GRADY CONSULTING, L.L.C.
Civil Engineers ♦ Land Surveyors ♦ Landscape Architects

STORMWATER REPORT

Definitive Subdivision
Old Cart Path Lane Ext. (70 Old Cart Path Lane)
Pembroke, Massachusetts

Prepared for:

Stephen Saia
70 Old Cart Path Lane
Pembroke, MA 02359

January 7, 2020
Revised: February 9, 2020

71 Evergreen Street, Suite 1 • Kingston, MA 02364 • Tel (781) 585-2300 • Fax (781) 585-2378

SUMMARY

This Stormwater Report has been prepared to document compliance with Stormwater Management Standards. The applicant is proposing to subdivide the existing 6.2 acre parcel into 4 lots including a 24-foot wide road and cul-de-sac with sidewalk on both sides.

A drainage system consisting of catch basin and manholes is proposed for the roadway. The closed drainage system discharges to sediment forebays and infiltration basins to the northwest and southeast of the proposed development. The infiltration basin is designed to fully infiltrate the 2 and 10 year storms. Outlet control structures are proposed to reduce peak flows during the 25 and 100 year storms and to provide emergency overflow.

The design as proposed reduces peak runoff rates, improves and promotes infiltration, improves stormwater quality and treatment.

This analysis is divided into the following sections:

Section I Compliance with Massachusetts Stormwater Management Regulations
Section II Overall Site Analysis
Section III Operation and Maintenance Plan

The calculations have been performed for the 2, 10, and 25, 100-year 24 hour storm event, using HydroCAD 10.00 Stormwater Modeling computer program. This computer program is based upon the TR-55 computer models and uses the SCS Curvilinear Unit rainfall distribution. The closed drainage system calculation were performed using the HydroCAD Stormwater Modeling program.

SUMMARY OF STORMWATER FLOWS
(cfs)

Westerly flow towards Northwest Wetland

Design Storm		Existing Condition (Subcat 3)	Proposed Condition 14L(Subcat 5-9)	W. Surf El. Infil Basin
2-year	3.4”	0.02	0.02	65.46
10-year	4.7”	0.32	0.28	66.22
25-year	5.5”	0.98	0.89	66.68
100-year	7.0”	2.66	2.61	67.34

Westerly flow towards Southwest Wetland

Design Storm		Existing Condition 4L(Subcat 1-2)	Proposed Condition 12L(Subcat 1-4, 10)	W. Surf El. Infil Basin
2-year	3.4”	0.08	0.01	64.64
10-year	4.7”	0.76	0.10	65.80
25-year	5.5”	1.71	0.80	65.94
100-year	7.0”	3.95	3.35	66.16

Infiltration Basin #1 (11P)
Infiltration Rate = 2.41 in/hr

Design Storm		Max El. (ft)	Storage (cf)	Peak Inflow	Peak Exfiltration
2-year	3.4”	64.64	1,149	0.85	0.11
10-year	4.7”	65.80	3,748	1.69	0.14
25-year	5.5”	65.96	4,115	2.53	0.15
100-year	7.0”	66.16	4,719	4.16	0.16

Infiltration Basin #2 (13P)
Infiltration Rate = 2.41 in/hr

Design Storm		Max El. (ft)	Storage (cf)	Peak Inflow	Peak Exfiltration
2-year	3.4”	65.46	924	0.58	0.15
10-year	4.7”	66.22	3,160	1.80	0.18
25-year	5.5”	66.68	4,688	2.84	0.19
100-year	7.0”	67.34	7,140	4.17	0.22

Section I

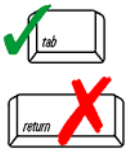
Compliance with Massachusetts Stormwater Management Regulations

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.

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

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

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): _____

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.

STANDARD 1. NO NEW STORMWATER CONVEYANCES
The proposed development proposes no new stormwater conveyances that discharge untreated stormwater off-site or cause down gradient erosion.

STANDARD 2. PEAK RATE ATTENUATION
The overall site analysis demonstrates that the stormwater management system has been designed so that the post-development peak discharge rates do not exceed the pre-development discharge rate.

STANDARD 3. STORMWATER RECHARGE
Test holes were excavated on site October 5, 2017. Based on Plymouth County Soil Survey, the consist of Hydrologic Soils Group "Type A", loamy sand for the majority of the site. Test holes performed on site showed the soil textual analysis consistent with the soils survey and an infiltration rate of 2.41 in/hr was used for the analysis.

TABLE 1
REQUIRED RECHARGE VOLUME AND DRAWDOWN

Impervious Area = 43,184 SF
Target Depth Factor (F) = 0.6"

Rv = F x impervious area = 0.6"x 43,184 SF x 1'/12"= 2,159 CF

Total Required Recharge =2,159 CF

Proposed:
Infiltration Basin #1(10 Year Infiltration) = 3,790 CF
Infiltration Basin #2(25 Year Infiltration) = 4,826 CF
Total = 8,616 CF

Drawdown Within 72 Hours

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$$

Where:
Rv = Storage Volume
K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3). For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.
Bottom Area = Bottom Area of Recharge Structure

Basin #1

$$\text{Time} = \frac{4{,}670\ CF}{(2.41"/hr)(1'/12")(1{,}612\ SF)} = 14.4\ hours < 72\ hours$$

Basin #2

$$\text{Time} = \frac{6{,}383 \text{ CF}}{(2.41\text{"/hr})(1\text{'}/12\text{"})(2{,}410 \text{ SF})} = 13.2 \text{ hours} < 72 \text{ hours}$$

Mounding Analysis

"Mounding analysis is required when the vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm (e.g., 10-year, 25-year, 50-year, or 100-year 24-hour storm). In such cases, the mounding analysis must demonstrate that the Required Recharge Volume (e.g., infiltration basin storage) is fully dewatered within 72 hours (so the next storm can be stored for exfiltration). The mounding analysis must also show that the groundwater mound that forms under the recharge system will not break out above the land or water surface of a wetland (e.g., it doesn't increase the water sheet elevation in a Bordering Vegetated Wetland, Salt Marsh, or Land Under Water within the 72-hour evaluation period)."

"The Hantush[1] or other equivalent method may be used to conduct the mounding analysis. The Hantush method predicts the maximum height of the groundwater mound beneath a rectangular or circular recharge area. It assumes unconfined groundwater flow, and that a linear relation exists between the water table elevation and water table decline rate. It results in a water table recession hydrograph depicting exponential decline. The Hantush method is available in proprietary software and free on-line calculators on the Web in automated format. If the analysis indicates the mound will prevent the infiltration BMP from fully draining within the 72-hour period, an iterative process must be employed to determine an alternative design that drains within the 72-hour period."

This mounding will not interfere with dewatering within 72 hours or result in break out above the land or water surface of a wetland.

See Mounding Analysis sheets

[1] Hantush 1967 – See Reference for Standard 3.

Basin 1

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.9970	*R*	**Recharge (infiltration) rate (feet/day)**
0.200	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
32.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
45.000	x	**1/2 length of basin (x direction, in feet)**
27.000	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
40.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

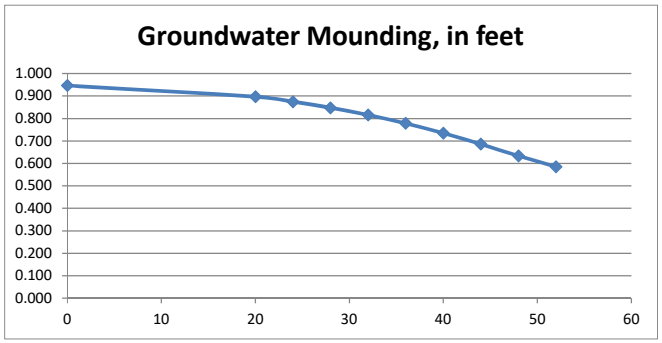
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

40.947	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.947	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.947	0
0.897	20
0.875	24
0.848	28
0.816	32
0.778	36
0.735	40
0.686	44
0.634	48
0.585	52

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Basin 2

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
1.5600	*R*	**Recharge (infiltration) rate (feet/day)**
0.200	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
32.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
38.000	x	**1/2 length of basin (x direction, in feet)**
28.000	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
40.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

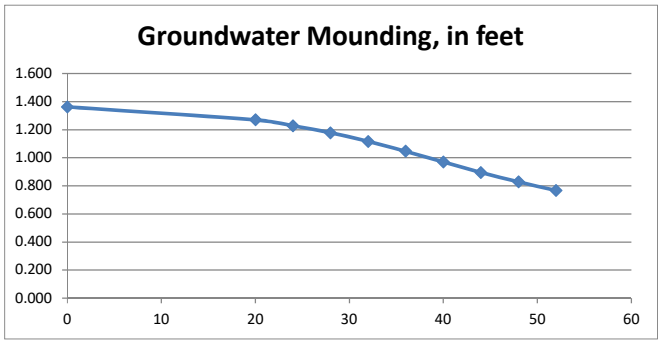
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

41.363	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.363	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.363	0
1.271	20
1.229	24
1.178	28
1.117	32
1.047	36
0.970	40
0.896	44
0.828	48
0.767	52

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

STANDARD 4. WATER QUALITY

TSS Removal

The proposed work meets the requirement for removal of total suspended solids (TSS). See TSS Removal Worksheet

Long-Term Pollution Prevention Plan

The long-term pollution prevention plan will be combined with the Operation and Maintenance Plan required by Standard 9.

WATER QUALITY TREATMENT VOLUME

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

V_{WQ} = *Required Water Quality Volume* (in cubic feet)
D_{WQ} = Water Quality Depth: one-inch for discharges within a Zone II or Interim Wellhead Protection Area, to or near another critical area, runoff from a LUHPPL, or exfiltration to soils with infiltration rate greater than 2.4 inches/hour or greater; ½-inch for discharges near or to other areas.
A_{IMP} = Impervious Area (in acres)

The site is located in soils with an infiltration rate greater than 2.4 inches/hour so a Water Quality Depth of one-inch is required.

V_{WQ} = (1 inch/12 inches/foot) * (43,184 square feet) = 3,598 CF

3,741 CF storage volume provided in the infiltration basin #1 below the drainage system outlet.

2,461 CF storage volume provided in the infiltration basin #2 below the drainage system outlet.

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basins 1 & 2

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Stormceptor	0.52	1.00	0.52	0.48
Infiltration Basin	0.80	0.48	0.38	0.10

Total TSS Removal = 90%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 70 Old Cart Path Lane

Prepared By: Grady Consulting LLC

Date: 2/9/2020

*Equals remaining load from previous BMP (E) which enters the BMP

STANDARD 5 LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS

The land use is not considered a higher potential pollutant load.

STANDARD 6. CRITICAL AREAS

The land use is not located within a critical area.

STANDARD 7. REDEVELOPMENT PROJECT

"A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions."

The project is not a redevelopment project.

STANDARD 8. CONSTRUCTION PERIOD CONTROLS

A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

The proposed project will disturb more than one acre of land and is required to obtain coverage under the NPDES Construction General Permit issued by EPA and prepare a Stormwater Pollution Plan (see attached O&M Plan during construction)

STANDARD 9. LONG-TERM OPERATION AND MAINTENANCE (O&M) PLAN

A Long -Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The Long-Term Operation and Maintenance Plan shall at a minimum include:

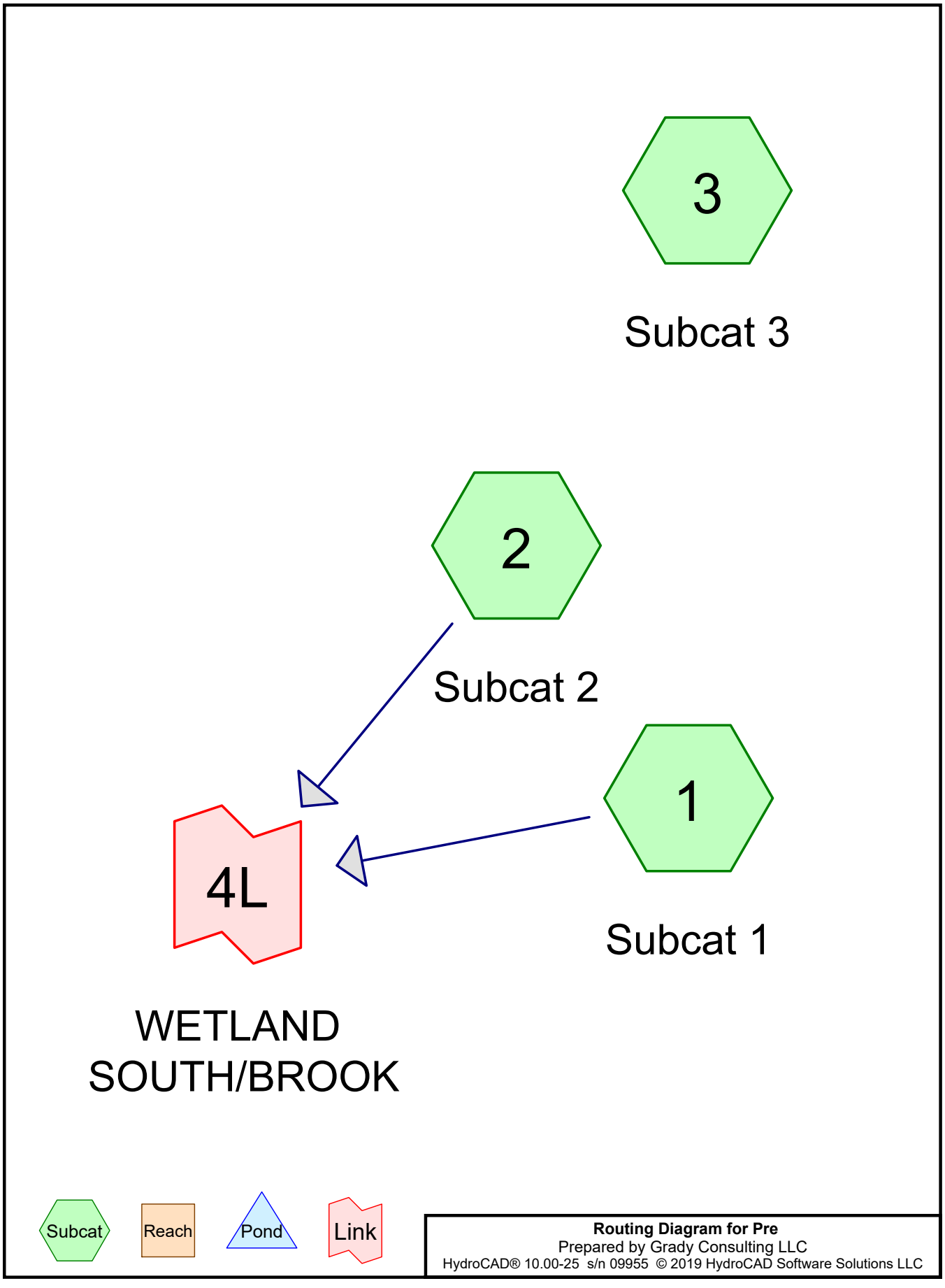
1. *Stormwater management system(s) owners;*
2. *The party or parties responsible for operation and maintenance, including how future property owners will be notified of the presence of the stormwater management system and the requirement for proper operation and maintenance;*
3. *The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;*
4. *A plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;*
5. *A description and delineation of public safety features; and*
6. *An estimated operations and maintenance budget.*

STANDARD 10. ILLICIT DISCHARGES PROHIBITED

"All illicit discharges to the stormwater management system are prohibited."

Section II

Overall Site Analysis



Routing Diagram for Pre
Prepared by Grady Consulting LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
136,963	49	50-75% Grass cover, Fair, HSG A (1, 2, 3)
17,932	98	Paved roads w/curbs & sewers, HSG A (1, 2, 3)
8,234	98	Roofs, HSG A (1, 2, 3)
200,303	36	Woods, Fair, HSG A (1, 2, 3)
363,432	**45**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
363,432	HSG A	1, 2, 3
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
363,432		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
136,963	0	0	0	0	136,963	50-75% Grass cover, Fair
17,932	0	0	0	0	17,932	Paved roads w/curbs & sewers
8,234	0	0	0	0	8,234	Roofs
200,303	0	0	0	0	200,303	Woods, Fair
363,432	**0**	**0**	**0**	**0**	**363,432**	**TOTAL AREA**

Time span=0.50-24.00 hrs, dt=0.02 hrs, 1176 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=42,391 sf 12.55% Impervious Runoff Depth>0.22"
Flow Length=368' Tc=8.5 min CN=52 Runoff=0.08 cfs 788 cf

Subcatchment 2: Subcat 2 Runoff Area=125,708 sf 6.95% Impervious Runoff Depth>0.09"
Flow Length=500' Tc=14.9 min CN=46 Runoff=0.03 cfs 896 cf

Subcatchment 3: Subcat 3 Runoff Area=195,333 sf 6.20% Impervious Runoff Depth>0.04"
Flow Length=786' Tc=19.9 min CN=43 Runoff=0.02 cfs 637 cf

Link 4L: WETLAND SOUTH/BROOK Inflow=0.08 cfs 1,683 cf
Primary=0.08 cfs 1,683 cf

Total Runoff Area = 363,432 sf Runoff Volume = 2,320 cf Average Runoff Depth = 0.08"
92.80% Pervious = 337,266 sf 7.20% Impervious = 26,166 sf

Summary for Subcatchment 1: Subcat 1

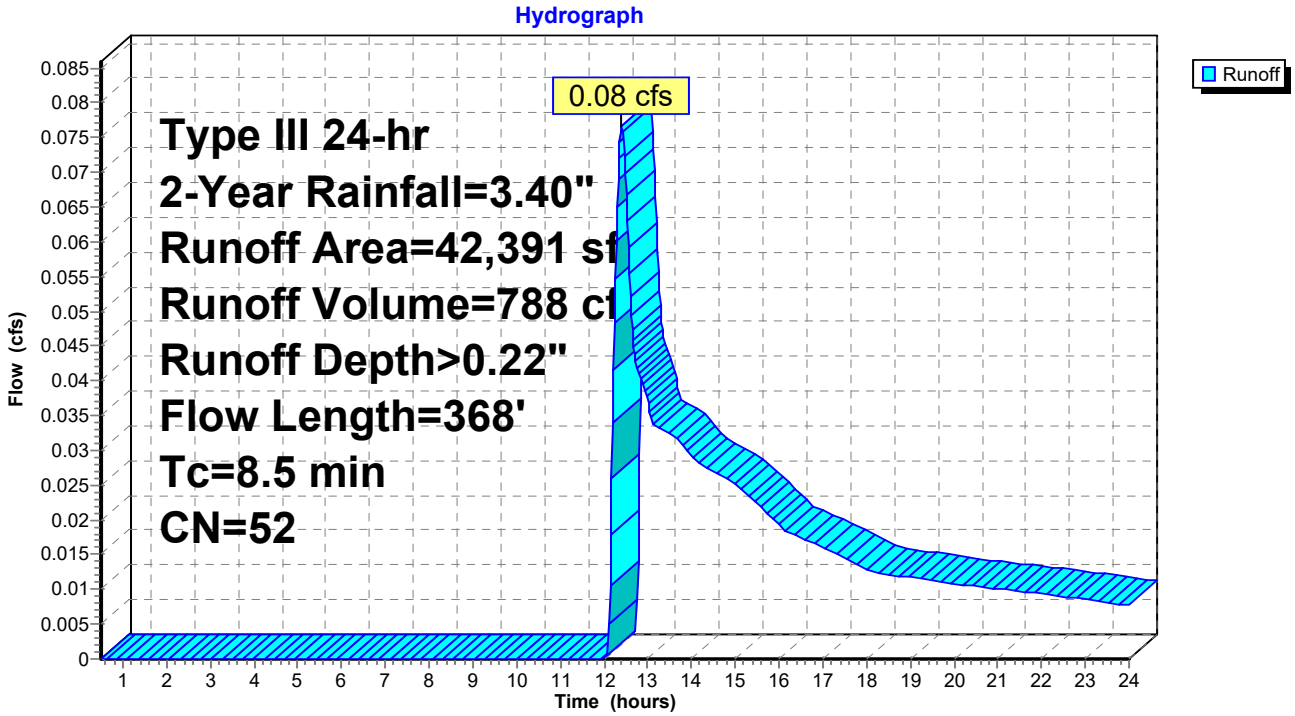
Runoff = 0.08 cfs @ 12.41 hrs, Volume= 788 cf, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
28,260	49	50-75% Grass cover, Fair, HSG A
5,097	98	Paved roads w/curbs & sewers, HSG A
222	98	Roofs, HSG A
8,811	36	Woods, Fair, HSG A
42,391	52	Weighted Average
37,071		87.45% Pervious Area
5,319		12.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0500	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.6	144	0.0530	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	174	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	368	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

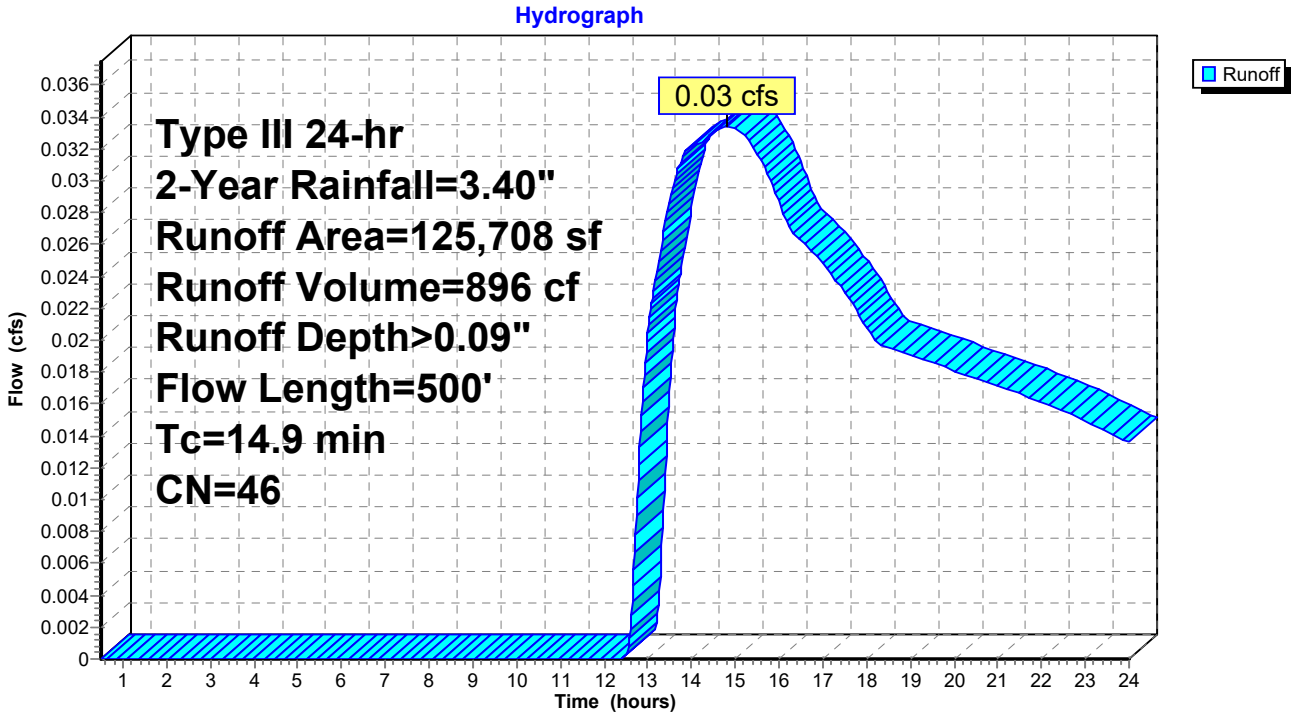
Runoff = 0.03 cfs @ 14.82 hrs, Volume= 896 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
55,632	49	50-75% Grass cover, Fair, HSG A
7,011	98	Paved roads w/curbs & sewers, HSG A
1,732	98	Roofs, HSG A
61,333	36	Woods, Fair, HSG A
125,708	46	Weighted Average
116,965		93.05% Pervious Area
8,743		6.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
0.9	143	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	307	0.0530	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
14.9	500	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

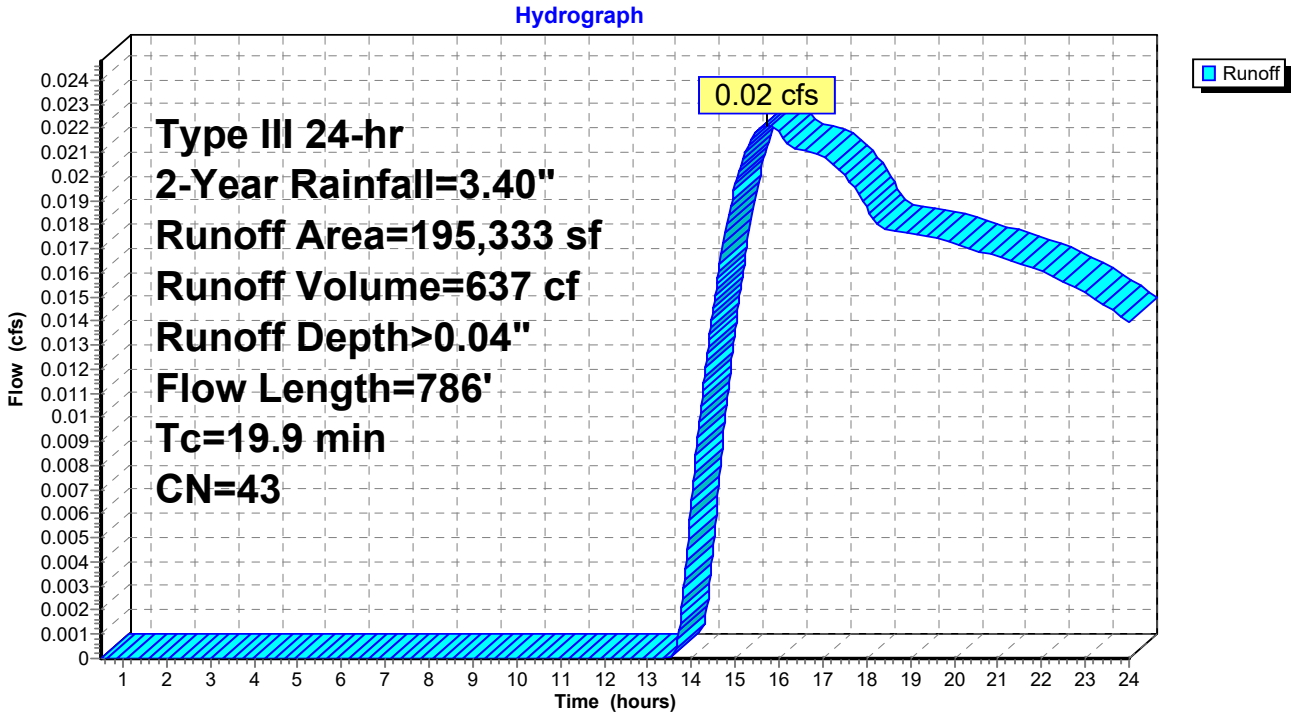
Runoff = 0.02 cfs @ 15.72 hrs, Volume= 637 cf, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
53,071	49	50-75% Grass cover, Fair, HSG A
5,824	98	Paved roads w/curbs & sewers, HSG A
6,280	98	Roofs, HSG A
130,159	36	Woods, Fair, HSG A
195,333	43	Weighted Average
183,229		93.80% Pervious Area
12,104		6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
2.1	371	0.0350	3.01		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	292	0.0130	1.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1920	7.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
19.9	786	Total			

Subcatchment 3: Subcat 3

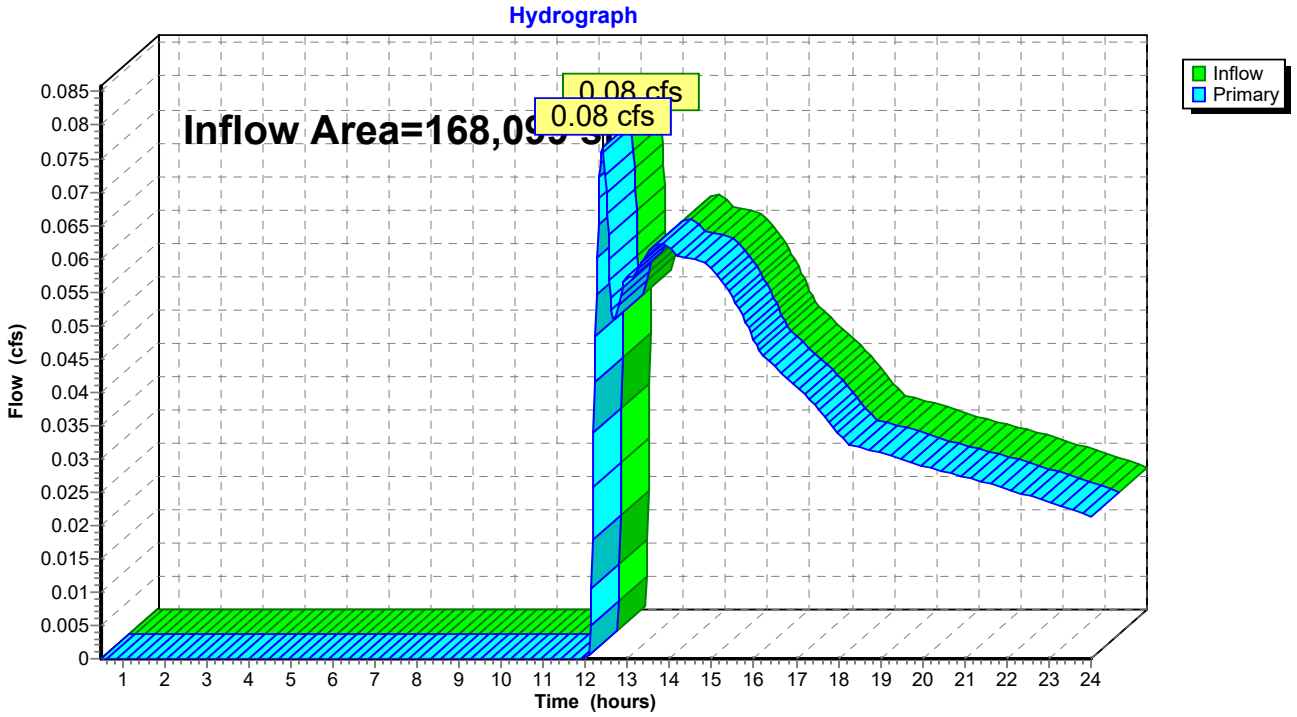


Summary for Link 4L: WETLAND SOUTH/BROOK

Inflow Area = 168,099 sf, 8.37% Impervious, Inflow Depth > 0.12" for 2-Year event
Inflow = 0.08 cfs @ 12.41 hrs, Volume= 1,683 cf
Primary = 0.08 cfs @ 12.41 hrs, Volume= 1,683 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 4L: WETLAND SOUTH/BROOK



Time span=0.50-24.00 hrs, dt=0.02 hrs, 1176 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=42,391 sf 12.55% Impervious Runoff Depth>0.67"
Flow Length=368' Tc=8.5 min CN=52 Runoff=0.45 cfs 2,374 cf

Subcatchment 2: Subcat 2 Runoff Area=125,708 sf 6.95% Impervious Runoff Depth>0.39"
Flow Length=500' Tc=14.9 min CN=46 Runoff=0.45 cfs 4,084 cf

Subcatchment 3: Subcat 3 Runoff Area=195,333 sf 6.20% Impervious Runoff Depth>0.27"
Flow Length=786' Tc=19.9 min CN=43 Runoff=0.32 cfs 4,415 cf

Link 4L: WETLAND SOUTH/BROOK Inflow=0.76 cfs 6,458 cf
Primary=0.76 cfs 6,458 cf

Total Runoff Area = 363,432 sf Runoff Volume = 10,873 cf Average Runoff Depth = 0.36"
92.80% Pervious = 337,266 sf 7.20% Impervious = 26,166 sf

Summary for Subcatchment 1: Subcat 1

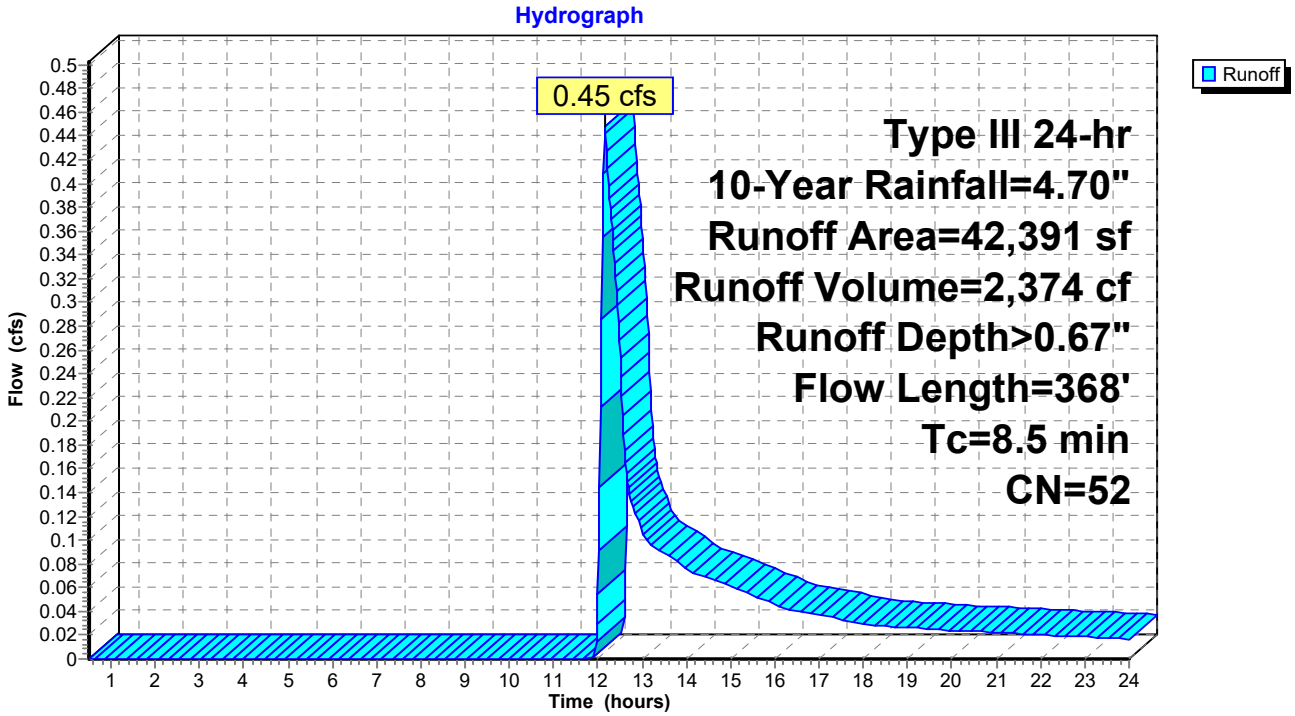
Runoff = 0.45 cfs @ 12.16 hrs, Volume= 2,374 cf, Depth> 0.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
28,260	49	50-75% Grass cover, Fair, HSG A
5,097	98	Paved roads w/curbs & sewers, HSG A
222	98	Roofs, HSG A
8,811	36	Woods, Fair, HSG A
42,391	52	Weighted Average
37,071		87.45% Pervious Area
5,319		12.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0500	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.6	144	0.0530	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	174	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	368	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

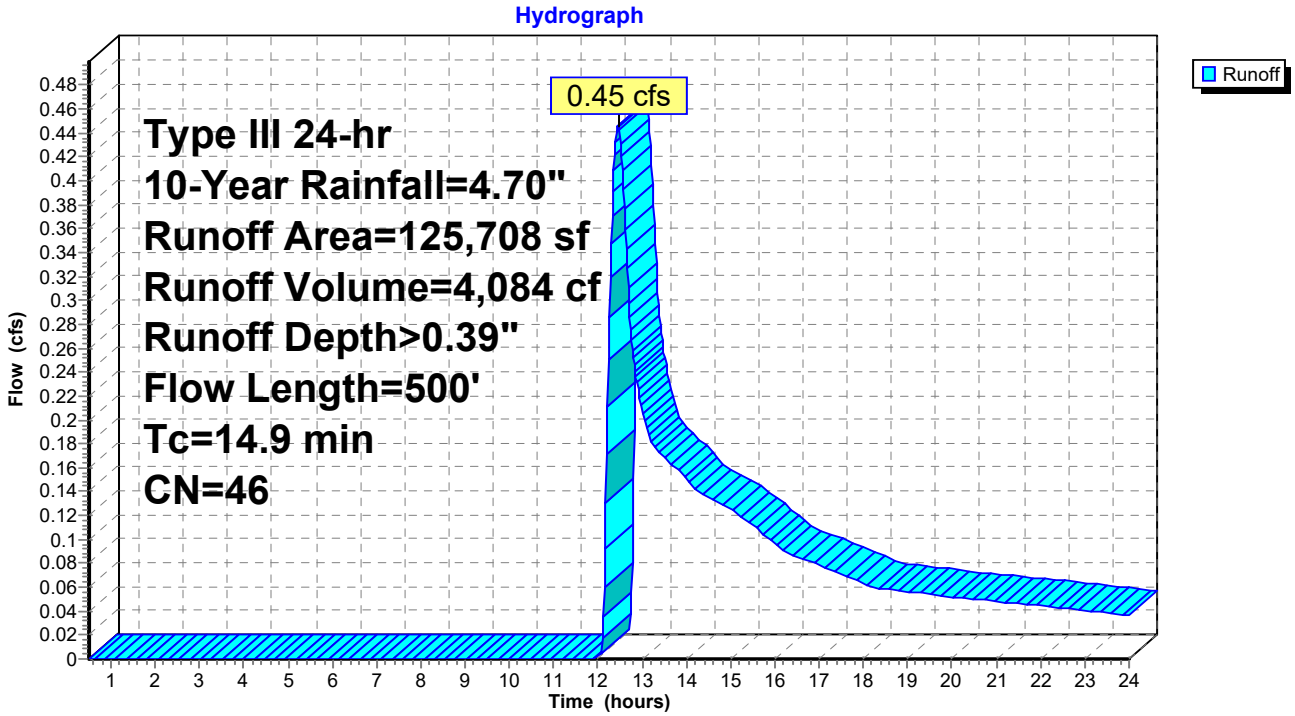
Runoff = 0.45 cfs @ 12.46 hrs, Volume= 4,084 cf, Depth> 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
55,632	49	50-75% Grass cover, Fair, HSG A
7,011	98	Paved roads w/curbs & sewers, HSG A
1,732	98	Roofs, HSG A
61,333	36	Woods, Fair, HSG A
125,708	46	Weighted Average
116,965		93.05% Pervious Area
8,743		6.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
0.9	143	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	307	0.0530	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
14.9	500	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

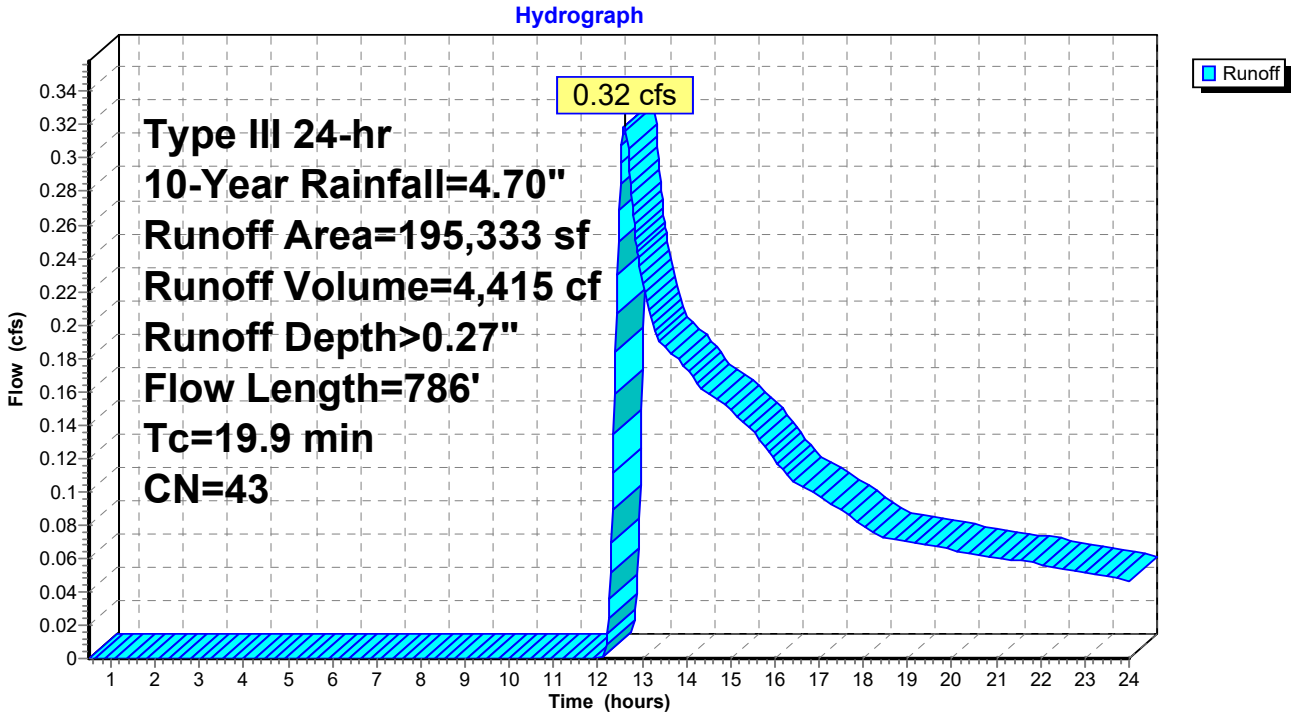
Runoff = 0.32 cfs @ 12.60 hrs, Volume= 4,415 cf, Depth> 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
53,071	49	50-75% Grass cover, Fair, HSG A
5,824	98	Paved roads w/curbs & sewers, HSG A
6,280	98	Roofs, HSG A
130,159	36	Woods, Fair, HSG A
195,333	43	Weighted Average
183,229		93.80% Pervious Area
12,104		6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
2.1	371	0.0350	3.01		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	292	0.0130	1.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1920	7.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
19.9	786	Total			

Subcatchment 3: Subcat 3

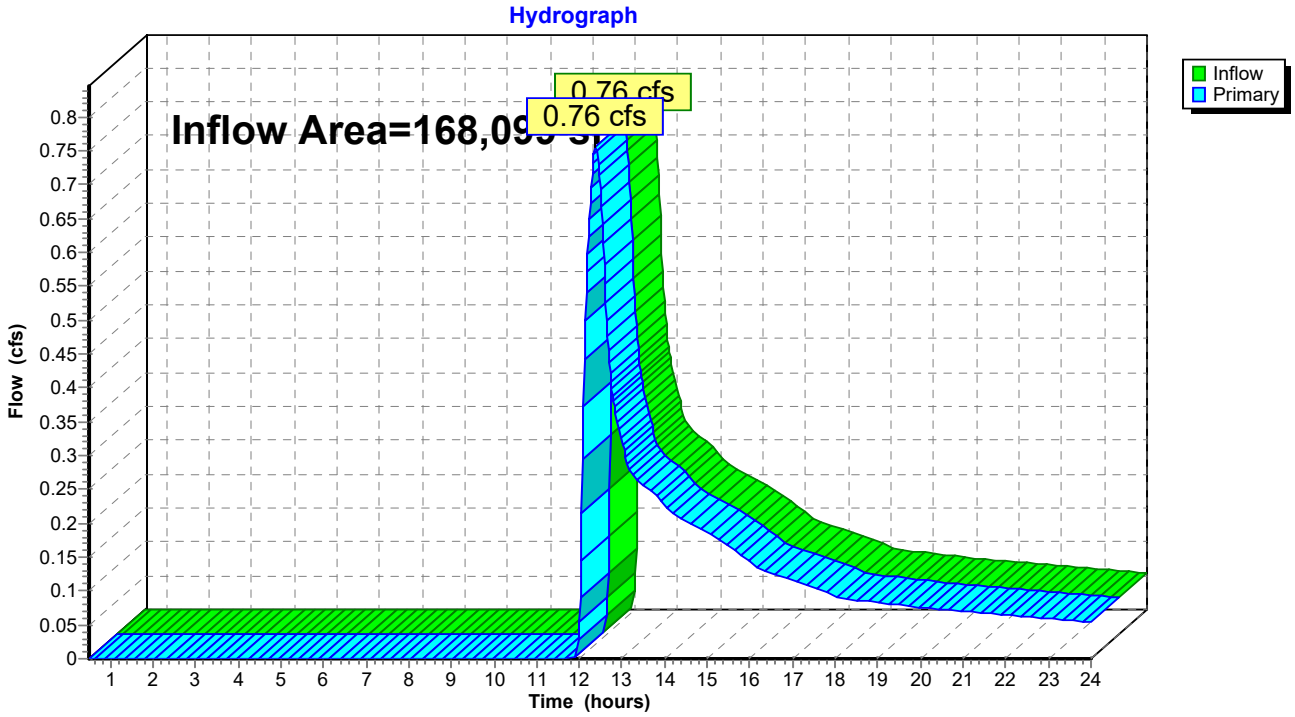


Summary for Link 4L: WETLAND SOUTH/BROOK

Inflow Area = 168,099 sf, 8.37% Impervious, Inflow Depth > 0.46" for 10-Year event
Inflow = 0.76 cfs @ 12.39 hrs, Volume= 6,458 cf
Primary = 0.76 cfs @ 12.39 hrs, Volume= 6,458 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 4L: WETLAND SOUTH/BROOK



Time span=0.50-24.00 hrs, dt=0.02 hrs, 1176 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=42,391 sf 12.55% Impervious Runoff Depth>1.08"
Flow Length=368' Tc=8.5 min CN=52 Runoff=0.89 cfs 3,823 cf

Subcatchment 2: Subcat 2 Runoff Area=125,708 sf 6.95% Impervious Runoff Depth>0.70"
Flow Length=500' Tc=14.9 min CN=46 Runoff=1.06 cfs 7,348 cf

Subcatchment 3: Subcat 3 Runoff Area=195,333 sf 6.20% Impervious Runoff Depth>0.53"
Flow Length=786' Tc=19.9 min CN=43 Runoff=0.98 cfs 8,657 cf

Link 4L: WETLAND SOUTH/BROOK Inflow=1.71 cfs 11,171 cf
Primary=1.71 cfs 11,171 cf

Total Runoff Area = 363,432 sf Runoff Volume = 19,828 cf Average Runoff Depth = 0.65"
92.80% Pervious = 337,266 sf 7.20% Impervious = 26,166 sf

Summary for Subcatchment 1: Subcat 1

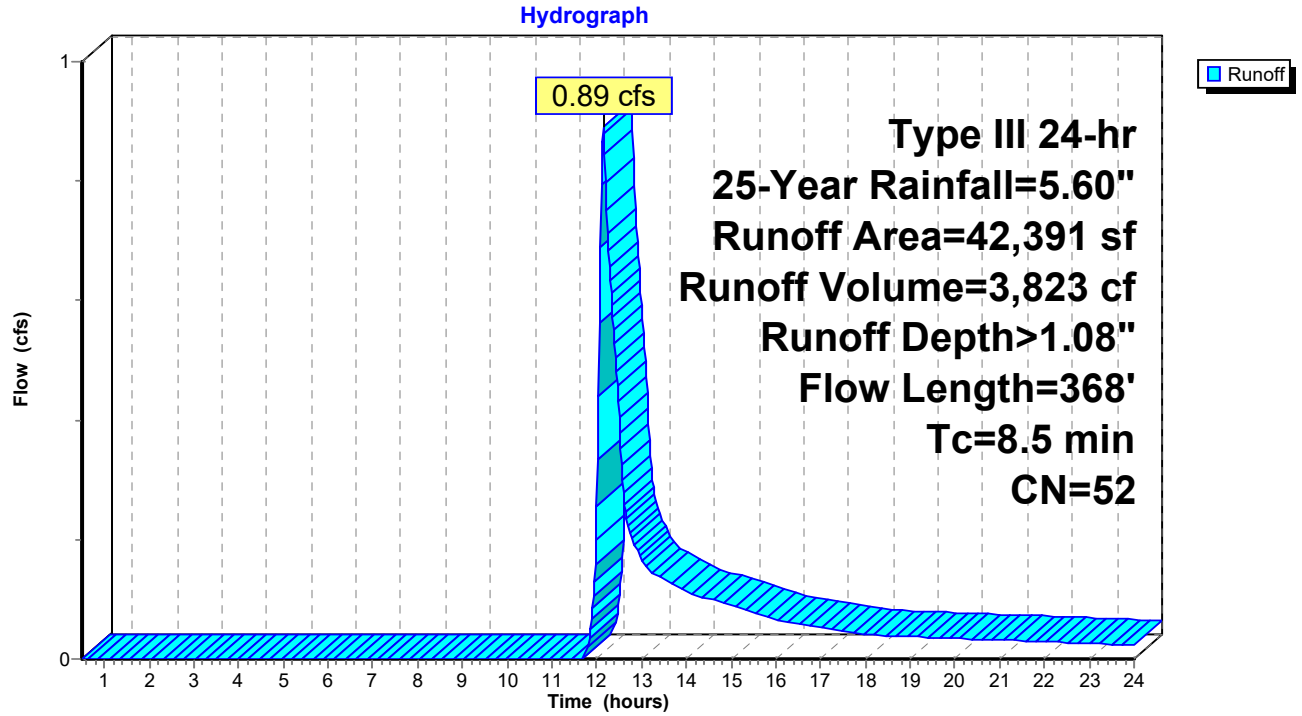
Runoff = 0.89 cfs @ 12.14 hrs, Volume= 3,823 cf, Depth> 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
28,260	49	50-75% Grass cover, Fair, HSG A
5,097	98	Paved roads w/curbs & sewers, HSG A
222	98	Roofs, HSG A
8,811	36	Woods, Fair, HSG A
42,391	52	Weighted Average
37,071		87.45% Pervious Area
5,319		12.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0500	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.6	144	0.0530	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	174	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	368	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

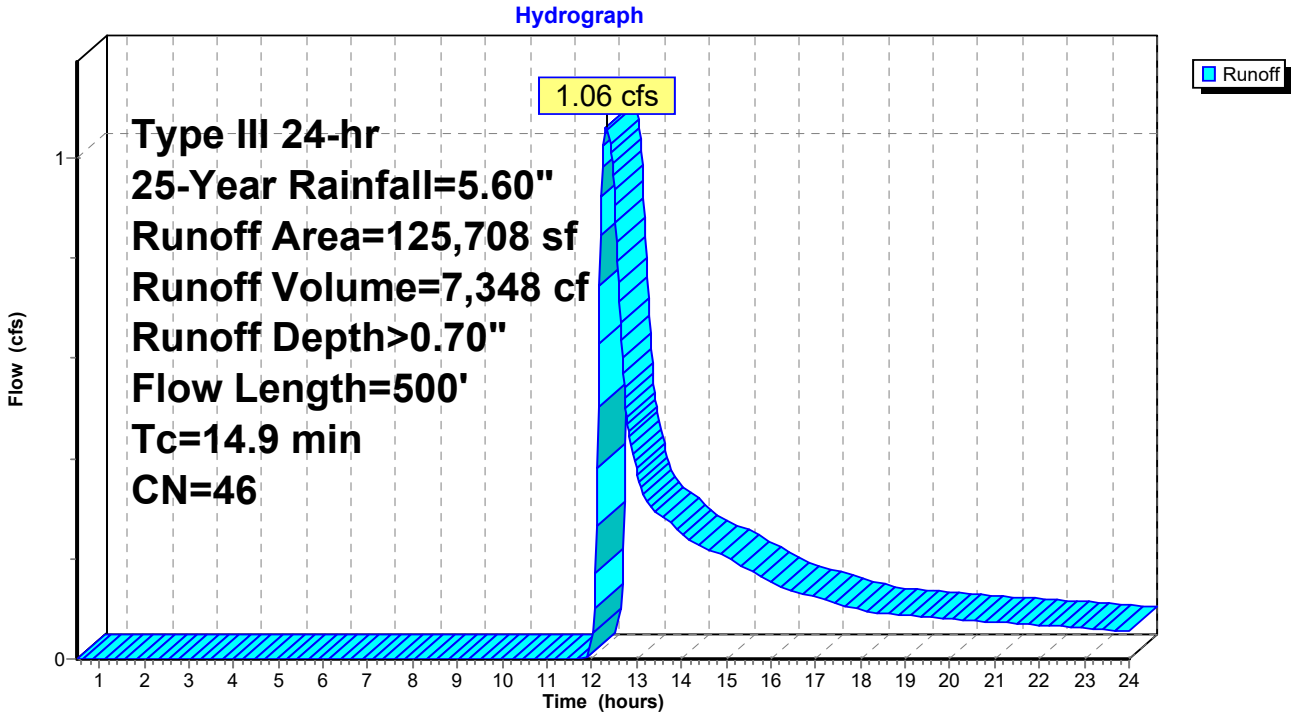
Runoff = 1.06 cfs @ 12.33 hrs, Volume= 7,348 cf, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
55,632	49	50-75% Grass cover, Fair, HSG A
7,011	98	Paved roads w/curbs & sewers, HSG A
1,732	98	Roofs, HSG A
61,333	36	Woods, Fair, HSG A
125,708	46	Weighted Average
116,965		93.05% Pervious Area
8,743		6.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
0.9	143	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	307	0.0530	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
14.9	500	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

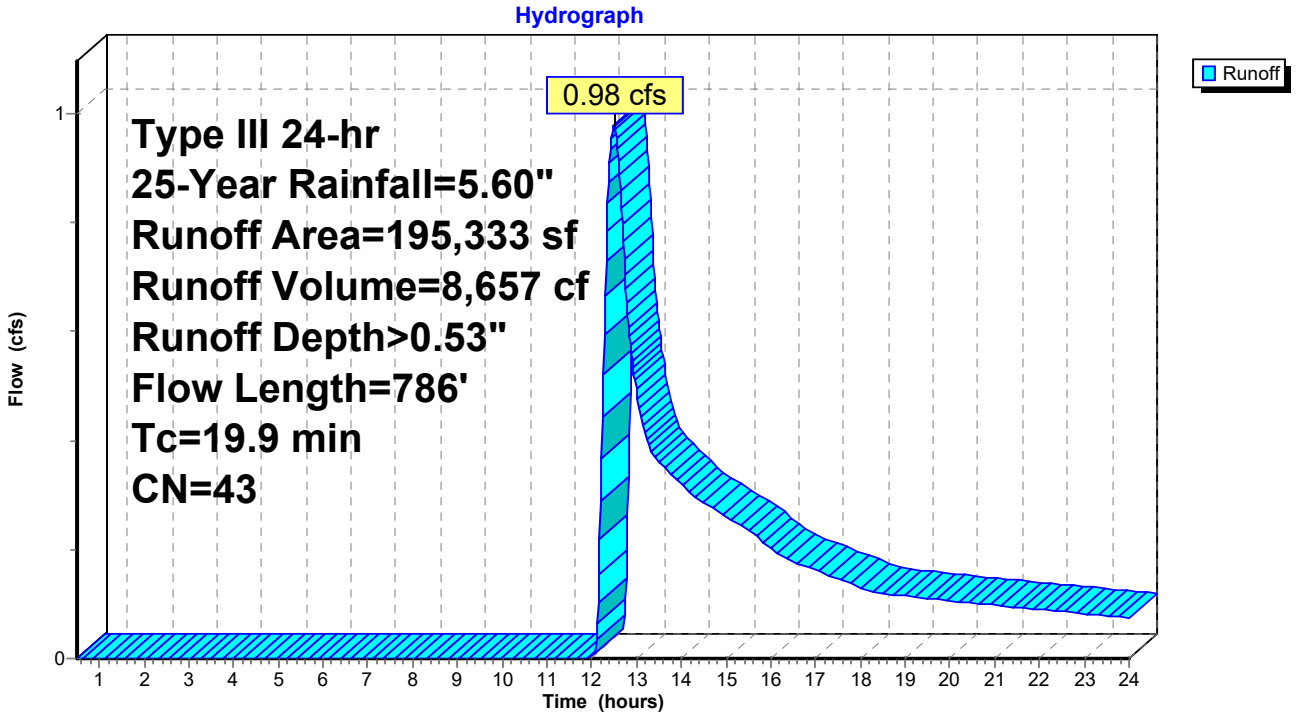
Runoff = 0.98 cfs @ 12.50 hrs, Volume= 8,657 cf, Depth> 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
53,071	49	50-75% Grass cover, Fair, HSG A
5,824	98	Paved roads w/curbs & sewers, HSG A
6,280	98	Roofs, HSG A
130,159	36	Woods, Fair, HSG A
195,333	43	Weighted Average
183,229		93.80% Pervious Area
12,104		6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
2.1	371	0.0350	3.01		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	292	0.0130	1.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1920	7.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
19.9	786	Total			

Subcatchment 3: Subcat 3

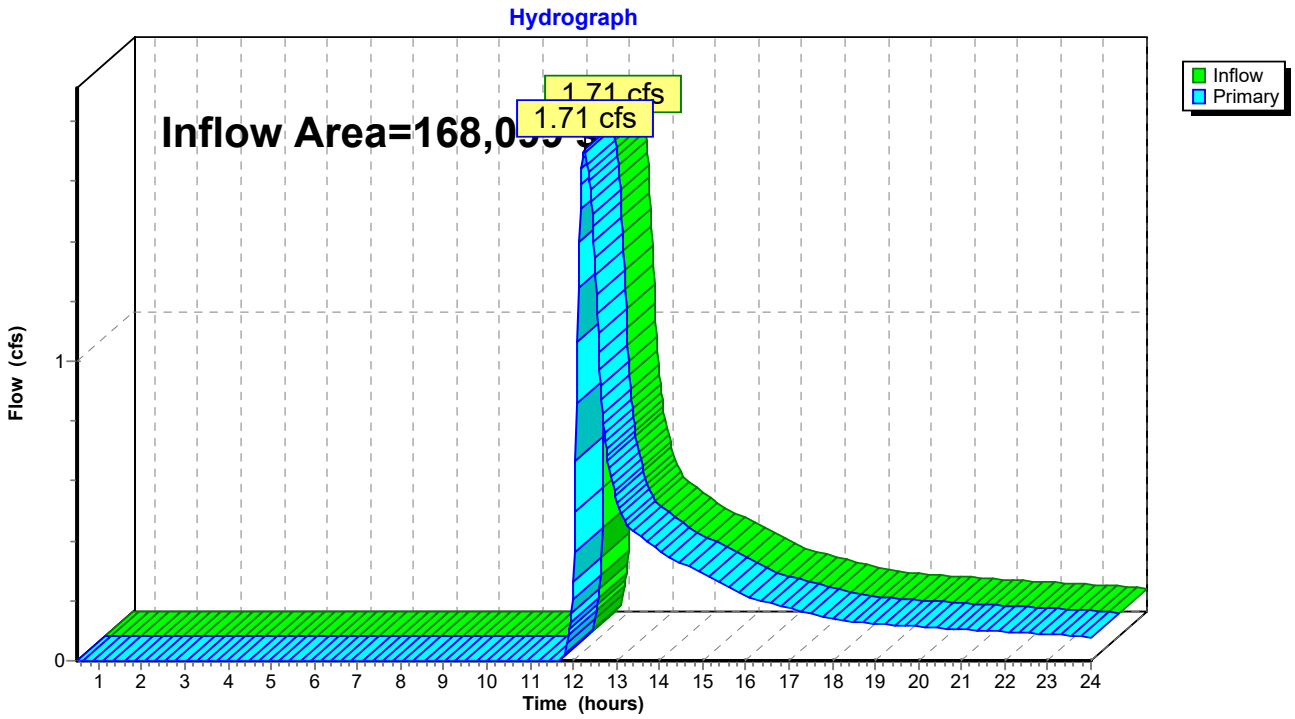


Summary for Link 4L: WETLAND SOUTH/BROOK

Inflow Area = 168,099 sf, 8.37% Impervious, Inflow Depth > 0.80" for 25-Year event
Inflow = 1.71 cfs @ 12.27 hrs, Volume= 11,171 cf
Primary = 1.71 cfs @ 12.27 hrs, Volume= 11,171 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 4L: WETLAND SOUTH/BROOK



Time span=0.50-24.00 hrs, dt=0.02 hrs, 1176 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=42,391 sf 12.55% Impervious Runoff Depth>1.84"
Flow Length=368' Tc=8.5 min CN=52 Runoff=1.73 cfs 6,508 cf

Subcatchment 2: Subcat 2 Runoff Area=125,708 sf 6.95% Impervious Runoff Depth>1.31"
Flow Length=500' Tc=14.9 min CN=46 Runoff=2.62 cfs 13,764 cf

Subcatchment 3: Subcat 3 Runoff Area=195,333 sf 6.20% Impervious Runoff Depth>1.07"
Flow Length=786' Tc=19.9 min CN=43 Runoff=2.66 cfs 17,359 cf

Link 4L: WETLAND SOUTH/BROOK Inflow=3.95 cfs 20,272 cf
Primary=3.95 cfs 20,272 cf

Total Runoff Area = 363,432 sf Runoff Volume = 37,631 cf Average Runoff Depth = 1.24"
92.80% Pervious = 337,266 sf 7.20% Impervious = 26,166 sf

Summary for Subcatchment 1: Subcat 1

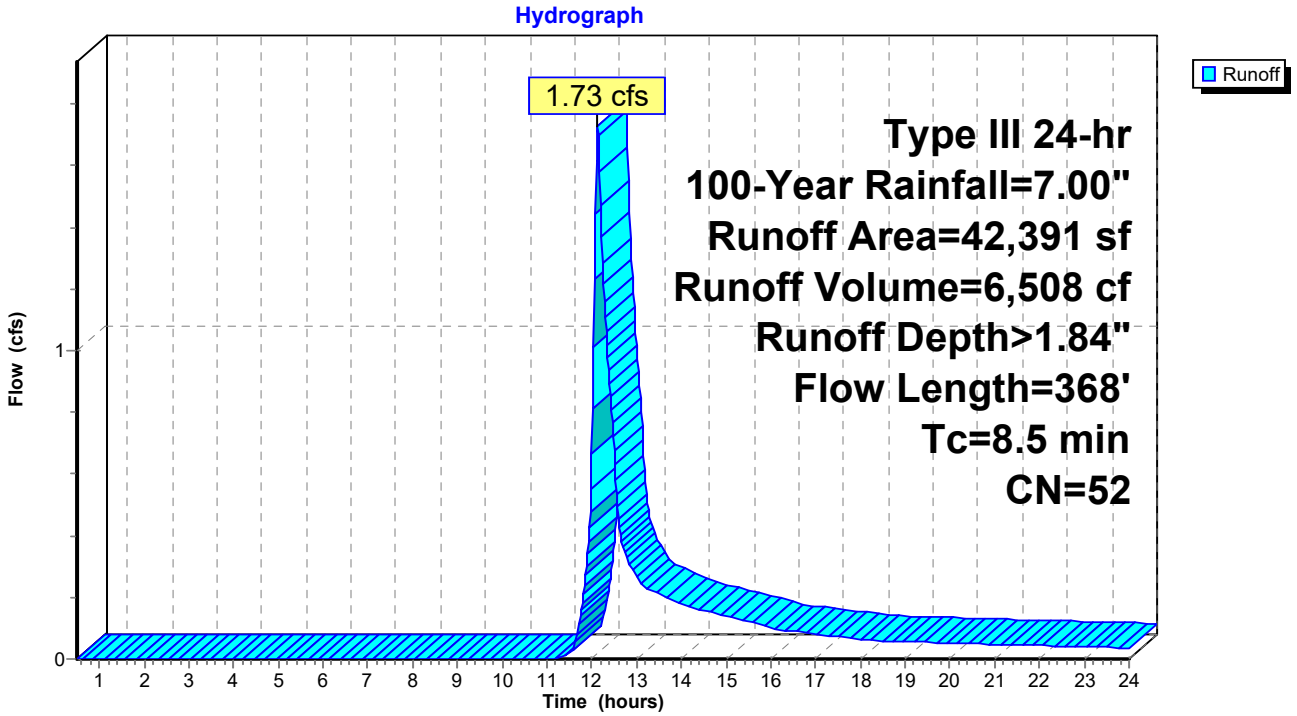
Runoff = 1.73 cfs @ 12.13 hrs, Volume= 6,508 cf, Depth> 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
28,260	49	50-75% Grass cover, Fair, HSG A
5,097	98	Paved roads w/curbs & sewers, HSG A
222	98	Roofs, HSG A
8,811	36	Woods, Fair, HSG A
42,391	52	Weighted Average
37,071		87.45% Pervious Area
5,319		12.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0500	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.6	144	0.0530	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	174	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.5	368	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

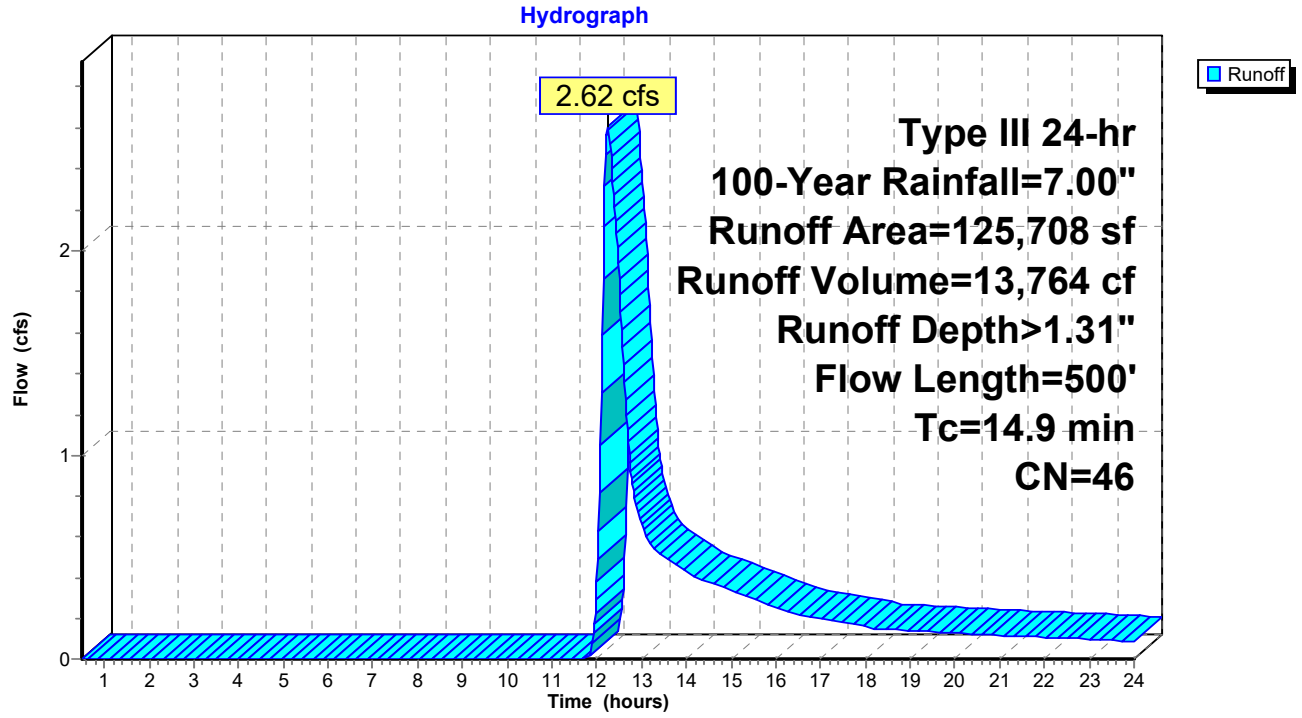
Runoff = 2.62 cfs @ 12.25 hrs, Volume= 13,764 cf, Depth> 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
55,632	49	50-75% Grass cover, Fair, HSG A
7,011	98	Paved roads w/curbs & sewers, HSG A
1,732	98	Roofs, HSG A
61,333	36	Woods, Fair, HSG A
125,708	46	Weighted Average
116,965		93.05% Pervious Area
8,743		6.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
0.9	143	0.0300	2.79		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	307	0.0530	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
14.9	500	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

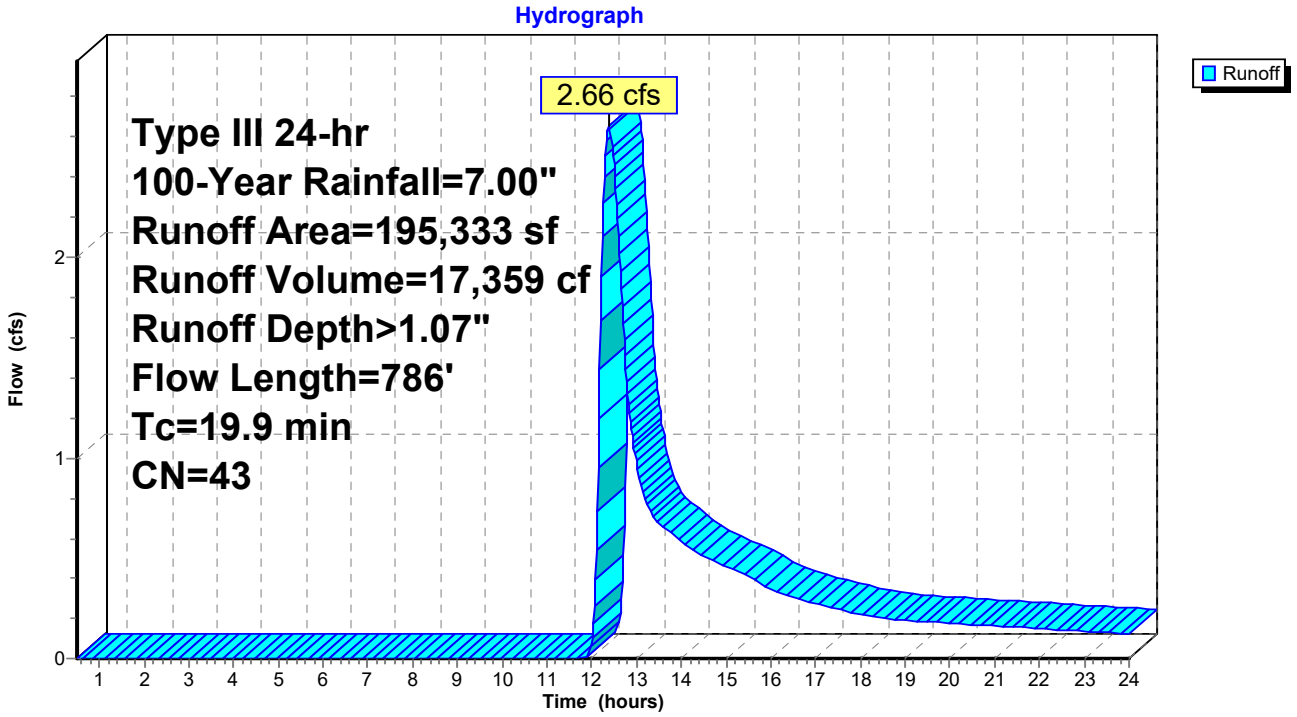
Runoff = 2.66 cfs @ 12.37 hrs, Volume= 17,359 cf, Depth> 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
53,071	49	50-75% Grass cover, Fair, HSG A
5,824	98	Paved roads w/curbs & sewers, HSG A
6,280	98	Roofs, HSG A
130,159	36	Woods, Fair, HSG A
195,333	43	Weighted Average
183,229		93.80% Pervious Area
12,104		6.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
2.1	371	0.0350	3.01		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
2.7	292	0.0130	1.84		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1920	7.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
19.9	786	Total			

Subcatchment 3: Subcat 3

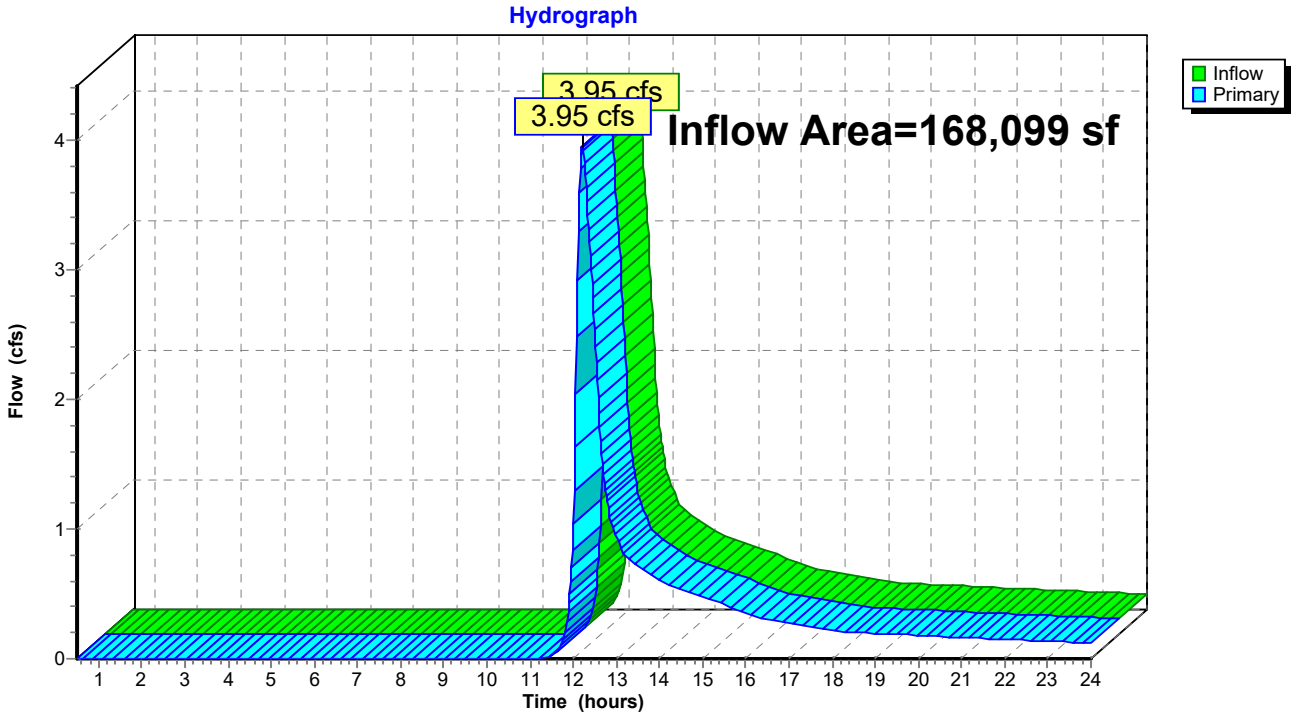


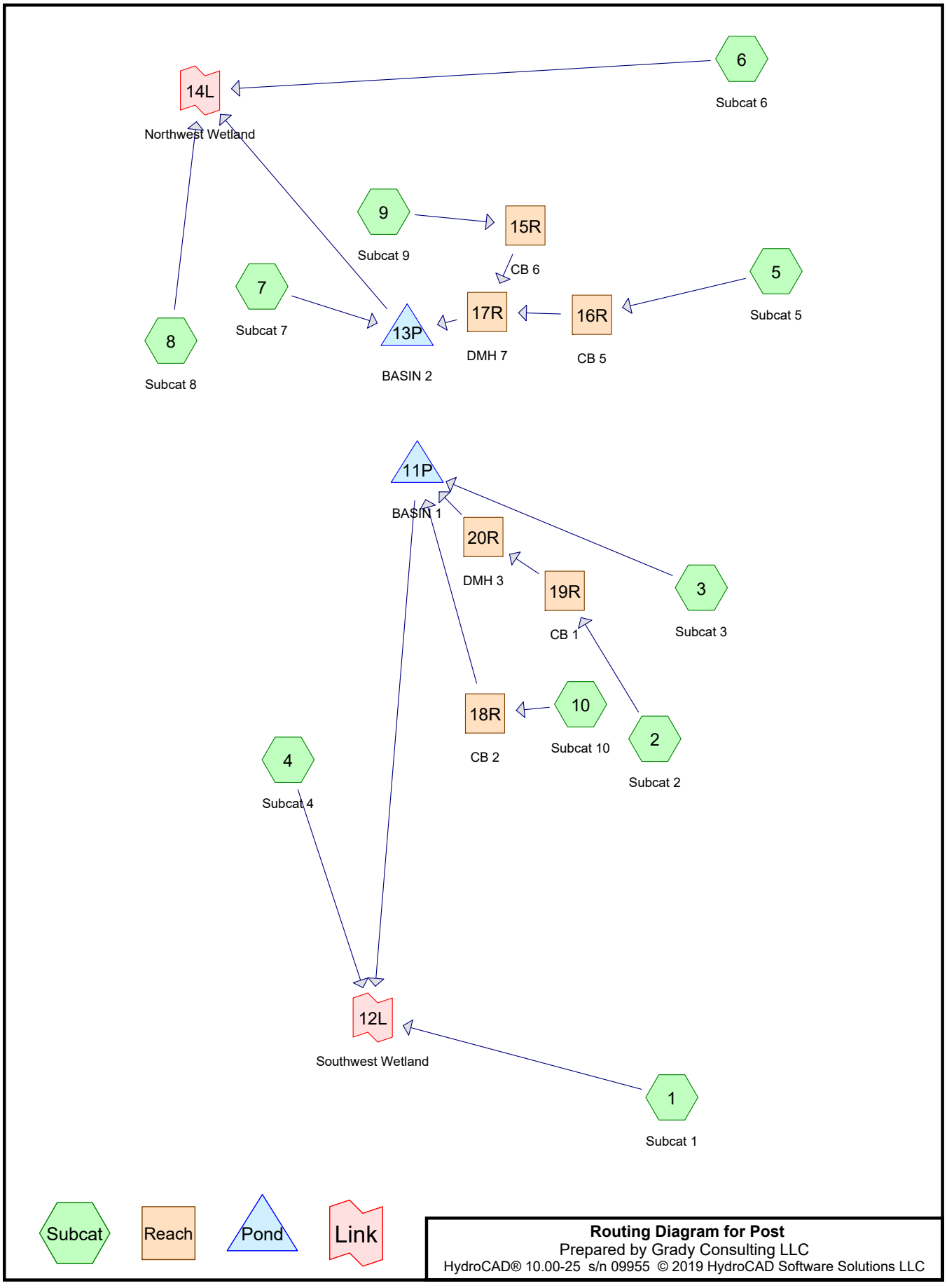
Summary for Link 4L: WETLAND SOUTH/BROOK

Inflow Area = 168,099 sf, 8.37% Impervious, Inflow Depth > 1.45" for 100-Year event
Inflow = 3.95 cfs @ 12.21 hrs, Volume= 20,272 cf
Primary = 3.95 cfs @ 12.21 hrs, Volume= 20,272 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 4L: WETLAND SOUTH/BROOK





Routing Diagram for Post
Prepared by Grady Consulting LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
169,794	49	50-75% Grass cover, Fair, HSG A (1, 2, 3, 4, 5, 6, 7, 8, 9, 10)
40,113	98	Paved roads w/curbs & sewers, HSG A (2, 3, 5, 6, 7, 9, 10)
12,460	98	Roofs, HSG A (3, 4, 5, 6, 7, 8, 9)
140,330	36	Woods, Fair, HSG A (1, 2, 3, 4, 5, 6, 8, 9, 10)
362,697	**51**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
362,697	HSG A	1, 2, 3, 4, 5, 6, 7, 8, 9, 10
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
362,697		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
169,794	0	0	0	0	169,794	50-75% Grass cover, Fair
40,113	0	0	0	0	40,113	Paved roads w/curbs & sewers
12,460	0	0	0	0	12,460	Roofs
140,330	0	0	0	0	140,330	Woods, Fair
362,697	**0**	**0**	**0**	**0**	**362,697**	**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	15R	67.50	67.40	10.4	0.0096	0.013	12.0	0.0	0.0
2	16R	67.50	67.40	32.0	0.0031	0.013	12.0	0.0	0.0
3	17R	67.40	67.00	24.0	0.0167	0.013	15.0	0.0	0.0
4	18R	66.46	66.40	17.3	0.0035	0.013	12.0	0.0	0.0
5	19R	66.46	66.40	4.5	0.0133	0.013	12.0	0.0	0.0
6	20R	66.40	66.00	32.0	0.0125	0.013	15.0	0.0	0.0

Time span=0.50-24.00 hrs, dt=0.02 hrs, 1176 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=20,328 sf 0.00% Impervious Runoff Depth>0.05"
Flow Length=319' Tc=10.0 min CN=44 Runoff=0.00 cfs 90 cf

Subcatchment 2: Subcat 2 Runoff Area=25,458 sf 30.88% Impervious Runoff Depth>0.65"
Flow Length=288' Tc=8.4 min CN=64 Runoff=0.32 cfs 1,386 cf

Subcatchment 3: Subcat 3 Runoff Area=61,448 sf 8.33% Impervious Runoff Depth>0.12"
Flow Length=311' Tc=16.0 min CN=48 Runoff=0.03 cfs 639 cf

Subcatchment 4: Subcat 4 Runoff Area=48,453 sf 1.98% Impervious Runoff Depth>0.02"
Flow Length=187' Tc=9.0 min CN=41 Runoff=0.00 cfs 73 cf

Subcatchment 5: Subcat 5 Runoff Area=67,517 sf 23.01% Impervious Runoff Depth>0.38"
Flow Length=455' Tc=14.9 min CN=57 Runoff=0.28 cfs 2,120 cf

Subcatchment 6: Subcat 6 Runoff Area=95,238 sf 5.26% Impervious Runoff Depth>0.05"
Flow Length=744' Tc=18.7 min CN=44 Runoff=0.02 cfs 419 cf

Subcatchment 7: Subcat 7 Runoff Area=12,907 sf 18.31% Impervious Runoff Depth>0.41"
Tc=6.0 min CN=58 Runoff=0.08 cfs 445 cf

Subcatchment 8: Subcat 8 Runoff Area=6,248 sf 5.00% Impervious Runoff Depth>0.09"
Tc=6.0 min CN=46 Runoff=0.00 cfs 45 cf

Subcatchment 9: Subcat 9 Runoff Area=14,166 sf 51.29% Impervious Runoff Depth>1.17"
Flow Length=137' Tc=8.6 min CN=74 Runoff=0.39 cfs 1,380 cf

Subcatchment 10: Subcat 10 Runoff Area=10,935 sf 74.50% Impervious Runoff Depth>1.93"
Tc=6.0 min CN=85 Runoff=0.57 cfs 1,756 cf

Reach 15R: CB 6 Avg. Flow Depth=0.23' Max Vel=2.93 fps Inflow=0.39 cfs 1,380 cf
12.0" Round Pipe n=0.013 L=10.4' S=0.0096 '/' Capacity=3.49 cfs Outflow=0.39 cfs 1,380 cf

Reach 16R: CB 5 Avg. Flow Depth=0.25' Max Vel=1.79 fps Inflow=0.28 cfs 2,120 cf
12.0" Round Pipe n=0.013 L=32.0' S=0.0031 '/' Capacity=1.99 cfs Outflow=0.28 cfs 2,119 cf

Reach 17R: DMH 7 Avg. Flow Depth=0.21' Max Vel=3.77 fps Inflow=0.51 cfs 3,499 cf
15.0" Round Pipe n=0.013 L=24.0' S=0.0167 '/' Capacity=8.34 cfs Outflow=0.51 cfs 3,499 cf

Reach 18R: CB 2 Avg. Flow Depth=0.35' Max Vel=2.26 fps Inflow=0.57 cfs 1,756 cf
12.0" Round Pipe n=0.013 L=17.3' S=0.0035 '/' Capacity=2.10 cfs Outflow=0.57 cfs 1,756 cf

Reach 19R: CB 1 Avg. Flow Depth=0.19' Max Vel=3.12 fps Inflow=0.32 cfs 1,386 cf
12.0" Round Pipe n=0.013 L=4.5' S=0.0133 '/' Capacity=4.11 cfs Outflow=0.32 cfs 1,386 cf

Reach 20R: DMH 3 Avg. Flow Depth=0.18' Max Vel=2.97 fps Inflow=0.32 cfs 1,386 cf
15.0" Round Pipe n=0.013 L=32.0' S=0.0125 '/' Capacity=7.22 cfs Outflow=0.32 cfs 1,386 cf

Pond 11P: BASIN 1 Peak Elev=64.64' Storage=1,149 cf Inflow=0.85 cfs 3,781 cf
Discarded=0.11 cfs 3,763 cf Primary=0.00 cfs 0 cf Outflow=0.11 cfs 3,763 cf

Pond 13P: BASIN 2 Peak Elev=65.46' Storage=924 cf Inflow=0.58 cfs 3,943 cf
Discarded=0.15 cfs 3,928 cf Primary=0.00 cfs 0 cf Outflow=0.15 cfs 3,928 cf

Link 12L: Southwest Wetland Inflow=0.01 cfs 163 cf
Primary=0.01 cfs 163 cf

Link 14L: Northwest Wetland Inflow=0.02 cfs 464 cf
Primary=0.02 cfs 464 cf

Total Runoff Area = 362,697 sf Runoff Volume = 8,352 cf Average Runoff Depth = 0.28"
85.50% Pervious = 310,124 sf 14.50% Impervious = 52,574 sf

Summary for Subcatchment 1: Subcat 1

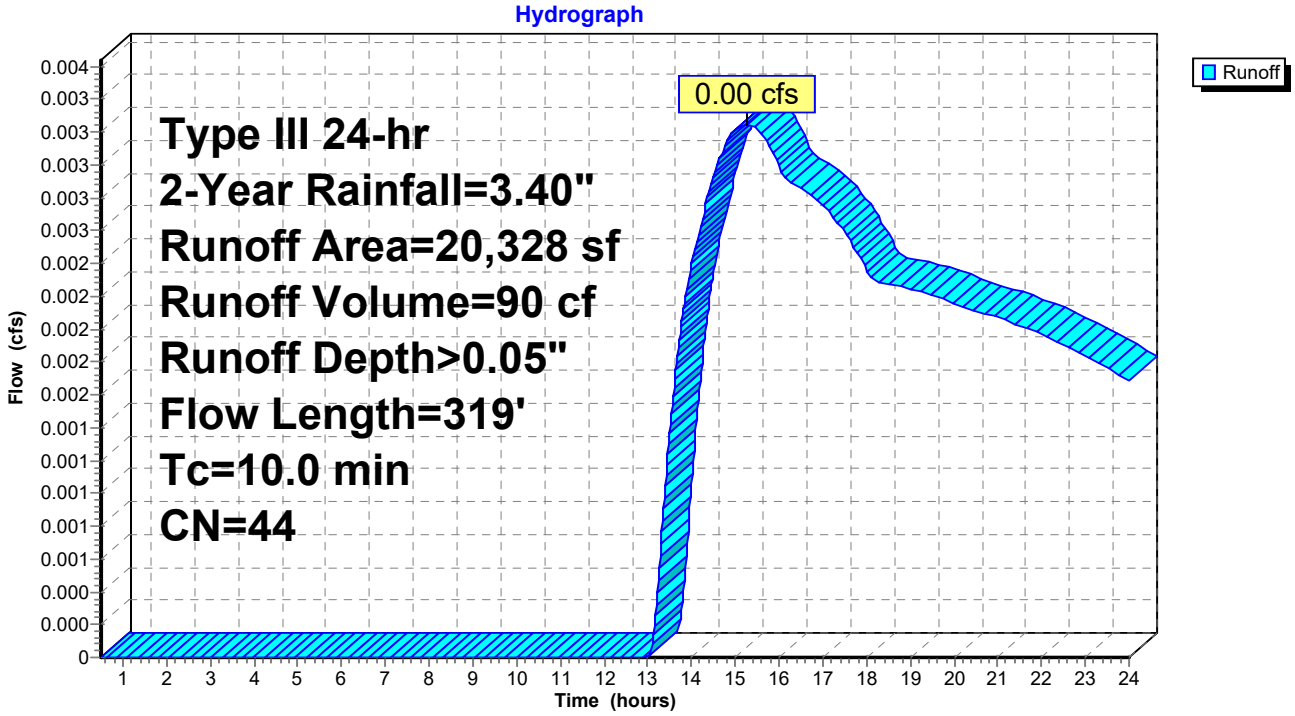
Runoff = 0.00 cfs @ 15.27 hrs, Volume= 90 cf, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
12,105	49	50-75% Grass cover, Fair, HSG A
8,223	36	Woods, Fair, HSG A
20,328	44	Weighted Average
20,328		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.7	148	0.0510	3.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	121	0.0190	2.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	319	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

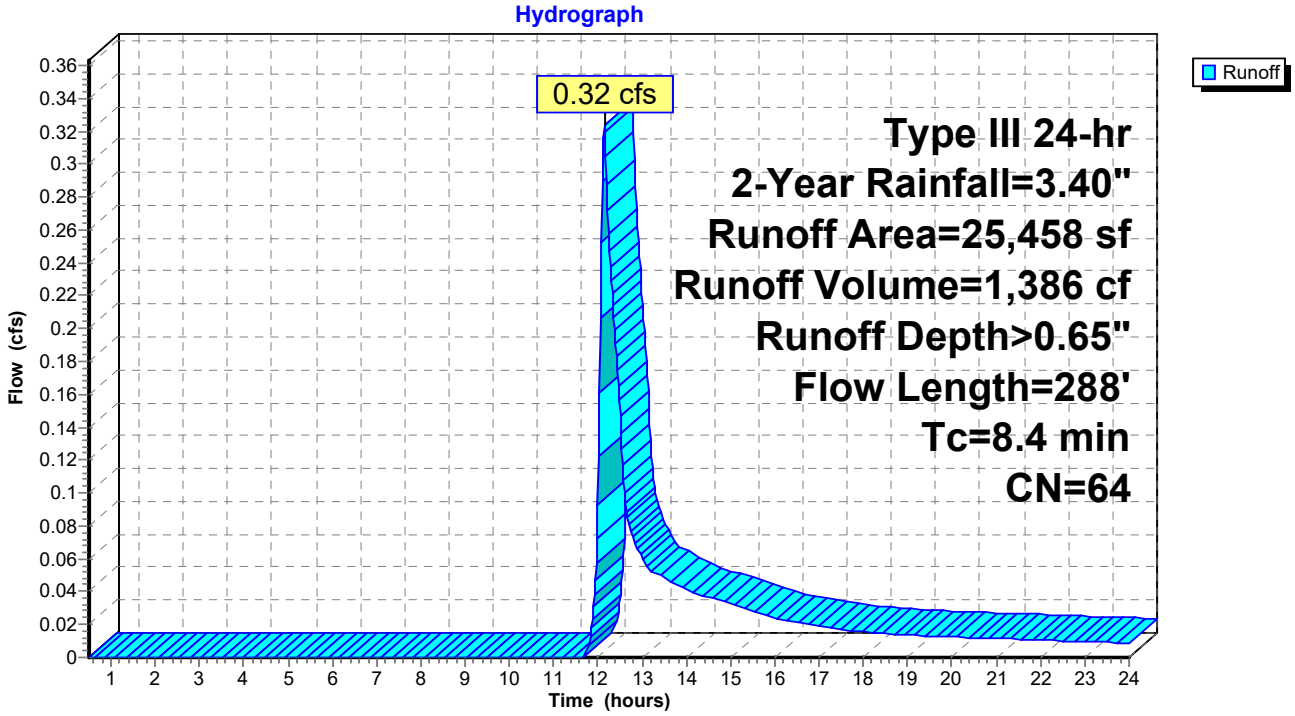
Runoff = 0.32 cfs @ 12.14 hrs, Volume= 1,386 cf, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
17,076	49	50-75% Grass cover, Fair, HSG A
7,862	98	Paved roads w/curbs & sewers, HSG A
520	36	Woods, Fair, HSG A
25,458	64	Weighted Average
17,596		69.12% Pervious Area
7,862		30.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0500	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.4	100	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	138	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.4	288	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

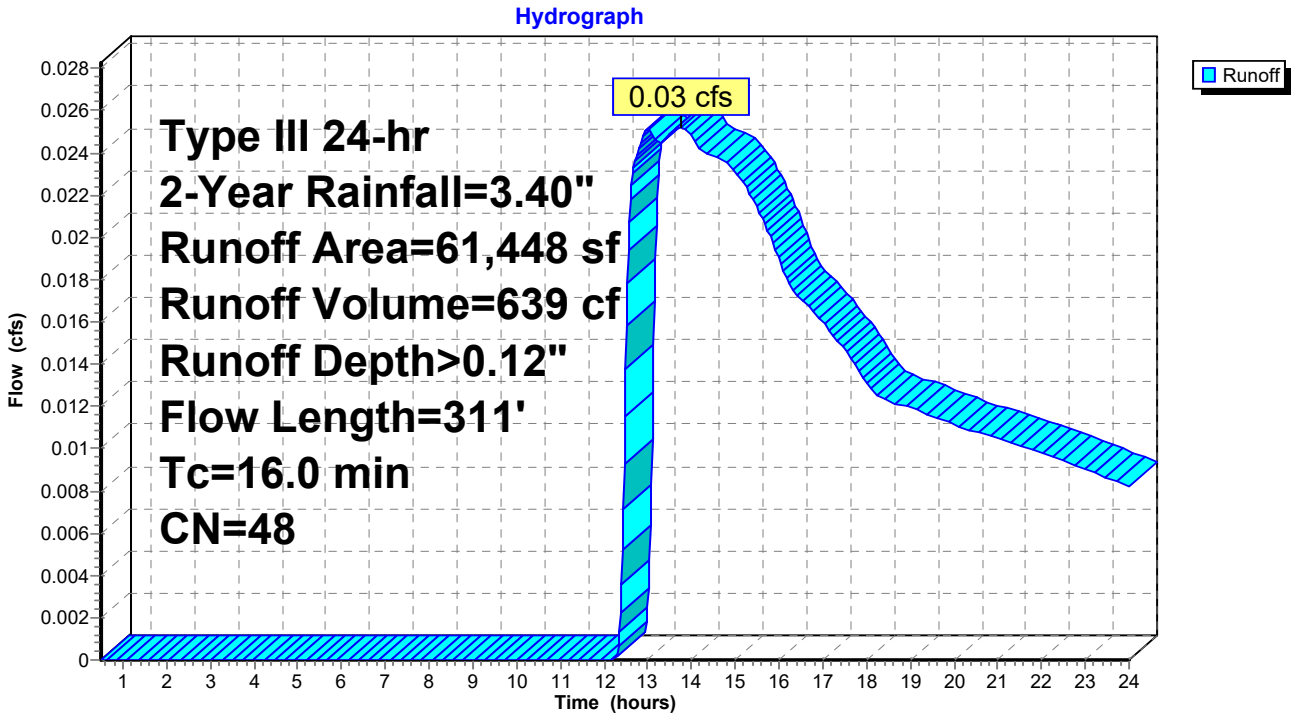
Runoff = 0.03 cfs @ 13.74 hrs, Volume= 639 cf, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
34,104	49	50-75% Grass cover, Fair, HSG A
3,296	98	Paved roads w/curbs & sewers, HSG A
1,826	98	Roofs, HSG A
22,223	36	Woods, Fair, HSG A
61,448	48	Weighted Average
56,327		91.67% Pervious Area
5,122		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
1.1	261	0.0580	3.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	311	Total			

Subcatchment 3: Subcat 3



Summary for Subcatchment 4: Subcat 4

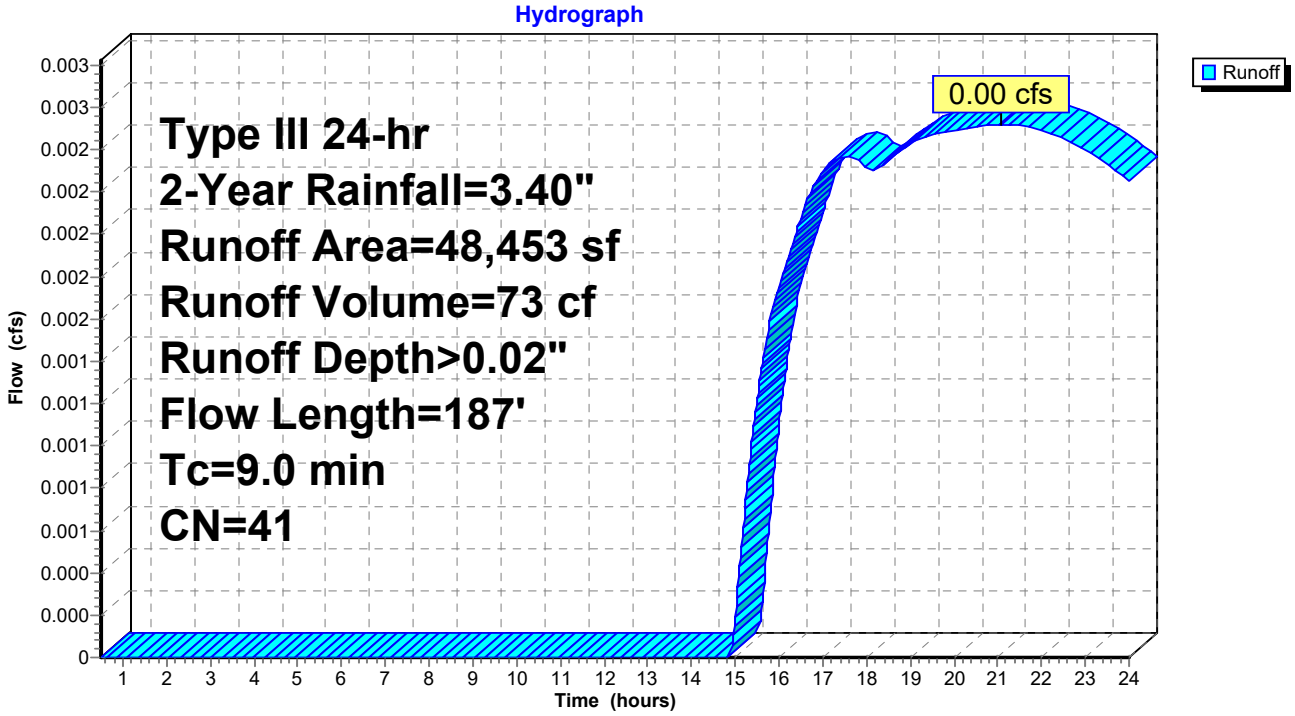
Runoff = 0.00 cfs @ 21.06 hrs, Volume= 73 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
12,754	49	50-75% Grass cover, Fair, HSG A
959	98	Roofs, HSG A
34,740	36	Woods, Fair, HSG A
48,453	41	Weighted Average
47,493		98.02% Pervious Area
959		1.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.0	26	0.3100	8.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	111	0.0410	3.26		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	187	Total			

Subcatchment 4: Subcat 4



Summary for Subcatchment 5: Subcat 5

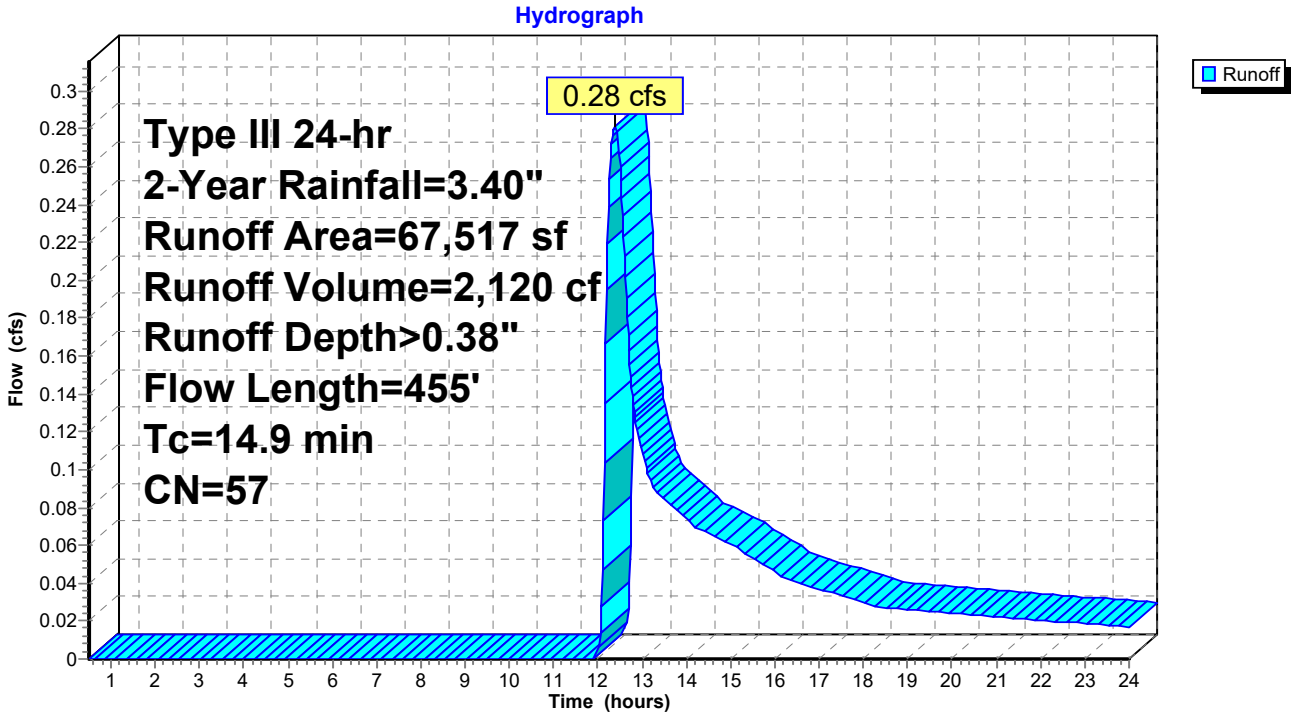
Runoff = 0.28 cfs @ 12.38 hrs, Volume= 2,120 cf, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
34,347	49	50-75% Grass cover, Fair, HSG A
10,540	98	Paved roads w/curbs & sewers, HSG A
4,994	98	Roofs, HSG A
17,636	36	Woods, Fair, HSG A
67,517	57	Weighted Average
51,983		76.99% Pervious Area
15,534		23.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0320	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
2.2	348	0.0270	2.65		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	57	0.0122	2.24		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
14.9	455	Total			

Subcatchment 5: Subcat 5



Summary for Subcatchment 6: Subcat 6

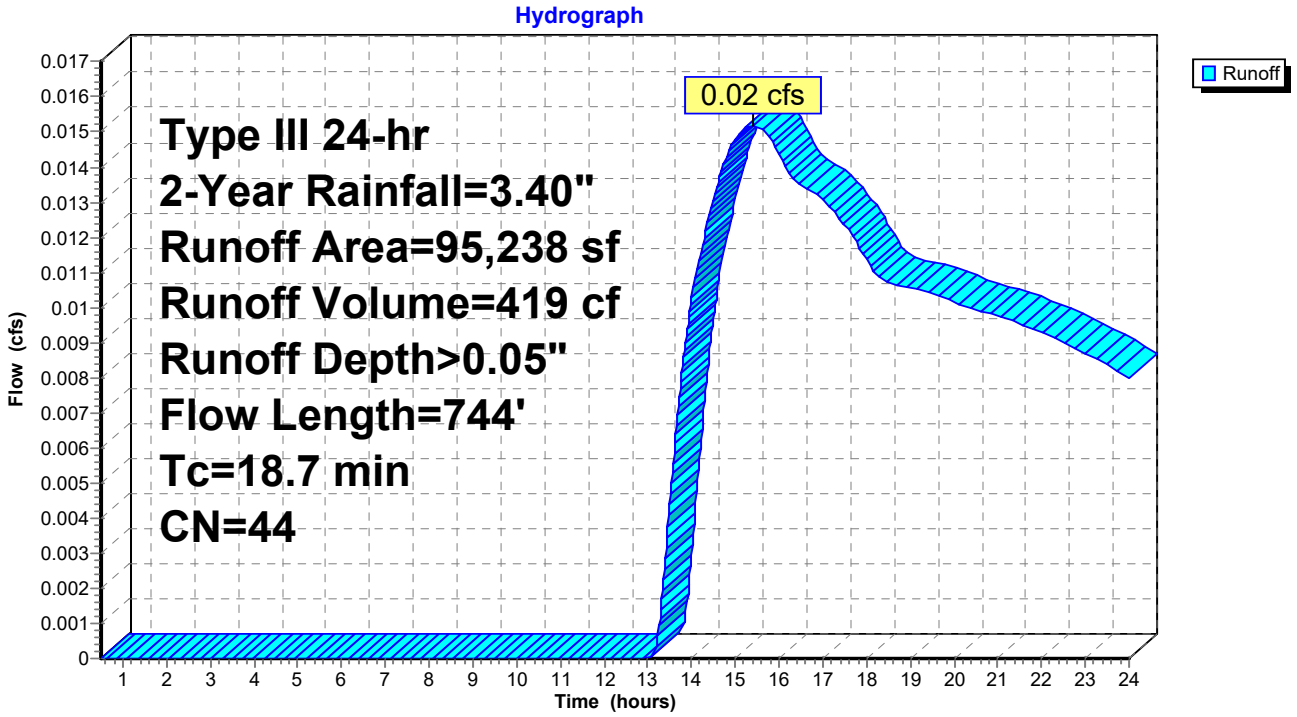
Runoff = 0.02 cfs @ 15.40 hrs, Volume= 419 cf, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
36,291	49	50-75% Grass cover, Fair, HSG A
2,198	98	Paved roads w/curbs & sewers, HSG A
2,810	98	Roofs, HSG A
53,938	36	Woods, Fair, HSG A
95,238	44	Weighted Average
90,229		94.74% Pervious Area
5,009		5.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
3.0	382	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	245	0.1600	6.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	67	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.7	744	Total			

Subcatchment 6: Subcat 6



Summary for Subcatchment 7: Subcat 7

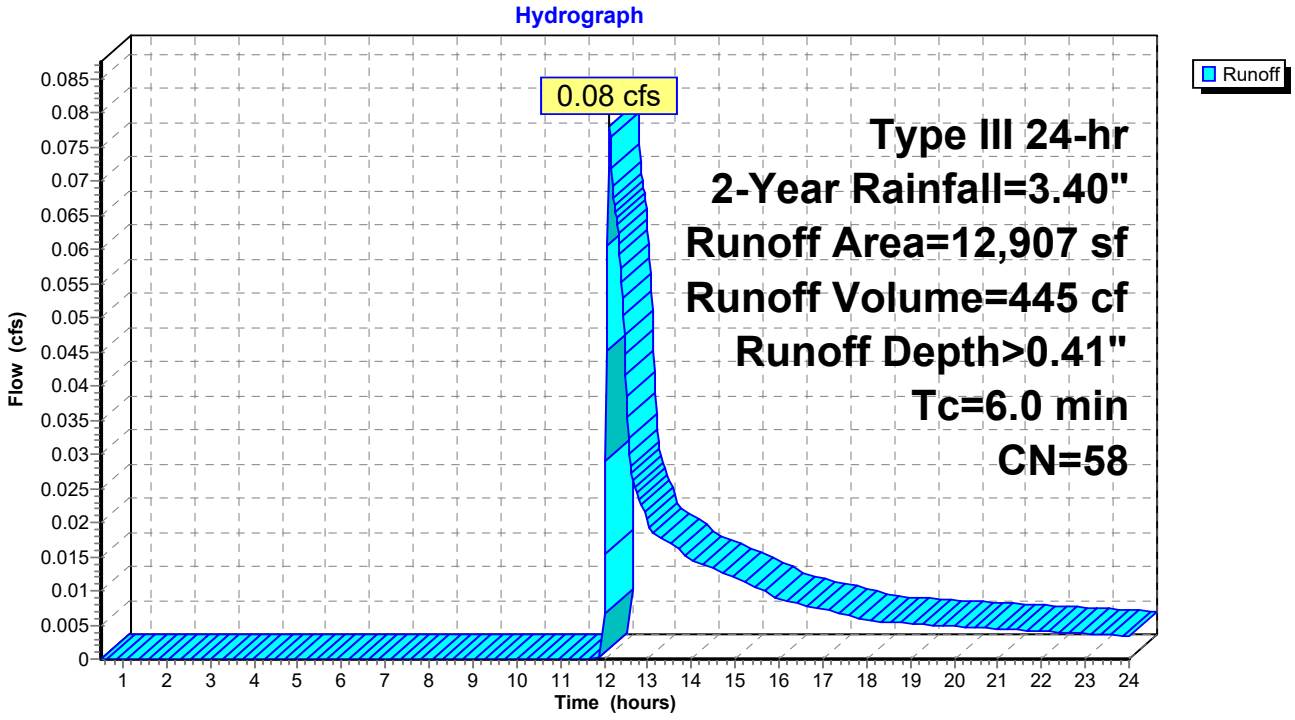
Runoff = 0.08 cfs @ 12.13 hrs, Volume= 445 cf, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
10,544	49	50-75% Grass cover, Fair, HSG A
1,337	98	Paved roads w/curbs & sewers, HSG A
1,026	98	Roofs, HSG A
12,907	58	Weighted Average
10,544		81.69% Pervious Area
2,363		18.31% Impervious Area

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

Subcatchment 7: Subcat 7



Summary for Subcatchment 8: Subcat 8

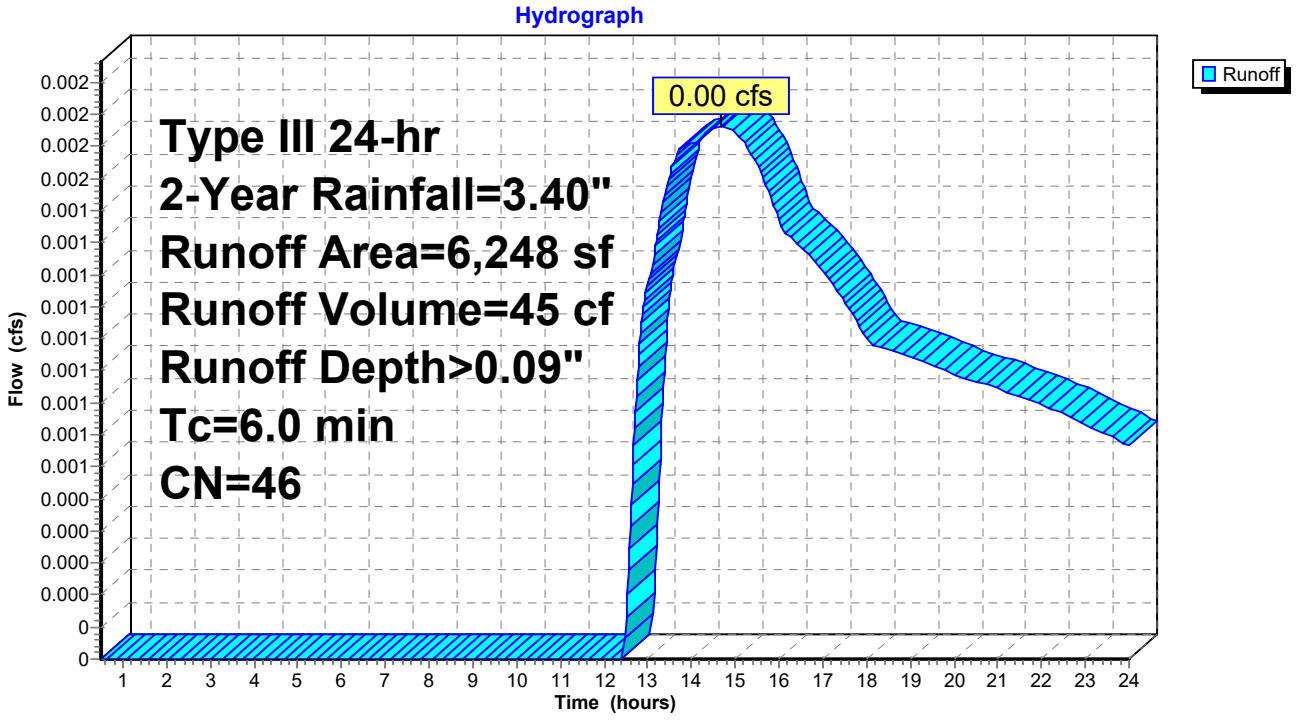
Runoff = 0.00 cfs @ 14.68 hrs, Volume= 45 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
3,110	49	50-75% Grass cover, Fair, HSG A
313	98	Roofs, HSG A
2,825	36	Woods, Fair, HSG A
6,248	46	Weighted Average
5,935		95.00% Pervious Area
313		5.00% Impervious Area

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

Subcatchment 8: Subcat 8



Summary for Subcatchment 9: Subcat 9

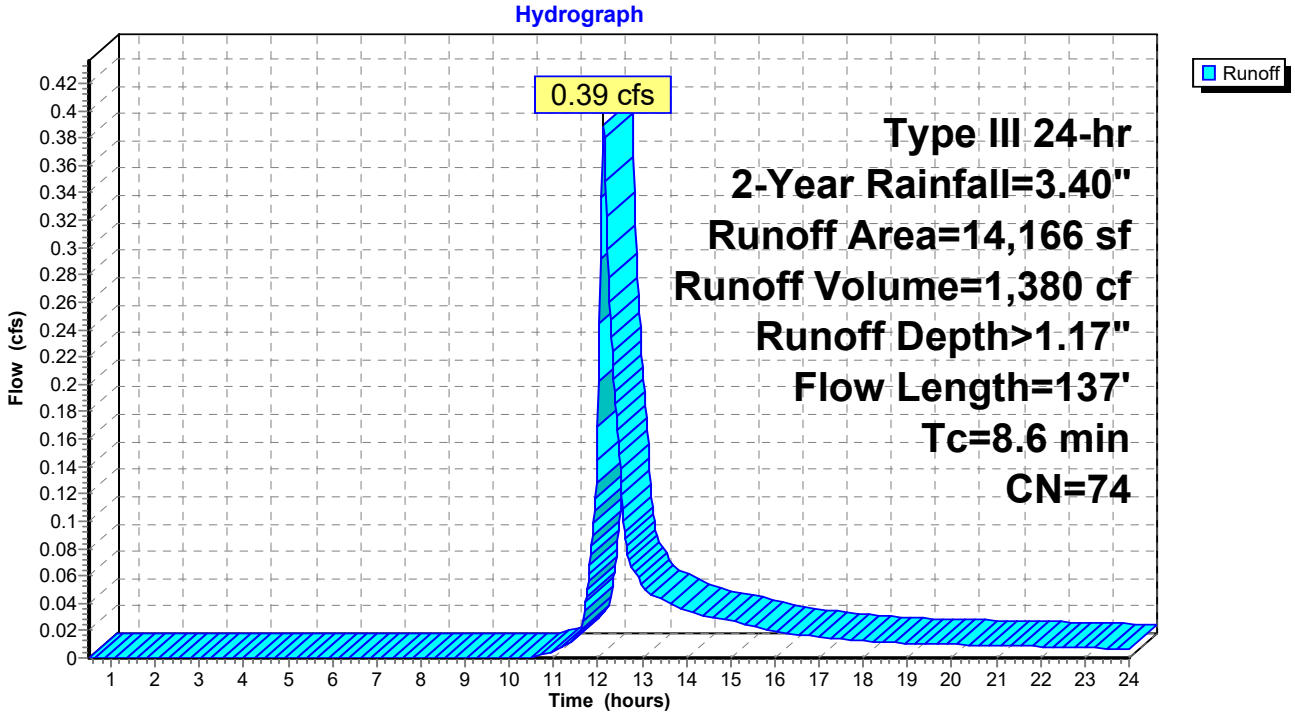
Runoff = 0.39 cfs @ 12.13 hrs, Volume= 1,380 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
6,698	49	50-75% Grass cover, Fair, HSG A
6,734	98	Paved roads w/curbs & sewers, HSG A
532	98	Roofs, HSG A
202	36	Woods, Fair, HSG A
14,166	74	Weighted Average
6,900		48.71% Pervious Area
7,266		51.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0360	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.8	87	0.0080	1.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.6	137	Total			

Subcatchment 9: Subcat 9



Summary for Subcatchment 10: Subcat 10

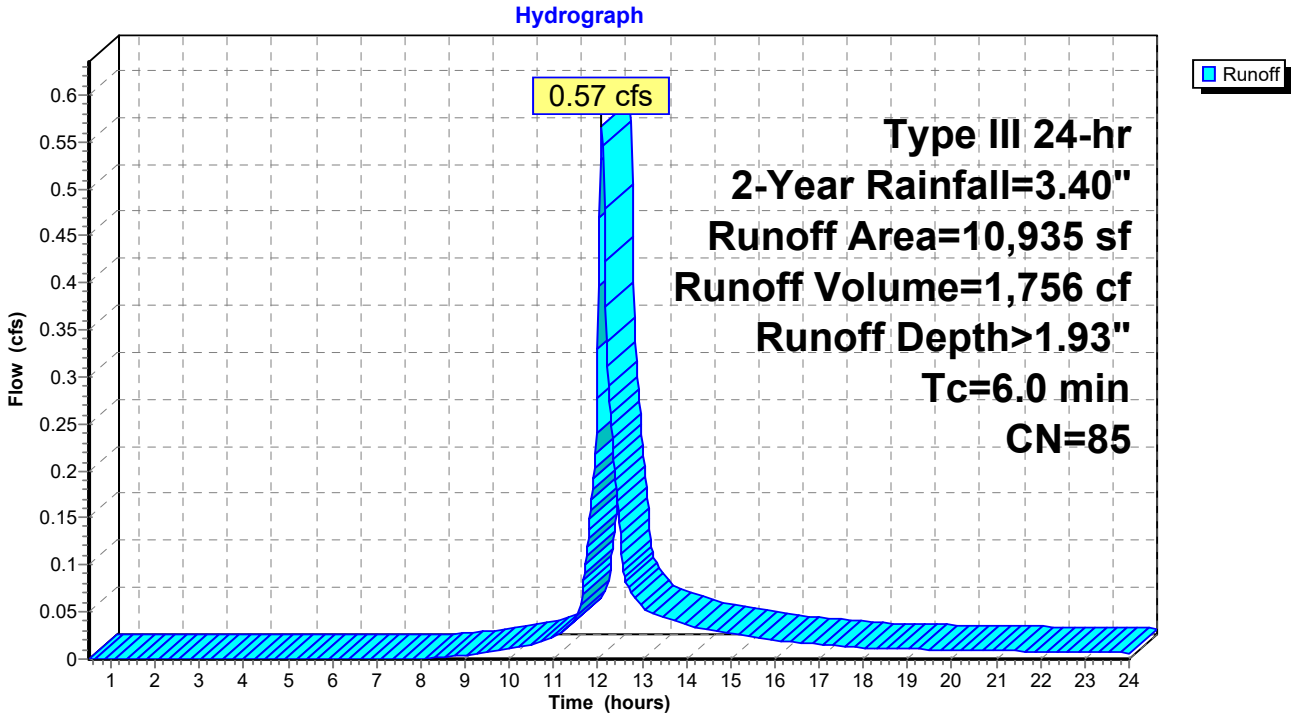
Runoff = 0.57 cfs @ 12.09 hrs, Volume= 1,756 cf, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
2,766	49	50-75% Grass cover, Fair, HSG A
8,146	98	Paved roads w/curbs & sewers, HSG A
23	36	Woods, Fair, HSG A
10,935	85	Weighted Average
2,789		25.50% Pervious Area
8,146		74.50% Impervious Area

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

Subcatchment 10: Subcat 10



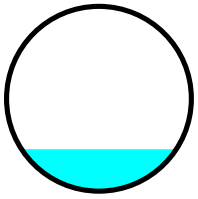
Summary for Reach 15R: CB 6

Inflow Area = 14,166 sf, 51.29% Impervious, Inflow Depth > 1.17" for 2-Year event
Inflow = 0.39 cfs @ 12.13 hrs, Volume= 1,380 cf
Outflow = 0.39 cfs @ 12.13 hrs, Volume= 1,380 cf, Atten= 0%, Lag= 0.0 min

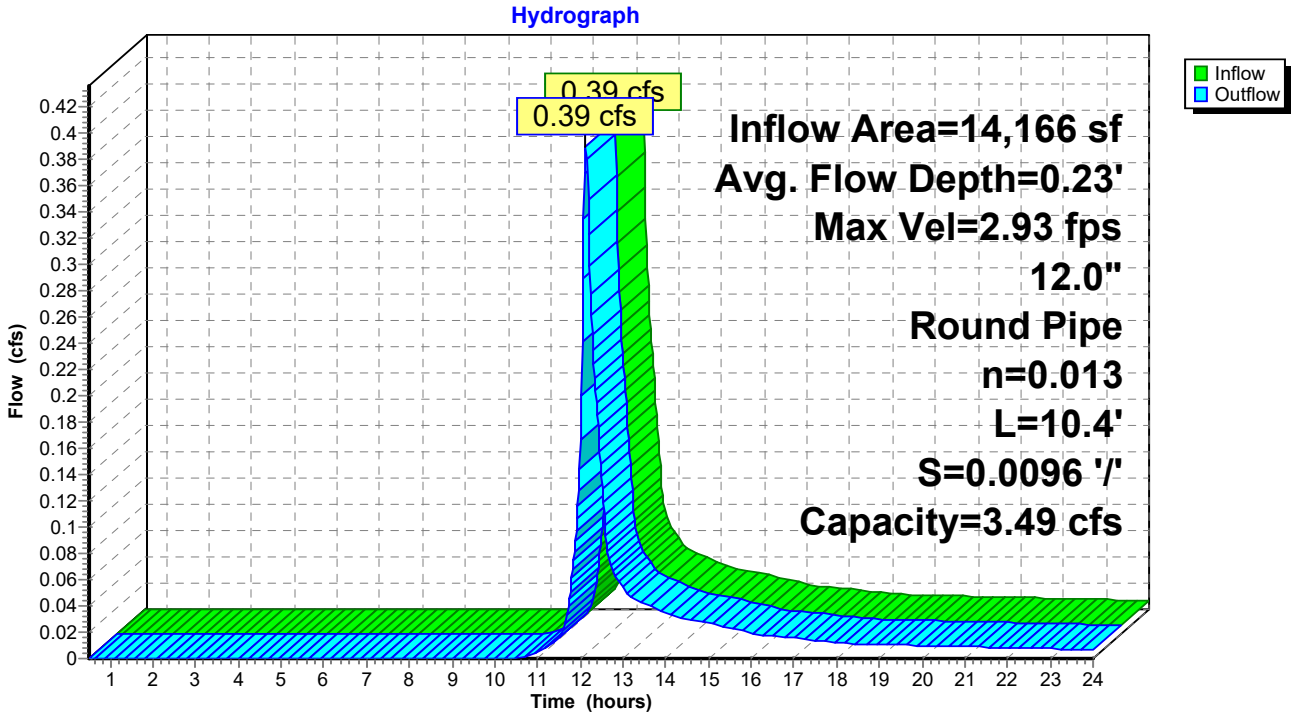
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.93 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.17 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.49 cfs

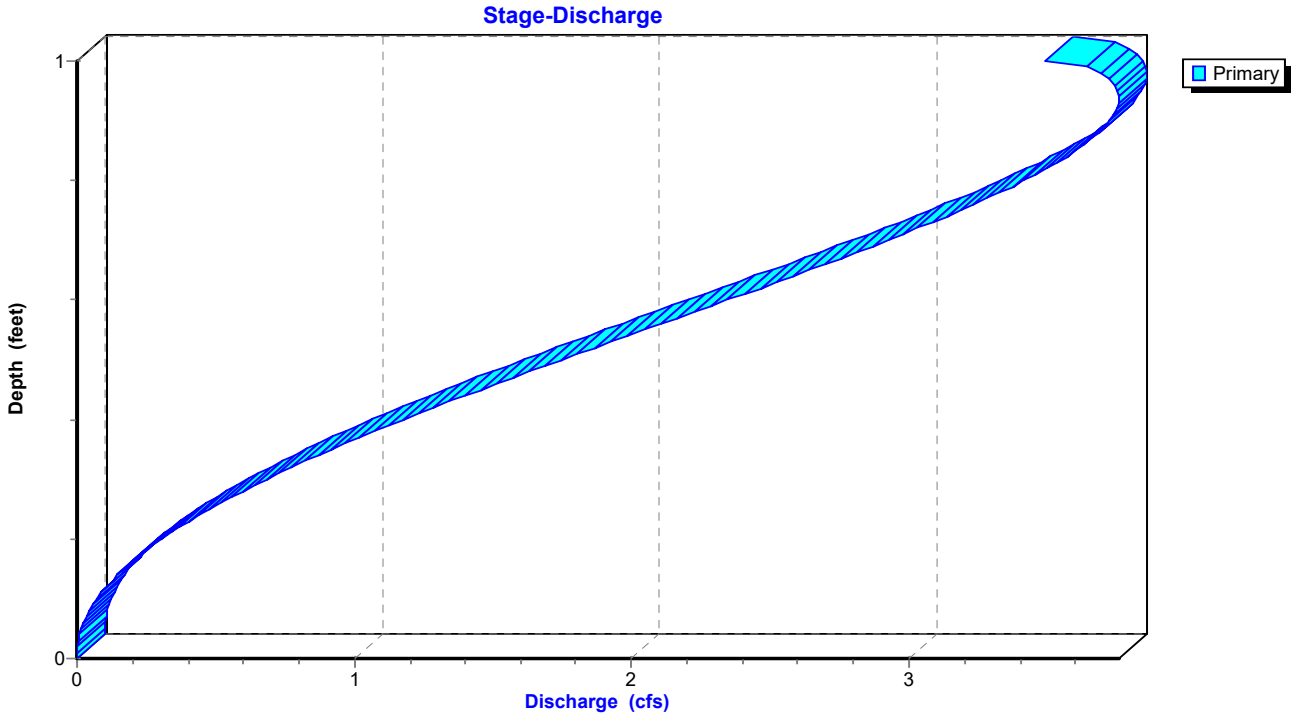
12.0" Round Pipe
n= 0.013
Length= 10.4' Slope= 0.0096 '/'
Inlet Invert= 67.50', Outlet Invert= 67.40'



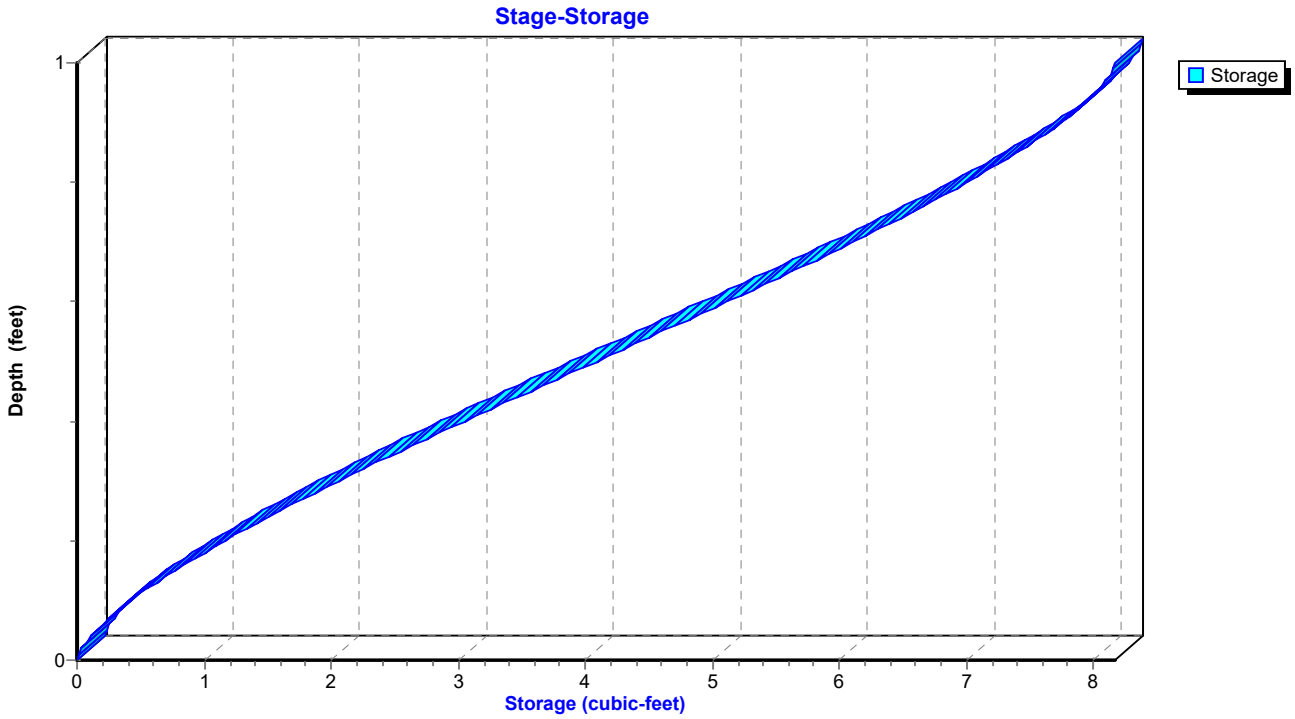
Reach 15R: CB 6



Reach 15R: CB 6



Reach 15R: CB 6



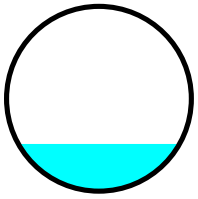
Summary for Reach 16R: CB 5

Inflow Area = 67,517 sf, 23.01% Impervious, Inflow Depth > 0.38" for 2-Year event
Inflow = 0.28 cfs @ 12.38 hrs, Volume= 2,120 cf
Outflow = 0.28 cfs @ 12.39 hrs, Volume= 2,119 cf, Atten= 0%, Lag= 0.2 min

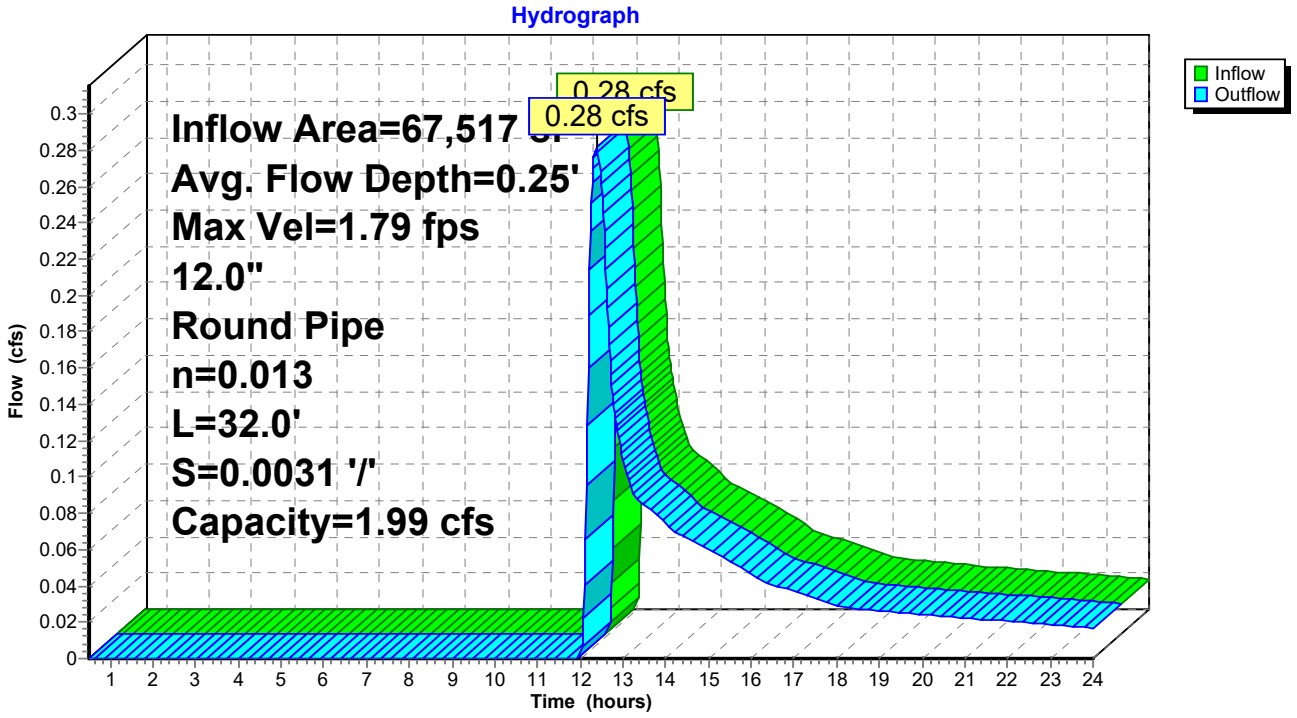
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.79 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 0.5 min

Peak Storage= 5 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.99 cfs

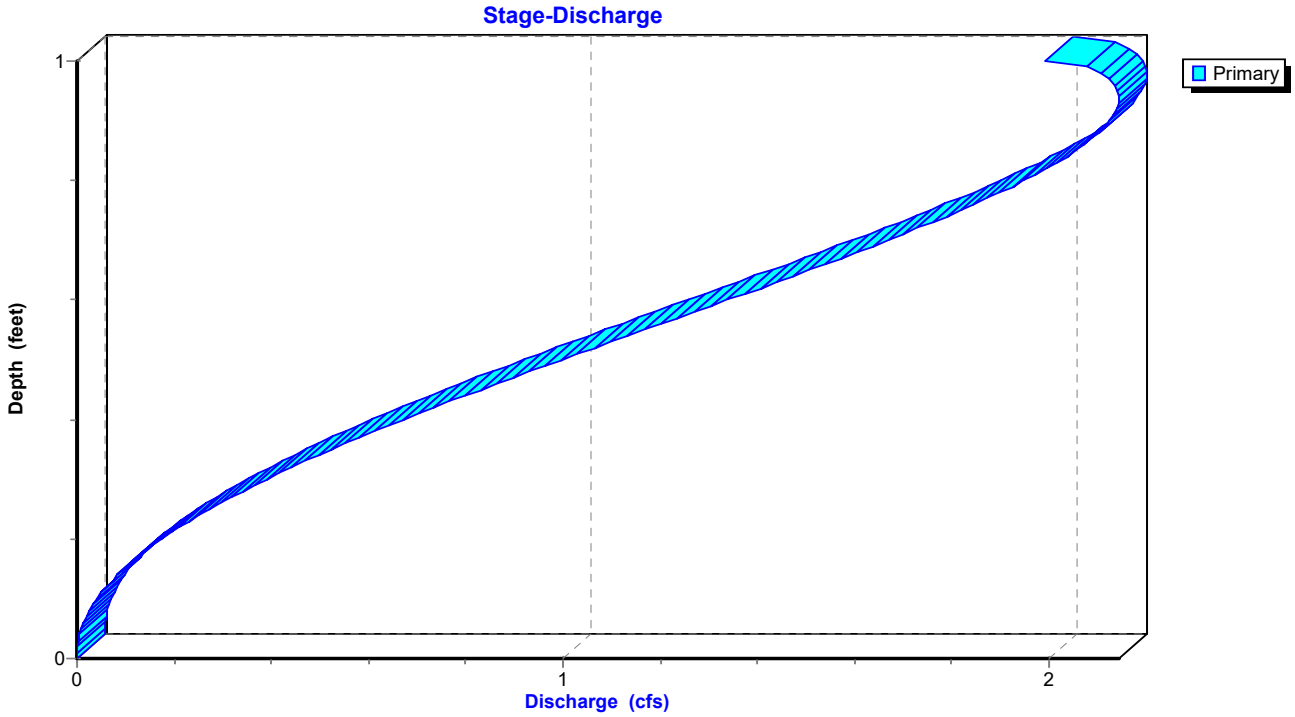
12.0" Round Pipe
n= 0.013
Length= 32.0' Slope= 0.0031 '/'
Inlet Invert= 67.50', Outlet Invert= 67.40'



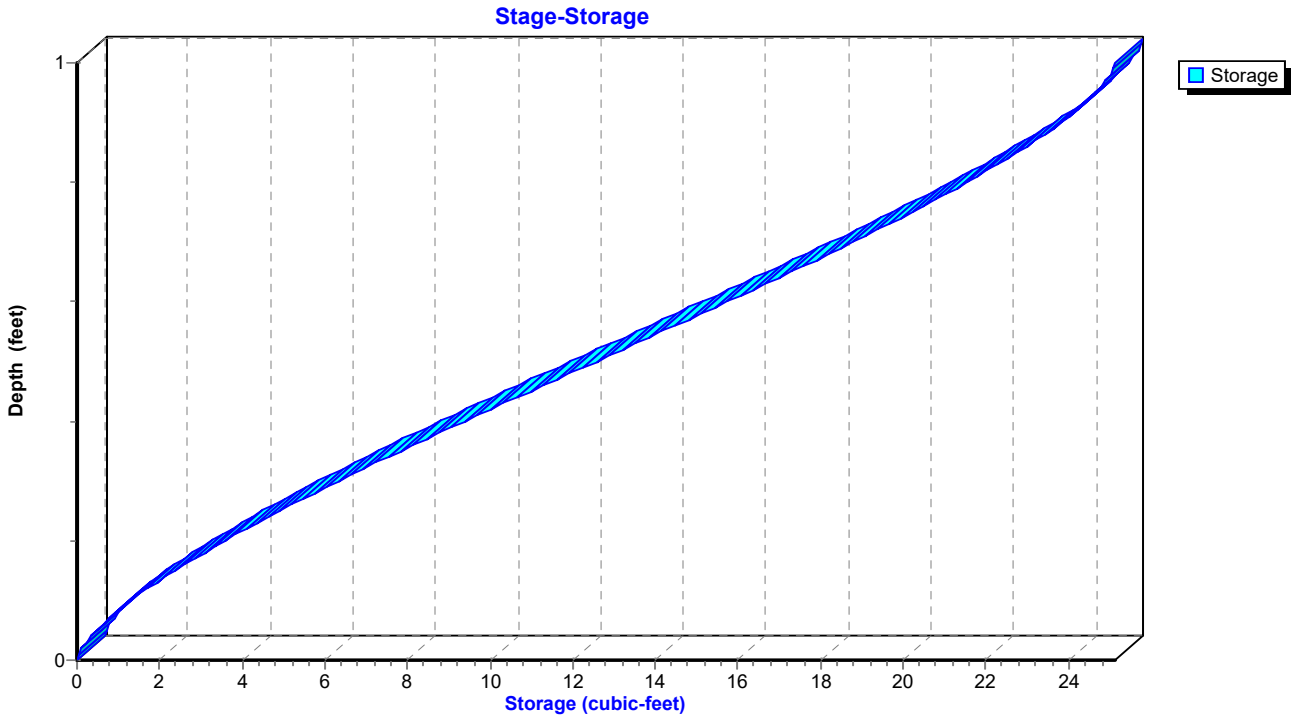
Reach 16R: CB 5



Reach 16R: CB 5



Reach 16R: CB 5



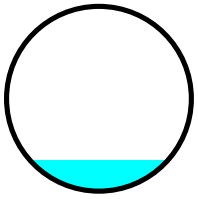
Summary for Reach 17R: DMH 7

Inflow Area = 81,683 sf, 27.91% Impervious, Inflow Depth > 0.51" for 2-Year event
Inflow = 0.51 cfs @ 12.23 hrs, Volume= 3,499 cf
Outflow = 0.51 cfs @ 12.23 hrs, Volume= 3,499 cf, Atten= 0%, Lag= 0.1 min

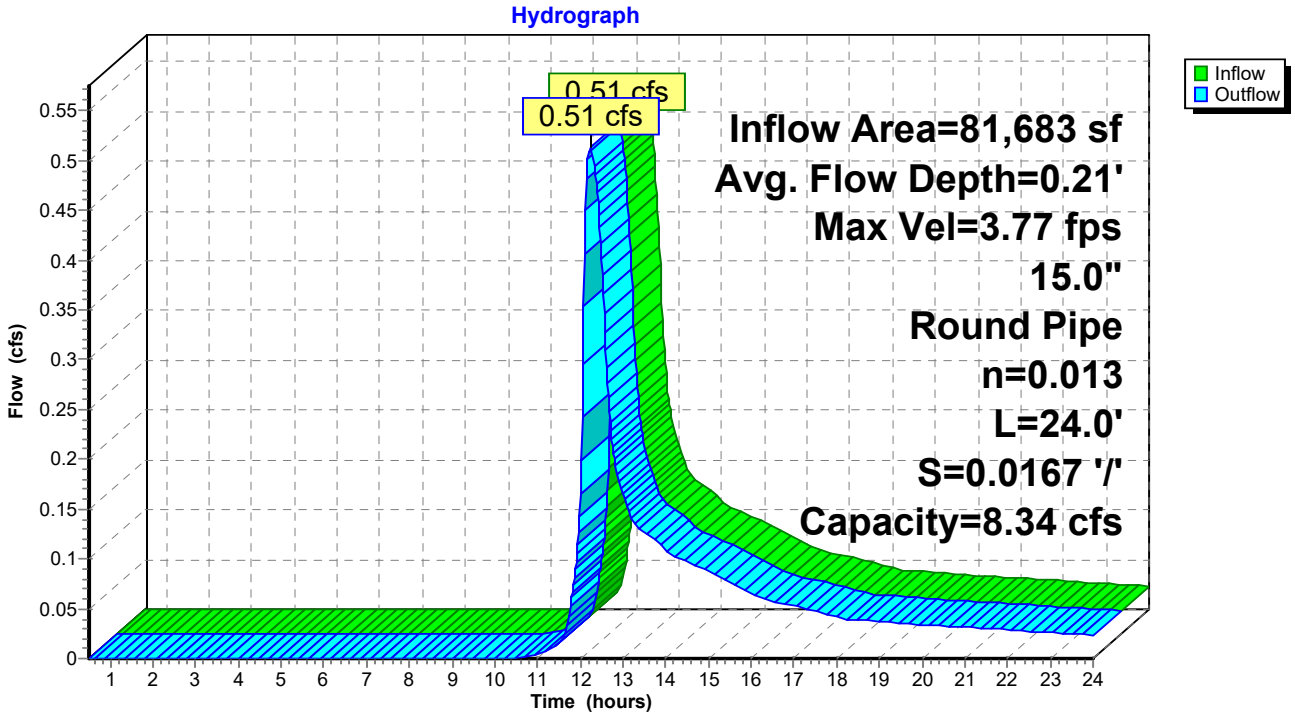
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 3.77 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.89 fps, Avg. Travel Time= 0.2 min

Peak Storage= 3 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 8.34 cfs

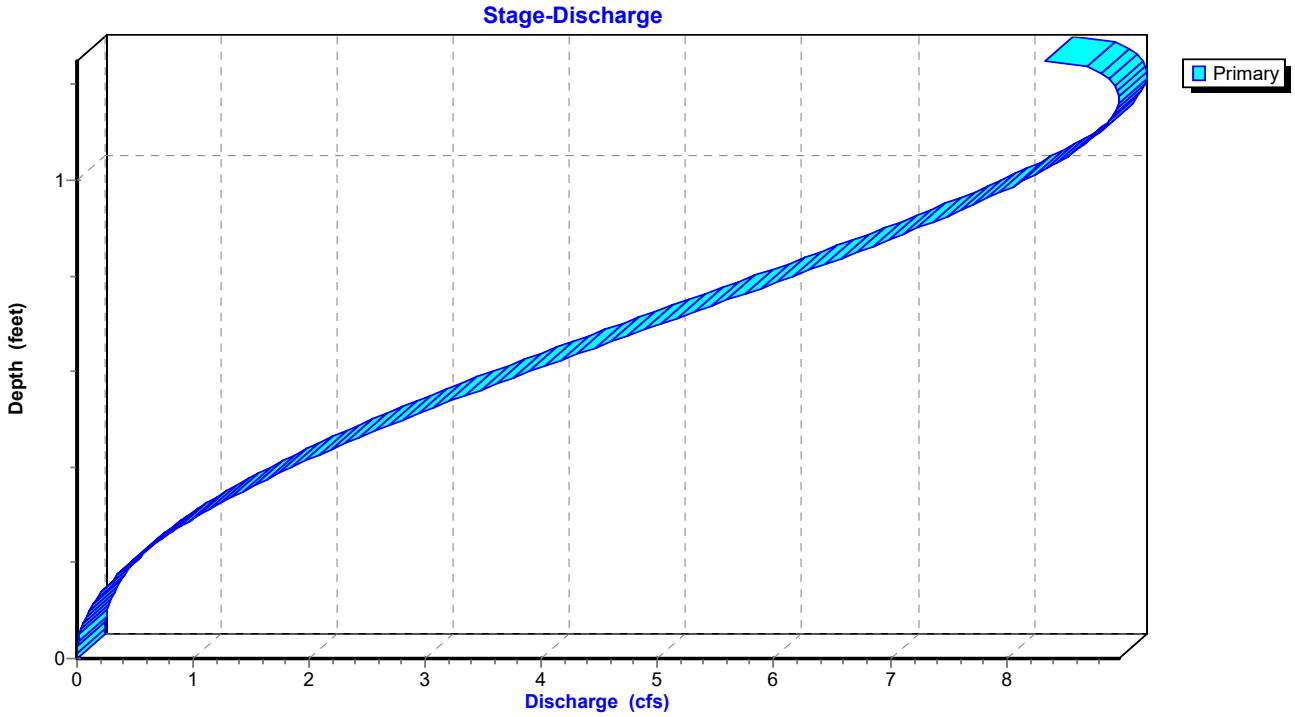
15.0" Round Pipe
n= 0.013
Length= 24.0' Slope= 0.0167 '/'
Inlet Invert= 67.40', Outlet Invert= 67.00'



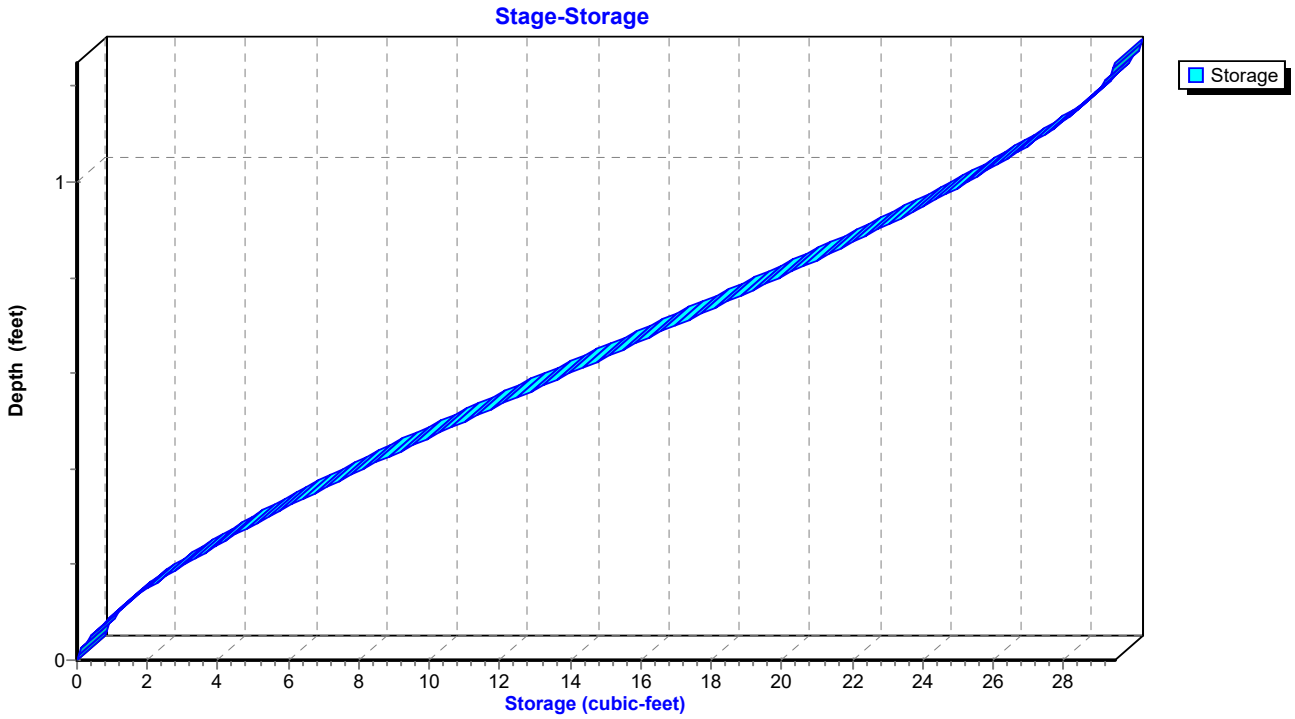
Reach 17R: DMH 7



Reach 17R: DMH 7



Reach 17R: DMH 7



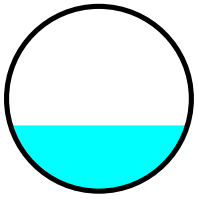
Summary for Reach 18R: CB 2

Inflow Area = 10,935 sf, 74.50% Impervious, Inflow Depth > 1.93" for 2-Year event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 1,756 cf
Outflow = 0.57 cfs @ 12.09 hrs, Volume= 1,756 cf, Atten= 0%, Lag= 0.1 min

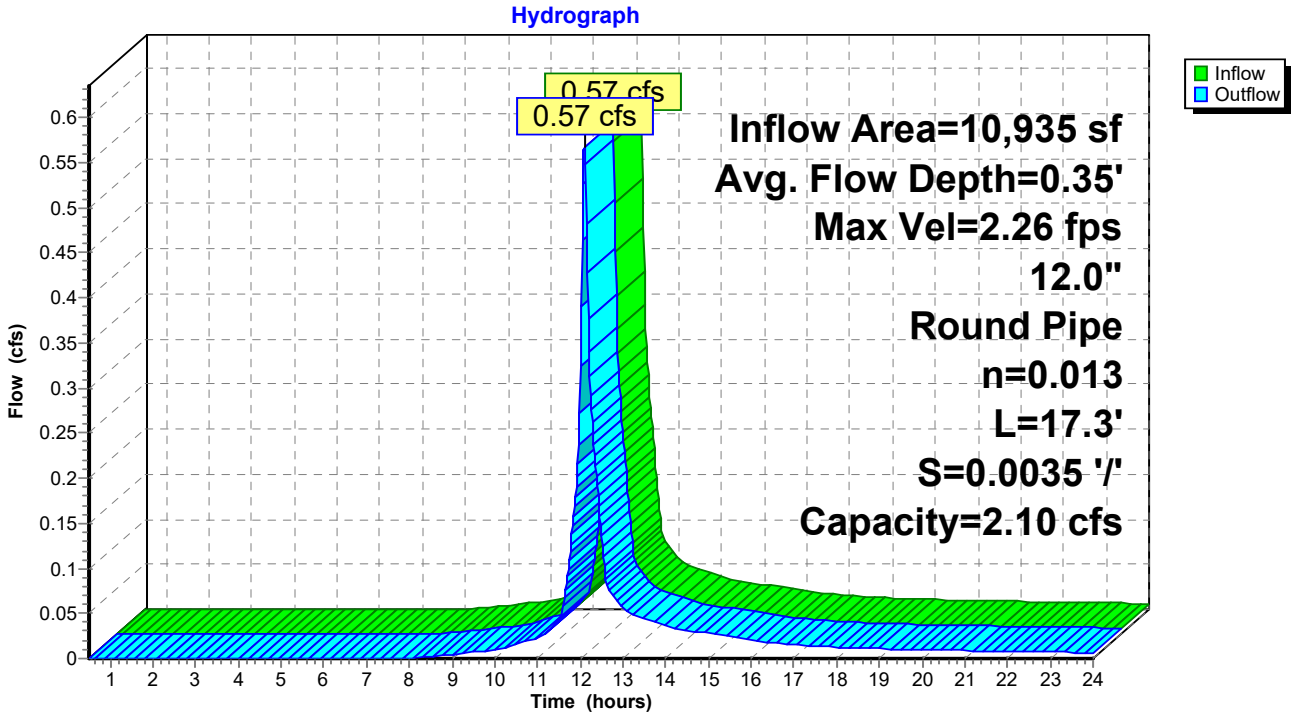
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 0.4 min

Peak Storage= 4 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.10 cfs

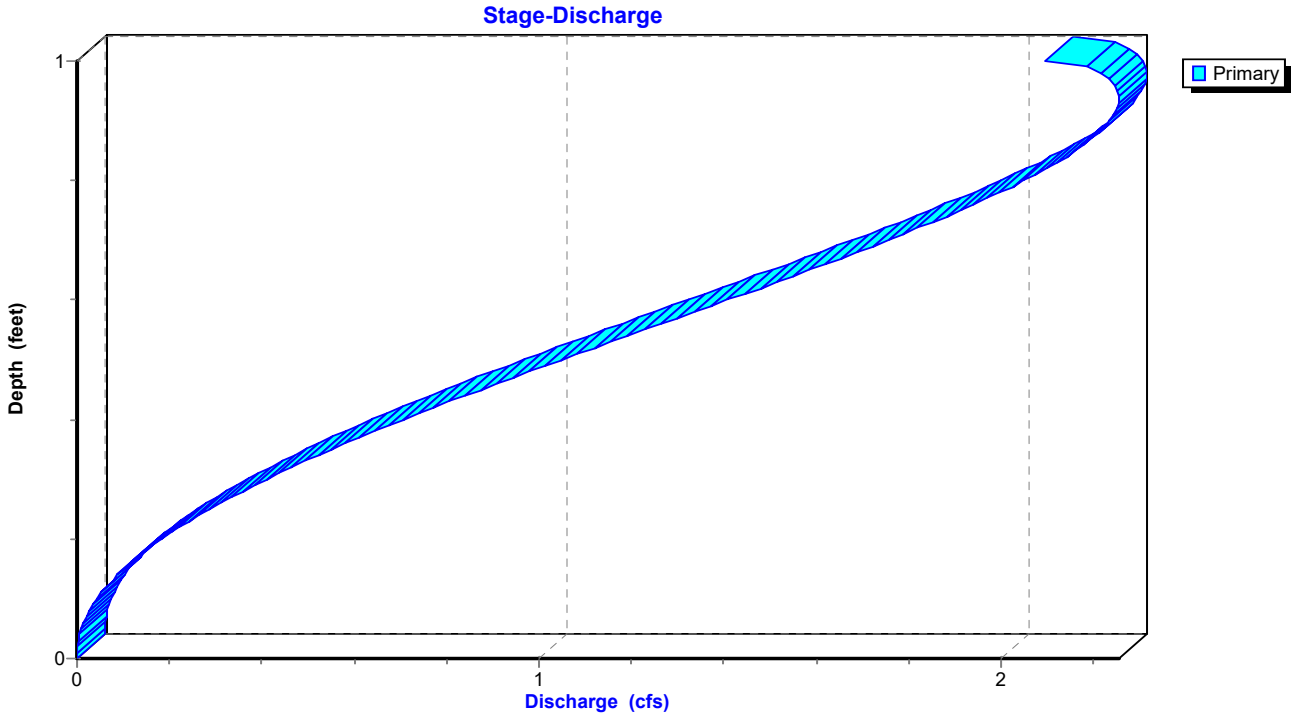
12.0" Round Pipe
n= 0.013
Length= 17.3' Slope= 0.0035 '/'
Inlet Invert= 66.46', Outlet Invert= 66.40'



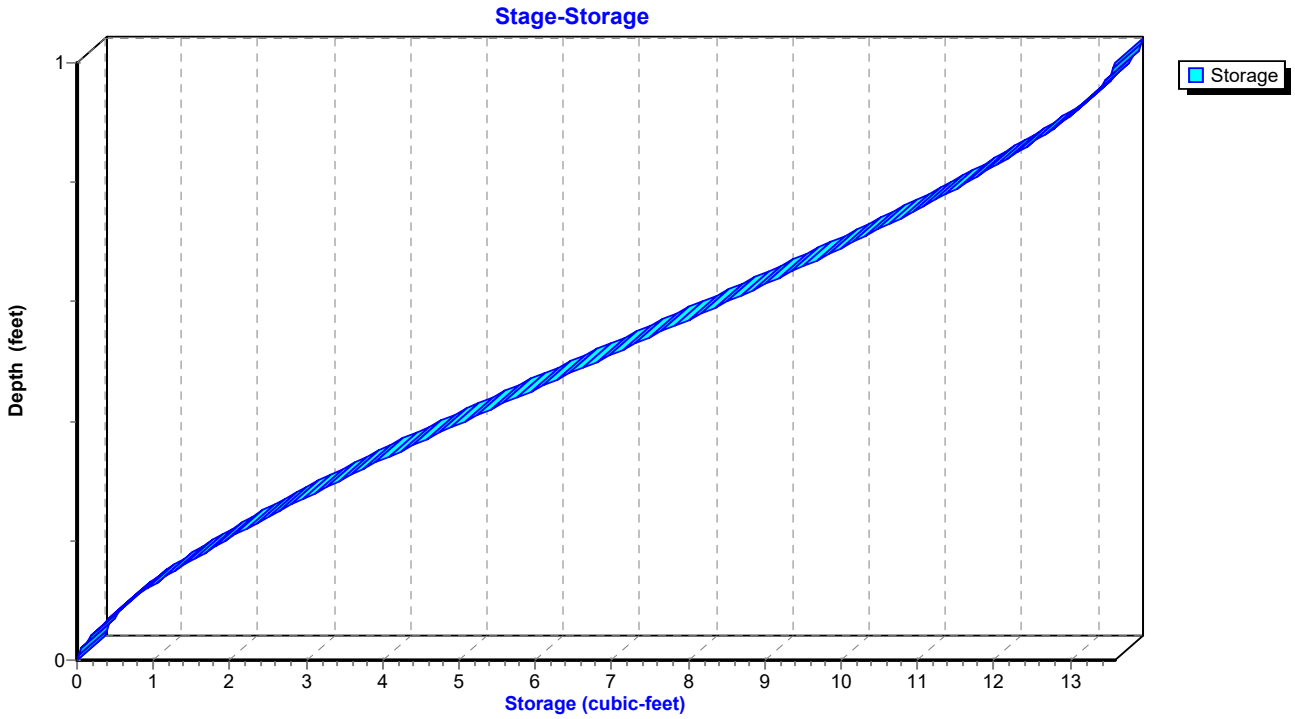
Reach 18R: CB 2



Reach 18R: CB 2



Reach 18R: CB 2



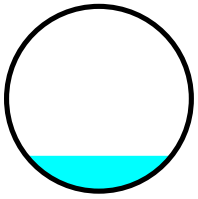
Summary for Reach 19R: CB 1

Inflow Area = 25,458 sf, 30.88% Impervious, Inflow Depth > 0.65" for 2-Year event
Inflow = 0.32 cfs @ 12.14 hrs, Volume= 1,386 cf
Outflow = 0.32 cfs @ 12.14 hrs, Volume= 1,386 cf, Atten= 0%, Lag= 0.0 min

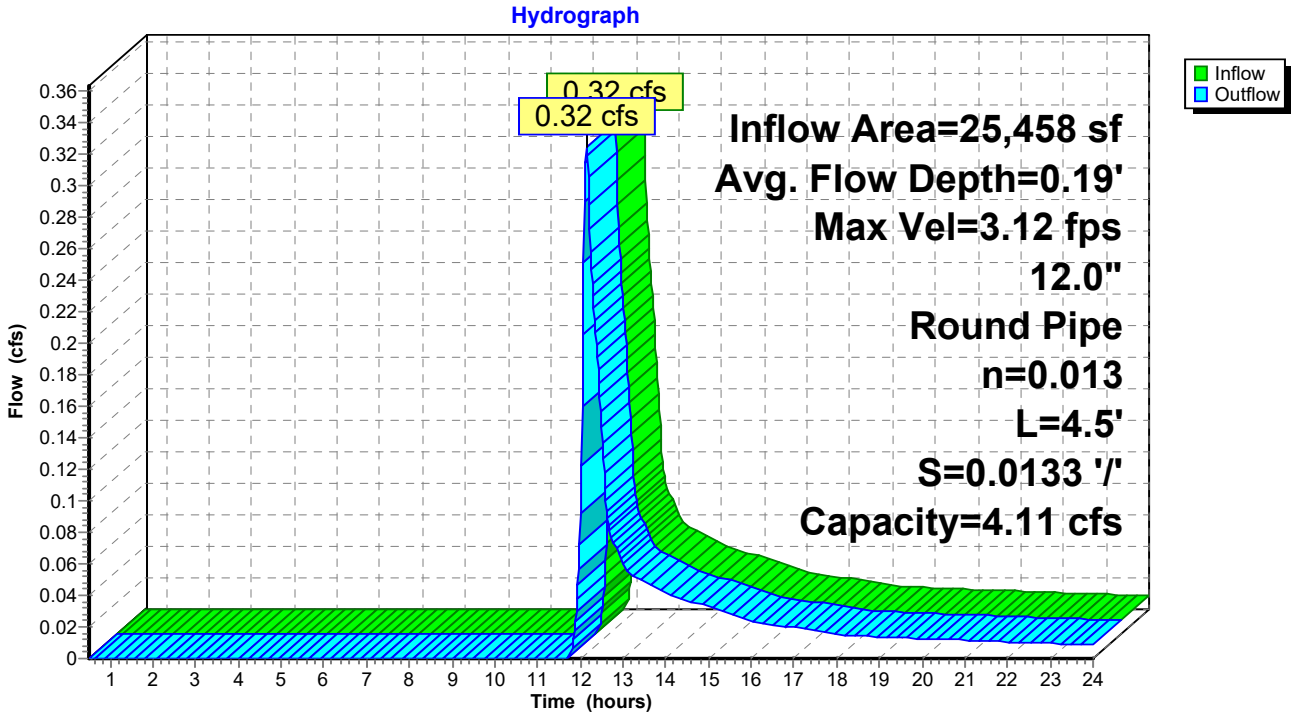
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 3.12 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 0.1 min

Peak Storage= 0 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.11 cfs

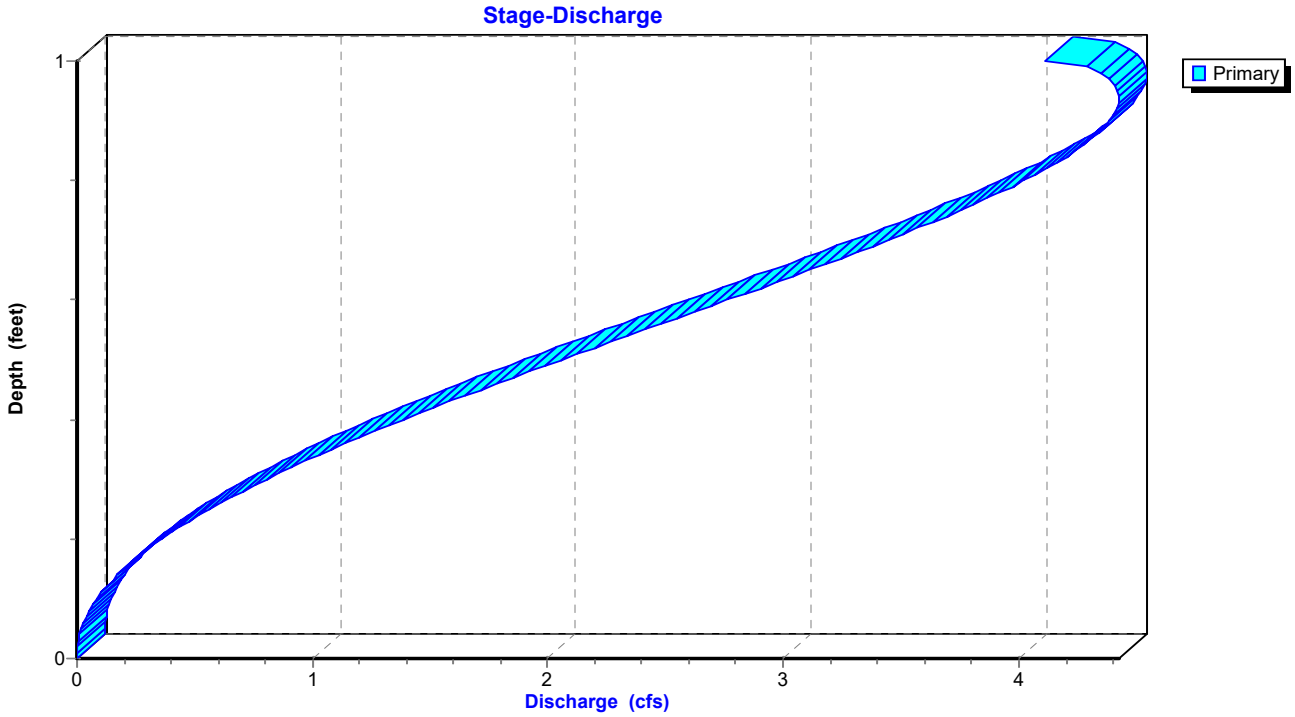
12.0" Round Pipe
n= 0.013
Length= 4.5' Slope= 0.0133 '/'
Inlet Invert= 66.46', Outlet Invert= 66.40'



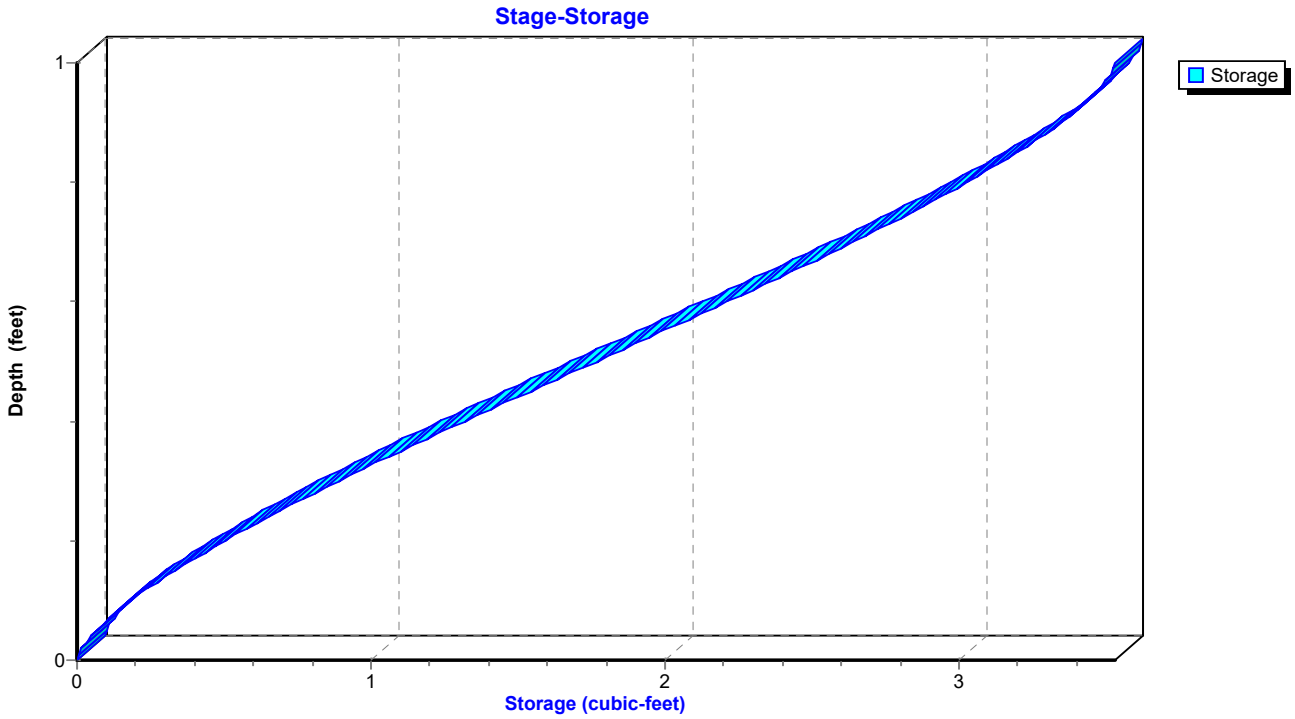
Reach 19R: CB 1



Reach 19R: CB 1



Reach 19R: CB 1



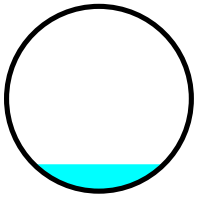
Summary for Reach 20R: DMH 3

Inflow Area = 25,458 sf, 30.88% Impervious, Inflow Depth > 0.65" for 2-Year event
Inflow = 0.32 cfs @ 12.14 hrs, Volume= 1,386 cf
Outflow = 0.32 cfs @ 12.15 hrs, Volume= 1,386 cf, Atten= 0%, Lag= 0.1 min

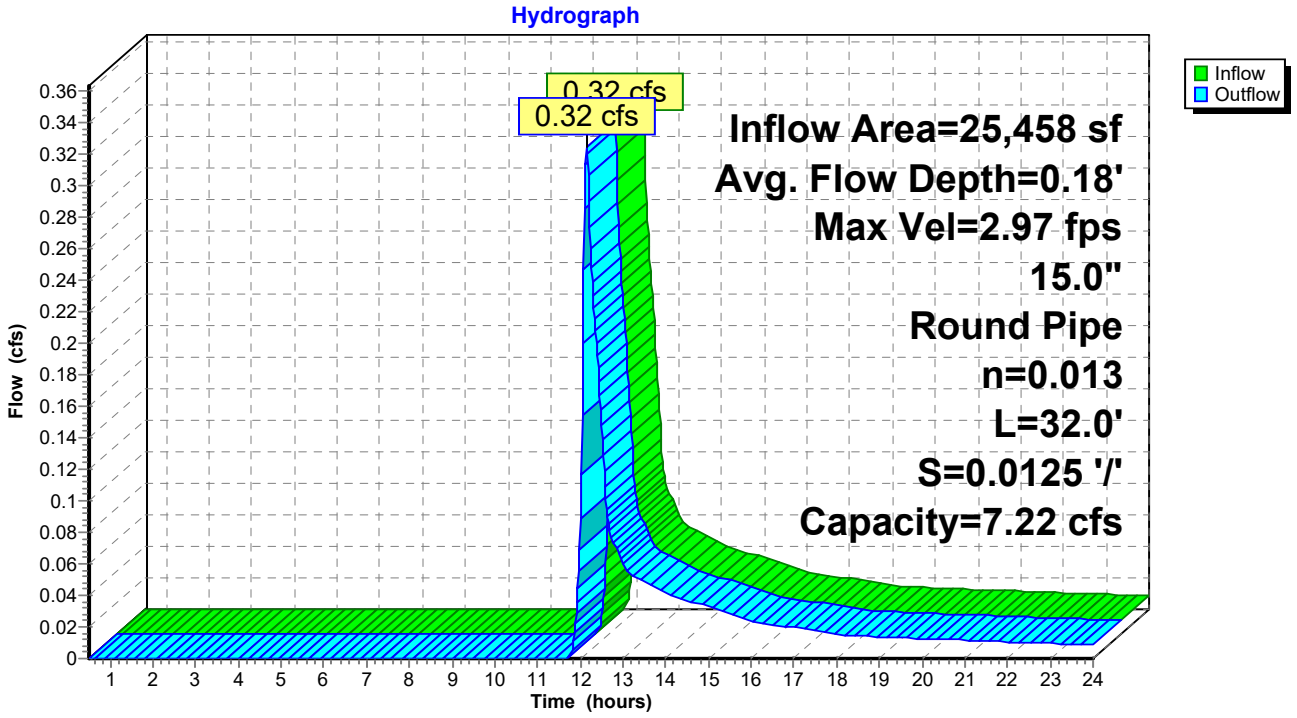
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.97 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.33 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.22 cfs

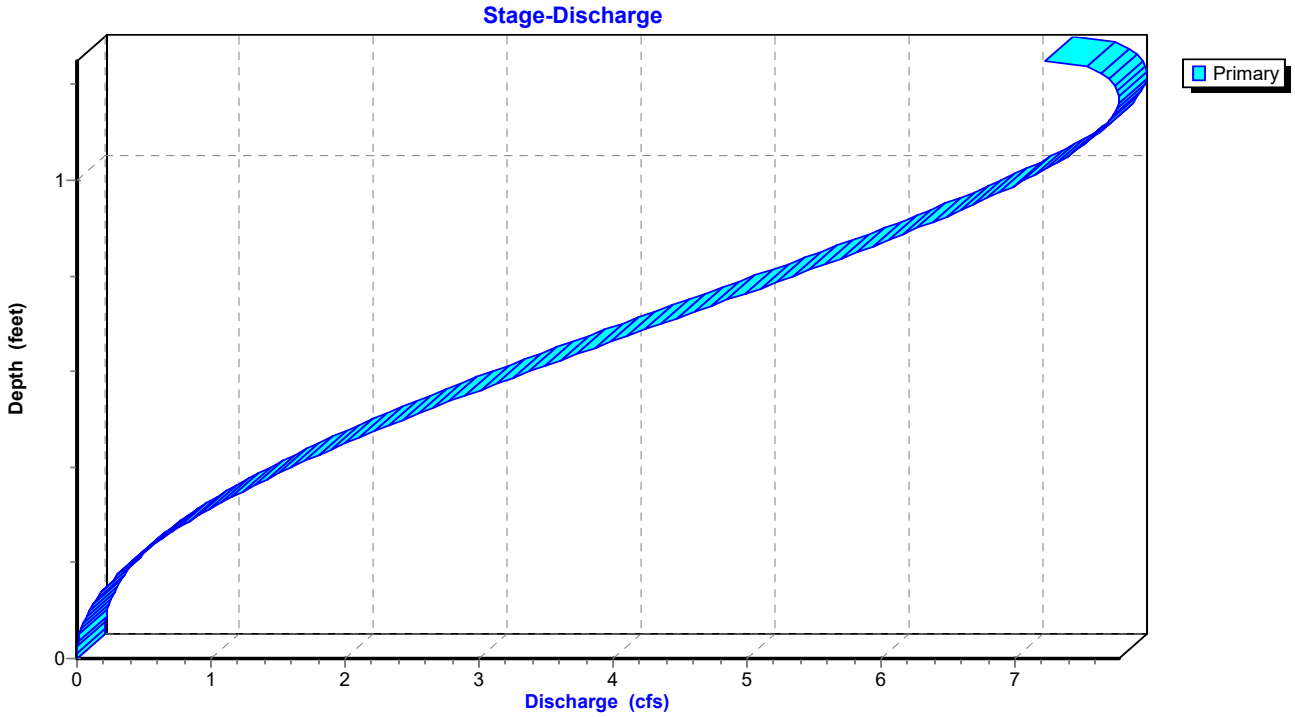
15.0" Round Pipe
n= 0.013
Length= 32.0' Slope= 0.0125 '/'
Inlet Invert= 66.40', Outlet Invert= 66.00'



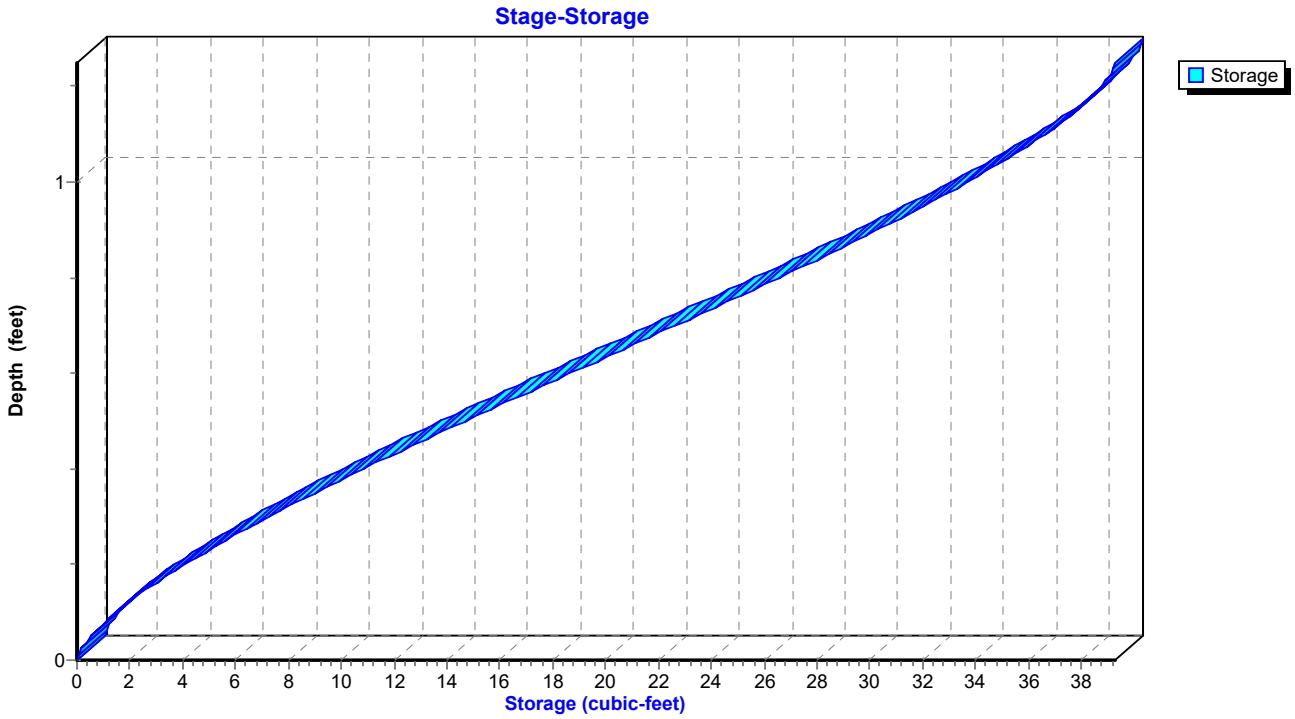
Reach 20R: DMH 3



Reach 20R: DMH 3



Reach 20R: DMH 3



Summary for Pond 11P: BASIN 1

Inflow Area = 97,841 sf, 21.60% Impervious, Inflow Depth > 0.46" for 2-Year event
Inflow = 0.85 cfs @ 12.11 hrs, Volume= 3,781 cf
Outflow = 0.11 cfs @ 13.84 hrs, Volume= 3,763 cf, Atten= 87%, Lag= 104.0 min
Discarded = 0.11 cfs @ 13.84 hrs, Volume= 3,763 cf
Primary = 0.00 cfs @ 0.50 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Peak Elev= 64.64' @ 13.84 hrs Surf.Area= 1,931 sf Storage= 1,149 cf

Plug-Flow detention time= 107.4 min calculated for 3,759 cf (99% of inflow)
Center-of-Mass det. time= 104.7 min (987.5 - 882.8)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	10,880 cf	**Custom Stage Data (Prismatic)**Listed below

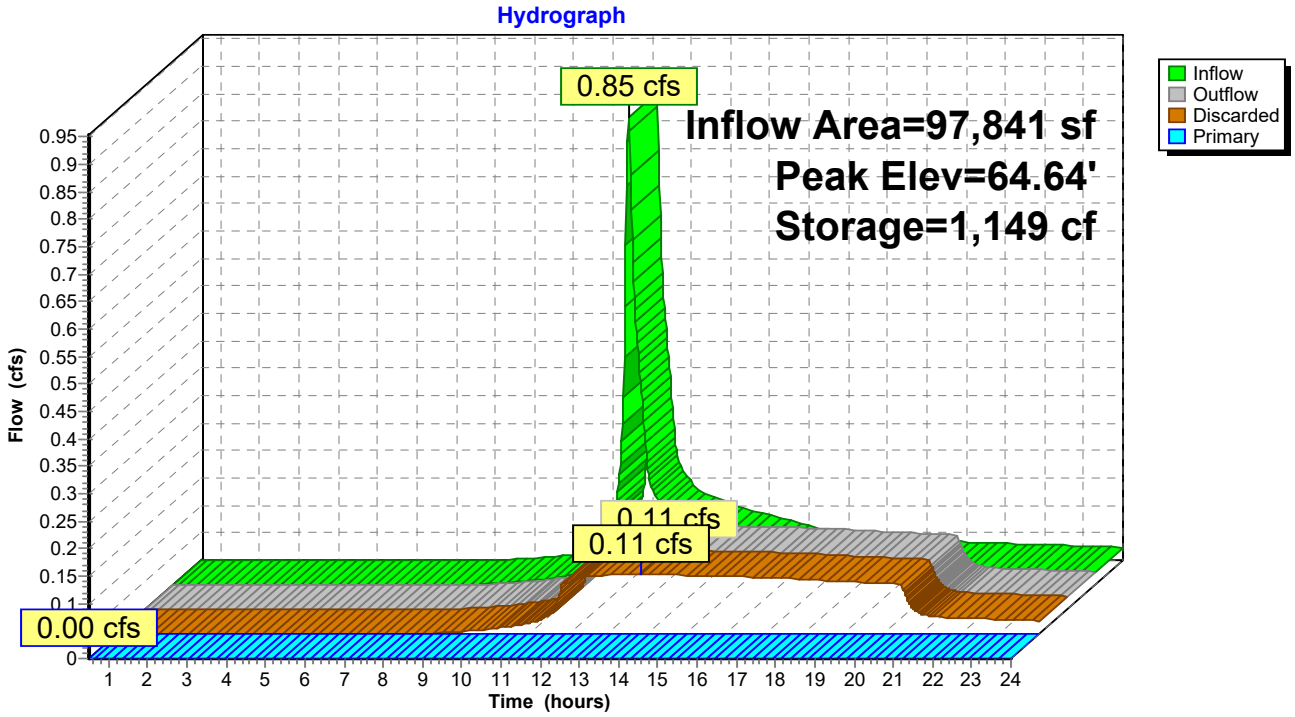
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	1,611	0	0
64.50	1,857	867	867
65.00	2,118	994	1,861
65.50	2,392	1,128	2,988
66.00	2,681	1,268	4,257
66.50	2,984	1,416	5,673
67.00	3,301	1,571	7,244
67.50	3,632	1,733	8,977
68.00	3,977	1,902	10,880

Device	Routing	Invert	Outlet Devices
#1	Primary	65.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	64.00'	**2.410 in/hr Exfiltration over Surface area**

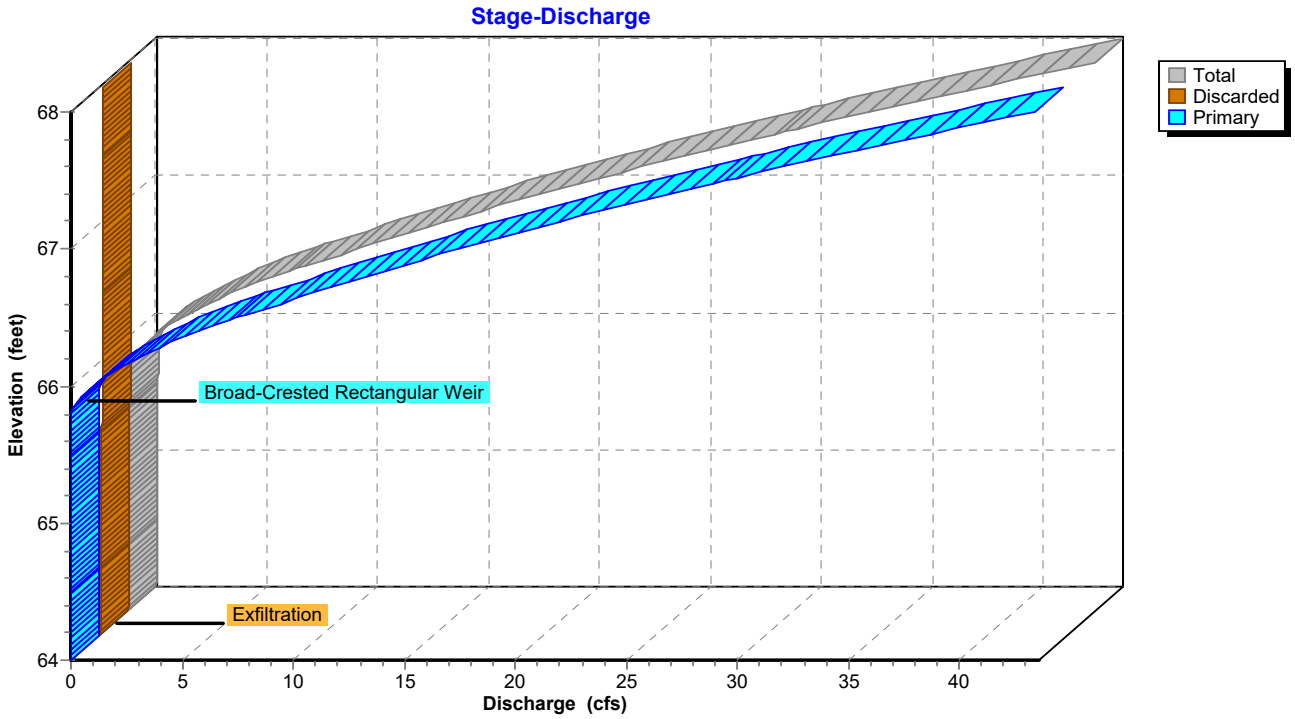
Discarded OutFlow Max=0.11 cfs @ 13.84 hrs HW=64.64' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.50 hrs HW=64.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

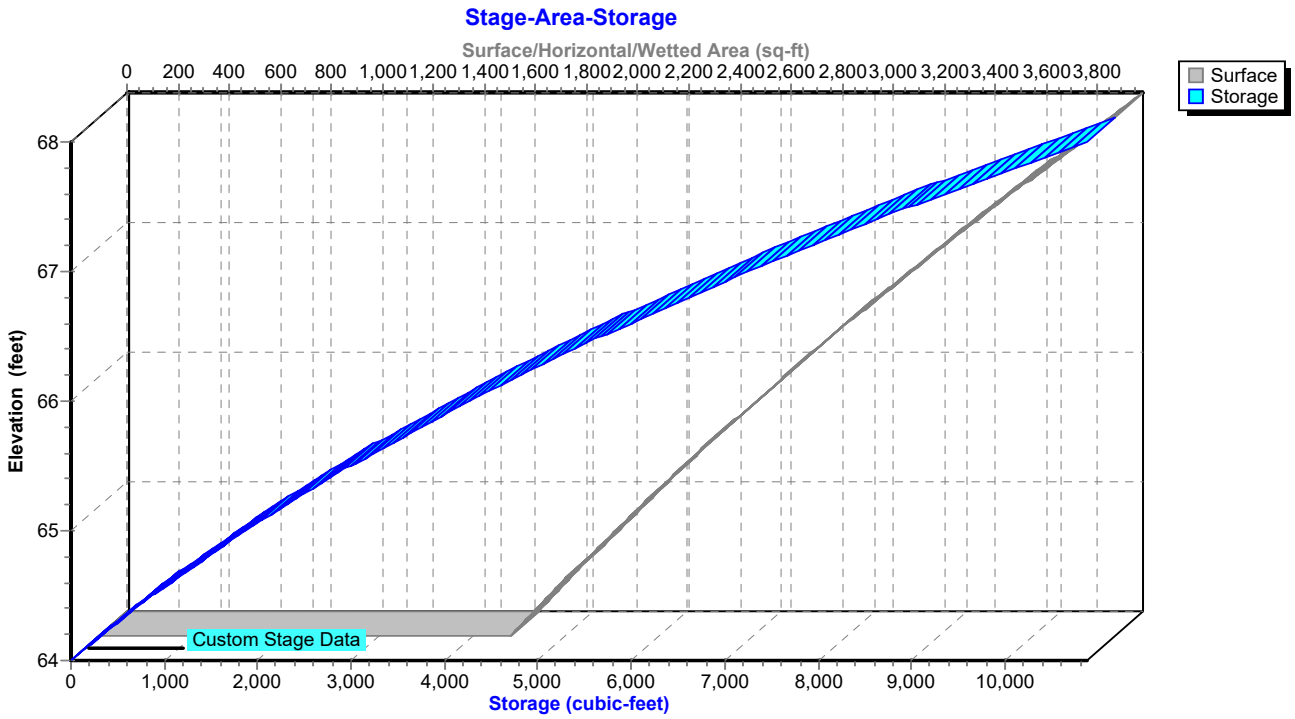
Pond 11P: BASIN 1



Pond 11P: BASIN 1



Pond 11P: BASIN 1



Summary for Pond 13P: BASIN 2

Inflow Area = 94,590 sf, 26.60% Impervious, Inflow Depth > 0.50" for 2-Year event
Inflow = 0.58 cfs @ 12.20 hrs, Volume= 3,943 cf
Outflow = 0.15 cfs @ 13.34 hrs, Volume= 3,928 cf, Atten= 74%, Lag= 68.1 min
Discarded = 0.15 cfs @ 13.34 hrs, Volume= 3,928 cf
Primary = 0.00 cfs @ 0.50 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Peak Elev= 65.46' @ 13.34 hrs Surf.Area= 2,684 sf Storage= 924 cf

Plug-Flow detention time= 56.3 min calculated for 3,928 cf (100% of inflow)
Center-of-Mass det. time= 54.3 min (961.6 - 907.3)

Volume	Invert	Avail.Storage	Storage Description
#1	65.10'	9,910 cf	**Custom Stage Data (Prismatic)**Listed below

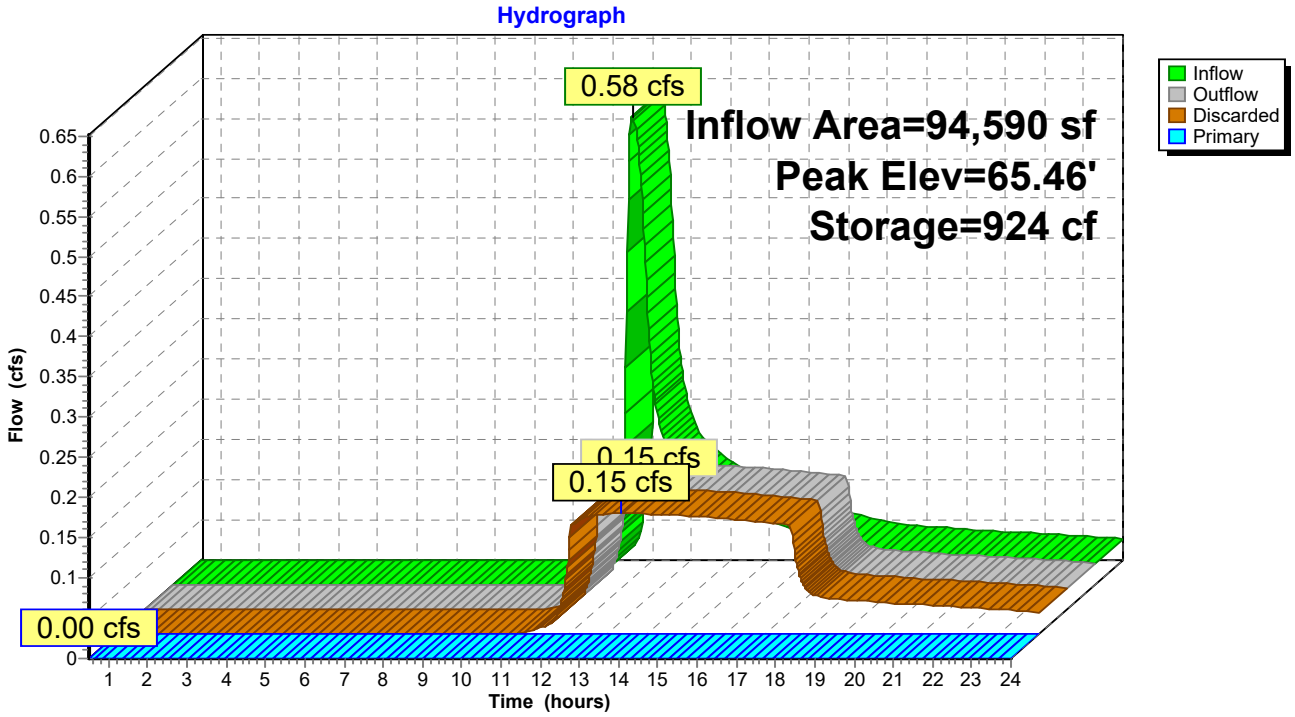
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.10	2,409	0	0
65.50	2,714	1,025	1,025
66.00	3,033	1,437	2,461
66.50	3,366	1,600	4,061
67.00	3,714	1,770	5,831
67.50	4,075	1,947	7,778
68.00	4,451	2,132	9,910

Device	Routing	Invert	Outlet Devices
#1	Primary	67.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	65.10'	**2.410 in/hr Exfiltration over Surface area**
#3	Primary	66.00'	**3.0" Vert. Orifice/Grate X 2.00** C= 0.600

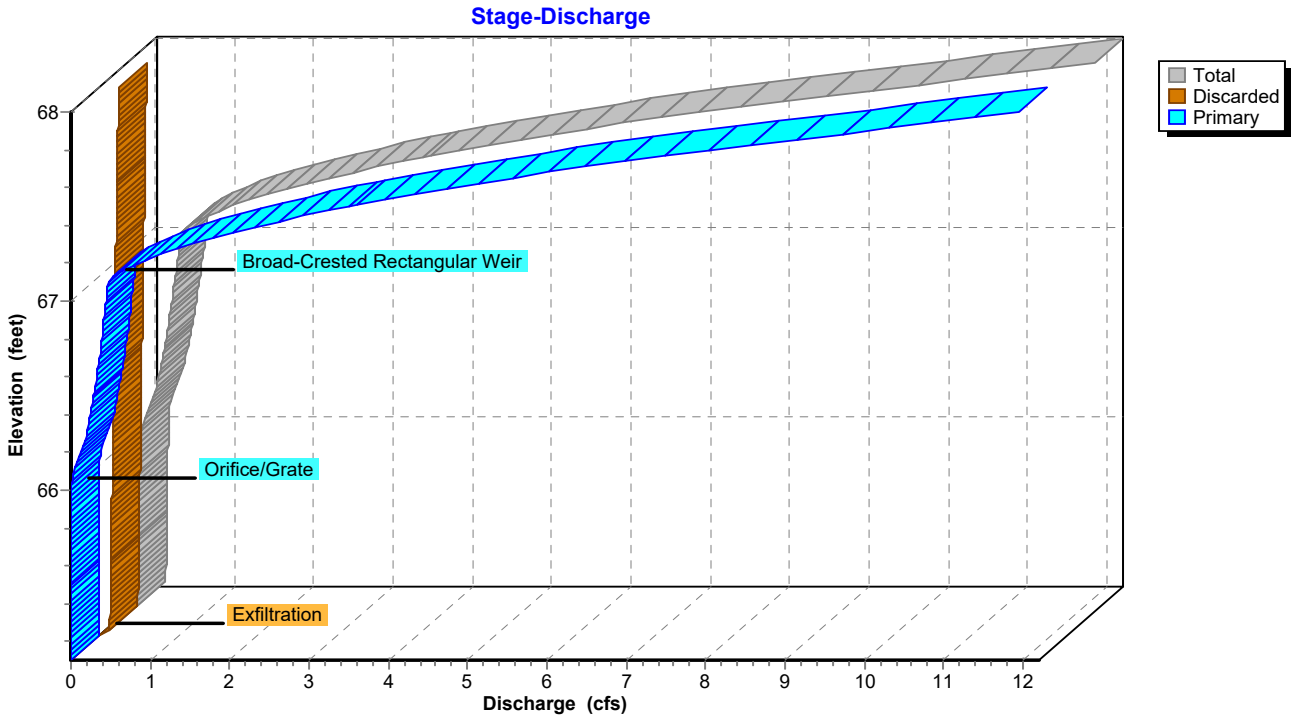
Discarded OutFlow Max=0.15 cfs @ 13.34 hrs HW=65.46' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 0.50 hrs HW=65.10' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

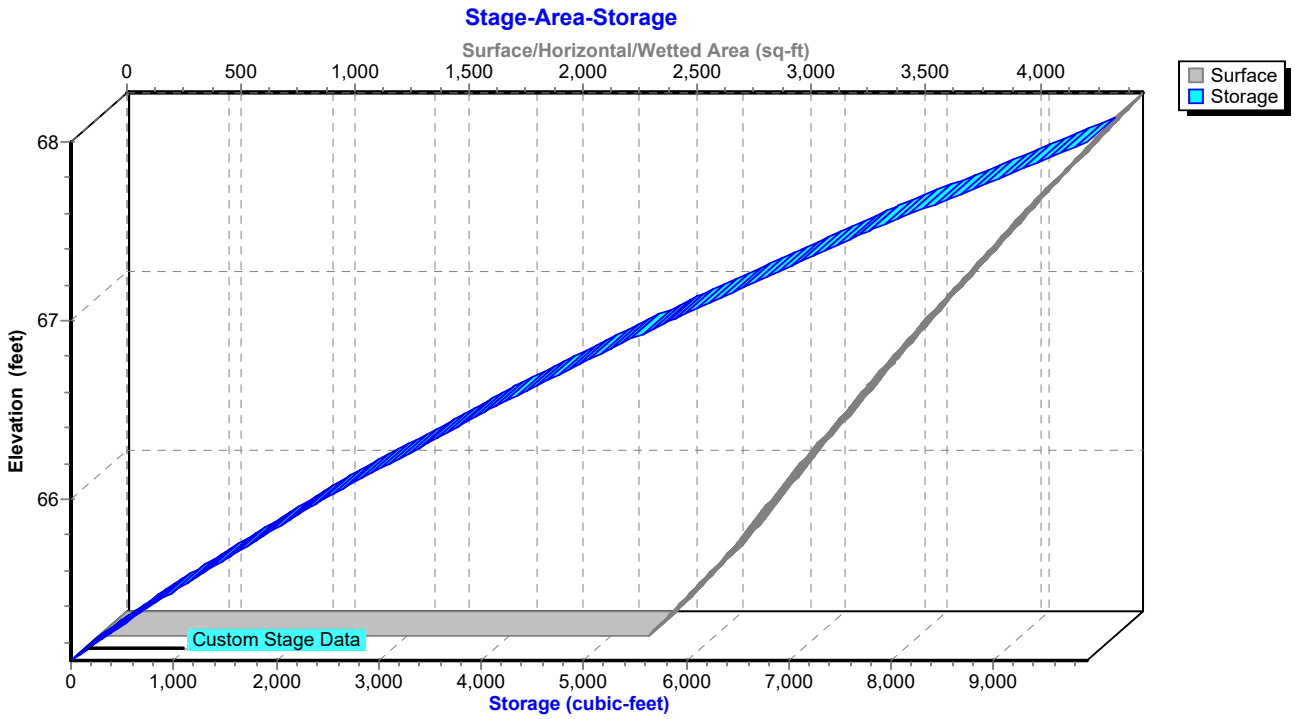
Pond 13P: BASIN 2



Pond 13P: BASIN 2



Pond 13P: BASIN 2

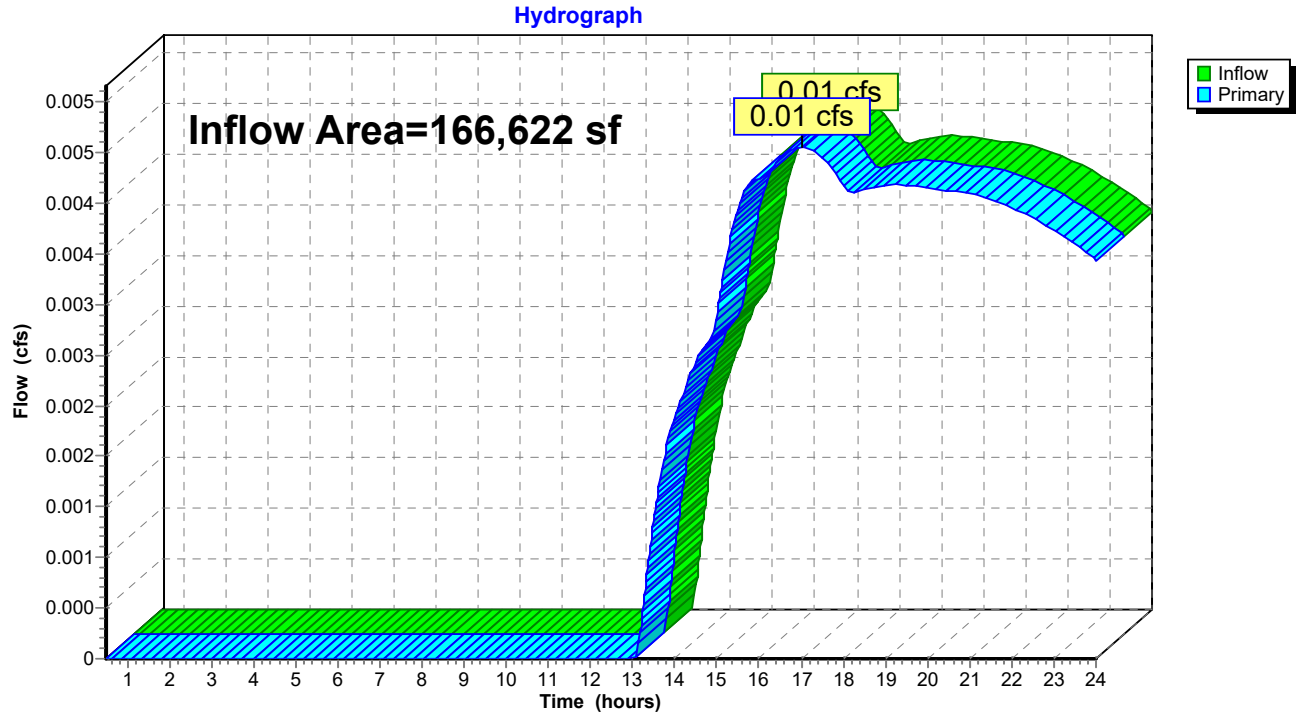


Summary for Link 12L: Southwest Wetland

Inflow Area = 166,622 sf, 13.26% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.01 cfs @ 17.02 hrs, Volume= 163 cf
Primary = 0.01 cfs @ 17.02 hrs, Volume= 163 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 12L: Southwest Wetland

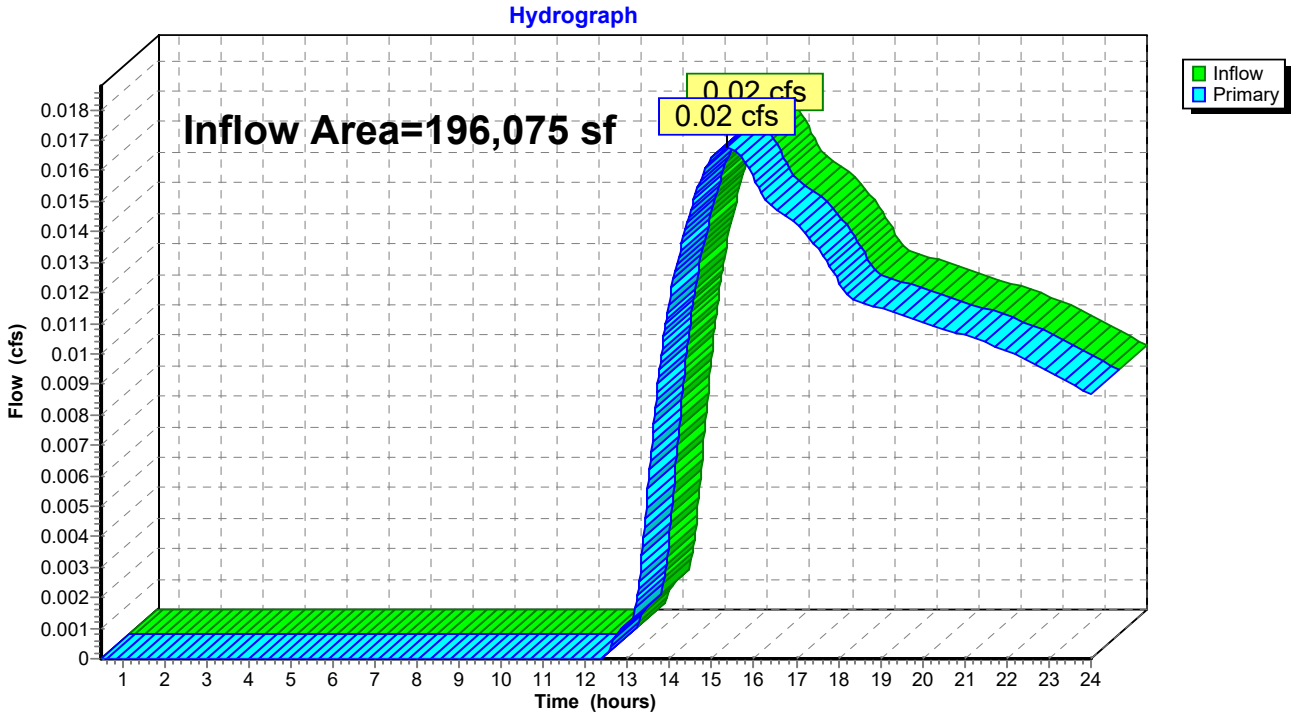


Summary for Link 14L: Northwest Wetland

Inflow Area = 196,075 sf, 15.55% Impervious, Inflow Depth > 0.03" for 2-Year event
Inflow = 0.02 cfs @ 15.36 hrs, Volume= 464 cf
Primary = 0.02 cfs @ 15.36 hrs, Volume= 464 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 14L: Northwest Wetland



Time span=0.50-24.00 hrs, dt=0.02 hrs, 1176 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=20,328 sf 0.00% Impervious Runoff Depth>0.31"
Flow Length=319' Tc=10.0 min CN=44 Runoff=0.05 cfs 526 cf

Subcatchment 2: Subcat 2 Runoff Area=25,458 sf 30.88% Impervious Runoff Depth>1.39"
Flow Length=288' Tc=8.4 min CN=64 Runoff=0.81 cfs 2,941 cf

Subcatchment 3: Subcat 3 Runoff Area=61,448 sf 8.33% Impervious Runoff Depth>0.48"
Flow Length=311' Tc=16.0 min CN=48 Runoff=0.30 cfs 2,442 cf

Subcatchment 4: Subcat 4 Runoff Area=48,453 sf 1.98% Impervious Runoff Depth>0.20"
Flow Length=187' Tc=9.0 min CN=41 Runoff=0.05 cfs 822 cf

Subcatchment 5: Subcat 5 Runoff Area=67,517 sf 23.01% Impervious Runoff Depth>0.94"
Flow Length=455' Tc=14.9 min CN=57 Runoff=1.05 cfs 5,312 cf

Subcatchment 6: Subcat 6 Runoff Area=95,238 sf 5.26% Impervious Runoff Depth>0.31"
Flow Length=744' Tc=18.7 min CN=44 Runoff=0.21 cfs 2,451 cf

Subcatchment 7: Subcat 7 Runoff Area=12,907 sf 18.31% Impervious Runoff Depth>1.01"
Tc=6.0 min CN=58 Runoff=0.29 cfs 1,082 cf

Subcatchment 8: Subcat 8 Runoff Area=6,248 sf 5.00% Impervious Runoff Depth>0.39"
Tc=6.0 min CN=46 Runoff=0.02 cfs 204 cf

Subcatchment 9: Subcat 9 Runoff Area=14,166 sf 51.29% Impervious Runoff Depth>2.12"
Flow Length=137' Tc=8.6 min CN=74 Runoff=0.73 cfs 2,507 cf

Subcatchment 10: Subcat 10 Runoff Area=10,935 sf 74.50% Impervious Runoff Depth>3.09"
Tc=6.0 min CN=85 Runoff=0.90 cfs 2,815 cf

Reach 15R: CB 6 Avg. Flow Depth=0.31' Max Vel=3.52 fps Inflow=0.73 cfs 2,507 cf
12.0" Round Pipe n=0.013 L=10.4' S=0.0096 '/' Capacity=3.49 cfs Outflow=0.73 cfs 2,507 cf

Reach 16R: CB 5 Avg. Flow Depth=0.51' Max Vel=2.57 fps Inflow=1.05 cfs 5,312 cf
12.0" Round Pipe n=0.013 L=32.0' S=0.0031 '/' Capacity=1.99 cfs Outflow=1.05 cfs 5,311 cf

Reach 17R: DMH 7 Avg. Flow Depth=0.37' Max Vel=5.23 fps Inflow=1.59 cfs 7,818 cf
15.0" Round Pipe n=0.013 L=24.0' S=0.0167 '/' Capacity=8.34 cfs Outflow=1.59 cfs 7,817 cf

Reach 18R: CB 2 Avg. Flow Depth=0.46' Max Vel=2.57 fps Inflow=0.90 cfs 2,815 cf
12.0" Round Pipe n=0.013 L=17.3' S=0.0035 '/' Capacity=2.10 cfs Outflow=0.90 cfs 2,814 cf

Reach 19R: CB 1 Avg. Flow Depth=0.30' Max Vel=4.06 fps Inflow=0.81 cfs 2,941 cf
12.0" Round Pipe n=0.013 L=4.5' S=0.0133 '/' Capacity=4.11 cfs Outflow=0.81 cfs 2,941 cf

Reach 20R: DMH 3 Avg. Flow Depth=0.28' Max Vel=3.89 fps Inflow=0.81 cfs 2,941 cf
15.0" Round Pipe n=0.013 L=32.0' S=0.0125 '/' Capacity=7.22 cfs Outflow=0.81 cfs 2,940 cf

Pond 11P: BASIN 1 Peak Elev=65.80' Storage=3,748 cf Inflow=1.69 cfs 8,196 cf
Discarded=0.14 cfs 6,240 cf Primary=0.00 cfs 0 cf Outflow=0.14 cfs 6,240 cf

Pond 13P: BASIN 2 Peak Elev=66.22' Storage=3,160 cf Inflow=1.80 cfs 8,899 cf
Discarded=0.18 cfs 7,306 cf Primary=0.14 cfs 1,210 cf Outflow=0.32 cfs 8,516 cf

Link 12L: Southwest Wetland Inflow=0.10 cfs 1,348 cf
Primary=0.10 cfs 1,348 cf

Link 14L: Northwest Wetland Inflow=0.28 cfs 3,865 cf
Primary=0.28 cfs 3,865 cf

Total Runoff Area = 362,697 sf Runoff Volume = 21,101 cf Average Runoff Depth = 0.70"
85.50% Pervious = 310,124 sf 14.50% Impervious = 52,574 sf

Summary for Subcatchment 1: Subcat 1

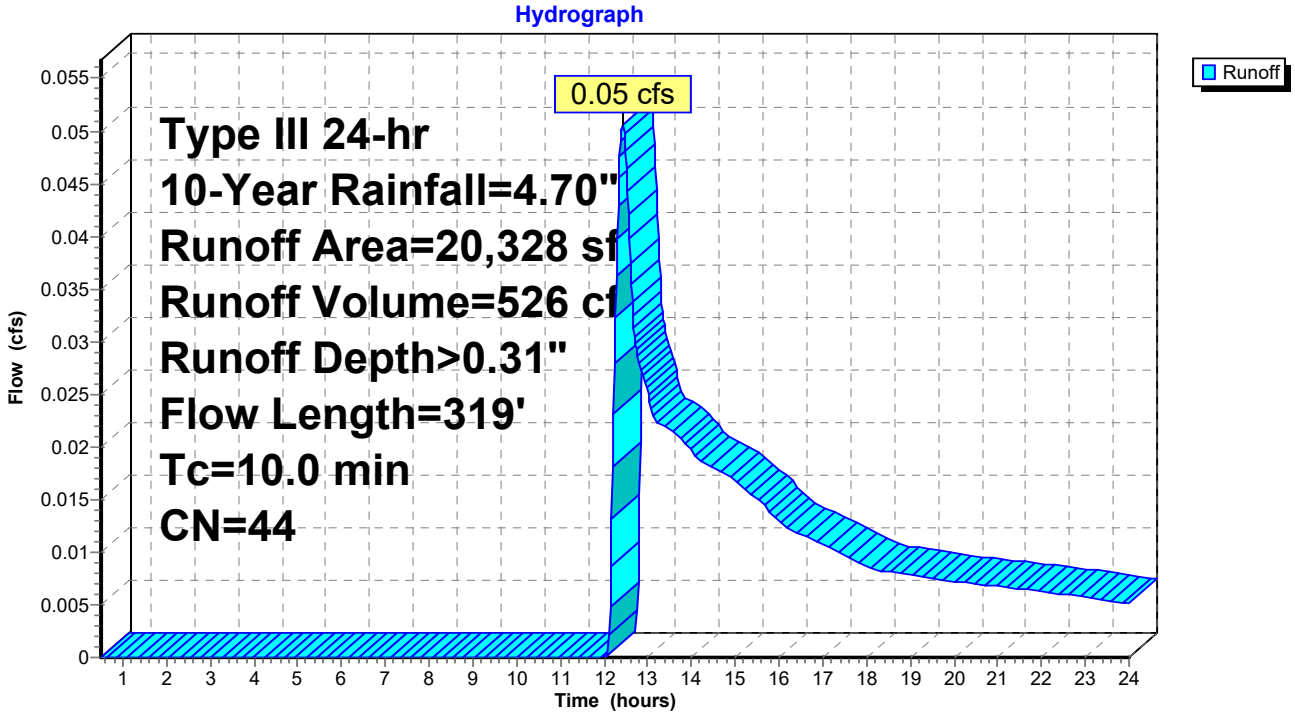
Runoff = 0.05 cfs @ 12.43 hrs, Volume= 526 cf, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
12,105	49	50-75% Grass cover, Fair, HSG A
8,223	36	Woods, Fair, HSG A
20,328	44	Weighted Average
20,328		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.7	148	0.0510	3.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	121	0.0190	2.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	319	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

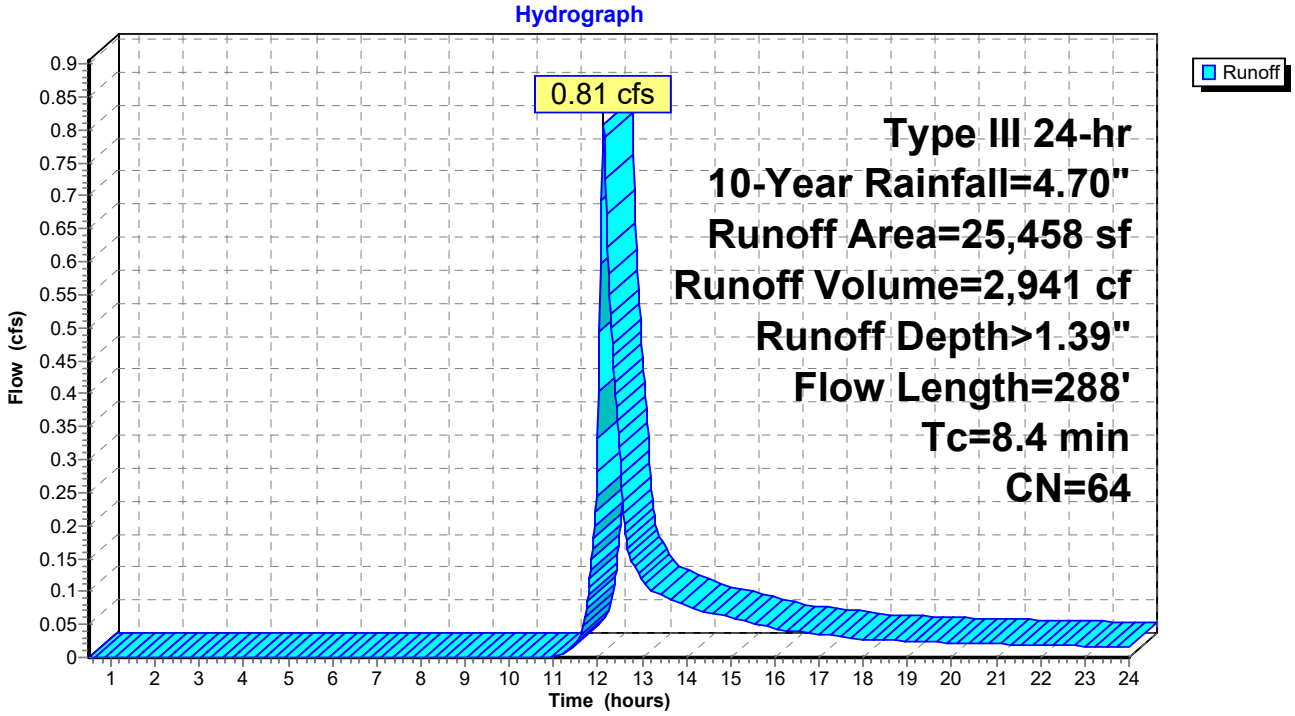
Runoff = 0.81 cfs @ 12.13 hrs, Volume= 2,941 cf, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
17,076	49	50-75% Grass cover, Fair, HSG A
7,862	98	Paved roads w/curbs & sewers, HSG A
520	36	Woods, Fair, HSG A
25,458	64	Weighted Average
17,596		69.12% Pervious Area
7,862		30.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0500	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.4	100	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	138	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.4	288	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

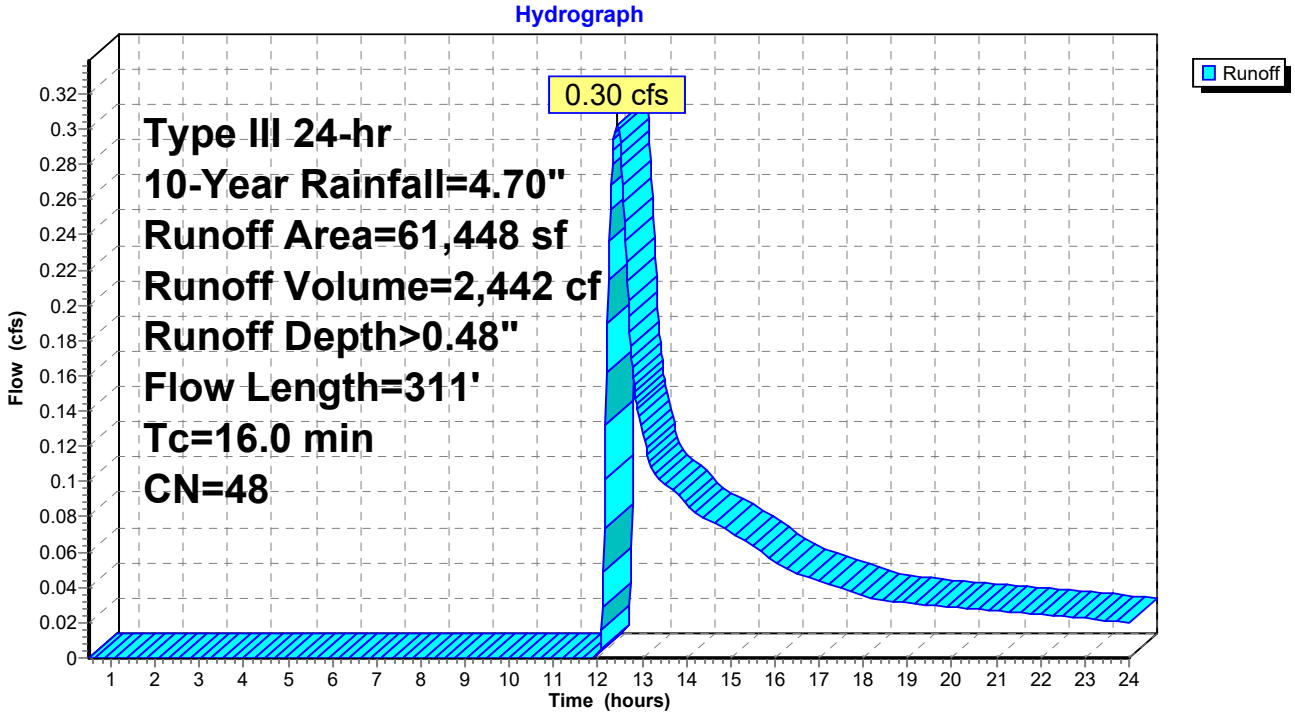
Runoff = 0.30 cfs @ 12.43 hrs, Volume= 2,442 cf, Depth> 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
34,104	49	50-75% Grass cover, Fair, HSG A
3,296	98	Paved roads w/curbs & sewers, HSG A
1,826	98	Roofs, HSG A
22,223	36	Woods, Fair, HSG A
61,448	48	Weighted Average
56,327		91.67% Pervious Area
5,122		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
1.1	261	0.0580	3.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	311	Total			

Subcatchment 3: Subcat 3



Summary for Subcatchment 4: Subcat 4

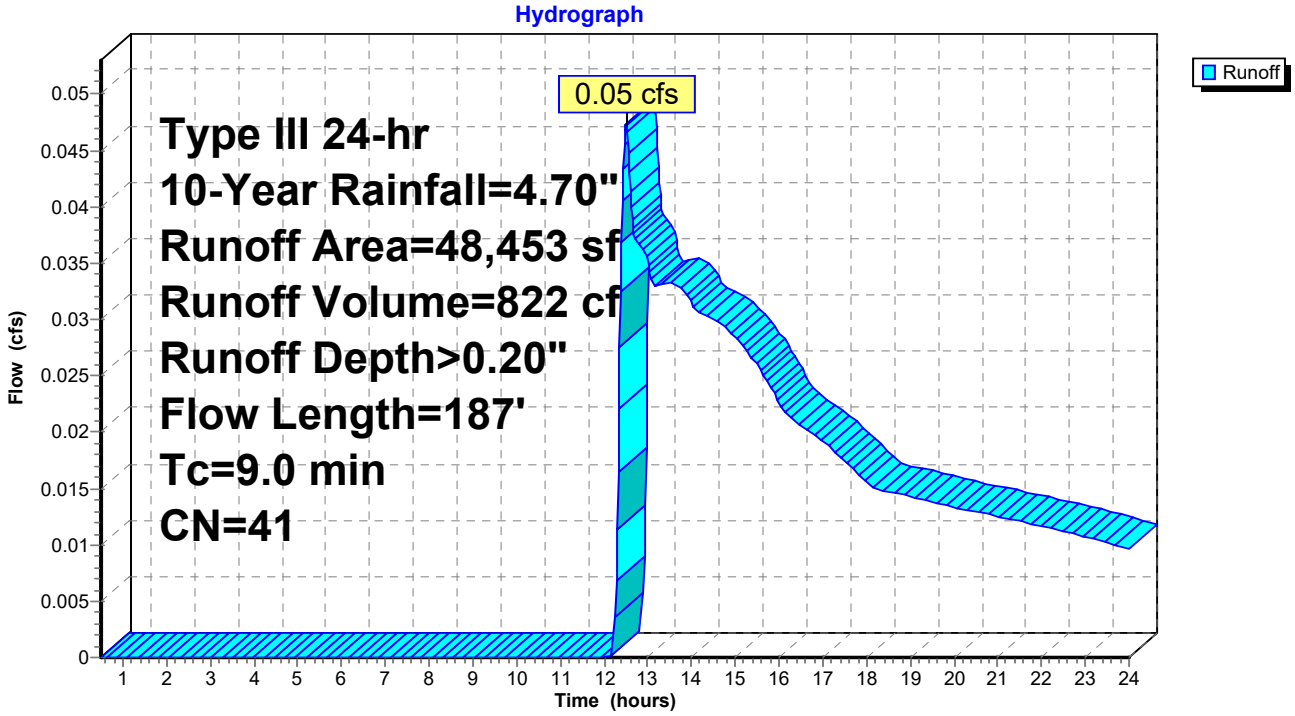
Runoff = 0.05 cfs @ 12.50 hrs, Volume= 822 cf, Depth> 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
12,754	49	50-75% Grass cover, Fair, HSG A
959	98	Roofs, HSG A
34,740	36	Woods, Fair, HSG A
48,453	41	Weighted Average
47,493		98.02% Pervious Area
959		1.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.0	26	0.3100	8.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	111	0.0410	3.26		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	187	Total			

Subcatchment 4: Subcat 4



Summary for Subcatchment 5: Subcat 5

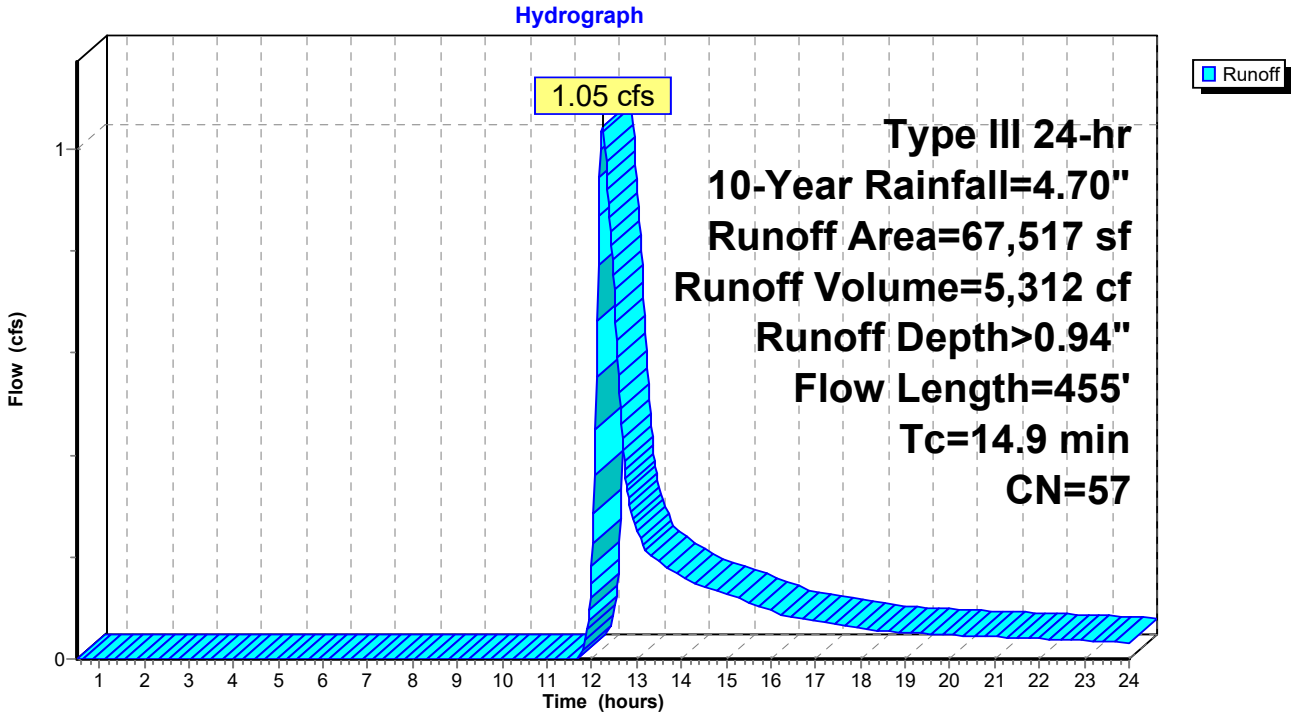
Runoff = 1.05 cfs @ 12.24 hrs, Volume= 5,312 cf, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
34,347	49	50-75% Grass cover, Fair, HSG A
10,540	98	Paved roads w/curbs & sewers, HSG A
4,994	98	Roofs, HSG A
17,636	36	Woods, Fair, HSG A
67,517	57	Weighted Average
51,983		76.99% Pervious Area
15,534		23.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0320	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
2.2	348	0.0270	2.65		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	57	0.0122	2.24		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
14.9	455	Total			

Subcatchment 5: Subcat 5



Summary for Subcatchment 6: Subcat 6

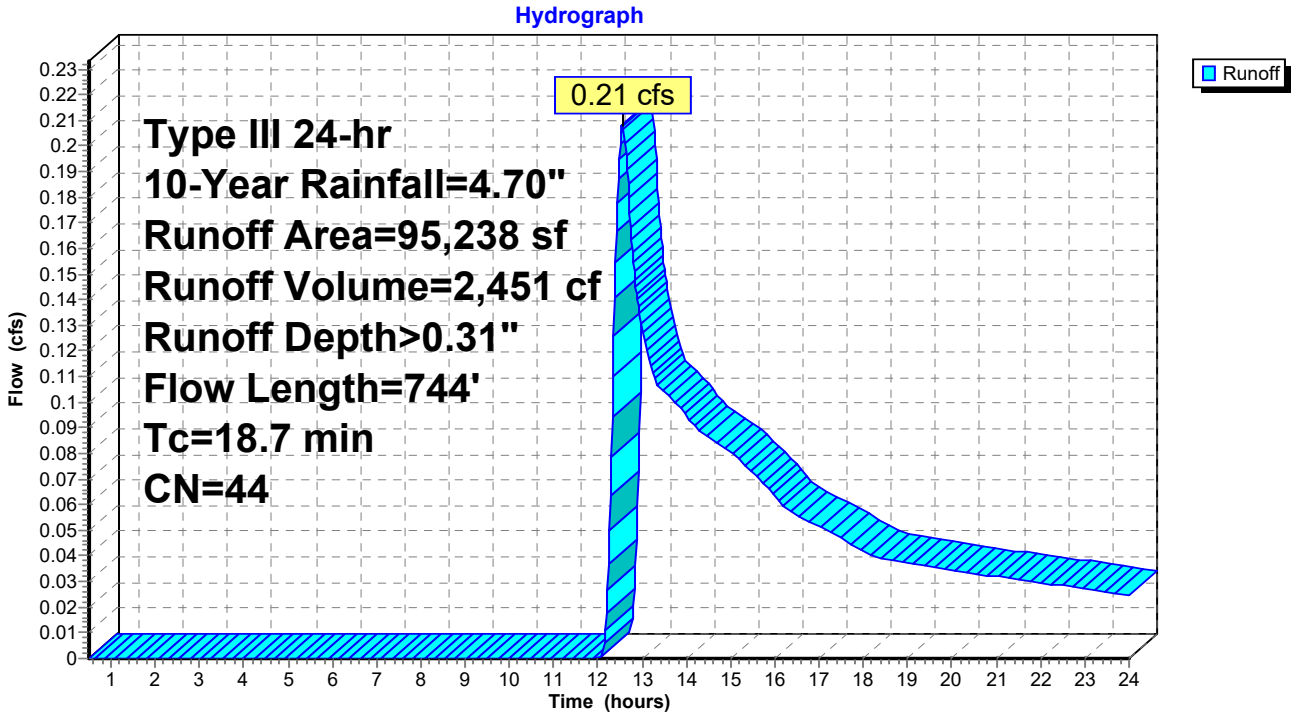
Runoff = 0.21 cfs @ 12.56 hrs, Volume= 2,451 cf, Depth> 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
36,291	49	50-75% Grass cover, Fair, HSG A
2,198	98	Paved roads w/curbs & sewers, HSG A
2,810	98	Roofs, HSG A
53,938	36	Woods, Fair, HSG A
95,238	44	Weighted Average
90,229		94.74% Pervious Area
5,009		5.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
3.0	382	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	245	0.1600	6.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	67	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.7	744	Total			

Subcatchment 6: Subcat 6



Summary for Subcatchment 7: Subcat 7

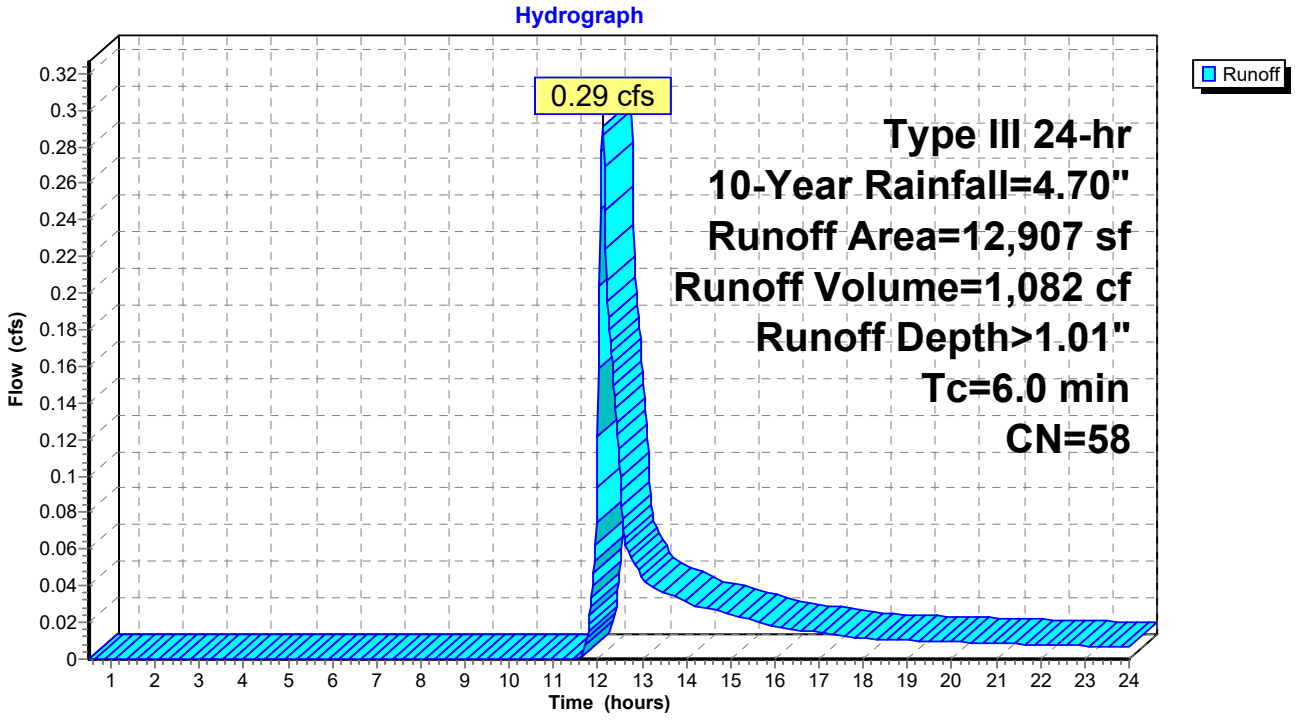
Runoff = 0.29 cfs @ 12.10 hrs, Volume= 1,082 cf, Depth> 1.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
10,544	49	50-75% Grass cover, Fair, HSG A
1,337	98	Paved roads w/curbs & sewers, HSG A
1,026	98	Roofs, HSG A
12,907	58	Weighted Average
10,544		81.69% Pervious Area
2,363		18.31% Impervious Area

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

Subcatchment 7: Subcat 7



Summary for Subcatchment 8: Subcat 8

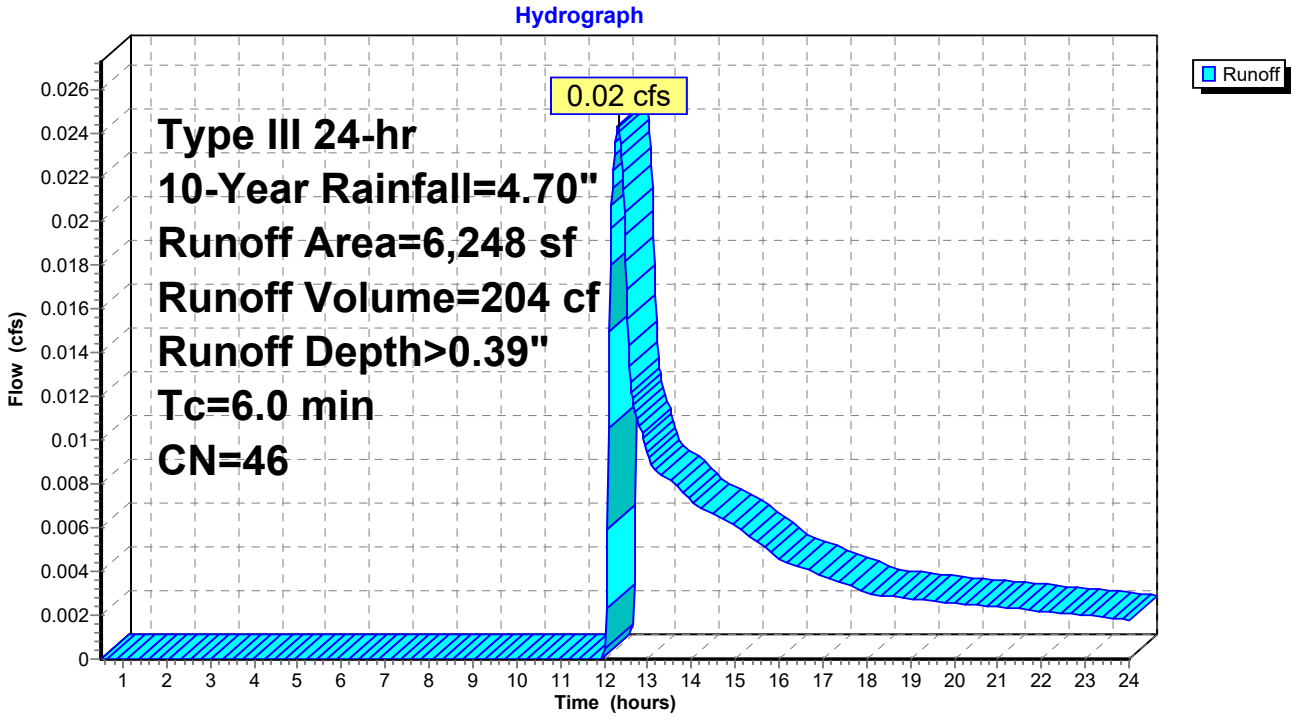
Runoff = 0.02 cfs @ 12.32 hrs, Volume= 204 cf, Depth> 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
3,110	49	50-75% Grass cover, Fair, HSG A
313	98	Roofs, HSG A
2,825	36	Woods, Fair, HSG A
6,248	46	Weighted Average
5,935		95.00% Pervious Area
313		5.00% Impervious Area

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

Subcatchment 8: Subcat 8



Summary for Subcatchment 9: Subcat 9

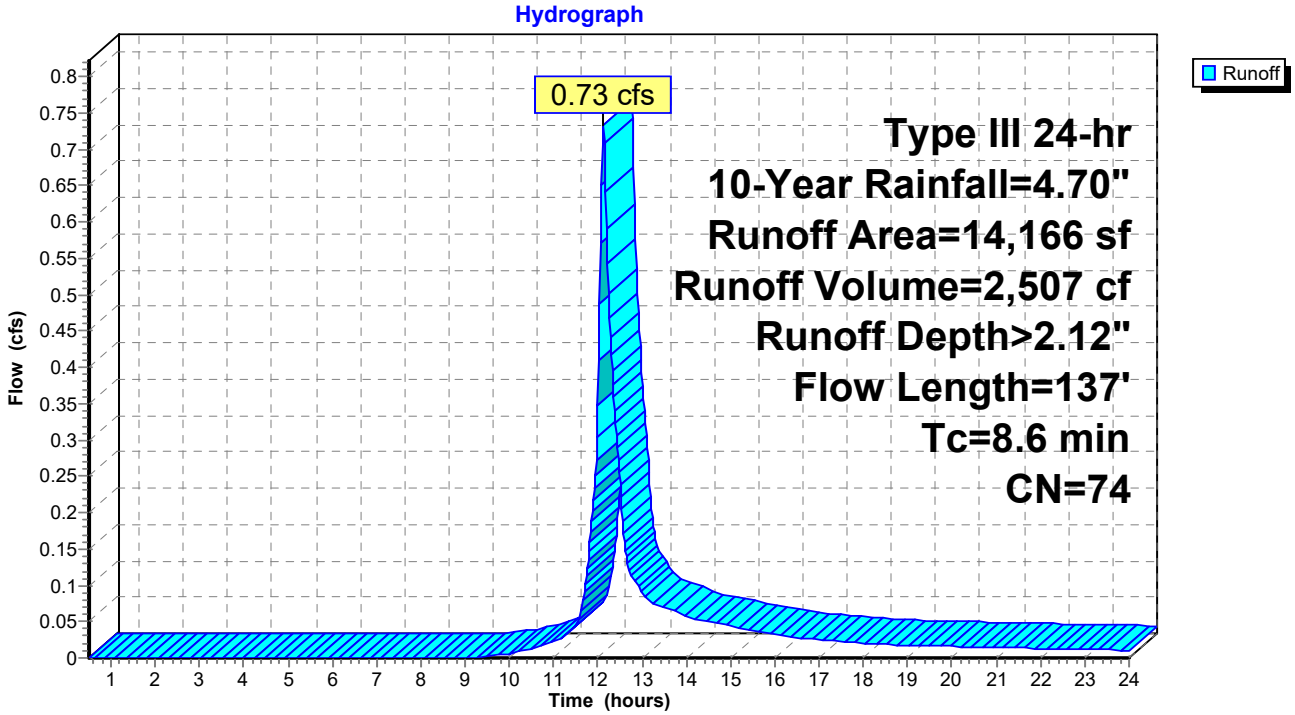
Runoff = 0.73 cfs @ 12.13 hrs, Volume= 2,507 cf, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
6,698	49	50-75% Grass cover, Fair, HSG A
6,734	98	Paved roads w/curbs & sewers, HSG A
532	98	Roofs, HSG A
202	36	Woods, Fair, HSG A
14,166	74	Weighted Average
6,900		48.71% Pervious Area
7,266		51.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0360	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.8	87	0.0080	1.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.6	137	Total			

Subcatchment 9: Subcat 9



Summary for Subcatchment 10: Subcat 10

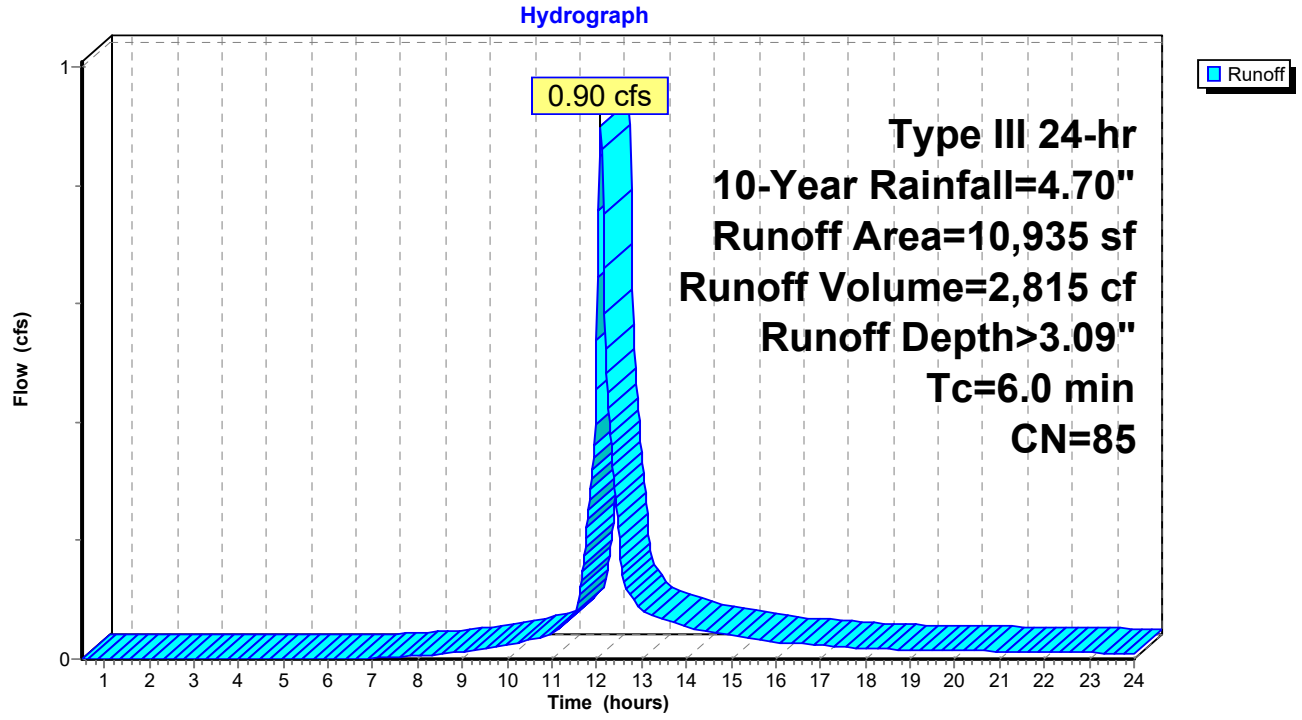
Runoff = 0.90 cfs @ 12.09 hrs, Volume= 2,815 cf, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
2,766	49	50-75% Grass cover, Fair, HSG A
8,146	98	Paved roads w/curbs & sewers, HSG A
23	36	Woods, Fair, HSG A
10,935	85	Weighted Average
2,789		25.50% Pervious Area
8,146		74.50% Impervious Area

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

Subcatchment 10: Subcat 10



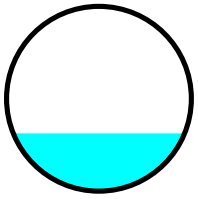
Summary for Reach 15R: CB 6

Inflow Area = 14,166 sf, 51.29% Impervious, Inflow Depth > 2.12" for 10-Year event
Inflow = 0.73 cfs @ 12.13 hrs, Volume= 2,507 cf
Outflow = 0.73 cfs @ 12.13 hrs, Volume= 2,507 cf, Atten= 0%, Lag= 0.0 min

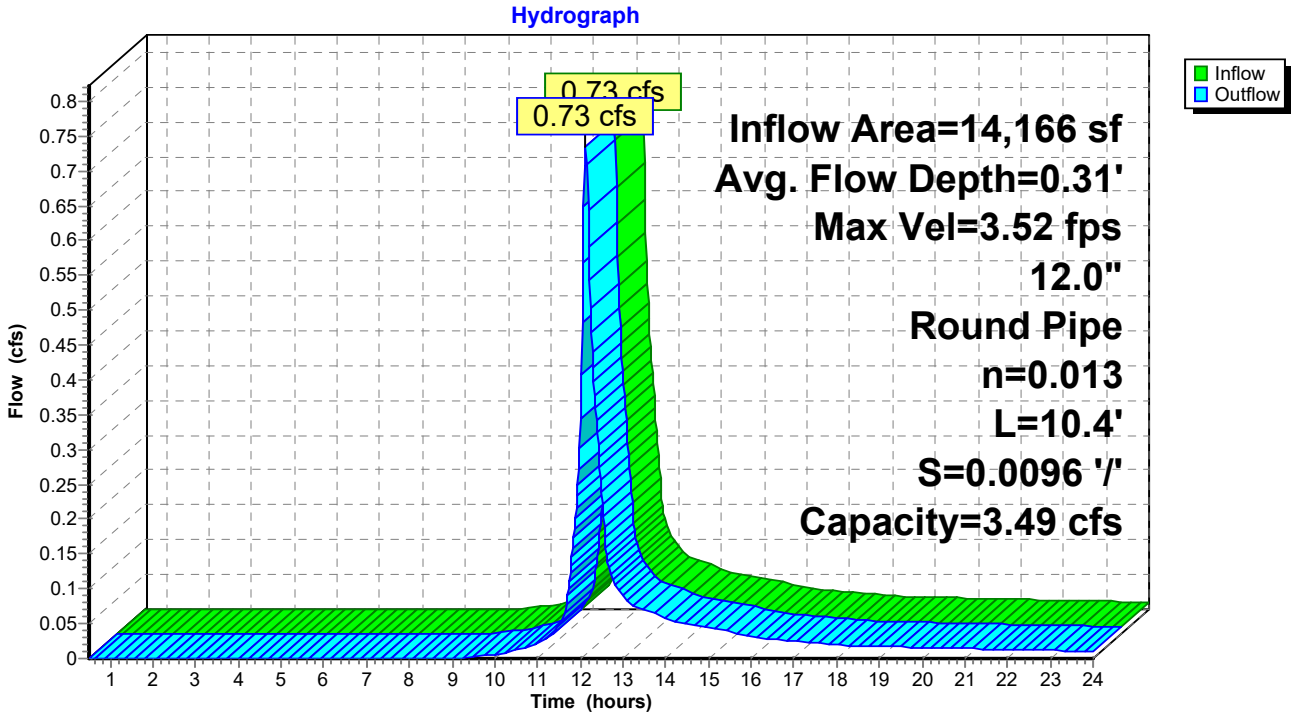
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 3.52 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.34 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.49 cfs

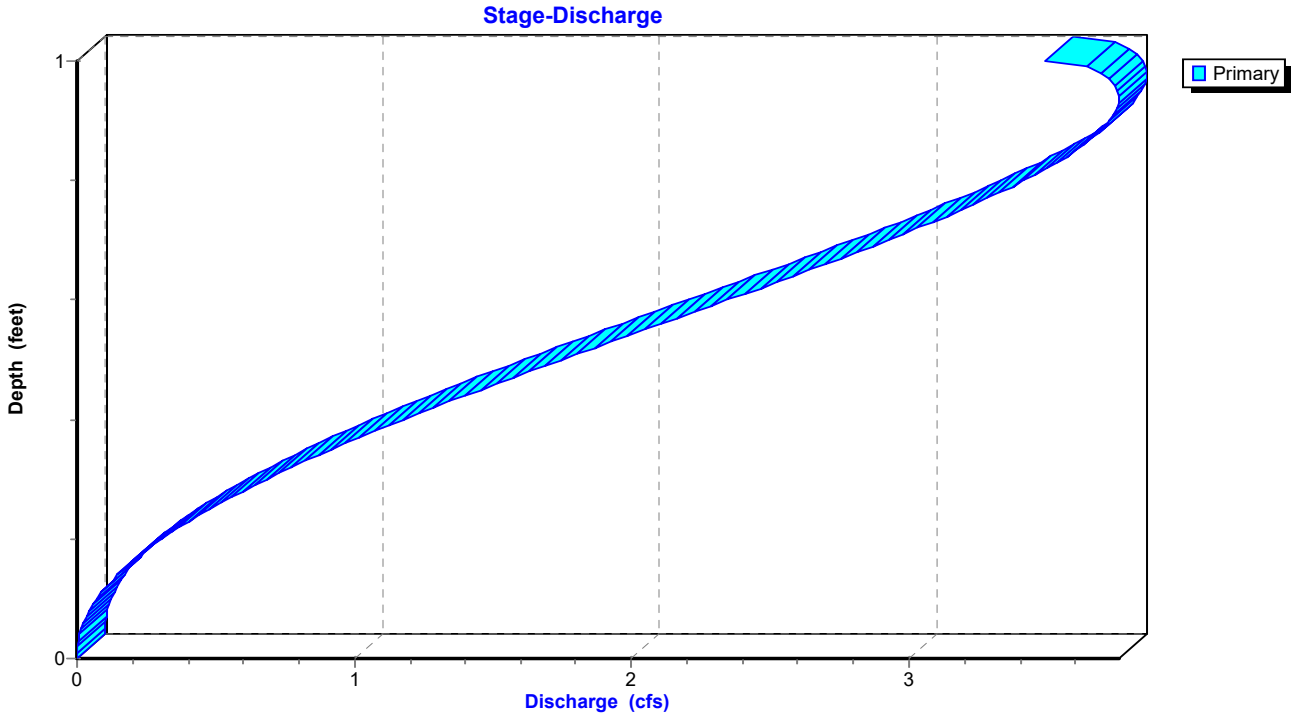
12.0" Round Pipe
n= 0.013
Length= 10.4' Slope= 0.0096 '/'
Inlet Invert= 67.50', Outlet Invert= 67.40'



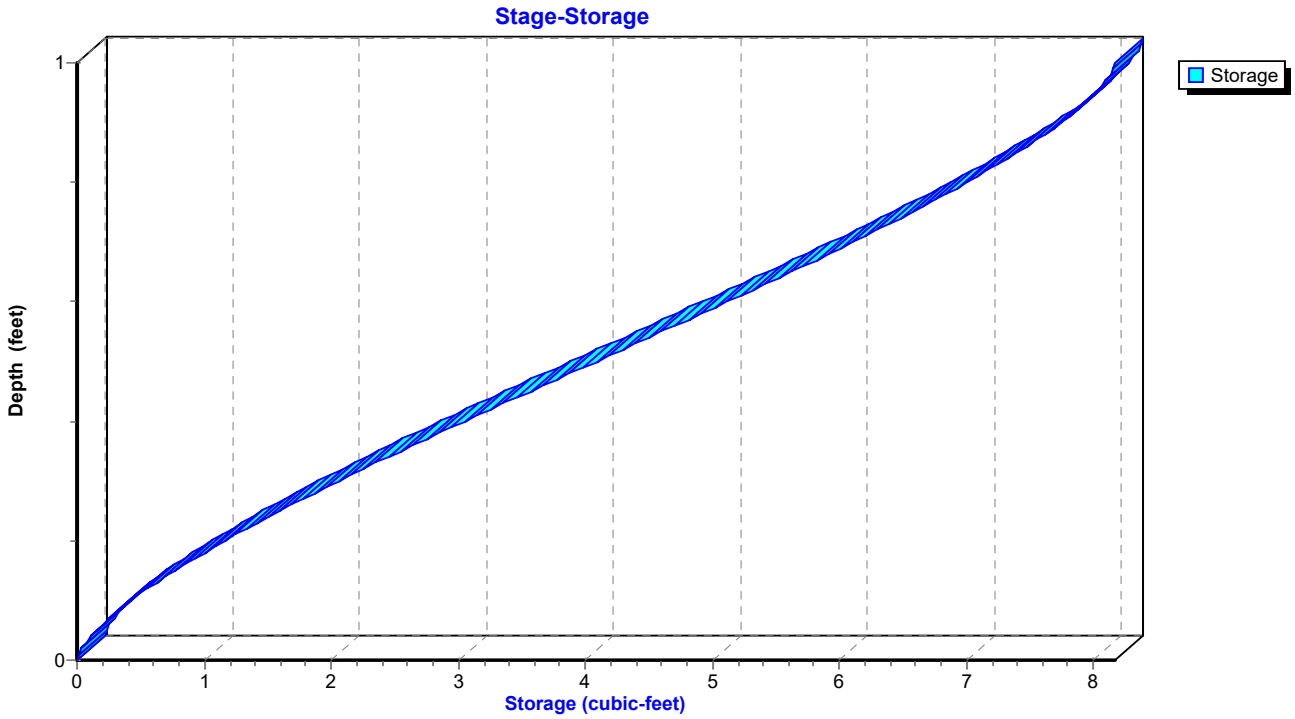
Reach 15R: CB 6



Reach 15R: CB 6



Reach 15R: CB 6



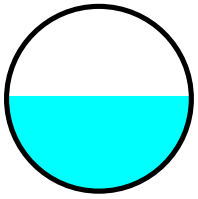
Summary for Reach 16R: CB 5

Inflow Area = 67,517 sf, 23.01% Impervious, Inflow Depth > 0.94" for 10-Year event
Inflow = 1.05 cfs @ 12.24 hrs, Volume= 5,312 cf
Outflow = 1.05 cfs @ 12.25 hrs, Volume= 5,311 cf, Atten= 0%, Lag= 0.2 min

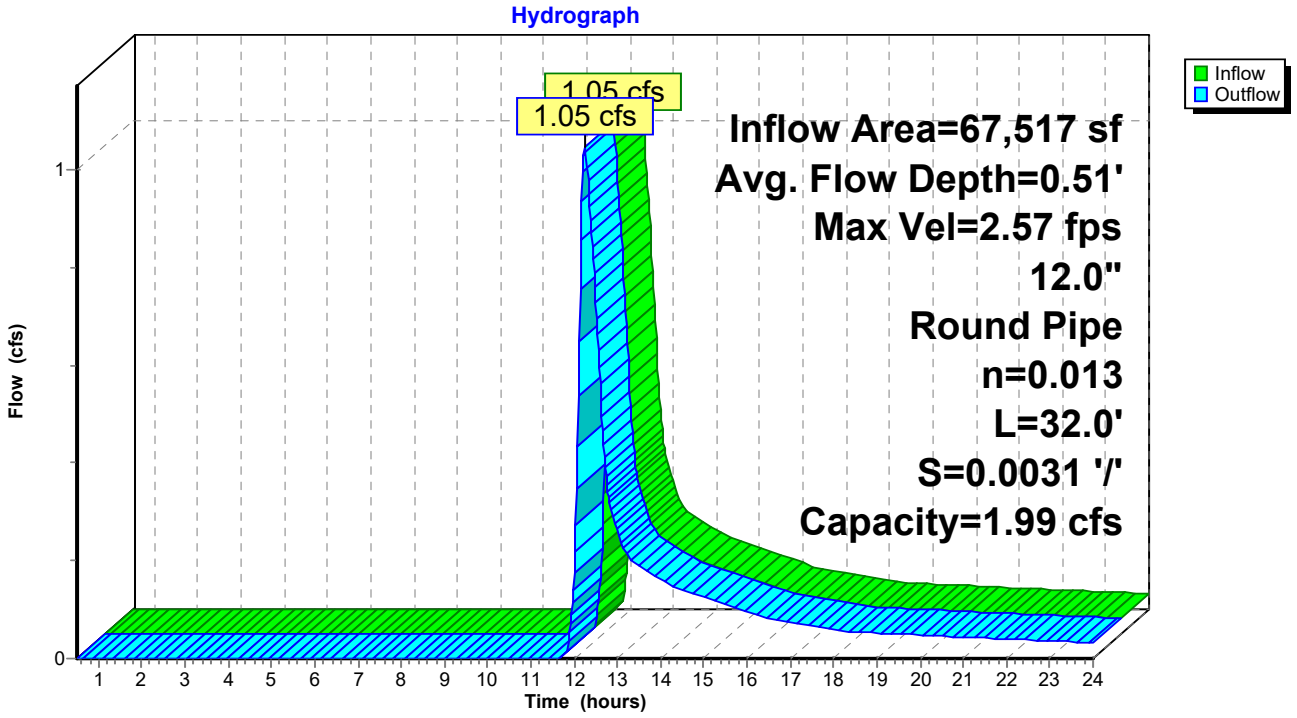
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.57 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.26 fps, Avg. Travel Time= 0.4 min

Peak Storage= 13 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.99 cfs

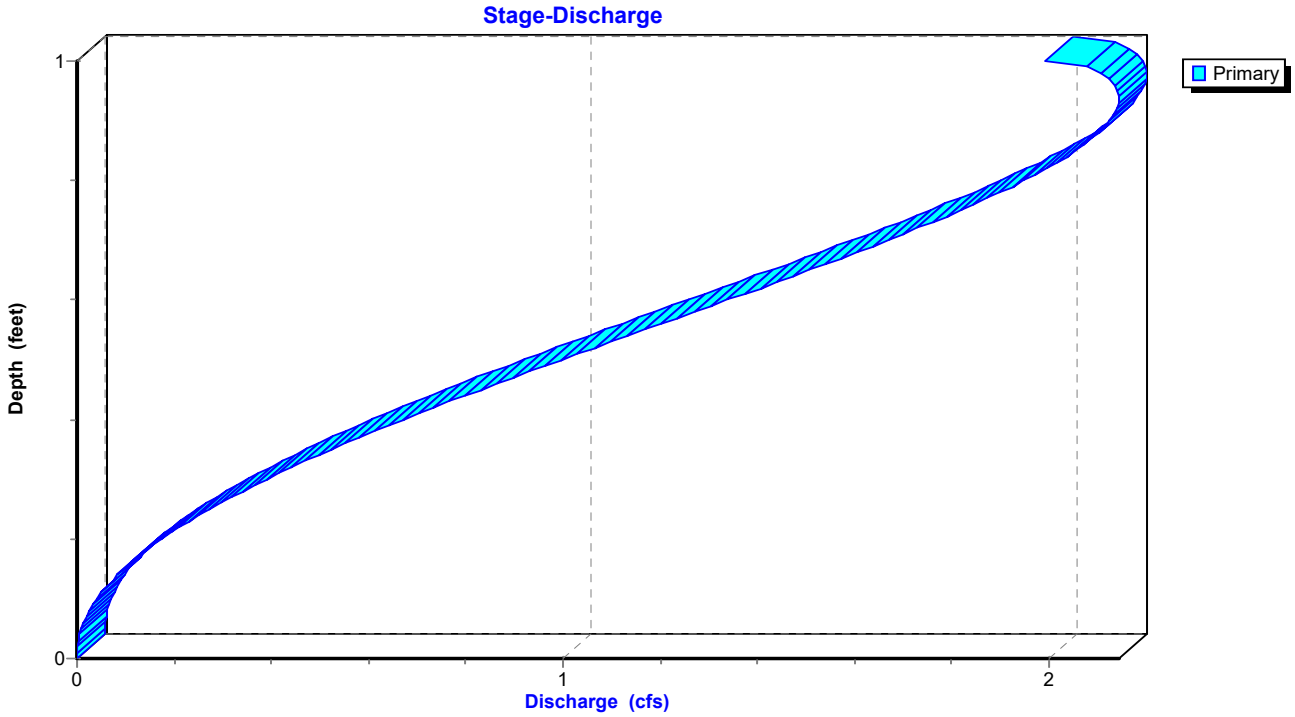
12.0" Round Pipe
n= 0.013
Length= 32.0' Slope= 0.0031 '/'
Inlet Invert= 67.50', Outlet Invert= 67.40'



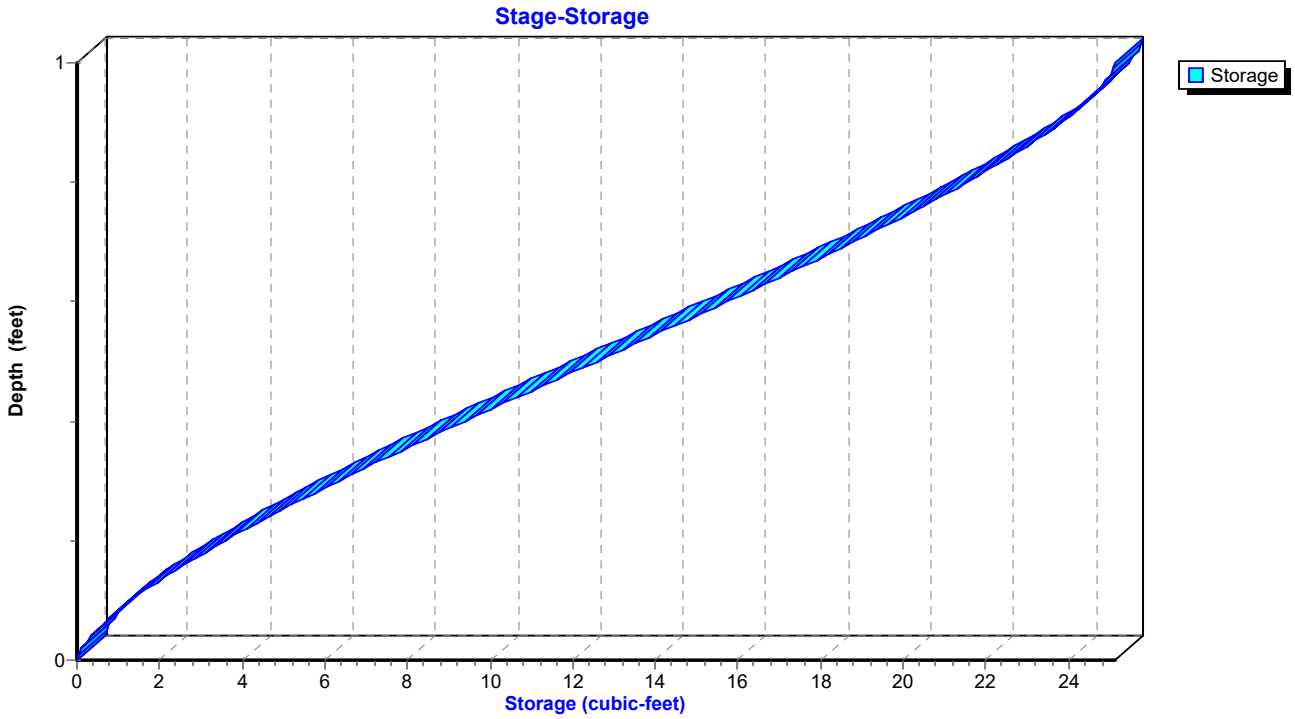
Reach 16R: CB 5



Reach 16R: CB 5



Reach 16R: CB 5



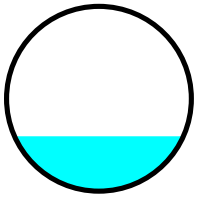
Summary for Reach 17R: DMH 7

Inflow Area = 81,683 sf, 27.91% Impervious, Inflow Depth > 1.15" for 10-Year event
Inflow = 1.59 cfs @ 12.20 hrs, Volume= 7,818 cf
Outflow = 1.59 cfs @ 12.20 hrs, Volume= 7,817 cf, Atten= 0%, Lag= 0.1 min

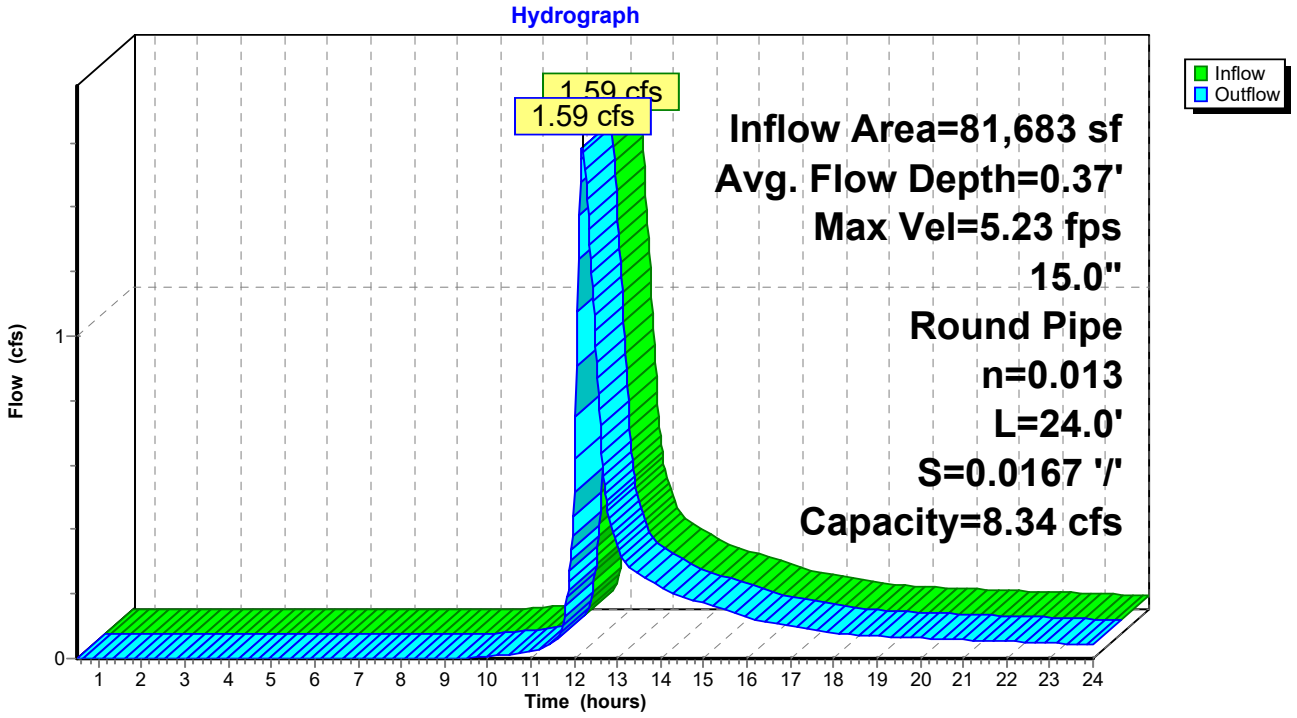
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 5.23 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.24 fps, Avg. Travel Time= 0.2 min

Peak Storage= 7 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 8.34 cfs

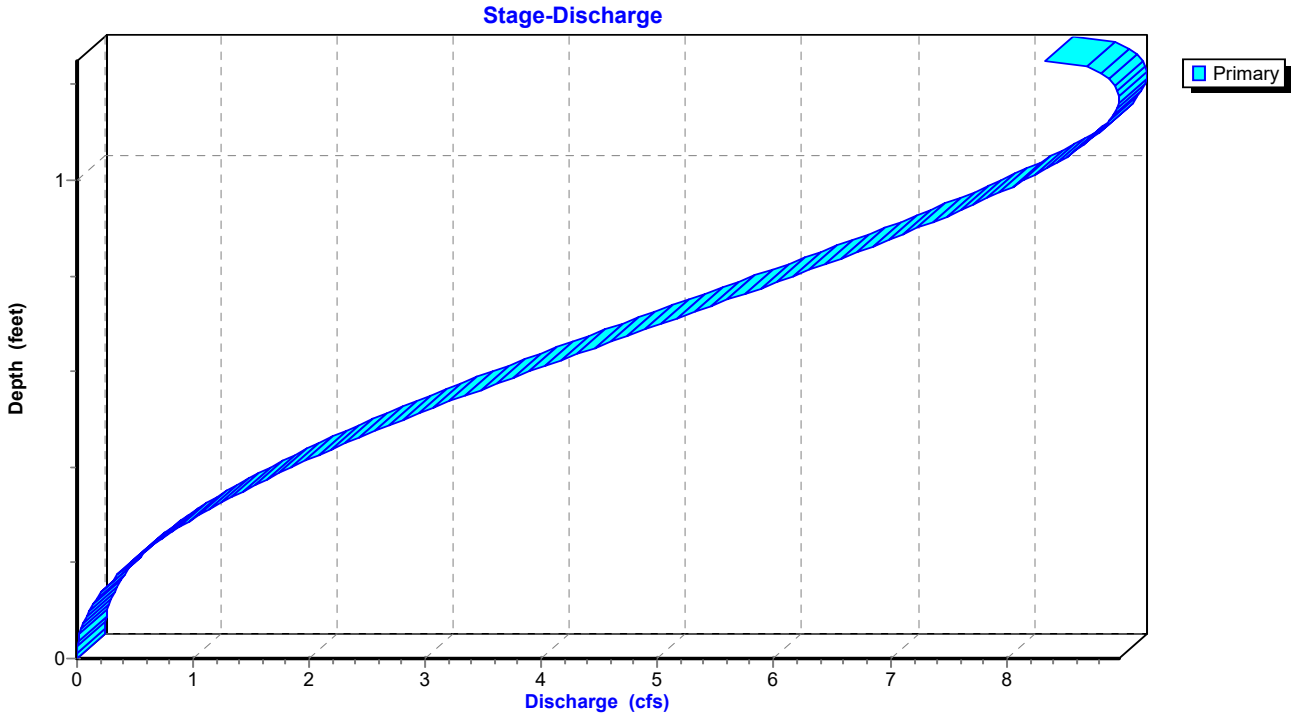
15.0" Round Pipe
n= 0.013
Length= 24.0' Slope= 0.0167 '/'
Inlet Invert= 67.40', Outlet Invert= 67.00'



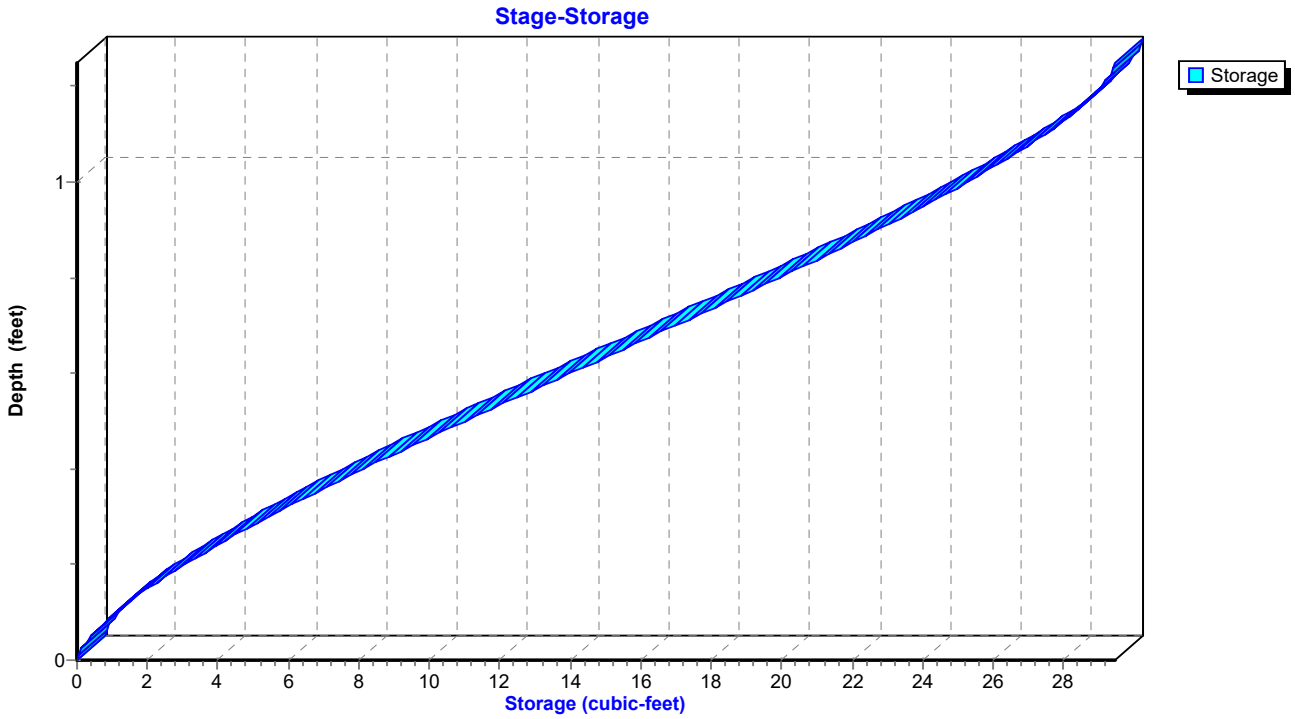
Reach 17R: DMH 7



Reach 17R: DMH 7



Reach 17R: DMH 7



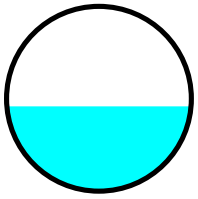
Summary for Reach 18R: CB 2

Inflow Area = 10,935 sf, 74.50% Impervious, Inflow Depth > 3.09" for 10-Year event
Inflow = 0.90 cfs @ 12.09 hrs, Volume= 2,815 cf
Outflow = 0.90 cfs @ 12.09 hrs, Volume= 2,814 cf, Atten= 0%, Lag= 0.1 min

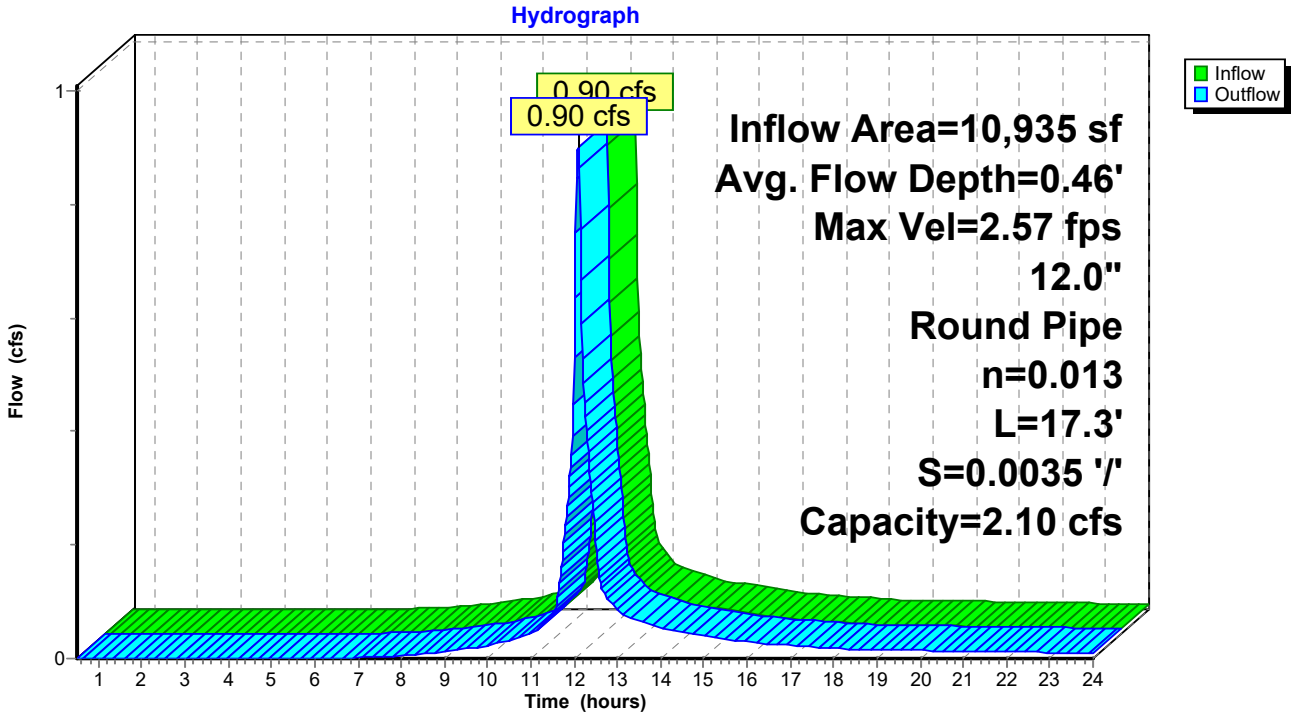
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.57 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 0.3 min

Peak Storage= 6 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.10 cfs

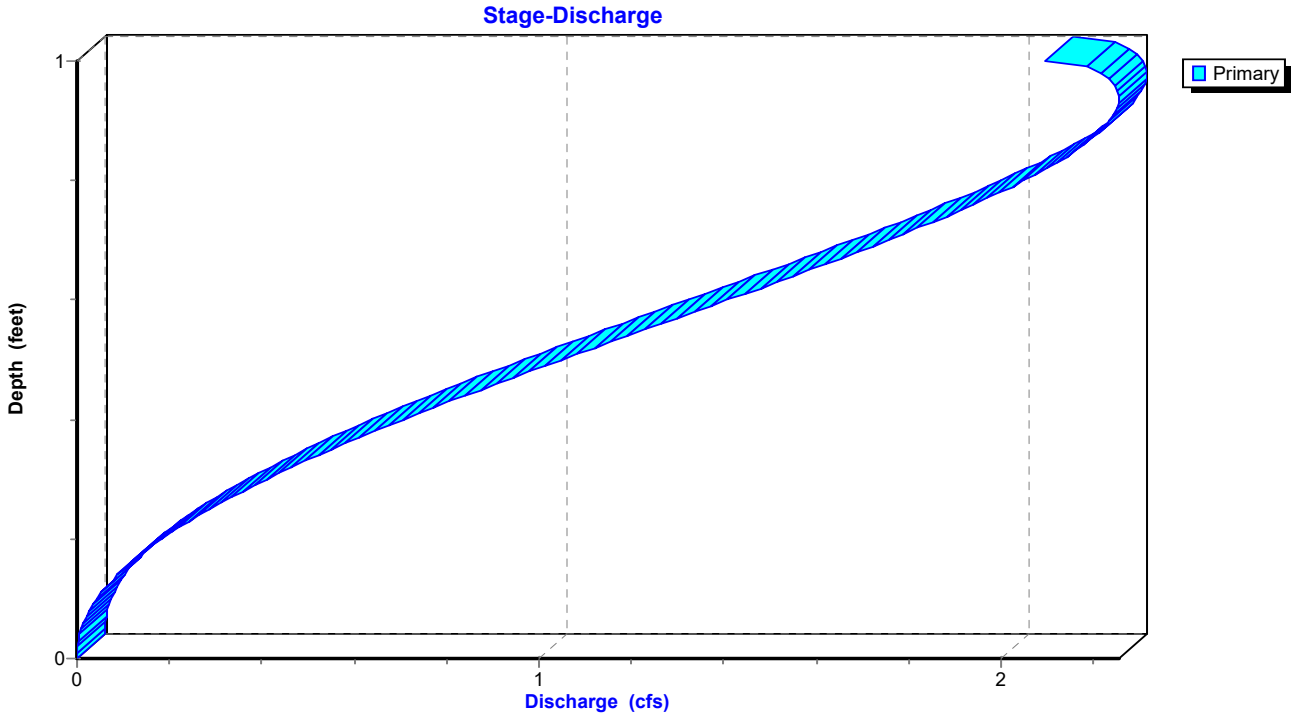
12.0" Round Pipe
n= 0.013
Length= 17.3' Slope= 0.0035 '/'
Inlet Invert= 66.46', Outlet Invert= 66.40'



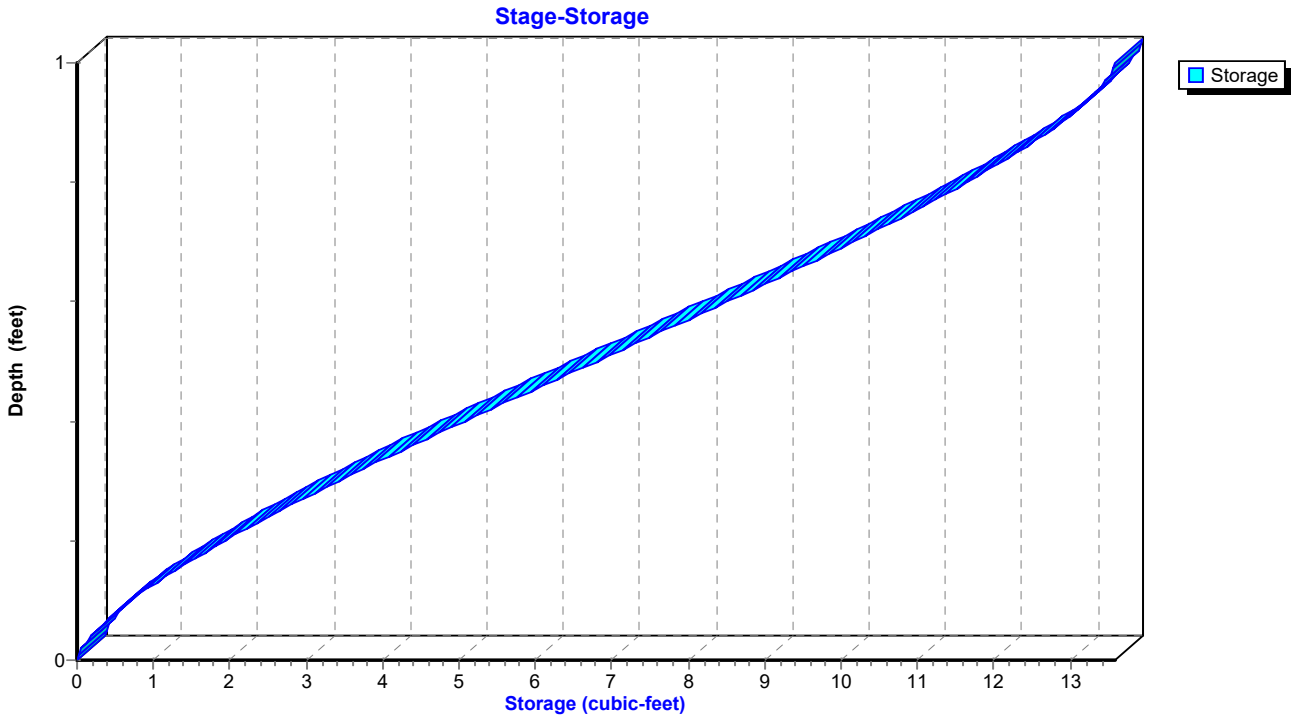
Reach 18R: CB 2



Reach 18R: CB 2



Reach 18R: CB 2



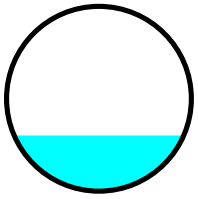
Summary for Reach 19R: CB 1

Inflow Area = 25,458 sf, 30.88% Impervious, Inflow Depth > 1.39" for 10-Year event
Inflow = 0.81 cfs @ 12.13 hrs, Volume= 2,941 cf
Outflow = 0.81 cfs @ 12.13 hrs, Volume= 2,941 cf, Atten= 0%, Lag= 0.0 min

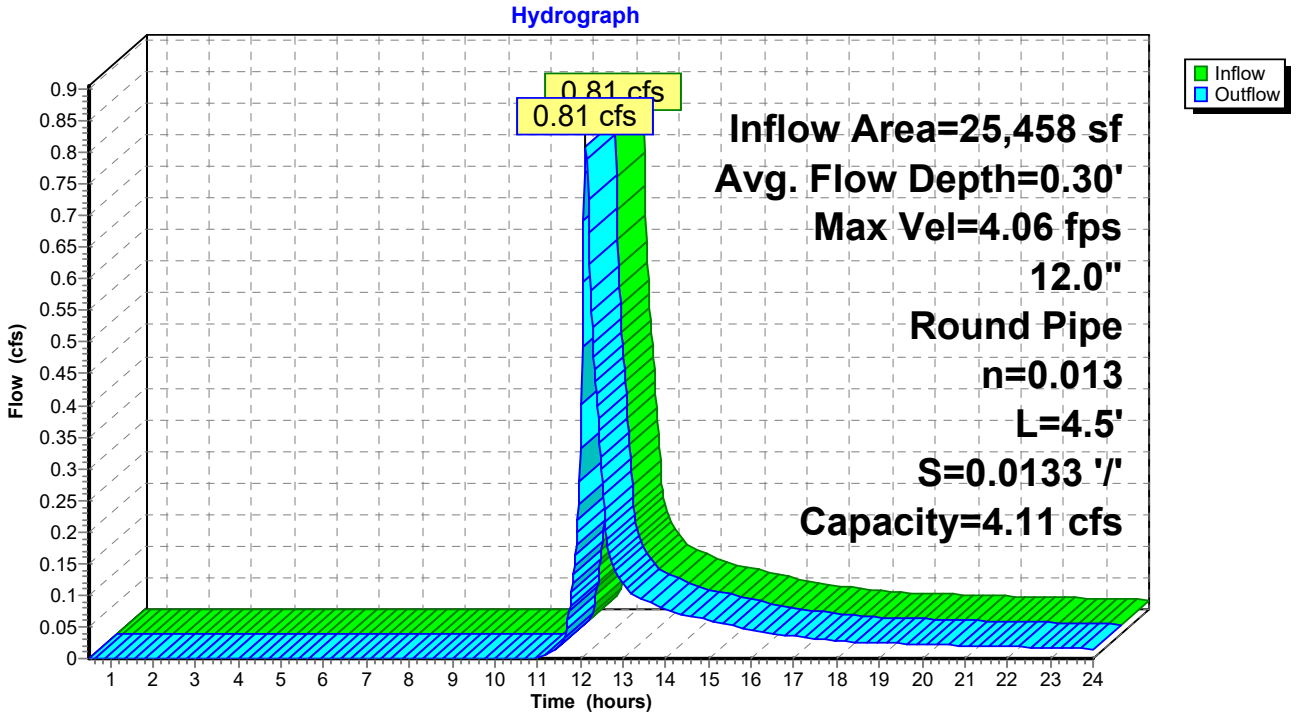
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.06 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.68 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.11 cfs

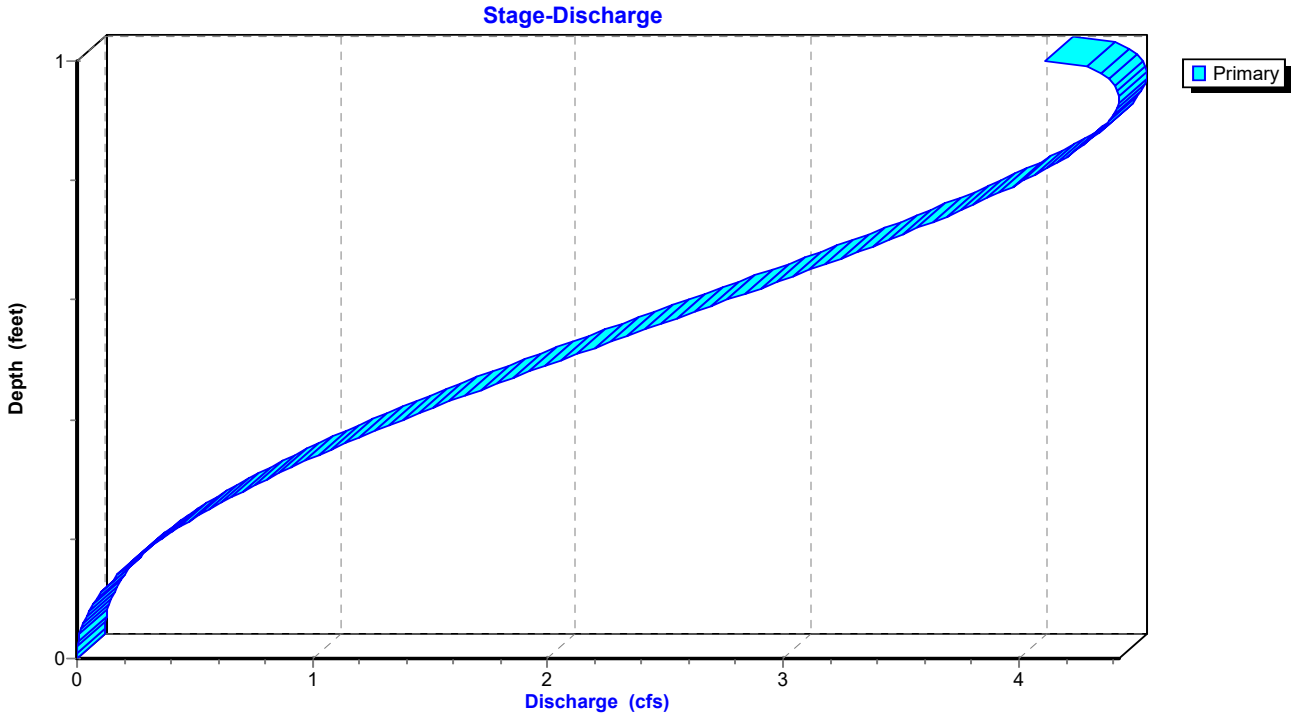
12.0" Round Pipe
n= 0.013
Length= 4.5' Slope= 0.0133 '/'
Inlet Invert= 66.46', Outlet Invert= 66.40'



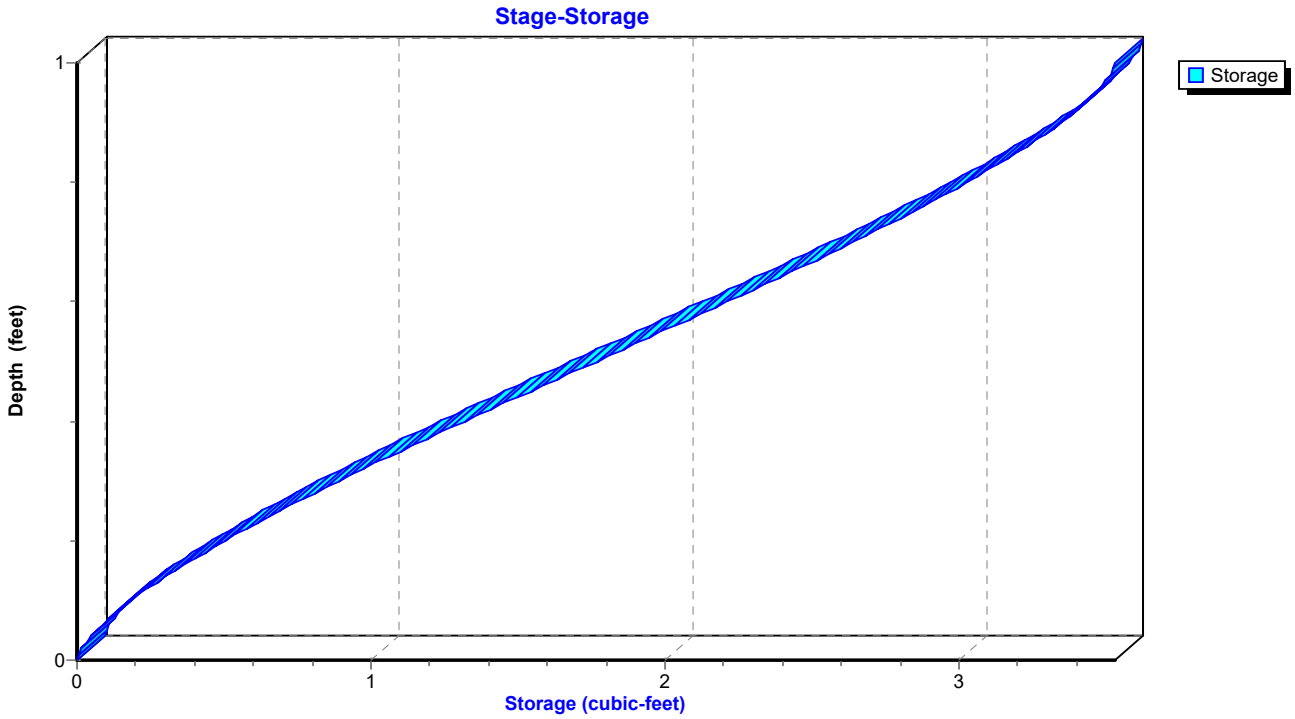
Reach 19R: CB 1



Reach 19R: CB 1



Reach 19R: CB 1



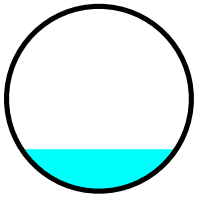
Summary for Reach 20R: DMH 3

Inflow Area = 25,458 sf, 30.88% Impervious, Inflow Depth > 1.39" for 10-Year event
Inflow = 0.81 cfs @ 12.13 hrs, Volume= 2,941 cf
Outflow = 0.81 cfs @ 12.13 hrs, Volume= 2,940 cf, Atten= 0%, Lag= 0.1 min

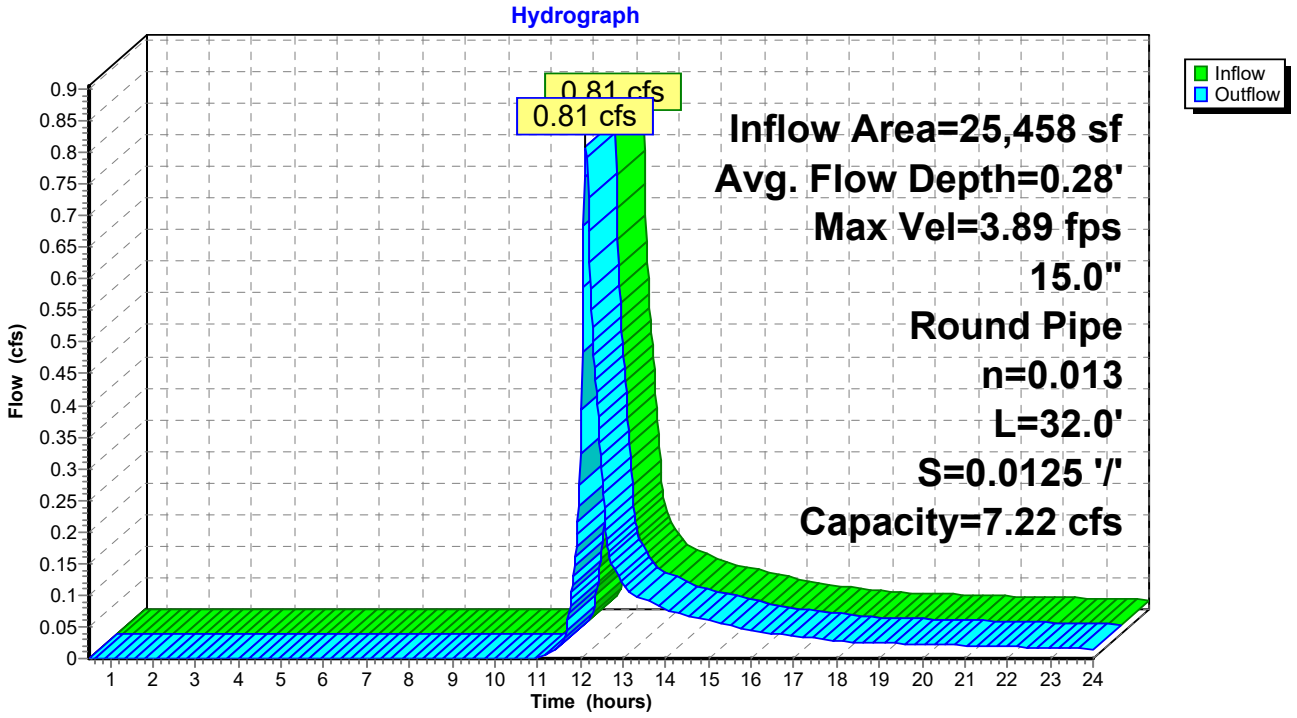
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 3.89 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.59 fps, Avg. Travel Time= 0.3 min

Peak Storage= 7 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.22 cfs

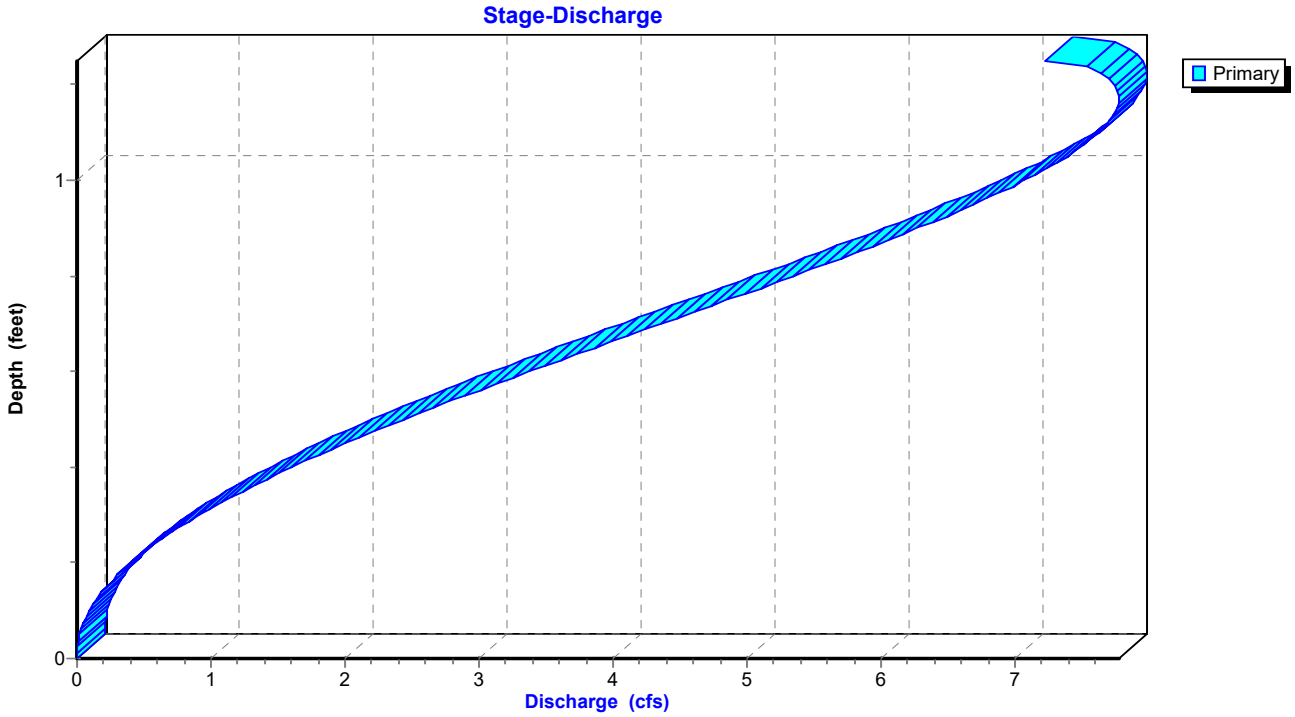
15.0" Round Pipe
n= 0.013
Length= 32.0' Slope= 0.0125 '/'
Inlet Invert= 66.40', Outlet Invert= 66.00'



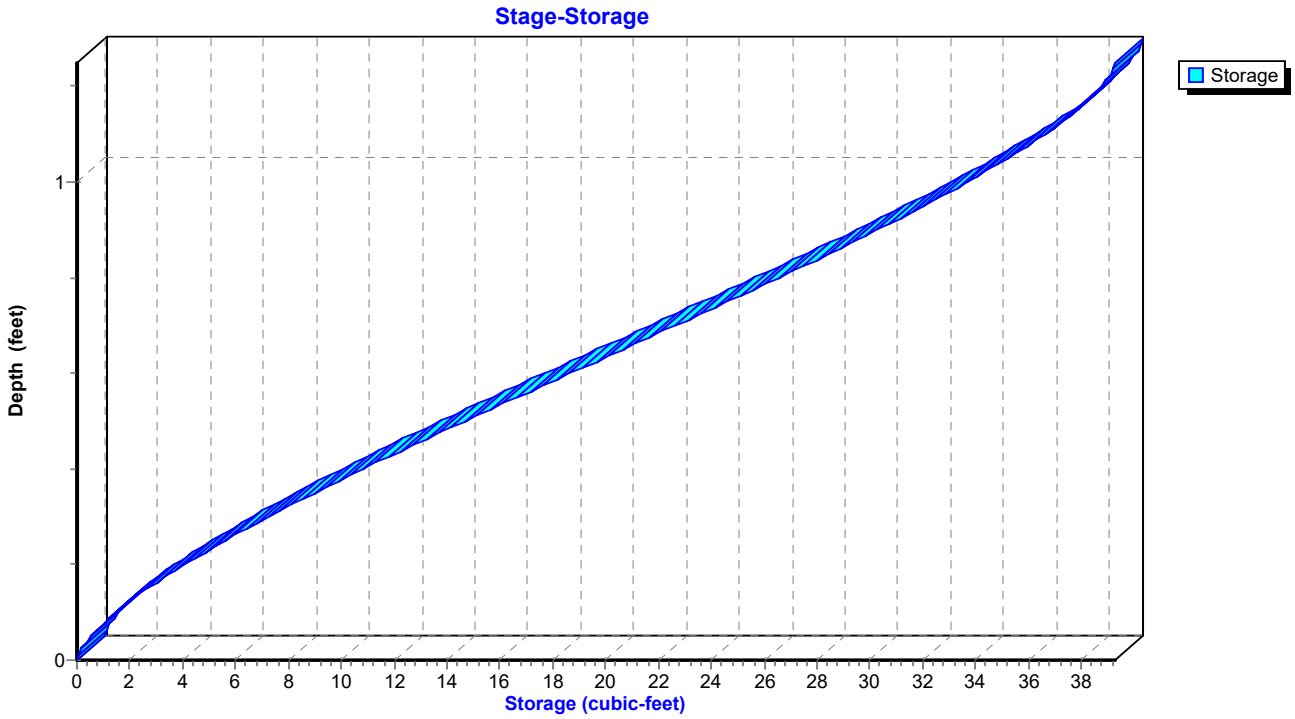
Reach 20R: DMH 3



Reach 20R: DMH 3



Reach 20R: DMH 3



Summary for Pond 11P: BASIN 1

Inflow Area = 97,841 sf, 21.60% Impervious, Inflow Depth > 1.01" for 10-Year event
Inflow = 1.69 cfs @ 12.11 hrs, Volume= 8,196 cf
Outflow = 0.14 cfs @ 15.68 hrs, Volume= 6,240 cf, Atten= 92%, Lag= 213.8 min
Discarded = 0.14 cfs @ 15.68 hrs, Volume= 6,240 cf
Primary = 0.00 cfs @ 0.50 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Peak Elev= 65.80' @ 15.68 hrs Surf.Area= 2,565 sf Storage= 3,748 cf

Plug-Flow detention time= 268.2 min calculated for 6,240 cf (76% of inflow)
Center-of-Mass det. time= 174.0 min (1,044.1 - 870.2)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	10,880 cf	**Custom Stage Data (Prismatic)**Listed below

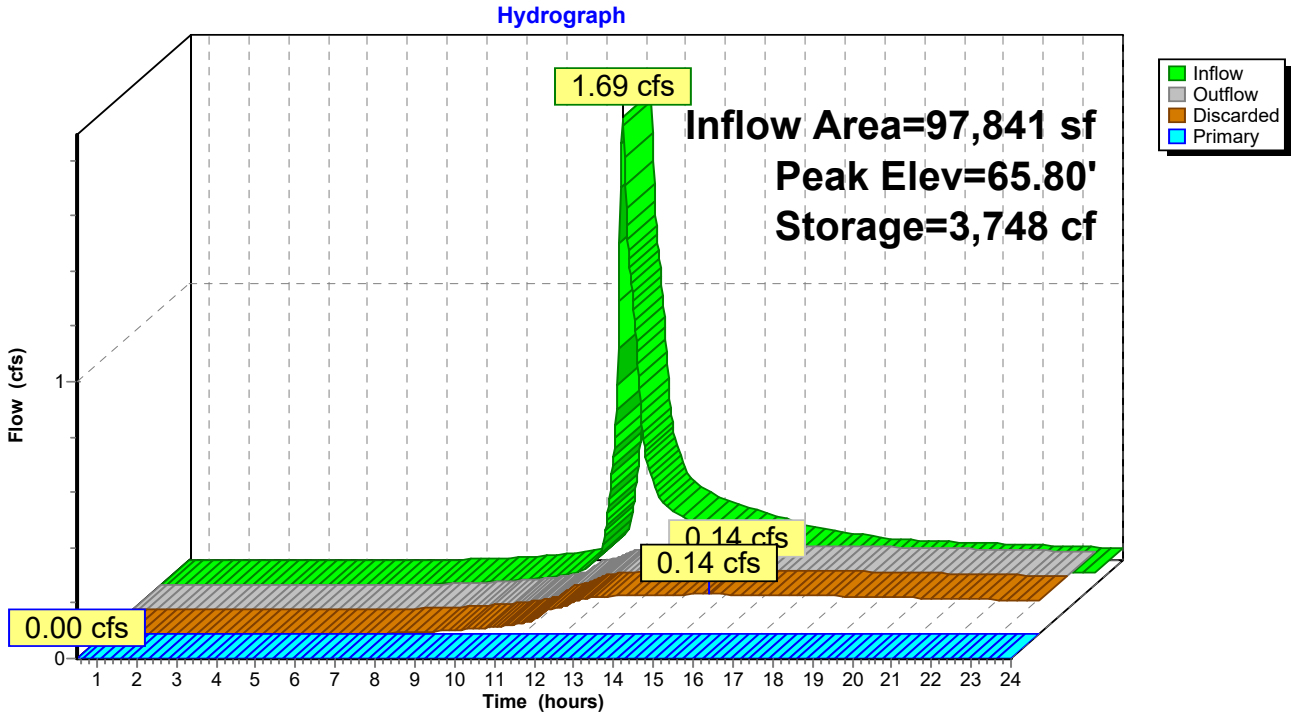
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	1,611	0	0
64.50	1,857	867	867
65.00	2,118	994	1,861
65.50	2,392	1,128	2,988
66.00	2,681	1,268	4,257
66.50	2,984	1,416	5,673
67.00	3,301	1,571	7,244
67.50	3,632	1,733	8,977
68.00	3,977	1,902	10,880

Device	Routing	Invert	Outlet Devices
#1	Primary	65.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	64.00'	**2.410 in/hr Exfiltration over Surface area**

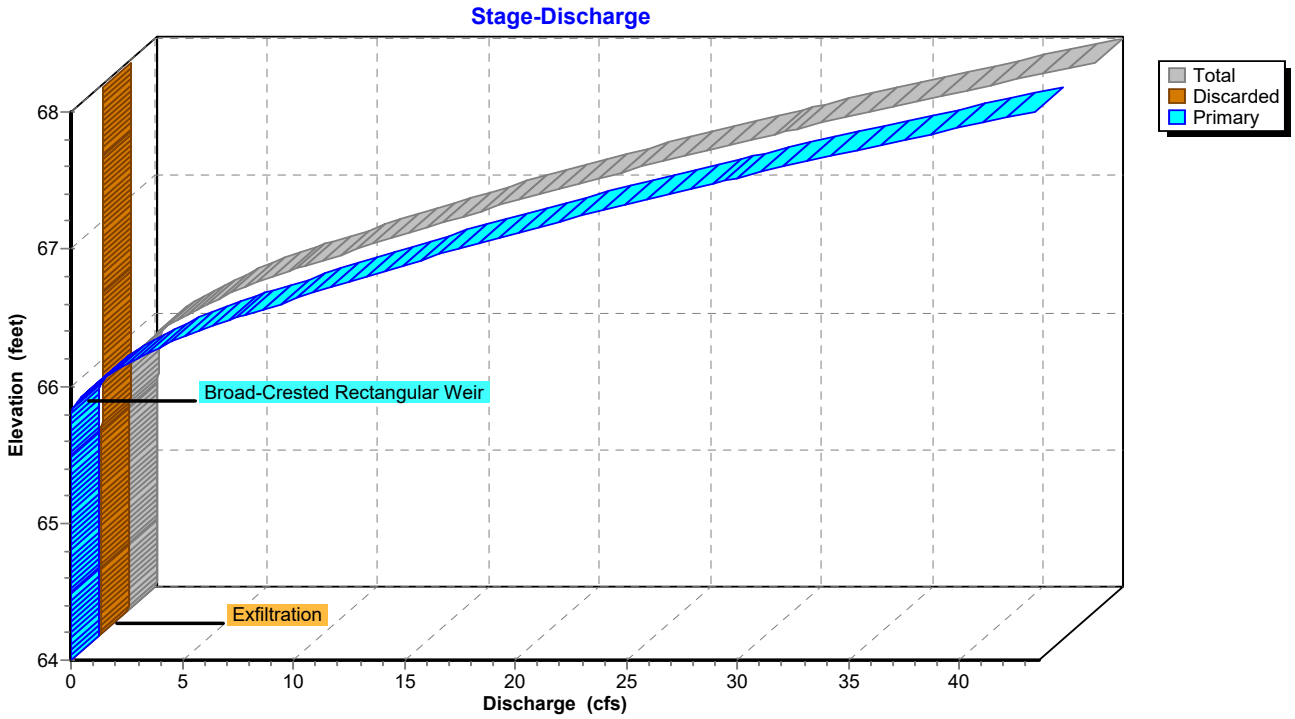
Discarded OutFlow Max=0.14 cfs @ 15.68 hrs HW=65.80' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.50 hrs HW=64.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

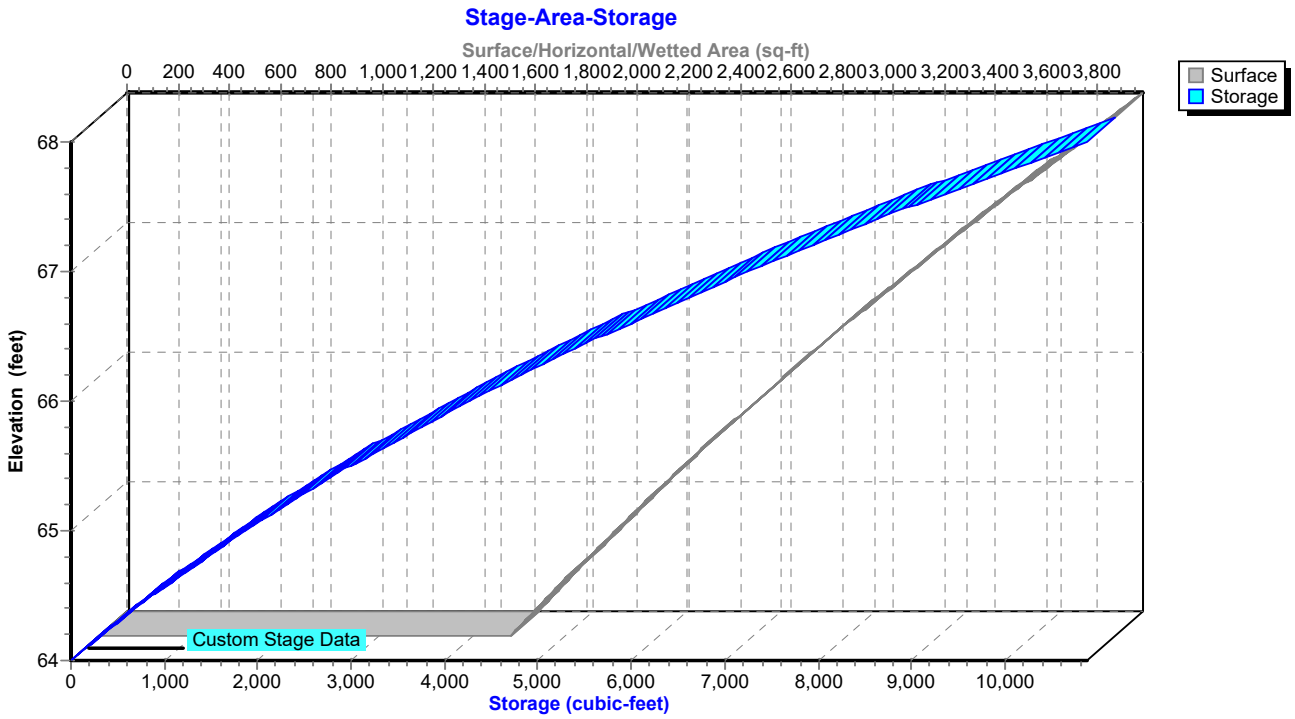
Pond 11P: BASIN 1



Pond 11P: BASIN 1



Pond 11P: BASIN 1



Summary for Pond 13P: BASIN 2

Inflow Area = 94,590 sf, 26.60% Impervious, Inflow Depth > 1.13" for 10-Year event
Inflow = 1.80 cfs @ 12.18 hrs, Volume= 8,899 cf
Outflow = 0.32 cfs @ 13.26 hrs, Volume= 8,516 cf, Atten= 82%, Lag= 64.8 min
Discarded = 0.18 cfs @ 13.26 hrs, Volume= 7,306 cf
Primary = 0.14 cfs @ 13.26 hrs, Volume= 1,210 cf

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Peak Elev= 66.22' @ 13.26 hrs Surf.Area= 3,178 sf Storage= 3,160 cf

Plug-Flow detention time= 168.5 min calculated for 8,516 cf (96% of inflow)
Center-of-Mass det. time= 145.9 min (1,026.0 - 880.1)

Volume	Invert	Avail.Storage	Storage Description
#1	65.10'	9,910 cf	**Custom Stage Data (Prismatic)**Listed below

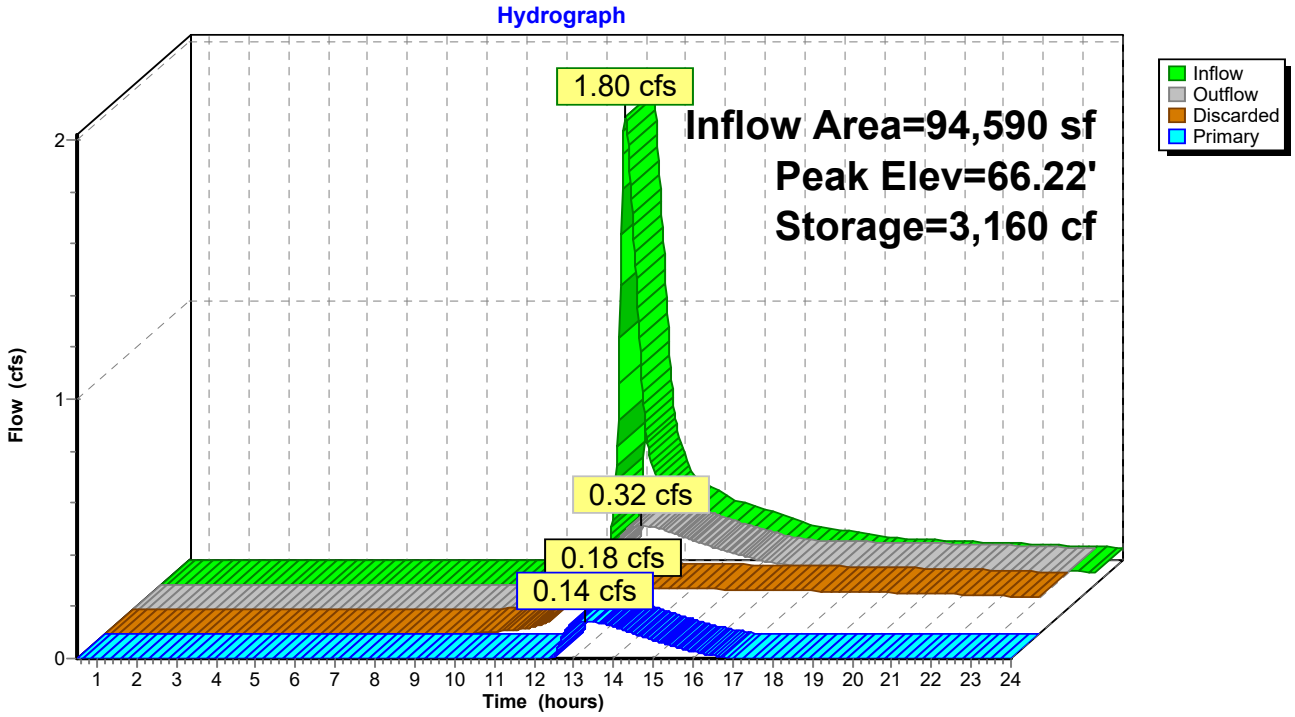
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.10	2,409	0	0
65.50	2,714	1,025	1,025
66.00	3,033	1,437	2,461
66.50	3,366	1,600	4,061
67.00	3,714	1,770	5,831
67.50	4,075	1,947	7,778
68.00	4,451	2,132	9,910

Device	Routing	Invert	Outlet Devices
#1	Primary	67.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	65.10'	**2.410 in/hr Exfiltration over Surface area**
#3	Primary	66.00'	**3.0" Vert. Orifice/Grate X 2.00** C= 0.600

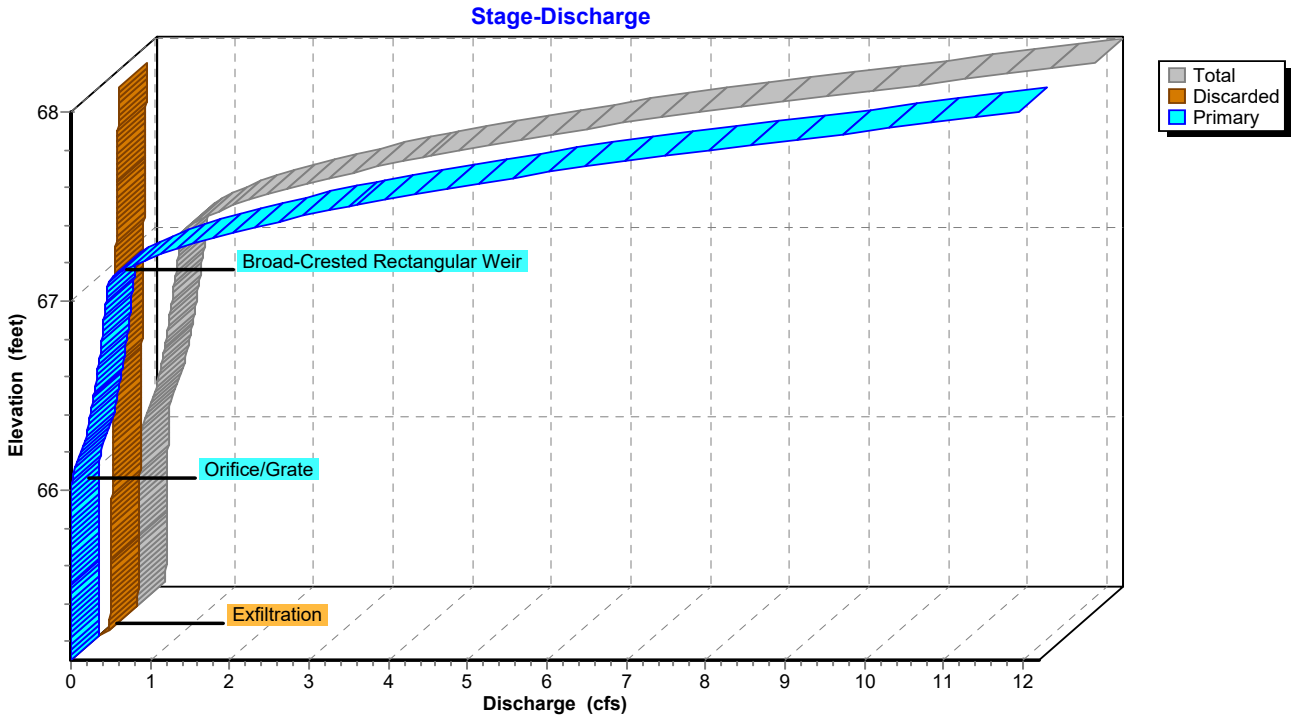
Discarded OutFlow Max=0.18 cfs @ 13.26 hrs HW=66.22' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.14 cfs @ 13.26 hrs HW=66.22' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Orifice Controls 0.14 cfs @ 1.59 fps)

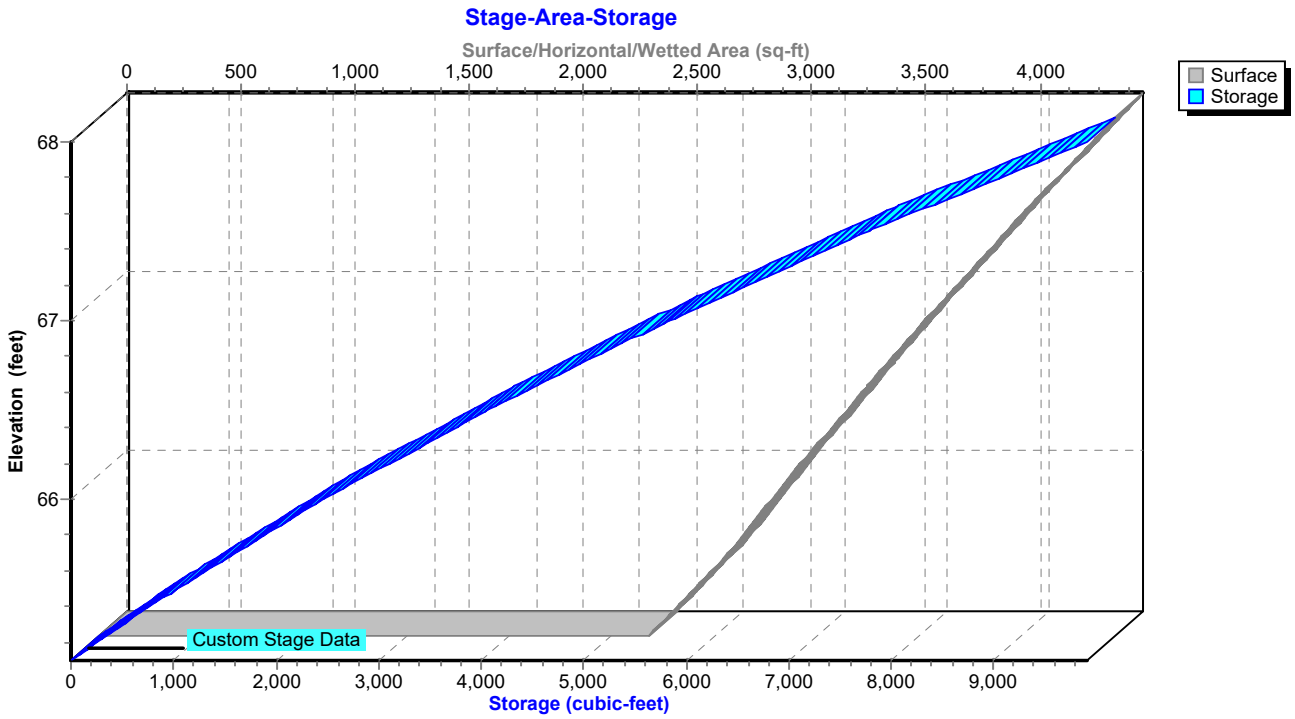
Pond 13P: BASIN 2



Pond 13P: BASIN 2



Pond 13P: BASIN 2

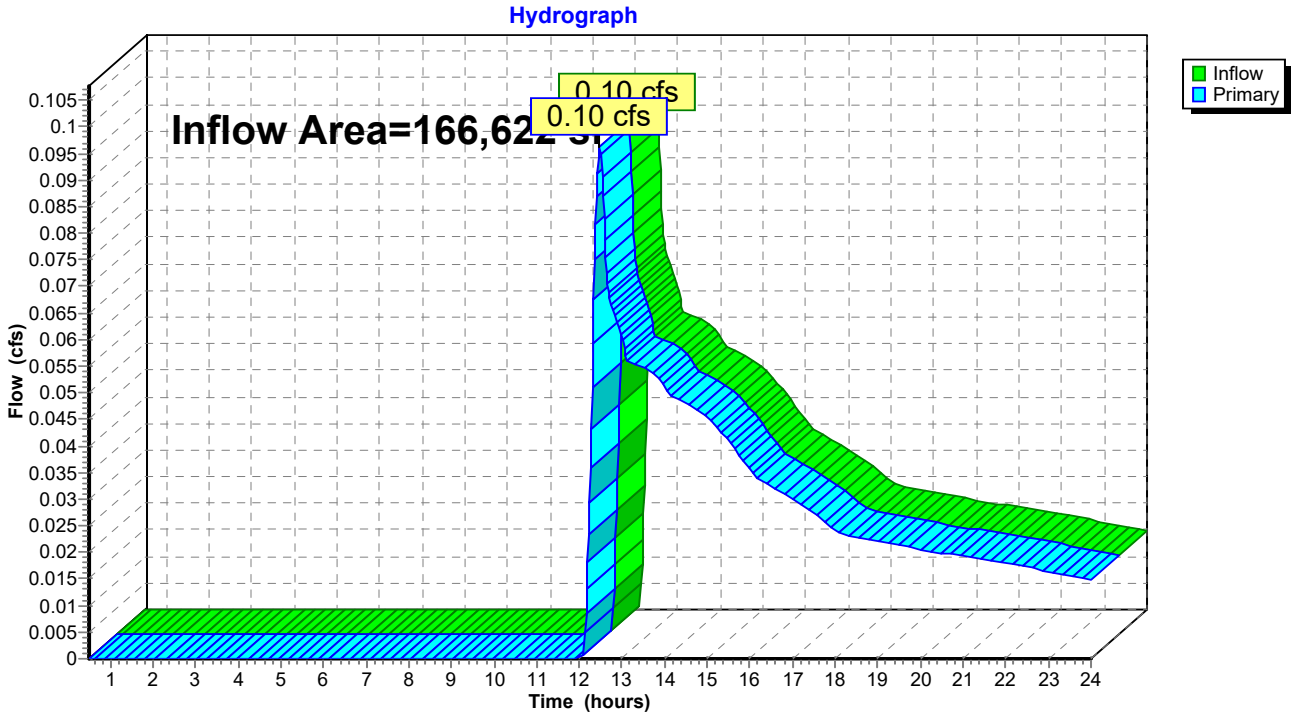


Summary for Link 12L: Southwest Wetland

Inflow Area = 166,622 sf, 13.26% Impervious, Inflow Depth > 0.10" for 10-Year event
Inflow = 0.10 cfs @ 12.48 hrs, Volume= 1,348 cf
Primary = 0.10 cfs @ 12.48 hrs, Volume= 1,348 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 12L: Southwest Wetland

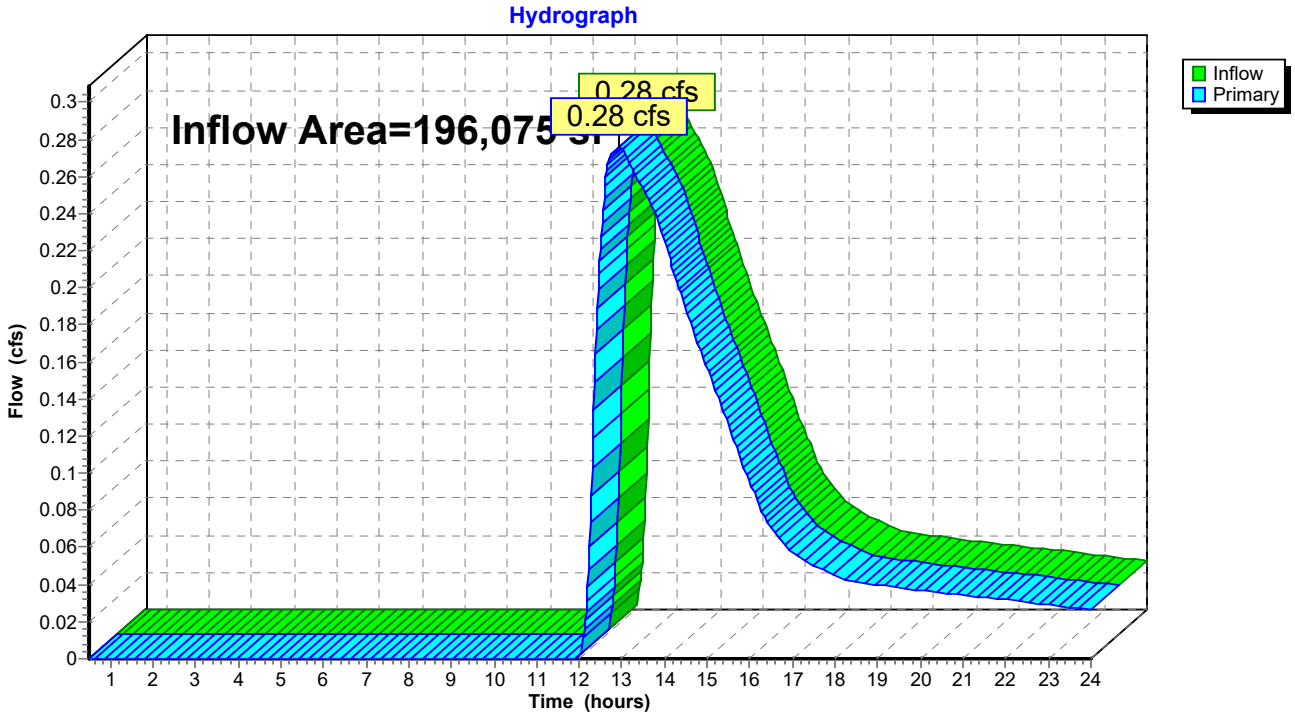


Summary for Link 14L: Northwest Wetland

Inflow Area = 196,075 sf, 15.55% Impervious, Inflow Depth > 0.24" for 10-Year event
Inflow = 0.28 cfs @ 12.94 hrs, Volume= 3,865 cf
Primary = 0.28 cfs @ 12.94 hrs, Volume= 3,865 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 14L: Northwest Wetland



Time span=0.50-24.00 hrs, dt=0.02 hrs, 1176 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=20,328 sf 0.00% Impervious Runoff Depth>0.59"
Flow Length=319' Tc=10.0 min CN=44 Runoff=0.13 cfs 997 cf

Subcatchment 2: Subcat 2 Runoff Area=25,458 sf 30.88% Impervious Runoff Depth>1.98"
Flow Length=288' Tc=8.4 min CN=64 Runoff=1.20 cfs 4,198 cf

Subcatchment 3: Subcat 3 Runoff Area=61,448 sf 8.33% Impervious Runoff Depth>0.82"
Flow Length=311' Tc=16.0 min CN=48 Runoff=0.67 cfs 4,206 cf

Subcatchment 4: Subcat 4 Runoff Area=48,453 sf 1.98% Impervious Runoff Depth>0.43"
Flow Length=187' Tc=9.0 min CN=41 Runoff=0.19 cfs 1,741 cf

Subcatchment 5: Subcat 5 Runoff Area=67,517 sf 23.01% Impervious Runoff Depth>1.43"
Flow Length=455' Tc=14.9 min CN=57 Runoff=1.75 cfs 8,059 cf

Subcatchment 6: Subcat 6 Runoff Area=95,238 sf 5.26% Impervious Runoff Depth>0.59"
Flow Length=744' Tc=18.7 min CN=44 Runoff=0.57 cfs 4,654 cf

Subcatchment 7: Subcat 7 Runoff Area=12,907 sf 18.31% Impervious Runoff Depth>1.51"
Tc=6.0 min CN=58 Runoff=0.48 cfs 1,625 cf

Subcatchment 8: Subcat 8 Runoff Area=6,248 sf 5.00% Impervious Runoff Depth>0.70"
Tc=6.0 min CN=46 Runoff=0.07 cfs 367 cf

Subcatchment 9: Subcat 9 Runoff Area=14,166 sf 51.29% Impervious Runoff Depth>2.85"
Flow Length=137' Tc=8.6 min CN=74 Runoff=0.99 cfs 3,360 cf

Subcatchment 10: Subcat 10 Runoff Area=10,935 sf 74.50% Impervious Runoff Depth>3.92"
Tc=6.0 min CN=85 Runoff=1.14 cfs 3,575 cf

Reach 15R: CB 6 Avg. Flow Depth=0.36' Max Vel=3.83 fps Inflow=0.99 cfs 3,360 cf
12.0" Round Pipe n=0.013 L=10.4' S=0.0096 '/' Capacity=3.49 cfs Outflow=0.99 cfs 3,360 cf

Reach 16R: CB 5 Avg. Flow Depth=0.73' Max Vel=2.86 fps Inflow=1.75 cfs 8,059 cf
12.0" Round Pipe n=0.013 L=32.0' S=0.0031 '/' Capacity=1.99 cfs Outflow=1.75 cfs 8,058 cf

Reach 17R: DMH 7 Avg. Flow Depth=0.47' Max Vel=5.94 fps Inflow=2.50 cfs 11,418 cf
15.0" Round Pipe n=0.013 L=24.0' S=0.0167 '/' Capacity=8.34 cfs Outflow=2.50 cfs 11,418 cf

Reach 18R: CB 2 Avg. Flow Depth=0.52' Max Vel=2.72 fps Inflow=1.14 cfs 3,575 cf
12.0" Round Pipe n=0.013 L=17.3' S=0.0035 '/' Capacity=2.10 cfs Outflow=1.14 cfs 3,574 cf

Reach 19R: CB 1 Avg. Flow Depth=0.37' Max Vel=4.54 fps Inflow=1.20 cfs 4,198 cf
12.0" Round Pipe n=0.013 L=4.5' S=0.0133 '/' Capacity=4.11 cfs Outflow=1.20 cfs 4,198 cf

Reach 20R: DMH 3 Avg. Flow Depth=0.34' Max Vel=4.35 fps Inflow=1.20 cfs 4,198 cf
15.0" Round Pipe n=0.013 L=32.0' S=0.0125 '/' Capacity=7.22 cfs Outflow=1.20 cfs 4,197 cf

Pond 11P: BASIN 1 Peak Elev=65.94' Storage=4,115 cf Inflow=2.53 cfs 11,978 cf
Discarded=0.15 cfs 6,647 cf Primary=0.62 cfs 2,778 cf Outflow=0.77 cfs 9,425 cf

Pond 13P: BASIN 2 Peak Elev=66.68' Storage=4,688 cf Inflow=2.84 cfs 13,042 cf
Discarded=0.19 cfs 7,816 cf Primary=0.35 cfs 4,167 cf Outflow=0.55 cfs 11,982 cf

Link 12L: Southwest Wetland Inflow=0.80 cfs 5,516 cf
Primary=0.80 cfs 5,516 cf

Link 14L: Northwest Wetland Inflow=0.89 cfs 9,188 cf
Primary=0.89 cfs 9,188 cf

Total Runoff Area = 362,697 sf Runoff Volume = 32,782 cf Average Runoff Depth = 1.08"
85.50% Pervious = 310,124 sf 14.50% Impervious = 52,574 sf

Summary for Subcatchment 1: Subcat 1

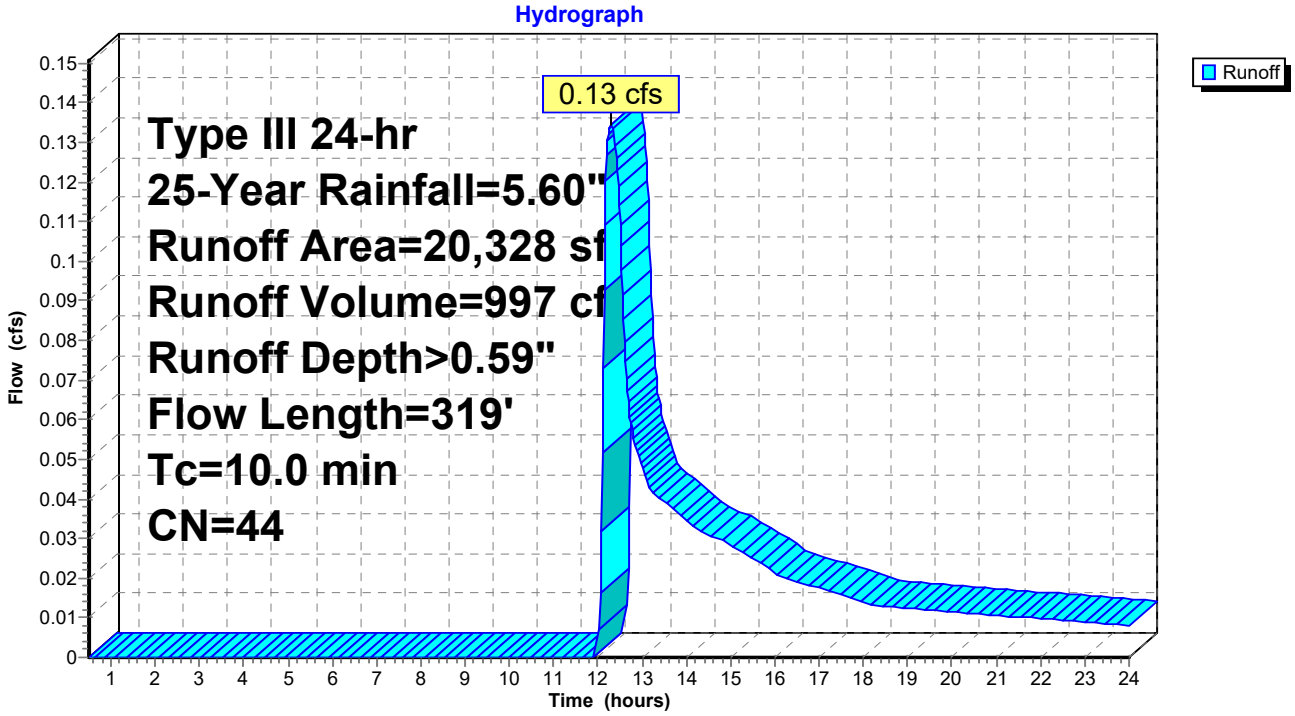
Runoff = 0.13 cfs @ 12.31 hrs, Volume= 997 cf, Depth> 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
12,105	49	50-75% Grass cover, Fair, HSG A
8,223	36	Woods, Fair, HSG A
20,328	44	Weighted Average
20,328		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.7	148	0.0510	3.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	121	0.0190	2.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	319	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

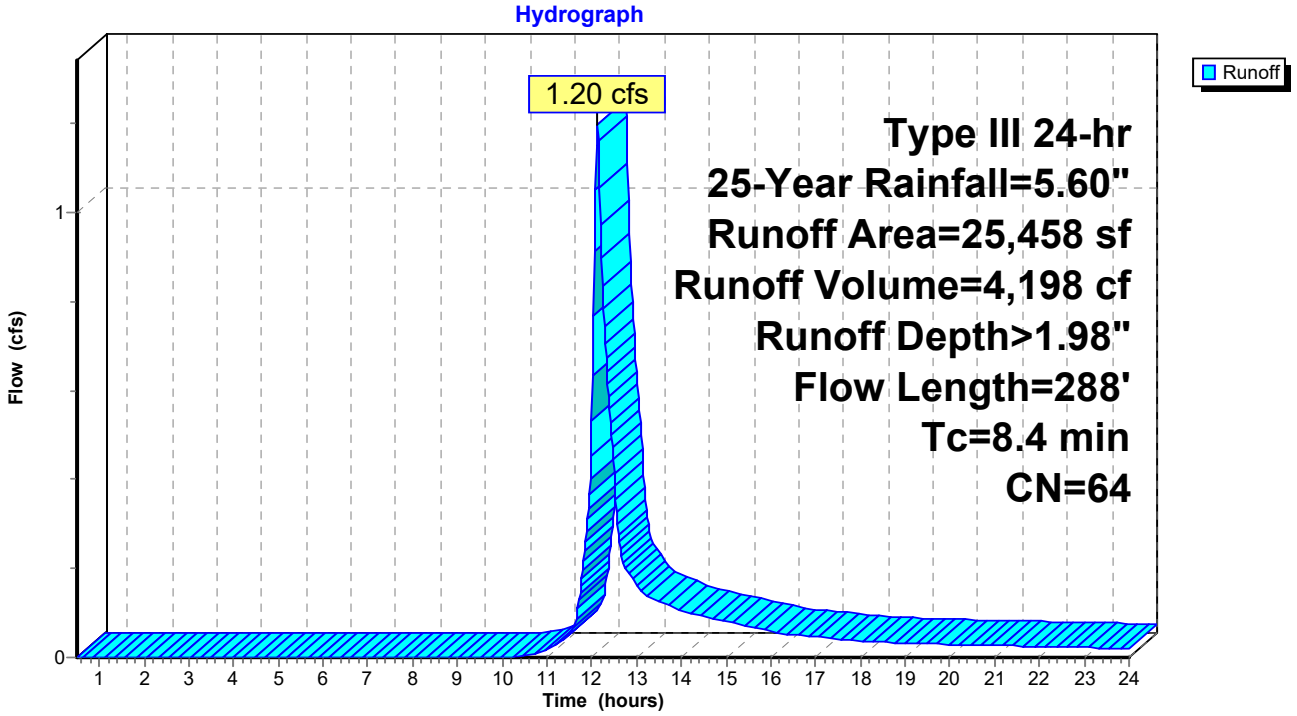
Runoff = 1.20 cfs @ 12.13 hrs, Volume= 4,198 cf, Depth> 1.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
17,076	49	50-75% Grass cover, Fair, HSG A
7,862	98	Paved roads w/curbs & sewers, HSG A
520	36	Woods, Fair, HSG A
25,458	64	Weighted Average
17,596		69.12% Pervious Area
7,862		30.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0500	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.4	100	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	138	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.4	288	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

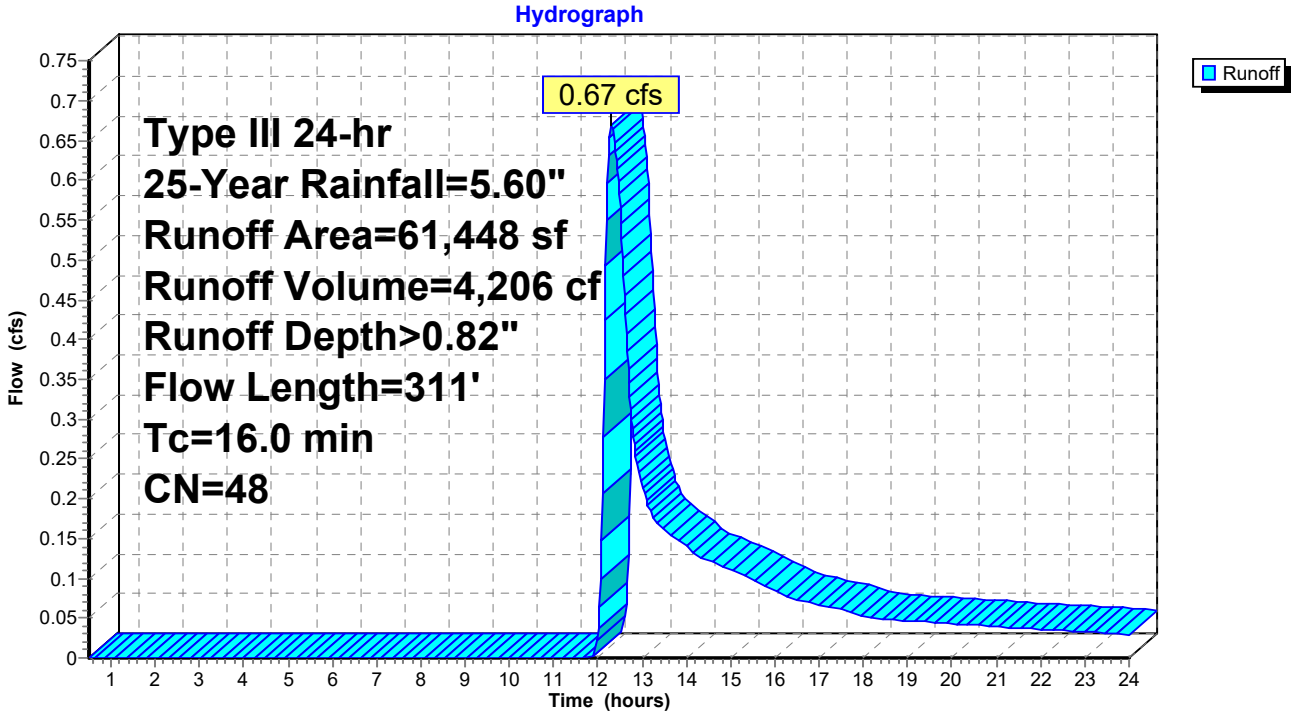
Runoff = 0.67 cfs @ 12.31 hrs, Volume= 4,206 cf, Depth> 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
34,104	49	50-75% Grass cover, Fair, HSG A
3,296	98	Paved roads w/curbs & sewers, HSG A
1,826	98	Roofs, HSG A
22,223	36	Woods, Fair, HSG A
61,448	48	Weighted Average
56,327		91.67% Pervious Area
5,122		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
1.1	261	0.0580	3.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	311	Total			

Subcatchment 3: Subcat 3



Summary for Subcatchment 4: Subcat 4

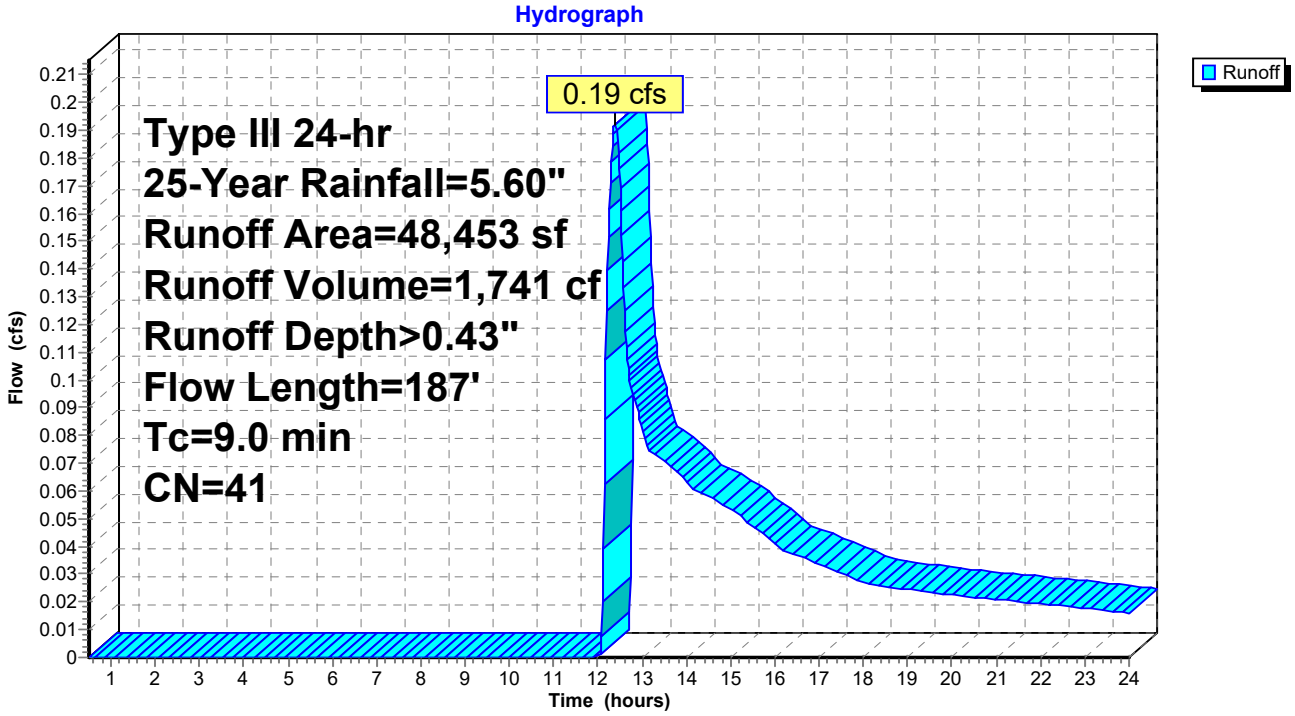
Runoff = 0.19 cfs @ 12.38 hrs, Volume= 1,741 cf, Depth> 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
12,754	49	50-75% Grass cover, Fair, HSG A
959	98	Roofs, HSG A
34,740	36	Woods, Fair, HSG A
48,453	41	Weighted Average
47,493		98.02% Pervious Area
959		1.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.0	26	0.3100	8.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	111	0.0410	3.26		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	187	Total			

Subcatchment 4: Subcat 4



Summary for Subcatchment 5: Subcat 5

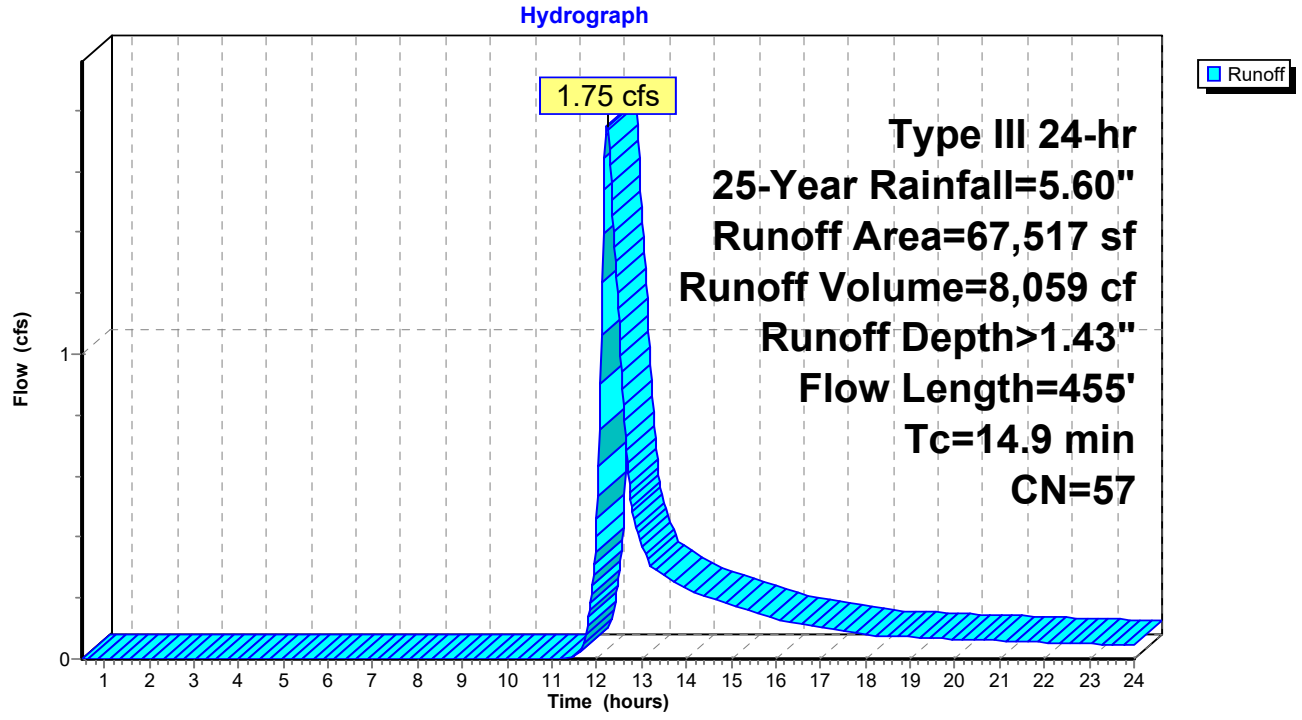
Runoff = 1.75 cfs @ 12.23 hrs, Volume= 8,059 cf, Depth> 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
34,347	49	50-75% Grass cover, Fair, HSG A
10,540	98	Paved roads w/curbs & sewers, HSG A
4,994	98	Roofs, HSG A
17,636	36	Woods, Fair, HSG A
67,517	57	Weighted Average
51,983		76.99% Pervious Area
15,534		23.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0320	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
2.2	348	0.0270	2.65		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	57	0.0122	2.24		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
14.9	455	Total			

Subcatchment 5: Subcat 5



Summary for Subcatchment 6: Subcat 6

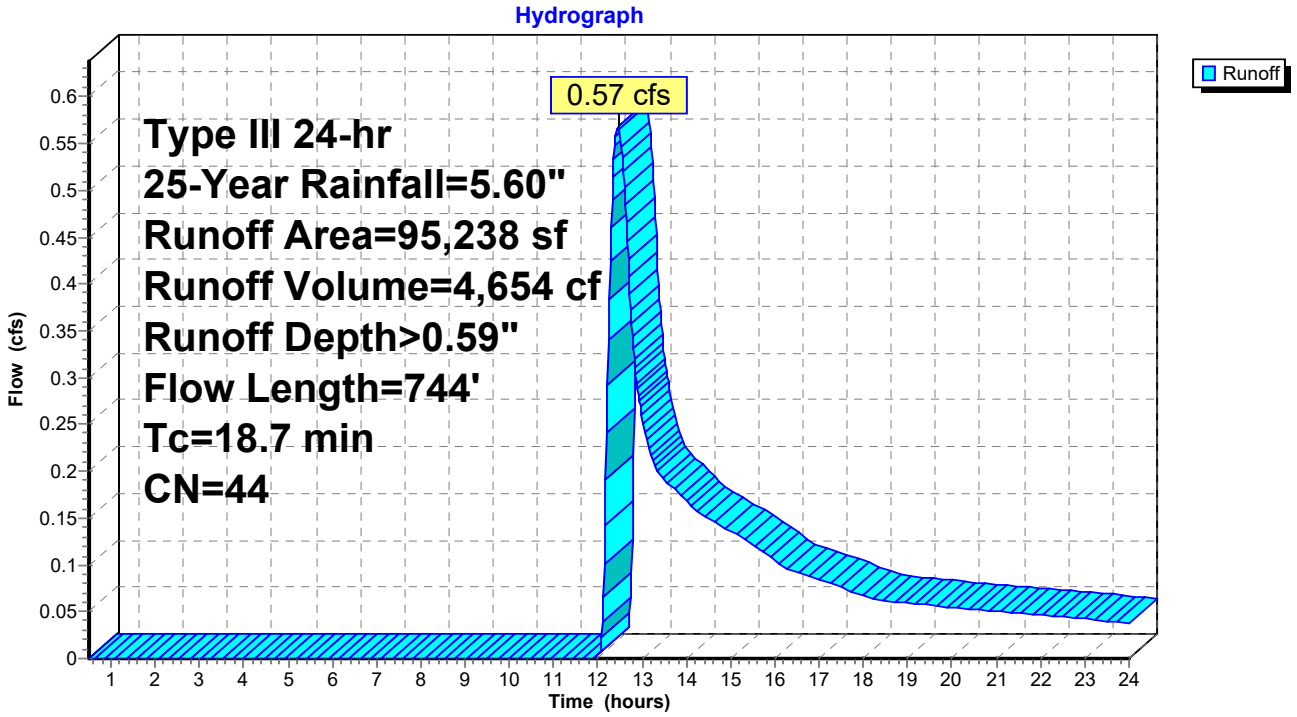
Runoff = 0.57 cfs @ 12.46 hrs, Volume= 4,654 cf, Depth> 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
36,291	49	50-75% Grass cover, Fair, HSG A
2,198	98	Paved roads w/curbs & sewers, HSG A
2,810	98	Roofs, HSG A
53,938	36	Woods, Fair, HSG A
95,238	44	Weighted Average
90,229		94.74% Pervious Area
5,009		5.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
3.0	382	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	245	0.1600	6.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	67	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.7	744	Total			

Subcatchment 6: Subcat 6



Summary for Subcatchment 7: Subcat 7

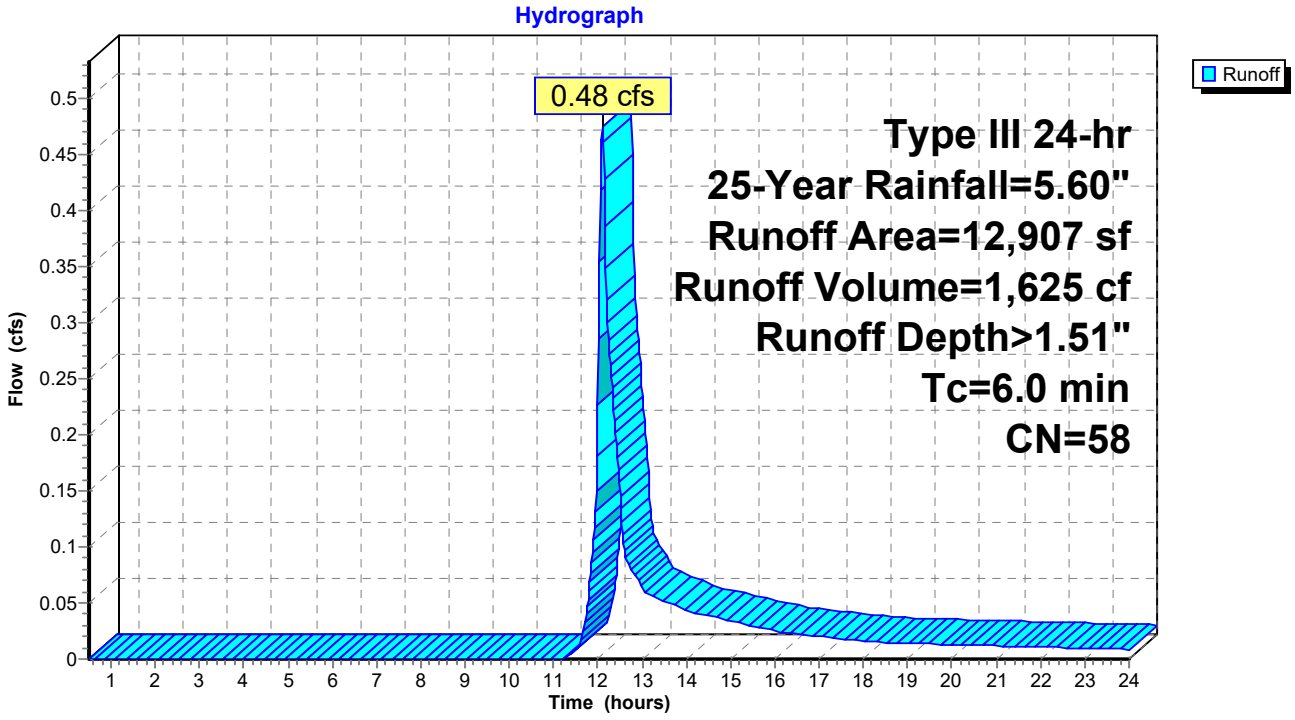
Runoff = 0.48 cfs @ 12.10 hrs, Volume= 1,625 cf, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
10,544	49	50-75% Grass cover, Fair, HSG A
1,337	98	Paved roads w/curbs & sewers, HSG A
1,026	98	Roofs, HSG A
12,907	58	Weighted Average
10,544		81.69% Pervious Area
2,363		18.31% Impervious Area

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

Subcatchment 7: Subcat 7



Summary for Subcatchment 8: Subcat 8

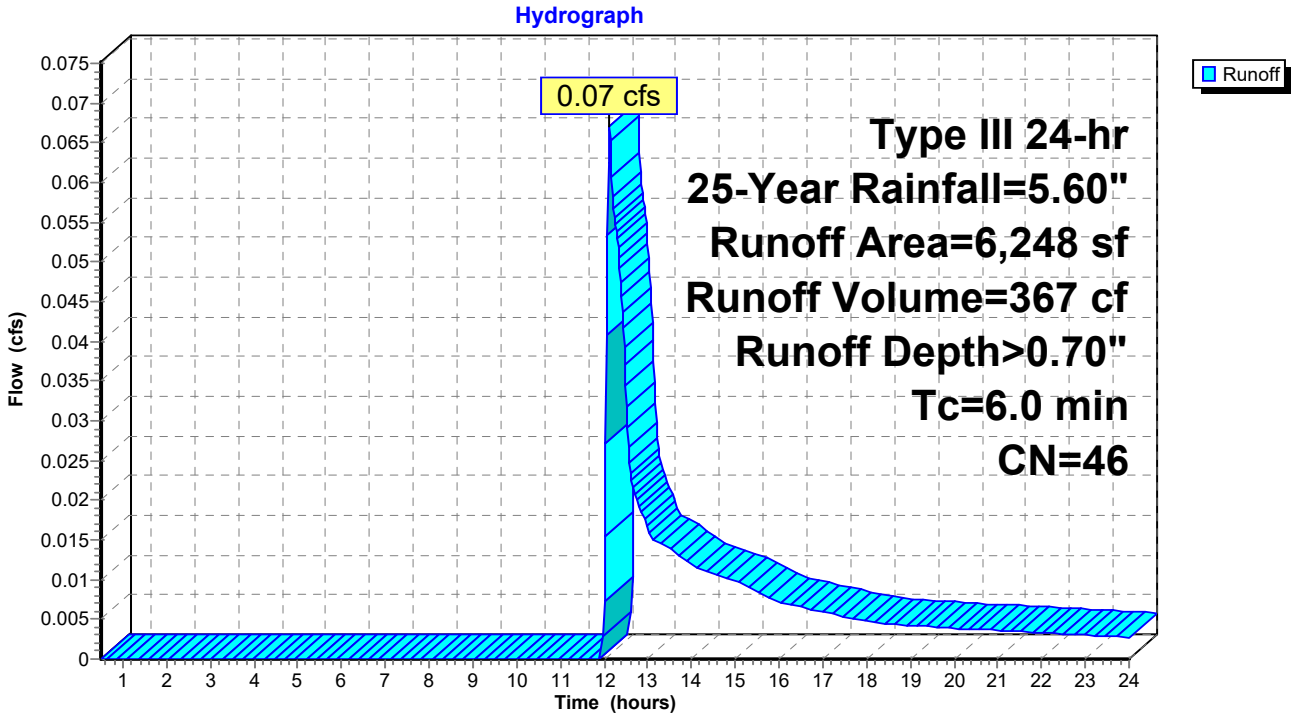
Runoff = 0.07 cfs @ 12.13 hrs, Volume= 367 cf, Depth> 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
3,110	49	50-75% Grass cover, Fair, HSG A
313	98	Roofs, HSG A
2,825	36	Woods, Fair, HSG A
6,248	46	Weighted Average
5,935		95.00% Pervious Area
313		5.00% Impervious Area

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

Subcatchment 8: Subcat 8



Summary for Subcatchment 9: Subcat 9

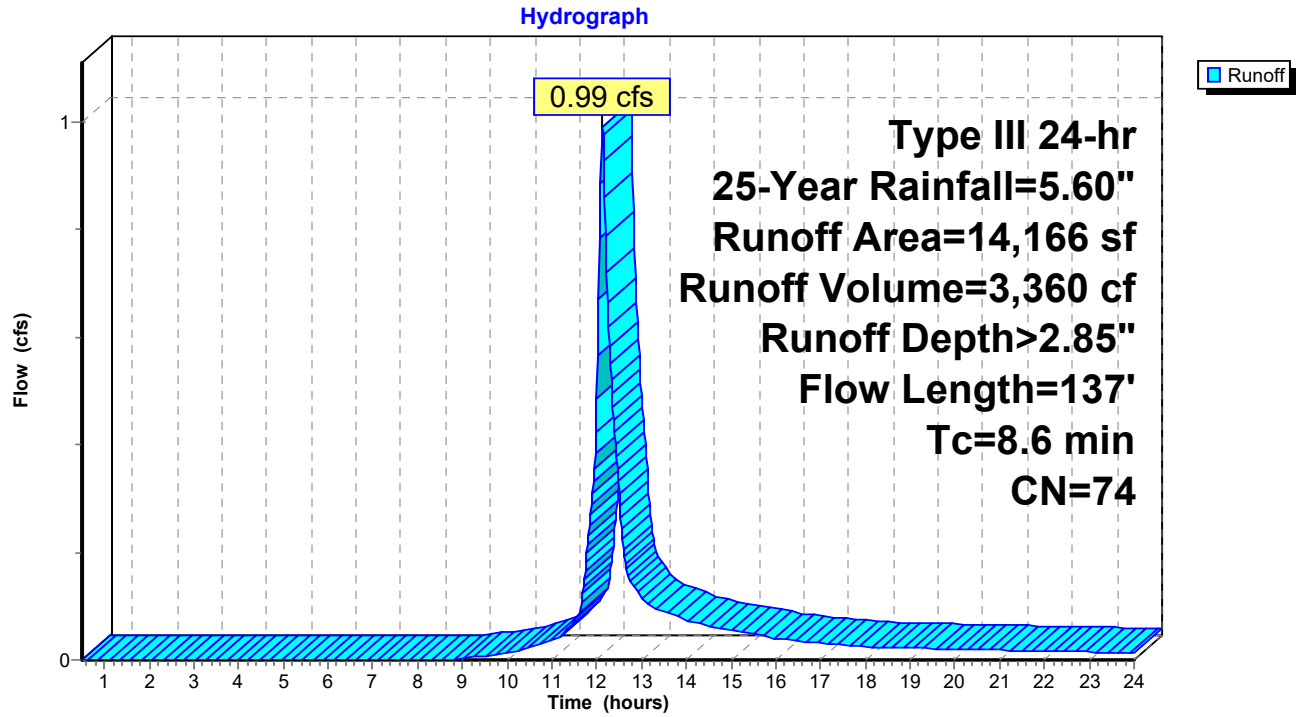
Runoff = 0.99 cfs @ 12.12 hrs, Volume= 3,360 cf, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
6,698	49	50-75% Grass cover, Fair, HSG A
6,734	98	Paved roads w/curbs & sewers, HSG A
532	98	Roofs, HSG A
202	36	Woods, Fair, HSG A
14,166	74	Weighted Average
6,900		48.71% Pervious Area
7,266		51.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0360	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.8	87	0.0080	1.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.6	137	Total			

Subcatchment 9: Subcat 9



Summary for Subcatchment 10: Subcat 10

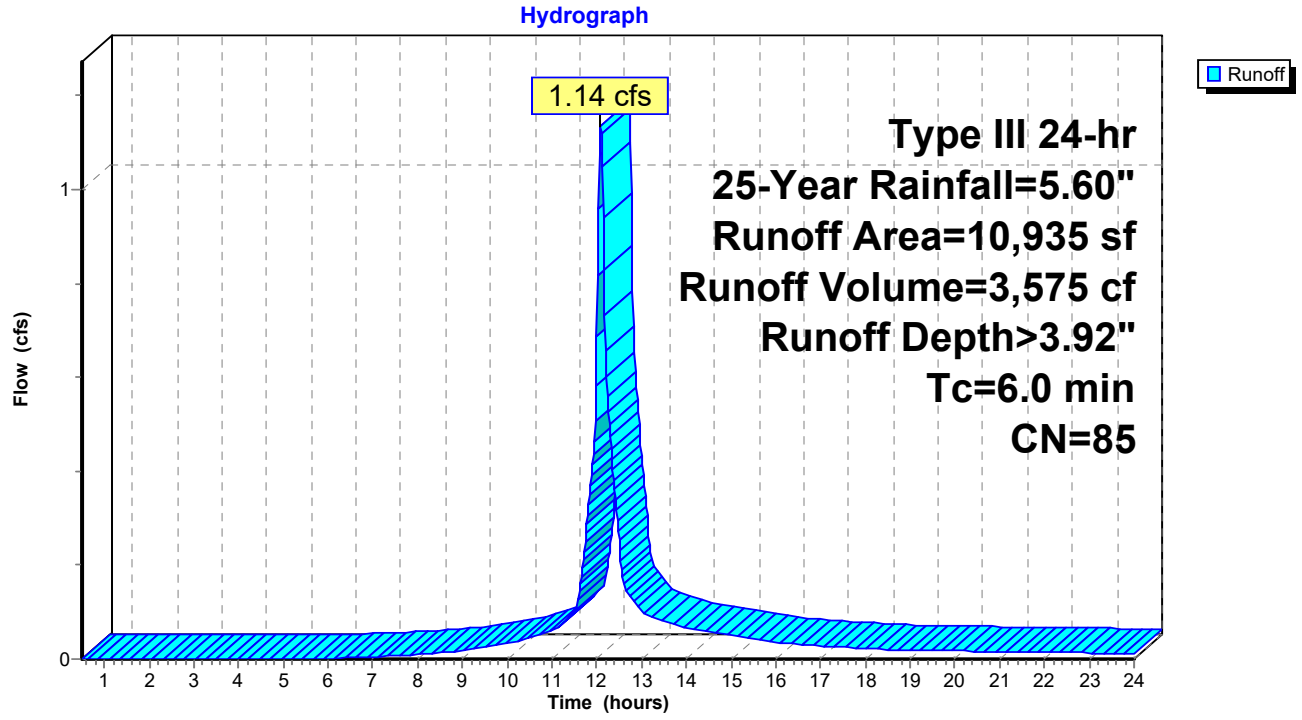
Runoff = 1.14 cfs @ 12.09 hrs, Volume= 3,575 cf, Depth> 3.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
2,766	49	50-75% Grass cover, Fair, HSG A
8,146	98	Paved roads w/curbs & sewers, HSG A
23	36	Woods, Fair, HSG A
10,935	85	Weighted Average
2,789		25.50% Pervious Area
8,146		74.50% Impervious Area

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

Subcatchment 10: Subcat 10



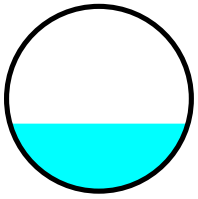
Summary for Reach 15R: CB 6

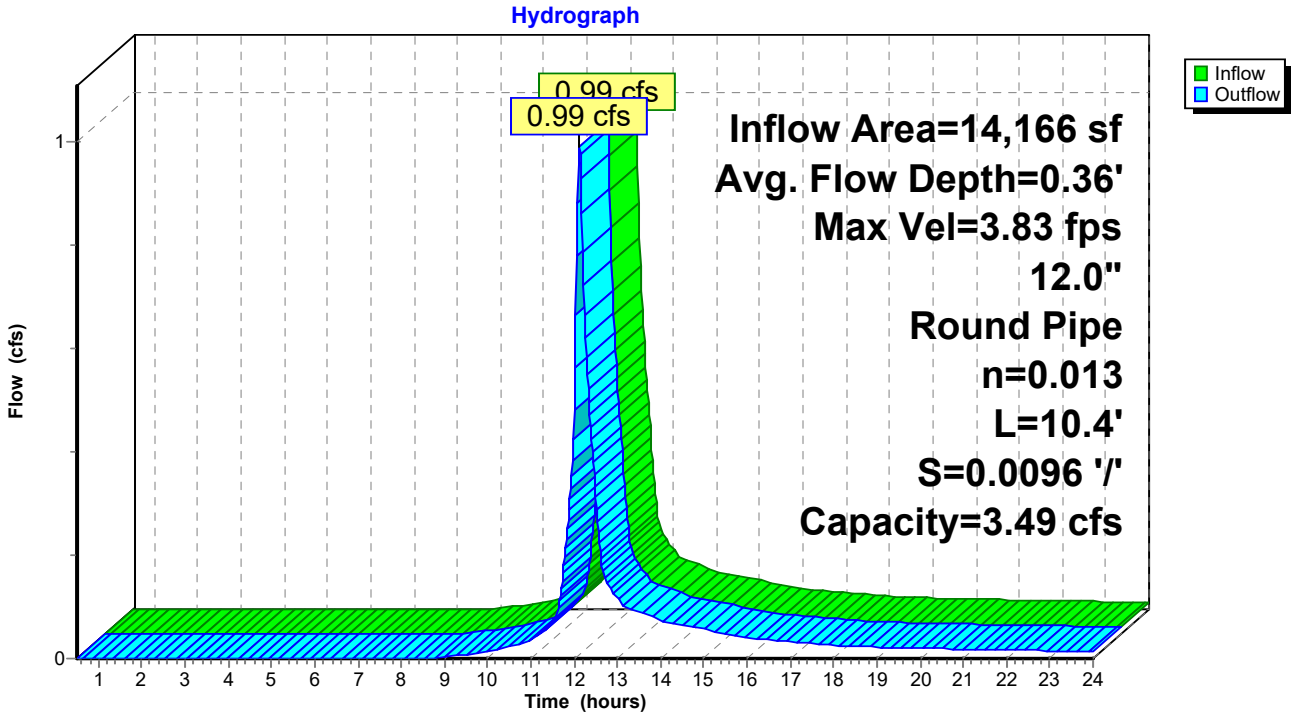
Inflow Area = 14,166 sf, 51.29% Impervious, Inflow Depth > 2.85" for 25-Year event
Inflow = 0.99 cfs @ 12.12 hrs, Volume= 3,360 cf
Outflow = 0.99 cfs @ 12.12 hrs, Volume= 3,360 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 3.83 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.43 fps, Avg. Travel Time= 0.1 min

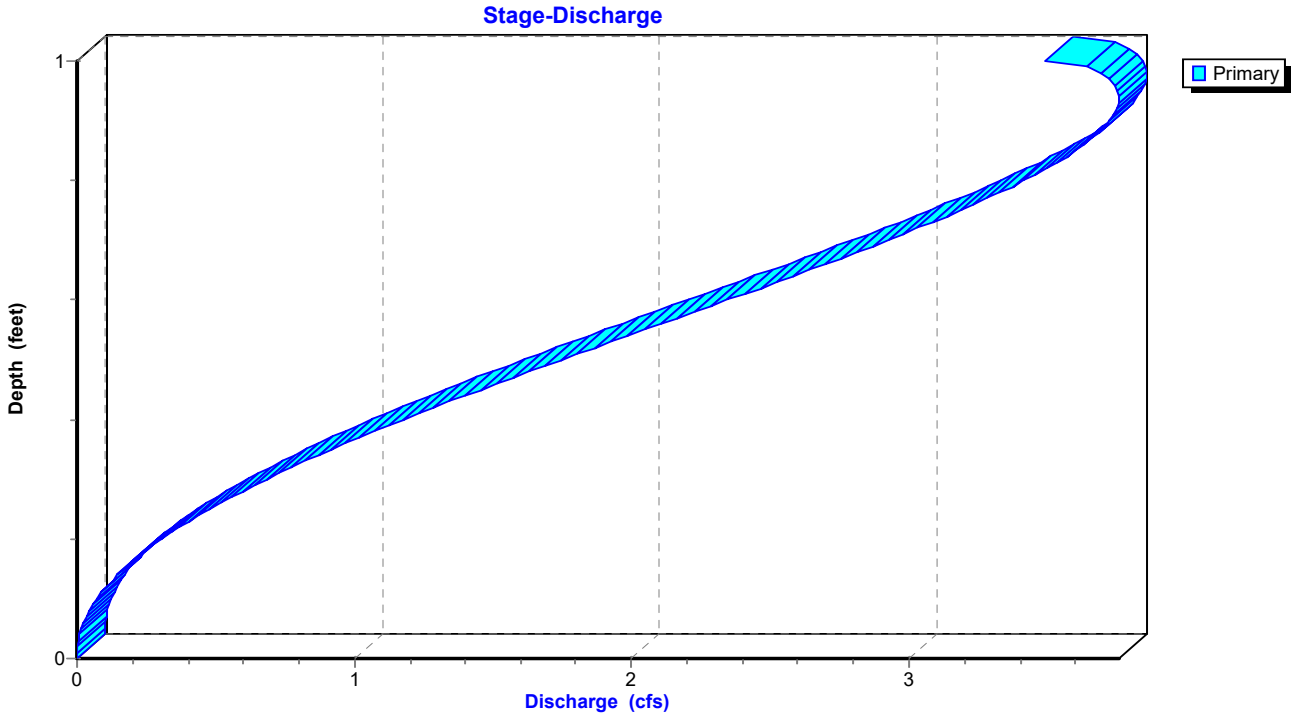
Peak Storage= 3 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.49 cfs

12.0" Round Pipe
n= 0.013
Length= 10.4' Slope= 0.0096 '/'
Inlet Invert= 67.50', Outlet Invert= 67.40'

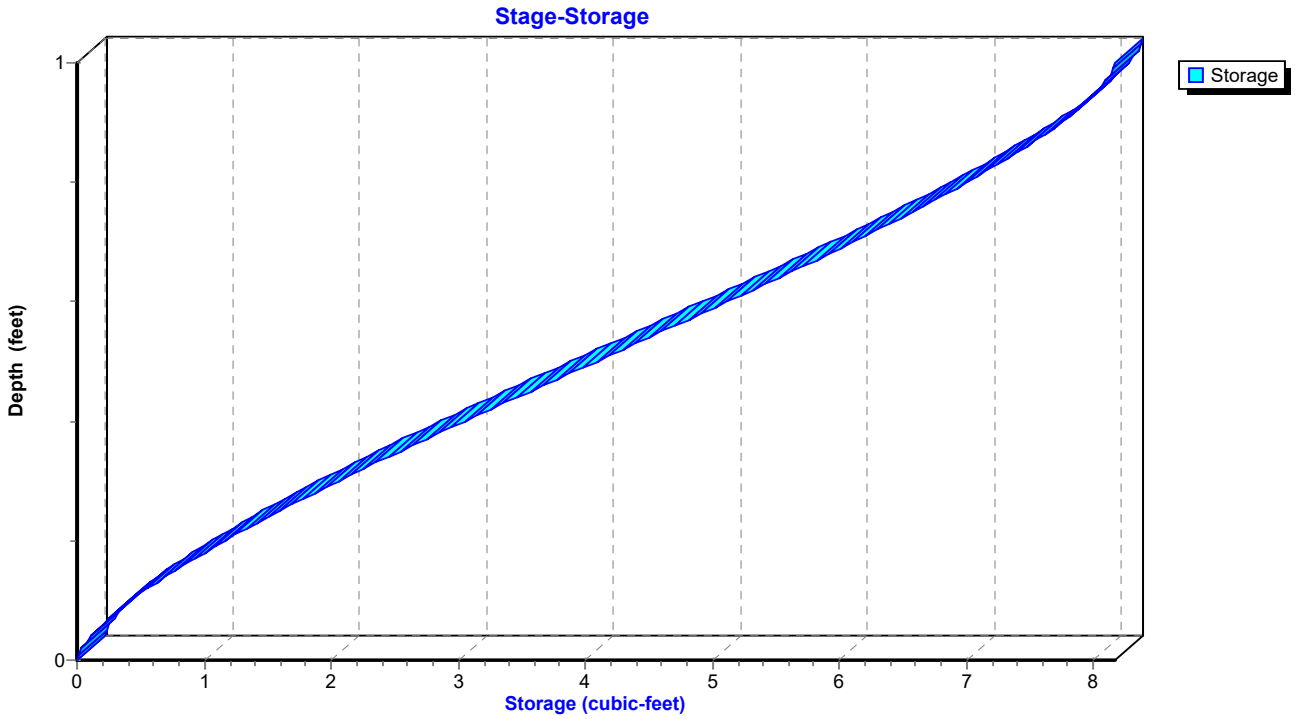




Reach 15R: CB 6



Reach 15R: CB 6



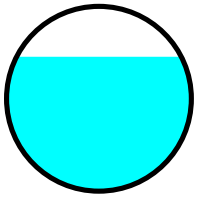
Summary for Reach 16R: CB 5

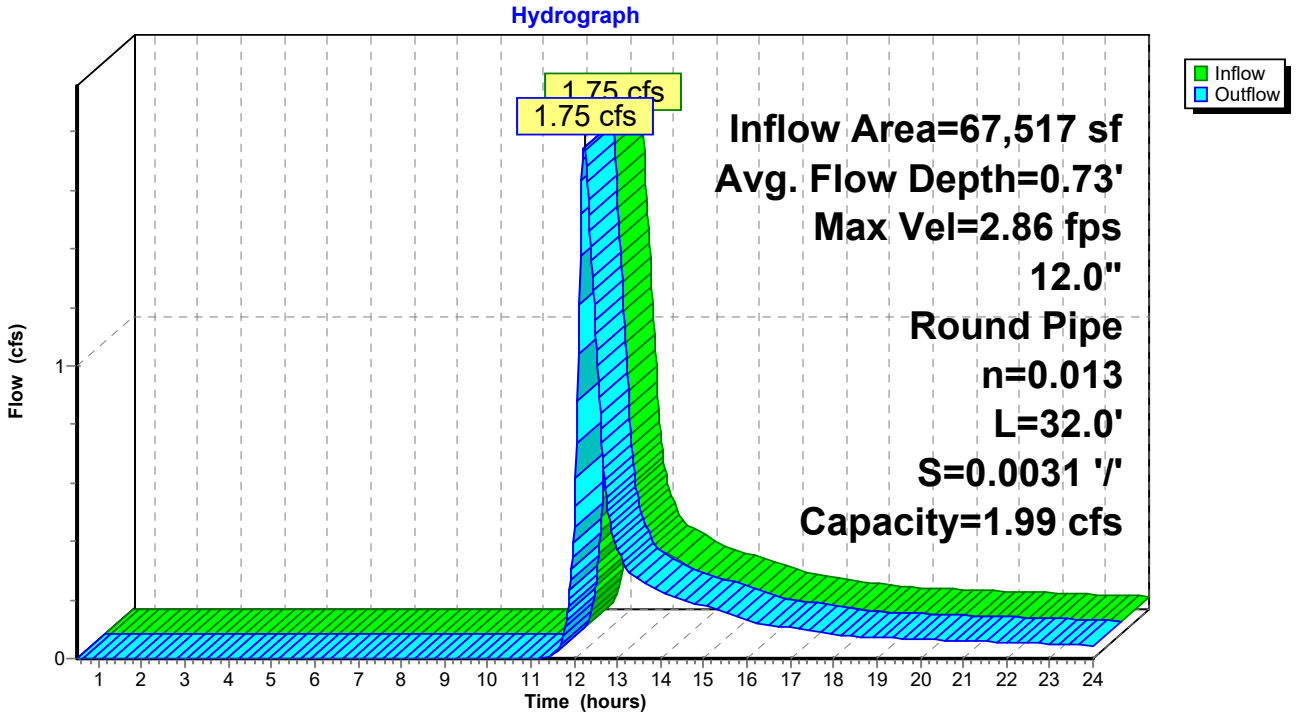
Inflow Area = 67,517 sf, 23.01% Impervious, Inflow Depth > 1.43" for 25-Year event
Inflow = 1.75 cfs @ 12.23 hrs, Volume= 8,059 cf
Outflow = 1.75 cfs @ 12.23 hrs, Volume= 8,058 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.86 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 0.4 min

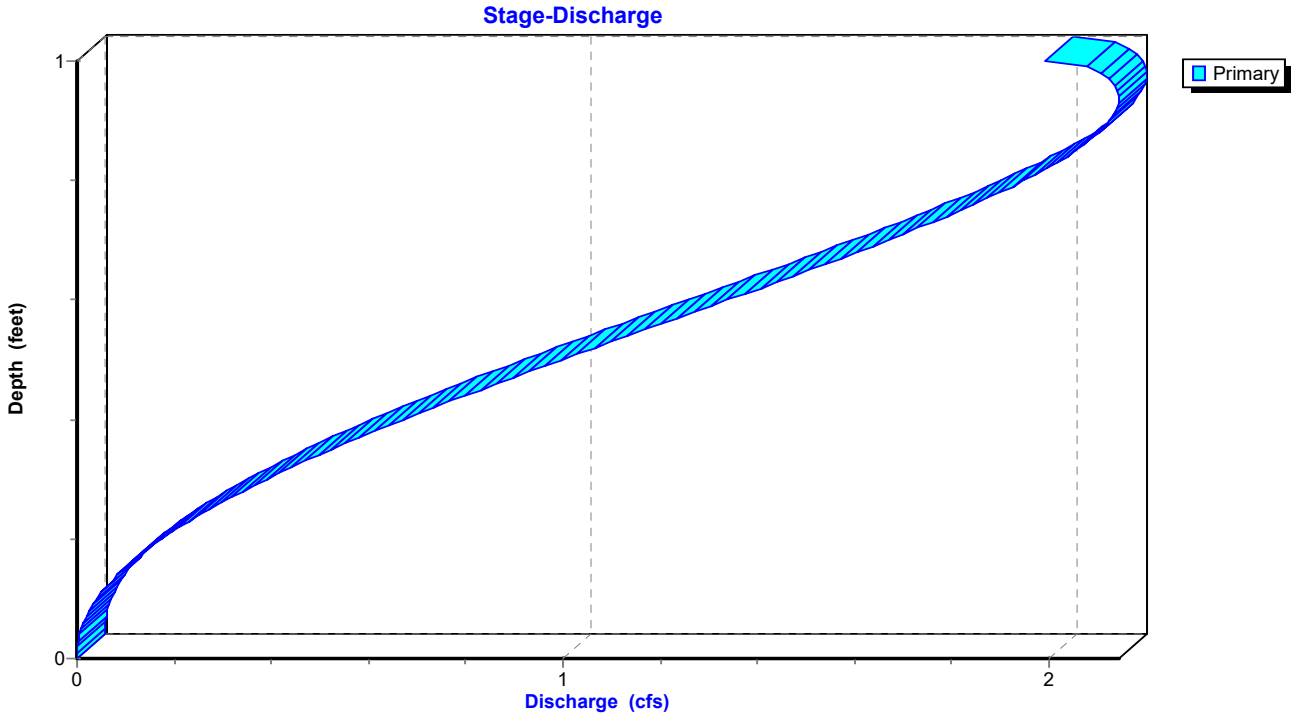
Peak Storage= 20 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.73'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.99 cfs

12.0" Round Pipe
n= 0.013
Length= 32.0' Slope= 0.0031 '/'
Inlet Invert= 67.50', Outlet Invert= 67.40'

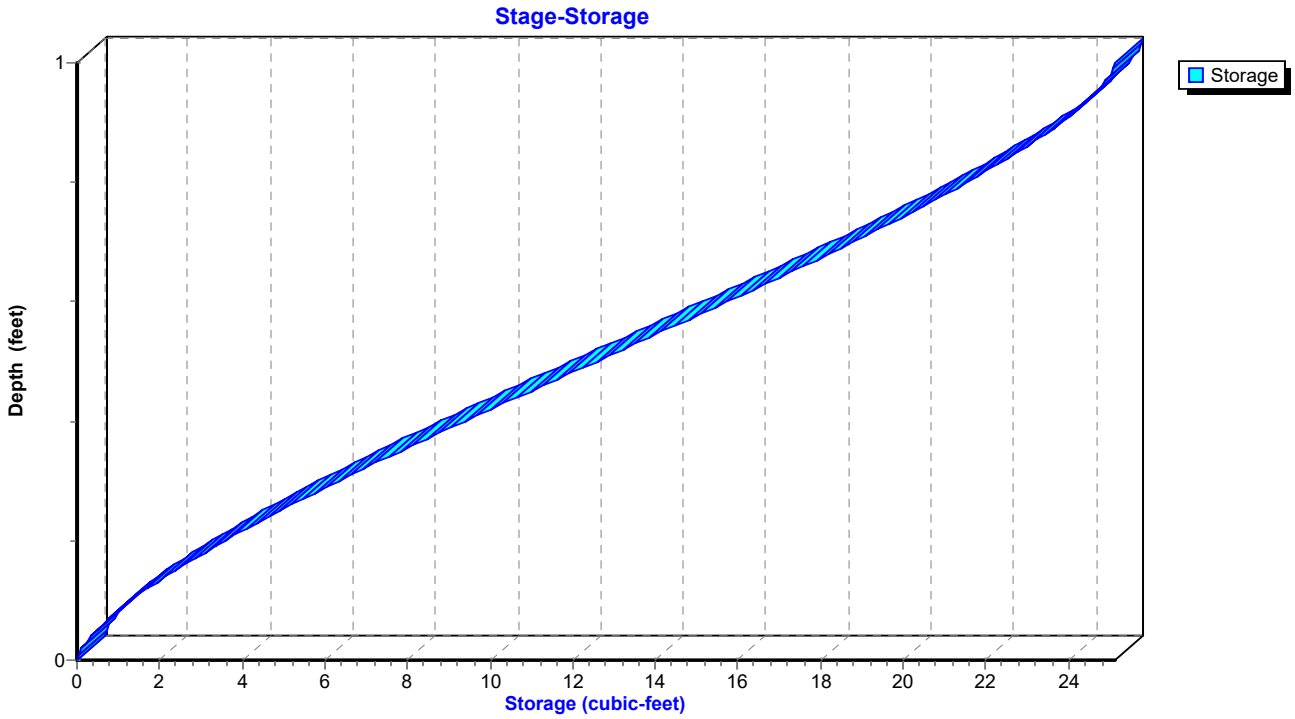




Reach 16R: CB 5



Reach 16R: CB 5



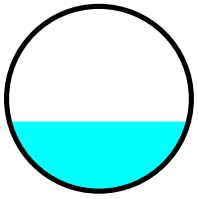
Summary for Reach 17R: DMH 7

Inflow Area = 81,683 sf, 27.91% Impervious, Inflow Depth > 1.68" for 25-Year event
Inflow = 2.50 cfs @ 12.19 hrs, Volume= 11,418 cf
Outflow = 2.50 cfs @ 12.19 hrs, Volume= 11,418 cf, Atten= 0%, Lag= 0.0 min

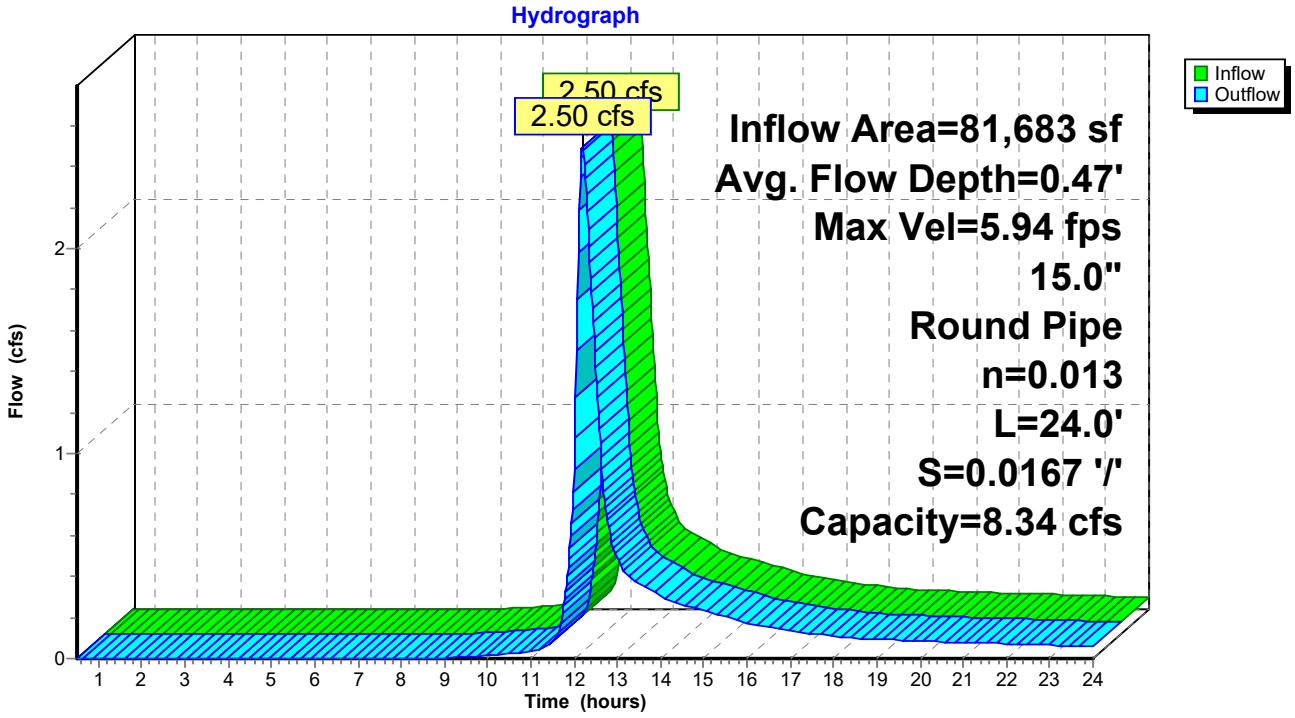
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 5.94 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.43 fps, Avg. Travel Time= 0.2 min

Peak Storage= 10 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 8.34 cfs

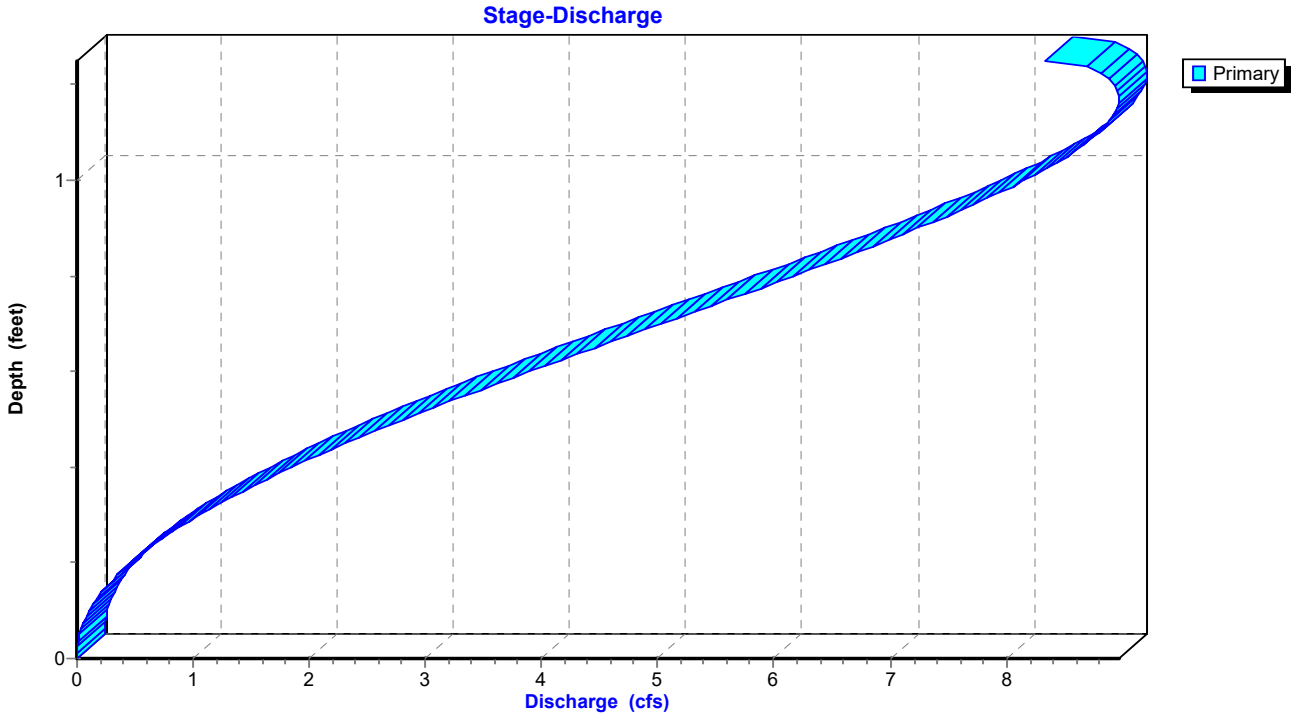
15.0" Round Pipe
n= 0.013
Length= 24.0' Slope= 0.0167 '/'
Inlet Invert= 67.40', Outlet Invert= 67.00'



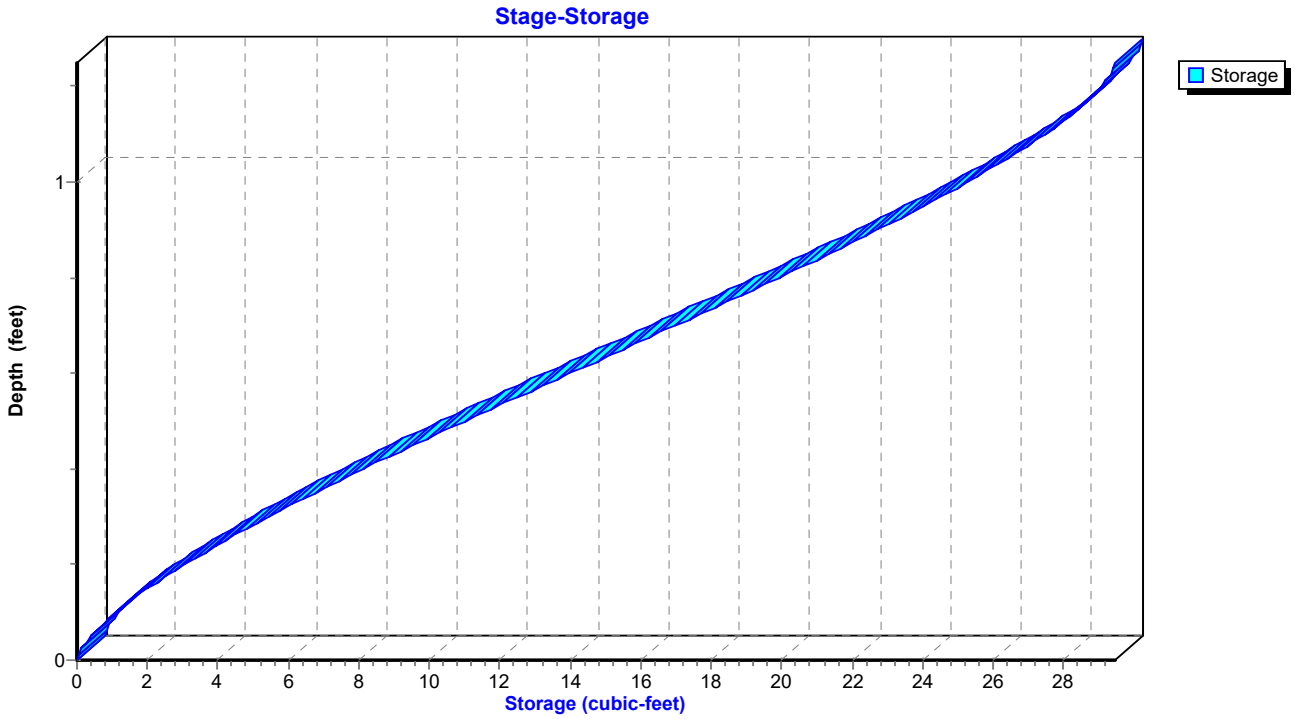
Reach 17R: DMH 7



Reach 17R: DMH 7



Reach 17R: DMH 7



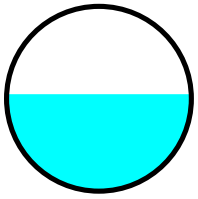
Summary for Reach 18R: CB 2

Inflow Area = 10,935 sf, 74.50% Impervious, Inflow Depth > 3.92" for 25-Year event
Inflow = 1.14 cfs @ 12.09 hrs, Volume= 3,575 cf
Outflow = 1.14 cfs @ 12.09 hrs, Volume= 3,574 cf, Atten= 0%, Lag= 0.1 min

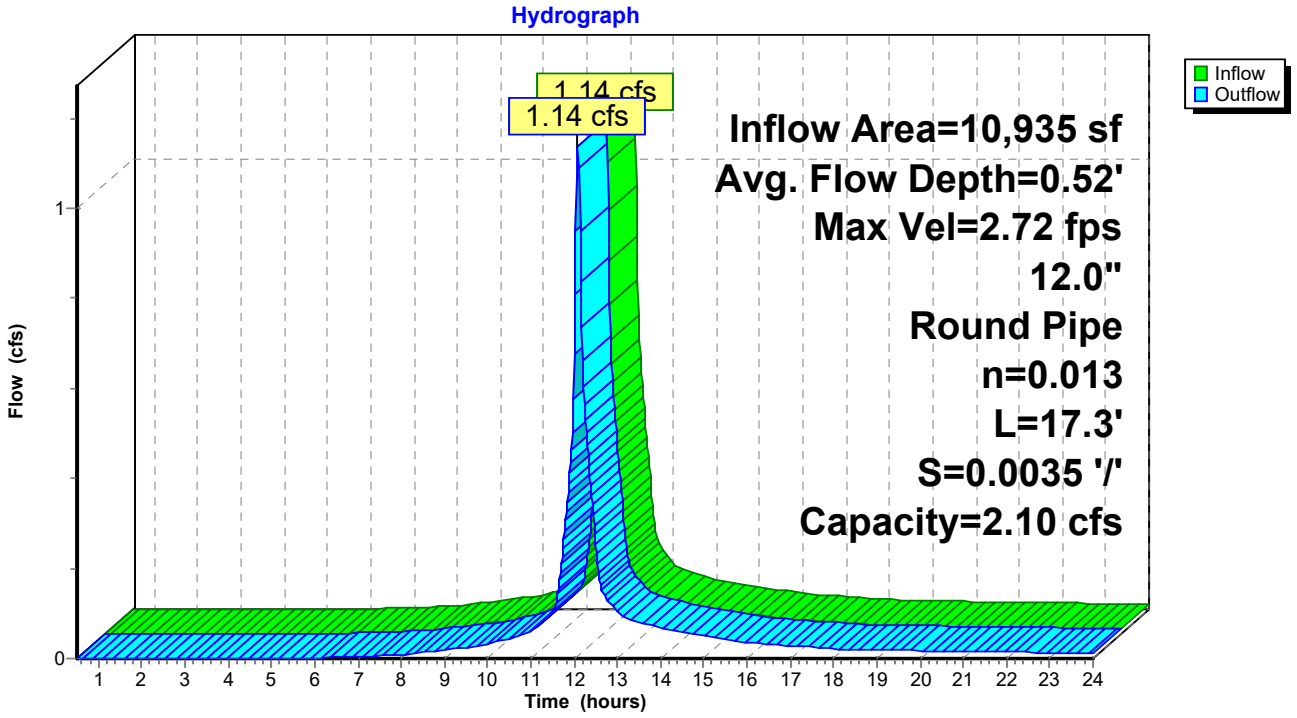
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.72 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.95 fps, Avg. Travel Time= 0.3 min

Peak Storage= 7 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.10 cfs

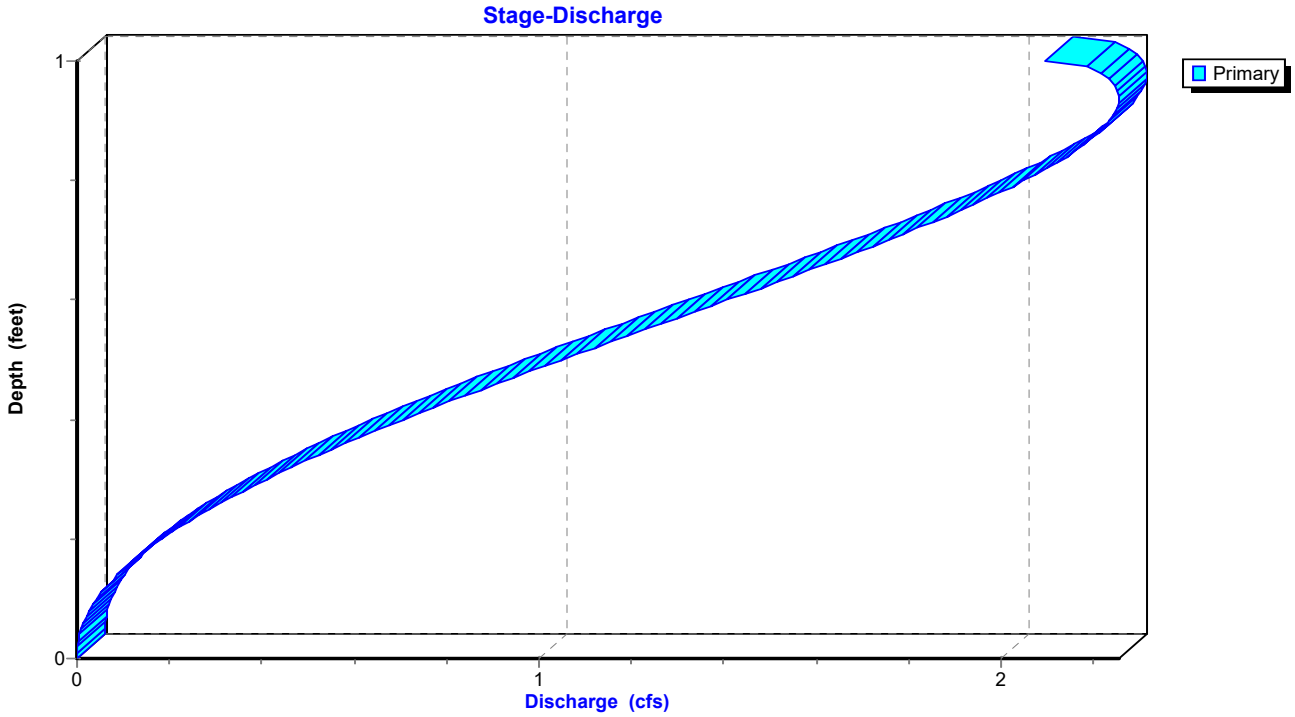
12.0" Round Pipe
n= 0.013
Length= 17.3' Slope= 0.0035 '/'
Inlet Invert= 66.46', Outlet Invert= 66.40'



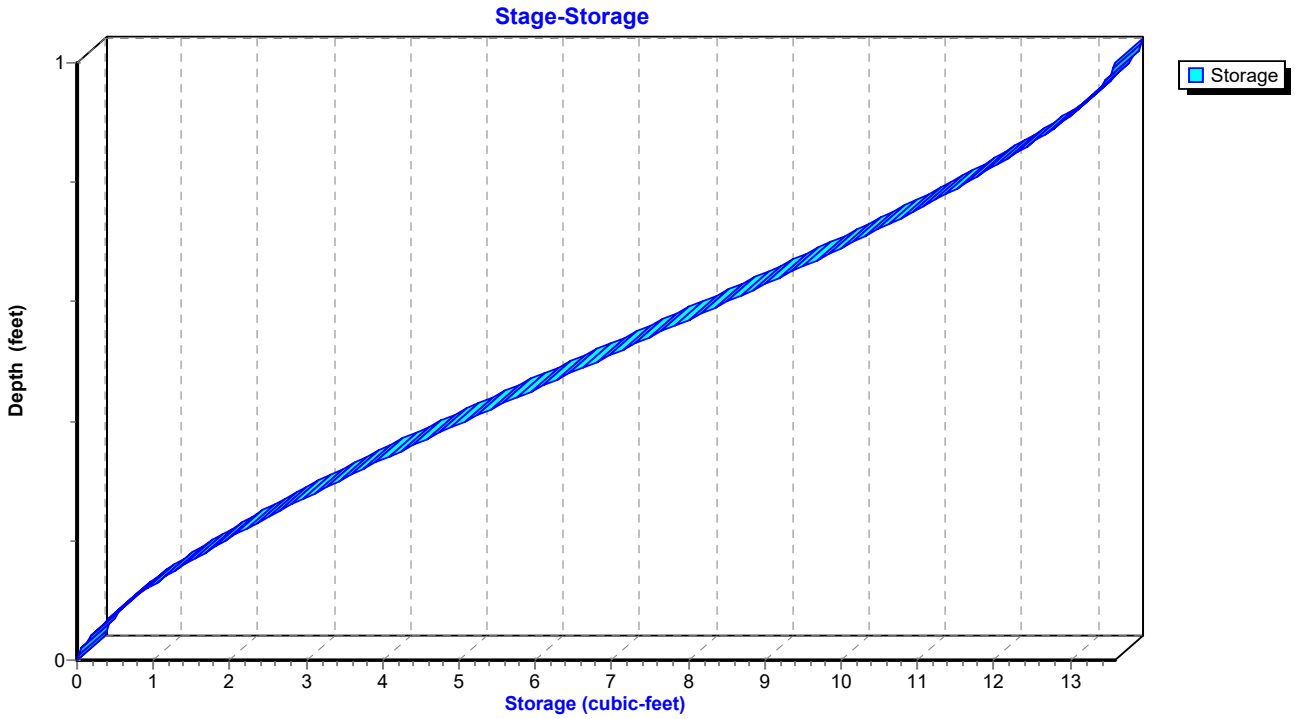
Reach 18R: CB 2



Reach 18R: CB 2



Reach 18R: CB 2



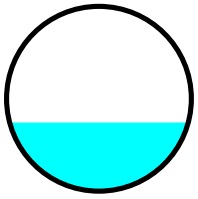
Summary for Reach 19R: CB 1

Inflow Area = 25,458 sf, 30.88% Impervious, Inflow Depth > 1.98" for 25-Year event
Inflow = 1.20 cfs @ 12.13 hrs, Volume= 4,198 cf
Outflow = 1.20 cfs @ 12.13 hrs, Volume= 4,198 cf, Atten= 0%, Lag= 0.0 min

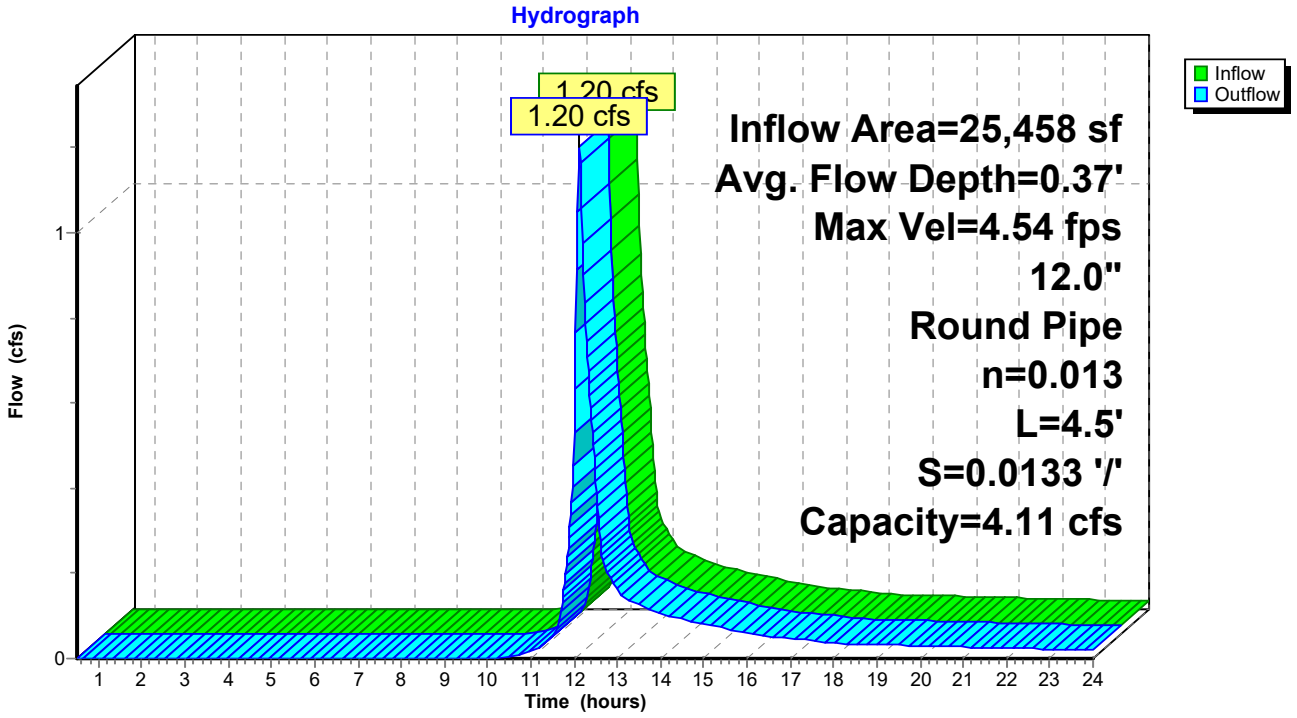
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.54 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.82 fps, Avg. Travel Time= 0.0 min

Peak Storage= 1 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.11 cfs

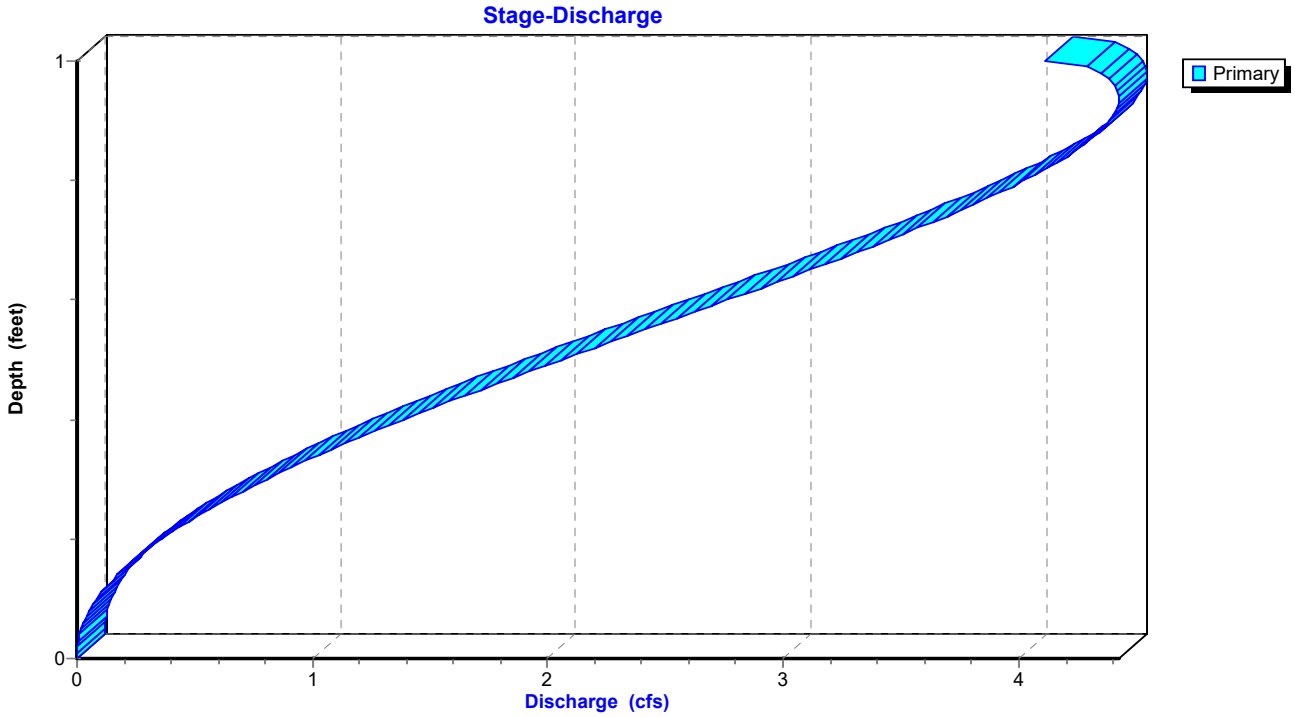
12.0" Round Pipe
n= 0.013
Length= 4.5' Slope= 0.0133 '/'
Inlet Invert= 66.46', Outlet Invert= 66.40'



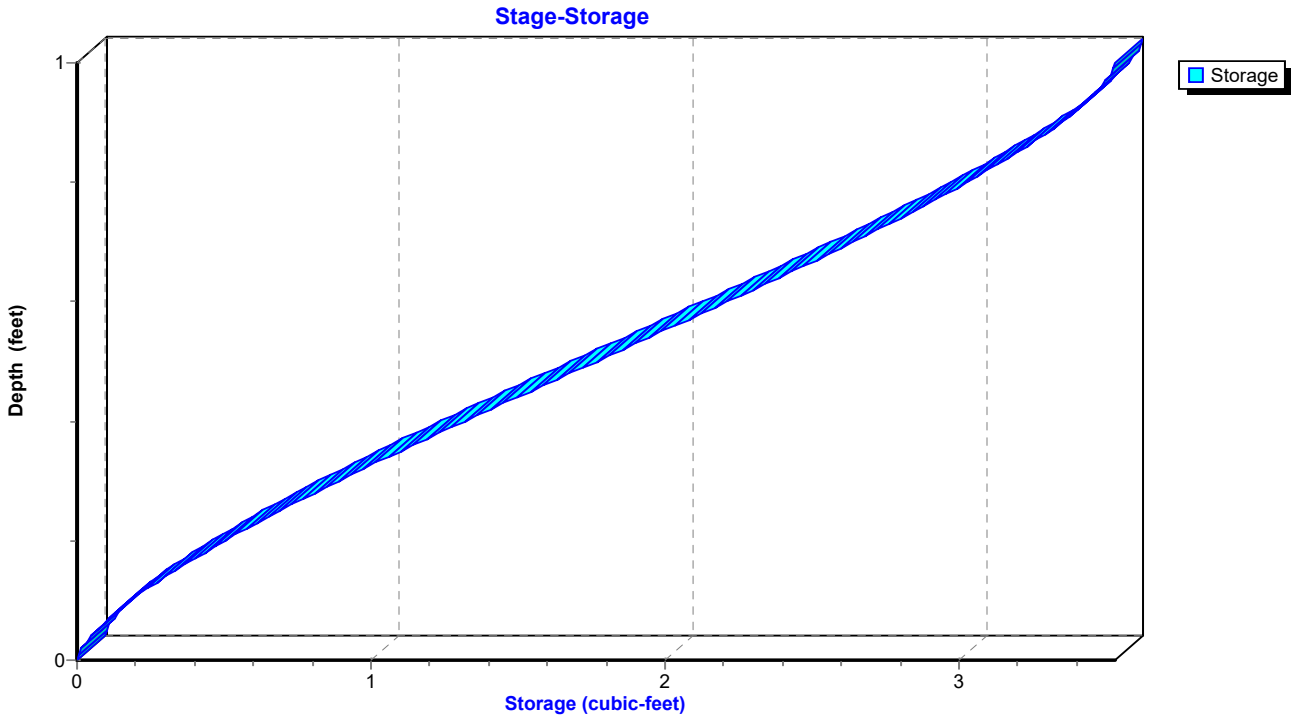
Reach 19R: CB 1



Reach 19R: CB 1



Reach 19R: CB 1



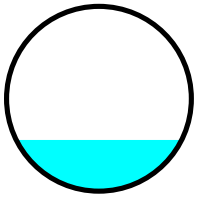
Summary for Reach 20R: DMH 3

Inflow Area = 25,458 sf, 30.88% Impervious, Inflow Depth > 1.98" for 25-Year event
Inflow = 1.20 cfs @ 12.13 hrs, Volume= 4,198 cf
Outflow = 1.20 cfs @ 12.13 hrs, Volume= 4,197 cf, Atten= 0%, Lag= 0.1 min

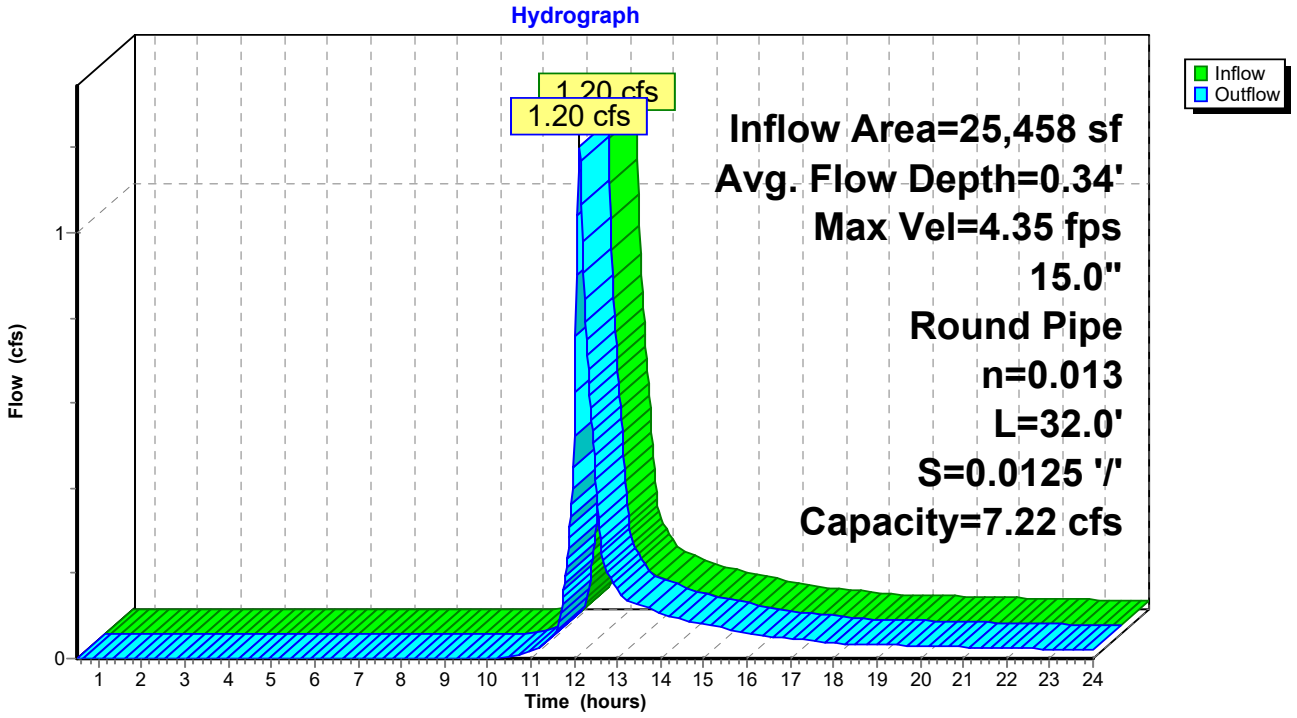
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.35 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.73 fps, Avg. Travel Time= 0.3 min

Peak Storage= 9 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.22 cfs

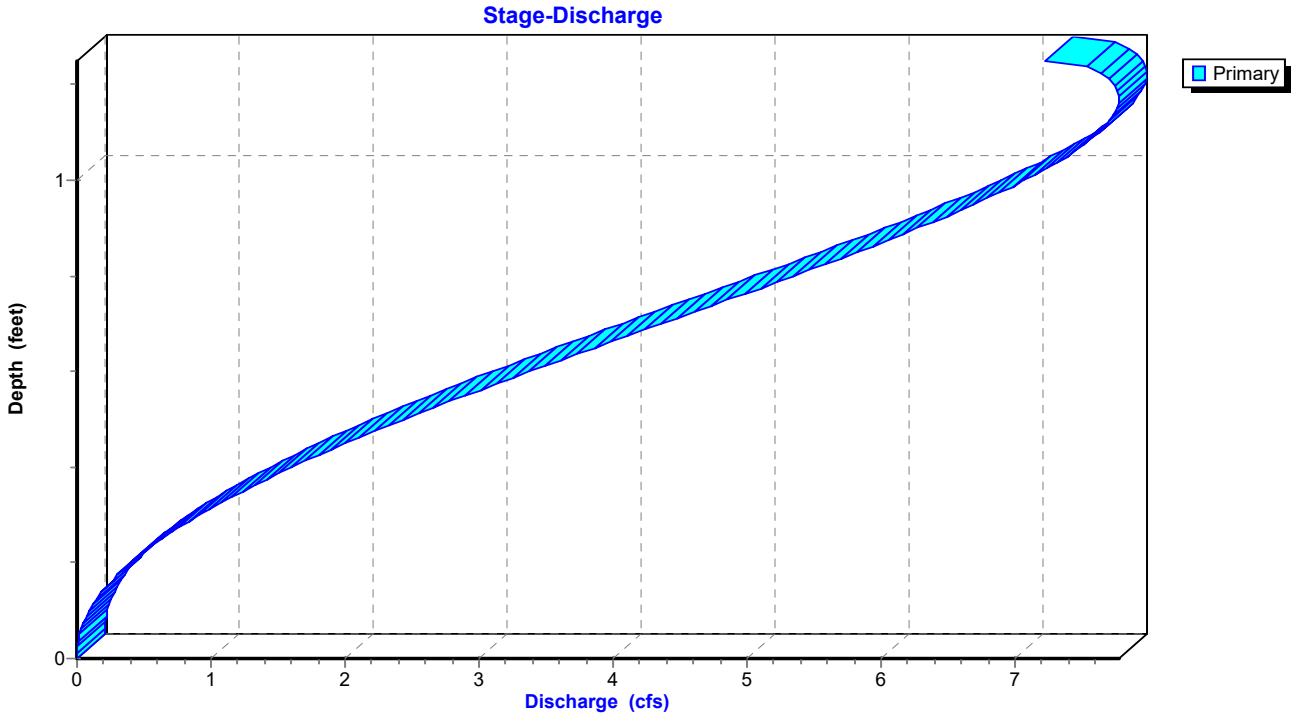
15.0" Round Pipe
n= 0.013
Length= 32.0' Slope= 0.0125 '/'
Inlet Invert= 66.40', Outlet Invert= 66.00'



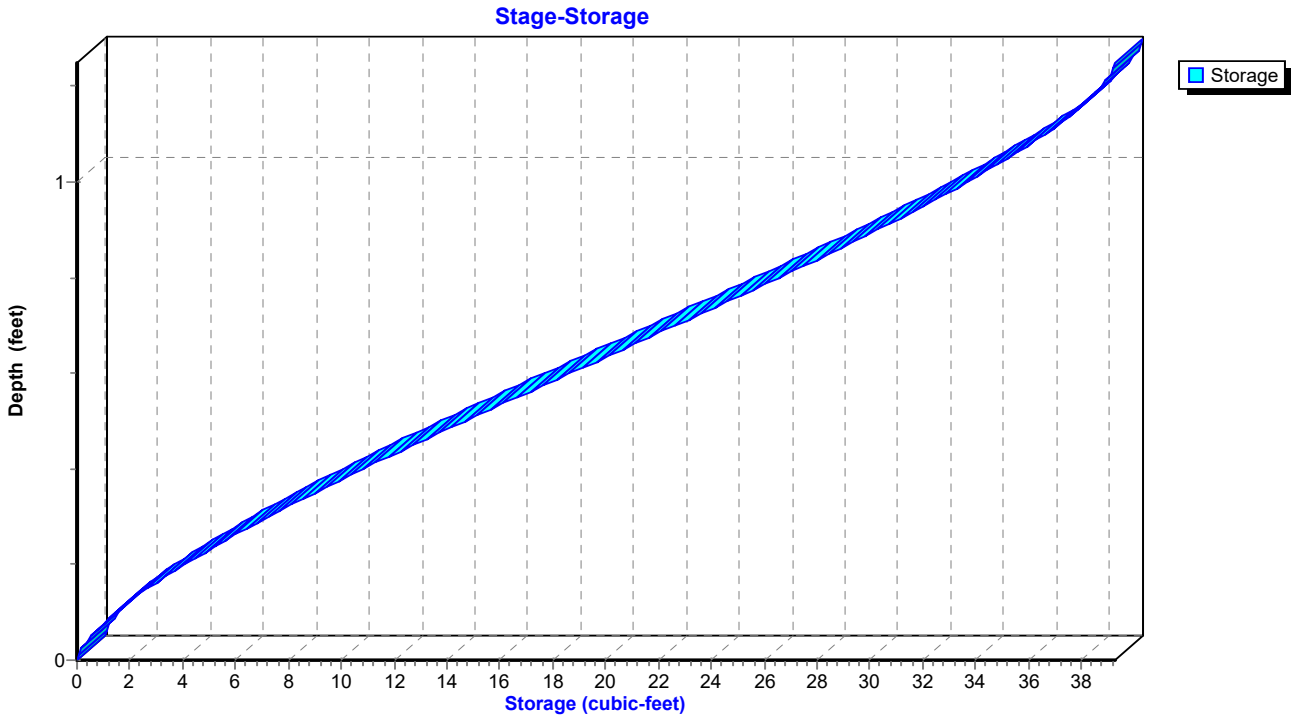
Reach 20R: DMH 3



Reach 20R: DMH 3



Reach 20R: DMH 3



Summary for Pond 11P: BASIN 1

Inflow Area = 97,841 sf, 21.60% Impervious, Inflow Depth > 1.47" for 25-Year event
Inflow = 2.53 cfs @ 12.12 hrs, Volume= 11,978 cf
Outflow = 0.77 cfs @ 12.66 hrs, Volume= 9,425 cf, Atten= 70%, Lag= 32.4 min
Discarded = 0.15 cfs @ 12.66 hrs, Volume= 6,647 cf
Primary = 0.62 cfs @ 12.66 hrs, Volume= 2,778 cf

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Peak Elev= 65.94' @ 12.66 hrs Surf.Area= 2,649 sf Storage= 4,115 cf

Plug-Flow detention time= 195.6 min calculated for 9,417 cf (79% of inflow)
Center-of-Mass det. time= 109.6 min (971.8 - 862.1)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	10,880 cf	**Custom Stage Data (Prismatic)**Listed below

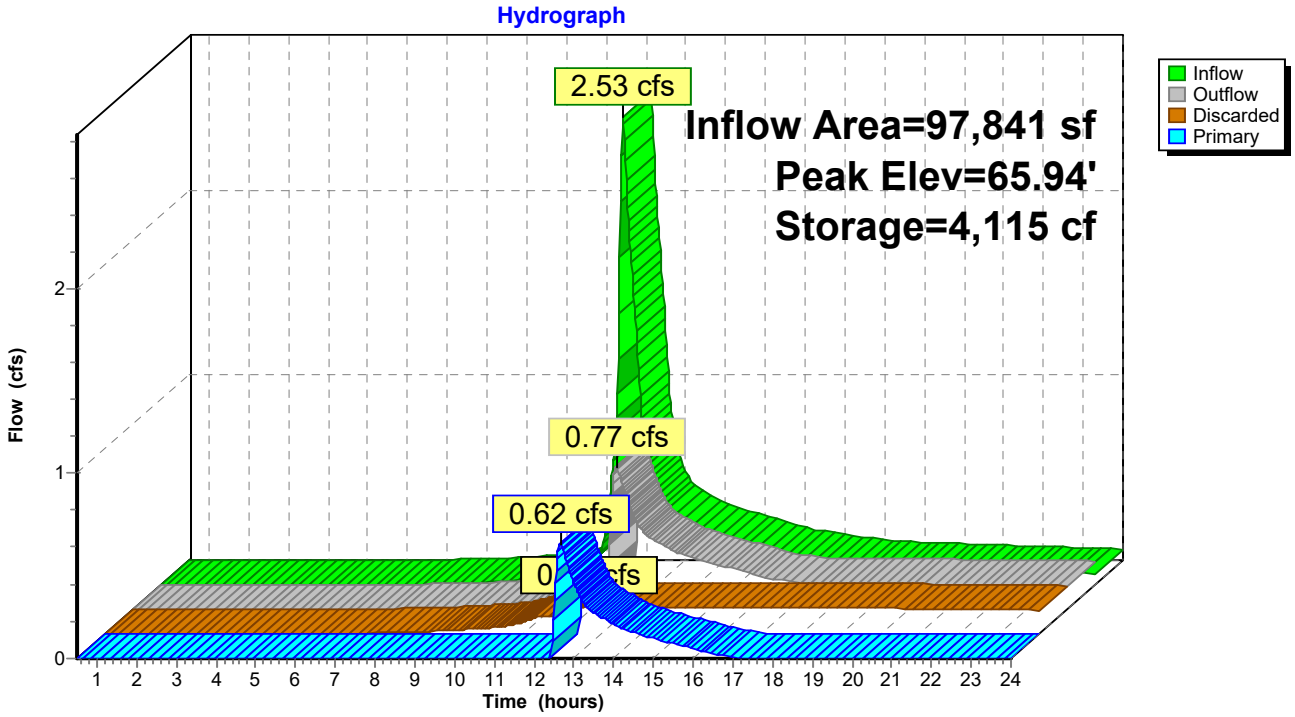
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	1,611	0	0
64.50	1,857	867	867
65.00	2,118	994	1,861
65.50	2,392	1,128	2,988
66.00	2,681	1,268	4,257
66.50	2,984	1,416	5,673
67.00	3,301	1,571	7,244
67.50	3,632	1,733	8,977
68.00	3,977	1,902	10,880

Device	Routing	Invert	Outlet Devices
#1	Primary	65.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	64.00'	**2.410 in/hr Exfiltration over Surface area**

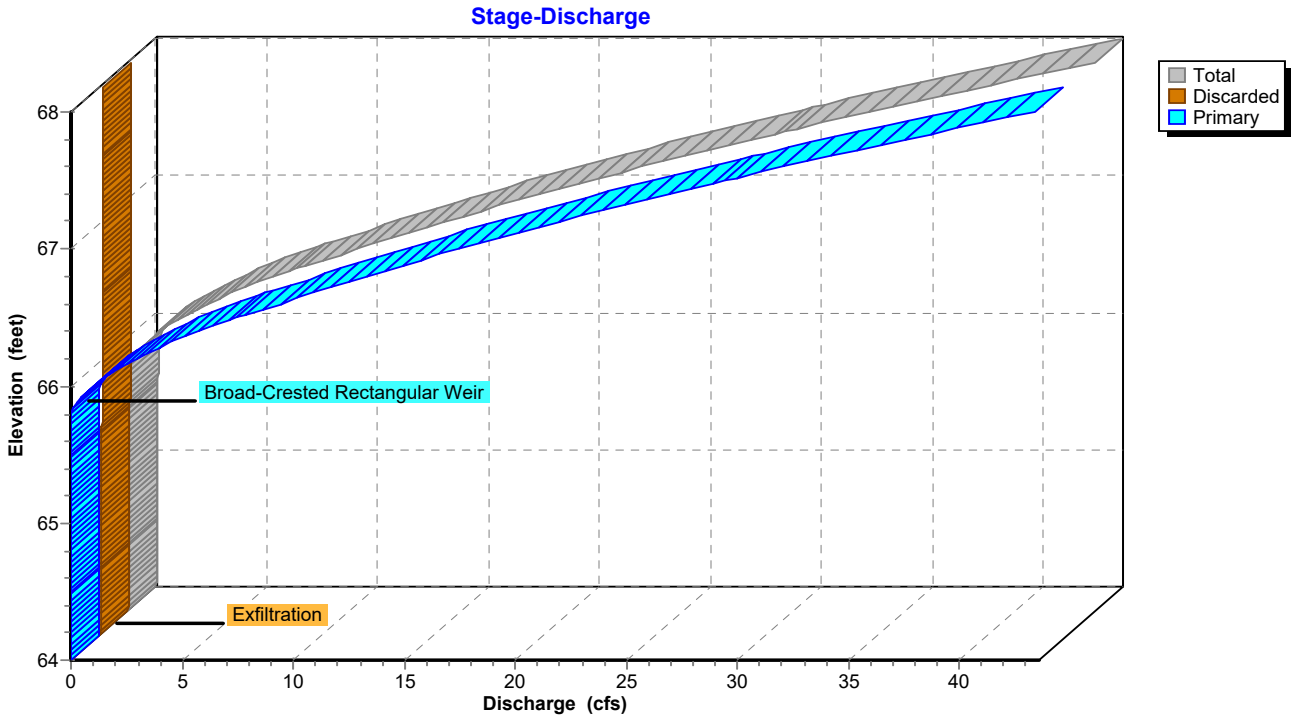
Discarded OutFlow Max=0.15 cfs @ 12.66 hrs HW=65.94' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.61 cfs @ 12.66 hrs HW=65.94' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.61 cfs @ 1.06 fps)

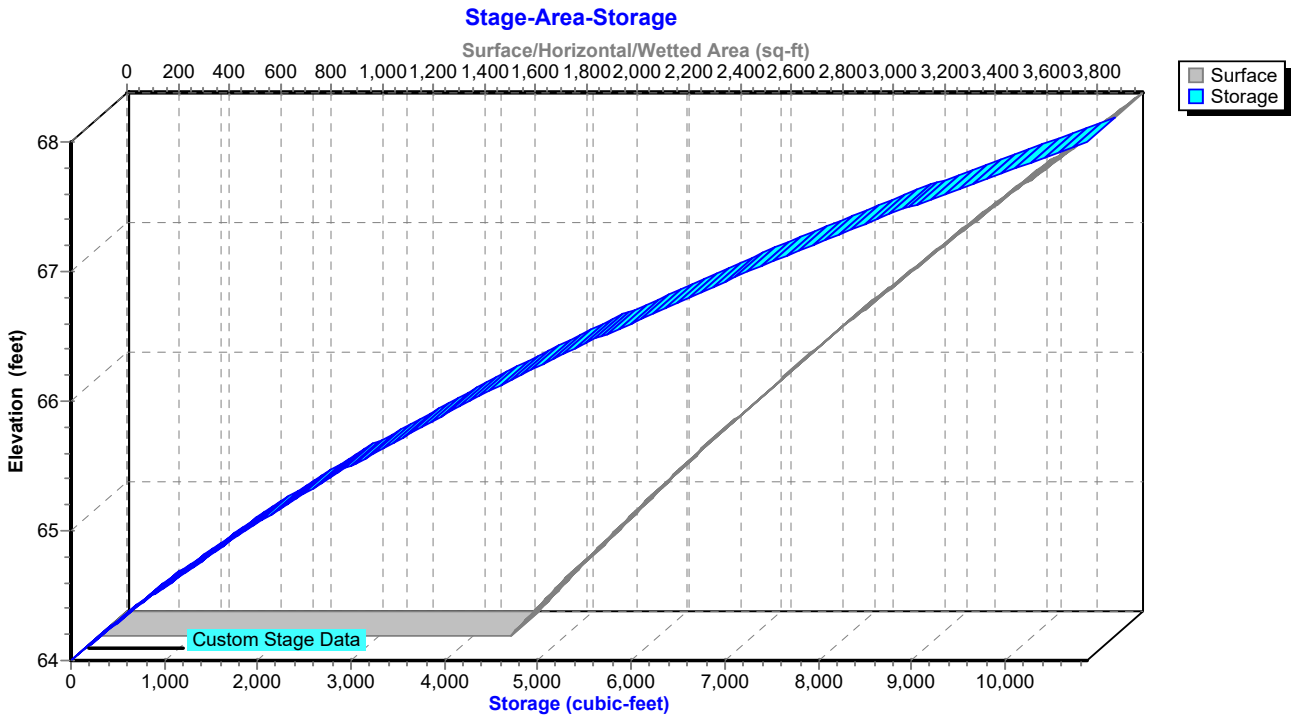
Pond 11P: BASIN 1



Pond 11P: BASIN 1



Pond 11P: BASIN 1



Summary for Pond 13P: BASIN 2

Inflow Area = 94,590 sf, 26.60% Impervious, Inflow Depth > 1.65" for 25-Year event
Inflow = 2.84 cfs @ 12.17 hrs, Volume= 13,042 cf
Outflow = 0.55 cfs @ 13.02 hrs, Volume= 11,982 cf, Atten= 81%, Lag= 50.5 min
Discarded = 0.19 cfs @ 13.02 hrs, Volume= 7,816 cf
Primary = 0.35 cfs @ 13.02 hrs, Volume= 4,167 cf

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Peak Elev= 66.68' @ 13.02 hrs Surf.Area= 3,489 sf Storage= 4,688 cf

Plug-Flow detention time= 153.1 min calculated for 11,982 cf (92% of inflow)
Center-of-Mass det. time= 112.7 min (981.2 - 868.5)

Volume	Invert	Avail.Storage	Storage Description
#1	65.10'	9,910 cf	**Custom Stage Data (Prismatic)**Listed below

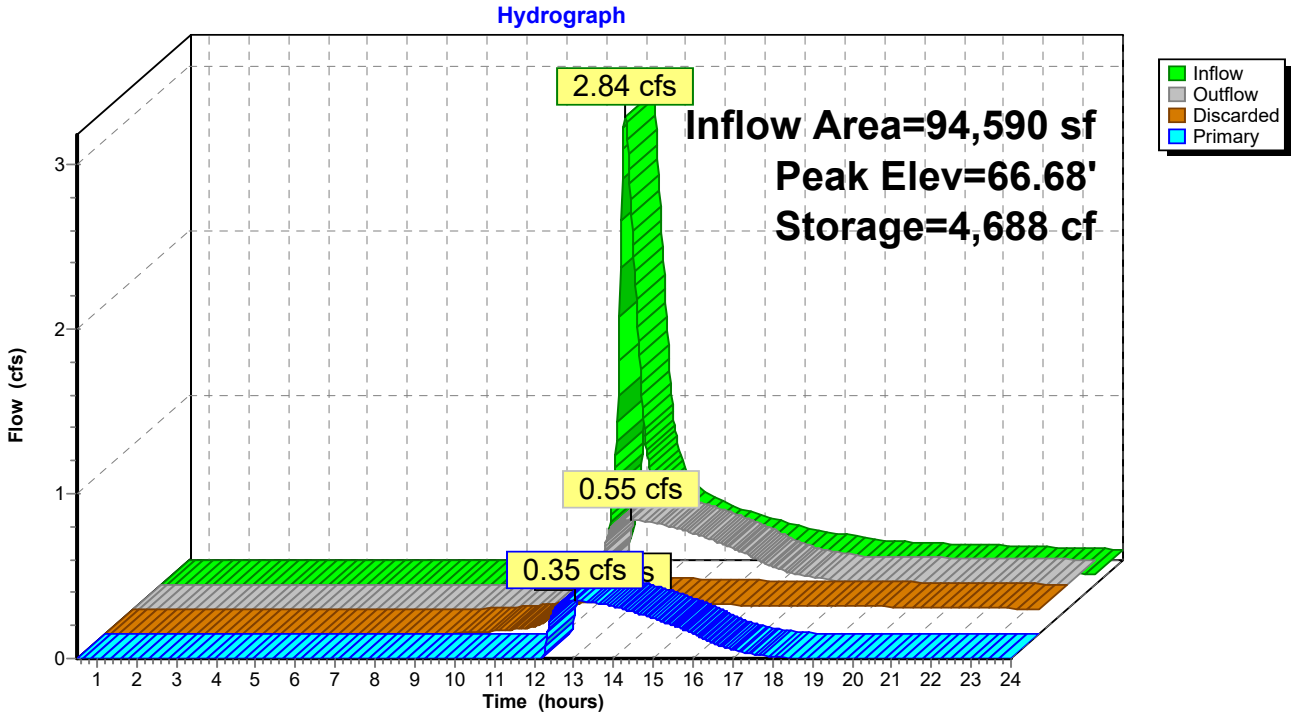
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.10	2,409	0	0
65.50	2,714	1,025	1,025
66.00	3,033	1,437	2,461
66.50	3,366	1,600	4,061
67.00	3,714	1,770	5,831
67.50	4,075	1,947	7,778
68.00	4,451	2,132	9,910

Device	Routing	Invert	Outlet Devices
#1	Primary	67.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	65.10'	**2.410 in/hr Exfiltration over Surface area**
#3	Primary	66.00'	**3.0" Vert. Orifice/Grate X 2.00** C= 0.600

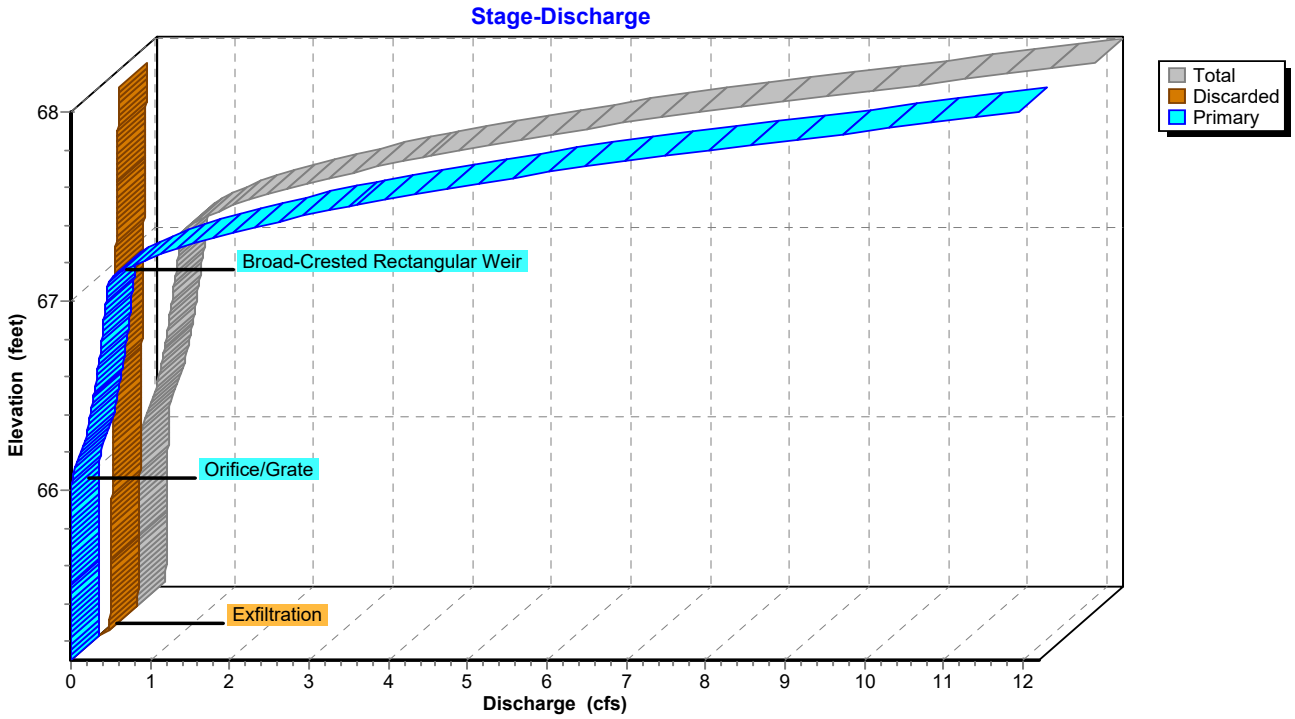
Discarded OutFlow Max=0.19 cfs @ 13.02 hrs HW=66.68' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.35 cfs @ 13.02 hrs HW=66.68' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Orifice Controls 0.35 cfs @ 3.58 fps)

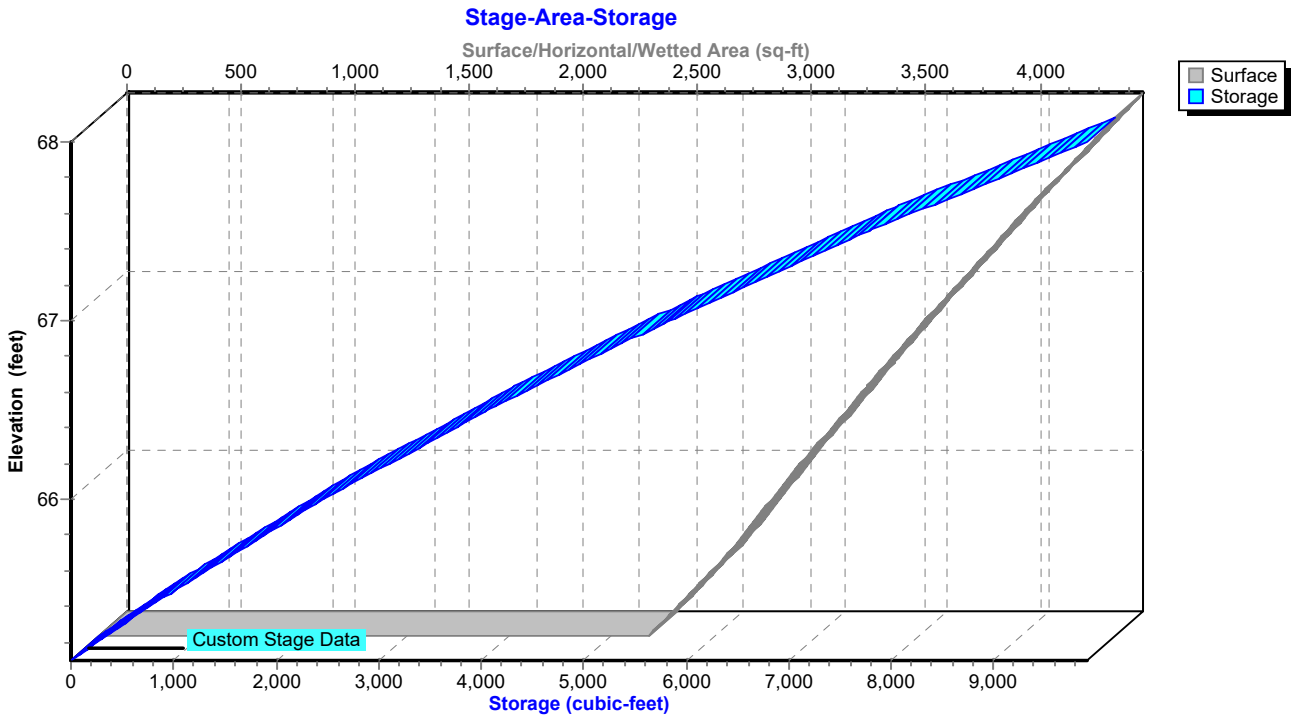
Pond 13P: BASIN 2



Pond 13P: BASIN 2



Pond 13P: BASIN 2

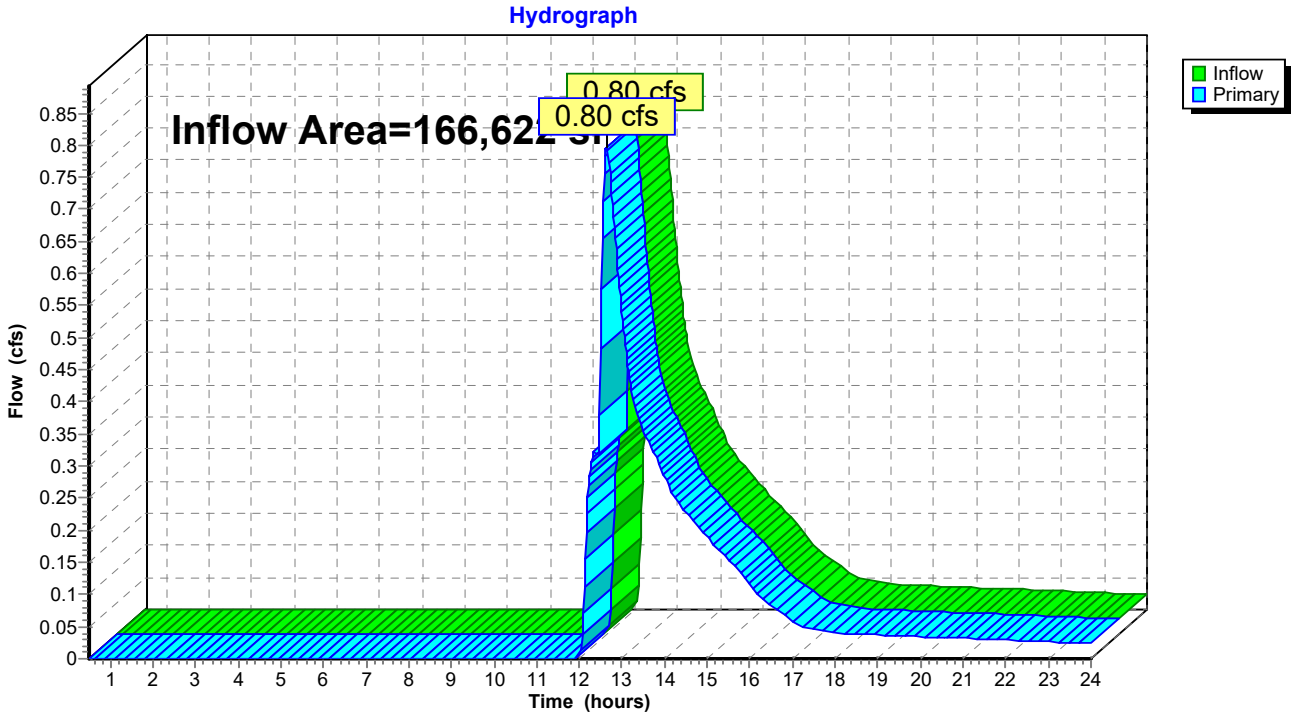


Summary for Link 12L: Southwest Wetland

Inflow Area = 166,622 sf, 13.26% Impervious, Inflow Depth > 0.40" for 25-Year event
Inflow = 0.80 cfs @ 12.64 hrs, Volume= 5,516 cf
Primary = 0.80 cfs @ 12.64 hrs, Volume= 5,516 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 12L: Southwest Wetland

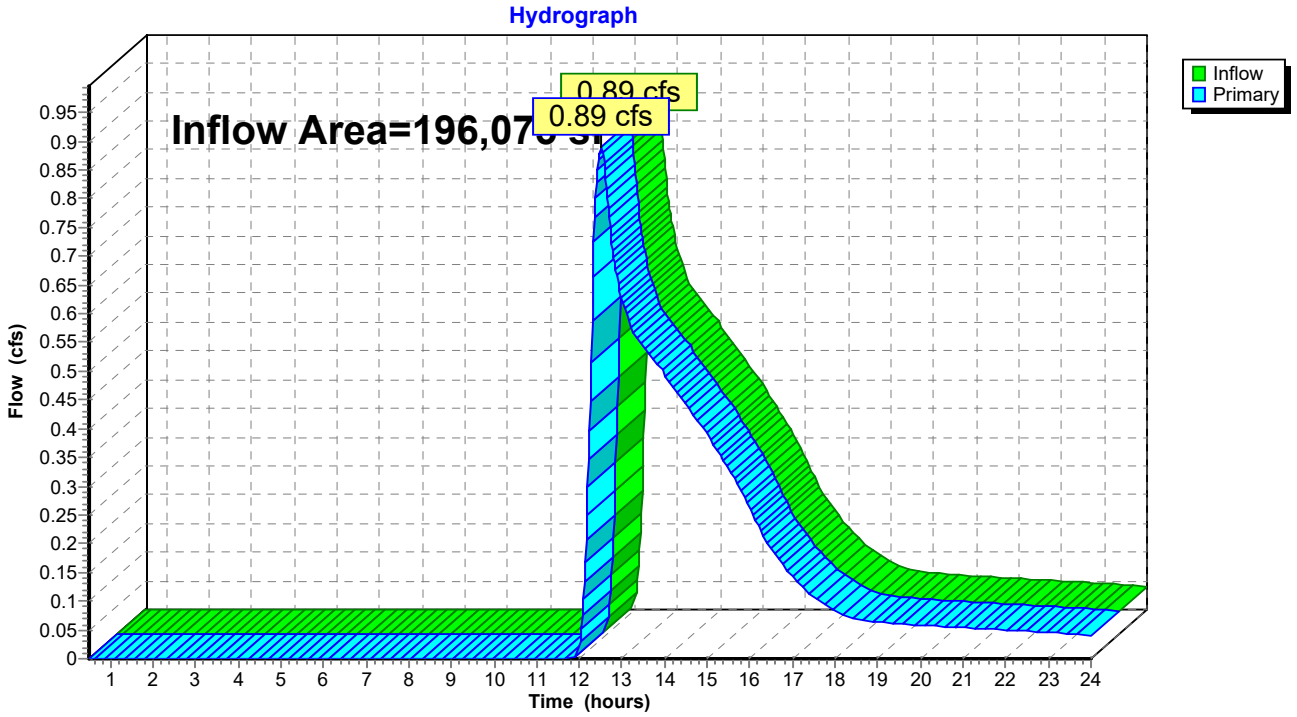


Summary for Link 14L: Northwest Wetland

Inflow Area = 196,075 sf, 15.55% Impervious, Inflow Depth > 0.56" for 25-Year event
Inflow = 0.89 cfs @ 12.50 hrs, Volume= 9,188 cf
Primary = 0.89 cfs @ 12.50 hrs, Volume= 9,188 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 14L: Northwest Wetland



Time span=0.50-24.00 hrs, dt=0.02 hrs, 1176 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=20,328 sf 0.00% Impervious Runoff Depth>1.15"
Flow Length=319' Tc=10.0 min CN=44 Runoff=0.39 cfs 1,950 cf

Subcatchment 2: Subcat 2 Runoff Area=25,458 sf 30.88% Impervious Runoff Depth>3.00"
Flow Length=288' Tc=8.4 min CN=64 Runoff=1.86 cfs 6,356 cf

Subcatchment 3: Subcat 3 Runoff Area=61,448 sf 8.33% Impervious Runoff Depth>1.48"
Flow Length=311' Tc=16.0 min CN=48 Runoff=1.49 cfs 7,597 cf

Subcatchment 4: Subcat 4 Runoff Area=48,453 sf 1.98% Impervious Runoff Depth>0.91"
Flow Length=187' Tc=9.0 min CN=41 Runoff=0.63 cfs 3,693 cf

Subcatchment 5: Subcat 5 Runoff Area=67,517 sf 23.01% Impervious Runoff Depth>2.30"
Flow Length=455' Tc=14.9 min CN=57 Runoff=3.00 cfs 12,965 cf

Subcatchment 6: Subcat 6 Runoff Area=95,238 sf 5.26% Impervious Runoff Depth>1.15"
Flow Length=744' Tc=18.7 min CN=44 Runoff=1.49 cfs 9,105 cf

Subcatchment 7: Subcat 7 Runoff Area=12,907 sf 18.31% Impervious Runoff Depth>2.41"
Tc=6.0 min CN=58 Runoff=0.80 cfs 2,588 cf

Subcatchment 8: Subcat 8 Runoff Area=6,248 sf 5.00% Impervious Runoff Depth>1.32"
Tc=6.0 min CN=46 Runoff=0.17 cfs 686 cf

Subcatchment 9: Subcat 9 Runoff Area=14,166 sf 51.29% Impervious Runoff Depth>4.04"
Flow Length=137' Tc=8.6 min CN=74 Runoff=1.41 cfs 4,764 cf

Subcatchment 10: Subcat 10 Runoff Area=10,935 sf 74.50% Impervious Runoff Depth>5.25"
Tc=6.0 min CN=85 Runoff=1.50 cfs 4,782 cf

Reach 15R: CB 6 Avg. Flow Depth=0.44' Max Vel=4.21 fps Inflow=1.41 cfs 4,764 cf
12.0" Round Pipe n=0.013 L=10.4' S=0.0096 '/' Capacity=3.49 cfs Outflow=1.41 cfs 4,764 cf

Reach 16R: CB 5 Avg. Flow Depth=1.00' Max Vel=2.89 fps Inflow=3.00 cfs 12,965 cf
12.0" Round Pipe n=0.013 L=32.0' S=0.0031 '/' Capacity=1.99 cfs Outflow=2.22 cfs 12,964 cf

Reach 17R: DMH 7 Avg. Flow Depth=0.56' Max Vel=6.45 fps Inflow=3.40 cfs 17,728 cf
15.0" Round Pipe n=0.013 L=24.0' S=0.0167 '/' Capacity=8.34 cfs Outflow=3.41 cfs 17,727 cf

Reach 18R: CB 2 Avg. Flow Depth=0.63' Max Vel=2.90 fps Inflow=1.50 cfs 4,782 cf
12.0" Round Pipe n=0.013 L=17.3' S=0.0035 '/' Capacity=2.10 cfs Outflow=1.50 cfs 4,782 cf

Reach 19R: CB 1 Avg. Flow Depth=0.47' Max Vel=5.11 fps Inflow=1.86 cfs 6,356 cf
12.0" Round Pipe n=0.013 L=4.5' S=0.0133 '/' Capacity=4.11 cfs Outflow=1.86 cfs 6,356 cf

Reach 20R: DMH 3 Avg. Flow Depth=0.43' Max Vel=4.93 fps Inflow=1.86 cfs 6,356 cf
15.0" Round Pipe n=0.013 L=32.0' S=0.0125 '/' Capacity=7.22 cfs Outflow=1.86 cfs 6,355 cf

Pond 11P: BASIN 1 Peak Elev=66.16' Storage=4,719 cf Inflow=4.16 cfs 18,734 cf
Discarded=0.16 cfs 7,086 cf Primary=2.54 cfs 8,384 cf Outflow=2.69 cfs 15,469 cf

Pond 13P: BASIN 2 Peak Elev=67.34' Storage=7,140 cf Inflow=4.17 cfs 20,314 cf
Discarded=0.22 cfs 8,620 cf Primary=1.82 cfs 9,833 cf Outflow=2.04 cfs 18,453 cf

Link 12L: Southwest Wetland Inflow=3.35 cfs 14,027 cf
Primary=3.35 cfs 14,027 cf

Link 14L: Northwest Wetland Inflow=2.61 cfs 19,624 cf
Primary=2.61 cfs 19,624 cf

Total Runoff Area = 362,697 sf Runoff Volume = 54,487 cf Average Runoff Depth = 1.80"
85.50% Pervious = 310,124 sf 14.50% Impervious = 52,574 sf

Summary for Subcatchment 1: Subcat 1

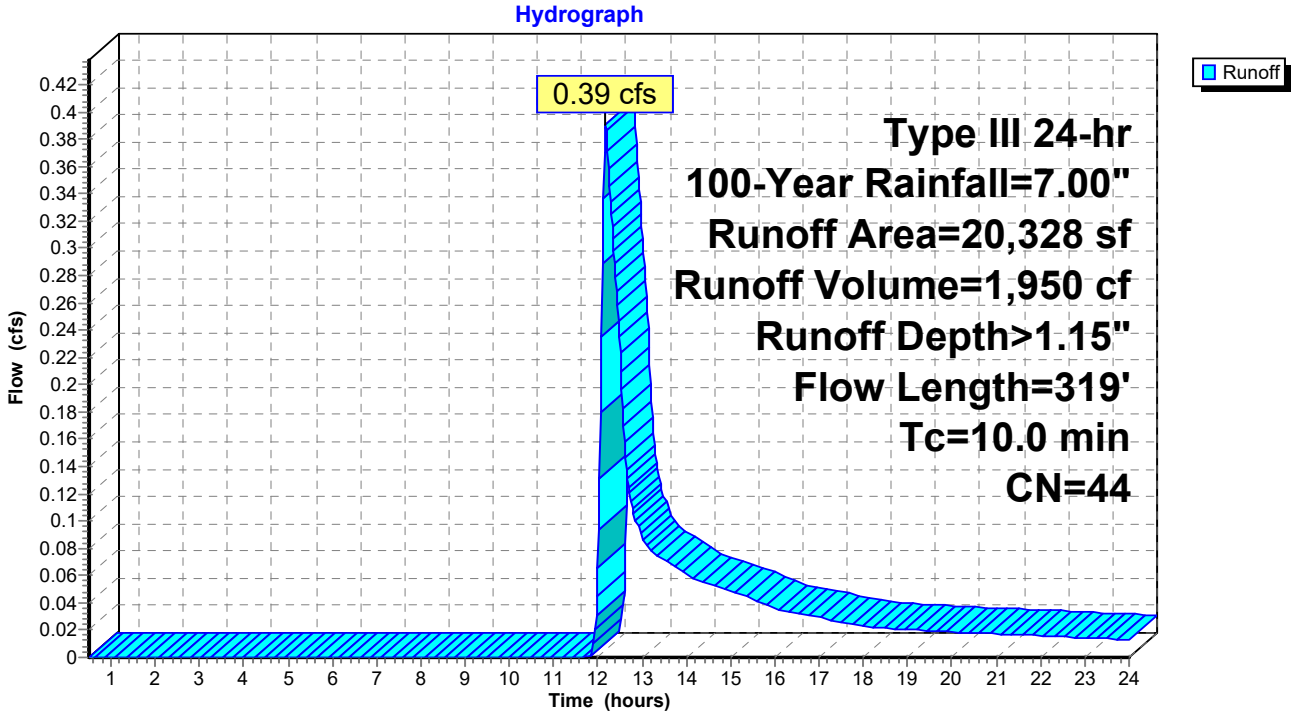
Runoff = 0.39 cfs @ 12.18 hrs, Volume= 1,950 cf, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
12,105	49	50-75% Grass cover, Fair, HSG A
8,223	36	Woods, Fair, HSG A
20,328	44	Weighted Average
20,328		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.7	148	0.0510	3.64		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.9	121	0.0190	2.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	319	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

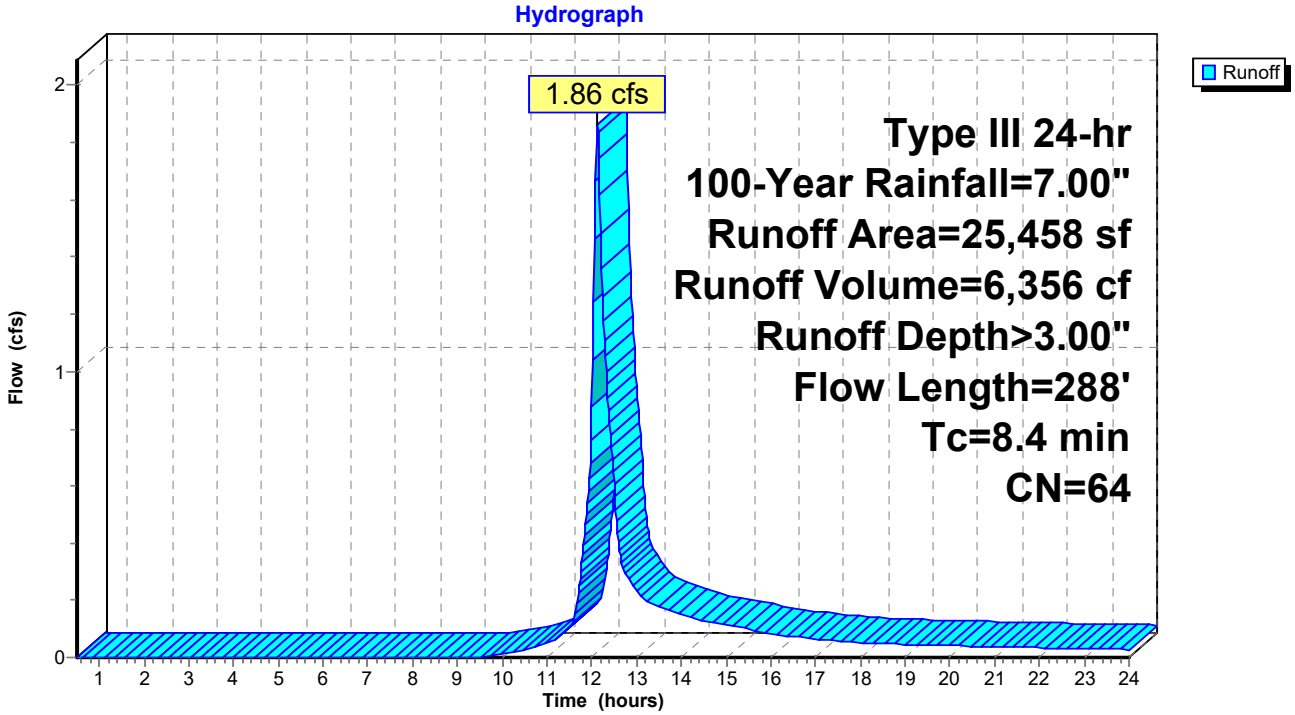
Runoff = 1.86 cfs @ 12.12 hrs, Volume= 6,356 cf, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
17,076	49	50-75% Grass cover, Fair, HSG A
7,862	98	Paved roads w/curbs & sewers, HSG A
520	36	Woods, Fair, HSG A
25,458	64	Weighted Average
17,596		69.12% Pervious Area
7,862		30.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0500	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.4	100	0.0600	3.94		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.1	138	0.0110	2.13		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.4	288	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

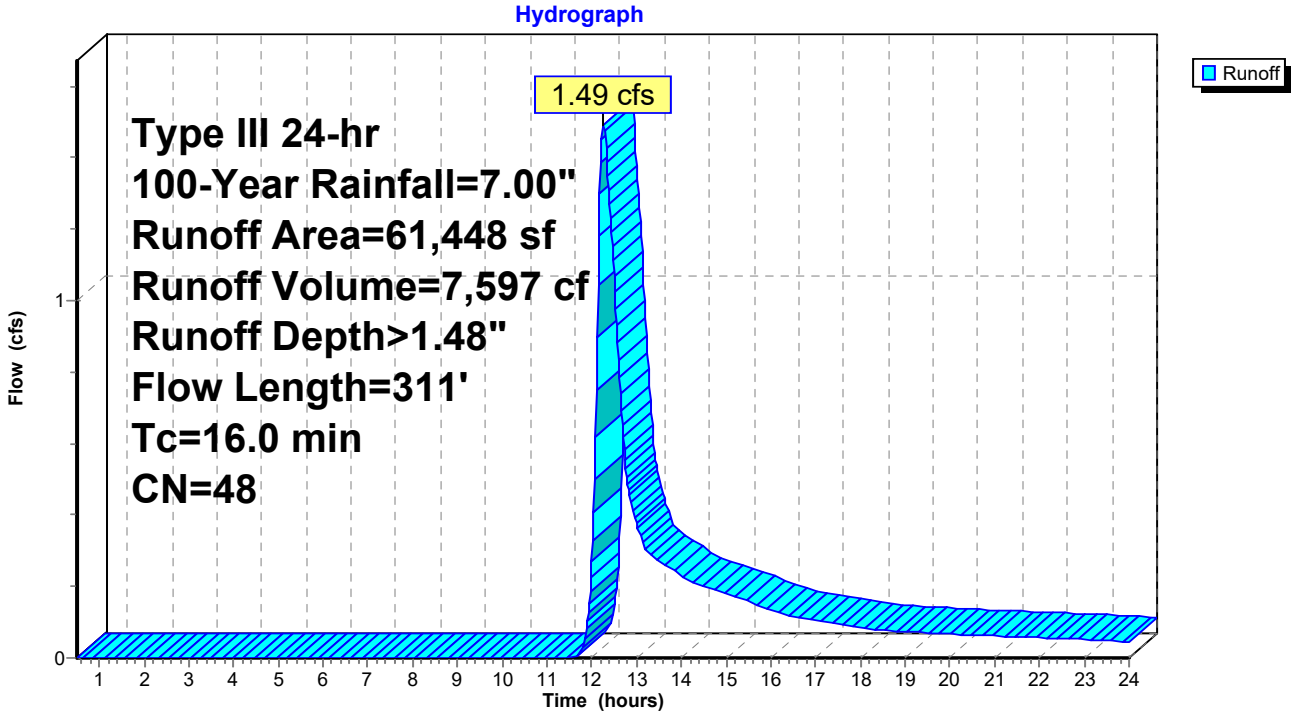
Runoff = 1.49 cfs @ 12.26 hrs, Volume= 7,597 cf, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
34,104	49	50-75% Grass cover, Fair, HSG A
3,296	98	Paved roads w/curbs & sewers, HSG A
1,826	98	Roofs, HSG A
22,223	36	Woods, Fair, HSG A
61,448	48	Weighted Average
56,327		91.67% Pervious Area
5,122		8.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
1.1	261	0.0580	3.88		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
16.0	311	Total			

Subcatchment 3: Subcat 3



Summary for Subcatchment 4: Subcat 4

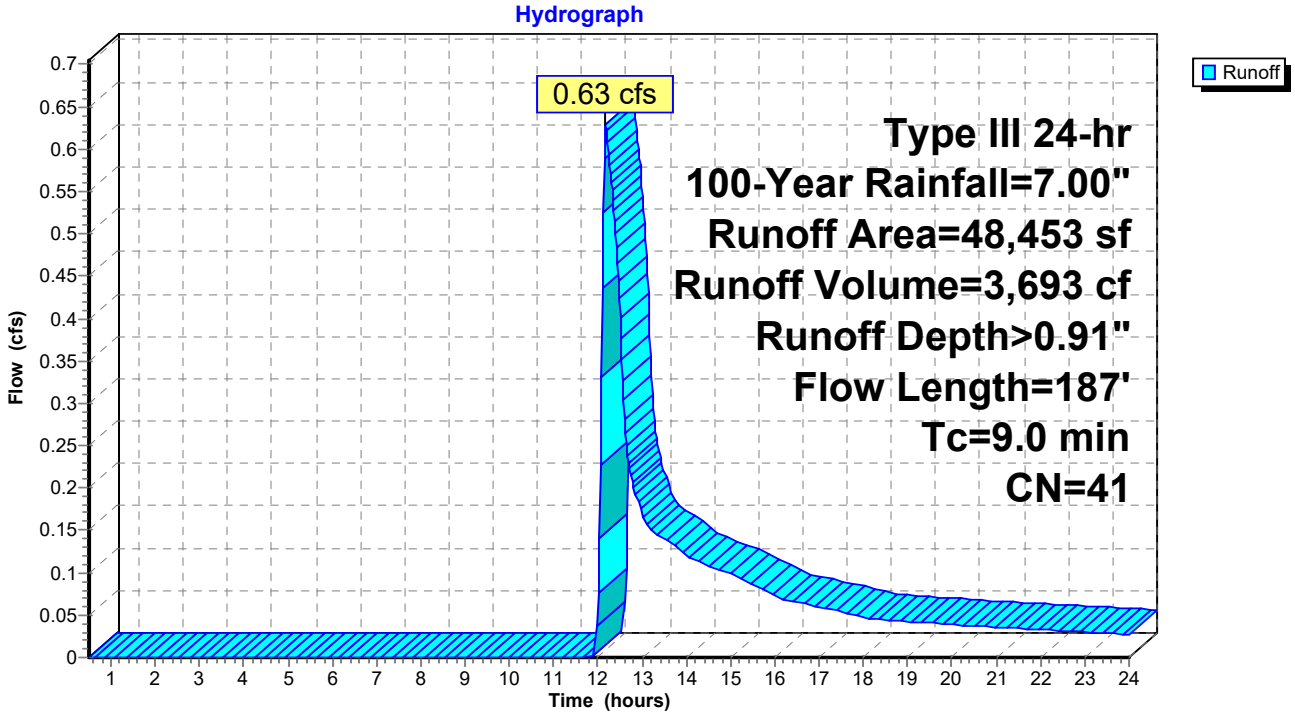
Runoff = 0.63 cfs @ 12.18 hrs, Volume= 3,693 cf, Depth> 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
12,754	49	50-75% Grass cover, Fair, HSG A
959	98	Roofs, HSG A
34,740	36	Woods, Fair, HSG A
48,453	41	Weighted Average
47,493		98.02% Pervious Area
959		1.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.0	26	0.3100	8.96		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	111	0.0410	3.26		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
9.0	187	Total			

Subcatchment 4: Subcat 4



Summary for Subcatchment 5: Subcat 5

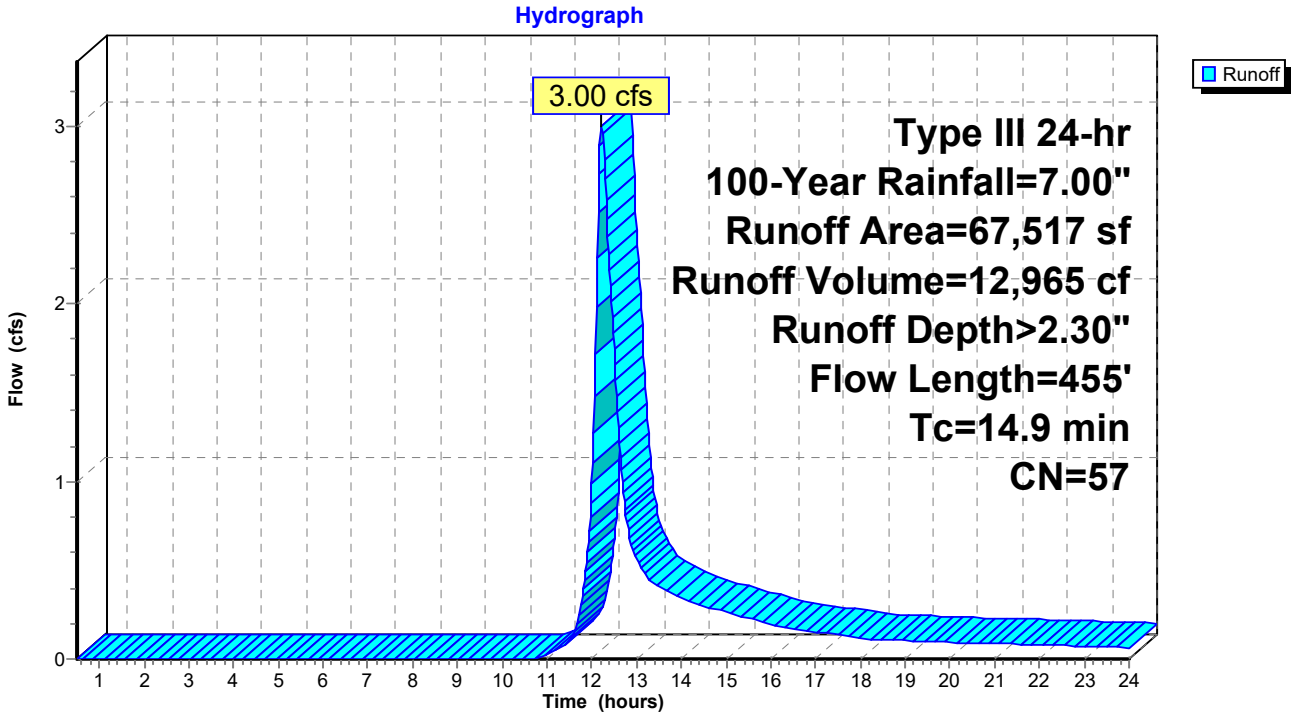
Runoff = 3.00 cfs @ 12.22 hrs, Volume= 12,965 cf, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
34,347	49	50-75% Grass cover, Fair, HSG A
10,540	98	Paved roads w/curbs & sewers, HSG A
4,994	98	Roofs, HSG A
17,636	36	Woods, Fair, HSG A
67,517	57	Weighted Average
51,983		76.99% Pervious Area
15,534		23.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0320	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
2.2	348	0.0270	2.65		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	57	0.0122	2.24		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
14.9	455	Total			

Subcatchment 5: Subcat 5



Summary for Subcatchment 6: Subcat 6

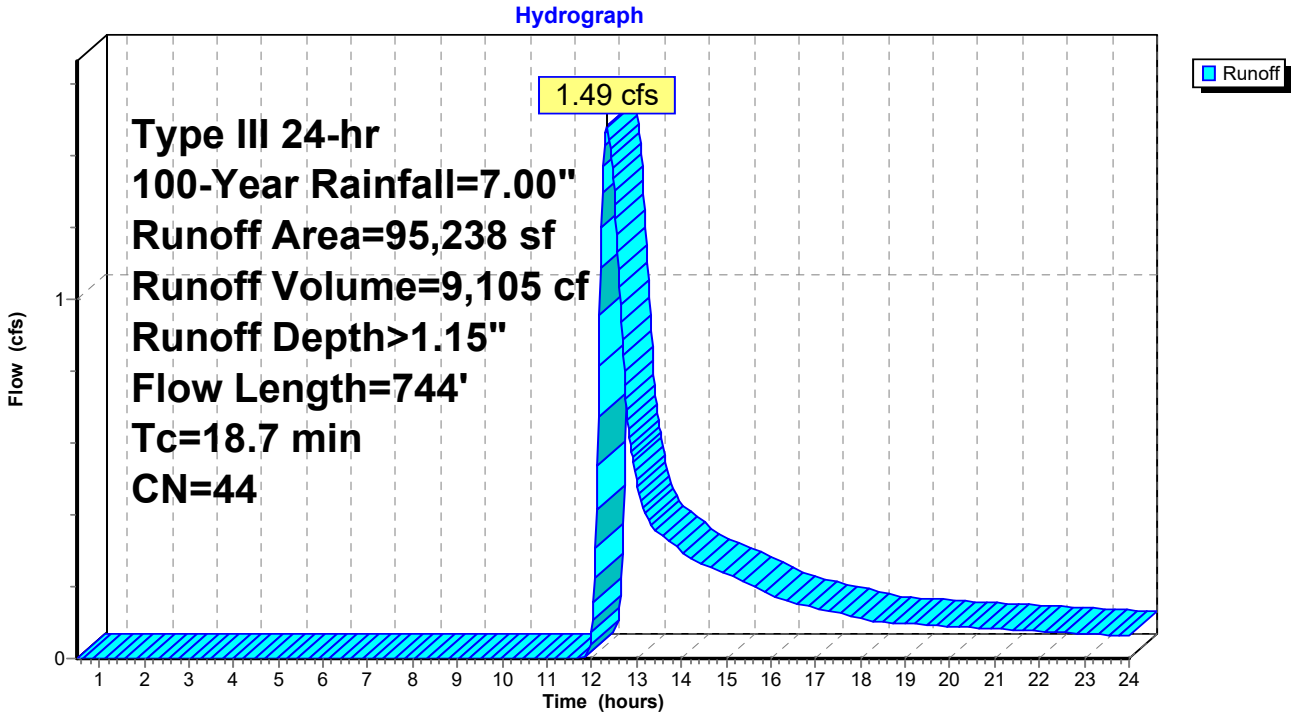
Runoff = 1.49 cfs @ 12.34 hrs, Volume= 9,105 cf, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
36,291	49	50-75% Grass cover, Fair, HSG A
2,198	98	Paved roads w/curbs & sewers, HSG A
2,810	98	Roofs, HSG A
53,938	36	Woods, Fair, HSG A
95,238	44	Weighted Average
90,229		94.74% Pervious Area
5,009		5.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	50	0.0200	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.20"
3.0	382	0.0170	2.10		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	245	0.1600	6.44		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	67	0.2100	7.38		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
18.7	744	Total			

Subcatchment 6: Subcat 6



Summary for Subcatchment 7: Subcat 7

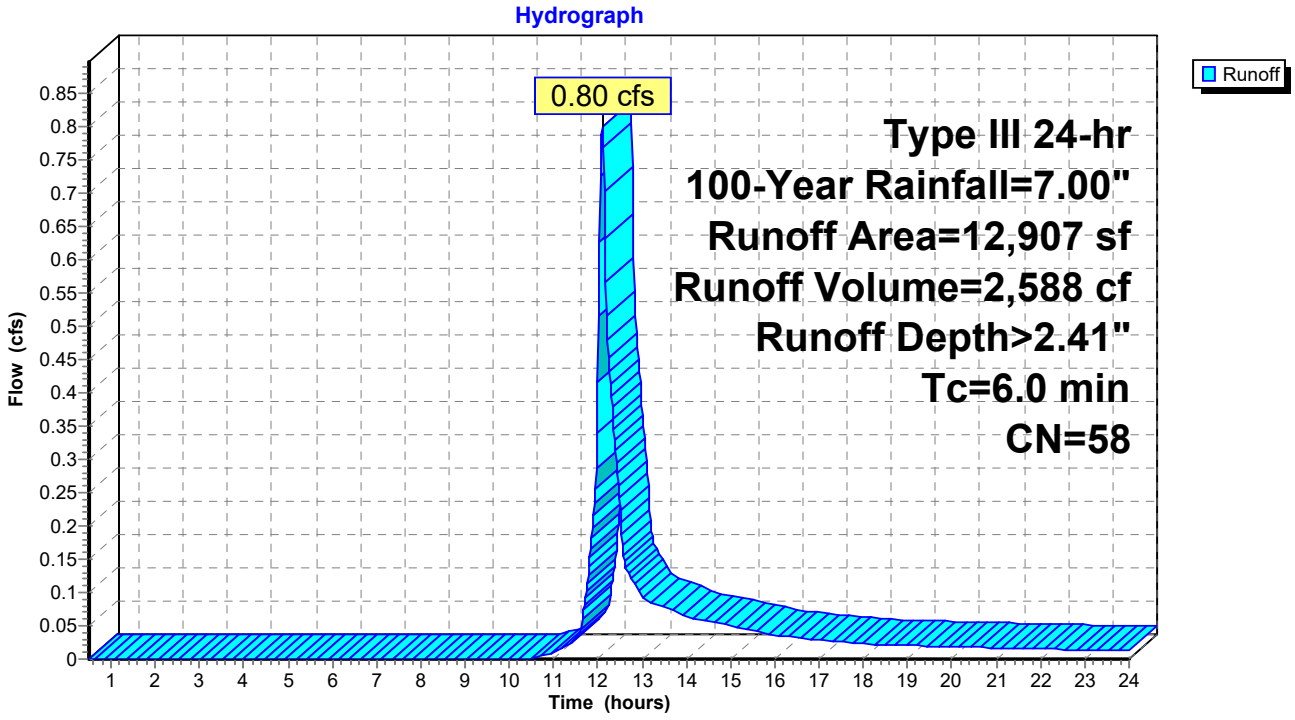
Runoff = 0.80 cfs @ 12.10 hrs, Volume= 2,588 cf, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
10,544	49	50-75% Grass cover, Fair, HSG A
1,337	98	Paved roads w/curbs & sewers, HSG A
1,026	98	Roofs, HSG A
12,907	58	Weighted Average
10,544		81.69% Pervious Area
2,363		18.31% Impervious Area

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

Subcatchment 7: Subcat 7



Summary for Subcatchment 8: Subcat 8

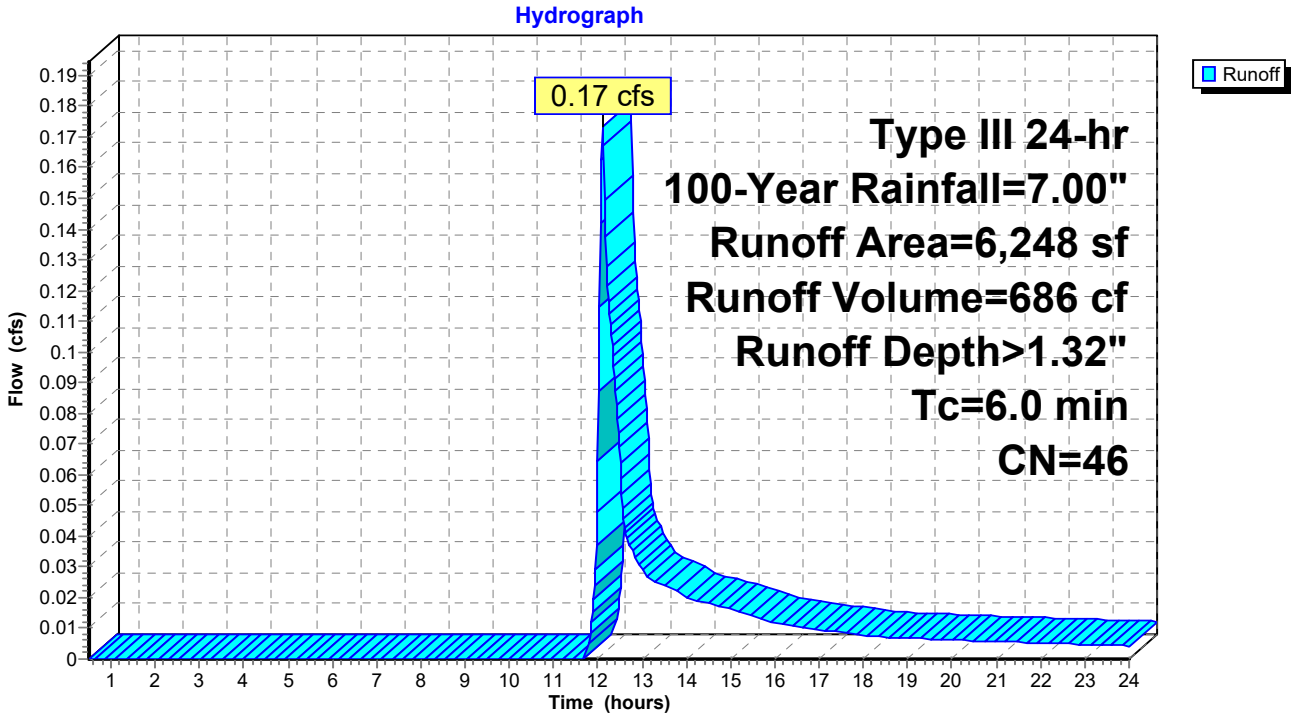
Runoff = 0.17 cfs @ 12.11 hrs, Volume= 686 cf, Depth> 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
3,110	49	50-75% Grass cover, Fair, HSG A
313	98	Roofs, HSG A
2,825	36	Woods, Fair, HSG A
6,248	46	Weighted Average
5,935		95.00% Pervious Area
313		5.00% Impervious Area

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

Subcatchment 8: Subcat 8



Summary for Subcatchment 9: Subcat 9

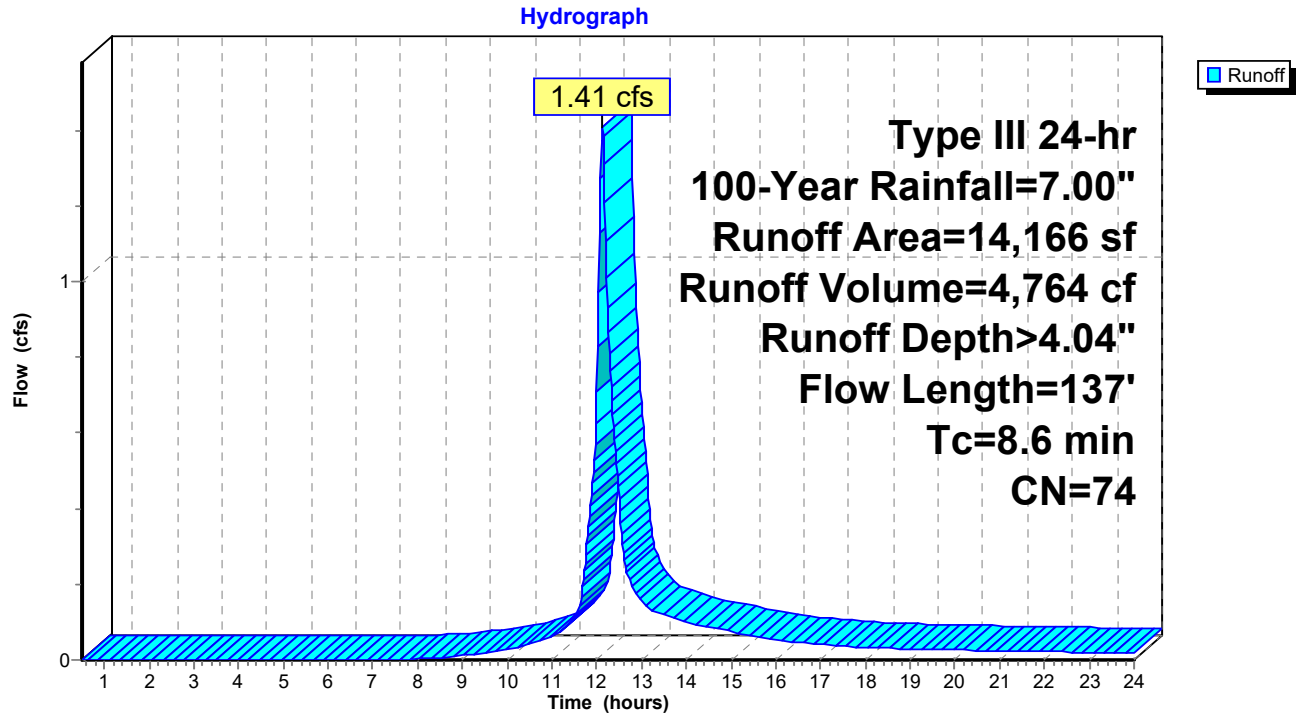
Runoff = 1.41 cfs @ 12.12 hrs, Volume= 4,764 cf, Depth> 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
6,698	49	50-75% Grass cover, Fair, HSG A
6,734	98	Paved roads w/curbs & sewers, HSG A
532	98	Roofs, HSG A
202	36	Woods, Fair, HSG A
14,166	74	Weighted Average
6,900		48.71% Pervious Area
7,266		51.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0360	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.20"
0.8	87	0.0080	1.82		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.6	137	Total			

Subcatchment 9: Subcat 9



Summary for Subcatchment 10: Subcat 10

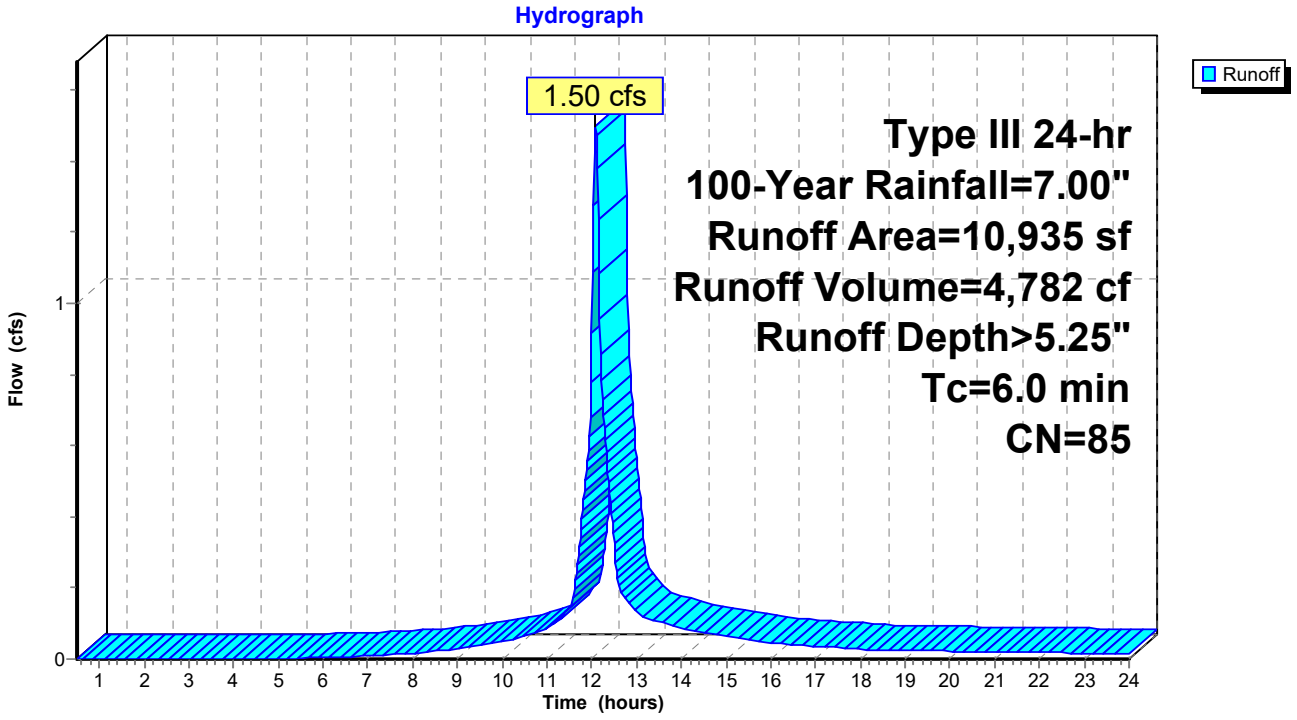
Runoff = 1.50 cfs @ 12.09 hrs, Volume= 4,782 cf, Depth> 5.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
2,766	49	50-75% Grass cover, Fair, HSG A
8,146	98	Paved roads w/curbs & sewers, HSG A
23	36	Woods, Fair, HSG A
10,935	85	Weighted Average
2,789		25.50% Pervious Area
8,146		74.50% Impervious Area

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

Subcatchment 10: Subcat 10



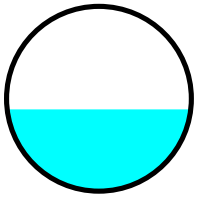
Summary for Reach 15R: CB 6

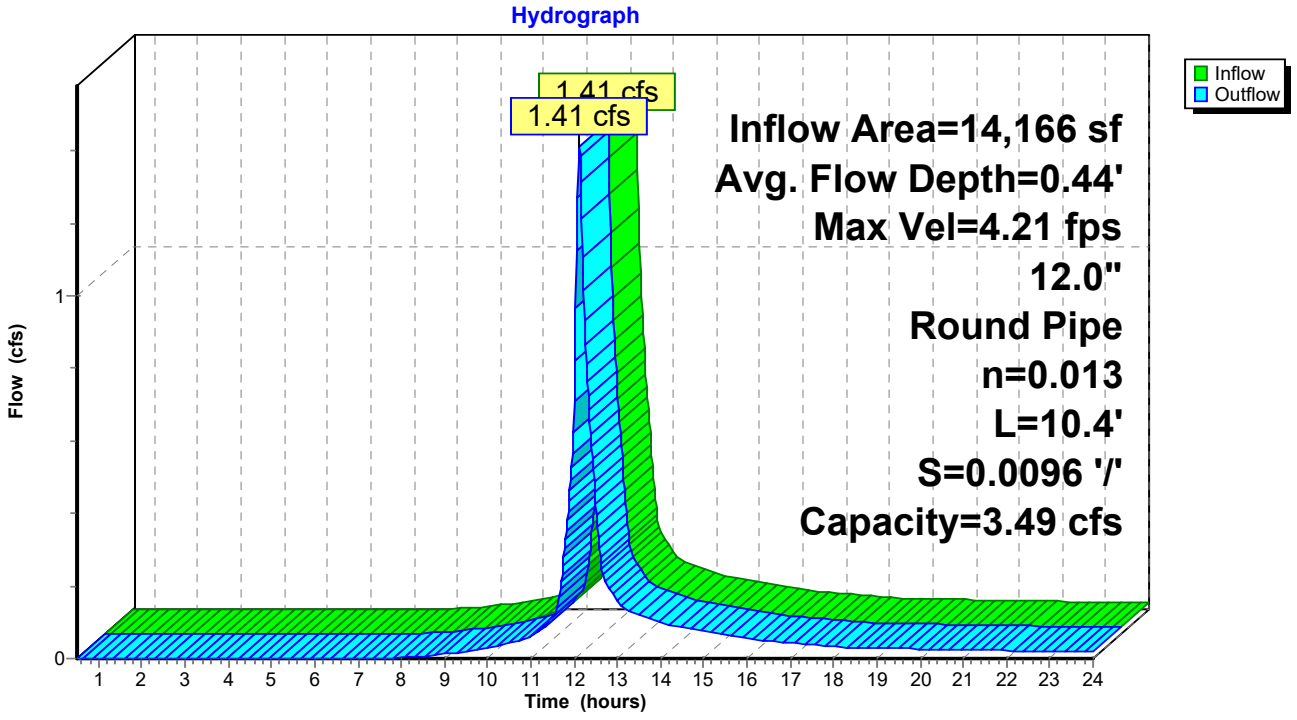
Inflow Area = 14,166 sf, 51.29% Impervious, Inflow Depth > 4.04" for 100-Year event
Inflow = 1.41 cfs @ 12.12 hrs, Volume= 4,764 cf
Outflow = 1.41 cfs @ 12.12 hrs, Volume= 4,764 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.21 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.55 fps, Avg. Travel Time= 0.1 min

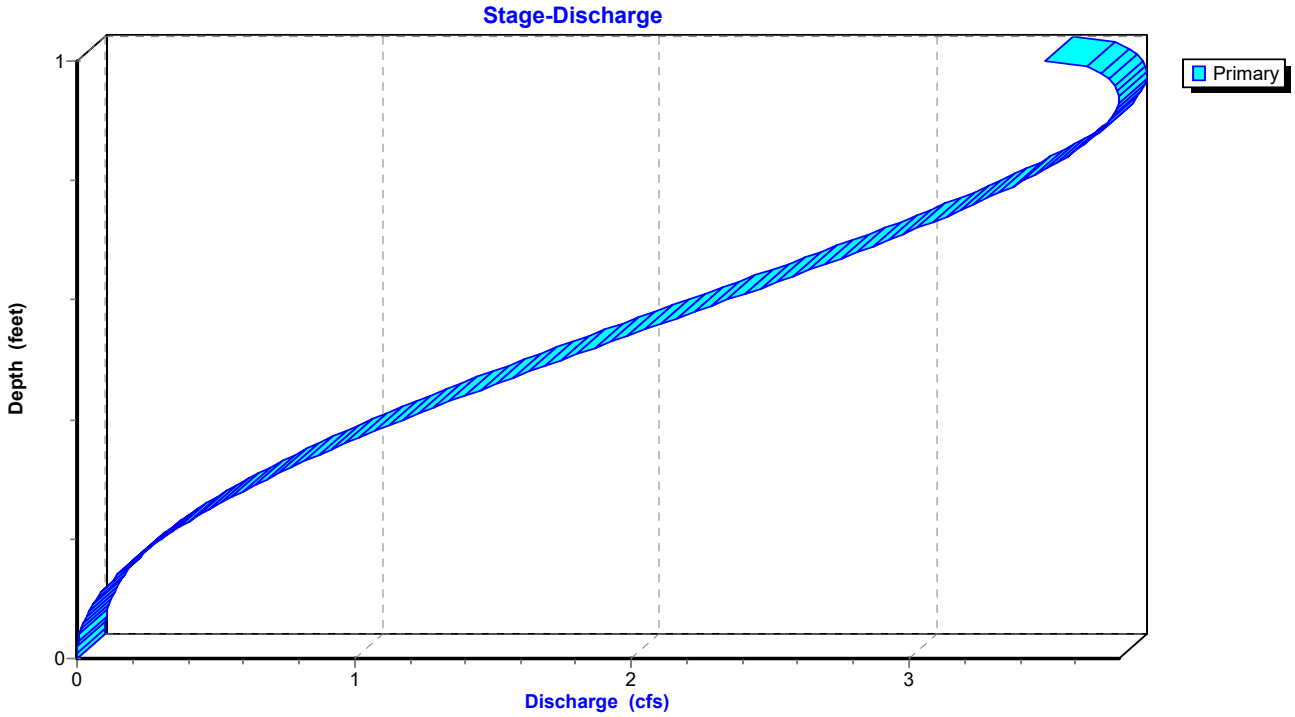
Peak Storage= 3 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.49 cfs

12.0" Round Pipe
n= 0.013
Length= 10.4' Slope= 0.0096 '/'
Inlet Invert= 67.50', Outlet Invert= 67.40'

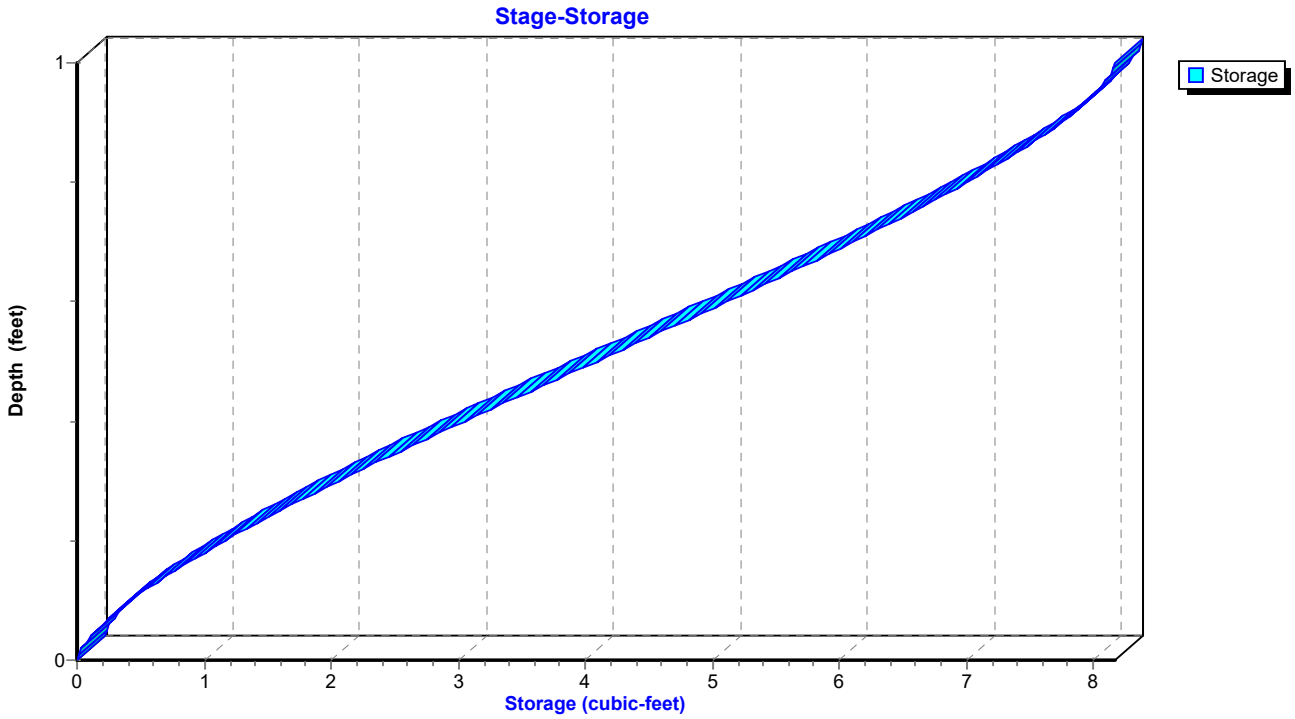




Reach 15R: CB 6



Reach 15R: CB 6



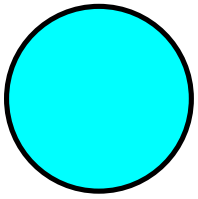
Summary for Reach 16R: CB 5

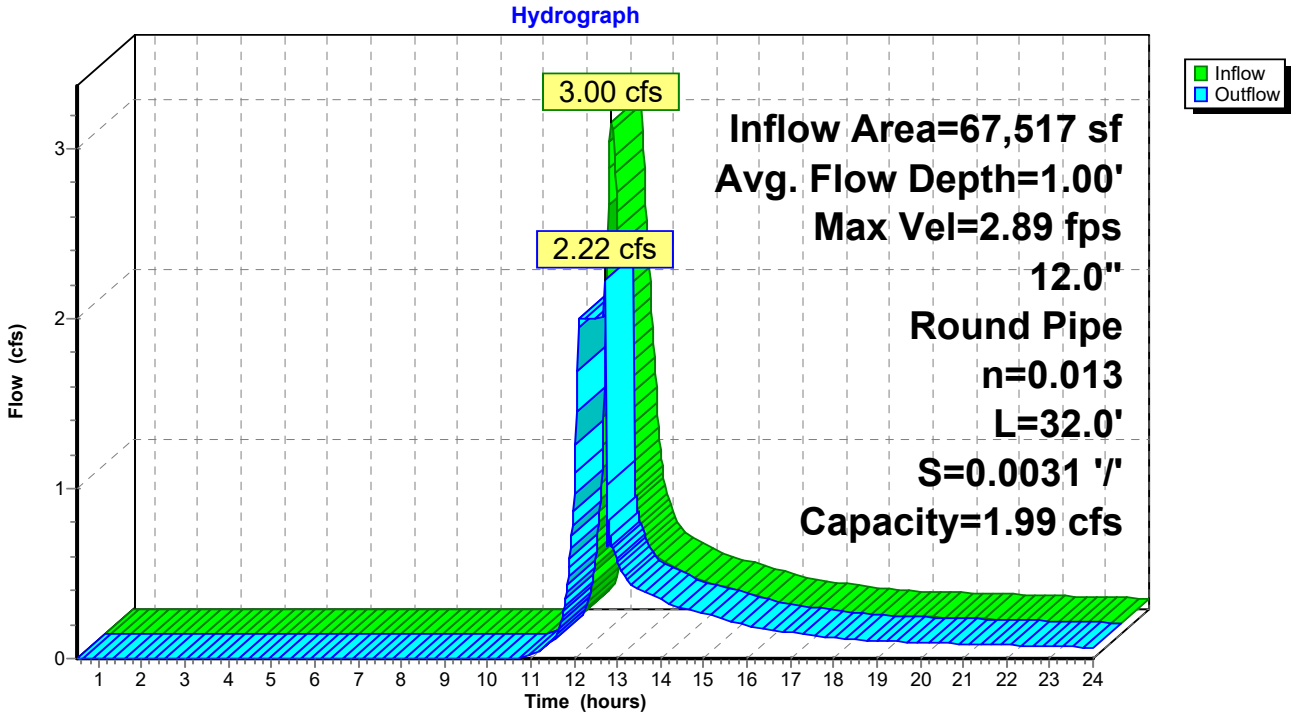
Inflow Area = 67,517 sf, 23.01% Impervious, Inflow Depth > 2.30" for 100-Year event
Inflow = 3.00 cfs @ 12.22 hrs, Volume= 12,965 cf
Outflow = 2.22 cfs @ 12.73 hrs, Volume= 12,964 cf, Atten= 26%, Lag= 30.8 min

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.89 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.51 fps, Avg. Travel Time= 0.4 min

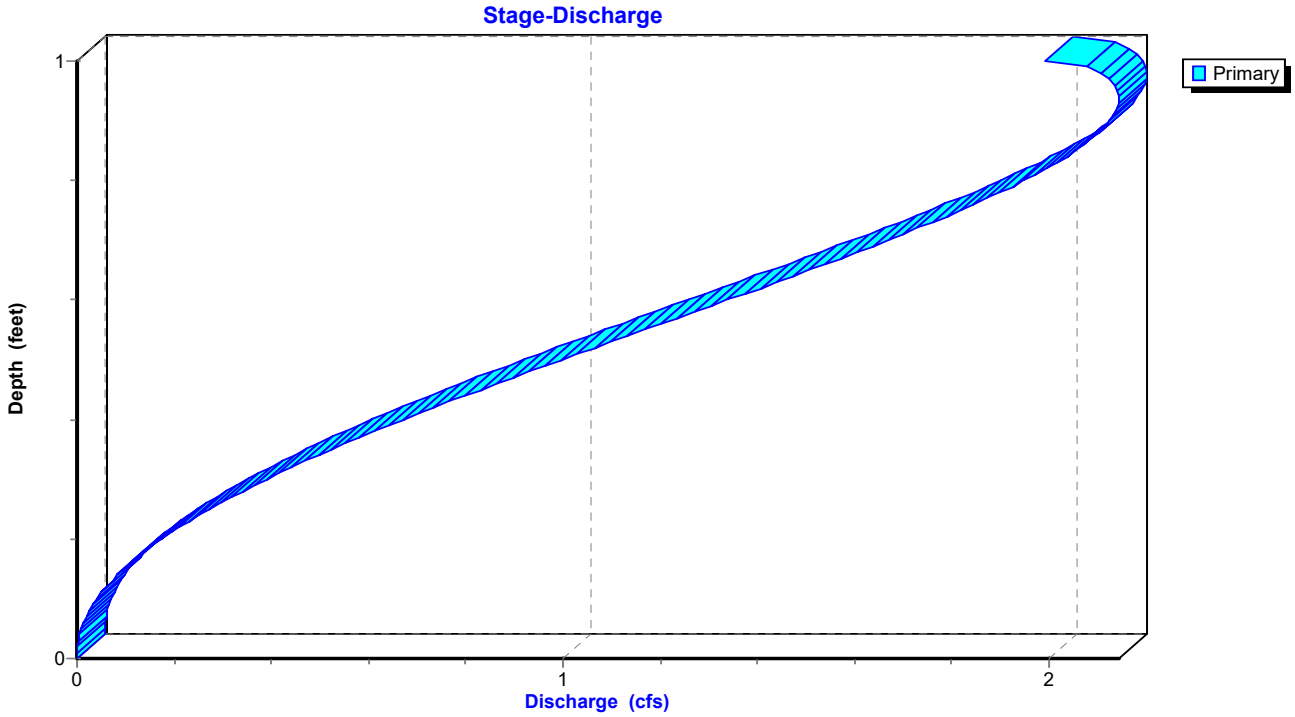
Peak Storage= 25 cf @ 12.12 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.99 cfs

12.0" Round Pipe
n= 0.013
Length= 32.0' Slope= 0.0031 '/'
Inlet Invert= 67.50', Outlet Invert= 67.40'

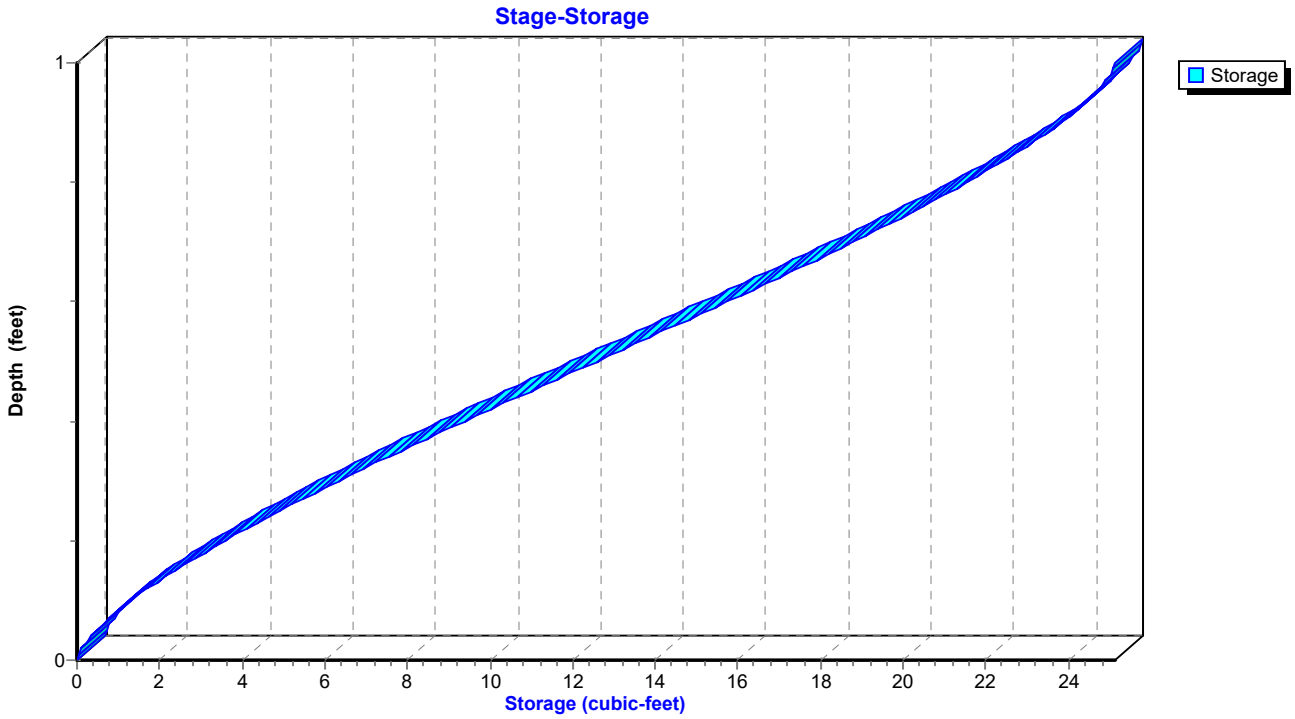




Reach 16R: CB 5



Reach 16R: CB 5



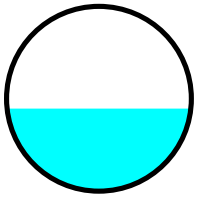
Summary for Reach 17R: DMH 7

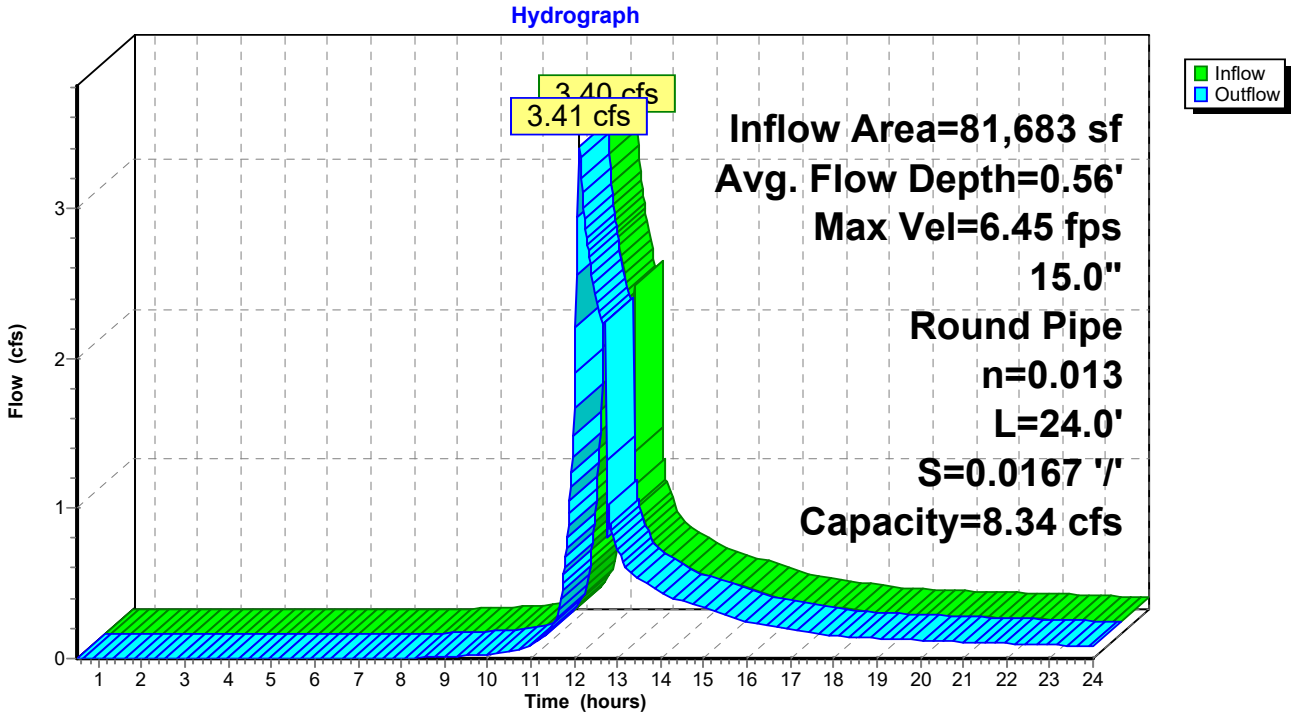
Inflow Area = 81,683 sf, 27.91% Impervious, Inflow Depth > 2.60" for 100-Year event
Inflow = 3.40 cfs @ 12.13 hrs, Volume= 17,728 cf
Outflow = 3.41 cfs @ 12.13 hrs, Volume= 17,727 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 6.45 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.66 fps, Avg. Travel Time= 0.2 min

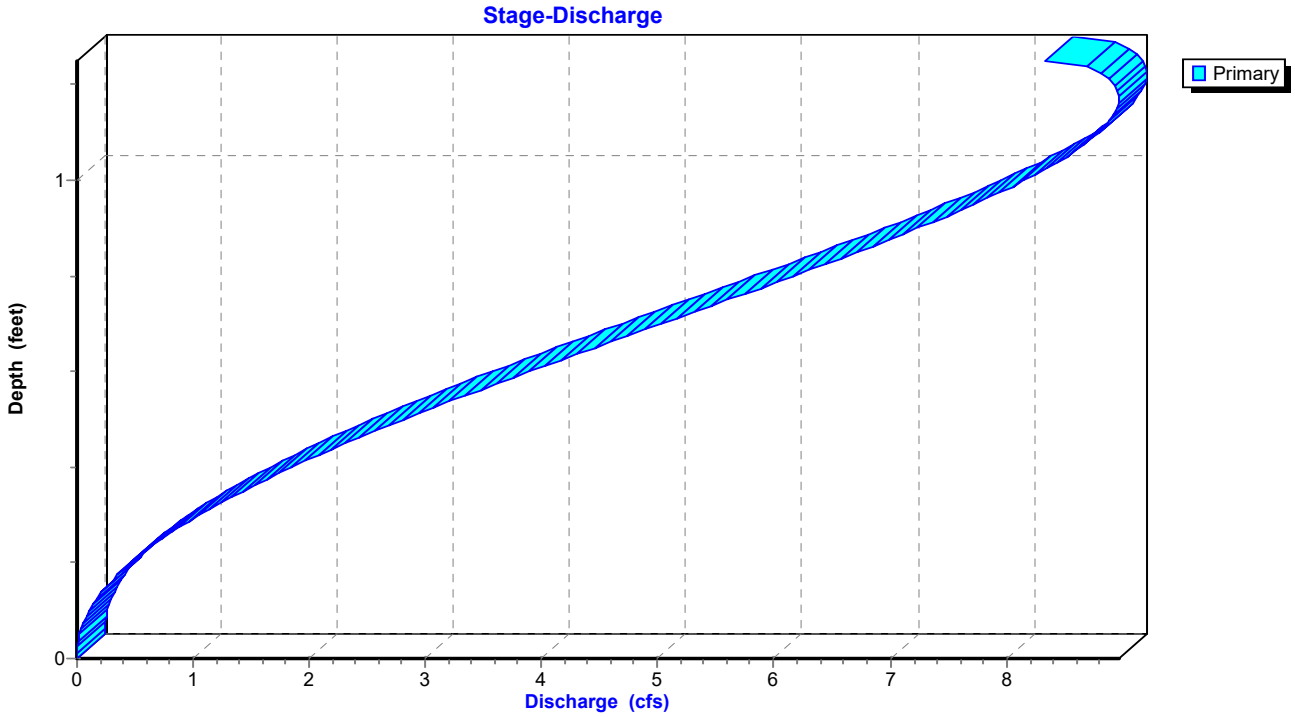
Peak Storage= 13 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 8.34 cfs

15.0" Round Pipe
n= 0.013
Length= 24.0' Slope= 0.0167 '/'
Inlet Invert= 67.40', Outlet Invert= 67.00'

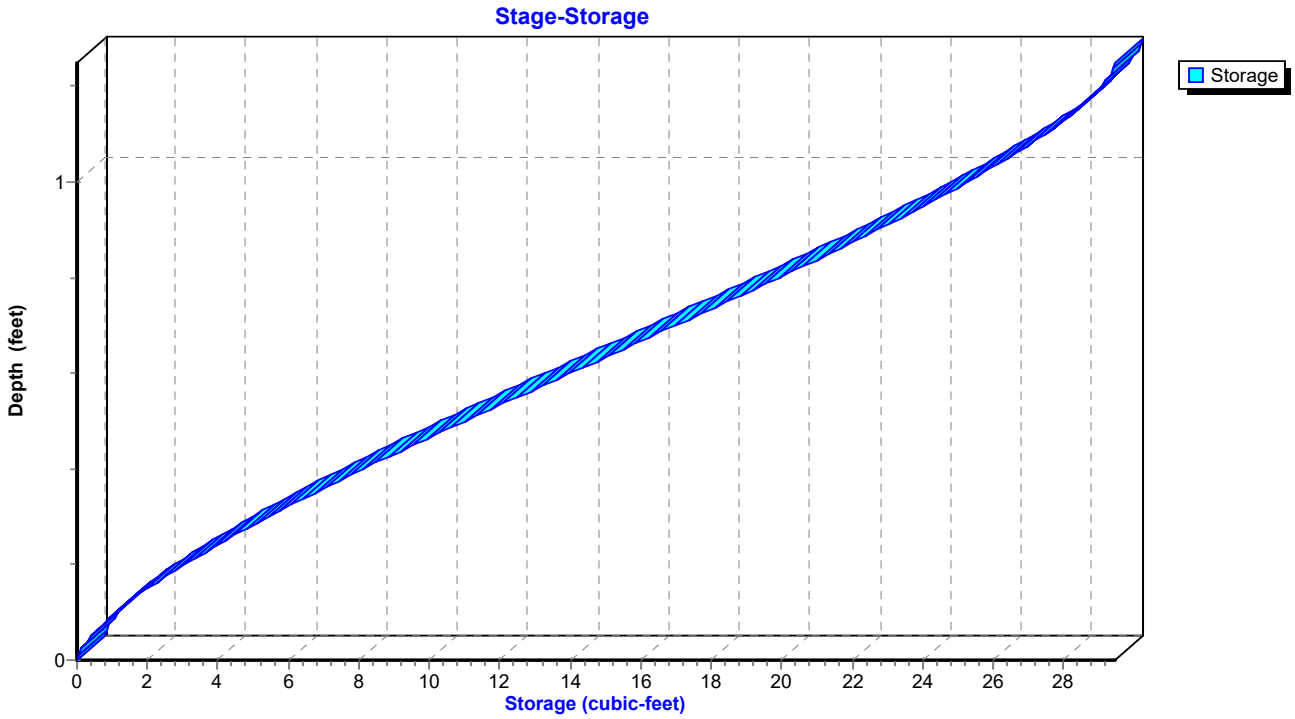




Reach 17R: DMH 7



Reach 17R: DMH 7



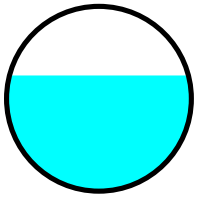
Summary for Reach 18R: CB 2

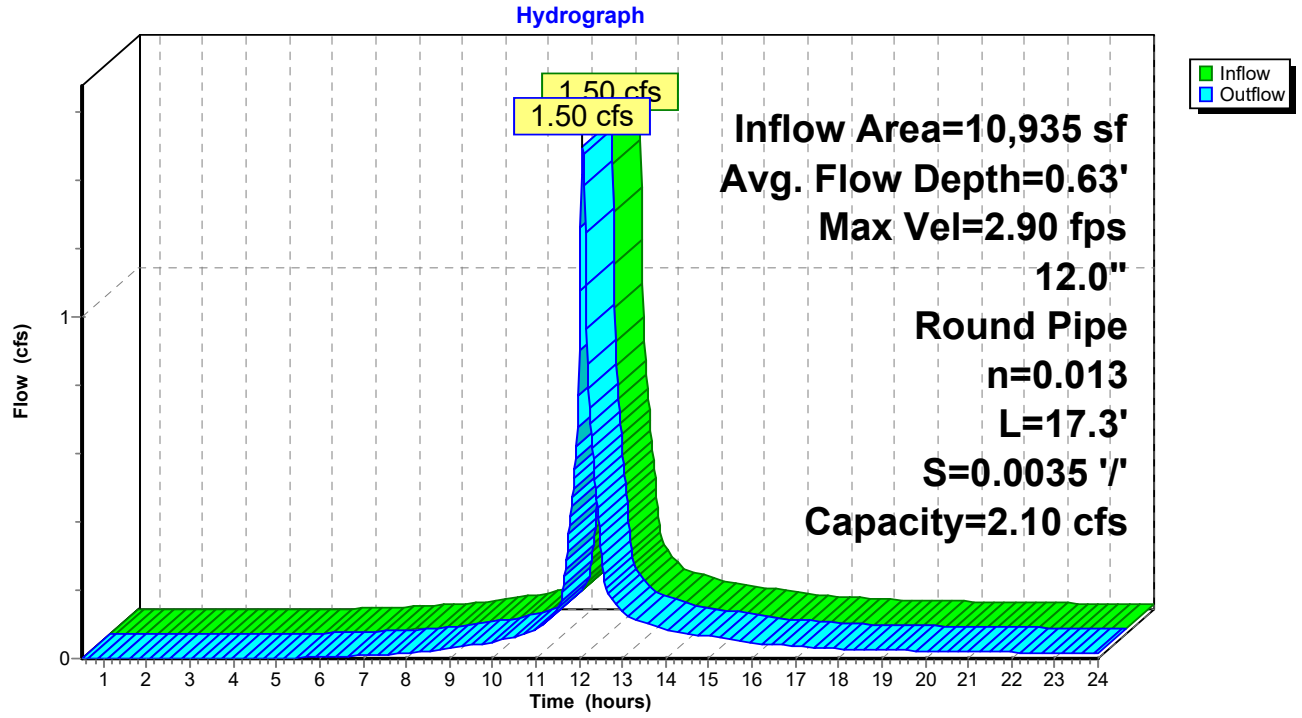
Inflow Area = 10,935 sf, 74.50% Impervious, Inflow Depth > 5.25" for 100-Year event
Inflow = 1.50 cfs @ 12.09 hrs, Volume= 4,782 cf
Outflow = 1.50 cfs @ 12.09 hrs, Volume= 4,782 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.90 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.01 fps, Avg. Travel Time= 0.3 min

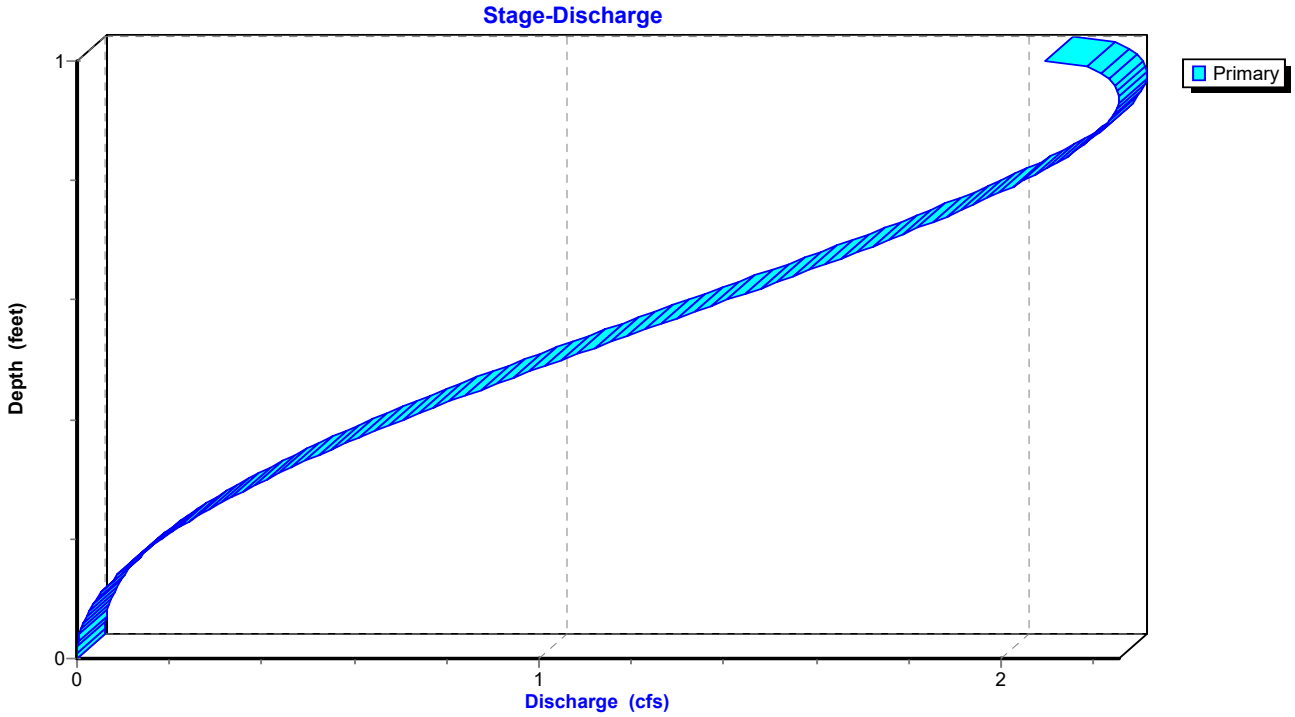
Peak Storage= 9 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.10 cfs

12.0" Round Pipe
n= 0.013
Length= 17.3' Slope= 0.0035 '/'
Inlet Invert= 66.46', Outlet Invert= 66.40'

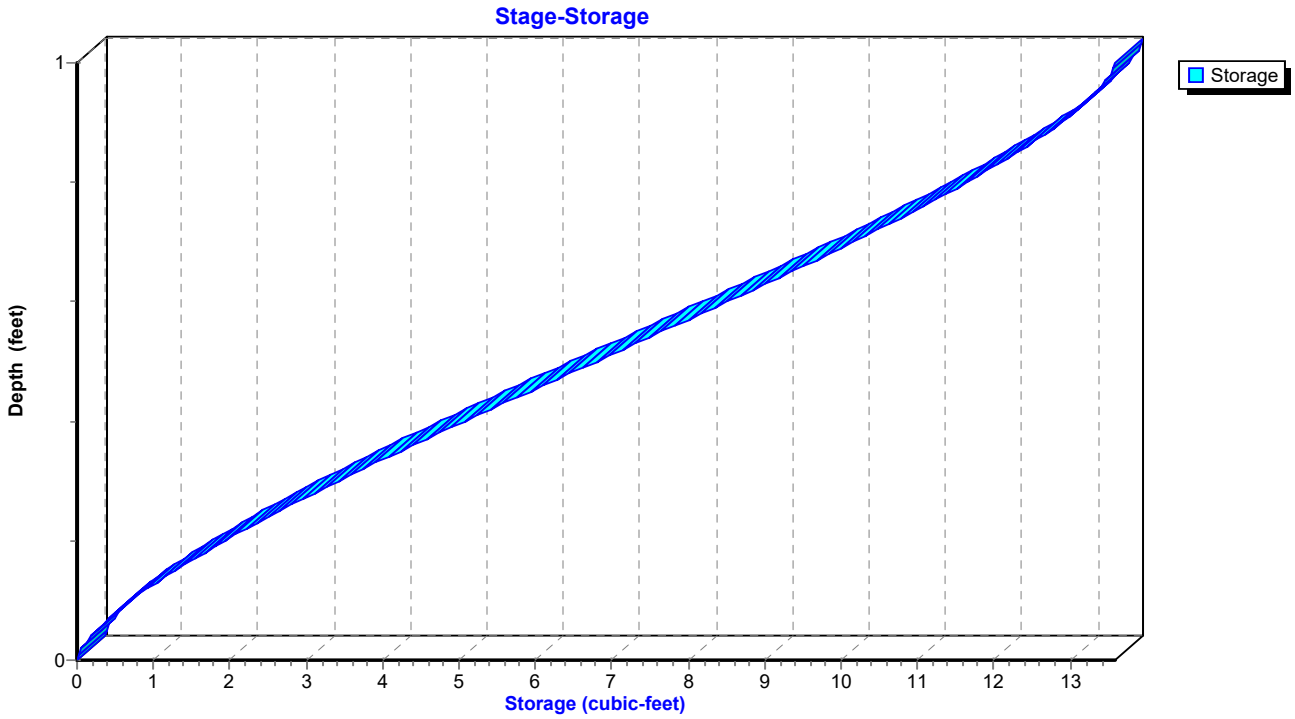




Reach 18R: CB 2



Reach 18R: CB 2



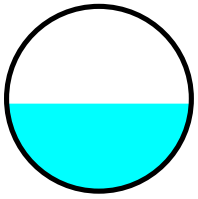
Summary for Reach 19R: CB 1

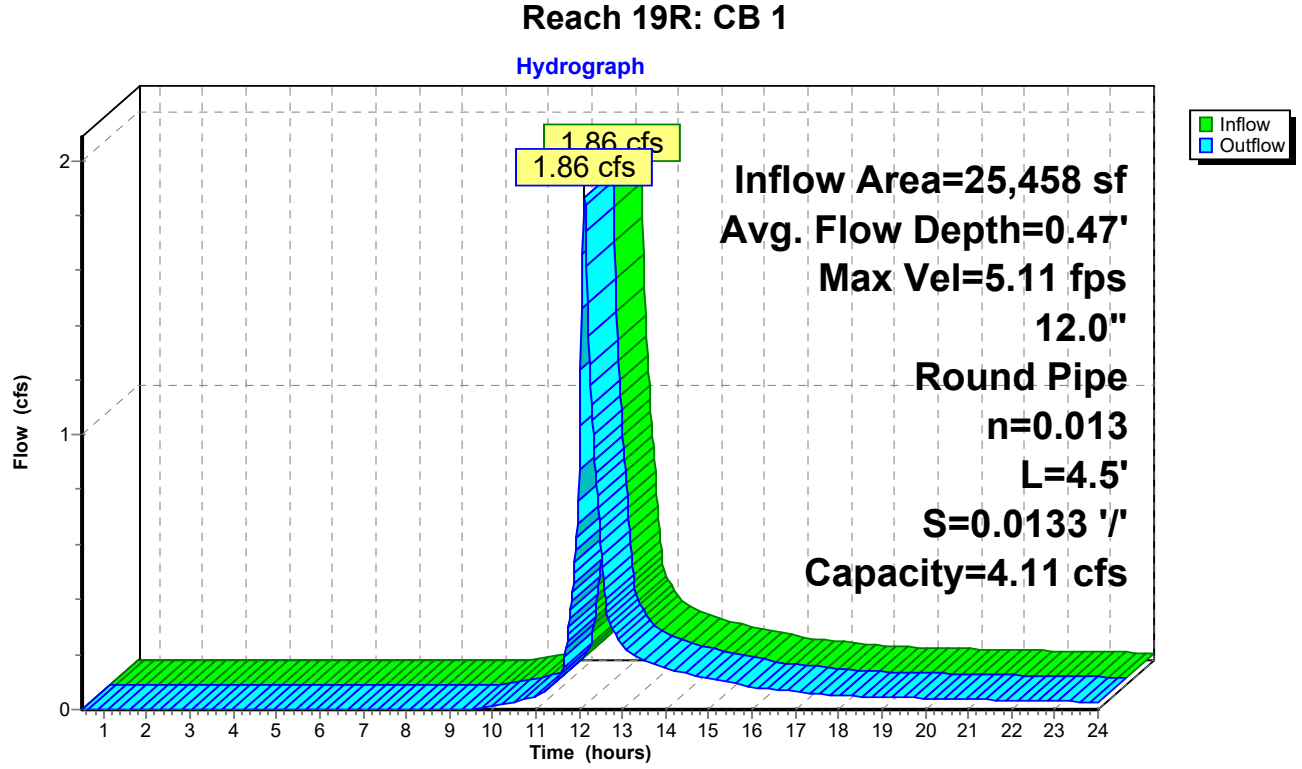
Inflow Area = 25,458 sf, 30.88% Impervious, Inflow Depth > 3.00" for 100-Year event
Inflow = 1.86 cfs @ 12.12 hrs, Volume= 6,356 cf
Outflow = 1.86 cfs @ 12.12 hrs, Volume= 6,356 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 5.11 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.00 fps, Avg. Travel Time= 0.0 min

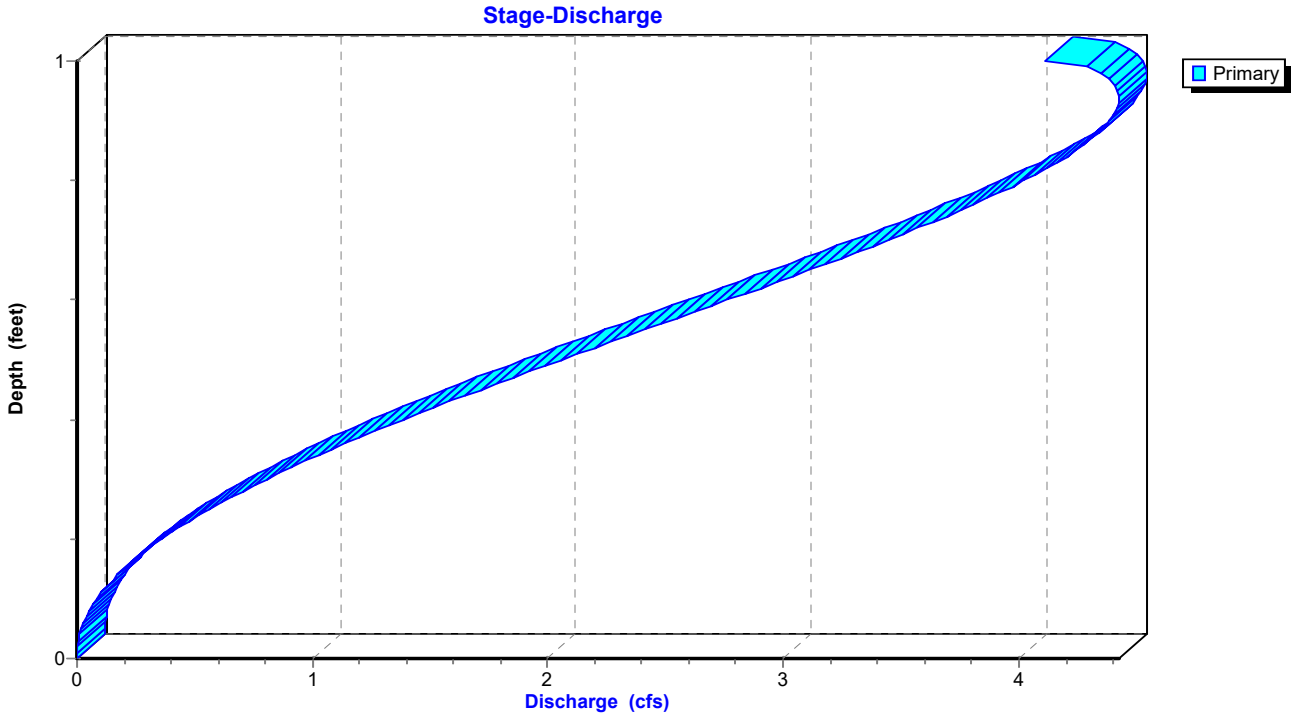
Peak Storage= 2 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 4.11 cfs

12.0" Round Pipe
n= 0.013
Length= 4.5' Slope= 0.0133 '/'
Inlet Invert= 66.46', Outlet Invert= 66.40'

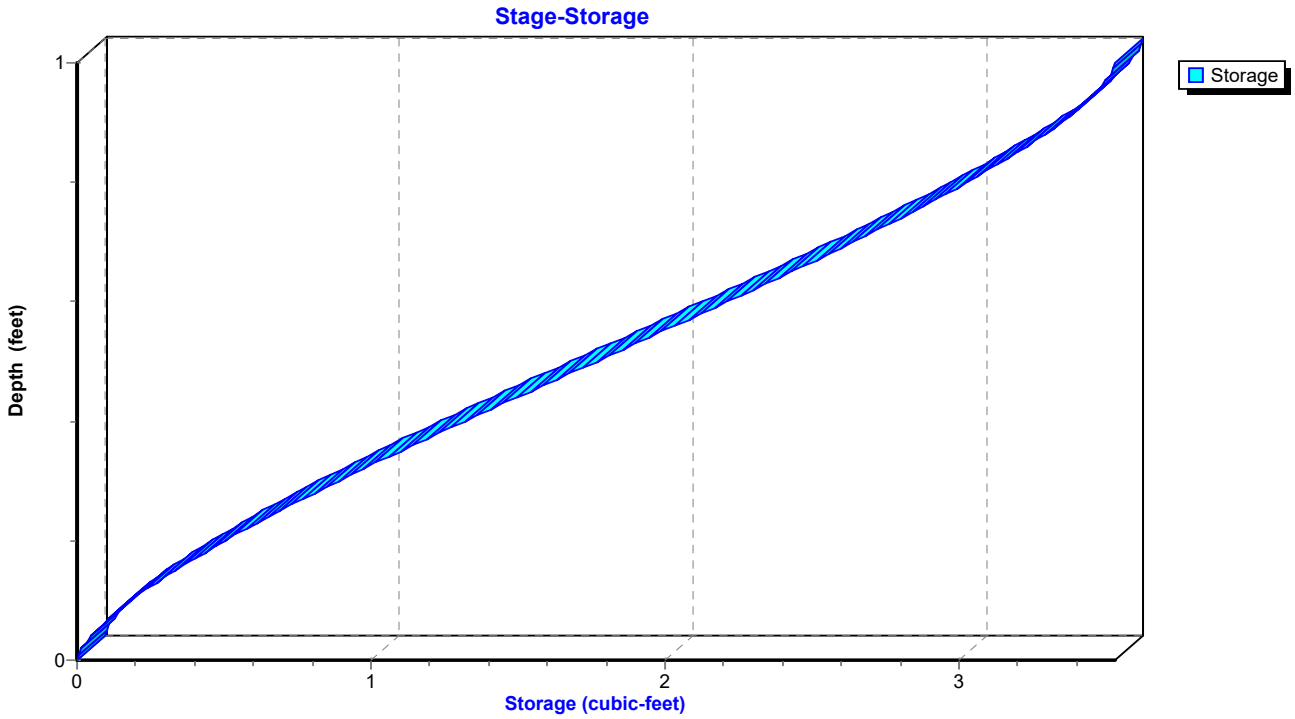




Reach 19R: CB 1



Reach 19R: CB 1



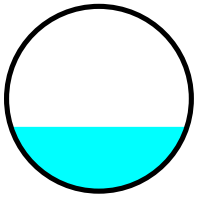
Summary for Reach 20R: DMH 3

Inflow Area = 25,458 sf, 30.88% Impervious, Inflow Depth > 3.00" for 100-Year event
Inflow = 1.86 cfs @ 12.12 hrs, Volume= 6,356 cf
Outflow = 1.86 cfs @ 12.13 hrs, Volume= 6,355 cf, Atten= 0%, Lag= 0.1 min

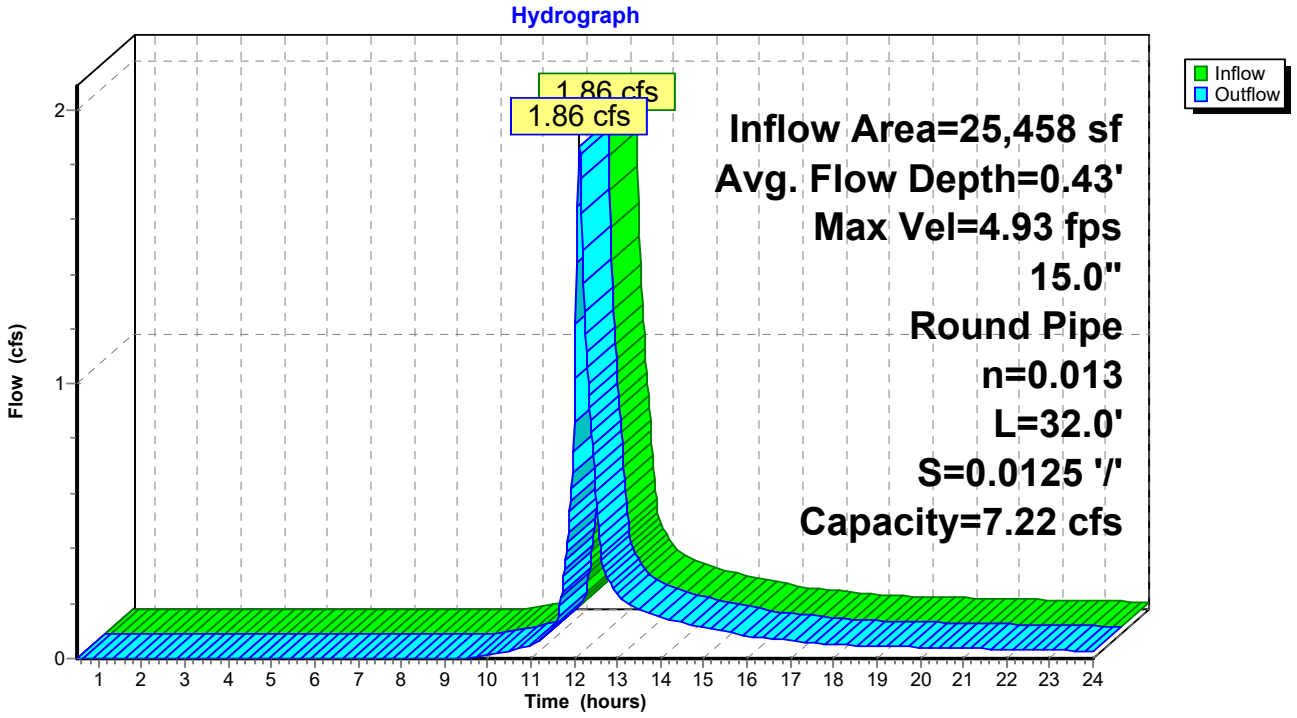
Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.93 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.90 fps, Avg. Travel Time= 0.3 min

Peak Storage= 12 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 7.22 cfs

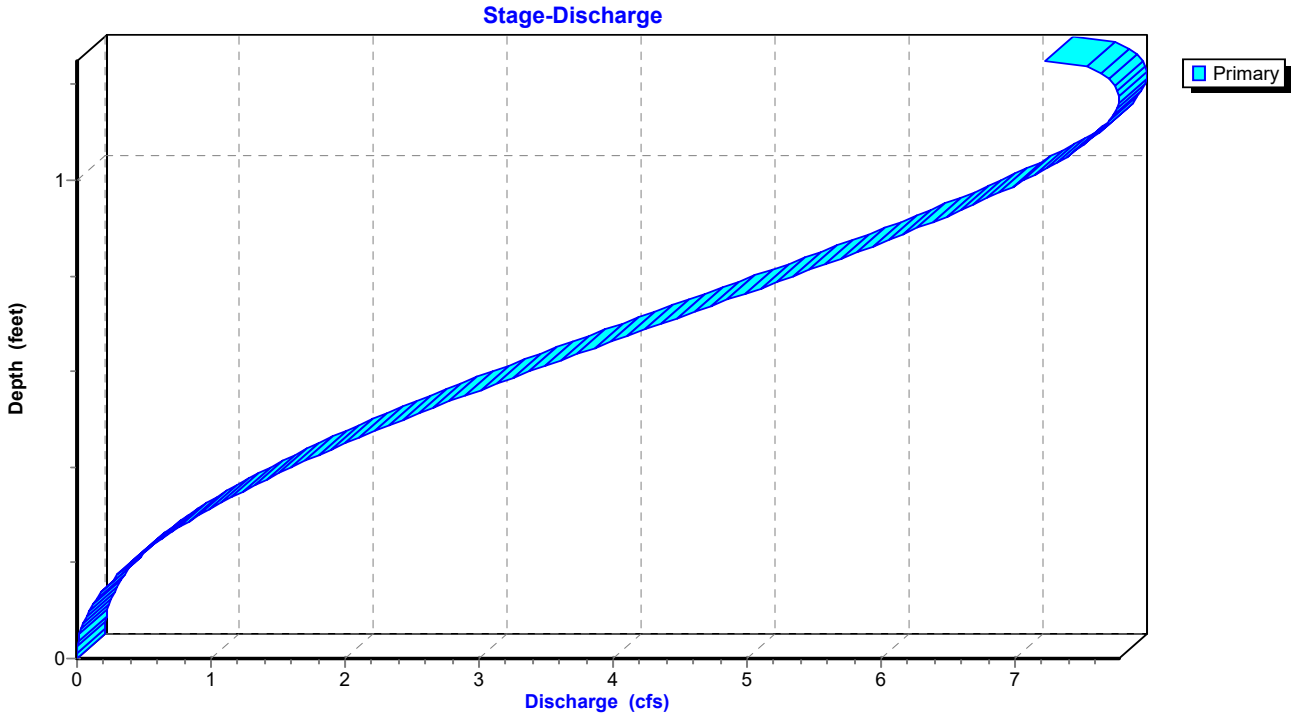
15.0" Round Pipe
n= 0.013
Length= 32.0' Slope= 0.0125 '/'
Inlet Invert= 66.40', Outlet Invert= 66.00'



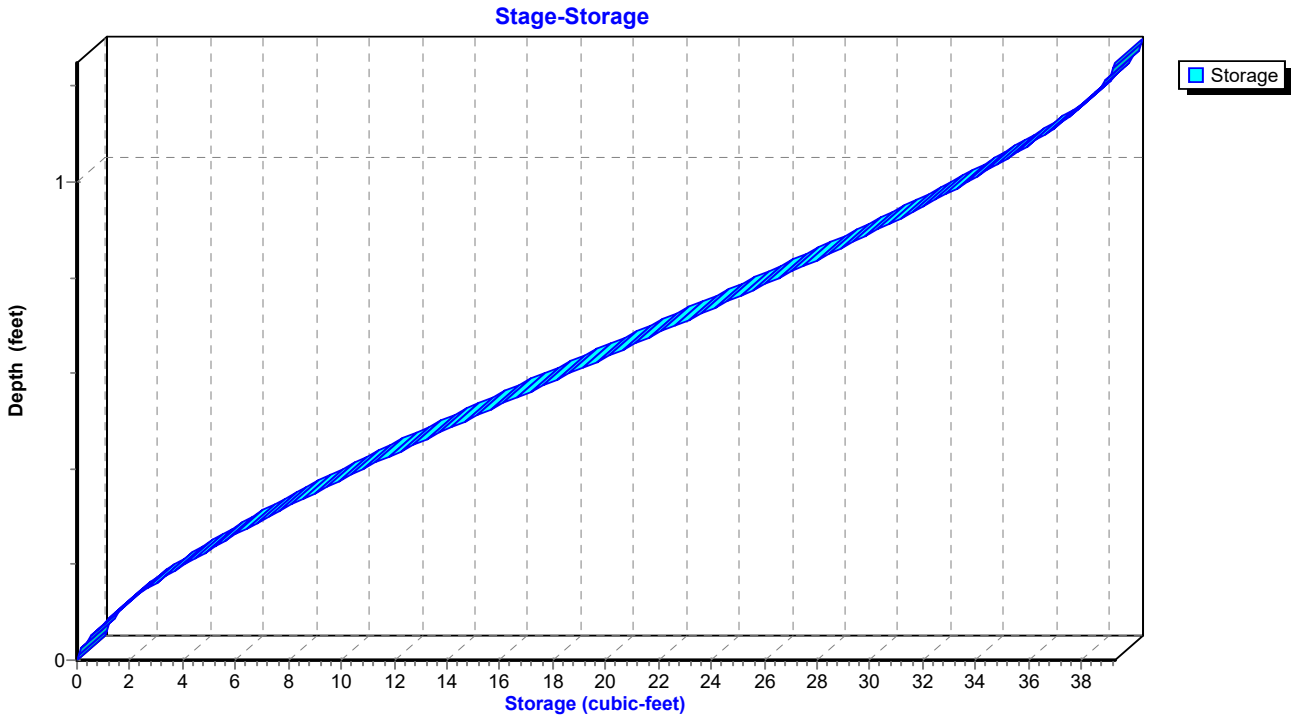
Reach 20R: DMH 3



Reach 20R: DMH 3



Reach 20R: DMH 3



Summary for Pond 11P: BASIN 1

Inflow Area = 97,841 sf, 21.60% Impervious, Inflow Depth > 2.30" for 100-Year event
Inflow = 4.16 cfs @ 12.13 hrs, Volume= 18,734 cf
Outflow = 2.69 cfs @ 12.38 hrs, Volume= 15,469 cf, Atten= 35%, Lag= 15.0 min
Discarded = 0.16 cfs @ 12.38 hrs, Volume= 7,086 cf
Primary = 2.54 cfs @ 12.38 hrs, Volume= 8,384 cf

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Peak Elev= 66.16' @ 12.38 hrs Surf.Area= 2,780 sf Storage= 4,719 cf

Plug-Flow detention time= 127.6 min calculated for 15,456 cf (83% of inflow)
Center-of-Mass det. time= 53.7 min (905.9 - 852.2)

Volume	Invert	Avail.Storage	Storage Description
#1	64.00'	10,880 cf	**Custom Stage Data (Prismatic)**Listed below

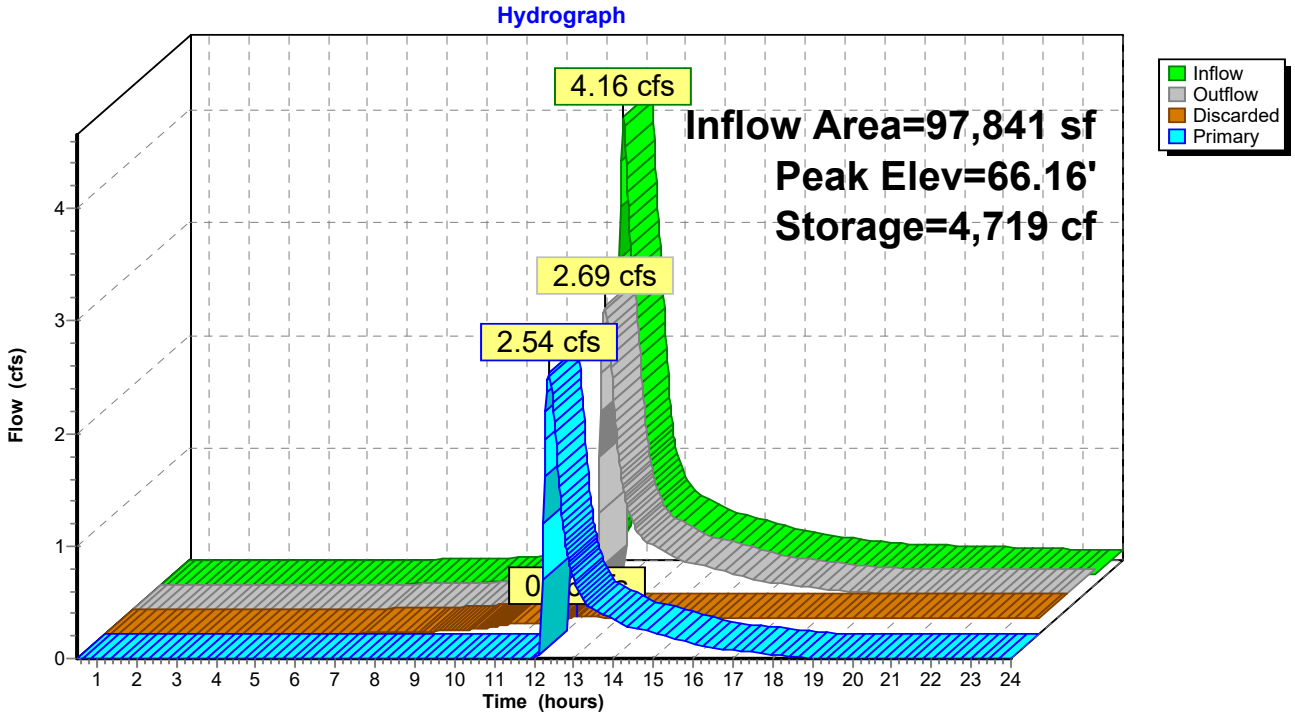
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
64.00	1,611	0	0
64.50	1,857	867	867
65.00	2,118	994	1,861
65.50	2,392	1,128	2,988
66.00	2,681	1,268	4,257
66.50	2,984	1,416	5,673
67.00	3,301	1,571	7,244
67.50	3,632	1,733	8,977
68.00	3,977	1,902	10,880

Device	Routing	Invert	Outlet Devices
#1	Primary	65.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	64.00'	**2.410 in/hr Exfiltration over Surface area**

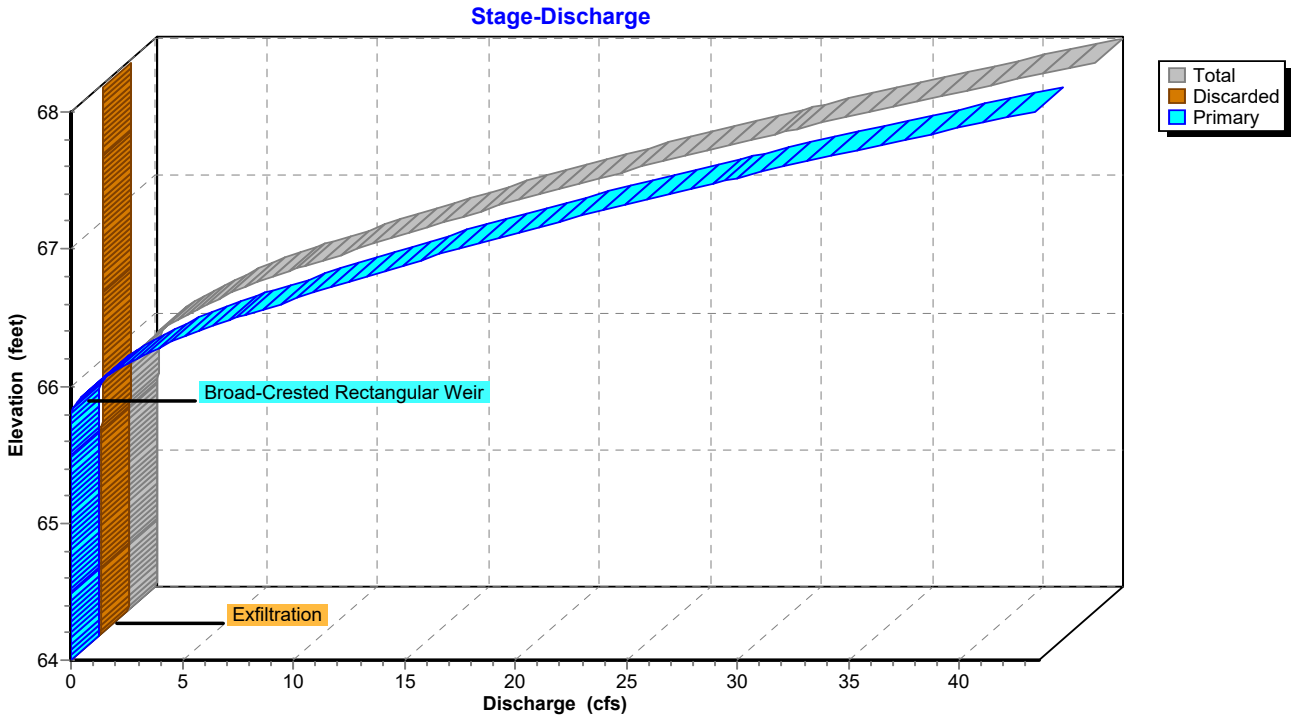
Discarded OutFlow Max=0.16 cfs @ 12.38 hrs HW=66.16' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=2.54 cfs @ 12.38 hrs HW=66.16' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.54 cfs @ 1.75 fps)

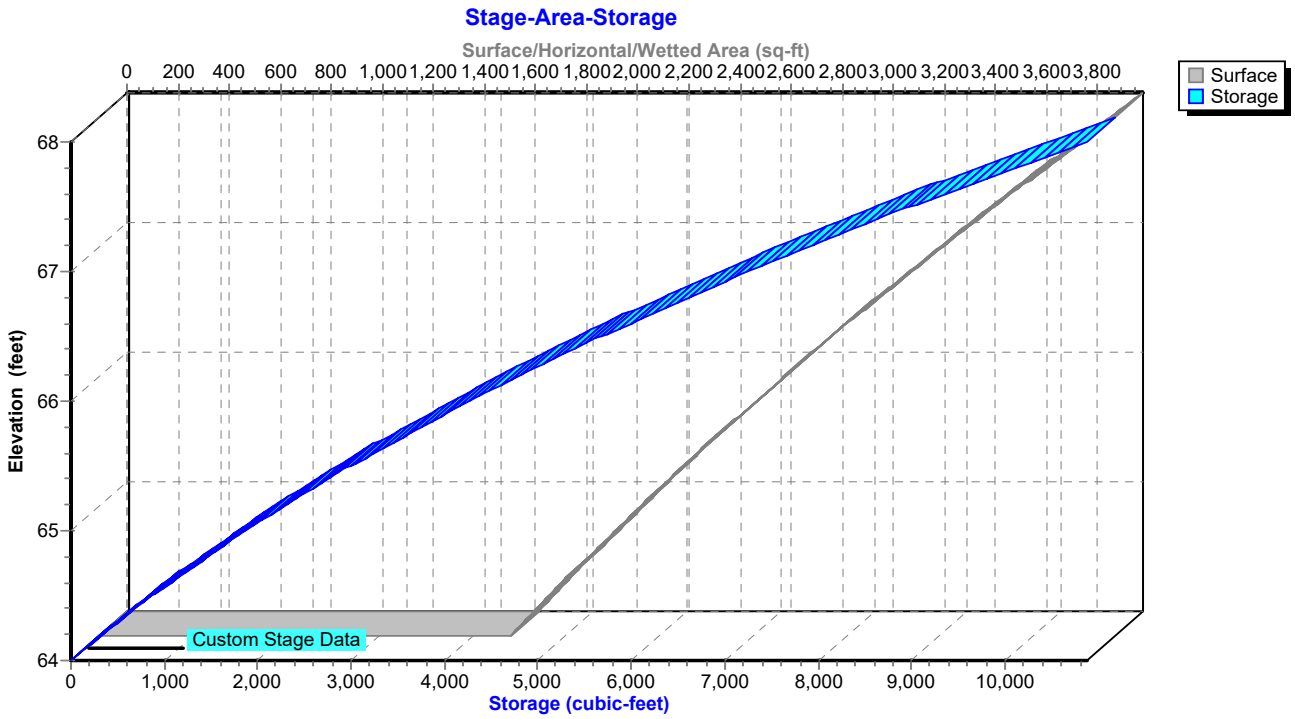
Pond 11P: BASIN 1



Pond 11P: BASIN 1



Pond 11P: BASIN 1



Summary for Pond 13P: BASIN 2

Inflow Area = 94,590 sf, 26.60% Impervious, Inflow Depth > 2.58" for 100-Year event
Inflow = 4.17 cfs @ 12.12 hrs, Volume= 20,314 cf
Outflow = 2.04 cfs @ 12.75 hrs, Volume= 18,453 cf, Atten= 51%, Lag= 37.7 min
Discarded = 0.22 cfs @ 12.75 hrs, Volume= 8,620 cf
Primary = 1.82 cfs @ 12.75 hrs, Volume= 9,833 cf

Routing by Stor-Ind method, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs
Peak Elev= 67.34' @ 12.75 hrs Surf.Area= 3,957 sf Storage= 7,140 cf

Plug-Flow detention time= 131.9 min calculated for 18,438 cf (91% of inflow)
Center-of-Mass det. time= 87.3 min (943.9 - 856.6)

Volume	Invert	Avail.Storage	Storage Description
#1	65.10'	9,910 cf	**Custom Stage Data (Prismatic)**Listed below

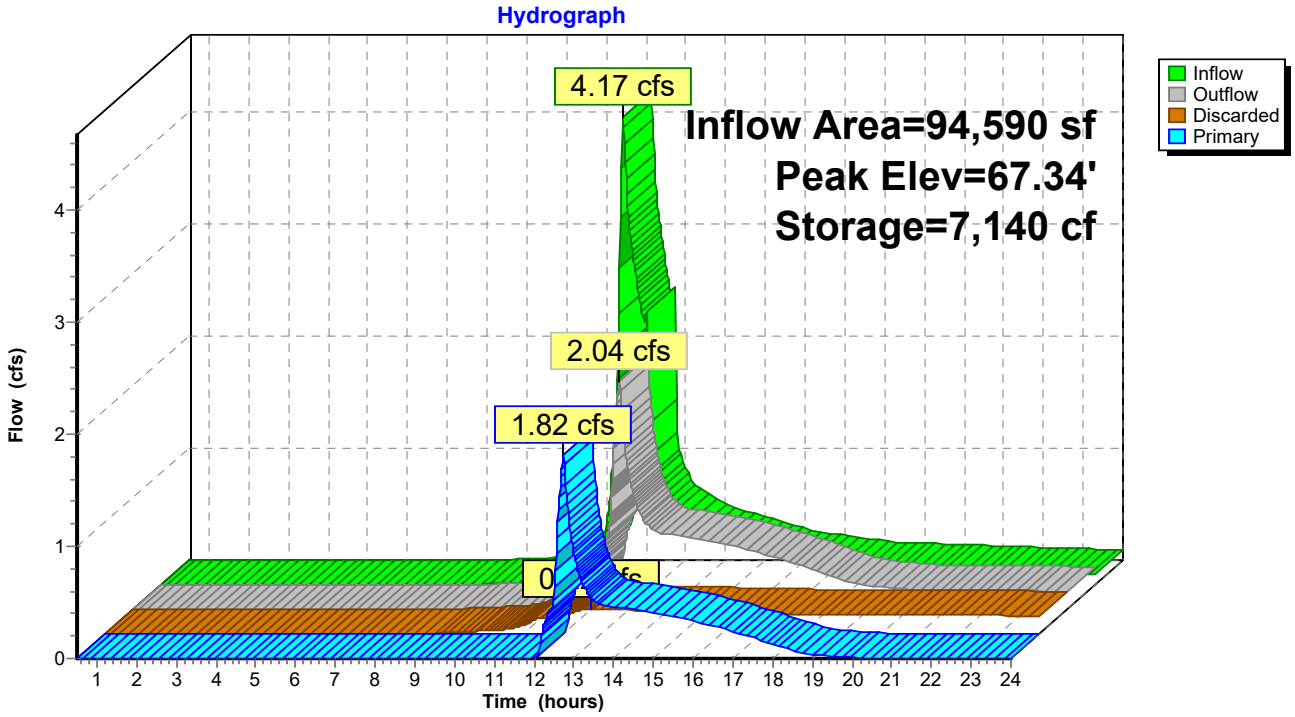
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.10	2,409	0	0
65.50	2,714	1,025	1,025
66.00	3,033	1,437	2,461
66.50	3,366	1,600	4,061
67.00	3,714	1,770	5,831
67.50	4,075	1,947	7,778
68.00	4,451	2,132	9,910

Device	Routing	Invert	Outlet Devices
#1	Primary	67.10'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	65.10'	**2.410 in/hr Exfiltration over Surface area**
#3	Primary	66.00'	**3.0" Vert. Orifice/Grate X 2.00** C= 0.600

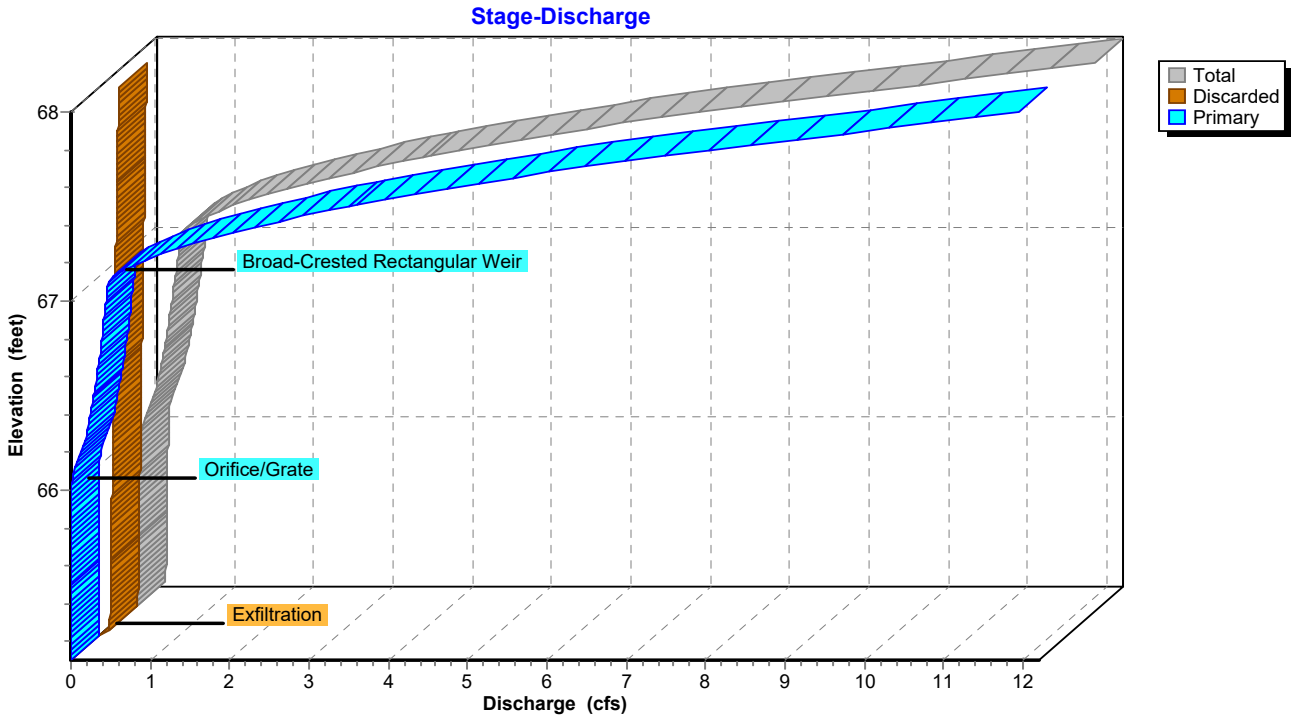
Discarded OutFlow Max=0.22 cfs @ 12.75 hrs HW=67.34' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=1.81 cfs @ 12.75 hrs HW=67.34' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Weir Controls 1.29 cfs @ 1.37 fps)
└**3=Orifice/Grate** (Orifice Controls 0.52 cfs @ 5.30 fps)

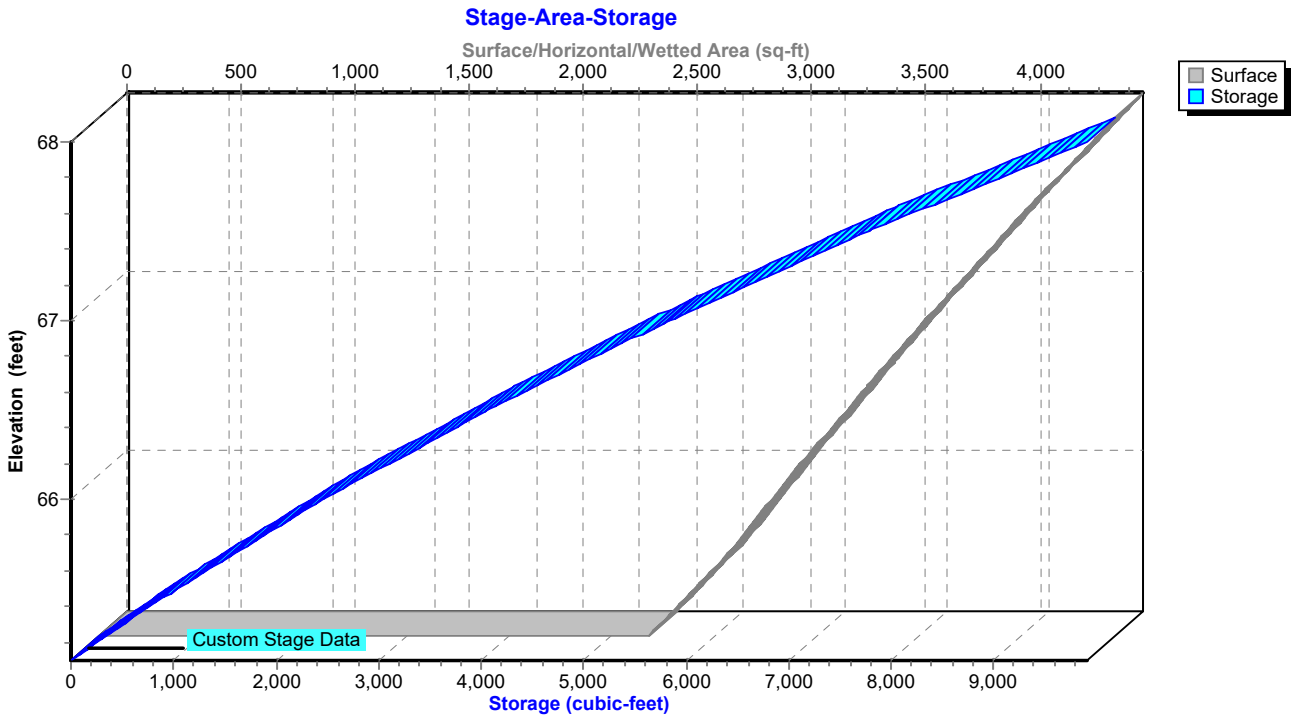
Pond 13P: BASIN 2



Pond 13P: BASIN 2



Pond 13P: BASIN 2

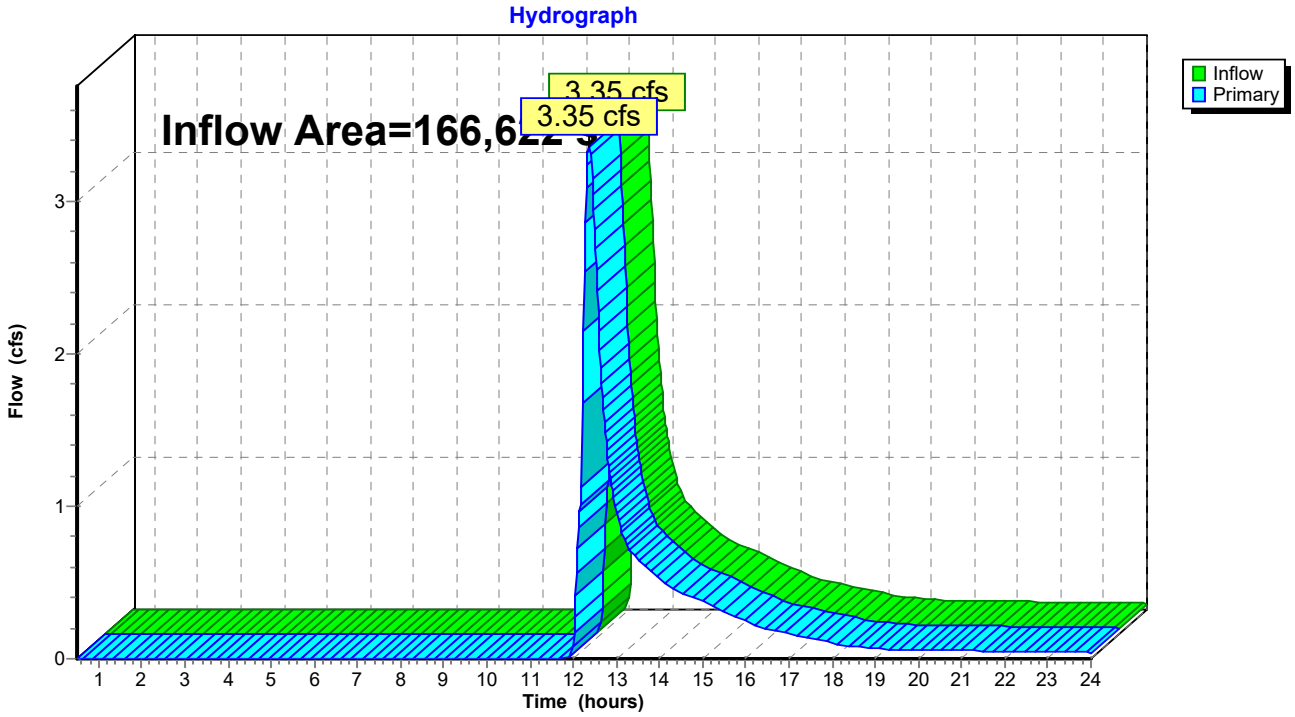


Summary for Link 12L: Southwest Wetland

Inflow Area = 166,622 sf, 13.26% Impervious, Inflow Depth > 1.01" for 100-Year event
Inflow = 3.35 cfs @ 12.37 hrs, Volume= 14,027 cf
Primary = 3.35 cfs @ 12.37 hrs, Volume= 14,027 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 12L: Southwest Wetland

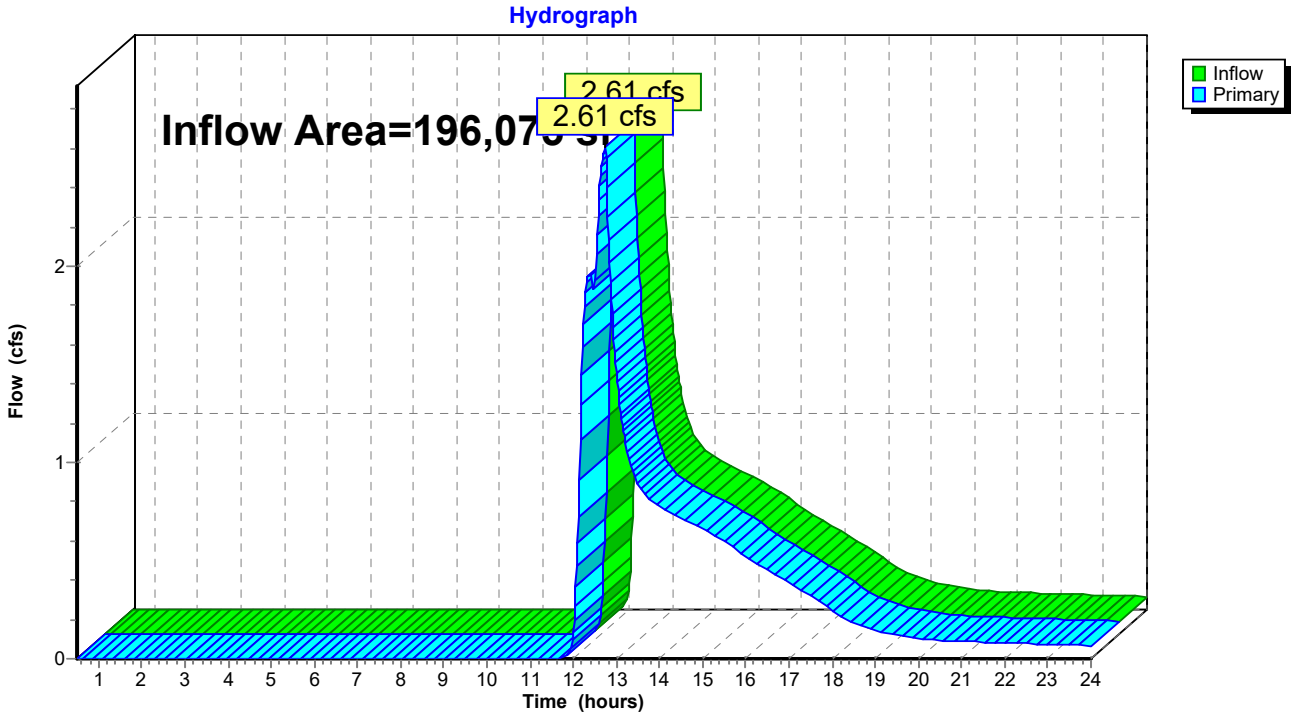


Summary for Link 14L: Northwest Wetland

Inflow Area = 196,075 sf, 15.55% Impervious, Inflow Depth > 1.20" for 100-Year event
Inflow = 2.61 cfs @ 12.74 hrs, Volume= 19,624 cf
Primary = 2.61 cfs @ 12.74 hrs, Volume= 19,624 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.50-24.00 hrs, dt= 0.02 hrs

Link 14L: Northwest Wetland



Section III

OPERATION AND MAINTENANCE PLAN

PROPOSED DRAINAGE SYSTEM – DURING CONSTRUCTION
Old Cart Path Lane Ext. (70 Old Cart Path Lane)
Pembroke, MA 02359

Owner:

Stephen Saia
70 Old Cart Path lane
Pembroke, MA 02359
Contact: Stephen Saia (781-826-8401)

Party Responsible for Operation and Maintenance:

Stephen Saia
70 Old Cart Path lane
Pembroke, MA 02359
Contact: Stephen Saia (781-826-8401)

Source of Funding:

Operation and Maintenance of this stormwater management system will be the responsibility of the property owner to include its successor and/or assigns, as the same may appear on record with the appropriate register of deeds.

During Construction:

Construction activities shall follow the Construction Sequence shown on the approved plan. During periods of active construction the stormwater management system shall be inspected on a weekly basis and within 24 hours of a storm event of greater than ½". Maintenance tasks shall be performed monthly or after significant rainfall events of 1" of rain or greater. During construction, silt-laden runoff shall be prevented from entering the drainage system and off-site properties. Temporary swales shall be constructed as needed during construction to direct runoff to sediment traps. Infiltration systems shall not be placed in service until after the installation of base course pavement and vegetative stabilization of the areas contributing to the systems.

During dewatering operations, all water pumped from the dewatering shall be directed to a "dirt bag" pumped sediment removal system (or approved equal) as manufactured by ACF Environmental. The unit shall be placed on a crushed stone blanket. Disposal of such "dirt bag" shall occur when the device is full and can no longer effectively filter sediment or allow water to pass at a reasonable flow rate. Disposal of this unit shall be the responsibility of the contractor and shall be as directed by the owner in accordance with applicable local, state, and federal guidelines and regulations.

Stabilized construction entrances shall be placed at the entrances and shall consist of 1½" to 2" stone and be constructed as shown on the approved plans.

All erosion and sedimentation control measures shall be in place prior to the commencement of any site work or earthwork operations, shall be maintained during construction, and shall remain in place until all site work is complete and ground cover is established.

Heavy equipment shall not be used on basin bottoms.

All exposed soils not to be paved shall be stabilized as soon as practical. Seed mixes shall only be applied during appropriate periods as recommended by the seed supplier, typically May 1 to October 15. Any exposed soils that can not be stabilized by vegetation during these dates shall be stabilized with hay bales, hay mulch, check dams, jute netting or other acceptable means.

Once each structure is in place, it should be maintained in accordance with the procedures described in the post-construction Operations and Maintenance Plan.

During dry periods where dust is created by construction activities the following control measures should be implemented.

- Sprinkling – The contractor may sprinkle the ground along haul roads and traffic areas until moist.
- Vegetative cover – Areas that are not expected to be disturbed regularly may be stabilized with vegetative cover.
- Mulch – Mulching can be used as a quick and effective means of dust control in recently disturbed areas.
- Spray on chemical soil treatments may be utilized. Application rates shall conform to manufacturers recommendations.

Inspections

The Owner shall be responsible to secure the services of a Professional Engineer to perform inspections as required. Inspections during periods of active construction shall be weekly and within 24 hours of a storm event of greater than ½ “. The Professional Engineer shall perform inspections to insure that the approved plan is being followed with particular attention to the Planning Board Approval and the Construction Sequencing. The Engineer shall be responsible for inspecting the roadway construction and the construction of the stormwater management system. The Engineer shall prepare and submit to the Planning Board, the Inspection Schedule and Evaluation Checklist (see attached) and, if necessary, request the required maintenance and/or repair of the necessary items. This form shall be stamped by the Engineer and the Owner shall be notified that specific changes and/or repairs are necessary.

For additional information, refer to Performance, Standards and Guidelines for Stormwater Management in Massachusetts, published by the Department of Environmental Protection.

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

PROJECT LOCATION: Old Cart Path Lane Ext. (70 Old Cart Path Lane) – Pembroke, MA
Latest Revision: 4/30/18

Stormwater Control Manager: _____ **Stamp**

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning / Repair Needed yes/no List items	Date of Cleaning/Repair	Performed By	Water Level in Detention System
Silt fence & swales and silt traps	After every major storm event							
Temporary Construction Entrance	Daily or as needed.							
Outlet control structure + Flow dissipator	After every major storm event							

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook for recommendations regarding frequency for inspection and maintenance of specific BMPs.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.
Other notes:(Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

PROPOSED DRAINAGE SYSTEM – POST CONSTRUCTION
Old Cart Path Lane Ext. (70 Old Cart Path Lane)
Pembroke, MA 02359

Owner:

Stephen Saia
70 Old Cart Path lane
Pembroke, MA 02359
Contact: Stephen Saia (781-826-8401)

Party Responsible for Operation and Maintenance:

During construction until roadway is accepted by Town
Stephen Saia

After roadway is completed and accepted by Town Meeting
Department of Public Works
Pembroke, MA 02359

Source of Funding:
Operation and Maintenance of this stormwater management system will be the responsibility of the owners until the road and drainage system are accepted by Town Meeting and conveyed to the Town of Pembroke. Once accepted by the Town, funding for operation and maintenance of the stormwater management system will be the responsibility of the Department of Public Works.

Post Construction Inspection and Maintenance:

Street Sweeping

Streets shall be swept at least twice per year. Sweeping shall be completed during the early spring, no later than May 1st, before sediment from winter sanding operations is washed into the drainage system. Disposal of the accumulated sediment shall be in accordance with applicable local, state, and federal guidelines and regulations.

Deep Sump Catch Basins

Deep sump catch basins shall become part of the roadway system and shall be inspected after every major storm event during construction and cleaned when sediment exceeds 18" depth. After construction when all slopes have been stabilized, basins shall be cleaned a minimum of twice per year. Disposal of the accumulated sediment shall be in accordance with applicable local, state, and federal guidelines and regulations.

Stormceptor Unit(s)

New Installations

The condition of each unit shall be checked after every runoff event for the first 30 days. The visual inspection shall ascertain that the unit is functioning properly (weir structure is not blocked) and shall measure the amount of sediment that has accumulated in the sump and floating trash and debris in the separation chamber. This can be done with a calibrated "dip stick" so that the depth of deposition can be tracked. Schedules for inspections and cleanout shall be based on storm events and pollutant accumulation.

Ongoing Operation

During the rainfall season, the unit shall be inspected at least once every 30 days. The floatables shall be removed and the sump cleaned when the sump is 85% full. If floatables accumulate more rapidly than the settleable solids, the floatables shall be removed using a vactor truck or dip net when the layer is two feet thick.

Cleanout of the Stormceptor units shall be performed no later than May 1st because of the nature of pollutants collected and the potential for odor generation from the decomposition of material collected and retained. This end of season cleanout will assist in preventing the discharge of pore water for the Stormceptor units during periods of low rainfall. The Stormceptor unit shall be cleaned at least twice yearly.

Cleanout and Disposal

Standard vactoring operations shall be employed in the cleanout of the Stormceptor units. Disposal of material from the Stormceptor units shall be in accordance with applicable local, state, and federal guidelines and regulations. Disposal of the decant material to a POTW is recommended. Field decanting to the storm drainage system shall not be permitted. Solids can be disposed similar to normal practices for materials collected from catch basin cleaning.

Infiltration Basin(s)

After construction, the infiltration basins should be inspected for standing water 1-2 days after any significant rainfall exceeding 1" of rainfall in 24 hours. If the infiltration basin is continuing to hold standing water after 2 days the owner should have outlet structure inspected and repaired. The basin should also be inspected to verify whether infiltration function has been lost. If infiltration capacity has become degraded, it should be restored under the direction of a qualified professional.

The infiltration basins should be inspected quarterly and at least once per year to ensure that the system is operating as intended. If accumulated sediment is observed within the basin it should be removed from the basin as necessary. Any sediment removed from the infiltration systems should be disposed of in accordance with Town, State and Federal Regulations. The system including the stormwater discharge locations should also be inspected for growth of any invasive species and removed if found.

The embankments of the basin shall be mowed periodically, to prevent the establishment of woody vegetation on the berms. Embankments and spillways shall be inspected annually for general structural integrity, with immediate corrective action as warranted by inspection.

Lawn Fertilization

Lawn fertilizer shall be slow release and limited to 3 lbs per 1000 s.f. per year.

STORMWATER MANAGEMENT
BEST MANAGEMENT PRACTICES

INSPECTION SCHEDULE AND EVALUATION CHECKLIST – POST CONSTRUCTION PHASE

PROJECT LOCATION: Old Cart Path Lane Ext. (70 Old Cart Path Lane) – Pembroke, MA
Latest Revision: 4/30/18

Best Management Practice	Inspection Frequency (1)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/ Repair Needed yes/no List items	Date of Cleaning/Repair	Performed By	Water Level in Detention System
Deep Sump Catch Basins	Twice per year							
Stormceptor	Twice per year							
Infiltration Basin	Once per year							

(1) Refer to the Massachusetts Stormwater Management, Volume Two: Stormwater Technical Handbook for recommendations regarding frequency for inspection and maintenance of specific BMPs.

Limited or no use of sodium chloride salts, fertilizers or pesticides recommended. Slow release fertilizer recommended.
Other notes:(Include deviations from: Con Com Order of Conditions, PB Approval, Construction Sequence and Approved Plan)

Stormwater Control Manager: _____ **Stamp**

258000 M

259000 M

70° 46' 52.5"

42° 03' 45"

JOINS PANEL 0208

4658000mN

4657000mN

MAP SCALE 1" = 500'

250 0 500 1000

FEET

METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0216J

FIRM

FLOOD INSURANCE RATE MAP

PLYMOUTH COUNTY, MASSACHUSETTS
(ALL JURISDICTIONS)

PANEL 216 OF 650
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DUXBURY, TOWN OF	250263	0216	J
PEMBROKE, TOWN OF	250277	0216	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25023C0216J

EFFECTIVE DATE
JULY 17, 2012

Federal Emergency Management Agency

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

April 25, 2018

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 (https://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.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

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: 1:4,450 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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:
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 10, Oct 6, 2017

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

Date(s) aerial images were photographed: Aug 26, 2014—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

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
37A	Massasoit - Mashpee complex, 0 to 3 percent slopes	9.3	11.2%
253B	Hinckley loamy sand, 3 to 8 percent slopes	53.9	65.4%
253C	Hinckley loamy sand, 8 to 15 percent slopes	3.9	4.8%
253E	Hinckley loamy sand, 15 to 35 percent slopes	1.1	1.3%
255A	Windsor loamy sand, 0 to 3 percent slopes	5.7	6.9%
256B	Deerfield fine sand, 3 to 8 percent slopes	1.2	1.5%
289C	Hinckley gravelly sandy loam, 8 to 15 percent slopes, bouldery	4.8	5.8%
704A	Freetown and Swansea coarse sands, 0 to 3 percent slopes, sanded surface and inactive	2.5	3.0%
Totals for Area of Interest		**82.4**	**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: Depressions, terraces, drainageways
Landform position (two-dimensional): Toeslope, footslope
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
Hydric soil rating: Yes

Description of Mashpee

Setting

Landform: Depressions, terraces, 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
Hydric soil rating: Yes

Minor Components

Deerfield

Percent of map unit: 5 percent
Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

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
Hydric soil rating: Yes

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
Hydric soil rating: Yes

253B—Hinckley loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svm8
Elevation: 0 to 1,430 feet
Mean annual precipitation: 36 to 53 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Hinckley

Setting

Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand

C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 8 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope, head slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, tread, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

253C—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Hinckley

Setting

Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Shoulder, toeslope, footslope, backslope
Landform position (three-dimensional): Crest, head slope, nose slope, side slope, riser
Down-slope shape: Convex, concave, linear
Across-slope shape: Concave, linear, convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Eskers, kames, outwash plains, outwash terraces, moraines
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Side slope, head slope, nose slope, crest, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Convex, concave, linear
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

253E—Hinckley loamy sand, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2svmd
Elevation: 0 to 860 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Hinckley

Setting

Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Crest, nose slope, side slope, head slope, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Linear, concave, convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 10 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Crest, nose slope, side slope, head slope, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Linear, concave, convex

Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope, nose slope, crest, riser
Down-slope shape: Convex, linear, concave
Across-slope shape: Linear, convex, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

255A—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkg
Elevation: 0 to 990 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Windsor, Loamy Sand

Setting

Landform: Deltas, dunes, outwash plains, outwash terraces
Landform position (three-dimensional): Riser, tread
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Deerfield, loamy sand

Percent of map unit: 10 percent
Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley, loamy sand

Percent of map unit: 5 percent
Landform: Deltas, eskers, kames, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

256B—Deerfield fine sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: bcwx
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: Farmland of statewide importance

Map Unit Composition

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

Description of Deerfield

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Footslope, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
Oa - 2 to 3 inches: highly decomposed plant material
E1 - 3 to 5 inches: fine sand
E2 - 5 to 8 inches: fine sand
Bs - 8 to 11 inches: fine sand
Bw1 - 11 to 15 inches: fine sand
Bw2 - 15 to 20 inches: fine sand
BC - 20 to 26 inches: fine sand
C1 - 26 to 39 inches: fine sand
C2 - 39 to 61 inches: fine sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 4 percent
Landform: Kames, outwash plains, terraces
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex

Across-slope shape: Convex
Hydric soil rating: No

Carver

Percent of map unit: 4 percent
Landform: Outwash plains, moraines, pitted outwash plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Mashpee

Percent of map unit: 4 percent
Landform: Depressions, terraces, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Massasoit

Percent of map unit: 4 percent
Landform: Depressions, terraces, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sudbury

Percent of map unit: 4 percent
Landform: Depressions, outwash plains, terraces
Landform position (two-dimensional): Footslope, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

289C—Hinckley gravelly sandy loam, 8 to 15 percent slopes, bouldery

Map Unit Setting

National map unit symbol: bd1l
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

Hinckley, bouldery, and similar soils: 80 percent

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

Description of Hinckley, Bouldery

Setting

Landform: Eskers, kames, terraces, outwash deltas
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 3 inches: gravelly sandy loam
Bw - 3 to 19 inches: very gravelly loamy coarse sand
C1 - 19 to 33 inches: very gravelly coarse sand
C2 - 33 to 60 inches: very gravelly coarse sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 28.34 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 10 percent
Landform: Kames, outwash plains, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Convex
Hydric soil rating: No

Gloucester, bouldery

Percent of map unit: 7 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex

Hydric soil rating: No

Barnstable, bouldery

Percent of map unit: 3 percent
Landform: Moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

704A—Freetown and Swansea coarse sands, 0 to 3 percent slopes, sanded surface and inactive

Map Unit Setting

National map unit symbol: 2tx05
Elevation: 0 to 140 feet
Mean annual precipitation: 40 to 52 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 190 to 250 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Freetown, sanded surface, inactive, and similar soils: 45 percent
Swansea, sanded surface, inactive, and similar soils: 45 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown, Sanded Surface, Inactive

Setting

Landform: Bogs, depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy human transported material over organic material

Typical profile

^Ap - 0 to 15 inches: coarse sand
2Oa - 15 to 79 inches: muck

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent

Frequency of ponding: None
Available water storage in profile: Very high (about 20.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Swansea, Sanded Surface, Inactive

Setting
Landform: Bogs, depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits

Typical profile
^Ap - 0 to 15 inches: coarse sand
Oa - 15 to 36 inches: muck
2Cg - 36 to 79 inches: coarse sand

Properties and qualities
Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: High (about 11.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Rainberry, sanded surface
Percent of map unit: 5 percent
Landform: Depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

Tihonet
Percent of map unit: 5 percent
Landform: Outwash plains
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf