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Stormwater Report

Prepared For

**122A Realty, LLC
274 Oak Street
Shrewsbury, MA 01545**

For

**Map 82 Parcel 27
2400 Main Street
Holden, MA 01520**

February 2, 2024



Civil & Environmental Engineering

Stormwater Management Report

Filing Requirement: To be filed with the Town of Holden Stormwater Committee under the Town's stormwater bylaw:

Filing Date:

Applicant: 122A Realty LLC
274 Oak Street
Shrewsbury, MA 01545

Landowner 122A Realty LLC
274 Oak Street
Shrewsbury, MA 01545

Project Site: Map 82 Parcel 27
2400 Main Street
Holden, MA 01520

Project Narrative:

This project is comprised of the construction of a new self-storage facility to be served by private water, private sewer, and on-site parking off of Main Street.

The stormwater from the site drains away from a high point at the northerly property line of 2400 Main Street to both the east and west of the lot via overland flow. The lot is currently mostly wooded with a earth moving operation currently occurring. Runoff from the new impervious area will be treated and infiltrated in accordance with the Town Bylaws and Massachusetts stormwater policies. Peak stormwater flow rates will be attenuated through a detention and infiltration basin area.

Documenting Compliance:

This site plan and report is to demonstrate compliance with the Massachusetts Stormwater Handbook and the Town's Stormwater Bylaw. The ten standards from the Massachusetts Stormwater Handbook are listed in this section with the compliance documentation or a reference to the documentation below.

Standard 1 - No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

There are no new untreated discharges proposed. All impervious area is treated with stormwater treatment train to exceed 90% TSS removal . Roof runoff is considered clean and does not require treatment.

Standard 2 - Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates...To prevent storm damage and downstream and off-site flooding, Standard 2 requires that the post-development peak discharge rate is equal to or less than the pre-development rate from the 2-year and the 10-year 24-hour storms...Proponents must also evaluate the impact of peak discharges from the 100-year 24-hour storm. If this evaluation shows that increased off-site flooding will result from peak discharges from the 100-year 24-hour storms, BMPs must also be provided to attenuate these discharges.

Attached with this report is the stormwater volume calculations, a HydroCAD report. The calculations are summarized in the table below, which shows peak stormwater discharge rates. The calculations demonstrate that there is no increase in peak stormwater discharge rates for the 2-year, and 10-year storm intervals. Calculations are also provided for the 100-year storm interval to demonstrate no downstream flooding.

	2-year	10-year	25- year	100-year
Pre-development (cfs) East	1.23	4.99	8.87	18.28
Post-development (cfs) East	0.27	1.75	3.45	7.70
Pre-development (cfs) West	2.43	7.94	13.47	26.39
Post-development (cfs) West	2.22	5.36	10.37	18.59

Standard 3 - Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Runoff from the new impervious areas generated from the proposed rooftop and driveway will infiltrated to match pre conditions.

Recharge volumes are calculated, below:

Pavement Area "B": 148,649 SF

Pavement Area "C": 20,382 SF

Rooftop Area "B": 86,386 SF

Rooftop Area "C" 11,804 SF

Impervious area "B": 235,035 SF

Impervious Area "C" 32,186 SF

Recharge 0.35 inch of Rainfall "B" soil: = 6,855 CF Req.

Recharge 0.25 inch of Rainfall "C" soil = 671 CF Req.

Total required = 7,526 CF

Recharge Volume Provided in basin below outlet: **9,845 CF Provided**

Standard 4 - Stormwater management systems shall be designed to remove 80% (of the average annual post-construction load of Total Suspended Solids (TSS)).

The post construction TSS load from impervious areas is limited to the proposed driveway area as roof runoff is considered clean. There is no new untreated discharge being proposed. Prior to the discharge point, treatment is provided by deep sump catch basins to a water quality unit, to a sediment forebay, to an infiltration basin.

Standard 5 - For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge (of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention al/ land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, MG.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314CMR4.00and314CMR5.00.

The site does not qualify as a land uses with higher potential pollutant loads.

Standard 6 - Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)l or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

No stormwater BMP's are being proposed within an environmentally sensitive area.

Standard 7 -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 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.

This is not a redevelopment project.

Standard 8 -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.

See site plan for proposed grading work. Straw waddles will be utilized at the downstream limit of work until the site is stabilized. Stockpile locations and details have been provided for construction phase activities.

Standard 9 -A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

The design includes a stone stormwater infiltration trench and subsurface chambers. The design incorporates devices that will require bi-annual maintenance to coincide with normal yard maintenance for a single-family home in New England. The devices are also placed in high visibility areas to ensure long term maintenance is carried out. Long term maintenance and care includes the following:

Infiltration Trench : To be edged/mowed and cleared of debris regularly, minimum bi-annually.

Infiltration Chambers & Outlet: To be mowed and cleared of debris semi-annually, minimum bi-annually. Remove inspection port cap and inspect for the presence of standing water.

Standard 10 - All illicit discharges to the stormwater management system are prohibited.

Illicit Discharge Compliance Statement

To the best of my knowledge no illicit discharges currently exist on the site and no future illicit discharge will be allowed, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.



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 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Mark A. Elbag Jr.

2-16-2024

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 Field¹
- 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

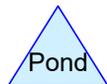
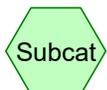
- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.



PRE FLOW WEST



PRE FLOW EAST



Routing Diagram for Main 2400 Holden developed final
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Main 2400 Holden developed final

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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1 inch	Type III 24-hr		Default	24.00	1	1.00	2
2	2 year	Type III 24-hr		Default	24.00	1	3.20	2
3	10 year	Type III 24-hr		Default	24.00	1	4.70	2
4	25 year	Type III 24-hr		Default	24.00	1	5.90	2
5	100 year	Type III 24-hr		Default	24.00	1	8.40	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
7.257	55	Woods, Good, HSG B (3S, 4S)
4.311	70	Woods, Good, HSG C (3S, 4S)
0.885	77	Woods, Good, HSG D (4S)
12.453	62	TOTAL AREA

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
7.257	HSG B	3S, 4S
4.311	HSG C	3S, 4S
0.885	HSG D	4S
0.000	Other	
12.453		TOTAL AREA

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	7.257	4.311	0.885	0.000	12.453	Woods, Good	3S, 4S
0.000	7.257	4.311	0.885	0.000	12.453	TOTAL AREA	

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Type III 24-hr 1 inch Rainfall=1.00"

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

Subcatchment 3S: PRE FLOW EAST

Runoff Area=243,737 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=722' Tc=13.7 min CN=60 Runoff=0.00 cfs 0.000 af

Subcatchment 4S: PRE FLOW WEST

Runoff Area=298,703 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=736' Tc=11.5 min CN=63 Runoff=0.00 cfs 0.000 af

Total Runoff Area = 12.453 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 12.453 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 1 inch Rainfall=1.00"

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Summary for Subcatchment 3S: PRE FLOW EAST

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

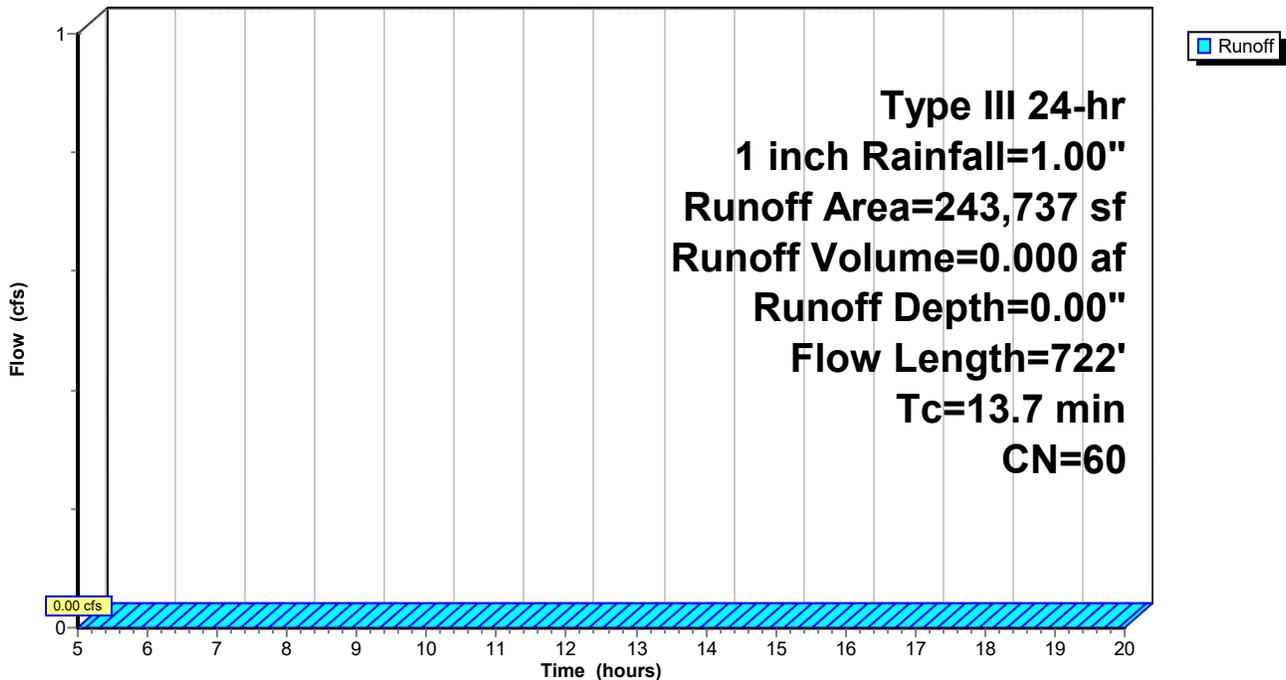
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
156,053	55	Woods, Good, HSG B
87,684	70	Woods, Good, HSG C
243,737	60	Weighted Average
243,737		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.8	672	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.7	722	Total			

Subcatchment 3S: PRE FLOW EAST

Hydrograph



Main 2400 Holden developed final

Type III 24-hr 1 inch Rainfall=1.00"

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Summary for Subcatchment 4S: PRE FLOW WEST

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

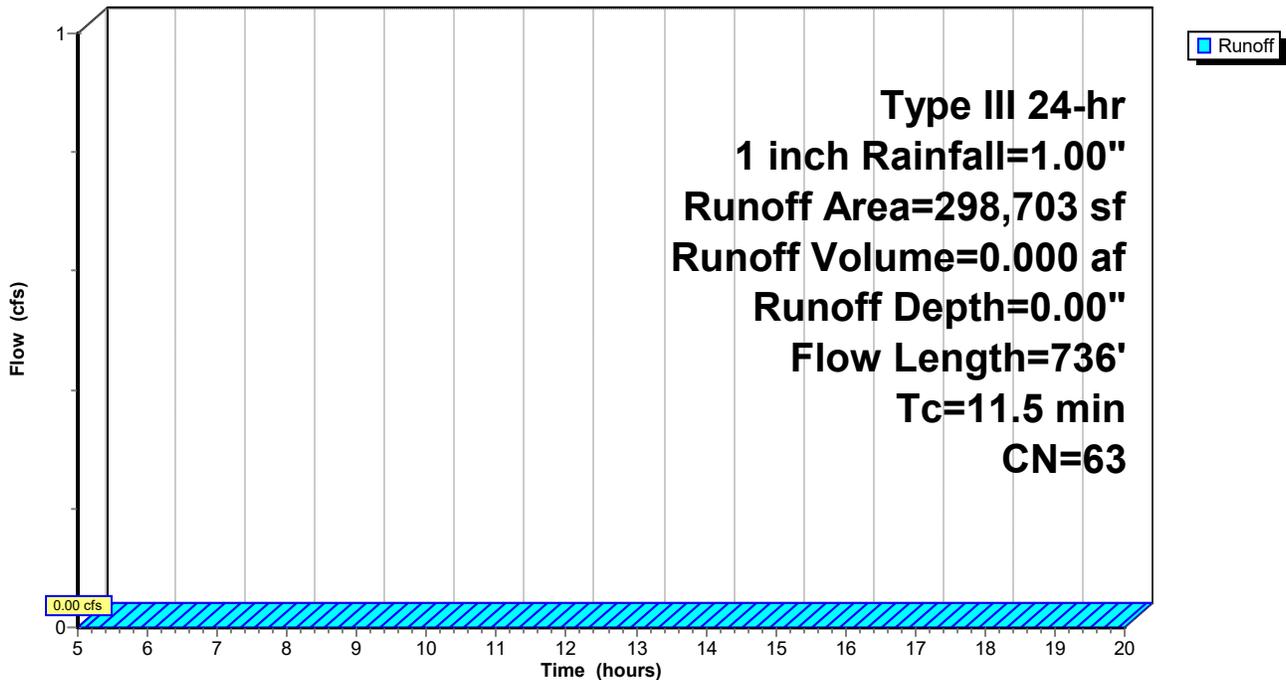
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
160,074	55	Woods, Good, HSG B
77,880	70	Woods, Good, HSG C
22,202	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
298,703	63	Weighted Average
298,703		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	686	0.1200	1.73		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.5	736	Total			

Subcatchment 4S: PRE FLOW WEST

Hydrograph



Main 2400 Holden developed final

Type III 24-hr 2 year Rainfall=3.20"

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

Subcatchment 3S: PRE FLOW EAST

Runoff Area=243,737 sf 0.00% Impervious Runoff Depth>0.35"
Flow Length=722' Tc=13.7 min CN=60 Runoff=1.23 cfs 0.165 af

Subcatchment 4S: PRE FLOW WEST

Runoff Area=298,703 sf 0.00% Impervious Runoff Depth>0.46"
Flow Length=736' Tc=11.5 min CN=63 Runoff=2.43 cfs 0.261 af

Total Runoff Area = 12.453 ac Runoff Volume = 0.426 af Average Runoff Depth = 0.41"
100.00% Pervious = 12.453 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 2 year Rainfall=3.20"

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Summary for Subcatchment 3S: PRE FLOW EAST

Runoff = 1.23 cfs @ 12.30 hrs, Volume= 0.165 af, Depth> 0.35"

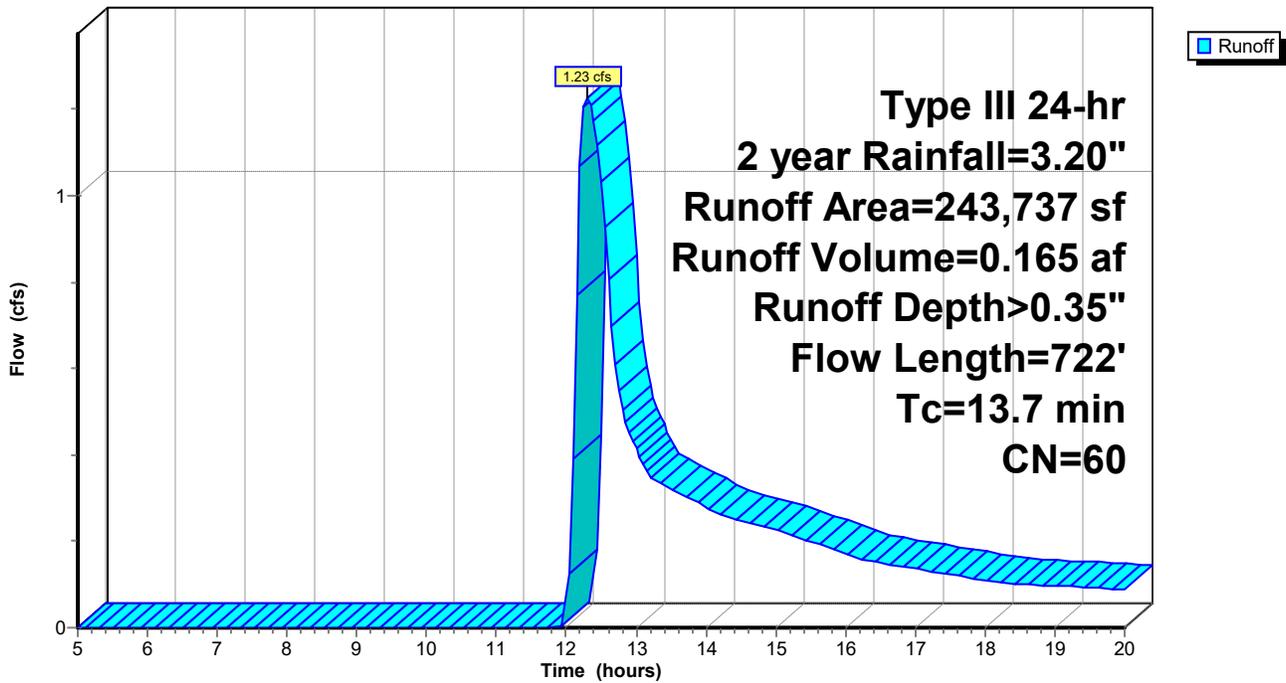
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
156,053	55	Woods, Good, HSG B
87,684	70	Woods, Good, HSG C
243,737	60	Weighted Average
243,737		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.8	672	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.7	722	Total			

Subcatchment 3S: PRE FLOW EAST

Hydrograph



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Type III 24-hr 2 year Rainfall=3.20"

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Summary for Subcatchment 4S: PRE FLOW WEST

Runoff = 2.43 cfs @ 12.21 hrs, Volume= 0.261 af, Depth> 0.46"

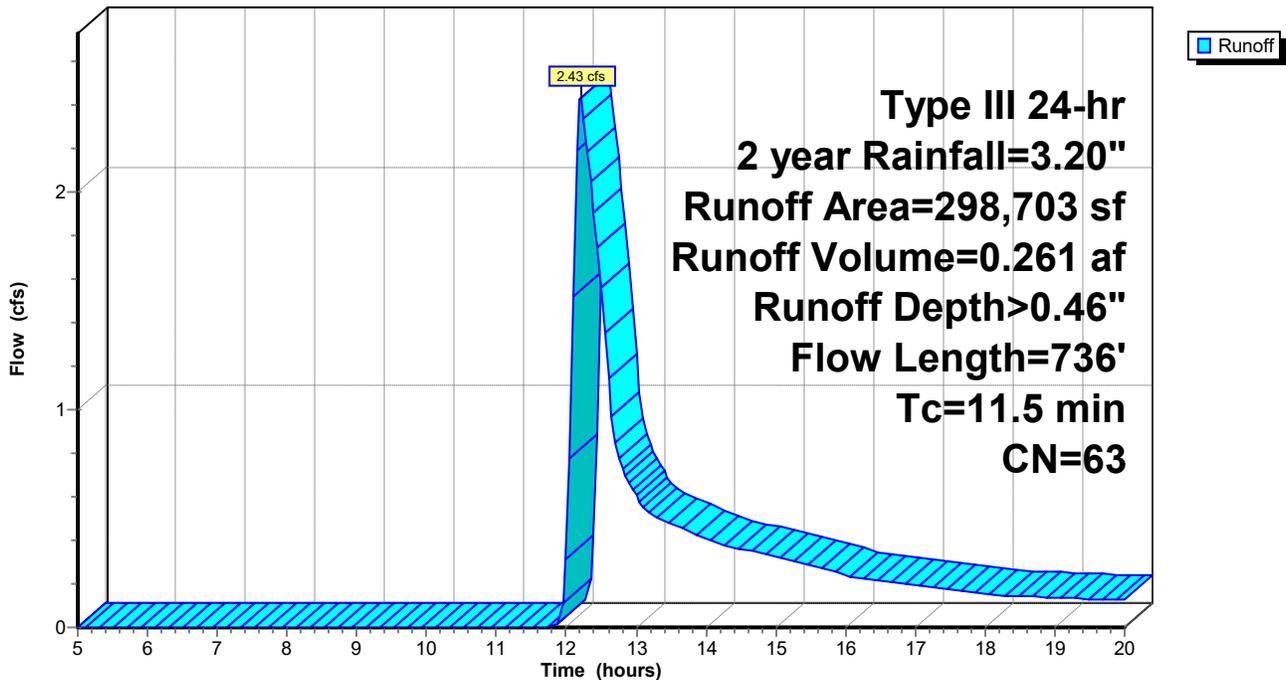
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
160,074	55	Woods, Good, HSG B
77,880	70	Woods, Good, HSG C
22,202	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
298,703	63	Weighted Average
298,703		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	686	0.1200	1.73		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.5	736	Total			

Subcatchment 4S: PRE FLOW WEST

Hydrograph



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Type III 24-hr 10 year Rainfall=4.70"

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

Subcatchment 3S: PRE FLOW EAST

Runoff Area=243,737 sf 0.00% Impervious Runoff Depth>1.01"
Flow Length=722' Tc=13.7 min CN=60 Runoff=4.99 cfs 0.472 af

Subcatchment 4S: PRE FLOW WEST

Runoff Area=298,703 sf 0.00% Impervious Runoff Depth>1.20"
Flow Length=736' Tc=11.5 min CN=63 Runoff=7.94 cfs 0.683 af

Total Runoff Area = 12.453 ac Runoff Volume = 1.155 af Average Runoff Depth = 1.11"
100.00% Pervious = 12.453 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 10 year Rainfall=4.70"

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Summary for Subcatchment 3S: PRE FLOW EAST

Runoff = 4.99 cfs @ 12.22 hrs, Volume= 0.472 af, Depth> 1.01"

