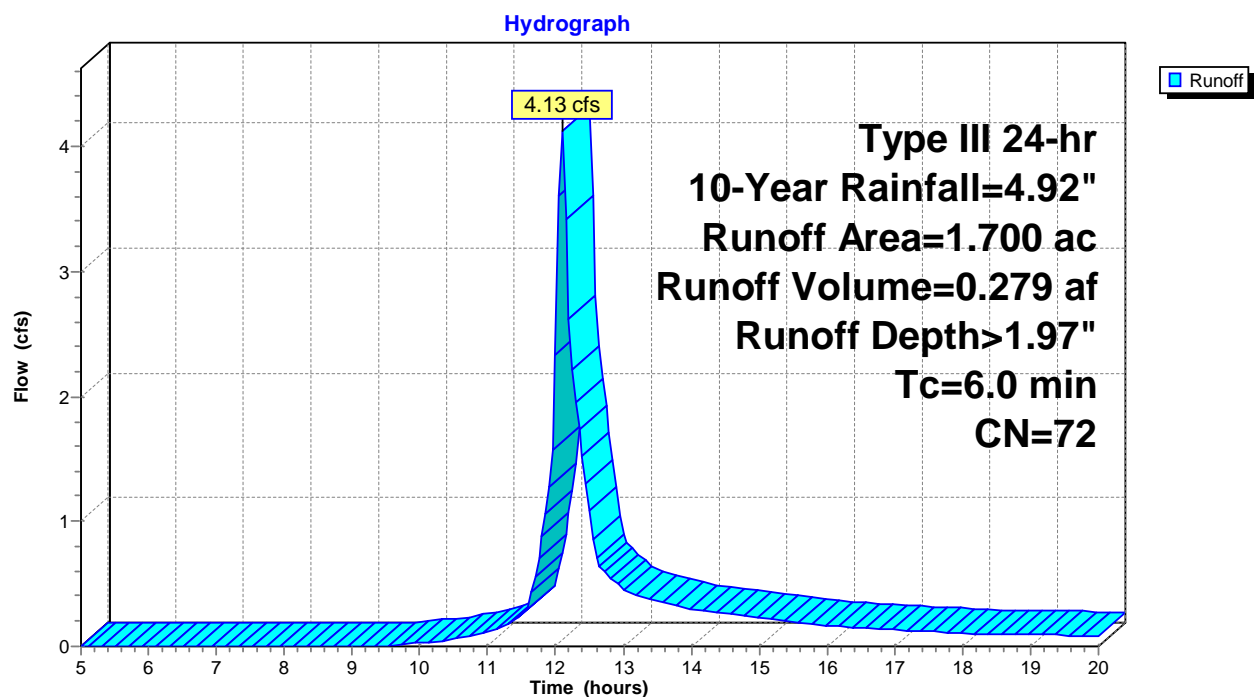
Summary for Subcatchment 7S: PRWS-10

Runoff = 4.13 cfs @ 12.10 hrs, Volume= 0.279 af, Depth> 1.97"
 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 |
|-----------|----|-----------------------|
| * 1.700 | 72 | |
| 1.700 | | 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

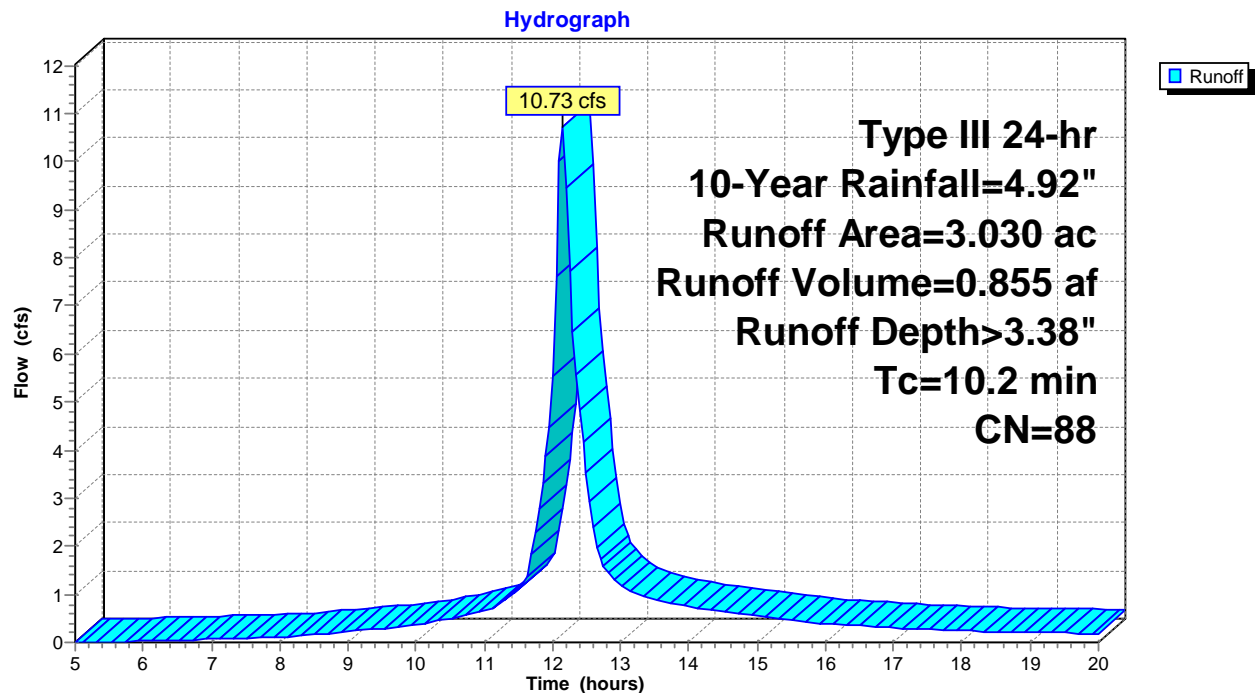
Summary for Subcatchment 8S: PRWS-11

Runoff = 10.73 cfs @ 12.14 hrs, Volume= 0.855 af, Depth> 3.38"
 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 |
|-----------|----|-----------------------|
| * 3.030 | 88 | |
| 3.030 | | 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

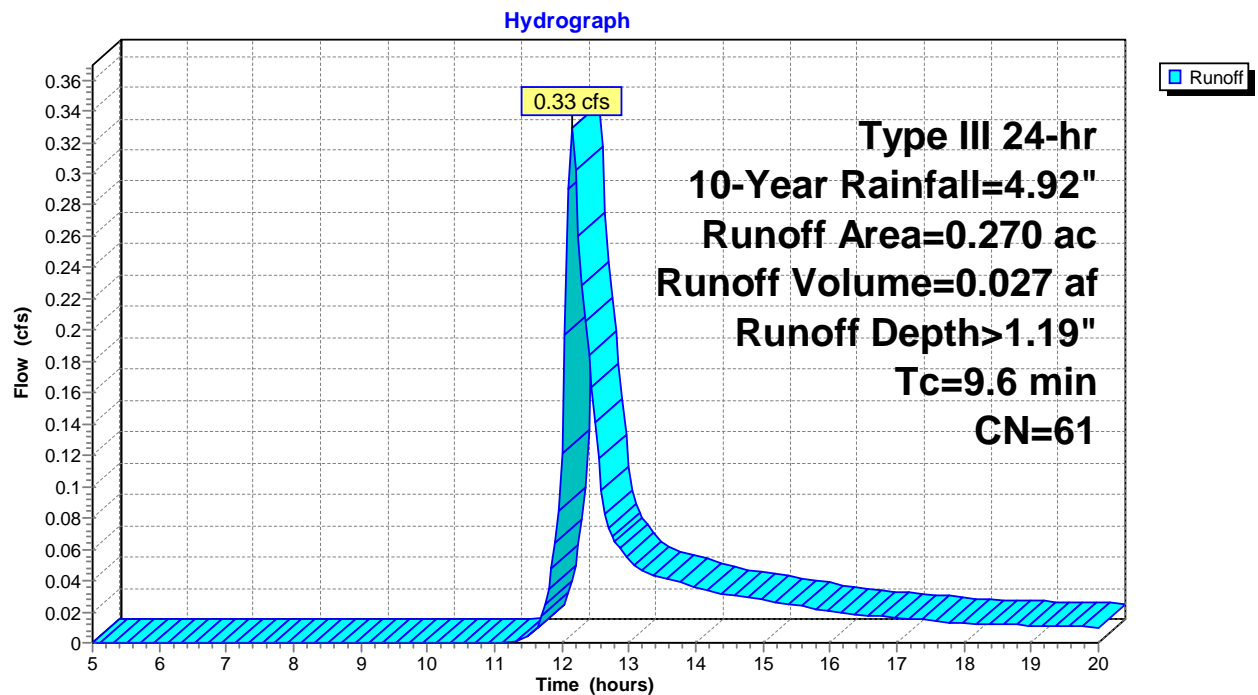
Summary for Subcatchment 9S: PRWS-30 / C

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

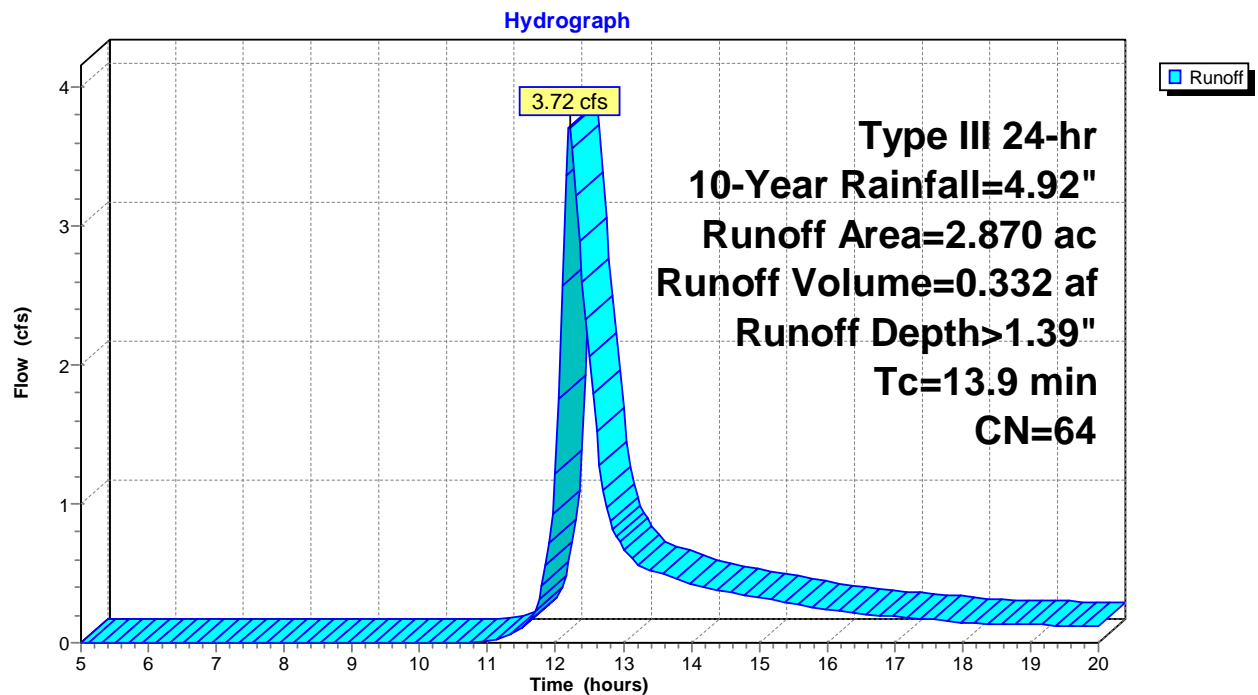
Summary for Subcatchment 13S: PRWS-20 / B

Runoff = 3.72 cfs @ 12.21 hrs, Volume= 0.332 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 |
|-----------|----|-----------------------|
| * 2.870 | 64 | |
| 2.870 | | 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

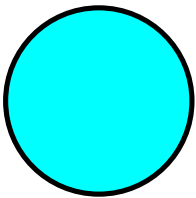
Summary for Reach 5R: 18" PIPE

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

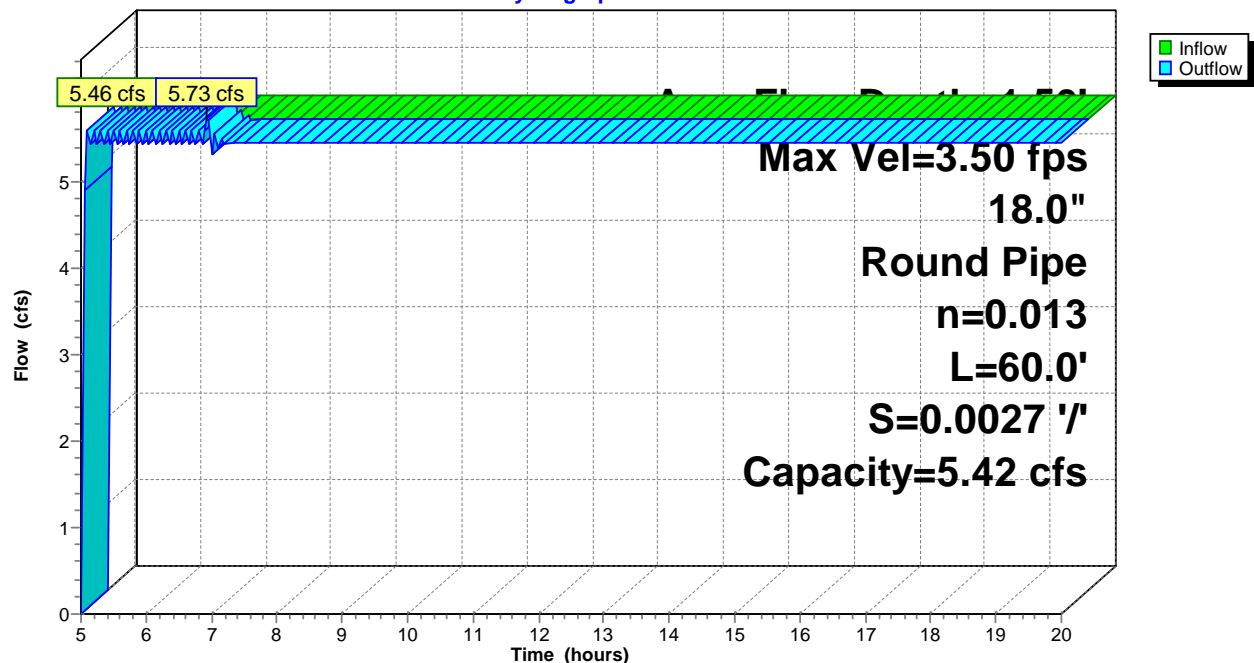
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

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'

**Reach 5R: 18" PIPE**

Hydrograph



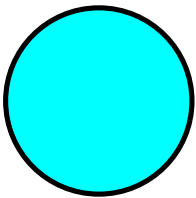
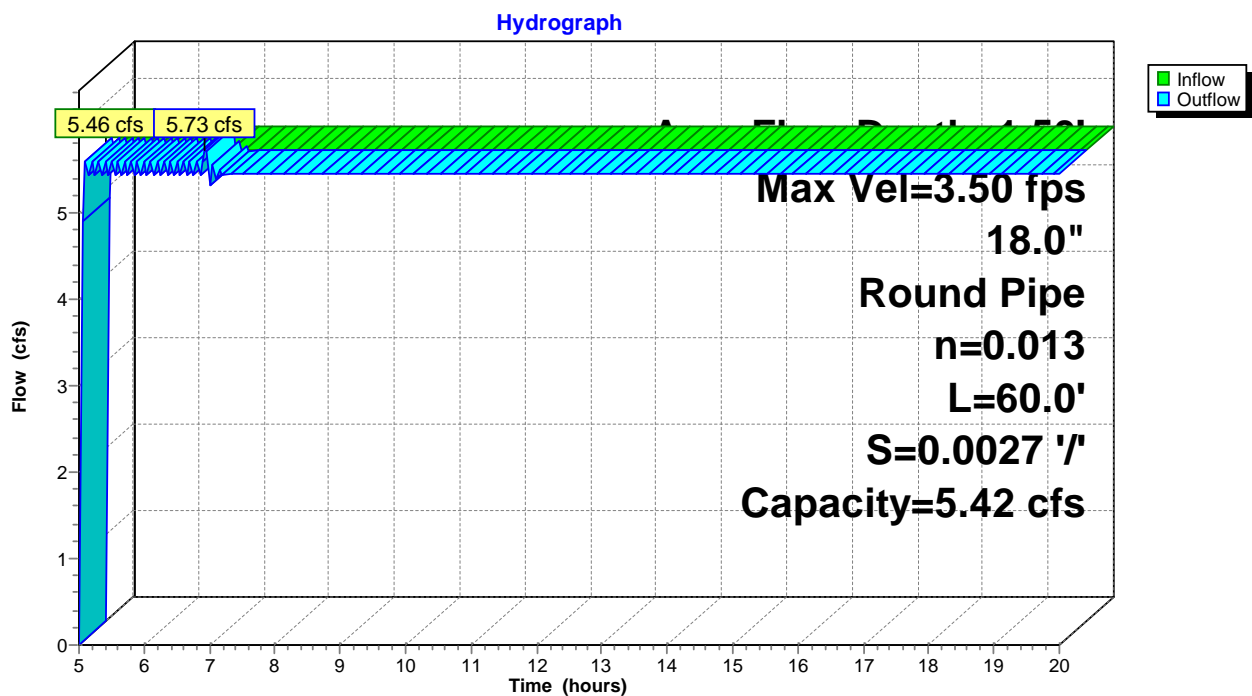
Summary for Reach 10R: 18" PIPE

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'

