*MILLENNIUM ENGINEERING, INC.*

*Land Surveyors and Civil Engineers*

# Stormwater Management Report

For The

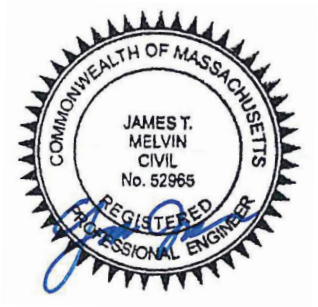
## Self-Storage Project

at

## 82 Lafayette Road
## Salisbury, MA

Prepared for:

## 82 Lafayette Road LLC.
12 56th Street
Newburyport, MA




Date: MAY 2, 2024

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82 Lafayette Road Salisbury, MA


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# I. Introduction

## Introduction

The subject parcel is described as Tax Map 22, Lot 15 on the Town of Salisbury, MA Assessor's Map. The project parcel is 4.5 acres in size with 3.3 acres upland and 1.2 acres wetland. Elevations on the site range from 34.00' to the north end of the parcel to 20.00' at the south end of the site. These elevations are based upon 1988 NAV datum.
The site improvements at 82 Lafayette Road proposes to construct and additional 16,800 S.F. 3-story storage facility on-site. The project will consist of the construction of a 3-story storage facility along with all associated utilities. The existing driveway will extend approximately 265 feet to the proposed parking/loading area. The proposed stormwater management system for the project includes catch basins, proprietary separators, and detention basins. The catch basins and Contech CDS units will remove suspended solids prior to discharging to the detention areas. The detention areas are implemented mitigate peak runoff rates so the post-development runoff rates will be less than or equal to the pre-development rates.

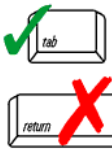
## II. Stormwater Management Checklist

**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 must be submitted with the Stormwater Report.

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

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

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

# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

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

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

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

## Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature


Signature and Date

## Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

# Checklist for Stormwater Report

## Checklist (continued)

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

☐ No disturbance to any Wetland Resource Areas

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

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

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

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

☐ Bioretention Cells (includes Rain Gardens)

☒ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☒ Other (describe): Contech CDS

**Standard 1: No New Untreated Discharges**

☒ No new untreated discharges

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

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 2: Peak Rate Attenuation**

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

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

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

**Standard 3: Recharge**

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 3: Recharge** (continued)

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

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

**Standard 4: Water Quality**

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 4: Water Quality** (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

**Standard 6: Critical Areas**

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

**Standard 9: Operation and Maintenance Plan**

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

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

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

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

**Standard 10: Prohibition of Illicit Discharges**

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

☒ An Illicit Discharge Compliance Statement is attached;

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

# III. Hydrologic Analysis

*Existing Site Characteristics*

In general, the property is irregular in shape and fronts Lafayette Road. The property contains 3.3 acres of upland and 1.2 acres of wetland. An existing storage facility and associated utilities are located at the entrance of the site. See the accompanying plan for a more detailed description of the existing site conditions and topography.

The lot consists of three soil groups: Raynham Silt Loam, 30A (Hydrologic Soil Group C/D); Belgrade very fine sandy loam, 225B (Hydrologic Soil Group C); and Buxton-Rock outcrop complex, 709B (Hydrologic Soil Group D). 12 test pits were performed onsite in September 2021. The test pits indicated C/D soils being present throughout the site. See Appendix E for the NRCS soil map.

*Proposed Site Features*

The Applicant proposes to extend the existing driveway towards the rear of the site where a 16,800 S.F. 3-story storage facility is proposed. Underground electrical and telecommunications service will also be provided. There are existing water and gas mains however, both are proposed to be extended to accommodate the proposed facility.

In order to address stormwater management regulations, catch basins, drain manholes, Contech Water Quality Units, and detention basins are proposed to store and treat stormwater 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 consists of the front two thirds of the site and drains off to the southeast towards bordering vegetated wetland. Area E2 consists of the remaining third of the site that flows east towards the bordering vegetated wetland. 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 | 2 Yr | 10 Yr | 100 Yr |
|---|---|---|---|---|
| | (Acres) | Storm | Storm | Storm |
| E1 | 2.73 | 3.11 | 6.66 | 16.06 |
| E2 | 1.08 | 1.16 | 2.54 | 6.24 |

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 P1A abuts the northwest property line and consists of the lawn and woodland area. The runoff flows over land towards the bordering vegetated wetland. Watershed Area P1B consist of the proposed roof area, pavement, lawn, and woods that drain into a constructed wetland and outlet near the vegetated wetland to the east. Watershed areas P1C and P1F consist primarily of grass. These areas discharged directly east to DP1. Area P1G, P1H, P1J, and P1K consist primarily of proposed pavement and some lawn areas (in P1G). These areas direct the stormwater runoff into the proposed drainage system and outlet at detention basin 1. Sub-catchment areas P1D and P1E contain the proposed roof area. The runoff from the roof is piped over to detention basin 1. Sub-catchment area P1I consists of the lawn area located within detention basin 1. Sub-catchment areas P2B1 and P2B2 contain the proposed pavement and grass area in front of the entrance to the proposed building. The runoff is collected into the proposed drainage system via catch basins and piped over to detention basin 2. The last sub-catchment, P2A, consists of the remaining lawn and woodland area. The runoff flows overland towards the vegetated wetland at the northeast end of the site at Design point 2.

**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 (Acres) | 2 Yr Storm | 10 Yr Storm | 100 Yr Storm |
|---|---|---|---|---|
| Total P1 | 2.77 | 3.01 | 6.38 | 14.62 |
| Total P2 | 0.99 | 1.13 | 2.47 | 6.24 |

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 (D soil) = F * impervious area
= 0.1 in * 50,643 s.f.
= 422 c.f.

**Total Required Recharge Volume = 422 c.f.**

**Total Recharge provided = 0 c.f.**
***maximum extend practical***

## 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 Detention Basins

## 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** | **0.92** | **0.75** | **0.69** | **0.06** |
| | | | | |
| | | | | |
| | | | | |

**Total TSS Removal =** **94%**

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

Project: M234259

Prepared By: SRC

Date: 1/25/2024

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

## VI. Water Quality Calculations

## Water Quality Calculations

The Massachusetts DEP requires water quality calculations based on 1/2 inch of runoff for the total impervious area associated with the proposed development. The following calculation identifies the water quality volume required.

**Detention Basin 1:**

Total Impervious Area contributing to Infiltration Area 1 = 6,180 s.f.
6,180 s.f. * 1/2" / 12 (to convert to ft) = 257 c.f. of runoff to be treated for water quality.

Volume of Detention area 1 below the lowest outlet = 1,442 c.f.

**Detention Basin 2:**

Total Impervious Area contributing to Infiltration Area 1 = 6,445 s.f.
6,445 s.f. * 1/2" / 12 (to convert to ft) = 268 c.f. of runoff to be treated for water quality.

Volume of Detention area 2 below the lowest outlet = 888 c.f.

**Existing Constructed Wetland (retrofit):**

Total Impervious Area contributing to Infiltration Area 1 = 14,500 s.f.
14,500 s.f. * 1/2" / 12 (to convert to ft) = 604 c.f. of runoff to be treated for water quality.

Volume of Existing Pond below the lowest outlet = 822 c.f.

## VII. Soils Analysis

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


August 24, 2023

# 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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# 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.

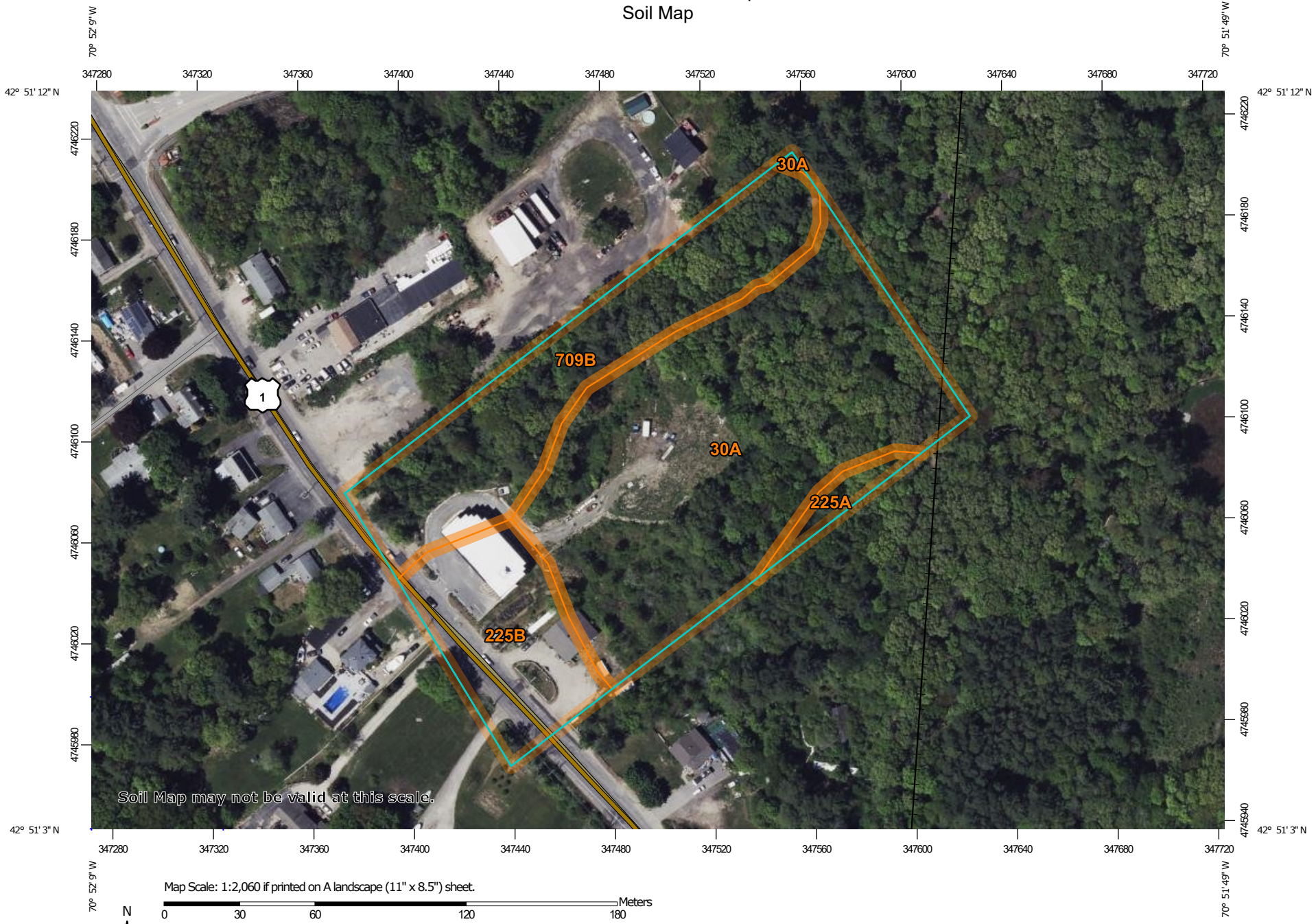
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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 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 18, Sep 9, 2022

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

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

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

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 30A | Raynham silt loam, 0 to 3 percent slopes | 3.9 | 55.5% |
| 225A | Belgrade very fine sandy loam, 0 to 3 percent slopes | 0.2 | 2.3% |
| 225B | Belgrade very fine sandy loam, 3 to 8 percent slopes | 1.1 | 15.2% |
| 709B | Buxton-Rock outcrop complex, 3 to 8 percent slopes | 1.9 | 27.0% |
| **Totals for Area of Interest** | | **7.1** | **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

## 30A—Raynham silt loam, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* vjq9
*Elevation:* 50 to 500 feet
*Mean annual precipitation:* 45 to 54 inches
*Mean annual air temperature:* 43 to 54 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Raynham and similar soils:* 75 percent
*Minor components:* 25 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Raynham

#### Setting

*Landform:* Depressions
*Landform position (two-dimensional):* Toeslope
*Landform position (three-dimensional):* Dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Parent material:* Soft coarse-silty lacustrine deposits

#### Typical profile

*H1 - 0 to 10 inches:* silt loam
*H2 - 10 to 27 inches:* very fine sandy loam
*H3 - 27 to 60 inches:* very fine sandy loam

#### Properties and qualities

*Slope:* 0 to 1 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Poorly drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* About 6 to 30 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum content:* 5 percent
*Available water supply, 0 to 60 inches:* High (about 11.7 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3w
*Hydrologic Soil Group:* C/D
*Ecological site:* F144AY019NH - Wet Lake Plain
*Hydric soil rating:* Yes

### Minor Components

#### Belgrade

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

**Walpole variant**
*Percent of map unit:* 5 percent
*Landform:* Terraces
*Hydric soil rating:* Yes

**Birdsall**
*Percent of map unit:* 5 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

**Amostown**
*Percent of map unit:* 5 percent
*Hydric soil rating:* No

## 225A—Belgrade very fine sandy loam, 0 to 3 percent slopes

**Map Unit Setting**
*National map unit symbol:* vj2n
*Elevation:* 0 to 100 feet
*Mean annual precipitation:* 45 to 54 inches
*Mean annual air temperature:* 43 to 54 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**
*Belgrade and similar soils:* 80 percent
*Minor components:* 20 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Belgrade**

**Setting**
*Landform:* Valleys
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Parent material:* Friable coarse-silty eolian deposits over soft coarse-silty glaciolacustrine deposits derived from metamorphic rock

**Typical profile**
*H1 - 0 to 9 inches:* very fine sandy loam
*H2 - 9 to 30 inches:* very fine sandy loam
*H3 - 30 to 60 inches:* loamy very fine sand

**Properties and qualities**
*Slope:* 0 to 3 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.06 to 2.00 in/hr)

*Depth to water table:* About 18 to 41 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* High (about 9.6 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2w
*Hydrologic Soil Group:* C
*Ecological site:* F144AY018NY - Moist Lake Plain
*Hydric soil rating:* No

**Minor Components**

**Raynham**

*Percent of map unit:* 10 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

**Unadilla**

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

## 225B—Belgrade very fine sandy loam, 3 to 8 percent slopes

**Map Unit Setting**

*National map unit symbol:* vj2r
*Elevation:* 0 to 100 feet
*Mean annual precipitation:* 45 to 54 inches
*Mean annual air temperature:* 43 to 54 degrees F
*Frost-free period:* 145 to 240 days
*Farmland classification:* All areas are prime farmland

**Map Unit Composition**

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

**Description of Belgrade**

**Setting**

*Landform:* Valleys
*Landform position (two-dimensional):* Footslope
*Landform position (three-dimensional):* Base slope
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Parent material:* Friable coarse-silty eolian deposits over soft coarse-silty glaciolacustrine deposits derived from metamorphic rock

**Typical profile**

*H1 - 0 to 9 inches:* very fine sandy loam

*H2 - 9 to 30 inches:* very fine sandy loam
*H3 - 30 to 60 inches:* loamy very fine sand

**Properties and qualities**

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to high (0.06 to 2.00 in/hr)
*Depth to water table:* About 18 to 41 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* High (about 9.6 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* C
*Ecological site:* F144AY018NY - Moist Lake Plain
*Hydric soil rating:* No

**Minor Components**

**Unadilla**

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

**Raynham**

*Percent of map unit:* 10 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

## 709B—Buxton-Rock outcrop complex, 3 to 8 percent slopes

**Map Unit Setting**

*National map unit symbol:* vj3v
*Elevation:* 0 to 70 feet
*Mean annual precipitation:* 45 to 54 inches
*Mean annual air temperature:* 43 to 54 degrees F
*Frost-free period:* 125 to 240 days
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Buxton and similar soils:* 70 percent
*Rock outcrop:* 15 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Buxton

#### Setting

*Landform:* Valleys, valleys
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Parent material:* Soft fine-loamy glaciolacustrine deposits derived from mica schist over hard fine-loamy glaciolacustrine deposits derived from mica schist

#### Typical profile

*H1 - 0 to 10 inches:* silt loam
*H2 - 10 to 30 inches:* silt loam
*H3 - 30 to 60 inches:* silty clay

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately high (0.00 to 0.20 in/hr)
*Depth to water table:* About 12 to 36 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* High (about 9.7 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 2e
*Hydrologic Soil Group:* D
*Ecological site:* F145XY006CT - Semi-Rich Moist Lake Plain
*Hydric soil rating:* No

### Description of Rock Outcrop

#### Setting

*Parent material:* Mica schist

#### Properties and qualities

*Slope:* 3 to 8 percent
*Depth to restrictive feature:* 0 inches to lithic bedrock

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 8s
*Hydric soil rating:* Unranked

### Minor Components

#### Suffield

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

#### Scantic

*Percent of map unit:* 5 percent
*Landform:* Depressions
*Hydric soil rating:* Yes

# References

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

# SOIL SUITABILITY ASSESSMENT REPORT

## COMMONWEALTH OF MASSACHUSETTS

## SALISBURY, MASSACHUSETTS

FOR NEW CONSTRUCTION OF ON-SITE STORMWATER MANAGEMENT

### SITE INFORMATION

October 10, 2023

Street Address: 82 Lafayette Road Town: Salisbury State: Massachusetts Zip Code: 01952 County: Essex

Land Use: Commercial Latitude: ~42° 51' 07.43" N Longitude: ~70° 52' 02.37" W

### PUBLISHED SOIL DATA AND MAP UNIT DESCRIPTION

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

Soil survey area: Essex County, Massachusetts, Northern Part Series name: 30A – Raynham Silt Loam, 0-3% slopes

Order: Inceptisol Suborder: Ochrepts Family: Coarse-silty, mixed, nonacidic, mesic Aeric Haplaquepts

Soil moisture regime: Udic Soil temperature regime: Mesic Runoff class: High

Soil hydric or upland: Upland soils Average depth to water table: 18"- 32" Depth to restrictive feature: > 80"

Frequency of flooding: None Frequency of ponding: None Available water supply (0-60"): High (~11.7")

Drainage Class: Poorly drained Hydrologic Soil Group: C/D Ksat: Moderately low to high (0.06 – 00.20 in/hr)

Ecological site: Moist Relict Lake Plain

### WETLAND AREA & USGS WELL MEASUREMENTS

National Wetland Inventory Map: NA Wetlands Conservancy Program: NA Bordering vegetative wetland: > 50'

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

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

Most recent data value: 10.79' on 10/09/23 (depth to water level in feet below land surface)

### SURFICIAL GEOLOGY

Geologic parent material: Soft coarse-silty lacustrine deposits Geomorphic component: Relict Lake Plain

Slope aspect: Southeasterly Landform position (2D): Toe slope Landform position (3D): Dip

Slope gradient: ~01-03% Down slope shape: Concave Across slope shape: Concave Slope complexity: Simple

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

Bedrock Type: Newburyport complex: Gray, medium-grained Tonalite and Granodiorite

# TP23-1 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-1

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 17" | C^ | Fine Sandy Loam Mixture | | | FILL |
| 17" → 48"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 23" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 23"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 48" Seasonal High Groundwater Table: 23" Apparent water: ___

# TP23-1 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 23" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 23" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-1 Upper boundary: ___
Lower boundary: ___

## *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.

*#1848* October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-2 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-2

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 16" | C^ | Fine Sandy Loam Mixture | | | FILL |
| 16" → 42"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 20" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 20"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 42" Seasonal High Groundwater Table: 20" Apparent water: ___

# TP23-2 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 20" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 20" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-2 Upper boundary: ___
Lower boundary: ___

## *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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Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-3 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-3

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 15" | C^ | Fine Sandy Loam Mixture | | | FILL |
| 15" → 40"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 20" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 20"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 40" Seasonal High Groundwater Table: 20" Apparent water: ___

# TP23-3 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 20" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 20" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-3 Upper boundary: ___
Lower boundary: ___

## *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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Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-4 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-4

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 32" | C^ | Fine Sandy Loam Mixture | | | FILL |
| 32" → 40"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 32" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 32"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 40" Seasonal High Groundwater Table: 32" Apparent water: ___

# TP23-4 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 32" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 32" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-4 Upper boundary: ___
Lower boundary: ___

## *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.

*#1848* October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-5 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^+$ feet Public water supply reservoir: $400^+$ feet Tributary to reservoir: $200^+$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-5

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 30" | C^ | Fine Sandy Loam Mixture | | | FILL |
| 30" → 43"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 32" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 32"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 43" Seasonal High Groundwater Table: 32" Apparent water: ___

# TP23-5 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 32" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 32" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-5 Upper boundary: ___
Lower boundary: ___

## *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.

*#1848* October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-6 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-6

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 07" | A | Sandy Loam | 10YR 3/2 very dark grayish brown | none observed | Very friable; moderate-grade; fine-to-medium granular structure; somewhat cohesive; fine grained mineral content; damp; non-sticky; non-plastic; many fine roots; free of clasts; clear wavy boundary. |
| 07" → 12" | $B_W$ | Sandy Loam | 10YR 4/4 dark yellowish brown | none observed | Very friable; moderate-grade, fine, sub-angular blocky structure; non-cohesive; fine-grained mineral content; damp; non-sticky; non-plastic; few fine roots; ~02% rounded to sub-rounded gravel content of mixed lithology; abrupt wavy boundary. |
| 12" → 33"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 23" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 23"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 33" Seasonal High Groundwater Table: 23" Apparent water: ___

# TP23-6 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 23" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 23" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-6 Upper boundary: ___
Lower boundary: ___

## *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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Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-7 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-7

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 07" | A | Sandy Loam | 10YR 3/2 very dark grayish brown | none observed | Very friable; moderate-grade; fine-to-medium granular structure; somewhat cohesive; fine grained mineral content; damp; non-sticky; non-plastic; many fine roots; free of clasts; clear wavy boundary. |
| 07" → 11" | $B_W$ | Sandy Loam | 10YR 4/4 dark yellowish brown | none observed | Very friable; moderate-grade, fine, sub-angular blocky structure; non-cohesive; fine-grained mineral content; damp; non-sticky; non-plastic; few fine roots; ~02% rounded to sub-rounded gravel content of mixed lithology; abrupt wavy boundary. |
| 11" → 33"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 18" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 18"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 33" Seasonal High Groundwater Table: 18" Apparent water: ___

# TP23-7 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 18" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 18" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-7 Upper boundary: ___
Lower boundary: ___

## *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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Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-8 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-8

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 11" | A | Sandy Loam | 10YR 3/2 very dark grayish brown | none observed | Very friable; moderate-grade; fine-to-medium granular structure; somewhat cohesive; fine grained mineral content; damp; non-sticky; non-plastic; many fine roots; free of clasts; clear wavy boundary. |
| 11" → 14" | $B_W$ | Sandy Loam | 10YR 4/4 dark yellowish brown | none observed | Very friable; moderate-grade, fine, sub-angular blocky structure; non-cohesive; fine-grained mineral content; damp; non-sticky; non-plastic; few fine roots; ~02% rounded to sub-rounded gravel content of mixed lithology; abrupt wavy boundary. |
| 14" → 25"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 21" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 21"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 25" Seasonal High Groundwater Table: 21" Apparent water: ___

# TP23-8 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 21" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 21" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-8 Upper boundary: ___
Lower boundary: ___

## *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.

*#1848* October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-9 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-9

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 09" | A | Sandy Loam | 10YR 3/2 very dark grayish brown | none observed | Very friable; moderate-grade; fine-to-medium granular structure; somewhat cohesive; fine grained mineral content; damp; non-sticky; non-plastic; many fine roots; free of clasts; clear wavy boundary. |
| 09" → 13" | $B_W$ | Sandy Loam | 10YR 4/4 dark yellowish brown | none observed | Very friable; moderate-grade, fine, sub-angular blocky structure; non-cohesive; fine-grained mineral content; damp; non-sticky; non-plastic; few fine roots; ~02% rounded to sub-rounded gravel content of mixed lithology; abrupt wavy boundary. |
| 13" → 25"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 21" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 21"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 25" Seasonal High Groundwater Table: 21" Apparent water: ___

# TP23-9 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 21" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 21" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-9 Upper boundary: ___
Lower boundary: ___

## *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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Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-10 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-10

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 05" | A | Sandy Loam | 10YR 3/2 very dark grayish brown | none observed | Very friable; moderate-grade; fine-to-medium granular structure; somewhat cohesive; fine grained mineral content; damp; non-sticky; non-plastic; many fine roots; free of clasts; clear wavy boundary. |
| 05" → 13" | $B_W$ | Sandy Loam | 10YR 4/4 dark yellowish brown | none observed | Very friable; moderate-grade, fine, sub-angular blocky structure; non-cohesive; fine-grained mineral content; damp; non-sticky; non-plastic; few fine roots; ~02% rounded to sub-rounded gravel content of mixed lithology; abrupt wavy boundary. |
| 13" → 29"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 23" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 23"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 29" Seasonal High Groundwater Table: 23" Apparent water: ___

# TP23-10 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 23" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 23" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-10 Upper boundary: ___
Lower boundary: ___

## *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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Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-11 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-11

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 11" | A | Sandy Loam | 10YR 3/2 very dark grayish brown | none observed | Very friable; moderate-grade; fine-to-medium granular structure; somewhat cohesive; fine grained mineral content; damp; non-sticky; non-plastic; many fine roots; free of clasts; clear wavy boundary. |
| 11" → 13" | $B_W$ | Sandy Loam | 10YR 4/4 dark yellowish brown | none observed | Very friable; moderate-grade, fine, sub-angular blocky structure; non-cohesive; fine-grained mineral content; damp; non-sticky; non-plastic; few fine roots; ~02% rounded to sub-rounded gravel content of mixed lithology; abrupt wavy boundary. |
| 13" → 37"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 23" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 23"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 37" Seasonal High Groundwater Table: 23" Apparent water: ___

# TP23-11 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 23" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 23" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-11 Upper boundary: ___
Lower boundary: ___

## *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.

*#1848* October 1998

Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# TP23-12 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

Date: October 10, 2023 Weather: Sunny, clear, 45°-50° F, still and dry.

Landscape: Upland Landform: Relict lakebed Position on landscape: Toe slope

Slope aspect: Southeasterly Slope (%): 00 – 03 % Slope complexity: Simple Land Cover: Grass field and forested

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

Wetlands: $50^{+}$ feet Public water supply reservoir: $400^{+}$ feet Tributary to reservoir: $200^{+}$ feet

Unsuitable materials present: Yes Disturbed soil: ___ Fill material: X Bedrock/ fractured rock: ___

## SOIL PROFILE ► TP23-12

| 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. |
|---|---|---|---|---|---|
| | | | | | |
| 00" → 08" | A | Sandy Loam | 10YR 3/2 very dark grayish brown | none observed | Very friable; moderate-grade; fine-to-medium granular structure; somewhat cohesive; fine grained mineral content; damp; non-sticky; non-plastic; many fine roots; free of clasts; clear wavy boundary. |
| 08" → 12" | $B_W$ | Sandy Loam | 10YR 4/4 dark yellowish brown | none observed | Very friable; moderate-grade, fine, sub-angular blocky structure; non-cohesive; fine-grained mineral content; damp; non-sticky; non-plastic; few fine roots; ~02% rounded to sub-rounded gravel content of mixed lithology; abrupt wavy boundary. |
| 12" → 37"+ | $2C_d$ | Silt Loam | 2.5Y 5/4 light olive brown | 24" (c,2,p) 5YR 5/8 Gley 1 7/N | Firm to friable; massive structure; very fine-grained mineral content; damp matrix; slightly sticky; non-plastic; poorly graded; free of clasts; dense matrix; tight in-situ; silty; seasonal high water table observed at 24"; no apparent water observed; no bedrock refusal at test hole depth. |

Depth to bedrock: > 37" Seasonal High Groundwater Table: 24" Apparent water: ___

# TP23-12 DEEP OBSERVATION HOLE

82 Lafayette Road, Salisbury, Massachusetts

## DEPTH TO 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: _____

## ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

Depth of Estimated Seasonal High Groundwater Table: 24" (below land surface)

Kind: Non-cemented iron masses and associated reduction rings and spots

Shape: Amorphous/ linear Location: In $_2C_d$ matrix

Hardness: Soft Boundary: Diffuse Abundance: Common Size: Medium Contrast: Prominent

Concentration color: 5YR 5/8 yellowish red Reduction color: Gley1 7/N light gray Moisture state: Damp

## DETERMINATION OF HIGH GROUNDWATER ELEVATION

Observed depth to redoximorphic features: 24" 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 ► Not Applicable

Depth of naturally occurring pervious material in TP23-12 Upper boundary: ___
Lower boundary: ___

## *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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Alexander F. Parker Date of License issuance

Massachusetts Soil Evaluator & License number

Unofficial testing 10/10/2023

Town of Salisbury Public Health Director Date of soil testing

# 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 Town of Salisbury, shall be implemented for the proposed development at 82 Lafayette Road 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**
82 Lafeyette Road Development, LLC
12 56th Street
Newburyport, MA 01950

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 the limit of work. 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 roadway. 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 proposed roadway 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.

*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.

*Detention Basin*

Inspect the basin at least once per year to ensure that the basins are operating as intended. In addition, inspect the basins during and after major storm events to determine if the basin is meeting expected detention times. Examine the outlet structure for evidence of clogging or outflow release velocities that are greater than the design flow. Check for erosion, cracking or tree growth on the embankment and any damage to the emergency spillway. Make any necessary repairs immediately.

Mow the upper-stage, side slopes, embankment, and emergency spillway at least twice per year. Remove any trash and or debris at this time.

*Constructed Wetland*

Constructed wetlands are included in the stormwater management plan design for the proposed development. The Homeowner's Association shall be responsible for proper maintenance and upkeep of the wetlands. To ensure proper performance and system longevity, the following maintenance schedule is recommended:

a.) Sediment and debris removal: Wetlands should be inspected twice a year by a certified wetland scientist, during both growing and non-growing seasons, in the first 3 years after construction. Observations during the inspections should include:
    i.) Types and distribution of dominant wetland plants in the wetlands;
    ii.) The presence and distribution of planted wetland species versus the presence and distribution of natural wetland species and any signs that natural species are overtaking planted species;
    iii.) Accumulation of sediment in the forebay and micropool. Any sediment and debris should be removed manually before the vegetation is adversely impacted;

In the event the micropool needs to be drained, a pump shall be placed within the micropool and the discharge pipe shall be directed into the outlet control structure.

Wetland protection: Efforts should be made, through snow and snow melt management, local bylaws and public education, to protect the wetlands from damages of snow removal and off street parking.

## 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 : | 82 Lafayette Road | | | | |
| PROJECT # : | Constructed Wetland Outlet #1 | | | | |
| BY : | SRC | | CHECKED BY : | | |
| DATE : | 1/3/2024 | STORM: | 10-Yr | DATE : | |

## DOWNSTREAM PIPE HYDRAULICS

| | | |
|---|---|---|
| Peak Discharge Required = | 1.01 | cfs |
| Depth of Flow* = | 0.13 | Feet |

## La AND W CALCULATIONS:

| | | |
|---|---|---|
| Culvert Diameter (Do) = | 12.0 | Inches |
| Tail Water Depth (TW)* = | 0.13 | Feet |
| Width of Apron @ U.S End (W) = | 3.0 | Feet |
| Length of Apron (La) = | 9 | Feet |
| Width of Apron @ D.S End (W) = | 12 | Feet |

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

## ROCK RIPRAP SIZE

$d_{50}$ = 0.16 Feet or 1.89 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 | 2.8 | to | 3.8 |
| 85 | 2.5 | to | 3.4 |
| 50 | 1.9 | to | 2.8 |
| 15 | 0.6 | to | 0.9 |

Minimum Rock Riprap Blanket Thickness = 6.0 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 |

Rockingham County Conservation District

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

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME : | 82 Lafayette Road | | | | |
| PROJECT # : | Constructed Wetland Outlet #2 | | | | |
| BY : | SRC | | CHECKED BY : | | |
| DATE : | 1/3/2024 | STORM: | 10-Yr | DATE : | |

## DOWNSTREAM PIPE HYDRAULICS

| | | |
|---|---|---|
| Peak Discharge Required = | 0.30 | cfs |
| Depth of Flow* = | 0.12 | Feet |

## La AND W CALCULATIONS:

| | | |
|---|---|---|
| Culvert Diameter (Do) = | 12.0 | Inches |
| Tail Water Depth (TW)* = | 0.12 | Feet |
| Width of Apron @ U.S End (W) = | 3.0 | Feet |
| Length of Apron (La) = | 8 | Feet |
| Width of Apron @ D.S End (W) = | 11 | Feet |

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

## ROCK RIPRAP SIZE

$d_{50}$ = 0.03 Feet or 0.39 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 | 0.6 | to | 0.8 |
| 85 | 0.5 | to | 0.7 |
| 50 | 0.4 | to | 0.6 |
| 15 | 0.1 | to | 0.2 |

Minimum Rock Riprap Blanket Thickness = 6.0 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 |

Rockingham County Conservation District

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

| | | | | | |
|---|---|---|---|---|---|
| PROJECT NAME : | 82 Lafayette Road | | | | |
| PROJECT # : | Constructed Wetland Outlet #3 | | | | |
| BY : | SRC | | CHECKED BY : | | |
| DATE : | 1/3/2024 | STORM: | 10-Yr | DATE : | |

## DOWNSTREAM PIPE HYDRAULICS

| | | |
|---|---|---|
| Peak Discharge Required = | 2.60 | cfs |
| Depth of Flow* = | 0.40 | Feet |

## La AND W CALCULATIONS:

| | | |
|---|---|---|
| Culvert Diameter (Do) = | 12.0 | Inches |
| Tail Water Depth (TW)* = | 0.40 | Feet |
| Width of Apron @ U.S End (W) = | 3.0 | Feet |
| Length of Apron (La) = | 12 | Feet |
| Width of Apron @ D.S End (W) = | 15 | Feet |

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

## ROCK RIPRAP SIZE

$d_{50}$ = 0.18 Feet or 2.15 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 | 3.2 | to | 4.3 |
| 85 | 2.8 | to | 3.9 |
| 50 | 2.1 | to | 3.2 |
| 15 | 0.6 | to | 1.1 |

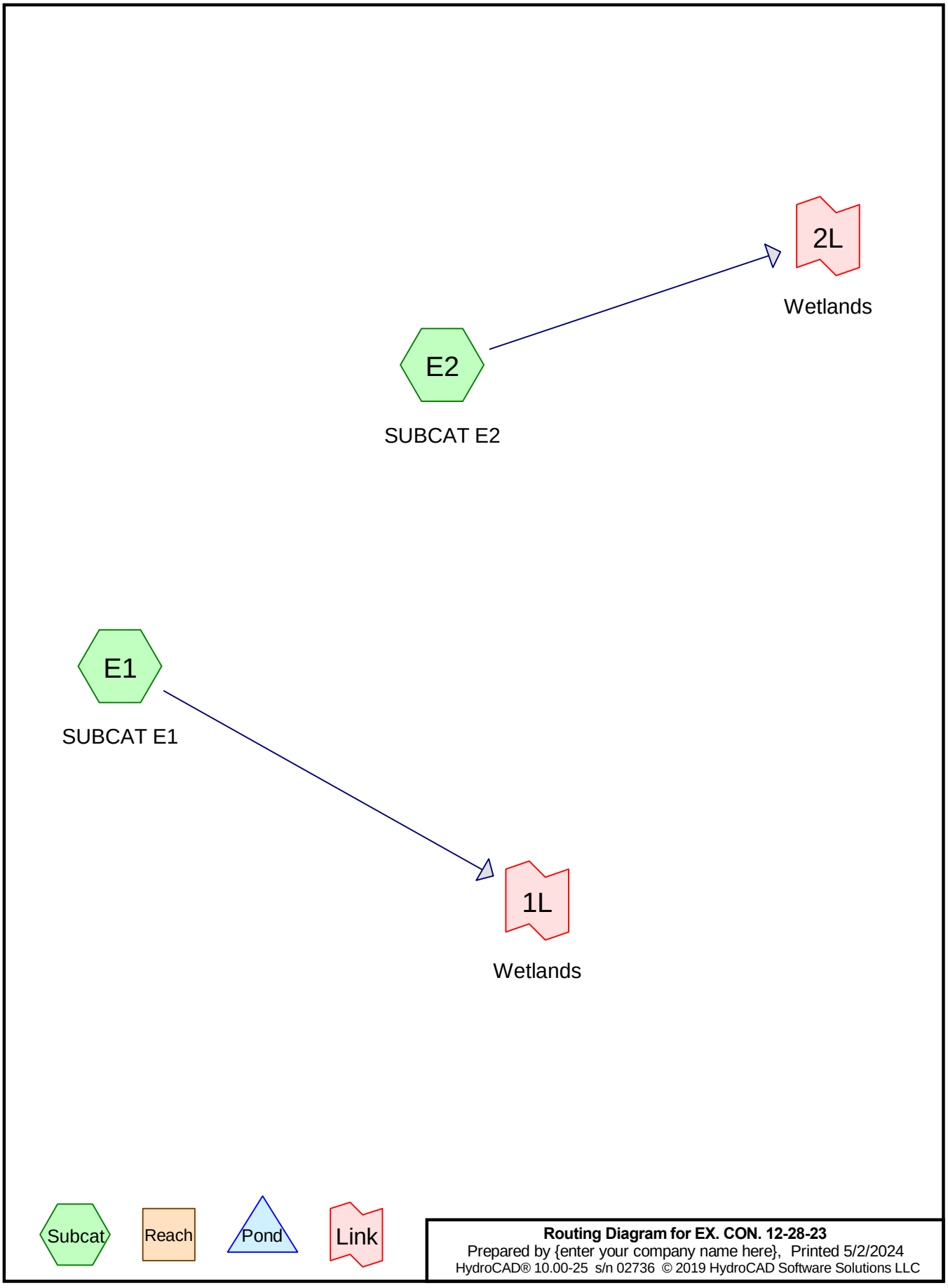
Minimum Rock Riprap Blanket Thickness = 6.4 Inches

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 EX. CON. 12-28-23**
Prepared by {enter your company name here}, Printed 5/2/2024

## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 23,214 | 84 | 50-75% Grass cover, Fair, HSG D (E1) |
| 143,083 | 77 | Woods, Good, HSG D (E1, E2) |
| **166,297** | **78** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 0 | HSG A | |
| 0 | HSG B | |
| 0 | HSG C | |
| 166,297 | HSG D | E1, E2 |
| 0 | Other | |
| **166,297** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover | Subcatch Numbers |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 23,214 | 0 | 23,214 | 50-75% Grass cover, Fair | |
| 0 | 0 | 0 | 143,083 | 0 | 143,083 | Woods, Good | |
| **0** | **0** | **0** | **166,297** | **0** | **166,297** | **TOTAL AREA** | |

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: SUBCAT E1** Runoff Area=119,193 sf 0.00% Impervious Runoff Depth>1.23"
Flow Length=181' Tc=12.3 min CN=78 Runoff=3.11 cfs 12,253 cf

**Subcatchment E2: SUBCAT E2** Runoff Area=47,104 sf 0.00% Impervious Runoff Depth>1.17"
Flow Length=215' Slope=0.0400 '/' Tc=12.3 min CN=77 Runoff=1.16 cfs 4,605 cf

**Link 1L: Wetlands** Inflow=3.11 cfs 12,253 cf
Primary=3.11 cfs 12,253 cf

**Link 2L: Wetlands** Inflow=1.16 cfs 4,605 cf
Primary=1.16 cfs 4,605 cf

**Total Runoff Area = 166,297 sf Runoff Volume = 16,857 cf Average Runoff Depth = 1.22"**
**100.00% Pervious = 166,297 sf 0.00% Impervious = 0 sf**

## Summary for Subcatchment E1: SUBCAT E1

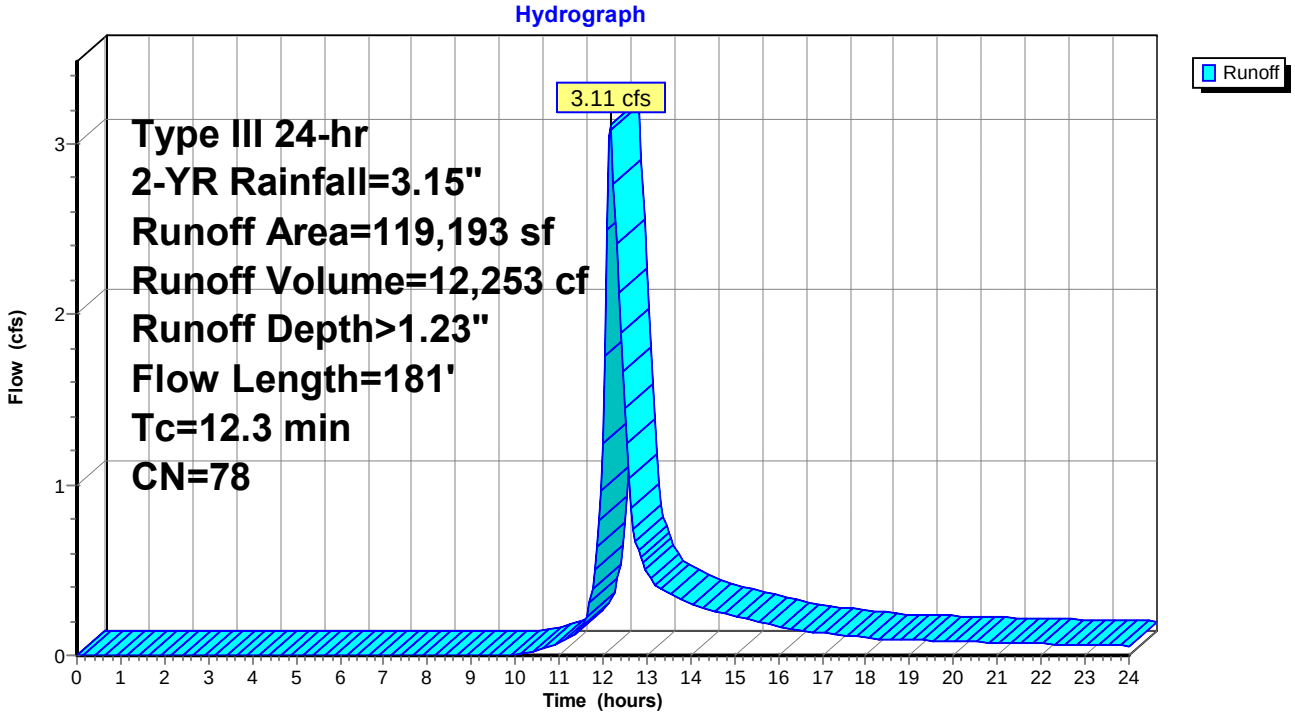
Runoff = 3.11 cfs @ 12.18 hrs, Volume= 12,253 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 18,709 | 84 | 50-75% Grass cover, Fair, HSG D |
| 4,505 | 84 | 50-75% Grass cover, Fair, HSG D |
| 95,979 | 77 | Woods, Good, HSG D |
| 119,193 | 78 | Weighted Average |
| 119,193 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0400 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 2.8 | 131 | 0.0250 | 0.79 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.3 | 181 | Total | | | |

## Subcatchment E1: SUBCAT E1



## Summary for Subcatchment E2: SUBCAT E2

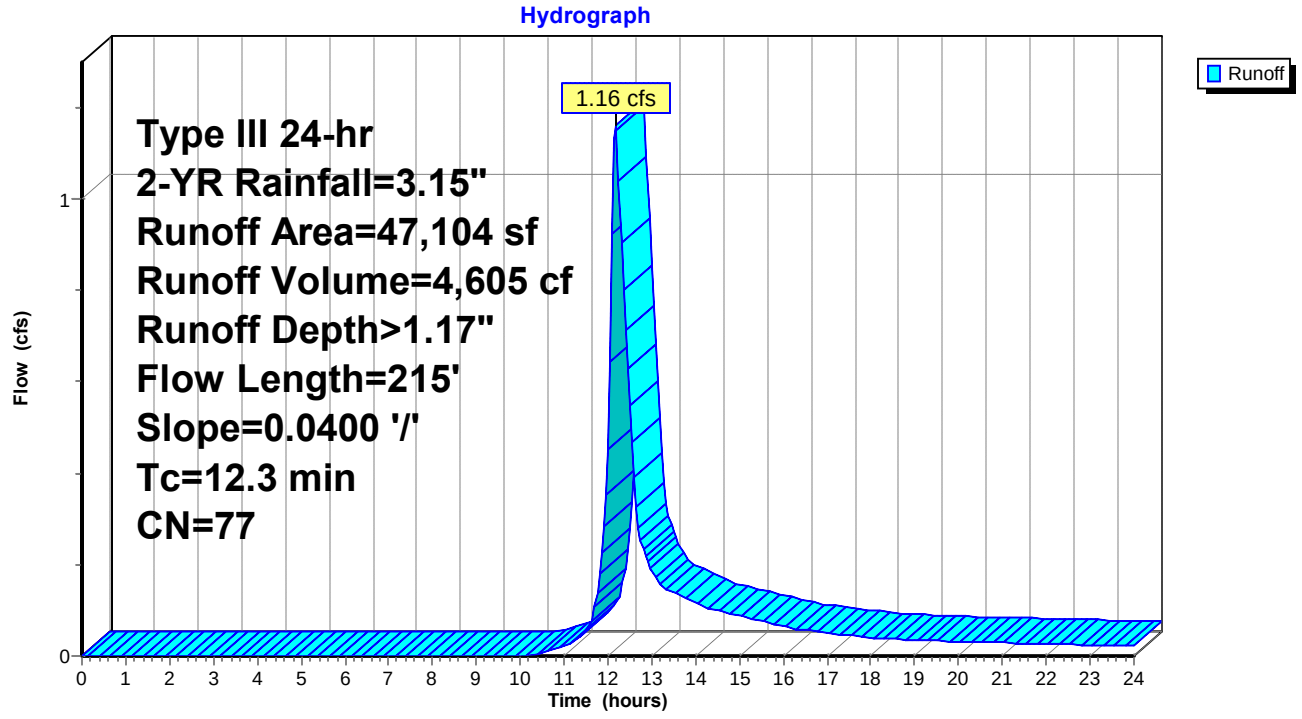
Runoff = 1.16 cfs @ 12.18 hrs, Volume= 4,605 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 47,104 | 77 | Woods, Good, HSG D |
| 47,104 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0400 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 2.7 | 165 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.3 | 215 | Total | | | |

## Subcatchment E2: SUBCAT E2

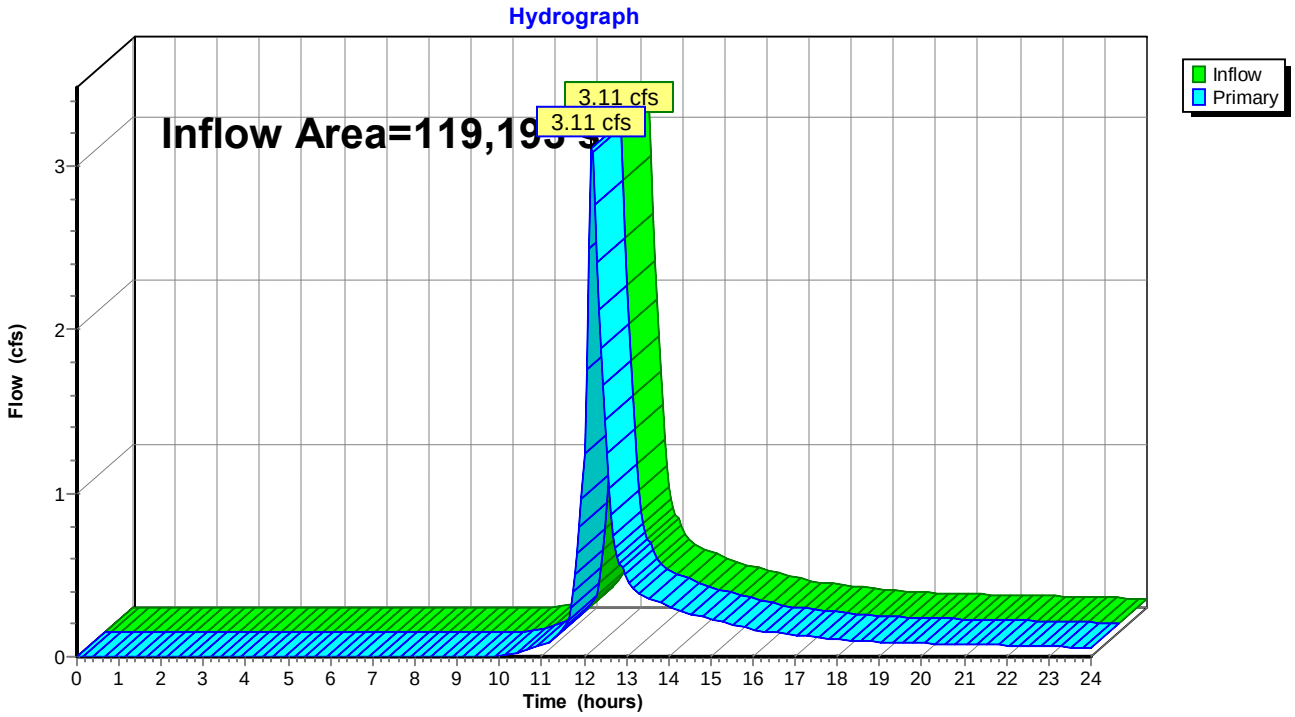


## Summary for Link 1L: Wetlands

Inflow Area = 119,193 sf, 0.00% Impervious, Inflow Depth > 1.23" for 2-YR event
Inflow = 3.11 cfs @ 12.18 hrs, Volume= 12,253 cf
Primary = 3.11 cfs @ 12.18 hrs, Volume= 12,253 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link 1L: Wetlands

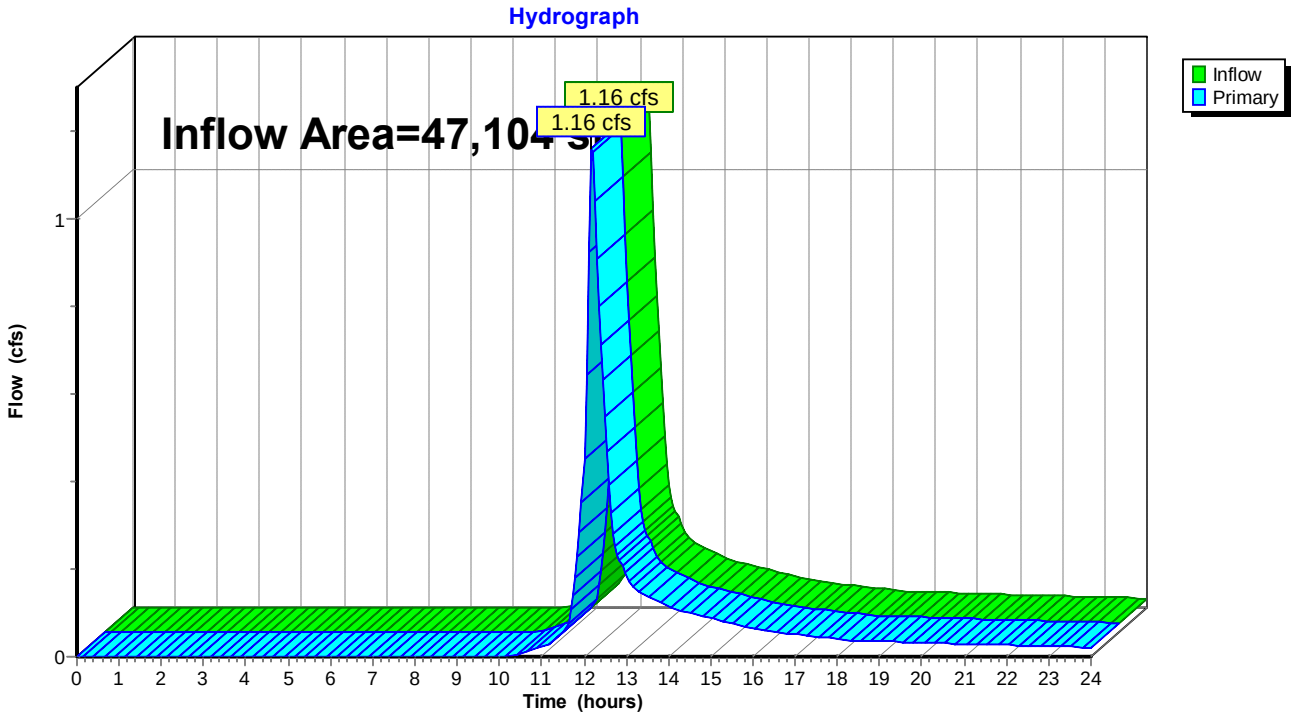


## Summary for Link 2L: Wetlands

Inflow Area = 47,104 sf, 0.00% Impervious, Inflow Depth > 1.17" for 2-YR event
Inflow = 1.16 cfs @ 12.18 hrs, Volume= 4,605 cf
Primary = 1.16 cfs @ 12.18 hrs, Volume= 4,605 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link 2L: Wetlands



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: SUBCAT E1** Runoff Area=119,193 sf 0.00% Impervious Runoff Depth>2.56"
Flow Length=181' Tc=12.3 min CN=78 Runoff=6.66 cfs 25,450 cf

**Subcatchment E2: SUBCAT E2** Runoff Area=47,104 sf 0.00% Impervious Runoff Depth>2.48"
Flow Length=215' Slope=0.0400 '/' Tc=12.3 min CN=77 Runoff=2.54 cfs 9,718 cf

**Link 1L: Wetlands** Inflow=6.66 cfs 25,450 cf
Primary=6.66 cfs 25,450 cf

**Link 2L: Wetlands** Inflow=2.54 cfs 9,718 cf
Primary=2.54 cfs 9,718 cf

**Total Runoff Area = 166,297 sf Runoff Volume = 35,168 cf Average Runoff Depth = 2.54"**
**100.00% Pervious = 166,297 sf 0.00% Impervious = 0 sf**

## Summary for Subcatchment E1: SUBCAT E1

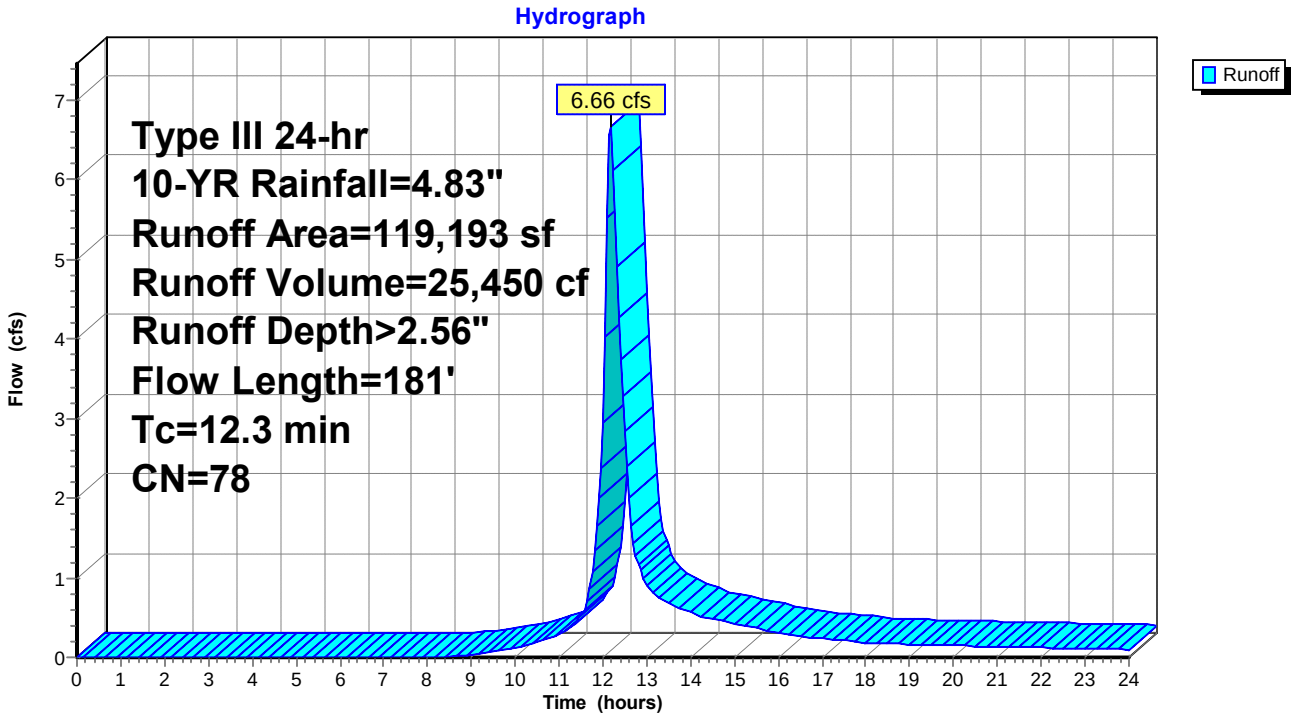
Runoff = 6.66 cfs @ 12.17 hrs, Volume= 25,450 cf, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 18,709 | 84 | 50-75% Grass cover, Fair, HSG D |
| 4,505 | 84 | 50-75% Grass cover, Fair, HSG D |
| 95,979 | 77 | Woods, Good, HSG D |
| 119,193 | 78 | Weighted Average |
| 119,193 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0400 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 2.8 | 131 | 0.0250 | 0.79 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.3 | 181 | Total | | | |

## Subcatchment E1: SUBCAT E1



## Summary for Subcatchment E2: SUBCAT E2

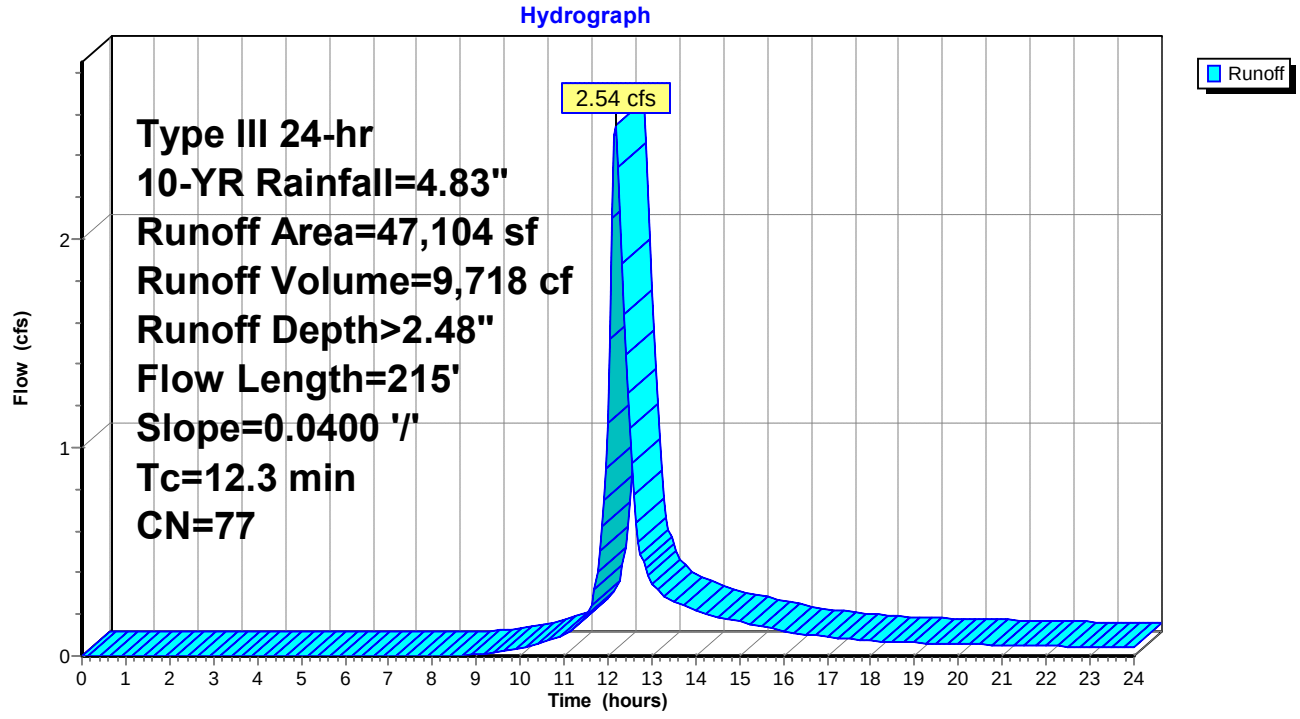
Runoff = 2.54 cfs @ 12.17 hrs, Volume= 9,718 cf, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 47,104 | 77 | Woods, Good, HSG D |
| 47,104 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0400 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 2.7 | 165 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.3 | 215 | Total | | | |

## Subcatchment E2: SUBCAT E2

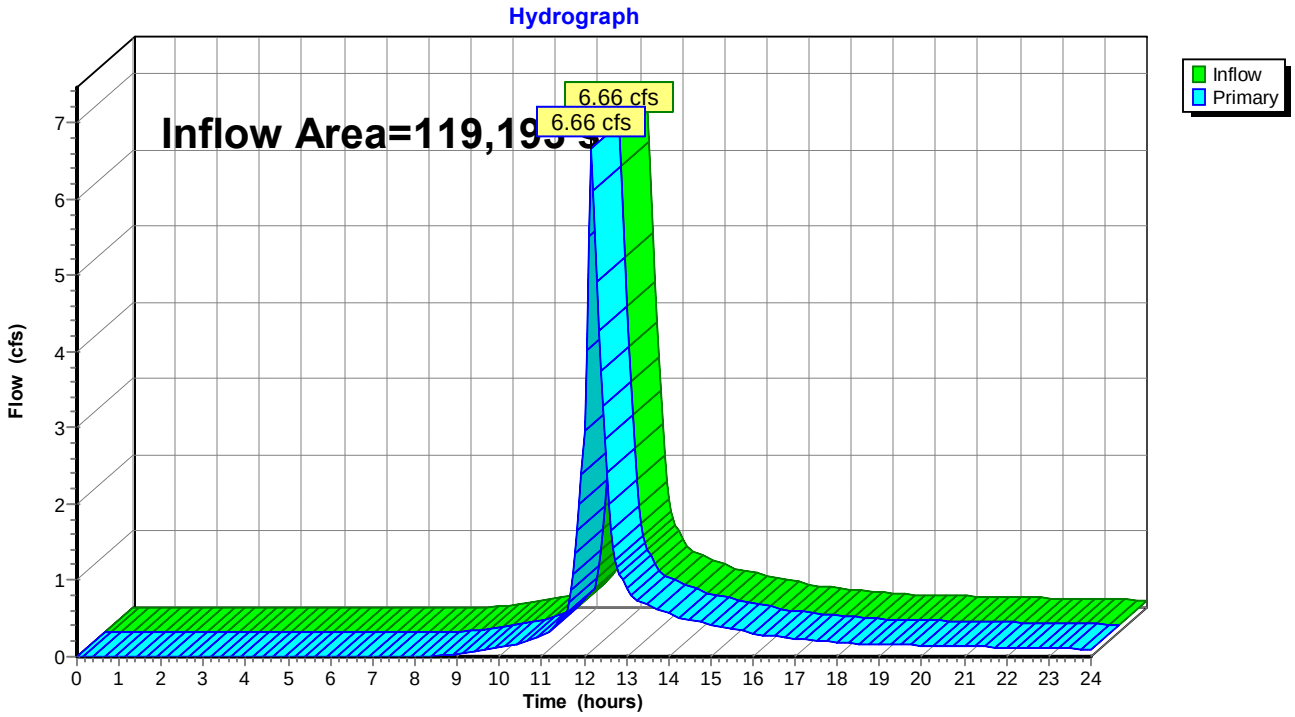


## Summary for Link 1L: Wetlands

Inflow Area = 119,193 sf, 0.00% Impervious, Inflow Depth > 2.56" for 10-YR event
Inflow = 6.66 cfs @ 12.17 hrs, Volume= 25,450 cf
Primary = 6.66 cfs @ 12.17 hrs, Volume= 25,450 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link 1L: Wetlands

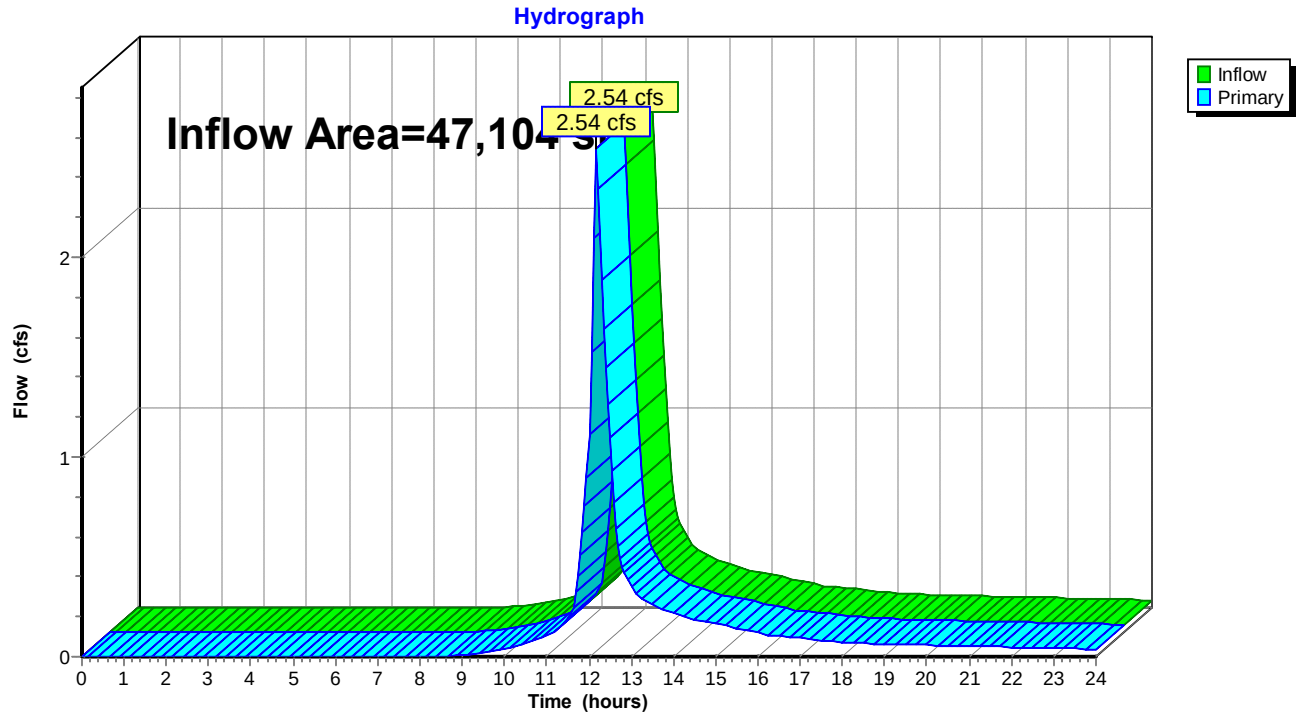


## Summary for Link 2L: Wetlands

Inflow Area = 47,104 sf, 0.00% Impervious, Inflow Depth > 2.48" for 10-YR event
Inflow = 2.54 cfs @ 12.17 hrs, Volume= 9,718 cf
Primary = 2.54 cfs @ 12.17 hrs, Volume= 9,718 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link 2L: Wetlands



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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: SUBCAT E1** Runoff Area=119,193 sf 0.00% Impervious Runoff Depth>6.25"
Flow Length=181' Tc=12.3 min CN=78 Runoff=16.06 cfs 62,119 cf

**Subcatchment E2: SUBCAT E2** Runoff Area=47,104 sf 0.00% Impervious Runoff Depth>6.13"
Flow Length=215' Slope=0.0400 '/' Tc=12.3 min CN=77 Runoff=6.24 cfs 24,067 cf

**Link 1L: Wetlands** Inflow=16.06 cfs 62,119 cf
Primary=16.06 cfs 62,119 cf

**Link 2L: Wetlands** Inflow=6.24 cfs 24,067 cf
Primary=6.24 cfs 24,067 cf

**Total Runoff Area = 166,297 sf Runoff Volume = 86,187 cf Average Runoff Depth = 6.22"**
**100.00% Pervious = 166,297 sf 0.00% Impervious = 0 sf**

## Summary for Subcatchment E1: SUBCAT E1

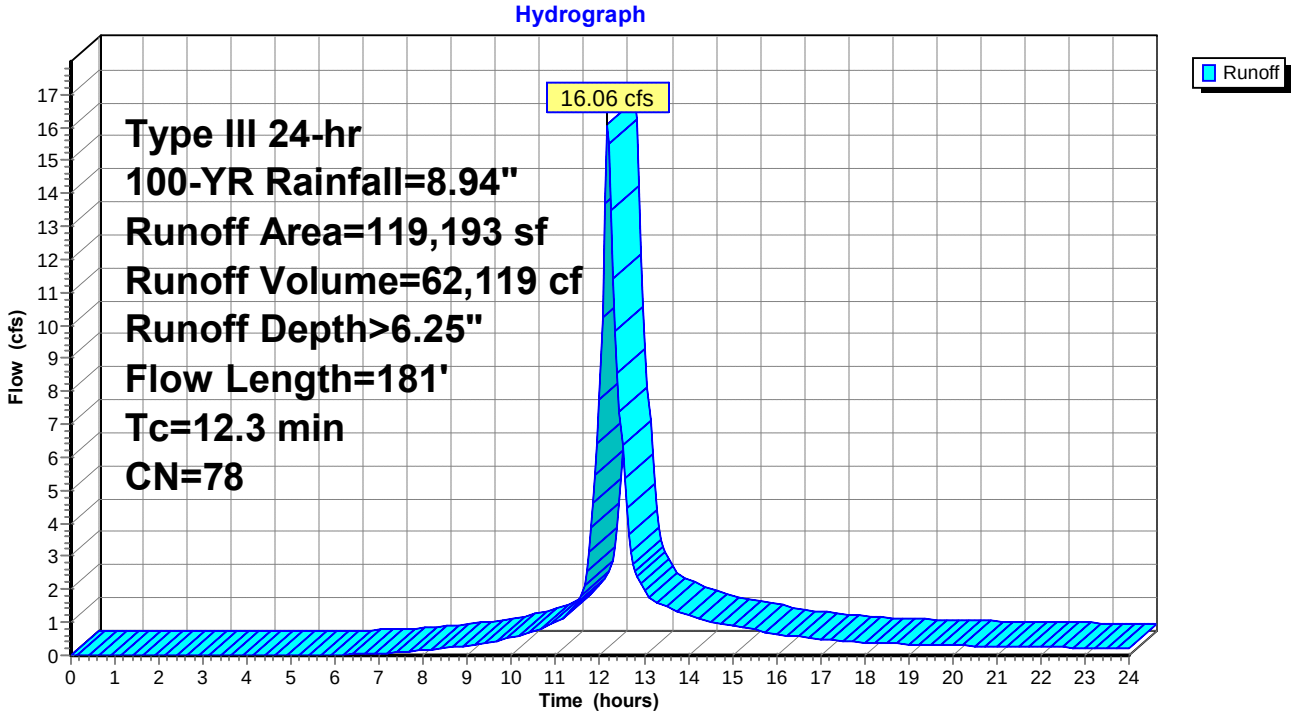
Runoff = 16.06 cfs @ 12.17 hrs, Volume= 62,119 cf, Depth> 6.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 18,709 | 84 | 50-75% Grass cover, Fair, HSG D |
| 4,505 | 84 | 50-75% Grass cover, Fair, HSG D |
| 95,979 | 77 | Woods, Good, HSG D |
| 119,193 | 78 | Weighted Average |
| 119,193 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0400 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 2.8 | 131 | 0.0250 | 0.79 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.3 | 181 | Total | | | |

## Subcatchment E1: SUBCAT E1



## Summary for Subcatchment E2: SUBCAT E2

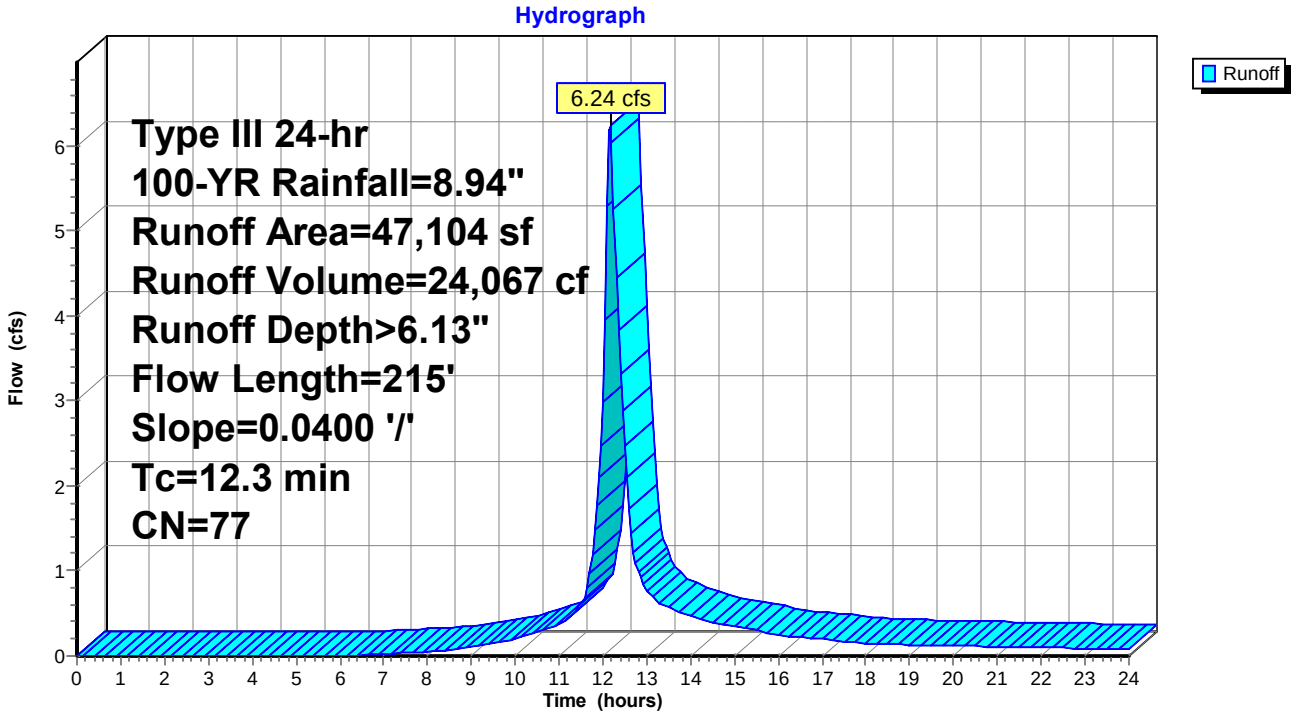
Runoff = 6.24 cfs @ 12.17 hrs, Volume= 24,067 cf, Depth> 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 47,104 | 77 | Woods, Good, HSG D |
| 47,104 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.5 | 50 | 0.0400 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 2.7 | 165 | 0.0400 | 1.00 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 12.3 | 215 | Total | | | |

## Subcatchment E2: SUBCAT E2

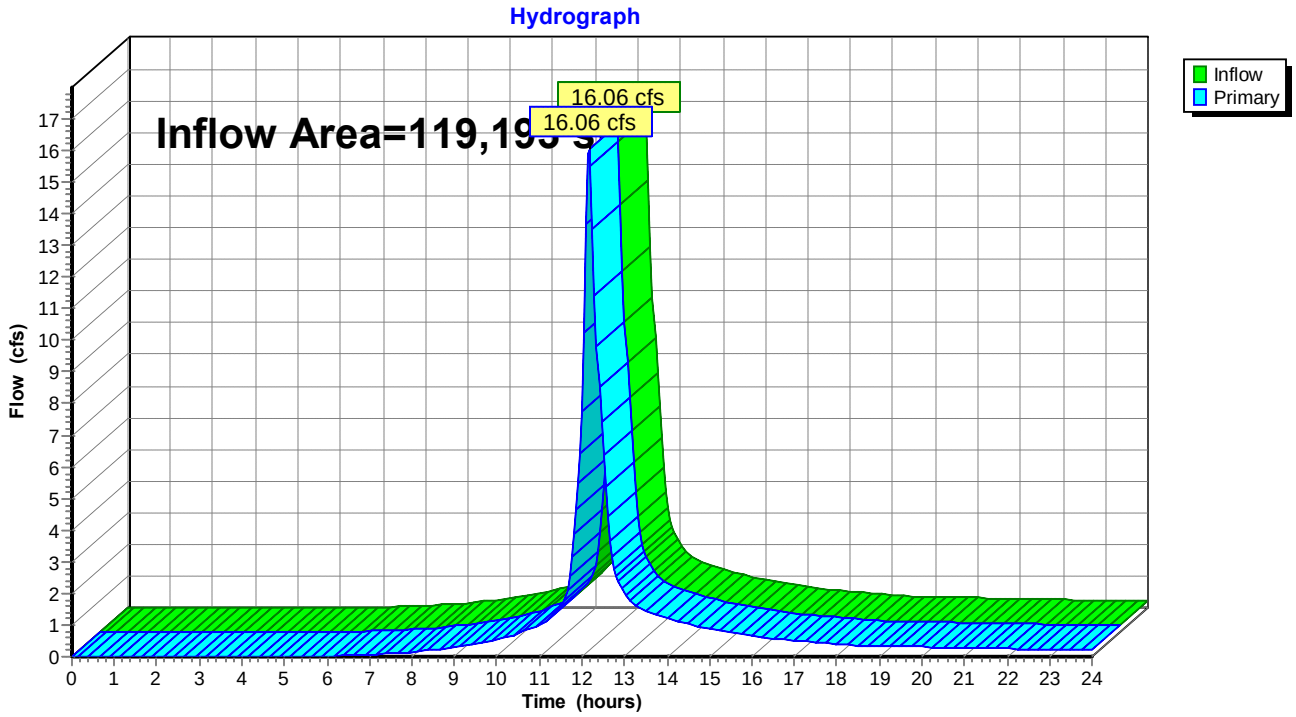


## Summary for Link 1L: Wetlands

Inflow Area = 119,193 sf, 0.00% Impervious, Inflow Depth > 6.25" for 100-YR event
Inflow = 16.06 cfs @ 12.17 hrs, Volume= 62,119 cf
Primary = 16.06 cfs @ 12.17 hrs, Volume= 62,119 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link 1L: Wetlands

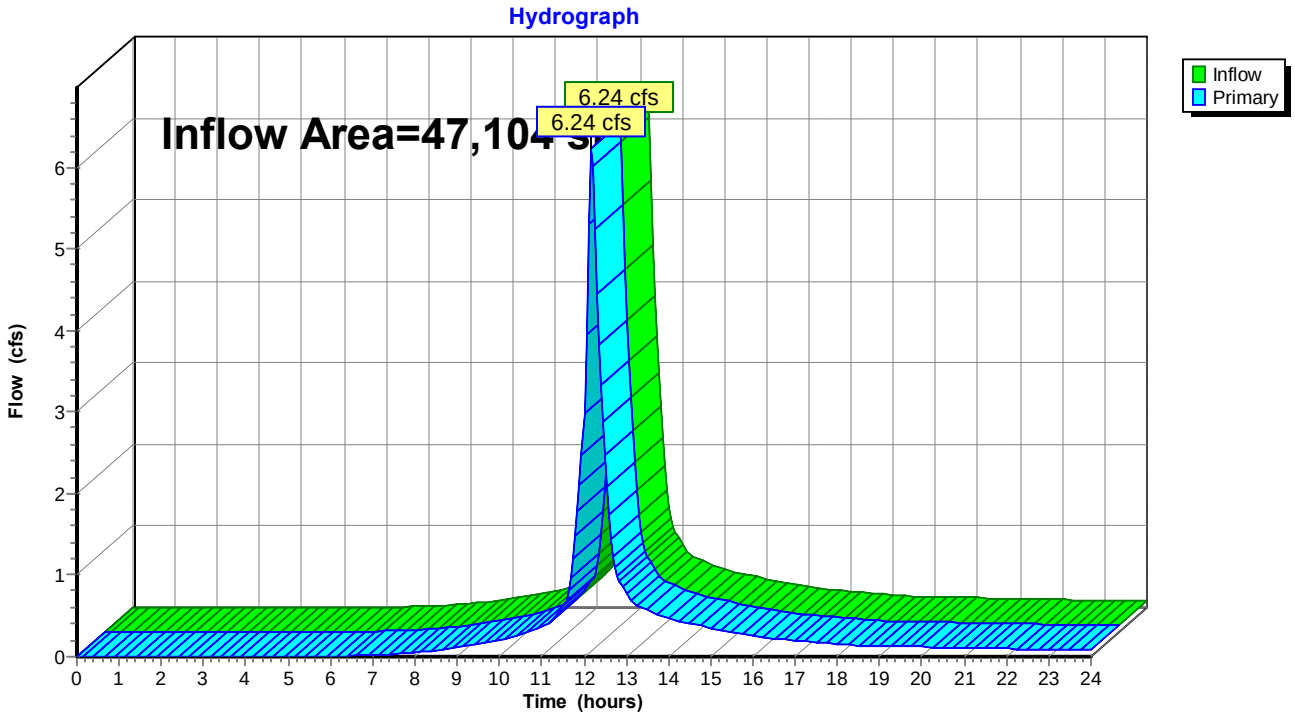


## Summary for Link 2L: Wetlands

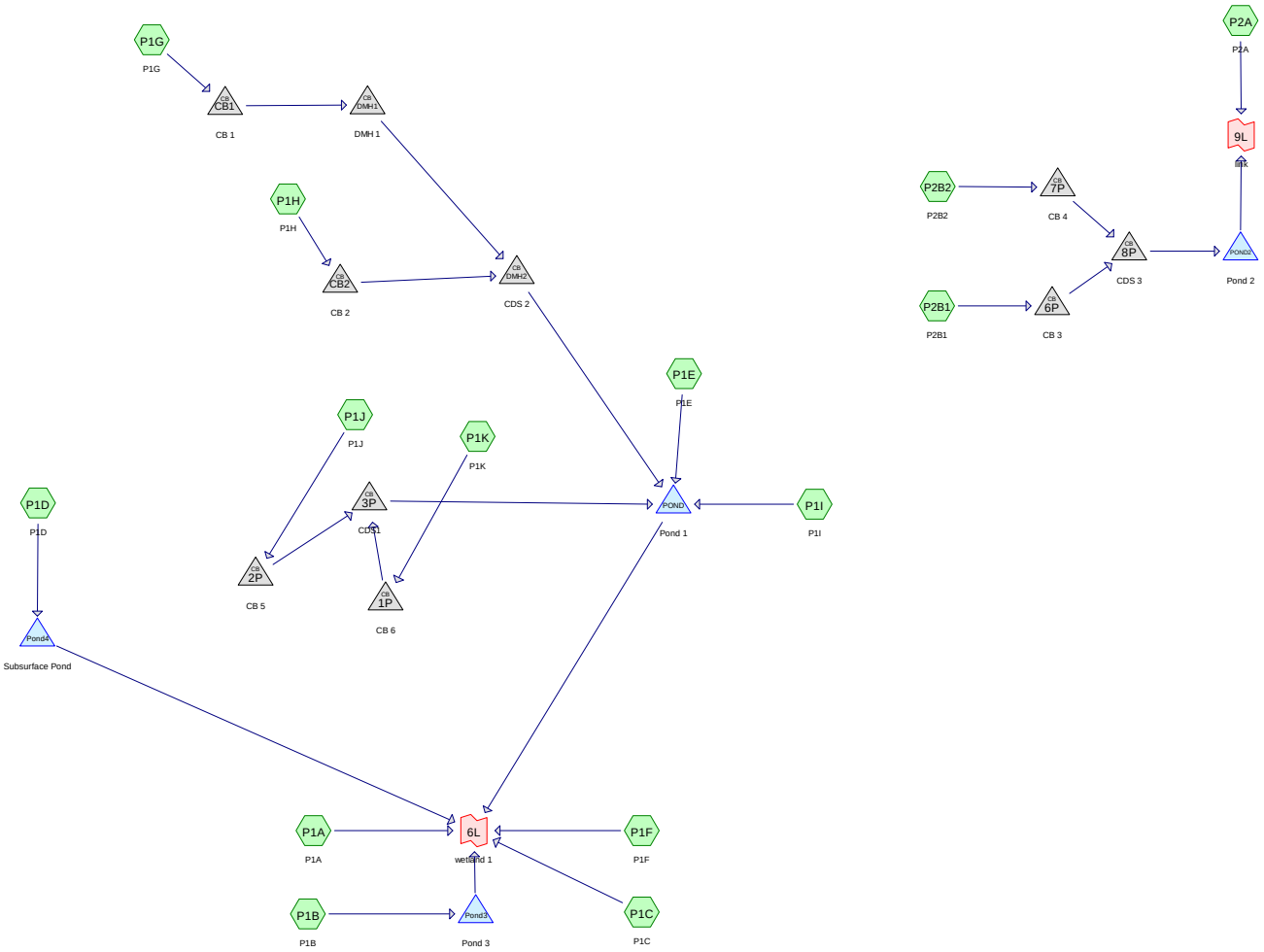
Inflow Area = 47,104 sf, 0.00% Impervious, Inflow Depth > 6.13" for 100-YR event
Inflow = 6.24 cfs @ 12.17 hrs, Volume= 24,067 cf
Primary = 6.24 cfs @ 12.17 hrs, Volume= 24,067 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link 2L: Wetlands



## c. Proposed Conditions HydroCAD Report




Subcat Reach Pond Link

**Routing Diagram for POST Phase II 4-15-24**

Prepared by {enter your company name here}, Printed 5/2/2024

## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 53,680 | 80 | >75% Grass cover, Good, HSG D (P1A, P1B, P1C, P1F, P1G, P1I, P2A, P2B1, P2B2) |
| 27,125 | 98 | Paved parking, HSG D (P1B, P1G, P1H, P1J, P1K, P2B1, P2B2) |
| 23,518 | 98 | Roofs, HSG D (P1B, P1D, P1E) |
| 59,914 | 77 | Woods, Good, HSG D (P1A, P1B, P2A) |
| **164,237** | **84** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 0 | HSG A | |
| 0 | HSG B | |
| 0 | HSG C | |
| 164,237 | HSG D | P1A, P1B, P1C, P1D, P1E, P1F, P1G, P1H, P1I, P1J, P1K, P2A, P2B1, P2B2 |
| 0 | Other | |
| **164,237** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover | Subcatch Numbers |
|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 53,680 | 0 | 53,680 | >75% Grass cover, Good | |
| 0 | 0 | 0 | 27,125 | 0 | 27,125 | Paved parking | |
| 0 | 0 | 0 | 23,518 | 0 | 23,518 | Roofs | |
| 0 | 0 | 0 | 59,914 | 0 | 59,914 | Woods, Good | |
| **0** | **0** | **0** | **164,237** | **0** | **164,237** | **TOTAL AREA** | |

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 P1A: P1A** Runoff Area=39,349 sf 0.00% Impervious Runoff Depth>1.23"
Flow Length=184' Tc=9.1 min CN=78 Runoff=1.13 cfs 4,048 cf

**Subcatchment P1B: P1B** Runoff Area=35,922 sf 57.12% Impervious Runoff Depth>2.03"
Flow Length=268' Tc=12.1 min CN=89 Runoff=1.60 cfs 6,083 cf

**Subcatchment P1C: P1C** Runoff Area=4,672 sf 0.00% Impervious Runoff Depth>1.36"
Tc=6.0 min CN=80 Runoff=0.17 cfs 530 cf

**Subcatchment P1D: P1D** Runoff Area=3,500 sf 100.00% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.24 cfs 850 cf

**Subcatchment P1E: P1E** Runoff Area=14,000 sf 100.00% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.96 cfs 3,402 cf

**Subcatchment P1F: P1F** Runoff Area=9,697 sf 0.00% Impervious Runoff Depth>1.36"
Tc=6.0 min CN=80 Runoff=0.35 cfs 1,101 cf

**Subcatchment P1G: P1G** Runoff Area=3,663 sf 40.98% Impervious Runoff Depth>1.87"
Tc=6.0 min CN=87 Runoff=0.18 cfs 571 cf

**Subcatchment P1H: P1H** Runoff Area=2,044 sf 100.00% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.14 cfs 497 cf

**Subcatchment P1I: P1I** Runoff Area=5,474 sf 0.00% Impervious Runoff Depth>1.36"
Tc=6.0 min CN=80 Runoff=0.20 cfs 621 cf

**Subcatchment P1J: P1J** Runoff Area=1,192 sf 100.00% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.08 cfs 290 cf

**Subcatchment P1K: P1K** Runoff Area=1,443 sf 100.00% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.10 cfs 351 cf

**Subcatchment P2A: P2A** Runoff Area=34,469 sf 0.00% Impervious Runoff Depth>1.24"
Tc=6.0 min CN=78 Runoff=1.10 cfs 3,549 cf

**Subcatchment P2B1: P2B1** Runoff Area=3,571 sf 98.88% Impervious Runoff Depth>2.92"
Tc=6.0 min CN=98 Runoff=0.24 cfs 868 cf

**Subcatchment P2B2: P2B2** Runoff Area=5,241 sf 55.60% Impervious Runoff Depth>2.12"
Tc=6.0 min CN=90 Runoff=0.29 cfs 926 cf

**Pond 1P: CB 6** Peak Elev=23.59' Inflow=0.10 cfs 351 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0050 '/' Outflow=0.10 cfs 351 cf

**Pond 2P: CB 5** Peak Elev=23.57' Inflow=0.08 cfs 290 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0055 '/' Outflow=0.08 cfs 290 cf

**Pond 3P: CDS1** Peak Elev=23.49' Inflow=0.18 cfs 640 cf
12.0" Round Culvert n=0.013 L=28.0' S=0.0050 '/' Outflow=0.18 cfs 640 cf

**Pond 6P: CB 3** Peak Elev=25.91' Inflow=0.24 cfs 868 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=0.24 cfs 868 cf

**Pond 7P: CB 4** Peak Elev=25.94' Inflow=0.29 cfs 926 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=0.29 cfs 926 cf

**Pond 8P: CDS 3** Peak Elev=25.81' Inflow=0.53 cfs 1,794 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=0.53 cfs 1,794 cf

**Pond CB1: CB 1** Peak Elev=25.19' Inflow=0.18 cfs 571 cf
12.0" Round Culvert n=0.013 L=7.0' S=0.0100 '/' Outflow=0.18 cfs 571 cf

**Pond CB2: CB 2** Peak Elev=24.43' Inflow=0.14 cfs 497 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0105 '/' Outflow=0.14 cfs 497 cf

**Pond DMH1: DMH 1** Peak Elev=25.01' Inflow=0.18 cfs 571 cf
12.0" Round Culvert n=0.013 L=77.0' S=0.0100 '/' Outflow=0.18 cfs 571 cf

**Pond DMH2: CDS 2** Peak Elev=24.23' Inflow=0.32 cfs 1,067 cf
12.0" Round Culvert n=0.013 L=41.0' S=0.0100 '/' Outflow=0.32 cfs 1,067 cf

**Pond POND: Pond 1** Peak Elev=24.53' Storage=2,254 cf Inflow=1.65 cfs 5,731 cf
Outflow=0.46 cfs 5,566 cf

**Pond POND2: Pond 2** Peak Elev=26.82' Storage=904 cf Inflow=0.53 cfs 1,794 cf
Outflow=0.05 cfs 1,546 cf

**Pond Pond3: Pond 3** Peak Elev=21.09' Storage=1,233 cf Inflow=1.60 cfs 6,083 cf
Outflow=1.42 cfs 6,016 cf

**Pond Pond4: Subsurface Pond** Peak Elev=27.28' Storage=490 cf Inflow=0.24 cfs 850 cf
Outflow=0.02 cfs 713 cf

**Link 6L: wetland 1** Inflow=3.01 cfs 17,975 cf
Primary=3.01 cfs 17,975 cf

**Link 9L: link** Inflow=1.13 cfs 5,095 cf
Primary=1.13 cfs 5,095 cf

**Total Runoff Area = 164,237 sf Runoff Volume = 23,686 cf Average Runoff Depth = 1.73"**
**69.16% Pervious = 113,594 sf 30.84% Impervious = 50,643 sf**

## Summary for Subcatchment P1A: P1A

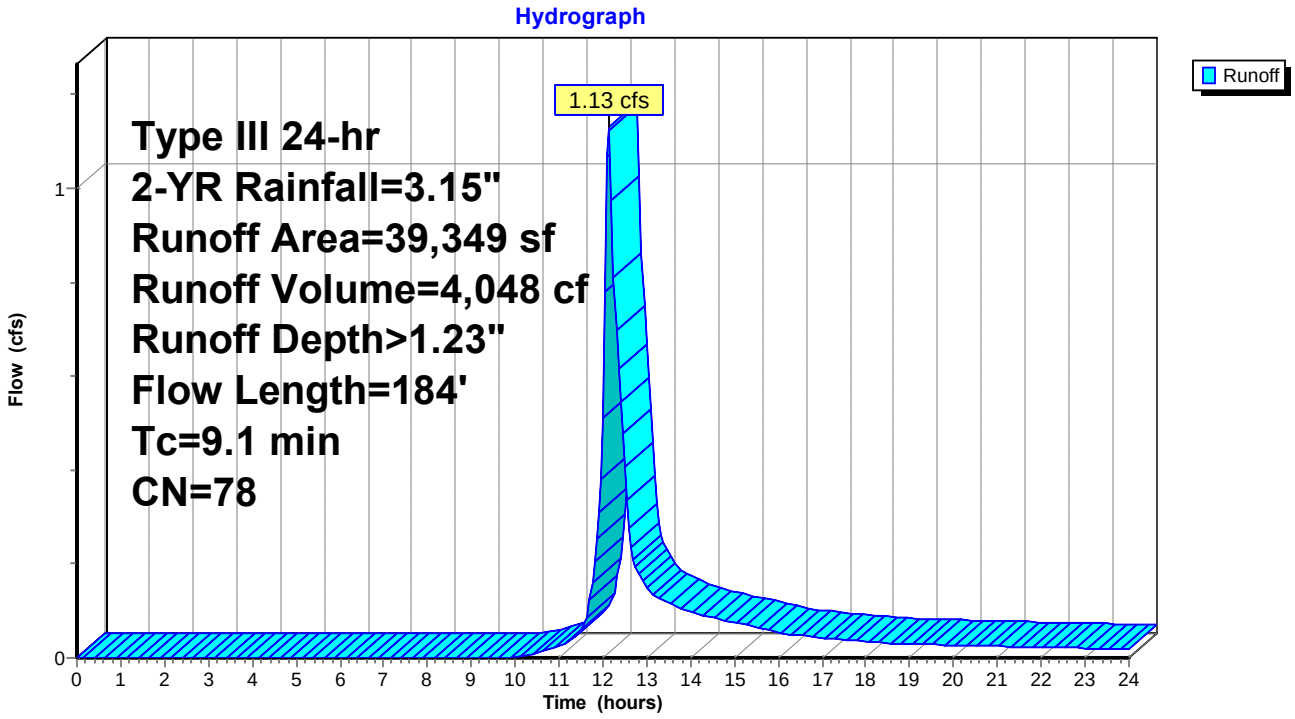
Runoff = 1.13 cfs @ 12.14 hrs, Volume= 4,048 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 9,812 | 80 | >75% Grass cover, Good, HSG D |
| 29,537 | 77 | Woods, Good, HSG D |
| 39,349 | 78 | Weighted Average |
| 39,349 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 50 | 0.0550 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.7 | 134 | 0.0430 | 3.34 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 9.1 | 184 | Total | | | |

## Subcatchment P1A: P1A



## Summary for Subcatchment P1B: P1B

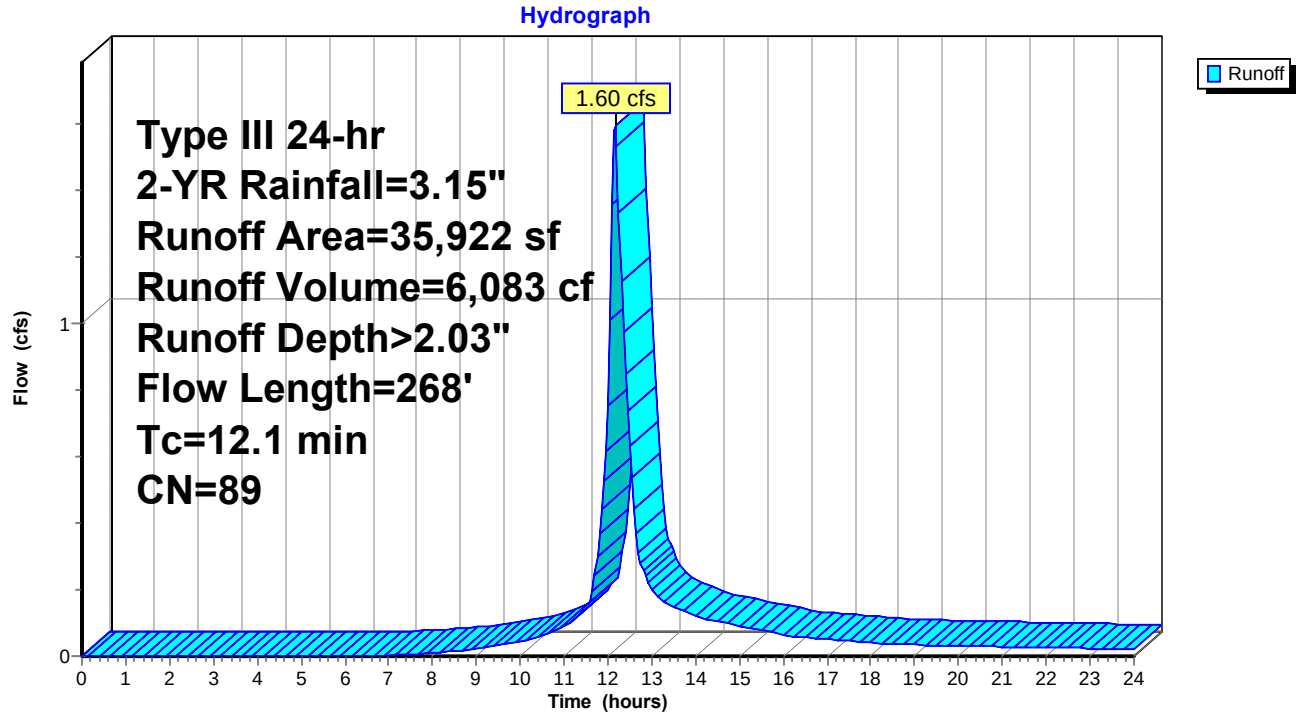
Runoff = 1.60 cfs @ 12.17 hrs, Volume= 6,083 cf, Depth> 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 6,018 | 98 | Roofs, HSG D |
| 14,500 | 98 | Paved parking, HSG D |
| 9,409 | 77 | Woods, Good, HSG D |
| 5,995 | 80 | >75% Grass cover, Good, HSG D |
| 35,922 | 89 | Weighted Average |
| 15,404 | | 42.88% Pervious Area |
| 20,518 | | 57.12% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.7 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.5 | 86 | 0.0350 | 3.01 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.9 | 132 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 12.1 | 268 | Total | | | |

## Subcatchment P1B: P1B



## Summary for Subcatchment P1C: P1C

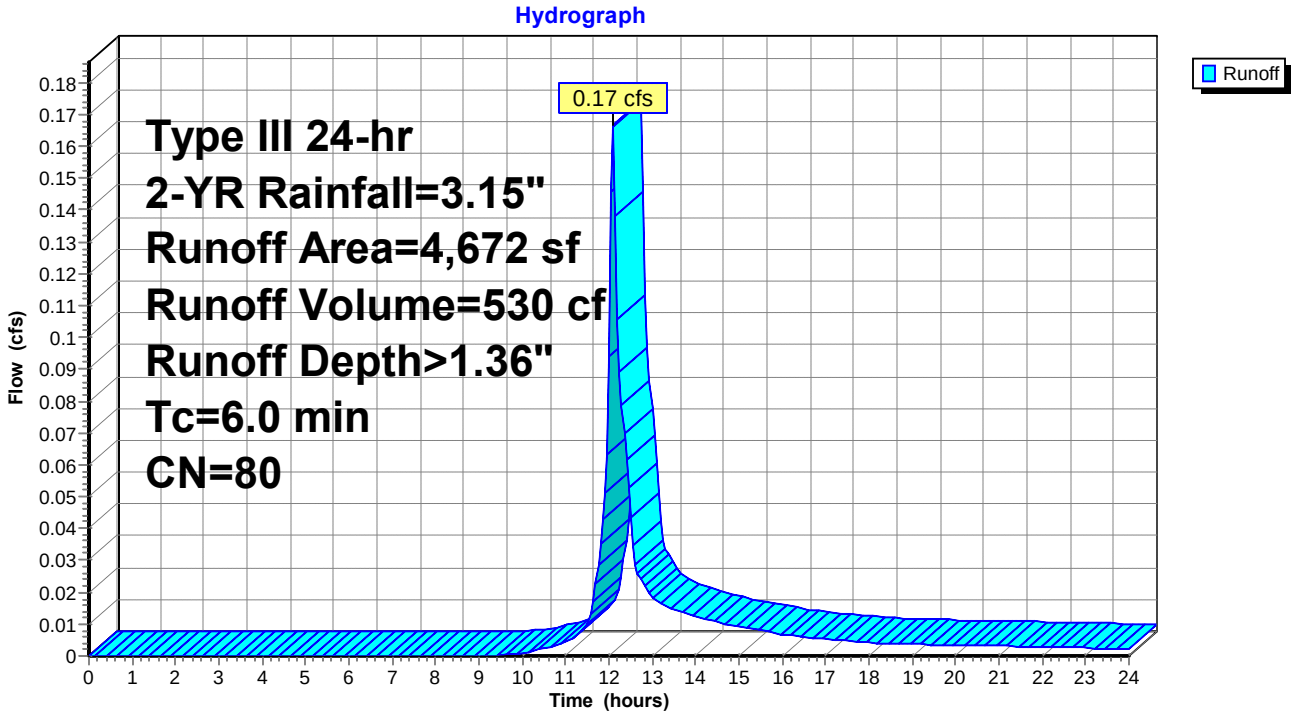
Runoff = 0.17 cfs @ 12.10 hrs, Volume= 530 cf, Depth> 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 4,672 | 80 | >75% Grass cover, Good, HSG D |
| 4,672 | | 100.00% Pervious Area |

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

## Subcatchment P1C: P1C



## Summary for Subcatchment P1D: P1D

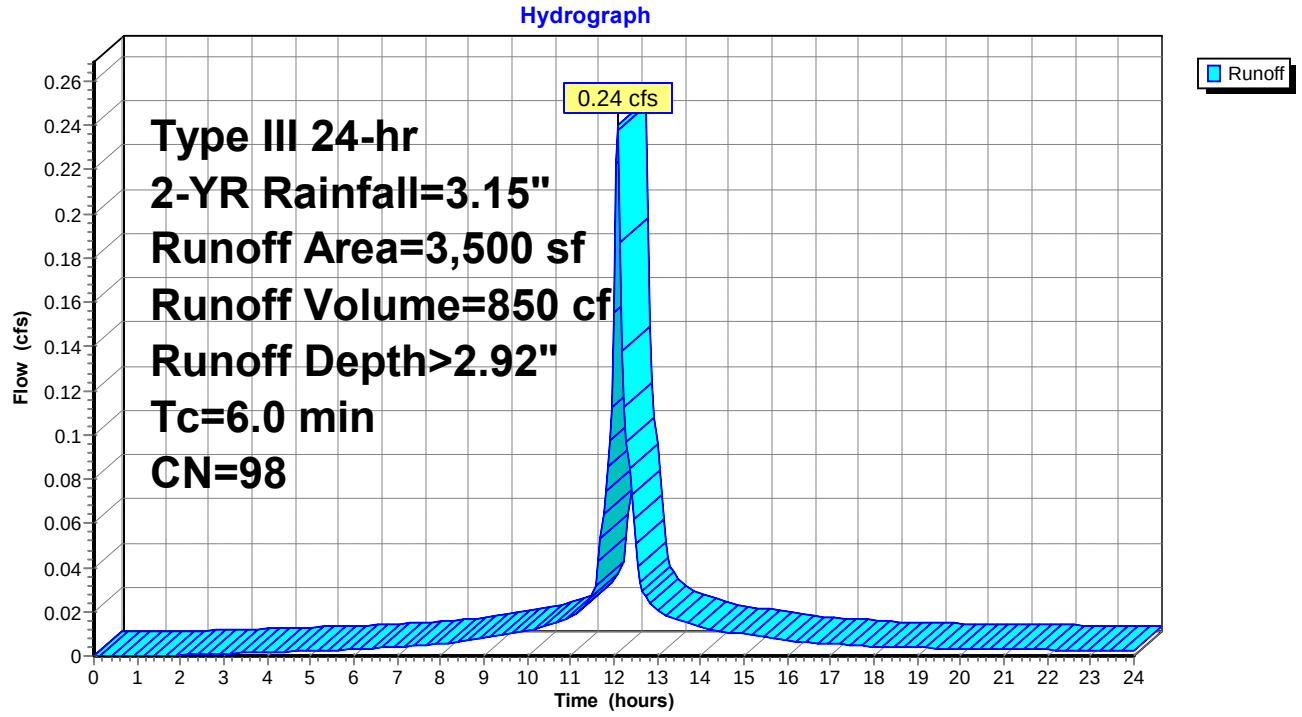
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 850 cf, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 3,500 | 98 | Roofs, HSG D |
| 3,500 | | 100.00% Impervious Area |

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

### Subcatchment P1D: P1D



## Summary for Subcatchment P1E: P1E

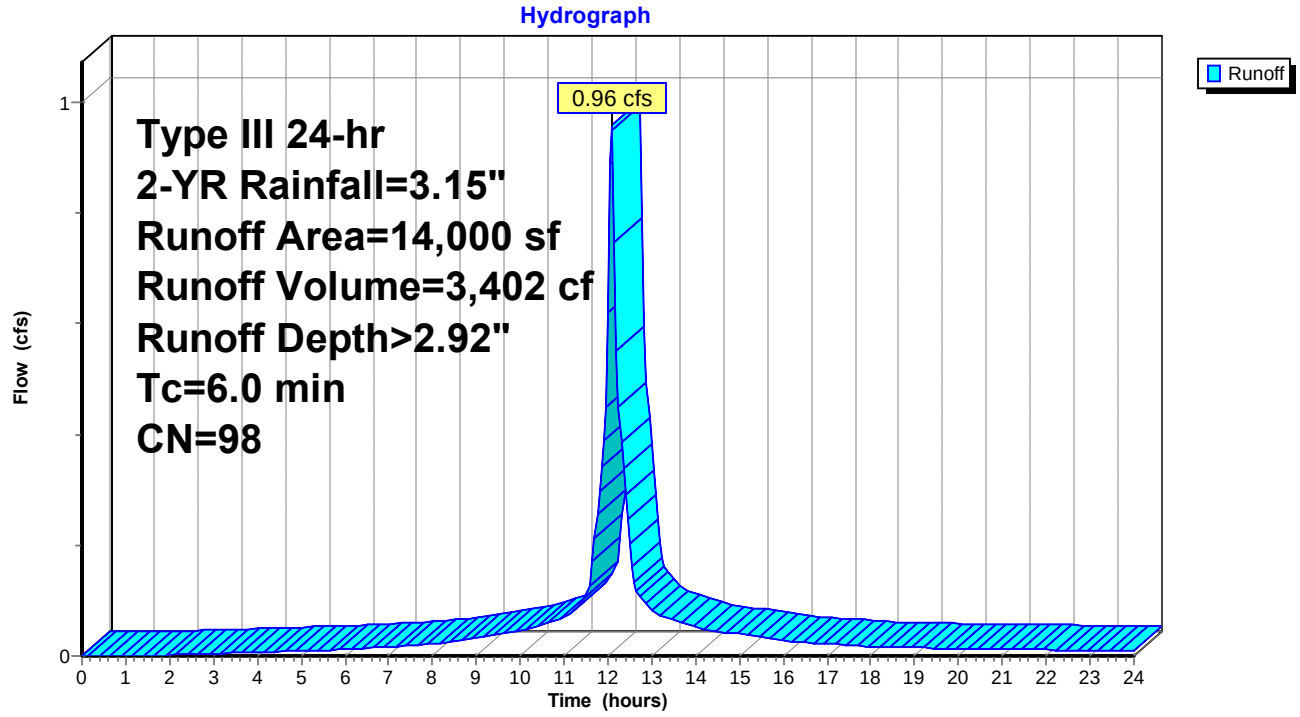
Runoff = 0.96 cfs @ 12.09 hrs, Volume= 3,402 cf, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 14,000 | 98 | Roofs, HSG D |
| 14,000 | | 100.00% Impervious Area |

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

## Subcatchment P1E: P1E



## Summary for Subcatchment P1F: P1F

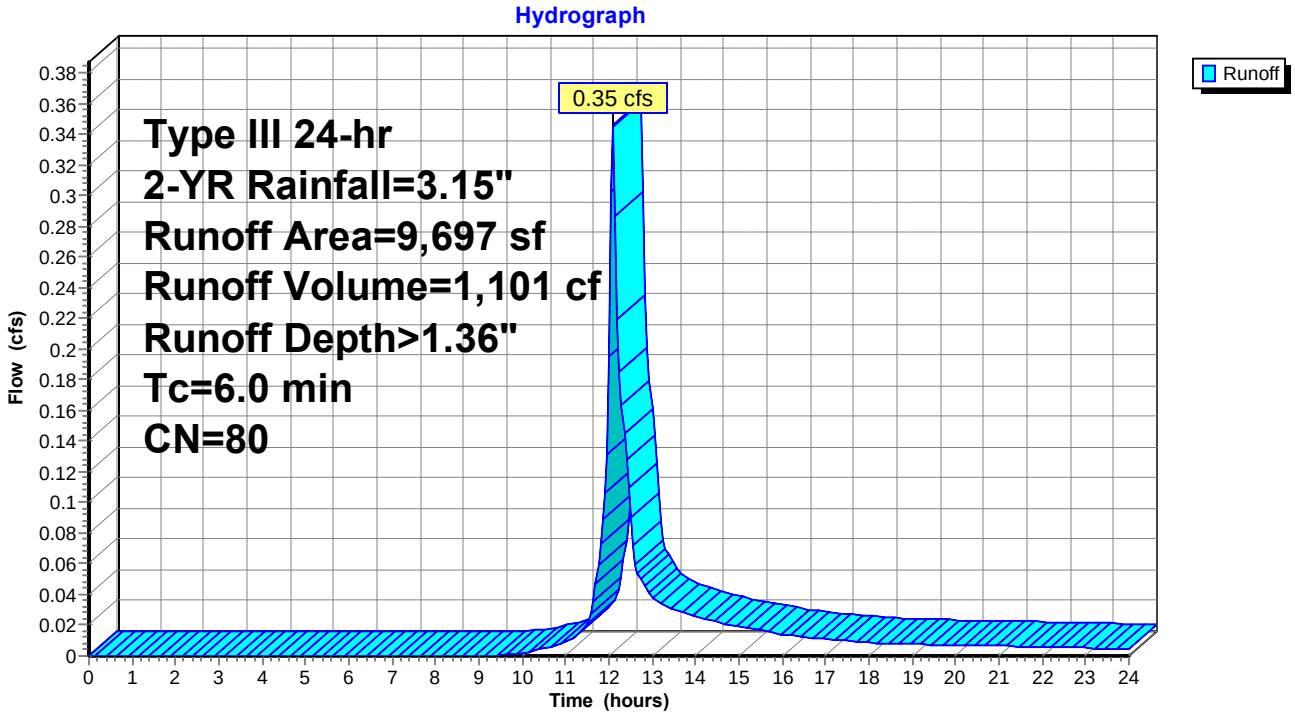
Runoff = 0.35 cfs @ 12.10 hrs, Volume= 1,101 cf, Depth> 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 9,697 | 80 | >75% Grass cover, Good, HSG D |
| 9,697 | | 100.00% Pervious Area |

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

## Subcatchment P1F: P1F



## Summary for Subcatchment P1G: P1G

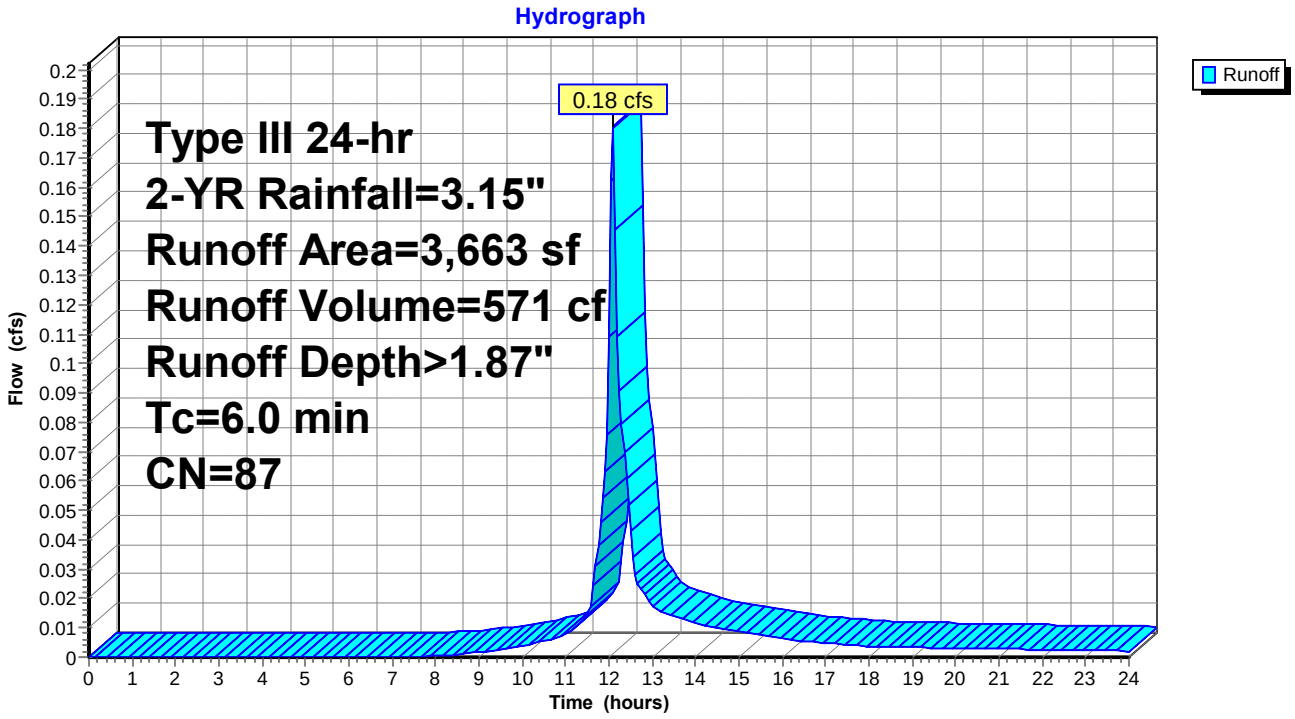
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 571 cf, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 2,162 | 80 | >75% Grass cover, Good, HSG D |
| 1,501 | 98 | Paved parking, HSG D |
| 3,663 | 87 | Weighted Average |
| 2,162 | | 59.02% Pervious Area |
| 1,501 | | 40.98% Impervious Area |

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

## Subcatchment P1G: P1G



## Summary for Subcatchment P1H: P1H

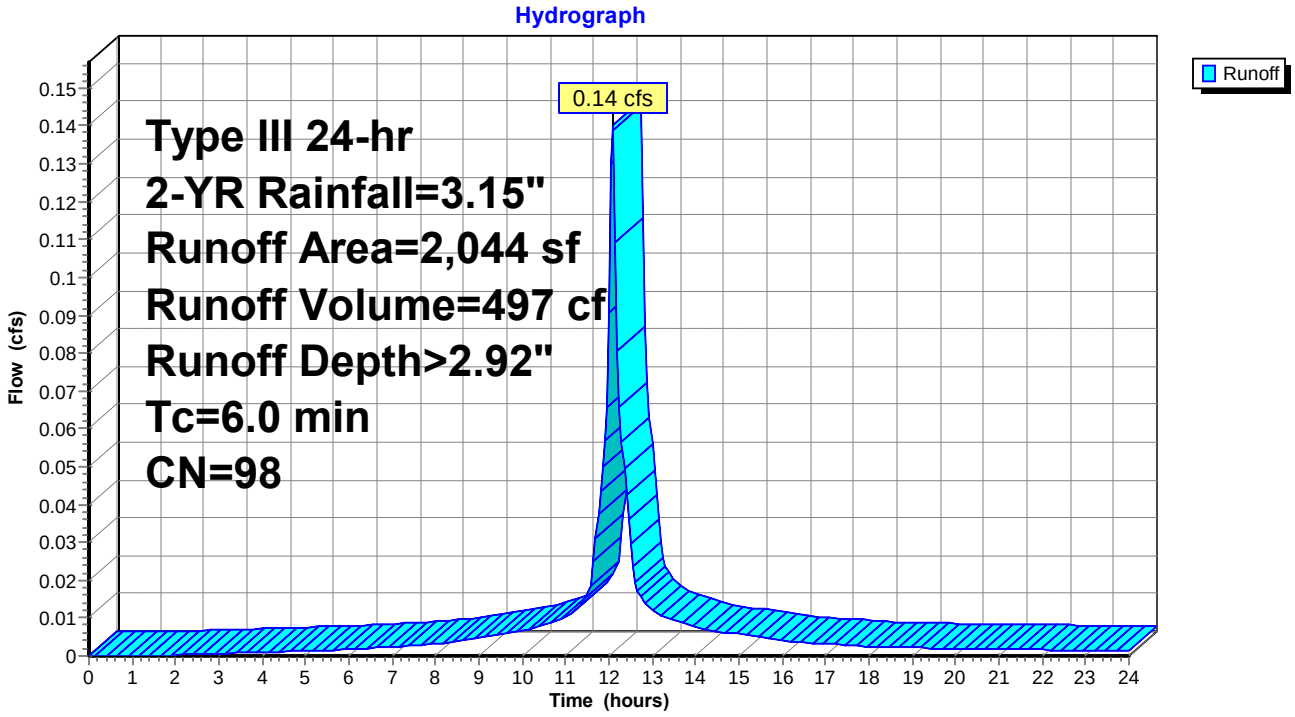
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 497 cf, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 2,044 | 98 | Paved parking, HSG D |
| 2,044 | | 100.00% Impervious Area |

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

### Subcatchment P1H: P1H



## Summary for Subcatchment P1I: P1I

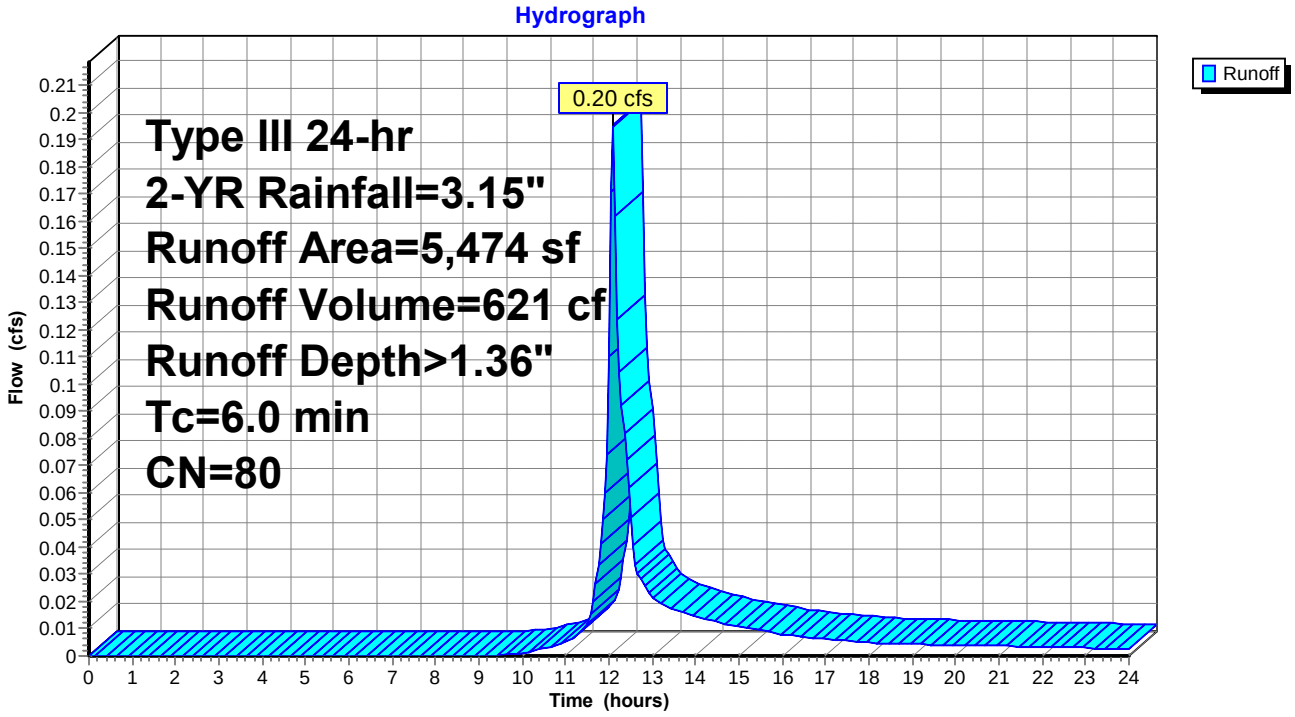
Runoff = 0.20 cfs @ 12.10 hrs, Volume= 621 cf, Depth> 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 5,474 | 80 | >75% Grass cover, Good, HSG D |
| 5,474 | | 100.00% Pervious Area |

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

## Subcatchment P1I: P1I



## Summary for Subcatchment P1J: P1J

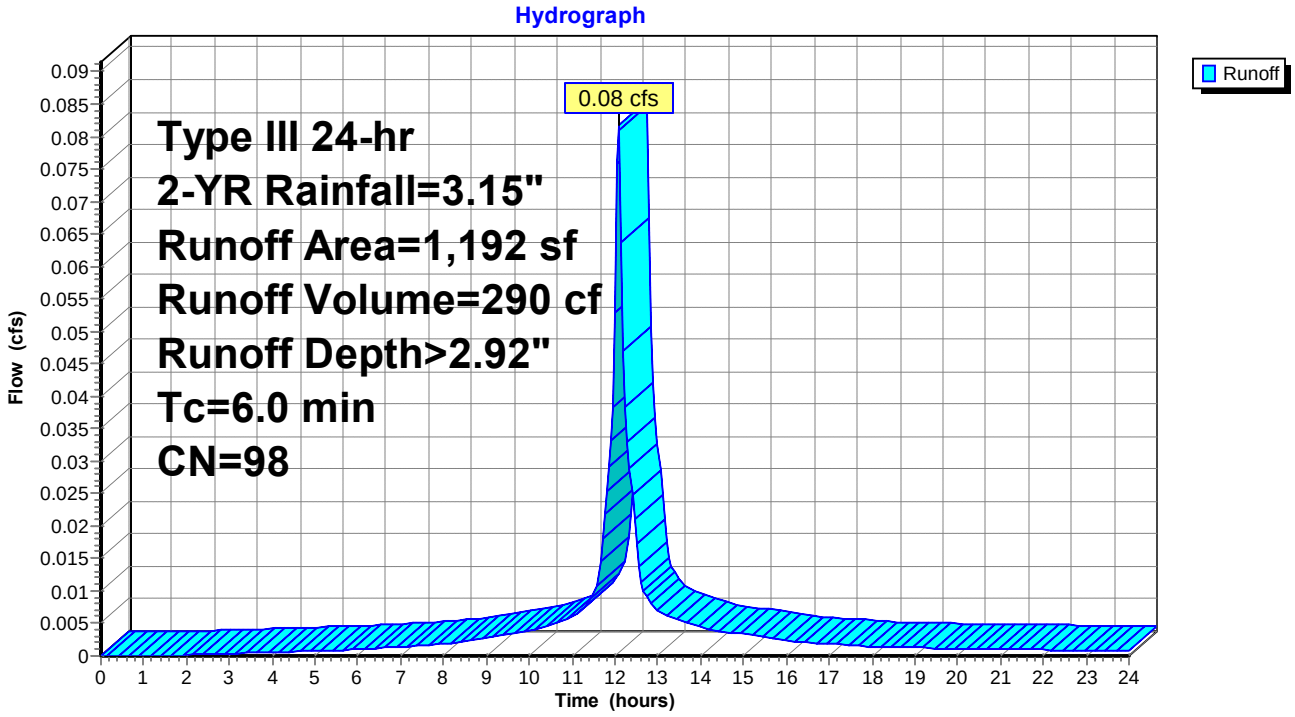
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 290 cf, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 1,192 | 98 | Paved parking, HSG D |
| 1,192 | | 100.00% Impervious Area |

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

## Subcatchment P1J: P1J



## Summary for Subcatchment P1K: P1K

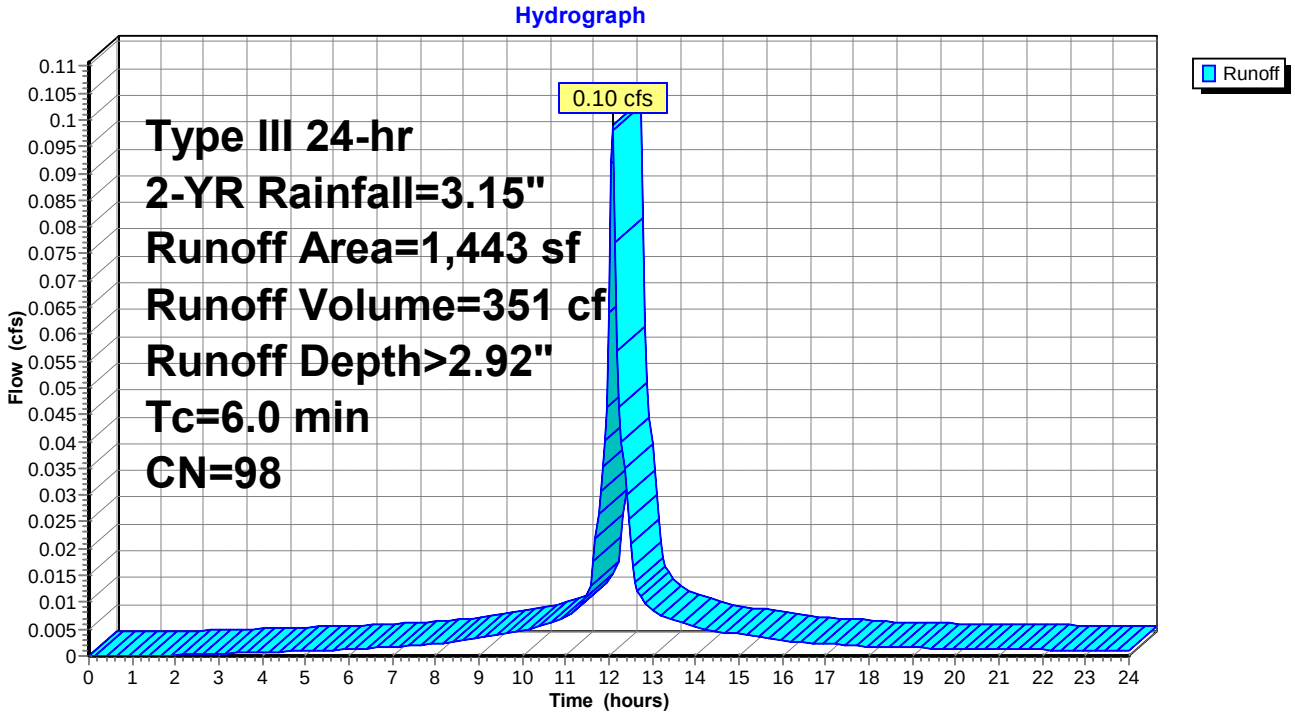
Runoff = 0.10 cfs @ 12.09 hrs, Volume= 351 cf, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 1,443 | 98 | Paved parking, HSG D |
| 1,443 | | 100.00% Impervious Area |

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

### Subcatchment P1K: P1K



## Summary for Subcatchment P2A: P2A

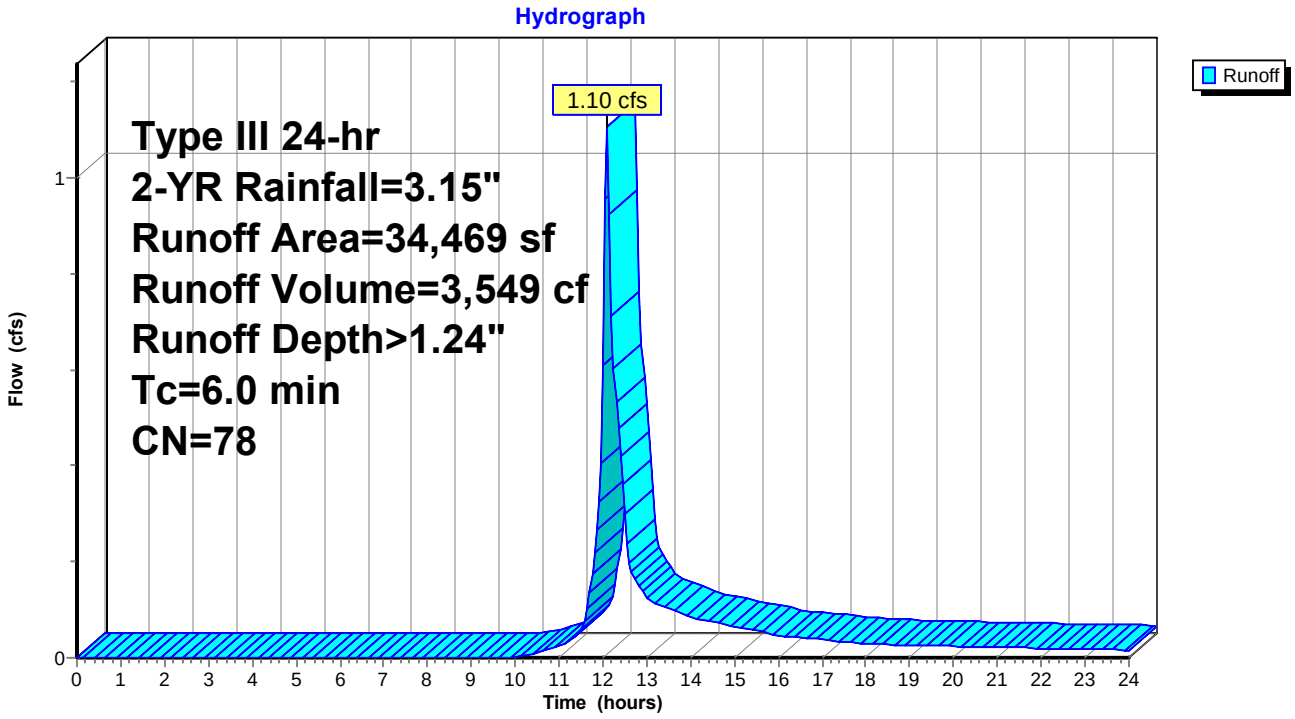
Runoff = 1.10 cfs @ 12.10 hrs, Volume= 3,549 cf, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 20,968 | 77 | Woods, Good, HSG D |
| 13,501 | 80 | >75% Grass cover, Good, HSG D |
| 34,469 | 78 | Weighted Average |
| 34,469 | | 100.00% Pervious Area |

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

## Subcatchment P2A: P2A



## Summary for Subcatchment P2B1: P2B1

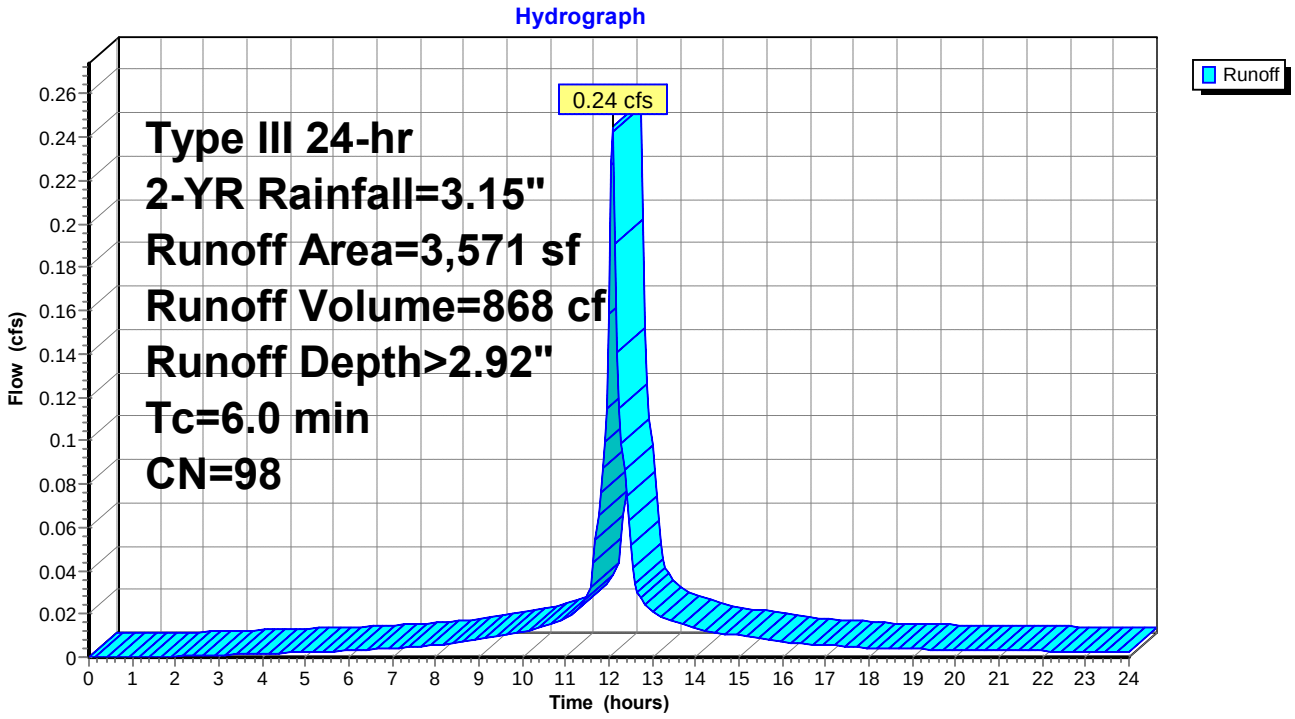
Runoff = 0.24 cfs @ 12.09 hrs, Volume= 868 cf, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 3,531 | 98 | Paved parking, HSG D |
| 40 | 80 | >75% Grass cover, Good, HSG D |
| 3,571 | 98 | Weighted Average |
| 40 | | 1.12% Pervious Area |
| 3,531 | | 98.88% Impervious Area |

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

## Subcatchment P2B1: P2B1



## Summary for Subcatchment P2B2: P2B2

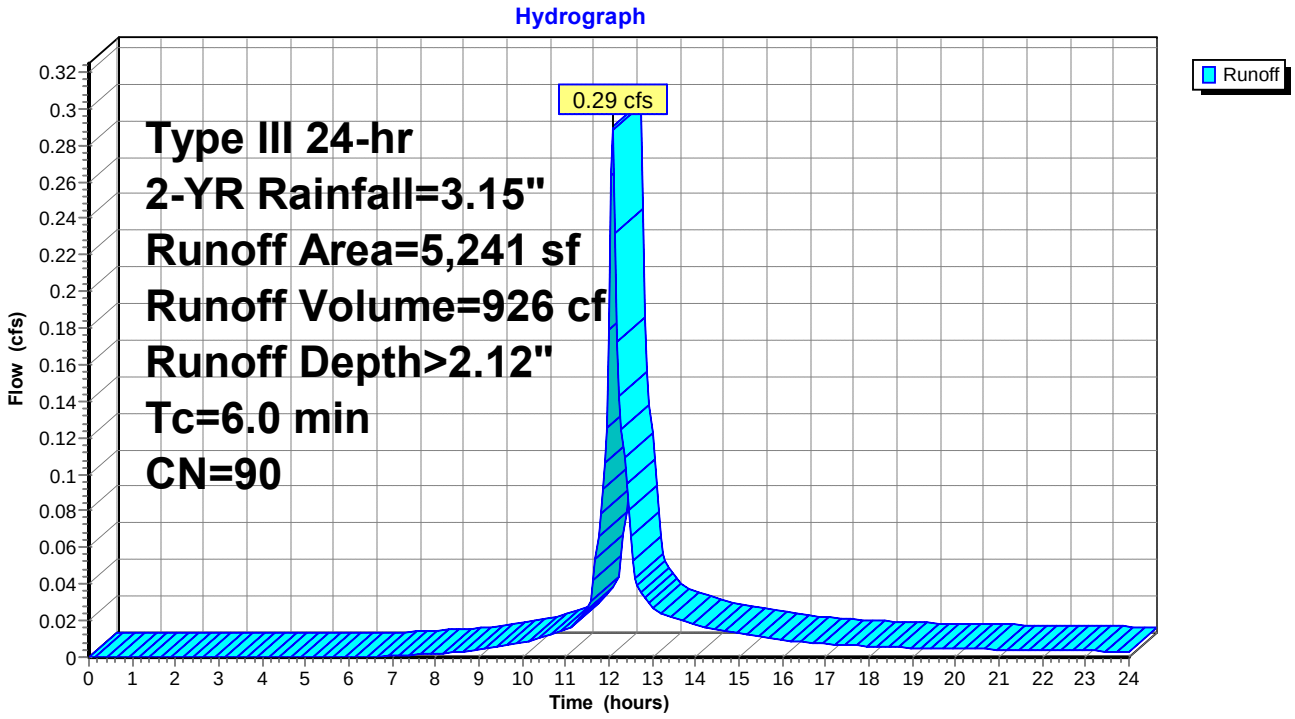
Runoff = 0.29 cfs @ 12.09 hrs, Volume= 926 cf, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.15"

| Area (sf) | CN | Description |
|---|---|---|
| 2,914 | 98 | Paved parking, HSG D |
| 2,327 | 80 | >75% Grass cover, Good, HSG D |
| 5,241 | 90 | Weighted Average |
| 2,327 | | 44.40% Pervious Area |
| 2,914 | | 55.60% Impervious Area |

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

## Subcatchment P2B2: P2B2



## Summary for Pond 1P: CB 6

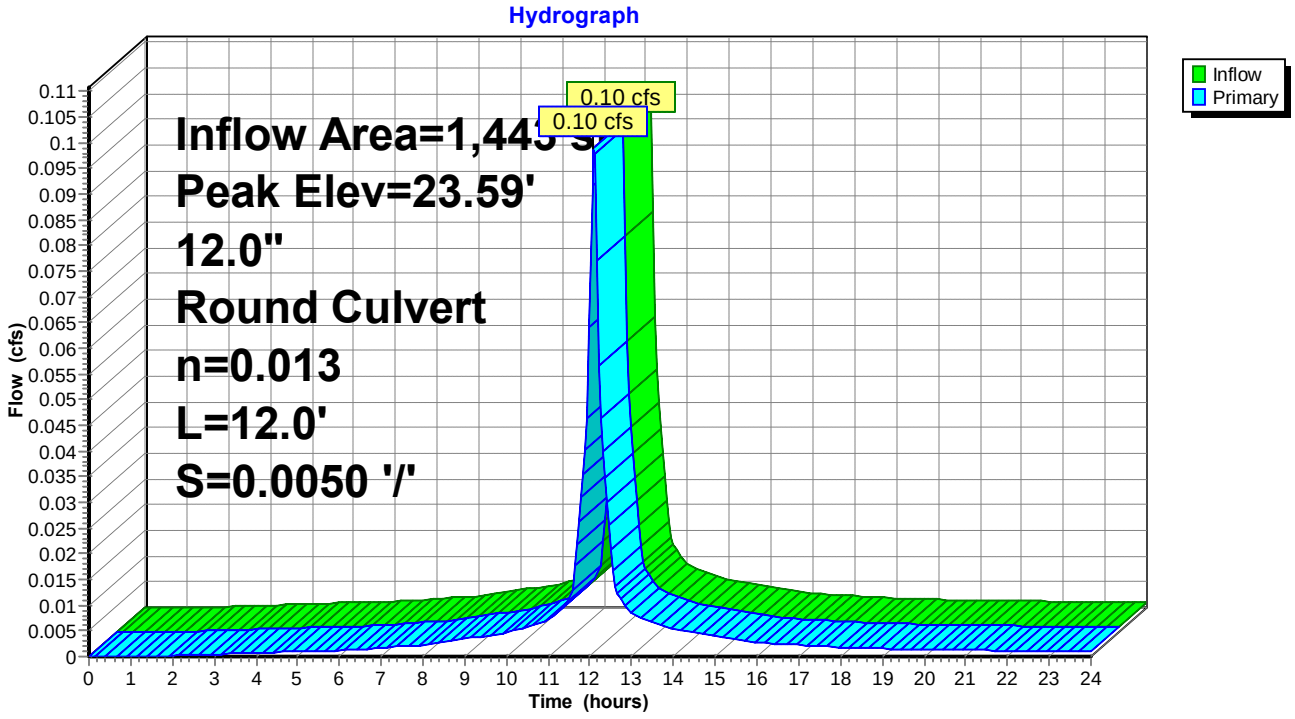
Inflow Area = 1,443 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-YR event
Inflow = 0.10 cfs @ 12.09 hrs, Volume= 351 cf
Outflow = 0.10 cfs @ 12.09 hrs, Volume= 351 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.10 cfs @ 12.09 hrs, Volume= 351 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.59' @ 12.09 hrs
Flood Elev= 26.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.40' | **12.0" Round Culvert**<br>L= 12.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.40' / 23.34' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.10 cfs @ 12.09 hrs HW=23.59' (Free Discharge)
**1=Culvert** (Barrel Controls 0.10 cfs @ 1.42 fps)

## Pond 1P: CB 6



## Summary for Pond 2P: CB 5

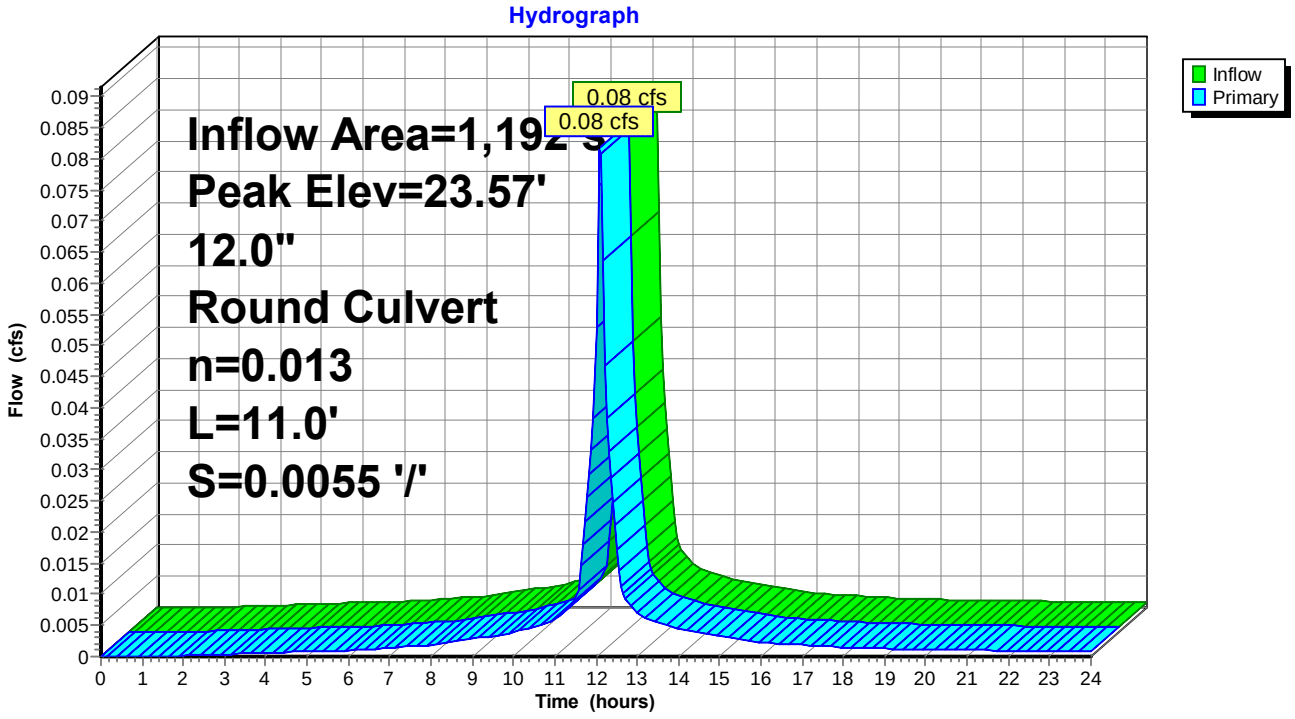
Inflow Area = 1,192 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-YR event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 290 cf
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 290 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.09 hrs, Volume= 290 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.57' @ 12.09 hrs
Flood Elev= 26.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.40' | **12.0" Round Culvert**<br>L= 11.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.40' / 23.34' S= 0.0055 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.08 cfs @ 12.09 hrs HW=23.57' (Free Discharge)
**1=Culvert** (Barrel Controls 0.08 cfs @ 1.37 fps)

## Pond 2P: CB 5



## Summary for Pond 3P: CDS1

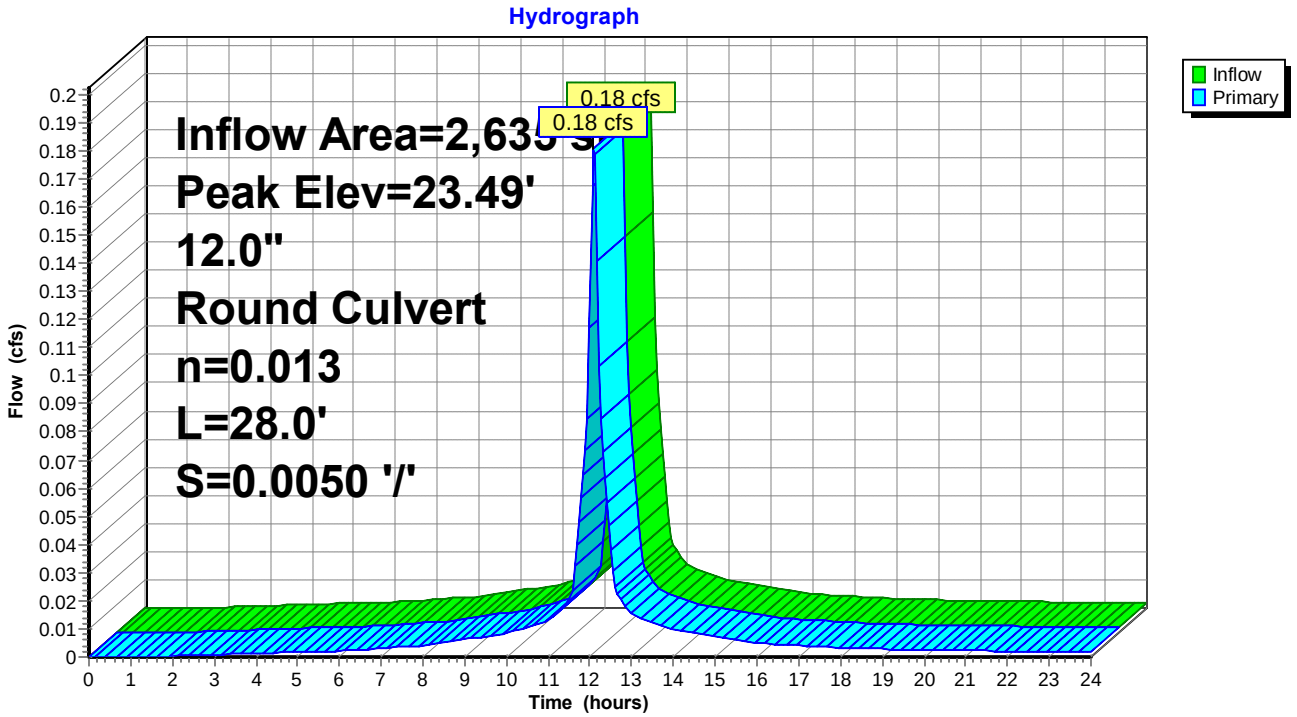
Inflow Area = 2,635 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-YR event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 640 cf
Outflow = 0.18 cfs @ 12.09 hrs, Volume= 640 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.09 hrs, Volume= 640 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.49' @ 12.09 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.24' | **12.0" Round Culvert**<br>L= 28.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.24' / 23.10' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.18 cfs @ 12.09 hrs HW=23.49' (Free Discharge)
**1=Culvert** (Barrel Controls 0.18 cfs @ 1.72 fps)

## Pond 3P: CDS1



## Summary for Pond 6P: CB 3

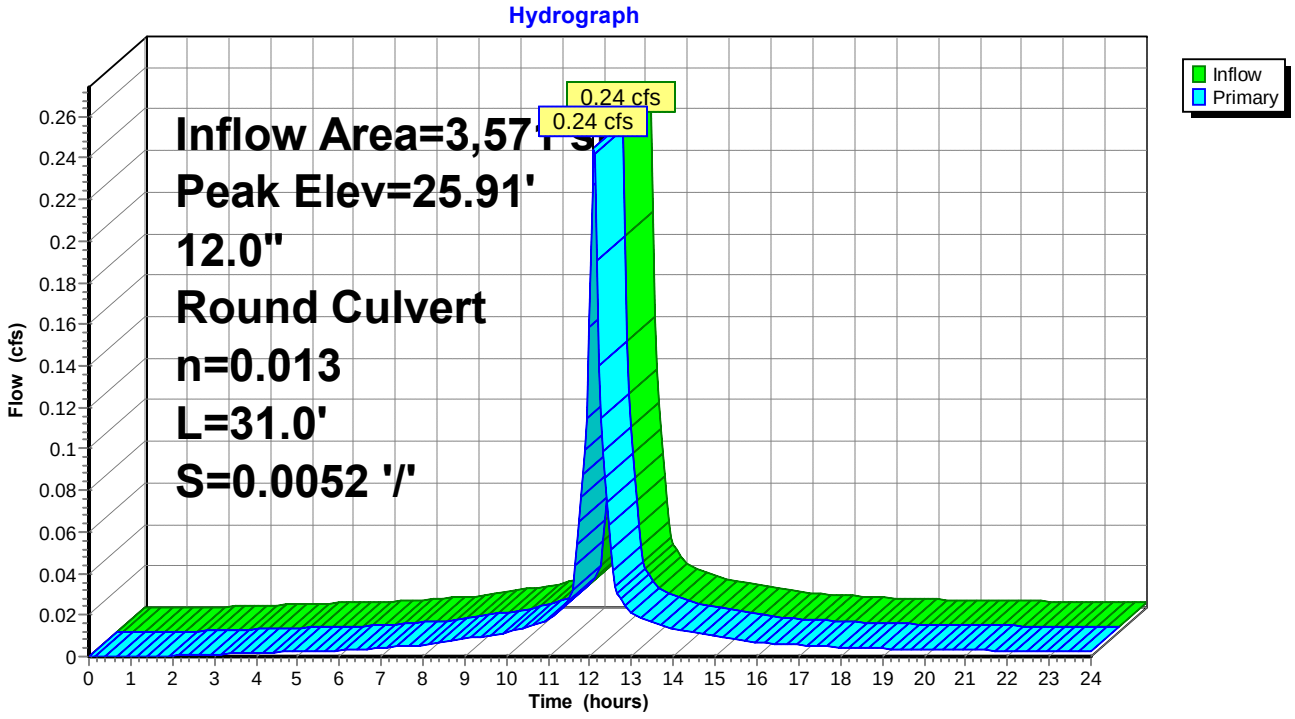
Inflow Area = 3,571 sf, 98.88% Impervious, Inflow Depth > 2.92" for 2-YR event
Inflow = 0.24 cfs @ 12.09 hrs, Volume= 868 cf
Outflow = 0.24 cfs @ 12.09 hrs, Volume= 868 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.09 hrs, Volume= 868 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.91' @ 12.09 hrs
Flood Elev= 28.20'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.62' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.62' / 25.46' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.24 cfs @ 12.09 hrs HW=25.91' (Free Discharge)
**1=Culvert** (Barrel Controls 0.24 cfs @ 1.88 fps)

## Pond 6P: CB 3



## Summary for Pond 7P: CB 4

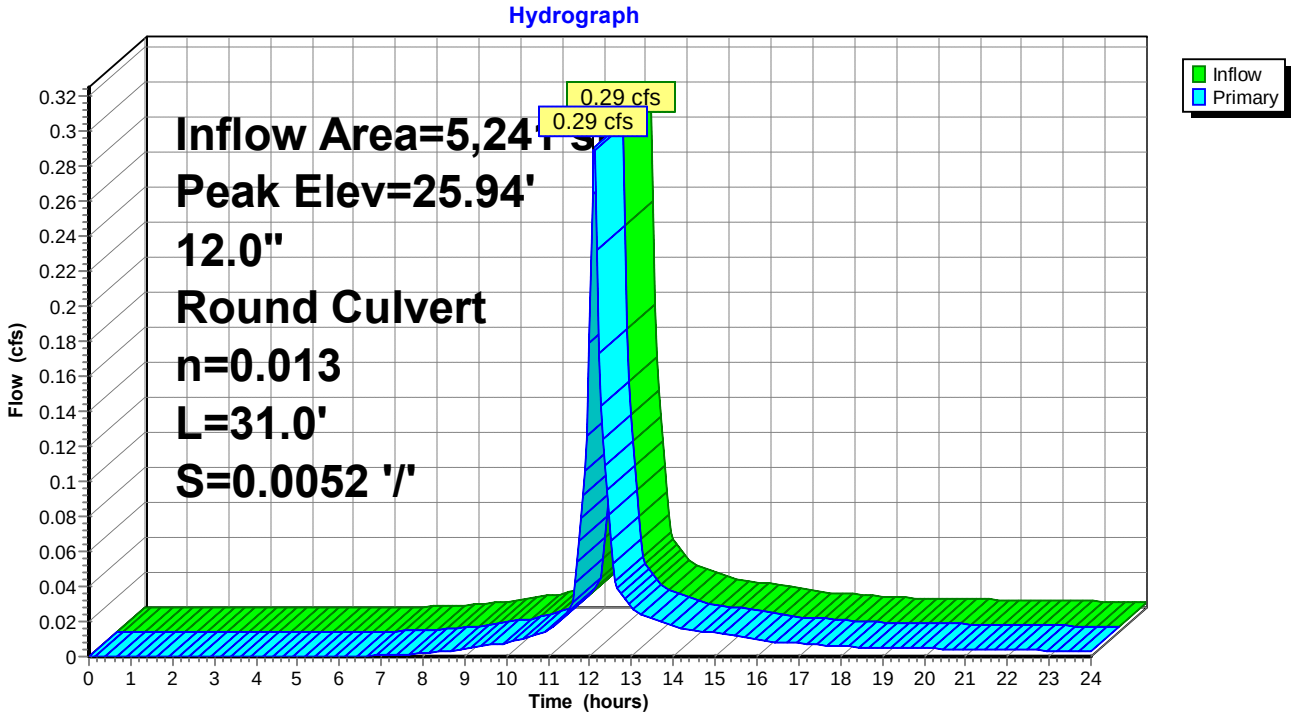
Inflow Area = 5,241 sf, 55.60% Impervious, Inflow Depth > 2.12" for 2-YR event
Inflow = 0.29 cfs @ 12.09 hrs, Volume= 926 cf
Outflow = 0.29 cfs @ 12.09 hrs, Volume= 926 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.09 hrs, Volume= 926 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.94' @ 12.09 hrs
Flood Elev= 28.25'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.62' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.62' / 25.46' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.28 cfs @ 12.09 hrs HW=25.94' (Free Discharge)
**1=Culvert** (Barrel Controls 0.28 cfs @ 1.97 fps)

## Pond 7P: CB 4



## Summary for Pond 8P: CDS 3

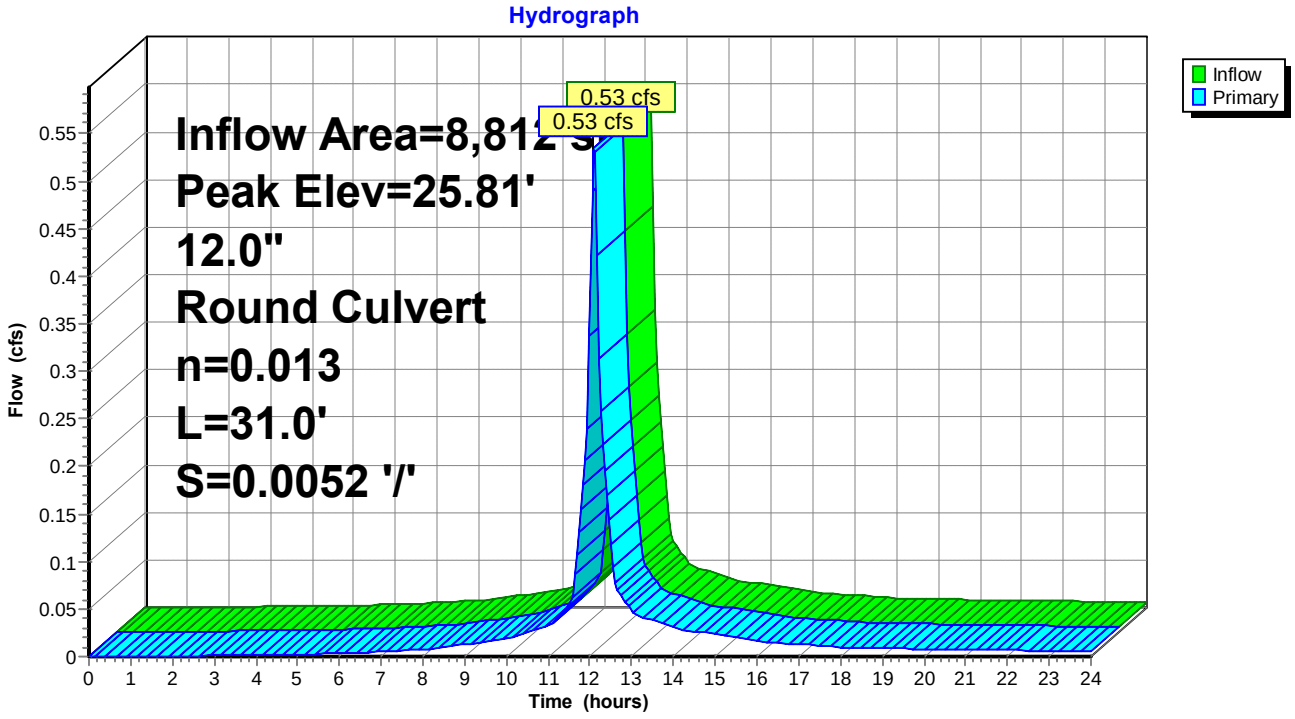
Inflow Area = 8,812 sf, 73.14% Impervious, Inflow Depth > 2.44" for 2-YR event
Inflow = 0.53 cfs @ 12.09 hrs, Volume= 1,794 cf
Outflow = 0.53 cfs @ 12.09 hrs, Volume= 1,794 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.53 cfs @ 12.09 hrs, Volume= 1,794 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.81' @ 12.09 hrs
Flood Elev= 28.60'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.36' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.36' / 25.20' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.52 cfs @ 12.09 hrs HW=25.80' (Free Discharge)
**1=Culvert** (Barrel Controls 0.52 cfs @ 2.28 fps)

## Pond 8P: CDS 3



## Summary for Pond CB1: CB 1

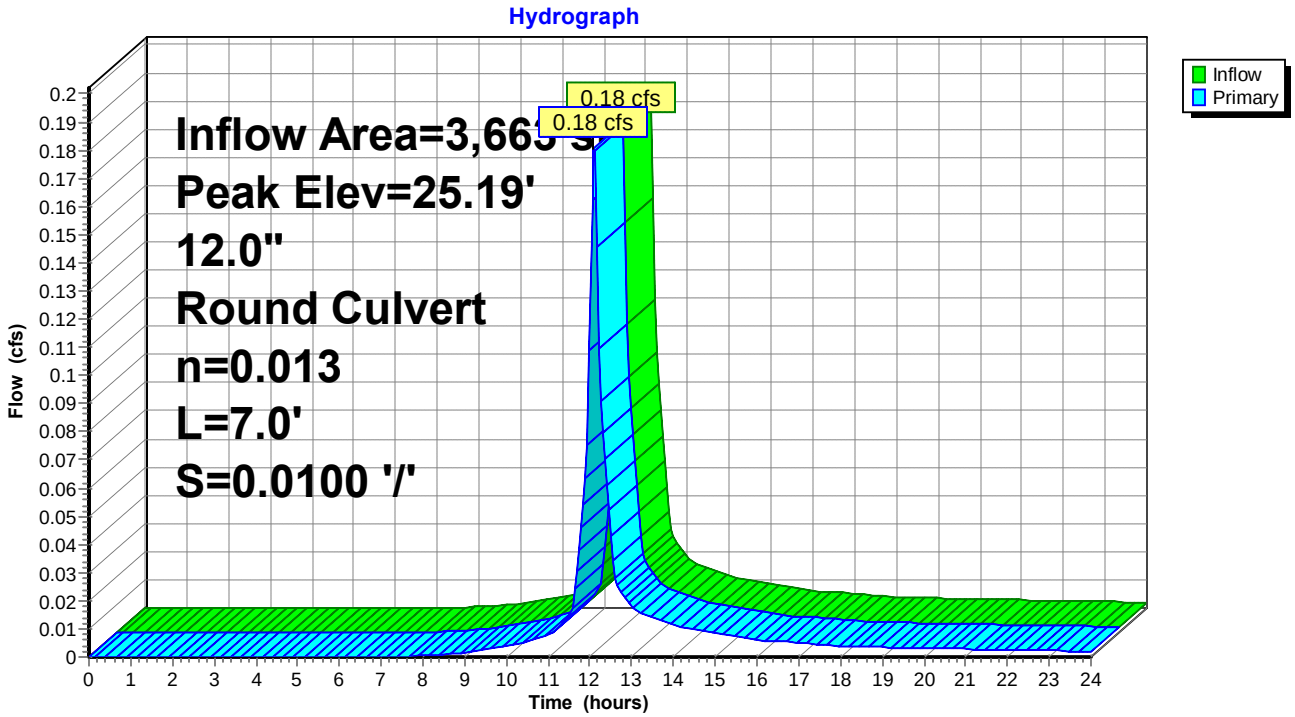
Inflow Area = 3,663 sf, 40.98% Impervious, Inflow Depth > 1.87" for 2-YR event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 571 cf
Outflow = 0.18 cfs @ 12.09 hrs, Volume= 571 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.09 hrs, Volume= 571 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.19' @ 12.09 hrs
Flood Elev= 28.50'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.95' | **12.0" Round Culvert** L= 7.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.95' / 24.88' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.18 cfs @ 12.09 hrs HW=25.19' (Free Discharge)
**1=Culvert** (Barrel Controls 0.18 cfs @ 1.81 fps)

## Pond CB1: CB 1



## Summary for Pond CB2: CB 2

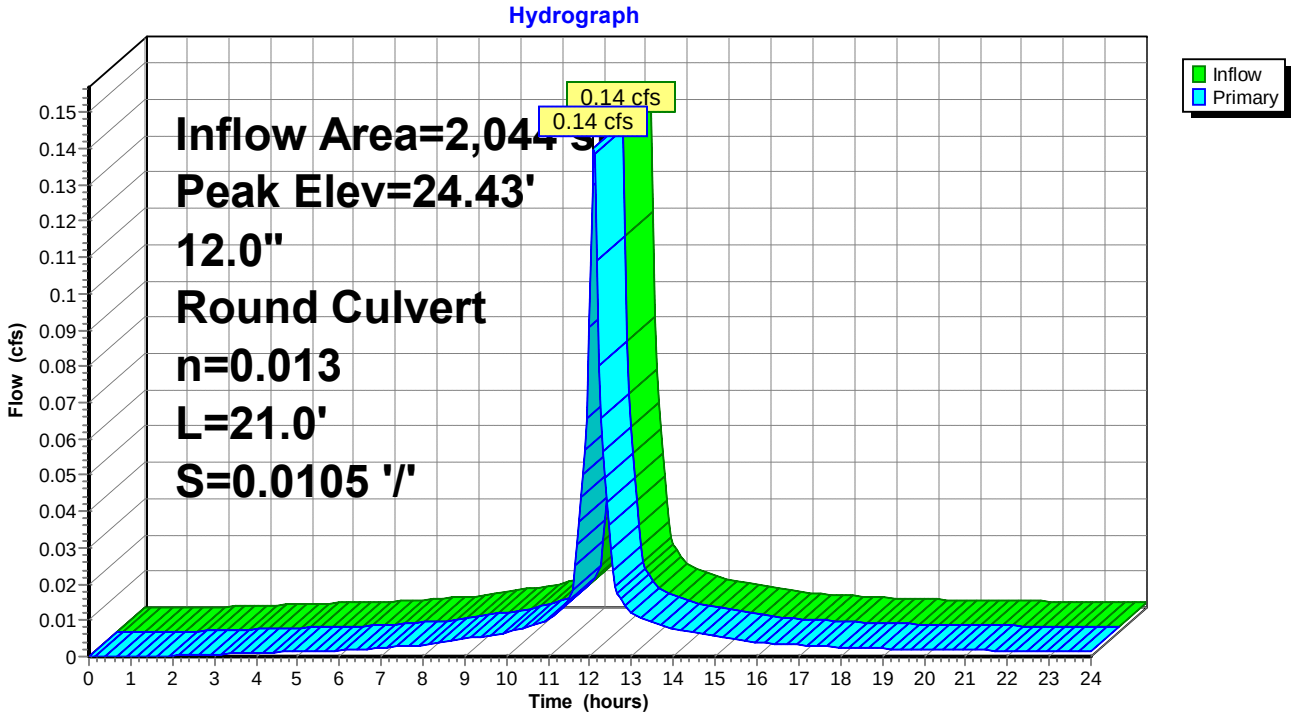
Inflow Area = 2,044 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-YR event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 497 cf
Outflow = 0.14 cfs @ 12.09 hrs, Volume= 497 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.14 cfs @ 12.09 hrs, Volume= 497 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 24.43' @ 12.09 hrs
Flood Elev= 28.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.23' | **12.0" Round Culvert**<br>L= 21.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.23' / 24.01' S= 0.0105 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.14 cfs @ 12.09 hrs HW=24.43' (Free Discharge)
**1=Culvert** (Inlet Controls 0.14 cfs @ 1.20 fps)

## Pond CB2: CB 2



## Summary for Pond DMH1: DMH 1

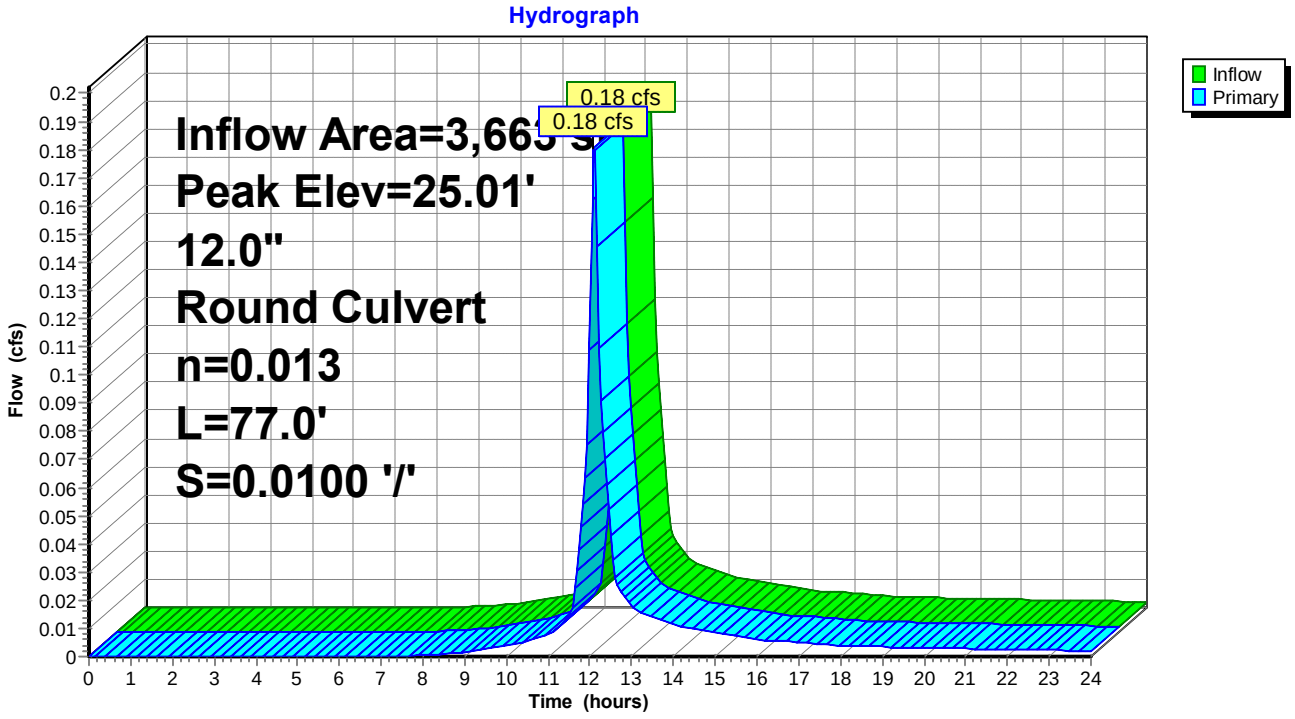
Inflow Area = 3,663 sf, 40.98% Impervious, Inflow Depth > 1.87" for 2-YR event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 571 cf
Outflow = 0.18 cfs @ 12.09 hrs, Volume= 571 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.09 hrs, Volume= 571 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.01' @ 12.09 hrs
Flood Elev= 28.75'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.78' | **12.0" Round Culvert**<br>L= 77.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.78' / 24.01' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.18 cfs @ 12.09 hrs HW=25.01' (Free Discharge)
**1=Culvert** (Inlet Controls 0.18 cfs @ 1.29 fps)

## Pond DMH1: DMH 1



## Summary for Pond DMH2: CDS 2

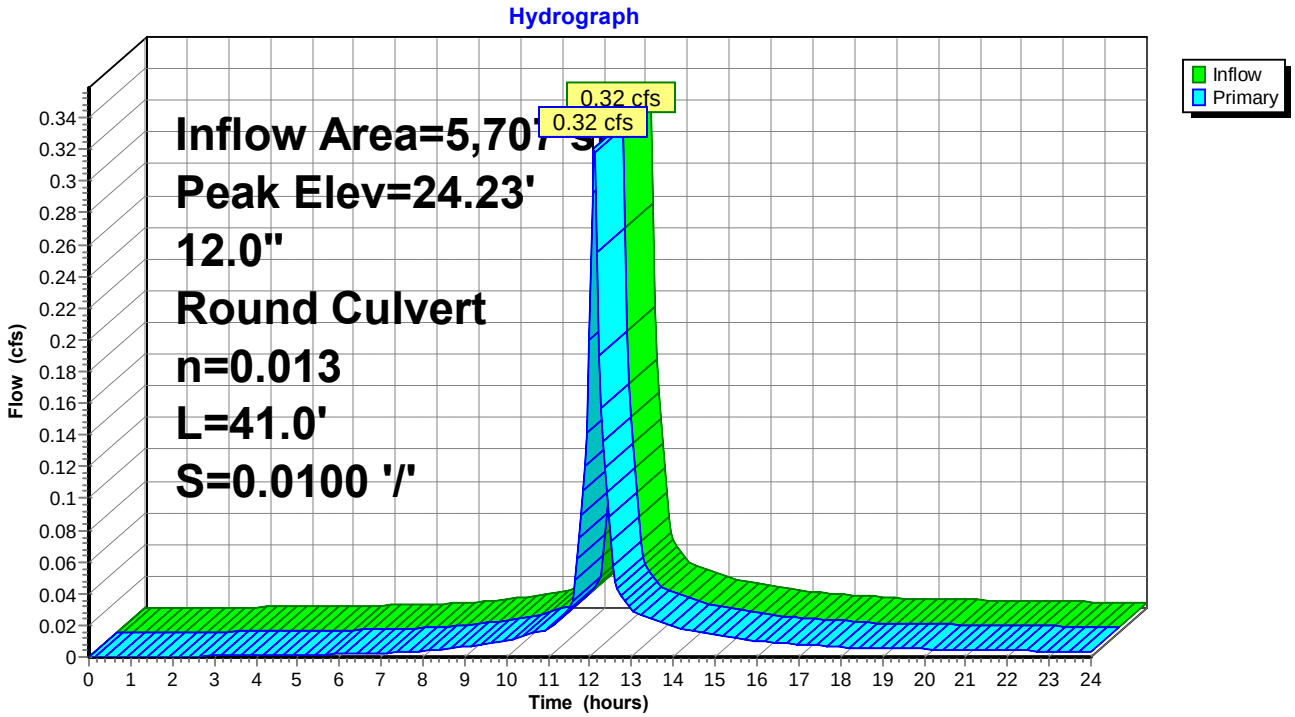
Inflow Area = 5,707 sf, 62.12% Impervious, Inflow Depth > 2.24" for 2-YR event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,067 cf
Outflow = 0.32 cfs @ 12.09 hrs, Volume= 1,067 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.09 hrs, Volume= 1,067 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 24.23' @ 12.09 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.91' | **12.0" Round Culvert**<br>L= 41.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.91' / 23.50' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.31 cfs @ 12.09 hrs HW=24.22' (Free Discharge)
**1=Culvert** (Inlet Controls 0.31 cfs @ 1.50 fps)

## Pond DMH2: CDS 2



## Summary for Pond POND: Pond 1

Inflow Area = 27,816 sf, 72.55% Impervious, Inflow Depth > 2.47" for 2-YR event
Inflow = 1.65 cfs @ 12.09 hrs, Volume= 5,731 cf
Outflow = 0.46 cfs @ 12.44 hrs, Volume= 5,566 cf, Atten= 72%, Lag= 21.1 min
Primary = 0.46 cfs @ 12.44 hrs, Volume= 5,566 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 24.53' @ 12.44 hrs Surf.Area= 2,053 sf Storage= 2,254 cf

Plug-Flow detention time= 146.9 min calculated for 5,555 cf (97% of inflow)
Center-of-Mass det. time= 129.4 min ( 901.4 - 771.9 )

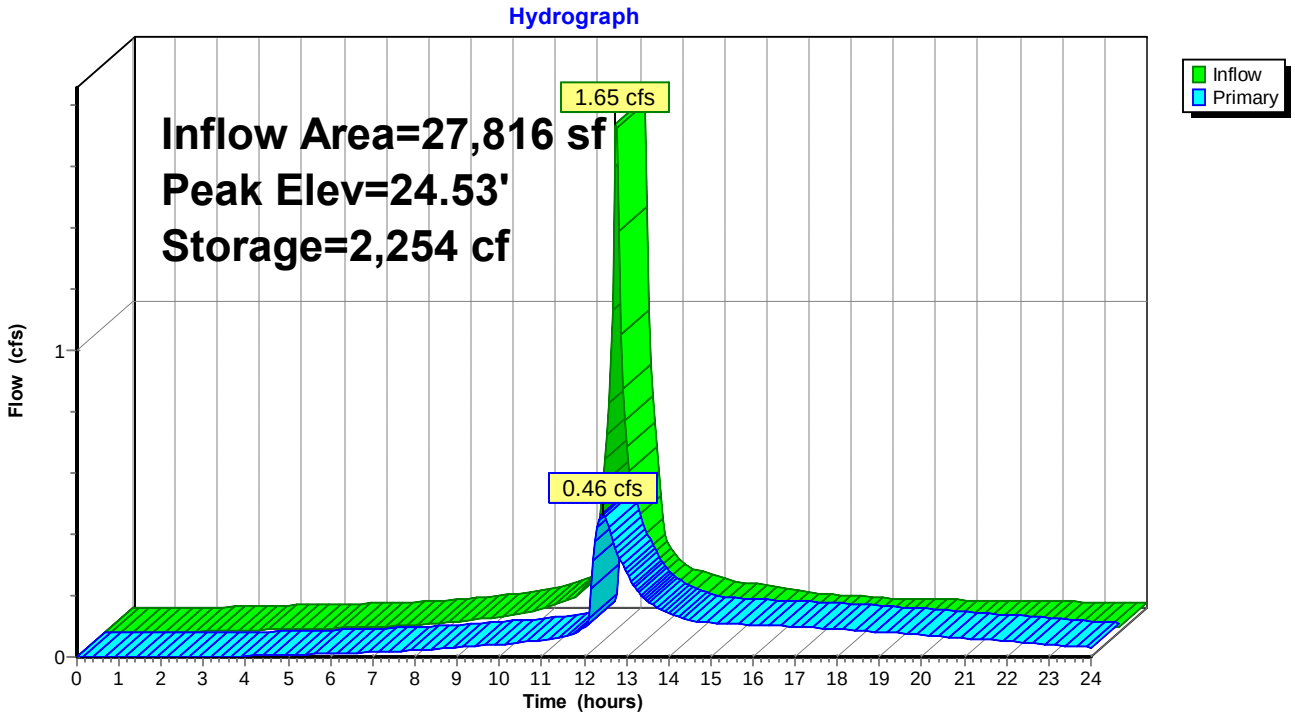
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 23.00' | 8,000 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 23.00 | 911 | 0 | 0 |
| 24.00 | 1,638 | 1,275 | 1,275 |
| 25.00 | 2,421 | 2,030 | 3,304 |
| 26.00 | 3,261 | 2,841 | 6,145 |
| 26.50 | 4,157 | 1,855 | 8,000 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 22.90' | **12.0" Round Culvert**<br>L= 26.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 22.90' / 22.00' S= 0.0346 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 23.00' | **2.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 24.15' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #4 | Device 1 | 25.65' | **24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |

**Primary OutFlow** Max=0.46 cfs @ 12.44 hrs HW=24.53' (Free Discharge)
└**1=Culvert** (Passes 0.46 cfs of 3.17 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 5.79 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.34 cfs @ 2.10 fps)
  └**4=Orifice/Grate** ( Controls 0.00 cfs)

## Pond POND: Pond 1



## Summary for Pond POND2: Pond 2

Inflow Area = 8,812 sf, 73.14% Impervious, Inflow Depth > 2.44" for 2-YR event
Inflow = 0.53 cfs @ 12.09 hrs, Volume= 1,794 cf
Outflow = 0.05 cfs @ 13.01 hrs, Volume= 1,546 cf, Atten= 91%, Lag= 55.3 min
Primary = 0.05 cfs @ 13.01 hrs, Volume= 1,546 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 26.82' @ 13.01 hrs Surf.Area= 742 sf Storage= 904 cf

Plug-Flow detention time= 264.4 min calculated for 1,543 cf (86% of inflow)
Center-of-Mass det. time= 203.8 min ( 986.3 - 782.5 )

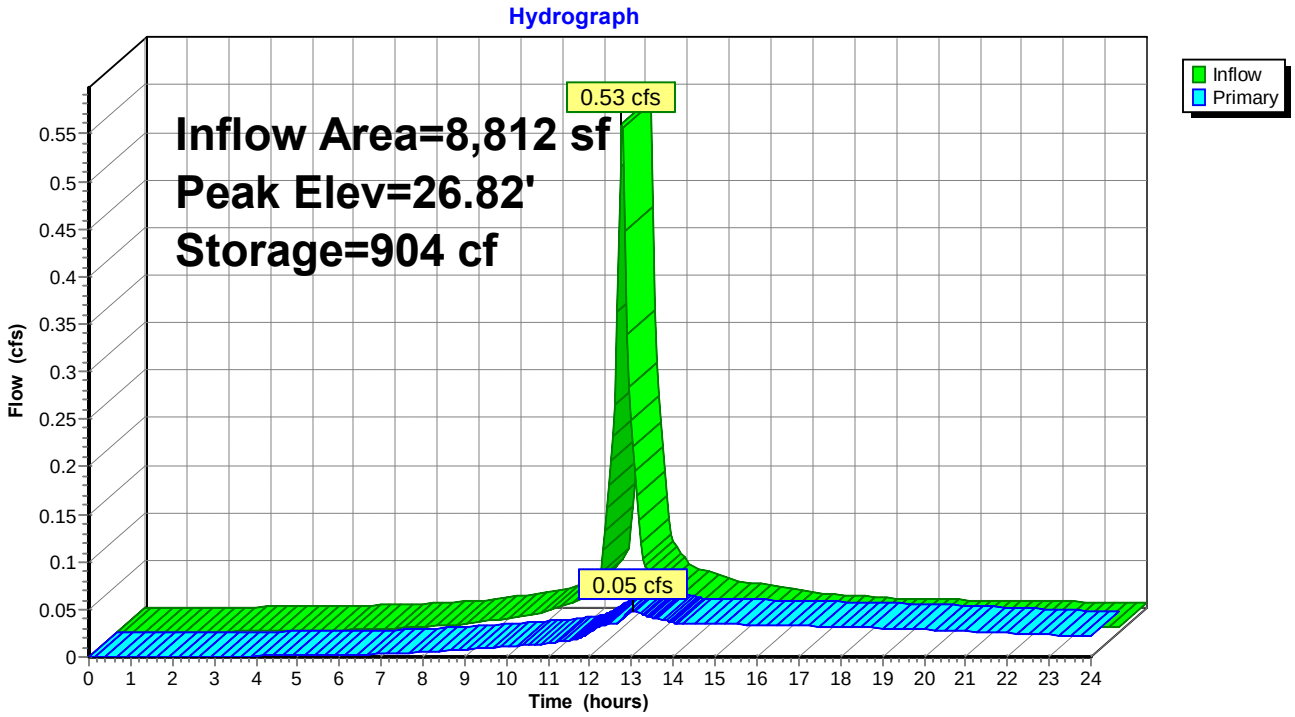
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 25.00' | 3,007 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 25.00 | 276 | 0 | 0 |
| 26.00 | 506 | 391 | 391 |
| 27.00 | 793 | 650 | 1,041 |
| 28.00 | 1,136 | 965 | 2,005 |
| 28.75 | 1,536 | 1,002 | 3,007 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.90' | **12.0" Round Culvert**<br>L= 40.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.90' / 24.50' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 25.00' | **1.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 26.80' | **4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #4 | Device 1 | 27.65' | **24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 |

**Primary OutFlow** Max=0.05 cfs @ 13.01 hrs HW=26.82' (Free Discharge)
└**1=Culvert** (Passes 0.05 cfs of 3.56 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.42 fps)
  ├**3=Orifice/Grate** (Weir Controls 0.01 cfs @ 0.48 fps)
  └**4=Orifice/Grate** ( Controls 0.00 cfs)

## Pond POND2: Pond 2



## Summary for Pond Pond3: Pond 3

Inflow Area = 35,922 sf, 57.12% Impervious, Inflow Depth > 2.03" for 2-YR event
Inflow = 1.60 cfs @ 12.17 hrs, Volume= 6,083 cf
Outflow = 1.42 cfs @ 12.24 hrs, Volume= 6,016 cf, Atten= 11%, Lag= 4.3 min
Primary = 1.42 cfs @ 12.24 hrs, Volume= 6,016 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 21.09' @ 12.24 hrs Surf.Area= 1,110 sf Storage= 1,233 cf

Plug-Flow detention time= 63.9 min calculated for 6,016 cf (99% of inflow)
Center-of-Mass det. time= 57.3 min ( 873.4 - 816.1 )

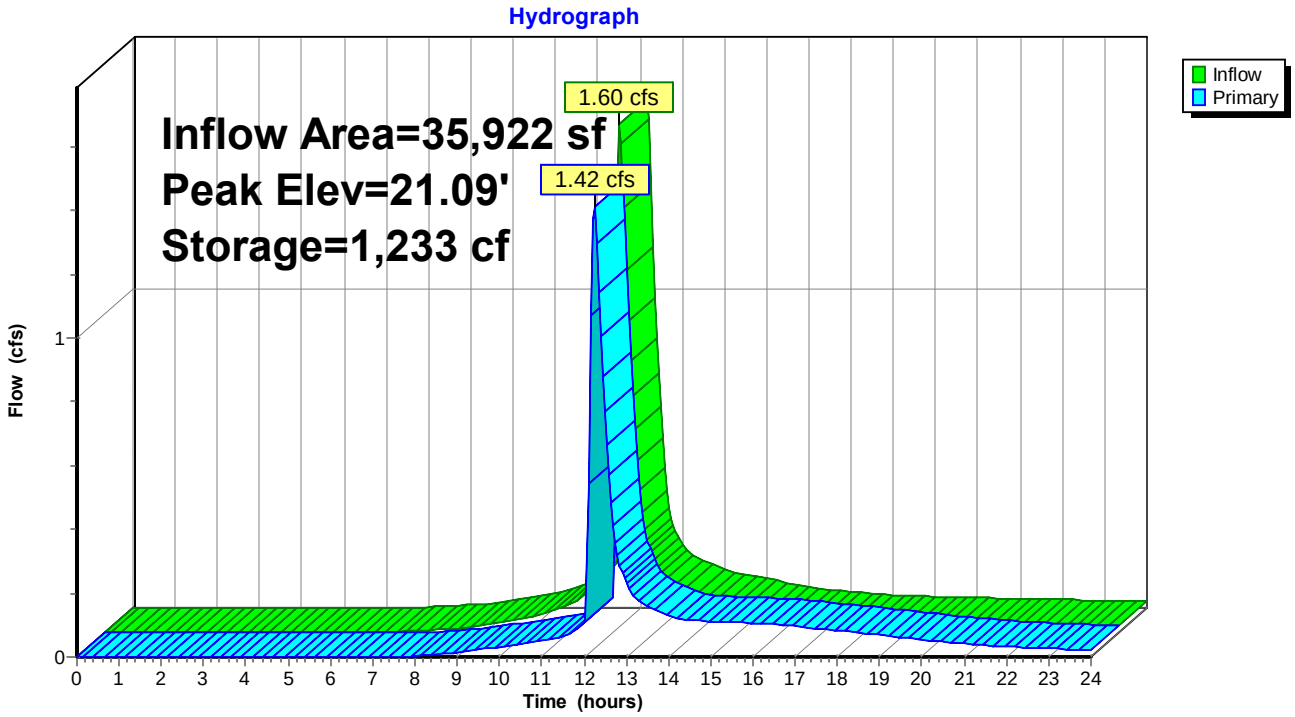
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 19.50' | 2,561 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 19.50 | 487 | 0 | 0 |
| 20.00 | 657 | 286 | 286 |
| 21.00 | 1,038 | 848 | 1,134 |
| 22.00 | 1,816 | 1,427 | 2,561 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 19.40' | **12.0" Round Culvert**<br>L= 46.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 19.40' / 19.00' S= 0.0087 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 20.75' | **24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 19.50' | **2.0" Vert. Orifice/Grate** C= 0.600 |

**Primary OutFlow** Max=1.40 cfs @ 12.24 hrs HW=21.09' (Free Discharge)
↑**1=Culvert** (Passes 1.40 cfs of 3.26 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 1.27 cfs @ 1.87 fps)
**3=Orifice/Grate** (Orifice Controls 0.13 cfs @ 5.91 fps)

## Pond Pond3: Pond 3



## Summary for Pond Pond4: Subsurface Pond

Inflow Area = 3,500 sf,100.00% Impervious, Inflow Depth > 2.92" for 2-YR event
Inflow = 0.24 cfs @ 12.09 hrs, Volume= 850 cf
Outflow = 0.02 cfs @ 12.92 hrs, Volume= 713 cf, Atten= 91%, Lag= 49.8 min
Primary = 0.02 cfs @ 12.92 hrs, Volume= 713 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 27.28' @ 12.92 hrs Surf.Area= 705 sf Storage= 490 cf

Plug-Flow detention time= 297.9 min calculated for 713 cf (84% of inflow)
Center-of-Mass det. time= 231.2 min ( 987.5 - 756.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 26.10' | 510 cf | **18.17'W x 38.80'L x 2.33'H Field A**<br>1,645 cf Overall - 369 cf Embedded = 1,276 cf x 40.0% Voids |
| #2A | 26.60' | 369 cf | **ADS_StormTech SC-310 +Cap** x 25 Inside #1<br>Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf<br>Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap<br>25 Chambers in 5 Rows |
| | | 879 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 26.40' | **12.0" Round Culvert** L= 6.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 26.40' / 26.25' S= 0.0231 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 26.50' | **1.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 27.75' | **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 |

**Primary OutFlow** Max=0.02 cfs @ 12.92 hrs HW=27.28' (Free Discharge)
↑**1=Culvert** (Passes 0.02 cfs of 1.85 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.15 fps)
**3=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond Pond4: Subsurface Pond - Chamber Wizard Field A

**Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)**
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

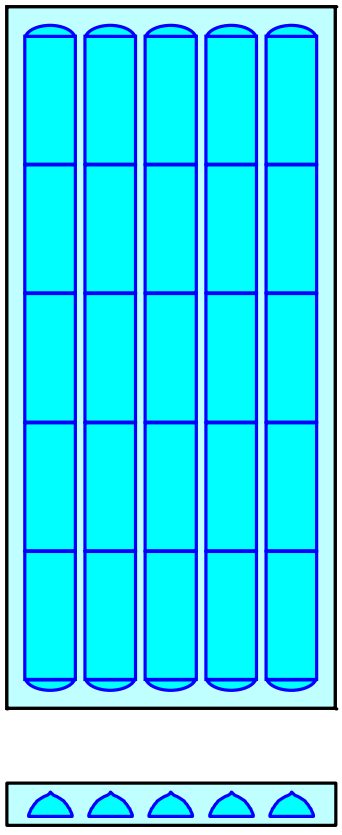
5 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 36.80' Row Length +12.0" End Stone x 2 = 38.80' Base Length
5 Rows x 34.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.17' Base Width
6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

25 Chambers x 14.7 cf = 368.5 cf Chamber Storage

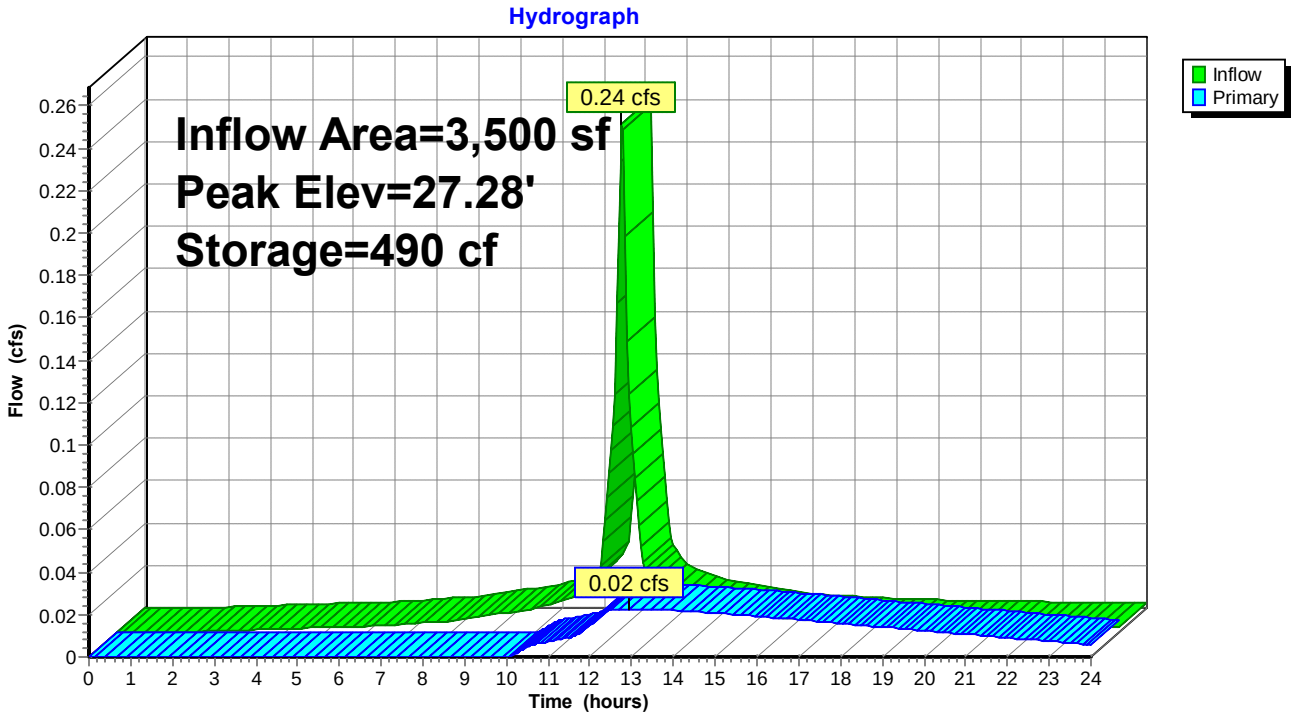
1,644.7 cf Field - 368.5 cf Chambers = 1,276.1 cf Stone x 40.0% Voids = 510.5 cf Stone Storage

Chamber Storage + Stone Storage = 879.0 cf = 0.020 af
Overall Storage Efficiency = 53.4%
Overall System Size = 38.80' x 18.17' x 2.33'

25 Chambers
60.9 cy Field
47.3 cy Stone



## Pond Pond4: Subsurface Pond

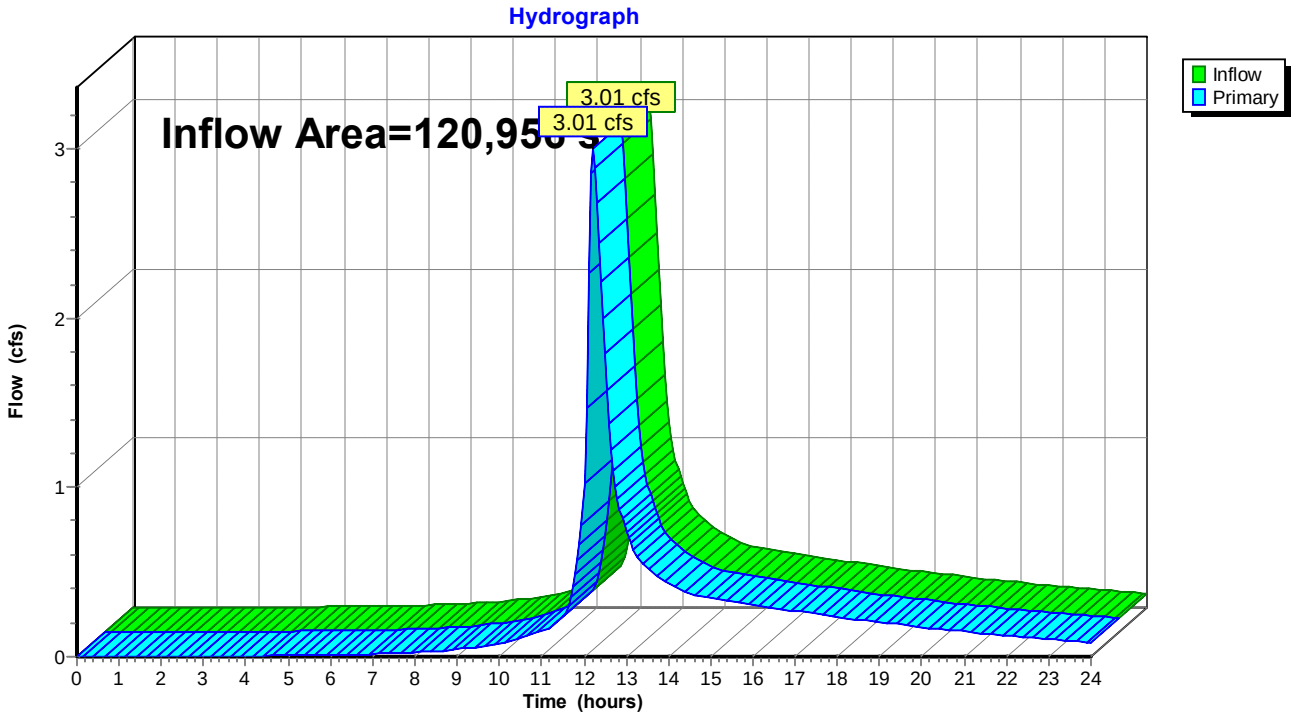


## Summary for Link 6L: wetland 1

Inflow Area = 120,956 sf, 36.54% Impervious, Inflow Depth > 1.78" for 2-YR event
Inflow = 3.01 cfs @ 12.20 hrs, Volume= 17,975 cf
Primary = 3.01 cfs @ 12.20 hrs, Volume= 17,975 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 6L: wetland 1

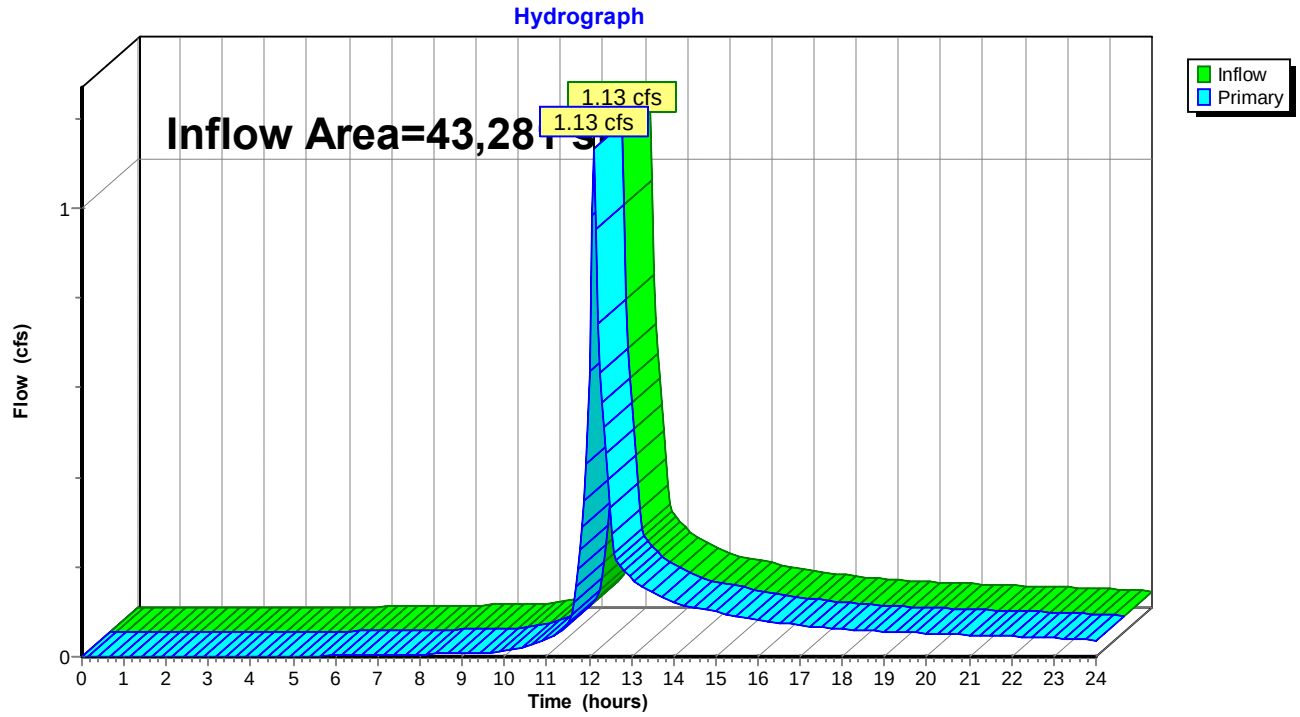


## Summary for Link 9L: link

Inflow Area = 43,281 sf, 14.89% Impervious, Inflow Depth > 1.41" for 2-YR event
Inflow = 1.13 cfs @ 12.10 hrs, Volume= 5,095 cf
Primary = 1.13 cfs @ 12.10 hrs, Volume= 5,095 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link 9L: link



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 P1A: P1A** Runoff Area=39,349 sf 0.00% Impervious Runoff Depth>2.56"
Flow Length=184' Tc=9.1 min CN=78 Runoff=2.40 cfs 8,407 cf

**Subcatchment P1B: P1B** Runoff Area=35,922 sf 57.12% Impervious Runoff Depth>3.60"
Flow Length=268' Tc=12.1 min CN=89 Runoff=2.78 cfs 10,785 cf

**Subcatchment P1C: P1C** Runoff Area=4,672 sf 0.00% Impervious Runoff Depth>2.74"
Tc=6.0 min CN=80 Runoff=0.34 cfs 1,068 cf

**Subcatchment P1D: P1D** Runoff Area=3,500 sf 100.00% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=0.37 cfs 1,339 cf

**Subcatchment P1E: P1E** Runoff Area=14,000 sf 100.00% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=1.48 cfs 5,356 cf

**Subcatchment P1F: P1F** Runoff Area=9,697 sf 0.00% Impervious Runoff Depth>2.74"
Tc=6.0 min CN=80 Runoff=0.70 cfs 2,216 cf

**Subcatchment P1G: P1G** Runoff Area=3,663 sf 40.98% Impervious Runoff Depth>3.40"
Tc=6.0 min CN=87 Runoff=0.32 cfs 1,039 cf

**Subcatchment P1H: P1H** Runoff Area=2,044 sf 100.00% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=0.22 cfs 782 cf

**Subcatchment P1I: P1I** Runoff Area=5,474 sf 0.00% Impervious Runoff Depth>2.74"
Tc=6.0 min CN=80 Runoff=0.40 cfs 1,251 cf

**Subcatchment P1J: P1J** Runoff Area=1,192 sf 100.00% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=0.13 cfs 456 cf

**Subcatchment P1K: P1K** Runoff Area=1,443 sf 100.00% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=0.15 cfs 552 cf

**Subcatchment P2A: P2A** Runoff Area=34,469 sf 0.00% Impervious Runoff Depth>2.57"
Tc=6.0 min CN=78 Runoff=2.34 cfs 7,370 cf

**Subcatchment P2B1: P2B1** Runoff Area=3,571 sf 98.88% Impervious Runoff Depth>4.59"
Tc=6.0 min CN=98 Runoff=0.38 cfs 1,366 cf

**Subcatchment P2B2: P2B2** Runoff Area=5,241 sf 55.60% Impervious Runoff Depth>3.71"
Tc=6.0 min CN=90 Runoff=0.49 cfs 1,620 cf

**Pond 1P: CB 6** Peak Elev=23.64' Inflow=0.15 cfs 552 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0050 '/' Outflow=0.15 cfs 552 cf

**Pond 2P: CB 5** Peak Elev=23.61' Inflow=0.13 cfs 456 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0055 '/' Outflow=0.13 cfs 456 cf

**Pond 3P: CDS1** Peak Elev=23.56' Inflow=0.28 cfs 1,008 cf
12.0" Round Culvert n=0.013 L=28.0' S=0.0050 '/' Outflow=0.28 cfs 1,008 cf

**Pond 6P: CB 3** Peak Elev=25.99' Inflow=0.38 cfs 1,366 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=0.38 cfs 1,366 cf

**Pond 7P: CB 4** Peak Elev=26.05' Inflow=0.49 cfs 1,620 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=0.49 cfs 1,620 cf

**Pond 8P: CDS 3** Peak Elev=25.95' Inflow=0.87 cfs 2,986 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=0.87 cfs 2,986 cf

**Pond CB1: CB 1** Peak Elev=25.29' Inflow=0.32 cfs 1,039 cf
12.0" Round Culvert n=0.013 L=7.0' S=0.0100 '/' Outflow=0.32 cfs 1,039 cf

**Pond CB2: CB 2** Peak Elev=24.49' Inflow=0.22 cfs 782 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0105 '/' Outflow=0.22 cfs 782 cf

**Pond DMH1: DMH 1** Peak Elev=25.10' Inflow=0.32 cfs 1,039 cf
12.0" Round Culvert n=0.013 L=77.0' S=0.0100 '/' Outflow=0.32 cfs 1,039 cf

**Pond DMH2: CDS 2** Peak Elev=24.33' Inflow=0.54 cfs 1,821 cf
12.0" Round Culvert n=0.013 L=41.0' S=0.0100 '/' Outflow=0.54 cfs 1,821 cf

**Pond POND: Pond 1** Peak Elev=25.04' Storage=3,397 cf Inflow=2.70 cfs 9,436 cf
Outflow=0.90 cfs 9,073 cf

**Pond POND2: Pond 2** Peak Elev=27.18' Storage=1,186 cf Inflow=0.87 cfs 2,986 cf
Outflow=0.30 cfs 2,599 cf

**Pond Pond3: Pond 3** Peak Elev=21.28' Storage=1,451 cf Inflow=2.78 cfs 10,785 cf
Outflow=2.59 cfs 10,650 cf

**Pond Pond4: Subsurface Pond** Peak Elev=27.79' Storage=695 cf Inflow=0.37 cfs 1,339 cf
Outflow=0.12 cfs 1,126 cf

**Link 6L: wetland 1** Inflow=6.38 cfs 32,540 cf
Primary=6.38 cfs 32,540 cf

**Link 9L: link** Inflow=2.47 cfs 9,969 cf
Primary=2.47 cfs 9,969 cf

**Total Runoff Area = 164,237 sf Runoff Volume = 43,608 cf Average Runoff Depth = 3.19"**
**69.16% Pervious = 113,594 sf 30.84% Impervious = 50,643 sf**

## Summary for Subcatchment P1A: P1A

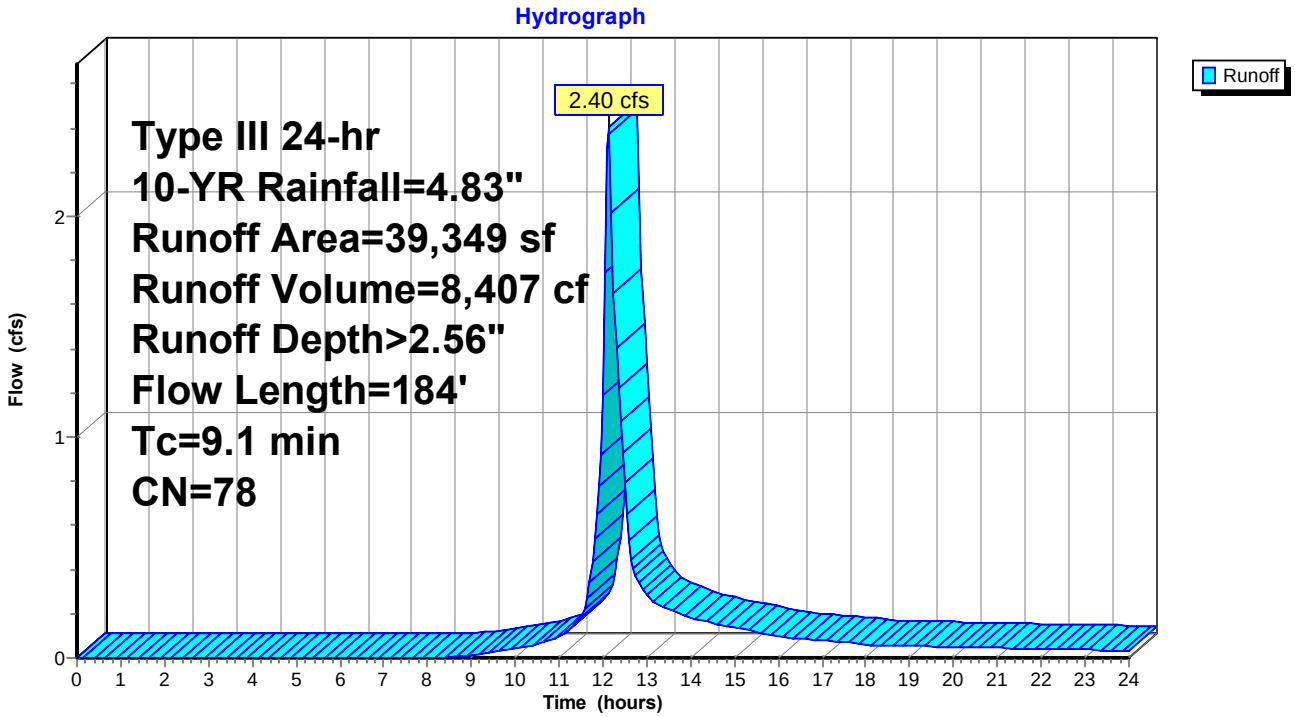
Runoff = 2.40 cfs @ 12.13 hrs, Volume= 8,407 cf, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 9,812 | 80 | >75% Grass cover, Good, HSG D |
| 29,537 | 77 | Woods, Good, HSG D |
| 39,349 | 78 | Weighted Average |
| 39,349 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 50 | 0.0550 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.7 | 134 | 0.0430 | 3.34 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 9.1 | 184 | Total | | | |

## Subcatchment P1A: P1A



## Summary for Subcatchment P1B: P1B

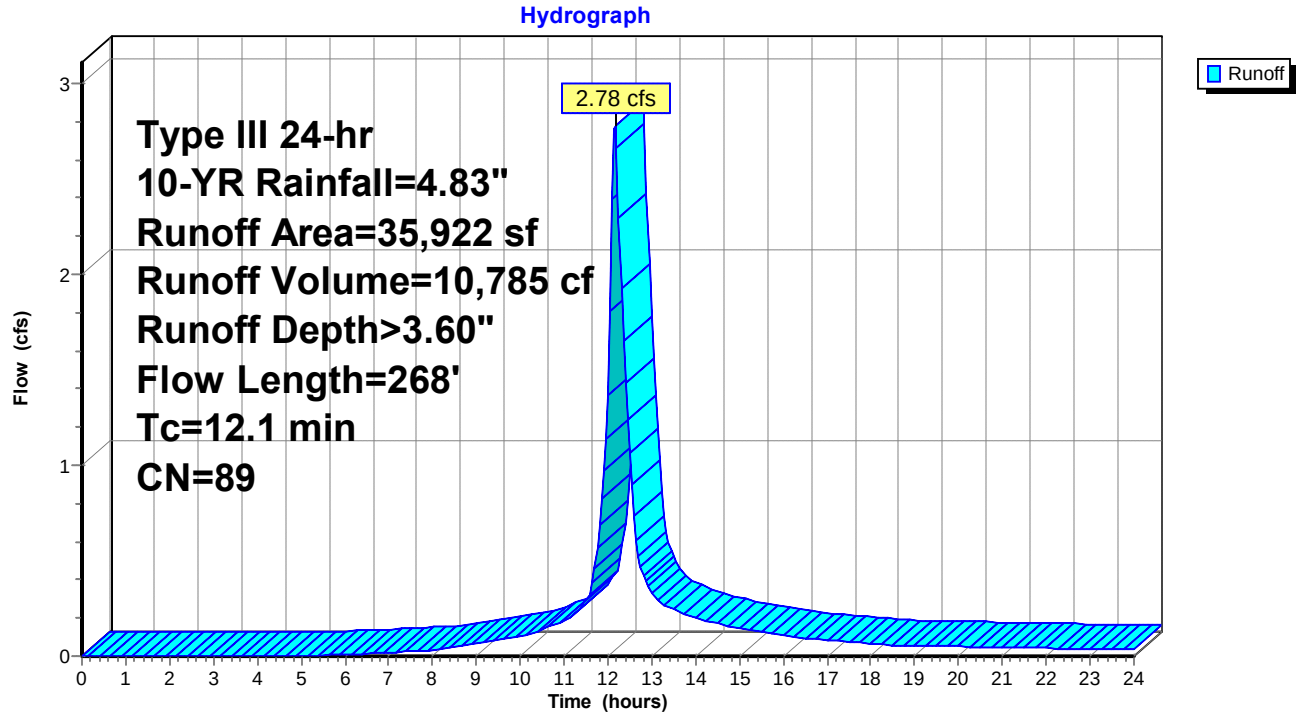
Runoff = 2.78 cfs @ 12.16 hrs, Volume= 10,785 cf, Depth> 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 6,018 | 98 | Roofs, HSG D |
| 14,500 | 98 | Paved parking, HSG D |
| 9,409 | 77 | Woods, Good, HSG D |
| 5,995 | 80 | >75% Grass cover, Good, HSG D |
| 35,922 | 89 | Weighted Average |
| 15,404 | | 42.88% Pervious Area |
| 20,518 | | 57.12% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.7 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.5 | 86 | 0.0350 | 3.01 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.9 | 132 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 12.1 | 268 | Total | | | |

## Subcatchment P1B: P1B



## Summary for Subcatchment P1C: P1C

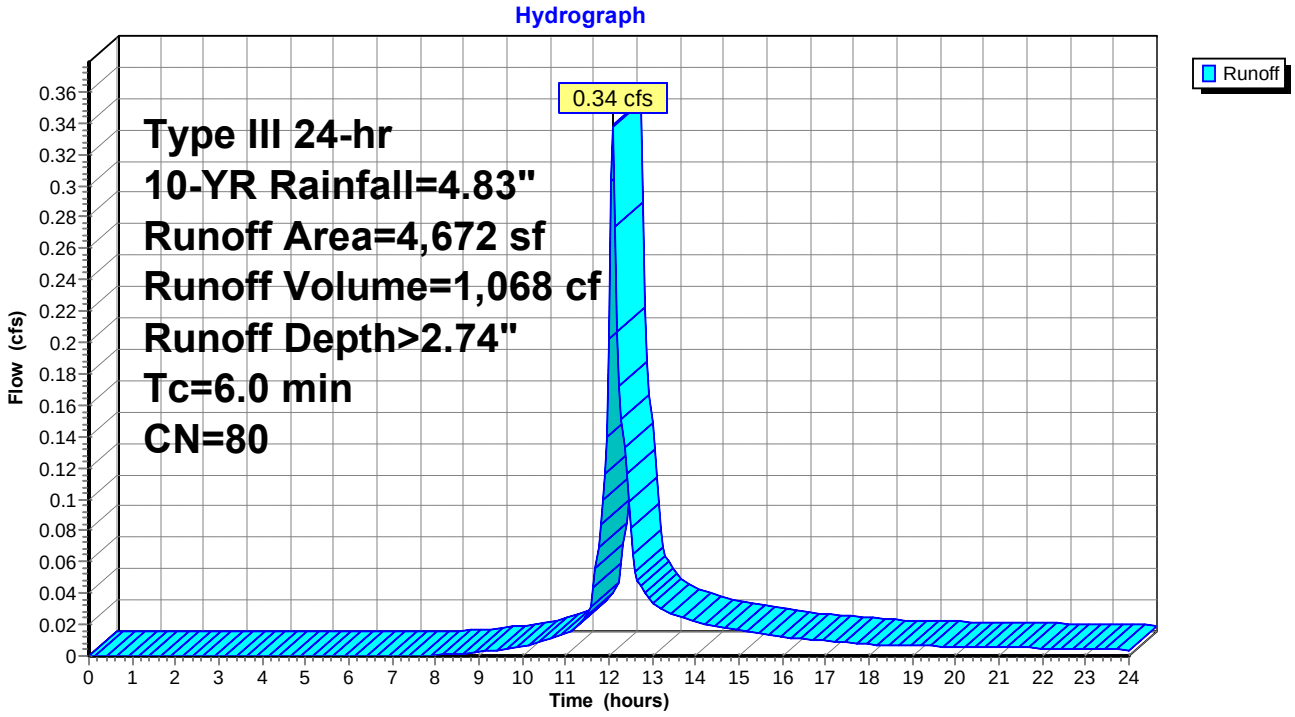
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 1,068 cf, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 4,672 | 80 | >75% Grass cover, Good, HSG D |
| 4,672 | | 100.00% Pervious Area |

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

## Subcatchment P1C: P1C



## Summary for Subcatchment P1D: P1D

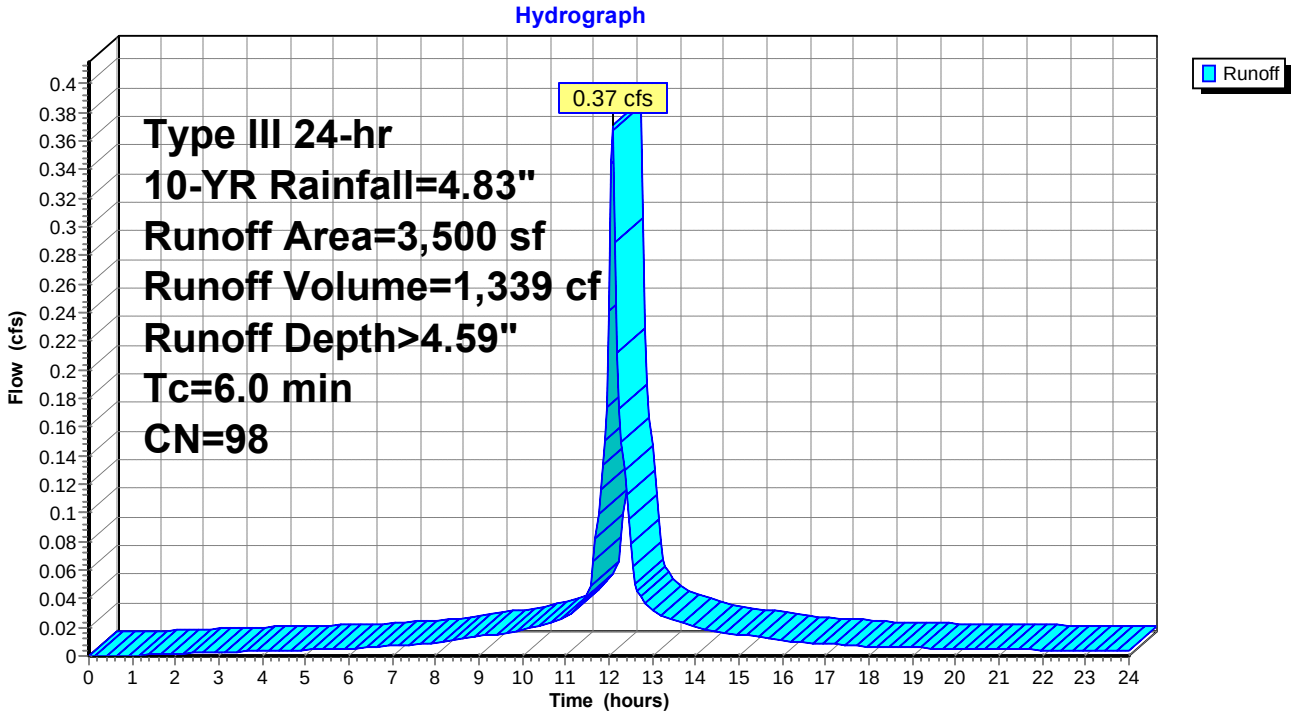
Runoff = 0.37 cfs @ 12.09 hrs, Volume= 1,339 cf, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 3,500 | 98 | Roofs, HSG D |
| 3,500 | | 100.00% Impervious Area |

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

## Subcatchment P1D: P1D



## Summary for Subcatchment P1E: P1E

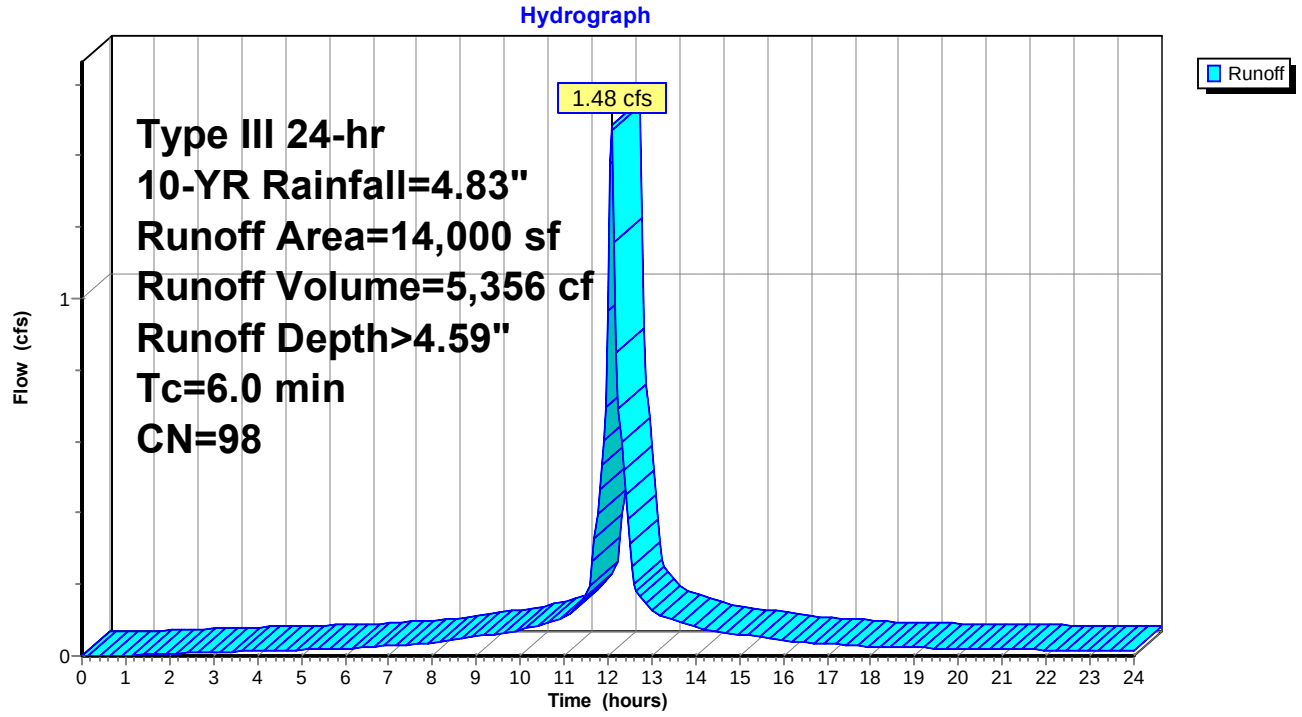
Runoff = 1.48 cfs @ 12.09 hrs, Volume= 5,356 cf, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 14,000 | 98 | Roofs, HSG D |
| 14,000 | | 100.00% Impervious Area |

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

## Subcatchment P1E: P1E



## Summary for Subcatchment P1F: P1F

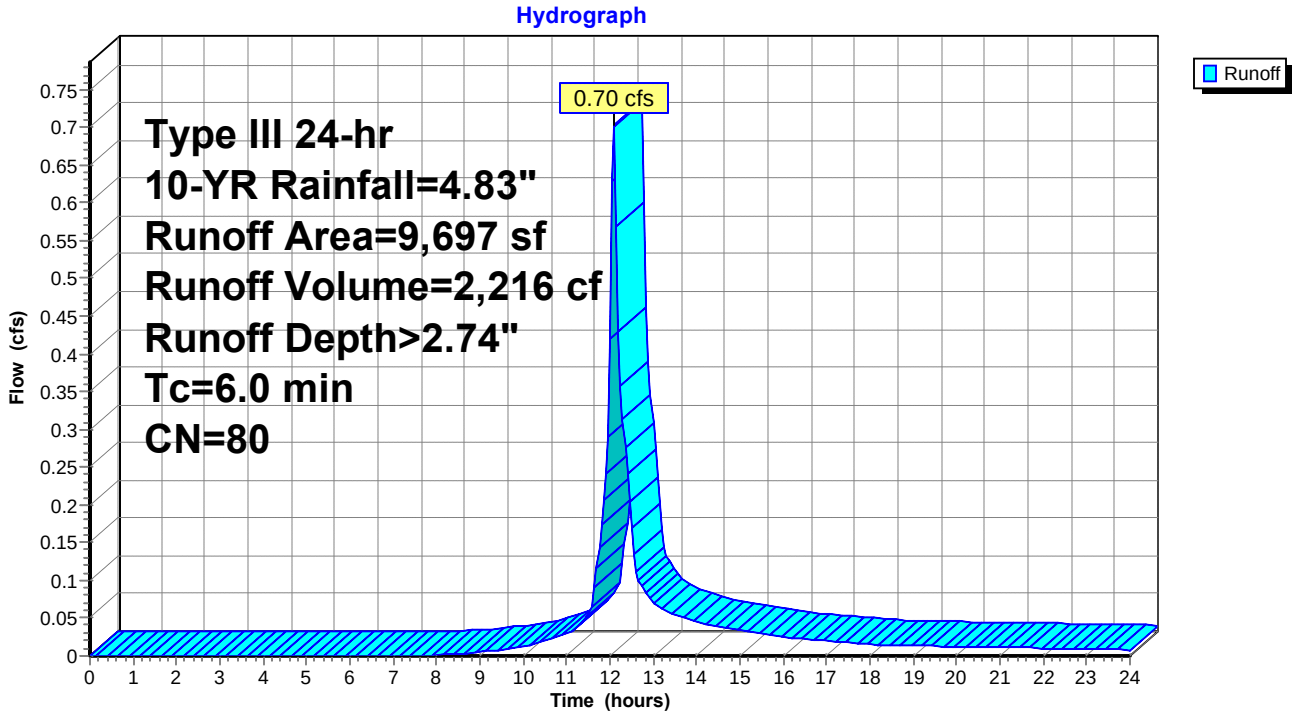
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,216 cf, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 9,697 | 80 | >75% Grass cover, Good, HSG D |
| 9,697 | | 100.00% Pervious Area |

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

## Subcatchment P1F: P1F



## Summary for Subcatchment P1G: P1G

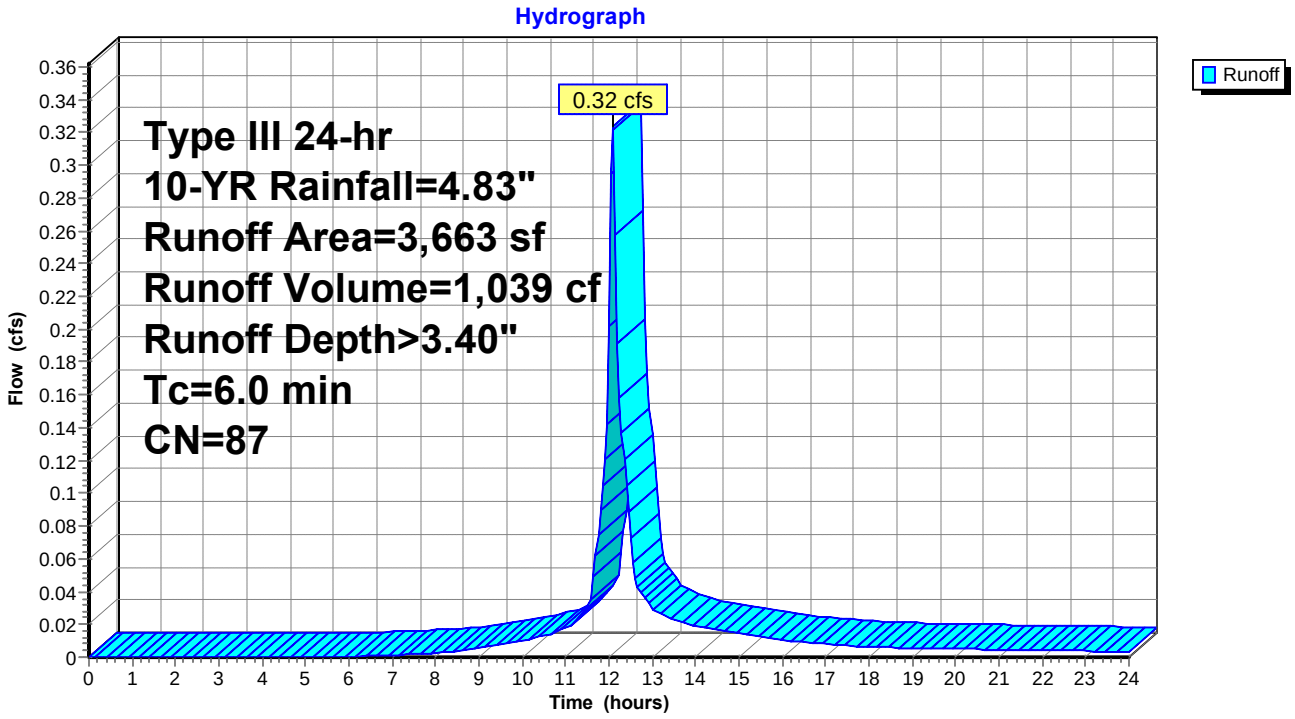
Runoff = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 2,162 | 80 | >75% Grass cover, Good, HSG D |
| 1,501 | 98 | Paved parking, HSG D |
| 3,663 | 87 | Weighted Average |
| 2,162 | | 59.02% Pervious Area |
| 1,501 | | 40.98% Impervious Area |

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

## Subcatchment P1G: P1G



## Summary for Subcatchment P1H: P1H

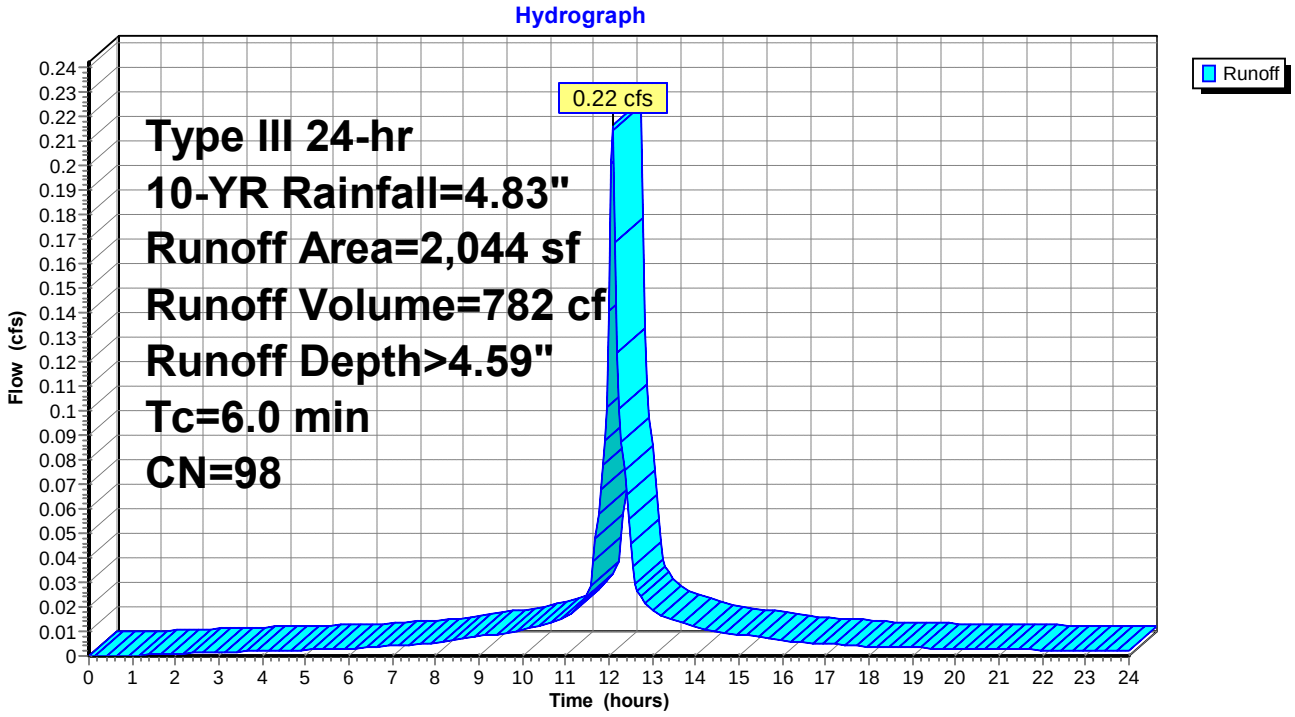
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 782 cf, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 2,044 | 98 | Paved parking, HSG D |
| 2,044 | | 100.00% Impervious Area |

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

## Subcatchment P1H: P1H



## Summary for Subcatchment P1I: P1I

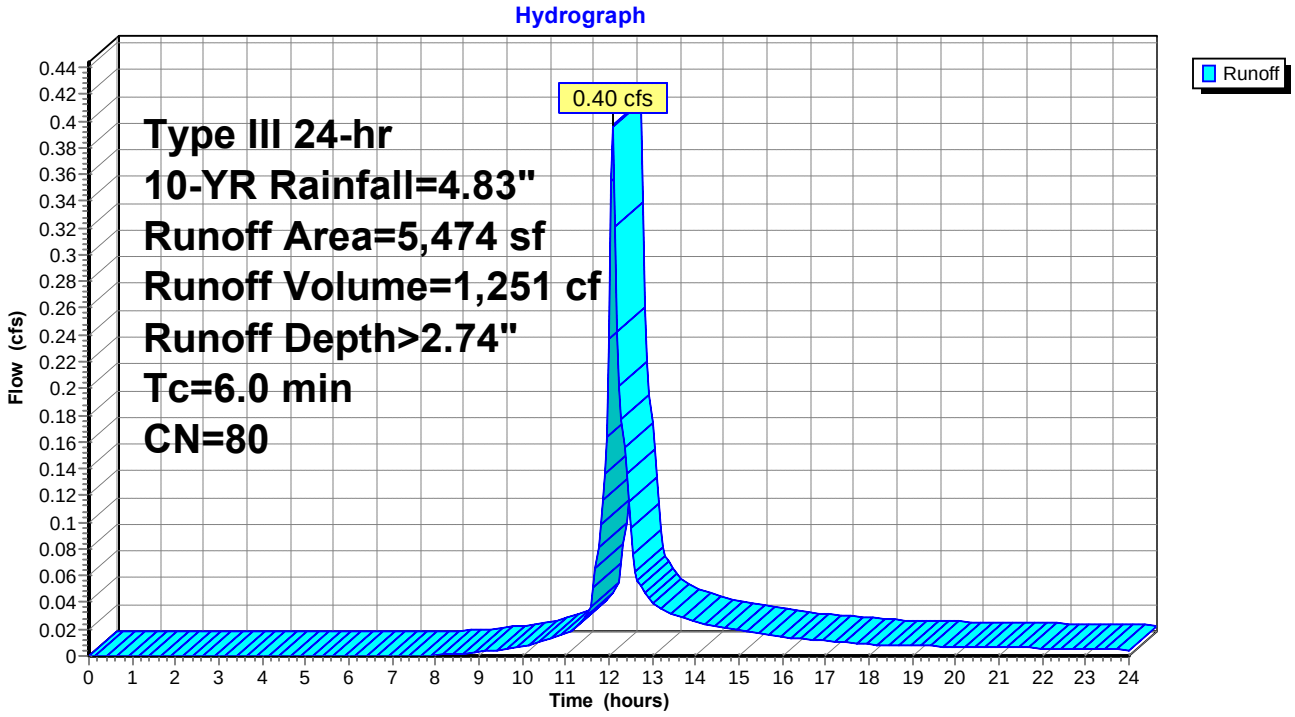
Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,251 cf, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 5,474 | 80 | >75% Grass cover, Good, HSG D |
| 5,474 | | 100.00% Pervious Area |

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

## Subcatchment P1I: P1I



## Summary for Subcatchment P1J: P1J

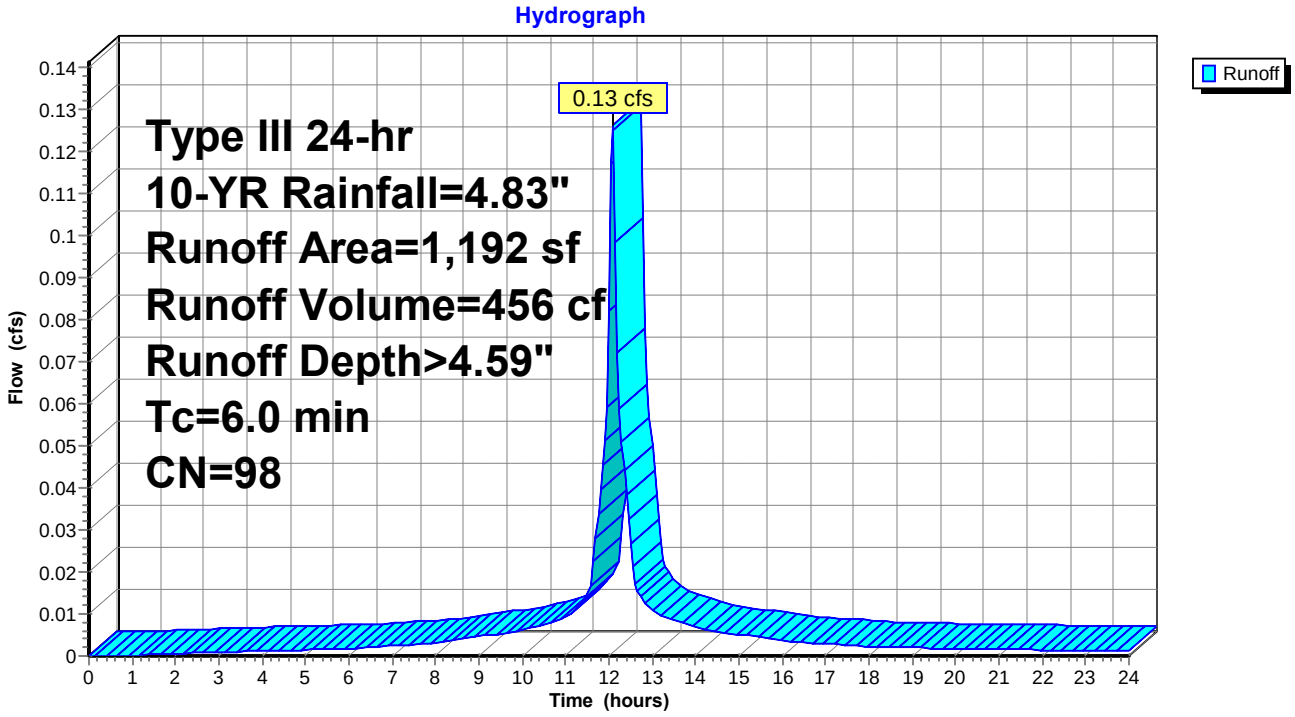
Runoff = 0.13 cfs @ 12.09 hrs, Volume= 456 cf, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 1,192 | 98 | Paved parking, HSG D |
| 1,192 | | 100.00% Impervious Area |

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

## Subcatchment P1J: P1J



## Summary for Subcatchment P1K: P1K

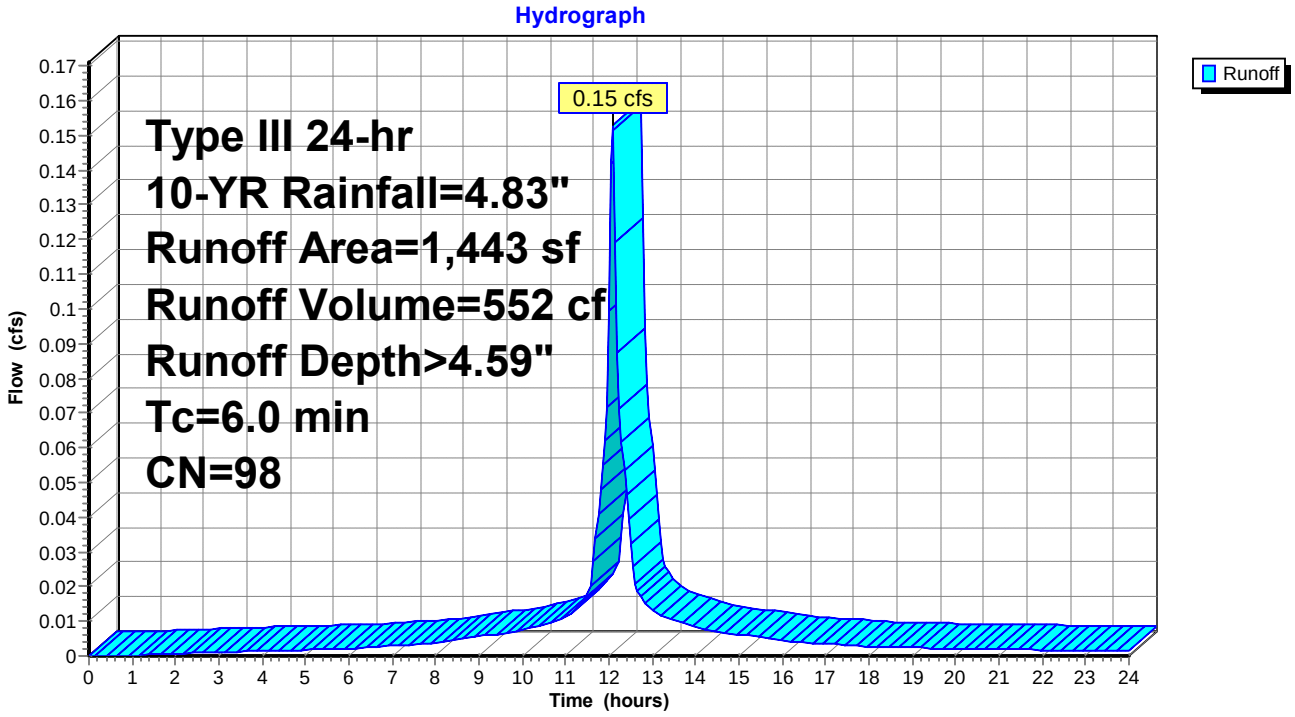
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 552 cf, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 1,443 | 98 | Paved parking, HSG D |
| 1,443 | | 100.00% Impervious Area |

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

## Subcatchment P1K: P1K



## Summary for Subcatchment P2A: P2A

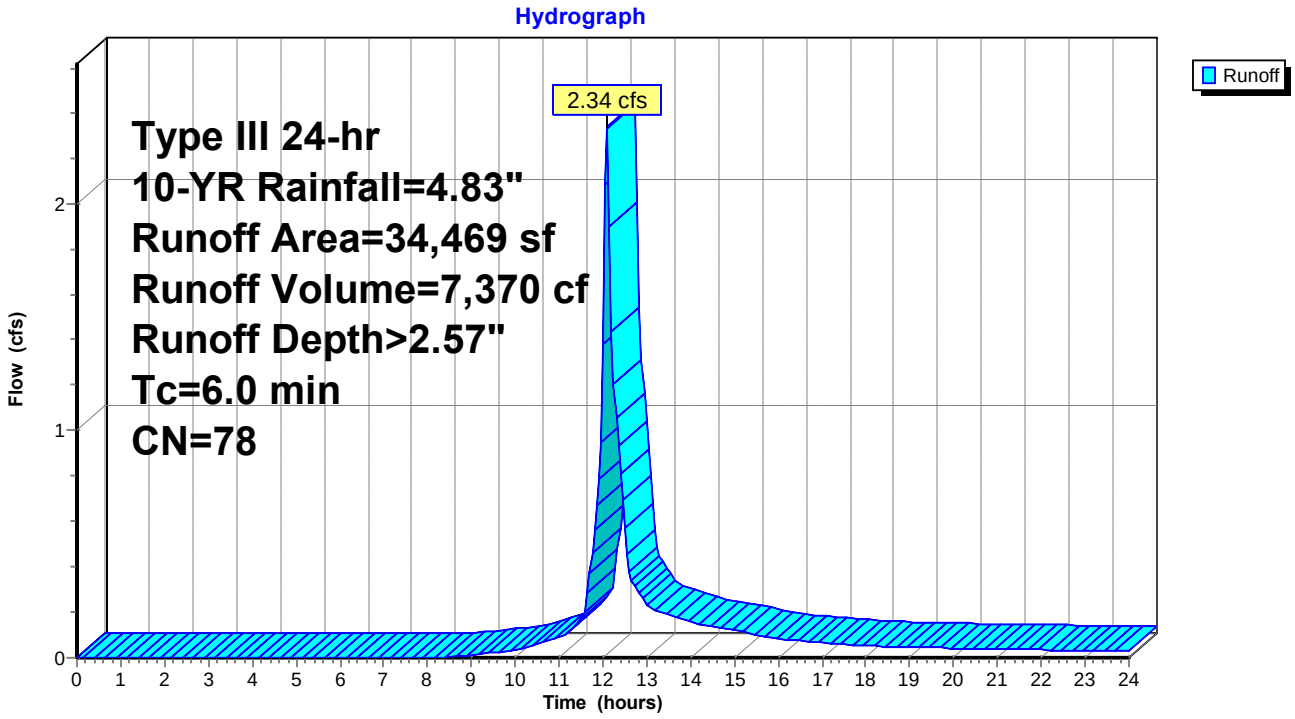
Runoff = 2.34 cfs @ 12.09 hrs, Volume= 7,370 cf, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 20,968 | 77 | Woods, Good, HSG D |
| 13,501 | 80 | >75% Grass cover, Good, HSG D |
| 34,469 | 78 | Weighted Average |
| 34,469 | | 100.00% Pervious Area |

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

## Subcatchment P2A: P2A



## Summary for Subcatchment P2B1: P2B1

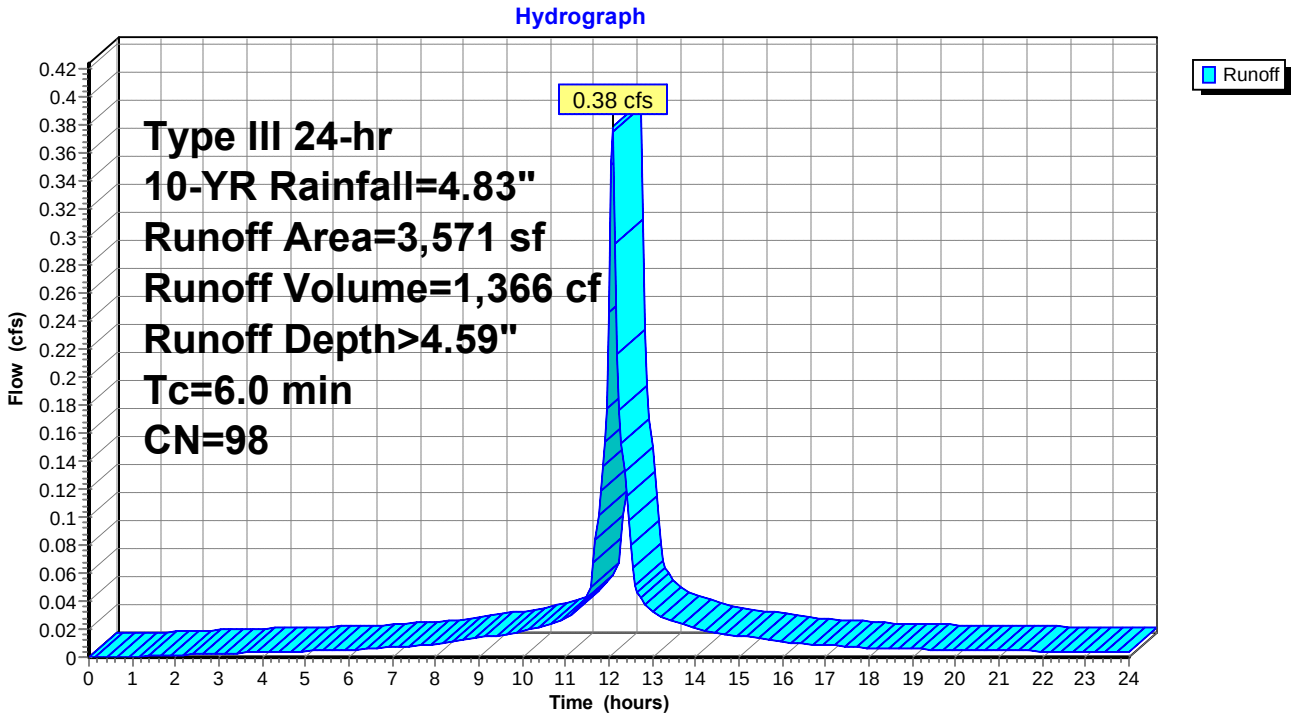
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 1,366 cf, Depth> 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 3,531 | 98 | Paved parking, HSG D |
| 40 | 80 | >75% Grass cover, Good, HSG D |
| 3,571 | 98 | Weighted Average |
| 40 | | 1.12% Pervious Area |
| 3,531 | | 98.88% Impervious Area |

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

## Subcatchment P2B1: P2B1



## Summary for Subcatchment P2B2: P2B2

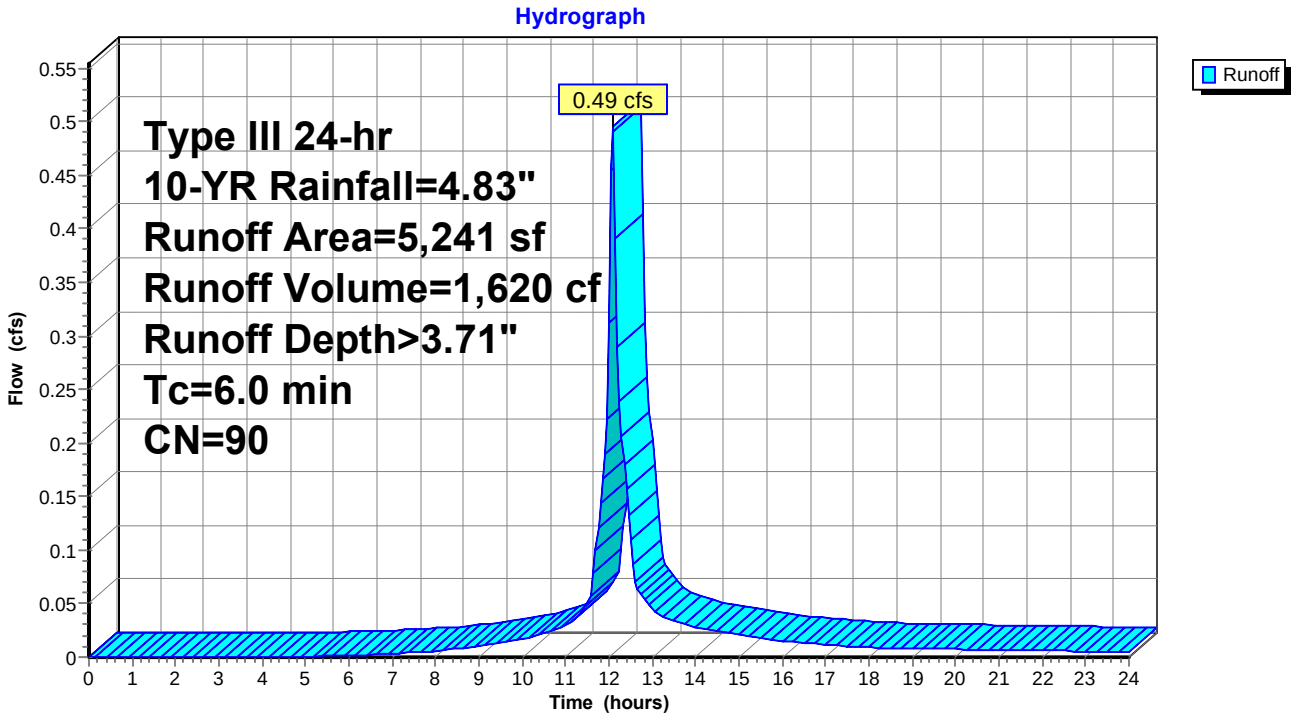
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,620 cf, Depth> 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.83"

| Area (sf) | CN | Description |
|---|---|---|
| 2,914 | 98 | Paved parking, HSG D |
| 2,327 | 80 | >75% Grass cover, Good, HSG D |
| 5,241 | 90 | Weighted Average |
| 2,327 | | 44.40% Pervious Area |
| 2,914 | | 55.60% Impervious Area |

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

## Subcatchment P2B2: P2B2



## Summary for Pond 1P: CB 6

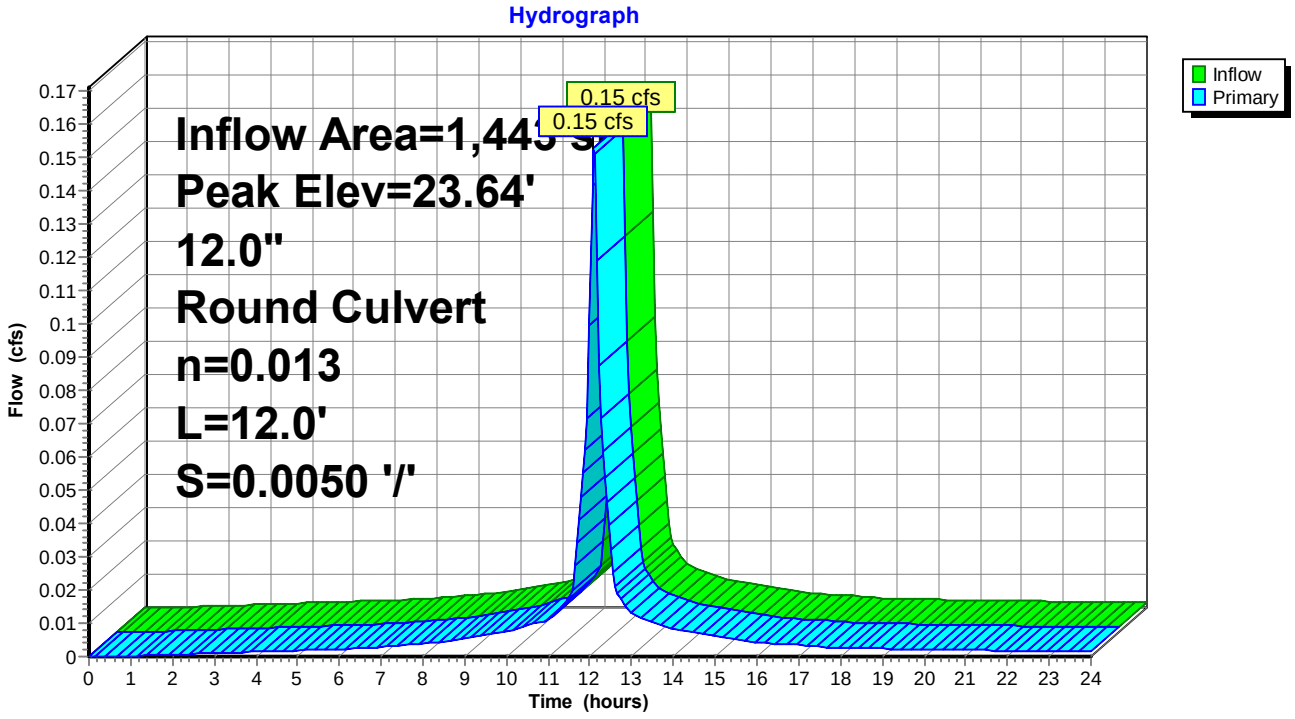
Inflow Area = 1,443 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-YR event
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 552 cf
Outflow = 0.15 cfs @ 12.09 hrs, Volume= 552 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.15 cfs @ 12.09 hrs, Volume= 552 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.64' @ 12.09 hrs
Flood Elev= 26.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.40' | **12.0" Round Culvert**<br>L= 12.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.40' / 23.34' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.15 cfs @ 12.09 hrs HW=23.64' (Free Discharge)
**1=Culvert** (Barrel Controls 0.15 cfs @ 1.58 fps)

## Pond 1P: CB 6



## Summary for Pond 2P: CB 5

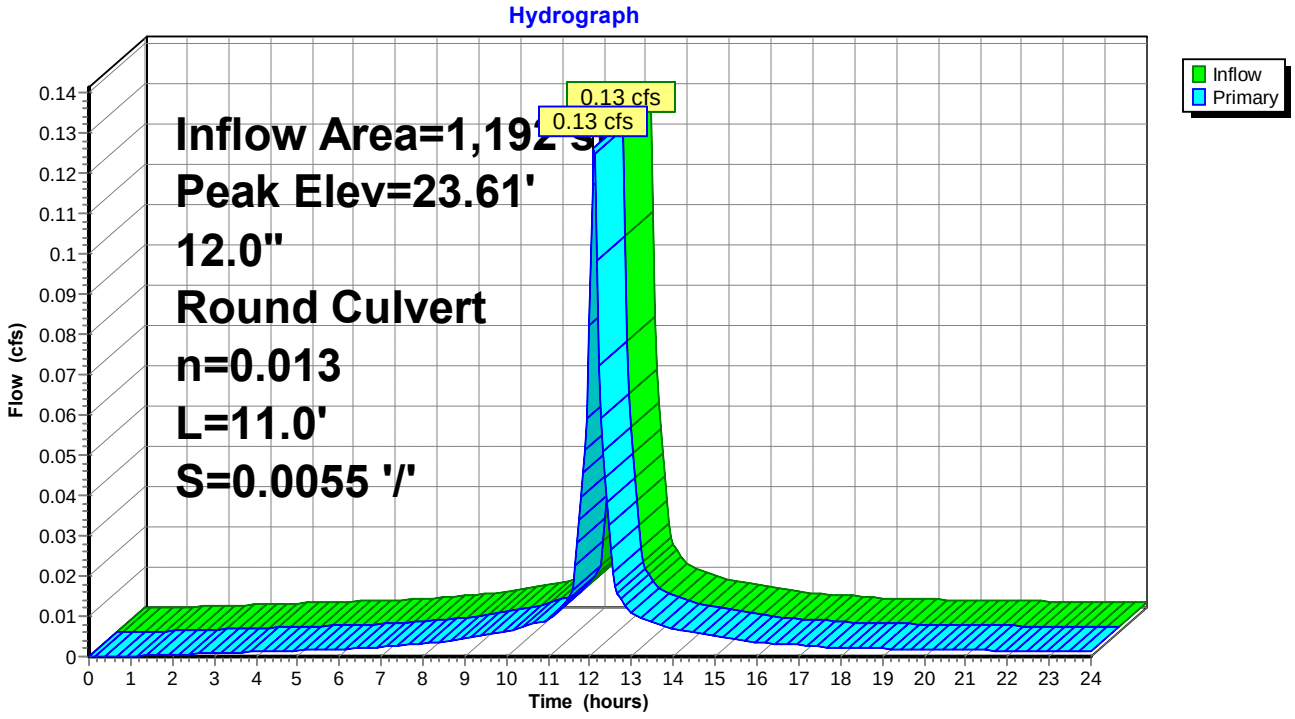
Inflow Area = 1,192 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-YR event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 456 cf
Outflow = 0.13 cfs @ 12.09 hrs, Volume= 456 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.13 cfs @ 12.09 hrs, Volume= 456 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.61' @ 12.09 hrs
Flood Elev= 26.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.40' | **12.0" Round Culvert**<br>L= 11.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.40' / 23.34' S= 0.0055 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.12 cfs @ 12.09 hrs HW=23.61' (Free Discharge)
**1=Culvert** (Barrel Controls 0.12 cfs @ 1.53 fps)

## Pond 2P: CB 5



## Summary for Pond 3P: CDS1

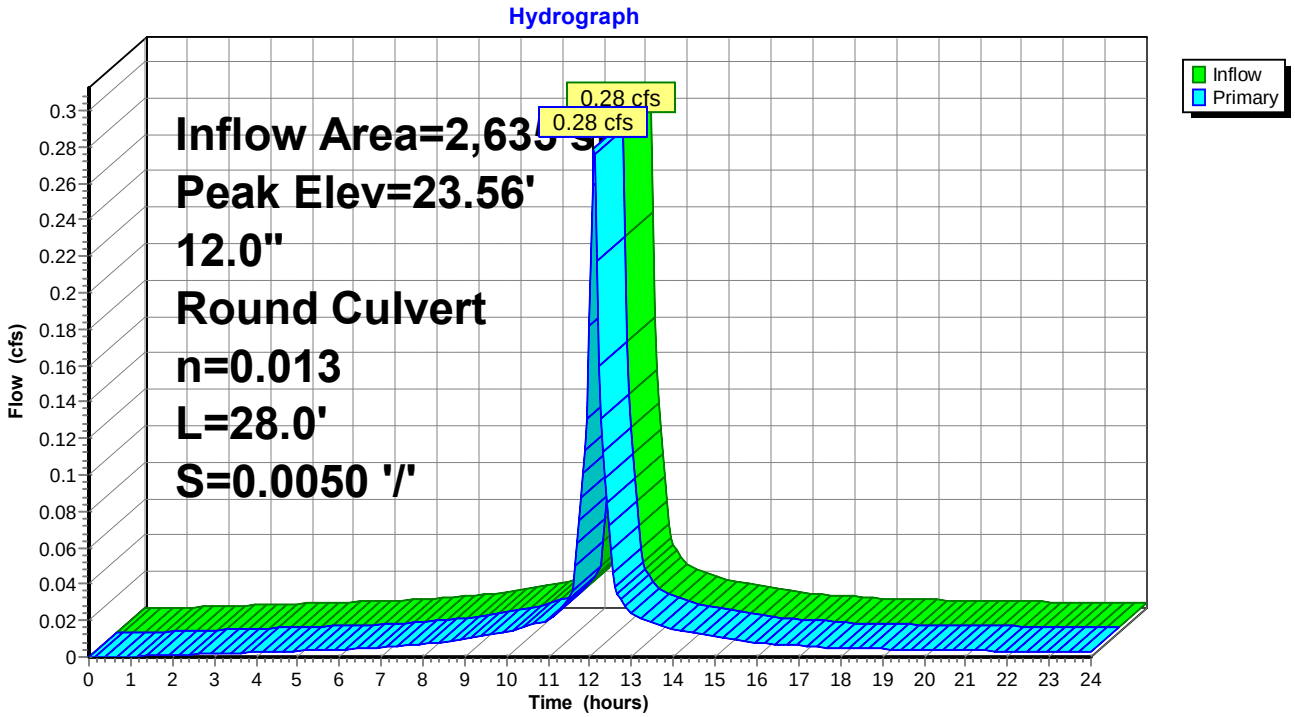
Inflow Area = 2,635 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-YR event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 1,008 cf
Outflow = 0.28 cfs @ 12.09 hrs, Volume= 1,008 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.09 hrs, Volume= 1,008 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.56' @ 12.09 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.24' | **12.0" Round Culvert**<br>L= 28.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.24' / 23.10' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.27 cfs @ 12.09 hrs HW=23.55' (Free Discharge)
**1=Culvert** (Barrel Controls 0.27 cfs @ 1.92 fps)

## Pond 3P: CDS1



## Summary for Pond 6P: CB 3

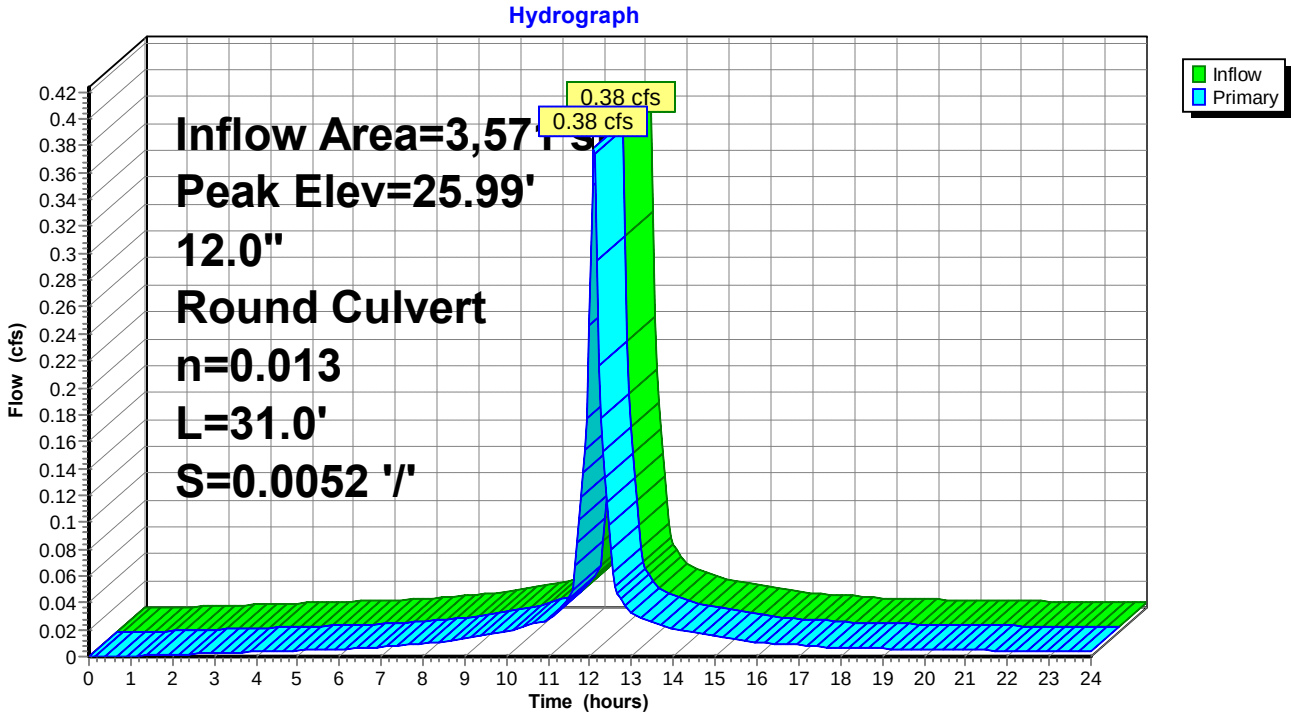
Inflow Area = 3,571 sf, 98.88% Impervious, Inflow Depth > 4.59" for 10-YR event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 1,366 cf
Outflow = 0.38 cfs @ 12.09 hrs, Volume= 1,366 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.38 cfs @ 12.09 hrs, Volume= 1,366 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.99' @ 12.09 hrs
Flood Elev= 28.20'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.62' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.62' / 25.46' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.37 cfs @ 12.09 hrs HW=25.99' (Free Discharge)
**1=Culvert** (Barrel Controls 0.37 cfs @ 2.10 fps)

## Pond 6P: CB 3



## Summary for Pond 7P: CB 4

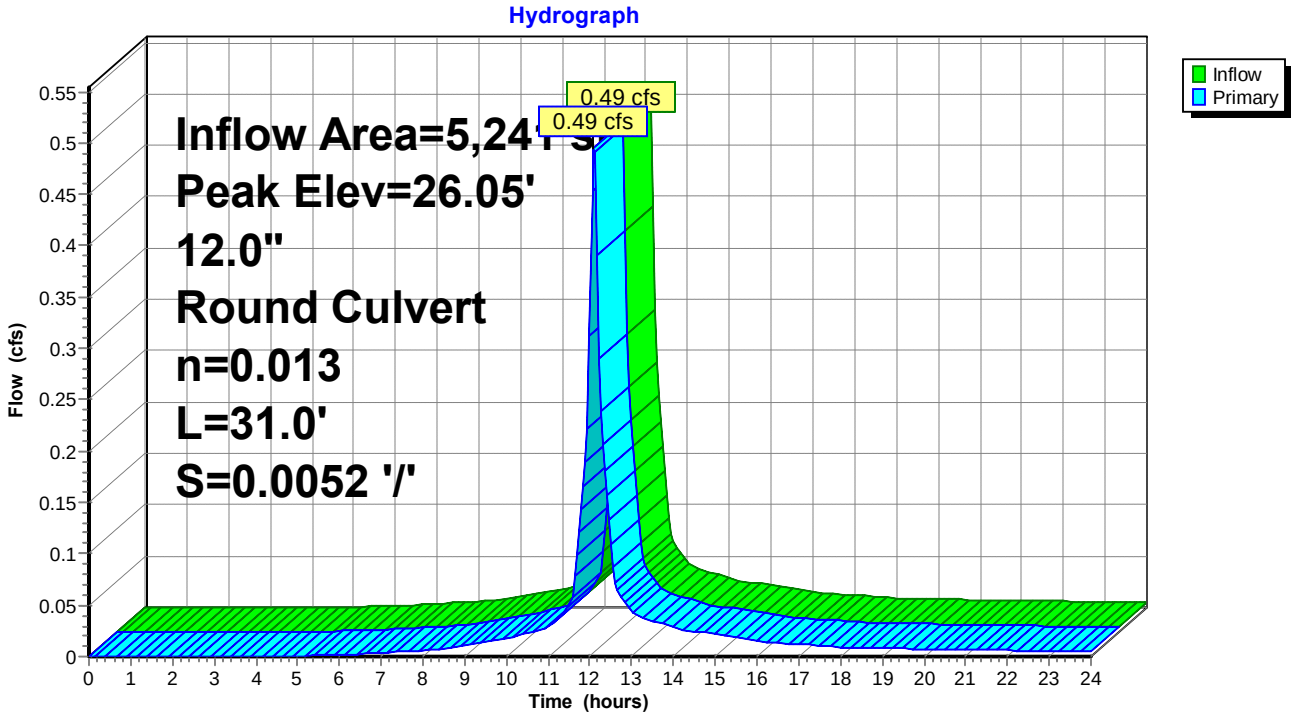
Inflow Area = 5,241 sf, 55.60% Impervious, Inflow Depth > 3.71" for 10-YR event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,620 cf
Outflow = 0.49 cfs @ 12.09 hrs, Volume= 1,620 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.09 hrs, Volume= 1,620 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 26.05' @ 12.09 hrs
Flood Elev= 28.25'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.62' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.62' / 25.46' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.48 cfs @ 12.09 hrs HW=26.04' (Free Discharge)
**1=Culvert** (Barrel Controls 0.48 cfs @ 2.24 fps)

## Pond 7P: CB 4



## Summary for Pond 8P: CDS 3

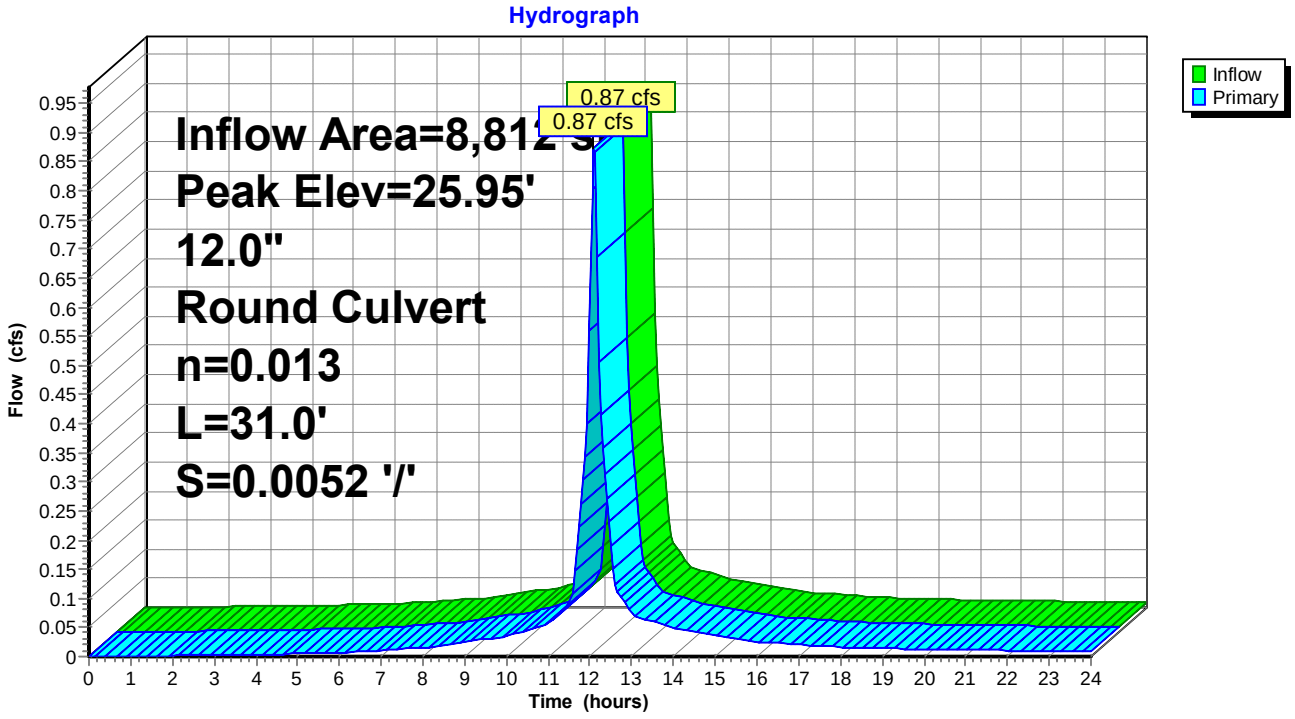
Inflow Area = 8,812 sf, 73.14% Impervious, Inflow Depth > 4.07" for 10-YR event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 2,986 cf
Outflow = 0.87 cfs @ 12.09 hrs, Volume= 2,986 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.87 cfs @ 12.09 hrs, Volume= 2,986 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.95' @ 12.09 hrs
Flood Elev= 28.60'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.36' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.36' / 25.20' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.85 cfs @ 12.09 hrs HW=25.94' (Free Discharge)
**1=Culvert** (Barrel Controls 0.85 cfs @ 2.57 fps)

## Pond 8P: CDS 3



## Summary for Pond CB1: CB 1

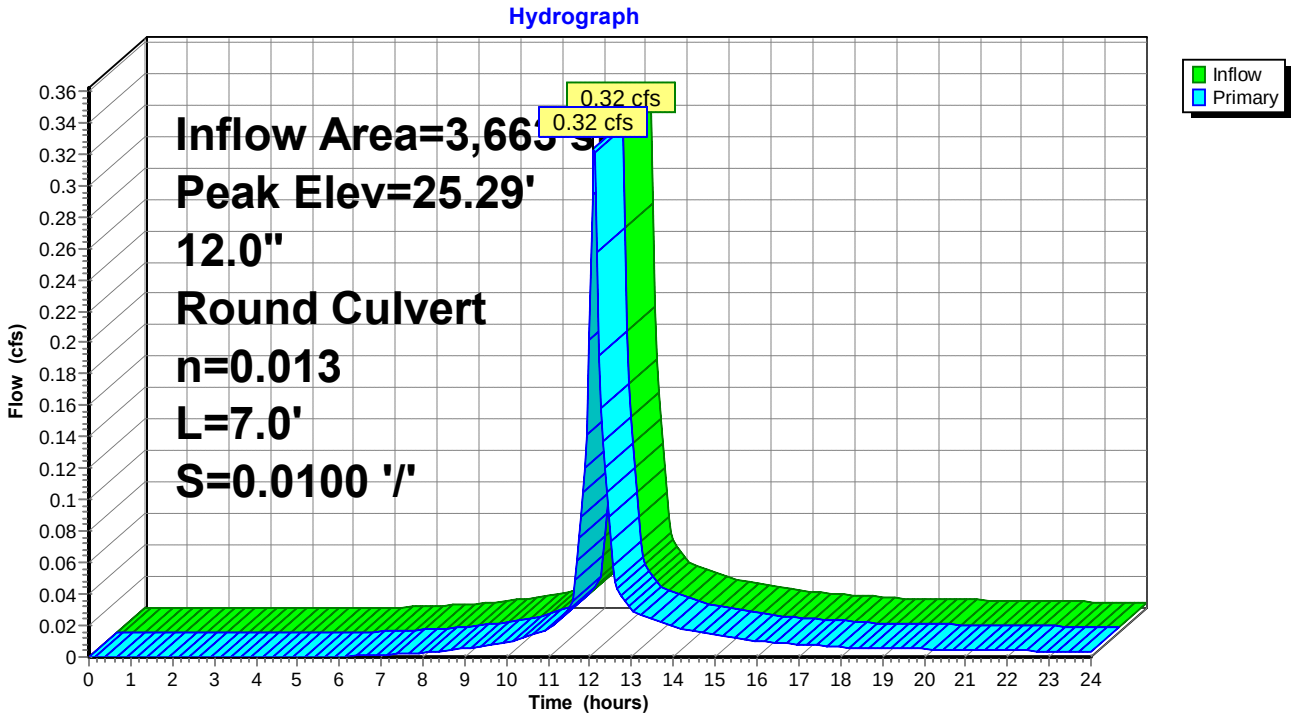
Inflow Area = 3,663 sf, 40.98% Impervious, Inflow Depth > 3.40" for 10-YR event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf
Outflow = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.29' @ 12.09 hrs
Flood Elev= 28.50'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.95' | **12.0" Round Culvert** L= 7.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.95' / 24.88' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.32 cfs @ 12.09 hrs HW=25.28' (Free Discharge)
**1=Culvert** (Barrel Controls 0.32 cfs @ 2.05 fps)

## Pond CB1: CB 1



## Summary for Pond CB2: CB 2

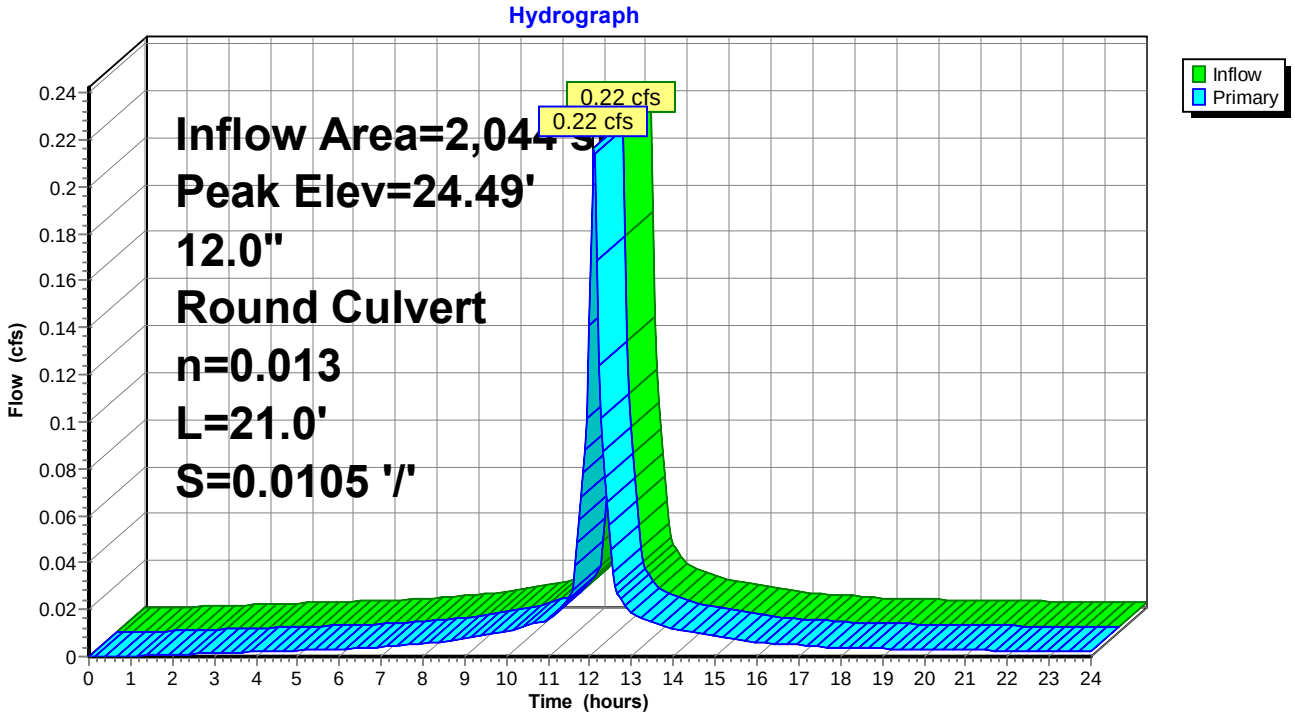
Inflow Area = 2,044 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-YR event
Inflow = 0.22 cfs @ 12.09 hrs, Volume= 782 cf
Outflow = 0.22 cfs @ 12.09 hrs, Volume= 782 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.22 cfs @ 12.09 hrs, Volume= 782 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 24.49' @ 12.09 hrs
Flood Elev= 28.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.23' | **12.0" Round Culvert**<br>L= 21.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.23' / 24.01' S= 0.0105 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.21 cfs @ 12.09 hrs HW=24.48' (Free Discharge)
**1=Culvert** (Inlet Controls 0.21 cfs @ 1.35 fps)

## Pond CB2: CB 2



## Summary for Pond DMH1: DMH 1

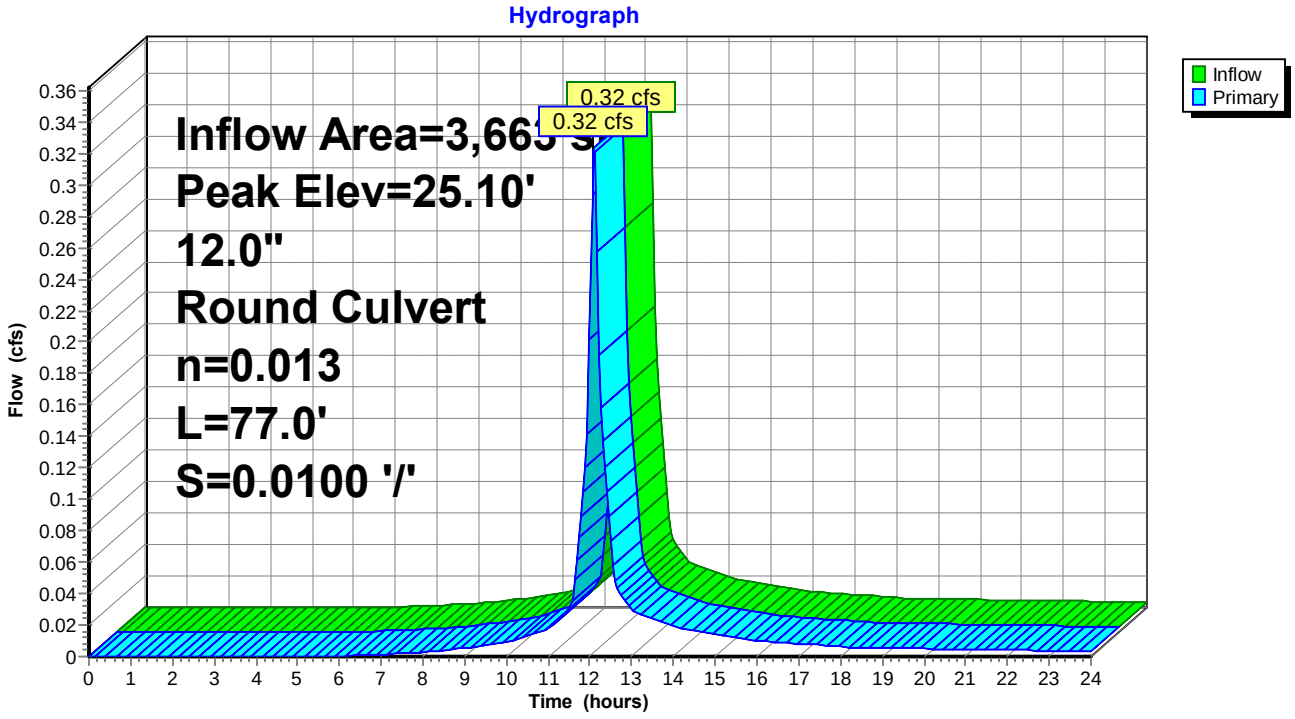
Inflow Area = 3,663 sf, 40.98% Impervious, Inflow Depth > 3.40" for 10-YR event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf
Outflow = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.32 cfs @ 12.09 hrs, Volume= 1,039 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.10' @ 12.09 hrs
Flood Elev= 28.75'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.78' | **12.0" Round Culvert**<br>L= 77.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.78' / 24.01' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.32 cfs @ 12.09 hrs HW=25.09' (Free Discharge)
**1=Culvert** (Inlet Controls 0.32 cfs @ 1.50 fps)

## Pond DMH1: DMH 1



## Summary for Pond DMH2: CDS 2

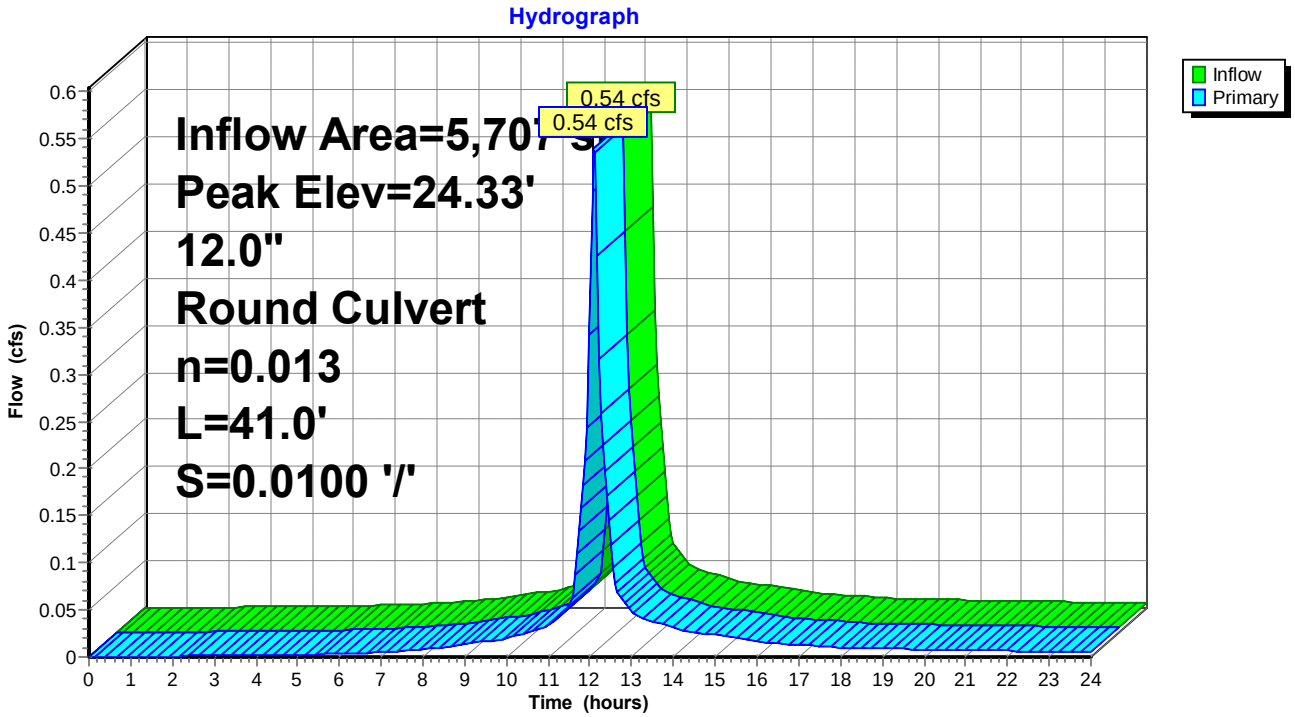
Inflow Area = 5,707 sf, 62.12% Impervious, Inflow Depth > 3.83" for 10-YR event
Inflow = 0.54 cfs @ 12.09 hrs, Volume= 1,821 cf
Outflow = 0.54 cfs @ 12.09 hrs, Volume= 1,821 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.54 cfs @ 12.09 hrs, Volume= 1,821 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 24.33' @ 12.09 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.91' | **12.0" Round Culvert**<br>L= 41.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.91' / 23.50' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.53 cfs @ 12.09 hrs HW=24.32' (Free Discharge)
**1=Culvert** (Inlet Controls 0.53 cfs @ 1.72 fps)

## Pond DMH2: CDS 2



## Summary for Pond POND: Pond 1

Inflow Area = 27,816 sf, 72.55% Impervious, Inflow Depth > 4.07" for 10-YR event
Inflow = 2.70 cfs @ 12.09 hrs, Volume= 9,436 cf
Outflow = 0.90 cfs @ 12.38 hrs, Volume= 9,073 cf, Atten= 67%, Lag= 17.3 min
Primary = 0.90 cfs @ 12.38 hrs, Volume= 9,073 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.04' @ 12.38 hrs Surf.Area= 2,453 sf Storage= 3,397 cf

Plug-Flow detention time= 121.8 min calculated for 9,054 cf (96% of inflow)
Center-of-Mass det. time= 99.0 min ( 863.0 - 764.0 )

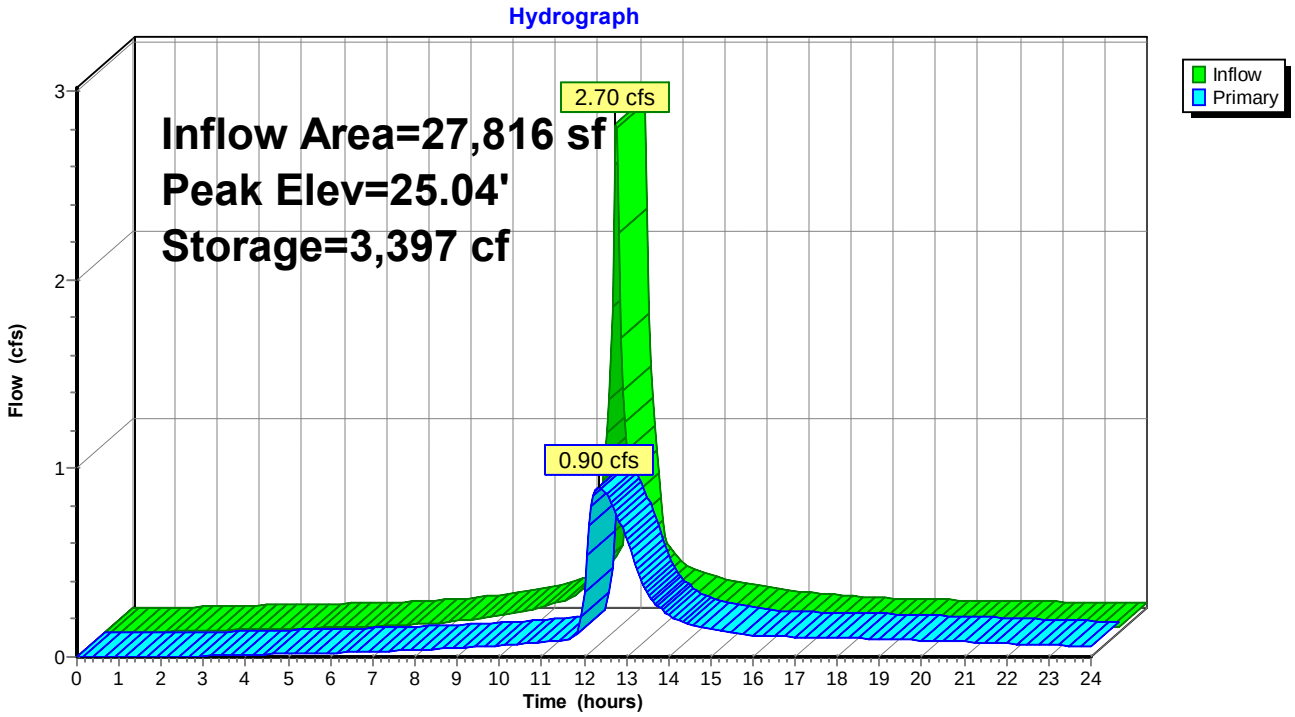
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 23.00' | 8,000 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 23.00 | 911 | 0 | 0 |
| 24.00 | 1,638 | 1,275 | 1,275 |
| 25.00 | 2,421 | 2,030 | 3,304 |
| 26.00 | 3,261 | 2,841 | 6,145 |
| 26.50 | 4,157 | 1,855 | 8,000 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 22.90' | **12.0" Round Culvert**<br>L= 26.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 22.90' / 22.00' S= 0.0346 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 23.00' | **2.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 24.15' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #4 | Device 1 | 25.65' | **24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |

**Primary OutFlow** Max=0.90 cfs @ 12.38 hrs HW=25.04' (Free Discharge)
└**1=Culvert** (Passes 0.90 cfs of 3.82 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.15 cfs @ 6.73 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.75 cfs @ 3.84 fps)
  └**4=Orifice/Grate** ( Controls 0.00 cfs)

## Pond POND: Pond 1



## Summary for Pond POND2: Pond 2

Inflow Area = 8,812 sf, 73.14% Impervious, Inflow Depth > 4.07" for 10-YR event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 2,986 cf
Outflow = 0.30 cfs @ 12.37 hrs, Volume= 2,599 cf, Atten= 66%, Lag= 17.0 min
Primary = 0.30 cfs @ 12.37 hrs, Volume= 2,599 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 27.18' @ 12.37 hrs Surf.Area= 854 sf Storage= 1,186 cf

Plug-Flow detention time= 185.0 min calculated for 2,599 cf (87% of inflow)
Center-of-Mass det. time= 126.5 min ( 898.1 - 771.6 )

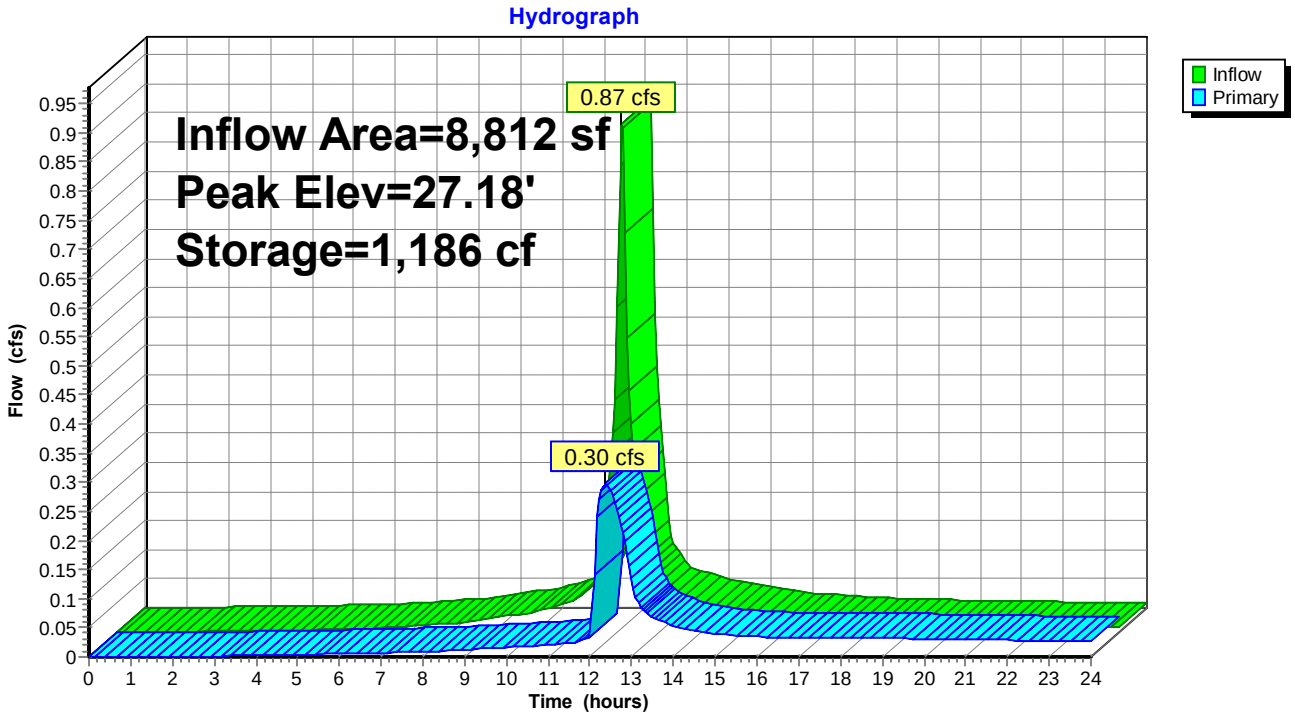
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 25.00' | 3,007 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 25.00 | 276 | 0 | 0 |
| 26.00 | 506 | 391 | 391 |
| 27.00 | 793 | 650 | 1,041 |
| 28.00 | 1,136 | 965 | 2,005 |
| 28.75 | 1,536 | 1,002 | 3,007 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.90' | **12.0" Round Culvert**<br>L= 40.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.90' / 24.50' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 25.00' | **1.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 26.80' | **4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #4 | Device 1 | 27.65' | **24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 |

**Primary OutFlow** Max=0.30 cfs @ 12.37 hrs HW=27.18' (Free Discharge)
└**1=Culvert** (Passes 0.30 cfs of 3.98 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 7.03 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.26 cfs @ 2.95 fps)
  └**4=Orifice/Grate** ( Controls 0.00 cfs)

## Pond POND2: Pond 2



## Summary for Pond Pond3: Pond 3

Inflow Area = 35,922 sf, 57.12% Impervious, Inflow Depth > 3.60" for 10-YR event
Inflow = 2.78 cfs @ 12.16 hrs, Volume= 10,785 cf
Outflow = 2.59 cfs @ 12.21 hrs, Volume= 10,650 cf, Atten= 7%, Lag= 3.0 min
Primary = 2.59 cfs @ 12.21 hrs, Volume= 10,650 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 21.28' @ 12.21 hrs Surf.Area= 1,254 sf Storage= 1,451 cf

Plug-Flow detention time= 51.7 min calculated for 10,628 cf (99% of inflow)
Center-of-Mass det. time= 44.0 min ( 844.1 - 800.1 )

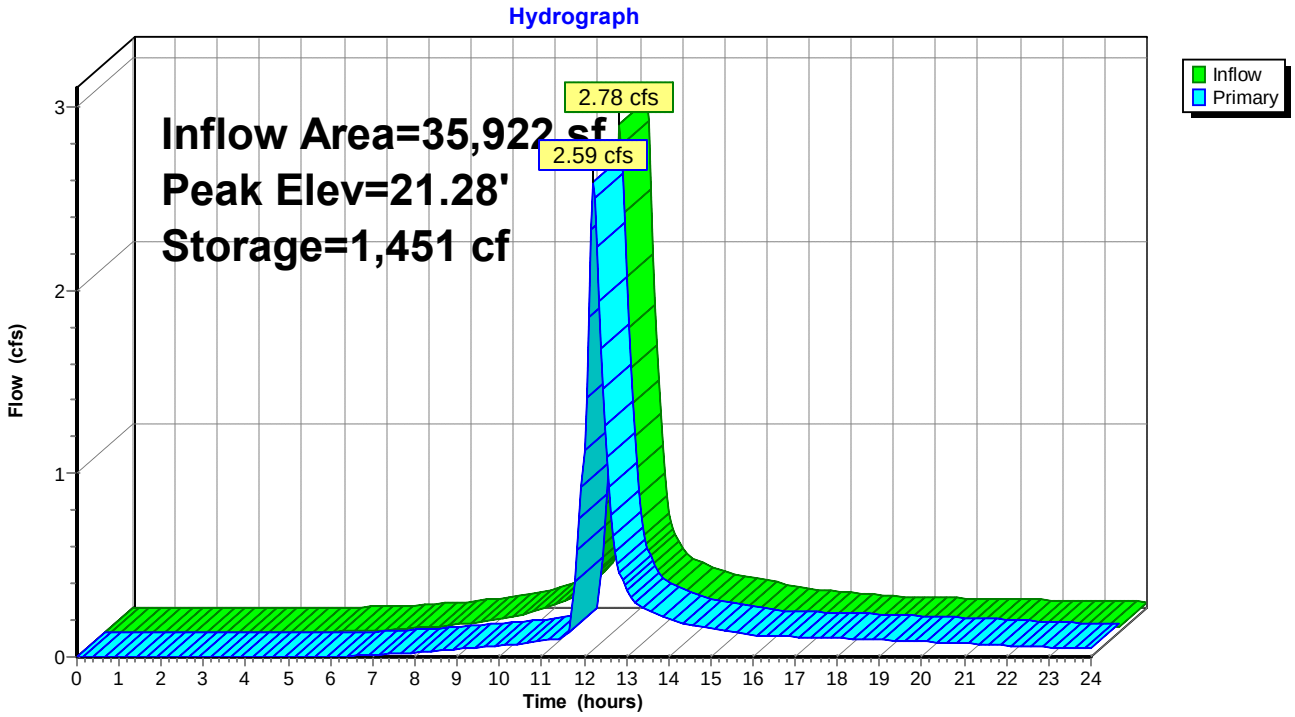
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 19.50' | 2,561 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 19.50 | 487 | 0 | 0 |
| 20.00 | 657 | 286 | 286 |
| 21.00 | 1,038 | 848 | 1,134 |
| 22.00 | 1,816 | 1,427 | 2,561 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 19.40' | **12.0" Round Culvert**<br>L= 46.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 19.40' / 19.00' S= 0.0087 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 20.75' | **24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 19.50' | **2.0" Vert. Orifice/Grate** C= 0.600 |

**Primary OutFlow** Max=2.56 cfs @ 12.21 hrs HW=21.27' (Free Discharge)
↑**1=Culvert** (Passes 2.56 cfs of 3.50 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 2.42 cfs @ 2.32 fps)
**3=Orifice/Grate** (Orifice Controls 0.14 cfs @ 6.26 fps)

## Pond Pond3: Pond 3



## Summary for Pond Pond4: Subsurface Pond

Inflow Area = 3,500 sf,100.00% Impervious, Inflow Depth > 4.59" for 10-YR event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 1,339 cf
Outflow = 0.12 cfs @ 12.42 hrs, Volume= 1,126 cf, Atten= 68%, Lag= 19.8 min
Primary = 0.12 cfs @ 12.42 hrs, Volume= 1,126 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 27.79' @ 12.42 hrs Surf.Area= 705 sf Storage= 695 cf

Plug-Flow detention time= 286.3 min calculated for 1,124 cf (84% of inflow)
Center-of-Mass det. time= 220.1 min ( 968.2 - 748.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 26.10' | 510 cf | **18.17'W x 38.80'L x 2.33'H Field A**<br>1,645 cf Overall - 369 cf Embedded = 1,276 cf x 40.0% Voids |
| #2A | 26.60' | 369 cf | **ADS_StormTech SC-310 +Cap** x 25 Inside #1<br>Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf<br>Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap<br>25 Chambers in 5 Rows |
| | | 879 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 26.40' | **12.0" Round Culvert** L= 6.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 26.40' / 26.25' S= 0.0231 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 26.50' | **1.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 27.75' | **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 |

**Primary OutFlow** Max=0.11 cfs @ 12.42 hrs HW=27.79' (Free Discharge)
↑—**1=Culvert** (Passes 0.11 cfs of 2.81 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.37 fps)
—**3=Broad-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.54 fps)

## Pond Pond4: Subsurface Pond - Chamber Wizard Field A

**Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)**
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

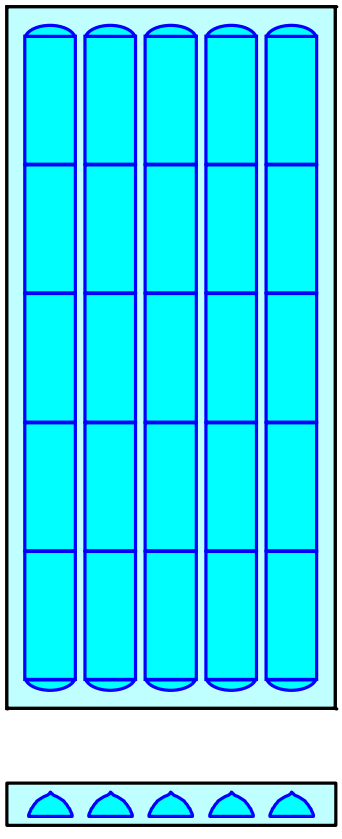
5 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 36.80' Row Length +12.0" End Stone x 2 = 38.80' Base Length
5 Rows x 34.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.17' Base Width
6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

25 Chambers x 14.7 cf = 368.5 cf Chamber Storage

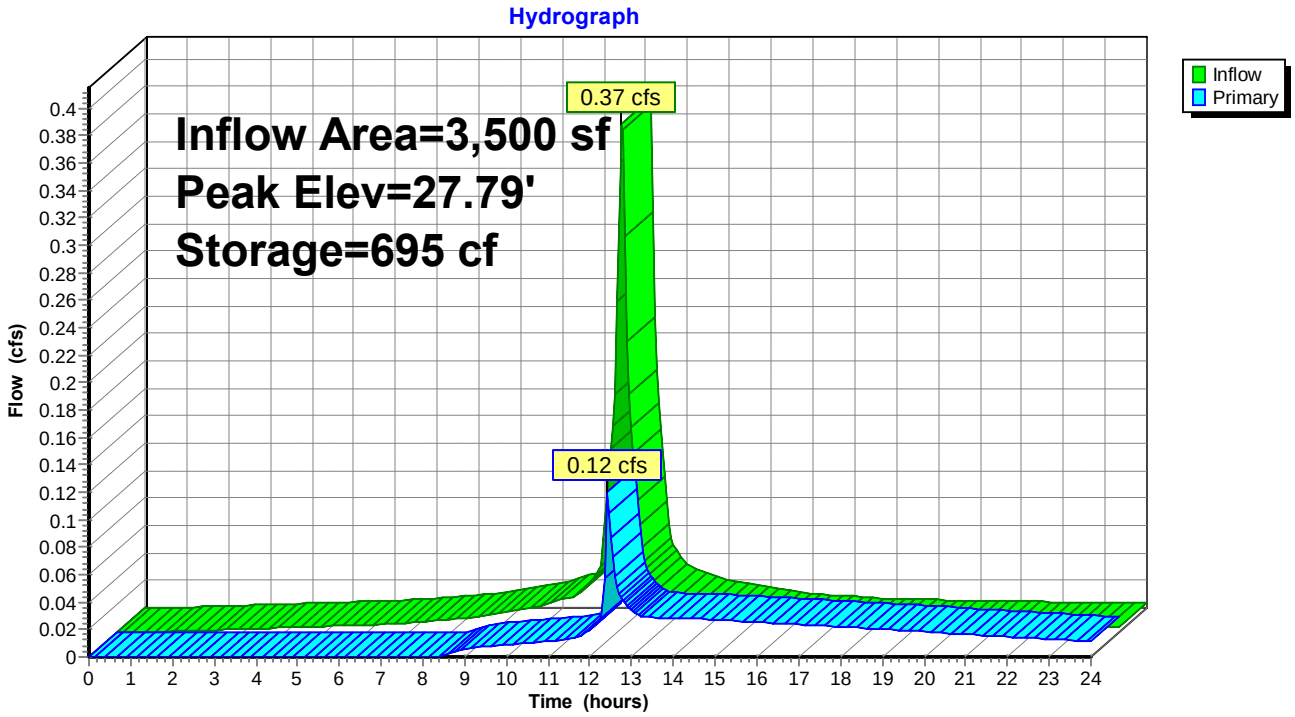
1,644.7 cf Field - 368.5 cf Chambers = 1,276.1 cf Stone x 40.0% Voids = 510.5 cf Stone Storage

Chamber Storage + Stone Storage = 879.0 cf = 0.020 af
Overall Storage Efficiency = 53.4%
Overall System Size = 38.80' x 18.17' x 2.33'

25 Chambers
60.9 cy Field
47.3 cy Stone



## Pond Pond4: Subsurface Pond

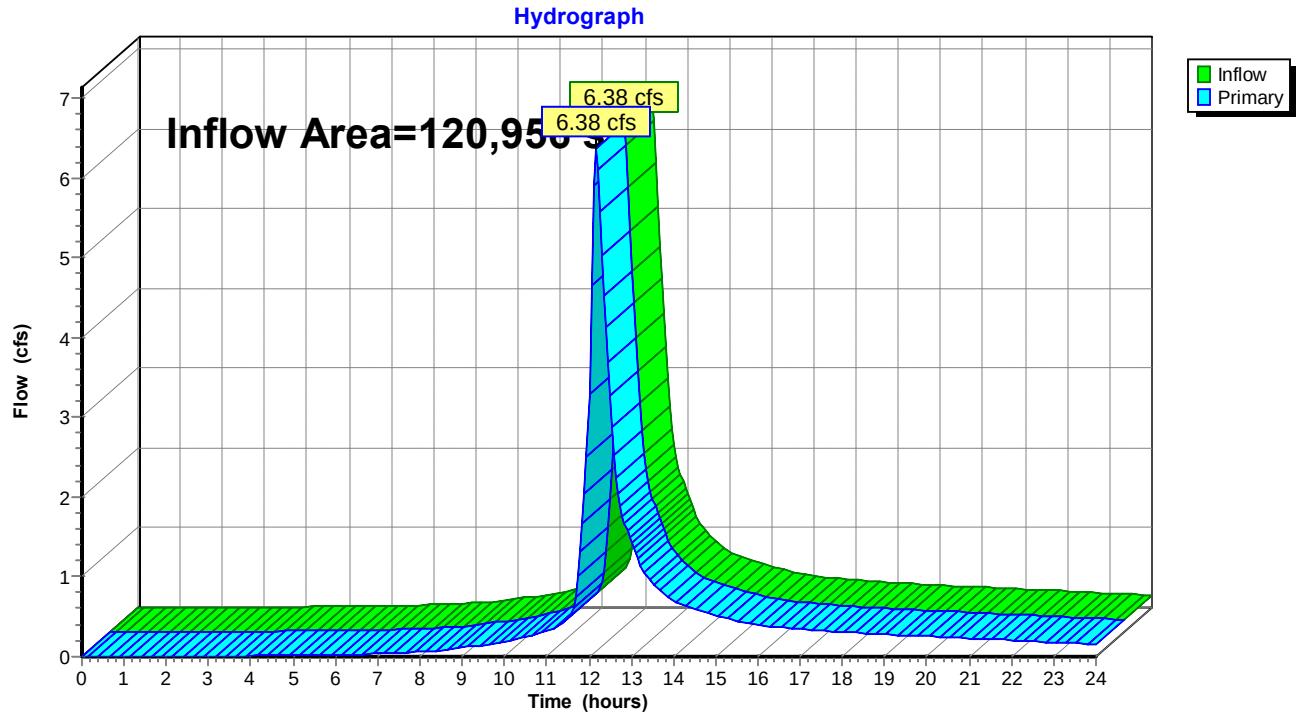


## Summary for Link 6L: wetland 1

Inflow Area = 120,956 sf, 36.54% Impervious, Inflow Depth > 3.23" for 10-YR event
Inflow = 6.38 cfs @ 12.16 hrs, Volume= 32,540 cf
Primary = 6.38 cfs @ 12.16 hrs, Volume= 32,540 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 6L: wetland 1

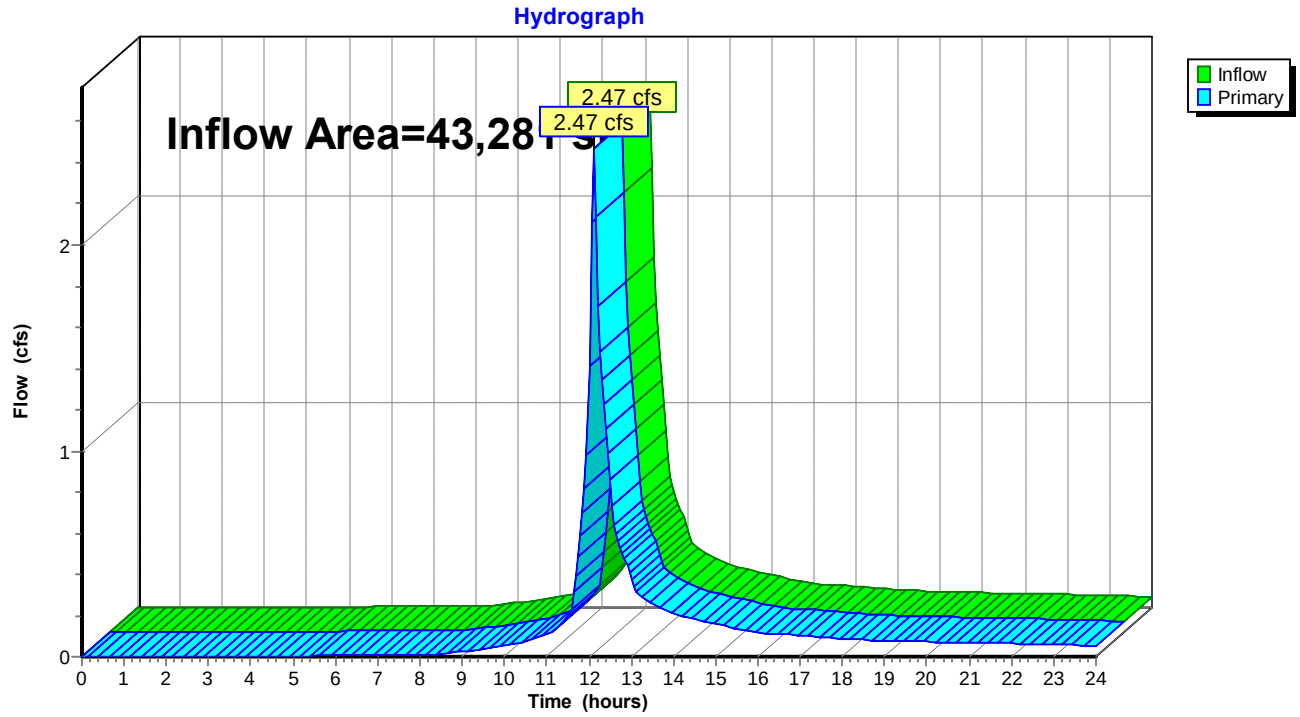


## Summary for Link 9L: link

Inflow Area = 43,281 sf, 14.89% Impervious, Inflow Depth > 2.76" for 10-YR event
Inflow = 2.47 cfs @ 12.10 hrs, Volume= 9,969 cf
Primary = 2.47 cfs @ 12.10 hrs, Volume= 9,969 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link 9L: link



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 P1A: P1A** Runoff Area=39,349 sf 0.00% Impervious Runoff Depth>6.26"
Flow Length=184' Tc=9.1 min CN=78 Runoff=5.77 cfs 20,519 cf

**Subcatchment P1B: P1B** Runoff Area=35,922 sf 57.12% Impervious Runoff Depth>7.60"
Flow Length=268' Tc=12.1 min CN=89 Runoff=5.63 cfs 22,746 cf

**Subcatchment P1C: P1C** Runoff Area=4,672 sf 0.00% Impervious Runoff Depth>6.51"
Tc=6.0 min CN=80 Runoff=0.78 cfs 2,533 cf

**Subcatchment P1D: P1D** Runoff Area=3,500 sf 100.00% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=0.69 cfs 2,536 cf

**Subcatchment P1E: P1E** Runoff Area=14,000 sf 100.00% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=2.76 cfs 10,144 cf

**Subcatchment P1F: P1F** Runoff Area=9,697 sf 0.00% Impervious Runoff Depth>6.51"
Tc=6.0 min CN=80 Runoff=1.63 cfs 5,258 cf

**Subcatchment P1G: P1G** Runoff Area=3,663 sf 40.98% Impervious Runoff Depth>7.36"
Tc=6.0 min CN=87 Runoff=0.67 cfs 2,247 cf

**Subcatchment P1H: P1H** Runoff Area=2,044 sf 100.00% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=0.40 cfs 1,481 cf

**Subcatchment P1I: P1I** Runoff Area=5,474 sf 0.00% Impervious Runoff Depth>6.51"
Tc=6.0 min CN=80 Runoff=0.92 cfs 2,968 cf

**Subcatchment P1J: P1J** Runoff Area=1,192 sf 100.00% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=0.23 cfs 864 cf

**Subcatchment P1K: P1K** Runoff Area=1,443 sf 100.00% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=0.28 cfs 1,046 cf

**Subcatchment P2A: P2A** Runoff Area=34,469 sf 0.00% Impervious Runoff Depth>6.26"
Tc=6.0 min CN=78 Runoff=5.60 cfs 17,984 cf

**Subcatchment P2B1: P2B1** Runoff Area=3,571 sf 98.88% Impervious Runoff Depth>8.69"
Tc=6.0 min CN=98 Runoff=0.70 cfs 2,587 cf

**Subcatchment P2B2: P2B2** Runoff Area=5,241 sf 55.60% Impervious Runoff Depth>7.73"
Tc=6.0 min CN=90 Runoff=0.99 cfs 3,375 cf

**Pond 1P: CB 6** Peak Elev=23.73' Inflow=0.28 cfs 1,046 cf
12.0" Round Culvert n=0.013 L=12.0' S=0.0050 '/' Outflow=0.28 cfs 1,046 cf

**Pond 2P: CB 5** Peak Elev=23.70' Inflow=0.23 cfs 864 cf
12.0" Round Culvert n=0.013 L=11.0' S=0.0055 '/' Outflow=0.23 cfs 864 cf

**Pond 3P: CDS1** Peak Elev=23.69' Inflow=0.52 cfs 1,909 cf
12.0" Round Culvert n=0.013 L=28.0' S=0.0050 '/' Outflow=0.52 cfs 1,909 cf

**Pond 6P: CB 3** Peak Elev=26.14' Inflow=0.70 cfs 2,587 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=0.70 cfs 2,587 cf

**Pond 7P: CB 4** Peak Elev=26.26' Inflow=0.99 cfs 3,375 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=0.99 cfs 3,375 cf

**Pond 8P: CDS 3** Peak Elev=26.25' Inflow=1.69 cfs 5,962 cf
12.0" Round Culvert n=0.013 L=31.0' S=0.0052 '/' Outflow=1.69 cfs 5,962 cf

**Pond CB1: CB 1** Peak Elev=25.46' Inflow=0.67 cfs 2,247 cf
12.0" Round Culvert n=0.013 L=7.0' S=0.0100 '/' Outflow=0.67 cfs 2,247 cf

**Pond CB2: CB 2** Peak Elev=24.59' Inflow=0.40 cfs 1,481 cf
12.0" Round Culvert n=0.013 L=21.0' S=0.0105 '/' Outflow=0.40 cfs 1,481 cf

**Pond DMH1: DMH 1** Peak Elev=25.25' Inflow=0.67 cfs 2,247 cf
12.0" Round Culvert n=0.013 L=77.0' S=0.0100 '/' Outflow=0.67 cfs 2,247 cf

**Pond DMH2: CDS 2** Peak Elev=24.53' Inflow=1.07 cfs 3,728 cf
12.0" Round Culvert n=0.013 L=41.0' S=0.0100 '/' Outflow=1.07 cfs 3,728 cf

**Pond POND: Pond 1** Peak Elev=25.82' Storage=5,583 cf Inflow=5.27 cfs 18,749 cf
Outflow=3.20 cfs 17,835 cf

**Pond POND2: Pond 2** Peak Elev=27.87' Storage=1,857 cf Inflow=1.69 cfs 5,962 cf
Outflow=1.13 cfs 5,323 cf

**Pond Pond3: Pond 3** Peak Elev=21.90' Storage=2,378 cf Inflow=5.63 cfs 22,746 cf
Outflow=4.22 cfs 22,225 cf

**Pond Pond4: Subsurface Pond** Peak Elev=27.90' Storage=729 cf Inflow=0.69 cfs 2,536 cf
Outflow=0.69 cfs 2,218 cf

**Link 6L: wetland 1** Inflow=14.62 cfs 70,588 cf
Primary=14.62 cfs 70,588 cf

**Link 9L: link** Inflow=6.24 cfs 23,307 cf
Primary=6.24 cfs 23,307 cf

**Total Runoff Area = 164,237 sf Runoff Volume = 96,287 cf Average Runoff Depth = 7.04"**
**69.16% Pervious = 113,594 sf 30.84% Impervious = 50,643 sf**

## Summary for Subcatchment P1A: P1A

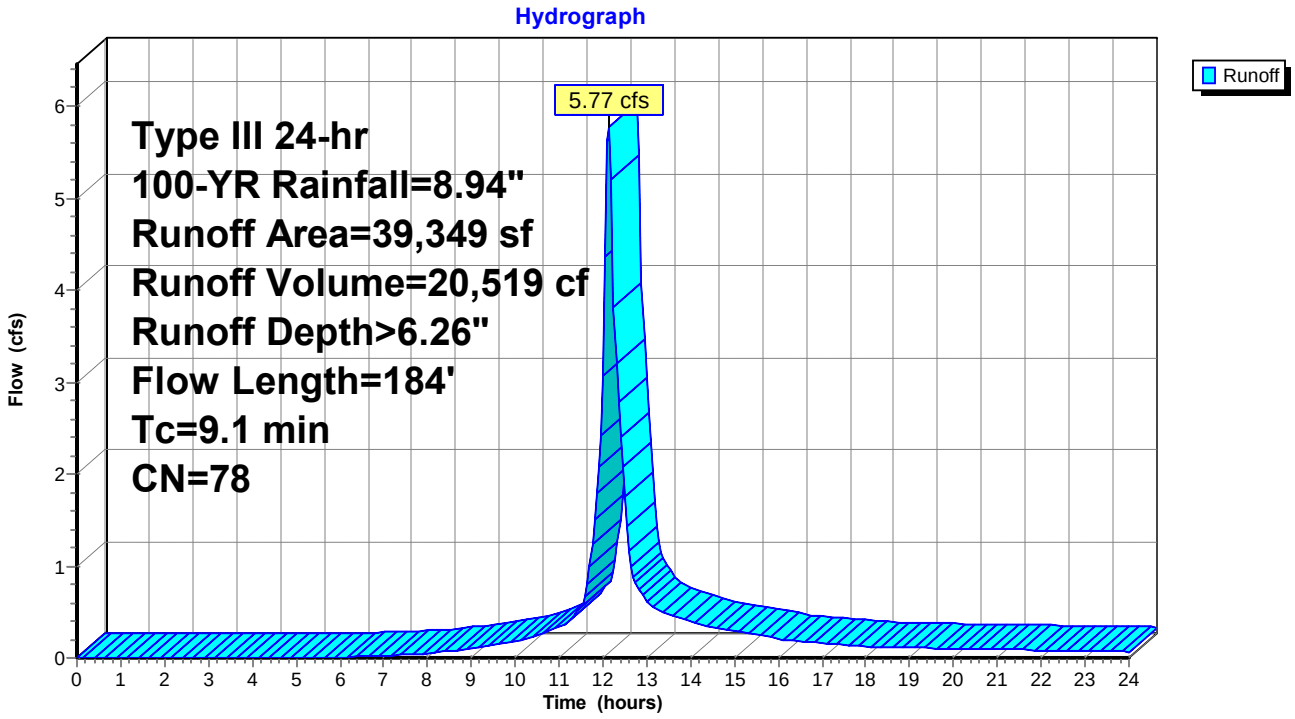
Runoff = 5.77 cfs @ 12.13 hrs, Volume= 20,519 cf, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 9,812 | 80 | >75% Grass cover, Good, HSG D |
| 29,537 | 77 | Woods, Good, HSG D |
| 39,349 | 78 | Weighted Average |
| 39,349 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.4 | 50 | 0.0550 | 0.10 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.7 | 134 | 0.0430 | 3.34 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 9.1 | 184 | Total | | | |

## Subcatchment P1A: P1A



## Summary for Subcatchment P1B: P1B

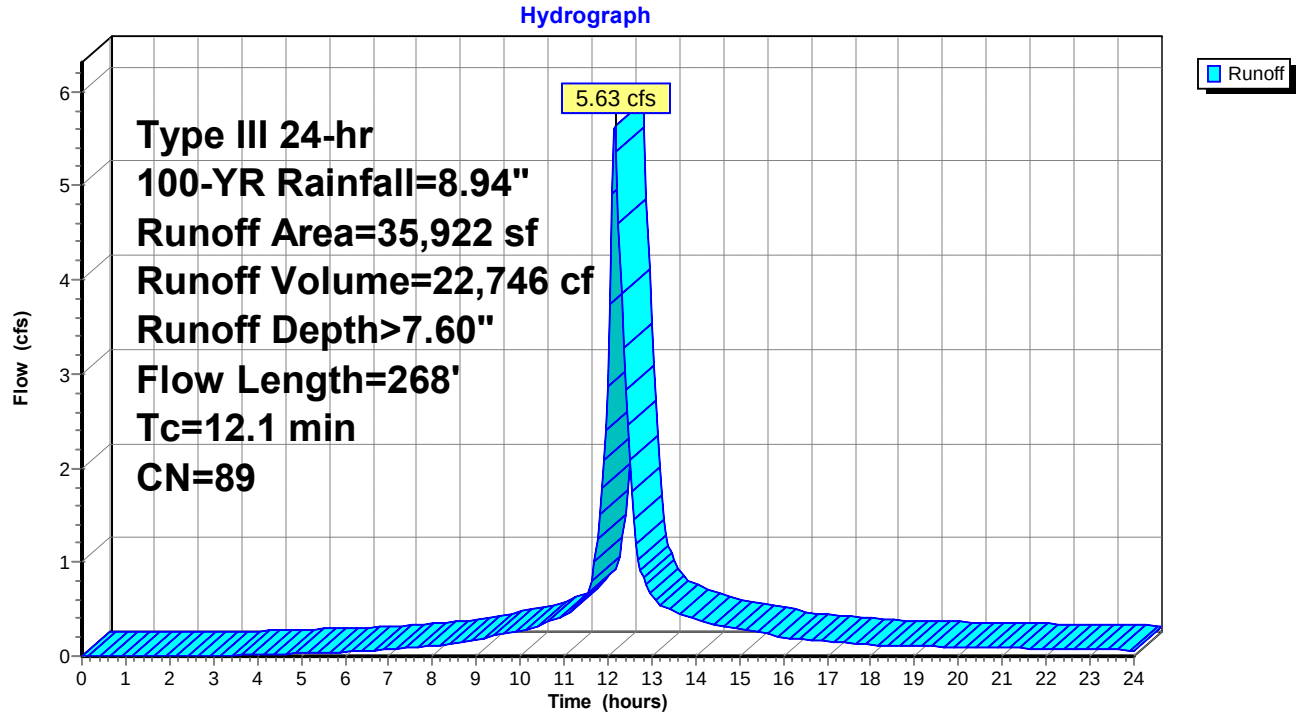
Runoff = 5.63 cfs @ 12.16 hrs, Volume= 22,746 cf, Depth> 7.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 6,018 | 98 | Roofs, HSG D |
| 14,500 | 98 | Paved parking, HSG D |
| 9,409 | 77 | Woods, Good, HSG D |
| 5,995 | 80 | >75% Grass cover, Good, HSG D |
| 35,922 | 89 | Weighted Average |
| 15,404 | | 42.88% Pervious Area |
| 20,518 | | 57.12% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.7 | 50 | 0.0300 | 0.08 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10" |
| 0.5 | 86 | 0.0350 | 3.01 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.9 | 132 | 0.0150 | 2.49 | | **Shallow Concentrated Flow,** Paved Kv= 20.3 fps |
| 12.1 | 268 | Total | | | |

## Subcatchment P1B: P1B



## Summary for Subcatchment P1C: P1C

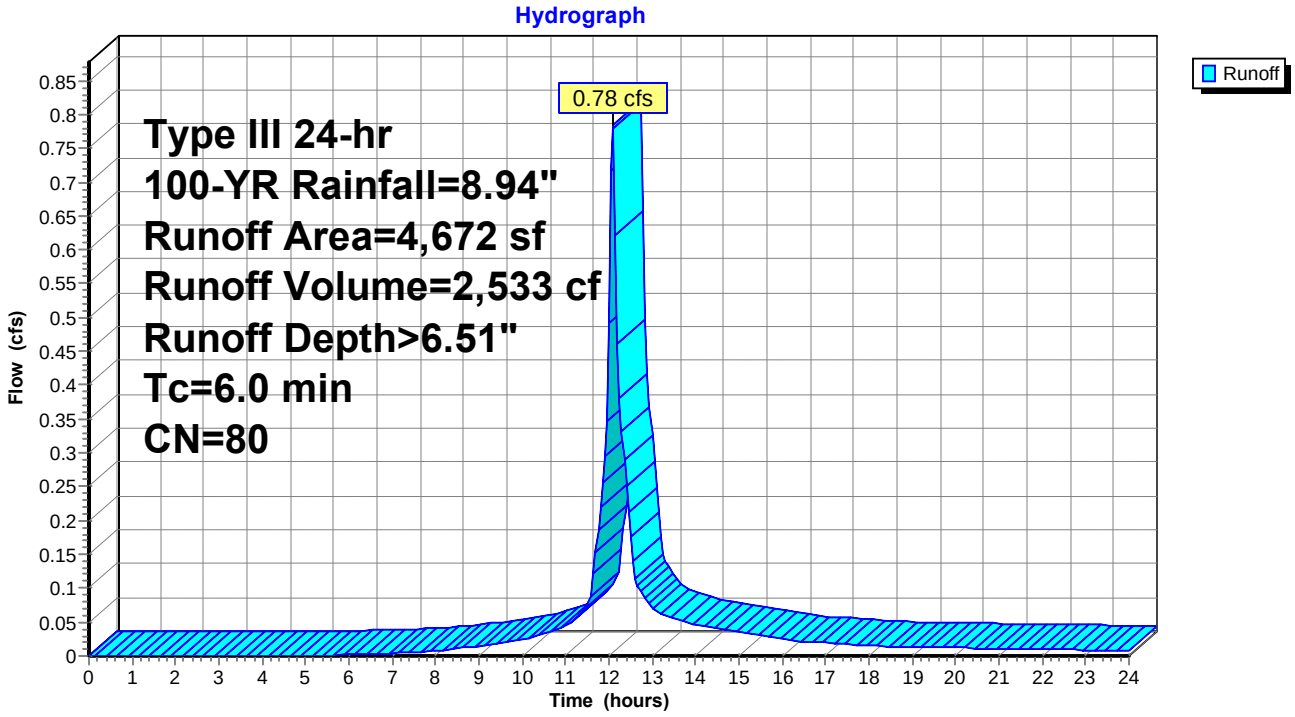
Runoff = 0.78 cfs @ 12.09 hrs, Volume= 2,533 cf, Depth> 6.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 4,672 | 80 | >75% Grass cover, Good, HSG D |
| 4,672 | | 100.00% Pervious Area |

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

## Subcatchment P1C: P1C



## Summary for Subcatchment P1D: P1D

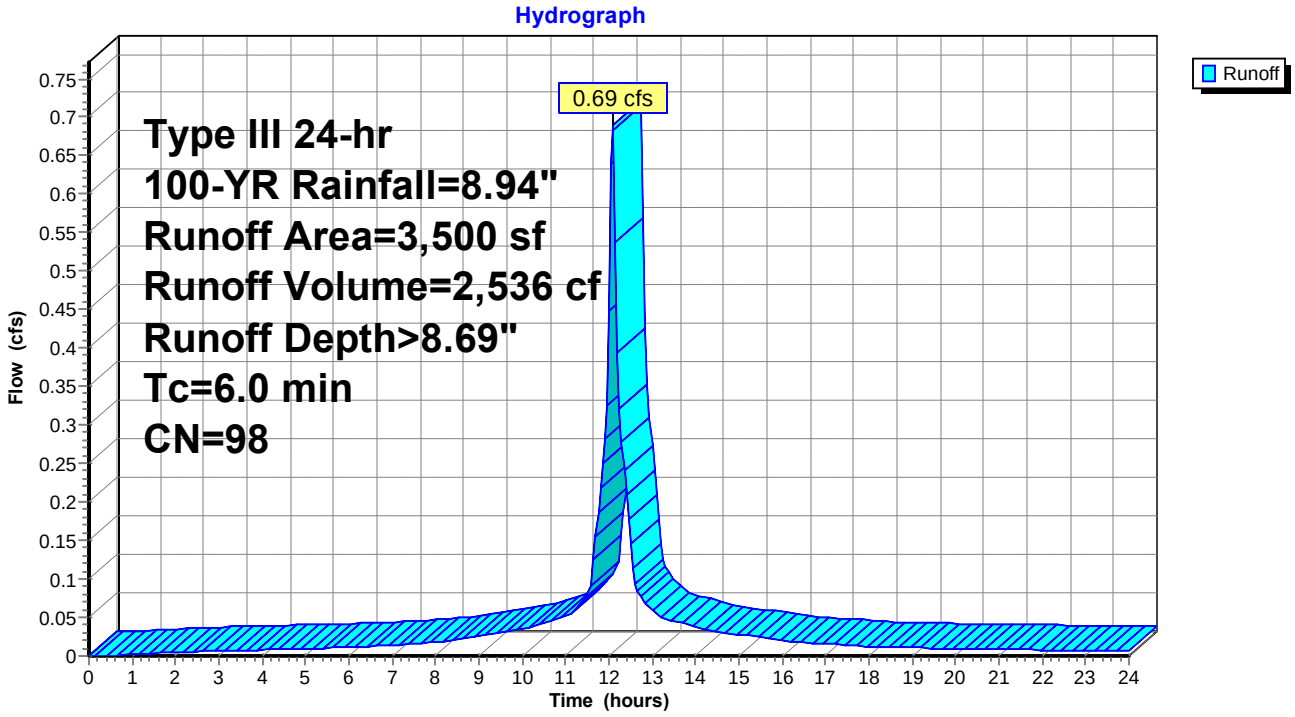
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 2,536 cf, Depth> 8.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 3,500 | 98 | Roofs, HSG D |
| 3,500 | | 100.00% Impervious Area |

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

## Subcatchment P1D: P1D



## Summary for Subcatchment P1E: P1E

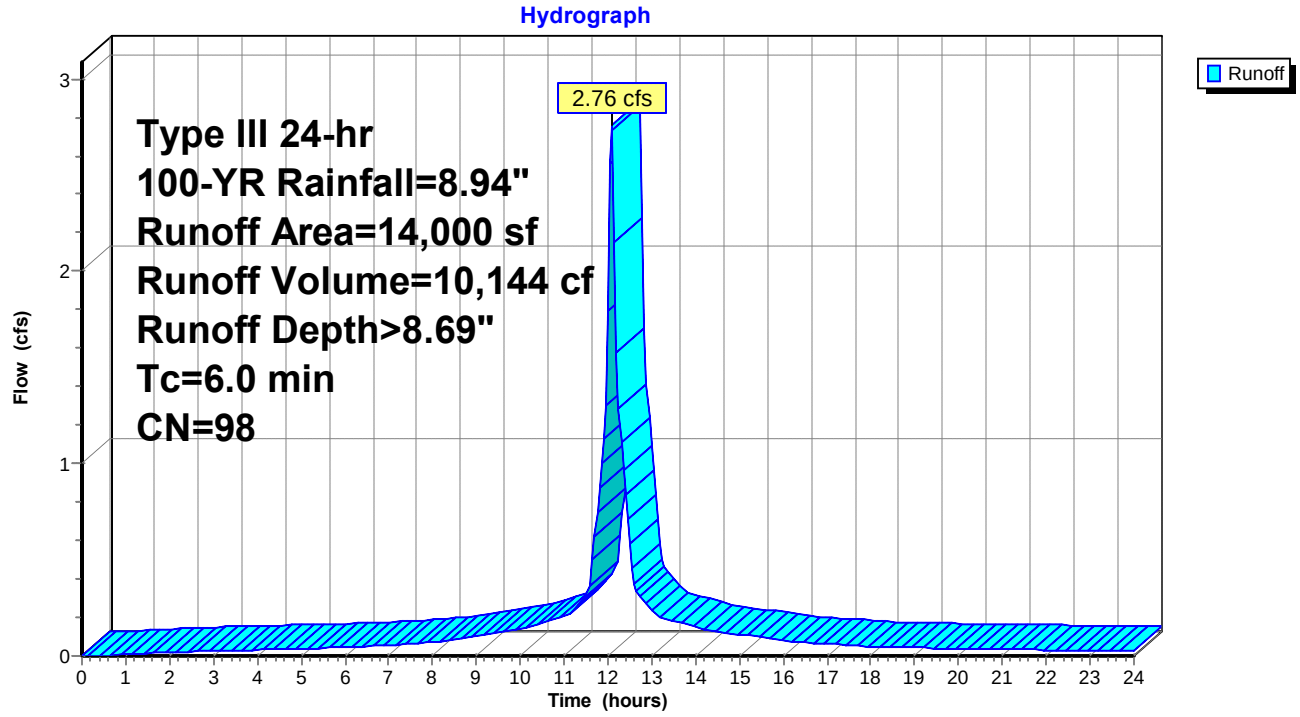
Runoff = 2.76 cfs @ 12.09 hrs, Volume= 10,144 cf, Depth> 8.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 14,000 | 98 | Roofs, HSG D |
| 14,000 | | 100.00% Impervious Area |

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

## Subcatchment P1E: P1E



## Summary for Subcatchment P1F: P1F

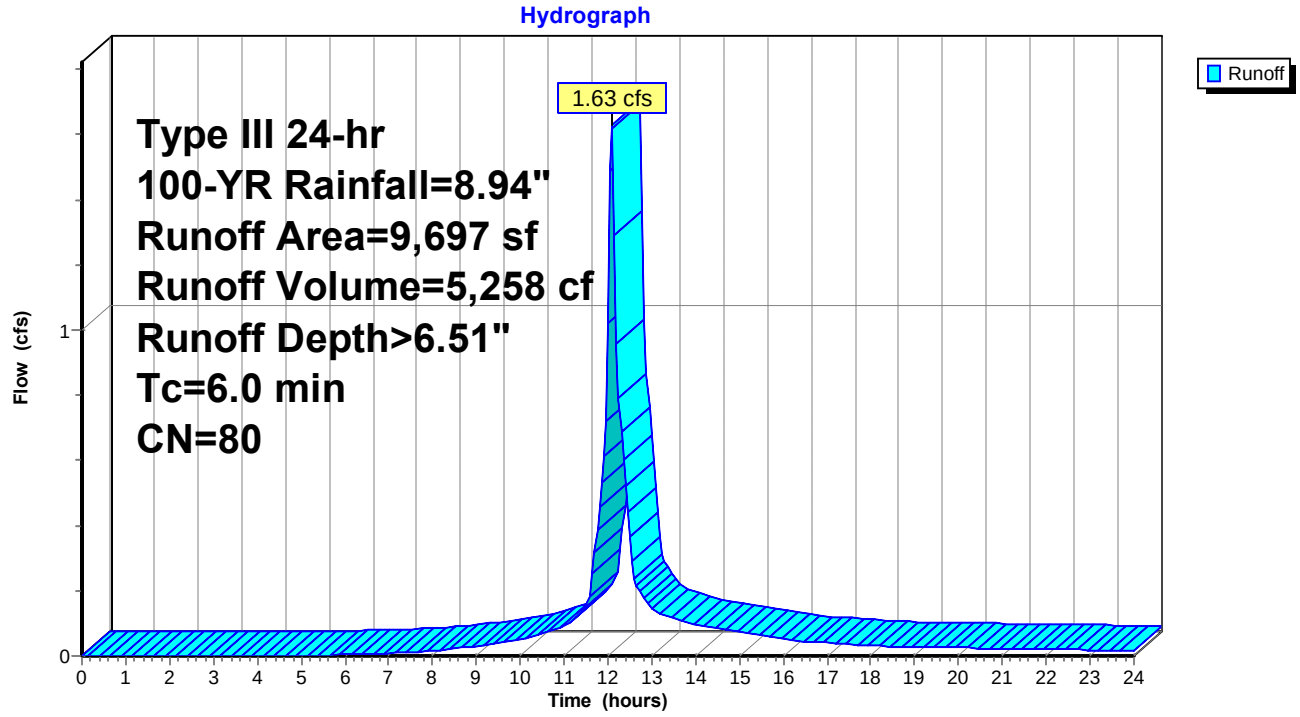
Runoff = 1.63 cfs @ 12.09 hrs, Volume= 5,258 cf, Depth> 6.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 9,697 | 80 | >75% Grass cover, Good, HSG D |
| 9,697 | | 100.00% Pervious Area |

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

## Subcatchment P1F: P1F



## Summary for Subcatchment P1G: P1G

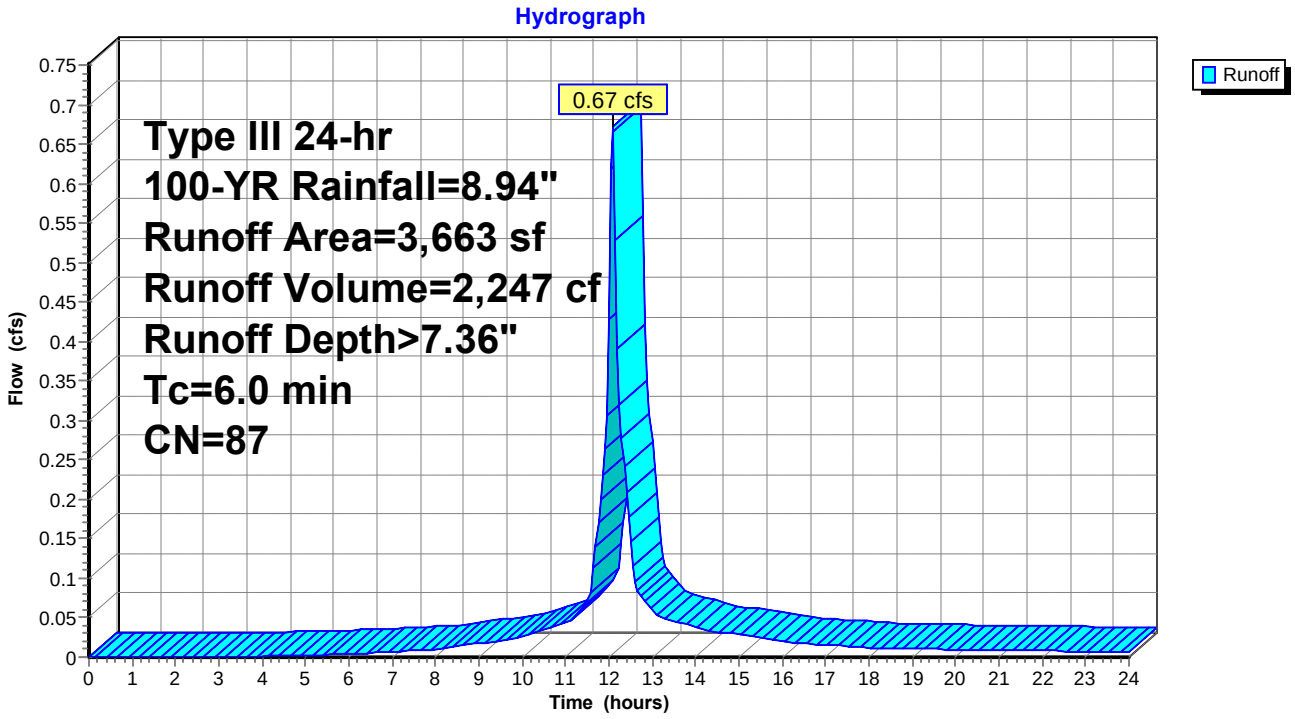
Runoff = 0.67 cfs @ 12.09 hrs, Volume= 2,247 cf, Depth> 7.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 2,162 | 80 | >75% Grass cover, Good, HSG D |
| 1,501 | 98 | Paved parking, HSG D |
| 3,663 | 87 | Weighted Average |
| 2,162 | | 59.02% Pervious Area |
| 1,501 | | 40.98% Impervious Area |

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

## Subcatchment P1G: P1G



## Summary for Subcatchment P1H: P1H

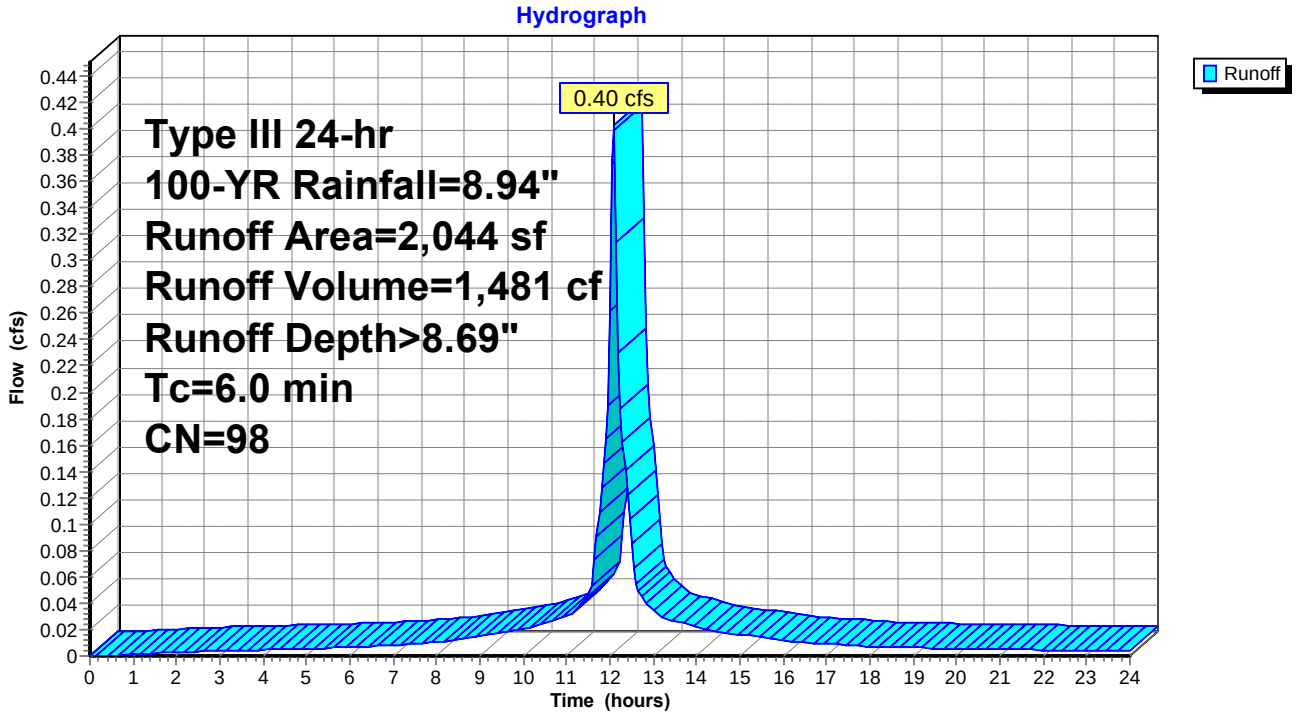
Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,481 cf, Depth> 8.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 2,044 | 98 | Paved parking, HSG D |
| 2,044 | | 100.00% Impervious Area |

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

## Subcatchment P1H: P1H



## Summary for Subcatchment P1I: P1I

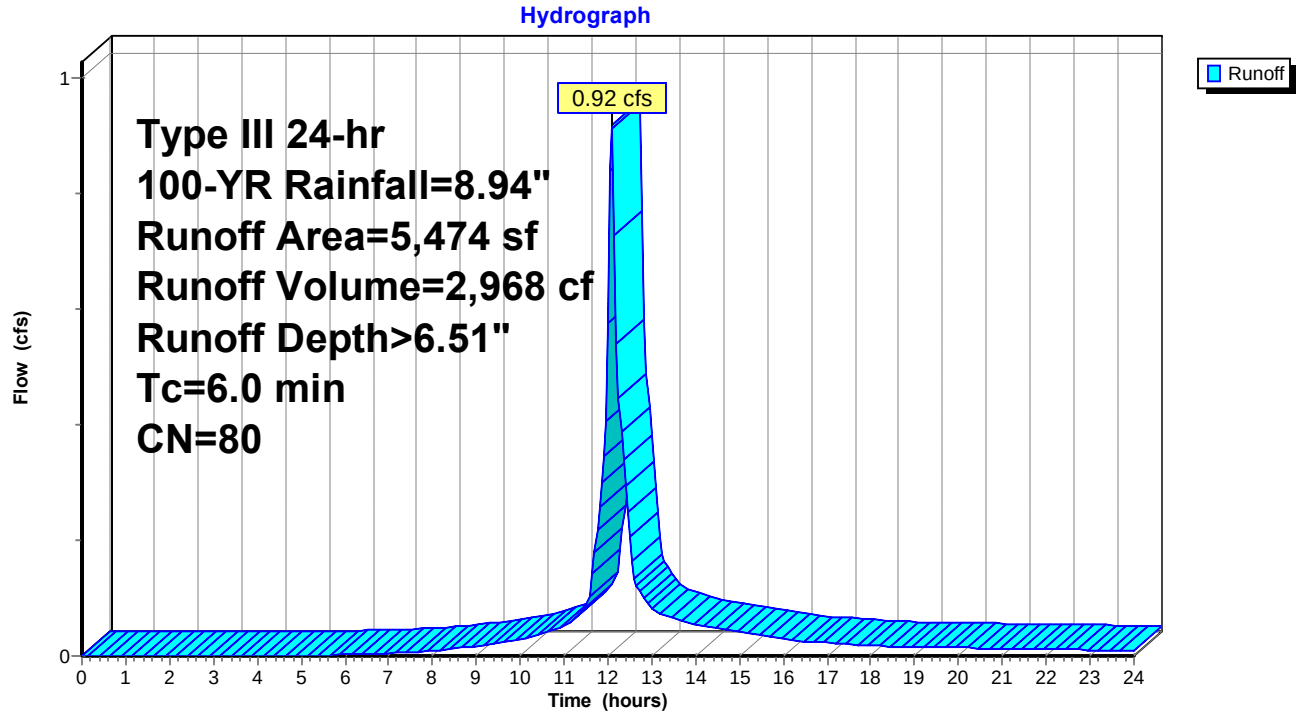
Runoff = 0.92 cfs @ 12.09 hrs, Volume= 2,968 cf, Depth> 6.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 5,474 | 80 | >75% Grass cover, Good, HSG D |
| 5,474 | | 100.00% Pervious Area |

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

## Subcatchment P1I: P1I



## Summary for Subcatchment P1J: P1J

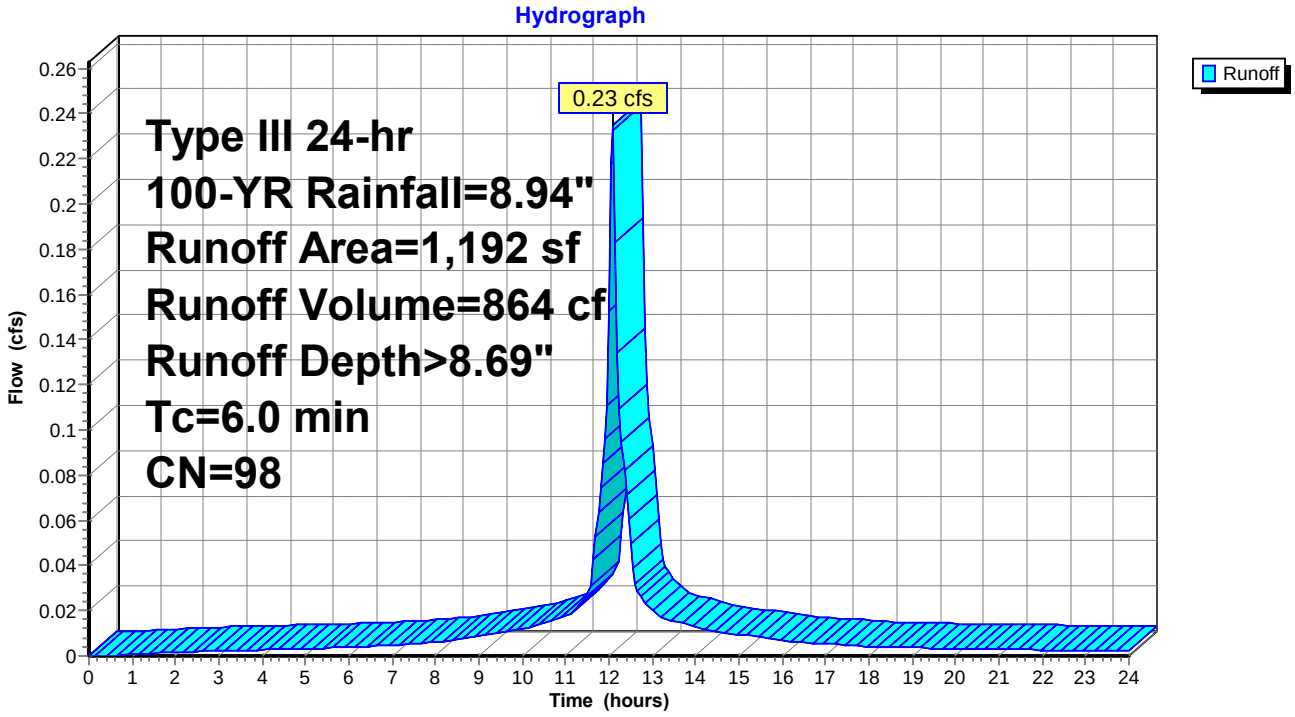
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 864 cf, Depth> 8.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 1,192 | 98 | Paved parking, HSG D |
| 1,192 | | 100.00% Impervious Area |

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

### Subcatchment P1J: P1J



## Summary for Subcatchment P1K: P1K

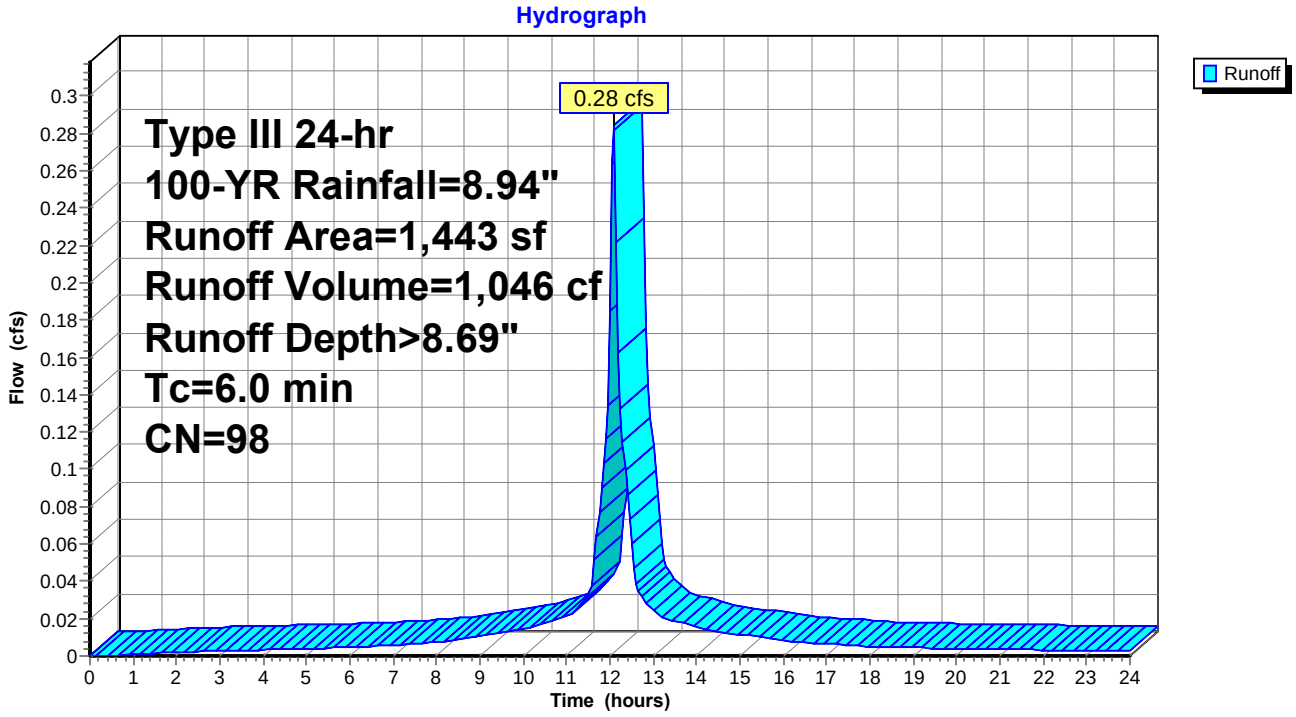
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 1,046 cf, Depth> 8.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 1,443 | 98 | Paved parking, HSG D |
| 1,443 | | 100.00% Impervious Area |

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

## Subcatchment P1K: P1K



## Summary for Subcatchment P2A: P2A

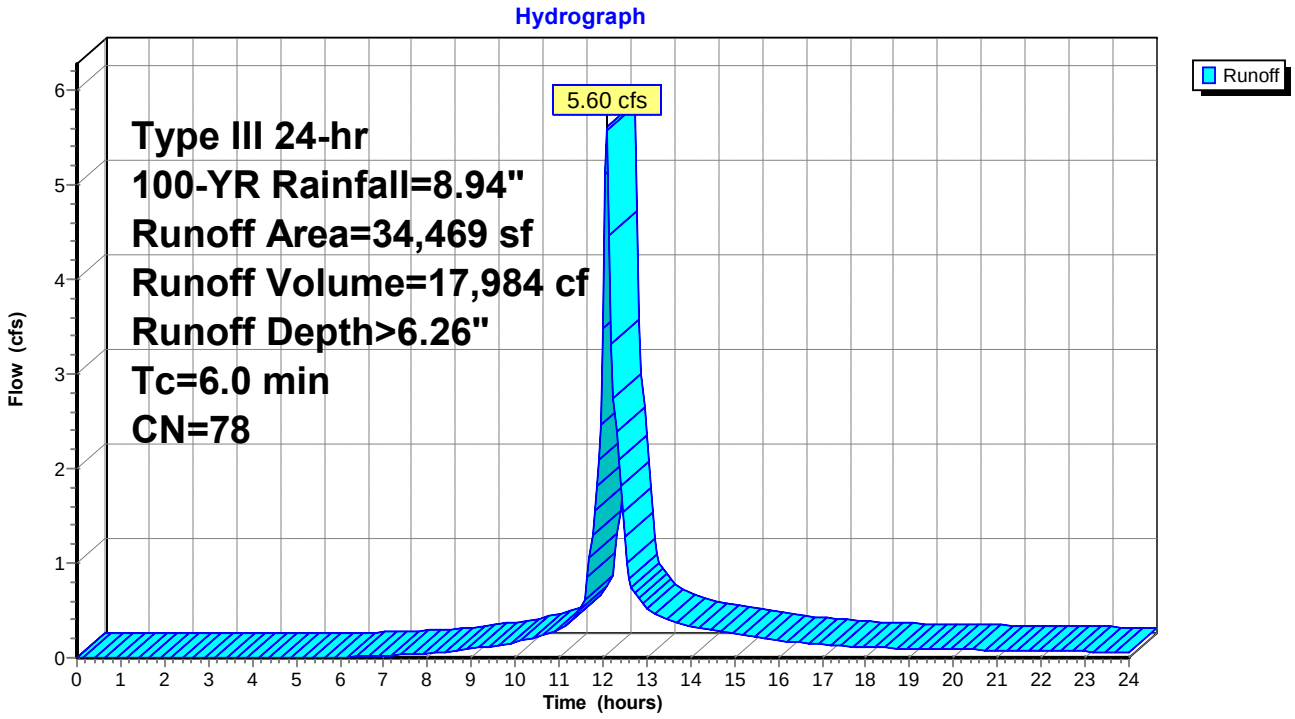
Runoff = 5.60 cfs @ 12.09 hrs, Volume= 17,984 cf, Depth> 6.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 20,968 | 77 | Woods, Good, HSG D |
| 13,501 | 80 | >75% Grass cover, Good, HSG D |
| 34,469 | 78 | Weighted Average |
| 34,469 | | 100.00% Pervious Area |

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

## Subcatchment P2A: P2A



## Summary for Subcatchment P2B1: P2B1

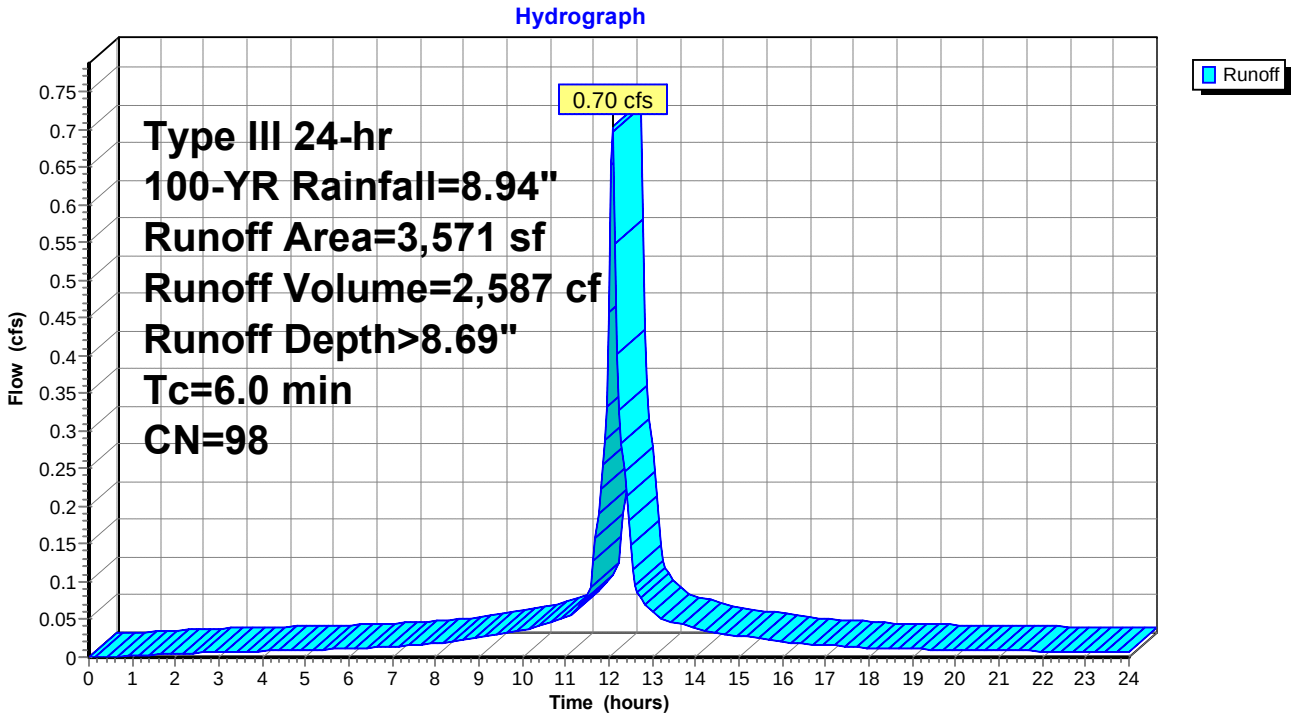
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,587 cf, Depth> 8.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 3,531 | 98 | Paved parking, HSG D |
| 40 | 80 | >75% Grass cover, Good, HSG D |
| 3,571 | 98 | Weighted Average |
| 40 | | 1.12% Pervious Area |
| 3,531 | | 98.88% Impervious Area |

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

## Subcatchment P2B1: P2B1



## Summary for Subcatchment P2B2: P2B2

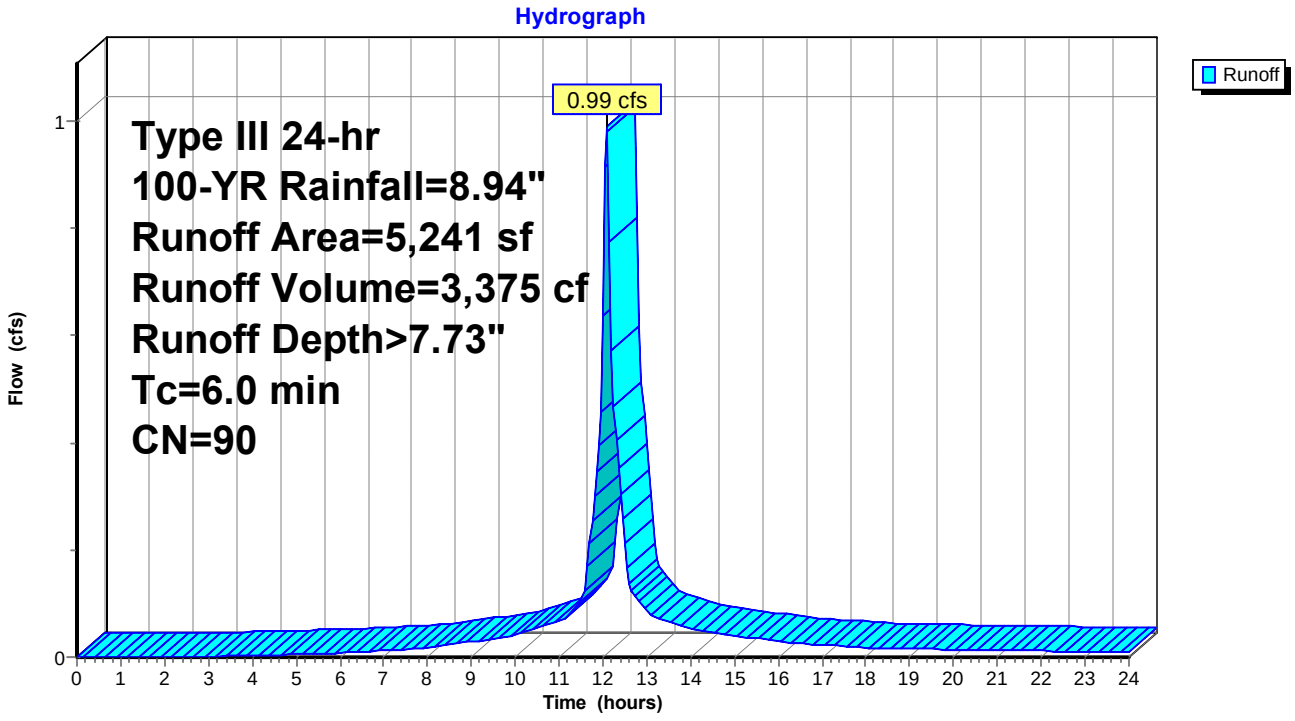
Runoff = 0.99 cfs @ 12.09 hrs, Volume= 3,375 cf, Depth> 7.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.94"

| Area (sf) | CN | Description |
|---|---|---|
| 2,914 | 98 | Paved parking, HSG D |
| 2,327 | 80 | >75% Grass cover, Good, HSG D |
| 5,241 | 90 | Weighted Average |
| 2,327 | | 44.40% Pervious Area |
| 2,914 | | 55.60% Impervious Area |

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

## Subcatchment P2B2: P2B2



## Summary for Pond 1P: CB 6

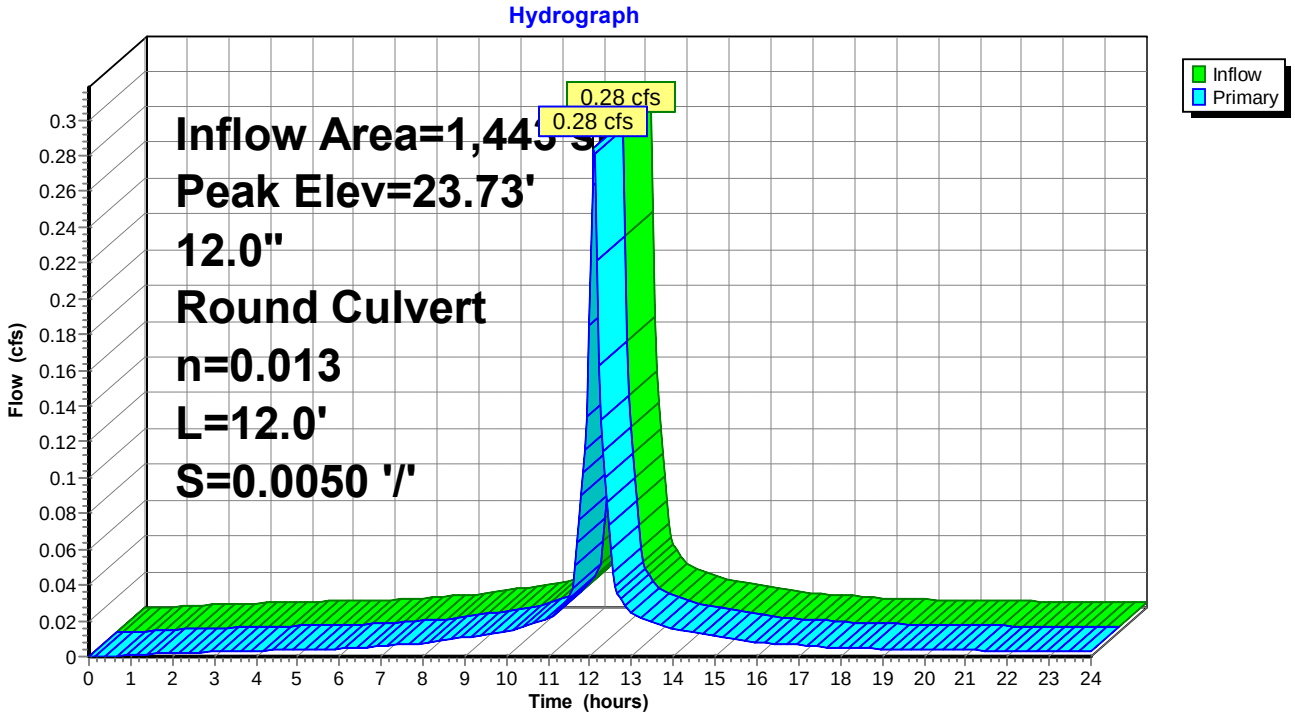
Inflow Area = 1,443 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-YR event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 1,046 cf
Outflow = 0.28 cfs @ 12.09 hrs, Volume= 1,046 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.09 hrs, Volume= 1,046 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.73' @ 12.09 hrs
Flood Elev= 26.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.40' | **12.0" Round Culvert**<br>L= 12.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.40' / 23.34' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.28 cfs @ 12.09 hrs HW=23.73' (Free Discharge)
**1=Culvert** (Barrel Controls 0.28 cfs @ 1.84 fps)

## Pond 1P: CB 6



## Summary for Pond 2P: CB 5

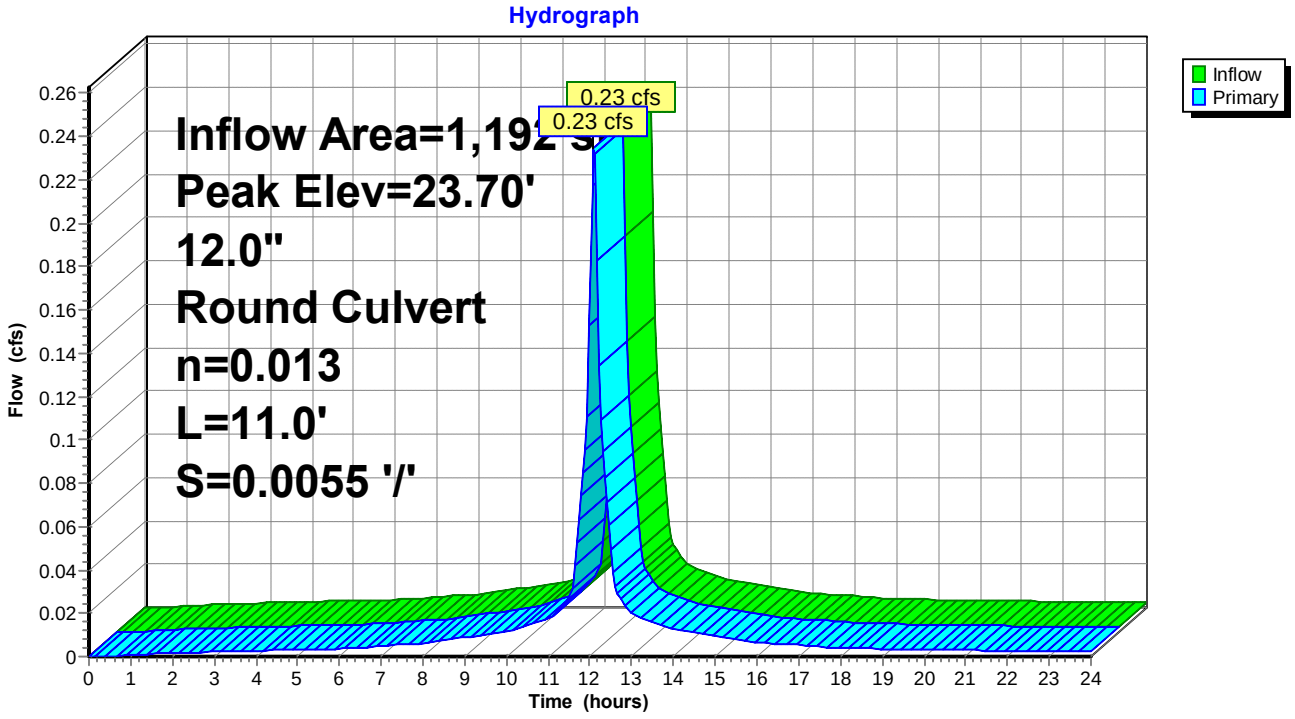
Inflow Area = 1,192 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-YR event
Inflow = 0.23 cfs @ 12.09 hrs, Volume= 864 cf
Outflow = 0.23 cfs @ 12.09 hrs, Volume= 864 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.23 cfs @ 12.09 hrs, Volume= 864 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.70' @ 12.09 hrs
Flood Elev= 26.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.40' | **12.0" Round Culvert**<br>L= 11.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.40' / 23.34' S= 0.0055 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.23 cfs @ 12.09 hrs HW=23.69' (Free Discharge)
**1=Culvert** (Barrel Controls 0.23 cfs @ 1.78 fps)

## Pond 2P: CB 5



## Summary for Pond 3P: CDS1

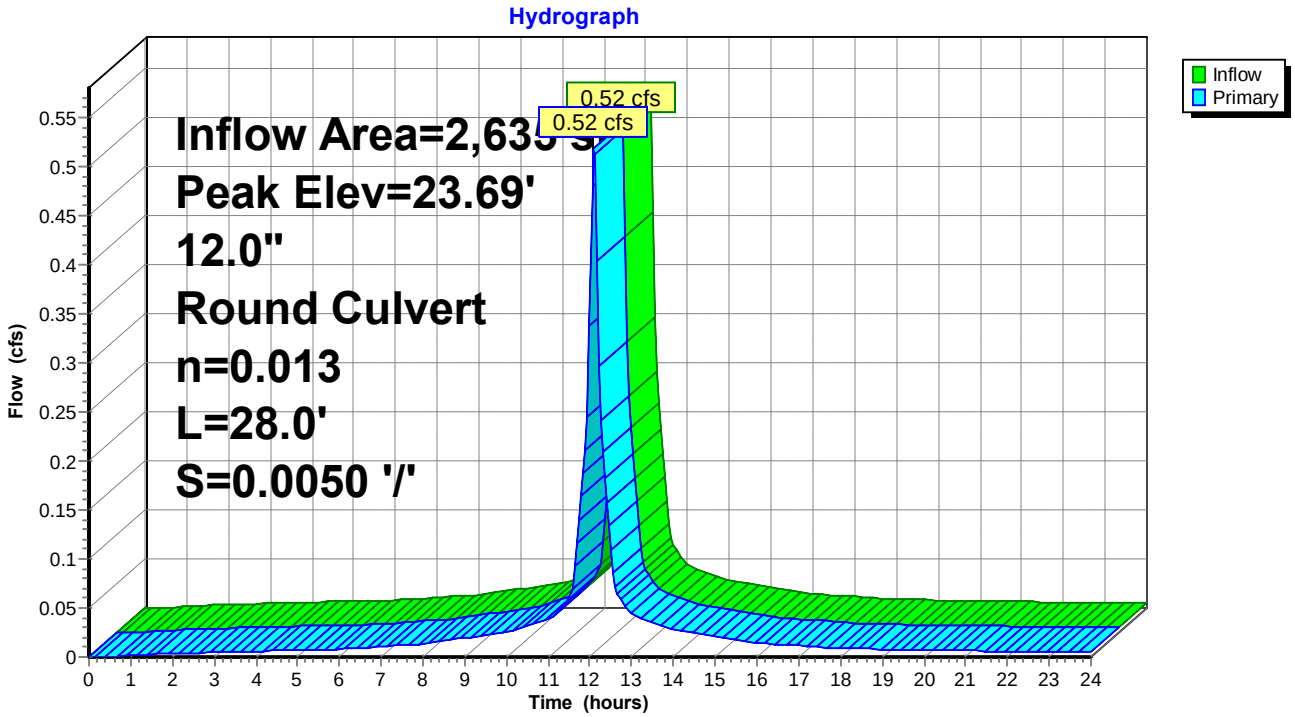
Inflow Area = 2,635 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-YR event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,909 cf
Outflow = 0.52 cfs @ 12.09 hrs, Volume= 1,909 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.52 cfs @ 12.09 hrs, Volume= 1,909 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.69' @ 12.09 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.24' | **12.0" Round Culvert**<br>L= 28.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.24' / 23.10' S= 0.0050 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.50 cfs @ 12.09 hrs HW=23.68' (Free Discharge)
**1=Culvert** (Barrel Controls 0.50 cfs @ 2.24 fps)

## Pond 3P: CDS1



## Summary for Pond 6P: CB 3

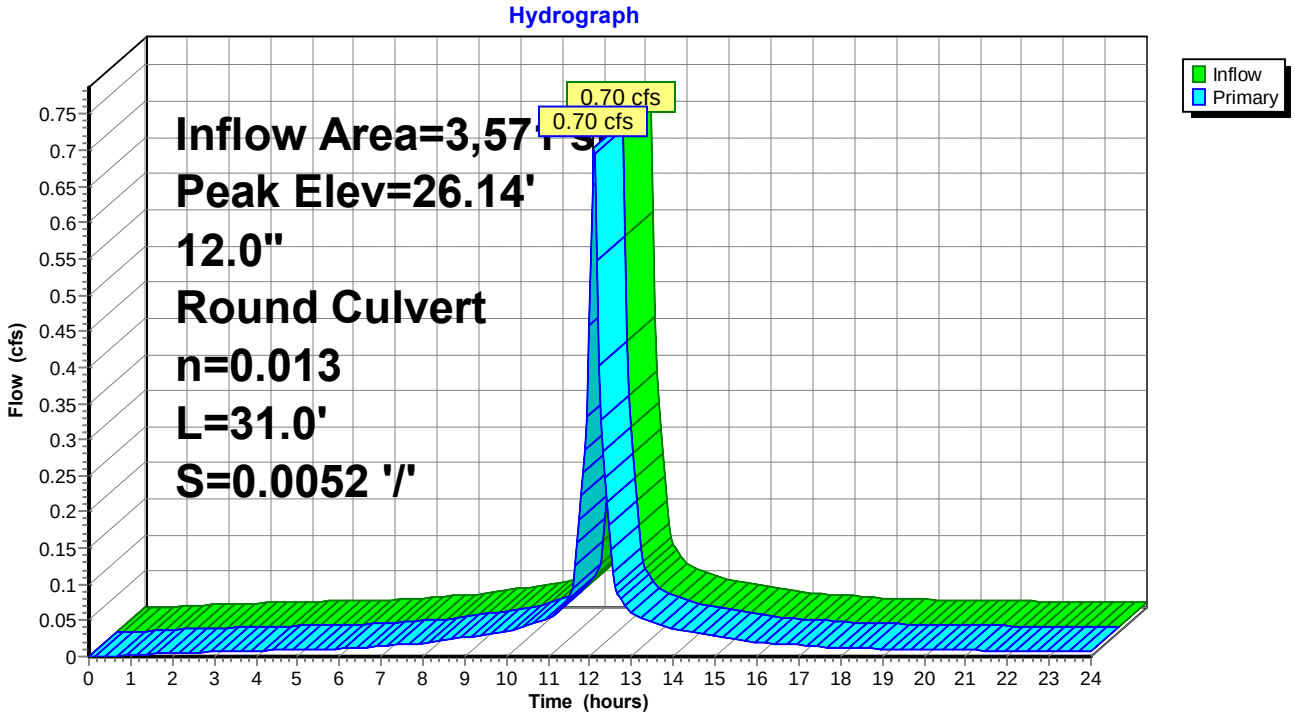
Inflow Area = 3,571 sf, 98.88% Impervious, Inflow Depth > 8.69" for 100-YR event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 2,587 cf
Outflow = 0.70 cfs @ 12.09 hrs, Volume= 2,587 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.70 cfs @ 12.09 hrs, Volume= 2,587 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 26.14' @ 12.09 hrs
Flood Elev= 28.20'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.62' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.62' / 25.46' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.68 cfs @ 12.09 hrs HW=26.14' (Free Discharge)
**1=Culvert** (Barrel Controls 0.68 cfs @ 2.44 fps)

## Pond 6P: CB 3



## Summary for Pond 7P: CB 4

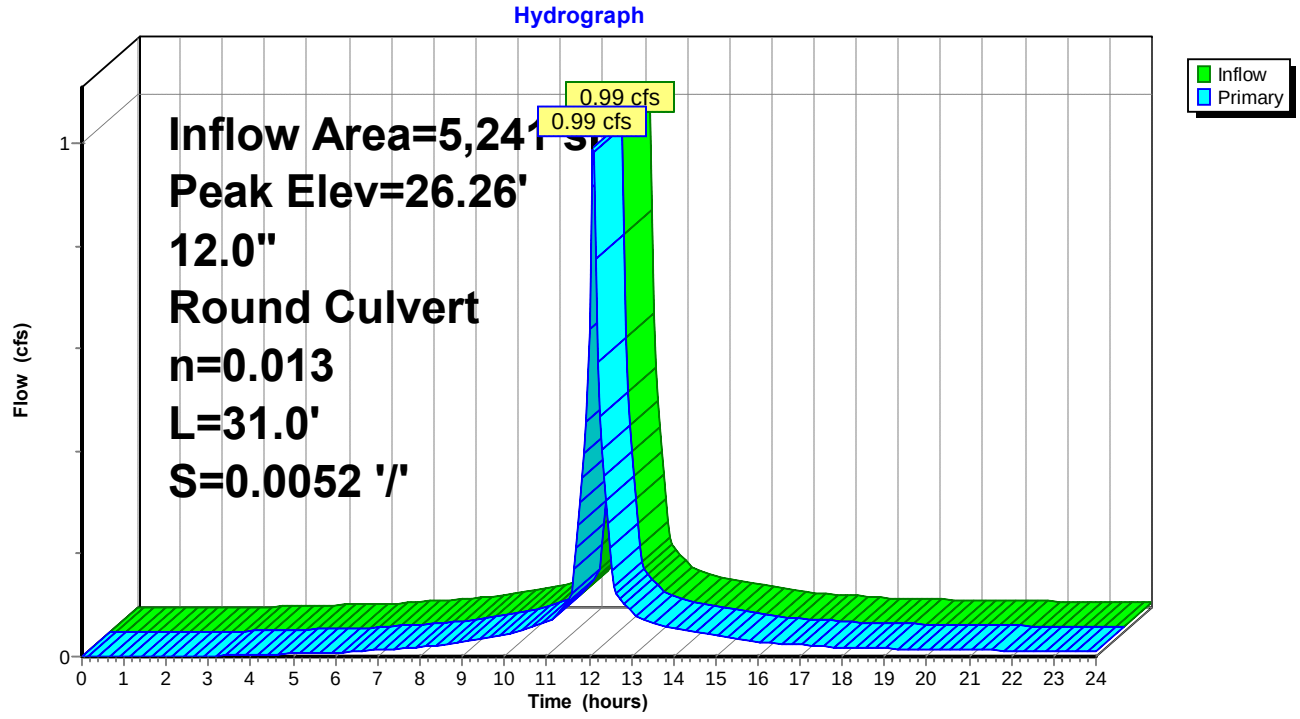
Inflow Area = 5,241 sf, 55.60% Impervious, Inflow Depth > 7.73" for 100-YR event
Inflow = 0.99 cfs @ 12.09 hrs, Volume= 3,375 cf
Outflow = 0.99 cfs @ 12.09 hrs, Volume= 3,375 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.99 cfs @ 12.09 hrs, Volume= 3,375 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 26.26' @ 12.09 hrs
Flood Elev= 28.25'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.62' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.62' / 25.46' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.96 cfs @ 12.09 hrs HW=26.25' (Free Discharge)
**1=Culvert** (Barrel Controls 0.96 cfs @ 2.64 fps)

## Pond 7P: CB 4



## Summary for Pond 8P: CDS 3

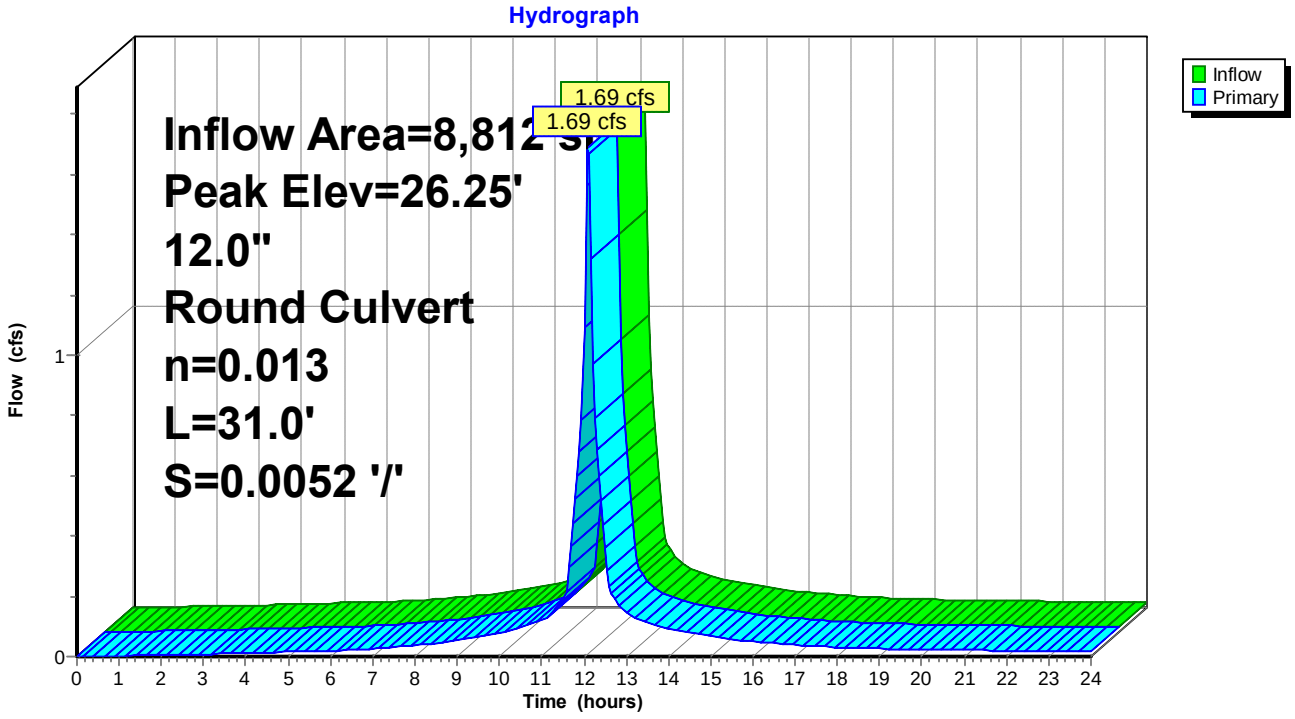
Inflow Area = 8,812 sf, 73.14% Impervious, Inflow Depth > 8.12" for 100-YR event
Inflow = 1.69 cfs @ 12.09 hrs, Volume= 5,962 cf
Outflow = 1.69 cfs @ 12.09 hrs, Volume= 5,962 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.69 cfs @ 12.09 hrs, Volume= 5,962 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 26.25' @ 12.09 hrs
Flood Elev= 28.60'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 25.36' | **12.0" Round Culvert**<br>L= 31.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 25.36' / 25.20' S= 0.0052 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.65 cfs @ 12.09 hrs HW=26.24' (Free Discharge)
**1=Culvert** (Barrel Controls 1.65 cfs @ 3.01 fps)

## Pond 8P: CDS 3



## Summary for Pond CB1: CB 1

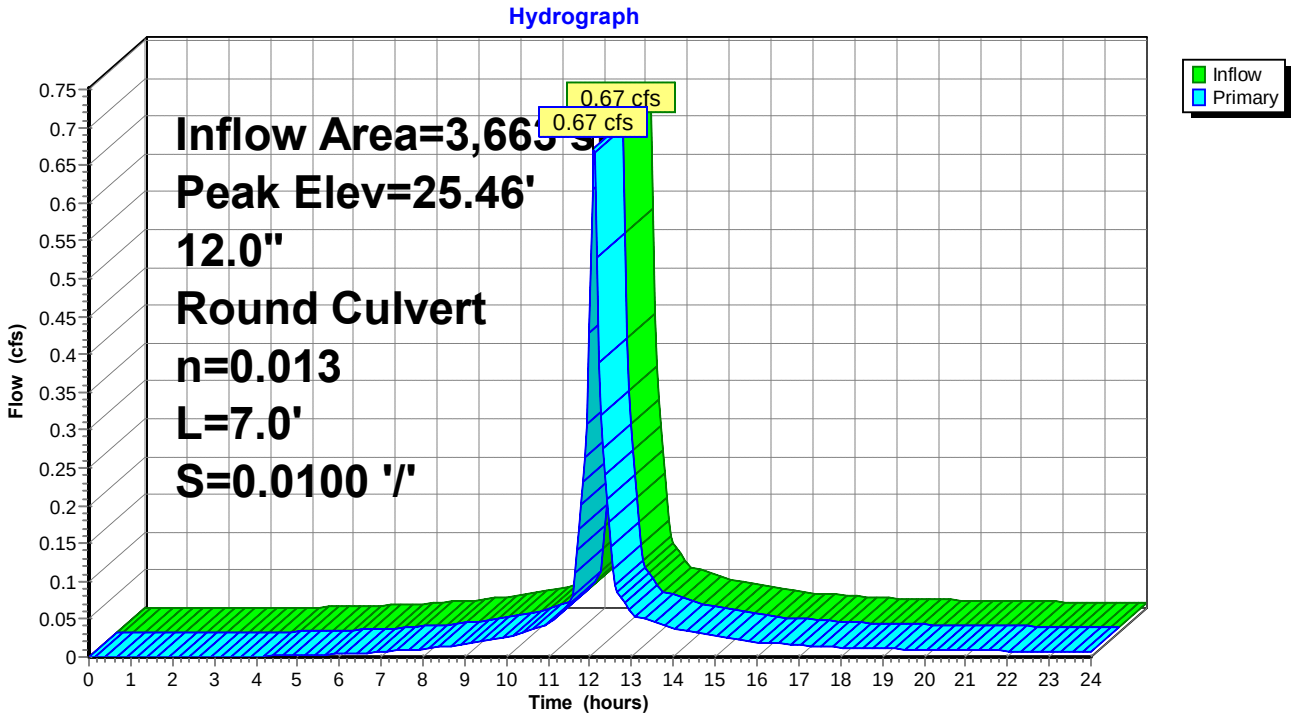
Inflow Area = 3,663 sf, 40.98% Impervious, Inflow Depth > 7.36" for 100-YR event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 2,247 cf
Outflow = 0.67 cfs @ 12.09 hrs, Volume= 2,247 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.09 hrs, Volume= 2,247 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.46' @ 12.09 hrs
Flood Elev= 28.50'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.95' | **12.0" Round Culvert** L= 7.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.95' / 24.88' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.65 cfs @ 12.09 hrs HW=25.45' (Free Discharge)
**1=Culvert** (Barrel Controls 0.65 cfs @ 2.40 fps)

## Pond CB1: CB 1



## Summary for Pond CB2: CB 2

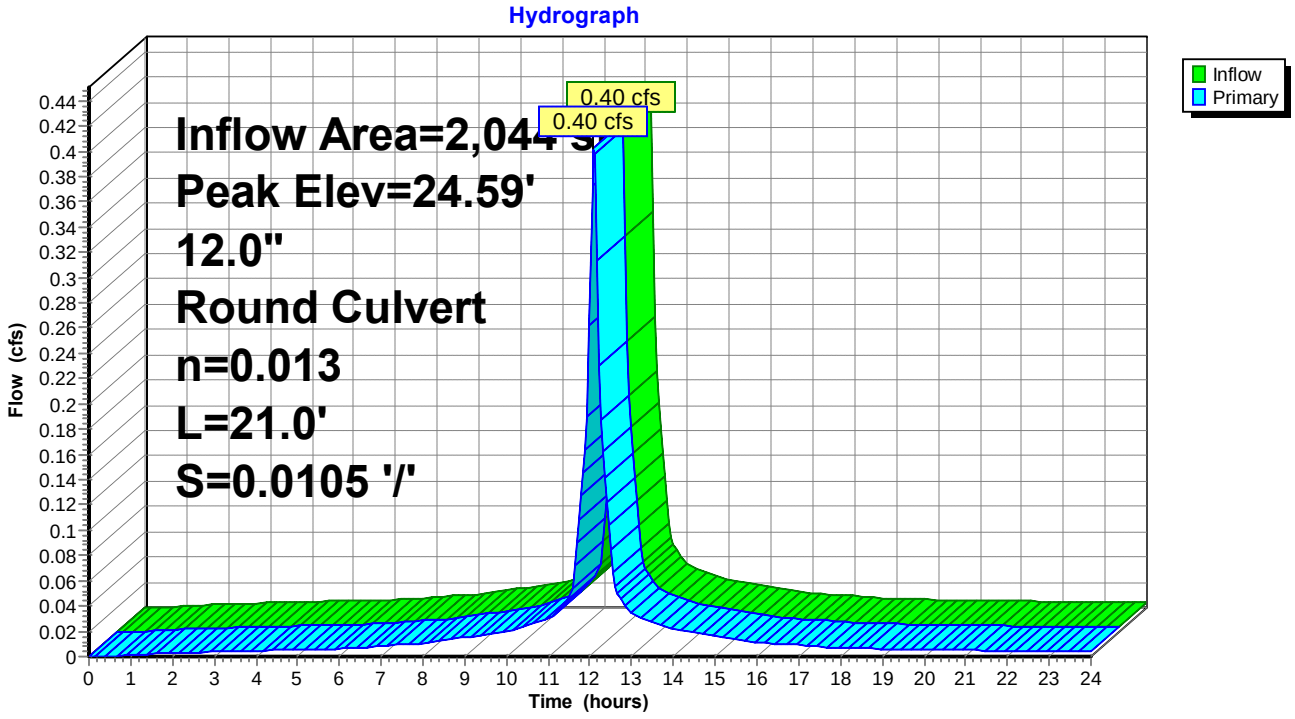
Inflow Area = 2,044 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-YR event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 1,481 cf
Outflow = 0.40 cfs @ 12.09 hrs, Volume= 1,481 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.09 hrs, Volume= 1,481 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 24.59' @ 12.09 hrs
Flood Elev= 28.00'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.23' | **12.0" Round Culvert**<br>L= 21.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.23' / 24.01' S= 0.0105 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.39 cfs @ 12.09 hrs HW=24.58' (Free Discharge)
**1=Culvert** (Inlet Controls 0.39 cfs @ 1.59 fps)

## Pond CB2: CB 2



## Summary for Pond DMH1: DMH 1

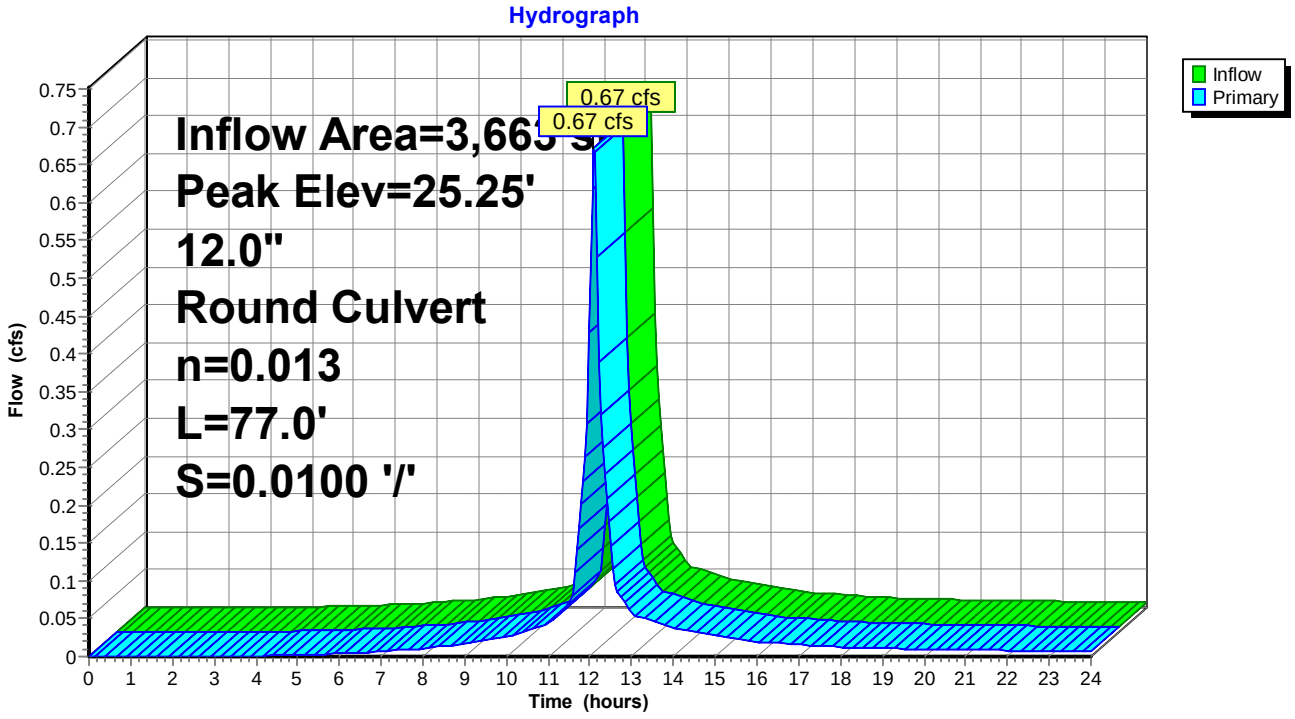
Inflow Area = 3,663 sf, 40.98% Impervious, Inflow Depth > 7.36" for 100-YR event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 2,247 cf
Outflow = 0.67 cfs @ 12.09 hrs, Volume= 2,247 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.67 cfs @ 12.09 hrs, Volume= 2,247 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.25' @ 12.09 hrs
Flood Elev= 28.75'

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.78' | **12.0" Round Culvert**<br>L= 77.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.78' / 24.01' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.65 cfs @ 12.09 hrs HW=25.24' (Free Discharge)
**1=Culvert** (Inlet Controls 0.65 cfs @ 1.83 fps)

## Pond DMH1: DMH 1



## Summary for Pond DMH2: CDS 2

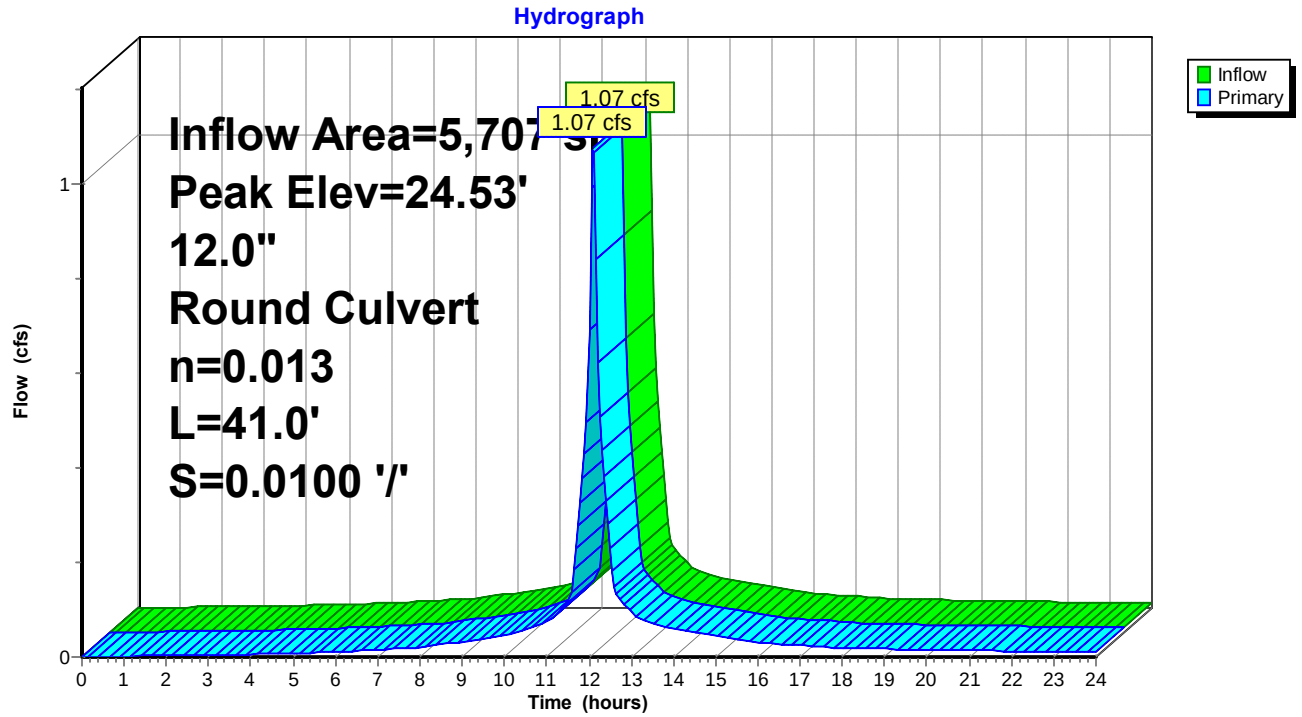
Inflow Area = 5,707 sf, 62.12% Impervious, Inflow Depth > 7.84" for 100-YR event
Inflow = 1.07 cfs @ 12.09 hrs, Volume= 3,728 cf
Outflow = 1.07 cfs @ 12.09 hrs, Volume= 3,728 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.07 cfs @ 12.09 hrs, Volume= 3,728 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 24.53' @ 12.09 hrs

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 23.91' | **12.0" Round Culvert**<br>L= 41.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 23.91' / 23.50' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.05 cfs @ 12.09 hrs HW=24.52' (Free Discharge)
**1=Culvert** (Inlet Controls 1.05 cfs @ 2.09 fps)

## Pond DMH2: CDS 2



## Summary for Pond POND: Pond 1

Inflow Area = 27,816 sf, 72.55% Impervious, Inflow Depth > 8.09" for 100-YR event
Inflow = 5.27 cfs @ 12.09 hrs, Volume= 18,749 cf
Outflow = 3.20 cfs @ 12.21 hrs, Volume= 17,835 cf, Atten= 39%, Lag= 7.4 min
Primary = 3.20 cfs @ 12.21 hrs, Volume= 17,835 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 25.82' @ 12.21 hrs Surf.Area= 3,113 sf Storage= 5,583 cf

Plug-Flow detention time= 94.7 min calculated for 17,798 cf (95% of inflow)
Center-of-Mass det. time= 66.6 min ( 820.3 - 753.8 )

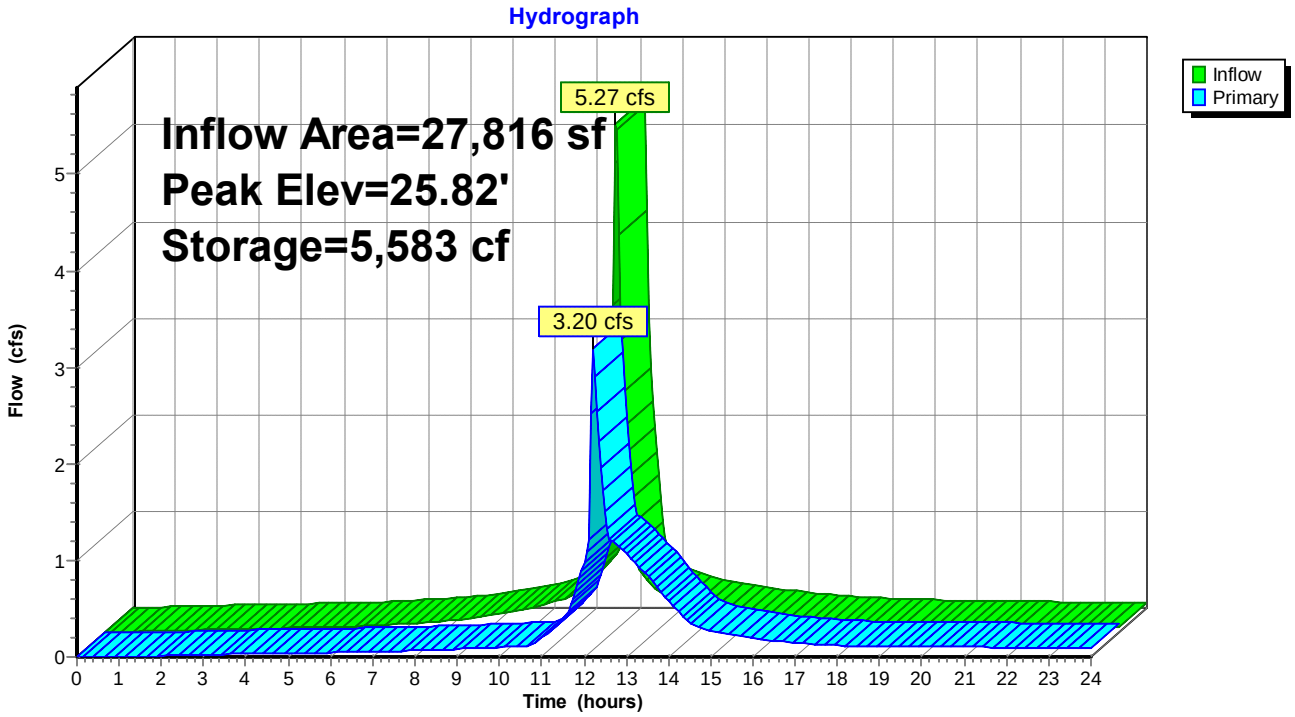
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 23.00' | 8,000 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 23.00 | 911 | 0 | 0 |
| 24.00 | 1,638 | 1,275 | 1,275 |
| 25.00 | 2,421 | 2,030 | 3,304 |
| 26.00 | 3,261 | 2,841 | 6,145 |
| 26.50 | 4,157 | 1,855 | 8,000 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 22.90' | **12.0" Round Culvert**<br>L= 26.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 22.90' / 22.00' S= 0.0346 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 23.00' | **2.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 24.15' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #4 | Device 1 | 25.65' | **24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600<br>Limited to weir flow at low heads |

**Primary OutFlow** Max=3.12 cfs @ 12.21 hrs HW=25.82' (Free Discharge)
└**1=Culvert** (Passes 3.12 cfs of 4.64 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.17 cfs @ 7.96 fps)
  ├**3=Orifice/Grate** (Orifice Controls 1.13 cfs @ 5.74 fps)
  └**4=Orifice/Grate** (Weir Controls 1.82 cfs @ 1.34 fps)

## Pond POND: Pond 1



## Summary for Pond POND2: Pond 2

Inflow Area = 8,812 sf, 73.14% Impervious, Inflow Depth > 8.12" for 100-YR event
Inflow = 1.69 cfs @ 12.09 hrs, Volume= 5,962 cf
Outflow = 1.13 cfs @ 12.18 hrs, Volume= 5,323 cf, Atten= 33%, Lag= 5.9 min
Primary = 1.13 cfs @ 12.18 hrs, Volume= 5,323 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 27.87' @ 12.18 hrs Surf.Area= 1,090 sf Storage= 1,857 cf

Plug-Flow detention time= 120.4 min calculated for 5,323 cf (89% of inflow)
Center-of-Mass det. time= 68.6 min ( 826.6 - 758.0 )

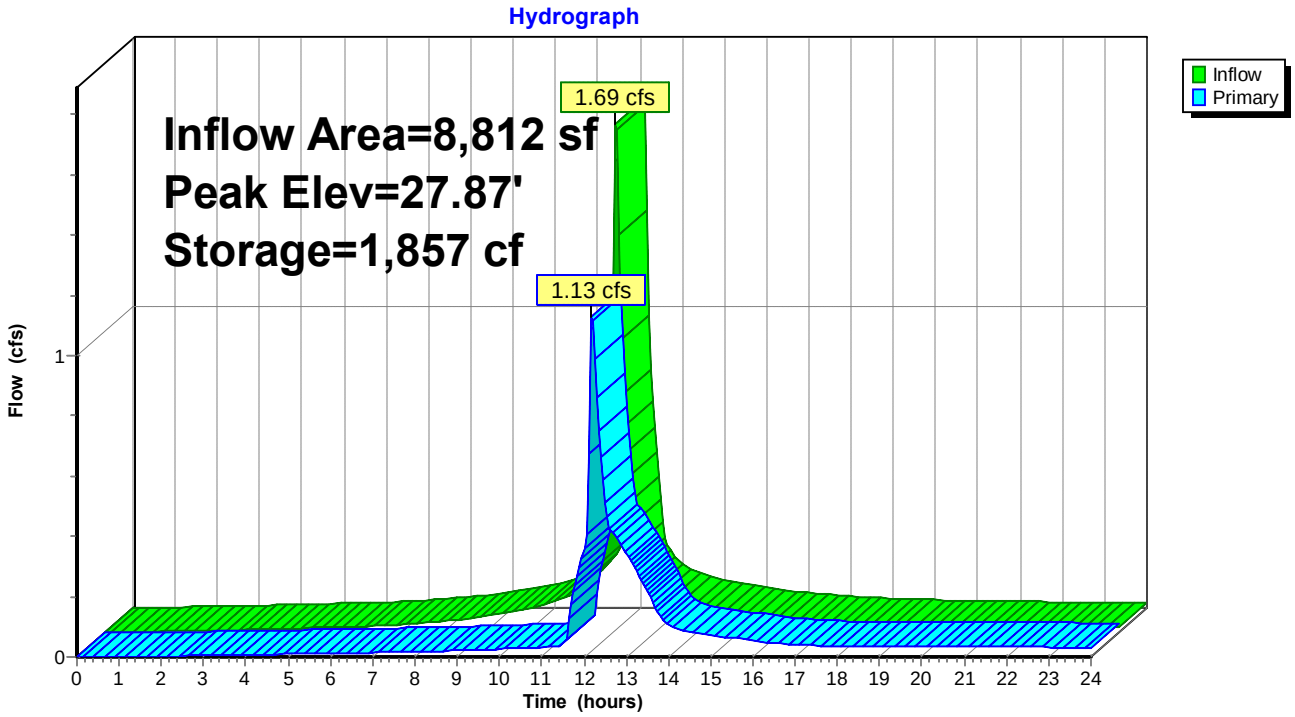
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 25.00' | 3,007 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 25.00 | 276 | 0 | 0 |
| 26.00 | 506 | 391 | 391 |
| 27.00 | 793 | 650 | 1,041 |
| 28.00 | 1,136 | 965 | 2,005 |
| 28.75 | 1,536 | 1,002 | 3,007 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 24.90' | **12.0" Round Culvert**<br>L= 40.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 24.90' / 24.50' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 25.00' | **1.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 26.80' | **4.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads |
| #4 | Device 1 | 27.65' | **24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 |

**Primary OutFlow** Max=1.11 cfs @ 12.18 hrs HW=27.86' (Free Discharge)
└**1=Culvert** (Passes 1.11 cfs of 4.69 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 8.09 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.43 cfs @ 4.96 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.63 cfs @ 1.48 fps)

## Pond POND2: Pond 2



## Summary for Pond Pond3: Pond 3

Inflow Area = 35,922 sf, 57.12% Impervious, Inflow Depth > 7.60" for 100-YR event
Inflow = 5.63 cfs @ 12.16 hrs, Volume= 22,746 cf
Outflow = 4.22 cfs @ 12.28 hrs, Volume= 22,225 cf, Atten= 25%, Lag= 6.8 min
Primary = 4.22 cfs @ 12.28 hrs, Volume= 22,225 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 21.90' @ 12.28 hrs Surf.Area= 1,736 sf Storage= 2,378 cf

Plug-Flow detention time= 38.0 min calculated for 22,179 cf (98% of inflow)
Center-of-Mass det. time= 24.2 min ( 804.5 - 780.3 )

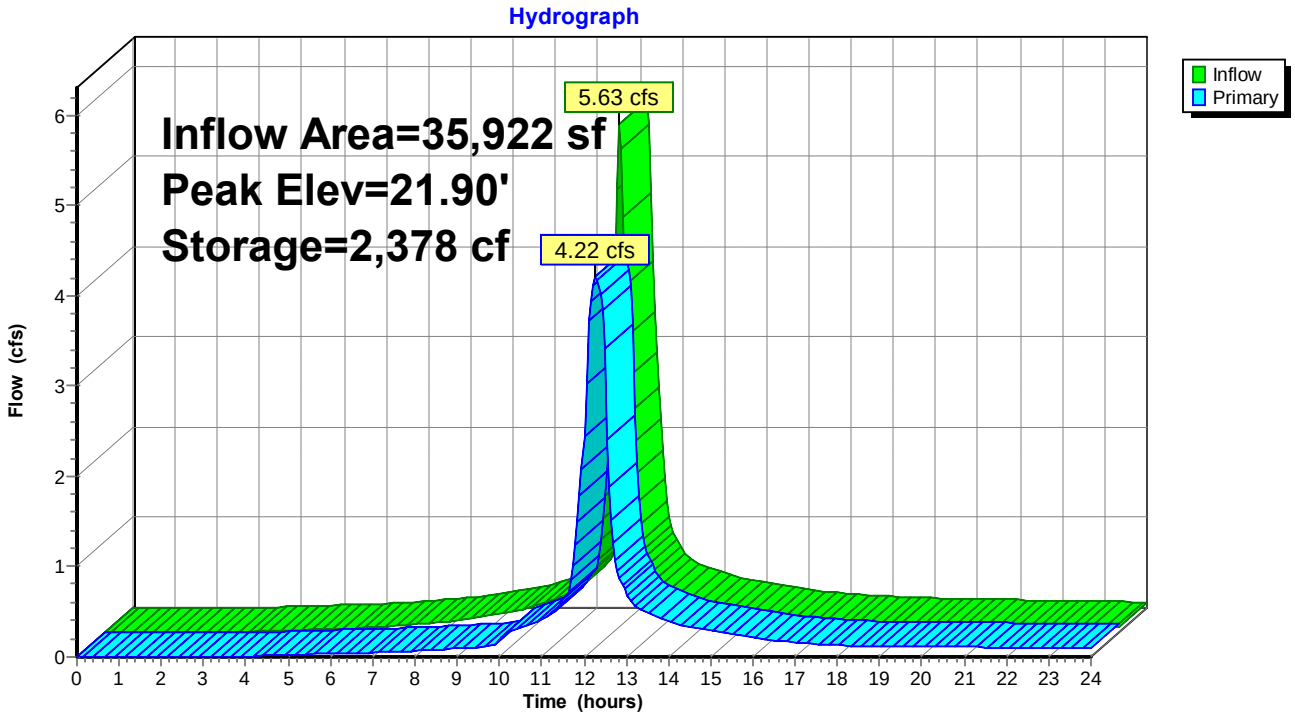
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 19.50' | 2,561 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 19.50 | 487 | 0 | 0 |
| 20.00 | 657 | 286 | 286 |
| 21.00 | 1,038 | 848 | 1,134 |
| 22.00 | 1,816 | 1,427 | 2,561 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 19.40' | **12.0" Round Culvert**<br>L= 46.0' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 19.40' / 19.00' S= 0.0087 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 20.75' | **24.0" W x 24.0" H Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 19.50' | **2.0" Vert. Orifice/Grate** C= 0.600 |

**Primary OutFlow** Max=4.21 cfs @ 12.28 hrs HW=21.89' (Free Discharge)
↑**1=Culvert** (Inlet Controls 4.21 cfs @ 5.36 fps)
↑**2=Orifice/Grate** (Passes < 7.81 cfs potential flow)
**3=Orifice/Grate** (Passes < 0.16 cfs potential flow)

## Pond Pond3: Pond 3



## Summary for Pond Pond4: Subsurface Pond

Inflow Area = 3,500 sf,100.00% Impervious, Inflow Depth > 8.69" for 100-YR event
Inflow = 0.69 cfs @ 12.09 hrs, Volume= 2,536 cf
Outflow = 0.69 cfs @ 12.10 hrs, Volume= 2,218 cf, Atten= 0%, Lag= 0.9 min
Primary = 0.69 cfs @ 12.10 hrs, Volume= 2,218 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 27.90' @ 12.10 hrs Surf.Area= 705 sf Storage= 729 cf

Plug-Flow detention time= 187.2 min calculated for 2,218 cf (87% of inflow)
Center-of-Mass det. time= 129.0 min ( 868.4 - 739.5 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1A | 26.10' | 510 cf | **18.17'W x 38.80'L x 2.33'H Field A**<br>1,645 cf Overall - 369 cf Embedded = 1,276 cf x 40.0% Voids |
| #2A | 26.60' | 369 cf | **ADS_StormTech SC-310 +Cap** x 25 Inside #1<br>Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf<br>Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap<br>25 Chambers in 5 Rows |
| | | 879 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 26.40' | **12.0" Round Culvert** L= 6.5' CPP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 26.40' / 26.25' S= 0.0231 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 26.50' | **1.0" Vert. Orifice/Grate** C= 0.600 |
| #3 | Device 1 | 27.75' | **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 |

**Primary OutFlow** Max=0.68 cfs @ 12.10 hrs HW=27.90' (Free Discharge)
↑—**1=Culvert** (Passes 0.68 cfs of 2.99 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.61 fps)
—**3=Broad-Crested Rectangular Weir** (Weir Controls 0.65 cfs @ 1.09 fps)

## Pond Pond4: Subsurface Pond - Chamber Wizard Field A

**Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)**
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

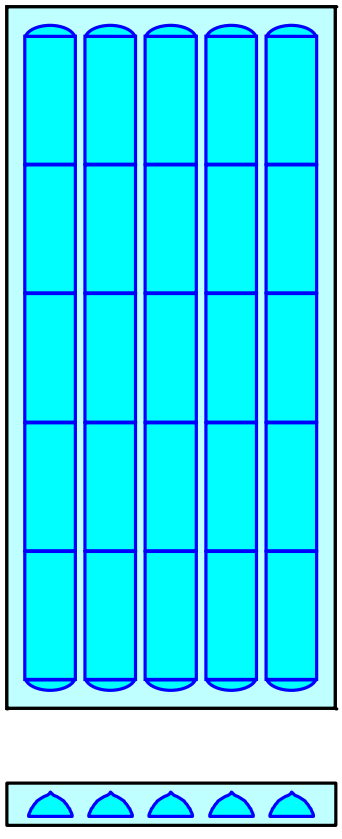
5 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 36.80' Row Length +12.0" End Stone x 2 = 38.80' Base Length
5 Rows x 34.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.17' Base Width
6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

25 Chambers x 14.7 cf = 368.5 cf Chamber Storage

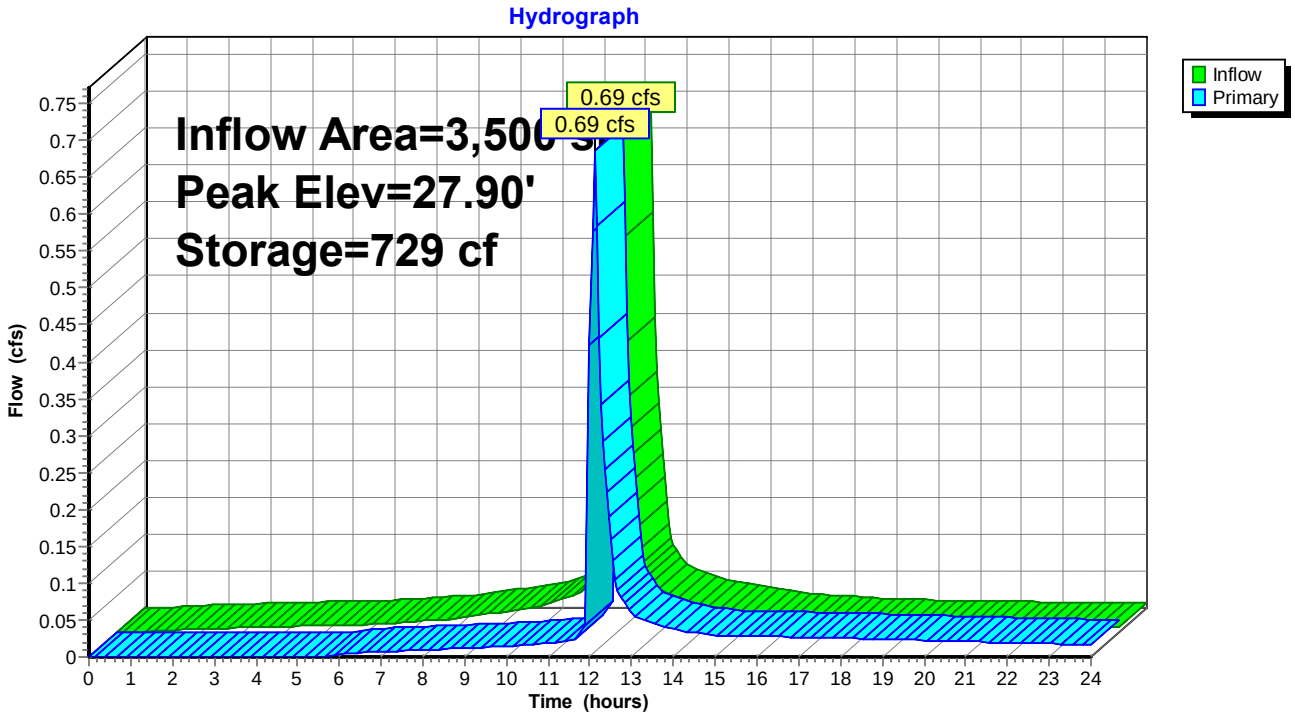
1,644.7 cf Field - 368.5 cf Chambers = 1,276.1 cf Stone x 40.0% Voids = 510.5 cf Stone Storage

Chamber Storage + Stone Storage = 879.0 cf = 0.020 af
Overall Storage Efficiency = 53.4%
Overall System Size = 38.80' x 18.17' x 2.33'

25 Chambers
60.9 cy Field
47.3 cy Stone



## Pond Pond4: Subsurface Pond

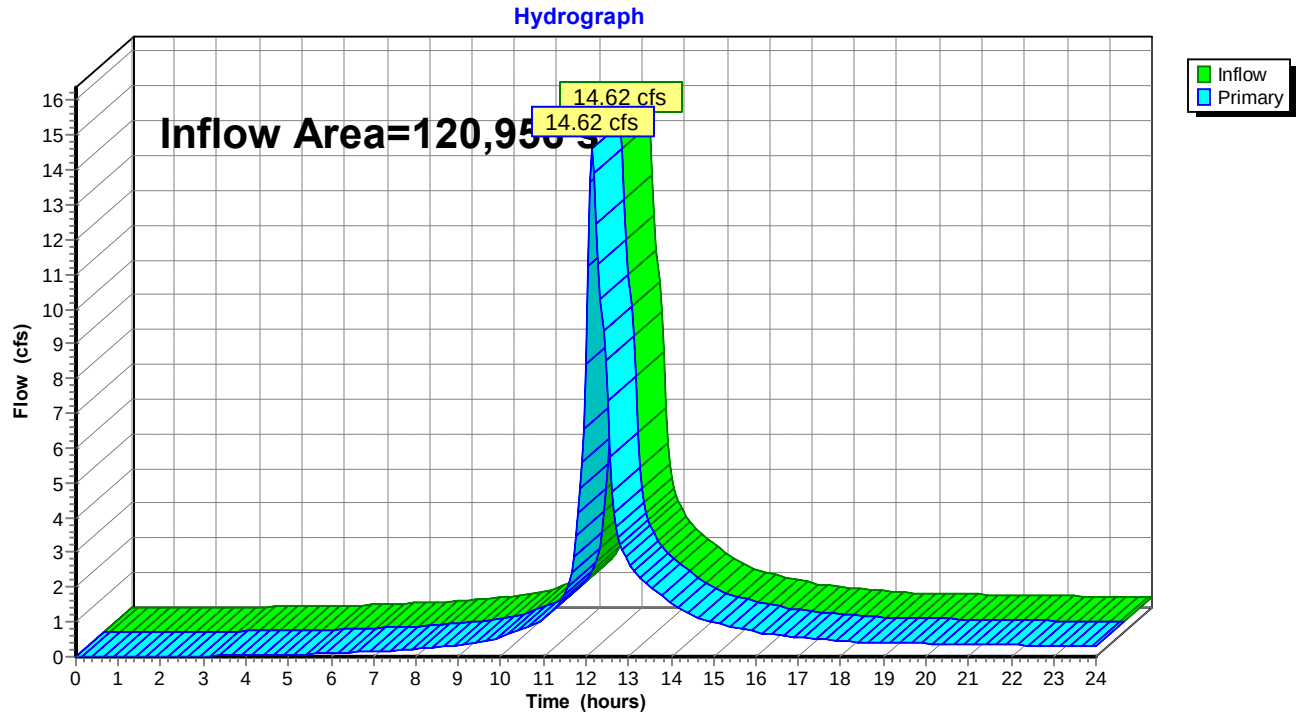


## Summary for Link 6L: wetland 1

Inflow Area = 120,956 sf, 36.54% Impervious, Inflow Depth > 7.00" for 100-YR event
Inflow = 14.62 cfs @ 12.15 hrs, Volume= 70,588 cf
Primary = 14.62 cfs @ 12.15 hrs, Volume= 70,588 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link 6L: wetland 1

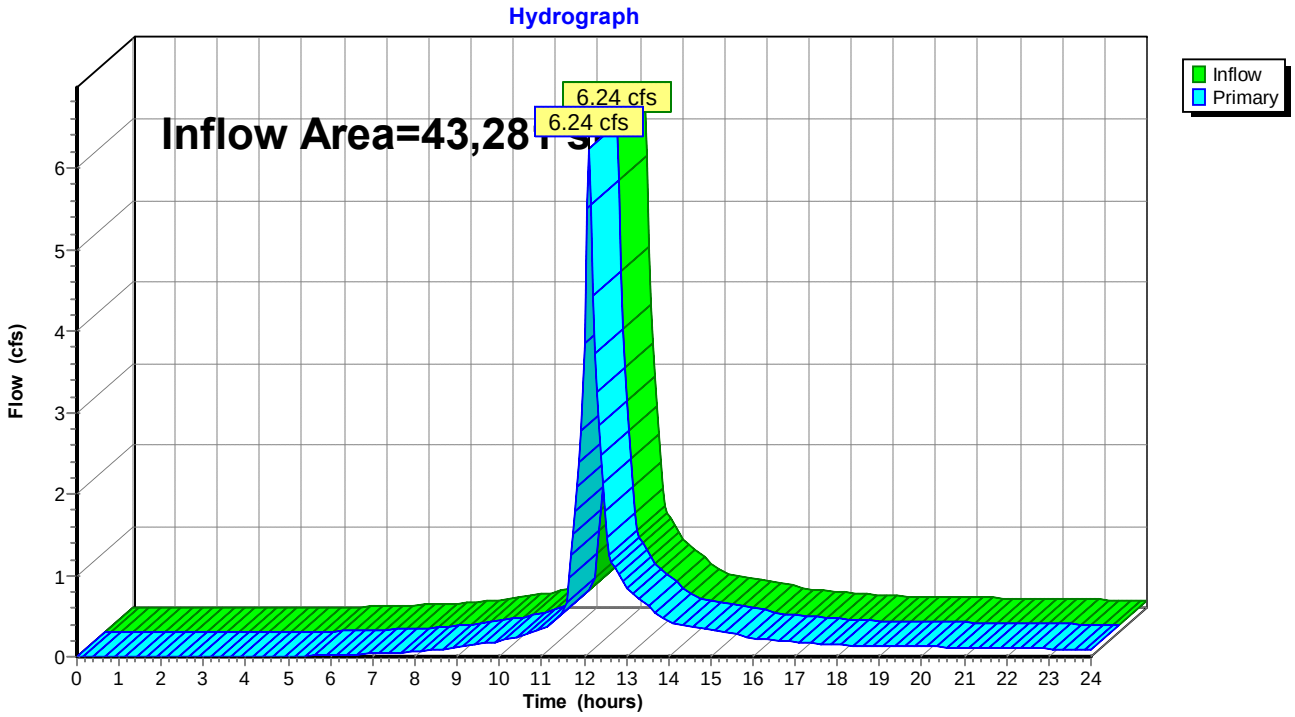


## Summary for Link 9L: link

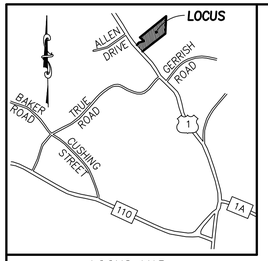
Inflow Area = 43,281 sf, 14.89% Impervious, Inflow Depth > 6.46" for 100-YR event
Inflow = 6.24 cfs @ 12.10 hrs, Volume= 23,307 cf
Primary = 6.24 cfs @ 12.10 hrs, Volume= 23,307 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

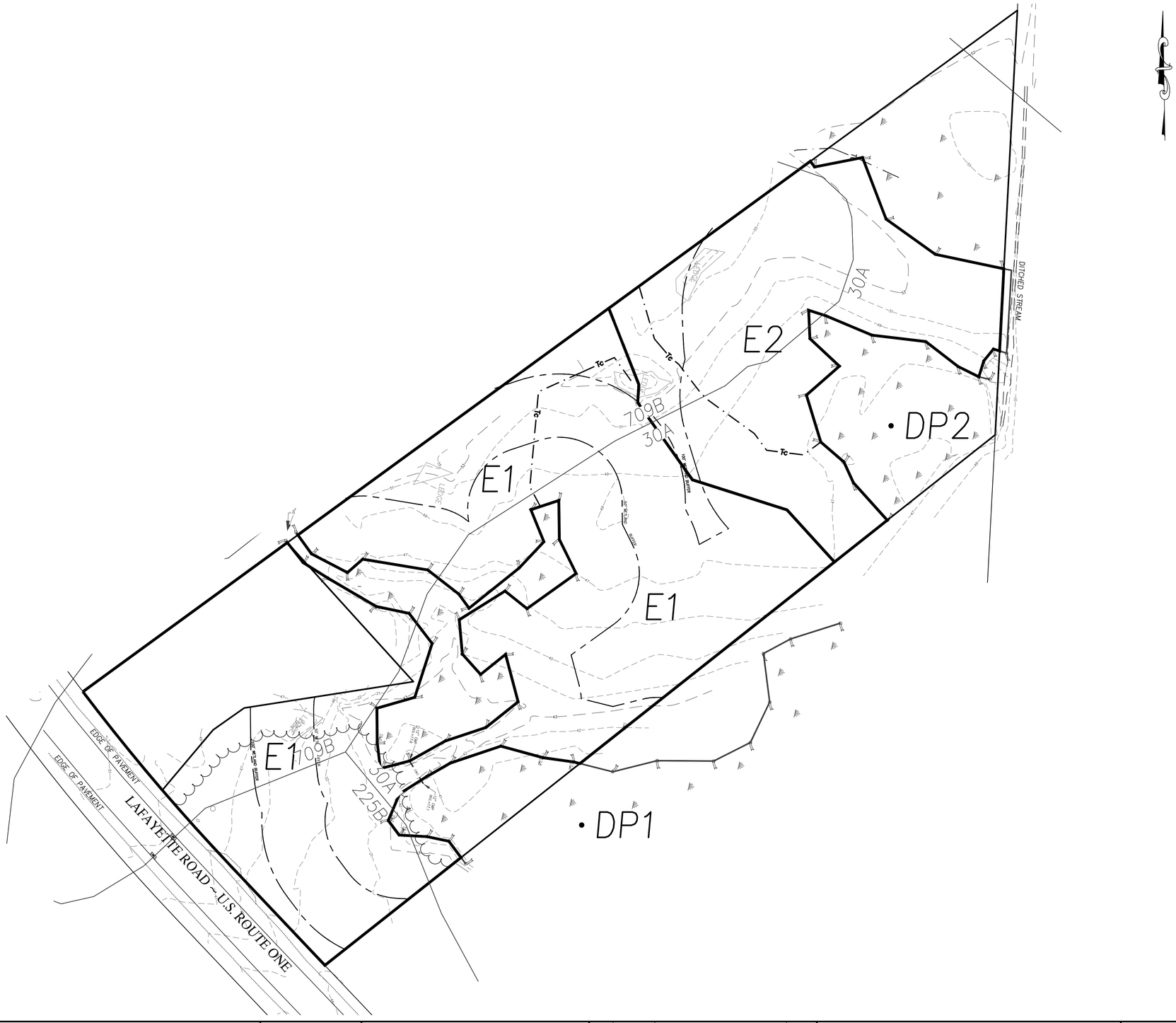
### Link 9L: link



## d. Watershed Maps




LOCUS MAP
N.T.S.




GRAPHIC SCALE
40 0 20 40 80 160
( IN FEET )
1 inch = 40'

PREPARED FOR

**BRENDAN DOHERTY**
82 LAFAYETTE ROAD
SALISBURY, MA

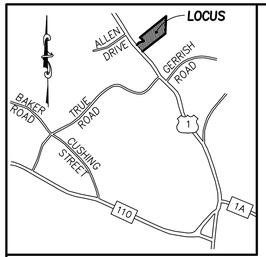
| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

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

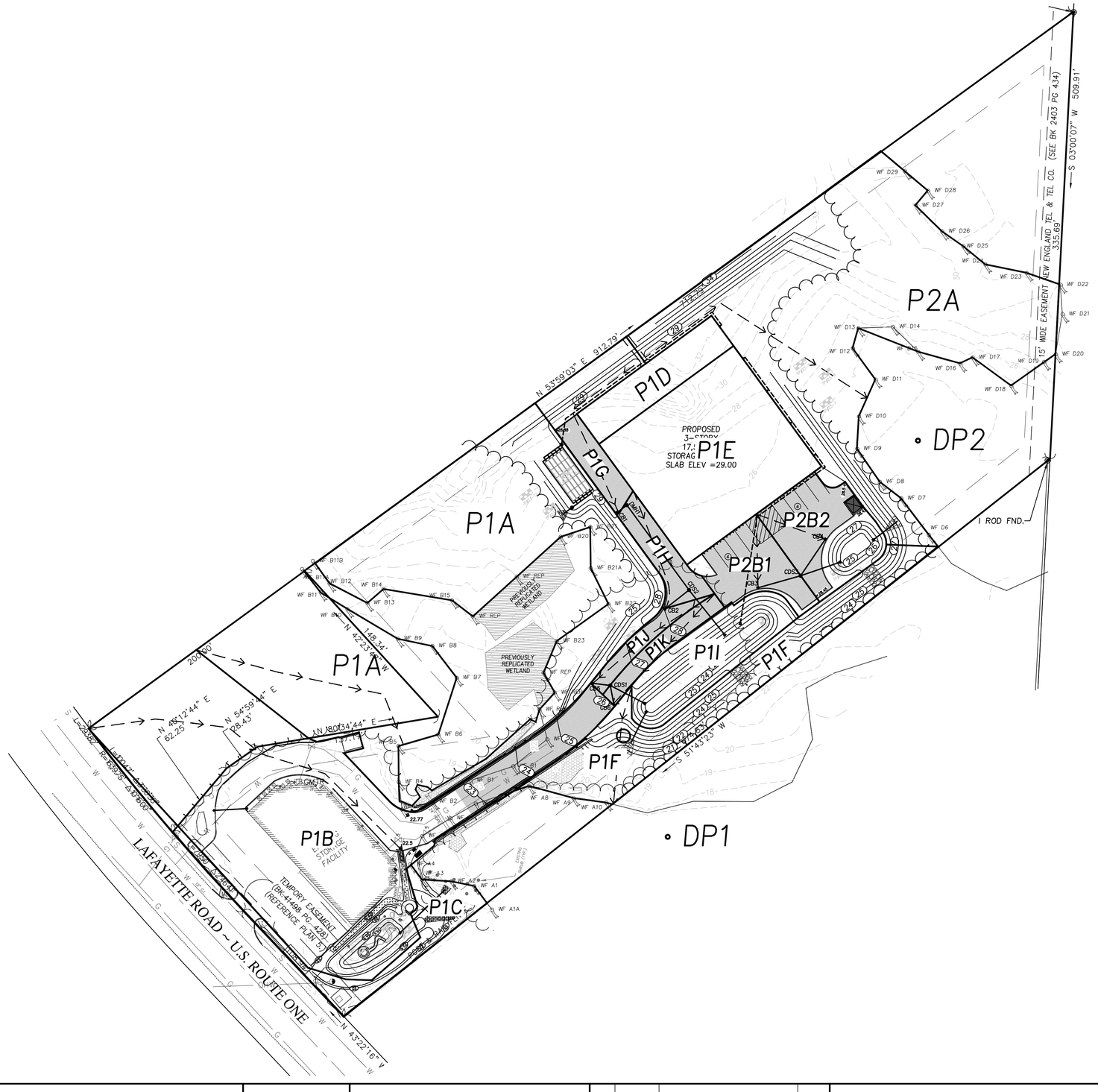
SCALE: 1"=40' | CALC. BY: S.R.C. | PROJECT: M234259
DATE: JAN. 25, 2024 | CHKD. BY: E.W.B.

# SITE PLAN
IN
SALISBURY, MA
AT
**82 LAFAYETTE ROAD**

PRE-WATERSHED MAP




LOCUS MAP
N.T.S.




GRAPHIC SCALE
40 0 20 40 80 160
( IN FEET )
1 inch = 40'

PREPARED FOR

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82 LAFAYETTE ROAD
SALISBURY, MA

| NO. | DATE | DESCRIPTION | BY |
|---|---|---|---|
| | | | |

MEI
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SCALE: 1"=40' | CALC. BY: S.R.C. | PROJECT: M234259
DATE: MAY 2, 2024 | CHKD. BY: E.W.B.

# SITE PLAN
IN
SALISBURY, MA
AT
**82 LAFAYETTE ROAD**

POST-WATERSHED MAP