Stormwater Management Report

43 Poole Street
in
Woburn, MA

January 29, 2023
(Revised April 1, 2023)

Prepared for:
43 Poole Street LLC

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1.0 Existing Conditions

1.1 Project Location

The Site, located at 43 Poole Street, is 1.87 acres in size and located in a R-1 Zoning District. The Site has frontage on Poole Street and Winter Road.

1.2 Present Uses

The Site currently contains a single family dwelling (43 Poole Street) and several auxiliary structures. There is an existing paved path within a City easement running from Poole Street east through abutting residential properties.

1.3 Physical Site Description

The overall tract contains 1.87 acres of land. Out of this tract 6,160 square feet is impervious cover made up of buildings, paved parking and walkways. The remaining land is wooded and lawn areas.

Topographically, the Site has a high point near the middle of the property and portions of the site slope south towards Halls Brook and north towards abutting residential properties.

A paved path over a portion of the Site is used by City residents.

Soil data for the site has been mapped by the Natural Resources Conservation Service (NRCS) and is available through the National Cooperative Soil Survey and is included in Appendix D with the Drainage Analysis.

The Site contains Merrimac-Urban land complex series soils. Merrimac series soils consist of deep, excessively drained soils formed in glaciofluvial materials. Saturated hydraulic conductivity is high or very high. Merrimac soils are in hydrologic soil group (HSG) A.

On site soil testing was performed on January 23, 2023. Test pit locations and soil logs are provided on the Existing Conditions Plan. The soil testing was performed to classify the soil, determine the estimated seasonal high groundwater, and to determine the texture of the soil. Soil in the test holes was classified as fine sand or sandy loam and was consistent throughout the site. The soil was found to be consistent with the mapping by the NRCS. Estimated seasonal high groundwater was not encountered in any of the test pits.

The “static” method using Rawls exfiltration rates of 8.27 in/hour for medium sand was used in designing stormwater infiltration areas.

1.4 Site Utilities

Utilities at the Site include municipal sanitary sewer and municipal water located in Winter Road and cross-country easements that will be extended into the development.

1.5 Site Access

The Site has access from Poole Street and Winter Road.

2.0 Proposed Development

2.1 Project Description

The proposed project will consist of a four-lot definitive subdivision. The existing single-family dwelling located at 43 Poole Street will remain. A forty foot right-of-way will be extended into the property from Winter Road ending in a cul-de-sac. The proposed right-of-way will provide frontage for three new single-family dwellings.

2.2 Site Utilities

All utilities necessary to service the new development are located within Winter Road or cross-country easement. A 8" cement lined ductile iron water main and 8" SDR 35 PVC sewer will be extended into the proposed development

Overhead electric and telecommunications services would be extended underground to service the project.

2.3 Environmental Impact

No alteration of the bordering vegetated wetland on the site is proposed by the development. The construction of the roadway will be located outside the 200-foot riparian and 150-foot buffer zone. Proposed dwelling construction and storm water management features will encroach into the 200-foot riparian and 150-foot buffer zone. Erosion control barriers will be installed to ensure that the wetland area is not impacted during construction.

2.4 Storm Water Management

The existing development contains approximately 6,160±square feet of impervious cover made up of buildings, paved parking and walkways. The proposed development will create approximately 22,270± square feet of impervious cover made up of roadway, buildings, driveways and walkways.

Drainage calculations were performed using HydroCAD® computer software. The storm events analyzed were the theoretical 2-year (3.30"), 10-year (5.20"), 50-year (7.30") and 100-year (8.21") storms. Rainfall was based on NOAA Atlas 14 data. Complete drainage calculations of the pre development and post development storm water runoff rates and volumes are provided herewith.

2.4.1 Standard 1

Standard 1 requires that no new untreated discharges to wetlands are created and that any new discharges would not result in erosion.

The proposed development contains no new discharge points directed toward the wetland or riverfront resource areas. All proposed impervious areas will connect to two subsurface infiltration systems.

Prior to construction erosion control (filtermitt silt sock) be installed at the downstream limits of work; to ensure that no activities occur closer to the wetland than approved and scouring, erosion, and discharges of sediment to the nearby wetland resource areas do not occur.

2.4.2 Standard 2

Standard 2 requires that post development peak discharge rates do not exceed pre development discharge rates.

In order to assess the impacts of the increased impervious areas at the site and to develop effective mitigation measures, hydrologic calculations were performed for the pre development and post development site conditions.

Table 1 is a Comparative Hydrologic Summary that compares the post development peak runoff flow rates and runoff volumes at the two point of analysis with the pre development site conditions. As the table indicates the post development runoff rates and volumes are at or below the predevelopment conditions in all storm events analyzed.

Pre-Development vs. Post-Development Drainage Summary Table:

To Halls Brook (south):

	Pre-Development		Post-Development	
Storm Event	**Rate (cfs)**	**Volume (af)**	**Rate (cfs)**	**Volume (af)**
2	**0.00**	**0.002**	**0.00**	**0.001**
10	**0.15**	**0.035**	**0.08**	**0.022**
50	**0.89**	**0.107**	**0.54**	**0.070**
100	**1.39**	**0.147**	**0.87**	**0.097**

To abutters (north):

	Pre-Development		Post-Development	
Storm Event	**Rate (cfs)**	**Volume (af)**	**Rate (cfs)**	**Volume (af)**
2	**0.01**	**0.001**	**0.01**	**0.003**
10	**0.20**	**0.070**	**0.15**	**0.026**
50	**0.87**	**0.088**	**0.68**	**0.069**
100	**1.24**	**0.117**	**0.97**	**0.092**

2.4.3 Standard 3

Standard 3 requires that there not be a loss of annual groundwater recharge.

Two infiltration BMPs are proposed at the site to provide ground water recharge. The groundwater recharge calculations are based on a static analysis which simply compares the volume of recharge required to the storage volume in each recharge structure. This method does not take into consideration that recharge will actively occur during the rainfall event.

Required recharge volume for site =
= (22,270 s.f x 0.60") / 12 = 1,114 cubic feet.

Infiltration System-1:

Chamber Storage + Stone Storage = 2,304 cf

Infiltration Basin-2:

Chamber Storage + Stone Storage = 385 cf

Total Volume provided = 2,689 cubic feet

Criteria Satisfied

The regulations require that each infiltration BMP completely drains the required recharge volume within 72 hours. The subsurface infiltration system and the infiltration basin were designed using the dynamic in-situ method. in-field saturated hydraulic conductivity testing.

Infiltration System 1:
Bottom surface area=1,199 s.f.
Rawls saturated hydraulic conductivity: 8.27 inches per hour
Storage volume: 2,304 cf
Drawdown Time = (2,304 cf) / {(8.27 in/hr) x (1/12)}/ 1,199= 2.79 hours

Criteria Satisfied

Infiltration System 2
Bottom surface area=218.5 s.f.
Rawls saturated hydraulic conductivity: 8.27 inches per hour
Storage volume: 385 cf
Drawdown Time = (385 cf) / {(8.27 in/hr) x (1/12)}/ 218.5= 2.56 hours

Criteria Satisfied

2.4.4 Standard 4

Standard 4 requires the storm water management system to be designed to remove 80 percent of total suspended solids (TSS) from the storm water prior to discharge. This is achieved by implementing a series of Best Management Practices (BMPs) to treat the prescribed Water Quality Volume (WQV). TSS calculations were performed using the DEP TSS Removal Calculation Spreadsheet.

Location: 43 Poole Street

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)
Street Sweeping - 10%	0.10	1.00	0.10	0.90
Deep Sump and Hooded Catch Basin	0.25	0.90	0.23	0.68
Infiltration Basin	0.80	0.68	0.54	0.14
	0.00	0.14	0.00	0.14
	0.00	0.14	0.00	0.14

Total TSS Removal = 87%

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

Project: Lexington Meadows
Prepared By: FWR
Date: 1/27/2023

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

2.4.5 Standard 5

Standard 5 regulates discharges from sites with higher potential pollutant loads. Since the project is residential and is expected to generate less than 1000 vehicle trips per day on average, the site is not a Land Use with high Potential Pollutant Loads (LUHPPL).

2.4.6 Standard 6

Standard 6 regulates discharges to Outstanding Resource Waters (ORW). The site is not located within a Zone II for a public water supply, nor does runoff from the site discharge to an Outstanding Resource Water. Therefore, the design is in compliance with this standard.

2.4.7 Standard 7

Not applicable.

2.4.8 Standard 8

Standard 8 requires a plan to control construction related impacts. Erosion control features will be installed to control construction related impacts.

2.4.9 Standard 9

Standard 9 requires a long term operation and maintenance plan to ensure that the storm water management system performs as designed. The Stormwater operation and maintenance plan is included in the Drainage Analysis.

2.4.10 Standard 10

Standard 10 prohibits any illicit discharges to the storm water management systems. There are no illicit discharges to the storm water management system proposed.

Appendix A

Locus Map

Woburn WebGIS Map

1/29/2023, 10:38:23 PM

1:4,493

0 0.03 0.06 0.11 mi

0 0.04 0.09 0.18 km

Point of Interest
- School
- Property Information

Easements
- Easement
- Access Easement

- Private Access Easement
- Drain Easement
- Private Drain Easement
- Sewer Easement
- Private Sewer Easement
- Private Utility Easement
- Driveways
- Buildings

Esri Community Maps Contributors, MassGIS, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS,

Woburn WebGIS
City of Woburn GIS

Appendix B

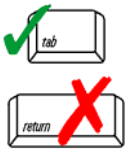
Storm Water Report Checklist

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

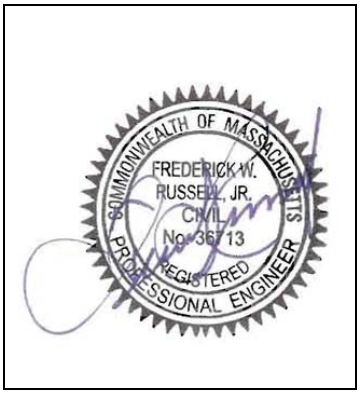
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



January 27, 2023

Signature and Date

Checklist

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

- ■ New development
- ☐ Redevelopment
- ☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☒ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☐ An Illicit Discharge Compliance Statement is attached;

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

Appendix C

Drainage Analysis

DRAINAGE ANALYSIS

43 Poole Street
Woburn, MA

January 29, 2023
(Revised April 1, 2023)

43 Poole Street
Drainage Summary

The overall tract contains 1.87 acres of land. Out of this tract 6,160±square feet is impervious cover made up of buildings, paved parking and walkways. The remaining land is wooded and lawn areas.

Topographically, the Site has a high point near the middle of the property and portions of the site slope south towards Halls Brook and north towards abutting residential properties.

The proposed project will consist of a four-lot definitive subdivision. The existing single-family dwelling located at 43 Poole Street will remain. A forty foot right-of-way will be extended into the property from Winter Road ending in a cul-de-sac. The proposed right-of-way will provide frontage for three new single-family dwellings. The proposed development will create approximately 22,270±square feet of impervious cover made up of roadway, buildings, driveways and walkways.

Soil data for the site has been mapped by the Natural Resources Conservation Service (NRCS). The Site contains Merrimac-Urban land complex series soils. Merrimac series soils consist of deep, excessively drained soils formed in glaciofluvial materials. Saturated hydraulic conductivity is high or very high. Merrimac soils are in hydrologic soil group (HSG) A.

In addition, on site soil testing was performed on January 23, 2023. Test pit locations and soil logs are provided on the Existing Conditions Plan. The soil testing was performed to classify the soil, determine the estimated seasonal high groundwater, and to determine the texture of the soil. Soil in the test holes was classified as fine sand or sandy loam and was consistent throughout the site. The soil was found to be consistent with the mapping by the NRCS. Estimated seasonal high groundwater was not encountered in any of the test pits.

The “static” method using Rawls exfiltration rates of 8.27 in/hour for medium sand was used in designing stormwater infiltration areas.

Stormwater runoff from the proposed right-of-way and driveways will flow to deep sump catch basins and then to two subsurface infiltration systems designed for the 100-year storm event. Since proposed dwelling designs have not been completed, subsurface infiltration systems designed for the 100-year storm event for all roof runoff will occur during the building permit phase.

Drainage calculations were performed using HydroCAD® computer software. The storm events analyzed were the theoretical 2-year (3.30”), 10-year (5.20”), 50-year (7.30”) and 100-year (8.21”) storms. Rainfall was based on NOAA Atlas 14 data. Complete drainage calculations of the pre development and post development storm water runoff rates and volumes are provided herewith.

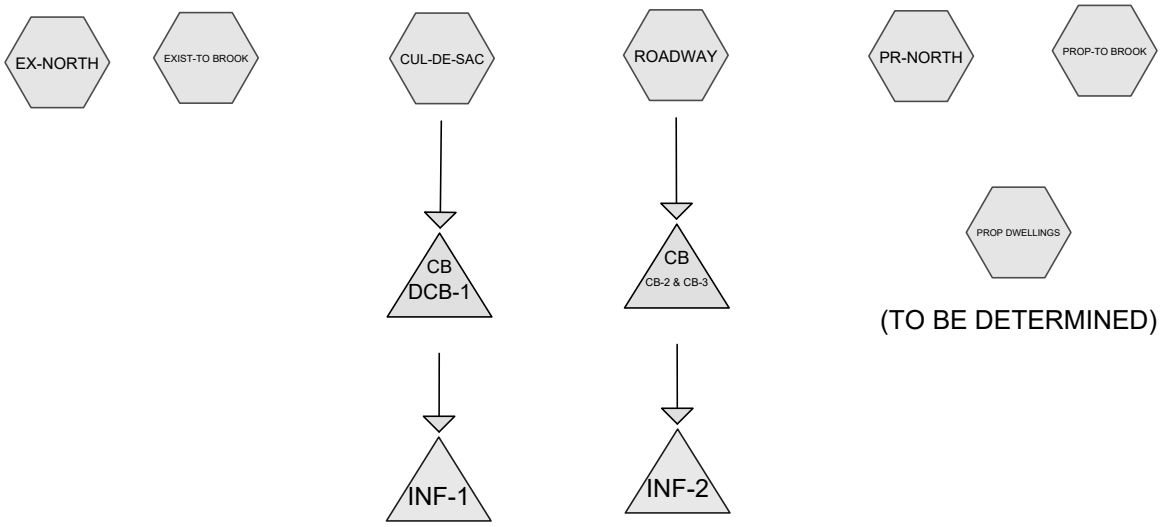
Below is a summary comparing peak rates of runoff and volume for existing and post-development conditions:

To Halls Brook (south):

	Pre-Development		Post-Development	
Storm Event	**Rate (cfs)**	**Volume (af)**	**Rate (cfs)**	**Volume (af)**
2	**0.00**	**0.002**	**0.00**	**0.001**
10	**0.15**	**0.035**	**0.08**	**0.022**
50	**0.89**	**0.107**	**0.54**	**0.070**
100	**1.39**	**0.147**	**0.87**	**0.097**

To abutters (north):

	Pre-Development		Post-Development	
Storm Event	**Rate (cfs)**	**Volume (af)**	**Rate (cfs)**	**Volume (af)**
2	**0.01**	**0.004**	**0.01**	**0.003**
10	**0.20**	**0.070**	**0.15**	**0.026**
50	**0.87**	**0.088**	**0.68**	**0.069**
100	**1.24**	**0.117**	**0.97**	**0.092**



Subcat Reach Pond Link

Routing Diagram for 43 Poole Street 03-31-23
Prepared by HP, Printed 4/10/2023
HydroCAD® 10.10-4b s/n 07616 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 yr storm	Type III 24-hr		Default	24.00	1	3.30	2
2	10 yr storm	Type III 24-hr		Default	24.00	1	5.20	2
3	50 yr storm	Type III 24-hr		Default	24.00	1	7.30	2
4	100 yr storm	Type III 24-hr		Default	24.00	1	8.21	2

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	CB-2 & CB-3	115.10	114.50	24.0	0.0250	0.010	0.0	12.0	0.0
2	DCB-1	116.50	115.50	40.0	0.0250	0.010	0.0	12.0	0.0

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CUL-DE-SAC: Runoff Area=13,590 sf 68.80% Impervious Runoff Depth=1.48"
Tc=10.0 min CN=80 Runoff=0.47 cfs 0.038 af

Subcatchment EX-NORTH: Runoff Area=31,340 sf 11.30% Impervious Runoff Depth=0.07"
Tc=10.0 min CN=46 Runoff=0.01 cfs 0.004 af

Subcatchment EXIST-TO BROOK: Runoff Area=49,960 sf 9.01% Impervious Runoff Depth=0.02"
Tc=10.0 min UI Adjusted CN=42 Runoff=0.00 cfs 0.002 af

Subcatchment PR-NORTH: Runoff Area=24,610 sf 12.60% Impervious Runoff Depth=0.07"
Tc=10.0 min CN=46 Runoff=0.01 cfs 0.003 af

Subcatchment PROP DWELLINGS: (TO BE Runoff Area=6,000 sf 100.00% Impervious Runoff Depth=3.07"
Tc=0.0 min CN=98 Runoff=0.52 cfs 0.035 af

Subcatchment PROP-TO BROOK: Runoff Area=35,020 sf 6.23% Impervious Runoff Depth=0.01"
Tc=10.0 min UI Adjusted CN=41 Runoff=0.00 cfs 0.001 af

Subcatchment ROADWAY: Runoff Area=2,080 sf 78.85% Impervious Runoff Depth=1.92"
Tc=10.0 min CN=86 Runoff=0.09 cfs 0.008 af

Pond CB-2 & CB-3: Peak Elev=115.27' Inflow=0.09 cfs 0.008 af
12.0" Round Culvert n=0.010 L=24.0' S=0.0250 '/' Outflow=0.09 cfs 0.008 af

Pond DCB-1: Peak Elev=116.89' Inflow=0.47 cfs 0.038 af
12.0" Round Culvert n=0.010 L=40.0' S=0.0250 '/' Outflow=0.47 cfs 0.038 af

Pond INF-1: Peak Elev=114.62' Storage=177 cf Inflow=0.47 cfs 0.038 af
Outflow=0.23 cfs 0.038 af

Pond INF-2: Peak Elev=113.52' Storage=41 cf Inflow=0.09 cfs 0.008 af
Outflow=0.04 cfs 0.008 af

Total Runoff Area = 3.733 ac Runoff Volume = 0.092 af Average Runoff Depth = 0.29"
81.36% Pervious = 3.037 ac 18.64% Impervious = 0.696 ac

Summary for Subcatchment CUL-DE-SAC:

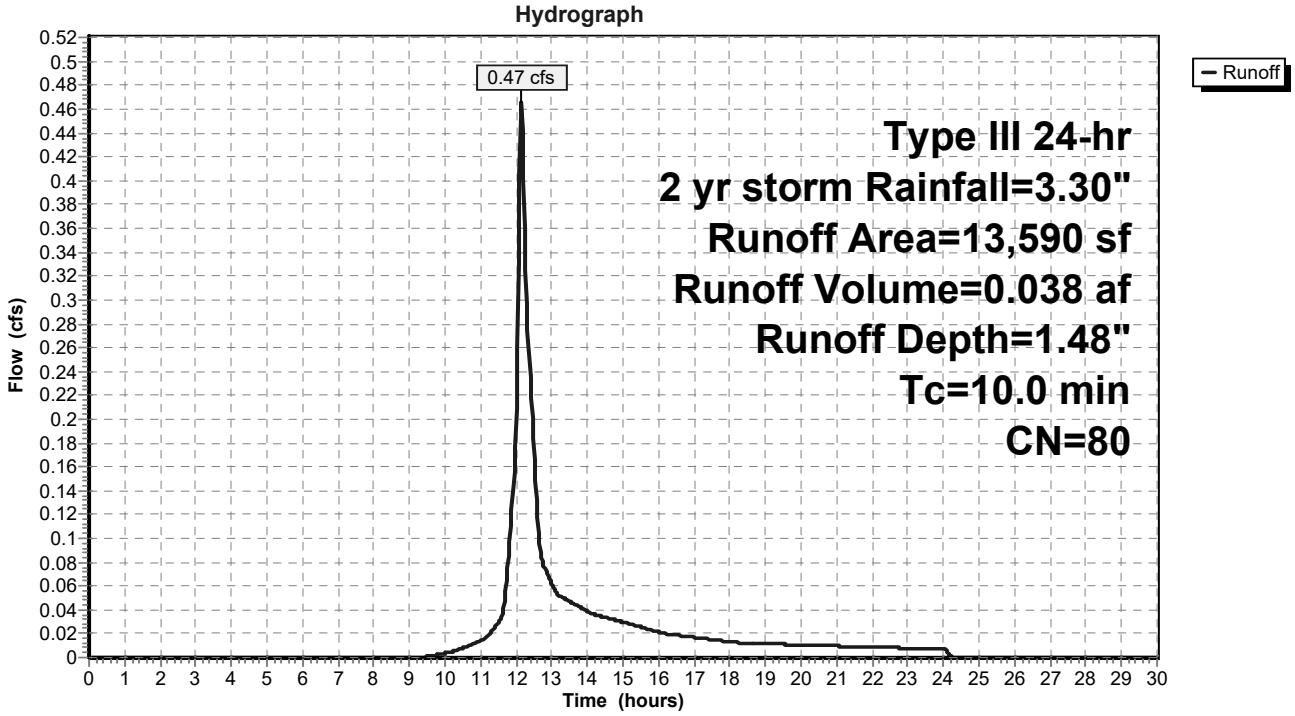
Runoff = 0.47 cfs @ 12.15 hrs, Volume= 0.038 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 yr storm Rainfall=3.30"

Area (sf)	CN	Description
9,350	98	Paved roads w/curbs & sewers, HSG A
4,240	39	>75% Grass cover, Good, HSG A
13,590	80	Weighted Average
4,240		31.20% Pervious Area
9,350		68.80% Impervious Area

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

Subcatchment CUL-DE-SAC:



Summary for Subcatchment EX-NORTH:

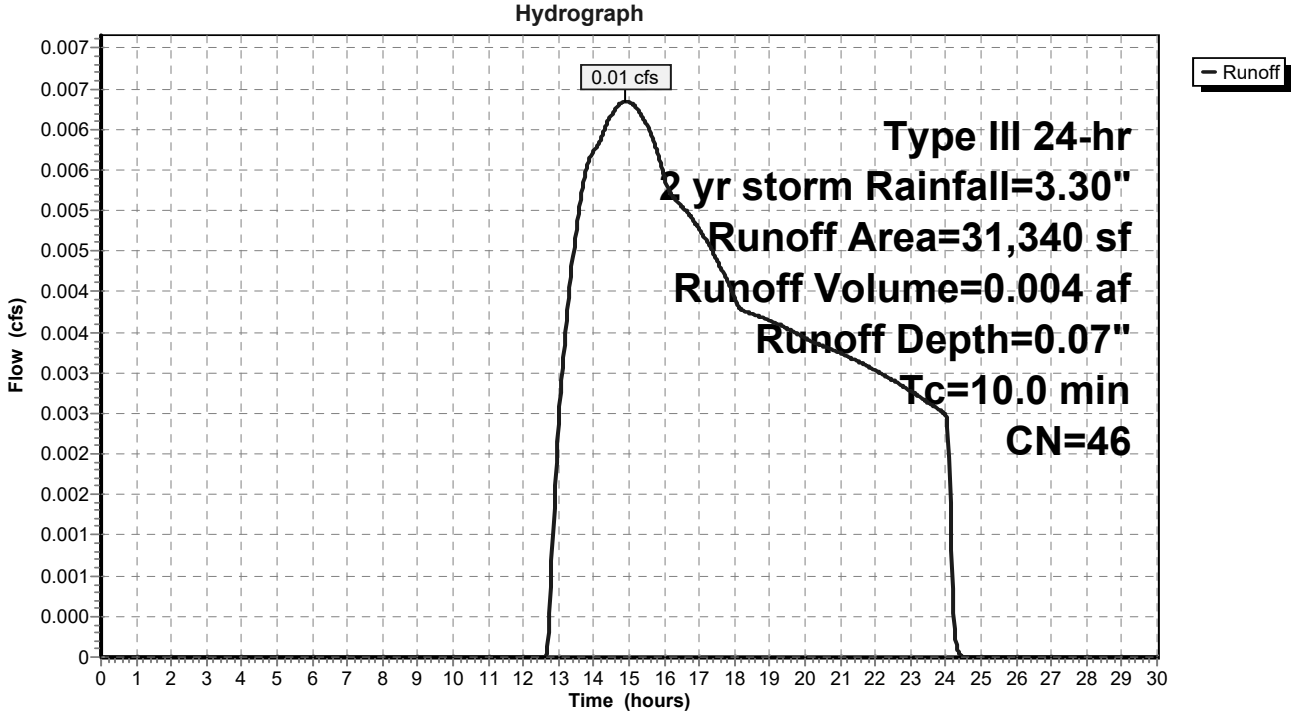
Runoff = 0.01 cfs @ 14.91 hrs, Volume= 0.004 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 yr storm Rainfall=3.30"

Area (sf)	CN	Description
1,660	98	Roofs, HSG A
1,880	98	Paved parking, HSG A
27,800	39	>75% Grass cover, Good, HSG A
31,340	46	Weighted Average
27,800		88.70% Pervious Area
3,540		11.30% Impervious Area

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

Subcatchment EX-NORTH:



Summary for Subcatchment EXIST-TO BROOK:

