1312 MAIN STREET
READING

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

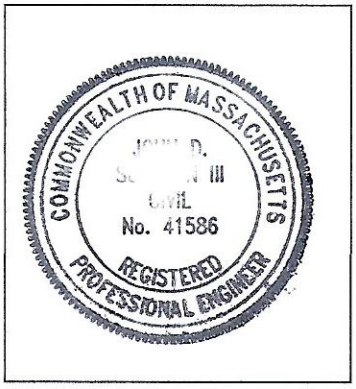
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Signature and Date 10/8/2020

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☒ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☒ Water Quality Swale

☒ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☐ An Illicit Discharge Compliance Statement is attached;

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

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

Version 1, Automated: Mar. 4, 2008

Location: 1312 Main Street, Reading

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice	**0.00**	**1.00**	**0.00**	**1.00**
Rain Garden	**0.90**	**1.00**	**0.90**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

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

Project:
Prepared By: **JDS**
Date: **10/8/2020**

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

STORMWATER QUALITY WORKSHEET

Stormwater Management Standard #3

Project:	1312 Main Street	**Calc By:**	JDS
Date:	8-Oct-20	**Client:**	

SECTION 1: **Water Quality Volume Calculation:**

REQUIRED:

Impervious Area:

25,623 S.F = 0.59 Acres

Volume Required:

$$25{,}623 \text{ S.F} \times 0.5 \text{ Inches} \times \frac{1 \text{ Ft}}{12 \text{ inches}} = 1{,}067 \text{ C.F.}$$

PROPOSED:

Infiltration Field = 1,447 C.F. (10 Year Storm)

SO	2,225 C.F.	>	1,067 C.F.

SECTION 2: **Recharge Volume Calculations**

REQUIRED:

Total Impervious Area:

25,623 S.F = 0.59 Acres

			Vol To Recharge (x Imp. Area)	
25,623	S.F. Over Soil Type "A" material	=	0.60	Inches of Runoff
	S.F. Over Soil Type "B" material	=	0.35	Inches of Runoff
	S.F. Over Soil Type "C" material	=	0.25	Inches of Runoff
	S.F. Over Soil Type "D" material		0.10	Inches of Runoff

Recharge Volume Required:

$$25{,}623 \text{ s.f.} \times 0.60 \times \frac{1 \text{ Ft}}{12 \text{ inches}} \text{ (Class A Soil)} = 1{,}281 \text{ C.F.}$$

10 YR Storm - Infiltration Area

SO	3876 C.F.	>	1,281 C.F.

Sullivan Engineering Group, LLC
Civil Engineers & Land Development Consultants

July 29, 2020

Town of Reading Engineering Department

Re: 1312 Main Street, Reading
Drainage Analysis for CPDC submission

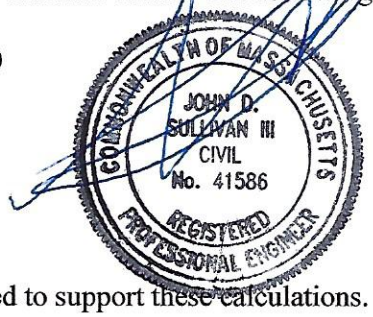
This drainage study was conducted at 1312 Main Street, Reading to evaluate the proposed Site development of the currently vacant lot to the north and the current developed lot since the proposed work will include construction on this property as well

Soil testing was conducted on the site on March 3, 2020 and the soils were found to be highly suitable for drainage recharge (Loamy sand). The Existing Conditions Plan (Sheet 2) shows the testhole locations and the soil logs. An exfiltration rate of 2.41 in/hr is being used in the drainage analysis based on the Rawl's rate for Loamy sand soil. The NRCS soil maps show this property being an "A" series soil. To mitigate the impact of the increase impervious surfaces with this site development two different stormwater management systems are proposed. For the new building roof and a portion of the paved driveway/parking areas an underground Cultec drainage infiltration system is proposed. Stormwater off the roof will be conveyed to the system via roof drains. The driveway/parking area will have stormwater collect via deep sump catchbasins which will drain via 12" HDPE drain pipe to a stormceptor and then into the Cultec infiltration system. There will be an emergency overflow from this infiltration field to the rain garden (the rain garden being the second type of stormwater BMP for this project). The cultec infiltration field is vertically sited 2 feet above the seasonal high groundwater table. The raingarden will capture a portion of the parking lot runoff and discharge to a rip-rap spreader for pretreatment prior to entry into the raingarden. There will be a gap in the vertical granite curbing to allow stormwater to enter the rip-rap pretreatment area. There will also be an outlet control concrete structure just outside the raingarden which will serve to allow excess water from the cultec infiltration field to flow to the raingarden. The raingarden will have a rip-rap spillway to allow a controlled release of stormwater in larger storm events. The drainage system has been sized utilizing the 2, 10, 100 year storm numbers provided by NOAA.

IMPORTANT....this project will require filing with the Conservation Commission for review and approval. This drainage report will be supplemented at that time with the NOI stormwater report, drainage performance standards, Operation & Maintenance requirements, and Long Term Pollution Prevention Plan.

The HydroCAD report models the Predevelopment Condition vs. Postdevelopment Condition for the entire site area. The stormwater design reduces the peak rate of runoff for the 2, 10, and 100 year storm event. The following is summary of the peak rate of runoff for various storm events:

	Predevelopment (cfs) WL1	Postdevelopment (cfs) WL1
Storm Event		
2 Year	0.06	0.05
10 Year	0.70	0.35
100 Year	3.88	3.66

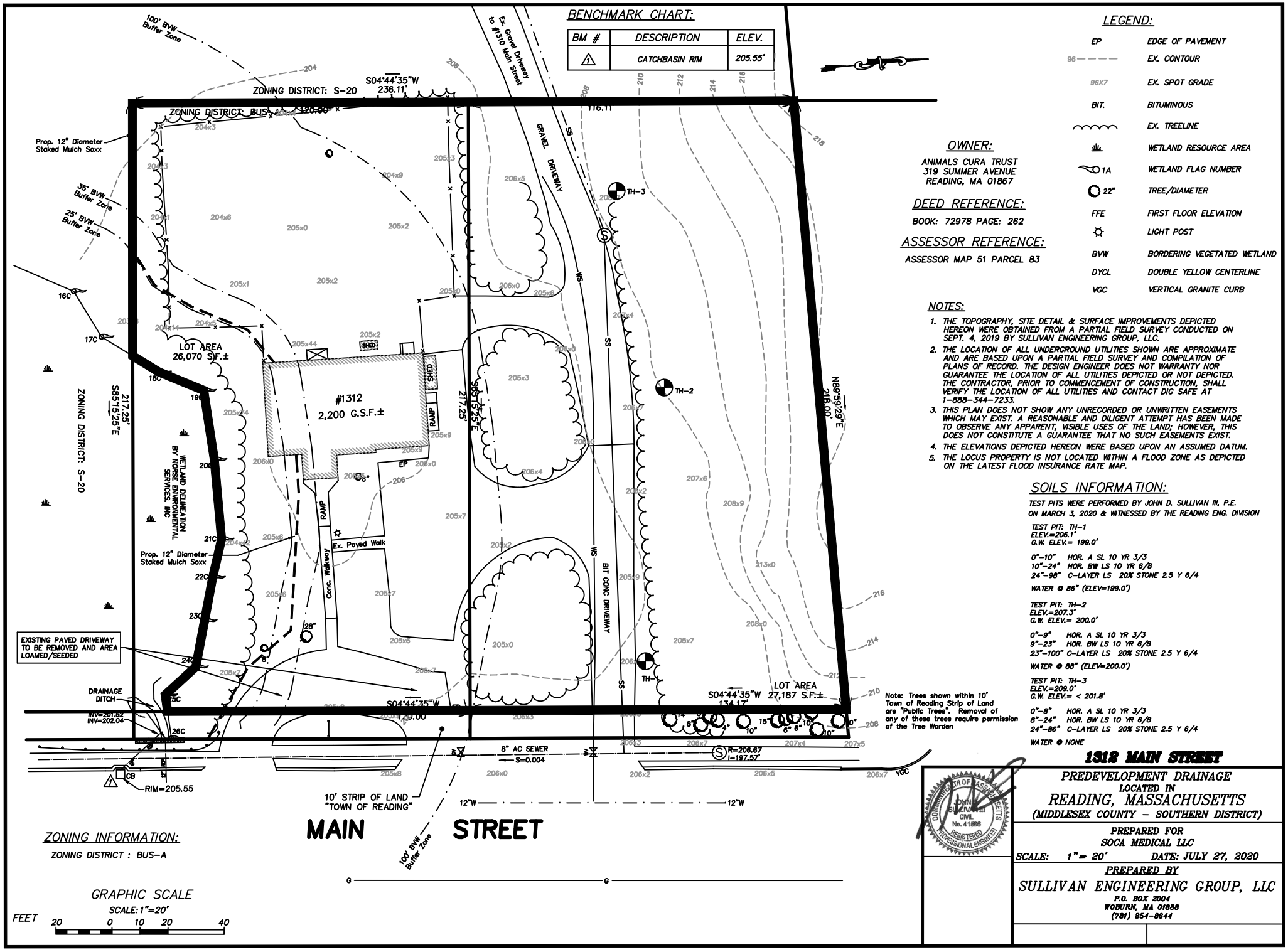


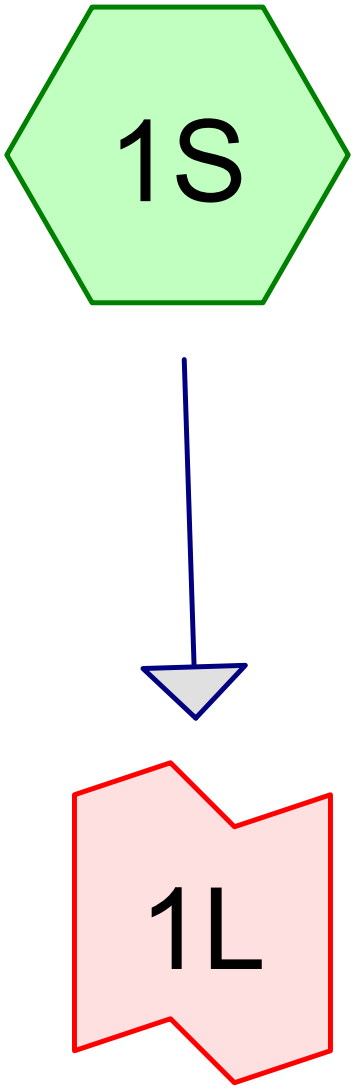
HydroCAD calculations with the accompanying subcatchment areas are attached to support these calculations.

Very Truly Yours,

John (Jack) D. Sullivan III, PE

PO Box 2004 Woburn, MA 01888 (781) 854-8644 e-mail: jacksull53@comcast.net


BENCHMARK CHART:
BM # | DESCRIPTION | ELEV.
1 | CATCHBASIN RIM | 205.55'
LEGEND:
EP EDGE OF PAVEMENT
96 EX. CONTOUR
96X7 EX. SPOT GRADE
BIT. BITUMINOUS
EX. TREELINE
WETLAND RESOURCE AREA
1A WETLAND FLAG NUMBER
22" TREE/DIAMETER
FFE FIRST FLOOR ELEVATION
LIGHT POST
BVW BORDERING VEGETATED WETLAND
DYCL DOUBLE YELLOW CENTERLINE
VGC VERTICAL GRANITE CURB
OWNER:
ANIMALS CURA TRUST
319 SUMMER AVENUE
READING, MA 01867
DEED REFERENCE:
BOOK: 72978 PAGE: 262
ASSESSOR REFERENCE:
ASSESSOR MAP 51 PARCEL 83
NOTES:
1. THE TOPOGRAPHY, SITE DETAIL & SURFACE IMPROVEMENTS DEPICTED HEREON WERE OBTAINED FROM A PARTIAL FIELD SURVEY CONDUCTED ON SEPT. 4, 2019 BY SULLIVAN ENGINEERING GROUP, LLC.
2. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE AND ARE BASED UPON A PARTIAL FIELD SURVEY AND COMPILATION OF PLANS OF RECORD. THE DESIGN ENGINEER DOES NOT WARRANTY NOR GUARANTEE THE LOCATION OF ALL UTILITIES DEPICTED OR NOT DEPICTED. THE CONTRACTOR, PRIOR TO COMMENCEMENT OF CONSTRUCTION, SHALL VERIFY THE LOCATION OF ALL UTILITIES AND CONTACT DIG SAFE AT 1-888-344-7233.
3. THIS PLAN DOES NOT SHOW ANY UNRECORDED OR UNWRITTEN EASEMENTS WHICH MAY EXIST. A REASONABLE AND DILIGENT ATTEMPT HAS BEEN MADE TO OBSERVE ANY APPARENT, VISIBLE USES OF THE LAND; HOWEVER, THIS DOES NOT CONSTITUTE A GUARANTEE THAT NO SUCH EASEMENTS EXIST.
4. THE ELEVATIONS DEPICTED HEREON WERE BASED UPON AN ASSUMED DATUM.
5. THE LOCUS PROPERTY IS NOT LOCATED WITHIN A FLOOD ZONE AS DEPICTED ON THE LATEST FLOOD INSURANCE RATE MAP.
SOILS INFORMATION:
TEST PITS WERE PERFORMED BY JOHN D. SULLIVAN III, P.E. ON MARCH 3, 2020 & WITNESSED BY THE READING ENG. DIVISION
TEST PIT: TH-1
ELEV.=206.1'
G.W. ELEV.= 199.0'
0"-10" HOR. A SL 10 YR 3/3
10"-24" HOR. BW LS 10 YR 6/8
24"-98" C-LAYER LS 20% STONE 2.5 Y 6/4
WATER @ 86" (ELEV=199.0')
TEST PIT: TH-2
ELEV.=207.3'
G.W. ELEV.= 200.0'
0"-9" HOR. A SL 10 YR 3/3
9"-23" HOR. BW LS 10 YR 6/8
23"-100" C-LAYER LS 20% STONE 2.5 Y 6/4
WATER @ 88" (ELEV=200.0')
TEST PIT: TH-3
ELEV.=209.0'
G.W. ELEV.= < 201.8'
0"-8" HOR. A SL 10 YR 3/3
8"-24" HOR. BW LS 10 YR 6/8
24"-86" C-LAYER LS 20% STONE 2.5 Y 6/4
WATER @ NONE
1312 MAIN STREET
PREDEVELOPMENT DRAINAGE
LOCATED IN
READING, MASSACHUSETTS
(MIDDLESEX COUNTY - SOUTHERN DISTRICT)
PREPARED FOR
SOCA MEDICAL LLC
SCALE: 1"= 20' DATE: JULY 27, 2020
PREPARED BY
SULLIVAN ENGINEERING GROUP, LLC
P.O. BOX 2004
WOBURN, MA 01888
(781) 854-8644
JOHN D. SULLIVAN III
CIVIL
No. 41586
REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
ZONING INFORMATION:
ZONING DISTRICT : BUS-A
GRAPHIC SCALE
SCALE: 1"=20'
FEET 20 0 10 20 40
MAIN STREET
ZONING DISTRICT: S-20
ZONING DISTRICT: BUS-A
S04°44'35"W 236.11'
S04°44'35"W 134.17'
S04°44'35"W 120.00'
N89°59'29"E 218.00'
S85°15'25"E 217.25'
LOT AREA 26,070 S.F.±
LOT AREA 27,187 S.F.±
#1312 2,200 G.S.F.±
SHED
RAMP
GRAVEL DRIVEWAY
BIT CONC DRIVEWAY
Conc. Walkway
Ex. Payed Walk
EP
WETLAND DELINEATION BY NORSE ENVIRONMENTAL SERVICES, INC
Prop. 12" Diameter Staked Mulch Soxx
EXISTING PAVED DRIVEWAY TO BE REMOVED AND AREA LOAMED/SEEDED
DRAINAGE DITCH
INV=201.52
INV=202.04
CB
RIM=205.55
8" AC SEWER
S=0.004
R=206.67
L=197.57'
10' STRIP OF LAND "TOWN OF READING"
100' BVW Buffer Zone
35' BVW Buffer Zone
25' BVW Buffer Zone
Ex. Gravel Driveway to #1310 Main Street
TH-1
TH-2
TH-3
Note: Trees shown within 10' Town of Reading Strip of Land are "Public Trees". Removal of any of these trees require permission of the Tree Warden



Total Offsite

Subcat Reach Pond Link

Drainage Diagram for Predevelopment
Prepared by Sullivan Engineering Group, LLC 7/29/2020

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

Subcatchment 1S: Runoff Area=50,105 sf Runoff Depth=0.14"
Tc=6.0 min CN=52 Runoff=0.06 cfs 0.014 af

Link 1L: Total Offsite Inflow=0.06 cfs 0.014 af
Primary=0.06 cfs 0.014 af

Total Runoff Area = 1.150 ac Runoff Volume = 0.014 af Average Runoff Depth = 0.14"

Subcatchment 1S:

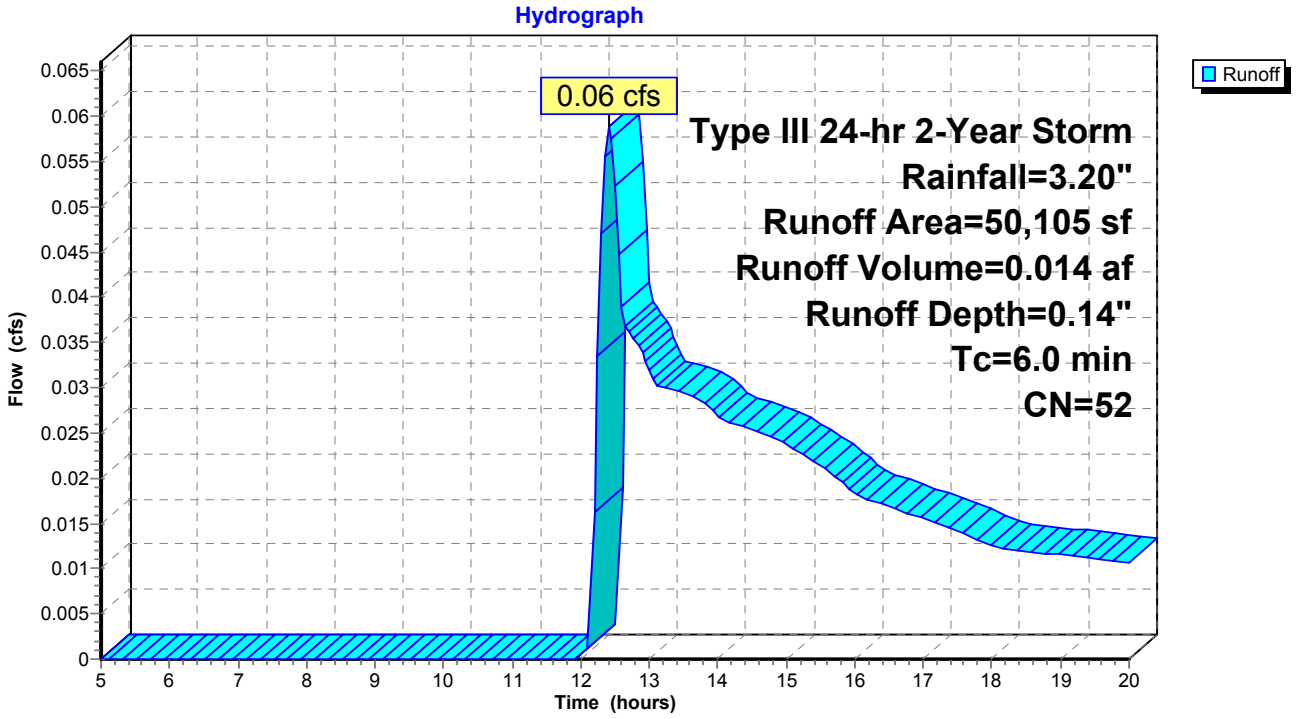
Runoff = 0.06 cfs @ 12.41 hrs, Volume= 0.014 af, Depth= 0.14"

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

Area (sf)	CN	Description
2,200	98	Roof Area
49	98	shed
6,266	98	pavement
272	98	walkway
2,524	76	Gravel roads, HSG A
11,511	49	50-75% Grass cover, Fair, HSG A
27,283	36	Woods, Fair, HSG A
50,105	52	Weighted Average

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

Subcatchment 1S:

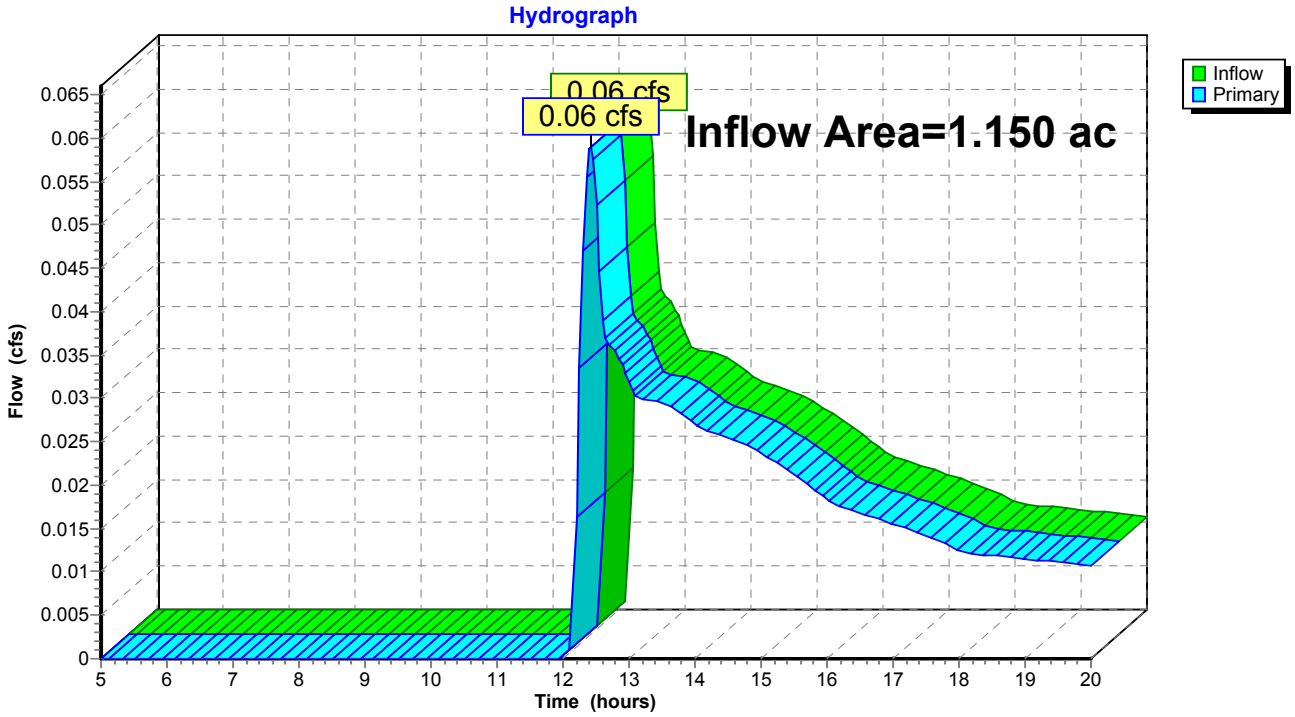


Link 1L: Total Offsite

Inflow Area = 1.150 ac, Inflow Depth = 0.14" for 2-Year Storm event
Inflow = 0.06 cfs @ 12.41 hrs, Volume= 0.014 af
Primary = 0.06 cfs @ 12.41 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

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

Link 1L: Total Offsite



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

Subcatchment 1S: Runoff Area=50,105 sf Runoff Depth=0.67"
Tc=6.0 min CN=52 Runoff=0.70 cfs 0.064 af

Link 1L: Total Offsite Inflow=0.70 cfs 0.064 af
Primary=0.70 cfs 0.064 af

Total Runoff Area = 1.150 ac Runoff Volume = 0.064 af Average Runoff Depth = 0.67"

Subcatchment 1S:

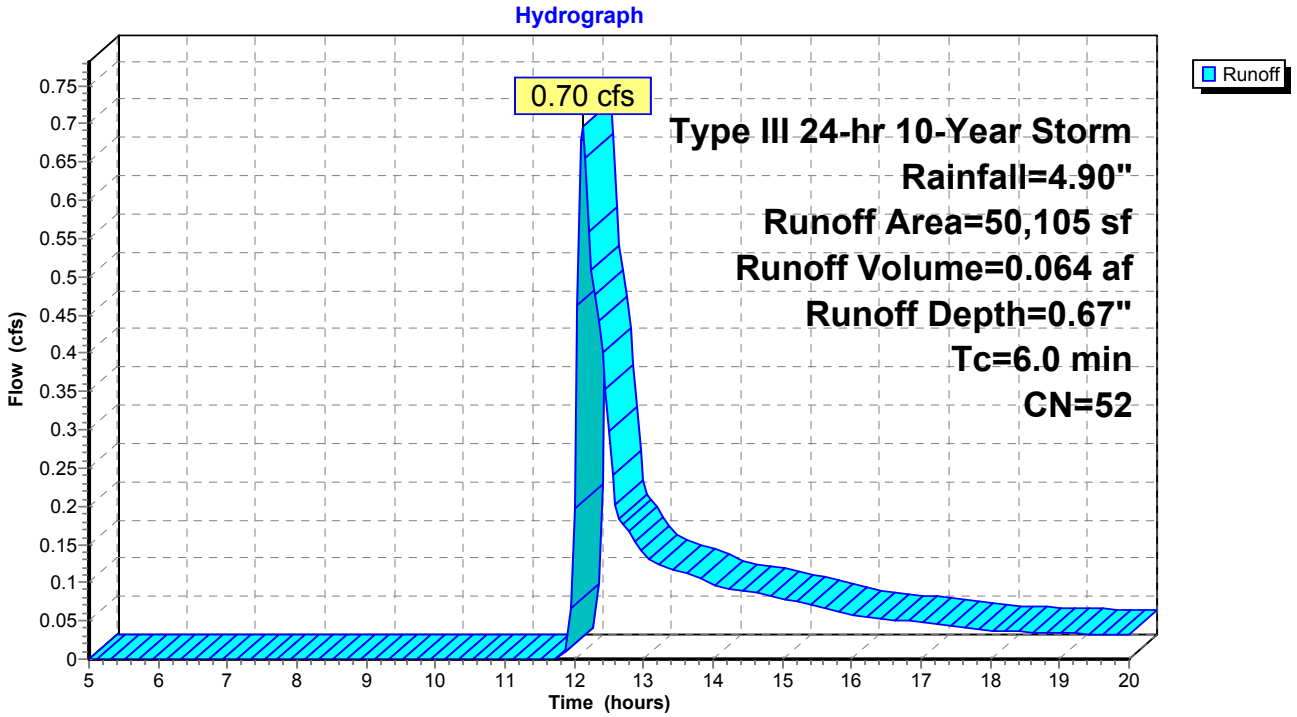
Runoff = 0.70 cfs @ 12.12 hrs, Volume= 0.064 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=4.90"