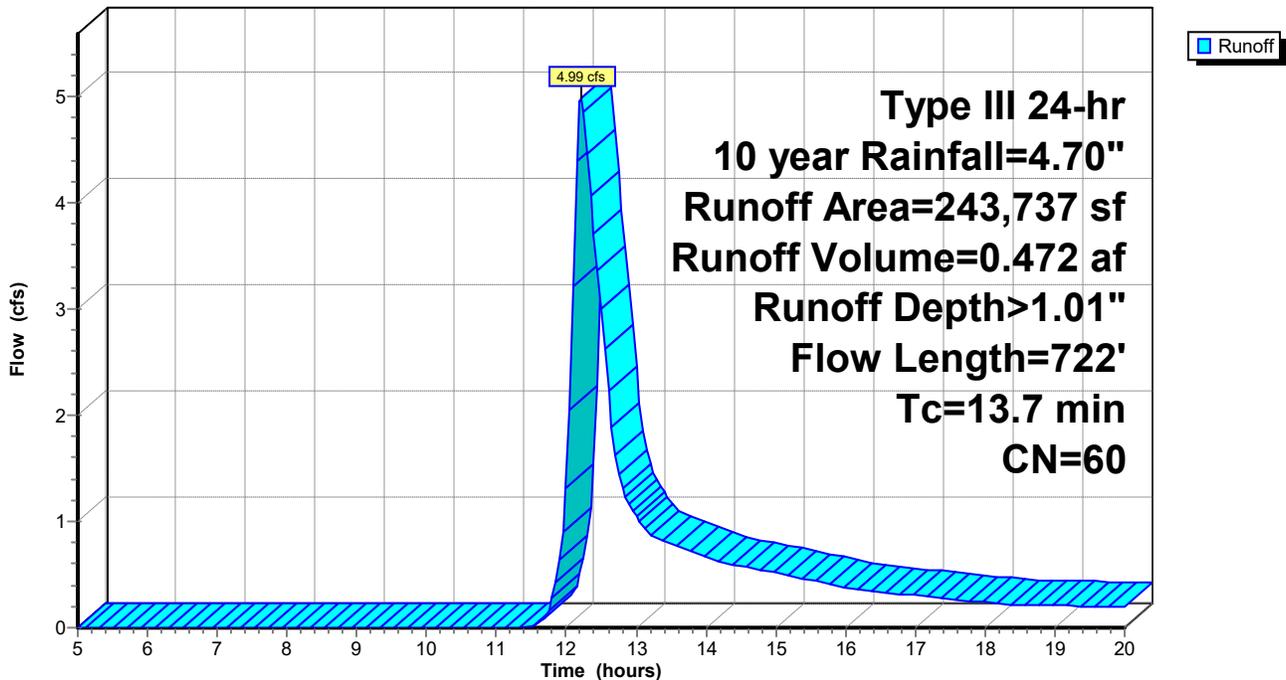
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 year Rainfall=4.70"

Area (sf)	CN	Description
156,053	55	Woods, Good, HSG B
87,684	70	Woods, Good, HSG C
243,737	60	Weighted Average
243,737		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.8	672	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.7	722	Total			

Subcatchment 3S: PRE FLOW EAST

Hydrograph



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Type III 24-hr 10 year Rainfall=4.70"

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Summary for Subcatchment 4S: PRE FLOW WEST

Runoff = 7.94 cfs @ 12.18 hrs, Volume= 0.683 af, Depth> 1.20"

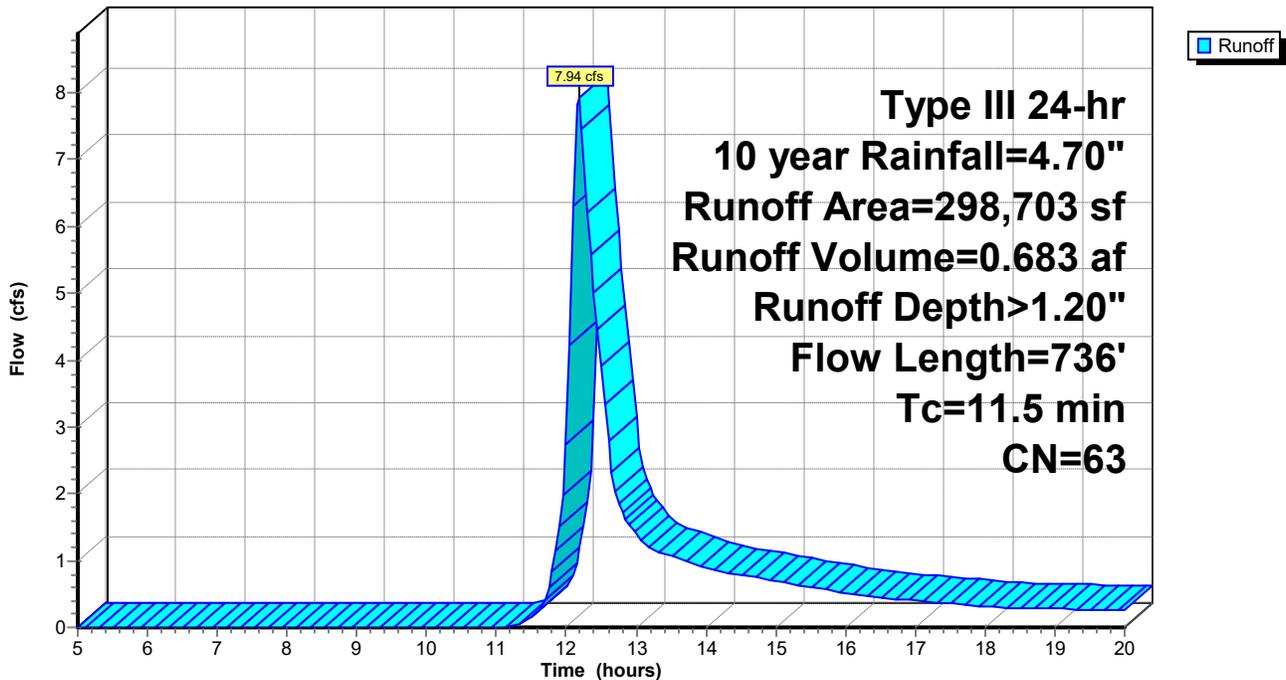
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=4.70"

Area (sf)	CN	Description
160,074	55	Woods, Good, HSG B
77,880	70	Woods, Good, HSG C
22,202	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
298,703	63	Weighted Average
298,703		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	686	0.1200	1.73		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.5	736	Total			

Subcatchment 4S: PRE FLOW WEST

Hydrograph



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Type III 24-hr 25 year Rainfall=5.90"

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

Subcatchment 3S: PRE FLOW EAST

Runoff Area=243,737 sf 0.00% Impervious Runoff Depth>1.69"
Flow Length=722' Tc=13.7 min CN=60 Runoff=8.87 cfs 0.786 af

Subcatchment 4S: PRE FLOW WEST

Runoff Area=298,703 sf 0.00% Impervious Runoff Depth>1.92"
Flow Length=736' Tc=11.5 min CN=63 Runoff=13.47 cfs 1.100 af

Total Runoff Area = 12.453 ac Runoff Volume = 1.886 af Average Runoff Depth = 1.82"
100.00% Pervious = 12.453 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 25 year Rainfall=5.90"

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Summary for Subcatchment 3S: PRE FLOW EAST

Runoff = 8.87 cfs @ 12.21 hrs, Volume= 0.786 af, Depth> 1.69"

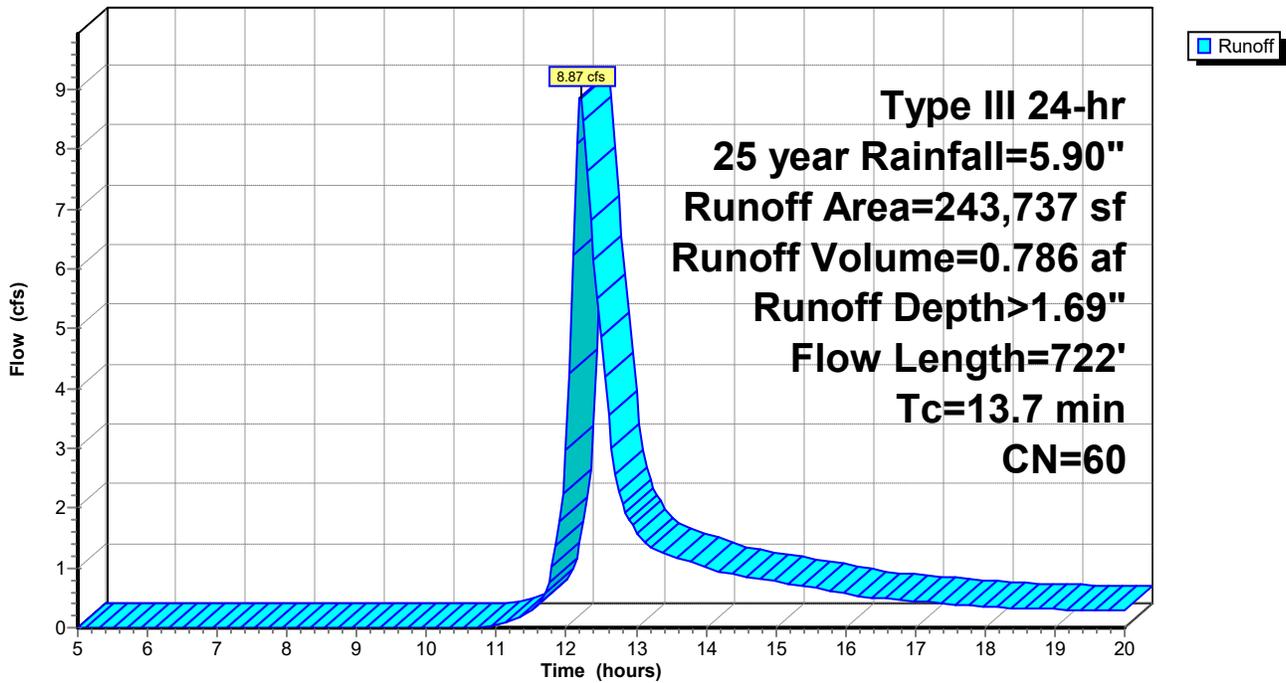
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=5.90"

Area (sf)	CN	Description
156,053	55	Woods, Good, HSG B
87,684	70	Woods, Good, HSG C
243,737	60	Weighted Average
243,737		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.8	672	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.7	722	Total			

Subcatchment 3S: PRE FLOW EAST

Hydrograph



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Type III 24-hr 25 year Rainfall=5.90"

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Summary for Subcatchment 4S: PRE FLOW WEST

Runoff = 13.47 cfs @ 12.17 hrs, Volume= 1.100 af, Depth> 1.92"

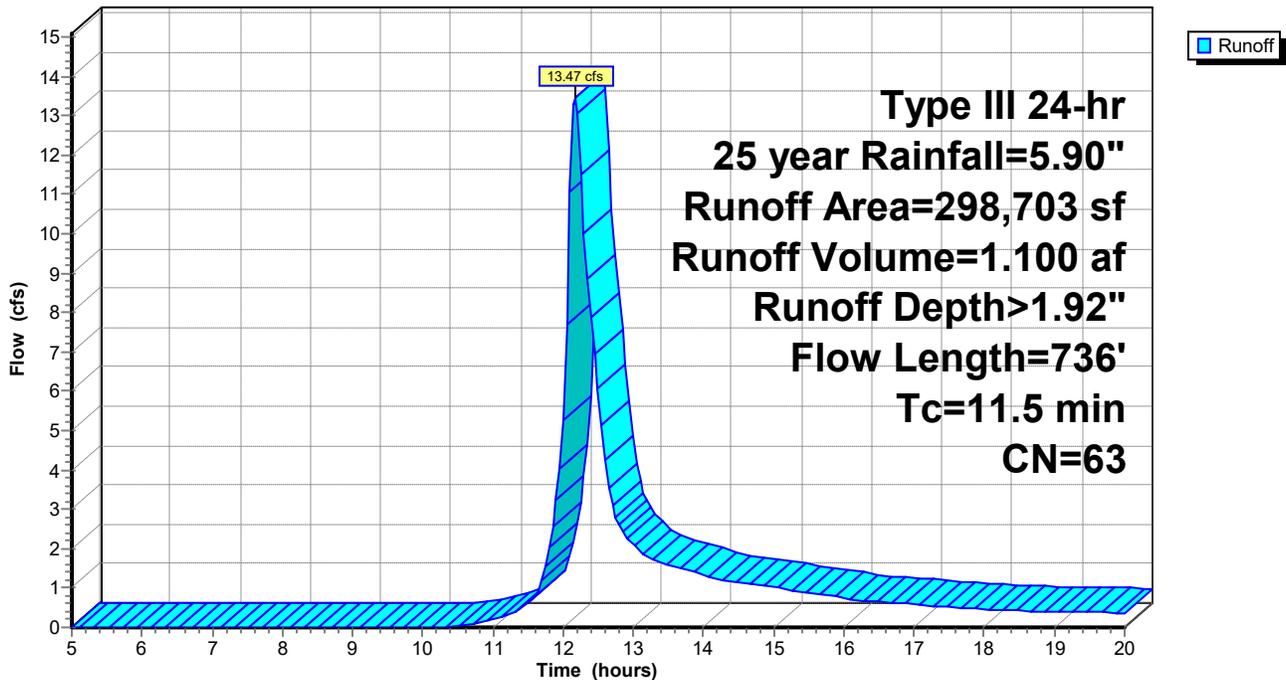
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=5.90"

Area (sf)	CN	Description
160,074	55	Woods, Good, HSG B
77,880	70	Woods, Good, HSG C
22,202	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
298,703	63	Weighted Average
298,703		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	686	0.1200	1.73		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.5	736	Total			

Subcatchment 4S: PRE FLOW WEST

Hydrograph



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Type III 24-hr 100 year Rainfall=8.40"

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

Subcatchment 3S: PRE FLOW EAST

Runoff Area=243,737 sf 0.00% Impervious Runoff Depth>3.35"
Flow Length=722' Tc=13.7 min CN=60 Runoff=18.28 cfs 1.561 af

Subcatchment 4S: PRE FLOW WEST

Runoff Area=298,703 sf 0.00% Impervious Runoff Depth>3.69"
Flow Length=736' Tc=11.5 min CN=63 Runoff=26.39 cfs 2.106 af

Total Runoff Area = 12.453 ac Runoff Volume = 3.667 af Average Runoff Depth = 3.53"
100.00% Pervious = 12.453 ac 0.00% Impervious = 0.000 ac

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Type III 24-hr 100 year Rainfall=8.40"

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Summary for Subcatchment 3S: PRE FLOW EAST

Runoff = 18.28 cfs @ 12.20 hrs, Volume= 1.561 af, Depth> 3.35"

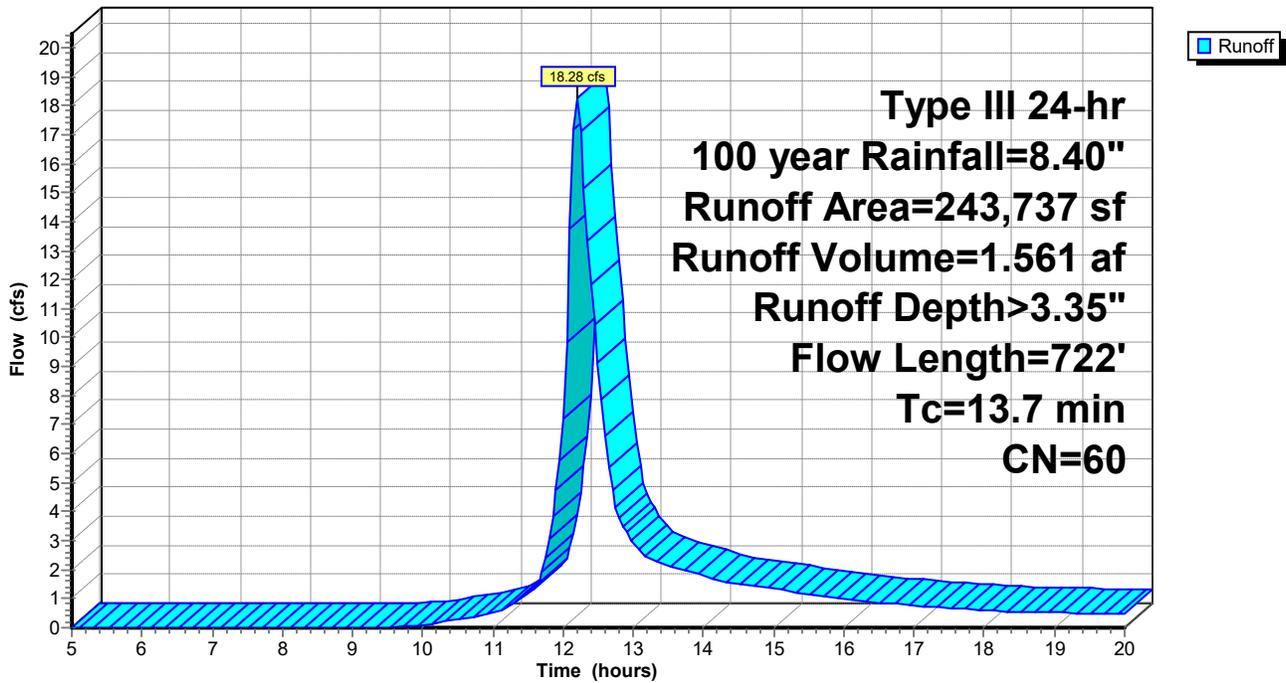
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.40"

Area (sf)	CN	Description
156,053	55	Woods, Good, HSG B
87,684	70	Woods, Good, HSG C
243,737	60	Weighted Average
243,737		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
8.8	672	0.0650	1.27		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.7	722	Total			

Subcatchment 3S: PRE FLOW EAST

Hydrograph



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Type III 24-hr 100 year Rainfall=8.40"

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Summary for Subcatchment 4S: PRE FLOW WEST

Runoff = 26.39 cfs @ 12.16 hrs, Volume= 2.106 af, Depth> 3.69"

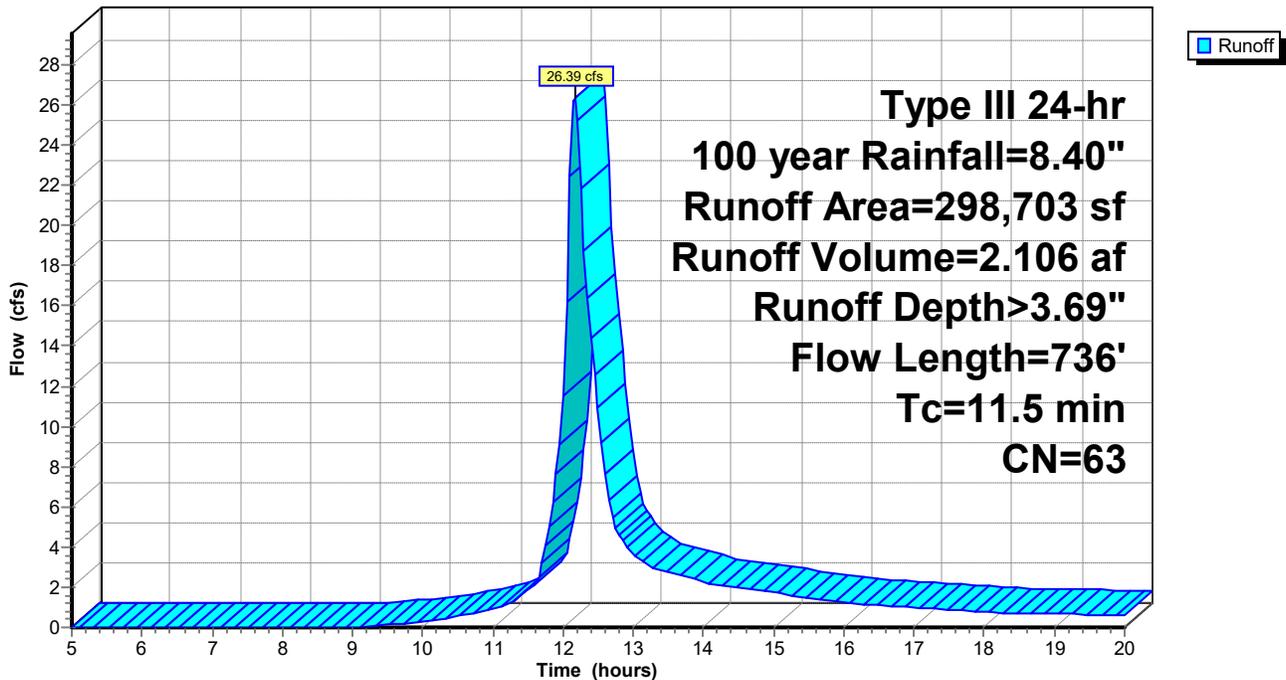
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.40"

Area (sf)	CN	Description
160,074	55	Woods, Good, HSG B
77,880	70	Woods, Good, HSG C
22,202	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
298,703	63	Weighted Average
298,703		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2000	0.17		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	686	0.1200	1.73		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.5	736	Total			

Subcatchment 4S: PRE FLOW WEST

Hydrograph





Drainarea



Landscaping



Paved area



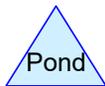
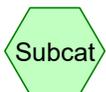
POND



Post flow west



POST FLOW EAST



Routing Diagram for Main 2400 Holden developed final
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Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1 inch	Type III 24-hr		Default	24.00	1	1.00	2
2	2 year	Type III 24-hr		Default	24.00	1	3.20	2
3	10 year	Type III 24-hr		Default	24.00	1	4.70	2
4	25 year	Type III 24-hr		Default	24.00	1	5.90	2
5	100 year	Type III 24-hr		Default	24.00	1	8.40	2

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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.336	61	>75% Grass cover, Good, HSG B (8S, 9S)
0.159	74	>75% Grass cover, Good, HSG C (8S, 9S)
2.540	48	Brush, Good, HSG B (8S, 9S, 10S)
0.838	65	Brush, Good, HSG C (8S, 9S)
3.413	98	Paved parking, HSG B (2S)
0.468	98	Paved parking, HSG C (2S)
1.983	98	Unconnected roofs, HSG B (2S)
0.271	98	Unconnected roofs, HSG C (2S)
0.491	70	Woods, Good, HSG C (10S)
0.885	77	Woods, Good, HSG D (10S)
12.383	79	TOTAL AREA

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Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
9.272	HSG B	2S, 8S, 9S, 10S
2.227	HSG C	2S, 8S, 9S, 10S
0.885	HSG D	10S
0.000	Other	
12.383		TOTAL AREA

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Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	1.336	0.159	0.000	0.000	1.495	>75% Grass cover, Good	8S, 9S
0.000	2.540	0.838	0.000	0.000	3.378	Brush, Good	8S, 9S, 10S
0.000	3.413	0.468	0.000	0.000	3.880	Paved parking	2S
0.000	1.983	0.271	0.000	0.000	2.254	Unconnected roofs	2S
0.000	0.000	0.491	0.885	0.000	1.376	Woods, Good	10S
0.000	9.272	2.227	0.885	0.000	12.383	TOTAL AREA	

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Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	995.00	994.00	60.0	0.0167	0.013	0.0	18.0	0.0

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Type III 24-hr 1 inch Rainfall=1.00"

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

Subcatchment 2S: Paved area Runoff Area=267,221 sf 100.00% Impervious Runoff Depth>0.75"
Tc=6.8 min CN=98 Runoff=5.23 cfs 0.382 af

Subcatchment 8S: Landscaping Runoff Area=102,779 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=56 Runoff=0.00 cfs 0.000 af