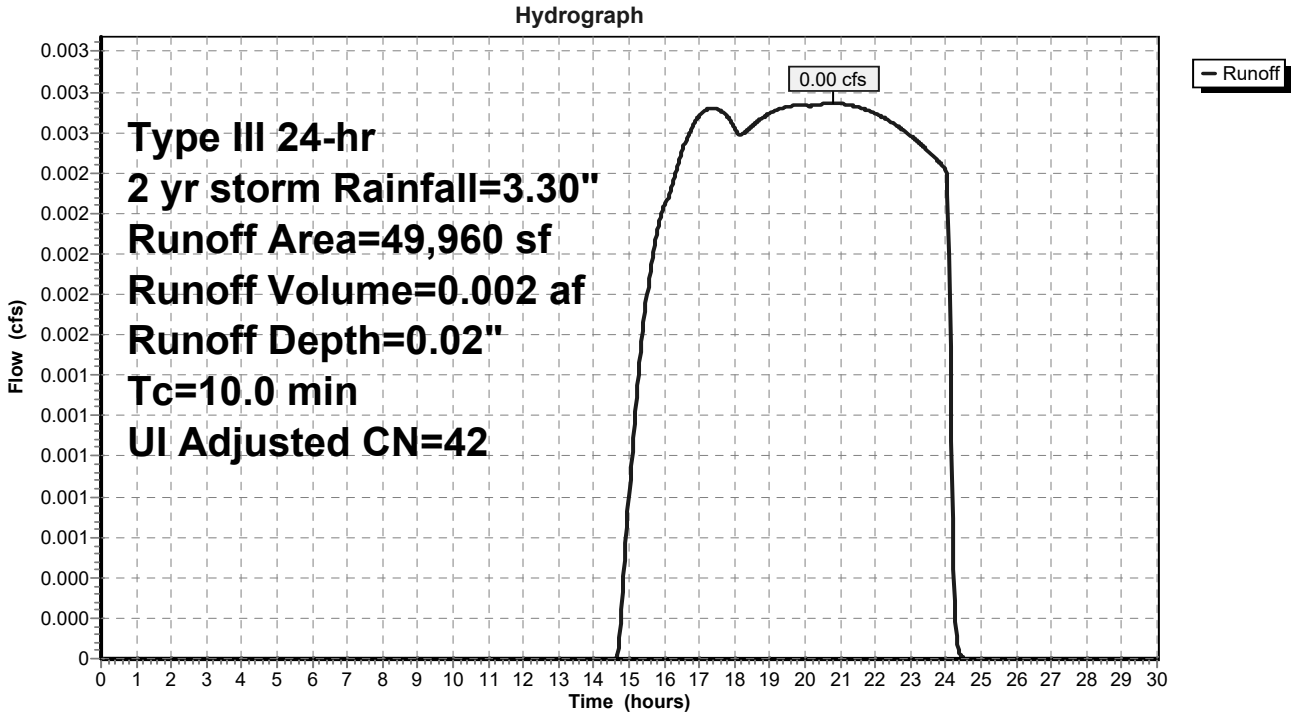
Runoff = 0.00 cfs @ 20.82 hrs, Volume= 0.002 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 yr storm Rainfall=3.30"

	Area (sf)	CN	Adj	Description
	800	98		Roofs, HSG A
	1,520	98		Paved parking, HSG A
*	2,180	98		Unconnected pavement, Path HSG A
	6,500	30		Woods, Good, HSG A
	38,960	39		>75% Grass cover, Good, HSG A
	49,960	43	42	Weighted Average, UI Adjusted
	45,460			90.99% Pervious Area
	4,500			9.01% Impervious Area
	2,180			48.44% Unconnected

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

Subcatchment EXIST-TO BROOK:



Summary for Subcatchment PR-NORTH:

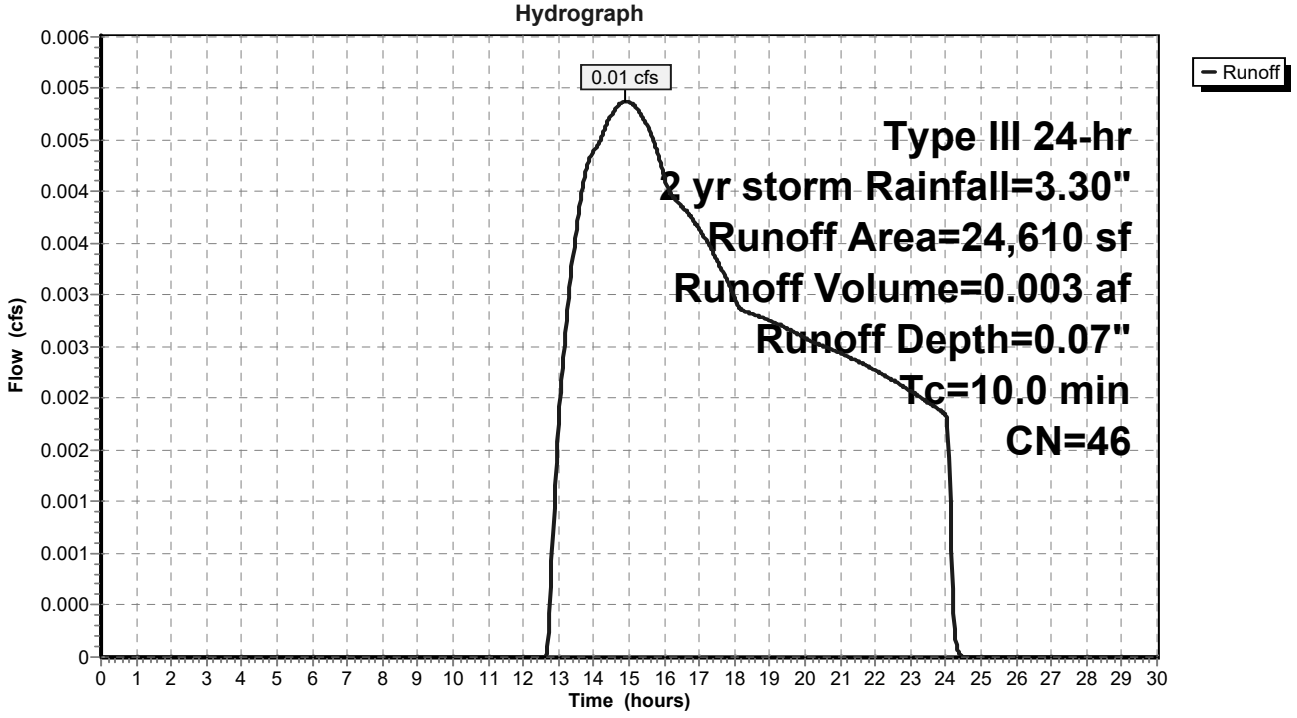
Runoff = 0.01 cfs @ 14.91 hrs, Volume= 0.003 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 yr storm Rainfall=3.30"

Area (sf)	CN	Description
1,490	98	Roofs, HSG A
1,610	98	Paved parking, HSG A
21,510	39	>75% Grass cover, Good, HSG A
24,610	46	Weighted Average
21,510		87.40% Pervious Area
3,100		12.60% Impervious Area

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

Subcatchment PR-NORTH:



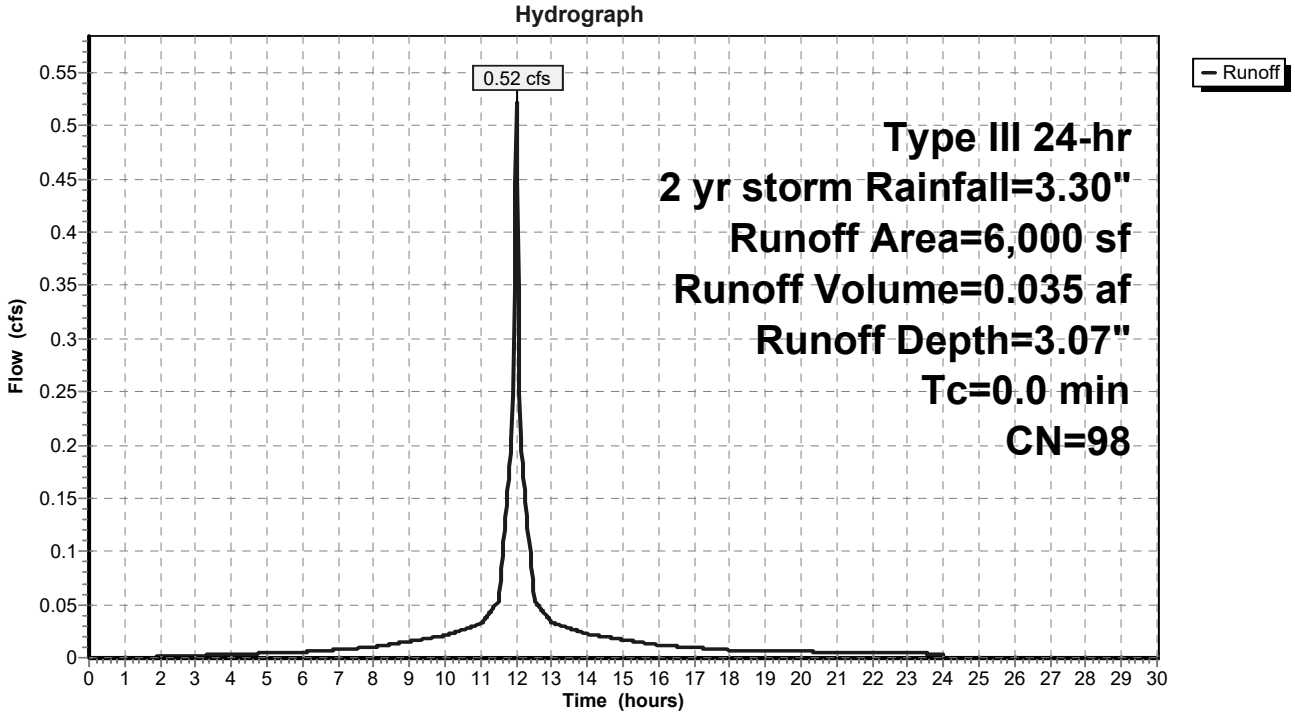
Summary for Subcatchment PROP DWELLINGS: (TO BE DETERMINED)

Runoff = 0.52 cfs @ 12.00 hrs, Volume= 0.035 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 yr storm Rainfall=3.30"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
6,000		100.00% Impervious Area

Subcatchment PROP DWELLINGS: (TO BE DETERMINED)



Summary for Subcatchment PROP-TO BROOK:

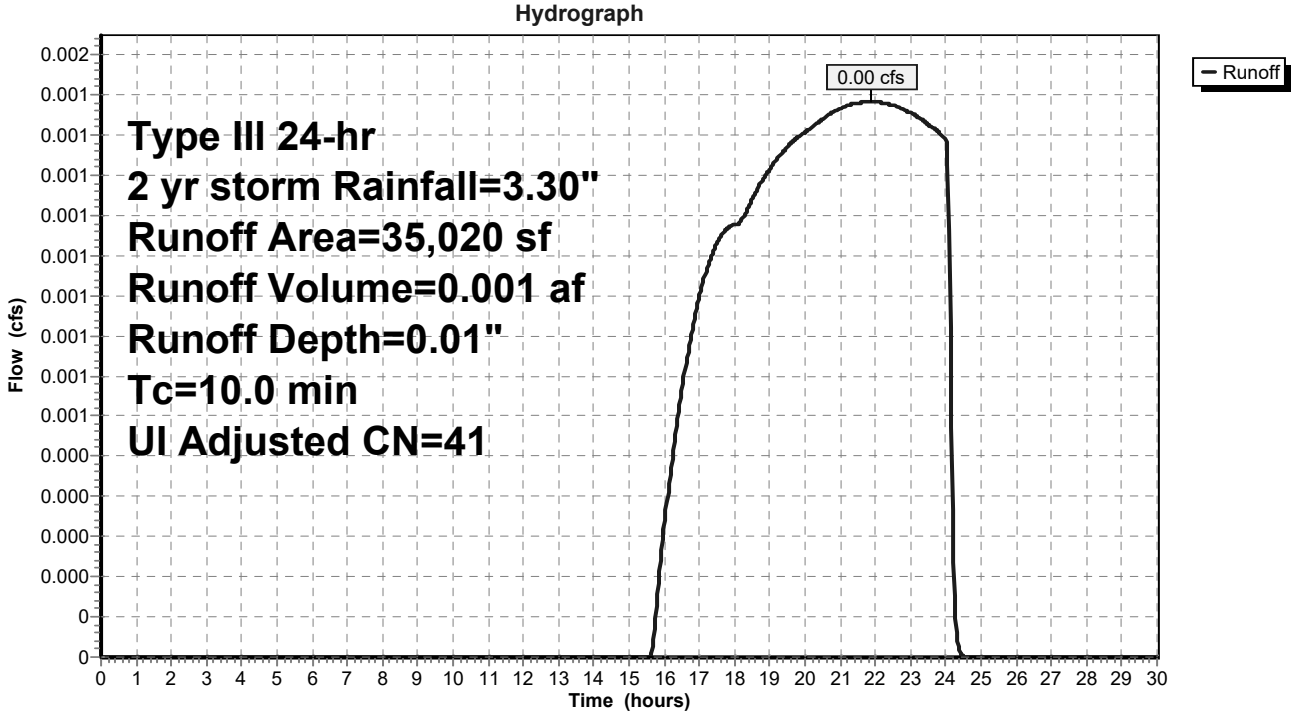
Runoff = 0.00 cfs @ 21.86 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 yr storm Rainfall=3.30"

	Area (sf)	CN	Adj	Description
*	2,180	98		Unconnected pavement, Path HSG A
	32,840	39		>75% Grass cover, Good, HSG A
	35,020	43	41	Weighted Average, UI Adjusted
	32,840			93.77% Pervious Area
	2,180			6.23% Impervious Area
	2,180			100.00% Unconnected

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

Subcatchment PROP-TO BROOK:



Summary for Subcatchment ROADWAY:

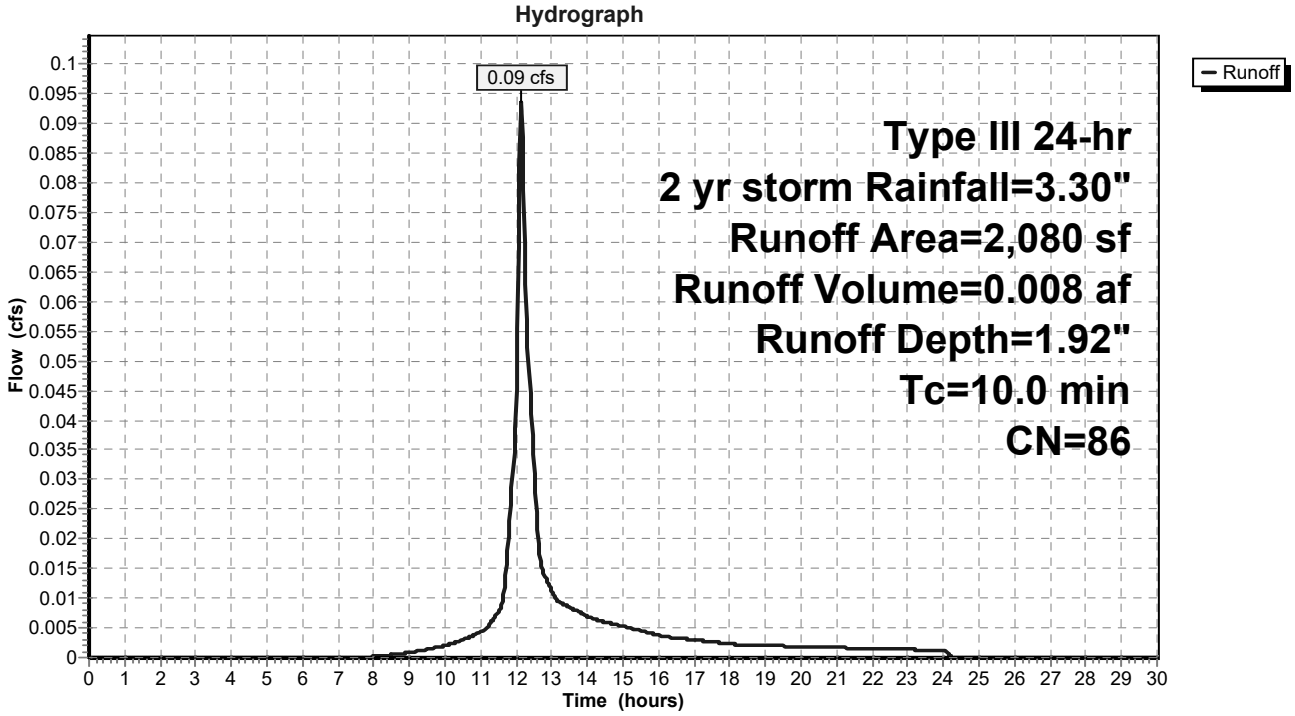
Runoff = 0.09 cfs @ 12.14 hrs, Volume= 0.008 af, Depth= 1.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 yr storm Rainfall=3.30"

Area (sf)	CN	Description
1,640	98	Paved roads w/curbs & sewers, HSG A
440	39	>75% Grass cover, Good, HSG A
2,080	86	Weighted Average
440		21.15% Pervious Area
1,640		78.85% Impervious Area

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

Subcatchment ROADWAY:



Summary for Pond CB-2 & CB-3:

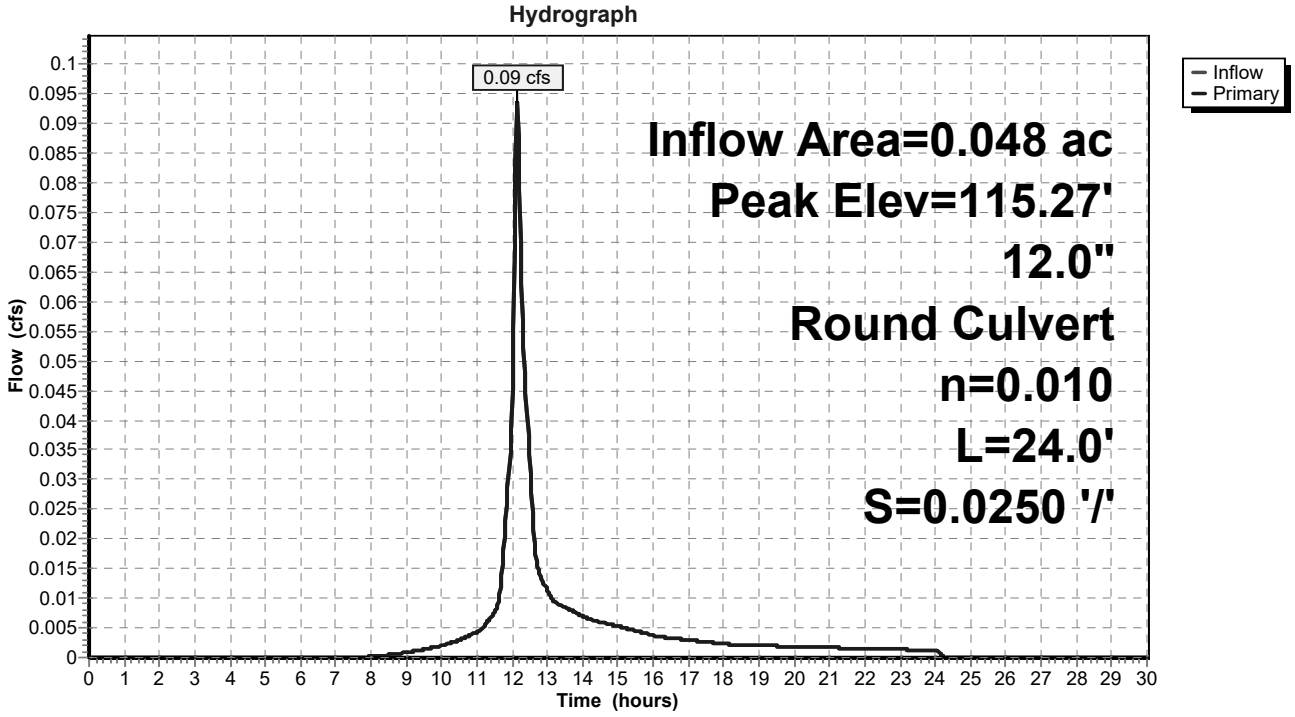
Inflow Area = 0.048 ac, 78.85% Impervious, Inflow Depth = 1.92" for 2 yr storm event
Inflow = 0.09 cfs @ 12.14 hrs, Volume= 0.008 af
Outflow = 0.09 cfs @ 12.14 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min
Primary = 0.09 cfs @ 12.14 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 115.27' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.10'	**12.0" Round Culvert** L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.10' / 114.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.09 cfs @ 12.14 hrs HW=115.27' (Free Discharge)
1=Culvert (Inlet Controls 0.09 cfs @ 1.09 fps)

Pond CB-2 & CB-3:



Summary for Pond DCB-1:

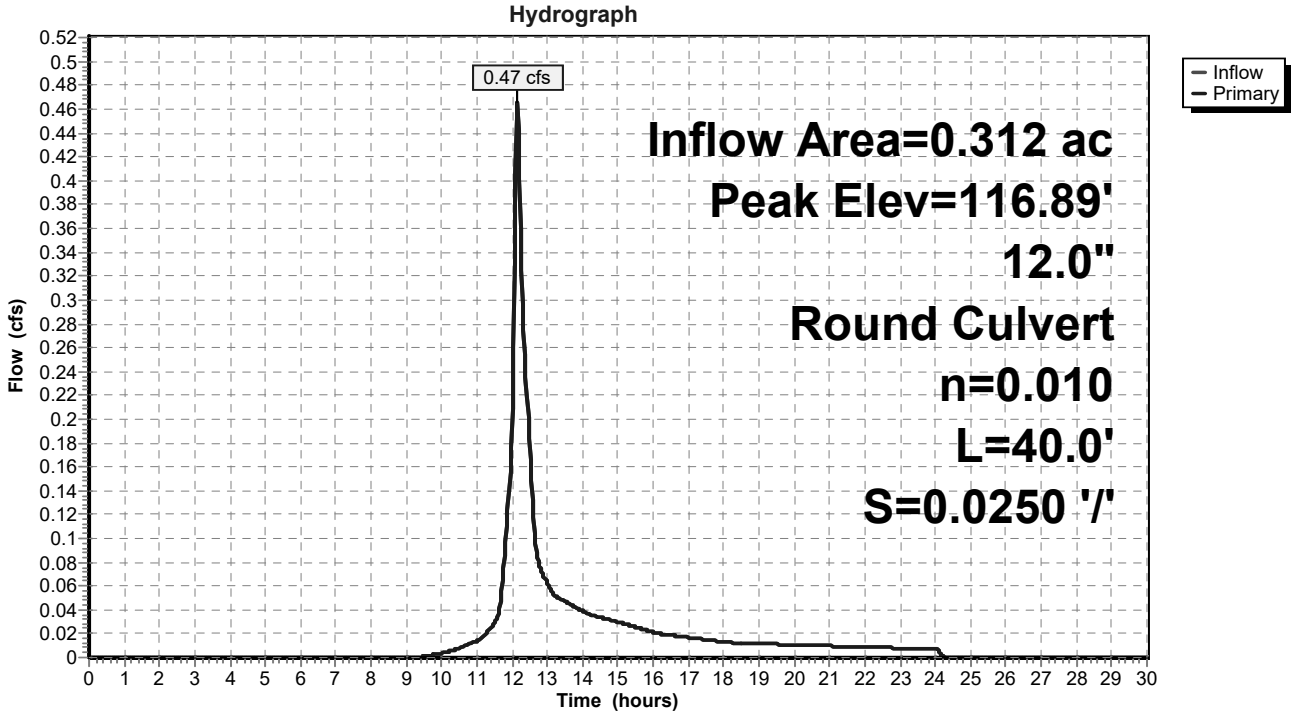
Inflow Area = 0.312 ac, 68.80% Impervious, Inflow Depth = 1.48" for 2 yr storm event
Inflow = 0.47 cfs @ 12.15 hrs, Volume= 0.038 af
Outflow = 0.47 cfs @ 12.15 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.15 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 116.89' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	116.50'	**12.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.50' / 115.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.46 cfs @ 12.15 hrs HW=116.88' (Free Discharge)
1=Culvert (Inlet Controls 0.46 cfs @ 1.67 fps)

Pond DCB-1:



Summary for Pond INF-1:

Inflow Area = 0.312 ac, 68.80% Impervious, Inflow Depth = 1.48" for 2 yr storm event
Inflow = 0.47 cfs @ 12.15 hrs, Volume= 0.038 af
Outflow = 0.23 cfs @ 12.03 hrs, Volume= 0.038 af, Atten= 51%, Lag= 0.0 min
Discarded = 0.23 cfs @ 12.03 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 114.62' @ 12.40 hrs Surf.Area= 1,198 sf Storage= 177 cf

Plug-Flow detention time= 4.0 min calculated for 0.038 af (100% of inflow)
Center-of-Mass det. time= 4.0 min (848.9 - 844.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.20'	1,018 cf	**20.50'W x 58.46'L x 3.50'H Field A** 4,194 cf Overall - 1,286 cf Embedded = 2,908 cf x 35.0% Voids
#2A	114.70'	1,286 cf	**ADS_StormTech SC-740 +Cap** x 28 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 28 Chambers in 4 Rows
		2,304 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	114.20'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.23 cfs @ 12.03 hrs HW=114.24' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Pond INF-1: - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

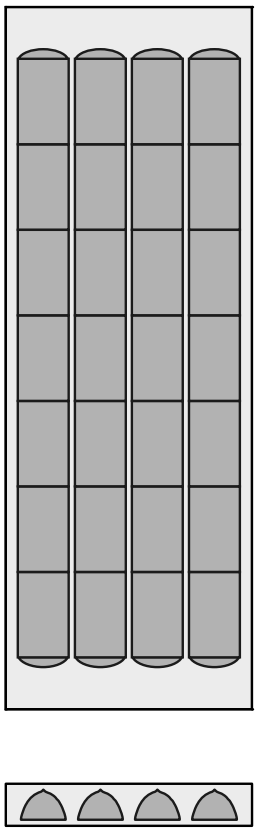
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +42.0" End Stone x 2 = 58.46' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