Area (sf)	CN	Description
2,200	98	Roof Area
49	98	shed
6,266	98	pavement
272	98	walkway
2,524	76	Gravel roads, HSG A
11,511	49	50-75% Grass cover, Fair, HSG A
27,283	36	Woods, Fair, HSG A
50,105	52	Weighted Average

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

Subcatchment 1S:

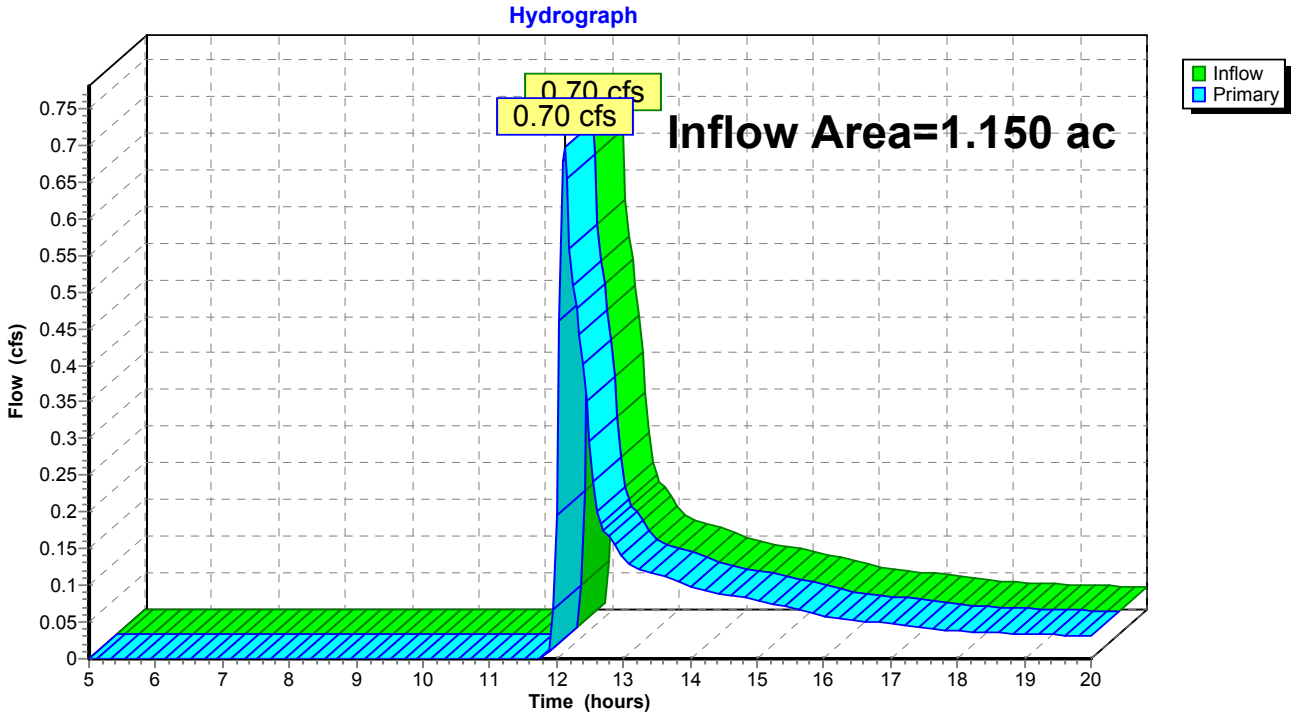


Link 1L: Total Offsite

Inflow Area = 1.150 ac, Inflow Depth = 0.67" for 10-Year Storm event
Inflow = 0.70 cfs @ 12.12 hrs, Volume= 0.064 af
Primary = 0.70 cfs @ 12.12 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

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

Link 1L: Total Offsite



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

Subcatchment 1S: Runoff Area=50,105 sf Runoff Depth=2.79"
Tc=6.0 min CN=52 Runoff=3.88 cfs 0.268 af

Link 1L: Total Offsite Inflow=3.88 cfs 0.268 af
Primary=3.88 cfs 0.268 af

Total Runoff Area = 1.150 ac Runoff Volume = 0.268 af Average Runoff Depth = 2.79"

Subcatchment 1S:

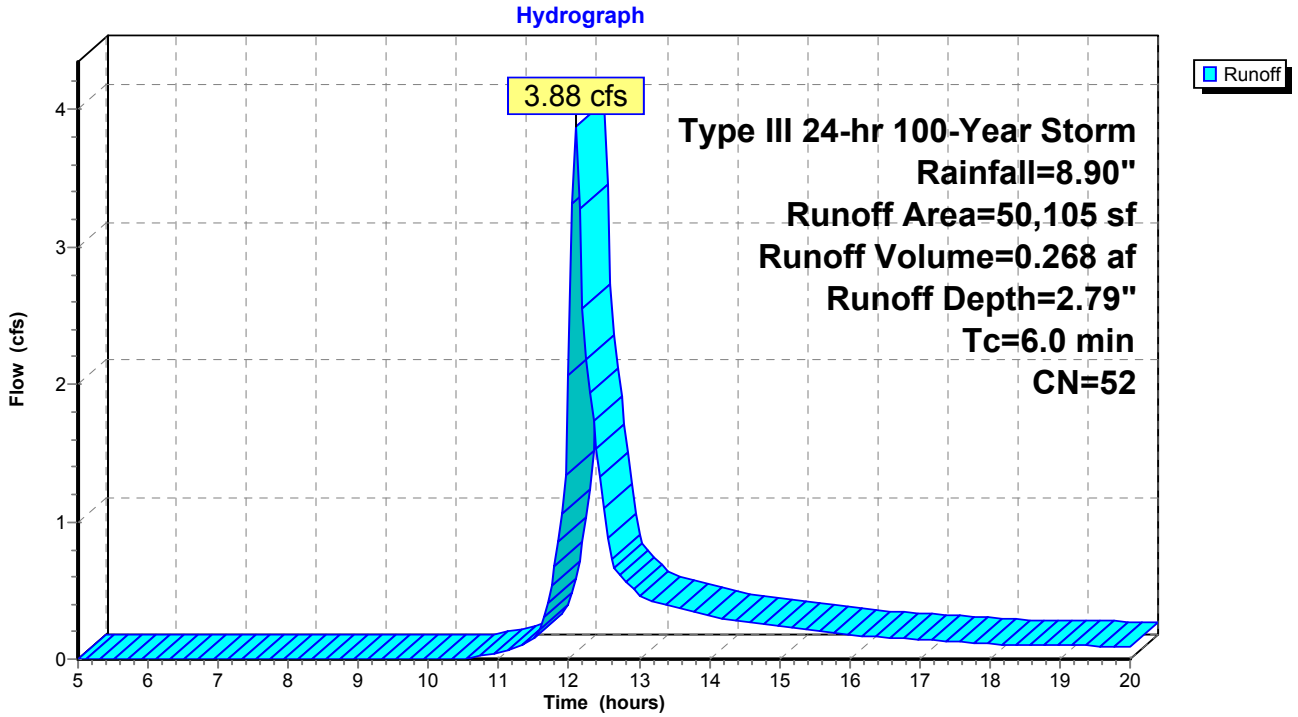
Runoff = 3.88 cfs @ 12.10 hrs, Volume= 0.268 af, Depth= 2.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=8.90"

Area (sf)	CN	Description
2,200	98	Roof Area
49	98	shed
6,266	98	pavement
272	98	walkway
2,524	76	Gravel roads, HSG A
11,511	49	50-75% Grass cover, Fair, HSG A
27,283	36	Woods, Fair, HSG A
50,105	52	Weighted Average

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

Subcatchment 1S:

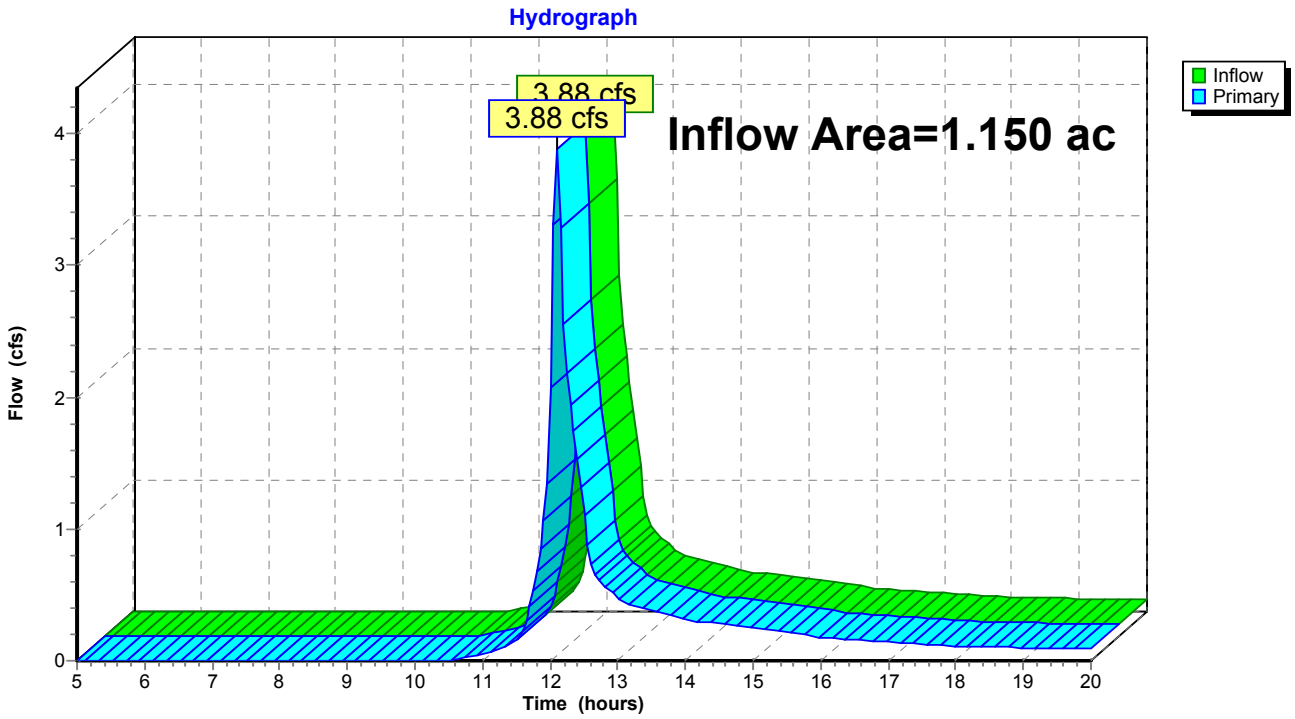


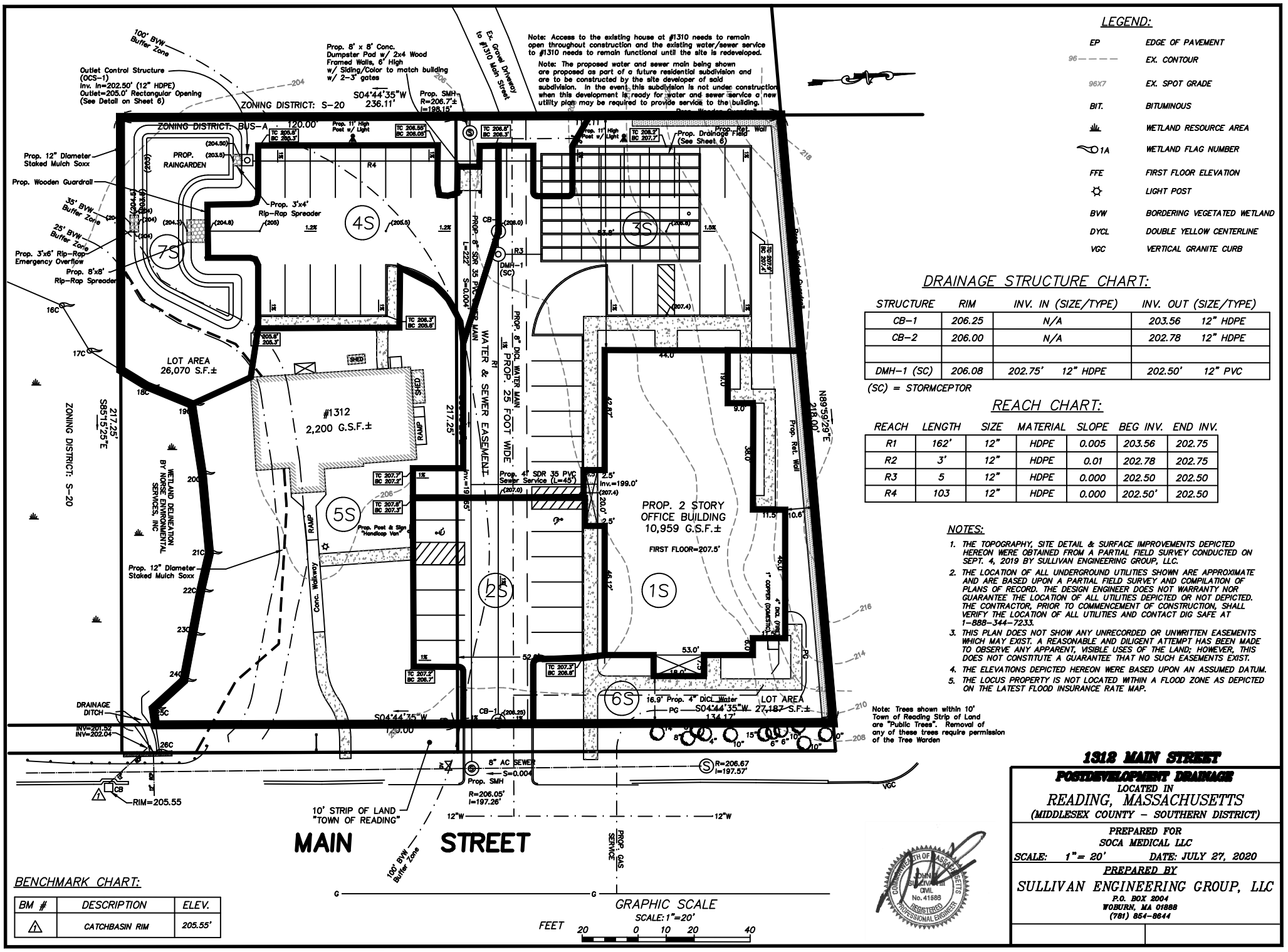
Link 1L: Total Offsite

Inflow Area = 1.150 ac, Inflow Depth = 2.79" for 100-Year Storm event
Inflow = 3.88 cfs @ 12.10 hrs, Volume= 0.268 af
Primary = 3.88 cfs @ 12.10 hrs, Volume= 0.268 af, Atten= 0%, Lag= 0.0 min

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

Link 1L: Total Offsite





LEGEND:

EP	EDGE OF PAVEMENT
96	EX. CONTOUR
96X7	EX. SPOT GRADE
BIT.	BITUMINOUS
	WETLAND RESOURCE AREA
1A	WETLAND FLAG NUMBER
FFE	FIRST FLOOR ELEVATION
	LIGHT POST
BVW	BORDERING VEGETATED WETLAND
DYCL	DOUBLE YELLOW CENTERLINE
VGC	VERTICAL GRANITE CURB

DRAINAGE STRUCTURE CHART:

STRUCTURE	RIM	INV. IN (SIZE/TYPE)	INV. OUT (SIZE/TYPE)
CB-1	206.25	N/A	203.56 12" HDPE
CB-2	206.00	N/A	202.78 12" HDPE
DMH-1 (SC)	206.08	202.75' 12" HDPE	202.50' 12" PVC

(SC) = STORMCEPTOR

REACH CHART:

REACH	LENGTH	SIZE	MATERIAL	SLOPE	BEG INV.	END INV.
R1	162'	12"	HDPE	0.005	203.56	202.75
R2	3'	12"	HDPE	0.01	202.78	202.75
R3	5	12"	HDPE	0.000	202.50	202.50
R4	103	12"	HDPE	0.000	202.50'	202.50

NOTES:

1. THE TOPOGRAPHY, SITE DETAIL & SURFACE IMPROVEMENTS DEPICTED HEREON WERE OBTAINED FROM A PARTIAL FIELD SURVEY CONDUCTED ON SEPT. 4, 2019 BY SULLIVAN ENGINEERING GROUP, LLC.
2. THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN ARE APPROXIMATE AND ARE BASED UPON A PARTIAL FIELD SURVEY AND COMPILATION OF PLANS OF RECORD. THE DESIGN ENGINEER DOES NOT WARRANTY NOR GUARANTEE THE LOCATION OF ALL UTILITIES DEPICTED OR NOT DEPICTED. THE CONTRACTOR, PRIOR TO COMMENCEMENT OF CONSTRUCTION, SHALL VERIFY THE LOCATION OF ALL UTILITIES AND CONTACT DIG SAFE AT 1-888-344-7233.
3. THIS PLAN DOES NOT SHOW ANY UNRECORDED OR UNWRITTEN EASEMENTS WHICH MAY EXIST. A REASONABLE AND DILIGENT ATTEMPT HAS BEEN MADE TO OBSERVE ANY APPARENT, VISIBLE USES OF THE LAND; HOWEVER, THIS DOES NOT CONSTITUTE A GUARANTEE THAT NO SUCH EASEMENTS EXIST.
4. THE ELEVATIONS DEPICTED HEREON WERE BASED UPON AN ASSUMED DATUM.
5. THE LOCUS PROPERTY IS NOT LOCATED WITHIN A FLOOD ZONE AS DEPICTED ON THE LATEST FLOOD INSURANCE RATE MAP.

Note: Trees shown within 10' Town of Reading Strip of Land are "Public Trees". Removal of any of these trees require permission of the Tree Warden

BENCHMARK CHART:

BM #	DESCRIPTION	ELEV.
△	CATCHBASIN RIM	205.55'

GRAPHIC SCALE
SCALE: 1"=20'
FEET 20 0 10 20 40

COMMONWEALTH OF MASSACHUSETTS — JOHN J. SULLIVAN III — CIVIL No. 41588 — REGISTERED PROFESSIONAL ENGINEER

1312 MAIN STREET

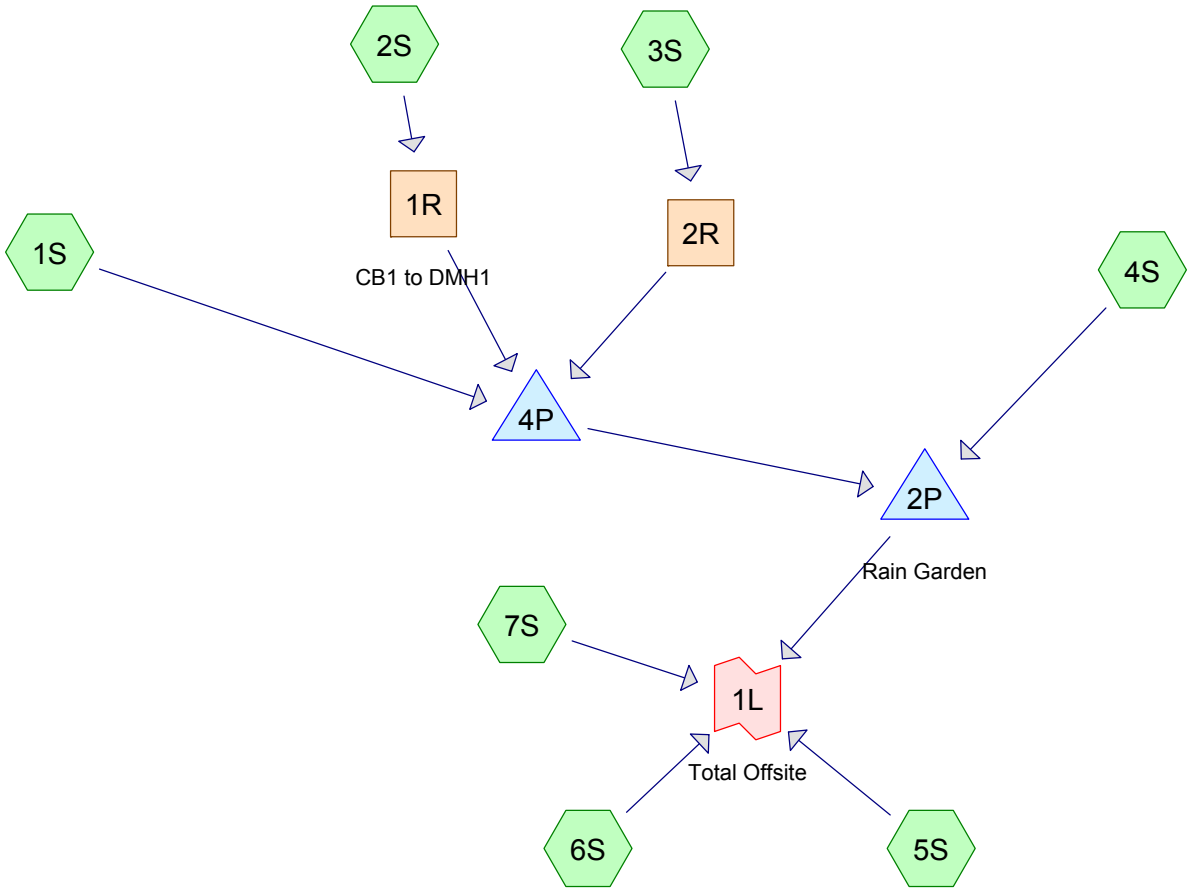
POSTDEVELOPMENT DRAINAGE

LOCATED IN
READING, MASSACHUSETTS
(MIDDLESEX COUNTY - SOUTHERN DISTRICT)

PREPARED FOR
SOCA MEDICAL LLC

SCALE: 1"= 20' DATE: JULY 27, 2020

PREPARED BY
SULLIVAN ENGINEERING GROUP, LLC
P.O. BOX 2004
WOBURN, MA 01888
(781) 854-8644



Subcat Reach Pond Link

Drainage Diagram for Postdevelopment
Prepared by Sullivan Engineering Group, LLC 7/29/2020

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

Subcatchment 1S: Runoff Area=6,410 sf Runoff Depth=2.77"
Tc=6.0 min CN=98 Runoff=0.45 cfs 0.034 af

Subcatchment 2S: Runoff Area=4,485 sf Runoff Depth=2.77"
Flow Length=78' Tc=1.1 min CN=98 Runoff=0.35 cfs 0.024 af

Subcatchment 3S: Runoff Area=11,270 sf Runoff Depth=1.96"
Flow Length=80' Tc=1.1 min CN=89 Runoff=0.70 cfs 0.042 af

Subcatchment 4S: Runoff Area=5,265 sf Runoff Depth=2.77"
Flow Length=103' Tc=1.3 min CN=98 Runoff=0.41 cfs 0.028 af

Subcatchment 5S: Runoff Area=12,229 sf Runoff Depth=0.14"
Tc=6.0 min CN=52 Runoff=0.01 cfs 0.003 af

Subcatchment 6S: Runoff Area=4,404 sf Runoff Depth=0.01"
Tc=6.0 min CN=43 Runoff=0.00 cfs 0.000 af

Subcatchment 7S: Runoff Area=6,042 sf Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Reach 1R: CB1 to DMH1 Peak Depth=0.23' Max Vel=2.5 fps Inflow=0.35 cfs 0.024 af
D=12.0" n=0.011 L=162.0' S=0.0050 '/' Capacity=2.98 cfs Outflow=0.33 cfs 0.024 af

Reach 2R: Peak Depth=0.28' Max Vel=3.9 fps Inflow=0.70 cfs 0.042 af
D=12.0" n=0.011 L=3.0' S=0.0100 '/' Capacity=4.21 cfs Outflow=0.69 cfs 0.042 af

Pond 2P: Rain Garden Peak Elev=204.02' Storage=1,454 cf Inflow=0.54 cfs 0.128 af
Discarded=0.09 cfs 0.080 af Primary=0.05 cfs 0.018 af Outflow=0.14 cfs 0.098 af

Pond 4P: Peak Elev=203.15' Storage=1,718 cf Inflow=1.38 cfs 0.100 af
Outflow=0.12 cfs 0.100 af

Link 1L: Total Offsite Inflow=0.05 cfs 0.022 af
Primary=0.05 cfs 0.022 af

Total Runoff Area = 1.150 ac Runoff Volume = 0.131 af Average Runoff Depth = 1.37"

Subcatchment 1S:

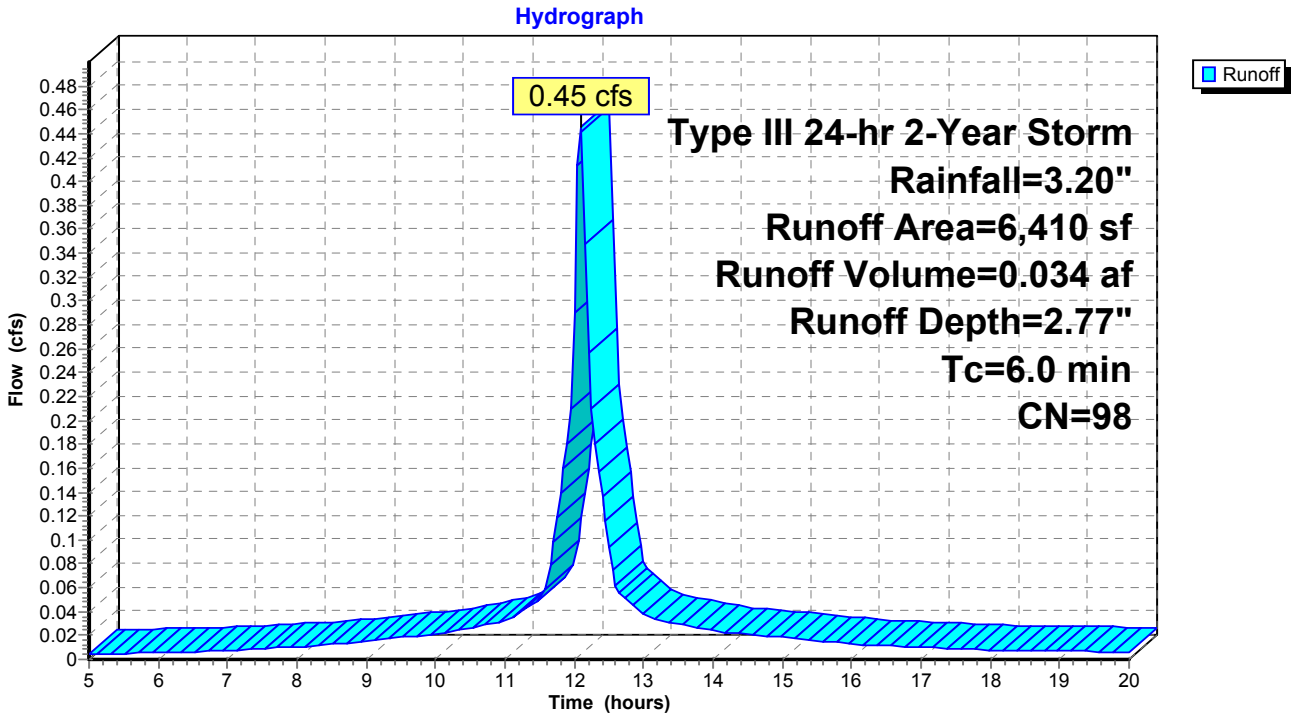
Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.034 af, Depth= 2.77"

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

Area (sf)	CN	Description
6,410	98	Roof Area

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

Subcatchment 1S:



Subcatchment 2S:

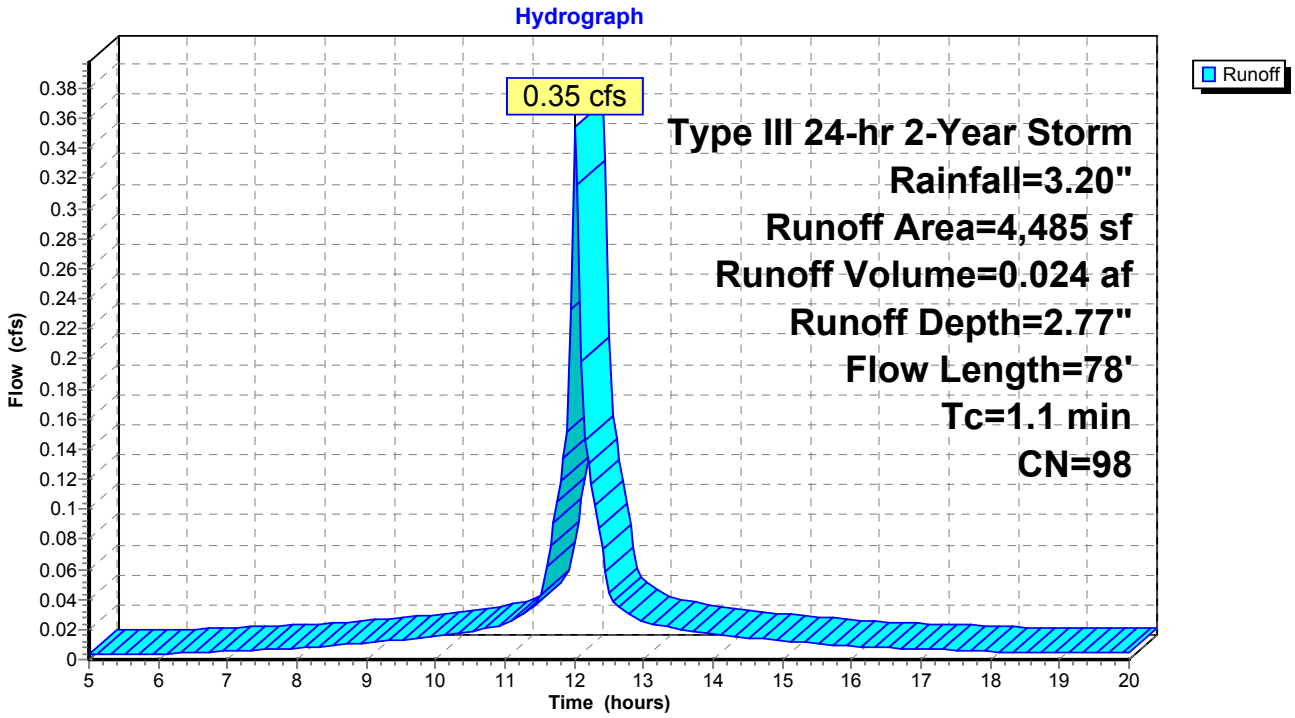
Runoff = 0.35 cfs @ 12.01 hrs, Volume= 0.024 af, Depth= 2.77"

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

Area (sf)	CN	Description
4,485	98	Pave, curb, sidewalk

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	28	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	78	Total			

Subcatchment 2S:



Subcatchment 3S:

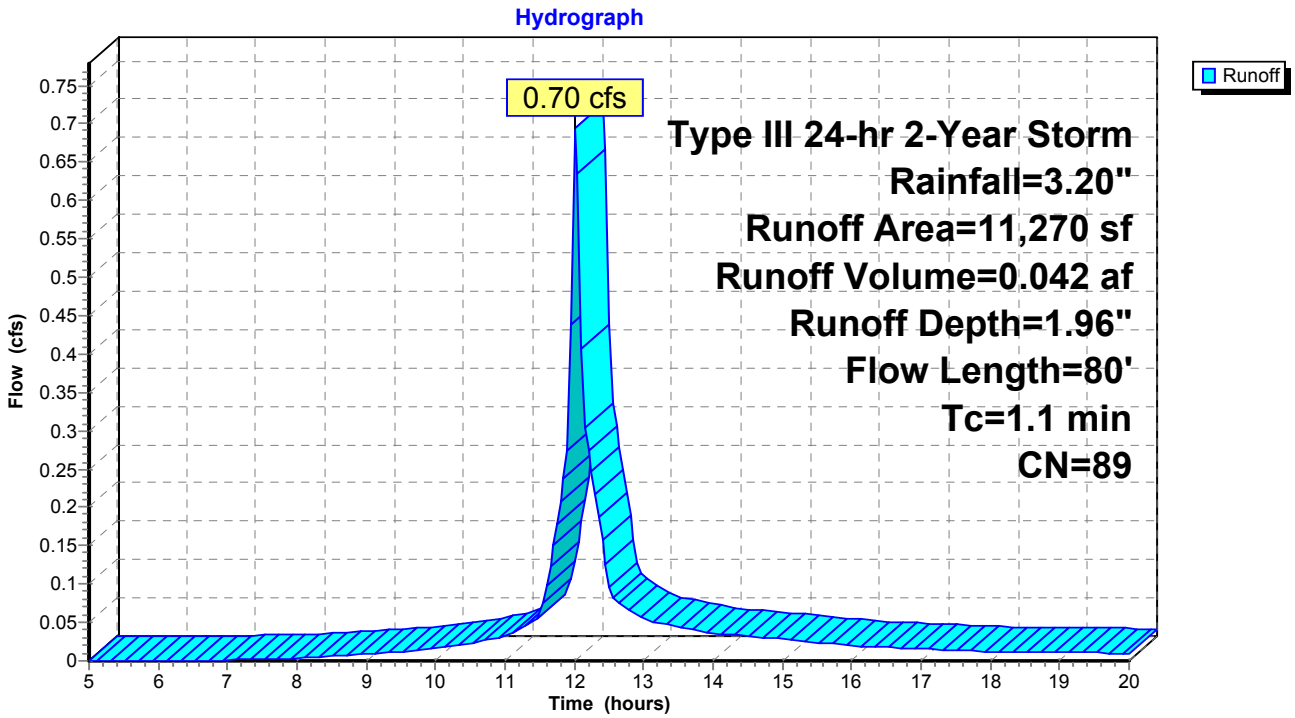
Runoff = 0.70 cfs @ 12.02 hrs, Volume= 0.042 af, Depth= 1.96"

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

Area (sf)	CN	Description
1,807	39	>75% Grass cover, Good, HSG A
9,463	98	Pavement, curb, walls, walk
11,270	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	80	Total			

Subcatchment 3S:



Subcatchment 4S:

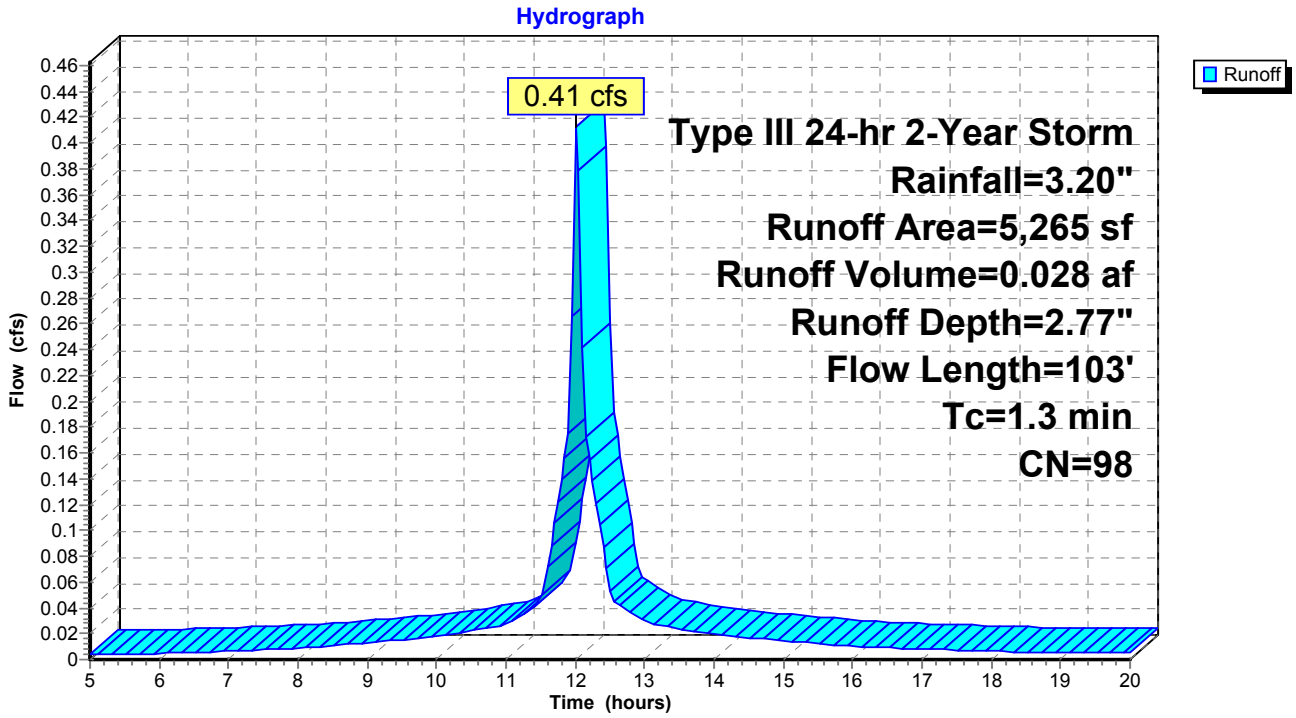
Runoff = 0.41 cfs @ 12.02 hrs, Volume= 0.028 af, Depth= 2.77"

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

Area (sf)	CN	Description
5,265	98	Pavement, curb, sidewalk

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0120	1.0		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	53	0.0120	2.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	103	Total			

Subcatchment 4S:



Subcatchment 5S:

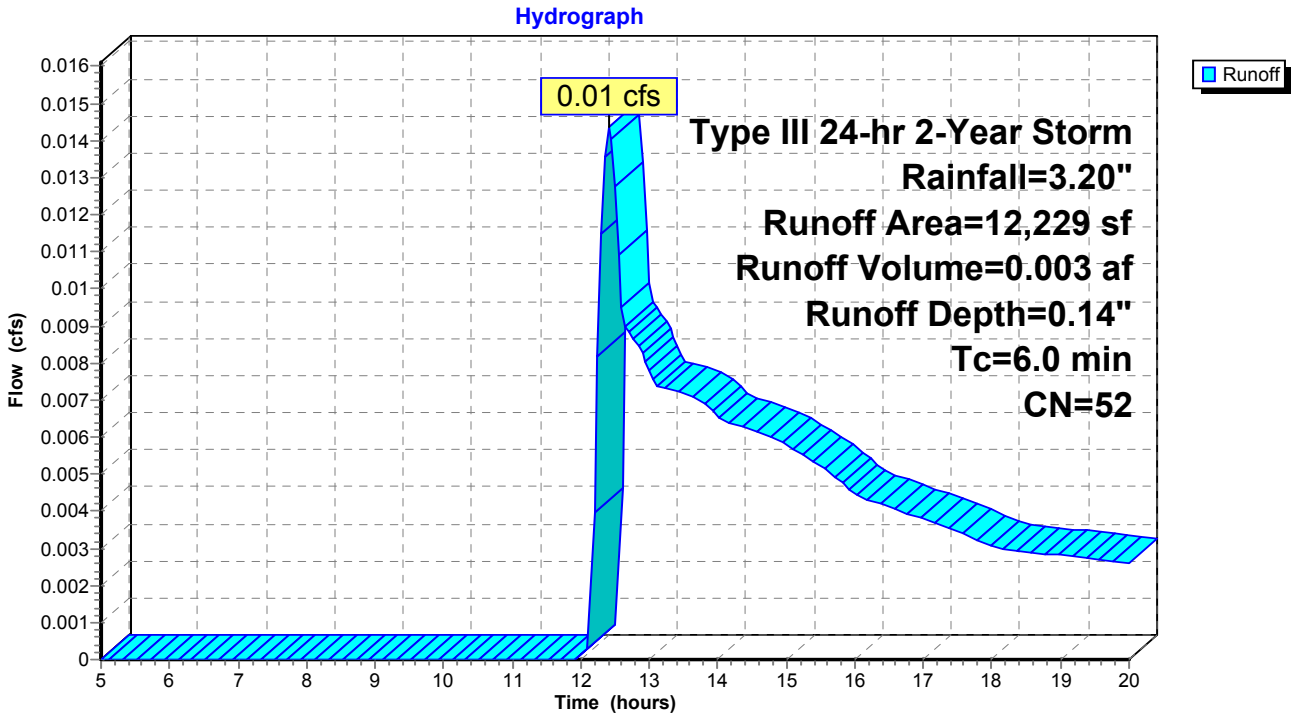
Runoff = 0.01 cfs @ 12.41 hrs, Volume= 0.003 af, Depth= 0.14"

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

Area (sf)	CN	Description
2,200	98	bldg
49	98	shed
350	98	walkway
9,630	39	>75% Grass cover, Good, HSG A
12,229	52	Weighted Average

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

Subcatchment 5S:



Subcatchment 6S:

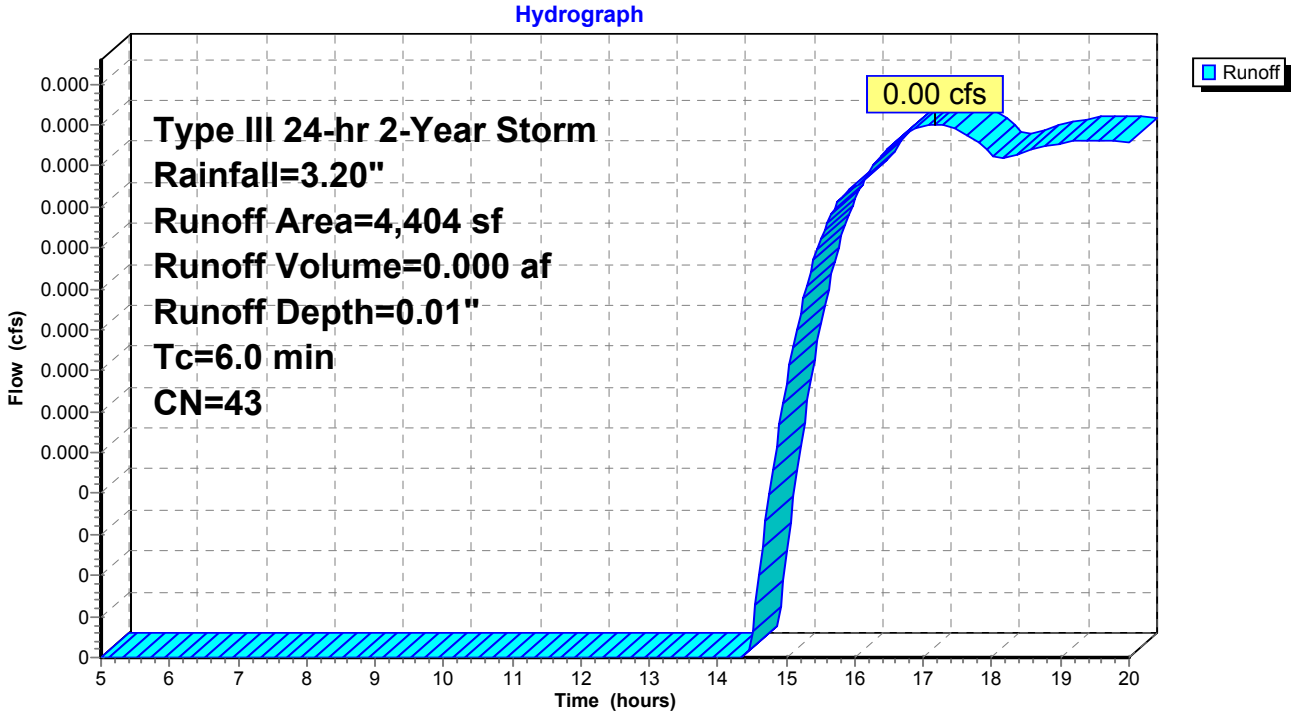
Runoff = 0.00 cfs @ 17.17 hrs, Volume= 0.000 af, Depth= 0.01"

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

Area (sf)	CN	Description
300	98	walkway
4,104	39	>75% Grass cover, Good, HSG A
4,404	43	Weighted Average

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

Subcatchment 6S:



Subcatchment 7S:

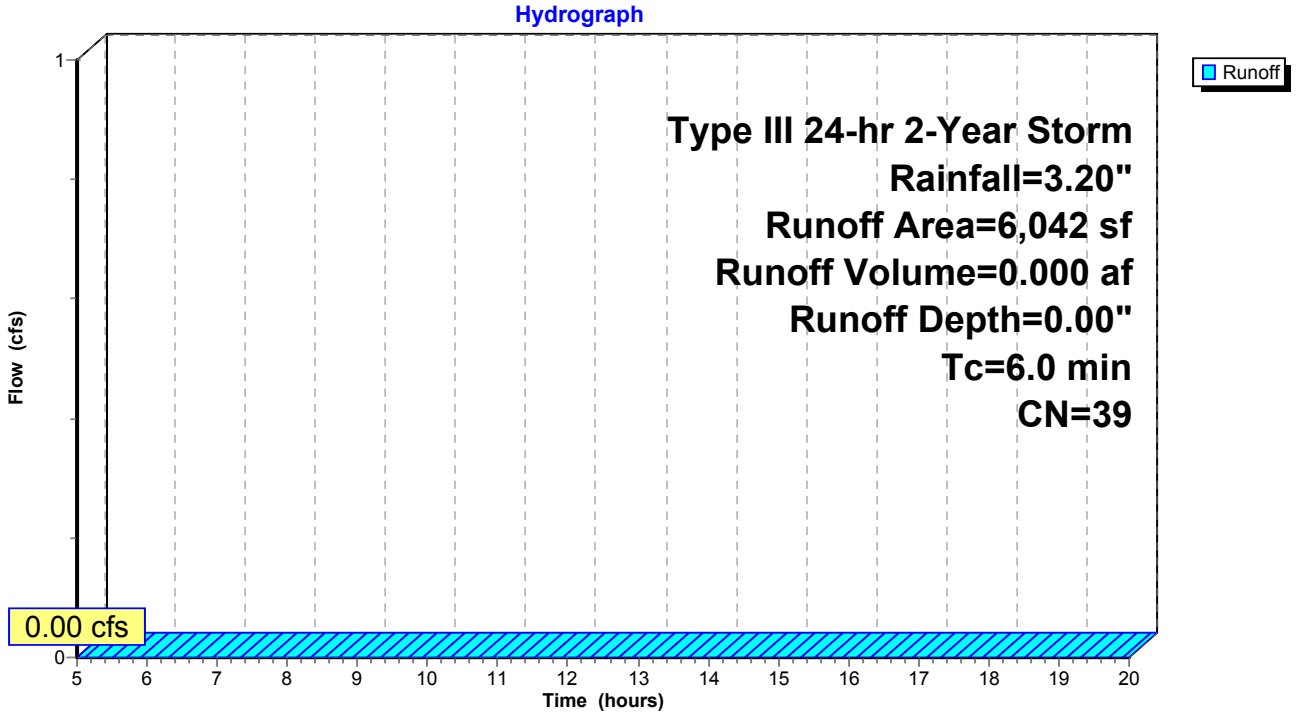
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

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

Area (sf)	CN	Description
6,042	39	>75% Grass cover, Good, HSG A

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

Subcatchment 7S:



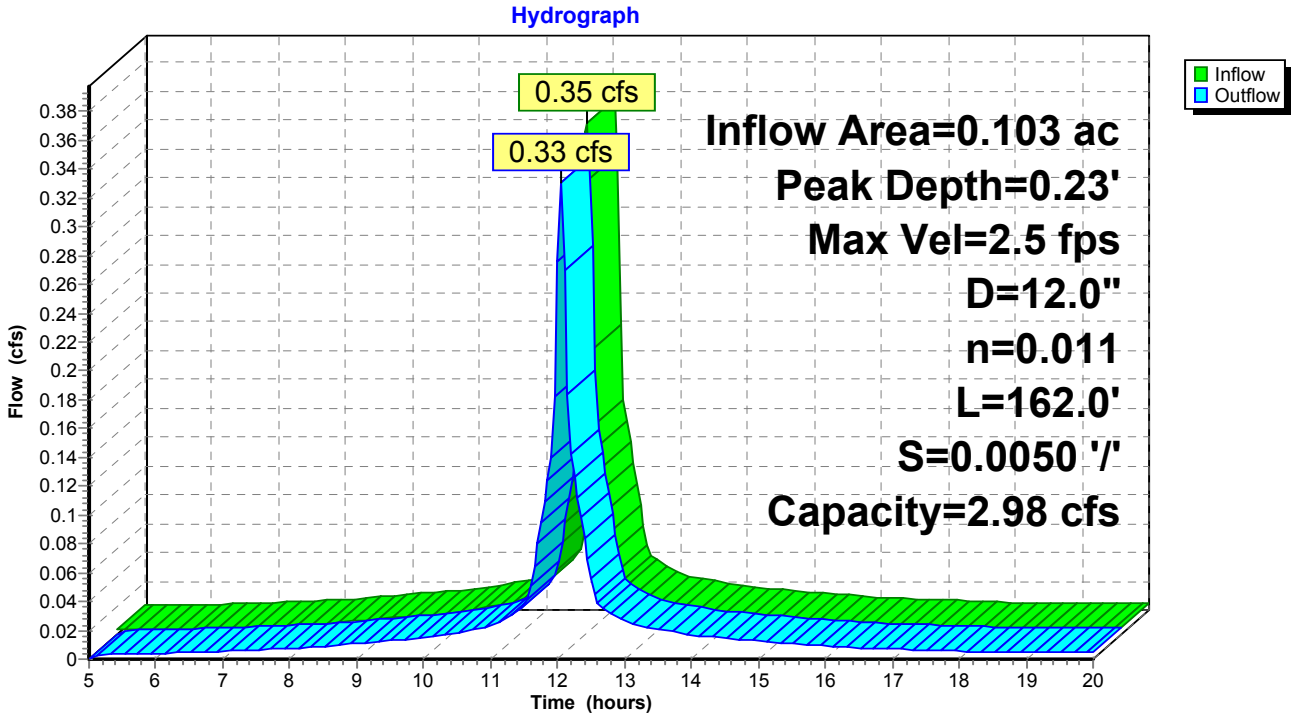
Reach 1R: CB1 to DMH1

Inflow Area = 0.103 ac, Inflow Depth = 2.77" for 2-Year Storm event
Inflow = 0.35 cfs @ 12.01 hrs, Volume= 0.024 af
Outflow = 0.33 cfs @ 12.05 hrs, Volume= 0.024 af, Atten= 7%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.9 fps, Avg. Travel Time= 2.9 min

Peak Depth= 0.23' @ 12.03 hrs
Capacity at bank full= 2.98 cfs
Inlet Invert= 203.56', Outlet Invert= 202.75'
12.0" Diameter Pipe n= 0.011 Length= 162.0' Slope= 0.0050 '/'

Reach 1R: CB1 to DMH1



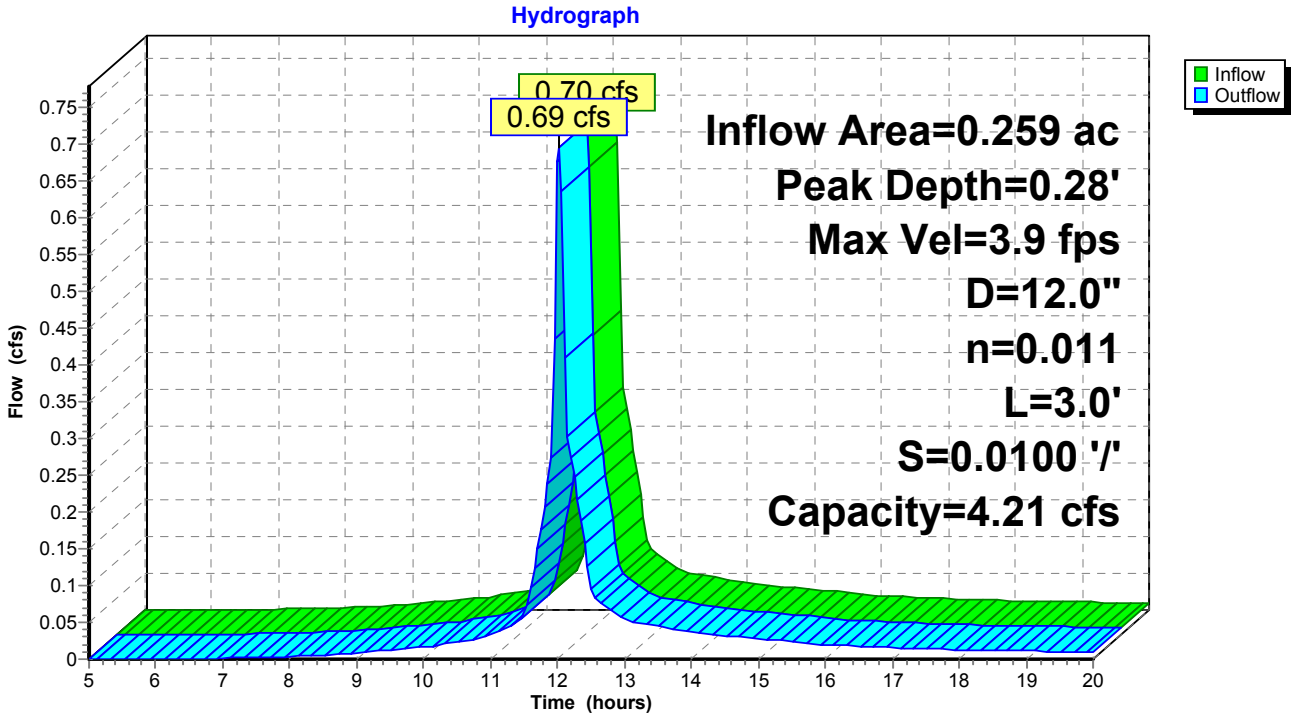
Reach 2R:

Inflow Area = 0.259 ac, Inflow Depth = 1.96" for 2-Year Storm event
Inflow = 0.70 cfs @ 12.02 hrs, Volume= 0.042 af
Outflow = 0.69 cfs @ 12.02 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.9 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.28' @ 12.02 hrs
Capacity at bank full= 4.21 cfs
Inlet Invert= 202.78', Outlet Invert= 202.75'
12.0" Diameter Pipe n= 0.011 Length= 3.0' Slope= 0.0100 '/'

Reach 2R:



Pond 2P: Rain Garden

Exfiltration Rate for LS using Rawls is 2.41 in/hr or 0.003347 ft/min

Inflow Area = 0.630 ac, Inflow Depth = 2.44" for 2-Year Storm event
Inflow = 0.54 cfs @ 12.02 hrs, Volume= 0.128 af
Outflow = 0.14 cfs @ 14.72 hrs, Volume= 0.098 af, Atten= 74%, Lag= 162.2 min
Discarded = 0.09 cfs @ 14.72 hrs, Volume= 0.080 af
Primary = 0.05 cfs @ 14.72 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 204.02' @ 14.72 hrs Surf.Area= 1,627 sf Storage= 1,454 cf
Plug-Flow detention time= 128.6 min calculated for 0.097 af (76% of inflow)
Center-of-Mass det. time= 51.7 min (889.4 - 837.7)

#	Invert	Avail.Storage	Storage Description
1	202.90'	2,225 cf	**Rain Garden (Prismatic)**Listed below

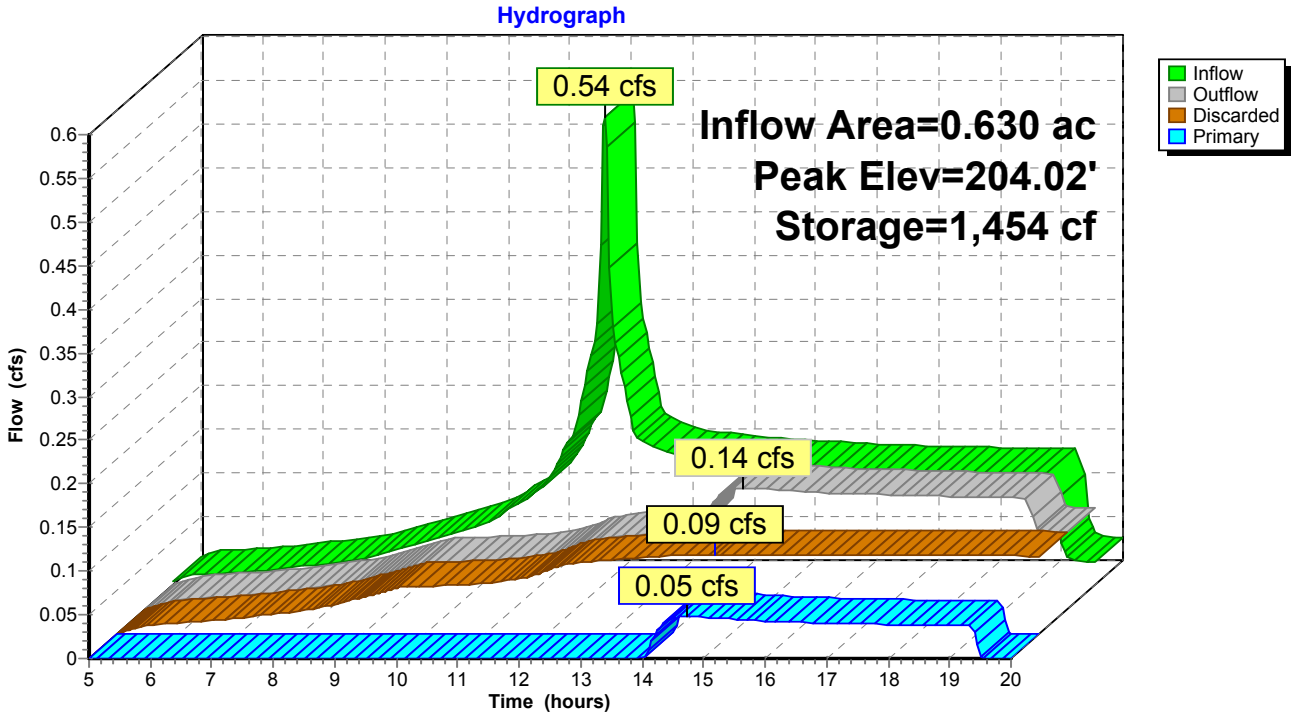
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
202.90	0	0	0
203.00	974	49	49
203.50	1,282	564	613
204.50	1,943	1,613	2,225

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.003347 fpm Exfiltration over entire Surface area**
2	Primary	204.00'	**6.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.09 cfs @ 14.72 hrs HW=204.02' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.05 cfs @ 14.72 hrs HW=204.02' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.05 cfs @ 0.4 fps)

Pond 2P: Rain Garden



Pond 4P:

Inflow Area = 0.509 ac, Inflow Depth = 2.36" for 2-Year Storm event
Inflow = 1.38 cfs @ 12.04 hrs, Volume= 0.100 af
Outflow = 0.12 cfs @ 11.45 hrs, Volume= 0.100 af, Atten= 91%, Lag= 0.0 min
Primary = 0.12 cfs @ 11.45 hrs, Volume= 0.100 af

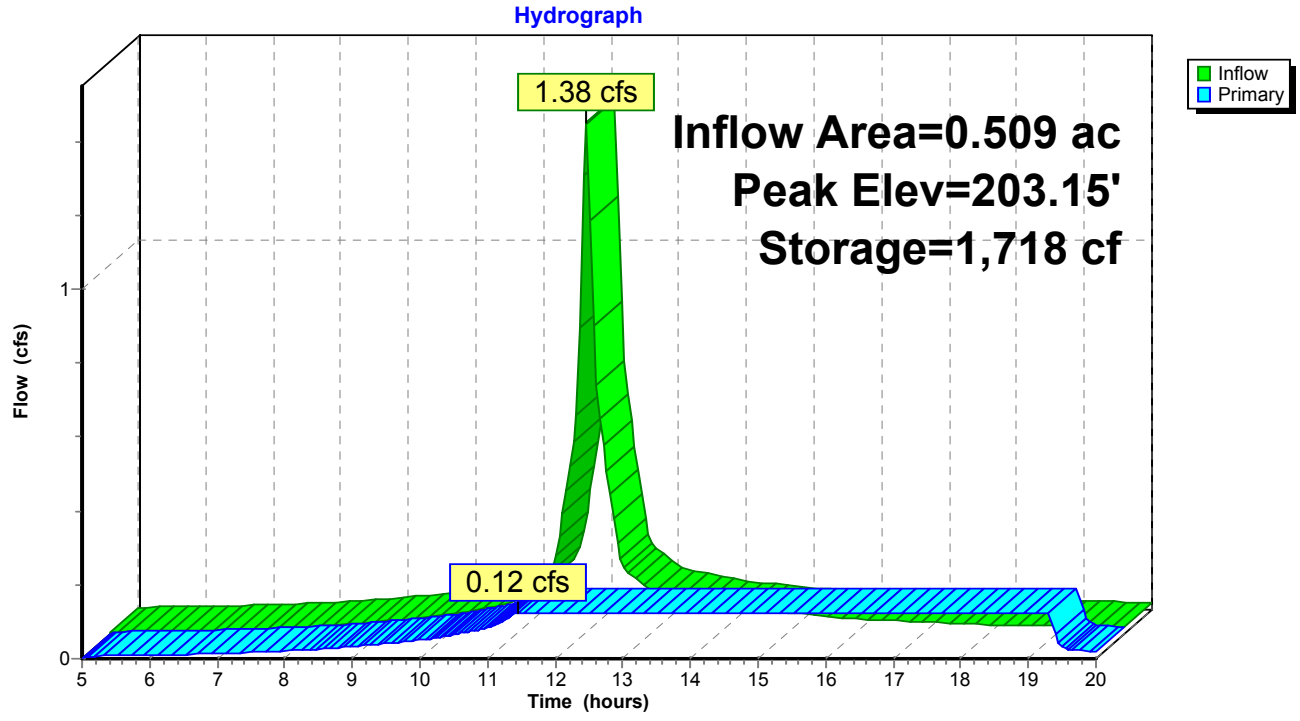
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 203.15' @ 12.97 hrs Surf.Area= 2,202 sf Storage= 1,718 cf
Plug-Flow detention time= 113.9 min calculated for 0.100 af (100% of inflow)
Center-of-Mass det. time= 113.0 min (866.4 - 753.4)

#	Invert	Avail.Storage	Storage Description
1	202.00'	1,803 cf	**38.64'W x 57.00'L x 3.54'H Prismatoid** 7,797 cf Overall - 3,289 cf Embedded = 4,507 cf x 40.0% Voids
2	202.50'	3,289 cf	**52.0"W x 30.5"H x 7.00'L Parabolic Arch** x 64 Inside #1
		5,092 cf	Total Available Storage

#	Routing	Invert	Outlet Devices
1	Primary	0.00'	**0.003347 fpm Exfiltration over entire Surface area**
2	Primary	205.00'	**3.00' x 0.50' Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.12 cfs @ 11.45 hrs HW=202.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.12 cfs)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 4P:

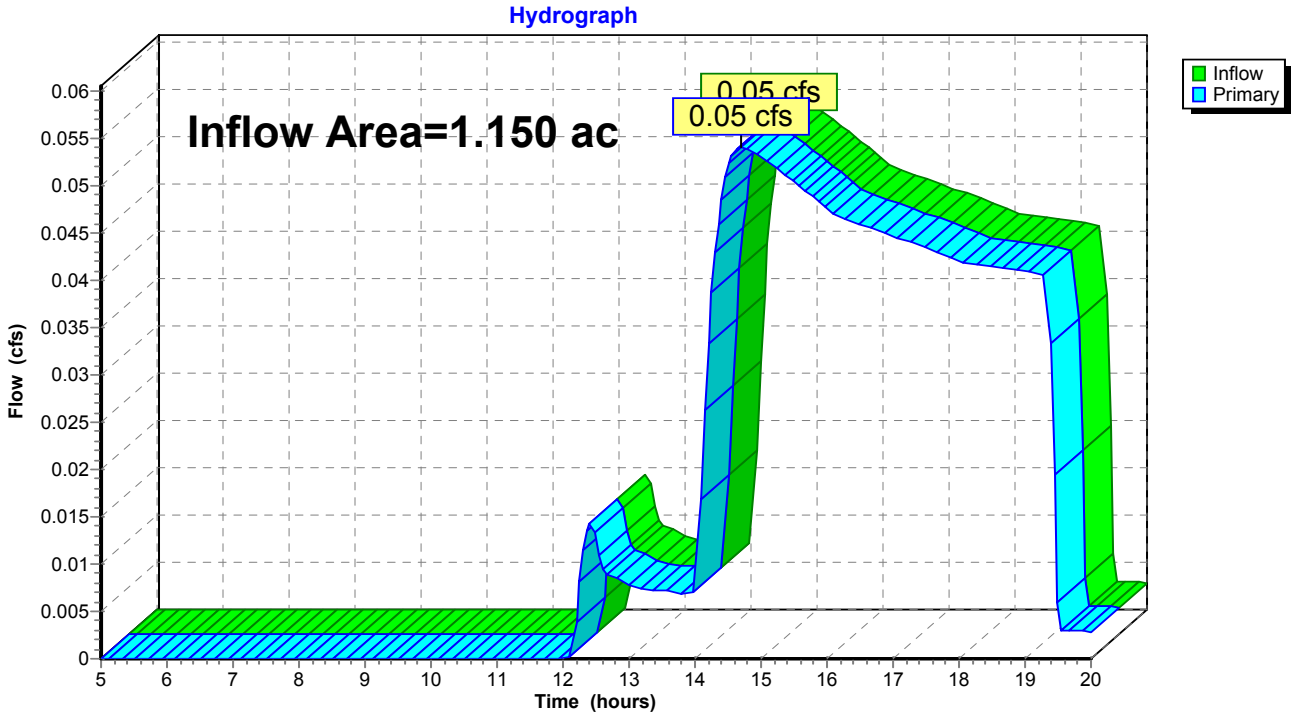


Link 1L: Total Offsite

Inflow Area = 1.150 ac, Inflow Depth = 0.22" for 2-Year Storm event
Inflow = 0.05 cfs @ 14.71 hrs, Volume= 0.022 af
Primary = 0.05 cfs @ 14.71 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

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

Link 1L: Total Offsite



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

Subcatchment 1S: Runoff Area=6,410 sf Runoff Depth=4.33"
Tc=6.0 min CN=98 Runoff=0.69 cfs 0.053 af

Subcatchment 2S: Runoff Area=4,485 sf Runoff Depth=4.33"
Flow Length=78' Tc=1.1 min CN=98 Runoff=0.55 cfs 0.037 af

Subcatchment 3S: Runoff Area=11,270 sf Runoff Depth=3.48"
Flow Length=80' Tc=1.1 min CN=89 Runoff=1.20 cfs 0.075 af

Subcatchment 4S: Runoff Area=5,265 sf Runoff Depth=4.33"
Flow Length=103' Tc=1.3 min CN=98 Runoff=0.64 cfs 0.044 af

Subcatchment 5S: Runoff Area=12,229 sf Runoff Depth=0.67"
Tc=6.0 min CN=52 Runoff=0.17 cfs 0.016 af

Subcatchment 6S: Runoff Area=4,404 sf Runoff Depth=0.27"
Tc=6.0 min CN=43 Runoff=0.01 cfs 0.002 af

Subcatchment 7S: Runoff Area=6,042 sf Runoff Depth=0.14"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.002 af

Reach 1R: CB1 to DMH1 Peak Depth=0.29' Max Vel=2.8 fps Inflow=0.55 cfs 0.037 af
D=12.0" n=0.011 L=162.0' S=0.0050 '/' Capacity=2.98 cfs Outflow=0.51 cfs 0.037 af

Reach 2R: Peak Depth=0.37' Max Vel=4.6 fps Inflow=1.20 cfs 0.075 af
D=12.0" n=0.011 L=3.0' S=0.0100 '/' Capacity=4.21 cfs Outflow=1.20 cfs 0.075 af

Pond 2P: Rain Garden Peak Elev=204.06' Storage=1,516 cf Inflow=0.76 cfs 0.161 af
Discarded=0.09 cfs 0.089 af Primary=0.22 cfs 0.039 af Outflow=0.31 cfs 0.128 af

Pond 4P: Peak Elev=204.13' Storage=3,433 cf Inflow=2.25 cfs 0.165 af
Outflow=0.12 cfs 0.118 af

Link 1L: Total Offsite Inflow=0.35 cfs 0.059 af
Primary=0.35 cfs 0.059 af

Total Runoff Area = 1.150 ac Runoff Volume = 0.228 af Average Runoff Depth = 2.38"

Subcatchment 1S:

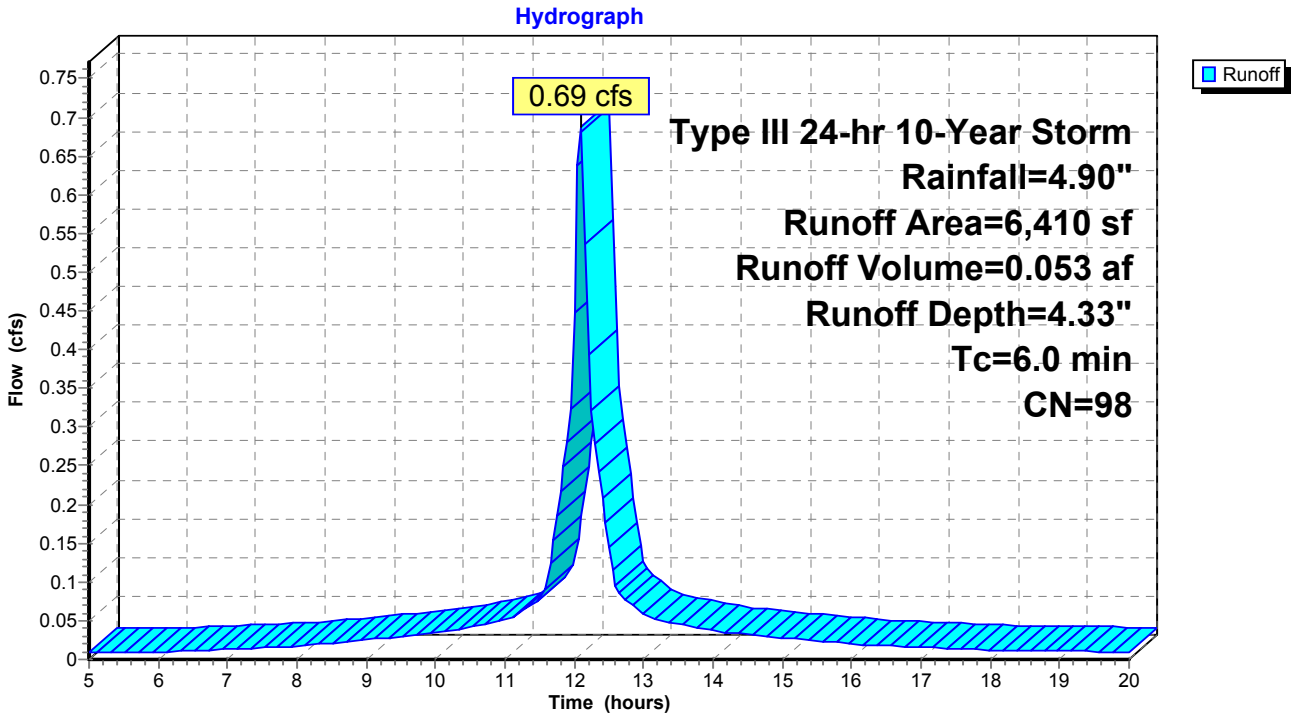
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 0.053 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=4.90"

Area (sf)	CN	Description
6,410	98	Roof Area

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

Subcatchment 1S:



Subcatchment 2S:

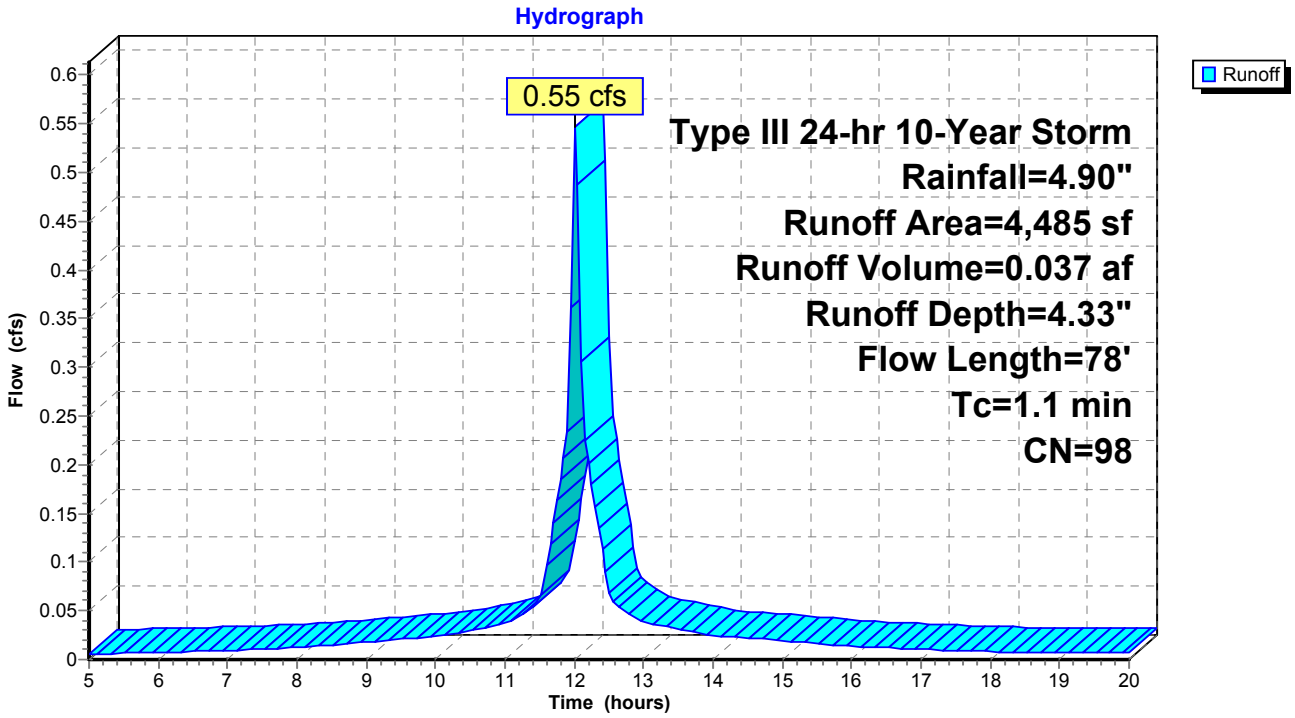
Runoff = 0.55 cfs @ 12.01 hrs, Volume= 0.037 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=4.90"

Area (sf)	CN	Description
4,485	98	Pave, curb, sidewalk

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	28	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	78	Total			

Subcatchment 2S:



Subcatchment 3S:

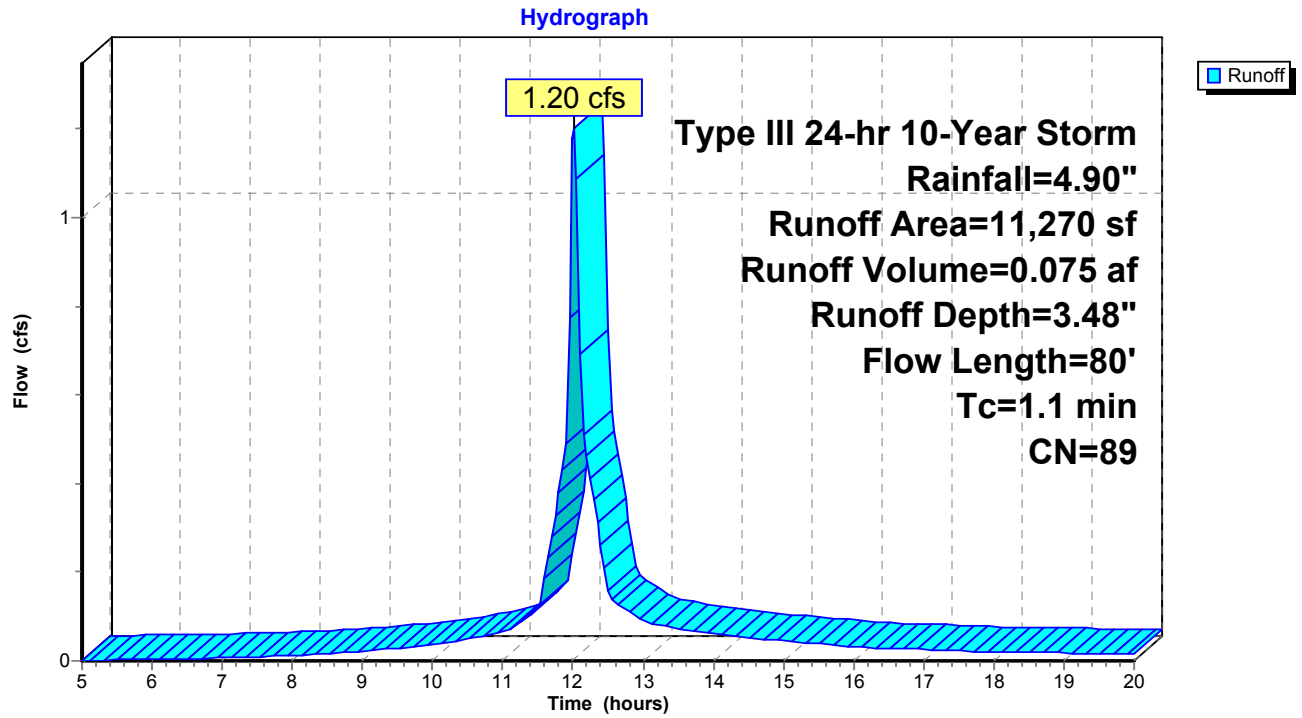
Runoff = 1.20 cfs @ 12.02 hrs, Volume= 0.075 af, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=4.90"

Area (sf)	CN	Description
1,807	39	>75% Grass cover, Good, HSG A
9,463	98	Pavement, curb, walls, walk
11,270	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	80	Total			

Subcatchment 3S:



Subcatchment 4S:

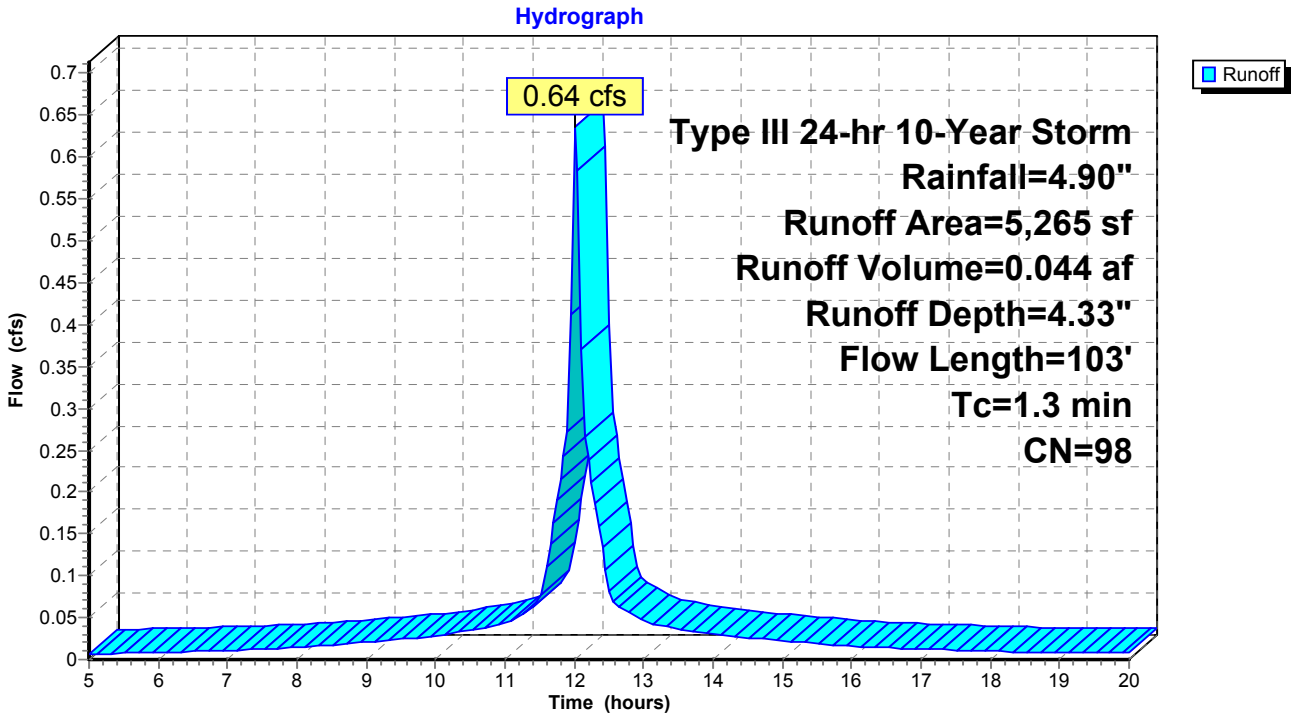
Runoff = 0.64 cfs @ 12.02 hrs, Volume= 0.044 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=4.90"

Area (sf)	CN	Description
5,265	98	Pavement, curb, sidewalk

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0120	1.0		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	53	0.0120	2.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	103	Total			

Subcatchment 4S:



Subcatchment 5S:

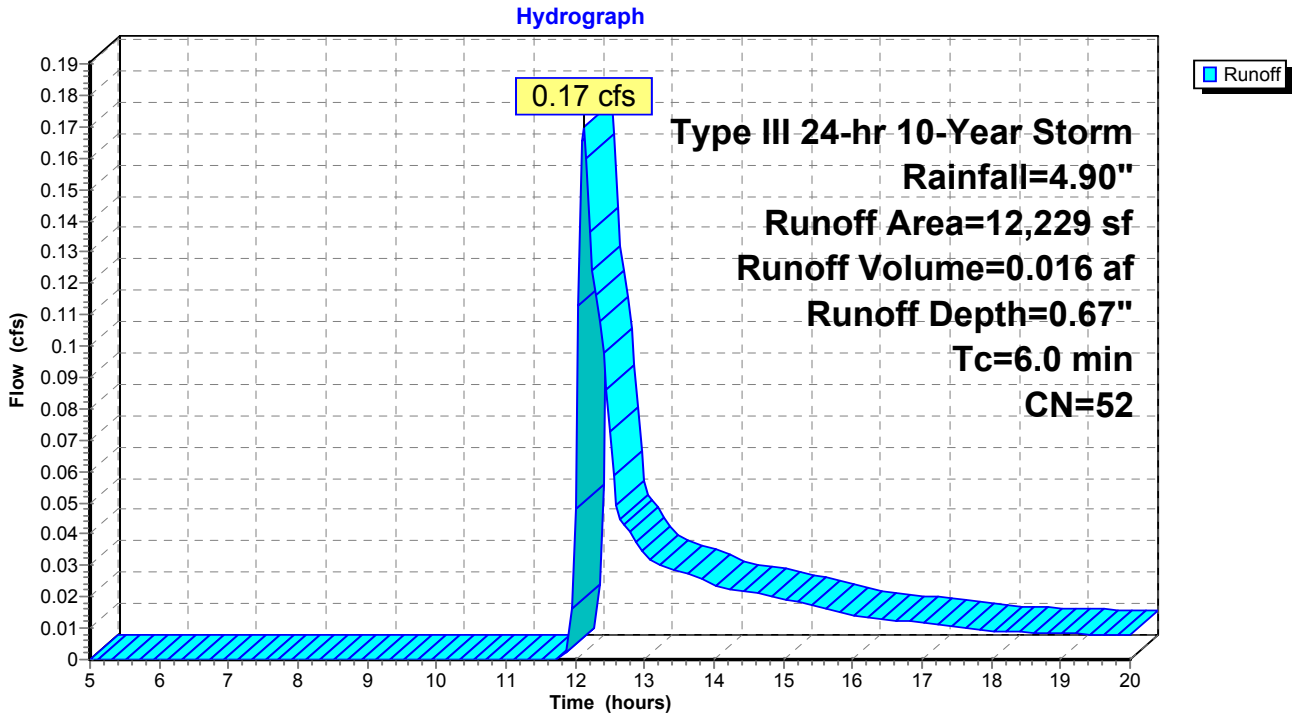
Runoff = 0.17 cfs @ 12.12 hrs, Volume= 0.016 af, Depth= 0.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=4.90"

Area (sf)	CN	Description
2,200	98	bldg
49	98	shed
350	98	walkway
9,630	39	>75% Grass cover, Good, HSG A
12,229	52	Weighted Average

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

Subcatchment 5S:



Subcatchment 6S:

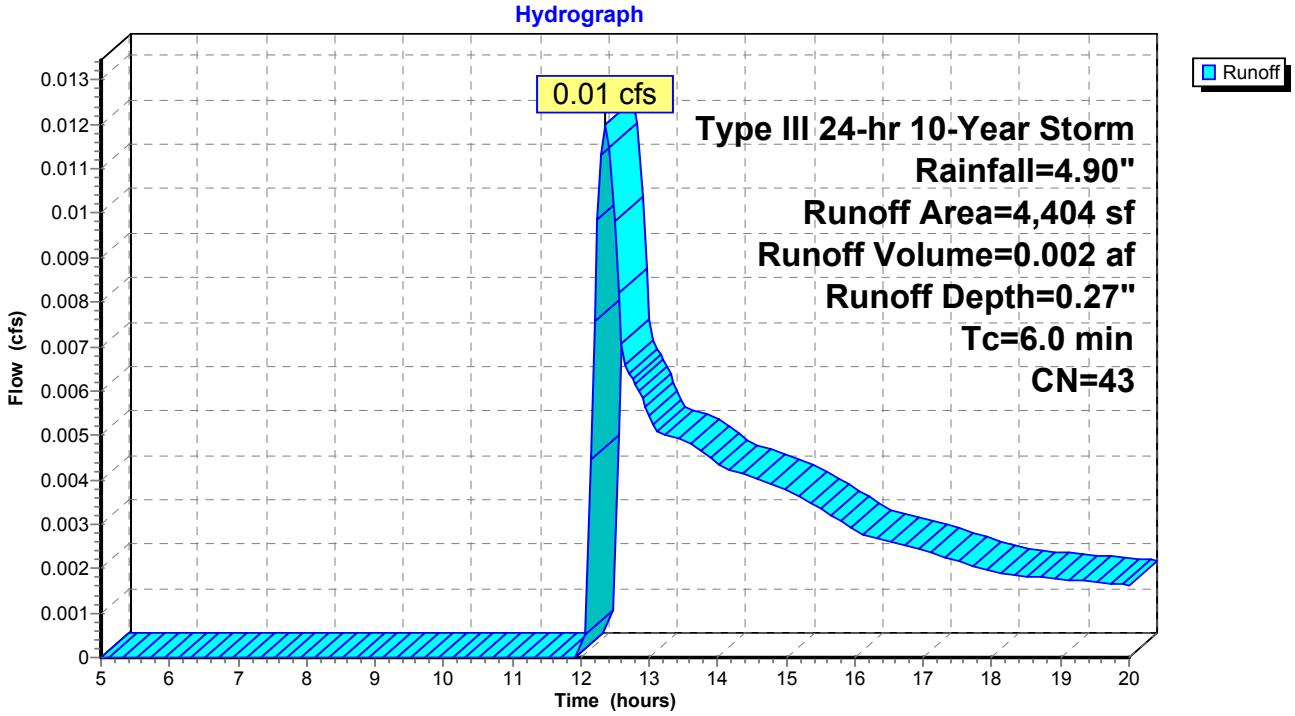
Runoff = 0.01 cfs @ 12.37 hrs, Volume= 0.002 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=4.90"

Area (sf)	CN	Description
300	98	walkway
4,104	39	>75% Grass cover, Good, HSG A
4,404	43	Weighted Average

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

Subcatchment 6S:



Subcatchment 7S:

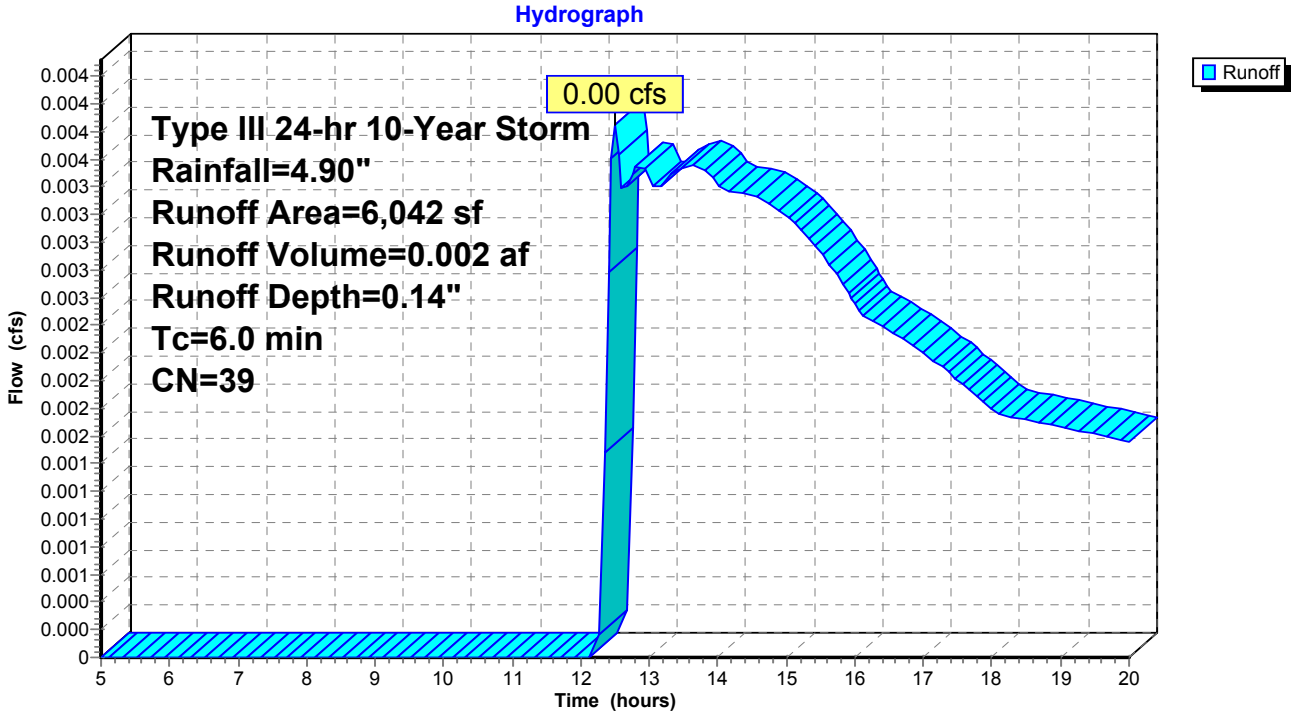
Runoff = 0.00 cfs @ 12.50 hrs, Volume= 0.002 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=4.90"

Area (sf)	CN	Description
6,042	39	>75% Grass cover, Good, HSG A

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

Subcatchment 7S:



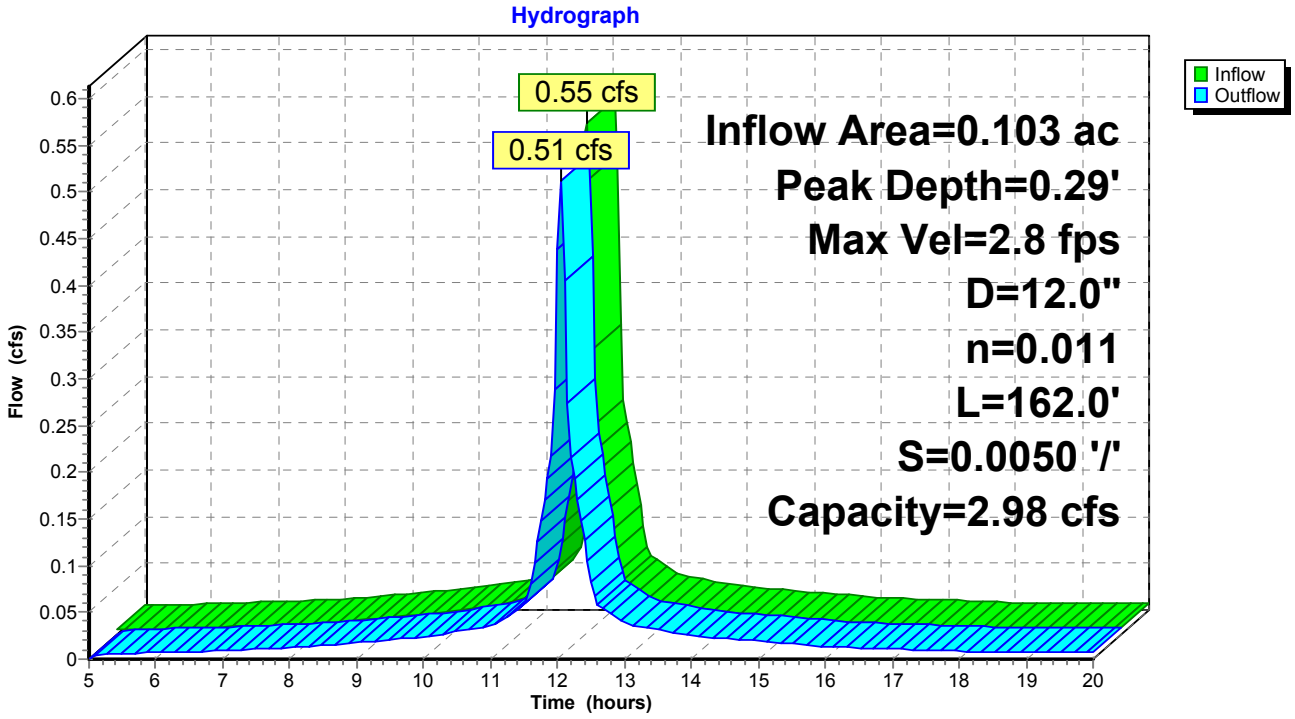
Reach 1R: CB1 to DMH1

Inflow Area = 0.103 ac, Inflow Depth = 4.33" for 10-Year Storm event
Inflow = 0.55 cfs @ 12.01 hrs, Volume= 0.037 af
Outflow = 0.51 cfs @ 12.05 hrs, Volume= 0.037 af, Atten= 6%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.8 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 2.5 min

Peak Depth= 0.29' @ 12.03 hrs
Capacity at bank full= 2.98 cfs
Inlet Invert= 203.56', Outlet Invert= 202.75'
12.0" Diameter Pipe n= 0.011 Length= 162.0' Slope= 0.0050 '/'

Reach 1R: CB1 to DMH1



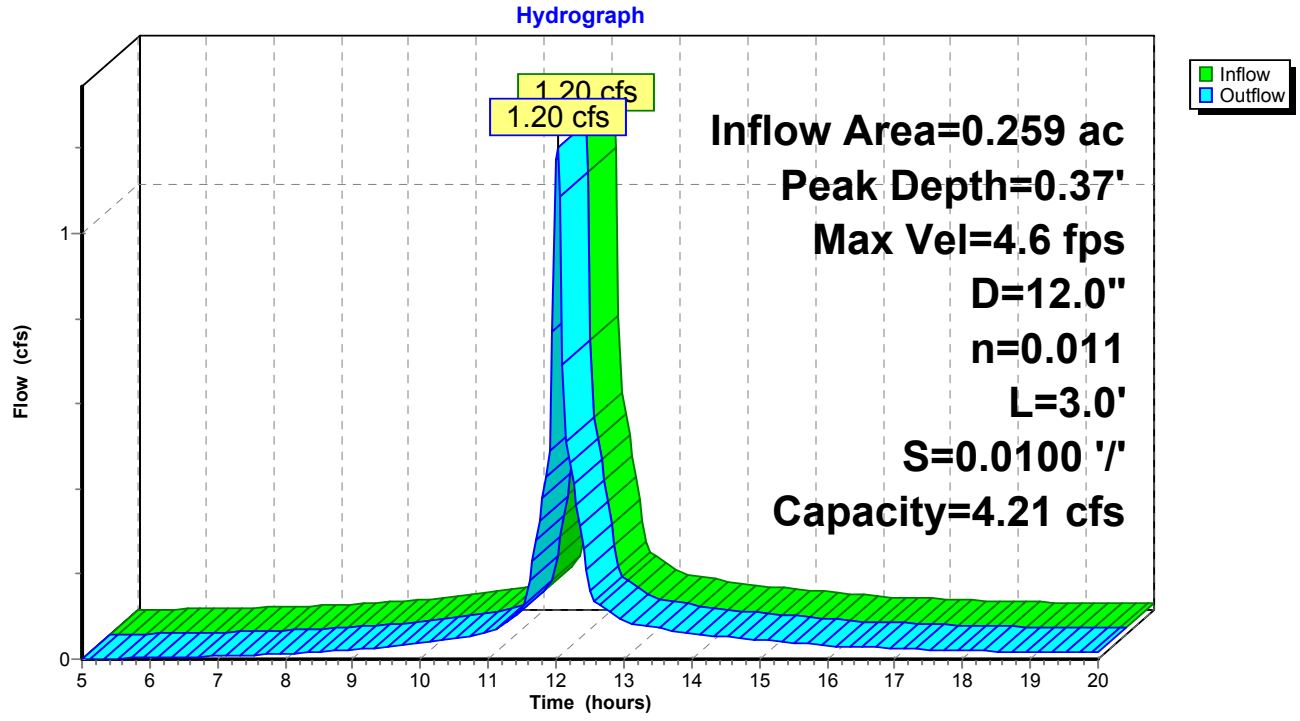
Reach 2R:

Inflow Area = 0.259 ac, Inflow Depth = 3.48" for 10-Year Storm event
Inflow = 1.20 cfs @ 12.02 hrs, Volume= 0.075 af
Outflow = 1.20 cfs @ 12.02 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.6 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 1.6 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.37' @ 12.02 hrs
Capacity at bank full= 4.21 cfs
Inlet Invert= 202.78', Outlet Invert= 202.75'
12.0" Diameter Pipe n= 0.011 Length= 3.0' Slope= 0.0100 '/'

Reach 2R:



Pond 2P: Rain Garden

Exfiltration Rate for LS using Rawls is 2.41 in/hr or 0.003347 ft/min

Inflow Area =	0.630 ac,	Inflow Depth =	3.07"	for 10-Year Storm event
Inflow =	0.76 cfs @	12.02 hrs,	Volume=	0.161 af
Outflow =	0.31 cfs @	12.30 hrs,	Volume=	0.128 af, Atten= 59%, Lag= 17.2 min
Discarded =	0.09 cfs @	12.30 hrs,	Volume=	0.089 af
Primary =	0.22 cfs @	12.30 hrs,	Volume=	0.039 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 204.06' @ 12.30 hrs Surf.Area= 1,652 sf Storage= 1,516 cf
Plug-Flow detention time= 118.1 min calculated for 0.128 af (79% of inflow)
Center-of-Mass det. time= 41.3 min (856.2 - 815.0)

#	Invert	Avail.Storage	Storage Description
1	202.90'	2,225 cf	**Rain Garden (Prismatic)**Listed below

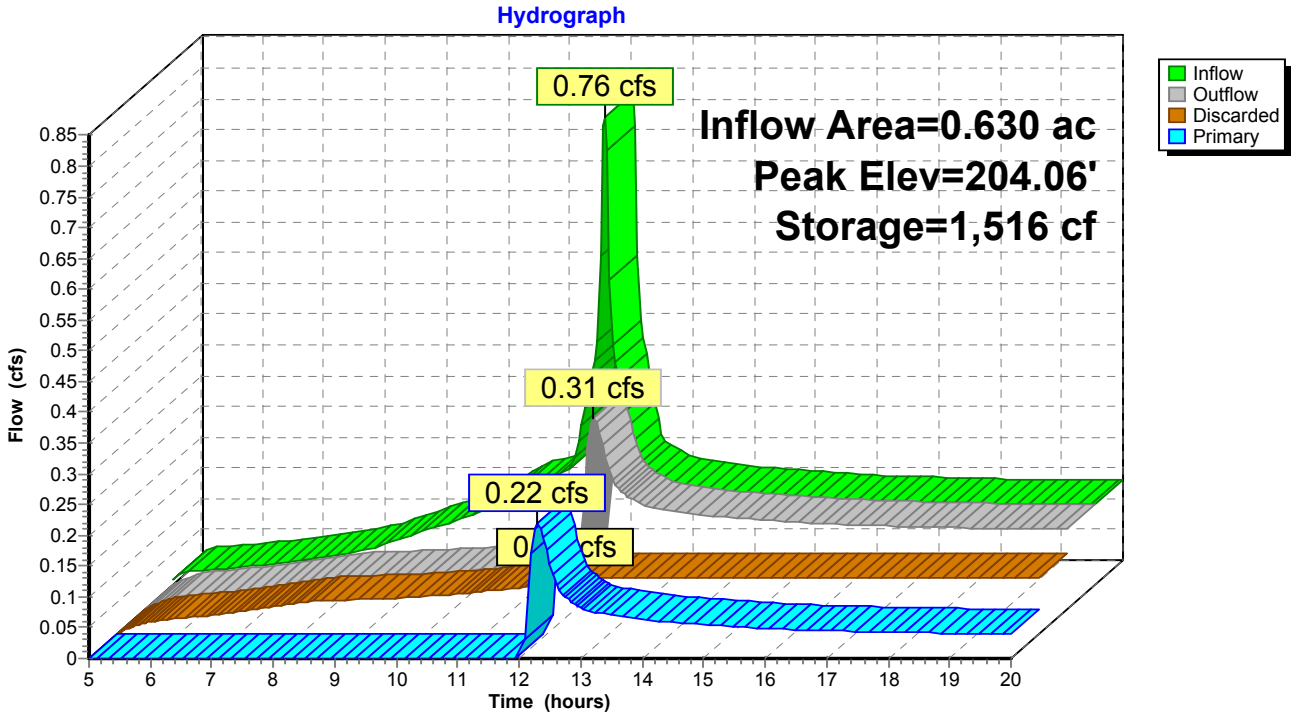
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
202.90	0	0	0
203.00	974	49	49
203.50	1,282	564	613
204.50	1,943	1,613	2,225

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.003347 fpm Exfiltration over entire Surface area**
2	Primary	204.00'	**6.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.09 cfs @ 12.30 hrs HW=204.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.22 cfs @ 12.30 hrs HW=204.06' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.22 cfs @ 0.6 fps)

Pond 2P: Rain Garden



Pond 4P:

Inflow Area = 0.509 ac, Inflow Depth = 3.89" for 10-Year Storm event
Inflow = 2.25 cfs @ 12.04 hrs, Volume= 0.165 af
Outflow = 0.12 cfs @ 10.65 hrs, Volume= 0.118 af, Atten= 95%, Lag= 0.0 min
Primary = 0.12 cfs @ 10.65 hrs, Volume= 0.118 af

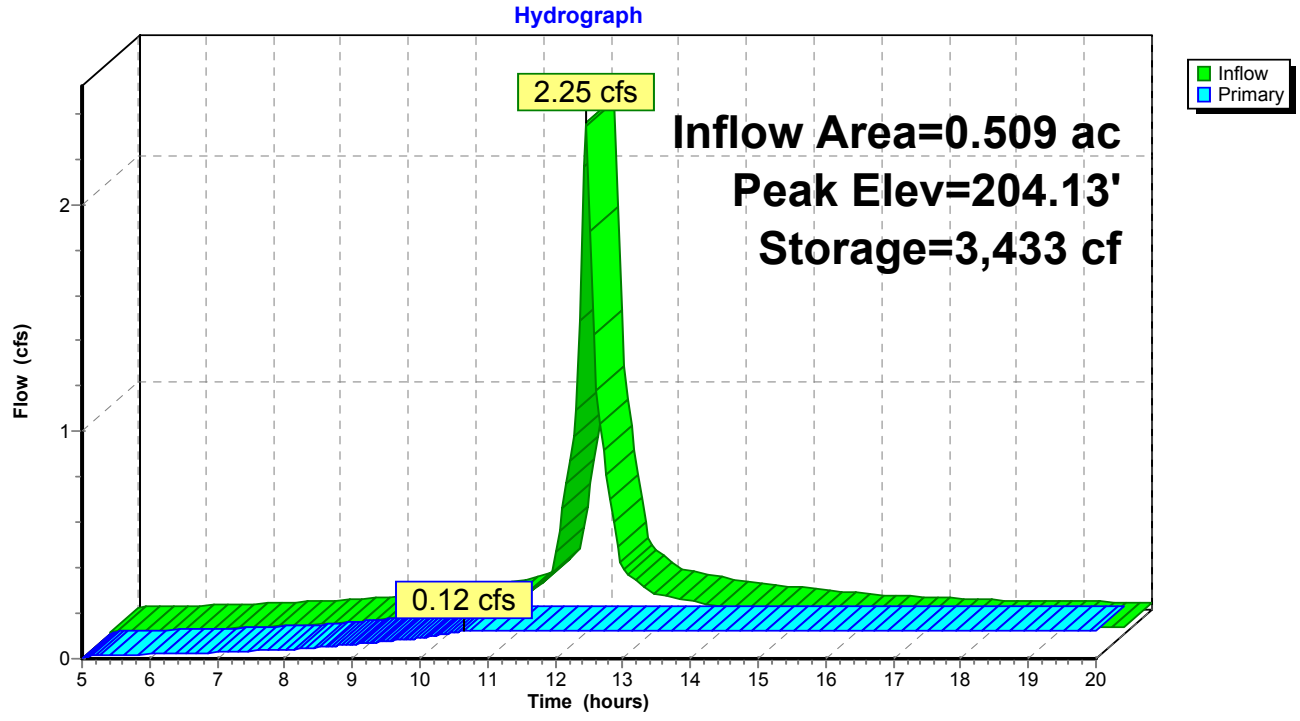
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 204.13' @ 13.99 hrs Surf.Area= 2,202 sf Storage= 3,433 cf
Plug-Flow detention time= 165.9 min calculated for 0.118 af (71% of inflow)
Center-of-Mass det. time= 99.4 min (845.8 - 746.5)

#	Invert	Avail.Storage	Storage Description
1	202.00'	1,803 cf	**38.64'W x 57.00'L x 3.54'H Prismatoid** 7,797 cf Overall - 3,289 cf Embedded = 4,507 cf x 40.0% Voids
2	202.50'	3,289 cf	**52.0"W x 30.5"H x 7.00'L Parabolic Arch** x 64 Inside #1
		5,092 cf	Total Available Storage

#	Routing	Invert	Outlet Devices
1	Primary	0.00'	**0.003347 fpm Exfiltration over entire Surface area**
2	Primary	205.00'	**3.00' x 0.50' Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.12 cfs @ 10.65 hrs HW=202.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 4P:

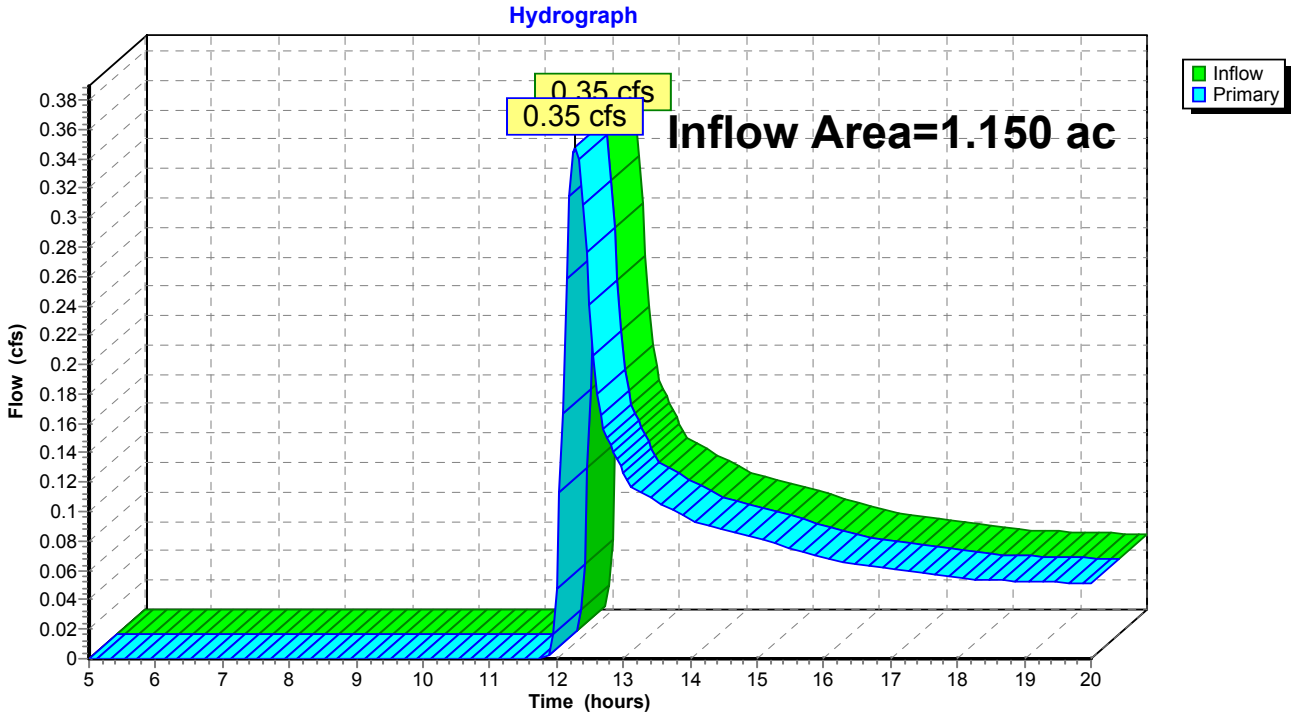


Link 1L: Total Offsite

Inflow Area = 1.150 ac, Inflow Depth = 0.61" for 10-Year Storm event
Inflow = 0.35 cfs @ 12.28 hrs, Volume= 0.059 af
Primary = 0.35 cfs @ 12.28 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min

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

Link 1L: Total Offsite



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

Subcatchment 1S: Runoff Area=6,410 sf Runoff Depth=7.96"
Tc=6.0 min CN=98 Runoff=1.26 cfs 0.098 af

Subcatchment 2S: Runoff Area=4,485 sf Runoff Depth=7.96"
Flow Length=78' Tc=1.1 min CN=98 Runoff=1.00 cfs 0.068 af

Subcatchment 3S: Runoff Area=11,270 sf Runoff Depth=7.15"
Flow Length=80' Tc=1.1 min CN=89 Runoff=2.38 cfs 0.154 af

Subcatchment 4S: Runoff Area=5,265 sf Runoff Depth=7.96"
Flow Length=103' Tc=1.3 min CN=98 Runoff=1.16 cfs 0.080 af

Subcatchment 5S: Runoff Area=12,229 sf Runoff Depth=2.79"
Tc=6.0 min CN=52 Runoff=0.95 cfs 0.065 af

Subcatchment 6S: Runoff Area=4,404 sf Runoff Depth=1.80"
Tc=6.0 min CN=43 Runoff=0.20 cfs 0.015 af

Subcatchment 7S: Runoff Area=6,042 sf Runoff Depth=1.38"
Tc=6.0 min CN=39 Runoff=0.19 cfs 0.016 af

Reach 1R: CB1 to DMH1 Peak Depth=0.39' Max Vel=3.4 fps Inflow=1.00 cfs 0.068 af
D=12.0" n=0.011 L=162.0' S=0.0050 '/' Capacity=2.98 cfs Outflow=0.94 cfs 0.068 af

Reach 2R: Peak Depth=0.54' Max Vel=5.5 fps Inflow=2.38 cfs 0.154 af
D=12.0" n=0.011 L=3.0' S=0.0100 '/' Capacity=4.21 cfs Outflow=2.38 cfs 0.154 af

Pond 2P: Rain Garden Peak Elev=204.32' Storage=1,937 cf Inflow=3.26 cfs 0.308 af
Discarded=0.10 cfs 0.100 af Primary=2.76 cfs 0.175 af Outflow=2.86 cfs 0.275 af

Pond 4P: Peak Elev=205.43' Storage=4,993 cf Inflow=4.29 cfs 0.320 af
Outflow=2.80 cfs 0.228 af

Link 1L: Total Offsite Inflow=3.66 cfs 0.272 af
Primary=3.66 cfs 0.272 af

Total Runoff Area = 1.150 ac Runoff Volume = 0.497 af Average Runoff Depth = 5.18"

Subcatchment 1S:

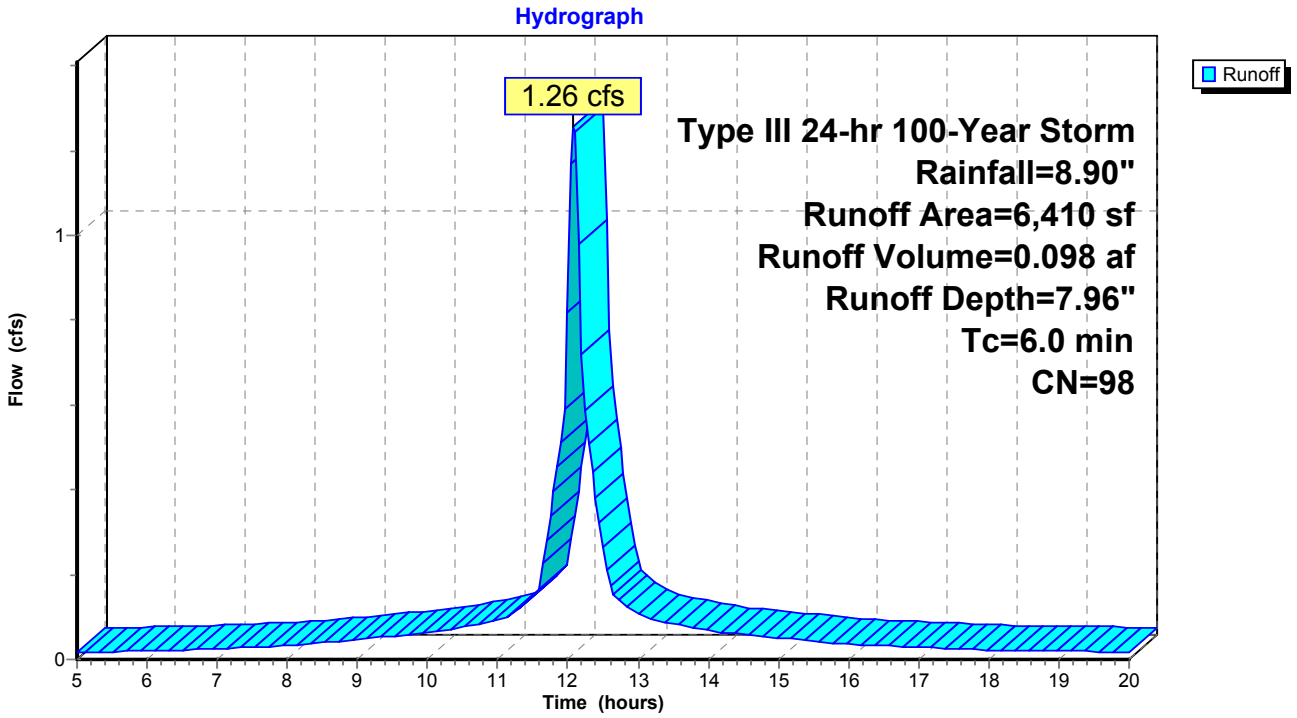
Runoff = 1.26 cfs @ 12.09 hrs, Volume= 0.098 af, Depth= 7.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=8.90"

Area (sf)	CN	Description
6,410	98	Roof Area

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

Subcatchment 1S:



Subcatchment 2S:

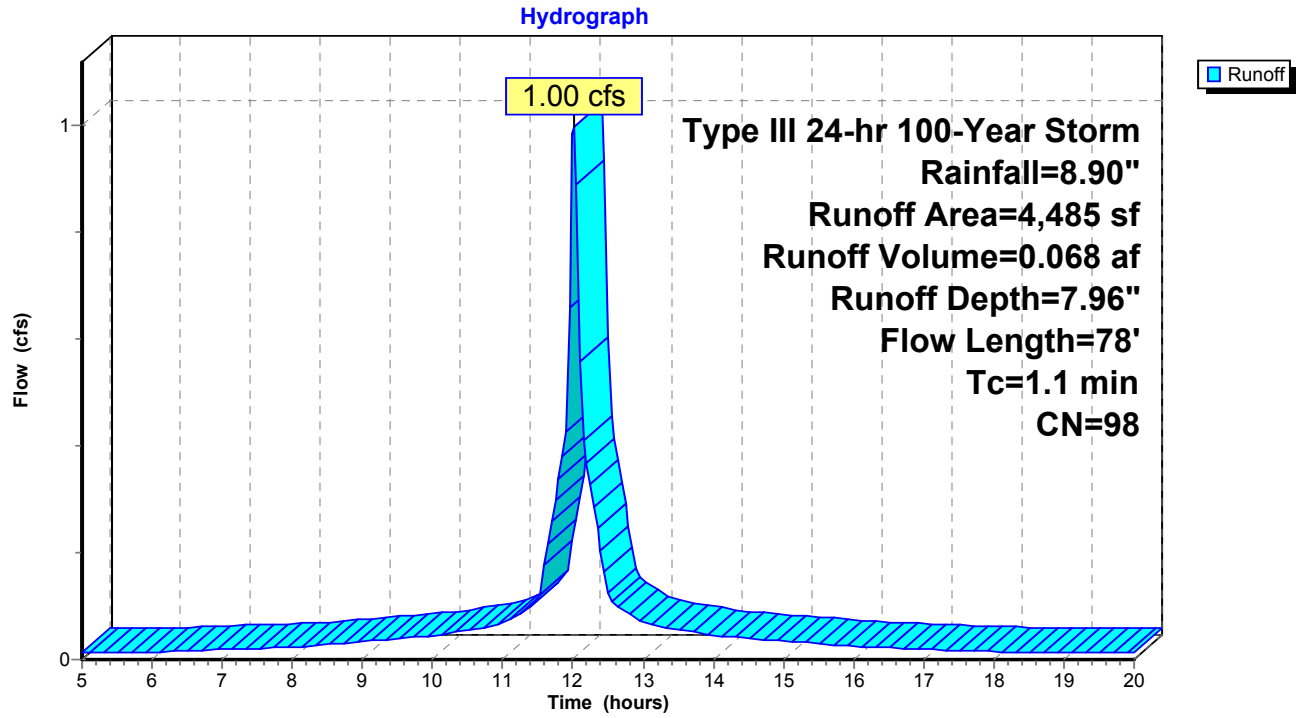
Runoff = 1.00 cfs @ 12.01 hrs, Volume= 0.068 af, Depth= 7.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=8.90"

Area (sf)	CN	Description
4,485	98	Pave, curb, sidewalk

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	28	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	78	Total			

Subcatchment 2S:



Subcatchment 3S:

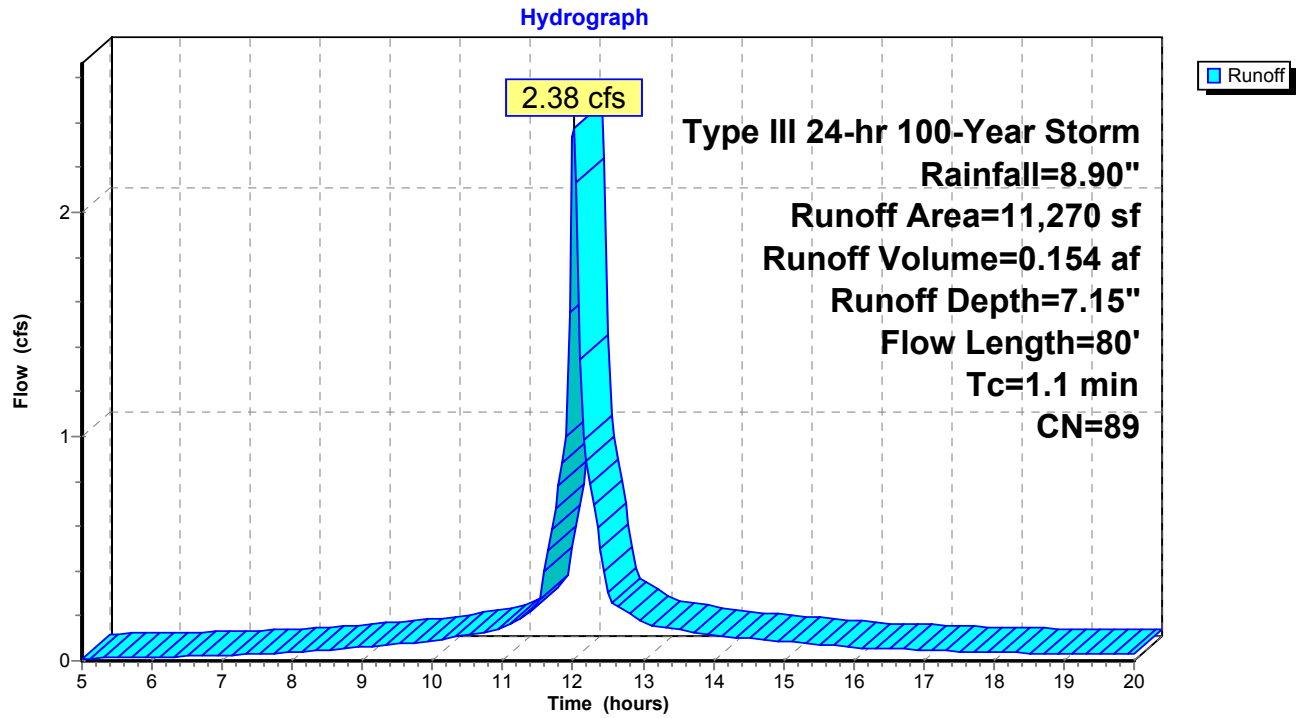
Runoff = 2.38 cfs @ 12.01 hrs, Volume= 0.154 af, Depth= 7.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=8.90"

Area (sf)	CN	Description
1,807	39	>75% Grass cover, Good, HSG A
9,463	98	Pavement, curb, walls, walk
11,270	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.9		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0100	2.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	80	Total			

Subcatchment 3S:



Subcatchment 4S:

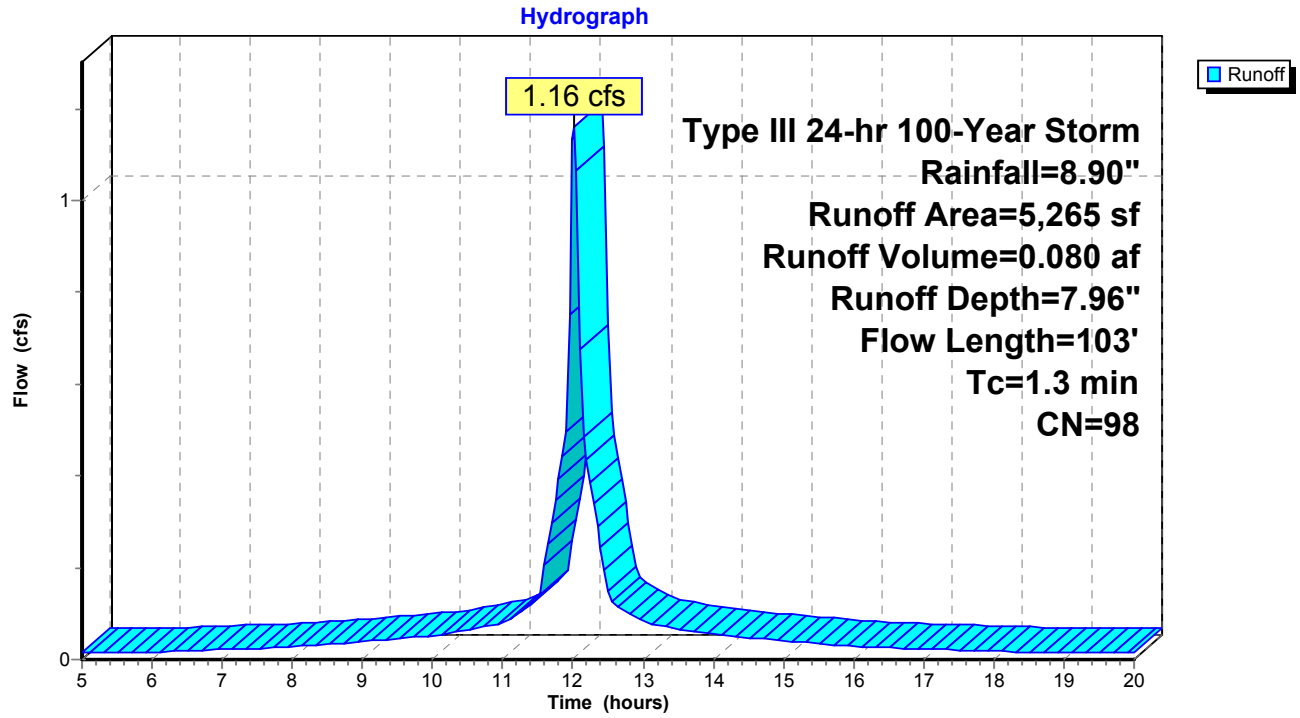
Runoff = 1.16 cfs @ 12.02 hrs, Volume= 0.080 af, Depth= 7.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=8.90"

Area (sf)	CN	Description
5,265	98	Pavement, curb, sidewalk

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0120	1.0		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	53	0.0120	2.2		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.3	103	Total			

Subcatchment 4S:



Subcatchment 5S:

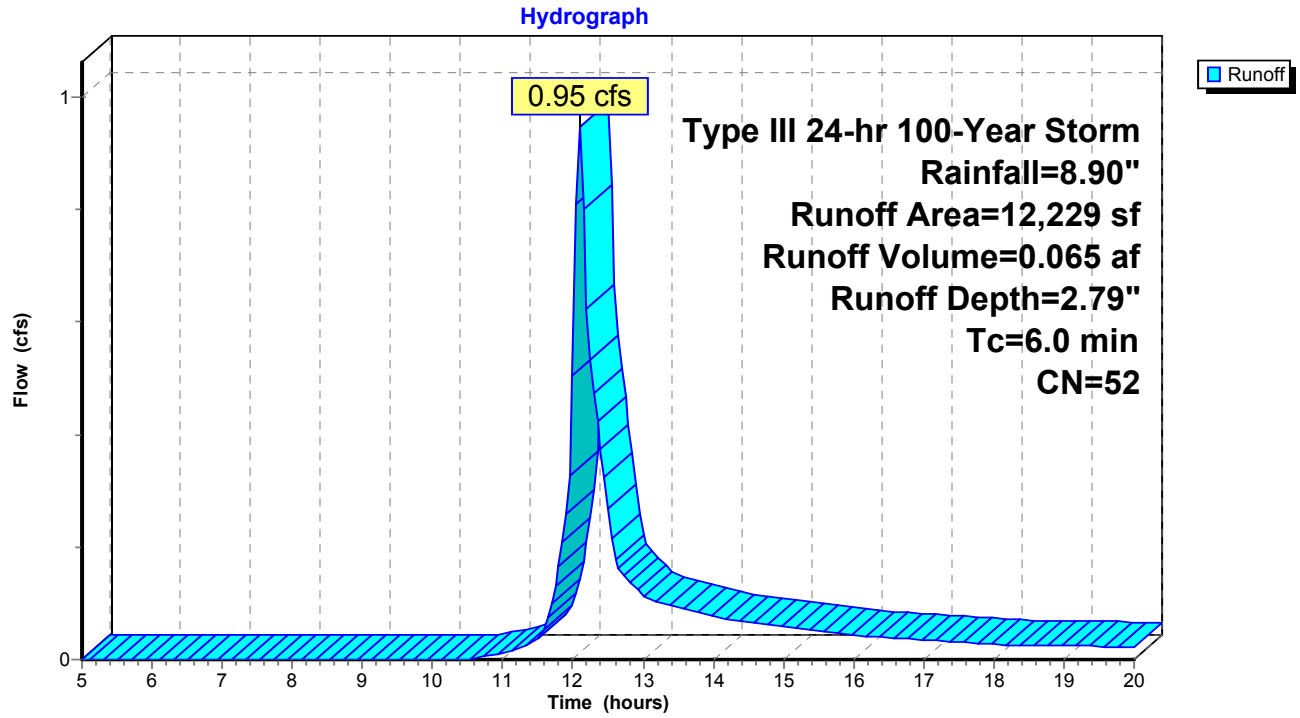
Runoff = 0.95 cfs @ 12.10 hrs, Volume= 0.065 af, Depth= 2.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=8.90"

Area (sf)	CN	Description
2,200	98	bldg
49	98	shed
350	98	walkway
9,630	39	>75% Grass cover, Good, HSG A
12,229	52	Weighted Average

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

Subcatchment 5S:



Subcatchment 6S:

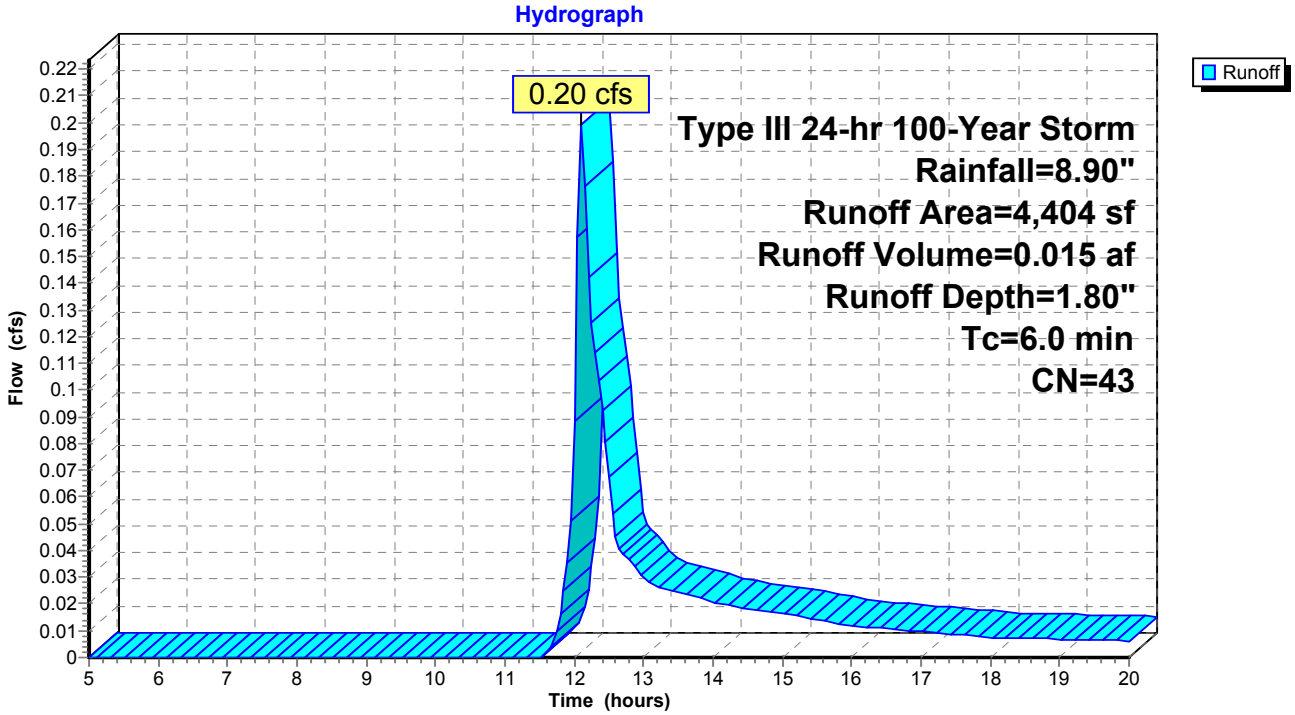
Runoff = 0.20 cfs @ 12.11 hrs, Volume= 0.015 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=8.90"

Area (sf)	CN	Description
300	98	walkway
4,104	39	>75% Grass cover, Good, HSG A
4,404	43	Weighted Average

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

Subcatchment 6S:



Subcatchment 7S:

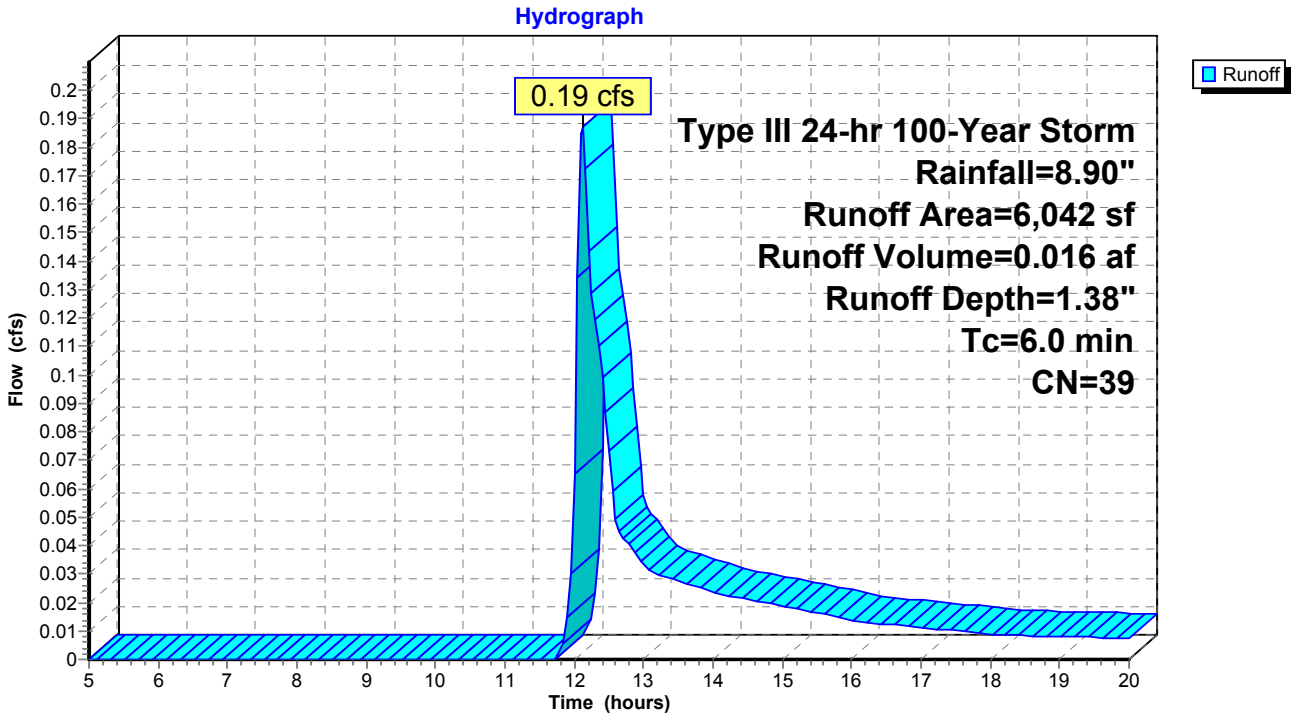
Runoff = 0.19 cfs @ 12.12 hrs, Volume= 0.016 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=8.90"

Area (sf)	CN	Description
6,042	39	>75% Grass cover, Good, HSG A

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

Subcatchment 7S:



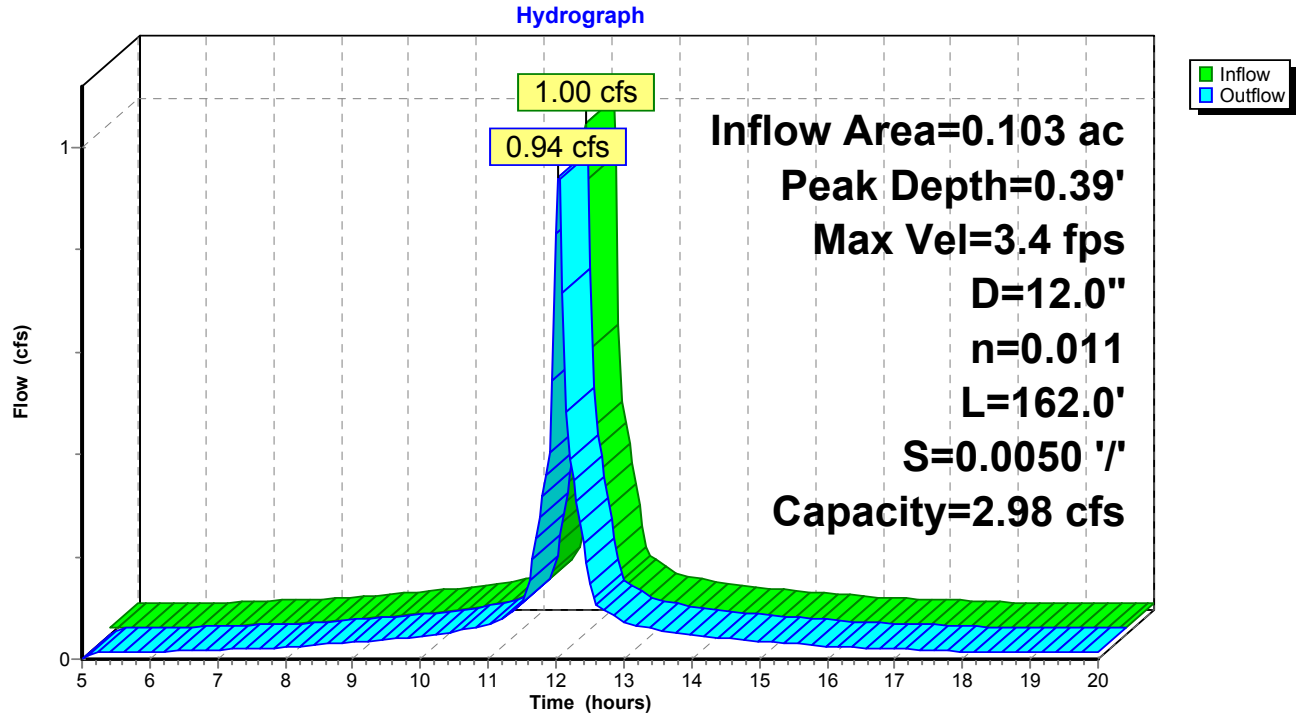
Reach 1R: CB1 to DMH1

Inflow Area = 0.103 ac, Inflow Depth = 7.96" for 100-Year Storm event
Inflow = 1.00 cfs @ 12.01 hrs, Volume= 0.068 af
Outflow = 0.94 cfs @ 12.04 hrs, Volume= 0.068 af, Atten= 6%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.4 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.3 fps, Avg. Travel Time= 2.1 min

Peak Depth= 0.39' @ 12.03 hrs
Capacity at bank full= 2.98 cfs
Inlet Invert= 203.56', Outlet Invert= 202.75'
12.0" Diameter Pipe n= 0.011 Length= 162.0' Slope= 0.0050 '/'

Reach 1R: CB1 to DMH1



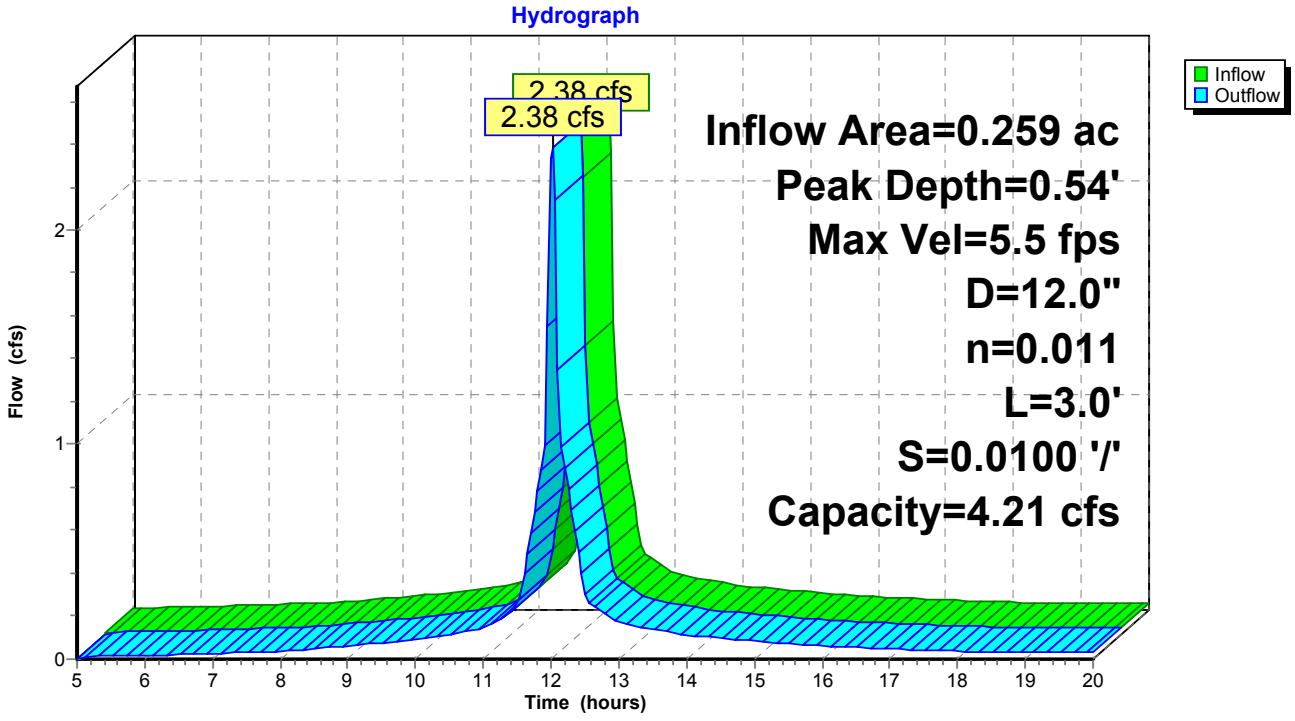
Reach 2R:

Inflow Area = 0.259 ac, Inflow Depth = 7.15" for 100-Year Storm event
Inflow = 2.38 cfs @ 12.01 hrs, Volume= 0.154 af
Outflow = 2.38 cfs @ 12.01 hrs, Volume= 0.154 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.5 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 2.0 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.54' @ 12.01 hrs
Capacity at bank full= 4.21 cfs
Inlet Invert= 202.78', Outlet Invert= 202.75'
12.0" Diameter Pipe n= 0.011 Length= 3.0' Slope= 0.0100 '/'

Reach 2R:



Pond 2P: Rain Garden

Exfiltration Rate for LS using Rawls is 2.41 in/hr or 0.003347 ft/min

Inflow Area = 0.630 ac, Inflow Depth = 5.87" for 100-Year Storm event
Inflow = 3.26 cfs @ 12.16 hrs, Volume= 0.308 af
Outflow = 2.86 cfs @ 12.21 hrs, Volume= 0.275 af, Atten= 12%, Lag= 2.8 min
Discarded = 0.10 cfs @ 12.21 hrs, Volume= 0.100 af
Primary = 2.76 cfs @ 12.21 hrs, Volume= 0.175 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 204.32' @ 12.21 hrs Surf.Area= 1,825 sf Storage= 1,937 cf
Plug-Flow detention time= 70.1 min calculated for 0.274 af (89% of inflow)
Center-of-Mass det. time= 28.5 min (798.1 - 769.6)

#	Invert	Avail.Storage	Storage Description
1	202.90'	2,225 cf	**Rain Garden (Prismatic)**Listed below

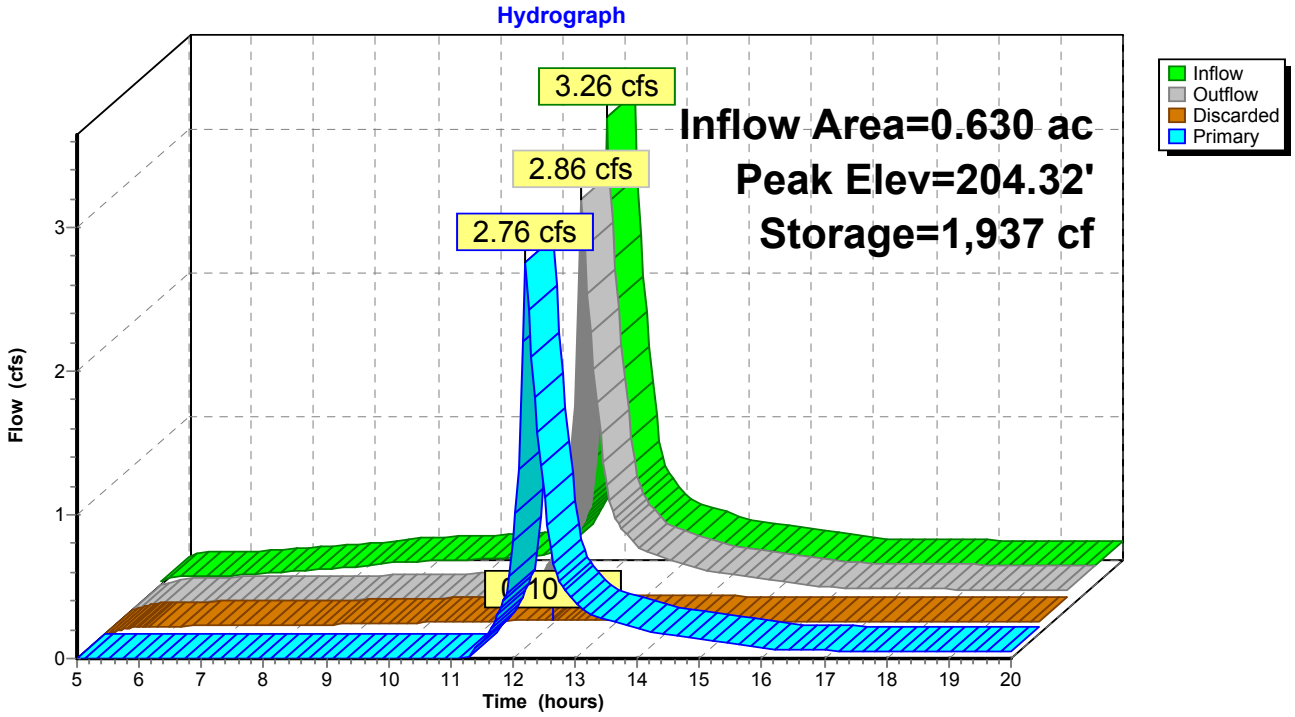
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
202.90	0	0	0
203.00	974	49	49
203.50	1,282	564	613
204.50	1,943	1,613	2,225

#	Routing	Invert	Outlet Devices
1	Discarded	0.00'	**0.003347 fpm Exfiltration over entire Surface area**
2	Primary	204.00'	**6.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.10 cfs @ 12.21 hrs HW=204.32' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=2.71 cfs @ 12.21 hrs HW=204.32' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 2.71 cfs @ 1.4 fps)

Pond 2P: Rain Garden



Pond 4P:

Inflow Area = 0.509 ac, Inflow Depth = 7.55" for 100-Year Storm event
Inflow = 4.29 cfs @ 12.04 hrs, Volume= 0.320 af
Outflow = 2.80 cfs @ 12.16 hrs, Volume= 0.228 af, Atten= 35%, Lag= 7.6 min
Primary = 2.80 cfs @ 12.16 hrs, Volume= 0.228 af

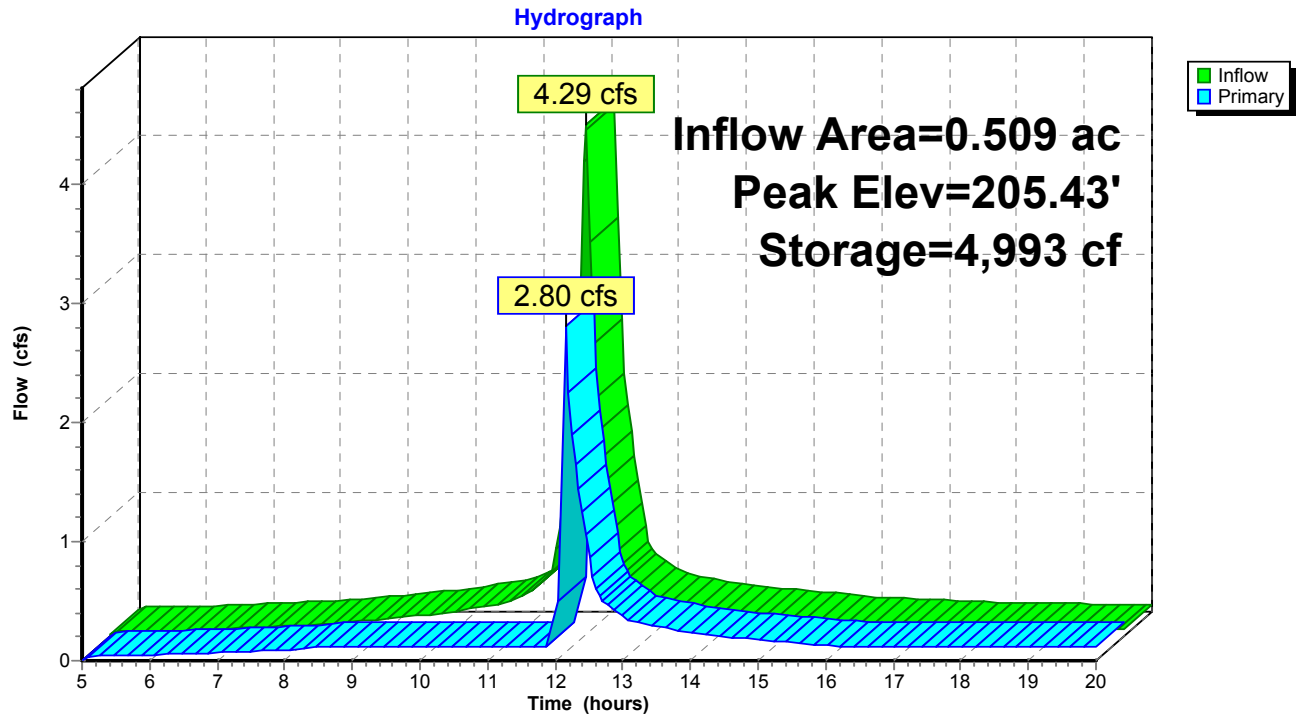
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 205.43' @ 12.16 hrs Surf.Area= 2,202 sf Storage= 4,993 cf
Plug-Flow detention time= 110.4 min calculated for 0.227 af (71% of inflow)
Center-of-Mass det. time= 44.8 min (783.7 - 738.9)

#	Invert	Avail.Storage	Storage Description
1	202.00'	1,803 cf	**38.64'W x 57.00'L x 3.54'H Prismatoid** 7,797 cf Overall - 3,289 cf Embedded = 4,507 cf x 40.0% Voids
2	202.50'	3,289 cf	**52.0"W x 30.5"H x 7.00'L Parabolic Arch** x 64 Inside #1
		5,092 cf	Total Available Storage

#	Routing	Invert	Outlet Devices
1	Primary	0.00'	**0.003347 fpm Exfiltration over entire Surface area**
2	Primary	205.00'	**3.00' x 0.50' Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=2.61 cfs @ 12.16 hrs HW=205.41' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.12 cfs)
└**2=Orifice/Grate** (Orifice Controls 2.49 cfs @ 2.0 fps)

Pond 4P:

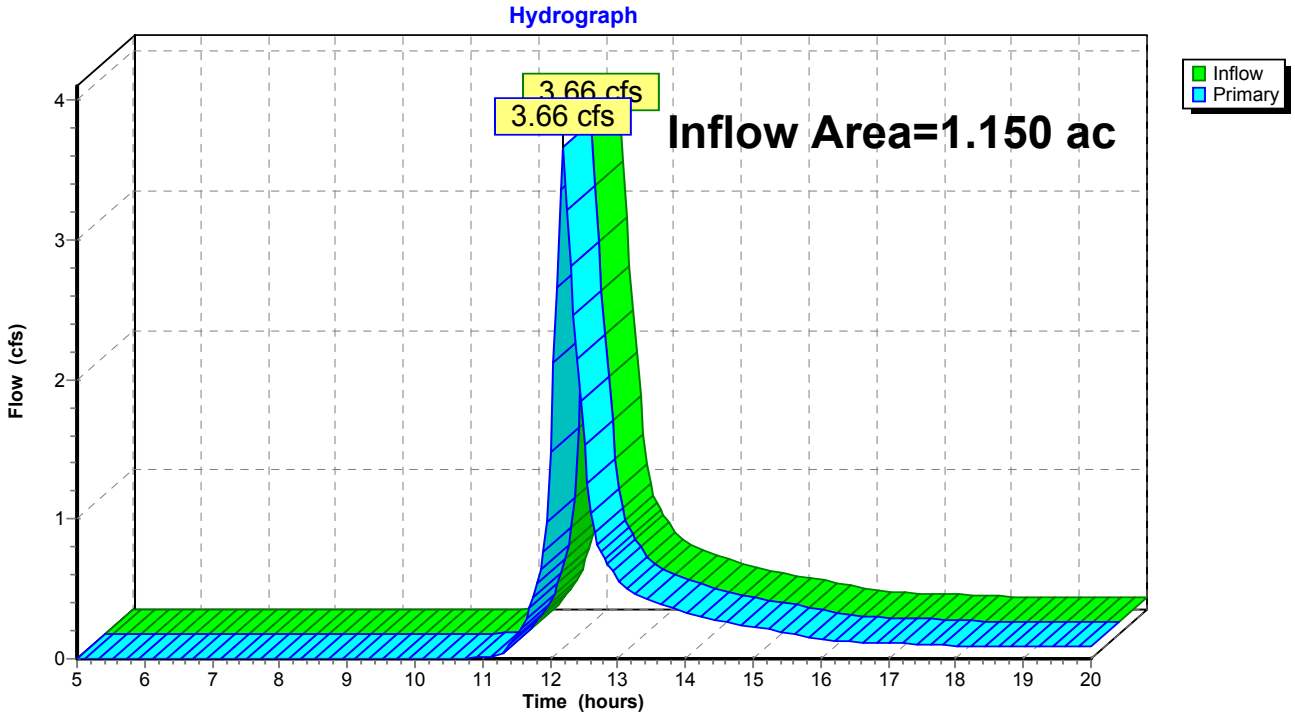


Link 1L: Total Offsite

Inflow Area = 1.150 ac, Inflow Depth = 2.83" for 100-Year Storm event
Inflow = 3.66 cfs @ 12.19 hrs, Volume= 0.272 af
Primary = 3.66 cfs @ 12.19 hrs, Volume= 0.272 af, Atten= 0%, Lag= 0.0 min

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

Link 1L: Total Offsite



Map Scale: 1:1,840 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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: Middlesex County, Massachusetts
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 13, 2019—Oct 5, 2019

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
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	0.8	5.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	3.9	24.7%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	2.2	13.8%
602	Urban land	1.4	8.8%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	7.5	47.5%
Totals for Area of Interest		**15.8**	**100.0%**

Post-Construction
Stormwater Maintenance Plan

Beginning with the construction of the drainage system, and continuing in perpetuity thereafter, the owner(s) of the site shall maintain in accordance with the following schedule:

a. Parking Lot sweeping and snow plowing – Pavement and walkways shall be swept in the early spring immediately after snow melt and at least twice other times annually. Snow shall be plowed onto the snow stockpile area shown on the design plans to encourage infiltration during subsequent thawing periods. Sediments shall be removed from snow storage areas in the early spring.
b. Paving and curbing – Paving and curbing shall be maintained in good condition to channel surface runoff into the rip-rap pretreatment area at the rear of the parking lot.
c. Roof drain inlets, downspouts, and roof drain pipes - All components of the roof drain collection system shall be inspected at least 3 times per year. Sediments and debris shall be removed and disposed of in accordance with all applicable federal, state, and local laws. Any components that become damaged shall be repaired or replaced immediately upon discovery to assure proper conveyance of stormwater runoff into the subsurface infiltration system.
d. Rain Gardens – The level of water in the Rain Gardens shall be monitored during and after heavy rain storms at least 3 times per year during the first year of operation and at least twice annually thereafter for evidence of clogging or other problems. The emergency overflow devices (spillway) shall be monitored to insure each is functioning properly and free of any obstructions.
e. Vegetation shall be maintained in healthy condition to prevent erosion and sedimentation in the drainage system and off-site wetland resource areas. The vegetation in the 'Rain Gardens" shall be maintained as native plants and/or shrubs, and shall not be converted to a mowed lawn or other use. Additionally, the post and rail fencing partial surrounding the rain garden shall be inspected 3 times per year to insure the fencing is intact.
f. Rip-Rap Pretreatment Area & Emergency Overflow spillway shall be inspected 3 times per year to insure any debris, trash, accumulated sediment, or leaves is removed and properly disposed of to insure functionality of these areas.

The Annual Stormwater Report (and repair information if performed) shall be submitted to the Town of Reading Engineering Department by January 15th of each calendar year.

Sullivan Engineering Group, LLC
Civil Engineers & Land Development Consultants

LONG-TERM POLLUTION PREVENTION PLAN

For

1312 Main Street

In

Reading, Massachusetts

October 7, 2020

Prepared For:

Reading Animal Clinic
1312 Main Street
Reading, MA 01867

LTPPP Coordinator

The construction site LTPPP coordinator for the facility is Reading Animal Clinic – c/o Beth Shurland (phone number: (781) 944-1699. The mailing address for Ms. Shurland is:
1312 Main Street, Reading, MA 01867

LTPPP Content

This LTPPP 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 BMP's
- 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
- 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
- Training for staff or personnel involved with implementing the LTPPP
- List of Emergency Contacts

Good Housekeeping Practices

Activity	Best Management Practices
Pavement Sweeping	Parking lot sweeping is required periodically (see Parking Lot Sweeping schedule). Dispose of debris in the garbage
Litter Control	Pick-up litter and other wastes periodically from outside areas including storm drain inlet grates and wetland resource areas.
Waste Disposal	* Inspect dumpsters and other waste containers periodically. repair or replace leaky dumpsters and containers. * Cover dumpsters and other waster containers * Never dispose of waster products in storm drain outlets * Recycle wastes or dispose properly.
Materials Storage	* Store materials such as grease, paints, detergents, metals, & raw materials in appropriate, labeled containers

PO Box 2004 Woburn, MA 01888 781-854-8644

	* Make sure all outdoor containers have lids, and that the lids are are adequately closed. * Store stockpiled materials inside a building, under a roof, or covered with a tarp to prevent contact with rain
Training	* Train employees (including subcontractors) regularly on good housekeeping practices. * Assign a person to be responsible for effective implementation Of BMP's
Equipment/Vehicle Cleaning	* Maintain equipment and vehicles regularly. check for and fix leaks * Use drip pans to collect leaks or spills during maintenance activities * Wash equipment/vehicles in a designated and/or covered area where the wash water is collected to be recycled or discharged to the sanitary sewer.

Provisions for storing materials and waste products

See "Material Storage" in the Good Housekeeping Practices section.

Vehicle Washing Controls

See "Equipment/Vehicle Cleaning" in the Good Housekeeping Practices section

Requirements for routine inspection and maintenance of stormwater BMP's

Reading Animal Clinic, LLC shall maintain the site in accordance with the following schedule;

a. Parking lot sweeping – Pavement and walkways shall be swept in the early spring immediately after snow melt and at least twice other times annually. Paving and curbing – Paving and curbing shall be maintained in good condition to channel surface runoff into the trench drains and rip-rap level spreader at rear of parking lot.
b. Roof drain inlets, downspouts, and roof drain pipes - All components of the roof drain collection system and the trench grate system shall be inspected at least 3 times per year. Sediments and debris shall be removed and disposed of in accordance with all applicable federal, state, and local laws. Any components that become damaged shall be repaired or replaced immediately upon discovery to assure proper conveyance of stormwater runoff into the subsurface infiltration system.
c. Rain Gardens – The level of water in the rain gardens shall be monitored during and after heavy rain storms at least 3 times per year and after every major storm during the first year of operation and at least twice annually thereafter for evidence of clogging or other problems. Sediment and/or debris collected in the rip-rap level spreader or the rain garden itself shall be removed and disposed of in accordance with all applicable federal, state, and local bylaws.
d. Vegetation shall be maintained in healthy condition to prevent erosion and sedimentation in the drainage system and wetland resource areas.

Spill Prevention and Response Plan

All vehicles on site will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.

Petroleum products will be stored in tightly sealed containers which are clearly labeled.

Spill kits will be included with all fueling sources and maintenance activities.

Any asphalt substances used onsite will be applied according to the manufacturer's recommendation.

All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm system will be reported to the National Response Center at 1-800-424-8802.

Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

Any asphalt substances used onsite will be applied according to the manufacturer's recommendation.

Sanitary waste will be collected from portable units a minimum of two times a week to avoid overfilling.

A covered dumpster will be used for all waste materials.

All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm system, but will be properly disposed according to the manufacturer's instructions.

Materials and equipment necessary for spill cleanup will be kept in the temporary material storage trailer onsite. Equipment will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, saw dust, and plastic and metal trash containers.

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Provisions for maintenance of lawns, gardens, and other landscaped areas

Grassed, landscaped, and garden areas will require routine maintenance such as watering, cutting, pruning, etc…Grass clippings, weeds, raked leaves, or tree branches should not be disposed of in wetland resource areas. These items should be disposed in a dumpster, trash can, or contact the Reading DPW to see if the Town has a designated disposal area.

Requirements for storage and use of fertilizers, herbicides, and pesticides

Fertilizers, herbicides, and pesticides should be stored in a weather-tight enclosure and in accordance with manufacturer's requirements. The use of fertilizers, herbicides, and pesticides should be used in small amounts and if possible, more environmentally sensitive alternatives would be preferred. Table 1 provides common trade name materials and the storm water pollutants associated with these materials.

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Table 1

Potential Construction Site Storm Water Pollutants

Trade Name Material	Chemical/Physical Description (1)	Storm Water Pollutants(1)
Pesticides (insecticides, fungicides, herbicides, rodenticides)	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbonates, arsenic
Fertilizer	Liquid or solid grains	Nitrogen, phosphorous
Plaster	White granules or powder	Calcium sulphate, calcium carbonate, sulfuric acid
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates
Asphalt	Black solid	Oil, petroleum distillates
Concrete	White solid	Limestone, sand
Glue, adhesives	White or yellow liquid	Polymers, epoxies
Paints	Various colored liquid	Metal oxides, stoddard solvent, talc, calcium carbonate, arsenic
Curing compounds	Creamy white liquid	Naphtha
Wastewater from construction equipment washing	Water	Soil, oil & grease, solids
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates
Antifreeze/coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)
Erosion	Solid Particles	Soil, Sediment

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Provisions for Solid Waste Management

All solid waste materials during construction will be collected and stored in a securely lidded metal dumpster. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied as needed offsite. No construction materials will be buried on-site. All personnel will be instructed regarding the correct procedure for waste disposal. All sanitary waste will be collected from the portable units a minimum of two times per week. Good housekeeping and spill control practices will be followed during construction to minimize storm water contamination from petroleum products, fertilizers, paints, and concrete.

Snow disposal and plowing plans relative to Wetland Resource Areas

Snow disposal and plowing will be the responsibility of the owner and snow shall be stockpiled in areas designated on the design plans. In heavy snow events it may be necessary to haul snow offsite. Under no circumstance shall snow be disposed of in a wetland resource area.

Winter Road salt and/or Sand use and storage restrictions

The owner may use winter road salt and/or sand for treatment of the driveway surfaces. The use of the sand and/or salt shall be provided to the minimum extent to provide safety. Sand and/or winter salt shall be stored off-site.

Street Sweeping Schedules

Pavement sweeping – Pavement areas shall be swept in the early spring immediately after snow melt and at least twice other times annually.

Provisions for Prevention of Illicit Discharges to Stormwater Management System

Table 1 details numerous materials which should not be discharged to the Stormwater Management System. If a "spill" occurs, please refer to the "Spill Prevention and Response" section of this report. The materials listed in Table 1 should be stored in a weather-tight enclosure to reduce the risk of discharge to the stormwater management system. In the event of a discharge to the Stormwater System, the drywells should be pumped off contents by a licensed contractor.

Training for staff or personnel involved with implementing the LTPPP

Employees will be educated about the requirements of the LTPPP. This will include background on the components and goals of the LTPPP and hands-on-training in erosion controls, spill prevention and response, good housekeeping, proper material handling, disposal and control of waste, equipment fueling, and proper storage, washing, and inspection procedures. All employees will be trained prior to their first day on the site.

List of Emergency Contacts

Beth Shurland 781-944-1699

Construction
Storm Water Pollution
Prevention Plan

1312 Main Street, Reading
New Reading Animal Clinic

October 7, 2020

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LIST OF TABLES

LIST OF FIGURES

* See Site Plan for Erosion Controls & Management

1.0 INTRODUCTION

1.1 Background

In 1972, Congress passed the Federal Water Pollution Control Act (FWPCA), also known as the Clean Water Act (CWA), to restore and maintain the quality of the nation's waterways. The ultimate goal was to make sure that rivers and streams were fishable, swimmable, and drinkable. In 1987, the Water Quality Act (WQA) added provisions to the CWA that allowed the EPA to govern storm water discharges from construction sites. On March 10, 2003, EPA published the final notice for General Permits for Storm Water Discharges from Construction Activities Disturbing 1 Acre or Greater. The general permit includes provisions for development of a Storm Water Pollution Prevention Plan (SWPPP) to maximize the potential benefits of pollution prevention and sediment and erosion control measures at construction sites.

Development, implementation, and maintenance of the SWPPP will provide North Shore Construction & Development, Inc (general contractor) with the framework for reducing soil erosion and minimizing pollutants in storm water during construction of the six (6) buildings each containing two dwelling units. The SWPPP will:

Define the characteristics of the site and the type of construction which will be occurring;

Describe the site plan for the facility to be constructed;

Describe the practices that will be implemented to control erosion and the release of pollutants in storm water;

Create an implementation schedule to ensure that the practices described in this SWPPP are in fact implemented and to evaluate the plan’s effectiveness in reducing erosion, sediment, and pollutant levels in storm water discharged from the site; and

Describe the final stabilization/termination design to minimize erosion and prevent storm water impacts after construction is complete.

1.2 SWPPP Content

This SWPPP includes the following:

Identification of the SWPPP coordinator with a description of this person's duties;

Identification of the storm water pollution prevention team that will assist in implementation of the SWPPP during construction.

Description of the existing site conditions including existing land use for the site (i.e., wooded areas, open grassed areas, pavement, buildings, etc.), soil types. at the site, as well as the location of surface waters which are located on or next to the site (wetlands, streams, rivers, lakes, ponds, etc.);

Identification of the body of water(s) which will receive runoff from the construction site, including the ultimate body of water that receives the storm water;

Identification of drainage areas and potential storm water contaminants;

Description of storm water management controls and various Best Management Practices (BMPs) necessary to reduce erosion, sediment and pollutants in storm water discharge;

Description of the facility monitoring plan and how controls will be coordinated with construction activities; and a

Description of the implementation schedule and provisions for amendment of the plan.

2.0 SWPPP COORDINATOR AND DUTIES

The construction site SWPPP coordinator for the facility is Ms. Beth Shurland (phone number: (781) 944-1699 with the Reading Animal Clinic. A general contractor will be hired and will be given the responsibility of:

Implement the SWPPP plan with the aid of the SWPPP team;

Oversee maintenance practices identified as BMPs in the SWPPP;

Implement and oversee employee training;

Conduct or provide for inspection and monitoring activities;

Identify other potential pollutant sources and make sure they are added to the plan;

Identify any deficiencies in the SWPPP and make sure they are corrected; and

Ensure that any changes in construction plans are addressed in the SWPPP.

3.0 FACILITY DESCRIPTION

3.1 Site Location

The construction site is located at 1312 Main Street, Reading with a current building (to remain) and a vacant lot (to be developed with a new building). The site consists of two lots of record on the westerly side of Main Street in the vicinity of Main Street and Franklin Street.

3.2 Construction Type

The project will consist of a new building to be constructed on the vacant lot (outside of wetland jurisdiction). The portion of this project under control of the conservation commission involves a parking lot, rain garden, concrete walkway, and site grading.

3.3 Existing Site Conditions

The present site consists of two lots of record. One lot is the current home to the Reading Animal Clinic. This building is to remain but will be rented or leased with a determination of a tenant not known at this time. There are wetlands on the southerly side of the property. There is a second vacant lot to the north of the existing building site. This lot is mostly wooded and there exists a gravel driveway that provides egress to a residential home to the rear of the site.

3.4 Site Plan

A Site Plan is attached showing property boundaries, the proposed location of the buildings, paved driveway locations, underground infiltration units, and proposed site grading. The plan is to retain the existing commercial building on one lot and build a new commercial building (new home of the Reading Animal clinic) on the second lot. Both properties will share parking. The portion of this site under jurisdiction of the Conservation Commission involves a proposed paved parking lot, rain garden, concrete walkway, site grading, and landscaping. There is a drainage system associated with the new building that involves a stormceptor, catchbasins, and an underground drainage infiltration field.

4.0 IDENTIFICATION OF POTENTIAL STORM WATER CONTAMINANTS

The purpose of this section is to identify pollutants that could impact storm water during construction of the facility.

4.1 Significant Material Inventory

Pollutants that result from clearing, grading, excavation, and building materials and have the potential to be present in storm water runoff are listed in Table 1. This table includes information regarding material type, chemical and physical description, and the specific regulated storm water pollutants associated with each material.

4.2 Potential Areas for Storm Water Contamination

The following potential source areas of storm water contamination were identified and evaluated:

Cleared and graded areas;

Building construction;

Construction site entrance and asphalt driveway construction;

All undisturbed areas.

Table 2 presents site specific information regarding storm water pollution potential from each of these areas.

4.3 A Summary of Available Storm Water Sampling Data

No storm water sampling data is available for the site.

4.4 Waterbody Receiving Stormwater Discharge

Based on the most current USGS map for this area, the stormwater runoff for this site flows to the wetland area on the westerly portion of this site. There is a culvert under Main Street that connects two wetland areas.

Table 1

Potential Construction Site Storm Water Pollutants

Trade Name Material	Chemical/Physical Description (1)	Storm Water Pollutants(1)
Pesticides (insecticides,fungicides, herbicides, rodenticides)	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic
Fertilizer	Liquid or solid grains	Nitrogen, phosphorous
Plaster	White granules or powder	Calcium sulphate, calcium carbonate, sulfuric acid
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates
Asphalt	Black solid	Oil, petroleum distillates
Concrete	White solid	Limestone, sand
Glue, adhesives	White or yellow liquid	Polymers, epoxies
Paints	Various colored liquid	Metal oxides, stoddard solvent, talc, calcium carbonate, arsenic
Curing compounds	Creamy white liquid	Naphtha
Wastewater from construction equipment washing	Water	Soil, oil & grease, solids
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates
Antifreeze/coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)
Erosion	Solid Particles	Soil, Sediment

(1) Data obtained from MSDSs when available

Table 2

Locations of Potential Sources of Storm Water Contamination

Drainage Area	Potential Storm Water Contamination Point	Potential Pollutants	Potential Problem
	Building construction	Plaster, cleaning solvents, asphalt, concrete, paints, hydraulic oil, gasoline, antifreeze, soil erosion, fertilizer, pesticides, glue adhesives, curing compounds, wood preservatives, kerosene	Accidental spills of paints and cleaning solvents, leaking hydraulic oil and antifreeze from construction equipment, gasoline and diesel fuel spills while fueling construction equipment, erosion of exposed and stockpiled soils, and degradation of scrap dry wall can potentially contaminate storm water. Asphalt chemicals can be released to storm water if a rain event occurs before curing is complete.
	Construction driveways	Asphalt, hydraulic oil, gasoline, antifreeze, soil erosion, fertilizer, pesticides	Leaking hydraulic oil and antifreeze from clearing, grading and asphalt application construction equipment. Gasoline and diesel fuel spills while fueling construction equipment, and erosion of exposed and stockpiled soils. Asphalt chemicals can be released to storm water if a rain event occurs before curing is complete. Tracking of soil into the road through the construction site entrance.
	Tree removal area	Soil erosion, fertilizer, pesticides	Ruts caused by logging equipment can fill with water, preventing complete re-vegetation.
	All undisturbed Areas	None	No storm water related issues with this completely vegetated area

5.0 STORM WATER MANAGEMENT CONTROLS

The purpose of this section is to identify the types of temporary and permanent erosion and sediment controls that will be used during construction activities. The controls will provide soil stabilization for disturbed areas and structural controls to divert runoff and remove sediment. This section will also address control of other potential storm water pollutant sources such as construction materials (paints, concrete dust, solvents, plaster), waste disposal, control of vehicle traffic, and sanitary waste disposal.

5.1 Temporary and Permanent Erosion Control Practices

A list of best management procedures (BMPs) has been developed and the locations of these BMPs are shown on the approved Site Development plan. A number of the BMPs included in this plan have been developed to serve as post-construction storm water controls.

Site Wide Control Measures

To prevent soil from washing into the undisturbed areas of the site, the following BMPs will be implemented:

Silt fencing (or 12 inch mulch soxx) will be placed along the "low-side" limit of work line before any clearing or grading takes place. Additionally, orange construction fencing will be installed along the entire limit of work area to insure protected areas remain intact.

Combination of various forms of siltation control are proposed at various locations throughout the site based on proximity to the wetland resource areas (See the "Erosion and Sediment Control" plan)

Designated Soil stockpiling areas are shown

Snow stockpile areas are shown

5.2 Construction Practices to Minimize Storm Water Contamination

All waste materials will be collected and stored in a securely lidded metal dumpster. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied as needed offsite. No construction materials will be buried on-site. All personnel will be instructed regarding the correct procedure for waste disposal. All sanitary waste will be collected from the portable units a minimum of two times per week. Good housekeeping and spill control practices will be followed during construction to minimize storm water contamination from petroleum products, fertilizers, paints, and concrete. Good housekeeping practices for each drainage area are list below.

To prevent potential storm water contamination, the following BMPs will be implemented:

All vehicles on site will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage.

Petroleum products will be stored in tightly sealed containers which are clearly labeled.

Spill kits will be included with all fueling sources and maintenance activities.

Any asphalt substances used onsite will be applied according to the manufacturer's recommendation.

All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm system will be reported to the National Response Center at 1-800-424-8802.

Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

Any asphalt substances used onsite will be applied according to the manufacturer's recommendation.

Sanitary waste will be collected from portable units a minimum of two times a week to avoid overfilling.

A covered dumpster will be used for all waste materials.

All paint containers and curing compounds will be tightly sealed and stored when not required for use. Excess paint will not be discharged to the storm system, but will be properly disposed according to the manufacturer's instructions.

Materials and equipment necessary for spill cleanup will be kept in the temporary material storage trailer onsite. Equipment will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, saw dust, and plastic and metal trash containers.

Spray guns will be cleaned on a removable tarp.

5.3 Coordination of BMPs with Construction Activities

Structural BMPs will be coordinated with construction activities so the BMP is in place before construction begins. The following BMPs will be coordinated with construction activities:

The temporary perimeter controls (various forms of erosion control barriers) will be installed ***before*** any clearing and grading begins. (See Erosion and Sediment Control Plan for forms of erosion control & locations)

Once construction activity ceases in an area, that area will be stabilized with permanent seed or other permanent landscaping means.

The temporary perimeter controls will not be removed and shall be maintained until all construction activities at the site are complete and soils have been stabilized.

6.0 MAINTENANCE/INSPECTION PROCEDURES

6.1 Inspections

Visual inspections of all cleared and graded areas of the construction site will be performed daily and within 12 hours of the end of a storm with rainfall amounts greater than 0.5 inches. The inspection will be conducted by the SWPPP coordinator or his designated stormwater team members. The inspection will verify that the structural BMPs described in Section 5 of this SWPPP are in good condition and are minimizing erosion. The inspection will also verify that the procedures used to prevent storm water contamination from construction materials and petroleum products are effective.

The following inspection and maintenance practices will be used to maintain erosion and sediment controls:

Built up sediment will be removed from erosion control barriers when it has reached one third the barrier height.

Silt fences will be inspected for depth of sediment, for tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.

Temporary and permanent seeding will be inspected for bare spots, washouts, and healthy growth.

The maintenance inspection report will be made after each inspection. A copy of the report form to be completed by the SWPPP coordinator is provided in Appendix A of this SWPPP. Completed forms will be maintained on-site during the entire construction project. Following construction, the completed forms will be retained at the general contractors office, North Shore Residential Development, Inc, for a minimum of 1 year.

If construction activities or design modifications are made to the site plan which could impact storm water, this SWPPP will be amended appropriately. The amended SWPPP will have a description of the new activities that contribute to the increased pollutant loading and the planned source control activities.

6.2 Employee Training

Employees will be educated about the requirements of the SWPPP. This will include background on the components and goals of the SWPPP and hands-on-training in erosion controls, spill prevention and response, good housekeeping, proper material handling, disposal and control of waste, equipment fueling, and proper storage, washing, and inspection procedures. All employees will be trained prior to their first day on the site.

6.3 Certification

Owner Certification (Reading Animal Clinic)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manages the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

_____
Name

_____
Title

_____
Date

Contractor Certification (Not selected at this time)

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this certification.

_____

Name

_____

Title

_____

Date

Appendix A

Inspection Logs

1312 Main Street, Reading

Storm Water Pollution Prevention Plan

Inspection and Maintenance Report Form

To be completed every 7 days and within 24 hours of a rainfall event of 0.5 inches or more

Inspector: _____ Date:_____

Inspector's Qualifications:

Days since last rainfall: _____ Amount of last rainfall: _____

Stabilization Measures

Drainage Area	Date Since Last Disturbance	Date of Next Disturbance	Stabilized (Yes/No)	Stabilized With	Condition

Stabilization required:

To be performed by:_____ On or before:_____

1312 Main Street, Reading

Storm Water Pollution Prevention Plan

Inspection and Maintenance Report Form

Driveway Entrance(s):

Does Much Sediment Get Tracked on to Road?	Is the Gravel Clean or is it Filled with Sediment?

Maintenance required for driveway entrance(s):

_____

To be performed by:_____ On or Before:_____

1312 Main Street, Reading

Storm Water Pollution Prevention Plan
Inspection and Maintenance Report Form

Perimeter Structural Controls:

Date: _____

Silt Fence

Drainage Area Perimeter	Has Silt Reached 1/3 of Fence Height?	Is Fence Properly Secured?	Is There Evidence of Washout or Over-topping?

Maintenance required for silt fence:

To be performed by:_____ On or before:_____

1312 Main Street, Reading

Storm Water Pollution Prevention Plan
Inspection and Maintenance Report Form

Changes required to the pollution prevention plan:

Reasons for changes:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are signification penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature:_____ Date:_____