*MILLENNIUM ENGINEERING, INC.*

*Land Surveyors and Civil Engineers*

# STORMWATER MANAGEMENT REPORT

FOR THE

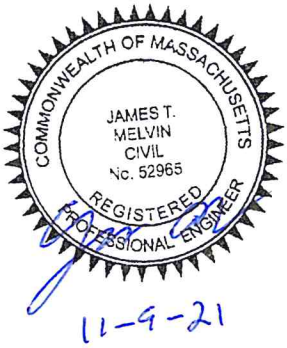
## SITE PLAN

AT

## 12 INGALLS COURT
## METHUEN, MA

PREPARED FOR:

L.D. RUSSO, INC.
198 AYER ROAD
HARVARD, MA




DATE: OCTOBER 11, 2021
REVISED: NOVEMBER 9, 2021

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Stormwater Management Report
12 Ingalls Court, Methuen, MA

# I. Introduction

## Introduction

The subject parcel is described as Tax Map 716, Block 115, Lot 2A on the City of Methuen, MA Assessor's Map. The project parcel is 3.36 acres in size. Elevations on the site range from 116.00' in the northwest corner of the parcel to 56.00' along the Spicket River. These elevations are based upon 1988 NAV datum.

The Site Plan proposes to construct a multifamily residential structure at 12 Ingalls Court in Methuen, Massachusetts. The project will consist of the re-construction of an access drive and parking area, the demolition of an existing building, and the construction of a new multi-family residential building. Most of the existing access drive and parking areas will remain in place. The proposed stormwater management system for the project includes catch basins, proprietary separators, and subsurface infiltration structures. Portions of the existing stormwater management system will remain in place and unchanged. The catch basins and Contech CDS units will remove suspended solids prior to discharging to the infiltration areas. The infiltration areas will provide stormwater recharge to the groundwater and mitigate peak runoff rates so the post-development runoff rates will be less than or equal to the pre-development rates.

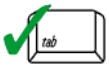
## II. Stormwater Management Checklist

**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

[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.

## B. Stormwater Checklist and Certification

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

# Checklist for Stormwater Report

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.

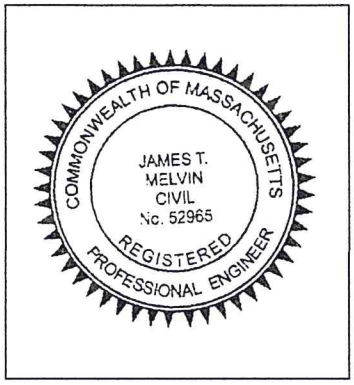
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that 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




11-9-21

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 (continued)

# Checklist for Stormwater Report

**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): Contech CDS, Subsurface infiltration Structures

**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** (continued)

# Checklist for Stormwater Report

**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** (continued)

# Checklist for Stormwater Report

**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** (continued)

# Checklist for Stormwater Report

**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** (continued)

# Checklist for Stormwater Report

**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** (continued)

# Checklist for Stormwater Report

**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.

# III. Hydrologic Analysis

*Existing Site Characteristics*

In general, the property is irregular in shape and fronts Granite Street. The Spicket River is located along the southern property line and a wetland resource area is present along the bank of the river. An existing commcerial building with associated driveway, patio, parking areas and utilities is located on-site. See the accompanying plan for a more detailed description of the existing site conditions and topography.

The lot consists of three soil groups: Hinckley Loamy Sand, 253B (Hydrologic Soil Group A); Hinckley and Windsor Soils, 257E (Hydrologic Soil Group A); and Urban Land, 602. 3 test pits were previously performed onsite in August 2016. The test pits indicated sandy soils throughout the site, more indicative of A soils being present throughout the site. See Appendix E for the NRCS soil map.

*Proposed Site Features*

The Applicant proposes to construct a multi-family residential building. Access to the property will be via an existing access drive from both Ingalls Court and Granite Street. A portion of the existing parking area will be re-graded and repaved to accommodate the new residential building. Underground electrical and telecommunications service will also be provided. Sewer and water services are proposed to be connected to the City of Methuen's sewer main and 6" water main located on site.

In order to address stormwater management regulations, catch basins, Cotech Water Quality Units, and subsurface infiltration areas are proposed to treat, store, and infiltrate runoff.

**WATERSHED ANALYSIS AND METHODOLOGY**

The stormwater runoff management system was analyzed using the storm events of the 2-year, 10-year and 100-year frequency. The analysis was performed using HydroCAD, version 10.00. Using USDA NRCS TR-20 and TR-55 methods of estimating runoff, the program uses the measured characteristics of the site and computes runoff produced by simulated rainfall events. The results are then used to design runoff control structures.

Existing drainage area boundaries were developed using an onsite topographic survey performed by Millennium Engineering, Inc. Proposed site development boundaries were developed from proposed grades and ground cover designed to minimize site storm water management structure requirements.

Hydrologic soil groups and curve numbers were estimated for existing and proposed developed conditions using available NRCS Soil Maps, current vegetation, and terrain.

**DRAINAGE ANALYSIS**

The purpose of the drainage analysis is two-fold. The first is to analyze and quantify the pre-development runoff flows through the site. The second purpose is to evaluate the impact of the proposed development on drainage patterns and flows, both within and outside the site, and to design a stormwater management system to adequately convey post-development runoff.

The design of the stormwater management system has the following goals:

1.) Minimize or eliminate erosion and sedimentation during construction as well as after development.

2.) To ensure that post-development flows do not have an adverse effect on downstream drainage structures and landowners.

3.) To design a stormwater and treatment system which will carry the surface runoff and satisfy goals one and two.

To determine the hydrological effect of the proposed development on the watershed, the existing conditions must first be analyzed.

**WATERSHED DESCRIPTION: EXISTING CONDITIONS**

Depending on the soil classification, type of ground cover present and the direction of the flow of runoff, the existing site is divided into watershed areas. Watershed area E1 – E3 and E10 consists of portions of the existing access drive, existing building, landscaped areas, and parking areas. These subcatchments are directed into the existing drainage system and into the existing subsurface infiltration system. E4 and E6 contains portions of the paved and gravel parking areas. These subcatchments flow into existing catch basins and into the subsurface infiltration system. Subcatchments E5, E7, and E9 contains paved parking areas that flow into existing catch basins and are discharged towards the Spicket River. Subcatchment E8 contains a large undeveloped portions of the site that is primarily wooded and borders the Spicket River. A small portion of the existing paved area fand a building area included in this subcatchment. E8 flows overland to the Spicket River. See the attached plans (Watersheds and HydroCad Data, sheet 1 of 2) for the watershed area boundaries and the pre-development time of concentration flow paths.

**WATERSHED ANALYSIS: EXISTING CONDITIONS**

The existing conditions were modeled using the tabular hydrograph method with a Type III synthetic storm distribution for the 2, 10 and 100-year storm recurrence intervals. Runoff hydrographs were produced to estimate existing peak discharge.

Flows for the three storm simulations are as follows:

Existing (Pre-development) Peak Runoff Rates (c.f.s.)

| Subcatchment | Size (Acres) | 2 Yr Storm | 10 Yr Storm | 100 Yr Storm |
|---|---|---|---|---|
| Total E | 5.39 | 2.53 | 6.24 | 20.60 |

The pre-development drainage calculations can be found in Appendix A.

**WATERSHED DESCRIPTION: POST-DEVELOPMENT CONDITIONS**

To determine the post development runoff, new watersheds, runoff curve numbers and times of concentration were generated reflecting the changes in the topography and surface cover. The post-development watersheds are shown on the attached plans (Watersheds and HydroCad Data, sheet 2 of 2). Watershed area P1 consists of the proposed building, an undeveloped portion of the site along the Spicket River, an existing paved area and existing building. P1 flows overland to the Spicket River. Area P2 contains a portion of the access drive, parking and landscaped areas. The runoff is collected by a catch basin, directed into a Contech pretreatment unit, and into Infiltration Area 1. Area P3 contains a portion of the access drive, parking area, and landscaped areas. The runoff is collected by a catch basin, directed towards a Contech pretreatment unit, and into Infiltration Area 2. Area P4 – P6 contain portions of the existing parking area. The runoff is directed into catch basins and directed towards the Spicket River. Area P7 contains a portion of an existing building and is directed into Infiltration Area 1.

**WATERSHED ANALYSIS: POST-DEVELOPMENT CONDITIONS**

The proposed developed conditions were modeled using the tabular hydrograph method with a Type III synthetic storm distribution for the 2, 10 and 100-year storm recurrence intervals. Runoff hydrographs were produced to estimate the post-development peak discharge.

Flows for the three storm simulations are as follows:

Post-Developed Peak Runoff Rates (c.f.s.)

| Subcatchment | Size | 2 Yr | 10 Yr | 100 Yr |
|---|---|---|---|---|
| | (Acres) | Storm | Storm | Storm |
| Total P | 5.39 | 1.27 | 3.13 | 17.60 |

The post-development drainage calculations can be found in Appendix B.

## IV. Stormwater Recharge Calculations

## Stormwater Recharge Calculations

Calculations were performed to ensure that the proposed project will comply with the groundwater recharge requirements of the Mass **DEP** Stormwater Management Standards. The required recharge volume was calculated as follows:

The Required Recharge Volume equals a depth of runoff corresponding to the soil type times the impervious areas located on site.

Rv = Fx Impervious area Where:

Rv = Required Recharge Volume, expressed in cubic feet

F = Target Depth Factor associated with each Hydrologic Soil

Group Impervious Area = pavement and rooftop area on site

For the proposed project:

Required Recharge volume, Rv (A soil) = F * impervious area
= 0.60 in * 69,892 s.f.
= 3,495 c.f.

**Total Required Recharge Volume = 3,495 c.f.**

**Total Recharge provided = 3,746 c.f.**
**Inf. Area 1= 1,960 c.f.**
**Inf. Area 2= 1,786 c.f.**

Drawdown Calculation

Infiltration Area 1

Drawdown Time = $\frac{Rv}{(K)\ (Bottom\ Area)}$

Rv=Storage Volume= 1,960 c.f.
K=Saturated Hydraulic Conductivity=8.27 in./hr
Bottom Area=1,604 s.f.

Drawdown Time = $\frac{1,960\ c.f.}{(8.27\ in/hr)(1ft/12in)(1,604\ s.f.)}$

Drawdown Time = 1.78 hours

Infiltration Area 2

Drawdown Time = $\frac{Rv}{(K)\ (Bottom\ Area)}$

Rv=Storage Volume= 1,786 c.f.
K=Saturated Hydraulic Conductivity=8.27 in./hr
Bottom Area=1,350 s.f.

Drawdown Time = $\frac{1,786\ c.f.}{(8.27\ in/hr)(1ft/12in)(1,350\ s.f.)}$

Drawdown Time = 1.92 hours

## V. TSS Removal Calculations

INSTRUCTIONS:

*Non-automated: Mar. 4, 2008*

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Pretreatment for Inf. Area 1

# TSS Removal Calculation Worksheet

| A<br>BMP[1] | B<br>TSS Removal Rate[1] | C<br>Starting TSS Load* | D<br>Amount Removed (B*C) | E<br>Remaining Load (C-D) |
|---|---|---|---|---|
| **Deep Sump/Hooded Catch Basin** | **0.25** | **1.00** | **0.25** | **0.75** |
| **Contech CDS** | **0.85** | **0.75** | **0.64** | **0.11** |
| | | | | |
| | | | | |
| | | | | |

**Total TSS Removal =** **89%**

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

Project: M213895

Prepared By: JTM

Date: 10/11/2021

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

INSTRUCTIONS:

*Non-automated: Mar. 4, 2008*

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

# TSS Removal Calculation Worksheet

Location: Pretreatment for Inf. Area 2

| A<br>BMP[1] | B<br>TSS Removal Rate[1] | C<br>Starting TSS Load* | D<br>Amount Removed (B*C) | E<br>Remaining Load (C-D) |
|---|---|---|---|---|
| **Deep Sump/Hooded Catch Basin** | **0.25** | **1.00** | **0.25** | **0.75** |
| **Contech CDS** | **0.85** | **0.75** | **0.64** | **0.11** |
| | | | | |
| | | | | |
| | | | | |

**Total TSS Removal =** **89%**

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

Project: M213895

Prepared By: JTM

Date: 10/11/2021

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

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

*Version 1, Automated: Mar. 4, 2008*

Location: Infiltration Area 1

## TSS Removal Calculation Worksheet

| B<br>BMP[1] | C<br>TSS Removal Rate[1] | D<br>Starting TSS Load* | E<br>Amount Removed (C*D) | F<br>Remaining Load (D-E) |
|---|---|---|---|---|
| **Subsurface Infiltration Structure** | **0.80** | **1.00** | **0.80** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |

**Total TSS Removal =** **80%**

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

Project: M213895
Prepared By: JTM
Date: 10/11/2021

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

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

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

*Version 1, Automated: Mar. 4, 2008*

Location: Infiltration Area 2

## TSS Removal Calculation Worksheet

| B<br>BMP[1] | C<br>TSS Removal Rate[1] | D<br>Starting TSS Load* | E<br>Amount Removed (C*D) | F<br>Remaining Load (D-E) |
|---|---|---|---|---|
| **Subsurface Infiltration Structure** | **0.80** | **1.00** | **0.80** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |
| | **0.00** | **0.20** | **0.00** | **0.20** |

**Total TSS Removal =** **80%**

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

Project: M213895
Prepared By: JTM
Date: 10/11/2021

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

# CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
# BASED ON THE RATIONAL RAINFALL METHOD

## 12 INGALLS COURT
## METHUEN, MA

| | | | |
|---|---|---|---|
| Area | **0.45 ac** | Unit Site Designation | **DMH 2** |
| Weighted C | **0.9** | Rainfall Station # | **69** |
| $t_c$ | **6 min** | | |
| CDS Model | **1515-3** | CDS Treatment Capacity | **1.0 cfs** |

| Rainfall Intensity[1] (in/hr) | Percent Rainfall Volume[1] | Cumulative Rainfall Volume | Total Flowrate (cfs) | Treated Flowrate (cfs) | Incremental Removal (%) |
|---|---|---|---|---|---|
| 0.02 | 10.2% | 10.2% | 0.01 | 0.01 | 9.8 |
| 0.04 | 9.6% | 19.8% | 0.02 | 0.02 | 9.3 |
| 0.06 | 9.4% | 29.3% | 0.02 | 0.02 | 9.0 |
| 0.08 | 7.7% | 37.0% | 0.03 | 0.03 | 7.3 |
| 0.10 | 8.6% | 45.6% | 0.04 | 0.04 | 8.1 |
| 0.12 | 6.3% | 51.9% | 0.05 | 0.05 | 5.9 |
| 0.14 | 4.7% | 56.5% | 0.06 | 0.06 | 4.4 |
| 0.16 | 4.6% | 61.2% | 0.06 | 0.06 | 4.3 |
| 0.18 | 3.5% | 64.7% | 0.07 | 0.07 | 3.3 |
| 0.20 | 4.3% | 69.1% | 0.08 | 0.08 | 4.0 |
| 0.25 | 8.0% | 77.1% | 0.10 | 0.10 | 7.2 |
| 0.30 | 5.6% | 82.7% | 0.12 | 0.12 | 5.0 |
| 0.35 | 4.4% | 87.0% | 0.14 | 0.14 | 3.8 |
| 0.40 | 2.5% | 89.5% | 0.16 | 0.16 | 2.2 |
| 0.45 | 2.5% | 92.1% | 0.18 | 0.18 | 2.1 |
| 0.50 | 1.4% | 93.5% | 0.20 | 0.20 | 1.2 |
| 0.75 | 5.0% | 98.5% | 0.30 | 0.30 | 3.9 |
| 1.00 | 1.0% | 99.5% | 0.41 | 0.41 | 0.7 |
| 1.50 | 0.0% | 99.5% | 0.61 | 0.61 | 0.0 |
| 2.00 | 0.0% | 99.5% | 0.81 | 0.81 | 0.0 |
| 3.00 | 0.5% | 100.0% | 1.22 | 1.00 | 0.1 |
| | | | | | 91.6 |
| | | | | Removal Efficiency Adjustment[2] = | 6.5% |
| | | | | Predicted % Annual Rainfall Treated = | 93.5% |
| | | | | **Predicted Net Annual Load Removal Efficiency =** | **85.1%** |

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

# CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
# BASED ON THE RATIONAL RAINFALL METHOD

## 12 INGALLS COURT
## METHUEN, MA

| | | | |
|---|---|---|---|
| Area | **0.45 ac** | Unit Site Designation | **DMH 3** |
| Weighted C | **0.9** | Rainfall Station # | **69** |
| $t_c$ | **6 min** | | |
| CDS Model | **1515-3** | CDS Treatment Capacity | **1.0 cfs** |

| Rainfall Intensity[1] (in/hr) | Percent Rainfall Volume[1] | Cumulative Rainfall Volume | Total Flowrate (cfs) | Treated Flowrate (cfs) | Incremental Removal (%) |
|---|---|---|---|---|---|
| 0.02 | 10.2% | 10.2% | 0.01 | 0.01 | 9.8 |
| 0.04 | 9.6% | 19.8% | 0.02 | 0.02 | 9.3 |
| 0.06 | 9.4% | 29.3% | 0.02 | 0.02 | 9.0 |
| 0.08 | 7.7% | 37.0% | 0.03 | 0.03 | 7.3 |
| 0.10 | 8.6% | 45.6% | 0.04 | 0.04 | 8.1 |
| 0.12 | 6.3% | 51.9% | 0.05 | 0.05 | 5.9 |
| 0.14 | 4.7% | 56.5% | 0.06 | 0.06 | 4.4 |
| 0.16 | 4.6% | 61.2% | 0.06 | 0.06 | 4.3 |
| 0.18 | 3.5% | 64.7% | 0.07 | 0.07 | 3.3 |
| 0.20 | 4.3% | 69.1% | 0.08 | 0.08 | 4.0 |
| 0.25 | 8.0% | 77.1% | 0.10 | 0.10 | 7.2 |
| 0.30 | 5.6% | 82.7% | 0.12 | 0.12 | 5.0 |
| 0.35 | 4.4% | 87.0% | 0.14 | 0.14 | 3.8 |
| 0.40 | 2.5% | 89.5% | 0.16 | 0.16 | 2.2 |
| 0.45 | 2.5% | 92.1% | 0.18 | 0.18 | 2.1 |
| 0.50 | 1.4% | 93.5% | 0.20 | 0.20 | 1.2 |
| 0.75 | 5.0% | 98.5% | 0.30 | 0.30 | 3.9 |
| 1.00 | 1.0% | 99.5% | 0.40 | 0.40 | 0.7 |
| 1.50 | 0.0% | 99.5% | 0.61 | 0.61 | 0.0 |
| 2.00 | 0.0% | 99.5% | 0.81 | 0.81 | 0.0 |
| 3.00 | 0.5% | 100.0% | 1.21 | 1.00 | 0.1 |
| | | | | | 91.6 |
| | | | | Removal Efficiency Adjustment[2] = | 6.5% |
| | | | | Predicted % Annual Rainfall Treated = | 93.5% |
| | | | | **Predicted Net Annual Load Removal Efficiency =** | **85.1%** |

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

## VI. Water Quality Calculations

## Water Quality Calculations

The Massachusetts DEP requires water quality calculations based on 1 inch of runoff for the total impervious area associated with the proposed development. The following calculation identifies the water quality volume required.

Infiltration Area 1

Total Impervious Area contributing to Infiltration Area 1 = 19,603 s.f.
19,603 s.f. * 1" / 12 (to convert to ft) = 1,634 c.f. of runoff to be treated for water quality.

Volume of infiltration area 1 below the lowest outlet = 1,960 c.f.

Infiltration Area 2

Total Impervious Area contributing to Infiltration Area 2 = 19,583 s.f.
19,583 s.f. * 1" / 12 (to convert to ft) = 1,632 c.f. of runoff to be treated for water quality.

Volume of infiltration area 2 below the lowest outlet = 1,786 c.f.

**Project:** 12 Ingalls Court
**Location:** Methuen, MA
**Prepared For:** Millennium Engineering

**Purpose:** To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

**Reference:** Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

**Procedure:** Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi$^2$/watershed inches (csm/in).

Compute Q Rate using the following equation:

$$Q = (qu)\ (A)\ (WQV)$$

where:

Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

| Structure Name | Impv. (acres) | A (miles$^2$) | $t_c$ (min) | $t_c$ (hr) | WQV (in) | qu (csm/in.) | Q (cfs) |
|---|---|---|---|---|---|---|---|
| DMH 2 | 0.45 | 0.0007031 | 6.0 | 0.100 | 1.00 | 774.00 | 0.54 |
| DMH 3 | 0.45 | 0.0007016 | 6.0 | 0.100 | 1.00 | 774.00 | 0.54 |
| | | | | | | | |
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## VII. Soils Analysis

# SOIL SUITABILITY ASSESSMENT REPORT

## COMMONWEALTH OF MASSACHUSETTS

## METHUEN, MASSACHUSETTS

SOIL EVALUATION FOR DETERMINATION OF SOIL TYPE AND GROUNDWATER TABLE ELEVATIONS

*SITE INFORMATION* Map: 716 Block: 115 Lot: 2A

Street Address: 12 Ingalls Court Town: Methuen State: Massachusetts Zip Code: 01844 County: Essex

Land Use: Residential Latitude: ~42° 43' 12.80" N Longitude: ~71° 11' 02.14" W

*PUBLISHED SOIL DATA AND MAP UNIT DESCRIPTION*

Physiographic Division: Appalachian Highlands Province: New England Section: Seaboard lowland section

Soil survey area: Essex County, Massachusetts, Northern Part Series name: 257E – Hinckley & Windsor, 25-35% slopes

Soil Order: Entisol Soil Suborder: Psamments Soil Family: Mixed, mesic, Typic Udipsamments

Soil moisture regime: Udic Soil temperature regime: Mesic Land Cover: Asphalt Runoff class: Very low

Soil hydric or upland: Upland Average depth to water table: > 80" Depth to restrictive feature: > 80"

Frequency of flooding: None Frequency of ponding: None Available water capacity: Low (~3.1")

Drainage Class: Excessively drained Hydrologic Soil Group: A Ksat: Moderately high to high (1.42 – 99.00 in/hr)

Ecological site: Dry outwash

*WETLAND AREA & USGS WELL MEASUREMENTS*

National Wetland Inventory Map: NA Wetlands Conservancy Program: NA Bordering vegetative wetland: NA

Current Water Resource Condition (USGS): Well Site # 424841071004101- MA-HLW 23 Haverhill, MA.,

Well depth: 15.10 feet Land surface altitude: 100.00 feet above NGVD29 Latitude: ~42°48'41.8" N Longitude: ~71°00'41.7"

Most recent data value: 11.94' on 10/02/21 (depth to water level in feet below land surface) Range: Much above normal

*SURFICIAL GEOLOGY*

Surficial Geology: Qcs: collapsed stratified sand deposits

Geologic parent material: Sandy and gravelly outwash deposits Geomorphic landform: Outwash terrace

Slope aspect: Southerly Landform position (2D): Backslope Landform position (3D): Side slope

Slope gradient: ~0-3% Down slope shape: Linear Across slope shape: Linear Slope complexity: Simple

Bedrock outcropping in vicinity: None observed Glacial erratics in vicinity: None observed

Bedrock Type: Berwick Formation – Silurian (440 – 420 Ma): Gray to gray green phyllite and calcareous quartzite and quartz-mica schist and well bedded calc-silicates.

# TP 21-1 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

Date: Wednesday, September 29, 2021 Time: 09:30 Weather: Overcast, ~45-50°F, breezy

Landscape: Upland Landform: Outwash terrace Position on landscape: Side slope

Slope aspect: Easterly Slope (%): 00- 03% Slope complexity: Simple Land Cover: Asphalt parking areas

Property line: $10^{+}$ feet Drainage way: $50^{+}$ feet Drinking water well: $100^{+}$ feet Abutting septic system: $50^{+}$ feet

Wetlands: $100^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

## *SOIL PROFILE ► TP 21-1*

| Depth below land surface (inches) | Soil Horizon/ Layer | Soil Texture (USDA/ NRCS) | Soil Color (Munsell) | Redoxomorphic Features/ ESHGWT | Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc. |
|---|---|---|---|---|---|
| 09" → 00" | | | | | Asphalt and base gravel |
| 00" → 100" | $_{2}$C | Sand | 2.5Y 6/4 light yellowish brown | none observed | Loose, structureless-single-grained; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; dry; ~ 10% gravel content of mixed lithology; clear wavy boundary |
| 100"→ 114" | Oi | Sandy Loam | 10YR 2/1 black | 108" (m,2-3,p) 2.5YR 4/6 10YR 7/1 | Very friable; fibric organic horizon; weak-grade; coarse massive structure; cohesive matrix; mucky; mixed very fine to fine-grained mineral content; slightly damp matrix; outgassing of methane detected; slightly sticky; non-plastic; no bedrock refusal at test hole depth |

Depth to bedrock: > 114" Seasonal High Groundwater Table: 108" Apparent water table: Not observed

# TP 21-1 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

## DEPTH TO APPARENT/ PHREATIC GROUNDWATER TABLE None Observed

Apparent water seeping from pit face:___ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: Slightly damp

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth below grade to observed Estimated Seasonal High Groundwater Table: 108”

Kind: Iron concentrations; iron coating on sand grains Location: Oi matrix Shape: Amorphous

Hardness: Soft Boundary: Diffuse Abundance: Many Size: Medium to coarse Contrast: Prominent

Concentration color: 2.5YR 4/6 red Reduction color: 10YR 7/1 light gray Moisture state: Damp to wet

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 108” inches below grade

Observed water weeping from side of deep hole: ___ inches below grade

Observed depth to stabilized phreatic water: ___ inches below grade

## DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 8.33 feet

Depth of naturally occurring pervious material in TP 21-1 Upper boundary: 00”
Lower boundary: 100”

## *Certification*

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *#1848* — June 1998

Massachusetts Evaluator & Certification number — Date of Soil Evaluator Certification

Unofficial testing for drainage — 09/29/21

Witness: City of Methuen — Date of soil testing

# TP 21-2 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

Date: Wednesday, September 29, 2021 Time: 10:41 Weather: Overcast, ~45-50°F, breezy

Landscape: Upland Landform: Outwash terrace Position on landscape: Side slope

Slope aspect: Easterly Slope (%): 00- 03% Slope complexity: Simple Land Cover: Asphalt parking areas

Property line: $10^{+}$ feet Drainage way: $50^{+}$ feet Drinking water well: $100^{+}$ feet Abutting septic system: $50^{+}$ feet

Wetlands: $100^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

## *SOIL PROFILE ► TP 21-2*

| Depth below land surface (inches) | Soil Horizon/ Layer | Soil Texture (USDA/ NRCS) | Soil Color (Munsell) | Redoxomorphic Features/ ESHGWT | Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc. |
|---|---|---|---|---|---|
| 08" → 00" | | | | | Asphalt and base gravel |
| 00" → 110" | $_{2}$C | Sand | 2.5Y 6/4 light yellowish brown | 109" (m,2-3,p) 2.5YR 4/6 10YR 7/1 | Loose, structureless-single-grained; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; dry; ~ 10% gravel content of mixed lithology; variegated colors in upper part of matrix; clear wavy boundary. |
| 110"→115" | Oi | Sandy Loam | 10YR 2/1 black | | Very friable; fibric organic horizon; weak-grade; coarse massive structure; cohesive matrix; mucky; mixed very fine to fine-grained mineral content; slightly damp matrix; outgassing of methane detected; slightly sticky; non-plastic; no bedrock refusal at test hole depth. |

Depth to bedrock: > 115" Seasonal High Groundwater Table: 109" Apparent water table: Not observed

# TP 21-2 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

## DEPTH TO APPARENT/ PHREATIC GROUNDWATER TABLE None Observed

Apparent water seeping from pit face:___ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: Slightly damp

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth below grade to observed Estimated Seasonal High Groundwater Table: 109”

Kind: Iron concentrations; iron coating on sand grains Location: 2C matrix Shape: Amorphous

Hardness: Soft Boundary: Diffuse Abundance: Many Size: Medium to coarse Contrast: Prominent

Concentration color: 2.5YR 4/6 red Reduction color: 10YR 7/1 light gray Moisture state: Damp to wet

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 109” inches below grade

Observed water weeping from side of deep hole: ___ inches below grade

Observed depth to stabilized phreatic water: ___ inches below grade

## DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 9.16 feet

Depth of naturally occurring pervious material in TP 21-2 Upper boundary: 00”
Lower boundary: 110”

## *Certification*

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *#1848* — June 1998

Massachusetts Evaluator & Certification number — Date of Soil Evaluator Certification

Unofficial testing for drainage — 09/29/21

Witness: City of Methuen — Date of soil testing

# TP 21-3 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

Date: Wednesday, September 29, 2021 Time: 12:49 Weather: Overcast, ~45-50°F, breezy

Landscape: Upland Landform: Outwash terrace Position on landscape: Side slope

Slope aspect: Easterly Slope (%): 00- 03% Slope complexity: Simple Land Cover: Asphalt parking areas

Property line: $10^{+}$ feet Drainage way: $50^{+}$ feet Drinking water well: $100^{+}$ feet Abutting septic system: $50^{+}$ feet

Wetlands: $100^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

## *SOIL PROFILE ► TP 21-3*

| Depth below land surface (inches) | Soil Horizon/ Layer | Soil Texture (USDA/ NRCS) | Soil Color (Munsell) | Redoxomorphic Features/ ESHGWT | Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc. |
|---|---|---|---|---|---|
| | | | | | |
| 06" → 00" | | | | | Asphalt and base gravel |
| 00" → 82" | $_{2}$C | Sand | 2.5Y 6/4 light yellowish brown | | Loose, structureless-single-grained; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; dry; ~ 10% gravel content of mixed lithology; clear wavy boundary. |
| 82 " → 109" | Oi | Sandy Loam | 10YR 2/1 black | 90" (m,2-3,p) 2.5YR 4/6 10YR 7/1 | Very friable; fibric organic horizon; weak-grade; coarse massive structure; cohesive matrix; mucky; mixed very fine to fine-grained mineral content; slightly damp matrix; outgassing of methane detected; slightly sticky; non-plastic; no bedrock refusal at test hole depth. |

Depth to bedrock: > 109" Seasonal High Groundwater Table: 90" Apparent water table: Not observed

# TP 21-3 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

## DEPTH TO APPARENT/ PHREATIC GROUNDWATER TABLE None Observed

Apparent water seeping from pit face:___ (below land surface) Depth to stabilized apparent water: ___ (below land surface)

Soil moisture state: Slightly damp

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth below grade to observed Estimated Seasonal High Groundwater Table: 90”

Kind: Iron concentrations; iron coating on sand grains Location: Oi matrix Shape: Amorphous

Hardness: Soft Boundary: Diffuse Abundance: Many Size: Medium to coarse Contrast: Prominent

Concentration color: 2.5YR 4/6 red Reduction color: 10YR 7/1 light gray Moisture state: Damp to wet

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 90” inches below grade

Observed water weeping from side of deep hole: ___ inches below grade

Observed depth to stabilized phreatic water: ___ inches below grade

## DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 9.08 feet

Depth of naturally occurring pervious material in TP 21-3 Upper boundary: 00”
Lower boundary: 109”

## *Certification*

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *#1848* — June 1998

Massachusetts Evaluator & Certification number — Date of Soil Evaluator Certification

Unofficial testing for drainage — 09/29/21

Witness: City of Methuen — Date of soil testing

# TP 21-4 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

Date: Wednesday, September 29, 2021 Time: 13:55 Weather: Overcast, ~45-50°F, breezy

Landscape: Upland Landform: Outwash terrace Position on landscape: Side slope

Slope aspect: Easterly Slope (%): 00- 03% Slope complexity: Simple Land Cover: Asphalt parking areas

Property line: $10^{+}$ feet Drainage way: $50^{+}$ feet Drinking water well: $100^{+}$ feet Abutting septic system: $50^{+}$ feet

Wetlands: $100^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

## *SOIL PROFILE ► TP 21-4*

| Depth below land surface (inches) | Soil Horizon/ Layer | Soil Texture (USDA/ NRCS) | Soil Color (Munsell) | Redoxomorphic Features/ ESHGWT | Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc. |
|---|---|---|---|---|---|
| | | | | | |
| 11" → 00" | | | | | Asphalt and base gravel |
| 00" → 72" | $_2C_1$ | Sand | 10YR 7/1 light gray | | Loose, structureless-single-grained; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; dry; ~ 10% gravel content of mixed lithology; variegated colors in upper part of matrix; clear wavy boundary. |
| 72 " → 115" | $_2C_2$ | Sand | 2.5Y 6/4 light yellowish brown | 100" (m,2-3,p) 2.5YR 4/6 10YR 7/1 | Friable, structureless-single-grained; somewhat compact matrix; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; damp to wet; free of clasts; clear wavy boundary. |

Depth to bedrock: > 115" Seasonal High Groundwater Table: 100" Apparent water table: 105"

# TP 21-4 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

## DEPTH TO APPARENT/ PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: 105" (below land surface) Depth to stabilized apparent water: ____ (below land surface)

Soil moisture state: Damp to wet

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth below grade to observed Estimated Seasonal High Groundwater Table: 100"

Kind: Iron concentrations; iron coating on sand grains Location: Oi matrix Shape: Amorphous

Hardness: Soft Boundary: Diffuse Abundance: Many Size: Medium to coarse Contrast: Prominent

Concentration color: 2.5YR 4/6 red Reduction color: 10YR 7/1 light gray Moisture state: Damp to wet

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 100" inches below grade

Observed water weeping from side of deep hole: 105" inches below grade

Observed depth to stabilized phreatic water: ___ inches below grade

## DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 8.75 feet

Depth of naturally occurring pervious material in TP 21-4 Upper boundary: 00"
Lower boundary: 115"

*Certification*

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *#1848* — June 1998

Massachusetts Evaluator & Certification number — Date of Soil Evaluator Certification

Unofficial testing for drainage — 09/29/21

Witness: City of Methuen — Date of soil testing

# TP 21-5 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

Date: Wednesday, September 29, 2021 Time: 14:40 Weather: Overcast, ~45-50°F, breezy

Landscape: Upland Landform: Outwash terrace Position on landscape: Side slope

Slope aspect: Easterly Slope (%): 00- 03% Slope complexity: Simple Land Cover: Asphalt parking areas

Property line: $10^+$ feet Drainage way: $50^+$ feet Drinking water well: $100^+$ feet Abutting septic system: $50^+$ feet

Wetlands: $100^+$ feet Public water supply reservoir: $400^+$ feet Tributary to reservoir: $200^+$ feet

## *SOIL PROFILE ► TP 21-5*

| Depth below land surface (inches) | Soil Horizon/ Layer | Soil Texture (USDA/ NRCS) | Soil Color (Munsell) | Redoxomorphic Features/ ESHGWT | Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc. |
|---|---|---|---|---|---|
| | | | | | |
| 11" → 00" | | | | | Asphalt and base gravel |
| 00" → 72" | $_2C_1$ | Sand | 10YR 7/1 light gray | | Loose, structureless-single-grained; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; dry; ~ 10% gravel content of mixed lithology; variegated colors in upper part of matrix; clear wavy boundary. |
| 72 " → 118" | $_2C_2$ | Sand | 2.5Y 6/4 light yellowish brown | 101" (m,2-3,p) 2.5YR 4/6 10YR 7/1 | Friable, structureless-single-grained; somewhat compact matrix; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; damp to wet; free of clasts; clear wavy boundary. |

Depth to bedrock: > 118" Seasonal High Groundwater Table: 101" Apparent water table: 106"

# TP 21-5 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

## DEPTH TO APPARENT/ PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: 106" (below land surface) Depth to stabilized apparent water: ____ (below land surface)

Soil moisture state: Damp to wet

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth below grade to observed Estimated Seasonal High Groundwater Table: 101"

Kind: Iron concentrations; iron coating on sand grains Location: Oi matrix Shape: Amorphous

Hardness: Soft Boundary: Diffuse Abundance: Many Size: Medium to coarse Contrast: Prominent

Concentration color: 2.5YR 4/6 red Reduction color: 10YR 7/1 light gray Moisture state: Damp to wet

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 101" inches below grade

Observed water weeping from side of deep hole: 106" inches below grade

Observed depth to stabilized phreatic water: ___ inches below grade

## DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 9.83 feet

Depth of naturally occurring pervious material in TP 21-5 Upper boundary: 00"
Lower boundary: 118"

## *Certification*

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

Alexander F. Parker *#1848* — June 1998

Massachusetts Evaluator & Certification number — Date of Soil Evaluator Certification

Unofficial testing for drainage — 09/29/21

Witness: City of Methuen — Date of soil testing

# TP 21-6 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

Date: Wednesday, September 29, 2021 Time: 15:30 Weather: Overcast, ~45-50°F, breezy

Landscape: Upland Landform: Outwash terrace Position on landscape: Side slope

Slope aspect: Easterly Slope (%): 00- 03% Slope complexity: Simple Land Cover: Asphalt parking areas

Property line: $10^{+}$ feet Drainage way: $50^{+}$ feet Drinking water well: $100^{+}$ feet Abutting septic system: $50^{+}$ feet

Wetlands: $100^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

## *SOIL PROFILE ► TP 21-6*

| Depth below land surface (inches) | Soil Horizon/ Layer | Soil Texture (USDA/ NRCS) | Soil Color (Munsell) | Redoxomorphic Features/ ESHGWT | Consistence, grade, size, structure, grain size, soil moisture state, roots, horizon boundary, clasts, stratification, artifacts, restrictive features, etc. |
|---|---|---|---|---|---|
| 07" → 00" | | | | | Asphalt and base gravel |
| 00" → 77" | $_2C_1$ | Sand | 10YR 7/1 light gray | | Loose, structureless-single-grained; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; dry; ~ 10% gravel content of mixed lithology; variegated colors in upper part of matrix; clear wavy boundary. |
| 77 " → 115" | $_2C_2$ | Sand | 2.5Y 6/4 light yellowish brown | 100" (m,2-3,p) 2.5YR 4/6 10YR 7/1 | Friable, structureless-single-grained; somewhat compact matrix; mixed very fine-to-medium grained mineral content; non-sticky; non-plastic; damp to wet; free of clasts; clear wavy boundary. |

Depth to bedrock: > 115" Seasonal High Groundwater Table: 100" Apparent water table: 104"

# TP 21-6 DEEP OBSERVATION HOLE

12 Ingalls Court, Methuen, Massachusetts

## DEPTH TO APPARENT/ PHREATIC GROUNDWATER TABLE

Apparent water seeping from pit face: 104" (below land surface) Depth to stabilized apparent water: ____ (below land surface)

Soil moisture state: Damp to wet

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth below grade to observed Estimated Seasonal High Groundwater Table: 100"

Kind: Iron concentrations; iron coating on sand grains Location: Oi matrix Shape: Amorphous

Hardness: Soft Boundary: Diffuse Abundance: Many Size: Medium to coarse Contrast: Prominent

Concentration color: 2.5YR 4/6 red Reduction color: 10YR 7/1 light gray Moisture state: Damp to wet

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 100" inches below grade

Observed water weeping from side of deep hole: 104" inches below grade

Observed depth to stabilized phreatic water: ___ inches below grade

## DEPTH OF NATURALLY OCCURRING PERVIOUS MATERIAL ► 9.58 feet

Depth of naturally occurring pervious material in TP 21-6 Upper boundary: 00"
Lower boundary: 115"

*Certification*

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.017.

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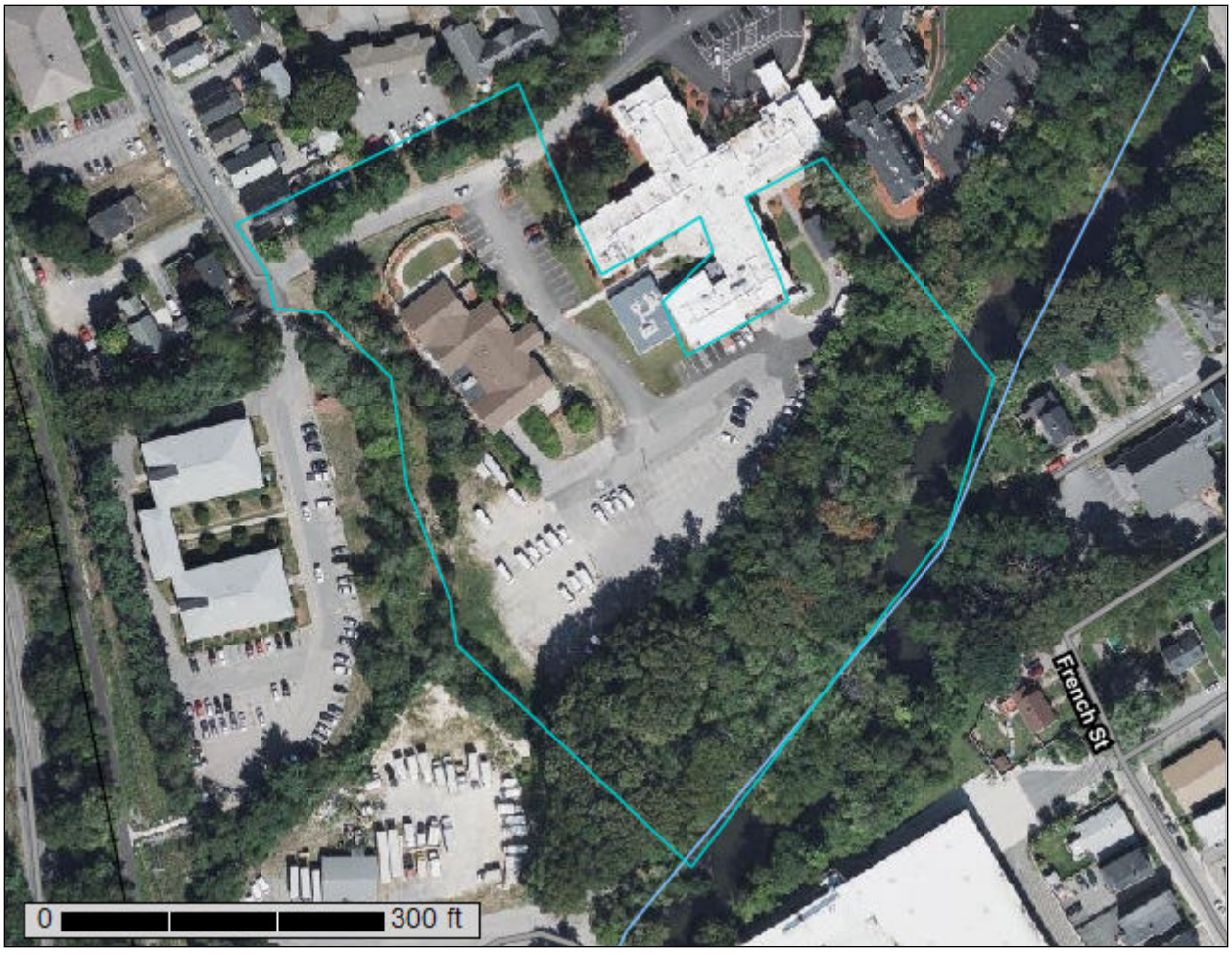
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

# Custom Soil Resource Report for Essex County, Massachusetts, Northern Part




October 12, 2021

# Preface

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

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

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

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

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

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

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# Contents

# How Soil Surveys Are Made

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

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

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

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

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

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

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

# Custom Soil Resource Report
## Soil Map


Map Scale: 1:1,660 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

## MAP LEGEND

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

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

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 17, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 13, 2020—Sep 15, 2020

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

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 1 | Water | 0.2 | 3.3% |
| 253B | Hinckley loamy sand, 3 to 8 percent slopes | 1.2 | 21.0% |
| 257E | Hinckley and Windsor soils, 25 to 35 percent slopes | 4.0 | 68.6% |
| 602 | Urban land | 0.4 | 7.2% |
| **Totals for Area of Interest** | | **5.9** | **100.0%** |

# Map Unit Descriptions

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

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

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

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

# Essex County, Massachusetts, Northern Part

## 1—Water

### Map Unit Setting

*National map unit symbol:* vjx4
*Frost-free period:* 125 to 165 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Water:* 100 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

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

### Map Unit Setting

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

### Map Unit Composition

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

### Description of Hinckley

#### Setting

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

#### Typical profile

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

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Excessively drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to very high (1.42 to 99.90 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)
*Available water supply, 0 to 60 inches:* Very low (about 3.0 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3s
*Hydrologic Soil Group:* A
*Ecological site:* F144AY022MA - Dry Outwash
*Hydric soil rating:* No

**Minor Components**

**Windsor**

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

**Sudbury**

*Percent of map unit:* 5 percent
*Landform:* Outwash deltas, outwash terraces, moraines, outwash plains, kame terraces
*Landform position (two-dimensional):* Backslope, footslope
*Landform position (three-dimensional):* Head slope, base slope, side slope, tread
*Down-slope shape:* Concave, linear
*Across-slope shape:* Concave, linear
*Hydric soil rating:* No

**Agawam**

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

## 257E—Hinckley and Windsor soils, 25 to 35 percent slopes

### Map Unit Setting

*National map unit symbol:* 2svm2
*Elevation:* 0 to 1,470 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Hinckley and similar soils:* 50 percent
*Windsor and similar soils:* 40 percent
*Minor components:* 10 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Hinckley

#### Setting

*Landform:* Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Nose slope, side slope, crest, head slope, riser
*Down-slope shape:* Concave, convex, linear
*Across-slope shape:* Convex, linear, concave
*Parent material:* Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

#### Typical profile

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

#### Properties and qualities

*Slope:* 25 to 35 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Excessively drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to very high (1.42 to 99.90 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)
*Available water supply, 0 to 60 inches:* Low (about 3.1 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 6e
*Hydrologic Soil Group:* A
*Ecological site:* F144AY022MA - Dry Outwash
*Hydric soil rating:* No

**Description of Windsor**

**Setting**

*Landform:* Moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Nose slope, side slope, crest, head slope, riser
*Down-slope shape:* Concave, convex, linear
*Across-slope shape:* Convex, linear, concave
*Parent material:* Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

**Typical profile**

*Oe - 0 to 1 inches:* moderately decomposed plant material
*A - 1 to 3 inches:* loamy sand
*Bw - 3 to 25 inches:* loamy sand
*C - 25 to 65 inches:* sand

**Properties and qualities**

*Slope:* 25 to 35 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Excessively drained
*Runoff class:* Very low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to very high (1.42 to 99.90 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)
*Available water supply, 0 to 60 inches:* Low (about 5.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 4e
*Hydrologic Soil Group:* A
*Ecological site:* F144AY022MA - Dry Outwash
*Hydric soil rating:* No

**Minor Components**

**Merrimac**

*Percent of map unit:* 10 percent
*Landform:* Kame terraces, outwash plains, kames, outwash terraces, moraines, eskers
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Nose slope, head slope, side slope, crest, riser

*Down-slope shape:* Concave, convex, linear
*Across-slope shape:* Convex, linear, concave
*Hydric soil rating:* No

## 602—Urban land

### Map Unit Setting

*National map unit symbol:* vjx3
*Frost-free period:* 125 to 165 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Urban land:* 80 percent
*Minor components:* 20 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Urban Land

#### Setting

*Parent material:* Excavated and filled land

### Minor Components

#### Udorthents

*Percent of map unit:* 10 percent
*Hydric soil rating:* No

#### Merrimac

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

#### Hinckley

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

#### Windsor

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

#### Charlton

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

#### Paxton

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

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# VIII. Long Term Pollution Prevention and Operations and Maintenance Plan

This long-term Stormwater Management System Operations and Maintenance (O&M) Plan, filed with the City of Methuen, shall be implemented for the proposed development at 12 Ingalls Court to ensure that the stormwater management system functions as designed. The Owner holds the primary responsibility for overseeing and implementing the O&M Plan and assigning a Property Manager who will be responsible for the proper operation and maintenance of the stormwater structures. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the O&M Plan. Included in the manual is a Stormwater Management O&M Plan identifying the key components of the stormwater system and a log for tracking inspections and maintenance.

The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, and source control significantly reduces the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular vacuuming and litter removal, and prohibitions on the use of pesticides.

The purpose of the Stormwater Operations and Maintenance (O&M) plan is to ensure inspection of the system, removal of accumulated sediments, oils, and debris, and implementation of corrective action and record keeping activities.

The ongoing responsibility is the Owner, its successors and assigns. Adequate maintenance is defined in this document as good working condition.

Contact information is provided below:

**Responsibility for Operations and Maintenance**
L.D. Russo, Inc.
198 Ayer Road
Harvard, MA

Illicit Discharge Compliance Statement

I, _____, verify that all illicit discharges to the stormwater management system are prohibited and no illicit discharges exist on the site.

EROSION AND SEDIMENT CONTROL BMPs

***Minimize Disturbed Area and Protect Natural Features and Soil***

Topsoil

Topsoil stripped from the immediate construction area can be temporarily stockpiled on site providing that the perimeter of the stockpiles is properly staked with silt fence at the toe of slope. The stockpiles shall be in areas that will not interfere with construction and at least 15 feet away from areas of concentrated flows or pavement. The area shall be inspected weekly for erosion and immediately after storm events. Areas on or around the stockpile that have eroded shall be stabilized immediately with erosion controls.

***Stabilize Soils***

Temporary Stabilization

- All vegetated areas which do not exhibit a minimum of 85% vegetative growth by Oct. 15th, or which are disturbed after Oct. 15th, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The placement of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.
- All ditches or swales which do not exhibit a minimum of 85% vegetative growth by Oct. 15th, or which are disturbed after Oct. 15th, shall be stabilized with stone or erosion control blankets appropriate for the design flow conditions.
- After November 15th, incomplete road surfaces, where work has stopped for the winter season, shall be protected with a minimum of 3 inches of crushed gravel.

***Protect Slopes***

Geotextile erosion control blankets shall be used to provide stabilization for slopes exceeding 3:1. Prepare soil before installing erosion control blanket, including any necessary application of lime, fertilizer, and seed. Begin at the top of the slope by anchoring the blanket in a 6" deep x 6" wide trench with approximately 12" extended beyond the upslope portion of the trench. Anchor the blanket with a row of staples/stakes approximately 12" apart in the bottom of the trench. Backfill and compact the trench after stapling. Apply seed to compacted soil and fold remaining 12" portion of back over seed and compacted soil. Secure over compacted soil with a row of staples/stakes spaced approximately 12" apart across the width of the blanket. Roll erosion control blanket either down or horizontally across the slope. Blanket will unroll with appropriate side against the soil surface. All blankets must be securely fastened to soil surface by placing staples/stakes in appropriate locations as shown in the staple pattern guide. When using the dot system, staples/stakes should be placed through each of the colored dots corresponding to the appropriate staple pattern. The edges of parallel blankets must be stapled with approximately

2"-5" overlap. Consecutive blankets spliced down the slope must be placed end over end (shingle style) with an approximate 3" overlap. Staple through overlapped area, approximately 12" apart across entire blanket's width. In loose soil conditions, the use of staple or stake lengths greater than 6" may be necessary to properly anchor the blanket.

***Establish Perimeter Controls and Sediment Barriers***

Silt fence shall be installed along the edge of wetlands. The silt fence shall be installed before construction begins. Wooden posts shall be doubled and coupled at filter cloth seams. Filter cloth shall be fastened securely to support netting with ties spaced every 24" at top, midsection, and bottom. When two sections of filter cloth adjoin each other, they shall be overlapped by 6 inches, folded and stapled. Silt fence shall be removed upon completion of the project and stabilization of all soil.

Maintenance:
1. Silt fence shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any repairs that are required shall be made immediately.
2. If the fabric on the silt fence shall decompose or become ineffective during the expected life of the fence, the fabric shall be replaced promptly.
3. Sediment deposits shall be inspected after every storm event. The deposits shall be removed when they reach approximately one-half the height of the barrier.
4. Sediment deposits that are removed or left in place after the fabric has been removed shall be graded to conform with the existing topography and vegetated.

***Establish Stabilized Construction Entrance***

A stabilized construction entrance shall be installed before construction begins on the site. The stone anti-tracking pad shall remain in place until the subgrade of pavement is installed.

1. Stone shall be 1-2" stone, reclaimed stone, or recycled concrete equivalent.
2. The length of the stabilized entrance shall not be less than 50'.
3. The thickness of the stone for the stabilized entrance shall not be less than 6".
4. Geotextile filter cloth shall be placed over the entire area prior to placing the stone.
5. All surface water that is flowing to or diverted toward the construction entrance shall be piped beneath the entrance. If piping is impractical, a berm with 5:1 slope that can be crossed by vehicles may be substituted for the pipe.
6. The entrance shall be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top-dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spilled, washed, or tracked onto public rights-of-way must be removed promptly.
7. Wheels shall be cleaned to remove mud prior to entrance onto public rights-of way. When washing is required, it shall be done on an area stabilized with stone which drains into an approved sediment trapping device.

***Catch Basin Inlet Protection***

Inlet protection devices intercept and/or filter sediment before it can be transported from a site into the storm drain system and discharged into a lake, river, stream, wetland, or other waterbody. These devices also keep sediment from filling or clogging storm drain pipes, ditches, and downgradient sediment traps or ponds. A siltsack or approved equal shall be used for catch basin inlet protection. It should be inspected weekly. When the restraint cord is no longer visible, siltsack is full and shall be emptied.

<u>POST-CONSTRUCTION BMPs</u>

*Snow and Snow Melt Management*

Proper management of snow and snow melt, snow removal and storage, use of deicing compounds, and other practices can minimize major runoff and pollutant loading impacts. Snow will be stored in areas adjacent to the edge of the access drive. Use of alternative deicing compounds, such as calcium chloride and calcium magnesium acetate, will be investigated for use. Professional services will be used for snow management.

*Deep Sump/Hooded Catch Basins*

Deep sump/hooded catch basins are incorporated in the proposed development's stormwater management plan as pre-treatment for the proposed drainage system. The sump provides for settlement of suspended solids and a hood is provided to remove floatables and trapped hydrocarbons. It is not anticipated that the access drive will become an area of high sediment loading. The sump should be inspected and cleaned at least four times per year; the more frequent the cleaning, the less likely sediment will be resuspended and subsequently discharged. Catch basin sediments and debris shall be disposed of at an approved DEP landfill. The owner shall be responsible for the catch basin cleaning operations.

*Infiltration Chamber*

Infiltration chambers are incorporated into the site design for infiltration. The chambers shall be inspected after every major storm event in the first 4 months after construction to ensure proper function. Inspection ports shall be utilized for access and assessment. After the four-month period, the chambers shall be inspected a minimum of twice per year. Any grit or sediment found within the chambers impacting infiltration shall be removed by manual or mechanical methods, such as a vacuum truck. The Condominium Association will be responsible for proper maintenance of the subsurface systems.

*CDS System*

A CDS2015-4 is incorporated into the site design for treatment for the proposed underground infiltration system. At a minimum, the unit shall be inspected twice per year (spring and fall). The CDS unit should be vacuum cleaned when the level of sediment has reached 75% of capacity in the isolated sump. Sediments and debris shall be disposed of at an approved DEP landfill. The owner shall be responsible for the CDS cleaning operations.

Rip Rap

Inspect the rip rap outlets regularly, especially after major storm events. Notation of any low spots or erosion should be made.

FINAL STABILIZATION

Permanent Seeding

Loam and hydroseed any disturbed surfaces after the final design grades have been achieved. A minimum of 6" of loam shall be installed. Seed mix shall be a maximum of 10% rye grass and a minimum of 90% permanent bluegrass and/or fescue. Lime shall be applied at a rate of 2 tons/acre.

Construction debris, trash and temporary BMPs (including silt fences, material storage areas, and inlet protection) will also be removed and any areas disturbed during removal will be seeded immediately.

# IIX. **Appendix**

## a. Rip-rap Sizing Calculations

Rockingham County Conservation District

# PIPE OUTLET PROTECTION APRON DESIGN
# And
# $d_{50}$ RIPRAP SIZING

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME : | 12 Ingalls Court | | | | |
| PROJECT # : | Outlet | | | | |
| BY : | JTM | | | CHECKED BY : | |
| DATE : | 11/9/2021 | STORM: | 100-Yr | DATE : | |

## DOWNSTREAM PIPE HYDRAULICS

| | | |
|---|---|---|
| Peak Discharge Required = | 5.59 | cfs |
| Depth of Flow* = | 0.20 | Feet |

## La AND W CALCULATIONS:

| | | |
|---|---|---|
| Culvert Diameter (Do) = | 12.0 | Inches |
| Tail Water Depth (TW)* = | 0.20 | Feet |
| Width of Apron @ U.S End (W) = | 3.0 | Feet |
| Length of Apron (La) = | 17 | Feet |
| Width of Apron @ D.S End (W) = | 20 | Feet |

***If outletting to Flat Area use TW depth = 0.2 x Do**

## ROCK RIPRAP SIZE

$d_{50}$ = 0.99 Feet or 11.91 Inches

$d_{50} = (0.02 \times Q^{4/3})/(Tw \times Do)$

## ROCK RIPRAP GRADATION (TABLE 7-24 OF NHDES HANDBOOK)

| % of Weight Smaller Than The Given Size | Size of Stone in Inches | | |
|---|---|---|---|
| 100 | 17.9 | to | 23.8 |
| 85 | 15.5 | to | 21.4 |
| 50 | 11.9 | to | 17.9 |
| 15 | 3.6 | to | 6.0 |

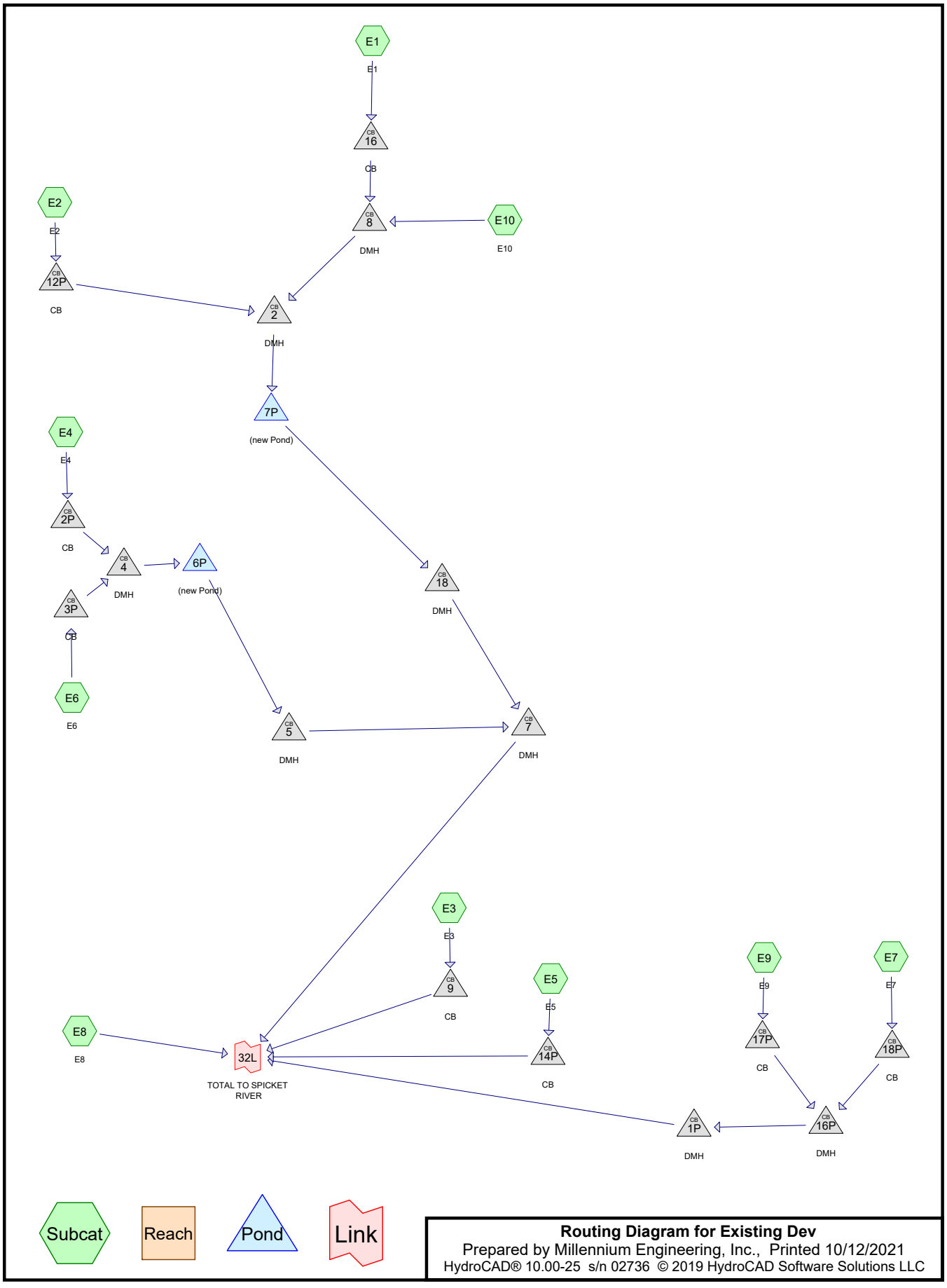
Minimum Rock Riprap Blanket Thickness = 35.7 Inches

Minimum Six inch Sand/Gravel Bedding or Geotextile Fabric Required Under All Rock Riprap

## FORMULAS USED (Reference NHDES HANDBOOK, Pages 7-114, 7-115)

| | |
|---|---|
| Manning's Uniform Channel Flow - | Q = (A x 1.486 x R^(2/3) x S^(1/2))/"n" |
| Length of Apron (La) TW< Do/2 - | La = (1.8 x Q/Do^1.5) + 7 x Do |
| Length of Apron (La) TW>= Do/2 - | La = 3.0 x Q/Do^1.5 + 7 x Do |
| Width of Apron @ D.S End TW < Do/2 - | W = 3 x Do + La |
| Width of Apron @ D.S End TW >= Do/2 - | W = 3 x Do + 0.4 x La |
| Width of D.S. Apron if in Channel - | Ch. BW +Sum of Side Slopes x Flow Depth |
| Width of Apron @ Culvert - | Wc = 3 x Do |

## b. Existing Conditions HydroCAD Report




**Routing Diagram for Existing Dev**

Prepared by Millennium Engineering, Inc., Printed 10/12/2021

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 1.162 | 49 | 50-75% Grass cover, Fair, HSG A (E1, E2, E4, E5, E6, E7) |
| 0.222 | 39 | >75% Grass cover, Good, HSG A (E3, E8) |
| 0.349 | 96 | Gravel surface, HSG A (E4, E5, E6, E7) |
| 1.313 | 98 | Paved parking, HSG A (E1, E2, E3, E4, E5, E7, E8, E9) |
| 0.155 | 98 | Roofs, HSG A (E1, E10, E3, E8) |
| 0.141 | 98 | Roofs, HSG C (E2) |
| 0.034 | 98 | Unconnected pavement, HSG A (E1) |
| 1.860 | 36 | Woods, Fair, HSG A (E8) |
| 0.063 | 83 | Woods, Poor, HSG D (E8) |
| 0.045 | 43 | Woods/grass comb., Fair, HSG A (E2) |
| 0.047 | 32 | Woods/grass comb., Good, HSG A (E1) |
| **5.391** | **62** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 5.187 | HSG A | E1, E10, E2, E3, E4, E5, E6, E7, E8, E9 |
| 0.000 | HSG B | |
| 0.141 | HSG C | E2 |
| 0.063 | HSG D | E8 |
| 0.000 | Other | |
| **5.391** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 1.162 | 0.000 | 0.000 | 0.000 | 0.000 | 1.162 | 50-75% Grass cover, Fair | E1, E2, E4, E5, E6, E7 |
| 0.222 | 0.000 | 0.000 | 0.000 | 0.000 | 0.222 | >75% Grass cover, Good | E3, E8 |
| 0.349 | 0.000 | 0.000 | 0.000 | 0.000 | 0.349 | Gravel surface | E4, E5, E6, E7 |
| 1.313 | 0.000 | 0.000 | 0.000 | 0.000 | 1.313 | Paved parking | E1, E2, E3, E4, E5, E7, E8, E9 |
| 0.155 | 0.000 | 0.141 | 0.000 | 0.000 | 0.296 | Roofs | E1, E10, E2, E3, E8 |
| 0.034 | 0.000 | 0.000 | 0.000 | 0.000 | 0.034 | Unconnected pavement | E1 |
| 1.860 | 0.000 | 0.000 | 0.000 | 0.000 | 1.860 | Woods, Fair | E8 |
| 0.000 | 0.000 | 0.000 | 0.063 | 0.000 | 0.063 | Woods, Poor | E8 |
| 0.045 | 0.000 | 0.000 | 0.000 | 0.000 | 0.045 | Woods/grass comb., Fair | E2 |
| 0.047 | 0.000 | 0.000 | 0.000 | 0.000 | 0.047 | Woods/grass comb., Good | E1 |
| **5.187** | **0.000** | **0.141** | **0.063** | **0.000** | **5.391** | **TOTAL AREA** | |

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 E1: E1** Runoff Area=39,960 sf 43.36% Impervious Runoff Depth=0.75"
Flow Length=267' Tc=7.1 min CN=69 Runoff=0.67 cfs 0.057 af

**Subcatchment E10: E10** Runoff Area=2,639 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.17 cfs 0.015 af

**Subcatchment E2: E2** Runoff Area=18,640 sf 45.04% Impervious Runoff Depth=0.80"
Flow Length=353' Tc=6.6 min CN=70 Runoff=0.35 cfs 0.028 af

**Subcatchment E3: E3** Runoff Area=2,446 sf 30.25% Impervious Runoff Depth=0.29"
Tc=6.0 min CN=57 Runoff=0.01 cfs 0.001 af

**Subcatchment E4: E4** Runoff Area=1,774 sf 18.60% Impervious Runoff Depth=1.12"
Tc=6.0 min CN=76 Runoff=0.05 cfs 0.004 af

**Subcatchment E5: E5** Runoff Area=23,688 sf 46.38% Impervious Runoff Depth=1.72"
Flow Length=423' Tc=9.7 min CN=85 Runoff=0.90 cfs 0.078 af

**Subcatchment E6: E6** Runoff Area=7,193 sf 0.00% Impervious Runoff Depth=0.85"
Flow Length=166' Tc=9.5 min CN=71 Runoff=0.13 cfs 0.012 af

**Subcatchment E7: E7** Runoff Area=40,532 sf 61.61% Impervious Runoff Depth=1.64"
Flow Length=504' Tc=10.2 min CN=84 Runoff=1.44 cfs 0.127 af

**Subcatchment E8: E8** Runoff Area=94,382 sf 2.80% Impervious Runoff Depth=0.00"
Flow Length=194' Tc=8.3 min CN=39 Runoff=0.00 cfs 0.000 af

**Subcatchment E9: E9** Runoff Area=3,571 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.23 cfs 0.020 af

**Pond 1P: DMH** Peak Elev=149.21' Inflow=1.63 cfs 0.147 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=1.63 cfs 0.147 af

**Pond 2: DMH** Peak Elev=149.06' Inflow=1.18 cfs 0.101 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=1.18 cfs 0.101 af

**Pond 2P: CB** Peak Elev=148.84' Inflow=0.05 cfs 0.004 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.05 cfs 0.004 af

**Pond 3P: CB** Peak Elev=148.91' Inflow=0.13 cfs 0.012 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.13 cfs 0.012 af

**Pond 4: DMH** Peak Elev=148.64' Inflow=0.17 cfs 0.015 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=0.17 cfs 0.015 af

**Pond 5: DMH** Peak Elev=148.41' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=0.00 cfs 0.000 af

**Pond 6P: (new Pond)** Peak Elev=89.37' Storage=0.000 af Inflow=0.17 cfs 0.015 af
Discarded=0.17 cfs 0.015 af Primary=0.00 cfs 0.000 af Outflow=0.17 cfs 0.015 af

**Pond 7: DMH** Peak Elev=148.41' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=0.00 cfs 0.000 af

**Pond 7P: (new Pond)** Peak Elev=89.79' Storage=0.021 af Inflow=1.18 cfs 0.101 af
Discarded=0.19 cfs 0.101 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.101 af

**Pond 8: DMH** Peak Elev=141.53' Inflow=0.83 cfs 0.072 af
12.0" Round Culvert n=0.013 L=70.5' S=-0.7362 '/' Outflow=0.83 cfs 0.072 af

**Pond 9: CB** Peak Elev=89.24' Inflow=0.01 cfs 0.001 af
12.0" Round Culvert n=0.013 L=23.0' S=-0.0174 '/' Outflow=0.01 cfs 0.001 af

**Pond 12P: CB** Peak Elev=149.05' Inflow=0.35 cfs 0.028 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.35 cfs 0.028 af

**Pond 14P: CB** Peak Elev=149.28' Inflow=0.90 cfs 0.078 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.90 cfs 0.078 af

**Pond 16: CB** Peak Elev=92.17' Inflow=0.67 cfs 0.057 af
12.0" Round Culvert n=0.013 L=76.0' S=0.0329 '/' Outflow=0.67 cfs 0.057 af

**Pond 16P: DMH** Peak Elev=149.21' Inflow=1.63 cfs 0.147 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=1.63 cfs 0.147 af

**Pond 17P: CB** Peak Elev=148.99' Inflow=0.23 cfs 0.020 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.23 cfs 0.020 af

**Pond 18: DMH** Peak Elev=148.41' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=0.00 cfs 0.000 af

**Pond 18P: CB** Peak Elev=149.47' Inflow=1.44 cfs 0.127 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=1.44 cfs 0.127 af

**Link 32L: TOTAL TO SPICKET RIVER** Inflow=2.53 cfs 0.226 af
Primary=2.53 cfs 0.226 af

**Total Runoff Area = 5.391 ac Runoff Volume = 0.342 af Average Runoff Depth = 0.76"**
**69.51% Pervious = 3.747 ac 30.49% Impervious = 1.644 ac**

## Summary for Subcatchment E1: E1

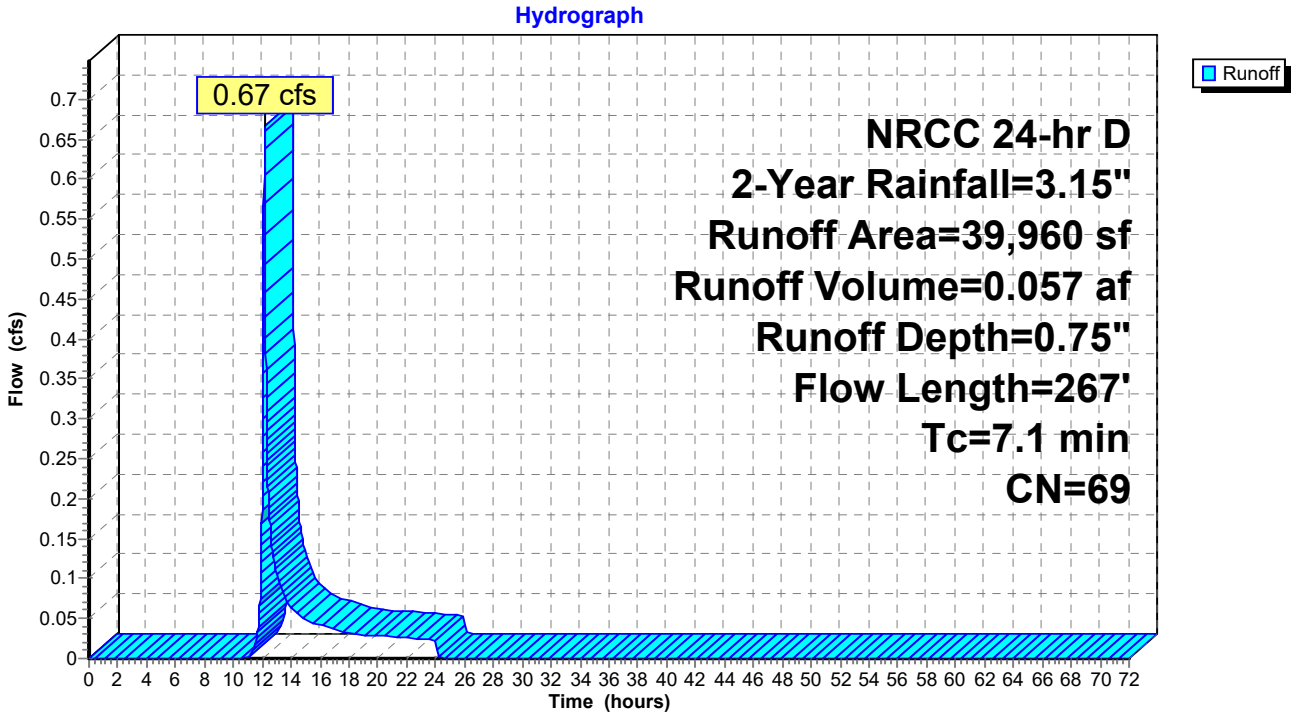
Runoff = 0.67 cfs @ 12.15 hrs, Volume= 0.057 af, Depth= 0.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 12,738 | 98 | Paved parking, HSG A |
| 3,090 | 98 | Roofs, HSG A |
| 1,498 | 98 | Unconnected pavement, HSG A |
| 2,032 | 32 | Woods/grass comb., Good, HSG A |
| 20,602 | 49 | 50-75% Grass cover, Fair, HSG A |
| 39,960 | 69 | Weighted Average |
| 22,634 | | 56.64% Pervious Area |
| 17,326 | | 43.36% Impervious Area |
| 1,498 | | 8.65% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 2.3 | 30 | 0.0700 | 0.22 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 3.5 | 20 | 0.0800 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.1 | 38 | 0.0800 | 4.55 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.1 | 18 | 0.1200 | 5.58 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.6 | 81 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.5 | 80 | 0.0200 | 2.87 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 7.1 | 267 | Total | | | |

## Subcatchment E1: E1



## Summary for Subcatchment E10: E10

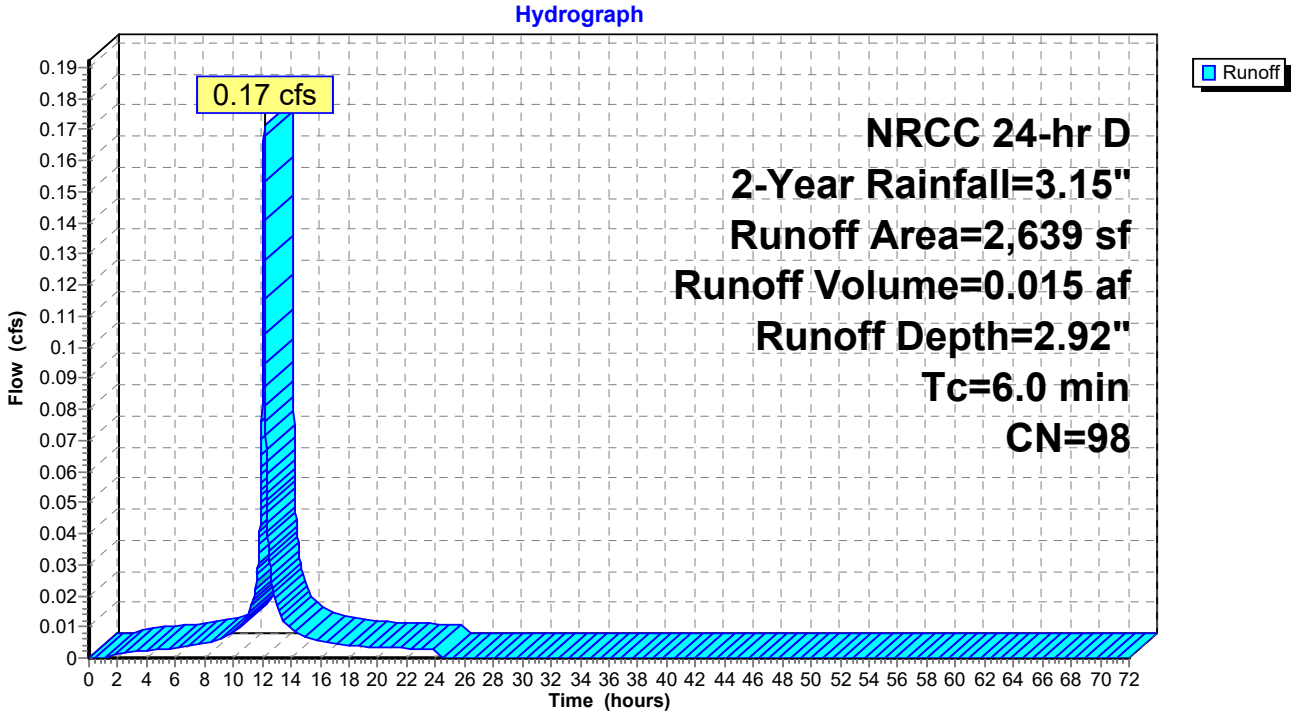
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.015 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 2,639 | 98 | Roofs, HSG A |
| 2,639 | | 100.00% Impervious Area |

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

## Subcatchment E10: E10



## Summary for Subcatchment E2: E2

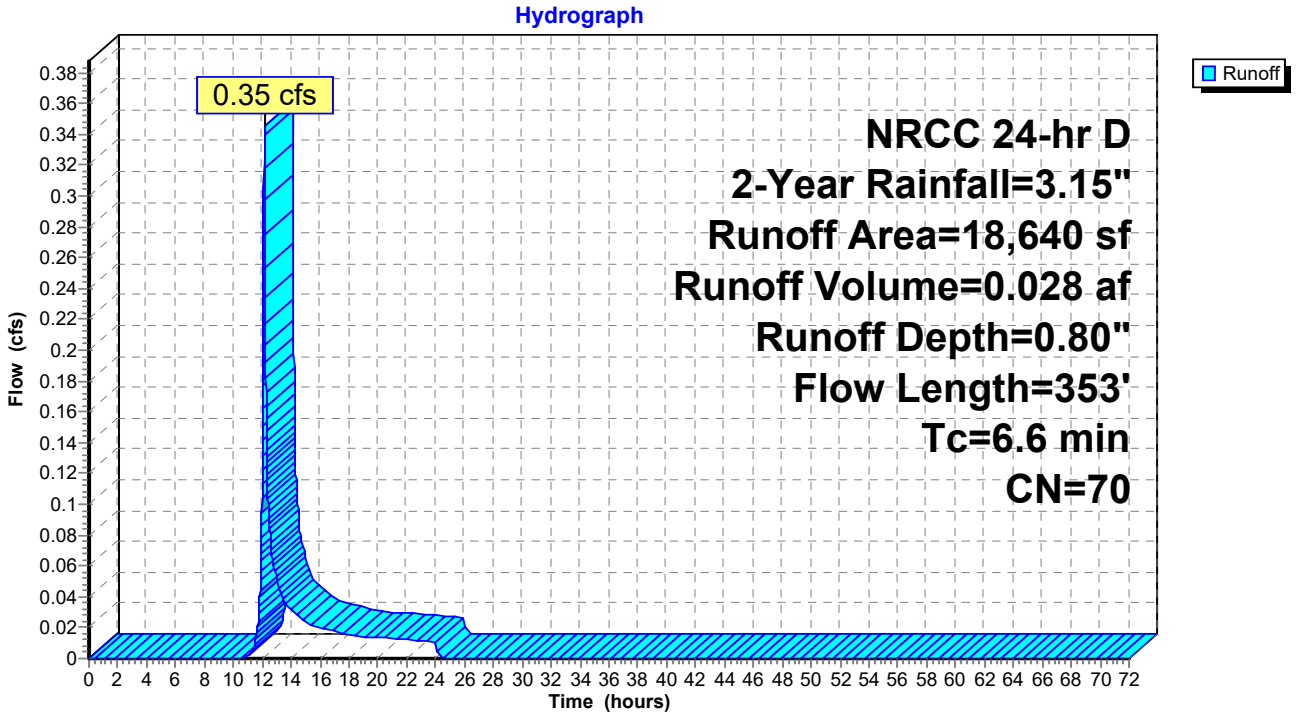
Runoff = 0.35 cfs @ 12.14 hrs, Volume= 0.028 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 6,144 | 98 | Roofs, HSG C |
| 2,252 | 98 | Paved parking, HSG A |
| 1,944 | 43 | Woods/grass comb., Fair, HSG A |
| 8,300 | 49 | 50-75% Grass cover, Fair, HSG A |
| 18,640 | 70 | Weighted Average |
| 10,244 | | 54.96% Pervious Area |
| 8,396 | | 45.04% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 2.7 | 40 | 0.0800 | 0.24 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 2.0 | 10 | 0.0800 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.2 | 51 | 0.0900 | 4.83 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.3 | 158 | 0.0150 | 1.97 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 54 | 0.0500 | 3.60 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 40 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 6.6 | 353 | Total | | | |

## Subcatchment E2: E2



## Summary for Subcatchment E3: E3

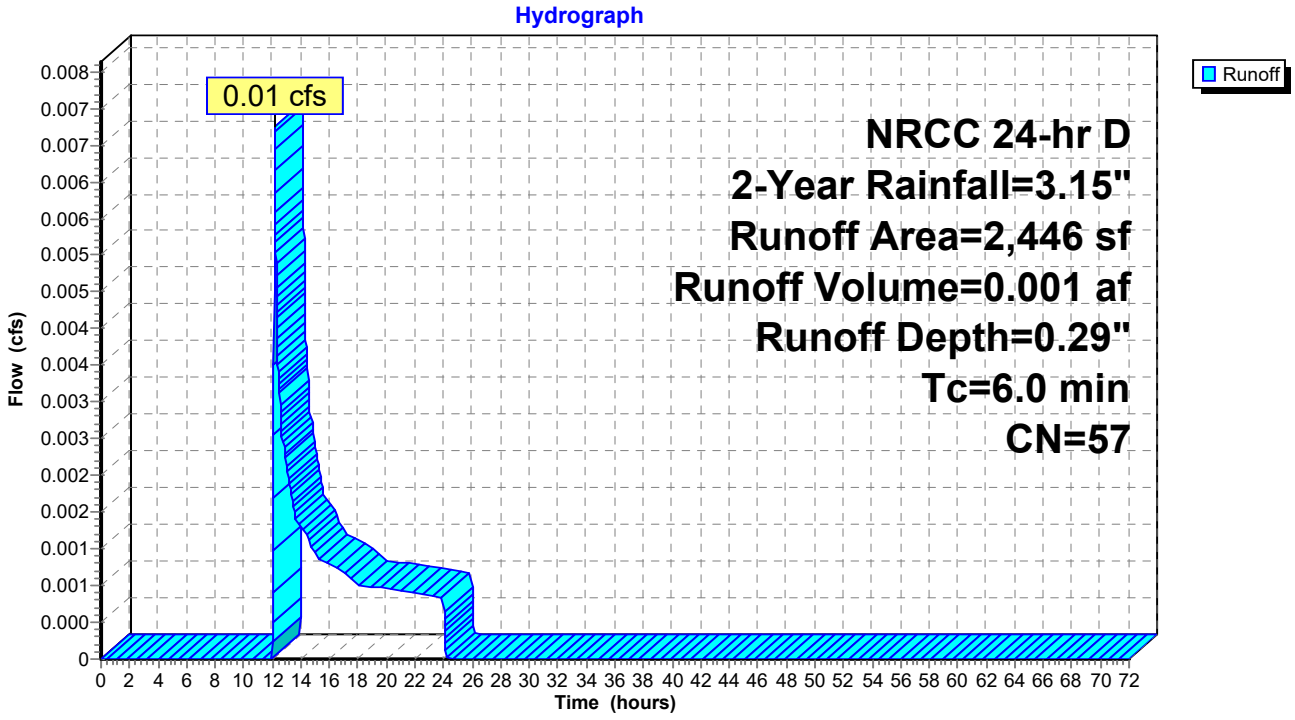
Runoff = 0.01 cfs @ 12.16 hrs, Volume= 0.001 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 383 | 98 | Roofs, HSG A |
| 357 | 98 | Paved parking, HSG A |
| 1,706 | 39 | >75% Grass cover, Good, HSG A |
| 2,446 | 57 | Weighted Average |
| 1,706 | | 69.75% Pervious Area |
| 740 | | 30.25% Impervious Area |