28 Chambers x 45.9 cf = 1,286.3 cf Chamber Storage

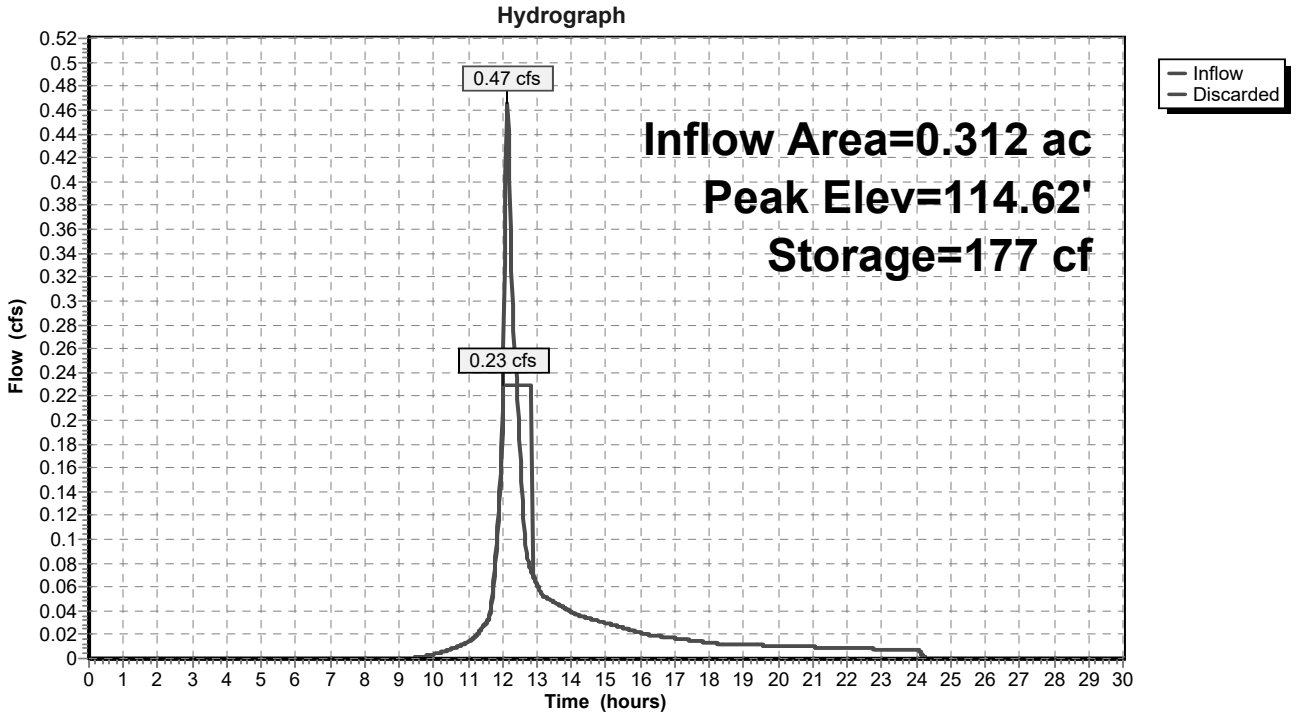
4,194.3 cf Field - 1,286.3 cf Chambers = 2,907.9 cf Stone x 35.0% Voids = 1,017.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,304.1 cf = 0.053 af
Overall Storage Efficiency = 54.9%
Overall System Size = 58.46' x 20.50' x 3.50'

28 Chambers
155.3 cy Field
107.7 cy Stone



Pond INF-1:


Hydrograph
Inflow Area=0.312 ac
Peak Elev=114.62'
Storage=177 cf
0.47 cfs
0.23 cfs
Inflow
Discarded
Flow (cfs)
Time (hours)

Summary for Pond INF-2:

Inflow Area = 0.048 ac, 78.85% Impervious, Inflow Depth = 1.92" for 2 yr storm event
Inflow = 0.09 cfs @ 12.14 hrs, Volume= 0.008 af
Outflow = 0.04 cfs @ 12.03 hrs, Volume= 0.008 af, Atten= 56%, Lag= 0.0 min
Discarded = 0.04 cfs @ 12.03 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 113.52' @ 12.42 hrs Surf.Area= 217 sf Storage= 41 cf

Plug-Flow detention time= 5.0 min calculated for 0.008 af (100% of inflow)
Center-of-Mass det. time= 5.0 min (829.9 - 824.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	113.00'	201 cf	**11.50'W x 18.86'L x 3.50'H Field A** 759 cf Overall - 184 cf Embedded = 575 cf x 35.0% Voids
#2A	113.50'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 4 Chambers in 2 Rows
		385 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	113.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 12.03 hrs HW=113.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Pond INF-2: - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 12.0" Spacing = 63.0" C-C Row Spacing

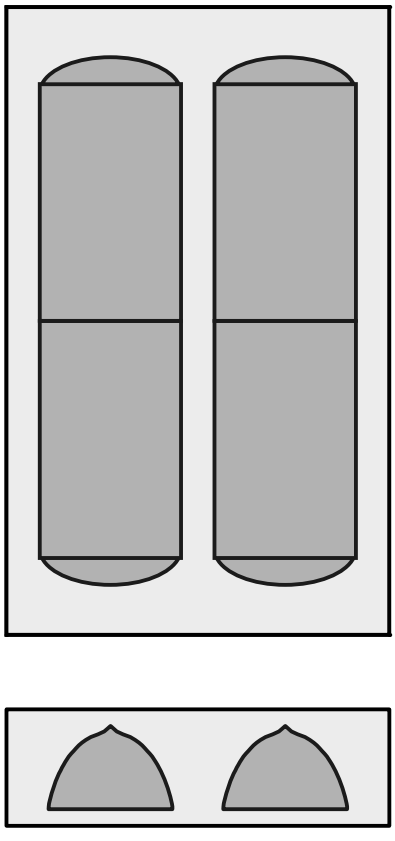
2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +18.0" End Stone x 2 = 18.86' Base Length
2 Rows x 51.0" Wide + 12.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

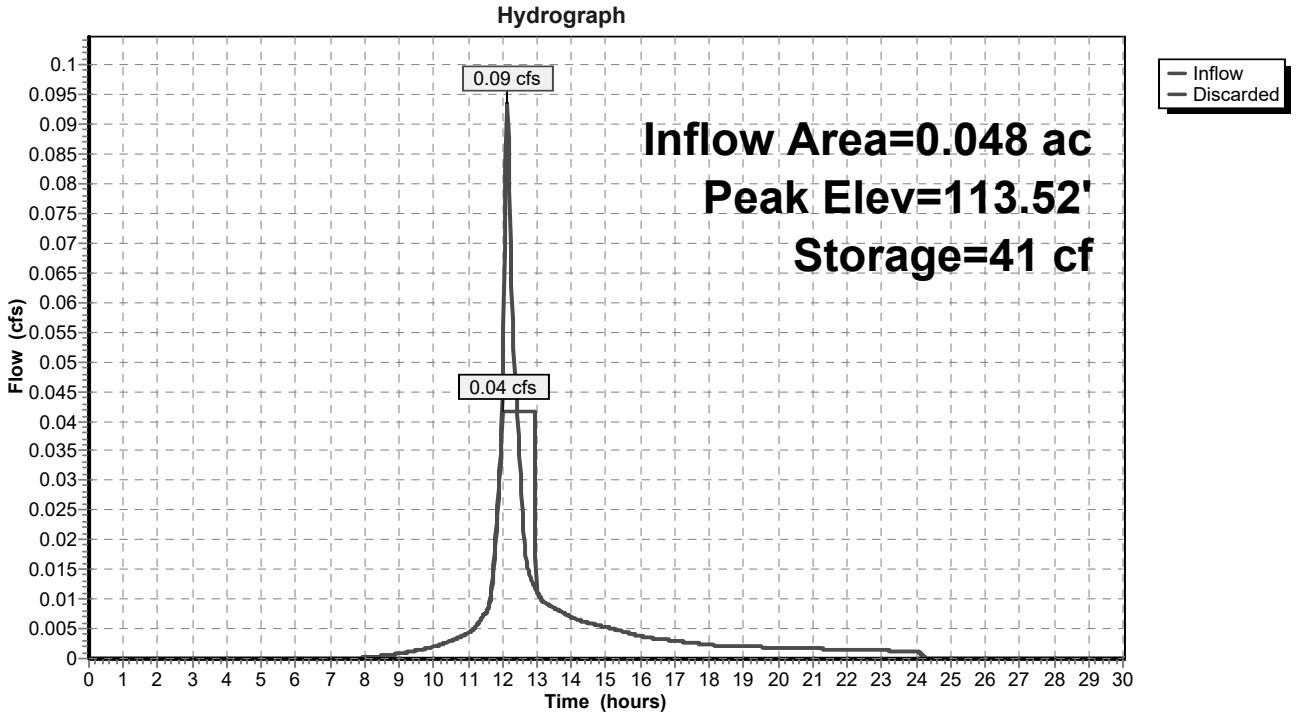
759.0 cf Field - 183.8 cf Chambers = 575.2 cf Stone x 35.0% Voids = 201.3 cf Stone Storage

Chamber Storage + Stone Storage = 385.1 cf = 0.009 af
Overall Storage Efficiency = 50.7%
Overall System Size = 18.86' x 11.50' x 3.50'

4 Chambers
28.1 cy Field
21.3 cy Stone



Pond INF-2:


Hydrograph
Inflow
Discarded
0.09 cfs
0.04 cfs
Inflow Area=0.048 ac
Peak Elev=113.52'
Storage=41 cf
Flow (cfs)
Time (hours)

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CUL-DE-SAC: Runoff Area=13,590 sf 68.80% Impervious Runoff Depth=3.07"
Tc=10.0 min CN=80 Runoff=0.98 cfs 0.080 af

Subcatchment EX-NORTH: Runoff Area=31,340 sf 11.30% Impervious Runoff Depth=0.56"
Tc=10.0 min CN=46 Runoff=0.20 cfs 0.033 af

Subcatchment EXIST-TO BROOK: Runoff Area=49,960 sf 9.01% Impervious Runoff Depth=0.37"
Tc=10.0 min UI Adjusted CN=42 Runoff=0.15 cfs 0.035 af

Subcatchment PR-NORTH: Runoff Area=24,610 sf 12.60% Impervious Runoff Depth=0.56"
Tc=10.0 min CN=46 Runoff=0.16 cfs 0.026 af

Subcatchment PROP DWELLINGS: (TO BE Runoff Area=6,000 sf 100.00% Impervious Runoff Depth=4.96"
Tc=0.0 min CN=98 Runoff=0.83 cfs 0.057 af

Subcatchment PROP-TO BROOK: Runoff Area=35,020 sf 6.23% Impervious Runoff Depth=0.32"
Tc=10.0 min UI Adjusted CN=41 Runoff=0.08 cfs 0.022 af

Subcatchment ROADWAY: Runoff Area=2,080 sf 78.85% Impervious Runoff Depth=3.65"
Tc=10.0 min CN=86 Runoff=0.18 cfs 0.015 af

Pond CB-2 & CB-3: Peak Elev=115.33' Inflow=0.18 cfs 0.015 af
12.0" Round Culvert n=0.010 L=24.0' S=0.0250 '/' Outflow=0.18 cfs 0.015 af

Pond DCB-1: Peak Elev=117.08' Inflow=0.98 cfs 0.080 af
12.0" Round Culvert n=0.010 L=40.0' S=0.0250 '/' Outflow=0.98 cfs 0.080 af

Pond INF-1: Peak Elev=115.43' Storage=853 cf Inflow=0.98 cfs 0.080 af
Outflow=0.23 cfs 0.080 af

Pond INF-2: Peak Elev=114.31' Storage=153 cf Inflow=0.18 cfs 0.015 af
Outflow=0.04 cfs 0.015 af

Total Runoff Area = 3.733 ac Runoff Volume = 0.268 af Average Runoff Depth = 0.86"
81.36% Pervious = 3.037 ac 18.64% Impervious = 0.696 ac

Summary for Subcatchment CUL-DE-SAC:

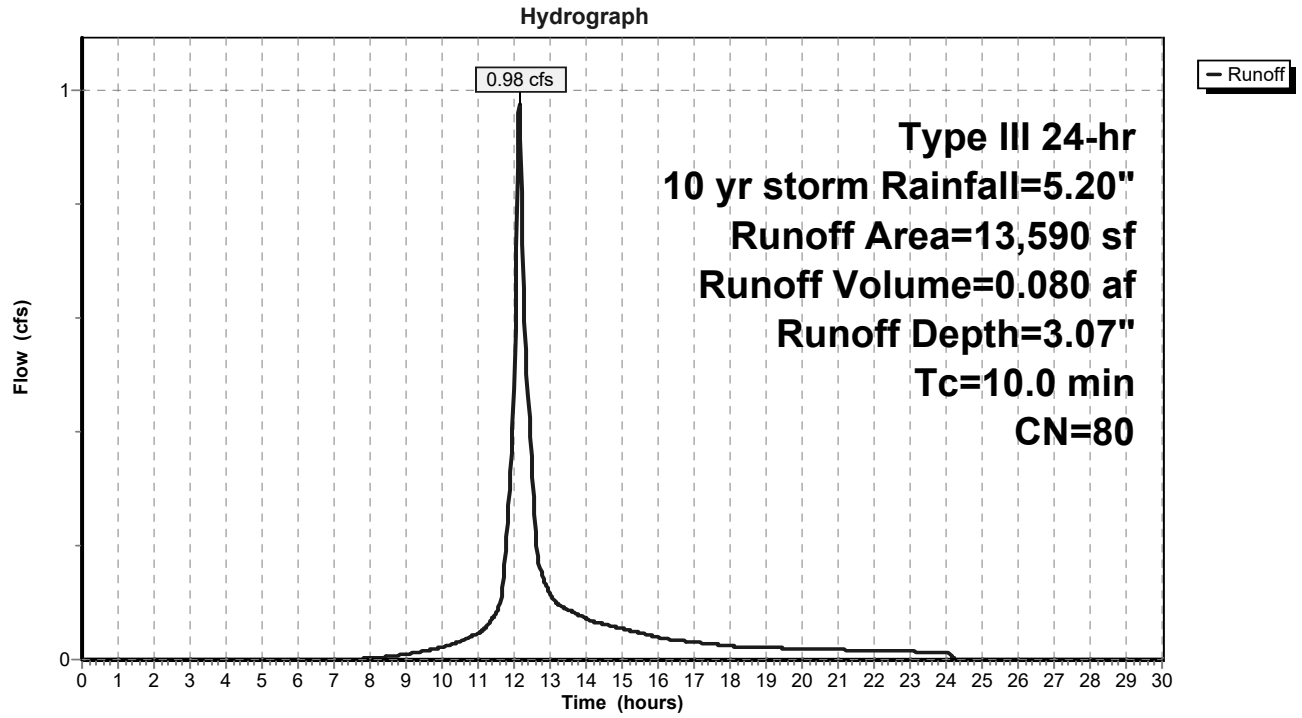
Runoff = 0.98 cfs @ 12.14 hrs, Volume= 0.080 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr storm Rainfall=5.20"

Area (sf)	CN	Description
9,350	98	Paved roads w/curbs & sewers, HSG A
4,240	39	>75% Grass cover, Good, HSG A
13,590	80	Weighted Average
4,240		31.20% Pervious Area
9,350		68.80% Impervious Area

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

Subcatchment CUL-DE-SAC:



Summary for Subcatchment EX-NORTH:

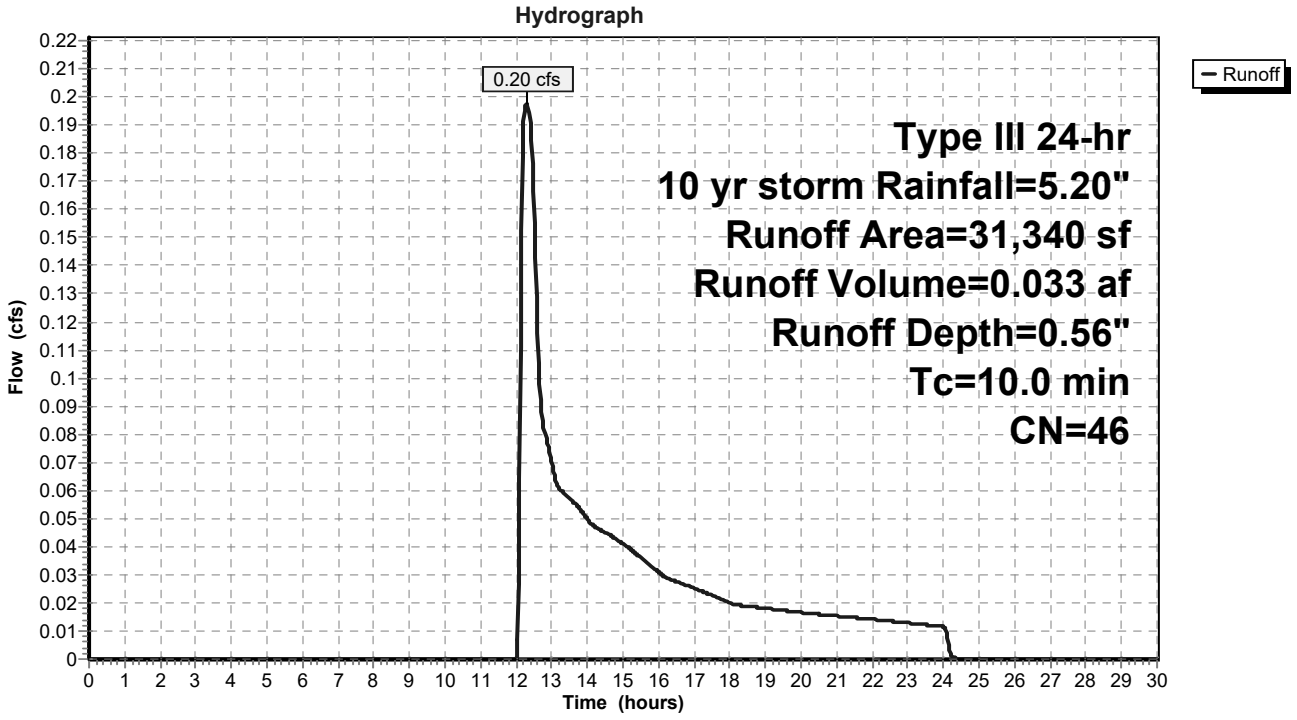
Runoff = 0.20 cfs @ 12.30 hrs, Volume= 0.033 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr storm Rainfall=5.20"

Area (sf)	CN	Description
1,660	98	Roofs, HSG A
1,880	98	Paved parking, HSG A
27,800	39	>75% Grass cover, Good, HSG A
31,340	46	Weighted Average
27,800		88.70% Pervious Area
3,540		11.30% Impervious Area

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

Subcatchment EX-NORTH:



Summary for Subcatchment EXIST-TO BROOK:

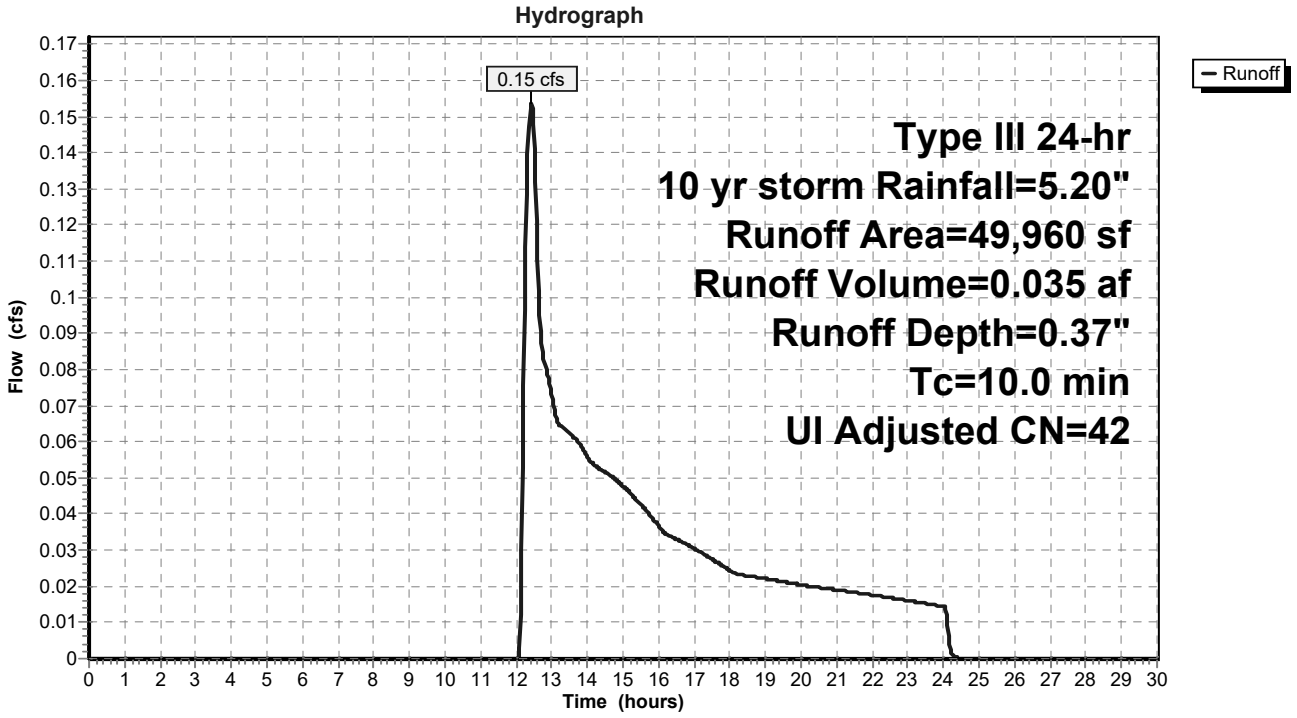
Runoff = 0.15 cfs @ 12.42 hrs, Volume= 0.035 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr storm Rainfall=5.20"

	Area (sf)	CN	Adj	Description
	800	98		Roofs, HSG A
	1,520	98		Paved parking, HSG A
*	2,180	98		Unconnected pavement, Path HSG A
	6,500	30		Woods, Good, HSG A
	38,960	39		>75% Grass cover, Good, HSG A
	49,960	43	42	Weighted Average, UI Adjusted
	45,460			90.99% Pervious Area
	4,500			9.01% Impervious Area
	2,180			48.44% Unconnected

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

Subcatchment EXIST-TO BROOK:



Summary for Subcatchment PR-NORTH:

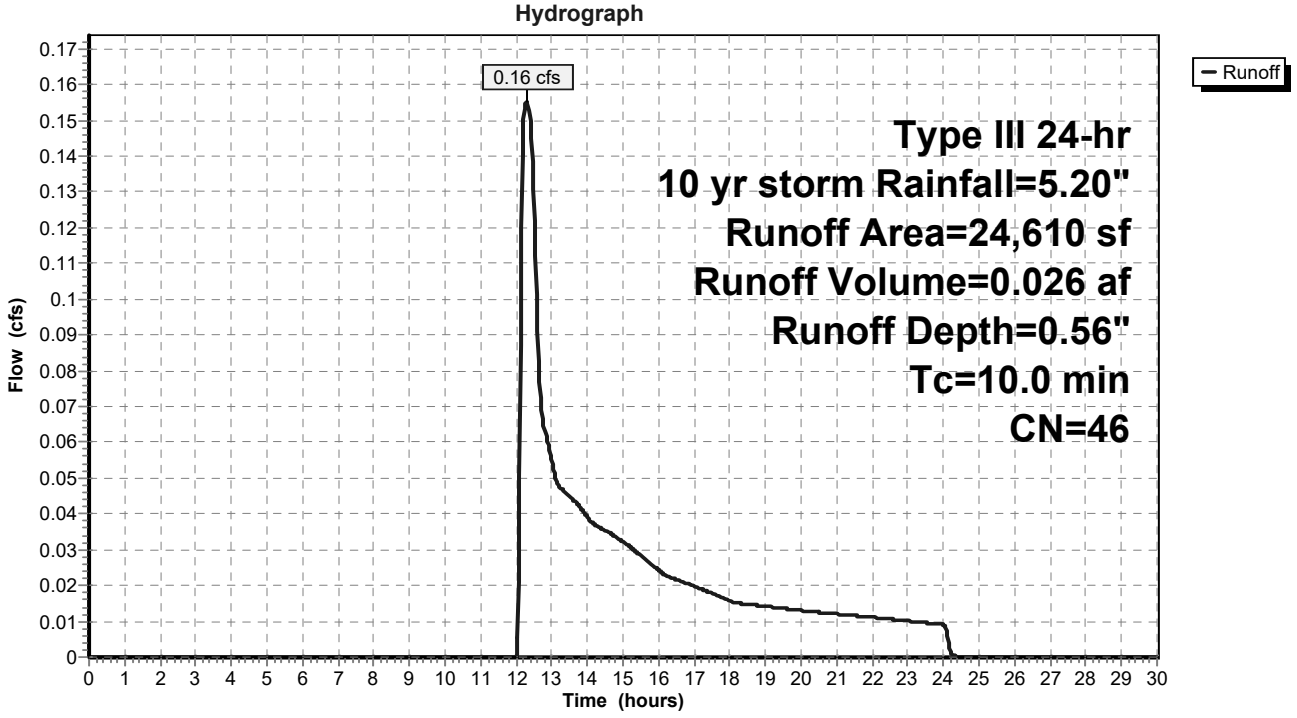
Runoff = 0.16 cfs @ 12.30 hrs, Volume= 0.026 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr storm Rainfall=5.20"