Subcatchment 9S: POST FLOW EAST Runoff Area=94,163 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=56 Runoff=0.00 cfs 0.000 af

Subcatchment 10S: Drainarea Runoff Area=75,253 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=500' Slope=0.0400 '/' Tc=23.8 min CN=69 Runoff=0.00 cfs 0.000 af

Reach 2R: Post flow west Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: POND Peak Elev=997.99' Storage=9,713 cf Inflow=5.23 cfs 0.382 af
Discarded=0.38 cfs 0.250 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.38 cfs 0.250 af

Total Runoff Area = 12.383 ac Runoff Volume = 0.382 af Average Runoff Depth = 0.37"
50.46% Pervious = 6.249 ac 49.54% Impervious = 6.135 ac

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Type III 24-hr 1 inch Rainfall=1.00"

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Summary for Subcatchment 2S: Paved area

Runoff = 5.23 cfs @ 12.10 hrs, Volume= 0.382 af, Depth> 0.75"
 Routed to Pond 1P : POND

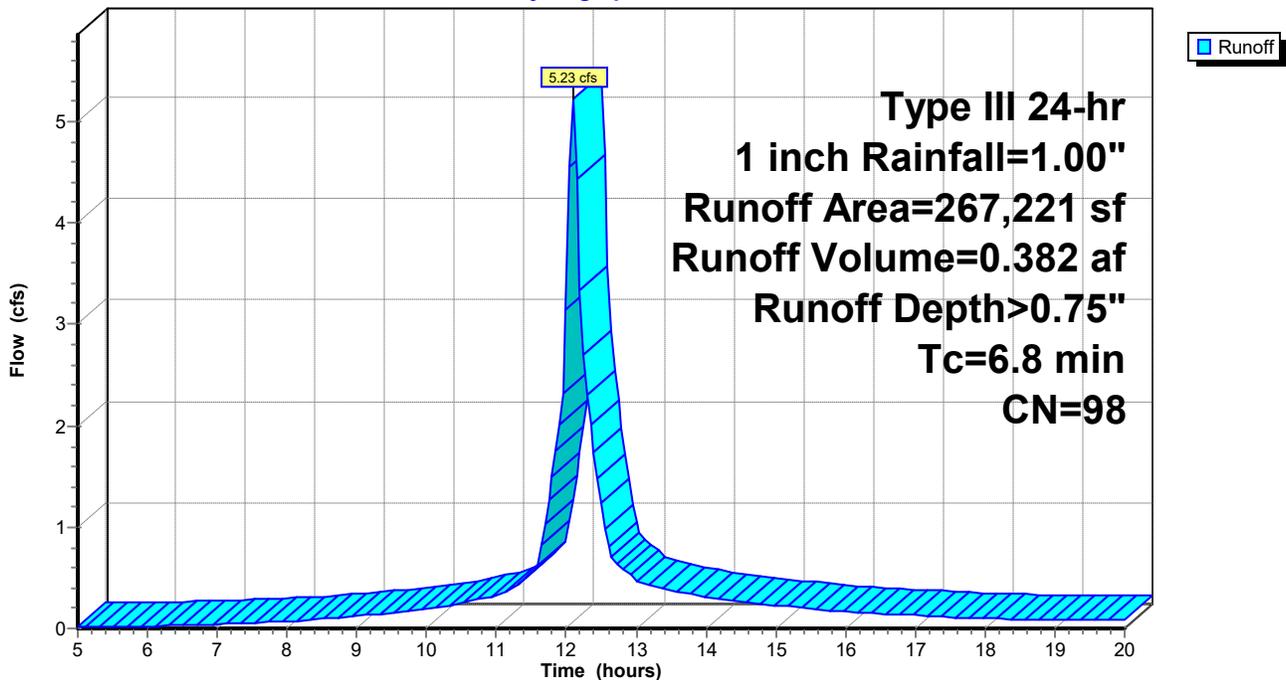
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
86,386	98	Unconnected roofs, HSG B
11,804	98	Unconnected roofs, HSG C
148,649	98	Paved parking, HSG B
20,382	98	Paved parking, HSG C
267,221	98	Weighted Average
267,221		100.00% Impervious Area
98,190		36.74% Unconnected

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

Subcatchment 2S: Paved area

Hydrograph



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Type III 24-hr 1 inch Rainfall=1.00"

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Summary for Subcatchment 8S: Landscaping

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Routed to Reach 2R : Post flow west

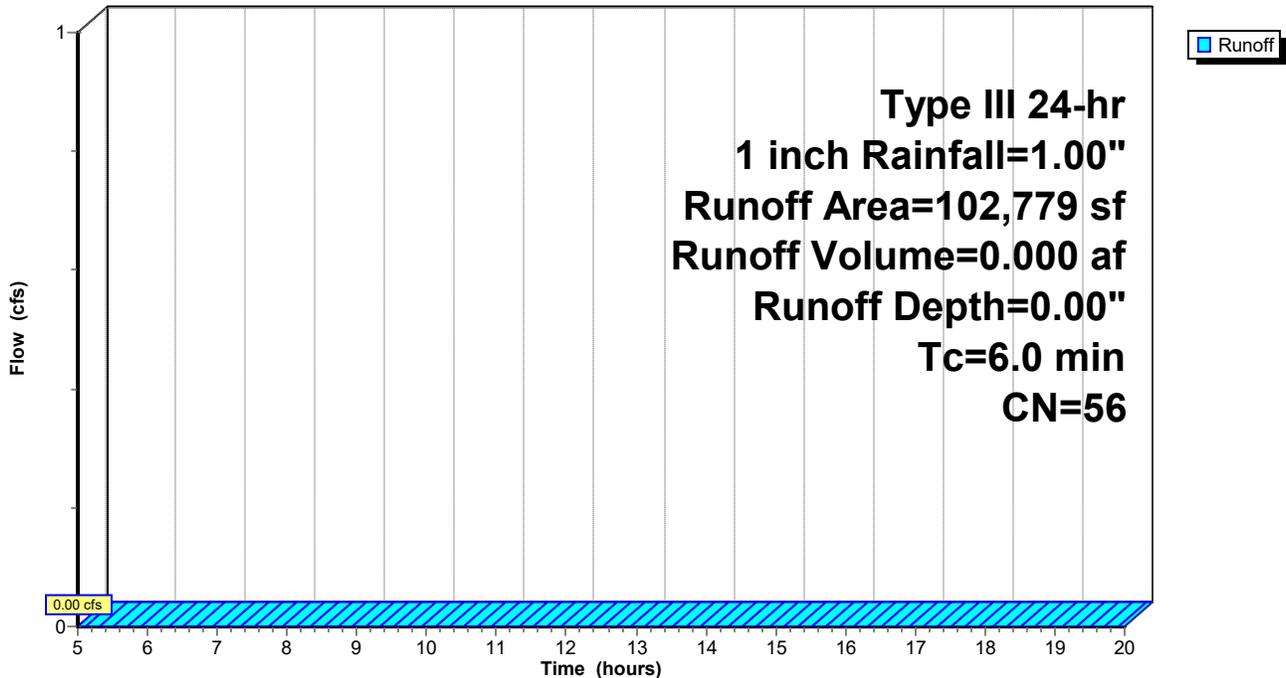
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
10,050	65	Brush, Good, HSG C
47,021	48	Brush, Good, HSG B
4,588	74	>75% Grass cover, Good, HSG C
1,905	61	>75% Grass cover, Good, HSG B
39,215	61	>75% Grass cover, Good, HSG B
102,779	56	Weighted Average
102,779		100.00% Pervious Area

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

Subcatchment 8S: Landscaping

Hydrograph



Summary for Subcatchment 9S: POST FLOW EAST

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

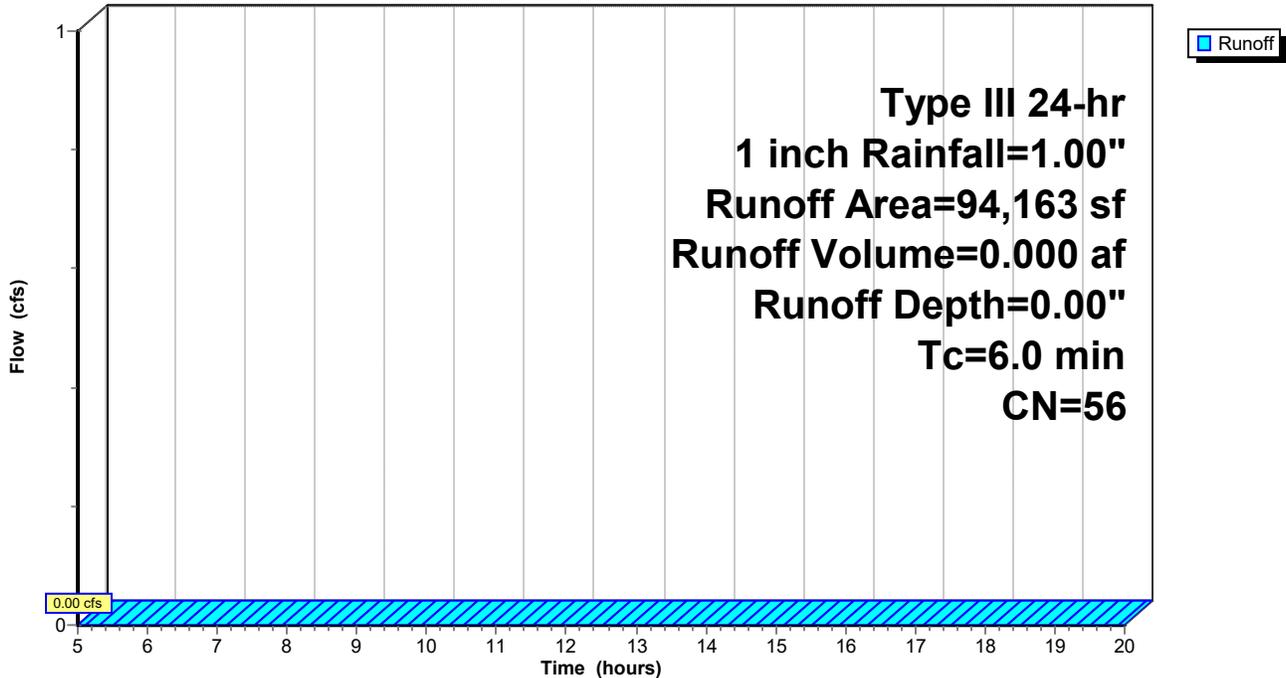
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
26,457	65	Brush, Good, HSG C
2,320	74	>75% Grass cover, Good, HSG C
48,296	48	Brush, Good, HSG B
17,090	61	>75% Grass cover, Good, HSG B
94,163	56	Weighted Average
94,163		100.00% Pervious Area

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

Subcatchment 9S: POST FLOW EAST

Hydrograph



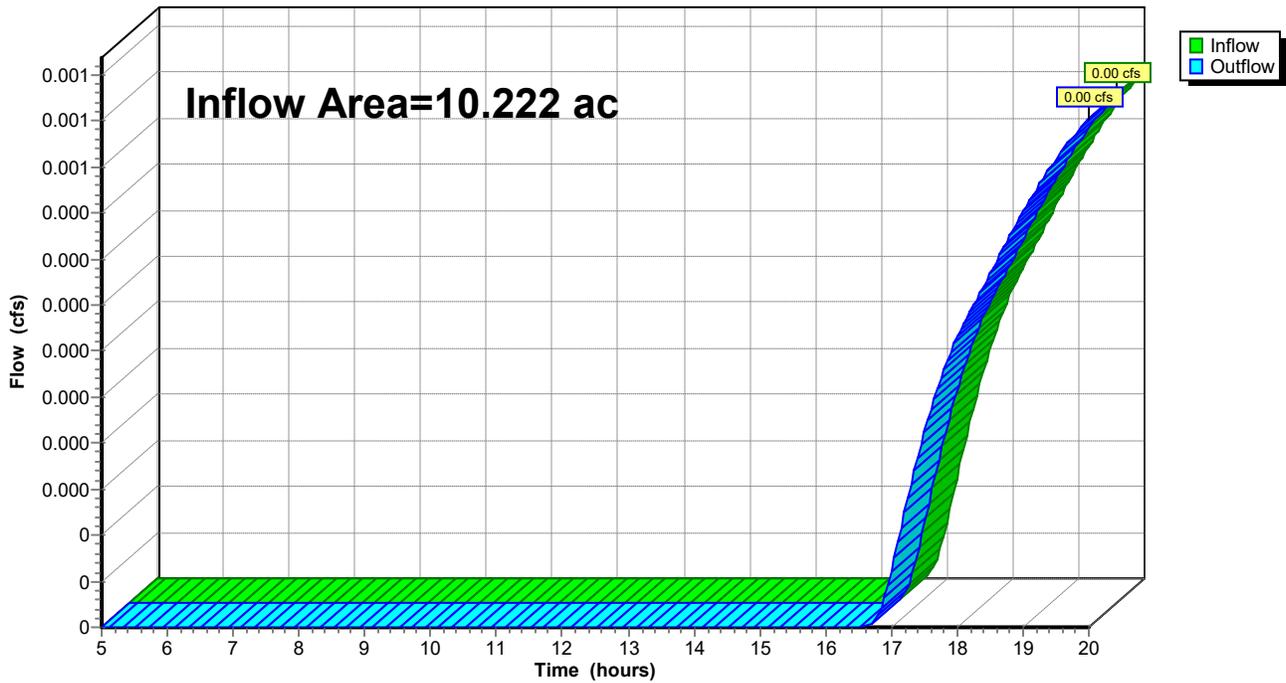
Summary for Reach 2R: Post flow west

Inflow Area = 10.222 ac, 60.02% Impervious, Inflow Depth > 0.00" for 1 inch event
Inflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: Post flow west

Hydrograph



Summary for Pond 1P: POND

Inflow Area = 6.135 ac, 100.00% Impervious, Inflow Depth > 0.75" for 1 inch event
 Inflow = 5.23 cfs @ 12.10 hrs, Volume= 0.382 af
 Outflow = 0.38 cfs @ 13.47 hrs, Volume= 0.250 af, Atten= 93%, Lag= 82.3 min
 Discarded = 0.38 cfs @ 13.47 hrs, Volume= 0.250 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Reach 2R : Post flow west
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Reach 2R : Post flow west

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 997.99' @ 13.47 hrs Surf.Area= 12,387 sf Storage= 9,713 cf

Plug-Flow detention time= 220.8 min calculated for 0.250 af (65% of inflow)
 Center-of-Mass det. time= 149.6 min (908.8 - 759.2)

Volume	Invert	Avail.Storage	Storage Description
#1	996.00'	88,839 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
996.00	1,600	0	0
997.00	2,800	2,200	2,200
998.00	12,489	7,645	9,845
999.00	16,000	14,245	24,089
1,000.00	20,500	18,250	42,339
1,001.00	23,500	22,000	64,339
1,002.00	25,500	24,500	88,839

Device	Routing	Invert	Outlet Devices
#1	Primary	995.00'	18.0" Round Culvert L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 995.00' / 994.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,001.80'	24.0" x 24.0" Horiz. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.20'	7.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	999.00'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#5	Device 1	998.00'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Discarded	996.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 994.00'
#7	Secondary	1,001.90'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

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Type III 24-hr 1 inch Rainfall=1.00"

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Discarded OutFlow Max=0.38 cfs @ 13.47 hrs HW=997.99' (Free Discharge)

↳ **6=Exfiltration** (Controls 0.38 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=996.00' (Free Discharge)

↳ **1=Culvert** (Passes 0.00 cfs of 4.27 cfs potential flow)

↳ **2=Orifice/Grate** (Controls 0.00 cfs)

↳ **3=Orifice/Grate** (Controls 0.00 cfs)

↳ **4=Orifice/Grate** (Controls 0.00 cfs)

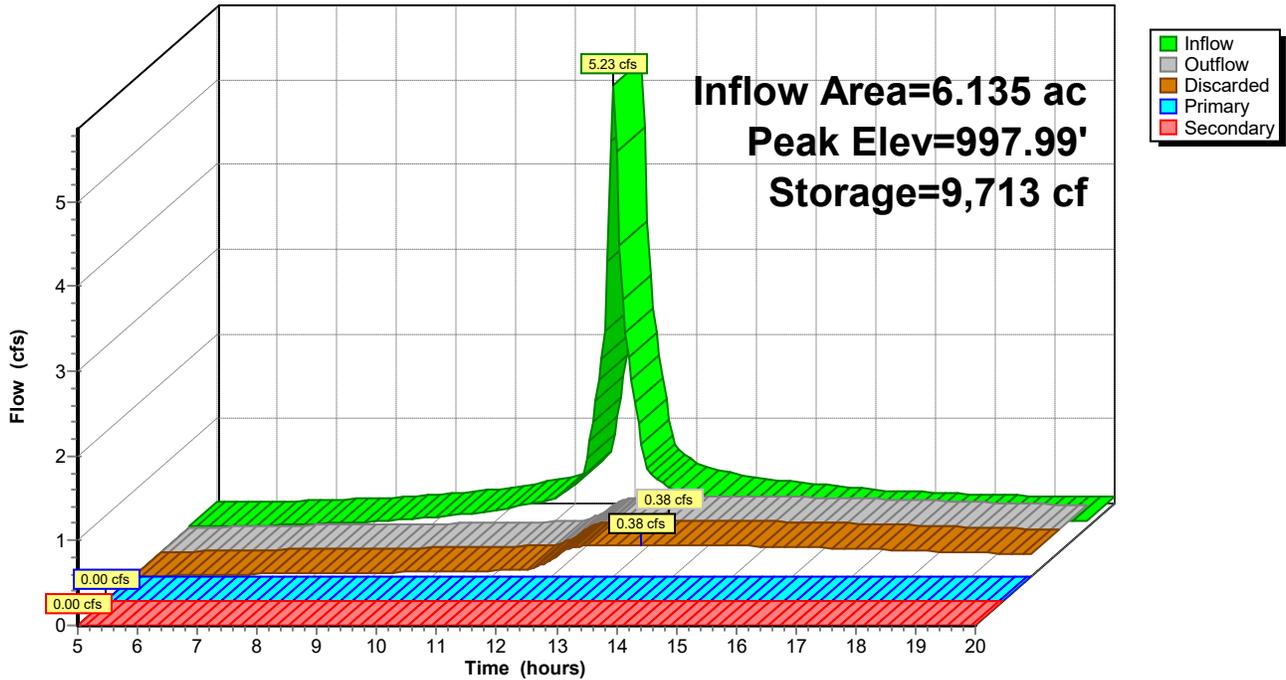
↳ **5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=996.00' (Free Discharge)

↳ **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POND

Hydrograph



Main 2400 Holden developed final

Type III 24-hr 2 year Rainfall=3.20"

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

Subcatchment 2S: Paved area Runoff Area=267,221 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.8 min CN=98 Runoff=18.26 cfs 1.418 af

Subcatchment 8S: Landscaping Runoff Area=102,779 sf 0.00% Impervious Runoff Depth>0.24"
Tc=6.0 min CN=56 Runoff=0.29 cfs 0.047 af

Subcatchment 9S: POST FLOW EAST Runoff Area=94,163 sf 0.00% Impervious Runoff Depth>0.24"
Tc=6.0 min CN=56 Runoff=0.27 cfs 0.043 af

Subcatchment 10S: Drainarea Runoff Area=75,253 sf 0.00% Impervious Runoff Depth>0.70"
Flow Length=500' Slope=0.0400 '/' Tc=23.8 min CN=69 Runoff=0.86 cfs 0.100 af

Reach 2R: Post flow west Inflow=2.22 cfs 0.559 af
Outflow=2.22 cfs 0.559 af

Pond 1P: POND Peak Elev=999.68' Storage=36,043 cf Inflow=18.26 cfs 1.418 af
Discarded=0.72 cfs 0.521 af Primary=1.20 cfs 0.412 af Secondary=0.00 cfs 0.000 af Outflow=1.92 cfs 0.933 af

Total Runoff Area = 12.383 ac Runoff Volume = 1.607 af Average Runoff Depth = 1.56"
50.46% Pervious = 6.249 ac 49.54% Impervious = 6.135 ac

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Type III 24-hr 2 year Rainfall=3.20"

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Summary for Subcatchment 2S: Paved area

Runoff = 18.26 cfs @ 12.10 hrs, Volume= 1.418 af, Depth> 2.77"
 Routed to Pond 1P : POND

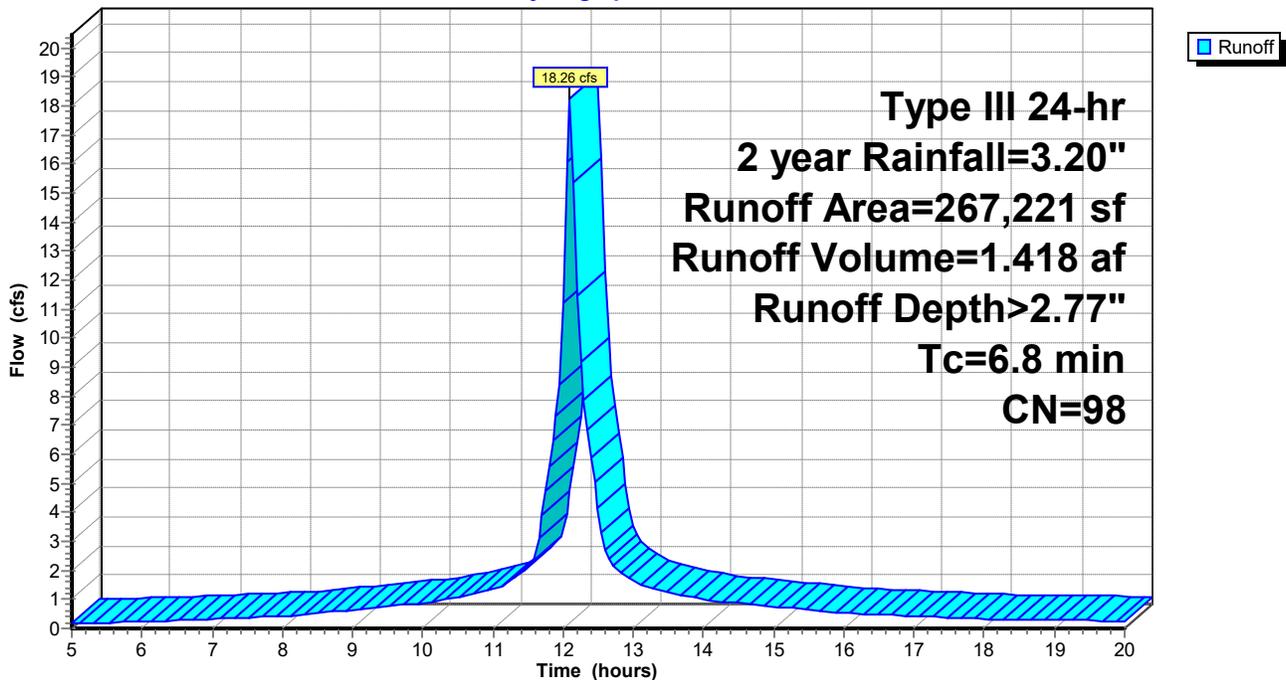
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
86,386	98	Unconnected roofs, HSG B
11,804	98	Unconnected roofs, HSG C
148,649	98	Paved parking, HSG B
20,382	98	Paved parking, HSG C
267,221	98	Weighted Average
267,221		100.00% Impervious Area
98,190		36.74% Unconnected