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

## Subcatchment E3: E3



## Summary for Subcatchment E4: E4

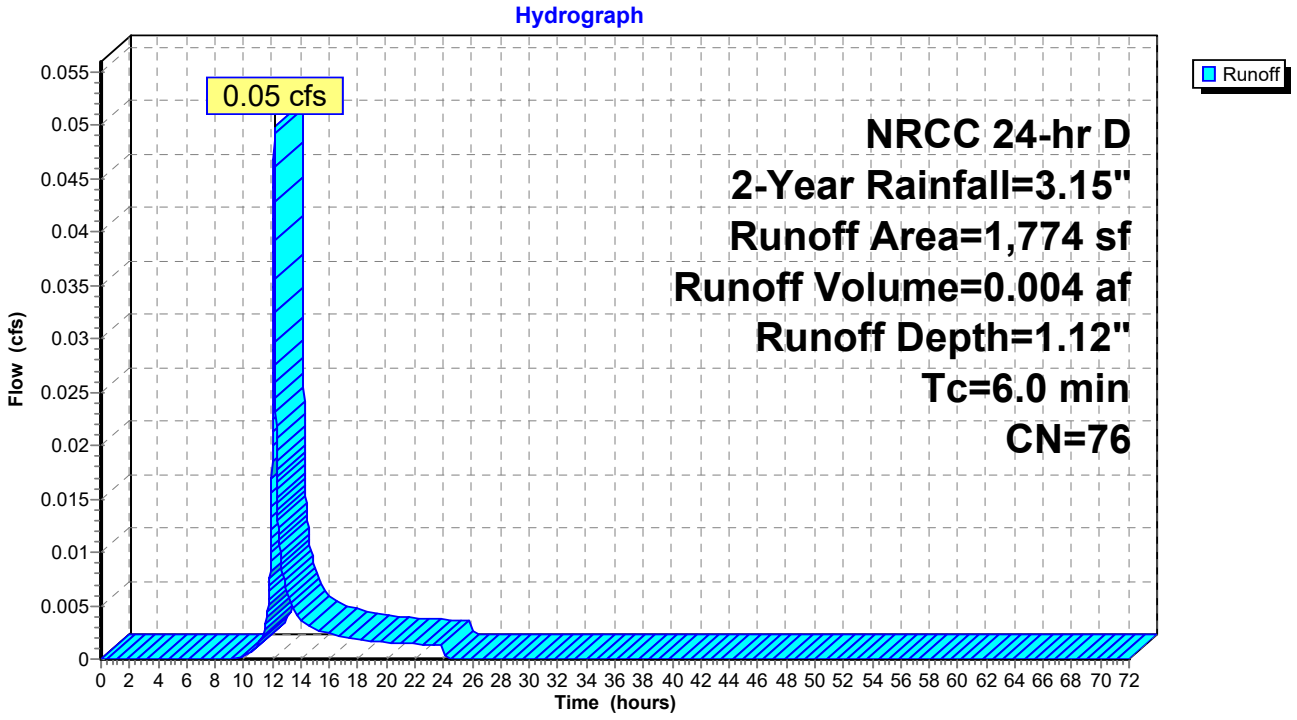
Runoff = 0.05 cfs @ 12.14 hrs, Volume= 0.004 af, Depth= 1.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 330 | 98 | Paved parking, HSG A |
| 661 | 96 | Gravel surface, HSG A |
| 783 | 49 | 50-75% Grass cover, Fair, HSG A |
| 1,774 | 76 | Weighted Average |
| 1,444 | | 81.40% Pervious Area |
| 330 | | 18.60% Impervious Area |

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

## Subcatchment E4: E4



## Summary for Subcatchment E5: E5

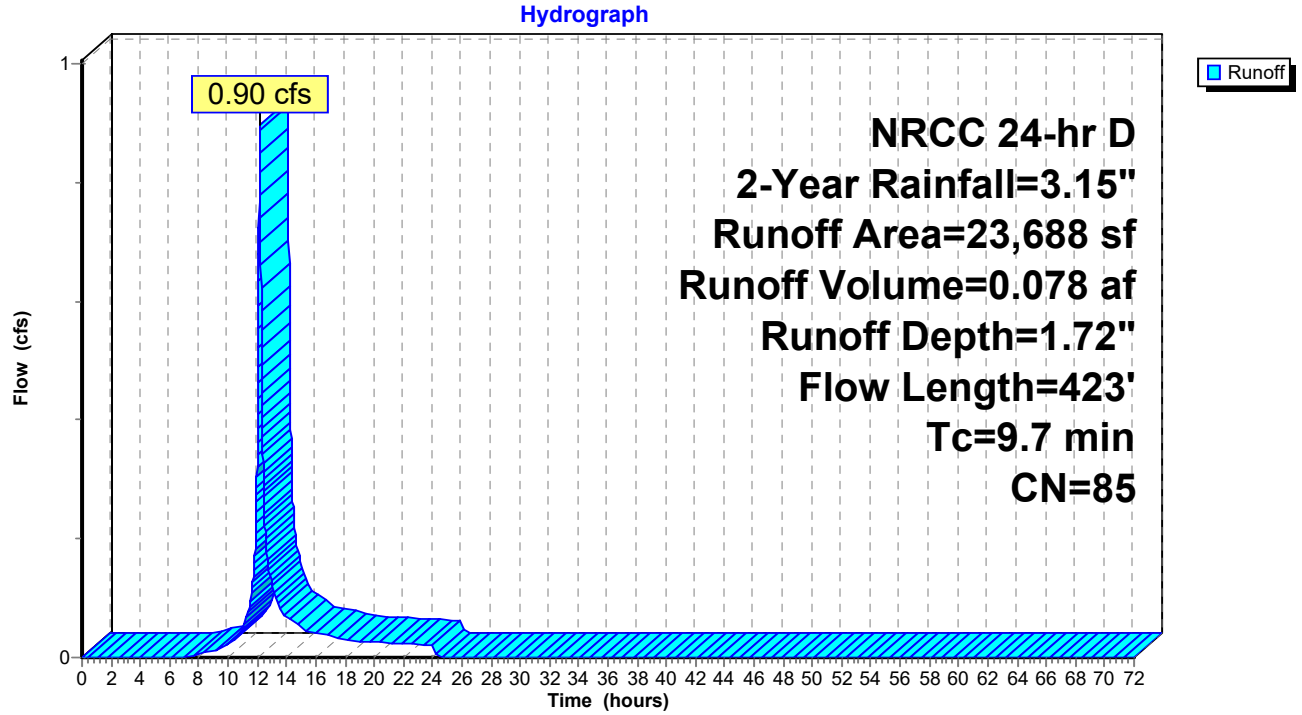
Runoff = 0.90 cfs @ 12.17 hrs, Volume= 0.078 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 10,987 | 98 | Paved parking, HSG A |
| 6,587 | 96 | Gravel surface, HSG A |
| 6,114 | 49 | 50-75% Grass cover, Fair, HSG A |
| 23,688 | 85 | Weighted Average |
| 12,701 | | 53.62% Pervious Area |
| 10,987 | | 46.38% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.8 | 20 | 0.0350 | 0.07 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 3.0 | 30 | 0.0350 | 0.16 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 0.9 | 120 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.0 | 253 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 9.7 | 423 | Total | | | |

## Subcatchment E5: E5



## Summary for Subcatchment E6: E6

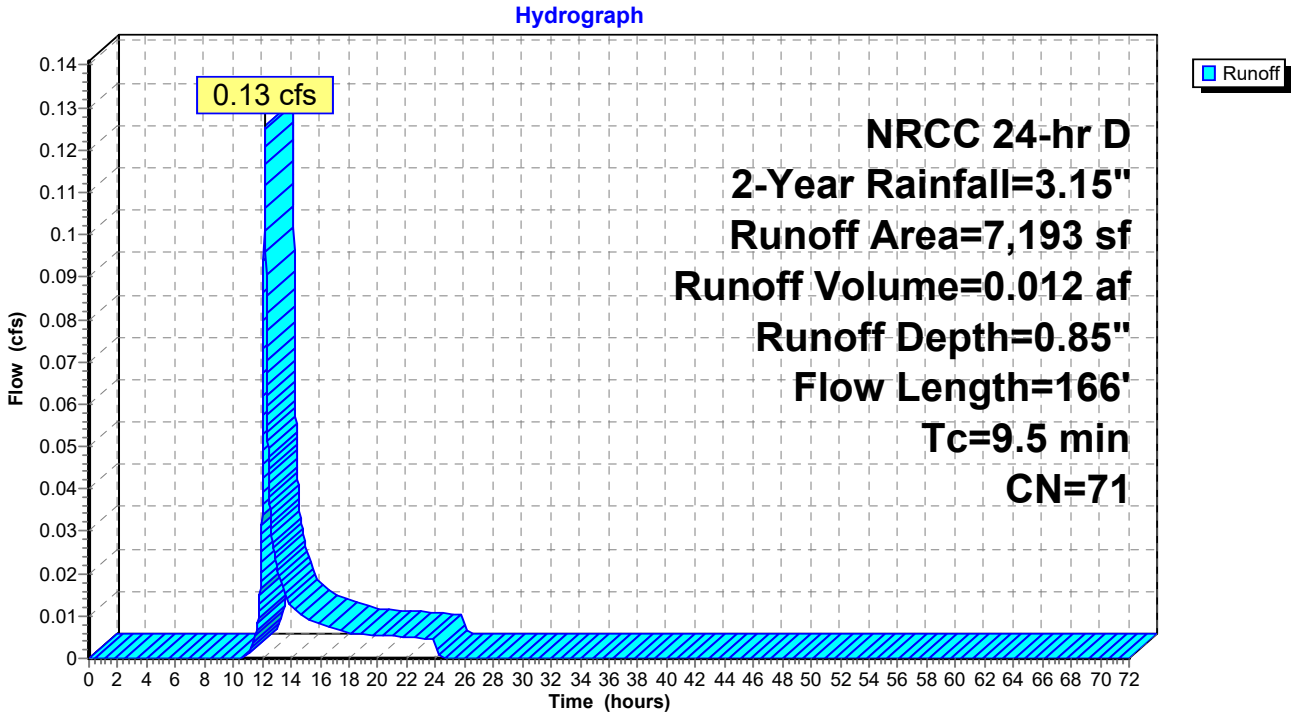
Runoff = 0.13 cfs @ 12.17 hrs, Volume= 0.012 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 3,426 | 96 | Gravel surface, HSG A |
| 3,767 | 49 | 50-75% Grass cover, Fair, HSG A |
| 7,193 | 71 | Weighted Average |
| 7,193 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.7 | 50 | 0.0500 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.8 | 116 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 9.5 | 166 | Total | | | |

## Subcatchment E6: E6



## Summary for Subcatchment E7: E7

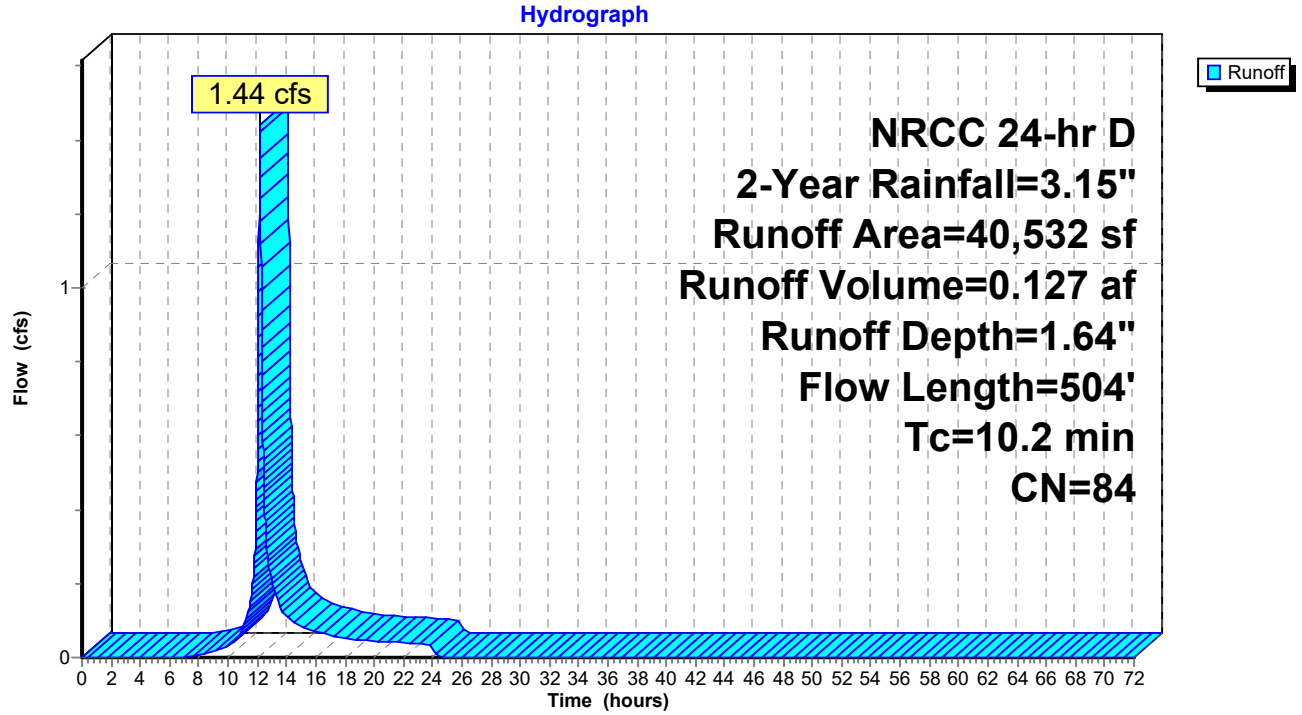
Runoff = 1.44 cfs @ 12.18 hrs, Volume= 0.127 af, Depth= 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 24,971 | 98 | Paved parking, HSG A |
| 4,531 | 96 | Gravel surface, HSG A |
| 11,030 | 49 | 50-75% Grass cover, Fair, HSG A |
| 40,532 | 84 | Weighted Average |
| 15,561 | | 38.39% Pervious Area |
| 24,971 | | 61.61% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.8 | 40 | 0.0600 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 10 | 0.0500 | 0.15 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 0.9 | 120 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.4 | 334 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 10.2 | 504 | Total | | | |

## Subcatchment E7: E7



## Summary for Subcatchment E8: E8

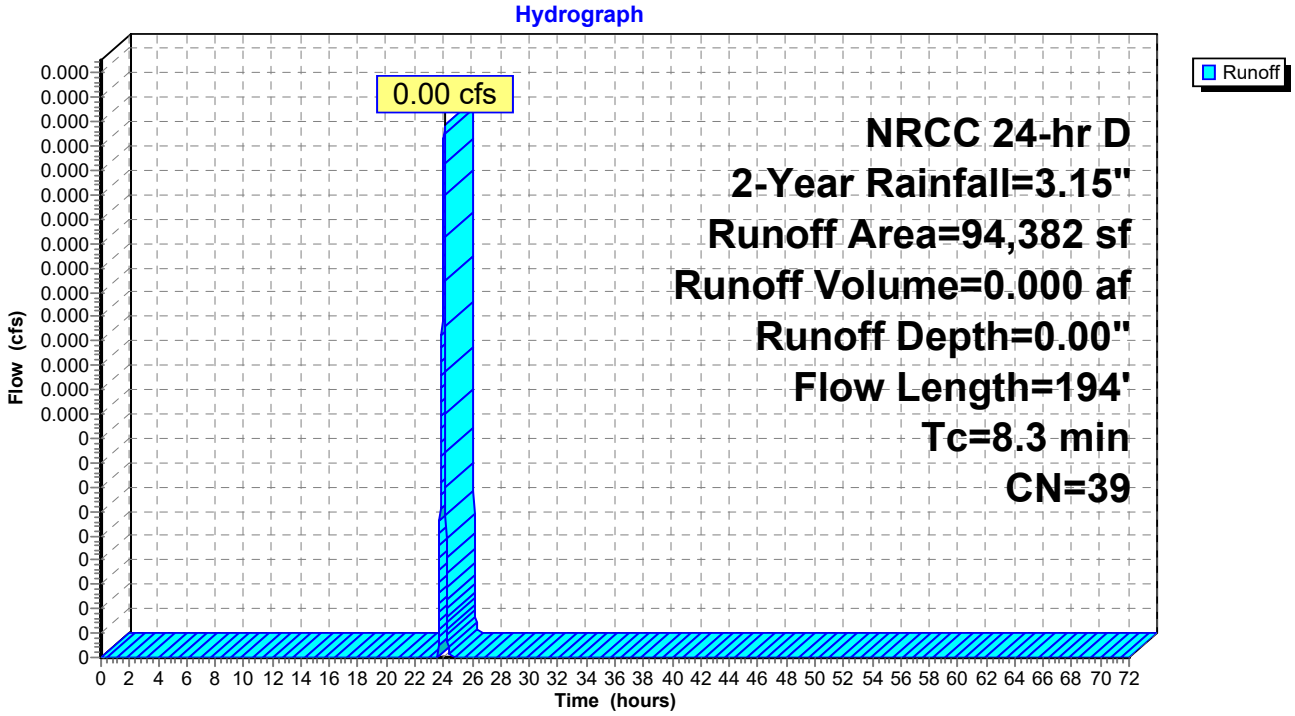
Runoff = 0.00 cfs @ 24.04 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 81,032 | 36 | Woods, Fair, HSG A |
| 2,749 | 83 | Woods, Poor, HSG D |
| 657 | 98 | Roofs, HSG A |
| 1,982 | 98 | Paved parking, HSG A |
| 7,962 | 39 | >75% Grass cover, Good, HSG A |
| 94,382 | 39 | Weighted Average |
| 91,743 | | 97.20% Pervious Area |
| 2,639 | | 2.80% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.3 | 50 | 0.3100 | 0.11 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10" |
| 1.0 | 144 | 0.2500 | 2.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 8.3 | 194 | Total | | | |

## Subcatchment E8: E8



## Summary for Subcatchment E9: E9

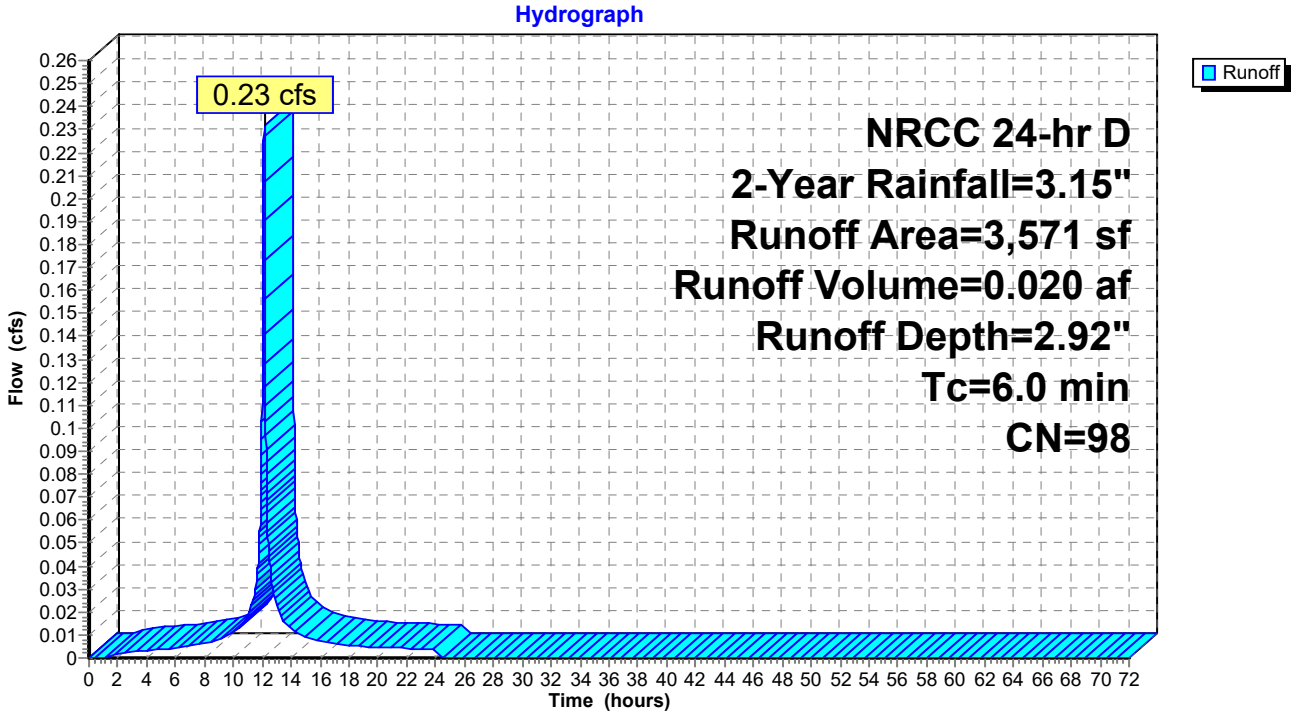
Runoff = 0.23 cfs @ 12.13 hrs, Volume= 0.020 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 3,571 | 98 | Paved parking, HSG A |
| 3,571 | | 100.00% Impervious Area |

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

## Subcatchment E9: E9



## Summary for Pond 1P: DMH

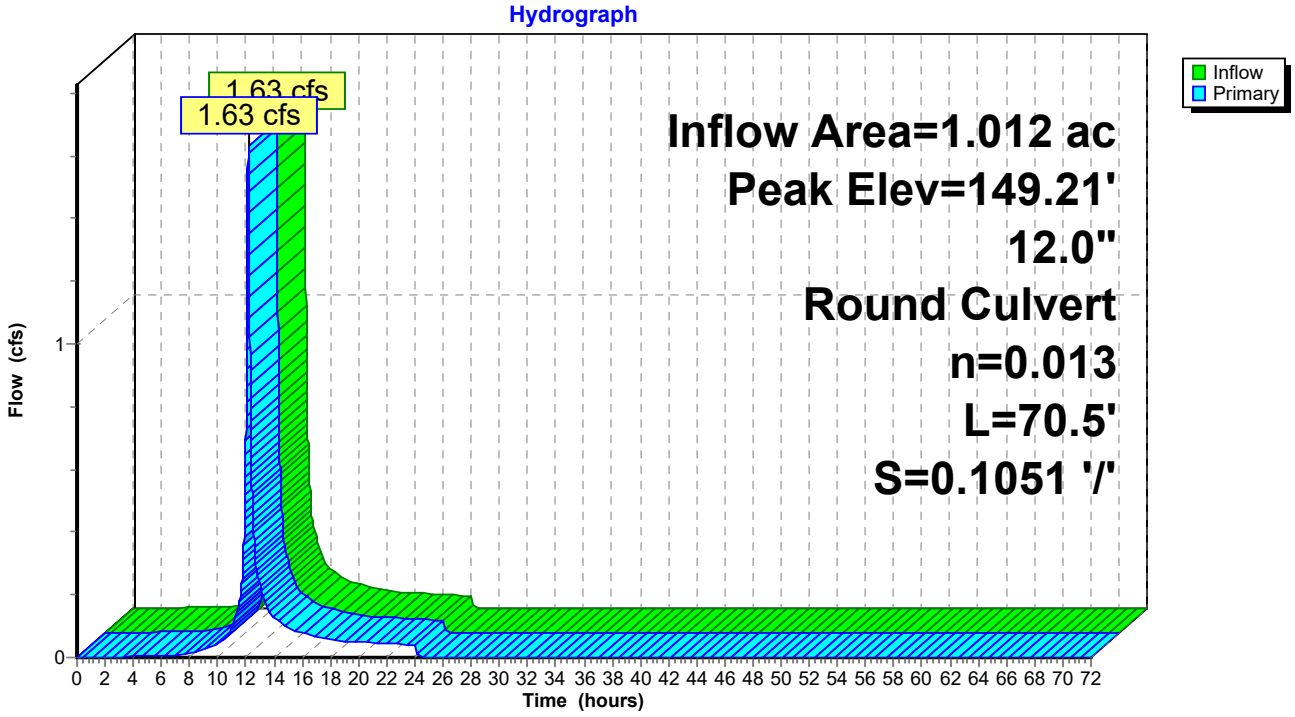
Inflow Area = 1.012 ac, 64.72% Impervious, Inflow Depth = 1.74" for 2-Year event
Inflow = 1.63 cfs @ 12.17 hrs, Volume= 0.147 af
Outflow = 1.63 cfs @ 12.17 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.0 min
Primary = 1.63 cfs @ 12.17 hrs, Volume= 0.147 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.21' @ 12.17 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.63 cfs @ 12.17 hrs HW=149.21' (Free Discharge)
**1=Culvert** (Inlet Controls 1.63 cfs @ 2.41 fps)

### Pond 1P: DMH



## Summary for Pond 2: DMH

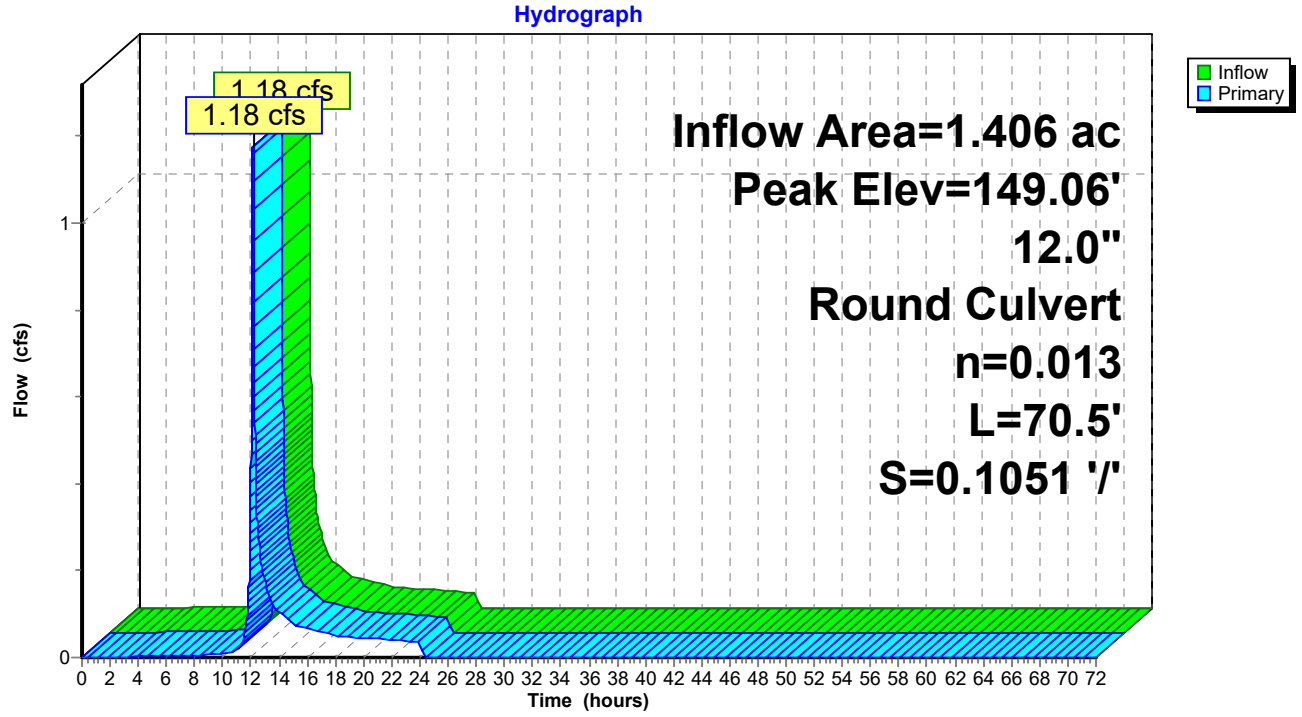
Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 0.86" for 2-Year event
Inflow = 1.18 cfs @ 12.15 hrs, Volume= 0.101 af
Outflow = 1.18 cfs @ 12.15 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min
Primary = 1.18 cfs @ 12.15 hrs, Volume= 0.101 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.06' @ 12.15 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.18 cfs @ 12.15 hrs HW=149.06' (Free Discharge)
**1=Culvert** (Inlet Controls 1.18 cfs @ 2.17 fps)

## Pond 2: DMH



## Summary for Pond 2P: CB

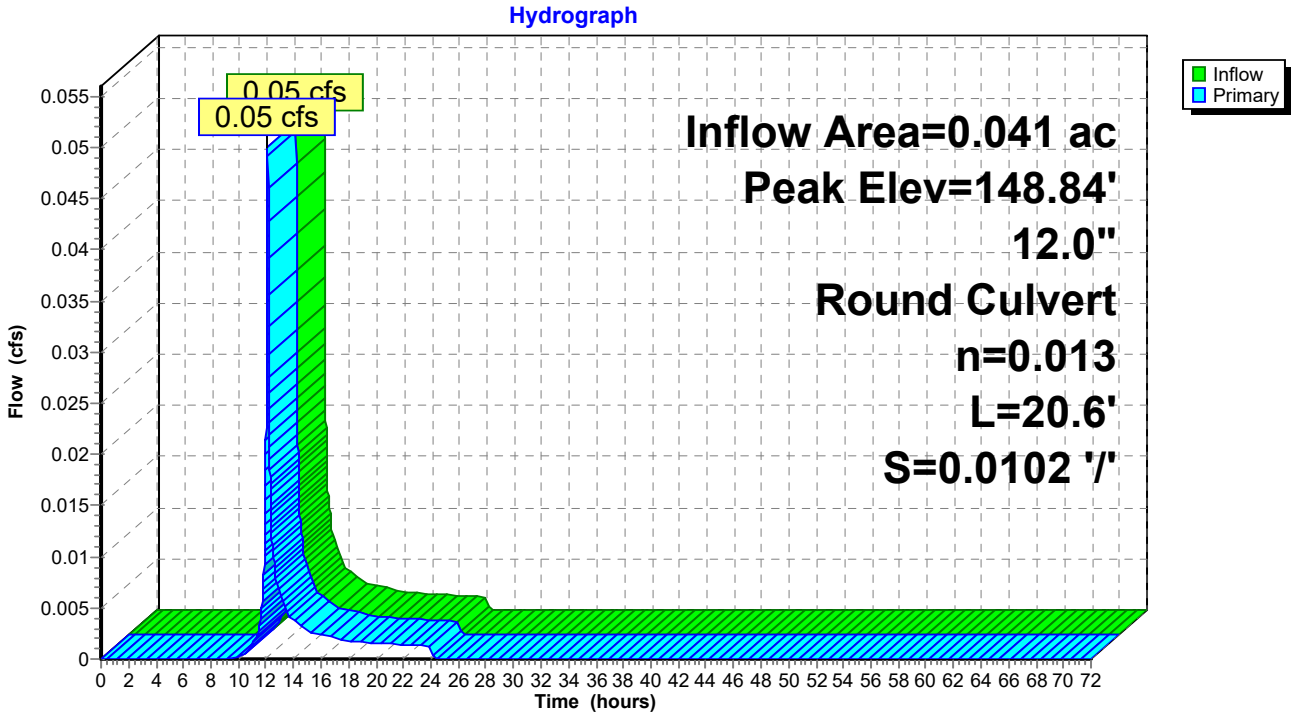
Inflow Area = 0.041 ac, 18.60% Impervious, Inflow Depth = 1.12" for 2-Year event
Inflow = 0.05 cfs @ 12.14 hrs, Volume= 0.004 af
Outflow = 0.05 cfs @ 12.14 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 12.14 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.84' @ 12.14 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.05 cfs @ 12.14 hrs HW=148.84' (Free Discharge)
**1=Culvert** (Inlet Controls 0.05 cfs @ 0.93 fps)

## Pond 2P: CB



## Summary for Pond 3P: CB

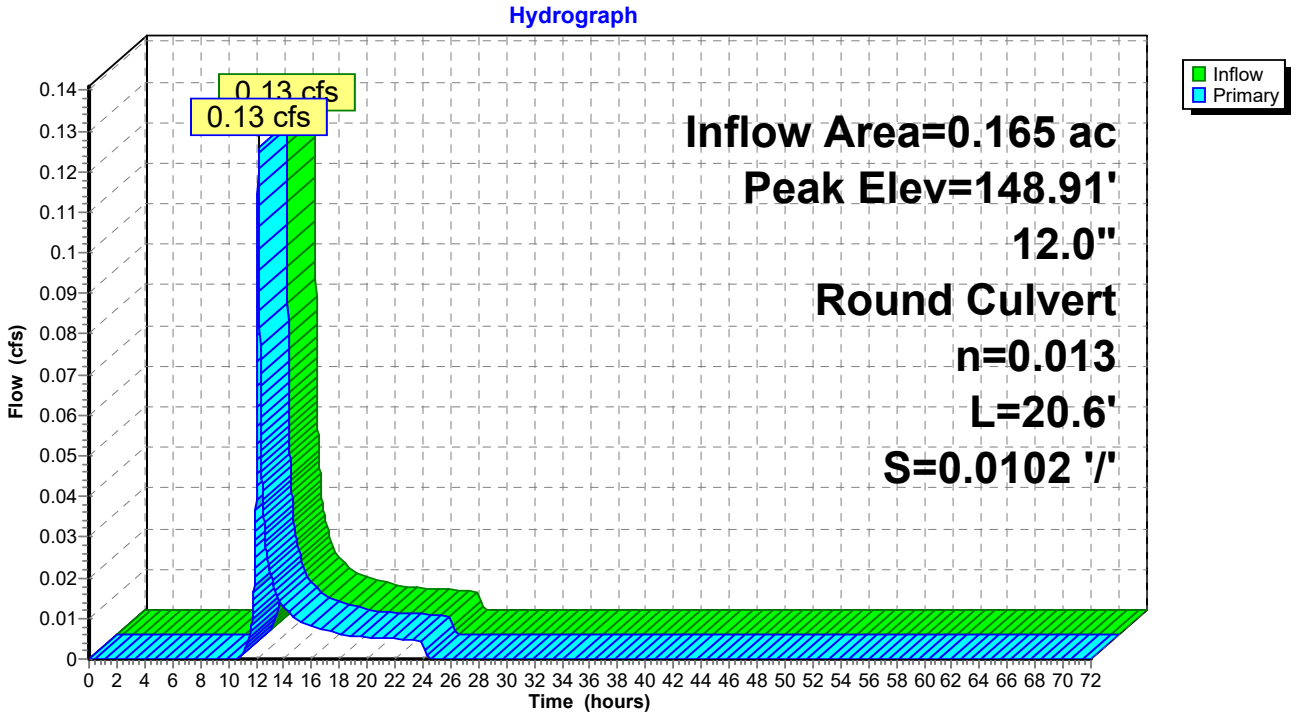
Inflow Area = 0.165 ac, 0.00% Impervious, Inflow Depth = 0.85" for 2-Year event
Inflow = 0.13 cfs @ 12.17 hrs, Volume= 0.012 af
Outflow = 0.13 cfs @ 12.17 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.17 hrs, Volume= 0.012 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.91' @ 12.17 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.12 cfs @ 12.17 hrs HW=148.91' (Free Discharge)
**1=Culvert** (Inlet Controls 0.12 cfs @ 1.18 fps)

## Pond 3P: CB



## Summary for Pond 4: DMH

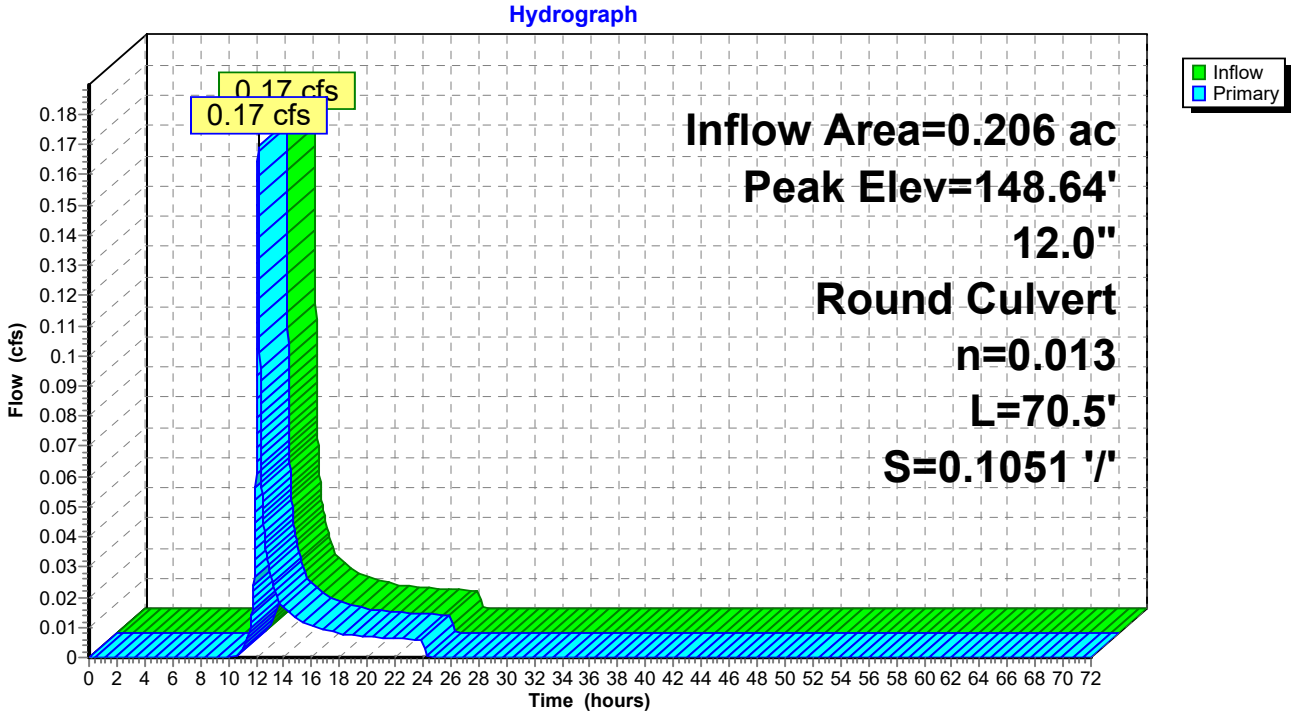
Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 0.90" for 2-Year event
Inflow = 0.17 cfs @ 12.16 hrs, Volume= 0.015 af
Outflow = 0.17 cfs @ 12.16 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min
Primary = 0.17 cfs @ 12.16 hrs, Volume= 0.015 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.64' @ 12.16 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.17 cfs @ 12.16 hrs HW=148.64' (Free Discharge)
**1=Culvert** (Inlet Controls 0.17 cfs @ 1.28 fps)

## Pond 4: DMH



## Summary for Pond 5: DMH

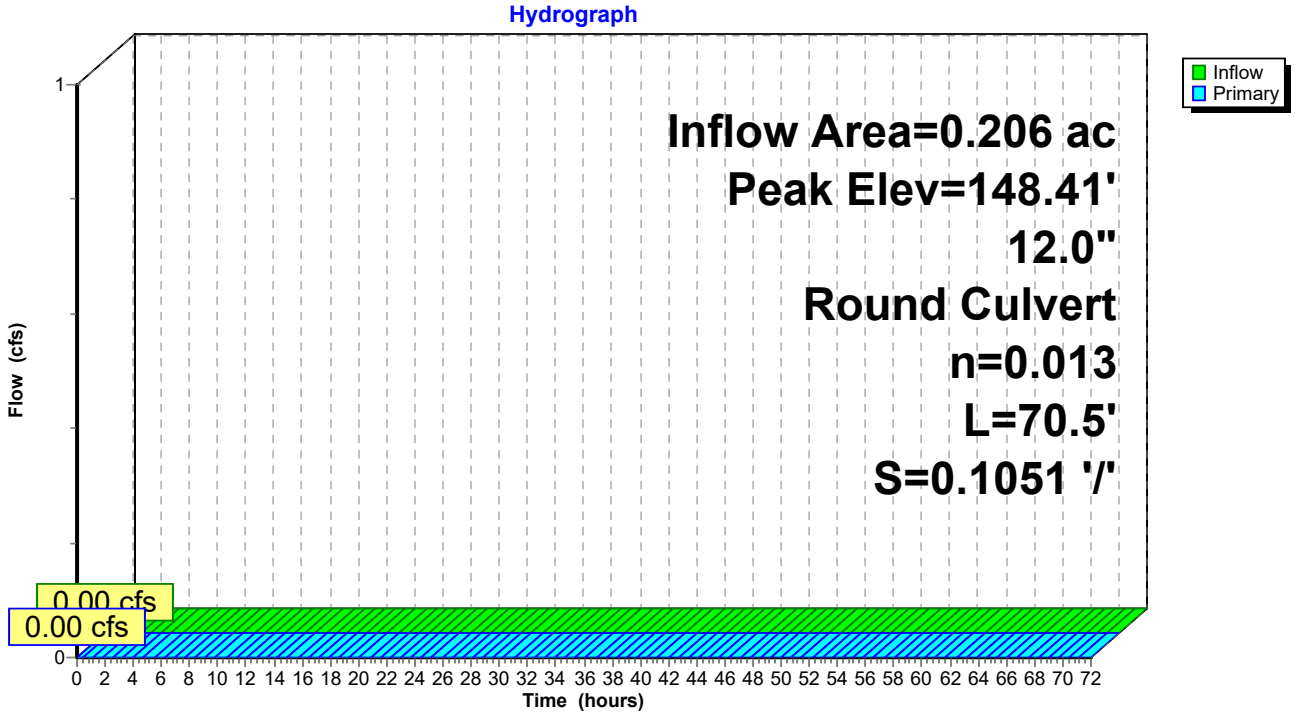
Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.41' @ 0.00 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=148.41' (Free Discharge)
**1=Culvert** ( Controls 0.00 cfs)

## Pond 5: DMH



## Summary for Pond 6P: (new Pond)

Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 0.90" for 2-Year event
Inflow = 0.17 cfs @ 12.16 hrs, Volume= 0.015 af
Outflow = 0.17 cfs @ 12.18 hrs, Volume= 0.015 af, Atten= 3%, Lag= 1.2 min
Discarded = 0.17 cfs @ 12.18 hrs, Volume= 0.015 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.37' @ 12.18 hrs Surf.Area= 0.022 ac Storage= 0.000 af

Plug-Flow detention time= 1.2 min calculated for 0.015 af (100% of inflow)
Center-of-Mass det. time= 1.2 min ( 907.4 - 906.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 89.33' | 0.022 af | **15.75'W x 60.58'L x 4.00'H Field A**<br>0.088 af Overall - 0.025 af Embedded = 0.062 af x 35.0% Voids |
| #2A | 90.33' | 0.025 af | **ADS_StormTech SC-740 +Cap** x 24 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>24 Chambers in 3 Rows |
| | | 0.047 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 89.33' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1.00' |
| #2 | Primary | 92.33' | **12.0" Round Culvert** L= 29.0' Ke= 0.500<br>Inlet / Outlet Invert= 92.33' / 92.04' S= 0.0100 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 89.43' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)<br>3.9' Crest Height |
| #4 | Device 2 | 92.33' | **4.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.18 cfs @ 12.18 hrs HW=89.37' (Free Discharge)
└**1=Exfiltration** ( Controls 0.18 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=89.33' (Free Discharge)
└**2=Culvert** ( Controls 0.00 cfs)
  ├**3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
  └**4=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 6P: (new Pond) - 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

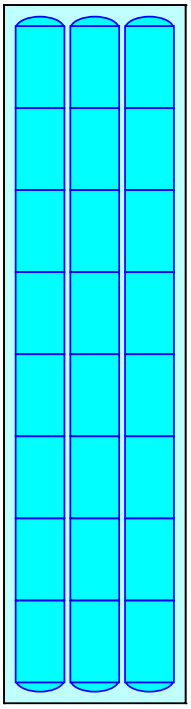
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

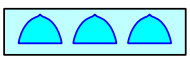
24 Chambers x 45.9 cf = 1,102.6 cf Chamber Storage

3,816.3 cf Field - 1,102.6 cf Chambers = 2,713.8 cf Stone x 35.0% Voids = 949.8 cf Stone Storage

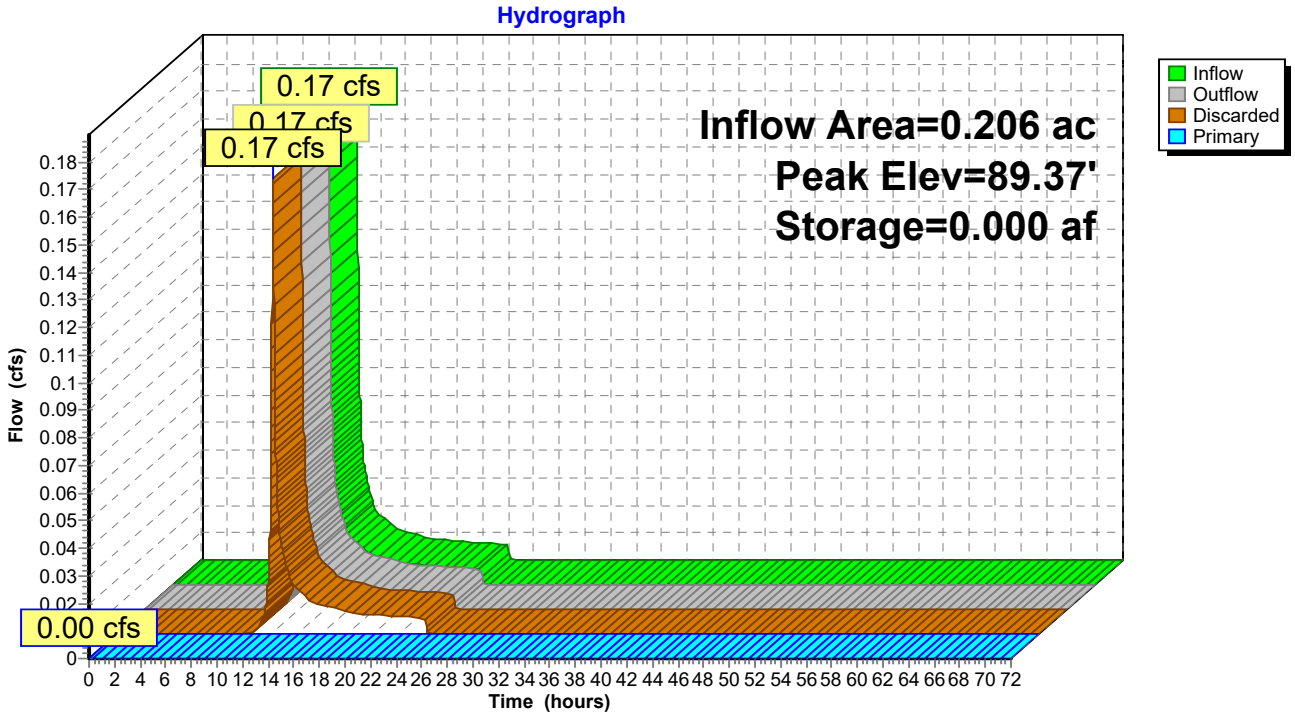
Chamber Storage + Stone Storage = 2,052.4 cf = 0.047 af
Overall Storage Efficiency = 53.8%
Overall System Size = 60.58' x 15.75' x 4.00'

24 Chambers
141.3 cy Field
100.5 cy Stone





## Pond 6P: (new Pond)



## Summary for Pond 7: DMH

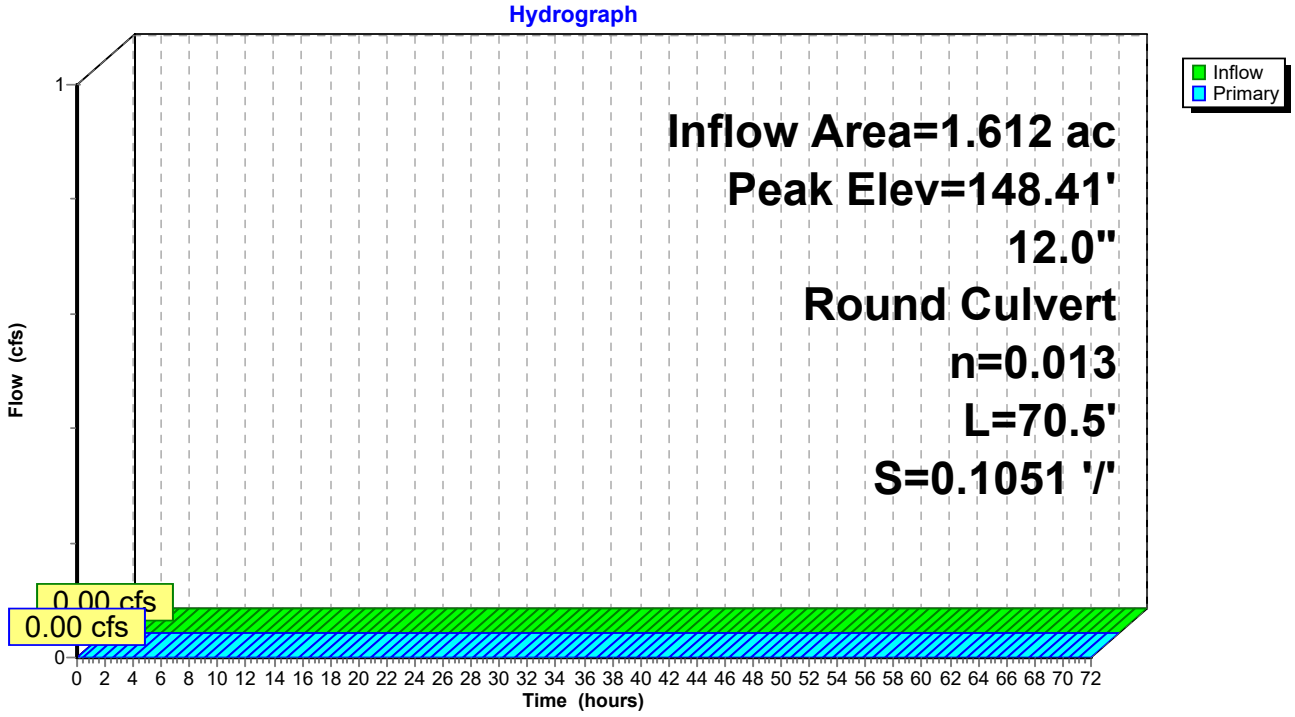
Inflow Area = 1.612 ac, 40.87% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.41' @ 0.00 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=148.41' (Free Discharge)
**1=Culvert** ( Controls 0.00 cfs)

### Pond 7: DMH



## Summary for Pond 7P: (new Pond)

Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 0.86" for 2-Year event
Inflow = 1.18 cfs @ 12.15 hrs, Volume= 0.101 af
Outflow = 0.19 cfs @ 12.92 hrs, Volume= 0.101 af, Atten= 84%, Lag= 46.7 min
Discarded = 0.19 cfs @ 12.92 hrs, Volume= 0.101 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.79' @ 12.92 hrs Surf.Area= 0.022 ac Storage= 0.021 af

Plug-Flow detention time= 31.6 min calculated for 0.101 af (100% of inflow)
Center-of-Mass det. time= 31.6 min ( 926.0 - 894.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 88.25' | 0.022 af | **15.75'W x 60.58'L x 3.67'H Field A**<br>0.080 af Overall - 0.025 af Embedded = 0.055 af x 40.0% Voids |
| #2A | 88.92' | 0.025 af | **ADS_StormTech SC-740 +Cap** x 24 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>24 Chambers in 3 Rows |
| | | 0.047 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 88.25' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1.00' |
| #2 | Primary | 92.33' | **12.0" Round Culvert** L= 29.0' Ke= 0.500<br>Inlet / Outlet Invert= 92.33' / 92.04' S= 0.0100 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 93.33' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #4 | Device 2 | 91.40' | **4.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.19 cfs @ 12.92 hrs HW=89.79' (Free Discharge)
└**1=Exfiltration** ( Controls 0.19 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=88.25' (Free Discharge)
└**2=Culvert** ( Controls 0.00 cfs)
  └**3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
  └**4=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 7P: (new Pond) - 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

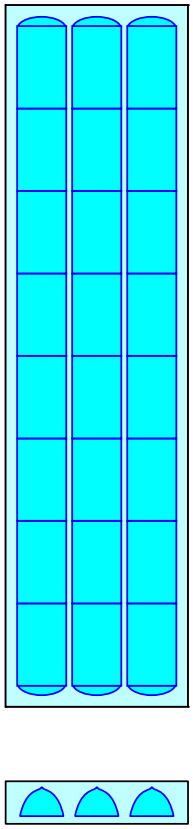
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
8.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.67' Field Height

24 Chambers x 45.9 cf = 1,102.6 cf Chamber Storage

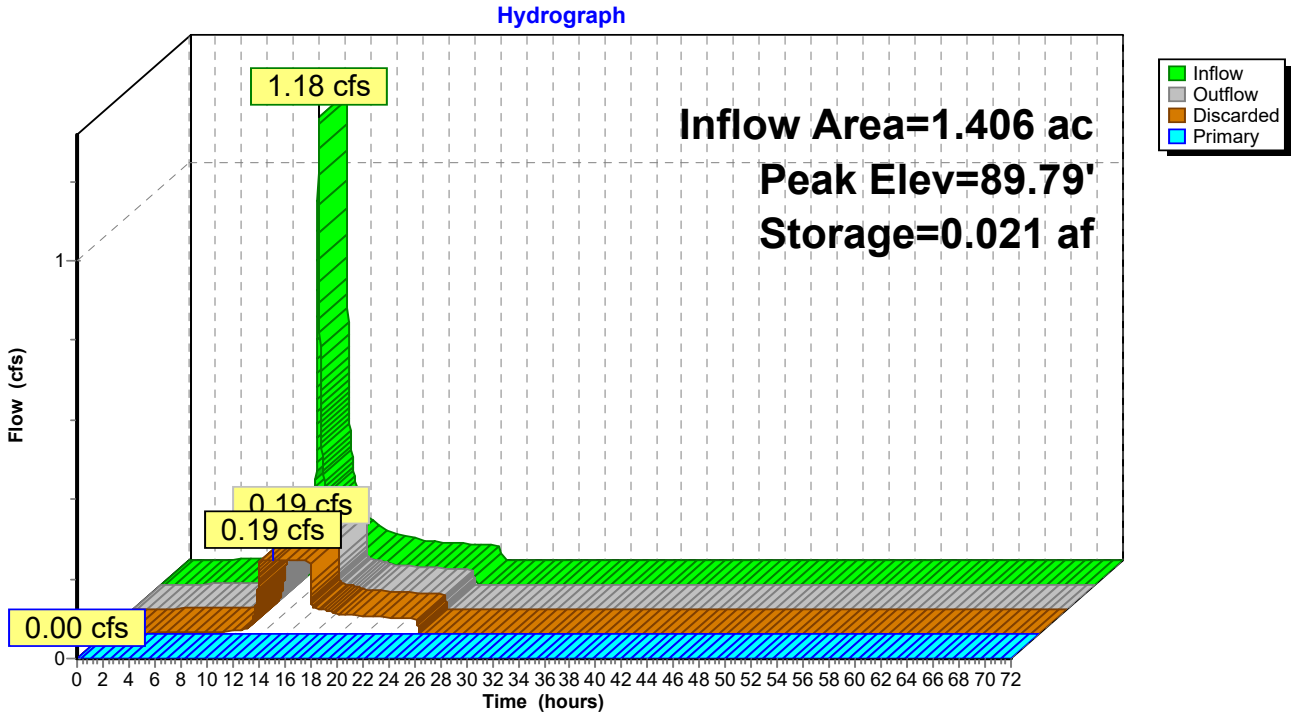
3,498.3 cf Field - 1,102.6 cf Chambers = 2,395.7 cf Stone x 40.0% Voids = 958.3 cf Stone Storage

Chamber Storage + Stone Storage = 2,060.9 cf = 0.047 af
Overall Storage Efficiency = 58.9%
Overall System Size = 60.58' x 15.75' x 3.67'

24 Chambers
129.6 cy Field
88.7 cy Stone



## Pond 7P: (new Pond)



## Summary for Pond 8: DMH

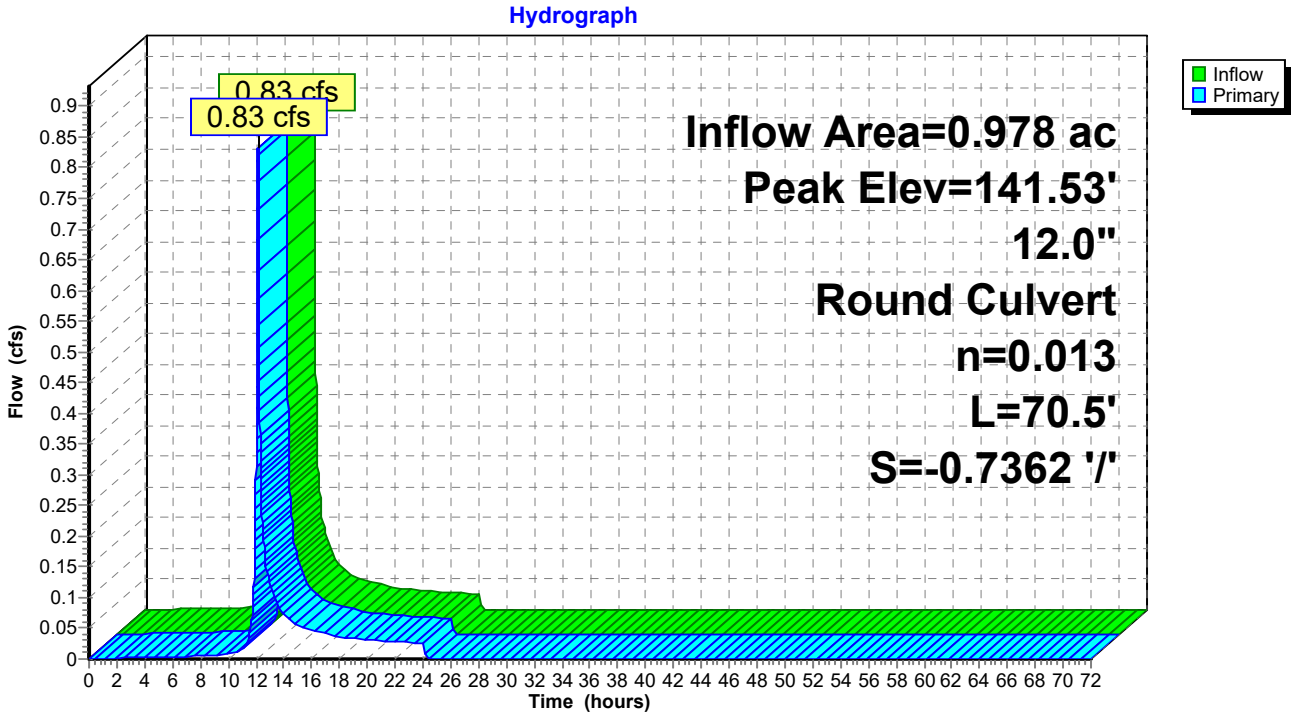
Inflow Area = 0.978 ac, 46.87% Impervious, Inflow Depth = 0.89" for 2-Year event
Inflow = 0.83 cfs @ 12.15 hrs, Volume= 0.072 af
Outflow = 0.83 cfs @ 12.15 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 12.15 hrs, Volume= 0.072 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 141.53' @ 12.15 hrs
Flood Elev= 93.79'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 141.00' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.10' / 141.00' S= -0.7362 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.83 cfs @ 12.15 hrs HW=141.53' (Free Discharge)
**1=Culvert** (Inlet Controls 0.83 cfs @ 1.96 fps)

## Pond 8: DMH



## Summary for Pond 9: CB

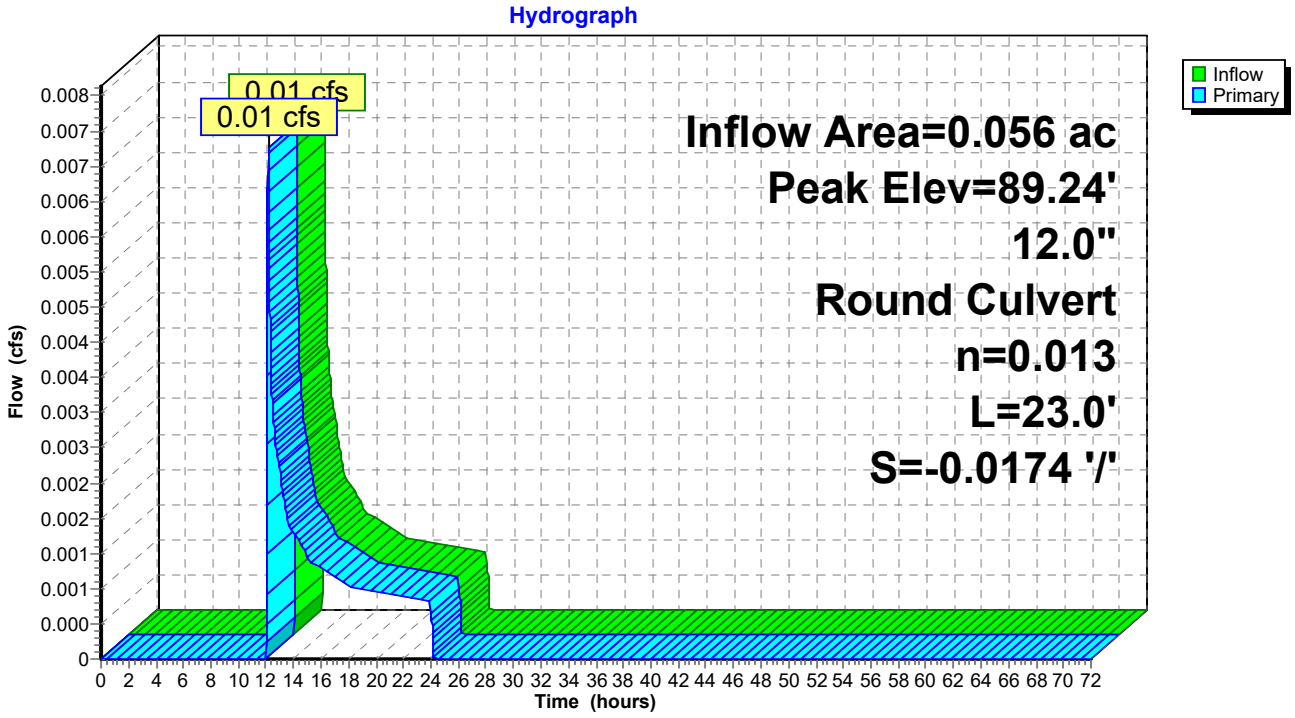
Inflow Area = 0.056 ac, 30.25% Impervious, Inflow Depth = 0.29" for 2-Year event
Inflow = 0.01 cfs @ 12.16 hrs, Volume= 0.001 af
Outflow = 0.01 cfs @ 12.16 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.01 cfs @ 12.16 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.24' @ 12.16 hrs
Flood Elev= 93.35'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 89.20' | **12.0" Round Culvert**<br>L= 23.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 88.80' / 89.20' S= -0.0174 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.01 cfs @ 12.16 hrs HW=89.24' (Free Discharge)
**1=Culvert** (Inlet Controls 0.01 cfs @ 0.56 fps)

## Pond 9: CB



## Summary for Pond 12P: CB

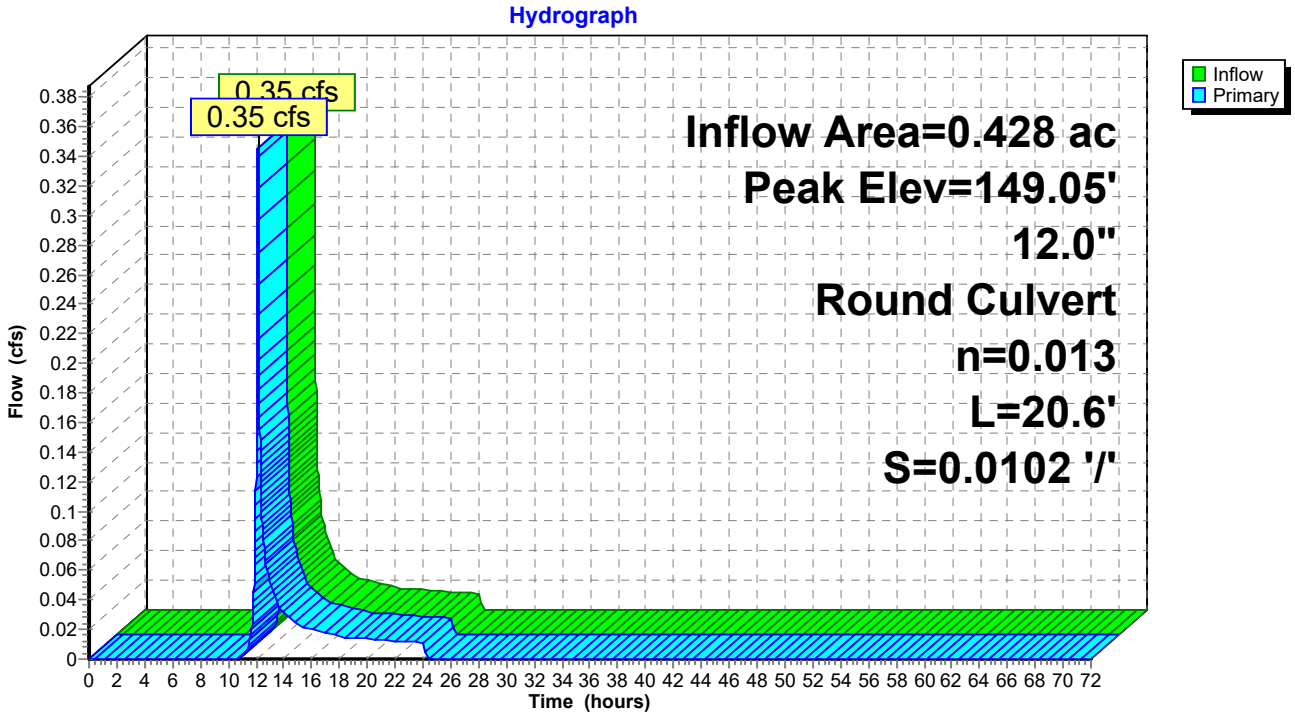
Inflow Area = 0.428 ac, 45.04% Impervious, Inflow Depth = 0.80" for 2-Year event
Inflow = 0.35 cfs @ 12.14 hrs, Volume= 0.028 af
Outflow = 0.35 cfs @ 12.14 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min
Primary = 0.35 cfs @ 12.14 hrs, Volume= 0.028 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.05' @ 12.14 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.34 cfs @ 12.14 hrs HW=149.05' (Free Discharge)
**1=Culvert** (Inlet Controls 0.34 cfs @ 1.54 fps)

## Pond 12P: CB



## Summary for Pond 14P: CB

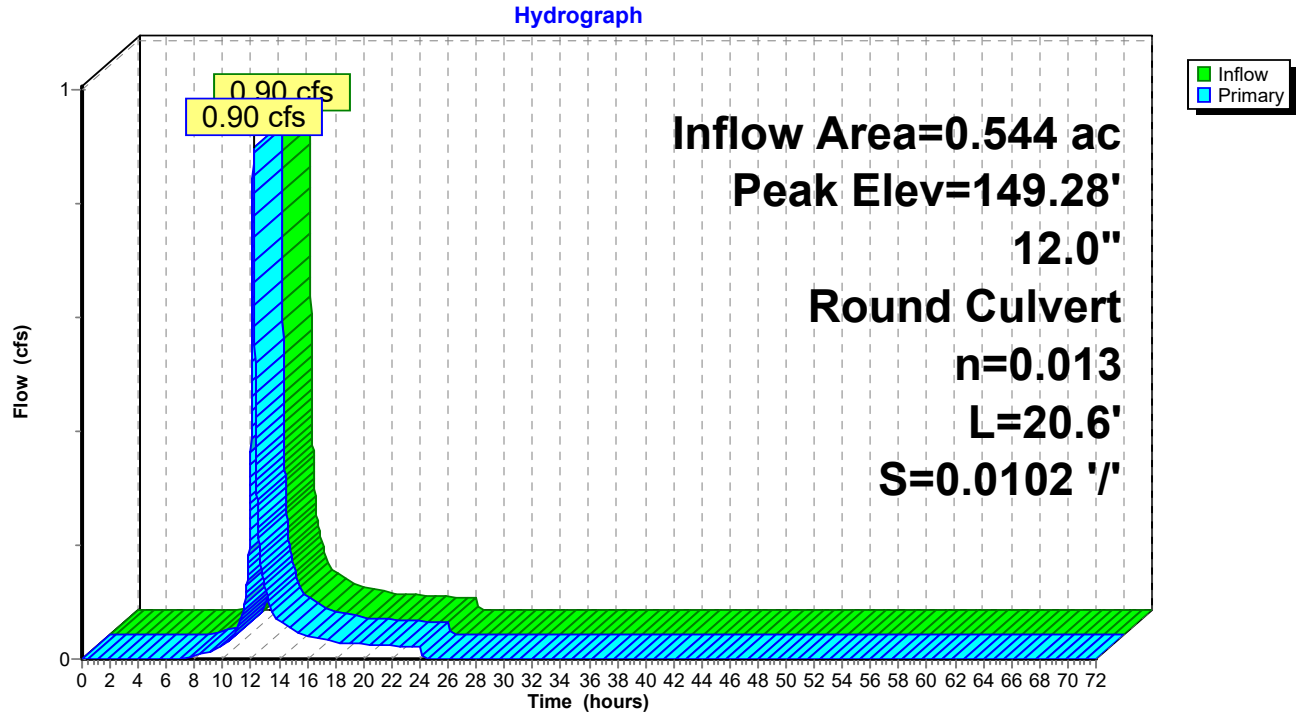
Inflow Area = 0.544 ac, 46.38% Impervious, Inflow Depth = 1.72" for 2-Year event
Inflow = 0.90 cfs @ 12.17 hrs, Volume= 0.078 af
Outflow = 0.90 cfs @ 12.17 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min
Primary = 0.90 cfs @ 12.17 hrs, Volume= 0.078 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.28' @ 12.17 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.90 cfs @ 12.17 hrs HW=149.28' (Free Discharge)
**1=Culvert** (Inlet Controls 0.90 cfs @ 2.00 fps)

## Pond 14P: CB



## Summary for Pond 16: CB

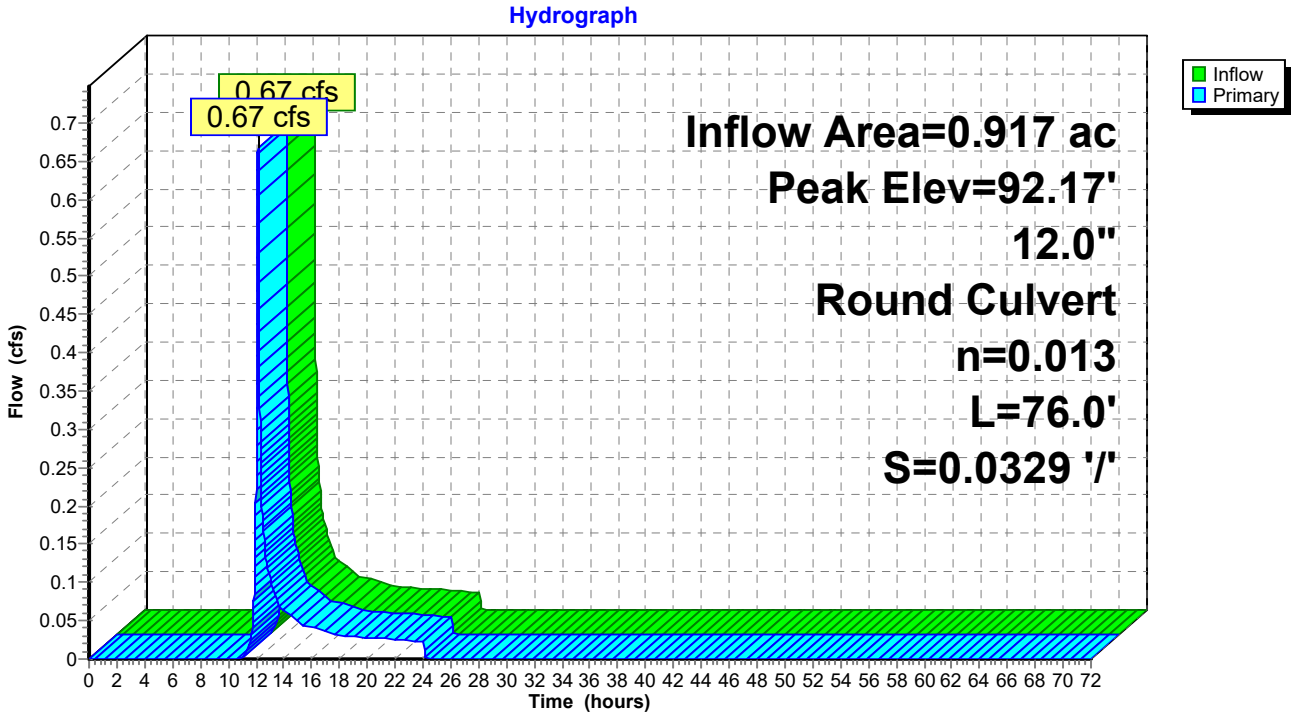
Inflow Area = 0.917 ac, 43.36% Impervious, Inflow Depth = 0.75" for 2-Year event
Inflow = 0.67 cfs @ 12.15 hrs, Volume= 0.057 af
Outflow = 0.67 cfs @ 12.15 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.15 hrs, Volume= 0.057 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 92.17' @ 12.15 hrs
Flood Elev= 96.19'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 91.70' | **12.0" Round Culvert**<br>L= 76.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 91.70' / 89.20' S= 0.0329 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.67 cfs @ 12.15 hrs HW=92.17' (Free Discharge)
**1=Culvert** (Inlet Controls 0.67 cfs @ 1.84 fps)

## Pond 16: CB



## Summary for Pond 16P: DMH

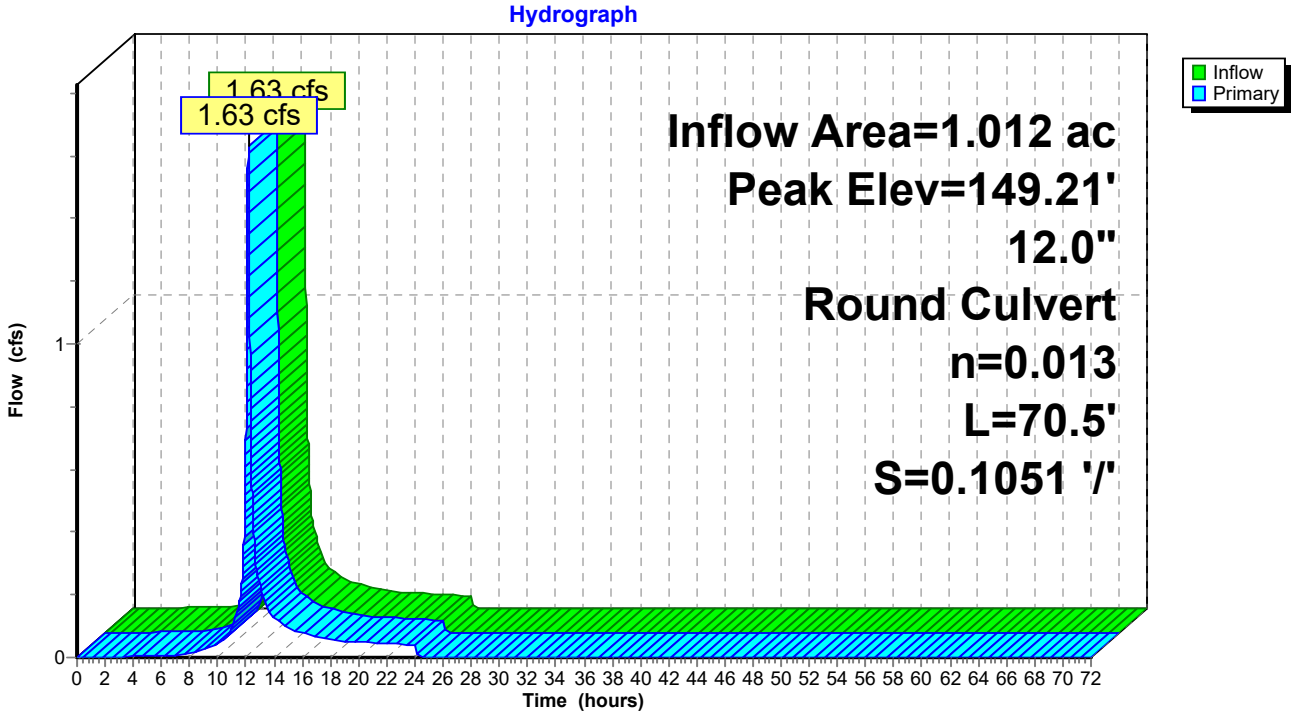
Inflow Area = 1.012 ac, 64.72% Impervious, Inflow Depth = 1.74" for 2-Year event
Inflow = 1.63 cfs @ 12.17 hrs, Volume= 0.147 af
Outflow = 1.63 cfs @ 12.17 hrs, Volume= 0.147 af, Atten= 0%, Lag= 0.0 min
Primary = 1.63 cfs @ 12.17 hrs, Volume= 0.147 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.21' @ 12.17 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.63 cfs @ 12.17 hrs HW=149.21' (Free Discharge)
**1=Culvert** (Inlet Controls 1.63 cfs @ 2.41 fps)

### Pond 16P: DMH



## Summary for Pond 17P: CB

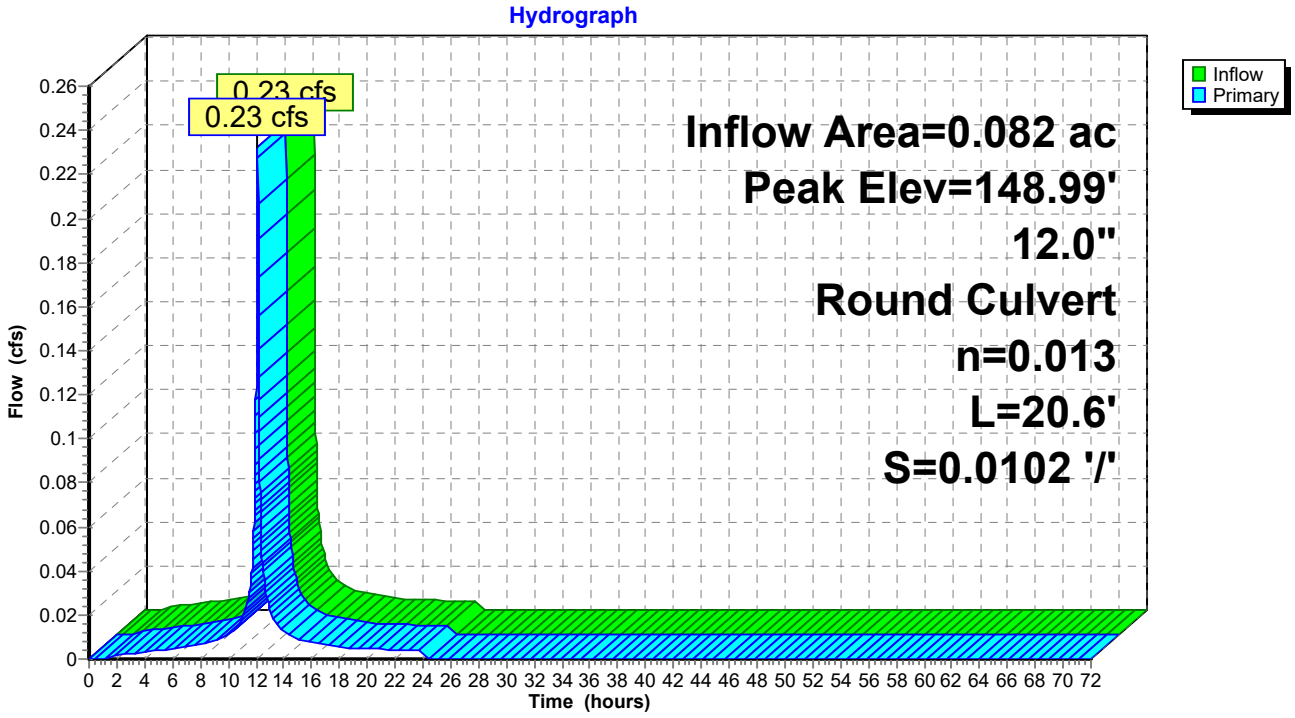
Inflow Area = 0.082 ac,100.00% Impervious, Inflow Depth = 2.92" for 2-Year event
Inflow = 0.23 cfs @ 12.13 hrs, Volume= 0.020 af
Outflow = 0.23 cfs @ 12.13 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.23 cfs @ 12.13 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.99' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.23 cfs @ 12.13 hrs HW=148.99' (Free Discharge)
**1=Culvert** (Inlet Controls 0.23 cfs @ 1.38 fps)

## Pond 17P: CB



## Summary for Pond 18: DMH

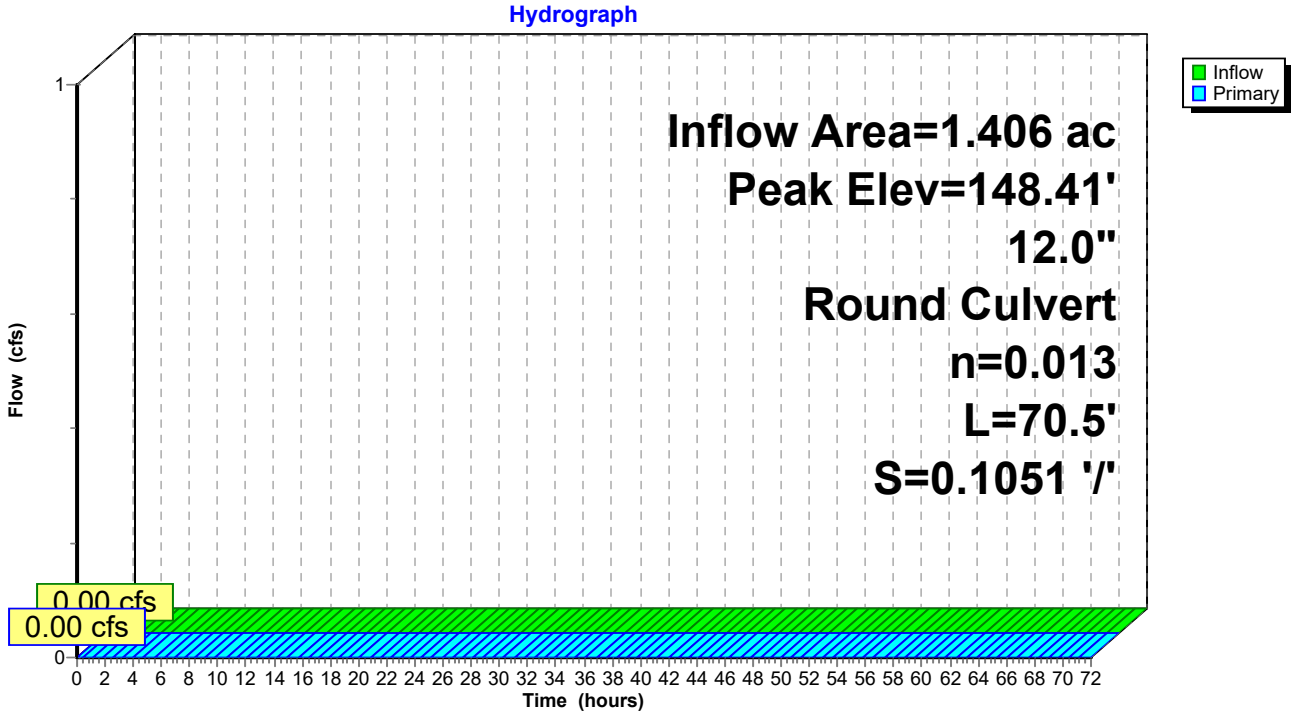
Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.41' @ 0.00 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=148.41' (Free Discharge)
**1=Culvert** ( Controls 0.00 cfs)