Area (sf)	CN	Description
1,490	98	Roofs, HSG A
1,610	98	Paved parking, HSG A
21,510	39	>75% Grass cover, Good, HSG A
24,610	46	Weighted Average
21,510		87.40% Pervious Area
3,100		12.60% Impervious Area

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

Subcatchment PR-NORTH:



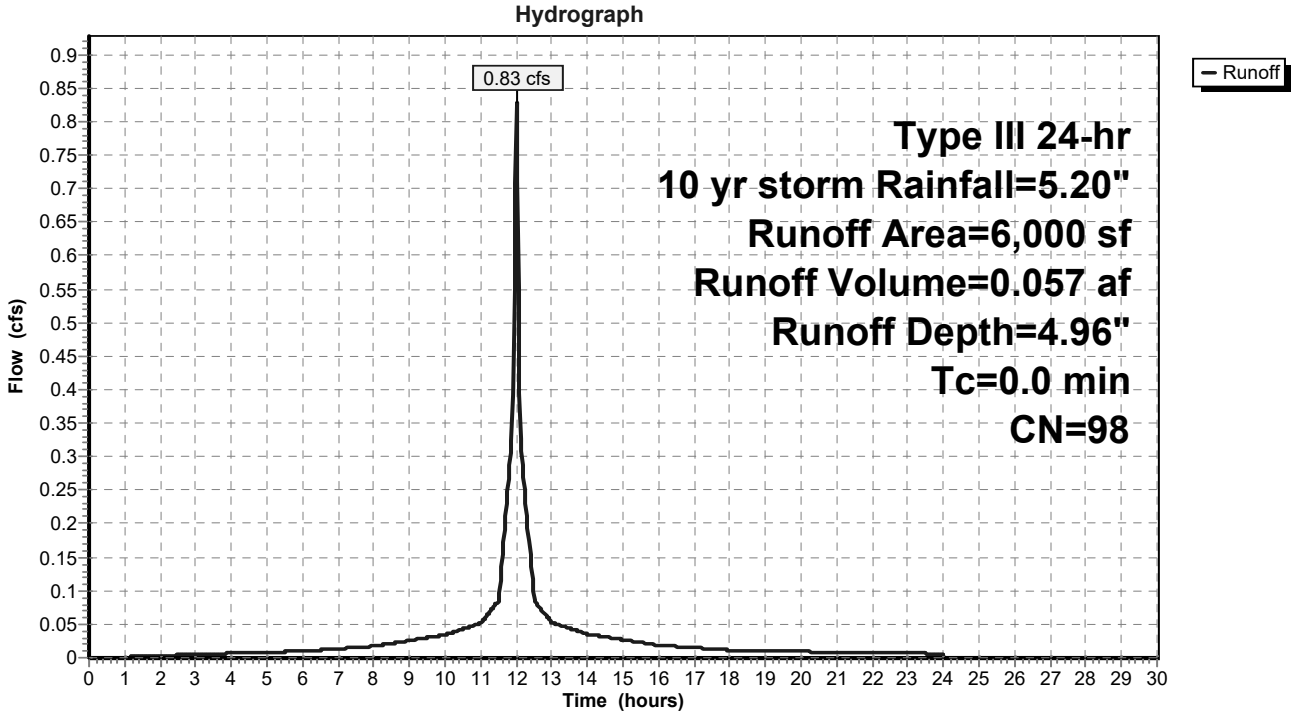
Summary for Subcatchment PROP DWELLINGS: (TO BE DETERMINED)

Runoff = 0.83 cfs @ 12.00 hrs, Volume= 0.057 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr storm Rainfall=5.20"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
6,000		100.00% Impervious Area

Subcatchment PROP DWELLINGS: (TO BE DETERMINED)



Summary for Subcatchment PROP-TO BROOK:

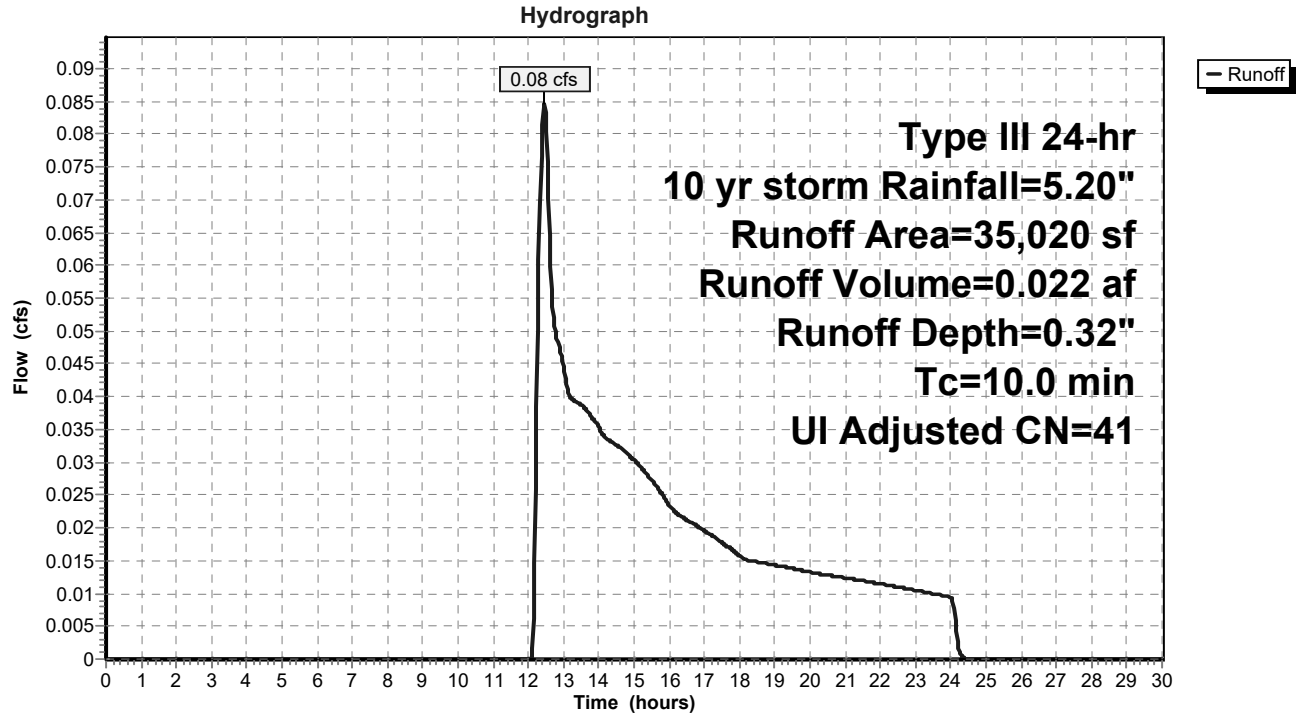
Runoff = 0.08 cfs @ 12.44 hrs, Volume= 0.022 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr storm Rainfall=5.20"

	Area (sf)	CN	Adj	Description
*	2,180	98		Unconnected pavement, Path HSG A
	32,840	39		>75% Grass cover, Good, HSG A
	35,020	43	41	Weighted Average, UI Adjusted
	32,840			93.77% Pervious Area
	2,180			6.23% Impervious Area
	2,180			100.00% Unconnected

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

Subcatchment PROP-TO BROOK:



Summary for Subcatchment ROADWAY:

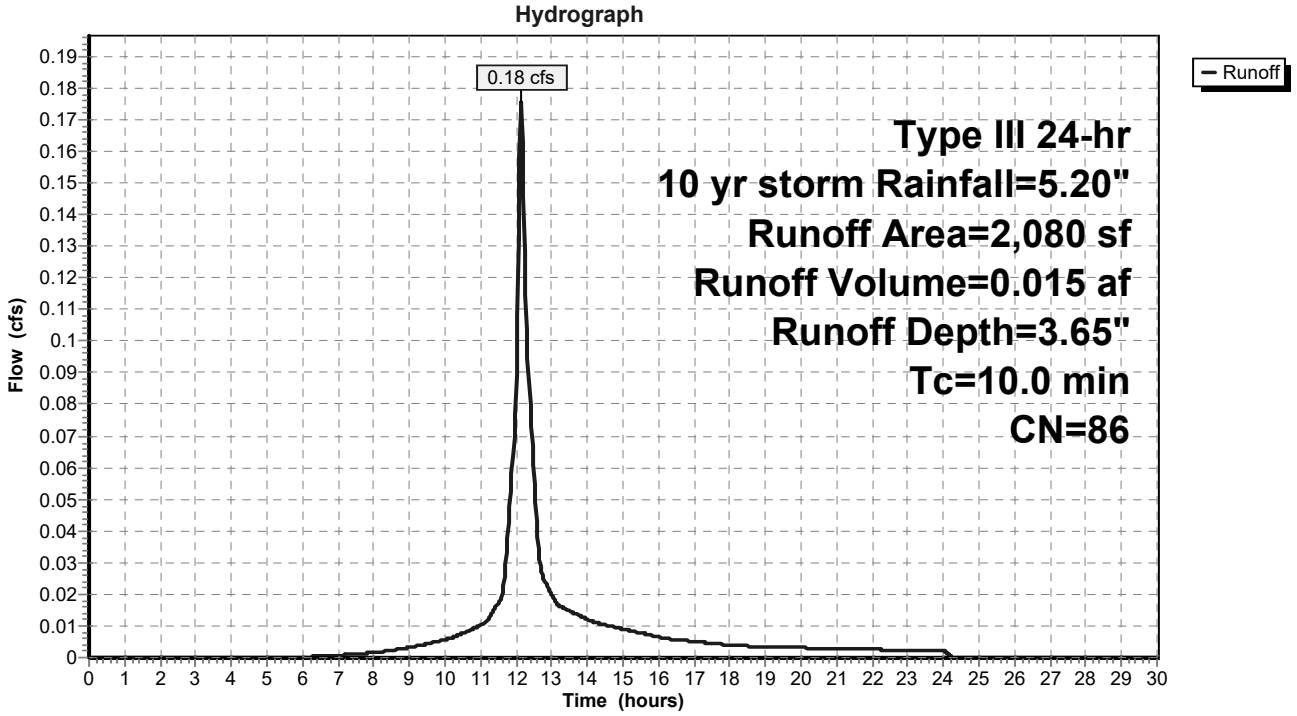
Runoff = 0.18 cfs @ 12.14 hrs, Volume= 0.015 af, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 yr storm Rainfall=5.20"

Area (sf)	CN	Description
1,640	98	Paved roads w/curbs & sewers, HSG A
440	39	>75% Grass cover, Good, HSG A
2,080	86	Weighted Average
440		21.15% Pervious Area
1,640		78.85% Impervious Area

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

Subcatchment ROADWAY:



Summary for Pond CB-2 & CB-3:

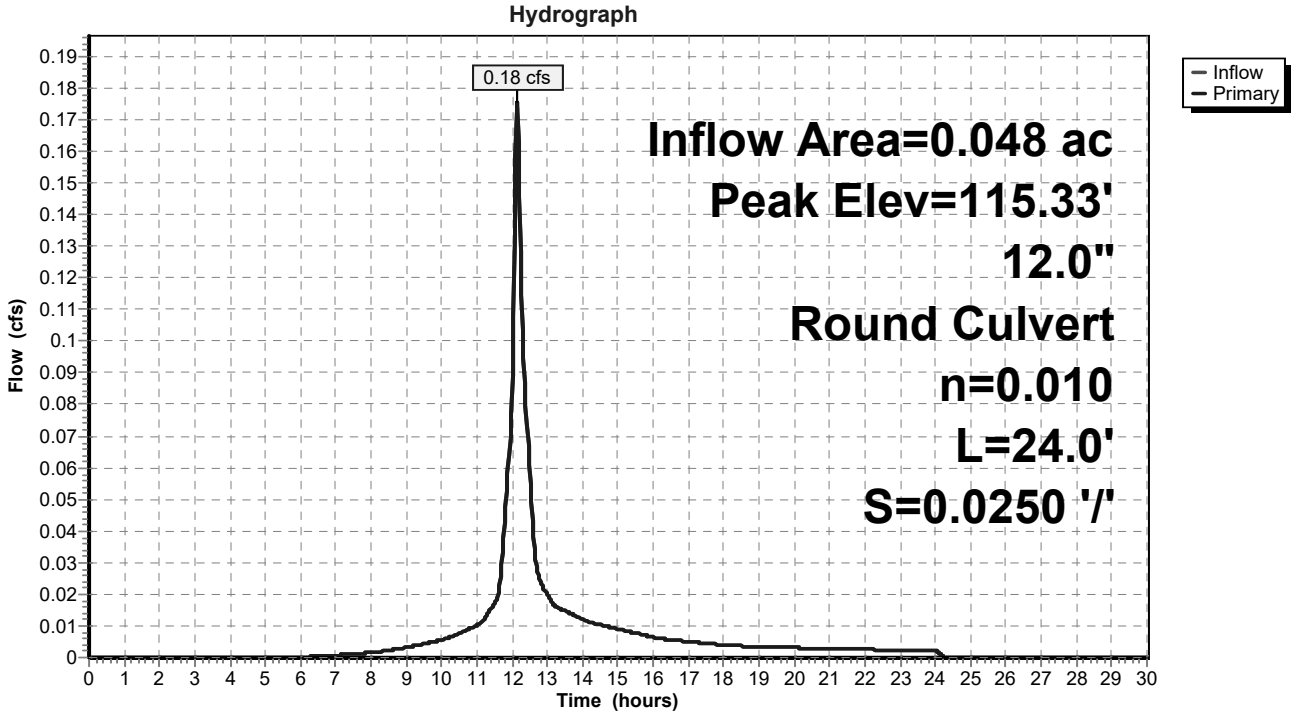
Inflow Area = 0.048 ac, 78.85% Impervious, Inflow Depth = 3.65" for 10 yr storm event
Inflow = 0.18 cfs @ 12.14 hrs, Volume= 0.015 af
Outflow = 0.18 cfs @ 12.14 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.14 hrs, Volume= 0.015 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 115.33' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.10'	**12.0" Round Culvert** L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.10' / 114.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.17 cfs @ 12.14 hrs HW=115.33' (Free Discharge)
1=Culvert (Inlet Controls 0.17 cfs @ 1.29 fps)

Pond CB-2 & CB-3:



Summary for Pond DCB-1:

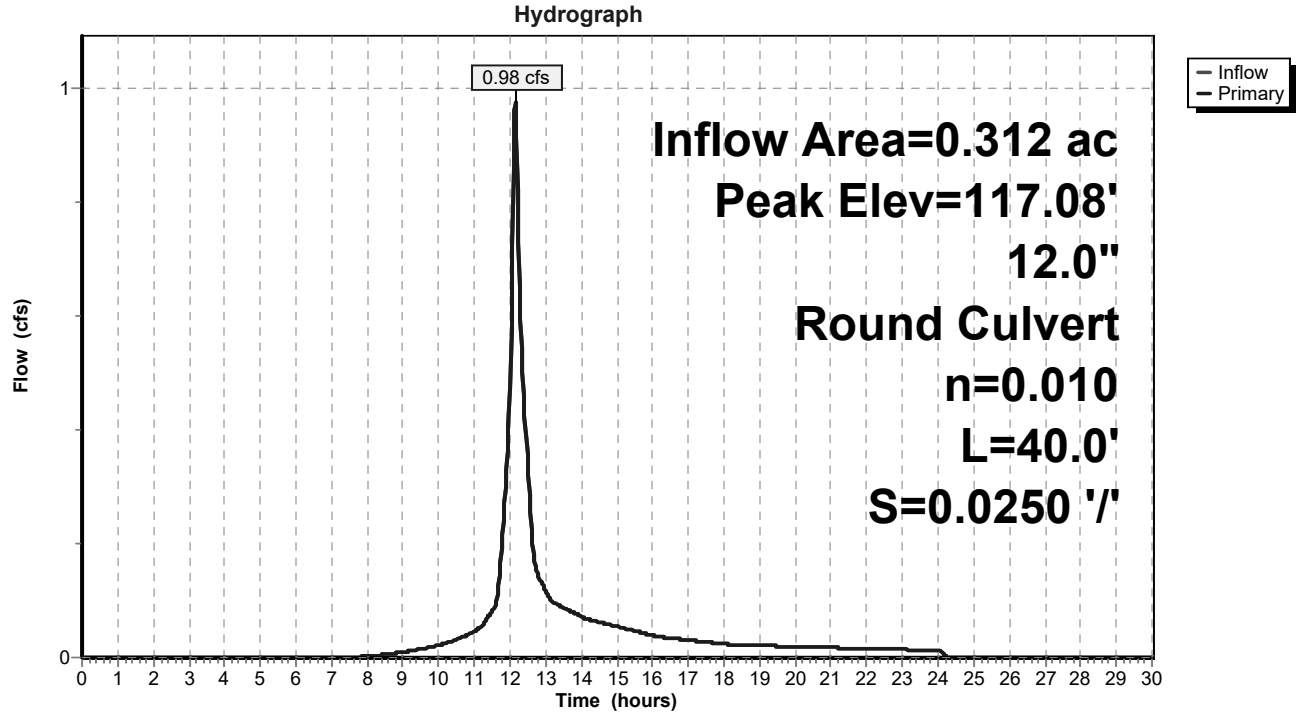
Inflow Area = 0.312 ac, 68.80% Impervious, Inflow Depth = 3.07" for 10 yr storm event
Inflow = 0.98 cfs @ 12.14 hrs, Volume= 0.080 af
Outflow = 0.98 cfs @ 12.14 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min
Primary = 0.98 cfs @ 12.14 hrs, Volume= 0.080 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 117.08' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	116.50'	**12.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.50' / 115.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.97 cfs @ 12.14 hrs HW=117.08' (Free Discharge)
1=Culvert (Inlet Controls 0.97 cfs @ 2.05 fps)

Pond DCB-1:



Summary for Pond INF-1:

Inflow Area = 0.312 ac, 68.80% Impervious, Inflow Depth = 3.07" for 10 yr storm event
Inflow = 0.98 cfs @ 12.14 hrs, Volume= 0.080 af
Outflow = 0.23 cfs @ 11.85 hrs, Volume= 0.080 af, Atten= 76%, Lag= 0.0 min
Discarded = 0.23 cfs @ 11.85 hrs, Volume= 0.080 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 115.43' @ 12.60 hrs Surf.Area= 1,198 sf Storage= 853 cf

Plug-Flow detention time= 21.6 min calculated for 0.080 af (100% of inflow)
Center-of-Mass det. time= 21.6 min (845.4 - 823.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.20'	1,018 cf	**20.50'W x 58.46'L x 3.50'H Field A** 4,194 cf Overall - 1,286 cf Embedded = 2,908 cf x 35.0% Voids
#2A	114.70'	1,286 cf	**ADS_StormTech SC-740 +Cap** x 28 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 28 Chambers in 4 Rows
		2,304 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	114.20'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.23 cfs @ 11.85 hrs HW=114.24' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Pond INF-1: - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

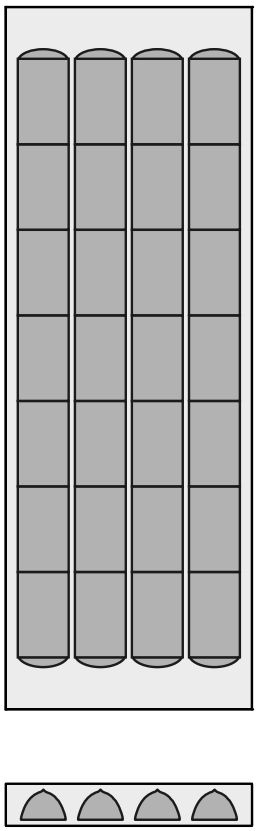
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +42.0" End Stone x 2 = 58.46' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

28 Chambers x 45.9 cf = 1,286.3 cf Chamber Storage

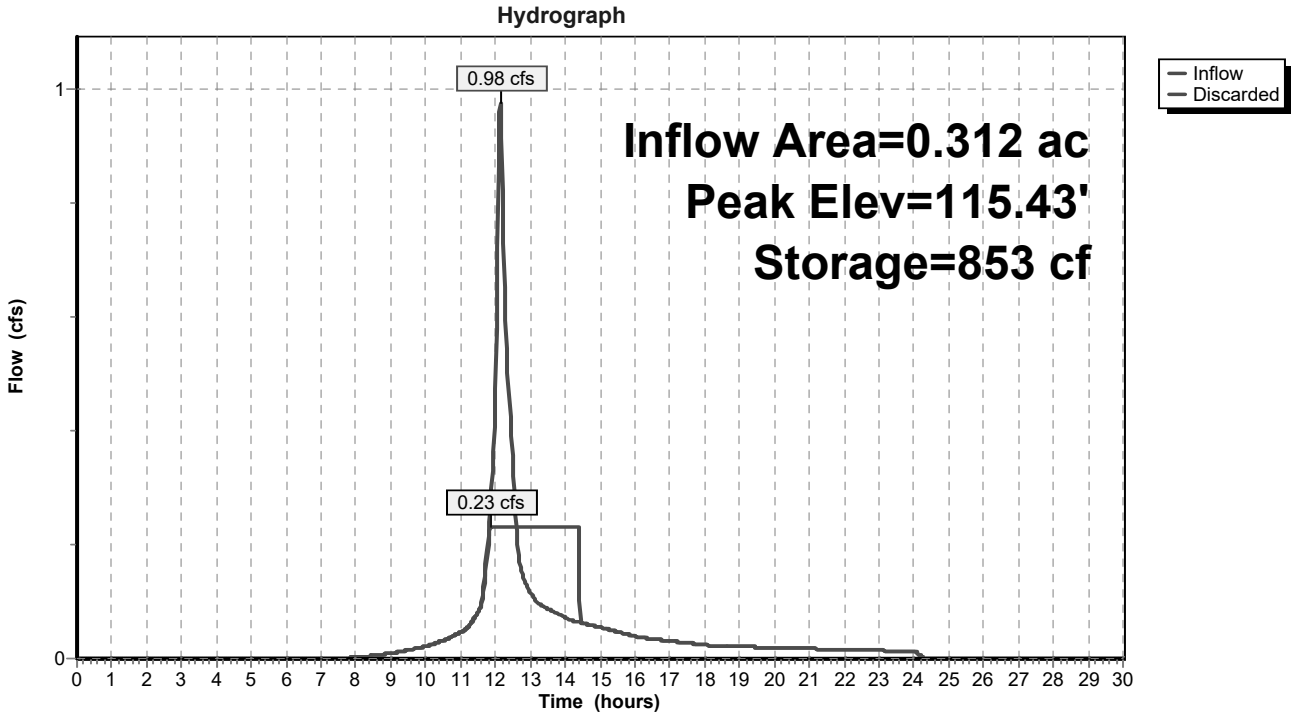
4,194.3 cf Field - 1,286.3 cf Chambers = 2,907.9 cf Stone x 35.0% Voids = 1,017.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,304.1 cf = 0.053 af
Overall Storage Efficiency = 54.9%
Overall System Size = 58.46' x 20.50' x 3.50'

28 Chambers
155.3 cy Field
107.7 cy Stone



Pond INF-1:


Hydrograph
Inflow
Discarded
0.98 cfs
0.23 cfs
Inflow Area=0.312 ac
Peak Elev=115.43'
Storage=853 cf
Flow (cfs)
Time (hours)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Summary for Pond INF-2:

Inflow Area = 0.048 ac, 78.85% Impervious, Inflow Depth = 3.65" for 10 yr storm event
Inflow = 0.18 cfs @ 12.14 hrs, Volume= 0.015 af
Outflow = 0.04 cfs @ 11.82 hrs, Volume= 0.015 af, Atten= 76%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.82 hrs, Volume= 0.015 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 114.31' @ 12.58 hrs Surf.Area= 217 sf Storage= 153 cf

Plug-Flow detention time= 20.6 min calculated for 0.015 af (100% of inflow)
Center-of-Mass det. time= 20.5 min (827.2 - 806.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	113.00'	201 cf	**11.50'W x 18.86'L x 3.50'H Field A** 759 cf Overall - 184 cf Embedded = 575 cf x 35.0% Voids
#2A	113.50'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 4 Chambers in 2 Rows
		385 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	113.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 11.82 hrs HW=113.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Pond INF-2: - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 12.0" Spacing = 63.0" C-C Row Spacing

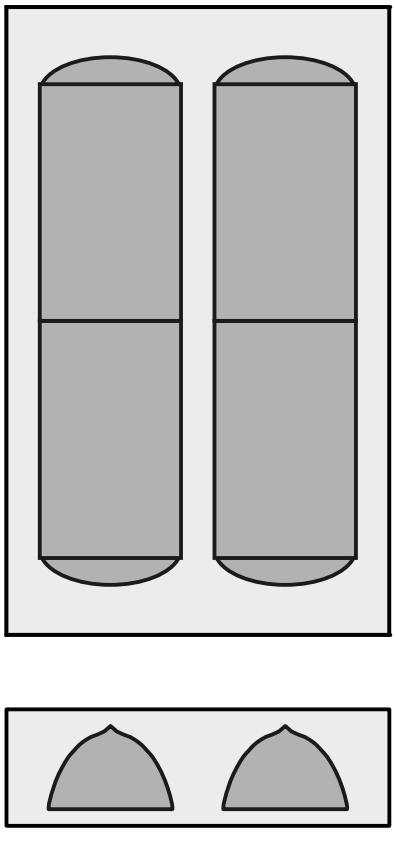
2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +18.0" End Stone x 2 = 18.86' Base Length
2 Rows x 51.0" Wide + 12.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