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

Subcatchment 2S: Paved area

Hydrograph



Summary for Subcatchment 8S: Landscaping

Runoff = 0.29 cfs @ 12.31 hrs, Volume= 0.047 af, Depth> 0.24"
 Routed to Reach 2R : Post flow west

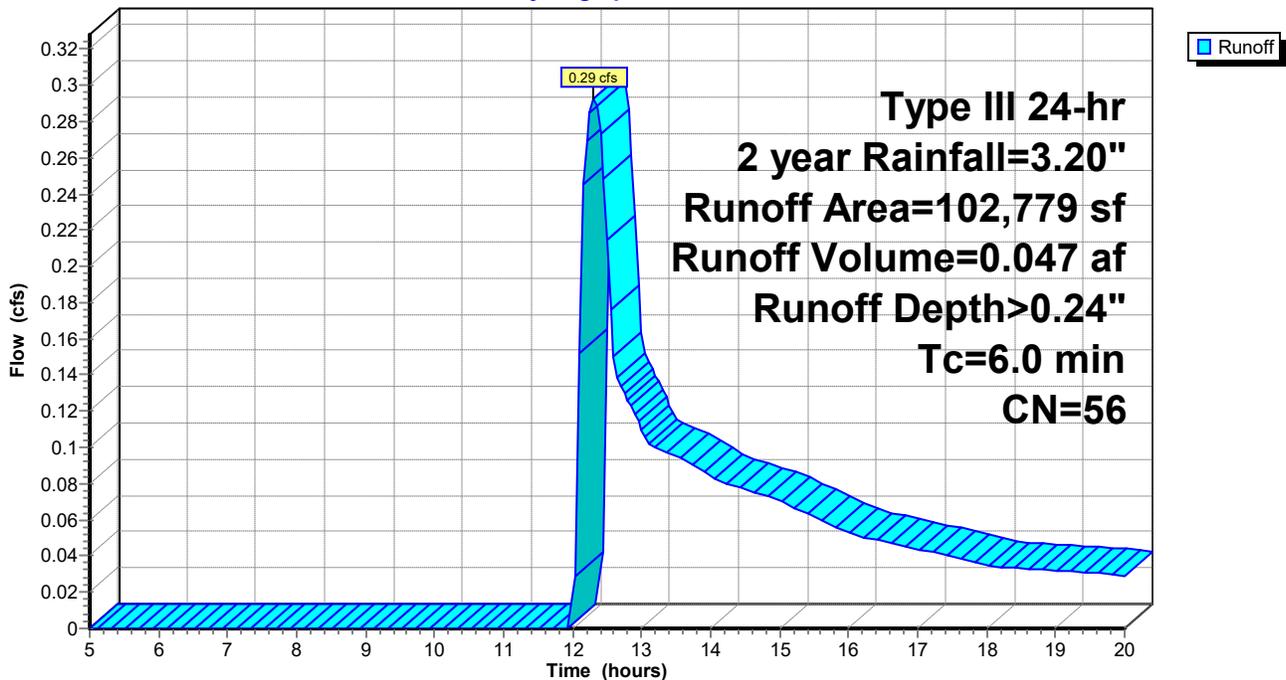
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
10,050	65	Brush, Good, HSG C
47,021	48	Brush, Good, HSG B
4,588	74	>75% Grass cover, Good, HSG C
1,905	61	>75% Grass cover, Good, HSG B
39,215	61	>75% Grass cover, Good, HSG B
102,779	56	Weighted Average
102,779		100.00% Pervious Area

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

Subcatchment 8S: Landscaping

Hydrograph



Summary for Subcatchment 9S: POST FLOW EAST

Runoff = 0.27 cfs @ 12.31 hrs, Volume= 0.043 af, Depth> 0.24"

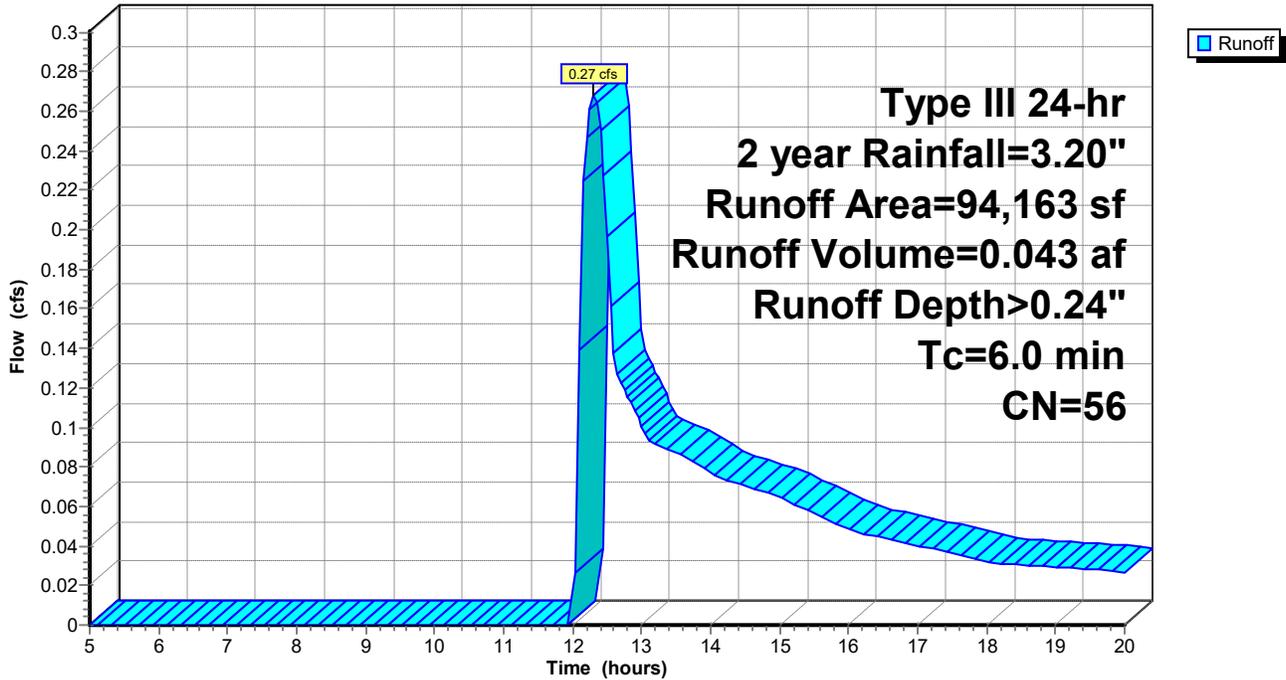
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
26,457	65	Brush, Good, HSG C
2,320	74	>75% Grass cover, Good, HSG C
48,296	48	Brush, Good, HSG B
17,090	61	>75% Grass cover, Good, HSG B
94,163	56	Weighted Average
94,163		100.00% Pervious Area

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

Subcatchment 9S: POST FLOW EAST

Hydrograph



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Type III 24-hr 2 year Rainfall=3.20"

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Summary for Subcatchment 10S: Drainarea

Runoff = 0.86 cfs @ 12.38 hrs, Volume= 0.100 af, Depth> 0.70"
 Routed to Reach 2R : Post flow west

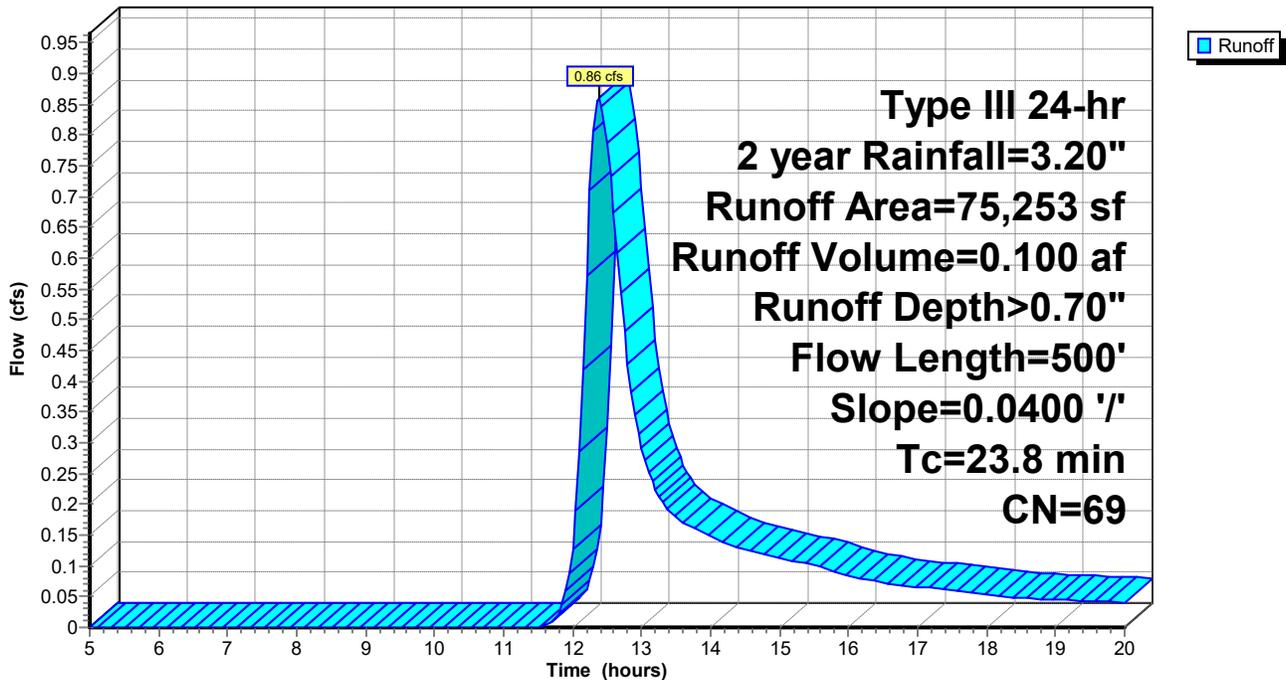
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2 year Rainfall=3.20"

Area (sf)	CN	Description
15,306	48	Brush, Good, HSG B
21,400	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
75,253	69	Weighted Average
75,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0400	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
7.5	450	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
23.8	500	Total			

Subcatchment 10S: Drainarea

Hydrograph



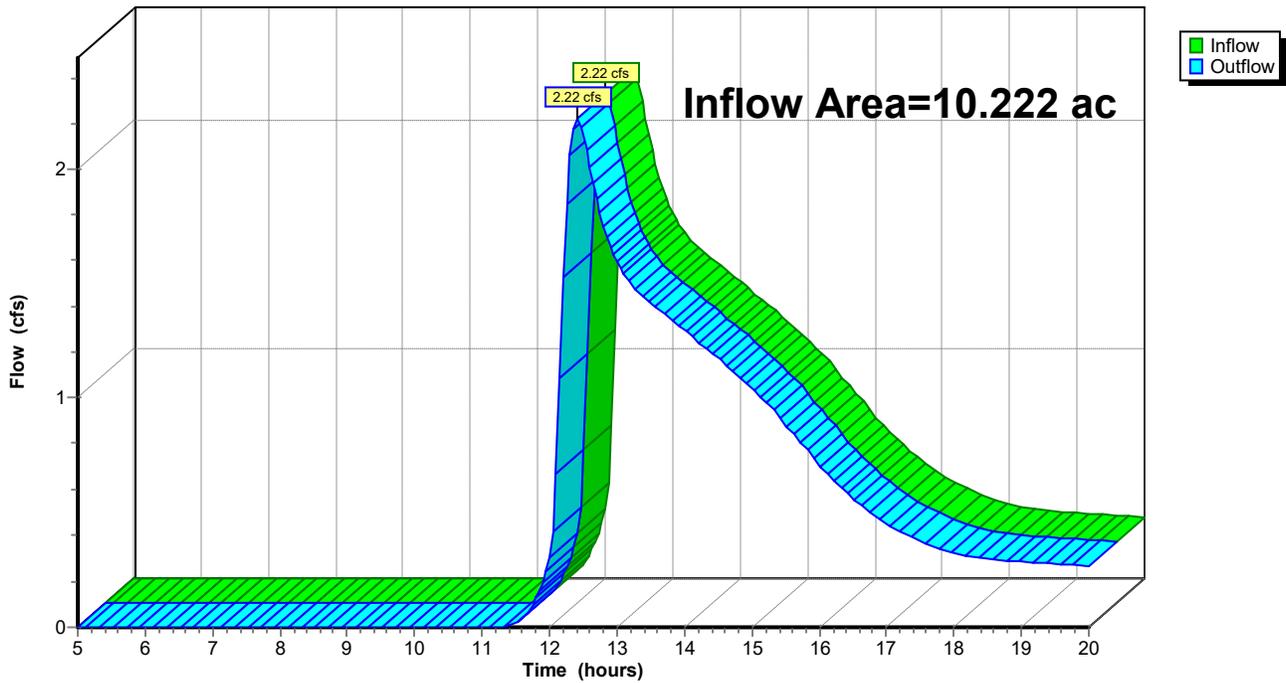
Summary for Reach 2R: Post flow west

Inflow Area = 10.222 ac, 60.02% Impervious, Inflow Depth > 0.66" for 2 year event
Inflow = 2.22 cfs @ 12.41 hrs, Volume= 0.559 af
Outflow = 2.22 cfs @ 12.41 hrs, Volume= 0.559 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: Post flow west

Hydrograph



Summary for Pond 1P: POND

Inflow Area = 6.135 ac, 100.00% Impervious, Inflow Depth > 2.77" for 2 year event
 Inflow = 18.26 cfs @ 12.10 hrs, Volume= 1.418 af
 Outflow = 1.92 cfs @ 12.84 hrs, Volume= 0.933 af, Atten= 89%, Lag= 44.4 min
 Discarded = 0.72 cfs @ 12.84 hrs, Volume= 0.521 af
 Primary = 1.20 cfs @ 12.84 hrs, Volume= 0.412 af
 Routed to Reach 2R : Post flow west
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Reach 2R : Post flow west

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 999.68' @ 12.84 hrs Surf.Area= 19,068 sf Storage= 36,043 cf

Plug-Flow detention time= 214.4 min calculated for 0.933 af (66% of inflow)
 Center-of-Mass det. time= 141.3 min (880.5 - 739.2)

Volume	Invert	Avail.Storage	Storage Description
#1	996.00'	88,839 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
996.00	1,600	0	0
997.00	2,800	2,200	2,200
998.00	12,489	7,645	9,845
999.00	16,000	14,245	24,089
1,000.00	20,500	18,250	42,339
1,001.00	23,500	22,000	64,339
1,002.00	25,500	24,500	88,839

Device	Routing	Invert	Outlet Devices
#1	Primary	995.00'	18.0" Round Culvert L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 995.00' / 994.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,001.80'	24.0" x 24.0" Horiz. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.20'	7.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	999.00'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#5	Device 1	998.00'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Discarded	996.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 994.00'
#7	Secondary	1,001.90'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

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Type III 24-hr 2 year Rainfall=3.20"

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Discarded OutFlow Max=0.72 cfs @ 12.84 hrs HW=999.68' (Free Discharge)

↳ **6=Exfiltration** (Controls 0.72 cfs)

Primary OutFlow Max=1.20 cfs @ 12.84 hrs HW=999.68' (Free Discharge)

↳ **1=Culvert** (Passes 1.20 cfs of 16.87 cfs potential flow)

↳ **2=Orifice/Grate** (Controls 0.00 cfs)

↳ **3=Orifice/Grate** (Controls 0.00 cfs)

↳ **4=Orifice/Grate** (Orifice Controls 0.90 cfs @ 3.31 fps)

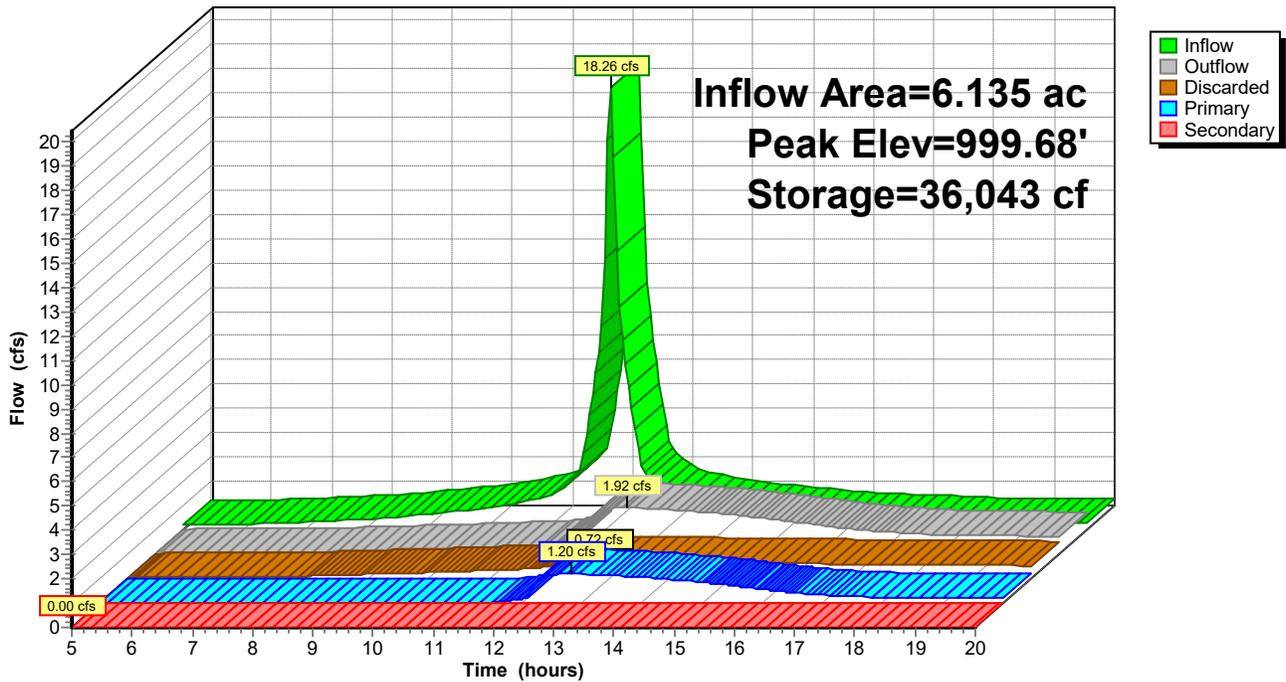
↳ **5=Orifice/Grate** (Orifice Controls 0.29 cfs @ 6.01 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=996.01' (Free Discharge)

↳ **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POND

Hydrograph



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Type III 24-hr 10 year Rainfall=4.70"

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

Subcatchment 2S: Paved area Runoff Area=267,221 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.8 min CN=98 Runoff=27.01 cfs 2.119 af

Subcatchment 8S: Landscaping Runoff Area=102,779 sf 0.00% Impervious Runoff Depth>0.79"
Tc=6.0 min CN=56 Runoff=1.91 cfs 0.156 af

Subcatchment 9S: POST FLOW EAST Runoff Area=94,163 sf 0.00% Impervious Runoff Depth>0.79"
Tc=6.0 min CN=56 Runoff=1.75 cfs 0.143 af

Subcatchment 10S: Drainarea Runoff Area=75,253 sf 0.00% Impervious Runoff Depth>1.59"
Flow Length=500' Slope=0.0400 '/' Tc=23.8 min CN=69 Runoff=2.13 cfs 0.228 af

Reach 2R: Post flow west Inflow=5.36 cfs 1.277 af
Outflow=5.36 cfs 1.277 af

Pond 1P: POND Peak Elev=1,000.49' Storage=52,745 cf Inflow=27.01 cfs 2.119 af
Discarded=0.90 cfs 0.640 af Primary=2.83 cfs 0.893 af Secondary=0.00 cfs 0.000 af Outflow=3.73 cfs 1.533 af

Total Runoff Area = 12.383 ac Runoff Volume = 2.646 af Average Runoff Depth = 2.56"
50.46% Pervious = 6.249 ac 49.54% Impervious = 6.135 ac

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Type III 24-hr 10 year Rainfall=4.70"

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Summary for Subcatchment 2S: Paved area

Runoff = 27.01 cfs @ 12.10 hrs, Volume= 2.119 af, Depth> 4.15"
 Routed to Pond 1P : POND

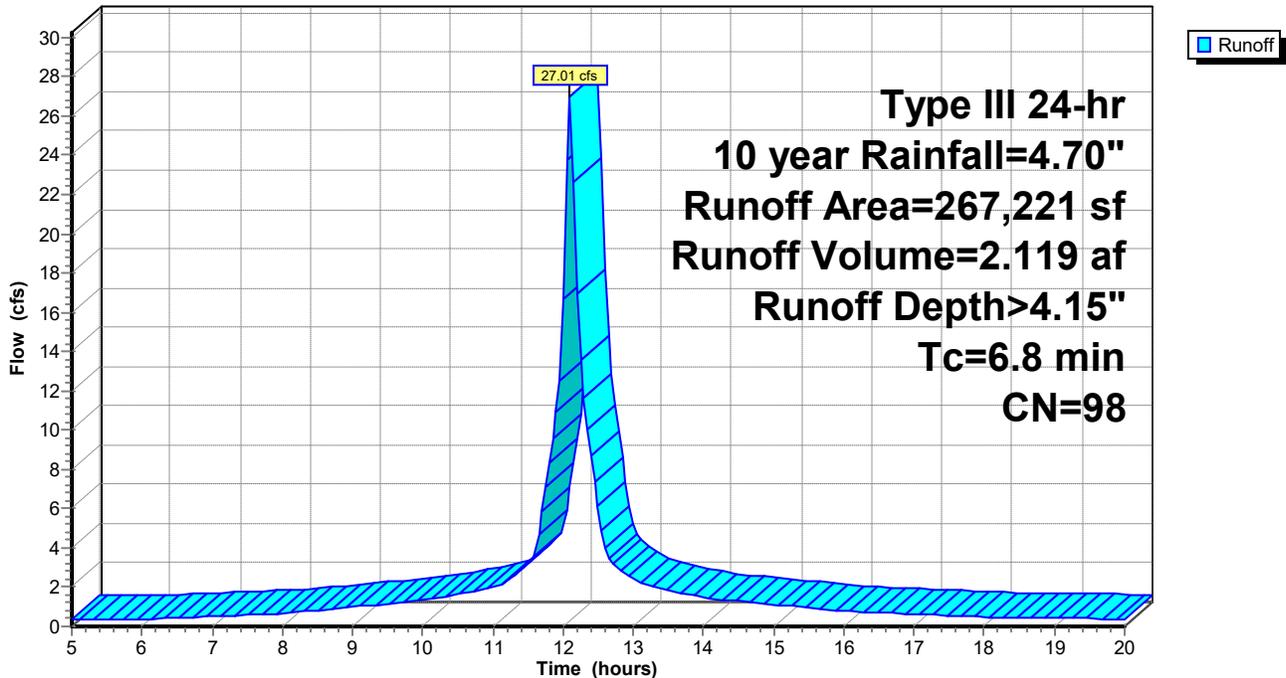
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 year Rainfall=4.70"

Area (sf)	CN	Description
86,386	98	Unconnected roofs, HSG B
11,804	98	Unconnected roofs, HSG C
148,649	98	Paved parking, HSG B
20,382	98	Paved parking, HSG C
267,221	98	Weighted Average
267,221		100.00% Impervious Area
98,190		36.74% Unconnected

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

Subcatchment 2S: Paved area

Hydrograph



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Type III 24-hr 10 year Rainfall=4.70"

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Summary for Subcatchment 8S: Landscaping

Runoff = 1.91 cfs @ 12.11 hrs, Volume= 0.156 af, Depth> 0.79"
 Routed to Reach 2R : Post flow west

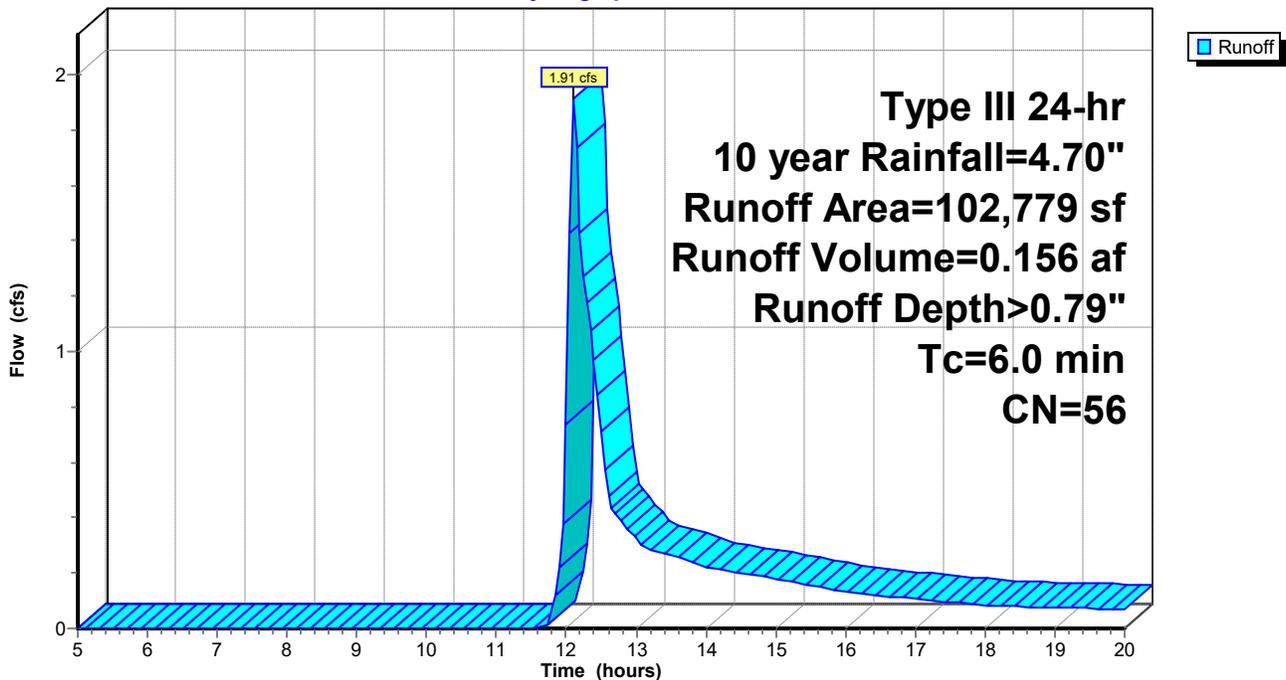
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 year Rainfall=4.70"

Area (sf)	CN	Description
10,050	65	Brush, Good, HSG C
47,021	48	Brush, Good, HSG B
4,588	74	>75% Grass cover, Good, HSG C
1,905	61	>75% Grass cover, Good, HSG B
39,215	61	>75% Grass cover, Good, HSG B
102,779	56	Weighted Average
102,779		100.00% Pervious Area

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

Subcatchment 8S: Landscaping

Hydrograph



Summary for Subcatchment 9S: POST FLOW EAST

Runoff = 1.75 cfs @ 12.11 hrs, Volume= 0.143 af, Depth> 0.79"

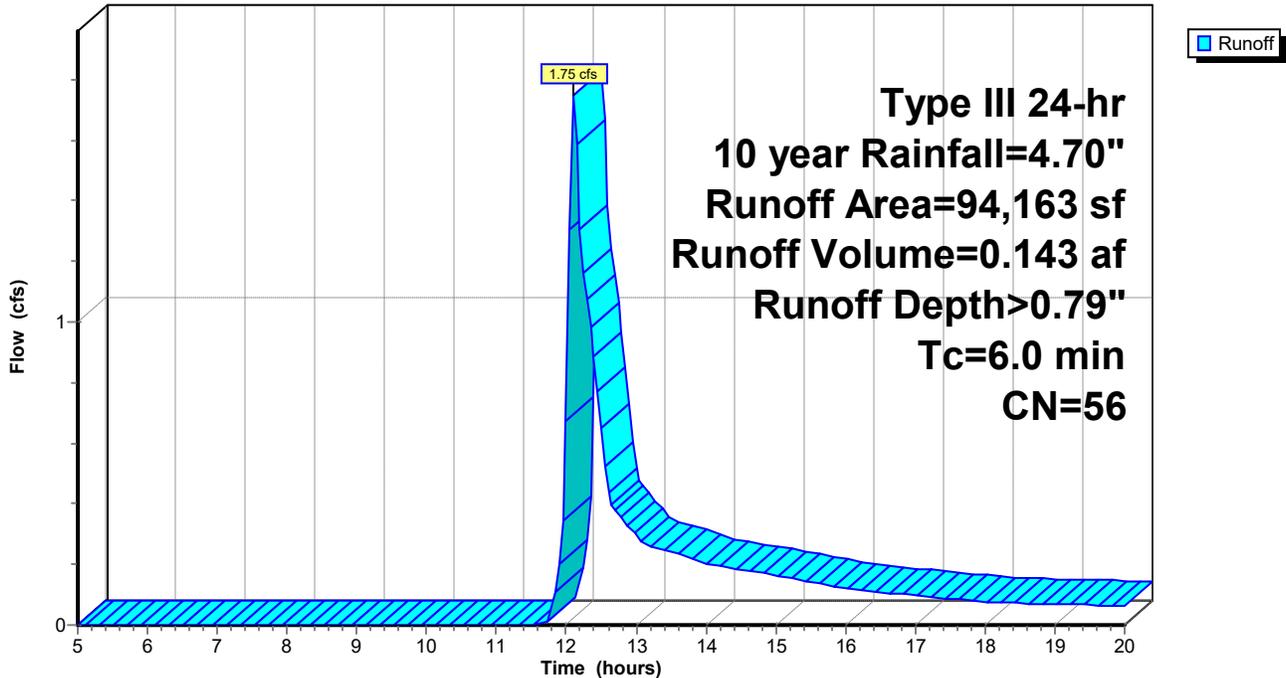
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 year Rainfall=4.70"

Area (sf)	CN	Description
26,457	65	Brush, Good, HSG C
2,320	74	>75% Grass cover, Good, HSG C
48,296	48	Brush, Good, HSG B
17,090	61	>75% Grass cover, Good, HSG B
94,163	56	Weighted Average
94,163		100.00% Pervious Area

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

Subcatchment 9S: POST FLOW EAST

Hydrograph



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Type III 24-hr 10 year Rainfall=4.70"

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Summary for Subcatchment 10S: Drainarea

Runoff = 2.13 cfs @ 12.35 hrs, Volume= 0.228 af, Depth> 1.59"
 Routed to Reach 2R : Post flow west

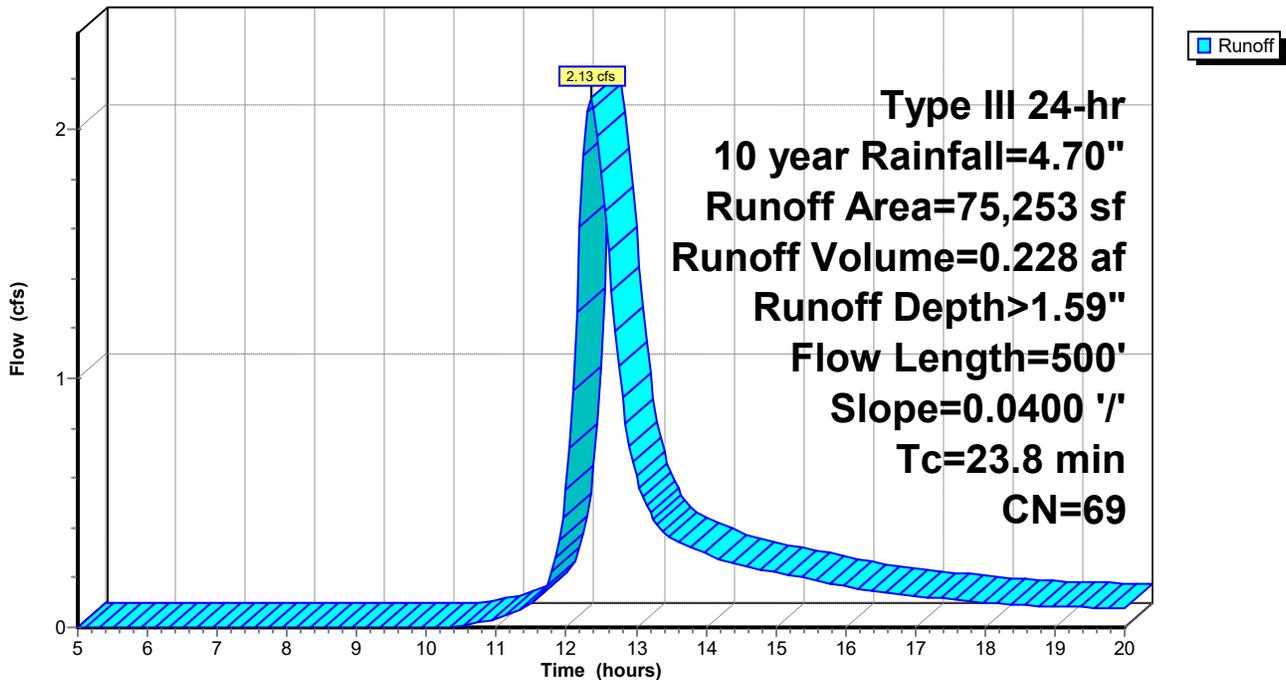
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10 year Rainfall=4.70"

Area (sf)	CN	Description
15,306	48	Brush, Good, HSG B
21,400	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
75,253	69	Weighted Average
75,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0400	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
7.5	450	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
23.8	500	Total			

Subcatchment 10S: Drainarea

Hydrograph



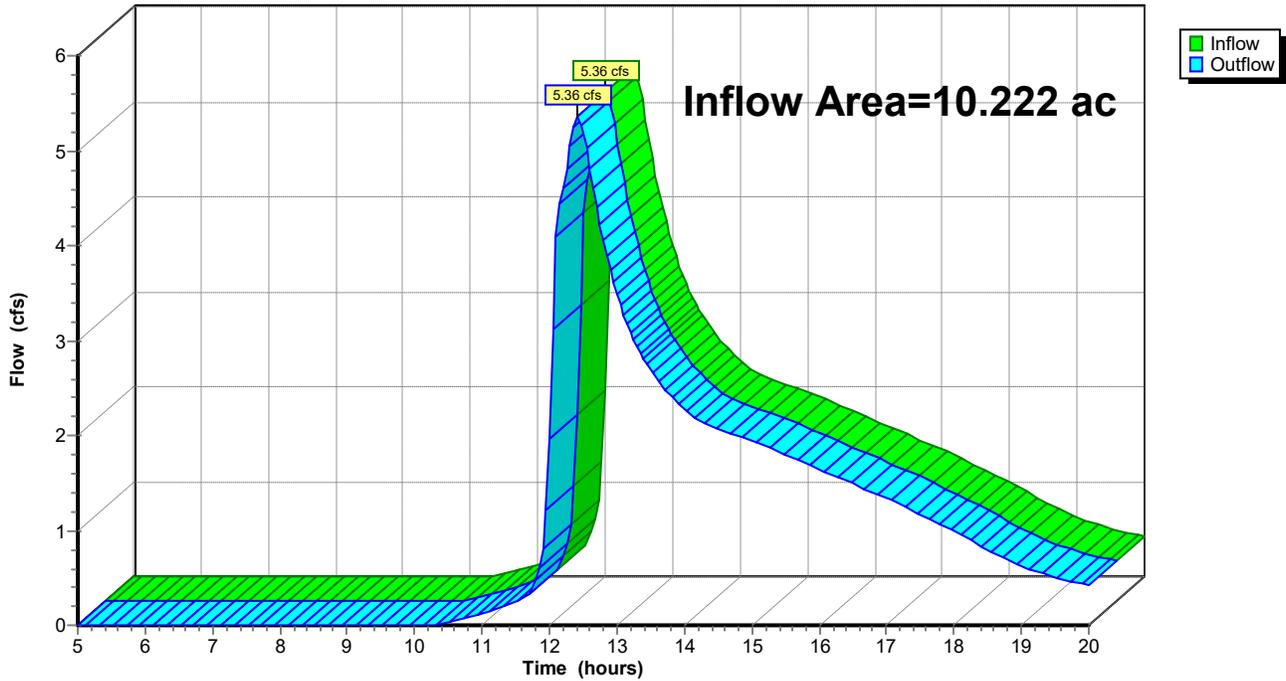
Summary for Reach 2R: Post flow west

Inflow Area = 10.222 ac, 60.02% Impervious, Inflow Depth > 1.50" for 10 year event
Inflow = 5.36 cfs @ 12.42 hrs, Volume= 1.277 af
Outflow = 5.36 cfs @ 12.42 hrs, Volume= 1.277 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: Post flow west

Hydrograph



Summary for Pond 1P: POND

Inflow Area = 6.135 ac, 100.00% Impervious, Inflow Depth > 4.15" for 10 year event
 Inflow = 27.01 cfs @ 12.10 hrs, Volume= 2.119 af
 Outflow = 3.73 cfs @ 12.63 hrs, Volume= 1.533 af, Atten= 86%, Lag= 31.8 min
 Discarded = 0.90 cfs @ 12.63 hrs, Volume= 0.640 af
 Primary = 2.83 cfs @ 12.63 hrs, Volume= 0.893 af
 Routed to Reach 2R : Post flow west
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Reach 2R : Post flow west

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,000.49' @ 12.63 hrs Surf.Area= 21,970 sf Storage= 52,745 cf

Plug-Flow detention time= 209.4 min calculated for 1.532 af (72% of inflow)
 Center-of-Mass det. time= 143.7 min (879.8 - 736.1)

Volume	Invert	Avail.Storage	Storage Description
#1	996.00'	88,839 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
996.00	1,600	0	0
997.00	2,800	2,200	2,200
998.00	12,489	7,645	9,845
999.00	16,000	14,245	24,089
1,000.00	20,500	18,250	42,339
1,001.00	23,500	22,000	64,339
1,002.00	25,500	24,500	88,839

Device	Routing	Invert	Outlet Devices
#1	Primary	995.00'	18.0" Round Culvert L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 995.00' / 994.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,001.80'	24.0" x 24.0" Horiz. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.20'	7.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	999.00'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#5	Device 1	998.00'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Discarded	996.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 994.00'
#7	Secondary	1,001.90'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Main 2400 Holden developed final

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Type III 24-hr 10 year Rainfall=4.70"

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Discarded OutFlow Max=0.90 cfs @ 12.63 hrs HW=1,000.49' (Free Discharge)

↳ **6=Exfiltration** (Controls 0.90 cfs)

Primary OutFlow Max=2.82 cfs @ 12.63 hrs HW=1,000.49' (Free Discharge)

↳ **1=Culvert** (Passes 2.82 cfs of 18.52 cfs potential flow)

↳ **2=Orifice/Grate** (Controls 0.00 cfs)

↳ **3=Orifice/Grate** (Orifice Controls 0.97 cfs @ 1.83 fps)

↳ **4=Orifice/Grate** (Orifice Controls 1.49 cfs @ 5.45 fps)

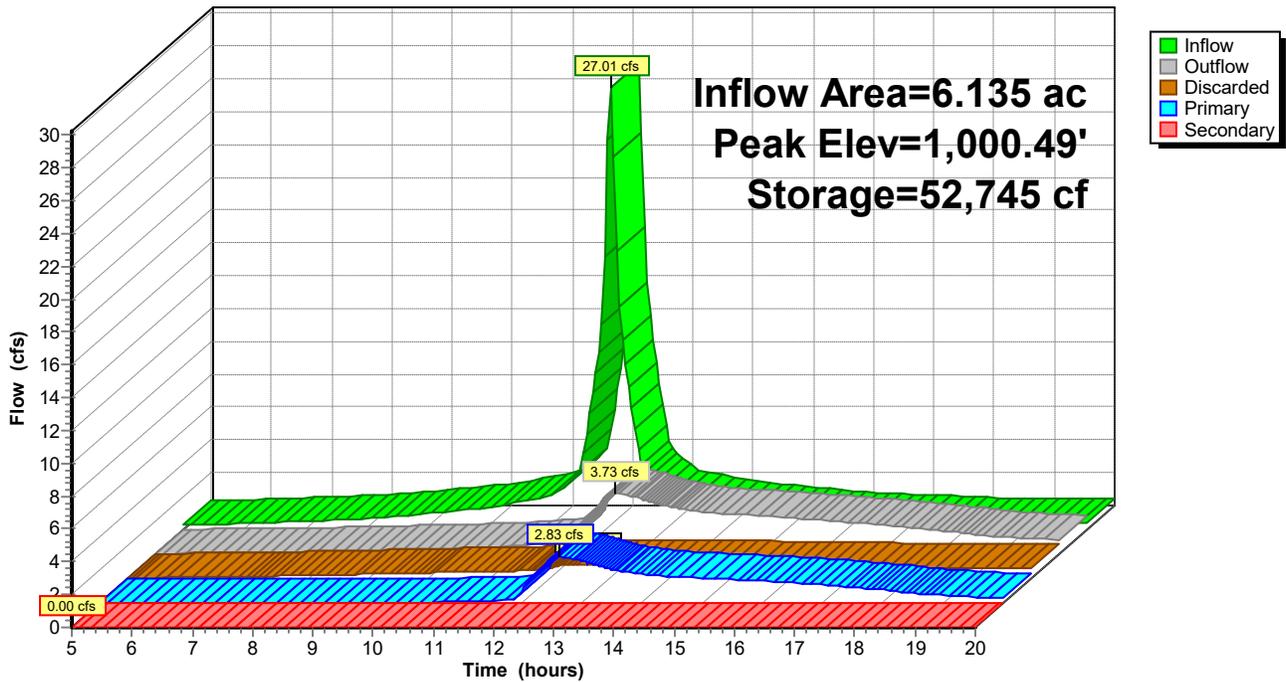
↳ **5=Orifice/Grate** (Orifice Controls 0.36 cfs @ 7.40 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=996.02' (Free Discharge)

↳ **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POND

Hydrograph



Main 2400 Holden developed final

Type III 24-hr 25 year Rainfall=5.90"

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

Subcatchment 2S: Paved area Runoff Area=267,221 sf 100.00% Impervious Runoff Depth>5.24"
Tc=6.8 min CN=98 Runoff=33.99 cfs 2.678 af

Subcatchment 8S: Landscaping Runoff Area=102,779 sf 0.00% Impervious Runoff Depth>1.39"
Tc=6.0 min CN=56 Runoff=3.76 cfs 0.273 af

Subcatchment 9S: POST FLOW EAST Runoff Area=94,163 sf 0.00% Impervious Runoff Depth>1.39"
Tc=6.0 min CN=56 Runoff=3.45 cfs 0.250 af

Subcatchment 10S: Drainarea Runoff Area=75,253 sf 0.00% Impervious Runoff Depth>2.42"
Flow Length=500' Slope=0.0400 '/' Tc=23.8 min CN=69 Runoff=3.29 cfs 0.348 af

Reach 2R: Post flow west Inflow=10.37 cfs 1.974 af
Outflow=10.37 cfs 1.974 af

Pond 1P: POND Peak Elev=1,000.96' Storage=63,287 cf Inflow=33.99 cfs 2.678 af
Discarded=1.00 cfs 0.697 af Primary=5.64 cfs 1.352 af Secondary=0.00 cfs 0.000 af Outflow=6.63 cfs 2.049 af

Total Runoff Area = 12.383 ac Runoff Volume = 3.549 af Average Runoff Depth = 3.44"
50.46% Pervious = 6.249 ac 49.54% Impervious = 6.135 ac

Main 2400 Holden developed final

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Type III 24-hr 25 year Rainfall=5.90"

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Summary for Subcatchment 2S: Paved area

Runoff = 33.99 cfs @ 12.10 hrs, Volume= 2.678 af, Depth> 5.24"
 Routed to Pond 1P : POND

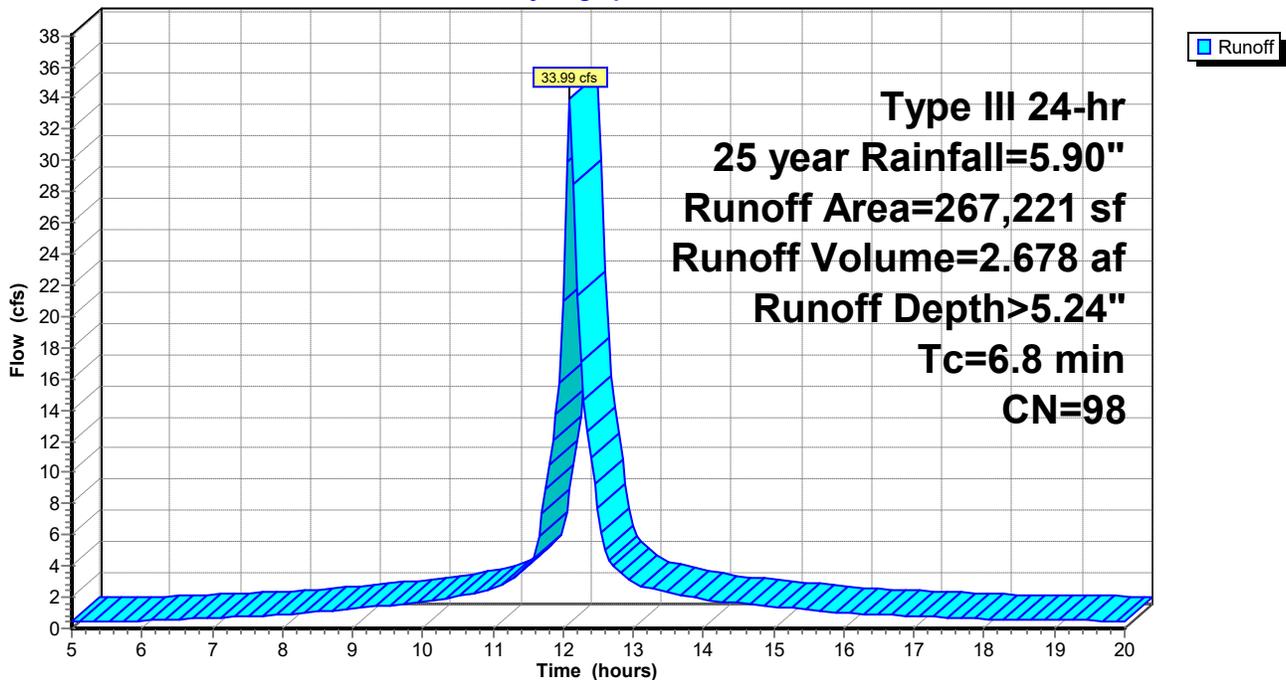
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 year Rainfall=5.90"

Area (sf)	CN	Description
86,386	98	Unconnected roofs, HSG B
11,804	98	Unconnected roofs, HSG C
148,649	98	Paved parking, HSG B
20,382	98	Paved parking, HSG C
267,221	98	Weighted Average
267,221		100.00% Impervious Area
98,190		36.74% Unconnected

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

Subcatchment 2S: Paved area

Hydrograph



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Type III 24-hr 25 year Rainfall=5.90"

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Summary for Subcatchment 8S: Landscaping

Runoff = 3.76 cfs @ 12.10 hrs, Volume= 0.273 af, Depth> 1.39"
 Routed to Reach 2R : Post flow west

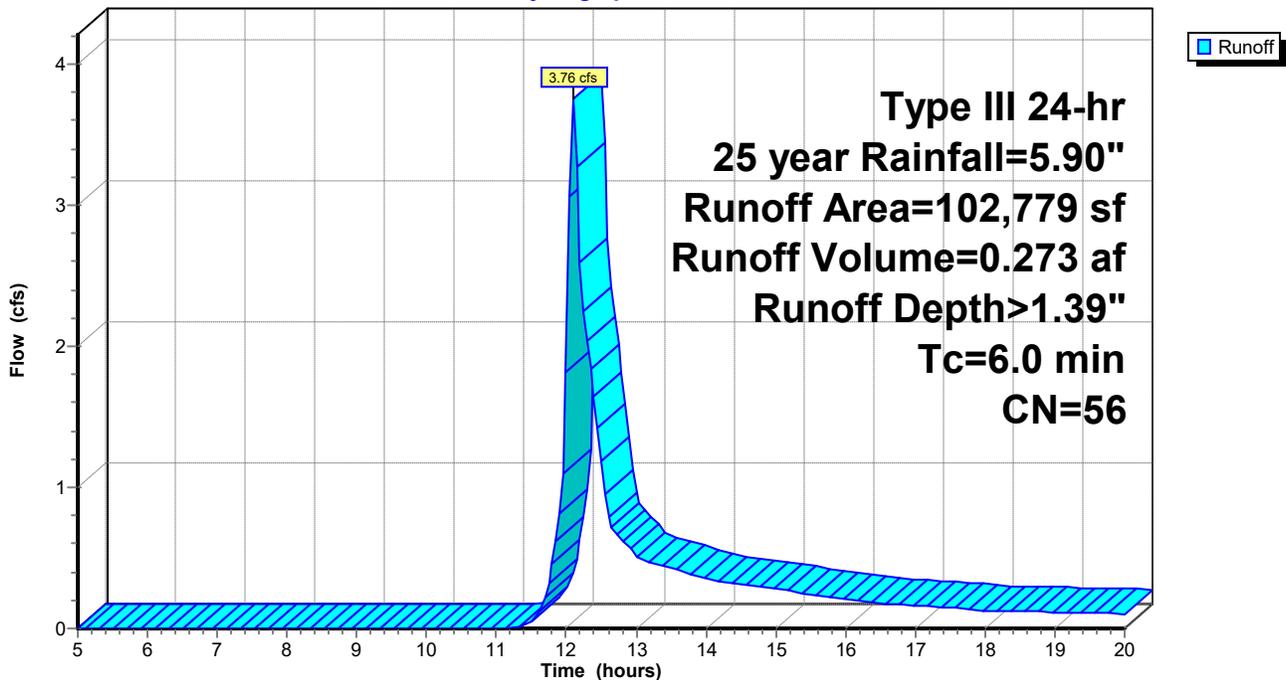
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 year Rainfall=5.90"

Area (sf)	CN	Description
10,050	65	Brush, Good, HSG C
47,021	48	Brush, Good, HSG B
4,588	74	>75% Grass cover, Good, HSG C
1,905	61	>75% Grass cover, Good, HSG B
39,215	61	>75% Grass cover, Good, HSG B
102,779	56	Weighted Average
102,779		100.00% Pervious Area

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

Subcatchment 8S: Landscaping

Hydrograph



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Type III 24-hr 25 year Rainfall=5.90"

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Summary for Subcatchment 9S: POST FLOW EAST

Runoff = 3.45 cfs @ 12.10 hrs, Volume= 0.250 af, Depth> 1.39"

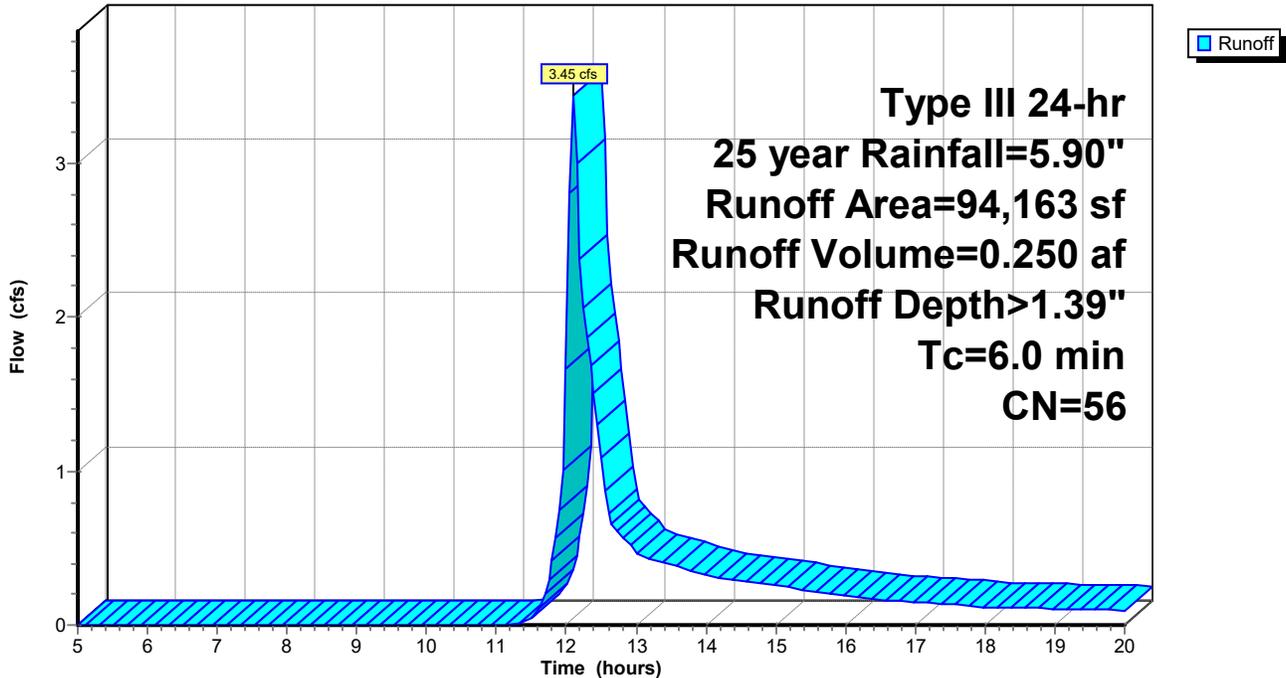
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=5.90"

Area (sf)	CN	Description
26,457	65	Brush, Good, HSG C
2,320	74	>75% Grass cover, Good, HSG C
48,296	48	Brush, Good, HSG B
17,090	61	>75% Grass cover, Good, HSG B
94,163	56	Weighted Average
94,163		100.00% Pervious Area

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

Subcatchment 9S: POST FLOW EAST

Hydrograph



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Type III 24-hr 25 year Rainfall=5.90"

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Summary for Subcatchment 10S: Drainarea

Runoff = 3.29 cfs @ 12.34 hrs, Volume= 0.348 af, Depth> 2.42"
 Routed to Reach 2R : Post flow west

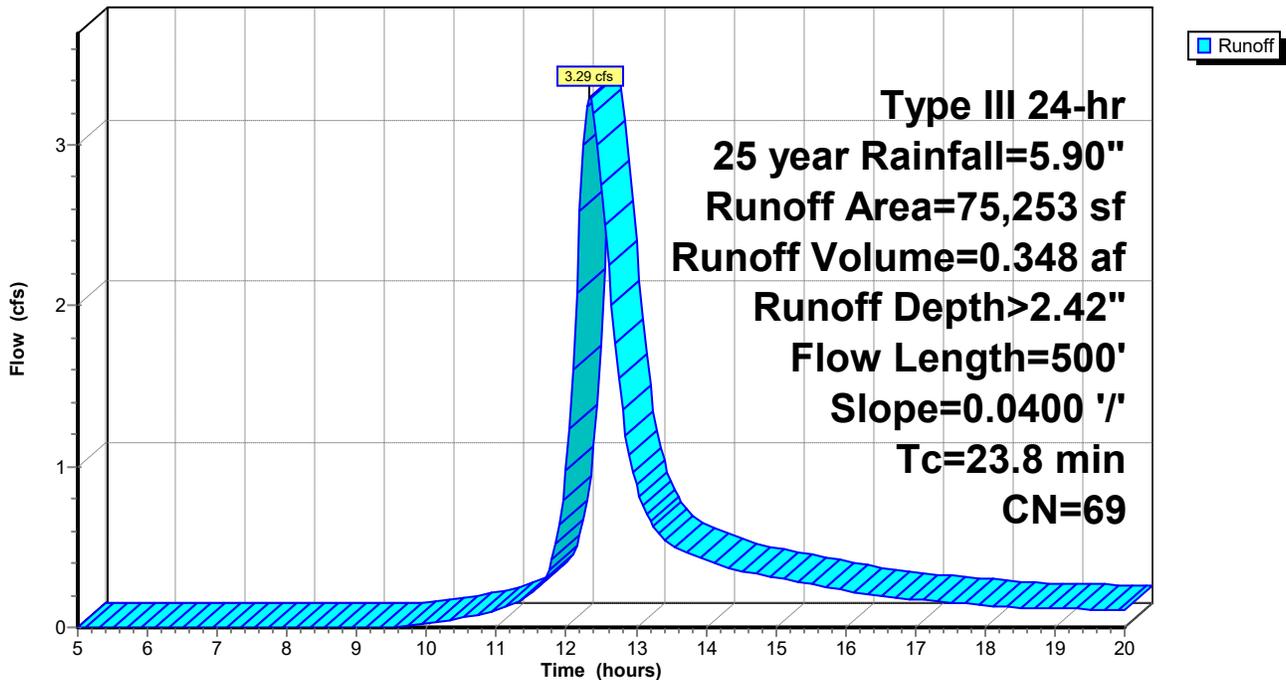
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25 year Rainfall=5.90"

Area (sf)	CN	Description
15,306	48	Brush, Good, HSG B
21,400	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
75,253	69	Weighted Average
75,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0400	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
7.5	450	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
23.8	500	Total			

Subcatchment 10S: Drainarea

Hydrograph



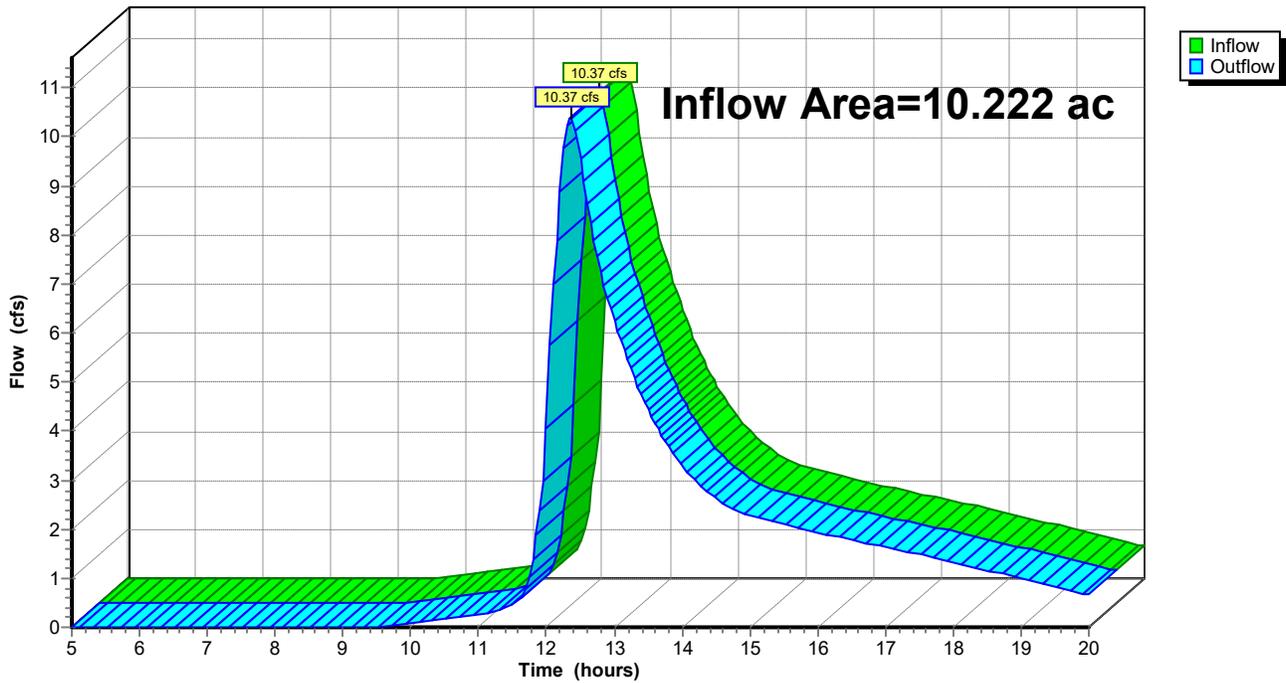
Summary for Reach 2R: Post flow west

Inflow Area = 10.222 ac, 60.02% Impervious, Inflow Depth > 2.32" for 25 year event
Inflow = 10.37 cfs @ 12.35 hrs, Volume= 1.974 af
Outflow = 10.37 cfs @ 12.35 hrs, Volume= 1.974 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: Post flow west

Hydrograph



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Type III 24-hr 25 year Rainfall=5.90"

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Summary for Pond 1P: POND

Inflow Area = 6.135 ac, 100.00% Impervious, Inflow Depth > 5.24" for 25 year event
 Inflow = 33.99 cfs @ 12.10 hrs, Volume= 2.678 af
 Outflow = 6.63 cfs @ 12.54 hrs, Volume= 2.049 af, Atten= 80%, Lag= 26.4 min
 Discarded = 1.00 cfs @ 12.54 hrs, Volume= 0.697 af
 Primary = 5.64 cfs @ 12.54 hrs, Volume= 1.352 af
 Routed to Reach 2R : Post flow west
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Reach 2R : Post flow west

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,000.96' @ 12.54 hrs Surf.Area= 23,365 sf Storage= 63,287 cf

Plug-Flow detention time= 190.1 min calculated for 2.041 af (76% of inflow)
 Center-of-Mass det. time= 130.5 min (865.4 - 734.8)

Volume	Invert	Avail.Storage	Storage Description
#1	996.00'	88,839 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
996.00	1,600	0	0
997.00	2,800	2,200	2,200
998.00	12,489	7,645	9,845
999.00	16,000	14,245	24,089
1,000.00	20,500	18,250	42,339
1,001.00	23,500	22,000	64,339
1,002.00	25,500	24,500	88,839

Device	Routing	Invert	Outlet Devices
#1	Primary	995.00'	18.0" Round Culvert L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 995.00' / 994.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,001.80'	24.0" x 24.0" Horiz. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.20'	7.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	999.00'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#5	Device 1	998.00'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Discarded	996.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 994.00'
#7	Secondary	1,001.90'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

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Type III 24-hr 25 year Rainfall=5.90"

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Discarded OutFlow Max=1.00 cfs @ 12.54 hrs HW=1,000.95' (Free Discharge)

↳ **6=Exfiltration** (Controls 1.00 cfs)

Primary OutFlow Max=5.63 cfs @ 12.54 hrs HW=1,000.95' (Free Discharge)

↳ **1=Culvert** (Passes 5.63 cfs of 19.41 cfs potential flow)

↳ **2=Orifice/Grate** (Controls 0.00 cfs)

↳ **3=Orifice/Grate** (Orifice Controls 3.50 cfs @ 3.27 fps)

↳ **4=Orifice/Grate** (Orifice Controls 1.73 cfs @ 6.36 fps)

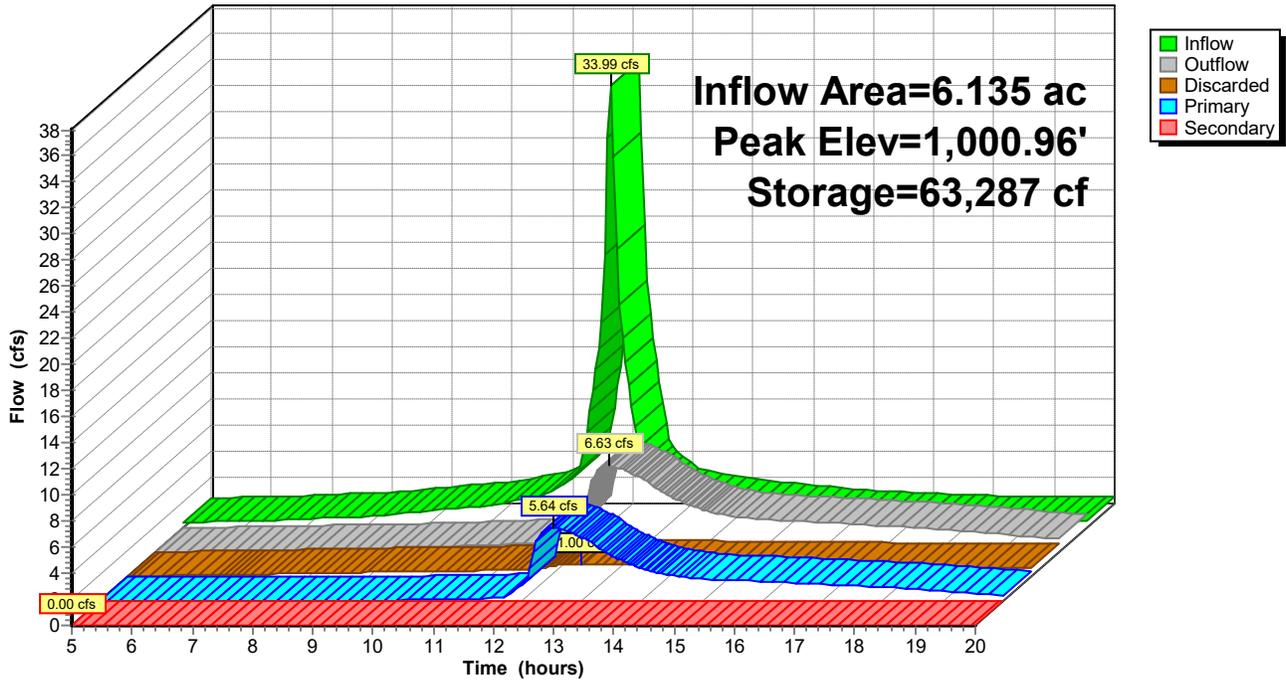
↳ **5=Orifice/Grate** (Orifice Controls 0.40 cfs @ 8.10 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=996.02' (Free Discharge)

↳ **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POND

Hydrograph



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Type III 24-hr 100 year Rainfall=8.40"

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

Subcatchment 2S: Paved area Runoff Area=267,221 sf 100.00% Impervious Runoff Depth>7.51"
Tc=6.8 min CN=98 Runoff=48.50 cfs 3.838 af

Subcatchment 8S: Landscaping Runoff Area=102,779 sf 0.00% Impervious Runoff Depth>2.91"
Tc=6.0 min CN=56 Runoff=8.40 cfs 0.573 af

Subcatchment 9S: POST FLOW EAST Runoff Area=94,163 sf 0.00% Impervious Runoff Depth>2.91"
Tc=6.0 min CN=56 Runoff=7.70 cfs 0.525 af

Subcatchment 10S: Drainarea Runoff Area=75,253 sf 0.00% Impervious Runoff Depth>4.35"
Flow Length=500' Slope=0.0400 '/' Tc=23.8 min CN=69 Runoff=5.93 cfs 0.626 af

Reach 2R: Post flow west Inflow=18.59 cfs 3.521 af
Outflow=18.59 cfs 3.521 af

Pond 1P: POND Peak Elev=1,001.90' Storage=86,292 cf Inflow=48.50 cfs 3.838 af
Discarded=1.18 cfs 0.798 af Primary=10.37 cfs 2.322 af Secondary=0.00 cfs 0.000 af Outflow=11.55 cfs 3.120 af

Total Runoff Area = 12.383 ac Runoff Volume = 5.562 af Average Runoff Depth = 5.39"
50.46% Pervious = 6.249 ac 49.54% Impervious = 6.135 ac

Main 2400 Holden developed final

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Type III 24-hr 100 year Rainfall=8.40"

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Summary for Subcatchment 2S: Paved area

Runoff = 48.50 cfs @ 12.10 hrs, Volume= 3.838 af, Depth> 7.51"
 Routed to Pond 1P : POND

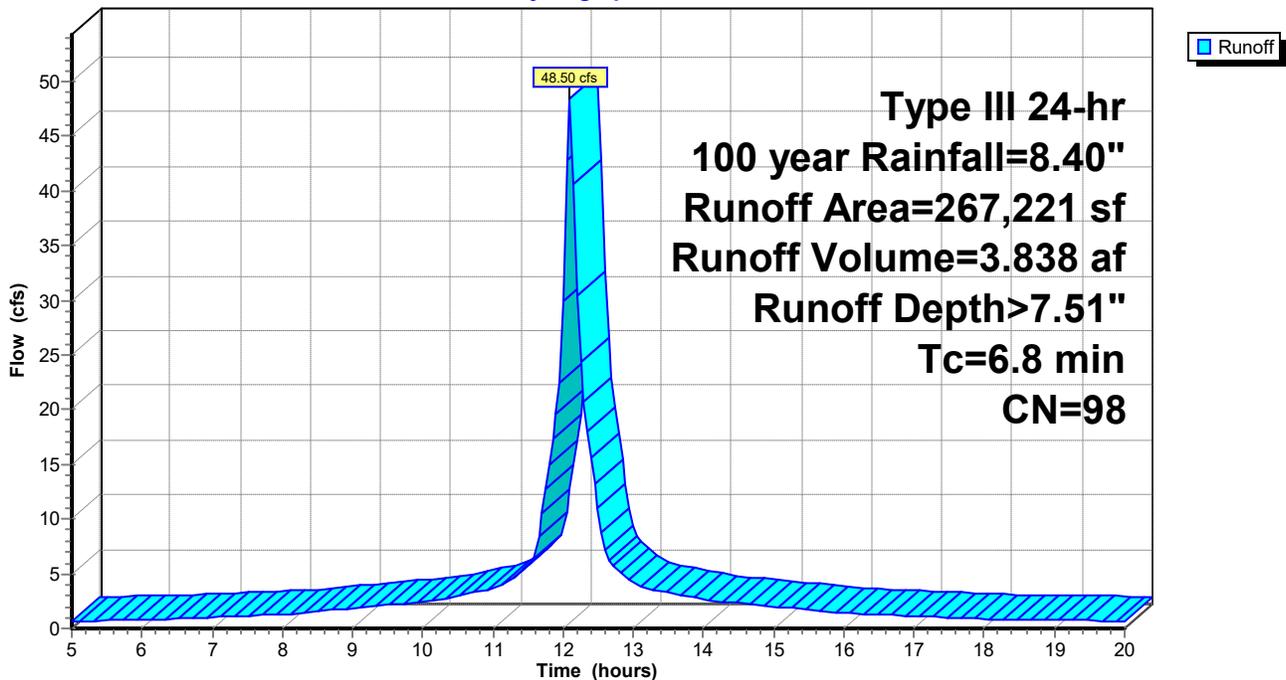
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 year Rainfall=8.40"

Area (sf)	CN	Description
86,386	98	Unconnected roofs, HSG B
11,804	98	Unconnected roofs, HSG C
148,649	98	Paved parking, HSG B
20,382	98	Paved parking, HSG C
267,221	98	Weighted Average
267,221		100.00% Impervious Area
98,190		36.74% Unconnected

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

Subcatchment 2S: Paved area

Hydrograph



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Type III 24-hr 100 year Rainfall=8.40"

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Summary for Subcatchment 8S: Landscaping

Runoff = 8.40 cfs @ 12.10 hrs, Volume= 0.573 af, Depth> 2.91"
 Routed to Reach 2R : Post flow west

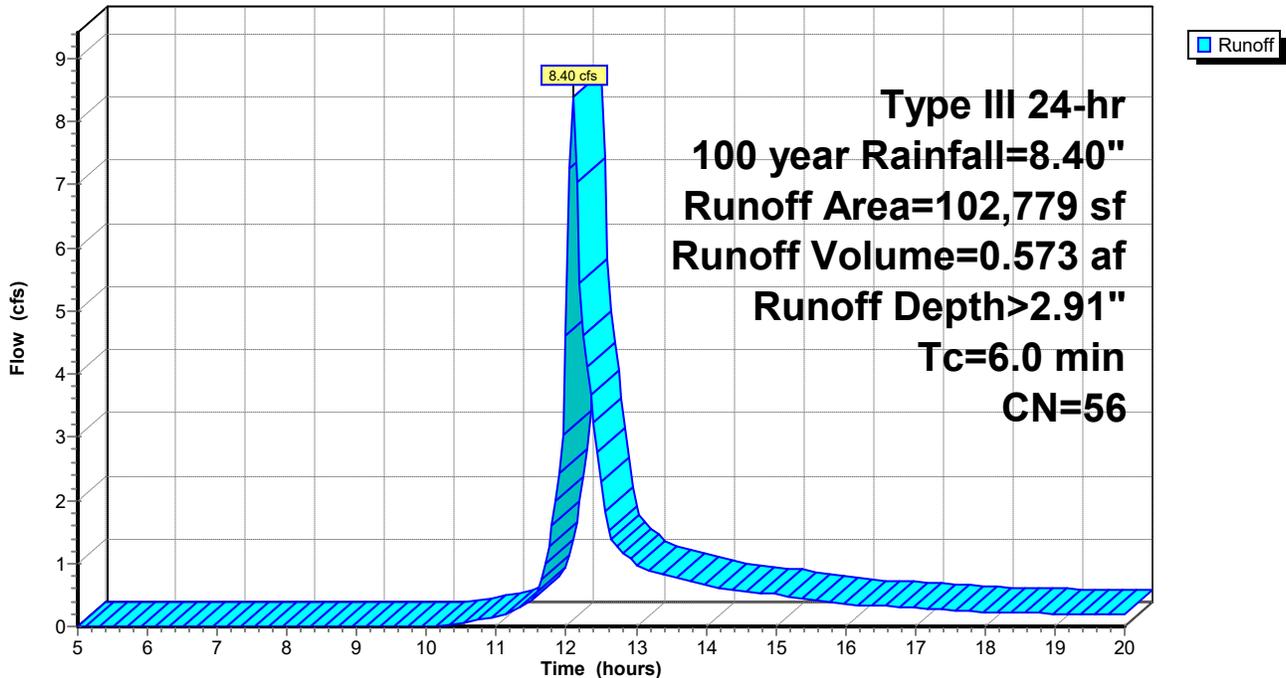
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 year Rainfall=8.40"

Area (sf)	CN	Description
10,050	65	Brush, Good, HSG C
47,021	48	Brush, Good, HSG B
4,588	74	>75% Grass cover, Good, HSG C
1,905	61	>75% Grass cover, Good, HSG B
39,215	61	>75% Grass cover, Good, HSG B
102,779	56	Weighted Average
102,779		100.00% Pervious Area

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

Subcatchment 8S: Landscaping

Hydrograph



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Type III 24-hr 100 year Rainfall=8.40"

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Summary for Subcatchment 9S: POST FLOW EAST

Runoff = 7.70 cfs @ 12.10 hrs, Volume= 0.525 af, Depth> 2.91"

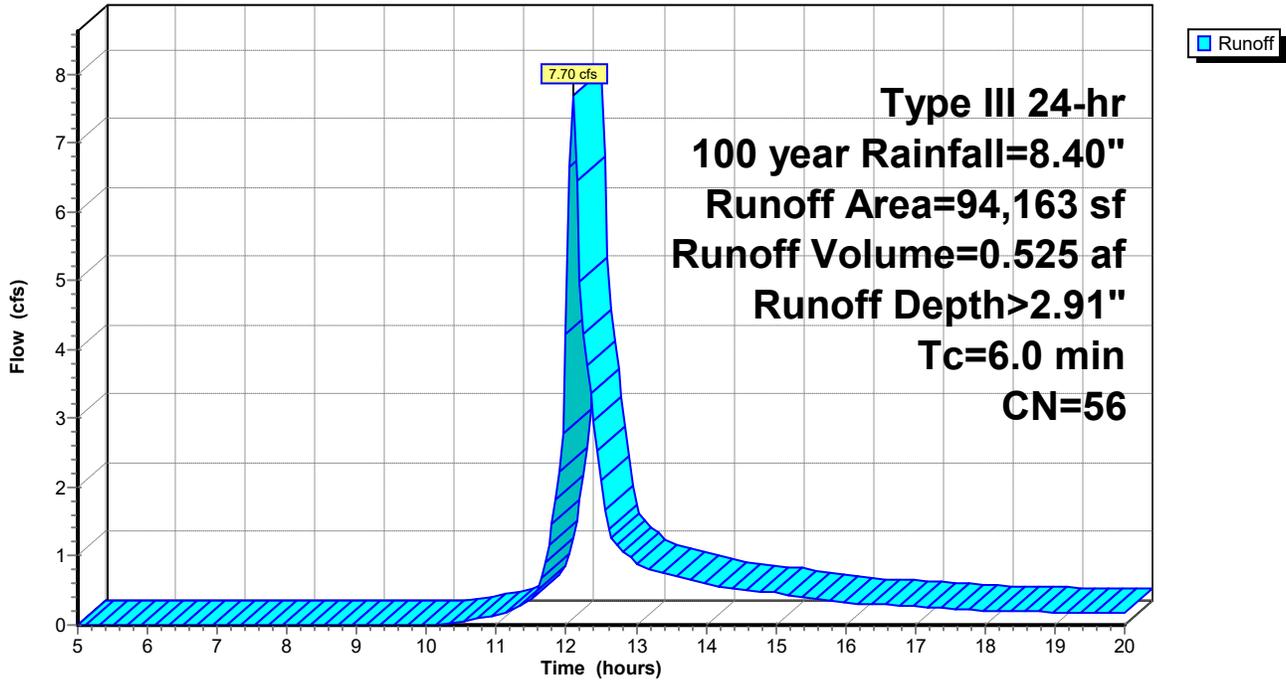
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.40"

Area (sf)	CN	Description
26,457	65	Brush, Good, HSG C
2,320	74	>75% Grass cover, Good, HSG C
48,296	48	Brush, Good, HSG B
17,090	61	>75% Grass cover, Good, HSG B
94,163	56	Weighted Average
94,163		100.00% Pervious Area

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

Subcatchment 9S: POST FLOW EAST

Hydrograph



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Type III 24-hr 100 year Rainfall=8.40"

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Summary for Subcatchment 10S: Drainarea

Runoff = 5.93 cfs @ 12.33 hrs, Volume= 0.626 af, Depth> 4.35"
 Routed to Reach 2R : Post flow west

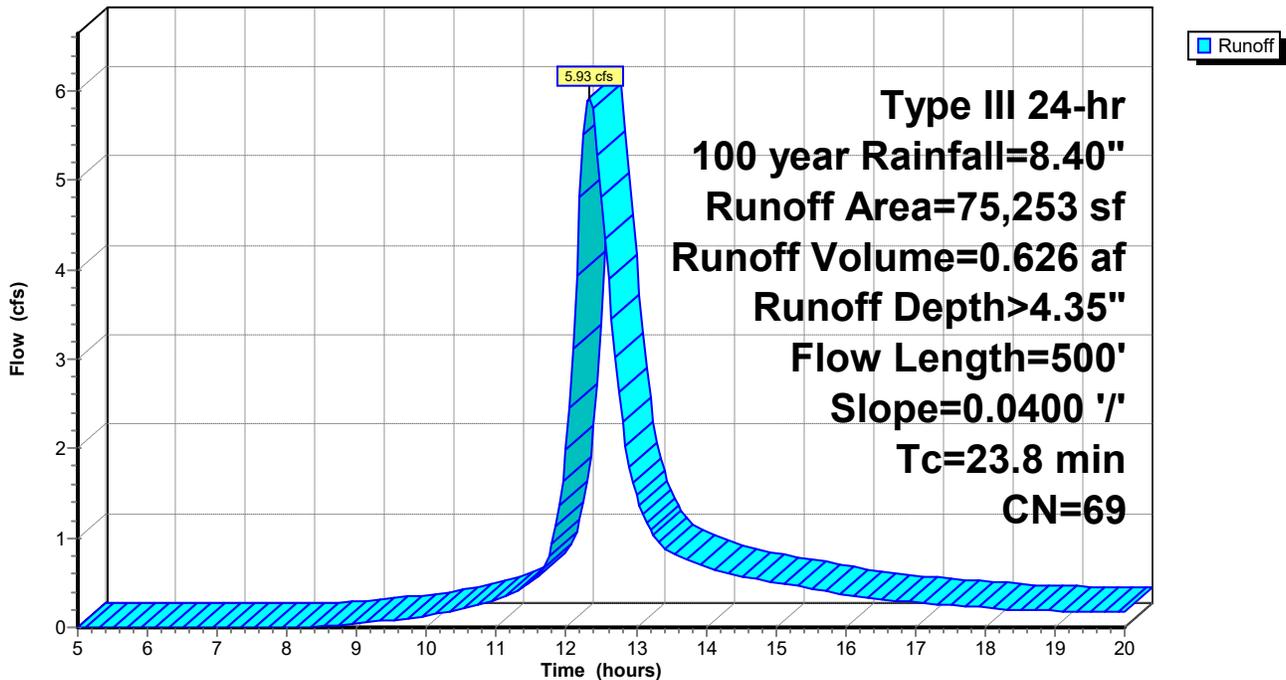
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100 year Rainfall=8.40"

Area (sf)	CN	Description
15,306	48	Brush, Good, HSG B
21,400	70	Woods, Good, HSG C
38,547	77	Woods, Good, HSG D
75,253	69	Weighted Average
75,253		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0400	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
7.5	450	0.0400	1.00		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
23.8	500	Total			

Subcatchment 10S: Drainarea

Hydrograph



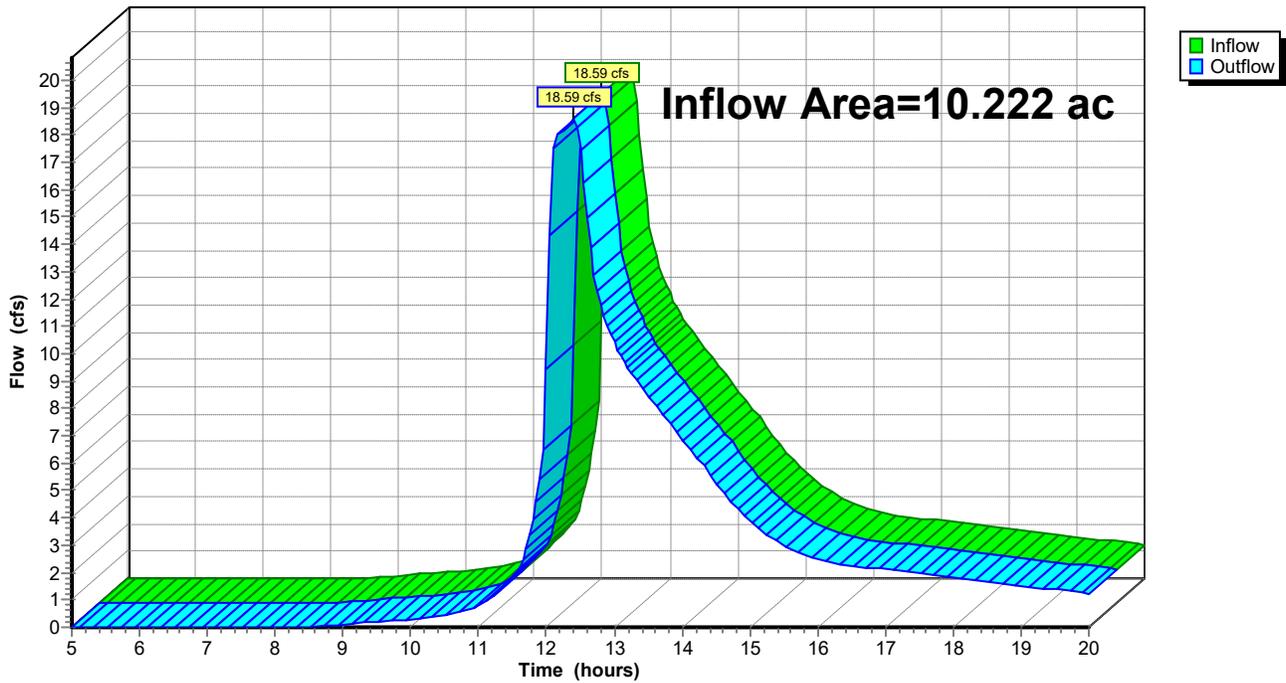
Summary for Reach 2R: Post flow west

Inflow Area = 10.222 ac, 60.02% Impervious, Inflow Depth > 4.13" for 100 year event
Inflow = 18.59 cfs @ 12.40 hrs, Volume= 3.521 af
Outflow = 18.59 cfs @ 12.40 hrs, Volume= 3.521 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: Post flow west

Hydrograph



Summary for Pond 1P: POND

Inflow Area = 6.135 ac, 100.00% Impervious, Inflow Depth > 7.51" for 100 year event
 Inflow = 48.50 cfs @ 12.10 hrs, Volume= 3.838 af
 Outflow = 11.55 cfs @ 12.49 hrs, Volume= 3.120 af, Atten= 76%, Lag= 23.6 min
 Discarded = 1.18 cfs @ 12.49 hrs, Volume= 0.798 af
 Primary = 10.37 cfs @ 12.49 hrs, Volume= 2.322 af
 Routed to Reach 2R : Post flow west
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Routed to Reach 2R : Post flow west

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 1,001.90' @ 12.49 hrs Surf.Area= 25,299 sf Storage= 86,292 cf

Plug-Flow detention time= 169.3 min calculated for 3.119 af (81% of inflow)
 Center-of-Mass det. time= 116.4 min (849.9 - 733.5)

Volume	Invert	Avail.Storage	Storage Description
#1	996.00'	88,839 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
996.00	1,600	0	0
997.00	2,800	2,200	2,200
998.00	12,489	7,645	9,845
999.00	16,000	14,245	24,089
1,000.00	20,500	18,250	42,339
1,001.00	23,500	22,000	64,339
1,002.00	25,500	24,500	88,839

Device	Routing	Invert	Outlet Devices
#1	Primary	995.00'	18.0" Round Culvert L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 995.00' / 994.00' S= 0.0167 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	1,001.80'	24.0" x 24.0" Horiz. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,000.20'	7.0" Vert. Orifice/Grate X 4.00 C= 0.600 Limited to weir flow at low heads
#4	Device 1	999.00'	5.0" Vert. Orifice/Grate X 2.00 C= 0.600 Limited to weir flow at low heads
#5	Device 1	998.00'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#6	Discarded	996.00'	1.020 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 994.00'
#7	Secondary	1,001.90'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Main 2400 Holden developed final

Prepared by Mark M Santora PE Inc

HydroCAD® 10.20-2d s/n 01681 © 2021 HydroCAD Software Solutions LLC

Type III 24-hr 100 year Rainfall=8.40"

Printed 1/29/2024

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Discarded OutFlow Max=1.18 cfs @ 12.49 hrs HW=1,001.90' (Free Discharge)

↳ **6=Exfiltration** (Controls 1.18 cfs)

Primary OutFlow Max=10.33 cfs @ 12.49 hrs HW=1,001.90' (Free Discharge)

↳ **1=Culvert** (Passes 10.33 cfs of 21.10 cfs potential flow)

↳ **2=Orifice/Grate** (Weir Controls 1.62 cfs @ 1.03 fps)

↳ **3=Orifice/Grate** (Orifice Controls 6.11 cfs @ 5.71 fps)

↳ **4=Orifice/Grate** (Orifice Controls 2.15 cfs @ 7.90 fps)

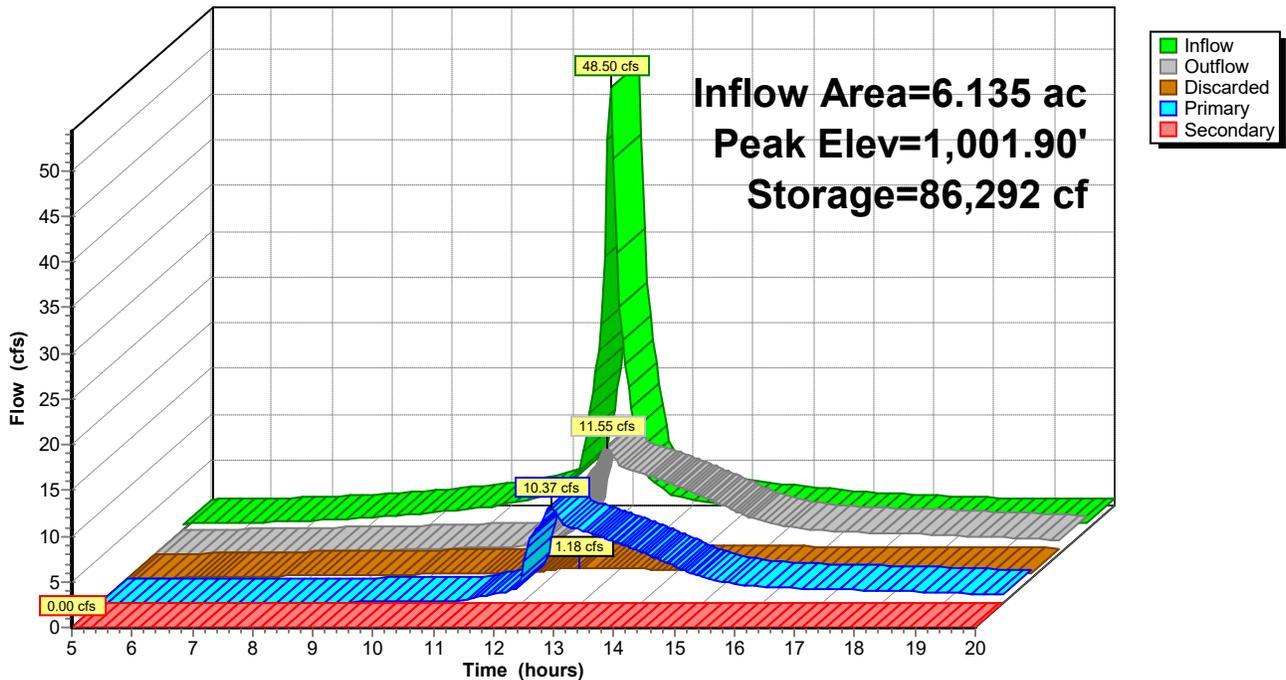
↳ **5=Orifice/Grate** (Orifice Controls 0.46 cfs @ 9.35 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=996.04' (Free Discharge)

↳ **7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POND

Hydrograph



	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day
1yr	0.21	0.32	0.39	0.53	0.65	0.87	1yr	0.56	0.85	1.01	1.38	1.84	2.09	2.19	1yr	1.85
2yr	0.33	0.51	0.63	0.86	1.06	1.25	2yr	0.91	1.22	1.43	1.85	2.36	3.06	3.33	2yr	2.71
5yr	0.38	0.58	0.72	0.99	1.26	1.48	5yr	1.09	1.45	1.69	2.19	2.80	3.63	3.93	5yr	3.21
10yr	0.42	0.64	0.79	1.11	1.43	1.67	10yr	1.24	1.64	1.88	2.48	3.17	4.07	4.43	10yr	3.60
25yr	0.47	0.72	0.90	1.28	1.68	1.98	25yr	1.45	1.94	2.20	2.94	3.75	4.73	5.41	25yr	4.19
50yr	0.52	0.79	0.98	1.41	1.90	2.25	50yr	1.64	2.20	2.49	3.34	4.26	5.28	6.14	50yr	4.67
100yr	0.57	0.86	1.08	1.56	2.13	2.56	100yr	1.84	2.50	2.81	3.55	4.86	5.92	6.98	100yr	5.24
200yr	0.63	0.94	1.19	1.73	2.41	2.91	200yr	2.08	2.85	3.18	3.99	5.54	6.63	7.92	200yr	5.87
500yr	0.71	1.06	1.36	1.98	2.82	3.46	500yr	2.43	3.38	3.75	4.65	6.63	7.60	9.33	500yr	6.72

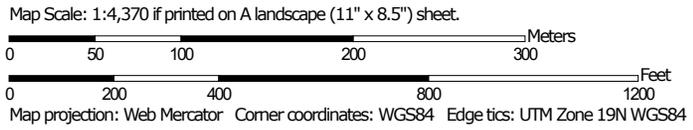
Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day
1yr	0.31	0.47	0.58	0.78	0.96	1.18	1yr	0.83	1.16	1.35	1.76	2.25	2.88	3.14	1yr	2.55
2yr	0.37	0.57	0.70	0.94	1.16	1.34	2yr	1.00	1.31	1.54	1.99	2.52	3.34	3.60	2yr	2.95
5yr	0.43	0.67	0.83	1.14	1.45	1.75	5yr	1.25	1.71	1.98	2.53	3.17	4.34	4.82	5yr	3.84
10yr	0.51	0.78	0.96	1.35	1.74	2.14	10yr	1.50	2.10	2.46	3.05	3.79	5.37	6.01	10yr	4.75
25yr	0.63	0.96	1.19	1.70	2.24	2.81	25yr	1.93	2.75	3.23	3.90	4.81	7.10	8.03	25yr	6.28
50yr	0.74	1.13	1.40	2.02	2.72	3.44	50yr	2.34	3.36	3.96	4.72	5.75	8.81	10.06	50yr	7.80
100yr	0.88	1.33	1.66	2.40	3.29	4.21	100yr	2.84	4.11	4.86	6.02	6.89	10.94	12.61	100yr	9.68
200yr	1.04	1.56	1.98	2.86	3.99	5.16	200yr	3.44	5.04	5.98	7.33	8.24	13.56	15.82	200yr	12.00
500yr	1.30	1.94	2.49	3.62	5.15	6.74	500yr	4.44	6.59	7.84	9.53	10.43	18.04	21.38	500yr	15.96

Soil Map—Worcester County, Massachusetts, Northeastern Part; and Worcester County, Massachusetts, Northwestern Part



Soil Map may not be valid at this scale.



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 scales ranging from 1:20,000 to 1:25,000.

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: Worcester County, Massachusetts, Northeastern Part

Survey Area Data: Version 18, Sep 10, 2023

Soil Survey Area: Worcester County, Massachusetts, Northwestern Part

Survey Area Data: Version 17, Sep 13, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

MAP LEGEND

MAP INFORMATION

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
71A	Ridgebury fine sandy loam, 0 to 3 percent slopes, extremely stony	1.5	1.6%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	6.4	6.7%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	1.3	1.4%
102C	Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes	14.6	15.2%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	4.9	5.1%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	0.0	0.0%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	3.4	3.5%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	4.6	4.8%
421B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	3.1	3.2%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	9.2	9.5%
422D	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	10.5	10.9%
651	Udorthents, smoothed	1.9	1.9%
Subtotals for Soil Survey Area		61.4	63.8%
Totals for Area of Interest		96.2	100.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
305C	Paxton fine sandy loam, 8 to 15 percent slopes	1.4	1.5%
355C	Marlow fine sandy loam, 8 to 15 percent slopes	17.0	17.7%
901E	Berkshire-Marlow association, 15 to 45 percent slopes, extremely stony	0.6	0.7%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
905C	Peru-Marlow association, 3 to 15 percent slopes, extremely stony	0.0	0.0%
910C	Woodbridge-Paxton association, 3 to 15 percent slopes, extremely stony	6.3	6.5%
918B	Ridgebury-Whitman association, 0 to 8 percent slopes, extremely stony	5.2	5.4%
926C	Charlton-Chatfield association, 3 to 15 percent slopes, extremely stony	4.2	4.4%
Subtotals for Soil Survey Area		34.8	36.1%
Totals for Area of Interest		96.2	100.0%

Worcester County, Massachusetts, Northeastern Part

102C—Chatfield-Hollis-Rock outcrop complex, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2w69g

Elevation: 0 to 1,540 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

Chatfield, extremely stony, and similar soils: 39 percent

Hollis, extremely stony, and similar soils: 26 percent

Rock outcrop: 17 percent

Minor components: 18 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chatfield, Extremely Stony

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope, crest

Down-slope shape: Convex

Across-slope shape: Linear, convex

Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

O_i - 0 to 1 inches: slightly decomposed plant material

A - 1 to 2 inches: fine sandy loam

B_w - 2 to 30 inches: gravelly fine sandy loam

2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent

Surface area covered with cobbles, stones or boulders: 9.0 percent

Depth to restrictive feature: 20 to 41 inches to lithic bedrock

Drainage class: Well drained

Runoff class: High

Capacity of the most limiting layer to transmit water (K_{sat}): Very low (0.00 to 0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: B

Ecological site: F144AY034CT - Well Drained Till Uplands

Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Nose slope, side slope,
crest

Down-slope shape: Convex

Across-slope shape: Linear, convex

Parent material: Coarse-loamy melt-out till derived from granite,
gneiss, and/or schist

Typical profile

O_i - 0 to 2 inches: slightly decomposed plant material

A - 2 to 7 inches: gravelly fine sandy loam

B_w - 7 to 16 inches: gravelly fine sandy loam

2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 0 to 15 percent

Surface area covered with cobbles, stones or boulders: 9.0 percent

Depth to restrictive feature: 8 to 23 inches to lithic bedrock

Drainage class: Somewhat excessively drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (K_{sat}): Very low
(0.00 to 0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Ecological site: F144AY033MA - Shallow Dry Till Uplands

Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Igneous and metamorphic rock

Properties and qualities

Slope: 0 to 15 percent

Depth to restrictive feature: 0 inches to lithic bedrock

Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 8

Hydrologic Soil Group: D

Hydric soil rating: No

Minor Components

Charlton, extremely stony

Percent of map unit: 12 percent

Landform: Ridges, hills

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Side slope, crest

Down-slope shape: Convex, linear

Across-slope shape: Convex

Hydric soil rating: No

Sutton, extremely stony

Percent of map unit: 3 percent

Landform: Hills, ground moraines

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

Paxton, extremely stony

Percent of map unit: 2 percent

Landform: Ground moraines, hills, drumlins

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Convex, linear

Across-slope shape: Linear, convex

Hydric soil rating: No

Leicester, extremely stony

Percent of map unit: 1 percent

Landform: Ground moraines, hills, drainageways, depressions

Landform position (two-dimensional): Footslope, toeslope

Landform position (three-dimensional): Base slope

Down-slope shape: Concave, linear

Across-slope shape: Concave

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part

Survey Area Data: Version 18, Sep 10, 2023

Soil Survey Area: Worcester County, Massachusetts, Northwestern Part

Survey Area Data: Version 17, Sep 13, 2023

Worcester County, Massachusetts, Northeastern Part

312B—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qs
Elevation: 0 to 1,580 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

Woodbridge, extremely stony, and similar soils: 82 percent
Minor components: 18 percent
*Estimates are based on observations, descriptions, and transects of
the mapunit.*

Description of Woodbridge, Extremely Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss,
granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low
to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: C/D

Ecological site: F144AY037MA - Moist Dense Till Uplands

Hydric soil rating: No

Minor Components

Paxton, extremely stony

Percent of map unit: 10 percent

Landform: Ground moraines, hills, drumlins

Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Crest, side slope

Down-slope shape: Convex, linear

Across-slope shape: Linear, convex

Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 8 percent

Landform: Hills, drainageways, drumlins, depressions, ground moraines

Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Head slope, base slope

Down-slope shape: Concave

Across-slope shape: Concave

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part

Survey Area Data: Version 18, Sep 10, 2023

Soil Survey Area: Worcester County, Massachusetts, Northwestern Part

Survey Area Data: Version 17, Sep 13, 2023

Inlet Calculations

2400 Main St

DWH
1/24/2024

Inlet	Run-off Coefficient				Time of Concentration							Peak Run-off Rate				
	Impervious		Permeable		Total Area (Acres)	C (Composite)	Smooth Surf.			Rough Surf.			Time of Concentration	Return Period (Years)	Intensity (in/hr)	Total Run-off (cfs)
	Impervious Area (Acres)	Run-off Coef.	Permeable Area (Acres)	Run-off Coef.			Segment Length	Slope	Travel Time	Segment Length	Slope	Travel Time				
CB-1	0.78	0.98		0.30	0.78	0.98	280.00	0.01	3.61				6.00	25	6.25	4.78
CB-2	0.82	0.98		0.30	0.82	0.98	300.00	0.01	3.74				6.00	25	6.25	5.02
CB-3	0.61	0.98		0.30	0.61	0.98	300.00	0.01	3.74				6.00	25	6.25	3.73
CB-4	0.68	0.98		0.30	0.68	0.98	340.00	0.01	3.98				6.00	25	6.25	4.16
CB-5	0.14	0.98		0.30	0.14	0.98	104.00	0.01	2.20				6.00	25	6.25	0.86
CB-6	0.61	0.98		0.30	0.61	0.98	250.00	0.01	3.42				6.00	25	6.25	3.73
CB-7	0.20	0.98		0.30	0.20	0.98	80.00	0.01	1.93				6.00	25	6.25	1.22
CB-8	0.21	0.98		0.30	0.21	0.98	125.00	0.01	2.41				6.00	25	6.25	1.29
CB-9	0.33	0.98		0.30	0.33	0.98	310.00	0.01	3.80				6.00	25	6.25	2.02
CB-10	0.52	0.98		0.30	0.52	0.98	300.00	0.01	3.74				6.00	25	6.25	3.18
CB-11	0.69	0.98		0.30	0.69	0.98	295.00	0.01	3.71				6.00	25	6.25	4.22
CB-12	0.68	0.98		0.30	0.68	0.98	320.00	0.01	3.86				6.00	25	6.25	4.16

Pipe Sizing Calculations

2400 Main St

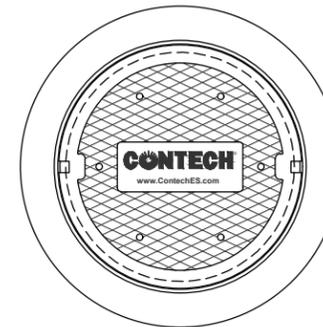
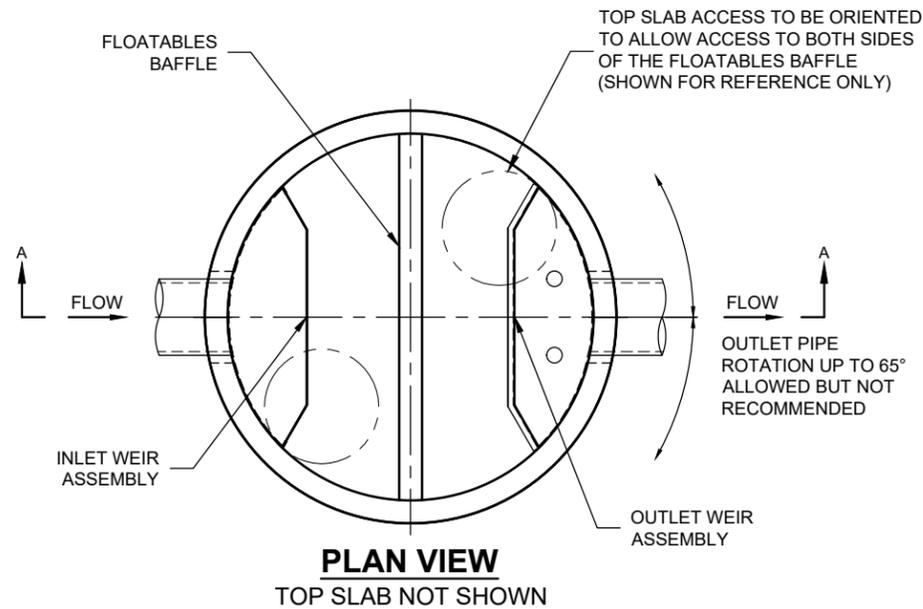
DWH
1/18/24

Pipe Run		Run-Off									Pipe Properties					
From	To	Return Period (Years)	Inlet Area (Acres)	C (Inlet)	Inlet Time of Concentration	Total Area (Acres)	C (Composite)	Total Time of Concentration	Intensity (in/hr)	Run-off (cfs)	Slope of Pipe	Length of pipe	Min. Pipe Size (in)	Actual Pipe Size (in)	Capacity (cfs)	Velocity (fps)
DCB1	DMH1	25	0.78	0.98	6.00	0.78	0.98	6.00	6.25	4.78	0.008	151	12.7	15	7.51	6.13
DMH1	DMH2	25	0.82	0.98	6.00	1.60	0.98	6.41	6.13	9.62	0.008	124	16.5	18	12.23	6.92
DMH2	DMH3	25	0.61	0.98	6.00	2.21	0.98	6.71	6.06	13.12	0.014	87	16.6	18	16.17	9.16
DMH3	DMH4	25	0.68	0.98	6.00	2.89	0.98	6.87	6.02	17.04	0.017	230	17.7	18	17.82	10.09
CB6	DMH5	25	0.61	0.98	6.00	0.61	0.98	6.00	6.25	3.73	0.008	172	12.0	12	4.14	5.28
DMH5	DMH6	25	0.14	0.98	6.00	0.75	0.98	6.54	6.10	4.48	0.022	52	12.0	12	6.87	8.75
DMH6	DMH4	25	0.21	0.98	6.00	0.96	0.98	6.64	6.07	5.71	0.014	51	12.2	15	9.94	8.11
CB12	DMH9	25	0.68	0.98	6.00	0.68	0.98	6.00	6.25	4.16	0.017	18	12.0	12	6.04	7.69
DMH9	DMH8	25				0.68	0.98	6.04	6.24	4.16	0.008	92	12.0	12	4.14	5.28
DHM8	DMH7	25	0.69	0.98	6.00	1.37	0.98	6.33	6.16	8.26	0.008	107	15.5	18	12.23	6.92
DMH7	DMH4	25	0.52	0.98	6.00	1.89	0.98	6.59	6.09	11.27	0.008	46	17.5	18	12.23	6.92
DMH4	STU	25	6.07	0.98	6.00	6.07	0.98	6.87	6.02	35.79	0.017	4	23.4	24	38.42	12.24

I:\COMMON\CAD\TREATMENT\24 SCICLONEX\40 STANDARD DRAWINGS\IN PROCESS\SCX-08-DTL.DWG 2/19/2023 3:21 PM

SCICLONEX DESIGN NOTES

THE STANDARD SCX-08 CONFIGURATION IS SHOWN.

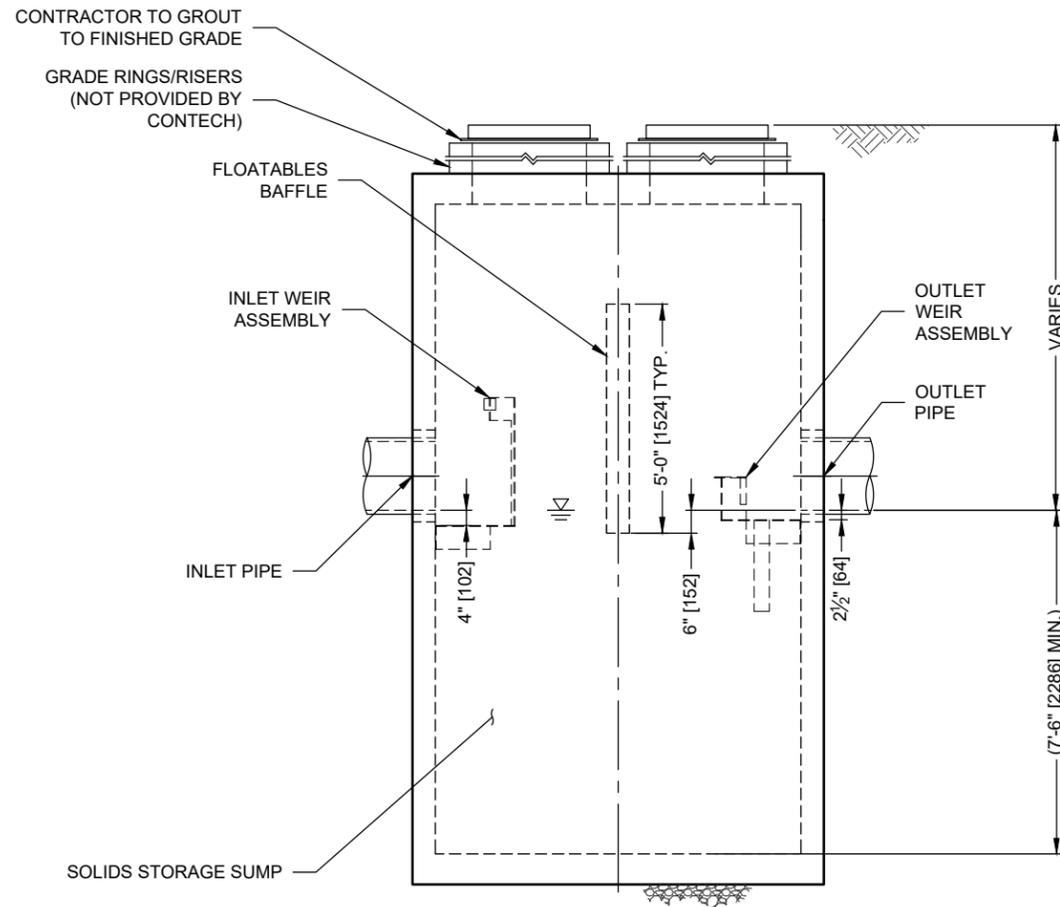


FRAME AND COVER
(MAY VARY)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:



SECTION A-A

SciCloneX™
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

GENERAL NOTES

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

INSTALLATION NOTES

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

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com

8301 State Highway 29 North, Alexandria, MN 56308
800-328-2047 320-852-7500 320-852-7067 FAX

SCX-08
SCICLONEX
STANDARD DETAIL



**Estimated Net Annual Solids Load Reduction
Based on the Rational Rainfall Method**



**2400 Main St (CES 788256)
Holden, MA
Elbag Engineering / STU 1**

AREA	6.34	acres	SCICLONEX MODEL	SCX-8	
WEIGHTED C	0.90		PARTICLE SIZE	110	microns
TC	6.00	minutes	RAINFALL STATION	70	

Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Hydraulic Loading Rate (gpm/ft2)	Removal Efficiency (%)	Incremental Removal (%)
0.04	15.1%	2.04	100.0	15.1
0.08	24.6%	4.08	100.0	24.6
0.12	13.7%	6.11	100.0	13.7
0.16	9.4%	8.15	100.0	9.4
0.20	6.6%	10.19	100.0	6.6
0.24	5.2%	12.23	99.4	5.2
0.28	4.8%	14.27	97.9	4.7
0.32	3.1%	16.30	96.3	3.0
0.36	2.7%	18.34	94.8	2.6
0.40	2.1%	20.38	93.3	2.0
0.48	2.5%	24.46	90.2	2.2
0.56	2.0%	28.53	87.1	1.8
0.64	1.4%	32.61	84.0	1.2
0.72	1.0%	36.68	80.9	0.8
0.80	1.1%	40.76	77.8	0.8
1.00	1.6%	50.95	70.0	1.2
1.20	0.9%	61.14	62.3	0.6
1.40	0.6%	71.33	54.5	0.3
1.60	0.5%	81.52	46.8	0.2
				96.2
Removal Efficiency Adjustment ² =				0.0%
Predicted % Annual Rainfall Treated =				99.6%
Predicted Net Annual Load Removal Efficiency =				96.2%

1 - Based on 14 years of 15-minute rainfall data from NCDC Station 2107, East Brimfield Lake, Worcester County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.