### Pond 18: DMH



## Summary for Pond 18P: CB

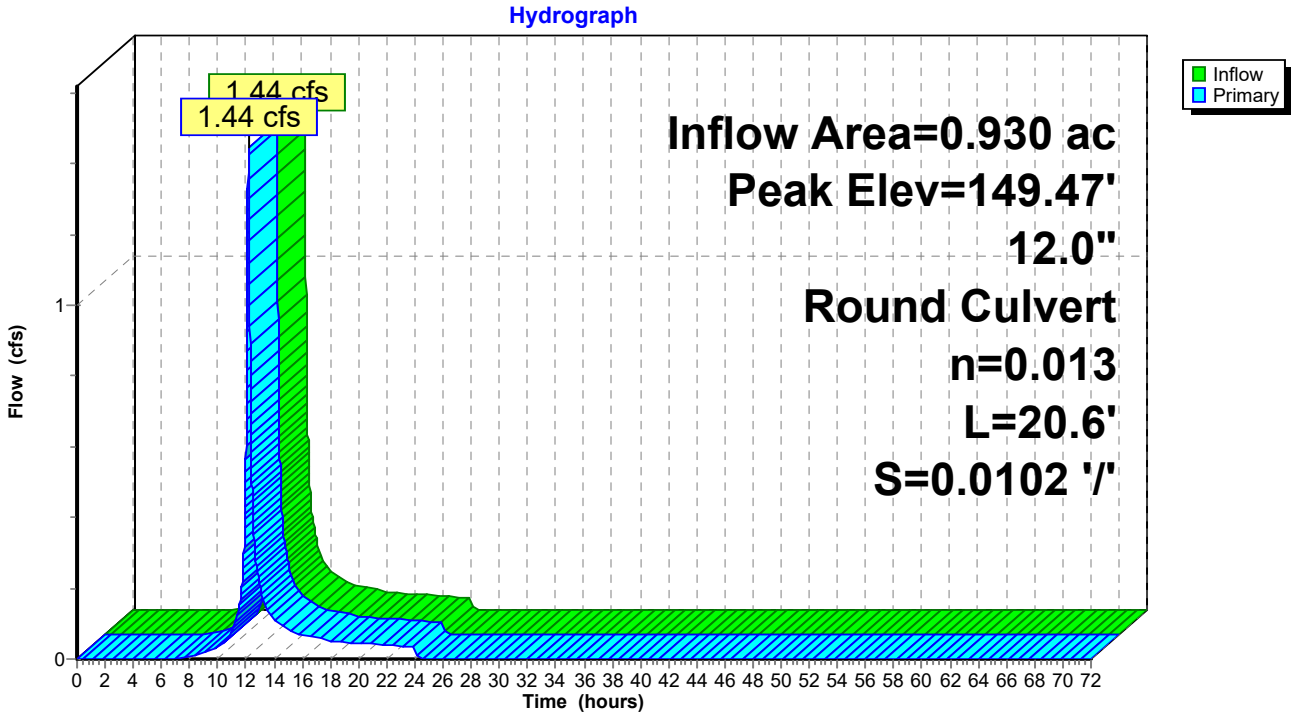
Inflow Area = 0.930 ac, 61.61% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 1.44 cfs @ 12.18 hrs, Volume= 0.127 af
Outflow = 1.44 cfs @ 12.18 hrs, Volume= 0.127 af, Atten= 0%, Lag= 0.0 min
Primary = 1.44 cfs @ 12.18 hrs, Volume= 0.127 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.47' @ 12.18 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.44 cfs @ 12.18 hrs HW=149.46' (Free Discharge)
**1=Culvert** (Barrel Controls 1.44 cfs @ 3.20 fps)

## Pond 18P: CB

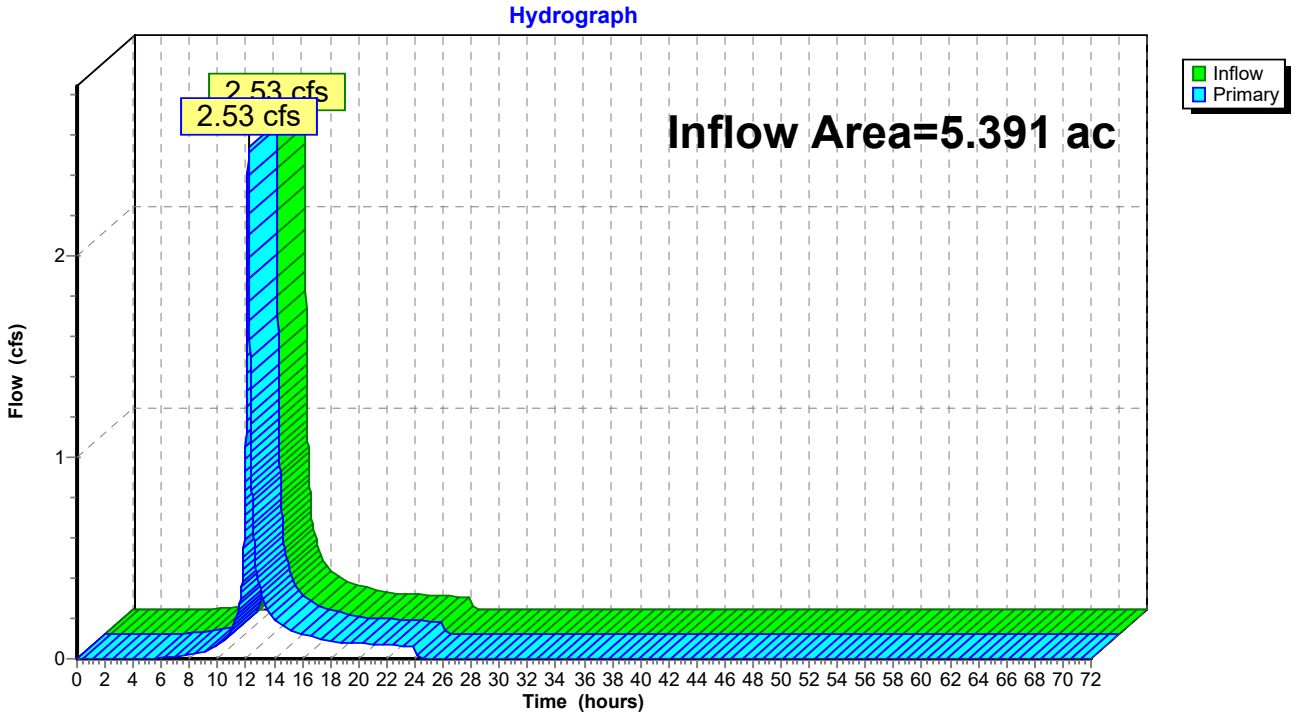


## Summary for Link 32L: TOTAL TO SPICKET RIVER

Inflow Area = 5.391 ac, 30.49% Impervious, Inflow Depth = 0.50" for 2-Year event
Inflow = 2.53 cfs @ 12.17 hrs, Volume= 0.226 af
Primary = 2.53 cfs @ 12.17 hrs, Volume= 0.226 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

## Link 32L: TOTAL TO SPICKET RIVER



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 E1: E1** Runoff Area=39,960 sf 43.36% Impervious Runoff Depth=1.83"
Flow Length=267' Tc=7.1 min CN=69 Runoff=1.78 cfs 0.140 af

**Subcatchment E10: E10** Runoff Area=2,639 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.27 cfs 0.023 af

**Subcatchment E2: E2** Runoff Area=18,640 sf 45.04% Impervious Runoff Depth=1.91"
Flow Length=353' Tc=6.6 min CN=70 Runoff=0.89 cfs 0.068 af

**Subcatchment E3: E3** Runoff Area=2,446 sf 30.25% Impervious Runoff Depth=1.02"
Tc=6.0 min CN=57 Runoff=0.06 cfs 0.005 af

**Subcatchment E4: E4** Runoff Area=1,774 sf 18.60% Impervious Runoff Depth=2.40"
Tc=6.0 min CN=76 Runoff=0.11 cfs 0.008 af

**Subcatchment E5: E5** Runoff Area=23,688 sf 46.38% Impervious Runoff Depth=3.21"
Flow Length=423' Tc=9.7 min CN=85 Runoff=1.66 cfs 0.146 af

**Subcatchment E6: E6** Runoff Area=7,193 sf 0.00% Impervious Runoff Depth=1.99"
Flow Length=166' Tc=9.5 min CN=71 Runoff=0.32 cfs 0.027 af

**Subcatchment E7: E7** Runoff Area=40,532 sf 61.61% Impervious Runoff Depth=3.12"
Flow Length=504' Tc=10.2 min CN=84 Runoff=2.71 cfs 0.242 af

**Subcatchment E8: E8** Runoff Area=94,382 sf 2.80% Impervious Runoff Depth=0.17"
Flow Length=194' Tc=8.3 min CN=39 Runoff=0.04 cfs 0.030 af

**Subcatchment E9: E9** Runoff Area=3,571 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.36 cfs 0.031 af

**Pond 1P: DMH** Peak Elev=149.92' Inflow=3.00 cfs 0.273 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=3.00 cfs 0.273 af

**Pond 2: DMH** Peak Elev=149.87' Inflow=2.92 cfs 0.232 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=2.92 cfs 0.232 af

**Pond 2P: CB** Peak Elev=148.90' Inflow=0.11 cfs 0.008 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.11 cfs 0.008 af

**Pond 3P: CB** Peak Elev=149.03' Inflow=0.32 cfs 0.027 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.32 cfs 0.027 af

**Pond 4: DMH** Peak Elev=148.77' Inflow=0.41 cfs 0.036 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=0.41 cfs 0.036 af

**Pond 5: DMH** Peak Elev=148.41' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=0.00 cfs 0.000 af

**Pond 6P: (new Pond)** Peak Elev=89.76' Storage=0.003 af Inflow=0.41 cfs 0.036 af
Discarded=0.18 cfs 0.036 af Primary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.036 af

**Pond 7: DMH** Peak Elev=149.43' Inflow=2.16 cfs 0.040 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=2.16 cfs 0.040 af

**Pond 7P: (new Pond)** Peak Elev=93.61' Storage=0.047 af Inflow=2.92 cfs 0.232 af
Discarded=0.19 cfs 0.192 af Primary=2.16 cfs 0.040 af Outflow=2.36 cfs 0.232 af

**Pond 8: DMH** Peak Elev=141.96' Inflow=2.04 cfs 0.163 af
12.0" Round Culvert n=0.013 L=70.5' S=-0.7362 '/' Outflow=2.04 cfs 0.163 af

**Pond 9: CB** Peak Elev=89.33' Inflow=0.06 cfs 0.005 af
12.0" Round Culvert n=0.013 L=23.0' S=-0.0174 '/' Outflow=0.06 cfs 0.005 af

**Pond 12P: CB** Peak Elev=149.27' Inflow=0.89 cfs 0.068 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.89 cfs 0.068 af

**Pond 14P: CB** Peak Elev=149.53' Inflow=1.66 cfs 0.146 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=1.66 cfs 0.146 af

**Pond 16: CB** Peak Elev=92.56' Inflow=1.78 cfs 0.140 af
12.0" Round Culvert n=0.013 L=76.0' S=0.0329 '/' Outflow=1.78 cfs 0.140 af

**Pond 16P: DMH** Peak Elev=149.92' Inflow=3.00 cfs 0.273 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=3.00 cfs 0.273 af

**Pond 17P: CB** Peak Elev=149.05' Inflow=0.36 cfs 0.031 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.36 cfs 0.031 af

**Pond 18: DMH** Peak Elev=149.43' Inflow=2.16 cfs 0.040 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=2.16 cfs 0.040 af

**Pond 18P: CB** Peak Elev=150.05' Inflow=2.71 cfs 0.242 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=2.71 cfs 0.242 af

**Link 32L: TOTAL TO SPICKET RIVER** Inflow=6.24 cfs 0.493 af
Primary=6.24 cfs 0.493 af

**Total Runoff Area = 5.391 ac Runoff Volume = 0.720 af Average Runoff Depth = 1.60"**
**69.51% Pervious = 3.747 ac 30.49% Impervious = 1.644 ac**

## Summary for Subcatchment E1: E1

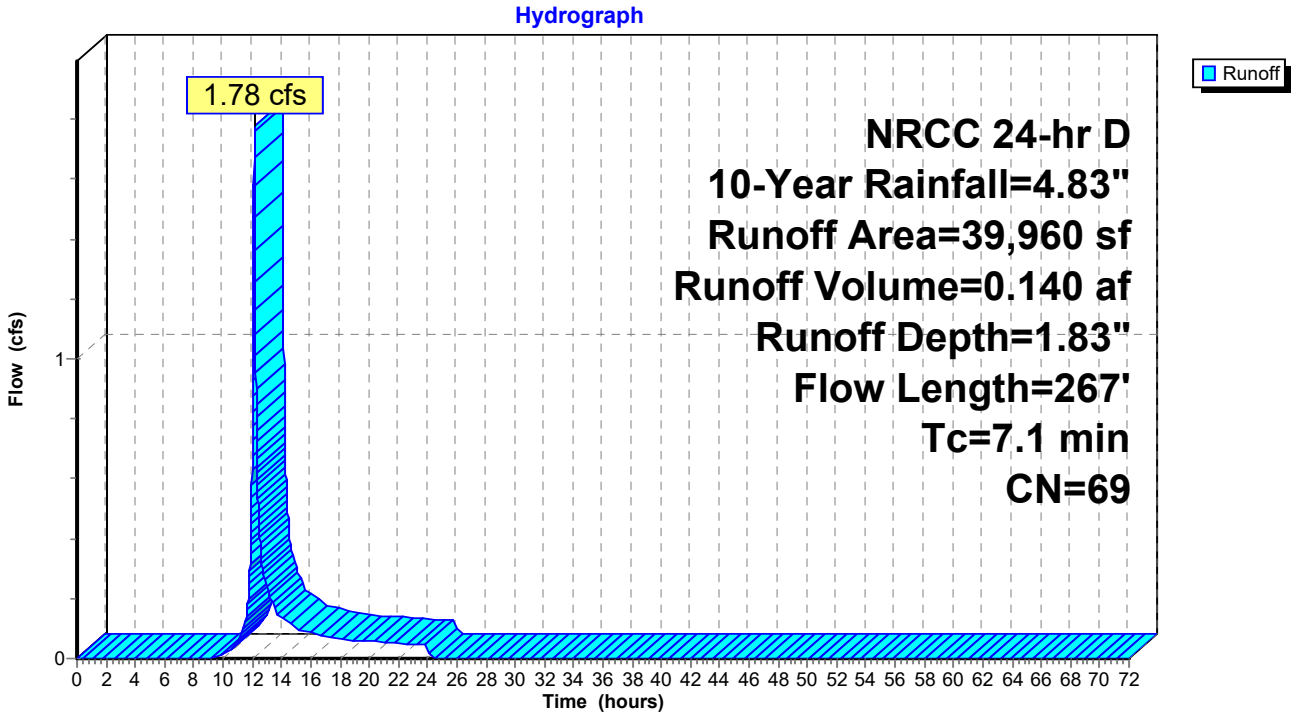
Runoff = 1.78 cfs @ 12.15 hrs, Volume= 0.140 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 12,738 | 98 | Paved parking, HSG A |
| 3,090 | 98 | Roofs, HSG A |
| 1,498 | 98 | Unconnected pavement, HSG A |
| 2,032 | 32 | Woods/grass comb., Good, HSG A |
| 20,602 | 49 | 50-75% Grass cover, Fair, HSG A |
| 39,960 | 69 | Weighted Average |
| 22,634 | | 56.64% Pervious Area |
| 17,326 | | 43.36% Impervious Area |
| 1,498 | | 8.65% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 2.3 | 30 | 0.0700 | 0.22 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 3.5 | 20 | 0.0800 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.1 | 38 | 0.0800 | 4.55 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.1 | 18 | 0.1200 | 5.58 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.6 | 81 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.5 | 80 | 0.0200 | 2.87 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 7.1 | 267 | Total | | | |

## Subcatchment E1: E1



## Summary for Subcatchment E10: E10

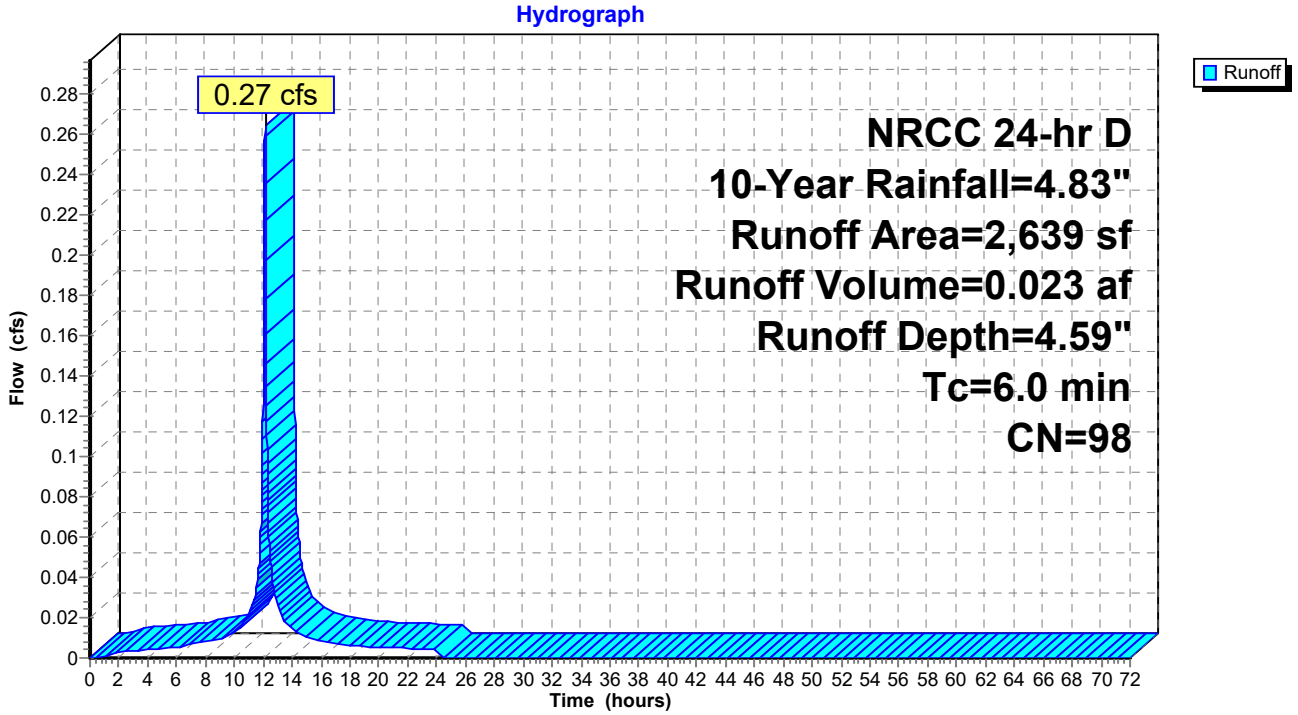
Runoff = 0.27 cfs @ 12.13 hrs, Volume= 0.023 af, Depth= 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 2,639 | 98 | Roofs, HSG A |
| 2,639 | | 100.00% Impervious Area |

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

## Subcatchment E10: E10



## Summary for Subcatchment E2: E2

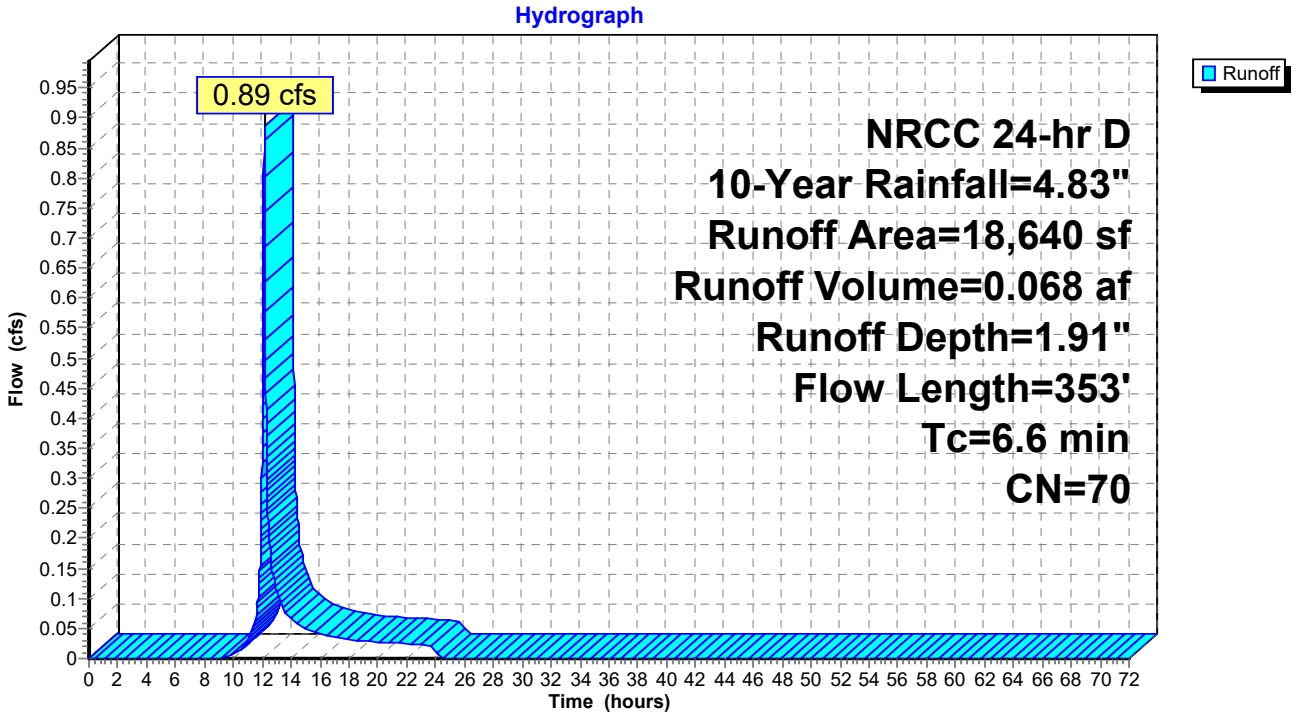
Runoff = 0.89 cfs @ 12.14 hrs, Volume= 0.068 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 6,144 | 98 | Roofs, HSG C |
| 2,252 | 98 | Paved parking, HSG A |
| 1,944 | 43 | Woods/grass comb., Fair, HSG A |
| 8,300 | 49 | 50-75% Grass cover, Fair, HSG A |
| 18,640 | 70 | Weighted Average |
| 10,244 | | 54.96% Pervious Area |
| 8,396 | | 45.04% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 2.7 | 40 | 0.0800 | 0.24 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 2.0 | 10 | 0.0800 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.2 | 51 | 0.0900 | 4.83 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.3 | 158 | 0.0150 | 1.97 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 54 | 0.0500 | 3.60 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 40 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 6.6 | 353 | Total | | | |

## Subcatchment E2: E2



## Summary for Subcatchment E3: E3

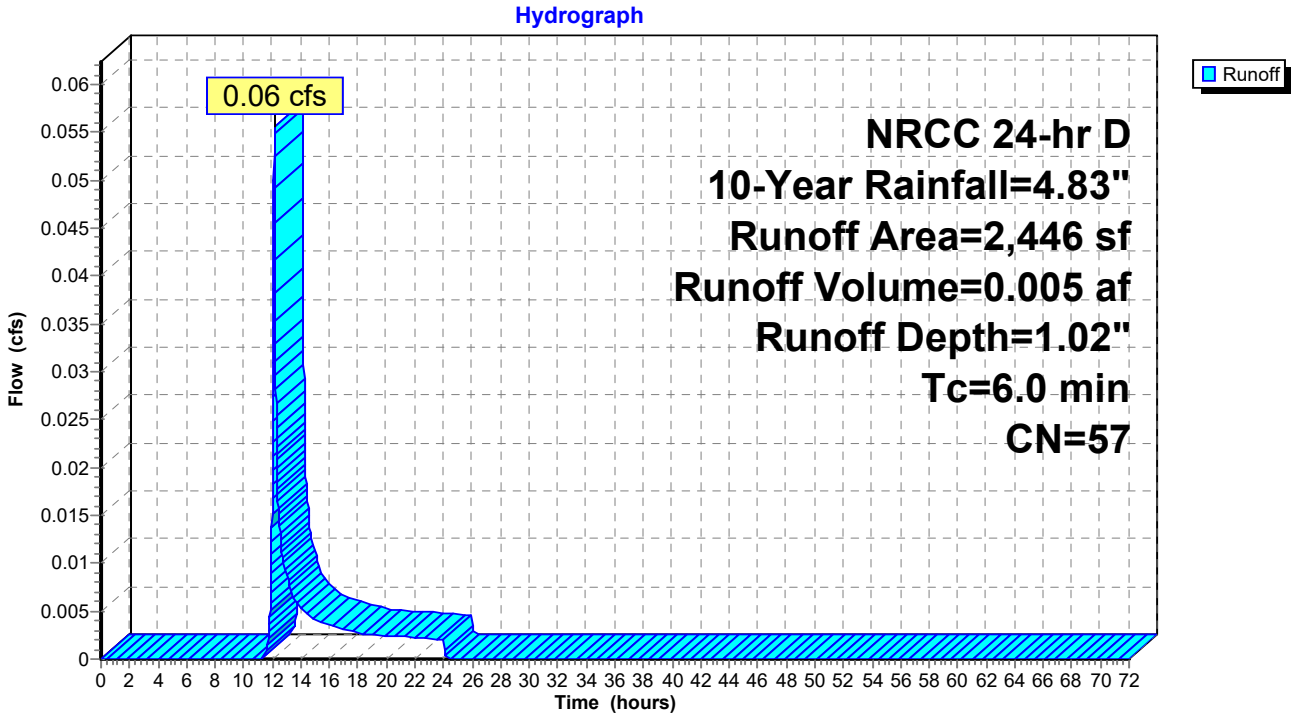
Runoff = 0.06 cfs @ 12.14 hrs, Volume= 0.005 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 383 | 98 | Roofs, HSG A |
| 357 | 98 | Paved parking, HSG A |
| 1,706 | 39 | >75% Grass cover, Good, HSG A |
| 2,446 | 57 | Weighted Average |
| 1,706 | | 69.75% Pervious Area |
| 740 | | 30.25% Impervious Area |

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

## Subcatchment E3: E3



## Summary for Subcatchment E4: E4

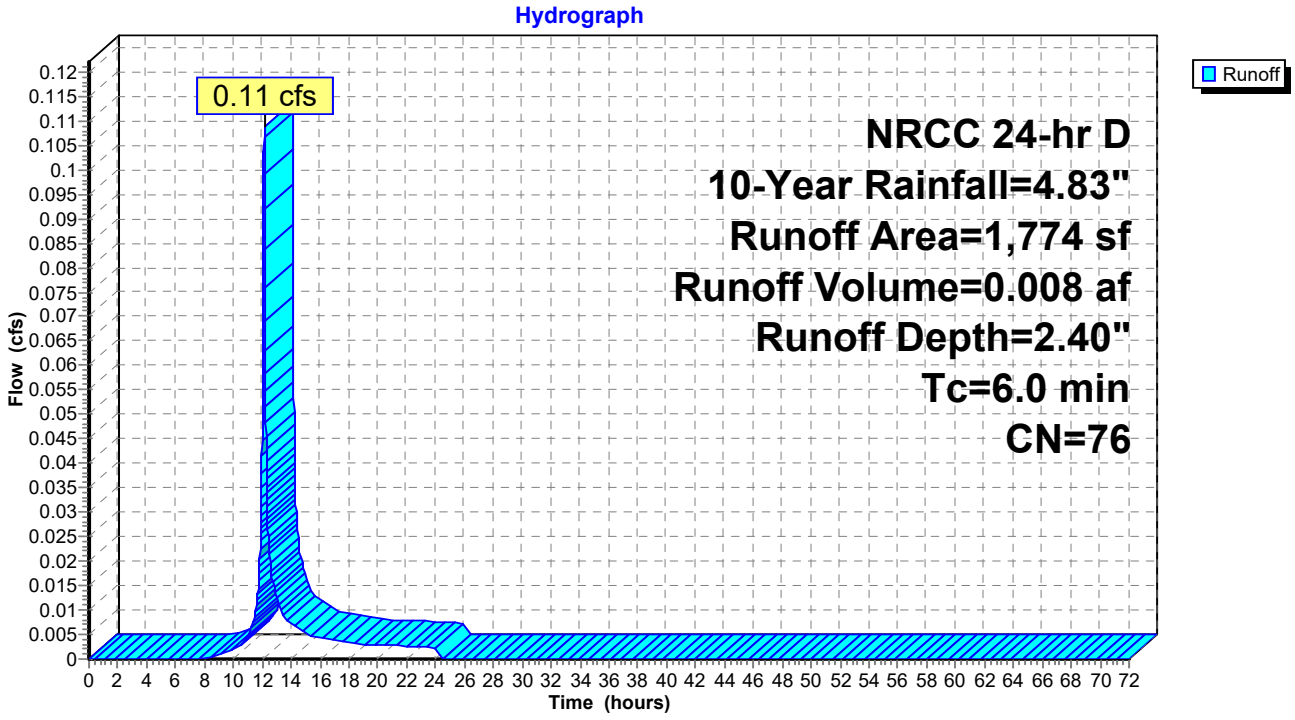
Runoff = 0.11 cfs @ 12.13 hrs, Volume= 0.008 af, Depth= 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 330 | 98 | Paved parking, HSG A |
| 661 | 96 | Gravel surface, HSG A |
| 783 | 49 | 50-75% Grass cover, Fair, HSG A |
| 1,774 | 76 | Weighted Average |
| 1,444 | | 81.40% Pervious Area |
| 330 | | 18.60% Impervious Area |

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

## Subcatchment E4: E4



## Summary for Subcatchment E5: E5

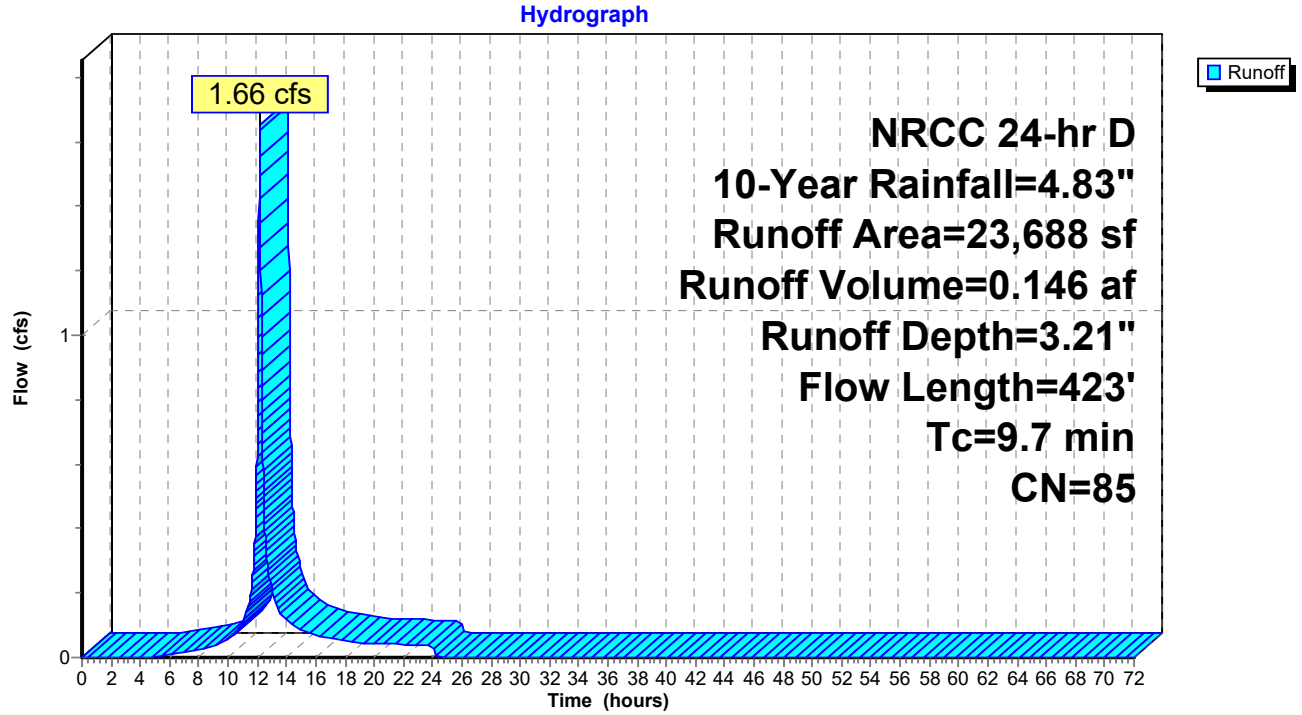
Runoff = 1.66 cfs @ 12.17 hrs, Volume= 0.146 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 10,987 | 98 | Paved parking, HSG A |
| 6,587 | 96 | Gravel surface, HSG A |
| 6,114 | 49 | 50-75% Grass cover, Fair, HSG A |
| 23,688 | 85 | Weighted Average |
| 12,701 | | 53.62% Pervious Area |
| 10,987 | | 46.38% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.8 | 20 | 0.0350 | 0.07 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 3.0 | 30 | 0.0350 | 0.16 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 0.9 | 120 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.0 | 253 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 9.7 | 423 | Total | | | |

## Subcatchment E5: E5



## Summary for Subcatchment E6: E6

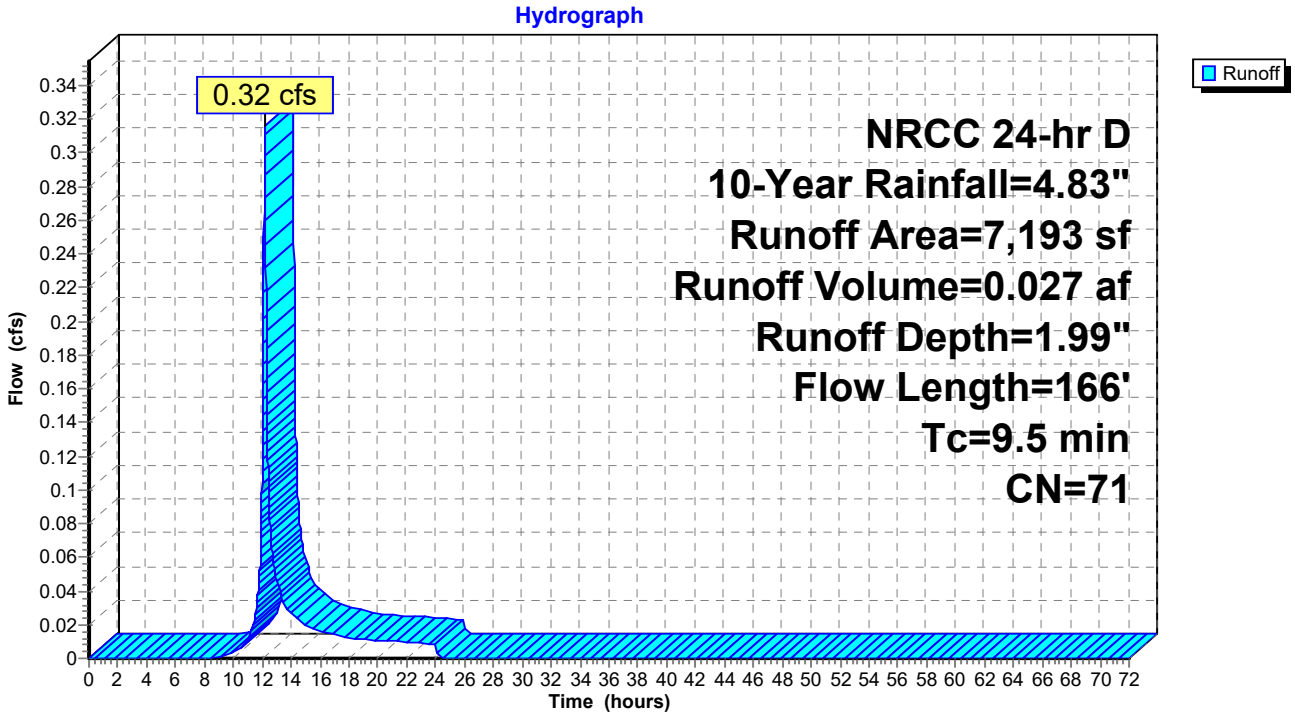
Runoff = 0.32 cfs @ 12.17 hrs, Volume= 0.027 af, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 3,426 | 96 | Gravel surface, HSG A |
| 3,767 | 49 | 50-75% Grass cover, Fair, HSG A |
| 7,193 | 71 | Weighted Average |
| 7,193 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.7 | 50 | 0.0500 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.8 | 116 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 9.5 | 166 | Total | | | |

## Subcatchment E6: E6



## Summary for Subcatchment E7: E7

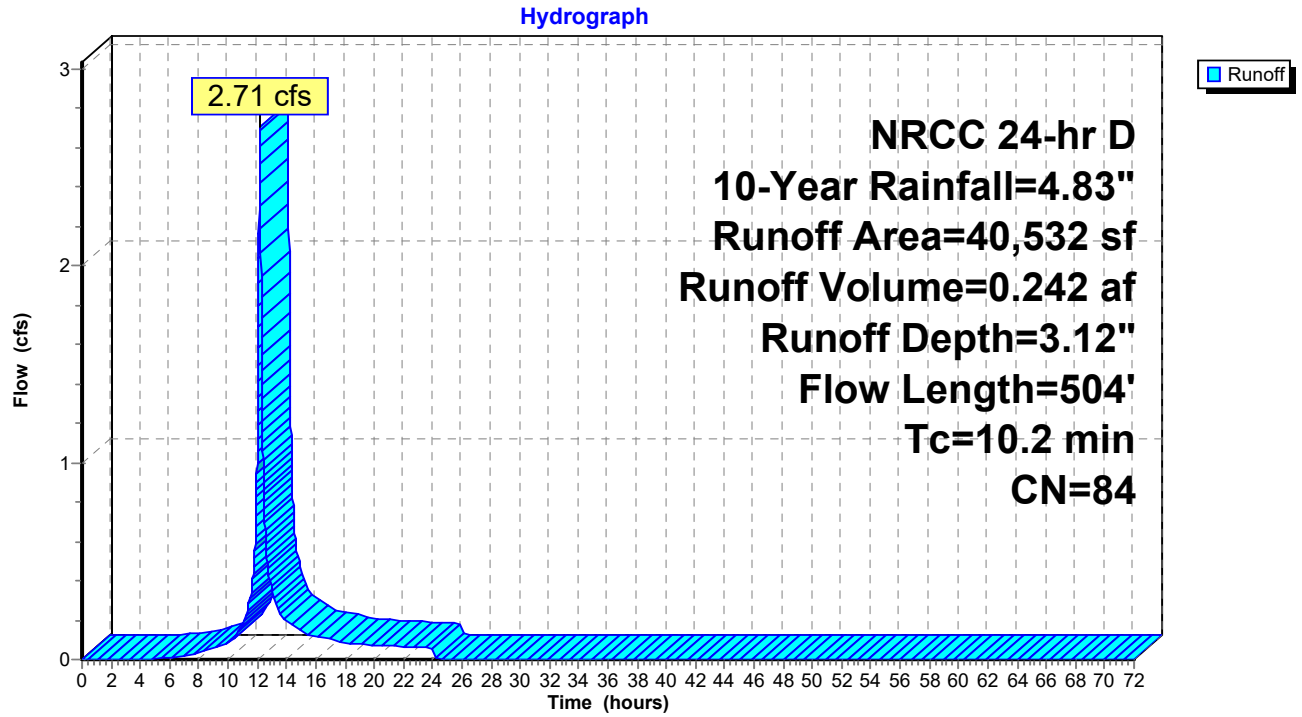
Runoff = 2.71 cfs @ 12.18 hrs, Volume= 0.242 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 24,971 | 98 | Paved parking, HSG A |
| 4,531 | 96 | Gravel surface, HSG A |
| 11,030 | 49 | 50-75% Grass cover, Fair, HSG A |
| 40,532 | 84 | Weighted Average |
| 15,561 | | 38.39% Pervious Area |
| 24,971 | | 61.61% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.8 | 40 | 0.0600 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 10 | 0.0500 | 0.15 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 0.9 | 120 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.4 | 334 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 10.2 | 504 | Total | | | |

## Subcatchment E7: E7



## Summary for Subcatchment E8: E8

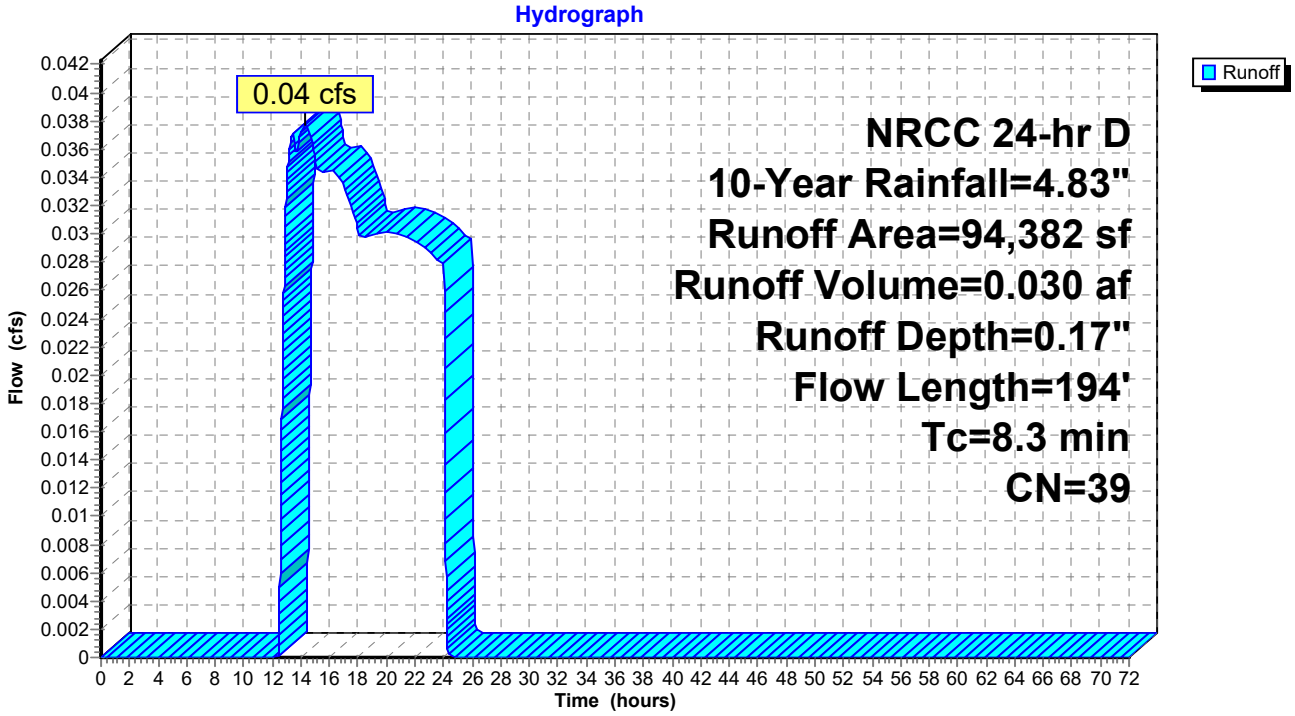
Runoff = 0.04 cfs @ 14.27 hrs, Volume= 0.030 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 81,032 | 36 | Woods, Fair, HSG A |
| 2,749 | 83 | Woods, Poor, HSG D |
| 657 | 98 | Roofs, HSG A |
| 1,982 | 98 | Paved parking, HSG A |
| 7,962 | 39 | >75% Grass cover, Good, HSG A |
| 94,382 | 39 | Weighted Average |
| 91,743 | | 97.20% Pervious Area |
| 2,639 | | 2.80% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.3 | 50 | 0.3100 | 0.11 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10" |
| 1.0 | 144 | 0.2500 | 2.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 8.3 | 194 | Total | | | |

## Subcatchment E8: E8



## Summary for Subcatchment E9: E9

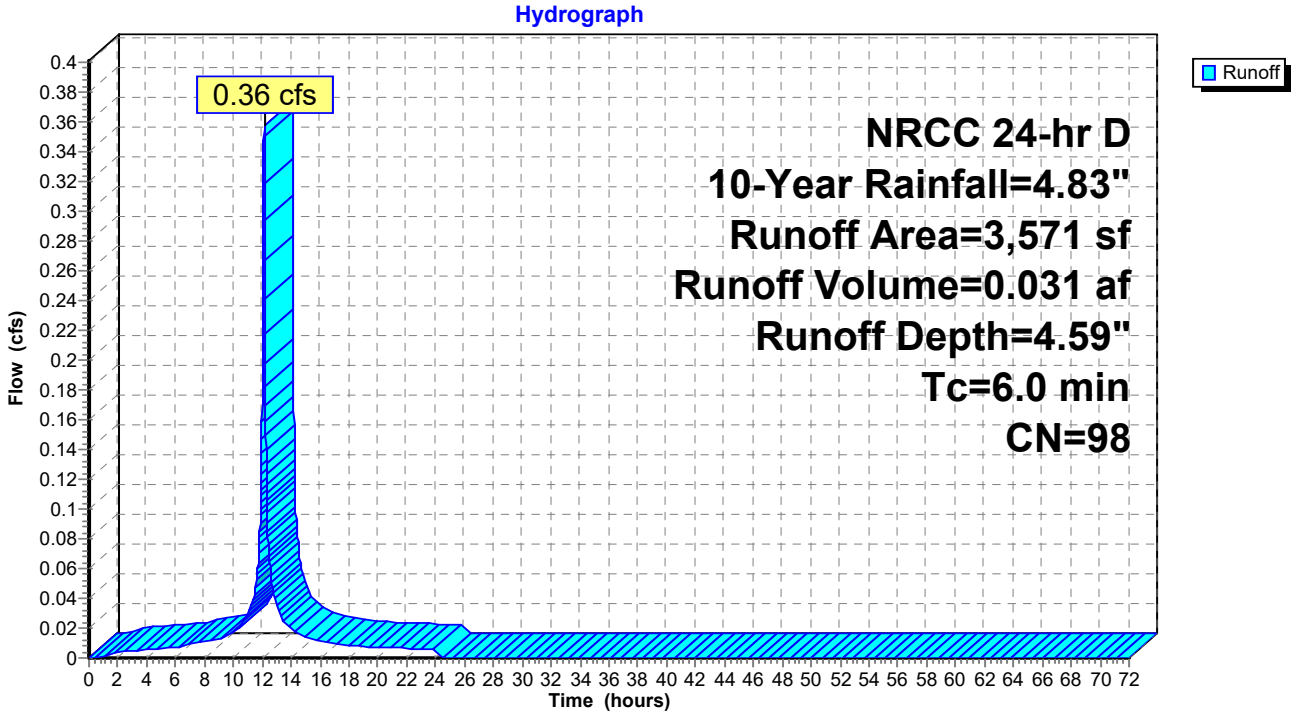
Runoff = 0.36 cfs @ 12.13 hrs, Volume= 0.031 af, Depth= 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 3,571 | 98 | Paved parking, HSG A |
| 3,571 | | 100.00% Impervious Area |

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

## Subcatchment E9: E9



## Summary for Pond 1P: DMH

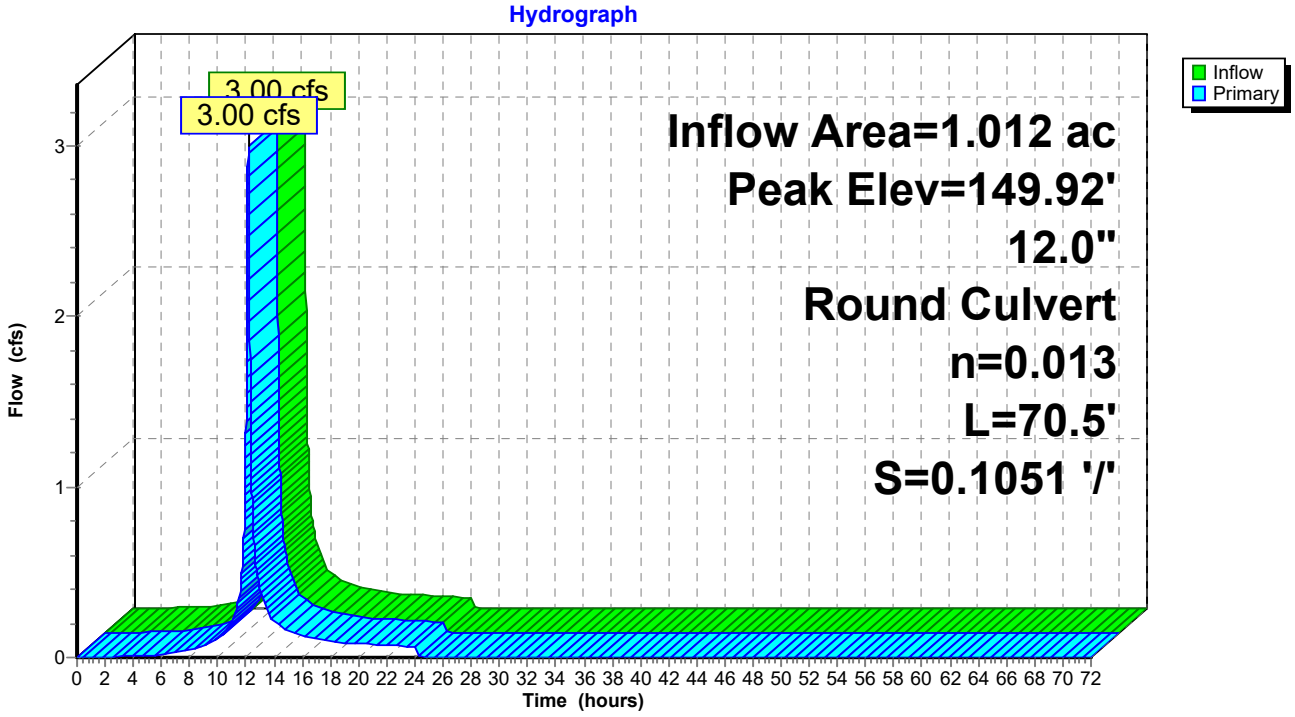
Inflow Area = 1.012 ac, 64.72% Impervious, Inflow Depth = 3.23" for 10-Year event
Inflow = 3.00 cfs @ 12.17 hrs, Volume= 0.273 af
Outflow = 3.00 cfs @ 12.17 hrs, Volume= 0.273 af, Atten= 0%, Lag= 0.0 min
Primary = 3.00 cfs @ 12.17 hrs, Volume= 0.273 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.92' @ 12.17 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.00 cfs @ 12.17 hrs HW=149.92' (Free Discharge)
**1=Culvert** (Inlet Controls 3.00 cfs @ 3.82 fps)

### Pond 1P: DMH



## Summary for Pond 2: DMH

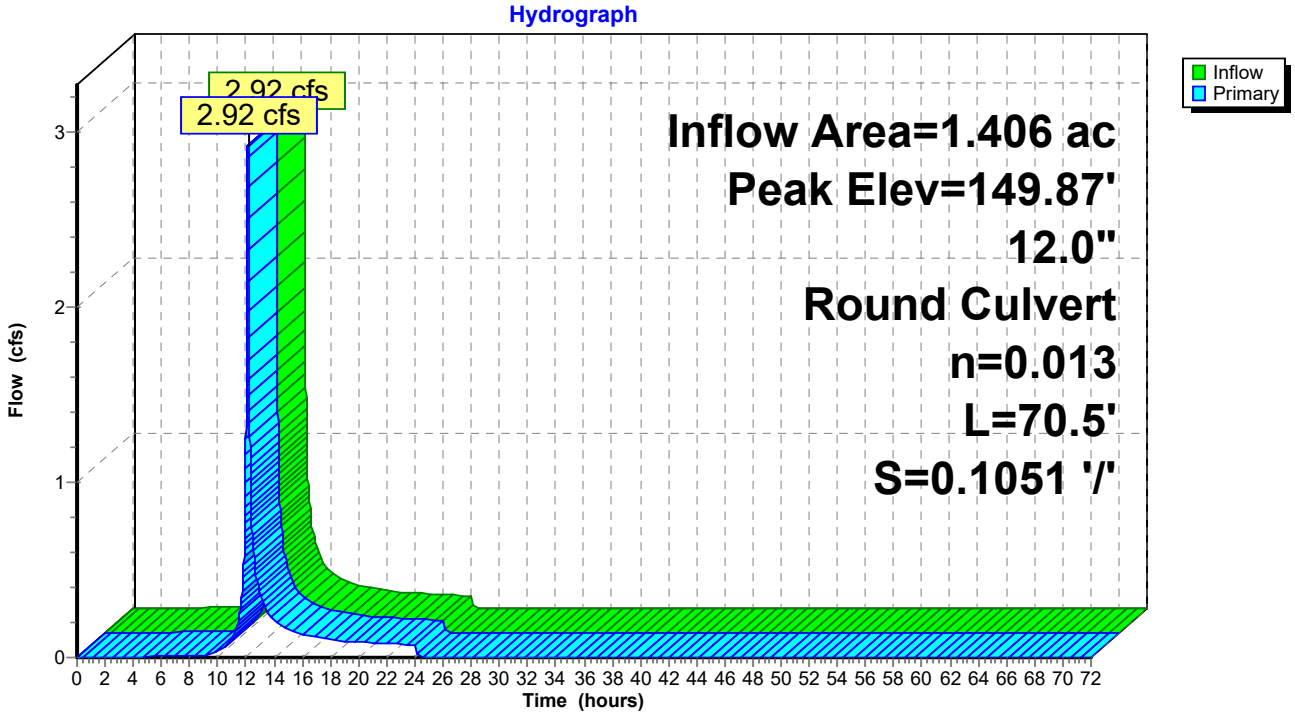
Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 1.98" for 10-Year event
Inflow = 2.92 cfs @ 12.14 hrs, Volume= 0.232 af
Outflow = 2.92 cfs @ 12.14 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.0 min
Primary = 2.92 cfs @ 12.14 hrs, Volume= 0.232 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.87' @ 12.14 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.92 cfs @ 12.14 hrs HW=149.86' (Free Discharge)
**1=Culvert** (Inlet Controls 2.92 cfs @ 3.71 fps)

### Pond 2: DMH



## Summary for Pond 2P: CB

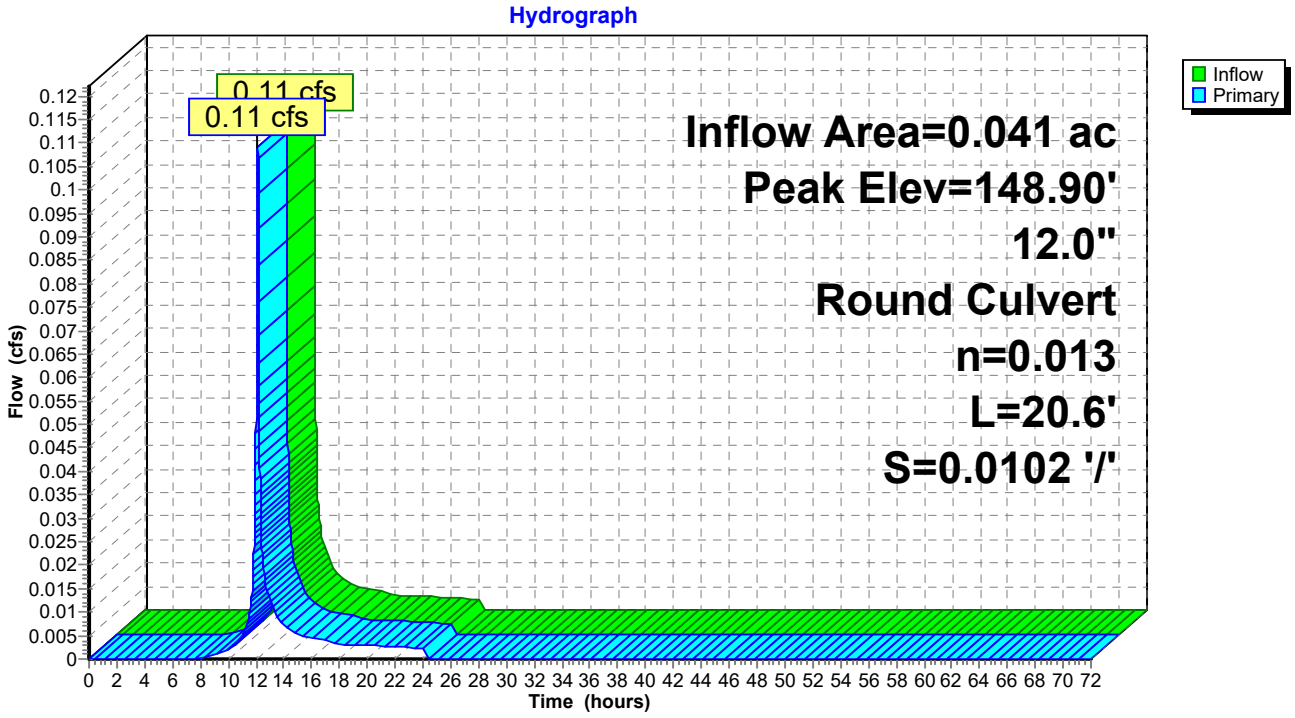
Inflow Area = 0.041 ac, 18.60% Impervious, Inflow Depth = 2.40" for 10-Year event
Inflow = 0.11 cfs @ 12.13 hrs, Volume= 0.008 af
Outflow = 0.11 cfs @ 12.13 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 12.13 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.90' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.11 cfs @ 12.13 hrs HW=148.90' (Free Discharge)
**1=Culvert** (Inlet Controls 0.11 cfs @ 1.13 fps)

## Pond 2P: CB



## Summary for Pond 3P: CB

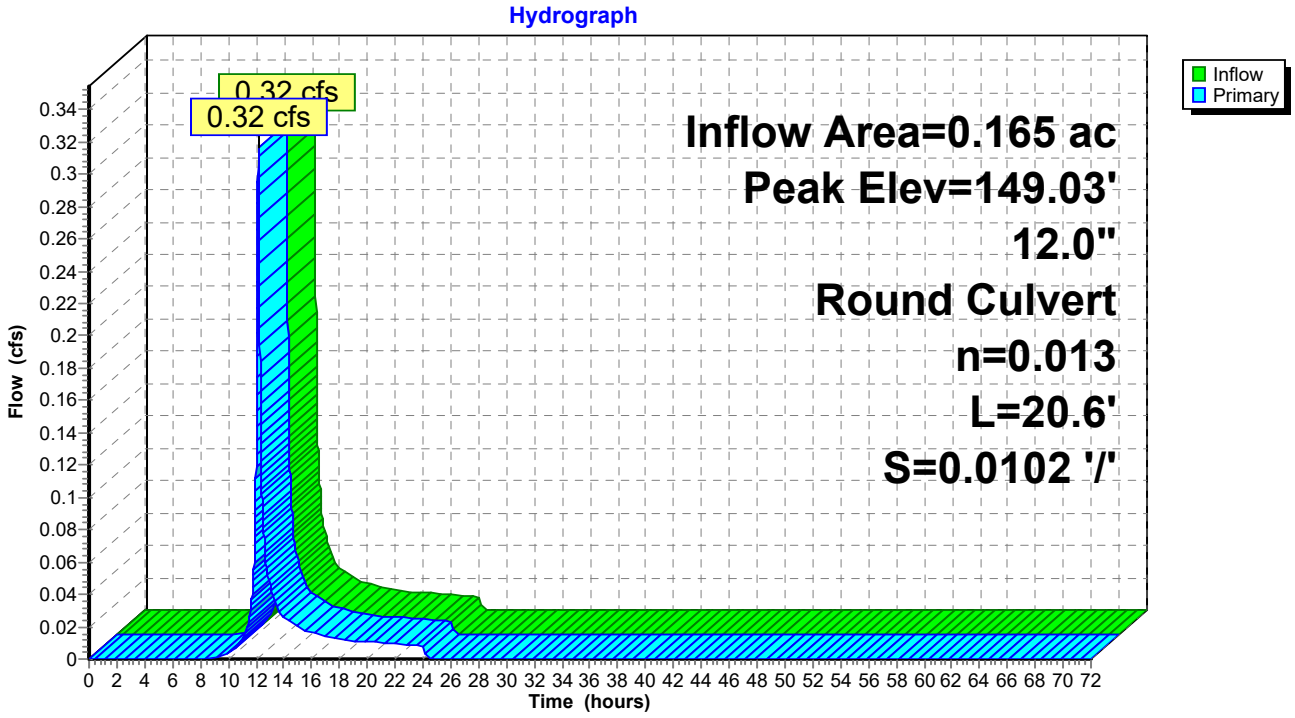
Inflow Area = 0.165 ac, 0.00% Impervious, Inflow Depth = 1.99" for 10-Year event
Inflow = 0.32 cfs @ 12.17 hrs, Volume= 0.027 af
Outflow = 0.32 cfs @ 12.17 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.17 hrs, Volume= 0.027 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.03' @ 12.17 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.32 cfs @ 12.17 hrs HW=149.03' (Free Discharge)
**1=Culvert** (Inlet Controls 0.32 cfs @ 1.50 fps)

## Pond 3P: CB



## Summary for Pond 4: DMH

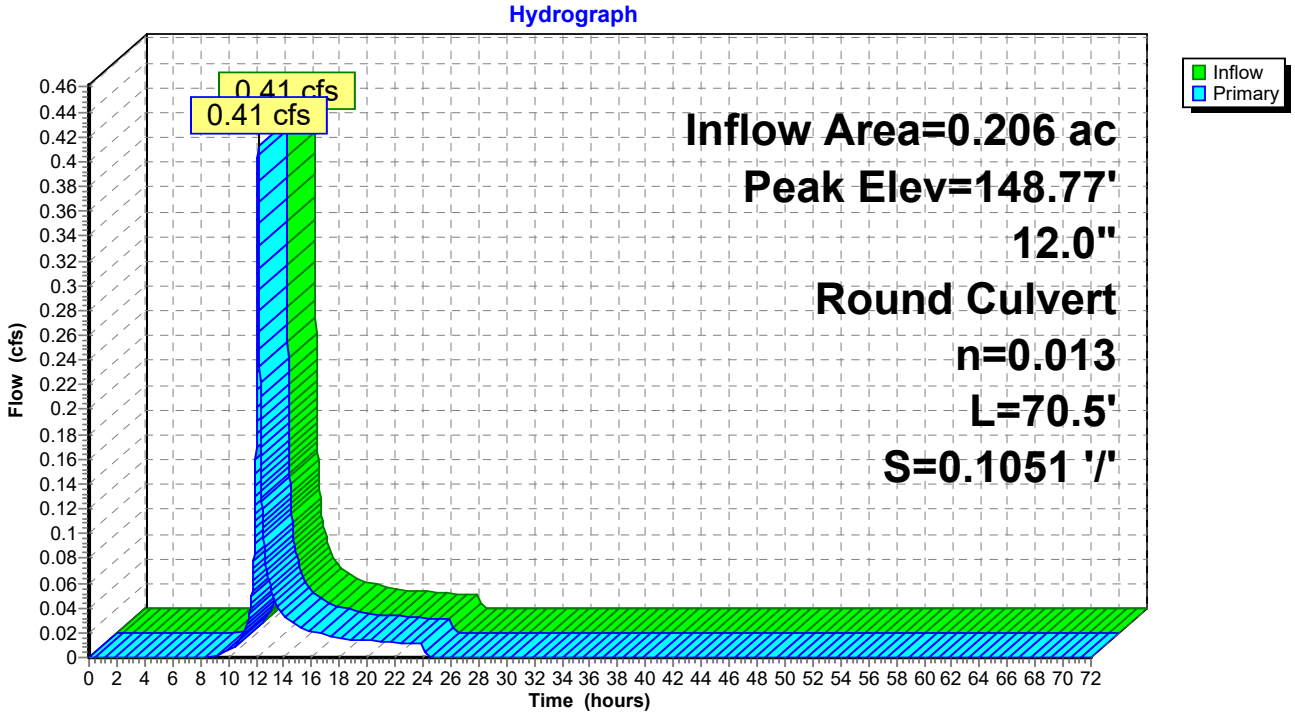
Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 2.07" for 10-Year event
Inflow = 0.41 cfs @ 12.16 hrs, Volume= 0.036 af
Outflow = 0.41 cfs @ 12.16 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.0 min
Primary = 0.41 cfs @ 12.16 hrs, Volume= 0.036 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.77' @ 12.16 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.41 cfs @ 12.16 hrs HW=148.77' (Free Discharge)
**1=Culvert** (Inlet Controls 0.41 cfs @ 1.61 fps)

## Pond 4: DMH



## Summary for Pond 5: DMH

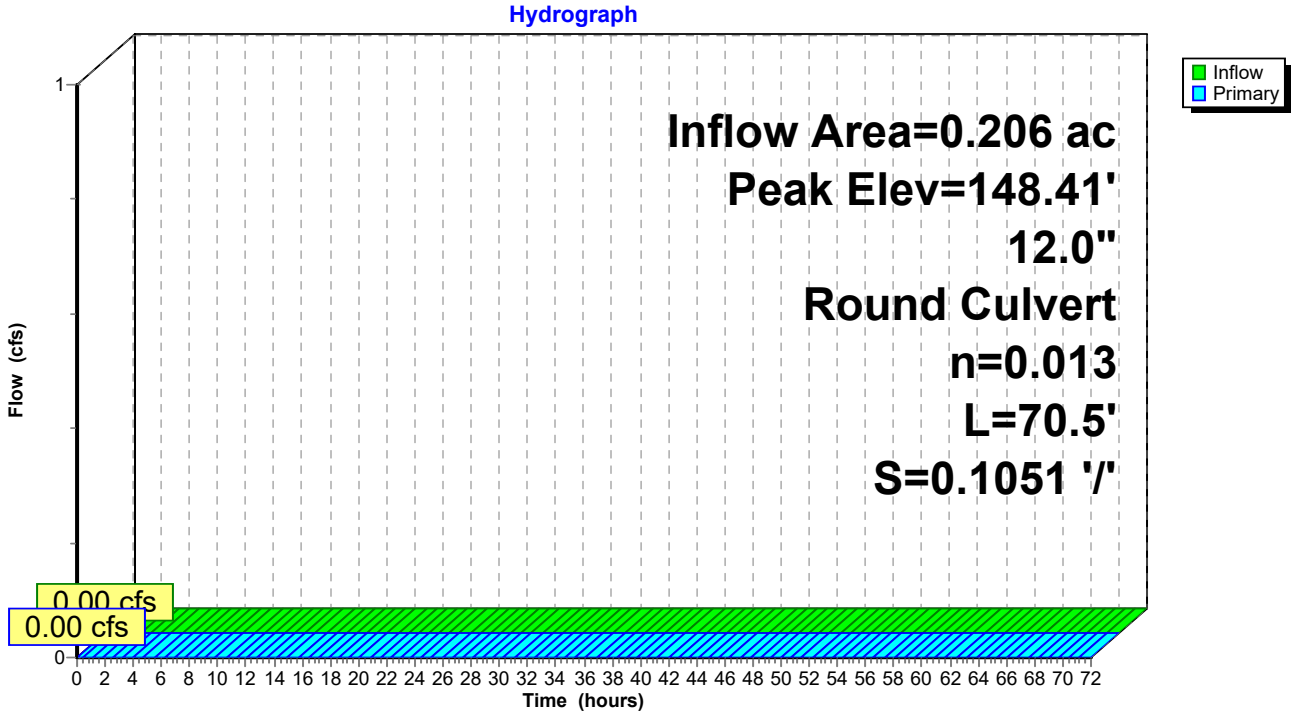
Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.41' @ 0.00 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=148.41' (Free Discharge)
**1=Culvert** ( Controls 0.00 cfs)

## Pond 5: DMH



## Summary for Pond 6P: (new Pond)

Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 2.07" for 10-Year event
Inflow = 0.41 cfs @ 12.16 hrs, Volume= 0.036 af
Outflow = 0.18 cfs @ 12.33 hrs, Volume= 0.036 af, Atten= 56%, Lag= 10.4 min
Discarded = 0.18 cfs @ 12.33 hrs, Volume= 0.036 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.76' @ 12.33 hrs Surf.Area= 0.022 ac Storage= 0.003 af

Plug-Flow detention time= 3.5 min calculated for 0.035 af (100% of inflow)
Center-of-Mass det. time= 3.5 min ( 878.0 - 874.5 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 89.33' | 0.022 af | **15.75'W x 60.58'L x 4.00'H Field A**<br>0.088 af Overall - 0.025 af Embedded = 0.062 af x 35.0% Voids |
| #2A | 90.33' | 0.025 af | **ADS_StormTech SC-740 +Cap** x 24 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>24 Chambers in 3 Rows |
| | | 0.047 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 89.33' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1.00' |
| #2 | Primary | 92.33' | **12.0" Round Culvert** L= 29.0' Ke= 0.500<br>Inlet / Outlet Invert= 92.33' / 92.04' S= 0.0100 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 89.43' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)<br>3.9' Crest Height |
| #4 | Device 2 | 92.33' | **4.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.18 cfs @ 12.33 hrs HW=89.76' (Free Discharge)
└**1=Exfiltration** ( Controls 0.18 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=89.33' (Free Discharge)
└**2=Culvert** ( Controls 0.00 cfs)
  ├**3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
  └**4=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 6P: (new Pond) - 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

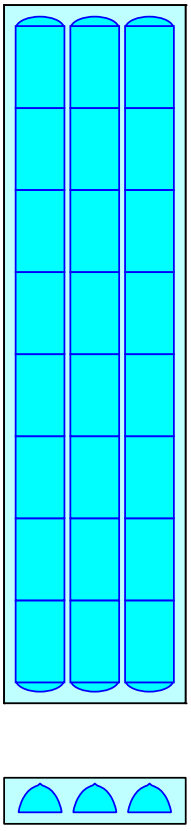
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

24 Chambers x 45.9 cf = 1,102.6 cf Chamber Storage

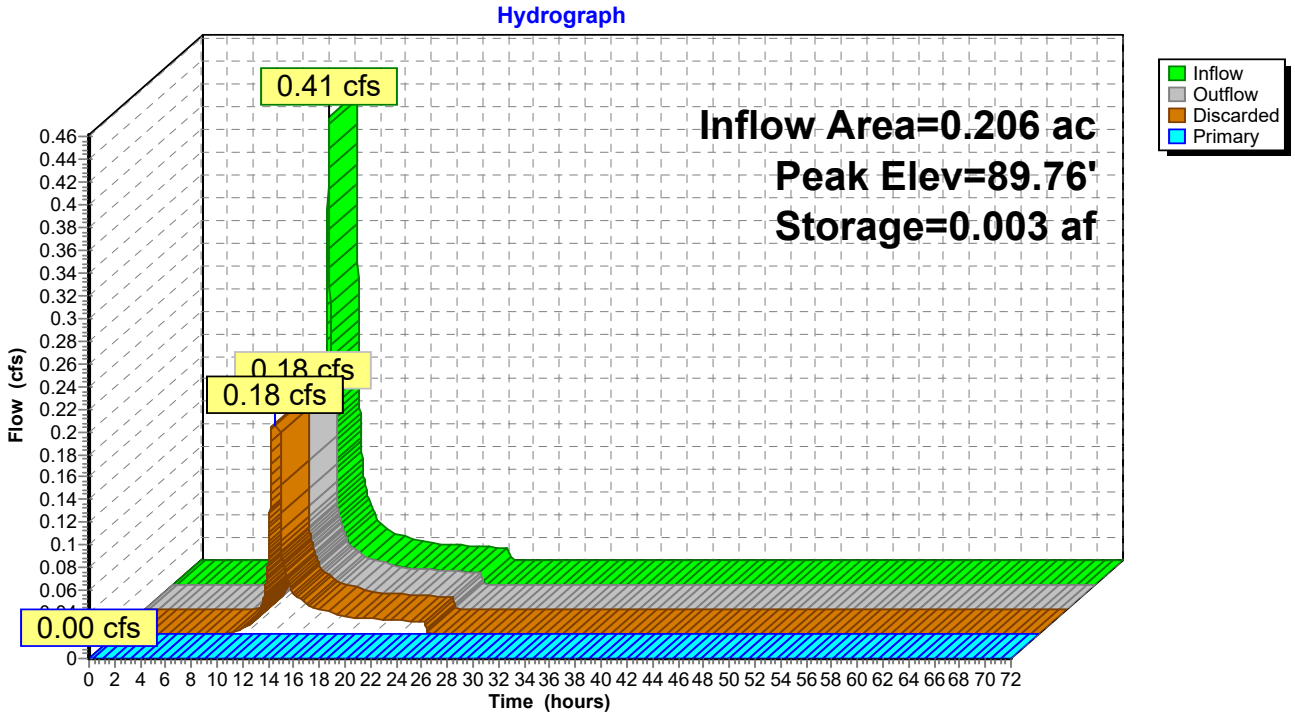
3,816.3 cf Field - 1,102.6 cf Chambers = 2,713.8 cf Stone x 35.0% Voids = 949.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,052.4 cf = 0.047 af
Overall Storage Efficiency = 53.8%
Overall System Size = 60.58' x 15.75' x 4.00'

24 Chambers
141.3 cy Field
100.5 cy Stone



## Pond 6P: (new Pond)



## Summary for Pond 7: DMH

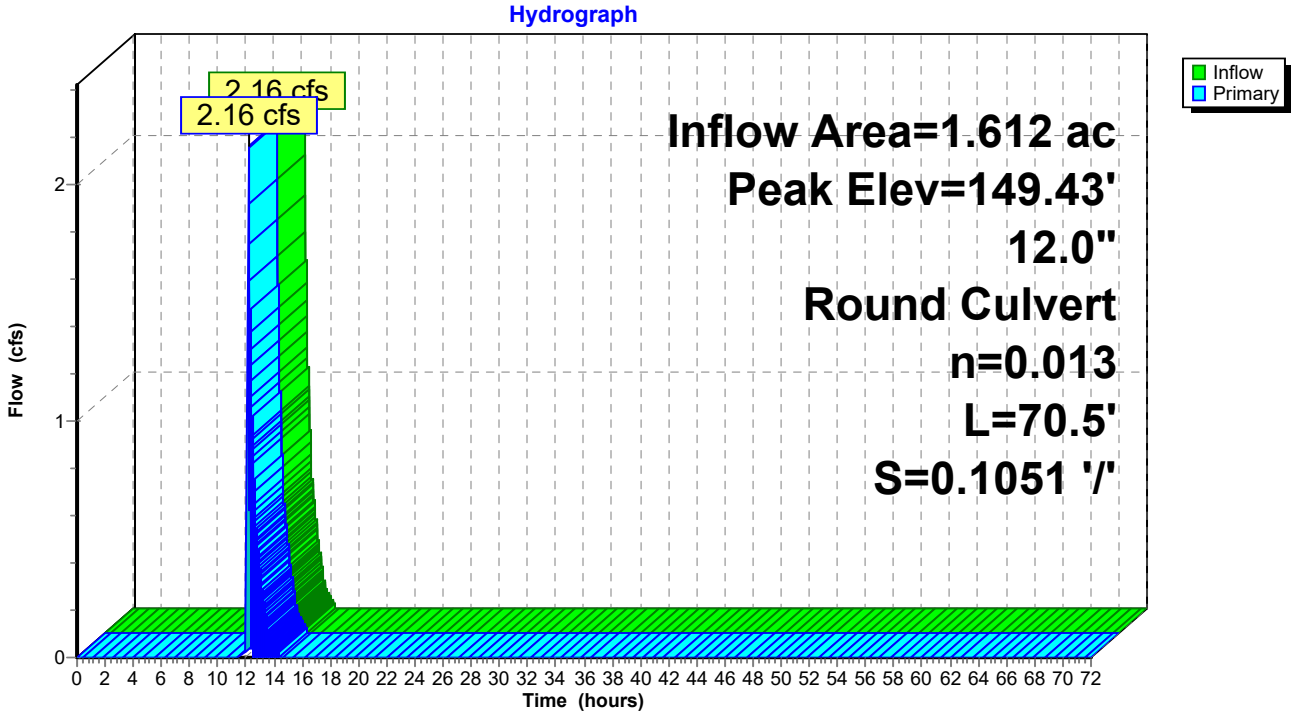
Inflow Area = 1.612 ac, 40.87% Impervious, Inflow Depth = 0.30" for 10-Year event
Inflow = 2.16 cfs @ 12.22 hrs, Volume= 0.040 af
Outflow = 2.16 cfs @ 12.22 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 2.16 cfs @ 12.22 hrs, Volume= 0.040 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.43' @ 12.22 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.11 cfs @ 12.22 hrs HW=149.41' (Free Discharge)
**1=Culvert** (Inlet Controls 2.11 cfs @ 2.69 fps)

### Pond 7: DMH



## Summary for Pond 7P: (new Pond)

Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 1.98" for 10-Year event
Inflow = 2.92 cfs @ 12.14 hrs, Volume= 0.232 af
Outflow = 2.36 cfs @ 12.22 hrs, Volume= 0.232 af, Atten= 19%, Lag= 4.6 min
Discarded = 0.19 cfs @ 12.22 hrs, Volume= 0.192 af
Primary = 2.16 cfs @ 12.22 hrs, Volume= 0.040 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 93.61' @ 12.22 hrs Surf.Area= 0.022 ac Storage= 0.047 af

Plug-Flow detention time= 84.1 min calculated for 0.232 af (100% of inflow)
Center-of-Mass det. time= 84.1 min ( 953.2 - 869.1 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 88.25' | 0.022 af | **15.75'W x 60.58'L x 3.67'H Field A**<br>0.080 af Overall - 0.025 af Embedded = 0.055 af x 40.0% Voids |
| #2A | 88.92' | 0.025 af | **ADS_StormTech SC-740 +Cap** x 24 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>24 Chambers in 3 Rows |
| | | 0.047 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 88.25' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1.00' |
| #2 | Primary | 92.33' | **12.0" Round Culvert** L= 29.0' Ke= 0.500<br>Inlet / Outlet Invert= 92.33' / 92.04' S= 0.0100 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 93.33' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #4 | Device 2 | 91.40' | **4.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.19 cfs @ 12.22 hrs HW=93.61' (Free Discharge)
└**1=Exfiltration** ( Controls 0.19 cfs)

**Primary OutFlow** Max=2.08 cfs @ 12.22 hrs HW=93.60' (Free Discharge)
└**2=Culvert** (Passes 2.08 cfs of 3.32 cfs potential flow)
  └**3=Broad-Crested Rectangular Weir** (Weir Controls 1.61 cfs @ 1.48 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.47 cfs @ 5.43 fps)

## Pond 7P: (new Pond) - 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

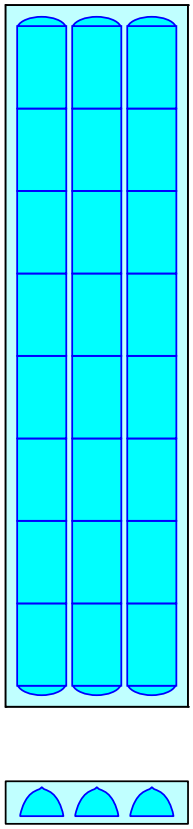
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
8.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.67' Field Height

24 Chambers x 45.9 cf = 1,102.6 cf Chamber Storage

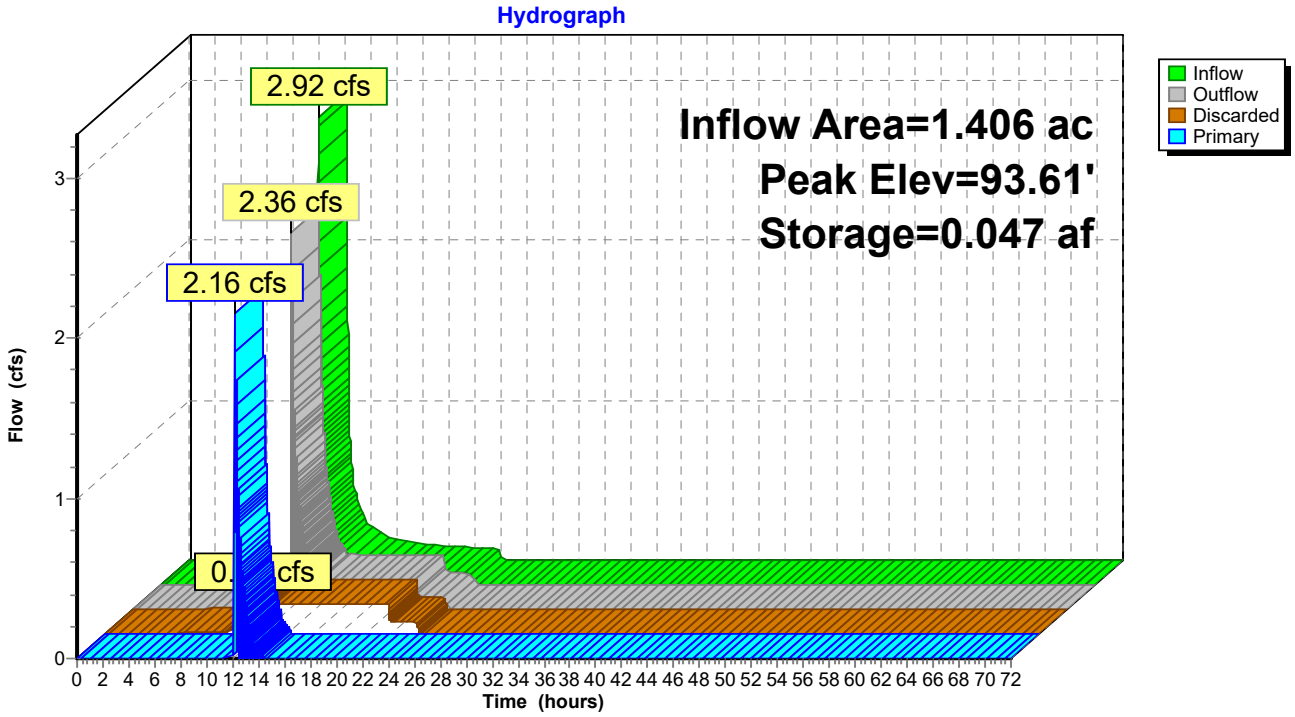
3,498.3 cf Field - 1,102.6 cf Chambers = 2,395.7 cf Stone x 40.0% Voids = 958.3 cf Stone Storage

Chamber Storage + Stone Storage = 2,060.9 cf = 0.047 af
Overall Storage Efficiency = 58.9%
Overall System Size = 60.58' x 15.75' x 3.67'

24 Chambers
129.6 cy Field
88.7 cy Stone



## Pond 7P: (new Pond)



## Summary for Pond 8: DMH

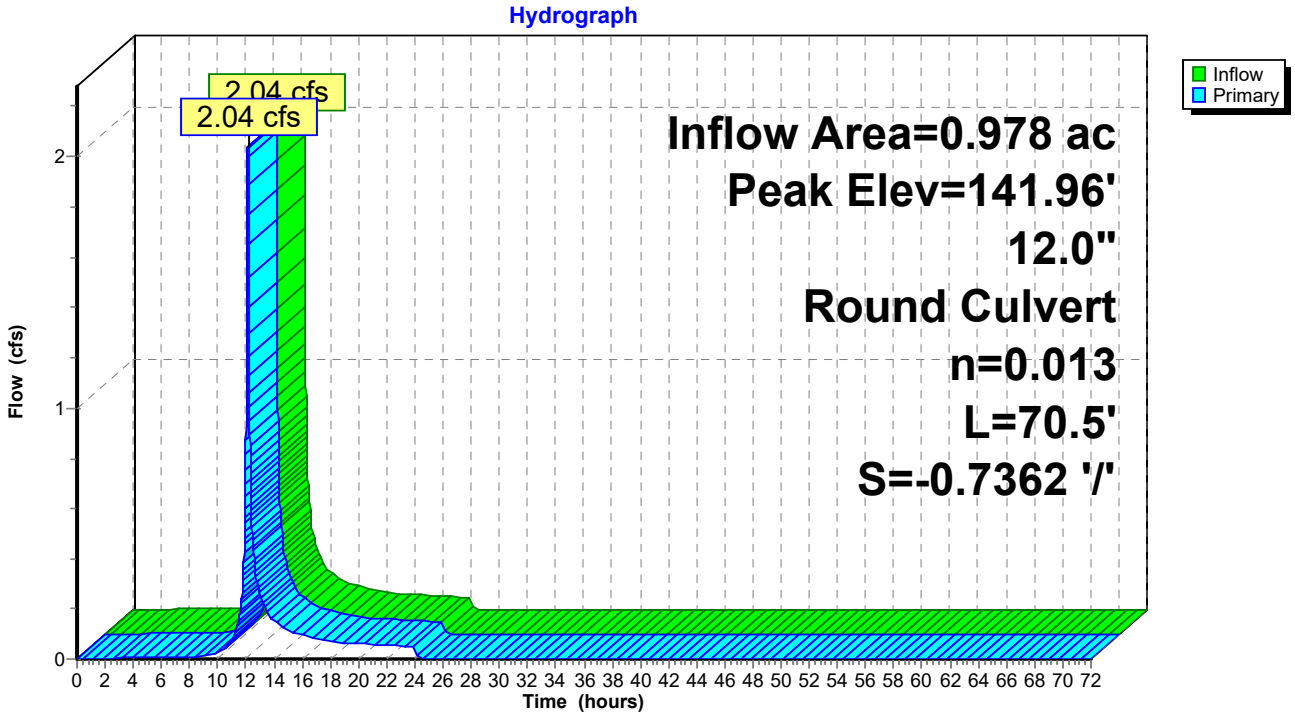
Inflow Area = 0.978 ac, 46.87% Impervious, Inflow Depth = 2.01" for 10-Year event
Inflow = 2.04 cfs @ 12.14 hrs, Volume= 0.163 af
Outflow = 2.04 cfs @ 12.14 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min
Primary = 2.04 cfs @ 12.14 hrs, Volume= 0.163 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 141.96' @ 12.14 hrs
Flood Elev= 93.79'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 141.00' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.10' / 141.00' S= -0.7362 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.03 cfs @ 12.14 hrs HW=141.96' (Free Discharge)
**1=Culvert** (Inlet Controls 2.03 cfs @ 2.63 fps)

## Pond 8: DMH



## Summary for Pond 9: CB

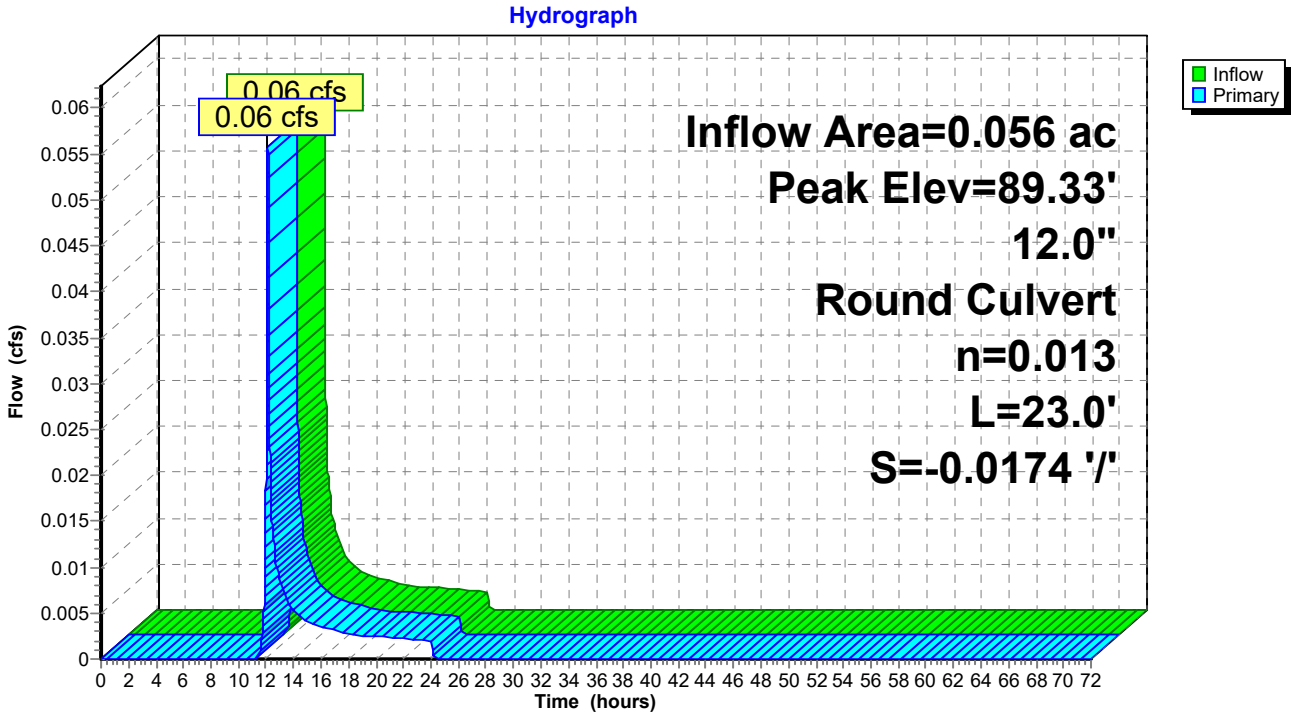
Inflow Area = 0.056 ac, 30.25% Impervious, Inflow Depth = 1.02" for 10-Year event
Inflow = 0.06 cfs @ 12.14 hrs, Volume= 0.005 af
Outflow = 0.06 cfs @ 12.14 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 12.14 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.33' @ 12.14 hrs
Flood Elev= 93.35'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 89.20' | **12.0" Round Culvert**<br>L= 23.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 88.80' / 89.20' S= -0.0174 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.06 cfs @ 12.14 hrs HW=89.33' (Free Discharge)
**1=Culvert** (Inlet Controls 0.06 cfs @ 0.96 fps)

## Pond 9: CB



## Summary for Pond 12P: CB

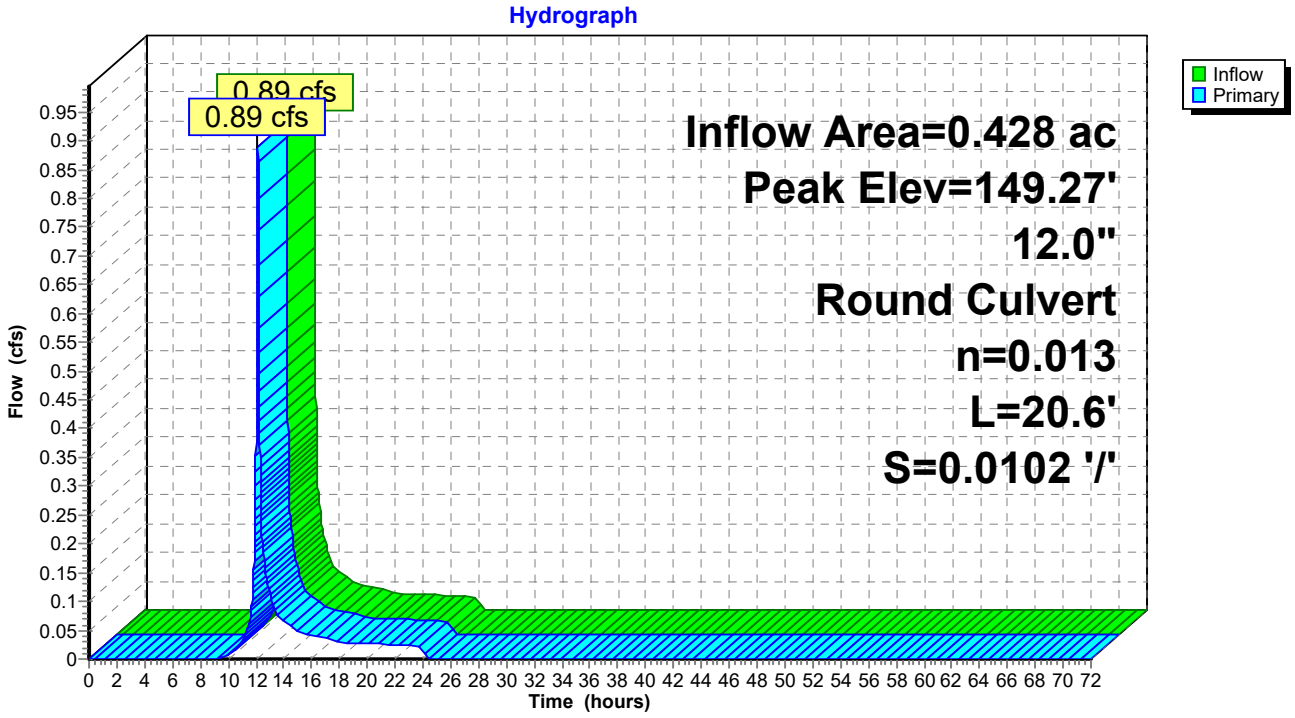
Inflow Area = 0.428 ac, 45.04% Impervious, Inflow Depth = 1.91" for 10-Year event
Inflow = 0.89 cfs @ 12.14 hrs, Volume= 0.068 af
Outflow = 0.89 cfs @ 12.14 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.14 hrs, Volume= 0.068 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.27' @ 12.14 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.89 cfs @ 12.14 hrs HW=149.27' (Free Discharge)
**1=Culvert** (Inlet Controls 0.89 cfs @ 2.00 fps)

## Pond 12P: CB



## Summary for Pond 14P: CB

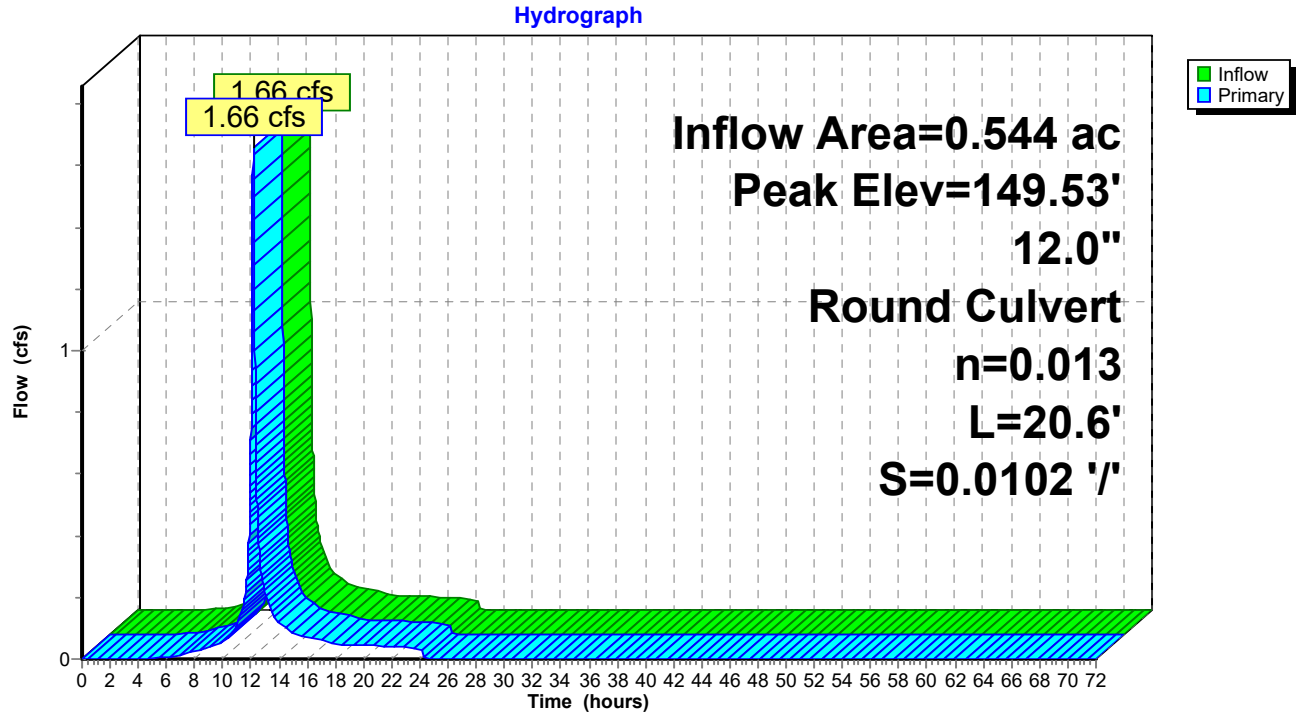
Inflow Area = 0.544 ac, 46.38% Impervious, Inflow Depth = 3.21" for 10-Year event
Inflow = 1.66 cfs @ 12.17 hrs, Volume= 0.146 af
Outflow = 1.66 cfs @ 12.17 hrs, Volume= 0.146 af, Atten= 0%, Lag= 0.0 min
Primary = 1.66 cfs @ 12.17 hrs, Volume= 0.146 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.53' @ 12.17 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.65 cfs @ 12.17 hrs HW=149.53' (Free Discharge)
**1=Culvert** (Barrel Controls 1.65 cfs @ 3.29 fps)

## Pond 14P: CB



## Summary for Pond 16: CB

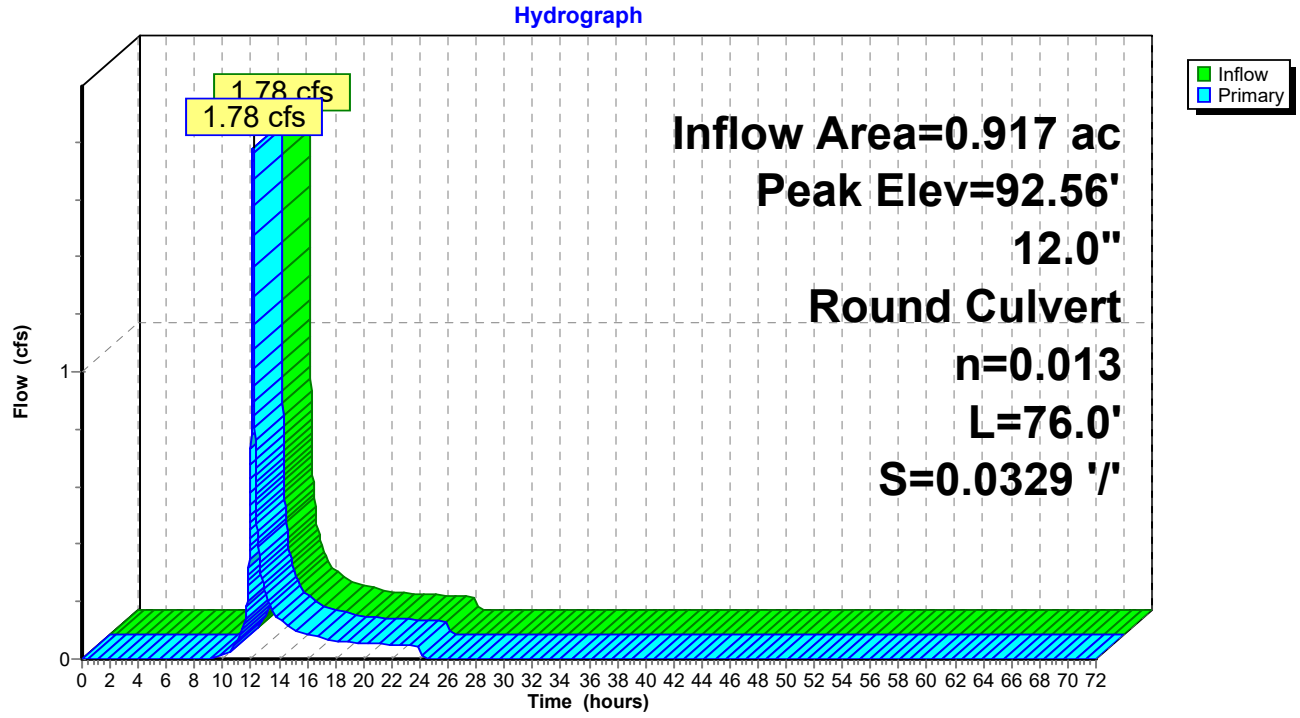
Inflow Area = 0.917 ac, 43.36% Impervious, Inflow Depth = 1.83" for 10-Year event
Inflow = 1.78 cfs @ 12.15 hrs, Volume= 0.140 af
Outflow = 1.78 cfs @ 12.15 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.0 min
Primary = 1.78 cfs @ 12.15 hrs, Volume= 0.140 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 92.56' @ 12.15 hrs
Flood Elev= 96.19'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 91.70' | **12.0" Round Culvert**<br>L= 76.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 91.70' / 89.20' S= 0.0329 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.77 cfs @ 12.15 hrs HW=92.55' (Free Discharge)
**1=Culvert** (Inlet Controls 1.77 cfs @ 2.48 fps)

## Pond 16: CB



## Summary for Pond 16P: DMH

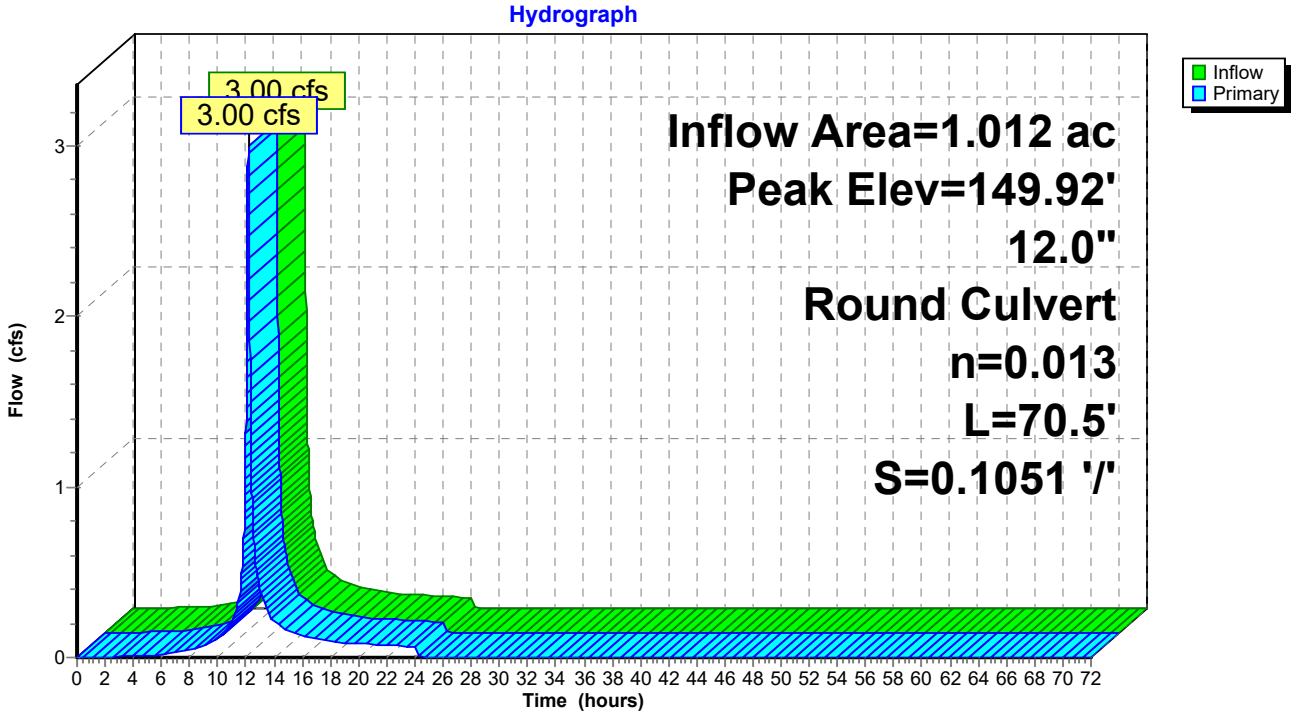
Inflow Area = 1.012 ac, 64.72% Impervious, Inflow Depth = 3.23" for 10-Year event
Inflow = 3.00 cfs @ 12.17 hrs, Volume= 0.273 af
Outflow = 3.00 cfs @ 12.17 hrs, Volume= 0.273 af, Atten= 0%, Lag= 0.0 min
Primary = 3.00 cfs @ 12.17 hrs, Volume= 0.273 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.92' @ 12.17 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.00 cfs @ 12.17 hrs HW=149.92' (Free Discharge)
**1=Culvert** (Inlet Controls 3.00 cfs @ 3.82 fps)

### Pond 16P: DMH



## Summary for Pond 17P: CB

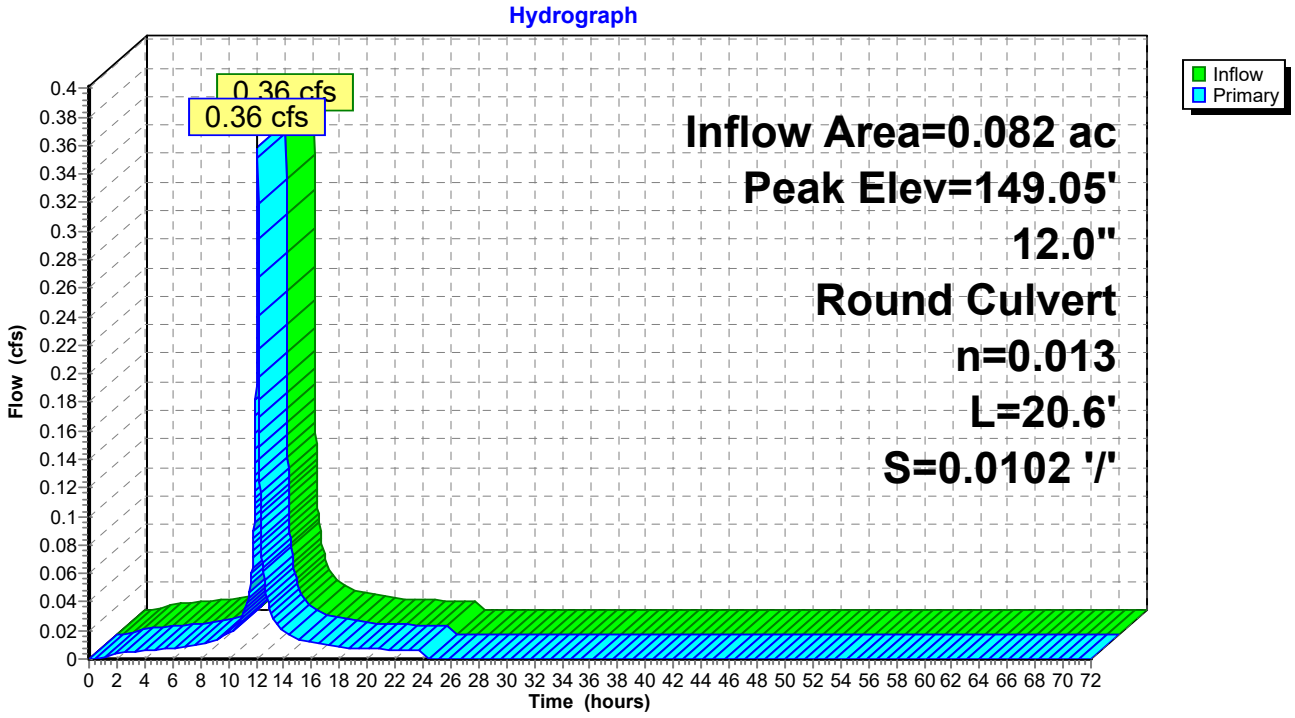
Inflow Area = 0.082 ac,100.00% Impervious, Inflow Depth = 4.59" for 10-Year event
Inflow = 0.36 cfs @ 12.13 hrs, Volume= 0.031 af
Outflow = 0.36 cfs @ 12.13 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min
Primary = 0.36 cfs @ 12.13 hrs, Volume= 0.031 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.05' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.36 cfs @ 12.13 hrs HW=149.05' (Free Discharge)
**1=Culvert** (Inlet Controls 0.36 cfs @ 1.55 fps)

## Pond 17P: CB



## Summary for Pond 18: DMH

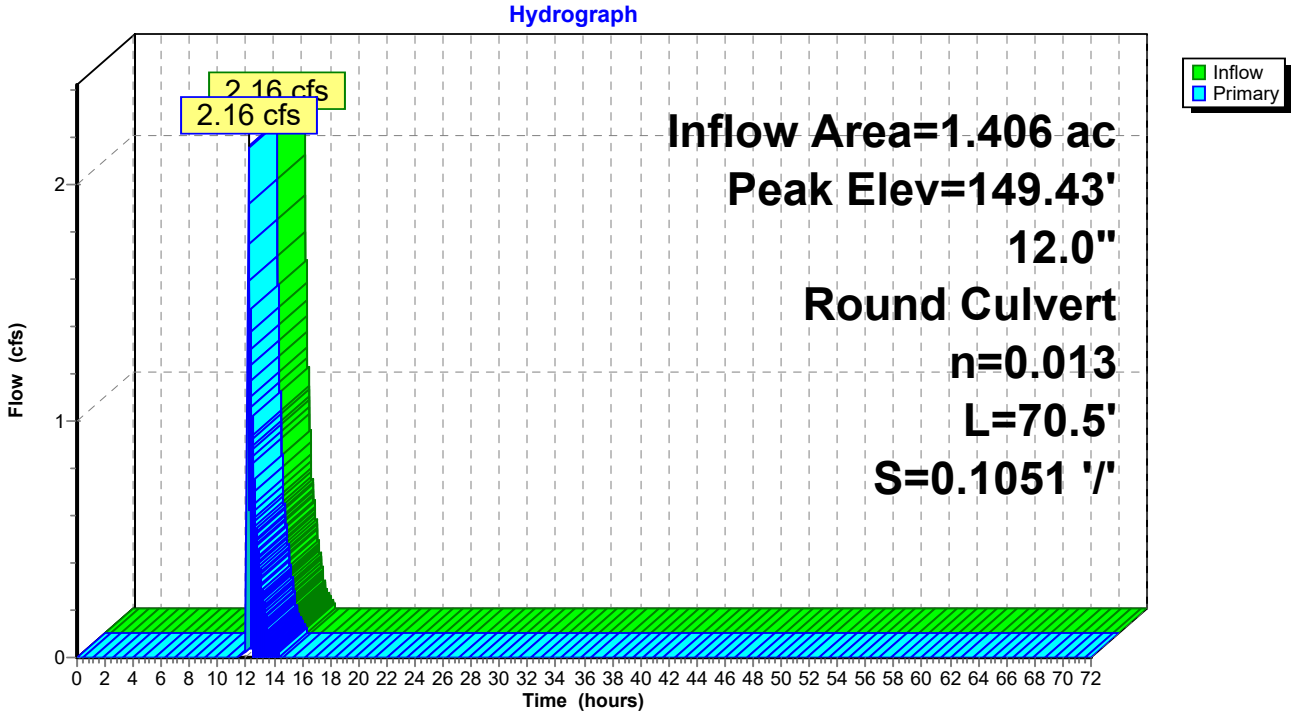
Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 0.34" for 10-Year event
Inflow = 2.16 cfs @ 12.22 hrs, Volume= 0.040 af
Outflow = 2.16 cfs @ 12.22 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 2.16 cfs @ 12.22 hrs, Volume= 0.040 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.43' @ 12.22 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.11 cfs @ 12.22 hrs HW=149.41' (Free Discharge)
**1=Culvert** (Inlet Controls 2.11 cfs @ 2.69 fps)

### Pond 18: DMH



## Summary for Pond 18P: CB

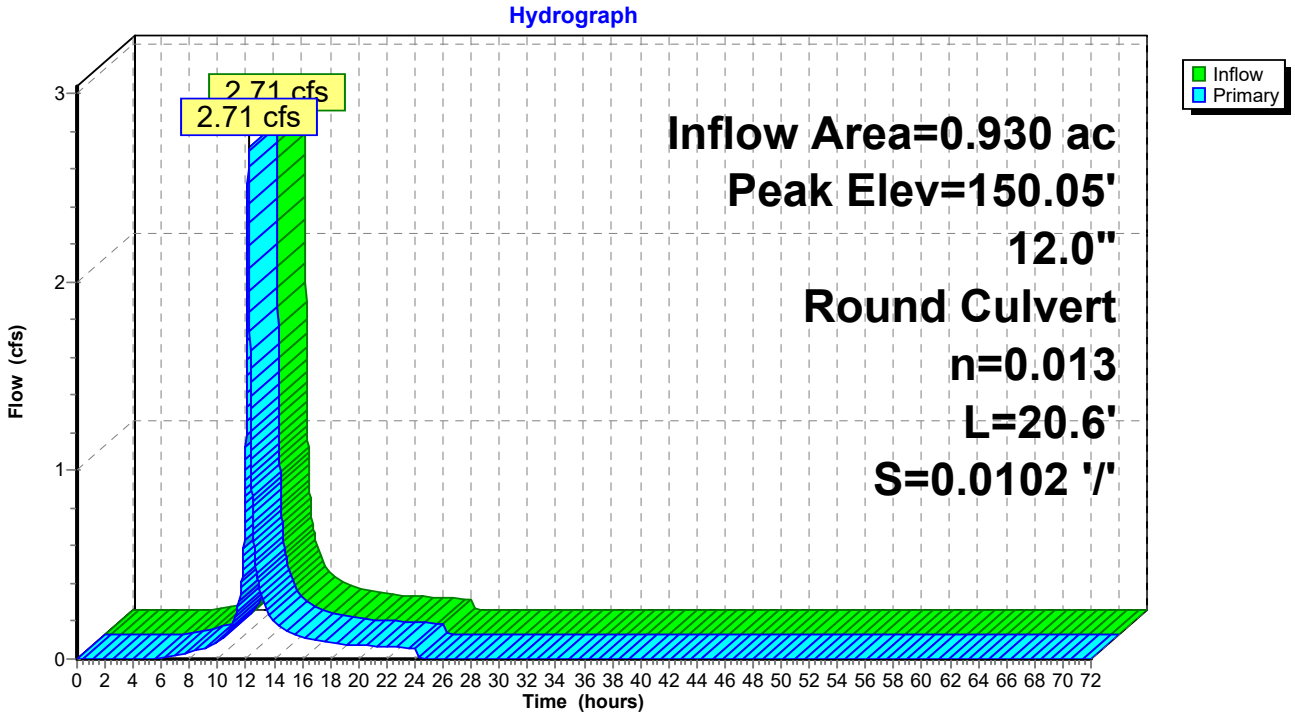
Inflow Area = 0.930 ac, 61.61% Impervious, Inflow Depth = 3.12" for 10-Year event
Inflow = 2.71 cfs @ 12.18 hrs, Volume= 0.242 af
Outflow = 2.71 cfs @ 12.18 hrs, Volume= 0.242 af, Atten= 0%, Lag= 0.0 min
Primary = 2.71 cfs @ 12.18 hrs, Volume= 0.242 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 150.05' @ 12.18 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.71 cfs @ 12.18 hrs HW=150.04' (Free Discharge)
**1=Culvert** (Inlet Controls 2.71 cfs @ 3.45 fps)

## Pond 18P: CB

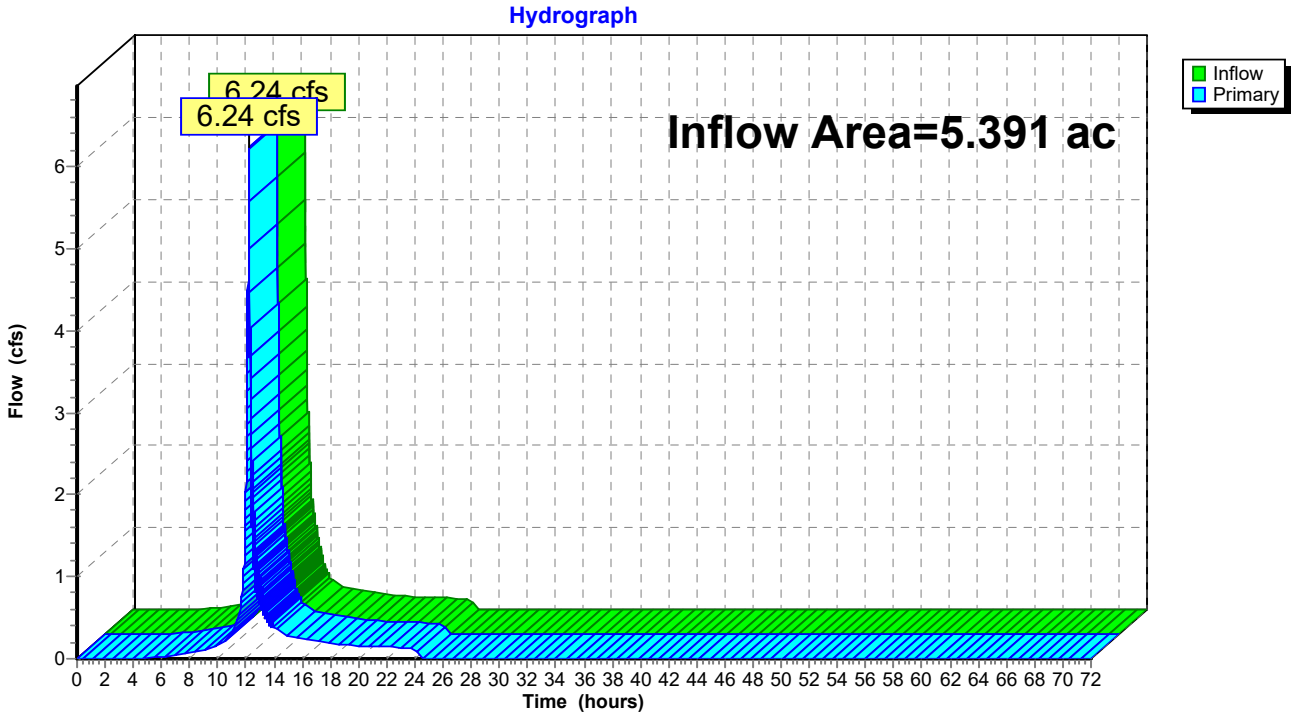


## Summary for Link 32L: TOTAL TO SPICKET RIVER

Inflow Area = 5.391 ac, 30.49% Impervious, Inflow Depth = 1.10" for 10-Year event
Inflow = 6.24 cfs @ 12.22 hrs, Volume= 0.493 af
Primary = 6.24 cfs @ 12.22 hrs, Volume= 0.493 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

## Link 32L: TOTAL TO SPICKET RIVER



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 E1: E1** Runoff Area=39,960 sf 43.36% Impervious Runoff Depth=5.16"
Flow Length=267' Tc=7.1 min CN=69 Runoff=5.04 cfs 0.394 af

**Subcatchment E10: E10** Runoff Area=2,639 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=0.49 cfs 0.044 af

**Subcatchment E2: E2** Runoff Area=18,640 sf 45.04% Impervious Runoff Depth=5.28"
Flow Length=353' Tc=6.6 min CN=70 Runoff=2.46 cfs 0.188 af

**Subcatchment E3: E3** Runoff Area=2,446 sf 30.25% Impervious Runoff Depth=3.69"
Tc=6.0 min CN=57 Runoff=0.23 cfs 0.017 af

**Subcatchment E4: E4** Runoff Area=1,774 sf 18.60% Impervious Runoff Depth=6.02"
Tc=6.0 min CN=76 Runoff=0.27 cfs 0.020 af

**Subcatchment E5: E5** Runoff Area=23,688 sf 46.38% Impervious Runoff Depth=7.12"
Flow Length=423' Tc=9.7 min CN=85 Runoff=3.53 cfs 0.323 af

**Subcatchment E6: E6** Runoff Area=7,193 sf 0.00% Impervious Runoff Depth=5.41"
Flow Length=166' Tc=9.5 min CN=71 Runoff=0.86 cfs 0.074 af

**Subcatchment E7: E7** Runoff Area=40,532 sf 61.61% Impervious Runoff Depth=7.00"
Flow Length=504' Tc=10.2 min CN=84 Runoff=5.86 cfs 0.543 af

**Subcatchment E8: E8** Runoff Area=94,382 sf 2.80% Impervious Runoff Depth=1.57"
Flow Length=194' Tc=8.3 min CN=39 Runoff=2.75 cfs 0.284 af

**Subcatchment E9: E9** Runoff Area=3,571 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=0.67 cfs 0.059 af

**Pond 1P: DMH** Peak Elev=153.52' Inflow=6.41 cfs 0.602 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=6.41 cfs 0.602 af

**Pond 2: DMH** Peak Elev=156.05' Inflow=7.98 cfs 0.627 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=7.98 cfs 0.627 af

**Pond 2P: CB** Peak Elev=149.01' Inflow=0.27 cfs 0.020 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.27 cfs 0.020 af

**Pond 3P: CB** Peak Elev=149.26' Inflow=0.86 cfs 0.074 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.86 cfs 0.074 af

**Pond 4: DMH** Peak Elev=149.04' Inflow=1.10 cfs 0.095 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=1.10 cfs 0.095 af

**Pond 5: DMH** Peak Elev=148.41' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=0.00 cfs 0.000 af

**Pond 6P: (new Pond)** Peak Elev=91.17' Storage=0.022 af Inflow=1.10 cfs 0.095 af
Discarded=0.19 cfs 0.095 af Primary=0.00 cfs 0.000 af Outflow=0.19 cfs 0.095 af

**Pond 7: DMH** Peak Elev=156.21' Inflow=8.07 cfs 0.330 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=8.07 cfs 0.330 af

**Pond 7P: (new Pond)** Peak Elev=97.38' Storage=0.047 af Inflow=7.98 cfs 0.627 af
Discarded=0.20 cfs 0.296 af Primary=8.07 cfs 0.330 af Outflow=8.27 cfs 0.627 af

**Pond 8: DMH** Peak Elev=144.92' Inflow=5.52 cfs 0.438 af
12.0" Round Culvert n=0.013 L=70.5' S=-0.7362 '/' Outflow=5.52 cfs 0.438 af

**Pond 9: CB** Peak Elev=89.46' Inflow=0.23 cfs 0.017 af
12.0" Round Culvert n=0.013 L=23.0' S=-0.0174 '/' Outflow=0.23 cfs 0.017 af

**Pond 12P: CB** Peak Elev=149.90' Inflow=2.46 cfs 0.188 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=2.46 cfs 0.188 af

**Pond 14P: CB** Peak Elev=150.62' Inflow=3.53 cfs 0.323 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=3.53 cfs 0.323 af

**Pond 16: CB** Peak Elev=95.05' Inflow=5.04 cfs 0.394 af
12.0" Round Culvert n=0.013 L=76.0' S=0.0329 '/' Outflow=5.04 cfs 0.394 af

**Pond 16P: DMH** Peak Elev=153.52' Inflow=6.41 cfs 0.602 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=6.41 cfs 0.602 af

**Pond 17P: CB** Peak Elev=149.19' Inflow=0.67 cfs 0.059 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=0.67 cfs 0.059 af

**Pond 18: DMH** Peak Elev=156.21' Inflow=8.07 cfs 0.330 af
12.0" Round Culvert n=0.013 L=70.5' S=0.1051 '/' Outflow=8.07 cfs 0.330 af

**Pond 18P: CB** Peak Elev=153.08' Inflow=5.86 cfs 0.543 af
12.0" Round Culvert n=0.013 L=20.6' S=0.0102 '/' Outflow=5.86 cfs 0.543 af

**Link 32L: TOTAL TO SPICKET RIVER** Inflow=20.60 cfs 1.557 af
Primary=20.60 cfs 1.557 af

**Total Runoff Area = 5.391 ac Runoff Volume = 1.948 af Average Runoff Depth = 4.34"**
**69.51% Pervious = 3.747 ac 30.49% Impervious = 1.644 ac**

## Summary for Subcatchment E1: E1

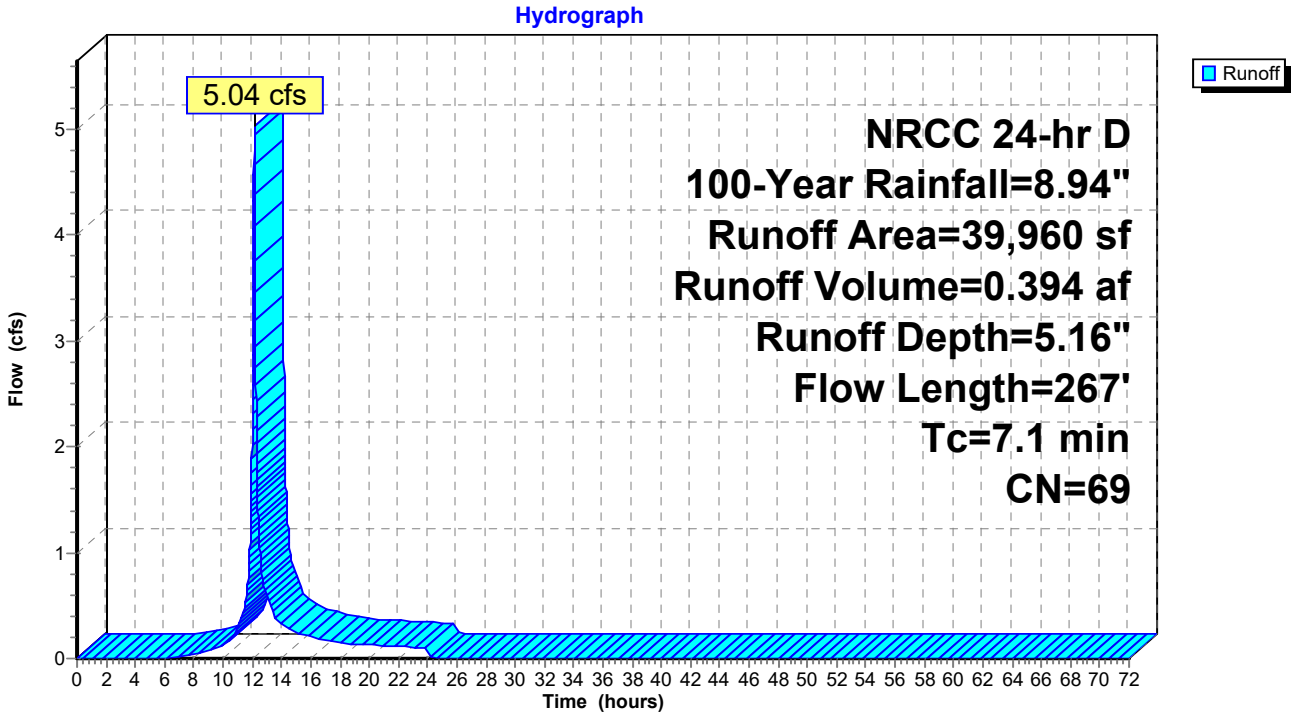
Runoff = 5.04 cfs @ 12.14 hrs, Volume= 0.394 af, Depth= 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 12,738 | 98 | Paved parking, HSG A |
| 3,090 | 98 | Roofs, HSG A |
| 1,498 | 98 | Unconnected pavement, HSG A |
| 2,032 | 32 | Woods/grass comb., Good, HSG A |
| 20,602 | 49 | 50-75% Grass cover, Fair, HSG A |
| 39,960 | 69 | Weighted Average |
| 22,634 | | 56.64% Pervious Area |
| 17,326 | | 43.36% Impervious Area |
| 1,498 | | 8.65% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 2.3 | 30 | 0.0700 | 0.22 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 3.5 | 20 | 0.0800 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.1 | 38 | 0.0800 | 4.55 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.1 | 18 | 0.1200 | 5.58 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.6 | 81 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.5 | 80 | 0.0200 | 2.87 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 7.1 | 267 | Total | | | |

## Subcatchment E1: E1



## Summary for Subcatchment E10: E10

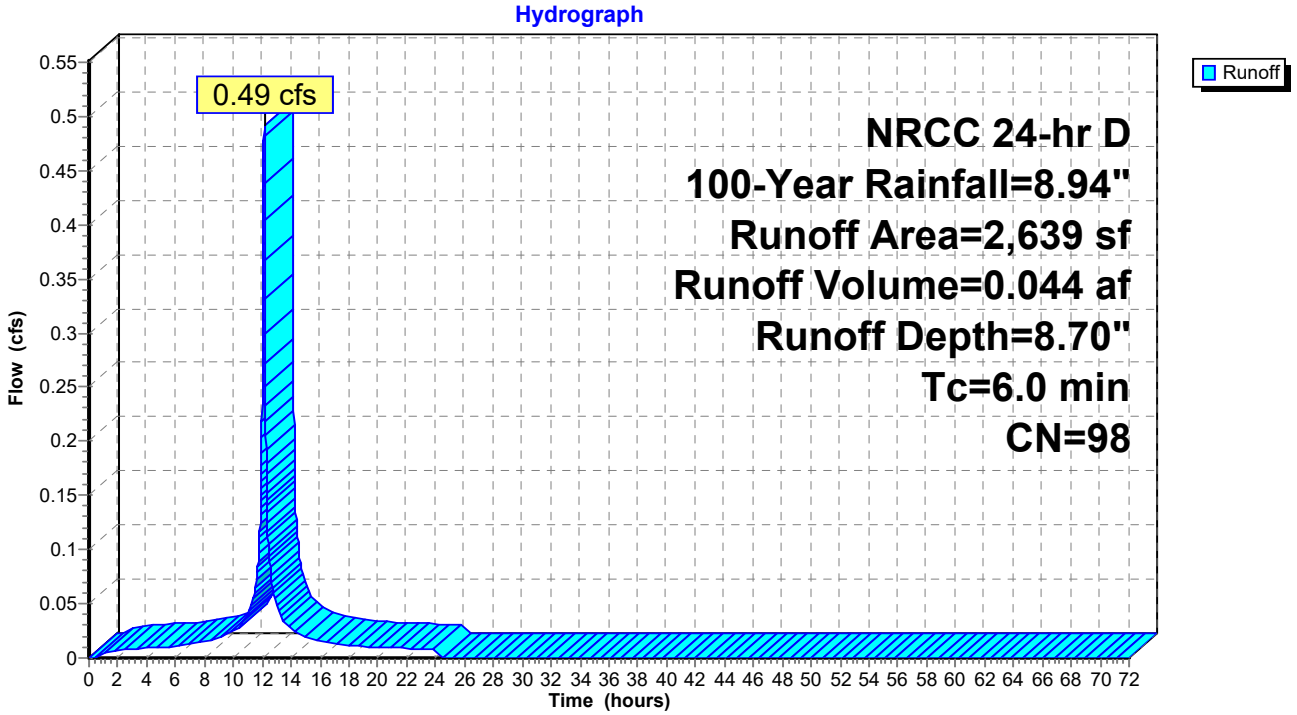
Runoff = 0.49 cfs @ 12.13 hrs, Volume= 0.044 af, Depth= 8.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 2,639 | 98 | Roofs, HSG A |
| 2,639 | | 100.00% Impervious Area |

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

## Subcatchment E10: E10



## Summary for Subcatchment E2: E2

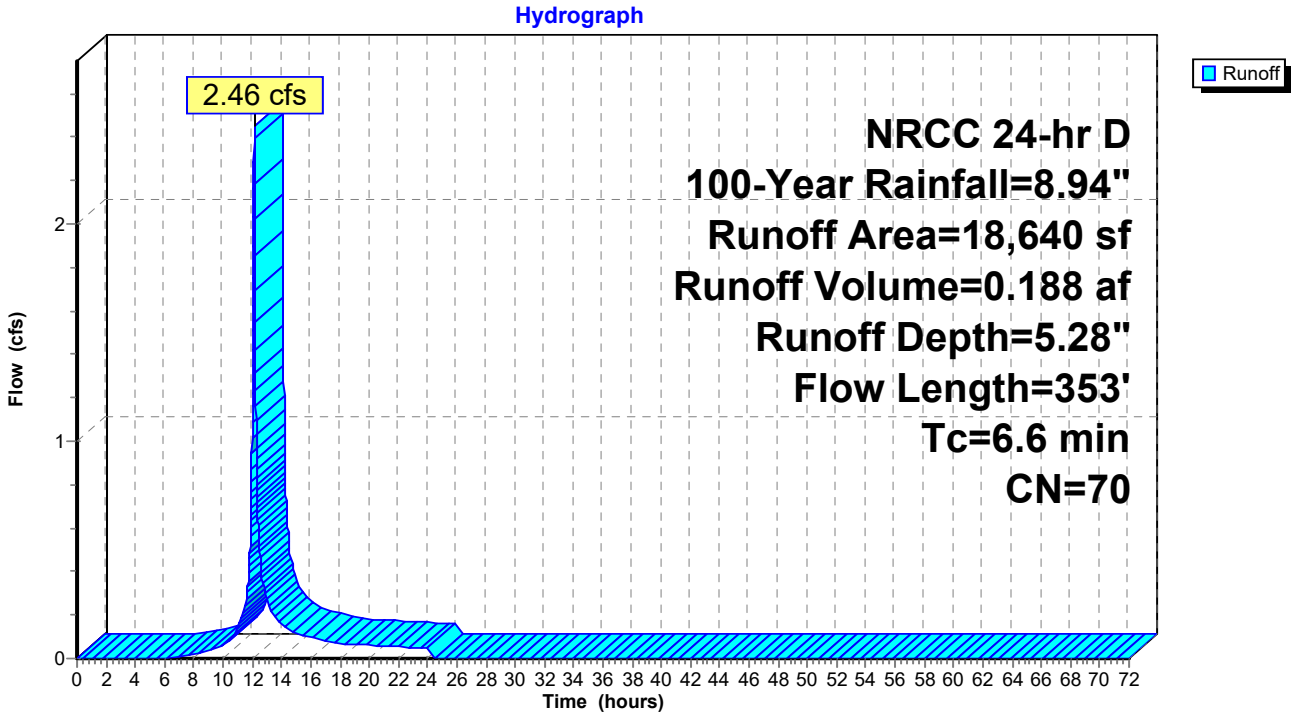
Runoff = 2.46 cfs @ 12.14 hrs, Volume= 0.188 af, Depth= 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 6,144 | 98 | Roofs, HSG C |
| 2,252 | 98 | Paved parking, HSG A |
| 1,944 | 43 | Woods/grass comb., Fair, HSG A |
| 8,300 | 49 | 50-75% Grass cover, Fair, HSG A |
| 18,640 | 70 | Weighted Average |
| 10,244 | | 54.96% Pervious Area |
| 8,396 | | 45.04% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 2.7 | 40 | 0.0800 | 0.24 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 2.0 | 10 | 0.0800 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.2 | 51 | 0.0900 | 4.83 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.3 | 158 | 0.0150 | 1.97 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 54 | 0.0500 | 3.60 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 40 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 6.6 | 353 | Total | | | |

## Subcatchment E2: E2



## Summary for Subcatchment E3: E3

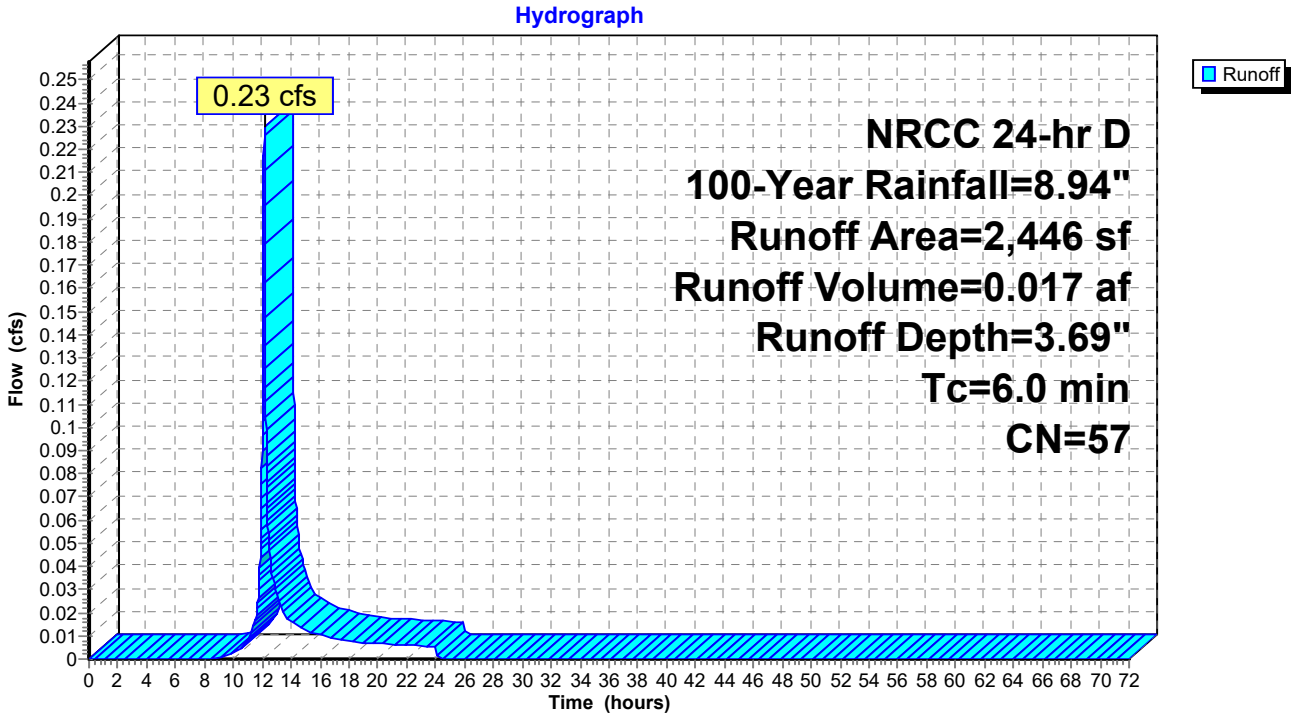
Runoff = 0.23 cfs @ 12.13 hrs, Volume= 0.017 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 383 | 98 | Roofs, HSG A |
| 357 | 98 | Paved parking, HSG A |
| 1,706 | 39 | >75% Grass cover, Good, HSG A |
| 2,446 | 57 | Weighted Average |
| 1,706 | | 69.75% Pervious Area |
| 740 | | 30.25% Impervious Area |

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

## Subcatchment E3: E3



## Summary for Subcatchment E4: E4

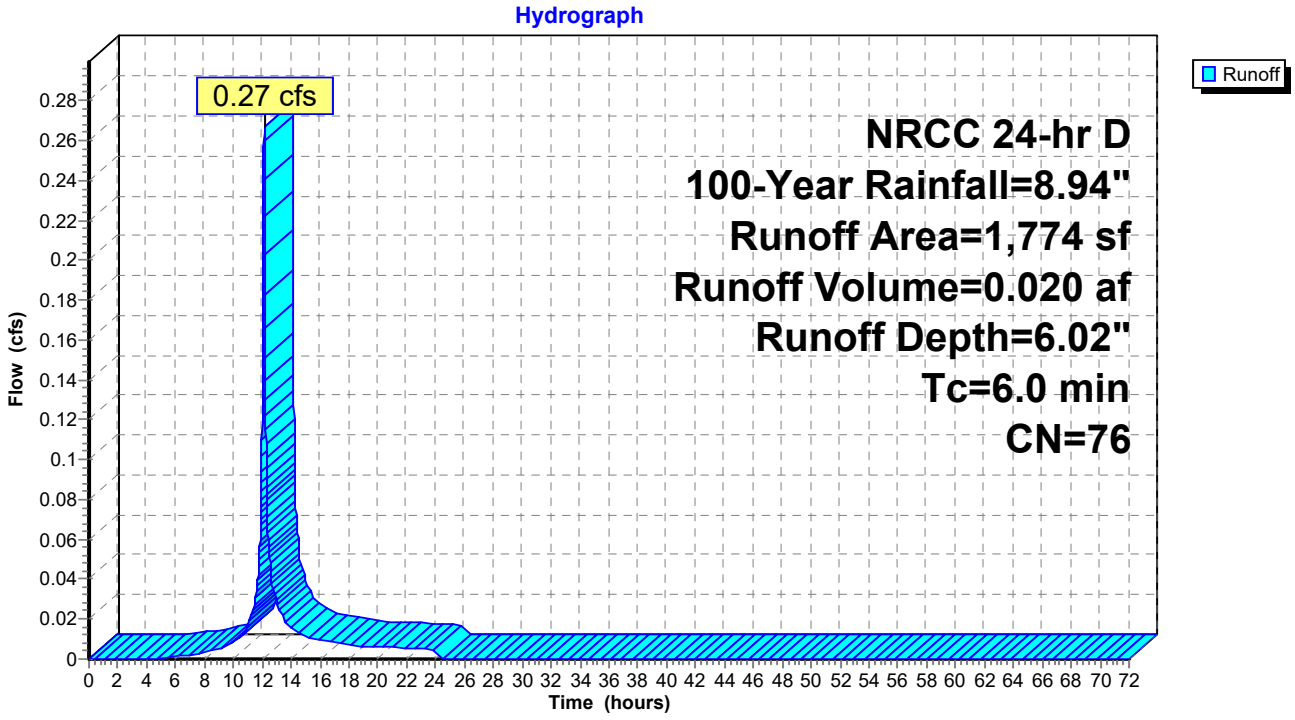
Runoff = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af, Depth= 6.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 330 | 98 | Paved parking, HSG A |
| 661 | 96 | Gravel surface, HSG A |
| 783 | 49 | 50-75% Grass cover, Fair, HSG A |
| 1,774 | 76 | Weighted Average |
| 1,444 | | 81.40% Pervious Area |
| 330 | | 18.60% Impervious Area |

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

## Subcatchment E4: E4



## Summary for Subcatchment E5: E5

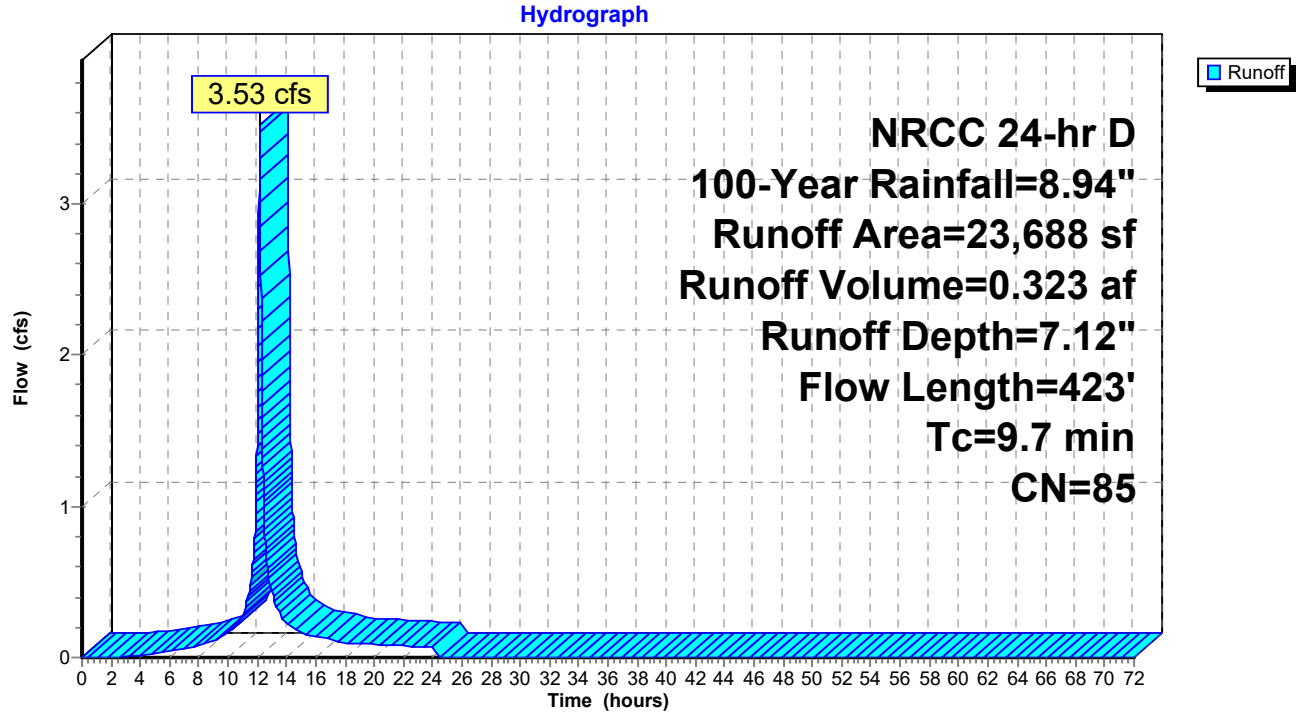
Runoff = 3.53 cfs @ 12.17 hrs, Volume= 0.323 af, Depth= 7.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 10,987 | 98 | Paved parking, HSG A |
| 6,587 | 96 | Gravel surface, HSG A |
| 6,114 | 49 | 50-75% Grass cover, Fair, HSG A |
| 23,688 | 85 | Weighted Average |
| 12,701 | | 53.62% Pervious Area |
| 10,987 | | 46.38% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.8 | 20 | 0.0350 | 0.07 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 3.0 | 30 | 0.0350 | 0.16 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 0.9 | 120 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.0 | 253 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 9.7 | 423 | Total | | | |

## Subcatchment E5: E5



## Summary for Subcatchment E6: E6

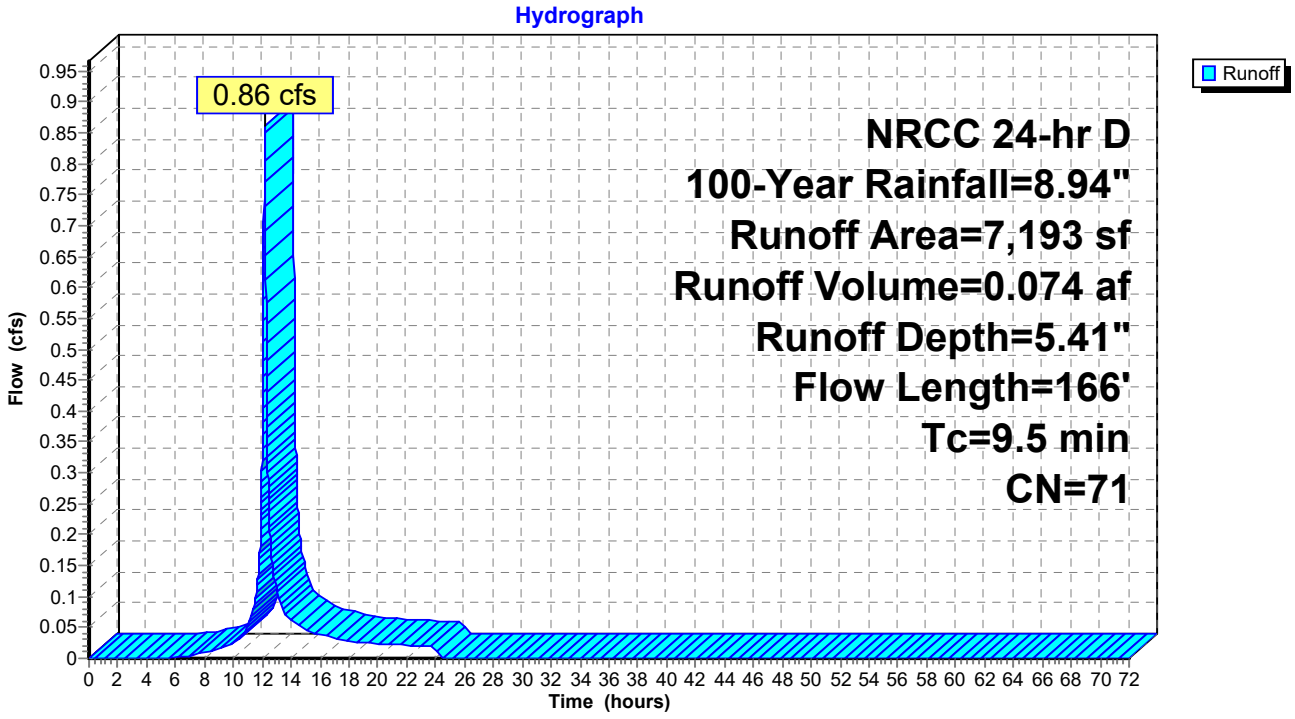
Runoff = 0.86 cfs @ 12.17 hrs, Volume= 0.074 af, Depth= 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 3,426 | 96 | Gravel surface, HSG A |
| 3,767 | 49 | 50-75% Grass cover, Fair, HSG A |
| 7,193 | 71 | Weighted Average |
| 7,193 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.7 | 50 | 0.0500 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.8 | 116 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 9.5 | 166 | Total | | | |

## Subcatchment E6: E6



## Summary for Subcatchment E7: E7

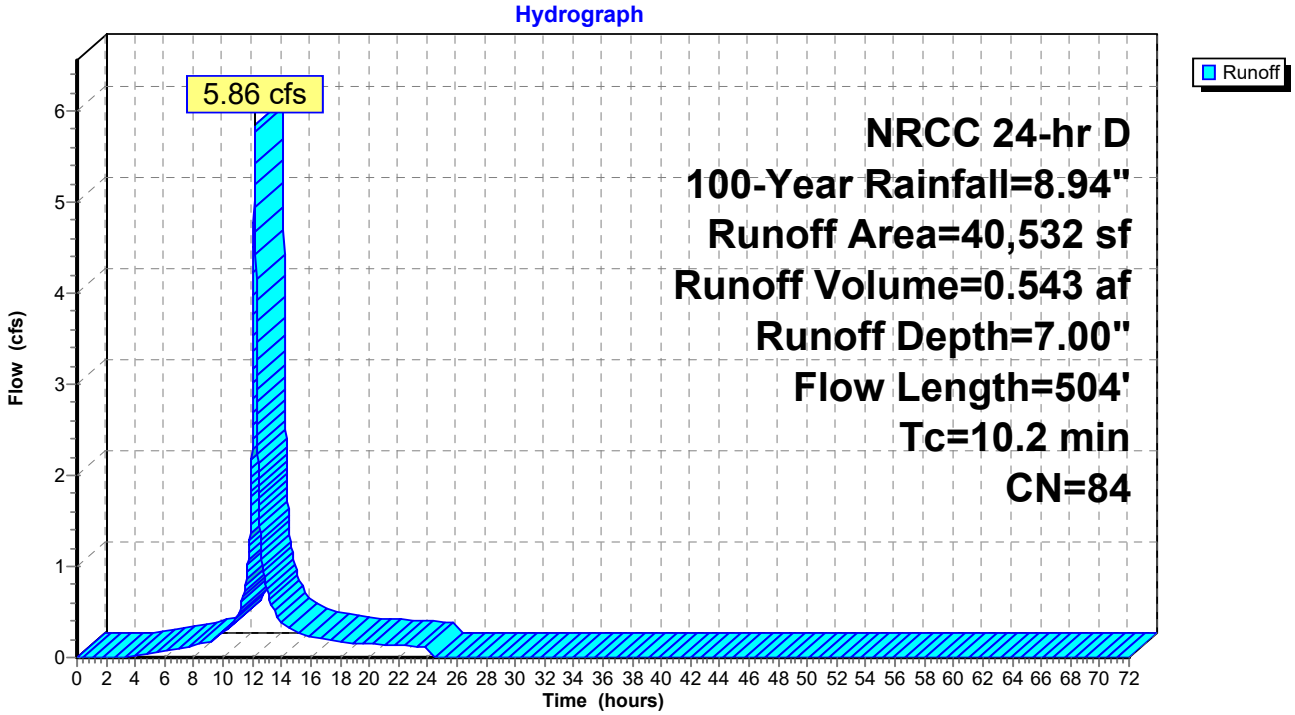
Runoff = 5.86 cfs @ 12.17 hrs, Volume= 0.543 af, Depth= 7.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 24,971 | 98 | Paved parking, HSG A |
| 4,531 | 96 | Gravel surface, HSG A |
| 11,030 | 49 | 50-75% Grass cover, Fair, HSG A |
| 40,532 | 84 | Weighted Average |
| 15,561 | | 38.39% Pervious Area |
| 24,971 | | 61.61% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.8 | 40 | 0.0600 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 1.1 | 10 | 0.0500 | 0.15 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.10" |
| 0.9 | 120 | 0.0200 | 2.28 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 1.4 | 334 | 0.0400 | 4.06 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 10.2 | 504 | Total | | | |

## Subcatchment E7: E7



## Summary for Subcatchment E8: E8

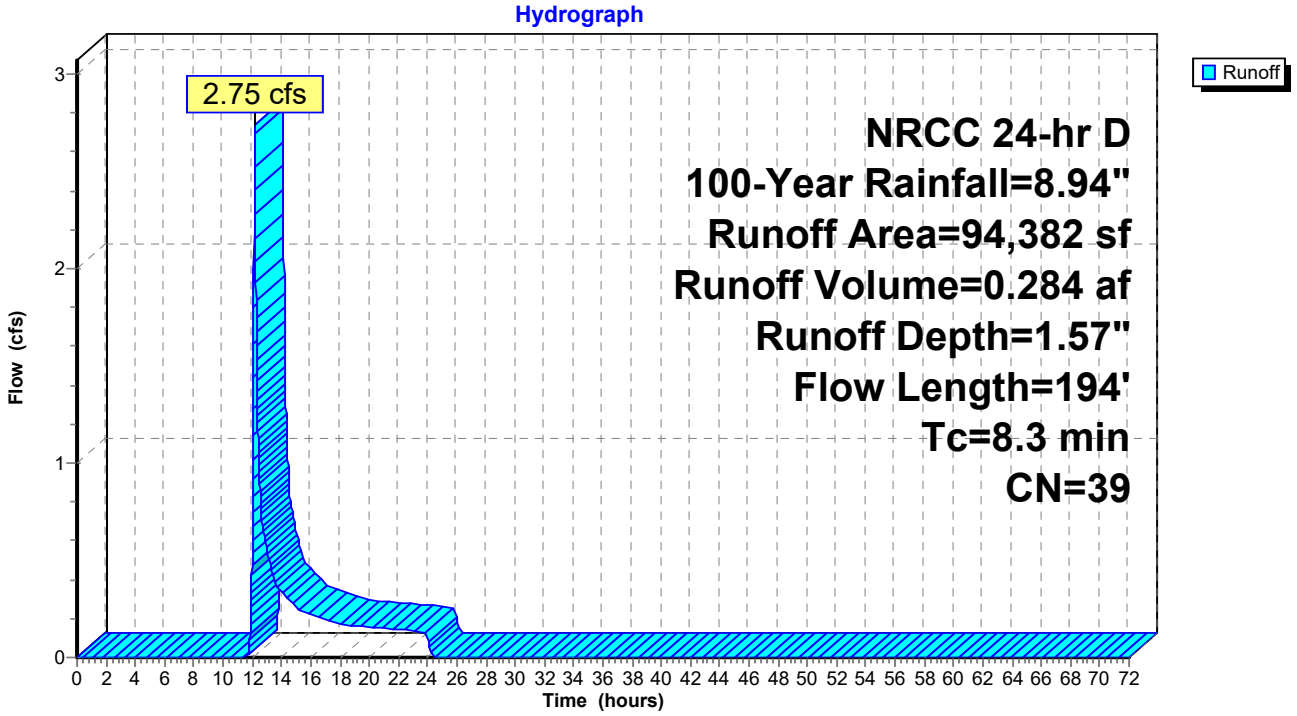
Runoff = 2.75 cfs @ 12.17 hrs, Volume= 0.284 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 81,032 | 36 | Woods, Fair, HSG A |
| 2,749 | 83 | Woods, Poor, HSG D |
| 657 | 98 | Roofs, HSG A |
| 1,982 | 98 | Paved parking, HSG A |
| 7,962 | 39 | >75% Grass cover, Good, HSG A |
| 94,382 | 39 | Weighted Average |
| 91,743 | | 97.20% Pervious Area |
| 2,639 | | 2.80% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.3 | 50 | 0.3100 | 0.11 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.10" |
| 1.0 | 144 | 0.2500 | 2.50 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 8.3 | 194 | Total | | | |

## Subcatchment E8: E8



## Summary for Subcatchment E9: E9

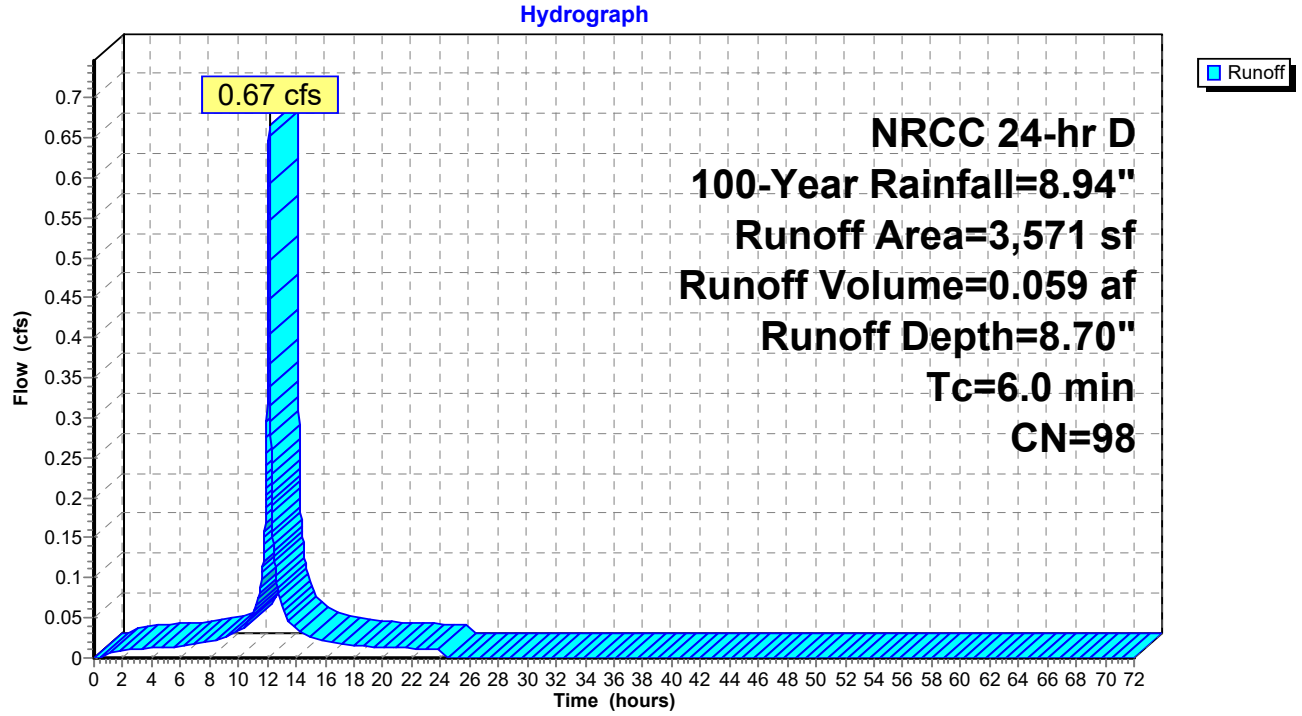
Runoff = 0.67 cfs @ 12.13 hrs, Volume= 0.059 af, Depth= 8.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 3,571 | 98 | Paved parking, HSG A |
| 3,571 | | 100.00% Impervious Area |

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

## Subcatchment E9: E9



## Summary for Pond 1P: DMH

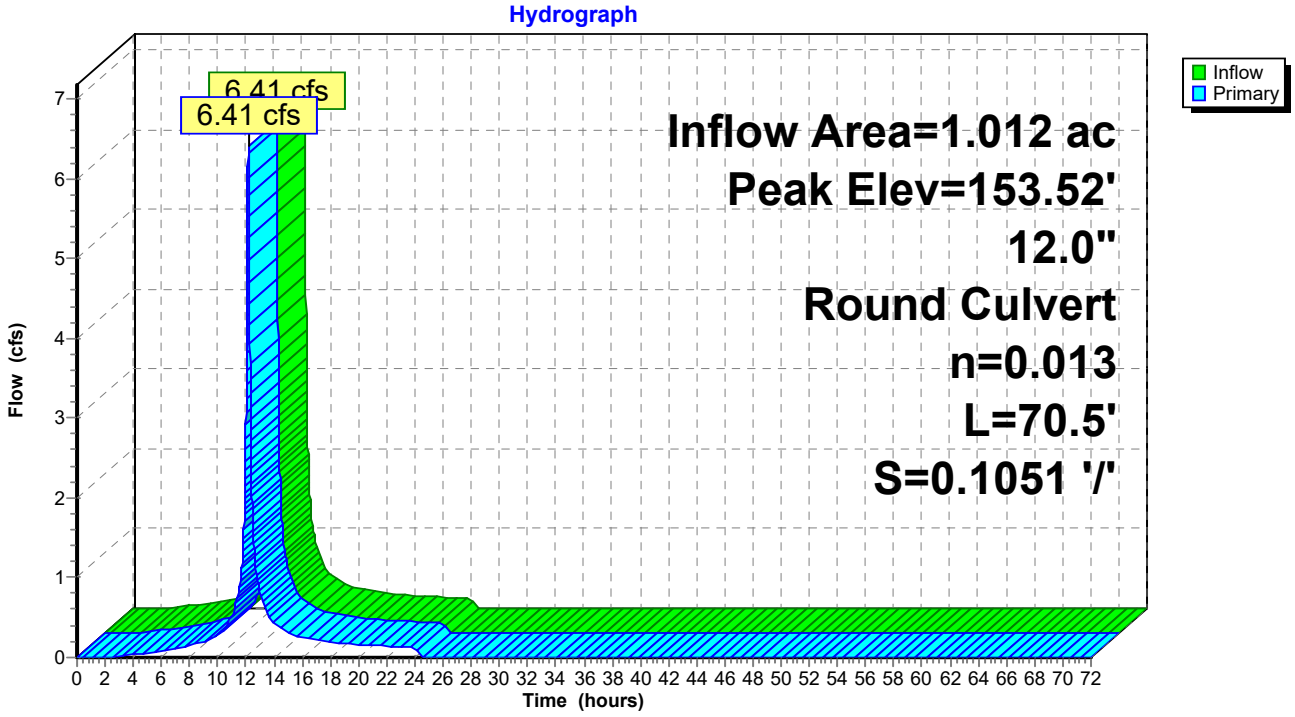
Inflow Area = 1.012 ac, 64.72% Impervious, Inflow Depth = 7.14" for 100-Year event
Inflow = 6.41 cfs @ 12.17 hrs, Volume= 0.602 af
Outflow = 6.41 cfs @ 12.17 hrs, Volume= 0.602 af, Atten= 0%, Lag= 0.0 min
Primary = 6.41 cfs @ 12.17 hrs, Volume= 0.602 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 153.52' @ 12.17 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=6.40 cfs @ 12.17 hrs HW=153.51' (Free Discharge)
└**1=Culvert** (Inlet Controls 6.40 cfs @ 8.15 fps)

## Pond 1P: DMH



## Summary for Pond 2: DMH

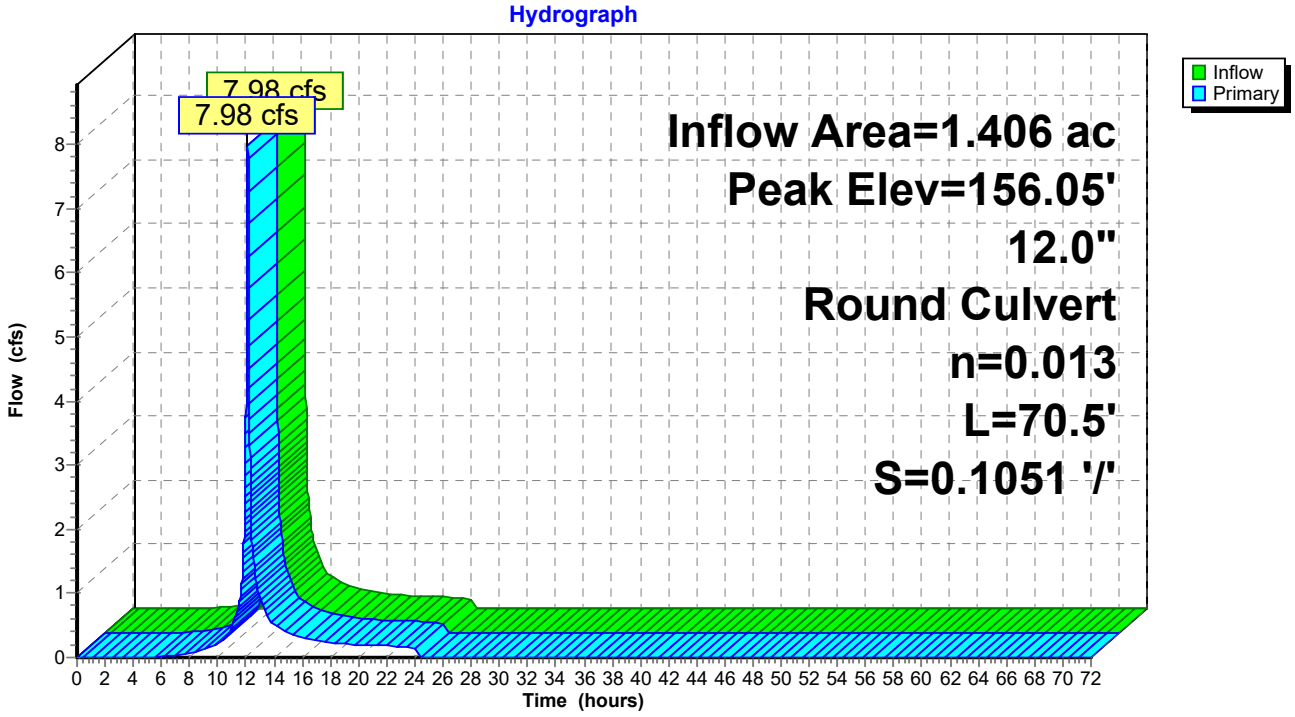
Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 5.35" for 100-Year event
Inflow = 7.98 cfs @ 12.14 hrs, Volume= 0.627 af
Outflow = 7.98 cfs @ 12.14 hrs, Volume= 0.627 af, Atten= 0%, Lag= 0.0 min
Primary = 7.98 cfs @ 12.14 hrs, Volume= 0.627 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 156.05' @ 12.14 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=7.98 cfs @ 12.14 hrs HW=156.05' (Free Discharge)
**1=Culvert** (Inlet Controls 7.98 cfs @ 10.16 fps)

### Pond 2: DMH



## Summary for Pond 2P: CB

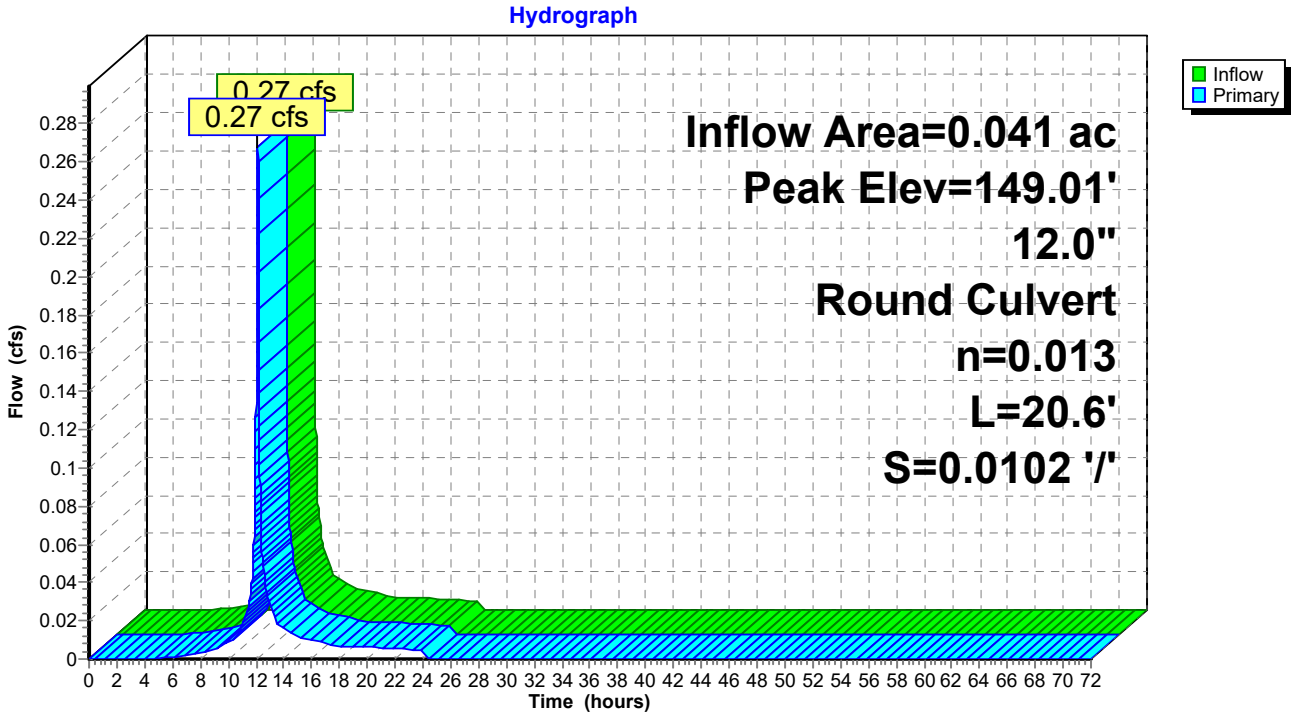
Inflow Area = 0.041 ac, 18.60% Impervious, Inflow Depth = 6.02" for 100-Year event
Inflow = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af
Outflow = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.01' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.27 cfs @ 12.13 hrs HW=149.01' (Free Discharge)
**1=Culvert** (Inlet Controls 0.27 cfs @ 1.44 fps)