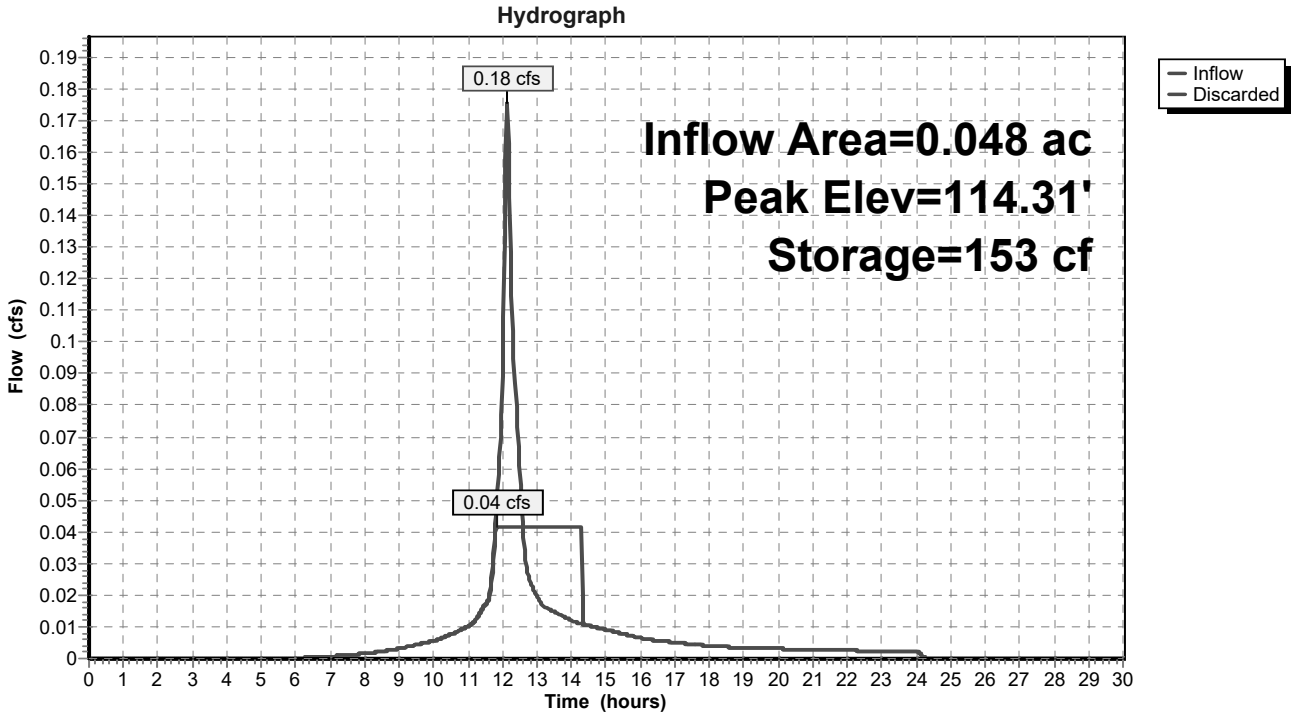
759.0 cf Field - 183.8 cf Chambers = 575.2 cf Stone x 35.0% Voids = 201.3 cf Stone Storage

Chamber Storage + Stone Storage = 385.1 cf = 0.009 af
Overall Storage Efficiency = 50.7%
Overall System Size = 18.86' x 11.50' x 3.50'

4 Chambers
28.1 cy Field
21.3 cy Stone



Pond INF-2:


Hydrograph
Inflow Area=0.048 ac
Peak Elev=114.31'
Storage=153 cf
0.18 cfs
0.04 cfs
Inflow
Discarded
Flow (cfs)
Time (hours)

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CUL-DE-SAC: Runoff Area=13,590 sf 68.80% Impervious Runoff Depth=4.97"
Tc=10.0 min CN=80 Runoff=1.57 cfs 0.129 af

Subcatchment EX-NORTH: Runoff Area=31,340 sf 11.30% Impervious Runoff Depth=1.47"
Tc=10.0 min CN=46 Runoff=0.87 cfs 0.088 af

Subcatchment EXIST-TO BROOK: Runoff Area=49,960 sf 9.01% Impervious Runoff Depth=1.12"
Tc=10.0 min UI Adjusted CN=42 Runoff=0.89 cfs 0.107 af

Subcatchment PR-NORTH: Runoff Area=24,610 sf 12.60% Impervious Runoff Depth=1.47"
Tc=10.0 min CN=46 Runoff=0.68 cfs 0.069 af

Subcatchment PROP DWELLINGS: (TO BE Runoff Area=6,000 sf 100.00% Impervious Runoff Depth=7.06"
Tc=0.0 min CN=98 Runoff=1.17 cfs 0.081 af

Subcatchment PROP-TO BROOK: Runoff Area=35,020 sf 6.23% Impervious Runoff Depth=1.04"
Tc=10.0 min UI Adjusted CN=41 Runoff=0.54 cfs 0.070 af

Subcatchment ROADWAY: Runoff Area=2,080 sf 78.85% Impervious Runoff Depth=5.65"
Tc=10.0 min CN=86 Runoff=0.27 cfs 0.023 af

Pond CB-2 & CB-3: Peak Elev=115.39' Inflow=0.27 cfs 0.023 af
12.0" Round Culvert n=0.010 L=24.0' S=0.0250 '/' Outflow=0.27 cfs 0.023 af

Pond DCB-1: Peak Elev=117.28' Inflow=1.57 cfs 0.129 af
12.0" Round Culvert n=0.010 L=40.0' S=0.0250 '/' Outflow=1.57 cfs 0.129 af

Pond INF-1: Peak Elev=116.68' Storage=1,818 cf Inflow=1.57 cfs 0.129 af
Outflow=0.23 cfs 0.129 af

Pond INF-2: Peak Elev=115.49' Storage=301 cf Inflow=0.27 cfs 0.023 af
Outflow=0.04 cfs 0.023 af

Total Runoff Area = 3.733 ac Runoff Volume = 0.567 af Average Runoff Depth = 1.82"
81.36% Pervious = 3.037 ac 18.64% Impervious = 0.696 ac

Summary for Subcatchment CUL-DE-SAC:

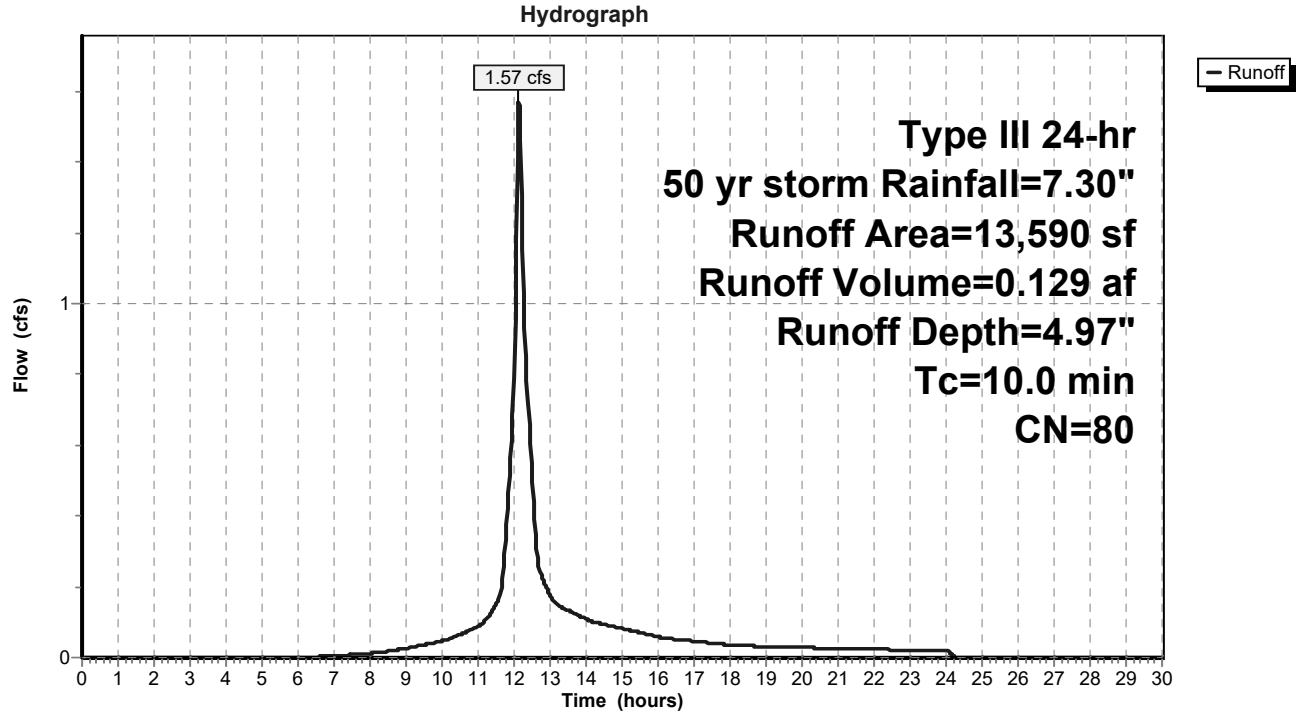
Runoff = 1.57 cfs @ 12.14 hrs, Volume= 0.129 af, Depth= 4.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 50 yr storm Rainfall=7.30"

Area (sf)	CN	Description
9,350	98	Paved roads w/curbs & sewers, HSG A
4,240	39	>75% Grass cover, Good, HSG A
13,590	80	Weighted Average
4,240		31.20% Pervious Area
9,350		68.80% Impervious Area

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

Subcatchment CUL-DE-SAC:



Summary for Subcatchment EX-NORTH:

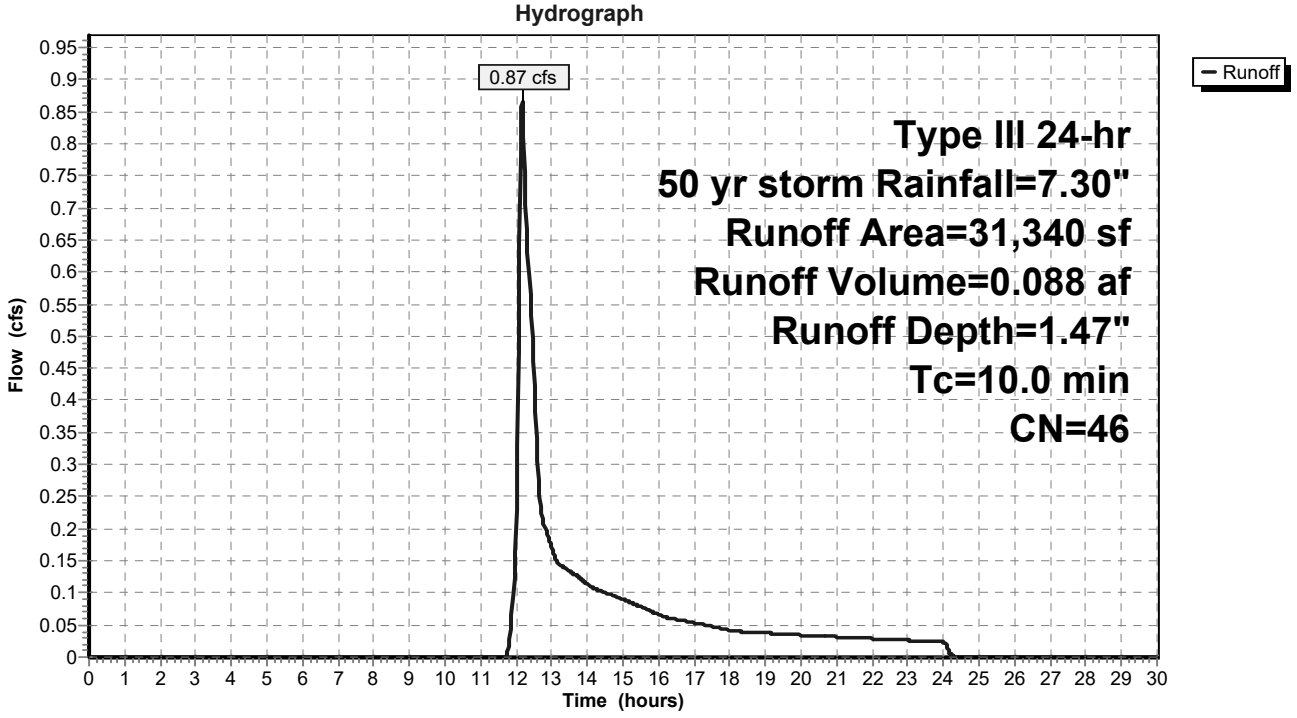
Runoff = 0.87 cfs @ 12.16 hrs, Volume= 0.088 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 50 yr storm Rainfall=7.30"

Area (sf)	CN	Description
1,660	98	Roofs, HSG A
1,880	98	Paved parking, HSG A
27,800	39	>75% Grass cover, Good, HSG A
31,340	46	Weighted Average
27,800		88.70% Pervious Area
3,540		11.30% Impervious Area

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

Subcatchment EX-NORTH:



Summary for Subcatchment EXIST-TO BROOK:

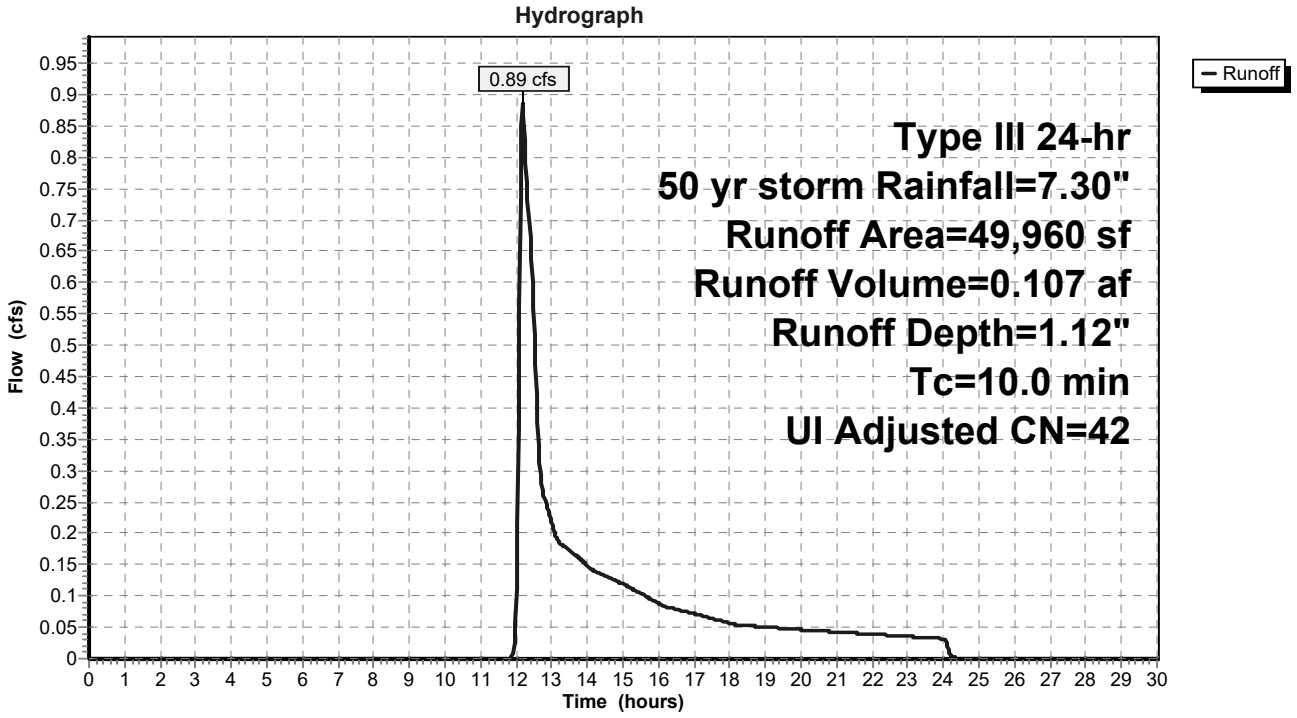
Runoff = 0.89 cfs @ 12.18 hrs, Volume= 0.107 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 50 yr storm Rainfall=7.30"

	Area (sf)	CN	Adj	Description
	800	98		Roofs, HSG A
	1,520	98		Paved parking, HSG A
*	2,180	98		Unconnected pavement, Path HSG A
	6,500	30		Woods, Good, HSG A
	38,960	39		>75% Grass cover, Good, HSG A
	49,960	43	42	Weighted Average, UI Adjusted
	45,460			90.99% Pervious Area
	4,500			9.01% Impervious Area
	2,180			48.44% Unconnected

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

Subcatchment EXIST-TO BROOK:



Summary for Subcatchment PR-NORTH:

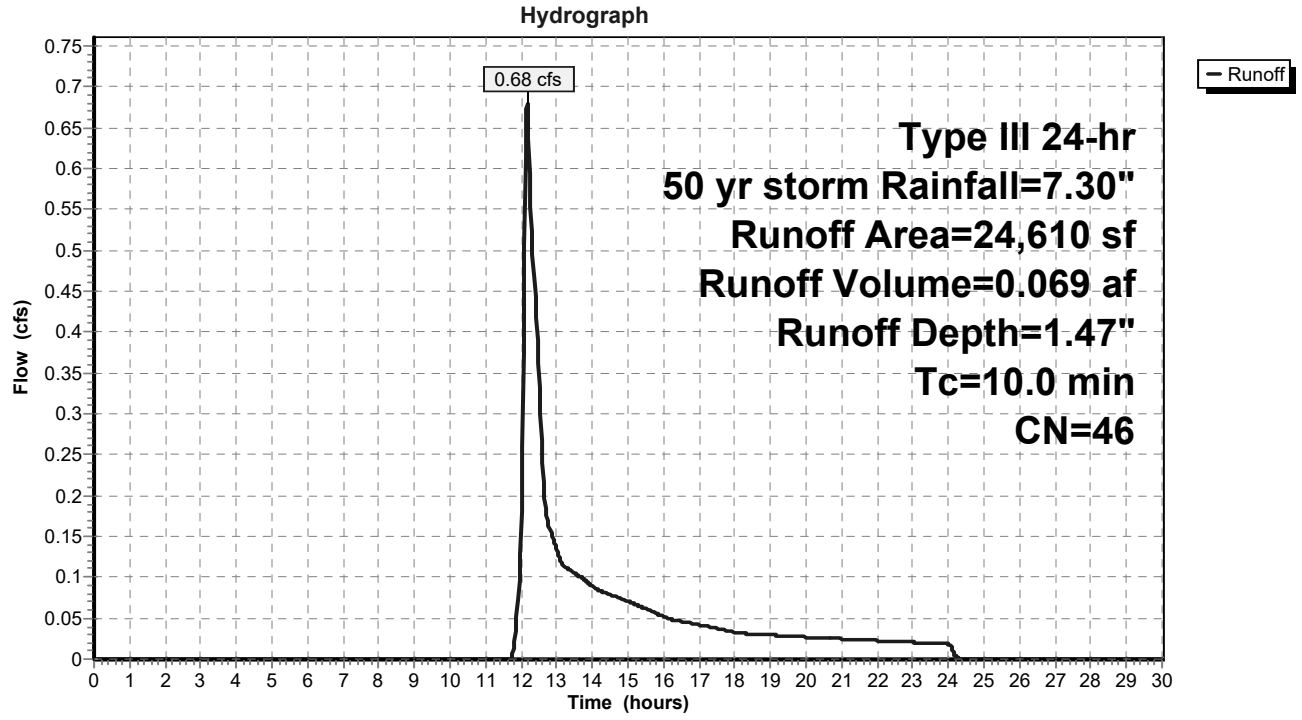
Runoff = 0.68 cfs @ 12.16 hrs, Volume= 0.069 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 50 yr storm Rainfall=7.30"

Area (sf)	CN	Description
1,490	98	Roofs, HSG A
1,610	98	Paved parking, HSG A
21,510	39	>75% Grass cover, Good, HSG A
24,610	46	Weighted Average
21,510		87.40% Pervious Area
3,100		12.60% Impervious Area

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

Subcatchment PR-NORTH:



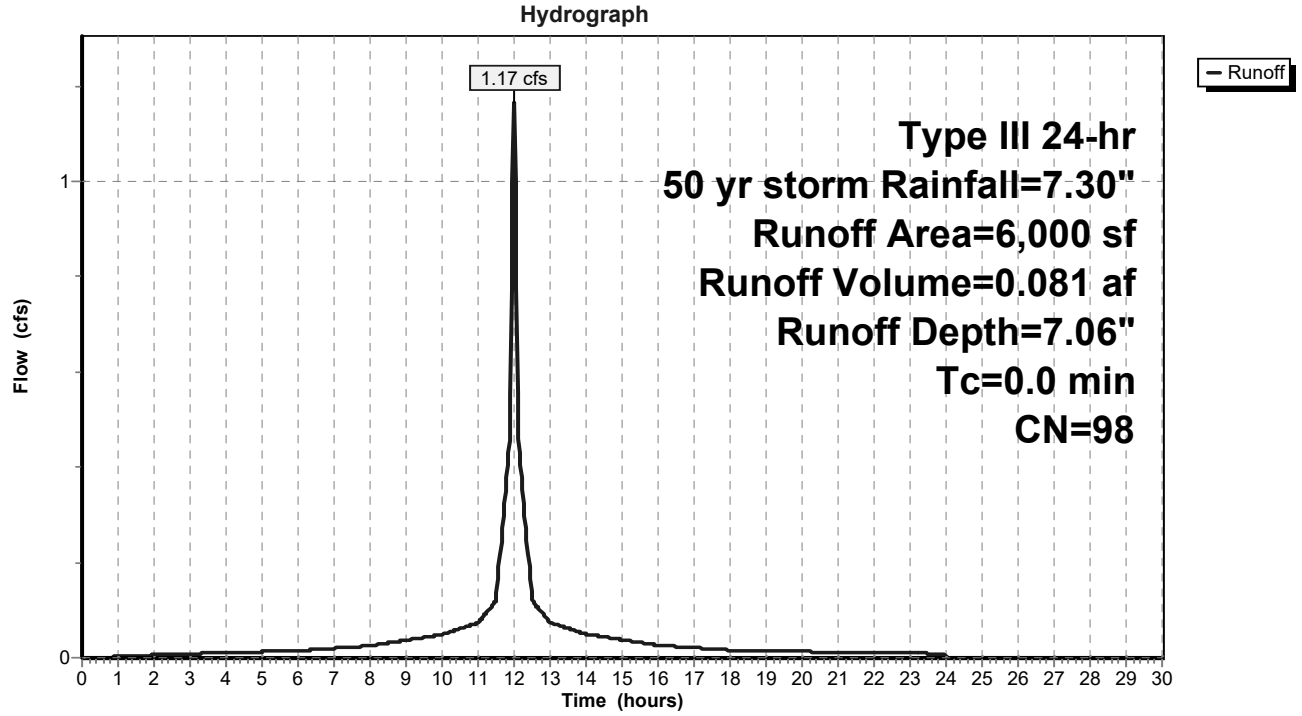
Summary for Subcatchment PROP DWELLINGS: (TO BE DETERMINED)

Runoff = 1.17 cfs @ 12.00 hrs, Volume= 0.081 af, Depth= 7.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 50 yr storm Rainfall=7.30"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
6,000		100.00% Impervious Area

Subcatchment PROP DWELLINGS: (TO BE DETERMINED)



Summary for Subcatchment PROP-TO BROOK:

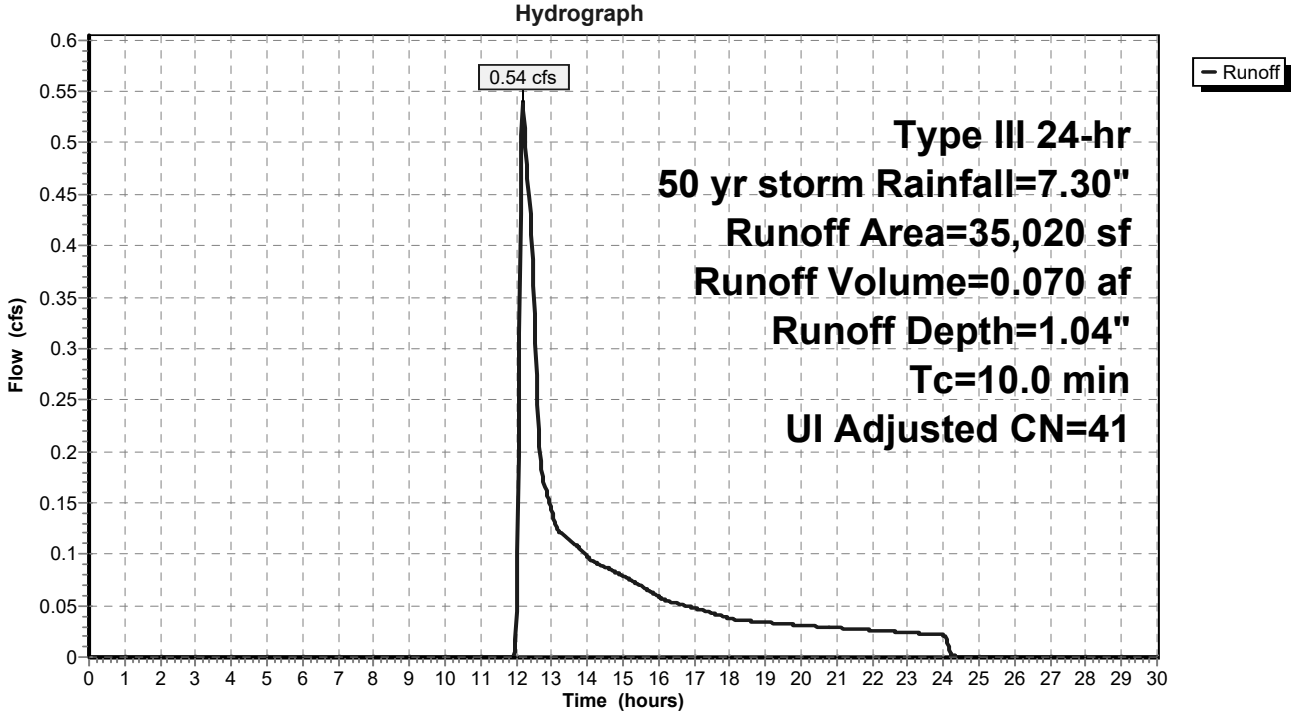
Runoff = 0.54 cfs @ 12.19 hrs, Volume= 0.070 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 50 yr storm Rainfall=7.30"

	Area (sf)	CN	Adj	Description
*	2,180	98		Unconnected pavement, Path HSG A
	32,840	39		>75% Grass cover, Good, HSG A
	35,020	43	41	Weighted Average, UI Adjusted
	32,840			93.77% Pervious Area
	2,180			6.23% Impervious Area
	2,180			100.00% Unconnected

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

Subcatchment PROP-TO BROOK:



Summary for Subcatchment ROADWAY:

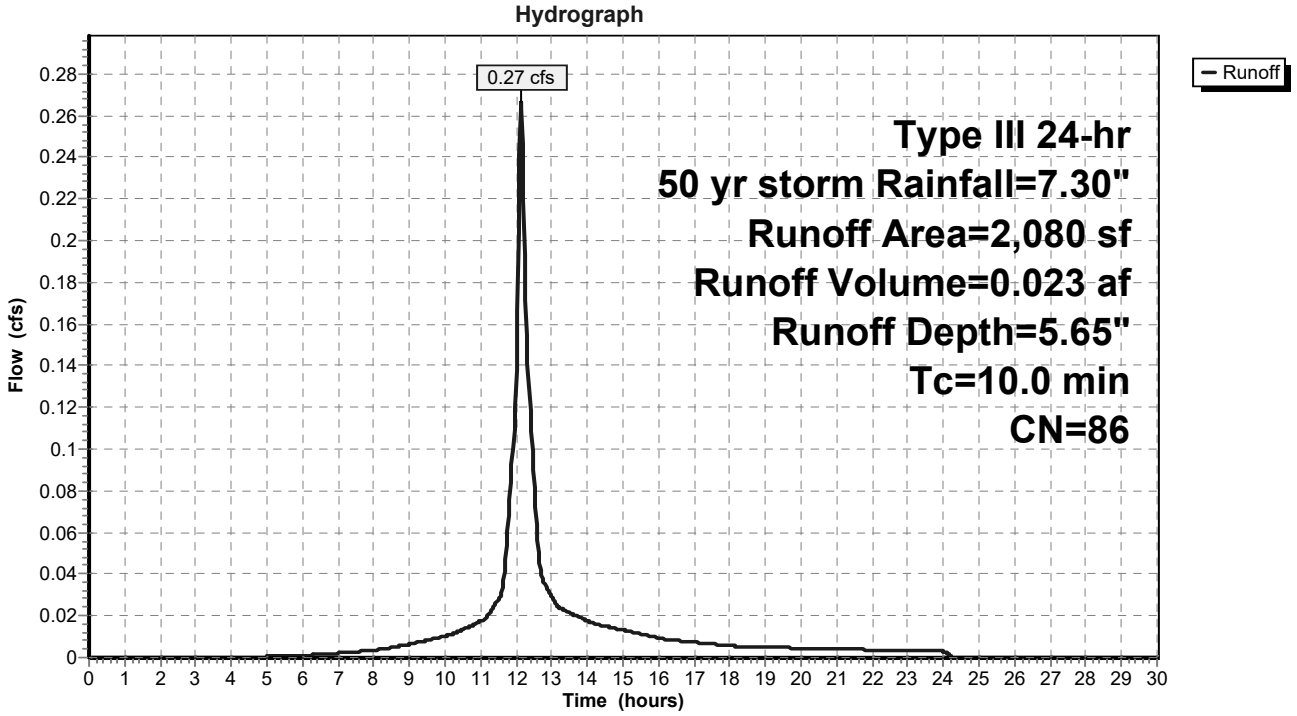
Runoff = 0.27 cfs @ 12.14 hrs, Volume= 0.023 af, Depth= 5.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 50 yr storm Rainfall=7.30"

Area (sf)	CN	Description
1,640	98	Paved roads w/curbs & sewers, HSG A
440	39	>75% Grass cover, Good, HSG A
2,080	86	Weighted Average
440		21.15% Pervious Area
1,640		78.85% Impervious Area

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

Subcatchment ROADWAY:



Summary for Pond CB-2 & CB-3:

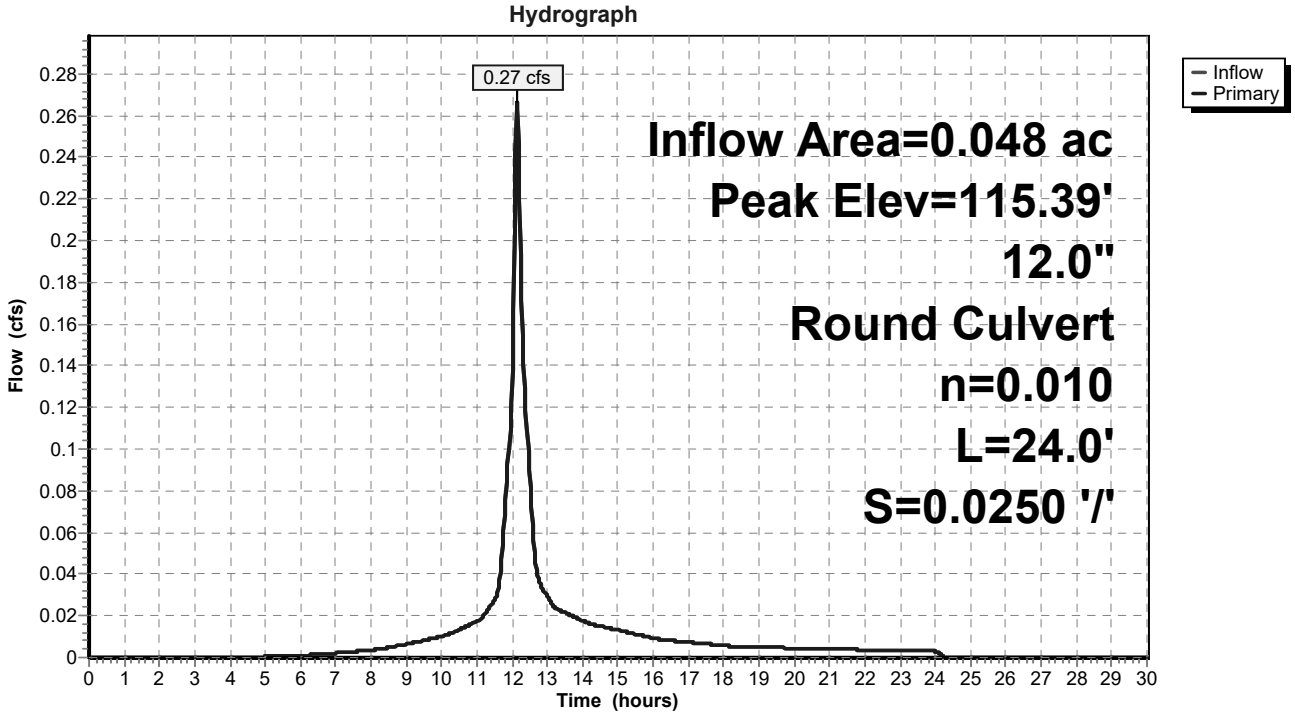
Inflow Area = 0.048 ac, 78.85% Impervious, Inflow Depth = 5.65" for 50 yr storm event
Inflow = 0.27 cfs @ 12.14 hrs, Volume= 0.023 af
Outflow = 0.27 cfs @ 12.14 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.14 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 115.39' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.10'	**12.0" Round Culvert** L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.10' / 114.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.26 cfs @ 12.14 hrs HW=115.38' (Free Discharge)
1=Culvert (Inlet Controls 0.26 cfs @ 1.43 fps)

Pond CB-2 & CB-3:



Summary for Pond DCB-1:

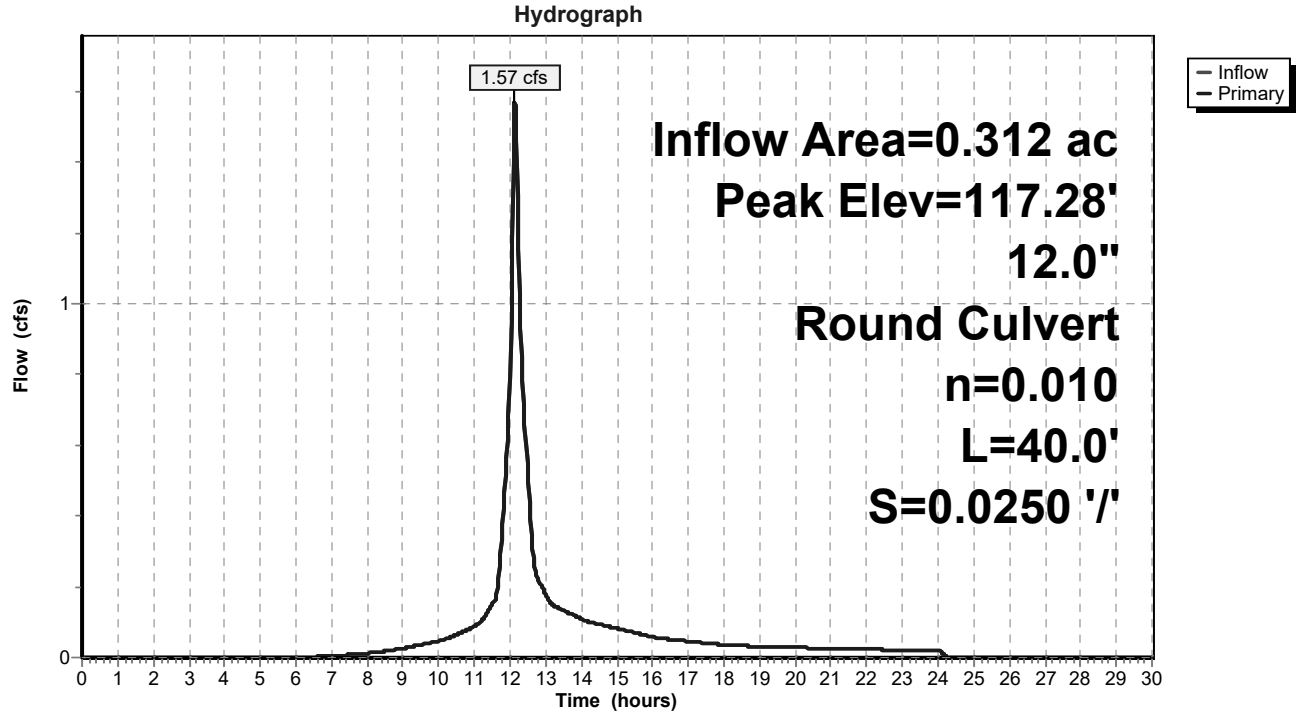
Inflow Area = 0.312 ac, 68.80% Impervious, Inflow Depth = 4.97" for 50 yr storm event
Inflow = 1.57 cfs @ 12.14 hrs, Volume= 0.129 af
Outflow = 1.57 cfs @ 12.14 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min
Primary = 1.57 cfs @ 12.14 hrs, Volume= 0.129 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 117.28' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	116.50'	**12.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.50' / 115.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.55 cfs @ 12.14 hrs HW=117.28' (Free Discharge)
1=Culvert (Inlet Controls 1.55 cfs @ 2.37 fps)

Pond DCB-1:



Summary for Pond INF-1:

Inflow Area = 0.312 ac, 68.80% Impervious, Inflow Depth = 4.97" for 50 yr storm event
Inflow = 1.57 cfs @ 12.14 hrs, Volume= 0.129 af
Outflow = 0.23 cfs @ 11.70 hrs, Volume= 0.129 af, Atten= 85%, Lag= 0.0 min
Discarded = 0.23 cfs @ 11.70 hrs, Volume= 0.129 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 116.68' @ 12.76 hrs Surf.Area= 1,198 sf Storage= 1,818 cf

Plug-Flow detention time= 55.3 min calculated for 0.129 af (100% of inflow)
Center-of-Mass det. time= 55.3 min (865.3 - 810.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.20'	1,018 cf	**20.50'W x 58.46'L x 3.50'H Field A** 4,194 cf Overall - 1,286 cf Embedded = 2,908 cf x 35.0% Voids
#2A	114.70'	1,286 cf	**ADS_StormTech SC-740 +Cap** x 28 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 28 Chambers in 4 Rows
		2,304 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	114.20'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.23 cfs @ 11.70 hrs HW=114.24' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Pond INF-1: - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

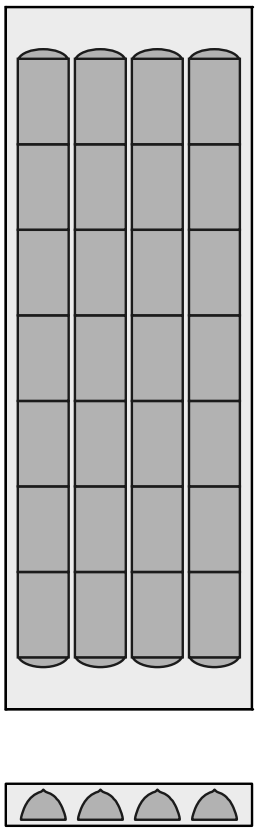
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +42.0" End Stone x 2 = 58.46' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

28 Chambers x 45.9 cf = 1,286.3 cf Chamber Storage

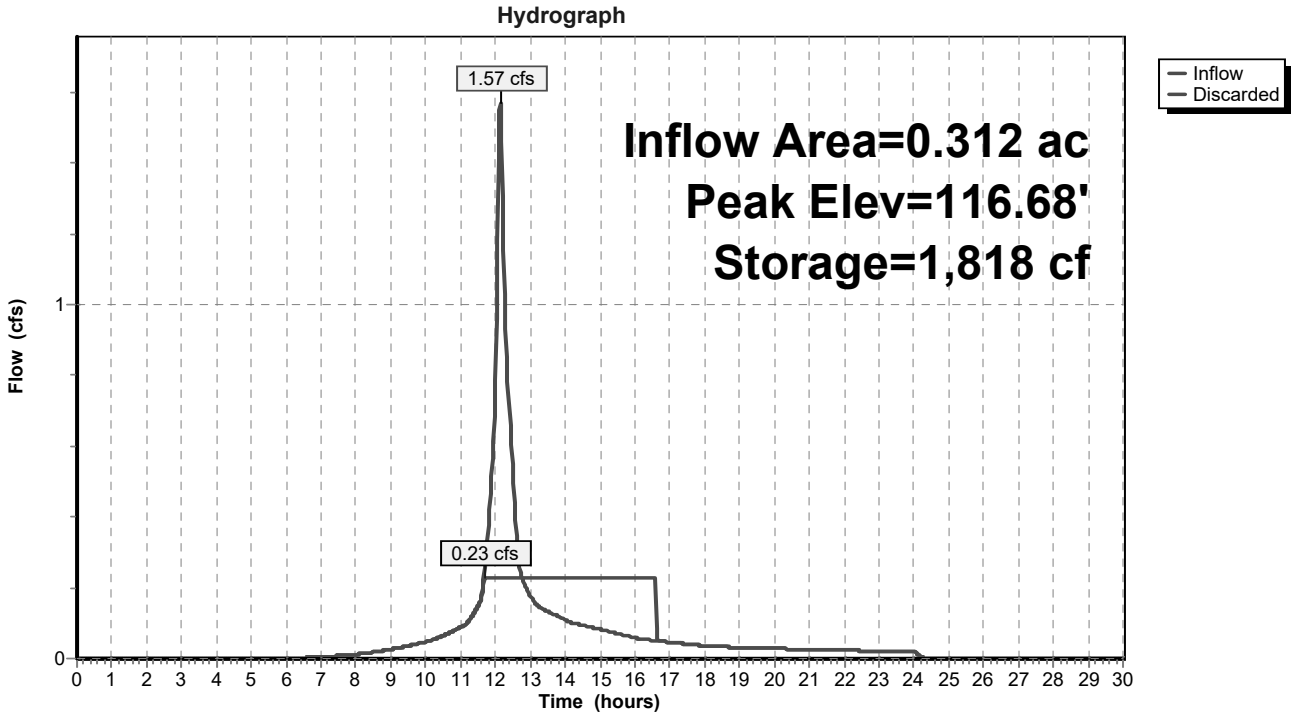
4,194.3 cf Field - 1,286.3 cf Chambers = 2,907.9 cf Stone x 35.0% Voids = 1,017.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,304.1 cf = 0.053 af
Overall Storage Efficiency = 54.9%
Overall System Size = 58.46' x 20.50' x 3.50'

28 Chambers
155.3 cy Field
107.7 cy Stone



Pond INF-1:


Hydrograph
Inflow
Discarded
1.57 cfs
0.23 cfs
Inflow Area=0.312 ac
Peak Elev=116.68'
Storage=1,818 cf
Flow (cfs)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Time (hours)

Summary for Pond INF-2:

Inflow Area = 0.048 ac, 78.85% Impervious, Inflow Depth = 5.65" for 50 yr storm event
Inflow = 0.27 cfs @ 12.14 hrs, Volume= 0.023 af
Outflow = 0.04 cfs @ 11.70 hrs, Volume= 0.023 af, Atten= 84%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.70 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 115.49' @ 12.70 hrs Surf.Area= 217 sf Storage= 301 cf

Plug-Flow detention time= 47.0 min calculated for 0.023 af (100% of inflow)
Center-of-Mass det. time= 47.0 min (841.6 - 794.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	113.00'	201 cf	**11.50'W x 18.86'L x 3.50'H Field A** 759 cf Overall - 184 cf Embedded = 575 cf x 35.0% Voids
#2A	113.50'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 4 Chambers in 2 Rows
		385 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	113.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 11.70 hrs HW=113.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Pond INF-2: - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 12.0" Spacing = 63.0" C-C Row Spacing

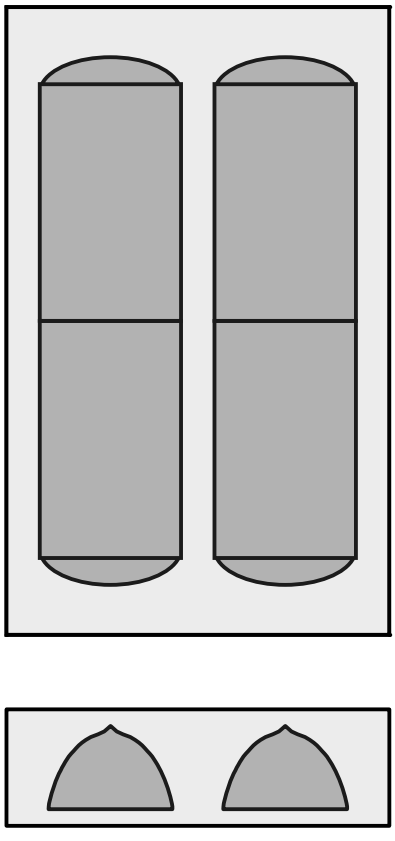
2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +18.0" End Stone x 2 = 18.86' Base Length
2 Rows x 51.0" Wide + 12.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

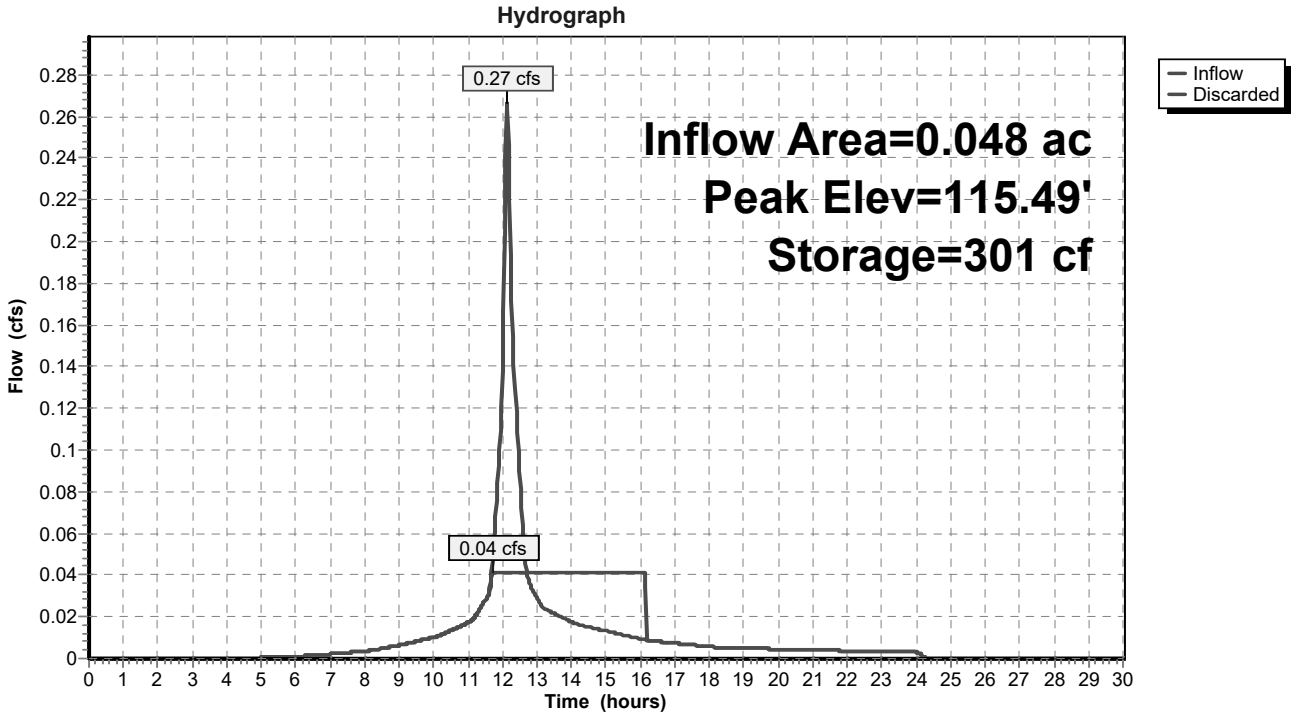
759.0 cf Field - 183.8 cf Chambers = 575.2 cf Stone x 35.0% Voids = 201.3 cf Stone Storage

Chamber Storage + Stone Storage = 385.1 cf = 0.009 af
Overall Storage Efficiency = 50.7%
Overall System Size = 18.86' x 11.50' x 3.50'

4 Chambers
28.1 cy Field
21.3 cy Stone



Pond INF-2:


Hydrograph
Inflow
Discarded
0.27 cfs
0.04 cfs
Inflow Area=0.048 ac
Peak Elev=115.49'
Storage=301 cf
Flow (cfs)
Time (hours)
0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Time span=0.00-30.00 hrs, dt=0.03 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CUL-DE-SAC: Runoff Area=13,590 sf 68.80% Impervious Runoff Depth=5.82"
Tc=10.0 min CN=80 Runoff=1.82 cfs 0.151 af

Subcatchment EX-NORTH: Runoff Area=31,340 sf 11.30% Impervious Runoff Depth=1.95"
Tc=10.0 min CN=46 Runoff=1.24 cfs 0.117 af

Subcatchment EXIST-TO BROOK: Runoff Area=49,960 sf 9.01% Impervious Runoff Depth=1.54"
Tc=10.0 min UI Adjusted CN=42 Runoff=1.39 cfs 0.147 af

Subcatchment PR-NORTH: Runoff Area=24,610 sf 12.60% Impervious Runoff Depth=1.95"
Tc=10.0 min CN=46 Runoff=0.97 cfs 0.092 af

Subcatchment PROP DWELLINGS: (TO BE Runoff Area=6,000 sf 100.00% Impervious Runoff Depth=7.97"
Tc=0.0 min CN=98 Runoff=1.31 cfs 0.091 af

Subcatchment PROP-TO BROOK: Runoff Area=35,020 sf 6.23% Impervious Runoff Depth=1.44"
Tc=10.0 min UI Adjusted CN=41 Runoff=0.87 cfs 0.097 af

Subcatchment ROADWAY: Runoff Area=2,080 sf 78.85% Impervious Runoff Depth=6.54"
Tc=10.0 min CN=86 Runoff=0.31 cfs 0.026 af

Pond CB-2 & CB-3: Peak Elev=115.41' Inflow=0.31 cfs 0.026 af
12.0" Round Culvert n=0.010 L=24.0' S=0.0250 '/' Outflow=0.31 cfs 0.026 af

Pond DCB-1: Peak Elev=117.37' Inflow=1.82 cfs 0.151 af
12.0" Round Culvert n=0.010 L=40.0' S=0.0250 '/' Outflow=1.82 cfs 0.151 af

Pond INF-1: Peak Elev=117.63' Storage=2,275 cf Inflow=1.82 cfs 0.151 af
Outflow=0.23 cfs 0.151 af

Pond INF-2: Peak Elev=116.29' Storage=369 cf Inflow=0.31 cfs 0.026 af
Outflow=0.04 cfs 0.026 af

Total Runoff Area = 3.733 ac Runoff Volume = 0.722 af Average Runoff Depth = 2.32"
81.36% Pervious = 3.037 ac 18.64% Impervious = 0.696 ac

Summary for Subcatchment CUL-DE-SAC:

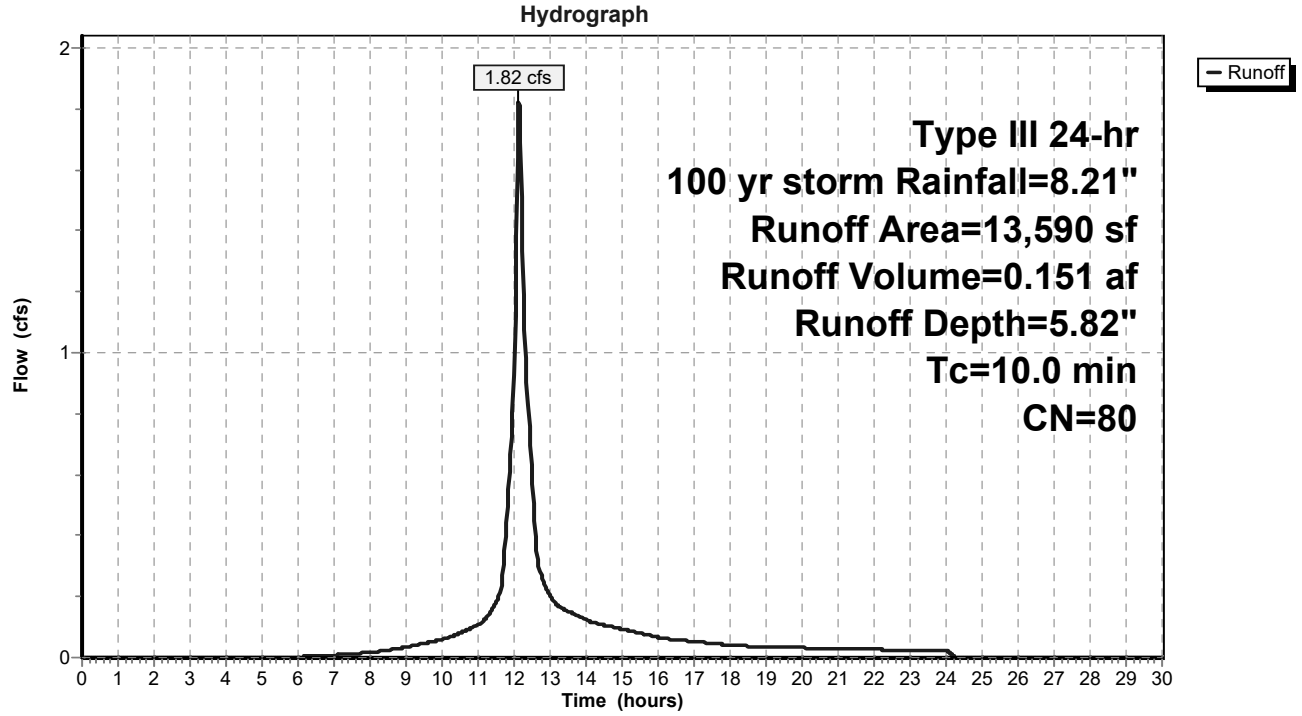
Runoff = 1.82 cfs @ 12.14 hrs, Volume= 0.151 af, Depth= 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 yr storm Rainfall=8.21"

Area (sf)	CN	Description
9,350	98	Paved roads w/curbs & sewers, HSG A
4,240	39	>75% Grass cover, Good, HSG A
13,590	80	Weighted Average
4,240		31.20% Pervious Area
9,350		68.80% Impervious Area

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

Subcatchment CUL-DE-SAC:



Summary for Subcatchment EX-NORTH:

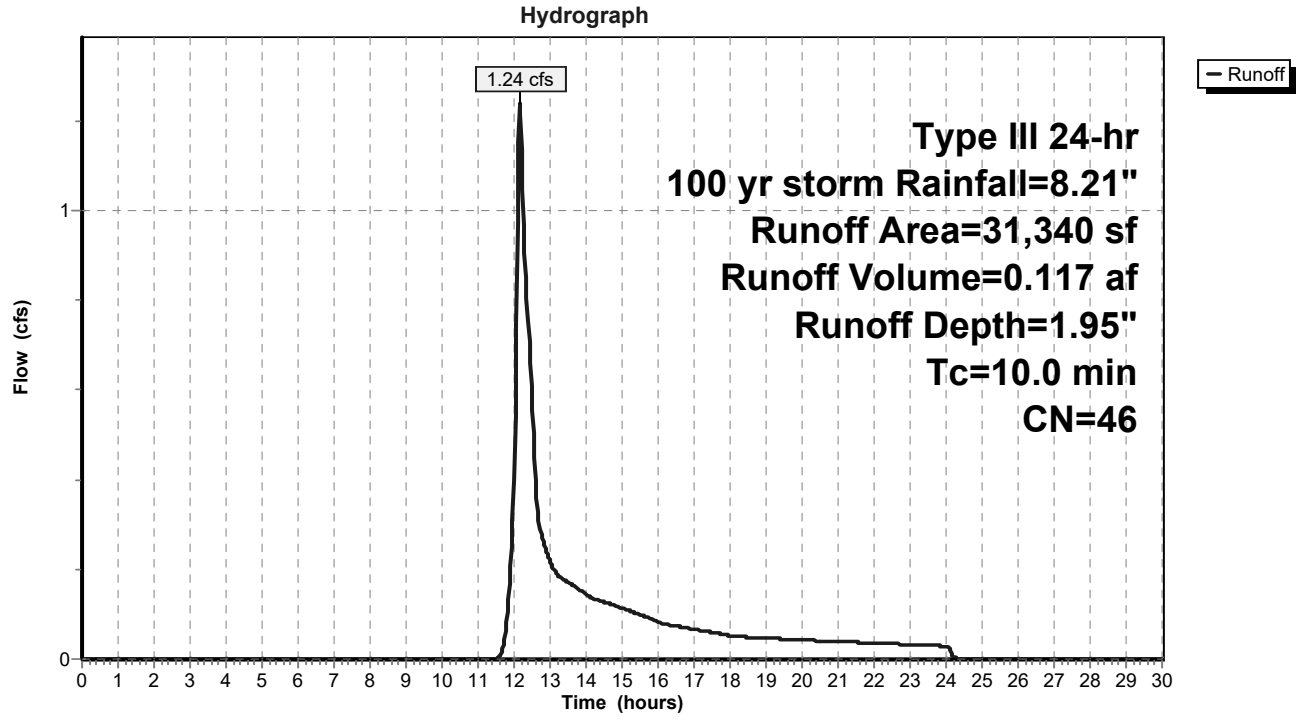
Runoff = 1.24 cfs @ 12.16 hrs, Volume= 0.117 af, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 yr storm Rainfall=8.21"

Area (sf)	CN	Description
1,660	98	Roofs, HSG A
1,880	98	Paved parking, HSG A
27,800	39	>75% Grass cover, Good, HSG A
31,340	46	Weighted Average
27,800		88.70% Pervious Area
3,540		11.30% Impervious Area

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

Subcatchment EX-NORTH:



Summary for Subcatchment EXIST-TO BROOK:

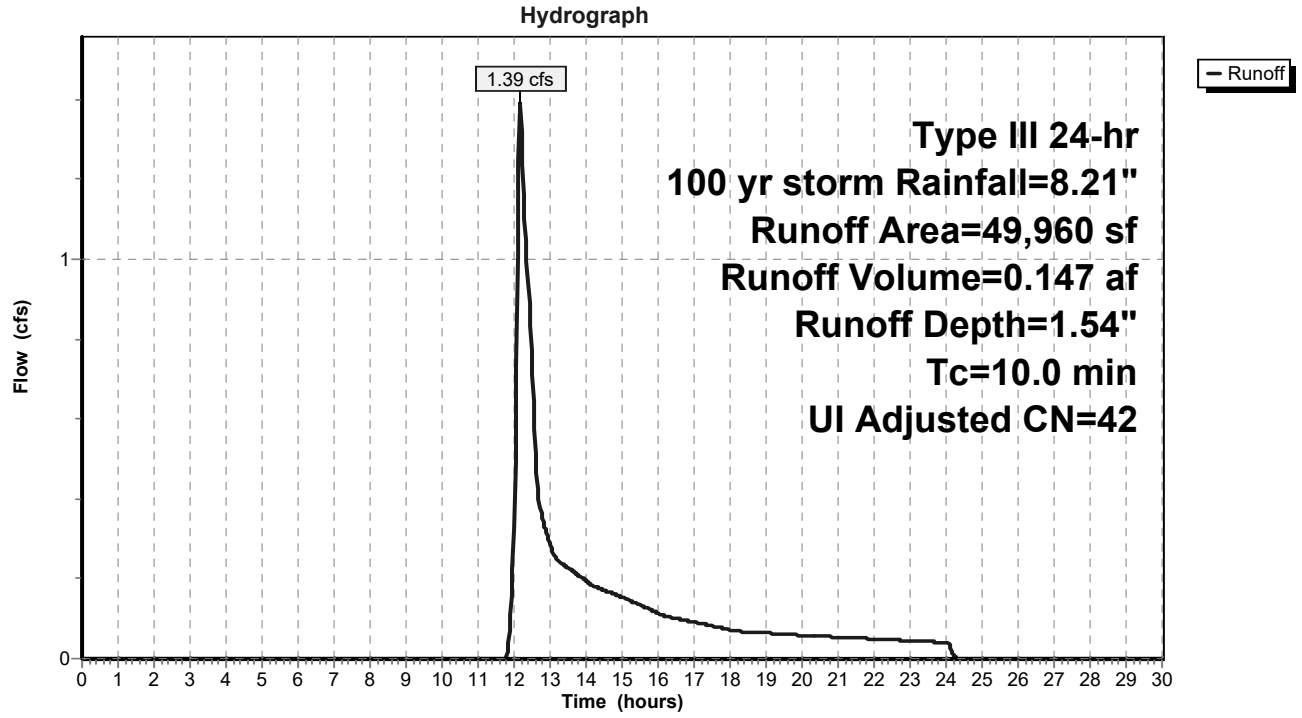
Runoff = 1.39 cfs @ 12.17 hrs, Volume= 0.147 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 yr storm Rainfall=8.21"

	Area (sf)	CN	Adj	Description
	800	98		Roofs, HSG A
	1,520	98		Paved parking, HSG A
*	2,180	98		Unconnected pavement, Path HSG A
	6,500	30		Woods, Good, HSG A
	38,960	39		>75% Grass cover, Good, HSG A
	49,960	43	42	Weighted Average, UI Adjusted
	45,460			90.99% Pervious Area
	4,500			9.01% Impervious Area
	2,180			48.44% Unconnected

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

Subcatchment EXIST-TO BROOK:



Summary for Subcatchment PR-NORTH:

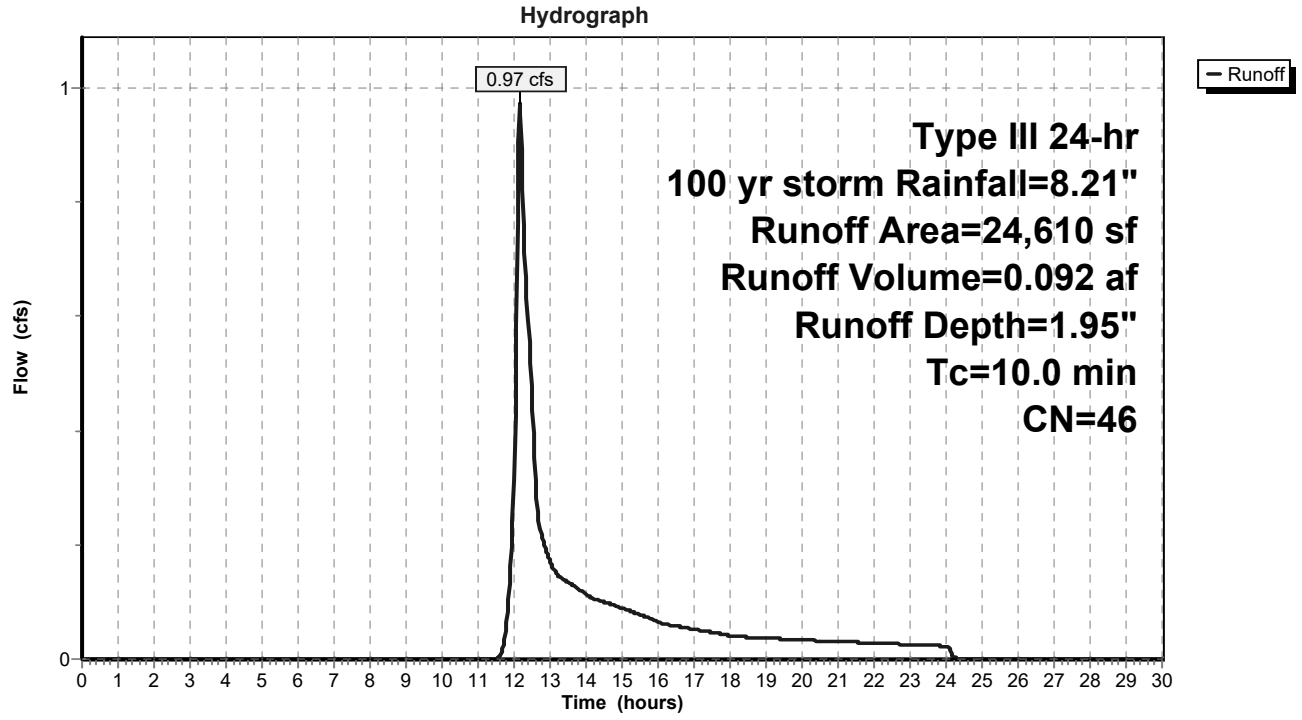
Runoff = 0.97 cfs @ 12.16 hrs, Volume= 0.092 af, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 yr storm Rainfall=8.21"

Area (sf)	CN	Description
1,490	98	Roofs, HSG A
1,610	98	Paved parking, HSG A
21,510	39	>75% Grass cover, Good, HSG A
24,610	46	Weighted Average
21,510		87.40% Pervious Area
3,100		12.60% Impervious Area

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

Subcatchment PR-NORTH:



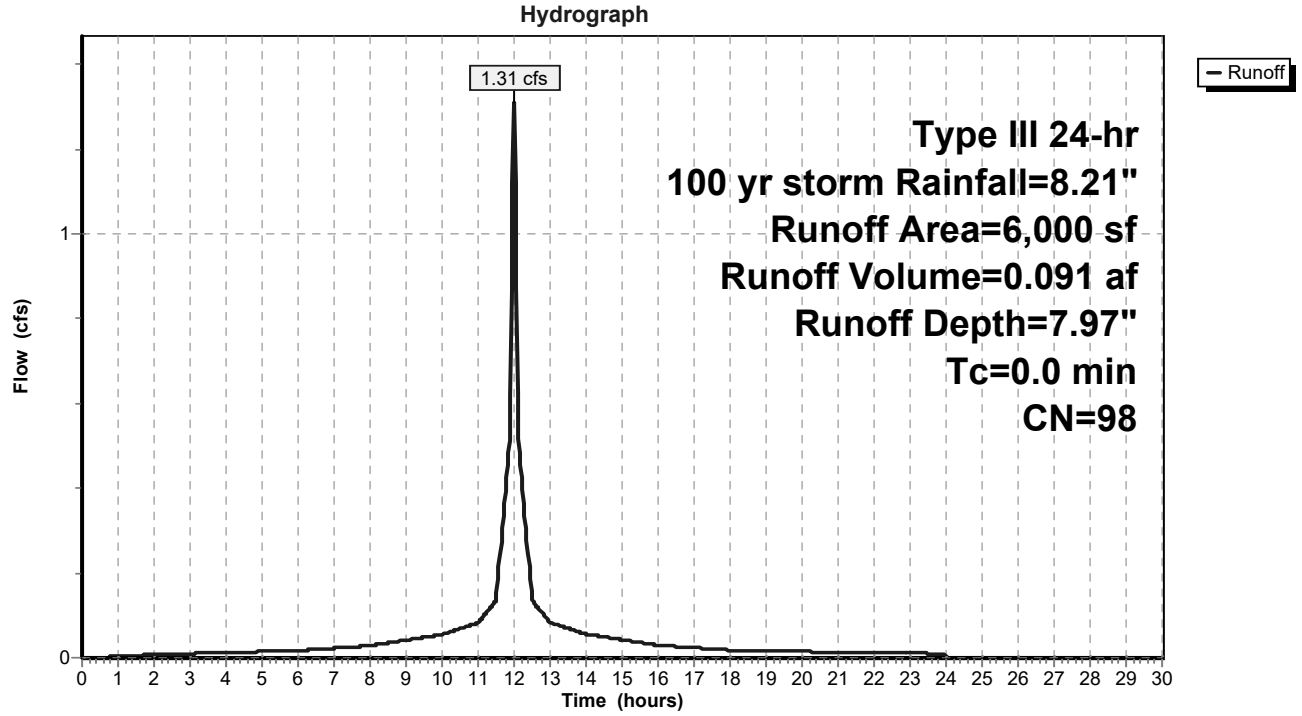
Summary for Subcatchment PROP DWELLINGS: (TO BE DETERMINED)

Runoff = 1.31 cfs @ 12.00 hrs, Volume= 0.091 af, Depth= 7.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 yr storm Rainfall=8.21"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
6,000		100.00% Impervious Area

Subcatchment PROP DWELLINGS: (TO BE DETERMINED)



Summary for Subcatchment PROP-TO BROOK:

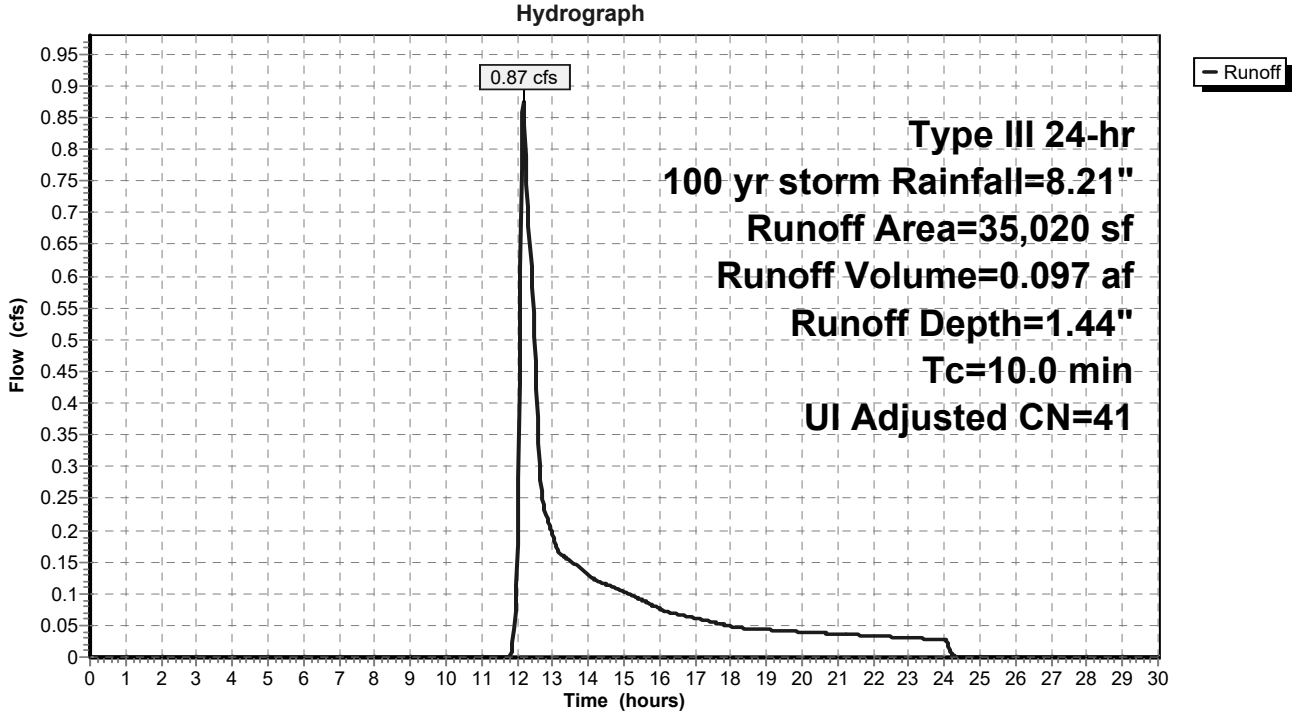
Runoff = 0.87 cfs @ 12.17 hrs, Volume= 0.097 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 yr storm Rainfall=8.21"

	Area (sf)	CN	Adj	Description
*	2,180	98		Unconnected pavement, Path HSG A
	32,840	39		>75% Grass cover, Good, HSG A
	35,020	43	41	Weighted Average, UI Adjusted
	32,840			93.77% Pervious Area
	2,180			6.23% Impervious Area
	2,180			100.00% Unconnected

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

Subcatchment PROP-TO BROOK:



Summary for Subcatchment ROADWAY:

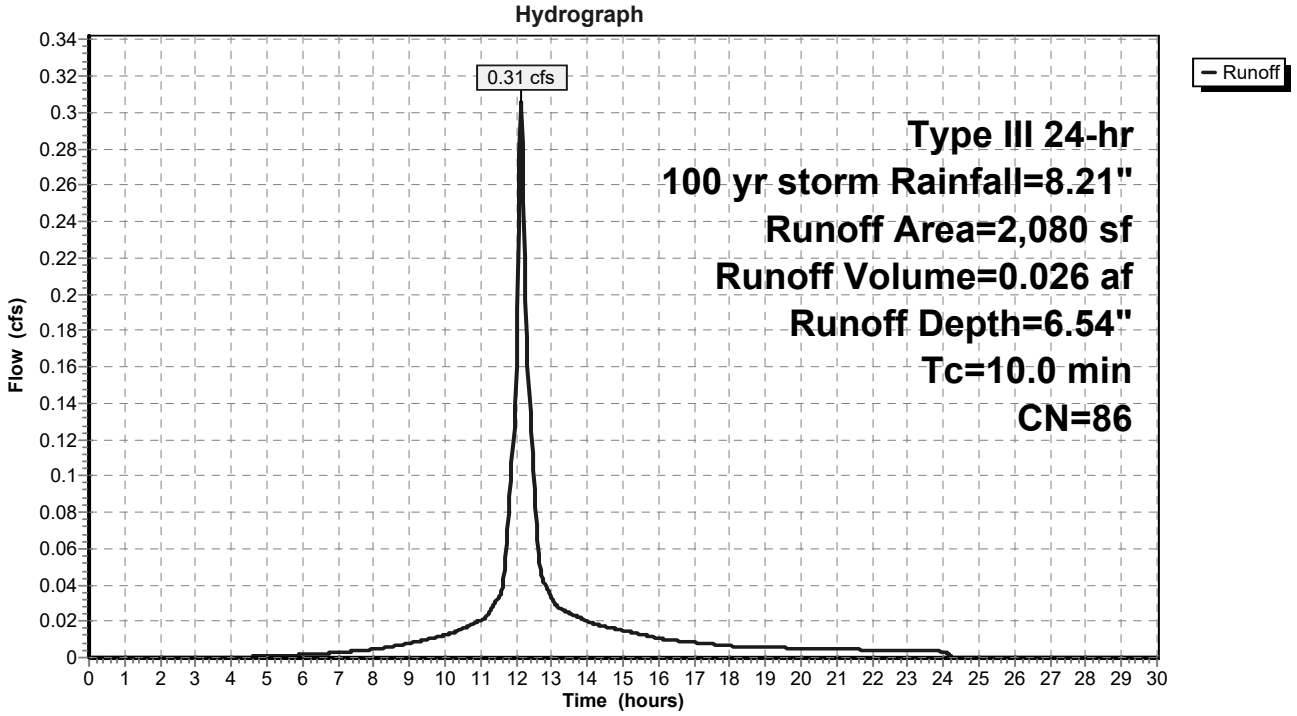
Runoff = 0.31 cfs @ 12.14 hrs, Volume= 0.026 af, Depth= 6.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Type III 24-hr 100 yr storm Rainfall=8.21"

Area (sf)	CN	Description
1,640	98	Paved roads w/curbs & sewers, HSG A
440	39	>75% Grass cover, Good, HSG A
2,080	86	Weighted Average
440		21.15% Pervious Area
1,640		78.85% Impervious Area

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

Subcatchment ROADWAY:



Summary for Pond CB-2 & CB-3:

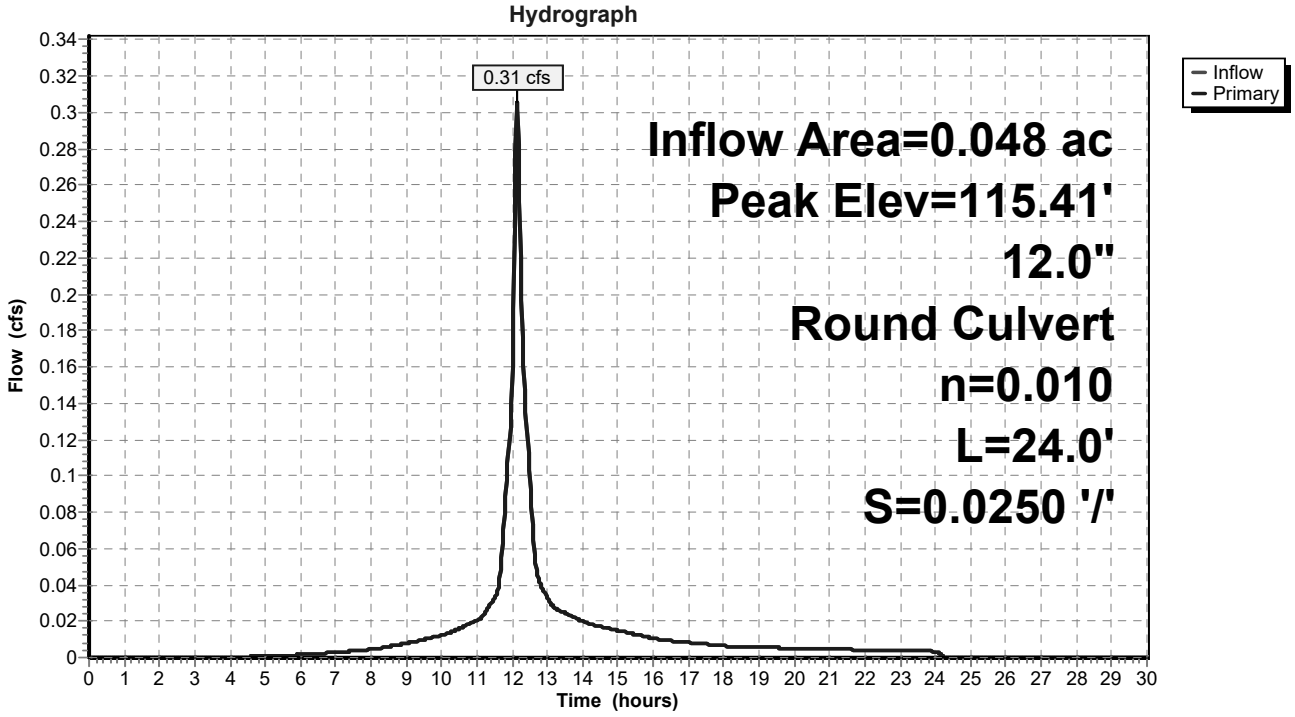
Inflow Area = 0.048 ac, 78.85% Impervious, Inflow Depth = 6.54" for 100 yr storm event
Inflow = 0.31 cfs @ 12.14 hrs, Volume= 0.026 af
Outflow = 0.31 cfs @ 12.14 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 12.14 hrs, Volume= 0.026 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 115.41' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	115.10'	**12.0" Round Culvert** L= 24.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 115.10' / 114.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.30 cfs @ 12.14 hrs HW=115.41' (Free Discharge)
1=Culvert (Inlet Controls 0.30 cfs @ 1.49 fps)

Pond CB-2 & CB-3:



Summary for Pond DCB-1:

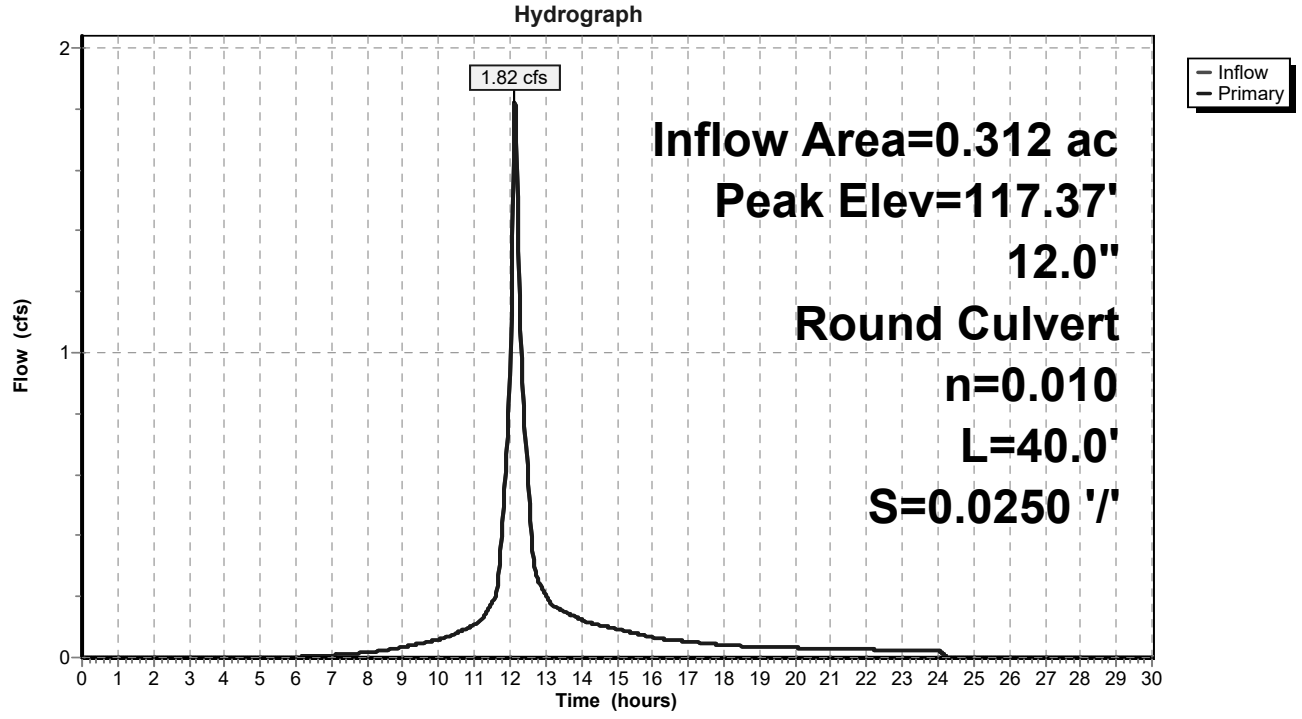
Inflow Area = 0.312 ac, 68.80% Impervious, Inflow Depth = 5.82" for 100 yr storm event
Inflow = 1.82 cfs @ 12.14 hrs, Volume= 0.151 af
Outflow = 1.82 cfs @ 12.14 hrs, Volume= 0.151 af, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.14 hrs, Volume= 0.151 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 117.37' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	116.50'	**12.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 116.50' / 115.50' S= 0.0250 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.81 cfs @ 12.14 hrs HW=117.37' (Free Discharge)
1=Culvert (Inlet Controls 1.81 cfs @ 2.50 fps)

Pond DCB-1:



Summary for Pond INF-1:

Inflow Area = 0.312 ac, 68.80% Impervious, Inflow Depth = 5.82" for 100 yr storm event
Inflow = 1.82 cfs @ 12.14 hrs, Volume= 0.151 af
Outflow = 0.23 cfs @ 11.67 hrs, Volume= 0.151 af, Atten= 87%, Lag= 0.0 min
Discarded = 0.23 cfs @ 11.67 hrs, Volume= 0.151 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 117.63' @ 12.88 hrs Surf.Area= 1,198 sf Storage= 2,275 cf

Plug-Flow detention time= 72.8 min calculated for 0.151 af (100% of inflow)
Center-of-Mass det. time= 72.7 min (878.3 - 805.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	114.20'	1,018 cf	**20.50'W x 58.46'L x 3.50'H Field A** 4,194 cf Overall - 1,286 cf Embedded = 2,908 cf x 35.0% Voids
#2A	114.70'	1,286 cf	**ADS_StormTech SC-740 +Cap** x 28 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 28 Chambers in 4 Rows
		2,304 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	114.20'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.23 cfs @ 11.67 hrs HW=114.24' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Pond INF-1: - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

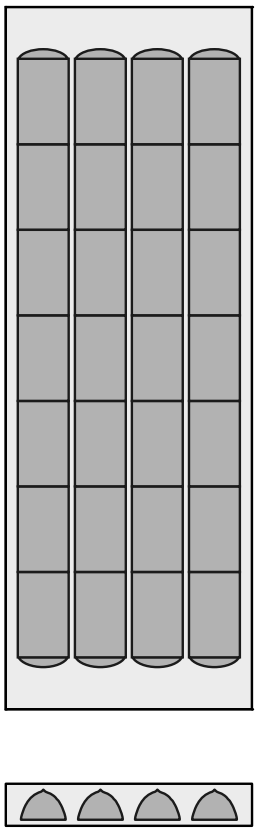
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +42.0" End Stone x 2 = 58.46' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

28 Chambers x 45.9 cf = 1,286.3 cf Chamber Storage

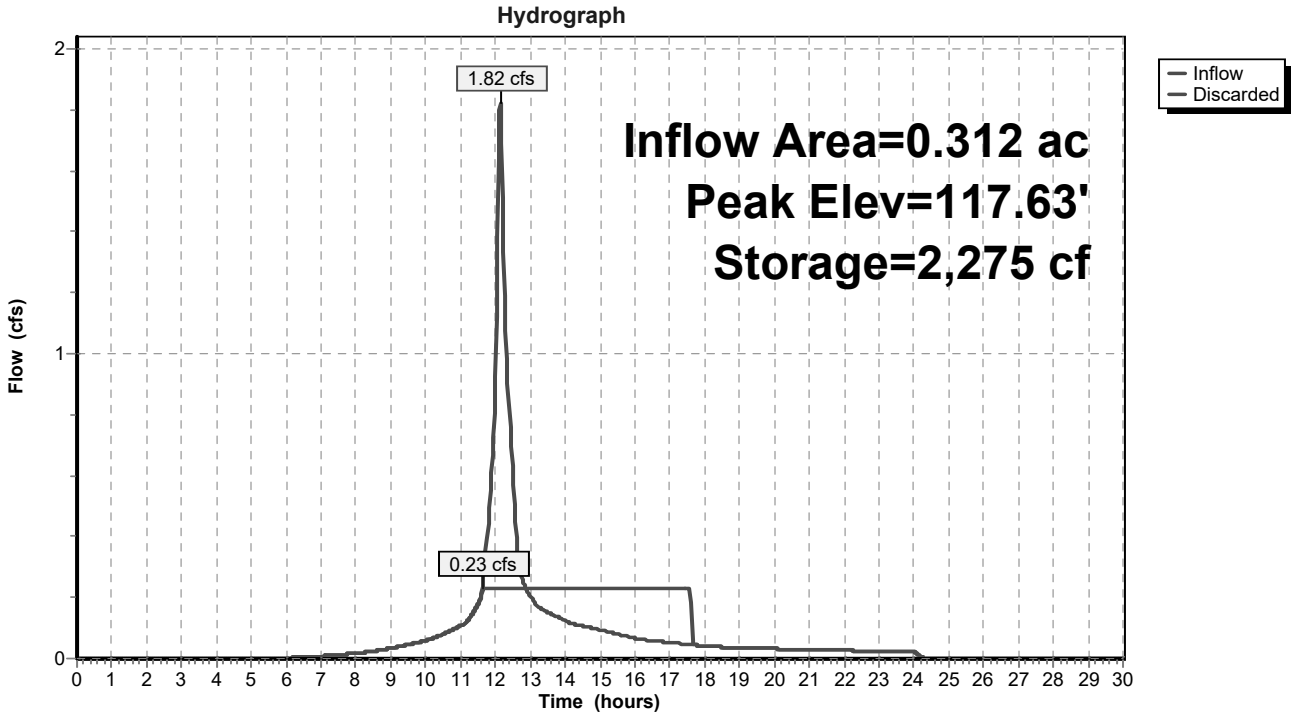
4,194.3 cf Field - 1,286.3 cf Chambers = 2,907.9 cf Stone x 35.0% Voids = 1,017.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,304.1 cf = 0.053 af
Overall Storage Efficiency = 54.9%
Overall System Size = 58.46' x 20.50' x 3.50'

28 Chambers
155.3 cy Field
107.7 cy Stone



Pond INF-1:


Hydrograph
Inflow
Discarded
1.82 cfs
0.23 cfs
Inflow Area=0.312 ac
Peak Elev=117.63'
Storage=2,275 cf
Flow (cfs)
Time (hours)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Summary for Pond INF-2:

Inflow Area = 0.048 ac, 78.85% Impervious, Inflow Depth = 6.54" for 100 yr storm event
Inflow = 0.31 cfs @ 12.14 hrs, Volume= 0.026 af
Outflow = 0.04 cfs @ 11.67 hrs, Volume= 0.026 af, Atten= 86%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.67 hrs, Volume= 0.026 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.03 hrs
Peak Elev= 116.29' @ 12.78 hrs Surf.Area= 217 sf Storage= 369 cf

Plug-Flow detention time= 60.4 min calculated for 0.026 af (100% of inflow)
Center-of-Mass det. time= 60.4 min (851.0 - 790.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	113.00'	201 cf	**11.50'W x 18.86'L x 3.50'H Field A** 759 cf Overall - 184 cf Embedded = 575 cf x 35.0% Voids
#2A	113.50'	184 cf	**ADS_StormTech SC-740 +Cap** x 4 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 4 Chambers in 2 Rows
		385 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	113.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 11.67 hrs HW=113.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Pond INF-2: - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 12.0" Spacing = 63.0" C-C Row Spacing

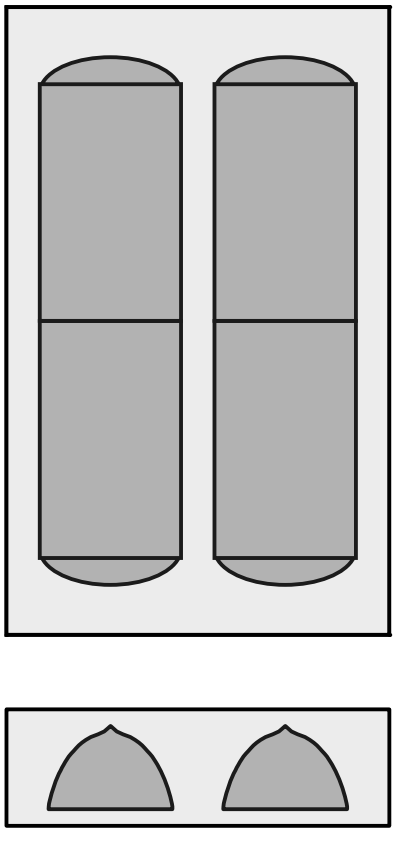
2 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 15.86' Row Length +18.0" End Stone x 2 = 18.86' Base Length
2 Rows x 51.0" Wide + 12.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

4 Chambers x 45.9 cf = 183.8 cf Chamber Storage

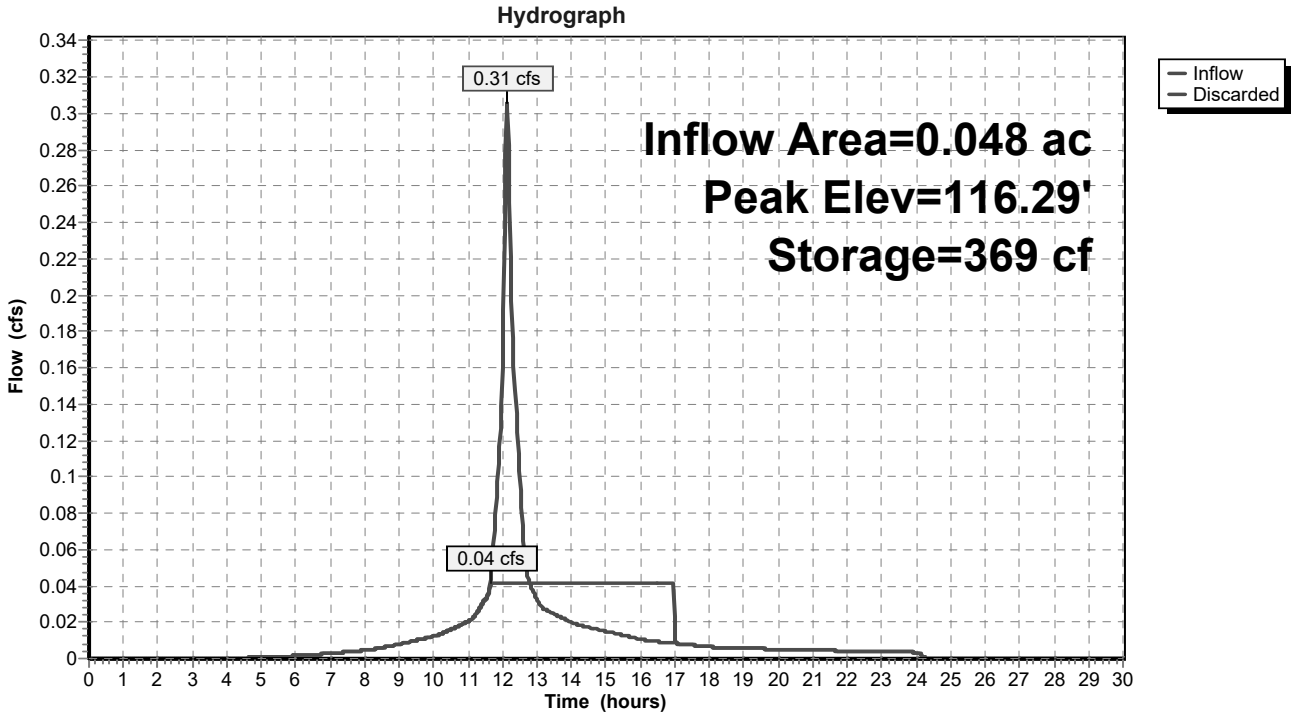
759.0 cf Field - 183.8 cf Chambers = 575.2 cf Stone x 35.0% Voids = 201.3 cf Stone Storage

Chamber Storage + Stone Storage = 385.1 cf = 0.009 af
Overall Storage Efficiency = 50.7%
Overall System Size = 18.86' x 11.50' x 3.50'

4 Chambers
28.1 cy Field
21.3 cy Stone



Pond INF-2:


Hydrograph
Inflow
Discarded
0.31 cfs
0.04 cfs
Inflow Area=0.048 ac
Peak Elev=116.29'
Storage=369 cf
Flow (cfs)
Time (hours)
0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28 0.3 0.32 0.34
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Stormwater Operation & Maintenance Plan

43 Poole Street
Woburn, MA

Prepared For: 43 Poole Street, LLC

January 27, 2023

Applicant's Name:

43 Poole Street

Party Responsible for Maintenance (until transfer to HOA):

43 Poole Street

Project Description:

The proposed project will consist of a four-lot definitive subdivision. The existing single-family dwelling located at 43 Poole Street will remain. A forty foot right-of-way will be extended into the property from Winter Road ending in a cul-de-sac. The proposed right-of-way will provide frontage for three new single-family dwellings.

Planned Erosion and Sedimentation Control Measures during construction Activities

Dewatering

Dewatering may be required during roadway construction and utility installation. Should the need for dewatering arise, groundwater will be pumped directly into a temporary settling basin or frac tank/dewatering box, which will act as a sediment trap during construction. All temporary settling basins or tanks will be located within close proximity of daily work activities. Prior to discharge, all groundwater will be treated by means of the settling basin through a series of stone check dams or acceptable substitute. Discharges from sediment basins will be free of visible floating, suspended and settleable solids that would impair the functions of a wetland or degrade the chemical composition of the wetland resource area receiving ground or surface water flows and will be to the combined system.

Storm Drain Inlet Protection

A temporary storm inlet protection filter will be placed around all catch basin units or silt sacks will be installed. The purpose of the filter or silt sacks is to prevent the inflow of sediments into the closed drainage system. The filter shall remain in place until a permanent vegetative cover is established and the transport of sediment is no longer visibly apparent. The filter shall be inspected and maintained on a weekly basis.

Surface Stabilization

The surface of all disturbed areas shall be stabilized during and after construction. Temporary measures shall be taken during construction to prevent erosion and siltation. No construction sediment shall be allowed to enter any infiltration system. All disturbed slopes will be stabilized with a permanent vegetative cover. Some or all of the following measures will be utilized on this project as conditions may warrant.

a. Temporary Seeding
b. Temporary Mulching
c. Permanent Seeding
d. Placement of Sod
e. Hydroseeding
f. Placement of Hay
g. Placement of Jute Netting

Subsurface Infiltration Systems

Erosion controls (such as haybales, filtermitt or silt fencing) and temporary swales should be installed around the perimeter of the excavation to collect and/or divert runoff containing fines and sediments from entering the infiltration system during construction. The existing subgrade under the system bed area shall not be compacted or subject to excessive construction equipment traffic. Once the site is stabilized and final grade over the system is established, ensure that proper signs and/or barricades around the system are installed to avoid compaction or vehicular traffic over the system. During construction, the Infiltration Systems should be inspected weekly and after every major storm event. Ponded water inside the system (as visible from the observation wells) after several days often indicates that the bottom of the system is clogged. If the system is found to be clogged, flushing and vacuuming of the system using a sewer vacuum truck will be required (search "sewer vacuum truck services").

Long-Term Inspection and Maintenance Measures After Construction

Erosion Control

Eroded sediments can adversely affect the performance of the stormwater management system. Eroding or barren areas should be immediately re-vegetated.

Debris and Litter Removal

Trash may collect in the BMP's, potentially causing clogging of the facilities. All debris and litter shall be removed when necessary, and after each storm event. Sediment and debris collected from vacuuming sweeping should be disposed at a permitted wasted disposal facility.

Subsurface Infiltration Systems

The subsurface infiltration systems should be inspected after the first several rainfall events or few months after construction, after all major storms (>2-year), and on regular bi-annual scheduled dates. Ponded water inside the system (as visible from the observation wells) after several days often indicates that the bottom of the system is clogged. If the systems are found to be clogged, flushing and vacuuming of the systems will be required.

Deep Sump Catch Basins

The catch basins shall be inspected two (2) times per year, and if necessary, any maintenance shall be performed so that it functions as designed. The catch basins shall be cleaned twice per year, and when sediment in the bottom of the sump reaches within 12 inches below the bottom of the outlet. Inlet and outlet pipes should be checked for clogging. At a minimum, inspection of the catch basin shall be performed during the last week of April and the first week of October each year.

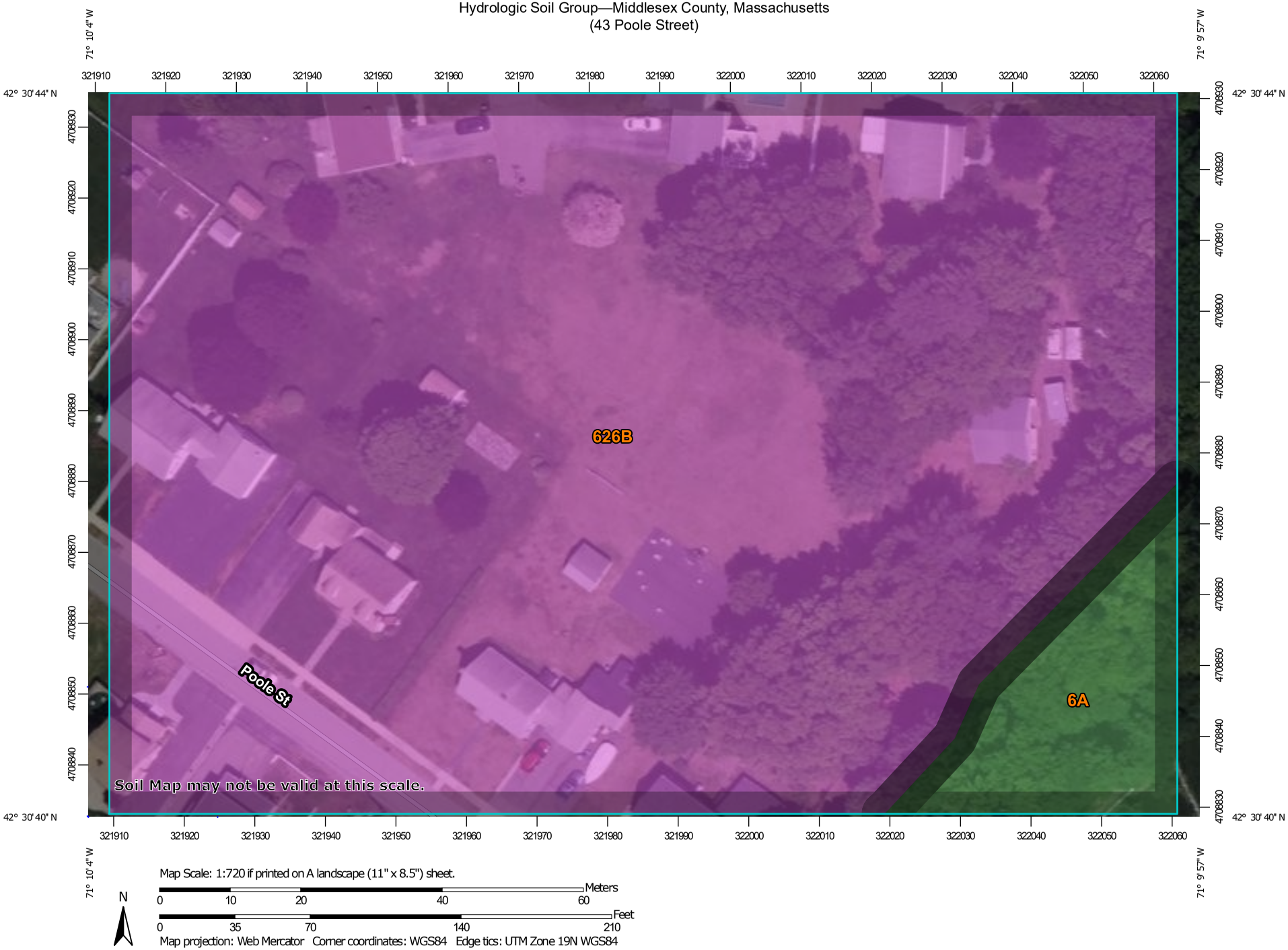
Erosion Control

Once all areas are stabilized, tubular sediment erosion control shall be cut and compost spread evenly. Burlap sock shall be removed and disposed of accordingly.

Other:

Additional maintenance specifications may also be referenced in the Order of Conditions issued by the Woburn Conservation Commission.

Hydrologic Soil Group—Middlesex County, Massachusetts
(43 Poole Street)



Map Scale: 1:720 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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 22, Sep 9, 2022

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

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

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	0.3	6.6%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	3.6	93.4%
Totals for Area of Interest			**3.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher