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DRAINAGE EVALUATION

Assessor's Map 63, Lot 6B, 6C & Lot 31
Plymouth Street, Halifax, Massachusetts
January 13, 2020

Prepared For:
R & J LLC

Prepared By:

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Project #H13002

COMMONWEALTH OF MASSACHUSETTS
LAWRENCE P. SILVA
CIVIL
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REGISTERED
PROFESSIONAL ENGINEER

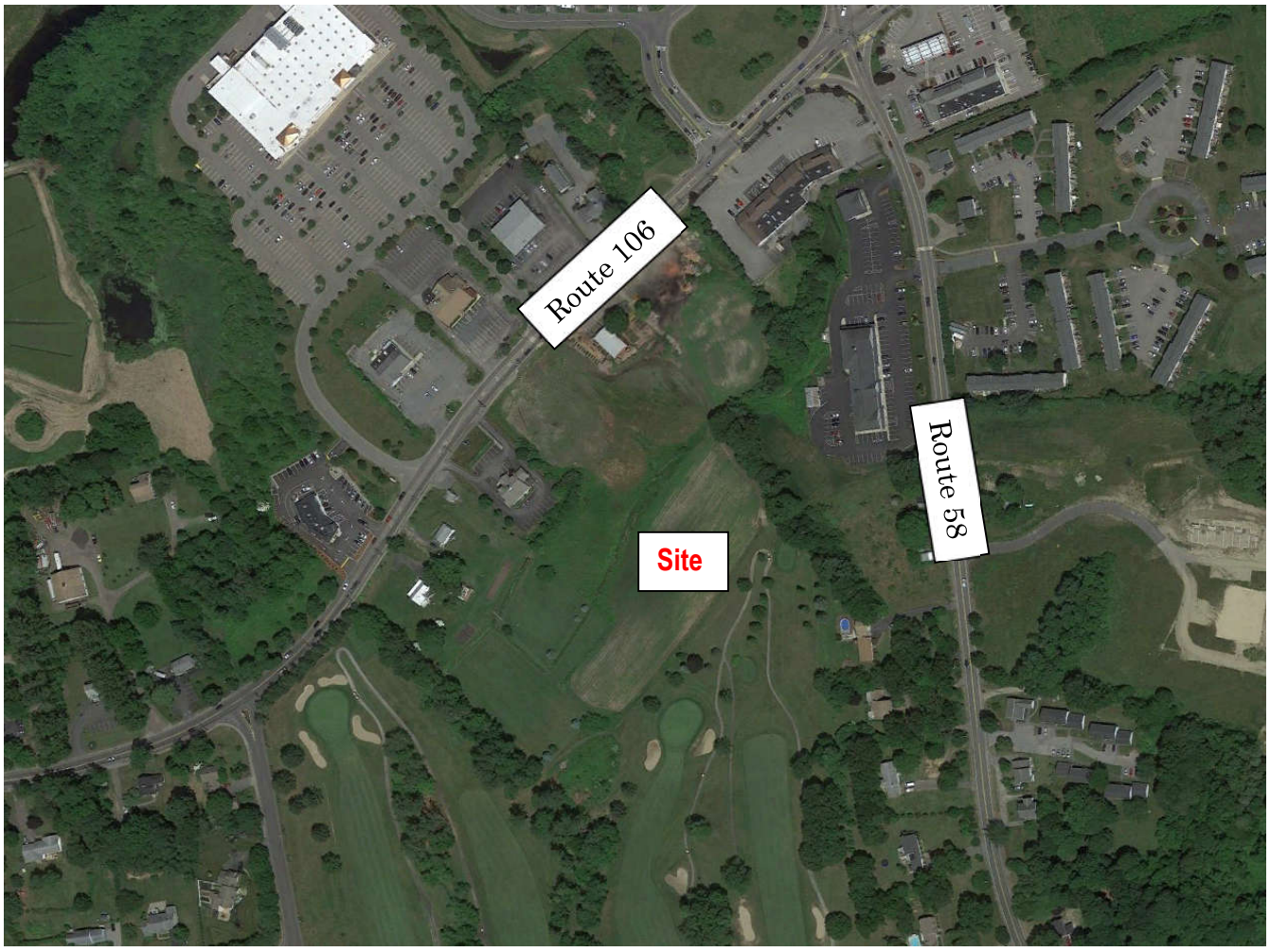
Lawrence P. Silva, P.E.

1-16-2020
Date

DRAINAGE SUMMARY
Assessor's Map 63, Lot 6B, Lot 6C, & Lot 31
Plymouth Street, Halifax, Massachusetts
January 13, 2020

Locus Description:

The subject property is located on the south side of Plymouth Street (Rte. 106) and to the west of Monponsett Street (Rte. 58). The property is bordered by a few residences to the west, commercial development to the north and east, and a 209 acre country club to the south. The proposed development will encompass three lots comprising of 11.10 acres agricultural fields and a portion of the Halifax Country Club for drainage and septic. There is a small, 0.68 acre, pocket of wetlands on the site. The property is Zoned Commercial and Residential.

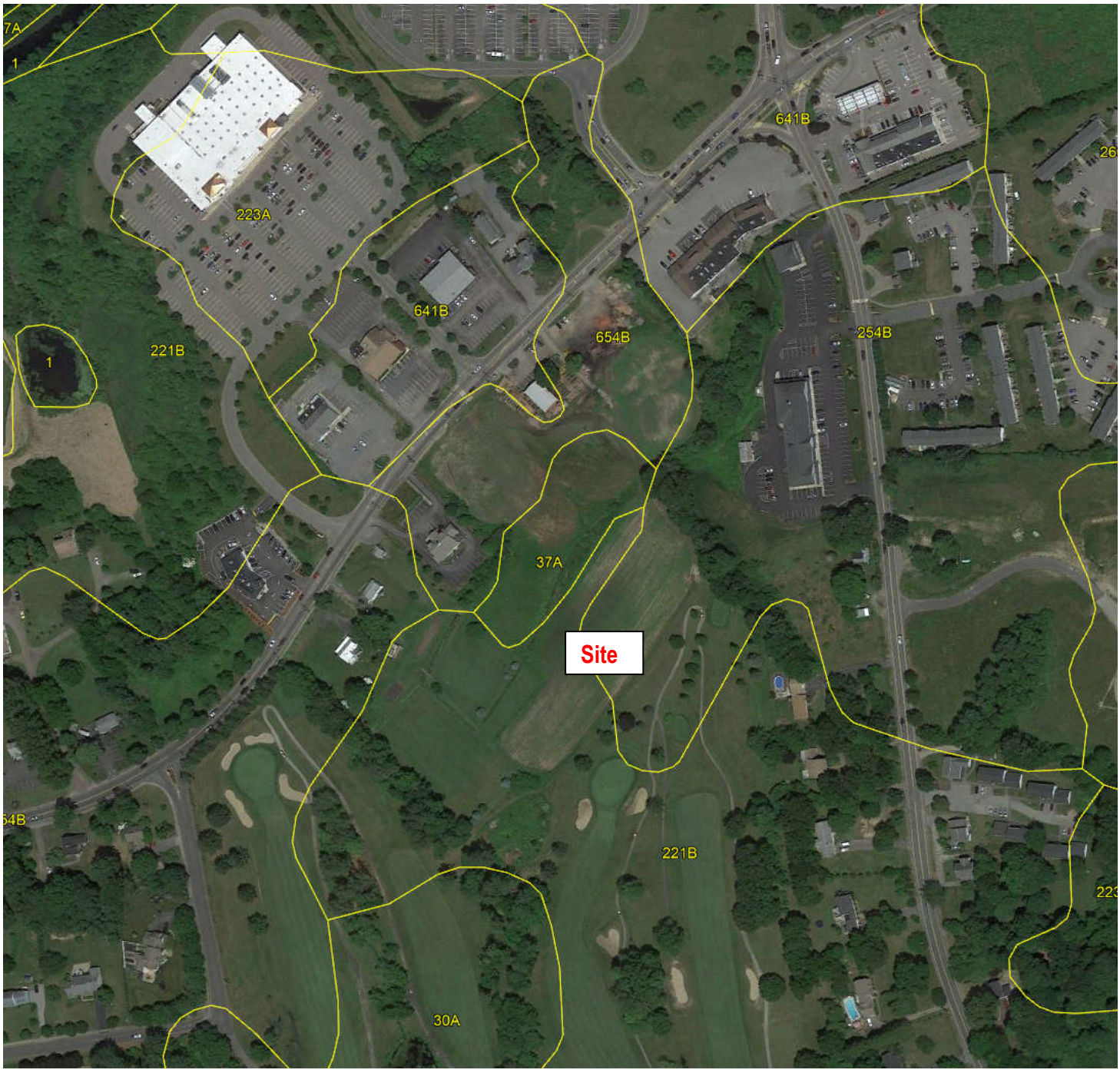


Project Description:

This project proposes five Quadruplex and five Duplex condominiums, approximately 857 feet of new roadway with a cul-de-sac, utilities, and a drainage system.

Soils:

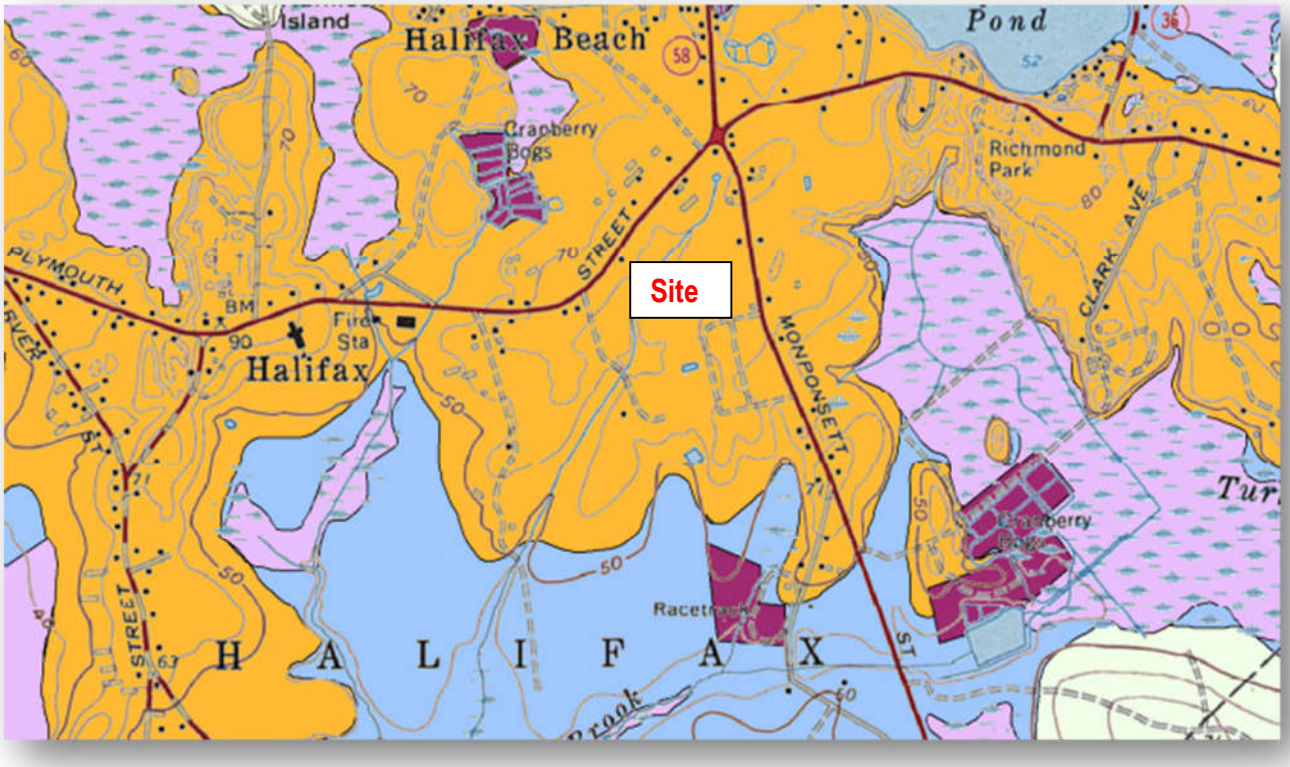
A review of the Natural Resources Conservation Service[1], Plymouth County Soil Survey revealed the site soils to be primarily 254B (Hydrologic soil Group A), Merrimac – Sandy Loam, 654B (Hydrologic soil Group B) Udorthents, 221B (Hydrologic soil Group C), Eldridge-Fine Sandy Loam, and 37A (Hydrologic soil Group D) Massasoit – Mashpee Complex.



[1] Survey Area Data Version 7, September 19, 2014.

Surficial Geology:

The Surficial Geology map published by the US Geological Survey dated 2011 and indicates the site lies within coarse deposits."



Coarse deposits include gravel deposits composed of at least 50 percent gravel-size clasts; cobbles and boulders predominate; minor amounts of sand occur within gravel beds, and sand comprises few separate layers. Gravel layers generally are poorly sorted, and bedding commonly is distorted and faulted due to postdepositional collapse related to melting of ice. Sand and gravel deposits occur as mixtures of gravel and sand within individual layers and as layers of sand alternating with layers of gravel. Sand and gravel layers generally range from 25 to 50 percent gravel particles and from 50 to 75 percent sand particles. Layers are well to poorly sorted; bedding may be distorted and faulted due to postdepositional collapse. Sand deposits are composed mainly of very coarse to fine sand, commonly in well-sorted layers. Coarser layers may contain up to 25 percent gravel particles, generally granules and pebbles; finer layers may contain some very fine sand, silt, and clay

Floodplain:

The Flood Insurance Rate Map identifies the location of the building and activity as being in Zone X; Community Panel No. 25023C0326J; dated July 17, 2012.

Pre-Development Conditions

Estimates of stormwater runoff associated with the proposed project were determined using the USDA NRCS publication TR-55, the basis of HydroCAD 10.0. This methodology uses soil type, time of concentration, vegetative cover and topographical conditions to develop hydrographs for various storm events. For this study the 2, 10, 25, and 100-year storm events were analyzed. The calculations estimate the pre- and post-development peak runoff rates and stormwater volumes for each storm event. Water quality mitigation using various Best Management Practices (BMPs) are identified to achieve compliance with Massachusetts Stormwater Management Standards.

In the development of the pre-development hydrologic analysis the site is delineated into one general sub catchment area (EX-A) consisting of approximately 10.6 acres. This area has a general flow from the north to the south. There are several existing drainage ditches across the property that serve as study points. The stormwater calculations for various storm events for the overall site are summarized in the following table.

HydroCAD Pre-Development Estimates

Storm Event	Peak Rate (cfs)	Peak Volume (acre-feet)
2-yr	14.4	1.08
10-yr	28.0	2.04
25-yr	36.4	2.64
100-yr	51.6	3.74

Post-Development Conditions

The proposed project includes five 4-unit quadraplex condominiums, five 2-unit duplex condominiums, approximately 857 feet of new roadway along with a cul-de-sac, and landscaped areas. Runoff from the proposed roadway along with its upslope area will be directed to deep sump and hooded catch basins, drain manholes, sediment forebays, and drainage basins.

The post-development analysis includes eight sub watershed areas designated by their final discharge point. The sub catchment areas for each catch basin (CB-1, CB-2, & CB-3), consist of pavement and lawn areas and will remove *trash, debris, and coarse sediment from stormwater runoff*. This will collect the first flush of a rain fall before flowing into the drainage basin. The sediment forebay prior to Basin 1 has been provided and sized for 0.5" of rainfall over the proposed impervious area requiring 871 cubic feet of storage for Basin 1. The sediment forebay as designed, provides 895 cubic feet of storage below the overflow. The sediment forebay, prior to Basin 2, has been sized for 0.5" of rainfall over the proposed impervious area requiring 926 cubic feet of storage. The sediment forebay as designed, provides 1,992 cubic feet of storage below the overflow. Sub catchment areas (DV-A through DV-C) consisting of lawn and natural areas will bypass stormwater control devices and flow overland naturally.

Conclusion

The peak rate of stormwater leaving the site will not be increased as a result of the proposed development. The proposed stormwater management systems will provide the necessary storage to reduce the peak rate of runoff from the 2, 10, 25, and 100-year storm events below pre-development rates. The routing calculations demonstrate that the overall routed development peak runoff rates and volumes are below Pre-Development peak runoff rates and peak volume totals for all storm events. The stormwater calculations for various storm events are summarized in the following tables. The design and construction of the individual sites and roadway systems will also be done in compliance with the NPDES, the Massachusetts DEP Stormwater Management Standards and with local requirements of the Town of Halifax

HydroCAD Post-Development Estimates and Comparison

Storm Event	Pre-Development Peak Rate (cfs)	Post Development Peak Rate (cfs)
2-yr	14.4	5.6
10-yr	28.0	14.9
25-yr	36.4	20.3
100-yr	51.6	30.5

Volume Summary:

The table below illustrates the total volume will decrease for all storm events.

Storm Event	Pre-Development Volume (ac-ft)	Post Development Volume (ac-ft)
2-yr	1.08	0.80
10-yr	2.04	1.63
25-yr	2.64	2.17
100-yr	3.74	3.17

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"SUPPLEMENTAL INFORMATION"

Assessor's Map 63, Lot 6B, 6C & Lot 31
Plymouth Street, Halifax, Massachusetts

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Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

1-28-2020

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): 25' "No Touch" Buffer

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☒ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☐ Redevelopment Project

☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Stormwater Management Calculations

Assessor's Map 63, Lot 6B & Lot 31
Plymouth Street, Halifax, Massachusetts
January 13, 2020

Standard 3: Recharge Calculations

Recharge Volume Required: Proposed Road and Driveway Areas (CB1&2)

$Rv\ (CB1\&2) = (F / 12$ inches/foot) * (A_{IMP} * 43,560 square feet/acre)

Where: F = Target Depth Factor (in inches) 0.60-inches (HSG A soil)
= Target Depth Factor (in inches) 0.35-inches (HSG B soil)
= Target Depth Factor (in inches) 0.25-inches (HSG C soil)
= Target Depth Factor (in inches) 0.10-inches (HSG D soil)
A_{IMP} = Impervious Area (in acres)

= [(0.60 inches/12 inches/foot)][(0.16 acre)(43,560 square feet/acre)] =
(0.05 ft) (6,970 sf) = **349± cf**
= [(0.35 inches/12 inches/foot)][(0.13 acre)(43,560 square feet/acre)] =
(0.03 ft) (5,663 sf) = **170± cf**
= [(0.25 inches/12 inches/foot)][(0.10 acre)(43,560 square feet/acre)] =
(0.02 ft) (4,356 sf) = **87± cf**
= [(0.10 inches/12 inches/foot)][(0.15 acre)(43,560 square feet/acre)] =
(0.01 ft) (6,534 sf) = **65± cf**
Rv (CB1&2) Total = 671± cf

Recharge Volume Required: Proposed Road and Driveway Areas (CB3)

$Rv(CB3) = (F / 12$ inches/foot) * (A_{IMP} * 43,560 square feet/acre)

Where: F = Target Depth Factor (in inches) 0.60-inches (HSG A soil)
= Target Depth Factor (in inches) 0.25-inches (HSG C soil)
A_{IMP} = Impervious Area (in acres)

= [(0.60 inches/12 inches/foot)][(0.25 acre)(43,560 square feet/acre)]
(0.05 ft) (10,890 sf) = **545± cf**
= [(0.25 inches/12 inches/foot)][(0.38 acre)(43,560 square feet/acre)]
(0.02 ft) (16,553 sf) = **331± cf**
Rv (CB3) Total = 876± cf

Recharge Volume Provided: Basin 1

A = Rv (CB1&2) ÷ (nD+KT) =
Where: A is the minimum required surface area of the bottom of the infiltration structure
D is a depth of the infiltration facility (Elev. 66.3-66.0=0.30-ft)-Basin 1
n is the Void space (open air – none)
K is the saturated hydraulic conductivity. (0.27" – Silt Loam)
T is the allowable drawdown during the peak of the storm (use 2 hours)

A= 671 cf ÷ [0.30 ft + ((0.27"/hr/12"/ft) x (2hr))] =
671 cf ÷ (0.30 ft + 0.045ft) =
671 cf ÷ 0.345 ft = 1,945 sf
V=AxD
V is the Storage Volume determined
V required = 1,945 sf * 0.30 feet = 584 cf
V provided = 793 cf (@El.-66.3)
(See attached HydroCAD Report Stage-Area-Storage for Pond 5B: Basin 1)
Recharge volume provided 793 cf Basin 1

Drawdown within 72 hours:

$$Time_{drawdown} = \frac{Vprovided}{(K)(Bottom\ Area * n)}$$

Where: V = Storage Volume
K = Saturated Hydraulic Conductivity
Bottom Area = Bottom Area of Recharge Structure

$$Time_{drawndown} = \frac{793cf}{(0.27\ in/hr * 1\ ft/12in)*(2{,}547\ sf * 100\%)} = 14\ hours < 72\ hours$$

Recharge Volume Provided: Basin 2B

A =Rv(CB3) ÷ (nD+KT) =
Where: A is the minimum required surface area of the bottom of the infiltration structure
D is a depth of the infiltration facility (Elev. 64.1-63.5=0.60-ft)-Basin 2B
n is the Void space (open air – none)
K is the saturated hydraulic conductivity. (0.27" – Silt Loam)
T is the allowable drawdown during the peak of the storm (use 2 hours)

A = 876 cf ÷ [0.60 ft + ((0.27"/hr/12"/ft) x (2hr))] =
876 cf ÷ (0.60 ft + 0.045ft) =
876 cf ÷ 0.645 ft = 1,358 sf

V=AxD
V is the Storage Volume determined
V required = 1,358 sf * 0.60 feet = 815 cf
V provided = 1025 cf (@El.-64.1)
(See attached HydroCAD Report Stage-Area-Storage for Pond 7C: Basin 2B)
Recharge volume provided 1,025 cf

Drawdown within 72 hours:

$$Time_{drawdown} = \frac{Vprovided}{(K)(Bottom\ Area * n)}$$

Where: V = Storage Volume
K = Saturated Hydraulic Conductivity
Bottom Area = Bottom Area of Recharge Structure

$$Time_{drawndown} = \frac{1{,}025 cf}{(0.27\ in/hr * 1\ ft/12in) * (1{,}477\ sf * 100\%)} = 31\ hours < 72\ hours$$

Recharge Volume: Proposed Roof Area

Each proposed building will be furnished with its own on-site roof infiltration system.
Typical roof area = 1,824 square feet (Per Recharge System)
Proposed infiltration trenches 2-2'W x 38'L x 2'D w/ 12"Ø perforated pipe
V pipe provided = 12"Ø – 0.79 s.f./l.f. x 38' = 30.0 cf
V stone provided = 2' x 38' x 2' x 2 – (30.0 cf pipe vol.) x (0.40 porosity) = 109.6 cf
Total volume provided = 30.0 cf pipe + 97.6 cf stone = 139.6 cf
Total 15 systems x 139.6 cf = **2,094 cf**

Total Recharge Volume Required = Rv (CB1&2) + Rv (CB3) = 671 cf + 876 cf = 1,547 cf

Total volume provided =
793 cf (Basin1) + 1,025 cf (Basin 2B) + 2,094 cf (Roof Recharge) = 3,912 cf

Total 3,912 cubic feet > 1,547 cubic feet :.Required Recharge is Adequate

Standard 4: Water Quality Calculations

The *Required Water Quality Volume* (V_{WQ}) is based on 0.5-inches of runoff

Required Water Quality Volume: Catch Basin 1 & 2
Total impervious area: 0.54 acres

V_{WQ} = (D_{WQ}/12 inches/foot) * (A_{IMP} * 43,560 square feet/acre)

Where: V_{WQ} = Required Water Quality Volume (in cubic feet)
D_{WQ} = Water Quality Depth: 0.5-inch
A_{IMP} = Impervious Area (in acres without roofs)

= [(0.5 inches/12 inches/foot)][(0.54 acre)(43,560 square feet/acre)]
(.04 ft) * (23522 sf) = **941± cf**

Water Quality Volume provided: **Sediment Forebay 1A=995 cubic feet @ El. 67.3**
(See attached HydroCAD Report Stage-Area-Storage for Pond 5A: SF 1A)

Total = 995 cubic feet> 941 cubic feet :. Required Water Quality is Adequate

Catch Basin 1 &2
TSS Removal Calculation Worksheet

Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
TSS Removal prior to infiltration 44% minimum	1	-	0.56	**44%**

Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
TSS Removal After infiltration	1	-	0.11	**89%**

Required Water Quality Volume: Catch Basin 3
Total impervious area: <u>0.63 acres</u>

V_{WQ} = (D_{WQ}/12 inches/foot) * (A_{IMP} * 43,560 square feet/acre)

Where: V_{WQ} = Required Water Quality Volume (in cubic feet)
D_{WQ} = Water Quality Depth: 0.5-inch
A_{IMP} = Impervious Area (in acres without roofs)

= [(0.5 inches/12 inches/foot)][(0.63 acre)(43,560 square feet/acre)]
(0.04 ft) * (2,7443sf) = **1,098± cubic feet**

Water Quality provided: **Sediment Forebay 2A =1,992 cubic feet @ El. 66.5**
(See attached HydroCAD Report Stage-Area-Storage for Pond 11A: SF 2A)

Total = 1,992 cubic feet> 1,098 cubic feet :. Required Water Quality is Adequate.

<u>Catch Basin 3 into Basin 2</u>
<u>TSS Removal Calculation Worksheet</u>

Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
TSS Removal prior to infiltration 44% minimum	1	-	0.56	**44%**

Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Sediment Forebay	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
TSS Removal After infiltration	1	-	0.11	**89%**

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Plymouth County, Massachusetts

August 15, 2015

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

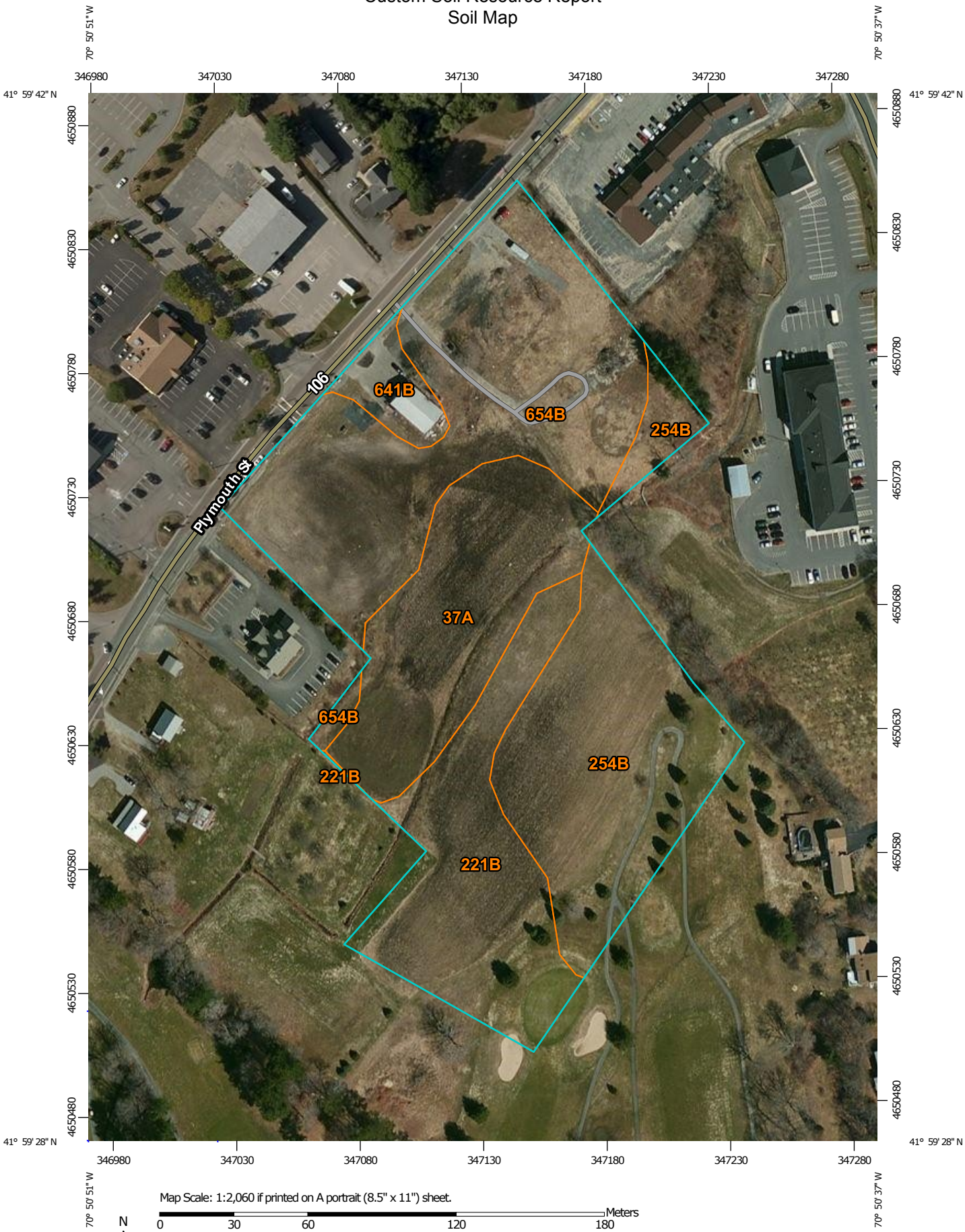
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,060 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Plymouth County, Massachusetts
Survey Area Data: Version 7, Sep 19, 2014

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

Date(s) aerial images were photographed: Mar 30, 2011—Sep 4, 2014

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.

Map Unit Legend

Plymouth County, Massachusetts (MA023)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
37A	Massasoit - Mashpee complex, 0 to 3 percent slopes	1.8	18.1%
221B	Eldridge fine sandy loam, 3 to 8 percent slopes	1.9	19.2%
254B	Merrimac sandy loam, 3 to 8 percent slopes	2.4	24.9%
641B	Urban land, outwash substratum, 0 to 8 percent slopes	0.3	3.1%
654B	Udorthents, loamy, 0 to 8 percent slopes	3.4	34.6%
Totals for Area of Interest		**9.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially

where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Plymouth County, Massachusetts

37A—Massasoit - Mashpee complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: bd1q
Elevation: 0 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Massasoit and similar soils: 55 percent
Mashpee and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Massasoit

Setting

Landform: Drainageways, terraces, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
Oa - 1 to 3 inches: highly decomposed plant material
A - 3 to 5 inches: fine sand
Eg1 - 5 to 11 inches: fine sand
Eg2 - 11 to 13 inches: fine sand
Bhs - 13 to 17 inches: fine sand
Bsm - 17 to 23 inches: fine sand
Bs - 23 to 26 inches: fine sand
BC - 26 to 43 inches: fine sand
Cg - 43 to 80 inches: loamy very fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 7 to 20 inches to ortstein
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: D

Description of Mashpee

Setting

Landform: Terraces, depressions, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

Oe1 - 0 to 2 inches: moderately decomposed plant material
Oe2 - 2 to 4 inches: moderately decomposed plant material
Oa - 4 to 5 inches: highly decomposed plant material
AE - 5 to 7 inches: loamy fine sand
Eg - 7 to 11 inches: fine sand
Bh1 - 11 to 13 inches: fine sand
Bh2 - 13 to 17 inches: fine sand
Bs - 17 to 24 inches: loamy fine sand
C1 - 24 to 39 inches: fine sand
C2 - 39 to 65 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 5.95 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D

Minor Components

Deerfield

Percent of map unit: 5 percent
Landform: Terraces, deltas, outwash plains
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave

Rainberry

Percent of map unit: 3 percent
Landform: Depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave

Across-slope shape: Linear

Squamscott

Percent of map unit: 2 percent
Landform: Lake terraces, lake plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave

221B—Eldridge fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: bcwz
Elevation: 0 to 310 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Eldridge and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eldridge

Setting

Landform: Lake plains, lake terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Sandy eolian deposits and/or sandy glaciofluvial deposits over coarse-silty glaciolacustrine deposits

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw - 10 to 20 inches: fine sandy loam
C1 - 20 to 29 inches: fine sand
C2 - 29 to 38 inches: fine sand
2C3 - 38 to 52 inches: silt
2C4 - 52 to 74 inches: silt

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 1.13 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D

Minor Components

Squamscott

Percent of map unit: 5 percent
Landform: Lake terraces, lake plains
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave

Hinesburg

Percent of map unit: 4 percent
Landform: Lake plains, deltas
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex

Deerfield

Percent of map unit: 3 percent
Landform: Terraces, deltas, outwash plains
Landform position (two-dimensional): Footslope, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave

Scio

Percent of map unit: 3 percent
Landform: Lakebeds, lake terraces, lake plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Concave

254B—Merrimac sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: bcxj
Elevation: 0 to 400 feet

Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Merrimac and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Kames, terraces, outwash plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits

Typical profile

Oi - 0 to 0 inches: slightly decomposed plant material
Oe - 0 to 2 inches: moderately decomposed plant material
AE - 2 to 3 inches: sandy loam
Bs - 3 to 5 inches: coarse sandy loam
Bw1 - 5 to 12 inches: coarse sandy loam
Bw2 - 12 to 18 inches: sandy loam
Bw3 - 18 to 22 inches: gravelly coarse sandy loam
2C1 - 22 to 38 inches: gravelly sand
2C2 - 38 to 72 inches: gravelly coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A

Minor Components

Carver

Percent of map unit: 8 percent
Landform: Pitted outwash plains, outwash plains, moraines
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex

Hinckley

Percent of map unit: 5 percent
Landform: Outwash deltas, eskers, terraces, kames
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex

Deerfield

Percent of map unit: 5 percent
Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Footslope, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave

Mashpee

Percent of map unit: 1 percent
Landform: Depressions, terraces, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave

Massasoit

Percent of map unit: 1 percent
Landform: Drainageways, terraces, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave

641B—Urban land, outwash substratum, 0 to 8 percent slopes

Map Unit Composition

Urban land, outwash substratum: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

654B—Udorthents, loamy, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: bd05
Elevation: 0 to 390 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, loamy, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Loamy

Setting

Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Coarse-loamy human transported material

Typical profile

^A - 0 to 5 inches: loam
^C1 - 5 to 21 inches: gravelly loam
^C2 - 21 to 80 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.01 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B

Minor Components

Udipsamments

Percent of map unit: 10 percent
Landform: Dikes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear

Udorthents, wet substratum

Percent of map unit: 10 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

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"ROUTING CALCULATIONS"

Assessor's Map 63, Lot 6B, 6C & Lot 31
Plymouth Street, Halifax, Massachusetts

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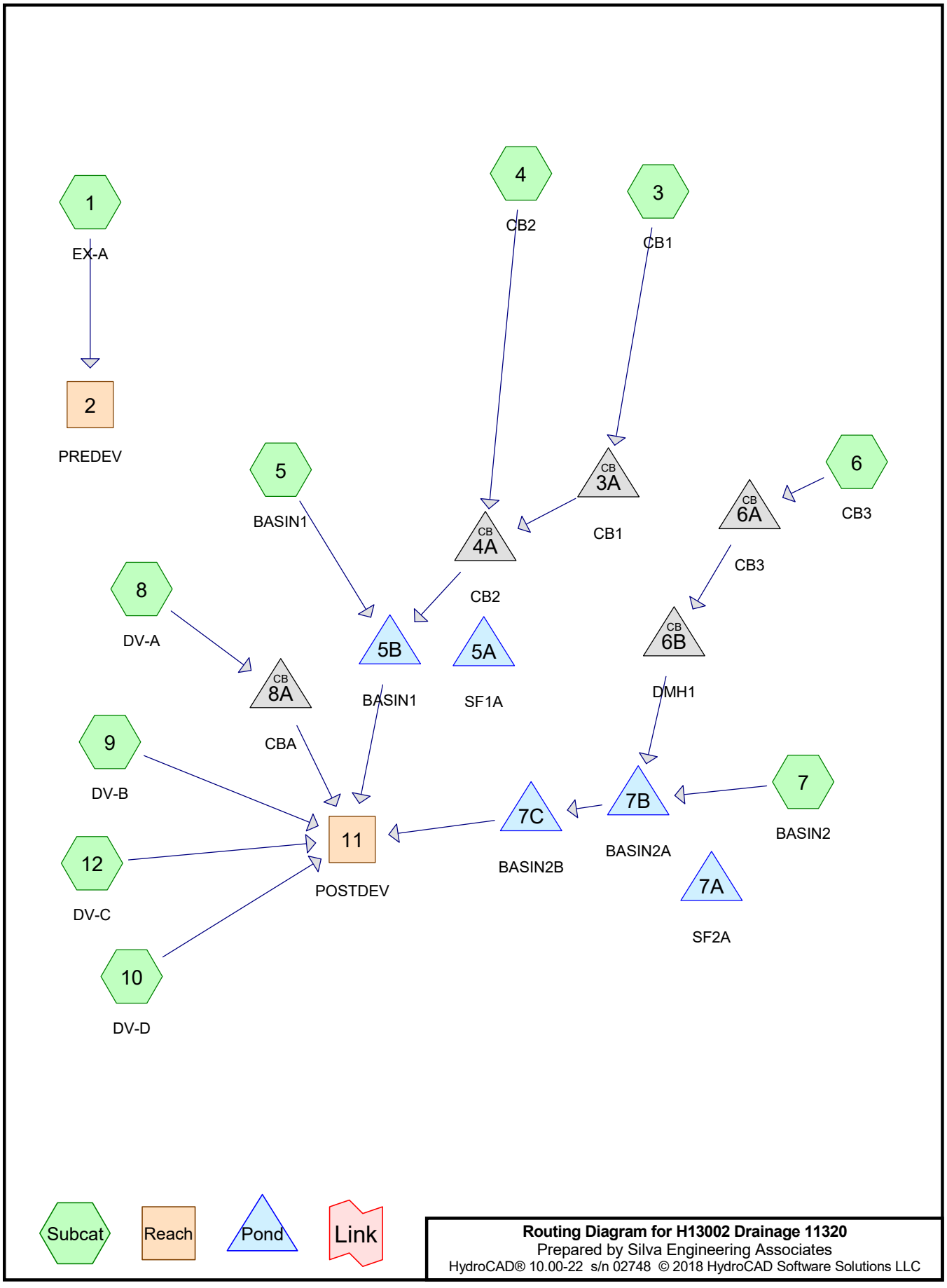


Routing Diagram for H13002 Drainage 11320
Prepared by Silva Engineering Associates

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.076	84	50-75% Grass cover, Fair, HSG D (10)
2.395	39	>75% Grass cover, Good, HSG A (1, 3, 4, 6, 8, 10)
0.145	61	>75% Grass cover, Good, HSG B (1, 3, 8, 9)
3.069	74	>75% Grass cover, Good, HSG C (1, 3, 4, 6, 7)
0.209	80	>75% Grass cover, Good, HSG D (3, 5, 8)
1.277	48	Brush, Good, HSG B (8)
3.542	65	Brush, Good, HSG C (10)
0.270	73	Brush, Good, HSG D (8)
0.107	96	Gravel surface, HSG A (1, 10)
0.352	96	Gravel surface, HSG B (1)
0.023	96	Gravel surface, HSG D (1)
0.145	98	Paved parking, HSG A (3, 4, 8)
0.103	98	Paved parking, HSG B (3, 8)
0.044	98	Paved parking, HSG C (3, 4)
0.147	98	Paved parking, HSG D (3, 8)
0.656	98	Paved roads w/curbs & sewers, HSG A (4, 6)
0.059	98	Paved roads w/curbs & sewers, HSG B (4)
0.033	98	Paved roads w/curbs & sewers, HSG C (4)
0.055	98	Paved roads w/curbs & sewers, HSG D (4)
0.326	98	Roofs, HSG A (8, 10)
0.058	98	Roofs, HSG B (1, 8)
0.275	98	Roofs, HSG C (8, 10)
0.039	98	Roofs, HSG D (8, 10)
1.249	67	Row crops, straight row, Good, HSG A (1)
2.960	78	Row crops, straight row, Good, HSG B (1, 9)
1.656	85	Row crops, straight row, Good, HSG C (1)
1.104	89	Row crops, straight row, Good, HSG D (1, 9)
0.280	92	Urban commercial, 85% imp, HSG B (8)
0.176	98	Water Surface, HSG C (7)
0.122	98	Water Surface, HSG D (5)
0.130	30	Woods, Good, HSG A (1)
0.701	70	Woods, Good, HSG C (1)
0.005	77	Woods, Good, HSG D (1)
0.420	72	Woods/grass comb., Good, HSG C (12)

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
5.008	HSG A	1, 3, 4, 6, 8, 10
5.234	HSG B	1, 3, 4, 8, 9
9.916	HSG C	1, 3, 4, 6, 7, 8, 10, 12
2.050	HSG D	1, 3, 4, 5, 8, 9, 10
0.000	Other	

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.076	0.000	0.076	50-75% Grass cover, Fair	10
2.395	0.145	3.069	0.209	0.000	5.818	>75% Grass cover, Good	1, 3, 4, 5, 6, 7, 8, 9, 10
0.000	1.277	3.542	0.270	0.000	5.089	Brush, Good	8, 10
0.107	0.352	0.000	0.023	0.000	0.482	Gravel surface	1, 10
0.145	0.103	0.044	0.147	0.000	0.439	Paved parking	3, 4, 8
0.656	0.059	0.033	0.055	0.000	0.803	Paved roads w/curbs & sewers	4, 6
0.326	0.058	0.275	0.039	0.000	0.698	Roofs	1, 8, 10
1.249	2.960	1.656	1.104	0.000	6.969	Row crops, straight row, Good	1, 9
0.000	0.280	0.000	0.000	0.000	0.280	Urban commercial, 85% imp	8
0.000	0.000	0.176	0.122	0.000	0.298	Water Surface	5, 7
0.130	0.000	0.701	0.005	0.000	0.836	Woods, Good	1
0.000	0.000	0.420	0.000	0.000	0.420	Woods/grass comb., Good	12

Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: EX-A Runoff Area=11.104 ac 0.48% Impervious Runoff Depth=1.17"
Flow Length=536' Tc=6.0 min CN=74 Runoff=14.4 cfs 1.08 af

Reach 2: PREDEV Inflow=14.4 cfs 1.08 af
Outflow=14.4 cfs 1.08 af

Subcatchment 3: CB1 Runoff Area=0.400 ac 81.50% Impervious Runoff Depth=2.26"
Flow Length=350' Tc=6.0 min CN=89 Runoff=1.0 cfs 0.08 af

Pond 3A: CB1 Peak Elev=71.79' Inflow=1.0 cfs 0.08 af
Outflow=1.0 cfs 0.08 af

Subcatchment 4: CB2 Runoff Area=0.245 ac 75.51% Impervious Runoff Depth=2.09"
Flow Length=308' Tc=7.2 min CN=87 Runoff=0.6 cfs 0.04 af

Pond 4A: CB2 Peak Elev=71.79' Inflow=1.6 cfs 0.12 af
Outflow=1.6 cfs 0.12 af

Subcatchment 5: BASIN1 Runoff Area=0.223 ac 54.71% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=90 Runoff=0.6 cfs 0.04 af

Pond 5A: SF1A Peak Elev=0.00' Storage=0 cf
Primary=0.0 cfs 0.00 af

Pond 5B: BASIN1 Peak Elev=66.91' Storage=2,587 cf Inflow=2.2 cfs 0.16 af
Outflow=0.9 cfs 0.14 af

Subcatchment 6: CB3 Runoff Area=0.790 ac 79.87% Impervious Runoff Depth=2.09"
Flow Length=360' Tc=8.1 min CN=87 Runoff=1.8 cfs 0.14 af

Pond 6A: CB3 Peak Elev=71.07' Inflow=1.8 cfs 0.14 af
Outflow=1.8 cfs 0.14 af

Pond 6B: DMH1 Peak Elev=67.43' Inflow=1.8 cfs 0.14 af
15.0" Round Culvert n=0.013 L=183.0' S=0.0050 '/' Outflow=1.8 cfs 0.14 af

Subcatchment 7: BASIN2 Runoff Area=0.490 ac 35.92% Impervious Runoff Depth=1.77"
Flow Length=82' Tc=6.4 min CN=83 Runoff=1.0 cfs 0.07 af

Pond 7A: SF2A Peak Elev=0.00' Storage=0 cf
Primary=0.0 cfs 0.00 af

Pond 7B: BASIN2A Peak Elev=66.48' Storage=3,064 cf Inflow=2.8 cfs 0.21 af
Outflow=2.1 cfs 0.15 af

Pond 7C: BASIN2B Peak Elev=64.21' Storage=1,254 cf Inflow=2.1 cfs 0.15 af
Discarded=0.0 cfs 0.02 af Primary=1.0 cfs 0.13 af Outflow=1.1 cfs 0.15 af

Subcatchment 8: DV-A Runoff Area=2.793 ac 20.19% Impervious Runoff Depth=0.53"
Flow Length=453' Tc=6.5 min CN=61 Runoff=1.1 cfs 0.12 af

Pond 8A: CBA Peak Elev=69.91' Inflow=1.1 cfs 0.12 af
Outflow=1.1 cfs 0.12 af

Subcatchment 9: DV-B Runoff Area=0.893 ac 0.00% Impervious Runoff Depth=1.36"
Flow Length=410' Tc=8.1 min CN=77 Runoff=1.3 cfs 0.10 af

Subcatchment 10: DV-D Runoff Area=4.850 ac 8.64% Impervious Runoff Depth=0.66"
Flow Length=491' Tc=15.7 min CN=64 Runoff=2.2 cfs 0.26 af

Reach 11: POSTDEV Inflow=5.6 cfs 0.80 af
Outflow=5.6 cfs 0.80 af

Subcatchment 12: DV-C Runoff Area=0.420 ac 0.00% Impervious Runoff Depth=1.06"
Flow Length=491' Tc=15.7 min CN=72 Runoff=0.4 cfs 0.04 af

Summary for Subcatchment 1: EX-A

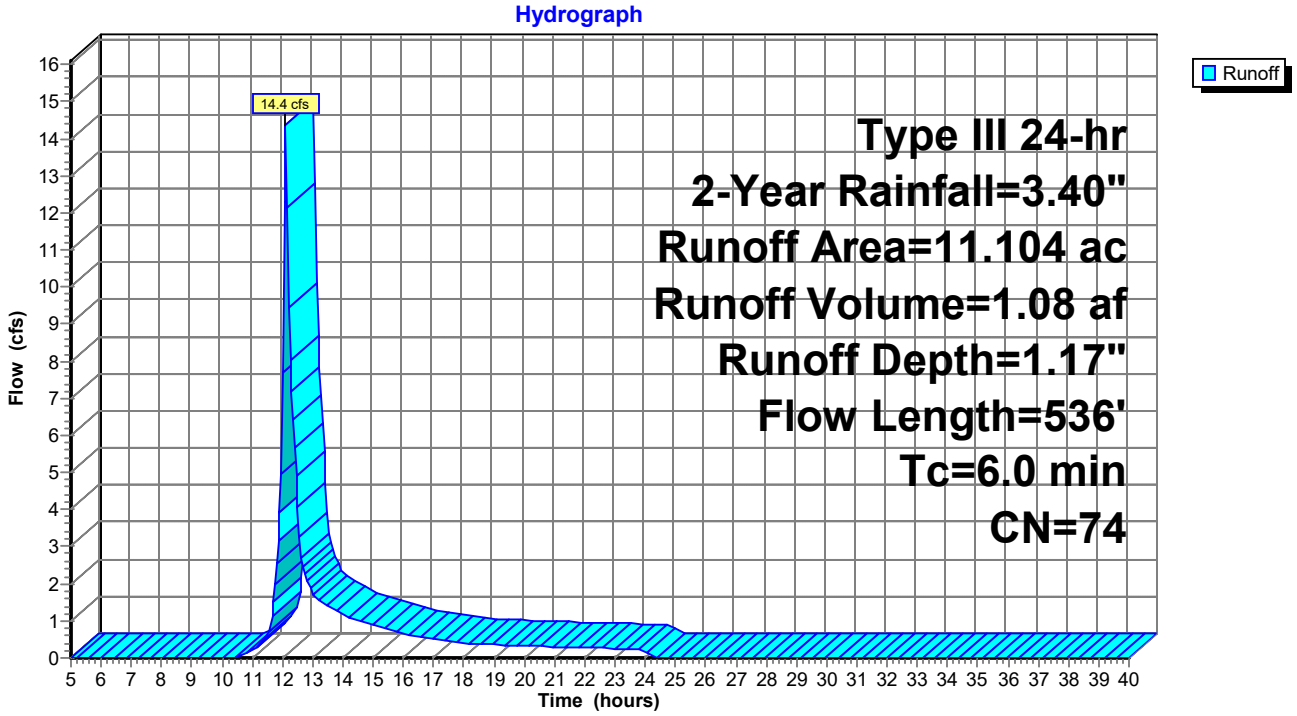
Runoff = 14.4 cfs @ 12.10 hrs, Volume= 1.08 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.051	96	Gravel surface, HSG A
1.249	67	Row crops, straight row, Good, HSG A
0.503	39	>75% Grass cover, Good, HSG A
0.130	30	Woods, Good, HSG A
0.053	98	Roofs, HSG B
0.352	96	Gravel surface, HSG B
2.127	78	Row crops, straight row, Good, HSG B
0.013	61	>75% Grass cover, Good, HSG B
1.656	85	Row crops, straight row, Good, HSG C
2.693	74	>75% Grass cover, Good, HSG C
0.701	70	Woods, Good, HSG C
0.023	96	Gravel surface, HSG D
1.099	89	Row crops, straight row, Good, HSG D
0.005	77	Woods, Good, HSG D
0.449	39	>75% Grass cover, Good, HSG A
11.104	74	Weighted Average
11.051		99.52% Pervious Area
0.053		0.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, X1** Smooth surfaces n= 0.011 P2= 3.40"
1.0	95	0.0100	1.61		**Shallow Concentrated Flow, X2** Unpaved Kv= 16.1 fps
0.8	77	0.0300	1.56		**Shallow Concentrated Flow, X3** Cultivated Straight Rows Kv= 9.0 fps
1.1	87	0.0200	1.27		**Shallow Concentrated Flow, X4** Cultivated Straight Rows Kv= 9.0 fps
0.9	46	0.0100	0.90		**Shallow Concentrated Flow, X5** Cultivated Straight Rows Kv= 9.0 fps
0.8	58	0.0200	1.27		**Shallow Concentrated Flow, X6** Cultivated Straight Rows Kv= 9.0 fps
0.4	123	0.0100	4.62	12.01	**Channel Flow, X7** Area= 2.6 sf Perim= 4.6' r= 0.57' n= 0.022 Earth, clean & straight
5.9	536	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1: EX-A

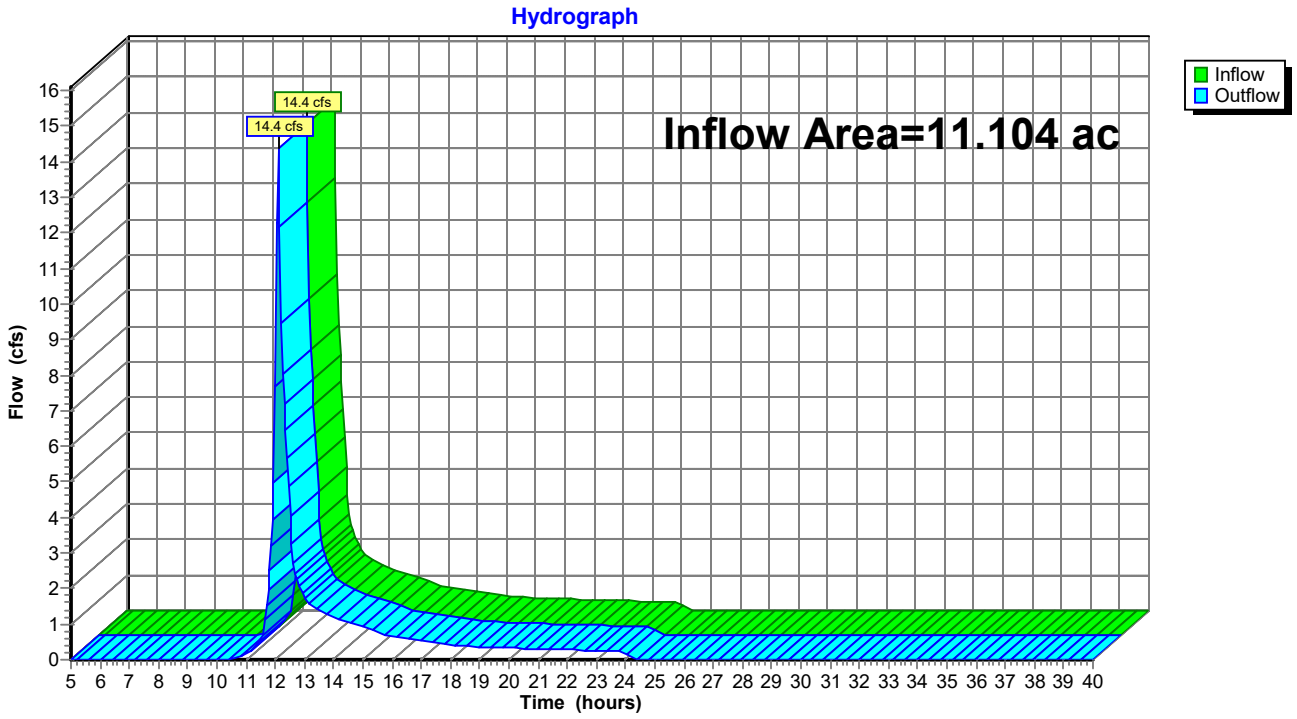


Summary for Reach 2: PREDEV

Inflow Area = 11.104 ac, 0.48% Impervious, Inflow Depth = 1.17" for 2-Year event
Inflow = 14.4 cfs @ 12.10 hrs, Volume= 1.08 af
Outflow = 14.4 cfs @ 12.10 hrs, Volume= 1.08 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3

Reach 2: PREDEV



Summary for Subcatchment 3: CB1

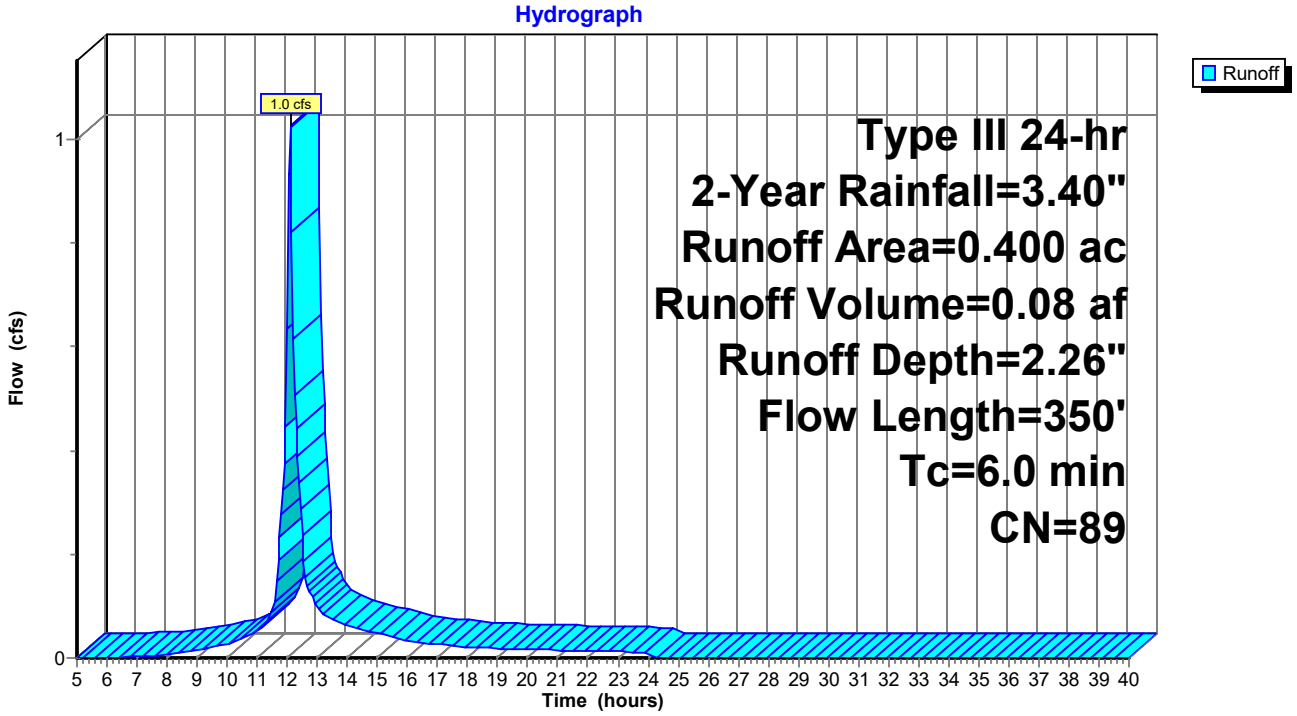
Runoff = 1.0 cfs @ 12.09 hrs, Volume= 0.08 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.122	98	Paved parking, HSG A
0.004	61	>75% Grass cover, Good, HSG B
0.012	80	>75% Grass cover, Good, HSG D
0.008	74	>75% Grass cover, Good, HSG C
0.050	39	>75% Grass cover, Good, HSG A
0.067	98	Paved parking, HSG B
0.039	98	Paved parking, HSG C
0.098	98	Paved parking, HSG D
0.400	89	Weighted Average
0.074		18.50% Pervious Area
0.326		81.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	39	0.0200	1.17		**Sheet Flow, 1a** Smooth surfaces n= 0.011 P2= 3.40"
2.6	311	0.0100	2.03		**Shallow Concentrated Flow, 1c** Paved Kv= 20.3 fps
3.2	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3: CB1



Summary for Pond 3A: CB1

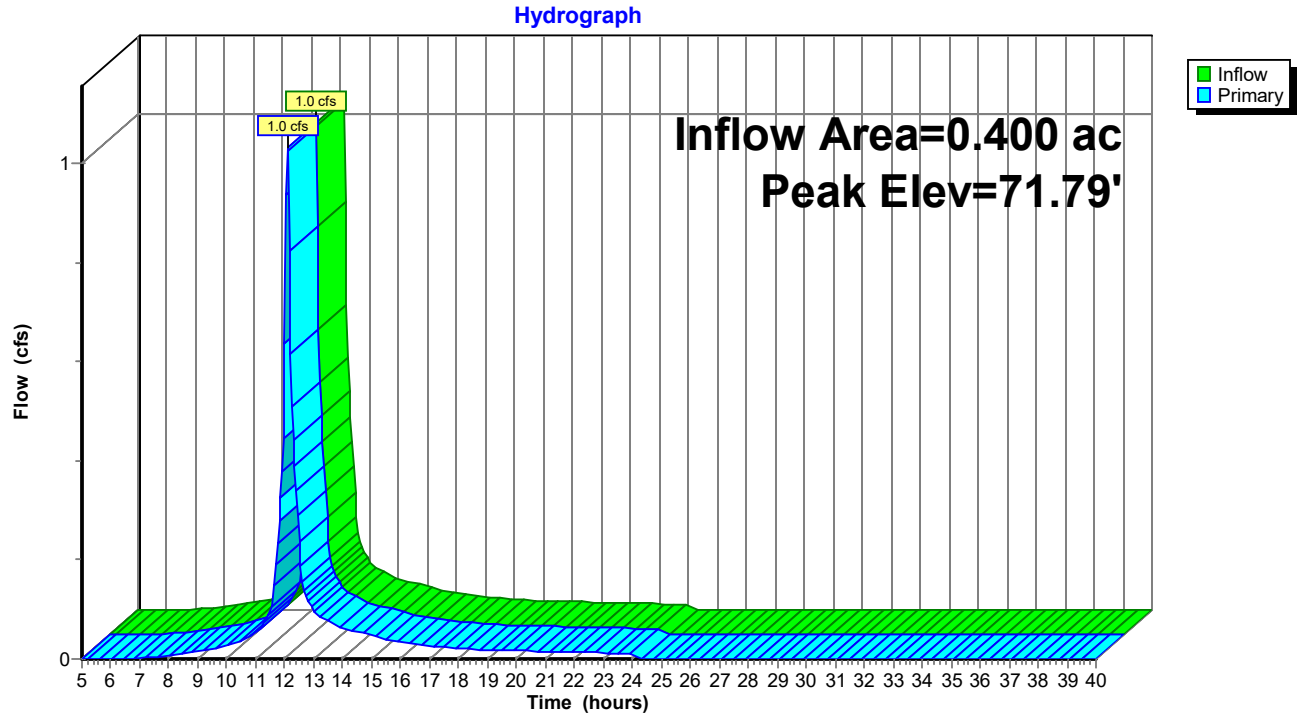
Inflow Area = 0.400 ac, 81.50% Impervious, Inflow Depth = 2.26" for 2-Year event
Inflow = 1.0 cfs @ 12.09 hrs, Volume= 0.08 af
Outflow = 1.0 cfs @ 12.09 hrs, Volume= 0.08 af, Atten= 0%, Lag= 0.0 min
Primary = 1.0 cfs @ 12.09 hrs, Volume= 0.08 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.79' @ 12.10 hrs
Flood Elev= 71.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 12.00 columns** X 12 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.70'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 2	67.70'	**12.0" Round Culvert** L= 18.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.70' / 67.34' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.0 cfs @ 12.09 hrs HW=71.79' TW=71.78' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 1.0 cfs @ 0.24 fps)
└─**2=Orifice/Grate** (Orifice Controls 0.0 cfs @ 0.24 fps)
└─**3=Culvert** (Passes 0.0 cfs of 0.1 cfs potential flow)

Pond 3A: CB1



Summary for Subcatchment 4: CB2

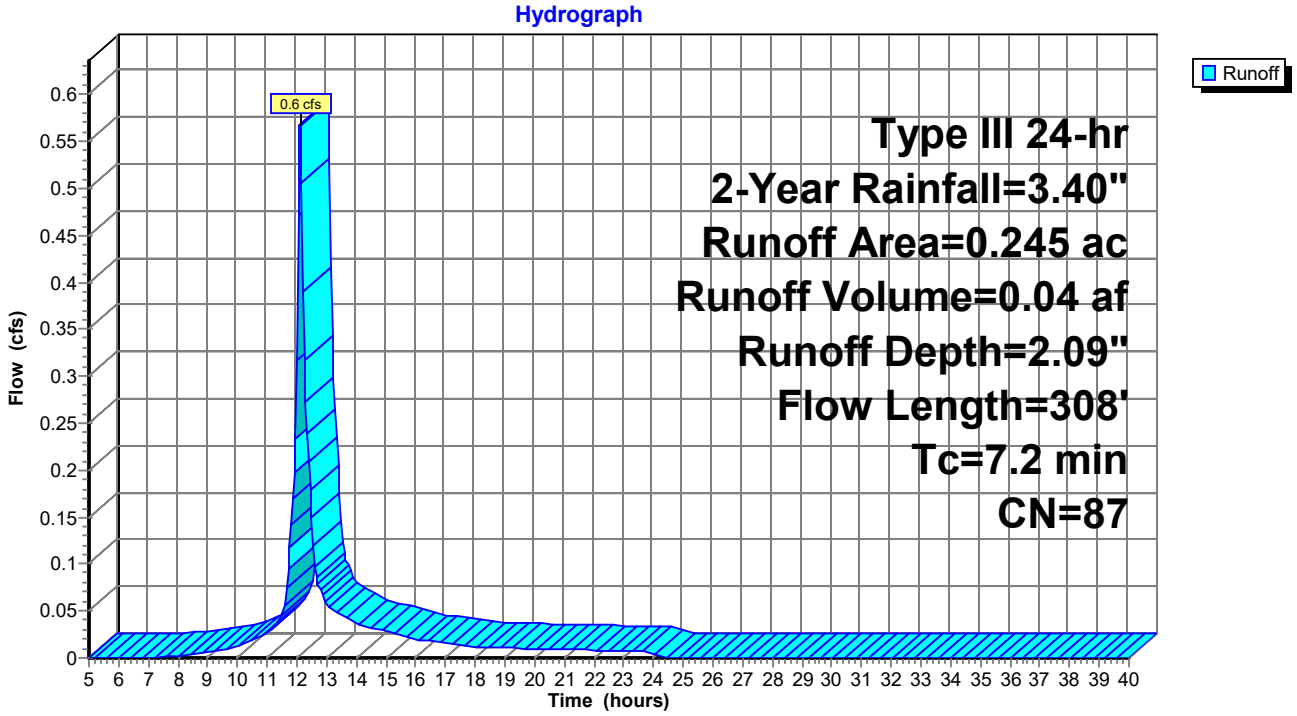
Runoff = 0.6 cfs @ 12.11 hrs, Volume= 0.04 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.025	98	Paved roads w/curbs & sewers, HSG A
0.008	98	Paved parking, HSG A
0.035	39	>75% Grass cover, Good, HSG A
0.059	98	Paved roads w/curbs & sewers, HSG B
0.033	98	Paved roads w/curbs & sewers, HSG C
0.005	98	Paved parking, HSG C
0.025	74	>75% Grass cover, Good, HSG C
0.055	98	Paved roads w/curbs & sewers, HSG D
0.245	87	Weighted Average
0.060		24.49% Pervious Area
0.185		75.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	26	0.0200	0.09		**Sheet Flow, 2a** Grass: Dense n= 0.240 P2= 3.40"
0.3	15	0.0200	0.97		**Sheet Flow, 2b** Smooth surfaces n= 0.011 P2= 3.40"
2.2	267	0.0100	2.03		**Shallow Concentrated Flow, 2c** Paved Kv= 20.3 fps
7.2	308	Total			

Subcatchment 4: CB2



Summary for Pond 4A: CB2

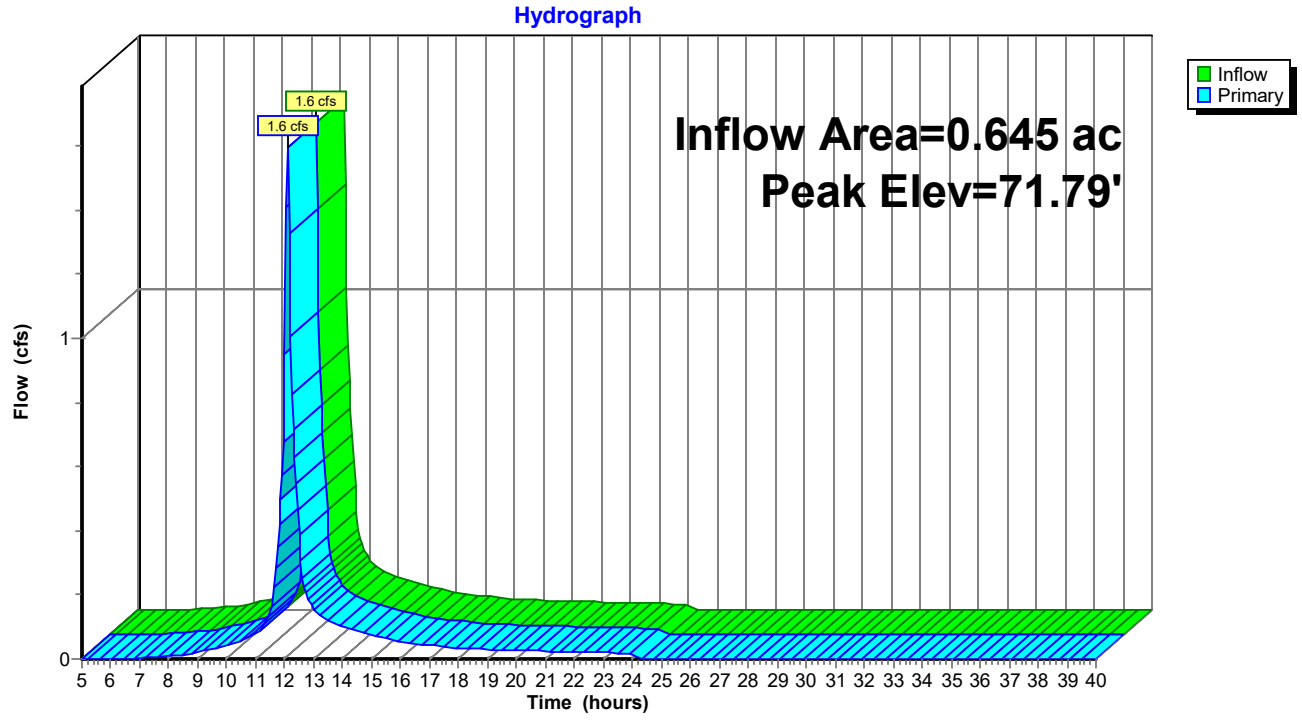
Inflow Area = 0.645 ac, 79.22% Impervious, Inflow Depth = 2.20" for 2-Year event
Inflow = 1.6 cfs @ 12.10 hrs, Volume= 0.12 af
Outflow = 1.6 cfs @ 12.10 hrs, Volume= 0.12 af, Atten= 0%, Lag= 0.0 min
Primary = 1.6 cfs @ 12.10 hrs, Volume= 0.12 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.79' @ 12.10 hrs
Flood Elev= 71.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.70'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 2	67.24'	**15.0" Round Culvert** L= 18.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.24' / 67.06' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=1.6 cfs @ 12.10 hrs HW=71.79' TW=66.75' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 1.4 cfs @ 1.41 fps)
└─**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 0.94 fps)
└─**3=Culvert** (Passes 0.2 cfs of 1.4 cfs potential flow)

Pond 4A: CB2



Summary for Subcatchment 5: BASIN1

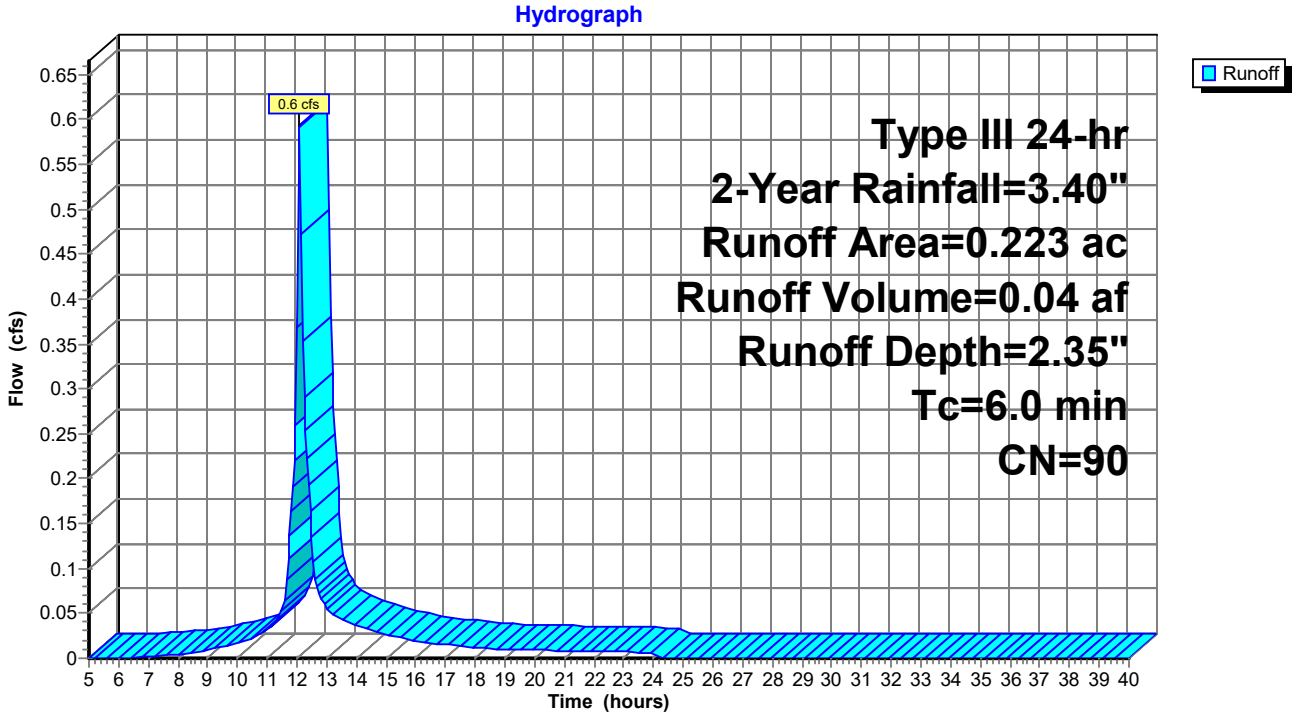
Runoff = 0.6 cfs @ 12.09 hrs, Volume= 0.04 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.122	98	Water Surface, HSG D
0.101	80	>75% Grass cover, Good, HSG D
0.223	90	Weighted Average
0.101		45.29% Pervious Area
0.122		54.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, B1-A**

Subcatchment 5: BASIN1



Summary for Pond 5A: SF1A

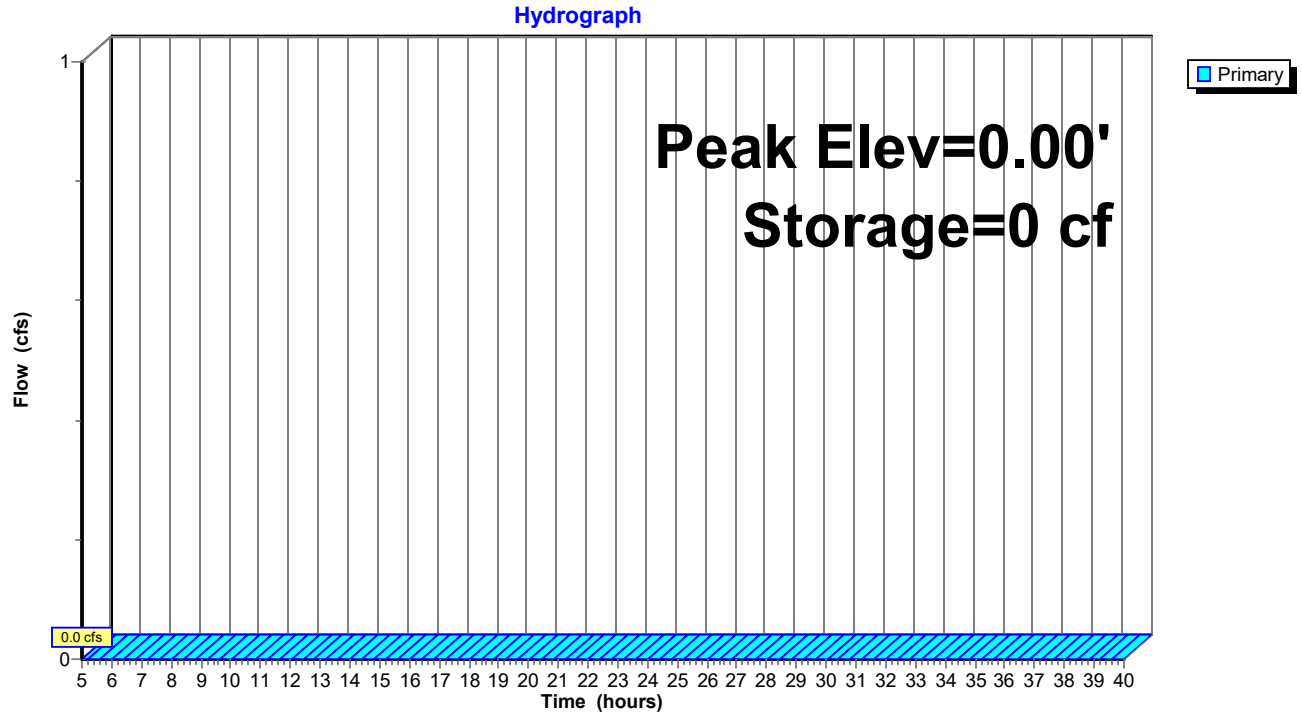
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	1,207 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	504	0	0
67.00	907	706	706
67.50	1,097	501	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5A: SF1A



Summary for Pond 5B: BASIN1

Inflow Area = 0.868 ac, 72.93% Impervious, Inflow Depth = 2.24" for 2-Year event
Inflow = 2.2 cfs @ 12.09 hrs, Volume= 0.16 af
Outflow = 0.9 cfs @ 12.33 hrs, Volume= 0.14 af, Atten= 59%, Lag= 14.1 min
Primary = 0.9 cfs @ 12.33 hrs, Volume= 0.14 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 66.91' @ 12.33 hrs Surf.Area= 3,133 sf Storage= 2,587 cf
Flood Elev= 68.50' Surf.Area= 6,300 sf Storage= 9,880 cf

Plug-Flow detention time= 126.3 min calculated for 0.14 af (89% of inflow)
Center-of-Mass det. time= 74.6 min (884.5 - 809.9)

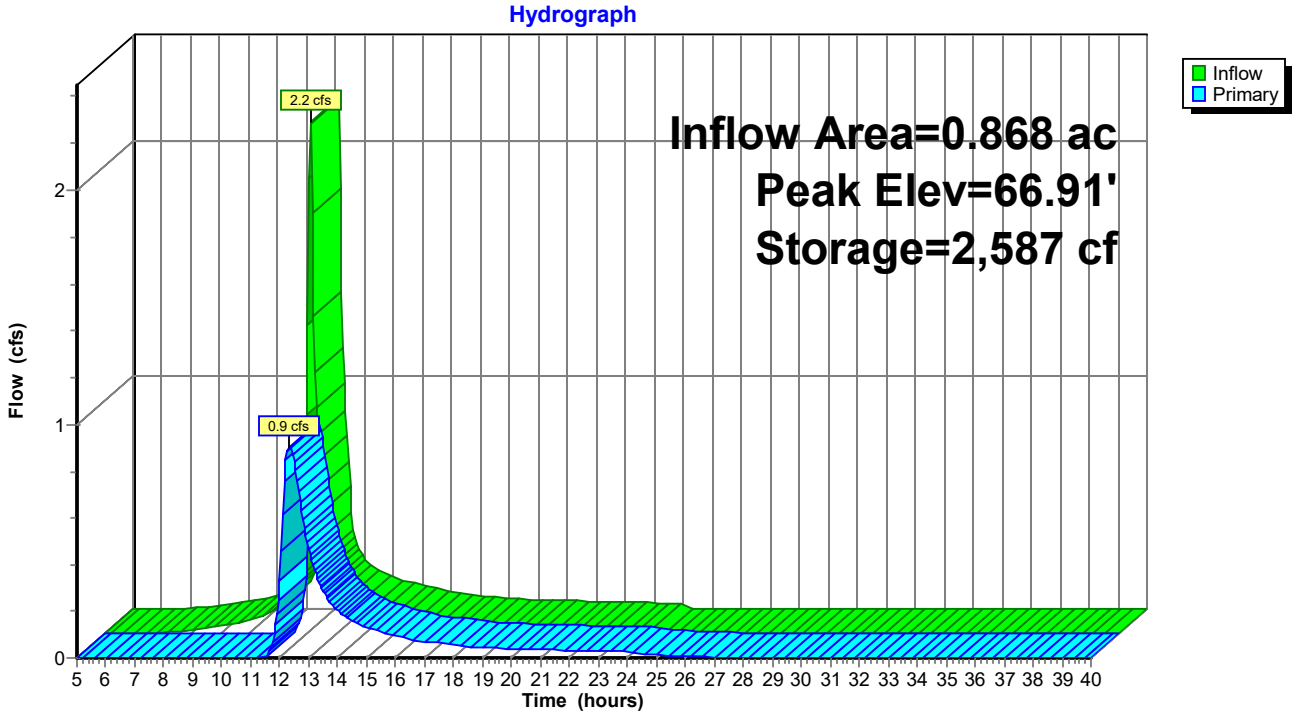
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	9,880 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	2,547	0	0
67.00	3,190	2,869	2,869
67.50	3,525	1,679	4,547
68.00	5,752	2,319	6,867
68.50	6,300	3,013	9,880

Device	Routing	Invert	Outlet Devices
#1	Primary	66.30'	**0.7' long x 1.20' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	67.50'	**8.0' long x 0.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.9 cfs @ 12.33 hrs HW=66.91' TW=0.00' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.9 cfs @ 2.55 fps)
2=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5B: BASIN1



Summary for Subcatchment 6: CB3

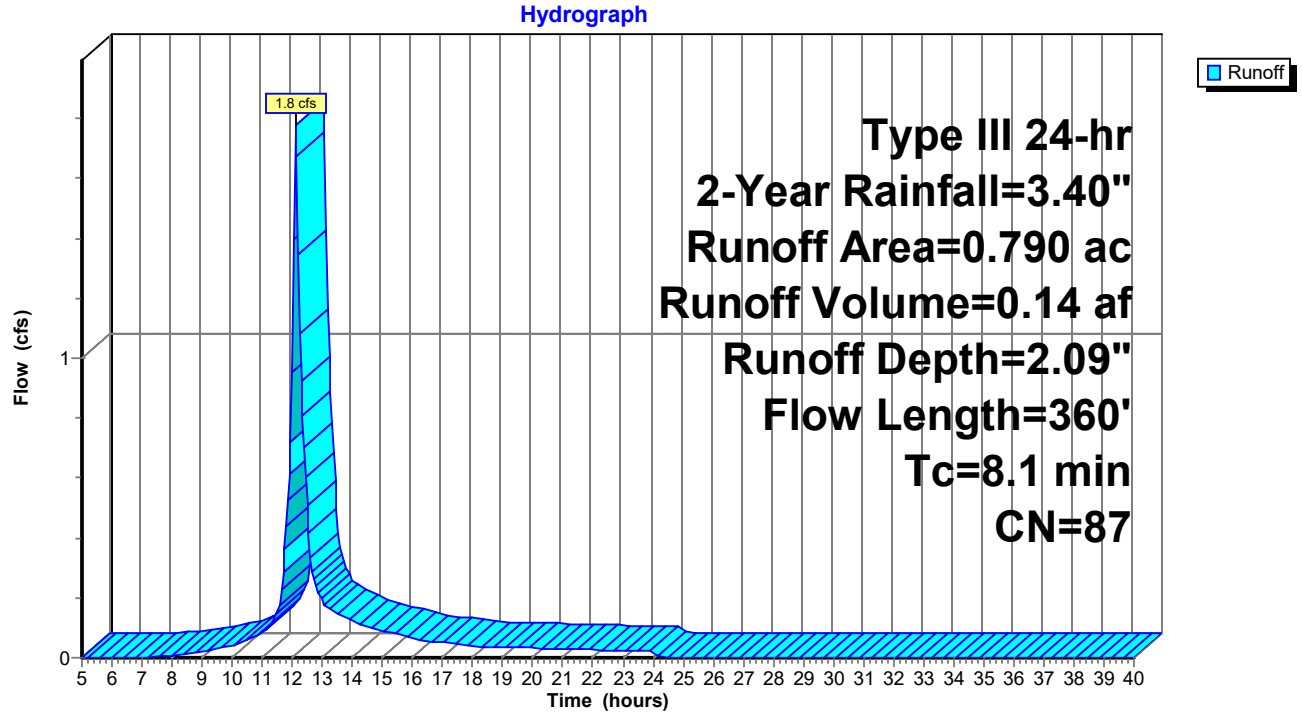
Runoff = 1.8 cfs @ 12.12 hrs, Volume= 0.14 af, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.631	98	Paved roads w/curbs & sewers, HSG A
0.130	39	>75% Grass cover, Good, HSG A
0.029	74	>75% Grass cover, Good, HSG C
0.790	87	Weighted Average
0.159		20.13% Pervious Area
0.631		79.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0200	0.09		**Sheet Flow, 3a** Grass: Dense n= 0.240 P2= 3.40"
0.2	14	0.0200	0.96		**Sheet Flow, 3b** Smooth surfaces n= 0.011 P2= 3.40"
2.6	316	0.0100	2.03		**Shallow Concentrated Flow, 3c** Paved Kv= 20.3 fps
8.1	360	Total			

Subcatchment 6: CB3



Summary for Pond 6A: CB3

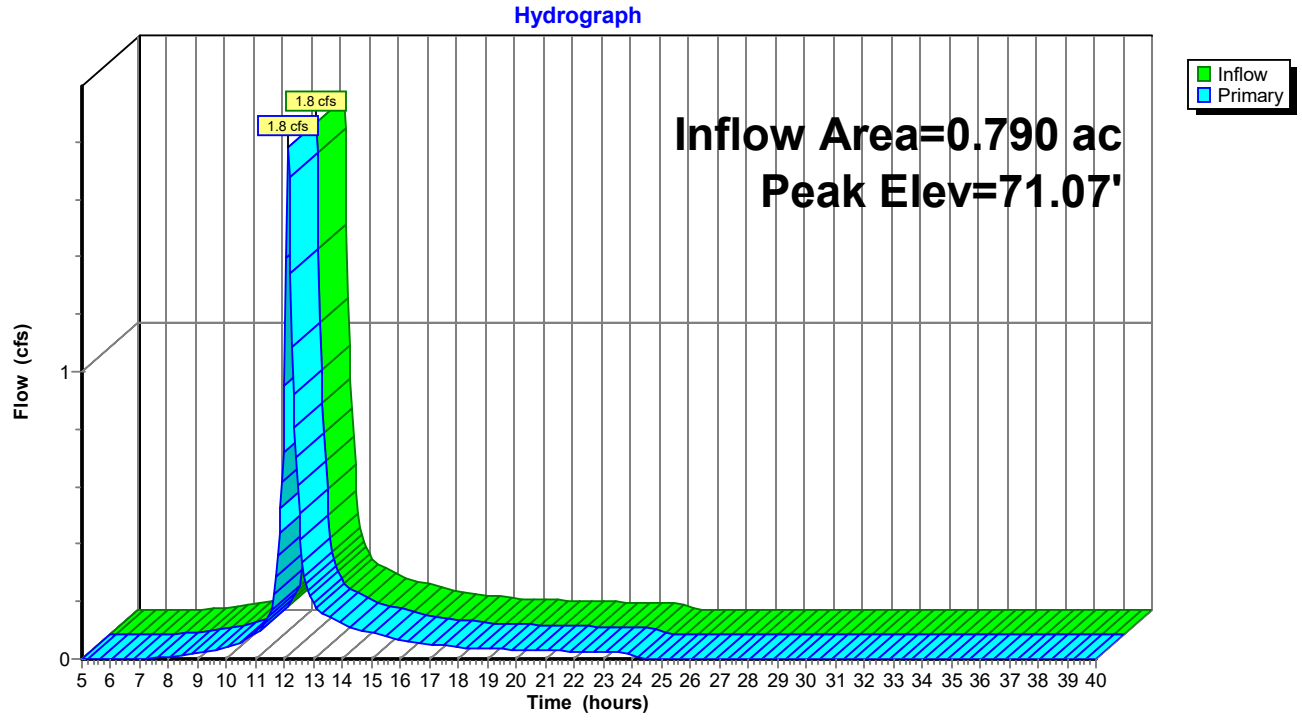
Inflow Area = 0.790 ac, 79.87% Impervious, Inflow Depth = 2.09" for 2-Year event
Inflow = 1.8 cfs @ 12.12 hrs, Volume= 0.14 af
Outflow = 1.8 cfs @ 12.12 hrs, Volume= 0.14 af, Atten= 0%, Lag= 0.0 min
Primary = 1.8 cfs @ 12.12 hrs, Volume= 0.14 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.07' @ 12.12 hrs
Flood Elev= 71.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 12.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.00'	**48.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	67.25'	**15.0" Round Culvert** L= 57.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 67.25' / 66.68' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=1.7 cfs @ 12.12 hrs HW=71.07' TW=67.42' (Dynamic Tailwater)
- **1=Orifice/Grate** (Passes 1.5 cfs of 2.5 cfs potential flow)
  - **3=Culvert** (Outlet Controls 1.5 cfs @ 1.23 fps)
- **2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 0.83 fps)

Pond 6A: CB3



Summary for Pond 6B: DMH1

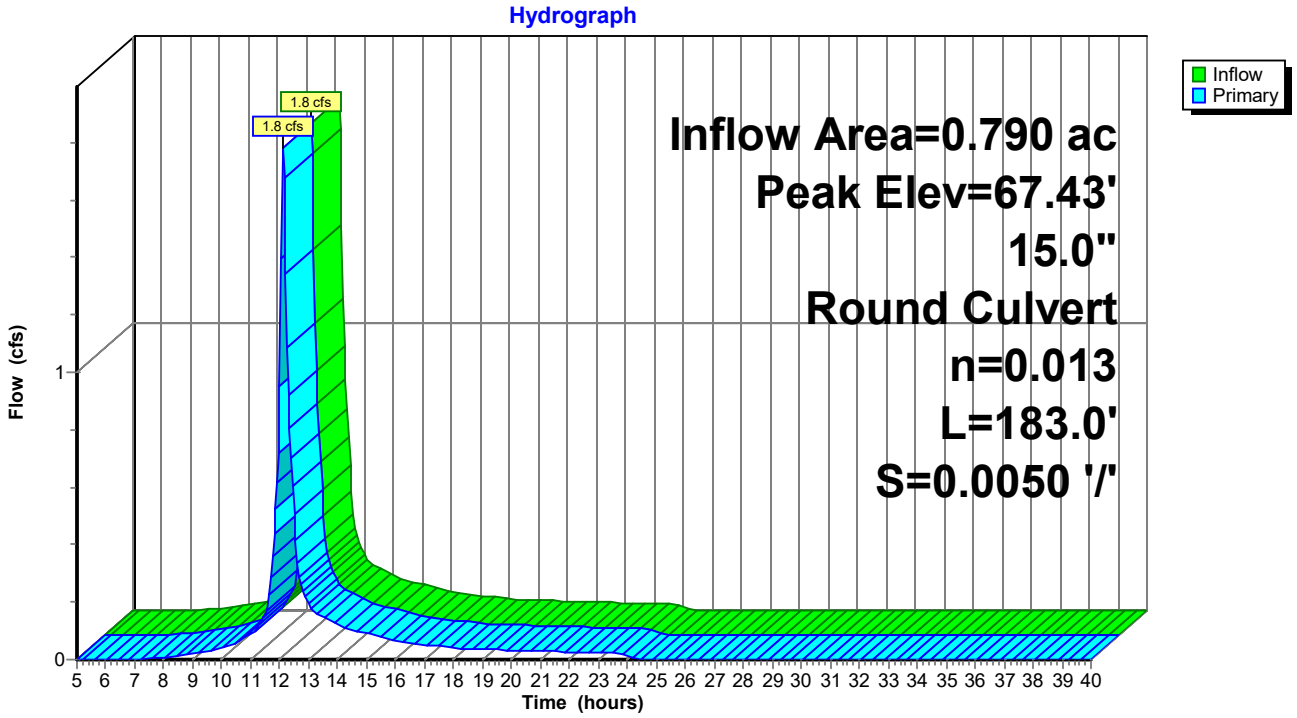
Inflow Area = 0.790 ac, 79.87% Impervious, Inflow Depth = 2.09" for 2-Year event
Inflow = 1.8 cfs @ 12.12 hrs, Volume= 0.14 af
Outflow = 1.8 cfs @ 12.12 hrs, Volume= 0.14 af, Atten= 0%, Lag= 0.0 min
Primary = 1.8 cfs @ 12.12 hrs, Volume= 0.14 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 67.43' @ 12.13 hrs
Flood Elev= 71.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	66.68'	**15.0" Round Culvert** L= 183.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 66.68' / 65.76' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=1.7 cfs @ 12.12 hrs HW=67.42' TW=66.37' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.7 cfs @ 3.29 fps)

Pond 6B: DMH1



Summary for Subcatchment 7: BASIN2

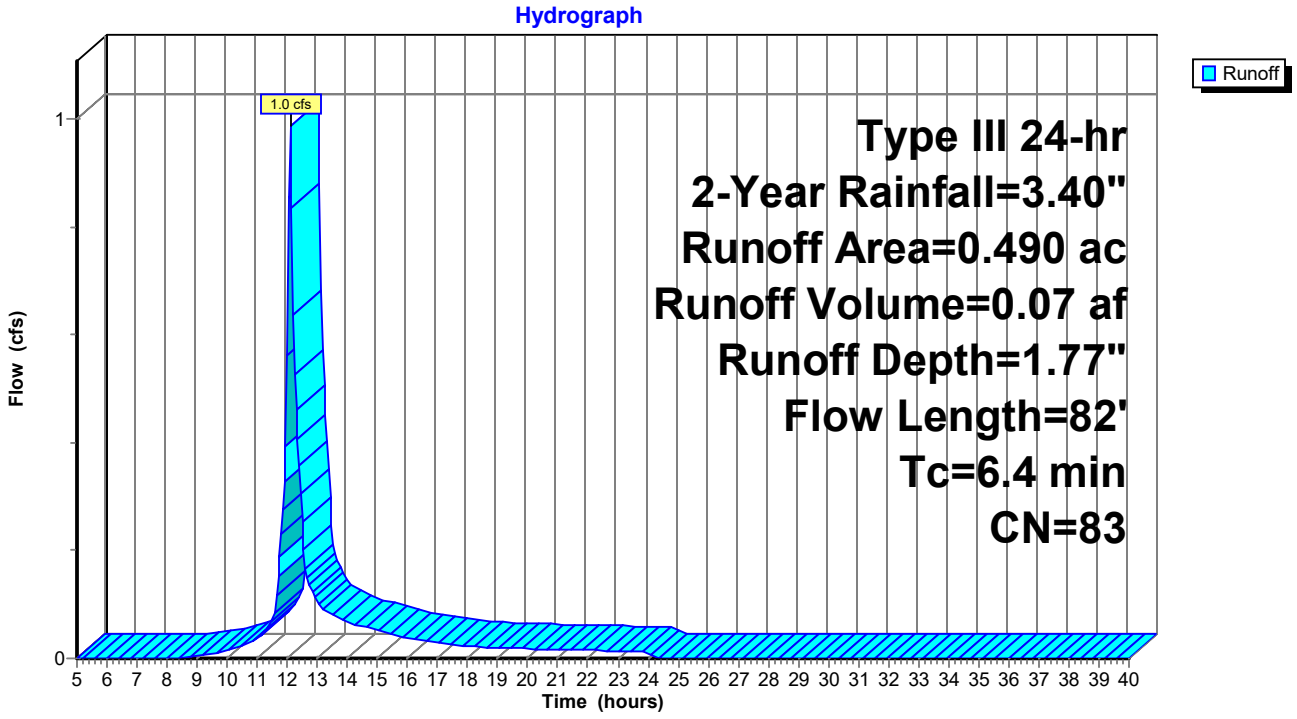
Runoff = 1.0 cfs @ 12.10 hrs, Volume= 0.07 af, Depth= 1.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.314	74	>75% Grass cover, Good, HSG C
0.176	98	Water Surface, HSG C
0.490	83	Weighted Average
0.314		64.08% Pervious Area
0.176		35.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, B2a** Grass: Dense n= 0.240 P2= 3.40"
0.4	32	0.0300	1.21		**Shallow Concentrated Flow, B2b** Short Grass Pasture Kv= 7.0 fps
6.4	82	Total			

Subcatchment 7: BASIN2



Summary for Pond 7A: SF2A

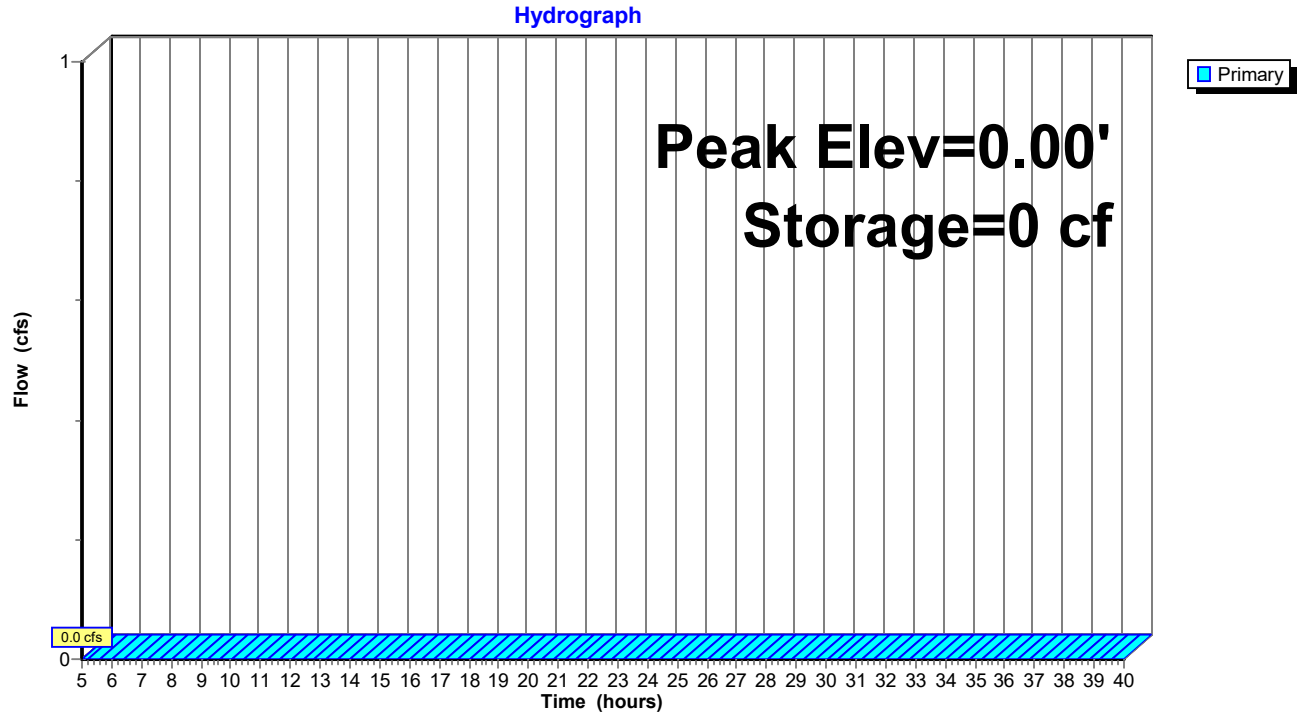
Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	2,916 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	954	0	0
66.00	1,448	1,201	1,201
67.00	1,982	1,715	2,916

Device	Routing	Invert	Outlet Devices
#1	Primary	63.50'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 7A: SF2A



Summary for Pond 7B: BASIN2A

Inflow Area = 1.280 ac, 63.05% Impervious, Inflow Depth = 1.97" for 2-Year event
Inflow = 2.8 cfs @ 12.11 hrs, Volume= 0.21 af
Outflow = 2.1 cfs @ 12.21 hrs, Volume= 0.15 af, Atten= 23%, Lag= 5.8 min
Primary = 2.1 cfs @ 12.21 hrs, Volume= 0.15 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 66.48' @ 12.21 hrs Surf.Area= 2,620 sf Storage= 3,064 cf
Flood Elev= 67.50' Surf.Area= 3,422 sf Storage= 6,152 cf

Plug-Flow detention time= 153.5 min calculated for 0.15 af (71% of inflow)
Center-of-Mass det. time= 60.9 min (883.4 - 822.5)

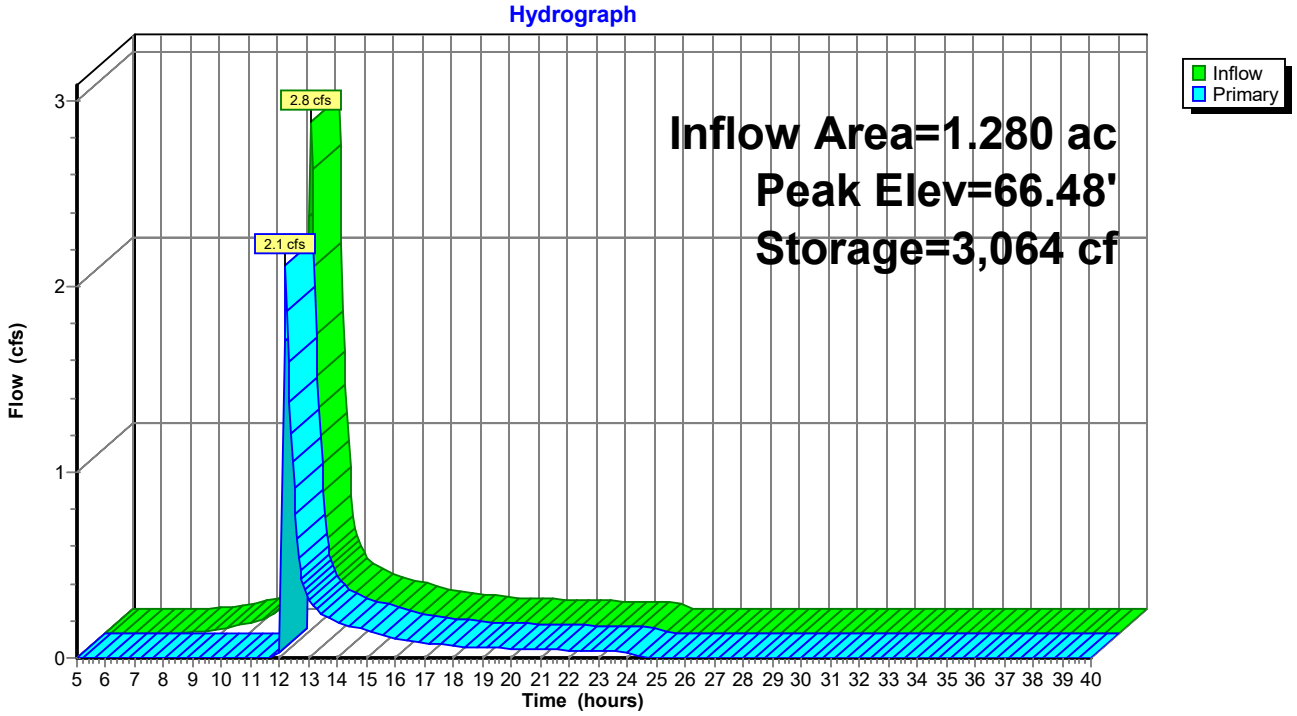
Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	6,152 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	1,548	0	0
66.00	2,257	1,903	1,903
67.00	3,020	2,639	4,541
67.50	3,422	1,611	6,152

Device	Routing	Invert	Outlet Devices
#1	Primary	66.30'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=2.1 cfs @ 12.21 hrs HW=66.47' TW=63.85' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 2.1 cfs @ 0.99 fps)

Pond 7B: BASIN2A



Summary for Pond 7C: BASIN2B

Inflow Area = 1.280 ac, 63.05% Impervious, Inflow Depth = 1.41" for 2-Year event
Inflow = 2.1 cfs @ 12.21 hrs, Volume= 0.15 af
Outflow = 1.1 cfs @ 12.46 hrs, Volume= 0.15 af, Atten= 50%, Lag= 15.0 min
Discarded = 0.0 cfs @ 12.46 hrs, Volume= 0.02 af
Primary = 1.0 cfs @ 12.46 hrs, Volume= 0.13 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 64.21' @ 12.46 hrs Surf.Area= 2,041 sf Storage= 1,254 cf
Flood Elev= 65.60' Surf.Area= 3,235 sf Storage= 4,892 cf

Plug-Flow detention time= 84.4 min calculated for 0.15 af (100% of inflow)
Center-of-Mass det. time= 85.2 min (968.6 - 883.4)

Volume	Invert	Avail.Storage	Storage Description
#1	63.50'	6,649 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

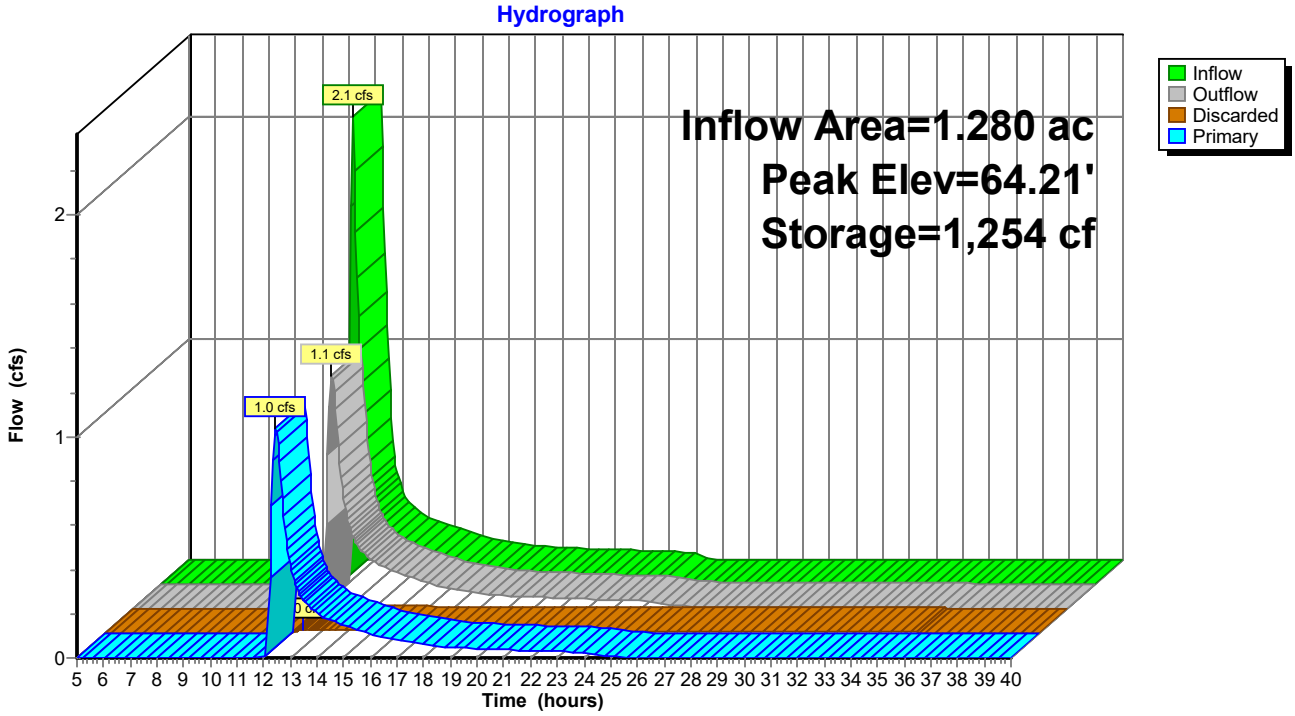
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
63.50	1,477	0	0
64.00	1,862	835	835
65.00	2,695	2,279	3,113
66.00	3,595	3,145	6,258
66.10	4,222	391	6,649

Device	Routing	Invert	Outlet Devices
#1	Discarded	63.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 59.50'
#2	Primary	63.70'	**15.0" Round Culvert** L= 427.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.70' / 61.00' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.0 cfs @ 12.46 hrs HW=64.21' (Free Discharge)
1=Exfiltration (Controls 0.0 cfs)

Primary OutFlow Max=1.0 cfs @ 12.46 hrs HW=64.21' TW=0.00' (Dynamic Tailwater)
2=Culvert (Barrel Controls 1.0 cfs @ 3.22 fps)

Pond 7C: BASIN2B



Summary for Subcatchment 8: DV-A

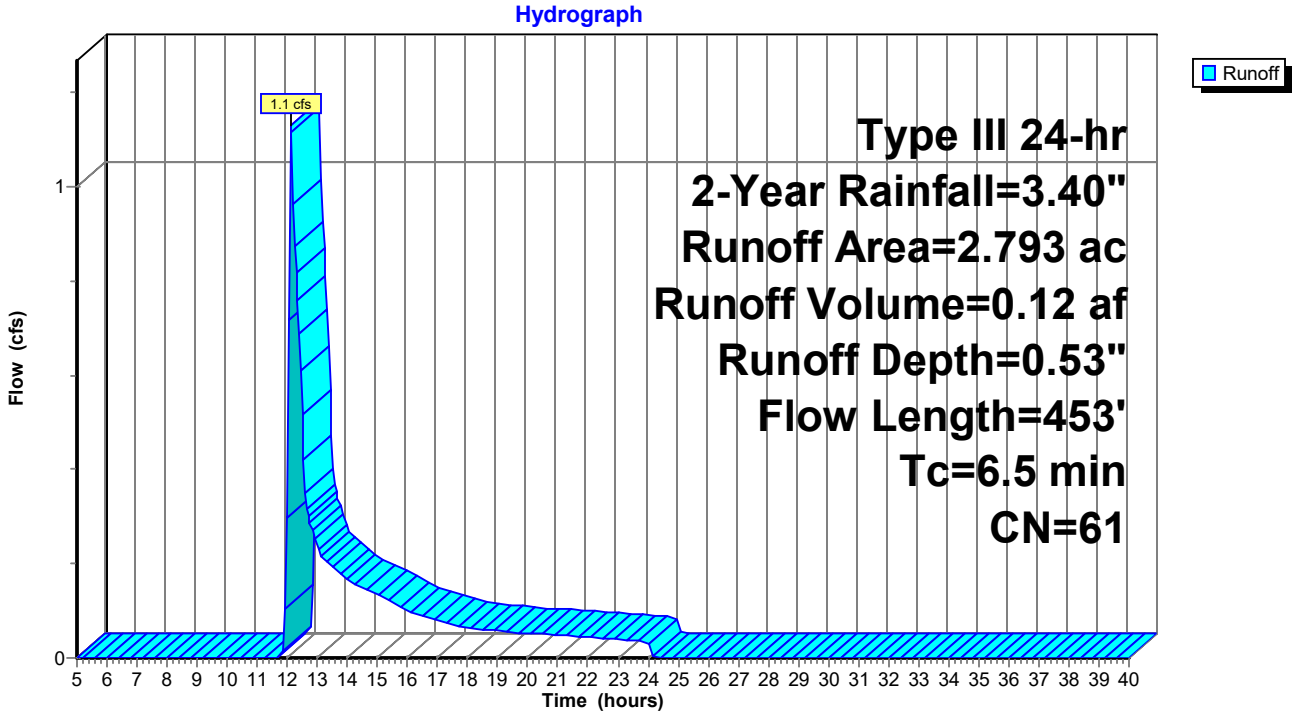
Runoff = 1.1 cfs @ 12.13 hrs, Volume= 0.12 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.280	92	Urban commercial, 85% imp, HSG B
0.005	98	Roofs, HSG B
0.200	98	Roofs, HSG A
0.049	98	Paved parking, HSG D
0.036	98	Paved parking, HSG B
0.015	98	Paved parking, HSG A
0.270	73	Brush, Good, HSG D
0.096	80	>75% Grass cover, Good, HSG D
0.471	39	>75% Grass cover, Good, HSG A
0.073	61	>75% Grass cover, Good, HSG B
0.018	98	Roofs, HSG D
0.003	98	Roofs, HSG C
1.277	48	Brush, Good, HSG B
2.793	61	Weighted Average
2.229		79.81% Pervious Area
0.564		20.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A1** Smooth surfaces n= 0.011 P2= 3.40"
1.0	95	0.0100	1.61		**Shallow Concentrated Flow, A2** Unpaved Kv= 16.1 fps
0.8	77	0.0300	1.56		**Shallow Concentrated Flow, A3** Cultivated Straight Rows Kv= 9.0 fps
1.1	87	0.0200	1.27		**Shallow Concentrated Flow, A4** Cultivated Straight Rows Kv= 9.0 fps
2.7	144	0.0100	0.90		**Shallow Concentrated Flow, A5** Cultivated Straight Rows Kv= 9.0 fps
6.5	453	Total			

Subcatchment 8: DV-A



Summary for Pond 8A: CBA

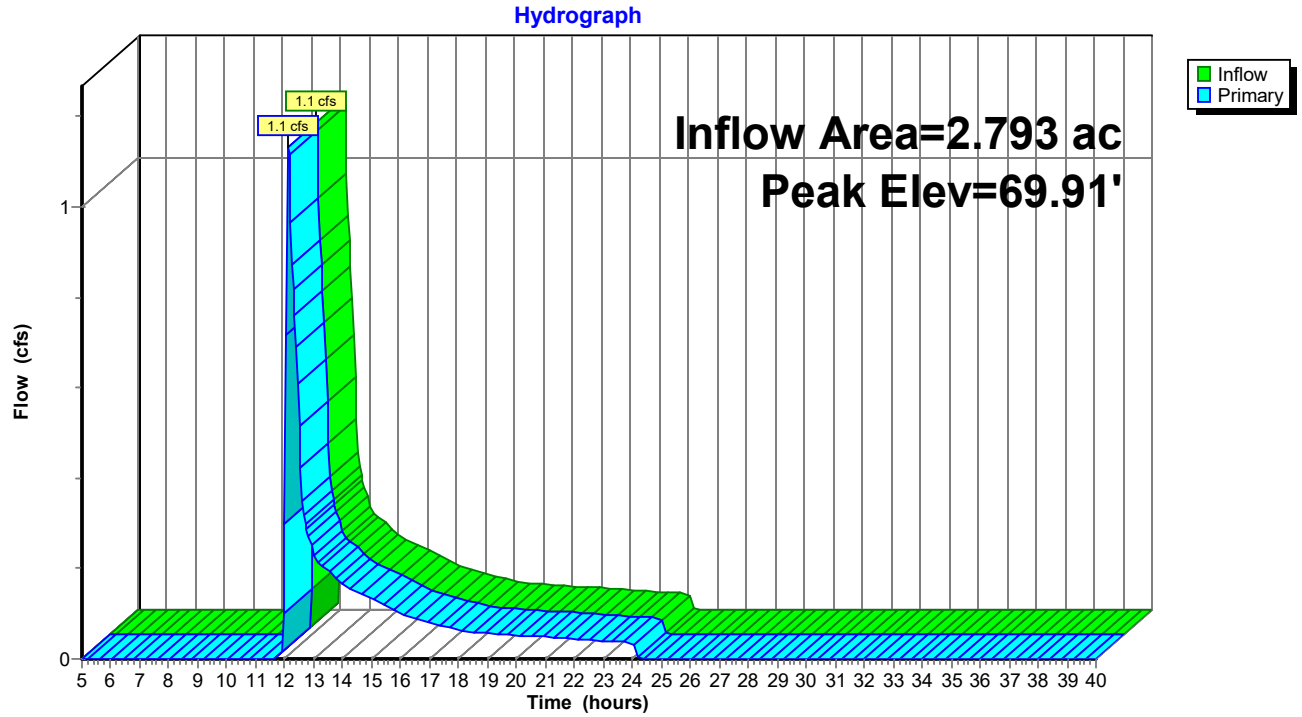
Inflow Area = 2.793 ac, 20.19% Impervious, Inflow Depth = 0.53" for 2-Year event
Inflow = 1.1 cfs @ 12.13 hrs, Volume= 0.12 af
Outflow = 1.1 cfs @ 12.13 hrs, Volume= 0.12 af, Atten= 0%, Lag= 0.0 min
Primary = 1.1 cfs @ 12.13 hrs, Volume= 0.12 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 69.91' @ 12.13 hrs
Flood Elev= 72.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.80'	**24.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	67.70'	**18.0" Round Culvert** L= 118.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 67.70' / 66.50' S= 0.0102 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=1.1 cfs @ 12.13 hrs HW=69.91' TW=0.00' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Weir Controls 1.1 cfs @ 1.10 fps)
└─**2=Culvert** (Passes 1.1 cfs of 2.6 cfs potential flow)

Pond 8A: CBA



Summary for Subcatchment 9: DV-B

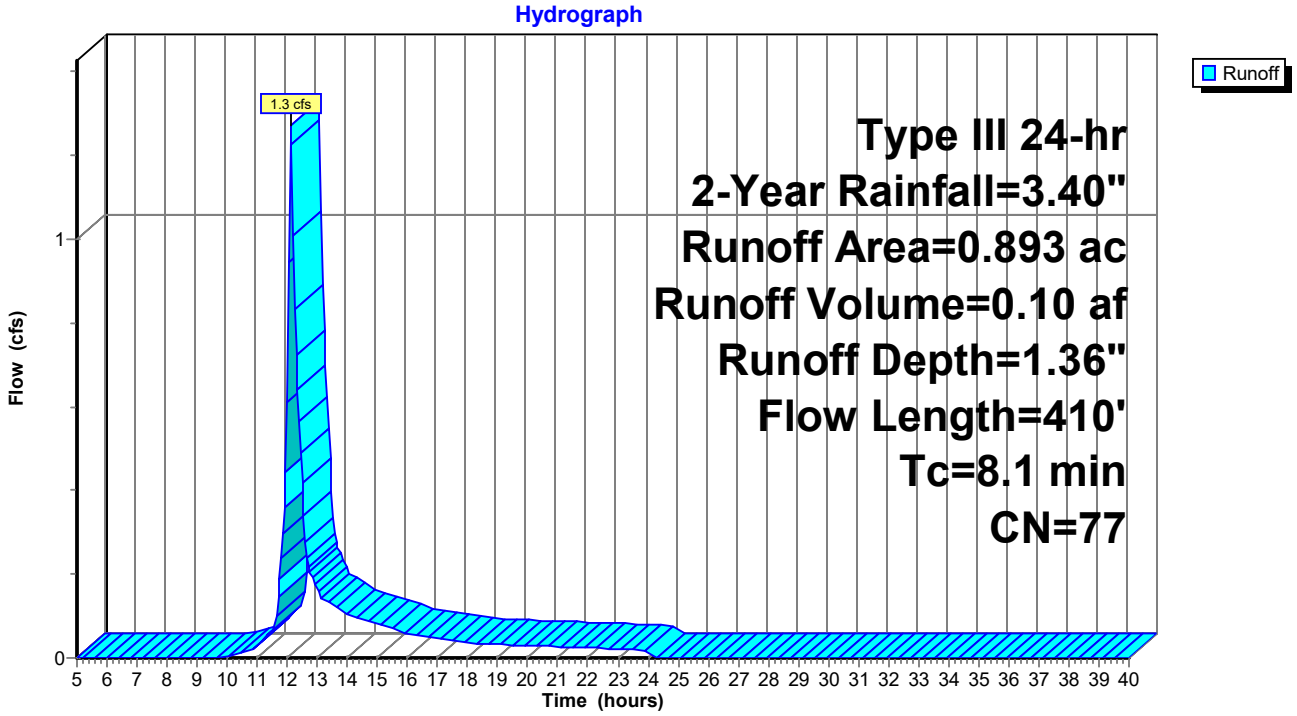
Runoff = 1.3 cfs @ 12.12 hrs, Volume= 0.10 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.833	78	Row crops, straight row, Good, HSG B
0.055	61	>75% Grass cover, Good, HSG B
0.005	89	Row crops, straight row, Good, HSG D
0.893	77	Weighted Average
0.893		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	50	0.0200	0.32		**Sheet Flow, B1** Cultivated: Residue<=20% n= 0.060 P2= 3.40"
0.9	81	0.0250	1.42		**Shallow Concentrated Flow, B2** Cultivated Straight Rows Kv= 9.0 fps
2.0	109	0.0100	0.90		**Shallow Concentrated Flow, B3** Cultivated Straight Rows Kv= 9.0 fps
0.4	37	0.0300	1.56		**Shallow Concentrated Flow, B4** Cultivated Straight Rows Kv= 9.0 fps
2.2	133	0.0200	0.99		**Shallow Concentrated Flow, B5** Short Grass Pasture Kv= 7.0 fps
8.1	410	Total			

Subcatchment 9: DV-B



Summary for Subcatchment 10: DV-D

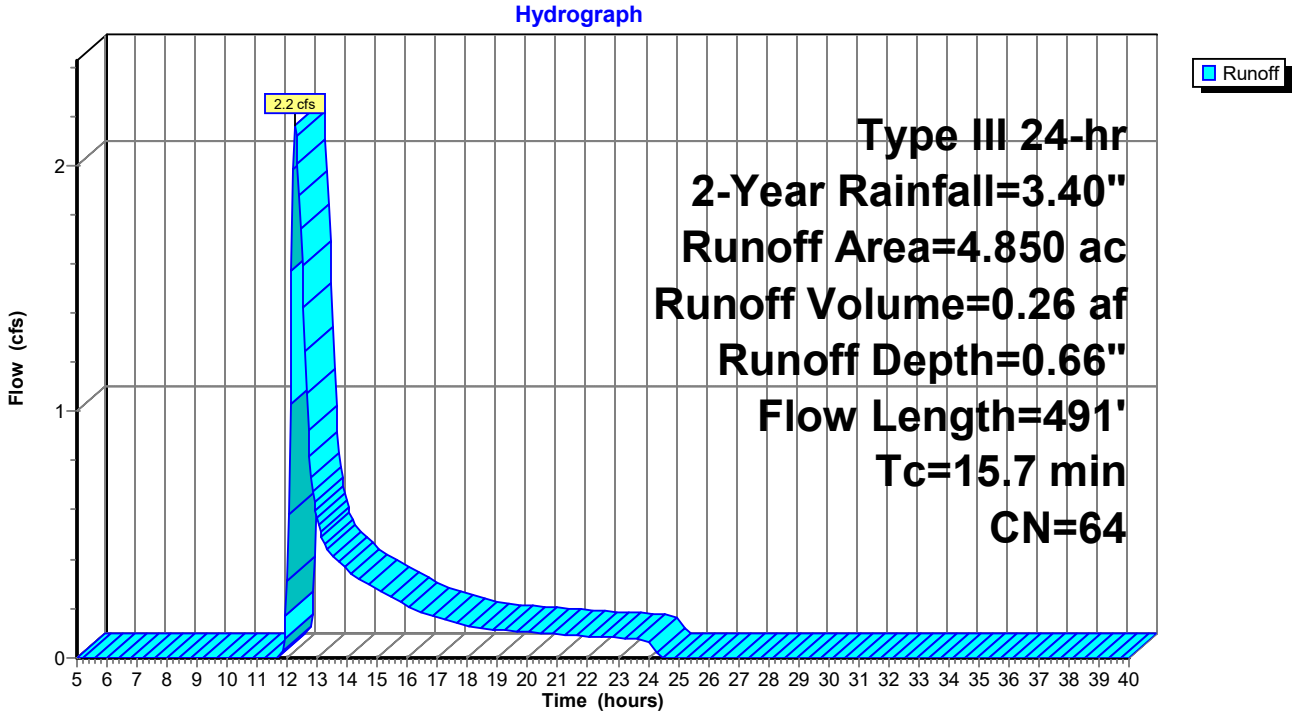
Runoff = 2.2 cfs @ 12.27 hrs, Volume= 0.26 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.056	96	Gravel surface, HSG A
0.757	39	>75% Grass cover, Good, HSG A
0.126	98	Roofs, HSG A
0.272	98	Roofs, HSG C
0.021	98	Roofs, HSG D
0.076	84	50-75% Grass cover, Fair, HSG D
3.542	65	Brush, Good, HSG C
4.850	64	Weighted Average
4.431		91.36% Pervious Area
0.419		8.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, C1** Grass: Dense n= 0.240 P2= 3.40"
1.9	78	0.0100	0.70		**Shallow Concentrated Flow, C2** Short Grass Pasture Kv= 7.0 fps
0.8	39	0.0150	0.86		**Shallow Concentrated Flow, C3** Short Grass Pasture Kv= 7.0 fps
0.9	46	0.0150	0.86		**Shallow Concentrated Flow, C4** Short Grass Pasture Kv= 7.0 fps
1.8	75	0.0100	0.70		**Shallow Concentrated Flow, C5** Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0300	1.21		**Shallow Concentrated Flow, C6** Short Grass Pasture Kv= 7.0 fps
2.2	93	0.0100	0.70		**Shallow Concentrated Flow, C7** Short Grass Pasture Kv= 7.0 fps
0.4	24	0.0400	1.00		**Shallow Concentrated Flow, C8** Woodland Kv= 5.0 fps
1.2	52	0.0200	0.71		**Shallow Concentrated Flow, C9** Woodland Kv= 5.0 fps
15.7	491	Total			

Subcatchment 10: DV-D

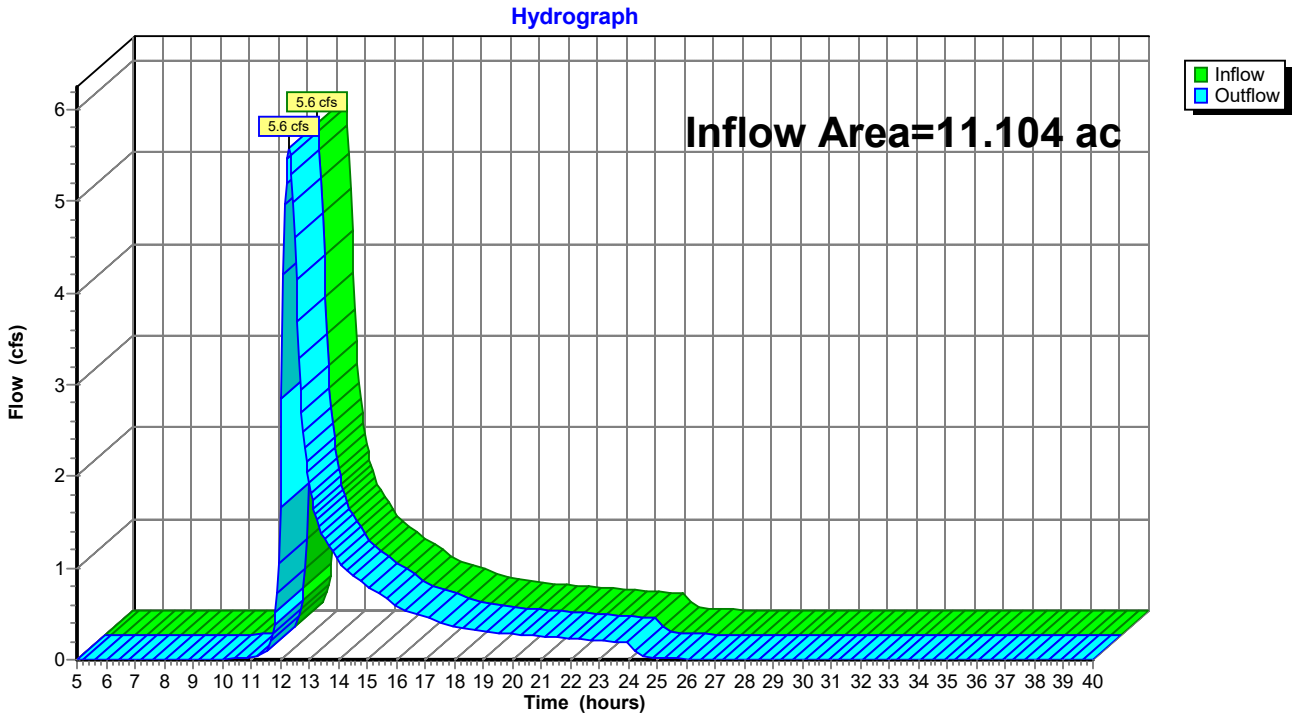


Summary for Reach 11: POSTDEV

Inflow Area = 11.104 ac, 21.82% Impervious, Inflow Depth = 0.86" for 2-Year event
Inflow = 5.6 cfs @ 12.31 hrs, Volume= 0.80 af
Outflow = 5.6 cfs @ 12.31 hrs, Volume= 0.80 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3

Reach 11: POSTDEV



Summary for Subcatchment 12: DV-C

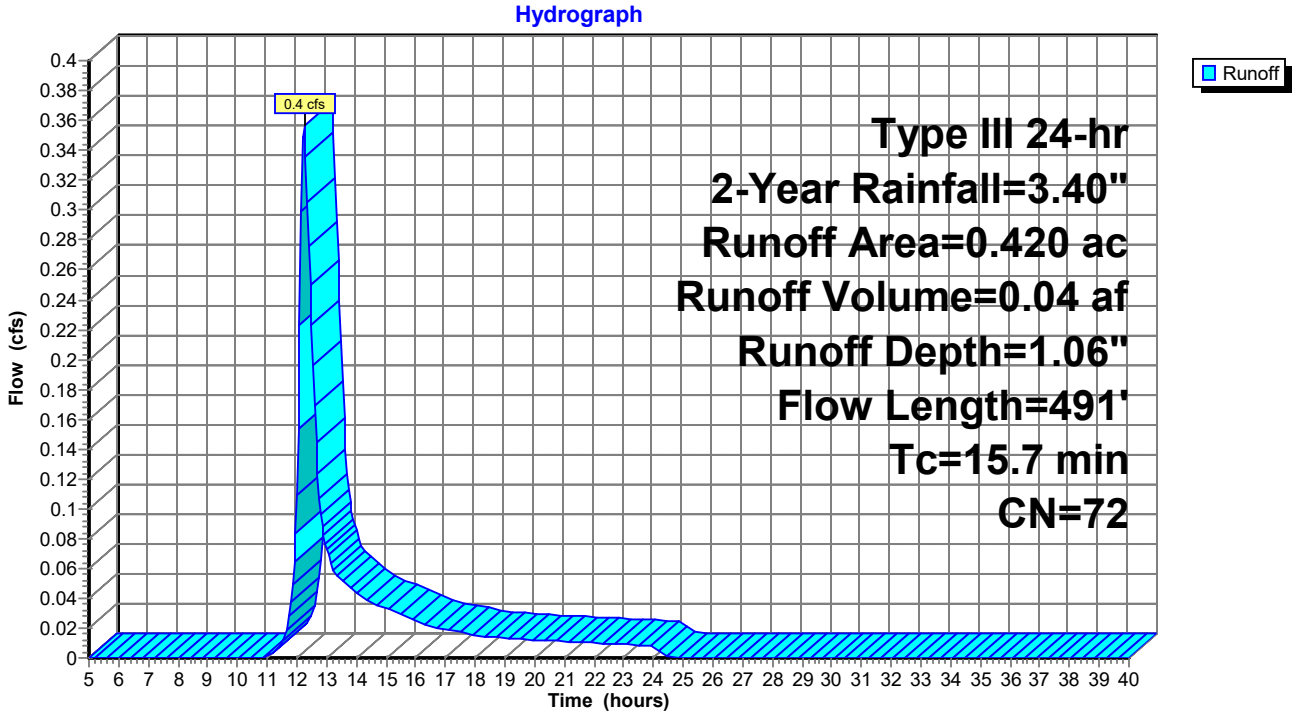
Runoff = 0.4 cfs @ 12.24 hrs, Volume= 0.04 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (ac)	CN	Description
0.420	72	Woods/grass comb., Good, HSG C
0.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, C1**
					Grass: Dense n= 0.240 P2= 3.40"
1.9	78	0.0100	0.70		**Shallow Concentrated Flow, C2**
					Short Grass Pasture Kv= 7.0 fps
0.8	39	0.0150	0.86		**Shallow Concentrated Flow, C3**
					Short Grass Pasture Kv= 7.0 fps
0.9	46	0.0150	0.86		**Shallow Concentrated Flow, C4**
					Short Grass Pasture Kv= 7.0 fps
1.8	75	0.0100	0.70		**Shallow Concentrated Flow, C5**
					Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0300	1.21		**Shallow Concentrated Flow, C6**
					Short Grass Pasture Kv= 7.0 fps
2.2	93	0.0100	0.70		**Shallow Concentrated Flow, C7**
					Short Grass Pasture Kv= 7.0 fps
0.4	24	0.0400	1.00		**Shallow Concentrated Flow, C8**
					Woodland Kv= 5.0 fps
1.2	52	0.0200	0.71		**Shallow Concentrated Flow, C9**
					Woodland Kv= 5.0 fps
15.7	491	Total			

Subcatchment 12: DV-C



Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: EX-A Runoff Area=11.104 ac 0.48% Impervious Runoff Depth=2.21"
Flow Length=536' Tc=6.0 min CN=74 Runoff=28.0 cfs 2.04 af

Reach 2: PREDEV Inflow=28.0 cfs 2.04 af
Outflow=28.0 cfs 2.04 af

Subcatchment 3: CB1 Runoff Area=0.400 ac 81.50% Impervious Runoff Depth>3.58"
Flow Length=350' Tc=6.0 min CN=89 Runoff=1.6 cfs 0.12 af

Pond 3A: CB1 Peak Elev=71.88' Inflow=1.6 cfs 0.12 af
Outflow=1.6 cfs 0.12 af

Subcatchment 4: CB2 Runoff Area=0.245 ac 75.51% Impervious Runoff Depth=3.38"
Flow Length=308' Tc=7.2 min CN=87 Runoff=0.9 cfs 0.07 af

Pond 4A: CB2 Peak Elev=71.88' Inflow=2.5 cfs 0.19 af
Outflow=2.5 cfs 0.19 af

Subcatchment 5: BASIN1 Runoff Area=0.223 ac 54.71% Impervious Runoff Depth>3.68"
Tc=6.0 min CN=90 Runoff=0.9 cfs 0.07 af

Pond 5A: SF1A Peak Elev=0.00' Storage=0 cf
Primary=0.0 cfs 0.00 af

Pond 5B: BASIN1 Peak Elev=67.23' Storage=3,610 cf Inflow=3.4 cfs 0.26 af
Outflow=1.5 cfs 0.24 af

Subcatchment 6: CB3 Runoff Area=0.790 ac 79.87% Impervious Runoff Depth=3.38"
Flow Length=360' Tc=8.1 min CN=87 Runoff=2.8 cfs 0.22 af

Pond 6A: CB3 Peak Elev=71.14' Inflow=2.8 cfs 0.22 af
Outflow=2.8 cfs 0.22 af

Pond 6B: DMH1 Peak Elev=67.68' Inflow=2.8 cfs 0.22 af
15.0" Round Culvert n=0.013 L=183.0' S=0.0050 '/' Outflow=2.8 cfs 0.22 af

Subcatchment 7: BASIN2 Runoff Area=0.490 ac 35.92% Impervious Runoff Depth=2.99"
Flow Length=82' Tc=6.4 min CN=83 Runoff=1.7 cfs 0.12 af

Pond 7A: SF2A Peak Elev=0.00' Storage=0 cf
Primary=0.0 cfs 0.00 af

Pond 7B: BASIN2A Peak Elev=66.58' Storage=3,326 cf Inflow=4.5 cfs 0.34 af
Outflow=4.2 cfs 0.28 af

Pond 7C: BASIN2B Peak Elev=64.63' Storage=2,180 cf Inflow=4.2 cfs 0.28 af
Discarded=0.0 cfs 0.02 af Primary=3.0 cfs 0.26 af Outflow=3.0 cfs 0.28 af

Subcatchment 8: DV-A Runoff Area=2.793 ac 20.19% Impervious Runoff Depth=1.25"
Flow Length=453' Tc=6.5 min CN=61 Runoff=3.6 cfs 0.29 af

Pond 8A: CBA Peak Elev=70.04' Inflow=3.6 cfs 0.29 af
Outflow=3.6 cfs 0.29 af

Subcatchment 9: DV-B Runoff Area=0.893 ac 0.00% Impervious Runoff Depth=2.46"
Flow Length=410' Tc=8.1 min CN=77 Runoff=2.4 cfs 0.18 af

Subcatchment 10: DV-D Runoff Area=4.850 ac 8.64% Impervious Runoff Depth=1.45"
Flow Length=491' Tc=15.7 min CN=64 Runoff=5.6 cfs 0.59 af

Reach 11: POSTDEV Inflow=14.9 cfs 1.63 af
Outflow=14.9 cfs 1.63 af

Subcatchment 12: DV-C Runoff Area=0.420 ac 0.00% Impervious Runoff Depth=2.05"
Flow Length=491' Tc=15.7 min CN=72 Runoff=0.7 cfs 0.07 af

Summary for Subcatchment 1: EX-A

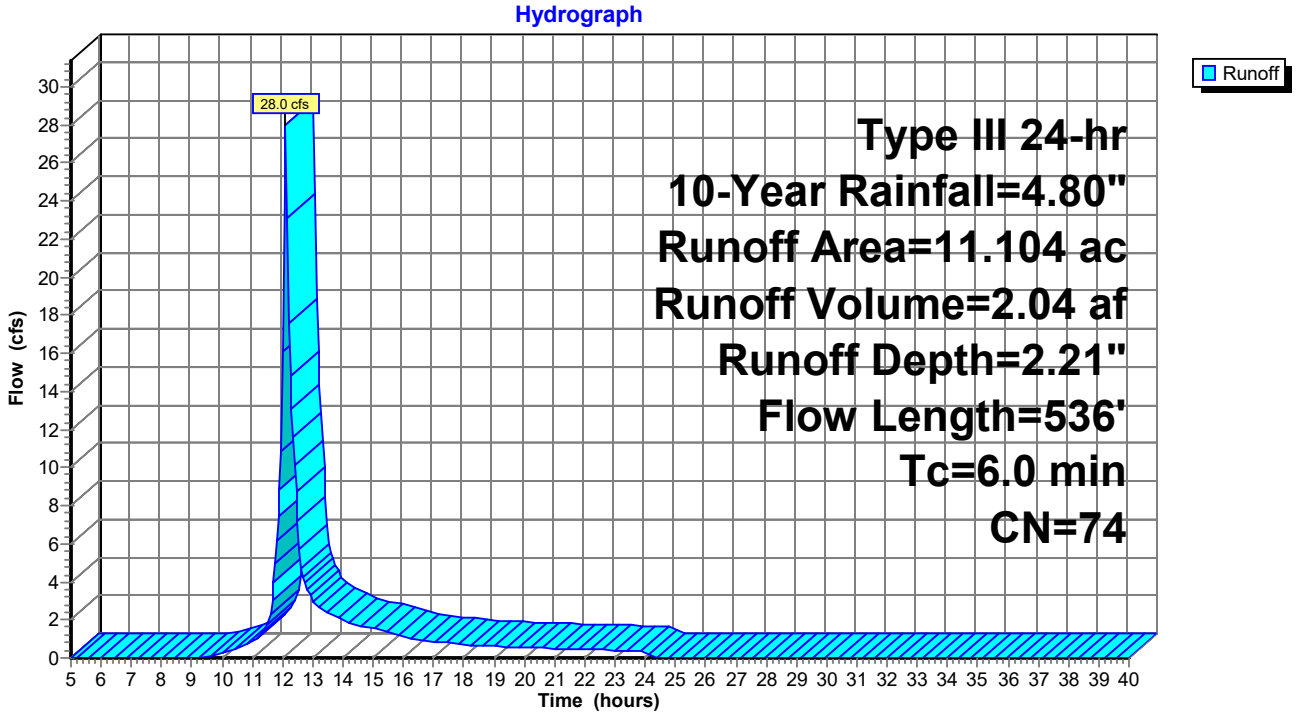
Runoff = 28.0 cfs @ 12.10 hrs, Volume= 2.04 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.051	96	Gravel surface, HSG A
1.249	67	Row crops, straight row, Good, HSG A
0.503	39	>75% Grass cover, Good, HSG A
0.130	30	Woods, Good, HSG A
0.053	98	Roofs, HSG B
0.352	96	Gravel surface, HSG B
2.127	78	Row crops, straight row, Good, HSG B
0.013	61	>75% Grass cover, Good, HSG B
1.656	85	Row crops, straight row, Good, HSG C
2.693	74	>75% Grass cover, Good, HSG C
0.701	70	Woods, Good, HSG C
0.023	96	Gravel surface, HSG D
1.099	89	Row crops, straight row, Good, HSG D
0.005	77	Woods, Good, HSG D
0.449	39	>75% Grass cover, Good, HSG A
11.104	74	Weighted Average
11.051		99.52% Pervious Area
0.053		0.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, X1** Smooth surfaces n= 0.011 P2= 3.40"
1.0	95	0.0100	1.61		**Shallow Concentrated Flow, X2** Unpaved Kv= 16.1 fps
0.8	77	0.0300	1.56		**Shallow Concentrated Flow, X3** Cultivated Straight Rows Kv= 9.0 fps
1.1	87	0.0200	1.27		**Shallow Concentrated Flow, X4** Cultivated Straight Rows Kv= 9.0 fps
0.9	46	0.0100	0.90		**Shallow Concentrated Flow, X5** Cultivated Straight Rows Kv= 9.0 fps
0.8	58	0.0200	1.27		**Shallow Concentrated Flow, X6** Cultivated Straight Rows Kv= 9.0 fps
0.4	123	0.0100	4.62	12.01	**Channel Flow, X7** Area= 2.6 sf Perim= 4.6' r= 0.57' n= 0.022 Earth, clean & straight
5.9	536	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1: EX-A

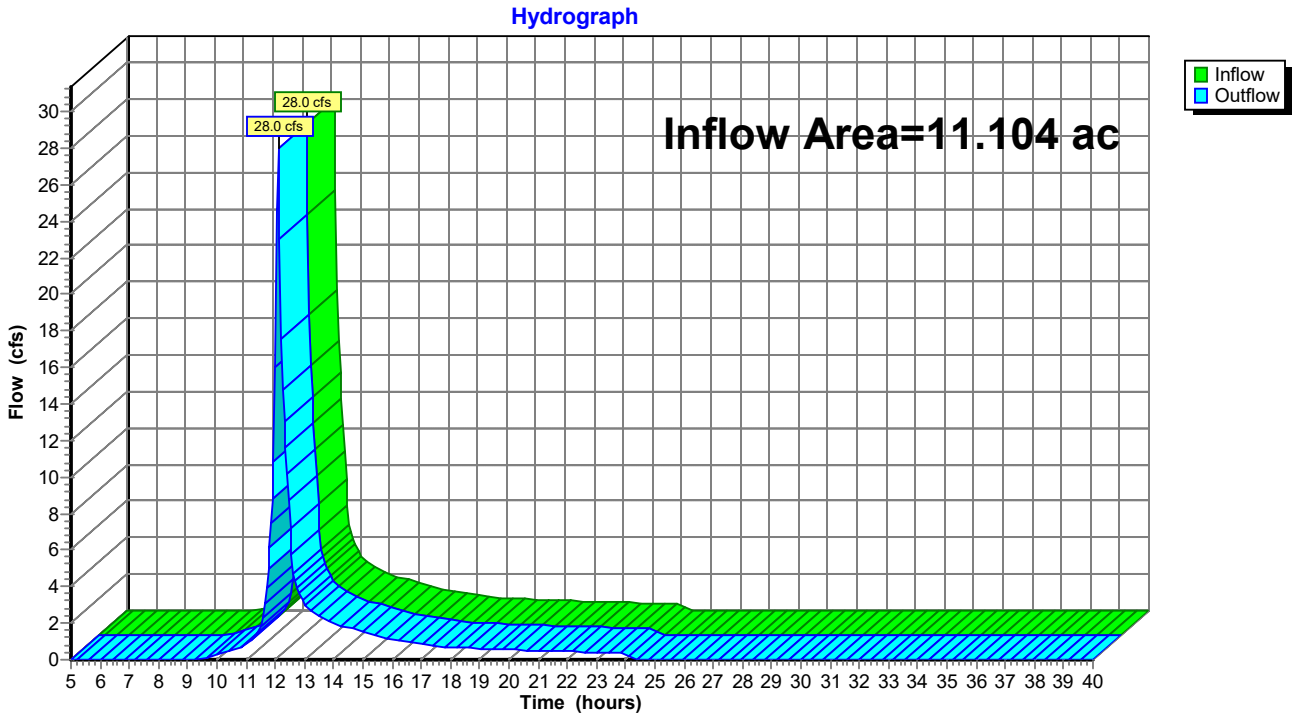


Summary for Reach 2: PREDEV

Inflow Area = 11.104 ac, 0.48% Impervious, Inflow Depth = 2.21" for 10-Year event
Inflow = 28.0 cfs @ 12.10 hrs, Volume= 2.04 af
Outflow = 28.0 cfs @ 12.10 hrs, Volume= 2.04 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3

Reach 2: PREDEV



Summary for Subcatchment 3: CB1

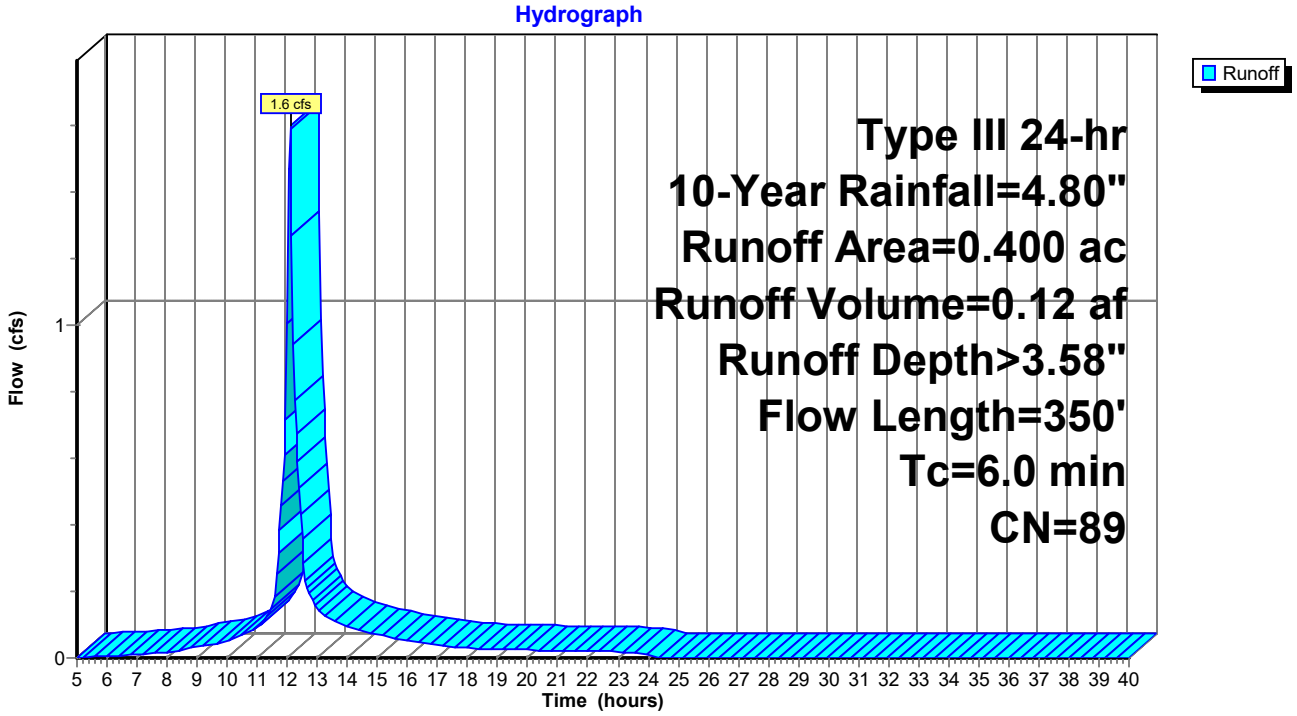
Runoff = 1.6 cfs @ 12.09 hrs, Volume= 0.12 af, Depth> 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.122	98	Paved parking, HSG A
0.004	61	>75% Grass cover, Good, HSG B
0.012	80	>75% Grass cover, Good, HSG D
0.008	74	>75% Grass cover, Good, HSG C
0.050	39	>75% Grass cover, Good, HSG A
0.067	98	Paved parking, HSG B
0.039	98	Paved parking, HSG C
0.098	98	Paved parking, HSG D
0.400	89	Weighted Average
0.074		18.50% Pervious Area
0.326		81.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	39	0.0200	1.17		**Sheet Flow, 1a** Smooth surfaces n= 0.011 P2= 3.40"
2.6	311	0.0100	2.03		**Shallow Concentrated Flow, 1c** Paved Kv= 20.3 fps
3.2	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3: CB1



Summary for Pond 3A: CB1

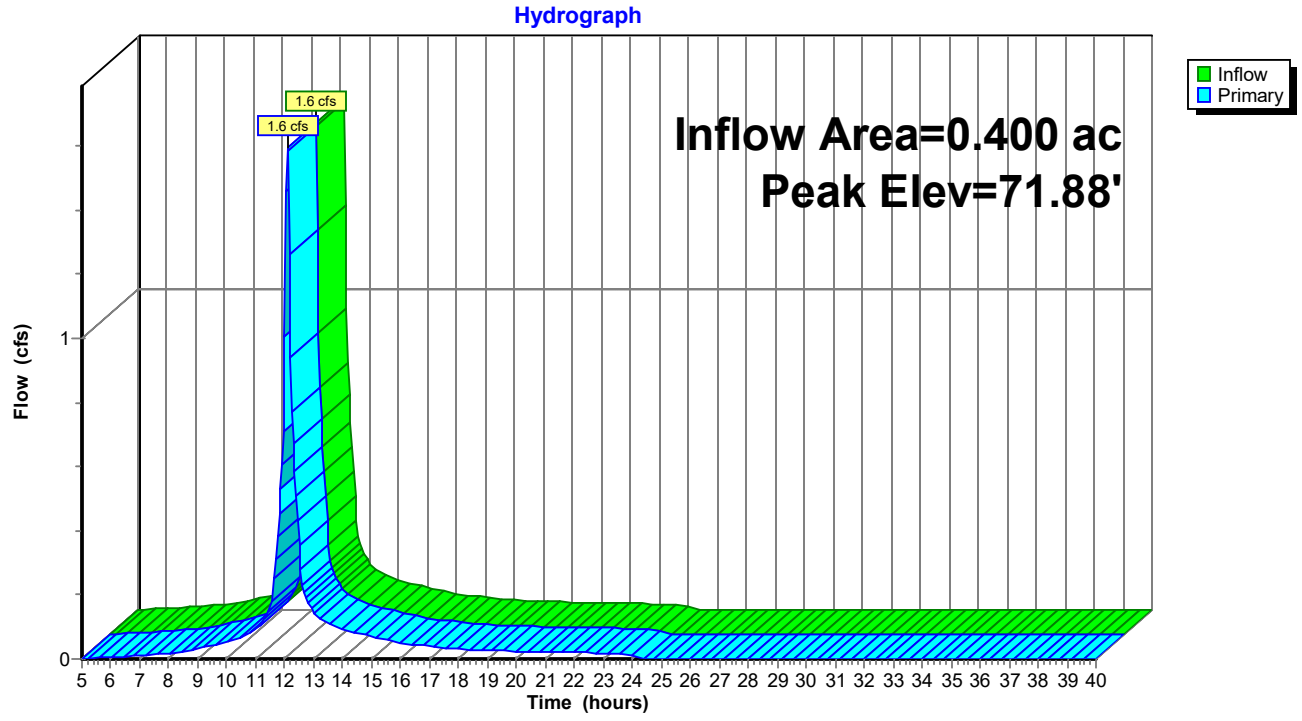
Inflow Area = 0.400 ac, 81.50% Impervious, Inflow Depth > 3.58" for 10-Year event
Inflow = 1.6 cfs @ 12.09 hrs, Volume= 0.12 af
Outflow = 1.6 cfs @ 12.09 hrs, Volume= 0.12 af, Atten= 0%, Lag= 0.0 min
Primary = 1.6 cfs @ 12.09 hrs, Volume= 0.12 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.88' @ 12.09 hrs
Flood Elev= 71.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 12.00 columns** X 12 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.70'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 2	67.70'	**12.0" Round Culvert** L= 18.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.70' / 67.34' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.6 cfs @ 12.09 hrs HW=71.88' TW=71.87' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 1.4 cfs @ 0.36 fps)
└─**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 0.36 fps)
└─**3=Culvert** (Passes 0.1 cfs of 0.2 cfs potential flow)

Pond 3A: CB1



Summary for Subcatchment 4: CB2

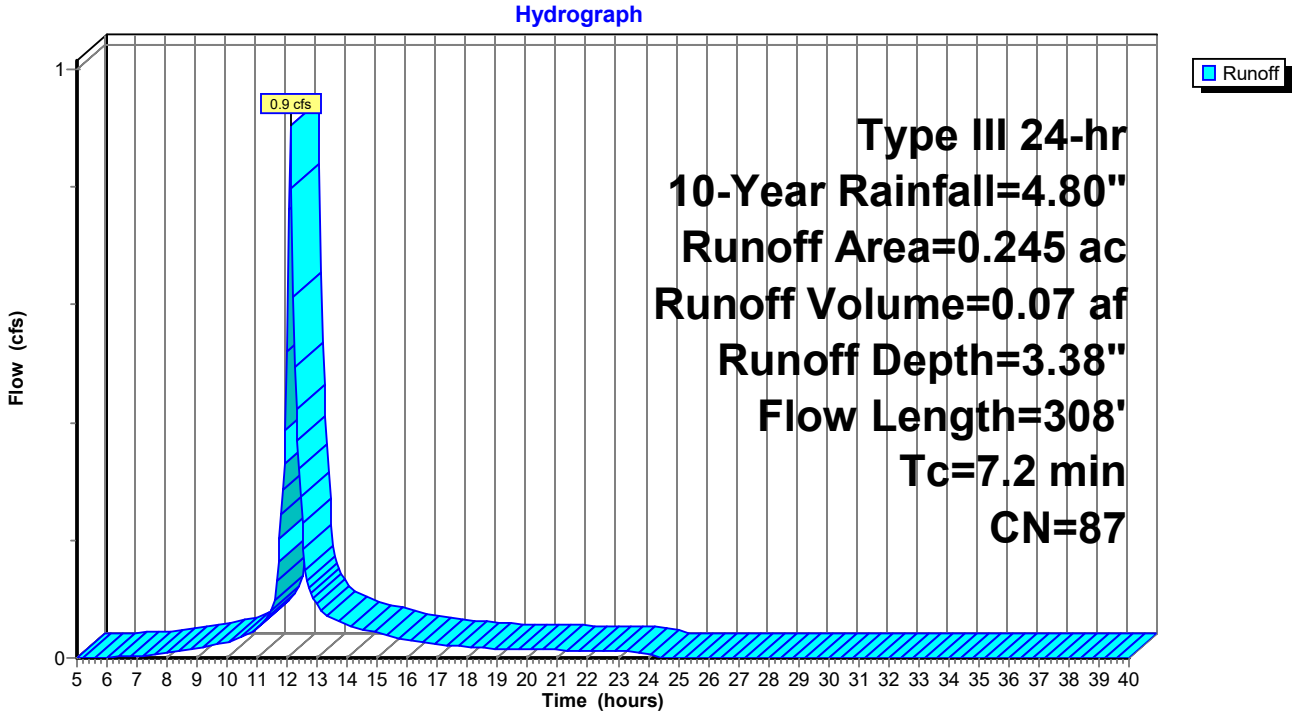
Runoff = 0.9 cfs @ 12.10 hrs, Volume= 0.07 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.025	98	Paved roads w/curbs & sewers, HSG A
0.008	98	Paved parking, HSG A
0.035	39	>75% Grass cover, Good, HSG A
0.059	98	Paved roads w/curbs & sewers, HSG B
0.033	98	Paved roads w/curbs & sewers, HSG C
0.005	98	Paved parking, HSG C
0.025	74	>75% Grass cover, Good, HSG C
0.055	98	Paved roads w/curbs & sewers, HSG D
0.245	87	Weighted Average
0.060		24.49% Pervious Area
0.185		75.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	26	0.0200	0.09		**Sheet Flow, 2a** Grass: Dense n= 0.240 P2= 3.40"
0.3	15	0.0200	0.97		**Sheet Flow, 2b** Smooth surfaces n= 0.011 P2= 3.40"
2.2	267	0.0100	2.03		**Shallow Concentrated Flow, 2c** Paved Kv= 20.3 fps
7.2	308	Total			

Subcatchment 4: CB2



Summary for Pond 4A: CB2

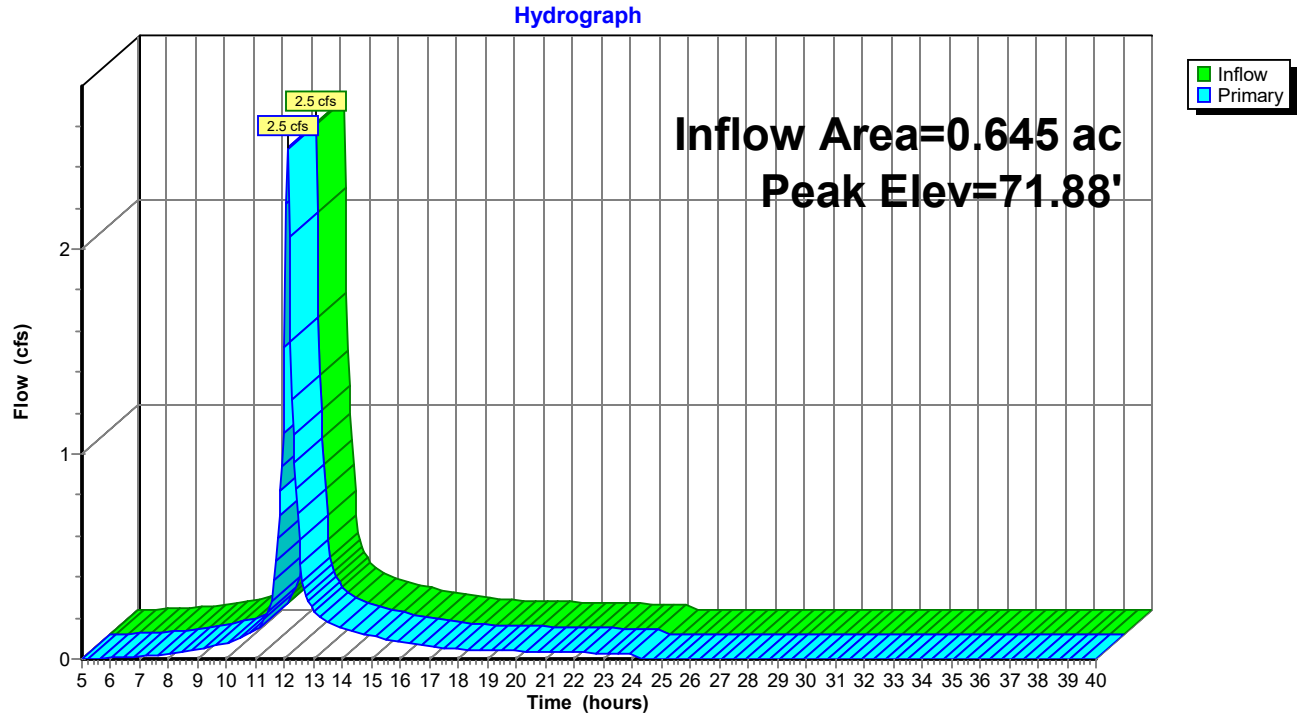
Inflow Area = 0.645 ac, 79.22% Impervious, Inflow Depth > 3.50" for 10-Year event
Inflow = 2.5 cfs @ 12.09 hrs, Volume= 0.19 af
Outflow = 2.5 cfs @ 12.09 hrs, Volume= 0.19 af, Atten= 0%, Lag= 0.0 min
Primary = 2.5 cfs @ 12.09 hrs, Volume= 0.19 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.88' @ 12.09 hrs
Flood Elev= 71.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.70'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 2	67.24'	**15.0" Round Culvert** L= 18.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.24' / 67.06' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=2.5 cfs @ 12.09 hrs HW=71.87' TW=67.03' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Orifice Controls 2.0 cfs @ 2.00 fps)
└─**2=Orifice/Grate** (Orifice Controls 0.5 cfs @ 1.33 fps)
└─**3=Culvert** (Passes 0.5 cfs of 1.9 cfs potential flow)

Pond 4A: CB2



Summary for Subcatchment 5: BASIN1

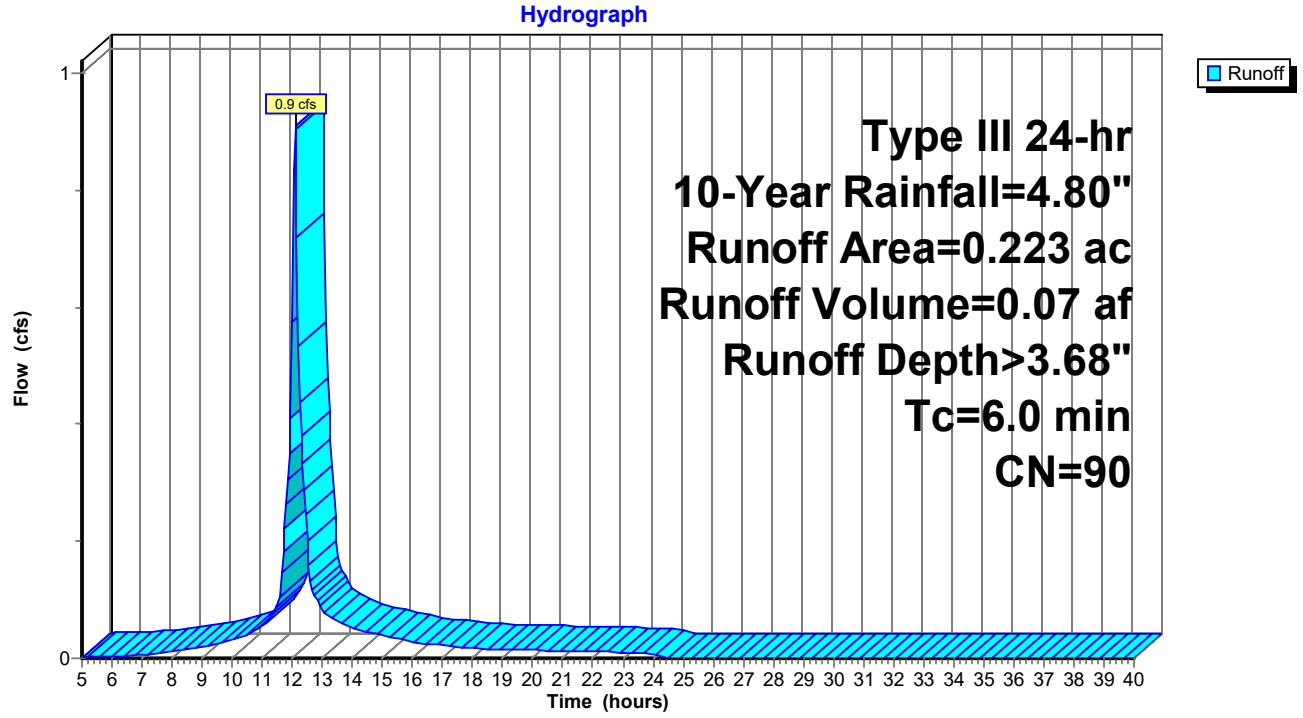
Runoff = 0.9 cfs @ 12.09 hrs, Volume= 0.07 af, Depth> 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.122	98	Water Surface, HSG D
0.101	80	>75% Grass cover, Good, HSG D
0.223	90	Weighted Average
0.101		45.29% Pervious Area
0.122		54.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, B1-A**

Subcatchment 5: BASIN1



Summary for Pond 5A: SF1A

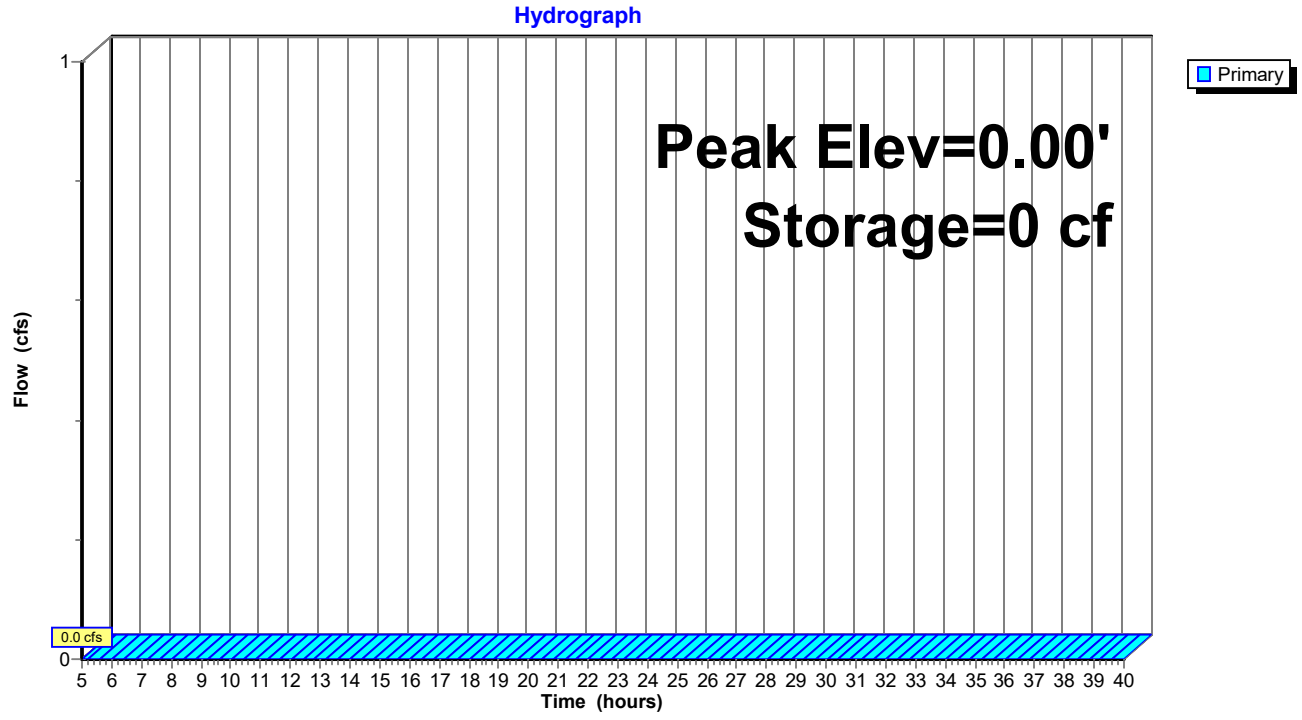
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	1,207 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	504	0	0
67.00	907	706	706
67.50	1,097	501	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5A: SF1A



Summary for Pond 5B: BASIN1

Inflow Area = 0.868 ac, 72.93% Impervious, Inflow Depth > 3.55" for 10-Year event
Inflow = 3.4 cfs @ 12.09 hrs, Volume= 0.26 af
Outflow = 1.5 cfs @ 12.30 hrs, Volume= 0.24 af, Atten= 56%, Lag= 12.3 min
Primary = 1.5 cfs @ 12.30 hrs, Volume= 0.24 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 67.23' @ 12.30 hrs Surf.Area= 3,342 sf Storage= 3,610 cf
Flood Elev= 68.50' Surf.Area= 6,300 sf Storage= 9,880 cf

Plug-Flow detention time= 101.9 min calculated for 0.24 af (93% of inflow)
Center-of-Mass det. time= 64.2 min (861.2 - 797.1)

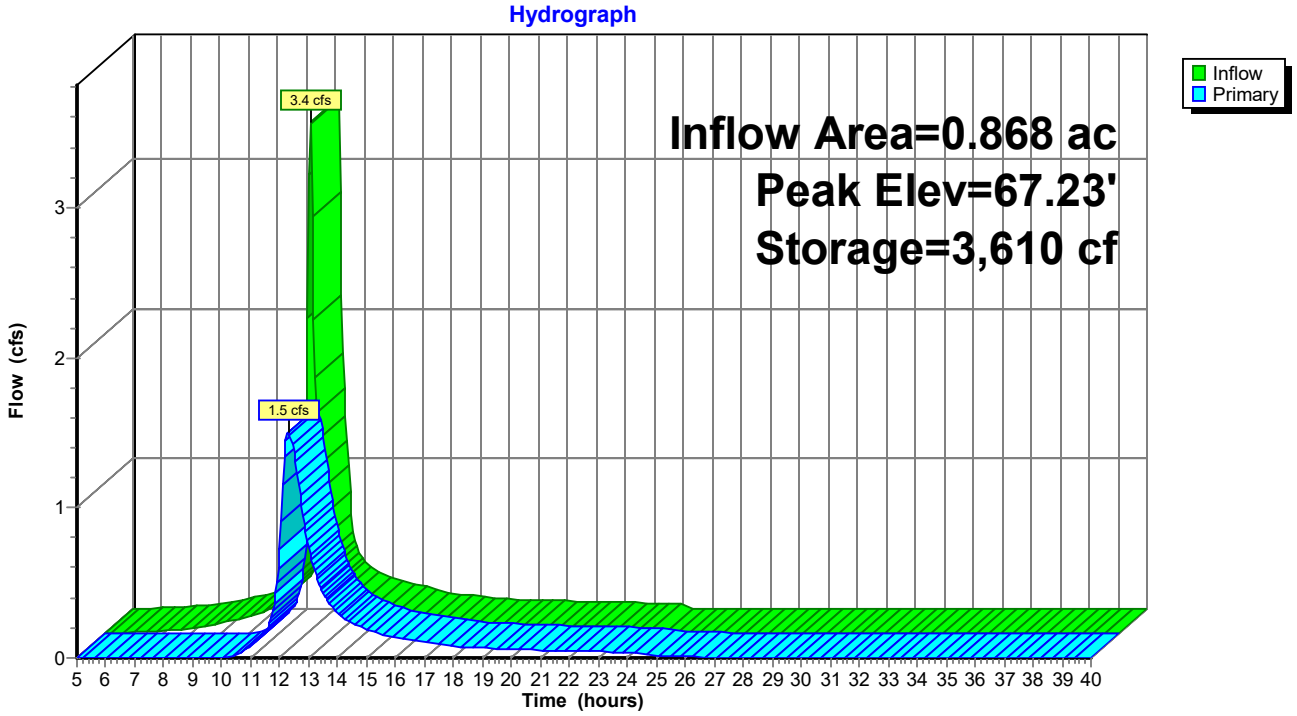
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	9,880 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	2,547	0	0
67.00	3,190	2,869	2,869
67.50	3,525	1,679	4,547
68.00	5,752	2,319	6,867
68.50	6,300	3,013	9,880

Device	Routing	Invert	Outlet Devices
#1	Primary	66.30'	**0.7' long x 1.20' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	67.50'	**8.0' long x 0.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.5 cfs @ 12.30 hrs HW=67.23' TW=0.00' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Weir Controls 1.5 cfs @ 3.15 fps)
2=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5B: BASIN1



Summary for Subcatchment 6: CB3

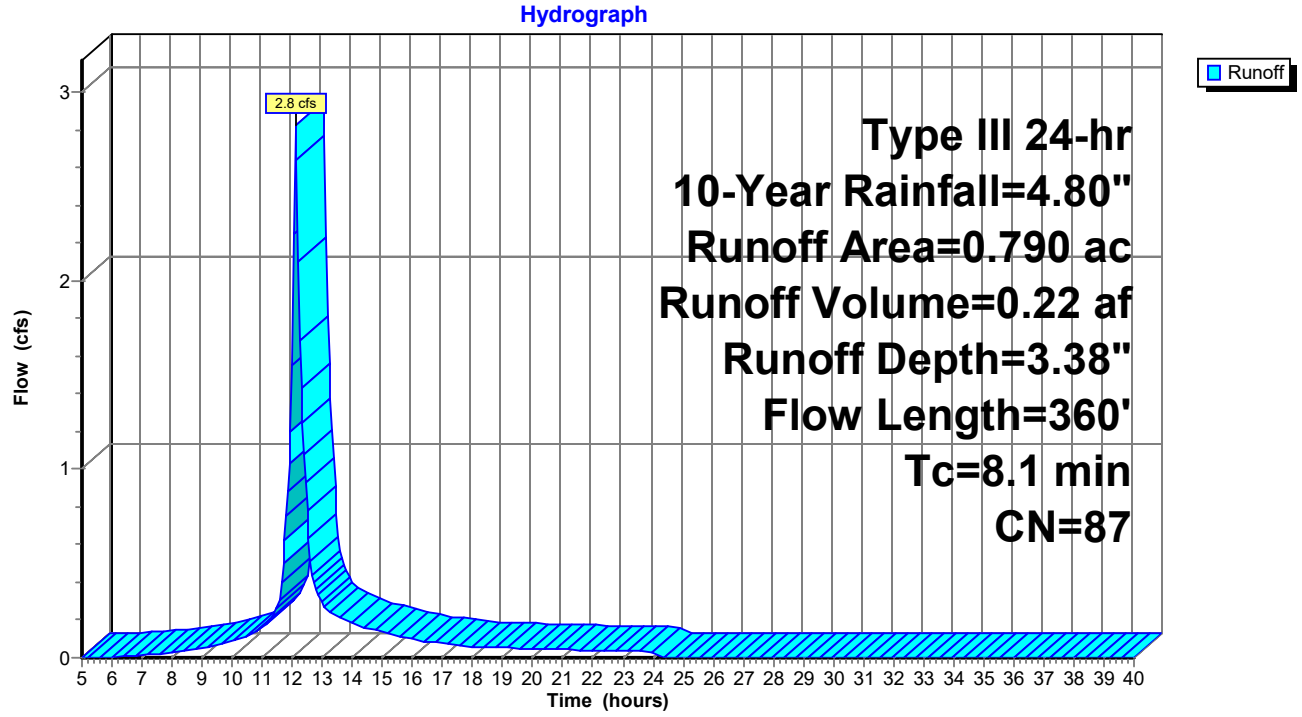
Runoff = 2.8 cfs @ 12.11 hrs, Volume= 0.22 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.631	98	Paved roads w/curbs & sewers, HSG A
0.130	39	>75% Grass cover, Good, HSG A
0.029	74	>75% Grass cover, Good, HSG C
0.790	87	Weighted Average
0.159		20.13% Pervious Area
0.631		79.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0200	0.09		**Sheet Flow, 3a** Grass: Dense n= 0.240 P2= 3.40"
0.2	14	0.0200	0.96		**Sheet Flow, 3b** Smooth surfaces n= 0.011 P2= 3.40"
2.6	316	0.0100	2.03		**Shallow Concentrated Flow, 3c** Paved Kv= 20.3 fps
8.1	360	Total			

Subcatchment 6: CB3



Summary for Pond 6A: CB3

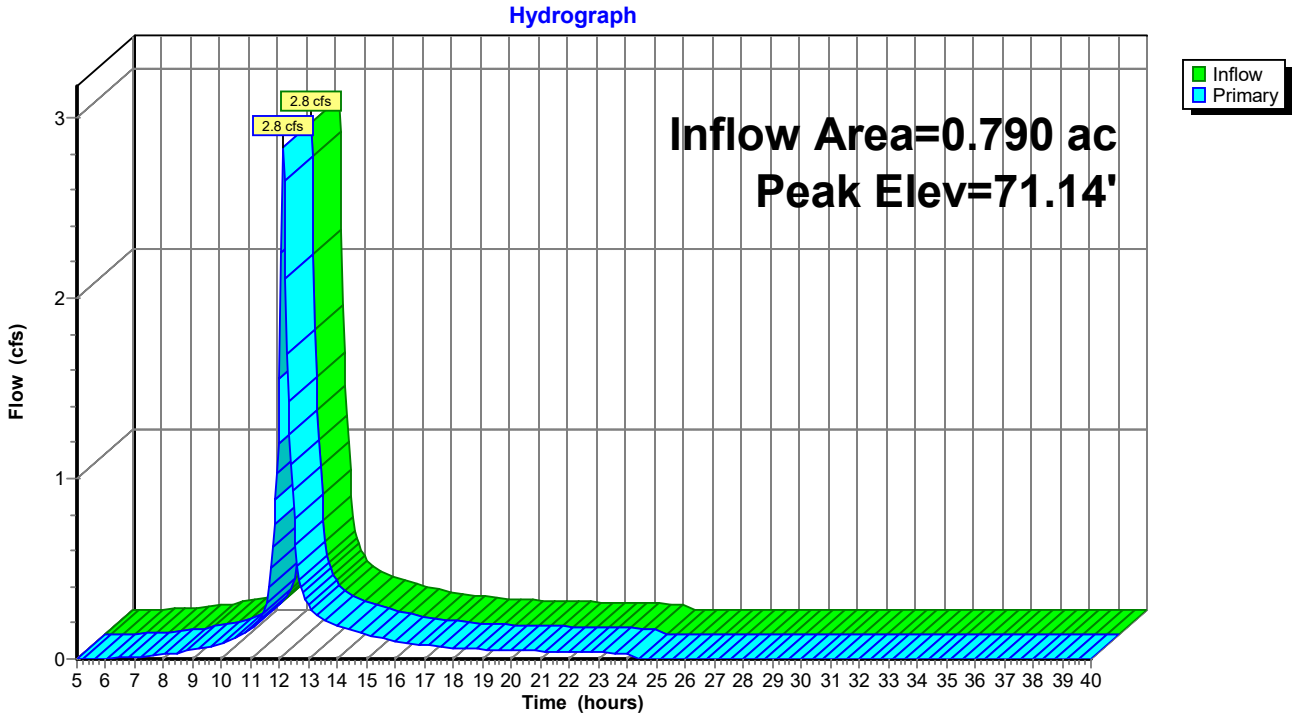
Inflow Area = 0.790 ac, 79.87% Impervious, Inflow Depth = 3.38" for 10-Year event
Inflow = 2.8 cfs @ 12.11 hrs, Volume= 0.22 af
Outflow = 2.8 cfs @ 12.11 hrs, Volume= 0.22 af, Atten= 0%, Lag= 0.0 min
Primary = 2.8 cfs @ 12.11 hrs, Volume= 0.22 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.14' @ 12.11 hrs
Flood Elev= 71.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 12.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.00'	**48.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	67.25'	**15.0" Round Culvert** L= 57.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 67.25' / 66.68' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=2.8 cfs @ 12.11 hrs HW=71.13' TW=67.66' (Dynamic Tailwater)
└─**1=Orifice/Grate** (Passes 2.1 cfs of 3.5 cfs potential flow)
└─**3=Culvert** (Outlet Controls 2.1 cfs @ 1.74 fps)
└─**2=Orifice/Grate** (Orifice Controls 0.6 cfs @ 1.17 fps)

Pond 6A: CB3



Summary for Pond 6B: DMH1

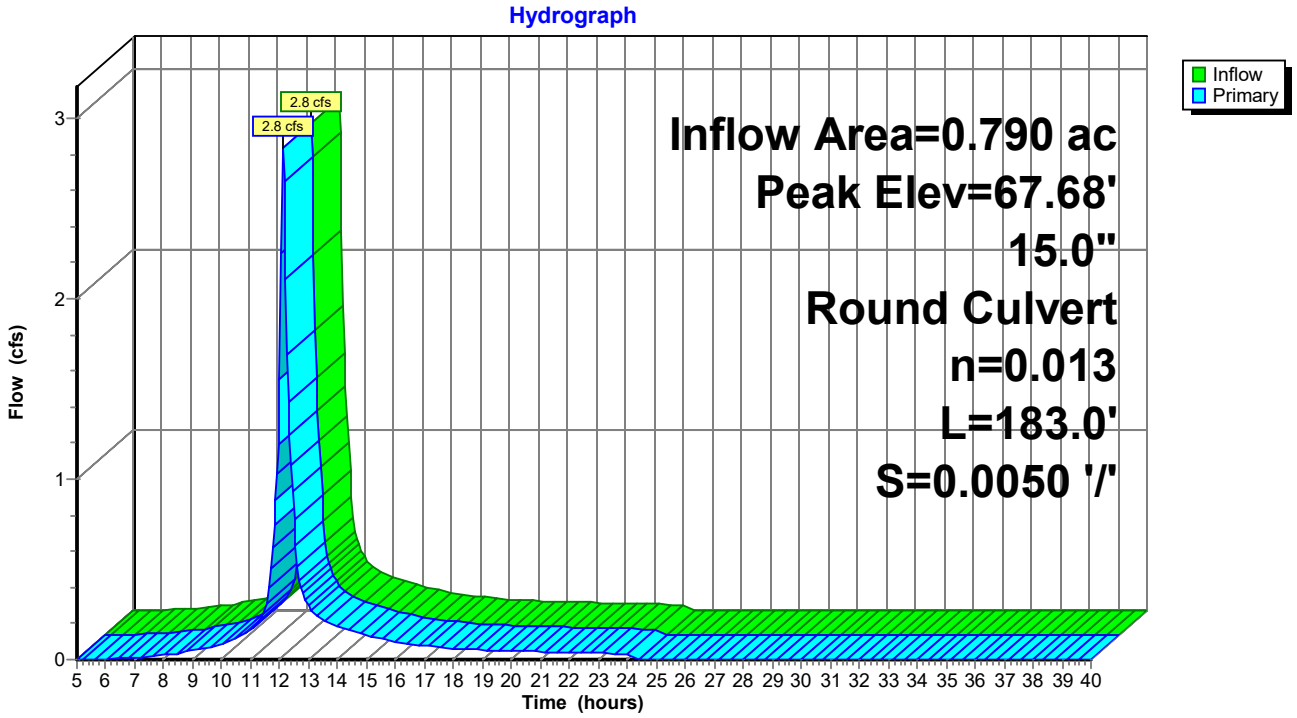
Inflow Area = 0.790 ac, 79.87% Impervious, Inflow Depth = 3.38" for 10-Year event
Inflow = 2.8 cfs @ 12.11 hrs, Volume= 0.22 af
Outflow = 2.8 cfs @ 12.11 hrs, Volume= 0.22 af, Atten= 0%, Lag= 0.0 min
Primary = 2.8 cfs @ 12.11 hrs, Volume= 0.22 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 67.68' @ 12.12 hrs
Flood Elev= 71.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	66.68'	**15.0" Round Culvert** L= 183.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 66.68' / 65.76' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=2.8 cfs @ 12.11 hrs HW=67.66' TW=66.57' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.8 cfs @ 3.67 fps)

Pond 6B: DMH1



Summary for Subcatchment 7: BASIN2

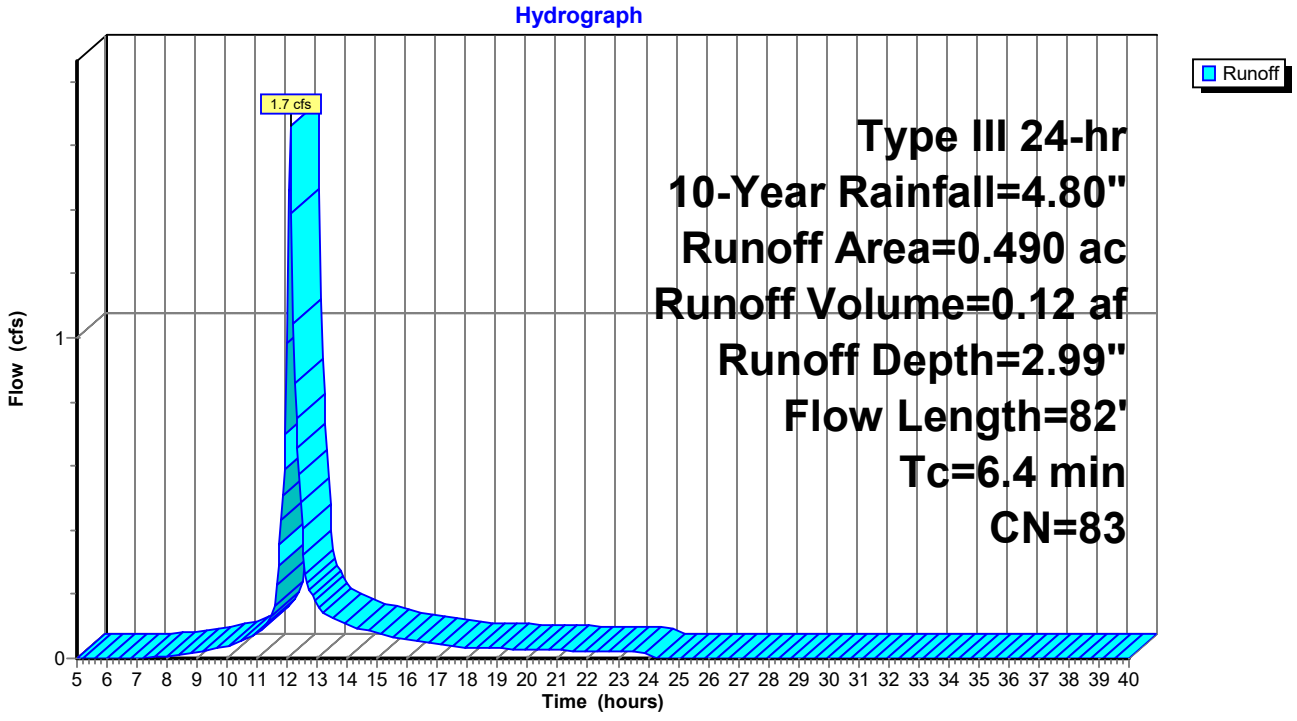
Runoff = 1.7 cfs @ 12.10 hrs, Volume= 0.12 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.314	74	>75% Grass cover, Good, HSG C
0.176	98	Water Surface, HSG C
0.490	83	Weighted Average
0.314		64.08% Pervious Area
0.176		35.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, B2a** Grass: Dense n= 0.240 P2= 3.40"
0.4	32	0.0300	1.21		**Shallow Concentrated Flow, B2b** Short Grass Pasture Kv= 7.0 fps
6.4	82	Total			

Subcatchment 7: BASIN2



Summary for Pond 7A: SF2A

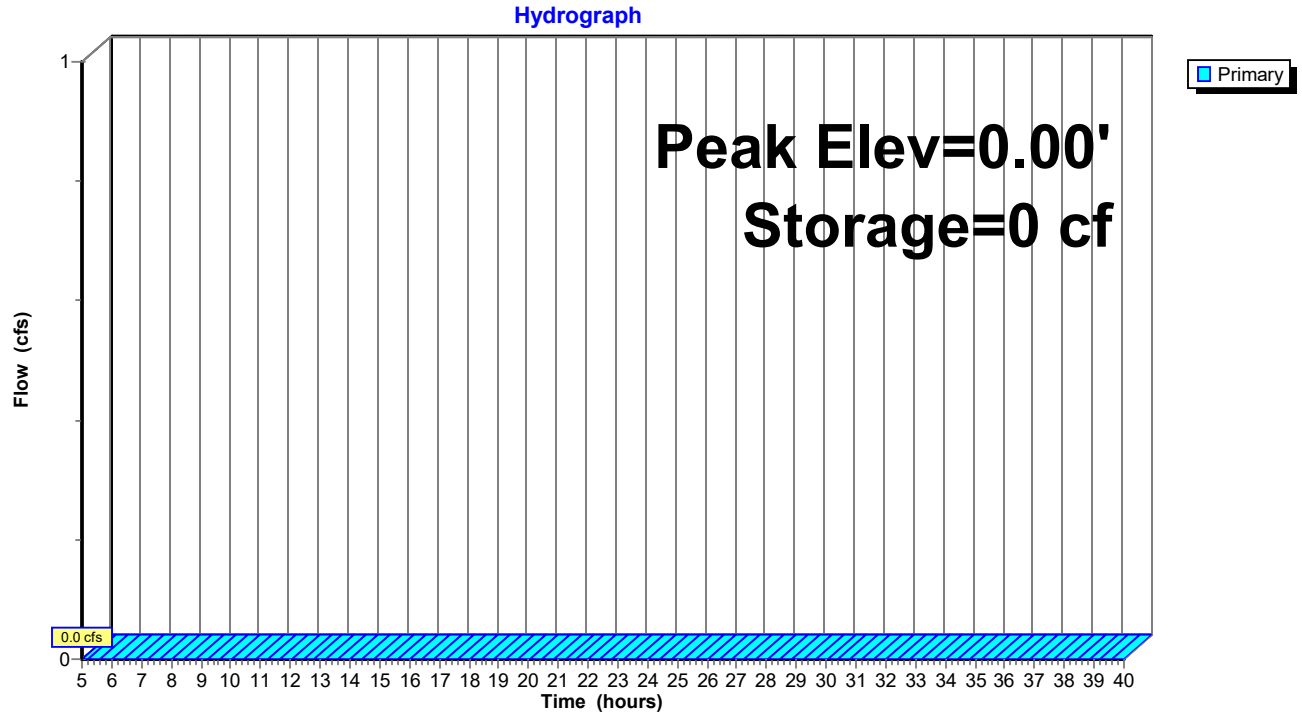
Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	2,916 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	954	0	0
66.00	1,448	1,201	1,201
67.00	1,982	1,715	2,916

Device	Routing	Invert	Outlet Devices
#1	Primary	63.50'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 7A: SF2A



Summary for Pond 7B: BASIN2A

Inflow Area = 1.280 ac, 63.05% Impervious, Inflow Depth = 3.23" for 10-Year event
Inflow = 4.5 cfs @ 12.11 hrs, Volume= 0.34 af
Outflow = 4.2 cfs @ 12.14 hrs, Volume= 0.28 af, Atten= 6%, Lag= 2.1 min
Primary = 4.2 cfs @ 12.14 hrs, Volume= 0.28 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 66.58' @ 12.14 hrs Surf.Area= 2,696 sf Storage= 3,326 cf
Flood Elev= 67.50' Surf.Area= 3,422 sf Storage= 6,152 cf

Plug-Flow detention time= 112.1 min calculated for 0.28 af (83% of inflow)
Center-of-Mass det. time= 41.3 min (849.9 - 808.5)

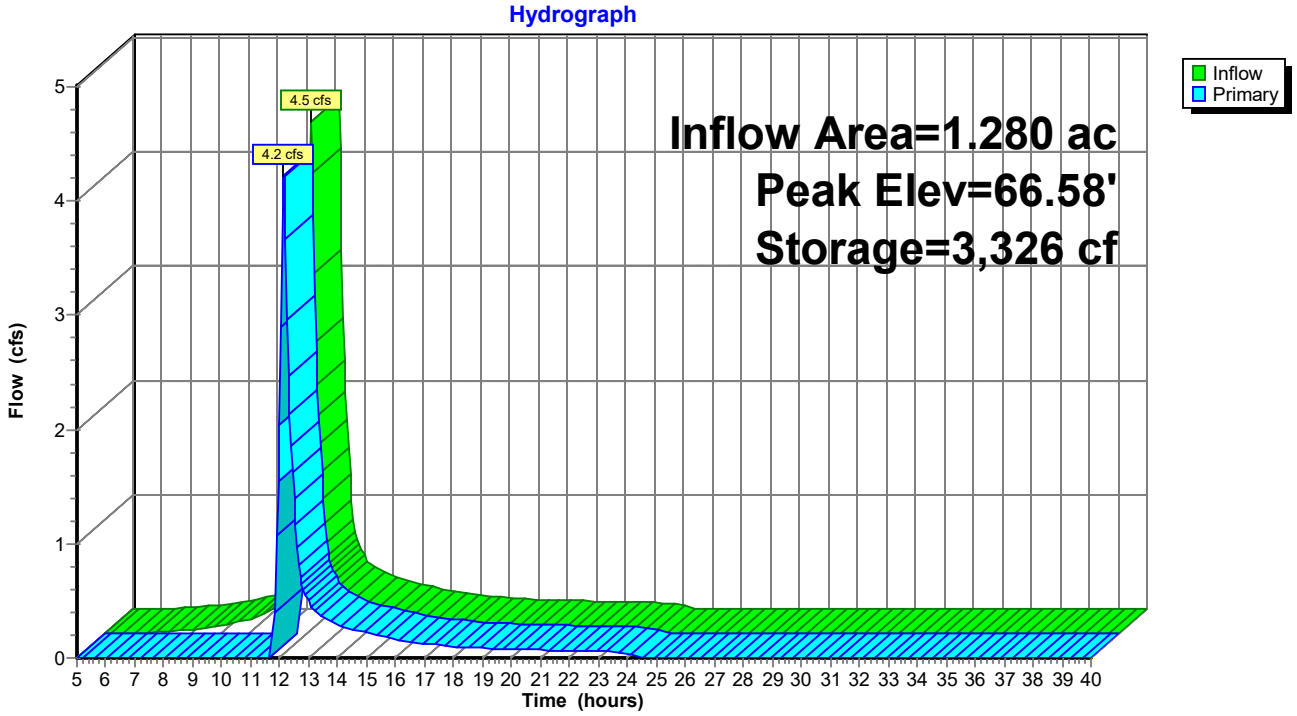
Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	6,152 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	1,548	0	0
66.00	2,257	1,903	1,903
67.00	3,020	2,639	4,541
67.50	3,422	1,611	6,152

Device	Routing	Invert	Outlet Devices
#1	Primary	66.30'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=4.2 cfs @ 12.14 hrs HW=66.57' TW=64.47' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 4.2 cfs @ 1.27 fps)

Pond 7B: BASIN2A



Summary for Pond 7C: BASIN2B

Inflow Area = 1.280 ac, 63.05% Impervious, Inflow Depth = 2.67" for 10-Year event
Inflow = 4.2 cfs @ 12.14 hrs, Volume= 0.28 af
Outflow = 3.0 cfs @ 12.26 hrs, Volume= 0.28 af, Atten= 29%, Lag= 6.8 min
Discarded = 0.0 cfs @ 12.26 hrs, Volume= 0.02 af
Primary = 3.0 cfs @ 12.26 hrs, Volume= 0.26 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 64.63' @ 12.26 hrs Surf.Area= 2,389 sf Storage= 2,180 cf
Flood Elev= 65.60' Surf.Area= 3,235 sf Storage= 4,892 cf

Plug-Flow detention time= 51.3 min calculated for 0.28 af (100% of inflow)
Center-of-Mass det. time= 52.1 min (902.0 - 849.9)

Volume	Invert	Avail.Storage	Storage Description
#1	63.50'	6,649 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

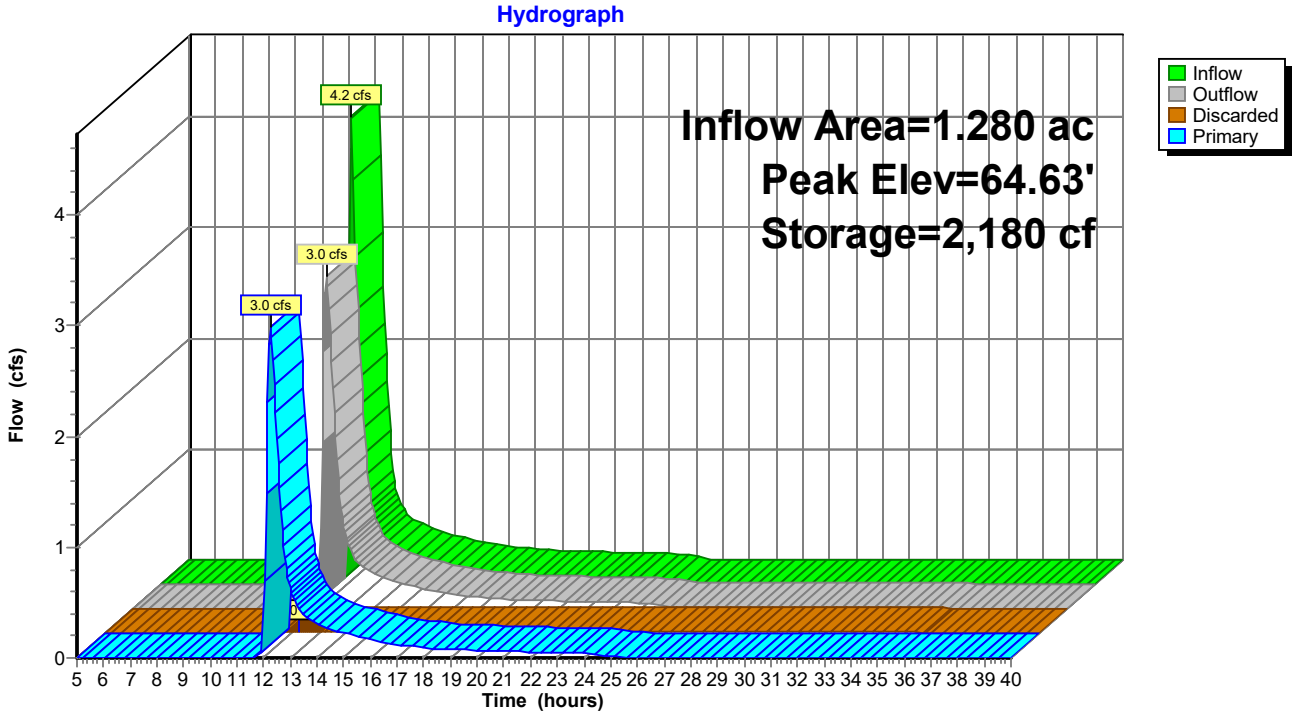
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
63.50	1,477	0	0
64.00	1,862	835	835
65.00	2,695	2,279	3,113
66.00	3,595	3,145	6,258
66.10	4,222	391	6,649

Device	Routing	Invert	Outlet Devices
#1	Discarded	63.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 59.50'
#2	Primary	63.70'	**15.0" Round Culvert** L= 427.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.70' / 61.00' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.0 cfs @ 12.26 hrs HW=64.63' (Free Discharge)
1=Exfiltration (Controls 0.0 cfs)

Primary OutFlow Max=3.0 cfs @ 12.26 hrs HW=64.63' TW=0.00' (Dynamic Tailwater)
2=Culvert (Barrel Controls 3.0 cfs @ 4.22 fps)

Pond 7C: BASIN2B



Summary for Subcatchment 8: DV-A

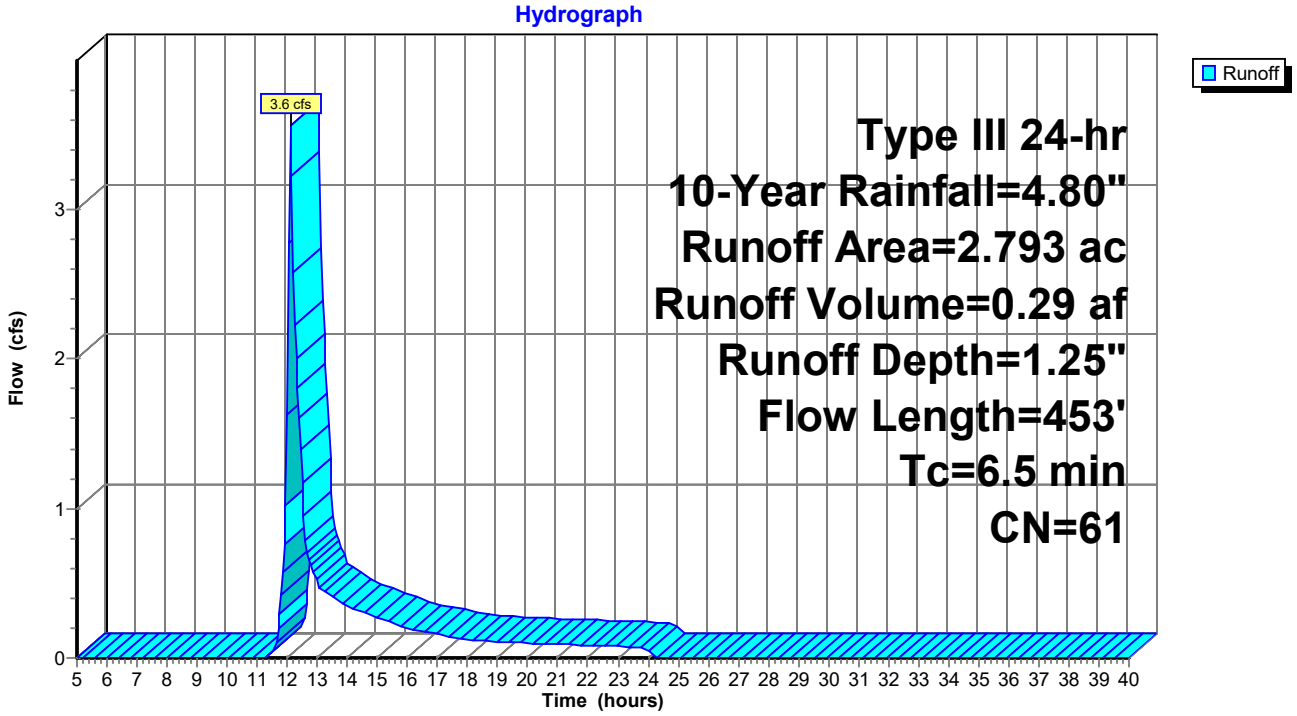
Runoff = 3.6 cfs @ 12.11 hrs, Volume= 0.29 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.280	92	Urban commercial, 85% imp, HSG B
0.005	98	Roofs, HSG B
0.200	98	Roofs, HSG A
0.049	98	Paved parking, HSG D
0.036	98	Paved parking, HSG B
0.015	98	Paved parking, HSG A
0.270	73	Brush, Good, HSG D
0.096	80	>75% Grass cover, Good, HSG D
0.471	39	>75% Grass cover, Good, HSG A
0.073	61	>75% Grass cover, Good, HSG B
0.018	98	Roofs, HSG D
0.003	98	Roofs, HSG C
1.277	48	Brush, Good, HSG B
2.793	61	Weighted Average
2.229		79.81% Pervious Area
0.564		20.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A1** Smooth surfaces n= 0.011 P2= 3.40"
1.0	95	0.0100	1.61		**Shallow Concentrated Flow, A2** Unpaved Kv= 16.1 fps
0.8	77	0.0300	1.56		**Shallow Concentrated Flow, A3** Cultivated Straight Rows Kv= 9.0 fps
1.1	87	0.0200	1.27		**Shallow Concentrated Flow, A4** Cultivated Straight Rows Kv= 9.0 fps
2.7	144	0.0100	0.90		**Shallow Concentrated Flow, A5** Cultivated Straight Rows Kv= 9.0 fps
6.5	453	Total			

Subcatchment 8: DV-A



Summary for Pond 8A: CBA

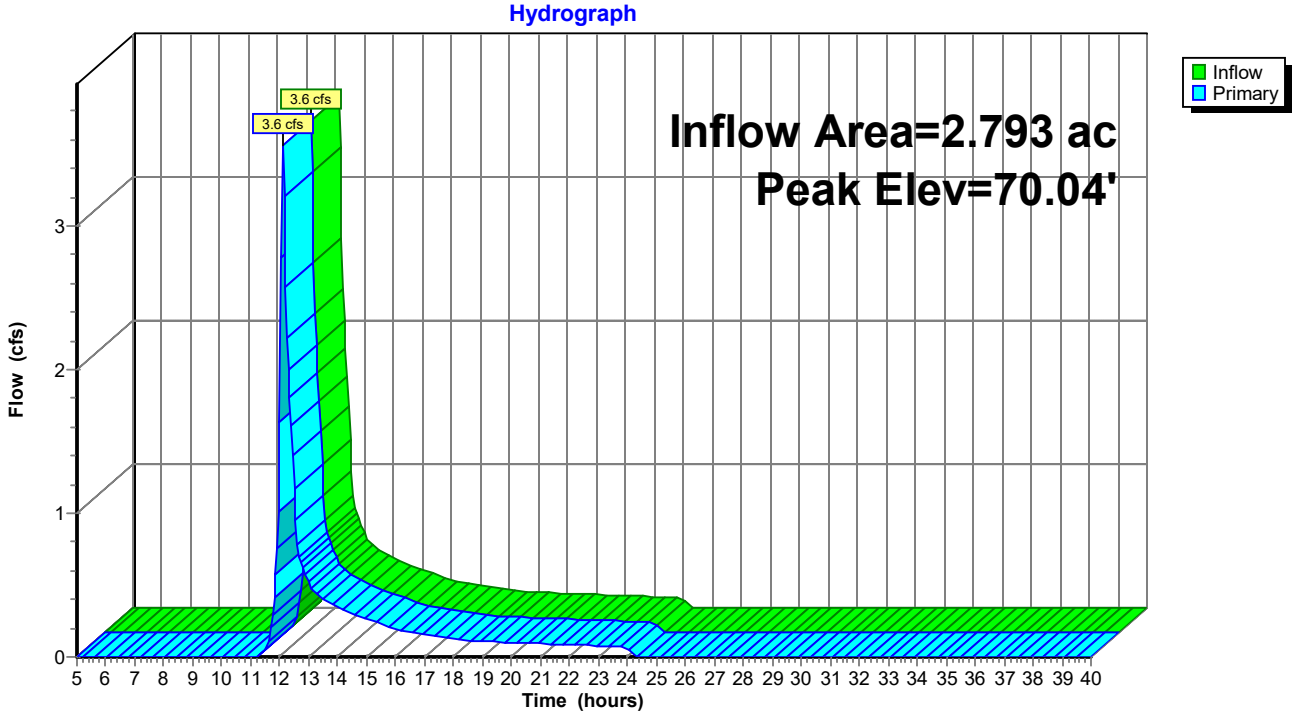
Inflow Area = 2.793 ac, 20.19% Impervious, Inflow Depth = 1.25" for 10-Year event
Inflow = 3.6 cfs @ 12.11 hrs, Volume= 0.29 af
Outflow = 3.6 cfs @ 12.11 hrs, Volume= 0.29 af, Atten= 0%, Lag= 0.0 min
Primary = 3.6 cfs @ 12.11 hrs, Volume= 0.29 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 70.04' @ 12.11 hrs
Flood Elev= 72.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.80'	**24.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	67.70'	**18.0" Round Culvert** L= 118.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 67.70' / 66.50' S= 0.0102 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=3.5 cfs @ 12.11 hrs HW=70.04' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Weir Controls 3.5 cfs @ 1.60 fps)
└**2=Culvert** (Passes 3.5 cfs of 3.8 cfs potential flow)

Pond 8A: CBA



Summary for Subcatchment 9: DV-B

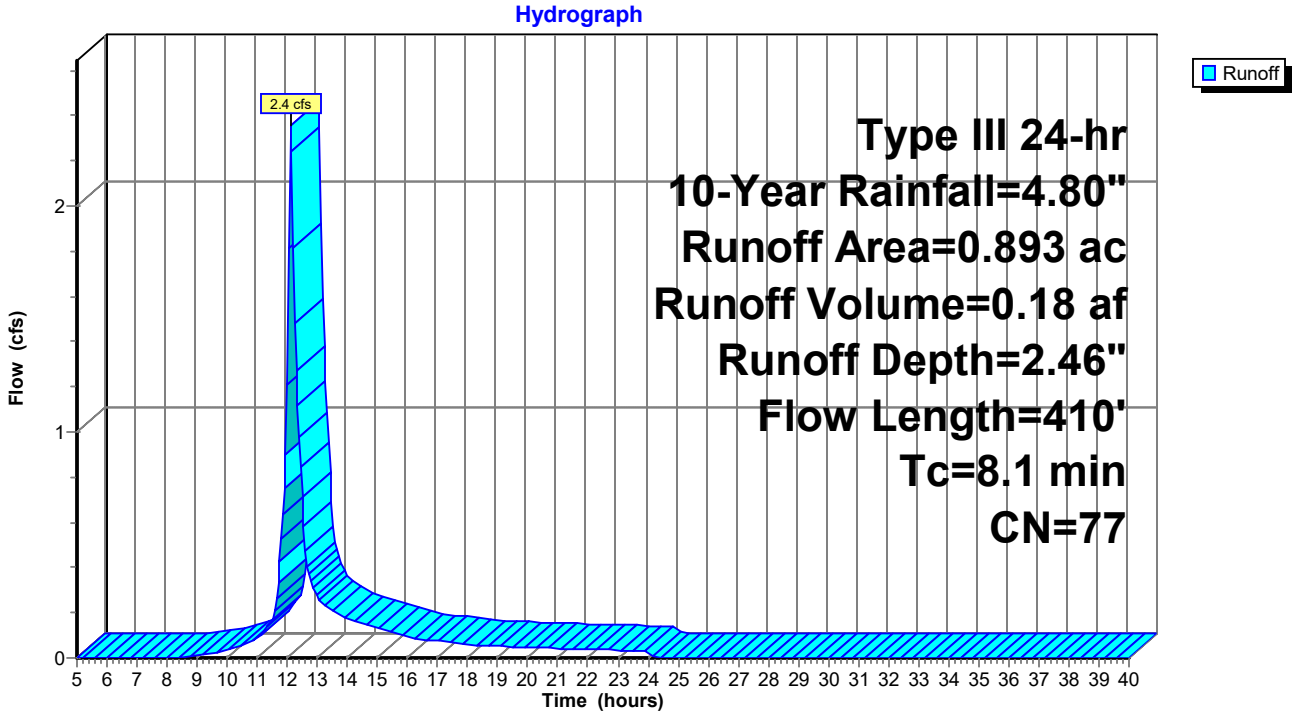
Runoff = 2.4 cfs @ 12.12 hrs, Volume= 0.18 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.833	78	Row crops, straight row, Good, HSG B
0.055	61	>75% Grass cover, Good, HSG B
0.005	89	Row crops, straight row, Good, HSG D
0.893	77	Weighted Average
0.893		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	50	0.0200	0.32		**Sheet Flow, B1** Cultivated: Residue<=20% n= 0.060 P2= 3.40"
0.9	81	0.0250	1.42		**Shallow Concentrated Flow, B2** Cultivated Straight Rows Kv= 9.0 fps
2.0	109	0.0100	0.90		**Shallow Concentrated Flow, B3** Cultivated Straight Rows Kv= 9.0 fps
0.4	37	0.0300	1.56		**Shallow Concentrated Flow, B4** Cultivated Straight Rows Kv= 9.0 fps
2.2	133	0.0200	0.99		**Shallow Concentrated Flow, B5** Short Grass Pasture Kv= 7.0 fps
8.1	410	Total			

Subcatchment 9: DV-B



Summary for Subcatchment 10: DV-D

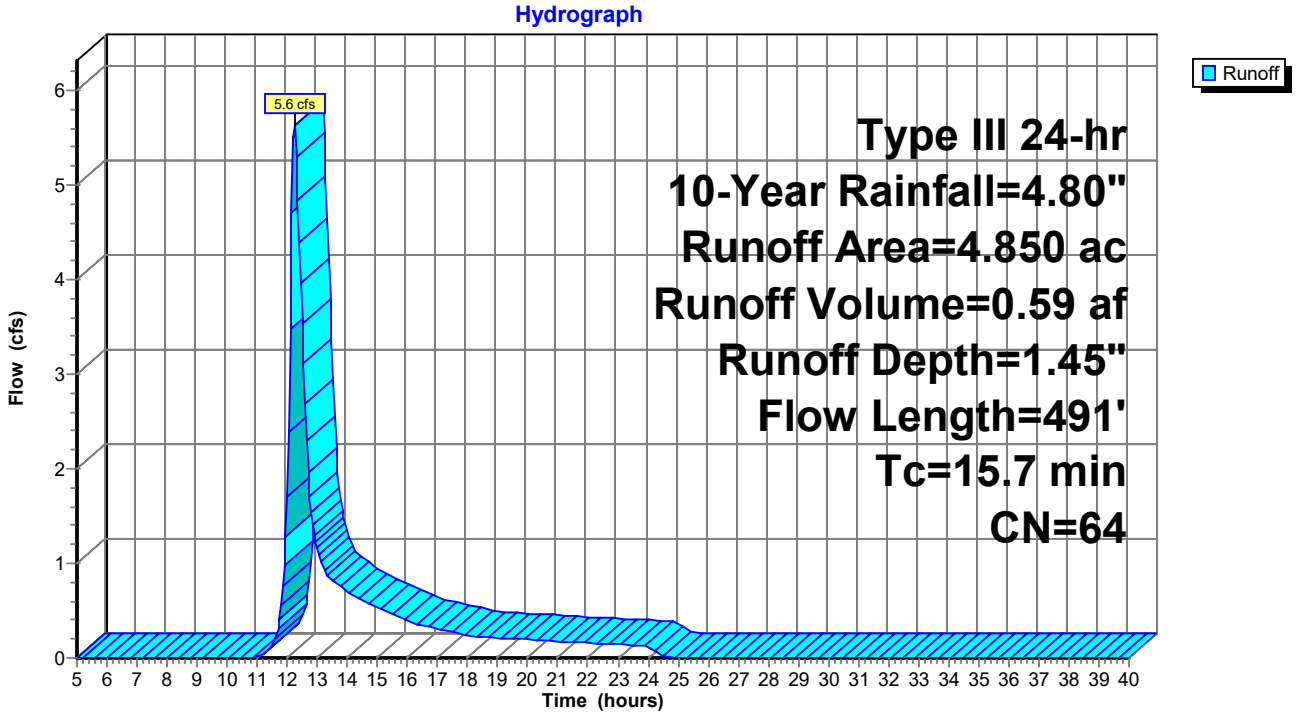
Runoff = 5.6 cfs @ 12.24 hrs, Volume= 0.59 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.056	96	Gravel surface, HSG A
0.757	39	>75% Grass cover, Good, HSG A
0.126	98	Roofs, HSG A
0.272	98	Roofs, HSG C
0.021	98	Roofs, HSG D
0.076	84	50-75% Grass cover, Fair, HSG D
3.542	65	Brush, Good, HSG C
4.850	64	Weighted Average
4.431		91.36% Pervious Area
0.419		8.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, C1** Grass: Dense n= 0.240 P2= 3.40"
1.9	78	0.0100	0.70		**Shallow Concentrated Flow, C2** Short Grass Pasture Kv= 7.0 fps
0.8	39	0.0150	0.86		**Shallow Concentrated Flow, C3** Short Grass Pasture Kv= 7.0 fps
0.9	46	0.0150	0.86		**Shallow Concentrated Flow, C4** Short Grass Pasture Kv= 7.0 fps
1.8	75	0.0100	0.70		**Shallow Concentrated Flow, C5** Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0300	1.21		**Shallow Concentrated Flow, C6** Short Grass Pasture Kv= 7.0 fps
2.2	93	0.0100	0.70		**Shallow Concentrated Flow, C7** Short Grass Pasture Kv= 7.0 fps
0.4	24	0.0400	1.00		**Shallow Concentrated Flow, C8** Woodland Kv= 5.0 fps
1.2	52	0.0200	0.71		**Shallow Concentrated Flow, C9** Woodland Kv= 5.0 fps
15.7	491	Total			

Subcatchment 10: DV-D

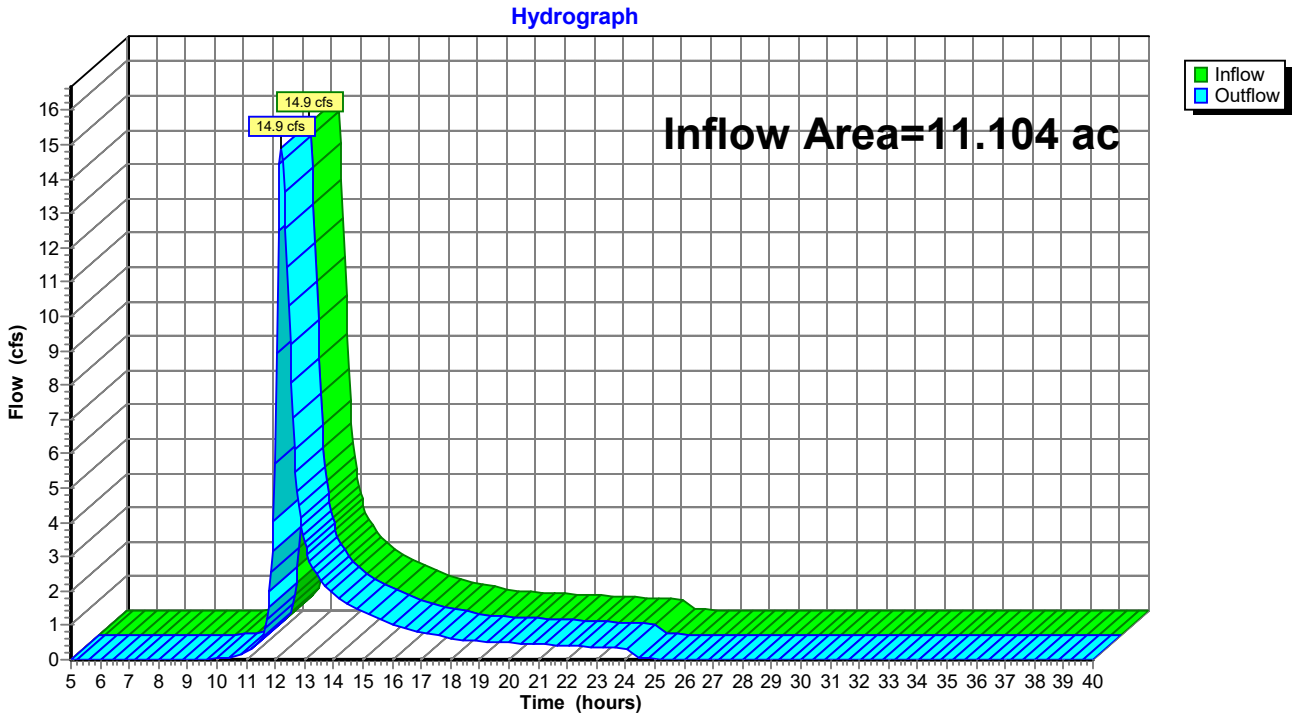


Summary for Reach 11: POSTDEV

Inflow Area = 11.104 ac, 21.82% Impervious, Inflow Depth = 1.77" for 10-Year event
Inflow = 14.9 cfs @ 12.20 hrs, Volume= 1.63 af
Outflow = 14.9 cfs @ 12.20 hrs, Volume= 1.63 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3

Reach 11: POSTDEV



Summary for Subcatchment 12: DV-C

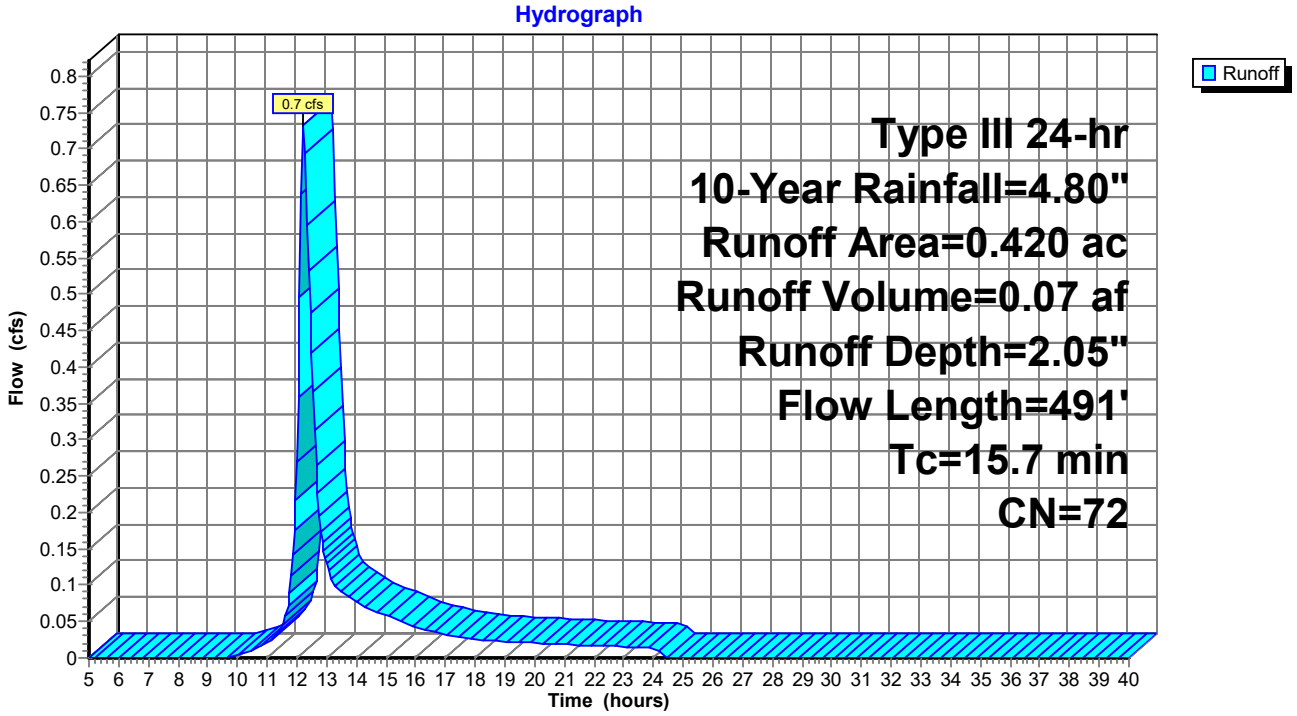
Runoff = 0.7 cfs @ 12.22 hrs, Volume= 0.07 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
0.420	72	Woods/grass comb., Good, HSG C
0.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, C1** Grass: Dense n= 0.240 P2= 3.40"
1.9	78	0.0100	0.70		**Shallow Concentrated Flow, C2** Short Grass Pasture Kv= 7.0 fps
0.8	39	0.0150	0.86		**Shallow Concentrated Flow, C3** Short Grass Pasture Kv= 7.0 fps
0.9	46	0.0150	0.86		**Shallow Concentrated Flow, C4** Short Grass Pasture Kv= 7.0 fps
1.8	75	0.0100	0.70		**Shallow Concentrated Flow, C5** Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0300	1.21		**Shallow Concentrated Flow, C6** Short Grass Pasture Kv= 7.0 fps
2.2	93	0.0100	0.70		**Shallow Concentrated Flow, C7** Short Grass Pasture Kv= 7.0 fps
0.4	24	0.0400	1.00		**Shallow Concentrated Flow, C8** Woodland Kv= 5.0 fps
1.2	52	0.0200	0.71		**Shallow Concentrated Flow, C9** Woodland Kv= 5.0 fps
15.7	491	Total			

Subcatchment 12: DV-C



Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: EX-A Runoff Area=11.104 ac 0.48% Impervious Runoff Depth=2.85"
Flow Length=536' Tc=6.0 min CN=74 Runoff=36.4 cfs 2.64 af

Reach 2: PREDEV Inflow=36.4 cfs 2.64 af
Outflow=36.4 cfs 2.64 af

Subcatchment 3: CB1 Runoff Area=0.400 ac 81.50% Impervious Runoff Depth>4.35"
Flow Length=350' Tc=6.0 min CN=89 Runoff=1.9 cfs 0.14 af

Pond 3A: CB1 Peak Elev=71.94' Inflow=1.9 cfs 0.14 af
Outflow=1.9 cfs 0.14 af

Subcatchment 4: CB2 Runoff Area=0.245 ac 75.51% Impervious Runoff Depth>4.14"
Flow Length=308' Tc=7.2 min CN=87 Runoff=1.1 cfs 0.08 af

Pond 4A: CB2 Peak Elev=71.93' Inflow=3.0 cfs 0.23 af
Outflow=3.0 cfs 0.23 af

Subcatchment 5: BASIN1 Runoff Area=0.223 ac 54.71% Impervious Runoff Depth>4.45"
Tc=6.0 min CN=90 Runoff=1.1 cfs 0.08 af

Pond 5A: SF1A Peak Elev=0.00' Storage=0 cf
Primary=0.0 cfs 0.00 af

Pond 5B: BASIN1 Peak Elev=67.39' Storage=4,173 cf Inflow=4.1 cfs 0.31 af
Outflow=1.8 cfs 0.29 af

Subcatchment 6: CB3 Runoff Area=0.790 ac 79.87% Impervious Runoff Depth>4.14"
Flow Length=360' Tc=8.1 min CN=87 Runoff=3.4 cfs 0.27 af

Pond 6A: CB3 Peak Elev=71.18' Inflow=3.4 cfs 0.27 af
Outflow=3.4 cfs 0.27 af

Pond 6B: DMH1 Peak Elev=67.80' Inflow=3.4 cfs 0.27 af
15.0" Round Culvert n=0.013 L=183.0' S=0.0050 '/' Outflow=3.4 cfs 0.27 af

Subcatchment 7: BASIN2 Runoff Area=0.490 ac 35.92% Impervious Runoff Depth=3.72"
Flow Length=82' Tc=6.4 min CN=83 Runoff=2.1 cfs 0.15 af

Pond 7A: SF2A Peak Elev=0.00' Storage=0 cf
Primary=0.0 cfs 0.00 af

Pond 7B: BASIN2A Peak Elev=66.61' Storage=3,429 cf Inflow=5.5 cfs 0.42 af
Outflow=5.2 cfs 0.36 af

Pond 7C: BASIN2B Peak Elev=64.81' Storage=2,617 cf Inflow=5.2 cfs 0.36 af
Discarded=0.0 cfs 0.02 af Primary=3.9 cfs 0.34 af Outflow=3.9 cfs 0.36 af

Subcatchment 8: DV-A Runoff Area=2.793 ac 20.19% Impervious Runoff Depth=1.74"
Flow Length=453' Tc=6.5 min CN=61 Runoff=5.2 cfs 0.41 af

Pond 8A: CBA Peak Elev=70.25' Inflow=5.2 cfs 0.41 af
Outflow=5.2 cfs 0.41 af

Subcatchment 9: DV-B Runoff Area=0.893 ac 0.00% Impervious Runoff Depth=3.13"
Flow Length=410' Tc=8.1 min CN=77 Runoff=3.0 cfs 0.23 af

Subcatchment 10: DV-D Runoff Area=4.850 ac 8.64% Impervious Runoff Depth=1.98"
Flow Length=491' Tc=15.7 min CN=64 Runoff=8.0 cfs 0.80 af

Reach 11: POSTDEV Inflow=20.3 cfs 2.17 af
Outflow=20.3 cfs 2.17 af

Subcatchment 12: DV-C Runoff Area=0.420 ac 0.00% Impervious Runoff Depth=2.67"
Flow Length=491' Tc=15.7 min CN=72 Runoff=1.0 cfs 0.09 af

Summary for Subcatchment 1: EX-A

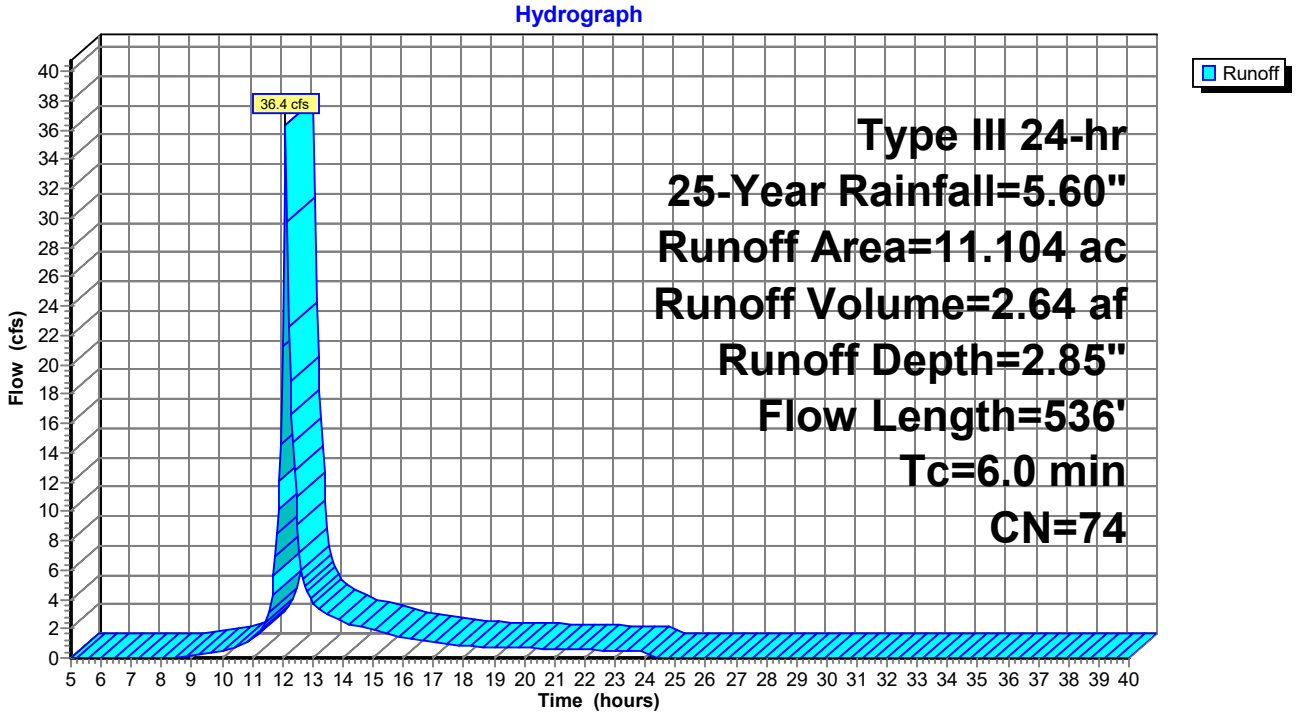
Runoff = 36.4 cfs @ 12.09 hrs, Volume= 2.64 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.051	96	Gravel surface, HSG A
1.249	67	Row crops, straight row, Good, HSG A
0.503	39	>75% Grass cover, Good, HSG A
0.130	30	Woods, Good, HSG A
0.053	98	Roofs, HSG B
0.352	96	Gravel surface, HSG B
2.127	78	Row crops, straight row, Good, HSG B
0.013	61	>75% Grass cover, Good, HSG B
1.656	85	Row crops, straight row, Good, HSG C
2.693	74	>75% Grass cover, Good, HSG C
0.701	70	Woods, Good, HSG C
0.023	96	Gravel surface, HSG D
1.099	89	Row crops, straight row, Good, HSG D
0.005	77	Woods, Good, HSG D
0.449	39	>75% Grass cover, Good, HSG A
11.104	74	Weighted Average
11.051		99.52% Pervious Area
0.053		0.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, X1** Smooth surfaces n= 0.011 P2= 3.40"
1.0	95	0.0100	1.61		**Shallow Concentrated Flow, X2** Unpaved Kv= 16.1 fps
0.8	77	0.0300	1.56		**Shallow Concentrated Flow, X3** Cultivated Straight Rows Kv= 9.0 fps
1.1	87	0.0200	1.27		**Shallow Concentrated Flow, X4** Cultivated Straight Rows Kv= 9.0 fps
0.9	46	0.0100	0.90		**Shallow Concentrated Flow, X5** Cultivated Straight Rows Kv= 9.0 fps
0.8	58	0.0200	1.27		**Shallow Concentrated Flow, X6** Cultivated Straight Rows Kv= 9.0 fps
0.4	123	0.0100	4.62	12.01	**Channel Flow, X7** Area= 2.6 sf Perim= 4.6' r= 0.57' n= 0.022 Earth, clean & straight
5.9	536	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1: EX-A

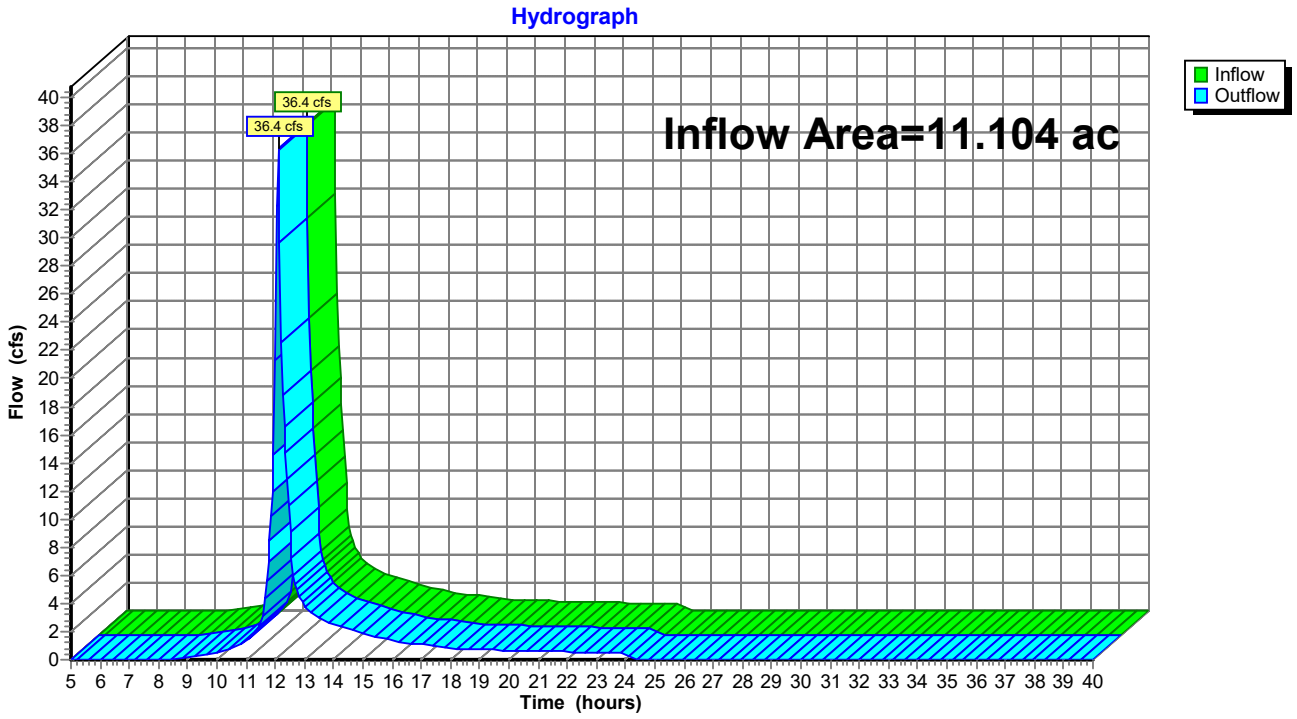


Summary for Reach 2: PREDEV

Inflow Area = 11.104 ac, 0.48% Impervious, Inflow Depth = 2.85" for 25-Year event
Inflow = 36.4 cfs @ 12.09 hrs, Volume= 2.64 af
Outflow = 36.4 cfs @ 12.09 hrs, Volume= 2.64 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3

Reach 2: PREDEV



Summary for Subcatchment 3: CB1

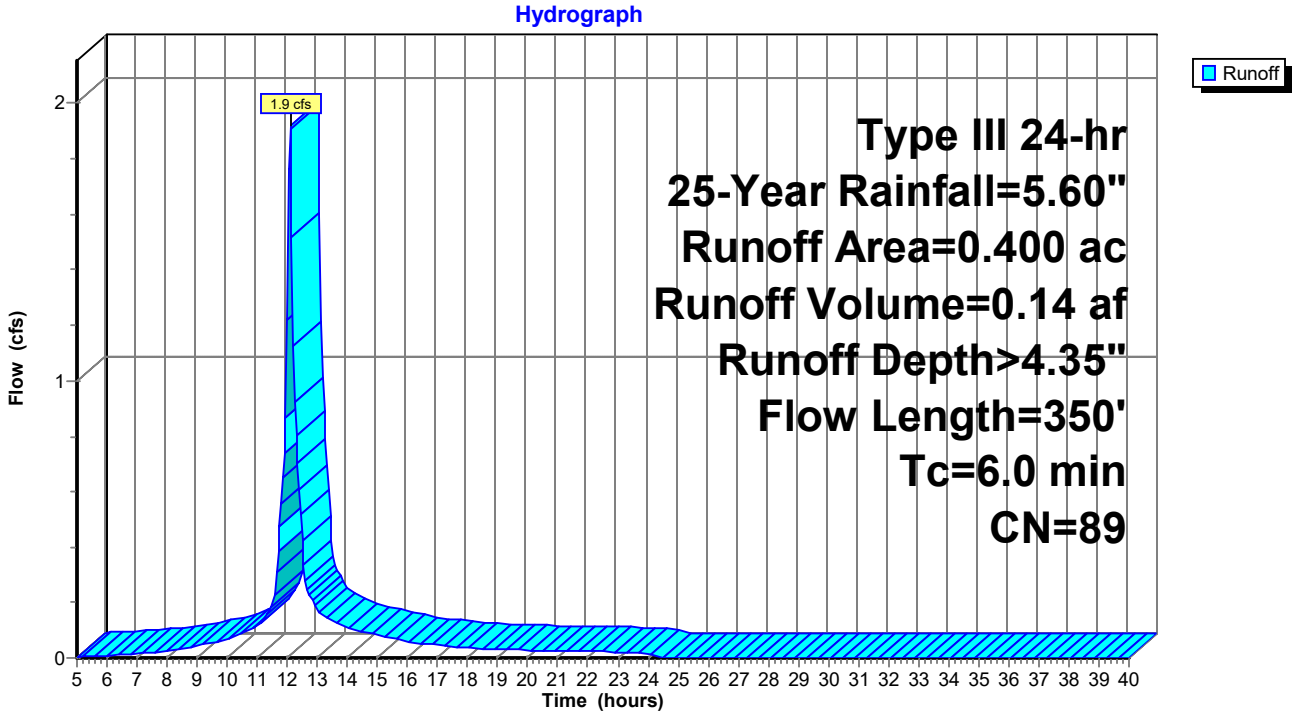
Runoff = 1.9 cfs @ 12.09 hrs, Volume= 0.14 af, Depth> 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.122	98	Paved parking, HSG A
0.004	61	>75% Grass cover, Good, HSG B
0.012	80	>75% Grass cover, Good, HSG D
0.008	74	>75% Grass cover, Good, HSG C
0.050	39	>75% Grass cover, Good, HSG A
0.067	98	Paved parking, HSG B
0.039	98	Paved parking, HSG C
0.098	98	Paved parking, HSG D
0.400	89	Weighted Average
0.074		18.50% Pervious Area
0.326		81.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	39	0.0200	1.17		**Sheet Flow, 1a** Smooth surfaces n= 0.011 P2= 3.40"
2.6	311	0.0100	2.03		**Shallow Concentrated Flow, 1c** Paved Kv= 20.3 fps
3.2	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3: CB1



Summary for Pond 3A: CB1

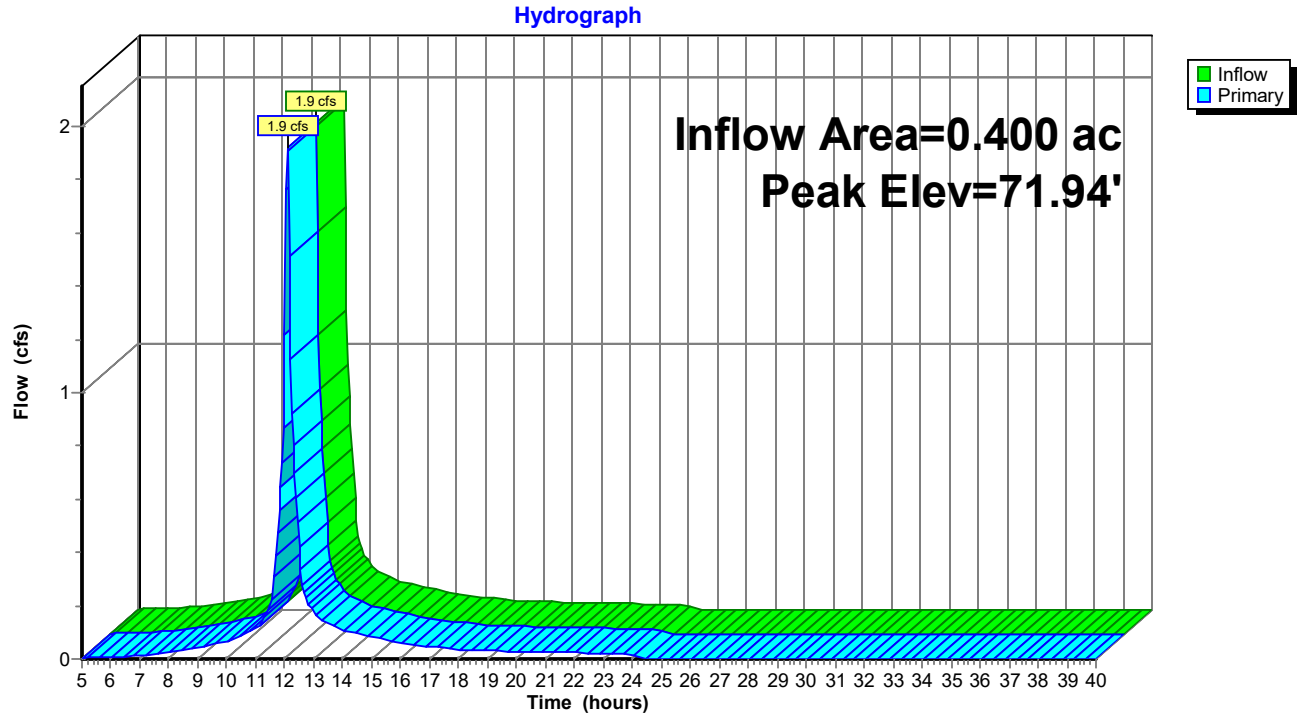
Inflow Area = 0.400 ac, 81.50% Impervious, Inflow Depth > 4.35" for 25-Year event
Inflow = 1.9 cfs @ 12.09 hrs, Volume= 0.14 af
Outflow = 1.9 cfs @ 12.09 hrs, Volume= 0.14 af, Atten= 0%, Lag= 0.0 min
Primary = 1.9 cfs @ 12.09 hrs, Volume= 0.14 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.94' @ 12.09 hrs
Flood Elev= 71.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 12.00 columns** X 12 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.70'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 2	67.70'	**12.0" Round Culvert** L= 18.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.70' / 67.34' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=1.9 cfs @ 12.09 hrs HW=71.93' TW=71.92' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 1.7 cfs @ 0.42 fps)
- **2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 0.42 fps)
  - **3=Culvert** (Passes 0.2 cfs of 0.3 cfs potential flow)

Pond 3A: CB1



Summary for Subcatchment 4: CB2

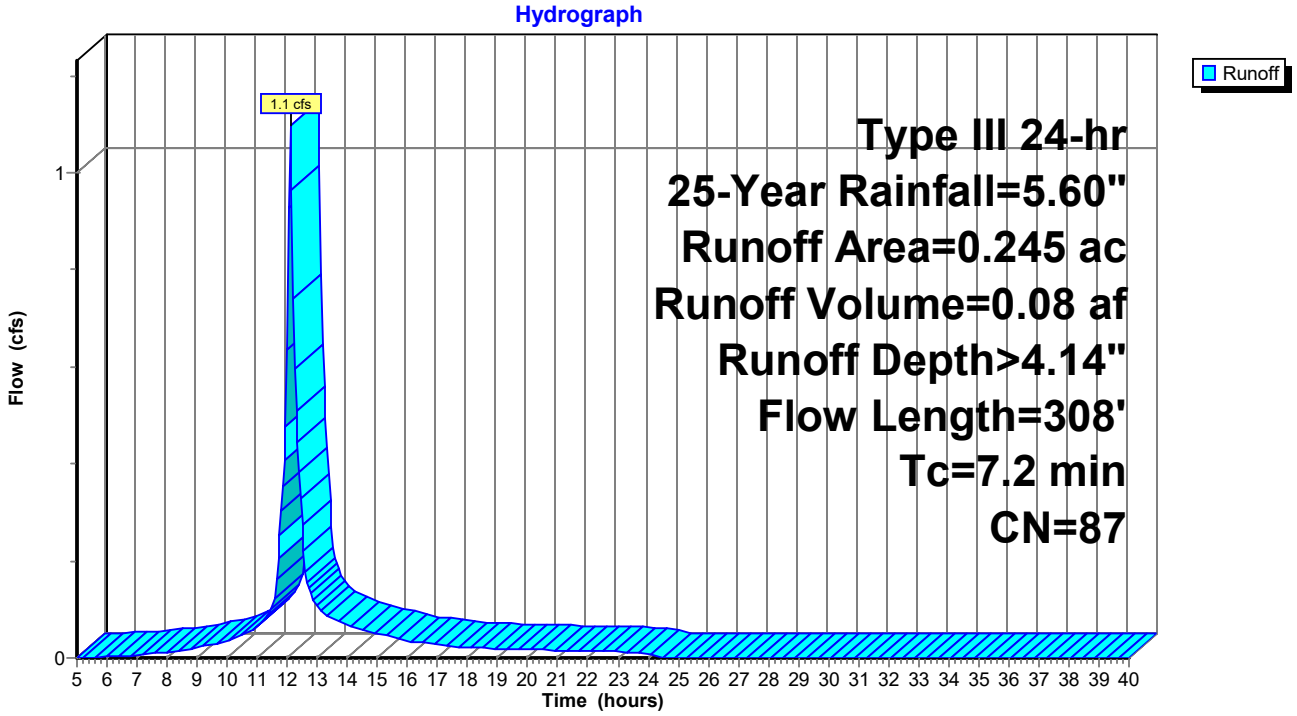
Runoff = 1.1 cfs @ 12.10 hrs, Volume= 0.08 af, Depth> 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.025	98	Paved roads w/curbs & sewers, HSG A
0.008	98	Paved parking, HSG A
0.035	39	>75% Grass cover, Good, HSG A
0.059	98	Paved roads w/curbs & sewers, HSG B
0.033	98	Paved roads w/curbs & sewers, HSG C
0.005	98	Paved parking, HSG C
0.025	74	>75% Grass cover, Good, HSG C
0.055	98	Paved roads w/curbs & sewers, HSG D
0.245	87	Weighted Average
0.060		24.49% Pervious Area
0.185		75.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	26	0.0200	0.09		**Sheet Flow, 2a** Grass: Dense n= 0.240 P2= 3.40"
0.3	15	0.0200	0.97		**Sheet Flow, 2b** Smooth surfaces n= 0.011 P2= 3.40"
2.2	267	0.0100	2.03		**Shallow Concentrated Flow, 2c** Paved Kv= 20.3 fps
7.2	308	Total			

Subcatchment 4: CB2



Summary for Pond 4A: CB2

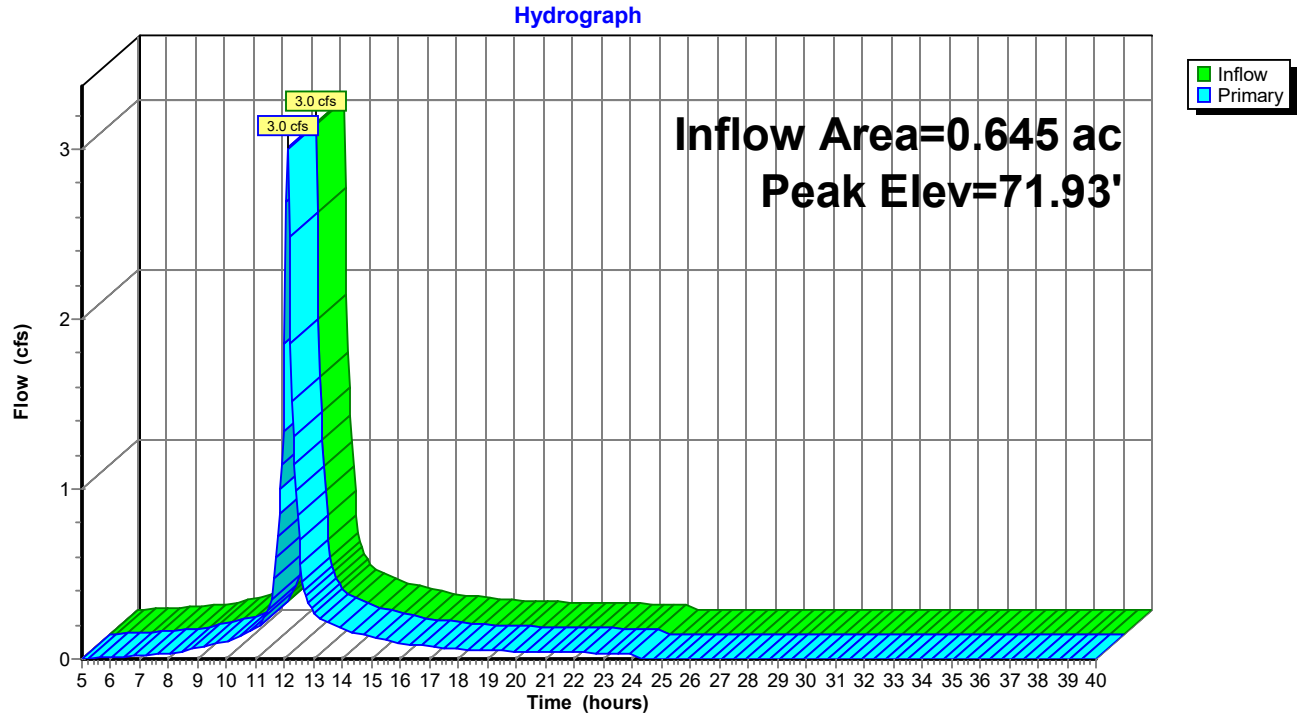
Inflow Area = 0.645 ac, 79.22% Impervious, Inflow Depth > 4.27" for 25-Year event
Inflow = 3.0 cfs @ 12.09 hrs, Volume= 0.23 af
Outflow = 3.0 cfs @ 12.09 hrs, Volume= 0.23 af, Atten= 0%, Lag= 0.0 min
Primary = 3.0 cfs @ 12.09 hrs, Volume= 0.23 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.93' @ 12.09 hrs
Flood Elev= 71.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.70'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 2	67.24'	**15.0" Round Culvert** L= 18.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.24' / 67.06' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=3.0 cfs @ 12.09 hrs HW=71.92' TW=67.16' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 2.3 cfs @ 2.28 fps)
- **2=Orifice/Grate** (Orifice Controls 0.7 cfs @ 1.52 fps)
  - **3=Culvert** (Passes 0.7 cfs of 2.2 cfs potential flow)

Pond 4A: CB2



Summary for Subcatchment 5: BASIN1

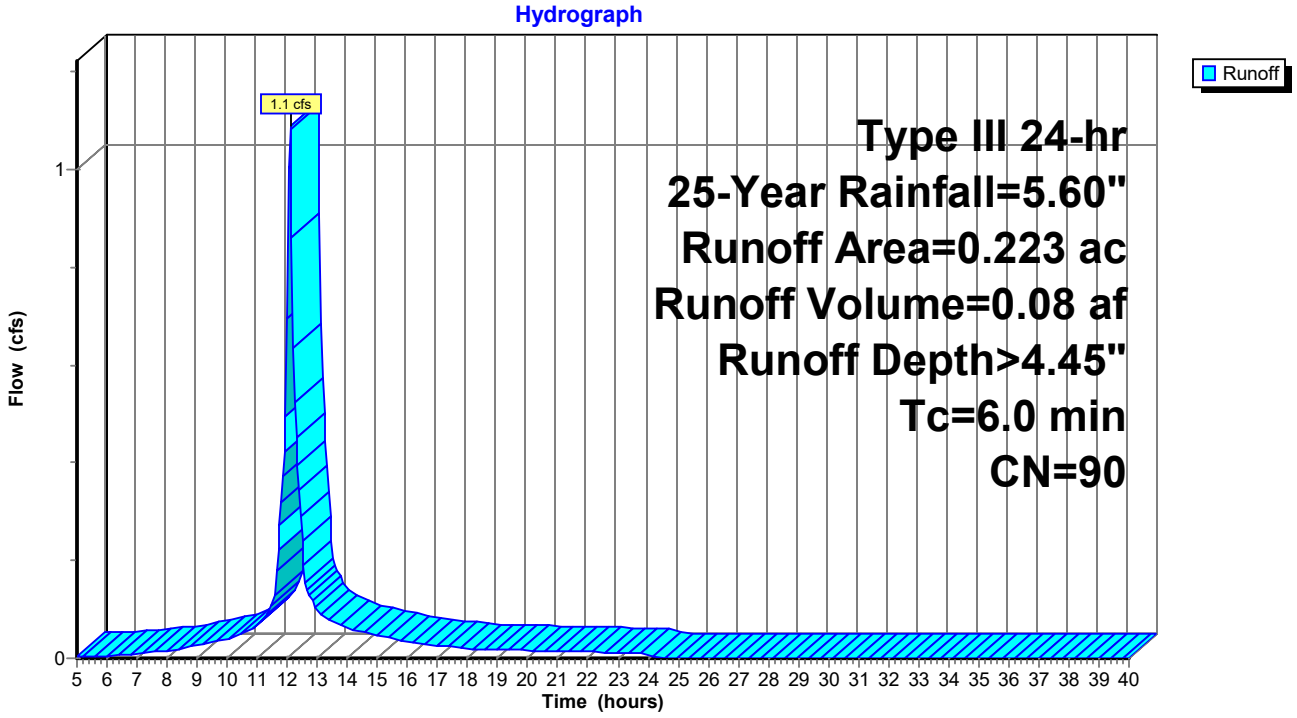
Runoff = 1.1 cfs @ 12.09 hrs, Volume= 0.08 af, Depth> 4.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.122	98	Water Surface, HSG D
0.101	80	>75% Grass cover, Good, HSG D
0.223	90	Weighted Average
0.101		45.29% Pervious Area
0.122		54.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, B1-A**

Subcatchment 5: BASIN1



Summary for Pond 5A: SF1A

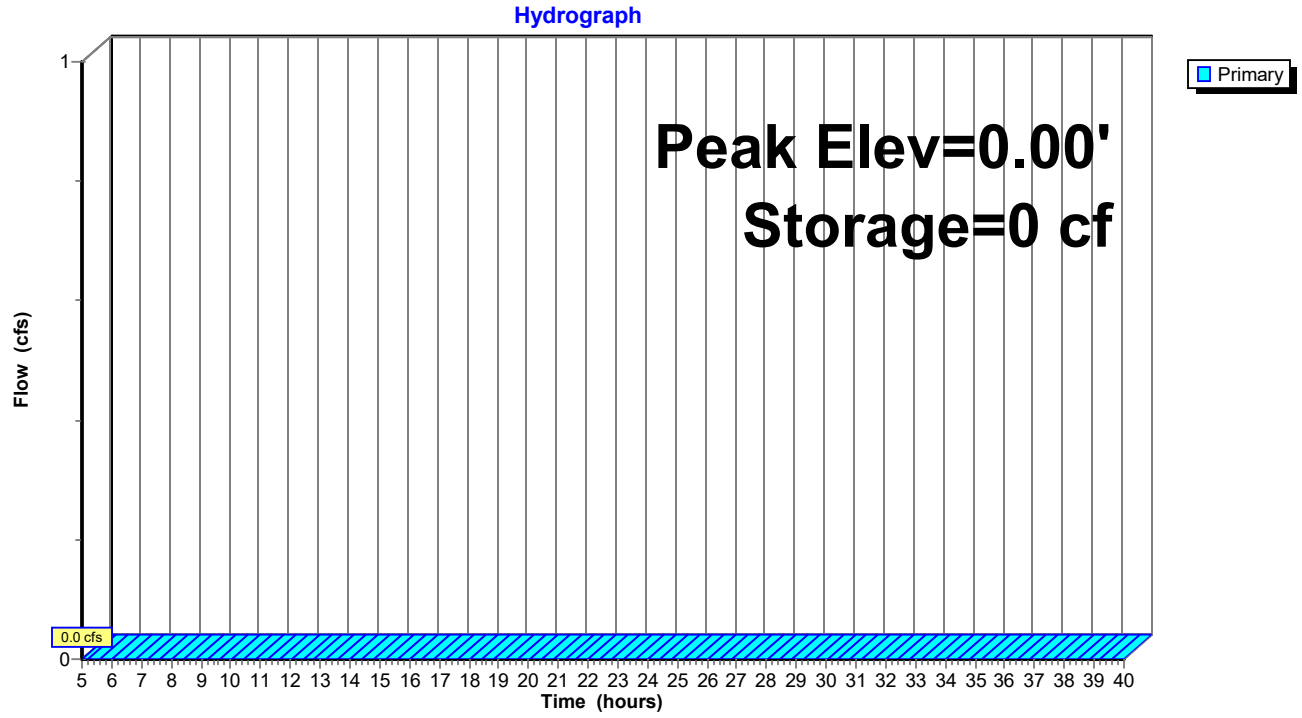
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	1,207 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	504	0	0
67.00	907	706	706
67.50	1,097	501	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5A: SF1A



Summary for Pond 5B: BASIN1

Inflow Area = 0.868 ac, 72.93% Impervious, Inflow Depth > 4.31" for 25-Year event
Inflow = 4.1 cfs @ 12.09 hrs, Volume= 0.31 af
Outflow = 1.8 cfs @ 12.30 hrs, Volume= 0.29 af, Atten= 56%, Lag= 12.2 min
Primary = 1.8 cfs @ 12.30 hrs, Volume= 0.29 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 67.39' @ 12.30 hrs Surf.Area= 3,453 sf Storage= 4,173 cf
Flood Elev= 68.50' Surf.Area= 6,300 sf Storage= 9,880 cf

Plug-Flow detention time= 91.7 min calculated for 0.29 af (94% of inflow)
Center-of-Mass det. time= 60.5 min (852.5 - 792.0)

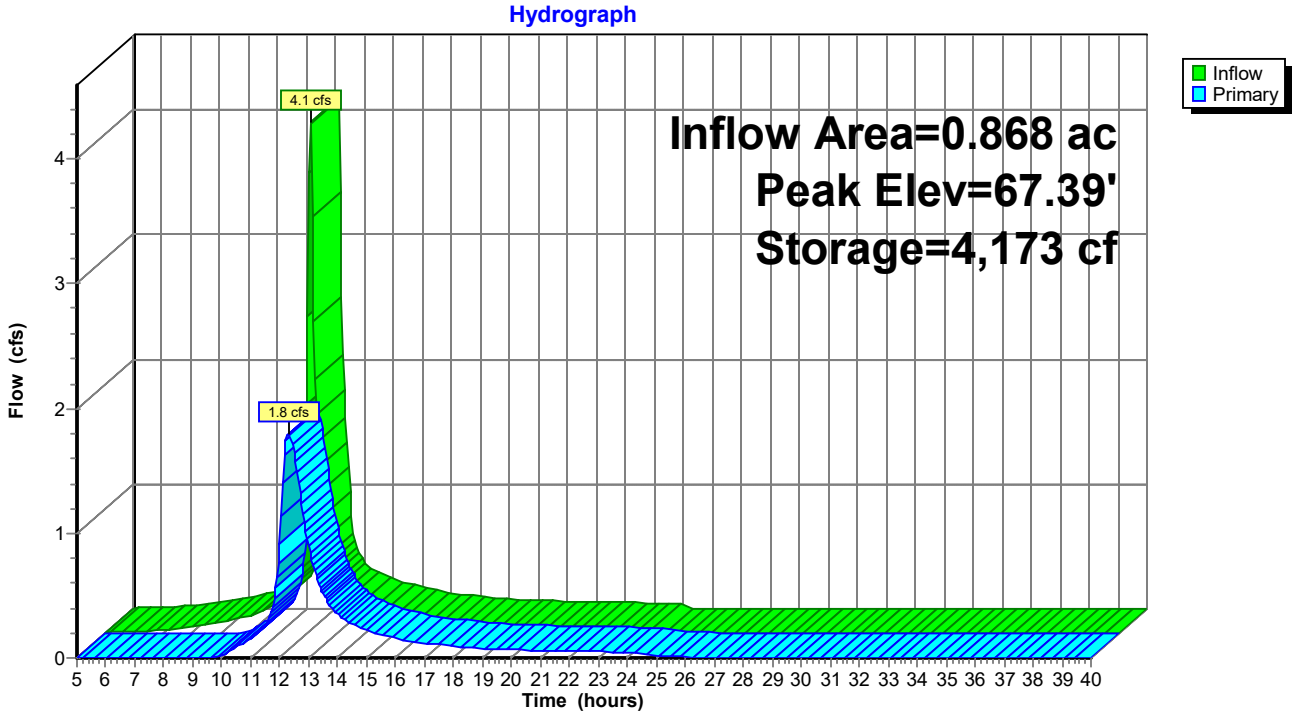
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	9,880 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	2,547	0	0
67.00	3,190	2,869	2,869
67.50	3,525	1,679	4,547
68.00	5,752	2,319	6,867
68.50	6,300	3,013	9,880

Device	Routing	Invert	Outlet Devices
#1	Primary	66.30'	**0.7' long x 1.20' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	67.50'	**8.0' long x 0.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.8 cfs @ 12.30 hrs HW=67.39' TW=0.00' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Weir Controls 1.8 cfs @ 3.42 fps)
2=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5B: BASIN1



Summary for Subcatchment 6: CB3

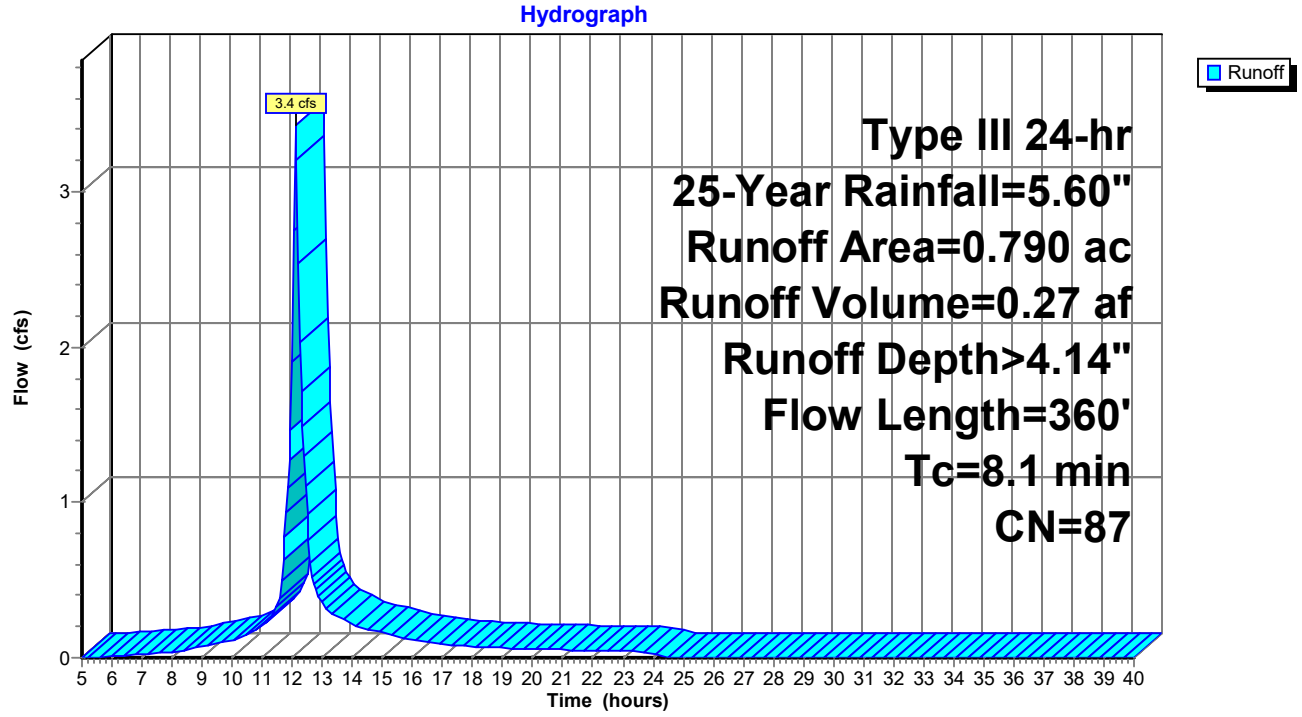
Runoff = 3.4 cfs @ 12.11 hrs, Volume= 0.27 af, Depth> 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.631	98	Paved roads w/curbs & sewers, HSG A
0.130	39	>75% Grass cover, Good, HSG A
0.029	74	>75% Grass cover, Good, HSG C
0.790	87	Weighted Average
0.159		20.13% Pervious Area
0.631		79.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0200	0.09		**Sheet Flow, 3a** Grass: Dense n= 0.240 P2= 3.40"
0.2	14	0.0200	0.96		**Sheet Flow, 3b** Smooth surfaces n= 0.011 P2= 3.40"
2.6	316	0.0100	2.03		**Shallow Concentrated Flow, 3c** Paved Kv= 20.3 fps
8.1	360	Total			

Subcatchment 6: CB3



Summary for Pond 6A: CB3

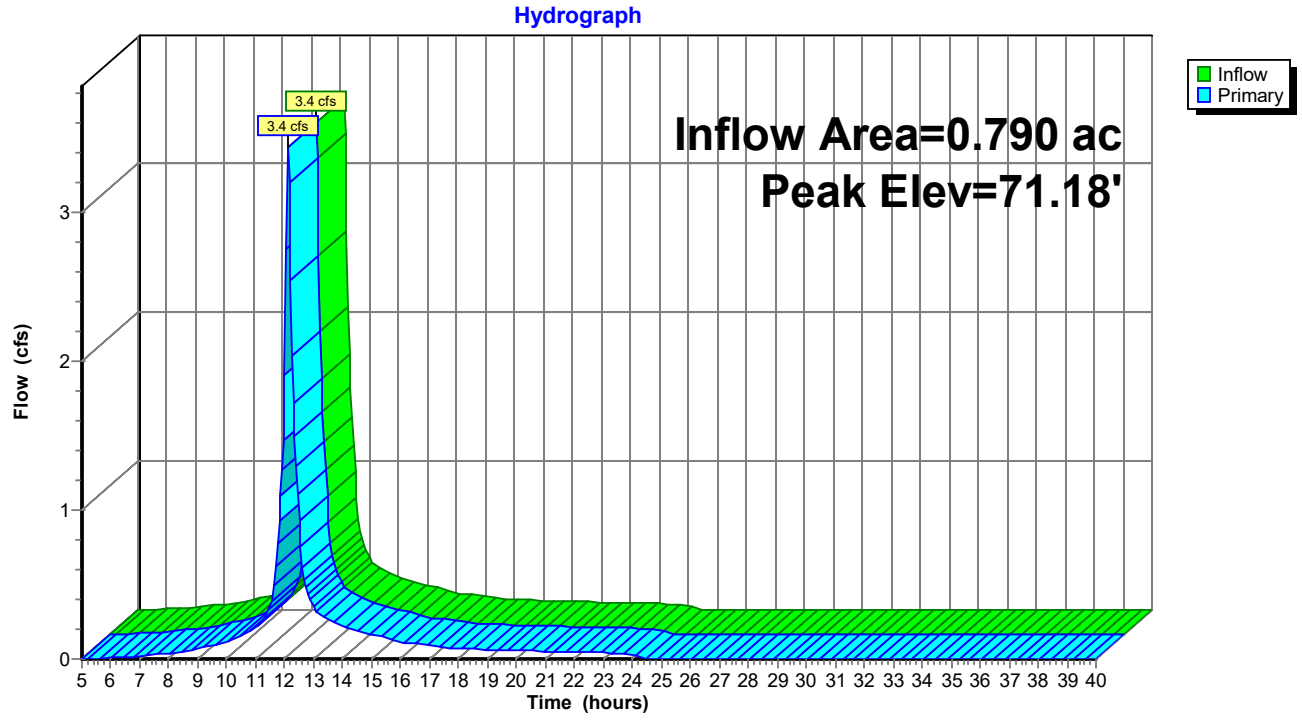
Inflow Area = 0.790 ac, 79.87% Impervious, Inflow Depth > 4.14" for 25-Year event
Inflow = 3.4 cfs @ 12.11 hrs, Volume= 0.27 af
Outflow = 3.4 cfs @ 12.11 hrs, Volume= 0.27 af, Atten= 0%, Lag= 0.0 min
Primary = 3.4 cfs @ 12.11 hrs, Volume= 0.27 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.18' @ 12.11 hrs
Flood Elev= 71.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 12.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.00'	**48.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	67.25'	**15.0" Round Culvert** L= 57.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 67.25' / 66.68' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=3.4 cfs @ 12.11 hrs HW=71.17' TW=67.78' (Dynamic Tailwater)
- **1=Orifice/Grate** (Passes 2.4 cfs of 4.0 cfs potential flow)
  - **3=Culvert** (Outlet Controls 2.4 cfs @ 1.98 fps)
- **2=Orifice/Grate** (Orifice Controls 0.9 cfs @ 1.33 fps)

Pond 6A: CB3



Summary for Pond 6B: DMH1

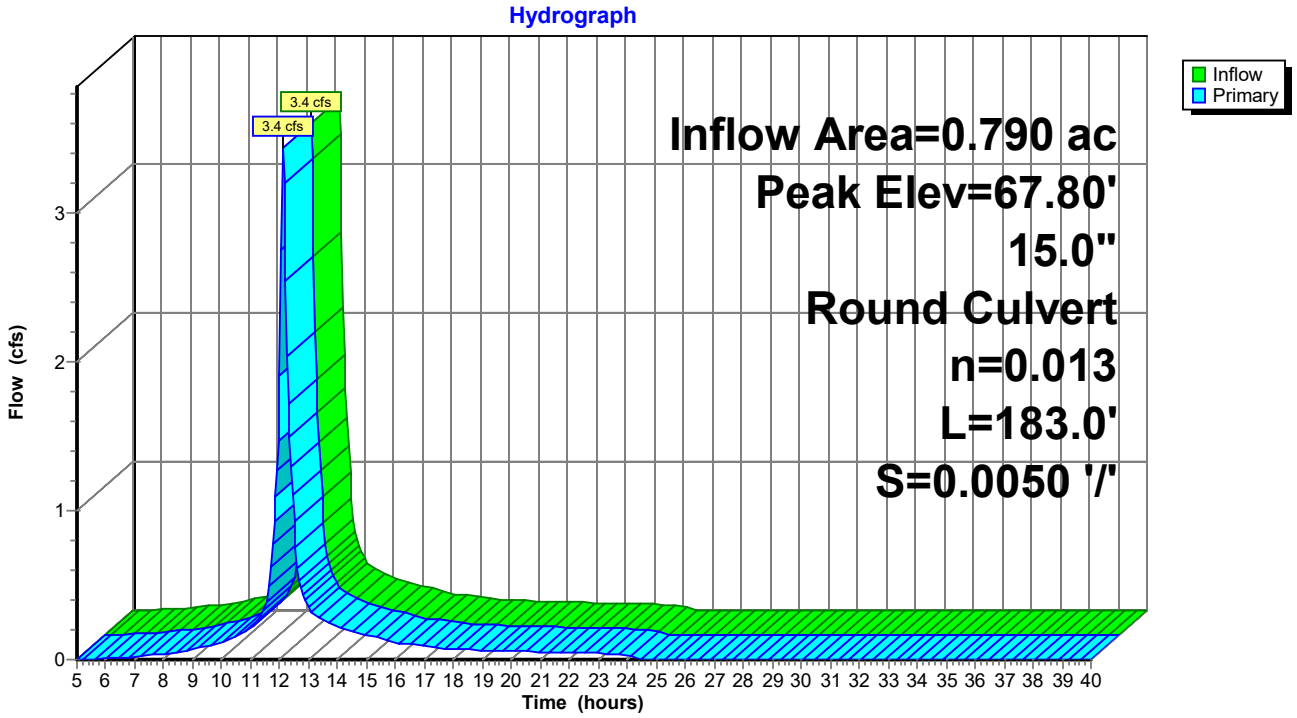
Inflow Area = 0.790 ac, 79.87% Impervious, Inflow Depth > 4.14" for 25-Year event
Inflow = 3.4 cfs @ 12.11 hrs, Volume= 0.27 af
Outflow = 3.4 cfs @ 12.11 hrs, Volume= 0.27 af, Atten= 0%, Lag= 0.0 min
Primary = 3.4 cfs @ 12.11 hrs, Volume= 0.27 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 67.80' @ 12.11 hrs
Flood Elev= 71.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	66.68'	**15.0" Round Culvert** L= 183.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 66.68' / 65.76' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=3.4 cfs @ 12.11 hrs HW=67.78' TW=66.60' (Dynamic Tailwater)
1=Culvert (Outlet Controls 3.4 cfs @ 3.90 fps)

Pond 6B: DMH1



Summary for Subcatchment 7: BASIN2

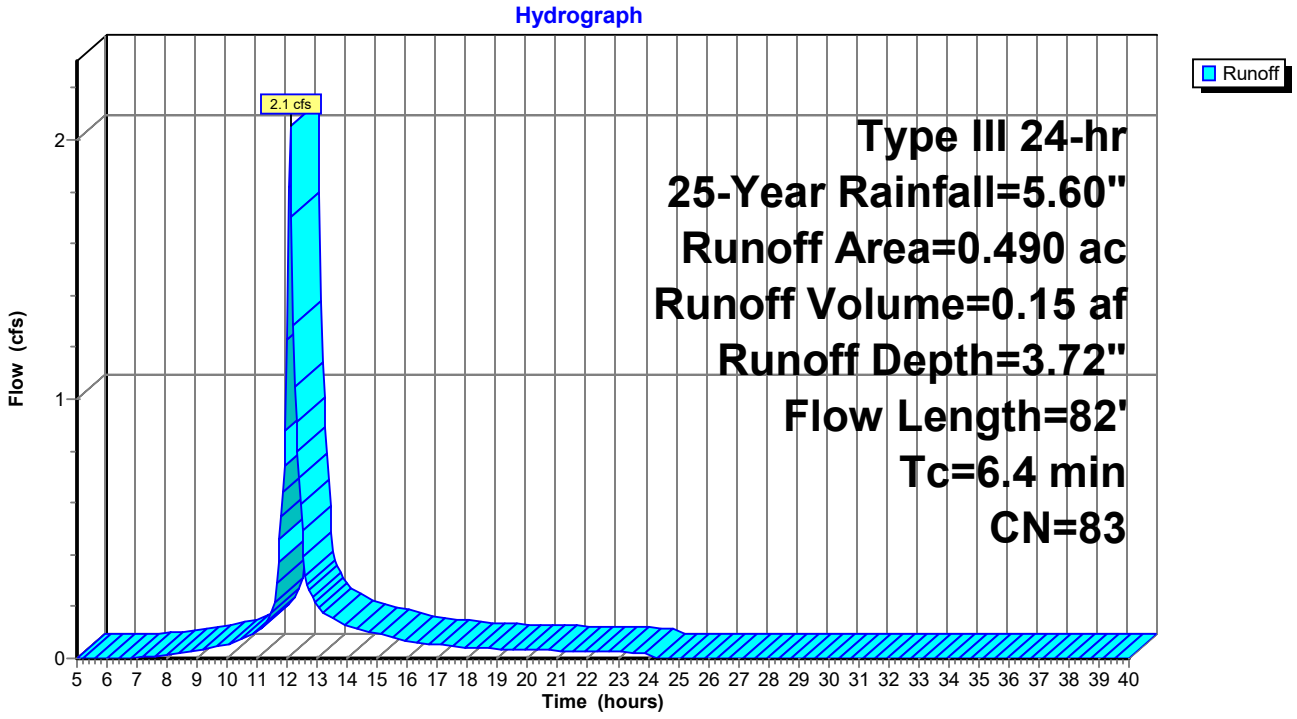
Runoff = 2.1 cfs @ 12.10 hrs, Volume= 0.15 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.314	74	>75% Grass cover, Good, HSG C
0.176	98	Water Surface, HSG C
0.490	83	Weighted Average
0.314		64.08% Pervious Area
0.176		35.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, B2a** Grass: Dense n= 0.240 P2= 3.40"
0.4	32	0.0300	1.21		**Shallow Concentrated Flow, B2b** Short Grass Pasture Kv= 7.0 fps
6.4	82	Total			

Subcatchment 7: BASIN2



Summary for Pond 7A: SF2A

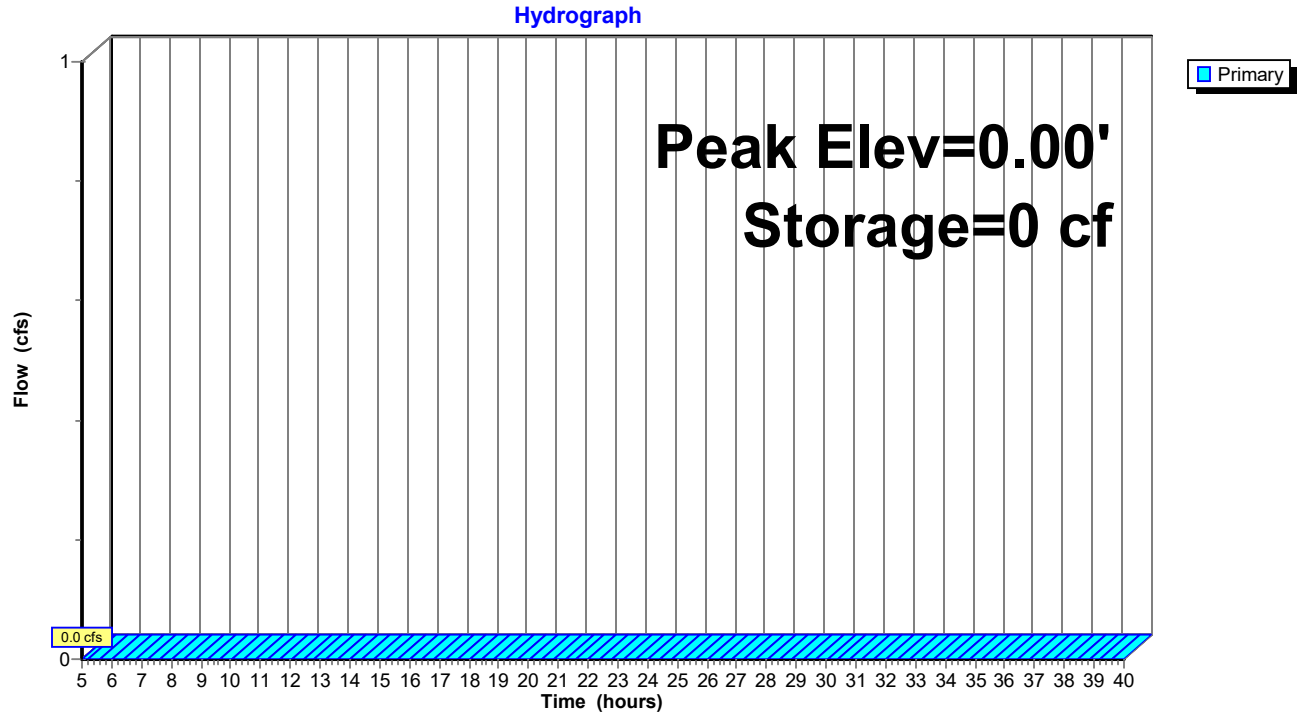
Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	2,916 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	954	0	0
66.00	1,448	1,201	1,201
67.00	1,982	1,715	2,916

Device	Routing	Invert	Outlet Devices
#1	Primary	63.50'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 7A: SF2A



Summary for Pond 7B: BASIN2A

Inflow Area = 1.280 ac, 63.05% Impervious, Inflow Depth > 3.98" for 25-Year event
Inflow = 5.5 cfs @ 12.11 hrs, Volume= 0.42 af
Outflow = 5.2 cfs @ 12.14 hrs, Volume= 0.36 af, Atten= 5%, Lag= 2.0 min
Primary = 5.2 cfs @ 12.14 hrs, Volume= 0.36 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 66.61' @ 12.14 hrs Surf.Area= 2,725 sf Storage= 3,429 cf
Flood Elev= 67.50' Surf.Area= 3,422 sf Storage= 6,152 cf

Plug-Flow detention time= 99.5 min calculated for 0.36 af (86% of inflow)
Center-of-Mass det. time= 37.2 min (839.9 - 802.7)

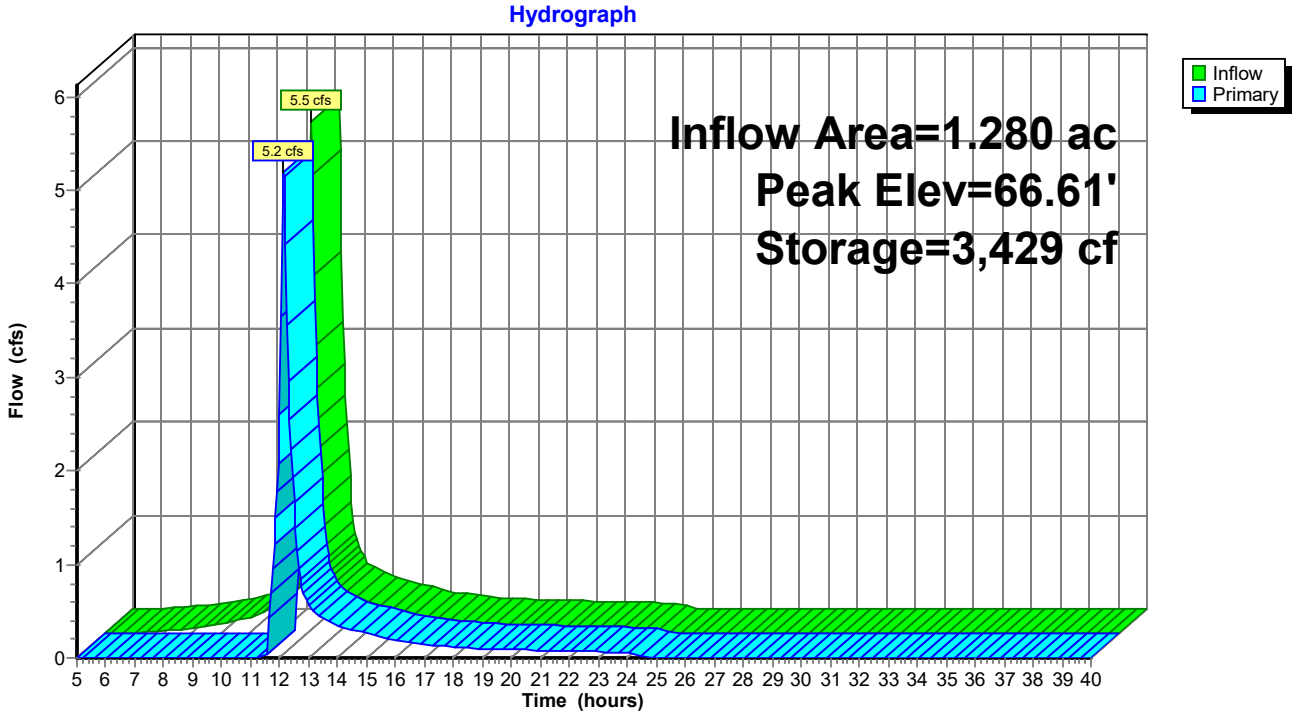
Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	6,152 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	1,548	0	0
66.00	2,257	1,903	1,903
67.00	3,020	2,639	4,541
67.50	3,422	1,611	6,152

Device	Routing	Invert	Outlet Devices
#1	Primary	66.30'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=5.1 cfs @ 12.14 hrs HW=66.61' TW=64.68' (Dynamic Tailwater)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 5.1 cfs @ 1.37 fps)

Pond 7B: BASIN2A



Summary for Pond 7C: BASIN2B

Inflow Area = 1.280 ac, 63.05% Impervious, Inflow Depth = 3.41" for 25-Year event
Inflow = 5.2 cfs @ 12.14 hrs, Volume= 0.36 af
Outflow = 3.9 cfs @ 12.23 hrs, Volume= 0.36 af, Atten= 25%, Lag= 5.8 min
Discarded = 0.0 cfs @ 12.24 hrs, Volume= 0.02 af
Primary = 3.9 cfs @ 12.23 hrs, Volume= 0.34 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 64.81' @ 12.24 hrs Surf.Area= 2,537 sf Storage= 2,617 cf
Flood Elev= 65.60' Surf.Area= 3,235 sf Storage= 4,892 cf

Plug-Flow detention time= 43.0 min calculated for 0.36 af (100% of inflow)
Center-of-Mass det. time= 43.8 min (883.8 - 839.9)

Volume	Invert	Avail.Storage	Storage Description
#1	63.50'	6,649 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

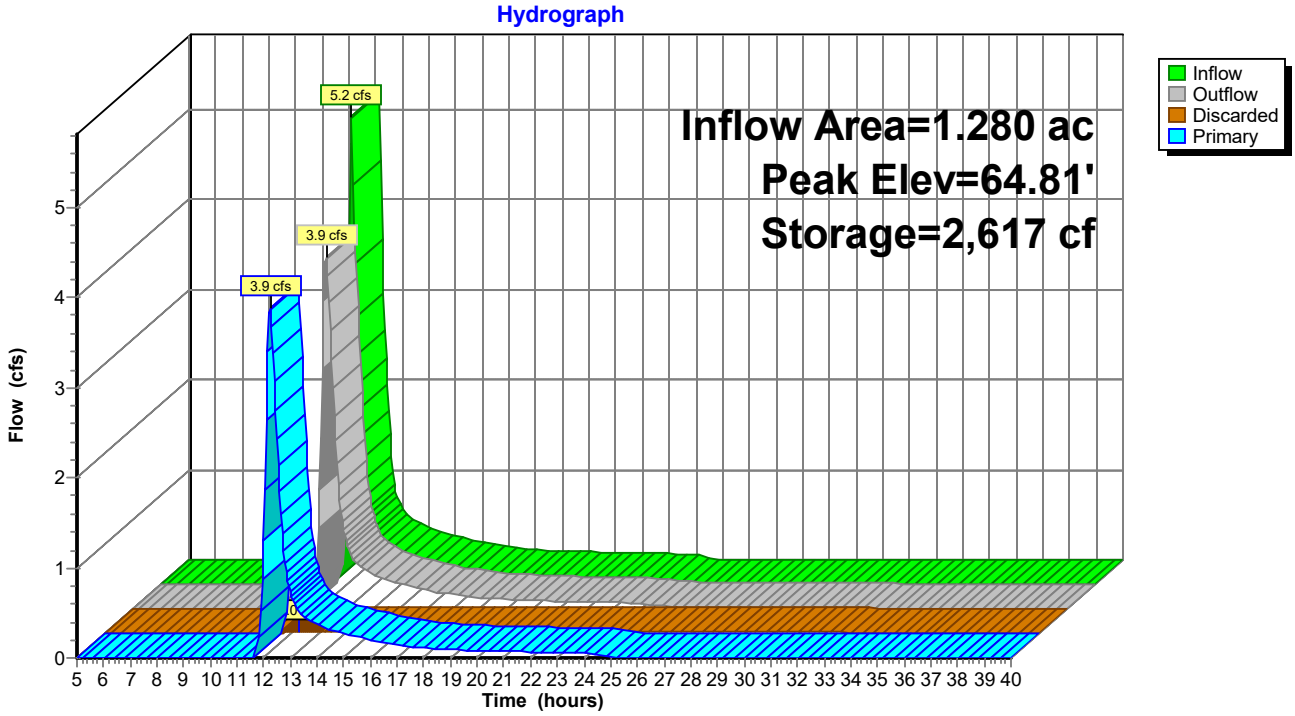
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
63.50	1,477	0	0
64.00	1,862	835	835
65.00	2,695	2,279	3,113
66.00	3,595	3,145	6,258
66.10	4,222	391	6,649

Device	Routing	Invert	Outlet Devices
#1	Discarded	63.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 59.50'
#2	Primary	63.70'	**15.0" Round Culvert** L= 427.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.70' / 61.00' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.0 cfs @ 12.24 hrs HW=64.81' (Free Discharge)
1=Exfiltration (Controls 0.0 cfs)

Primary OutFlow Max=3.9 cfs @ 12.23 hrs HW=64.81' TW=0.00' (Dynamic Tailwater)
2=Culvert (Barrel Controls 3.9 cfs @ 4.46 fps)

Pond 7C: BASIN2B



Summary for Subcatchment 8: DV-A

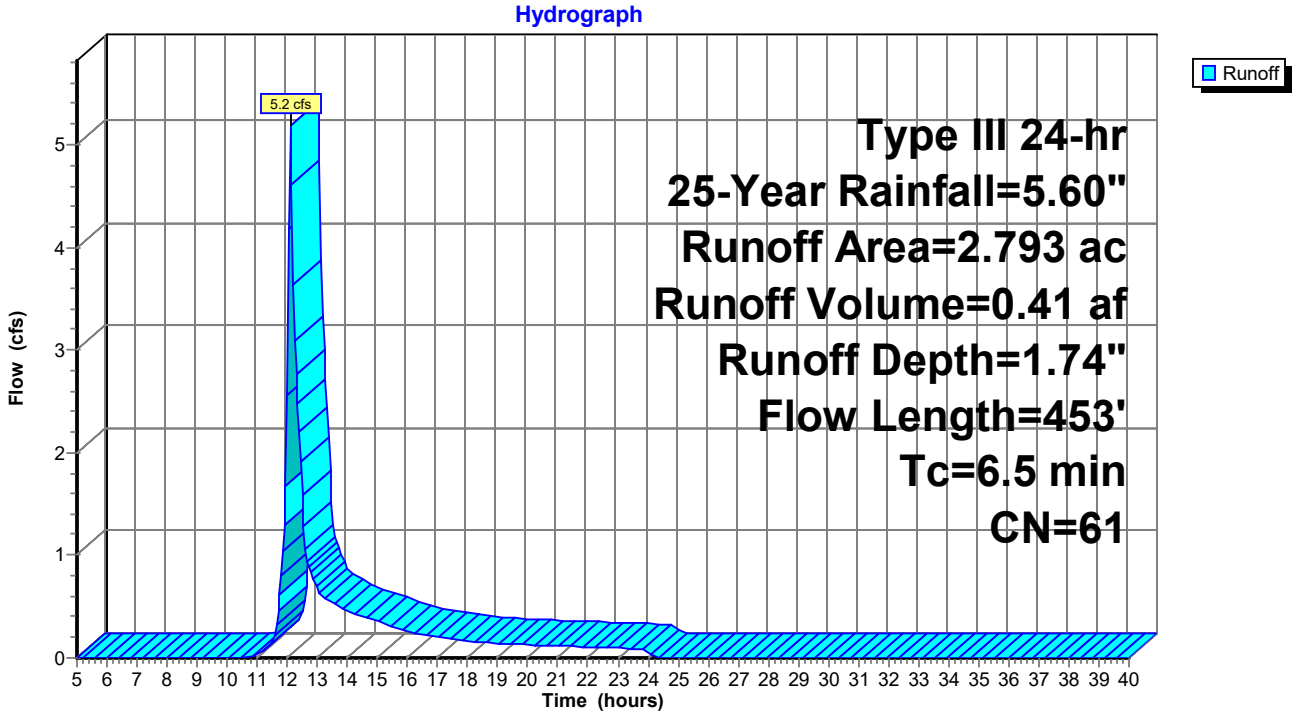
Runoff = 5.2 cfs @ 12.11 hrs, Volume= 0.41 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.280	92	Urban commercial, 85% imp, HSG B
0.005	98	Roofs, HSG B
0.200	98	Roofs, HSG A
0.049	98	Paved parking, HSG D
0.036	98	Paved parking, HSG B
0.015	98	Paved parking, HSG A
0.270	73	Brush, Good, HSG D
0.096	80	>75% Grass cover, Good, HSG D
0.471	39	>75% Grass cover, Good, HSG A
0.073	61	>75% Grass cover, Good, HSG B
0.018	98	Roofs, HSG D
0.003	98	Roofs, HSG C
1.277	48	Brush, Good, HSG B
2.793	61	Weighted Average
2.229		79.81% Pervious Area
0.564		20.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A1** Smooth surfaces n= 0.011 P2= 3.40"
1.0	95	0.0100	1.61		**Shallow Concentrated Flow, A2** Unpaved Kv= 16.1 fps
0.8	77	0.0300	1.56		**Shallow Concentrated Flow, A3** Cultivated Straight Rows Kv= 9.0 fps
1.1	87	0.0200	1.27		**Shallow Concentrated Flow, A4** Cultivated Straight Rows Kv= 9.0 fps
2.7	144	0.0100	0.90		**Shallow Concentrated Flow, A5** Cultivated Straight Rows Kv= 9.0 fps
6.5	453	Total			

Subcatchment 8: DV-A



Summary for Pond 8A: CBA

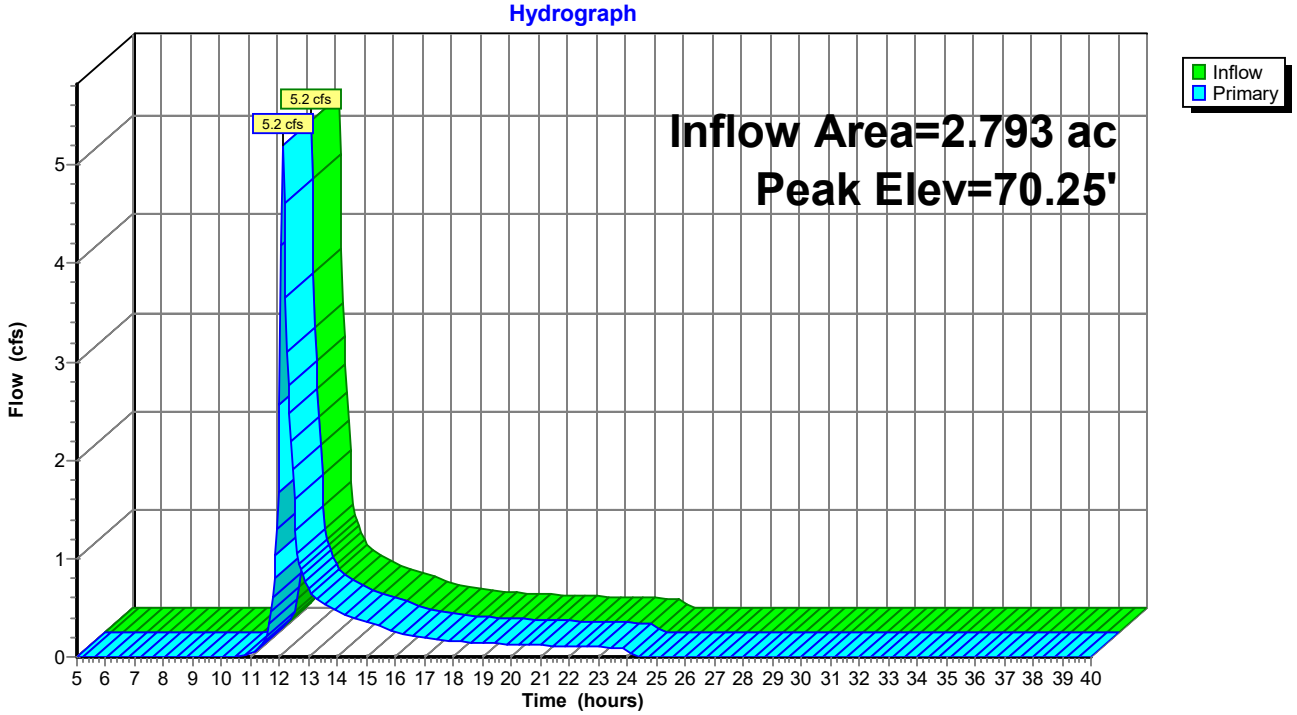
Inflow Area = 2.793 ac, 20.19% Impervious, Inflow Depth = 1.74" for 25-Year event
Inflow = 5.2 cfs @ 12.11 hrs, Volume= 0.41 af
Outflow = 5.2 cfs @ 12.11 hrs, Volume= 0.41 af, Atten= 0%, Lag= 0.0 min
Primary = 5.2 cfs @ 12.11 hrs, Volume= 0.41 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 70.25' @ 12.11 hrs
Flood Elev= 72.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.80'	**24.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	67.70'	**18.0" Round Culvert** L= 118.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 67.70' / 66.50' S= 0.0102 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=5.1 cfs @ 12.11 hrs HW=70.24' TW=0.00' (Dynamic Tailwater)
↳**1=Orifice/Grate** (Passes 5.1 cfs of 8.5 cfs potential flow)
↳**2=Culvert** (Outlet Controls 5.1 cfs @ 2.89 fps)

Pond 8A: CBA



Summary for Subcatchment 9: DV-B

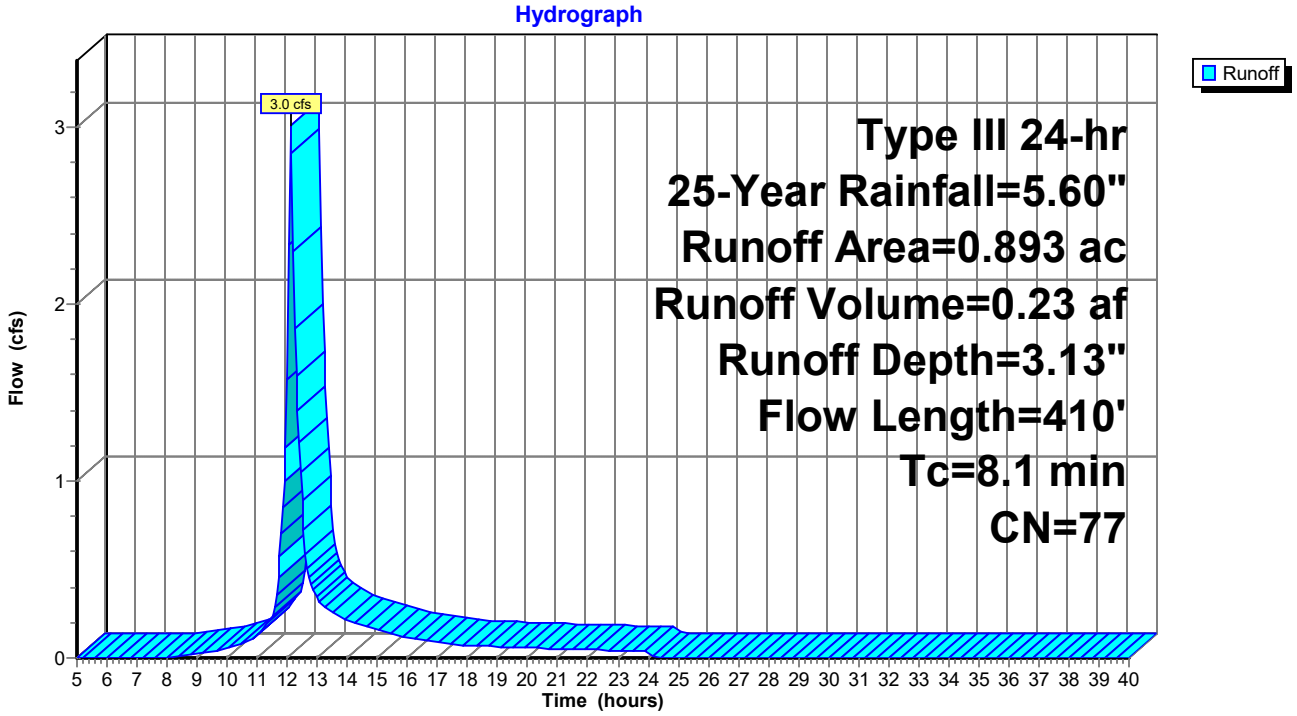
Runoff = 3.0 cfs @ 12.12 hrs, Volume= 0.23 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.833	78	Row crops, straight row, Good, HSG B
0.055	61	>75% Grass cover, Good, HSG B
0.005	89	Row crops, straight row, Good, HSG D
0.893	77	Weighted Average
0.893		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	50	0.0200	0.32		**Sheet Flow, B1** Cultivated: Residue<=20% n= 0.060 P2= 3.40"
0.9	81	0.0250	1.42		**Shallow Concentrated Flow, B2** Cultivated Straight Rows Kv= 9.0 fps
2.0	109	0.0100	0.90		**Shallow Concentrated Flow, B3** Cultivated Straight Rows Kv= 9.0 fps
0.4	37	0.0300	1.56		**Shallow Concentrated Flow, B4** Cultivated Straight Rows Kv= 9.0 fps
2.2	133	0.0200	0.99		**Shallow Concentrated Flow, B5** Short Grass Pasture Kv= 7.0 fps
8.1	410	Total			

Subcatchment 9: DV-B



Summary for Subcatchment 10: DV-D

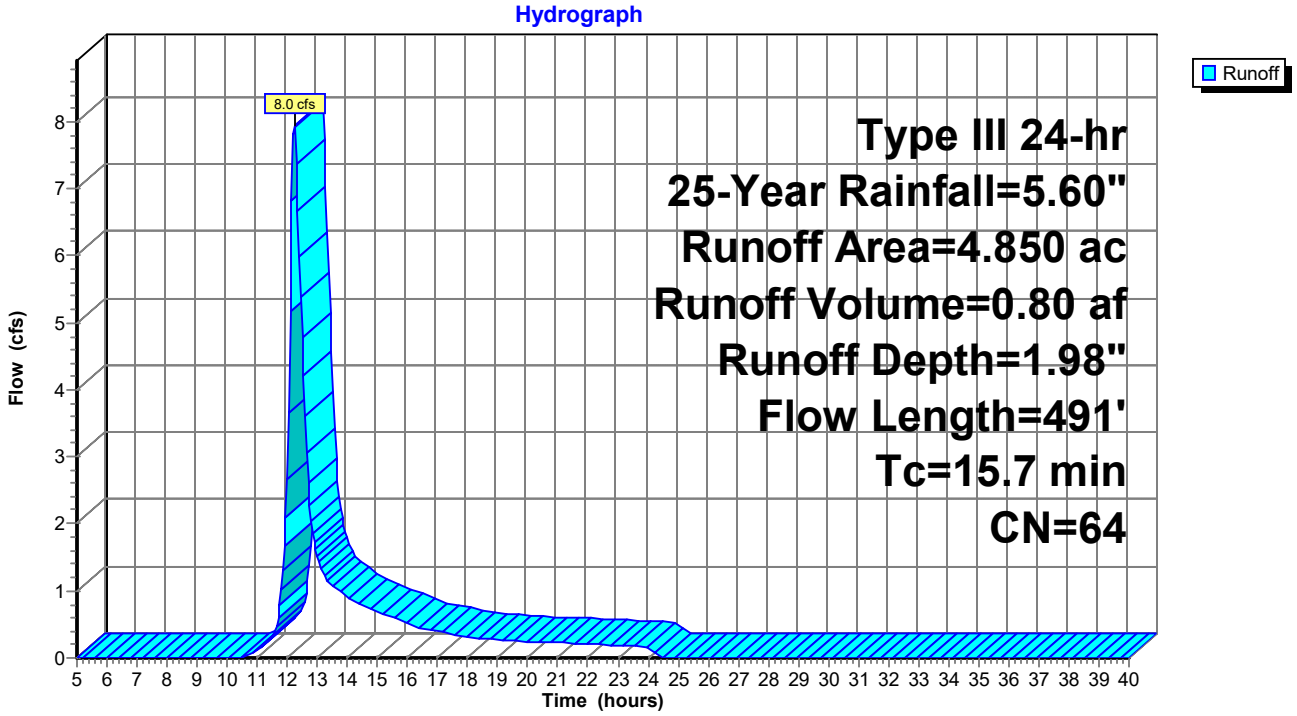
Runoff = 8.0 cfs @ 12.23 hrs, Volume= 0.80 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.056	96	Gravel surface, HSG A
0.757	39	>75% Grass cover, Good, HSG A
0.126	98	Roofs, HSG A
0.272	98	Roofs, HSG C
0.021	98	Roofs, HSG D
0.076	84	50-75% Grass cover, Fair, HSG D
3.542	65	Brush, Good, HSG C
4.850	64	Weighted Average
4.431		91.36% Pervious Area
0.419		8.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, C1** Grass: Dense n= 0.240 P2= 3.40"
1.9	78	0.0100	0.70		**Shallow Concentrated Flow, C2** Short Grass Pasture Kv= 7.0 fps
0.8	39	0.0150	0.86		**Shallow Concentrated Flow, C3** Short Grass Pasture Kv= 7.0 fps
0.9	46	0.0150	0.86		**Shallow Concentrated Flow, C4** Short Grass Pasture Kv= 7.0 fps
1.8	75	0.0100	0.70		**Shallow Concentrated Flow, C5** Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0300	1.21		**Shallow Concentrated Flow, C6** Short Grass Pasture Kv= 7.0 fps
2.2	93	0.0100	0.70		**Shallow Concentrated Flow, C7** Short Grass Pasture Kv= 7.0 fps
0.4	24	0.0400	1.00		**Shallow Concentrated Flow, C8** Woodland Kv= 5.0 fps
1.2	52	0.0200	0.71		**Shallow Concentrated Flow, C9** Woodland Kv= 5.0 fps
15.7	491	Total			

Subcatchment 10: DV-D

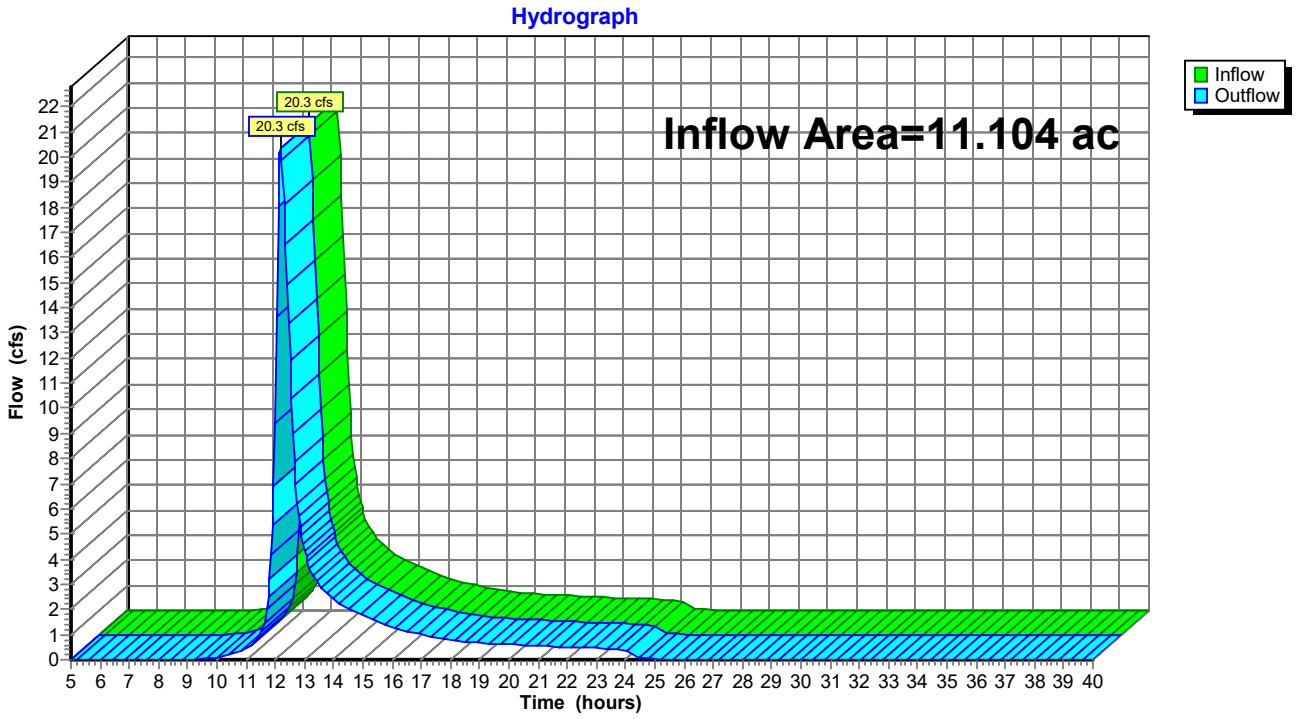


Summary for Reach 11: POSTDEV

Inflow Area = 11.104 ac, 21.82% Impervious, Inflow Depth = 2.34" for 25-Year event
Inflow = 20.3 cfs @ 12.18 hrs, Volume= 2.17 af
Outflow = 20.3 cfs @ 12.18 hrs, Volume= 2.17 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3

Reach 11: POSTDEV



Summary for Subcatchment 12: DV-C

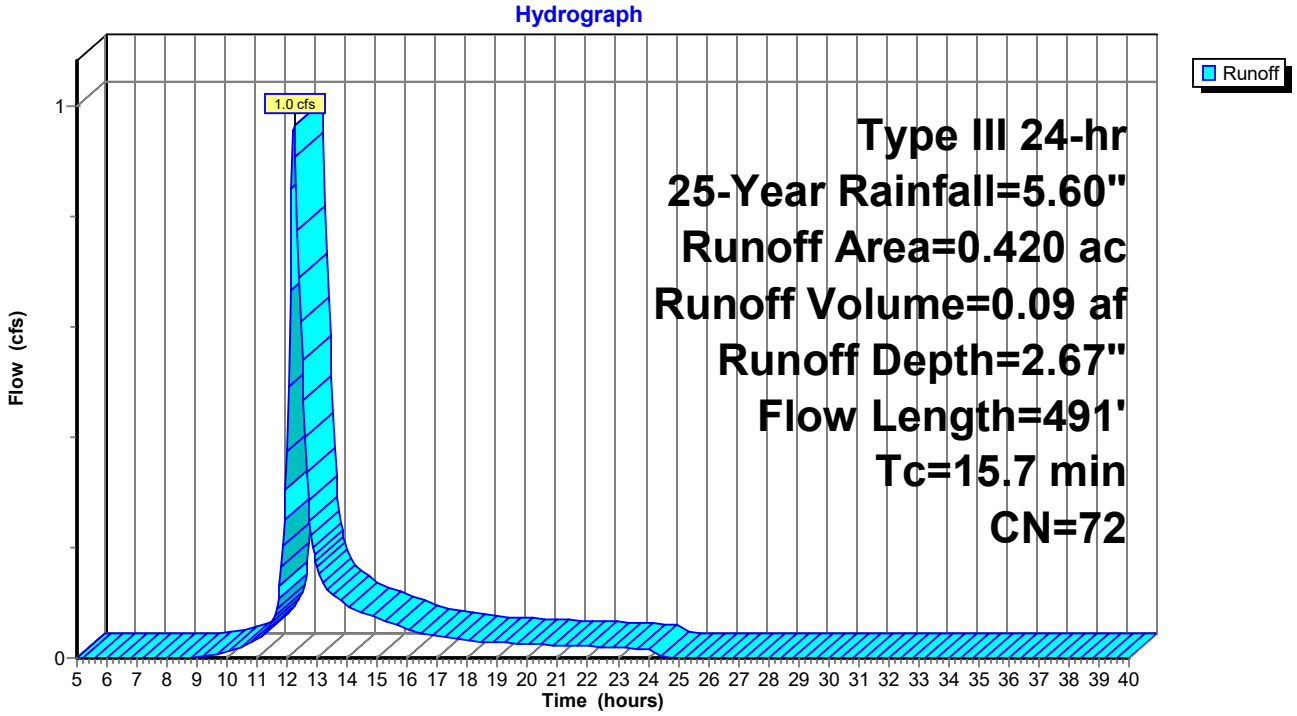
Runoff = 1.0 cfs @ 12.22 hrs, Volume= 0.09 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (ac)	CN	Description
0.420	72	Woods/grass comb., Good, HSG C
0.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, C1**
					Grass: Dense n= 0.240 P2= 3.40"
1.9	78	0.0100	0.70		**Shallow Concentrated Flow, C2**
					Short Grass Pasture Kv= 7.0 fps
0.8	39	0.0150	0.86		**Shallow Concentrated Flow, C3**
					Short Grass Pasture Kv= 7.0 fps
0.9	46	0.0150	0.86		**Shallow Concentrated Flow, C4**
					Short Grass Pasture Kv= 7.0 fps
1.8	75	0.0100	0.70		**Shallow Concentrated Flow, C5**
					Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0300	1.21		**Shallow Concentrated Flow, C6**
					Short Grass Pasture Kv= 7.0 fps
2.2	93	0.0100	0.70		**Shallow Concentrated Flow, C7**
					Short Grass Pasture Kv= 7.0 fps
0.4	24	0.0400	1.00		**Shallow Concentrated Flow, C8**
					Woodland Kv= 5.0 fps
1.2	52	0.0200	0.71		**Shallow Concentrated Flow, C9**
					Woodland Kv= 5.0 fps
15.7	491	Total			

Subcatchment 12: DV-C



Time span=5.00-40.00 hrs, dt=0.05 hrs, 701 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: EX-A Runoff Area=11.104 ac 0.48% Impervious Runoff Depth=4.04"
Flow Length=536' Tc=6.0 min CN=74 Runoff=51.6 cfs 3.74 af

Reach 2: PREDEV Inflow=51.6 cfs 3.74 af
Outflow=51.6 cfs 3.74 af

Subcatchment 3: CB1 Runoff Area=0.400 ac 81.50% Impervious Runoff Depth>5.69"
Flow Length=350' Tc=6.0 min CN=89 Runoff=2.5 cfs 0.19 af

Pond 3A: CB1 Peak Elev=72.03' Inflow=2.5 cfs 0.19 af
Outflow=2.5 cfs 0.19 af

Subcatchment 4: CB2 Runoff Area=0.245 ac 75.51% Impervious Runoff Depth>5.47"
Flow Length=308' Tc=7.2 min CN=87 Runoff=1.4 cfs 0.11 af

Pond 4A: CB2 Peak Elev=72.02' Inflow=3.9 cfs 0.30 af
Outflow=3.9 cfs 0.30 af

Subcatchment 5: BASIN1 Runoff Area=0.223 ac 54.71% Impervious Runoff Depth>5.80"
Tc=6.0 min CN=90 Runoff=1.4 cfs 0.11 af

Pond 5A: SF1A Peak Elev=0.00' Storage=0 cf
Primary=0.0 cfs 0.00 af

Pond 5B: BASIN1 Peak Elev=67.60' Storage=4,933 cf Inflow=5.3 cfs 0.41 af
Outflow=3.0 cfs 0.39 af

Subcatchment 6: CB3 Runoff Area=0.790 ac 79.87% Impervious Runoff Depth>5.47"
Flow Length=360' Tc=8.1 min CN=87 Runoff=4.5 cfs 0.36 af

Pond 6A: CB3 Peak Elev=71.25' Inflow=4.5 cfs 0.36 af
Outflow=4.5 cfs 0.36 af

Pond 6B: DMH1 Peak Elev=68.06' Inflow=4.5 cfs 0.36 af
15.0" Round Culvert n=0.013 L=183.0' S=0.0050 '/' Outflow=4.5 cfs 0.36 af

Subcatchment 7: BASIN2 Runoff Area=0.490 ac 35.92% Impervious Runoff Depth=5.03"
Flow Length=82' Tc=6.4 min CN=83 Runoff=2.7 cfs 0.21 af

Pond 7A: SF2A Peak Elev=0.00' Storage=0 cf
Primary=0.0 cfs 0.00 af

Pond 7B: BASIN2A Peak Elev=66.67' Storage=3,593 cf Inflow=7.2 cfs 0.57 af
Outflow=6.9 cfs 0.51 af

Pond 7C: BASIN2B Peak Elev=65.08' Storage=3,329 cf Inflow=6.9 cfs 0.51 af
Discarded=0.0 cfs 0.02 af Primary=5.0 cfs 0.48 af Outflow=5.0 cfs 0.51 af

Subcatchment 8: DV-A Runoff Area=2.793 ac 20.19% Impervious Runoff Depth=2.70"
Flow Length=453' Tc=6.5 min CN=61 Runoff=8.4 cfs 0.63 af

Pond 8A: CBA Peak Elev=70.97' Inflow=8.4 cfs 0.63 af
Outflow=8.4 cfs 0.63 af

Subcatchment 9: DV-B Runoff Area=0.893 ac 0.00% Impervious Runoff Depth=4.37"
Flow Length=410' Tc=8.1 min CN=77 Runoff=4.2 cfs 0.32 af

Subcatchment 10: DV-D Runoff Area=4.850 ac 8.64% Impervious Runoff Depth=3.00"
Flow Length=491' Tc=15.7 min CN=64 Runoff=12.4 cfs 1.21 af

Reach 11: POSTDEV Inflow=30.5 cfs 3.17 af
Outflow=30.5 cfs 3.17 af

Subcatchment 12: DV-C Runoff Area=0.420 ac 0.00% Impervious Runoff Depth=3.83"
Flow Length=491' Tc=15.7 min CN=72 Runoff=1.4 cfs 0.13 af

Summary for Subcatchment 1: EX-A

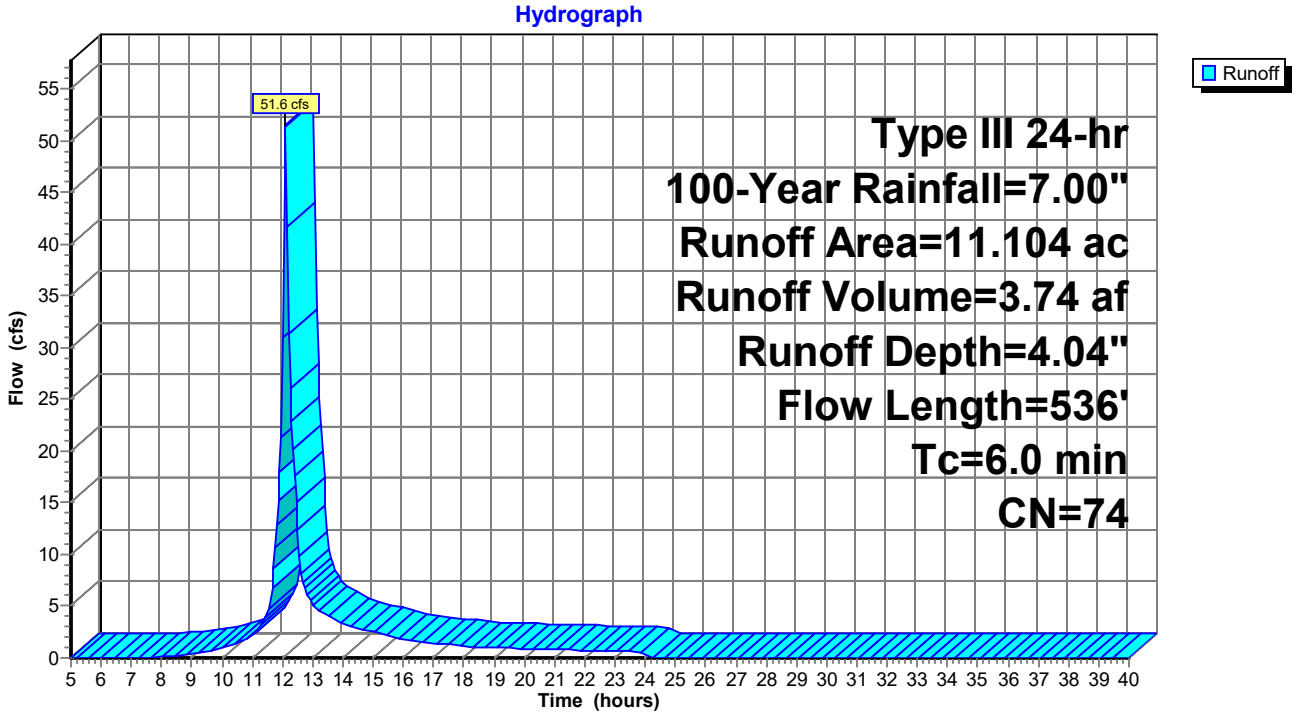
Runoff = 51.6 cfs @ 12.09 hrs, Volume= 3.74 af, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.051	96	Gravel surface, HSG A
1.249	67	Row crops, straight row, Good, HSG A
0.503	39	>75% Grass cover, Good, HSG A
0.130	30	Woods, Good, HSG A
0.053	98	Roofs, HSG B
0.352	96	Gravel surface, HSG B
2.127	78	Row crops, straight row, Good, HSG B
0.013	61	>75% Grass cover, Good, HSG B
1.656	85	Row crops, straight row, Good, HSG C
2.693	74	>75% Grass cover, Good, HSG C
0.701	70	Woods, Good, HSG C
0.023	96	Gravel surface, HSG D
1.099	89	Row crops, straight row, Good, HSG D
0.005	77	Woods, Good, HSG D
0.449	39	>75% Grass cover, Good, HSG A
11.104	74	Weighted Average
11.051		99.52% Pervious Area
0.053		0.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, X1** Smooth surfaces n= 0.011 P2= 3.40"
1.0	95	0.0100	1.61		**Shallow Concentrated Flow, X2** Unpaved Kv= 16.1 fps
0.8	77	0.0300	1.56		**Shallow Concentrated Flow, X3** Cultivated Straight Rows Kv= 9.0 fps
1.1	87	0.0200	1.27		**Shallow Concentrated Flow, X4** Cultivated Straight Rows Kv= 9.0 fps
0.9	46	0.0100	0.90		**Shallow Concentrated Flow, X5** Cultivated Straight Rows Kv= 9.0 fps
0.8	58	0.0200	1.27		**Shallow Concentrated Flow, X6** Cultivated Straight Rows Kv= 9.0 fps
0.4	123	0.0100	4.62	12.01	**Channel Flow, X7** Area= 2.6 sf Perim= 4.6' r= 0.57' n= 0.022 Earth, clean & straight
5.9	536	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1: EX-A

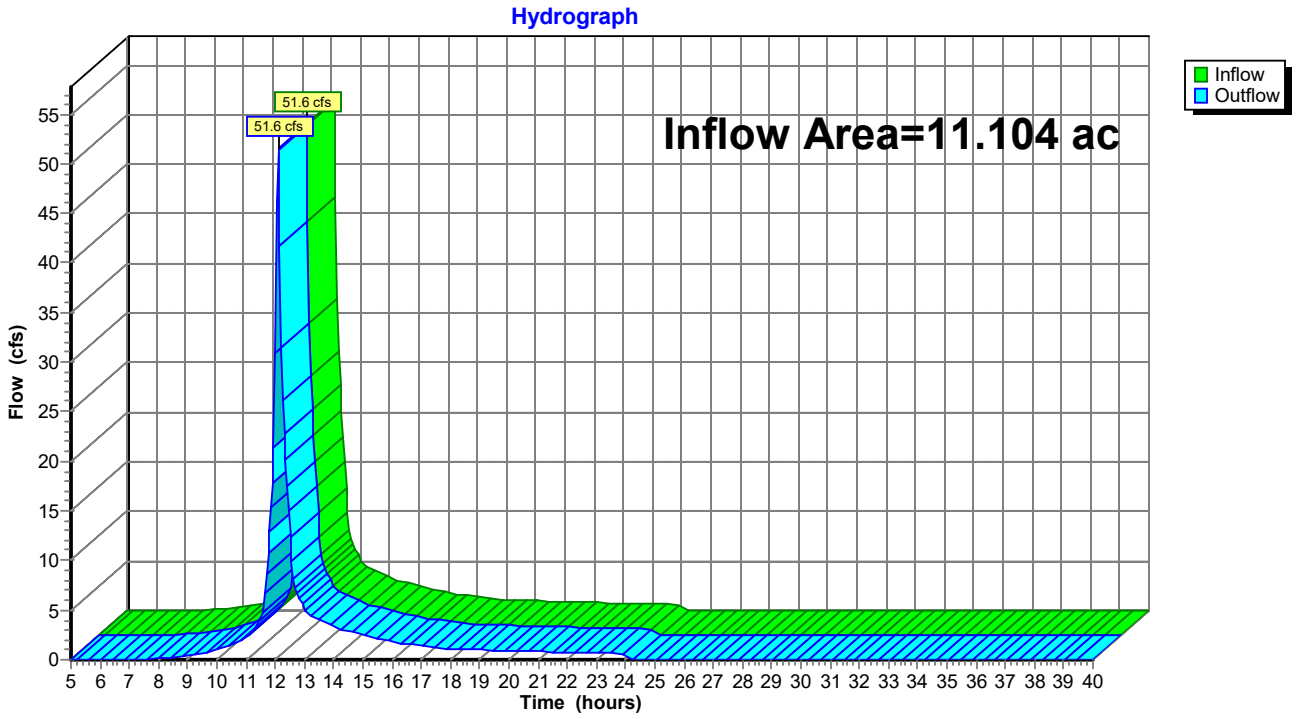


Summary for Reach 2: PREDEV

Inflow Area = 11.104 ac, 0.48% Impervious, Inflow Depth = 4.04" for 100-Year event
Inflow = 51.6 cfs @ 12.09 hrs, Volume= 3.74 af
Outflow = 51.6 cfs @ 12.09 hrs, Volume= 3.74 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3

Reach 2: PREDEV



Summary for Subcatchment 3: CB1

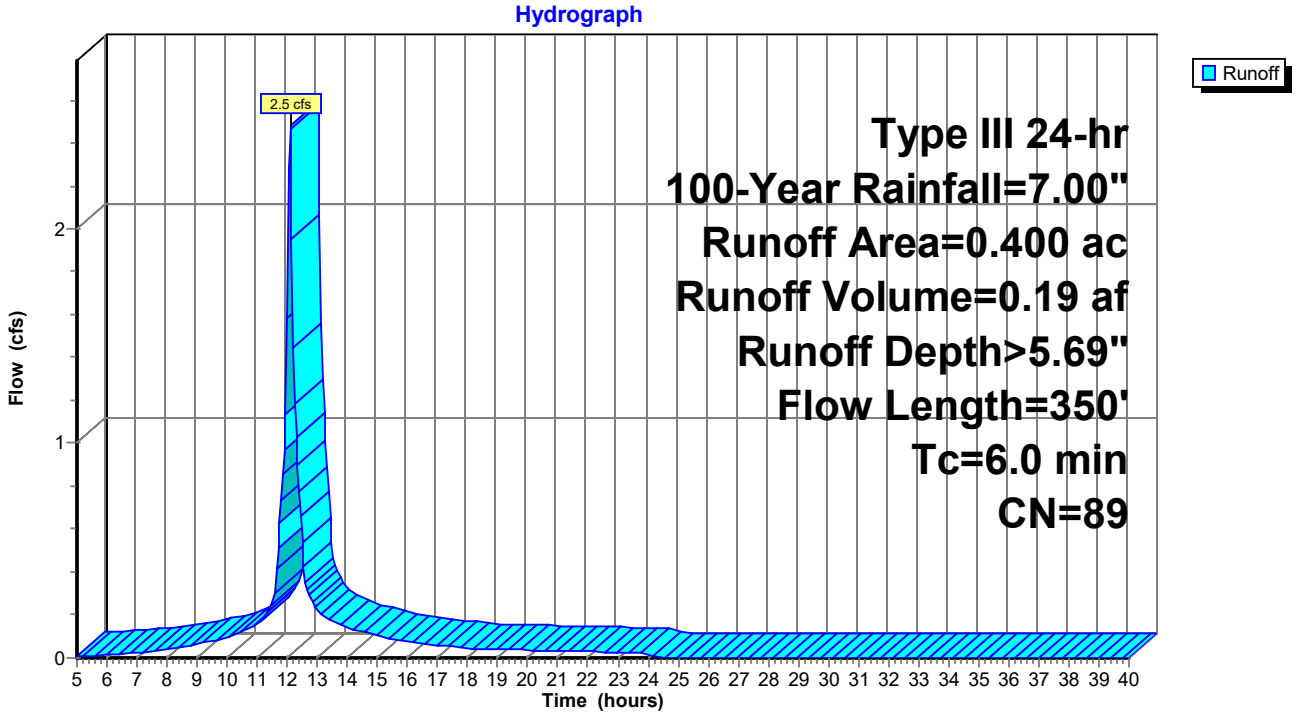
Runoff = 2.5 cfs @ 12.09 hrs, Volume= 0.19 af, Depth> 5.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.122	98	Paved parking, HSG A
0.004	61	>75% Grass cover, Good, HSG B
0.012	80	>75% Grass cover, Good, HSG D
0.008	74	>75% Grass cover, Good, HSG C
0.050	39	>75% Grass cover, Good, HSG A
0.067	98	Paved parking, HSG B
0.039	98	Paved parking, HSG C
0.098	98	Paved parking, HSG D
0.400	89	Weighted Average
0.074		18.50% Pervious Area
0.326		81.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	39	0.0200	1.17		**Sheet Flow, 1a** Smooth surfaces n= 0.011 P2= 3.40"
2.6	311	0.0100	2.03		**Shallow Concentrated Flow, 1c** Paved Kv= 20.3 fps
3.2	350	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3: CB1



Summary for Pond 3A: CB1

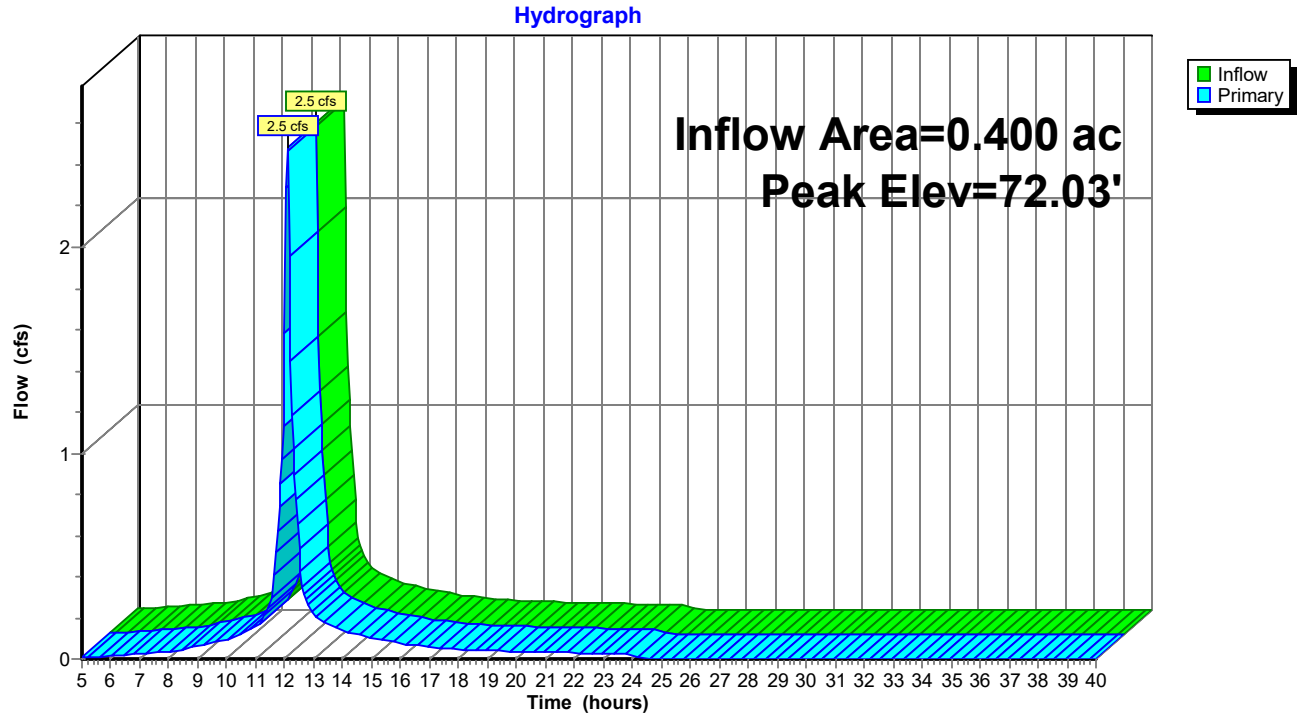
Inflow Area = 0.400 ac, 81.50% Impervious, Inflow Depth > 5.69" for 100-Year event
Inflow = 2.5 cfs @ 12.09 hrs, Volume= 0.19 af
Outflow = 2.5 cfs @ 12.09 hrs, Volume= 0.19 af, Atten= 0%, Lag= 0.0 min
Primary = 2.5 cfs @ 12.09 hrs, Volume= 0.19 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 72.03' @ 12.09 hrs
Flood Elev= 71.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 12.00 columns** X 12 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.70'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 2	67.70'	**12.0" Round Culvert** L= 18.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.70' / 67.34' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.4 cfs @ 12.09 hrs HW=72.02' TW=72.01' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 2.1 cfs @ 0.53 fps)
- **2=Orifice/Grate** (Passes 0.3 cfs of 0.3 cfs potential flow)
  - **3=Culvert** (Inlet Controls 0.3 cfs @ 0.41 fps)

Pond 3A: CB1



Summary for Subcatchment 4: CB2

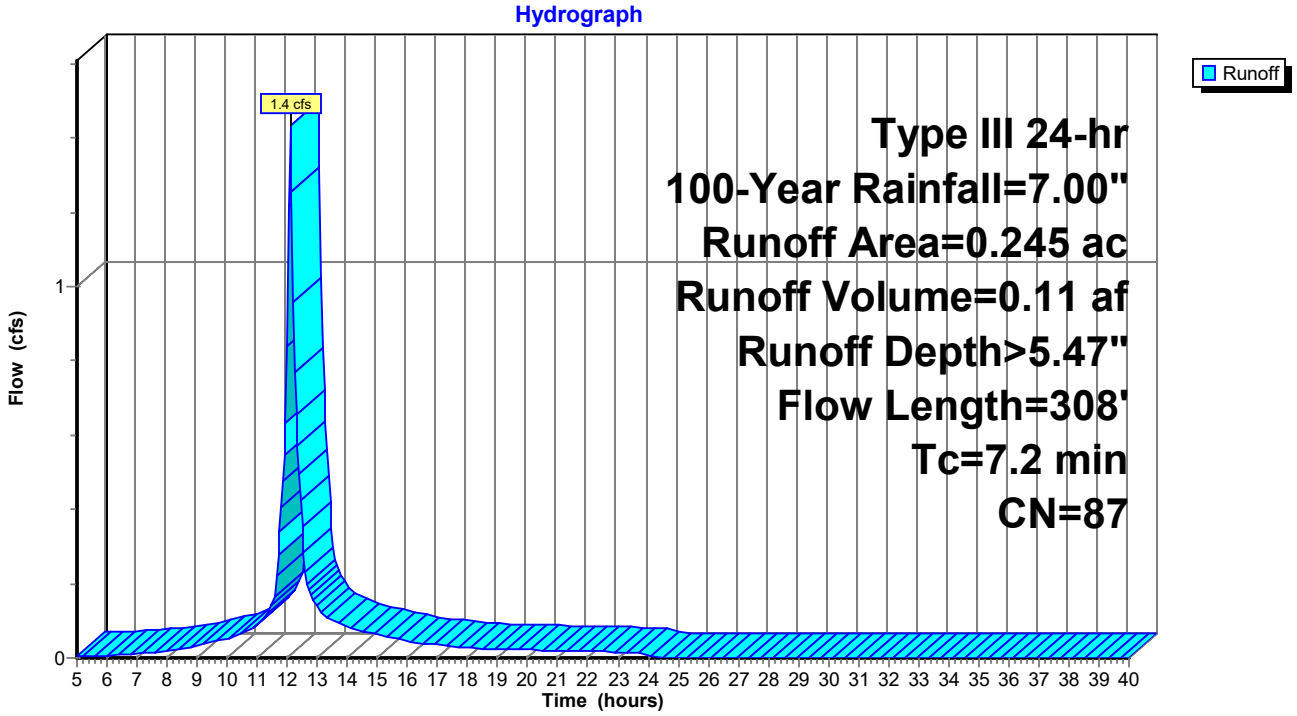
Runoff = 1.4 cfs @ 12.10 hrs, Volume= 0.11 af, Depth> 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.025	98	Paved roads w/curbs & sewers, HSG A
0.008	98	Paved parking, HSG A
0.035	39	>75% Grass cover, Good, HSG A
0.059	98	Paved roads w/curbs & sewers, HSG B
0.033	98	Paved roads w/curbs & sewers, HSG C
0.005	98	Paved parking, HSG C
0.025	74	>75% Grass cover, Good, HSG C
0.055	98	Paved roads w/curbs & sewers, HSG D
0.245	87	Weighted Average
0.060		24.49% Pervious Area
0.185		75.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	26	0.0200	0.09		**Sheet Flow, 2a** Grass: Dense n= 0.240 P2= 3.40"
0.3	15	0.0200	0.97		**Sheet Flow, 2b** Smooth surfaces n= 0.011 P2= 3.40"
2.2	267	0.0100	2.03		**Shallow Concentrated Flow, 2c** Paved Kv= 20.3 fps
7.2	308	Total			

Subcatchment 4: CB2



Summary for Pond 4A: CB2

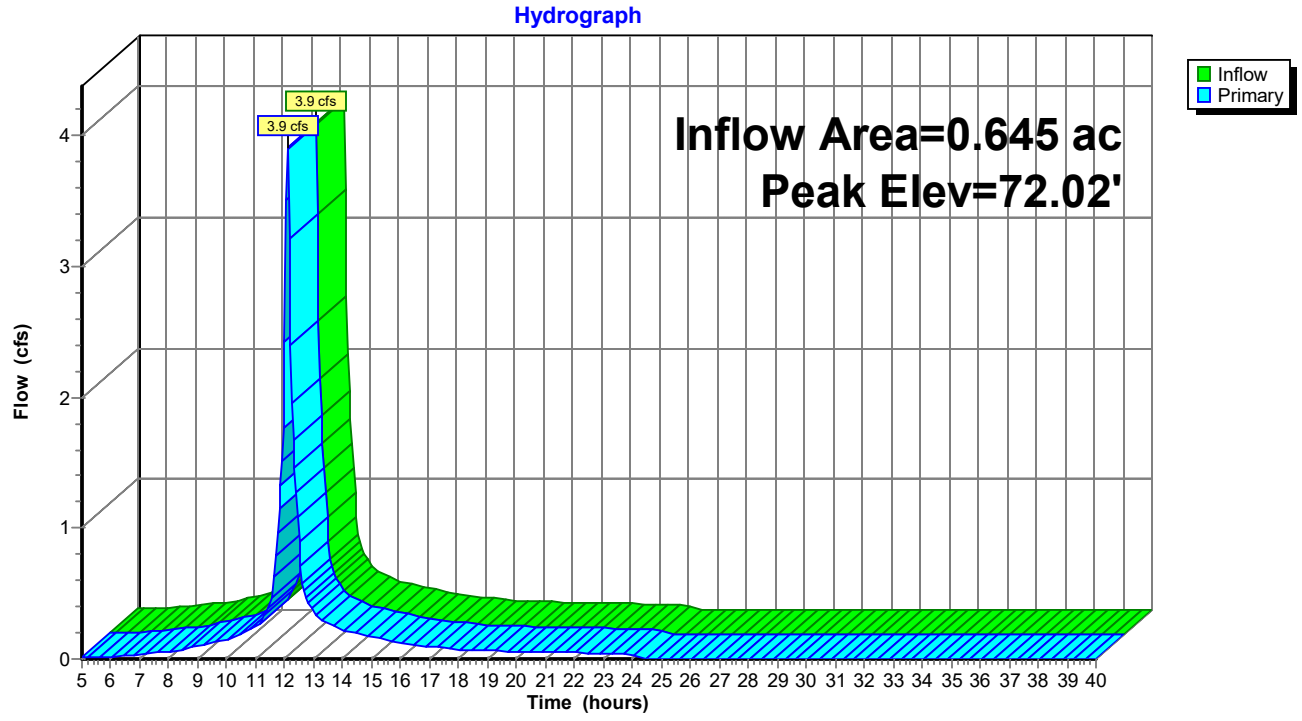
Inflow Area = 0.645 ac, 79.22% Impervious, Inflow Depth > 5.61" for 100-Year event
Inflow = 3.9 cfs @ 12.09 hrs, Volume= 0.30 af
Outflow = 3.9 cfs @ 12.09 hrs, Volume= 0.30 af, Atten= 0%, Lag= 0.0 min
Primary = 3.9 cfs @ 12.09 hrs, Volume= 0.30 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 72.02' @ 12.09 hrs
Flood Elev= 71.95'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 6.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.70'	**24.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 2	67.24'	**15.0" Round Culvert** L= 18.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 67.24' / 67.06' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=3.8 cfs @ 12.09 hrs HW=72.02' TW=67.38' (Dynamic Tailwater)
- **1=Orifice/Grate** (Orifice Controls 2.7 cfs @ 2.71 fps)
- **2=Orifice/Grate** (Orifice Controls 1.1 cfs @ 1.80 fps)
  - **3=Culvert** (Passes 1.1 cfs of 2.6 cfs potential flow)

Pond 4A: CB2



Summary for Subcatchment 5: BASIN1

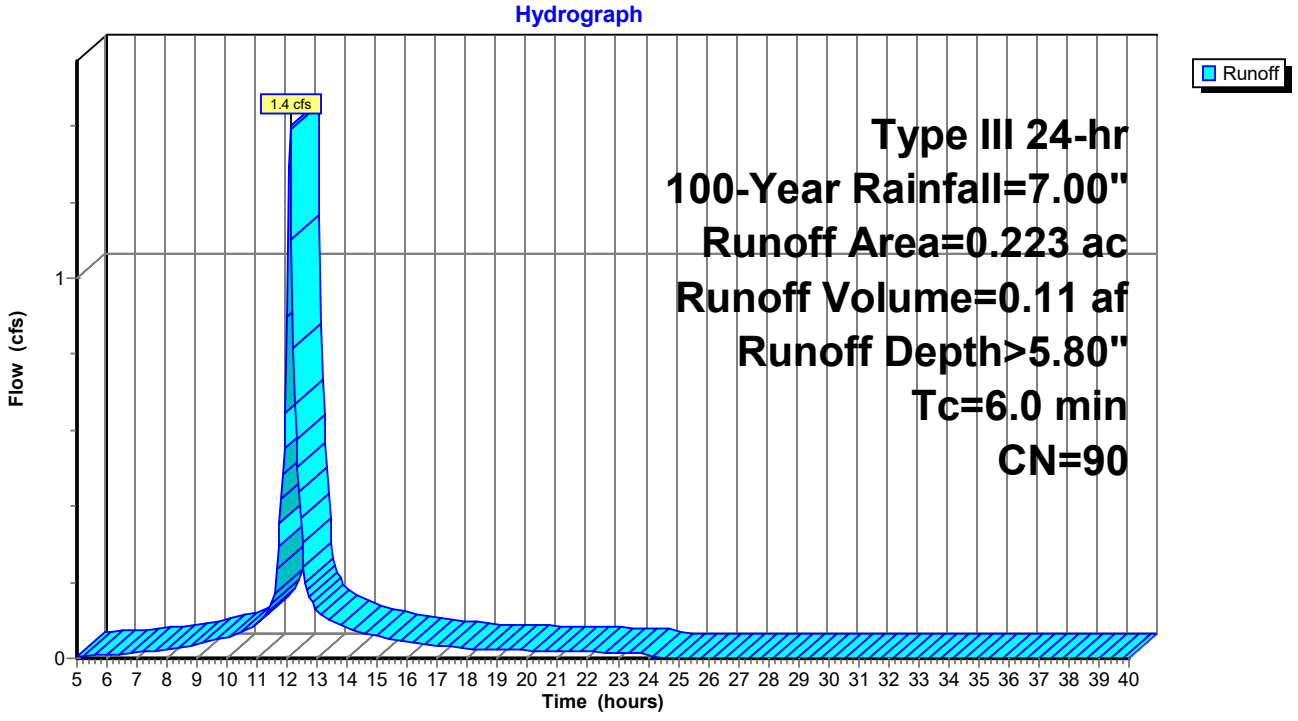
Runoff = 1.4 cfs @ 12.09 hrs, Volume= 0.11 af, Depth> 5.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.122	98	Water Surface, HSG D
0.101	80	>75% Grass cover, Good, HSG D
0.223	90	Weighted Average
0.101		45.29% Pervious Area
0.122		54.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, B1-A**

Subcatchment 5: BASIN1



Summary for Pond 5A: SF1A

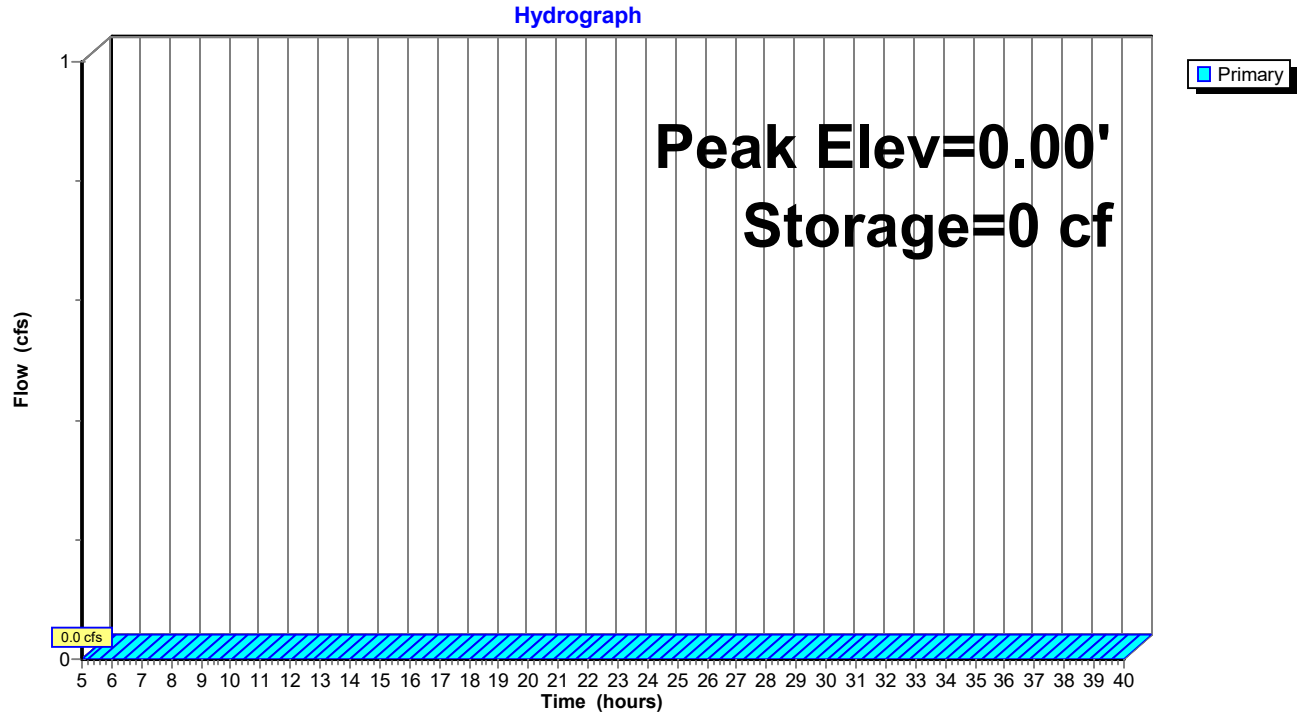
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	1,207 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	504	0	0
67.00	907	706	706
67.50	1,097	501	1,207

Device	Routing	Invert	Outlet Devices
#1	Primary	67.00'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 5A: SF1A



Summary for Pond 5B: BASIN1

Inflow Area = 0.868 ac, 72.93% Impervious, Inflow Depth > 5.66" for 100-Year event
Inflow = 5.3 cfs @ 12.09 hrs, Volume= 0.41 af
Outflow = 3.0 cfs @ 12.22 hrs, Volume= 0.39 af, Atten= 43%, Lag= 7.9 min
Primary = 3.0 cfs @ 12.22 hrs, Volume= 0.39 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 67.60' @ 12.22 hrs Surf.Area= 3,982 sf Storage= 4,933 cf
Flood Elev= 68.50' Surf.Area= 6,300 sf Storage= 9,880 cf

Plug-Flow detention time= 80.9 min calculated for 0.39 af (96% of inflow)
Center-of-Mass det. time= 55.0 min (840.5 - 785.5)

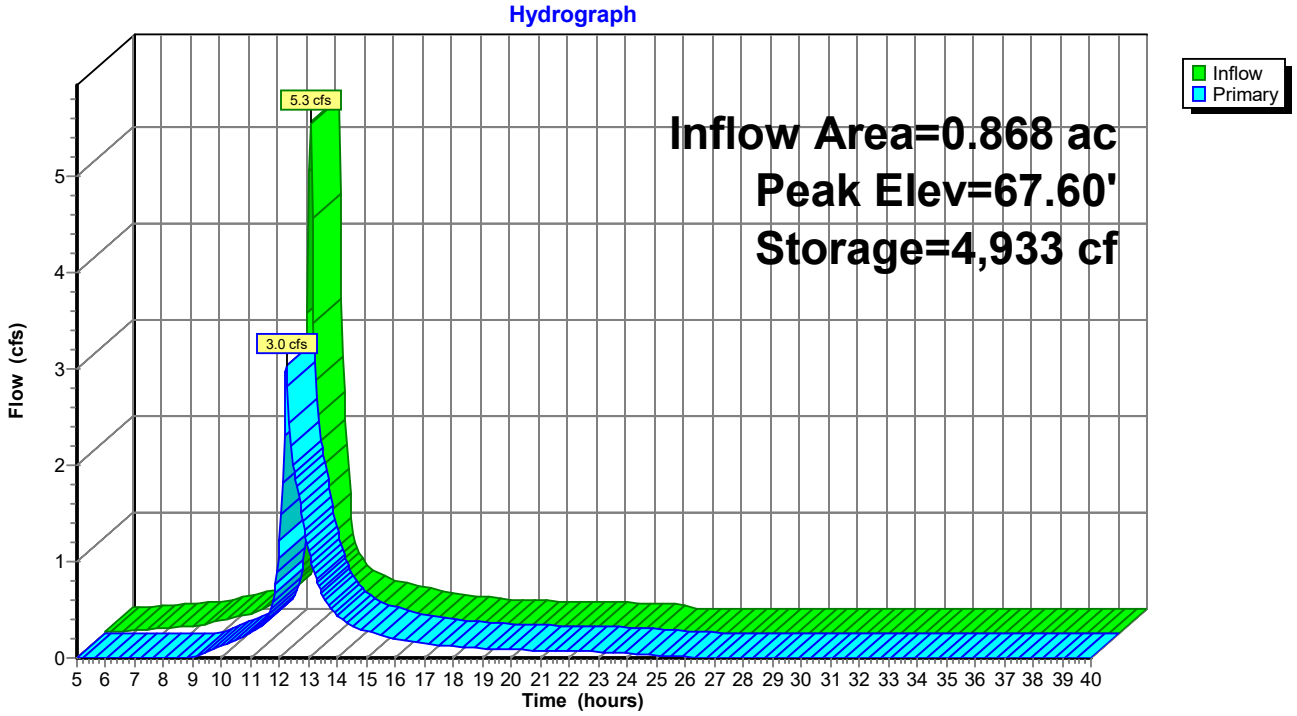
Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	9,880 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	2,547	0	0
67.00	3,190	2,869	2,869
67.50	3,525	1,679	4,547
68.00	5,752	2,319	6,867
68.50	6,300	3,013	9,880

Device	Routing	Invert	Outlet Devices
#1	Primary	66.30'	**0.7' long x 1.20' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Primary	67.50'	**8.0' long x 0.50' rise Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=2.9 cfs @ 12.22 hrs HW=67.60' TW=0.00' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Orifice Controls 2.2 cfs @ 3.94 fps)
2=Sharp-Crested Rectangular Weir (Weir Controls 0.8 cfs @ 1.01 fps)

Pond 5B: BASIN1



Summary for Subcatchment 6: CB3

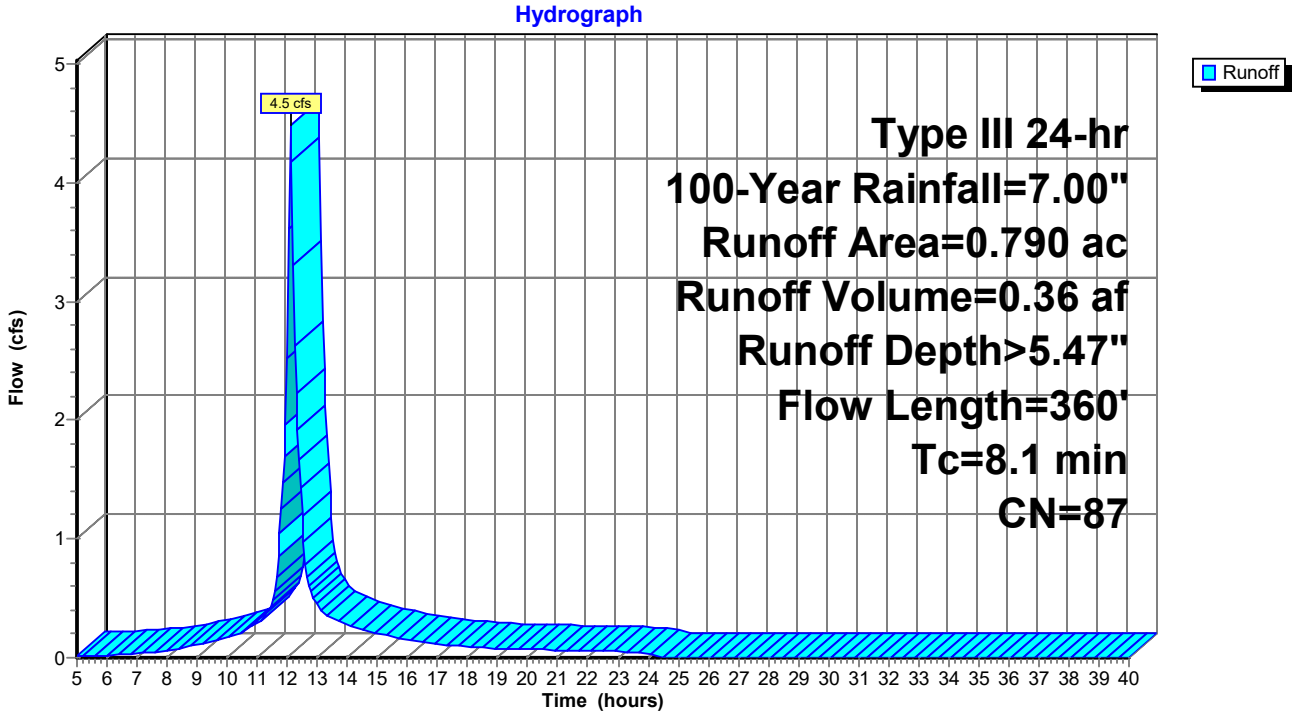
Runoff = 4.5 cfs @ 12.11 hrs, Volume= 0.36 af, Depth> 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.631	98	Paved roads w/curbs & sewers, HSG A
0.130	39	>75% Grass cover, Good, HSG A
0.029	74	>75% Grass cover, Good, HSG C
0.790	87	Weighted Average
0.159		20.13% Pervious Area
0.631		79.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	30	0.0200	0.09		**Sheet Flow, 3a** Grass: Dense n= 0.240 P2= 3.40"
0.2	14	0.0200	0.96		**Sheet Flow, 3b** Smooth surfaces n= 0.011 P2= 3.40"
2.6	316	0.0100	2.03		**Shallow Concentrated Flow, 3c** Paved Kv= 20.3 fps
8.1	360	Total			

Subcatchment 6: CB3



Summary for Pond 6A: CB3

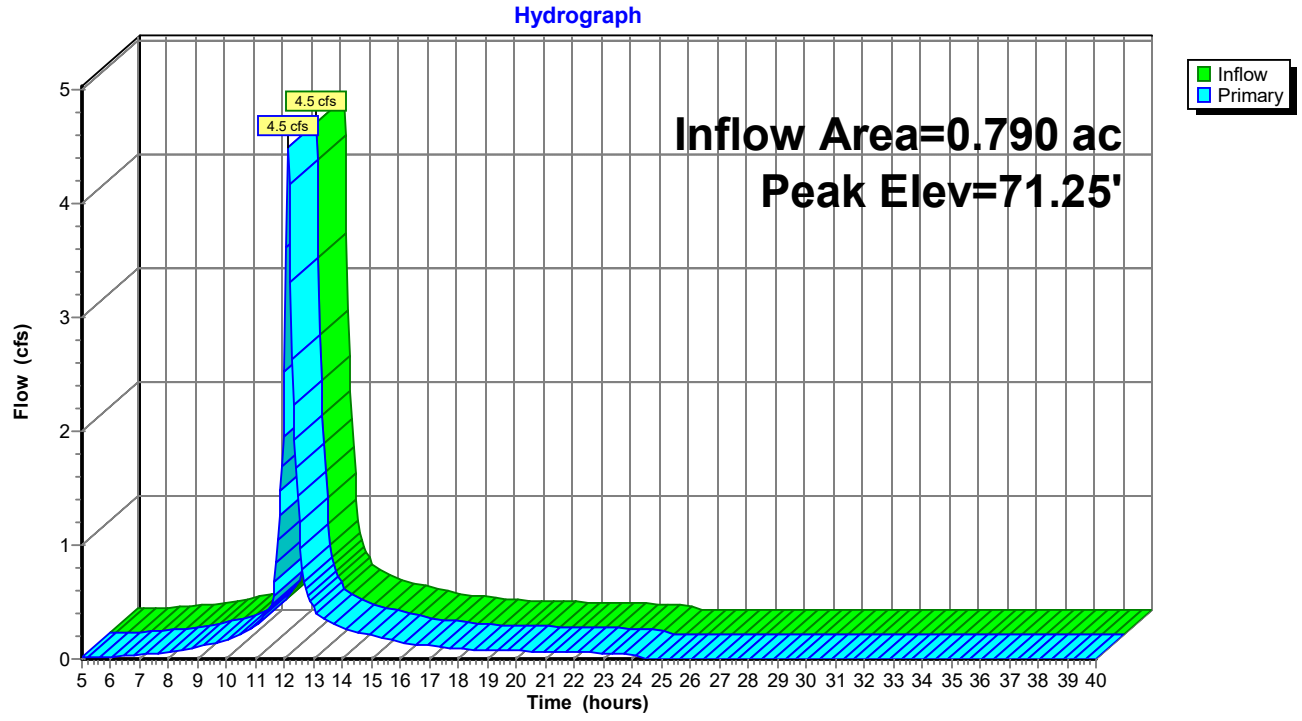
Inflow Area = 0.790 ac, 79.87% Impervious, Inflow Depth > 5.47" for 100-Year event
Inflow = 4.5 cfs @ 12.11 hrs, Volume= 0.36 af
Outflow = 4.5 cfs @ 12.11 hrs, Volume= 0.36 af, Atten= 0%, Lag= 0.0 min
Primary = 4.5 cfs @ 12.11 hrs, Volume= 0.36 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 71.25' @ 12.11 hrs
Flood Elev= 71.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	71.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 12.00 columns** X 6 rows C= 0.600 Limited to weir flow at low heads
#2	Primary	71.00'	**48.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	67.25'	**15.0" Round Culvert** L= 57.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 67.25' / 66.68' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=4.4 cfs @ 12.11 hrs HW=71.24' TW=68.03' (Dynamic Tailwater)
- **1=Orifice/Grate** (Passes 2.9 cfs of 4.7 cfs potential flow)
  - **3=Culvert** (Outlet Controls 2.9 cfs @ 2.34 fps)
- **2=Orifice/Grate** (Orifice Controls 1.5 cfs @ 1.57 fps)

Pond 6A: CB3



Summary for Pond 6B: DMH1

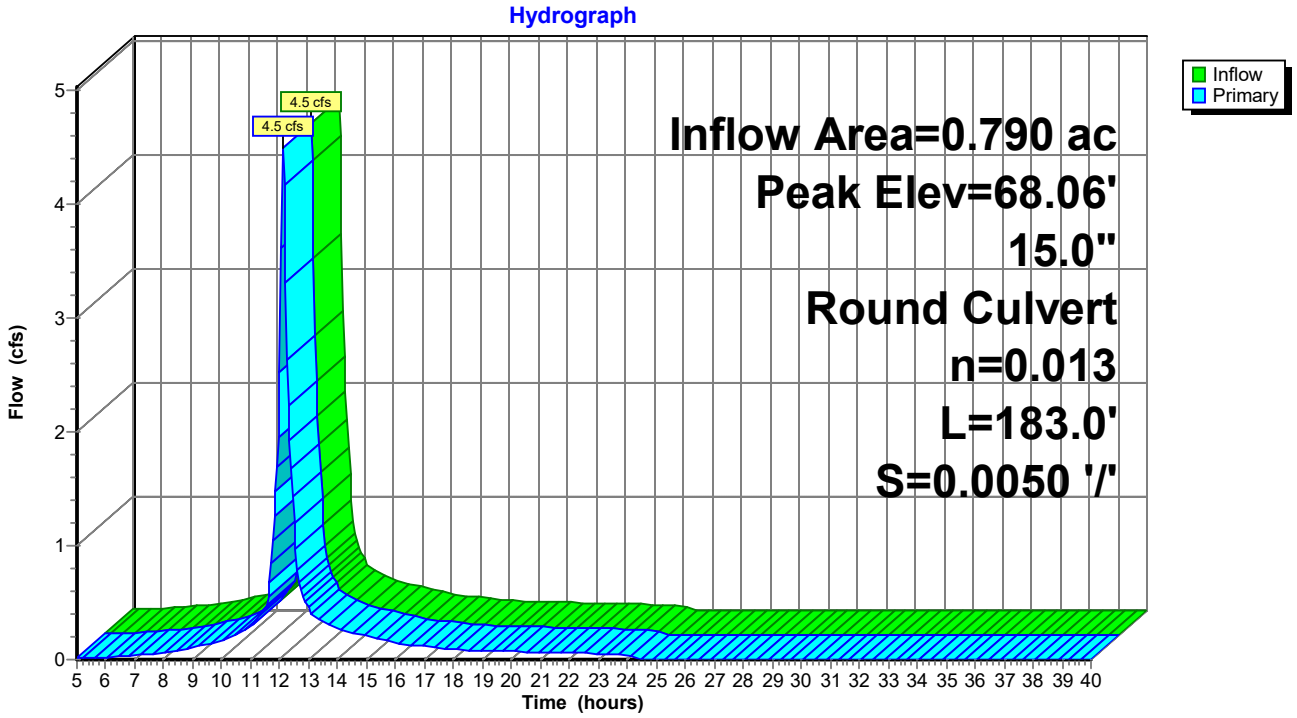
Inflow Area = 0.790 ac, 79.87% Impervious, Inflow Depth > 5.47" for 100-Year event
Inflow = 4.5 cfs @ 12.11 hrs, Volume= 0.36 af
Outflow = 4.5 cfs @ 12.11 hrs, Volume= 0.36 af, Atten= 0%, Lag= 0.0 min
Primary = 4.5 cfs @ 12.11 hrs, Volume= 0.36 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 68.06' @ 12.11 hrs
Flood Elev= 71.72'

Device	Routing	Invert	Outlet Devices
#1	Primary	66.68'	**15.0" Round Culvert** L= 183.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 66.68' / 65.76' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=4.4 cfs @ 12.11 hrs HW=68.03' TW=66.66' (Dynamic Tailwater)
1=Culvert (Barrel Controls 4.4 cfs @ 4.12 fps)

Pond 6B: DMH1



Summary for Subcatchment 7: BASIN2

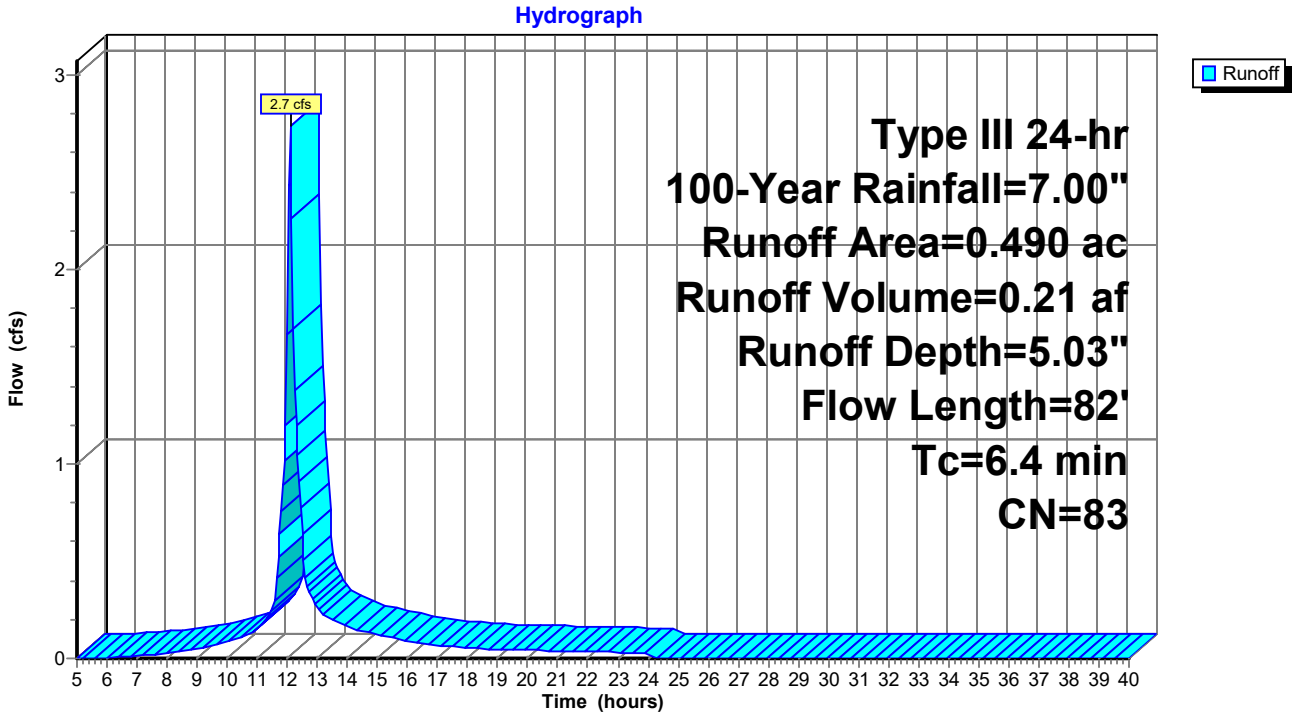
Runoff = 2.7 cfs @ 12.09 hrs, Volume= 0.21 af, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.314	74	>75% Grass cover, Good, HSG C
0.176	98	Water Surface, HSG C
0.490	83	Weighted Average
0.314		64.08% Pervious Area
0.176		35.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, B2a** Grass: Dense n= 0.240 P2= 3.40"
0.4	32	0.0300	1.21		**Shallow Concentrated Flow, B2b** Short Grass Pasture Kv= 7.0 fps
6.4	82	Total			

Subcatchment 7: BASIN2



Summary for Pond 7A: SF2A

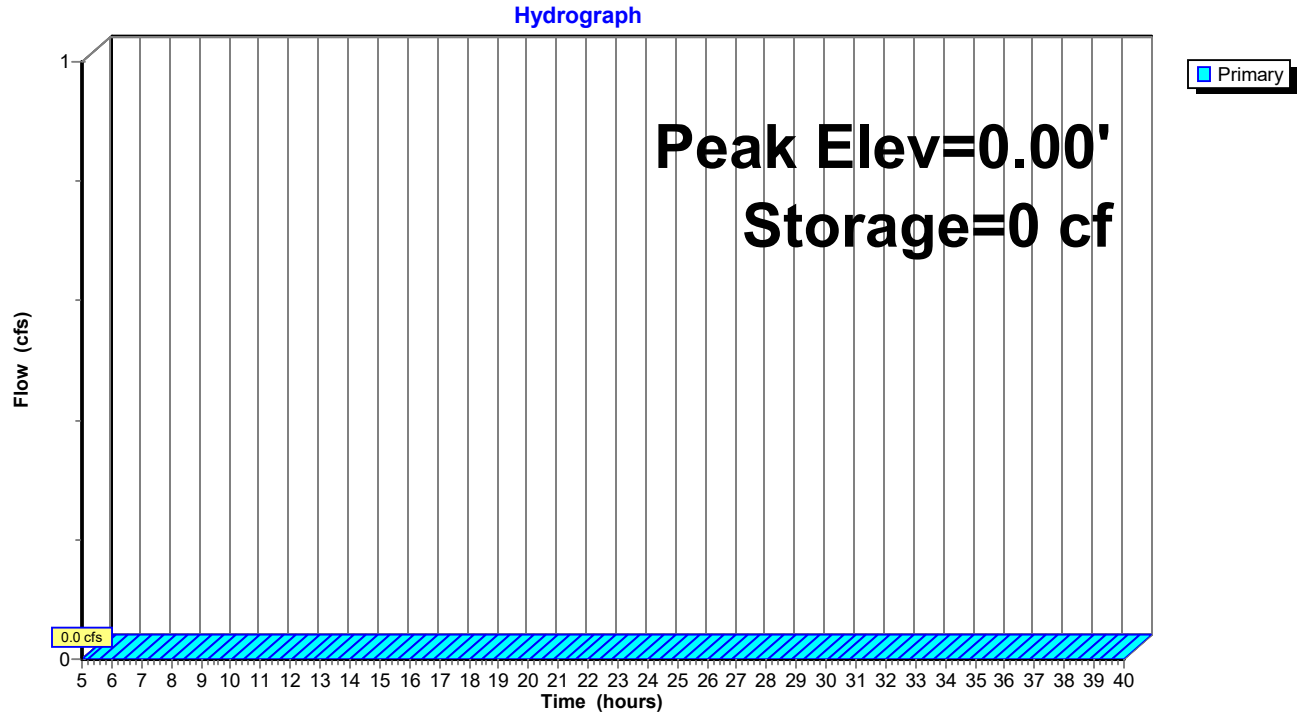
Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	2,916 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	954	0	0
66.00	1,448	1,201	1,201
67.00	1,982	1,715	2,916

Device	Routing	Invert	Outlet Devices
#1	Primary	63.50'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond 7A: SF2A



Summary for Pond 7B: BASIN2A

Inflow Area = 1.280 ac, 63.05% Impervious, Inflow Depth > 5.30" for 100-Year event
Inflow = 7.2 cfs @ 12.11 hrs, Volume= 0.57 af
Outflow = 6.9 cfs @ 12.14 hrs, Volume= 0.51 af, Atten= 5%, Lag= 1.8 min
Primary = 6.9 cfs @ 12.14 hrs, Volume= 0.51 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 66.67' @ 12.13 hrs Surf.Area= 2,770 sf Storage= 3,593 cf
Flood Elev= 67.50' Surf.Area= 3,422 sf Storage= 6,152 cf

Plug-Flow detention time= 82.9 min calculated for 0.50 af (89% of inflow)
Center-of-Mass det. time= 32.7 min (827.7 - 795.0)

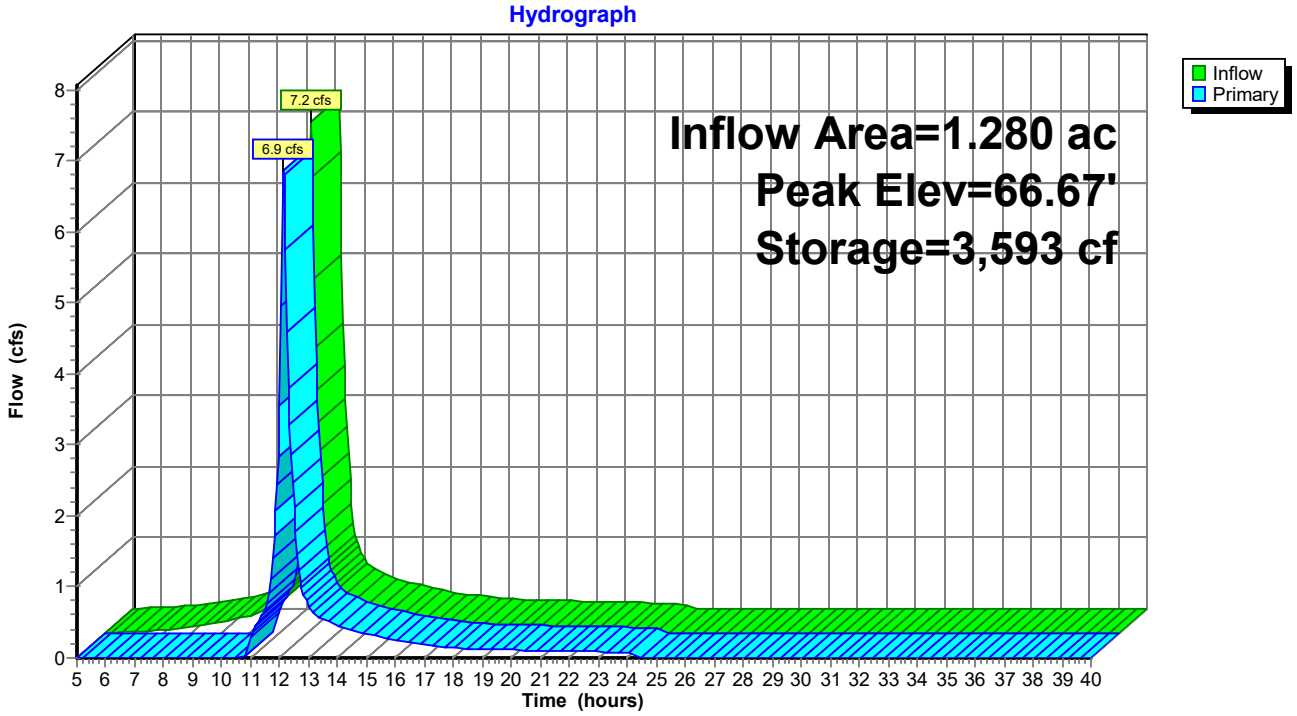
Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	6,152 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	1,548	0	0
66.00	2,257	1,903	1,903
67.00	3,020	2,639	4,541
67.50	3,422	1,611	6,152

Device	Routing	Invert	Outlet Devices
#1	Primary	66.30'	**12.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=6.7 cfs @ 12.14 hrs HW=66.67' TW=64.92' (Dynamic Tailwater)
1=Broad-Crested Rectangular Weir (Weir Controls 6.7 cfs @ 1.52 fps)

Pond 7B: BASIN2A



Summary for Pond 7C: BASIN2B

Inflow Area = 1.280 ac, 63.05% Impervious, Inflow Depth = 4.74" for 100-Year event
Inflow = 6.9 cfs @ 12.14 hrs, Volume= 0.51 af
Outflow = 5.0 cfs @ 12.23 hrs, Volume= 0.51 af, Atten= 27%, Lag= 5.9 min
Discarded = 0.0 cfs @ 12.23 hrs, Volume= 0.02 af
Primary = 5.0 cfs @ 12.23 hrs, Volume= 0.48 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 65.08' @ 12.23 hrs Surf.Area= 2,766 sf Storage= 3,329 cf
Flood Elev= 65.60' Surf.Area= 3,235 sf Storage= 4,892 cf

Plug-Flow detention time= 34.9 min calculated for 0.51 af (100% of inflow)
Center-of-Mass det. time= 35.8 min (863.5 - 827.7)

Volume	Invert	Avail.Storage	Storage Description
#1	63.50'	6,649 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

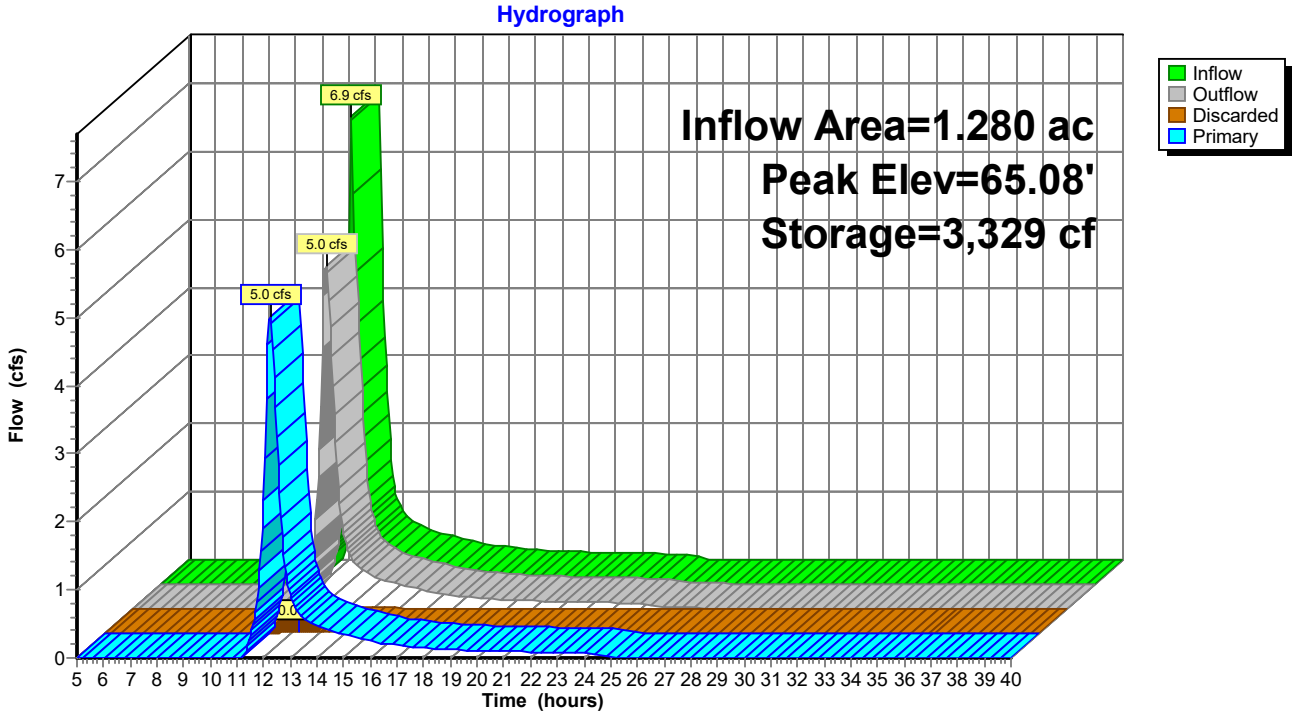
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
63.50	1,477	0	0
64.00	1,862	835	835
65.00	2,695	2,279	3,113
66.00	3,595	3,145	6,258
66.10	4,222	391	6,649

Device	Routing	Invert	Outlet Devices
#1	Discarded	63.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 59.50'
#2	Primary	63.70'	**15.0" Round Culvert** L= 427.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 63.70' / 61.00' S= 0.0063 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Discarded OutFlow Max=0.0 cfs @ 12.23 hrs HW=65.07' (Free Discharge)
1=Exfiltration (Controls 0.0 cfs)

Primary OutFlow Max=5.0 cfs @ 12.23 hrs HW=65.07' TW=0.00' (Dynamic Tailwater)
2=Culvert (Barrel Controls 5.0 cfs @ 4.62 fps)

Pond 7C: BASIN2B



Summary for Subcatchment 8: DV-A

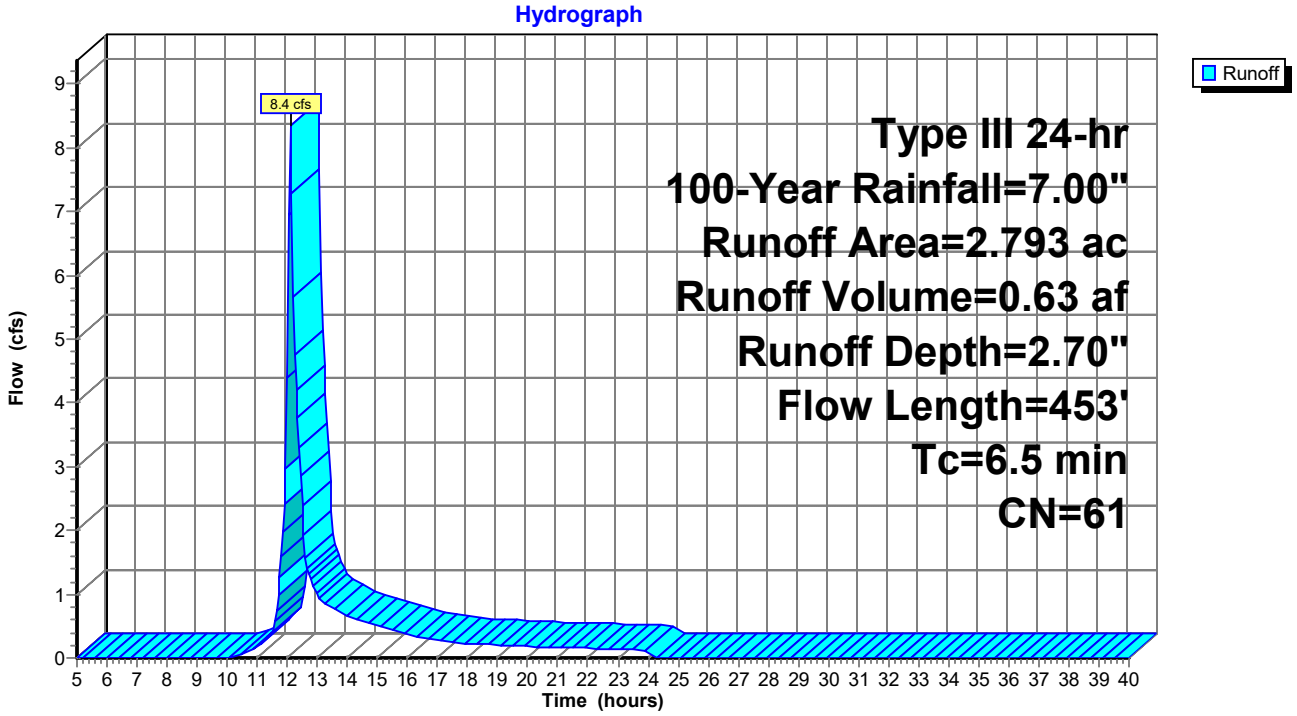
Runoff = 8.4 cfs @ 12.10 hrs, Volume= 0.63 af, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.280	92	Urban commercial, 85% imp, HSG B
0.005	98	Roofs, HSG B
0.200	98	Roofs, HSG A
0.049	98	Paved parking, HSG D
0.036	98	Paved parking, HSG B
0.015	98	Paved parking, HSG A
0.270	73	Brush, Good, HSG D
0.096	80	>75% Grass cover, Good, HSG D
0.471	39	>75% Grass cover, Good, HSG A
0.073	61	>75% Grass cover, Good, HSG B
0.018	98	Roofs, HSG D
0.003	98	Roofs, HSG C
1.277	48	Brush, Good, HSG B
2.793	61	Weighted Average
2.229		79.81% Pervious Area
0.564		20.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, A1** Smooth surfaces n= 0.011 P2= 3.40"
1.0	95	0.0100	1.61		**Shallow Concentrated Flow, A2** Unpaved Kv= 16.1 fps
0.8	77	0.0300	1.56		**Shallow Concentrated Flow, A3** Cultivated Straight Rows Kv= 9.0 fps
1.1	87	0.0200	1.27		**Shallow Concentrated Flow, A4** Cultivated Straight Rows Kv= 9.0 fps
2.7	144	0.0100	0.90		**Shallow Concentrated Flow, A5** Cultivated Straight Rows Kv= 9.0 fps
6.5	453	Total			

Subcatchment 8: DV-A



Summary for Pond 8A: CBA

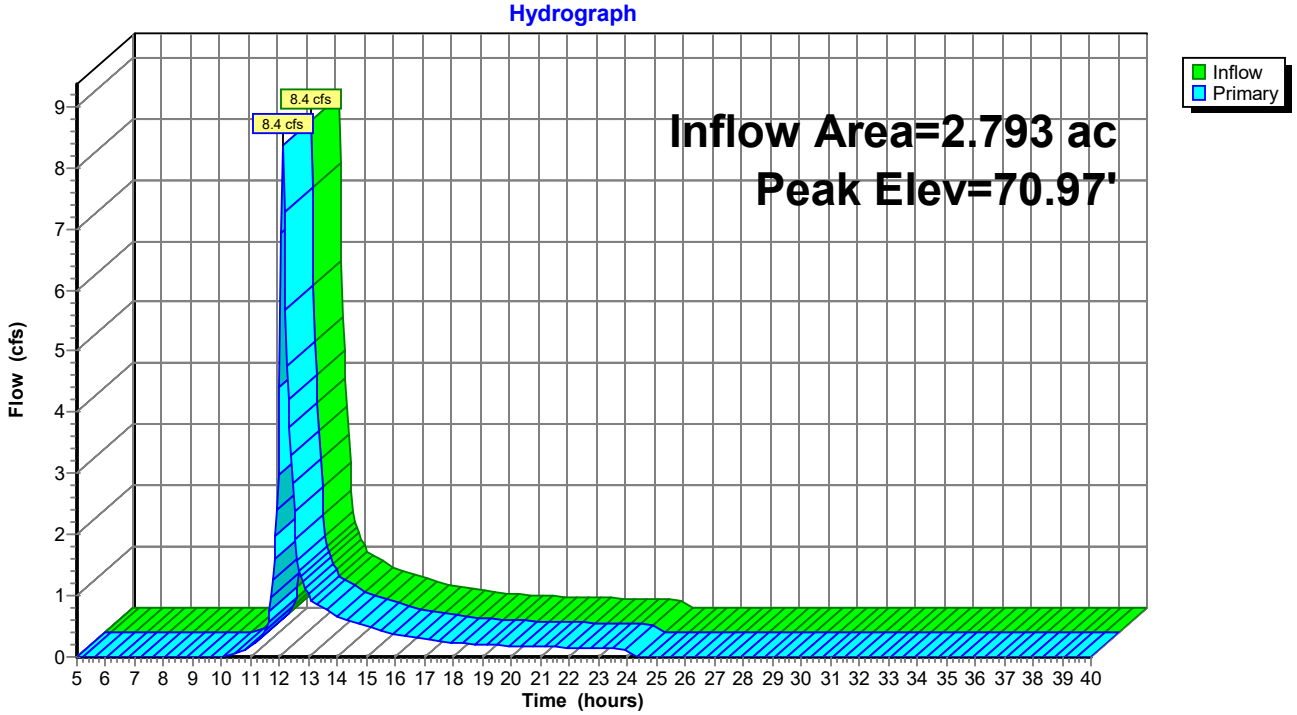
Inflow Area = 2.793 ac, 20.19% Impervious, Inflow Depth = 2.70" for 100-Year event
Inflow = 8.4 cfs @ 12.10 hrs, Volume= 0.63 af
Outflow = 8.4 cfs @ 12.10 hrs, Volume= 0.63 af, Atten= 0%, Lag= 0.0 min
Primary = 8.4 cfs @ 12.10 hrs, Volume= 0.63 af

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 70.97' @ 12.10 hrs
Flood Elev= 72.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.80'	**24.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	67.70'	**18.0" Round Culvert** L= 118.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 67.70' / 66.50' S= 0.0102 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=8.3 cfs @ 12.10 hrs HW=70.95' TW=0.00' (Dynamic Tailwater)
└**1=Orifice/Grate** (Passes 8.3 cfs of 25.8 cfs potential flow)
└**2=Culvert** (Outlet Controls 8.3 cfs @ 4.69 fps)

Pond 8A: CBA



Summary for Subcatchment 9: DV-B

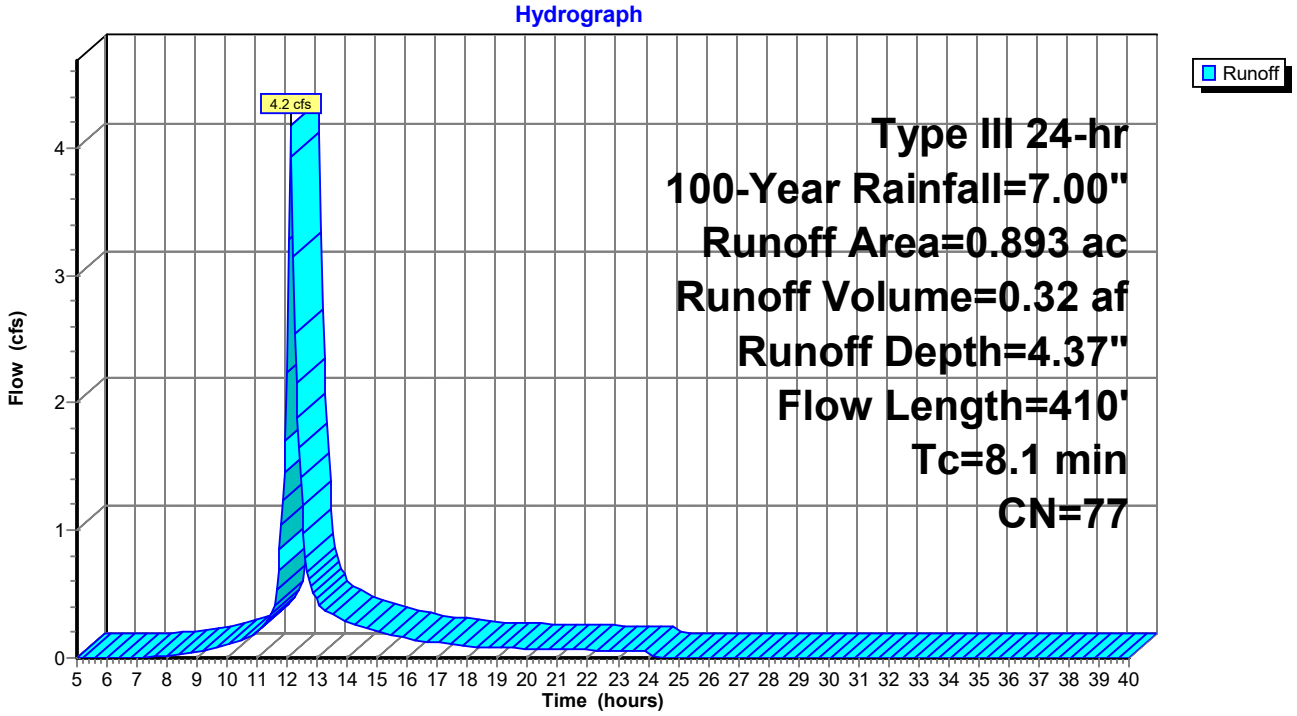
Runoff = 4.2 cfs @ 12.12 hrs, Volume= 0.32 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.833	78	Row crops, straight row, Good, HSG B
0.055	61	>75% Grass cover, Good, HSG B
0.005	89	Row crops, straight row, Good, HSG D
0.893	77	Weighted Average
0.893		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	50	0.0200	0.32		**Sheet Flow, B1** Cultivated: Residue<=20% n= 0.060 P2= 3.40"
0.9	81	0.0250	1.42		**Shallow Concentrated Flow, B2** Cultivated Straight Rows Kv= 9.0 fps
2.0	109	0.0100	0.90		**Shallow Concentrated Flow, B3** Cultivated Straight Rows Kv= 9.0 fps
0.4	37	0.0300	1.56		**Shallow Concentrated Flow, B4** Cultivated Straight Rows Kv= 9.0 fps
2.2	133	0.0200	0.99		**Shallow Concentrated Flow, B5** Short Grass Pasture Kv= 7.0 fps
8.1	410	Total			

Subcatchment 9: DV-B



Summary for Subcatchment 10: DV-D

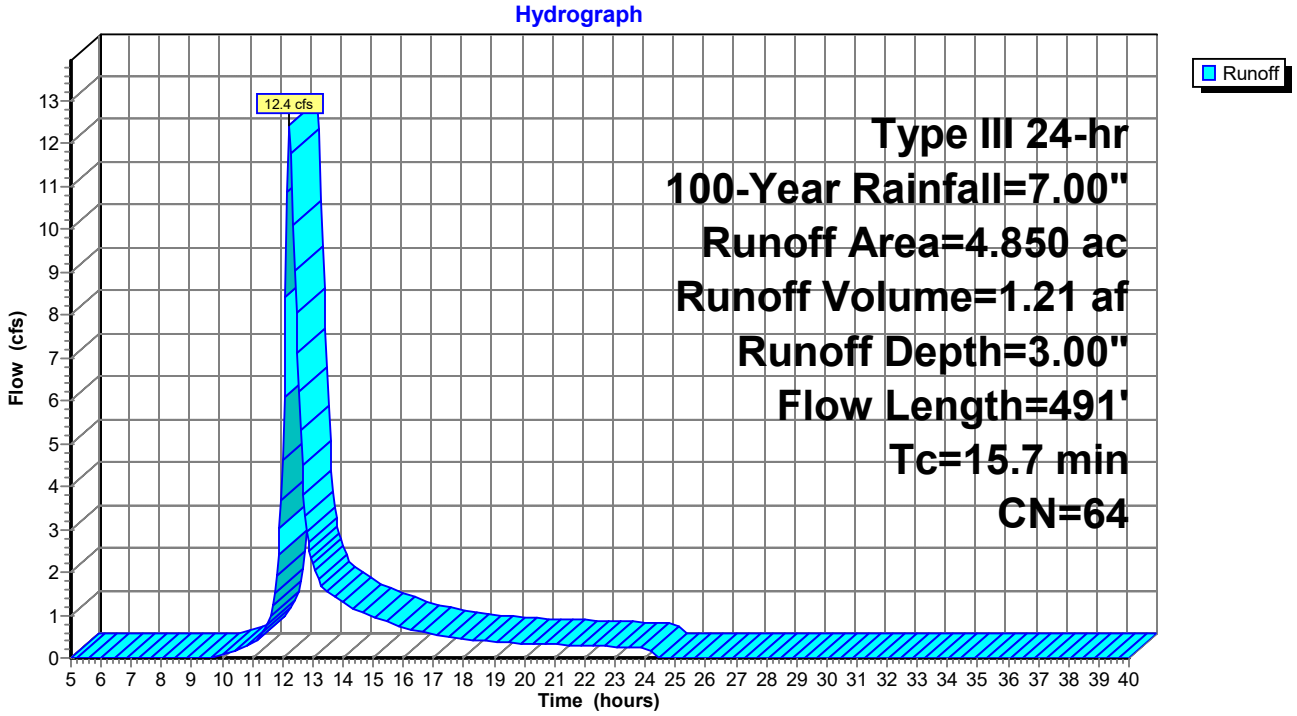
Runoff = 12.4 cfs @ 12.22 hrs, Volume= 1.21 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.056	96	Gravel surface, HSG A
0.757	39	>75% Grass cover, Good, HSG A
0.126	98	Roofs, HSG A
0.272	98	Roofs, HSG C
0.021	98	Roofs, HSG D
0.076	84	50-75% Grass cover, Fair, HSG D
3.542	65	Brush, Good, HSG C
4.850	64	Weighted Average
4.431		91.36% Pervious Area
0.419		8.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, C1** Grass: Dense n= 0.240 P2= 3.40"
1.9	78	0.0100	0.70		**Shallow Concentrated Flow, C2** Short Grass Pasture Kv= 7.0 fps
0.8	39	0.0150	0.86		**Shallow Concentrated Flow, C3** Short Grass Pasture Kv= 7.0 fps
0.9	46	0.0150	0.86		**Shallow Concentrated Flow, C4** Short Grass Pasture Kv= 7.0 fps
1.8	75	0.0100	0.70		**Shallow Concentrated Flow, C5** Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0300	1.21		**Shallow Concentrated Flow, C6** Short Grass Pasture Kv= 7.0 fps
2.2	93	0.0100	0.70		**Shallow Concentrated Flow, C7** Short Grass Pasture Kv= 7.0 fps
0.4	24	0.0400	1.00		**Shallow Concentrated Flow, C8** Woodland Kv= 5.0 fps
1.2	52	0.0200	0.71		**Shallow Concentrated Flow, C9** Woodland Kv= 5.0 fps
15.7	491	Total			

Subcatchment 10: DV-D

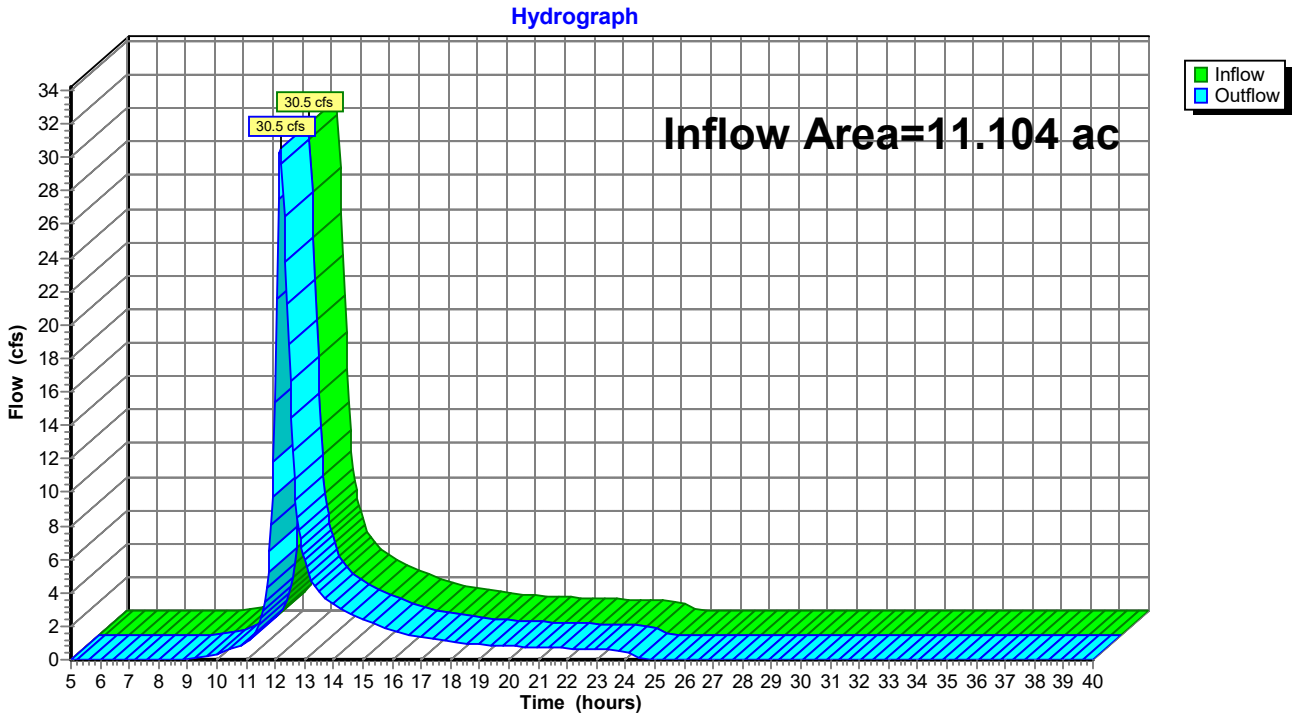


Summary for Reach 11: POSTDEV

Inflow Area = 11.104 ac, 21.82% Impervious, Inflow Depth = 3.43" for 100-Year event
Inflow = 30.5 cfs @ 12.18 hrs, Volume= 3.17 af
Outflow = 30.5 cfs @ 12.18 hrs, Volume= 3.17 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs / 3

Reach 11: POSTDEV



Summary for Subcatchment 12: DV-C

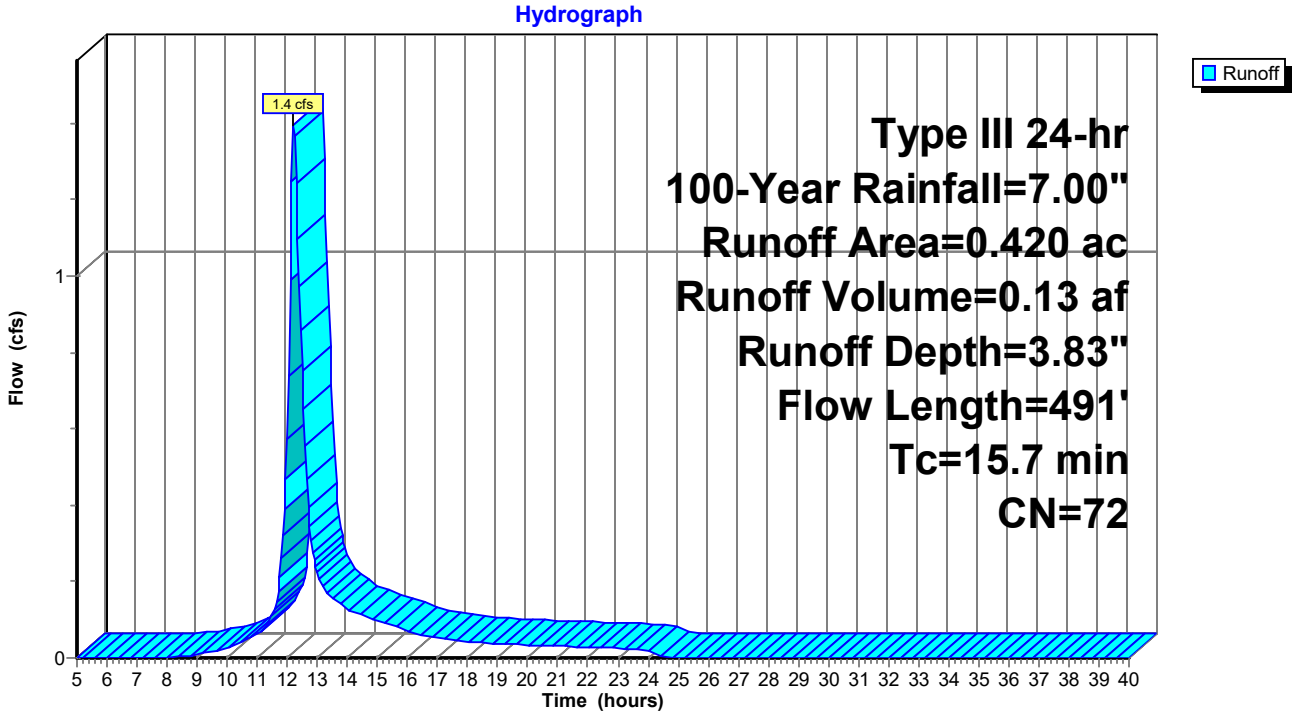
Runoff = 1.4 cfs @ 12.22 hrs, Volume= 0.13 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-40.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.420	72	Woods/grass comb., Good, HSG C
0.420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow, C1** Grass: Dense n= 0.240 P2= 3.40"
1.9	78	0.0100	0.70		**Shallow Concentrated Flow, C2** Short Grass Pasture Kv= 7.0 fps
0.8	39	0.0150	0.86		**Shallow Concentrated Flow, C3** Short Grass Pasture Kv= 7.0 fps
0.9	46	0.0150	0.86		**Shallow Concentrated Flow, C4** Short Grass Pasture Kv= 7.0 fps
1.8	75	0.0100	0.70		**Shallow Concentrated Flow, C5** Short Grass Pasture Kv= 7.0 fps
0.5	34	0.0300	1.21		**Shallow Concentrated Flow, C6** Short Grass Pasture Kv= 7.0 fps
2.2	93	0.0100	0.70		**Shallow Concentrated Flow, C7** Short Grass Pasture Kv= 7.0 fps
0.4	24	0.0400	1.00		**Shallow Concentrated Flow, C8** Woodland Kv= 5.0 fps
1.2	52	0.0200	0.71		**Shallow Concentrated Flow, C9** Woodland Kv= 5.0 fps
15.7	491	Total			

Subcatchment 12: DV-C



Silva
Engineering
Associates, P.C.

Lawrence P. Silva, P.E.

"OPERATION & MAINTENANCE SCHEDULE"

Assessor's Map 63, Lot 6B, 6C & Lot 31
Plymouth Street, Halifax, Massachusetts

Civil Engineers • Land Surveyors • Environmental Consultants
1615 Bedford Street • Bridgewater, MA 02324 • Phone (508) 697-3100 • FAX (508) 697-3136
Website: www.silvaeng.com • email: info@silvaeng.com

Long Term Pollution and Prevention Plan

Assessor's Map 63, Lot 6B, Lot 6C, & Lot 31
Plymouth Street, Halifax, Massachusetts
January 13, 2020

Good House Keeping:

The site is designed to maintain a high water quality treatment for all stormwater runoff. An *Operation and Maintenance* and *Stormwater Pollution Prevention Plan* have been developed and will be followed in as complete manner as possible.

Spill Prevention:

The largest, most probable quantity to be released is the contents of a single fuel storage tank of a vehicle or truck. The points of entry to the drainage system are via sheet flow into deep sump catch basins then into an oil/grit separator final discharge into the infiltration chambers. The long flow paths and crushed granite or limestone surface will allow time for cleaning before surface flow to the wetlands. This will also allow for a secondary measure of action to place absorbent booms or pads in these areas.

In the event of a hazardous materials spill on the site, the following parties shall be contacted:

Halifax Fire Department: (781) 293-1751
Then call MassDEP's Emergency Response at: 1-888-304-1133

Landscape and Lawn Maintenance:

Routine mowing and associated maintenance of all landscape features will occur weekly or as needed to prevent excessive growth and debris from occurring on site. Lawn clippings will be removed from the site by the Landscape Contractor. There shall be no fertilizers of pesticides used onsite.

Solid Waste Management:

Curbside trash pickup will be on a weekly basis or as needed.

Parking and Road Area Maintenance:

Parking and roadway sweeping will occur, at a minimum, twice a year. Snow shall be managed along the sides of the parking areas. Snow shall not be within 25 feet of a catch basin.

Training:

All personnel on site will be briefed on all requirements for implementing the Long Term Pollution Prevention Plan.

OPERATION AND MAINTENANCE SCHEDULE

Assessor's Map 63, Lot 6B, Lot 6C, & Lot 31
Plymouth Street, Halifax, Massachusetts
January 13, 2020

Project Owner & Source of Funding:
R & J LLC

Records:

The owner shall maintain an inspection log of all elements of the Stormwater management system. The owner shall maintain a maintenance log documenting the inspection and maintenance of the drainage structures under the owner's control. A copy of the "Stormwater Management Best Management Practices Inspection Schedule and Evaluation Checklist" and inspection logs shall be kept onsite at all times.

Emergency Contacts:

In the event of a hazardous materials spill on the site, the following parties shall be contacted:

Halifax Fire Department: (781) 293-1751
Then call MassDEP's Emergency Response at: 1-888-304-1133

Street Sweeping:

Roadway areas shall be swept quarterly, twice at the beginning of spring and twice at the end of autumn. The roadway shall also be swept upon the discovery of any significant amounts of sediment.

Deep Sump and Hooded Catch Basin:

The deep sump for the catch basins shall be inspected four times a year. The catch basin shall be cleaned upon the accumulation of 18" of sediment. Sediment removed shall be disposed of in accordance with applicable local, state, and federal guidelines and regulations.

Sediment Forebay:

The sediment forebay shall be inspected four times a year and shall be cleaned upon the accumulation of 6" of sediment. Sediment removed shall be disposed of in accordance with applicable local, state, and federal guidelines and regulations.

Drainage Basin:

Twice a year the Drainage Basin shall be inspected for erosion, trash and debris removed, mow the upper stages, side slopes, and embankments. Removal of weed and brush growth. Inspect and remove accumulated sediment yearly.

STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES
INSPECTION SCHEDULE AND EVALUATION CHECKLIST
CONSTRUCTION PHASE

Project Location:

Stormwater Control Manager:

Best Management Practice	Inspection frequency (1)	Date Inspected	Minimum maintenance and Key Items to Check	Cleaning/Repair Needed Yes / No List Items	Date of Cleaning/Repair	Performed By	Water Level in Retention / Detention & Infiltration System
Construction Entrance	Weekly or after every major storm event		Reshape and/or replace top stone. Removal of sediment.				
Street Sweeping	Weekly or after every major storm event		Removal of sediment and trash.				
Hooded Deep Sump Catch Basin & Silt Sack	Weekly or after every major storm event		Sediment not to exceed 9 inches.				
Sediment Forebay	Weekly or after every major storm event		Sediment not to exceed 6 inches.				
Drainage Basin	Weekly or after every major storm event		Inspect inlets/outlets, and remove trash and debris. Repair eroded areas.				

(1) Refer to frequencies list in this report or the Massachusetts Stormwater Management, Volume Two; Stormwater Technical Handbook (Latest Edition) for recommendations regarding frequency for inspection and maintenance of specific BMPs.

STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES
INSPECTION SCHEDULE AND EVALUATION CHECKLIST
POST CONSTRUCTION PHASE

Project Location:

Stormwater Control Manager:

Best Management Practice	Inspection frequency (1)	Date Inspected	Minimum maintenance and Key Items to Check	Cleaning/Repair Needed Yes / No List Items	Date of Cleaning/Repair	Performed By	Water Level in Retention / Detention & Infiltration System
Street Sweeping	Quarterly-Twice spring/Twice Fall		Removal of sediment and trash				
Hooded Deep Sump Catch Basin	Quarterly		Sediment not to exceed 18 inches.				
Sediment Forebay	Quarterly		Sediment not to exceed 6 inches.				
Drainage Basin	Bi-Annually- Annually-		Mow the upper stage, side slopes and embankment. Remove brush, weed, trash and debris. Inspect and remove sediment				

(1) Refer to frequencies list in this report or the Massachusetts Stormwater Management, Volume Two; Stormwater Technical Handbook (Latest Edition) for recommendations regarding frequency for inspection and maintenance of specific BMPs.
Note: Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.