**Reach 10R: 18" PIPE**

Summary for Pond 11P: DET 110

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth > 3.38" for 10-Year event
 Inflow = 10.73 cfs @ 12.14 hrs, Volume= 0.855 af
 Outflow = 6.17 cfs @ 12.32 hrs, Volume= 0.692 af, Atten= 43%, Lag= 10.8 min
 Primary = 6.17 cfs @ 12.32 hrs, Volume= 0.692 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= 129.24' @ 12.32 hrs Surf.Area= 0.088 ac Storage= 0.326 af

Plug-Flow detention time= 102.4 min calculated for 0.692 af (81% of inflow)
 Center-of-Mass det. time= 51.0 min (821.7 - 770.7)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|--|
| #1A | 125.10' | 0.000 af | 40.00'W x 96.00'L x 5.67'H Field A 0.500 af Overall - 0.500 af Embedded = 0.000 af x 40.0% Voids |
| #2A | 125.10' | 0.393 af | retain_it retain_it 5.0' x 60 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 5 Rows adjusted for 353.3 cf perimeter wall |
| | | 0.393 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|----------|---------|--|
| #1 | Primary | 123.20' | 18.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.20' / 122.00' S= 0.0240 '/' 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=6.08 cfs @ 12.32 hrs HW=129.23' (Free Discharge)

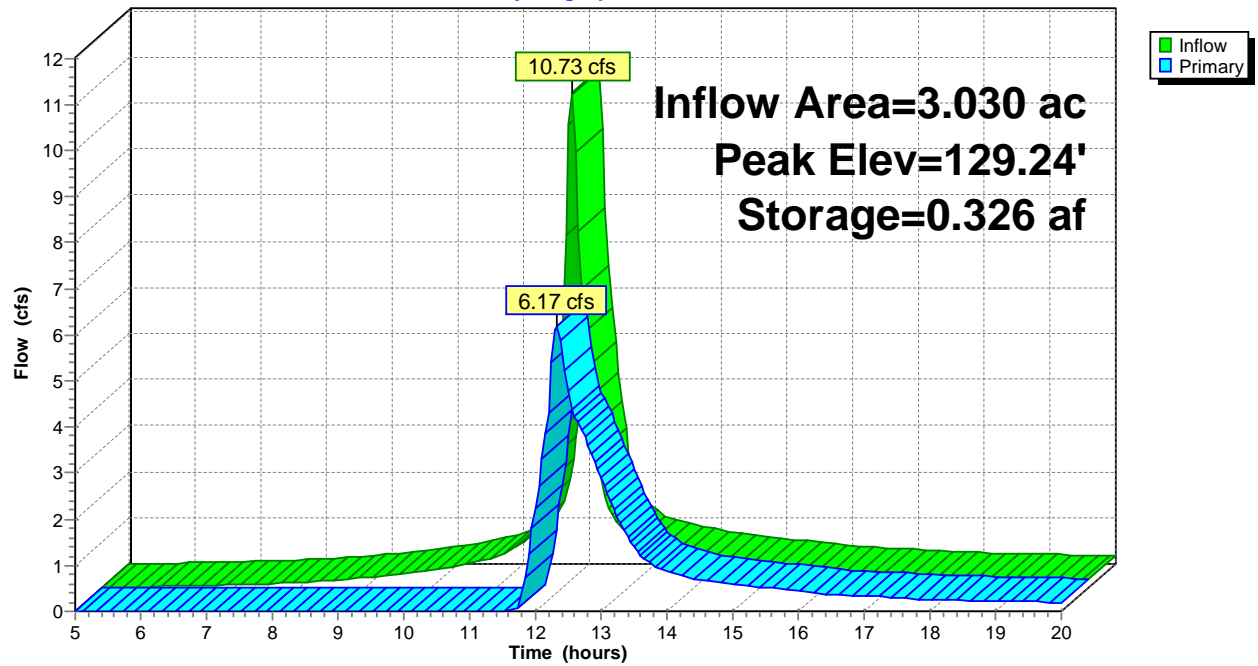
↑ **1=Culvert** (Passes 6.08 cfs of 15.44 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 4.63 cfs @ 6.63 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 1.45 cfs @ 1.58 fps)

Pond 11P: DET 110

Hydrograph



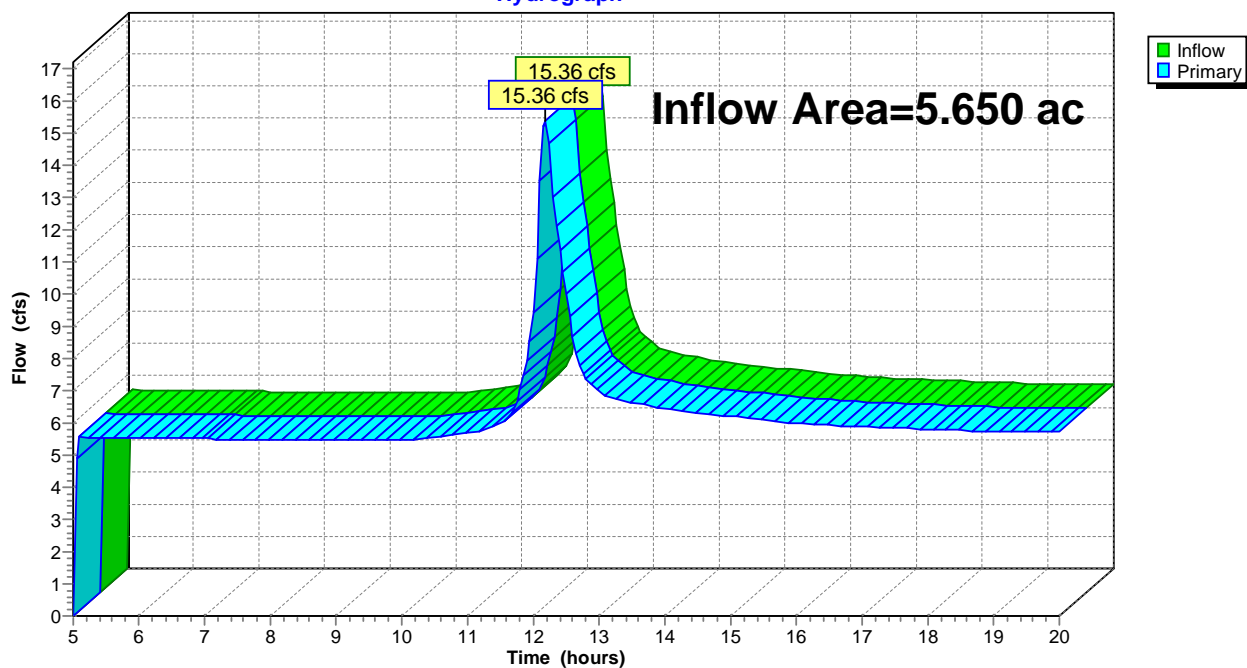
Summary for Link 6L: EX / A

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

Hydrograph



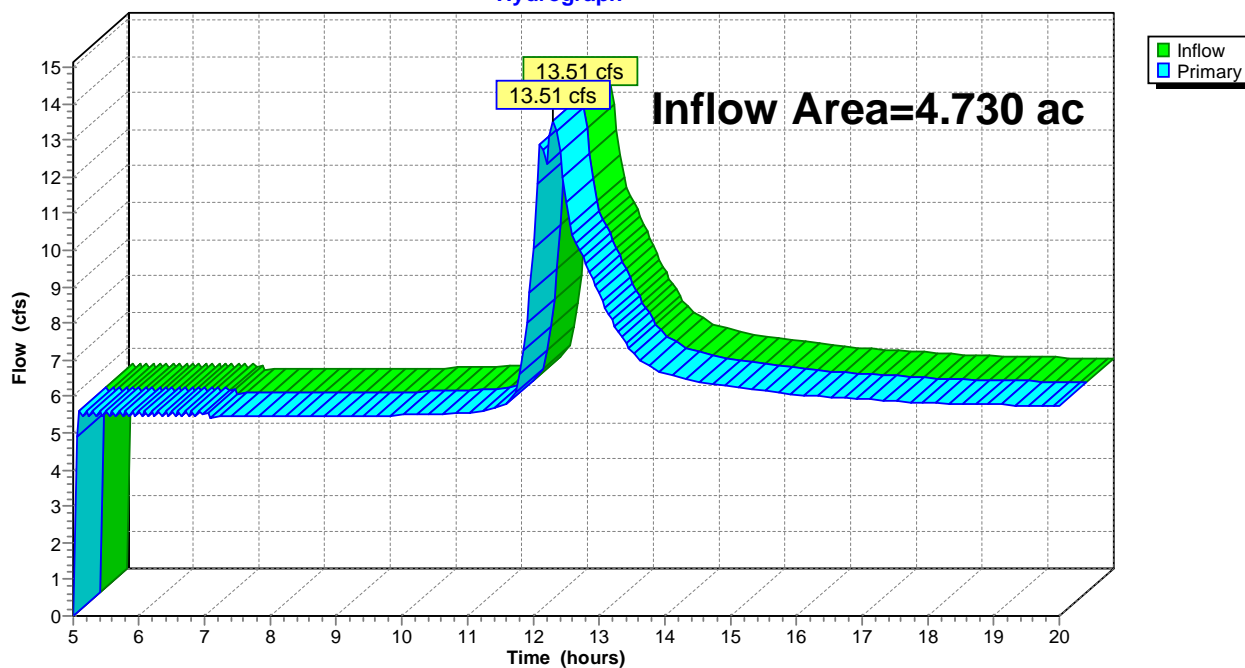
Summary for Link 12L: PR / A

Inflow Area = 4.730 ac, 0.00% Impervious, Inflow Depth > 19.65" for 10-Year event
Inflow = 13.51 cfs @ 12.31 hrs, Volume= 7.747 af
Primary = 13.51 cfs @ 12.31 hrs, Volume= 7.747 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

Hydrograph



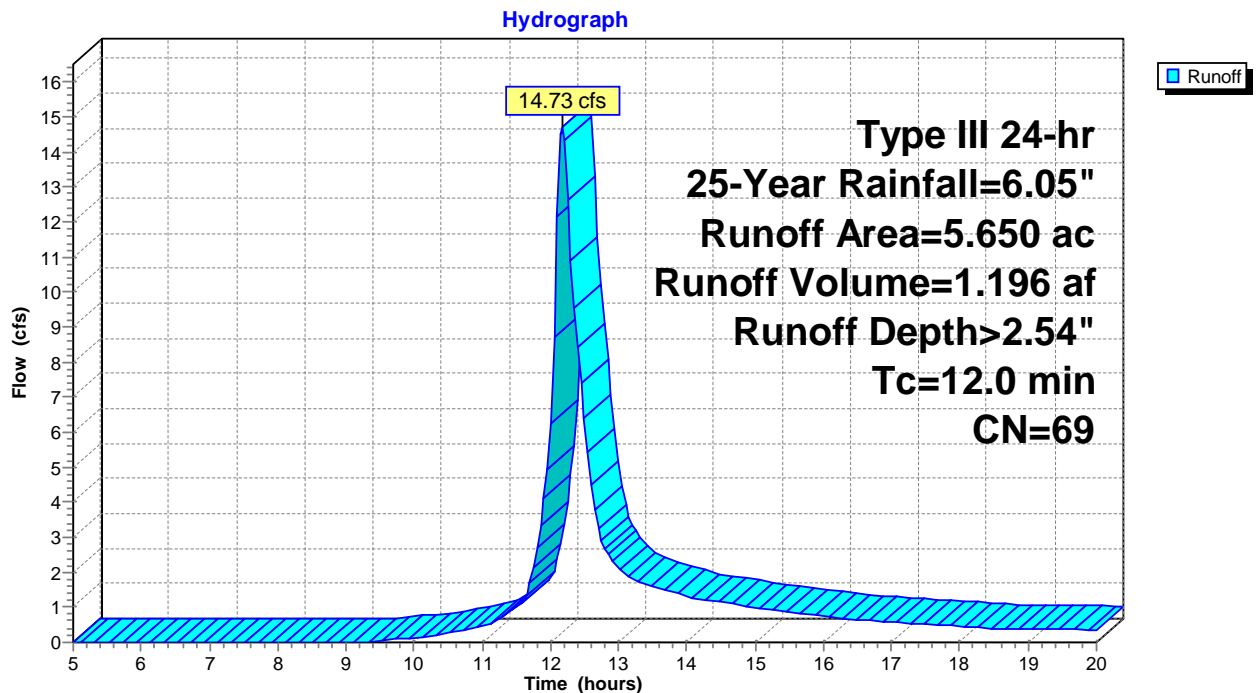
Summary for Subcatchment 1S: EXWS-10

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

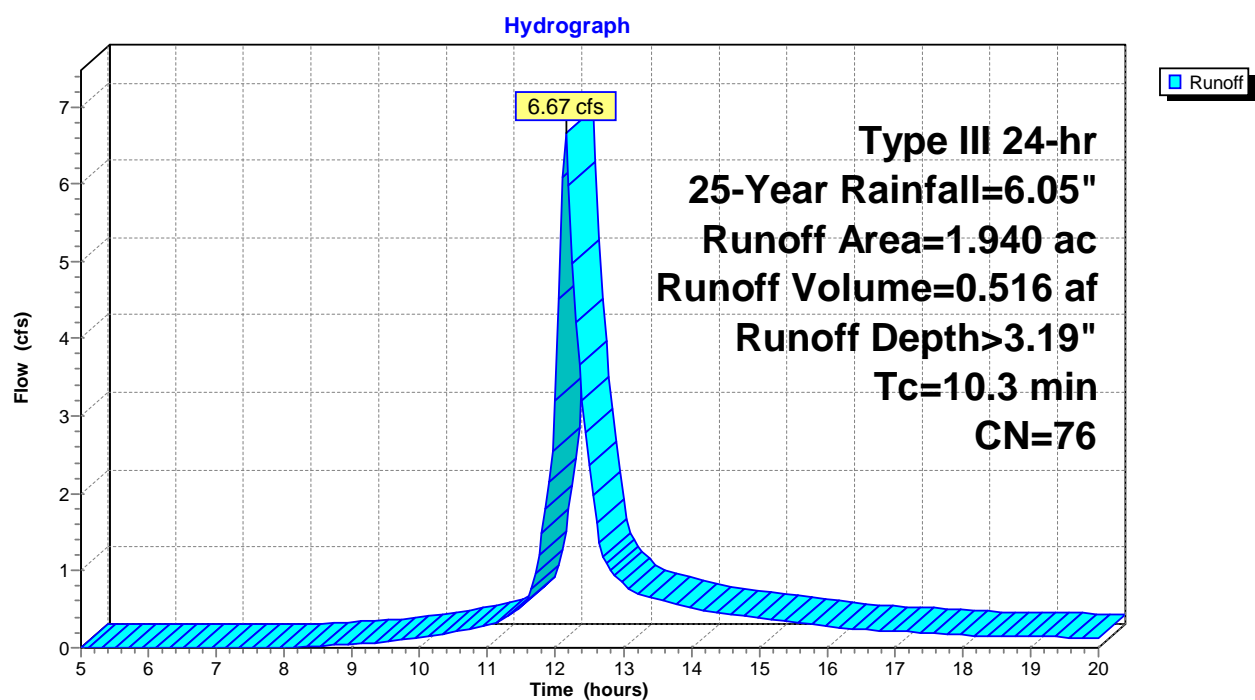
Summary for Subcatchment 2S: EXWS-20 / B

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

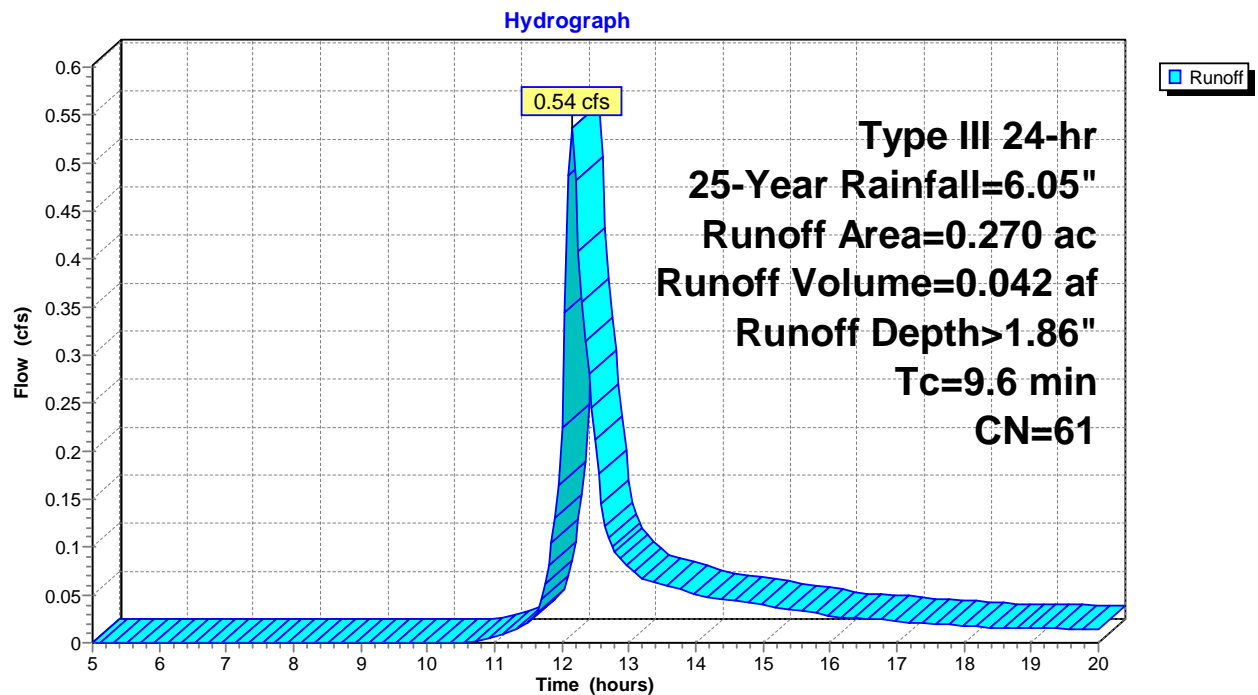
Summary for Subcatchment 3S: EXWS-30 / C

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

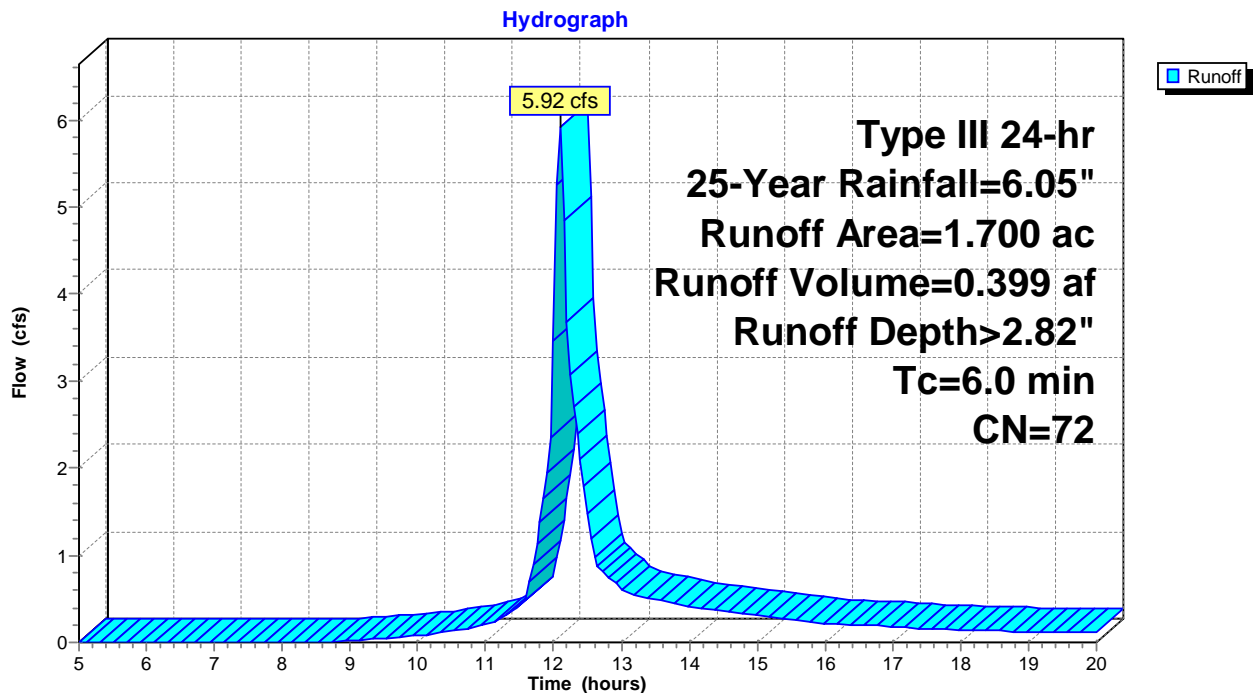
Summary for Subcatchment 7S: PRWS-10

Runoff = 5.92 cfs @ 12.09 hrs, Volume= 0.399 af, Depth> 2.82"
 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 |
|-----------|----|-----------------------|
| * 1.700 | 72 | |
| 1.700 | | 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

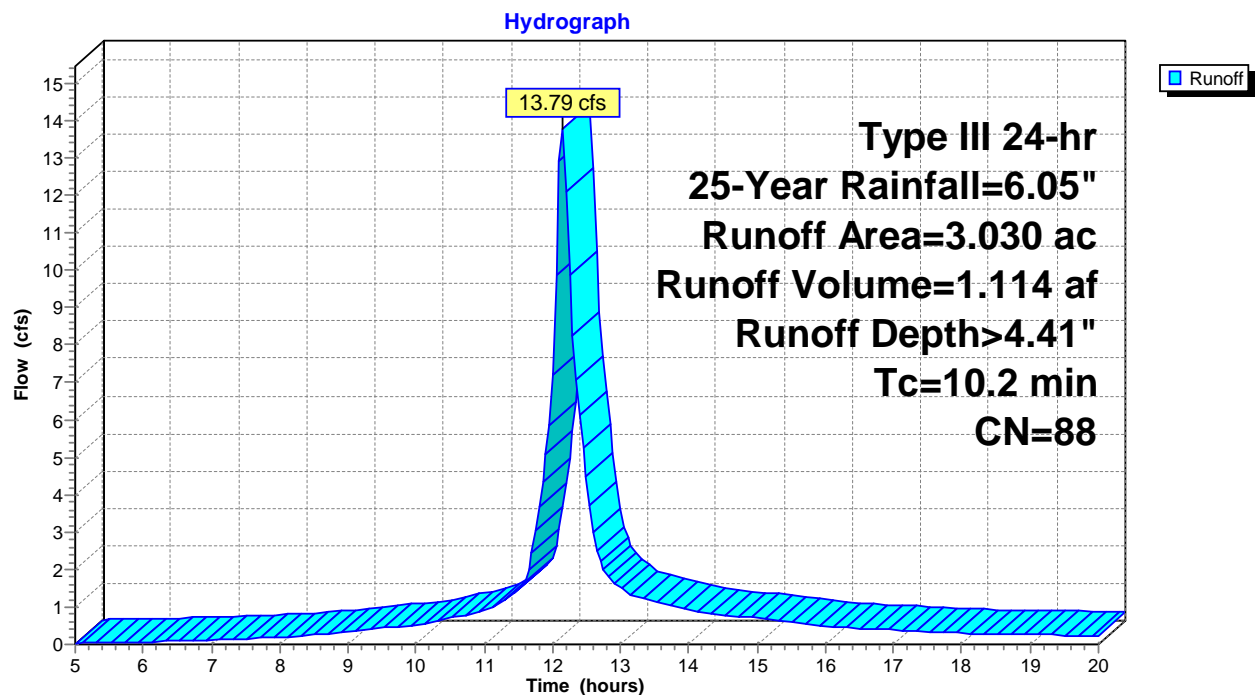
Summary for Subcatchment 8S: PRWS-11

Runoff = 13.79 cfs @ 12.14 hrs, Volume= 1.114 af, Depth> 4.41"
 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 |
|-----------|----|-----------------------|
| * 3.030 | 88 | |
| 3.030 | | 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

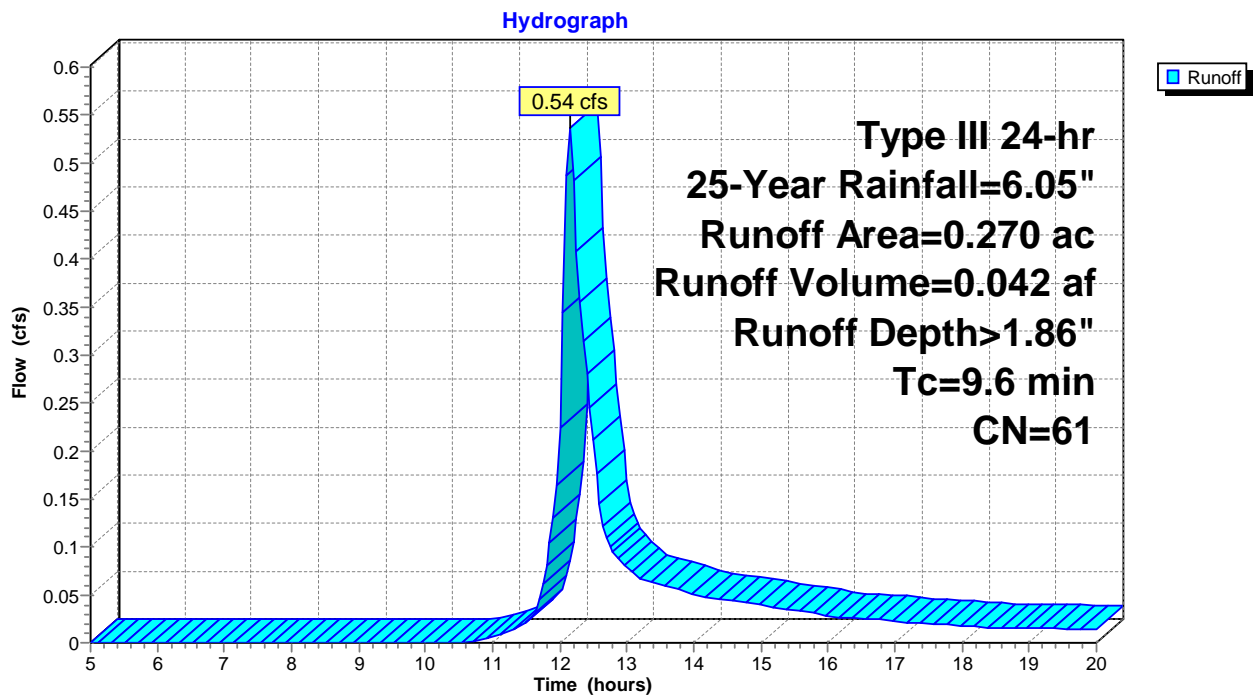
Summary for Subcatchment 9S: PRWS-30 / C

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

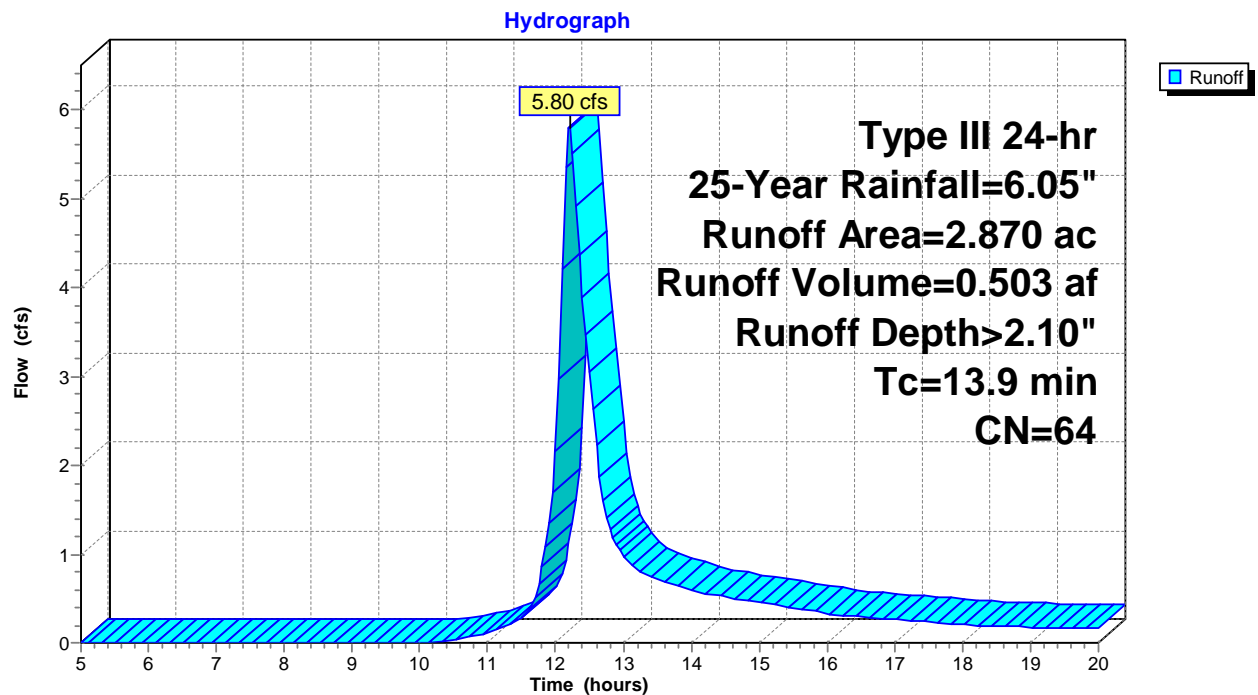
Summary for Subcatchment 13S: PRWS-20 / B

Runoff = 5.80 cfs @ 12.20 hrs, Volume= 0.503 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 |
|-----------|----|-----------------------|
| * 2.870 | 64 | |
| 2.870 | | 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'

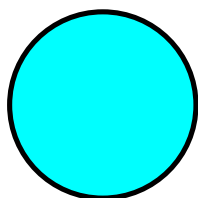
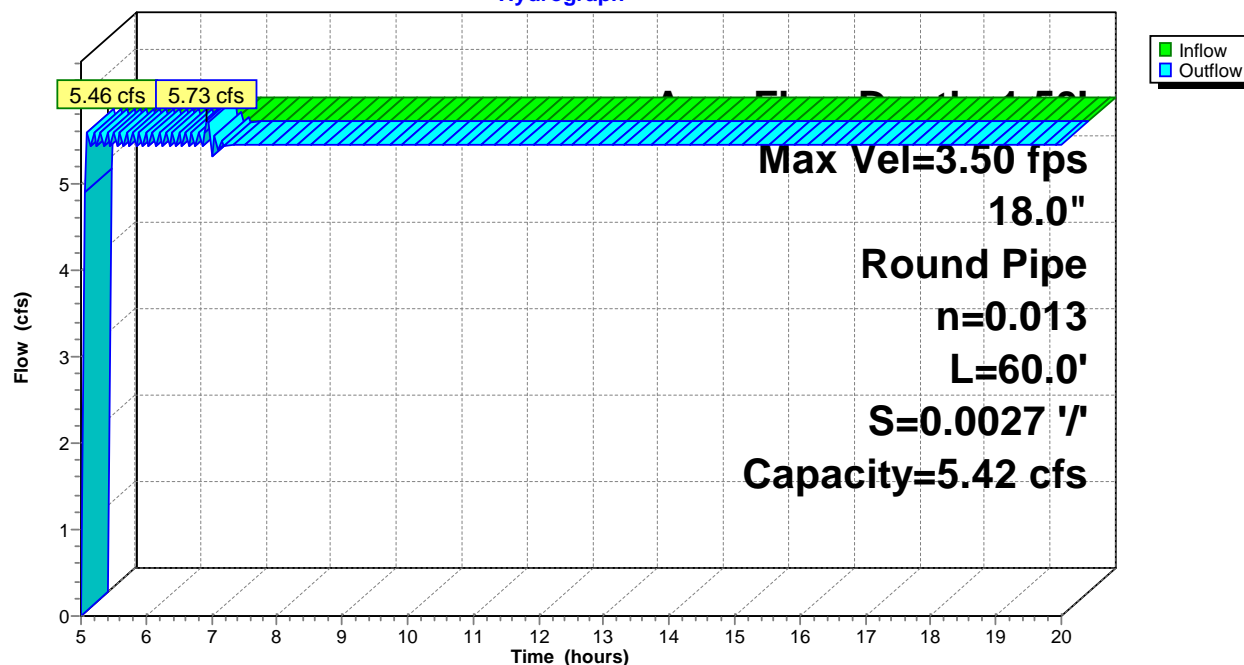
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 5.42 cfs

18.0" Round Pipe

n= 0.013

Length= 60.0' Slope= 0.0027 '/

Inlet Invert= 134.70', Outlet Invert= 134.54'

**Reach 5R: 18" PIPE****Hydrograph**

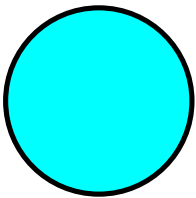
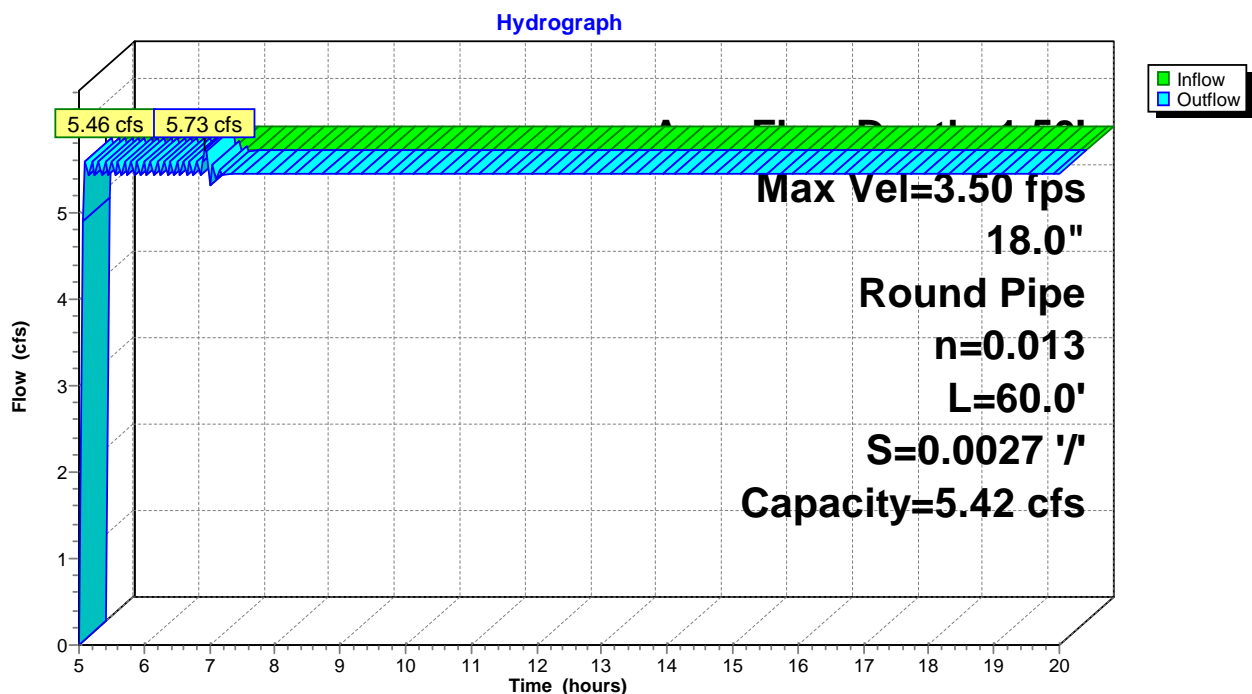
Summary for Reach 10R: 18" PIPE

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'

**Reach 10R: 18" PIPE**

Summary for Pond 11P: DET 110

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth > 4.41" for 25-Year event
 Inflow = 13.79 cfs @ 12.14 hrs, Volume= 1.114 af
 Outflow = 10.54 cfs @ 12.25 hrs, Volume= 0.950 af, Atten= 24%, Lag= 6.2 min
 Primary = 10.54 cfs @ 12.25 hrs, Volume= 0.950 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= 129.57' @ 12.25 hrs Surf.Area= 0.088 ac Storage= 0.352 af

Plug-Flow detention time= 89.4 min calculated for 0.946 af (85% of inflow)
 Center-of-Mass det. time= 46.5 min (811.0 - 764.6)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|--|
| #1A | 125.10' | 0.000 af | 40.00'W x 96.00'L x 5.67'H Field A 0.500 af Overall - 0.500 af Embedded = 0.000 af x 40.0% Voids |
| #2A | 125.10' | 0.393 af | retain_it retain_it 5.0' x 60 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 5 Rows adjusted for 353.3 cf perimeter wall |
| | | 0.393 af | Total Available Storage |

Storage Group A created with Chamber Wizard

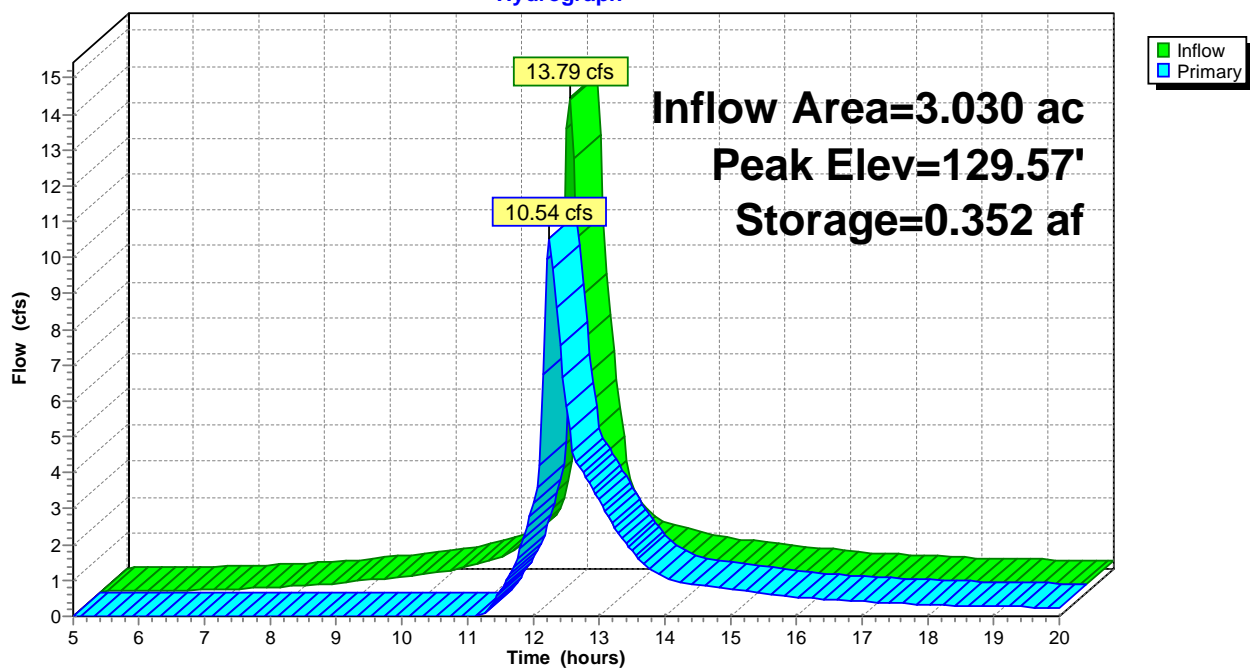
| Device | Routing | Invert | Outlet Devices |
|--------|----------|---------|---|
| #1 | Primary | 123.20' | 18.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.20' / 122.00' S= 0.0240 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf |
| #2 | Device 1 | 127.00' | 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=10.48 cfs @ 12.25 hrs HW=129.57' (Free Discharge)

↑ **1=Culvert** (Passes 10.48 cfs of 15.92 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 5.03 cfs @ 7.20 fps)

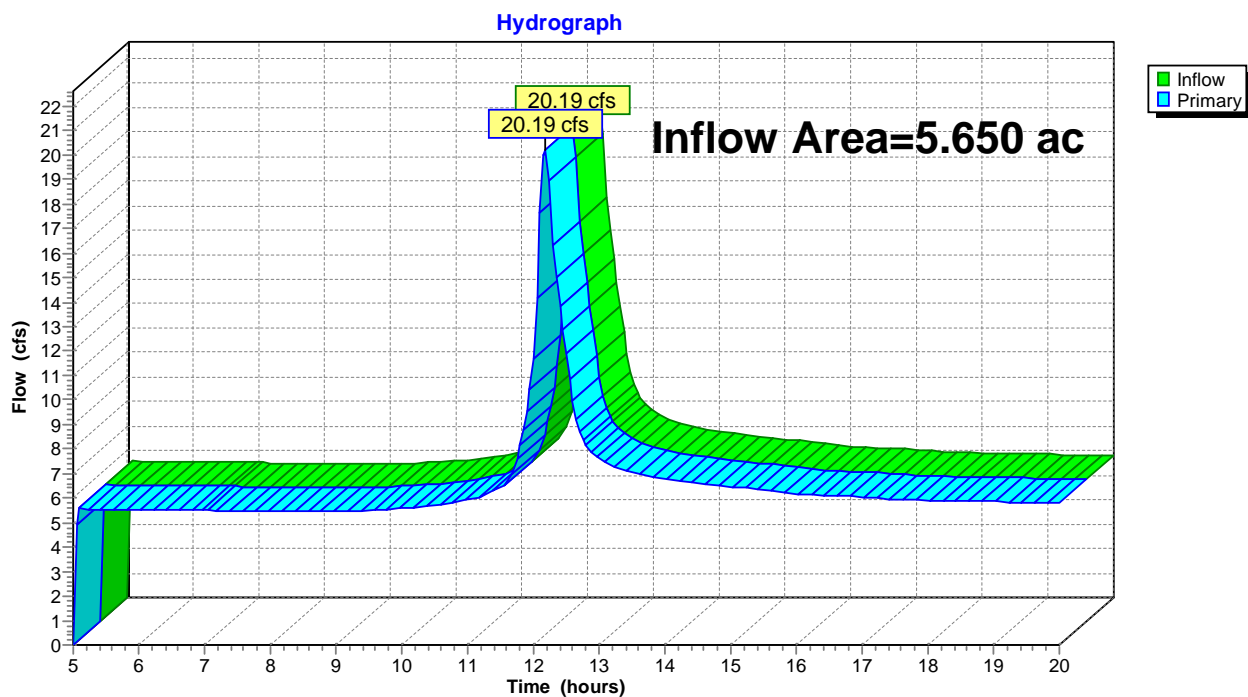
↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 5.45 cfs @ 2.47 fps)

Pond 11P: DET 110**Hydrograph**

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

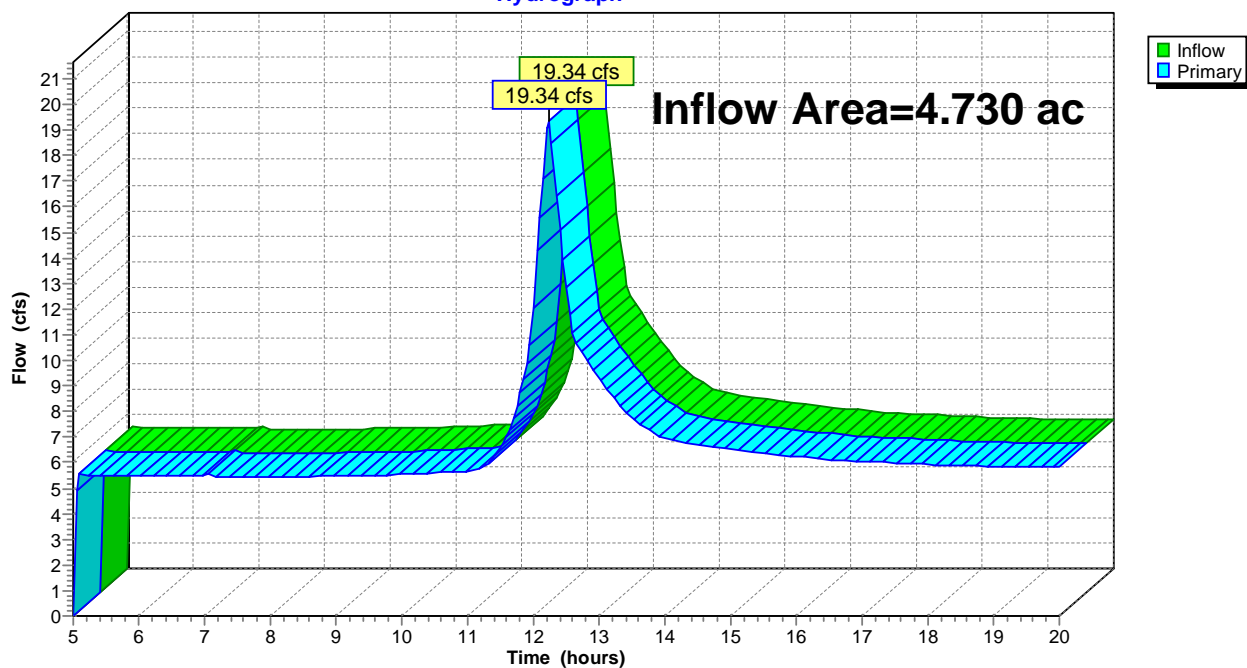
Summary for Link 12L: PR / A

Inflow Area = 4.730 ac, 0.00% Impervious, Inflow Depth > 20.61" for 25-Year event
Inflow = 19.34 cfs @ 12.22 hrs, Volume= 8.124 af
Primary = 19.34 cfs @ 12.22 hrs, Volume= 8.124 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

Hydrograph



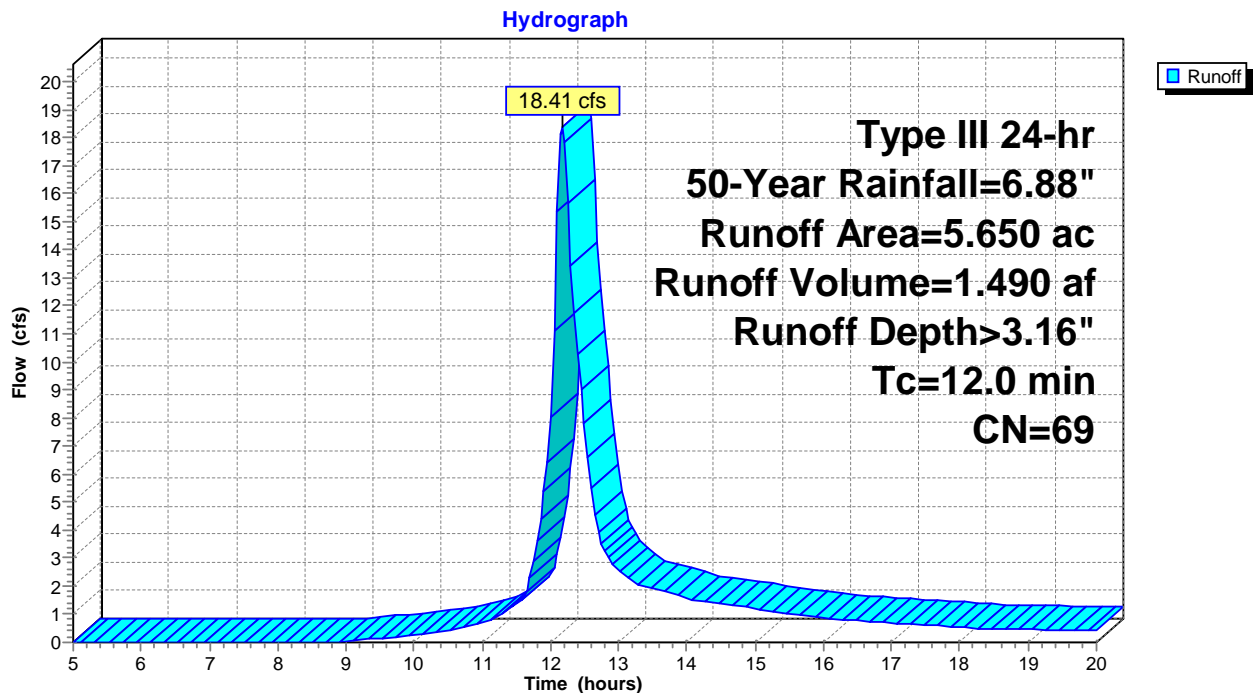
Summary for Subcatchment 1S: EXWS-10

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

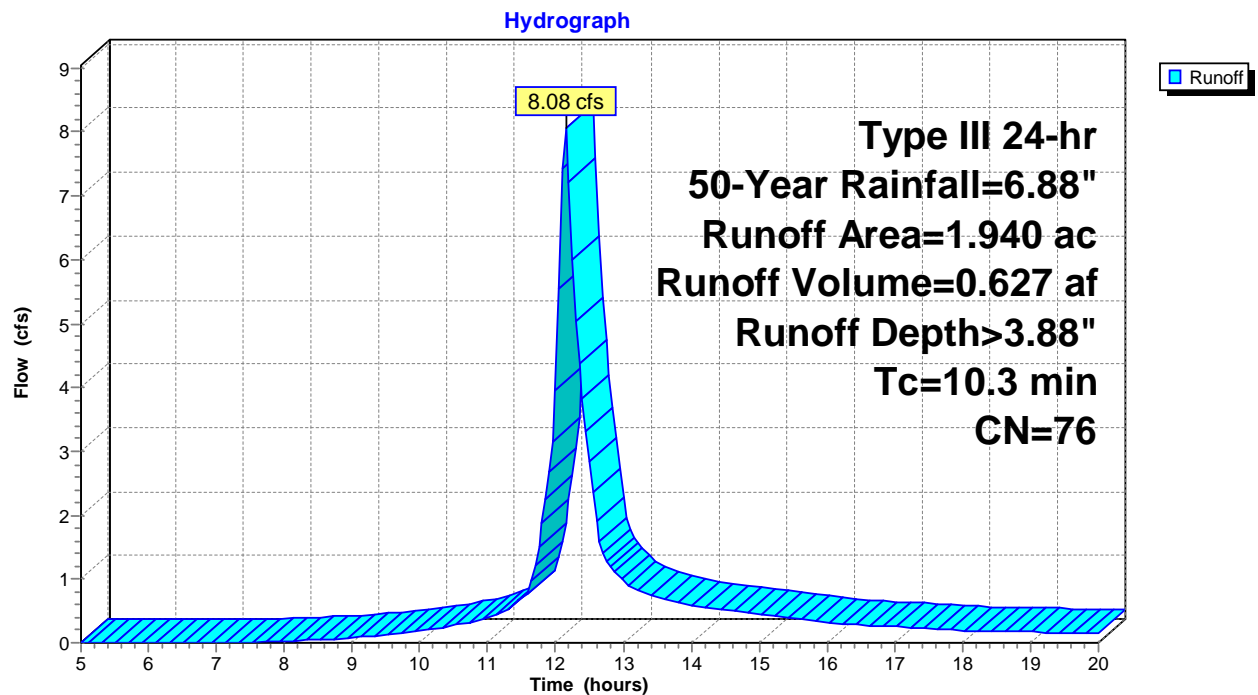
Summary for Subcatchment 2S: EXWS-20 / B

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

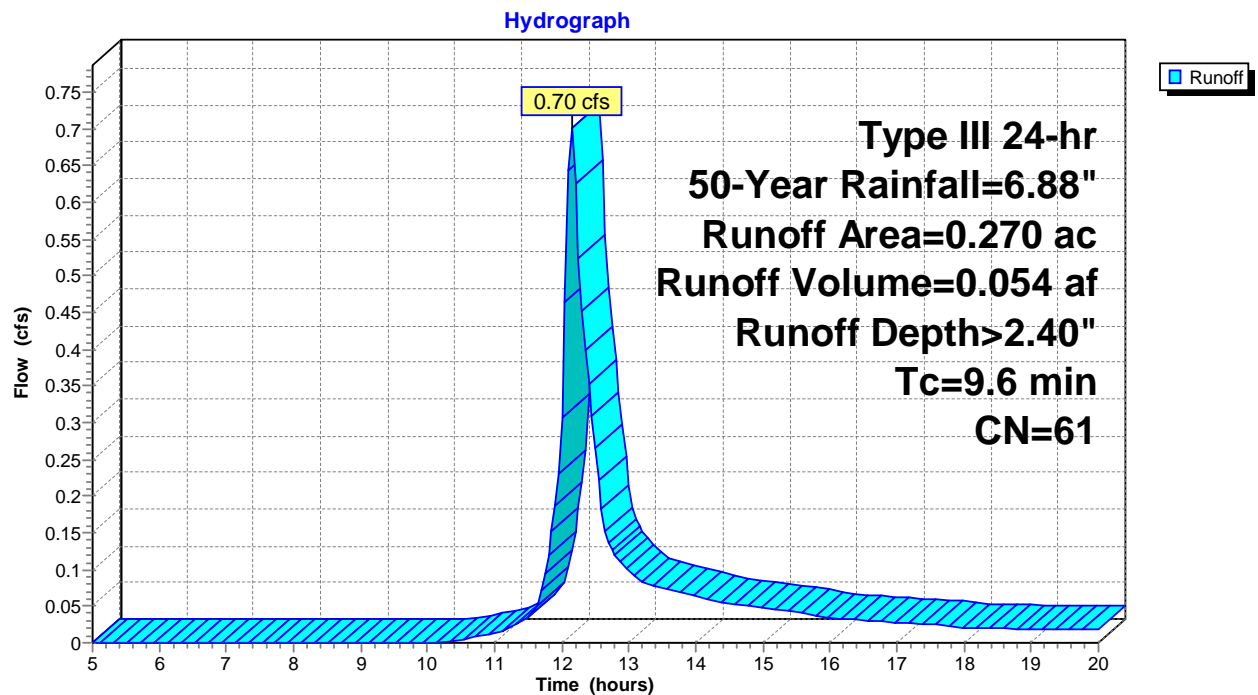
Summary for Subcatchment 3S: EXWS-30 / C

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

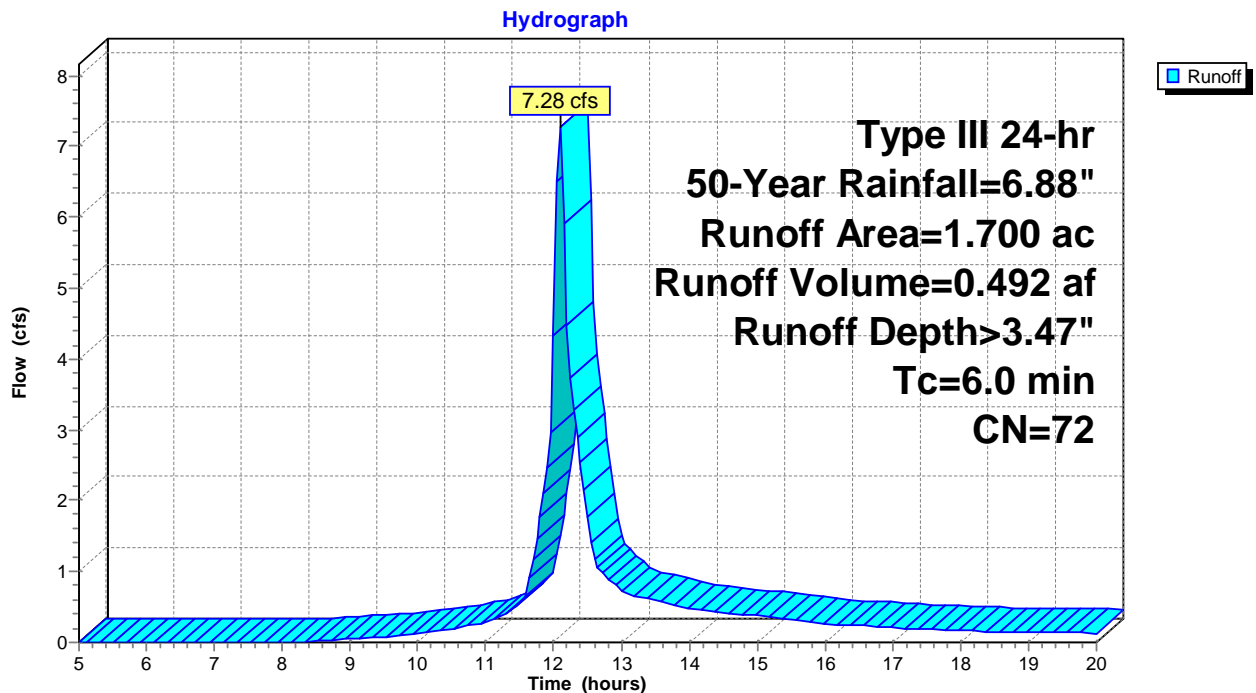
Summary for Subcatchment 7S: PRWS-10

Runoff = 7.28 cfs @ 12.09 hrs, Volume= 0.492 af, Depth> 3.47"
 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 |
|-----------|----|-----------------------|
| * 1.700 | 72 | |
| 1.700 | | 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

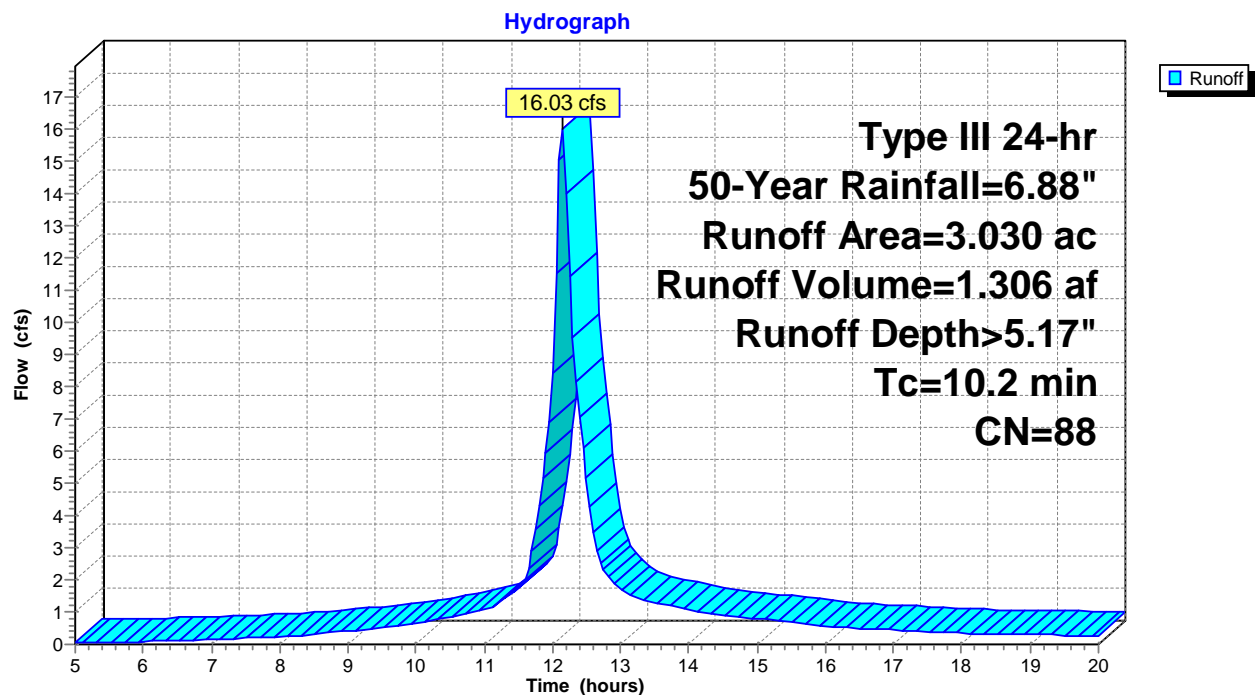
Summary for Subcatchment 8S: PRWS-11

Runoff = 16.03 cfs @ 12.14 hrs, Volume= 1.306 af, Depth> 5.17"
 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 |
|-----------|----|-----------------------|
| * 3.030 | 88 | |
| 3.030 | | 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

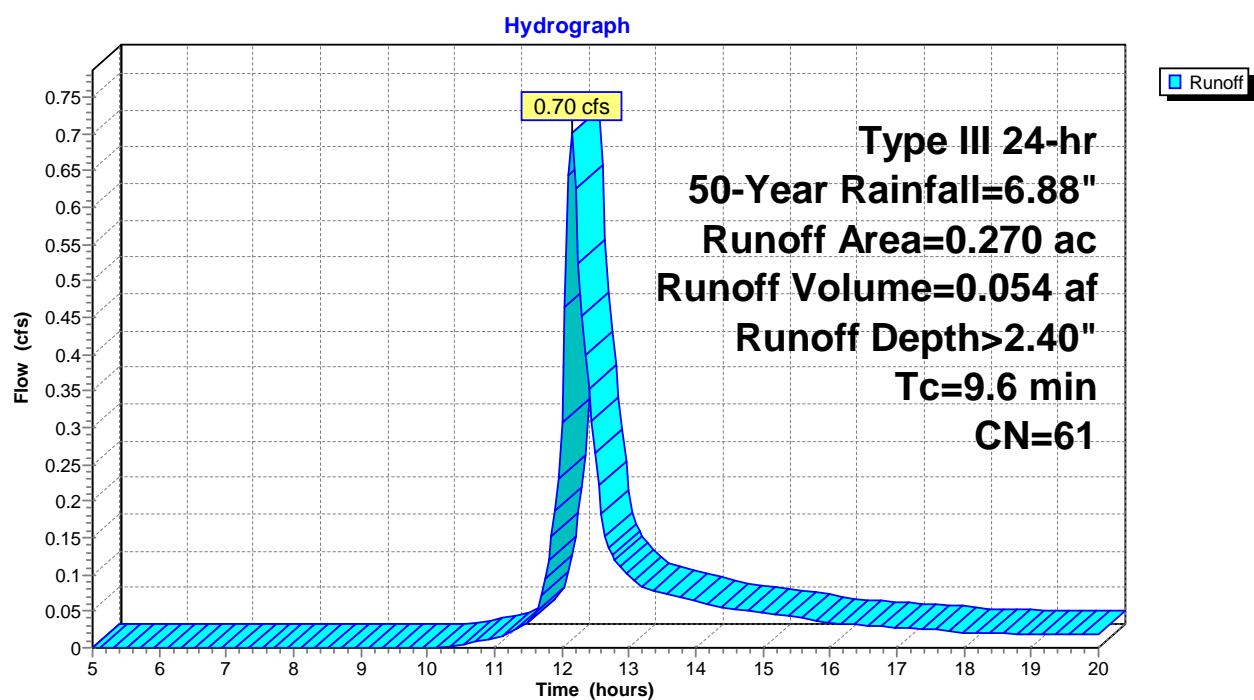
Summary for Subcatchment 9S: PRWS-30 / C

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

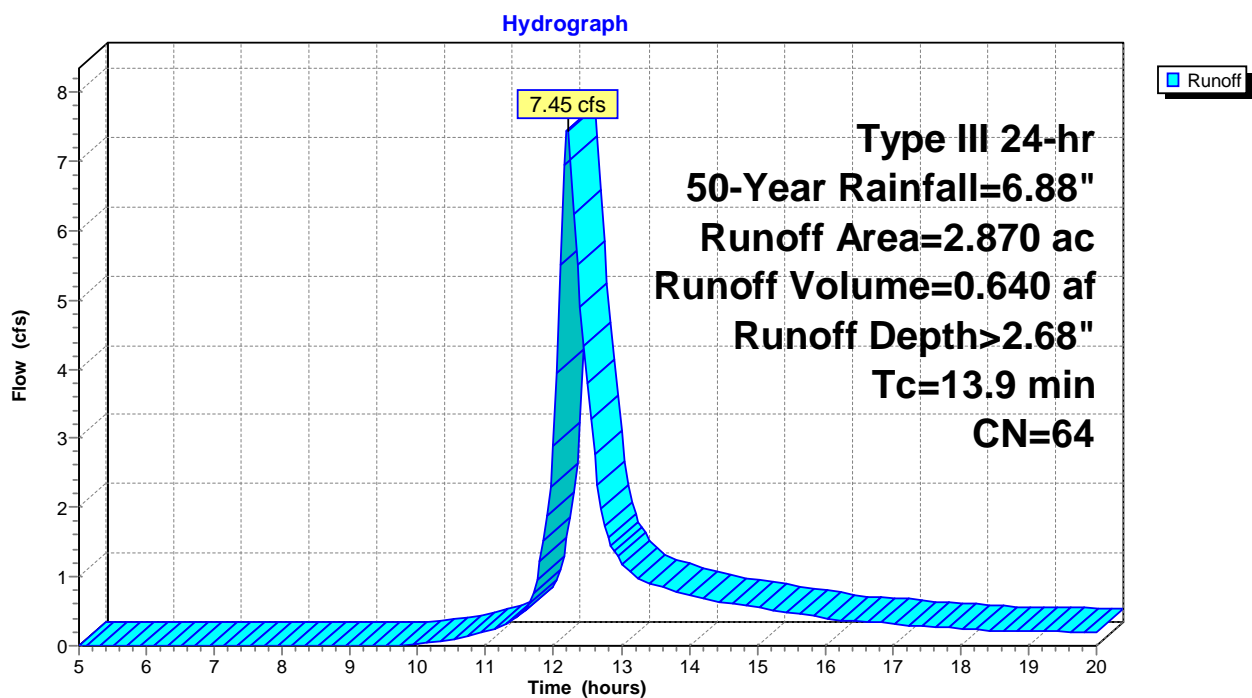
Summary for Subcatchment 13S: PRWS-20 / B

Runoff = 7.45 cfs @ 12.20 hrs, Volume= 0.640 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 |
|-----------|----|-----------------------|
| * 2.870 | 64 | |
| 2.870 | | 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

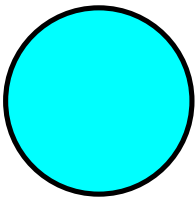
Summary for Reach 5R: 18" PIPE

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

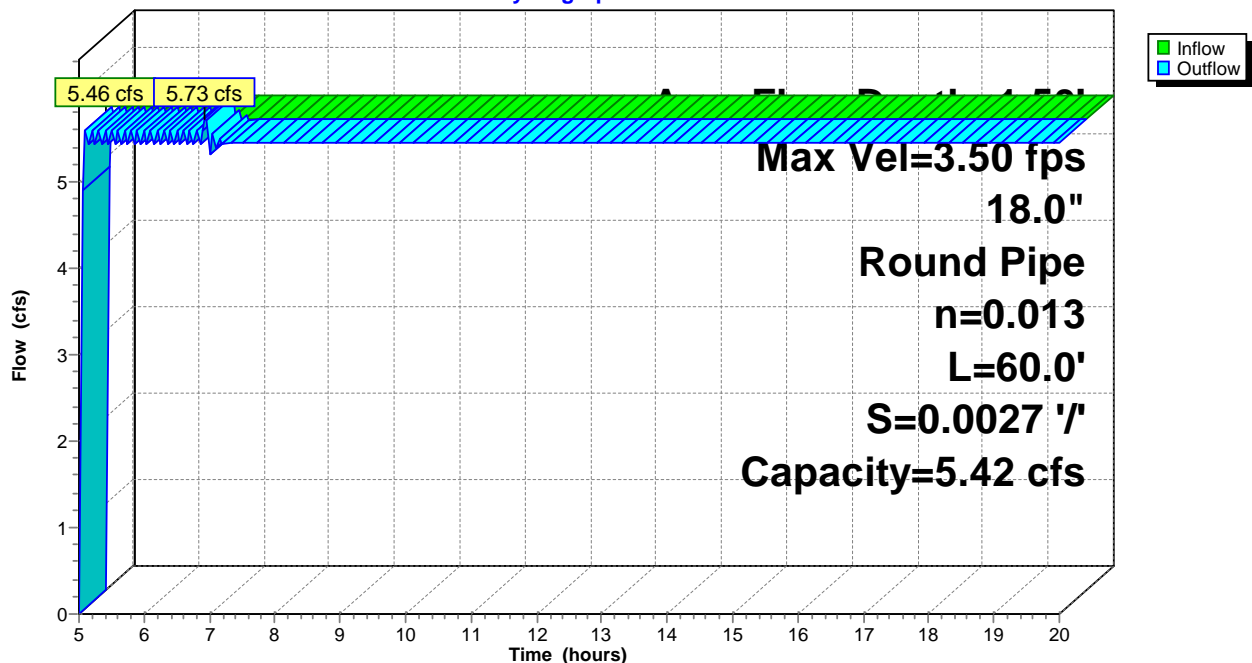
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
 Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

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'

**Reach 5R: 18" PIPE**

Hydrograph



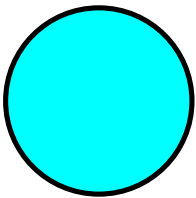
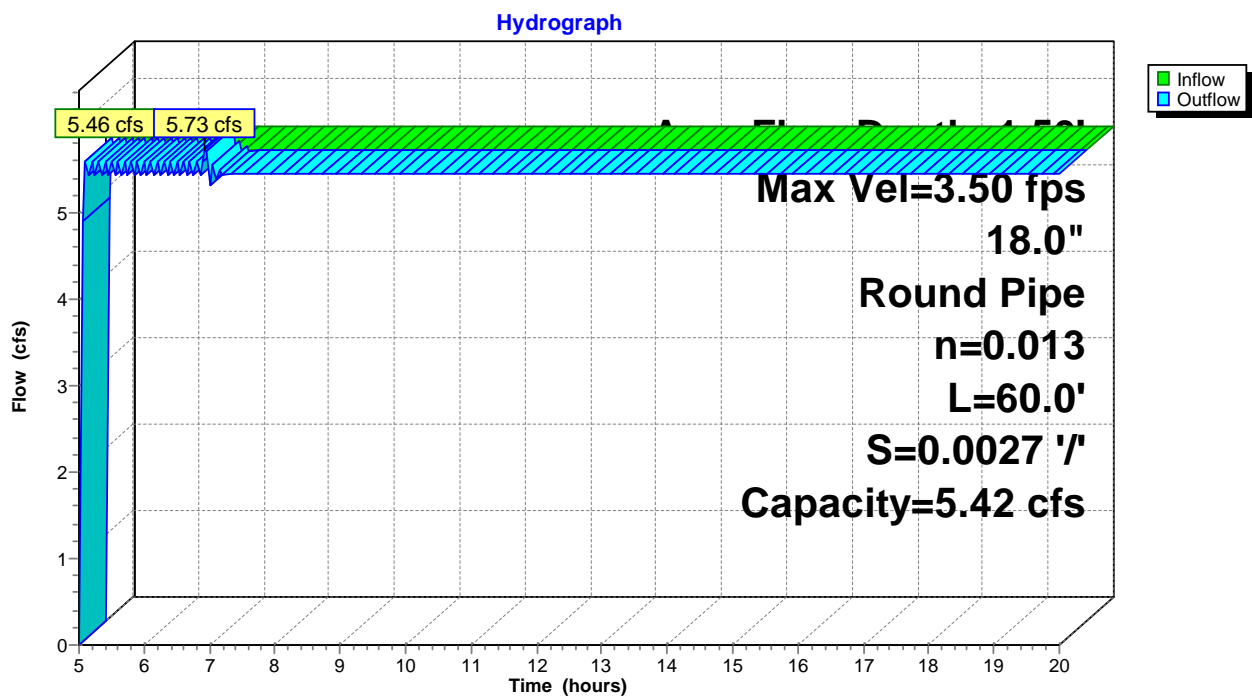
Summary for Reach 10R: 18" PIPE

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'

**Reach 10R: 18" PIPE**

Summary for Pond 11P: DET 110

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth > 5.17" for 50-Year event
 Inflow = 16.03 cfs @ 12.14 hrs, Volume= 1.306 af
 Outflow = 13.53 cfs @ 12.22 hrs, Volume= 1.140 af, Atten= 16%, Lag= 4.6 min
 Primary = 13.53 cfs @ 12.22 hrs, Volume= 1.140 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= 129.76' @ 12.22 hrs Surf.Area= 0.088 ac Storage= 0.366 af

Plug-Flow detention time= 82.5 min calculated for 1.137 af (87% of inflow)
 Center-of-Mass det. time= 43.8 min (804.9 - 761.1)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|--|
| #1A | 125.10' | 0.000 af | 40.00'W x 96.00'L x 5.67'H Field A 0.500 af Overall - 0.500 af Embedded = 0.000 af x 40.0% Voids |
| #2A | 125.10' | 0.393 af | retain_it retain_it 5.0' x 60 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 5 Rows adjusted for 353.3 cf perimeter wall |
| | | 0.393 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|----------|---------|---|
| #1 | Primary | 123.20' | 18.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.20' / 122.00' S= 0.0240 '/ 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=13.20 cfs @ 12.22 hrs HW=129.74' (Free Discharge)

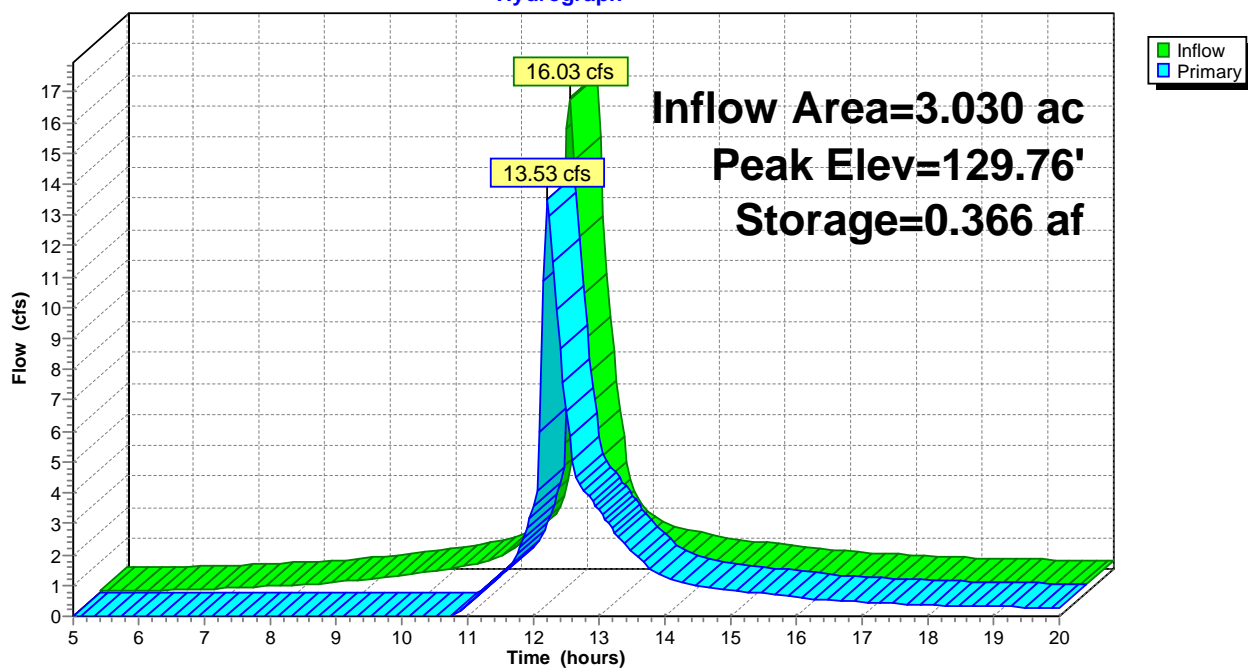
↑ **1=Culvert** (Passes 13.20 cfs of 16.16 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 5.21 cfs @ 7.47 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 7.98 cfs @ 2.81 fps)

Pond 11P: DET 110

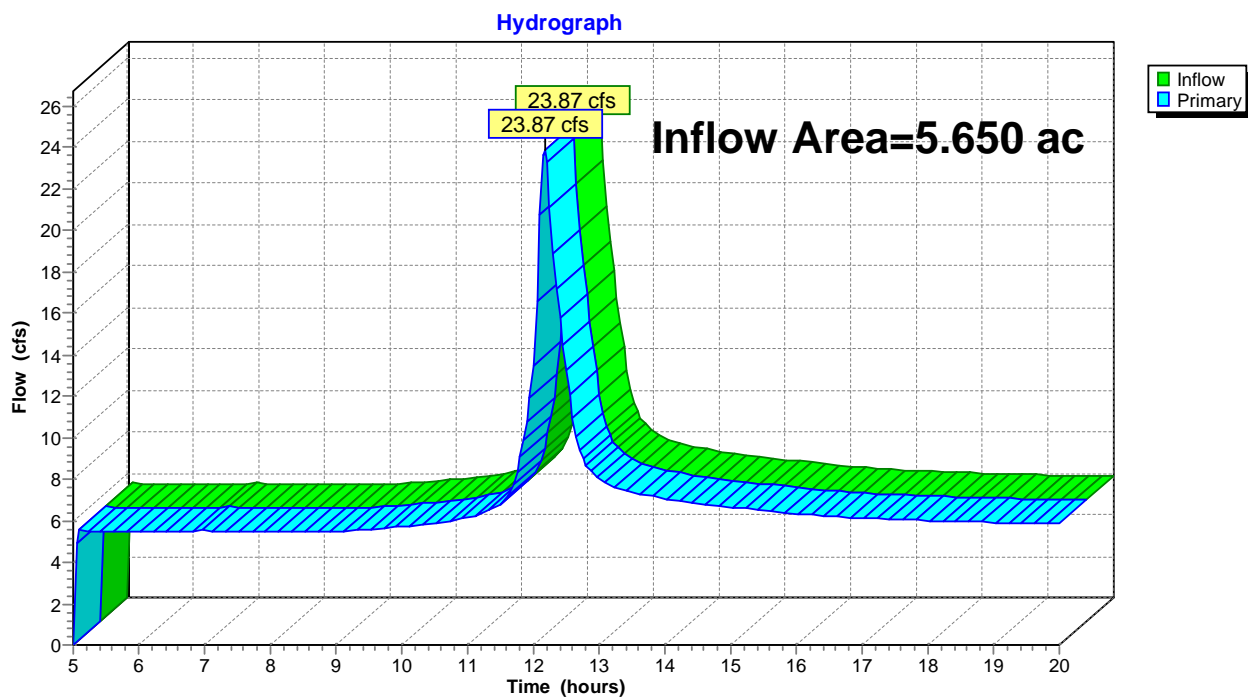
Hydrograph



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

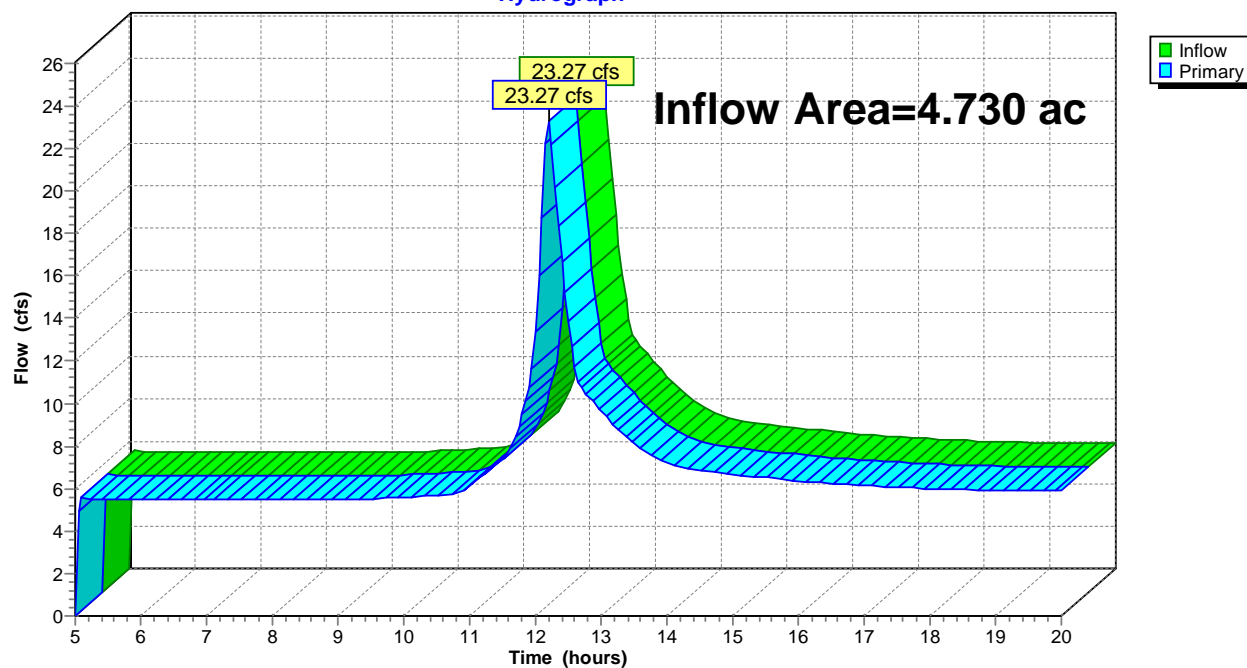
Summary for Link 12L: PR / A

Inflow Area = 4.730 ac, 0.00% Impervious, Inflow Depth > 21.33" for 50-Year event
Inflow = 23.27 cfs @ 12.20 hrs, Volume= 8.408 af
Primary = 23.27 cfs @ 12.20 hrs, Volume= 8.408 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

Hydrograph



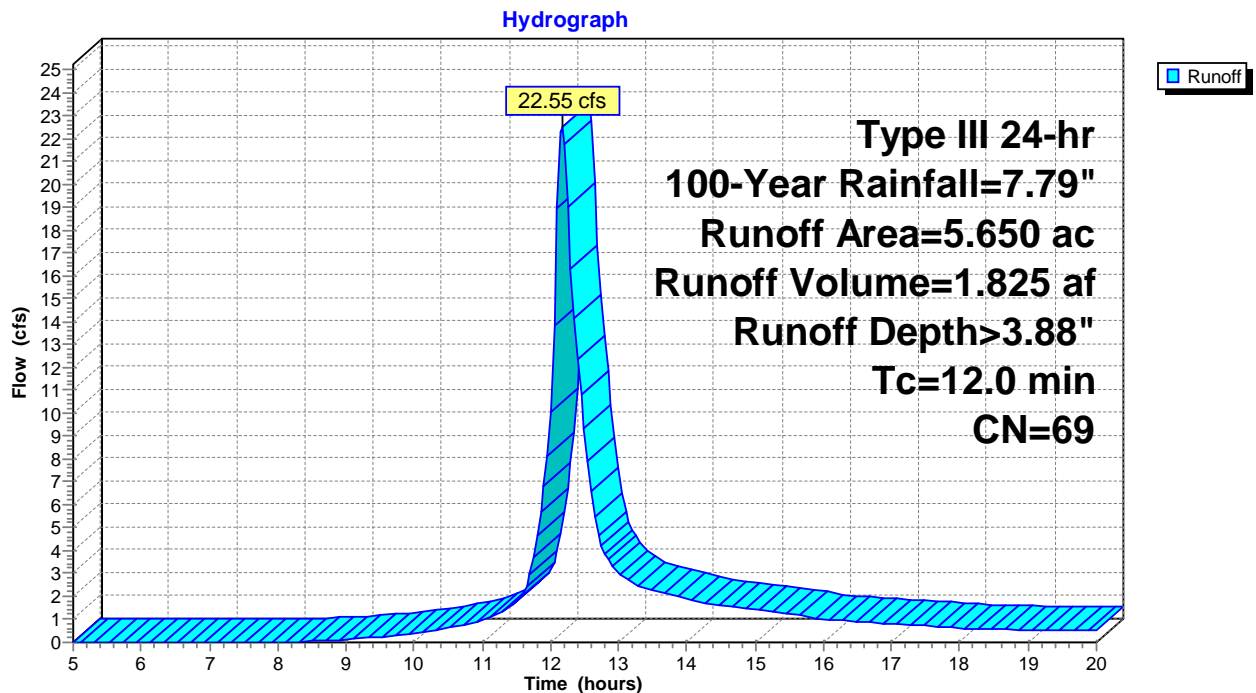
Summary for Subcatchment 1S: EXWS-10

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

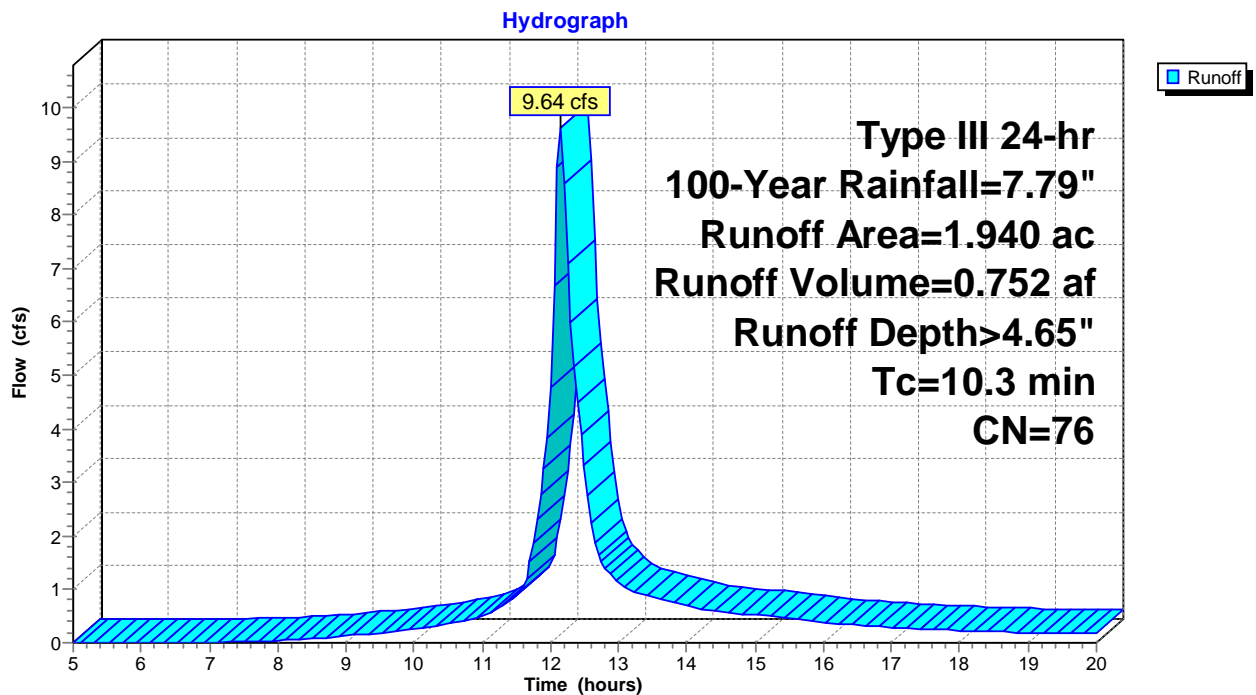
Summary for Subcatchment 2S: EXWS-20 / B

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

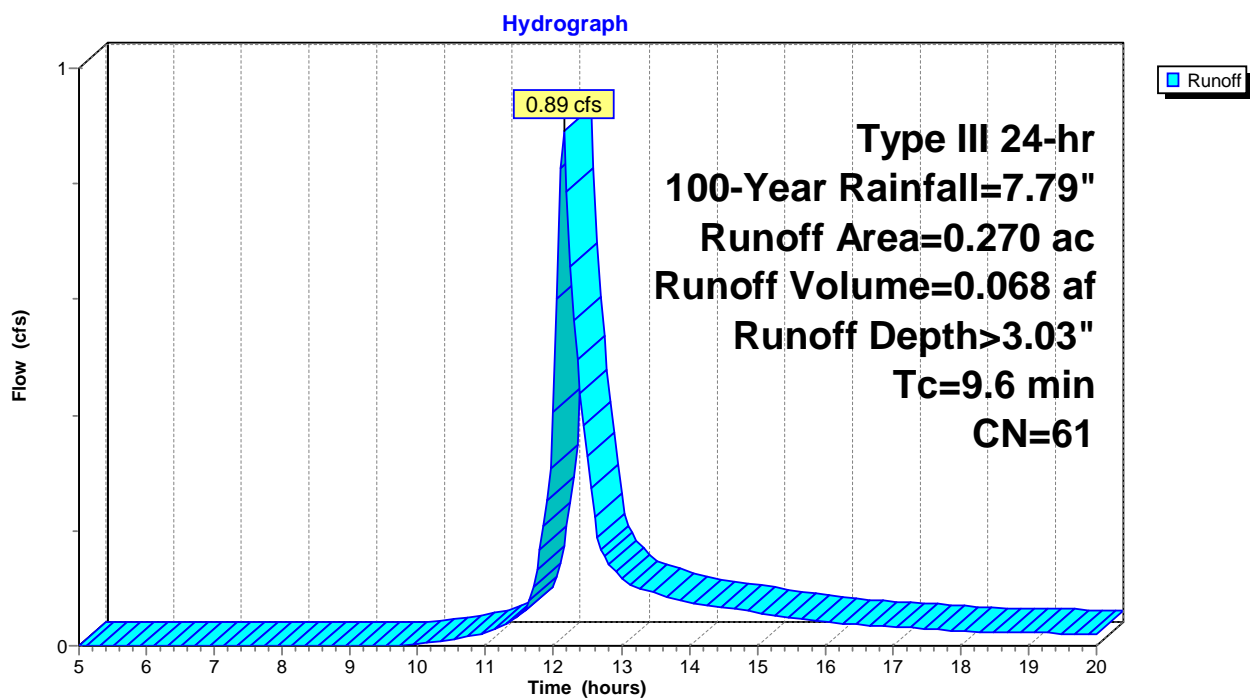
Summary for Subcatchment 3S: EXWS-30 / C

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

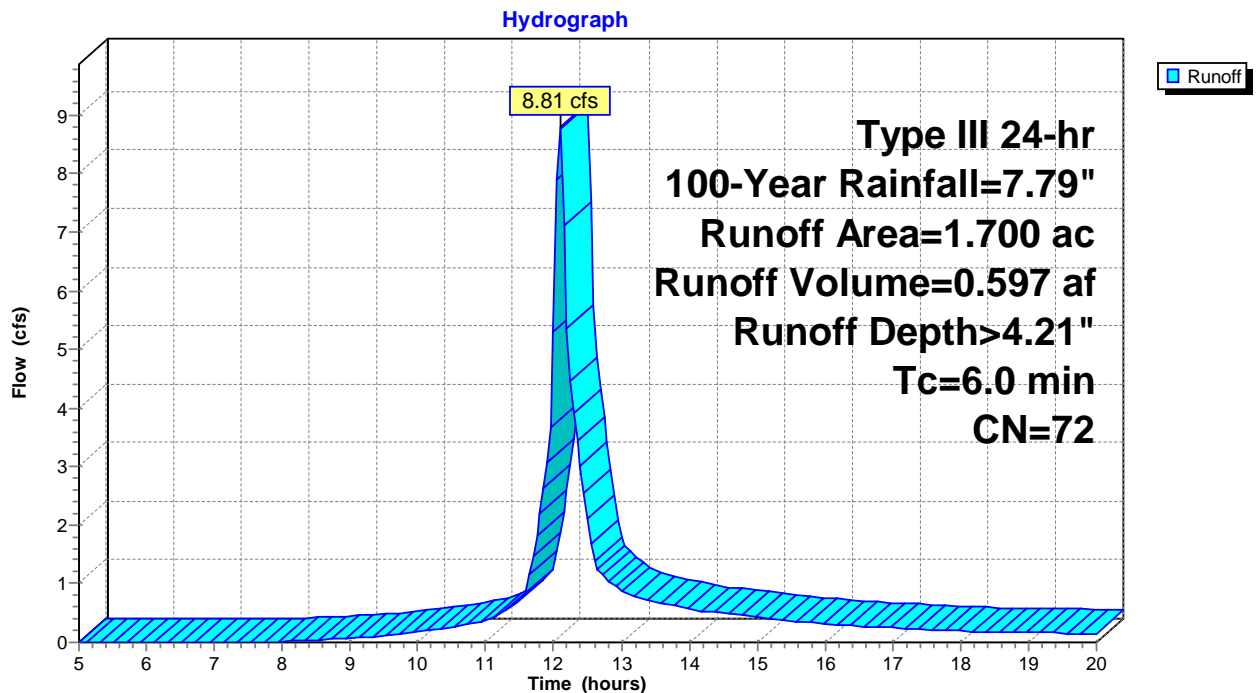
Summary for Subcatchment 7S: PRWS-10

Runoff = 8.81 cfs @ 12.09 hrs, Volume= 0.597 af, Depth> 4.21"
 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 |
|-----------|----|-----------------------|
| * 1.700 | 72 | |
| 1.700 | | 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

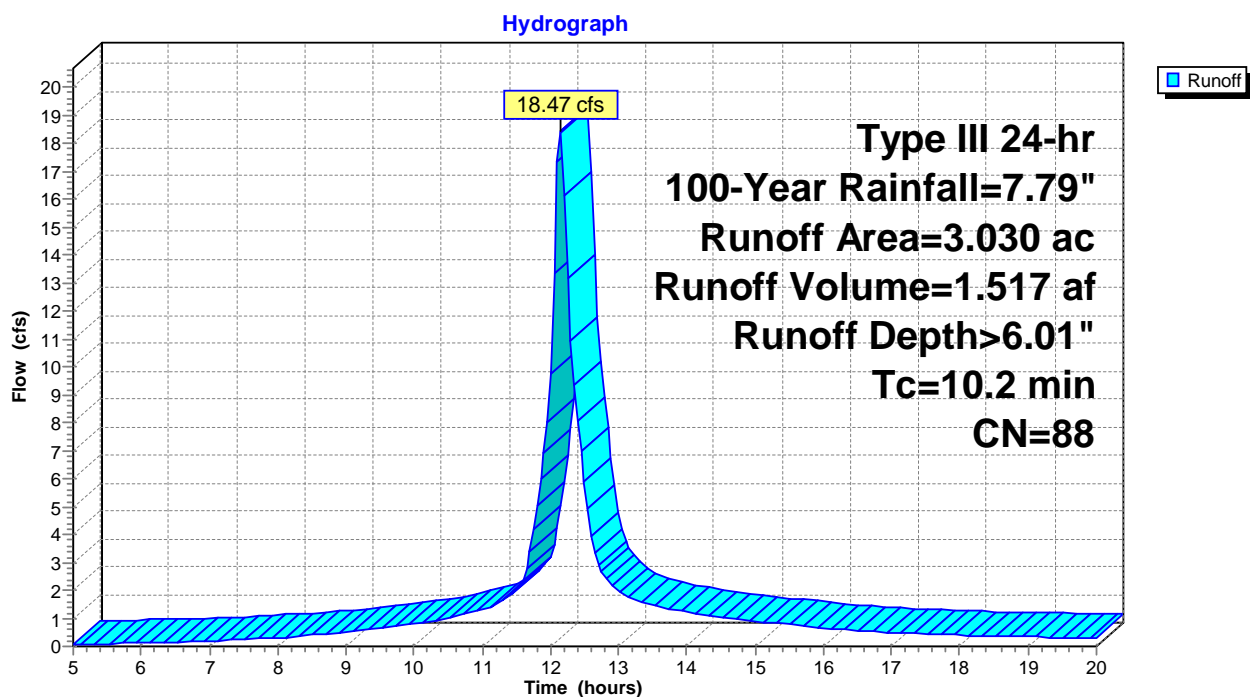
Summary for Subcatchment 8S: PRWS-11

Runoff = 18.47 cfs @ 12.14 hrs, Volume= 1.517 af, Depth> 6.01"
 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 |
|-----------|----|-----------------------|
| * 3.030 | 88 | |
| 3.030 | | 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

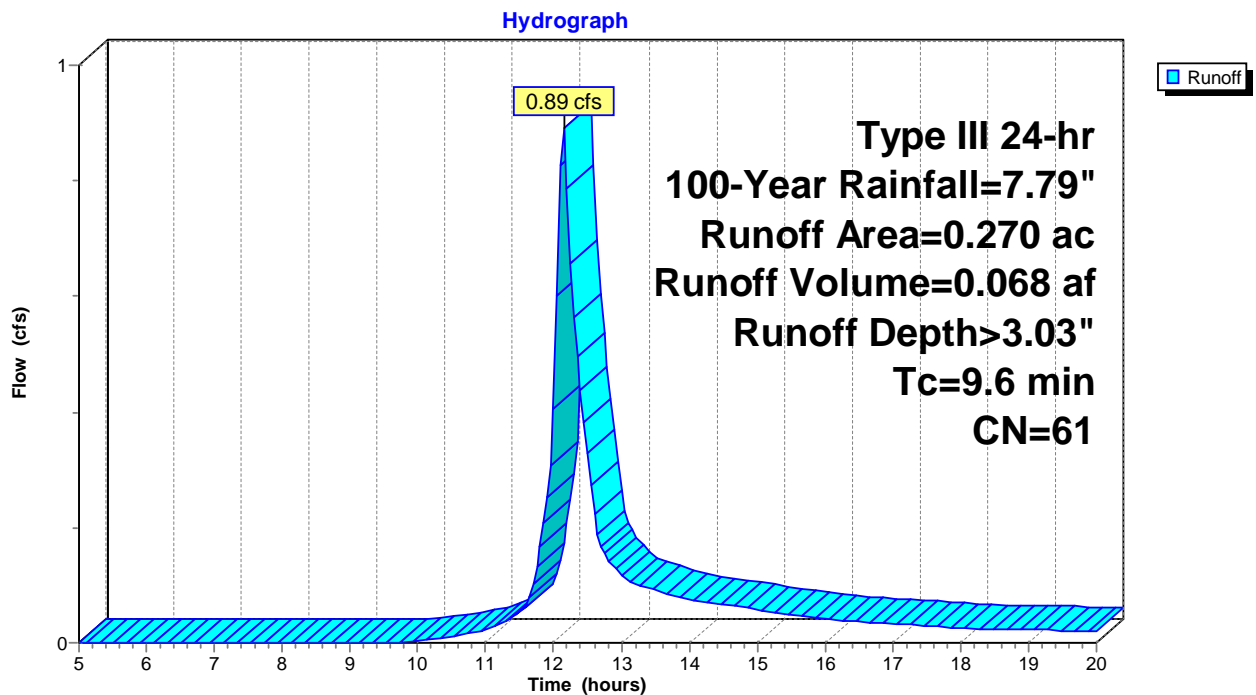
Summary for Subcatchment 9S: PRWS-30 / C

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

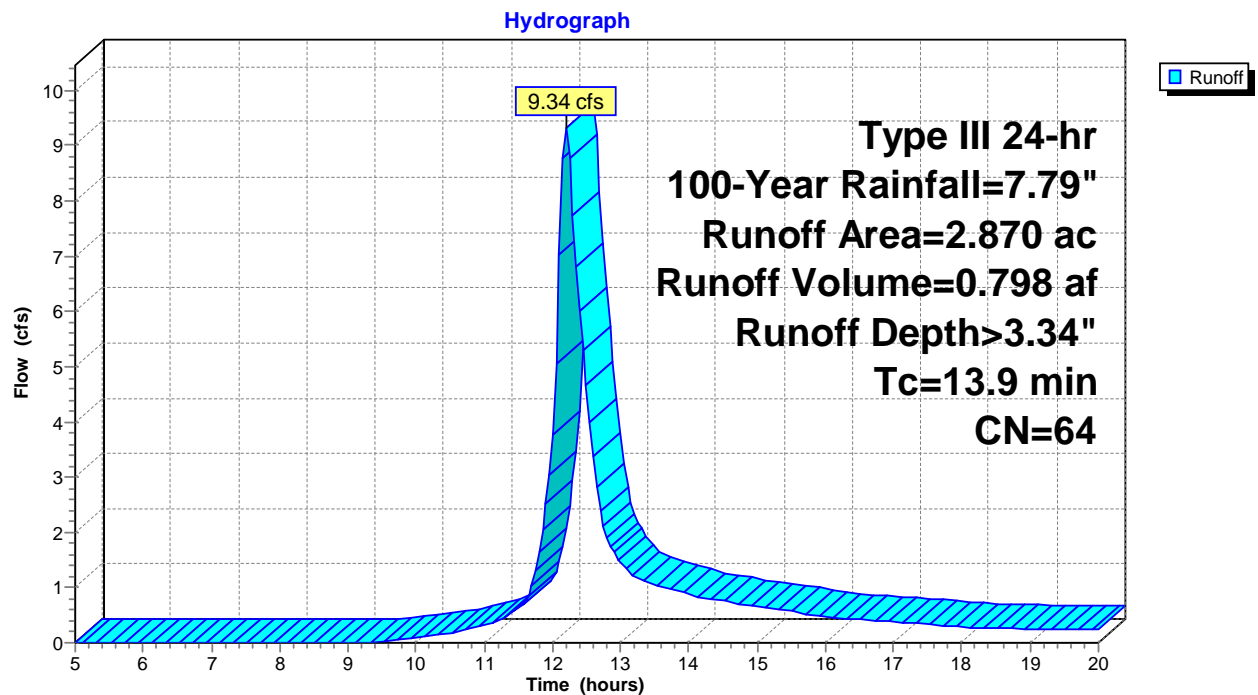
Summary for Subcatchment 13S: PRWS-20 / B

Runoff = 9.34 cfs @ 12.20 hrs, Volume= 0.798 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 |
|-----------|----|-----------------------|
| * 2.870 | 64 | |
| 2.870 | | 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

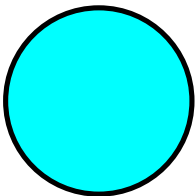
Summary for Reach 5R: 18" PIPE

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

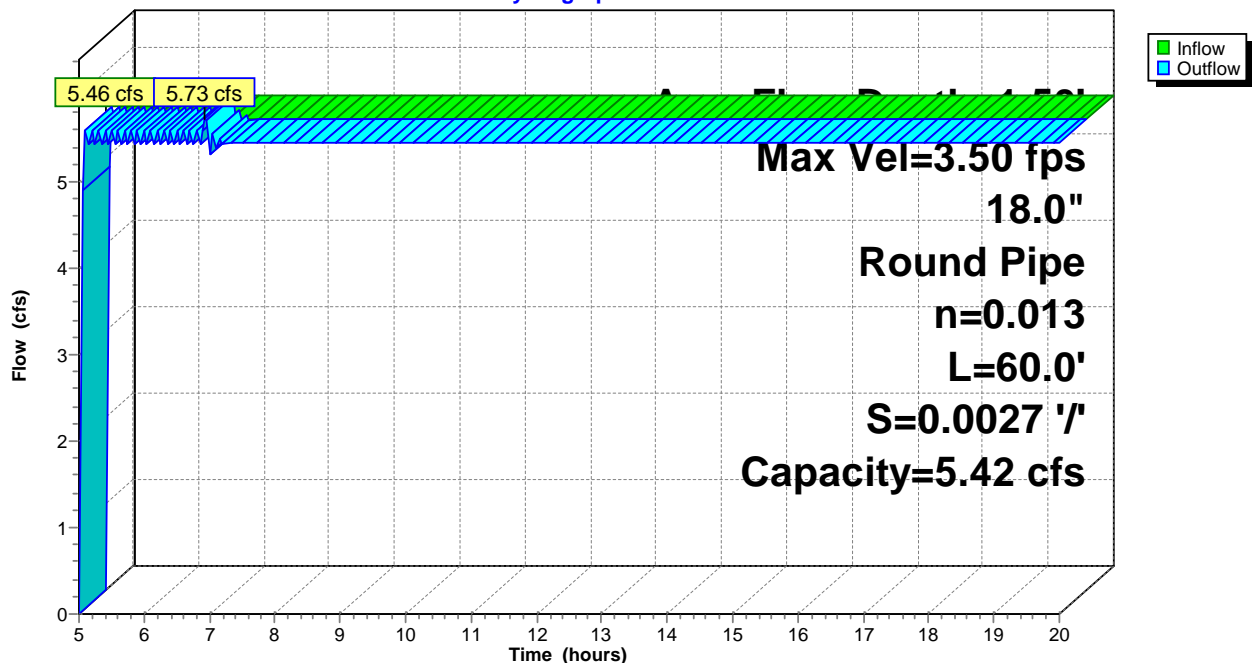
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.50 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.47 fps, Avg. Travel Time= 0.3 min

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'

**Reach 5R: 18" PIPE**

Hydrograph



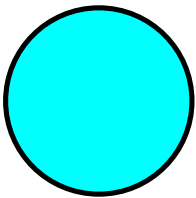
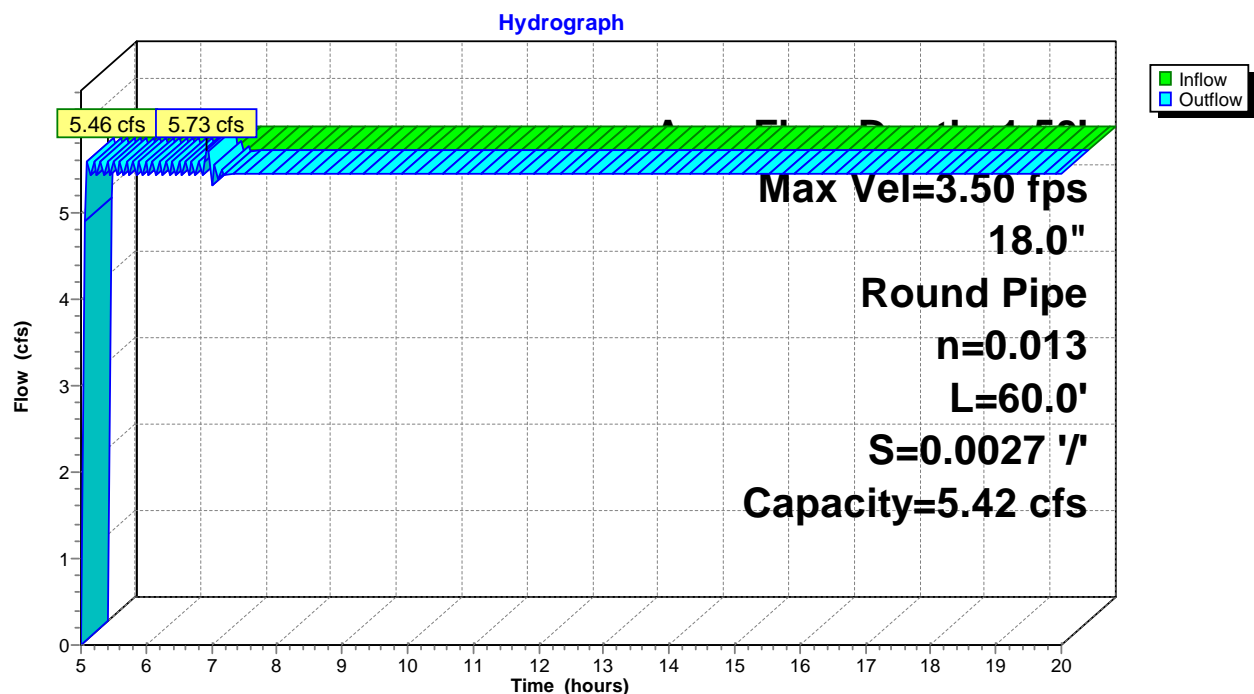
Summary for Reach 10R: 18" PIPE

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'

**Reach 10R: 18" PIPE**

Summary for Pond 11P: DET 110

Inflow Area = 3.030 ac, 0.00% Impervious, Inflow Depth > 6.01" for 100-Year event
 Inflow = 18.47 cfs @ 12.14 hrs, Volume= 1.517 af
 Outflow = 16.34 cfs @ 12.21 hrs, Volume= 1.351 af, Atten= 12%, Lag= 3.9 min
 Primary = 16.34 cfs @ 12.21 hrs, Volume= 1.351 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= 129.92' @ 12.21 hrs Surf.Area= 0.088 ac Storage= 0.379 af

Plug-Flow detention time= 76.3 min calculated for 1.346 af (89% of inflow)
 Center-of-Mass det. time= 41.2 min (799.3 - 758.1)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|--|
| #1A | 125.10' | 0.000 af | 40.00'W x 96.00'L x 5.67'H Field A 0.500 af Overall - 0.500 af Embedded = 0.000 af x 40.0% Voids |
| #2A | 125.10' | 0.393 af | retain_it retain_it 5.0' x 60 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 5 Rows adjusted for 353.3 cf perimeter wall |
| | | 0.393 af | Total Available Storage |

Storage Group A created with Chamber Wizard

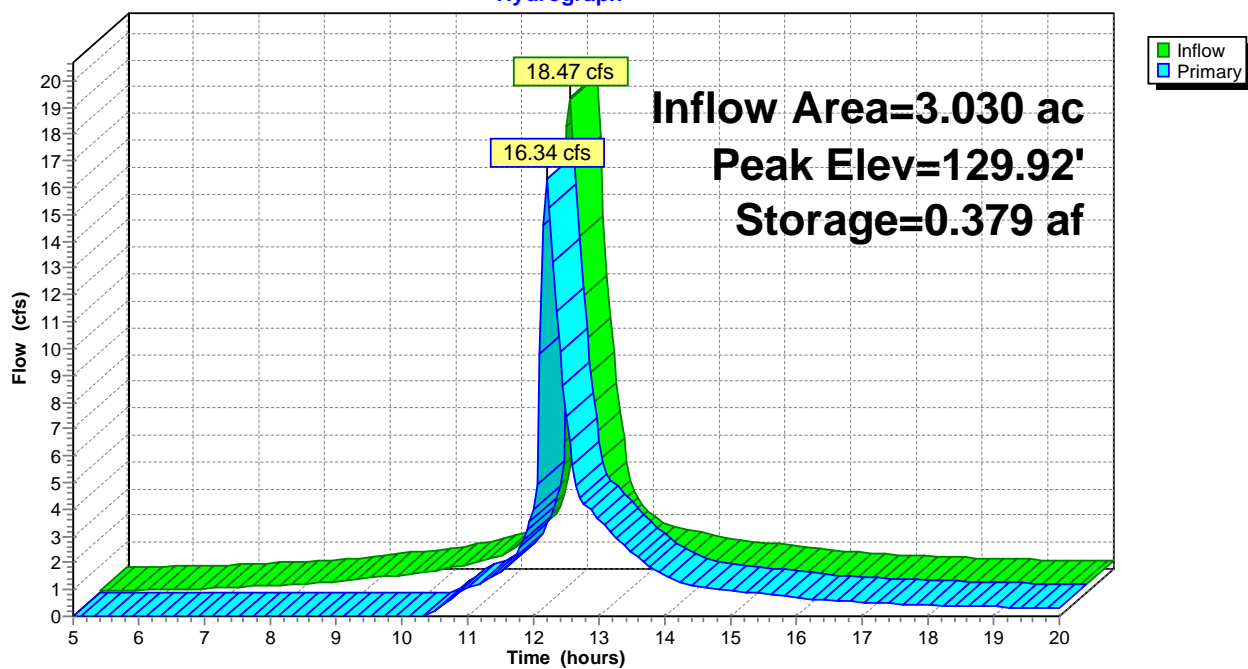
| Device | Routing | Invert | Outlet Devices |
|--------|----------|---------|---|
| #1 | Primary | 123.20' | 18.0" Round Culvert L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 123.20' / 122.00' S= 0.0240 '/ Cc= 0.900 n= 0.012, Flow Area= 1.77 sf |
| #2 | Device 1 | 127.00' | 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=16.20 cfs @ 12.21 hrs HW=129.91' (Free Discharge)

↑ **1=Culvert** (Passes 16.20 cfs of 16.40 cfs potential flow)

↑ **2=Orifice/Grate** (Orifice Controls 5.39 cfs @ 7.73 fps)

↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 10.81 cfs @ 3.12 fps)

Pond 11P: DET 110**Hydrograph**

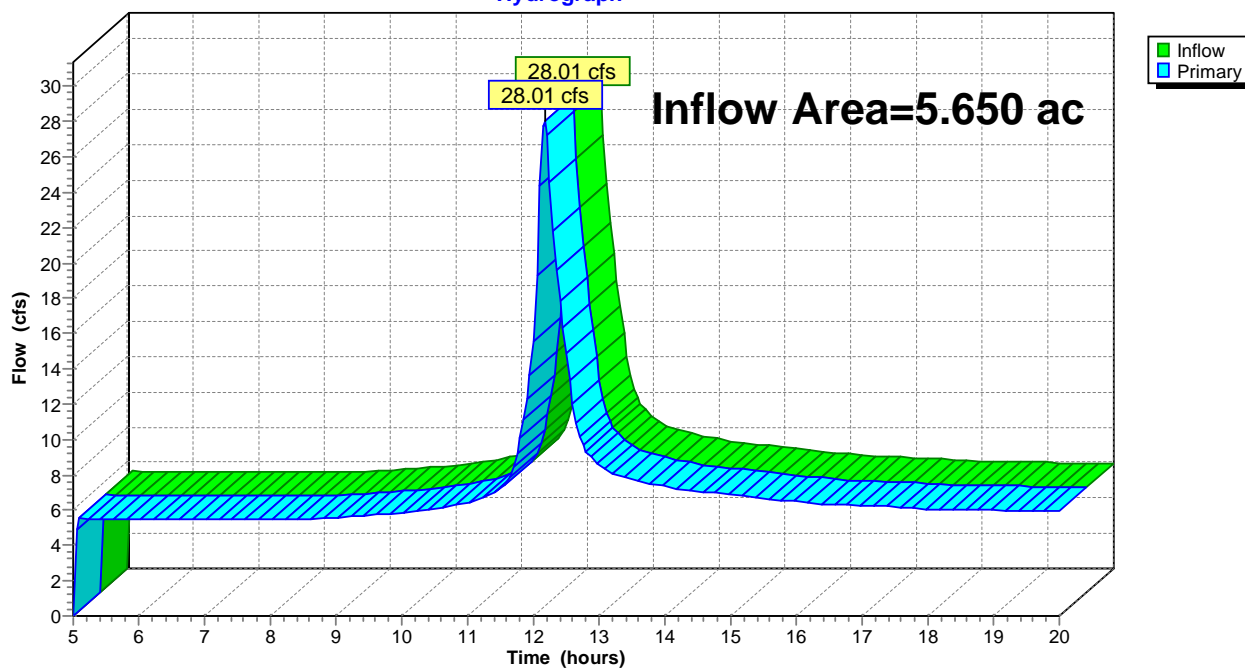
Summary for Link 6L: EX / A

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**Hydrograph**

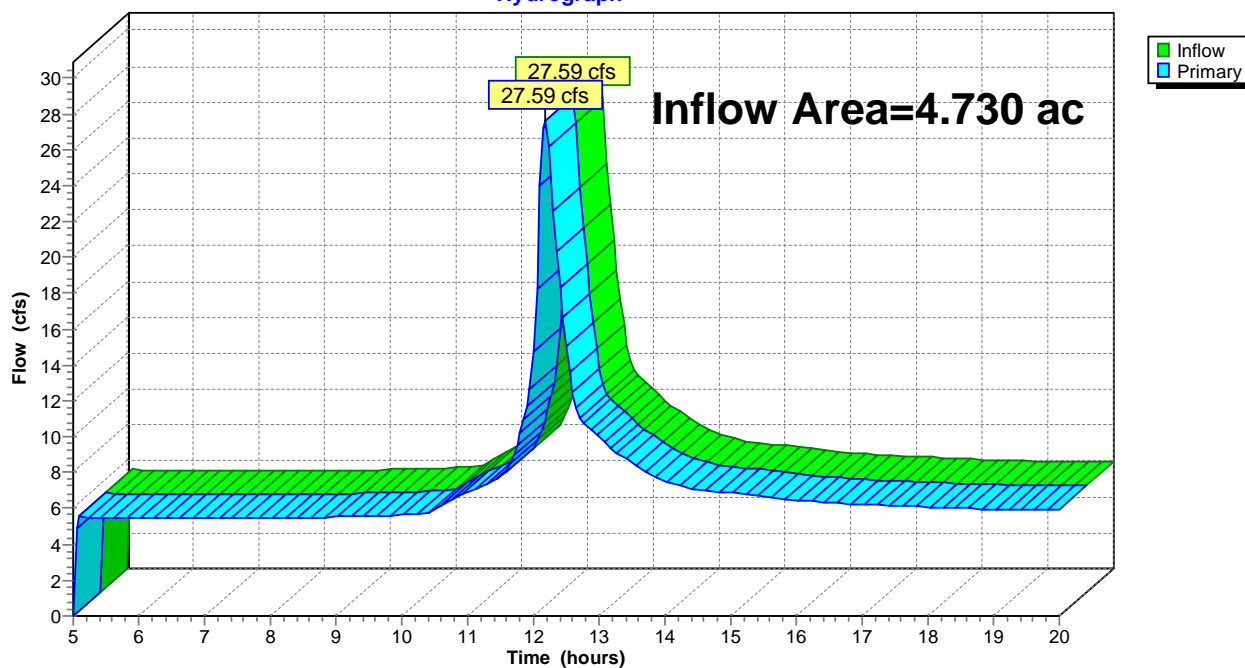
Summary for Link 12L: PR / A

Inflow Area = 4.730 ac, 0.00% Impervious, Inflow Depth > 22.13" for 100-Year event
Inflow = 27.59 cfs @ 12.17 hrs, Volume= 8.723 af
Primary = 27.59 cfs @ 12.17 hrs, Volume= 8.723 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

Hydrograph





Appendix H Watershed Maps

Deming Street Multi-Family Development

240 Deming Street, South Windsor, Connecticut

Drainage Report

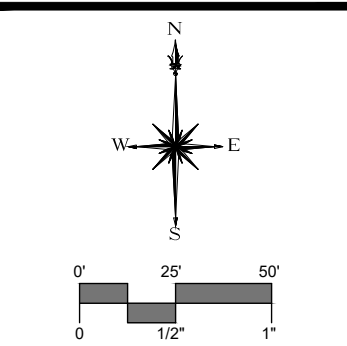
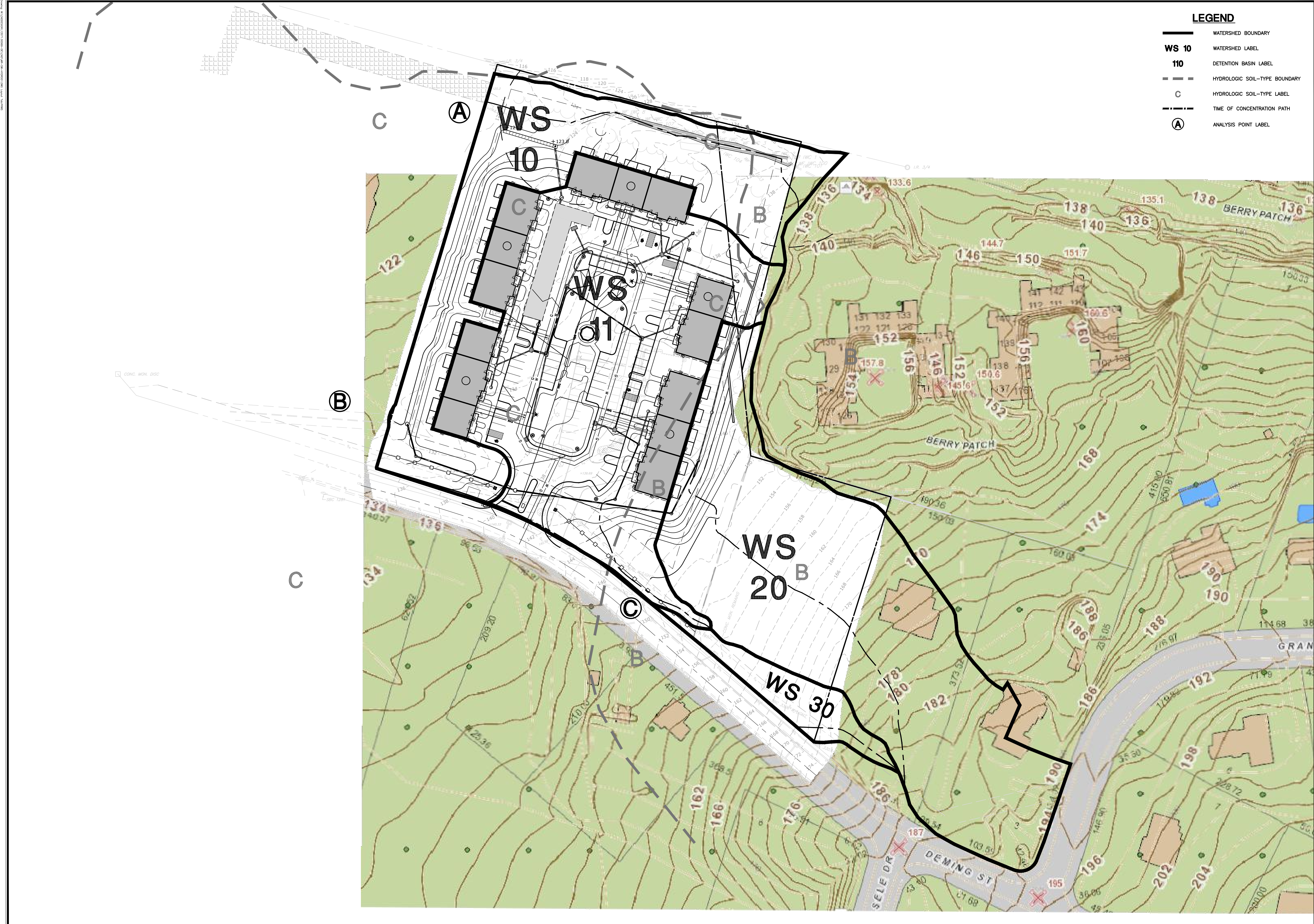
Prepared for:
Metro Realty
6 Executive Drive, Suite 100
Farmington, CT 06032


SLR Project No.: 141.13571.00069

June 28, 2023 (Rev: August 30, 2023) (**Revised August 30, 2023**)



NOTES: 1. NO PART OF THIS MAP SHALL BE USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT WAS PREPARED. 2. THE USER OF THIS MAP SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES. 3. THE USER OF THIS MAP SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE APPROPRIATE AGENCIES.





95 REATY DRIVE
203.271.1773
SLRCONSULTING.COM

| DESCRIPTION | DATE | BY |
|------------------|------------|-----|
| IWC RESUBMISSION | 08/30/2023 | MCB |
| | | |
| | | |
| | | |
| | | |
| | | |

WATERSHED MAP - PROPOSED CONDITIONS

PROPOSED MULTI-FAMILY DEVELOPMENT

240 DEMING STREET
SOUTH WINDSOR, CONNECTICUT

| | | |
|---------------|-------|---------|
| MCB | MCB | TD |
| DESIGNED | DRAWN | CHECKED |
| 1"=50' | | |
| JUNE 28, 2023 | | |
| 13571.00069 | | |
| PROJECT NO. | | |
| 2 OF 2 | | |
| SHEET NO. | | |
| PRWS | | |
| SHEET NAME | | |