## Pond 2P: CB



## Summary for Pond 3P: CB

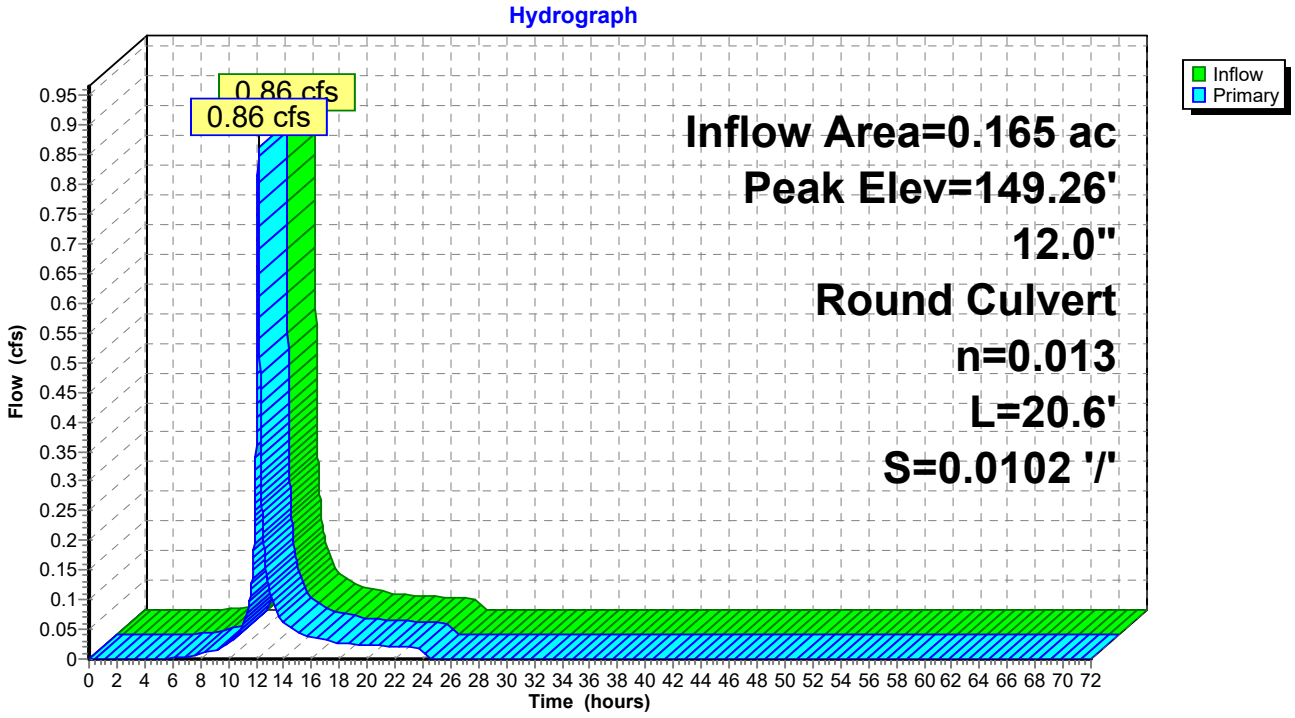
Inflow Area = 0.165 ac, 0.00% Impervious, Inflow Depth = 5.41" for 100-Year event
Inflow = 0.86 cfs @ 12.17 hrs, Volume= 0.074 af
Outflow = 0.86 cfs @ 12.17 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
Primary = 0.86 cfs @ 12.17 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.26' @ 12.17 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.86 cfs @ 12.17 hrs HW=149.26' (Free Discharge)
**1=Culvert** (Inlet Controls 0.86 cfs @ 1.98 fps)

## Pond 3P: CB



## Summary for Pond 4: DMH

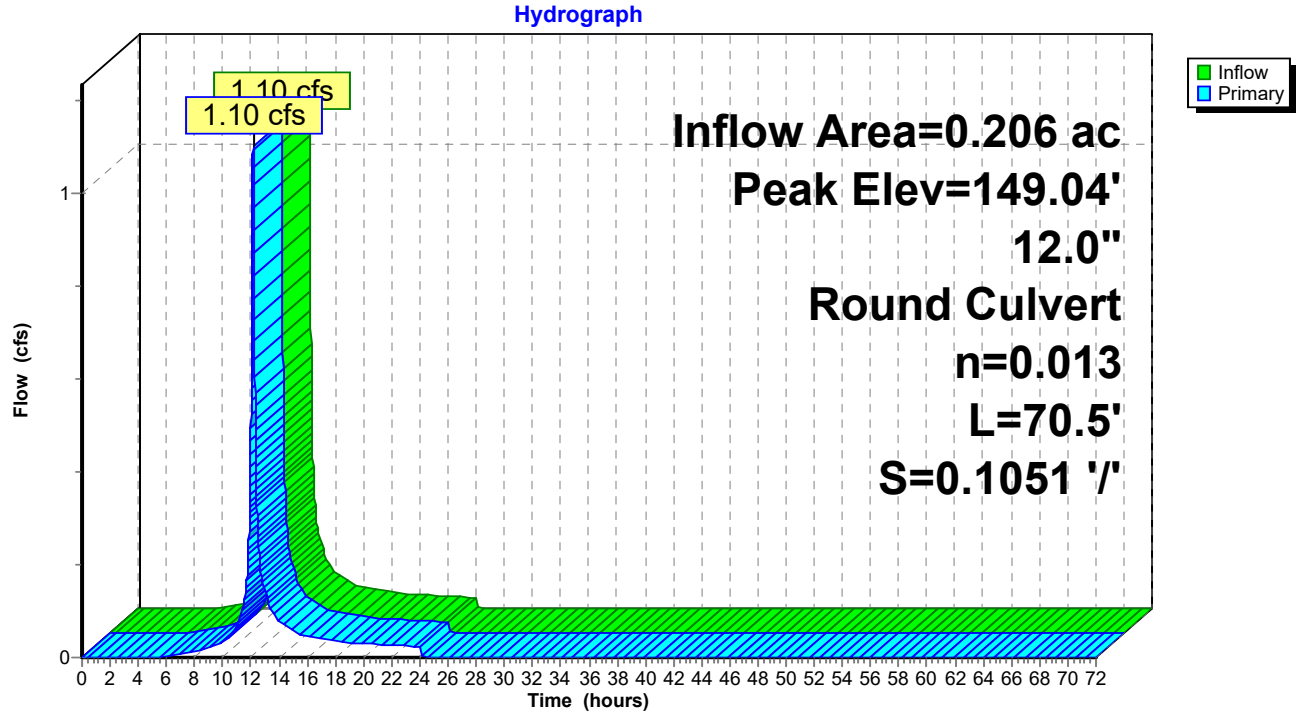
Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 5.53" for 100-Year event
Inflow = 1.10 cfs @ 12.15 hrs, Volume= 0.095 af
Outflow = 1.10 cfs @ 12.15 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min
Primary = 1.10 cfs @ 12.15 hrs, Volume= 0.095 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.04' @ 12.15 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.10 cfs @ 12.15 hrs HW=149.04' (Free Discharge)
**1=Culvert** (Inlet Controls 1.10 cfs @ 2.13 fps)

## Pond 4: DMH



## Summary for Pond 5: DMH

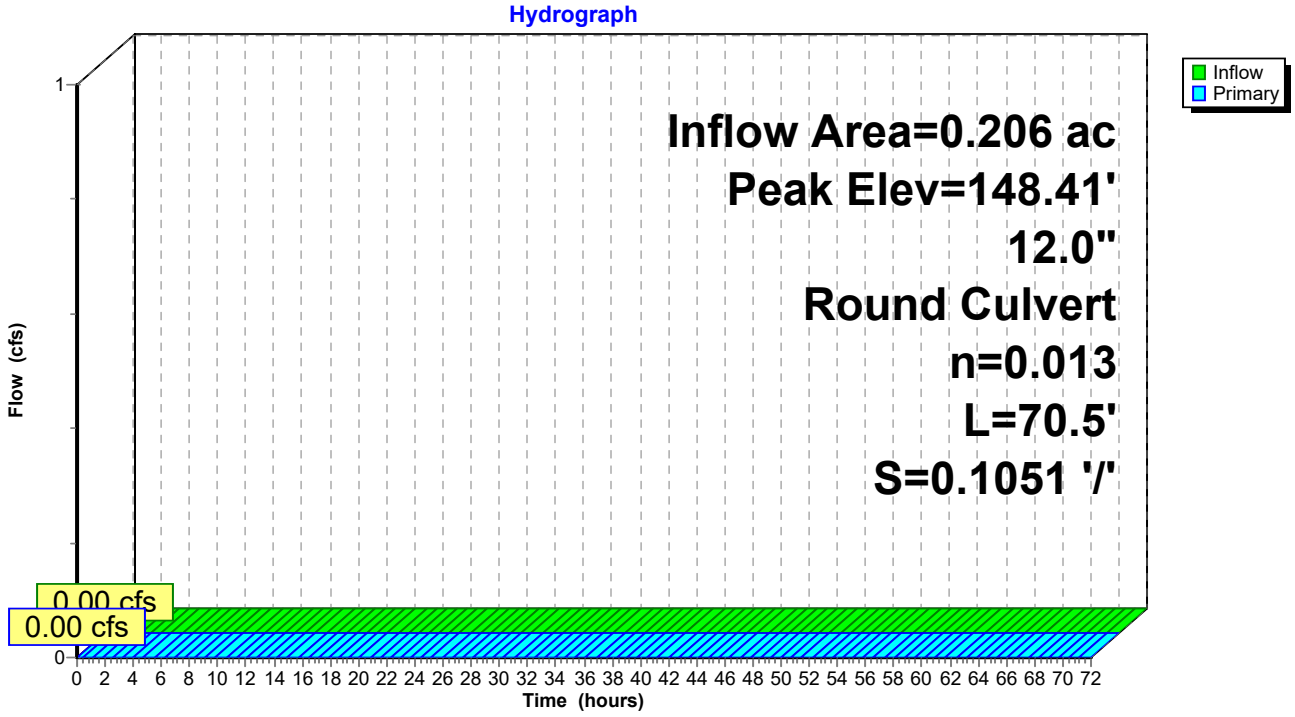
Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 0.00" for 100-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 148.41' @ 0.00 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=148.41' (Free Discharge)
**1=Culvert** ( Controls 0.00 cfs)

## Pond 5: DMH



## Summary for Pond 6P: (new Pond)

Inflow Area = 0.206 ac, 3.68% Impervious, Inflow Depth = 5.53" for 100-Year event
Inflow = 1.10 cfs @ 12.15 hrs, Volume= 0.095 af
Outflow = 0.19 cfs @ 12.69 hrs, Volume= 0.095 af, Atten= 83%, Lag= 31.9 min
Discarded = 0.19 cfs @ 12.69 hrs, Volume= 0.095 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 91.17' @ 12.69 hrs Surf.Area= 0.022 ac Storage= 0.022 af

Plug-Flow detention time= 29.9 min calculated for 0.095 af (100% of inflow)
Center-of-Mass det. time= 29.9 min ( 868.1 - 838.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 89.33' | 0.022 af | **15.75'W x 60.58'L x 4.00'H Field A**<br>0.088 af Overall - 0.025 af Embedded = 0.062 af x 35.0% Voids |
| #2A | 90.33' | 0.025 af | **ADS_StormTech SC-740 +Cap** x 24 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>24 Chambers in 3 Rows |
| | | 0.047 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 89.33' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1.00' |
| #2 | Primary | 92.33' | **12.0" Round Culvert** L= 29.0' Ke= 0.500<br>Inlet / Outlet Invert= 92.33' / 92.04' S= 0.0100 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 89.43' | **4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)<br>3.9' Crest Height |
| #4 | Device 2 | 92.33' | **4.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.19 cfs @ 12.69 hrs HW=91.17' (Free Discharge)
└**1=Exfiltration** ( Controls 0.19 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=89.33' (Free Discharge)
└**2=Culvert** ( Controls 0.00 cfs)
  ├**3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)
  └**4=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 6P: (new Pond) - 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

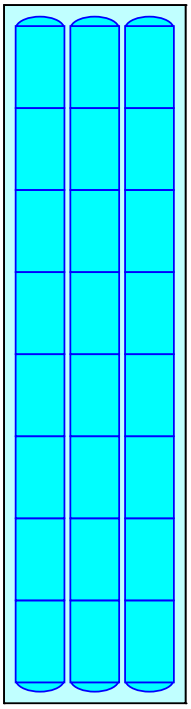
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
12.0" Base + 30.0" Chamber Height + 6.0" Cover = 4.00' Field Height

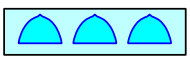
24 Chambers x 45.9 cf = 1,102.6 cf Chamber Storage

3,816.3 cf Field - 1,102.6 cf Chambers = 2,713.8 cf Stone x 35.0% Voids = 949.8 cf Stone Storage

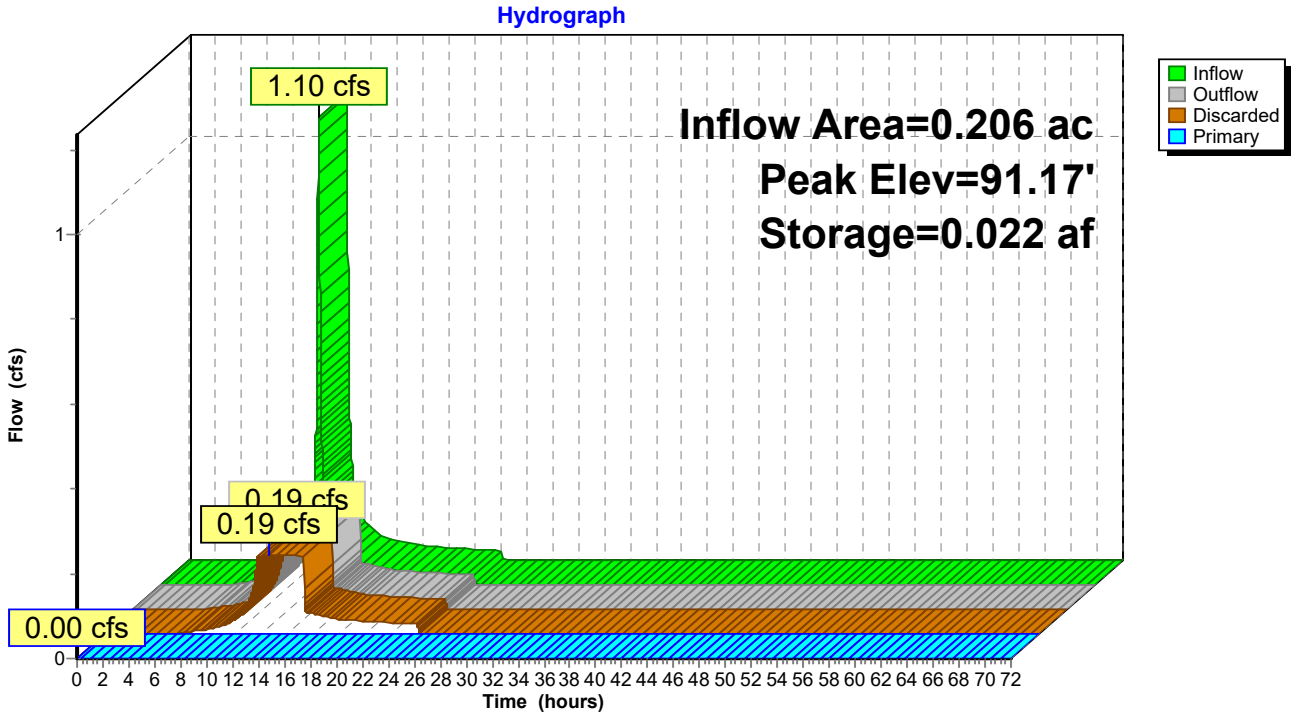
Chamber Storage + Stone Storage = 2,052.4 cf = 0.047 af
Overall Storage Efficiency = 53.8%
Overall System Size = 60.58' x 15.75' x 4.00'

24 Chambers
141.3 cy Field
100.5 cy Stone





## Pond 6P: (new Pond)



## Summary for Pond 7: DMH

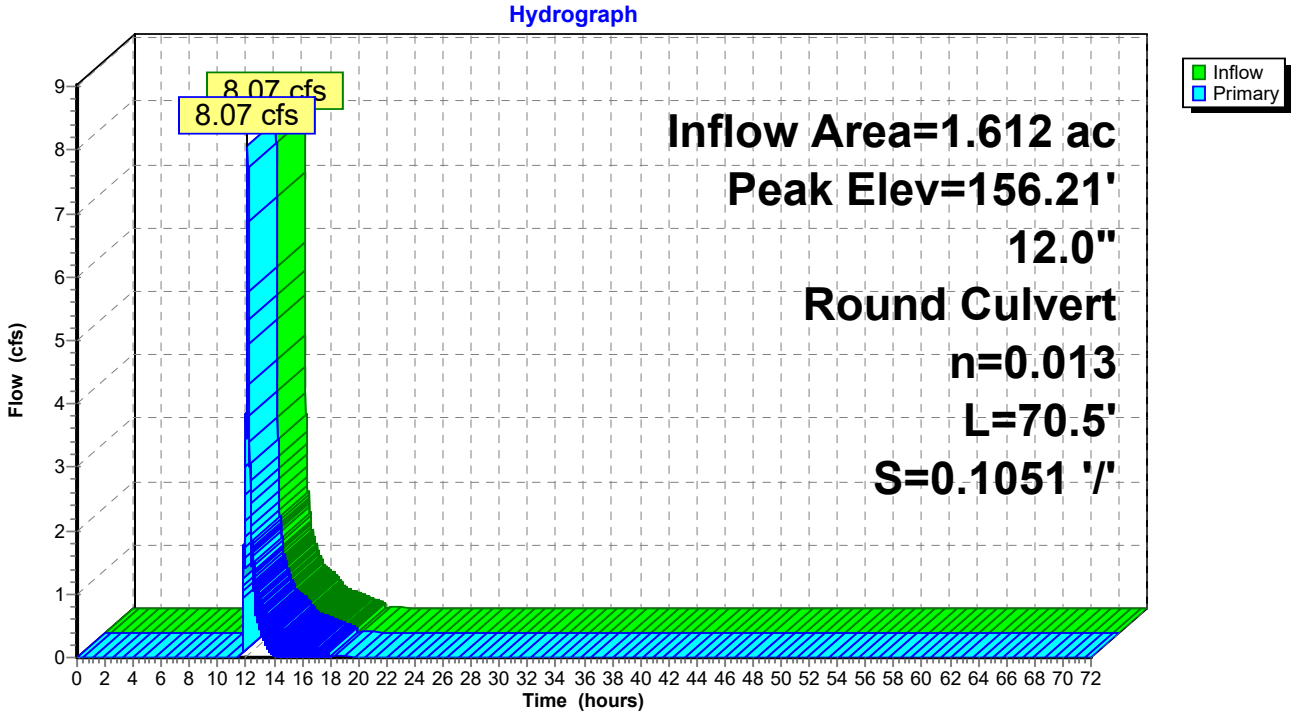
Inflow Area = 1.612 ac, 40.87% Impervious, Inflow Depth = 2.46" for 100-Year event
Inflow = 8.07 cfs @ 12.14 hrs, Volume= 0.330 af
Outflow = 8.07 cfs @ 12.14 hrs, Volume= 0.330 af, Atten= 0%, Lag= 0.0 min
Primary = 8.07 cfs @ 12.14 hrs, Volume= 0.330 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 156.21' @ 12.14 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=8.06 cfs @ 12.14 hrs HW=156.20' (Free Discharge)
**1=Culvert** (Inlet Controls 8.06 cfs @ 10.27 fps)

## Pond 7: DMH



## Summary for Pond 7P: (new Pond)

Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 5.35" for 100-Year event
Inflow = 7.98 cfs @ 12.14 hrs, Volume= 0.627 af
Outflow = 8.27 cfs @ 12.14 hrs, Volume= 0.627 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.20 cfs @ 12.14 hrs, Volume= 0.296 af
Primary = 8.07 cfs @ 12.14 hrs, Volume= 0.330 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 97.38' @ 12.14 hrs Surf.Area= 0.022 ac Storage= 0.047 af

Plug-Flow detention time= 63.6 min calculated for 0.627 af (100% of inflow)
Center-of-Mass det. time= 63.6 min ( 900.3 - 836.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 88.25' | 0.022 af | **15.75'W x 60.58'L x 3.67'H Field A**<br>0.080 af Overall - 0.025 af Embedded = 0.055 af x 40.0% Voids |
| #2A | 88.92' | 0.025 af | **ADS_StormTech SC-740 +Cap** x 24 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>24 Chambers in 3 Rows |
| | | 0.047 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 88.25' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 1.00' |
| #2 | Primary | 92.33' | **12.0" Round Culvert** L= 29.0' Ke= 0.500<br>Inlet / Outlet Invert= 92.33' / 92.04' S= 0.0100 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #3 | Device 2 | 93.33' | **4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00<br>Coef. (English) 2.80 2.92 3.08 3.30 3.32 |
| #4 | Device 2 | 91.40' | **4.0" Vert. Orifice/Grate** C= 0.600 |

**Discarded OutFlow** Max=0.20 cfs @ 12.14 hrs HW=97.38' (Free Discharge)
└**1=Exfiltration** ( Controls 0.20 cfs)

**Primary OutFlow** Max=8.06 cfs @ 12.14 hrs HW=97.38' (Free Discharge)
└**2=Culvert** (Inlet Controls 8.06 cfs @ 10.27 fps)
  └**3=Broad-Crested Rectangular Weir** (Passes < 108.06 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 0.94 cfs potential flow)

## Pond 7P: (new Pond) - 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

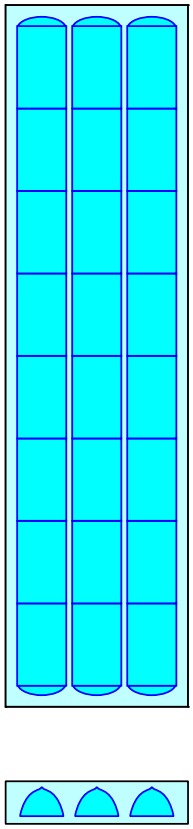
8 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 58.58' Row Length +12.0" End Stone x 2 = 60.58' Base Length
3 Rows x 51.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 15.75' Base Width
8.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.67' Field Height

24 Chambers x 45.9 cf = 1,102.6 cf Chamber Storage

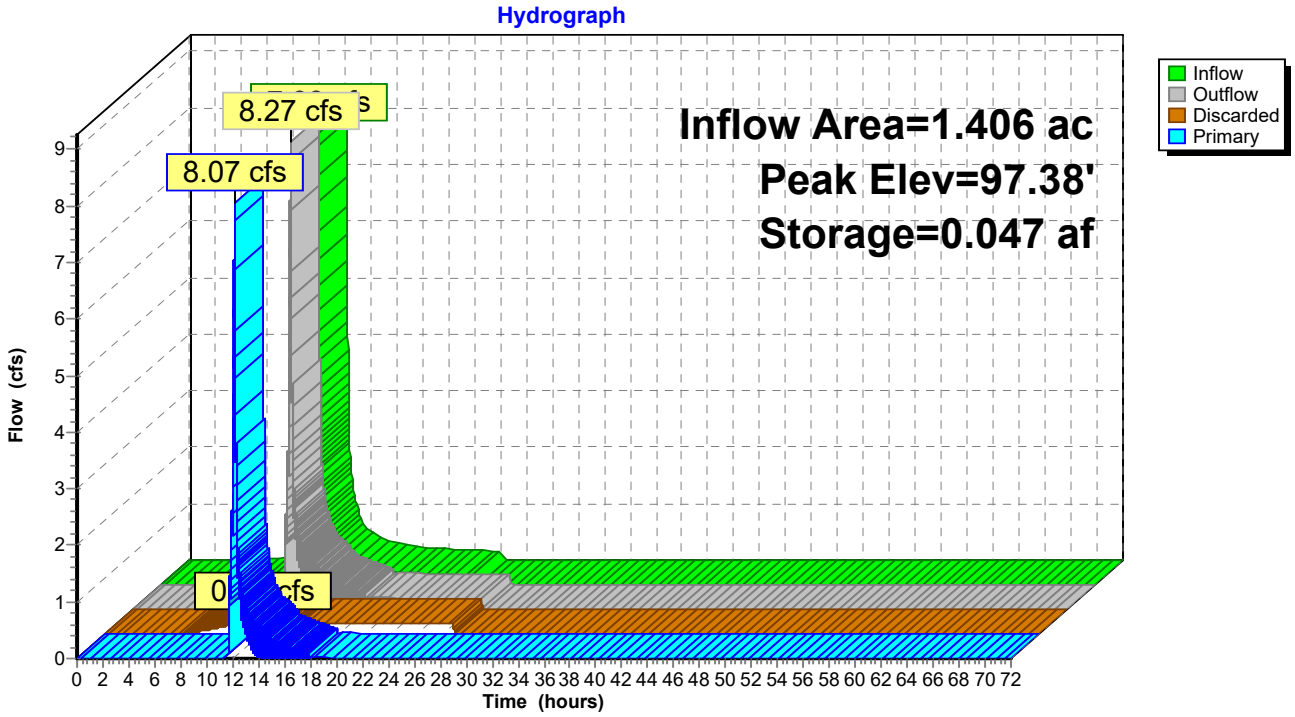
3,498.3 cf Field - 1,102.6 cf Chambers = 2,395.7 cf Stone x 40.0% Voids = 958.3 cf Stone Storage

Chamber Storage + Stone Storage = 2,060.9 cf = 0.047 af
Overall Storage Efficiency = 58.9%
Overall System Size = 60.58' x 15.75' x 3.67'

24 Chambers
129.6 cy Field
88.7 cy Stone



## Pond 7P: (new Pond)



## Summary for Pond 8: DMH

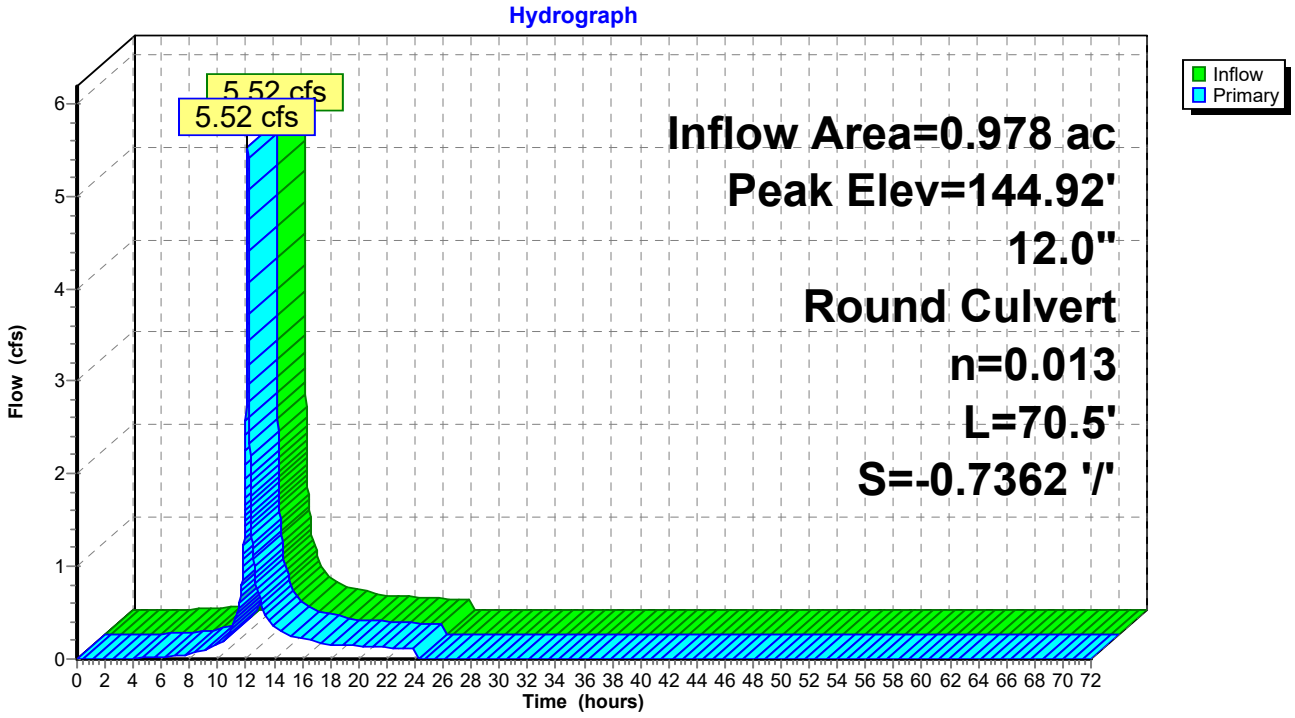
Inflow Area = 0.978 ac, 46.87% Impervious, Inflow Depth = 5.38" for 100-Year event
Inflow = 5.52 cfs @ 12.14 hrs, Volume= 0.438 af
Outflow = 5.52 cfs @ 12.14 hrs, Volume= 0.438 af, Atten= 0%, Lag= 0.0 min
Primary = 5.52 cfs @ 12.14 hrs, Volume= 0.438 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 144.92' @ 12.14 hrs
Flood Elev= 93.79'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 141.00' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.10' / 141.00' S= -0.7362 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=5.52 cfs @ 12.14 hrs HW=144.91' (Free Discharge)
**1=Culvert** (Inlet Controls 5.52 cfs @ 7.02 fps)

## Pond 8: DMH



## Summary for Pond 9: CB

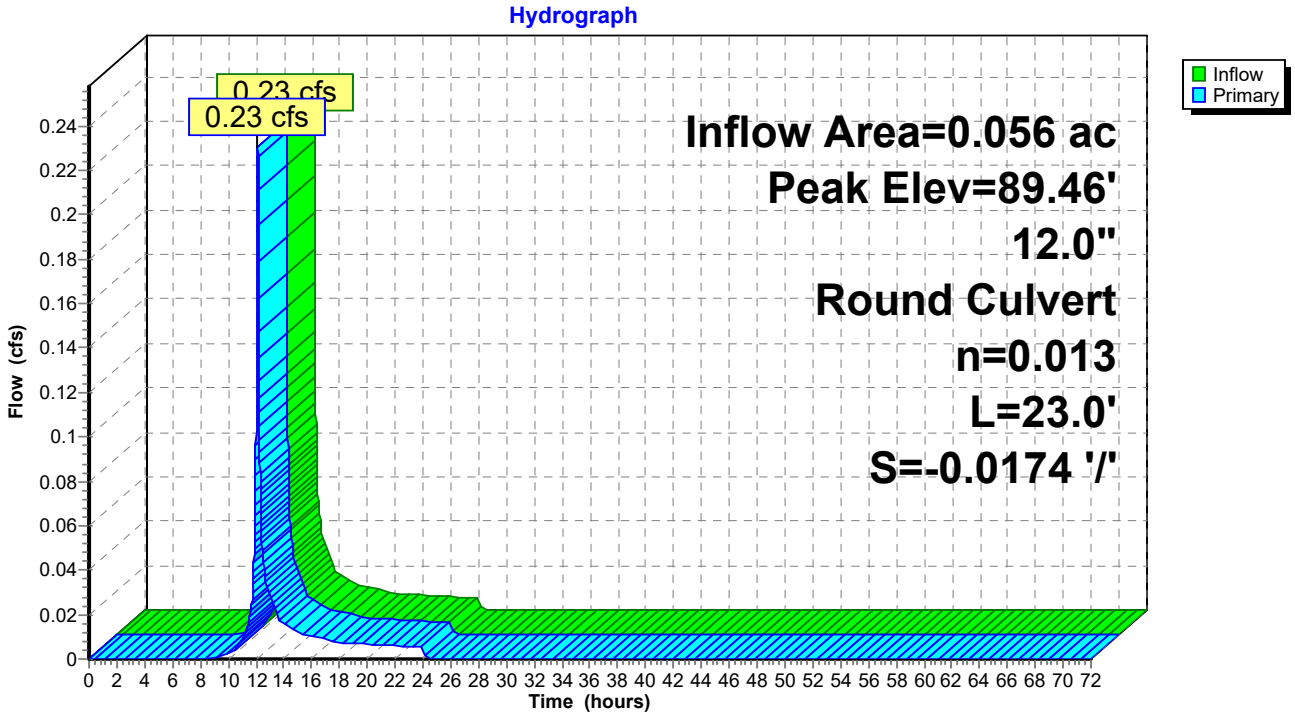
Inflow Area = 0.056 ac, 30.25% Impervious, Inflow Depth = 3.69" for 100-Year event
Inflow = 0.23 cfs @ 12.13 hrs, Volume= 0.017 af
Outflow = 0.23 cfs @ 12.13 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min
Primary = 0.23 cfs @ 12.13 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.46' @ 12.13 hrs
Flood Elev= 93.35'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 89.20' | **12.0" Round Culvert**<br>L= 23.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 88.80' / 89.20' S= -0.0174 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.23 cfs @ 12.13 hrs HW=89.46' (Free Discharge)
**1=Culvert** (Inlet Controls 0.23 cfs @ 1.38 fps)

## Pond 9: CB



## Summary for Pond 12P: CB

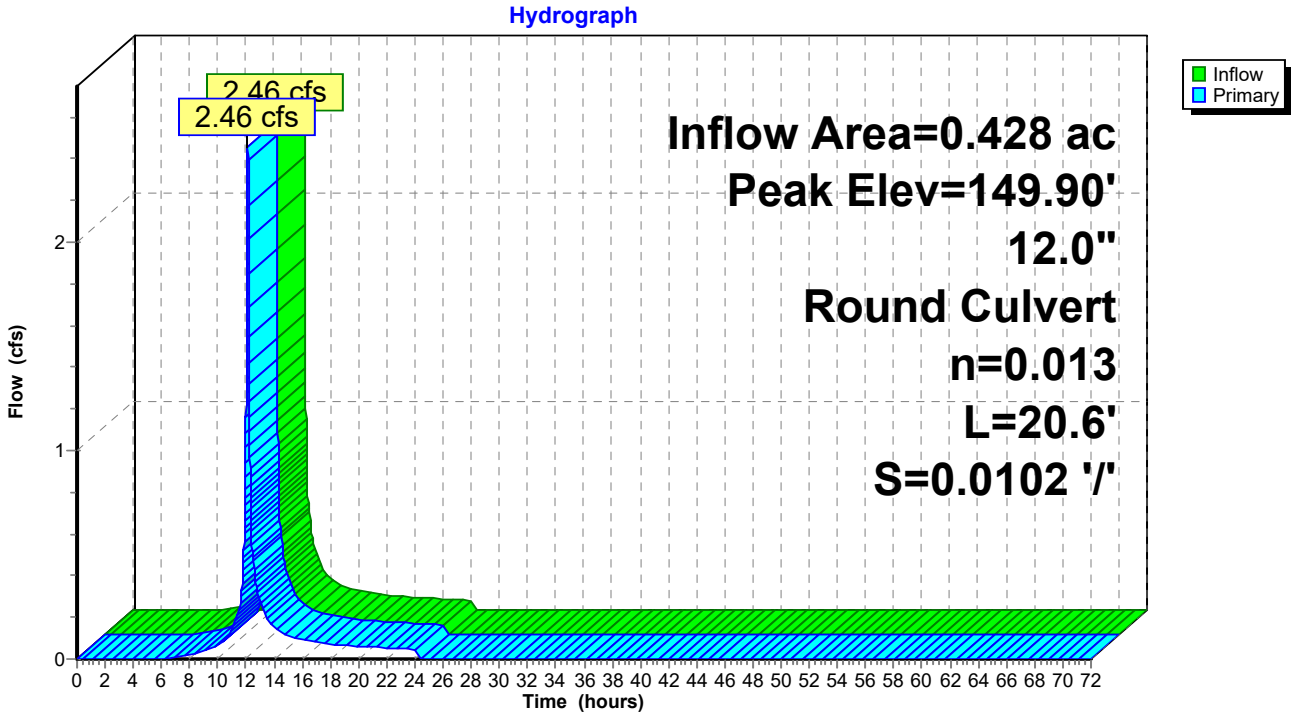
Inflow Area = 0.428 ac, 45.04% Impervious, Inflow Depth = 5.28" for 100-Year event
Inflow = 2.46 cfs @ 12.14 hrs, Volume= 0.188 af
Outflow = 2.46 cfs @ 12.14 hrs, Volume= 0.188 af, Atten= 0%, Lag= 0.0 min
Primary = 2.46 cfs @ 12.14 hrs, Volume= 0.188 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.90' @ 12.14 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.45 cfs @ 12.14 hrs HW=149.90' (Free Discharge)
**1=Culvert** (Inlet Controls 2.45 cfs @ 3.12 fps)

### Pond 12P: CB



## Summary for Pond 14P: CB

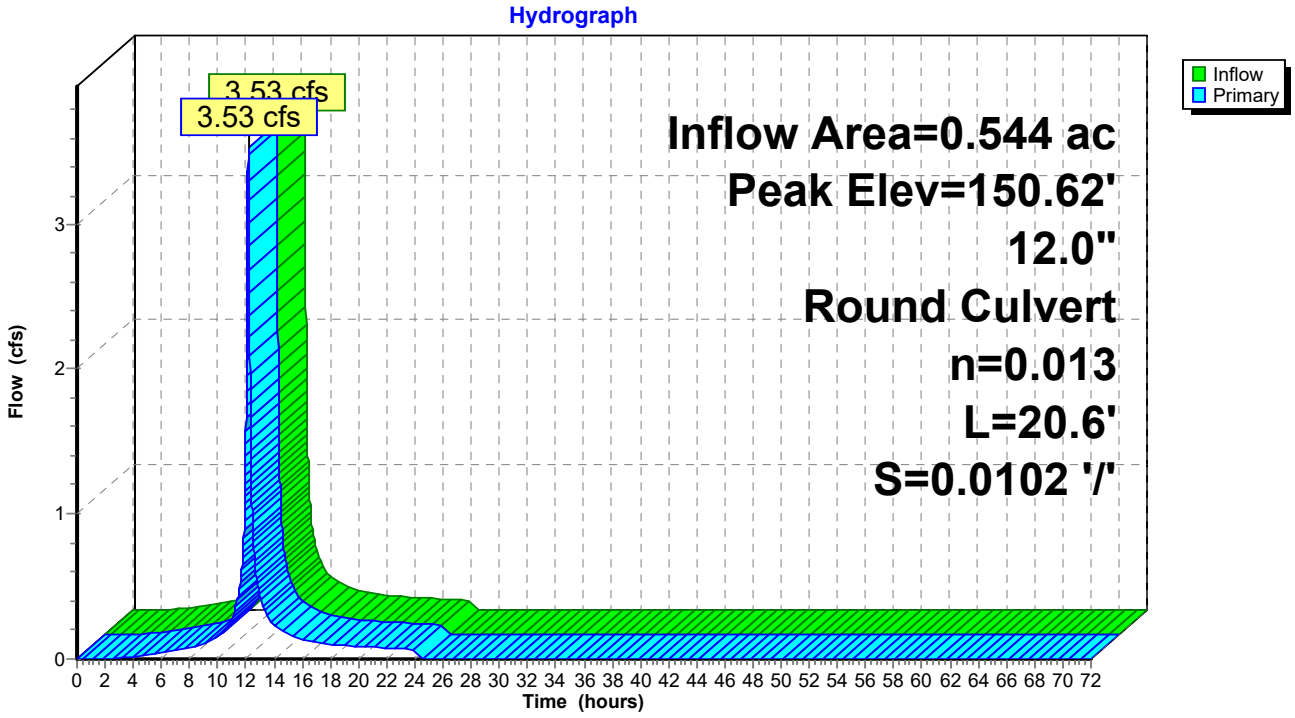
Inflow Area = 0.544 ac, 46.38% Impervious, Inflow Depth = 7.12" for 100-Year event
Inflow = 3.53 cfs @ 12.17 hrs, Volume= 0.323 af
Outflow = 3.53 cfs @ 12.17 hrs, Volume= 0.323 af, Atten= 0%, Lag= 0.0 min
Primary = 3.53 cfs @ 12.17 hrs, Volume= 0.323 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 150.62' @ 12.17 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.52 cfs @ 12.17 hrs HW=150.61' (Free Discharge)
**1=Culvert** (Inlet Controls 3.52 cfs @ 4.48 fps)

## Pond 14P: CB



## Summary for Pond 16: CB

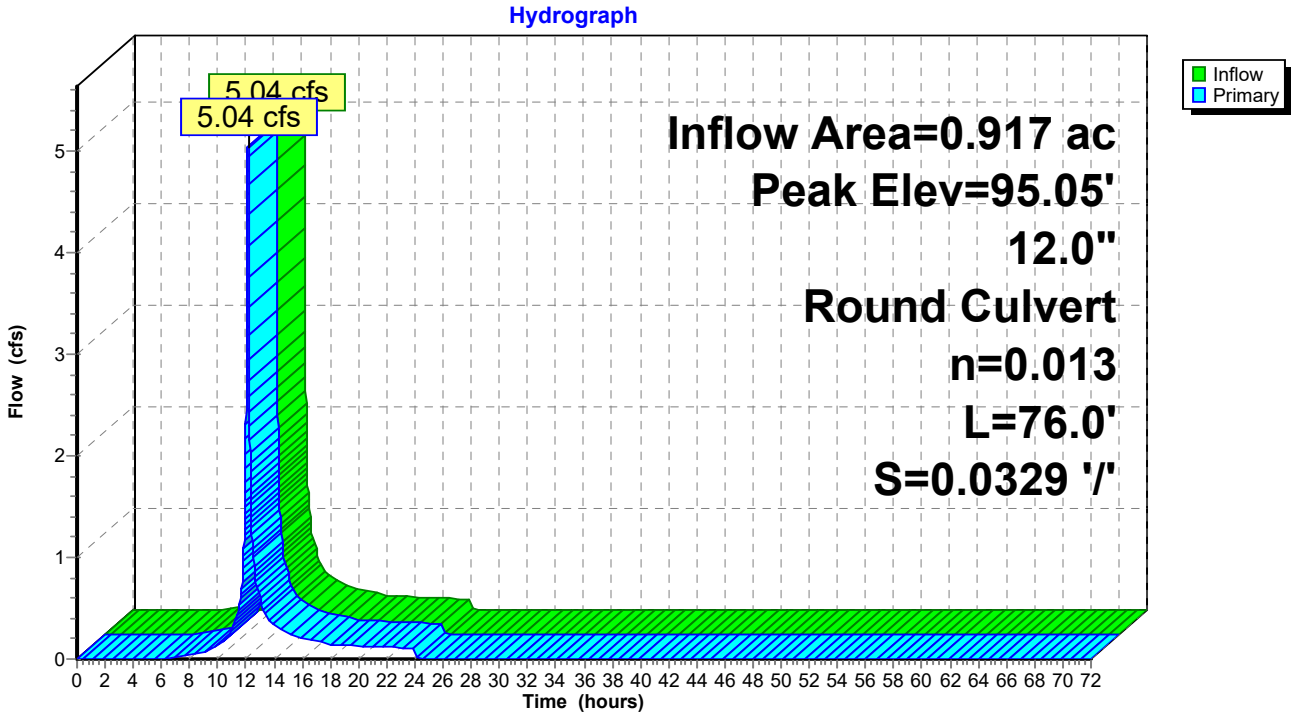
Inflow Area = 0.917 ac, 43.36% Impervious, Inflow Depth = 5.16" for 100-Year event
Inflow = 5.04 cfs @ 12.14 hrs, Volume= 0.394 af
Outflow = 5.04 cfs @ 12.14 hrs, Volume= 0.394 af, Atten= 0%, Lag= 0.0 min
Primary = 5.04 cfs @ 12.14 hrs, Volume= 0.394 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 95.05' @ 12.14 hrs
Flood Elev= 96.19'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 91.70' | **12.0" Round Culvert**<br>L= 76.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 91.70' / 89.20' S= 0.0329 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=5.03 cfs @ 12.14 hrs HW=95.04' (Free Discharge)
**1=Culvert** (Inlet Controls 5.03 cfs @ 6.41 fps)

## Pond 16: CB



## Summary for Pond 16P: DMH

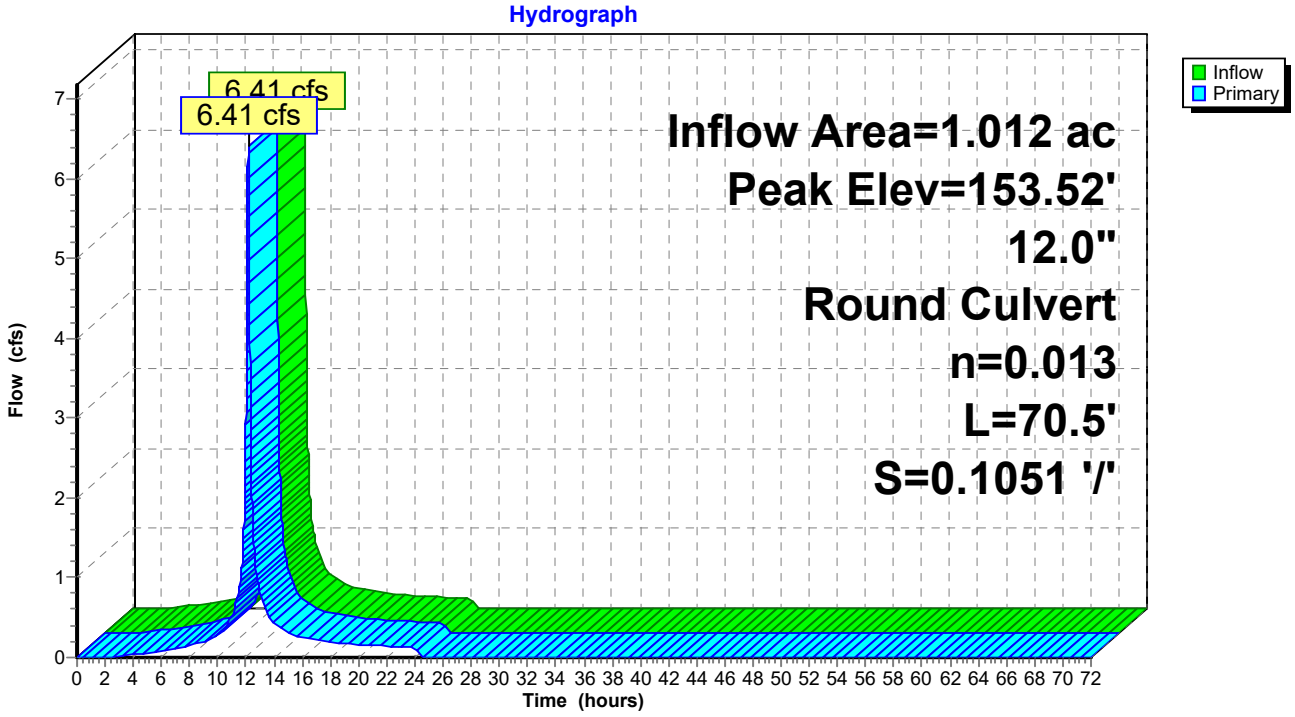
Inflow Area = 1.012 ac, 64.72% Impervious, Inflow Depth = 7.14" for 100-Year event
Inflow = 6.41 cfs @ 12.17 hrs, Volume= 0.602 af
Outflow = 6.41 cfs @ 12.17 hrs, Volume= 0.602 af, Atten= 0%, Lag= 0.0 min
Primary = 6.41 cfs @ 12.17 hrs, Volume= 0.602 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 153.52' @ 12.17 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=6.40 cfs @ 12.17 hrs HW=153.51' (Free Discharge)
└**1=Culvert** (Inlet Controls 6.40 cfs @ 8.15 fps)

### Pond 16P: DMH



## Summary for Pond 17P: CB

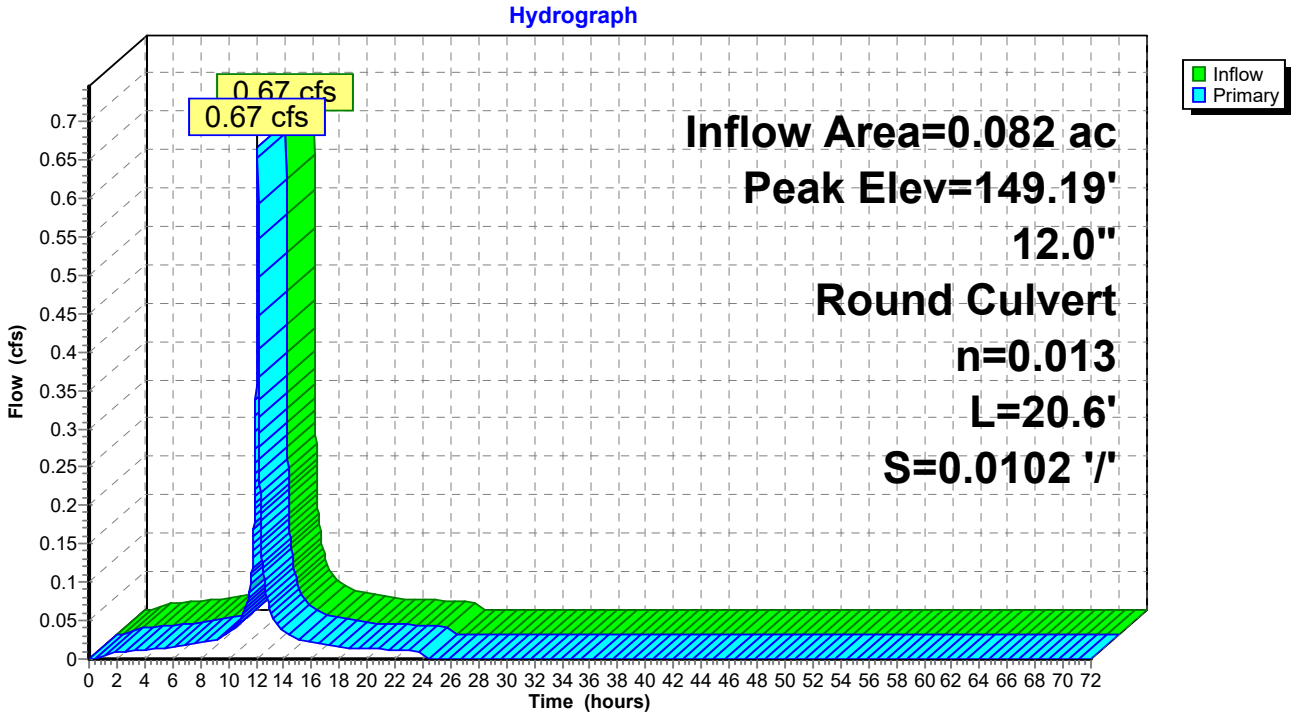
Inflow Area = 0.082 ac,100.00% Impervious, Inflow Depth = 8.70" for 100-Year event
Inflow = 0.67 cfs @ 12.13 hrs, Volume= 0.059 af
Outflow = 0.67 cfs @ 12.13 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.13 hrs, Volume= 0.059 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 149.19' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.67 cfs @ 12.13 hrs HW=149.19' (Free Discharge)
**1=Culvert** (Inlet Controls 0.67 cfs @ 1.84 fps)

## Pond 17P: CB



## Summary for Pond 18: DMH

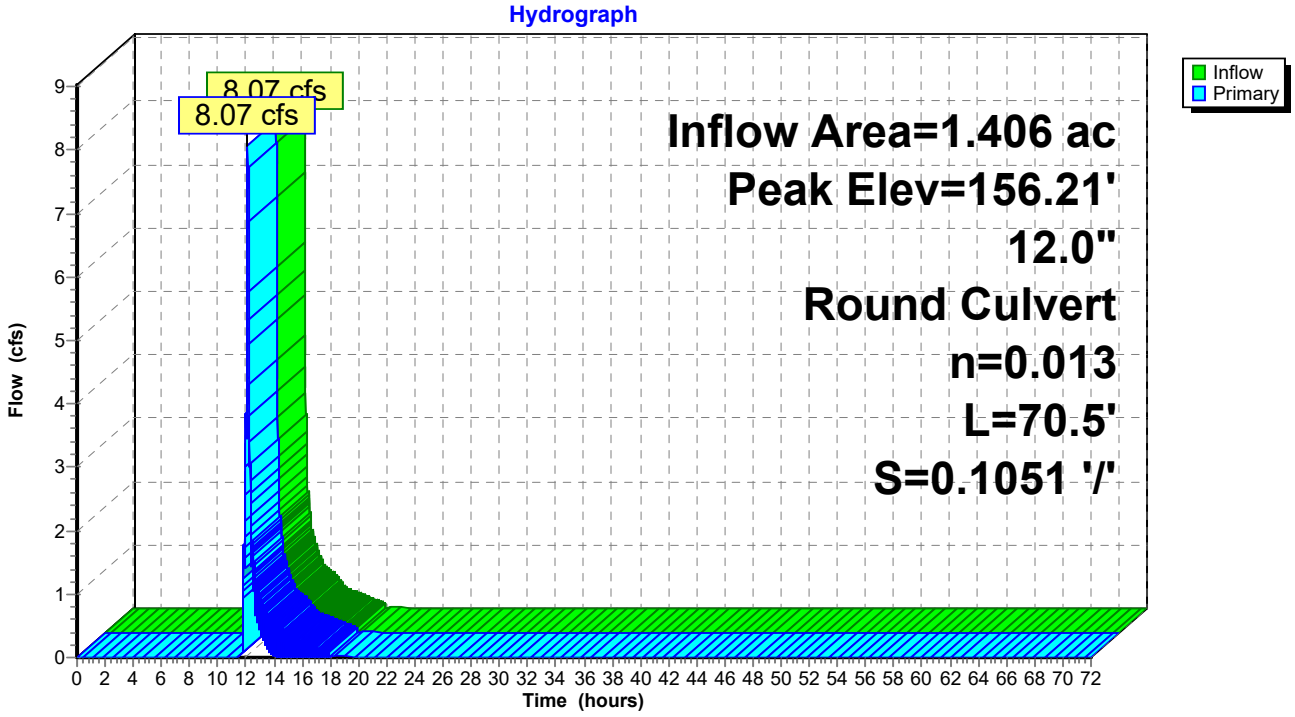
Inflow Area = 1.406 ac, 46.31% Impervious, Inflow Depth = 2.82" for 100-Year event
Inflow = 8.07 cfs @ 12.14 hrs, Volume= 0.330 af
Outflow = 8.07 cfs @ 12.14 hrs, Volume= 0.330 af, Atten= 0%, Lag= 0.0 min
Primary = 8.07 cfs @ 12.14 hrs, Volume= 0.330 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 156.21' @ 12.14 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.41' | **12.0" Round Culvert**<br>L= 70.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.41' / 141.00' S= 0.1051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=8.06 cfs @ 12.14 hrs HW=156.20' (Free Discharge)
**1=Culvert** (Inlet Controls 8.06 cfs @ 10.27 fps)

### Pond 18: DMH



## Summary for Pond 18P: CB

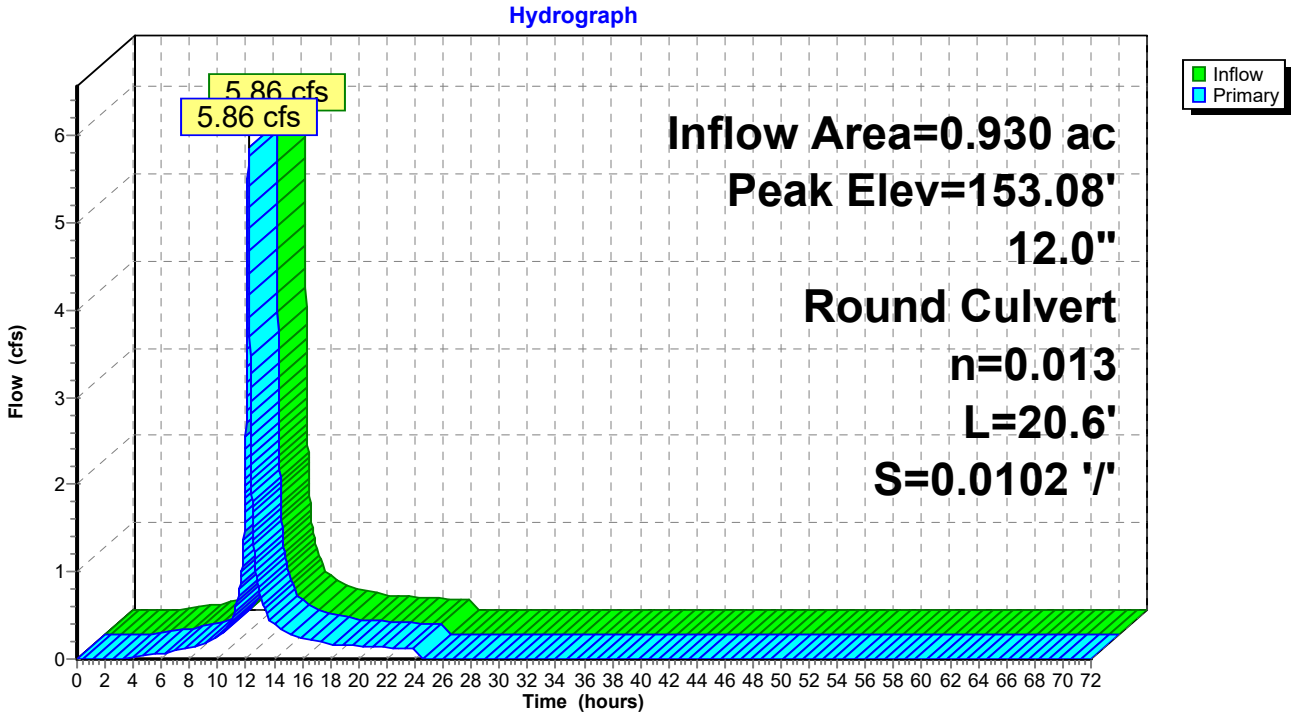
Inflow Area = 0.930 ac, 61.61% Impervious, Inflow Depth = 7.00" for 100-Year event
Inflow = 5.86 cfs @ 12.17 hrs, Volume= 0.543 af
Outflow = 5.86 cfs @ 12.17 hrs, Volume= 0.543 af, Atten= 0%, Lag= 0.0 min
Primary = 5.86 cfs @ 12.17 hrs, Volume= 0.543 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 153.08' @ 12.17 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 148.72' | **12.0" Round Culvert**<br>L= 20.6' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 148.72' / 148.51' S= 0.0102 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=5.86 cfs @ 12.17 hrs HW=153.07' (Free Discharge)
**1=Culvert** (Inlet Controls 5.86 cfs @ 7.46 fps)

## Pond 18P: CB

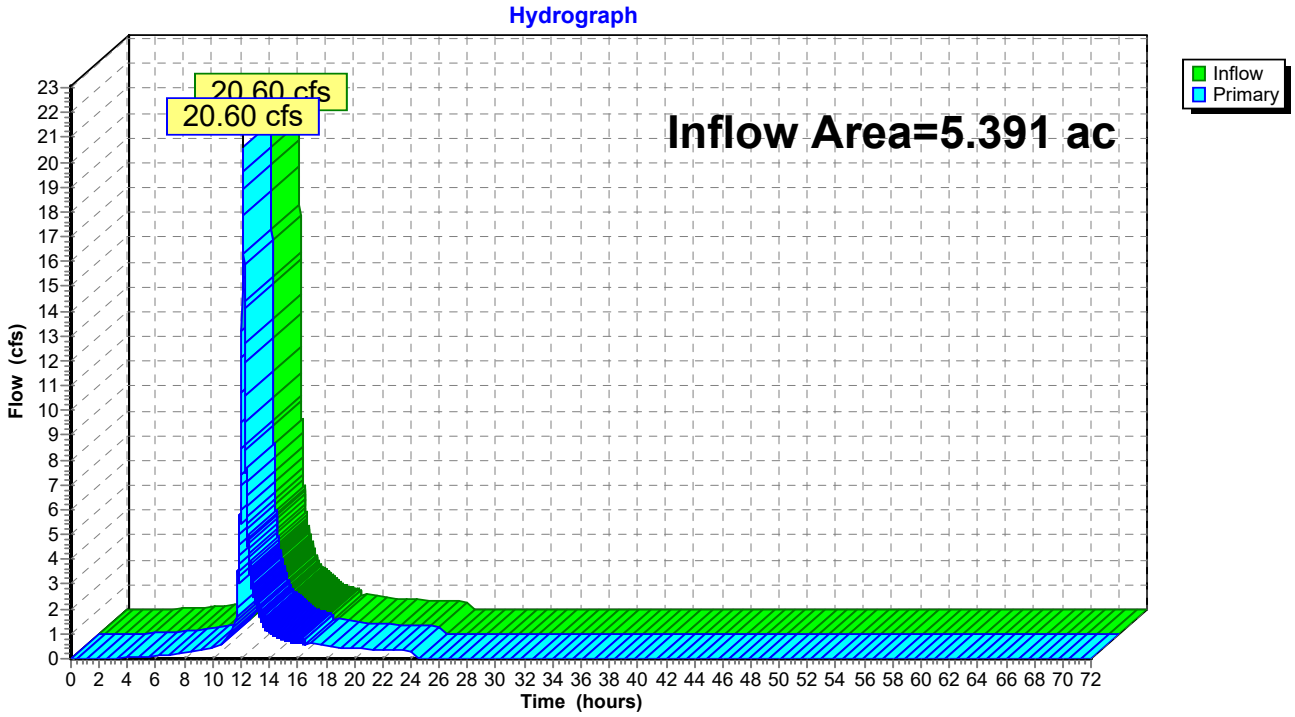


## Summary for Link 32L: TOTAL TO SPICKET RIVER

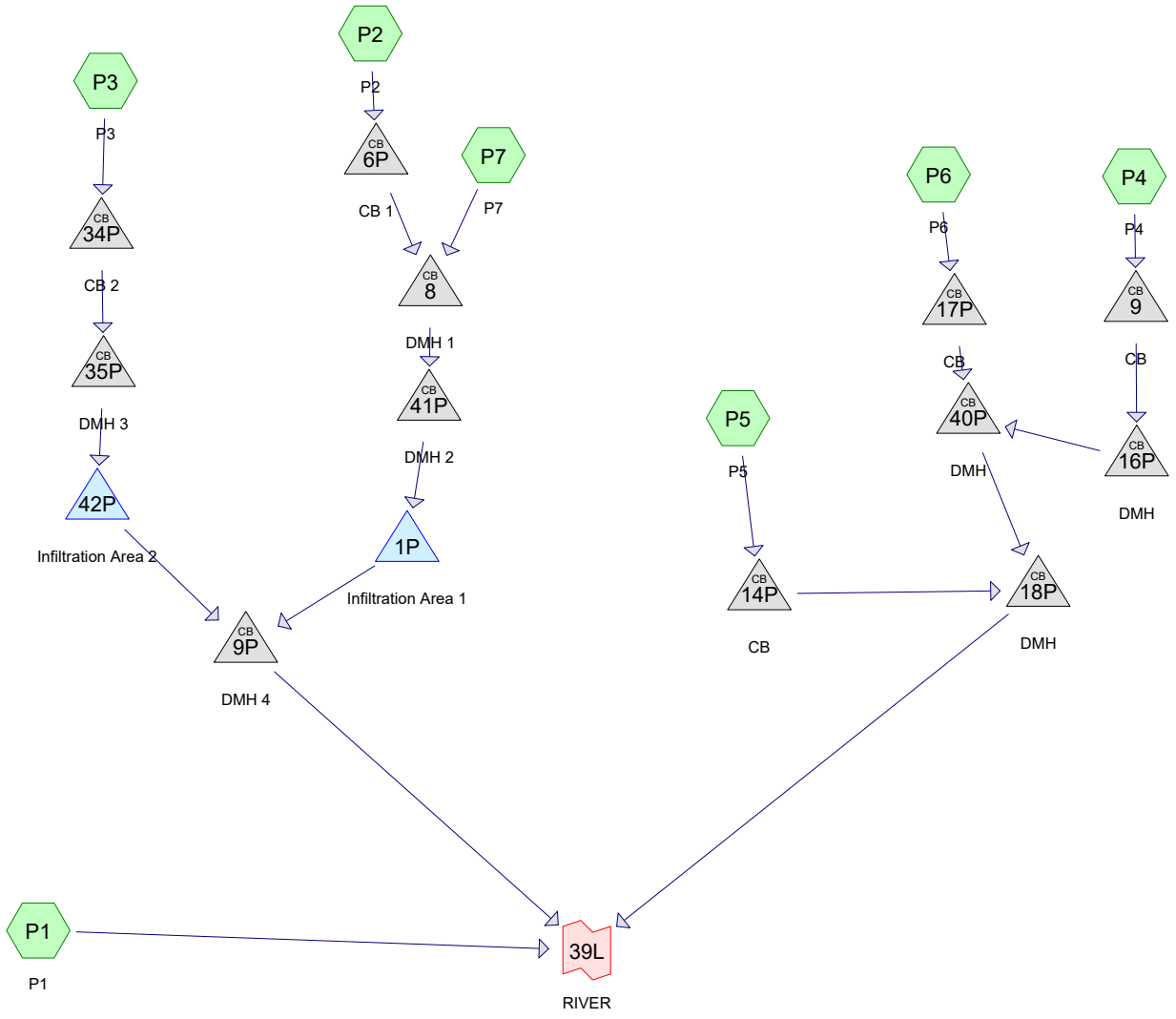
Inflow Area = 5.391 ac, 30.49% Impervious, Inflow Depth = 3.47" for 100-Year event
Inflow = 20.60 cfs @ 12.16 hrs, Volume= 1.557 af
Primary = 20.60 cfs @ 12.16 hrs, Volume= 1.557 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

## Link 32L: TOTAL TO SPICKET RIVER



## c. Proposed Conditions HydroCAD Report




Subcat Reach Pond Link

**Routing Diagram for Post Dev Revised 11-3-21**
Prepared by Millennium Engineering, Inc., Printed 11/9/2021

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 1.010 | 39 | >75% Grass cover, Good, HSG A (P1, P2, P3, P4, P6) |
| 1.471 | 98 | Paved parking, HSG A (P1, P2, P3, P4, P5, P6) |
| 0.742 | 98 | Roofs, HSG A (P1, P7) |
| 0.050 | 98 | Unconnected pavement, HSG A (P1) |
| 0.056 | 98 | Unconnected roofs, HSG A (P1) |
| 2.004 | 36 | Woods, Fair, HSG A (P1) |
| 0.063 | 45 | Woods, Poor, HSG A (P1) |
| **5.395** | **63** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 5.395 | HSG A | P1, P2, P3, P4, P5, P6, P7 |
| 0.000 | HSG B | |
| 0.000 | HSG C | |
| 0.000 | HSG D | |
| 0.000 | Other | |
| **5.395** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 1.010 | 0.000 | 0.000 | 0.000 | 0.000 | 1.010 | >75% Grass cover, Good | P1, P2, P3, P4, P6 |
| 1.471 | 0.000 | 0.000 | 0.000 | 0.000 | 1.471 | Paved parking | P1, P2, P3, P4, P5, P6 |
| 0.742 | 0.000 | 0.000 | 0.000 | 0.000 | 0.742 | Roofs | P1, P7 |
| 0.050 | 0.000 | 0.000 | 0.000 | 0.000 | 0.050 | Unconnected pavement | P1 |
| 0.056 | 0.000 | 0.000 | 0.000 | 0.000 | 0.056 | Unconnected roofs | P1 |
| 2.004 | 0.000 | 0.000 | 0.000 | 0.000 | 2.004 | Woods, Fair | P1 |
| 0.063 | 0.000 | 0.000 | 0.000 | 0.000 | 0.063 | Woods, Poor | P1 |
| **5.395** | **0.000** | **0.000** | **0.000** | **0.000** | **5.395** | **TOTAL AREA** | |

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 P1: P1** Runoff Area=145,292 sf 25.32% Impervious Runoff Depth=0.14"
Flow Length=698' Tc=11.6 min UI Adjusted CN=51 Runoff=0.06 cfs 0.039 af

**Subcatchment P2: P2** Runoff Area=34,941 sf 56.10% Impervious Runoff Depth=0.90"
Tc=6.0 min CN=72 Runoff=0.77 cfs 0.060 af

**Subcatchment P3: P3** Runoff Area=24,177 sf 81.00% Impervious Runoff Depth=1.87"
Tc=6.0 min CN=87 Runoff=1.15 cfs 0.087 af

**Subcatchment P4: P4** Runoff Area=19,867 sf 76.45% Impervious Runoff Depth=1.64"
Tc=6.0 min CN=84 Runoff=0.84 cfs 0.062 af

**Subcatchment P5: P5** Runoff Area=4,524 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.29 cfs 0.025 af

**Subcatchment P6: P6** Runoff Area=3,568 sf 73.71% Impervious Runoff Depth=1.50"
Tc=6.0 min CN=82 Runoff=0.14 cfs 0.010 af

**Subcatchment P7: P7** Runoff Area=2,652 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=0.17 cfs 0.015 af

**Pond 1P: Infiltration Area 1** Peak Elev=88.72' Storage=0.008 af Inflow=0.94 cfs 0.075 af
Discarded=0.33 cfs 0.075 af Primary=0.00 cfs 0.000 af Outflow=0.33 cfs 0.075 af

**Pond 6P: CB 1** Peak Elev=92.18' Inflow=0.77 cfs 0.060 af
12.0" Round Culvert n=0.013 L=24.5' S=0.1041 '/' Outflow=0.77 cfs 0.060 af

**Pond 8: DMH 1** Peak Elev=89.64' Inflow=0.94 cfs 0.075 af
12.0" Round Culvert n=0.013 L=32.8' S=0.0052 '/' Outflow=0.94 cfs 0.075 af

**Pond 9: CB** Peak Elev=81.63' Inflow=0.84 cfs 0.062 af
12.0" Round Culvert n=0.013 L=23.0' S=0.0348 '/' Outflow=0.84 cfs 0.062 af

**Pond 9P: DMH 4** Peak Elev=85.15' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=121.0' S=0.0050 '/' Outflow=0.00 cfs 0.000 af

**Pond 14P: CB** Peak Elev=79.17' Inflow=0.29 cfs 0.025 af
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=0.29 cfs 0.025 af

**Pond 16P: DMH** Peak Elev=79.03' Inflow=0.84 cfs 0.062 af
12.0" Round Culvert n=0.013 L=15.0' S=0.0467 '/' Outflow=0.84 cfs 0.062 af

**Pond 17P: CB** Peak Elev=83.37' Inflow=0.14 cfs 0.010 af
12.0" Round Culvert n=0.013 L=3.0' S=0.1667 '/' Outflow=0.14 cfs 0.010 af

**Pond 18P: DMH** Peak Elev=77.88' Inflow=1.27 cfs 0.098 af
12.0" Round Culvert n=0.013 L=40.7' S=0.0835 '/' Outflow=1.27 cfs 0.098 af

**Pond 34P: CB 2** Peak Elev=86.16' Inflow=1.15 cfs 0.087 af
12.0" Round Culvert n=0.013 L=130.0' S=0.0050 '/' Outflow=1.15 cfs 0.087 af

**Pond 35P: DMH 3** Peak Elev=85.58' Inflow=1.15 cfs 0.087 af
12.0" Round Culvert n=0.013 L=10.0' S=0.0050 '/' Outflow=1.15 cfs 0.087 af

**Pond 40P: DMH** Peak Elev=78.28' Inflow=0.97 cfs 0.073 af
12.0" Round Culvert n=0.013 L=28.0' S=0.0143 '/' Outflow=0.97 cfs 0.073 af

**Pond 41P: DMH 2** Peak Elev=89.39' Inflow=0.94 cfs 0.075 af
12.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=0.94 cfs 0.075 af

**Pond 42P: Infiltration Area 2** Peak Elev=85.58' Storage=0.013 af Inflow=1.15 cfs 0.087 af
Discarded=0.33 cfs 0.087 af Primary=0.00 cfs 0.000 af Outflow=0.33 cfs 0.087 af

**Link 39L: RIVER** Inflow=1.27 cfs 0.137 af
Primary=1.27 cfs 0.137 af

**Total Runoff Area = 5.395 ac Runoff Volume = 0.298 af Average Runoff Depth = 0.66"**
**57.04% Pervious = 3.077 ac 42.96% Impervious = 2.318 ac**

## Summary for Subcatchment P1: P1

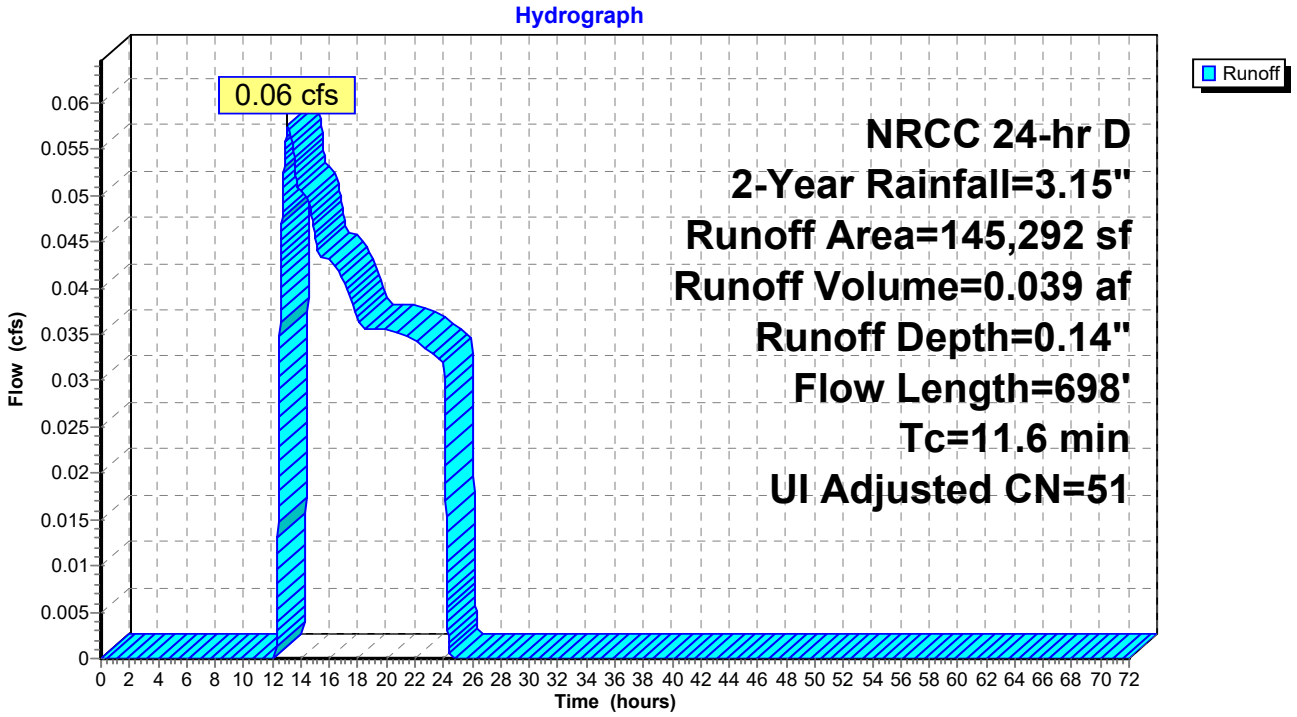
Runoff = 0.06 cfs @ 13.08 hrs, Volume= 0.039 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Adj | Description |
|---|---|---|---|
| 87,315 | 36 | | Woods, Fair, HSG A |
| 29,675 | 98 | | Roofs, HSG A |
| 2,420 | 98 | | Unconnected roofs, HSG A |
| 2,530 | 98 | | Paved parking, HSG A |
| 2,749 | 45 | | Woods, Poor, HSG A |
| 18,439 | 39 | | >75% Grass cover, Good, HSG A |
| 2,164 | 98 | | Unconnected pavement, HSG A |
| 145,292 | 52 | 51 | Weighted Average, UI Adjusted |
| 108,503 | | | 74.68% Pervious Area |
| 36,789 | | | 25.32% Impervious Area |
| 4,584 | | | 12.46% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.4 | 50 | 0.0750 | 0.11 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.4 | 46 | 0.0800 | 1.98 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 2.1 | 322 | 0.0300 | 2.60 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 0.8 | 132 | 0.0350 | 2.81 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 0.9 | 148 | 0.2800 | 2.65 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 11.6 | 698 | Total | | | |

## Subcatchment P1: P1



## Summary for Subcatchment P2: P2

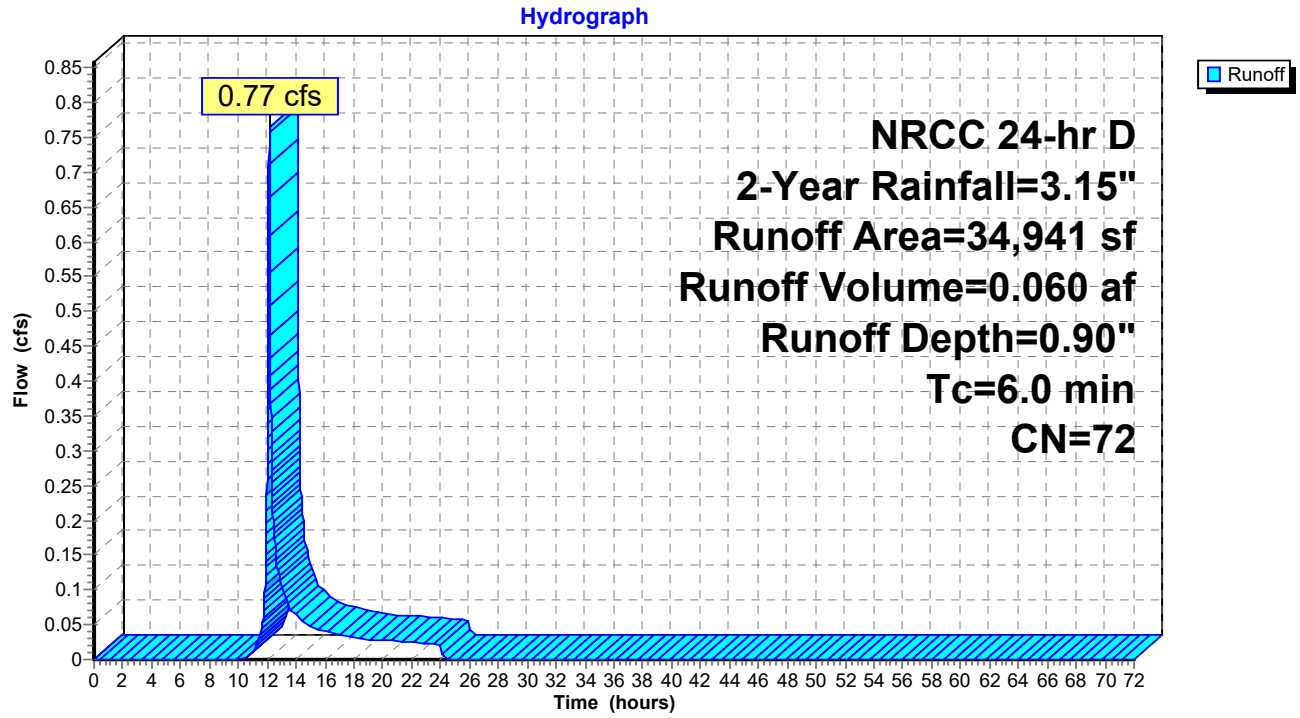
Runoff = 0.77 cfs @ 12.14 hrs, Volume= 0.060 af, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 19,603 | 98 | Paved parking, HSG A |
| 15,338 | 39 | >75% Grass cover, Good, HSG A |
| 34,941 | 72 | Weighted Average |
| 15,338 | | 43.90% Pervious Area |
| 19,603 | | 56.10% Impervious Area |

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

## Subcatchment P2: P2



## Summary for Subcatchment P3: P3

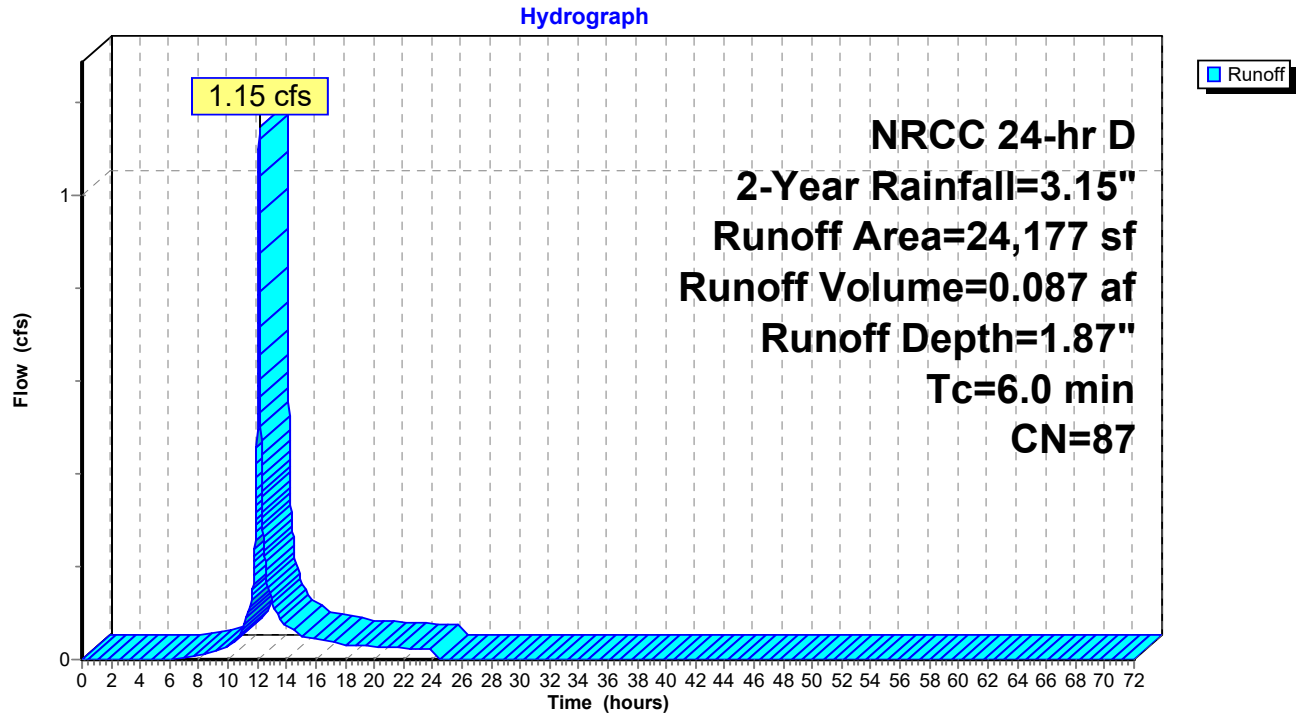
Runoff = 1.15 cfs @ 12.13 hrs, Volume= 0.087 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 19,583 | 98 | Paved parking, HSG A |
| 4,594 | 39 | >75% Grass cover, Good, HSG A |
| 24,177 | 87 | Weighted Average |
| 4,594 | | 19.00% Pervious Area |
| 19,583 | | 81.00% Impervious Area |

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

## Subcatchment P3: P3



## Summary for Subcatchment P4: P4

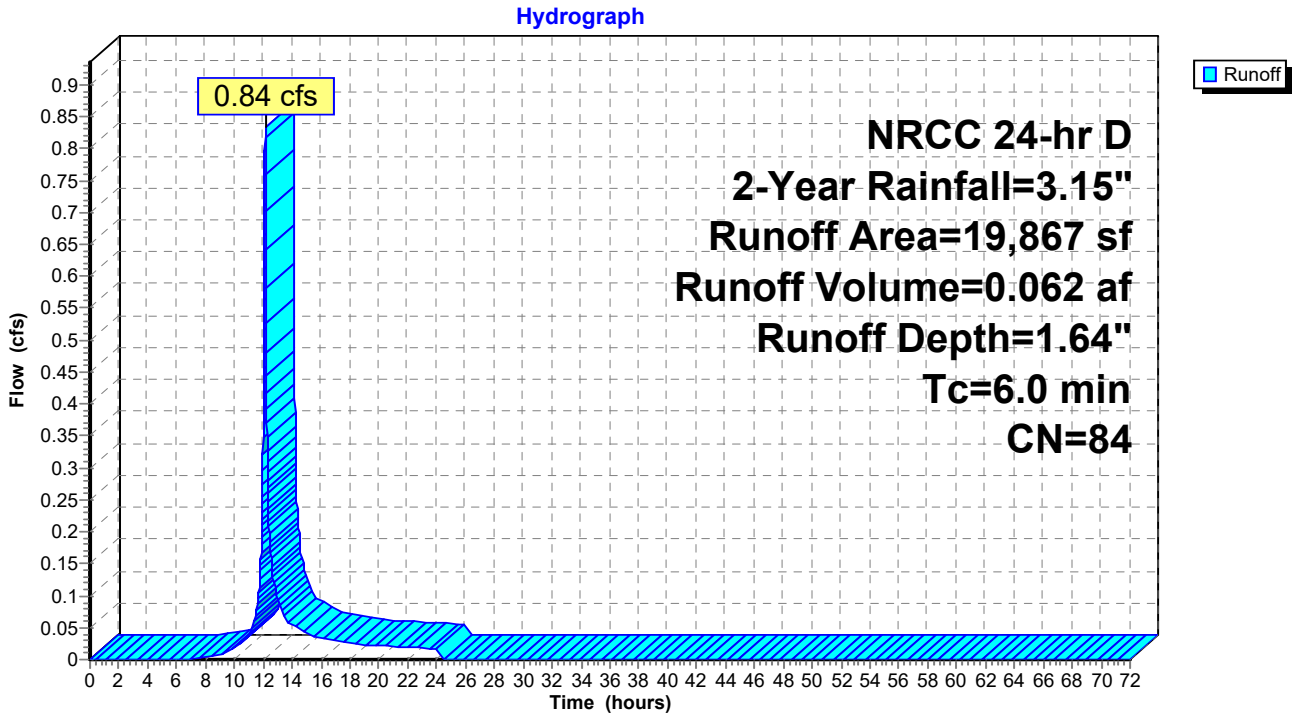
Runoff = 0.84 cfs @ 12.13 hrs, Volume= 0.062 af, Depth= 1.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 15,188 | 98 | Paved parking, HSG A |
| 4,679 | 39 | >75% Grass cover, Good, HSG A |
| 19,867 | 84 | Weighted Average |
| 4,679 | | 23.55% Pervious Area |
| 15,188 | | 76.45% Impervious Area |

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

## Subcatchment P4: P4



## Summary for Subcatchment P5: P5

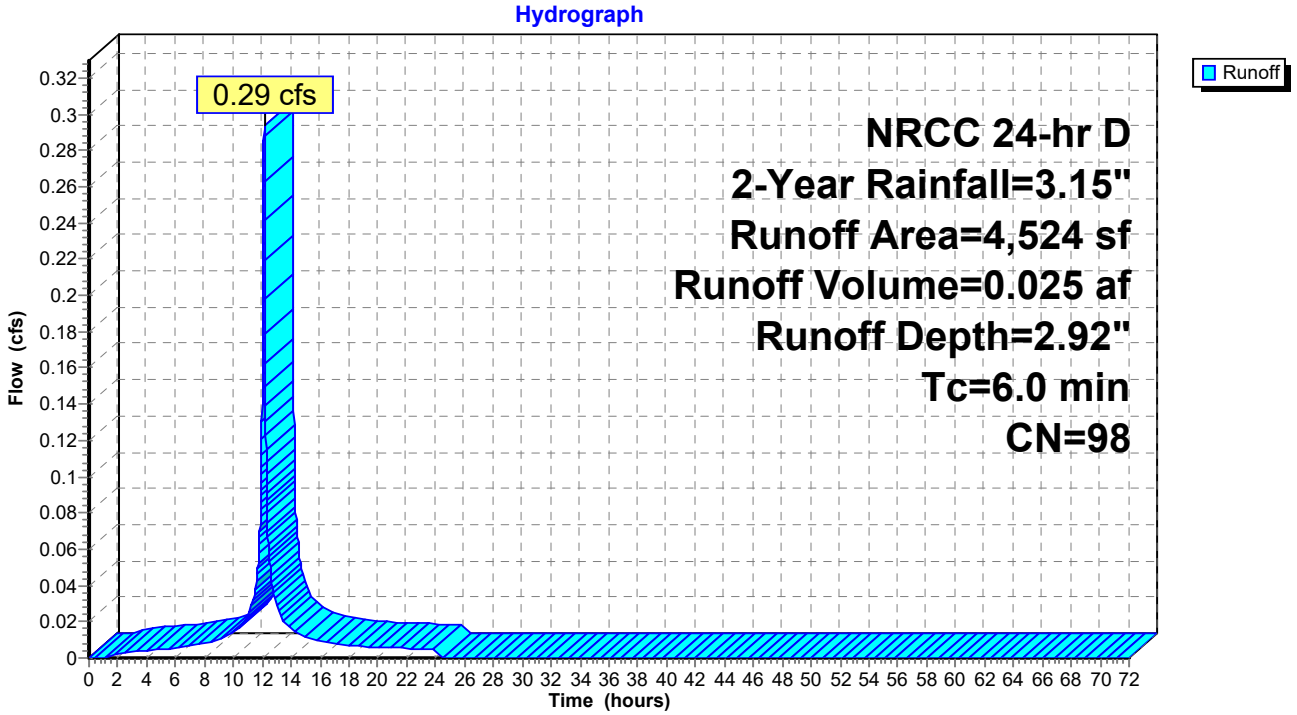
Runoff = 0.29 cfs @ 12.13 hrs, Volume= 0.025 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 4,524 | 98 | Paved parking, HSG A |
| 4,524 | | 100.00% Impervious Area |

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

## Subcatchment P5: P5



## Summary for Subcatchment P6: P6

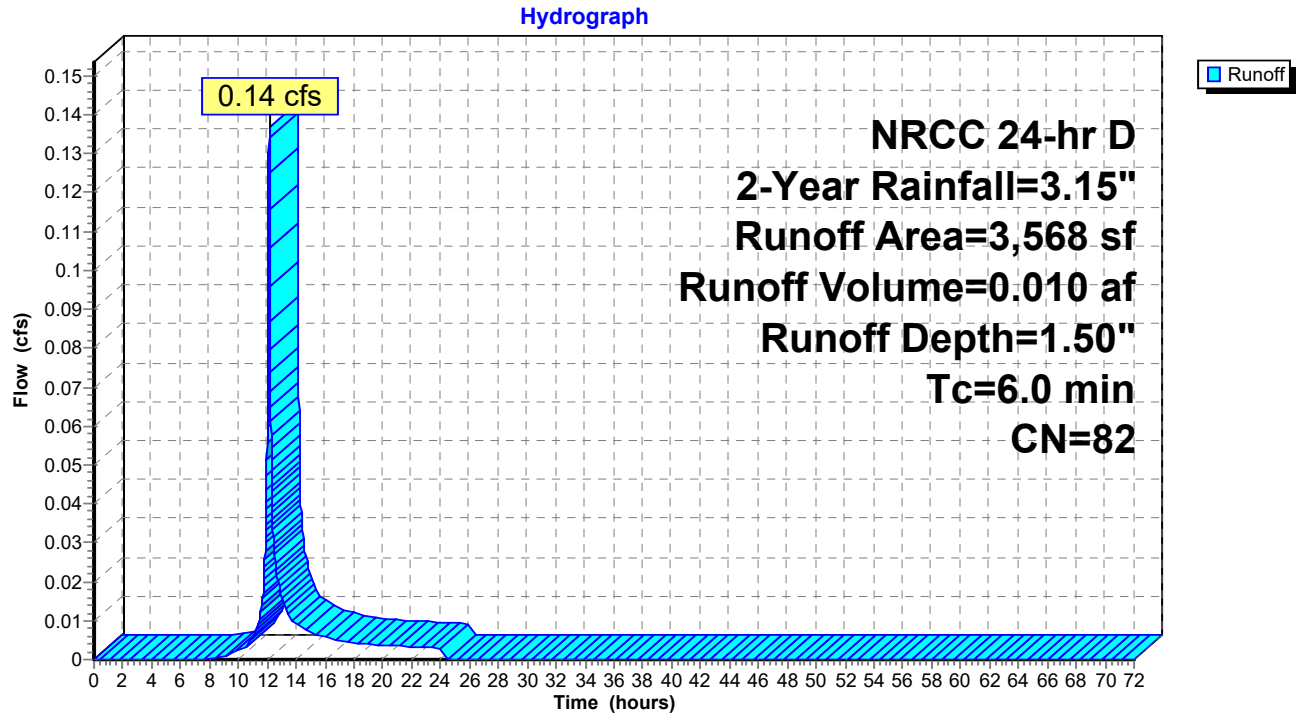
Runoff = 0.14 cfs @ 12.13 hrs, Volume= 0.010 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 2,630 | 98 | Paved parking, HSG A |
| 938 | 39 | >75% Grass cover, Good, HSG A |
| 3,568 | 82 | Weighted Average |
| 938 | | 26.29% Pervious Area |
| 2,630 | | 73.71% Impervious Area |

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

## Subcatchment P6: P6



## Summary for Subcatchment P7: P7

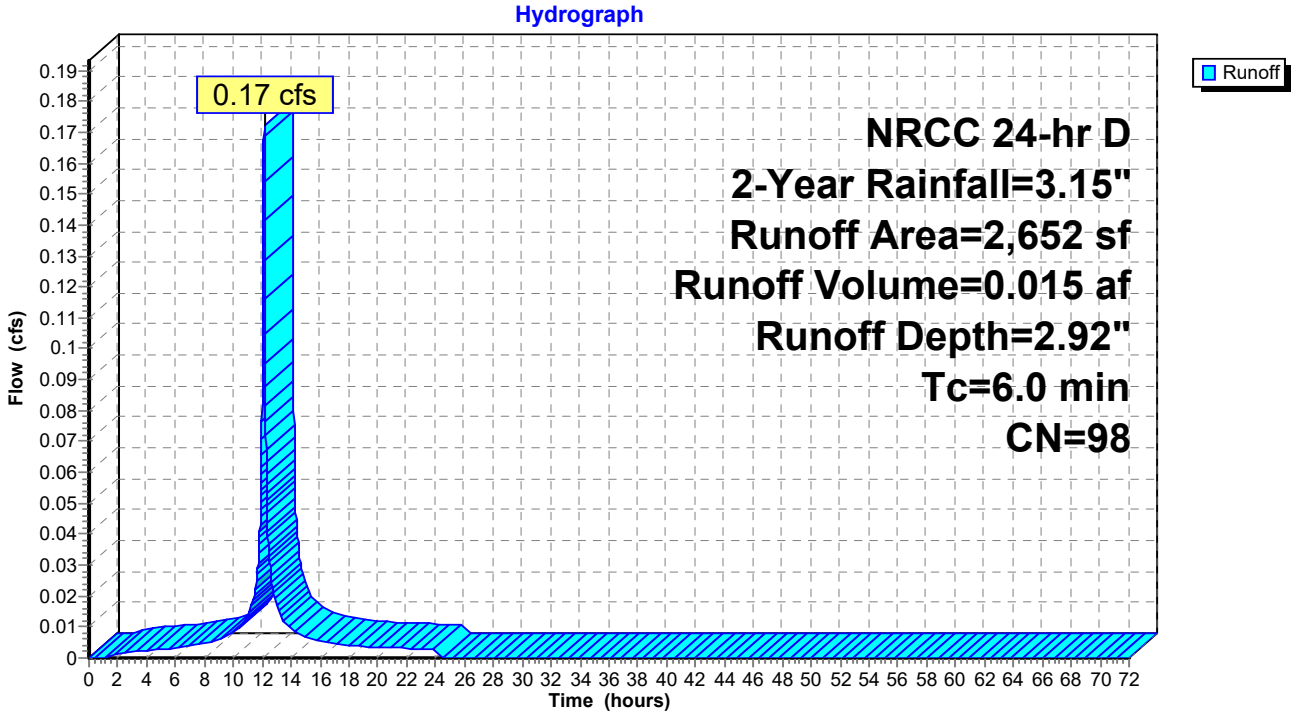
Runoff = 0.17 cfs @ 12.13 hrs, Volume= 0.015 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 2,652 | 98 | Roofs, HSG A |
| 2,652 | | 100.00% Impervious Area |

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

## Subcatchment P7: P7



## Summary for Pond 1P: Infiltration Area 1

Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 1.04" for 2-Year event
Inflow = 0.94 cfs @ 12.14 hrs, Volume= 0.075 af
Outflow = 0.33 cfs @ 12.30 hrs, Volume= 0.075 af, Atten= 65%, Lag= 10.1 min
Discarded = 0.33 cfs @ 12.30 hrs, Volume= 0.075 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 88.72' @ 12.30 hrs Surf.Area= 0.037 ac Storage= 0.008 af

Plug-Flow detention time= 4.4 min calculated for 0.075 af (100% of inflow)
Center-of-Mass det. time= 4.4 min ( 880.6 - 876.1 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 88.20' | 0.034 af | **30.00'W x 53.46'L x 3.50'H Field A**<br>0.129 af Overall - 0.044 af Embedded = 0.085 af x 40.0% Voids |
| #2A | 88.70' | 0.044 af | **ADS_StormTech SC-740 +Cap** x 42 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>42 Chambers in 6 Rows |
| | | 0.078 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 88.20' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 82.00' |
| #2 | Primary | 89.50' | **12.0" Round Culvert**<br>L= 36.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.50' / 85.25' S= 0.1181 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |

**Discarded OutFlow** Max=0.33 cfs @ 12.30 hrs HW=88.72' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.33 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=88.20' (Free Discharge)
↑—**2=Culvert** ( Controls 0.00 cfs)

## Pond 1P: Infiltration Area 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

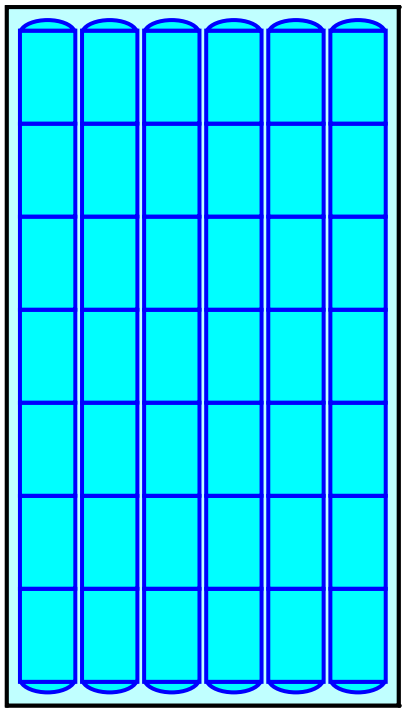
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

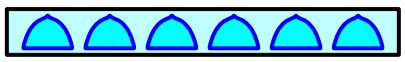
42 Chambers x 45.9 cf = 1,929.5 cf Chamber Storage

5,613.0 cf Field - 1,929.5 cf Chambers = 3,683.5 cf Stone x 40.0% Voids = 1,473.4 cf Stone Storage

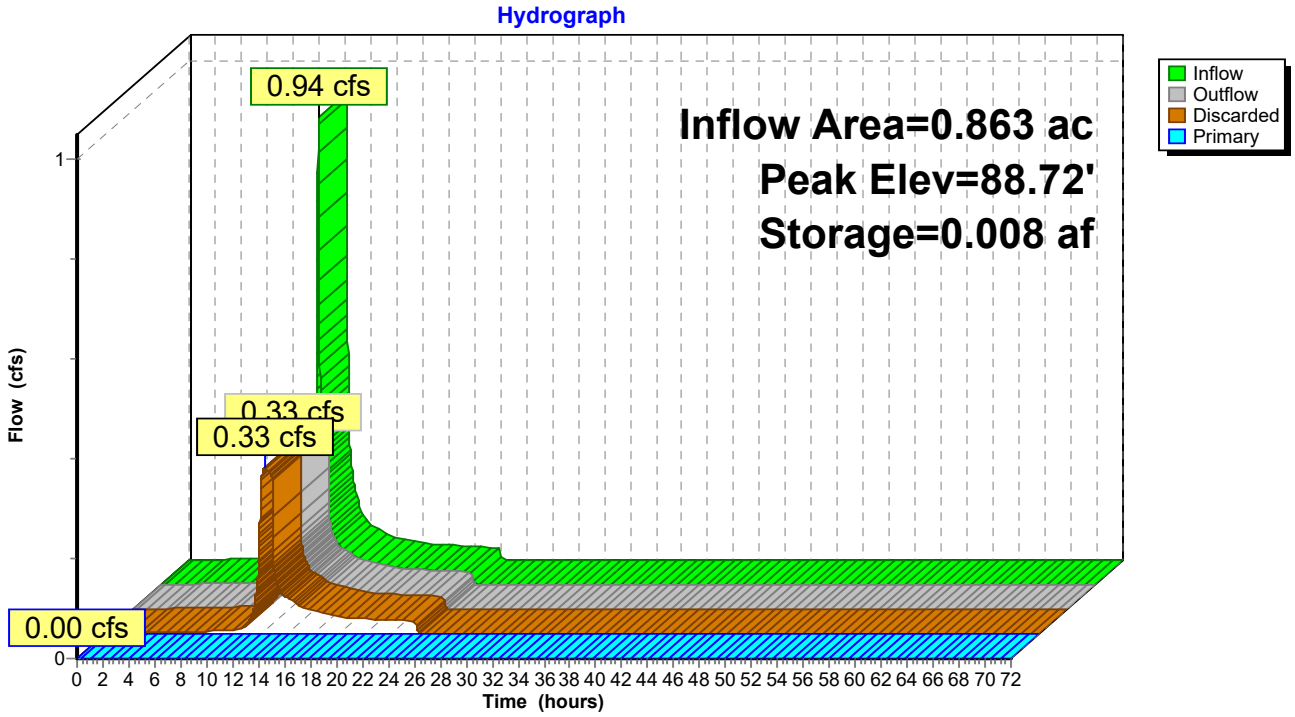
Chamber Storage + Stone Storage = 3,402.9 cf = 0.078 af
Overall Storage Efficiency = 60.6%
Overall System Size = 53.46' x 30.00' x 3.50'

42 Chambers
207.9 cy Field
136.4 cy Stone





## Pond 1P: Infiltration Area 1



## Summary for Pond 6P: CB 1

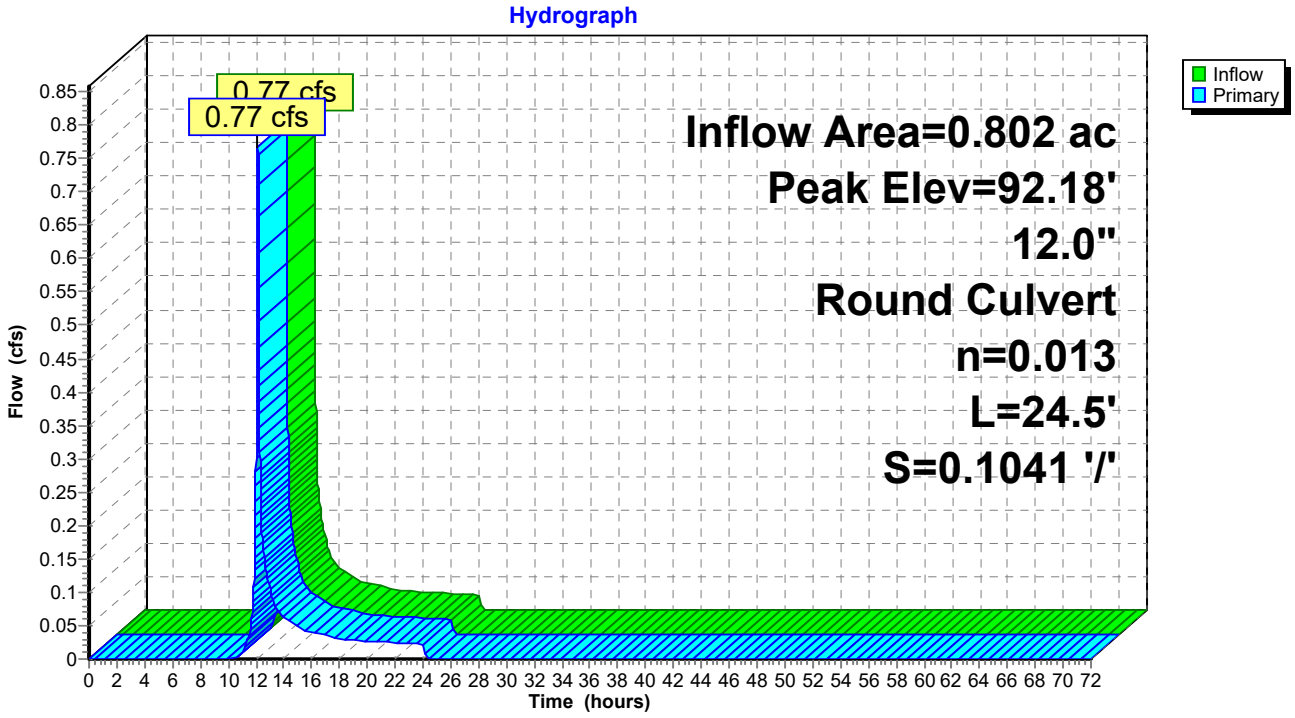
Inflow Area = 0.802 ac, 56.10% Impervious, Inflow Depth = 0.90" for 2-Year event
Inflow = 0.77 cfs @ 12.14 hrs, Volume= 0.060 af
Outflow = 0.77 cfs @ 12.14 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.14 hrs, Volume= 0.060 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 92.18' @ 12.14 hrs
Flood Elev= 95.67'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 91.67' | **12.0" Round Culvert**<br>L= 24.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 91.67' / 89.12' S= 0.1041 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.76 cfs @ 12.14 hrs HW=92.18' (Free Discharge)
**1=Culvert** (Inlet Controls 0.76 cfs @ 1.91 fps)

## Pond 6P: CB 1



## Summary for Pond 8: DMH 1

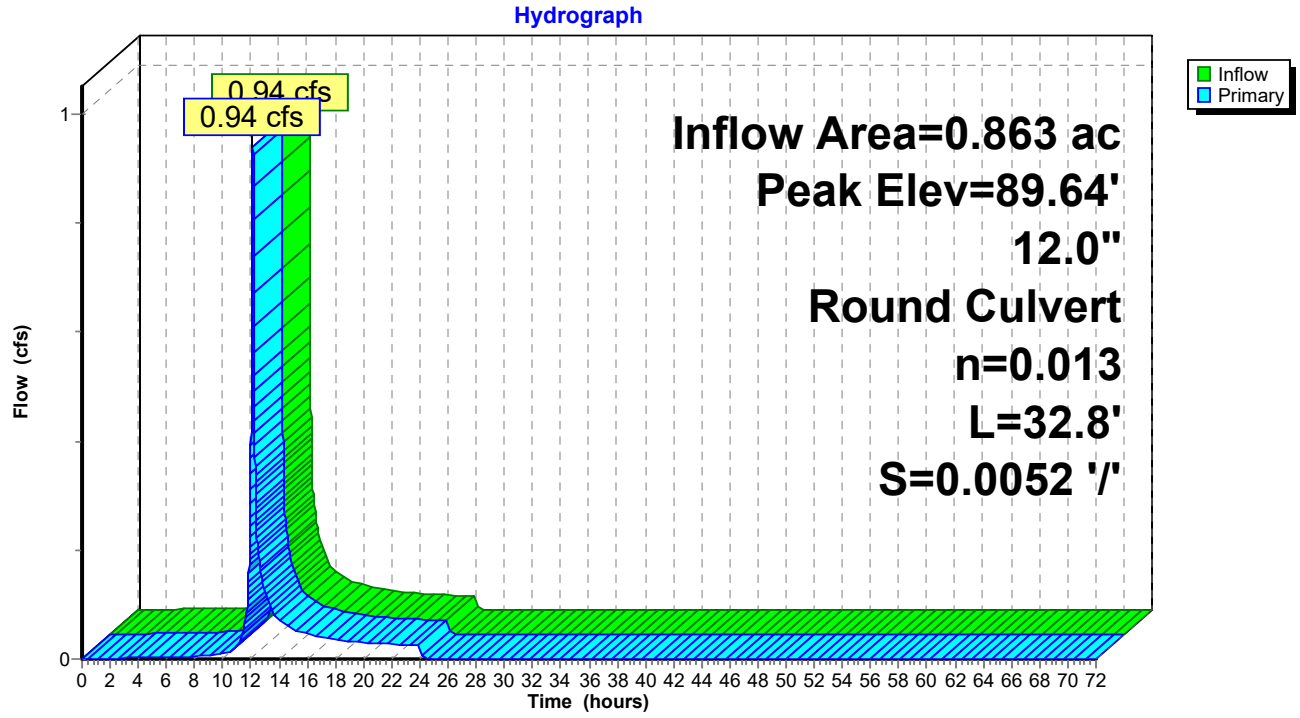
Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 1.04" for 2-Year event
Inflow = 0.94 cfs @ 12.14 hrs, Volume= 0.075 af
Outflow = 0.94 cfs @ 12.14 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.14 hrs, Volume= 0.075 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.64' @ 12.14 hrs
Flood Elev= 94.46'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 89.02' | **12.0" Round Culvert**<br>L= 32.8' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.02' / 88.85' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.93 cfs @ 12.14 hrs HW=89.64' (Free Discharge)
**1=Culvert** (Barrel Controls 0.93 cfs @ 2.64 fps)

## Pond 8: DMH 1



## Summary for Pond 9: CB

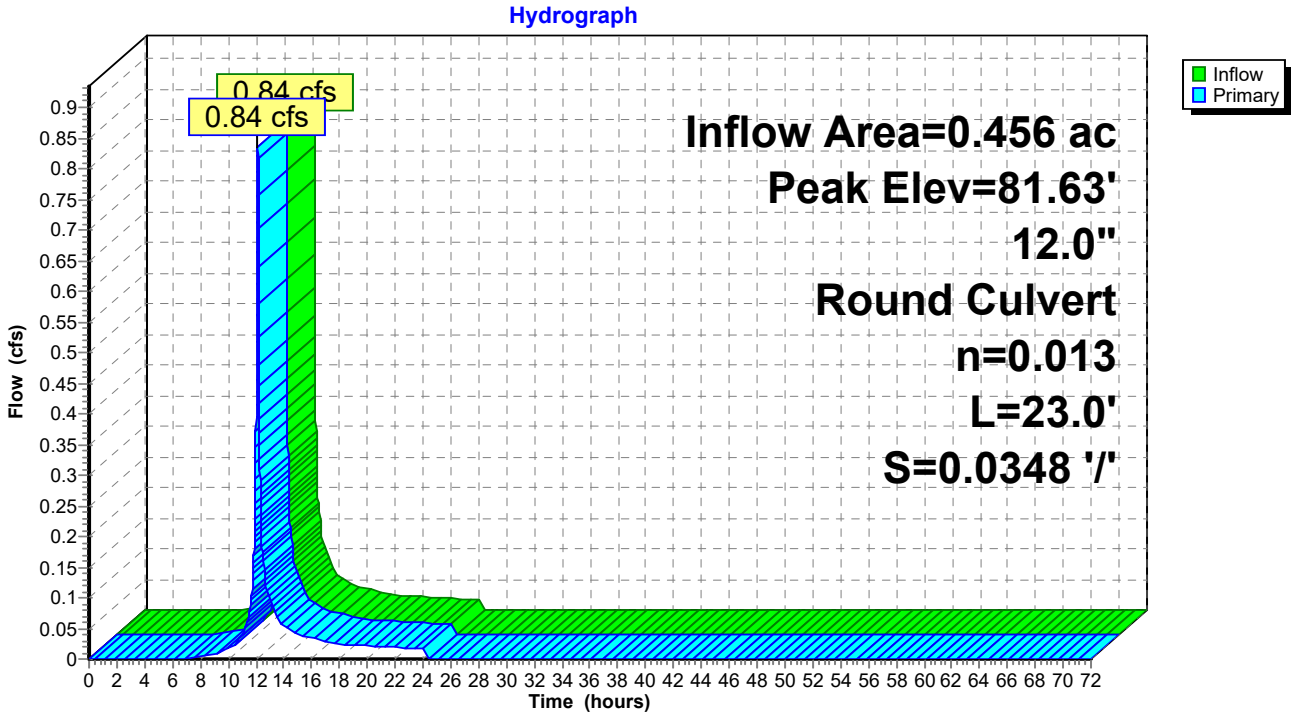
Inflow Area = 0.456 ac, 76.45% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 0.84 cfs @ 12.13 hrs, Volume= 0.062 af
Outflow = 0.84 cfs @ 12.13 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min
Primary = 0.84 cfs @ 12.13 hrs, Volume= 0.062 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 81.63' @ 12.13 hrs
Flood Elev= 93.35'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 81.10' | **12.0" Round Culvert**<br>L= 23.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 81.10' / 80.30' S= 0.0348 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.83 cfs @ 12.13 hrs HW=81.63' (Free Discharge)
**1=Culvert** (Inlet Controls 0.83 cfs @ 1.96 fps)

## Pond 9: CB



## Summary for Pond 9P: DMH 4

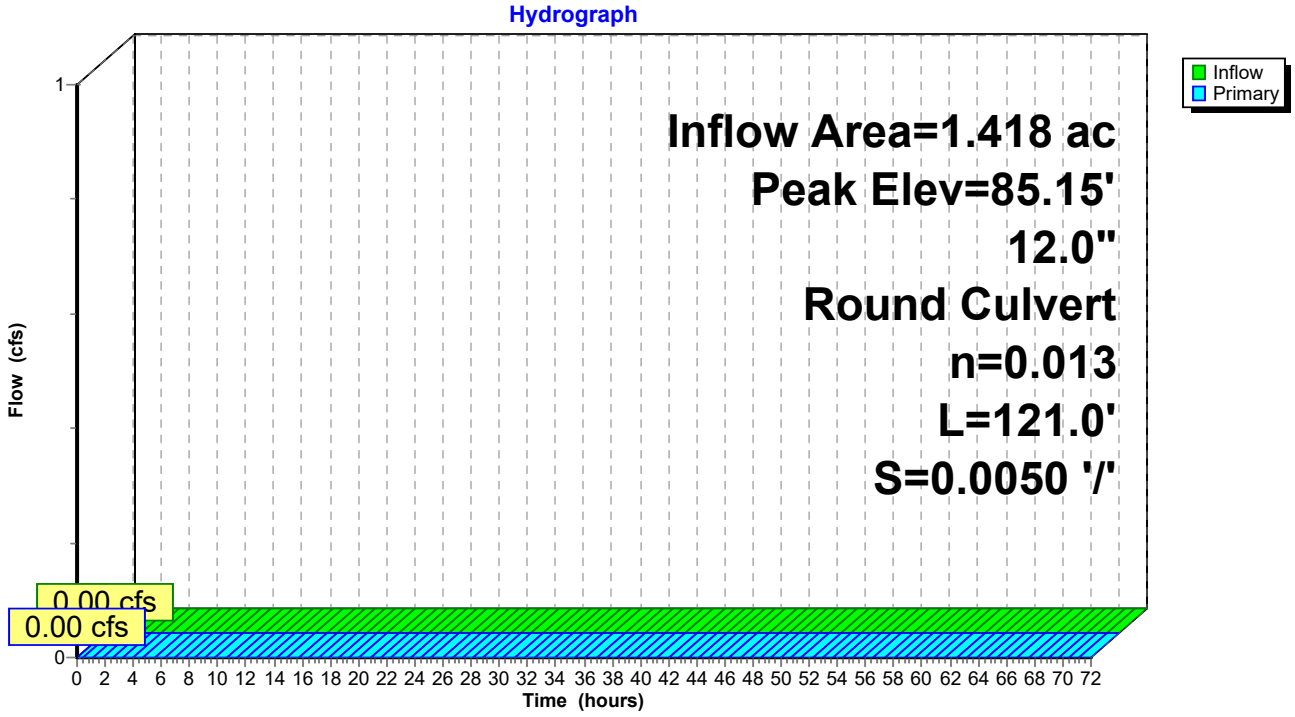
Inflow Area = 1.418 ac, 67.73% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 85.15' @ 0.00 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.15' | **12.0" Round Culvert**<br>L= 121.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 85.15' / 84.54' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=85.15' (Free Discharge)
**1=Culvert** ( Controls 0.00 cfs)

### Pond 9P: DMH 4



## Summary for Pond 14P: CB

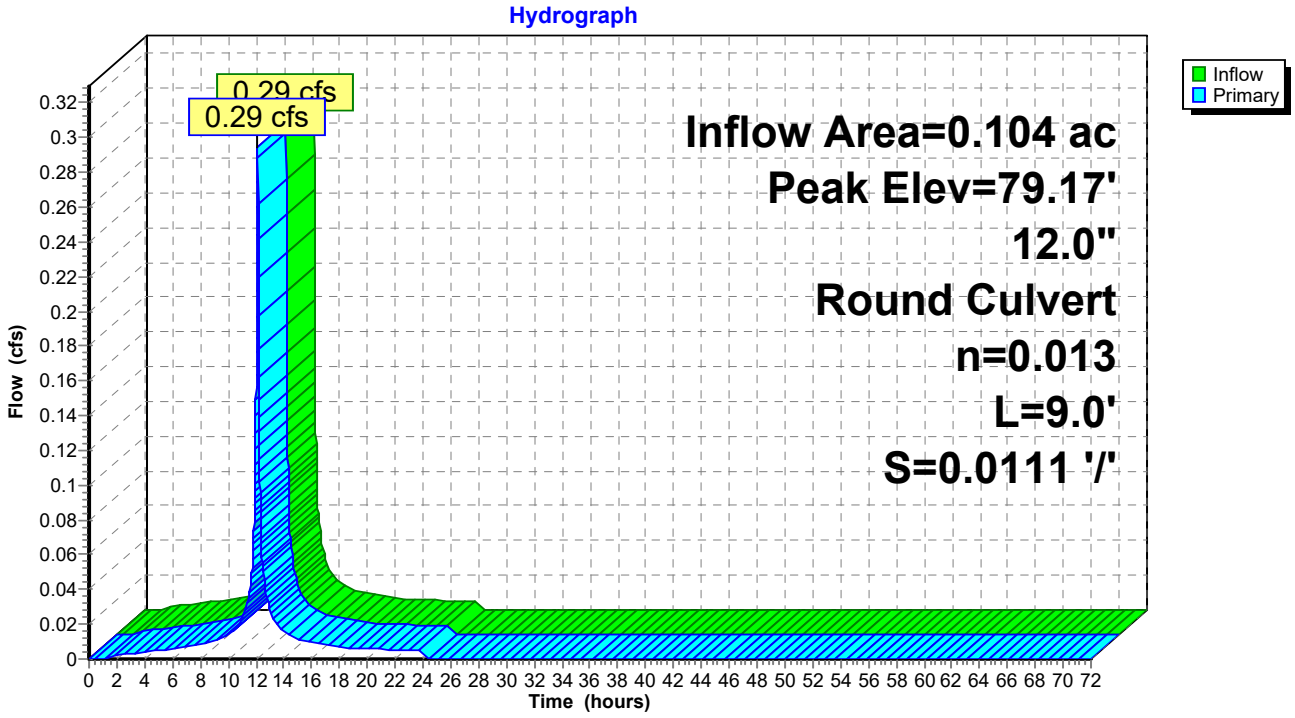
Inflow Area = 0.104 ac,100.00% Impervious, Inflow Depth = 2.92" for 2-Year event
Inflow = 0.29 cfs @ 12.13 hrs, Volume= 0.025 af
Outflow = 0.29 cfs @ 12.13 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.13 hrs, Volume= 0.025 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.17' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 79.00' | **12.0" Round Culvert**<br>L= 9.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 79.00' / 78.90' S= 0.0111 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.09 cfs @ 12.13 hrs HW=79.17' (Free Discharge)
**1=Culvert** (Inlet Controls 0.09 cfs @ 1.10 fps)

## Pond 14P: CB



## Summary for Pond 16P: DMH

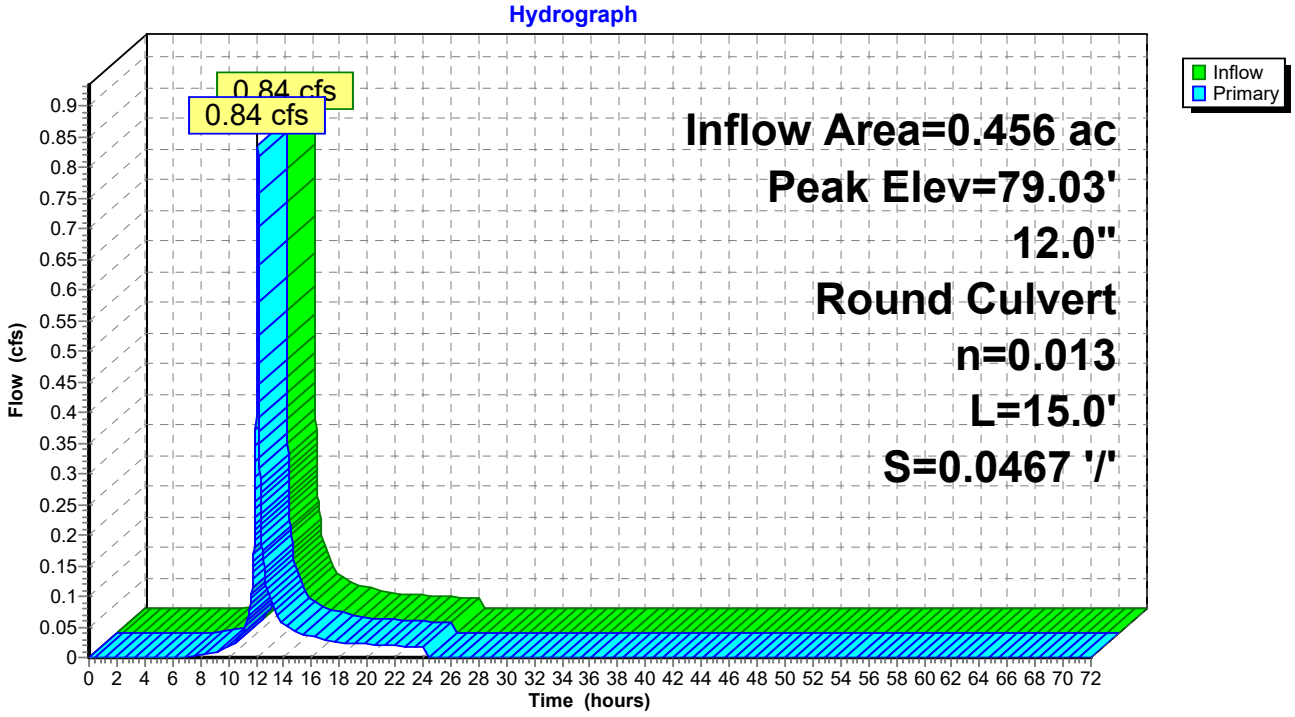
Inflow Area = 0.456 ac, 76.45% Impervious, Inflow Depth = 1.64" for 2-Year event
Inflow = 0.84 cfs @ 12.13 hrs, Volume= 0.062 af
Outflow = 0.84 cfs @ 12.13 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min
Primary = 0.84 cfs @ 12.13 hrs, Volume= 0.062 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.03' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 78.50' | **12.0" Round Culvert**<br>L= 15.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 78.50' / 77.80' S= 0.0467 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.83 cfs @ 12.13 hrs HW=79.03' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.83 cfs @ 1.96 fps)

## Pond 16P: DMH



## Summary for Pond 17P: CB

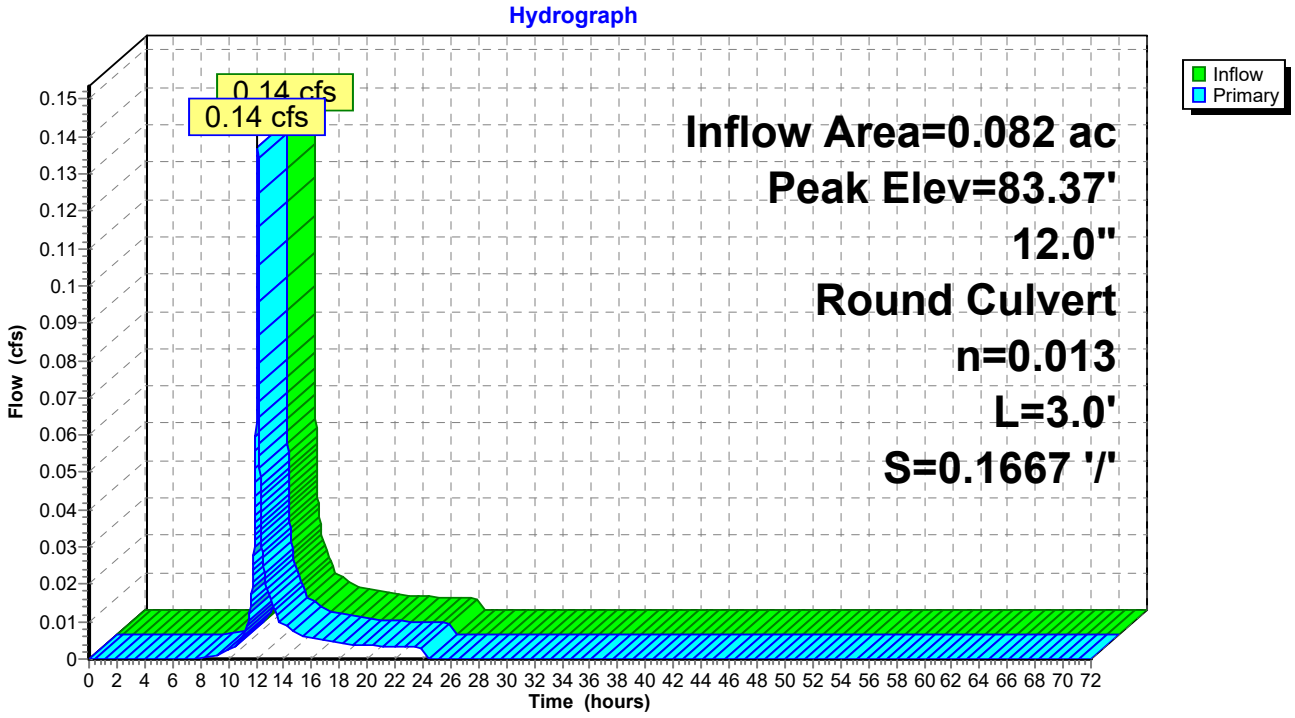
Inflow Area = 0.082 ac, 73.71% Impervious, Inflow Depth = 1.50" for 2-Year event
Inflow = 0.14 cfs @ 12.13 hrs, Volume= 0.010 af
Outflow = 0.14 cfs @ 12.13 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.14 cfs @ 12.13 hrs, Volume= 0.010 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 83.37' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 83.30' | **12.0" Round Culvert**<br>L= 3.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 83.30' / 82.80' S= 0.1667 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.02 cfs @ 12.13 hrs HW=83.37' (Free Discharge)
**1=Culvert** (Inlet Controls 0.02 cfs @ 0.73 fps)

## Pond 17P: CB



## Summary for Pond 18P: DMH

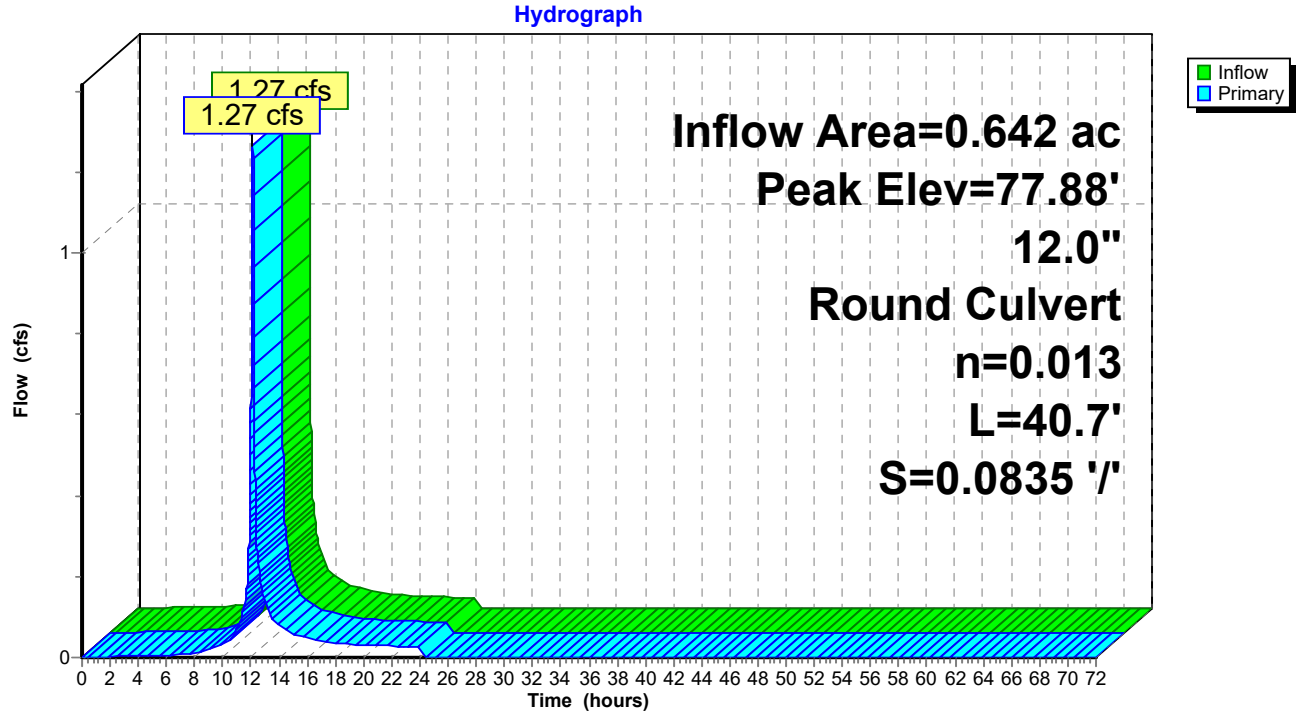
Inflow Area = 0.642 ac, 79.91% Impervious, Inflow Depth = 1.83" for 2-Year event
Inflow = 1.27 cfs @ 12.13 hrs, Volume= 0.098 af
Outflow = 1.27 cfs @ 12.13 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
Primary = 1.27 cfs @ 12.13 hrs, Volume= 0.098 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 77.88' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.20' | **12.0" Round Culvert**<br>L= 40.7' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 77.20' / 73.80' S= 0.0835 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.26 cfs @ 12.13 hrs HW=77.88' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.26 cfs @ 2.22 fps)

## Pond 18P: DMH



## Summary for Pond 34P: CB 2

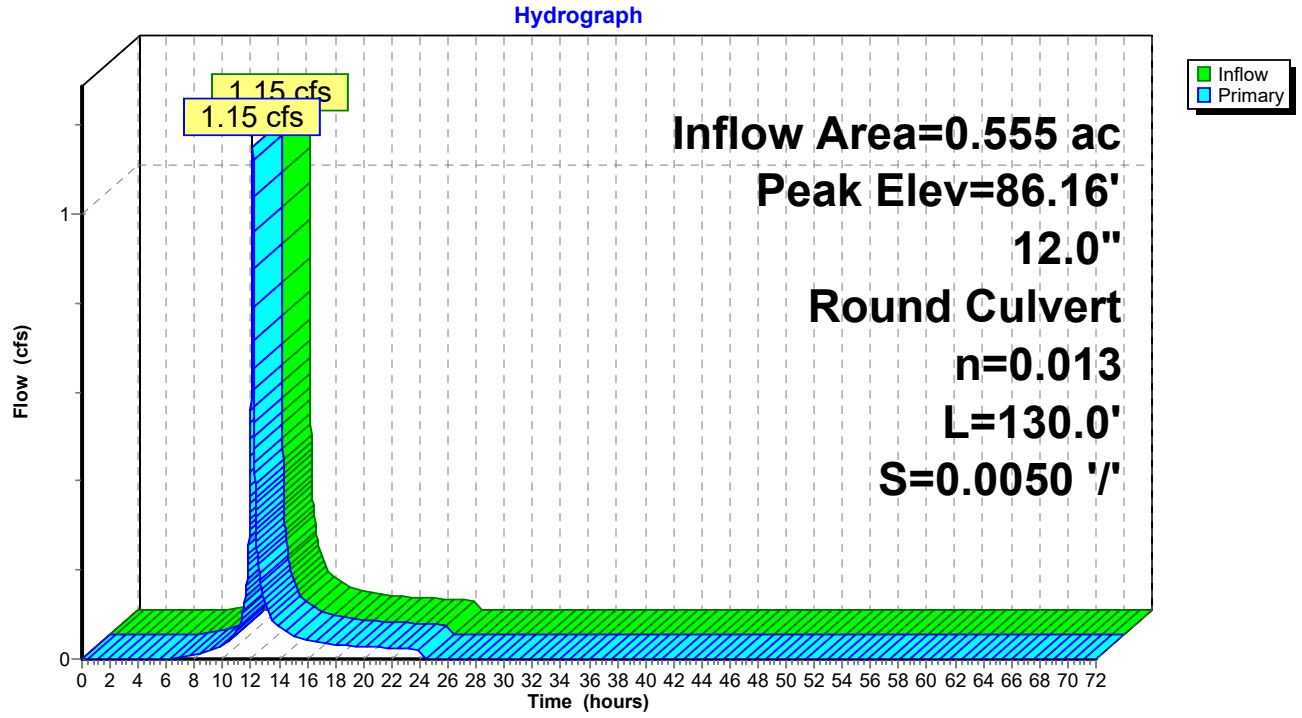
Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 1.87" for 2-Year event
Inflow = 1.15 cfs @ 12.13 hrs, Volume= 0.087 af
Outflow = 1.15 cfs @ 12.13 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min
Primary = 1.15 cfs @ 12.13 hrs, Volume= 0.087 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 86.16' @ 12.13 hrs
Flood Elev= 88.70'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.50' | **12.0" Round Culvert**<br>L= 130.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 85.50' / 84.85' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.15 cfs @ 12.13 hrs HW=86.16' (Free Discharge)
**1=Culvert** (Barrel Controls 1.15 cfs @ 2.96 fps)

## Pond 34P: CB 2



## Summary for Pond 35P: DMH 3

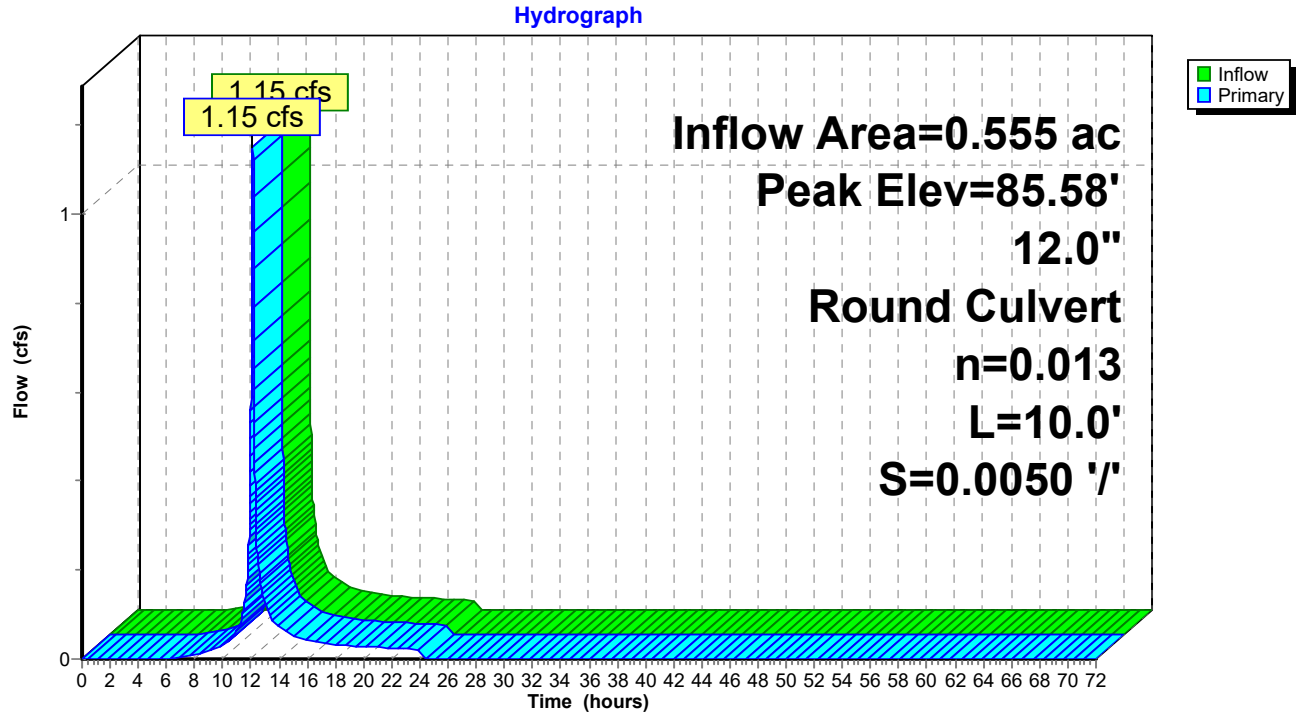
Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 1.87" for 2-Year event
Inflow = 1.15 cfs @ 12.13 hrs, Volume= 0.087 af
Outflow = 1.15 cfs @ 12.13 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min
Primary = 1.15 cfs @ 12.13 hrs, Volume= 0.087 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 85.58' @ 12.13 hrs
Flood Elev= 90.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 84.85' | **12.0" Round Culvert**<br>L= 10.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 84.85' / 84.80' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.15 cfs @ 12.13 hrs HW=85.58' (Free Discharge)
**1=Culvert** (Barrel Controls 1.15 cfs @ 2.61 fps)

### Pond 35P: DMH 3



## Summary for Pond 40P: DMH

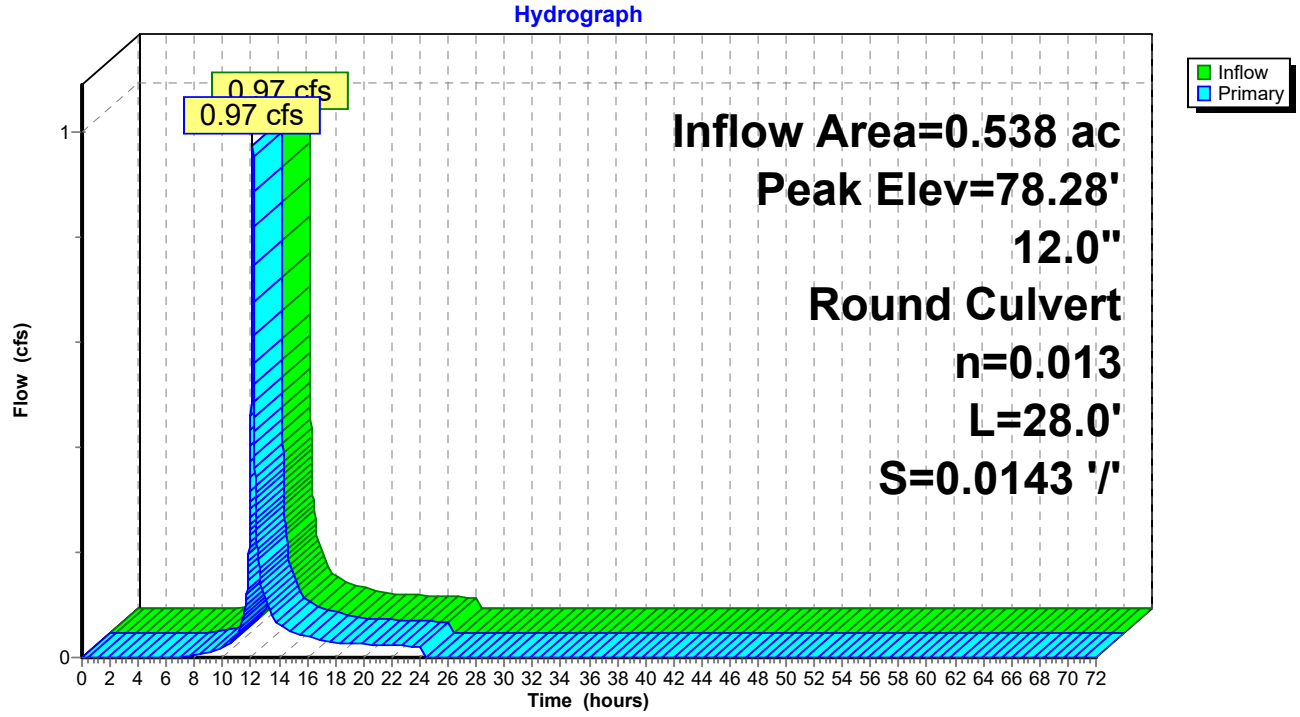
Inflow Area = 0.538 ac, 76.03% Impervious, Inflow Depth = 1.62" for 2-Year event
Inflow = 0.97 cfs @ 12.13 hrs, Volume= 0.073 af
Outflow = 0.97 cfs @ 12.13 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min
Primary = 0.97 cfs @ 12.13 hrs, Volume= 0.073 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 78.28' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.70' | **12.0" Round Culvert**<br>L= 28.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 77.70' / 77.30' S= 0.0143 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.97 cfs @ 12.13 hrs HW=78.28' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.97 cfs @ 2.05 fps)

## Pond 40P: DMH



## Summary for Pond 41P: DMH 2

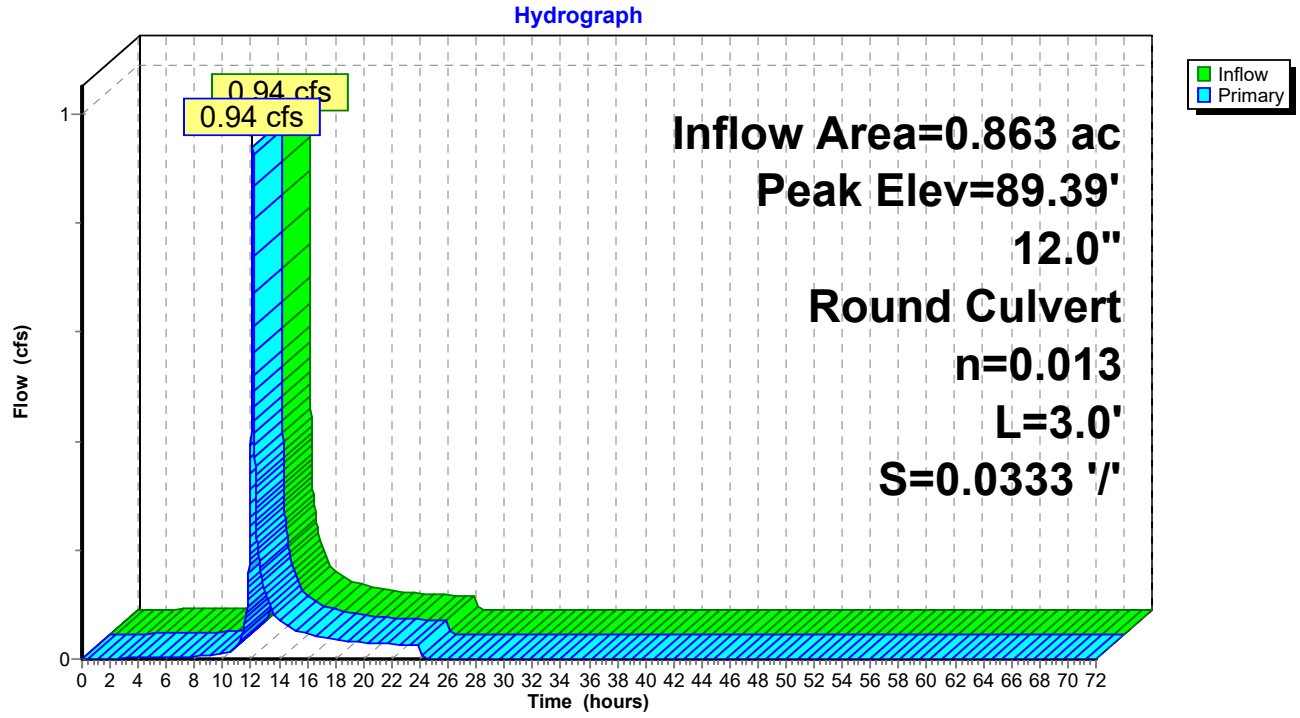
Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 1.04" for 2-Year event
Inflow = 0.94 cfs @ 12.14 hrs, Volume= 0.075 af
Outflow = 0.94 cfs @ 12.14 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.14 hrs, Volume= 0.075 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.39' @ 12.14 hrs
Flood Elev= 93.37'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 88.80' | **12.0" Round Culvert**<br>L= 3.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 88.80' / 88.70' S= 0.0333 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.93 cfs @ 12.14 hrs HW=89.39' (Free Discharge)
**1=Culvert** (Barrel Controls 0.93 cfs @ 2.81 fps)

### Pond 41P: DMH 2



## Summary for Pond 42P: Infiltration Area 2

Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 1.87" for 2-Year event
Inflow = 1.15 cfs @ 12.13 hrs, Volume= 0.087 af
Outflow = 0.33 cfs @ 12.34 hrs, Volume= 0.087 af, Atten= 71%, Lag= 12.4 min
Discarded = 0.33 cfs @ 12.34 hrs, Volume= 0.087 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 85.58' @ 12.34 hrs Surf.Area= 0.031 ac Storage= 0.013 af

Plug-Flow detention time= 8.2 min calculated for 0.087 af (100% of inflow)
Center-of-Mass det. time= 8.2 min ( 848.9 - 840.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 84.80' | 0.029 af | **25.25'W x 53.46'L x 3.50'H Field A**<br>0.108 af Overall - 0.037 af Embedded = 0.072 af x 40.0% Voids |
| #2A | 85.30' | 0.037 af | **ADS_StormTech SC-740 +Cap** x 35 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>35 Chambers in 5 Rows |
| | | 0.066 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 84.80' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 82.00' |
| #2 | Primary | 86.50' | **12.0" Round Culvert**<br>L= 125.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 86.50' / 85.25' S= 0.0100 '/' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Discarded OutFlow** Max=0.33 cfs @ 12.34 hrs HW=85.58' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.33 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=84.80' (Free Discharge)
↑**2=Culvert** ( Controls 0.00 cfs)

## Pond 42P: Infiltration Area 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 + 6.0" Spacing = 57.0" C-C Row Spacing

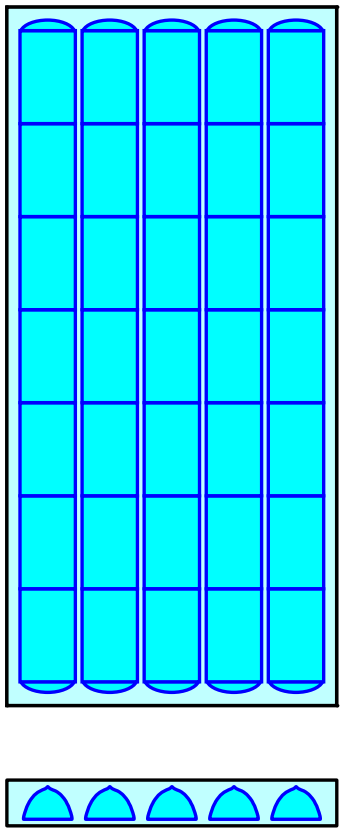
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

35 Chambers x 45.9 cf = 1,607.9 cf Chamber Storage

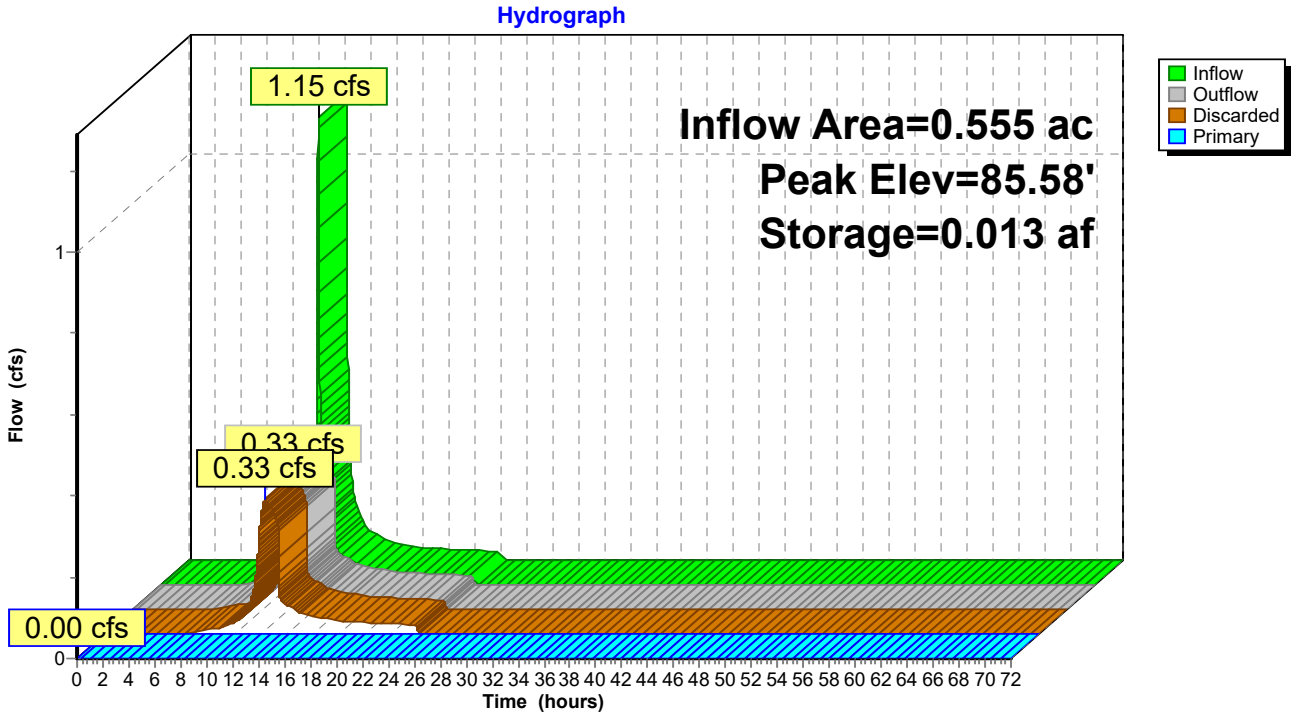
4,724.2 cf Field - 1,607.9 cf Chambers = 3,116.3 cf Stone x 40.0% Voids = 1,246.5 cf Stone Storage

Chamber Storage + Stone Storage = 2,854.4 cf = 0.066 af
Overall Storage Efficiency = 60.4%
Overall System Size = 53.46' x 25.25' x 3.50'

35 Chambers
175.0 cy Field
115.4 cy Stone



## Pond 42P: Infiltration Area 2

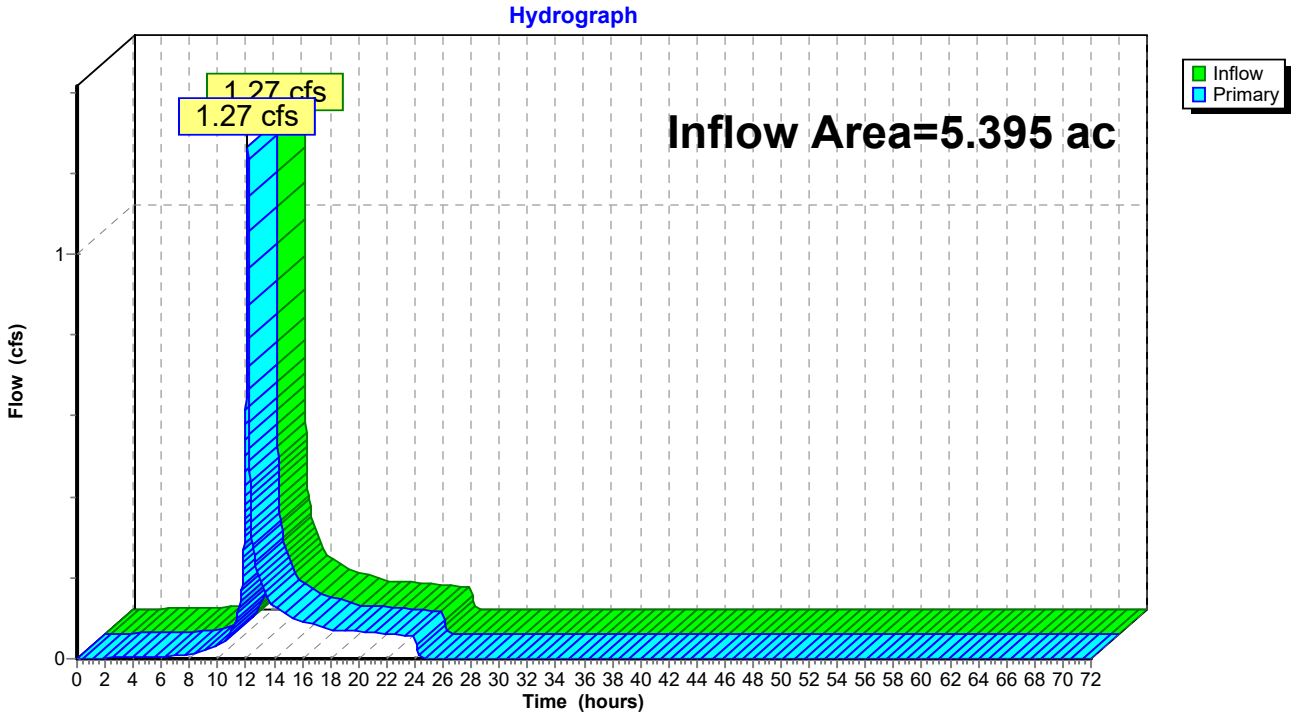


## Summary for Link 39L: RIVER

Inflow Area = 5.395 ac, 42.96% Impervious, Inflow Depth = 0.30" for 2-Year event
Inflow = 1.27 cfs @ 12.13 hrs, Volume= 0.137 af
Primary = 1.27 cfs @ 12.13 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

### Link 39L: RIVER



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 P1: P1** Runoff Area=145,292 sf 25.32% Impervious Runoff Depth=0.68"
Flow Length=698' Tc=11.6 min UI Adjusted CN=51 Runoff=1.31 cfs 0.188 af

**Subcatchment P2: P2** Runoff Area=34,941 sf 56.10% Impervious Runoff Depth=2.07"
Tc=6.0 min CN=72 Runoff=1.85 cfs 0.138 af

**Subcatchment P3: P3** Runoff Area=24,177 sf 81.00% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=87 Runoff=2.05 cfs 0.158 af

**Subcatchment P4: P4** Runoff Area=19,867 sf 76.45% Impervious Runoff Depth=3.12"
Tc=6.0 min CN=84 Runoff=1.56 cfs 0.118 af

**Subcatchment P5: P5** Runoff Area=4,524 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.45 cfs 0.040 af

**Subcatchment P6: P6** Runoff Area=3,568 sf 73.71% Impervious Runoff Depth=2.93"
Tc=6.0 min CN=82 Runoff=0.27 cfs 0.020 af

**Subcatchment P7: P7** Runoff Area=2,652 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=0.27 cfs 0.023 af

**Pond 1P: Infiltration Area 1** Peak Elev=89.58' Storage=0.033 af Inflow=2.11 cfs 0.162 af
Discarded=0.38 cfs 0.161 af Primary=0.02 cfs 0.001 af Outflow=0.40 cfs 0.162 af

**Pond 6P: CB 1** Peak Elev=92.55' Inflow=1.85 cfs 0.138 af
12.0" Round Culvert n=0.013 L=24.5' S=0.1041 '/' Outflow=1.85 cfs 0.138 af

**Pond 8: DMH 1** Peak Elev=90.06' Inflow=2.11 cfs 0.162 af
12.0" Round Culvert n=0.013 L=32.8' S=0.0052 '/' Outflow=2.11 cfs 0.162 af

**Pond 9: CB** Peak Elev=81.88' Inflow=1.56 cfs 0.118 af
12.0" Round Culvert n=0.013 L=23.0' S=0.0348 '/' Outflow=1.56 cfs 0.118 af

**Pond 9P: DMH 4** Peak Elev=85.24' Inflow=0.02 cfs 0.001 af
12.0" Round Culvert n=0.013 L=121.0' S=0.0050 '/' Outflow=0.02 cfs 0.001 af

**Pond 14P: CB** Peak Elev=79.26' Inflow=0.45 cfs 0.040 af
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=0.45 cfs 0.040 af

**Pond 16P: DMH** Peak Elev=79.28' Inflow=1.56 cfs 0.118 af
12.0" Round Culvert n=0.013 L=15.0' S=0.0467 '/' Outflow=1.56 cfs 0.118 af

**Pond 17P: CB** Peak Elev=83.44' Inflow=0.27 cfs 0.020 af
12.0" Round Culvert n=0.013 L=3.0' S=0.1667 '/' Outflow=0.27 cfs 0.020 af

**Pond 18P: DMH** Peak Elev=78.28' Inflow=2.28 cfs 0.178 af
12.0" Round Culvert n=0.013 L=40.7' S=0.0835 '/' Outflow=2.28 cfs 0.178 af

**Pond 34P: CB 2** Peak Elev=86.47' Inflow=2.05 cfs 0.158 af
12.0" Round Culvert n=0.013 L=130.0' S=0.0050 '/' Outflow=2.05 cfs 0.158 af

**Pond 35P: DMH 3** Peak Elev=85.90' Inflow=2.05 cfs 0.158 af
12.0" Round Culvert n=0.013 L=10.0' S=0.0050 '/' Outflow=2.05 cfs 0.158 af

**Pond 40P: DMH** Peak Elev=78.57' Inflow=1.83 cfs 0.138 af
12.0" Round Culvert n=0.013 L=28.0' S=0.0143 '/' Outflow=1.83 cfs 0.138 af

**Pond 41P: DMH 2** Peak Elev=89.80' Inflow=2.11 cfs 0.162 af
12.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=2.11 cfs 0.162 af

**Pond 42P: Infiltration Area 2** Peak Elev=86.41' Storage=0.033 af Inflow=2.05 cfs 0.158 af
Discarded=0.41 cfs 0.158 af Primary=0.00 cfs 0.000 af Outflow=0.41 cfs 0.158 af

**Link 39L: RIVER** Inflow=3.13 cfs 0.367 af
Primary=3.13 cfs 0.367 af

**Total Runoff Area = 5.395 ac Runoff Volume = 0.685 af Average Runoff Depth = 1.52"**
**57.04% Pervious = 3.077 ac 42.96% Impervious = 2.318 ac**

## Summary for Subcatchment P1: P1

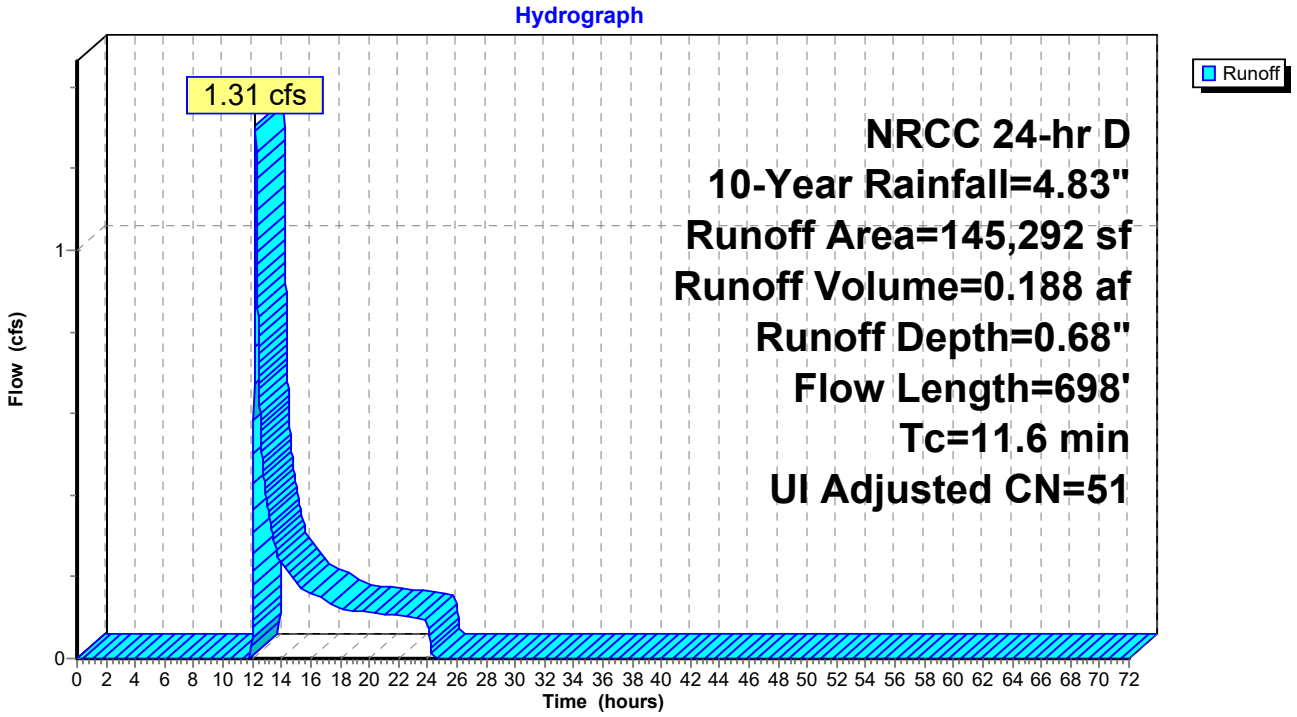
Runoff = 1.31 cfs @ 12.22 hrs, Volume= 0.188 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Adj | Description |
|---|---|---|---|
| 87,315 | 36 | | Woods, Fair, HSG A |
| 29,675 | 98 | | Roofs, HSG A |
| 2,420 | 98 | | Unconnected roofs, HSG A |
| 2,530 | 98 | | Paved parking, HSG A |
| 2,749 | 45 | | Woods, Poor, HSG A |
| 18,439 | 39 | | >75% Grass cover, Good, HSG A |
| 2,164 | 98 | | Unconnected pavement, HSG A |
| 145,292 | 52 | 51 | Weighted Average, UI Adjusted |
| 108,503 | | | 74.68% Pervious Area |
| 36,789 | | | 25.32% Impervious Area |
| 4,584 | | | 12.46% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.4 | 50 | 0.0750 | 0.11 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.4 | 46 | 0.0800 | 1.98 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 2.1 | 322 | 0.0300 | 2.60 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 0.8 | 132 | 0.0350 | 2.81 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 0.9 | 148 | 0.2800 | 2.65 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 11.6 | 698 | Total | | | |

## Subcatchment P1: P1



## Summary for Subcatchment P2: P2

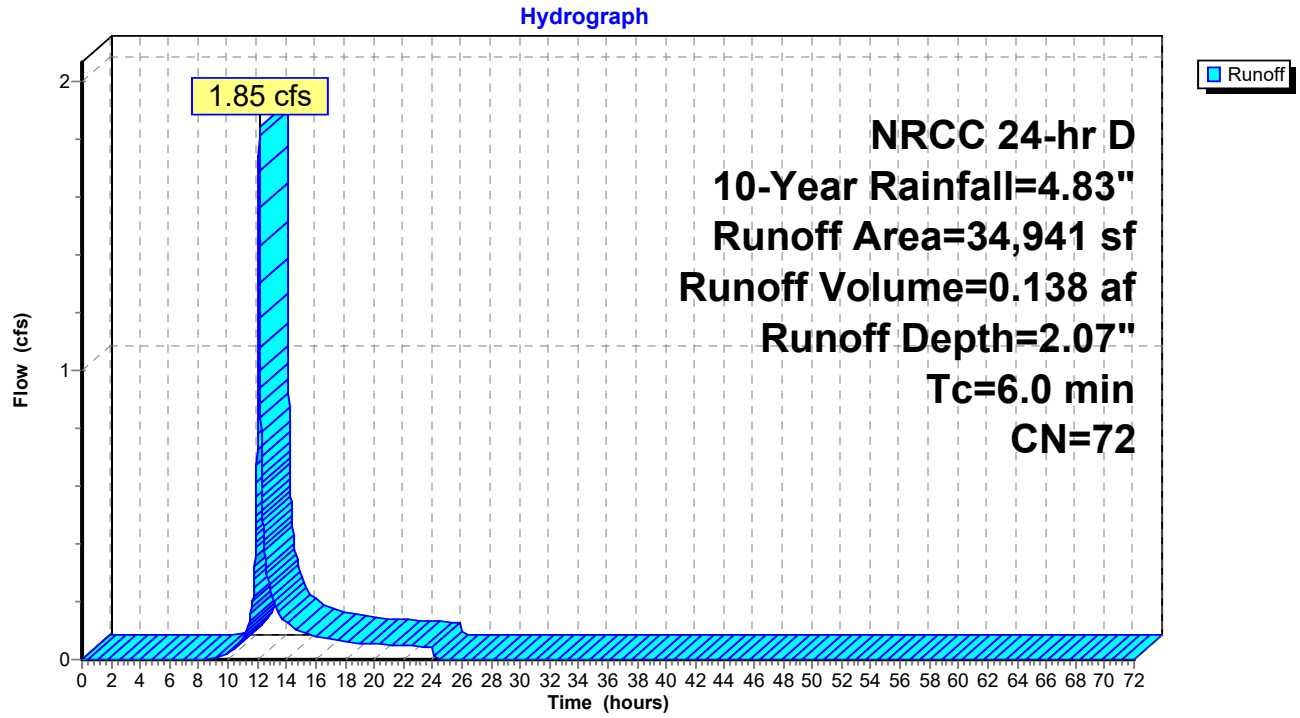
Runoff = 1.85 cfs @ 12.13 hrs, Volume= 0.138 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 19,603 | 98 | Paved parking, HSG A |
| 15,338 | 39 | >75% Grass cover, Good, HSG A |
| 34,941 | 72 | Weighted Average |
| 15,338 | | 43.90% Pervious Area |
| 19,603 | | 56.10% Impervious Area |

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

## Subcatchment P2: P2



## Summary for Subcatchment P3: P3

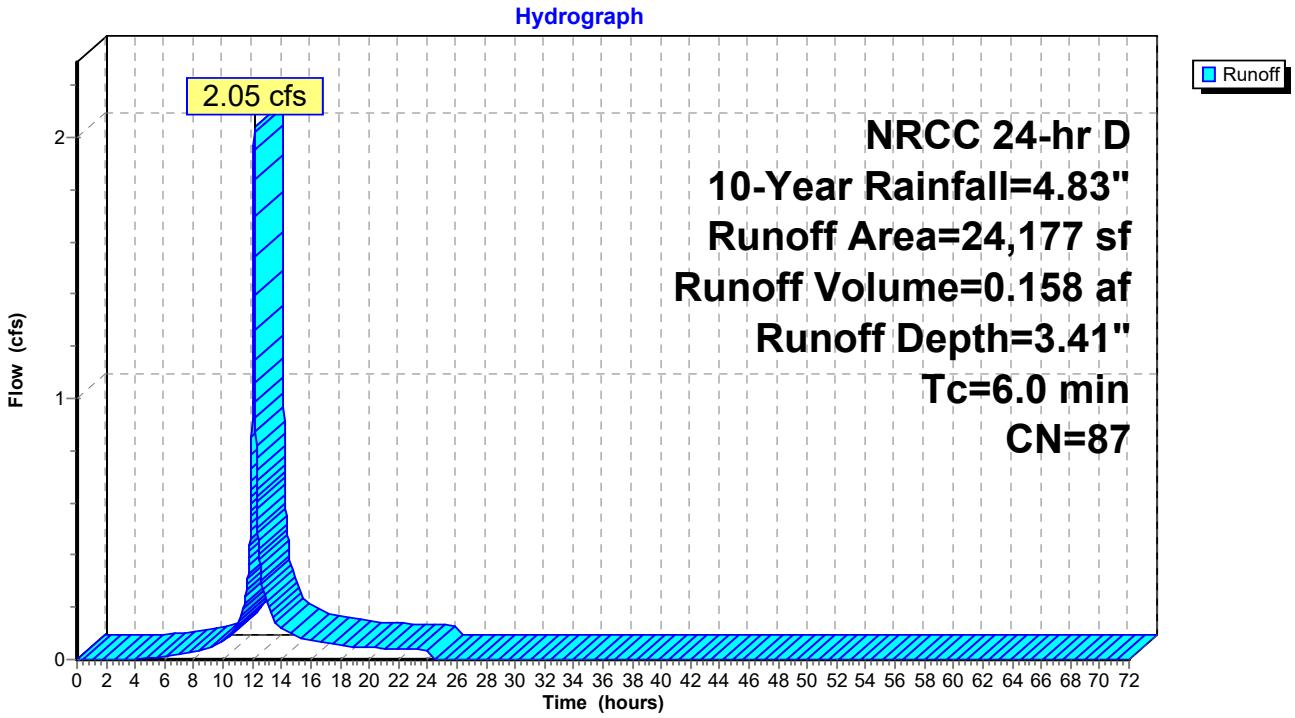
Runoff = 2.05 cfs @ 12.13 hrs, Volume= 0.158 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 19,583 | 98 | Paved parking, HSG A |
| 4,594 | 39 | >75% Grass cover, Good, HSG A |
| 24,177 | 87 | Weighted Average |
| 4,594 | | 19.00% Pervious Area |
| 19,583 | | 81.00% Impervious Area |

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

## Subcatchment P3: P3



## Summary for Subcatchment P4: P4

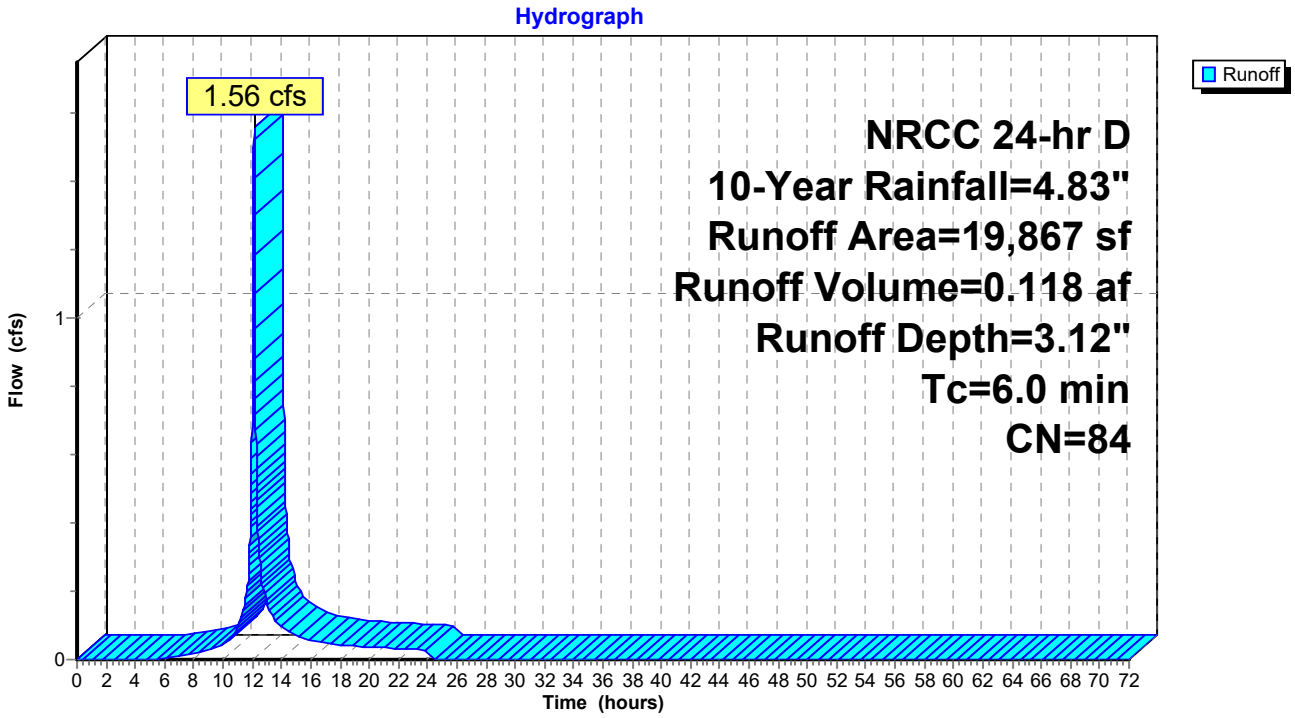
Runoff = 1.56 cfs @ 12.13 hrs, Volume= 0.118 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 15,188 | 98 | Paved parking, HSG A |
| 4,679 | 39 | >75% Grass cover, Good, HSG A |
| 19,867 | 84 | Weighted Average |
| 4,679 | | 23.55% Pervious Area |
| 15,188 | | 76.45% Impervious Area |

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

## Subcatchment P4: P4



## Summary for Subcatchment P5: P5

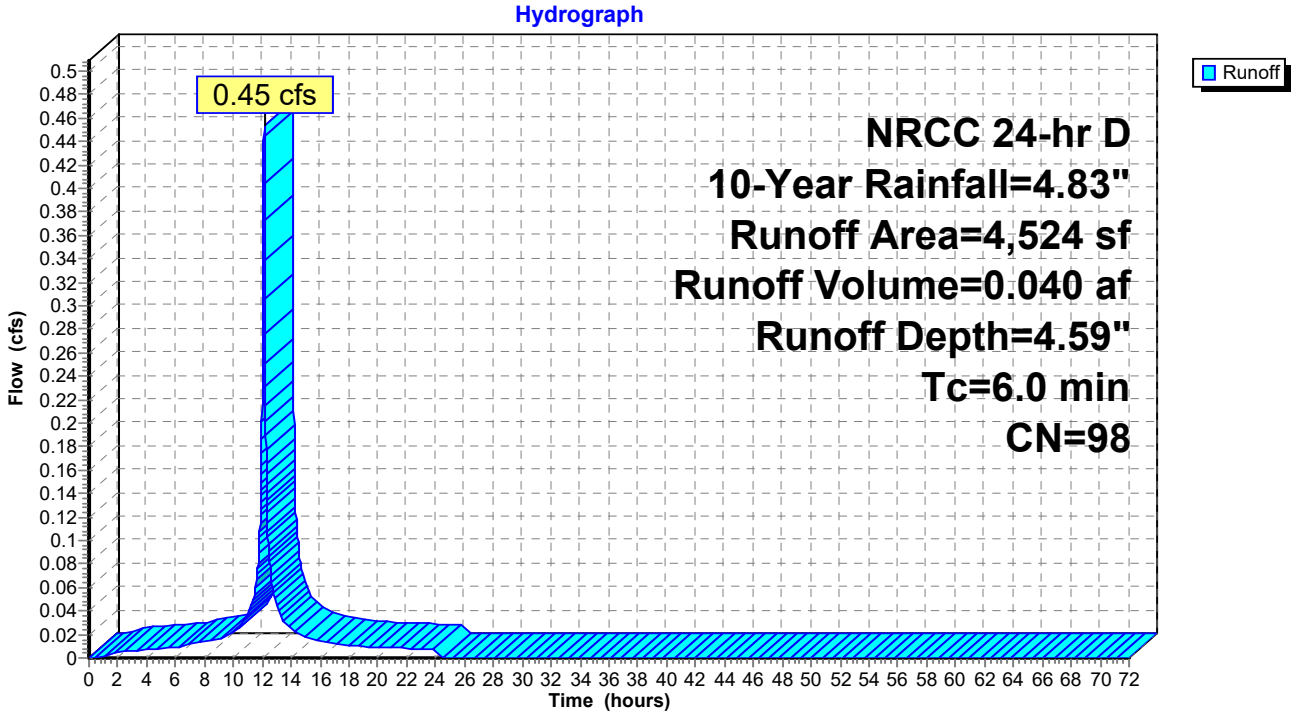
Runoff = 0.45 cfs @ 12.13 hrs, Volume= 0.040 af, Depth= 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 4,524 | 98 | Paved parking, HSG A |
| 4,524 | | 100.00% Impervious Area |

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

## Subcatchment P5: P5



## Summary for Subcatchment P6: P6

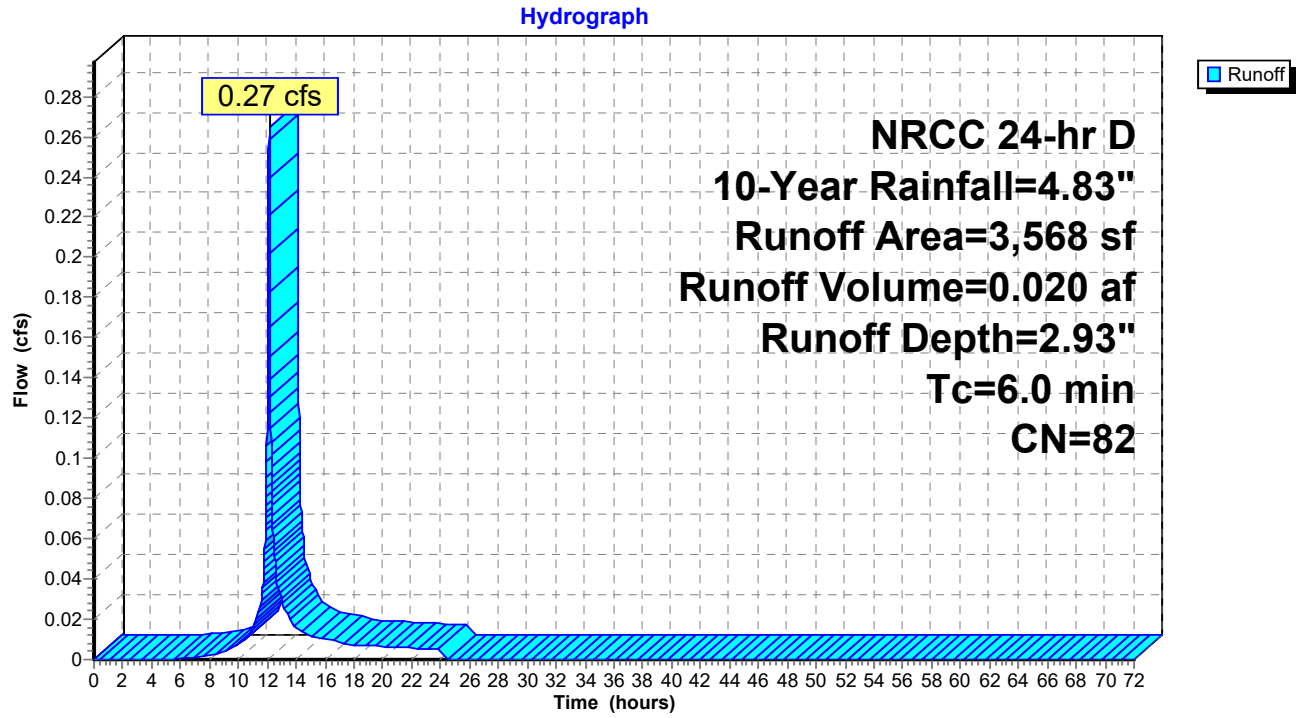
Runoff = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 2,630 | 98 | Paved parking, HSG A |
| 938 | 39 | >75% Grass cover, Good, HSG A |
| 3,568 | 82 | Weighted Average |
| 938 | | 26.29% Pervious Area |
| 2,630 | | 73.71% Impervious Area |

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

## Subcatchment P6: P6



## Summary for Subcatchment P7: P7

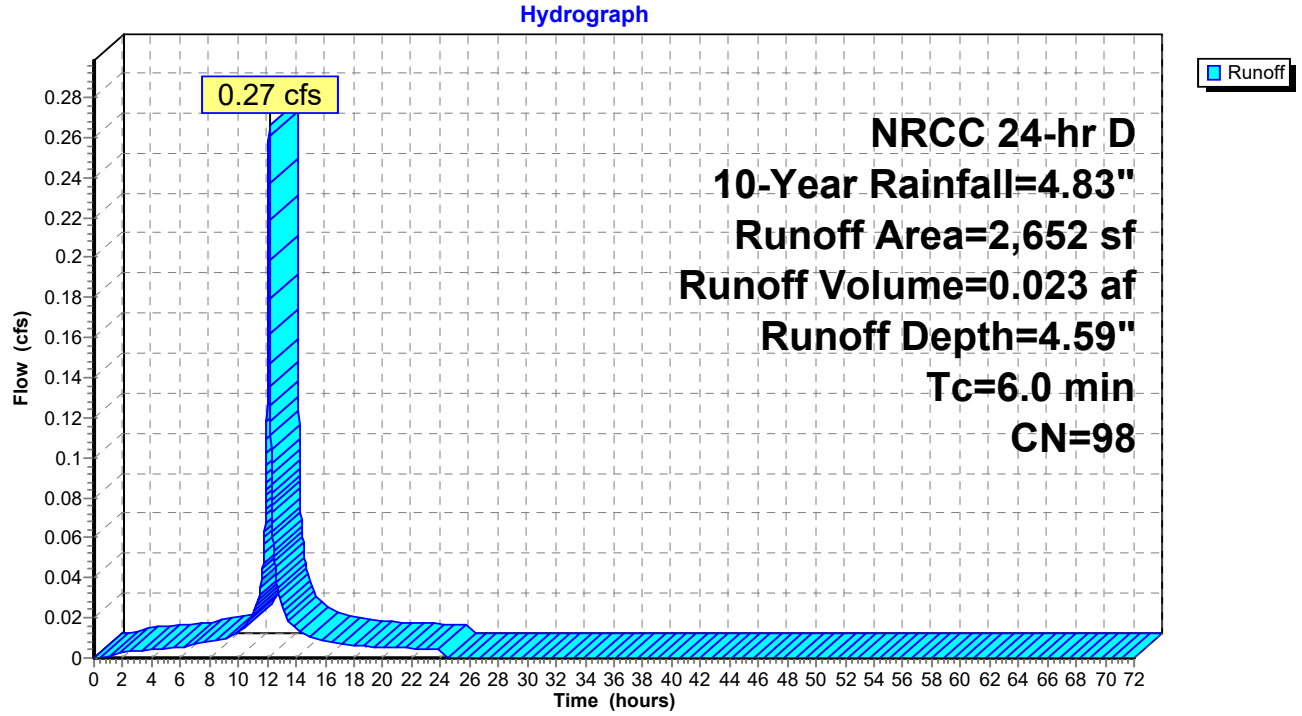
Runoff = 0.27 cfs @ 12.13 hrs, Volume= 0.023 af, Depth= 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 2,652 | 98 | Roofs, HSG A |
| 2,652 | | 100.00% Impervious Area |

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

## Subcatchment P7: P7



## Summary for Pond 1P: Infiltration Area 1

Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 2.25" for 10-Year event
Inflow = 2.11 cfs @ 12.13 hrs, Volume= 0.162 af
Outflow = 0.40 cfs @ 12.56 hrs, Volume= 0.162 af, Atten= 81%, Lag= 25.4 min
Discarded = 0.38 cfs @ 12.56 hrs, Volume= 0.161 af
Primary = 0.02 cfs @ 12.56 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.58' @ 12.56 hrs Surf.Area= 0.037 ac Storage= 0.033 af

Plug-Flow detention time= 22.6 min calculated for 0.162 af (100% of inflow)
Center-of-Mass det. time= 22.6 min ( 877.6 - 855.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 88.20' | 0.034 af | **30.00'W x 53.46'L x 3.50'H Field A**<br>0.129 af Overall - 0.044 af Embedded = 0.085 af x 40.0% Voids |
| #2A | 88.70' | 0.044 af | **ADS_StormTech SC-740 +Cap** x 42 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>42 Chambers in 6 Rows |
| | | 0.078 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 88.20' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 82.00' |
| #2 | Primary | 89.50' | **12.0" Round Culvert**<br>L= 36.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.50' / 85.25' S= 0.1181 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |

**Discarded OutFlow** Max=0.38 cfs @ 12.56 hrs HW=89.58' (Free Discharge)
↑**1=Exfiltration** ( Controls 0.38 cfs)

**Primary OutFlow** Max=0.02 cfs @ 12.56 hrs HW=89.58' (Free Discharge)
↑**2=Culvert** (Inlet Controls 0.02 cfs @ 0.77 fps)

## Pond 1P: Infiltration Area 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

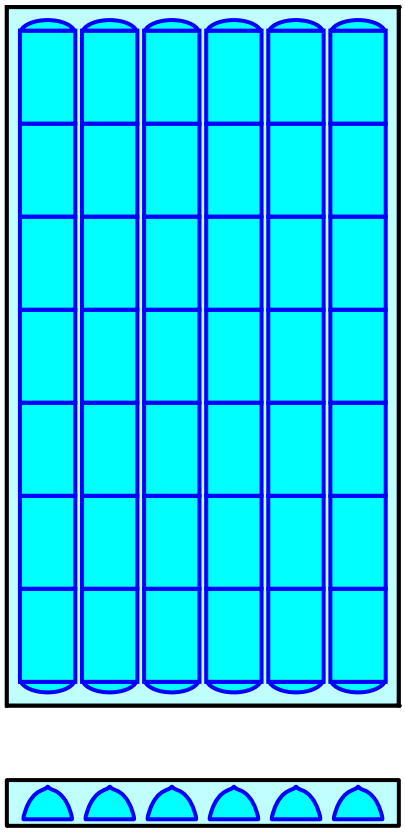
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

42 Chambers x 45.9 cf = 1,929.5 cf Chamber Storage

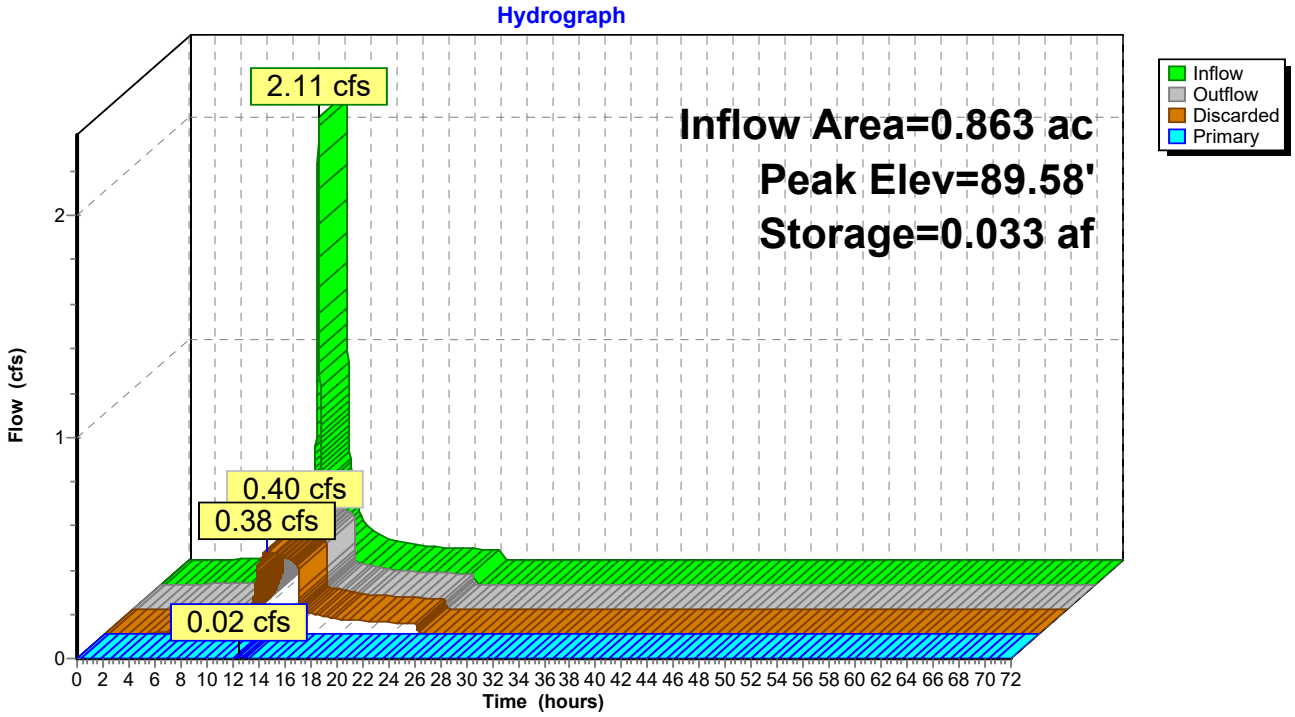
5,613.0 cf Field - 1,929.5 cf Chambers = 3,683.5 cf Stone x 40.0% Voids = 1,473.4 cf Stone Storage

Chamber Storage + Stone Storage = 3,402.9 cf = 0.078 af
Overall Storage Efficiency = 60.6%
Overall System Size = 53.46' x 30.00' x 3.50'

42 Chambers
207.9 cy Field
136.4 cy Stone



## Pond 1P: Infiltration Area 1



## Summary for Pond 6P: CB 1

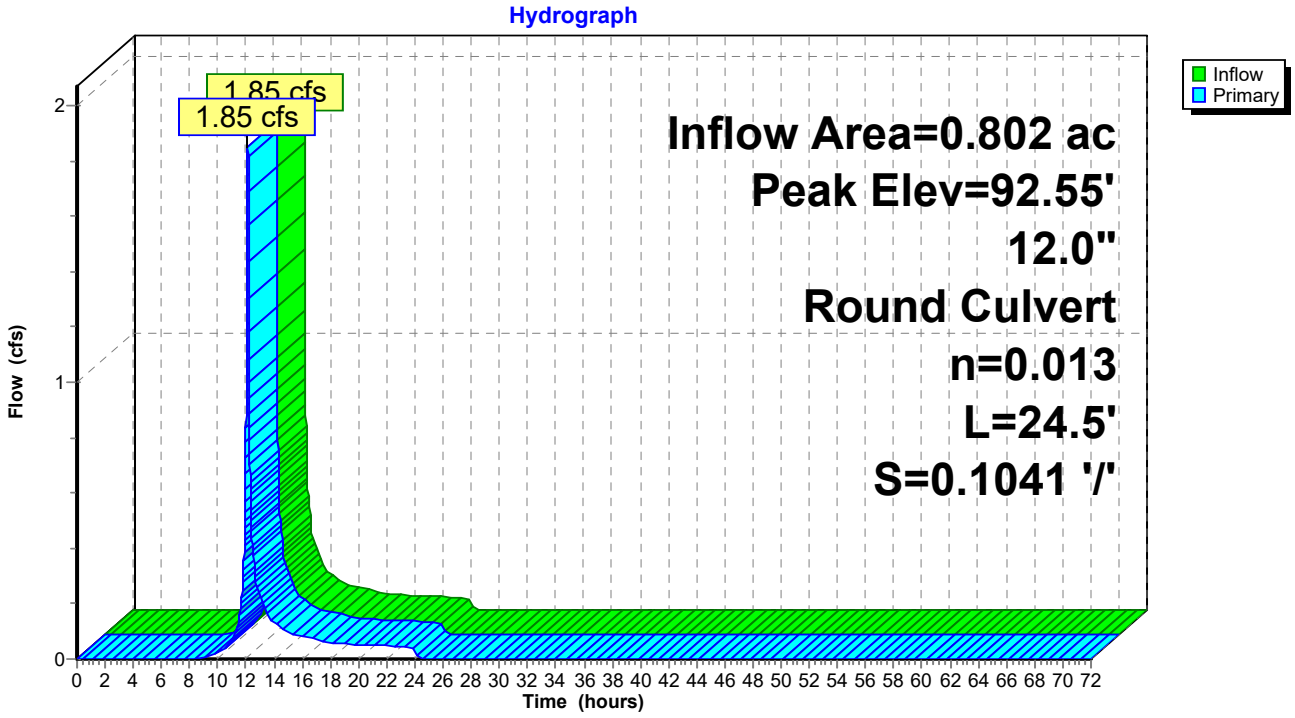
Inflow Area = 0.802 ac, 56.10% Impervious, Inflow Depth = 2.07" for 10-Year event
Inflow = 1.85 cfs @ 12.13 hrs, Volume= 0.138 af
Outflow = 1.85 cfs @ 12.13 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.85 cfs @ 12.13 hrs, Volume= 0.138 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 92.55' @ 12.13 hrs
Flood Elev= 95.67'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 91.67' | **12.0" Round Culvert**<br>L= 24.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 91.67' / 89.12' S= 0.1041 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.84 cfs @ 12.13 hrs HW=92.55' (Free Discharge)
**1=Culvert** (Inlet Controls 1.84 cfs @ 2.52 fps)

## Pond 6P: CB 1



## Summary for Pond 8: DMH 1

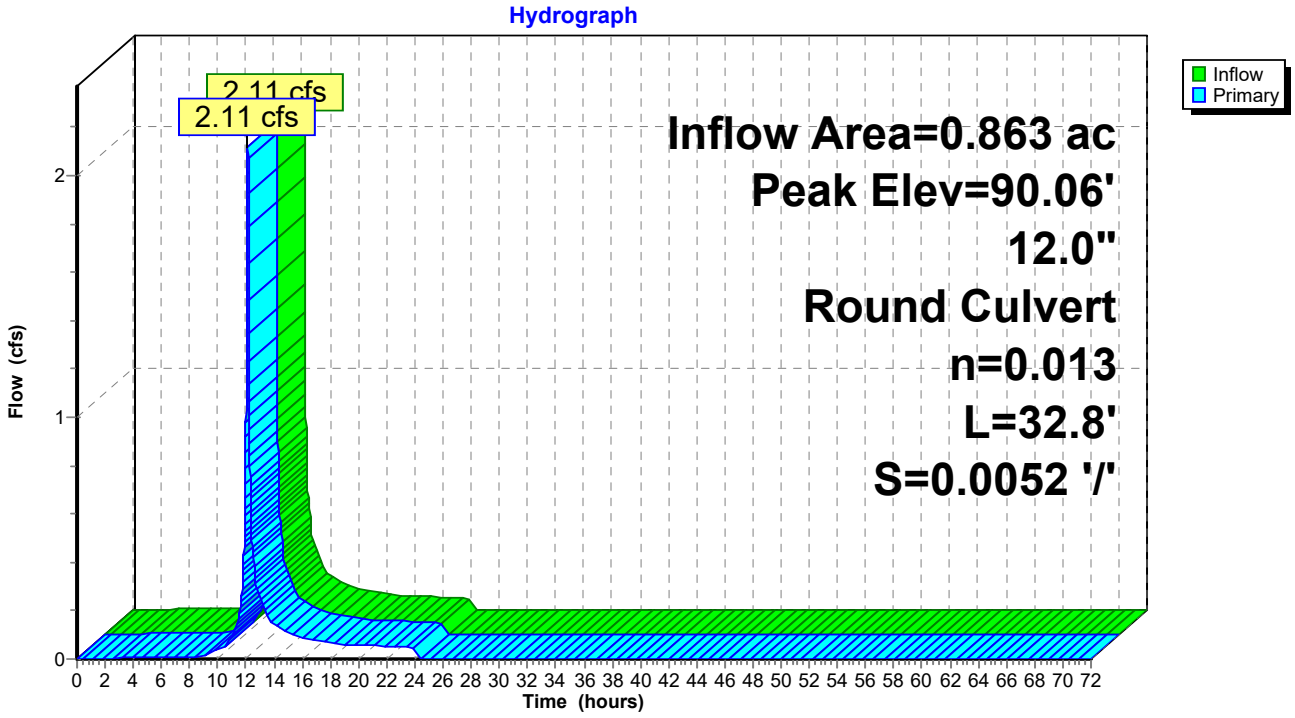
Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 2.25" for 10-Year event
Inflow = 2.11 cfs @ 12.13 hrs, Volume= 0.162 af
Outflow = 2.11 cfs @ 12.13 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min
Primary = 2.11 cfs @ 12.13 hrs, Volume= 0.162 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 90.06' @ 12.13 hrs
Flood Elev= 94.46'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 89.02' | **12.0" Round Culvert**<br>L= 32.8' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.02' / 88.85' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.11 cfs @ 12.13 hrs HW=90.06' (Free Discharge)
**1=Culvert** (Barrel Controls 2.11 cfs @ 3.21 fps)

## Pond 8: DMH 1



## Summary for Pond 9: CB

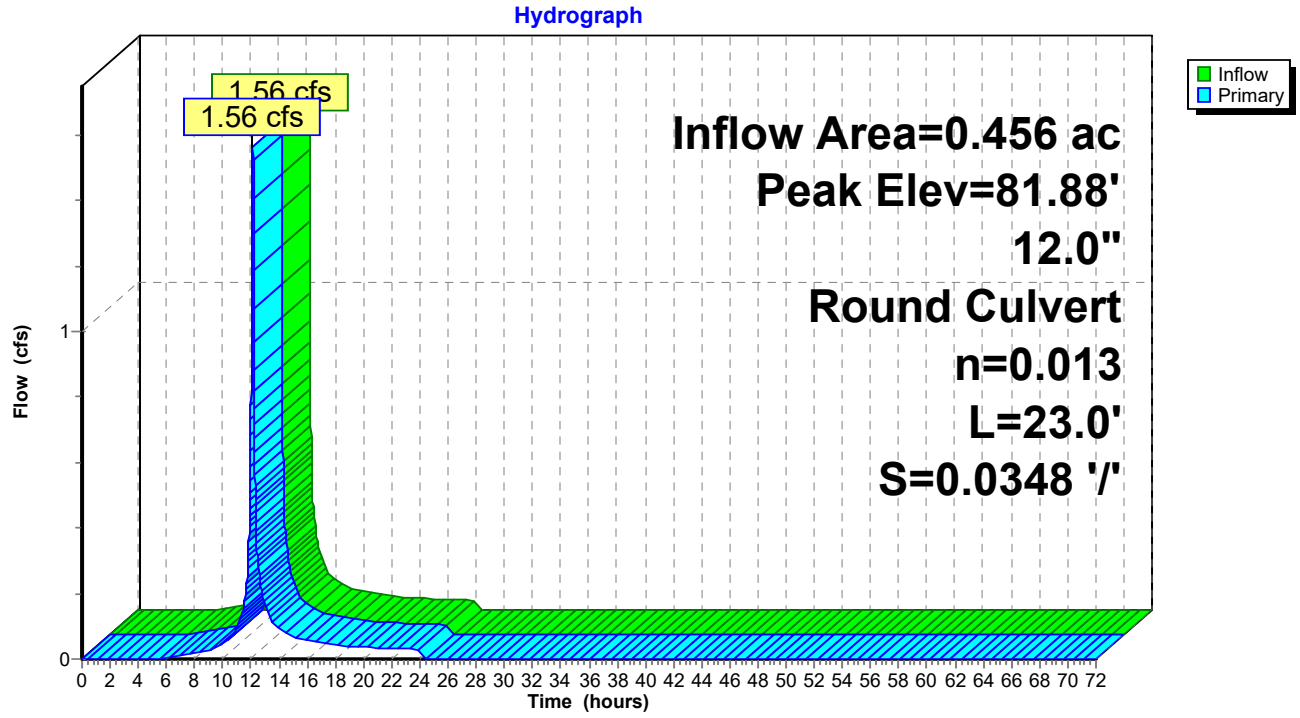
Inflow Area = 0.456 ac, 76.45% Impervious, Inflow Depth = 3.12" for 10-Year event
Inflow = 1.56 cfs @ 12.13 hrs, Volume= 0.118 af
Outflow = 1.56 cfs @ 12.13 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min
Primary = 1.56 cfs @ 12.13 hrs, Volume= 0.118 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 81.88' @ 12.13 hrs
Flood Elev= 93.35'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 81.10' | **12.0" Round Culvert**<br>L= 23.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 81.10' / 80.30' S= 0.0348 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.56 cfs @ 12.13 hrs HW=81.88' (Free Discharge)
**1=Culvert** (Inlet Controls 1.56 cfs @ 2.37 fps)

## Pond 9: CB



## Summary for Pond 9P: DMH 4

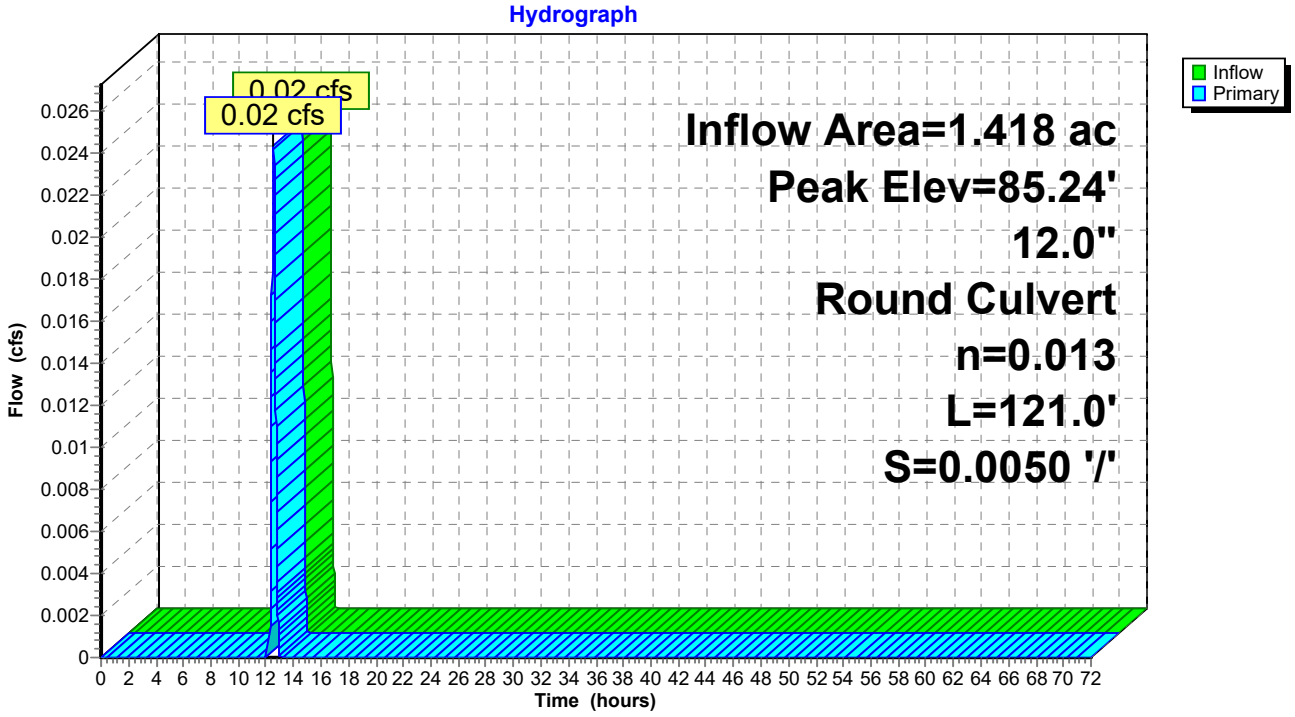
Inflow Area = 1.418 ac, 67.73% Impervious, Inflow Depth = 0.01" for 10-Year event
Inflow = 0.02 cfs @ 12.56 hrs, Volume= 0.001 af
Outflow = 0.02 cfs @ 12.56 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 12.56 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 85.24' @ 12.56 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.15' | **12.0" Round Culvert**<br>L= 121.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 85.15' / 84.54' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.02 cfs @ 12.56 hrs HW=85.24' (Free Discharge)
**1=Culvert** (Barrel Controls 0.02 cfs @ 1.02 fps)

### Pond 9P: DMH 4



## Summary for Pond 14P: CB

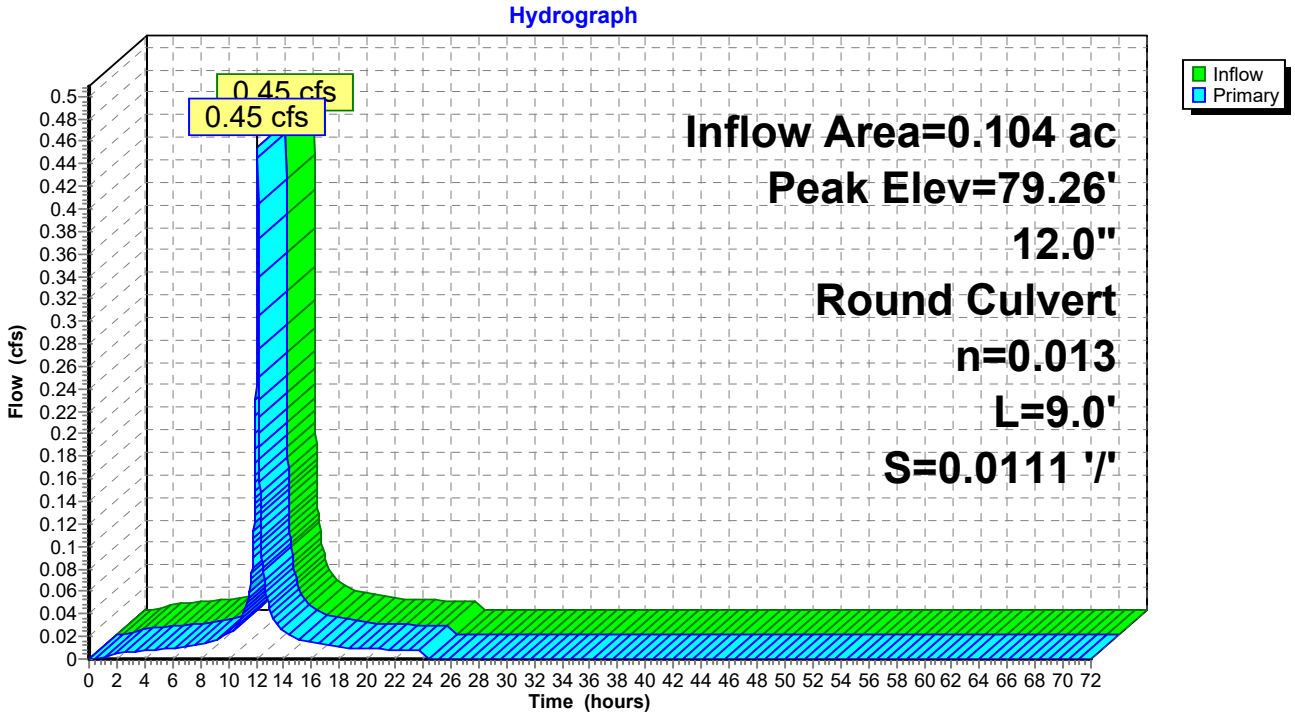
Inflow Area = 0.104 ac,100.00% Impervious, Inflow Depth = 4.59" for 10-Year event
Inflow = 0.45 cfs @ 12.13 hrs, Volume= 0.040 af
Outflow = 0.45 cfs @ 12.13 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 0.45 cfs @ 12.13 hrs, Volume= 0.040 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.26' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 79.00' | **12.0" Round Culvert**<br>L= 9.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 79.00' / 78.90' S= 0.0111 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.21 cfs @ 12.13 hrs HW=79.26' (Free Discharge)
**1=Culvert** (Barrel Controls 0.21 cfs @ 1.99 fps)

## Pond 14P: CB



## Summary for Pond 16P: DMH

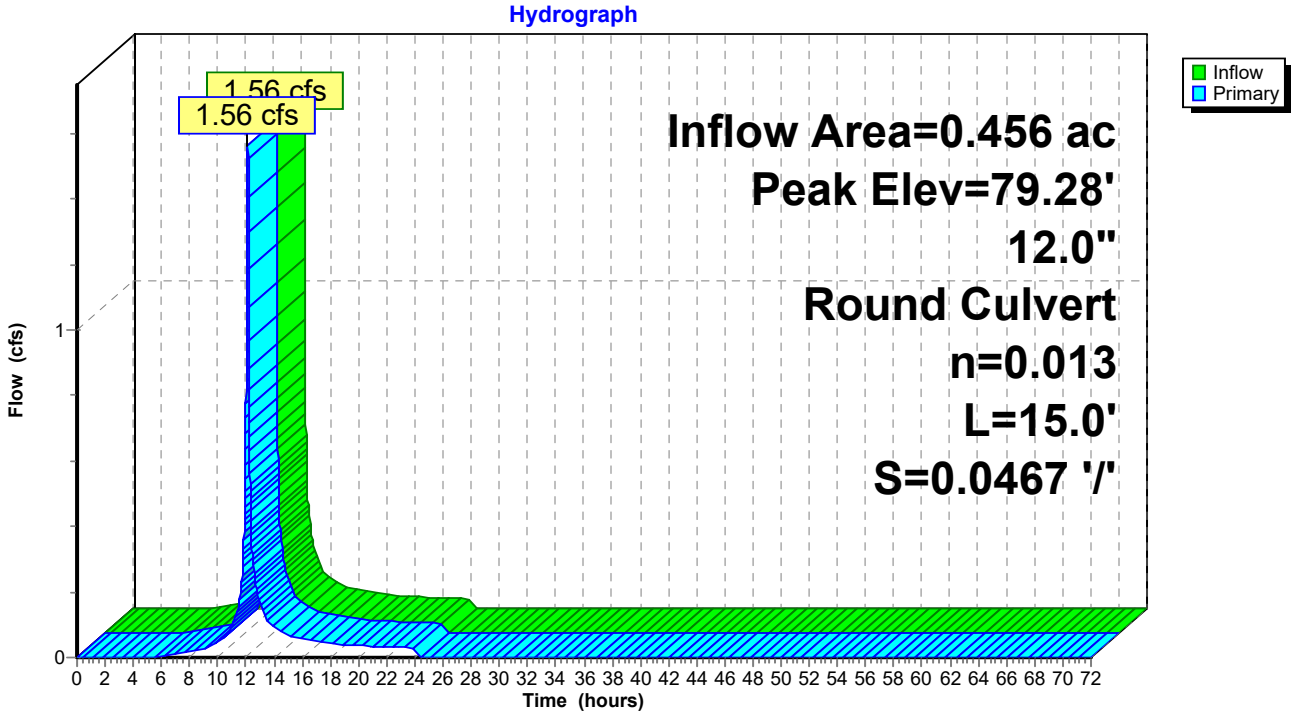
Inflow Area = 0.456 ac, 76.45% Impervious, Inflow Depth = 3.12" for 10-Year event
Inflow = 1.56 cfs @ 12.13 hrs, Volume= 0.118 af
Outflow = 1.56 cfs @ 12.13 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min
Primary = 1.56 cfs @ 12.13 hrs, Volume= 0.118 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.28' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 78.50' | **12.0" Round Culvert**<br>L= 15.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 78.50' / 77.80' S= 0.0467 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.56 cfs @ 12.13 hrs HW=79.28' (Free Discharge)
**1=Culvert** (Inlet Controls 1.56 cfs @ 2.37 fps)

## Pond 16P: DMH



## Summary for Pond 17P: CB

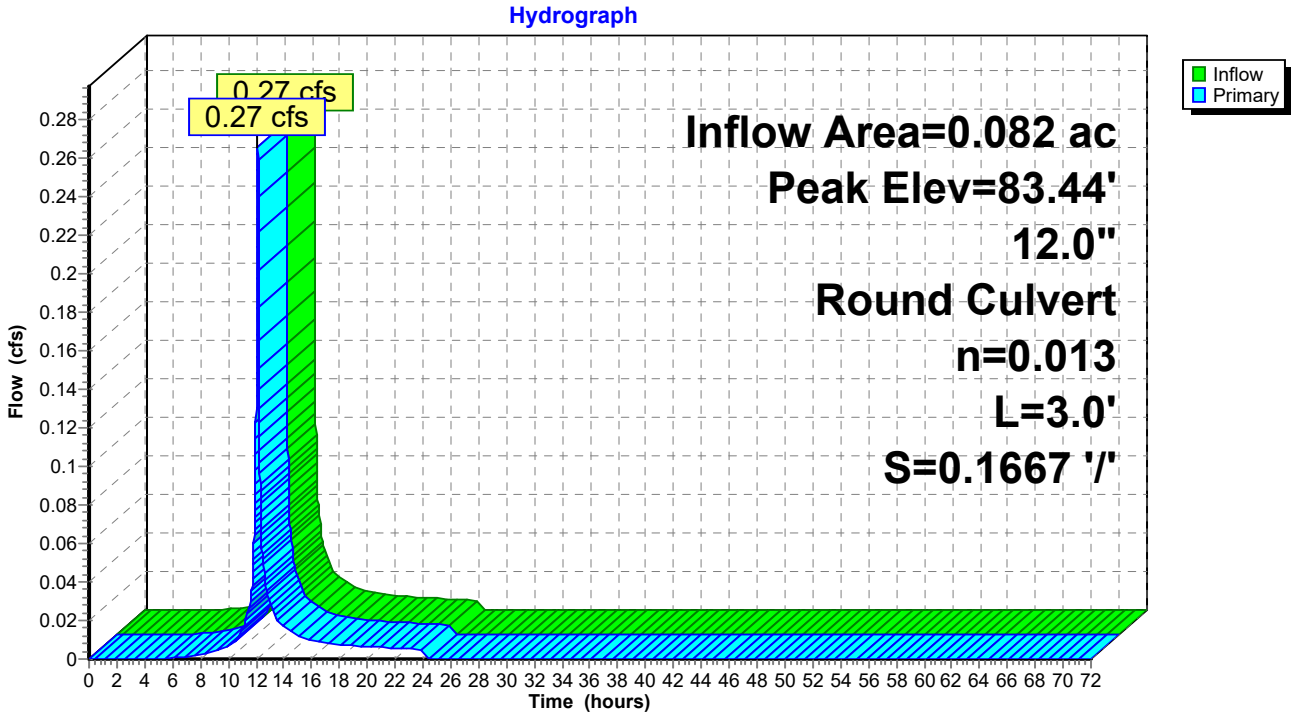
Inflow Area = 0.082 ac, 73.71% Impervious, Inflow Depth = 2.93" for 10-Year event
Inflow = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af
Outflow = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.13 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 83.44' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 83.30' | **12.0" Round Culvert**<br>L= 3.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 83.30' / 82.80' S= 0.1667 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.07 cfs @ 12.13 hrs HW=83.44' (Free Discharge)
**1=Culvert** (Inlet Controls 0.07 cfs @ 1.01 fps)

## Pond 17P: CB



## Summary for Pond 18P: DMH

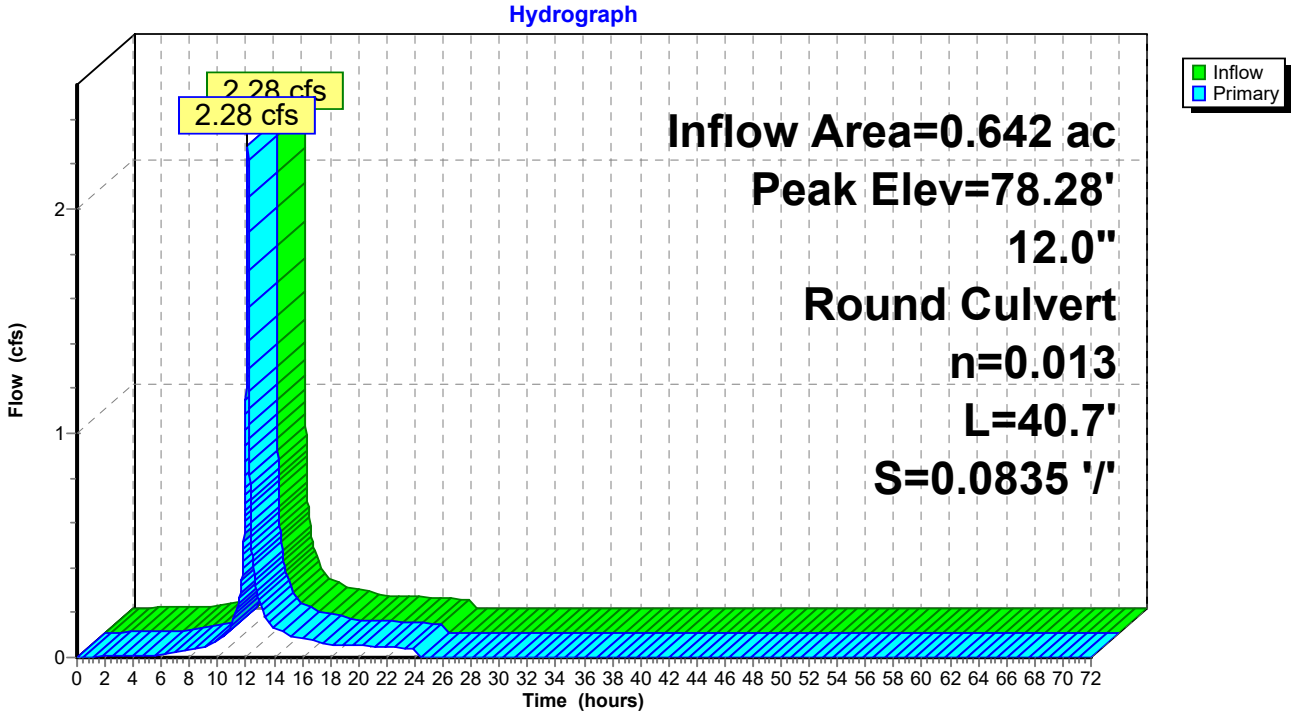
Inflow Area = 0.642 ac, 79.91% Impervious, Inflow Depth = 3.33" for 10-Year event
Inflow = 2.28 cfs @ 12.13 hrs, Volume= 0.178 af
Outflow = 2.28 cfs @ 12.13 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min
Primary = 2.28 cfs @ 12.13 hrs, Volume= 0.178 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 78.28' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.20' | **12.0" Round Culvert**<br>L= 40.7' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 77.20' / 73.80' S= 0.0835 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.28 cfs @ 12.13 hrs HW=78.28' (Free Discharge)
**1=Culvert** (Inlet Controls 2.28 cfs @ 2.90 fps)

### Pond 18P: DMH



## Summary for Pond 34P: CB 2

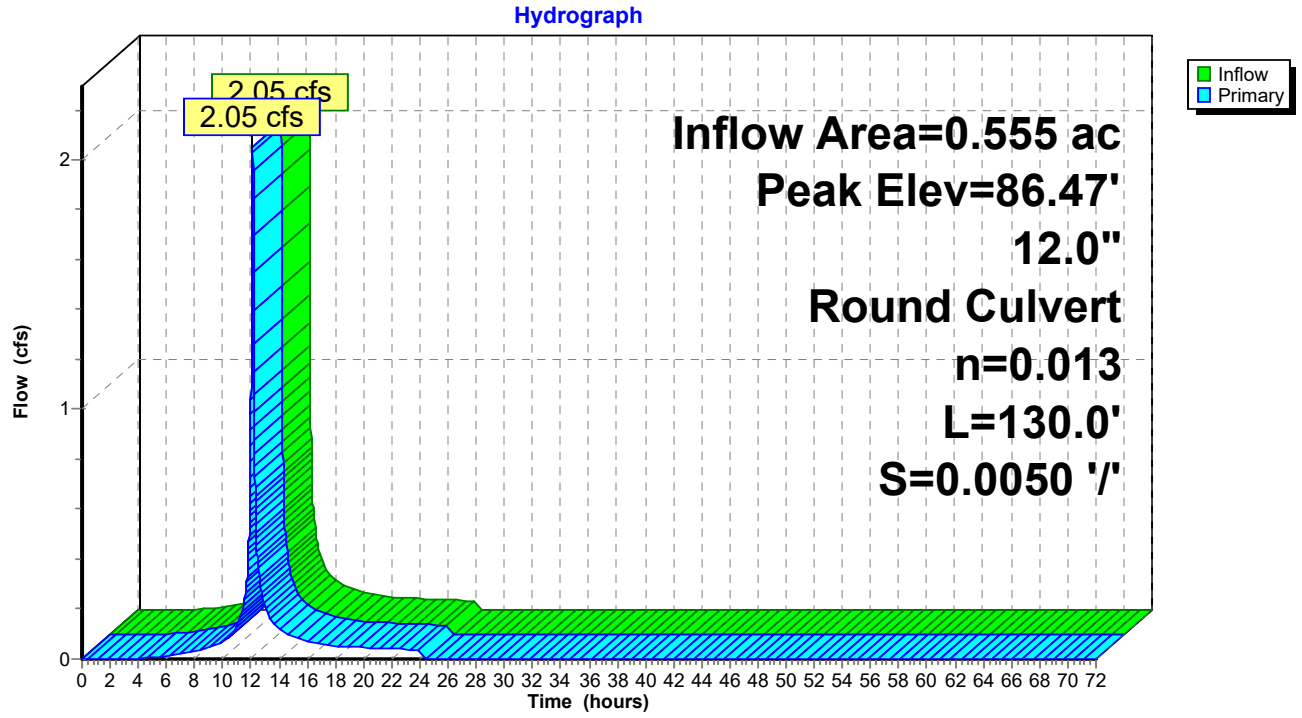
Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 3.41" for 10-Year event
Inflow = 2.05 cfs @ 12.13 hrs, Volume= 0.158 af
Outflow = 2.05 cfs @ 12.13 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min
Primary = 2.05 cfs @ 12.13 hrs, Volume= 0.158 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 86.47' @ 12.13 hrs
Flood Elev= 88.70'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.50' | **12.0" Round Culvert**<br>L= 130.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 85.50' / 84.85' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.05 cfs @ 12.13 hrs HW=86.47' (Free Discharge)
**1=Culvert** (Barrel Controls 2.05 cfs @ 3.35 fps)

### Pond 34P: CB 2



## Summary for Pond 35P: DMH 3

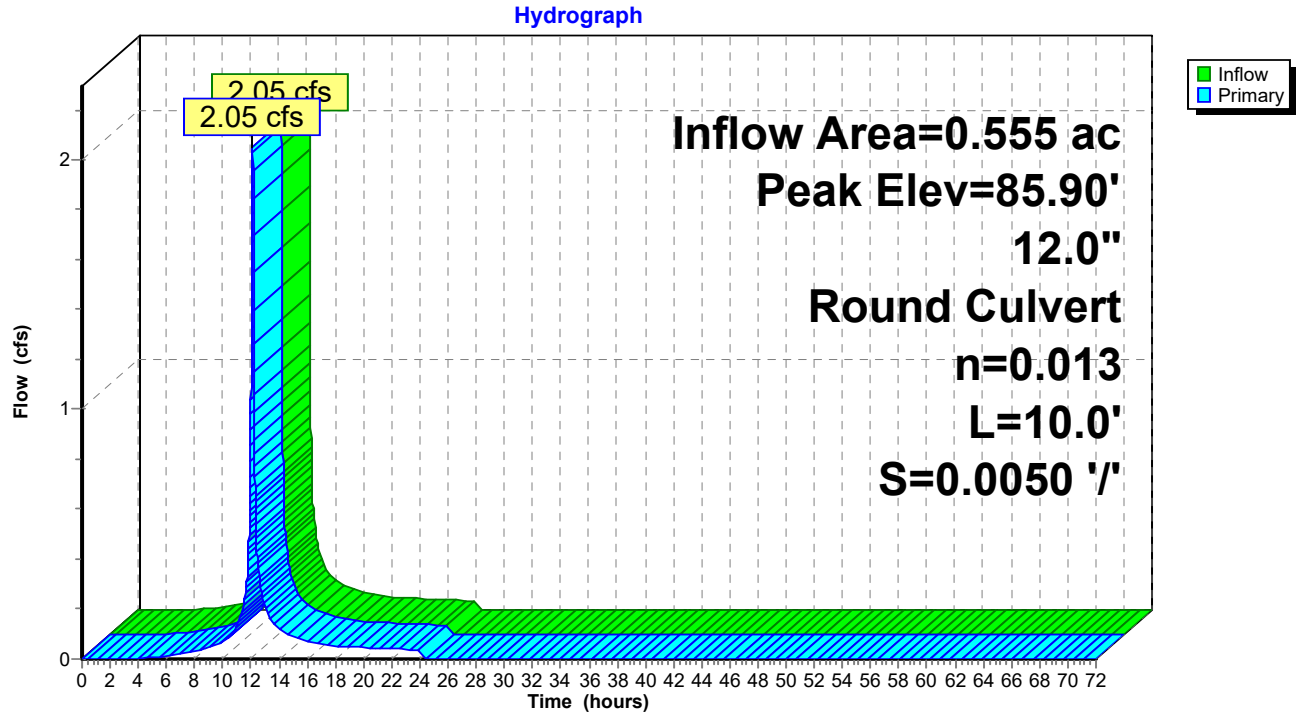
Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 3.41" for 10-Year event
Inflow = 2.05 cfs @ 12.13 hrs, Volume= 0.158 af
Outflow = 2.05 cfs @ 12.13 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min
Primary = 2.05 cfs @ 12.13 hrs, Volume= 0.158 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 85.90' @ 12.13 hrs
Flood Elev= 90.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 84.85' | **12.0" Round Culvert**<br>L= 10.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 84.85' / 84.80' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.05 cfs @ 12.13 hrs HW=85.90' (Free Discharge)
**1=Culvert** (Barrel Controls 2.05 cfs @ 3.07 fps)

### Pond 35P: DMH 3



## Summary for Pond 40P: DMH

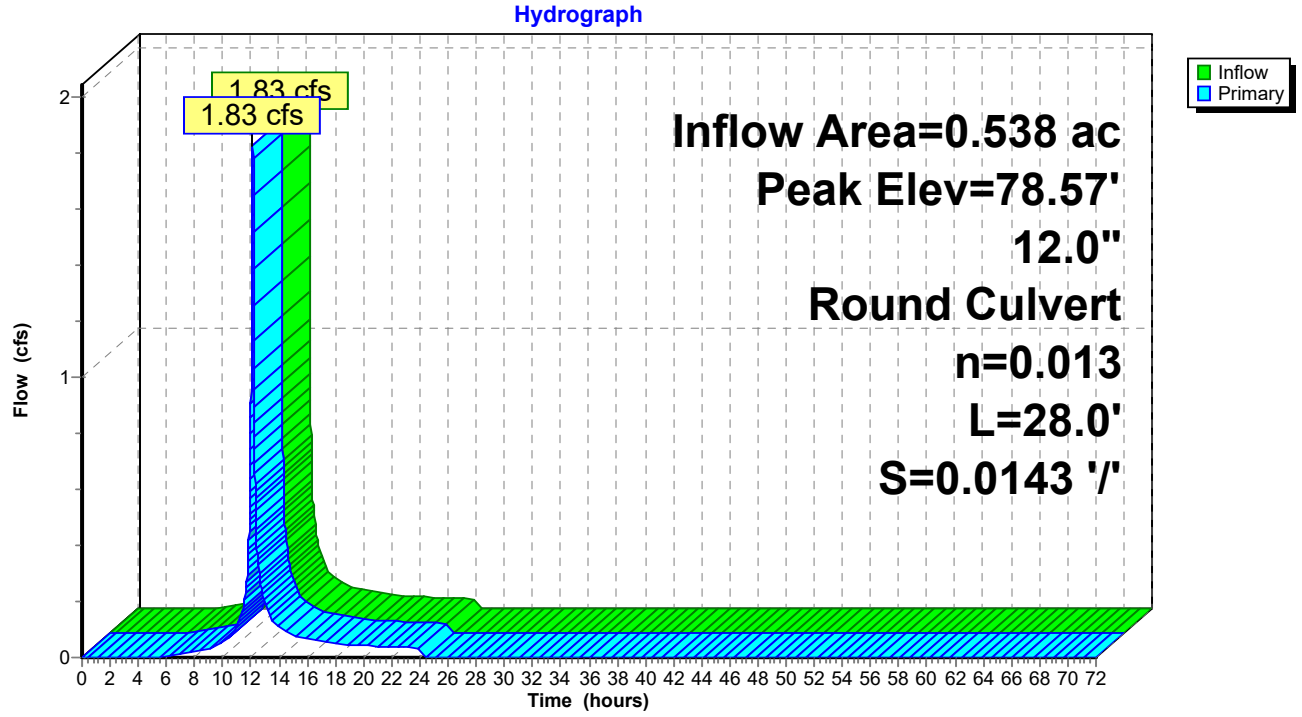
Inflow Area = 0.538 ac, 76.03% Impervious, Inflow Depth = 3.09" for 10-Year event
Inflow = 1.83 cfs @ 12.13 hrs, Volume= 0.138 af
Outflow = 1.83 cfs @ 12.13 hrs, Volume= 0.138 af, Atten= 0%, Lag= 0.0 min
Primary = 1.83 cfs @ 12.13 hrs, Volume= 0.138 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 78.57' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.70' | **12.0" Round Culvert**<br>L= 28.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 77.70' / 77.30' S= 0.0143 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.82 cfs @ 12.13 hrs HW=78.57' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.82 cfs @ 2.51 fps)

### Pond 40P: DMH



## Summary for Pond 41P: DMH 2

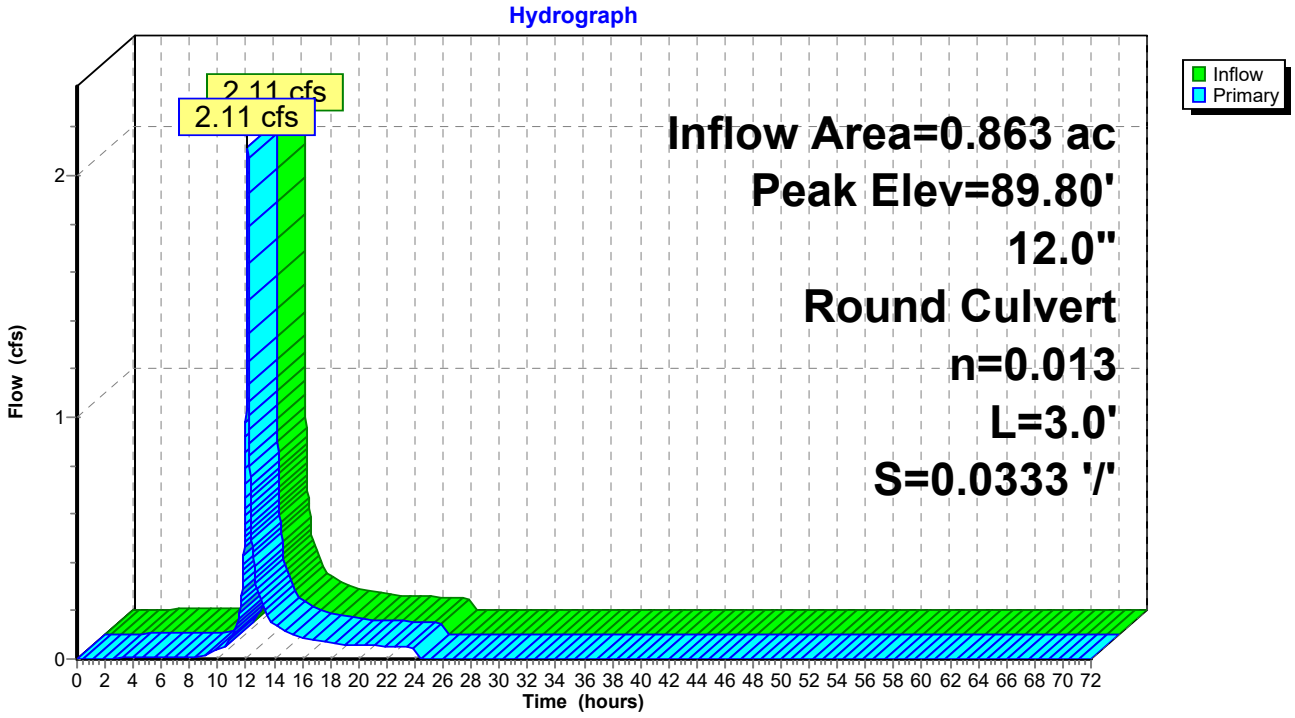
Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 2.25" for 10-Year event
Inflow = 2.11 cfs @ 12.13 hrs, Volume= 0.162 af
Outflow = 2.11 cfs @ 12.13 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min
Primary = 2.11 cfs @ 12.13 hrs, Volume= 0.162 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.80' @ 12.13 hrs
Flood Elev= 93.37'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 88.80' | **12.0" Round Culvert**<br>L= 3.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 88.80' / 88.70' S= 0.0333 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.11 cfs @ 12.13 hrs HW=89.80' (Free Discharge)
**1=Culvert** (Inlet Controls 2.11 cfs @ 2.69 fps)

### Pond 41P: DMH 2



## Summary for Pond 42P: Infiltration Area 2

Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 3.41" for 10-Year event
Inflow = 2.05 cfs @ 12.13 hrs, Volume= 0.158 af
Outflow = 0.41 cfs @ 12.44 hrs, Volume= 0.158 af, Atten= 80%, Lag= 18.4 min
Discarded = 0.41 cfs @ 12.44 hrs, Volume= 0.158 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 86.41' @ 12.44 hrs Surf.Area= 0.031 ac Storage= 0.033 af

Plug-Flow detention time= 20.8 min calculated for 0.158 af (100% of inflow)
Center-of-Mass det. time= 20.8 min ( 839.3 - 818.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 84.80' | 0.029 af | **25.25'W x 53.46'L x 3.50'H Field A**<br>0.108 af Overall - 0.037 af Embedded = 0.072 af x 40.0% Voids |
| #2A | 85.30' | 0.037 af | **ADS_StormTech SC-740 +Cap** x 35 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>35 Chambers in 5 Rows |
| | | 0.066 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 84.80' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 82.00' |
| #2 | Primary | 86.50' | **12.0" Round Culvert**<br>L= 125.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 86.50' / 85.25' S= 0.0100 '/' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Discarded OutFlow** Max=0.41 cfs @ 12.44 hrs HW=86.41' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.41 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=84.80' (Free Discharge)
↑—**2=Culvert** ( Controls 0.00 cfs)

## Pond 42P: Infiltration Area 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 + 6.0" Spacing = 57.0" C-C Row Spacing

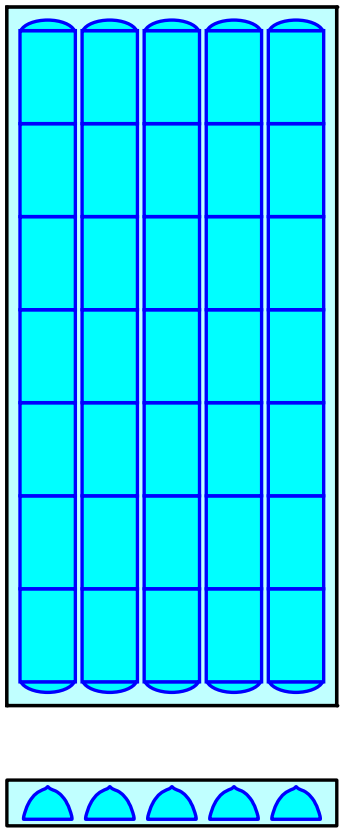
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

35 Chambers x 45.9 cf = 1,607.9 cf Chamber Storage

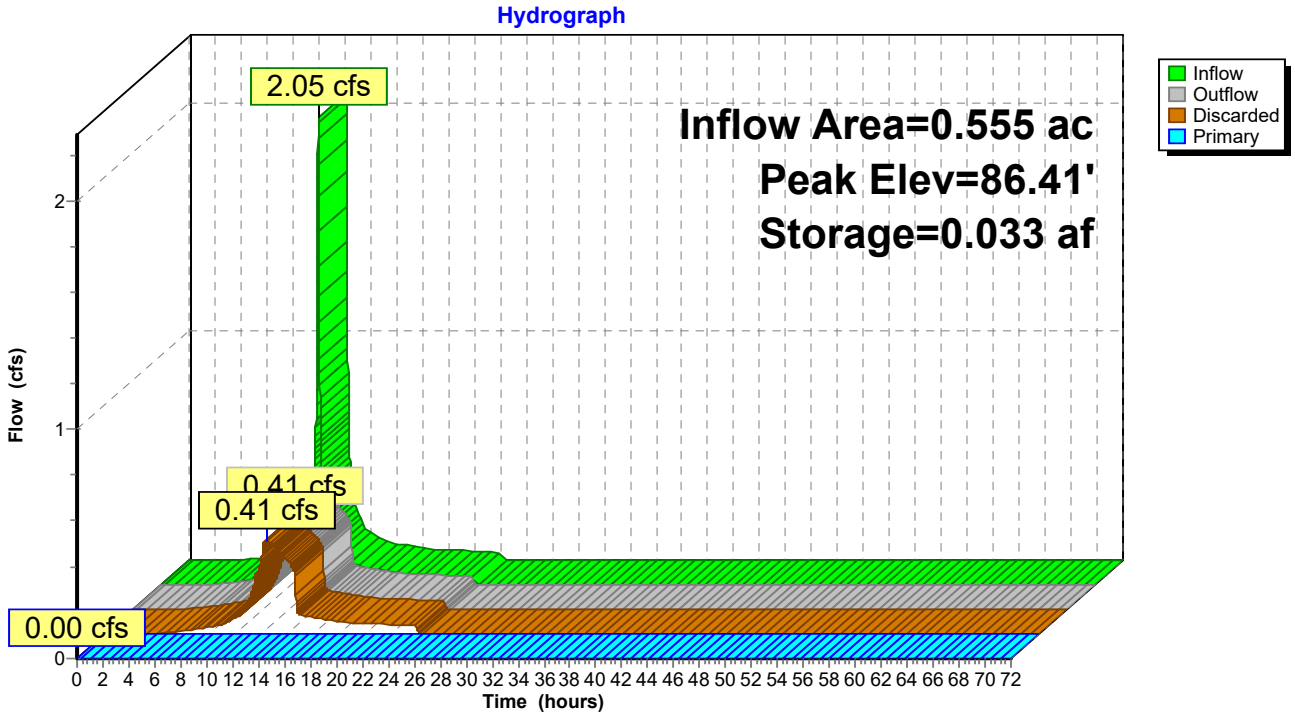
4,724.2 cf Field - 1,607.9 cf Chambers = 3,116.3 cf Stone x 40.0% Voids = 1,246.5 cf Stone Storage

Chamber Storage + Stone Storage = 2,854.4 cf = 0.066 af
Overall Storage Efficiency = 60.4%
Overall System Size = 53.46' x 25.25' x 3.50'

35 Chambers
175.0 cy Field
115.4 cy Stone



## Pond 42P: Infiltration Area 2

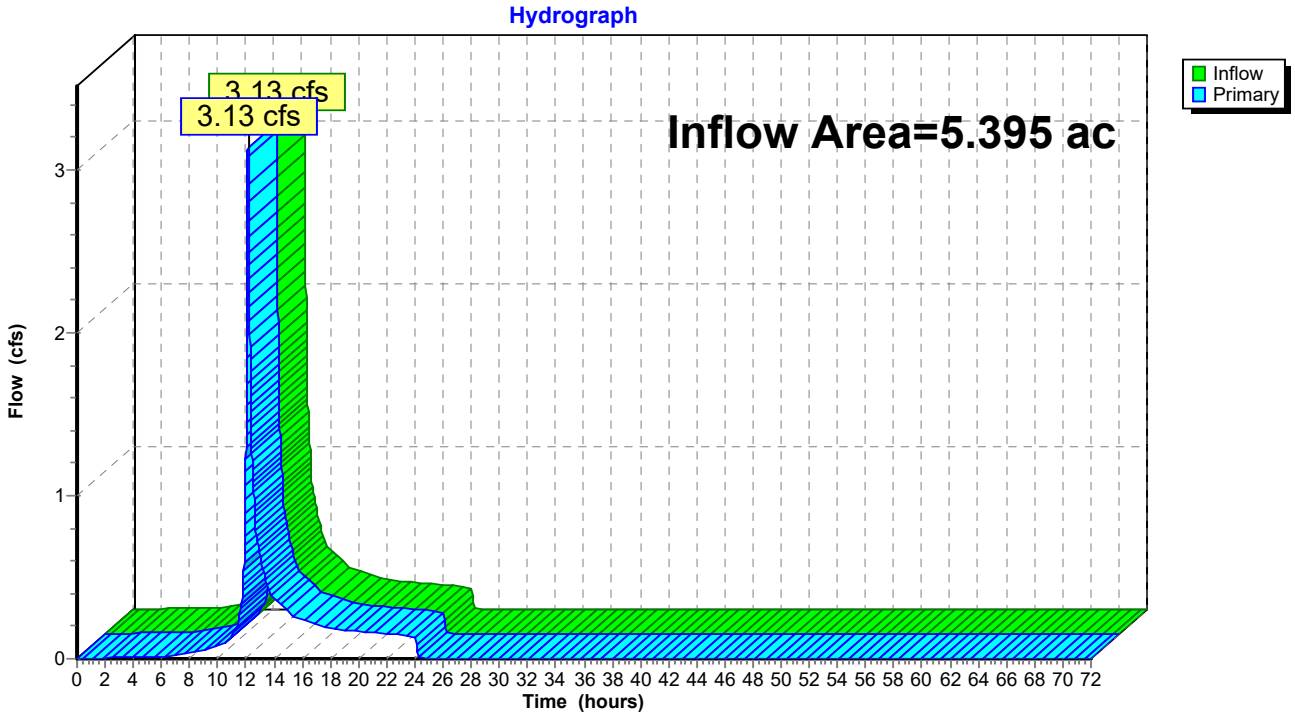


## Summary for Link 39L: RIVER

Inflow Area = 5.395 ac, 42.96% Impervious, Inflow Depth = 0.82" for 10-Year event
Inflow = 3.13 cfs @ 12.15 hrs, Volume= 0.367 af
Primary = 3.13 cfs @ 12.15 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

### Link 39L: RIVER



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 P1: P1** Runoff Area=145,292 sf 25.32% Impervious Runoff Depth=2.96"
Flow Length=698' Tc=11.6 min UI Adjusted CN=51 Runoff=8.51 cfs 0.823 af

**Subcatchment P2: P2** Runoff Area=34,941 sf 56.10% Impervious Runoff Depth=5.53"
Tc=6.0 min CN=72 Runoff=4.90 cfs 0.370 af

**Subcatchment P3: P3** Runoff Area=24,177 sf 81.00% Impervious Runoff Depth=7.37"
Tc=6.0 min CN=87 Runoff=4.22 cfs 0.341 af

**Subcatchment P4: P4** Runoff Area=19,867 sf 76.45% Impervious Runoff Depth=7.00"
Tc=6.0 min CN=84 Runoff=3.36 cfs 0.266 af

**Subcatchment P5: P5** Runoff Area=4,524 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=0.84 cfs 0.075 af

**Subcatchment P6: P6** Runoff Area=3,568 sf 73.71% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=82 Runoff=0.59 cfs 0.046 af

**Subcatchment P7: P7** Runoff Area=2,652 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=0.49 cfs 0.044 af

**Pond 1P: Infiltration Area 1** Peak Elev=91.07' Storage=0.069 af Inflow=5.39 cfs 0.414 af
Discarded=0.45 cfs 0.300 af Primary=3.09 cfs 0.114 af Outflow=3.54 cfs 0.414 af

**Pond 6P: CB 1** Peak Elev=94.86' Inflow=4.90 cfs 0.370 af
12.0" Round Culvert n=0.013 L=24.5' S=0.1041 '/' Outflow=4.90 cfs 0.370 af

**Pond 8: DMH 1** Peak Elev=92.78' Inflow=5.39 cfs 0.414 af
12.0" Round Culvert n=0.013 L=32.8' S=0.0052 '/' Outflow=5.39 cfs 0.414 af

**Pond 9: CB** Peak Elev=82.87' Inflow=3.36 cfs 0.266 af
12.0" Round Culvert n=0.013 L=23.0' S=0.0348 '/' Outflow=3.36 cfs 0.266 af

**Pond 9P: DMH 4** Peak Elev=90.03' Inflow=5.59 cfs 0.178 af
12.0" Round Culvert n=0.013 L=121.0' S=0.0050 '/' Outflow=5.59 cfs 0.178 af

**Pond 14P: CB** Peak Elev=79.48' Inflow=0.84 cfs 0.075 af
12.0" Round Culvert n=0.013 L=9.0' S=0.0111 '/' Outflow=0.84 cfs 0.075 af

**Pond 16P: DMH** Peak Elev=80.27' Inflow=3.36 cfs 0.266 af
12.0" Round Culvert n=0.013 L=15.0' S=0.0467 '/' Outflow=3.36 cfs 0.266 af

**Pond 17P: CB** Peak Elev=83.61' Inflow=0.59 cfs 0.046 af
12.0" Round Culvert n=0.013 L=3.0' S=0.1667 '/' Outflow=0.59 cfs 0.046 af

**Pond 18P: DMH** Peak Elev=80.28' Inflow=4.79 cfs 0.387 af
12.0" Round Culvert n=0.013 L=40.7' S=0.0835 '/' Outflow=4.79 cfs 0.387 af

**Pond 34P: CB 2** Peak Elev=88.54' Inflow=4.22 cfs 0.341 af
12.0" Round Culvert n=0.013 L=130.0' S=0.0050 '/' Outflow=4.22 cfs 0.341 af

**Pond 35P: DMH 3** Peak Elev=87.35' Inflow=4.22 cfs 0.341 af
12.0" Round Culvert n=0.013 L=10.0' S=0.0050 '/' Outflow=4.22 cfs 0.341 af

**Pond 40P: DMH** Peak Elev=79.95' Inflow=3.95 cfs 0.312 af
12.0" Round Culvert n=0.013 L=28.0' S=0.0143 '/' Outflow=3.95 cfs 0.312 af

**Pond 41P: DMH 2** Peak Elev=92.56' Inflow=5.39 cfs 0.414 af
12.0" Round Culvert n=0.013 L=3.0' S=0.0333 '/' Outflow=5.39 cfs 0.414 af

**Pond 42P: Infiltration Area 2** Peak Elev=87.71' Storage=0.058 af Inflow=4.22 cfs 0.341 af
Discarded=0.53 cfs 0.277 af Primary=2.52 cfs 0.064 af Outflow=3.04 cfs 0.341 af

**Link 39L: RIVER** Inflow=17.60 cfs 1.389 af
Primary=17.60 cfs 1.389 af

**Total Runoff Area = 5.395 ac Runoff Volume = 1.965 af Average Runoff Depth = 4.37"**
**57.04% Pervious = 3.077 ac 42.96% Impervious = 2.318 ac**

## Summary for Subcatchment P1: P1

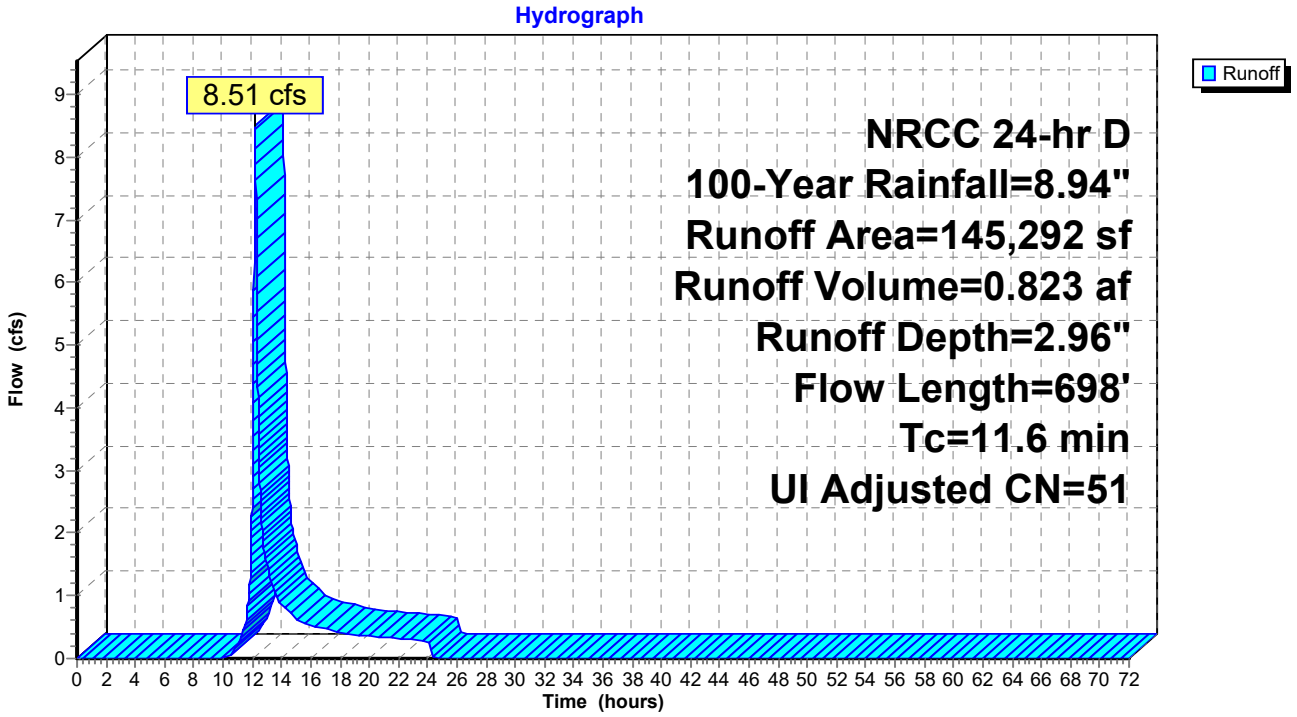
Runoff = 8.51 cfs @ 12.20 hrs, Volume= 0.823 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Adj | Description |
|---|---|---|---|
| 87,315 | 36 | | Woods, Fair, HSG A |
| 29,675 | 98 | | Roofs, HSG A |
| 2,420 | 98 | | Unconnected roofs, HSG A |
| 2,530 | 98 | | Paved parking, HSG A |
| 2,749 | 45 | | Woods, Poor, HSG A |
| 18,439 | 39 | | >75% Grass cover, Good, HSG A |
| 2,164 | 98 | | Unconnected pavement, HSG A |
| 145,292 | 52 | 51 | Weighted Average, UI Adjusted |
| 108,503 | | | 74.68% Pervious Area |
| 36,789 | | | 25.32% Impervious Area |
| 4,584 | | | 12.46% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.4 | 50 | 0.0750 | 0.11 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.4 | 46 | 0.0800 | 1.98 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 2.1 | 322 | 0.0300 | 2.60 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 0.8 | 132 | 0.0350 | 2.81 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 0.9 | 148 | 0.2800 | 2.65 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 11.6 | 698 | Total | | | |

## Subcatchment P1: P1



## Summary for Subcatchment P2: P2

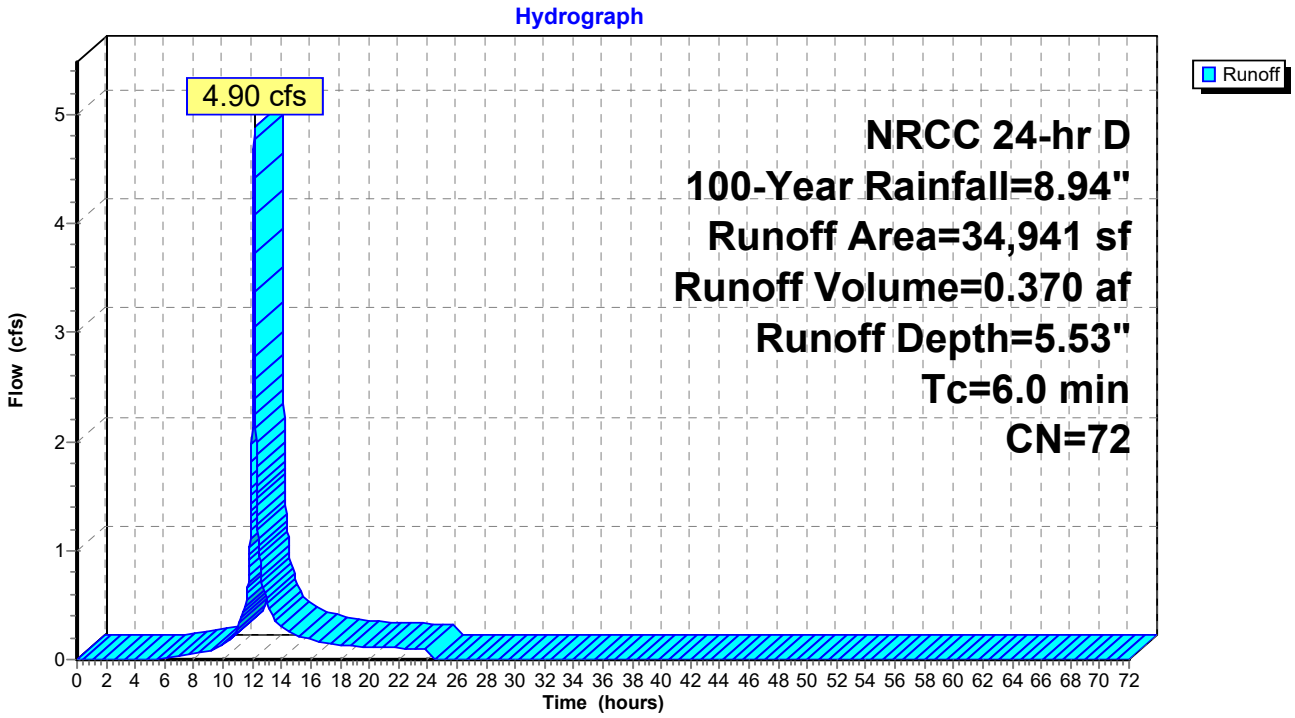
Runoff = 4.90 cfs @ 12.13 hrs, Volume= 0.370 af, Depth= 5.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 19,603 | 98 | Paved parking, HSG A |
| 15,338 | 39 | >75% Grass cover, Good, HSG A |
| 34,941 | 72 | Weighted Average |
| 15,338 | | 43.90% Pervious Area |
| 19,603 | | 56.10% Impervious Area |

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

## Subcatchment P2: P2



## Summary for Subcatchment P3: P3

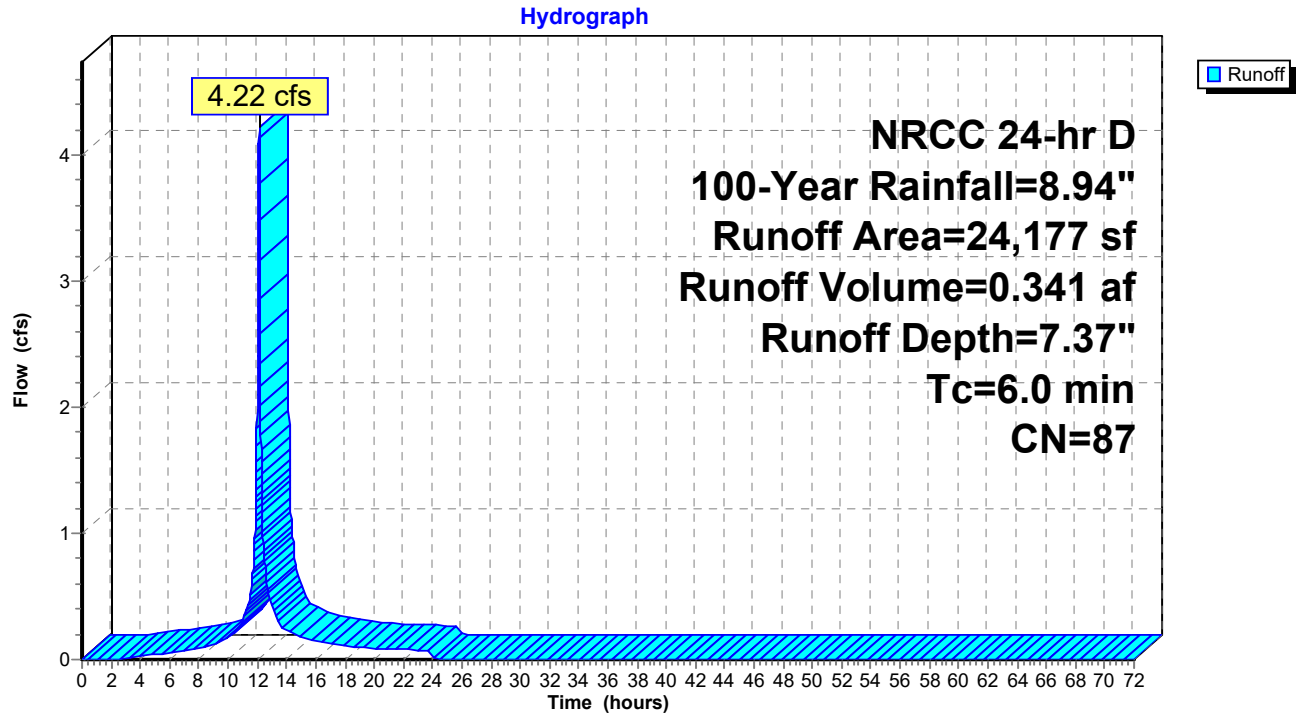
Runoff = 4.22 cfs @ 12.13 hrs, Volume= 0.341 af, Depth= 7.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 19,583 | 98 | Paved parking, HSG A |
| 4,594 | 39 | >75% Grass cover, Good, HSG A |
| 24,177 | 87 | Weighted Average |
| 4,594 | | 19.00% Pervious Area |
| 19,583 | | 81.00% Impervious Area |

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

### Subcatchment P3: P3



## Summary for Subcatchment P4: P4

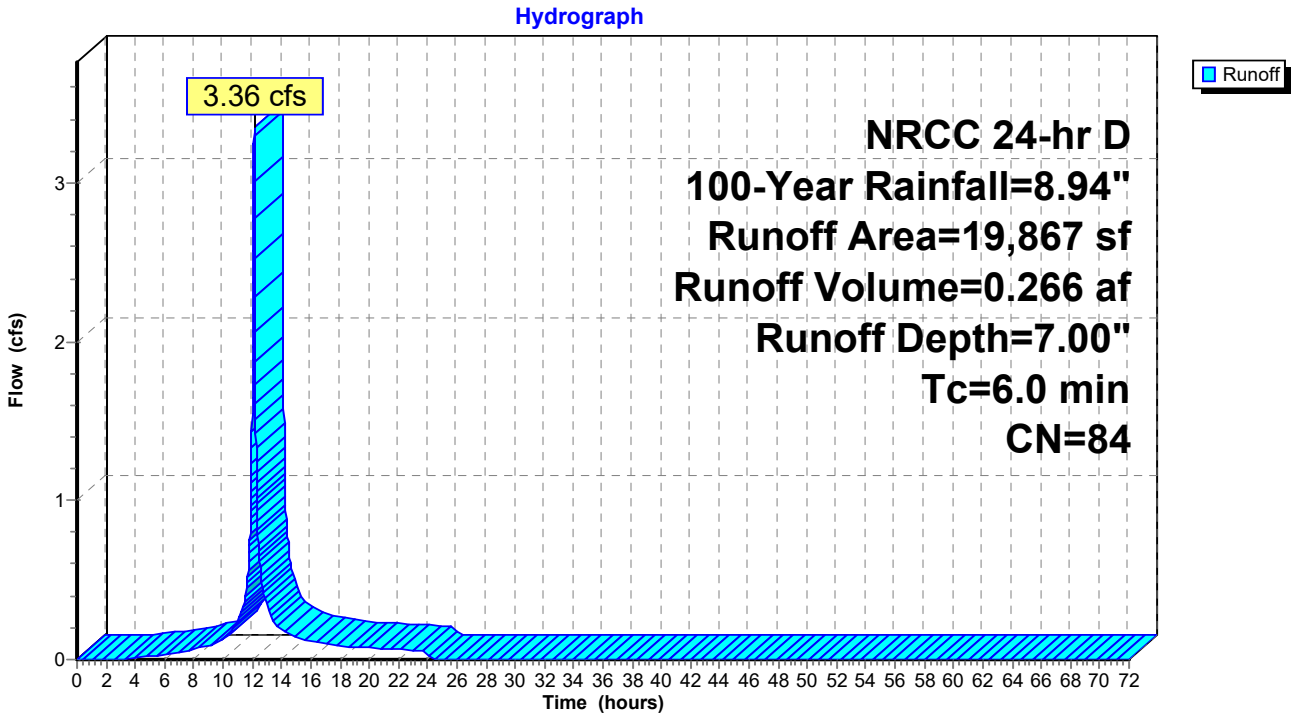
Runoff = 3.36 cfs @ 12.13 hrs, Volume= 0.266 af, Depth= 7.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 15,188 | 98 | Paved parking, HSG A |
| 4,679 | 39 | >75% Grass cover, Good, HSG A |
| 19,867 | 84 | Weighted Average |
| 4,679 | | 23.55% Pervious Area |
| 15,188 | | 76.45% Impervious Area |

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

### Subcatchment P4: P4



## Summary for Subcatchment P5: P5

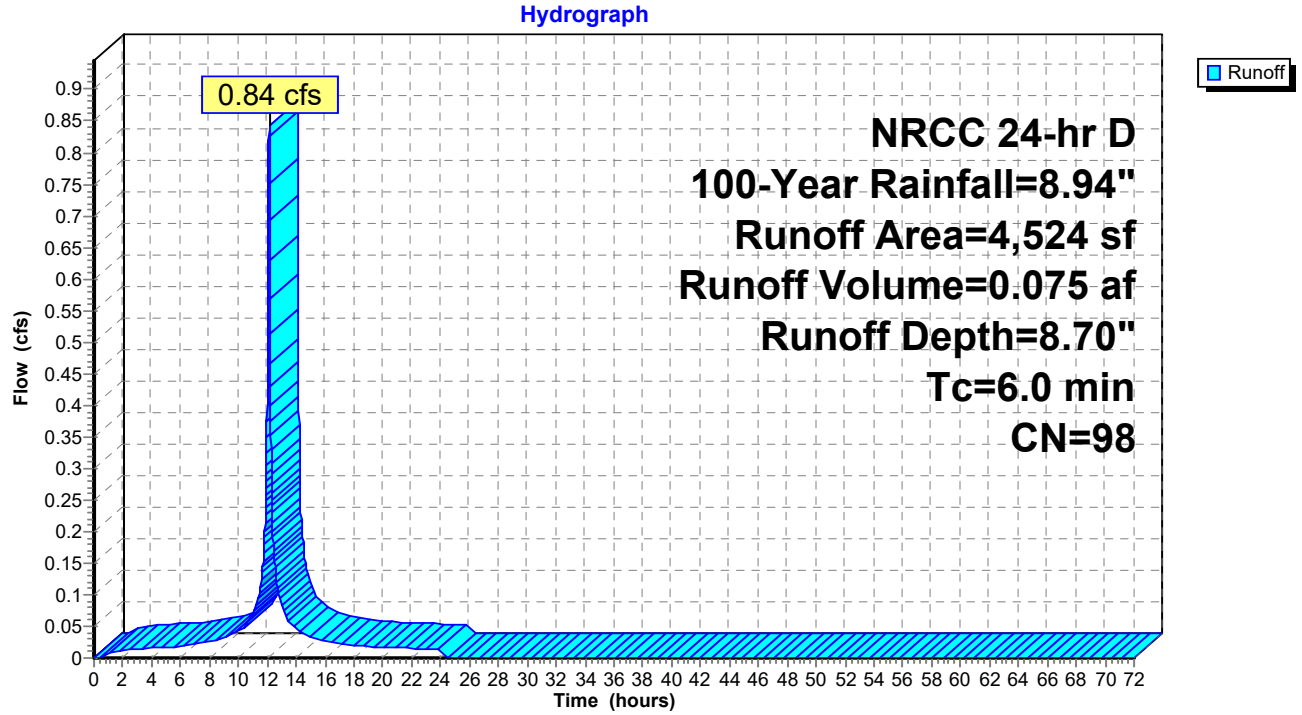
Runoff = 0.84 cfs @ 12.13 hrs, Volume= 0.075 af, Depth= 8.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 4,524 | 98 | Paved parking, HSG A |
| 4,524 | | 100.00% Impervious Area |

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

## Subcatchment P5: P5



## Summary for Subcatchment P6: P6

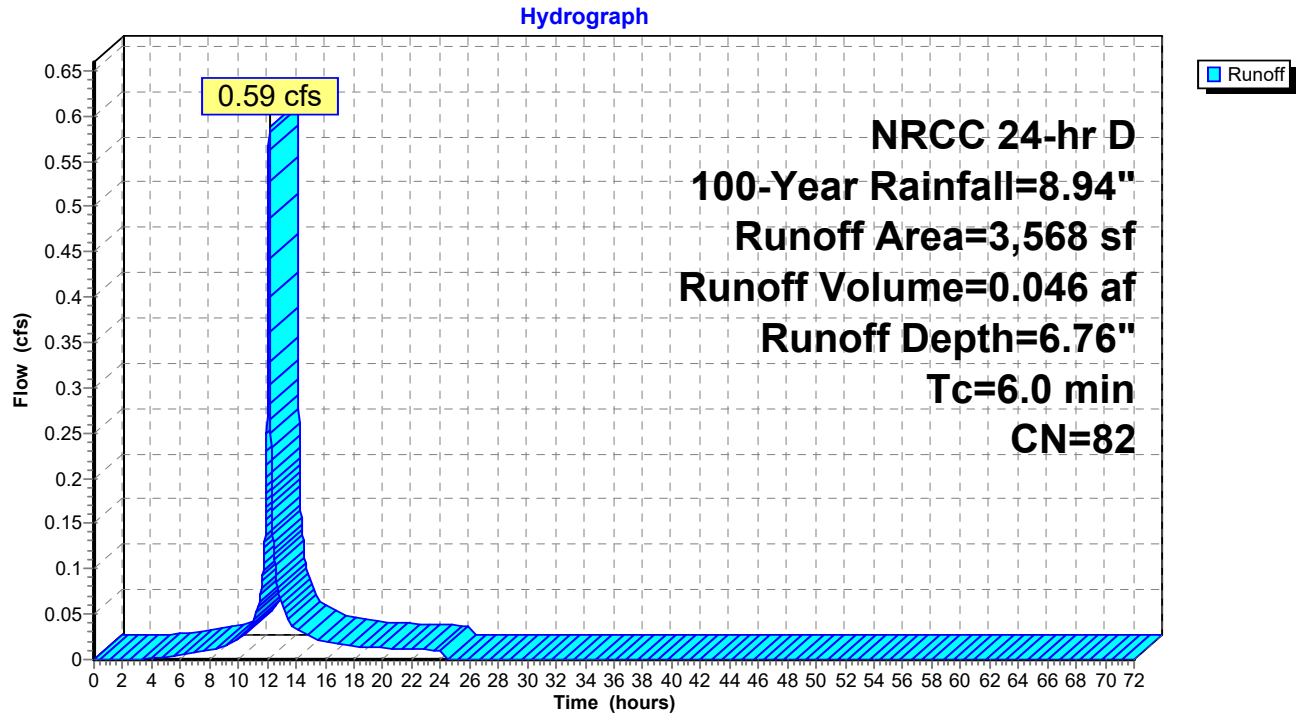
Runoff = 0.59 cfs @ 12.13 hrs, Volume= 0.046 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 2,630 | 98 | Paved parking, HSG A |
| 938 | 39 | >75% Grass cover, Good, HSG A |
| 3,568 | 82 | Weighted Average |
| 938 | | 26.29% Pervious Area |
| 2,630 | | 73.71% Impervious Area |

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

## Subcatchment P6: P6



## Summary for Subcatchment P7: P7

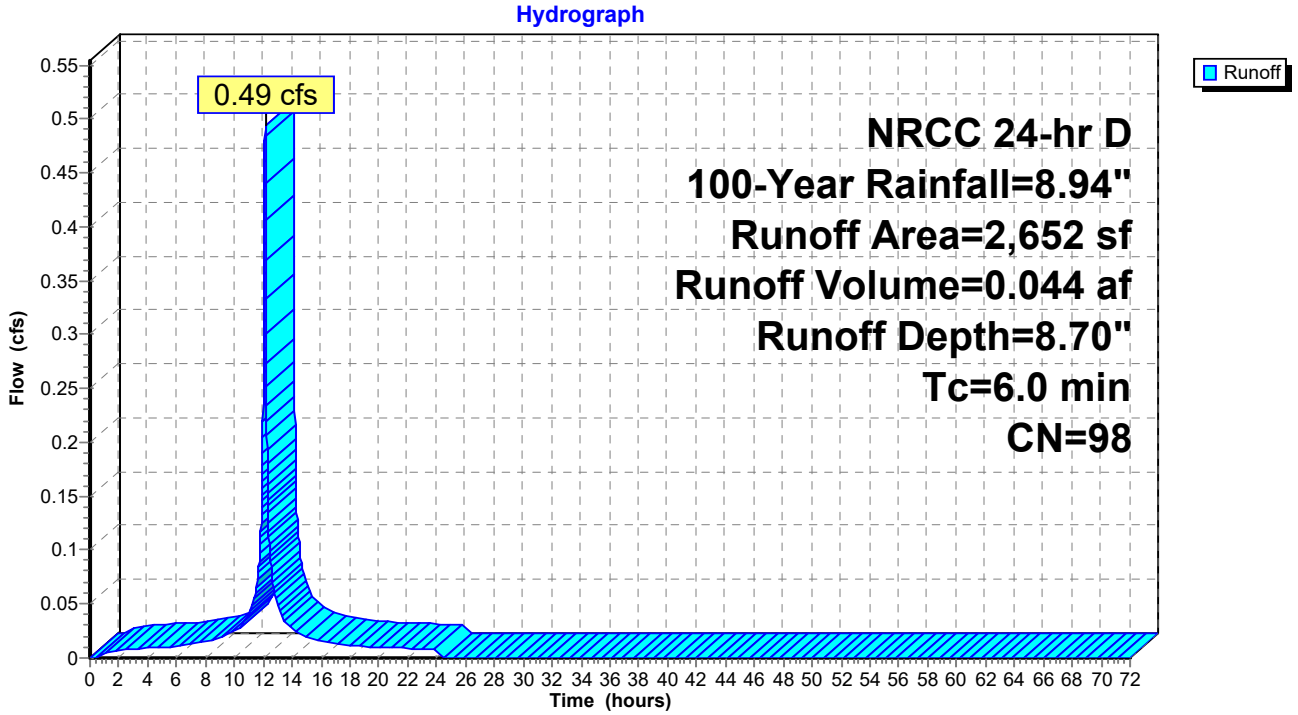
Runoff = 0.49 cfs @ 12.13 hrs, Volume= 0.044 af, Depth= 8.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 2,652 | 98 | Roofs, HSG A |
| 2,652 | | 100.00% Impervious Area |

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

## Subcatchment P7: P7



## Summary for Pond 1P: Infiltration Area 1

Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 5.75" for 100-Year event
Inflow = 5.39 cfs @ 12.13 hrs, Volume= 0.414 af
Outflow = 3.54 cfs @ 12.19 hrs, Volume= 0.414 af, Atten= 34%, Lag= 3.8 min
Discarded = 0.45 cfs @ 12.19 hrs, Volume= 0.300 af
Primary = 3.09 cfs @ 12.19 hrs, Volume= 0.114 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 91.07' @ 12.19 hrs Surf.Area= 0.037 ac Storage= 0.069 af

Plug-Flow detention time= 22.3 min calculated for 0.414 af (100% of inflow)
Center-of-Mass det. time= 22.3 min ( 848.1 - 825.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 88.20' | 0.034 af | **30.00'W x 53.46'L x 3.50'H Field A**<br>0.129 af Overall - 0.044 af Embedded = 0.085 af x 40.0% Voids |
| #2A | 88.70' | 0.044 af | **ADS_StormTech SC-740 +Cap** x 42 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>42 Chambers in 6 Rows |
| | | 0.078 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 88.20' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 82.00' |
| #2 | Primary | 89.50' | **12.0" Round Culvert**<br>L= 36.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.50' / 85.25' S= 0.1181 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |

**Discarded OutFlow** Max=0.45 cfs @ 12.19 hrs HW=91.07' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.45 cfs)

**Primary OutFlow** Max=3.08 cfs @ 12.19 hrs HW=91.07' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 3.08 cfs @ 3.93 fps)

## Pond 1P: Infiltration Area 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

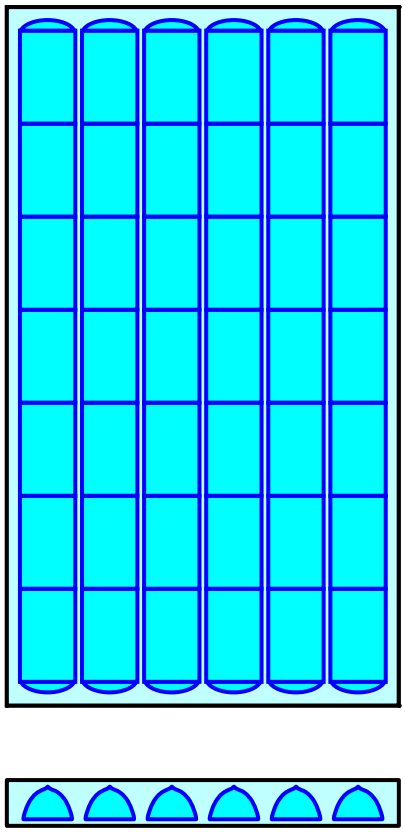
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.00' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

42 Chambers x 45.9 cf = 1,929.5 cf Chamber Storage

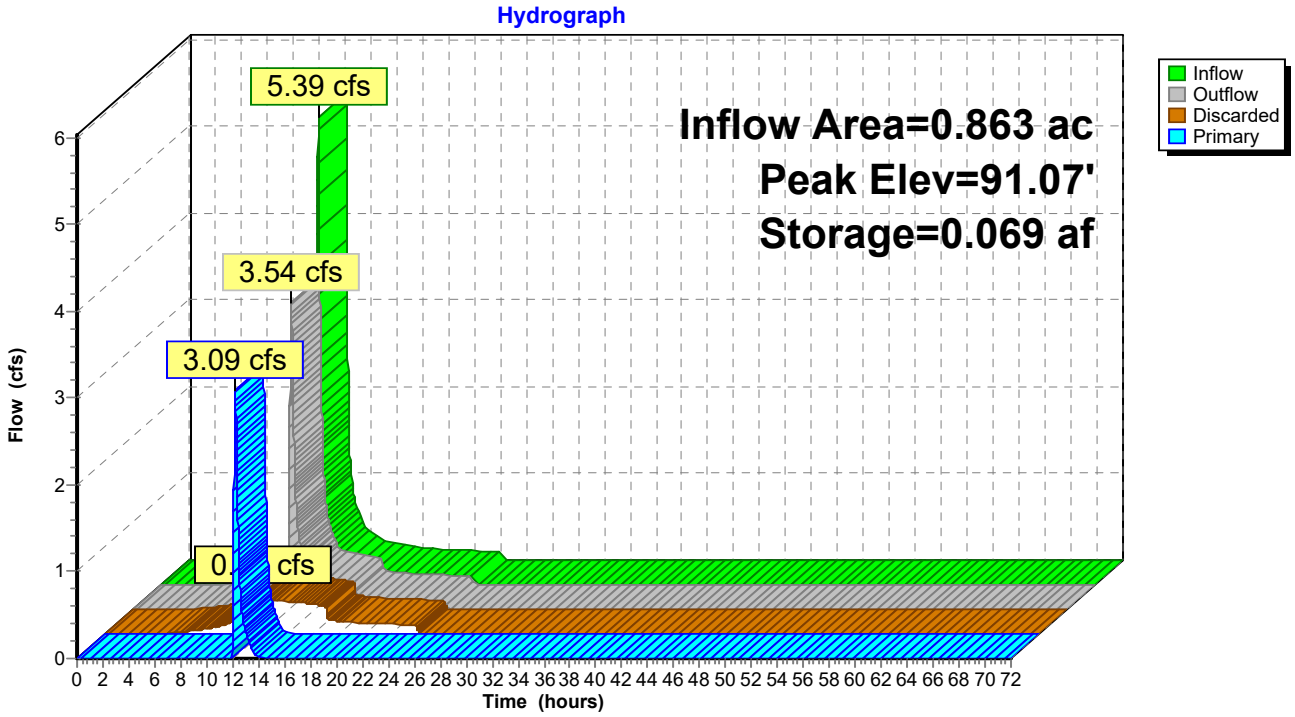
5,613.0 cf Field - 1,929.5 cf Chambers = 3,683.5 cf Stone x 40.0% Voids = 1,473.4 cf Stone Storage

Chamber Storage + Stone Storage = 3,402.9 cf = 0.078 af
Overall Storage Efficiency = 60.6%
Overall System Size = 53.46' x 30.00' x 3.50'

42 Chambers
207.9 cy Field
136.4 cy Stone



## Pond 1P: Infiltration Area 1



## Summary for Pond 6P: CB 1

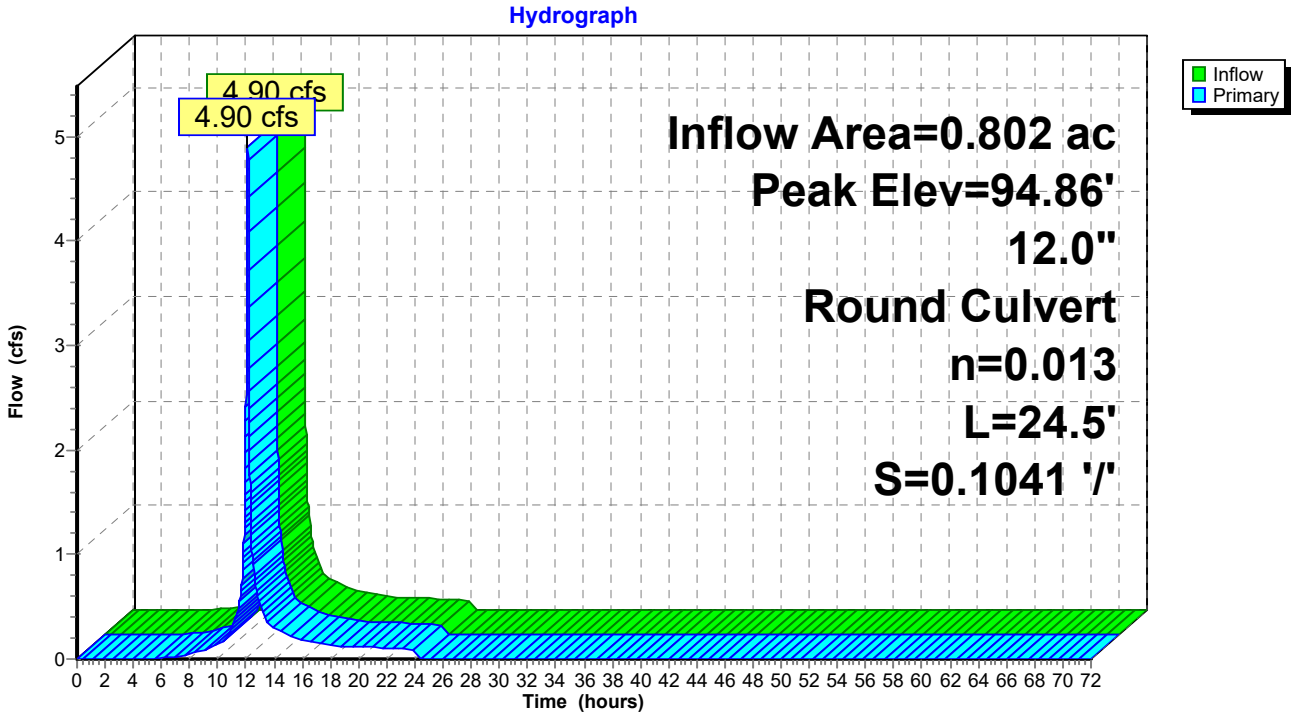
Inflow Area = 0.802 ac, 56.10% Impervious, Inflow Depth = 5.53" for 100-Year event
Inflow = 4.90 cfs @ 12.13 hrs, Volume= 0.370 af
Outflow = 4.90 cfs @ 12.13 hrs, Volume= 0.370 af, Atten= 0%, Lag= 0.0 min
Primary = 4.90 cfs @ 12.13 hrs, Volume= 0.370 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 94.86' @ 12.13 hrs
Flood Elev= 95.67'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 91.67' | **12.0" Round Culvert**<br>L= 24.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 91.67' / 89.12' S= 0.1041 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=4.89 cfs @ 12.13 hrs HW=94.85' (Free Discharge)
**1=Culvert** (Inlet Controls 4.89 cfs @ 6.23 fps)

## Pond 6P: CB 1



## Summary for Pond 8: DMH 1

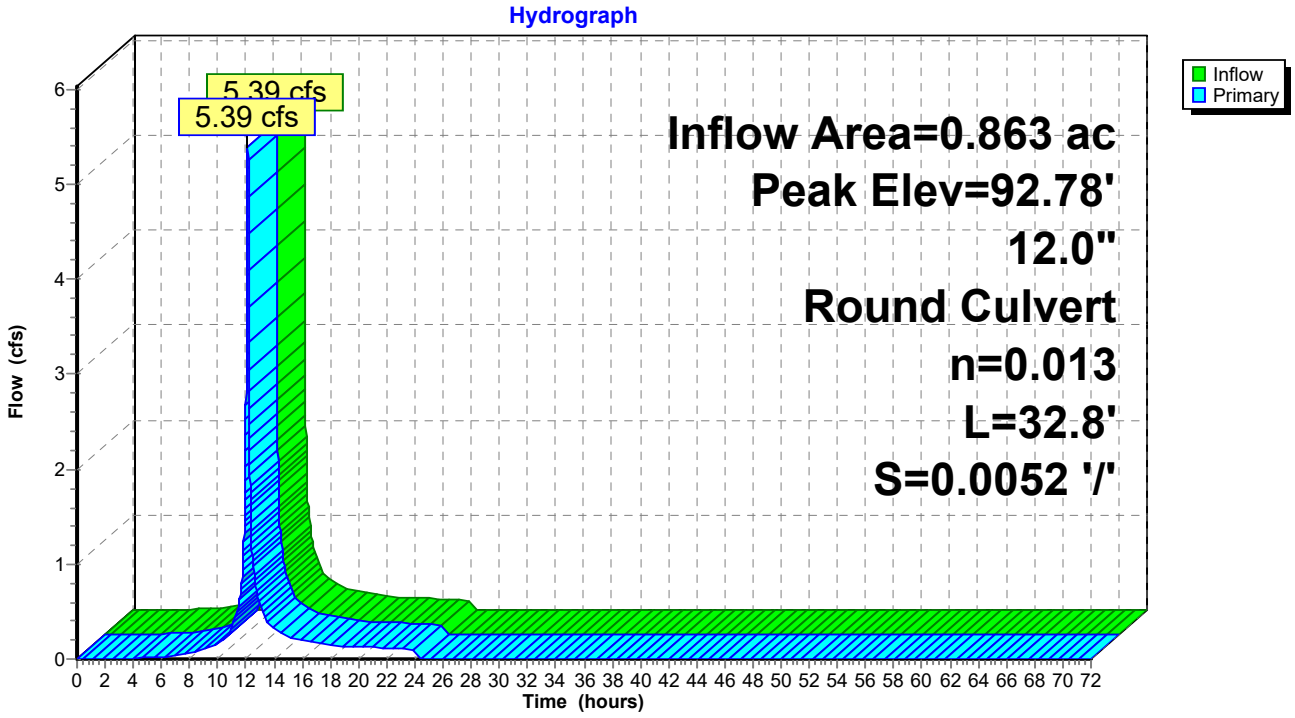
Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 5.75" for 100-Year event
Inflow = 5.39 cfs @ 12.13 hrs, Volume= 0.414 af
Outflow = 5.39 cfs @ 12.13 hrs, Volume= 0.414 af, Atten= 0%, Lag= 0.0 min
Primary = 5.39 cfs @ 12.13 hrs, Volume= 0.414 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 92.78' @ 12.13 hrs
Flood Elev= 94.46'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 89.02' | **12.0" Round Culvert**<br>L= 32.8' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 89.02' / 88.85' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=5.38 cfs @ 12.13 hrs HW=92.77' (Free Discharge)
**1=Culvert** (Inlet Controls 5.38 cfs @ 6.86 fps)

## Pond 8: DMH 1



## Summary for Pond 9: CB

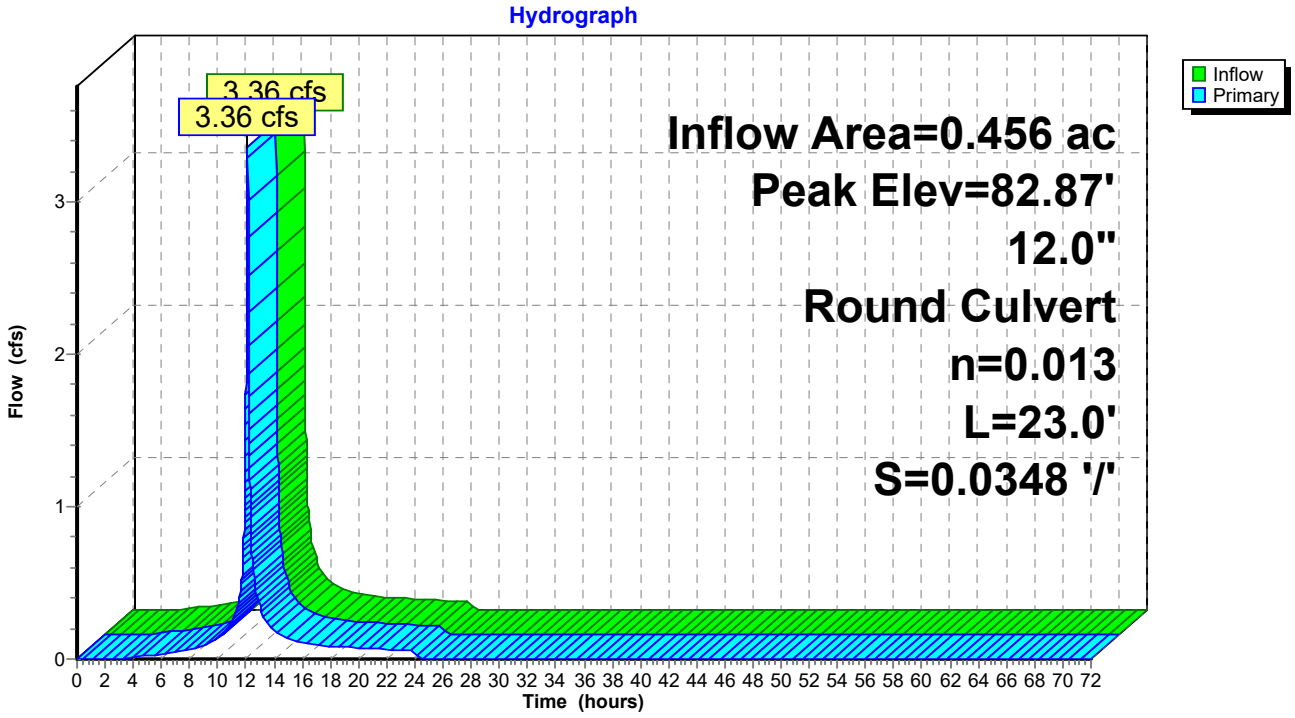
Inflow Area = 0.456 ac, 76.45% Impervious, Inflow Depth = 7.00" for 100-Year event
Inflow = 3.36 cfs @ 12.13 hrs, Volume= 0.266 af
Outflow = 3.36 cfs @ 12.13 hrs, Volume= 0.266 af, Atten= 0%, Lag= 0.0 min
Primary = 3.36 cfs @ 12.13 hrs, Volume= 0.266 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 82.87' @ 12.13 hrs
Flood Elev= 93.35'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 81.10' | **12.0" Round Culvert**<br>L= 23.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 81.10' / 80.30' S= 0.0348 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.36 cfs @ 12.13 hrs HW=82.87' (Free Discharge)
**1=Culvert** (Inlet Controls 3.36 cfs @ 4.28 fps)

## Pond 9: CB



## Summary for Pond 9P: DMH 4

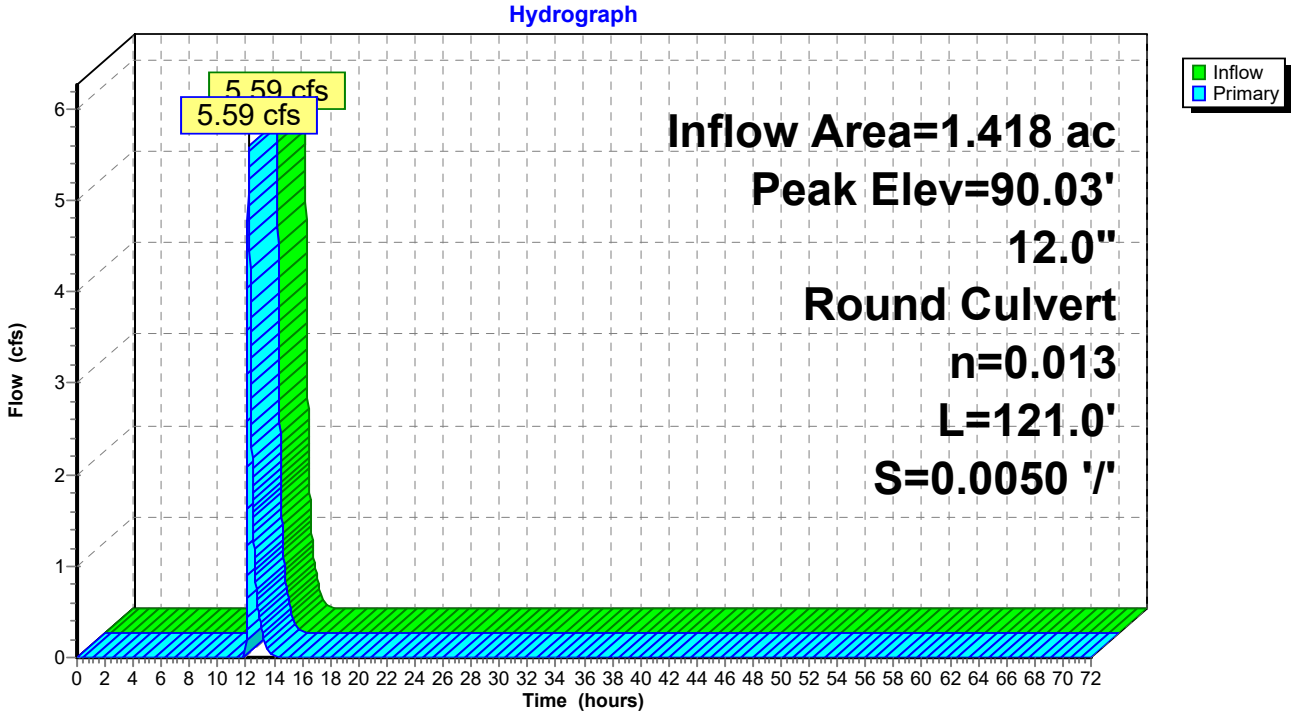
Inflow Area = 1.418 ac, 67.73% Impervious, Inflow Depth = 1.50" for 100-Year event
Inflow = 5.59 cfs @ 12.19 hrs, Volume= 0.178 af
Outflow = 5.59 cfs @ 12.19 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min
Primary = 5.59 cfs @ 12.19 hrs, Volume= 0.178 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 90.03' @ 12.19 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.15' | **12.0" Round Culvert**<br>L= 121.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 85.15' / 84.54' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=5.59 cfs @ 12.19 hrs HW=90.03' (Free Discharge)
└**1=Culvert** (Barrel Controls 5.59 cfs @ 7.12 fps)

### Pond 9P: DMH 4



## Summary for Pond 14P: CB

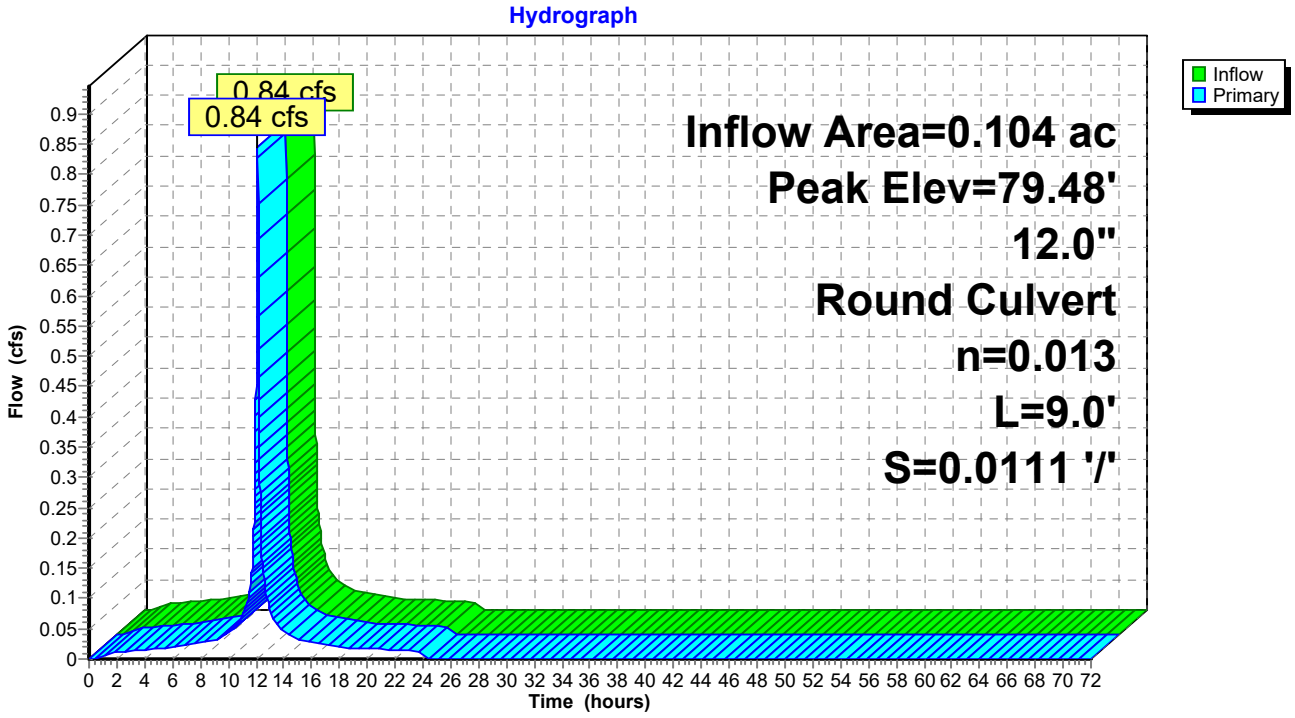
Inflow Area = 0.104 ac,100.00% Impervious, Inflow Depth = 8.70" for 100-Year event
Inflow = 0.84 cfs @ 12.13 hrs, Volume= 0.075 af
Outflow = 0.84 cfs @ 12.13 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Primary = 0.84 cfs @ 12.13 hrs, Volume= 0.075 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.48' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 79.00' | **12.0" Round Culvert**<br>L= 9.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 79.00' / 78.90' S= 0.0111 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.63 cfs @ 12.13 hrs HW=79.48' (Free Discharge)
**1=Culvert** (Barrel Controls 0.63 cfs @ 2.49 fps)

## Pond 14P: CB



## Summary for Pond 16P: DMH

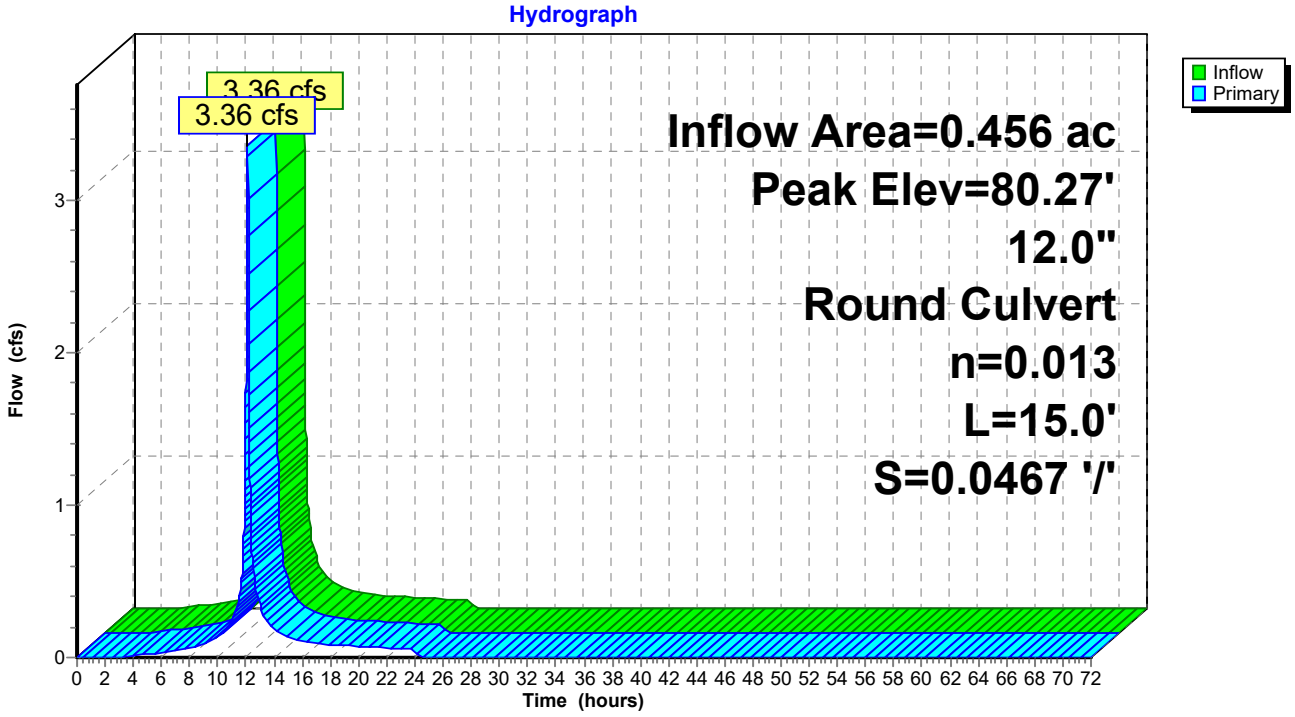
Inflow Area = 0.456 ac, 76.45% Impervious, Inflow Depth = 7.00" for 100-Year event
Inflow = 3.36 cfs @ 12.13 hrs, Volume= 0.266 af
Outflow = 3.36 cfs @ 12.13 hrs, Volume= 0.266 af, Atten= 0%, Lag= 0.0 min
Primary = 3.36 cfs @ 12.13 hrs, Volume= 0.266 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 80.27' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 78.50' | **12.0" Round Culvert**<br>L= 15.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 78.50' / 77.80' S= 0.0467 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.36 cfs @ 12.13 hrs HW=80.27' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.36 cfs @ 4.28 fps)

## Pond 16P: DMH



## Summary for Pond 17P: CB

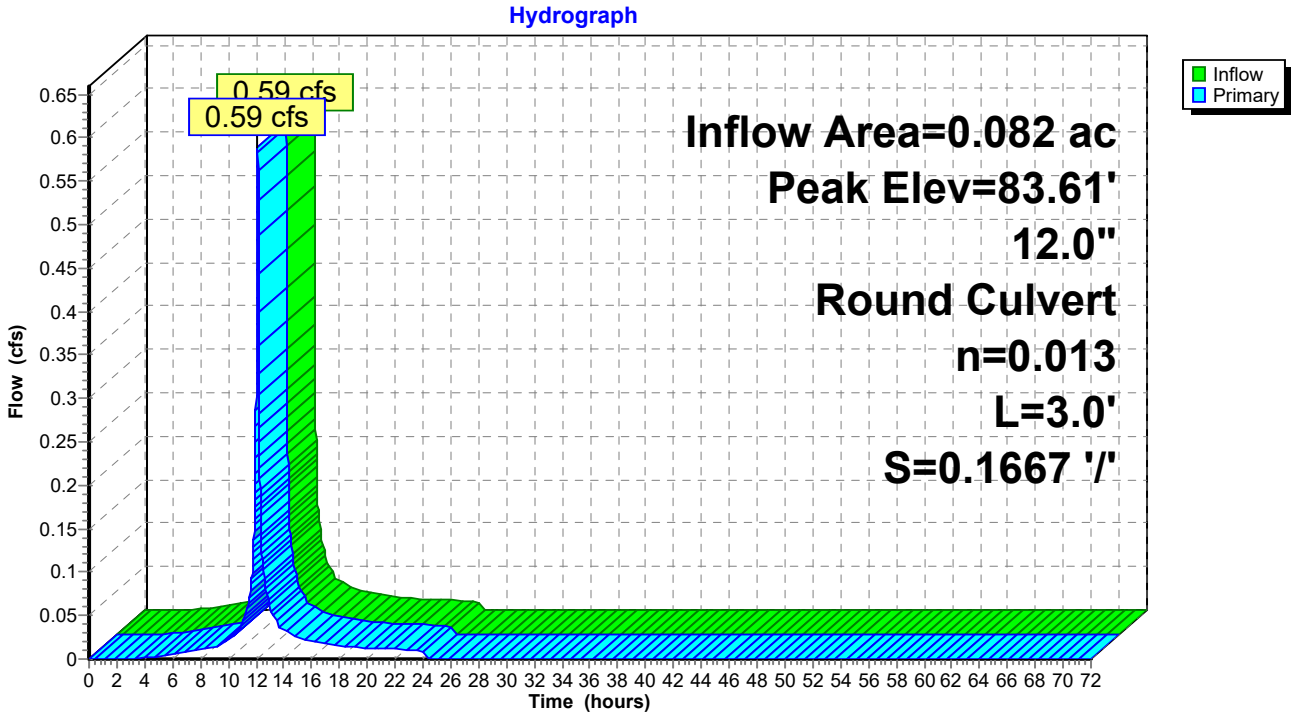
Inflow Area = 0.082 ac, 73.71% Impervious, Inflow Depth = 6.76" for 100-Year event
Inflow = 0.59 cfs @ 12.13 hrs, Volume= 0.046 af
Outflow = 0.59 cfs @ 12.13 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min
Primary = 0.59 cfs @ 12.13 hrs, Volume= 0.046 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 83.61' @ 12.13 hrs
Flood Elev= 152.72'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 83.30' | **12.0" Round Culvert**<br>L= 3.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 83.30' / 82.80' S= 0.1667 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.32 cfs @ 12.13 hrs HW=83.61' (Free Discharge)
**1=Culvert** (Inlet Controls 0.32 cfs @ 1.51 fps)

### Pond 17P: CB



## Summary for Pond 18P: DMH

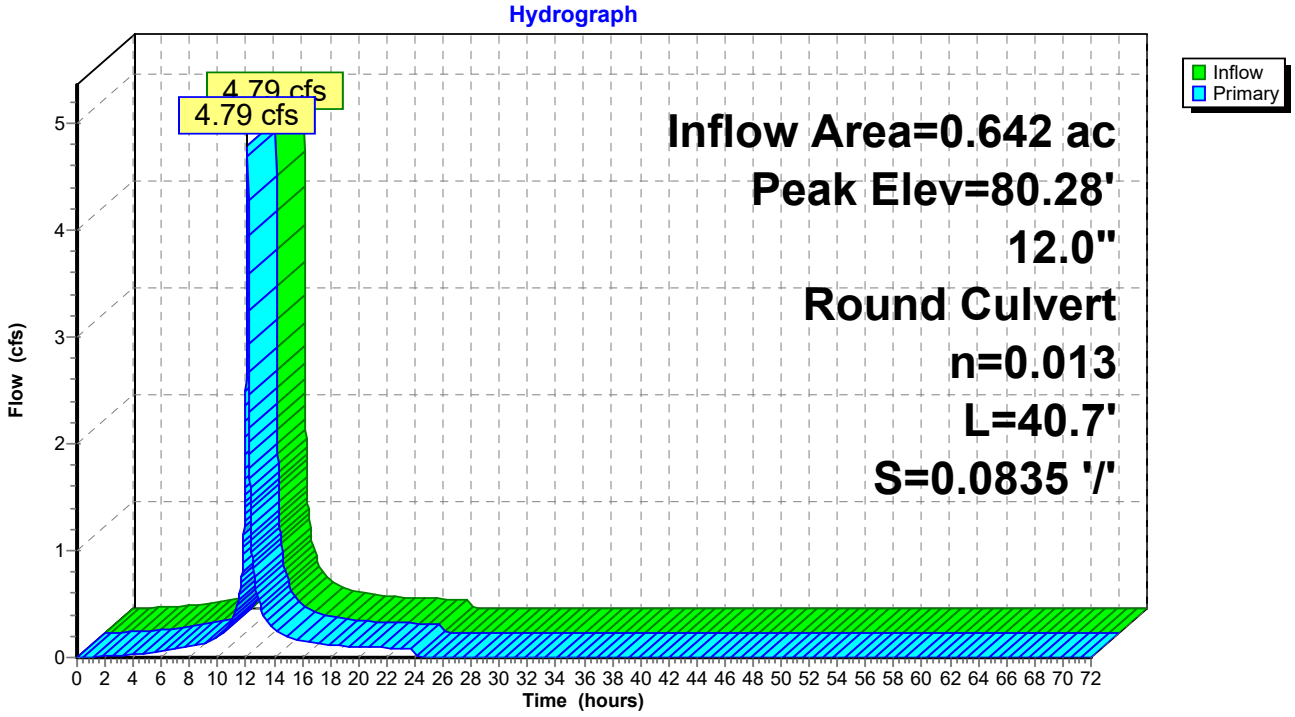
Inflow Area = 0.642 ac, 79.91% Impervious, Inflow Depth = 7.24" for 100-Year event
Inflow = 4.79 cfs @ 12.13 hrs, Volume= 0.387 af
Outflow = 4.79 cfs @ 12.13 hrs, Volume= 0.387 af, Atten= 0%, Lag= 0.0 min
Primary = 4.79 cfs @ 12.13 hrs, Volume= 0.387 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 80.28' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.20' | **12.0" Round Culvert**<br>L= 40.7' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 77.20' / 73.80' S= 0.0835 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=4.79 cfs @ 12.13 hrs HW=80.28' (Free Discharge)
**1=Culvert** (Inlet Controls 4.79 cfs @ 6.10 fps)

## Pond 18P: DMH



## Summary for Pond 34P: CB 2

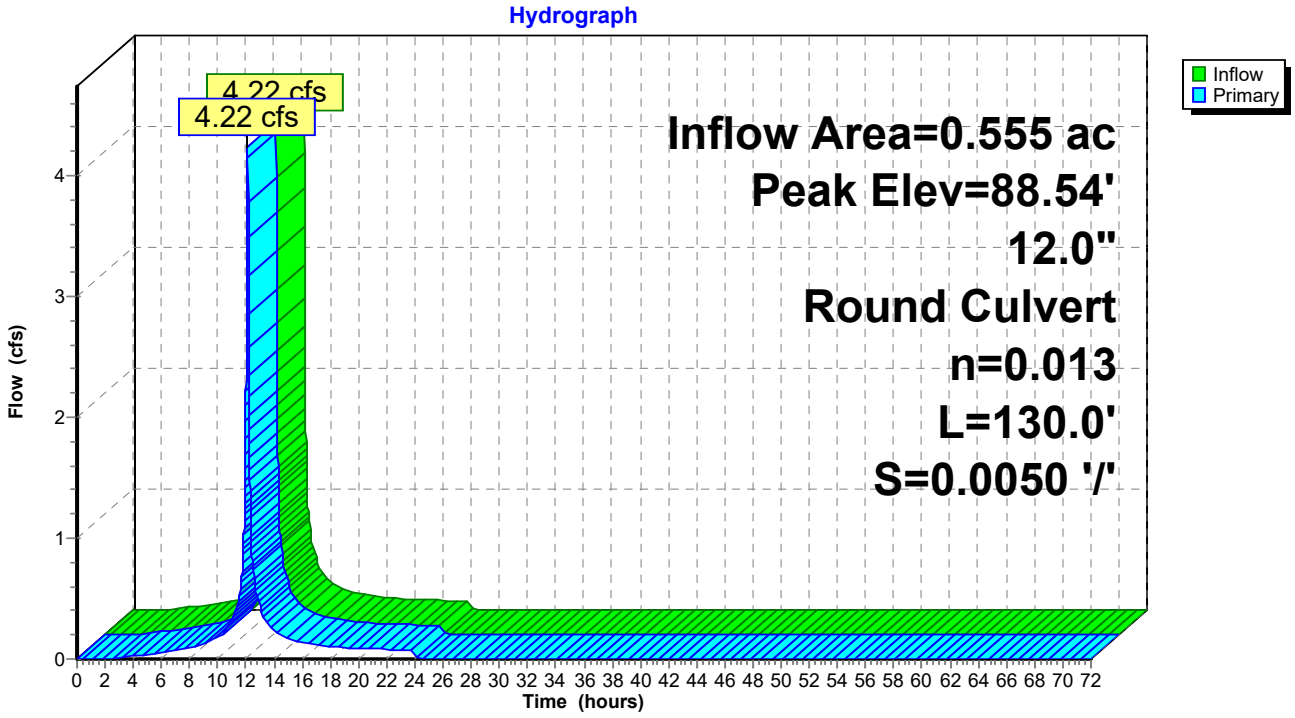
Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 7.37" for 100-Year event
Inflow = 4.22 cfs @ 12.13 hrs, Volume= 0.341 af
Outflow = 4.22 cfs @ 12.13 hrs, Volume= 0.341 af, Atten= 0%, Lag= 0.0 min
Primary = 4.22 cfs @ 12.13 hrs, Volume= 0.341 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 88.54' @ 12.13 hrs
Flood Elev= 88.70'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 85.50' | **12.0" Round Culvert**<br>L= 130.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 85.50' / 84.85' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=4.22 cfs @ 12.13 hrs HW=88.53' (Free Discharge)
**1=Culvert** (Barrel Controls 4.22 cfs @ 5.38 fps)

## Pond 34P: CB 2



## Summary for Pond 35P: DMH 3

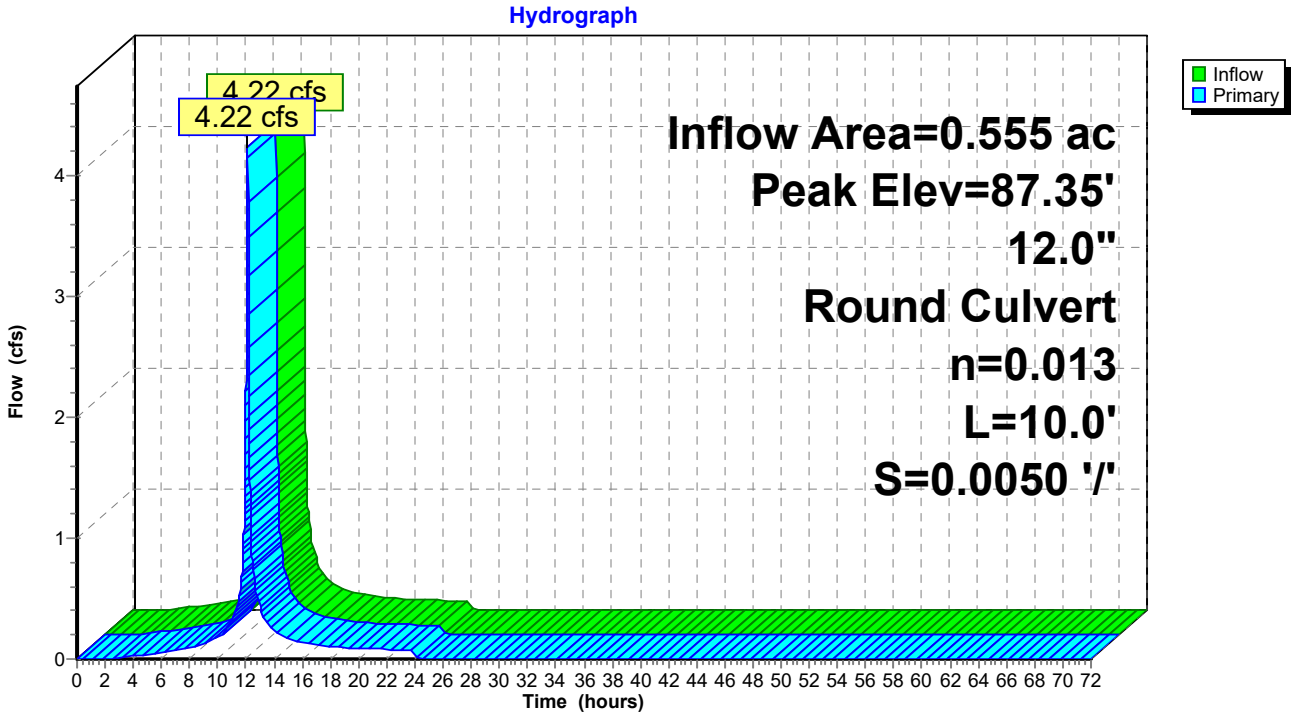
Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 7.37" for 100-Year event
Inflow = 4.22 cfs @ 12.13 hrs, Volume= 0.341 af
Outflow = 4.22 cfs @ 12.13 hrs, Volume= 0.341 af, Atten= 0%, Lag= 0.0 min
Primary = 4.22 cfs @ 12.13 hrs, Volume= 0.341 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 87.35' @ 12.13 hrs
Flood Elev= 90.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 84.85' | **12.0" Round Culvert**<br>L= 10.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 84.85' / 84.80' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=4.22 cfs @ 12.13 hrs HW=87.35' (Free Discharge)
**1=Culvert** (Inlet Controls 4.22 cfs @ 5.38 fps)

### Pond 35P: DMH 3



## Summary for Pond 40P: DMH

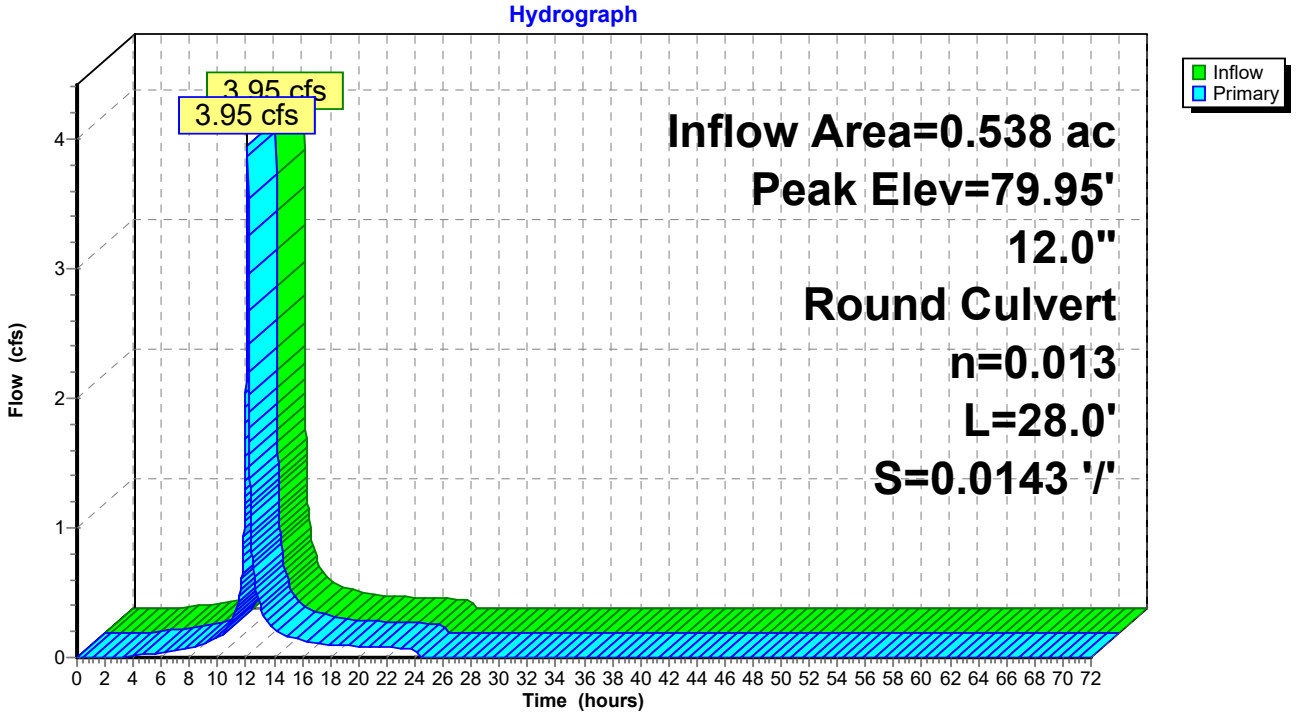
Inflow Area = 0.538 ac, 76.03% Impervious, Inflow Depth = 6.96" for 100-Year event
Inflow = 3.95 cfs @ 12.13 hrs, Volume= 0.312 af
Outflow = 3.95 cfs @ 12.13 hrs, Volume= 0.312 af, Atten= 0%, Lag= 0.0 min
Primary = 3.95 cfs @ 12.13 hrs, Volume= 0.312 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.95' @ 12.13 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.70' | **12.0" Round Culvert**<br>L= 28.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 77.70' / 77.30' S= 0.0143 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.95 cfs @ 12.13 hrs HW=79.95' (Free Discharge)
**1=Culvert** (Inlet Controls 3.95 cfs @ 5.03 fps)

### Pond 40P: DMH



## Summary for Pond 41P: DMH 2

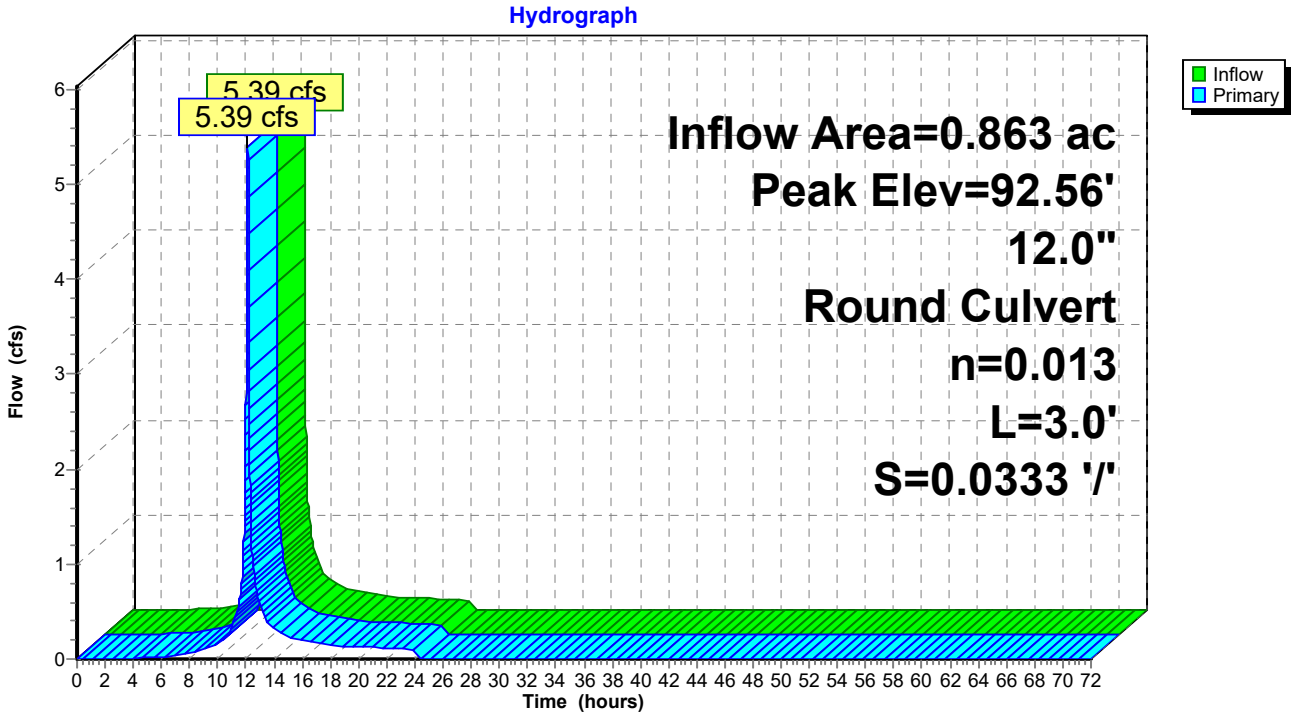
Inflow Area = 0.863 ac, 59.20% Impervious, Inflow Depth = 5.75" for 100-Year event
Inflow = 5.39 cfs @ 12.13 hrs, Volume= 0.414 af
Outflow = 5.39 cfs @ 12.13 hrs, Volume= 0.414 af, Atten= 0%, Lag= 0.0 min
Primary = 5.39 cfs @ 12.13 hrs, Volume= 0.414 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 92.56' @ 12.13 hrs
Flood Elev= 93.37'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 88.80' | **12.0" Round Culvert**<br>L= 3.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 88.80' / 88.70' S= 0.0333 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=5.38 cfs @ 12.13 hrs HW=92.55' (Free Discharge)
**1=Culvert** (Inlet Controls 5.38 cfs @ 6.86 fps)

### Pond 41P: DMH 2



## Summary for Pond 42P: Infiltration Area 2

Inflow Area = 0.555 ac, 81.00% Impervious, Inflow Depth = 7.37" for 100-Year event
Inflow = 4.22 cfs @ 12.13 hrs, Volume= 0.341 af
Outflow = 3.04 cfs @ 12.18 hrs, Volume= 0.341 af, Atten= 28%, Lag= 3.3 min
Discarded = 0.53 cfs @ 12.18 hrs, Volume= 0.277 af
Primary = 2.52 cfs @ 12.18 hrs, Volume= 0.064 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 87.71' @ 12.18 hrs Surf.Area= 0.031 ac Storage= 0.058 af

Plug-Flow detention time= 21.4 min calculated for 0.341 af (100% of inflow)
Center-of-Mass det. time= 21.4 min ( 812.9 - 791.5 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 84.80' | 0.029 af | **25.25'W x 53.46'L x 3.50'H Field A**<br>0.108 af Overall - 0.037 af Embedded = 0.072 af x 40.0% Voids |
| #2A | 85.30' | 0.037 af | **ADS_StormTech SC-740 +Cap** x 35 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>35 Chambers in 5 Rows |
| | | 0.066 af | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 84.80' | **8.270 in/hr Exfiltration over Surface area**<br>Conductivity to Groundwater Elevation = 82.00' |
| #2 | Primary | 86.50' | **12.0" Round Culvert**<br>L= 125.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 86.50' / 85.25' S= 0.0100 '/' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Discarded OutFlow** Max=0.53 cfs @ 12.18 hrs HW=87.71' (Free Discharge)
↑—**1=Exfiltration** ( Controls 0.53 cfs)

**Primary OutFlow** Max=2.51 cfs @ 12.18 hrs HW=87.71' (Free Discharge)
↑—**2=Culvert** (Inlet Controls 2.51 cfs @ 3.20 fps)

## Pond 42P: Infiltration Area 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 + 6.0" Spacing = 57.0" C-C Row Spacing

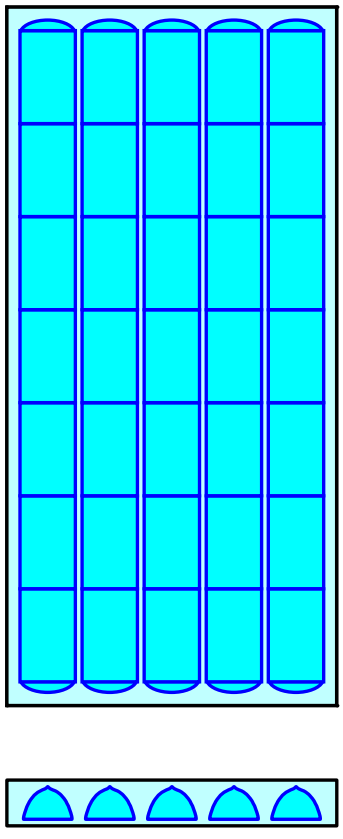
7 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 51.46' Row Length +12.0" End Stone x 2 = 53.46' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

35 Chambers x 45.9 cf = 1,607.9 cf Chamber Storage

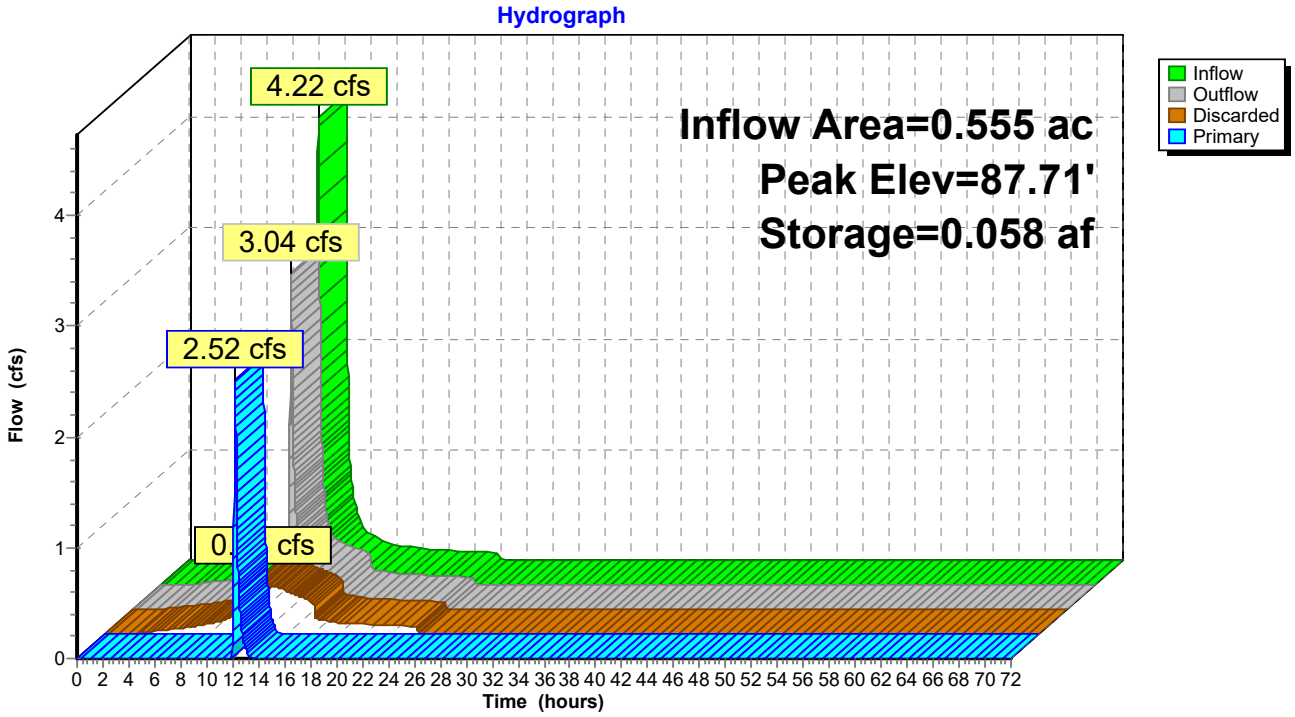
4,724.2 cf Field - 1,607.9 cf Chambers = 3,116.3 cf Stone x 40.0% Voids = 1,246.5 cf Stone Storage

Chamber Storage + Stone Storage = 2,854.4 cf = 0.066 af
Overall Storage Efficiency = 60.4%
Overall System Size = 53.46' x 25.25' x 3.50'

35 Chambers
175.0 cy Field
115.4 cy Stone



## Pond 42P: Infiltration Area 2

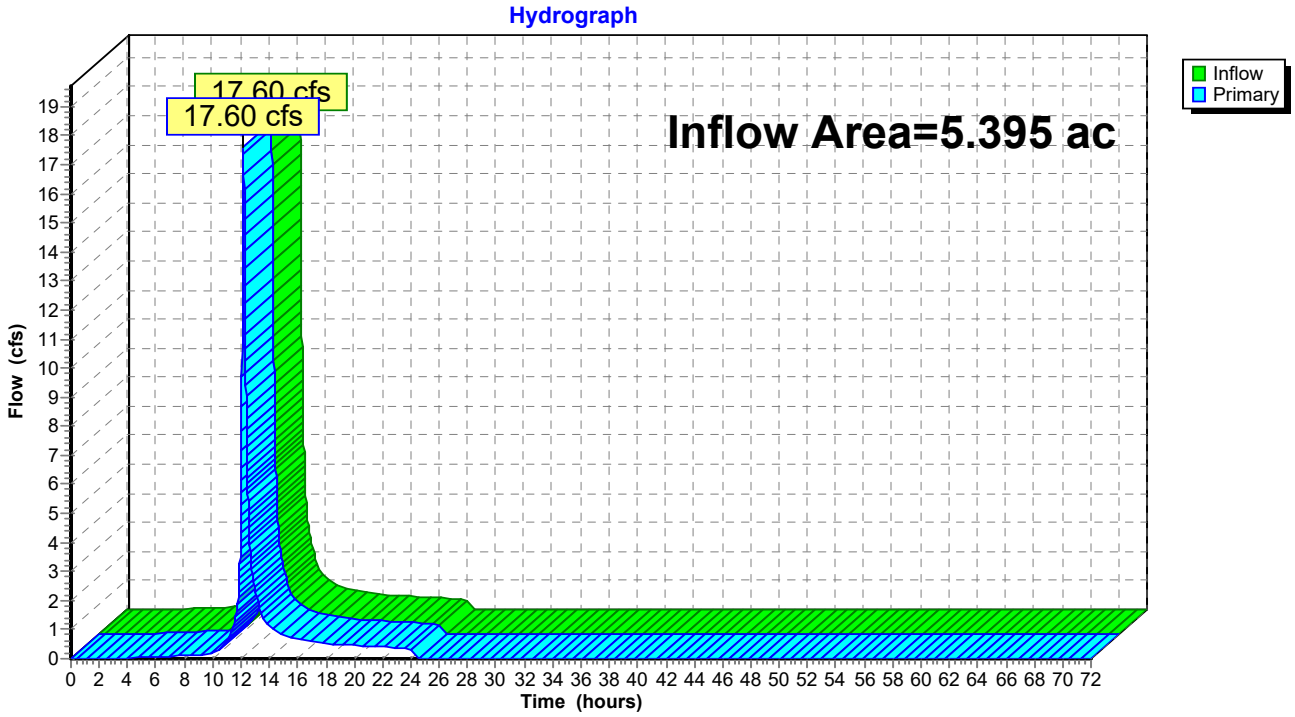


## Summary for Link 39L: RIVER

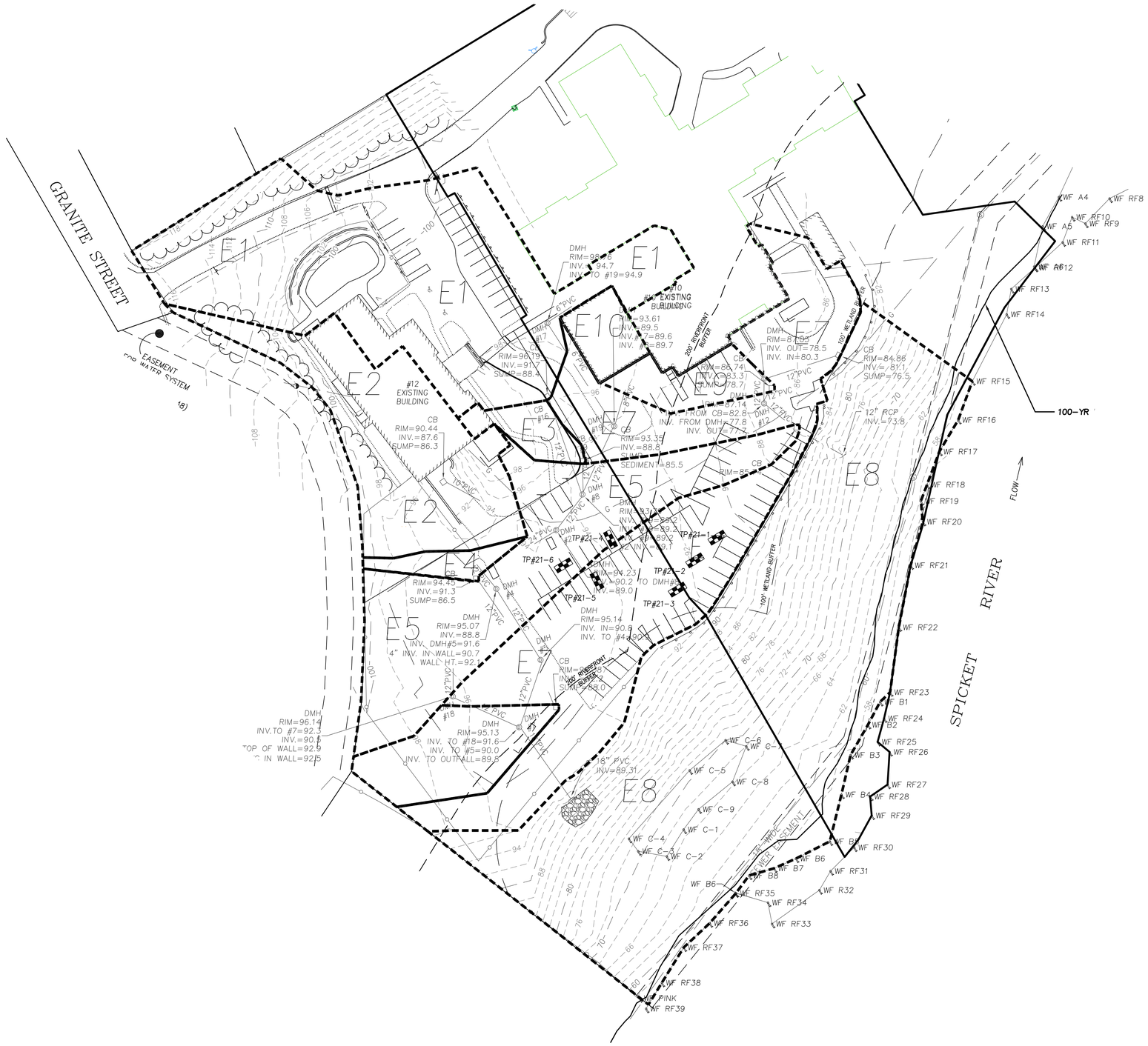
Inflow Area = 5.395 ac, 42.96% Impervious, Inflow Depth = 3.09" for 100-Year event
Inflow = 17.60 cfs @ 12.17 hrs, Volume= 1.389 af
Primary = 17.60 cfs @ 12.17 hrs, Volume= 1.389 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

## Link 39L: RIVER



## d. Watershed Maps




GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )

1 INCH = 40'

PREPARED FOR

L.D. RUSSO, INC.

198 AYER ROAD

HARVARD, MA

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|

MEI

MILLENNIUM ENGINEERING, INC.

ENGINEERING AND LAND SURVEYING

62 ELM ST. SALISBURY, MA 01952 (978) 463-8980

13 HAMPTON RD. EXETER, NH 03833 (603) 778-0528

SCALE: 1"=40' | DESG. BY: J.T.M.

DATE: OCT. 11, 2021 | CHKD. BY: E.W.B.

PROJECT: M213895

# SITE PLAN

IN

METHUEN, MA

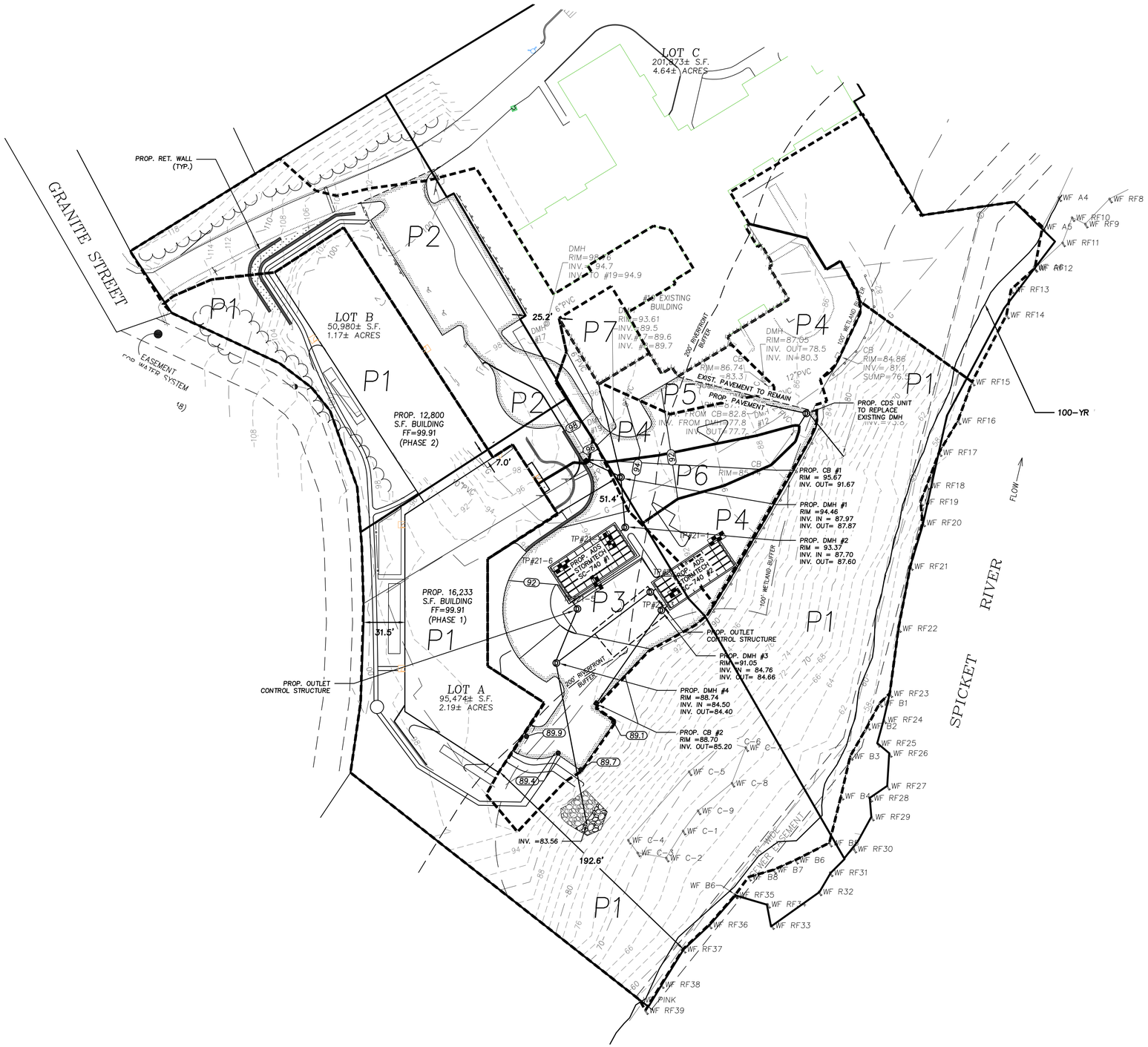
AT

12 INGALLS COURT

(MAP 716, BLOCK 115, LOT 2A)

PRE-DEVELOPMENT WATERSHED PLAN

SHEET: 1 OF 2




GRAPHIC SCALE

40 0 20 40 80 160

( IN FEET )

1 INCH = 40'

PREPARED FOR

L.D. RUSSO, INC.

198 AYER ROAD

HARVARD, MA

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |


MEI

MILLENNIUM ENGINEERING, INC.

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62 ELM ST. SALISBURY, MA 01952 (978) 463-8980

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SCALE: 1"=40' | DESG. BY: J.T.M.

DATE: OCT. 11, 2021 | CHKD. BY: E.W.B.

PROJECT: M213895

# SITE PLAN

IN

METHUEN, MA

AT

12 INGALLS COURT

(MAP 716, BLOCK 115, LOT 2A)

POST-DEVELOPMENT WATERSHED PLAN

SHEET: 2 OF 2