K. Stormwater Management Report

Attached hereto is the Stormwater Management Report, as summarized above in Section III.E.

DRAINAGE REPORT

ALLEN & MAJOR ASSOCIATES, INC.

Residences at Thoreau
275 Forest Ridge Road
Concord, Massachusetts

APPLICANT:
The Pinebrook Group
275 Forest Ridge Road
Concord, MA 01742

PREPARED BY:
Allen & Major Associates, Inc.
100 Commerce Way, Suite 5
Woburn, Massachusetts 01801
E.O.R. Timothy J. Williams PE

DRAINAGE REPORT

Due Diligence / Conceptual Design
275 Forest Ridge Road
Concord, Massachusetts

APPLICANT:
The Pinebrook Group
275 Forest Ridge Road
Concord, MA 01742

PREPARED BY:
Allen & Major Associates, Inc.
100 Commerce Way, Suite 5
Woburn, Massachusetts 01801

ISSUED:
December 20, 2023

REVISED:

A&M PROJECT NO.:
3172-01

TABLE OF CONTENTS

Introduction

The purpose of this drainage report is to provide an overview of the proposed stormwater management system (SMS) for the new development located at 275 Forest Ridge Road Concord, Massachusetts. The report will show by means of narrative, calculations and exhibits that the proposed stormwater management system will meet or exceed the Massachusetts Department of Environmental Protection (MassDEP) stormwater standards, and the town Stormwater Management Regulations.

The proposed site improvements include the demolishing of multiple small buildings, clearing of existing vegetation and constructing three multi-family buildings. Other improvements to the site include construction of surface parking, landscaping and underground utilities servicing the site. The project will be serviced by connecting existing utilities off Forest Ridge Road.

The proposed SMS incorporates structural and non-structural Best Management Practices (BMPs) to provide stormwater peak flow mitigation, quality treatment, and conveyance.

The SMS includes, catch basins, water quality units, drain manholes, roof drains, underground piping, underground infiltration systems, infiltration basins, and an Operation & Maintenance Plan.

Site Categorization for Stormwater Regulations

The proposed site at 275 Forest Ridge Road Concord is considered a new development under the DEP Stormwater Management Standards due to the net increase in impervious area. A new development project is required to meet all of Stormwater Management Standards listed within the MA DEP Stormwater Handbook.

Site Location and Access

The site consists of one lot with 50 feet of frontage on Forest Ridge Road entirely within the town of Concord. The site is situated between Forest Ridge Road to the South, Black Birch Lane to the West, and Border Road to the East. The site is currently accessed by one curb cut located on Forest Ridge Road.

Existing Site Conditions

The site currently includes multiple camp buildings, and recreational facilities. Most of the site in which construction will be taking place is currently wooded, except for one of the main buildings located on the west portion of the site and multiple smaller structures located throughout the entire northern portion of the site. The site topography slopes towards multiple different study points with multiple drainage basins on site.

The surface drainage flows were analyzed at six Study Points. Copies of the existing watershed plan, showing the boundaries of each catchment area, are provided in the rear pocket of this report.

Existing Soil Conditions

The on-site soils were identified using the USDA Natural Resources Conservation Services (NRCS) Soil Survey for Middlesex County. The site is primarily soil type 253 Hinckley loamy sand. These soil types are assumed to be A-type soils because of the landform (outwash terraces/plans) as well as the surrounding soil types.

A copy of the NRCS Custom Soil Resource Report is included in the appendix of this report.

FEMA Floodplain/Environmental Due Diligence

There are no portions of the site located within the FEMA Zone "AE" Special Flood Hazard Area Subject to Inundation by the 1% Annual Chance Flood (100-year floodplain). The official Flood Insurance Rate Map (FIRM) effective date July 7, 2014, community panel 312 of 656. Map numbers 25017C0358F and 25017C0366F. See section 3 of this report for a copy of the FEMA FIRM.

Environmentally Sensitive Zones

The Commonwealth of Massachusetts asserts control over numerous protected and regulated areas including: Areas of Critical Environmental Concern (ACEC); Outstanding Resource Waters (ORWs); Priority and Protected Habitat for rare and endangered species, and areas protected under the Wetlands Protection Act. The subject property is not located within any of these regulated areas.

Drainage Analysis Methodology

A peak rate of runoff will be determined using techniques and data found in the following:

1. Urban Hydrology for Small Watersheds – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.
2. HydroCAD © Stormwater Modeling System by HydroCAD Software Solutions LLC, version 10.00-24. The HydroCAD program was used to generate runoff hydrographs for the watershed areas, to determine discharge/ stage/storage characteristics for the stormwater BMPs, to perform drainage routing and to combine the results of the runoff hydrographs. HydroCAD uses the TR-20 methodology of the SCS Unit Hydrograph procedure (SCS-UH).
3. Soil Survey of Middlesex County Massachusetts by United States Department of Agriculture, NRCS. Soil types and boundaries were obtained from this reference.

Proposed Conditions – Peak Rate of Runoff

The stormwater runoff analysis of the existing and proposed conditions includes an estimate of the peak rate of runoff from various rainfall events. Peak runoff rates were developed using TR55 Urban Hydrology for Small Watersheds, developed by the U.S.

Department of Commerce, Engineering Division and the HydroCAD computer program. Further, the analysis has been prepared in accordance with the MassDEP and the town requirements and standard engineering practices. The peak rate of runoff has been estimated for each watershed during the 2, 10, 25, and 100-year storm events.

The proposed stormwater management system for the site consists of catch basins, water quality units, drain manholes, roof drains, underground piping, area drains, infiltration basins, and an underground infiltrations system. These systems have been designed in accordance with the MA DEP Stormwater Management Policy to recharge groundwater and reduce rate of runoff from the parcel.

MASSDEP Stormwater Performance Standards

The MA DEP Stormwater Management Policy was developed to improve water quality by implementing performance standards for stormwater management. The intent is to implement the stormwater management standards through the review of Notice of Intent filings by the issuing authority (Conservation Commission or DEP). The following section outlines how the proposed Stormwater Management System meets the standards set forth by the Policy.

BMP's implemented in the design include –

- Deep Sump Catch Basins
- Subsurface Structures
- Water Quality Units
- Underground Infiltration System
- Infiltration Basins

Stormwater Best Management Practices (BMP's) have been incorporated into the design of the project to mitigate the anticipated pollutant loading. An Operations and Maintenance Plan has been developed for the project, which addresses the long-term maintenance requirements of the proposed system.

Temporary erosion and sedimentation controls will be incorporated into the construction phase of the project. These temporary controls may include straw bale and/or silt fence barriers, inlet sediment traps, slope stabilization, and stabilized construction entrances.

The Massachusetts Department of Environmental Protection has established ten (10) Stormwater Management Standards. A project that meets or exceeds the standards is presumed to satisfy the regulatory requirements regarding stormwater management. The Standards are enumerated below as well as descriptions and supporting calculations as to how the Project will comply with the Standards:

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

   The proposed development will not introduce any new outfalls with direct discharge to a wetland area or waters of the Commonwealth of Massachusetts. All discharges will be treated for water quality and the rate will not be increased over existing conditions.

2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

The proposed development has been designed so that the post-development peak discharge rates do not exceed the predevelopment peak discharge rates. A summary of the existing and proposed discharge rates is included within this document.

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

   The existing annual recharge for the site has been approximated in the proposed condition. There are proposed subsurface infiltration systems designed to meet this requirement. Stormwater runoff generated from the impervious areas of the proposed development are routed through these infiltration BMPs. The proposed Recharge Volume is based on the Static Method per the MA DEP Stormwater Management Standards, Volume 3, Chapter 1.

   See the appendix located at section 6 of this report for stormwater recharge calculations.

4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:*
   - *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
   - *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
   - *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

   Standard #4 is met when structural stormwater best management practices are sized to capture and treat the required water quality volume and pretreatment is provided in accordance with the Massachusetts Stormwater Handbook. Standard

#4 also requires that suitable source control measures are identified in the Long-term Pollution Prevention Plan. The water quality volume for the site redevelopment is captured and treated using underground infiltration systems with isolator rows, water quality units, and drywells.

The implemented BMPs have been designed to treat the contributing water quality volume. These water quality calculations can be seen within the appendix of this report.

The proposed stormwater management system has been designed to remove 80% of the average annual post-construction load for each treatment train. The TSS removal calculations can be seen within the appendix of this report.

The TSS removal efficiencies for the proprietary separator are based on the values assigned under the Technology Acceptance and Reciprocity Partnership (TARP) testing protocol. The TARP is a workgroup of the Environmental Council of States that was originally comprised of California, Illinois, Maryland, Massachusetts, New Jersey, New York, Pennsylvania and Virginia. TARP is recognized in the MA DEP Stormwater Management Handbook as a valid source for assigning TSS removal efficiencies for proprietary separators.

5. *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

   The site is not considered a land use with higher potential pollutant loads.

6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the*

Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The project site does not discharge stormwater within a Zone II or Interim Wellhead Protection Area or near a critical area. Critical Areas are Outstanding Resource Waters as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 314 CMR 9.02 and 310 CMR 10.04, and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

7. *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

   The proposed project is not considered a re-development project under the Stormwater Management Handbook guidelines as there is an increase in the amount of impervious area.

8. *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

   A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction has been developed. A detailed Erosion and Sedimentation Control Plan is included in the Permit Drawings. The proponent will prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) prior to commencement of construction activities that will result in the disturbance of one acre of land or more.

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

   A Long-Term Operation & Maintenance (O&M) Plan has been developed for the proposed stormwater management system and is included within this document. See Section 2.0 of this report.

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

    See appendix for Illicit Discharge Statement

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

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 (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): Underground Infiltration Sytstem (Stormtech MC-720), Infiltration Basins

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

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

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

Checklist (continued)

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.

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

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 (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 (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.

SECTION 2.0 -
OPERATION & MAINTENANCE PLAN

Introduction

In accordance with the standards set forth by the Stormwater Management Policy issued by the Massachusetts Department of Environmental Protection (MassDEP), Allen & Major Associates, Inc. has prepared the following Operations & Maintenance (O&M) Plan for the proposed development at 275 Forest Ridge Road, Concord, MA.

The plan is broken down into three major sections. The first section describes construction-related erosion and sedimentation controls (Demolition & Construction Maintenance Plan). The second section describes the long-term pollution prevention measures (Long Term Pollution Prevention Plan). The third section is a post-construction operation and maintenance plan designed to address the long-term maintenance needs of the stormwater management system (Long-Term Maintenance Plan – Facilities Description).

Notification Procedures for Change of Responsibility for O&M

The Stormwater Management System (SMS) for this project is owned by The Pinebrook Group (owner). The owner shall be legally responsible for the long-term operation and maintenance of this SMS as outlined in this Operation and Maintenance Plan.

The owner shall submit an annual summary report and the completed Operation & Maintenance Schedule & Checklist to the Conservation Commission (via email or print copy), highlighting inspection and maintenance activities including performances of BMPs. Should ownership of the SMS change, the owner will continue to be responsible until the succeeding owner shall notify the Commission that the succeeding owner has assumed such responsibility. Upon subsequent transfers, the responsibility shall continue to be that of transferring owner until the transferee owner notifies the Commission of its assumption of responsibility.

In the event the SMS will serve multiple lots/owners, such as the subdivision of the existing parcel or creation of lease areas, the owner(s) shall establish an association on other legally enforceable arrangements under which the association or a single party shall have legal responsibility for the operation and maintenance of the entire SMS. The legal instrument creating such responsibility shall be recorded with the Registry of Deeds and promptly following its recording, a copy thereof shall be furnished to the Commission.

Contact Information

Stormwater Management System Owner:	The Pinebrook Group 275 Forest Ridge Road Concord, MA Phone: (339) 883-7836

Emergency Contact Information:

BLVD Reading LLC (Owner/Operator)	Phone: (339) 883-7836
Allen & Major Associates, Inc. (Site Civil Engineer)	Phone: (781) 935-6889
Concord Department of Public Works	Phone: (978) 318-3200
Concord Conservation Commission	Phone: (978) 318-3285
Concord Fire Department (non-emergency line)	Phone: (978) 318-3488
MassDEP Emergency Response	Phone: (888) 304-1133
Clean Harbors Inc (24-Hour Line)	Phone: (800) 645-8265

Demolition & Construction Maintenance Plan

1. Call Digsafe: 1-888-344-7233
2. Contact the town at least three (3) days prior to start of demolition and/or construction activities.
3. Install Erosion Control measures as shown on the Plans prepared by A&M. The town shall review the installation of straw bales and silt fencing prior to the start of any site demolition work. Install Construction fencing if determined to be necessary at the commencement of construction.
4. Install construction entrances, straw bales, and silt fence at the locations shown on the Erosion Control Plan prepared by A&M.
5. Site access shall be achieved only from the designated construction entrances.
6. Cut and clear trees in construction areas only (within the limit of work; see plans).
7. Stockpiles of materials subject to erosion shall be stabilized with erosion control matting or temporary seeding whenever practicable, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.
8. Install silt sacks and straw bales around each drain inlet prior to any demolition and or construction activities.

9. All erosion control measures shall be inspected weekly and after every rainfall event. Records of these inspections shall be kept on-site for review.
10. All erosion control measures shall be maintained, repaired, or replaced as required or at the direction of the owner's engineer or the town.
11. Sediment accumulation up-gradient of the straw bales, silt fence, and stone check dams greater than 6" in depth shall be removed and disposed of in accordance with all applicable regulations.
12. If it appears that sediment is exiting the site, silt sacks shall be installed in all catch basins adjacent to the site. Sediment accumulation on all adjacent catch basin inlets shall be removed and the silt sack replaced if torn or damaged.
13. Install stone check dams on-site during construction as needed. Refer to the erosion control details. Temporary sediment basins combined with stone check damns shall be installed on-site during construction to control and collect runoff from upland areas of this site during demolition and construction activities.
14. The contractor shall comply with the Sedimentation and Erosion Control Notes as shown on the Site Development Plans and Specifications.
15. The stabilized construction entrances shall be inspected weekly and records of inspections kept. The entrances shall be maintained by adding additional clean, angular, durable stone to remove the soil from the construction vehicle's tires when exiting the site. If soil is still leaving the site via the construction vehicle tires, adjacent roadways shall be kept clean by street sweeping.
16. Dust pollution shall be controlled using on-site water trucks and/or an approved soil stabilization product.
17. During demolition and construction activities, Status Reports on compliance with this O&M Document shall be submitted weekly. The report shall document any deficiencies and corrective actions taken by the applicant.

Long-Term Pollution Prevention Plan

Standard #4 from the MassDEP Stormwater Management Handbook requires that a Long-Term Pollution Prevention Plan (LTPPP) be prepared and incorporated as part of the Operation and Maintenance Plan of the Stormwater Management System. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges, and to describe the implementation of practices to reduce the pollutants in stormwater discharges. The following items describe the source control and proper procedures of the LTPPP.

- Housekeeping
  The existing development has been designed to maintain a high level of water quality treatment for all stormwater discharge to the wetland areas. An Operation and Maintenance (O&M) plan has been prepared and is included in this section of the report. The owner (or its designee) is responsible for adherence to the O&M plan in a strict and complete manner.

- Storing of Materials & Water Products
  The trash and waste program for the site includes exterior dumpsters. There is a trash contractor used to pick up the waste material in the dumpsters. The stormwater drainage system has water quality inlets designed to capture trash and debris.

- Vehicle Washing
  Outdoor vehicle washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions, as the detergent-rich water used to wash the grime off the vehicle enters the stormwater drainage system. The existing development does not include any designated vehicle washing areas, nor is it expected that any vehicle washing will take place on-site.

- Spill Prevention & Response
  Sources of potential spill hazards include vehicle fluids, liquid fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the buildings and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids or liquid fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:

  1. Spill hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
  2. Vehicle fluids and liquid fuel spill shall be remediated according to the local and state regulations governing fuel spills.
  3. The owner shall have the following equipment and materials on hand to address a spill clean-up: brooms, dust pans, mops, rags, gloves, absorptive material, sand, sawdust, plastic and metal trash containers.
  4. All spills shall be cleaned up immediately after discovery.
  5. Spills of toxic or hazardous material shall be reported, regardless of size, to the Massachusetts Department of Environmental Protection at (888) 304-1333.

6. Should a spill occur, the pollution prevention plan will be adjusted to include measures to prevent another spill of a similar nature. A description of the spill, along with the causes and cleanup measures will be included in the updated pollution prevention plan.

- Maintenance of Lawns, Gardens, and Other Landscaped Areas
  It should be recognized that this is a general guideline towards achieving high quality and well-groomed landscaped areas. The grounds staff/landscape contractor must recognize the shortcomings of a general maintenance plan such as this, and modify and/or augment it based on weekly, monthly, and yearly observations. In order to assure the highest quality conditions, the staff must also recognize and appreciate the need to be aware of the constantly changing conditions of the landscaping and be able to respond to them on a proactive basis. No trees shall be planted over the drain lines or recharge area, and that only shallow rooted plants and shrubs will be allowed.

  - Fertilizer
    Maintenance practices should be aimed at reducing environmental, mechanical and pest stresses to promote healthy and vigorous growth. When necessary, pest outbreaks should be treated with the most sensitive control measure available. Synthetic chemical controls should be used only as a last resort to organic and biological control methods. Fertilizer, synthetic chemical controls and pest management applications (when necessary) shall be performed only by licensed applicators in accordance with the manufacturer's label instructions when environmental conditions are conducive to controlled product application.

    Only slow-release organic fertilizers should be used in the planting and mulch areas to limit the amount of nutrients that could enter downstream resource areas. Fertilization of the planting and mulch areas will be performed within manufacturers labeling instructions and shall not exceed an NPK ration of 1:1:1 (i.e. Triple 10 fertilizer mix), considered a low nitrogen mixture. Fertilizers approved for the use under this O&M Plan are as follows:

Type:	LESCO® 28-0-12 (Lawn Fertilizer)
	MERIT® 0.2 Plus Turf Fertilizer
	MOMENTUM™ Force Weed & Feed

  - Suggested Aeration Program
    In-season aeration of lawn areas is good cultural practice, and is recommended whenever feasible. It should be accomplished with a solid thin tine aeration method to reduce disruption to the use of the area. The

depth of solid tine aeration is similar to core type, but should be performed when the soil is somewhat drier for a greater overall effect.

Depending on the intensity of use, it can be expected that all landscaped lawn areas will need aeration to reduce compaction at least once per year. The first operation should occur in late May following the spring season. Methods of reducing compaction will vary based on the nature of the compaction. Compaction on newly established landscaped areas is generally limited to the top 2-3" and can be alleviated using hollow core or thin tine aeration methods.

The spring aeration should consist of two passes at opposite directions with 1/4" hollow core tines penetrating 3-5" into the soil profile. Aeration should occur when the soil is moist but not saturated. The soil cores should be shattered in place and dragged or swept back into the turf to control thatch. If desired the cores may also be removed and the area top-dressed with sand or sandy loam. If the area drains on average too slowly, the topdressing should contain a higher percentage of sand. If it is draining on average too quickly, the top dressing should contain a higher percentage of soil and organic matter.

- Landscape Maintenance Program Practices:
  - Lawn
    1. Mow a minimum of once a week in spring, to a height of 2" to 2 1/2" high. Mowing should be frequent enough so that no more than 1/3 of grass blade is removed at each mowing. The top growth supports the roots; the shorter the grass is cute, the less the roots will grow. Short cutting also dries out the soil and encourages weeds to germinate.
    2. Mow approximately once every two weeks from July 1st to August 15th depending on lawn growth.
    3. Mow on a ten-day cycle in fall, when growth is stimulated by cooler nights and increased moisture.
    4. Do not remove grass clippings after mowing.
    5. Keep mower blades sharp to prevent ragged cuts on grass leaves, which cause a brownish appearance and increase the chance for disease to enter a leaf.
  - Shrubs
    1. Mulch not more than 3" depth with shredded pine or fir bark.

2. Hand prune annually, immediately after blooming, to remove 1/3 of the above-ground biomass (older stems). Stem removals are to occur within 6" of the ground to open up shrub and maintain two-year wood (the blooming wood).
3. Hand-prune evergreen shrubs only as needed to remove dead and damaged wood and to maintain the naturalistic form of the shrub. Never mechanically shear evergreen shrubs.

- <u>Trees</u>

1. Provide aftercare of new tree plantings for the first three years.
2. Do not fertilize trees, it artificially stimulates them (unless tree health warrants).
3. Water once a week for the first year; twice a month for the second; once a month for the third year.
4. Prune trees on a four-year cycle.

- <u>Invasive Species</u>

1. Inform the Conservation Commission Agent prior to the removal of invasive species proposed either through hand work or through chemical removal.

- <u>Storage and Use of Herbicides and Pesticides</u>

  Integrated Pest Management is the combination of all methods (of pest control) which may prevent, reduce, suppress, eliminate, or repel an insect population. The main requirements necessary to support any pest population are food, shelter and water, and any upset of the balance of these will assist in controlling a pest population. Scientific pest management is the knowledgeable use of all pest control methods (sanitation, mechanical, chemical) to benefit mankind's health, welfare, comfort, property and food. A Pest Management Professional (PMP) should be retained who is licensed with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Department of Agricultural Resources.

  The site manager will be provided with approved bulletin before entering into or renewing an agreement to apply pesticides for the control of indoor household or structural pests, refer to 333 CMR 13.08.

  Before beginning each application, the applicator must post a Department approved notice on all of the entrances to the treated room or area. The applicator must leave such notices posted after the application. The notice will be posted at conspicuous point(s) of access to the area treated. The location and number of signs will be determined by the configuration of the area to be treated based on the applicator's best judgment. It is intended to give sufficient notice so that no one comes into an area being treated unaware that the applicator is working and pesticides are being applied. However, if the contracting entity does not want the signs posted, he/she may sign a Department approved waiver indicating this.

The applicator or employer will provide to any person upon their request the following information on previously conducted applications:

1. Name and phone number of pest control company;
2. Date and time of the application;
3. Name and license number of the applicator;
4. Target pests; and
5. Name and EPA Registration Number of pesticide products applied.

- Pet Waste Management
  The owner's landscape crew (or designee) shall remove any obvious pet waste that has been left behind by pet owners within the development. The pet waste shall be disposed of in accordance with local and state regulations.
- Operations and Management of Septic Systems
  There are no proposed septic systems within the limits of the project.
- Management of Deicing Chemicals and Snow
  Snow will be stockpiled on site until the accumulated snow becomes a hazard to the daily operations of the site. It will be the responsibility of the snow removal contractor to properly dispose of transported snow according to MassDEP, Bureau of Resource Protection – Snow Disposal Guideline #BRPG01-01, governing the proper disposal of snow. It will be the responsibility of the snow removal contractor to follow these guidelines and all applicable laws and regulations

  The owner's maintenance staff (or its designee) will be responsible for the clearing of the sidewalk and building entrances. The owner may be required to use a de-icing agent such as potassium chloride to maintain a safe walking surface. If used, the de-icing agent for the walkways and building entrances will be kept within the storage rooms located within the building. If used, de-icing agents will not be stored outside. The owner's maintenance staff will limit the application of sand.

Long-Term Maintenance Plan – Facilities Description

A maintenance log will be kept (i.e. report) summarizing inspections, maintenance, and any corrective actions taken. The log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. The log will be made accessible to department staff and a copy provided to the department upon request.

The following is a description of the Stormwater Management System for the project site.

Stormwater Collection System – On-Site:

The stormwater collection system is a series of inlets located at low points within the limits of the paved area. All of the proposed on-site catch basins incorporate a deep sump and hooded outlet. The catch basins are connected by a closed gravity pipe network that pass through proprietary separators prior to entering the underground detention chamber or porous pavement.

Other Maintenance Activity:

- Mosquito Control - Both above ground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance, and treatment with larvicides can minimize this potential. See the supplemental information for Mosquito Control in Stormwater Management Practices, and the Operation and Maintenance Plan Schedule for inspection schedule.
- Street Sweeping - Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

Inspection and Maintenance Frequency and Corrective Measures

In accordance with MA DEP Stormwater Handbook: Volume 2, Chapter 2; the previously described BMPs will be inspected and the identified deficiencies will be corrected. Clean-out must include the removal and legal disposal of any accumulated sediments, trash, and debris. In any and all cases, operations, inspections, and maintenance activities shall utilize best practical measures to avoid and minimize impacts to wetland resource areas outside the footprint of the SMS.

Supplemental Information

- Operation & Maintenance Plan Schedule
- Massachusetts Stormwater Handbook, Chapter 5, Miscellaneous Stormwater Topics, Mosquito Control in Stormwater Management Practices.
- Massachusetts Department of Environmental Protection Bureau of Water Resources Snow Disposal Guidance.
- Stormtech Isolator ROW O&M Manual

OPERATION AND MAINTENANCE PLAN SCHEDULE

Date: 12/20/2023

ALLEN & MAJOR ASSOCIATES, INC.

Project: Due Diligence / Conceptual Design
Project Address: 275 Forest Ridge Road, Concord, MA
Responsible for O&M Plan: The Pinebrook Group
Address: 275 Forest Ridge Road, Concord, MA 01742
Phone: (339) 883-7836

BMP CATEGORY	BMP OR MAINTENANCE ACTIVITY	SCHEDULE/ FREQUENCY	NOTES	ESTIMATED ANNUAL MAINTENANCE COST	INSPECTION PERFORMED	
					DATE:	BY:
STRUCTURAL PRETREATMENT BMPs	DEEP SUMP CATCH BASIN	Four times per year (quarterly).	Inspect and clean catch basin units whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.	$1,000		
	PROPRIETARY SEPARATORS	In accordance with manufacturers requirements, but no less than twice a year following installation and once a year thereafter.	Remove sediment and other trapped pollutants at frequency or level specified by manufacturer.	$2,000		

All information within table is derived from Massachussetts Stormwater Handbook: Volume 2, Chapter 2

BMP CATEGORY	BMP OR MAINTENANCE ACTIVITY	SCHEDULE/ FREQUENCY	NOTES	ESTIMATED ANNUAL MAINTENANCE COST	INSPECTION PERFORMED	
					DATE:	BY:
INFILTRATION BMPs	**DRY WELL**	Inspect after every major storm in the first few months following construction. Thereafter, inspect annually.	Inspect dry wells. Measure the water depth in the observation well at 24- and 48-hour intervals after a storm. Calculate clearance rates by dividing the drop in water level (inches) by the time elapsed (hr.).	$500		
	SUBSURFACE STRUCTURES	Inspect structure inlets at least twice a year. Remove debris that may clog the system as needed.	Because subsurface structures are installed underground, they are extremely difficult to maintain. Remove any debris that might clog the system.	$500		
	OUTLET STRUCTURES	Periodic cleaning of Outlet Control Structures as needed.	Clear trash and debris as necessary.	$500		
	INFILTRATION BASIN	Inspect after every major storm during first 3 months of operation and twice a year thereafter. Clean pretreatment devices twice a year and after every major storm.	Inspect to ensure proper functioning. Mow the buffer area, side slopes, and basin bottom if grassed floor; rake if stone bottom; remove trash and debris; remove grass clippings and accumulated organic matter. Inspect and clean pretreatment devices.	$1,500		

All information within table is derived from Massachussetts Stormwater Handbook: Volume 2, Chapter 2

BMP CATEGORY	BMP OR MAINTENANCE ACTIVITY	SCHEDULE/ FREQUENCY	NOTES	ESTIMATED ANNUAL MAINTENANCE COST	INSPECTION PERFORMED	
					DATE:	BY:
OTHER MAINTENANCE ACTIVITY	**MISQUITO CONTROL**	Inspect BMPs as needed to ensure the system's drainage time is less than the maximum 72 hour period.	Massachusetts stormwater handbook requires all stormwater practices that are designed to drain do so within 72 hours to reduce the number of mosquitos that mature to adults since the aquatic stage of a mosquito is 7-10 days.	$100		
	SNOW STORAGE	Clear and remove snow to approved storage locations as necessary to ensure systems are working properly and are protected from meltwater pollutants.	Carefully select snow disposal sites before winter. Avoid dumping removed snow over catch basins, or in detention ponds, sediment forebays, rivers, wetlands, and flood plains. It is also prohibited to dump snow in the bioretention basins or gravel swales.	$500		
	STREET SWEEPING	Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably spring.	Sweep, power broom or vacuum paved areas. Submit information that confirms that all street sweepings have been completed in accordance with state and local requirements	$2,000		

All information within table is derived from Massachussetts Stormwater Handbook: Volume 2, Chapter 2

Chapter 5
Miscellaneous Stormwater Topics

Mosquito Control in Stormwater Management Practices

Both aboveground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance and treatment with larvicides can minimize this potential.

EPA recommends that stormwater treatment practices dewater within 3 days (72 hours) to reduce the number of mosquitoes that mature to adults, since the aquatic stage of many mosquito species is 7 to 10 days. Massachusetts has had a 72-hour dewatering rule in its Stormwater Management Standards since 1996. The 2008 technical specifications for BMPs set forth in Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook also concur with this practice by requiring that all stormwater practices designed to drain do so within 72 hours.

Some stormwater practices are designed to include permanent wet pools. These practices – if maintained properly – can limit mosquito breeding by providing habitat for mosquito predators. Additional measures that can be taken to reduce mosquito populations include increasing water circulation, attracting mosquito predators by adding suitable habitat, and applying larvicides.

The Massachusetts State Reclamation and Mosquito Control Board (SRMCB), through the Massachusetts Mosquito Control Districts, can undertake further mosquito control actions specifically for the purpose of mosquito control pursuant to Massachusetts General Law Chapter 252. The Mosquito Control Board, http://www.mass.gov/agr/mosquito/, describes mosquito control methods and is in the process of developing guidance documents that describe Best Management Practices for mosquito control projects.

The SRMCB and Mosquito Control Districts are not responsible for operating and maintaining stormwater BMPs to reduce mosquito populations. The owners of property that construct the stormwater BMPs or municipalities that "accept" them through local subdivision approval are responsible for their maintenance.[1] The SRMCB is composed of officials from MassDEP, Department of Agricultural Resources, and Department of Conservation and Recreation. The nine (9) Mosquito Control Districts overseen by the SRMCB are located throughout Massachusetts, covering 176 municipalities.

Construction Period Best Management Practices for Mosquito Control

To minimize mosquito breeding during construction, it is essential that the following actions be taken to minimize the creation of standing pools by taking the following actions:

- ***Minimize Land Disturbance:*** Minimizing land disturbance reduces the likelihood of mosquito breeding by reducing silt in runoff that will cause construction period controls to clog and retain standing pools of water for more than 72 hours.
- ***Catch Basin inlets:*** Inspect and refresh filter fabric, hay bales, filter socks or stone dams on a regular basis to ensure that any stormwater ponded at the inlet drains within 8 hours after precipitation stops. Shorter periods may be necessary to avoid hydroplaning in roads

[1] MassDEP and MassHighway understand that the numerous stormwater BMPs along state highways pose a unique challenge. To address this challenge, the 2004 MassHighway Stormwater Handbook will provide additional information on appropriate operation and maintenance practices for mosquito control when the Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards..

caused by water ponded at the catch basin inlet. Treat catch basin sumps with larvicides such as *Bacillus sphaericus* (*Bs*) using a licensed pesticide applicator.

- ***Check Dams:*** If temporary check dams are used during the construction period to lag peak rate of runoff or pond runoff for exfiltration, inspect and repair the check dams on a regular basis to ensure that any stormwater ponded behind the check dam drains within 72 hours.
- ***Design construction period sediment traps*** to dewater within 72 hours after precipitation. Because these traps are subject to high silt loads and tend to clog, treat them with the larvicide *Bs* after it rains from June through October, until the first frost occurs.
- ***Construction period open conveyances:*** When temporary manmade ditches are used for channelizing construction period runoff, inspect them on a regular basis to remove any accumulated sediment to restore flow capacity to the temporary ditch.
- ***Revegetating Disturbed Surfaces:*** Revegetating disturbed surfaces reduces sediment in runoff that will cause construction period controls to clog and retain standing pools of water for greater than 72 hours.
- ***Sediment fences/hay bale barriers:*** When inspections find standing pools of water beyond the 24-hour period after a storm, take action to restore barrier to its normal function.

<u>Post-Construction Stormwater Treatment Practices</u>

- Mosquito control begins with the environmentally sensitive site design. Environmentally sensitive site design that minimizes impervious surfaces reduces the amount of stormwater runoff. Disconnecting runoff using the LID Site Design credits outlined in the Massachusetts Stormwater Handbook reduces the amount of stormwater that must be conveyed to a treatment practice. Utilizing green roofs minimizes runoff from smaller storms. Storage media must be designed to dewater within 72 hours after precipitation.
- Mosquito control continues with the selection of structural stormwater BMPs that are unlikely to become breeding grounds for mosquitoes, such as:
    - ***Bioretention Areas/Rain Gardens/Sand Filter:*** These practices tend not to result in mosquito breeding. If any level spreaders, weirs or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
    - ***Infiltration Trenches:*** This practice tends not to result in mosquito breeding. If any level spreaders, weirs, or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
- Another mosquito control strategy is to select BMPs that can become habitats for mosquito predators, such as:
    - ***Constructed Stormwater Wetlands:*** Habitat features can be incorporated in constructed stormwater wetlands to attract dragonflies, amphibians, turtles, birds, bats, and other natural predators of mosquitoes.
    - ***Wet Basins:*** Wet basins can be designed to incorporate fish habitat features, such as deep pools. Introduce fish in consultation with Massachusetts Division of Fisheries and Wildlife. Vegetation within wet basins designed as fish habitat must be properly managed to ensure that vegetation does not overtake the habitat. Proper design to ensure that no low circulation or "dead" zones are created may reduce the potential for mosquito breeding. Introducing bubblers may increase water circulation in the wet basin.

Effective mosquito controls require proponents to design structural BMPs to prevent ponding and facilitate maintenance and, if necessary, the application of larvicides. Examples of such design practices include the following:

- ***Basins:*** Provide perimeter access around wet basins, extended dry detention basins and dry detention basins for both larviciding and routine maintenance. Control vegetation to ensure that access pathways stay open.
- ***BMPs without a permanent pool of water:*** All structural BMPs that do not rely on a permanent pool of water must drain and completely dewater within 72 hours after precipitation. This includes dry detention basins, extended dry detention basins, infiltration basins, and dry water quality swales. Use underdrains at extended dry detention basins to drain the small pools that form due to accumulation of silts. Wallace indicates that extended dry extended detention basins may breed more mosquitoes than wet basins. It is, therefore, imperative to design outlets from extended dry detention basins to completely dewater within the 72-hour period.
- ***Energy Dissipators and Flow Spreaders:*** Currier and Moeller, 2000 indicate that shallow recesses in energy dissipators and flow spreaders trap water where mosquitoes breed. Set the riprap in grout to reduce the shallow recesses and minimize mosquito breeding.
- ***Outlet control structures:*** Debris trapped in small orifices or on trash racks of outlet control structures such as multiple stage outlet risers may clog the orifices or the trash rack, causing a standing pool of water. Optimize the orifice size or trash rack mesh size to provide required peak rate attenuation/water quality detention/retention time while minimizing clogging.
- ***Rain Barrels and Cisterns:*** Seal lids to reduce the likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over inlets. The cistern system should be designed to ensure that all collected water is drained into it within 72 hours.
- ***Subsurface Structures, Deep Sump Catch Basins, Oil Grit Separators, and Leaching Catch Basins:*** Seal all manhole covers to reduce likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over the outlet (CALTRANS 2004).

The Operation and Maintenance Plan should provide for mosquito prevention and control.

- ***Check dams:*** Inspect permanent check dams on the schedule set forth in the O&M Plan. Inspect check dams 72 hours after storms for standing water ponding behind the dam. Take corrective action if standing water is found.
- ***Cisterns:*** Apply *Bs* larvicide in the cistern if any evidence of mosquitoes is found. The Operation and Maintenance Plan shall specify how often larvicides should be applied to waters in the cistern.
- ***Water quality swales:*** Remove and properly dispose of any accumulated sediment as scheduled in the Operation and Maintenance Plan.
- ***Larvicide Treatment:*** The Operation and Maintenance Plan must include measures to minimize mosquito breeding, including larviciding.
- The party identified in the Operation and Maintenance Plan as responsible for maintenance shall see that larvicides are applied as necessary to the following stormwater treatment practices: catch basins, oil/grit separators, wet basins, wet water quality swales, dry extended detention basins, infiltration basins, and constructed stormwater wetlands. The Operation and Maintenance Plan must ensure that all larvicides are applied by a licensed pesticide applicator and in compliance with all pesticide label requirements.
- The Operation and Maintenance Plan should identify the appropriate larvicide and the time and method of application. For example, *Bacillus sphaericus (Bs*), the preferred

larvicide for stormwater BMPs, should be hand-broadcast.[2] Alternatively, Altosid, a Methopren product, may be used. Because some practices are designed to dewater between storms, such as dry extended detention and infiltration basins, the Operation and Maintenance Plan should provide that larviciding must be conducted during or immediately after wet weather, when the detention or infiltration basin has a standing pool of water, unless a product is used that can withstand extended dry periods.

REFERENCES

California Department of Transportation, 2004, BMP Retrofit Pilot Program, Final Report, Report ID CTSW – RT – 1 – 050, http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/new_technology/CTSW-RT-01-050.pdf#xml=http://dap1.dot.ca.gov/cgi-bin/texis/webinator/search/pdfhi.txt?query=mosquito&db=db&pr=www&prox=page&rorder=500&rprox=500&rdfreq=500&rwfreq=500&rlead=500&sufs=0&order=r&cq=&id=4673373b7
Appendix E: Vector Monitoring and Abatement, http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/new_technology/
California Department of Transportation, 2001, Final Vector Report, Caltrans BMP Retrofit Project Sites, Districts 7 and 11, http://www.dot.ca.gov/hq/env/stormwater/special/newsetup/_pdfs/new_technology/CTSW-RT-01-050/AppendixE/01_FinalVectorReport.pdf
Currier, Brian, and Moeller, 2000, Glenn, Lessons Learned: The CALTRANS Storm Water Best Management Practice Retrofit Pilot Study, prepared by the California State University Sacramento and University of California Davis for the California Department of Transportation, http://www.owp.csus.edu/research/papers/papers/PP015.pdf
Massachusetts Department of Environmental Protection, 2001, West Nile Virus, Application of Pesticides to Wetland Resource Areas and Buffer Zones and Public Water systems, Guideline No. BRPG01-02, http://www.mass.gov/dep/water/wnvpolcy.doc
O'Meara, G.F., 2003, Mosquitoes Associated With Stormwater Detention/Retention Areas, ENY627, University of Florida, Institute of Food and Agricultural Sciences Extension, http://edis.ifas.ufl.edu/mg338
Taylor, Scott M., and Currier, Brian, 1999, A Wet Pond as a Storm Water Runoff BMP – Case Study, presented at Department of Environmental Resources Engineering, Humboldt State University, Arcata, California http://www.owp.csus.edu/research/papers/papers/PP004.pdf
U.S. EPA, 2005, Stormwater Structures and Mosquitoes, EPA 833-F-05-003, http://www.epa.gov/npdes/pubs/sw_wnv.pdf
U.S. EPA, 2003, Do Stormwater Retention Ponds Contribute to Mosquito Problems, Nonpoint source News-Notes, Issue No. 71, http://notes.tetratech-ffx.com/newsnotes.nsf/0/143f7fa99c3ea25485256d0100618bc9?OpenDocument
Virginia Department of Conservation and Recreation, 2003, Vector Control, Mosquitoes and Stormwater Management, Stormwater Management Technical Bulletin No. 8, http://www.dcr.virginia.gov/soil_&_water/documents/tecbltn8.pdf
Wallace, John R., Stormwater Management and Mosquito Ecology, Stormwater Magazine, March/April 2007, http://www.gradingandexcavation.com/sw_0703_management.html

[2] *Bacillus thuringienis israelensis* or *Bti* is usually applied by helicopter to wetlands and floodplains

Roads and Stormwater BMPs

In general, the stormwater BMPs used for land development projects can also be used for new roadways and roadway improvement projects. However, for improvement of existing roads, there are often constraints that limit the choice of BMP. These constraints derive from the linear configuration of the road, the limited area within the existing right-of-way, the structural and safety requirements attendant to good roadway design, and the long-term maintainability of the roadway drainage systems. The MassHighway Handbook provides strategies for dealing with the constraints associated with providing stormwater BMPs for roadway redevelopment projects.

Roadway design can minimize impacts caused by stormwater. Reducing roadway width reduces the total and peak volume of runoff. Designing a road with country drainage (no road shoulders or curbs) disconnects roadway runoff. Disconnection of roadway runoff is eligible for the Low Impact Site Design Credit provided the drainage is disconnected in accordance with specifications outlined in Volume 3.

Like other parties, municipalities that work within wetlands jurisdictional areas and adjacent buffer zones must design and implement structural stormwater best management practices in accordance with the Stormwater Management Standards and the Stormwater Management Handbook. In addition, in municipalities and areas where state agencies operate stormwater systems, the DPWs (or other town or state agencies) must meet the "good housekeeping" requirement of the municipality's or agency's MS4 permit.

MassHighway has taken stormwater management one step further by working with MassDEP to develop the MassHighway Storm Water Handbook for Highways and Bridges. The purpose of the MassHighway Handbook is to provide guidance for persons involved in the design, permitting, review and implementation of state highway projects, especially those involving existing roadways where physical constraints often limit the stormwater management options available. These constraints, like those common to redevelopment sites, may make it difficult to comply precisely with the requirements of the Stormwater Management Standards and the Massachusetts Stormwater Handbook.[3] In response to these constraints, MassDEP and MHD developed specific design, permitting, review and implementation practices that meet the unique challenges of providing environmental protection for existing state roads. The information in the MassHighway Handbook may also aid in the planning and design of projects to build new highways and to add lanes to existing highways, since they may face similar difficulties in meeting the requirements of the Stormwater Management Standards.

Although it is very useful, the MassHighway Handbook does not allow MassHighway projects to proceed without individual review and approval by the issuing authority when subject to the Wetlands Protection Act Regulations, 310 CMR 10.00, or the 401 Water Quality Certification Regulations, 314 CMR 9.00. For example, MassHighway must provide a Conservation Commission with a project-specific Operation and Maintenance Plan in accordance with Standard 9 that documents how the project's post-construction BMPs will be operated and maintained.[4]

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[3] The 2004 MassHighway Handbook outlines standardized methods for dealing with these constraints as they apply to highway redevelopment projects. MassDEP and MassHighway intend to work together to provide guidance for add a lane projects when the 2004 Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards.

[4] The general permit for municipal separate storm sewer systems (the MS4 Permit) requires MassHighway to develop and implement procedures for the proper operation and maintenance of stormwater BMPs. To

Some municipalities have asked if the MassHighway Handbook governs municipal road projects. The answer is no.[5] The MassHighway Handbook was developed in response to the unique problems and challenges arising out of the management of the state highway system. Like other project proponents, cities and towns planning road or other projects in areas subject to jurisdiction under the Wetlands Protection Act must design and implement LID, non-structural and structural best management practices in accordance with the Stormwater Management Standards and the Massachusetts Stormwater Handbook.

avoid duplication of effort, MassHighway may be able rely on the same procedures to fulfill the operation and maintenance requirements of Standard 9 and the MS 4 Permit.

[5] Although the MassHighway Handbook does not govern municipal road projects, cities and towns may find some of the information presented in the Handbook useful.

Massachusetts Department of Environmental Protection
Bureau of Water Resources
Snow Disposal Guidance

Effective Date: December 23, 2019

Applicability: Applies to all federal, state, regional and local agencies, as well as to private businesses.

Supersedes: Bureau of Resource Protection (BRP) Snow Disposal Guideline No. BRPG97-1 issued December 12, 1997 and BRPG01-01 issued March 8, 2001; Bureau of Water Resources (BWR) snow disposal guidance issued December 21, 2015 and December 12, 2018.

Approved by: Kathleen Baskin, Assistant Commissioner, Bureau of Water Resources

PURPOSE: To provide guidelines to all government agencies and private businesses regarding snow disposal site selection, site preparation and maintenance, and emergency snow disposal options that are protective of wetlands, drinking water, and water bodies, and are acceptable to the Massachusetts Department of Environmental Protection (MassDEP), Bureau of Water Resources.

APPLICABILITY: These Guidelines are issued by MassDEP's Bureau of Water Resources on behalf of all Bureau Programs (including Drinking Water Supply, Wetlands and Waterways, Wastewater Management, and Watershed Planning and Permitting). They apply to all federal agencies, state agencies, state authorities, municipal agencies and private businesses disposing of snow in the Commonwealth of Massachusetts.

INTRODUCTION

Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. While MassDEP is aware of the threats to public safety caused by snow, collected snow that is contaminated with road salt, sand, litter, and automotive pollutants such as oil also threatens public health and the environment.

As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and are toxic to aquatic life at certain levels. Sand washed into waterbodies can create sand bars or fill in wetlands and ponds, impacting aquatic life, causing flooding, and affecting our use of these resources.

There are several steps that communities can take to minimize the impacts of snow disposal on public health and the environment. These steps will help communities avoid the costs of a contaminated water supply, degraded waterbodies, and flooding. Everything that occurs on the land has the potential to impact the Commonwealth's water resources. Given the authority of local government over the use of the land, municipal officials and staff have a critically important role to play in protecting our water resources.

The purpose of these guidelines is to help federal agencies, state agencies, state authorities, municipalities and businesses select, prepare, and maintain appropriate snow disposal sites before the snow begins to accumulate through the winter. Following these guidelines and obtaining the necessary approvals may also help municipalities in cases when seeking reimbursement for snow disposal costs from the Federal Emergency Management Agency is possible.

RECOMMENDED GUIDELINES

These snow disposal guidelines address: (1) site selection; (2) site preparation and maintenance; and (3) emergency snow disposal.

1. SITE SELECTION

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas or upland locations on impervious surfaces away from water resources and drinking water wells. At these locations, the snow meltwater can filter into the soil, leaving behind sand and debris which can be removed in the spring. The following conditions should be followed:

- Within water supply Zone A and Zone II, avoid storage or disposal of snow and ice containing deicing chemicals that has been collected from streets located outside these zones. Municipalities may have a water supply protection land use control that prohibits the disposal of snow and ice containing deicing chemicals from outside the Zone A and Zone II, subject to the Massachusetts Drinking Water Regulations at 310 CMR 22.20C and 310 CMR 22.21(2).
- Avoid storage or disposal of snow or ice in Interim Wellhead Protection Areas (IWPA) of public water supply wells, and within 75 feet of a private well, where road salt may contaminate water supplies.
- Avoid dumping snow into any waterbody, including rivers, the ocean, reservoirs, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid dumping snow on MassDEP-designated high and medium-yield aquifers where it may contaminate groundwater.
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater, and in gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.

- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage systems including detention basins, swales or ditches. Snow combined with sand and debris may block a stormwater drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

Recommended Site Selection Procedures

It is important that the municipal Department of Public Works or Highway Department, Conservation Commission, and Board of Health work together to select appropriate snow disposal sites. The following steps should be taken:

- Estimate how much snow disposal capacity may be needed for the season so that an adequate number of disposal sites can be selected and prepared.
- Identify sites that could potentially be used for snow disposal, such as municipal open space (e.g., parking lots or parks).
- Select sites located in upland locations that are not likely to impact sensitive environmental resources first.
- If more storage space is still needed, prioritize the sites with the least environmental impact (using the site selection criteria, and local or MassGIS maps as a guide).

Snow Disposal Mapping Assistance

MassDEP has an online mapping tool to assist in identifying possible locations to potentially dispose of snow. MassDEP encourages municipalities to use this tool to identify possible snow disposal options. The tool identifies wetland resource areas, public drinking water supplies and other sensitive locations where snow should not be disposed. The tool may be accessed through the Internet at the following web address:
https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/.

2. SITE PREPARATION AND MAINTENANCE

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- Wherever possible maintain a 50-foot vegetated buffer between the disposal site and adjacent waterbodies to filter pollutants from the meltwater.
- Clear debris from the site prior to using the site for snow disposal.
- Clear debris from the site and properly dispose of it at the end of the snow season, and no later than May 15.

3. SNOW DISPOSAL APPROVALS

Proper snow disposal may be undertaken through one of the following approval procedures:

- Routine snow disposal – Minimal, if any, administrative review is required in these cases when upland and pervious snow disposal locations or upland locations on impervious surfaces that have functioning and maintained stormwater management systems have been identified, mapped, and used for snow disposal following ordinary snowfalls. Use of upland and pervious snow disposal sites avoids wetland resource areas and allows snow meltwater to recharge groundwater and will help filter pollutants, sand, and other debris. This process will address the majority of snow removal efforts until an entity exhausts all available upland snow disposal sites. The location and mapping of snow disposal sites will help facilitate each entity's routine snow management efforts.
- Emergency Certifications – If an entity demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions may issue an Emergency Certification under the Massachusetts Wetlands Protection regulations to authorize snow disposal in buffer zones to wetlands, certain open water areas, and certain wetland resource areas (i.e. within flood plains). Emergency Certifications can only be issued at the request of a public agency or by order of a public agency for the protection of the health or safety of citizens, and are limited to those activities necessary to abate the emergency. See 310 CMR 10.06(1)-(4). Use the following guidelines in these emergency situations:
    - Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming.
    - Do not dispose of snow in salt marshes, vegetated wetlands, certified vernal pools, shellfish beds, mudflats, drinking water reservoirs and their tributaries, Zone IIs or IWPAs of public water supply wells, Outstanding Resource Waters, or Areas of Critical Environmental Concern.
    - Do not dispose of snow where trucks may cause shoreline damage or erosion.
    - Consult with the municipal Conservation Commission to ensure that snow disposal in open water complies with local ordinances and bylaws.

- Severe Weather Emergency Declarations – In the event of a large-scale severe weather event, MassDEP may issue a broader Emergency Declaration under the Wetlands Protection Act which allows federal agencies, state agencies, state authorities, municipalities, and businesses greater flexibility in snow disposal practices. Emergency Declarations typically authorize greater snow disposal options while protecting especially sensitive resources such as public drinking water supplies, vernal pools, land containing shellfish, FEMA designated floodways, coastal dunes, and salt marsh. In the event of severe winter storm emergencies, the snow disposal site maps created by municipalities will enable MassDEP and the Massachusetts Emergency Management Agency (MEMA) in helping communities identify appropriate snow disposal locations.

  If upland disposal sites have been exhausted, the Emergency Declaration issued by MassDEP allows for snow disposal near water bodies. In these situations, a buffer of at least 50 feet, preferably vegetated, should still be maintained between the site and the waterbody. Furthermore, it is essential that the other guidelines for preparing and maintaining snow disposal sites be followed to minimize the threat to adjacent waterbodies.

Under extraordinary conditions, when all land-based snow disposal options are exhausted, the Emergency Declaration issued by MassDEP may allow disposal of snow in certain waterbodies under certain conditions. ***A federal agency, state agency, state authority, municipality or business seeking to dispose of snow in a waterbody should take the following steps***:

- Call the emergency contact phone number [(888) 304-1133)] and notify the MEMA of the municipality's intent.
- MEMA will ask for some information about where the requested disposal will take place.
- MEMA will confirm that the disposal is consistent with MassDEP's Severe Weather Emergency Declaration and these guidelines and is therefore approved.

During declared statewide snow emergency events, MassDEP's website will also highlight the emergency contact phone number [(888) 304-1133)] for authorizations and inquiries. For further non-emergency information about this Guidance you may contact your MassDEP Regional Office Service Center:

Northeast Regional Office, Wilmington, 978-694-3246
Southeast Regional Office, Lakeville, 508-946-2714
Central Regional Office, Worcester, 508-792-7650
Western Regional Office, Springfield, 413-755-2114

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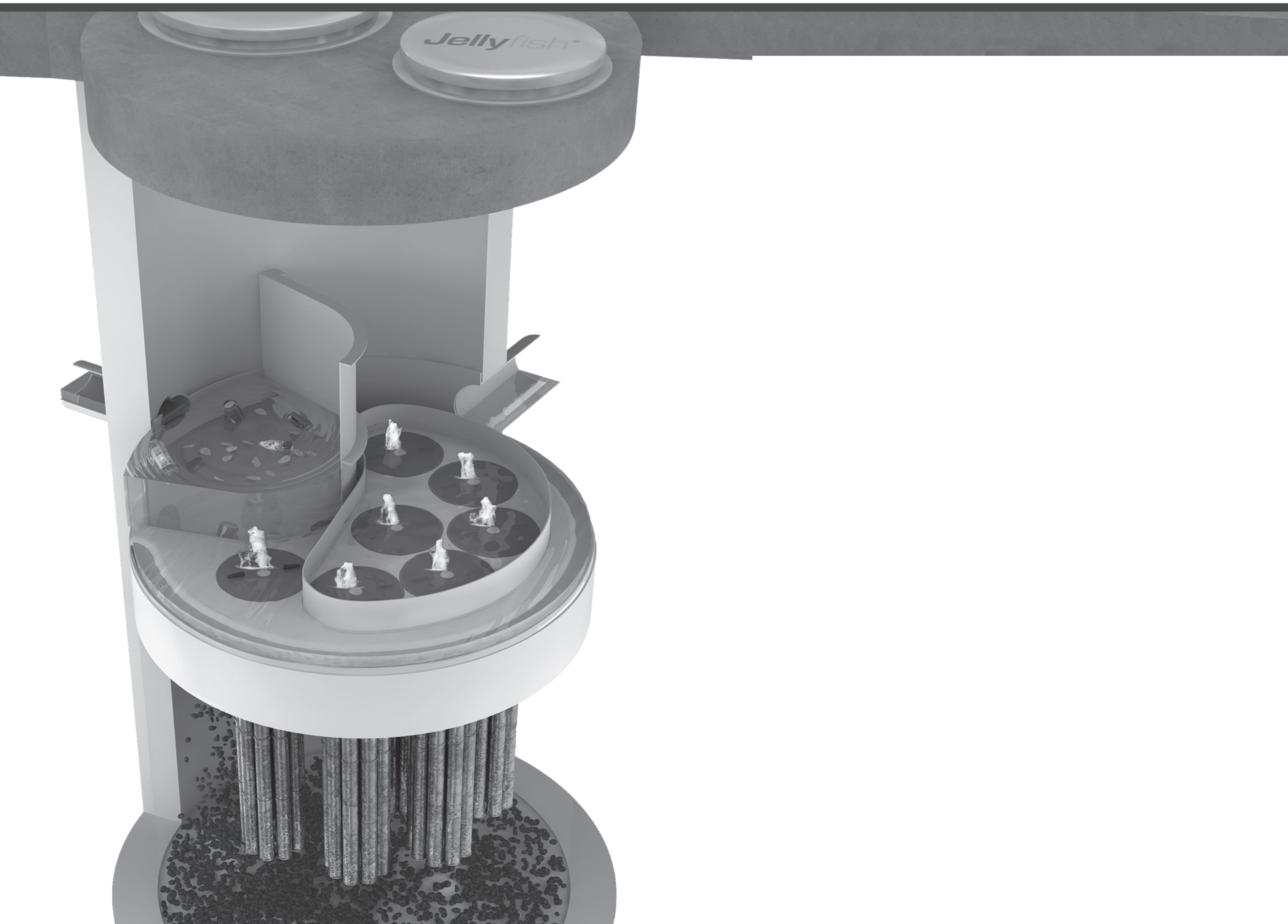
JellyFish® Filter Maintenance Guide



Jellyfish®

Jellyfish®

JELLYFISH® FILTER MANHOLE CONFIGURATIONS
INSPECTION & MAINTENANCE GUIDE

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1.0 Inspection and Maintenance Overview

The primary purpose of the Jellyfish® Filter is to capture and remove pollutants from stormwater runoff. As with any filtration system, these pollutants must be removed to maintain the filter's maximum treatment performance. Regular inspection and maintenance are required to insure proper functioning of the system.

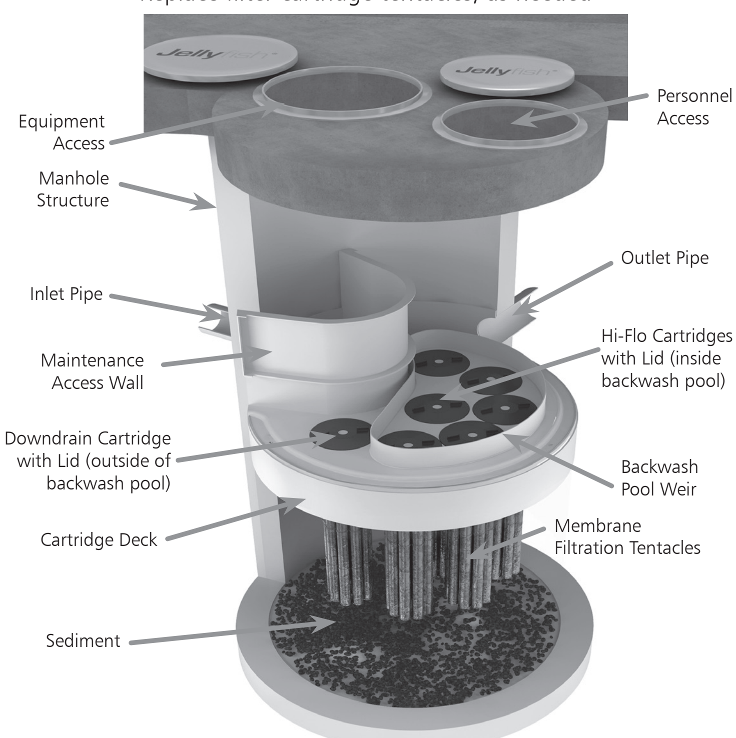
Maintenance frequencies and requirements are site specific and vary depending on pollutant loading. Additional maintenance activities may be required in the event of non-storm event runoff, such as base-flow or seasonal flow, an upstream chemical spill or due to excessive sediment loading from site erosion or extreme runoff events. It is a good practice to inspect the system after major storm events.

Inspection activities are typically conducted from surface observations and include:

- Observe if standing water is present
- Observe if there is any physical damage to the deck or cartridge lids
- Observe the amount of debris in the Maintenance Access Wall (MAW)

Maintenance activities typically include:

- Removal of oil, floatable trash and debris
- Removal of collected sediments
- Rinsing and re-installing the filter cartridges
- Replace filter cartridge tentacles, as needed



Note: Separator Skirt not shown

2.0 Inspection Timing

Inspection of the Jellyfish Filter is key in determining the maintenance requirements for, and to develop a history of the site's pollutant loading characteristics. In general, inspections should be performed at the times indicated below; *or per the approved project stormwater quality documents (if applicable), whichever is more frequent*.

1. Post-construction inspection is required prior to putting the Jellyfish Filter into service. All construction debris or construction-related sediment within the device must be removed, and any damage to system components repaired, before installing the filter cartridges.
2. A minimum of two inspections during the first year of operation to assess the sediment and floatable pollutant accumulation, and to ensure proper functioning of the system.
3. Inspection frequency in subsequent years is based on the inspection and maintenance plan developed in the first year of operation. Minimum frequency should be once per year.
4. Inspection is recommended after each major storm event.
5. Inspection is required immediately after an upstream oil, fuel or other chemical spill.

3.0 Inspection Procedure

The following procedure is recommended when performing inspections:

1. Provide traffic control measures as necessary.
2. Inspect the MAW for floatable pollutants such as trash, debris, and oil sheen.
3. Measure oil and sediment depth in several locations, by lowering a sediment probe through the MAW opening until contact is made with the floor of the structure. Record sediment depth, and presences of any oil layers.
4. Inspect cartridge lids. Missing or damaged cartridge lids to be replaced.
5. Inspect the MAW, cartridge deck, and backwash pool weir, for cracks or broken components. If damaged, repair is required.

3.1 Dry weather inspections

- Inspect the cartridge deck for standing water, and/or sediment on the deck.
- No standing water under normal operating conditions.
- Standing water inside the backwash pool, but not outside the backwash pool indicates that the filter cartridges need to be rinsed.

Inspection Utilitzing Sediment Probe

- Standing water outside the backwash pool may indicate a backwater condition caused by high water elevation in the receiving water body, or possibly a blockage in downstream infrastructure.
- Any appreciable sediment (≥1/16") accumulated on the deck surface should be removed.

3.2 Wet weather inspections

- Observe the rate and movement of water in the unit. Note the depth of water above deck elevation within the MAW.
- Less than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges (i.e. cartridges located outside the backwash pool).
- Greater than 6 inches, flow should be exiting the cartridge lids of each of the draindown cartridges and each of the hi-flo cartridges (i.e. cartridges located inside the backwash pool), and water should be overflowing the backwash pool weir.
- 18 inches or greater and relatively little flow is exiting the cartridge lids and outlet pipe, this condition indicates that the filter cartridges are occluded with sediment and need to be rinsed

4.0 Maintenance Requirements

Required maintenance for the Jellyfish Filter is based upon results of the most recent inspection, historical maintenance records, or the site specific water quality management plan; whichever is more frequent. In general, maintenance requires some combination of the following:

1. Sediment removal for depths reaching 12 inches or greater, or within 3 years of the most recent sediment cleaning, whichever occurs sooner.
2. Floatable trash, debris, and oil removal.
3. Deck cleaned and free from sediment.
4. Filter cartridges rinsed and re-installed as required by the most recent inspection results, or within 12 months of the most recent filter rinsing, whichever occurs sooner.
5. Replace tentacles if rinsing does not restore adequate hydraulic capacity, remove accumulated sediment, or if damaged or missing. It is recommended that tentacles should remain in service no longer than 5 years before replacement.
6. Damaged or missing cartridge deck components must be repaired or replaced as indicated by results of the most recent inspection.
7. The unit must be cleaned out and filter cartridges inspected immediately after an upstream oil, fuel, or chemical spill. Filter cartridge tentacles should be replaced if damaged or compromised by the spill.

5.0 Maintenance Procedure

The following procedures are recommended when maintaining the Jellyfish Filter:

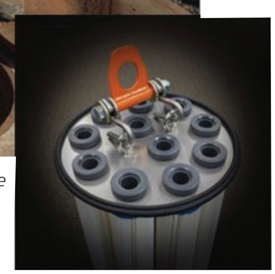
1. Provide traffic control measures as necessary.
2. Open all covers and hatches. Use ventilation equipment as required, according to confined space entry procedures.
3. Caution: Dropping objects onto the cartridge deck may cause damage.
4. Perform Inspection Procedure prior to maintenance activity.
5. To access the cartridge deck for filter cartridge service, descend the ladder and step directly onto the deck. Caution: Do not step onto the maintenance access wall (MAW) or backwash pool weir, as damage may result. Note that the cartridge deck may be slippery.
6. Maximum weight of maintenance crew and equipment on the cartridge deck not to exceed 450 lbs.

5.1 Filter Cartridge Removal

1. Remove a cartridge lid.
2. Remove cartridges from the deck using the lifting loops in the cartridge head plate. Rope or a lifting device (available from Contech) should be used. Caution: Should a snag occur, do not force the cartridge upward as damage to the tentacles may result. Wet cartridges typically weigh between 100 and 125 lbs.
3. Replace and secure the cartridge lid on the exposed empty receptacle as a safety precaution. Contech does not recommend exposing more than one empty cartridge receptacle at a time.

5.2 Filter Cartridge Rinsing

1. Remove all 11 tentacles from the cartridge head plate. Take care not to damage or break the plastic threaded nut or connector.
2. Position tentacles in a container (or over the MAW), with the threaded connector (open end) facing down, so rinse water is flushed through the membrane and captured in the container.



Cartridge Removal & Lifting Device

3. Using the Jellyfish rinse tool (available from Contech) or a low-pressure garden hose sprayer, direct water spray onto the tentacle membrane, sweeping from top to bottom along the length of the tentacle. Rinse until all sediment is removed from the membrane. Caution: Do not use a high pressure sprayer or focused stream of water on the membrane. Excessive water pressure may damage the membrane.

4. Collected rinse water is typically removed by vacuum hose.
5. Reattach tentacles to cartridge head plate. Reuse O-rings and nuts, ensuring proper placement on each tentacle.

5.3 Cleaning Procedure

1. Perform vacuum cleaning of the Jellyfish Filter only after filter cartridges have been removed from the system. Access the lower chamber for vacuum cleaning only through the maintenance access wall (MAW) opening, being careful not to damage the flexible plastic separator skirt that is attached to the underside of the deck. The separator skirt surrounds the filter cartridge zone, and could be torn if contacted by the wand. Do not lower the vacuum wand through a cartridge receptacle, as damage to the receptacle will result.
2. Vacuum floatable trash, debris, and oil, from the MAW opening. Alternatively, floatable solids may be removed by a net or skimmer.

Tentacle Rinse Using Jellyfish Rinse Tool

3. Pressure wash cartridge deck and receptacles to remove all sediment and debris. Sediment should be rinsed into the sump area. Take care not to flush rinse water into the outlet pipe.
4. Remove water from the sump area. Vacuum or pump equipment should only be introduced through the MAW.
5. Remove the sediment from the bottom of the unit through the MAW opening.

Vacuuming Sump Through MAW

6. For larger diameter Jellyfish Filter manholes (≥8-ft) and vaults without an MAW opening, complete sediment removal may be facilitated by removing a cartridge lid from an empty receptacle and inserting a jetting wand (not a vacuum wand) through the receptacle. Use the sprayer to rinse loosened sediment toward the vacuum hose in the MAW opening, being careful not to damage the receptacle.
7. After the unit is clean, re-fill the lower chamber with water if required by the local jurisdiction, and re-install filter cartridges.
8. Dispose of sediment, floatable trash and debris, oil, spent tentacles, and water according to local regulatory requirements.

5.4 Filter Cartridge Replacement

1. Cartridges should be installed after the deck has been cleaned. It is important that the receptacle surfaces be free from grit and debris.
2. If rinsing is ineffective in removing sediment from the tentacles, or if tentacles are damaged, provisions must be made to replace the spent or damaged tentacles with new tentacles. Contact Contech to order replacement tentacles.
3. Lower filter cartridge to the cartridge deck. Remove cartridge lid from deck and carefully lower the filter cartridge into the receptacle until head plate gasket is seated squarely in receptacle. Caution: Should a snag occur when lowering the cartridge into the receptacle, do not force the cartridge downward; damage may occur.
4. Replace the cartridge lid and check fit before completing rotation to a firm hand-tight attachment.

5.5 Chemical Spills

Caution: If a chemical spill has been captured, do not attempt maintenance. Immediately contact the local hazard response agency and contact Contech.

6.0 Related Maintenance Activities

Jellyfish units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

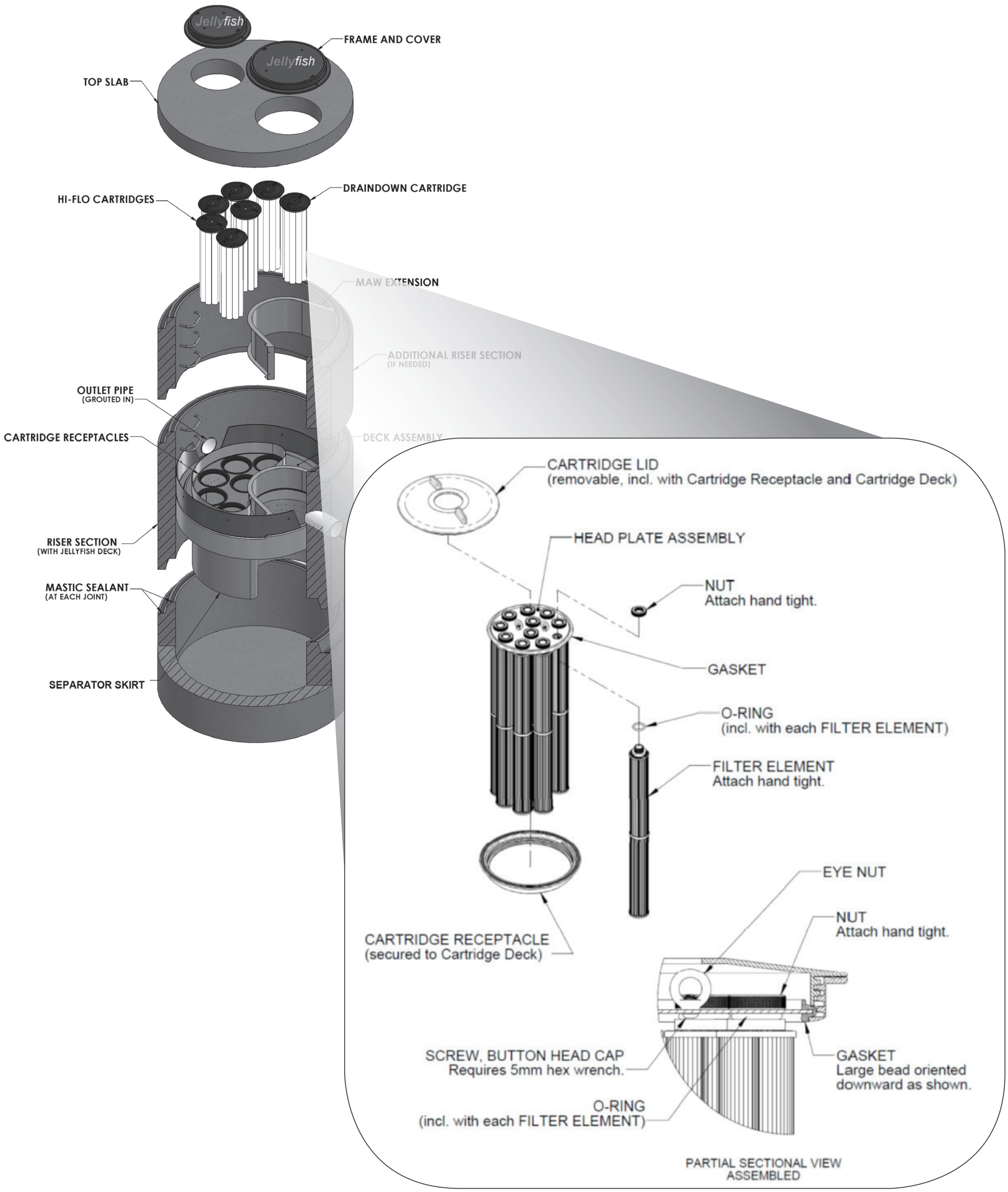
In order for maintenance of the Jellyfish filter to be successful, it is imperative that all other components be properly maintained. The maintenance and repair of upstream facilities should be carried out prior to Jellyfish maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

7.0 Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads. Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Jellyfish Filter Components & Filter Cartridge



Jellyfish Filter Inspection and Maintenance Log

Owner:				Jellyfish Model No:		
Location:				GPS Coordinates:		
Lande Use:	Commercial:		Industrial:		Service Station:	
	Roadway/Highway:		Airport:		Residential:	

Date/Time:						
Inspector:						
Maintenance Contractor:						
Visible Oil Present: (Y/N)						
Oil Quantity Removed:						
Floatable Debris Present: (Y/N)						
Floatable Debris Removed: (Y/N)						
Water Depth in Backwash Pool						
Draindown Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Cartridges: (Y/N)						
Hi-Flo Cartridges externally rinsed and recommissioned: (Y/N)						
New tentacles put on Hi-Flo Cartridges: (Y/N)						
Sediment Depth Measured: (Y/N)						
Sediment Depth (inches or mm):						
Sediment Removed: (Y/N)						
Cartridge Lids intact: (Y/N)						
Observed Damage:						
Comments:						

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800.338.1122
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Support

- Drawings and specifications are available at ContechES.com/jellyfish.
- Site-specific design support is available from Contech Engineered Solutions.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, wastewater treatment and earth stabilization products. For information on other Contech segment offerings, visit ContechES.com or call 800.338.1122

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CONTECH
ENGINEERED SOLUTIONS

Stormceptor® STC Owner's Manual

Stormceptor® STC

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For patent information, go to www.ContechES.com/ip.

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a "Hydrodynamic Separator (HDS)" or an "Oil Grit Separator (OGS)", engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- "STORMCEPTOR" is clearly marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site's tailwater conditions)
- Series Unit (combines treatment in two systems)

PLEASE MAINTAIN YOUR STORMCEPTOR

To ensure long-term environmental protection through continued performance as originally designed for your site, Stormceptor must be maintained, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call Contech at 1-800-338-1122.

2 – Stormceptor Operation and Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology. Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

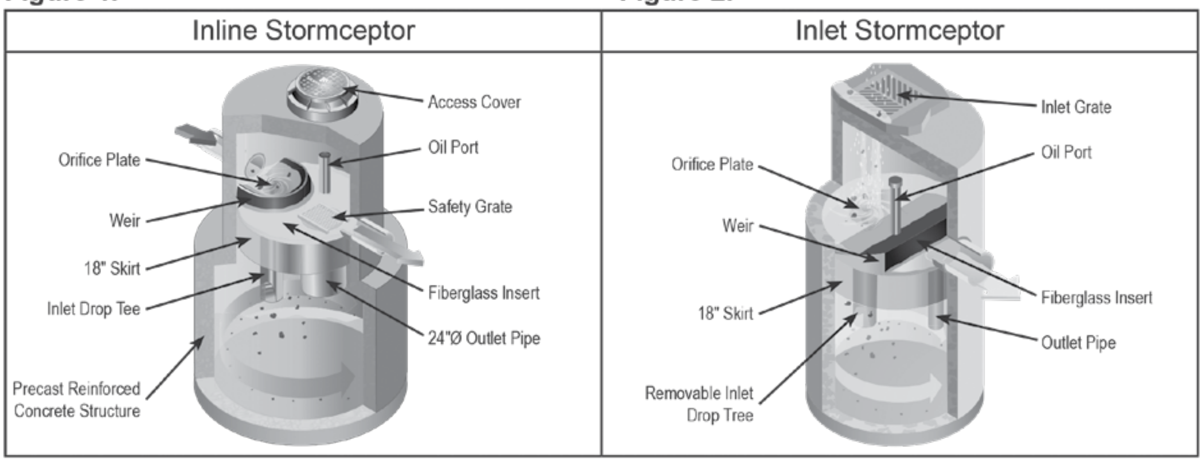
With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

Figure 1. Figure 2.



3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS and MAX) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using Table 1.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Contech Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS and OSR Stormceptor models are provided in Tables 1 and 2. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1. Stormceptor Dimensions - Insert to Base of Structure

STC Model	Insert to Base (in.)
450	60
900	55
1200	71
1800	105
2400	94
3600	134
4800	128
6000	150
7200	134
11000*	128
13000*	150
16000*	134

Notes:
1. Depth Below Pipe Inlet Invert to the Inside Top Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.
**Consist of two chamber structures in series.*

Table 2. Storage Capacities

STC Model	Hydrocarbon Storage Capacity (gal)	Sediment Capacity (ft^3)
450	86	46
900	251	89
1200	251	127
1800	251	207
2400	840	205
3600	840	373
4800	909	543
6000	909	687
7200	1059	839
11000*	2797	1089
13000*	2797	1374
16000*	3055	1677

Notes:
1. Hydrocarbon and Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.
**Consist of two chamber structures in series*

4 – Stormceptor Inspection and Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see Table 3). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.
- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in Table 2, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins.

For typical inspection and maintenance activities, no specific supplemental training is required

Recommended Stormceptor Inspection Procedure:

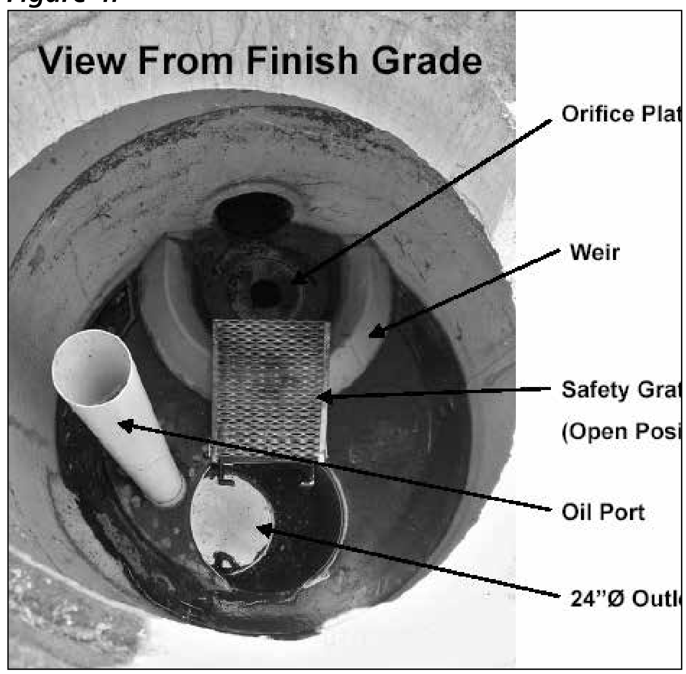
- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch or 6-inch diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, hoist and safety harness for specially trained personnel if confined space entry is required

Figure 3.

Figure 4.



Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck. No entry into the unit is required for maintenance. DO NOT ENTER THE STORMCEPTOR CHAMBER unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
  - » For 6-ft diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch outlet riser pipe (See Fig. 5).
  - » For 4-ft diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch drop tee hole (See Fig. 6).

Figure 5.

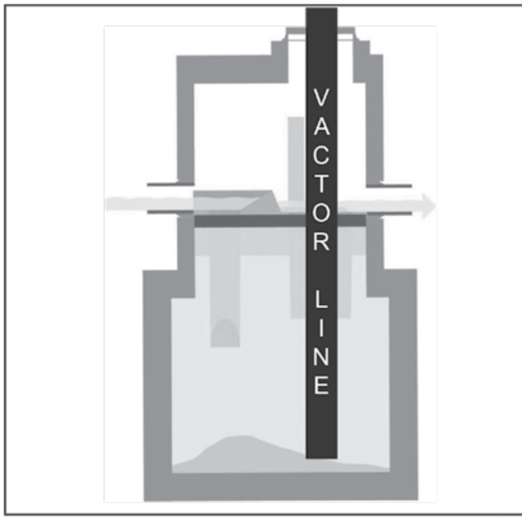
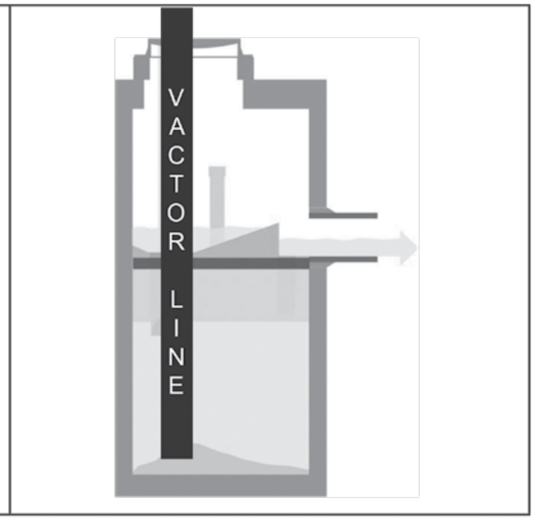


Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?

The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?

Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in Table 3 based on the unit size.

Table 3. Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment Depth (in)
450	8
900	8
1200	10
1800	15
2400	12
3600	17
4800	15
6000	18
7200	15
11000*	17
13000*	20
16000*	17

Notes:
1. The values above are for typical standard units.
** Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Contech Representative or call 800-338-1122.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

<u>Stormceptor Inspection and Maintenance Log</u>

Stormceptor Model No: ________________________________

Allowable Sediment Depth: ________________________________

Serial Number: ________________________________

Installation Date: ________________________________

Location Description of Unit: ________________________________

Other Comments: ________________________________

5 – Contact Information

Questions regarding the Stormceptor can be addressed by contacting your local Contech representative or by calling 800-338-1122.

SUPPORT

- Drawings and specifications are available at www.ContechES.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, and earth stabilization products. For information, visit www.ContechES.com or call 800.338.1122

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CONTECH® ENGINEERED SOLUTIONS

StormFilter Inspection and Maintenance Procedures

The Stormwater Management StormFilter®

Maintenance Guidelines

The primary purpose of the Stormwater Management StormFilter® is to filter and prevent pollutants from entering our waterways. Like any effective filtration system, periodically these pollutants must be removed to restore the StormFilter to its full efficiency and effectiveness.

Maintenance requirements and frequency are dependent on the pollutant load characteristics of each site. Maintenance activities may be required in the event of a chemical spill or due to excessive sediment loading from site erosion or extreme storms. It is a good practice to inspect the system after major storm events.

Maintenance Procedures

Although there are many effective maintenance options, we believe the following procedure to be efficient, using common equipment and existing maintenance protocols. The following two-step procedure is recommended::

1. **Inspection**
   - Inspection of the vault interior to determine the need for maintenance.
2. **Maintenance**
   - Cartridge replacement
   - Sediment removal

Inspection and Maintenance Timing

At least one scheduled inspection should take place per year with maintenance following as warranted.

First, an inspection should be done before the winter season. During the inspection the need for maintenance should be determined and, if disposal during maintenance will be required, samples of the accumulated sediments and media should be obtained.

Second, if warranted, a maintenance (replacement of the filter cartridges and removal of accumulated sediments) should be performed during periods of dry weather.

In addition to these two activities, it is important to check the condition of the StormFilter unit after major storms for potential damage caused by high flows and for high sediment accumulation that may be caused by localized erosion in the drainage area. It may be necessary to adjust the inspection/maintenance schedule depending on the actual operating conditions encountered by the system. In general, inspection activities can be conducted at any time, and maintenance should occur, if warranted, during dryer months in late summer to early fall.

Maintenance Frequency

The primary factor for determining frequency of maintenance for the StormFilter is sediment loading.

A properly functioning system will remove solids from water by trapping particulates in the porous structure of the filter media inside the cartridges. The flow through the system will naturally decrease as more and more particulates are trapped. Eventually the flow through the cartridges will be low enough to require replacement. It may be possible to extend the usable span of the cartridges by removing sediment from upstream trapping devices on a routine as-needed basis, in order to prevent material from being re-suspended and discharged to the StormFilter treatment system.

The average maintenance lifecycle is approximately 1-5 years. Site conditions greatly influence maintenance requirements. StormFilter units located in areas with erosion or active construction may need to be inspected and maintained more often than those with fully stabilized surface conditions.

Regulatory requirements or a chemical spill can shift maintenance timing as well. The maintenance frequency may be adjusted as additional monitoring information becomes available during the inspection program. Areas that develop known problems should be inspected more frequently than areas that demonstrate no problems, particularly after major storms. Ultimately, inspection and maintenance activities should be scheduled based on the historic records and characteristics of an individual StormFilter system or site. It is recommended that the site owner develop a database to properly manage StormFilter inspection and maintenance programs..

Inspection Procedures

The primary goal of an inspection is to assess the condition of the cartridges relative to the level of visual sediment loading as it relates to decreased treatment capacity. It may be desirable to conduct this inspection during a storm to observe the relative flow through the filter cartridges. If the submerged cartridges are severely plugged, then typically large amounts of sediments will be present and very little flow will be discharged from the drainage pipes. If this is the case, then maintenance is warranted and the cartridges need to be replaced.

> **Warning**: In the case of a spill, the worker should abort inspection activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct an inspection:

> **Important:** Inspection should be performed by a person who is familiar with the operation and configuration of the StormFilter treatment unit.

1. If applicable, set up safety equipment to protect and notify surrounding vehicle and pedestrian traffic.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the access portals to the vault and allow the system vent.
4. Without entering the vault, visually inspect the inside of the unit, and note accumulations of liquids and solids.
5. Be sure to record the level of sediment build-up on the floor of the vault, in the forebay, and on top of the cartridges. If flow is occurring, note the flow of water per drainage pipe. Record all observations. Digital pictures are valuable for historical documentation.
6. Close and fasten the access portals.
7. Remove safety equipment.
8. If appropriate, make notes about the local drainage area relative to ongoing construction, erosion problems, or high loading of other materials to the system.
9. Discuss conditions that suggest maintenance and make decision as to whether or not maintenance is needed.

Maintenance Decision Tree

The need for maintenance is typically based on results of the inspection. The following Maintenance Decision Tree should be used as a general guide. (Other factors, such as Regulatory Requirements, may need to be considered)

1. Sediment loading on the vault floor.
    a. If >4" of accumulated sediment, maintenance is required.
2. Sediment loading on top of the cartridge.
    a. If >1/4" of accumulation, maintenance is required.
3. Submerged cartridges.
    a. If >4" of static water above cartridge bottom for more than 24 hours after end of rain event, maintenance is required. (Catch basins have standing water in the cartridge bay.)
4. Plugged media.
    a. If pore space between media granules is absent, maintenance is required.
5. Bypass condition.
    a. If inspection is conducted during an average rain fall event and StormFilter remains in bypass condition (water over the internal outlet baffle wall or submerged cartridges), maintenance is required.
6. Hazardous material release.
    a. If hazardous material release (automotive fluids or other) is reported, maintenance is required.
7. Pronounced scum line.
    a. If pronounced scum line (say ≥ 1/4" thick) is present above top cap, maintenance is required.

Maintenance

Depending on the configuration of the particular system, maintenance personnel will be required to enter the vault to perform the maintenance.

> **Important**: If vault entry is required, OSHA rules for confined space entry must be followed.

Filter cartridge replacement should occur during dry weather. It may be necessary to plug the filter inlet pipe if base flows is occurring.

Replacement cartridges can be delivered to the site or customers facility. Information concerning how to obtain the replacement cartridges is available from Contech Engineered Solutions.

> **Warning**: In the case of a spill, the maintenance personnel should abort maintenance activities until the proper guidance is obtained. Notify the local hazard control agency and Contech Engineered Solutions immediately.

To conduct cartridge replacement and sediment removal maintenance:

1. If applicable, set up safety equipment to protect maintenance personnel and pedestrians from site hazards.
2. Visually inspect the external condition of the unit and take notes concerning defects/problems.
3. Open the doors (access portals) to the vault and allow the system to vent.
4. Without entering the vault, give the inside of the unit, including components, a general condition inspection.
5. Make notes about the external and internal condition of the vault. Give particular attention to recording the level of sediment build-up on the floor of the vault, in the forebay, and on top of the internal components.
6. Using appropriate equipment offload the replacement cartridges (up to 150 lbs. each) and set aside.
7. Remove used cartridges from the vault using one of the following methods:

Method 1:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

Using appropriate hoisting equipment, attach a cable from the boom, crane, or tripod to the loose cartridge. Contact Contech Engineered Solutions for suggested attachment devices.

B. Remove the used cartridges (up to 250 lbs. each) from the vault.

> **Important:** Care must be used to avoid damaging the cartridges during removal and installation. The cost of repairing components damaged during maintenance will be the responsibility of the owner.

C. Set the used cartridge aside or load onto the hauling truck.

D. Continue steps a through c until all cartridges have been removed.

Method 2:

A. This activity will require that maintenance personnel enter the vault to remove the cartridges from the under drain manifold and place them under the vault opening for lifting (removal). Disconnect each filter cartridge from the underdrain connector by rotating counterclockwise 1/4 of a turn. Roll the loose cartridge, on edge, to a convenient spot beneath the vault access.

B. Unscrew the cartridge cap.

C. Remove the cartridge hood and float.

D. At location under structure access, tip the cartridge on its side.

E. Empty the cartridge onto the vault floor. Reassemble the empty cartridge.

F. Set the empty, used cartridge aside or load onto the hauling truck.

G. Continue steps a through e until all cartridges have been removed.

8. Remove accumulated sediment from the floor of the vault and from the forebay. This can most effectively be accomplished by use of a vacuum truck.
9. Once the sediments are removed, assess the condition of the vault and the condition of the connectors.
10. Using the vacuum truck boom, crane, or tripod, lower and install the new cartridges. Once again, take care not to damage connections.
11. Close and fasten the door.
12. Remove safety equipment.
13. Finally, dispose of the accumulated materials in accordance with applicable regulations. Make arrangements to return the used **empty** cartridges to Contech Engineered Solutions.

Related Maintenance Activities - Performed on an as-needed basis

StormFilter units are often just one of many structures in a more comprehensive stormwater drainage and treatment system.

In order for maintenance of the StormFilter to be successful, it is imperative that all other components be properly maintained. The maintenance/repair of upstream facilities should be carried out prior to StormFilter maintenance activities.

In addition to considering upstream facilities, it is also important to correct any problems identified in the drainage area. Drainage area concerns may include: erosion problems, heavy oil loading, and discharges of inappropriate materials.

Material Disposal

The accumulated sediment found in stormwater treatment and conveyance systems must be handled and disposed of in accordance with regulatory protocols. It is possible for sediments to contain measurable concentrations of heavy metals and organic chemicals (such as pesticides and petroleum products). Areas with the greatest potential for high pollutant loading include industrial areas and heavily traveled roads.

Sediments and water must be disposed of in accordance with all applicable waste disposal regulations. When scheduling maintenance, consideration must be made for the disposal of solid and liquid wastes. This typically requires coordination with a local landfill for solid waste disposal. For liquid waste disposal a number of options are available including a municipal vacuum truck decant facility, local waste water treatment plant or on-site treatment and discharge.

Inspection Report

Date: ______________________ Personnel: ______________________

Location: ______________________ System Size: ______________________ Months in Service: ______________________

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other: __________

Sediment Thickness in Forebay: ______________________ Date: ______________________

Sediment Depth on Vault Floor: ______________________

Sediment Depth on Cartridge Top(s): ______________________

Structural Damage: ______________________

Estimated Flow from Drainage Pipes (if available): ______________________

Cartridges Submerged: Yes ☐ No ☐ Depth of Standing Water: ______________________

StormFilter Maintenance Activities (check off if done and give description)

☐ Trash and Debris Removal: ______________________

☐ Minor Structural Repairs: ______________________

☐ Drainage Area Report ______________________

Excessive Oil Loading: Yes ☐ No ☐ Source: ______________________

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: ______________________

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: ______________________

Items Needing Further Work: ______________________

Owners should contact the local public works department and inquire about how the department disposes of their street waste residuals.

Other Comments:

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Review the condition reports from the previous inspection visits.

StormFilter Maintenance Report

Date: ____________________________ Personnel: ____

Location: __________________________ System Size: ____

System Type: Vault ☐ Cast-In-Place ☐ Linear Catch Basin ☐ Manhole ☐ Other: ___________

List Safety Procedures and Equipment Used: ____

____

____

System Observations

Months in Service: ____

Oil in Forebay (if present): Yes ☐ No ☐

Sediment Depth in Forebay (if present): ____

Sediment Depth on Vault Floor: ____

Sediment Depth on Cartridge Top(s): ____

Structural Damage: ____

Drainage Area Report

Excessive Oil Loading: Yes ☐ No ☐ Source: ________________________________

Sediment Accumulation on Pavement: Yes ☐ No ☐ Source: ________________________________

Erosion of Landscaped Areas: Yes ☐ No ☐ Source: ________________________________

StormFilter Cartridge Replacement Maintenance Activities

Remove Trash and Debris: Yes ☐ No ☐ Details: ________________________________

Replace Cartridges: Yes ☐ No ☐ Details: ________________________________

Sediment Removed: Yes ☐ No ☐ Details: ________________________________

Quantity of Sediment Removed (estimate?):

Minor Structural Repairs: Yes ☐ No ☐ Details: ________________________________

Residuals (debris, sediment) Disposal Methods: ______________________________________

Notes:

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RECYCLED PAPER

800-338-1122

www.ContechES.com

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit www.ContechES.com or call 800.338.1122.

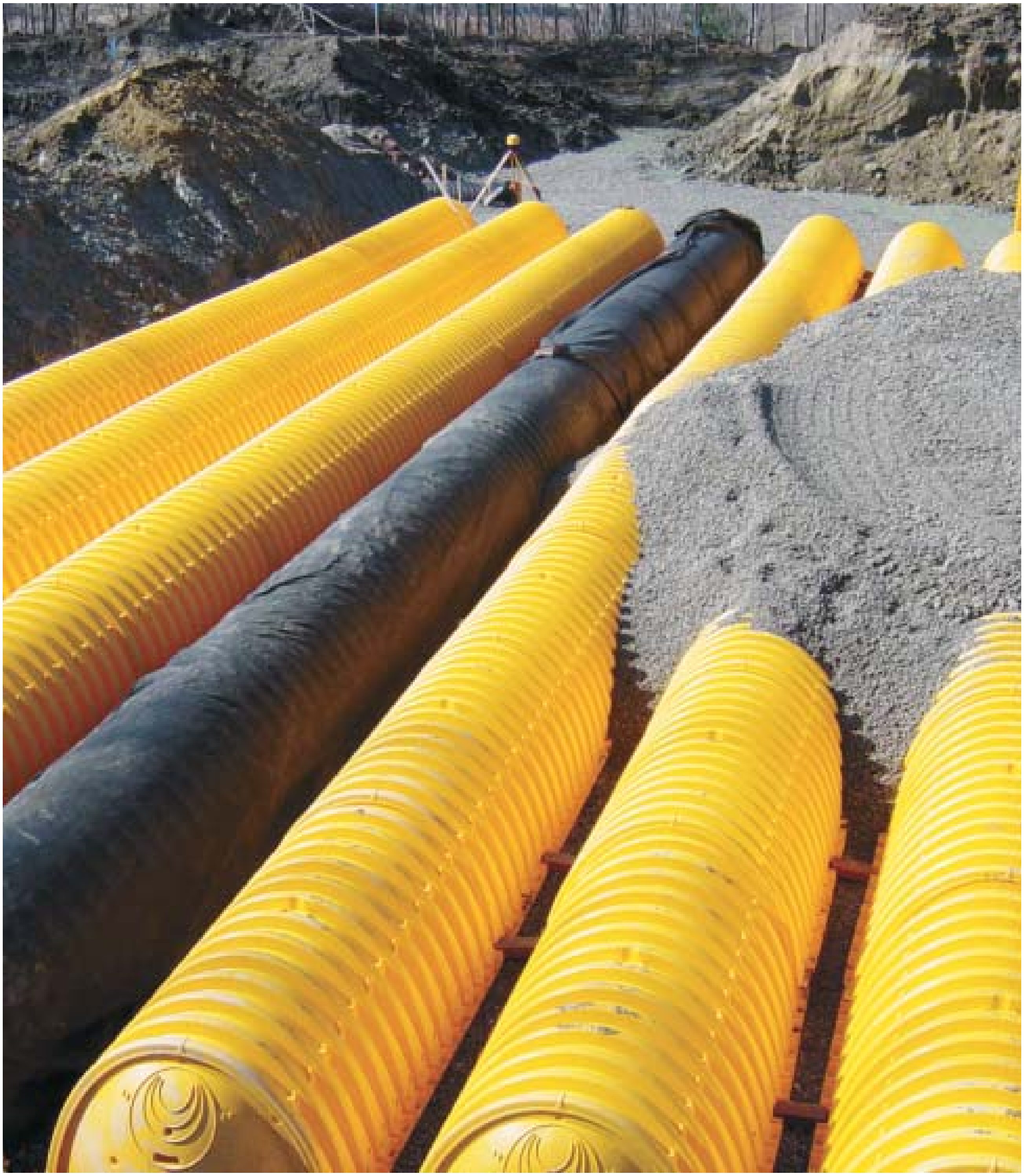
Support

- Drawings and specifications are available at www.conteches.com.
- Site-specific design support is available from our engineers.

StormTech®

Detention • Retention • Recharge

Subsurface Stormwater Management℠



Isolator™ Row O&M Manual

StormTech® Chamber System for Stormwater Management

1.0 The Isolator™ Row

1.1 INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a patent pending technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

1.2 THE ISOLATOR™ ROW

The Isolator Row is a row of StormTech chambers, either SC-740 or SC-310 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated side-walls allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

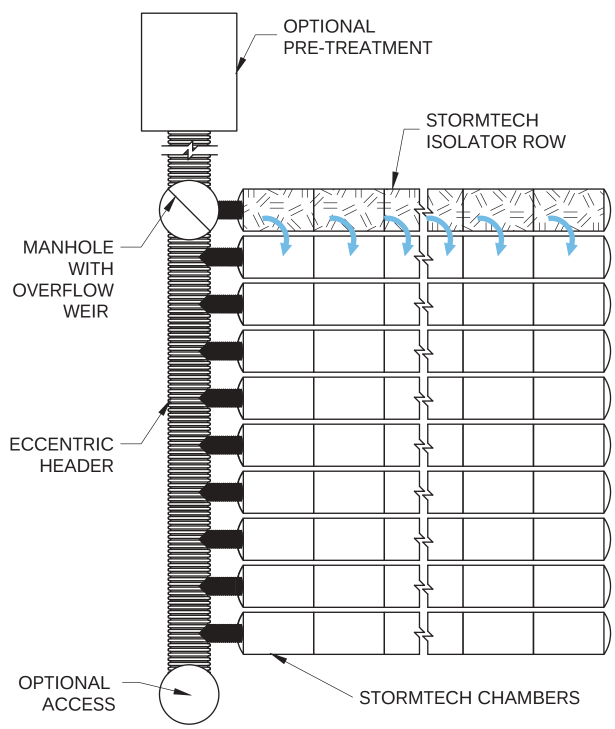
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber.

The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

StormTech Isolator Row with Overflow Spillway
(not to scale)



2.1 INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

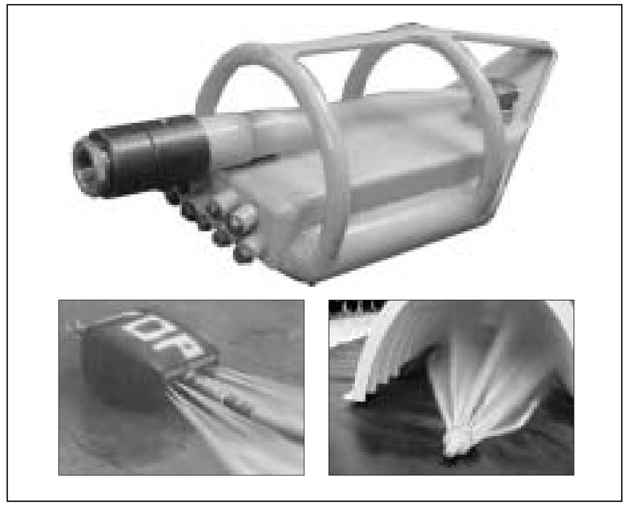
At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

2.2 MAINTENANCE

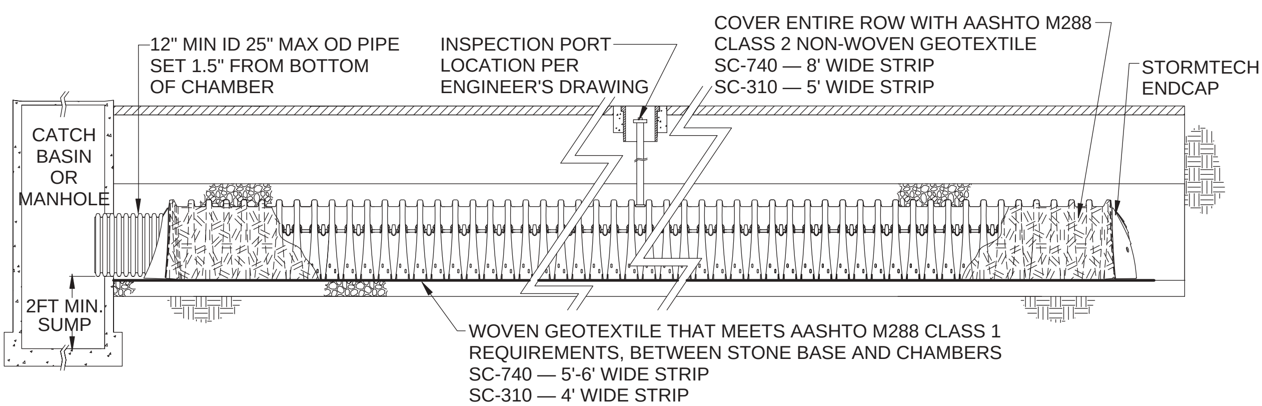
The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

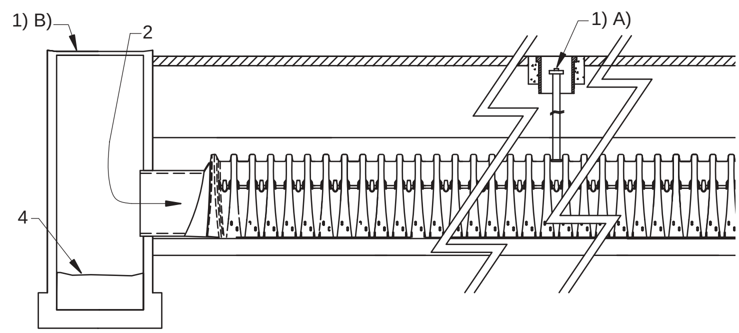
Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)



3.0 Isolator Row Step By Step Maintenance Procedures

StormTech Isolator Row (not to scale)



Step 1) Inspect Isolator Row for sediment

A) Inspection ports (if present)
- i. Remove lid from floor box frame
- ii. Remove cap from inspection riser
- iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.
- iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.

B) All Isolator Rows
- i. Remove cover from manhole at upstream end of Isolator Row
- ii. Using a flashlight, inspect down Isolator Row through outlet pipe
  1. Mirrors on poles or cameras may be used to avoid a confined space entry
  2. Follow OSHA regulations for confined space entry if entering manhole
- iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2. If not proceed to Step 3.

Step 2) Clean out Isolator Row using the JetVac process

A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable

B) Apply multiple passes of JetVac until backflush water is clean

C) Vacuum manhole sump as required

Step 3) Replace all caps, lids and covers, record observations and actions

Step 4) Inspect & clean catch basins and manholes upstream of the StormTech system

Sample Maintenance Log

Date	Stadia Rod Readings: Fixed point to chamber bottom (1)	Stadia Rod Readings: Fixed point to top of sediment (2)	Sediment Depth (1) - (2)	Observations/Actions	Inspector
3/15/01	6.3 ft.	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft.	Some grit felt	sm
6/20/03		5.8	0.5 ft.	Mucky feel, debris visible in manhole and in Isolator row, maintenance due	rv
7/7/03	6.3 ft.		0	System jetted and vacuumed	djm

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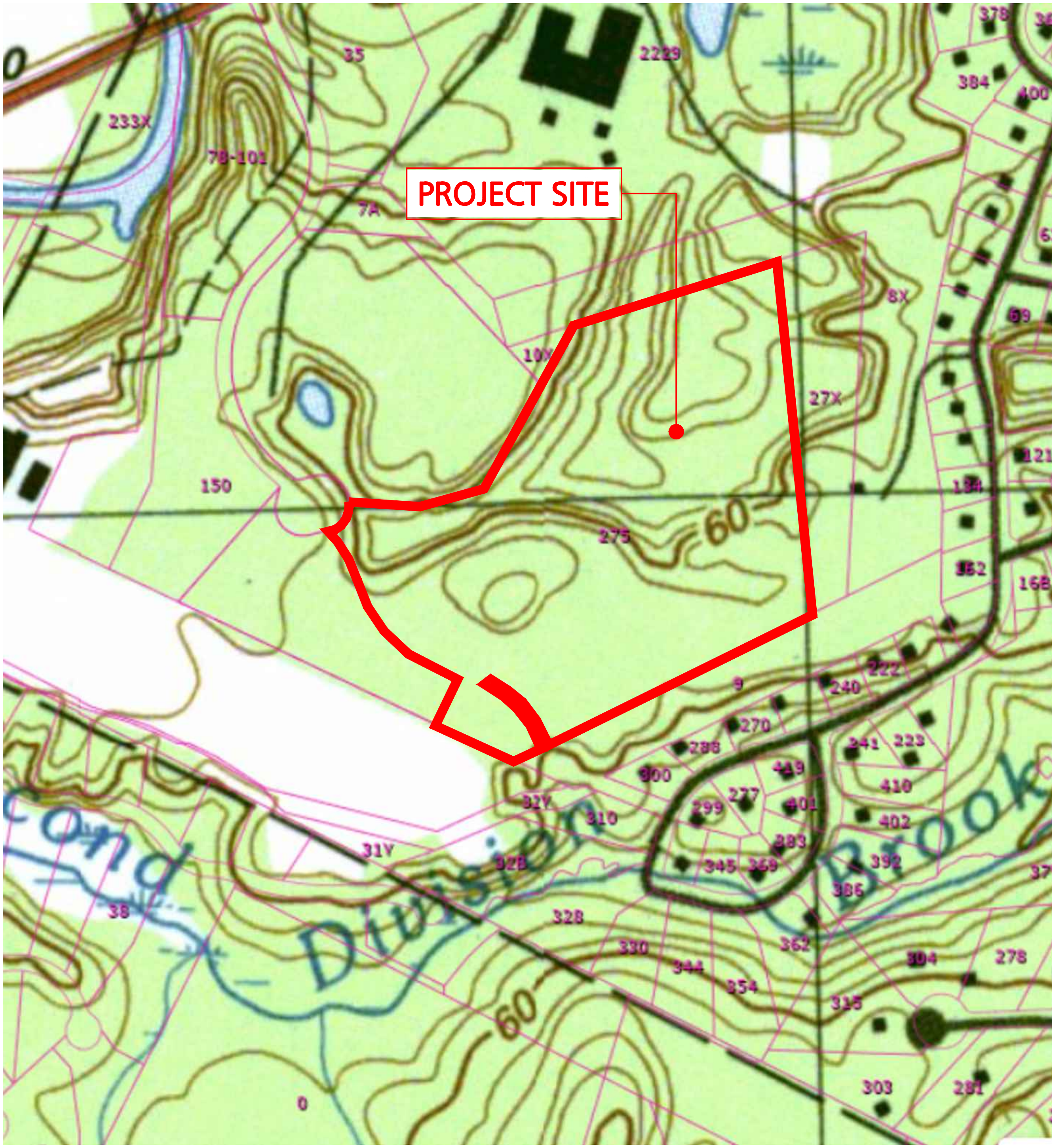
SECTION 3.0 -
EXHIBITS



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ALLEN & MAJOR ASSOCIATES, INC.

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FAX: (781) 935-2896

WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

PROJECT:

275 FOREST RIDGE ROAD, CONCORD, MA 01742

USGS SITE LOCUS MAP

PROJECT NO.	3172-01	DATE:	11-07-2023
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	SMF	CHECKED BY:	TJW

SHEET No.

EX-1

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AERIAL PHOTO

PROJECT NO.	3172-01	DATE:	11-07-2023
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	SMF	CHECKED BY:	TJW

SHEET No.
EX-2

THERE ARE NO DEP WETLANDS DIRECTLY ON SITE
THE SITE DOES FALLS WITHIN 100 FOOT WETLAND BUFFER

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PROJECT:
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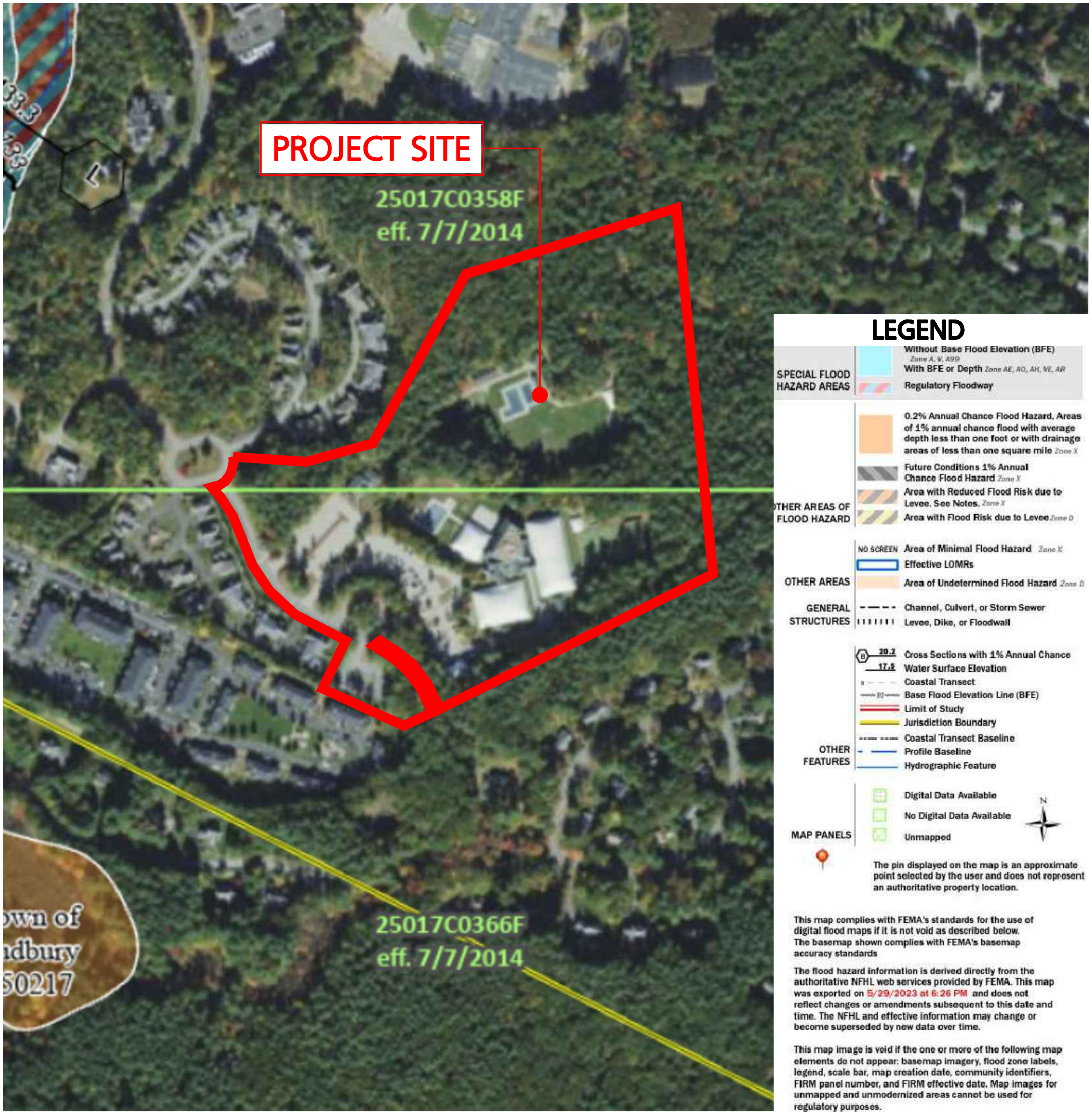
WETLANDS MAP

PROJECT NO.	3172-01	DATE:	11-07-2023
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	SMF	CHECKED BY:	TJW

SHEET No.
EX-3



FEMA FLOOD INSURANCE RATE MAP
MIDDLESEX COUNTY, MASSACHUSETTS
COMMUNITY PANEL 312 OF 656
MAP NUMBER 25017C0313E
EFFECTIVE DATE: JUNE 4, 2010

SITE IS NOT LOCATED IN A FLOOD HAZARD ZONE

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PROJECT:
275 FOREST RIDGE ROAD, CONCORD, MA 01742

FEMA FIRM MAP

PROJECT NO.	3172-01	DATE:	11-07-2023
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	SMF	CHECKED BY:	TJW

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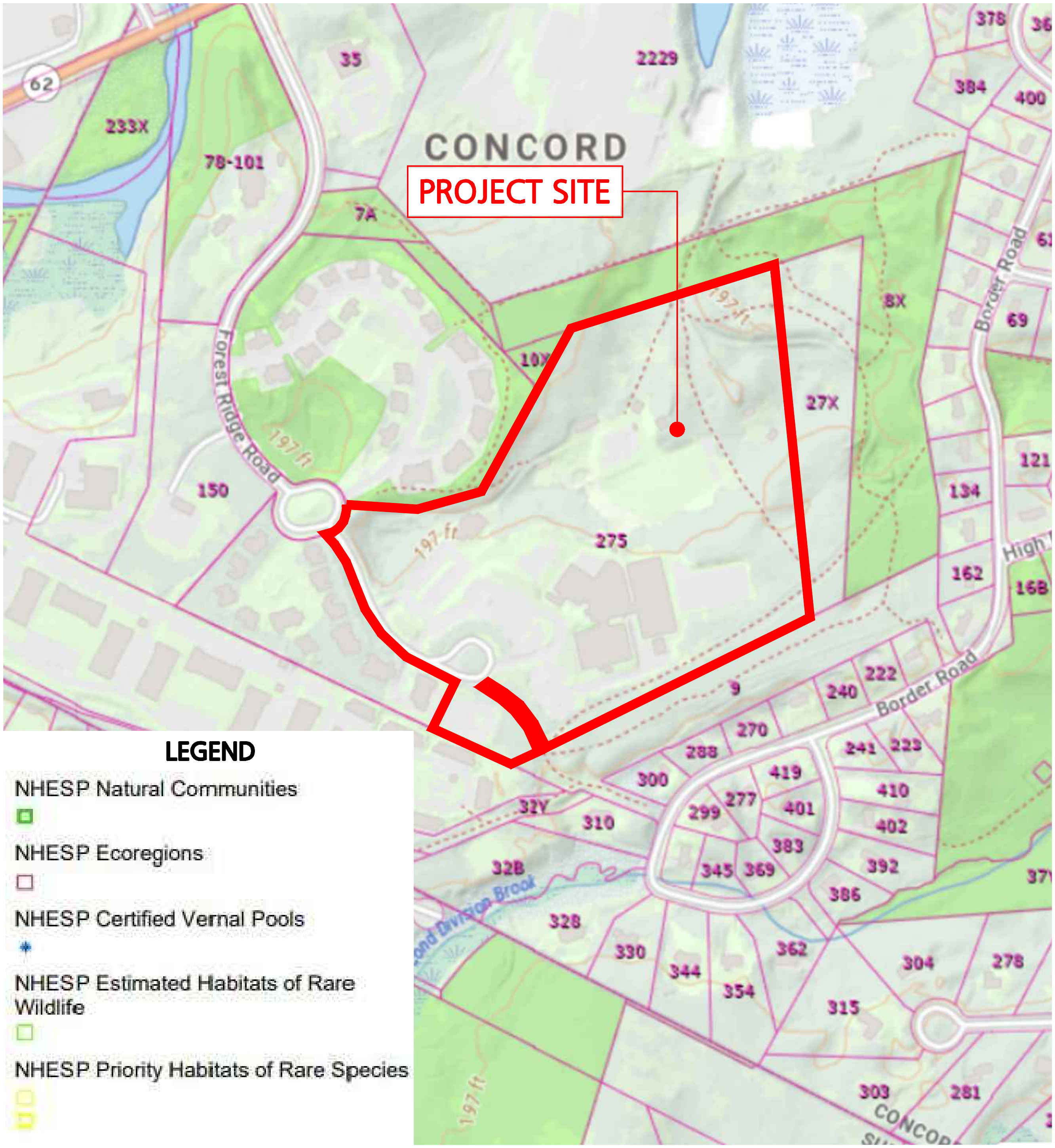
SHEET No.
EX-4



NO PRIORITY & ESTIMATED HABITATS LOCATED ON SITE

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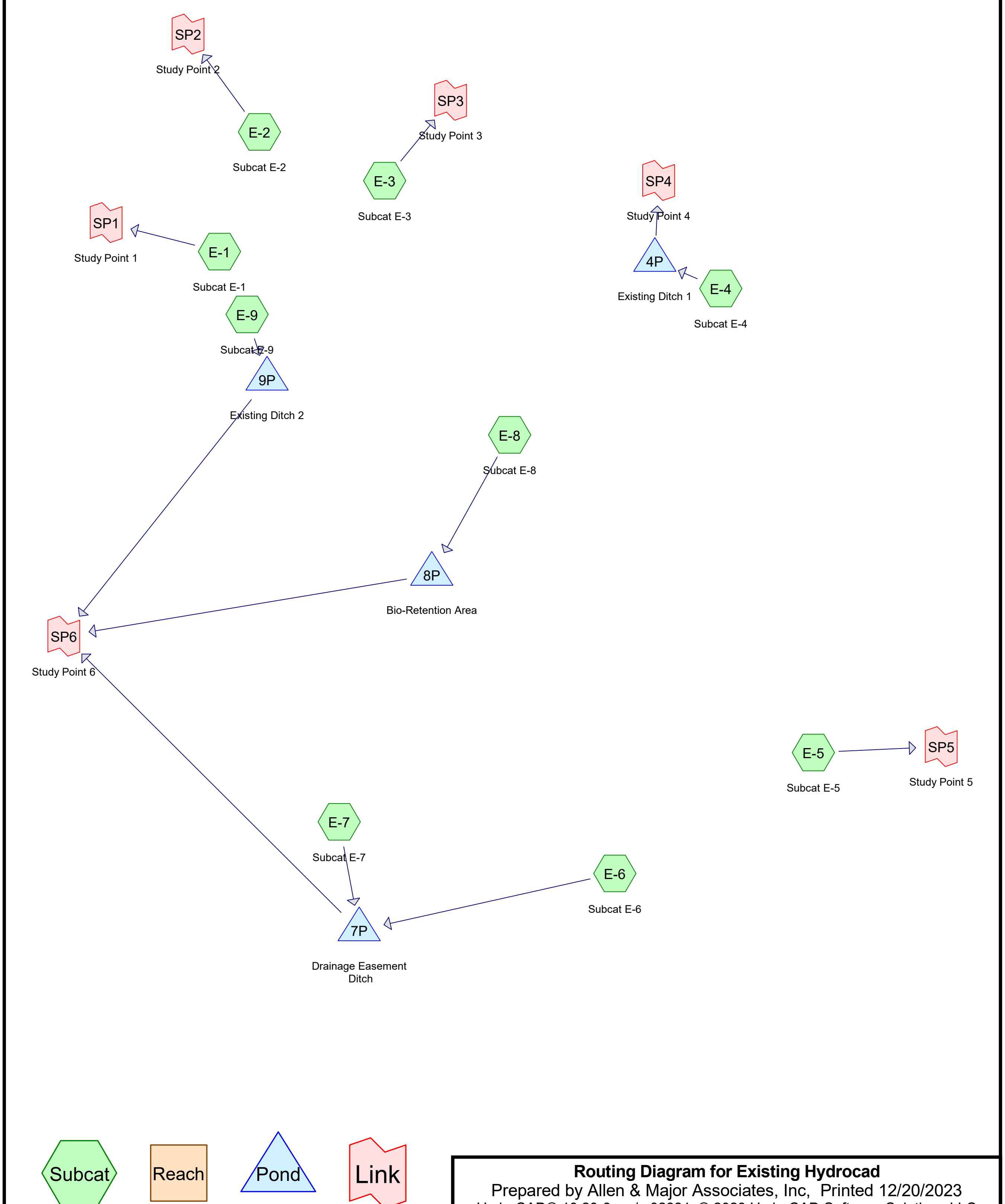
PROJECT:
275 FOREST RIDGE ROAD, CONCORD, MA 01742

PRIORITY & ESTIMATED HABITATS

PROJECT NO.	3172-01	DATE:	11-07-2023
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	SMF	CHECKED BY:	TJW

SHEET No.
EX-5

SECTION 4.0 -
EXISTING DRAINAGE ANALYSIS



Routing Diagram for Existing Hydrocad
Prepared by Allen & Major Associates, Inc, Printed 12/20/2023
HydroCAD® 10.20-3c s/n 02881 © 2023 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4067 MA Concord Middlesex County Central
Rainfall events imported from "Atlas-14-Rain.txt" for 444 MA Middlesex Central
Rainfall events imported from "NRCS-Rain.txt" for 4067 MA Concord Middlesex County Central

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	D	Default	24.00	1	3.09	2
2	10-Year	NRCC 24-hr	D	Default	24.00	1	4.65	2
3	25-Year	NRCC 24-hr	D	Default	24.00	1	5.87	2
4	100-Year	NRCC 24-hr	D	Default	24.00	1	8.36	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
203,891	54	1/2 acre lots, 25% imp, HSG A (E-6, E-7, E-8, E-9)
301,384	39	>75% Grass cover, Good, HSG A (E-5, E-6, E-7, E-8, E-9)
48,960	72	Dirt roads, HSG A (E-1, E-3, E-4, E-5, E-6, E-7, E-8, E-9)
151,825	98	Paved parking, HSG A (E-5, E-6, E-7)
92,710	98	Roofs, HSG A (E-2, E-3, E-5, E-7, E-8, E-9)
95,638	98	Unconnected pavement, HSG A (E-5, E-6, E-7, E-8)
752,667	30	Woods, Good, HSG A (E-1, E-2, E-3, E-4, E-5, E-6, E-7, E-8, E-9)
1,647,074	**50**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
1,647,074	HSG A	E-1, E-2, E-3, E-4, E-5, E-6, E-7, E-8, E-9
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
1,647,074		**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	Su Nu
203,891	0	0	0	0	203,891	1/2 acre lots, 25% imp	
301,384	0	0	0	0	301,384	>75% Grass cover, Good	
48,960	0	0	0	0	48,960	Dirt roads	
151,825	0	0	0	0	151,825	Paved parking	
92,710	0	0	0	0	92,710	Roofs	
95,638	0	0	0	0	95,638	Unconnected pavement	
752,667	0	0	0	0	752,667	Woods, Good	
1,647,074	**0**	**0**	**0**	**0**	**1,647,074**	**TOTAL AREA**	

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

Subcatchment E-1: Subcat E-1 Runoff Area=12,581 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=188' Tc=8.8 min CN=36 Runoff=0.00 cfs 0 cf

Subcatchment E-2: Subcat E-2 Runoff Area=32,388 sf 0.29% Impervious Runoff Depth=0.00"
Flow Length=230' Tc=7.5 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment E-3: Subcat E-3 Runoff Area=85,727 sf 1.59% Impervious Runoff Depth=0.00"
Flow Length=341' Tc=10.4 min CN=33 Runoff=0.00 cfs 0 cf

Subcatchment E-4: Subcat E-4 Runoff Area=39,239 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=201' Tc=12.2 min CN=32 Runoff=0.00 cfs 0 cf

Subcatchment E-5: Subcat E-5 Runoff Area=198,881 sf 26.41% Impervious Runoff Depth>0.07"
Tc=6.0 min UI Adjusted CN=50 Runoff=0.05 cfs 1,198 cf

Subcatchment E-6: Subcat E-6 Runoff Area=260,840 sf 59.51% Impervious Runoff Depth>0.79"
Tc=6.0 min CN=73 Runoff=5.64 cfs 17,145 cf

Subcatchment E-7: Subcat E-7 Runoff Area=122,430 sf 13.61% Impervious Runoff Depth>0.01"
Tc=6.0 min CN=44 Runoff=0.01 cfs 91 cf

Subcatchment E-8: Subcat E-8 Runoff Area=784,340 sf 20.31% Impervious Runoff Depth>0.01"
Flow Length=845' Tc=27.8 min UI Adjusted CN=45 Runoff=0.07 cfs 927 cf

Subcatchment E-9: Subcat E-9 Runoff Area=110,648 sf 5.39% Impervious Runoff Depth=0.00"
Flow Length=353' Tc=10.8 min CN=37 Runoff=0.00 cfs 0 cf

Pond 4P: Existing Ditch 1 Peak Elev=193.00' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond 7P: Drainage Easement Ditch Peak Elev=174.94' Storage=1,672 cf Inflow=5.64 cfs 17,236 cf
Discarded=2.41 cfs 17,223 cf Primary=0.00 cfs 0 cf Outflow=2.41 cfs 17,223 cf

Pond 8P: Bio-Retention Area Peak Elev=159.13' Storage=127 cf Inflow=0.07 cfs 927 cf
Discarded=0.06 cfs 798 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 798 cf

Pond 9P: Existing Ditch 2 Peak Elev=163.00' Storage=0 cf Inflow=0.00 cfs 0 cf
Discarded=0.00 cfs 0 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf

Link SP1: Study Point 1 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP2: Study Point 2 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP3: Study Point 3 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP4: Study Point 4 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP5: Study Point 5 Inflow=0.05 cfs 1,198 cf
Primary=0.05 cfs 1,198 cf

Link SP6: Study Point 6 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,647,074 sf Runoff Volume = 19,360 cf Average Runoff Depth = 0.14"
76.25% Pervious = 1,255,929 sf 23.75% Impervious = 391,146 sf

Summary for Subcatchment E-1: Subcat E-1

[45] Hint: Runoff=Zero

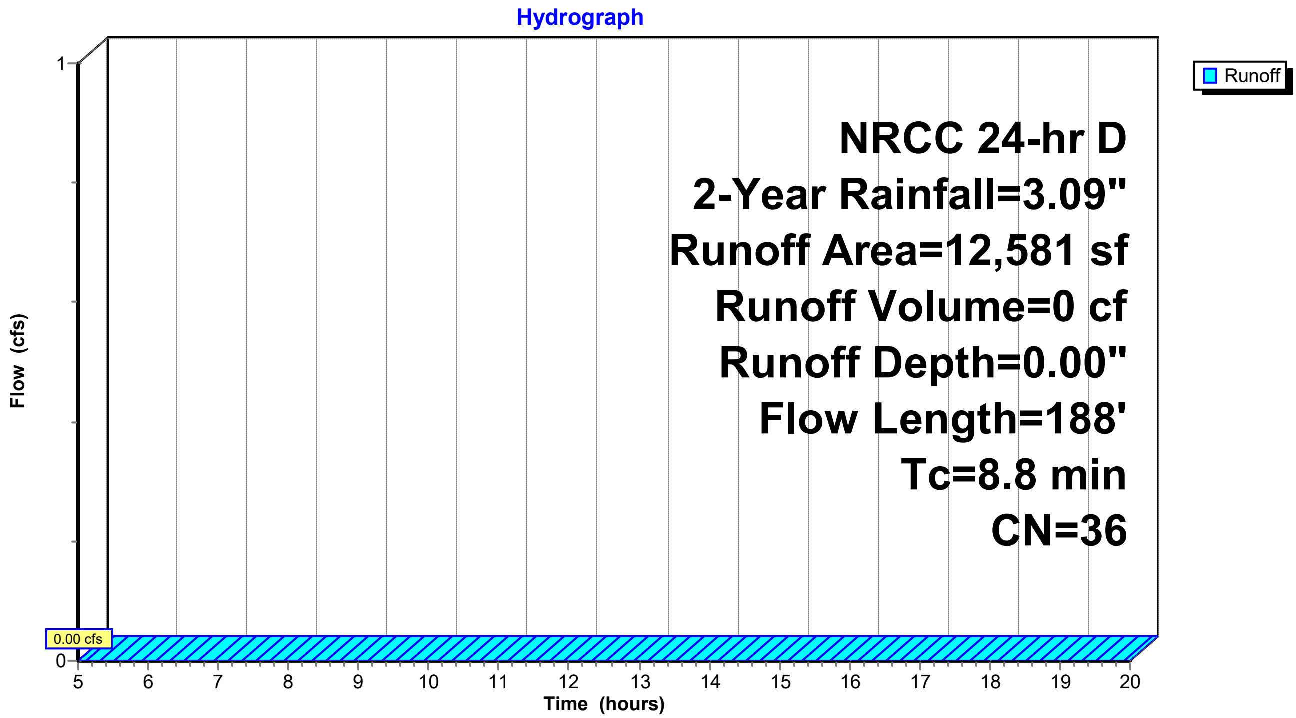
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
6,126	30	Woods, Good, HSG A
23	30	Woods, Good, HSG A
1,198	30	Woods, Good, HSG A
3,288	30	Woods, Good, HSG A
1,947	72	Dirt roads, HSG A
12,581	36	Weighted Average
12,581		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0900	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.7	55	0.2540	1.26		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
0.1	15	0.0660	4.14		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.3	18	0.1380	0.93		**Shallow Concentrated Flow, D-E** Forest w/Heavy Litter Kv= 2.5 fps
0.1	14	0.0570	3.84		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
0.7	36	0.1250	0.88		**Shallow Concentrated Flow, F-G** Forest w/Heavy Litter Kv= 2.5 fps
8.8	188	Total			

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

[45] Hint: Runoff=Zero

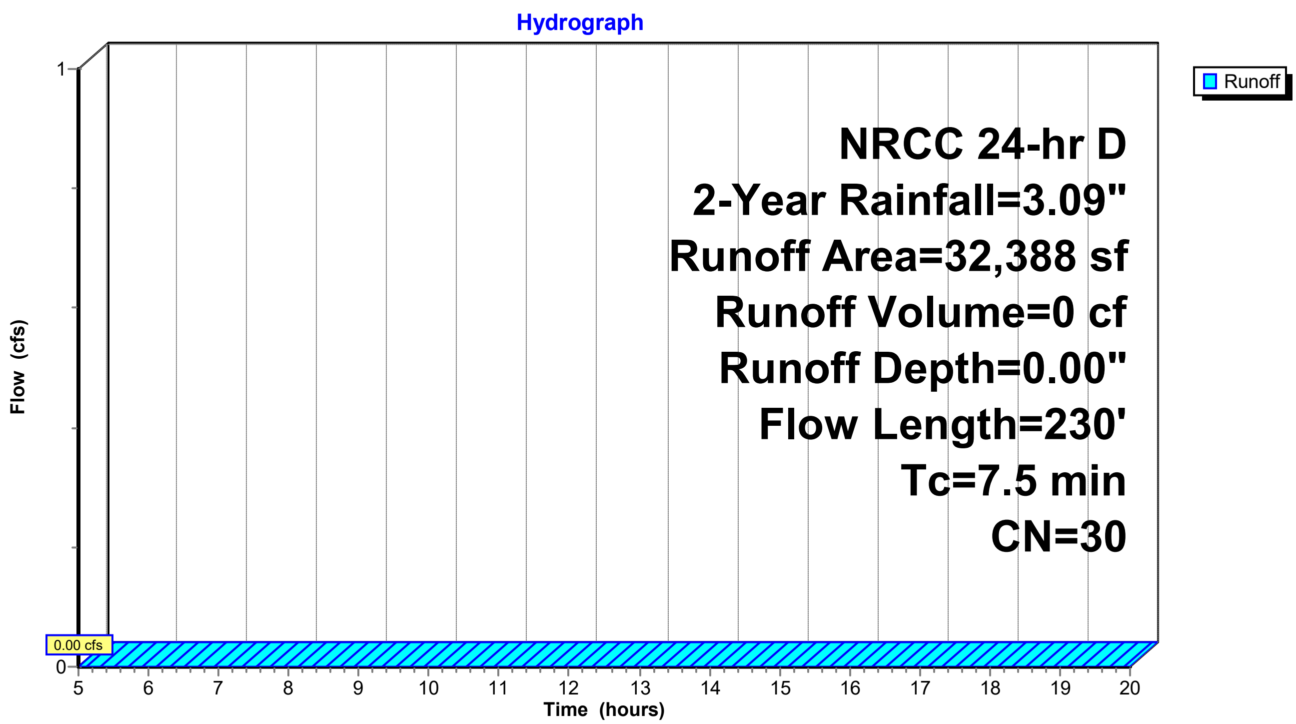
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
95	98	Roofs, HSG A
32,293	30	Woods, Good, HSG A
32,388	30	Weighted Average
32,293		99.71% Pervious Area
95		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1800	0.16		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.7	92	0.1950	2.21		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	88	0.0340	0.92		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.5	230	Total			

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

[45] Hint: Runoff=Zero

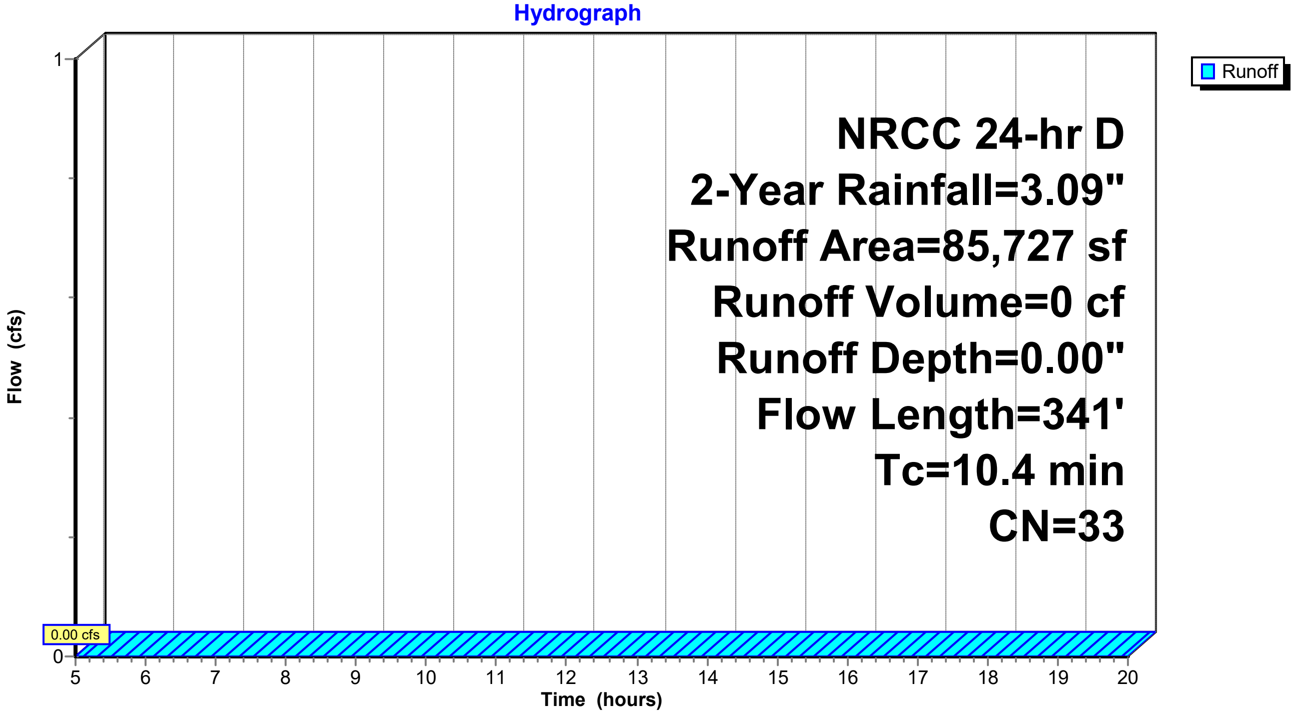
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
64,217	30	Woods, Good, HSG A
17,077	30	Woods, Good, HSG A
618	98	Roofs, HSG A
347	98	Roofs, HSG A
400	98	Roofs, HSG A
3,068	72	Dirt roads, HSG A
85,727	33	Weighted Average
84,362		98.41% Pervious Area
1,365		1.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.5	74	0.2160	2.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	60	0.0250	2.55		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
2.3	157	0.0510	1.13		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
10.4	341	Total			

Subcatchment E-3: Subcat E-3



Summary for Subcatchment E-4: Subcat E-4

[45] Hint: Runoff=Zero

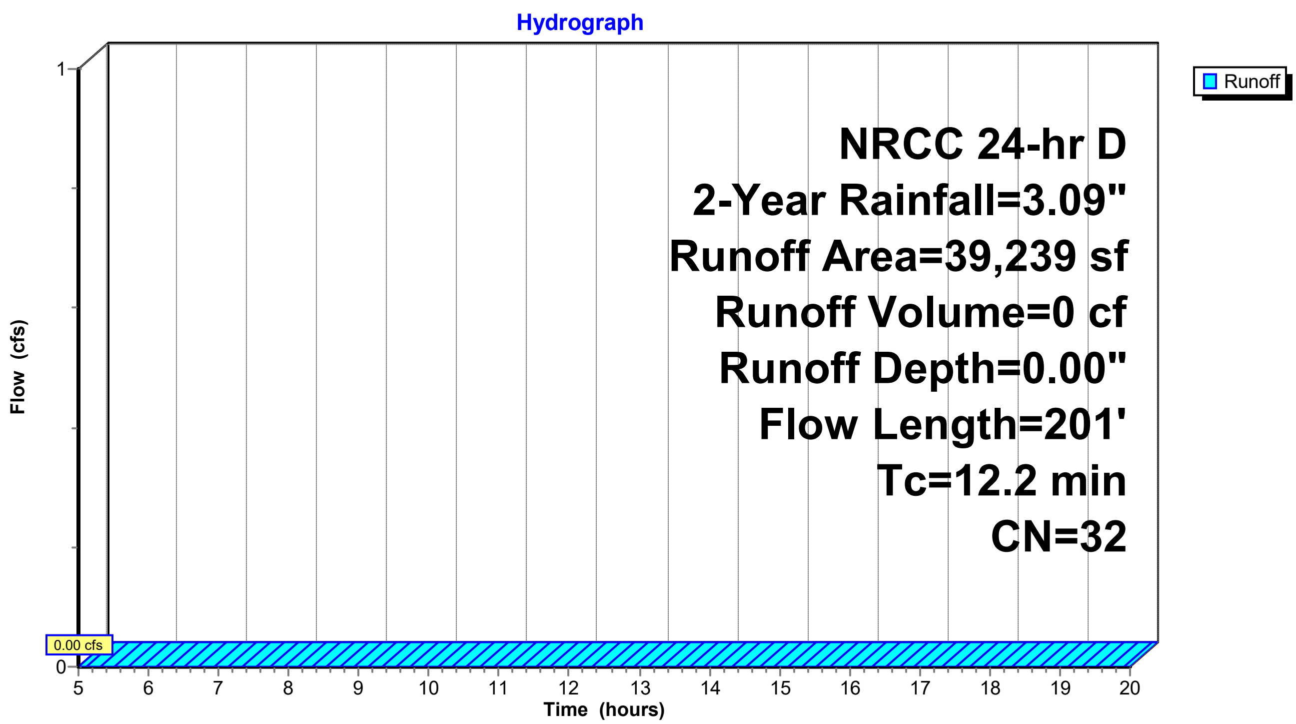
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 4P : Existing Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
19,291	30	Woods, Good, HSG A
18,208	30	Woods, Good, HSG A
1,739	72	Dirt roads, HSG A
39,239	32	Weighted Average
39,239		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	21	0.0200	0.99		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.2	201	Total			

Subcatchment E-4: Subcat E-4



Summary for Subcatchment E-5: Subcat E-5

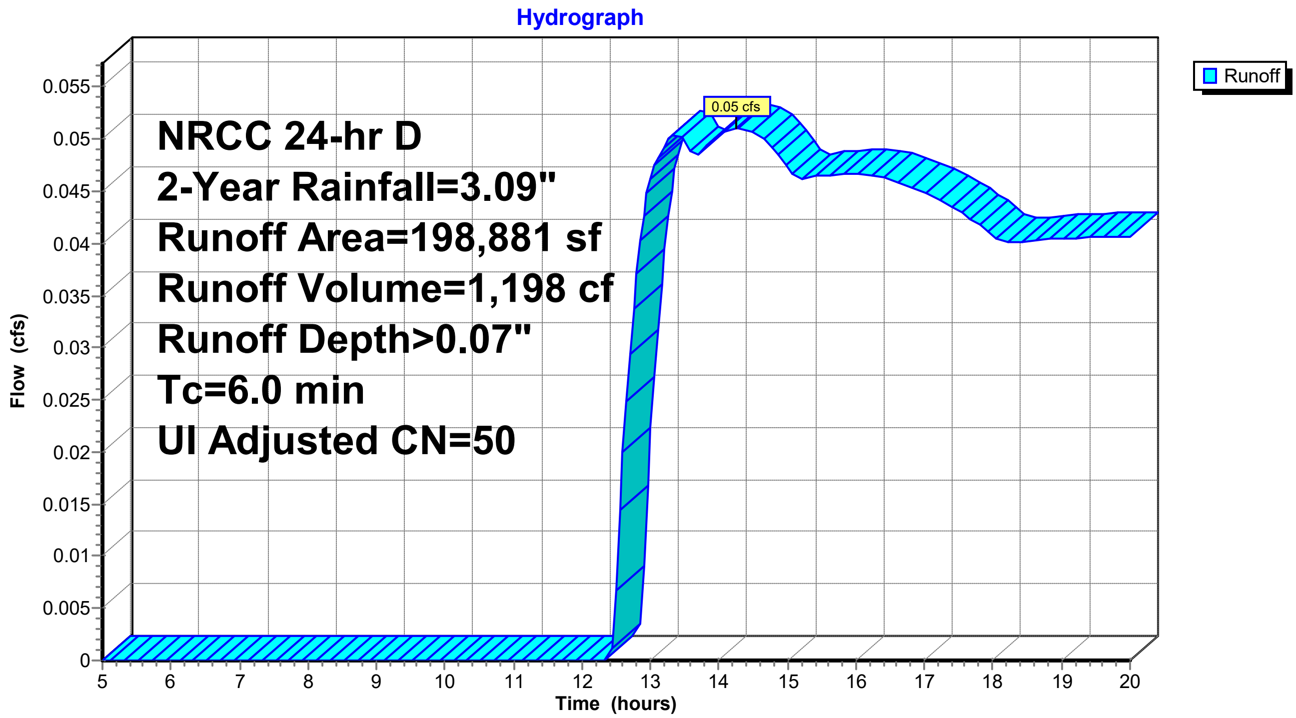
Runoff = 0.05 cfs @ 14.25 hrs, Volume= 1,198 cf, Depth> 0.07"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Adj	Description
60,243	30		Woods, Good, HSG A
21,040	30		Woods, Good, HSG A
11,413	30		Woods, Good, HSG A
5,380	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
16,563	39		>75% Grass cover, Good, HSG A
0	39		>75% Grass cover, Good, HSG A
315	39		>75% Grass cover, Good, HSG A
1,914	39		>75% Grass cover, Good, HSG A
761	39		>75% Grass cover, Good, HSG A
10,302	39		>75% Grass cover, Good, HSG A
1,325	30		Woods, Good, HSG A
13,415	72		Dirt roads, HSG A
527	98		Unconnected pavement, HSG A
43	98		Unconnected pavement, HSG A
38	98		Unconnected pavement, HSG A
39	98		Unconnected pavement, HSG A
13,837	98		Unconnected pavement, HSG A
33	98		Unconnected pavement, HSG A
16,302	98		Paved parking, HSG A
330	39		>75% Grass cover, Good, HSG A
9,969	98		Roofs, HSG A
395	98		Roofs, HSG A
1,474	98		Roofs, HSG A
2	98		Roofs, HSG A
9,863	98		Roofs, HSG A
3,360	39		>75% Grass cover, Good, HSG A
198,881	52	50	Weighted Average, UI Adjusted
146,360			73.59% Pervious Area
52,521			26.41% Impervious Area
14,517			27.64% Unconnected

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

Subcatchment E-5: Subcat E-5



Summary for Subcatchment E-6: Subcat E-6

Runoff = 5.64 cfs @ 12.14 hrs, Volume= 17,145 cf, Depth> 0.79"
Routed to Pond 7P : Drainage Easement Ditch

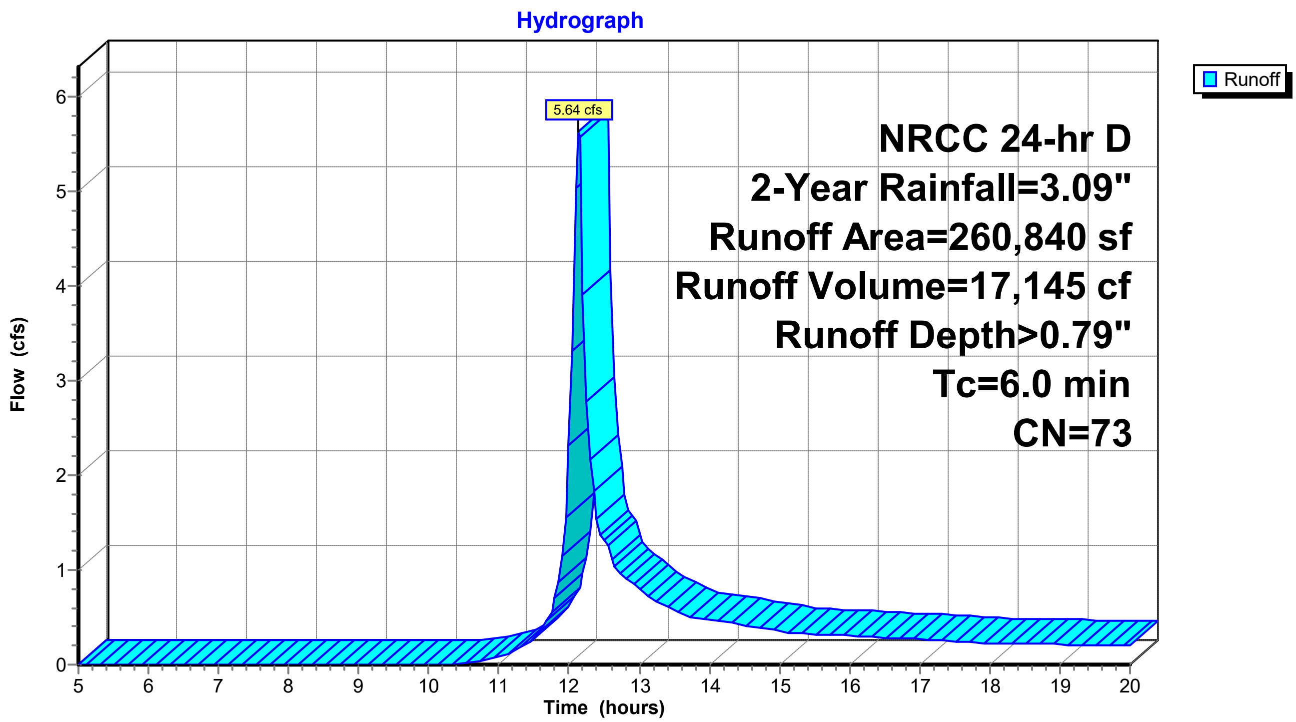
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
76	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
512	30	Woods, Good, HSG A
87	30	Woods, Good, HSG A
580	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
234	30	Woods, Good, HSG A
41	30	Woods, Good, HSG A
17	30	Woods, Good, HSG A
124	39	>75% Grass cover, Good, HSG A
1,324	39	>75% Grass cover, Good, HSG A
3,326	39	>75% Grass cover, Good, HSG A
197	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
1,494	39	>75% Grass cover, Good, HSG A
488	39	>75% Grass cover, Good, HSG A
0	39	>75% Grass cover, Good, HSG A
1,039	39	>75% Grass cover, Good, HSG A
80	30	Woods, Good, HSG A
5,897	39	>75% Grass cover, Good, HSG A
207	39	>75% Grass cover, Good, HSG A
38	39	>75% Grass cover, Good, HSG A
35,199	54	1/2 acre lots, 25% imp, HSG A
2,290	54	1/2 acre lots, 25% imp, HSG A
2,360	98	Unconnected pavement, HSG A
889	98	Unconnected pavement, HSG A
5,804	98	Unconnected pavement, HSG A
135,515	98	Paved parking, HSG A
563	98	Unconnected pavement, HSG A
3,565	39	>75% Grass cover, Good, HSG A
2,358	30	Woods, Good, HSG A
6,778	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
1,577	39	>75% Grass cover, Good, HSG A
1,768	39	>75% Grass cover, Good, HSG A
362	39	>75% Grass cover, Good, HSG A
12,602	30	Woods, Good, HSG A
10,885	39	>75% Grass cover, Good, HSG A
4,375	30	Woods, Good, HSG A
2,426	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
348	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
44	72	Dirt roads, HSG A
591	39	>75% Grass cover, Good, HSG A
2,039	39	>75% Grass cover, Good, HSG A
564	39	>75% Grass cover, Good, HSG A
91	98	Unconnected pavement, HSG A

623	98	Unconnected pavement, HSG A
3	39	>75% Grass cover, Good, HSG A
839	39	>75% Grass cover, Good, HSG A
6	39	>75% Grass cover, Good, HSG A
6,902	39	>75% Grass cover, Good, HSG A
2,574	39	>75% Grass cover, Good, HSG A
260,840	73	Weighted Average
105,622		40.49% Pervious Area
155,218		59.51% Impervious Area
10,331		6.66% Unconnected

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

Subcatchment E-6: Subcat E-6



Summary for Subcatchment E-7: Subcat E-7

[73] Warning: Peak may fall outside time span

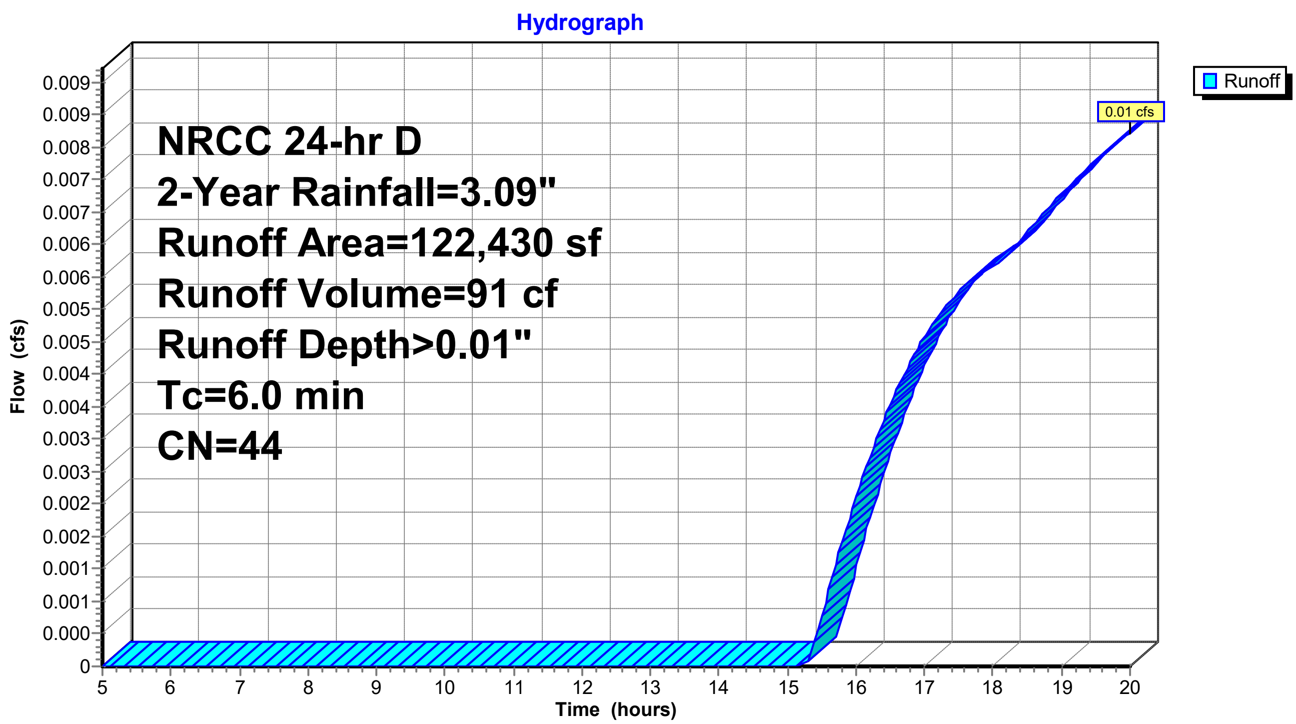
Runoff = 0.01 cfs @ 20.00 hrs, Volume= 91 cf, Depth> 0.01"
Routed to Pond 7P : Drainage Easement Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
72	30	Woods, Good, HSG A
62,479	30	Woods, Good, HSG A
1,141	30	Woods, Good, HSG A
114	39	>75% Grass cover, Good, HSG A
990	39	>75% Grass cover, Good, HSG A
243	39	>75% Grass cover, Good, HSG A
3,704	39	>75% Grass cover, Good, HSG A
215	30	Woods, Good, HSG A
3,897	54	1/2 acre lots, 25% imp, HSG A
37,219	54	1/2 acre lots, 25% imp, HSG A
113	98	Unconnected pavement, HSG A
159	98	Unconnected pavement, HSG A
5,286	98	Roofs, HSG A
5,740	72	Dirt roads, HSG A
234	39	>75% Grass cover, Good, HSG A
8	98	Paved parking, HSG A
789	98	Unconnected pavement, HSG A
26	98	Unconnected pavement, HSG A
1	98	Unconnected pavement, HSG A
122,430	44	Weighted Average
105,770		86.39% Pervious Area
16,661		13.61% Impervious Area
1,088		6.53% Unconnected

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

Subcatchment E-7: Subcat E-7



Summary for Subcatchment E-8: Subcat E-8

[73] Warning: Peak may fall outside time span

Runoff = 0.07 cfs @ 20.00 hrs, Volume= 927 cf, Depth> 0.01"
Routed to Pond 8P : Bio-Retention Area

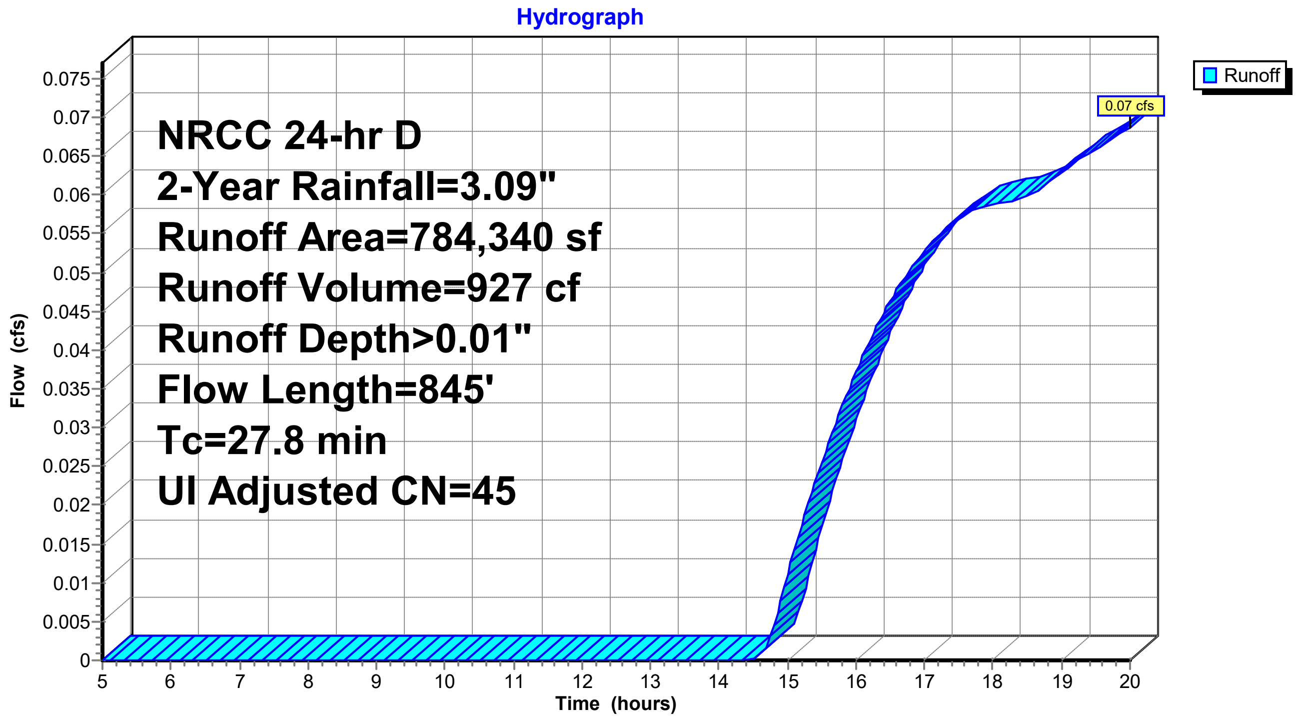
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Adj	Description
0	30		Woods, Good, HSG A
37,409	30		Woods, Good, HSG A
151,691	30		Woods, Good, HSG A
13,674	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
51,870	30		Woods, Good, HSG A
67,378	30		Woods, Good, HSG A
57	39		>75% Grass cover, Good, HSG A
107	39		>75% Grass cover, Good, HSG A
1,057	39		>75% Grass cover, Good, HSG A
58	39		>75% Grass cover, Good, HSG A
10,449	39		>75% Grass cover, Good, HSG A
104,791	39		>75% Grass cover, Good, HSG A
87,385	39		>75% Grass cover, Good, HSG A
1,978	39		>75% Grass cover, Good, HSG A
161	39		>75% Grass cover, Good, HSG A
103,904	54		1/2 acre lots, 25% imp, HSG A
665	72		Dirt roads, HSG A
61	98		Unconnected pavement, HSG A
71	98		Unconnected pavement, HSG A
70	98		Unconnected pavement, HSG A
16,908	98		Unconnected pavement, HSG A
26,556	98		Unconnected pavement, HSG A
1,433	98		Unconnected pavement, HSG A
110	98		Unconnected pavement, HSG A
11,569	98		Unconnected pavement, HSG A
1,743	98		Unconnected pavement, HSG A
3,101	98		Unconnected pavement, HSG A
12	98		Unconnected pavement, HSG A
71	98		Unconnected pavement, HSG A
210	98		Unconnected pavement, HSG A
299	98		Unconnected pavement, HSG A
7,456	98		Unconnected pavement, HSG A
30	98		Unconnected pavement, HSG A
273	98		Roofs, HSG A
131	98		Roofs, HSG A
605	98		Roofs, HSG A
1,939	98		Roofs, HSG A
598	98		Roofs, HSG A
9,916	98		Roofs, HSG A
47,139	98		Roofs, HSG A
175	98		Roofs, HSG A
713	98		Roofs, HSG A
278	98		Roofs, HSG A
879	98		Roofs, HSG A
395	98		Roofs, HSG A
602	98		Roofs, HSG A
9,672	72		Dirt roads, HSG A
8,690	72		Dirt roads, HSG A

784,340	48	45	Weighted Average, UI Adjusted
625,021			79.69% Pervious Area
159,319			20.31% Impervious Area
69,702			43.75% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	50	0.0240	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
2.0	76	0.0660	0.64		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	79	0.0120	0.77		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.2	27	0.0127	2.29		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
3.9	220	0.0180	0.94		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
8.3	393	0.0990	0.79		**Shallow Concentrated Flow, F-G** Forest w/Heavy Litter Kv= 2.5 fps
27.8	845	Total			

Subcatchment E-8: Subcat E-8



Summary for Subcatchment E-9: Subcat E-9

[45] Hint: Runoff=Zero

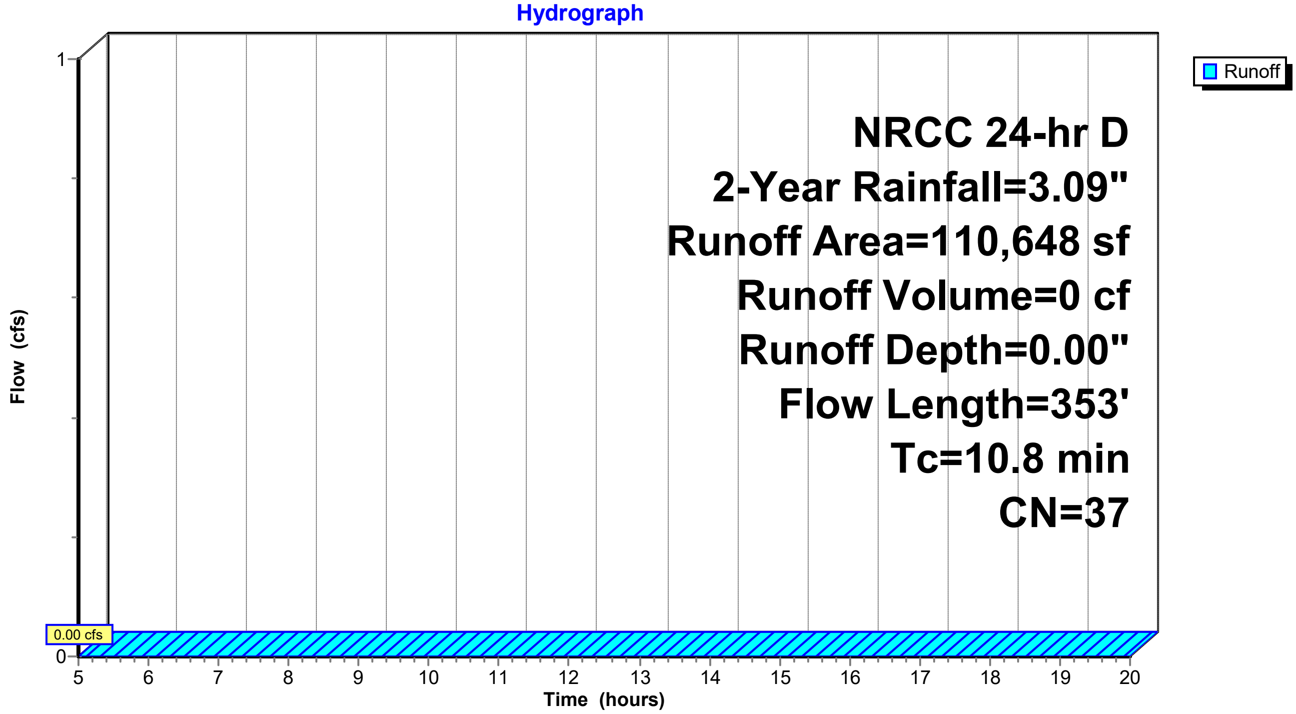
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 9P : Existing Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
835	30	Woods, Good, HSG A
18,276	30	Woods, Good, HSG A
65,542	30	Woods, Good, HSG A
13	39	>75% Grass cover, Good, HSG A
21,381	54	1/2 acre lots, 25% imp, HSG A
621	98	Roofs, HSG A
3,980	72	Dirt roads, HSG A
110,648	37	Weighted Average
104,681		94.61% Pervious Area
5,967		5.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.2000	0.17		**Sheet Flow, A-B**
					Woods: Light underbrush n= 0.400 P2= 3.09"
5.8	303	0.1220	0.87		**Shallow Concentrated Flow, B-C**
					Forest w/Heavy Litter Kv= 2.5 fps
10.8	353	Total			

Subcatchment E-9: Subcat E-9



Summary for Pond 4P: Existing Ditch 1

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 193.00' @ 5.00 hrs Surf.Area= 30 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

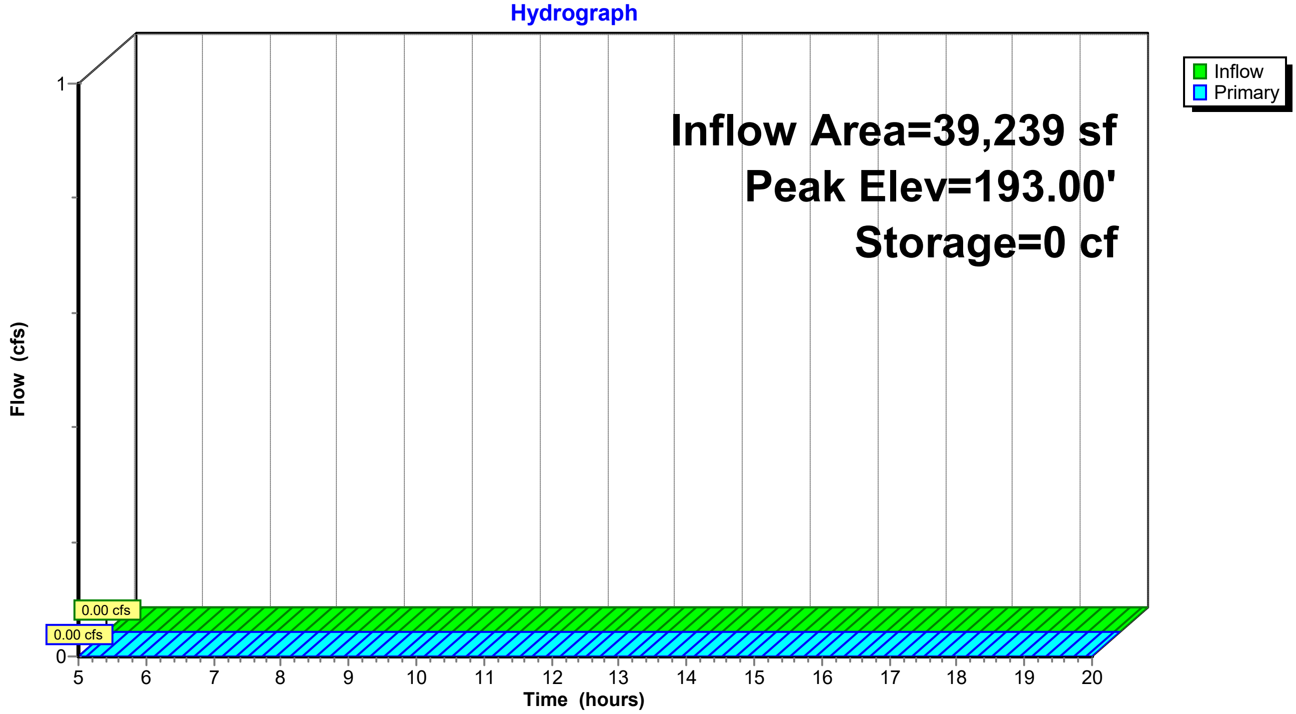
Volume	Invert	Avail.Storage	Storage Description
#1	193.00'	17,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.00	30	0	0
194.00	1,087	559	559
195.00	2,356	1,722	2,280
196.00	3,959	3,158	5,438
197.00	5,956	4,958	10,395
198.00	8,319	7,138	17,533

Device	Routing	Invert	Outlet Devices
#1	Primary	197.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=193.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Existing Ditch 1



Summary for Pond 7P: Drainage Easement Ditch

Inflow Area = 383,270 sf, 44.85% Impervious, Inflow Depth > 0.54" for 2-Year event
Inflow = 5.64 cfs @ 12.14 hrs, Volume= 17,236 cf
Outflow = 2.41 cfs @ 12.05 hrs, Volume= 17,223 cf, Atten= 57%, Lag= 0.0 min
Discarded = 2.41 cfs @ 12.05 hrs, Volume= 17,223 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 174.94' @ 12.28 hrs Surf.Area= 3,077 sf Storage= 1,672 cf

Plug-Flow detention time= 3.1 min calculated for 17,166 cf (100% of inflow)
Center-of-Mass det. time= 2.9 min (840.3 - 837.4)

Volume	Invert	Avail.Storage	Storage Description
#1	174.00'	345,939 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

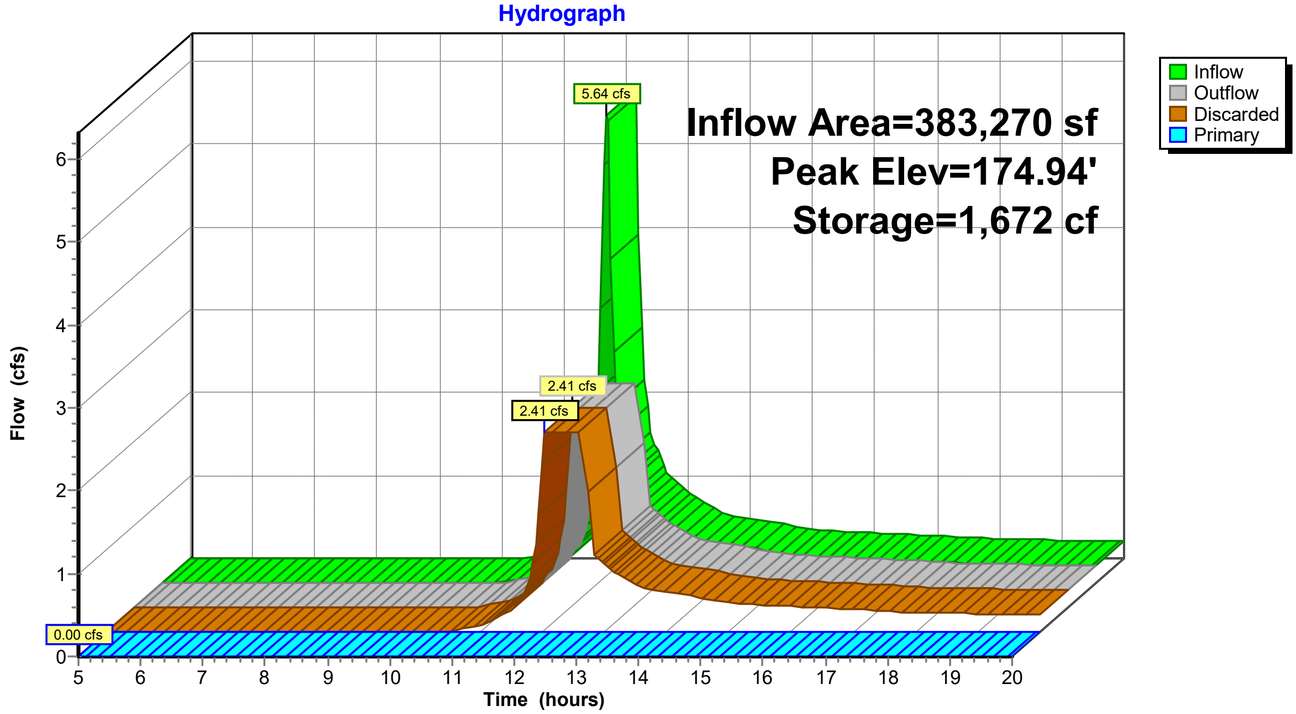
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.00	491	0	0
175.00	3,251	1,871	1,871
176.00	4,753	4,002	5,873
177.00	6,309	5,531	11,404
178.00	7,641	6,975	18,379
179.00	8,869	8,255	26,634
180.00	10,188	9,529	36,163
181.00	11,953	11,071	47,233
182.00	14,143	13,048	60,281
183.00	16,525	15,334	75,615
184.00	19,118	17,822	93,437
185.00	21,426	20,272	113,709
186.00	23,221	22,324	136,032
187.00	24,868	24,045	160,077
188.00	26,530	25,699	185,776
189.00	28,209	27,370	213,145
190.00	30,172	29,191	242,336
191.00	32,732	31,452	273,788
192.00	36,071	34,402	308,189
193.00	39,428	37,750	345,939

Device	Routing	Invert	Outlet Devices
#1	Primary	192.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	174.00'	**2.41 cfs Exfiltration at all elevations**

Discarded OutFlow Max=2.41 cfs @ 12.05 hrs HW=174.26' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 2.41 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=174.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Drainage Easement Ditch



Summary for Pond 8P: Bio-Retention Area

Inflow Area = 784,340 sf, 20.31% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.07 cfs @ 20.00 hrs, Volume= 927 cf
Outflow = 0.06 cfs @ 20.00 hrs, Volume= 798 cf, Atten= 13%, Lag= 0.0 min
Discarded = 0.06 cfs @ 20.00 hrs, Volume= 798 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 159.13' @ 20.00 hrs Surf.Area= 1,075 sf Storage= 127 cf

Plug-Flow detention time= 26.9 min calculated for 795 cf (86% of inflow)
Center-of-Mass det. time= 8.8 min (1,082.0 - 1,073.2)

Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	100,011 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

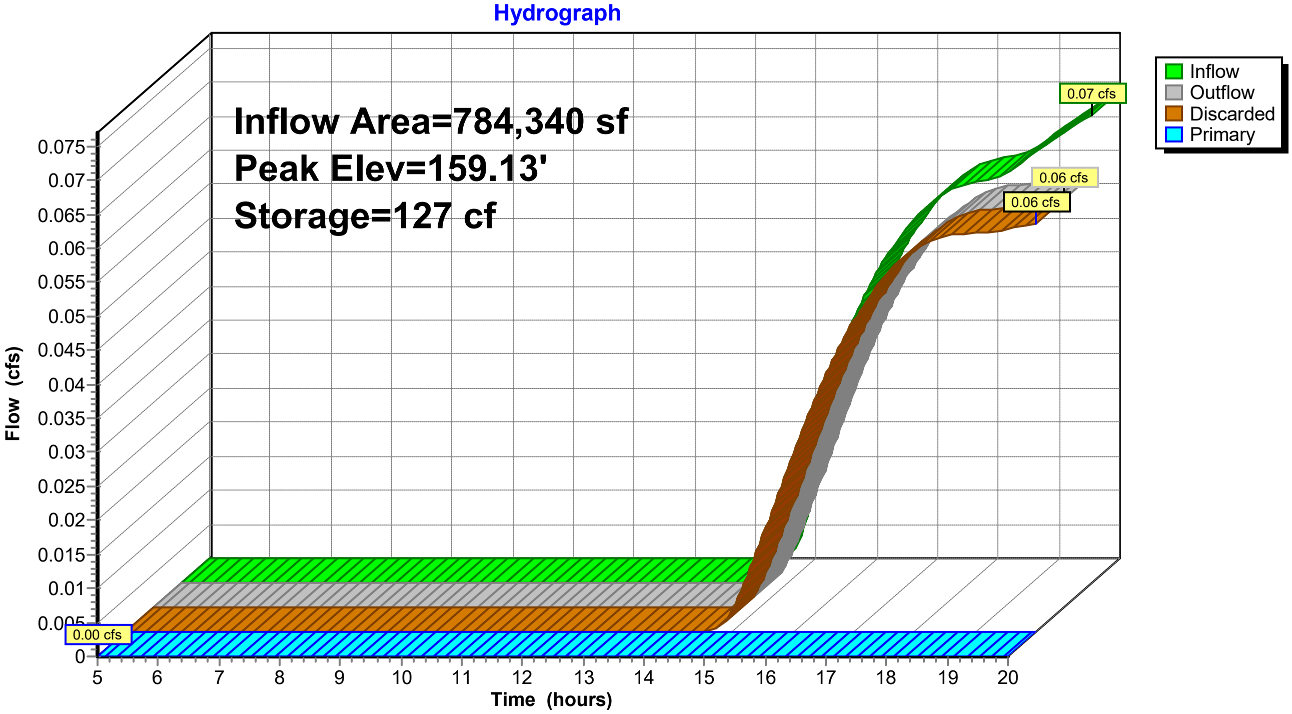
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
159.00	934	176.0	0	0	934
160.00	2,320	278.0	1,575	1,575	4,626
161.00	3,563	292.0	2,919	4,495	5,322
162.00	4,546	305.0	4,045	8,539	6,008
163.00	5,553	339.0	5,041	13,580	7,780
164.00	6,677	374.0	6,106	19,687	9,798
165.00	8,367	426.0	7,506	27,193	13,132
166.00	12,063	523.0	10,159	37,352	20,473
167.00	17,347	642.0	14,625	51,977	31,520
168.00	23,464	806.0	20,329	72,306	50,432
169.00	32,175	988.0	27,705	100,011	76,430

Device	Routing	Invert	Outlet Devices
#1	Primary	168.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	159.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.06 cfs @ 20.00 hrs HW=159.13' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=159.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Bio-Retention Area



Summary for Pond 9P: Existing Ditch 2

Inflow Area = 110,648 sf, 5.39% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 163.00' @ 5.00 hrs Surf.Area= 333 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	94,144 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

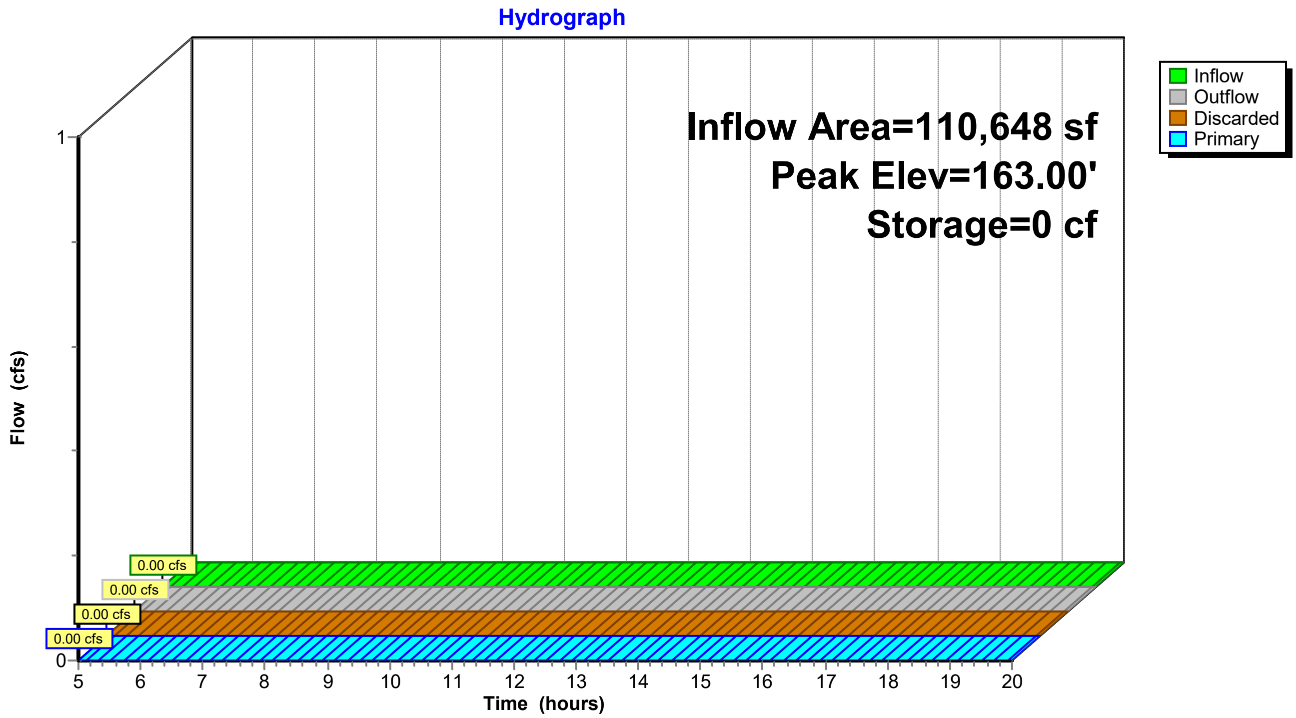
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
163.00	333	0	0
164.00	1,602	968	968
165.00	2,975	2,289	3,256
166.00	4,470	3,723	6,979
167.00	6,302	5,386	12,365
168.00	8,505	7,404	19,768
169.00	10,882	9,694	29,462
170.00	13,282	12,082	41,544
171.00	15,858	14,570	56,114
172.00	18,847	17,353	73,466
173.00	22,508	20,678	94,144

Device	Routing	Invert	Outlet Devices
#1	Primary	172.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	163.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=163.00' (Free Discharge)
└─**2=Exfiltration** (Passes 0.00 cfs of 0.02 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=163.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 9P: Existing Ditch 2

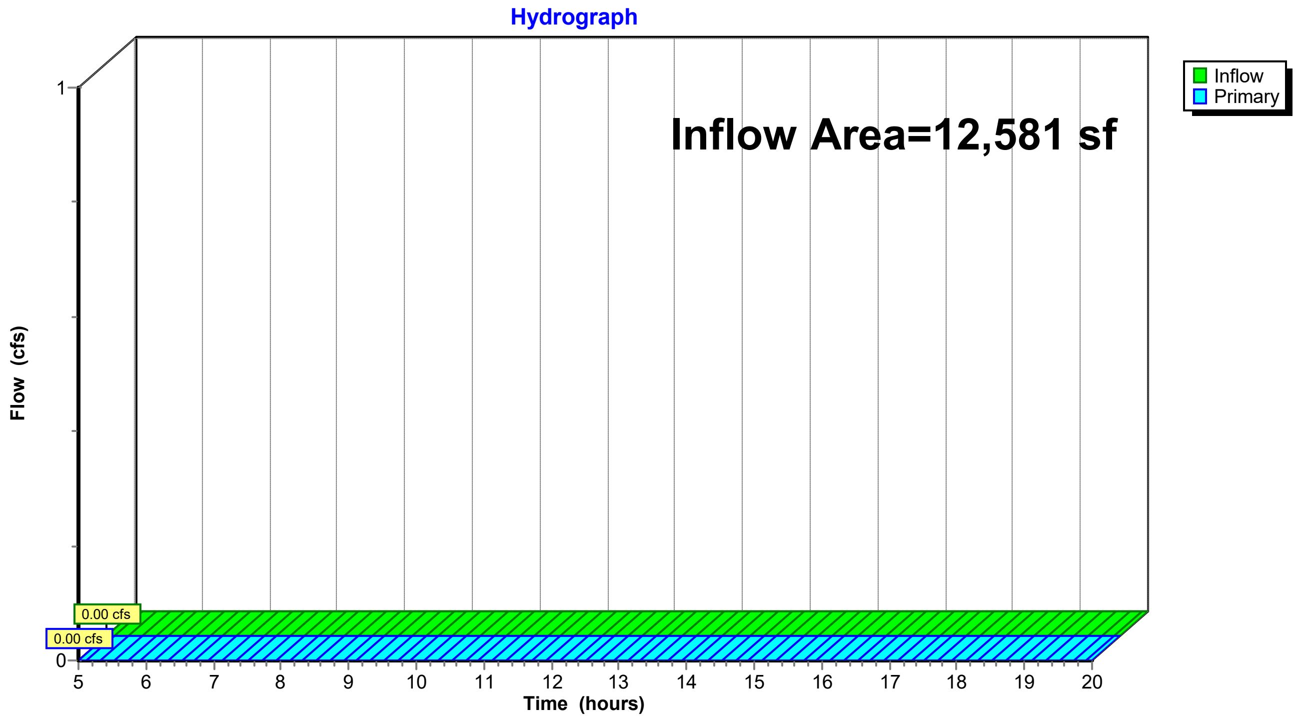


Summary for Link SP1: Study Point 1

Inflow Area = 12,581 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP1: Study Point 1

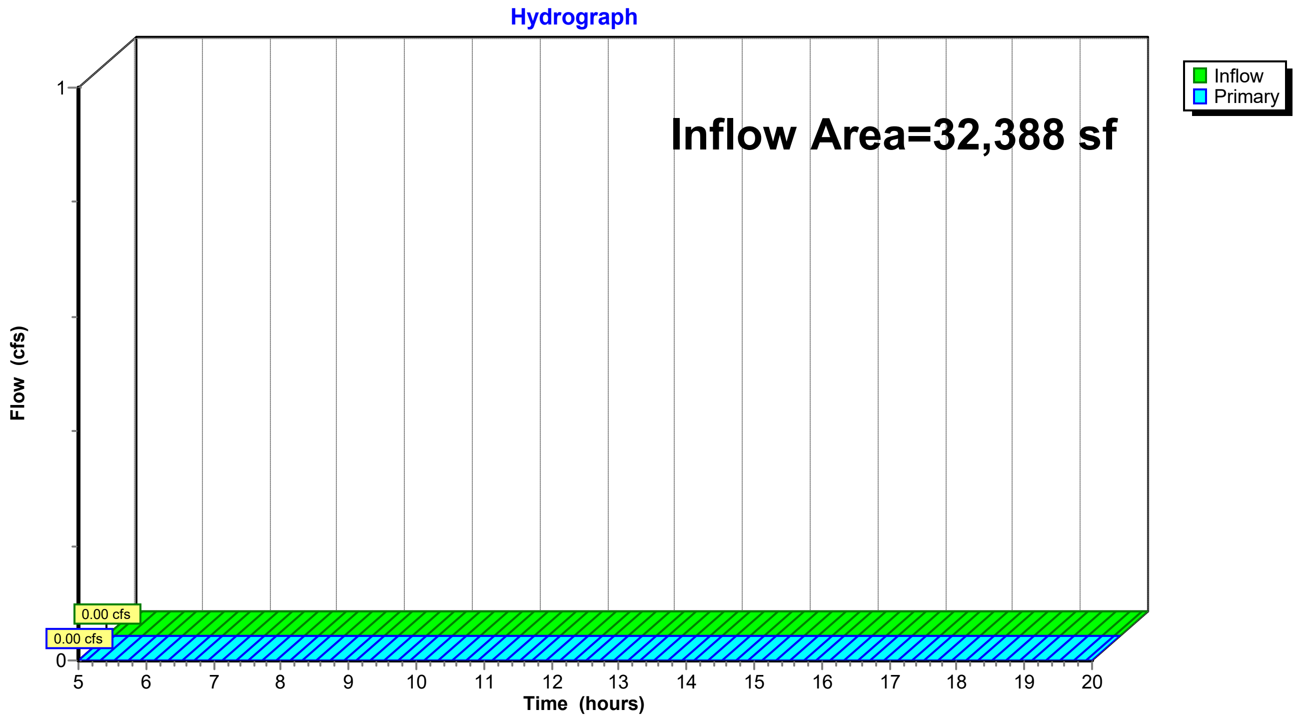


Summary for Link SP2: Study Point 2

Inflow Area =	32,388 sf,	0.29% Impervious,	Inflow Depth = 0.00"	for 2-Year event	
Inflow =	0.00 cfs @	5.00 hrs, Volume=	0 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf,	Atten= 0%,	Lag= 0.0 min

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

Link SP2: Study Point 2

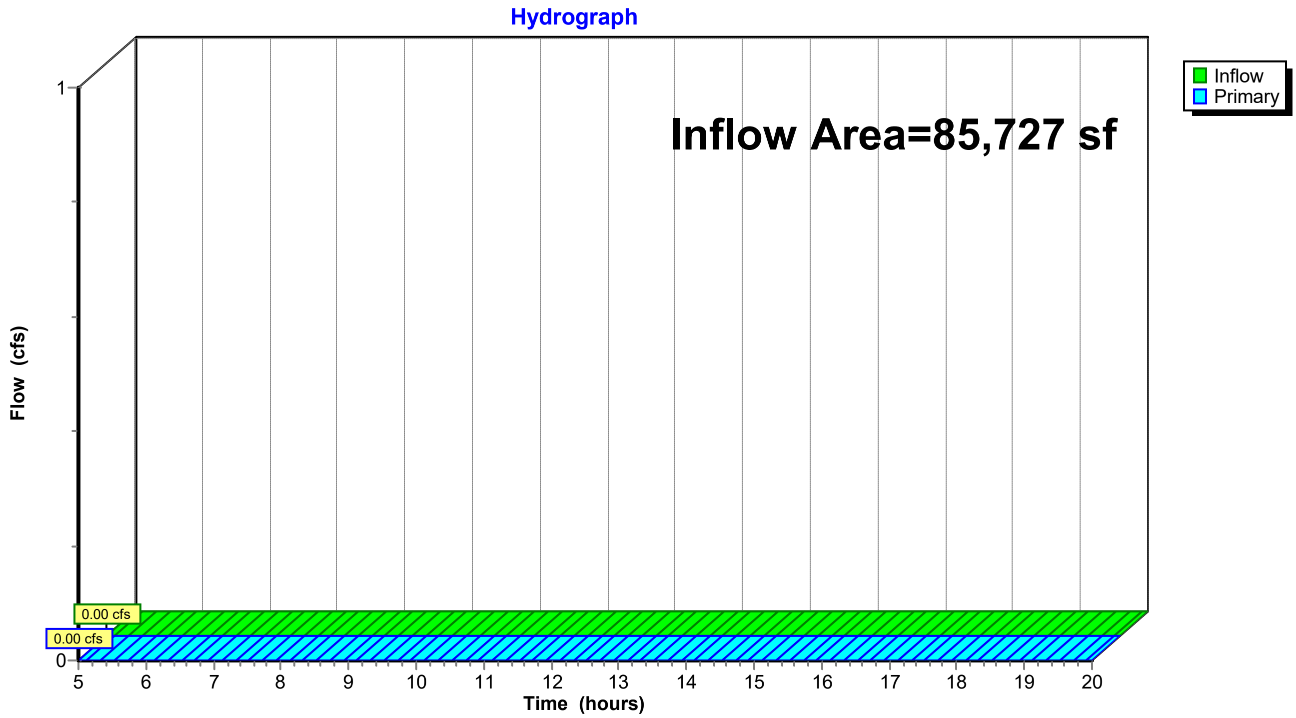


Summary for Link SP3: Study Point 3

Inflow Area =	85,727 sf,	1.59% Impervious,	Inflow Depth = 0.00"	for 2-Year event
Inflow =	0.00 cfs @	5.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP3: Study Point 3

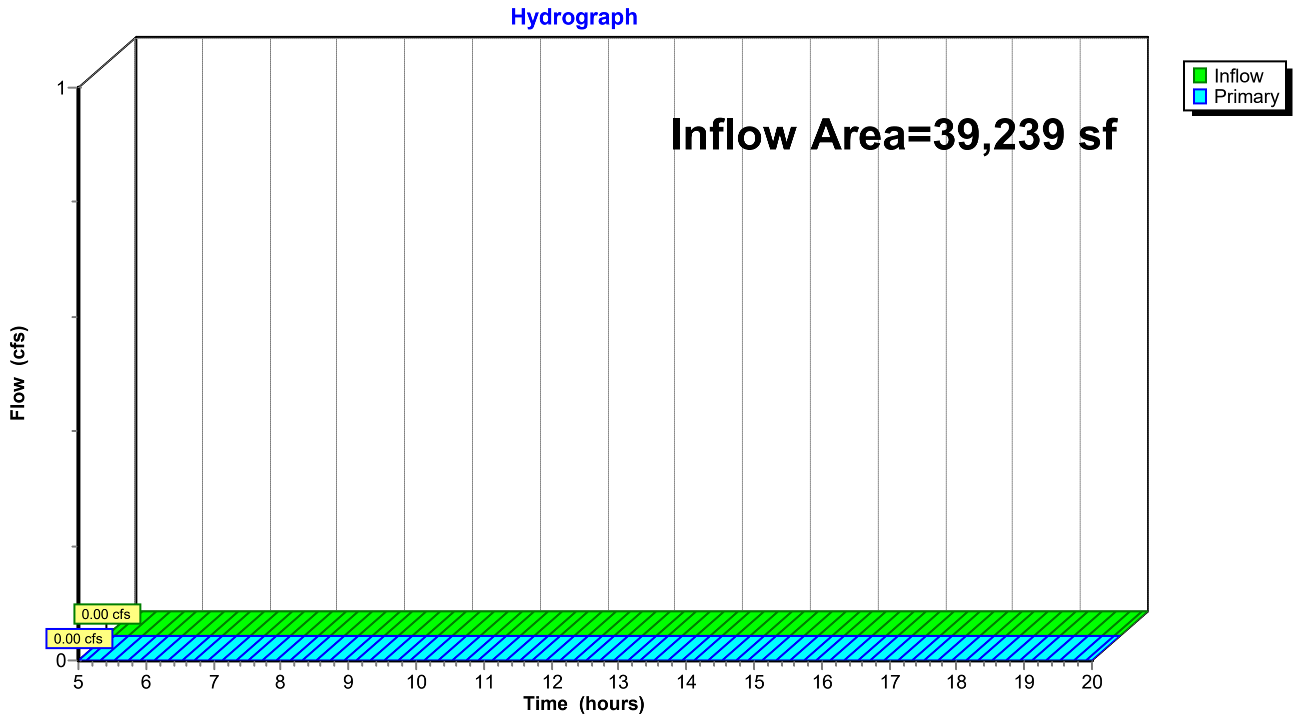


Summary for Link SP4: Study Point 4

Inflow Area =	39,239 sf,	0.00% Impervious,	Inflow Depth = 0.00"	for 2-Year event	
Inflow =	0.00 cfs @	5.00 hrs, Volume=	0 cf		
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf,	Atten= 0%,	Lag= 0.0 min

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

Link SP4: Study Point 4

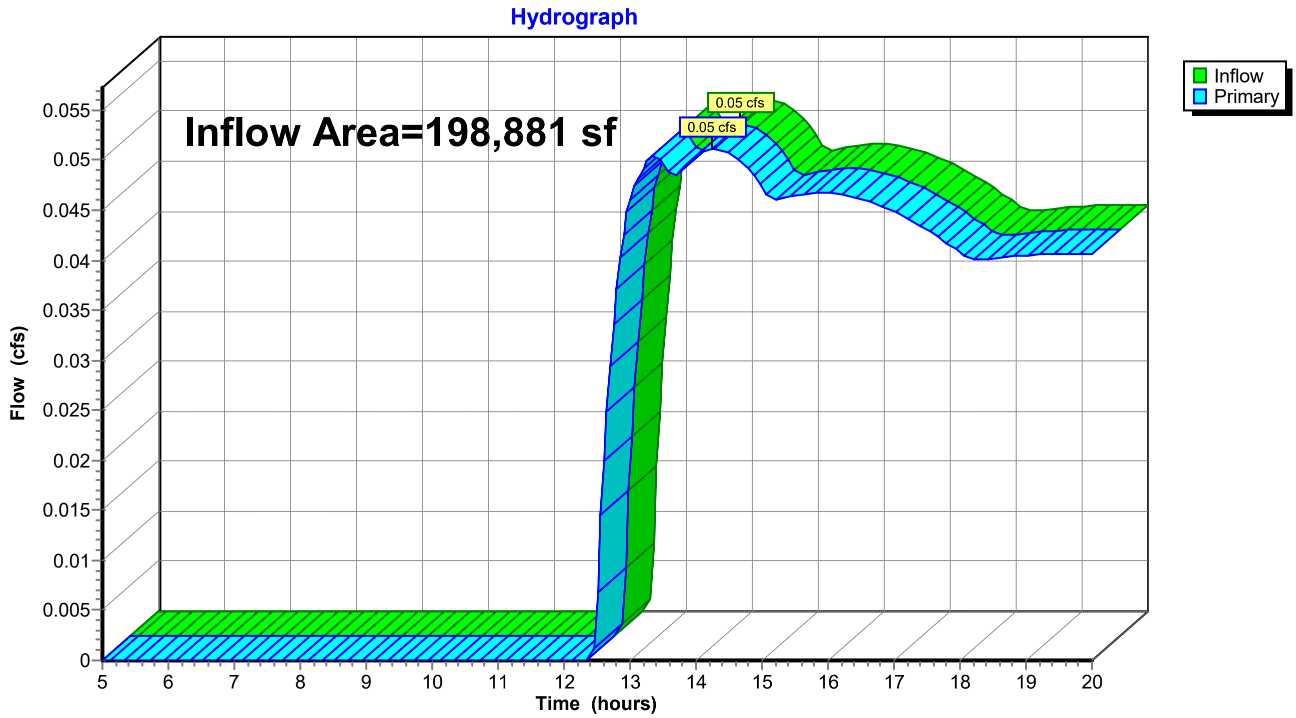


Summary for Link SP5: Study Point 5

Inflow Area = 198,881 sf, 26.41% Impervious, Inflow Depth > 0.07" for 2-Year event
Inflow = 0.05 cfs @ 14.25 hrs, Volume= 1,198 cf
Primary = 0.05 cfs @ 14.25 hrs, Volume= 1,198 cf, Atten= 0%, Lag= 0.0 min

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

Link SP5: Study Point 5

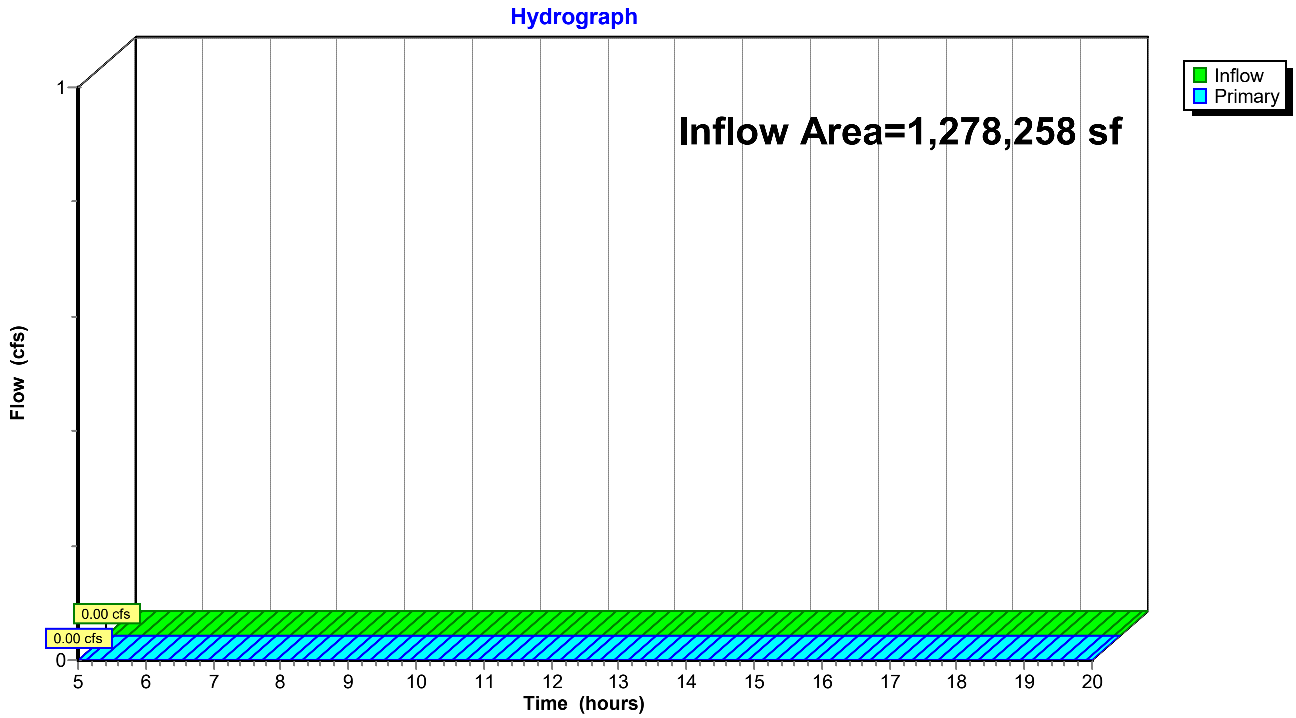


Summary for Link SP6: Study Point 6

Inflow Area = 1,278,258 sf, 26.38% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP6: Study Point 6



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

Subcatchment E-1: Subcat E-1 Runoff Area=12,581 sf 0.00% Impervious Runoff Depth>0.03"
Flow Length=188' Tc=8.8 min CN=36 Runoff=0.00 cfs 35 cf

Subcatchment E-2: Subcat E-2 Runoff Area=32,388 sf 0.29% Impervious Runoff Depth=0.00"
Flow Length=230' Tc=7.5 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment E-3: Subcat E-3 Runoff Area=85,727 sf 1.59% Impervious Runoff Depth>0.00"
Flow Length=341' Tc=10.4 min CN=33 Runoff=0.00 cfs 27 cf

Subcatchment E-4: Subcat E-4 Runoff Area=39,239 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=201' Tc=12.2 min CN=32 Runoff=0.00 cfs 1 cf

Subcatchment E-5: Subcat E-5 Runoff Area=198,881 sf 26.41% Impervious Runoff Depth>0.45"
Tc=6.0 min UI Adjusted CN=50 Runoff=1.62 cfs 7,380 cf

Subcatchment E-6: Subcat E-6 Runoff Area=260,840 sf 59.51% Impervious Runoff Depth>1.78"
Tc=6.0 min CN=73 Runoff=12.94 cfs 38,676 cf

Subcatchment E-7: Subcat E-7 Runoff Area=122,430 sf 13.61% Impervious Runoff Depth>0.22"
Tc=6.0 min CN=44 Runoff=0.16 cfs 2,273 cf

Subcatchment E-8: Subcat E-8 Runoff Area=784,340 sf 20.31% Impervious Runoff Depth>0.25"
Flow Length=845' Tc=27.8 min UI Adjusted CN=45 Runoff=1.09 cfs 16,238 cf

Subcatchment E-9: Subcat E-9 Runoff Area=110,648 sf 5.39% Impervious Runoff Depth>0.05"
Flow Length=353' Tc=10.8 min CN=37 Runoff=0.02 cfs 447 cf

Pond 4P: Existing Ditch 1 Peak Elev=193.02' Storage=1 cf Inflow=0.00 cfs 1 cf
Outflow=0.00 cfs 0 cf

Pond 7P: Drainage Easement Ditch Peak Elev=176.58' Storage=8,890 cf Inflow=12.98 cfs 40,949 cf
Discarded=2.41 cfs 40,923 cf Primary=0.00 cfs 0 cf Outflow=2.41 cfs 40,923 cf

Pond 8P: Bio-Retention Area Peak Elev=162.31' Storage=10,004 cf Inflow=1.09 cfs 16,238 cf
Discarded=0.27 cfs 6,223 cf Primary=0.00 cfs 0 cf Outflow=0.27 cfs 6,223 cf

Pond 9P: Existing Ditch 2 Peak Elev=163.09' Storage=33 cf Inflow=0.02 cfs 447 cf
Discarded=0.02 cfs 413 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 413 cf

Link SP1: Study Point 1 Inflow=0.00 cfs 35 cf
Primary=0.00 cfs 35 cf

Link SP2: Study Point 2 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP3: Study Point 3 Inflow=0.00 cfs 27 cf
Primary=0.00 cfs 27 cf

Link SP4: Study Point 4 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP5: Study Point 5 Inflow=1.62 cfs 7,380 cf
Primary=1.62 cfs 7,380 cf

Link SP6: Study Point 6 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,647,074 sf Runoff Volume = 65,076 cf Average Runoff Depth = 0.47"
76.25% Pervious = 1,255,929 sf 23.75% Impervious = 391,146 sf

Summary for Subcatchment E-1: Subcat E-1

[73] Warning: Peak may fall outside time span

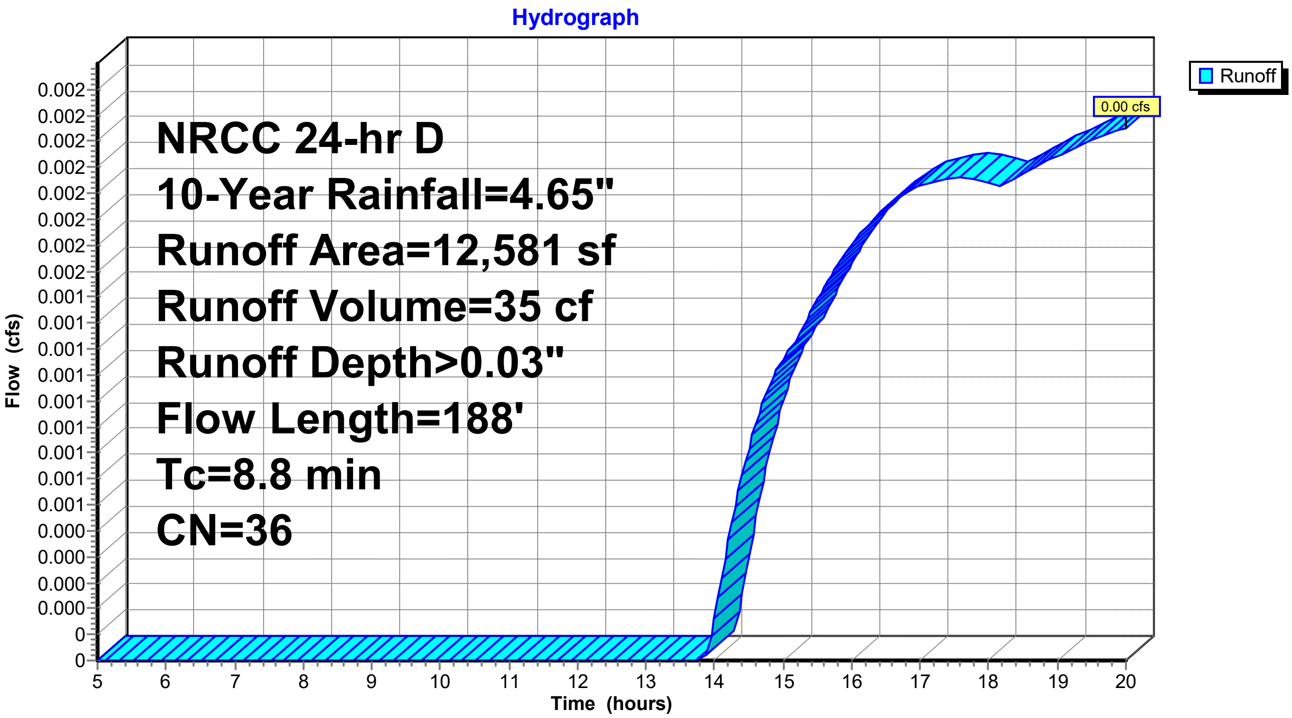
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 35 cf, Depth> 0.03"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
6,126	30	Woods, Good, HSG A
23	30	Woods, Good, HSG A
1,198	30	Woods, Good, HSG A
3,288	30	Woods, Good, HSG A
1,947	72	Dirt roads, HSG A
12,581	36	Weighted Average
12,581		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0900	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.7	55	0.2540	1.26		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
0.1	15	0.0660	4.14		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.3	18	0.1380	0.93		**Shallow Concentrated Flow, D-E** Forest w/Heavy Litter Kv= 2.5 fps
0.1	14	0.0570	3.84		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
0.7	36	0.1250	0.88		**Shallow Concentrated Flow, F-G** Forest w/Heavy Litter Kv= 2.5 fps
8.8	188	Total			

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

[45] Hint: Runoff=Zero

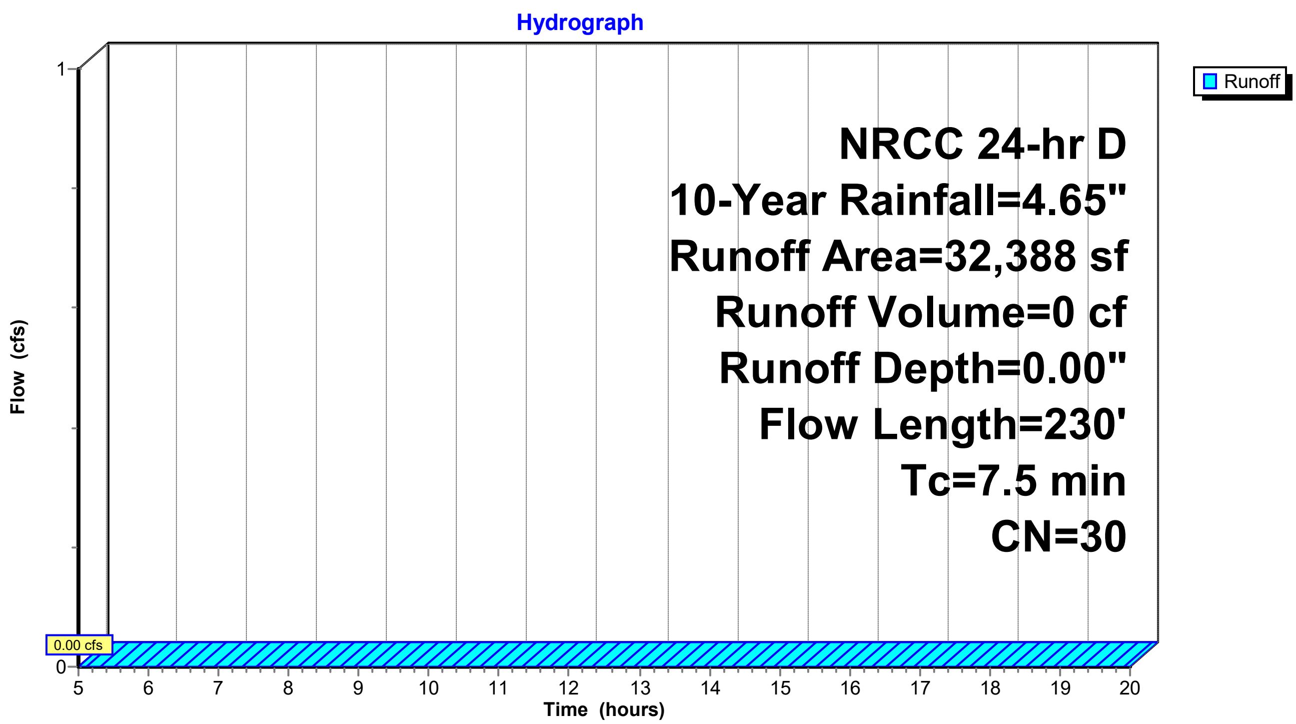
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
95	98	Roofs, HSG A
32,293	30	Woods, Good, HSG A
32,388	30	Weighted Average
32,293		99.71% Pervious Area
95		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1800	0.16		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.7	92	0.1950	2.21		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	88	0.0340	0.92		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.5	230	Total			

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

[73] Warning: Peak may fall outside time span

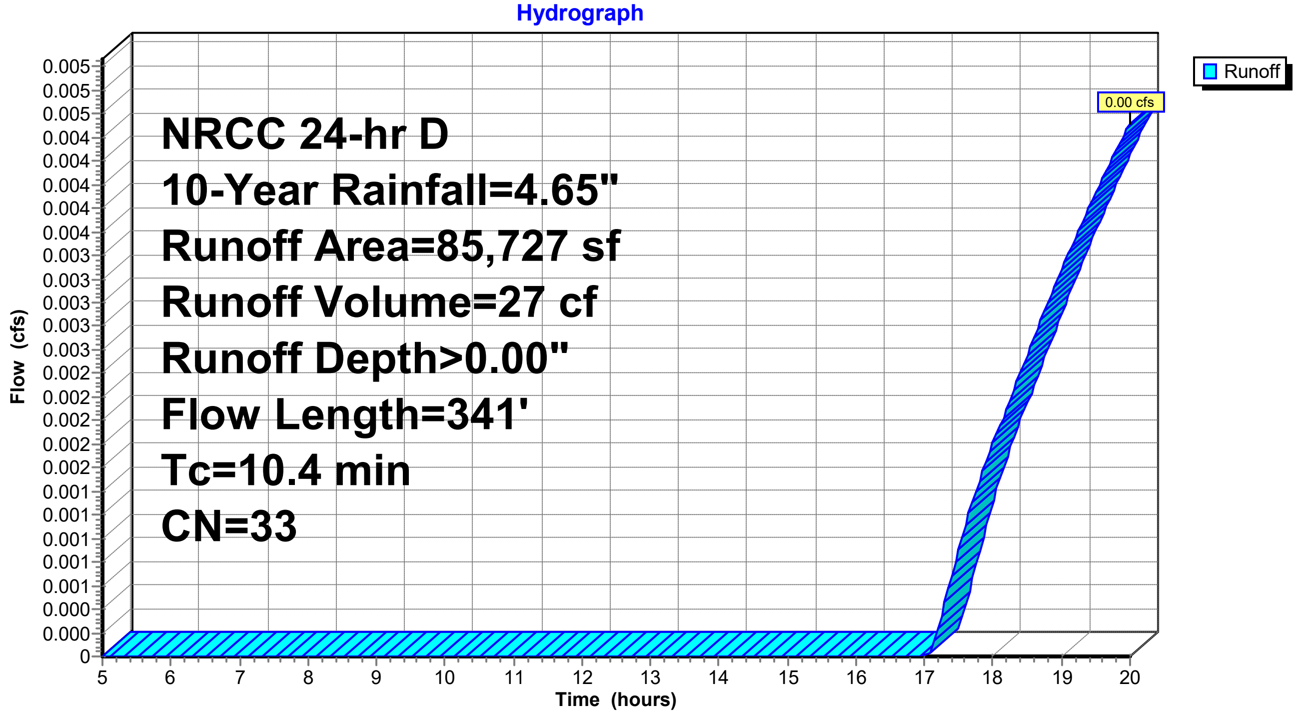
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 27 cf, Depth> 0.00"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
64,217	30	Woods, Good, HSG A
17,077	30	Woods, Good, HSG A
618	98	Roofs, HSG A
347	98	Roofs, HSG A
400	98	Roofs, HSG A
3,068	72	Dirt roads, HSG A
85,727	33	Weighted Average
84,362		98.41% Pervious Area
1,365		1.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.5	74	0.2160	2.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	60	0.0250	2.55		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
2.3	157	0.0510	1.13		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
10.4	341	Total			

Subcatchment E-3: Subcat E-3



Summary for Subcatchment E-4: Subcat E-4

[73] Warning: Peak may fall outside time span

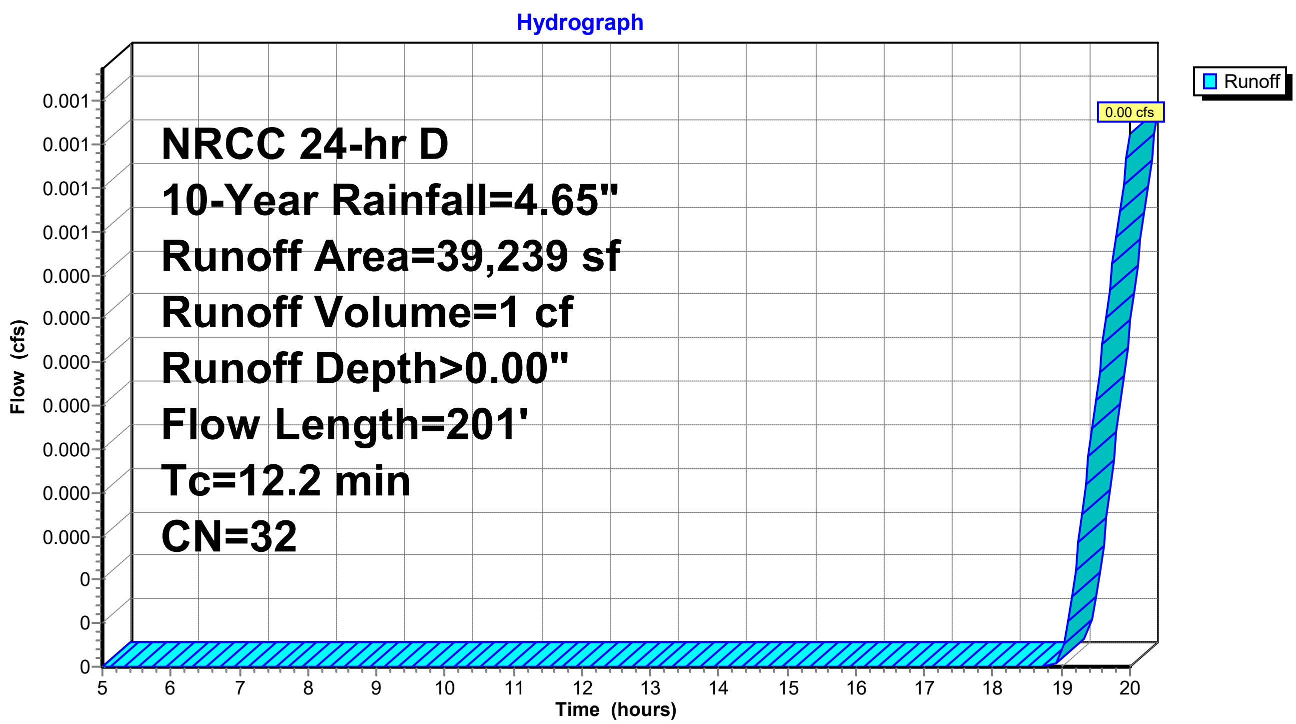
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 1 cf, Depth> 0.00"
Routed to Pond 4P : Existing Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
19,291	30	Woods, Good, HSG A
18,208	30	Woods, Good, HSG A
1,739	72	Dirt roads, HSG A
39,239	32	Weighted Average
39,239		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	21	0.0200	0.99		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.2	201	Total			

Subcatchment E-4: Subcat E-4



Summary for Subcatchment E-5: Subcat E-5

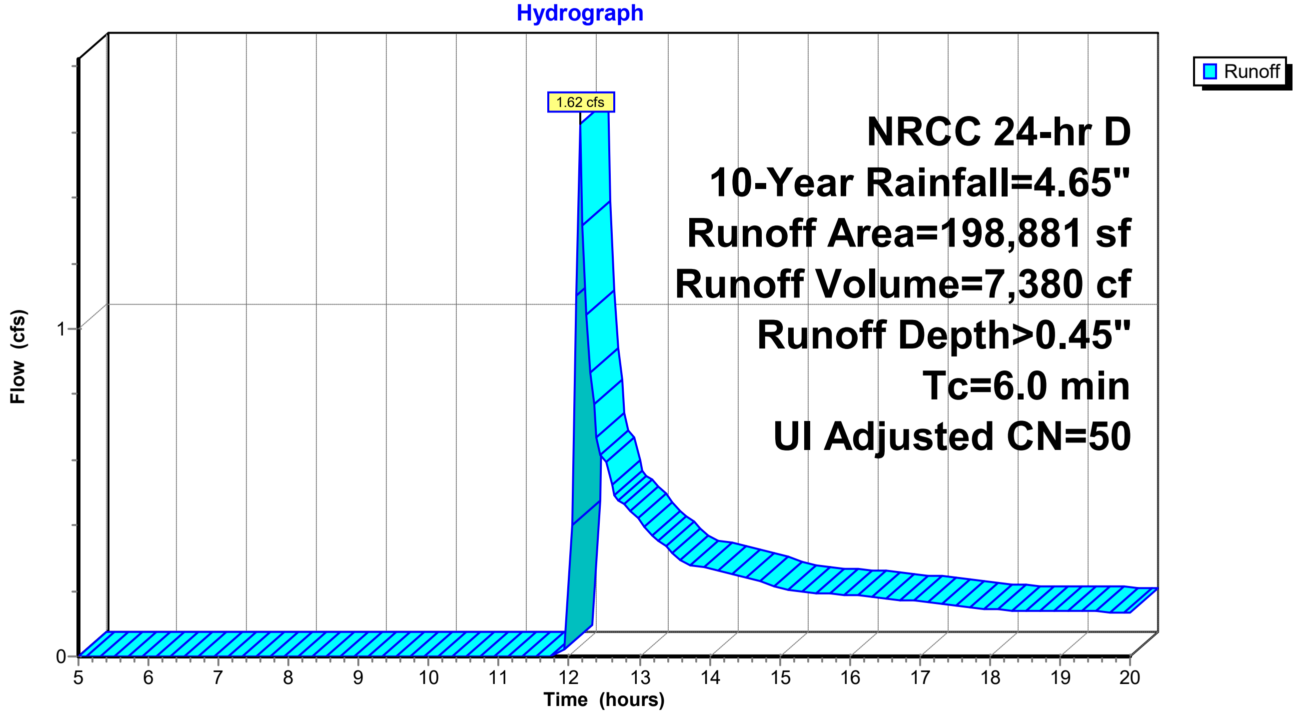
Runoff = 1.62 cfs @ 12.16 hrs, Volume= 7,380 cf, Depth> 0.45"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Adj	Description
60,243	30		Woods, Good, HSG A
21,040	30		Woods, Good, HSG A
11,413	30		Woods, Good, HSG A
5,380	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
16,563	39		>75% Grass cover, Good, HSG A
0	39		>75% Grass cover, Good, HSG A
315	39		>75% Grass cover, Good, HSG A
1,914	39		>75% Grass cover, Good, HSG A
761	39		>75% Grass cover, Good, HSG A
10,302	39		>75% Grass cover, Good, HSG A
1,325	30		Woods, Good, HSG A
13,415	72		Dirt roads, HSG A
527	98		Unconnected pavement, HSG A
43	98		Unconnected pavement, HSG A
38	98		Unconnected pavement, HSG A
39	98		Unconnected pavement, HSG A
13,837	98		Unconnected pavement, HSG A
33	98		Unconnected pavement, HSG A
16,302	98		Paved parking, HSG A
330	39		>75% Grass cover, Good, HSG A
9,969	98		Roofs, HSG A
395	98		Roofs, HSG A
1,474	98		Roofs, HSG A
2	98		Roofs, HSG A
9,863	98		Roofs, HSG A
3,360	39		>75% Grass cover, Good, HSG A
198,881	52	50	Weighted Average, UI Adjusted
146,360			73.59% Pervious Area
52,521			26.41% Impervious Area
14,517			27.64% Unconnected

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

Subcatchment E-5: Subcat E-5



Summary for Subcatchment E-6: Subcat E-6

Runoff = 12.94 cfs @ 12.13 hrs, Volume= 38,676 cf, Depth> 1.78"
Routed to Pond 7P : Drainage Easement Ditch

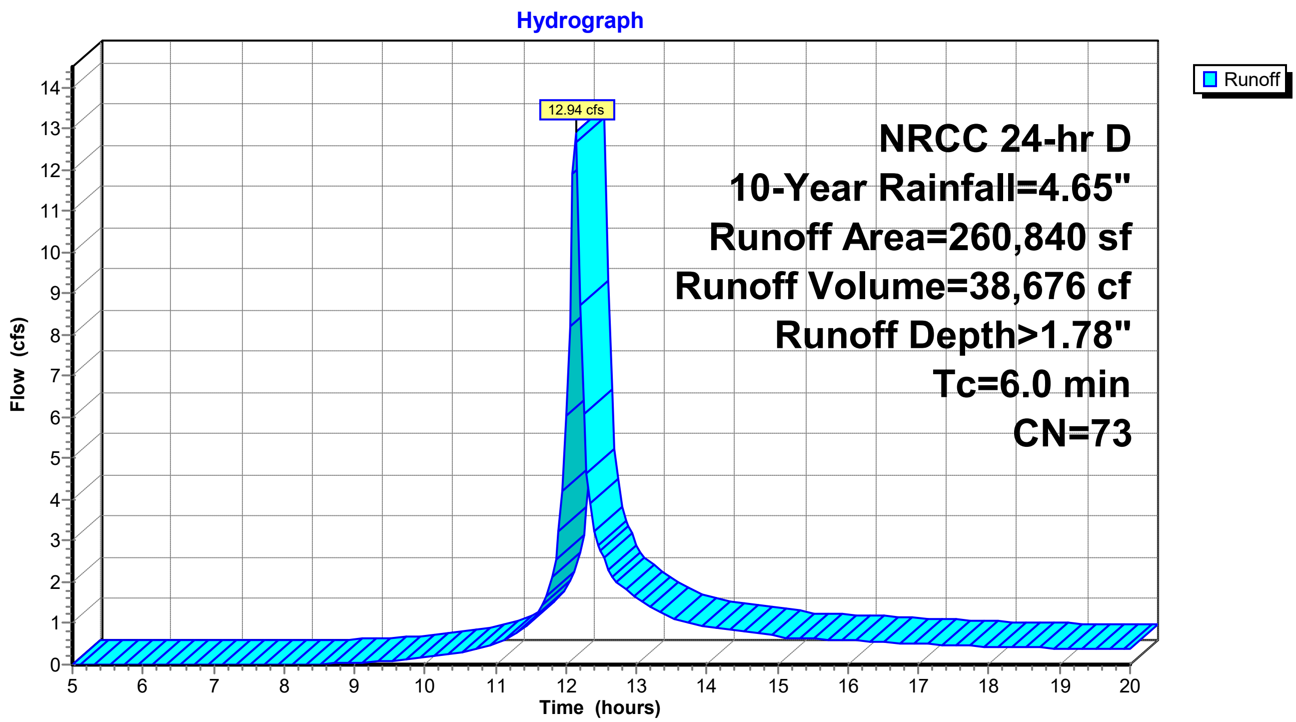
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
76	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
512	30	Woods, Good, HSG A
87	30	Woods, Good, HSG A
580	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
234	30	Woods, Good, HSG A
41	30	Woods, Good, HSG A
17	30	Woods, Good, HSG A
124	39	>75% Grass cover, Good, HSG A
1,324	39	>75% Grass cover, Good, HSG A
3,326	39	>75% Grass cover, Good, HSG A
197	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
1,494	39	>75% Grass cover, Good, HSG A
488	39	>75% Grass cover, Good, HSG A
0	39	>75% Grass cover, Good, HSG A
1,039	39	>75% Grass cover, Good, HSG A
80	30	Woods, Good, HSG A
5,897	39	>75% Grass cover, Good, HSG A
207	39	>75% Grass cover, Good, HSG A
38	39	>75% Grass cover, Good, HSG A
35,199	54	1/2 acre lots, 25% imp, HSG A
2,290	54	1/2 acre lots, 25% imp, HSG A
2,360	98	Unconnected pavement, HSG A
889	98	Unconnected pavement, HSG A
5,804	98	Unconnected pavement, HSG A
135,515	98	Paved parking, HSG A
563	98	Unconnected pavement, HSG A
3,565	39	>75% Grass cover, Good, HSG A
2,358	30	Woods, Good, HSG A
6,778	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
1,577	39	>75% Grass cover, Good, HSG A
1,768	39	>75% Grass cover, Good, HSG A
362	39	>75% Grass cover, Good, HSG A
12,602	30	Woods, Good, HSG A
10,885	39	>75% Grass cover, Good, HSG A
4,375	30	Woods, Good, HSG A
2,426	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
348	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
44	72	Dirt roads, HSG A
591	39	>75% Grass cover, Good, HSG A
2,039	39	>75% Grass cover, Good, HSG A
564	39	>75% Grass cover, Good, HSG A
91	98	Unconnected pavement, HSG A

623	98	Unconnected pavement, HSG A
3	39	>75% Grass cover, Good, HSG A
839	39	>75% Grass cover, Good, HSG A
6	39	>75% Grass cover, Good, HSG A
6,902	39	>75% Grass cover, Good, HSG A
2,574	39	>75% Grass cover, Good, HSG A
260,840	73	Weighted Average
105,622		40.49% Pervious Area
155,218		59.51% Impervious Area
10,331		6.66% Unconnected

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

Subcatchment E-6: Subcat E-6



Summary for Subcatchment E-7: Subcat E-7

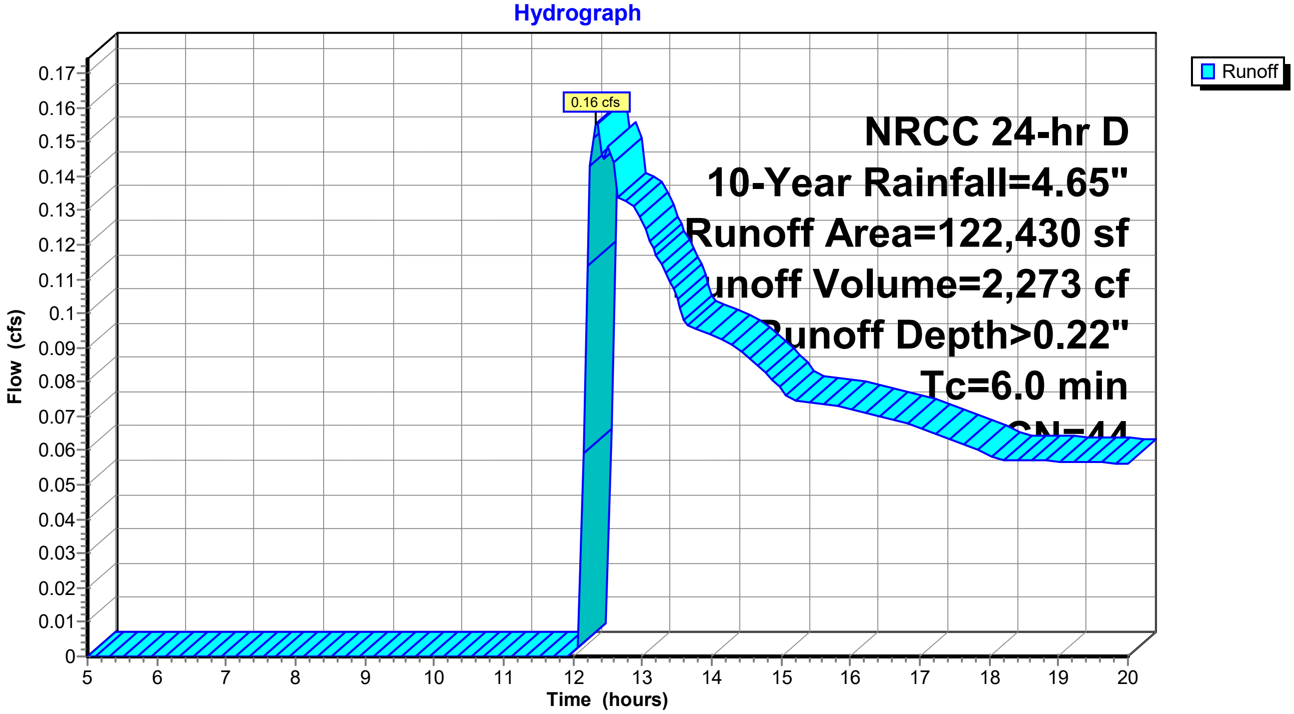
Runoff = 0.16 cfs @ 12.34 hrs, Volume= 2,273 cf, Depth> 0.22"
Routed to Pond 7P : Drainage Easement Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
72	30	Woods, Good, HSG A
62,479	30	Woods, Good, HSG A
1,141	30	Woods, Good, HSG A
114	39	>75% Grass cover, Good, HSG A
990	39	>75% Grass cover, Good, HSG A
243	39	>75% Grass cover, Good, HSG A
3,704	39	>75% Grass cover, Good, HSG A
215	30	Woods, Good, HSG A
3,897	54	1/2 acre lots, 25% imp, HSG A
37,219	54	1/2 acre lots, 25% imp, HSG A
113	98	Unconnected pavement, HSG A
159	98	Unconnected pavement, HSG A
5,286	98	Roofs, HSG A
5,740	72	Dirt roads, HSG A
234	39	>75% Grass cover, Good, HSG A
8	98	Paved parking, HSG A
789	98	Unconnected pavement, HSG A
26	98	Unconnected pavement, HSG A
1	98	Unconnected pavement, HSG A
122,430	44	Weighted Average
105,770		86.39% Pervious Area
16,661		13.61% Impervious Area
1,088		6.53% Unconnected

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

Subcatchment E-7: Subcat E-7



Summary for Subcatchment E-8: Subcat E-8

Runoff = 1.09 cfs @ 12.76 hrs, Volume= 16,238 cf, Depth> 0.25"
Routed to Pond 8P : Bio-Retention Area

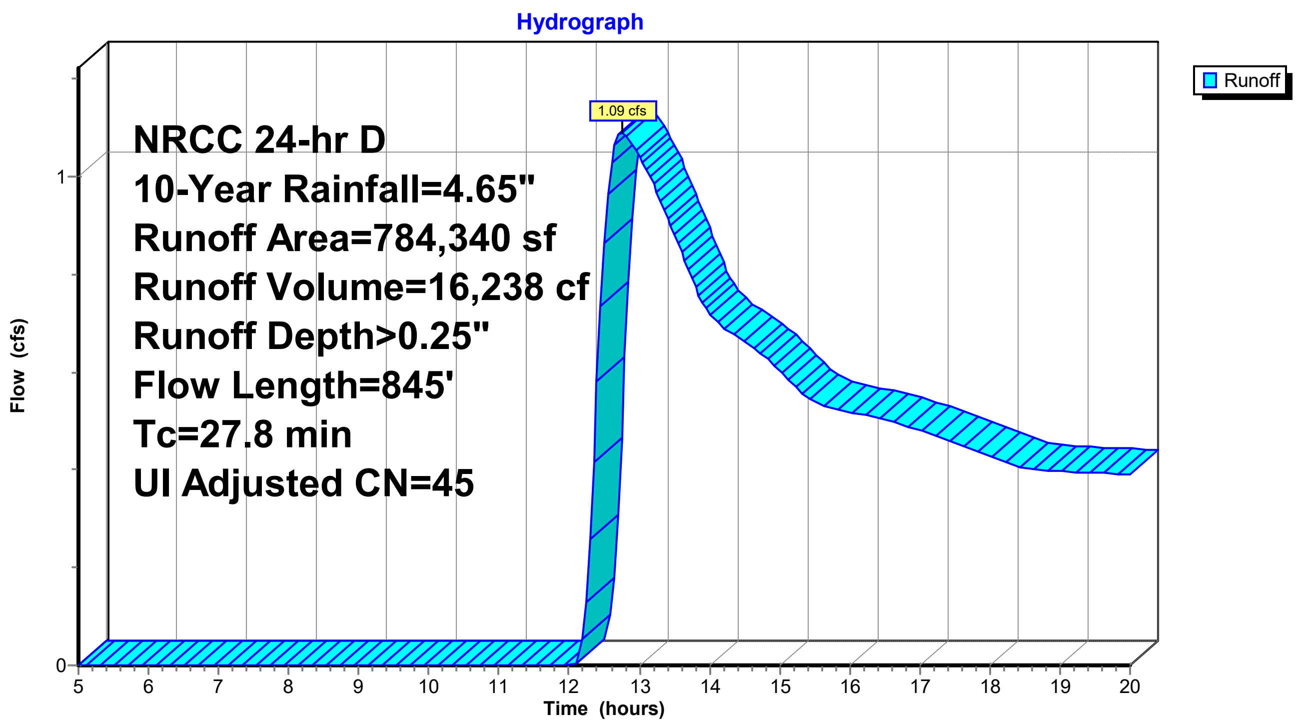
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Adj	Description
0	30		Woods, Good, HSG A
37,409	30		Woods, Good, HSG A
151,691	30		Woods, Good, HSG A
13,674	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
51,870	30		Woods, Good, HSG A
67,378	30		Woods, Good, HSG A
57	39		>75% Grass cover, Good, HSG A
107	39		>75% Grass cover, Good, HSG A
1,057	39		>75% Grass cover, Good, HSG A
58	39		>75% Grass cover, Good, HSG A
10,449	39		>75% Grass cover, Good, HSG A
104,791	39		>75% Grass cover, Good, HSG A
87,385	39		>75% Grass cover, Good, HSG A
1,978	39		>75% Grass cover, Good, HSG A
161	39		>75% Grass cover, Good, HSG A
103,904	54		1/2 acre lots, 25% imp, HSG A
665	72		Dirt roads, HSG A
61	98		Unconnected pavement, HSG A
71	98		Unconnected pavement, HSG A
70	98		Unconnected pavement, HSG A
16,908	98		Unconnected pavement, HSG A
26,556	98		Unconnected pavement, HSG A
1,433	98		Unconnected pavement, HSG A
110	98		Unconnected pavement, HSG A
11,569	98		Unconnected pavement, HSG A
1,743	98		Unconnected pavement, HSG A
3,101	98		Unconnected pavement, HSG A
12	98		Unconnected pavement, HSG A
71	98		Unconnected pavement, HSG A
210	98		Unconnected pavement, HSG A
299	98		Unconnected pavement, HSG A
7,456	98		Unconnected pavement, HSG A
30	98		Unconnected pavement, HSG A
273	98		Roofs, HSG A
131	98		Roofs, HSG A
605	98		Roofs, HSG A
1,939	98		Roofs, HSG A
598	98		Roofs, HSG A
9,916	98		Roofs, HSG A
47,139	98		Roofs, HSG A
175	98		Roofs, HSG A
713	98		Roofs, HSG A
278	98		Roofs, HSG A
879	98		Roofs, HSG A
395	98		Roofs, HSG A
602	98		Roofs, HSG A
9,672	72		Dirt roads, HSG A
8,690	72		Dirt roads, HSG A

784,340	48	45	Weighted Average, UI Adjusted
625,021			79.69% Pervious Area
159,319			20.31% Impervious Area
69,702			43.75% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	50	0.0240	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
2.0	76	0.0660	0.64		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	79	0.0120	0.77		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.2	27	0.0127	2.29		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
3.9	220	0.0180	0.94		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
8.3	393	0.0990	0.79		**Shallow Concentrated Flow, F-G** Forest w/Heavy Litter Kv= 2.5 fps
27.8	845	Total			

Subcatchment E-8: Subcat E-8



Summary for Subcatchment E-9: Subcat E-9

[73] Warning: Peak may fall outside time span

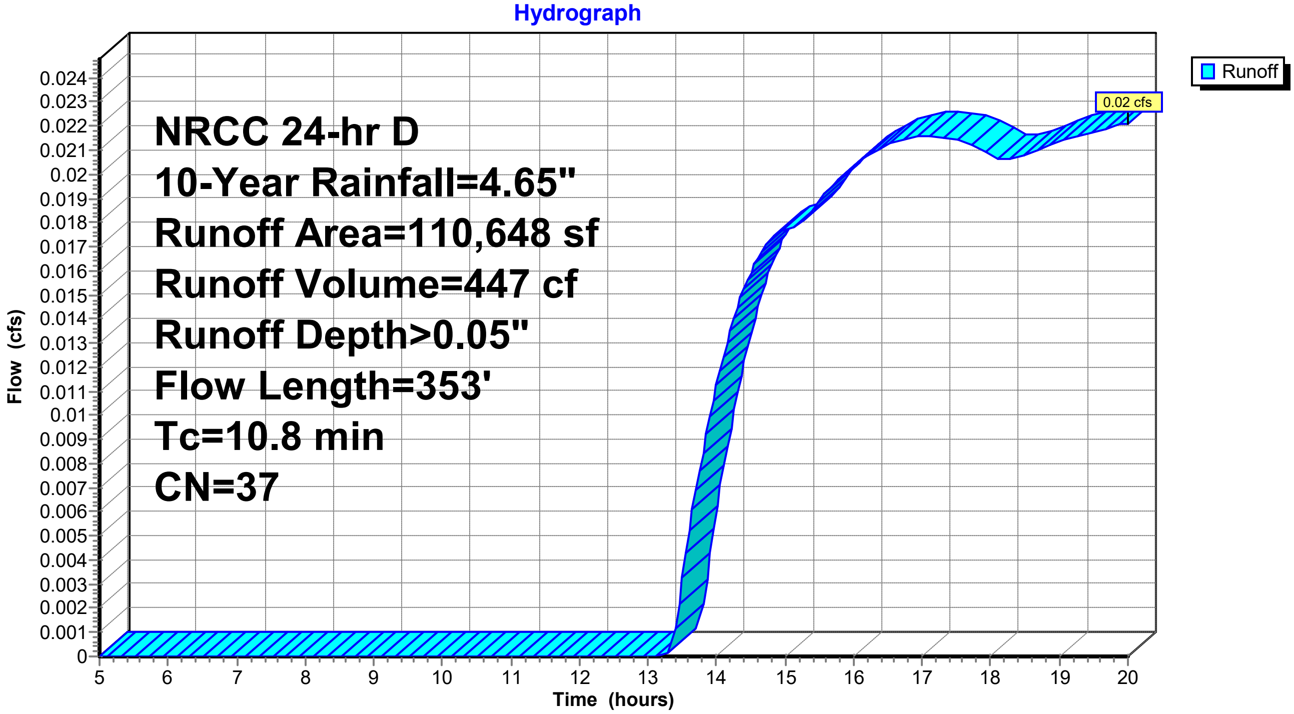
Runoff = 0.02 cfs @ 20.00 hrs, Volume= 447 cf, Depth> 0.05"
Routed to Pond 9P : Existing Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
835	30	Woods, Good, HSG A
18,276	30	Woods, Good, HSG A
65,542	30	Woods, Good, HSG A
13	39	>75% Grass cover, Good, HSG A
21,381	54	1/2 acre lots, 25% imp, HSG A
621	98	Roofs, HSG A
3,980	72	Dirt roads, HSG A
110,648	37	Weighted Average
104,681		94.61% Pervious Area
5,967		5.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.2000	0.17		**Sheet Flow, A-B**
					Woods: Light underbrush n= 0.400 P2= 3.09"
5.8	303	0.1220	0.87		**Shallow Concentrated Flow, B-C**
					Forest w/Heavy Litter Kv= 2.5 fps
10.8	353	Total			

Subcatchment E-9: Subcat E-9



Summary for Pond 4P: Existing Ditch 1

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth > 0.00" for 10-Year event
Inflow = 0.00 cfs @ 20.00 hrs, Volume= 1 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 193.02' @ 20.00 hrs Surf.Area= 51 sf Storage= 1 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

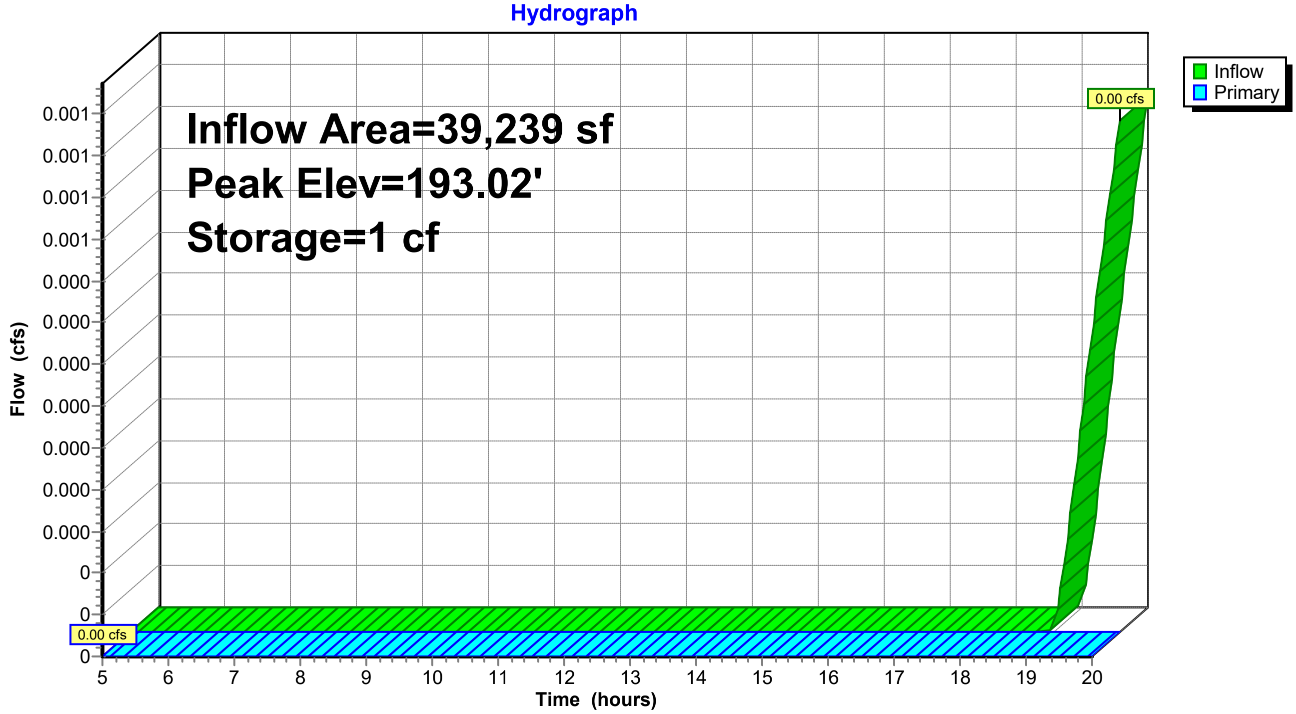
Volume	Invert	Avail.Storage	Storage Description
#1	193.00'	17,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.00	30	0	0
194.00	1,087	559	559
195.00	2,356	1,722	2,280
196.00	3,959	3,158	5,438
197.00	5,956	4,958	10,395
198.00	8,319	7,138	17,533

Device	Routing	Invert	Outlet Devices
#1	Primary	197.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=193.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Existing Ditch 1



Summary for Pond 7P: Drainage Easement Ditch

Inflow Area = 383,270 sf, 44.85% Impervious, Inflow Depth > 1.28" for 10-Year event
Inflow = 12.98 cfs @ 12.13 hrs, Volume= 40,949 cf
Outflow = 2.41 cfs @ 11.85 hrs, Volume= 40,923 cf, Atten= 81%, Lag= 0.0 min
Discarded = 2.41 cfs @ 11.85 hrs, Volume= 40,923 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 176.58' @ 12.61 hrs Surf.Area= 5,655 sf Storage= 8,890 cf

Plug-Flow detention time= 23.7 min calculated for 40,923 cf (100% of inflow)
Center-of-Mass det. time= 23.4 min (843.5 - 820.0)

Volume	Invert	Avail.Storage	Storage Description
#1	174.00'	345,939 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

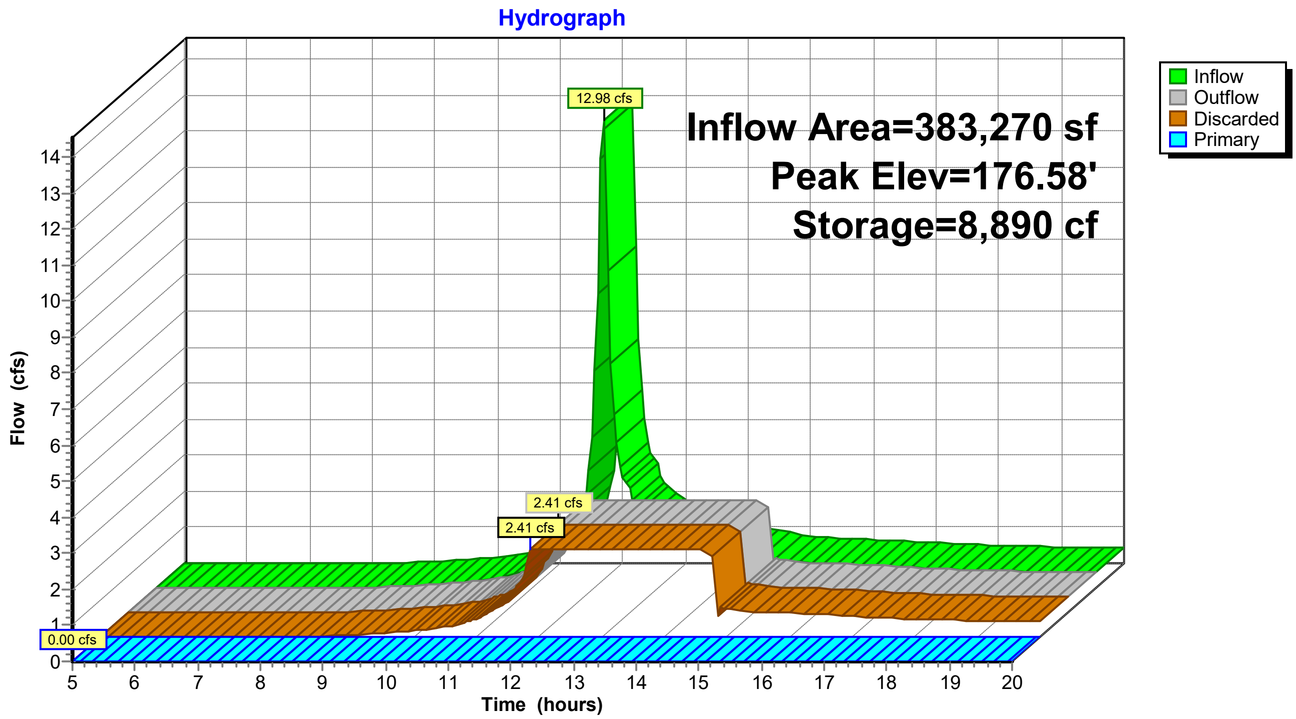
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.00	491	0	0
175.00	3,251	1,871	1,871
176.00	4,753	4,002	5,873
177.00	6,309	5,531	11,404
178.00	7,641	6,975	18,379
179.00	8,869	8,255	26,634
180.00	10,188	9,529	36,163
181.00	11,953	11,071	47,233
182.00	14,143	13,048	60,281
183.00	16,525	15,334	75,615
184.00	19,118	17,822	93,437
185.00	21,426	20,272	113,709
186.00	23,221	22,324	136,032
187.00	24,868	24,045	160,077
188.00	26,530	25,699	185,776
189.00	28,209	27,370	213,145
190.00	30,172	29,191	242,336
191.00	32,732	31,452	273,788
192.00	36,071	34,402	308,189
193.00	39,428	37,750	345,939

Device	Routing	Invert	Outlet Devices
#1	Primary	192.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	174.00'	**2.41 cfs Exfiltration at all elevations**

Discarded OutFlow Max=2.41 cfs @ 11.85 hrs HW=174.19' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 2.41 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=174.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Drainage Easement Ditch



Summary for Pond 8P: Bio-Retention Area

Inflow Area = 784,340 sf, 20.31% Impervious, Inflow Depth > 0.25" for 10-Year event
Inflow = 1.09 cfs @ 12.76 hrs, Volume= 16,238 cf
Outflow = 0.27 cfs @ 20.00 hrs, Volume= 6,223 cf, Atten= 75%, Lag= 434.6 min
Discarded = 0.27 cfs @ 20.00 hrs, Volume= 6,223 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 162.31' @ 20.00 hrs Surf.Area= 4,849 sf Storage= 10,004 cf

Plug-Flow detention time= 200.5 min calculated for 6,202 cf (38% of inflow)
Center-of-Mass det. time= 66.6 min (995.7 - 929.1)

Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	100,011 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

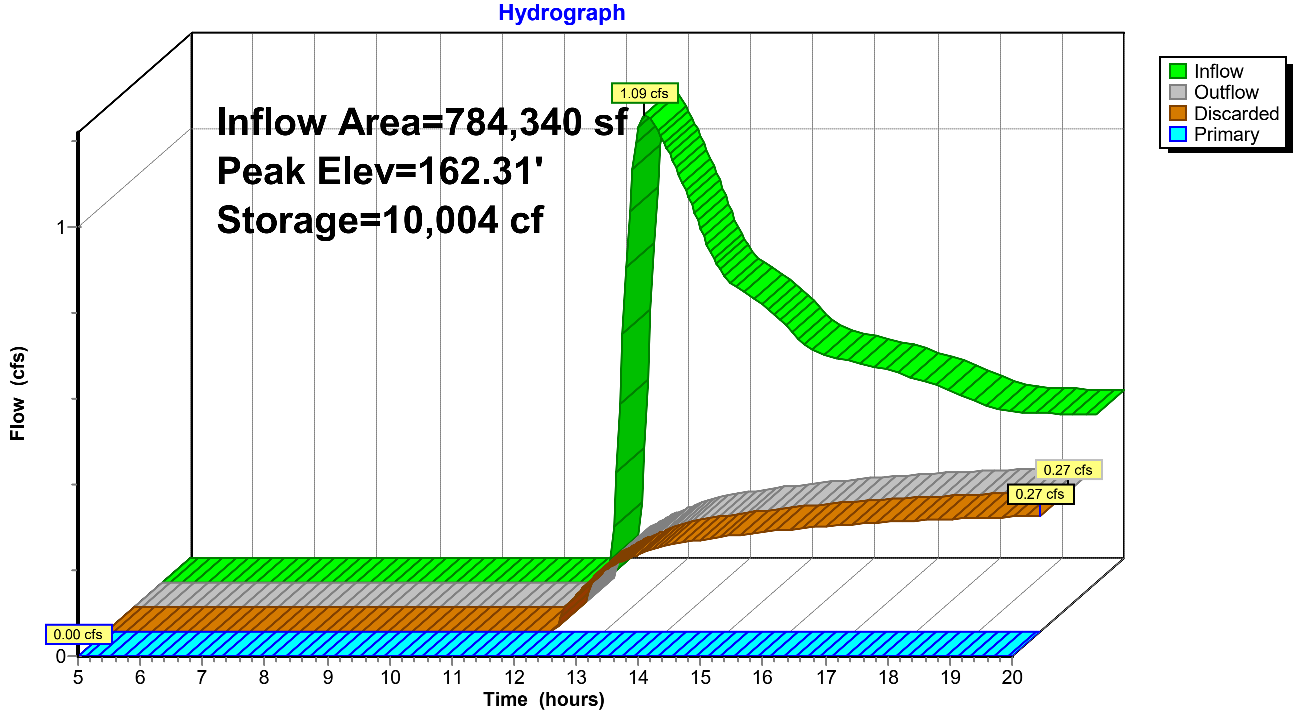
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
159.00	934	176.0	0	0	934
160.00	2,320	278.0	1,575	1,575	4,626
161.00	3,563	292.0	2,919	4,495	5,322
162.00	4,546	305.0	4,045	8,539	6,008
163.00	5,553	339.0	5,041	13,580	7,780
164.00	6,677	374.0	6,106	19,687	9,798
165.00	8,367	426.0	7,506	27,193	13,132
166.00	12,063	523.0	10,159	37,352	20,473
167.00	17,347	642.0	14,625	51,977	31,520
168.00	23,464	806.0	20,329	72,306	50,432
169.00	32,175	988.0	27,705	100,011	76,430

Device	Routing	Invert	Outlet Devices
#1	Primary	168.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	159.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.27 cfs @ 20.00 hrs HW=162.31' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.27 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=159.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Bio-Retention Area



Summary for Pond 9P: Existing Ditch 2

Inflow Area = 110,648 sf, 5.39% Impervious, Inflow Depth > 0.05" for 10-Year event
Inflow = 0.02 cfs @ 20.00 hrs, Volume= 447 cf
Outflow = 0.02 cfs @ 20.00 hrs, Volume= 413 cf, Atten= 1%, Lag= 0.0 min
Discarded = 0.02 cfs @ 20.00 hrs, Volume= 413 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 163.09' @ 20.00 hrs Surf.Area= 441 sf Storage= 33 cf

Plug-Flow detention time= 24.7 min calculated for 412 cf (92% of inflow)
Center-of-Mass det. time= 11.3 min (1,035.3 - 1,024.0)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	94,144 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

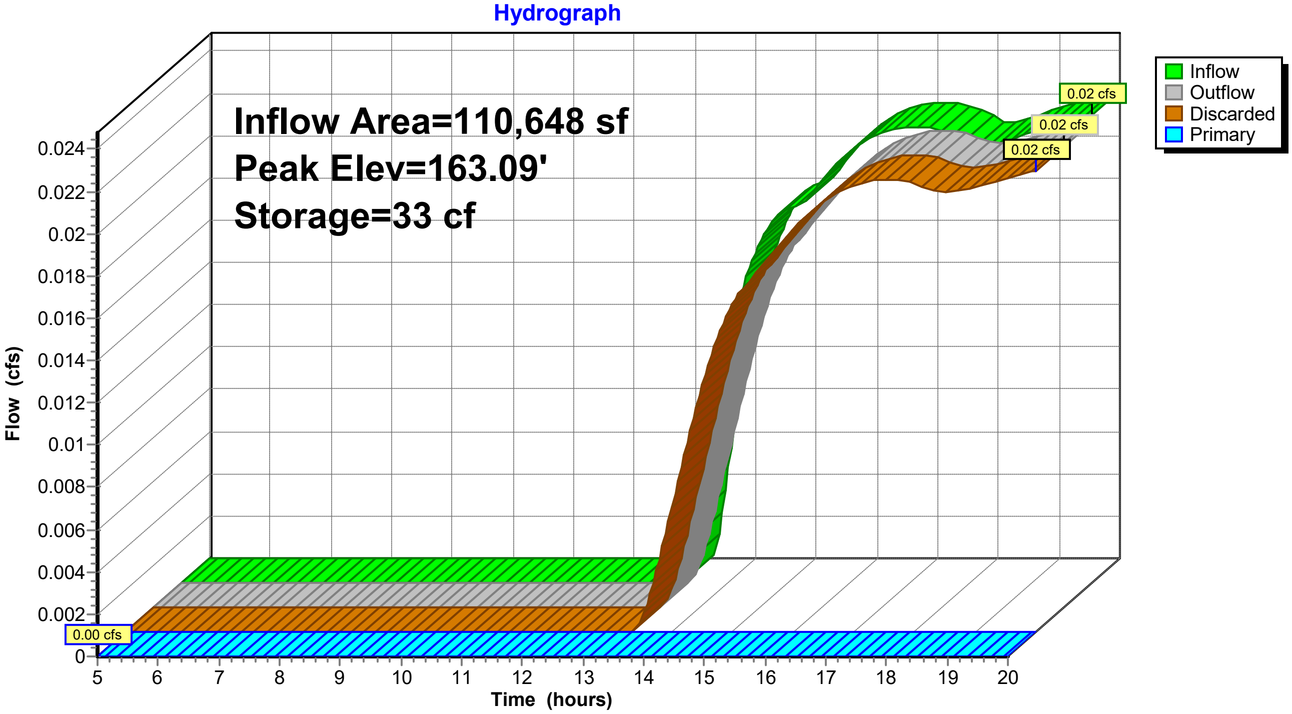
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
163.00	333	0	0
164.00	1,602	968	968
165.00	2,975	2,289	3,256
166.00	4,470	3,723	6,979
167.00	6,302	5,386	12,365
168.00	8,505	7,404	19,768
169.00	10,882	9,694	29,462
170.00	13,282	12,082	41,544
171.00	15,858	14,570	56,114
172.00	18,847	17,353	73,466
173.00	22,508	20,678	94,144

Device	Routing	Invert	Outlet Devices
#1	Primary	172.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	163.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 20.00 hrs HW=163.09' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=163.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

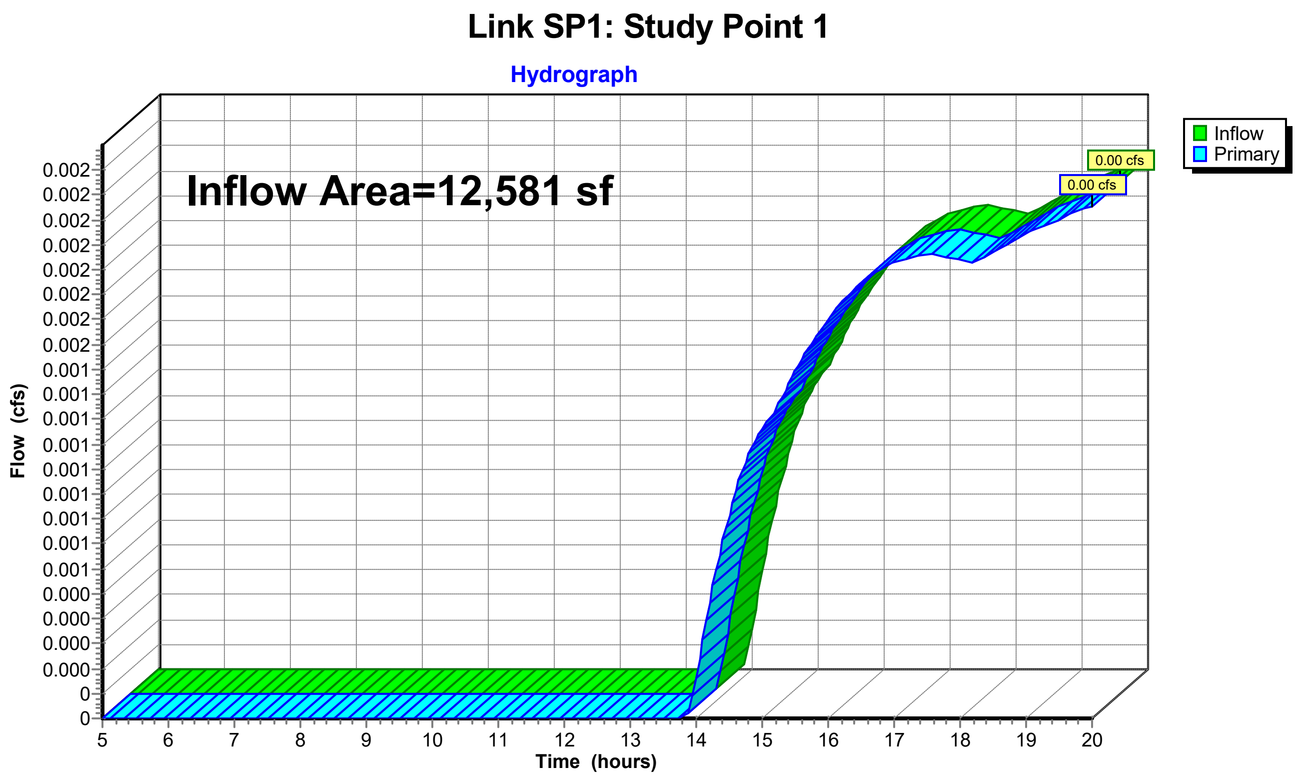
Pond 9P: Existing Ditch 2



Summary for Link SP1: Study Point 1

Inflow Area =	12,581 sf,	0.00% Impervious,	Inflow Depth > 0.03"	for 10-Year event
Inflow =	0.00 cfs @	20.00 hrs, Volume=	35 cf	
Primary =	0.00 cfs @	20.00 hrs, Volume=	35 cf, Atten= 0%, Lag= 0.0 min	

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

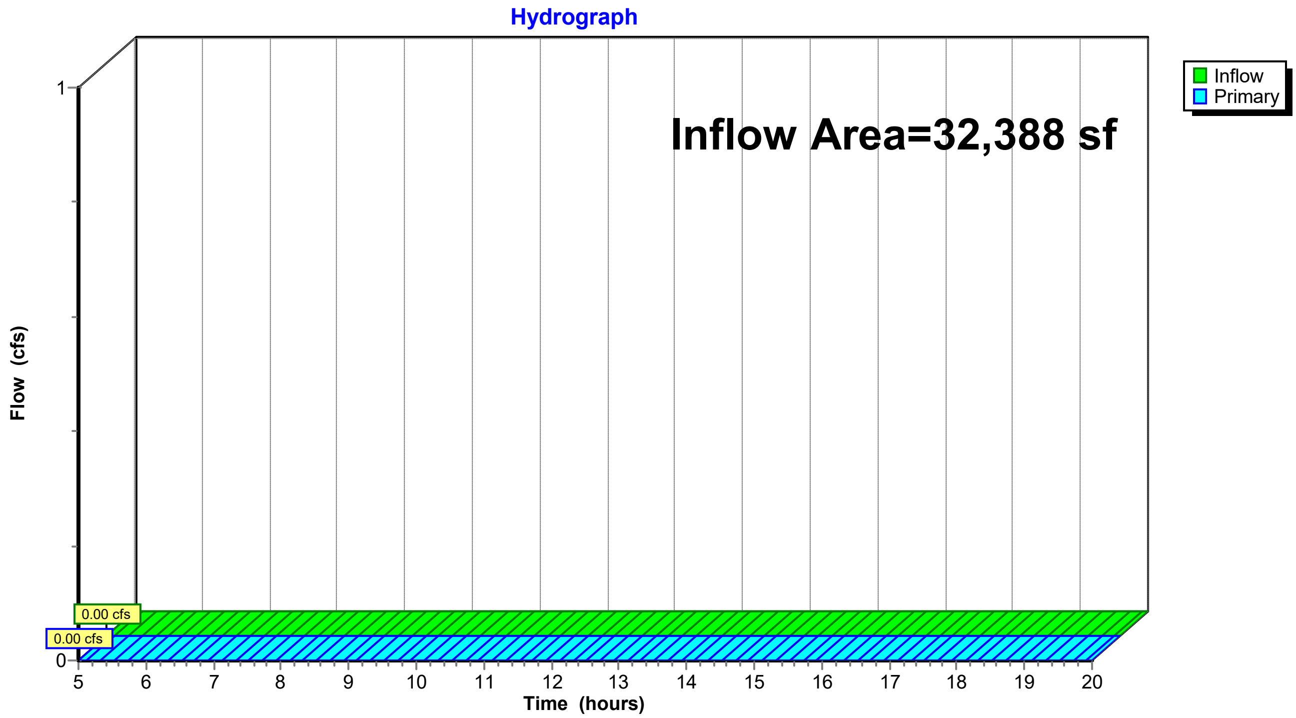


Summary for Link SP2: Study Point 2

Inflow Area =	32,388 sf,	0.29% Impervious,	Inflow Depth = 0.00"	for 10-Year event
Inflow =	0.00 cfs @	5.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP2: Study Point 2

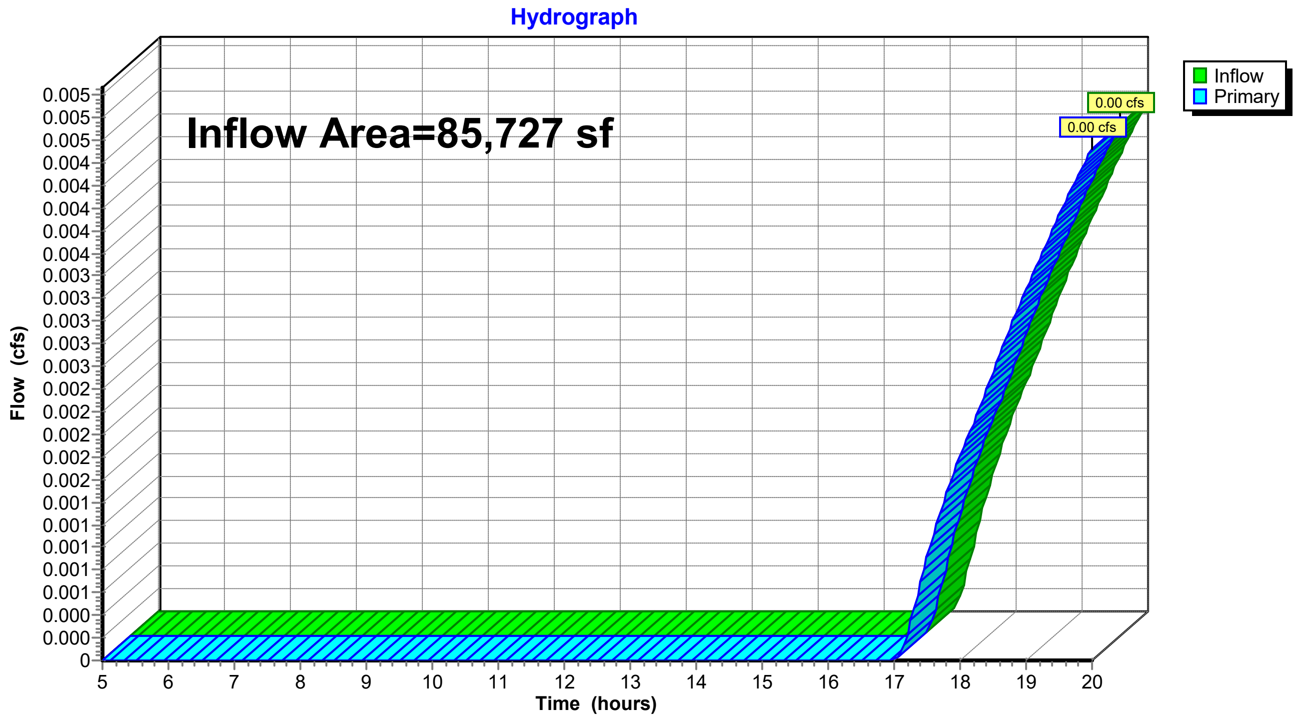


Summary for Link SP3: Study Point 3

Inflow Area =	85,727 sf,	1.59% Impervious,	Inflow Depth > 0.00"	for 10-Year event	
Inflow =	0.00 cfs @	20.00 hrs,	Volume=	27 cf	
Primary =	0.00 cfs @	20.00 hrs,	Volume=	27 cf,	Atten= 0%, Lag= 0.0 min

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

Link SP3: Study Point 3

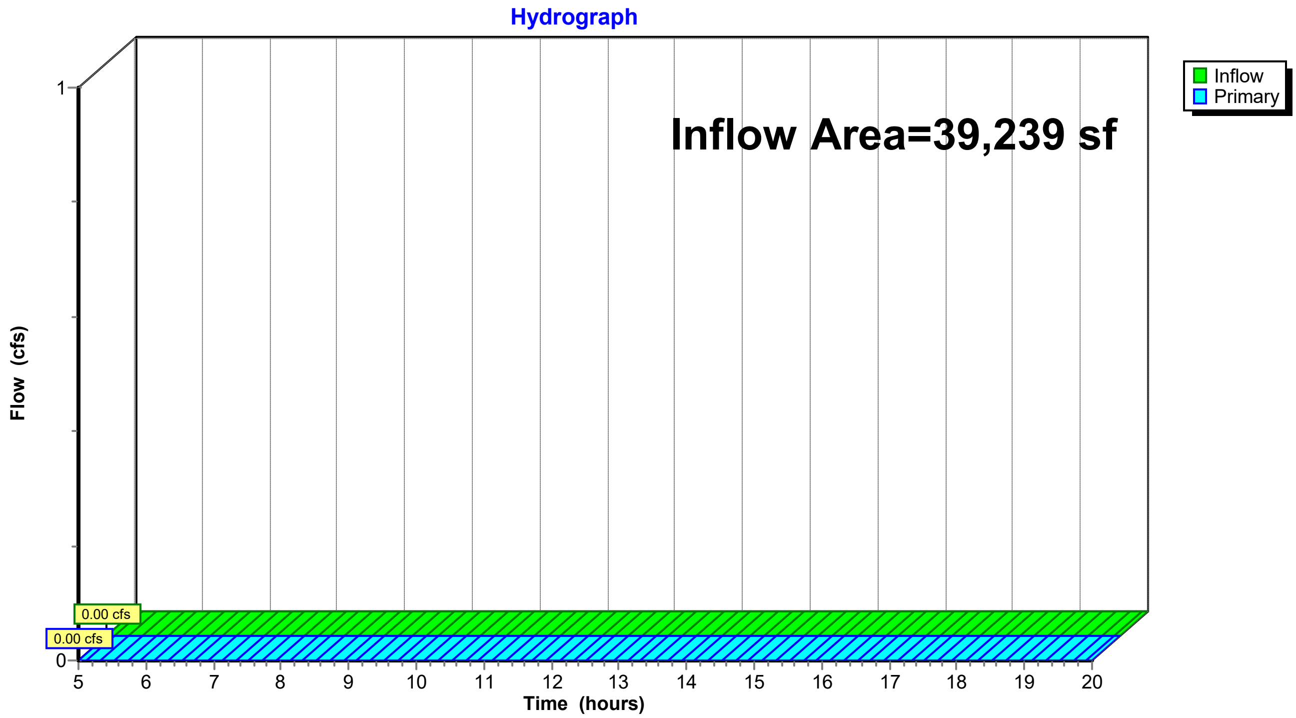


Summary for Link SP4: Study Point 4

Inflow Area =	39,239 sf,	0.00% Impervious,	Inflow Depth = 0.00"	for 10-Year event
Inflow =	0.00 cfs @	5.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

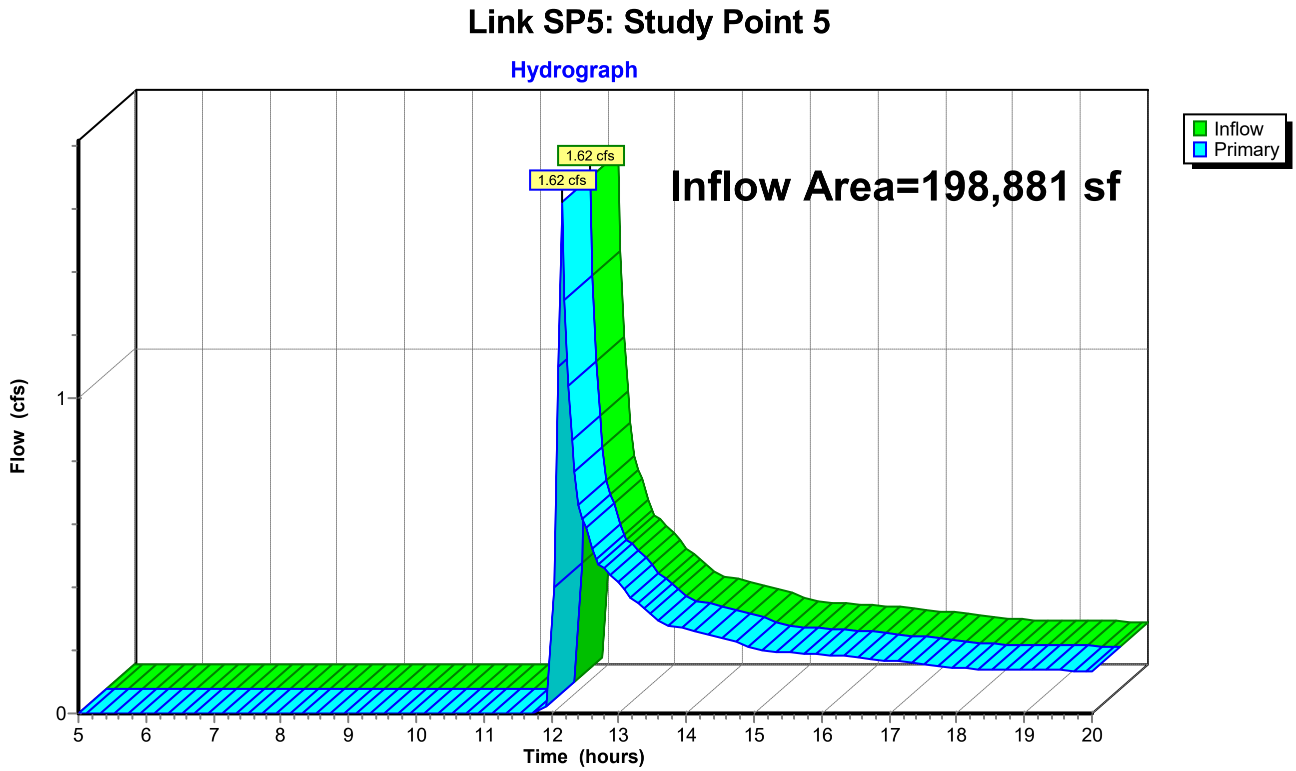
Link SP4: Study Point 4



Summary for Link SP5: Study Point 5

Inflow Area =	198,881 sf,	26.41% Impervious,	Inflow Depth > 0.45"	for 10-Year event	
Inflow =	1.62 cfs @	12.16 hrs, Volume=	7,380 cf		
Primary =	1.62 cfs @	12.16 hrs, Volume=	7,380 cf,	Atten= 0%,	Lag= 0.0 min

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

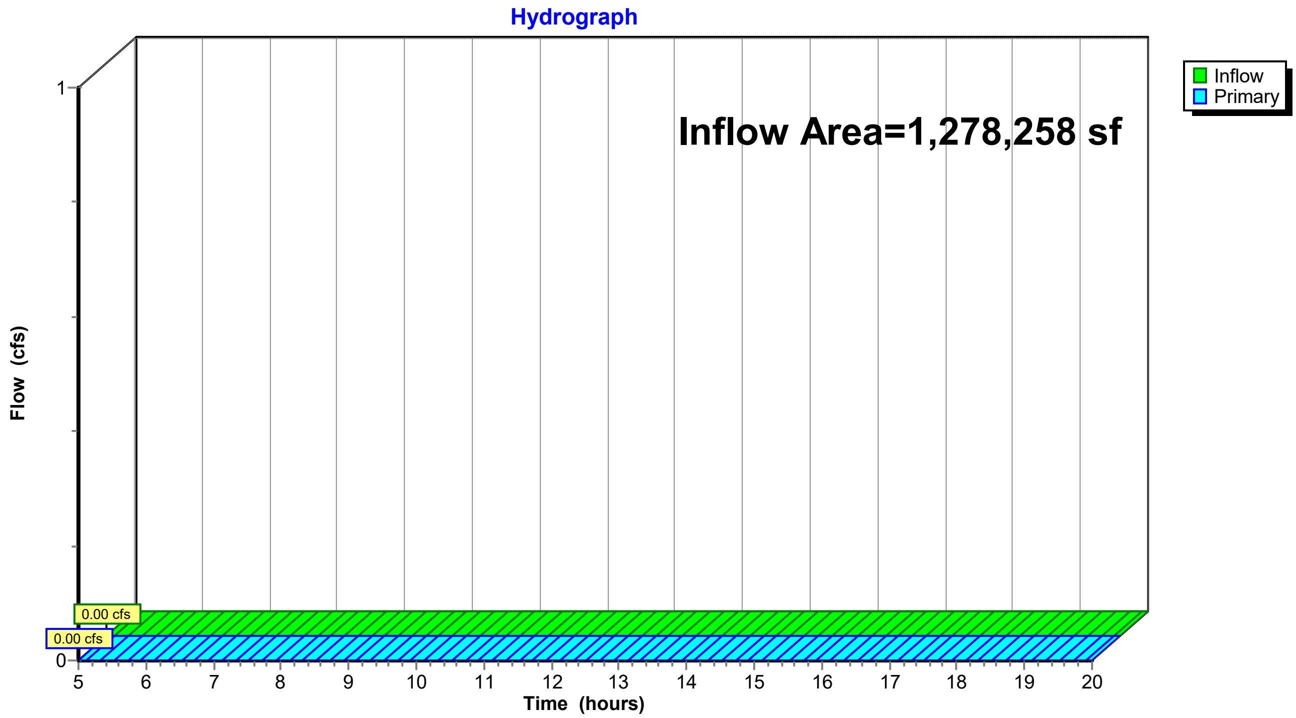


Summary for Link SP6: Study Point 6

Inflow Area =	1,278,258 sf,	26.38% Impervious,	Inflow Depth = 0.00"	for 10-Year event
Inflow =	0.00 cfs @	5.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP6: Study Point 6



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

Subcatchment E-1: Subcat E-1 Runoff Area=12,581 sf 0.00% Impervious Runoff Depth>0.19"
Flow Length=188' Tc=8.8 min CN=36 Runoff=0.01 cfs 197 cf

Subcatchment E-2: Subcat E-2 Runoff Area=32,388 sf 0.29% Impervious Runoff Depth>0.03"
Flow Length=230' Tc=7.5 min CN=30 Runoff=0.01 cfs 74 cf

Subcatchment E-3: Subcat E-3 Runoff Area=85,727 sf 1.59% Impervious Runoff Depth>0.09"
Flow Length=341' Tc=10.4 min CN=33 Runoff=0.03 cfs 660 cf

Subcatchment E-4: Subcat E-4 Runoff Area=39,239 sf 0.00% Impervious Runoff Depth>0.07"
Flow Length=201' Tc=12.2 min CN=32 Runoff=0.01 cfs 218 cf

Subcatchment E-5: Subcat E-5 Runoff Area=198,881 sf 26.41% Impervious Runoff Depth>0.90"
Tc=6.0 min UI Adjusted CN=50 Runoff=4.40 cfs 14,923 cf

Subcatchment E-6: Subcat E-6 Runoff Area=260,840 sf 59.51% Impervious Runoff Depth>2.67"
Tc=6.0 min CN=73 Runoff=19.24 cfs 57,956 cf

Subcatchment E-7: Subcat E-7 Runoff Area=122,430 sf 13.61% Impervious Runoff Depth>0.55"
Tc=6.0 min CN=44 Runoff=1.21 cfs 5,625 cf

Subcatchment E-8: Subcat E-8 Runoff Area=784,340 sf 20.31% Impervious Runoff Depth>0.59"
Flow Length=845' Tc=27.8 min UI Adjusted CN=45 Runoff=4.65 cfs 38,723 cf

Subcatchment E-9: Subcat E-9 Runoff Area=110,648 sf 5.39% Impervious Runoff Depth>0.22"
Flow Length=353' Tc=10.8 min CN=37 Runoff=0.11 cfs 2,071 cf

Pond 4P: Existing Ditch 1 Peak Elev=193.61' Storage=217 cf Inflow=0.01 cfs 218 cf
Outflow=0.00 cfs 0 cf

Pond 7P: Drainage Easement Ditch Peak Elev=178.05' Storage=18,797 cf Inflow=20.38 cfs 63,581 cf
Discarded=2.41 cfs 63,544 cf Primary=0.00 cfs 0 cf Outflow=2.41 cfs 63,544 cf

Pond 8P: Bio-Retention Area Peak Elev=165.07' Storage=27,810 cf Inflow=4.65 cfs 38,723 cf
Discarded=0.48 cfs 10,889 cf Primary=0.00 cfs 0 cf Outflow=0.48 cfs 10,889 cf

Pond 9P: Existing Ditch 2 Peak Elev=163.66' Storage=492 cf Inflow=0.11 cfs 2,071 cf
Discarded=0.07 cfs 1,628 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 1,628 cf

Link SP1: Study Point 1 Inflow=0.01 cfs 197 cf
Primary=0.01 cfs 197 cf

Link SP2: Study Point 2 Inflow=0.01 cfs 74 cf
Primary=0.01 cfs 74 cf

Link SP3: Study Point 3 Inflow=0.03 cfs 660 cf
Primary=0.03 cfs 660 cf

Link SP4: Study Point 4 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP5: Study Point 5 Inflow=4.40 cfs 14,923 cf
Primary=4.40 cfs 14,923 cf

Link SP6: Study Point 6 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,647,074 sf Runoff Volume = 120,447 cf Average Runoff Depth = 0.88"
76.25% Pervious = 1,255,929 sf 23.75% Impervious = 391,146 sf

Summary for Subcatchment E-1: Subcat E-1

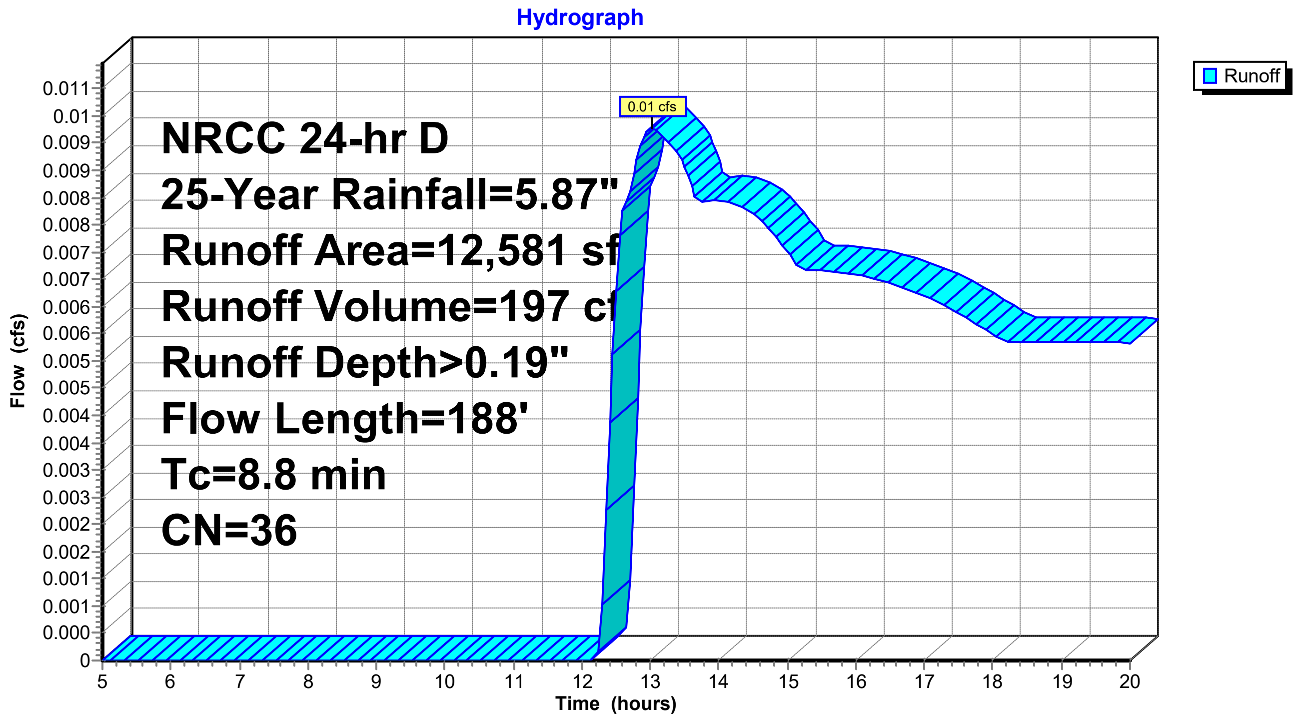
Runoff = 0.01 cfs @ 13.03 hrs, Volume= 197 cf, Depth> 0.19"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
6,126	30	Woods, Good, HSG A
23	30	Woods, Good, HSG A
1,198	30	Woods, Good, HSG A
3,288	30	Woods, Good, HSG A
1,947	72	Dirt roads, HSG A
12,581	36	Weighted Average
12,581		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0900	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.7	55	0.2540	1.26		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
0.1	15	0.0660	4.14		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.3	18	0.1380	0.93		**Shallow Concentrated Flow, D-E** Forest w/Heavy Litter Kv= 2.5 fps
0.1	14	0.0570	3.84		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
0.7	36	0.1250	0.88		**Shallow Concentrated Flow, F-G** Forest w/Heavy Litter Kv= 2.5 fps
8.8	188	Total			

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

[73] Warning: Peak may fall outside time span

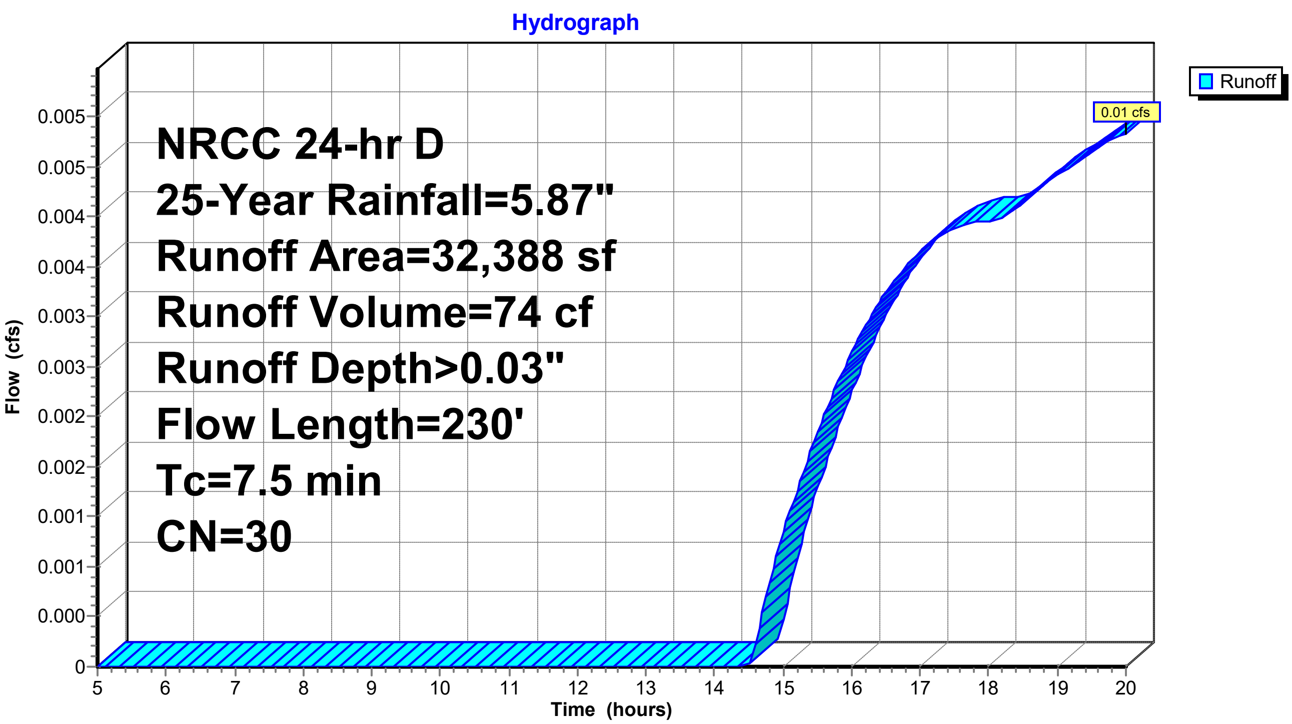
Runoff = 0.01 cfs @ 20.00 hrs, Volume= 74 cf, Depth> 0.03"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
95	98	Roofs, HSG A
32,293	30	Woods, Good, HSG A
32,388	30	Weighted Average
32,293		99.71% Pervious Area
95		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1800	0.16		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.7	92	0.1950	2.21		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	88	0.0340	0.92		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.5	230	Total			

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

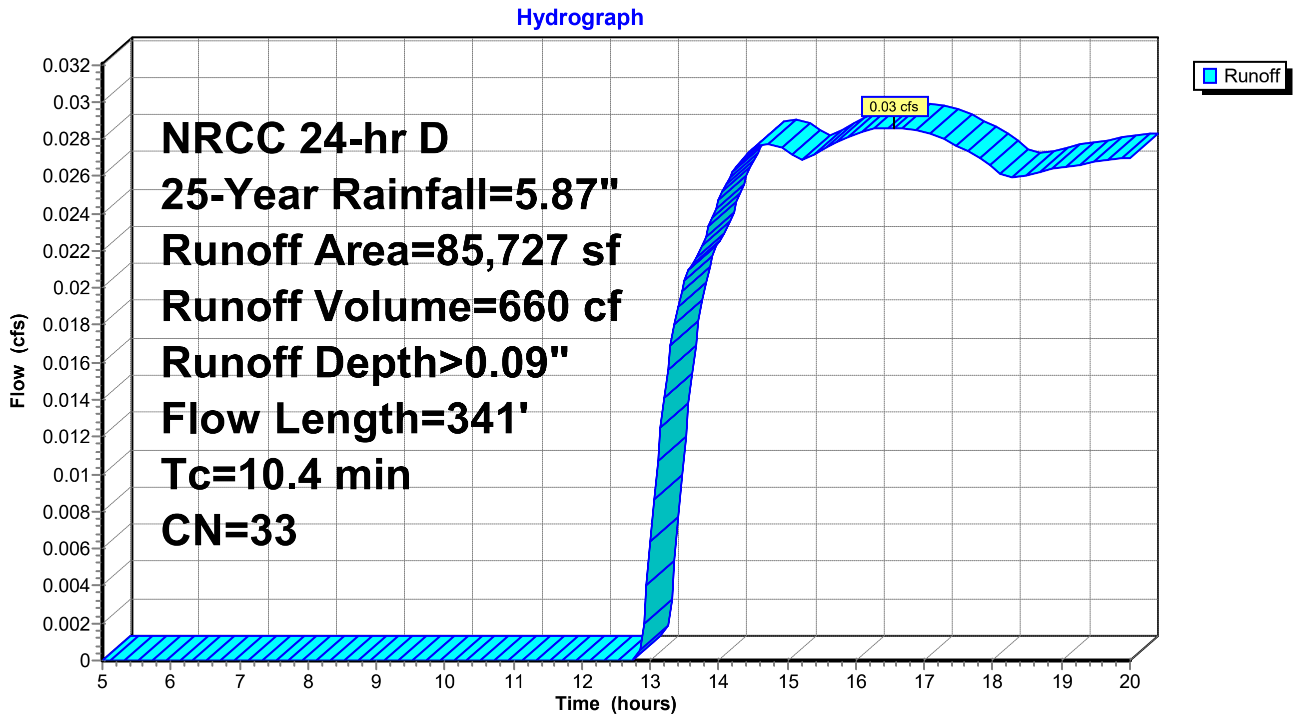
Runoff = 0.03 cfs @ 16.55 hrs, Volume= 660 cf, Depth> 0.09"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
64,217	30	Woods, Good, HSG A
17,077	30	Woods, Good, HSG A
618	98	Roofs, HSG A
347	98	Roofs, HSG A
400	98	Roofs, HSG A
3,068	72	Dirt roads, HSG A
85,727	33	Weighted Average
84,362		98.41% Pervious Area
1,365		1.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.5	74	0.2160	2.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	60	0.0250	2.55		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
2.3	157	0.0510	1.13		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
10.4	341	Total			

Subcatchment E-3: Subcat E-3



Summary for Subcatchment E-4: Subcat E-4

[73] Warning: Peak may fall outside time span

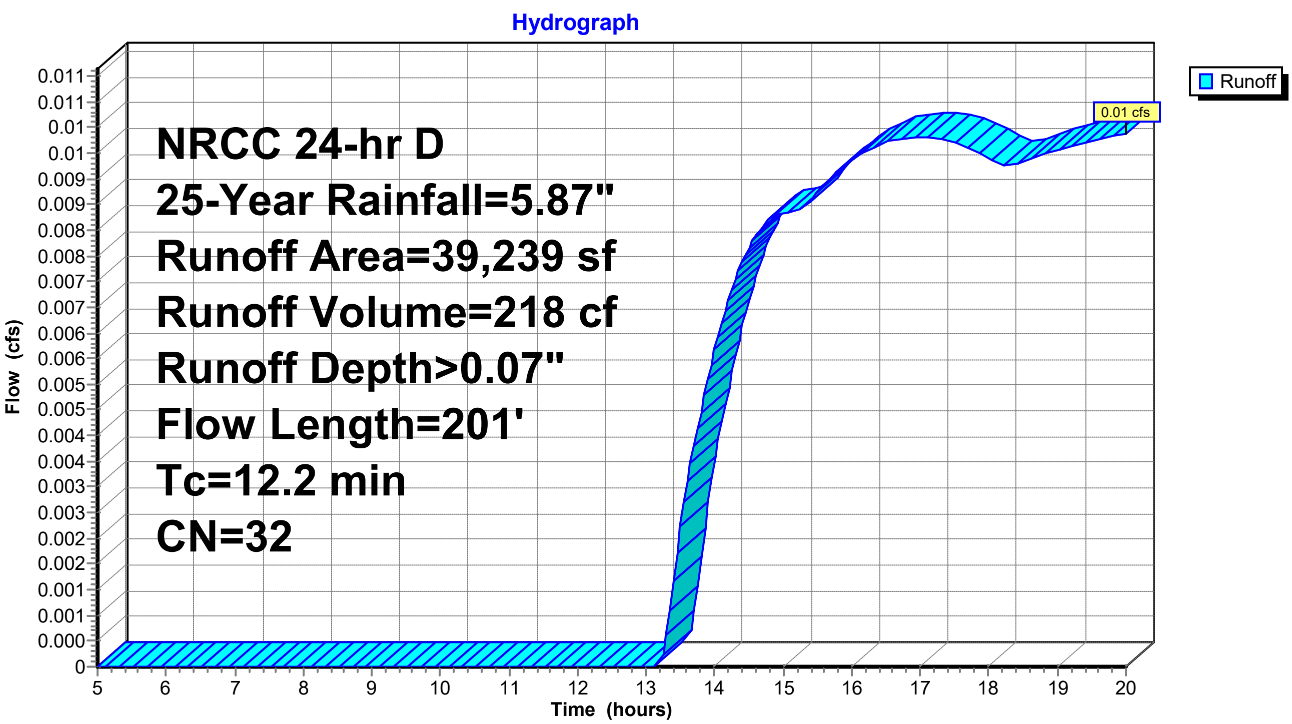
Runoff = 0.01 cfs @ 20.00 hrs, Volume= 218 cf, Depth> 0.07"
Routed to Pond 4P : Existing Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
19,291	30	Woods, Good, HSG A
18,208	30	Woods, Good, HSG A
1,739	72	Dirt roads, HSG A
39,239	32	Weighted Average
39,239		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	21	0.0200	0.99		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.2	201	Total			

Subcatchment E-4: Subcat E-4



Summary for Subcatchment E-5: Subcat E-5

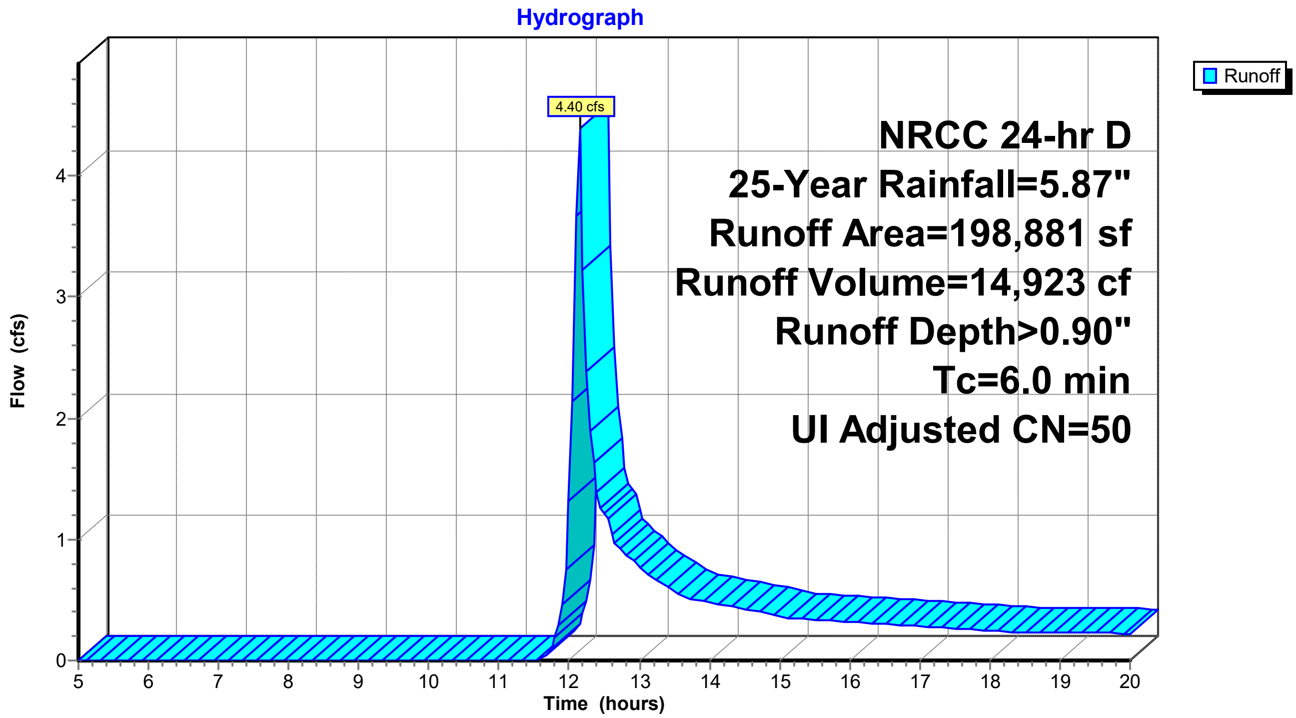
Runoff = 4.40 cfs @ 12.14 hrs, Volume= 14,923 cf, Depth> 0.90"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Adj	Description
60,243	30		Woods, Good, HSG A
21,040	30		Woods, Good, HSG A
11,413	30		Woods, Good, HSG A
5,380	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
16,563	39		>75% Grass cover, Good, HSG A
0	39		>75% Grass cover, Good, HSG A
315	39		>75% Grass cover, Good, HSG A
1,914	39		>75% Grass cover, Good, HSG A
761	39		>75% Grass cover, Good, HSG A
10,302	39		>75% Grass cover, Good, HSG A
1,325	30		Woods, Good, HSG A
13,415	72		Dirt roads, HSG A
527	98		Unconnected pavement, HSG A
43	98		Unconnected pavement, HSG A
38	98		Unconnected pavement, HSG A
39	98		Unconnected pavement, HSG A
13,837	98		Unconnected pavement, HSG A
33	98		Unconnected pavement, HSG A
16,302	98		Paved parking, HSG A
330	39		>75% Grass cover, Good, HSG A
9,969	98		Roofs, HSG A
395	98		Roofs, HSG A
1,474	98		Roofs, HSG A
2	98		Roofs, HSG A
9,863	98		Roofs, HSG A
3,360	39		>75% Grass cover, Good, HSG A
198,881	52	50	Weighted Average, UI Adjusted
146,360			73.59% Pervious Area
52,521			26.41% Impervious Area
14,517			27.64% Unconnected

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

Subcatchment E-5: Subcat E-5



Summary for Subcatchment E-6: Subcat E-6

Runoff = 19.24 cfs @ 12.13 hrs, Volume= 57,956 cf, Depth> 2.67"
Routed to Pond 7P : Drainage Easement Ditch

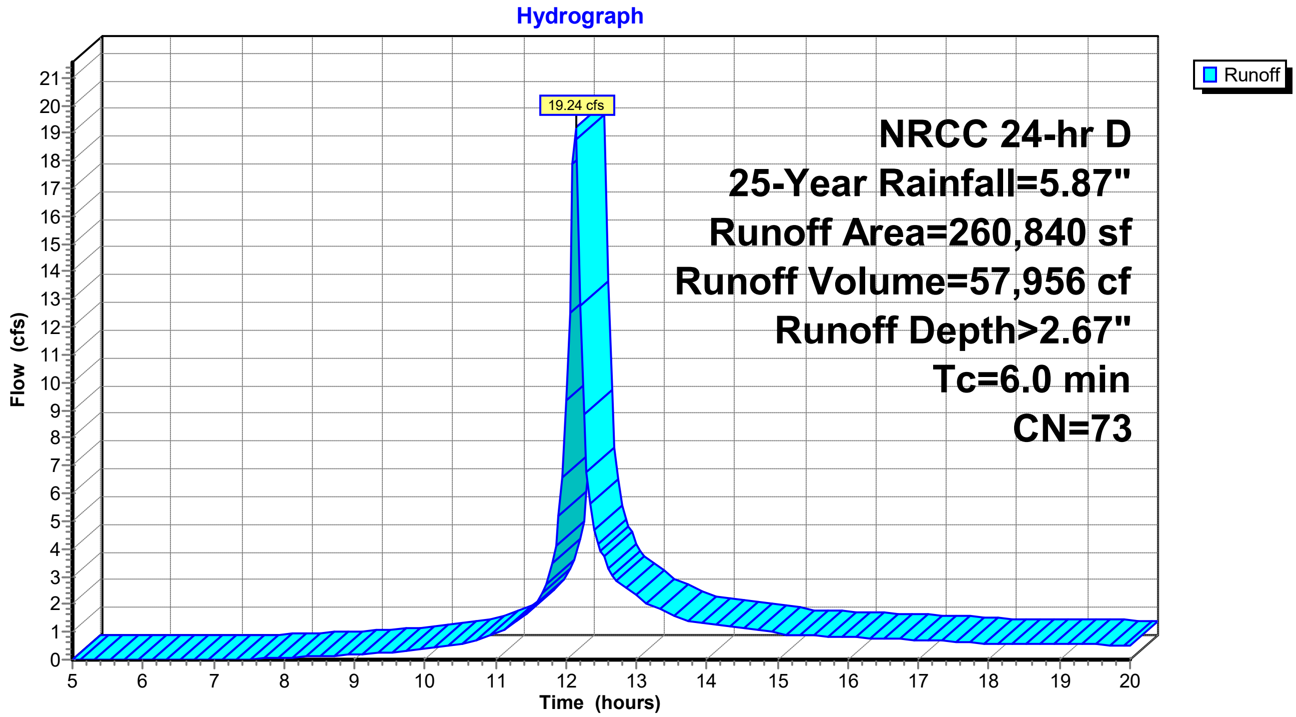
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
76	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
512	30	Woods, Good, HSG A
87	30	Woods, Good, HSG A
580	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
234	30	Woods, Good, HSG A
41	30	Woods, Good, HSG A
17	30	Woods, Good, HSG A
124	39	>75% Grass cover, Good, HSG A
1,324	39	>75% Grass cover, Good, HSG A
3,326	39	>75% Grass cover, Good, HSG A
197	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
1,494	39	>75% Grass cover, Good, HSG A
488	39	>75% Grass cover, Good, HSG A
0	39	>75% Grass cover, Good, HSG A
1,039	39	>75% Grass cover, Good, HSG A
80	30	Woods, Good, HSG A
5,897	39	>75% Grass cover, Good, HSG A
207	39	>75% Grass cover, Good, HSG A
38	39	>75% Grass cover, Good, HSG A
35,199	54	1/2 acre lots, 25% imp, HSG A
2,290	54	1/2 acre lots, 25% imp, HSG A
2,360	98	Unconnected pavement, HSG A
889	98	Unconnected pavement, HSG A
5,804	98	Unconnected pavement, HSG A
135,515	98	Paved parking, HSG A
563	98	Unconnected pavement, HSG A
3,565	39	>75% Grass cover, Good, HSG A
2,358	30	Woods, Good, HSG A
6,778	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
1,577	39	>75% Grass cover, Good, HSG A
1,768	39	>75% Grass cover, Good, HSG A
362	39	>75% Grass cover, Good, HSG A
12,602	30	Woods, Good, HSG A
10,885	39	>75% Grass cover, Good, HSG A
4,375	30	Woods, Good, HSG A
2,426	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
348	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
44	72	Dirt roads, HSG A
591	39	>75% Grass cover, Good, HSG A
2,039	39	>75% Grass cover, Good, HSG A
564	39	>75% Grass cover, Good, HSG A
91	98	Unconnected pavement, HSG A

623	98	Unconnected pavement, HSG A
3	39	>75% Grass cover, Good, HSG A
839	39	>75% Grass cover, Good, HSG A
6	39	>75% Grass cover, Good, HSG A
6,902	39	>75% Grass cover, Good, HSG A
2,574	39	>75% Grass cover, Good, HSG A
260,840	73	Weighted Average
105,622		40.49% Pervious Area
155,218		59.51% Impervious Area
10,331		6.66% Unconnected

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

Subcatchment E-6: Subcat E-6



Summary for Subcatchment E-7: Subcat E-7

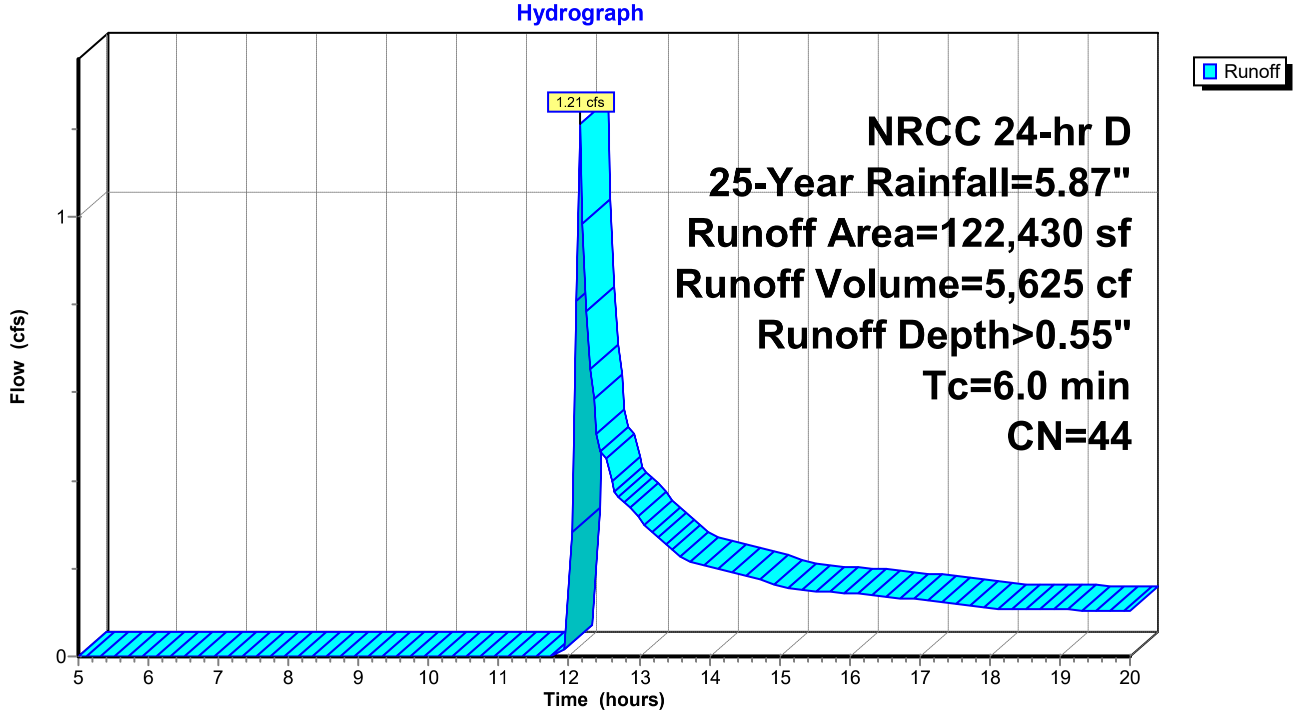
Runoff = 1.21 cfs @ 12.16 hrs, Volume= 5,625 cf, Depth> 0.55"
Routed to Pond 7P : Drainage Easement Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
72	30	Woods, Good, HSG A
62,479	30	Woods, Good, HSG A
1,141	30	Woods, Good, HSG A
114	39	>75% Grass cover, Good, HSG A
990	39	>75% Grass cover, Good, HSG A
243	39	>75% Grass cover, Good, HSG A
3,704	39	>75% Grass cover, Good, HSG A
215	30	Woods, Good, HSG A
3,897	54	1/2 acre lots, 25% imp, HSG A
37,219	54	1/2 acre lots, 25% imp, HSG A
113	98	Unconnected pavement, HSG A
159	98	Unconnected pavement, HSG A
5,286	98	Roofs, HSG A
5,740	72	Dirt roads, HSG A
234	39	>75% Grass cover, Good, HSG A
8	98	Paved parking, HSG A
789	98	Unconnected pavement, HSG A
26	98	Unconnected pavement, HSG A
1	98	Unconnected pavement, HSG A
122,430	44	Weighted Average
105,770		86.39% Pervious Area
16,661		13.61% Impervious Area
1,088		6.53% Unconnected

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

Subcatchment E-7: Subcat E-7



Summary for Subcatchment E-8: Subcat E-8

Runoff = 4.65 cfs @ 12.50 hrs, Volume= 38,723 cf, Depth> 0.59"
Routed to Pond 8P : Bio-Retention Area

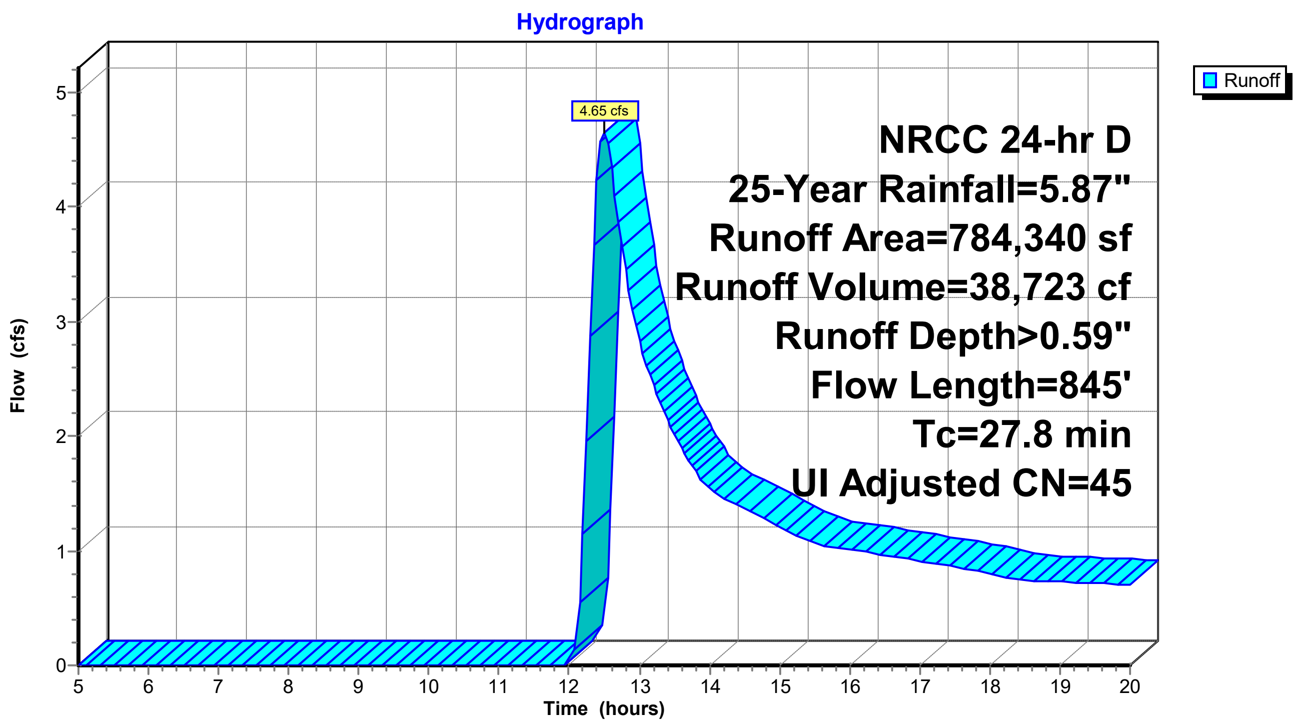
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Adj	Description
0	30		Woods, Good, HSG A
37,409	30		Woods, Good, HSG A
151,691	30		Woods, Good, HSG A
13,674	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
51,870	30		Woods, Good, HSG A
67,378	30		Woods, Good, HSG A
57	39		>75% Grass cover, Good, HSG A
107	39		>75% Grass cover, Good, HSG A
1,057	39		>75% Grass cover, Good, HSG A
58	39		>75% Grass cover, Good, HSG A
10,449	39		>75% Grass cover, Good, HSG A
104,791	39		>75% Grass cover, Good, HSG A
87,385	39		>75% Grass cover, Good, HSG A
1,978	39		>75% Grass cover, Good, HSG A
161	39		>75% Grass cover, Good, HSG A
103,904	54		1/2 acre lots, 25% imp, HSG A
665	72		Dirt roads, HSG A
61	98		Unconnected pavement, HSG A
71	98		Unconnected pavement, HSG A
70	98		Unconnected pavement, HSG A
16,908	98		Unconnected pavement, HSG A
26,556	98		Unconnected pavement, HSG A
1,433	98		Unconnected pavement, HSG A
110	98		Unconnected pavement, HSG A
11,569	98		Unconnected pavement, HSG A
1,743	98		Unconnected pavement, HSG A
3,101	98		Unconnected pavement, HSG A
12	98		Unconnected pavement, HSG A
71	98		Unconnected pavement, HSG A
210	98		Unconnected pavement, HSG A
299	98		Unconnected pavement, HSG A
7,456	98		Unconnected pavement, HSG A
30	98		Unconnected pavement, HSG A
273	98		Roofs, HSG A
131	98		Roofs, HSG A
605	98		Roofs, HSG A
1,939	98		Roofs, HSG A
598	98		Roofs, HSG A
9,916	98		Roofs, HSG A
47,139	98		Roofs, HSG A
175	98		Roofs, HSG A
713	98		Roofs, HSG A
278	98		Roofs, HSG A
879	98		Roofs, HSG A
395	98		Roofs, HSG A
602	98		Roofs, HSG A
9,672	72		Dirt roads, HSG A
8,690	72		Dirt roads, HSG A

784,340	48	45	Weighted Average, UI Adjusted
625,021			79.69% Pervious Area
159,319			20.31% Impervious Area
69,702			43.75% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	50	0.0240	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
2.0	76	0.0660	0.64		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	79	0.0120	0.77		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.2	27	0.0127	2.29		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
3.9	220	0.0180	0.94		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
8.3	393	0.0990	0.79		**Shallow Concentrated Flow, F-G** Forest w/Heavy Litter Kv= 2.5 fps
27.8	845	Total			

Subcatchment E-8: Subcat E-8



Summary for Subcatchment E-9: Subcat E-9

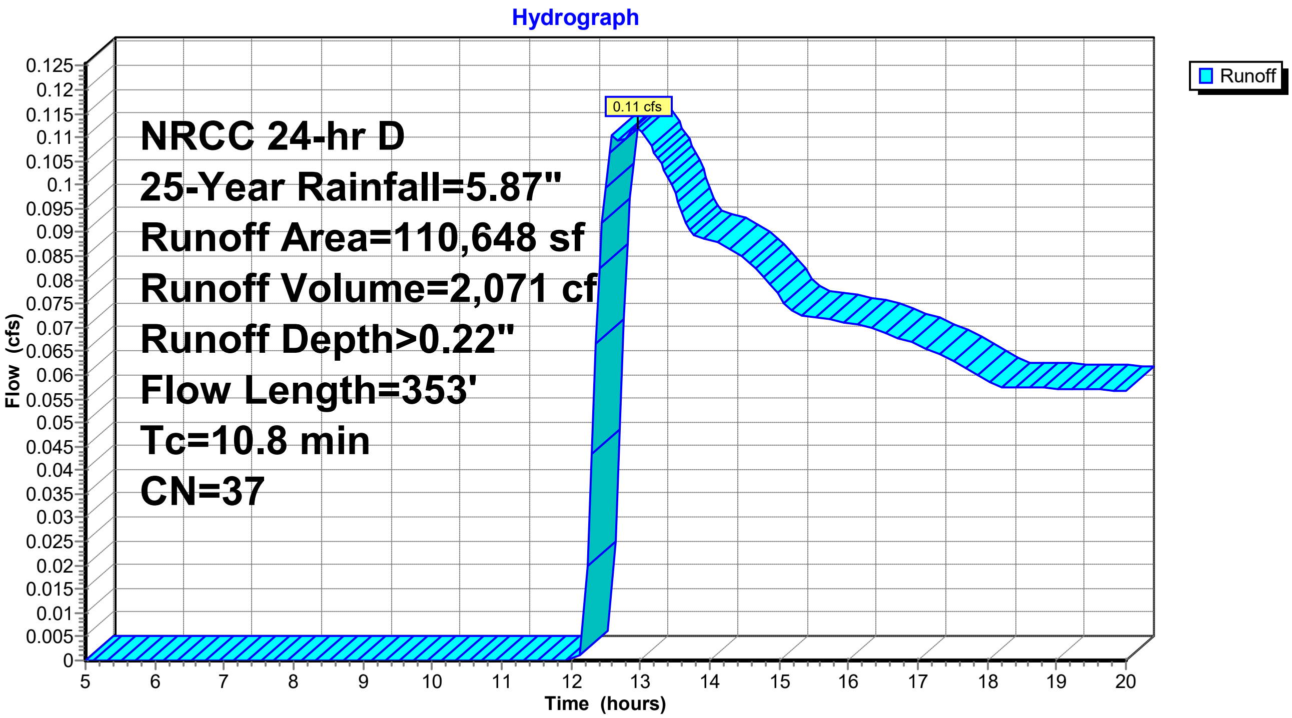
Runoff = 0.11 cfs @ 12.95 hrs, Volume= 2,071 cf, Depth> 0.22"
Routed to Pond 9P : Existing Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
835	30	Woods, Good, HSG A
18,276	30	Woods, Good, HSG A
65,542	30	Woods, Good, HSG A
13	39	>75% Grass cover, Good, HSG A
21,381	54	1/2 acre lots, 25% imp, HSG A
621	98	Roofs, HSG A
3,980	72	Dirt roads, HSG A
110,648	37	Weighted Average
104,681		94.61% Pervious Area
5,967		5.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.2000	0.17		**Sheet Flow, A-B**
					Woods: Light underbrush n= 0.400 P2= 3.09"
5.8	303	0.1220	0.87		**Shallow Concentrated Flow, B-C**
					Forest w/Heavy Litter Kv= 2.5 fps
10.8	353	Total			

Subcatchment E-9: Subcat E-9



Summary for Pond 4P: Existing Ditch 1

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth > 0.07" for 25-Year event
Inflow = 0.01 cfs @ 20.00 hrs, Volume= 218 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 193.61' @ 20.00 hrs Surf.Area= 678 sf Storage= 217 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

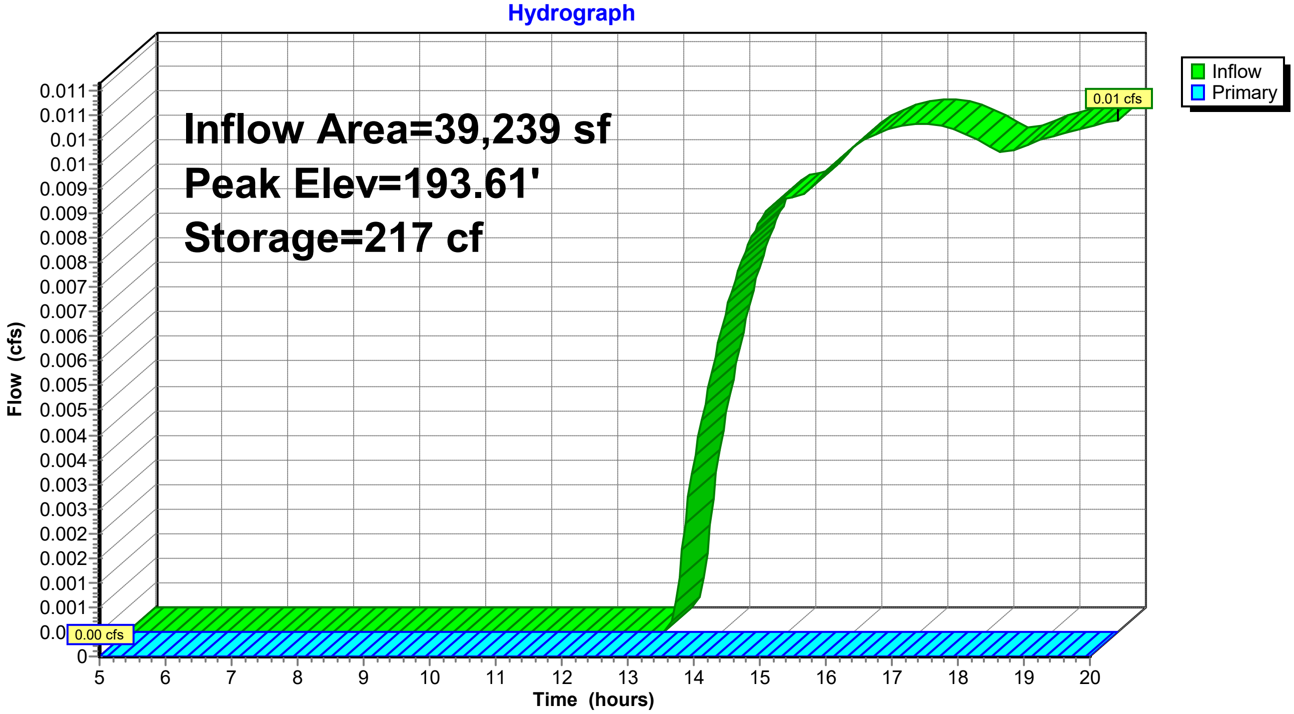
Volume	Invert	Avail.Storage	Storage Description
#1	193.00'	17,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.00	30	0	0
194.00	1,087	559	559
195.00	2,356	1,722	2,280
196.00	3,959	3,158	5,438
197.00	5,956	4,958	10,395
198.00	8,319	7,138	17,533

Device	Routing	Invert	Outlet Devices
#1	Primary	197.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=193.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Existing Ditch 1



Summary for Pond 7P: Drainage Easement Ditch

Inflow Area = 383,270 sf, 44.85% Impervious, Inflow Depth > 1.99" for 25-Year event
Inflow = 20.38 cfs @ 12.13 hrs, Volume= 63,581 cf
Outflow = 2.41 cfs @ 11.70 hrs, Volume= 63,544 cf, Atten= 88%, Lag= 0.0 min
Discarded = 2.41 cfs @ 11.70 hrs, Volume= 63,544 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 178.05' @ 13.10 hrs Surf.Area= 7,708 sf Storage= 18,797 cf

Plug-Flow detention time= 61.8 min calculated for 63,544 cf (100% of inflow)
Center-of-Mass det. time= 61.6 min (871.5 - 809.9)

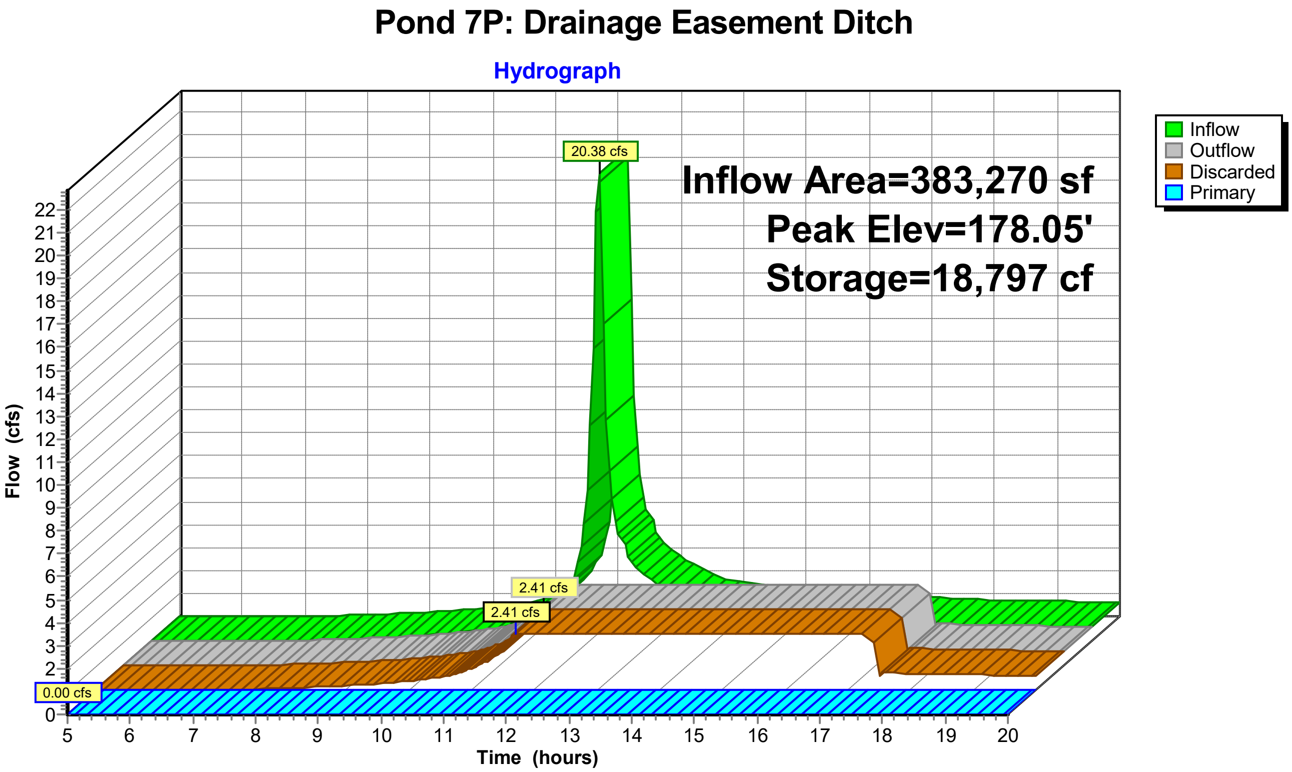
Volume	Invert	Avail.Storage	Storage Description
#1	174.00'	345,939 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.00	491	0	0
175.00	3,251	1,871	1,871
176.00	4,753	4,002	5,873
177.00	6,309	5,531	11,404
178.00	7,641	6,975	18,379
179.00	8,869	8,255	26,634
180.00	10,188	9,529	36,163
181.00	11,953	11,071	47,233
182.00	14,143	13,048	60,281
183.00	16,525	15,334	75,615
184.00	19,118	17,822	93,437
185.00	21,426	20,272	113,709
186.00	23,221	22,324	136,032
187.00	24,868	24,045	160,077
188.00	26,530	25,699	185,776
189.00	28,209	27,370	213,145
190.00	30,172	29,191	242,336
191.00	32,732	31,452	273,788
192.00	36,071	34,402	308,189
193.00	39,428	37,750	345,939

Device	Routing	Invert	Outlet Devices
#1	Primary	192.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	174.00'	**2.41 cfs Exfiltration at all elevations**

Discarded OutFlow Max=2.41 cfs @ 11.70 hrs HW=174.20' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 2.41 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=174.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)



Summary for Pond 8P: Bio-Retention Area

Inflow Area = 784,340 sf, 20.31% Impervious, Inflow Depth > 0.59" for 25-Year event
Inflow = 4.65 cfs @ 12.50 hrs, Volume= 38,723 cf
Outflow = 0.48 cfs @ 20.00 hrs, Volume= 10,889 cf, Atten= 90%, Lag= 450.1 min
Discarded = 0.48 cfs @ 20.00 hrs, Volume= 10,889 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 165.07' @ 20.00 hrs Surf.Area= 8,613 sf Storage= 27,810 cf

Plug-Flow detention time= 236.6 min calculated for 10,853 cf (28% of inflow)
Center-of-Mass det. time= 98.9 min (993.6 - 894.7)

Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	100,011 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

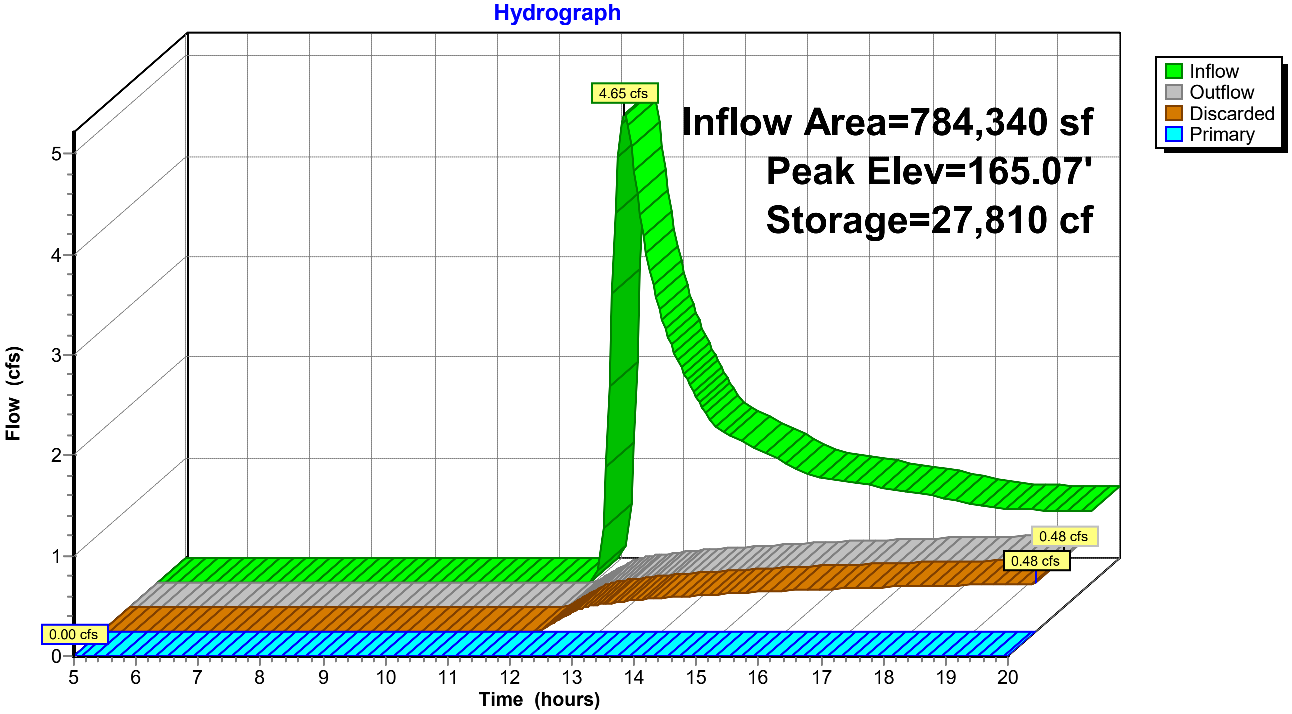
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
159.00	934	176.0	0	0	934
160.00	2,320	278.0	1,575	1,575	4,626
161.00	3,563	292.0	2,919	4,495	5,322
162.00	4,546	305.0	4,045	8,539	6,008
163.00	5,553	339.0	5,041	13,580	7,780
164.00	6,677	374.0	6,106	19,687	9,798
165.00	8,367	426.0	7,506	27,193	13,132
166.00	12,063	523.0	10,159	37,352	20,473
167.00	17,347	642.0	14,625	51,977	31,520
168.00	23,464	806.0	20,329	72,306	50,432
169.00	32,175	988.0	27,705	100,011	76,430

Device	Routing	Invert	Outlet Devices
#1	Primary	168.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	159.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.48 cfs @ 20.00 hrs HW=165.07' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.48 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=159.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Bio-Retention Area



Summary for Pond 9P: Existing Ditch 2

Inflow Area = 110,648 sf, 5.39% Impervious, Inflow Depth > 0.22" for 25-Year event
Inflow = 0.11 cfs @ 12.95 hrs, Volume= 2,071 cf
Outflow = 0.07 cfs @ 17.20 hrs, Volume= 1,628 cf, Atten= 42%, Lag= 255.2 min
Discarded = 0.07 cfs @ 17.20 hrs, Volume= 1,628 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 163.66' @ 17.20 hrs Surf.Area= 1,166 sf Storage= 492 cf

Plug-Flow detention time= 98.0 min calculated for 1,628 cf (79% of inflow)
Center-of-Mass det. time= 44.9 min (986.3 - 941.5)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	94,144 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

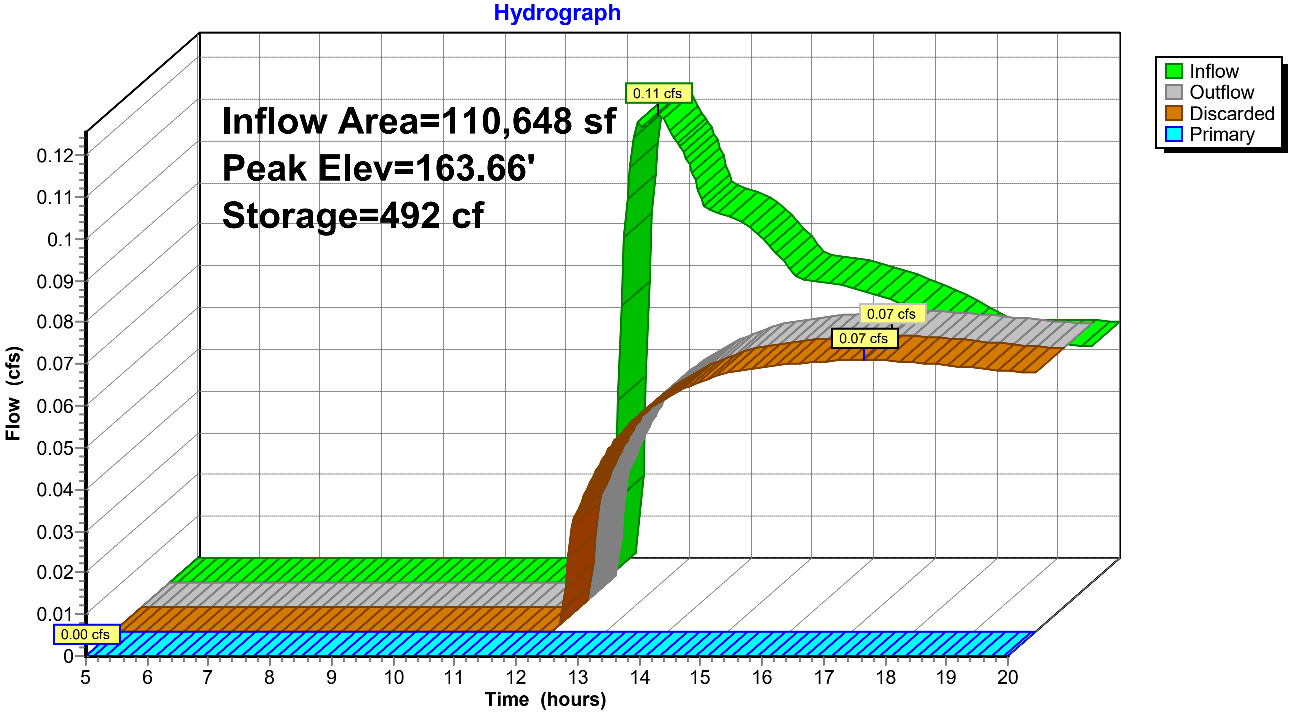
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
163.00	333	0	0
164.00	1,602	968	968
165.00	2,975	2,289	3,256
166.00	4,470	3,723	6,979
167.00	6,302	5,386	12,365
168.00	8,505	7,404	19,768
169.00	10,882	9,694	29,462
170.00	13,282	12,082	41,544
171.00	15,858	14,570	56,114
172.00	18,847	17,353	73,466
173.00	22,508	20,678	94,144

Device	Routing	Invert	Outlet Devices
#1	Primary	172.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	163.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.07 cfs @ 17.20 hrs HW=163.66' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=163.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 9P: Existing Ditch 2

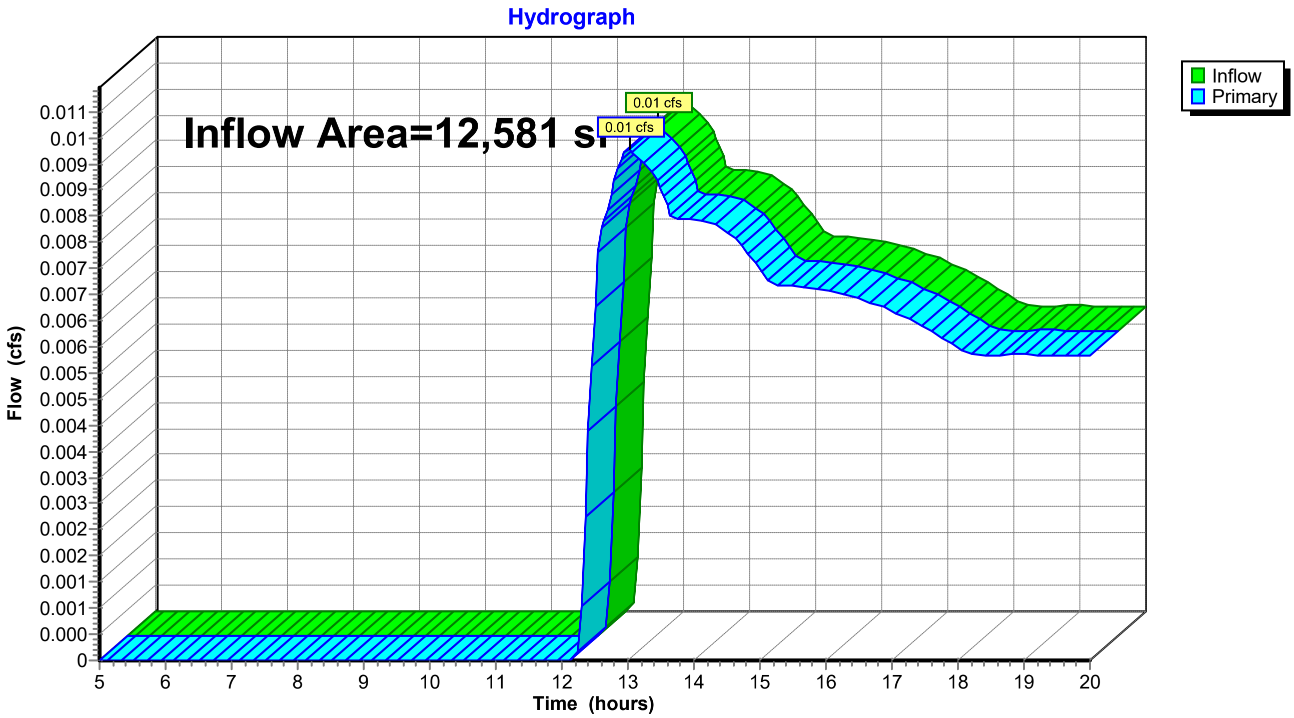


Summary for Link SP1: Study Point 1

Inflow Area = 12,581 sf, 0.00% Impervious, Inflow Depth > 0.19" for 25-Year event
Inflow = 0.01 cfs @ 13.03 hrs, Volume= 197 cf
Primary = 0.01 cfs @ 13.03 hrs, Volume= 197 cf, Atten= 0%, Lag= 0.0 min

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

Link SP1: Study Point 1

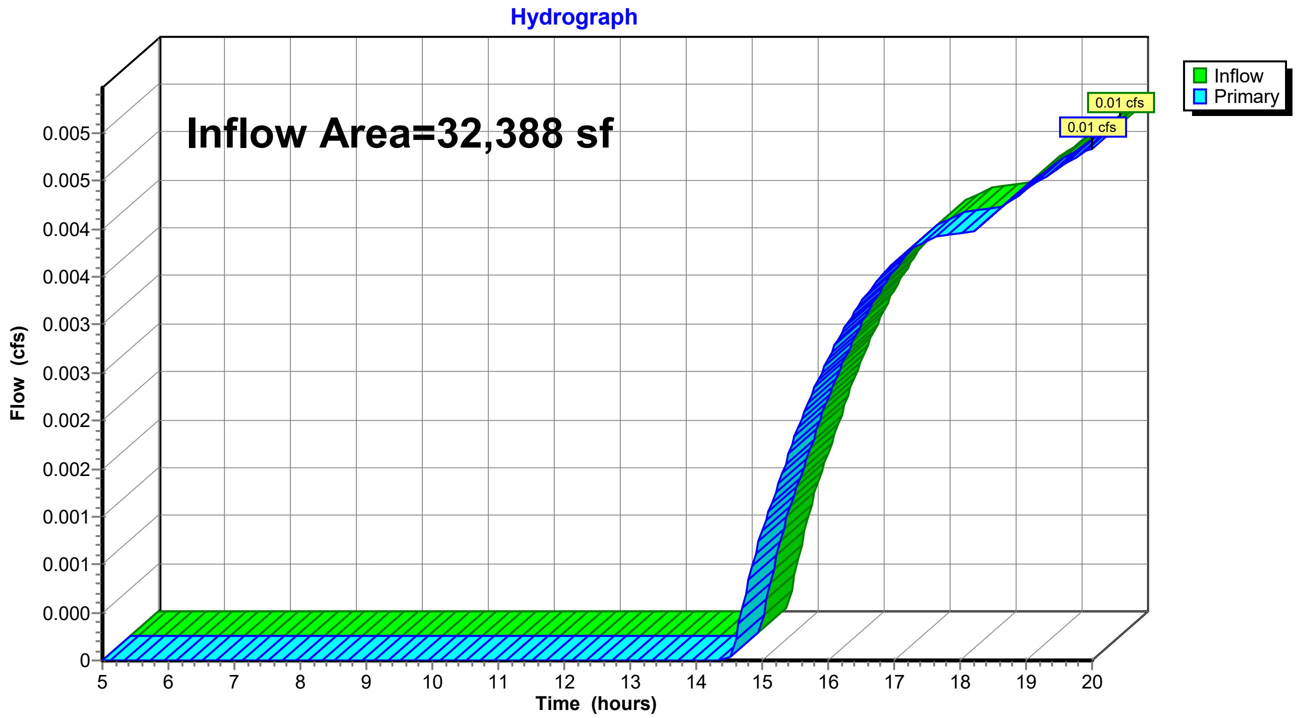


Summary for Link SP2: Study Point 2

Inflow Area =	32,388 sf,	0.29% Impervious,	Inflow Depth > 0.03"	for 25-Year event
Inflow =	0.01 cfs @	20.00 hrs, Volume=	74 cf	
Primary =	0.01 cfs @	20.00 hrs, Volume=	74 cf,	Atten= 0%, Lag= 0.0 min

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

Link SP2: Study Point 2

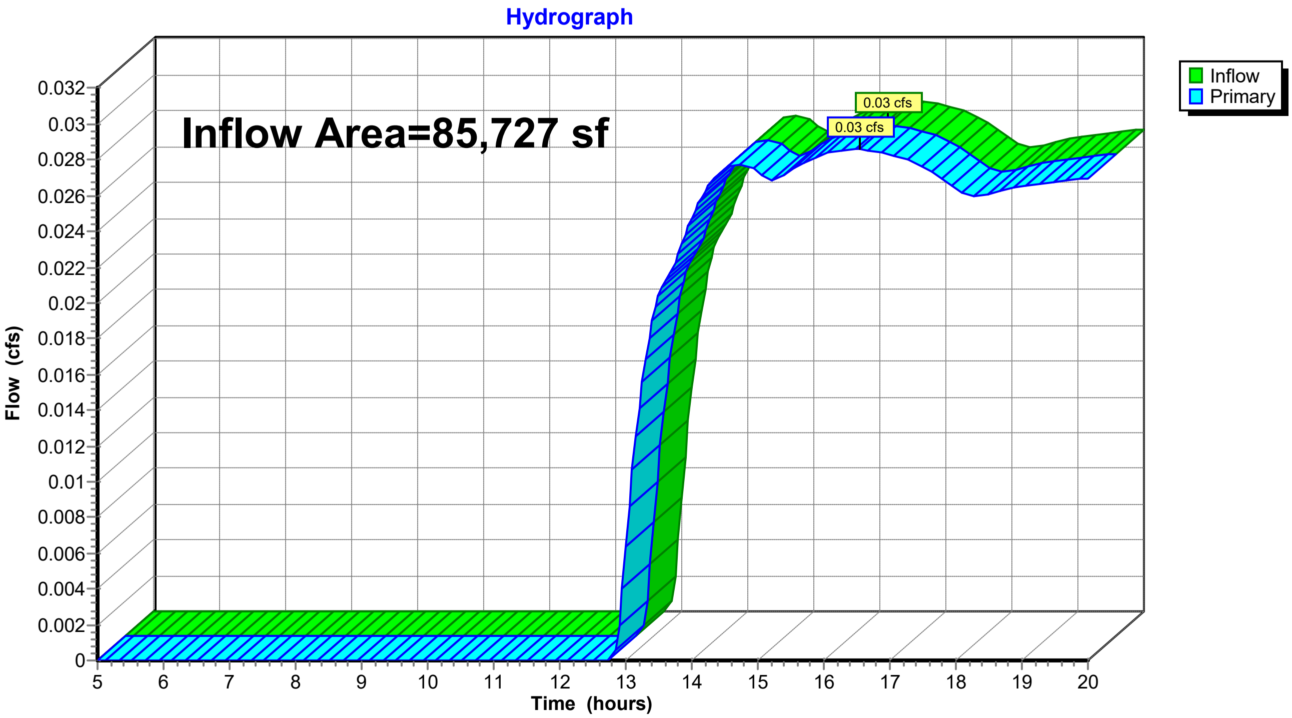


Summary for Link SP3: Study Point 3

Inflow Area =	85,727 sf,	1.59% Impervious,	Inflow Depth > 0.09"	for 25-Year event
Inflow =	0.03 cfs @	16.55 hrs, Volume=	660 cf	
Primary =	0.03 cfs @	16.55 hrs, Volume=	660 cf, Atten= 0%, Lag= 0.0 min	

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

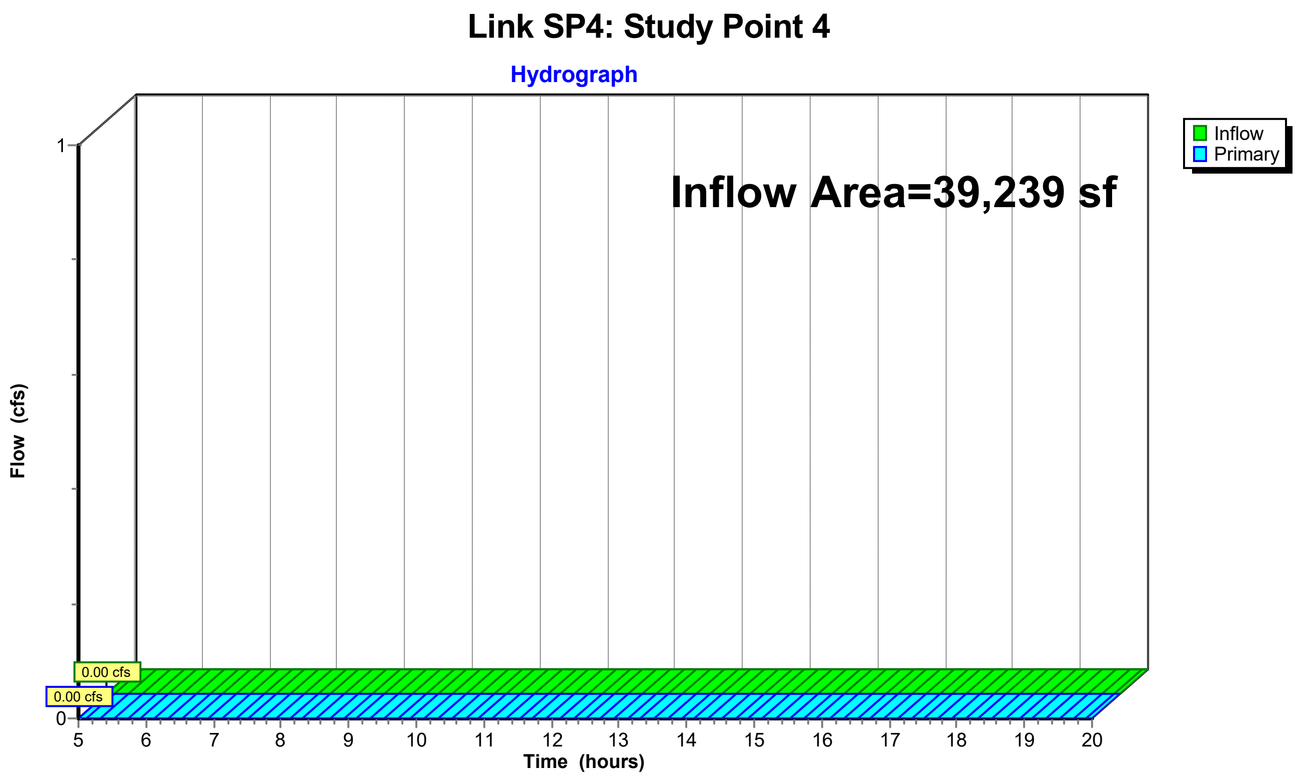
Link SP3: Study Point 3



Summary for Link SP4: Study Point 4

Inflow Area =	39,239 sf,	0.00% Impervious,	Inflow Depth = 0.00"	for 25-Year event
Inflow =	0.00 cfs @	5.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	5.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

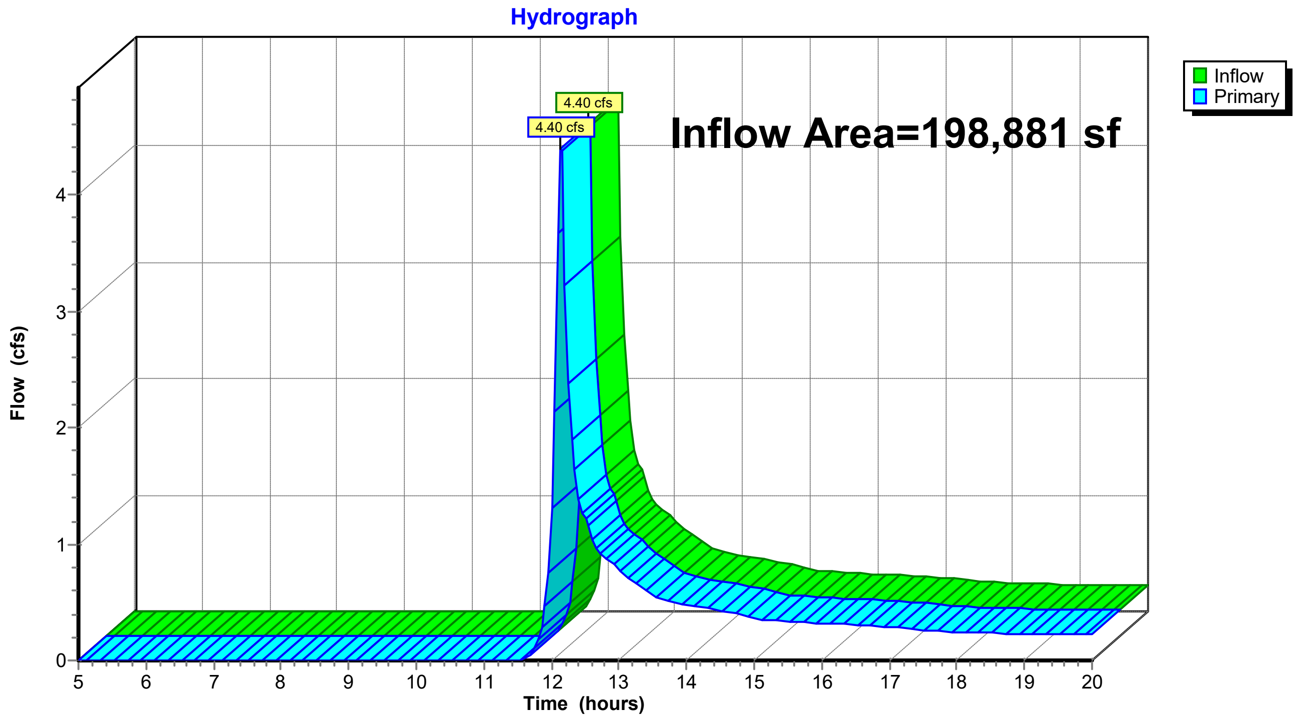


Summary for Link SP5: Study Point 5

Inflow Area = 198,881 sf, 26.41% Impervious, Inflow Depth > 0.90" for 25-Year event
Inflow = 4.40 cfs @ 12.14 hrs, Volume= 14,923 cf
Primary = 4.40 cfs @ 12.14 hrs, Volume= 14,923 cf, Atten= 0%, Lag= 0.0 min

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

Link SP5: Study Point 5

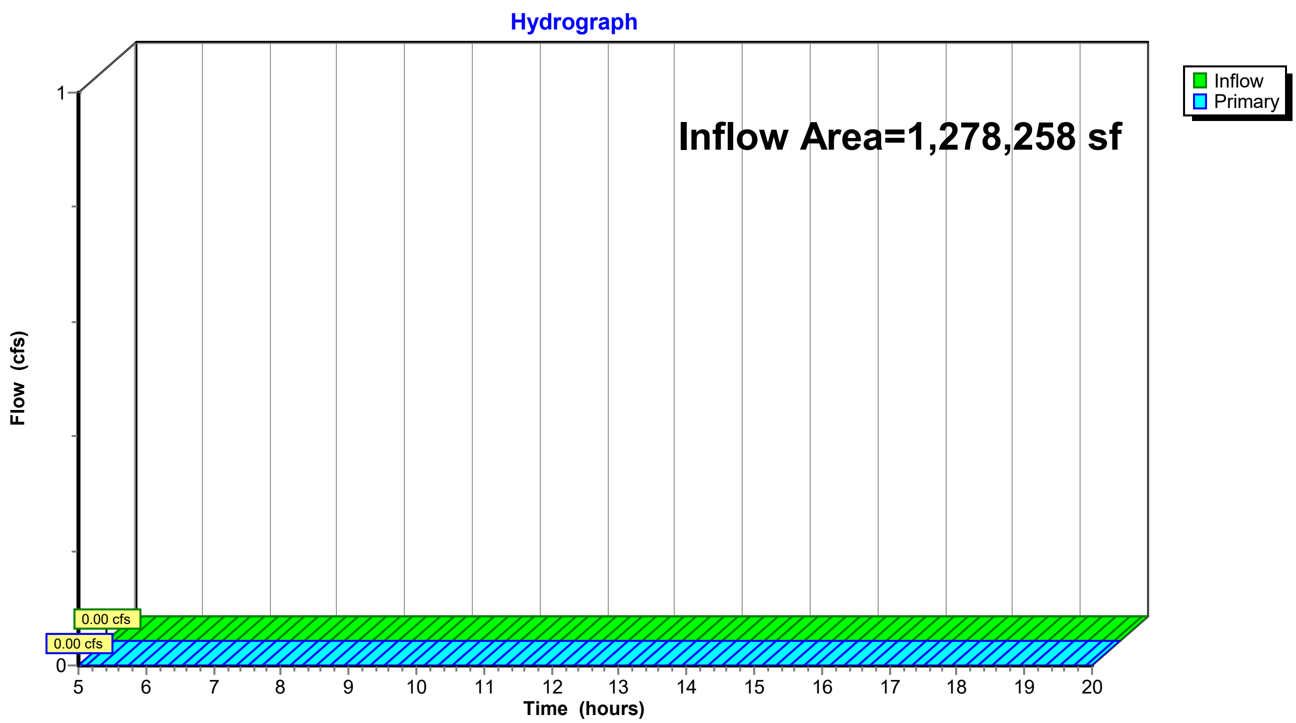


Summary for Link SP6: Study Point 6

Inflow Area = 1,278,258 sf, 26.38% Impervious, Inflow Depth = 0.00" for 25-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP6: Study Point 6



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

Subcatchment E-1: Subcat E-1 Runoff Area=12,581 sf 0.00% Impervious Runoff Depth>0.82"
Flow Length=188' Tc=8.8 min CN=36 Runoff=0.17 cfs 859 cf

Subcatchment E-2: Subcat E-2 Runoff Area=32,388 sf 0.29% Impervious Runoff Depth>0.37"
Flow Length=230' Tc=7.5 min CN=30 Runoff=0.06 cfs 1,006 cf

Subcatchment E-3: Subcat E-3 Runoff Area=85,727 sf 1.59% Impervious Runoff Depth>0.58"
Flow Length=341' Tc=10.4 min CN=33 Runoff=0.48 cfs 4,156 cf

Subcatchment E-4: Subcat E-4 Runoff Area=39,239 sf 0.00% Impervious Runoff Depth>0.51"
Flow Length=201' Tc=12.2 min CN=32 Runoff=0.15 cfs 1,658 cf

Subcatchment E-5: Subcat E-5 Runoff Area=198,881 sf 26.41% Impervious Runoff Depth>2.14"
Tc=6.0 min UI Adjusted CN=50 Runoff=11.65 cfs 35,395 cf

Subcatchment E-6: Subcat E-6 Runoff Area=260,840 sf 59.51% Impervious Runoff Depth>4.64"
Tc=6.0 min CN=73 Runoff=32.76 cfs 100,918 cf

Subcatchment E-7: Subcat E-7 Runoff Area=122,430 sf 13.61% Impervious Runoff Depth>1.54"
Tc=6.0 min CN=44 Runoff=4.90 cfs 15,721 cf

Subcatchment E-8: Subcat E-8 Runoff Area=784,340 sf 20.31% Impervious Runoff Depth>1.61"
Flow Length=845' Tc=27.8 min UI Adjusted CN=45 Runoff=17.69 cfs 105,261 cf

Subcatchment E-9: Subcat E-9 Runoff Area=110,648 sf 5.39% Impervious Runoff Depth>0.90"
Flow Length=353' Tc=10.8 min CN=37 Runoff=1.62 cfs 8,311 cf

Pond 4P: Existing Ditch 1 Peak Elev=194.71' Storage=1,655 cf Inflow=0.15 cfs 1,658 cf
Outflow=0.00 cfs 0 cf

Pond 7P: Drainage Easement Ditch Peak Elev=181.12' Storage=48,741 cf Inflow=37.61 cfs 116,638 cf
Discarded=2.41 cfs 88,222 cf Primary=0.00 cfs 0 cf Outflow=2.41 cfs 88,222 cf

Pond 8P: Bio-Retention Area Peak Elev=168.04' Storage=73,363 cf Inflow=17.69 cfs 105,261 cf
Discarded=1.33 cfs 31,877 cf Primary=0.00 cfs 0 cf Outflow=1.33 cfs 31,877 cf

Pond 9P: Existing Ditch 2 Peak Elev=165.17' Storage=3,771 cf Inflow=1.62 cfs 8,311 cf
Discarded=0.18 cfs 4,768 cf Primary=0.00 cfs 0 cf Outflow=0.18 cfs 4,768 cf

Link SP1: Study Point 1 Inflow=0.17 cfs 859 cf
Primary=0.17 cfs 859 cf

Link SP2: Study Point 2 Inflow=0.06 cfs 1,006 cf
Primary=0.06 cfs 1,006 cf

Link SP3: Study Point 3 Inflow=0.48 cfs 4,156 cf
Primary=0.48 cfs 4,156 cf

Link SP4: Study Point 4 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP5: Study Point 5 Inflow=11.65 cfs 35,395 cf
Primary=11.65 cfs 35,395 cf

Link SP6: Study Point 6 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,647,074 sf Runoff Volume = 273,285 cf Average Runoff Depth = 1.99"
76.25% Pervious = 1,255,929 sf 23.75% Impervious = 391,146 sf

Summary for Subcatchment E-1: Subcat E-1

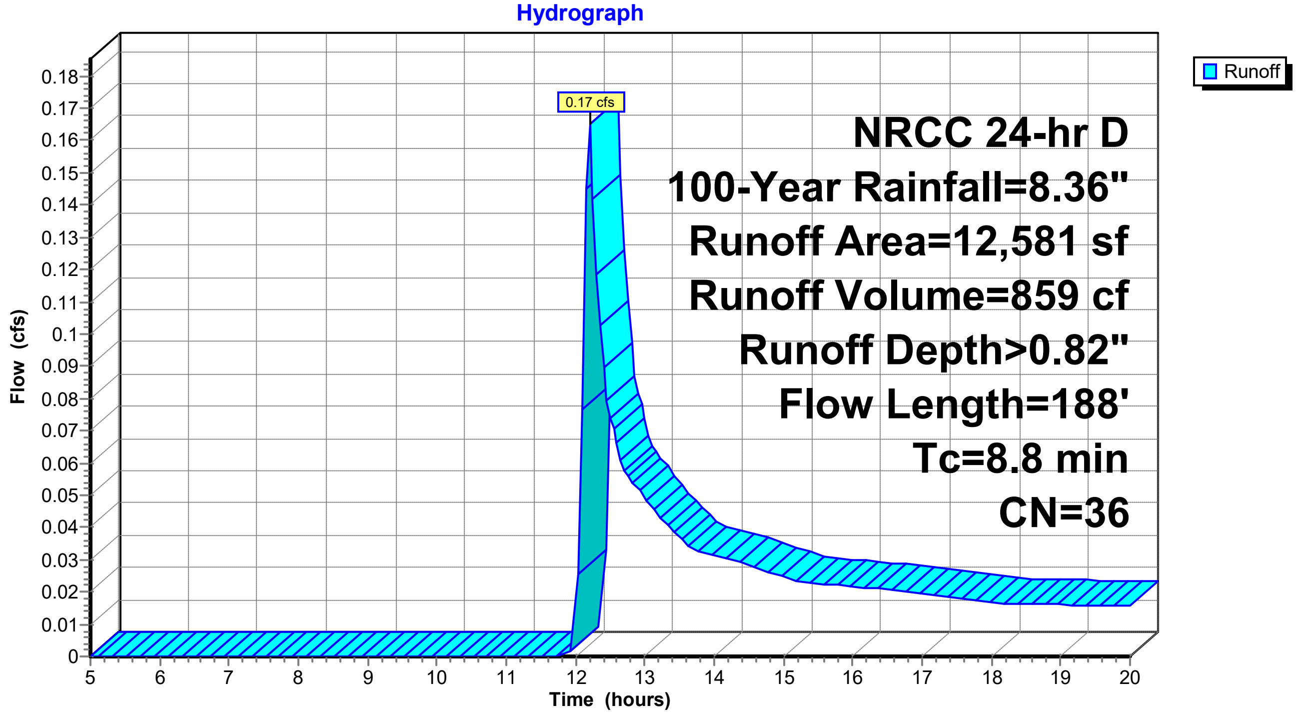
Runoff = 0.17 cfs @ 12.20 hrs, Volume= 859 cf, Depth> 0.82"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
6,126	30	Woods, Good, HSG A
23	30	Woods, Good, HSG A
1,198	30	Woods, Good, HSG A
3,288	30	Woods, Good, HSG A
1,947	72	Dirt roads, HSG A
12,581	36	Weighted Average
12,581		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0900	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.7	55	0.2540	1.26		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
0.1	15	0.0660	4.14		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
0.3	18	0.1380	0.93		**Shallow Concentrated Flow, D-E** Forest w/Heavy Litter Kv= 2.5 fps
0.1	14	0.0570	3.84		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
0.7	36	0.1250	0.88		**Shallow Concentrated Flow, F-G** Forest w/Heavy Litter Kv= 2.5 fps
8.8	188	Total			

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

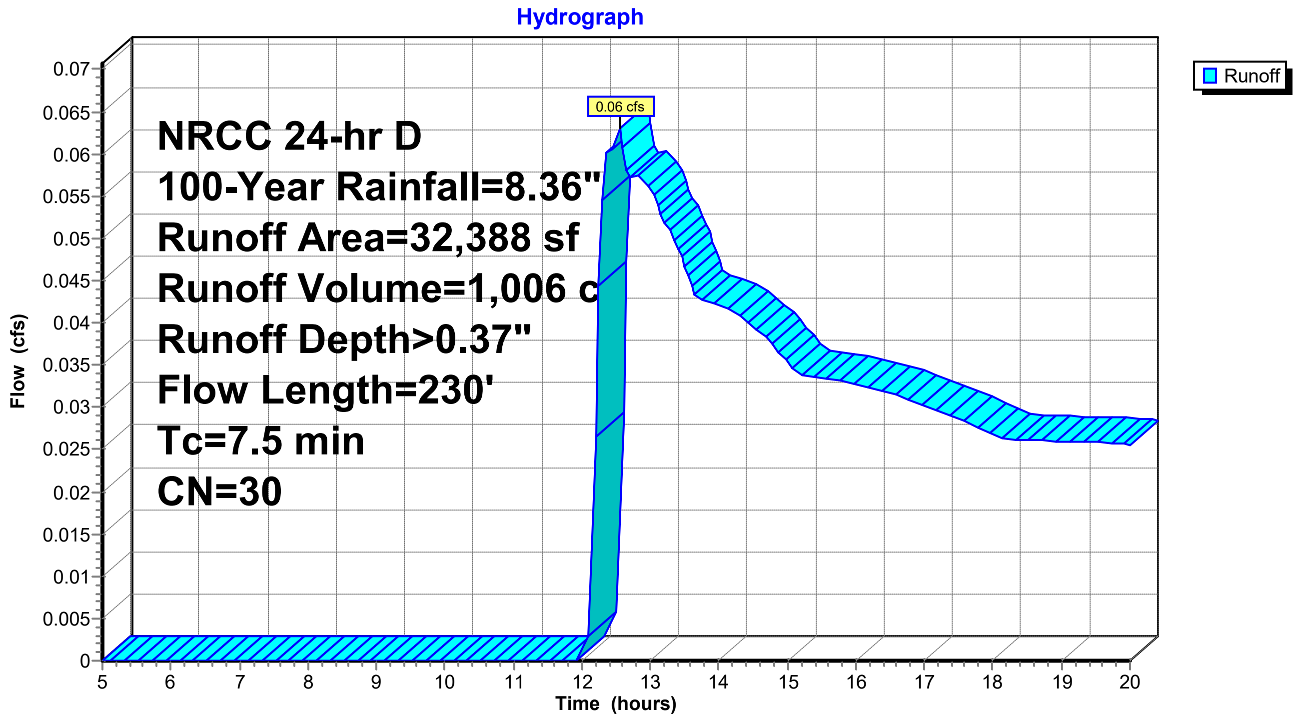
Runoff = 0.06 cfs @ 12.55 hrs, Volume= 1,006 cf, Depth> 0.37"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
95	98	Roofs, HSG A
32,293	30	Woods, Good, HSG A
32,388	30	Weighted Average
32,293		99.71% Pervious Area
95		0.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1800	0.16		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.7	92	0.1950	2.21		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	88	0.0340	0.92		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
7.5	230	Total			

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

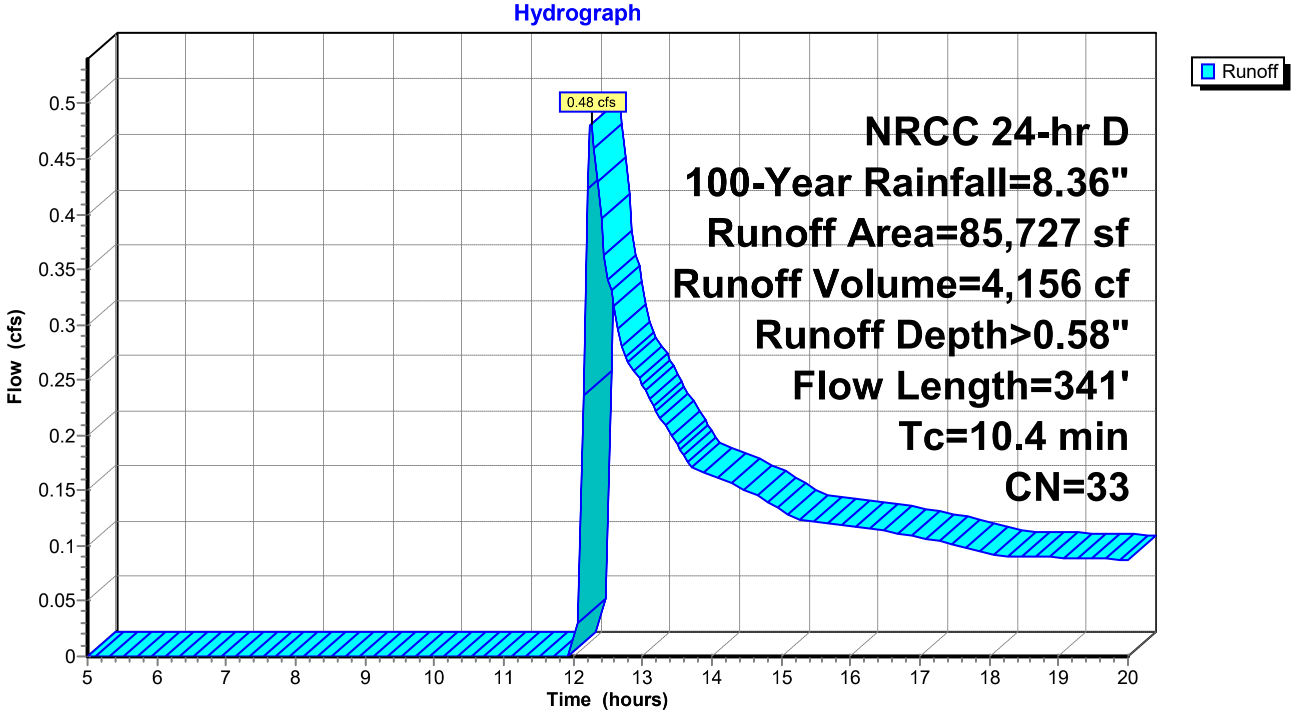
Runoff = 0.48 cfs @ 12.26 hrs, Volume= 4,156 cf, Depth> 0.58"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
64,217	30	Woods, Good, HSG A
17,077	30	Woods, Good, HSG A
618	98	Roofs, HSG A
347	98	Roofs, HSG A
400	98	Roofs, HSG A
3,068	72	Dirt roads, HSG A
85,727	33	Weighted Average
84,362		98.41% Pervious Area
1,365		1.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.5	74	0.2160	2.32		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.4	60	0.0250	2.55		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
2.3	157	0.0510	1.13		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
10.4	341	Total			

Subcatchment E-3: Subcat E-3



Summary for Subcatchment E-4: Subcat E-4

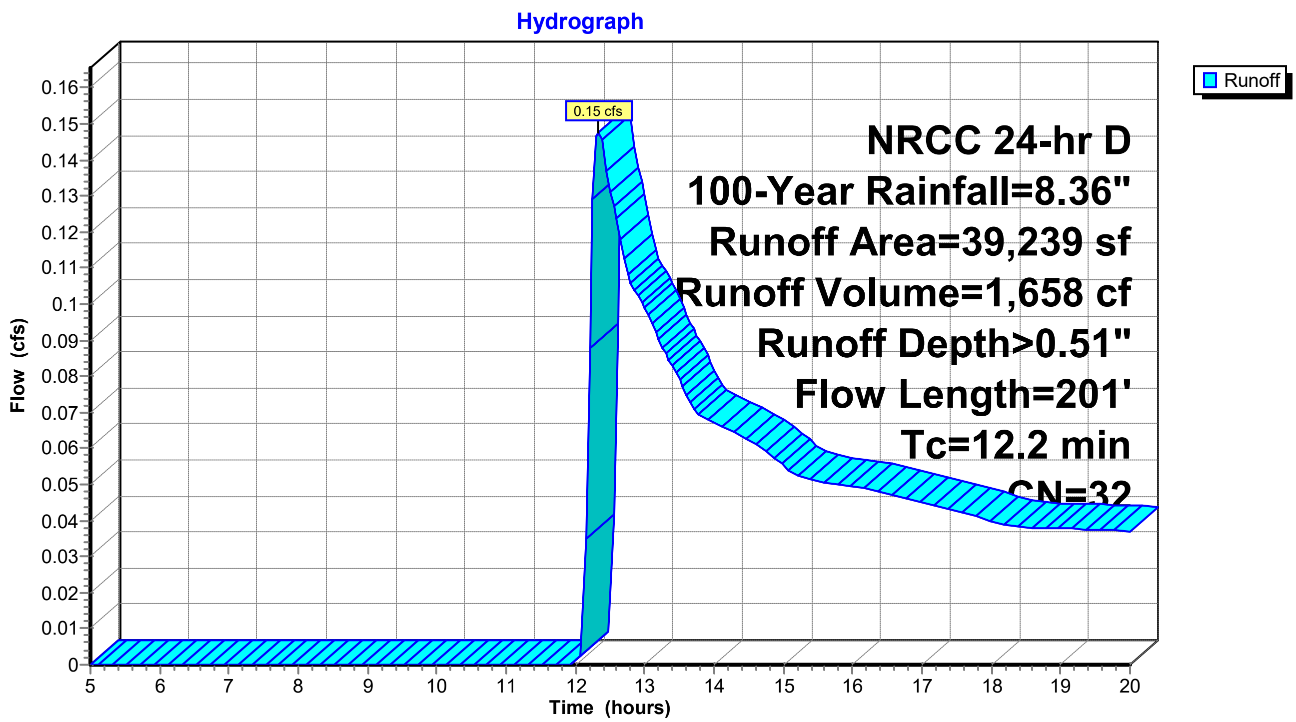
Runoff = 0.15 cfs @ 12.34 hrs, Volume= 1,658 cf, Depth> 0.51"
Routed to Pond 4P : Existing Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
19,291	30	Woods, Good, HSG A
18,208	30	Woods, Good, HSG A
1,739	72	Dirt roads, HSG A
39,239	32	Weighted Average
39,239		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.4	21	0.0200	0.99		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.1	130	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.2	201	Total			

Subcatchment E-4: Subcat E-4



Summary for Subcatchment E-5: Subcat E-5

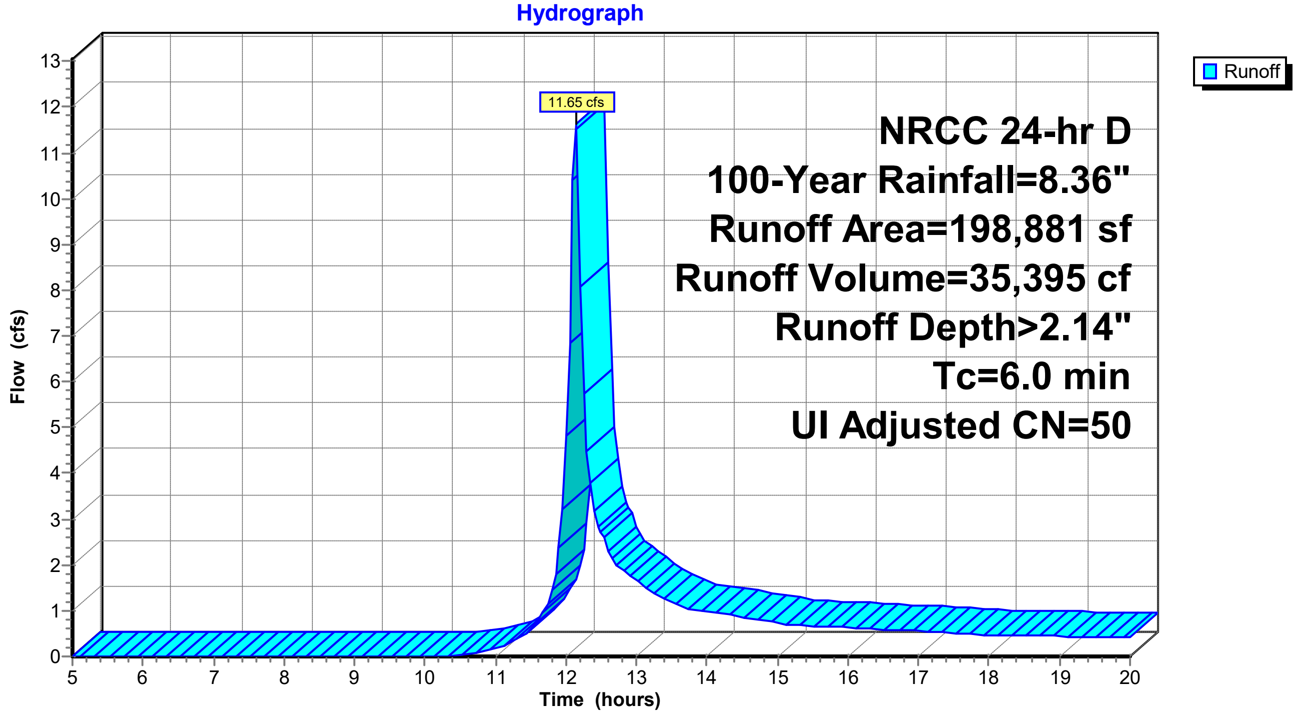
Runoff = 11.65 cfs @ 12.14 hrs, Volume= 35,395 cf, Depth> 2.14"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Adj	Description
60,243	30		Woods, Good, HSG A
21,040	30		Woods, Good, HSG A
11,413	30		Woods, Good, HSG A
5,380	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
16,563	39		>75% Grass cover, Good, HSG A
0	39		>75% Grass cover, Good, HSG A
315	39		>75% Grass cover, Good, HSG A
1,914	39		>75% Grass cover, Good, HSG A
761	39		>75% Grass cover, Good, HSG A
10,302	39		>75% Grass cover, Good, HSG A
1,325	30		Woods, Good, HSG A
13,415	72		Dirt roads, HSG A
527	98		Unconnected pavement, HSG A
43	98		Unconnected pavement, HSG A
38	98		Unconnected pavement, HSG A
39	98		Unconnected pavement, HSG A
13,837	98		Unconnected pavement, HSG A
33	98		Unconnected pavement, HSG A
16,302	98		Paved parking, HSG A
330	39		>75% Grass cover, Good, HSG A
9,969	98		Roofs, HSG A
395	98		Roofs, HSG A
1,474	98		Roofs, HSG A
2	98		Roofs, HSG A
9,863	98		Roofs, HSG A
3,360	39		>75% Grass cover, Good, HSG A
198,881	52	50	Weighted Average, UI Adjusted
146,360			73.59% Pervious Area
52,521			26.41% Impervious Area
14,517			27.64% Unconnected

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

Subcatchment E-5: Subcat E-5



Summary for Subcatchment E-6: Subcat E-6

Runoff = 32.76 cfs @ 12.13 hrs, Volume= 100,918 cf, Depth> 4.64"
Routed to Pond 7P : Drainage Easement Ditch

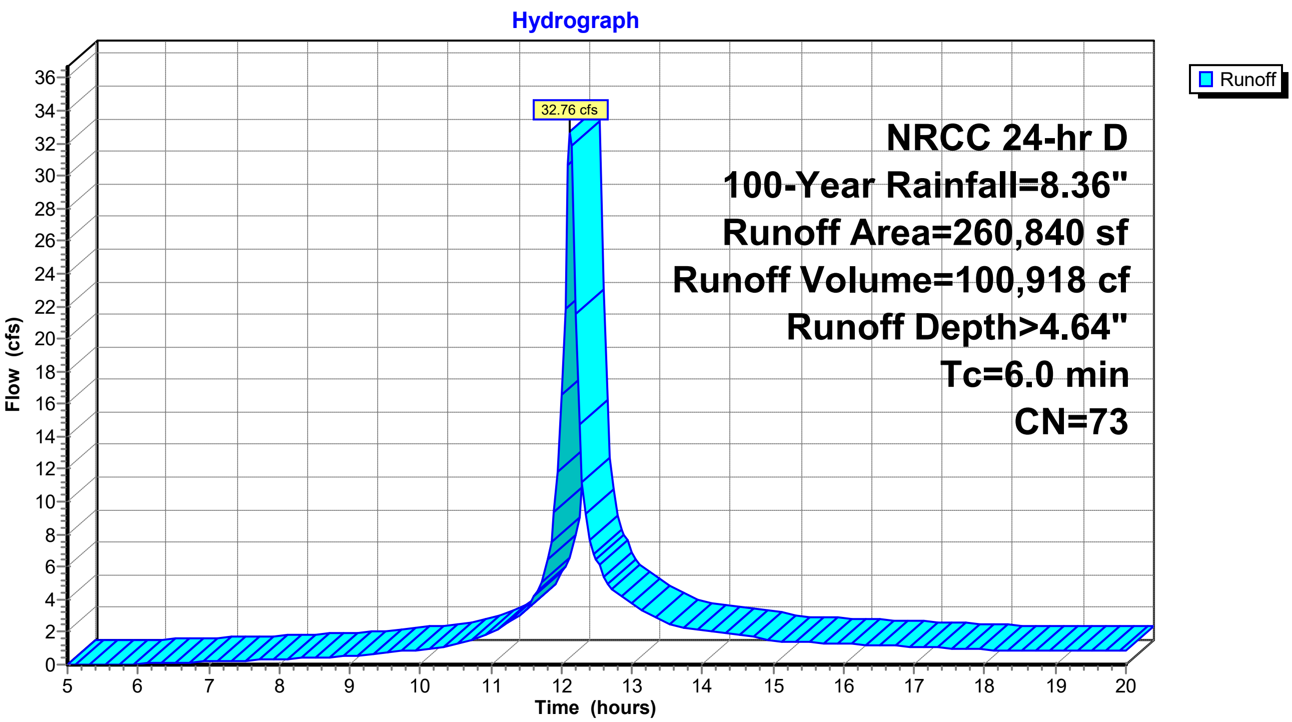
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
76	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
512	30	Woods, Good, HSG A
87	30	Woods, Good, HSG A
580	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
234	30	Woods, Good, HSG A
41	30	Woods, Good, HSG A
17	30	Woods, Good, HSG A
124	39	>75% Grass cover, Good, HSG A
1,324	39	>75% Grass cover, Good, HSG A
3,326	39	>75% Grass cover, Good, HSG A
197	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
1,494	39	>75% Grass cover, Good, HSG A
488	39	>75% Grass cover, Good, HSG A
0	39	>75% Grass cover, Good, HSG A
1,039	39	>75% Grass cover, Good, HSG A
80	30	Woods, Good, HSG A
5,897	39	>75% Grass cover, Good, HSG A
207	39	>75% Grass cover, Good, HSG A
38	39	>75% Grass cover, Good, HSG A
35,199	54	1/2 acre lots, 25% imp, HSG A
2,290	54	1/2 acre lots, 25% imp, HSG A
2,360	98	Unconnected pavement, HSG A
889	98	Unconnected pavement, HSG A
5,804	98	Unconnected pavement, HSG A
135,515	98	Paved parking, HSG A
563	98	Unconnected pavement, HSG A
3,565	39	>75% Grass cover, Good, HSG A
2,358	30	Woods, Good, HSG A
6,778	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
1,577	39	>75% Grass cover, Good, HSG A
1,768	39	>75% Grass cover, Good, HSG A
362	39	>75% Grass cover, Good, HSG A
12,602	30	Woods, Good, HSG A
10,885	39	>75% Grass cover, Good, HSG A
4,375	30	Woods, Good, HSG A
2,426	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
348	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
44	72	Dirt roads, HSG A
591	39	>75% Grass cover, Good, HSG A
2,039	39	>75% Grass cover, Good, HSG A
564	39	>75% Grass cover, Good, HSG A
91	98	Unconnected pavement, HSG A

623	98	Unconnected pavement, HSG A
3	39	>75% Grass cover, Good, HSG A
839	39	>75% Grass cover, Good, HSG A
6	39	>75% Grass cover, Good, HSG A
6,902	39	>75% Grass cover, Good, HSG A
2,574	39	>75% Grass cover, Good, HSG A
260,840	73	Weighted Average
105,622		40.49% Pervious Area
155,218		59.51% Impervious Area
10,331		6.66% Unconnected

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

Subcatchment E-6: Subcat E-6



Summary for Subcatchment E-7: Subcat E-7

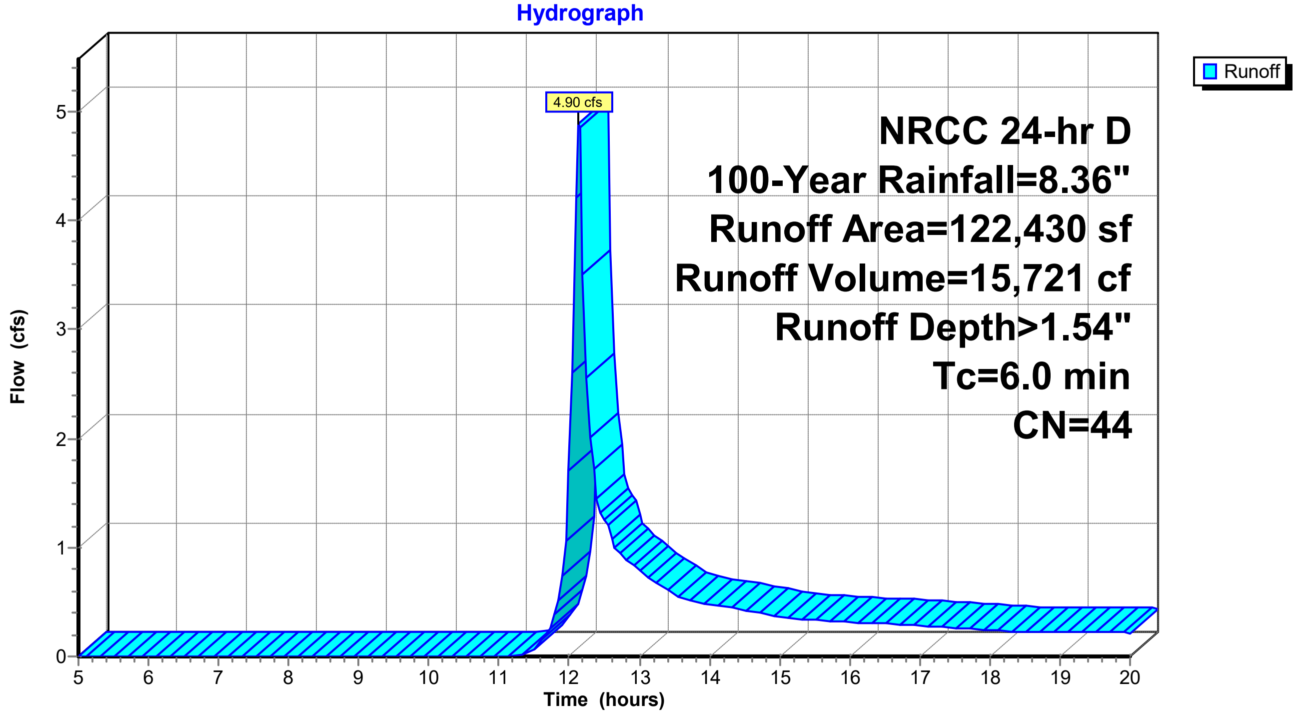
Runoff = 4.90 cfs @ 12.14 hrs, Volume= 15,721 cf, Depth> 1.54"
Routed to Pond 7P : Drainage Easement Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
72	30	Woods, Good, HSG A
62,479	30	Woods, Good, HSG A
1,141	30	Woods, Good, HSG A
114	39	>75% Grass cover, Good, HSG A
990	39	>75% Grass cover, Good, HSG A
243	39	>75% Grass cover, Good, HSG A
3,704	39	>75% Grass cover, Good, HSG A
215	30	Woods, Good, HSG A
3,897	54	1/2 acre lots, 25% imp, HSG A
37,219	54	1/2 acre lots, 25% imp, HSG A
113	98	Unconnected pavement, HSG A
159	98	Unconnected pavement, HSG A
5,286	98	Roofs, HSG A
5,740	72	Dirt roads, HSG A
234	39	>75% Grass cover, Good, HSG A
8	98	Paved parking, HSG A
789	98	Unconnected pavement, HSG A
26	98	Unconnected pavement, HSG A
1	98	Unconnected pavement, HSG A
122,430	44	Weighted Average
105,770		86.39% Pervious Area
16,661		13.61% Impervious Area
1,088		6.53% Unconnected

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

Subcatchment E-7: Subcat E-7



Summary for Subcatchment E-8: Subcat E-8

Runoff = 17.69 cfs @ 12.43 hrs, Volume= 105,261 cf, Depth> 1.61"
Routed to Pond 8P : Bio-Retention Area

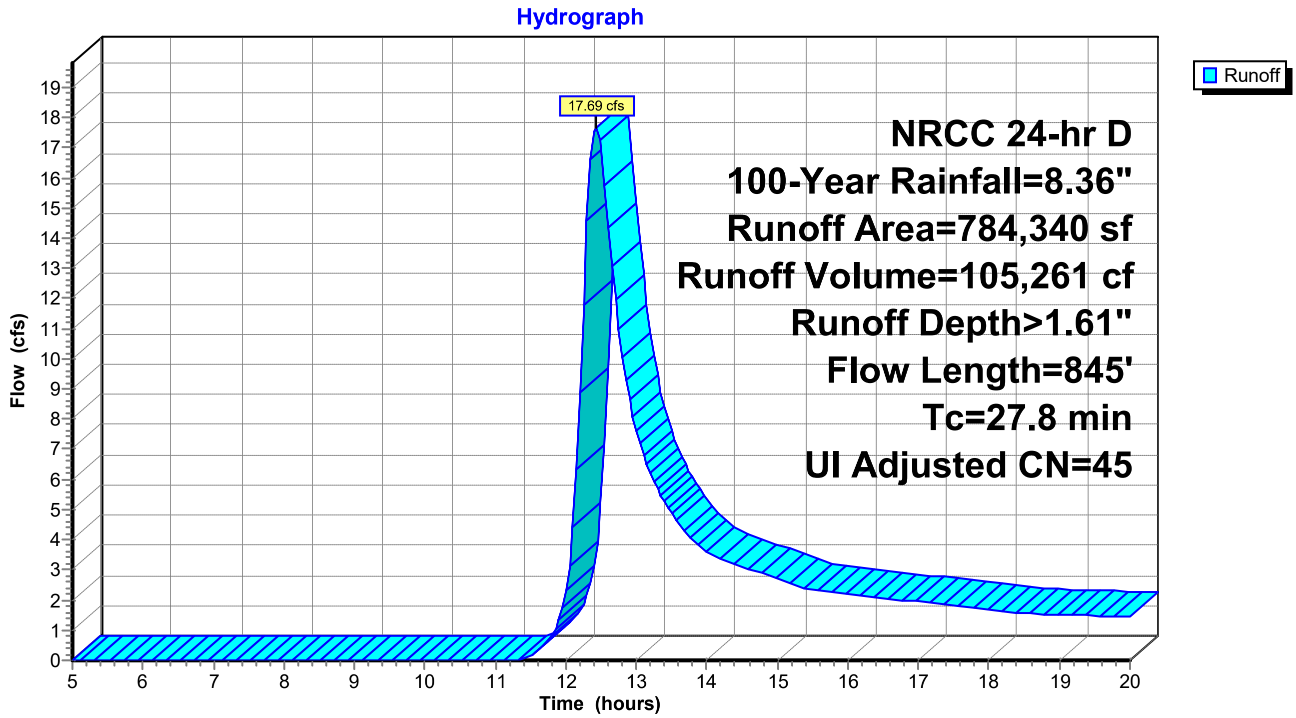
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Adj	Description
0	30		Woods, Good, HSG A
37,409	30		Woods, Good, HSG A
151,691	30		Woods, Good, HSG A
13,674	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
51,870	30		Woods, Good, HSG A
67,378	30		Woods, Good, HSG A
57	39		>75% Grass cover, Good, HSG A
107	39		>75% Grass cover, Good, HSG A
1,057	39		>75% Grass cover, Good, HSG A
58	39		>75% Grass cover, Good, HSG A
10,449	39		>75% Grass cover, Good, HSG A
104,791	39		>75% Grass cover, Good, HSG A
87,385	39		>75% Grass cover, Good, HSG A
1,978	39		>75% Grass cover, Good, HSG A
161	39		>75% Grass cover, Good, HSG A
103,904	54		1/2 acre lots, 25% imp, HSG A
665	72		Dirt roads, HSG A
61	98		Unconnected pavement, HSG A
71	98		Unconnected pavement, HSG A
70	98		Unconnected pavement, HSG A
16,908	98		Unconnected pavement, HSG A
26,556	98		Unconnected pavement, HSG A
1,433	98		Unconnected pavement, HSG A
110	98		Unconnected pavement, HSG A
11,569	98		Unconnected pavement, HSG A
1,743	98		Unconnected pavement, HSG A
3,101	98		Unconnected pavement, HSG A
12	98		Unconnected pavement, HSG A
71	98		Unconnected pavement, HSG A
210	98		Unconnected pavement, HSG A
299	98		Unconnected pavement, HSG A
7,456	98		Unconnected pavement, HSG A
30	98		Unconnected pavement, HSG A
273	98		Roofs, HSG A
131	98		Roofs, HSG A
605	98		Roofs, HSG A
1,939	98		Roofs, HSG A
598	98		Roofs, HSG A
9,916	98		Roofs, HSG A
47,139	98		Roofs, HSG A
175	98		Roofs, HSG A
713	98		Roofs, HSG A
278	98		Roofs, HSG A
879	98		Roofs, HSG A
395	98		Roofs, HSG A
602	98		Roofs, HSG A
9,672	72		Dirt roads, HSG A
8,690	72		Dirt roads, HSG A

784,340	48	45	Weighted Average, UI Adjusted
625,021			79.69% Pervious Area
159,319			20.31% Impervious Area
69,702			43.75% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	50	0.0240	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
2.0	76	0.0660	0.64		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	79	0.0120	0.77		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.2	27	0.0127	2.29		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
3.9	220	0.0180	0.94		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
8.3	393	0.0990	0.79		**Shallow Concentrated Flow, F-G** Forest w/Heavy Litter Kv= 2.5 fps
27.8	845	Total			

Subcatchment E-8: Subcat E-8



Summary for Subcatchment E-9: Subcat E-9

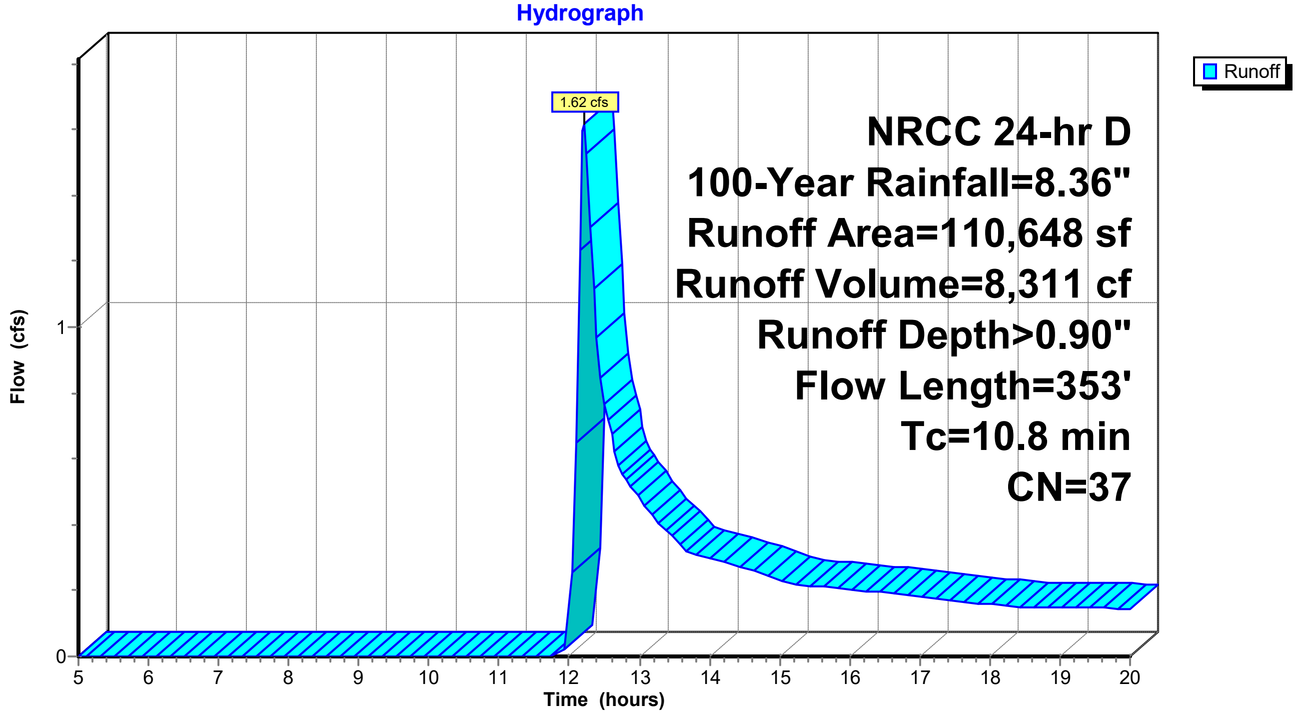
Runoff = 1.62 cfs @ 12.22 hrs, Volume= 8,311 cf, Depth> 0.90"
Routed to Pond 9P : Existing Ditch 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
835	30	Woods, Good, HSG A
18,276	30	Woods, Good, HSG A
65,542	30	Woods, Good, HSG A
13	39	>75% Grass cover, Good, HSG A
21,381	54	1/2 acre lots, 25% imp, HSG A
621	98	Roofs, HSG A
3,980	72	Dirt roads, HSG A
110,648	37	Weighted Average
104,681		94.61% Pervious Area
5,967		5.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	50	0.2000	0.17		**Sheet Flow, A-B**
					Woods: Light underbrush n= 0.400 P2= 3.09"
5.8	303	0.1220	0.87		**Shallow Concentrated Flow, B-C**
					Forest w/Heavy Litter Kv= 2.5 fps
10.8	353	Total			

Subcatchment E-9: Subcat E-9



Summary for Pond 4P: Existing Ditch 1

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth > 0.51" for 100-Year event
Inflow = 0.15 cfs @ 12.34 hrs, Volume= 1,658 cf
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 194.71' @ 20.00 hrs Surf.Area= 1,991 sf Storage= 1,655 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

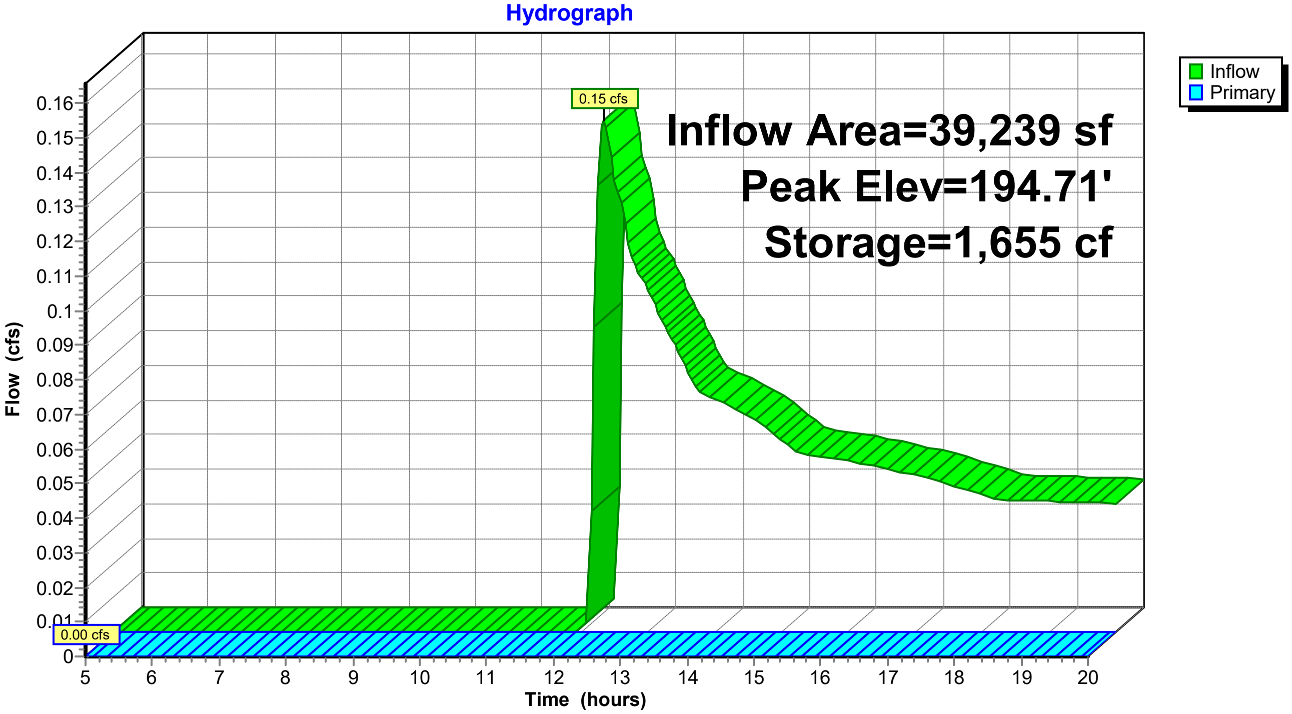
Volume	Invert	Avail.Storage	Storage Description
#1	193.00'	17,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.00	30	0	0
194.00	1,087	559	559
195.00	2,356	1,722	2,280
196.00	3,959	3,158	5,438
197.00	5,956	4,958	10,395
198.00	8,319	7,138	17,533

Device	Routing	Invert	Outlet Devices
#1	Primary	197.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=193.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Existing Ditch 1



Summary for Pond 7P: Drainage Easement Ditch

Inflow Area = 383,270 sf, 44.85% Impervious, Inflow Depth > 3.65" for 100-Year event
Inflow = 37.61 cfs @ 12.13 hrs, Volume= 116,638 cf
Outflow = 2.41 cfs @ 11.25 hrs, Volume= 88,222 cf, Atten= 94%, Lag= 0.0 min
Discarded = 2.41 cfs @ 11.25 hrs, Volume= 88,222 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 181.12' @ 14.24 hrs Surf.Area= 12,226 sf Storage= 48,741 cf

Plug-Flow detention time= 164.7 min calculated for 88,222 cf (76% of inflow)
Center-of-Mass det. time= 95.2 min (890.4 - 795.2)

Volume	Invert	Avail.Storage	Storage Description
#1	174.00'	345,939 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

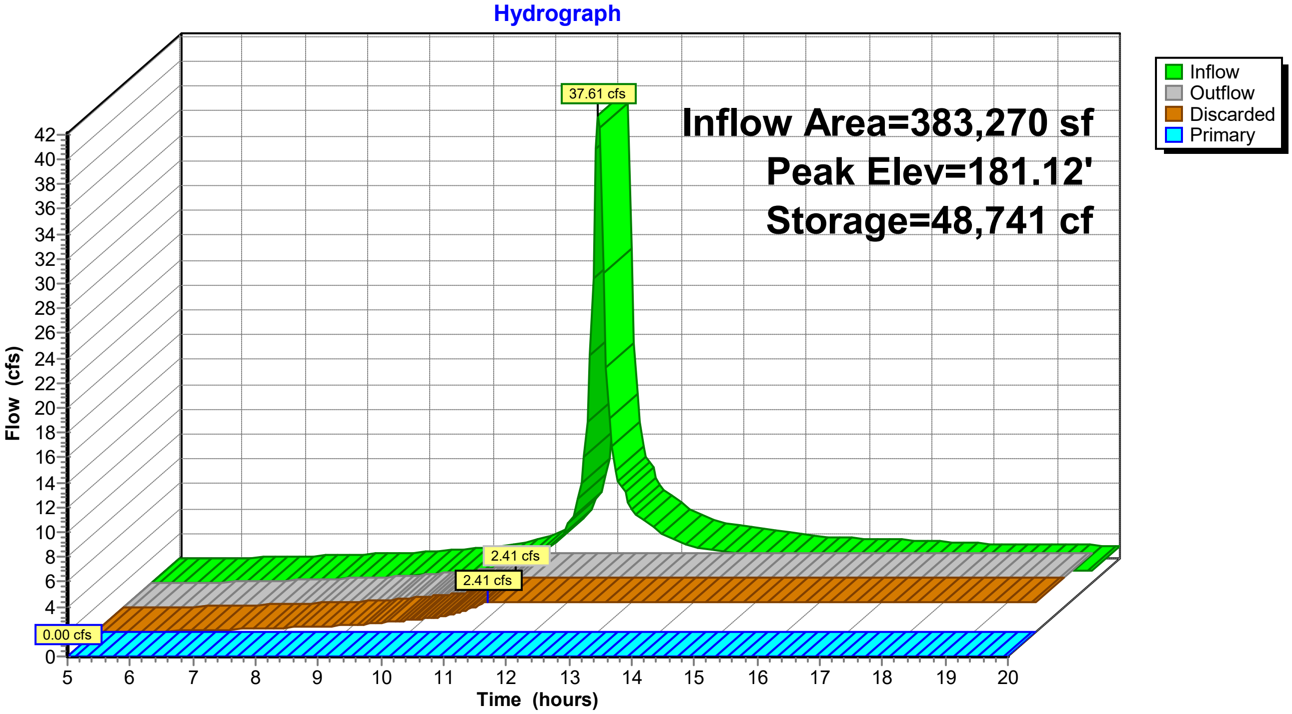
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.00	491	0	0
175.00	3,251	1,871	1,871
176.00	4,753	4,002	5,873
177.00	6,309	5,531	11,404
178.00	7,641	6,975	18,379
179.00	8,869	8,255	26,634
180.00	10,188	9,529	36,163
181.00	11,953	11,071	47,233
182.00	14,143	13,048	60,281
183.00	16,525	15,334	75,615
184.00	19,118	17,822	93,437
185.00	21,426	20,272	113,709
186.00	23,221	22,324	136,032
187.00	24,868	24,045	160,077
188.00	26,530	25,699	185,776
189.00	28,209	27,370	213,145
190.00	30,172	29,191	242,336
191.00	32,732	31,452	273,788
192.00	36,071	34,402	308,189
193.00	39,428	37,750	345,939

Device	Routing	Invert	Outlet Devices
#1	Primary	192.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	174.00'	**2.41 cfs Exfiltration at all elevations**

Discarded OutFlow Max=2.41 cfs @ 11.25 hrs HW=174.20' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 2.41 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=174.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Drainage Easement Ditch



Summary for Pond 8P: Bio-Retention Area

Inflow Area = 784,340 sf, 20.31% Impervious, Inflow Depth > 1.61" for 100-Year event
Inflow = 17.69 cfs @ 12.43 hrs, Volume= 105,261 cf
Outflow = 1.33 cfs @ 20.00 hrs, Volume= 31,877 cf, Atten= 92%, Lag= 454.3 min
Discarded = 1.33 cfs @ 20.00 hrs, Volume= 31,877 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 168.04' @ 20.00 hrs Surf.Area= 23,824 sf Storage= 73,363 cf

Plug-Flow detention time= 247.2 min calculated for 31,771 cf (30% of inflow)
Center-of-Mass det. time= 127.5 min (991.2 - 863.6)

Volume	Invert	Avail.Storage	Storage Description
#1	159.00'	100,011 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

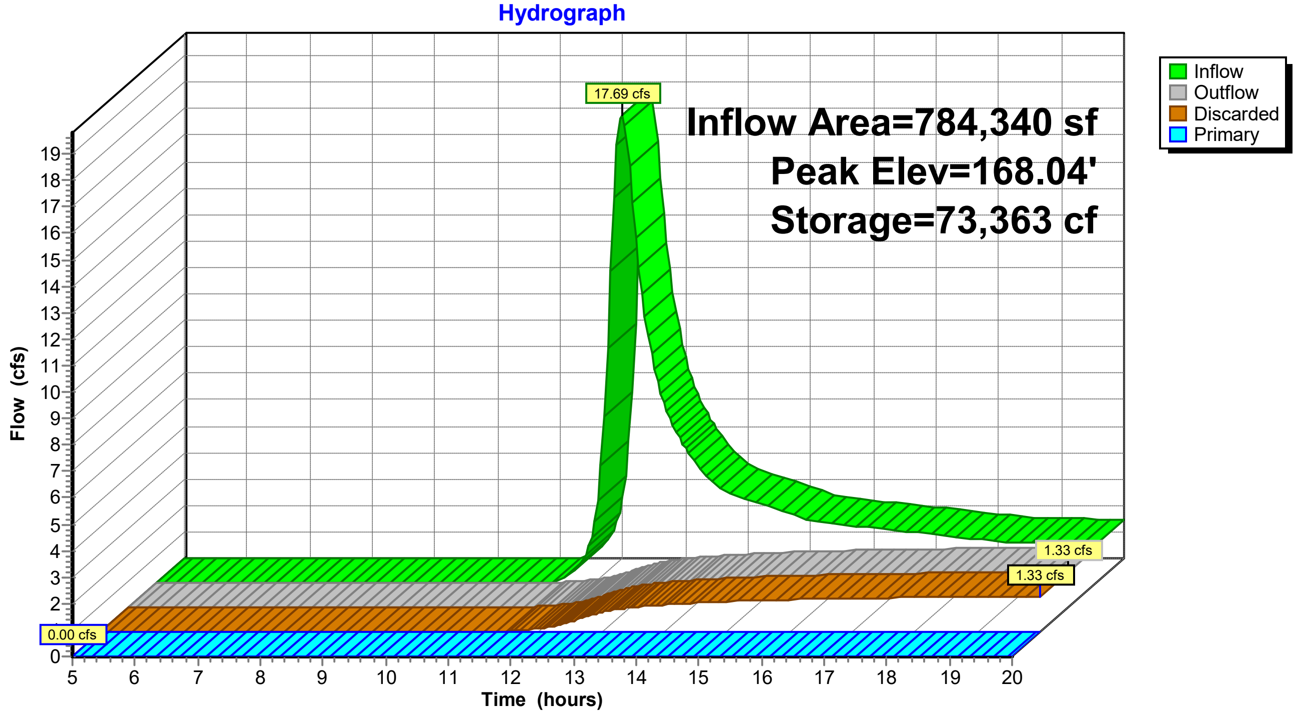
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
159.00	934	176.0	0	0	934
160.00	2,320	278.0	1,575	1,575	4,626
161.00	3,563	292.0	2,919	4,495	5,322
162.00	4,546	305.0	4,045	8,539	6,008
163.00	5,553	339.0	5,041	13,580	7,780
164.00	6,677	374.0	6,106	19,687	9,798
165.00	8,367	426.0	7,506	27,193	13,132
166.00	12,063	523.0	10,159	37,352	20,473
167.00	17,347	642.0	14,625	51,977	31,520
168.00	23,464	806.0	20,329	72,306	50,432
169.00	32,175	988.0	27,705	100,011	76,430

Device	Routing	Invert	Outlet Devices
#1	Primary	168.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	159.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.33 cfs @ 20.00 hrs HW=168.04' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 1.33 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=159.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 8P: Bio-Retention Area



Summary for Pond 9P: Existing Ditch 2

Inflow Area = 110,648 sf, 5.39% Impervious, Inflow Depth > 0.90" for 100-Year event
Inflow = 1.62 cfs @ 12.22 hrs, Volume= 8,311 cf
Outflow = 0.18 cfs @ 17.13 hrs, Volume= 4,768 cf, Atten= 89%, Lag= 294.8 min
Discarded = 0.18 cfs @ 17.13 hrs, Volume= 4,768 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 165.17' @ 17.13 hrs Surf.Area= 3,224 sf Storage= 3,771 cf

Plug-Flow detention time= 198.2 min calculated for 4,752 cf (57% of inflow)
Center-of-Mass det. time= 94.0 min (975.8 - 881.7)

Volume	Invert	Avail.Storage	Storage Description
#1	163.00'	94,144 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

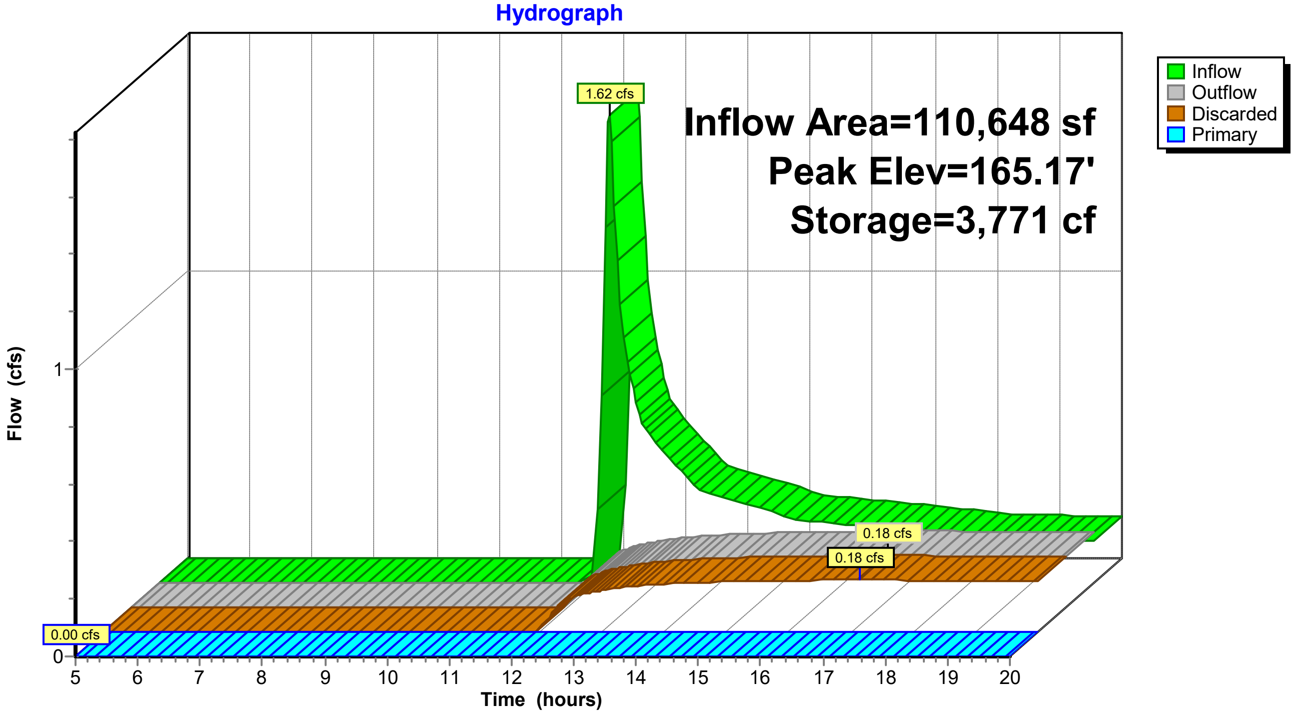
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
163.00	333	0	0
164.00	1,602	968	968
165.00	2,975	2,289	3,256
166.00	4,470	3,723	6,979
167.00	6,302	5,386	12,365
168.00	8,505	7,404	19,768
169.00	10,882	9,694	29,462
170.00	13,282	12,082	41,544
171.00	15,858	14,570	56,114
172.00	18,847	17,353	73,466
173.00	22,508	20,678	94,144

Device	Routing	Invert	Outlet Devices
#1	Primary	172.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	163.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.18 cfs @ 17.13 hrs HW=165.17' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.18 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=163.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 9P: Existing Ditch 2

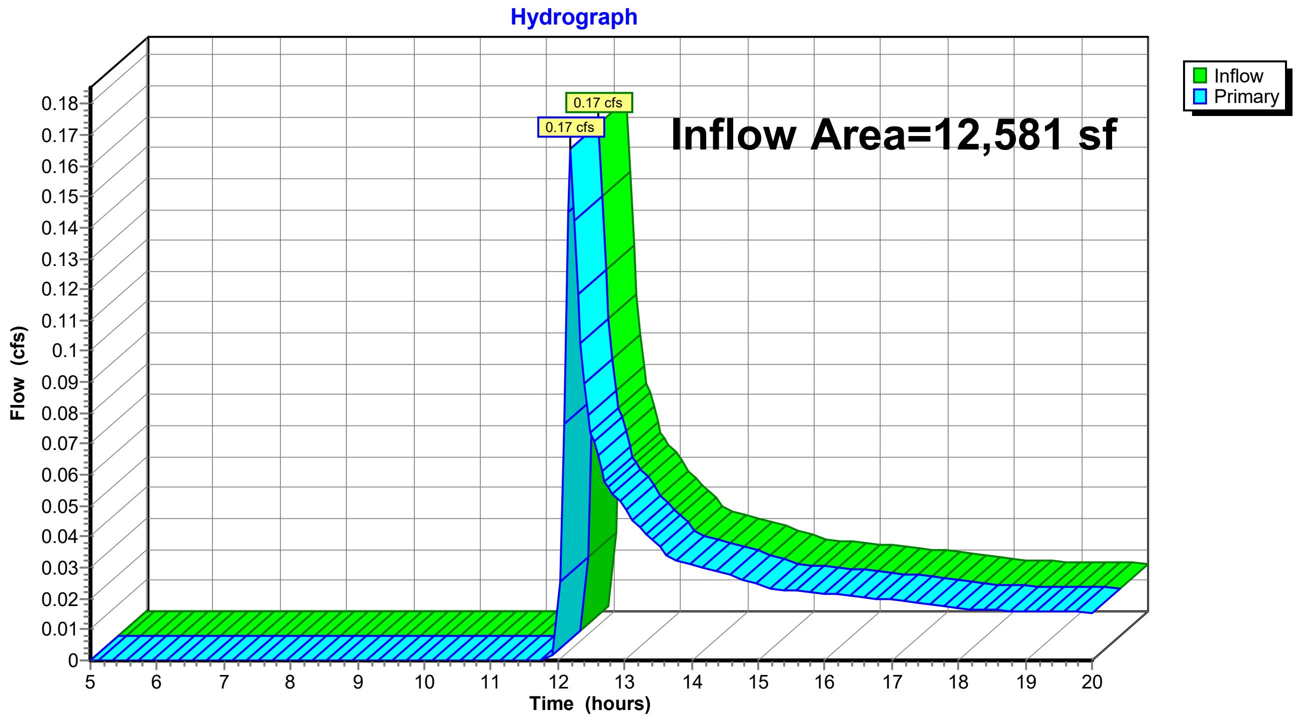


Summary for Link SP1: Study Point 1

Inflow Area =	12,581 sf,	0.00% Impervious,	Inflow Depth > 0.82"	for 100-Year event	
Inflow =	0.17 cfs @	12.20 hrs,	Volume=	859 cf	
Primary =	0.17 cfs @	12.20 hrs,	Volume=	859 cf,	Atten= 0%, Lag= 0.0 min

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

Link SP1: Study Point 1

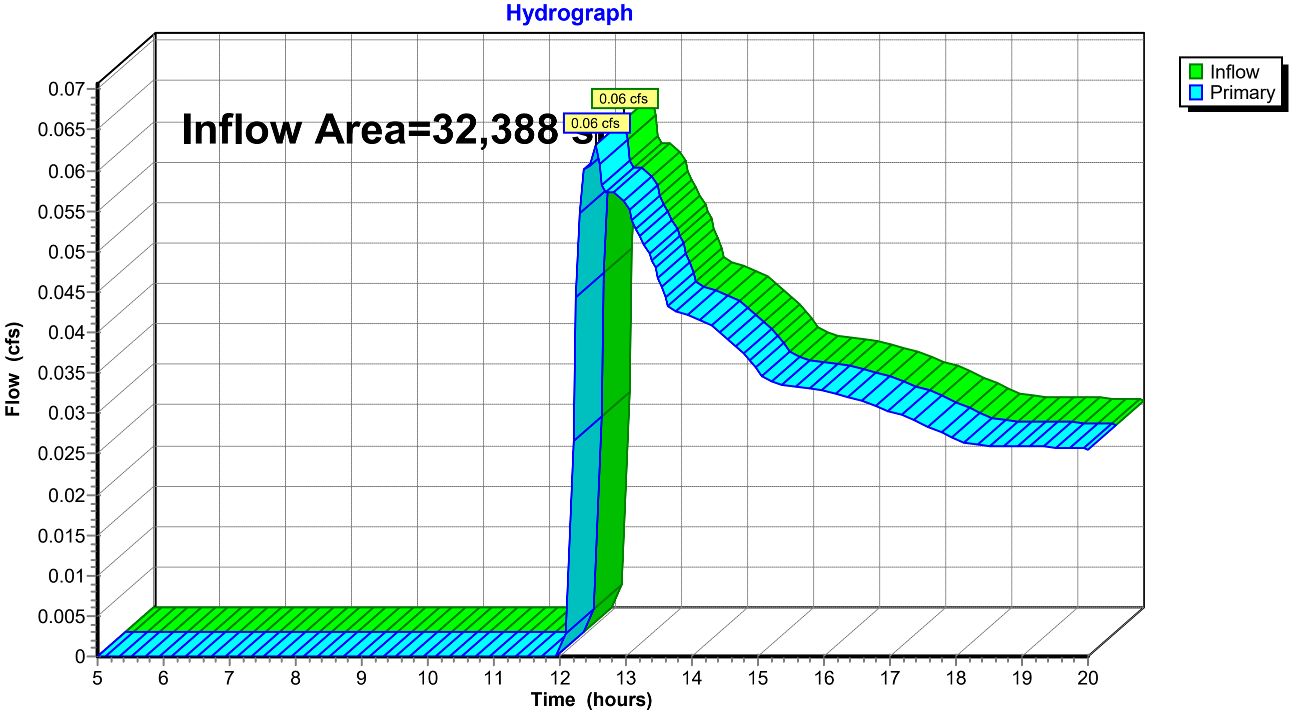


Summary for Link SP2: Study Point 2

Inflow Area =	32,388 sf,	0.29% Impervious,	Inflow Depth > 0.37"	for 100-Year event	
Inflow =	0.06 cfs @	12.55 hrs,	Volume=	1,006 cf	
Primary =	0.06 cfs @	12.55 hrs,	Volume=	1,006 cf,	Atten= 0%, Lag= 0.0 min

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

Link SP2: Study Point 2

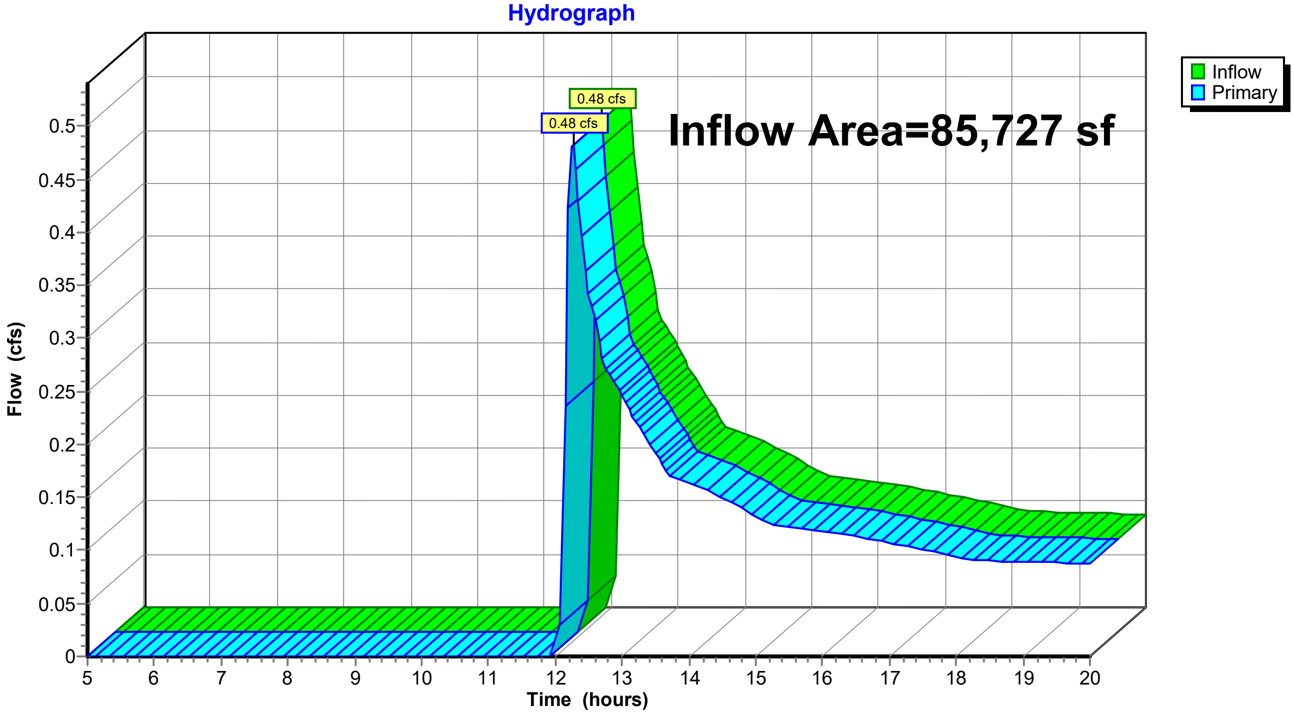


Summary for Link SP3: Study Point 3

Inflow Area =	85,727 sf,	1.59% Impervious,	Inflow Depth > 0.58"	for 100-Year event	
Inflow =	0.48 cfs @	12.26 hrs,	Volume=	4,156 cf	
Primary =	0.48 cfs @	12.26 hrs,	Volume=	4,156 cf,	Atten= 0%, Lag= 0.0 min

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

Link SP3: Study Point 3

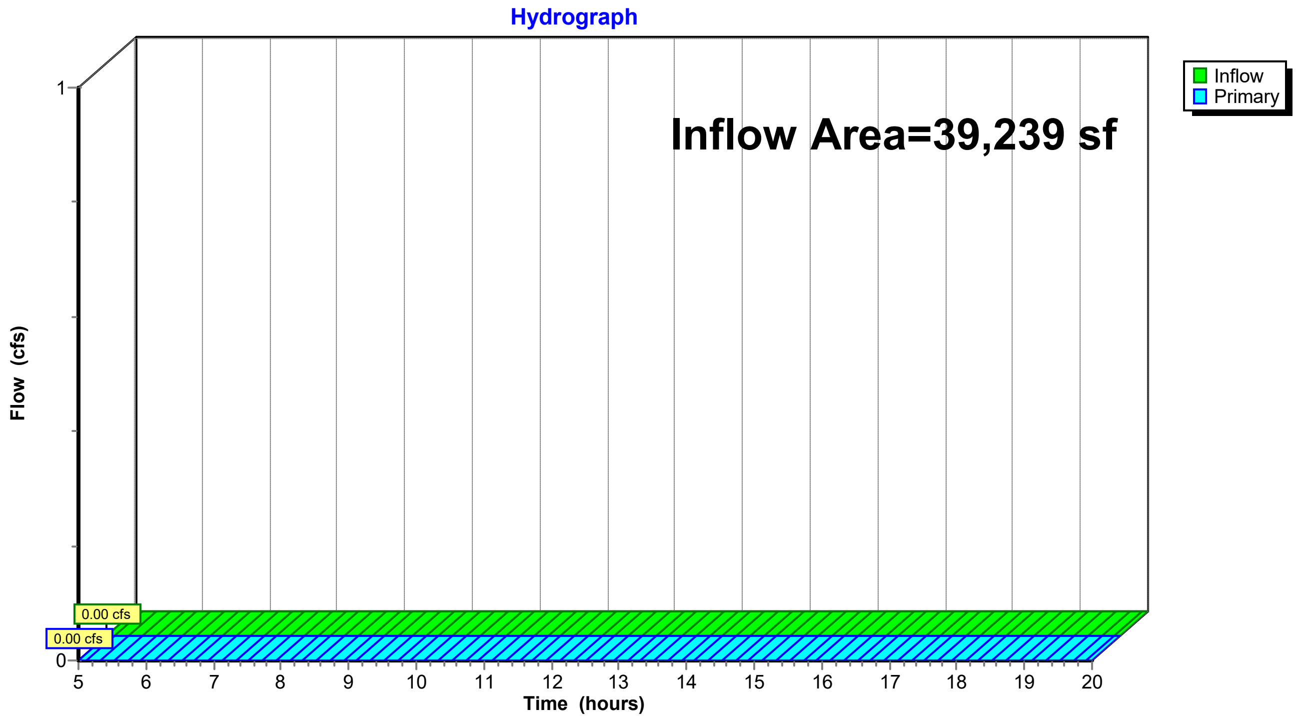


Summary for Link SP4: Study Point 4

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth = 0.00" for 100-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

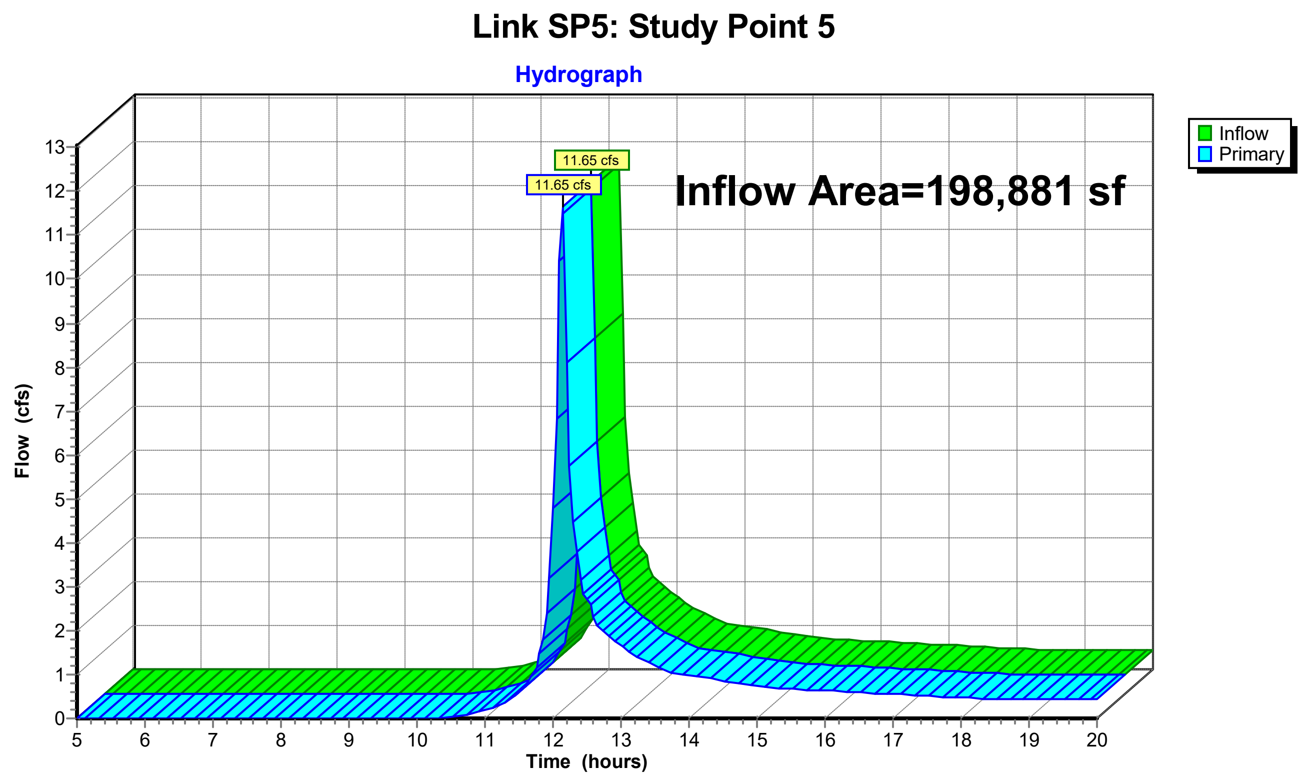
Link SP4: Study Point 4



Summary for Link SP5: Study Point 5

Inflow Area =	198,881 sf,	26.41% Impervious,	Inflow Depth > 2.14"	for 100-Year event	
Inflow =	11.65 cfs @	12.14 hrs, Volume=	35,395 cf		
Primary =	11.65 cfs @	12.14 hrs, Volume=	35,395 cf,	Atten= 0%,	Lag= 0.0 min

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

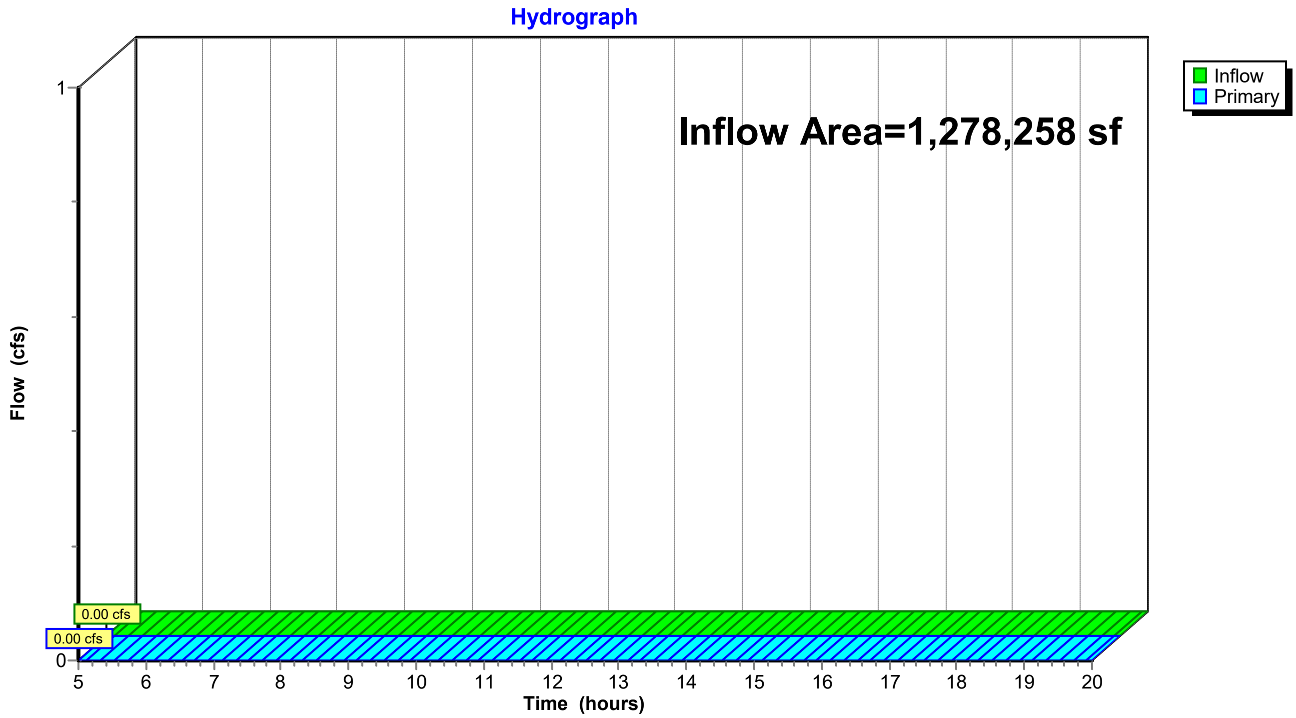


Summary for Link SP6: Study Point 6

Inflow Area = 1,278,258 sf, 26.38% Impervious, Inflow Depth = 0.00" for 100-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP6: Study Point 6



DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1-888-DIG-SAFE
1-888-344-7233

LEGEND

EXISTING WATERSHED	
SCS SOILS BOUNDARY	
Tc FLOW PATH	A - - - B
SUBCATCHMENT LABEL	E-1
SUBCATCHMENT BOUNDARY	
FLOW DIRECTION	

NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
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5. TOTAL SITE WATERSHED AREA IS 1,647,074± SF.
6. MINIMUM TIME OF CONCENTRATION IS 6.0 MINUTES.

STUDY POINT 6
INFILTRATE ON SITE

STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	0 CF
25YR STORM	0.00 CFS	0 CF
100YR STORM	0.00 CFS	0 CF

STUDY POINT 5
FLOW OFF SITE

STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.05 CFS	1,198 CF
10YR STORM	1.62 CFS	7,380 CF
25YR STORM	4.40 CFS	14,923 CF
100YR STORM	11.65 CFS	35,395 CF

GRAPHIC SCALE
50 0 25 50 100 200
(IN FEET)
1 inch = 50 ft.

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:
THE PINEBROOK GROUP
275 FOREST RIDGE ROAD
CONCORD, MA 01742

PROJECT:
THE RESIDENCES AT THOREAU
275 FOREST RIDGE ROAD
CONCORD, MA 01742

PROJECT NO.	3172-01	DATE:	12/20/2023
SCALE:	1" = 50'	DWG. NAME:	C-3172-01
DESIGNED BY:	BP	CHECKED BY:	TJW

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

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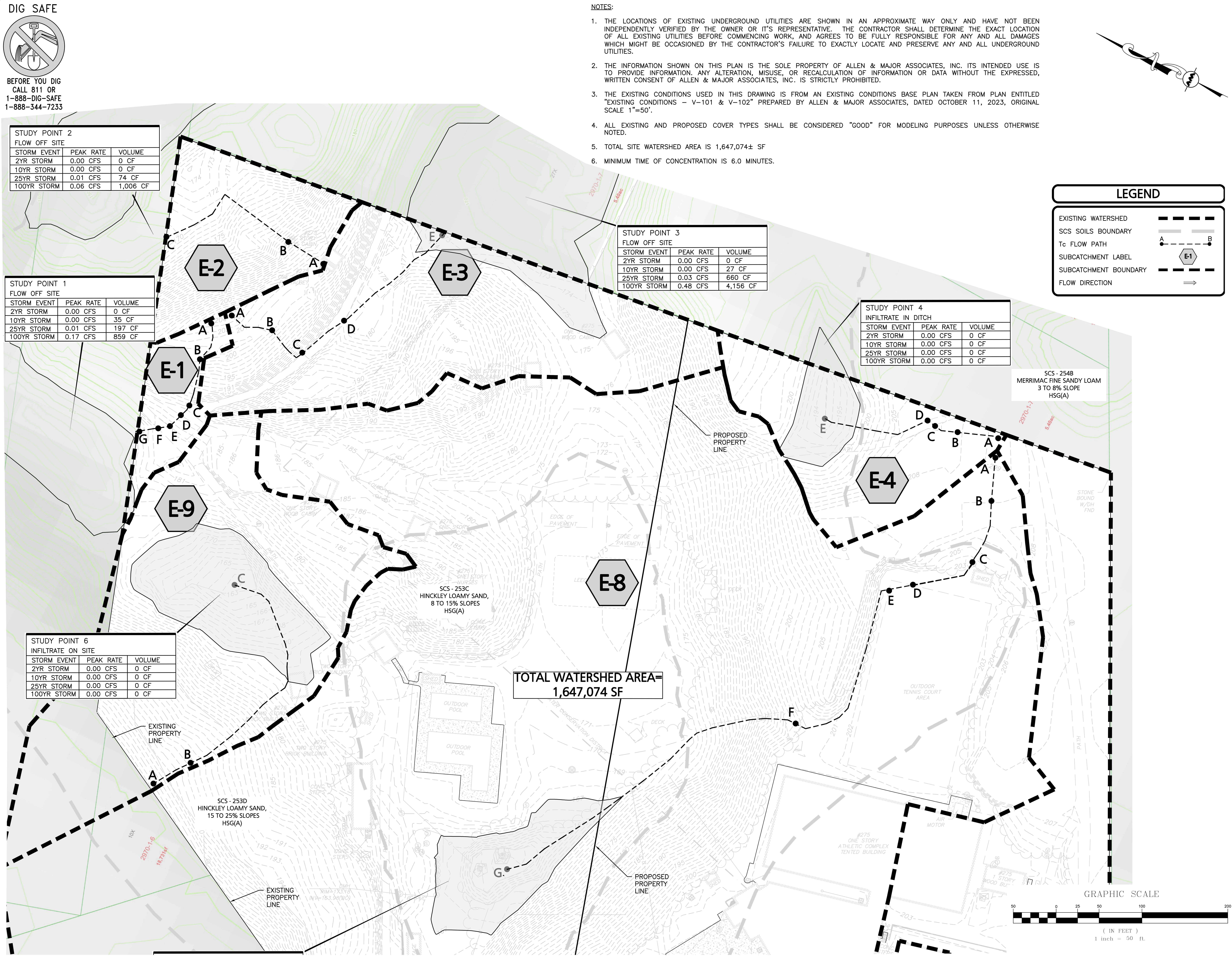
DRAWING TITLE: EXISTING WATERSHED PLAN

SHEET No. EWS-1A

N:\PROJECTS\3172-01\CIVIL\DRAWINGS\CURRENT\C-3172-01 – WATERSHED-EXISTING.DWG



STUDY POINT 2		
FLOW OFF SITE		
STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	0 CF
25YR STORM	0.01 CFS	74 CF
100YR STORM	0.06 CFS	1,006 CF

STUDY POINT 1		
FLOW OFF SITE		
STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	35 CF
25YR STORM	0.01 CFS	197 CF
100YR STORM	0.17 CFS	859 CF

STUDY POINT 3		
FLOW OFF SITE		
STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	27 CF
25YR STORM	0.03 CFS	660 CF
100YR STORM	0.48 CFS	4,156 CF

STUDY POINT 4		
INFILTRATE IN DITCH		
STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	0 CF
25YR STORM	0.00 CFS	0 CF
100YR STORM	0.00 CFS	0 CF

STUDY POINT 6		
INFILTRATE ON SITE		
STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	0 CF
25YR STORM	0.00 CFS	0 CF
100YR STORM	0.00 CFS	0 CF

NOTES:

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LEGEND

- EXISTING WATERSHED
- SCS SOILS BOUNDARY
- Tc FLOW PATH
- SUBCATCHMENT LABEL
- SUBCATCHMENT BOUNDARY
- FLOW DIRECTION

N:\PROJECTS\3172-01\CIVIL\DRAWINGS\CURRENT\C-3172-01 – WATERSHED-EXISTING.DWG

PROFESSIONAL ENGINEER FOR ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

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275 FOREST RIDGE ROAD
CONCORD, MA 01742

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THE RESIDENCES AT THOREAU
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PROJECT NO.	3172-01	DATE:	12/20/2023
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DESIGNED BY:	BP	CHECKED BY:	TJW

PREPARED BY:

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environmental consulting ◆ landscape architecture
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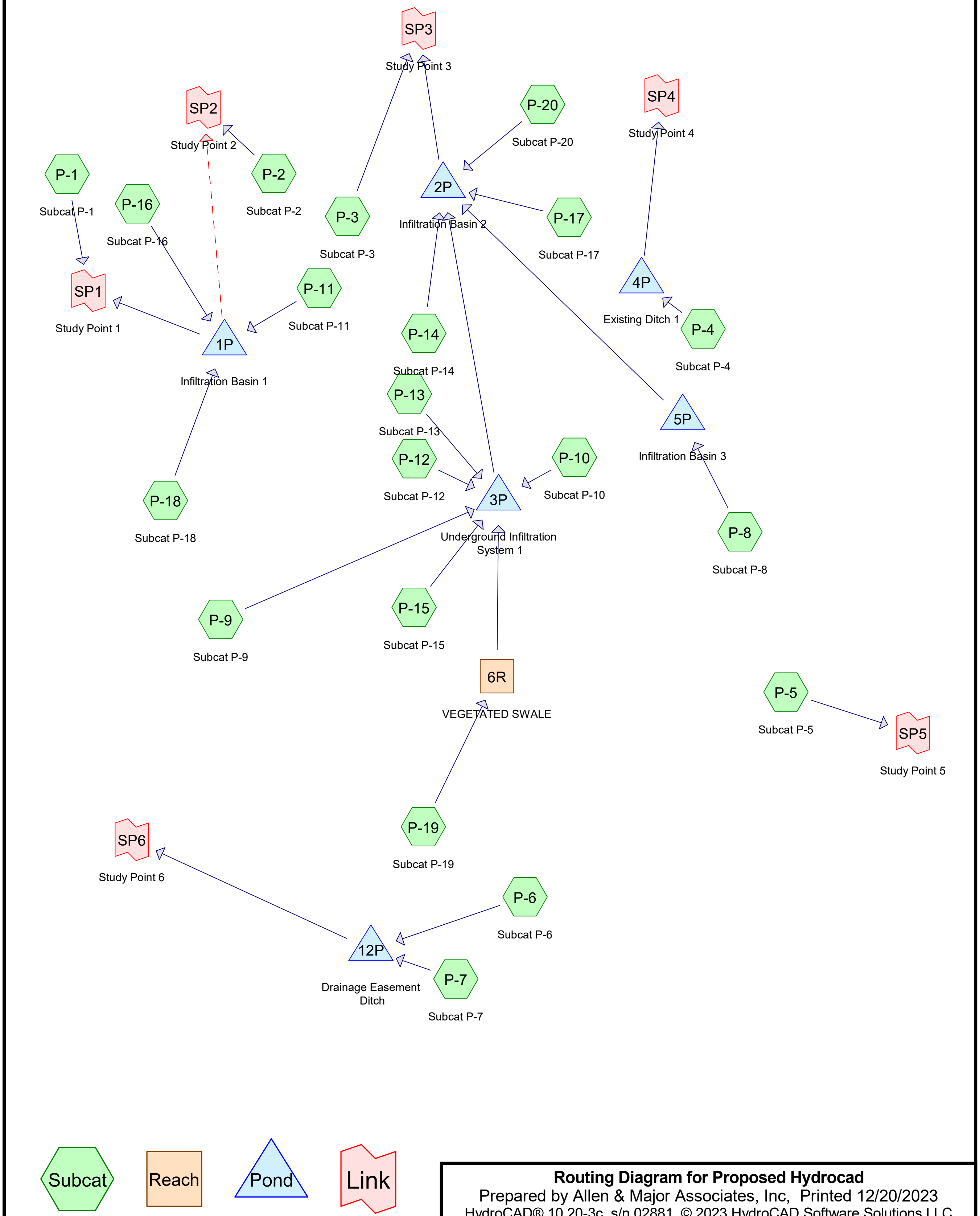
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: EXISTING WATERSHED PLAN

SHEET No. EWS-1B

SECTION 5.0 -
PROPOSED DRAINAGE ANALYSIS



Routing Diagram for Proposed Hydrocad

Prepared by Allen & Major Associates, Inc, Printed 12/20/2023

HydroCAD® 10.20-3c s/n 02881 © 2023 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "NRCS-Rain.txt" for 4067 MA Concord Middlesex County Central
Rainfall events imported from "Atlas-14-Rain.txt" for 444 MA Middlesex Central
Rainfall events imported from "NRCS-Rain.txt" for 4067 MA Concord Middlesex County Central

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NRCC 24-hr	D	Default	24.00	1	3.09	2
2	10-Year	NRCC 24-hr	D	Default	24.00	1	4.65	2
3	25-Year	NRCC 24-hr	D	Default	24.00	1	5.87	2
4	100-Year	NRCC 24-hr	D	Default	24.00	1	8.36	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
199,574	54	1/2 acre lots, 25% imp, HSG A (P-18, P-6, P-9)
272,940	39	>75% Grass cover, Good, HSG A (P-10, P-11, P-12, P-19, P-2, P-20, P-3, P-5, P-6, P-7, P-8, P-9)
14,079	72	Dirt roads, HSG A (P-5, P-8)
329,722	98	Paved parking, HSG A (P-10, P-11, P-12, P-5, P-6, P-7, P-9)
162,806	98	Roofs, HSG A (P-13, P-14, P-15, P-20, P-5, P-8)
77,436	98	Unconnected pavement, HSG A (P-19, P-5, P-6, P-7, P-8)
31,738	98	Water Surface, HSG A (P-16, P-17, P-18)
558,778	30	Woods, Good, HSG A (P-1, P-10, P-11, P-17, P-18, P-19, P-2, P-20, P-3, P-4, P-5, P-6, P-7, P-8, P-9)
1,647,074	**60**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
1,647,074	HSG A	P-1, P-10, P-11, P-12, P-13, P-14, P-15, P-16, P-17, P-18, P-19, P-2, P-20, P-3, P-4, P-5, P-6, P-7, P-8, P-9
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
1,647,074		**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	Su Nu
199,574	0	0	0	0	199,574	1/2 acre lots, 25% imp	
272,940	0	0	0	0	272,940	>75% Grass cover, Good	
14,079	0	0	0	0	14,079	Dirt roads	
329,722	0	0	0	0	329,722	Paved parking	
162,806	0	0	0	0	162,806	Roofs	
77,436	0	0	0	0	77,436	Unconnected pavement	
31,738	0	0	0	0	31,738	Water Surface	
558,778	0	0	0	0	558,778	Woods, Good	
1,647,074	**0**	**0**	**0**	**0**	**1,647,074**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	173.40	169.50	252.0	0.0155	0.013	0.0	12.0	0.0	
2	2P	175.40	173.00	63.5	0.0378	0.012	0.0	12.0	0.0	
3	3P	176.35	175.50	82.0	0.0104	0.012	0.0	12.0	0.0	

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 P-1: Subcat P-1 Runoff Area=22,598 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P-10: Subcat P-10 Runoff Area=81,309 sf 89.65% Impervious Runoff Depth>2.24"
Tc=6.0 min CN=92 Runoff=4.35 cfs 15,201 cf

Subcatchment P-11: Subcat P-11 Runoff Area=47,527 sf 87.57% Impervious Runoff Depth>2.15"
Tc=6.0 min CN=91 Runoff=2.46 cfs 8,525 cf

Subcatchment P-12: Subcat P-12 Runoff Area=77,507 sf 51.21% Impervious Runoff Depth>0.72"
Tc=6.0 min CN=69 Runoff=1.25 cfs 4,630 cf

Subcatchment P-13: Subcat P-13 Runoff Area=25,981 sf 100.00% Impervious Runoff Depth>2.85"
Tc=6.0 min CN=98 Runoff=1.60 cfs 6,181 cf

Subcatchment P-14: Subcat P-14 Runoff Area=22,568 sf 100.00% Impervious Runoff Depth>2.85"
Tc=6.0 min CN=98 Runoff=1.39 cfs 5,369 cf

Subcatchment P-15: Subcat P-15 Runoff Area=33,657 sf 100.00% Impervious Runoff Depth>2.85"
Tc=6.0 min CN=98 Runoff=2.07 cfs 8,007 cf

Subcatchment P-16: Subcat P-16 Runoff Area=17,787 sf 100.00% Impervious Runoff Depth>2.85"
Tc=6.0 min CN=98 Runoff=1.10 cfs 4,232 cf

Subcatchment P-17: Subcat P-17 Runoff Area=21,272 sf 65.59% Impervious Runoff Depth>1.02"
Tc=6.0 min CN=75 Runoff=0.52 cfs 1,805 cf

Subcatchment P-18: Subcat P-18 Runoff Area=40,673 sf 12.88% Impervious Runoff Depth>0.01"
Tc=6.0 min CN=42 Runoff=0.00 cfs 25 cf

Subcatchment P-19: Subcat P-19 Runoff Area=81,428 sf 11.42% Impervious Runoff Depth=0.00"
Tc=6.0 min UI Adjusted CN=39 Runoff=0.00 cfs 0 cf

Subcatchment P-2: Subcat P-2 Runoff Area=21,391 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=168' Tc=8.3 min CN=31 Runoff=0.00 cfs 0 cf

Subcatchment P-20: Subcat P-20 Runoff Area=53,066 sf 2.40% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=37 Runoff=0.00 cfs 0 cf

Subcatchment P-3: Subcat P-3 Runoff Area=10,242 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=350' Slope=0.0100 '/' Tc=17.6 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P-4: Subcat P-4 Runoff Area=39,239 sf 0.00% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P-5: Subcat P-5 Runoff Area=198,881 sf 26.41% Impervious Runoff Depth>0.11"
Tc=6.0 min UI Adjusted CN=50 Runoff=0.05 cfs 1,766 cf

Subcatchment P-6: Subcat P-6 Runoff Area=260,840 sf 59.51% Impervious Runoff Depth>0.91"
Flow Length=226' Tc=12.3 min CN=73 Runoff=4.47 cfs 19,750 cf

Subcatchment P-7: Subcat P-7 Runoff Area=52,610 sf 0.28% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=31 Runoff=0.00 cfs 0 cf

Subcatchment P-8: Subcat P-8 Runoff Area=319,050 sf 31.59% Impervious Runoff Depth>0.17"
Flow Length=452' Tc=19.4 min CN=53 Runoff=0.18 cfs 4,446 cf

Subcatchment P-9: Subcat P-9 Runoff Area=219,446 sf 26.87% Impervious Runoff Depth>0.17"
Tc=6.0 min CN=53 Runoff=0.13 cfs 3,098 cf

Reach 6R: VEGETATED SWALE Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
n=0.030 L=325.0' S=0.0394 '/' Capacity=48.93 cfs Outflow=0.00 cfs 0 cf

Pond 1P: Infiltration Basin 1 Peak Elev=174.06' Storage=3,773 cf Inflow=3.56 cfs 12,782 cf
Discarded=0.39 cfs 12,735 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.39 cfs 12,735 cf

Pond 2P: Infiltration Basin 2 Peak Elev=175.72' Storage=1,476 cf Inflow=1.91 cfs 7,174 cf
Discarded=0.37 cfs 7,147 cf Primary=0.00 cfs 0 cf Outflow=0.37 cfs 7,147 cf

Pond 3P: Underground Infiltration System 1 Peak Elev=171.91' Storage=7,561 cf Inflow=9.26 cfs 37,117 cf
Discarded=1.59 cfs 36,987 cf Primary=0.00 cfs 0 cf Outflow=1.59 cfs 36,987 cf

Pond 4P: Existing Ditch 1 Peak Elev=193.00' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond 5P: Infiltration Basin 3 Peak Elev=169.49' Storage=1,038 cf Inflow=0.18 cfs 4,446 cf
Discarded=0.10 cfs 3,554 cf Primary=0.00 cfs 0 cf Outflow=0.10 cfs 3,554 cf

Pond 12P: Drainage Easement Ditch Peak Elev=180.89' Storage=19,735 cf Inflow=4.47 cfs 19,750 cf
Outflow=0.00 cfs 0 cf

Link SP1: Study Point 1 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP2: Study Point 2 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP3: Study Point 3 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP4: Study Point 4 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP5: Study Point 5 Inflow=0.05 cfs 1,766 cf
Primary=0.05 cfs 1,766 cf

Link SP6: Study Point 6 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,647,074 sf Runoff Volume = 83,034 cf Average Runoff Depth = 0.60"
60.44% Pervious = 995,478 sf 39.56% Impervious = 651,596 sf

Summary for Subcatchment P-1: Subcat P-1

[45] Hint: Runoff=Zero

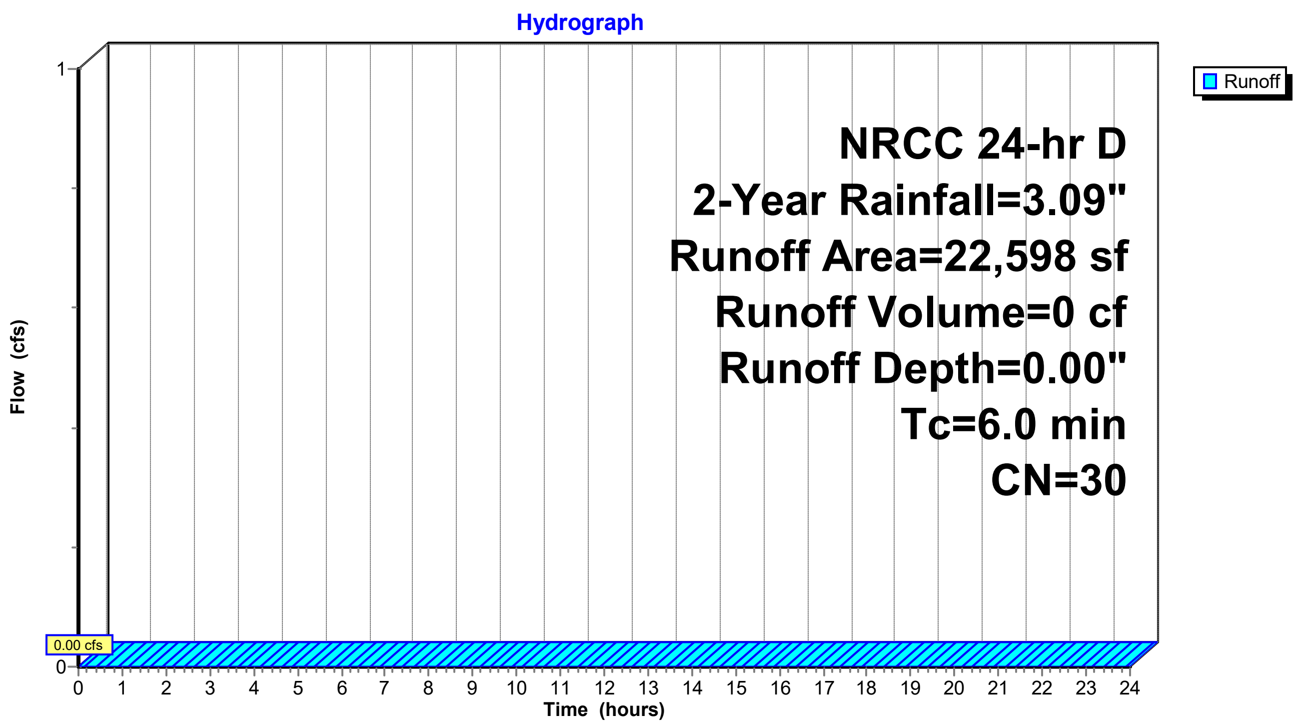
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
22,598	30	Woods, Good, HSG A
22,598		100.00% Pervious Area

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

Subcatchment P-1: Subcat P-1



Summary for Subcatchment P-10: Subcat P-10

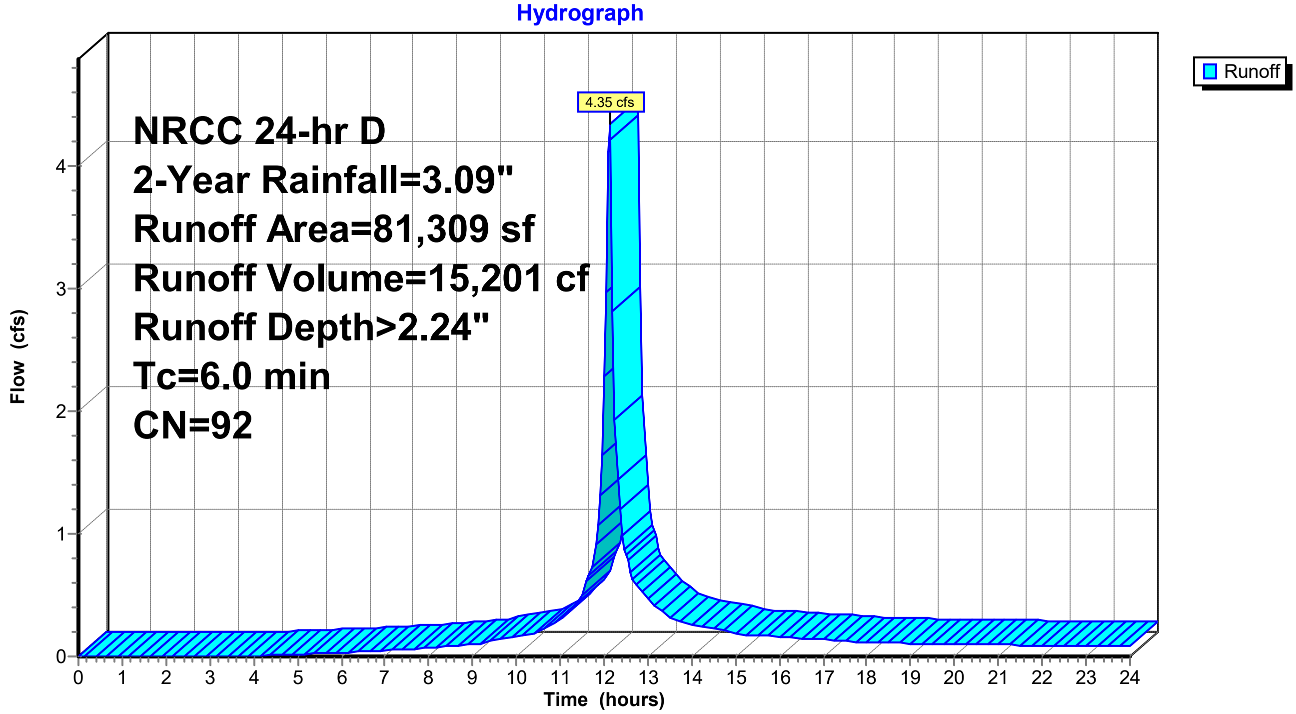
Runoff = 4.35 cfs @ 12.13 hrs, Volume= 15,201 cf, Depth> 2.24"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
72,894	98	Paved parking, HSG A
366	39	>75% Grass cover, Good, HSG A
158	39	>75% Grass cover, Good, HSG A
225	39	>75% Grass cover, Good, HSG A
204	39	>75% Grass cover, Good, HSG A
589	39	>75% Grass cover, Good, HSG A
450	39	>75% Grass cover, Good, HSG A
158	39	>75% Grass cover, Good, HSG A
71	39	>75% Grass cover, Good, HSG A
313	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
2	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
1,184	39	>75% Grass cover, Good, HSG A
969	39	>75% Grass cover, Good, HSG A
465	39	>75% Grass cover, Good, HSG A
2,238	39	>75% Grass cover, Good, HSG A
81,309	92	Weighted Average
8,415		10.35% Pervious Area
72,894		89.65% Impervious Area

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

Subcatchment P-10: Subcat P-10



Summary for Subcatchment P-11: Subcat P-11

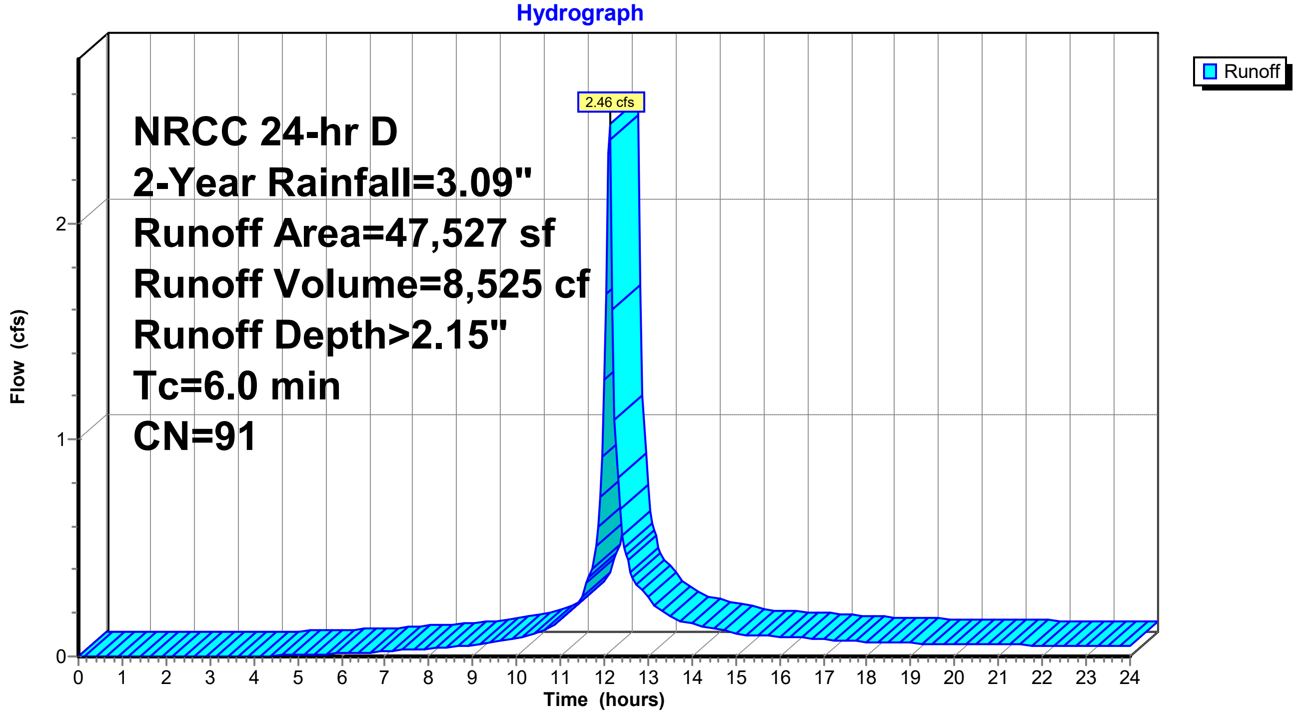
Runoff = 2.46 cfs @ 12.13 hrs, Volume= 8,525 cf, Depth> 2.15"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
41,622	98	Paved parking, HSG A
96	39	>75% Grass cover, Good, HSG A
527	39	>75% Grass cover, Good, HSG A
162	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
492	39	>75% Grass cover, Good, HSG A
2,498	39	>75% Grass cover, Good, HSG A
314	39	>75% Grass cover, Good, HSG A
944	39	>75% Grass cover, Good, HSG A
0	30	Woods, Good, HSG A
47,527	91	Weighted Average
5,906		12.43% Pervious Area
41,622		87.57% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

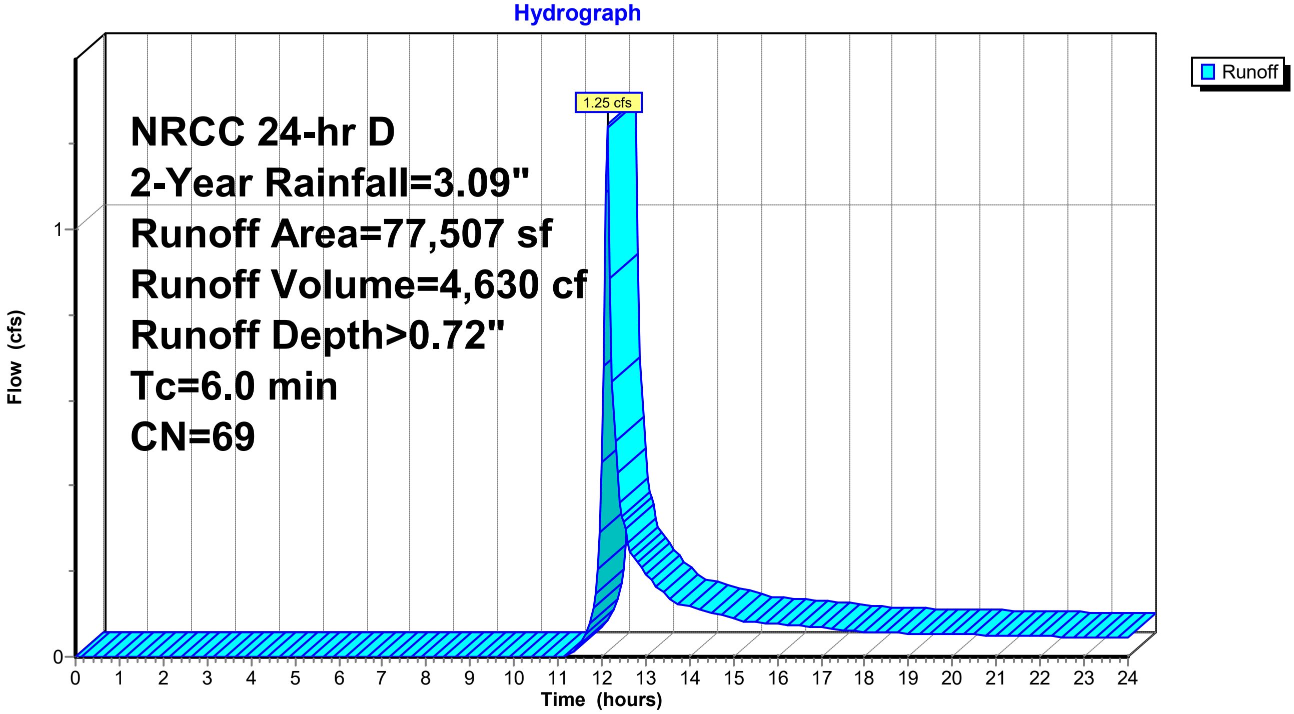
Runoff = 1.25 cfs @ 12.14 hrs, Volume= 4,630 cf, Depth> 0.72"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
0	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
4,403	39	>75% Grass cover, Good, HSG A
2,477	39	>75% Grass cover, Good, HSG A
1,191	39	>75% Grass cover, Good, HSG A
937	39	>75% Grass cover, Good, HSG A
173	39	>75% Grass cover, Good, HSG A
191	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
241	39	>75% Grass cover, Good, HSG A
507	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
200	39	>75% Grass cover, Good, HSG A
638	39	>75% Grass cover, Good, HSG A
442	39	>75% Grass cover, Good, HSG A
1,419	39	>75% Grass cover, Good, HSG A
1,858	39	>75% Grass cover, Good, HSG A
2,790	39	>75% Grass cover, Good, HSG A
1,695	39	>75% Grass cover, Good, HSG A
5,011	39	>75% Grass cover, Good, HSG A
90	39	>75% Grass cover, Good, HSG A
1,322	39	>75% Grass cover, Good, HSG A
1,414	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
1,339	39	>75% Grass cover, Good, HSG A
305	39	>75% Grass cover, Good, HSG A
3,810	39	>75% Grass cover, Good, HSG A
1,418	39	>75% Grass cover, Good, HSG A
349	39	>75% Grass cover, Good, HSG A
2,253	39	>75% Grass cover, Good, HSG A
39,692	98	Paved parking, HSG A
77,507	69	Weighted Average
37,815		48.79% Pervious Area
39,692		51.21% Impervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

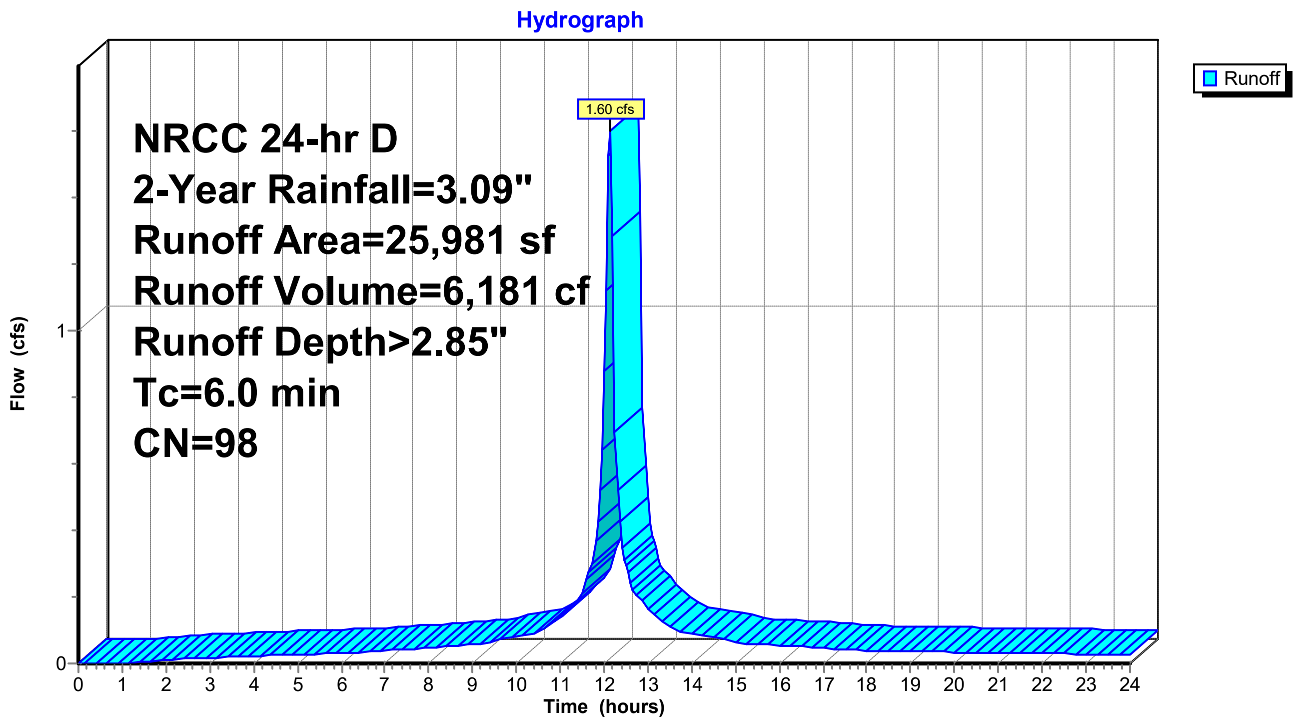
Runoff = 1.60 cfs @ 12.13 hrs, Volume= 6,181 cf, Depth> 2.85"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
25,981	98	Roofs, HSG A
25,981		100.00% Impervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

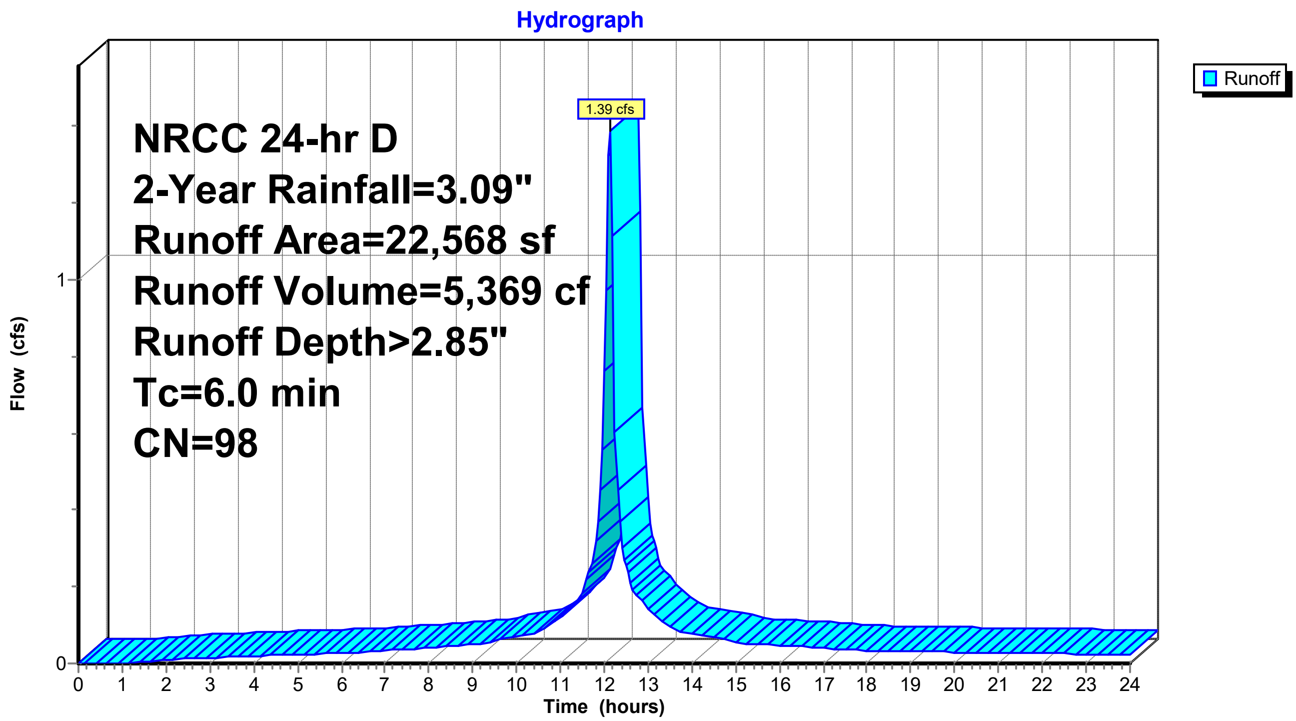
Runoff = 1.39 cfs @ 12.13 hrs, Volume= 5,369 cf, Depth> 2.85"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
22,568	98	Roofs, HSG A
22,568		100.00% Impervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

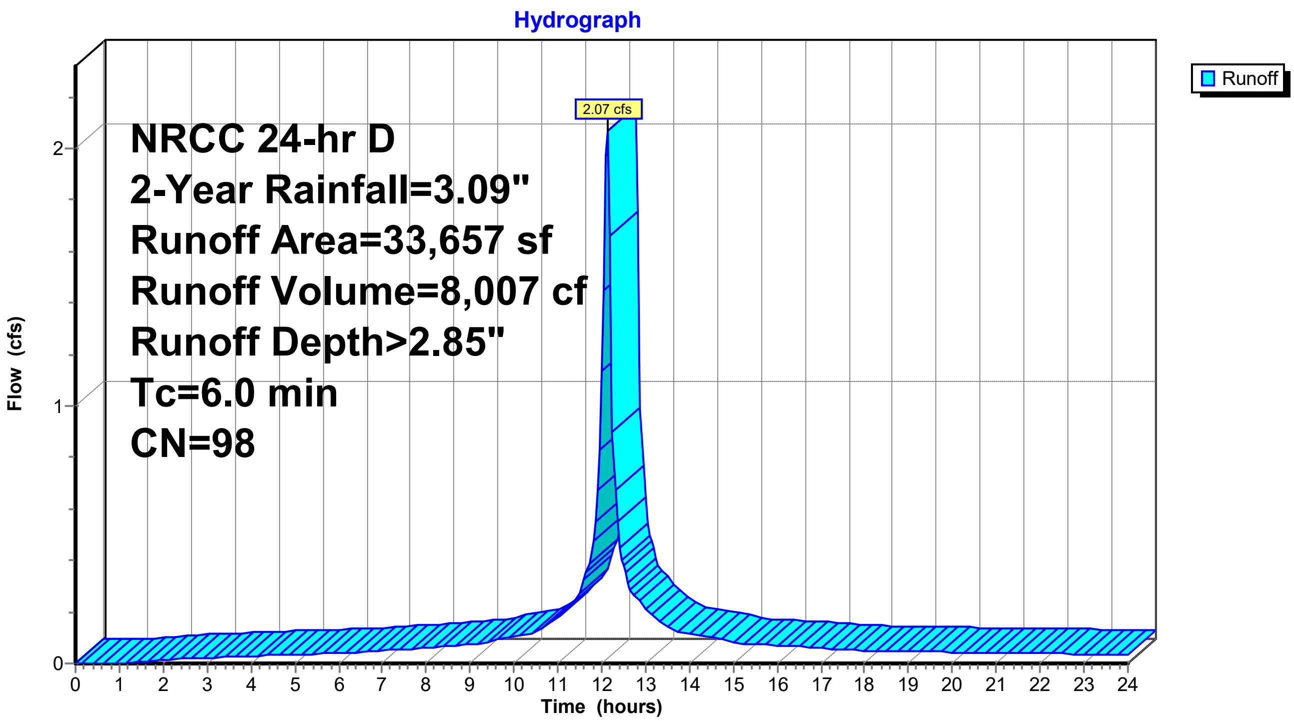
Runoff = 2.07 cfs @ 12.13 hrs, Volume= 8,007 cf, Depth> 2.85"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
33,657	98	Roofs, HSG A
33,657		100.00% Impervious Area

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

Subcatchment P-15: Subcat P-15



Summary for Subcatchment P-16: Subcat P-16

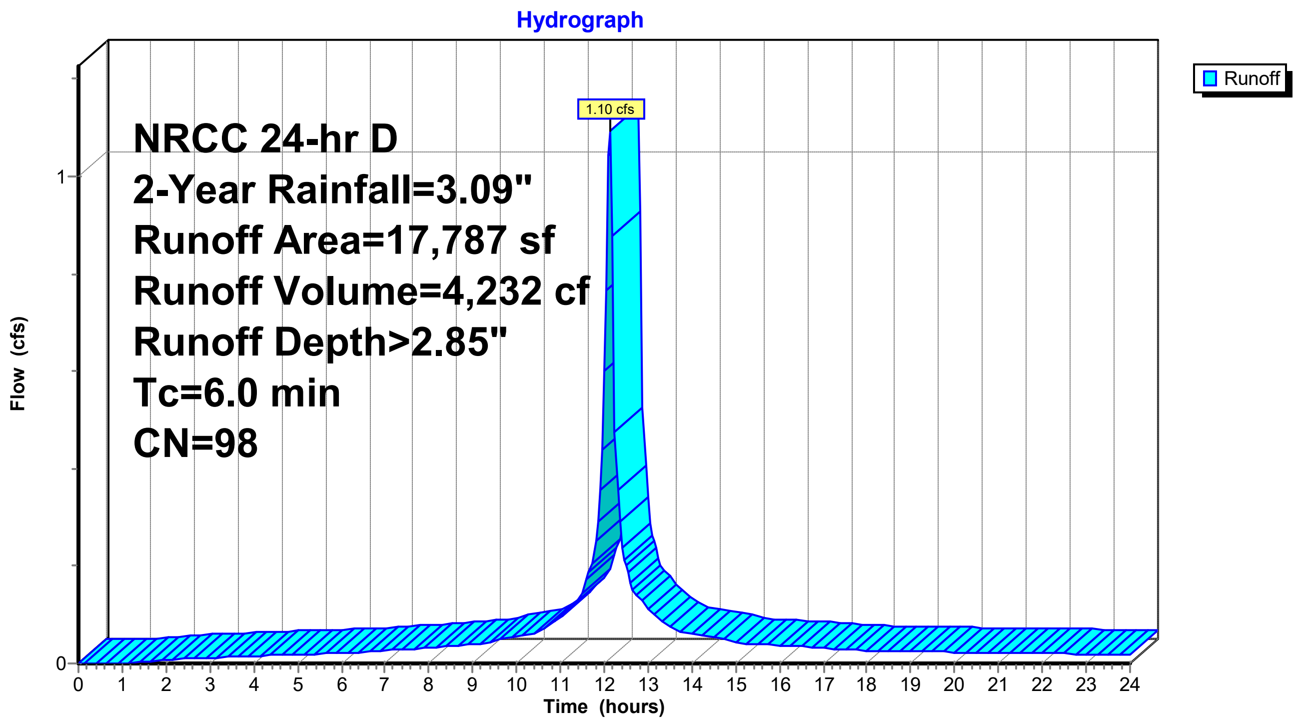
Runoff = 1.10 cfs @ 12.13 hrs, Volume= 4,232 cf, Depth> 2.85"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
17,787	98	Water Surface, HSG A
17,787		100.00% Impervious Area

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

Subcatchment P-16: Subcat P-16



Summary for Subcatchment P-17: Subcat P-17

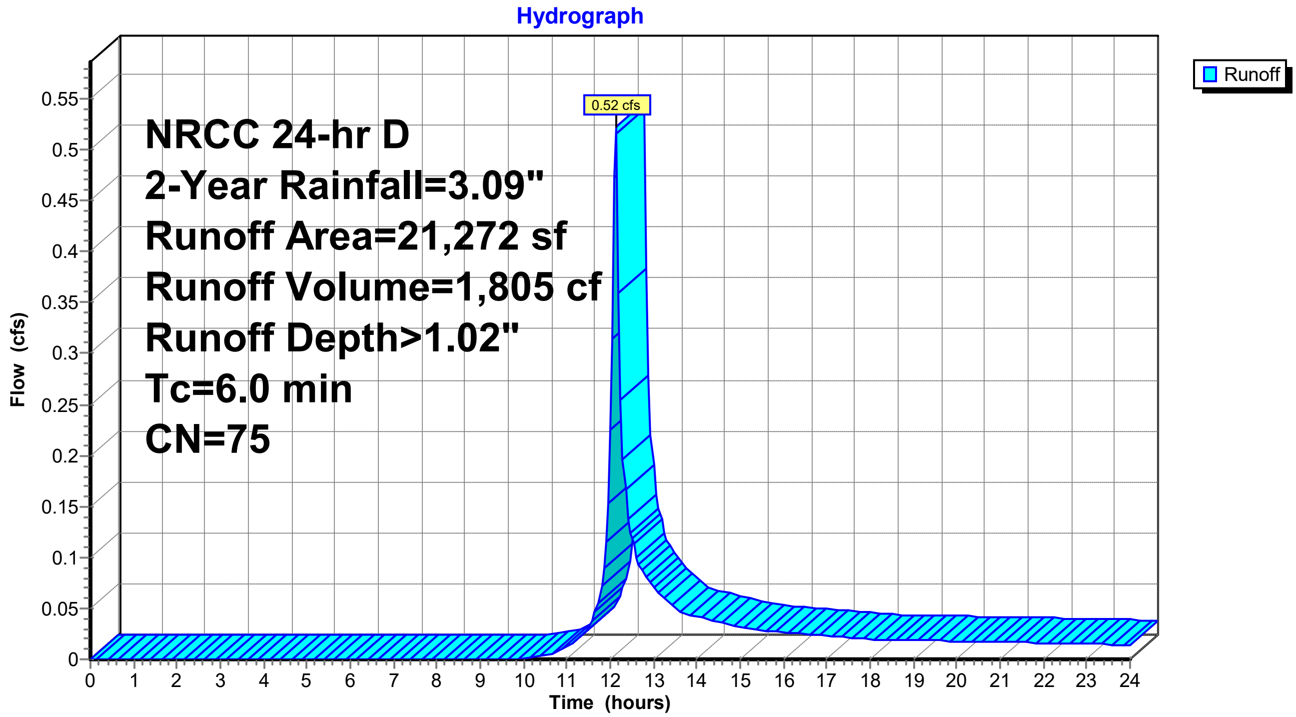
Runoff = 0.52 cfs @ 12.14 hrs, Volume= 1,805 cf, Depth> 1.02"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
13,951	98	Water Surface, HSG A
7,321	30	Woods, Good, HSG A
21,272	75	Weighted Average
7,321		34.41% Pervious Area
13,951		65.59% Impervious Area

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

Subcatchment P-17: Subcat P-17



Summary for Subcatchment P-18: Subcat P-18

[73] Warning: Peak may fall outside time span

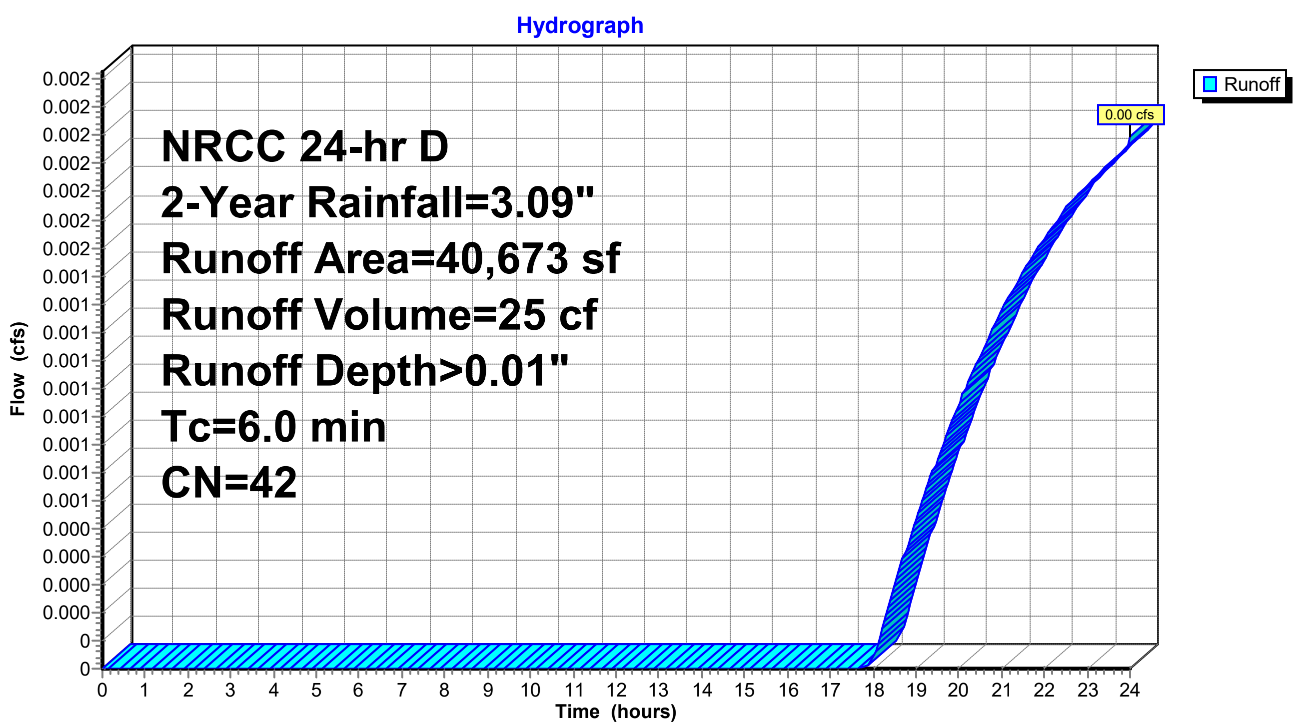
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 25 cf, Depth> 0.01"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
20,962	54	1/2 acre lots, 25% imp, HSG A
0	98	Water Surface, HSG A
19,711	30	Woods, Good, HSG A
40,673	42	Weighted Average
35,433		87.12% Pervious Area
5,240		12.88% Impervious Area

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

Subcatchment P-18: Subcat P-18



Summary for Subcatchment P-19: Subcat P-19

[45] Hint: Runoff=Zero

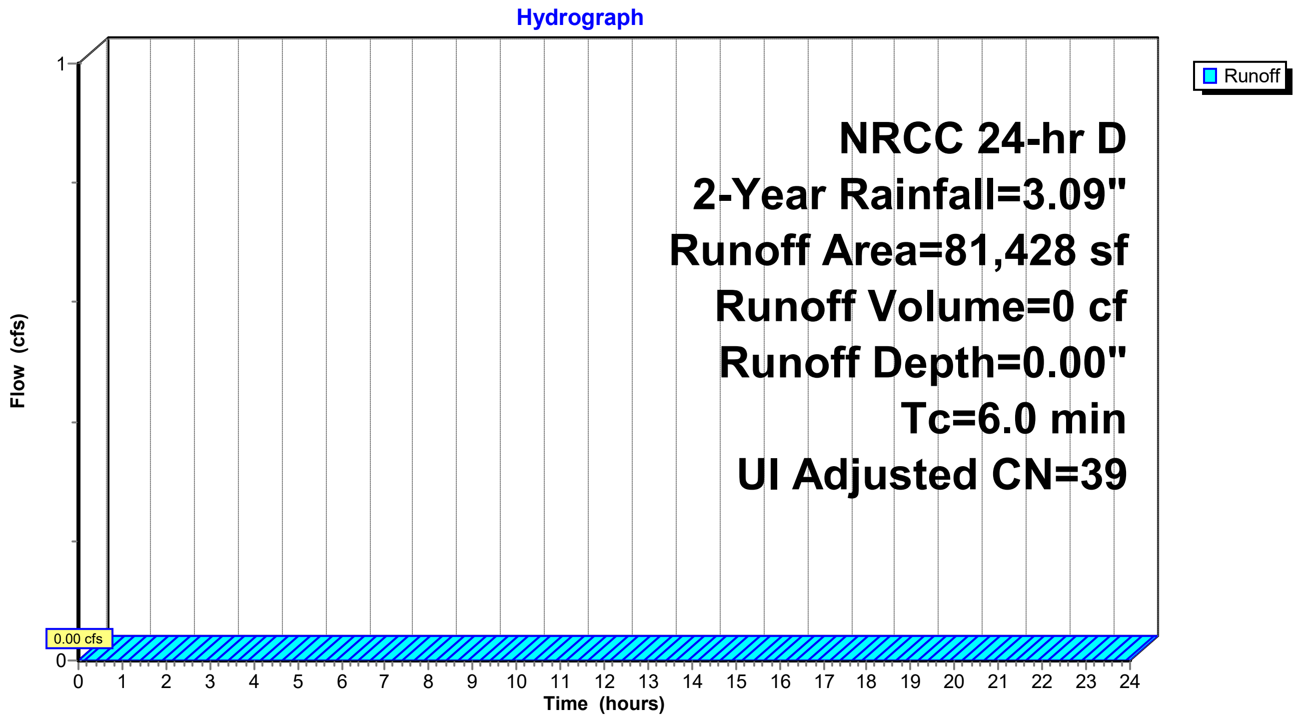
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Reach 6R : VEGETATED SWALE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Adj	Description
28,826	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
6,878	39		>75% Grass cover, Good, HSG A
44	98		Unconnected pavement, HSG A
61	98		Unconnected pavement, HSG A
9,162	98		Unconnected pavement, HSG A
30	98		Unconnected pavement, HSG A
36,428	39		>75% Grass cover, Good, HSG A
81,428	43	39	Weighted Average, UI Adjusted
72,131			88.58% Pervious Area
9,296			11.42% Impervious Area
9,296			100.00% Unconnected

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

Subcatchment P-19: Subcat P-19



Summary for Subcatchment P-2: Subcat P-2

[45] Hint: Runoff=Zero

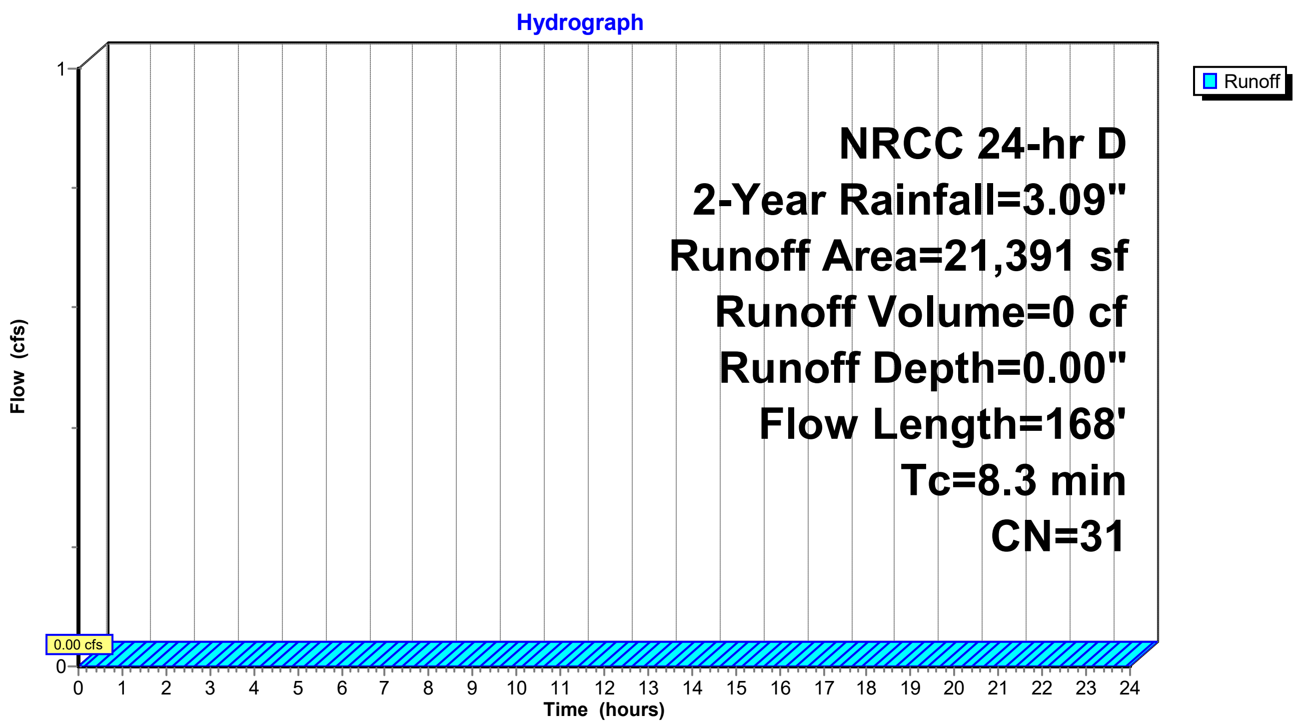
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
1,942	39	>75% Grass cover, Good, HSG A
19,449	30	Woods, Good, HSG A
21,391	31	Weighted Average
21,391		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.09"
0.7	118	0.1440	2.66		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.3	168	Total			

Subcatchment P-2: Subcat P-2



Summary for Subcatchment P-20: Subcat P-20

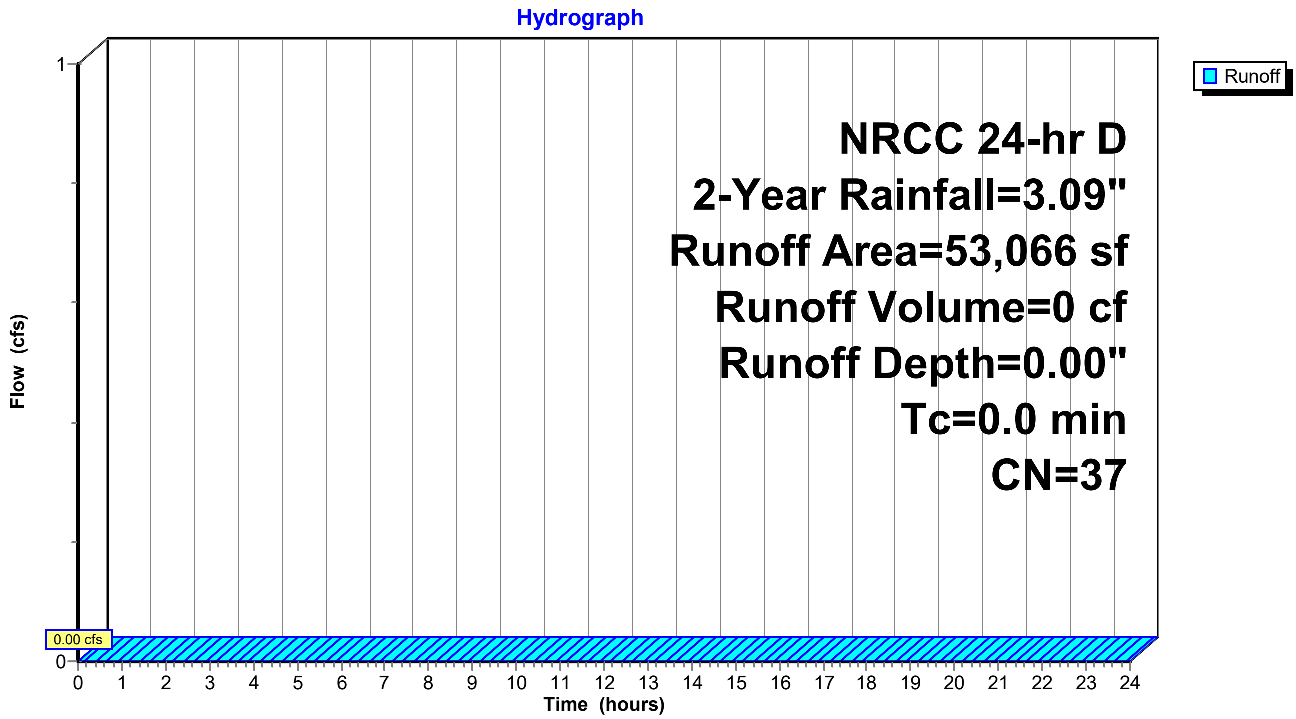
[46] Hint: Tc=0 (Instant runoff peak depends on dt)
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
22,364	30	Woods, Good, HSG A
8	30	Woods, Good, HSG A
29,421	39	>75% Grass cover, Good, HSG A
1,273	98	Roofs, HSG A
53,066	37	Weighted Average
51,793		97.60% Pervious Area
1,273		2.40% Impervious Area

Subcatchment P-20: Subcat P-20



Summary for Subcatchment P-3: Subcat P-3

[45] Hint: Runoff=Zero

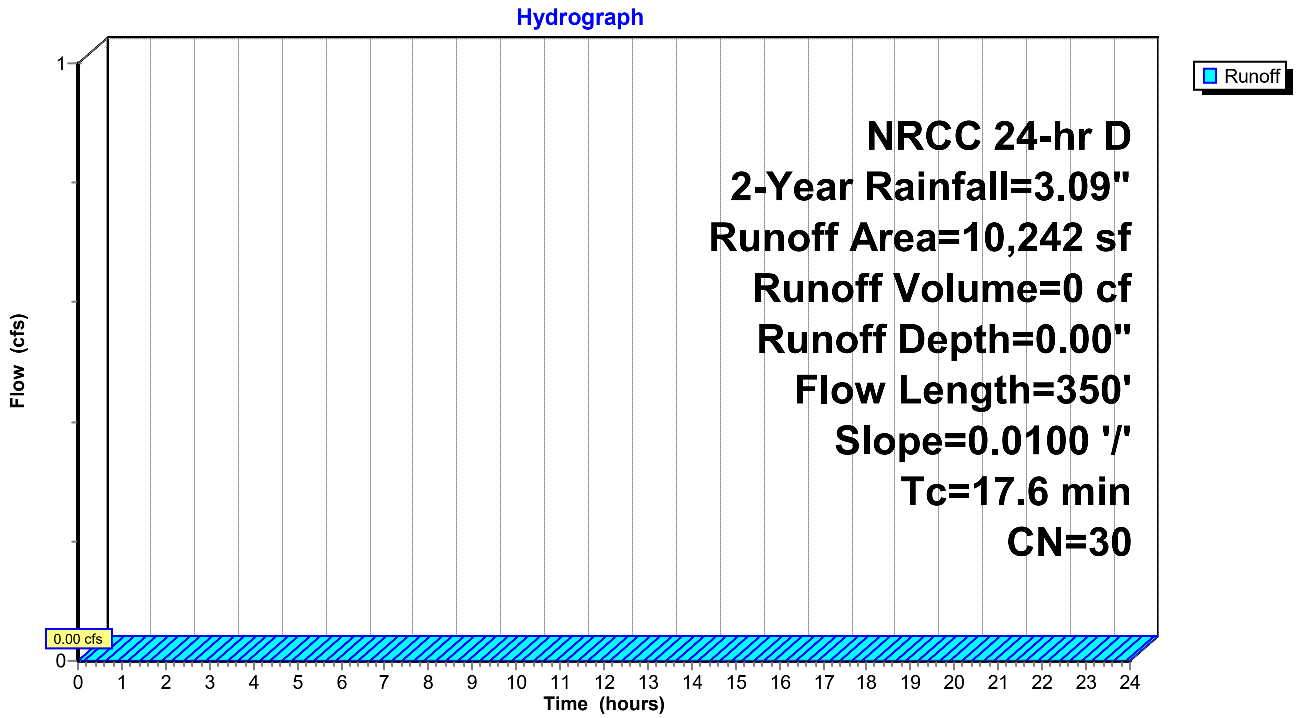
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
6	39	>75% Grass cover, Good, HSG A
10,236	30	Woods, Good, HSG A
10,242	30	Weighted Average
10,242		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.09"
10.0	300	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.6	350	Total			

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

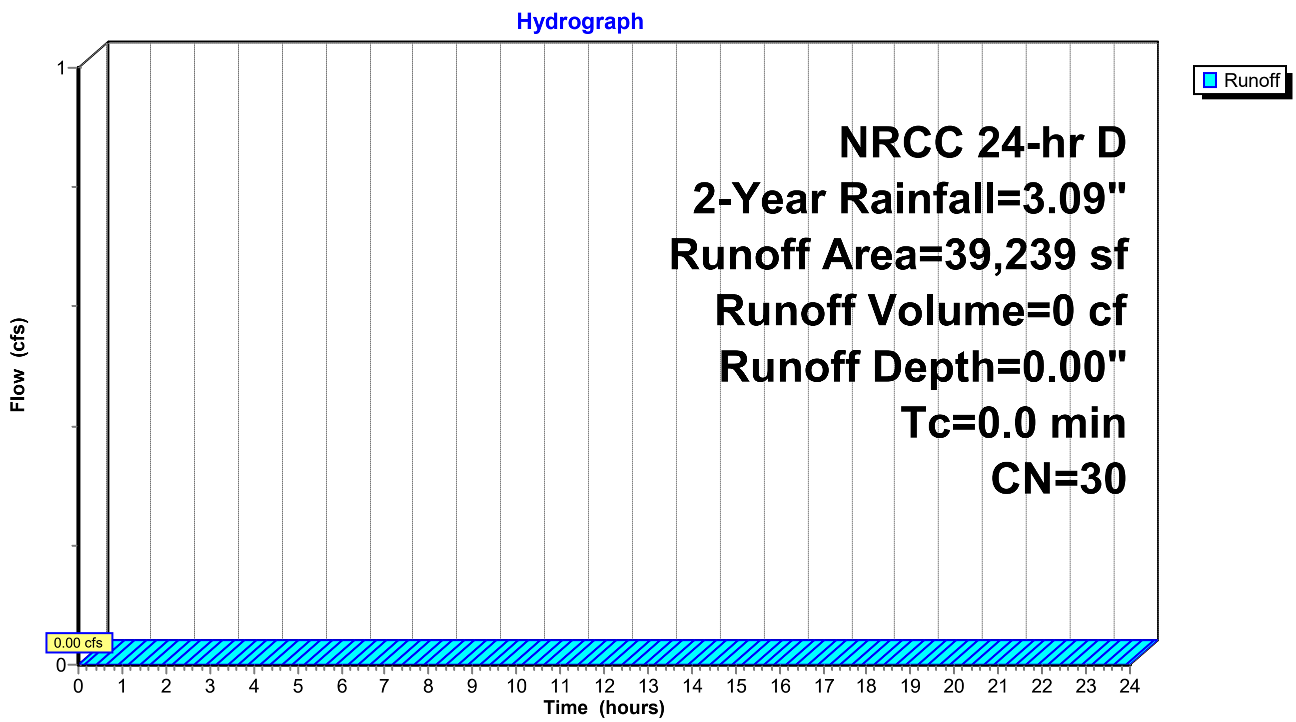
[46] Hint: Tc=0 (Instant runoff peak depends on dt)
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 4P : Existing Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
39,239	30	Woods, Good, HSG A
39,239		100.00% Pervious Area

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

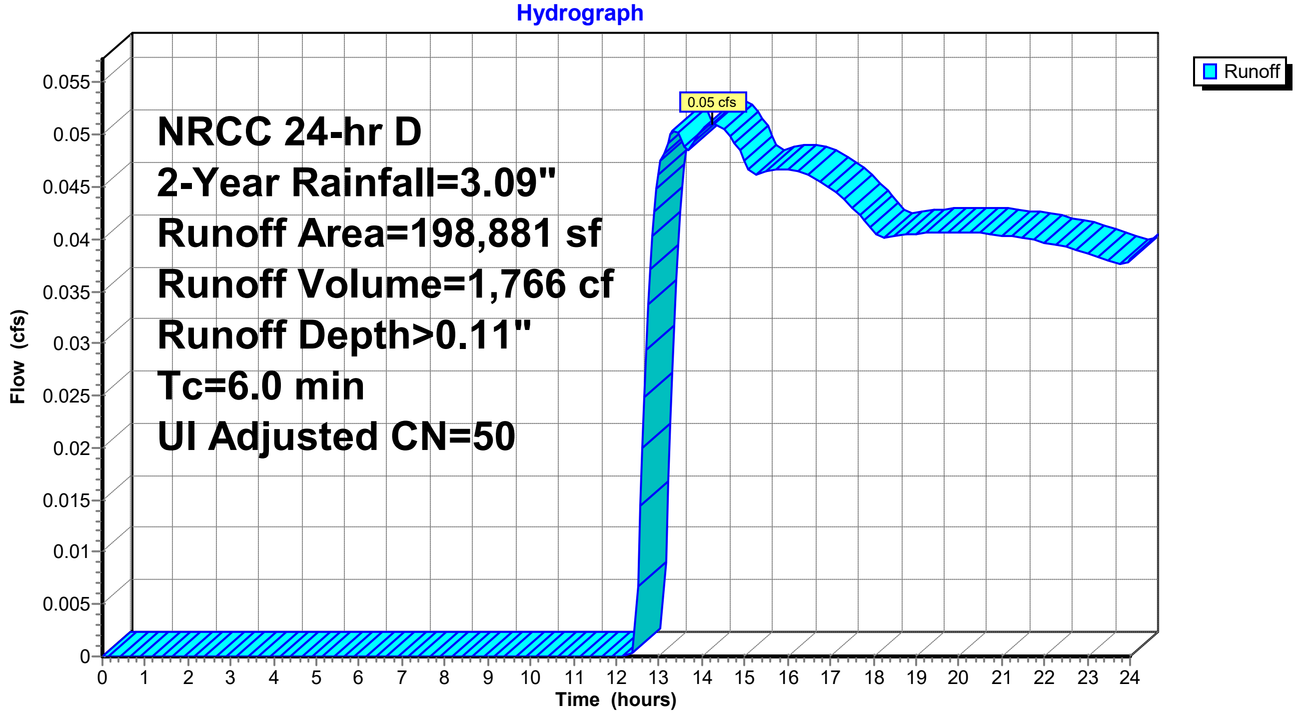
Runoff = 0.05 cfs @ 14.25 hrs, Volume= 1,766 cf, Depth> 0.11"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Adj	Description
21,040	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
60,243	30		Woods, Good, HSG A
11,413	30		Woods, Good, HSG A
5,380	30		Woods, Good, HSG A
0	39		>75% Grass cover, Good, HSG A
315	39		>75% Grass cover, Good, HSG A
1,914	39		>75% Grass cover, Good, HSG A
761	39		>75% Grass cover, Good, HSG A
10,302	39		>75% Grass cover, Good, HSG A
1,325	30		Woods, Good, HSG A
13,415	72		Dirt roads, HSG A
527	98		Unconnected pavement, HSG A
43	98		Unconnected pavement, HSG A
38	98		Unconnected pavement, HSG A
39	98		Unconnected pavement, HSG A
13,837	98		Unconnected pavement, HSG A
33	98		Unconnected pavement, HSG A
330	39		>75% Grass cover, Good, HSG A
9,969	98		Roofs, HSG A
395	98		Roofs, HSG A
1,474	98		Roofs, HSG A
2	98		Roofs, HSG A
9,863	98		Roofs, HSG A
3,360	39		>75% Grass cover, Good, HSG A
16,236	98		Paved parking, HSG A
56	98		Paved parking, HSG A
11	98		Paved parking, HSG A
11,291	39		>75% Grass cover, Good, HSG A
5,272	39		>75% Grass cover, Good, HSG A
198,881	52	50	Weighted Average, UI Adjusted
146,360			73.59% Pervious Area
52,521			26.41% Impervious Area
14,517			27.64% Unconnected

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

Runoff = 4.47 cfs @ 12.21 hrs, Volume= 19,750 cf, Depth> 0.91"
Routed to Pond 12P : Drainage Easement Ditch

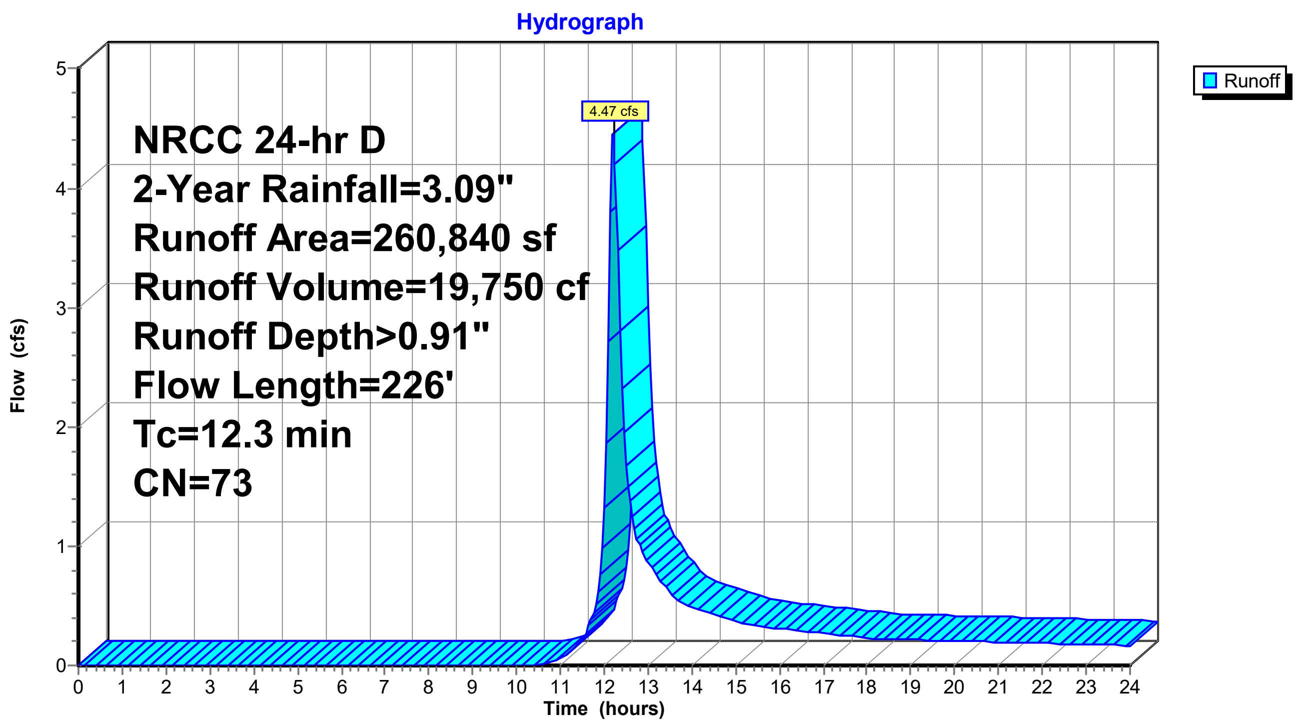
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
1	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
556	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
580	30	Woods, Good, HSG A
87	30	Woods, Good, HSG A
76	30	Woods, Good, HSG A
17	30	Woods, Good, HSG A
41	30	Woods, Good, HSG A
234	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
1,039	39	>75% Grass cover, Good, HSG A
80	30	Woods, Good, HSG A
124	39	>75% Grass cover, Good, HSG A
9,477	39	>75% Grass cover, Good, HSG A
1,324	39	>75% Grass cover, Good, HSG A
3,326	39	>75% Grass cover, Good, HSG A
197	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
849	39	>75% Grass cover, Good, HSG A
1,494	39	>75% Grass cover, Good, HSG A
488	39	>75% Grass cover, Good, HSG A
5,897	39	>75% Grass cover, Good, HSG A
207	39	>75% Grass cover, Good, HSG A
38	39	>75% Grass cover, Good, HSG A
35,199	54	1/2 acre lots, 25% imp, HSG A
2,290	54	1/2 acre lots, 25% imp, HSG A
5,803	98	Unconnected pavement, HSG A
2,360	98	Unconnected pavement, HSG A
889	98	Unconnected pavement, HSG A
715	98	Unconnected pavement, HSG A
135,515	98	Paved parking, HSG A
563	98	Unconnected pavement, HSG A
3,565	39	>75% Grass cover, Good, HSG A
2,358	30	Woods, Good, HSG A
6,778	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
1,577	39	>75% Grass cover, Good, HSG A
1,768	39	>75% Grass cover, Good, HSG A
362	39	>75% Grass cover, Good, HSG A
12,602	30	Woods, Good, HSG A
10,885	39	>75% Grass cover, Good, HSG A
4,375	30	Woods, Good, HSG A
2,426	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
348	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
2,039	39	>75% Grass cover, Good, HSG A

564	39	>75% Grass cover, Good, HSG A
591	39	>75% Grass cover, Good, HSG A
260,840	73	Weighted Average
105,623		40.49% Pervious Area
155,217		59.51% Impervious Area
10,330		6.66% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.3	15	0.0200	0.99		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	161	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.3	226	Total			

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

[45] Hint: Runoff=Zero

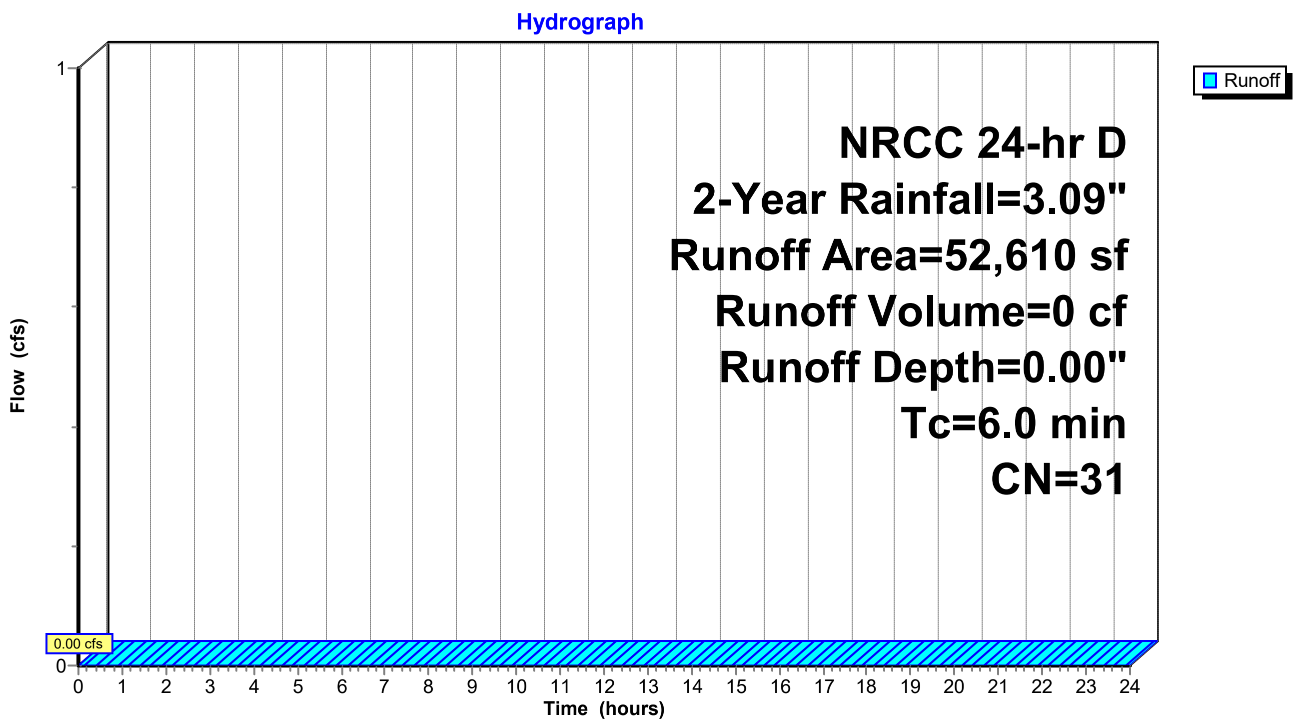
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 12P : Drainage Easement Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
49,207	30	Woods, Good, HSG A
72	30	Woods, Good, HSG A
2,969	39	>75% Grass cover, Good, HSG A
215	30	Woods, Good, HSG A
26	98	Unconnected pavement, HSG A
113	98	Unconnected pavement, HSG A
8	98	Paved parking, HSG A
52,610	31	Weighted Average
52,463		99.72% Pervious Area
147		0.28% Impervious Area
139		94.53% Unconnected

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

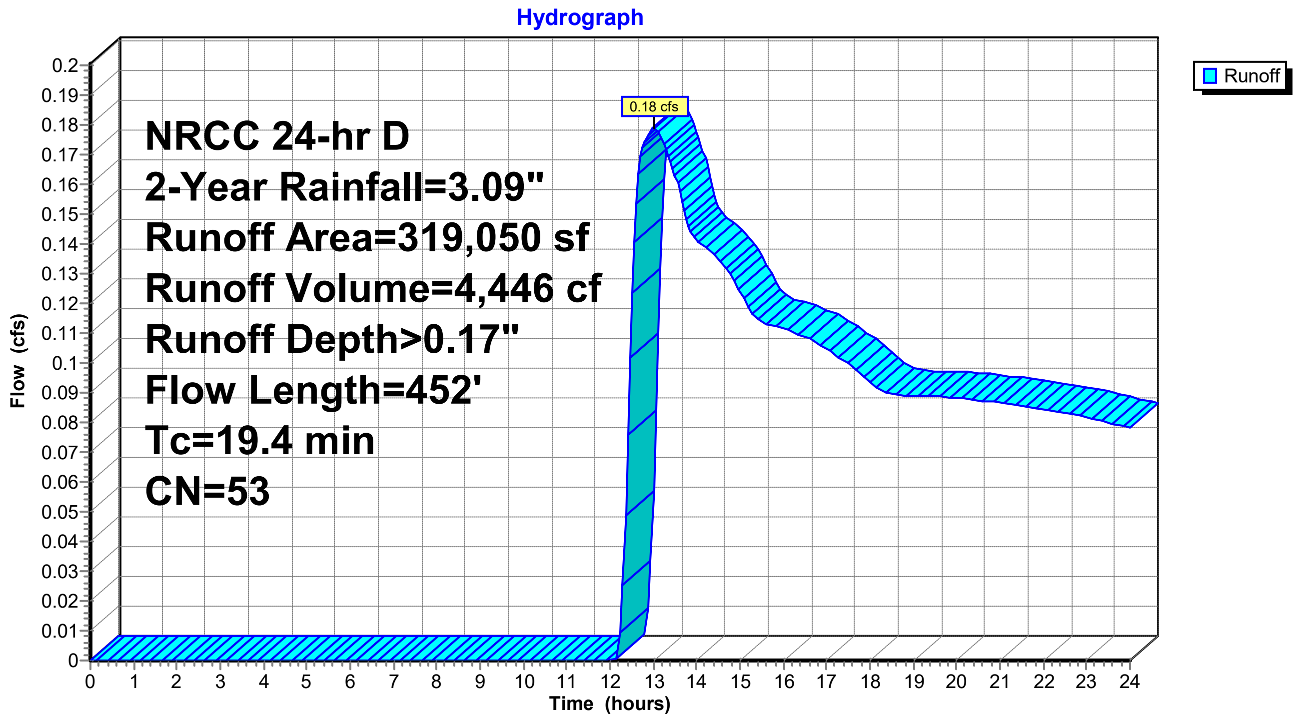
Runoff = 0.18 cfs @ 13.04 hrs, Volume= 4,446 cf, Depth> 0.17"
Routed to Pond 5P : Infiltration Basin 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
155,878	30	Woods, Good, HSG A
13,674	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
57	39	>75% Grass cover, Good, HSG A
1,057	39	>75% Grass cover, Good, HSG A
58	39	>75% Grass cover, Good, HSG A
44,905	39	>75% Grass cover, Good, HSG A
1,978	39	>75% Grass cover, Good, HSG A
665	72	Dirt roads, HSG A
1,101	98	Unconnected pavement, HSG A
7,746	98	Unconnected pavement, HSG A
26,556	98	Unconnected pavement, HSG A
12	98	Unconnected pavement, HSG A
71	98	Unconnected pavement, HSG A
210	98	Unconnected pavement, HSG A
7,456	98	Unconnected pavement, HSG A
9,916	98	Roofs, HSG A
47,139	98	Roofs, HSG A
175	98	Roofs, HSG A
395	98	Roofs, HSG A
319,050	53	Weighted Average
218,273		68.41% Pervious Area
100,778		31.59% Impervious Area
43,153		42.82% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	50	0.0240	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
2.0	76	0.0660	0.64		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	79	0.0120	0.77		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0270	3.34		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
3.9	220	0.0180	0.94		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
19.4	452	Total			

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

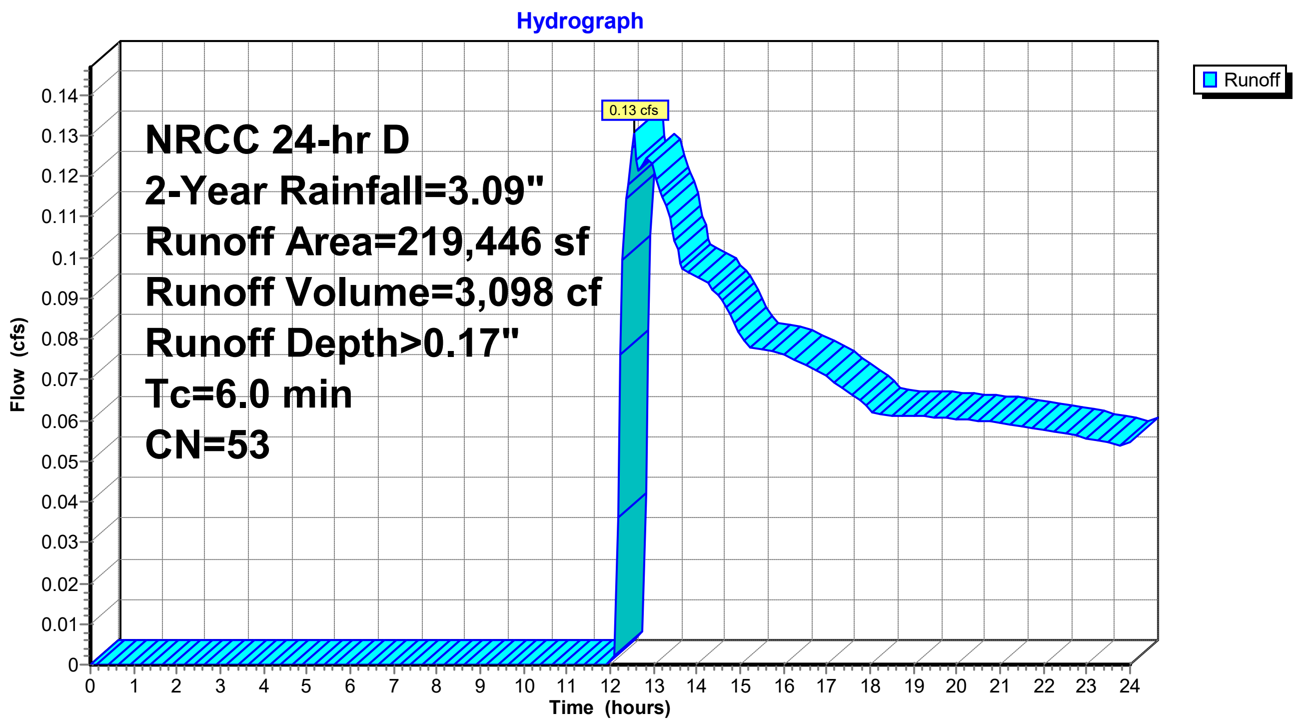
Runoff = 0.13 cfs @ 12.54 hrs, Volume= 3,098 cf, Depth> 0.17"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 2-Year Rainfall=3.09"

Area (sf)	CN	Description
103,904	54	1/2 acre lots, 25% imp, HSG A
37,219	54	1/2 acre lots, 25% imp, HSG A
5,066	39	>75% Grass cover, Good, HSG A
23,689	98	Paved parking, HSG A
49,568	30	Woods, Good, HSG A
219,446	53	Weighted Average
160,476		73.13% Pervious Area
58,969		26.87% Impervious Area

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

Subcatchment P-9: Subcat P-9



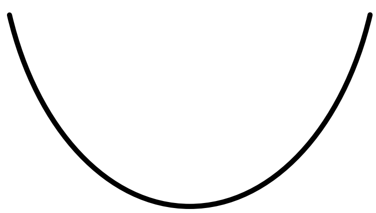
Summary for Reach 6R: VEGETATED SWALE

Inflow Area = 81,428 sf, 11.42% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond 3P : Underground Infiltration System 1

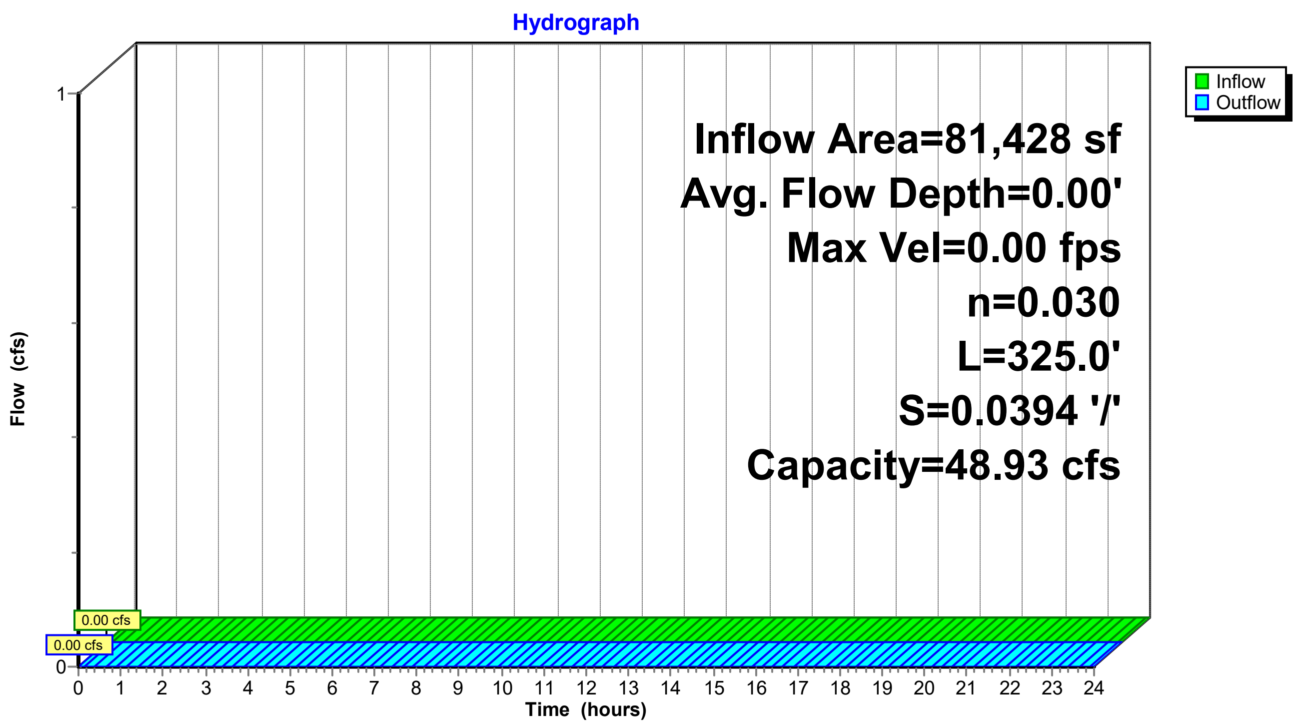
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 5.3 sf, Capacity= 48.93 cfs

4.00' x 2.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 325.0' Slope= 0.0394 '/'
Inlet Invert= 193.00', Outlet Invert= 180.20'



Reach 6R: VEGETATED SWALE



Summary for Pond 1P: Infiltration Basin 1

Inflow Area = 105,988 sf, 61.00% Impervious, Inflow Depth > 1.45" for 2-Year event
Inflow = 3.56 cfs @ 12.13 hrs, Volume= 12,782 cf
Outflow = 0.39 cfs @ 12.97 hrs, Volume= 12,735 cf, Atten= 89%, Lag= 50.4 min
Discarded = 0.39 cfs @ 12.97 hrs, Volume= 12,735 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Study Point 1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP2 : Study Point 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 174.06' @ 12.97 hrs Surf.Area= 7,065 sf Storage= 3,773 cf

Plug-Flow detention time= 69.7 min calculated for 12,735 cf (100% of inflow)
Center-of-Mass det. time= 67.4 min (868.3 - 800.9)

Volume	Invert	Avail.Storage	Storage Description
#1	173.50'	36,336 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
173.50	6,319	436.0	0	0	6,319
174.00	6,981	446.0	3,324	3,324	7,055
175.00	8,346	465.0	7,653	10,977	8,505
176.00	9,768	483.0	9,048	20,025	9,944
177.00	11,247	502.0	10,499	30,523	11,512
177.50	12,008	512.0	5,813	36,336	12,358

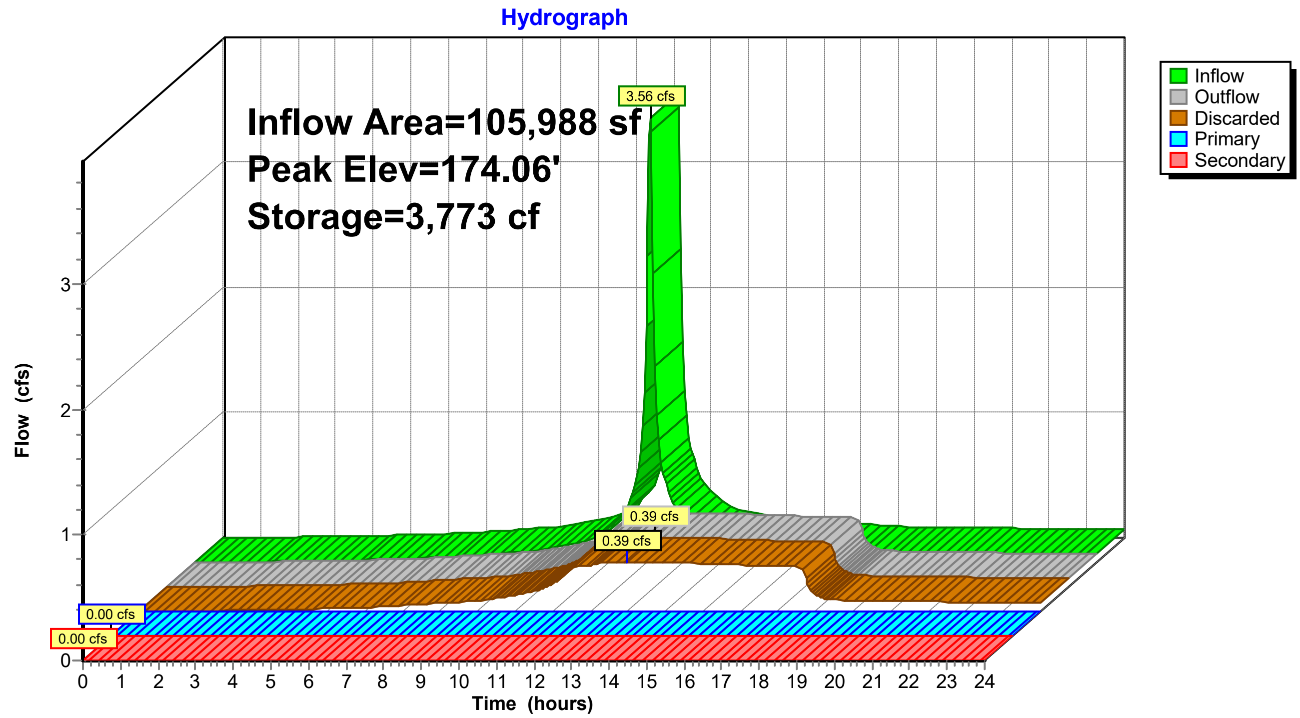
Device	Routing	Invert	Outlet Devices
#1	Secondary	173.40'	**12.0" Round Culvert** L= 252.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 173.40' / 169.50' S= 0.0155 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	176.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	176.50'	**13.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Discarded	173.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.39 cfs @ 12.97 hrs HW=174.06' (Free Discharge)
4=Exfiltration (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=173.50' (Free Discharge)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=173.50' (Free Discharge)
1=Culvert (Passes 0.00 cfs of 0.03 cfs potential flow)
2=Orifice/Grate (Controls 0.00 cfs)

Pond 1P: Infiltration Basin 1



Summary for Pond 2P: Infiltration Basin 2

[79] Warning: Submerged Pond 3P Primary device # 1 OUTLET by 0.22'

Inflow Area = 935,284 sf, 40.53% Impervious, Inflow Depth > 0.09" for 2-Year event
Inflow = 1.91 cfs @ 12.13 hrs, Volume= 7,174 cf
Outflow = 0.37 cfs @ 12.50 hrs, Volume= 7,147 cf, Atten= 80%, Lag= 22.2 min
Discarded = 0.37 cfs @ 12.50 hrs, Volume= 7,147 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP3 : Study Point 3

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 175.72' @ 12.50 hrs Surf.Area= 6,686 sf Storage= 1,476 cf

Plug-Flow detention time= 26.5 min calculated for 7,132 cf (99% of inflow)
Center-of-Mass det. time= 24.0 min (817.8 - 793.8)

Volume	Invert	Avail.Storage	Storage Description
#1	175.50'	33,751 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

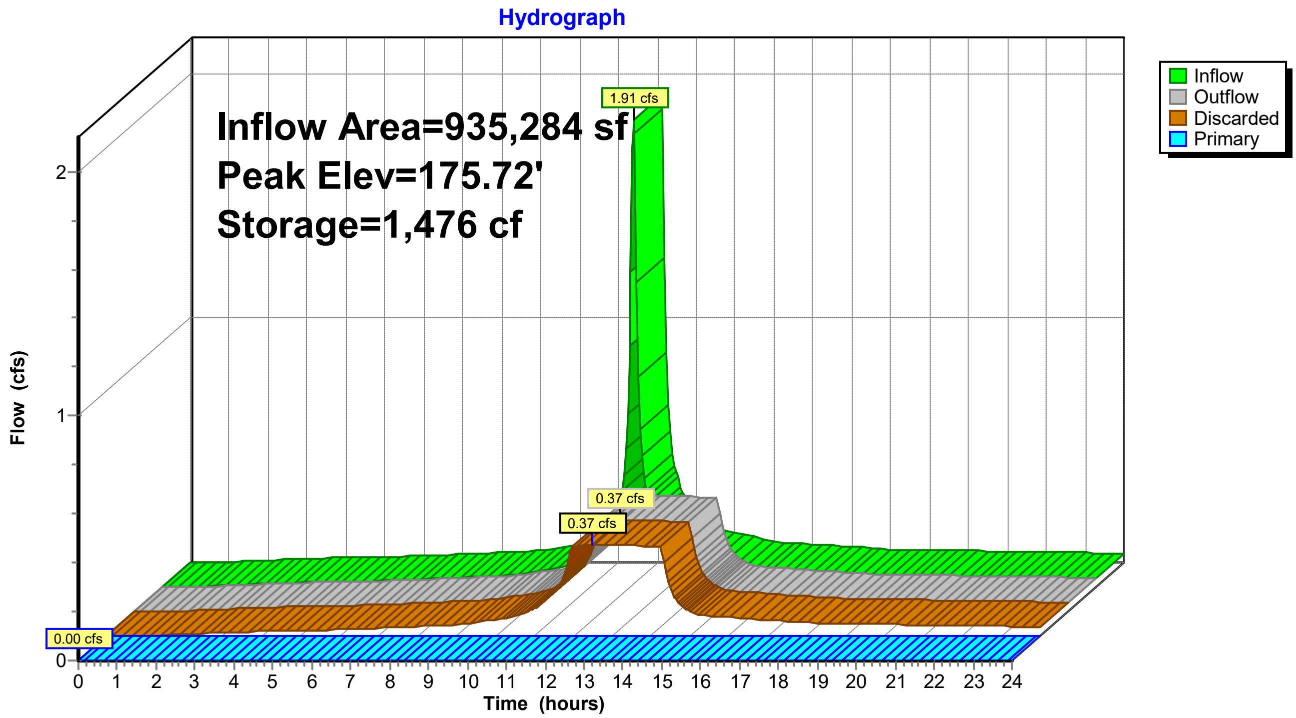
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
175.50	6,483	301.0	0	0	6,483
176.00	6,941	310.0	3,355	3,355	6,946
177.00	7,900	329.0	7,415	10,771	7,964
178.00	8,915	348.0	8,402	19,173	9,042
179.00	9,987	367.0	9,446	28,619	10,181
179.50	10,544	376.0	5,132	33,751	10,744

Device	Routing	Invert	Outlet Devices
#1	Primary	175.40'	**12.0" Round Culvert** L= 63.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 175.40' / 173.00' S= 0.0378 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	178.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	178.50'	**13.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Discarded	175.50'	**2.410 in/hr Exfiltration over Surface area**
#5	Primary	178.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.37 cfs @ 12.50 hrs HW=175.72' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.50' (Free Discharge)
├─**1=Culvert** (Passes 0.00 cfs of 0.03 cfs potential flow)
│ └─**2=Orifice/Grate** (Controls 0.00 cfs)
├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin 2



Summary for Pond 3P: Underground Infiltration System 1

Inflow Area = 519,328 sf, 46.31% Impervious, Inflow Depth > 0.86" for 2-Year event
Inflow = 9.26 cfs @ 12.13 hrs, Volume= 37,117 cf
Outflow = 1.59 cfs @ 11.90 hrs, Volume= 36,987 cf, Atten= 83%, Lag= 0.0 min
Discarded = 1.59 cfs @ 11.90 hrs, Volume= 36,987 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 2P : Infiltration Basin 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 171.91' @ 12.62 hrs Surf.Area= 28,516 sf Storage= 7,561 cf

Plug-Flow detention time= 30.1 min calculated for 36,910 cf (99% of inflow)
Center-of-Mass det. time= 27.9 min (852.9 - 825.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	171.25'	14,193 cf	**37.58'W x 238.18'L x 6.75'H Field A**
			60,422 cf Overall - 24,939 cf Embedded = 35,483 cf x 40.0% Voids
#2A	172.00'	24,939 cf	**ADS_StormTech MC-7200 +Cap** x 140 Inside #1
			Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
			Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
			140 Chambers in 4 Rows
			Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
#3B	171.25'	16,906 cf	**37.58'W x 284.32'L x 6.75'H Field B**
			72,128 cf Overall - 29,863 cf Embedded = 42,264 cf x 40.0% Voids
#4B	172.00'	29,863 cf	**ADS_StormTech MC-7200 +Cap** x 168 Inside #3
			Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
			Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
			168 Chambers in 4 Rows
			Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
#5C	171.25'	6,107 cf	**28.50'W x 132.71'L x 6.75'H Field C**
			25,530 cf Overall - 10,262 cf Embedded = 15,268 cf x 40.0% Voids
#6C	172.00'	10,262 cf	**ADS_StormTech MC-7200 +Cap** x 57 Inside #5
			Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
			Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
			57 Chambers in 3 Rows
			Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf
#7D	171.25'	8,180 cf	**28.50'W x 178.85'L x 6.75'H Field D**
			34,406 cf Overall - 13,955 cf Embedded = 20,451 cf x 40.0% Voids
#8D	172.00'	13,955 cf	**ADS_StormTech MC-7200 +Cap** x 78 Inside #7
			Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
			Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
			78 Chambers in 3 Rows
			Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf
#9	173.47'	68 cf	**4.00'D x 5.45'H Vertical Cone/Cylinder** -Impervious
		124,474 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard
Storage Group D created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	176.35'	**12.0" Round Culvert** L= 82.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 176.35' / 175.50' S= 0.0104 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	177.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	171.25'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.59 cfs @ 11.90 hrs HW=171.34' (Free Discharge)
↑—**3=Exfiltration** (Exfiltration Controls 1.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=171.25' (Free Discharge)
↑—**1=Culvert** (Controls 0.00 cfs)
  ↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

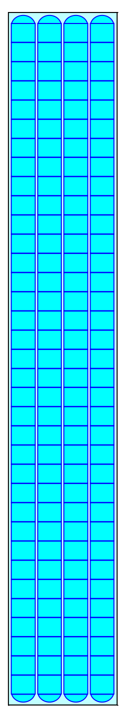
35 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 236.17' Row Length +12.0" End Stone x 2 = 238.18' Base Length
4 Rows x 100.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 37.58' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

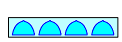
140 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 4 Rows = 24,938.6 cf Chamber Storage

60,422.0 cf Field - 24,938.6 cf Chambers = 35,483.4 cf Stone x 40.0% Voids = 14,193.4 cf Stone Storage

Chamber Storage + Stone Storage = 39,132.0 cf = 0.898 af
Overall Storage Efficiency = 64.8%
Overall System Size = 238.18' x 37.58' x 6.75'

140 Chambers
2,237.9 cy Field
1,314.2 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field B

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

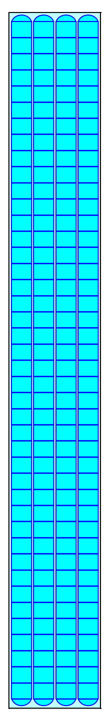
42 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 282.32' Row Length +12.0" End Stone x 2 = 284.32' Base Length
4 Rows x 100.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 37.58' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

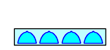
168 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 4 Rows = 29,863.1 cf Chamber Storage

72,127.6 cf Field - 29,863.1 cf Chambers = 42,264.5 cf Stone x 40.0% Voids = 16,905.8 cf Stone Storage

Chamber Storage + Stone Storage = 46,768.9 cf = 1.074 af
Overall Storage Efficiency = 64.8%
Overall System Size = 284.32' x 37.58' x 6.75'

168 Chambers
2,671.4 cy Field
1,565.4 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field C

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

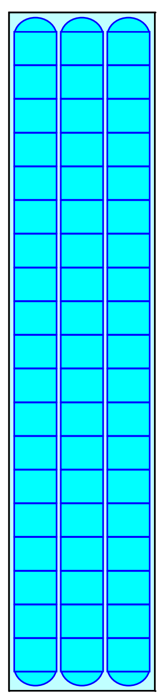
19 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 130.71' Row Length +12.0" End Stone x 2 = 132.71' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

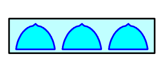
57 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 3 Rows = 10,261.9 cf Chamber Storage

25,529.8 cf Field - 10,261.9 cf Chambers = 15,267.9 cf Stone x 40.0% Voids = 6,107.1 cf Stone Storage

Chamber Storage + Stone Storage = 16,369.1 cf = 0.376 af
Overall Storage Efficiency = 64.1%
Overall System Size = 132.71' x 28.50' x 6.75'

57 Chambers
945.5 cy Field
565.5 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field D

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

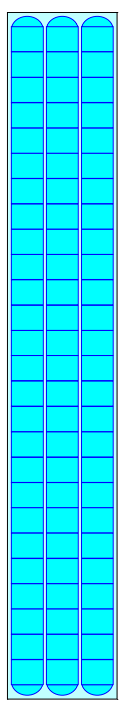
26 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 176.85' Row Length +12.0" End Stone x 2 = 178.85' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

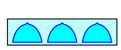
78 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 3 Rows = 13,955.3 cf Chamber Storage

34,406.3 cf Field - 13,955.3 cf Chambers = 20,451.0 cf Stone x 40.0% Voids = 8,180.4 cf Stone Storage

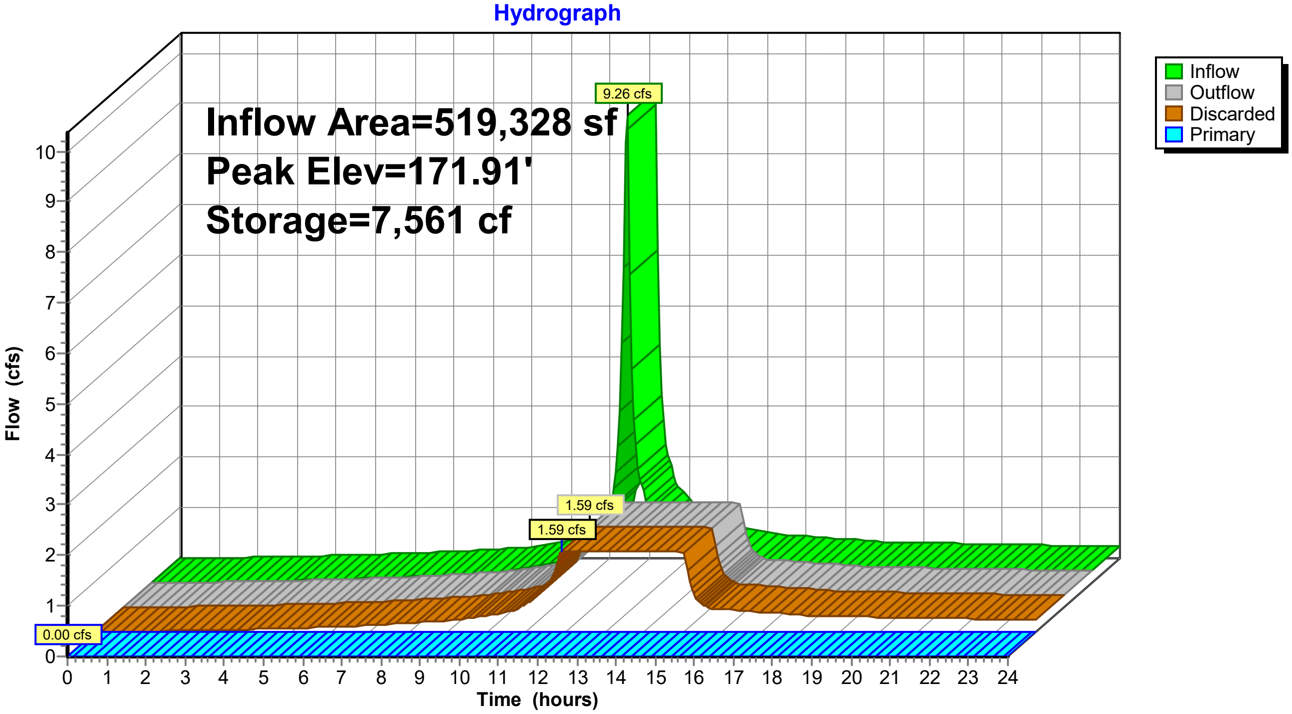
Chamber Storage + Stone Storage = 22,135.7 cf = 0.508 af
Overall Storage Efficiency = 64.3%
Overall System Size = 178.85' x 28.50' x 6.75'

78 Chambers
1,274.3 cy Field
757.4 cy Stone





Pond 3P: Underground Infiltration System 1



Summary for Pond 4P: Existing Ditch 1

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 193.00' @ 0.00 hrs Surf.Area= 30 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

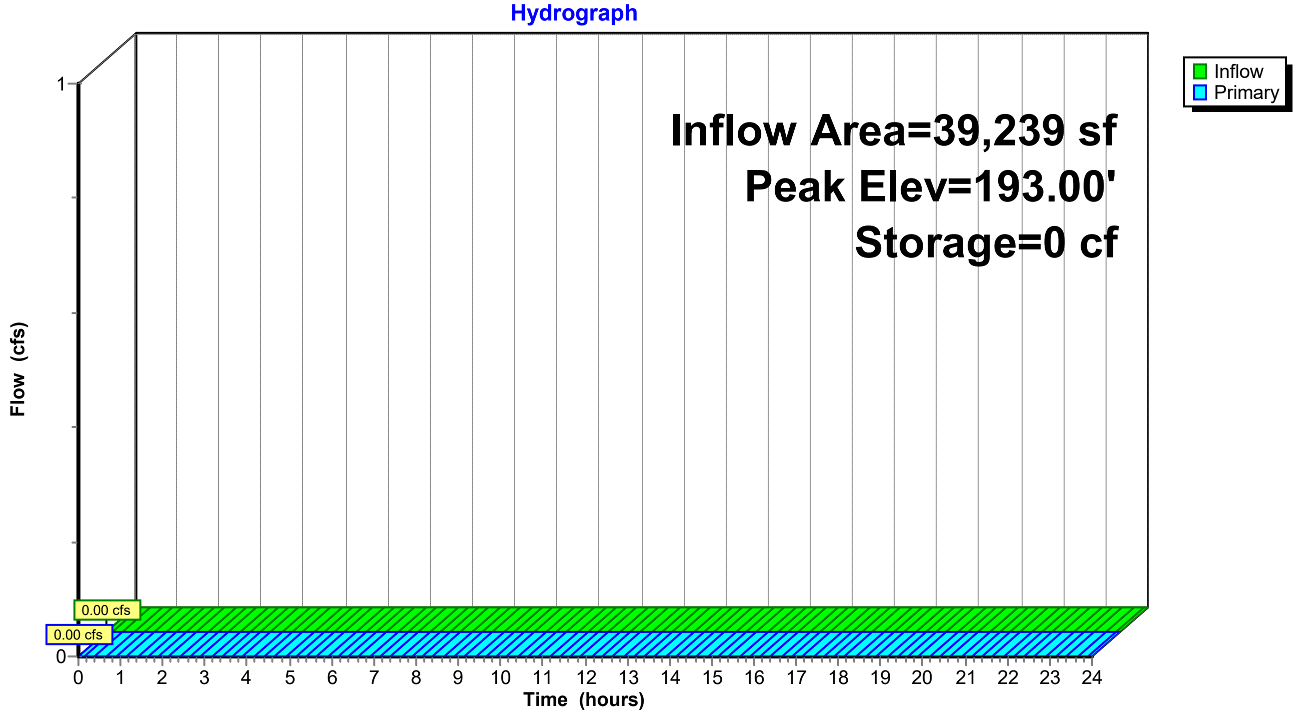
Volume	Invert	Avail.Storage	Storage Description
#1	193.00'	17,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.00	30	0	0
194.00	1,087	559	559
195.00	2,356	1,722	2,280
196.00	3,959	3,158	5,438
197.00	5,956	4,958	10,395
198.00	8,319	7,138	17,533

Device	Routing	Invert	Outlet Devices
#1	Primary	197.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=193.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Existing Ditch 1



Summary for Pond 5P: Infiltration Basin 3

[92] Warning: Device #1 is above defined storage

Inflow Area =	319,050 sf, 31.59% Impervious,	Inflow Depth > 0.17"	for 2-Year event
Inflow =	0.18 cfs @ 13.04 hrs, Volume=	4,446 cf	
Outflow =	0.10 cfs @ 17.62 hrs, Volume=	3,554 cf, Atten= 45%, Lag= 275.3 min	
Discarded =	0.10 cfs @ 17.62 hrs, Volume=	3,554 cf	
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0 cf	

Routed to Pond 2P : Infiltration Basin 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 169.49' @ 17.62 hrs Surf.Area= 1,762 sf Storage= 1,038 cf

Plug-Flow detention time= 150.2 min calculated for 3,546 cf (80% of inflow)
Center-of-Mass det. time= 73.8 min (1,119.4 - 1,045.6)

Volume	Invert	Avail.Storage	Storage Description
#1	167.25'	98,738 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

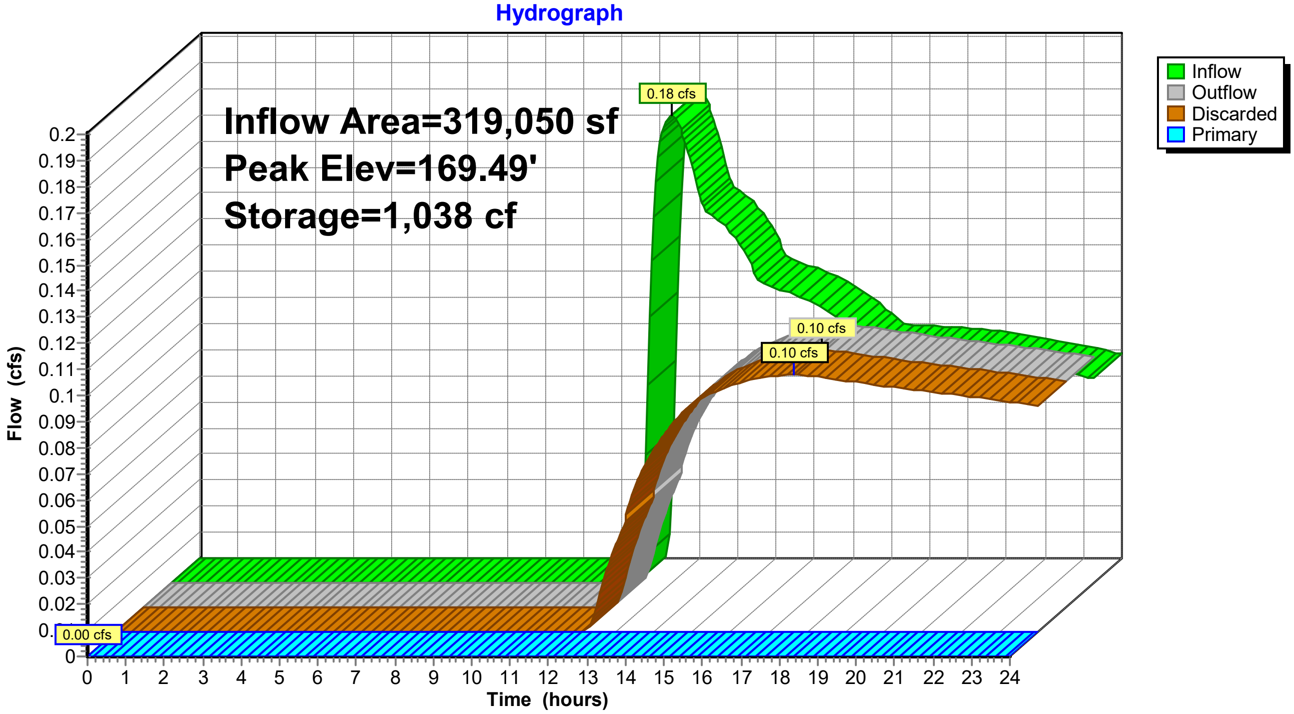
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.25	10	10.0	0	0	10
168.00	123	56.0	42	42	253
169.00	749	153.0	392	434	1,870
170.00	3,236	269.0	1,847	2,281	5,771
171.00	6,972	361.0	4,986	7,267	10,394
172.00	11,470	482.0	9,128	16,395	18,522
173.00	16,453	631.0	13,887	30,282	31,730
174.00	20,831	887.0	18,599	48,881	62,664
175.00	25,123	931.0	22,944	71,825	69,094
176.00	28,744	1,007.0	26,913	98,738	80,855

Device	Routing	Invert	Outlet Devices
#1	Primary	179.00'	**20.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	167.25'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.10 cfs @ 17.62 hrs HW=169.49' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=167.25' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Infiltration Basin 3



Summary for Pond 12P: Drainage Easement Ditch

Inflow Area = 313,450 sf, 49.57% Impervious, Inflow Depth > 0.76" for 2-Year event
Inflow = 4.47 cfs @ 12.21 hrs, Volume= 19,750 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 180.89' @ 24.00 hrs Surf.Area= 6,262 sf Storage= 19,735 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

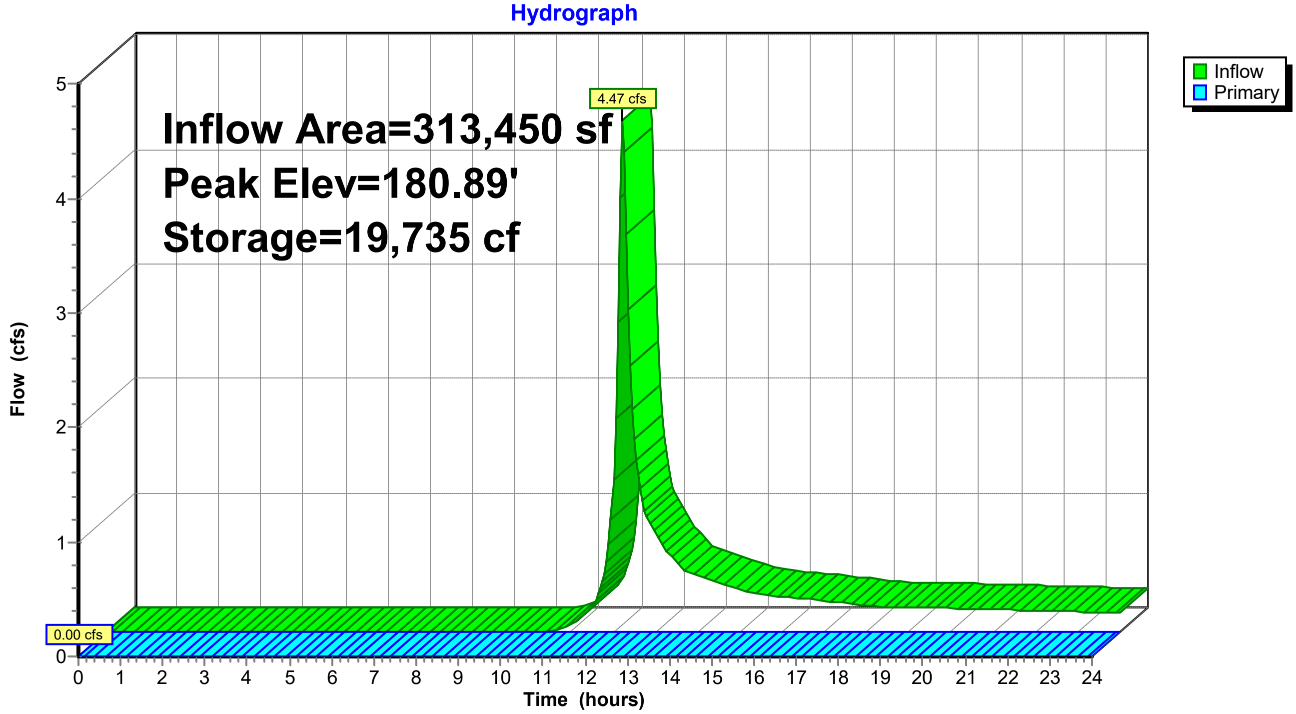
Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	223,106 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
175.00	395	0	0
176.00	1,346	871	871
177.00	2,592	1,969	2,840
178.00	3,425	3,009	5,848
179.00	4,340	3,883	9,731
180.00	5,326	4,833	14,564
181.00	6,375	5,851	20,414
182.00	7,498	6,937	27,351
183.00	8,708	8,103	35,454
184.00	10,008	9,358	44,812
185.00	11,390	10,699	55,511
186.00	12,859	12,125	67,635
187.00	14,373	13,616	81,251
188.00	15,934	15,154	96,405
189.00	17,547	16,741	113,145
190.00	19,261	18,404	131,549
191.00	21,004	20,133	151,682
192.00	22,805	21,905	173,586
193.00	24,735	23,770	197,356
194.00	26,764	25,750	223,106

Device	Routing	Invert	Outlet Devices
#1	Primary	193.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12P: Drainage Easement Ditch

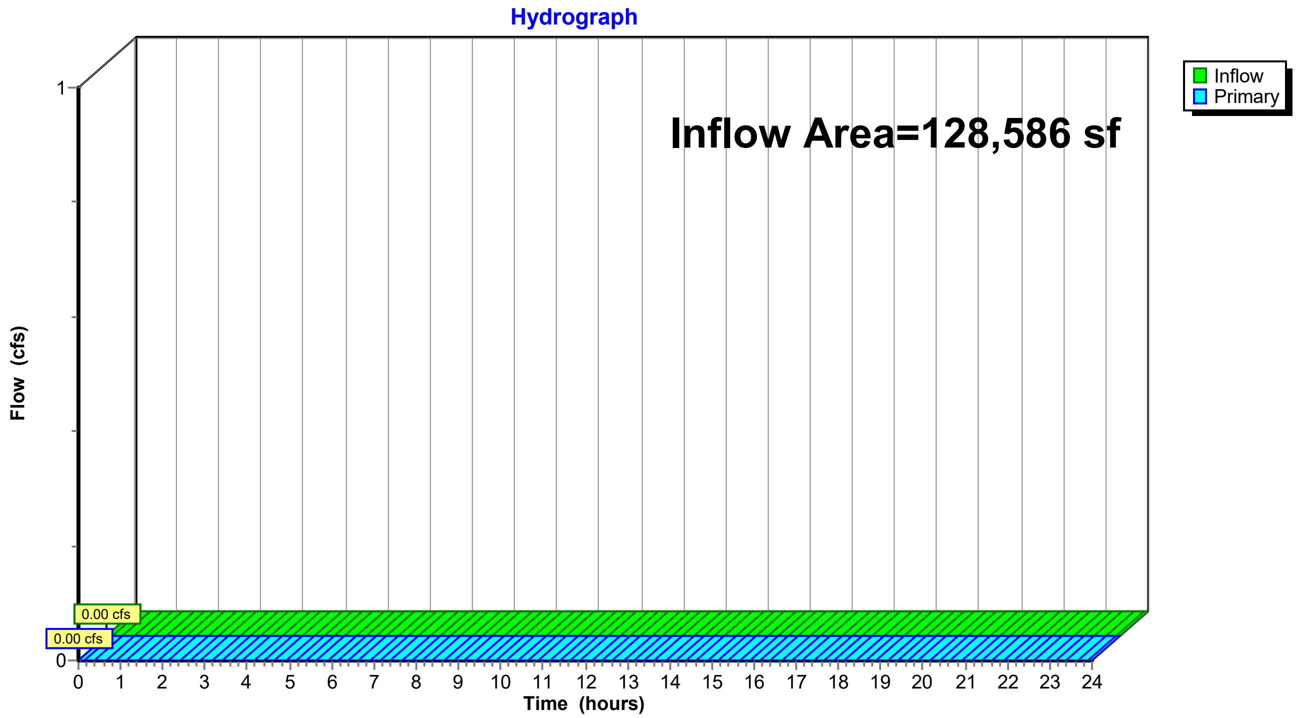


Summary for Link SP1: Study Point 1

Inflow Area = 128,586 sf, 50.28% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP1: Study Point 1

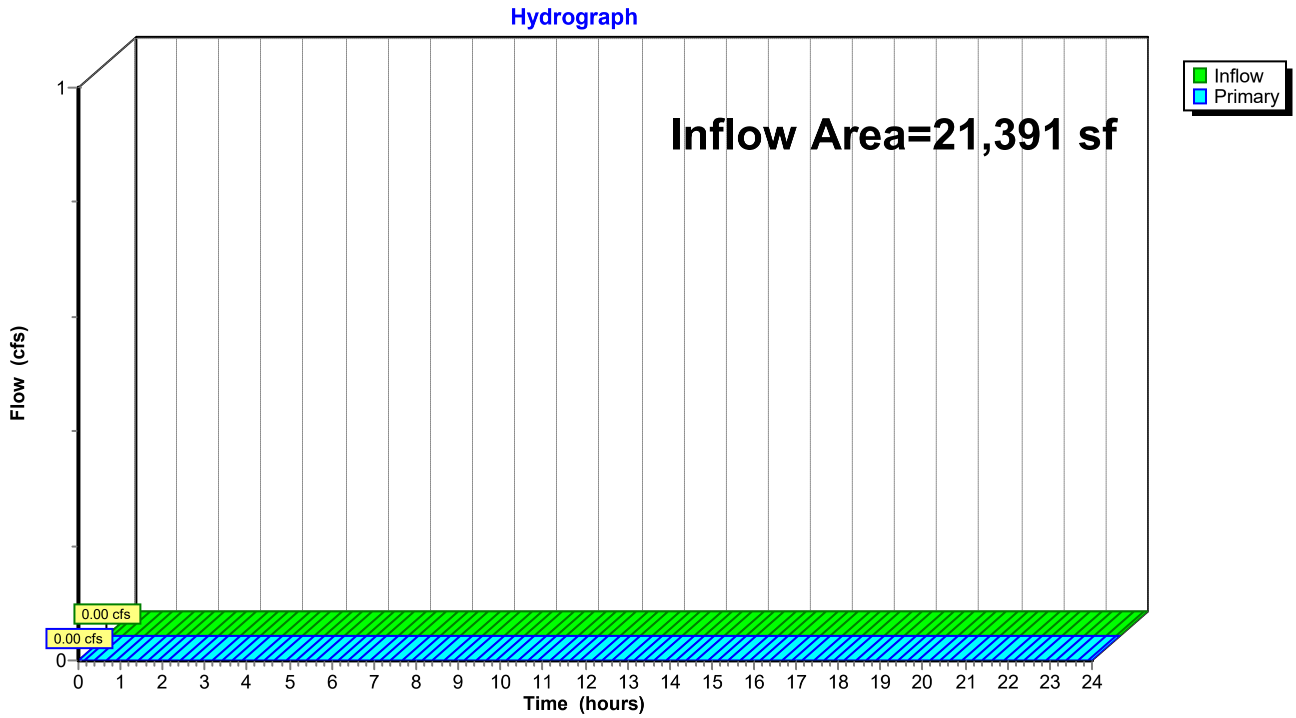


Summary for Link SP2: Study Point 2

Inflow Area = 21,391 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP2: Study Point 2

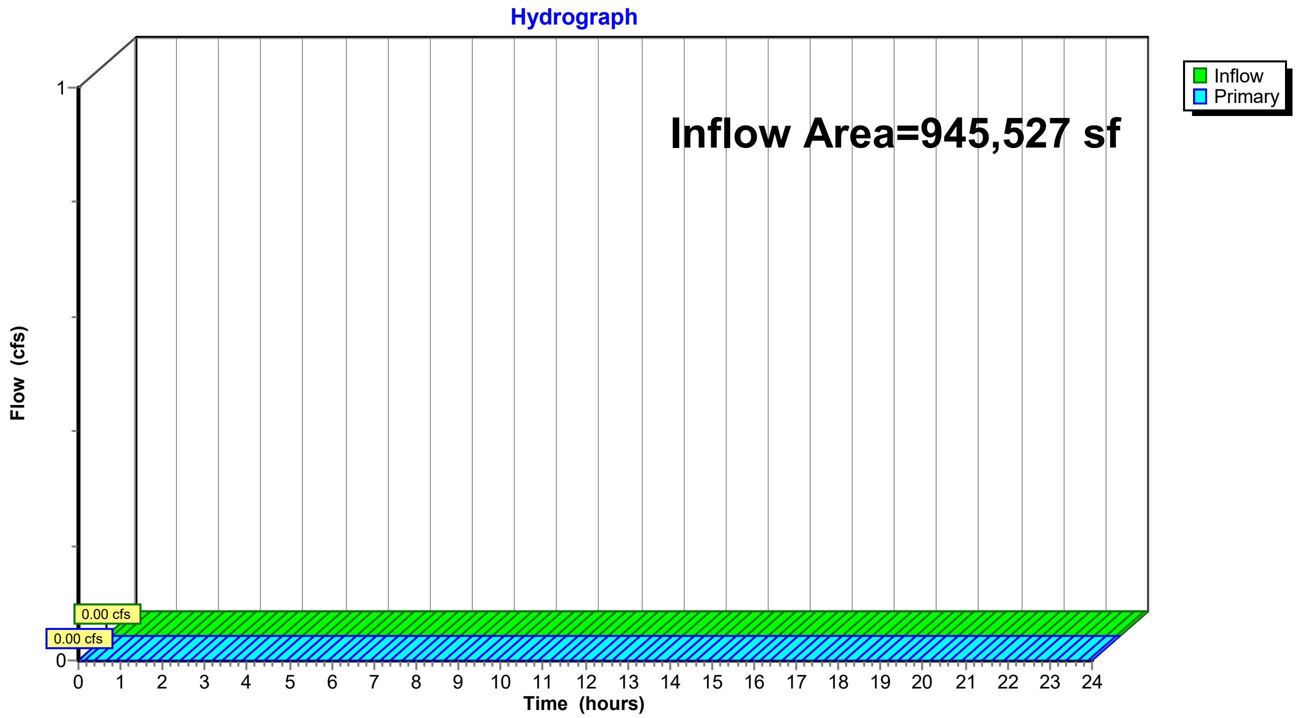


Summary for Link SP3: Study Point 3

Inflow Area = 945,527 sf, 40.09% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP3: Study Point 3

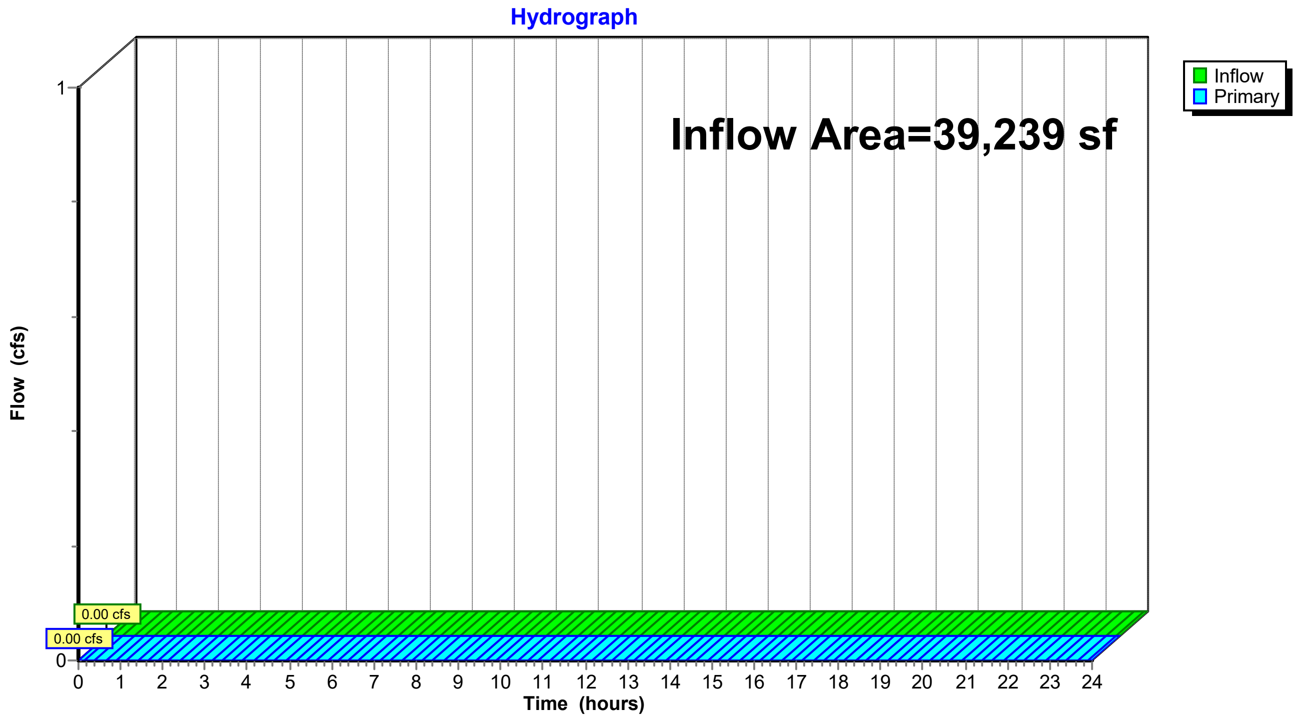


Summary for Link SP4: Study Point 4

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP4: Study Point 4

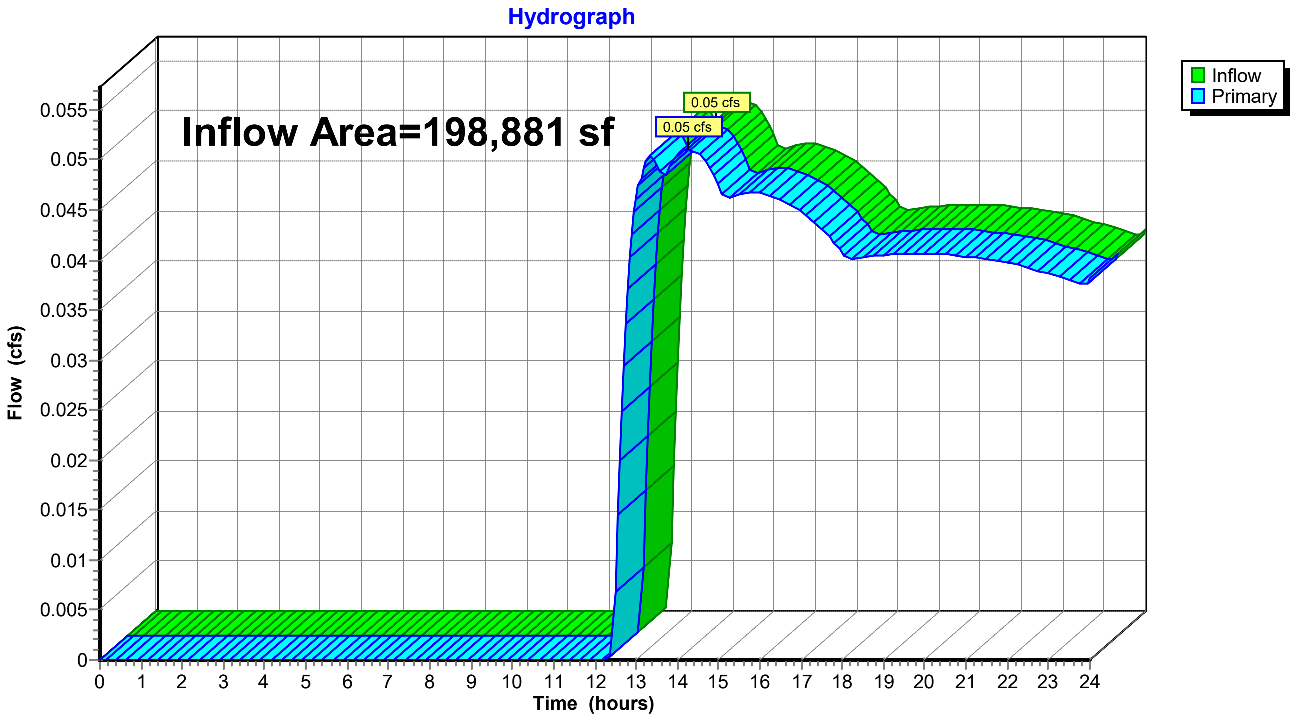


Summary for Link SP5: Study Point 5

Inflow Area = 198,881 sf, 26.41% Impervious, Inflow Depth > 0.11" for 2-Year event
Inflow = 0.05 cfs @ 14.25 hrs, Volume= 1,766 cf
Primary = 0.05 cfs @ 14.25 hrs, Volume= 1,766 cf, Atten= 0%, Lag= 0.0 min

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

Link SP5: Study Point 5

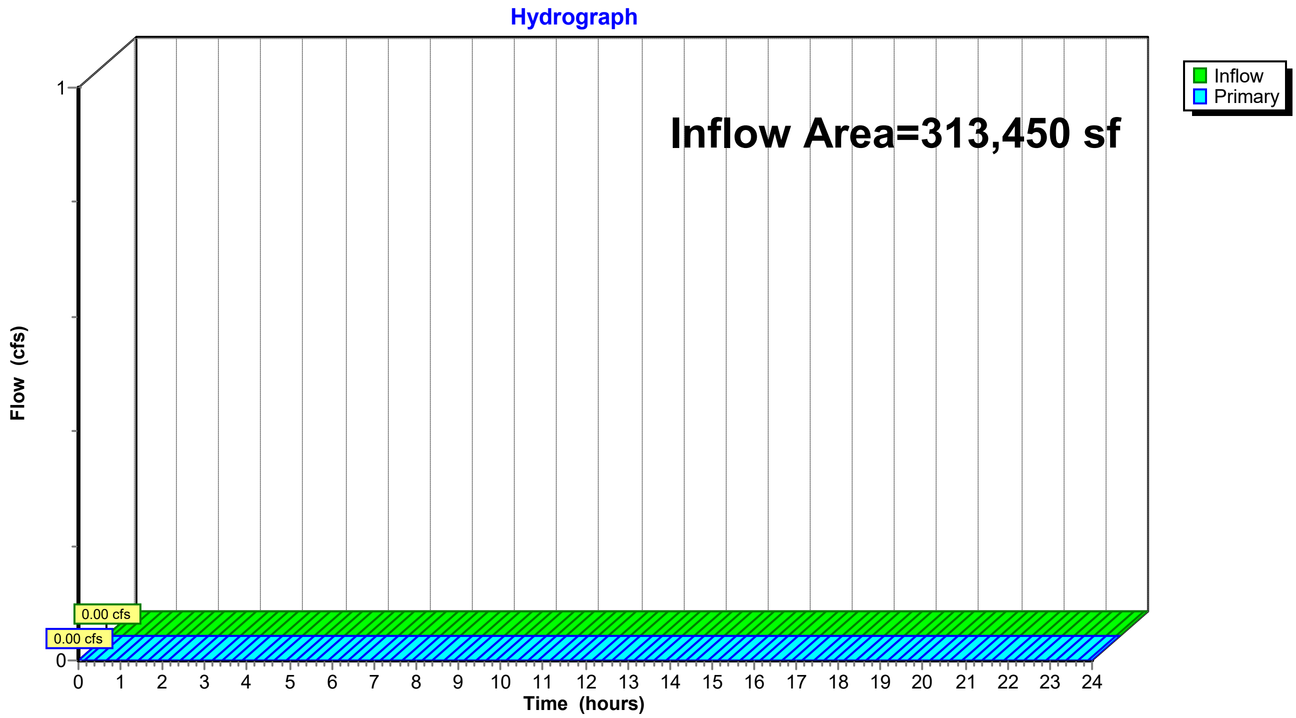


Summary for Link SP6: Study Point 6

Inflow Area = 313,450 sf, 49.57% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP6: Study Point 6



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 P-1: Subcat P-1 Runoff Area=22,598 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P-10: Subcat P-10 Runoff Area=81,309 sf 89.65% Impervious Runoff Depth>3.74"
Tc=6.0 min CN=92 Runoff=7.04 cfs 25,365 cf

Subcatchment P-11: Subcat P-11 Runoff Area=47,527 sf 87.57% Impervious Runoff Depth>3.64"
Tc=6.0 min CN=91 Runoff=4.04 cfs 14,411 cf

Subcatchment P-12: Subcat P-12 Runoff Area=77,507 sf 51.21% Impervious Runoff Depth>1.70"
Tc=6.0 min CN=69 Runoff=3.23 cfs 11,005 cf

Subcatchment P-13: Subcat P-13 Runoff Area=25,981 sf 100.00% Impervious Runoff Depth>4.41"
Tc=6.0 min CN=98 Runoff=2.42 cfs 9,546 cf

Subcatchment P-14: Subcat P-14 Runoff Area=22,568 sf 100.00% Impervious Runoff Depth>4.41"
Tc=6.0 min CN=98 Runoff=2.11 cfs 8,292 cf

Subcatchment P-15: Subcat P-15 Runoff Area=33,657 sf 100.00% Impervious Runoff Depth>4.41"
Tc=6.0 min CN=98 Runoff=3.14 cfs 12,367 cf

Subcatchment P-16: Subcat P-16 Runoff Area=17,787 sf 100.00% Impervious Runoff Depth>4.41"
Tc=6.0 min CN=98 Runoff=1.66 cfs 6,536 cf

Subcatchment P-17: Subcat P-17 Runoff Area=21,272 sf 65.59% Impervious Runoff Depth>2.16"
Tc=6.0 min CN=75 Runoff=1.14 cfs 3,838 cf

Subcatchment P-18: Subcat P-18 Runoff Area=40,673 sf 12.88% Impervious Runoff Depth>0.23"
Tc=6.0 min CN=42 Runoff=0.03 cfs 766 cf

Subcatchment P-19: Subcat P-19 Runoff Area=81,428 sf 11.42% Impervious Runoff Depth>0.13"
Tc=6.0 min UI Adjusted CN=39 Runoff=0.03 cfs 910 cf

Subcatchment P-2: Subcat P-2 Runoff Area=21,391 sf 0.00% Impervious Runoff Depth>0.00"
Flow Length=168' Tc=8.3 min CN=31 Runoff=0.00 cfs 3 cf

Subcatchment P-20: Subcat P-20 Runoff Area=53,066 sf 2.40% Impervious Runoff Depth>0.08"
Tc=0.0 min CN=37 Runoff=0.01 cfs 375 cf

Subcatchment P-3: Subcat P-3 Runoff Area=10,242 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=350' Slope=0.0100 '/' Tc=17.6 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P-4: Subcat P-4 Runoff Area=39,239 sf 0.00% Impervious Runoff Depth=0.00"
Tc=0.0 min CN=30 Runoff=0.00 cfs 0 cf

Subcatchment P-5: Subcat P-5 Runoff Area=198,881 sf 26.41% Impervious Runoff Depth>0.55"
Tc=6.0 min UI Adjusted CN=50 Runoff=1.62 cfs 9,172 cf

Subcatchment P-6: Subcat P-6 Runoff Area=260,840 sf 59.51% Impervious Runoff Depth>2.00"
Flow Length=226' Tc=12.3 min CN=73 Runoff=10.39 cfs 43,497 cf

Subcatchment P-7: Subcat P-7 Runoff Area=52,610 sf 0.28% Impervious Runoff Depth>0.00"
Tc=6.0 min CN=31 Runoff=0.00 cfs 7 cf

Subcatchment P-8: Subcat P-8 Runoff Area=319,050 sf 31.59% Impervious Runoff Depth>0.70"
Flow Length=452' Tc=19.4 min CN=53 Runoff=2.49 cfs 18,521 cf

Subcatchment P-9: Subcat P-9 Runoff Area=219,446 sf 26.87% Impervious Runoff Depth>0.70"
Tc=6.0 min CN=53 Runoff=2.83 cfs 12,847 cf

Reach 6R: VEGETATED SWALE Avg. Flow Depth=0.05' Max Vel=1.08 fps Inflow=0.03 cfs 910 cf
n=0.030 L=325.0' S=0.0394 '/' Capacity=48.93 cfs Outflow=0.03 cfs 897 cf

Pond 1P: Infiltration Basin 1 Peak Elev=174.59' Storage=7,666 cf Inflow=5.70 cfs 21,713 cf
Discarded=0.43 cfs 21,630 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.43 cfs 21,630 cf

Pond 2P: Infiltration Basin 2 Peak Elev=175.99' Storage=3,285 cf Inflow=3.25 cfs 12,505 cf
Discarded=0.39 cfs 12,455 cf Primary=0.00 cfs 0 cf Outflow=0.39 cfs 12,455 cf

Pond 3P: Underground Infiltration Peak Elev=172.53' Storage=21,741 cf Inflow=18.57 cfs 72,028 cf
Discarded=1.59 cfs 71,773 cf Primary=0.00 cfs 0 cf Outflow=1.59 cfs 71,773 cf

Pond 4P: Existing Ditch 1 Peak Elev=193.00' Storage=0 cf Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Pond 5P: Infiltration Basin 3 Peak Elev=170.90' Storage=6,584 cf Inflow=2.49 cfs 18,521 cf
Discarded=0.36 cfs 13,911 cf Primary=0.00 cfs 0 cf Outflow=0.36 cfs 13,911 cf

Pond 12P: Drainage Easement Ditch Peak Elev=183.86' Storage=43,471 cf Inflow=10.39 cfs 43,504 cf
Outflow=0.00 cfs 0 cf

Link SP1: Study Point 1 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP2: Study Point 2 Inflow=0.00 cfs 3 cf
Primary=0.00 cfs 3 cf

Link SP3: Study Point 3 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP4: Study Point 4 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP5: Study Point 5 Inflow=1.62 cfs 9,172 cf
Primary=1.62 cfs 9,172 cf

Link SP6: Study Point 6 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,647,074 sf Runoff Volume = 177,458 cf Average Runoff Depth = 1.29"
60.44% Pervious = 995,478 sf 39.56% Impervious = 651,596 sf

Summary for Subcatchment P-1: Subcat P-1

[45] Hint: Runoff=Zero

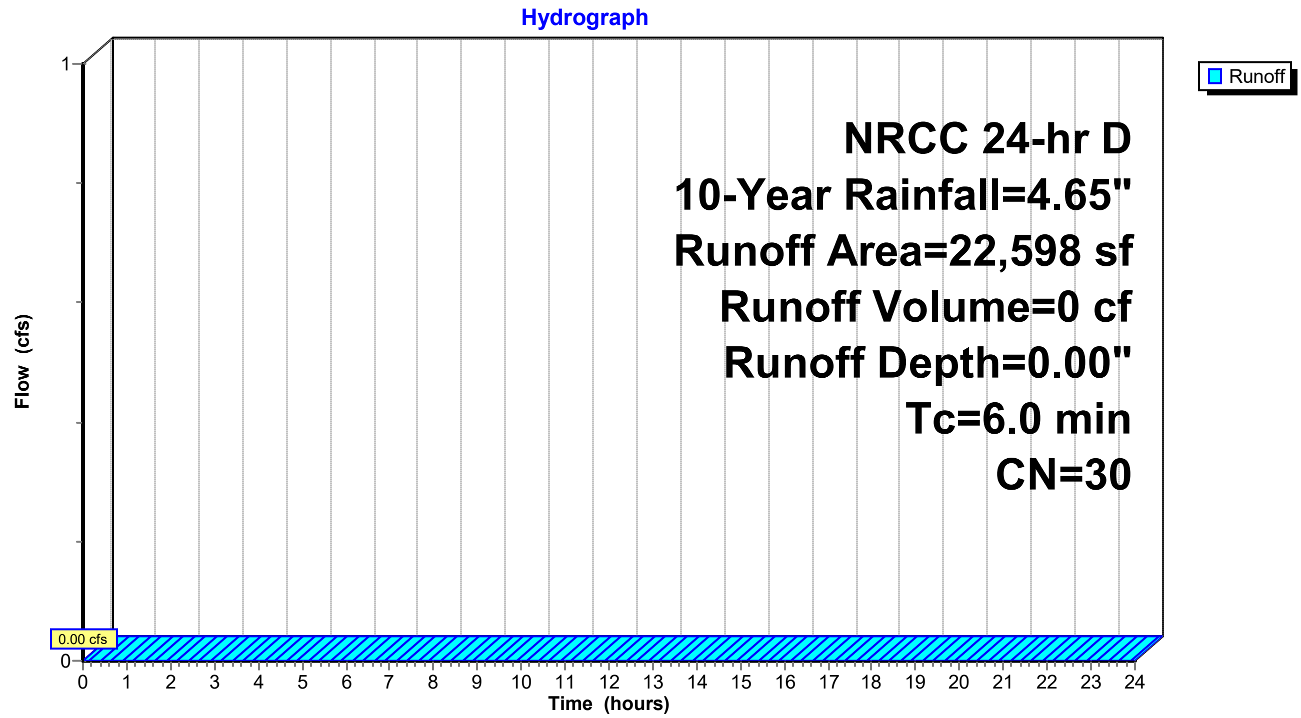
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
22,598	30	Woods, Good, HSG A
22,598		100.00% Pervious Area

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

Subcatchment P-1: Subcat P-1



Summary for Subcatchment P-10: Subcat P-10

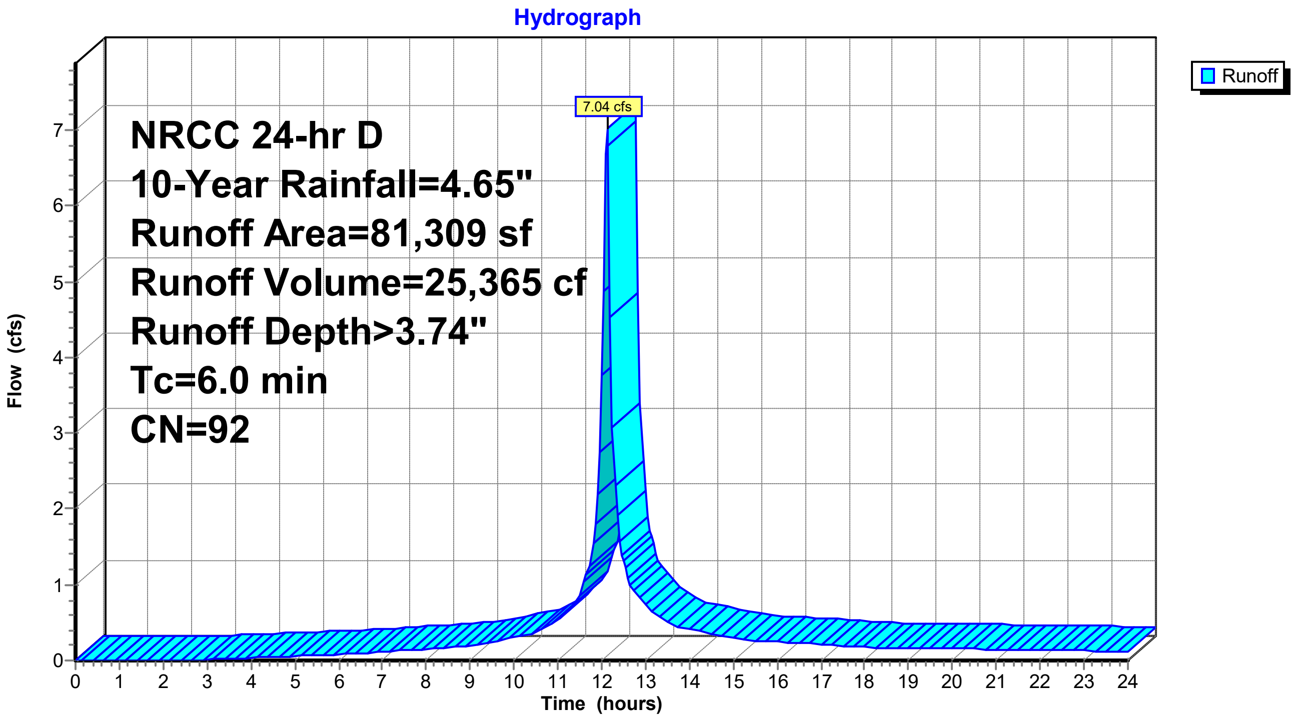
Runoff = 7.04 cfs @ 12.13 hrs, Volume= 25,365 cf, Depth> 3.74"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
72,894	98	Paved parking, HSG A
366	39	>75% Grass cover, Good, HSG A
158	39	>75% Grass cover, Good, HSG A
225	39	>75% Grass cover, Good, HSG A
204	39	>75% Grass cover, Good, HSG A
589	39	>75% Grass cover, Good, HSG A
450	39	>75% Grass cover, Good, HSG A
158	39	>75% Grass cover, Good, HSG A
71	39	>75% Grass cover, Good, HSG A
313	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
2	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
1,184	39	>75% Grass cover, Good, HSG A
969	39	>75% Grass cover, Good, HSG A
465	39	>75% Grass cover, Good, HSG A
2,238	39	>75% Grass cover, Good, HSG A
81,309	92	Weighted Average
8,415		10.35% Pervious Area
72,894		89.65% Impervious Area

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

Subcatchment P-10: Subcat P-10



Summary for Subcatchment P-11: Subcat P-11

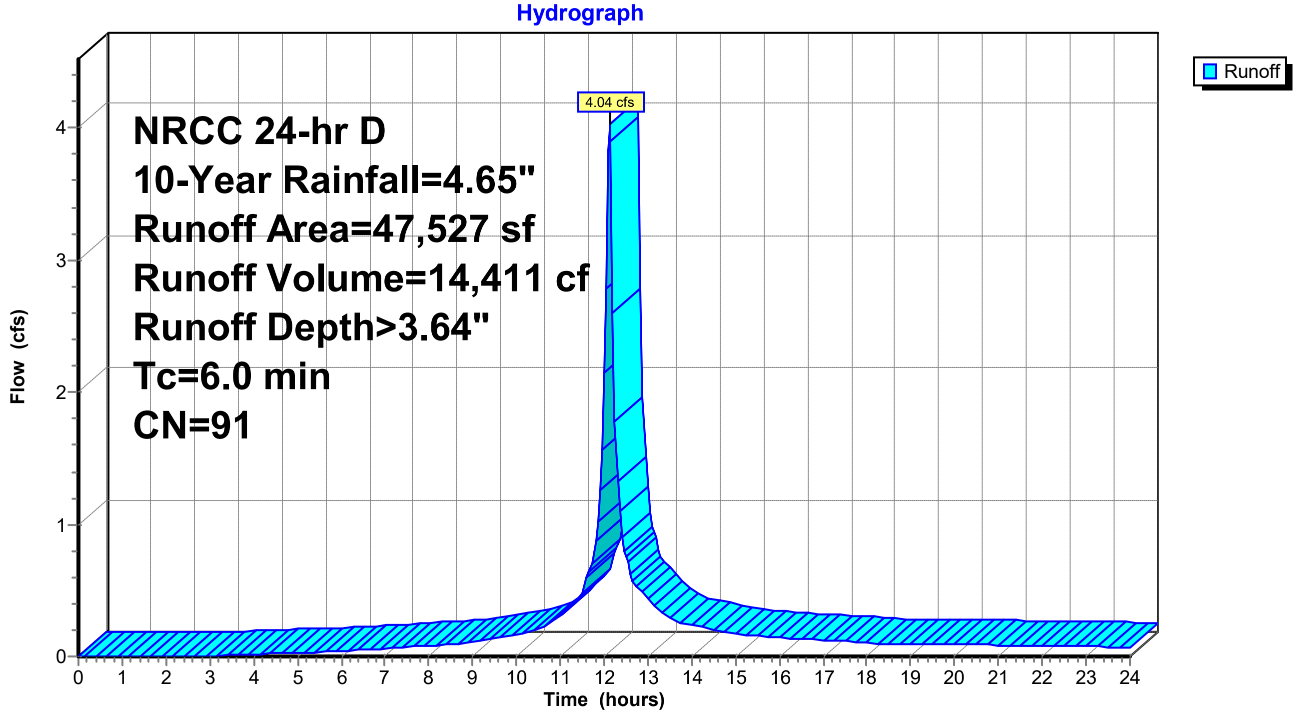
Runoff = 4.04 cfs @ 12.13 hrs, Volume= 14,411 cf, Depth> 3.64"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
41,622	98	Paved parking, HSG A
96	39	>75% Grass cover, Good, HSG A
527	39	>75% Grass cover, Good, HSG A
162	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
492	39	>75% Grass cover, Good, HSG A
2,498	39	>75% Grass cover, Good, HSG A
314	39	>75% Grass cover, Good, HSG A
944	39	>75% Grass cover, Good, HSG A
0	30	Woods, Good, HSG A
47,527	91	Weighted Average
5,906		12.43% Pervious Area
41,622		87.57% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

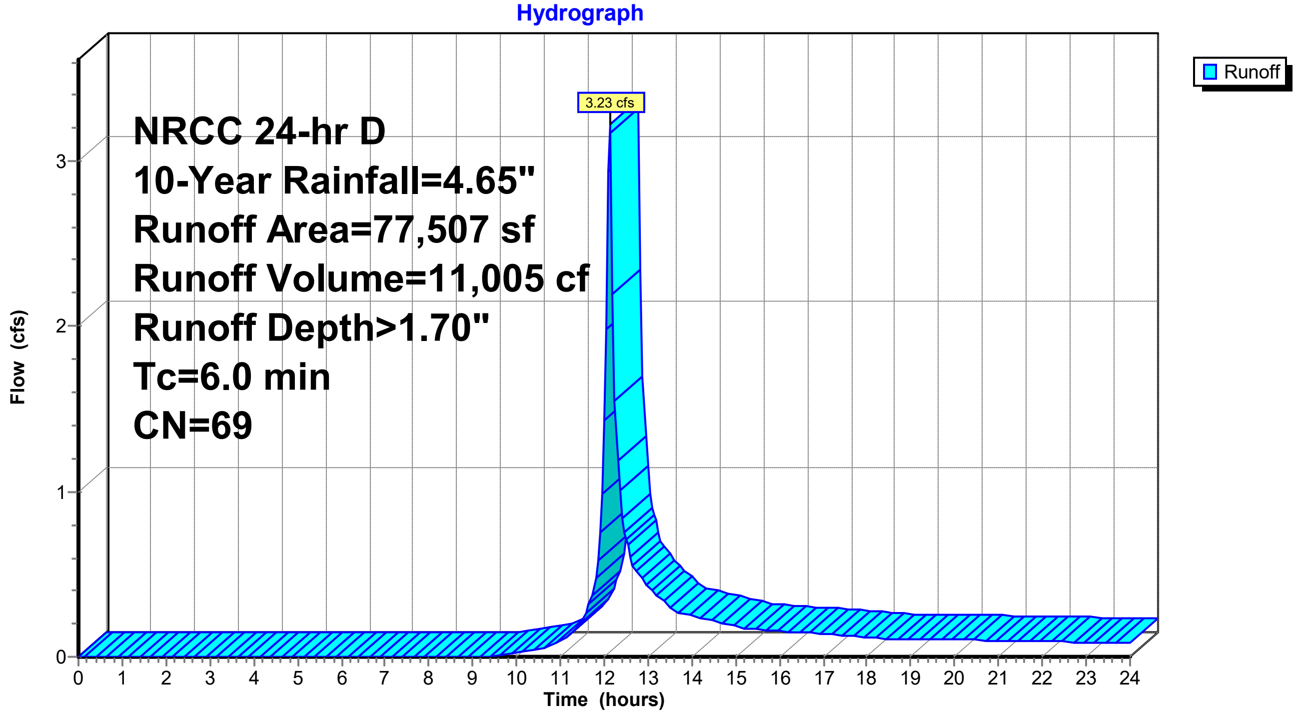
Runoff = 3.23 cfs @ 12.13 hrs, Volume= 11,005 cf, Depth> 1.70"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
0	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
4,403	39	>75% Grass cover, Good, HSG A
2,477	39	>75% Grass cover, Good, HSG A
1,191	39	>75% Grass cover, Good, HSG A
937	39	>75% Grass cover, Good, HSG A
173	39	>75% Grass cover, Good, HSG A
191	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
241	39	>75% Grass cover, Good, HSG A
507	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
200	39	>75% Grass cover, Good, HSG A
638	39	>75% Grass cover, Good, HSG A
442	39	>75% Grass cover, Good, HSG A
1,419	39	>75% Grass cover, Good, HSG A
1,858	39	>75% Grass cover, Good, HSG A
2,790	39	>75% Grass cover, Good, HSG A
1,695	39	>75% Grass cover, Good, HSG A
5,011	39	>75% Grass cover, Good, HSG A
90	39	>75% Grass cover, Good, HSG A
1,322	39	>75% Grass cover, Good, HSG A
1,414	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
1,339	39	>75% Grass cover, Good, HSG A
305	39	>75% Grass cover, Good, HSG A
3,810	39	>75% Grass cover, Good, HSG A
1,418	39	>75% Grass cover, Good, HSG A
349	39	>75% Grass cover, Good, HSG A
2,253	39	>75% Grass cover, Good, HSG A
39,692	98	Paved parking, HSG A
77,507	69	Weighted Average
37,815		48.79% Pervious Area
39,692		51.21% Impervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

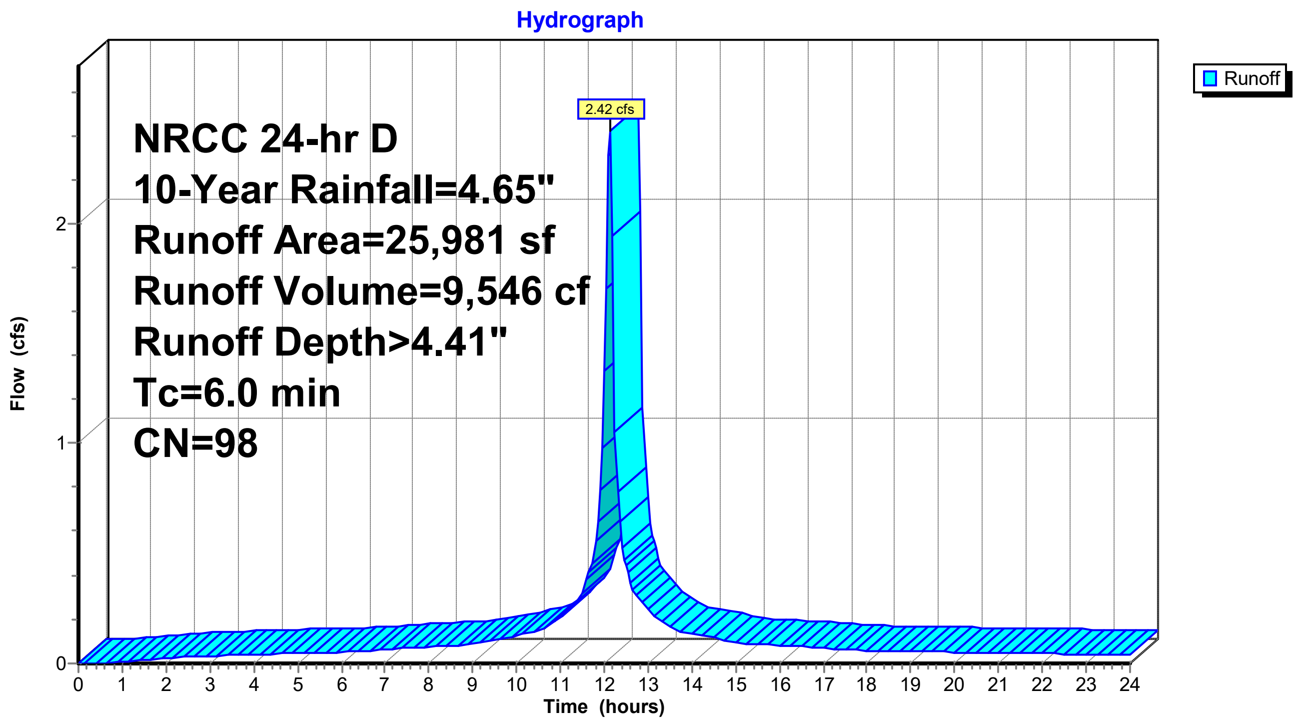
Runoff = 2.42 cfs @ 12.13 hrs, Volume= 9,546 cf, Depth> 4.41"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
25,981	98	Roofs, HSG A
25,981		100.00% Impervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

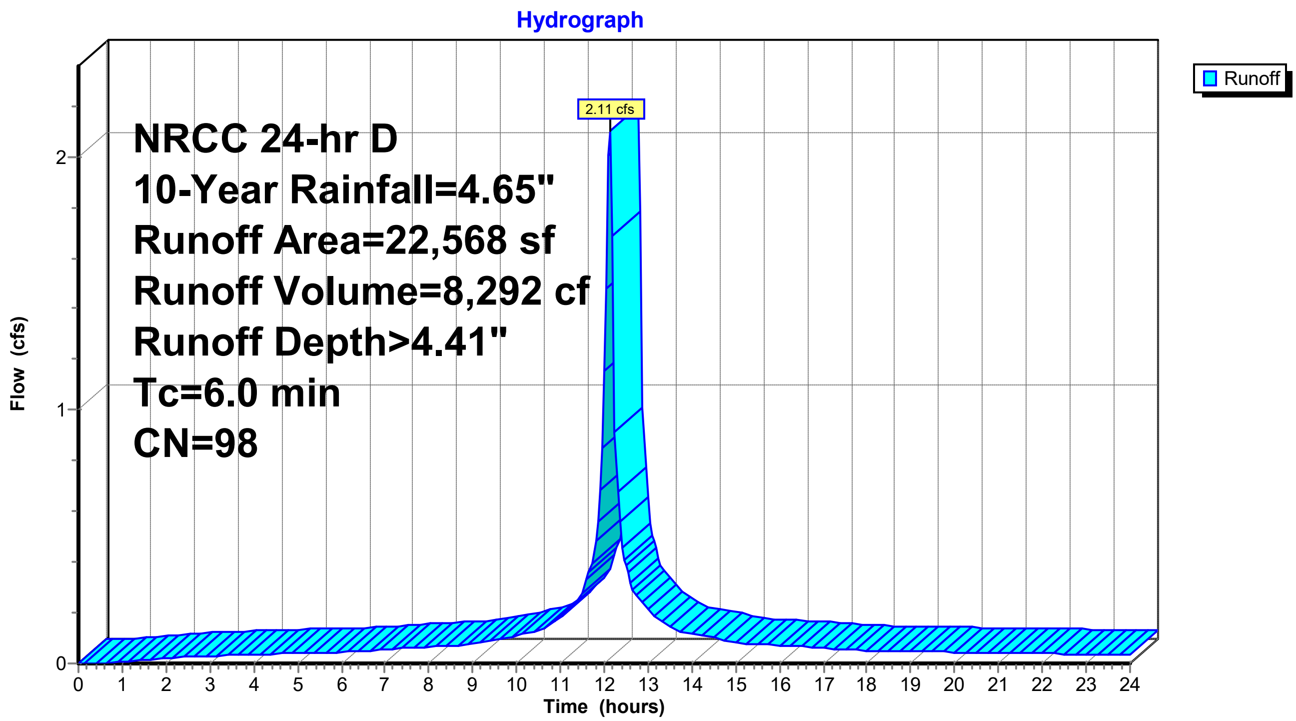
Runoff = 2.11 cfs @ 12.13 hrs, Volume= 8,292 cf, Depth> 4.41"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
22,568	98	Roofs, HSG A
22,568		100.00% Impervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

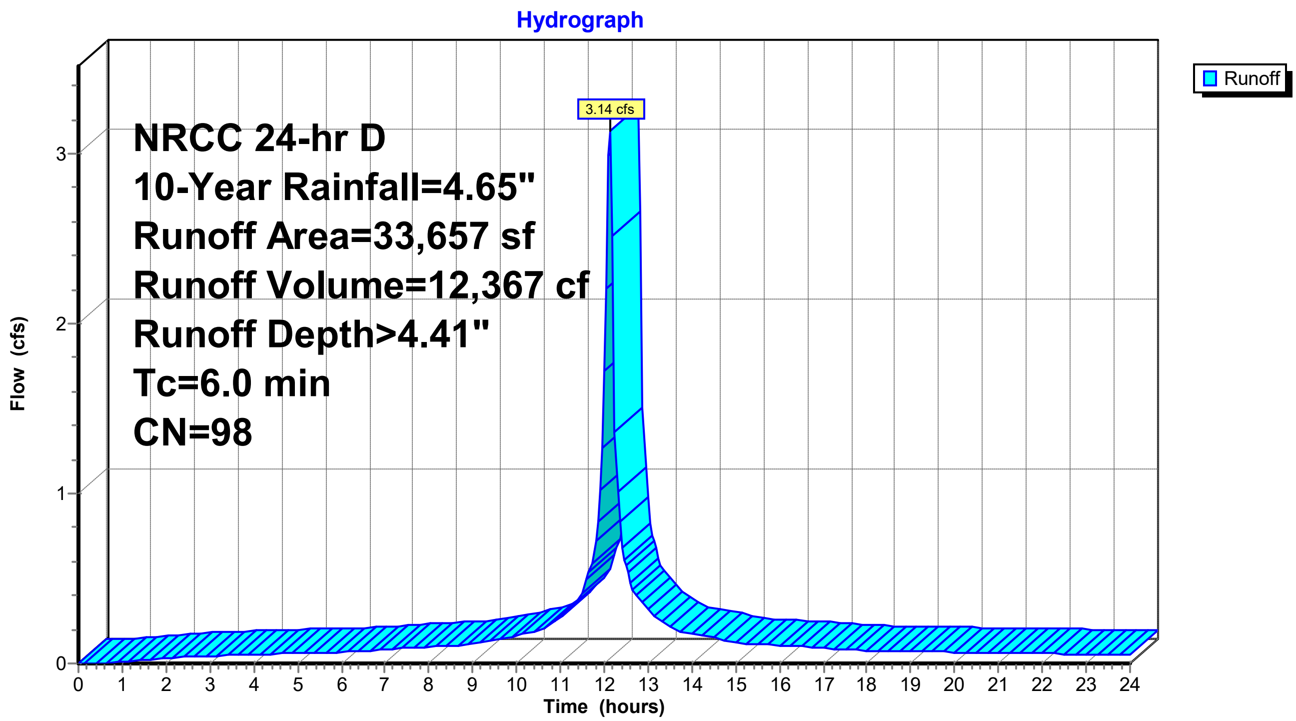
Runoff = 3.14 cfs @ 12.13 hrs, Volume= 12,367 cf, Depth> 4.41"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
33,657	98	Roofs, HSG A
33,657		100.00% Impervious Area

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

Subcatchment P-15: Subcat P-15



Summary for Subcatchment P-16: Subcat P-16

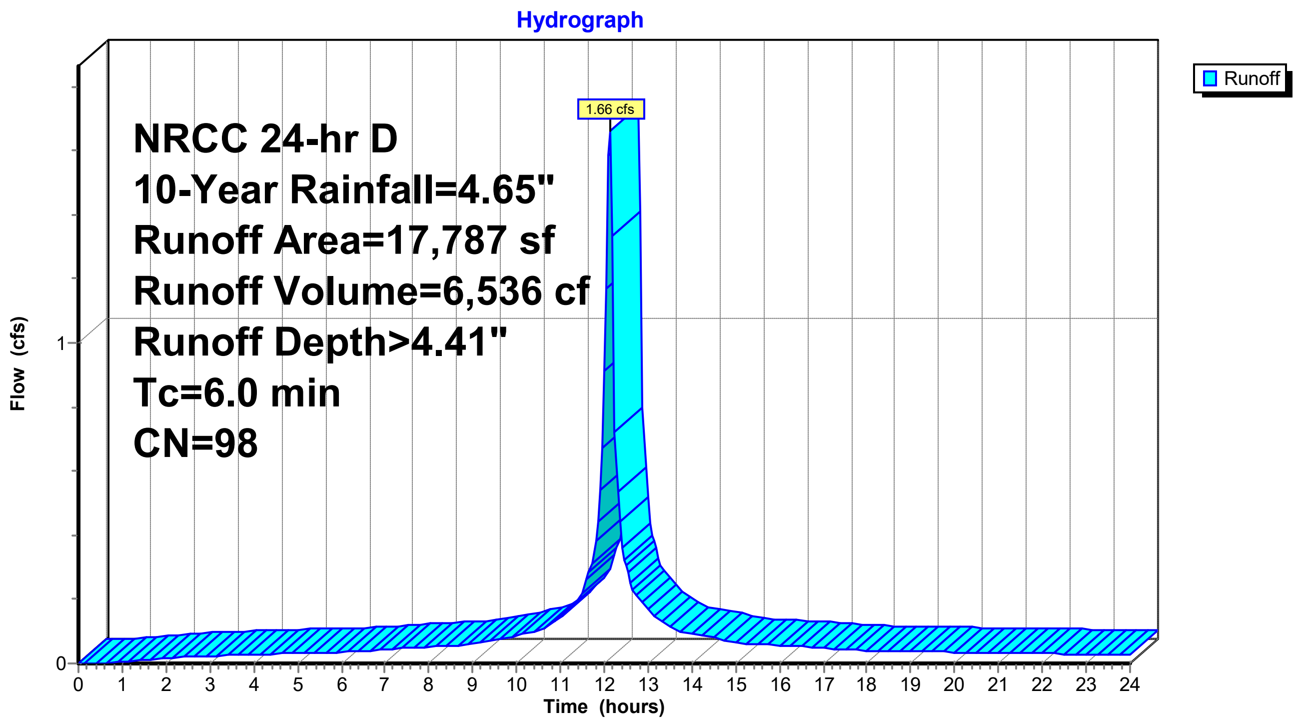
Runoff = 1.66 cfs @ 12.13 hrs, Volume= 6,536 cf, Depth> 4.41"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
17,787	98	Water Surface, HSG A
17,787		100.00% Impervious Area

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

Subcatchment P-16: Subcat P-16



Summary for Subcatchment P-17: Subcat P-17

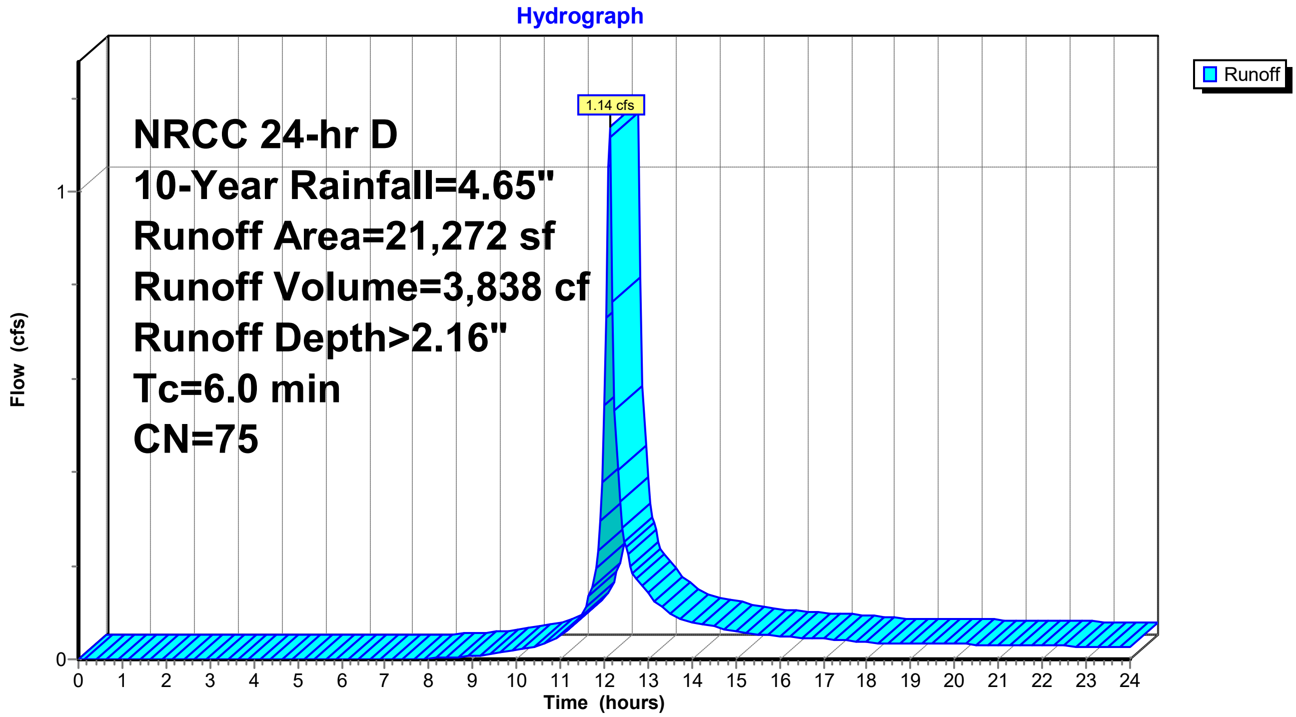
Runoff = 1.14 cfs @ 12.13 hrs, Volume= 3,838 cf, Depth> 2.16"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
13,951	98	Water Surface, HSG A
7,321	30	Woods, Good, HSG A
21,272	75	Weighted Average
7,321		34.41% Pervious Area
13,951		65.59% Impervious Area

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

Subcatchment P-17: Subcat P-17



Summary for Subcatchment P-18: Subcat P-18

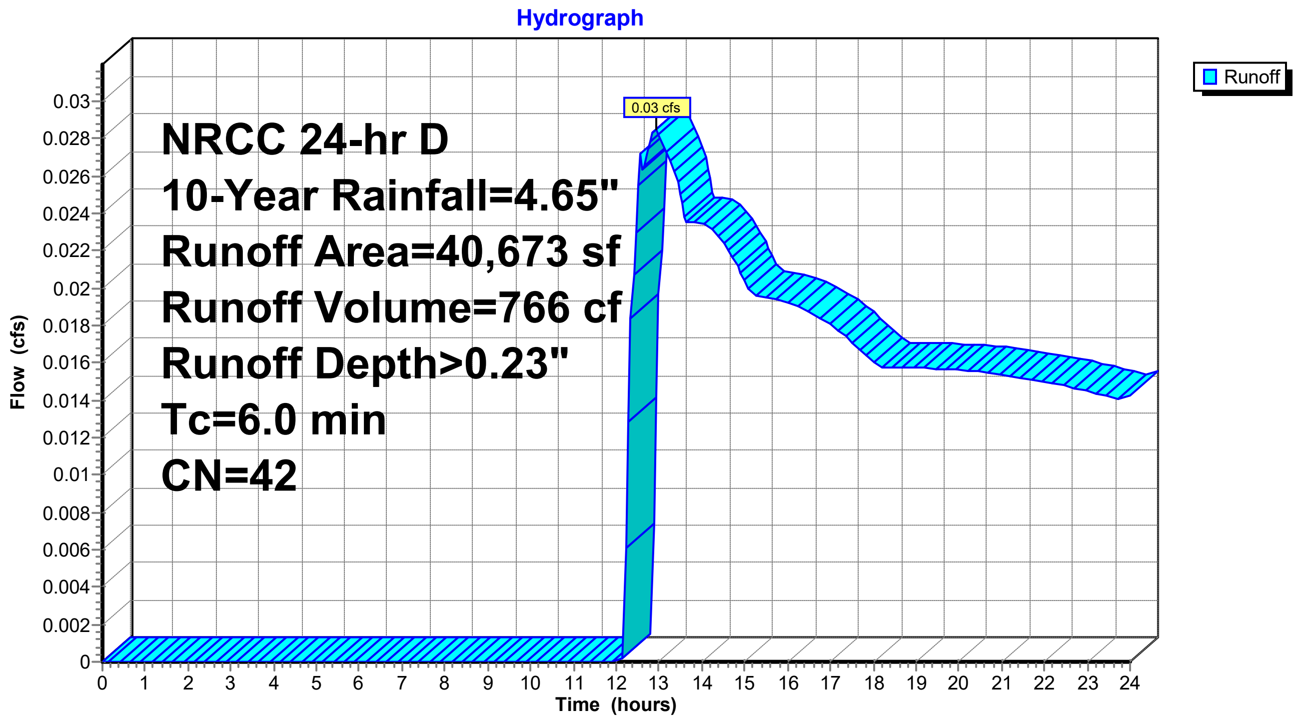
Runoff = 0.03 cfs @ 12.95 hrs, Volume= 766 cf, Depth> 0.23"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
20,962	54	1/2 acre lots, 25% imp, HSG A
0	98	Water Surface, HSG A
19,711	30	Woods, Good, HSG A
40,673	42	Weighted Average
35,433		87.12% Pervious Area
5,240		12.88% Impervious Area

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

Subcatchment P-18: Subcat P-18



Summary for Subcatchment P-19: Subcat P-19

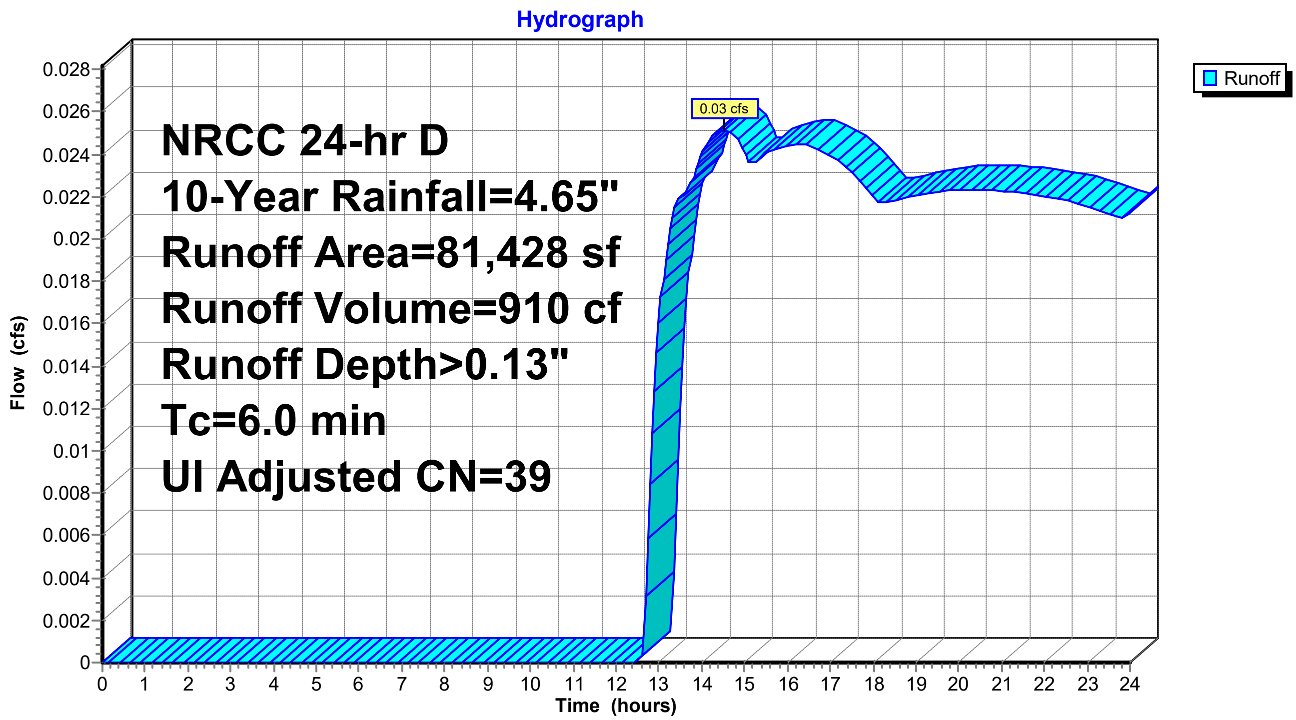
Runoff = 0.03 cfs @ 14.54 hrs, Volume= 910 cf, Depth> 0.13"
Routed to Reach 6R : VEGETATED SWALE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Adj	Description
28,826	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
6,878	39		>75% Grass cover, Good, HSG A
44	98		Unconnected pavement, HSG A
61	98		Unconnected pavement, HSG A
9,162	98		Unconnected pavement, HSG A
30	98		Unconnected pavement, HSG A
36,428	39		>75% Grass cover, Good, HSG A
81,428	43	39	Weighted Average, UI Adjusted
72,131			88.58% Pervious Area
9,296			11.42% Impervious Area
9,296			100.00% Unconnected

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

Subcatchment P-19: Subcat P-19



Summary for Subcatchment P-2: Subcat P-2

[73] Warning: Peak may fall outside time span

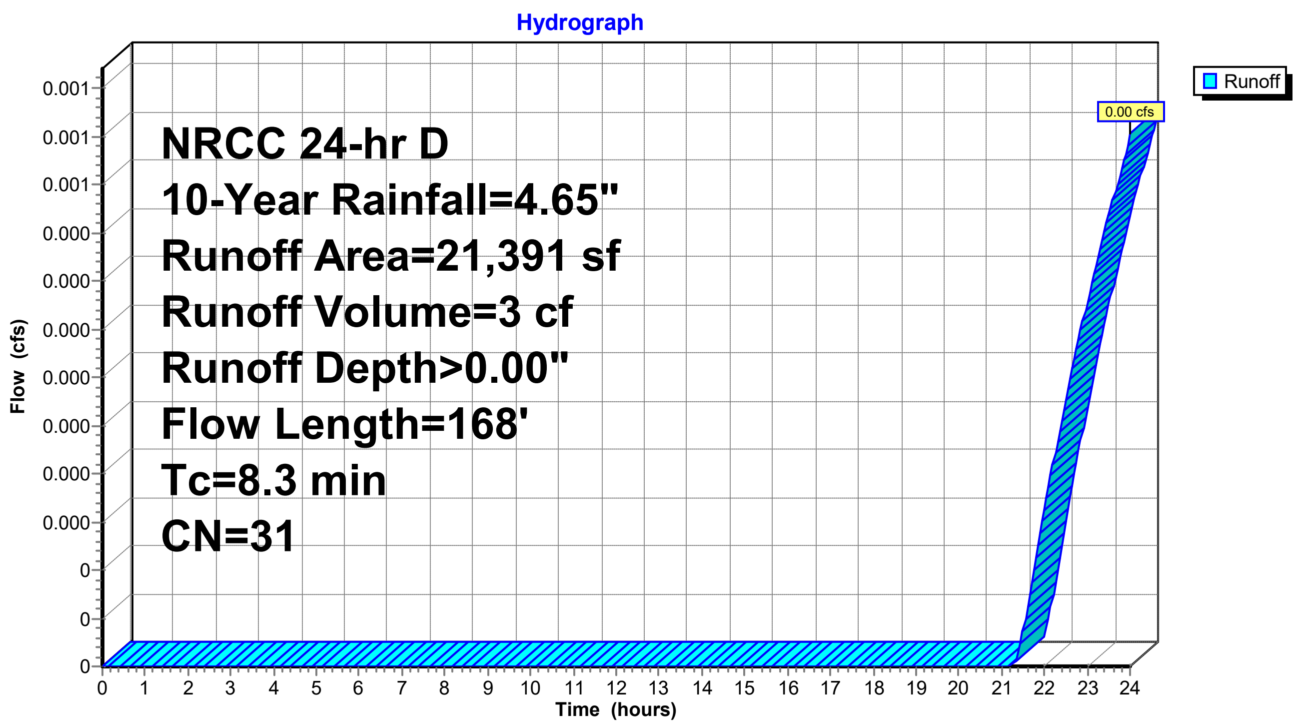
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 3 cf, Depth> 0.00"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
1,942	39	>75% Grass cover, Good, HSG A
19,449	30	Woods, Good, HSG A
21,391	31	Weighted Average
21,391		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.09"
0.7	118	0.1440	2.66		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.3	168	Total			

Subcatchment P-2: Subcat P-2



Summary for Subcatchment P-20: Subcat P-20

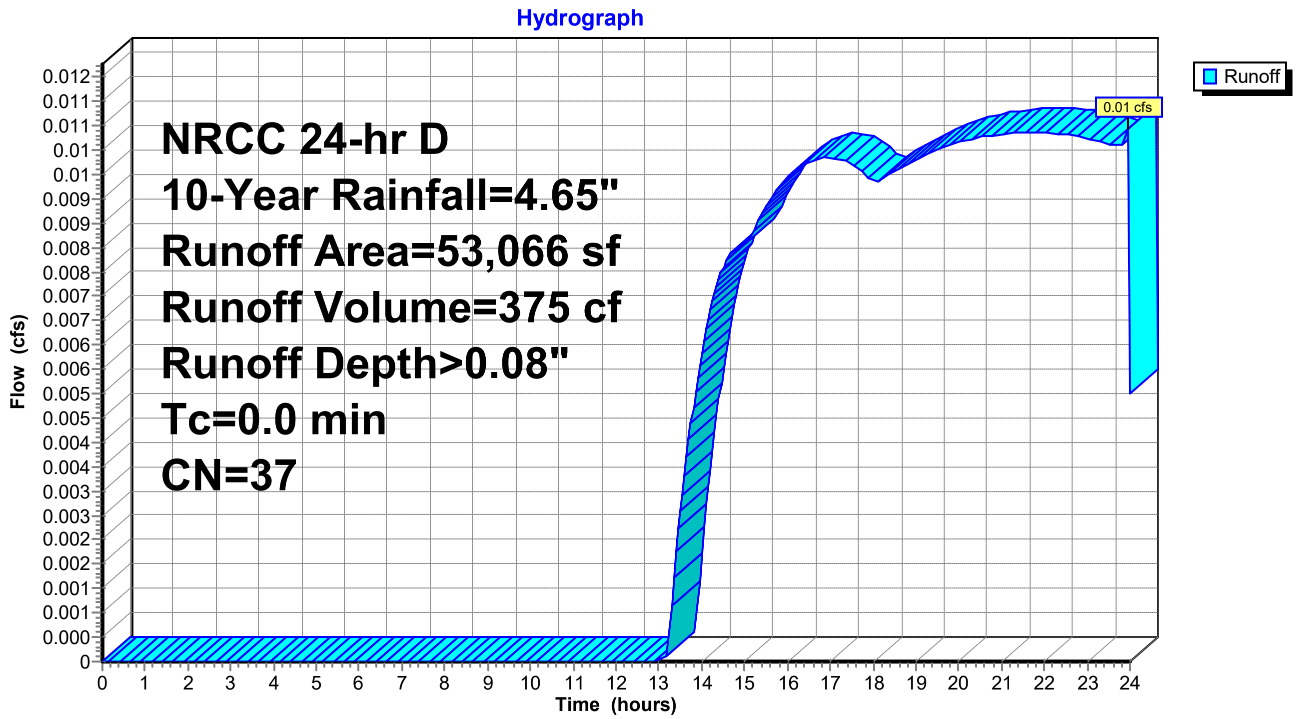
[46] Hint: Tc=0 (Instant runoff peak depends on dt)
[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 23.95 hrs, Volume= 375 cf, Depth> 0.08"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
22,364	30	Woods, Good, HSG A
8	30	Woods, Good, HSG A
29,421	39	>75% Grass cover, Good, HSG A
1,273	98	Roofs, HSG A
53,066	37	Weighted Average
51,793		97.60% Pervious Area
1,273		2.40% Impervious Area

Subcatchment P-20: Subcat P-20



Summary for Subcatchment P-3: Subcat P-3

[45] Hint: Runoff=Zero

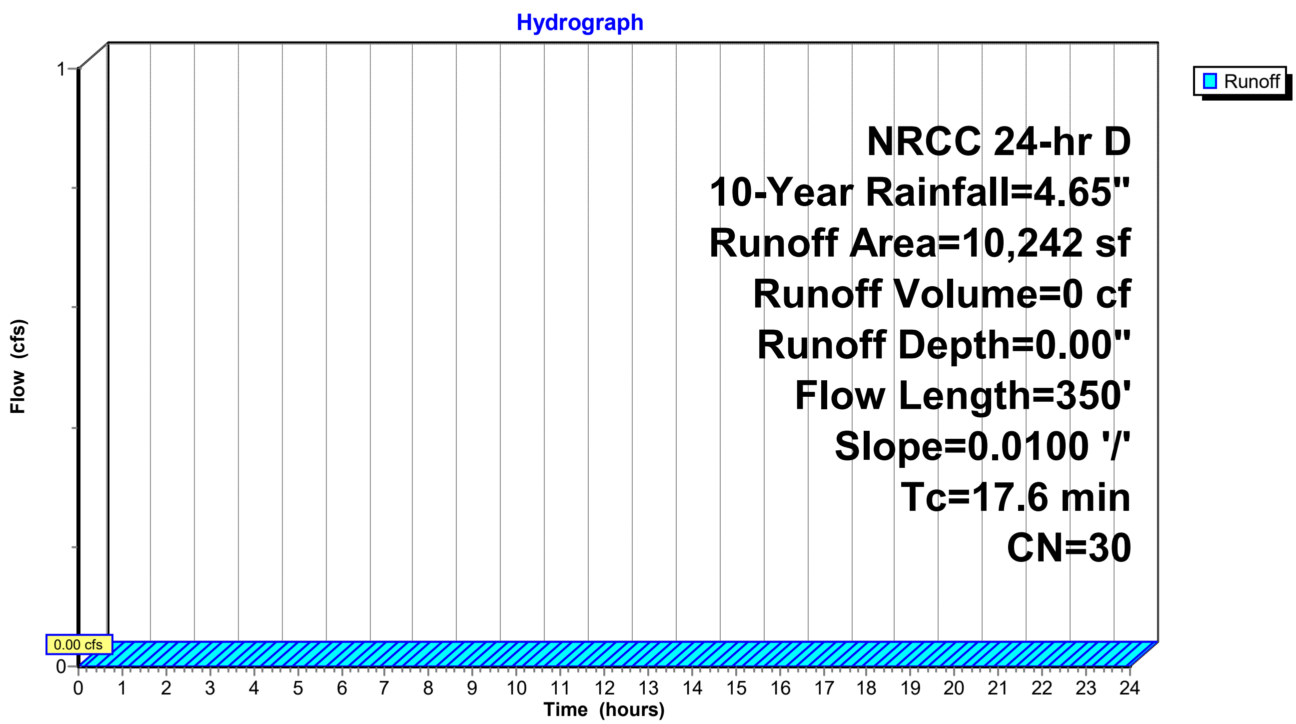
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
6	39	>75% Grass cover, Good, HSG A
10,236	30	Woods, Good, HSG A
10,242	30	Weighted Average
10,242		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.09"
10.0	300	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.6	350	Total			

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

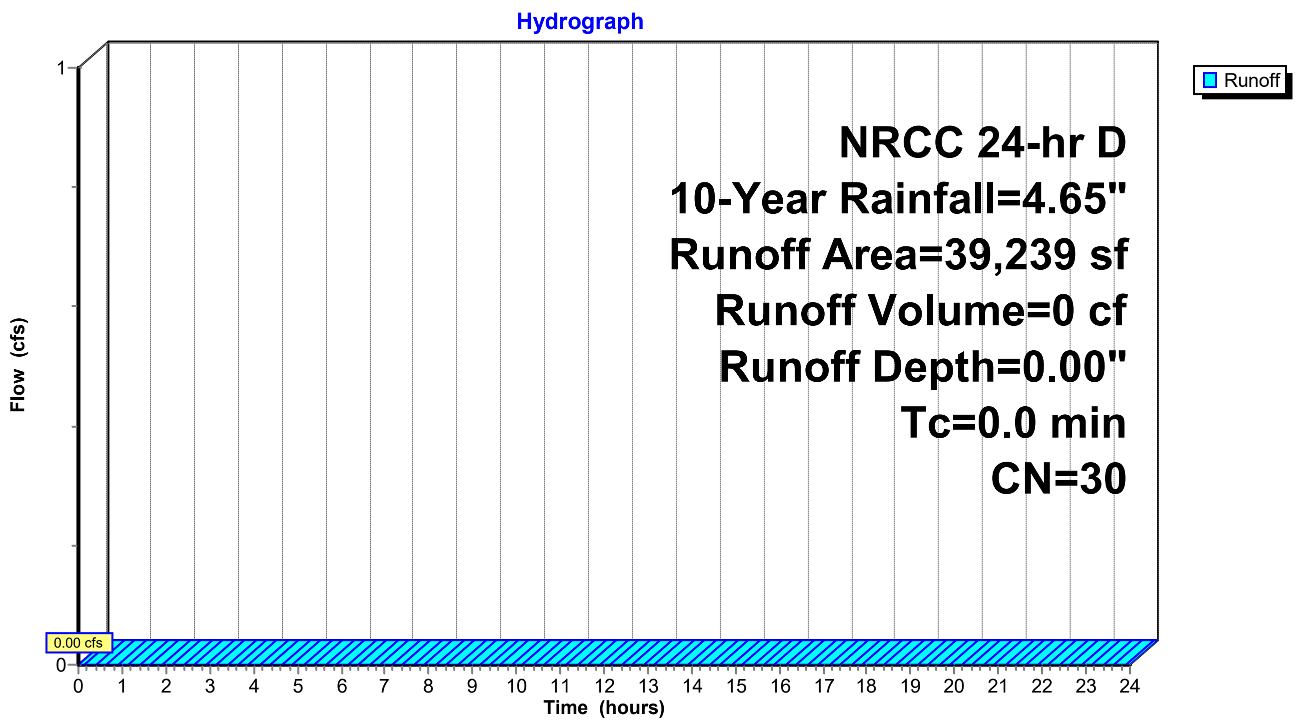
[46] Hint: Tc=0 (Instant runoff peak depends on dt)
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 4P : Existing Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
39,239	30	Woods, Good, HSG A
39,239		100.00% Pervious Area

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

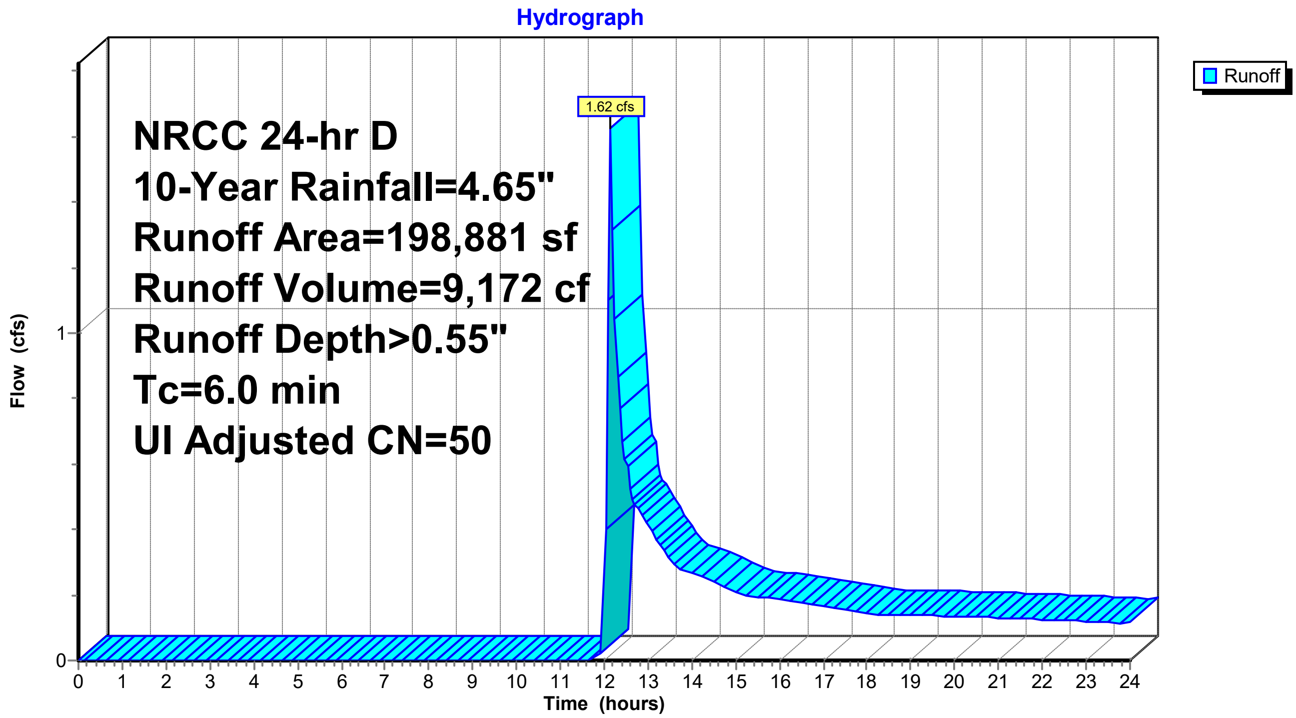
Runoff = 1.62 cfs @ 12.16 hrs, Volume= 9,172 cf, Depth> 0.55"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Adj	Description
21,040	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
60,243	30		Woods, Good, HSG A
11,413	30		Woods, Good, HSG A
5,380	30		Woods, Good, HSG A
0	39		>75% Grass cover, Good, HSG A
315	39		>75% Grass cover, Good, HSG A
1,914	39		>75% Grass cover, Good, HSG A
761	39		>75% Grass cover, Good, HSG A
10,302	39		>75% Grass cover, Good, HSG A
1,325	30		Woods, Good, HSG A
13,415	72		Dirt roads, HSG A
527	98		Unconnected pavement, HSG A
43	98		Unconnected pavement, HSG A
38	98		Unconnected pavement, HSG A
39	98		Unconnected pavement, HSG A
13,837	98		Unconnected pavement, HSG A
33	98		Unconnected pavement, HSG A
330	39		>75% Grass cover, Good, HSG A
9,969	98		Roofs, HSG A
395	98		Roofs, HSG A
1,474	98		Roofs, HSG A
2	98		Roofs, HSG A
9,863	98		Roofs, HSG A
3,360	39		>75% Grass cover, Good, HSG A
16,236	98		Paved parking, HSG A
56	98		Paved parking, HSG A
11	98		Paved parking, HSG A
11,291	39		>75% Grass cover, Good, HSG A
5,272	39		>75% Grass cover, Good, HSG A
198,881	52	50	Weighted Average, UI Adjusted
146,360			73.59% Pervious Area
52,521			26.41% Impervious Area
14,517			27.64% Unconnected

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

Runoff = 10.39 cfs @ 12.21 hrs, Volume= 43,497 cf, Depth> 2.00"
Routed to Pond 12P : Drainage Easement Ditch

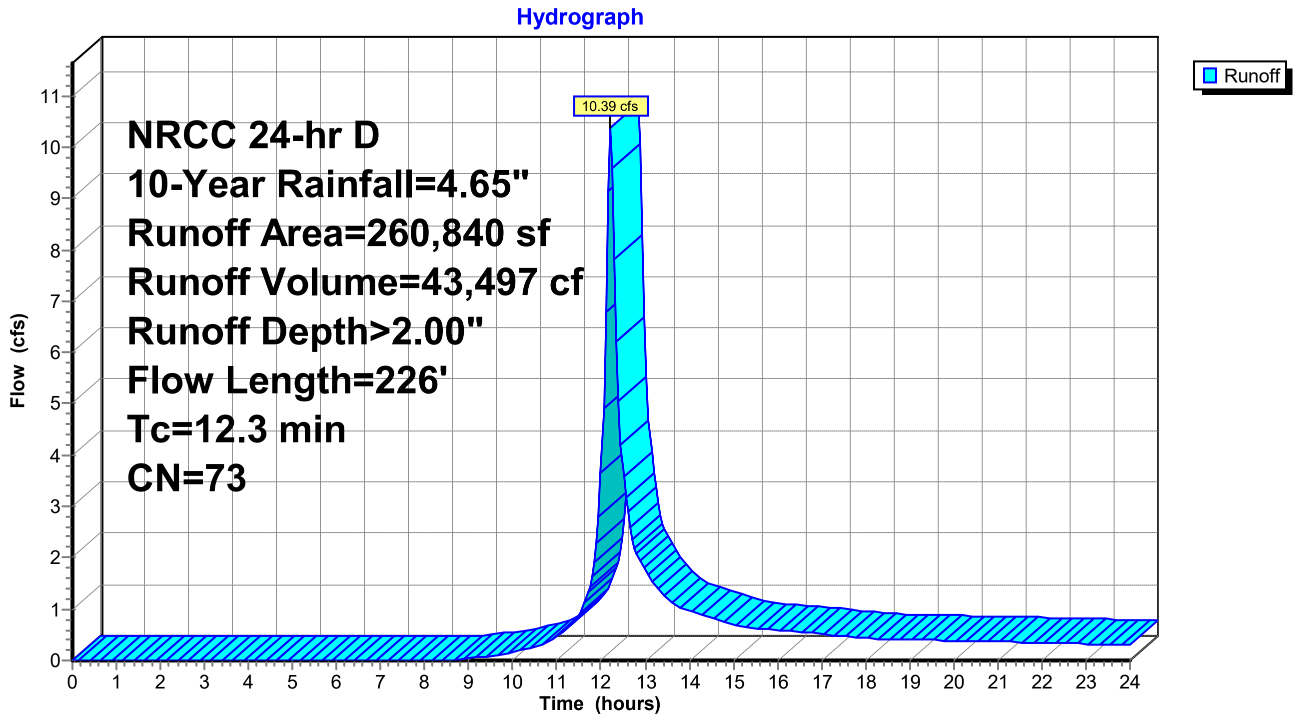
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
1	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
556	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
580	30	Woods, Good, HSG A
87	30	Woods, Good, HSG A
76	30	Woods, Good, HSG A
17	30	Woods, Good, HSG A
41	30	Woods, Good, HSG A
234	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
1,039	39	>75% Grass cover, Good, HSG A
80	30	Woods, Good, HSG A
124	39	>75% Grass cover, Good, HSG A
9,477	39	>75% Grass cover, Good, HSG A
1,324	39	>75% Grass cover, Good, HSG A
3,326	39	>75% Grass cover, Good, HSG A
197	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
849	39	>75% Grass cover, Good, HSG A
1,494	39	>75% Grass cover, Good, HSG A
488	39	>75% Grass cover, Good, HSG A
5,897	39	>75% Grass cover, Good, HSG A
207	39	>75% Grass cover, Good, HSG A
38	39	>75% Grass cover, Good, HSG A
35,199	54	1/2 acre lots, 25% imp, HSG A
2,290	54	1/2 acre lots, 25% imp, HSG A
5,803	98	Unconnected pavement, HSG A
2,360	98	Unconnected pavement, HSG A
889	98	Unconnected pavement, HSG A
715	98	Unconnected pavement, HSG A
135,515	98	Paved parking, HSG A
563	98	Unconnected pavement, HSG A
3,565	39	>75% Grass cover, Good, HSG A
2,358	30	Woods, Good, HSG A
6,778	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
1,577	39	>75% Grass cover, Good, HSG A
1,768	39	>75% Grass cover, Good, HSG A
362	39	>75% Grass cover, Good, HSG A
12,602	30	Woods, Good, HSG A
10,885	39	>75% Grass cover, Good, HSG A
4,375	30	Woods, Good, HSG A
2,426	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
348	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
2,039	39	>75% Grass cover, Good, HSG A

564	39	>75% Grass cover, Good, HSG A
591	39	>75% Grass cover, Good, HSG A
260,840	73	Weighted Average
105,623		40.49% Pervious Area
155,217		59.51% Impervious Area
10,330		6.66% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.3	15	0.0200	0.99		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	161	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.3	226	Total			

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

[73] Warning: Peak may fall outside time span

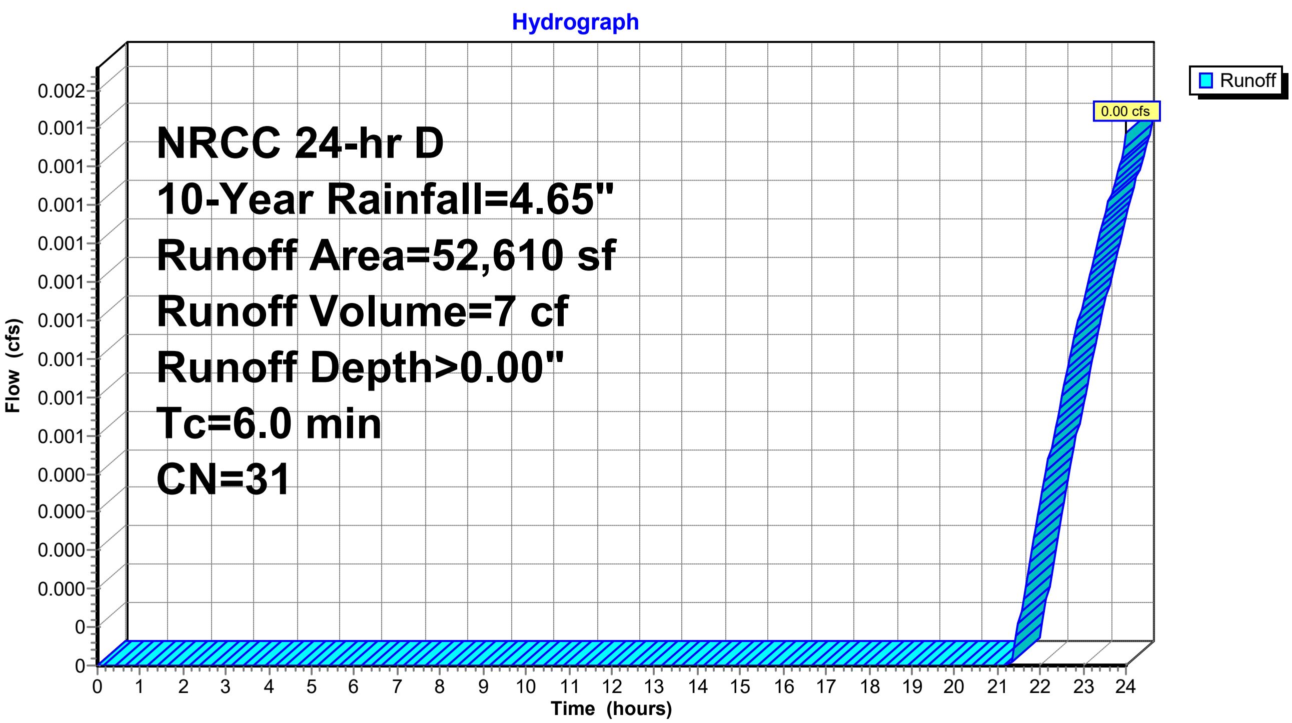
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 7 cf, Depth> 0.00"
Routed to Pond 12P : Drainage Easement Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
49,207	30	Woods, Good, HSG A
72	30	Woods, Good, HSG A
2,969	39	>75% Grass cover, Good, HSG A
215	30	Woods, Good, HSG A
26	98	Unconnected pavement, HSG A
113	98	Unconnected pavement, HSG A
8	98	Paved parking, HSG A
52,610	31	Weighted Average
52,463		99.72% Pervious Area
147		0.28% Impervious Area
139		94.53% Unconnected

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

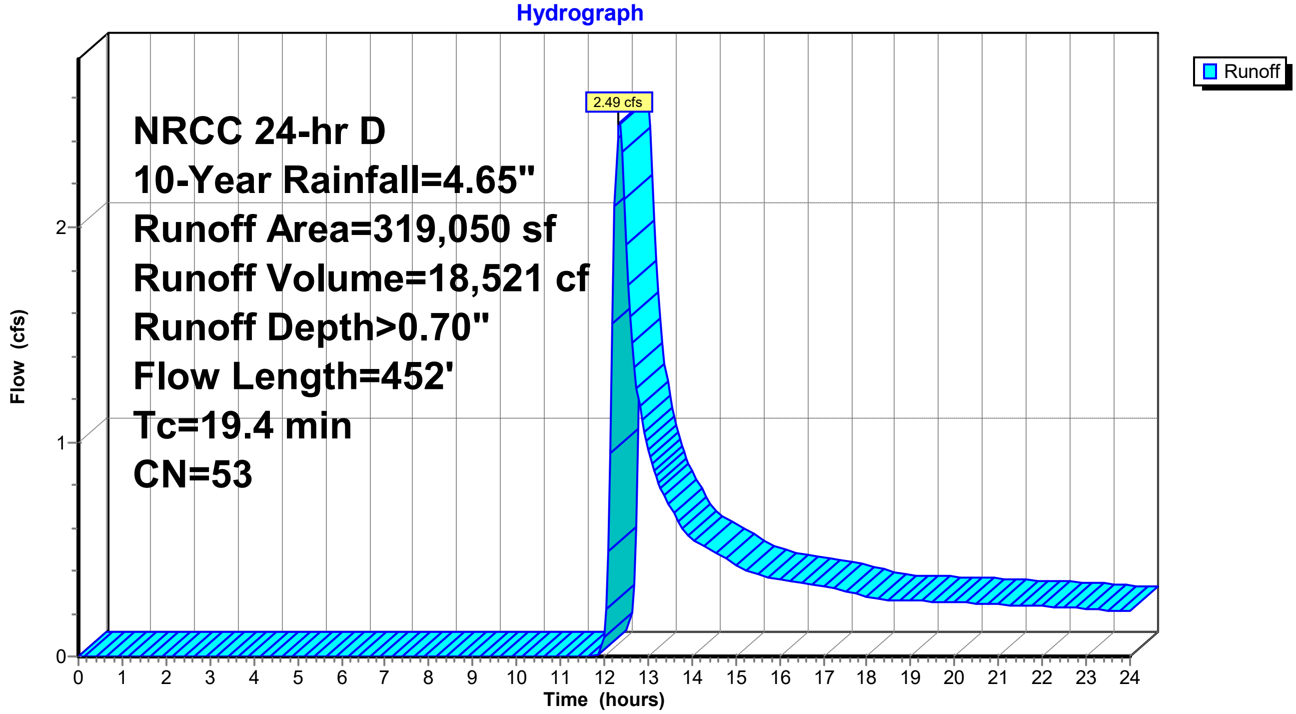
Runoff = 2.49 cfs @ 12.34 hrs, Volume= 18,521 cf, Depth> 0.70"
Routed to Pond 5P : Infiltration Basin 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
155,878	30	Woods, Good, HSG A
13,674	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
57	39	>75% Grass cover, Good, HSG A
1,057	39	>75% Grass cover, Good, HSG A
58	39	>75% Grass cover, Good, HSG A
44,905	39	>75% Grass cover, Good, HSG A
1,978	39	>75% Grass cover, Good, HSG A
665	72	Dirt roads, HSG A
1,101	98	Unconnected pavement, HSG A
7,746	98	Unconnected pavement, HSG A
26,556	98	Unconnected pavement, HSG A
12	98	Unconnected pavement, HSG A
71	98	Unconnected pavement, HSG A
210	98	Unconnected pavement, HSG A
7,456	98	Unconnected pavement, HSG A
9,916	98	Roofs, HSG A
47,139	98	Roofs, HSG A
175	98	Roofs, HSG A
395	98	Roofs, HSG A
319,050	53	Weighted Average
218,273		68.41% Pervious Area
100,778		31.59% Impervious Area
43,153		42.82% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	50	0.0240	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
2.0	76	0.0660	0.64		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	79	0.0120	0.77		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0270	3.34		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
3.9	220	0.0180	0.94		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
19.4	452	Total			

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

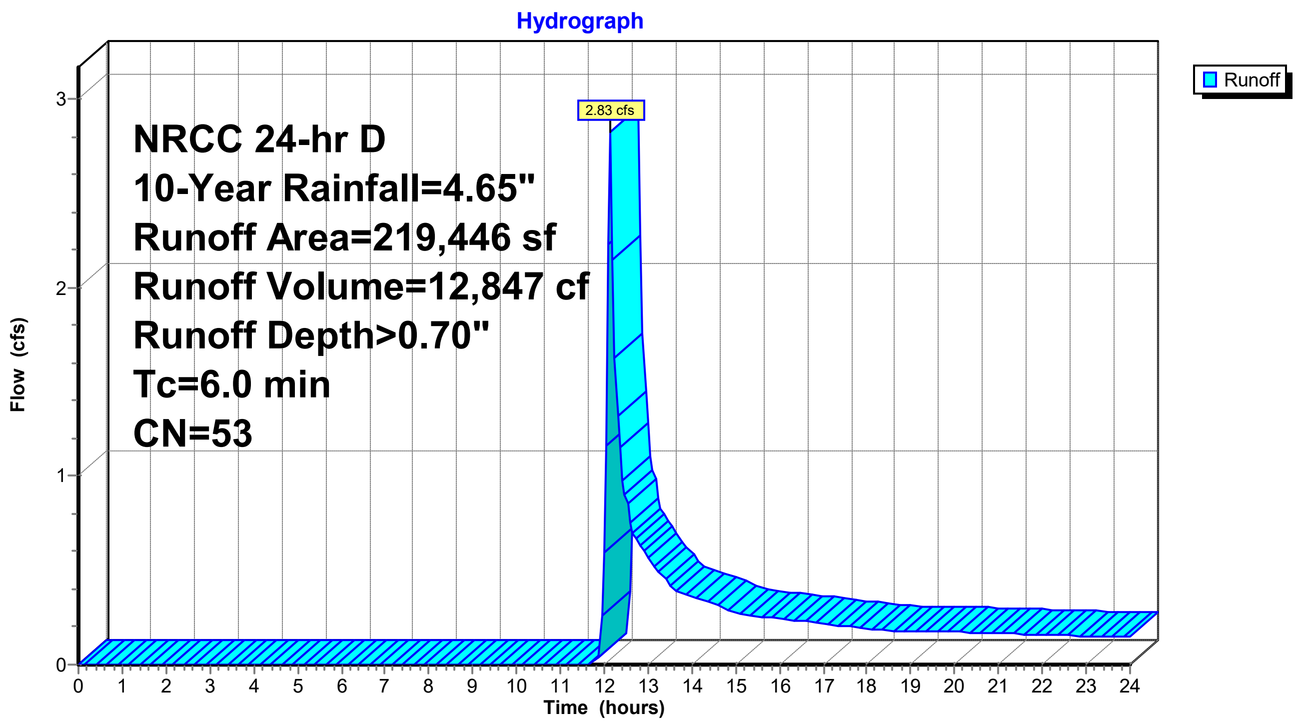
Runoff = 2.83 cfs @ 12.15 hrs, Volume= 12,847 cf, Depth> 0.70"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 10-Year Rainfall=4.65"

Area (sf)	CN	Description
103,904	54	1/2 acre lots, 25% imp, HSG A
37,219	54	1/2 acre lots, 25% imp, HSG A
5,066	39	>75% Grass cover, Good, HSG A
23,689	98	Paved parking, HSG A
49,568	30	Woods, Good, HSG A
219,446	53	Weighted Average
160,476		73.13% Pervious Area
58,969		26.87% Impervious Area

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

Subcatchment P-9: Subcat P-9



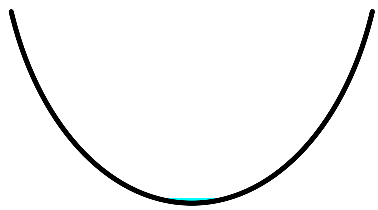
Summary for Reach 6R: VEGETATED SWALE

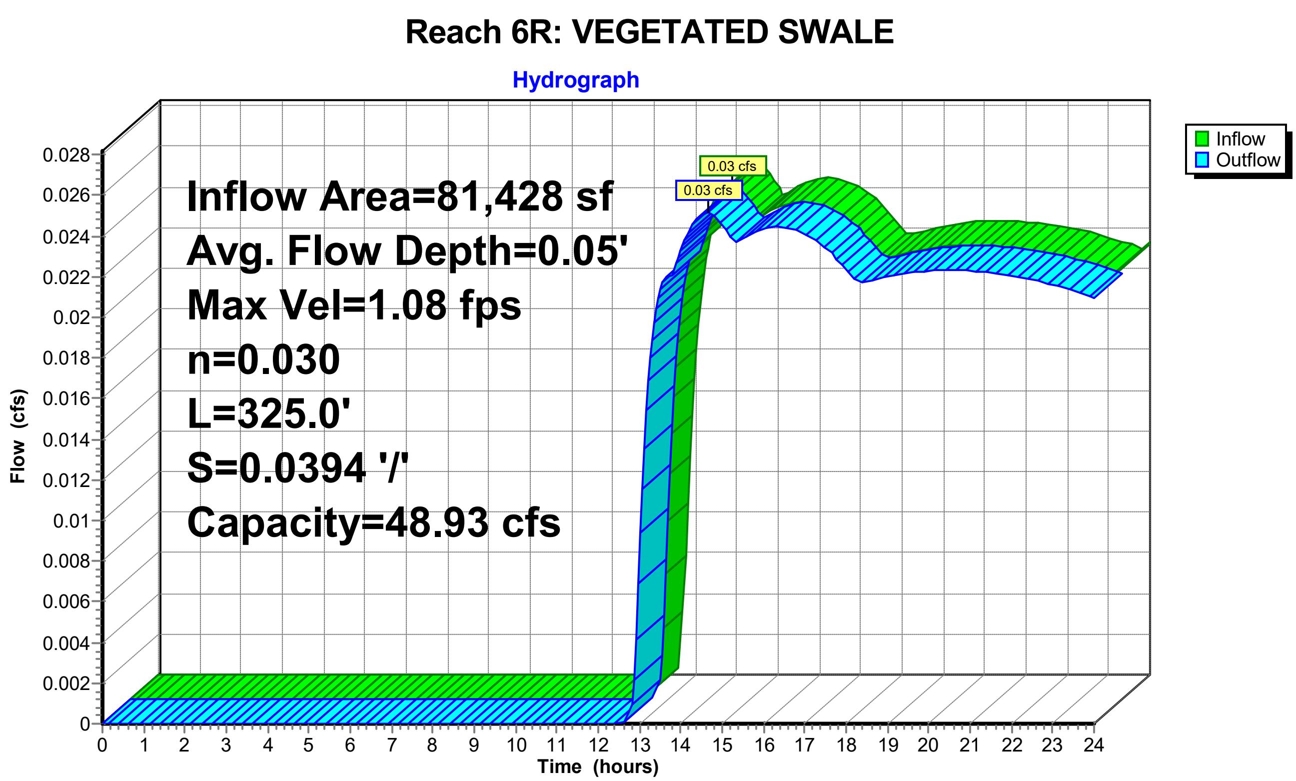
Inflow Area = 81,428 sf, 11.42% Impervious, Inflow Depth > 0.13" for 10-Year event
Inflow = 0.03 cfs @ 14.54 hrs, Volume= 910 cf
Outflow = 0.03 cfs @ 14.65 hrs, Volume= 897 cf, Atten= 0%, Lag= 6.6 min
Routed to Pond 3P : Underground Infiltration System 1

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.08 fps, Min. Travel Time= 5.0 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 5.2 min

Peak Storage= 8 cf @ 14.57 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 0.65'
Bank-Full Depth= 2.00' Flow Area= 5.3 sf, Capacity= 48.93 cfs

4.00' x 2.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 325.0' Slope= 0.0394 '/'
Inlet Invert= 193.00', Outlet Invert= 180.20'





Summary for Pond 1P: Infiltration Basin 1

Inflow Area = 105,988 sf, 61.00% Impervious, Inflow Depth > 2.46" for 10-Year event
Inflow = 5.70 cfs @ 12.13 hrs, Volume= 21,713 cf
Outflow = 0.43 cfs @ 13.51 hrs, Volume= 21,630 cf, Atten= 92%, Lag= 82.8 min
Discarded = 0.43 cfs @ 13.51 hrs, Volume= 21,630 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Study Point 1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP2 : Study Point 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 174.59' @ 13.51 hrs Surf.Area= 7,770 sf Storage= 7,666 cf

Plug-Flow detention time= 150.5 min calculated for 21,585 cf (99% of inflow)
Center-of-Mass det. time= 147.8 min (942.3 - 794.6)

Volume	Invert	Avail.Storage	Storage Description
#1	173.50'	36,336 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
173.50	6,319	436.0	0	0	6,319
174.00	6,981	446.0	3,324	3,324	7,055
175.00	8,346	465.0	7,653	10,977	8,505
176.00	9,768	483.0	9,048	20,025	9,944
177.00	11,247	502.0	10,499	30,523	11,512
177.50	12,008	512.0	5,813	36,336	12,358

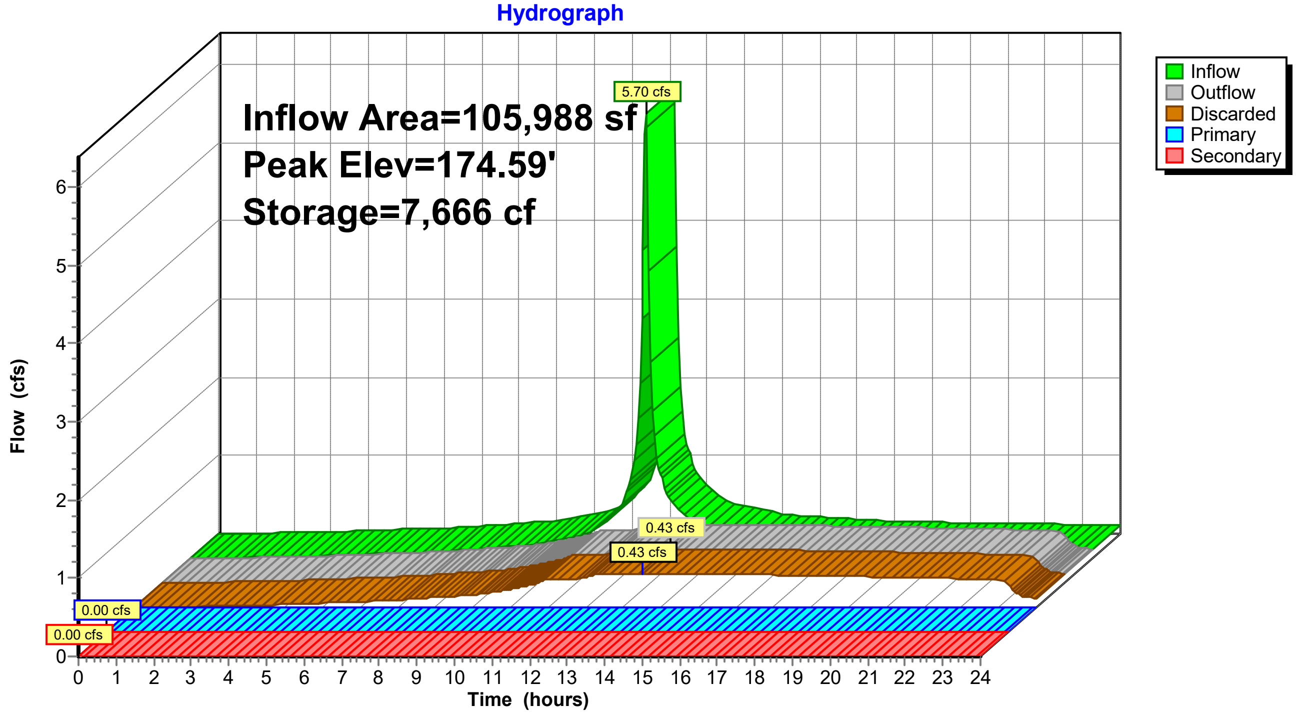
Device	Routing	Invert	Outlet Devices
#1	Secondary	173.40'	**12.0" Round Culvert** L= 252.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 173.40' / 169.50' S= 0.0155 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	176.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	176.50'	**13.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Discarded	173.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.43 cfs @ 13.51 hrs HW=174.59' (Free Discharge)
└—**4=Exfiltration** (Exfiltration Controls 0.43 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=173.50' (Free Discharge)
└—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=173.50' (Free Discharge)
└—**1=Culvert** (Passes 0.00 cfs of 0.03 cfs potential flow)
  └—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin 1



Summary for Pond 2P: Infiltration Basin 2

[79] Warning: Submerged Pond 3P Primary device # 1 OUTLET by 0.49'

```
Inflow Area =      935,284 sf,  40.53% Impervious,  Inflow Depth >  0.16"   for  10-Year event
Inflow      =       3.25 cfs @  12.13 hrs,  Volume=         12,505 cf
Outflow     =       0.39 cfs @  12.90 hrs,  Volume=         12,455 cf,  Atten= 88%,  Lag= 46.5 min
Discarded   =       0.39 cfs @  12.90 hrs,  Volume=         12,455 cf
Primary     =       0.00 cfs @   0.00 hrs,  Volume=              0 cf
    Routed to Link SP3 : Study Point 3
```

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 175.99' @ 12.90 hrs Surf.Area= 6,932 sf Storage= 3,285 cf

Plug-Flow detention time= 58.3 min calculated for 12,429 cf (99% of inflow)
Center-of-Mass det. time= 55.6 min (853.2 - 797.6)

Volume	Invert	Avail.Storage	Storage Description
#1	175.50'	33,751 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

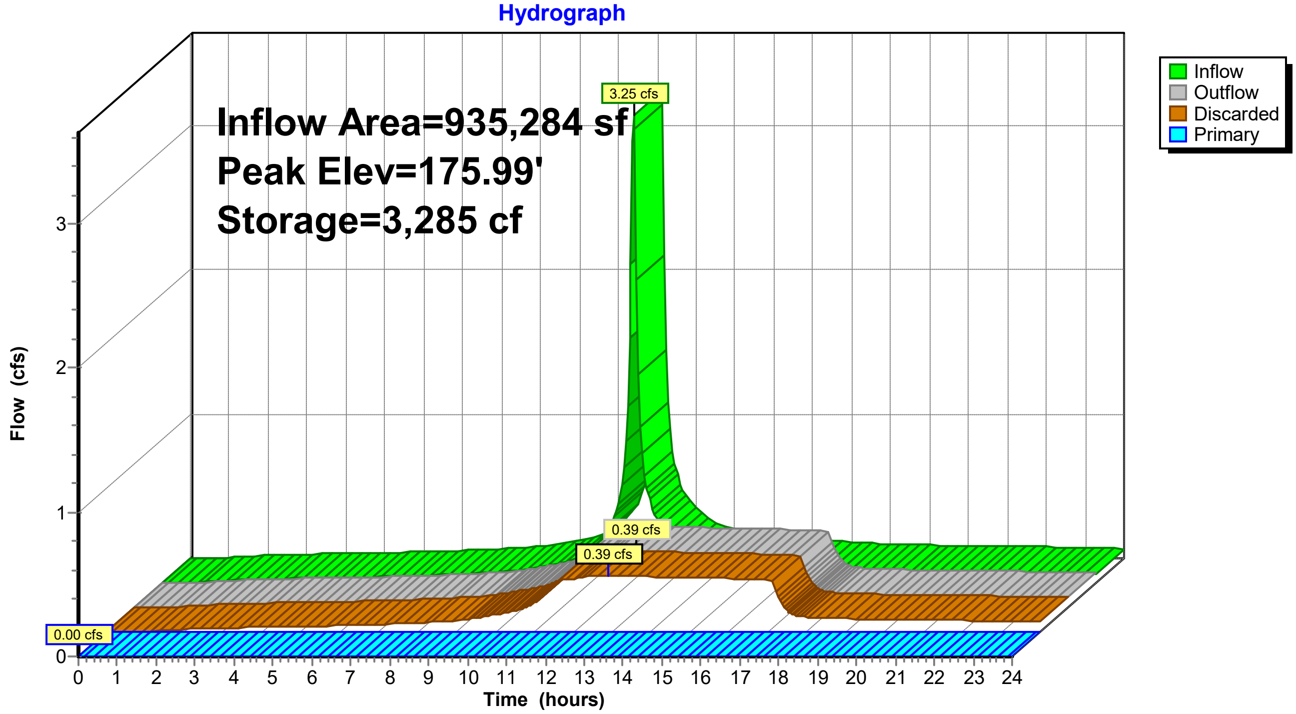
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
175.50	6,483	301.0	0	0	6,483
176.00	6,941	310.0	3,355	3,355	6,946
177.00	7,900	329.0	7,415	10,771	7,964
178.00	8,915	348.0	8,402	19,173	9,042
179.00	9,987	367.0	9,446	28,619	10,181
179.50	10,544	376.0	5,132	33,751	10,744

Device	Routing	Invert	Outlet Devices
#1	Primary	175.40'	**12.0" Round Culvert** L= 63.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 175.40' / 173.00' S= 0.0378 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	178.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	178.50'	**13.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Discarded	175.50'	**2.410 in/hr Exfiltration over Surface area**
#5	Primary	178.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.39 cfs @ 12.90 hrs HW=175.99' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.50' (Free Discharge)
├─**1=Culvert** (Passes 0.00 cfs of 0.03 cfs potential flow)
│ └─**2=Orifice/Grate** (Controls 0.00 cfs)
├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin 2



Summary for Pond 3P: Underground Infiltration System 1

Inflow Area = 519,328 sf, 46.31% Impervious, Inflow Depth > 1.66" for 10-Year event
Inflow = 18.57 cfs @ 12.13 hrs, Volume= 72,028 cf
Outflow = 1.59 cfs @ 11.55 hrs, Volume= 71,773 cf, Atten= 91%, Lag= 0.0 min
Discarded = 1.59 cfs @ 11.55 hrs, Volume= 71,773 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 2P : Infiltration Basin 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 172.53' @ 13.54 hrs Surf.Area= 28,516 sf Storage= 21,741 cf

Plug-Flow detention time= 108.6 min calculated for 71,623 cf (99% of inflow)
Center-of-Mass det. time= 106.3 min (933.3 - 827.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	171.25'	14,193 cf	**37.58'W x 238.18'L x 6.75'H Field A** 60,422 cf Overall - 24,939 cf Embedded = 35,483 cf x 40.0% Voids
#2A	172.00'	24,939 cf	**ADS_StormTech MC-7200 +Cap** x 140 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 140 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
#3B	171.25'	16,906 cf	**37.58'W x 284.32'L x 6.75'H Field B** 72,128 cf Overall - 29,863 cf Embedded = 42,264 cf x 40.0% Voids
#4B	172.00'	29,863 cf	**ADS_StormTech MC-7200 +Cap** x 168 Inside #3 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 168 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
#5C	171.25'	6,107 cf	**28.50'W x 132.71'L x 6.75'H Field C** 25,530 cf Overall - 10,262 cf Embedded = 15,268 cf x 40.0% Voids
#6C	172.00'	10,262 cf	**ADS_StormTech MC-7200 +Cap** x 57 Inside #5 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 57 Chambers in 3 Rows Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf
#7D	171.25'	8,180 cf	**28.50'W x 178.85'L x 6.75'H Field D** 34,406 cf Overall - 13,955 cf Embedded = 20,451 cf x 40.0% Voids
#8D	172.00'	13,955 cf	**ADS_StormTech MC-7200 +Cap** x 78 Inside #7 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 78 Chambers in 3 Rows Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf
#9	173.47'	68 cf	**4.00'D x 5.45'H Vertical Cone/Cylinder** -Impervious
		124,474 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard
Storage Group D created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	176.35'	**12.0" Round Culvert** L= 82.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 176.35' / 175.50' S= 0.0104 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	177.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	171.25'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.59 cfs @ 11.55 hrs HW=171.33' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 1.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=171.25' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

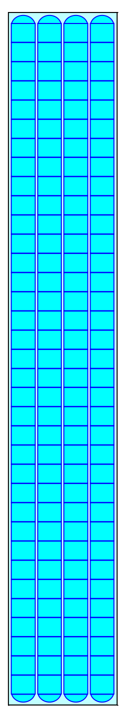
35 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 236.17' Row Length +12.0" End Stone x 2 = 238.18' Base Length
4 Rows x 100.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 37.58' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

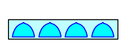
140 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 4 Rows = 24,938.6 cf Chamber Storage

60,422.0 cf Field - 24,938.6 cf Chambers = 35,483.4 cf Stone x 40.0% Voids = 14,193.4 cf Stone Storage

Chamber Storage + Stone Storage = 39,132.0 cf = 0.898 af
Overall Storage Efficiency = 64.8%
Overall System Size = 238.18' x 37.58' x 6.75'

140 Chambers
2,237.9 cy Field
1,314.2 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field B

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

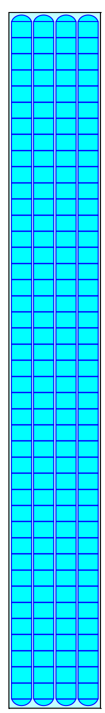
42 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 282.32' Row Length +12.0" End Stone x 2 = 284.32' Base Length
4 Rows x 100.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 37.58' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

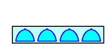
168 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 4 Rows = 29,863.1 cf Chamber Storage

72,127.6 cf Field - 29,863.1 cf Chambers = 42,264.5 cf Stone x 40.0% Voids = 16,905.8 cf Stone Storage

Chamber Storage + Stone Storage = 46,768.9 cf = 1.074 af
Overall Storage Efficiency = 64.8%
Overall System Size = 284.32' x 37.58' x 6.75'

168 Chambers
2,671.4 cy Field
1,565.4 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field C

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

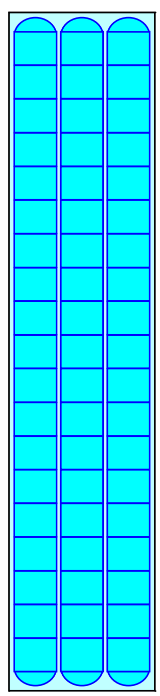
19 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 130.71' Row Length +12.0" End Stone x 2 = 132.71' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

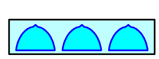
57 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 3 Rows = 10,261.9 cf Chamber Storage

25,529.8 cf Field - 10,261.9 cf Chambers = 15,267.9 cf Stone x 40.0% Voids = 6,107.1 cf Stone Storage

Chamber Storage + Stone Storage = 16,369.1 cf = 0.376 af
Overall Storage Efficiency = 64.1%
Overall System Size = 132.71' x 28.50' x 6.75'

57 Chambers
945.5 cy Field
565.5 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field D

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

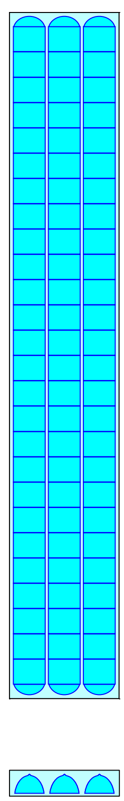
26 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 176.85' Row Length +12.0" End Stone x 2 = 178.85' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

78 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 3 Rows = 13,955.3 cf Chamber Storage

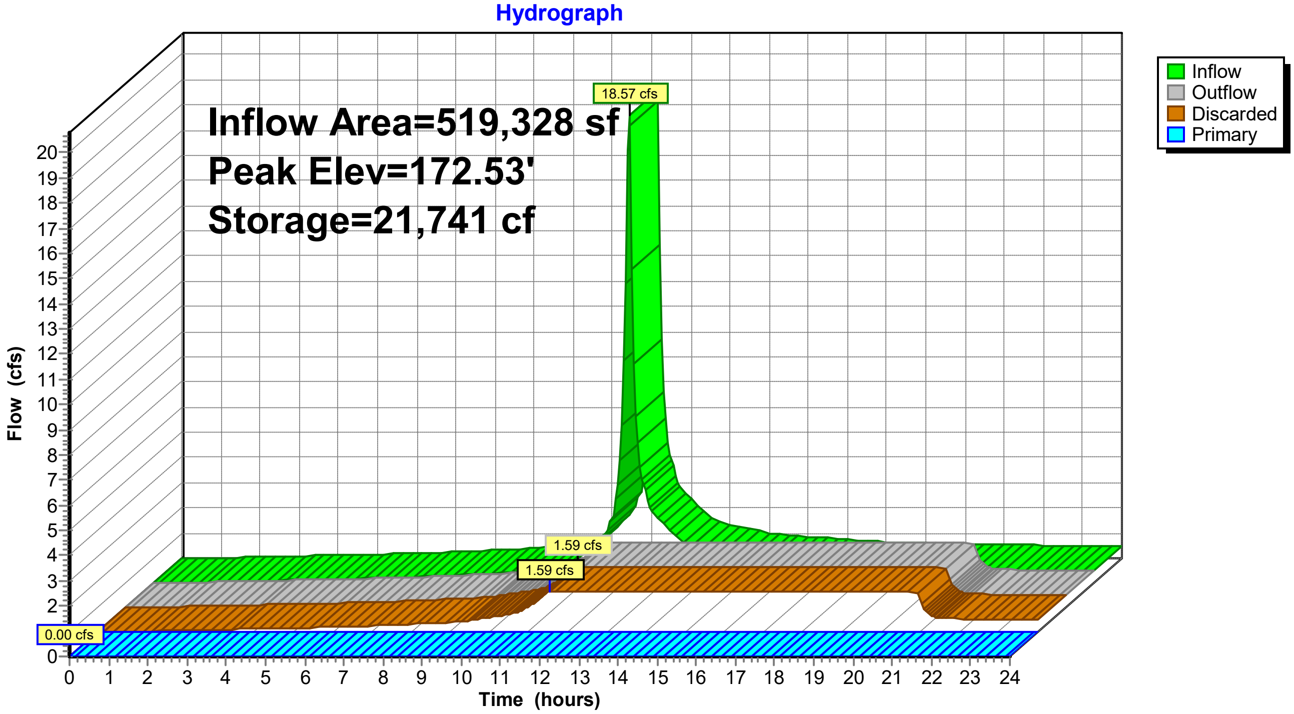
34,406.3 cf Field - 13,955.3 cf Chambers = 20,451.0 cf Stone x 40.0% Voids = 8,180.4 cf Stone Storage

Chamber Storage + Stone Storage = 22,135.7 cf = 0.508 af
Overall Storage Efficiency = 64.3%
Overall System Size = 178.85' x 28.50' x 6.75'

78 Chambers
1,274.3 cy Field
757.4 cy Stone



Pond 3P: Underground Infiltration System 1



Summary for Pond 4P: Existing Ditch 1

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 193.00' @ 0.00 hrs Surf.Area= 30 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

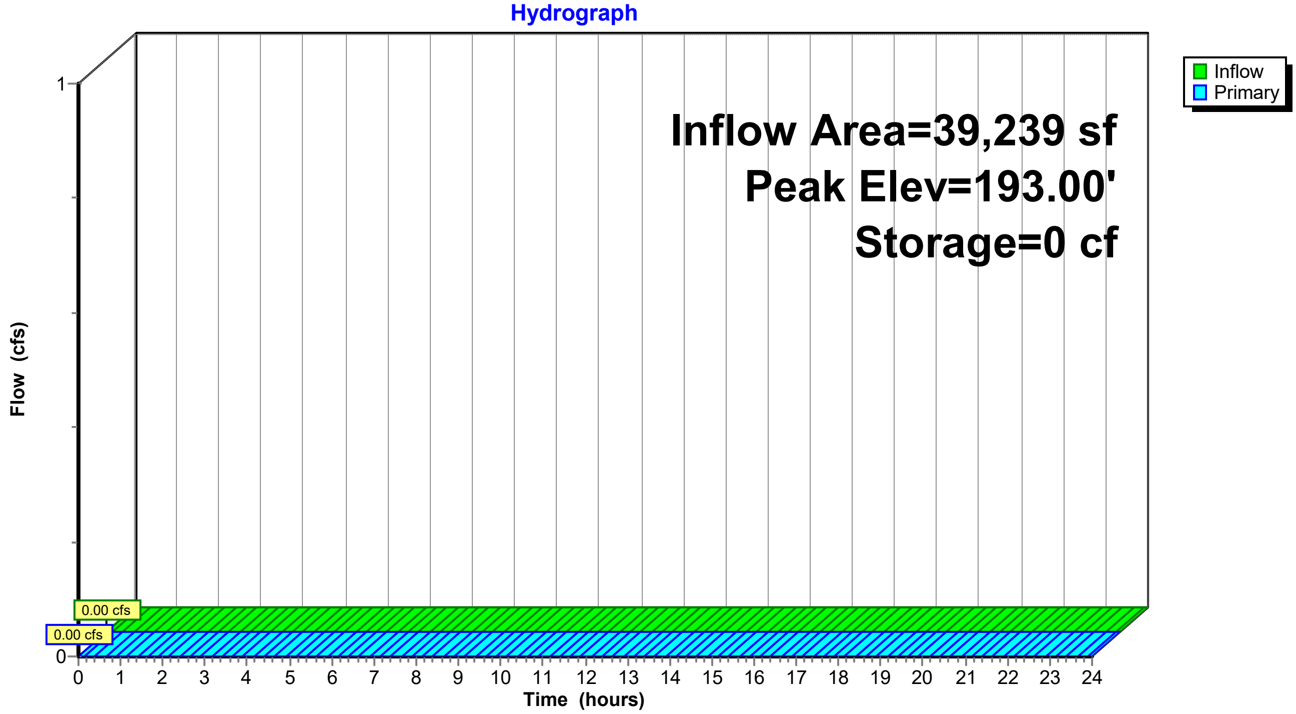
Volume	Invert	Avail.Storage	Storage Description
#1	193.00'	17,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.00	30	0	0
194.00	1,087	559	559
195.00	2,356	1,722	2,280
196.00	3,959	3,158	5,438
197.00	5,956	4,958	10,395
198.00	8,319	7,138	17,533

Device	Routing	Invert	Outlet Devices
#1	Primary	197.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=193.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4P: Existing Ditch 1



Summary for Pond 5P: Infiltration Basin 3

[92] Warning: Device #1 is above defined storage

Inflow Area = 319,050 sf, 31.59% Impervious, Inflow Depth > 0.70" for 10-Year event
Inflow = 2.49 cfs @ 12.34 hrs, Volume= 18,521 cf
Outflow = 0.36 cfs @ 15.95 hrs, Volume= 13,911 cf, Atten= 85%, Lag= 216.7 min
Discarded = 0.36 cfs @ 15.95 hrs, Volume= 13,911 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 2P : Infiltration Basin 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 170.90' @ 15.95 hrs Surf.Area= 6,529 sf Storage= 6,584 cf

Plug-Flow detention time= 231.6 min calculated for 13,882 cf (75% of inflow)
Center-of-Mass det. time= 127.3 min (1,086.4 - 959.2)

Volume	Invert	Avail.Storage	Storage Description
#1	167.25'	98,738 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

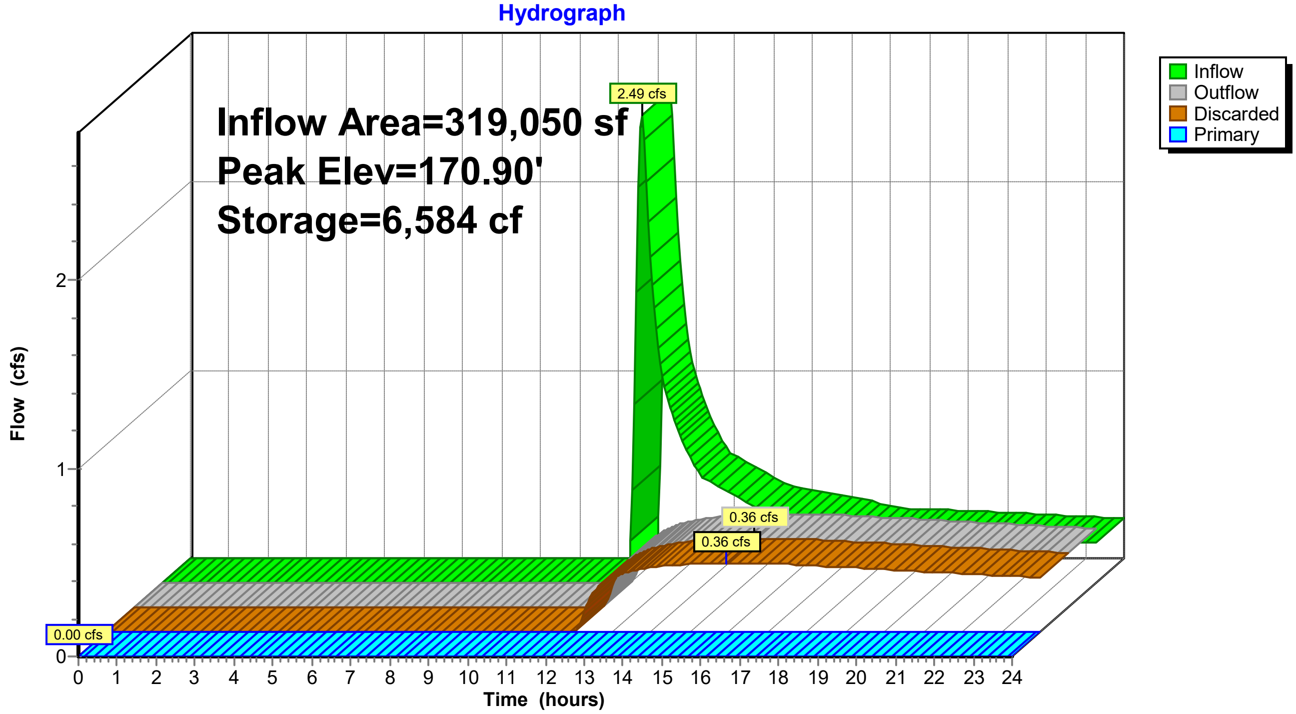
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.25	10	10.0	0	0	10
168.00	123	56.0	42	42	253
169.00	749	153.0	392	434	1,870
170.00	3,236	269.0	1,847	2,281	5,771
171.00	6,972	361.0	4,986	7,267	10,394
172.00	11,470	482.0	9,128	16,395	18,522
173.00	16,453	631.0	13,887	30,282	31,730
174.00	20,831	887.0	18,599	48,881	62,664
175.00	25,123	931.0	22,944	71,825	69,094
176.00	28,744	1,007.0	26,913	98,738	80,855

Device	Routing	Invert	Outlet Devices
#1	Primary	179.00'	**20.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	167.25'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.36 cfs @ 15.95 hrs HW=170.90' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=167.25' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Infiltration Basin 3



Summary for Pond 12P: Drainage Easement Ditch

Inflow Area = 313,450 sf, 49.57% Impervious, Inflow Depth > 1.67" for 10-Year event
Inflow = 10.39 cfs @ 12.21 hrs, Volume= 43,504 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 183.86' @ 24.00 hrs Surf.Area= 9,832 sf Storage= 43,471 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

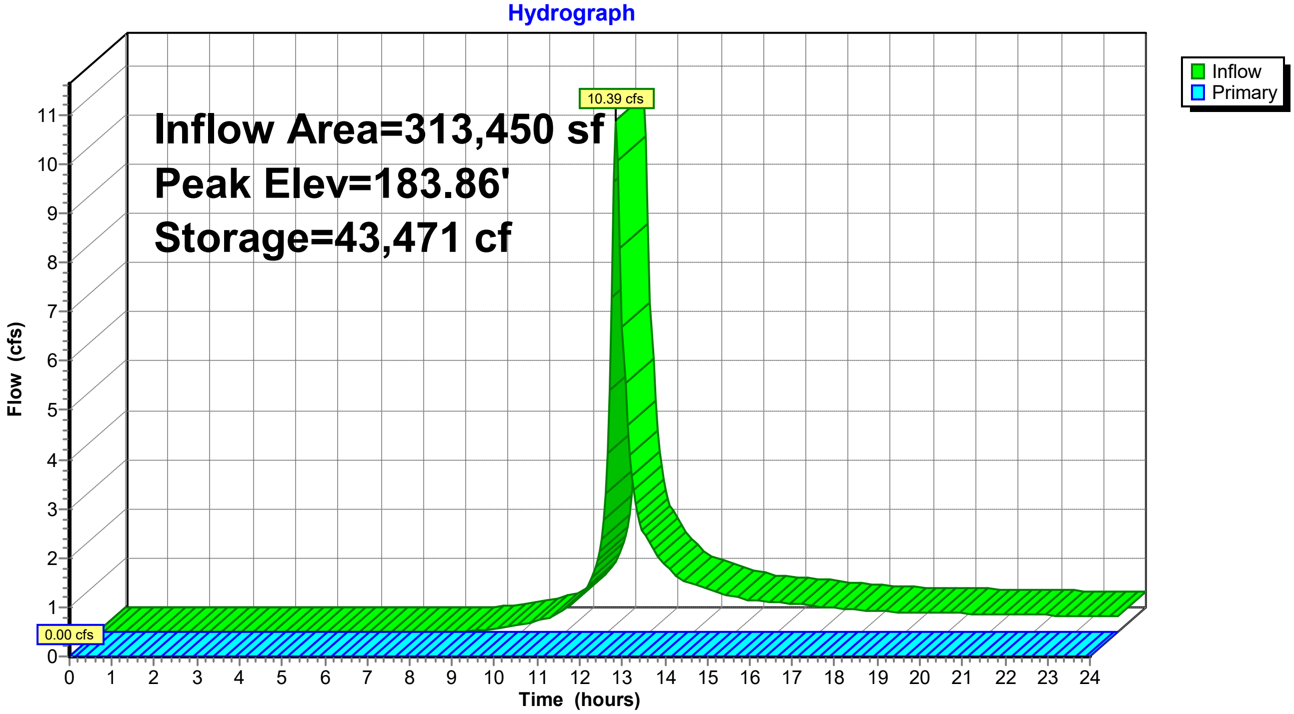
Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	223,106 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
175.00	395	0	0
176.00	1,346	871	871
177.00	2,592	1,969	2,840
178.00	3,425	3,009	5,848
179.00	4,340	3,883	9,731
180.00	5,326	4,833	14,564
181.00	6,375	5,851	20,414
182.00	7,498	6,937	27,351
183.00	8,708	8,103	35,454
184.00	10,008	9,358	44,812
185.00	11,390	10,699	55,511
186.00	12,859	12,125	67,635
187.00	14,373	13,616	81,251
188.00	15,934	15,154	96,405
189.00	17,547	16,741	113,145
190.00	19,261	18,404	131,549
191.00	21,004	20,133	151,682
192.00	22,805	21,905	173,586
193.00	24,735	23,770	197,356
194.00	26,764	25,750	223,106

Device	Routing	Invert	Outlet Devices
#1	Primary	193.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12P: Drainage Easement Ditch

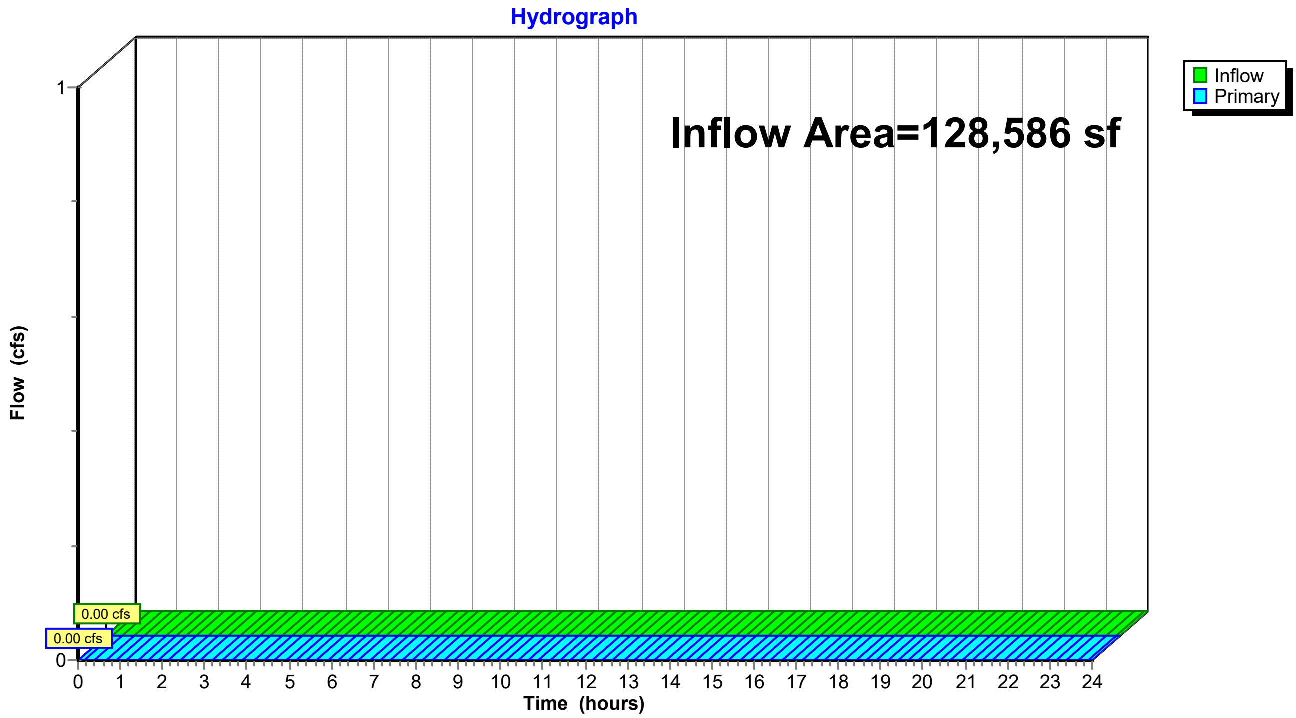


Summary for Link SP1: Study Point 1

Inflow Area =	128,586 sf,	50.28% Impervious,	Inflow Depth = 0.00"	for 10-Year event	
Inflow =	0.00 cfs @	0.00 hrs, Volume=	0 cf		
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf,	Atten= 0%,	Lag= 0.0 min

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

Link SP1: Study Point 1

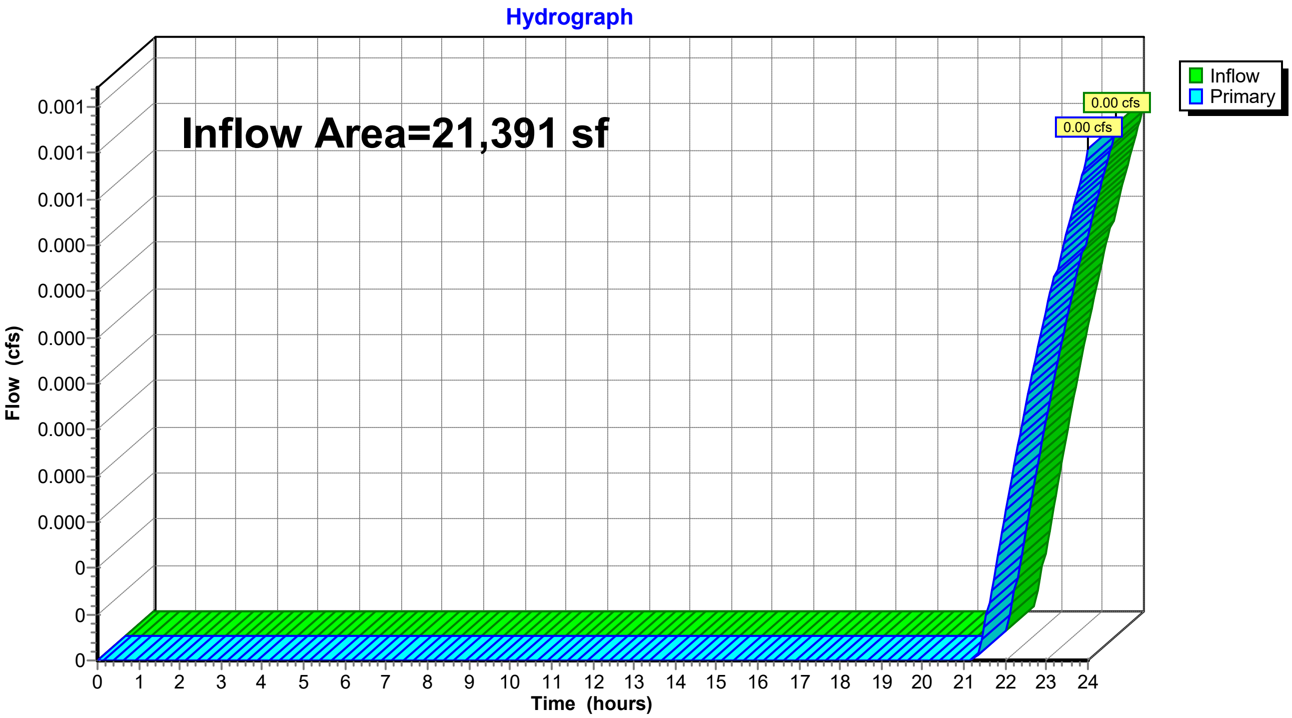


Summary for Link SP2: Study Point 2

Inflow Area =	21,391 sf,	0.00% Impervious,	Inflow Depth > 0.00"	for 10-Year event
Inflow =	0.00 cfs @	24.00 hrs, Volume=	3 cf	
Primary =	0.00 cfs @	24.00 hrs, Volume=	3 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP2: Study Point 2

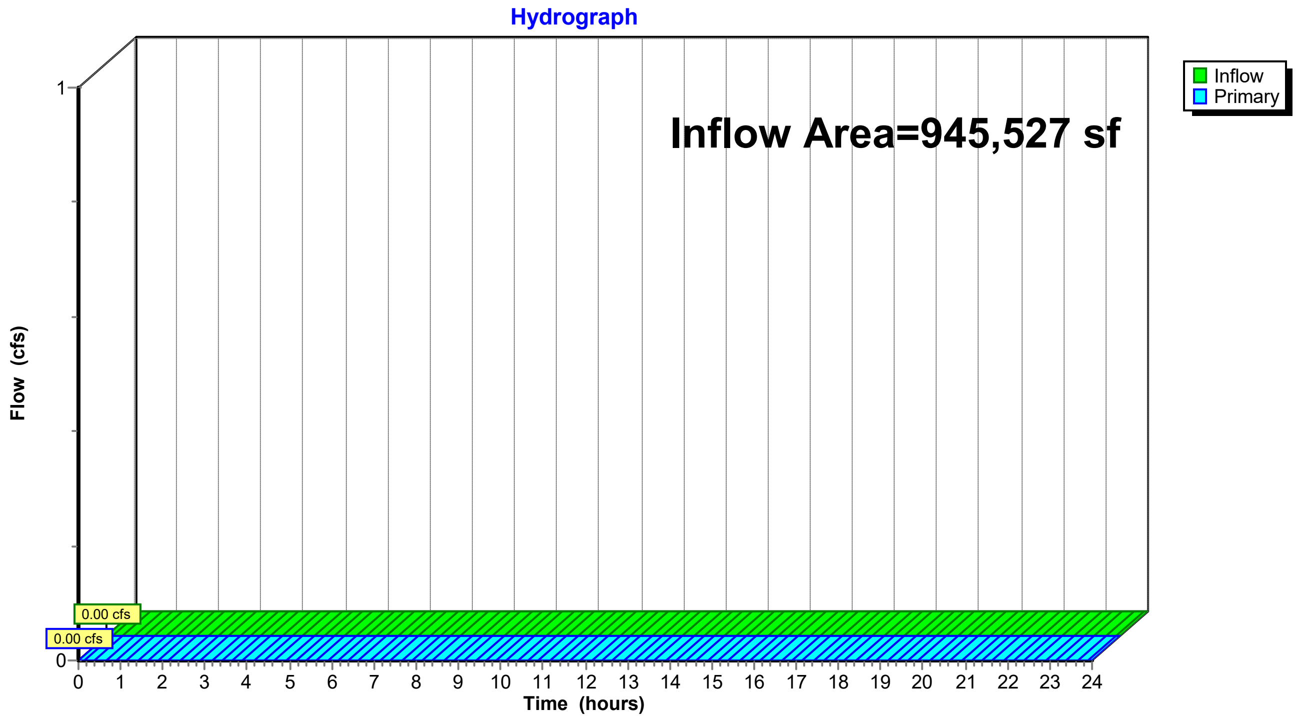


Summary for Link SP3: Study Point 3

Inflow Area = 945,527 sf, 40.09% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP3: Study Point 3

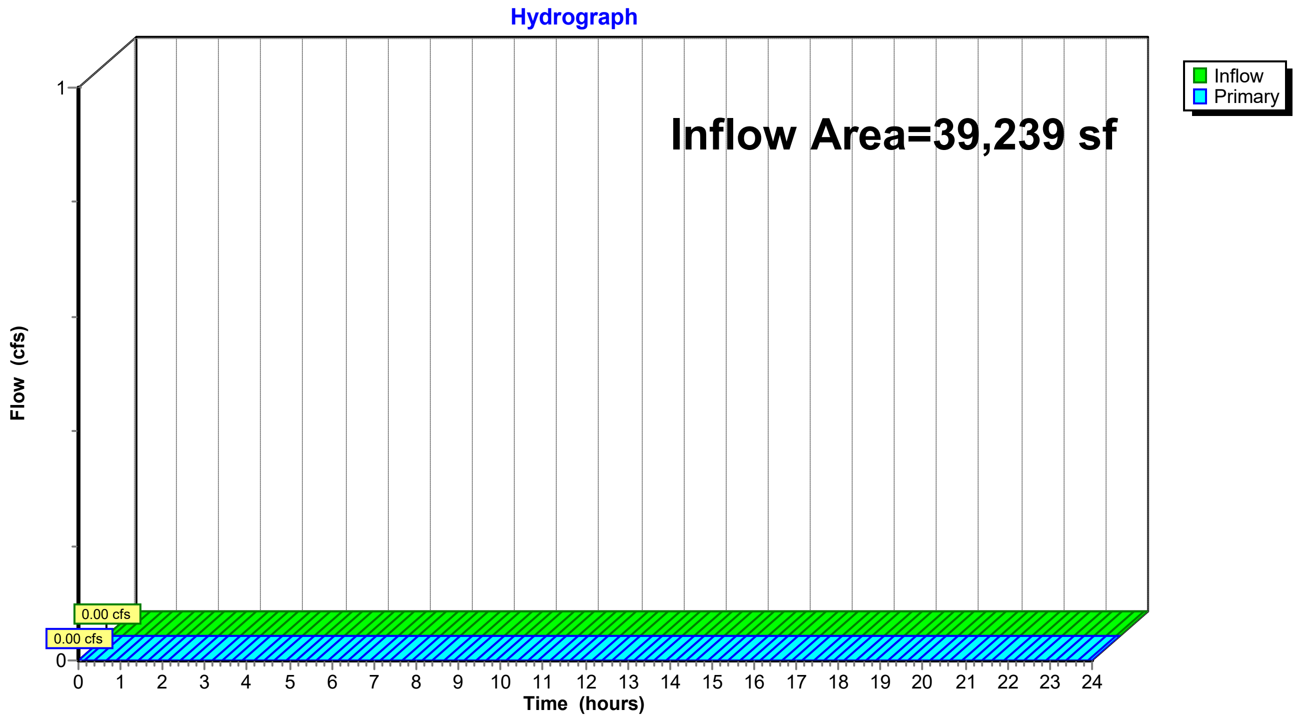


Summary for Link SP4: Study Point 4

Inflow Area =	39,239 sf,	0.00% Impervious,	Inflow Depth = 0.00"	for 10-Year event	
Inflow =	0.00 cfs @	0.00 hrs,	Volume=	0 cf	
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0 cf,	Atten= 0%, Lag= 0.0 min

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

Link SP4: Study Point 4

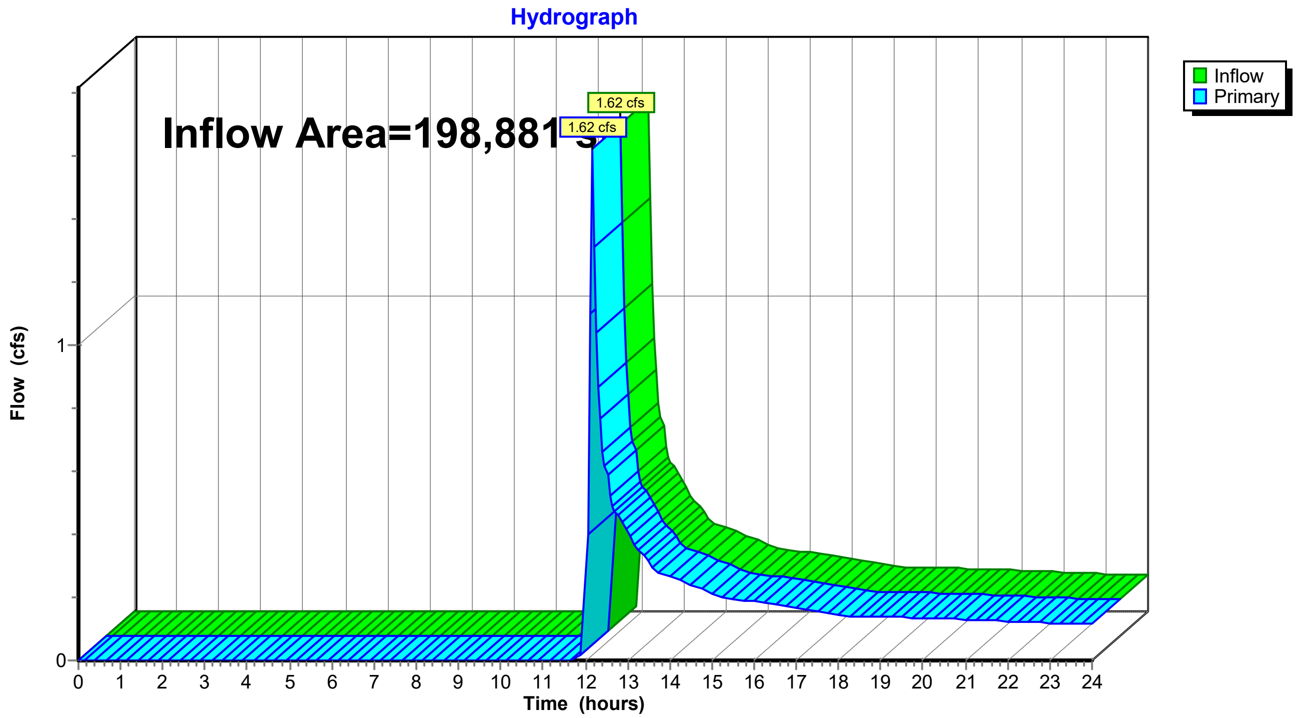


Summary for Link SP5: Study Point 5

Inflow Area =	198,881 sf,	26.41% Impervious,	Inflow Depth > 0.55"	for 10-Year event
Inflow =	1.62 cfs @	12.16 hrs, Volume=	9,172 cf	
Primary =	1.62 cfs @	12.16 hrs, Volume=	9,172 cf,	Atten= 0%, Lag= 0.0 min

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

Link SP5: Study Point 5

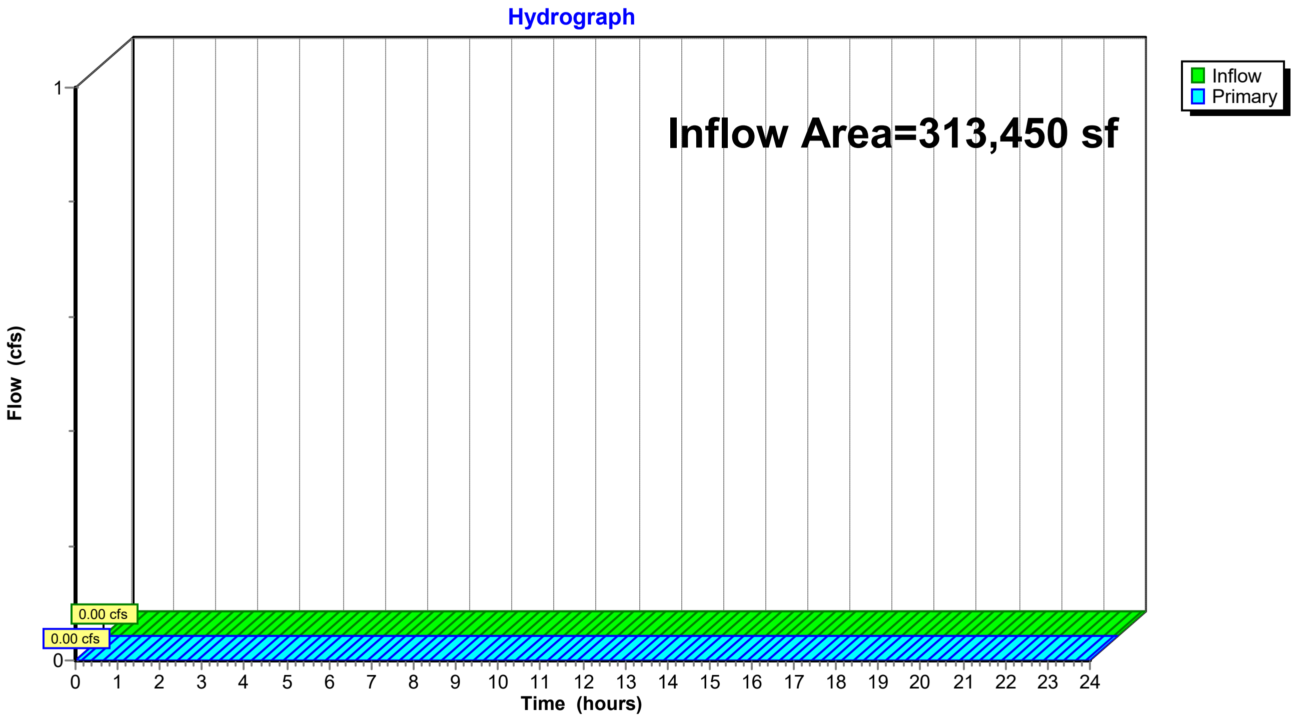


Summary for Link SP6: Study Point 6

Inflow Area =	313,450 sf, 49.57% Impervious,	Inflow Depth = 0.00"	for 10-Year event
Inflow =	0.00 cfs @ 0.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @ 0.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP6: Study Point 6



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 P-1: Subcat P-1 Runoff Area=22,598 sf 0.00% Impervious Runoff Depth>0.06"
Tc=6.0 min CN=30 Runoff=0.00 cfs 110 cf

Subcatchment P-10: Subcat P-10 Runoff Area=81,309 sf 89.65% Impervious Runoff Depth>4.94"
Tc=6.0 min CN=92 Runoff=9.12 cfs 33,445 cf

Subcatchment P-11: Subcat P-11 Runoff Area=47,527 sf 87.57% Impervious Runoff Depth>4.82"
Tc=6.0 min CN=91 Runoff=5.26 cfs 19,107 cf

Subcatchment P-12: Subcat P-12 Runoff Area=77,507 sf 51.21% Impervious Runoff Depth>2.61"
Tc=6.0 min CN=69 Runoff=5.00 cfs 16,838 cf

Subcatchment P-13: Subcat P-13 Runoff Area=25,981 sf 100.00% Impervious Runoff Depth>5.63"
Tc=6.0 min CN=98 Runoff=3.07 cfs 12,181 cf

Subcatchment P-14: Subcat P-14 Runoff Area=22,568 sf 100.00% Impervious Runoff Depth>5.63"
Tc=6.0 min CN=98 Runoff=2.66 cfs 10,581 cf

Subcatchment P-15: Subcat P-15 Runoff Area=33,657 sf 100.00% Impervious Runoff Depth>5.63"
Tc=6.0 min CN=98 Runoff=3.97 cfs 15,780 cf

Subcatchment P-16: Subcat P-16 Runoff Area=17,787 sf 100.00% Impervious Runoff Depth>5.63"
Tc=6.0 min CN=98 Runoff=2.10 cfs 8,339 cf

Subcatchment P-17: Subcat P-17 Runoff Area=21,272 sf 65.59% Impervious Runoff Depth>3.17"
Tc=6.0 min CN=75 Runoff=1.67 cfs 5,613 cf

Subcatchment P-18: Subcat P-18 Runoff Area=40,673 sf 12.88% Impervious Runoff Depth>0.57"
Tc=6.0 min CN=42 Runoff=0.25 cfs 1,929 cf

Subcatchment P-19: Subcat P-19 Runoff Area=81,428 sf 11.42% Impervious Runoff Depth>0.41"
Tc=6.0 min UI Adjusted CN=39 Runoff=0.16 cfs 2,764 cf

Subcatchment P-2: Subcat P-2 Runoff Area=21,391 sf 0.00% Impervious Runoff Depth>0.08"
Flow Length=168' Tc=8.3 min CN=31 Runoff=0.00 cfs 150 cf

Subcatchment P-20: Subcat P-20 Runoff Area=53,066 sf 2.40% Impervious Runoff Depth>0.31"
Tc=0.0 min CN=37 Runoff=0.06 cfs 1,378 cf

Subcatchment P-3: Subcat P-3 Runoff Area=10,242 sf 0.00% Impervious Runoff Depth>0.06"
Flow Length=350' Slope=0.0100 '/' Tc=17.6 min CN=30 Runoff=0.00 cfs 49 cf

Subcatchment P-4: Subcat P-4 Runoff Area=39,239 sf 0.00% Impervious Runoff Depth>0.06"
Tc=0.0 min CN=30 Runoff=0.01 cfs 193 cf

Subcatchment P-5: Subcat P-5 Runoff Area=198,881 sf 26.41% Impervious Runoff Depth>1.08"
Tc=6.0 min UI Adjusted CN=50 Runoff=4.40 cfs 17,850 cf

Subcatchment P-6: Subcat P-6 Runoff Area=260,840 sf 59.51% Impervious Runoff Depth>2.97"
Flow Length=226' Tc=12.3 min CN=73 Runoff=15.52 cfs 64,549 cf

Subcatchment P-7: Subcat P-7 Runoff Area=52,610 sf 0.28% Impervious Runoff Depth>0.08"
Tc=6.0 min CN=31 Runoff=0.01 cfs 370 cf

Subcatchment P-8: Subcat P-8 Runoff Area=319,050 sf 31.59% Impervious Runoff Depth>1.28"
Flow Length=452' Tc=19.4 min CN=53 Runoff=5.72 cfs 34,087 cf

Subcatchment P-9: Subcat P-9 Runoff Area=219,446 sf 26.87% Impervious Runoff Depth>1.29"
Tc=6.0 min CN=53 Runoff=6.25 cfs 23,614 cf

Reach 6R: VEGETATED SWALE Avg. Flow Depth=0.13' Max Vel=1.86 fps Inflow=0.16 cfs 2,764 cf
n=0.030 L=325.0' S=0.0394 '/' Capacity=48.93 cfs Outflow=0.16 cfs 2,745 cf

Pond 1P: Infiltration Basin 1 Peak Elev=175.06' Storage=11,477 cf Inflow=7.57 cfs 29,376 cf
Discarded=0.47 cfs 25,365 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.47 cfs 25,365 cf

Pond 2P: Infiltration Basin 2 Peak Elev=176.27' Storage=5,262 cf Inflow=4.34 cfs 17,573 cf
Discarded=0.40 cfs 17,501 cf Primary=0.00 cfs 0 cf Outflow=0.40 cfs 17,501 cf

Pond 3P: Underground Infiltration Peak Elev=173.26' Storage=39,457 cf Inflow=27.35 cfs 104,604 cf
Discarded=1.59 cfs 87,548 cf Primary=0.00 cfs 0 cf Outflow=1.59 cfs 87,548 cf

Pond 4P: Existing Ditch 1 Peak Elev=193.58' Storage=192 cf Inflow=0.01 cfs 193 cf
Outflow=0.00 cfs 0 cf

Pond 5P: Infiltration Basin 3 Peak Elev=171.83' Storage=14,547 cf Inflow=5.72 cfs 34,087 cf
Discarded=0.59 cfs 23,328 cf Primary=0.00 cfs 0 cf Outflow=0.59 cfs 23,328 cf

Pond 12P: Drainage Easement Ditch Peak Elev=185.78' Storage=64,875 cf Inflow=15.52 cfs 64,918 cf
Outflow=0.00 cfs 0 cf

Link SP1: Study Point 1 Inflow=0.00 cfs 110 cf
Primary=0.00 cfs 110 cf

Link SP2: Study Point 2 Inflow=0.00 cfs 150 cf
Primary=0.00 cfs 150 cf

Link SP3: Study Point 3 Inflow=0.00 cfs 49 cf
Primary=0.00 cfs 49 cf

Link SP4: Study Point 4 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP5: Study Point 5 Inflow=4.40 cfs 17,850 cf
Primary=4.40 cfs 17,850 cf

Link SP6: Study Point 6 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,647,074 sf Runoff Volume = 268,928 cf Average Runoff Depth = 1.96"
60.44% Pervious = 995,478 sf 39.56% Impervious = 651,596 sf

Summary for Subcatchment P-1: Subcat P-1

[73] Warning: Peak may fall outside time span

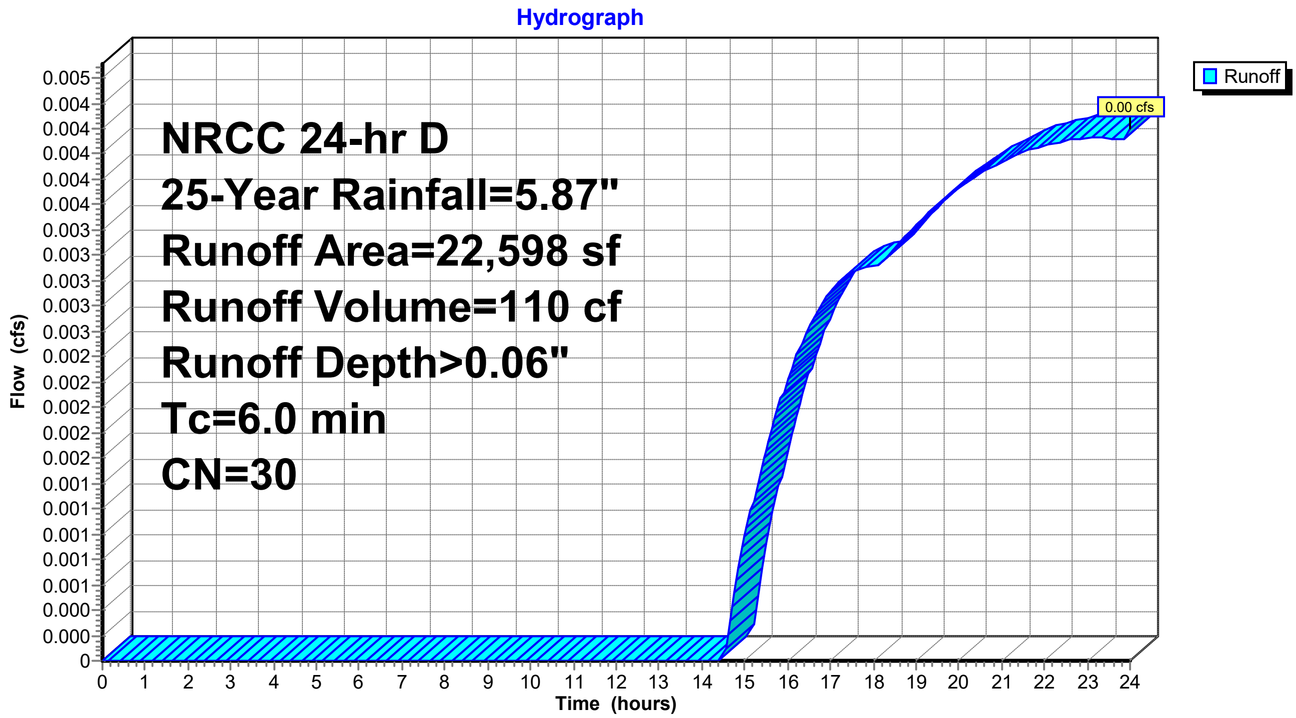
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 110 cf, Depth> 0.06"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
22,598	30	Woods, Good, HSG A
22,598		100.00% Pervious Area

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

Subcatchment P-1: Subcat P-1



Summary for Subcatchment P-10: Subcat P-10

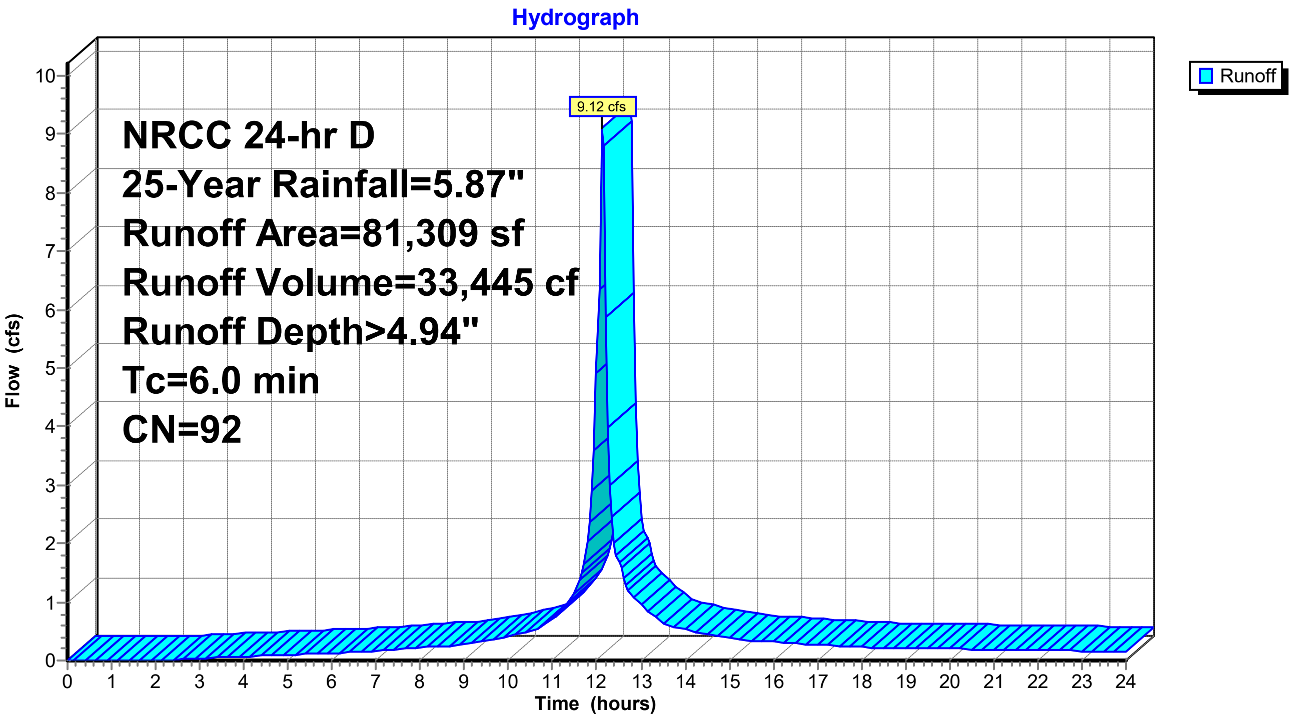
Runoff = 9.12 cfs @ 12.13 hrs, Volume= 33,445 cf, Depth> 4.94"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
72,894	98	Paved parking, HSG A
366	39	>75% Grass cover, Good, HSG A
158	39	>75% Grass cover, Good, HSG A
225	39	>75% Grass cover, Good, HSG A
204	39	>75% Grass cover, Good, HSG A
589	39	>75% Grass cover, Good, HSG A
450	39	>75% Grass cover, Good, HSG A
158	39	>75% Grass cover, Good, HSG A
71	39	>75% Grass cover, Good, HSG A
313	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
2	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
1,184	39	>75% Grass cover, Good, HSG A
969	39	>75% Grass cover, Good, HSG A
465	39	>75% Grass cover, Good, HSG A
2,238	39	>75% Grass cover, Good, HSG A
81,309	92	Weighted Average
8,415		10.35% Pervious Area
72,894		89.65% Impervious Area

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

Subcatchment P-10: Subcat P-10



Summary for Subcatchment P-11: Subcat P-11

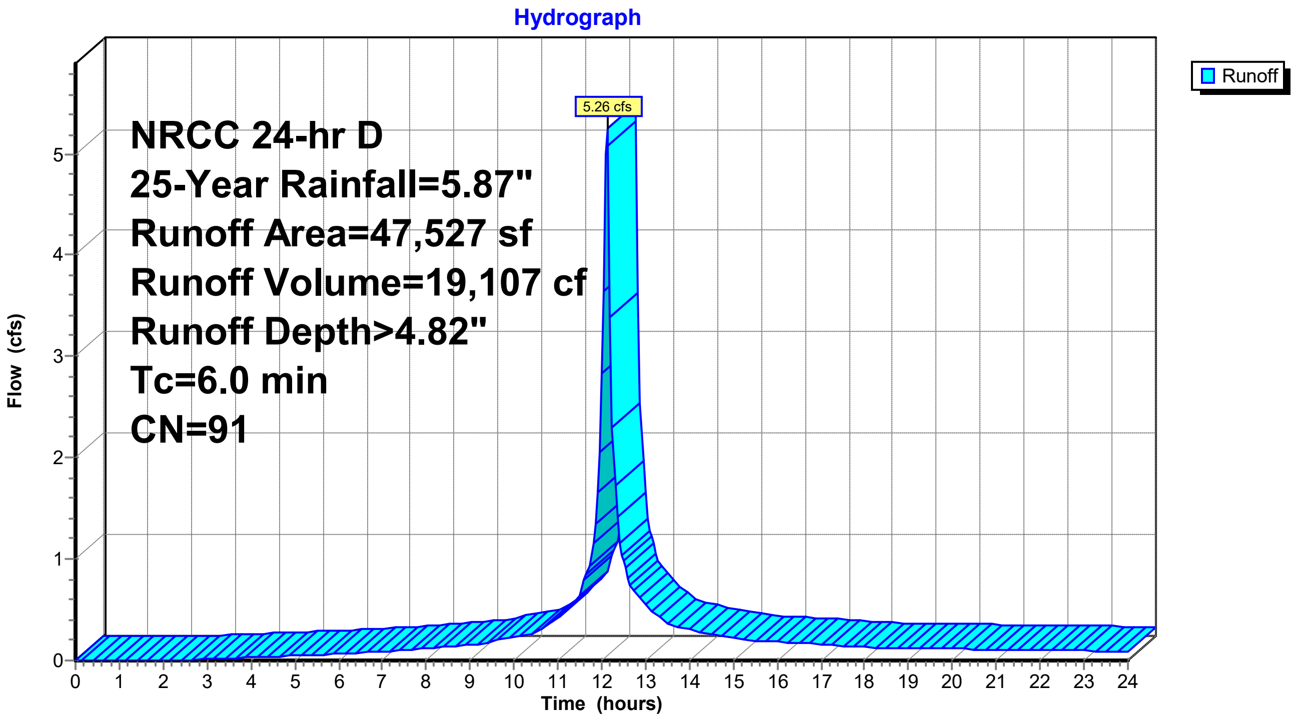
Runoff = 5.26 cfs @ 12.13 hrs, Volume= 19,107 cf, Depth> 4.82"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
41,622	98	Paved parking, HSG A
96	39	>75% Grass cover, Good, HSG A
527	39	>75% Grass cover, Good, HSG A
162	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
492	39	>75% Grass cover, Good, HSG A
2,498	39	>75% Grass cover, Good, HSG A
314	39	>75% Grass cover, Good, HSG A
944	39	>75% Grass cover, Good, HSG A
0	30	Woods, Good, HSG A
47,527	91	Weighted Average
5,906		12.43% Pervious Area
41,622		87.57% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

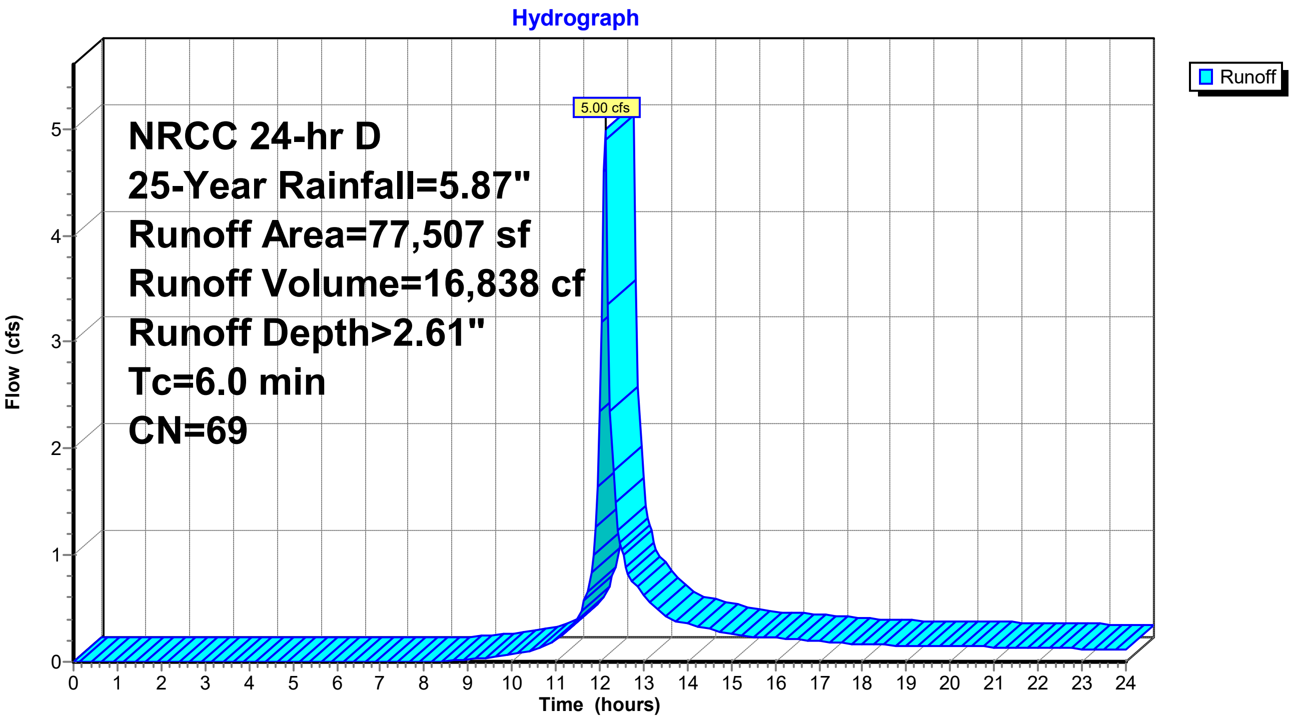
Runoff = 5.00 cfs @ 12.13 hrs, Volume= 16,838 cf, Depth> 2.61"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
0	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
4,403	39	>75% Grass cover, Good, HSG A
2,477	39	>75% Grass cover, Good, HSG A
1,191	39	>75% Grass cover, Good, HSG A
937	39	>75% Grass cover, Good, HSG A
173	39	>75% Grass cover, Good, HSG A
191	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
241	39	>75% Grass cover, Good, HSG A
507	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
200	39	>75% Grass cover, Good, HSG A
638	39	>75% Grass cover, Good, HSG A
442	39	>75% Grass cover, Good, HSG A
1,419	39	>75% Grass cover, Good, HSG A
1,858	39	>75% Grass cover, Good, HSG A
2,790	39	>75% Grass cover, Good, HSG A
1,695	39	>75% Grass cover, Good, HSG A
5,011	39	>75% Grass cover, Good, HSG A
90	39	>75% Grass cover, Good, HSG A
1,322	39	>75% Grass cover, Good, HSG A
1,414	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
1,339	39	>75% Grass cover, Good, HSG A
305	39	>75% Grass cover, Good, HSG A
3,810	39	>75% Grass cover, Good, HSG A
1,418	39	>75% Grass cover, Good, HSG A
349	39	>75% Grass cover, Good, HSG A
2,253	39	>75% Grass cover, Good, HSG A
39,692	98	Paved parking, HSG A
77,507	69	Weighted Average
37,815		48.79% Pervious Area
39,692		51.21% Impervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

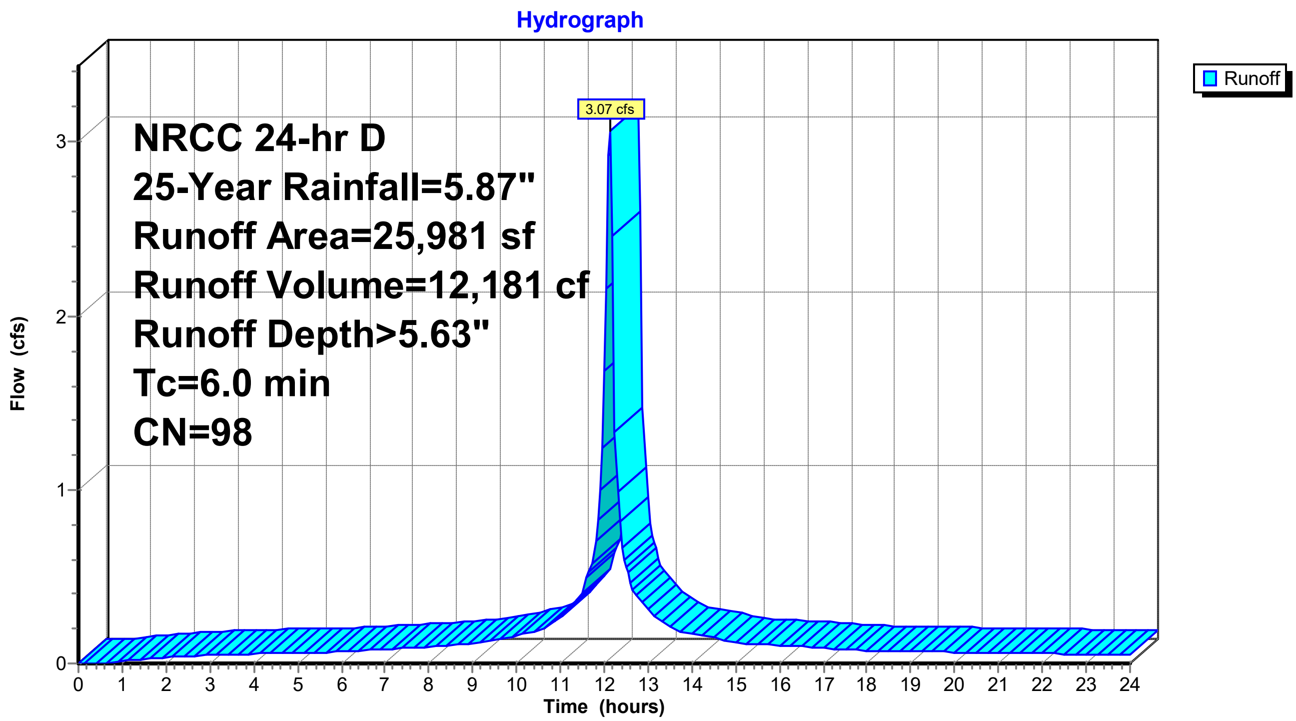
Runoff = 3.07 cfs @ 12.13 hrs, Volume= 12,181 cf, Depth> 5.63"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
25,981	98	Roofs, HSG A
25,981		100.00% Impervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

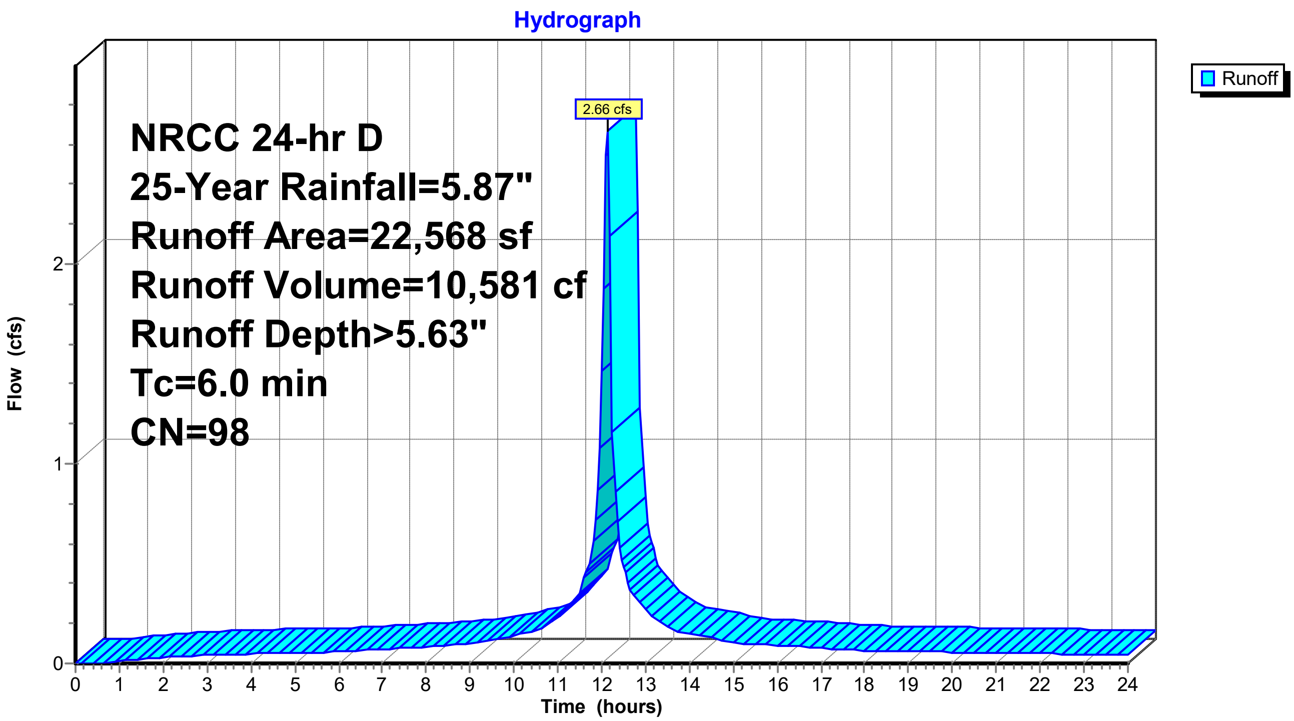
Runoff = 2.66 cfs @ 12.13 hrs, Volume= 10,581 cf, Depth> 5.63"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
22,568	98	Roofs, HSG A
22,568		100.00% Impervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

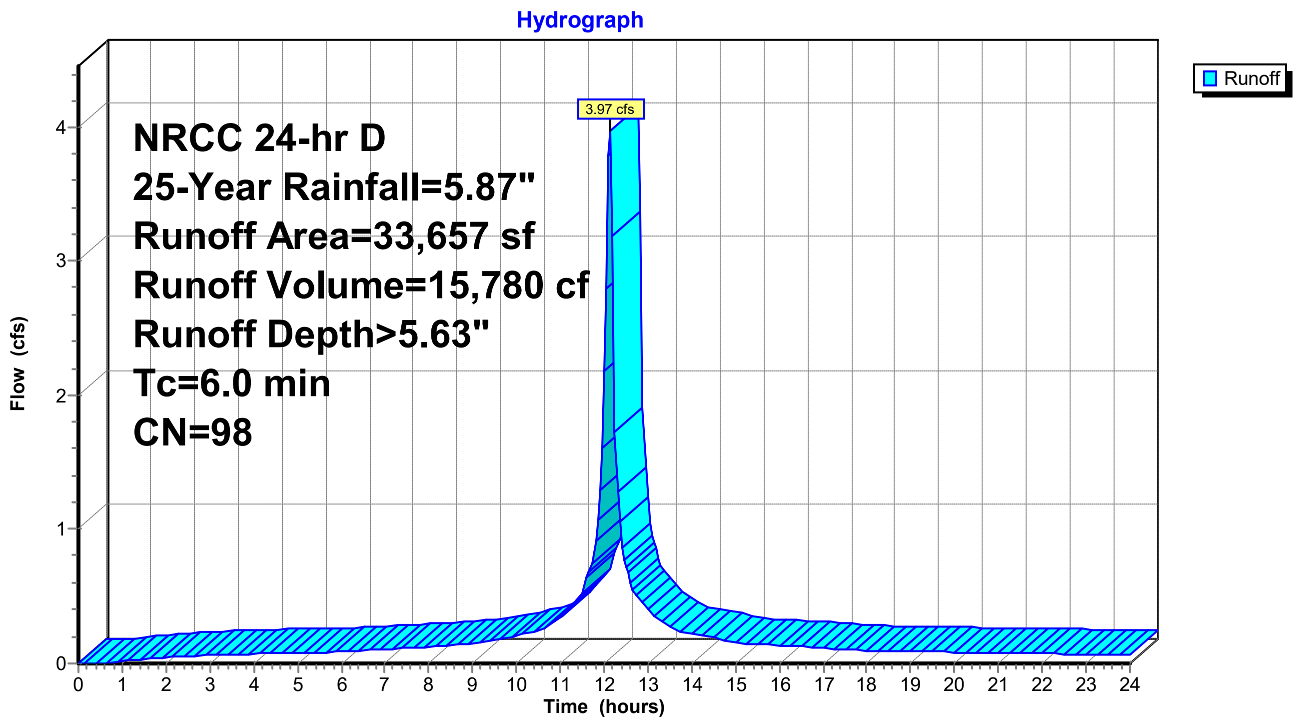
Runoff = 3.97 cfs @ 12.13 hrs, Volume= 15,780 cf, Depth> 5.63"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
33,657	98	Roofs, HSG A
33,657		100.00% Impervious Area

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

Subcatchment P-15: Subcat P-15



Summary for Subcatchment P-16: Subcat P-16

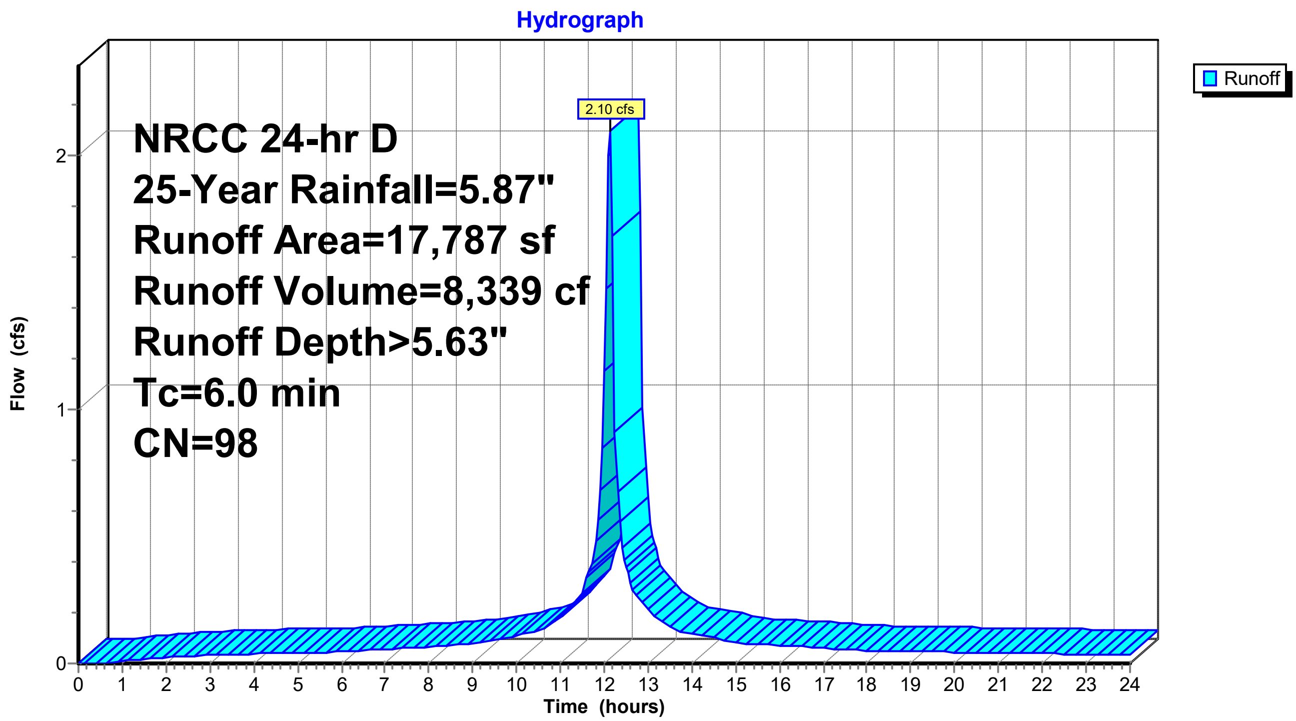
Runoff = 2.10 cfs @ 12.13 hrs, Volume= 8,339 cf, Depth> 5.63"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
17,787	98	Water Surface, HSG A
17,787		100.00% Impervious Area

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

Subcatchment P-16: Subcat P-16



Summary for Subcatchment P-17: Subcat P-17

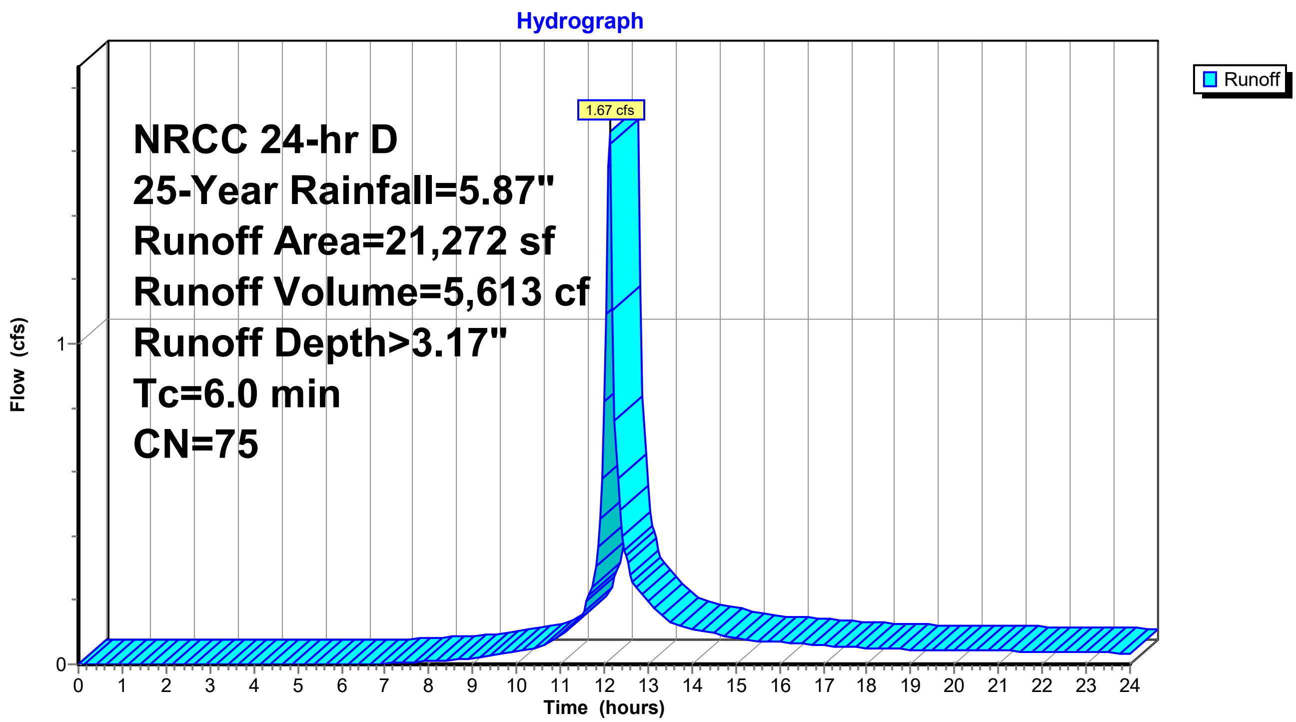
Runoff = 1.67 cfs @ 12.13 hrs, Volume= 5,613 cf, Depth> 3.17"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
13,951	98	Water Surface, HSG A
7,321	30	Woods, Good, HSG A
21,272	75	Weighted Average
7,321		34.41% Pervious Area
13,951		65.59% Impervious Area

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

Subcatchment P-17: Subcat P-17



Summary for Subcatchment P-18: Subcat P-18

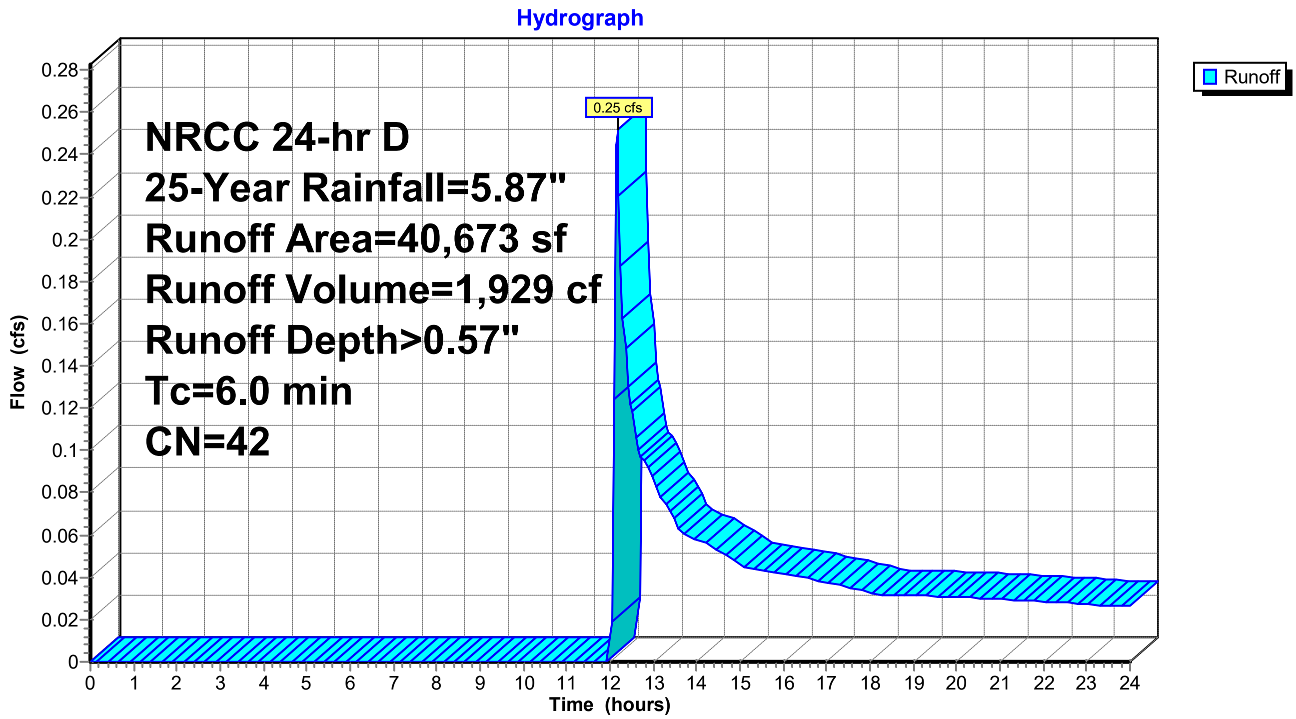
Runoff = 0.25 cfs @ 12.17 hrs, Volume= 1,929 cf, Depth> 0.57"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
20,962	54	1/2 acre lots, 25% imp, HSG A
0	98	Water Surface, HSG A
19,711	30	Woods, Good, HSG A
40,673	42	Weighted Average
35,433		87.12% Pervious Area
5,240		12.88% Impervious Area

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

Subcatchment P-18: Subcat P-18



Summary for Subcatchment P-19: Subcat P-19

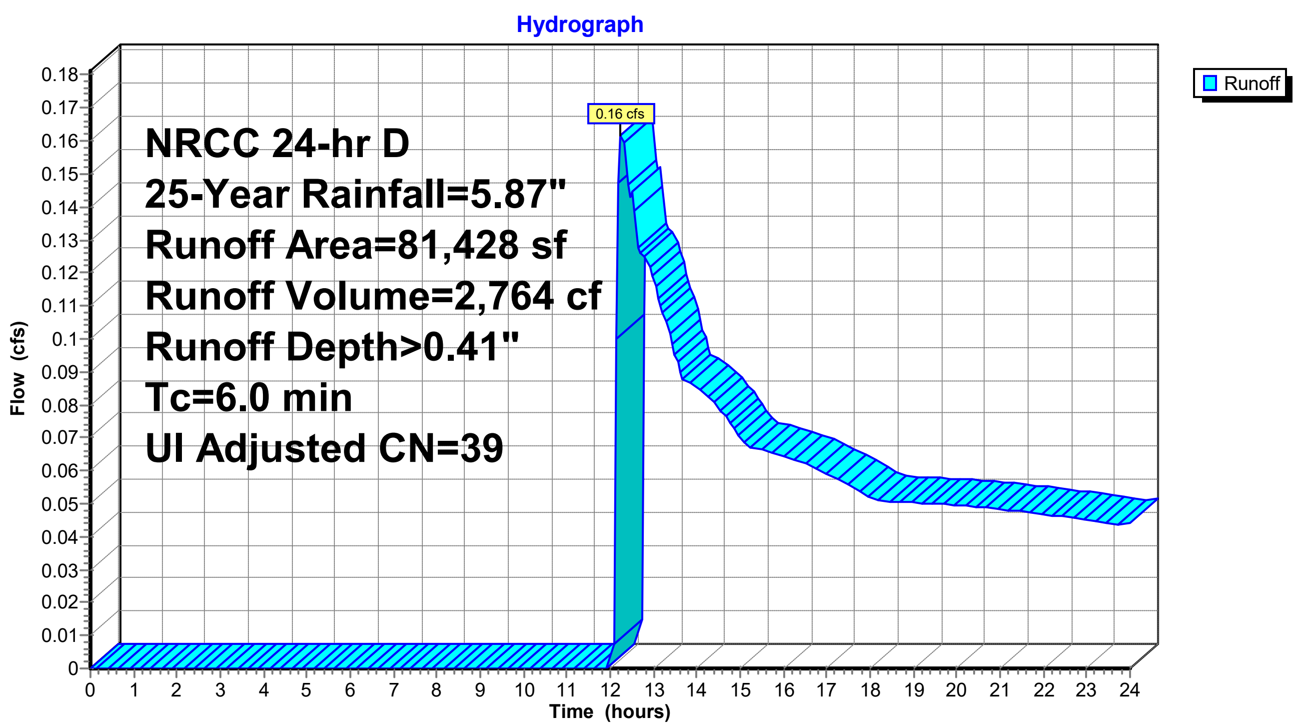
Runoff = 0.16 cfs @ 12.25 hrs, Volume= 2,764 cf, Depth> 0.41"
Routed to Reach 6R : VEGETATED SWALE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Adj	Description
28,826	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
6,878	39		>75% Grass cover, Good, HSG A
44	98		Unconnected pavement, HSG A
61	98		Unconnected pavement, HSG A
9,162	98		Unconnected pavement, HSG A
30	98		Unconnected pavement, HSG A
36,428	39		>75% Grass cover, Good, HSG A
81,428	43	39	Weighted Average, UI Adjusted
72,131			88.58% Pervious Area
9,296			11.42% Impervious Area
9,296			100.00% Unconnected

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

Subcatchment P-19: Subcat P-19



Summary for Subcatchment P-2: Subcat P-2

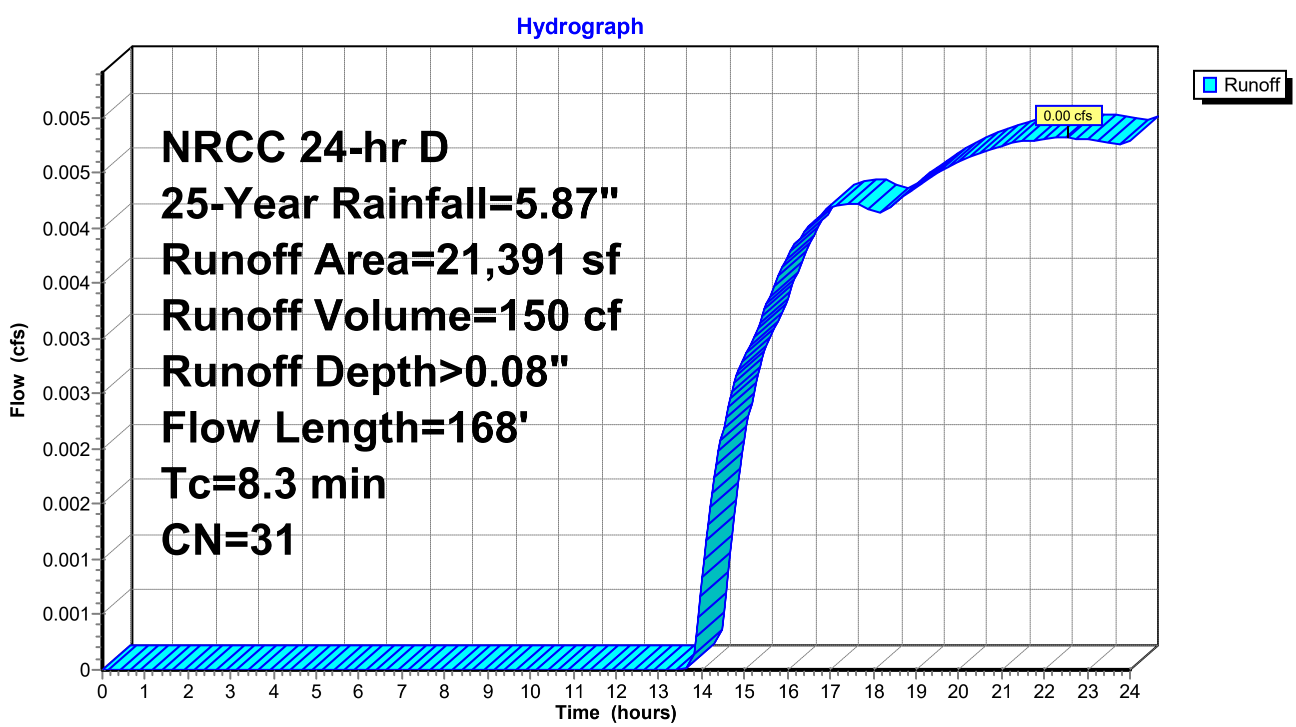
Runoff = 0.00 cfs @ 22.56 hrs, Volume= 150 cf, Depth> 0.08"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
1,942	39	>75% Grass cover, Good, HSG A
19,449	30	Woods, Good, HSG A
21,391	31	Weighted Average
21,391		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.09"
0.7	118	0.1440	2.66		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.3	168	Total			

Subcatchment P-2: Subcat P-2



Summary for Subcatchment P-20: Subcat P-20

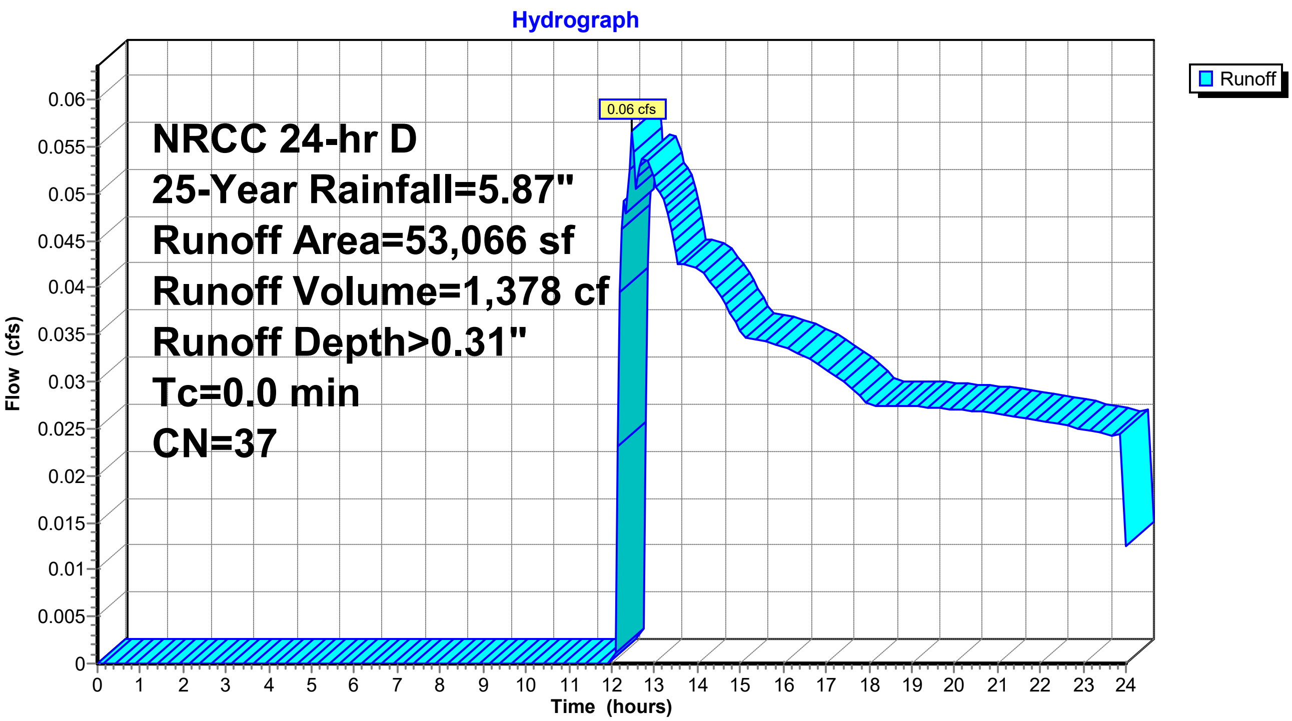
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.06 cfs @ 12.46 hrs, Volume= 1,378 cf, Depth> 0.31"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
22,364	30	Woods, Good, HSG A
8	30	Woods, Good, HSG A
29,421	39	>75% Grass cover, Good, HSG A
1,273	98	Roofs, HSG A
53,066	37	Weighted Average
51,793		97.60% Pervious Area
1,273		2.40% Impervious Area

Subcatchment P-20: Subcat P-20



Summary for Subcatchment P-3: Subcat P-3

[73] Warning: Peak may fall outside time span

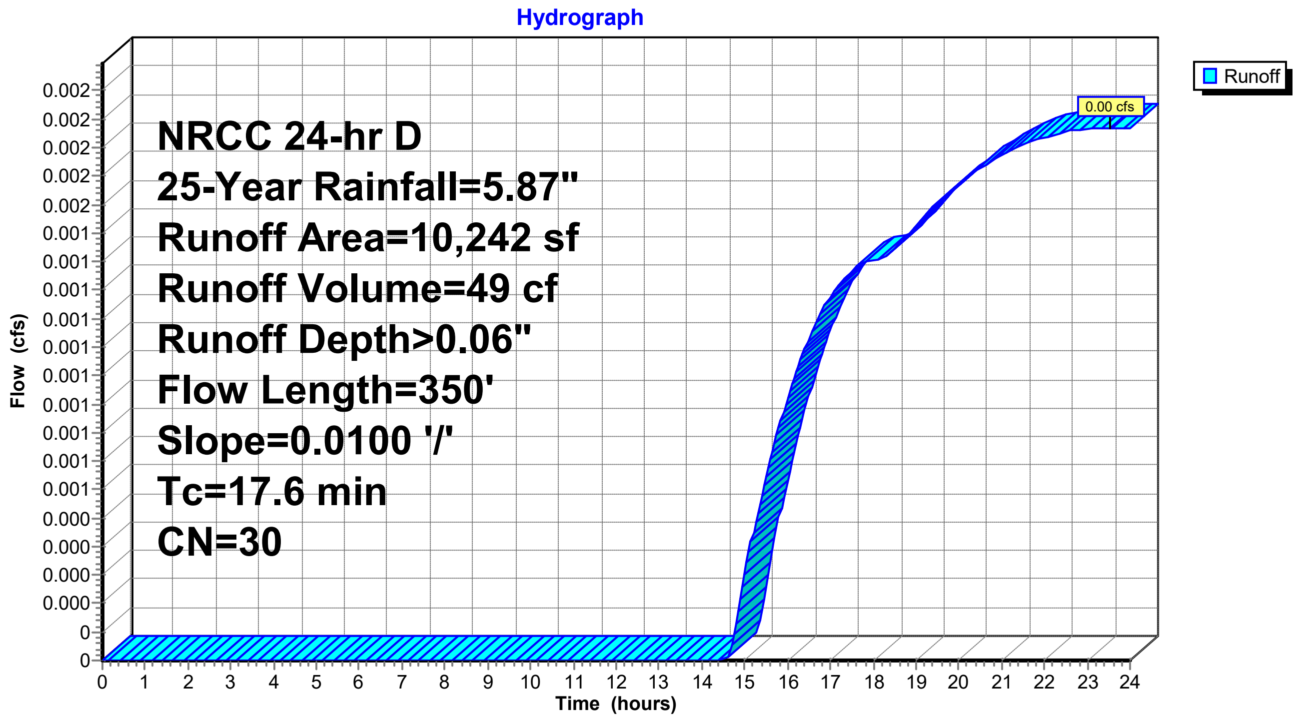
Runoff = 0.00 cfs @ 23.52 hrs, Volume= 49 cf, Depth> 0.06"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
6	39	>75% Grass cover, Good, HSG A
10,236	30	Woods, Good, HSG A
10,242	30	Weighted Average
10,242		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.09"
10.0	300	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.6	350	Total			

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

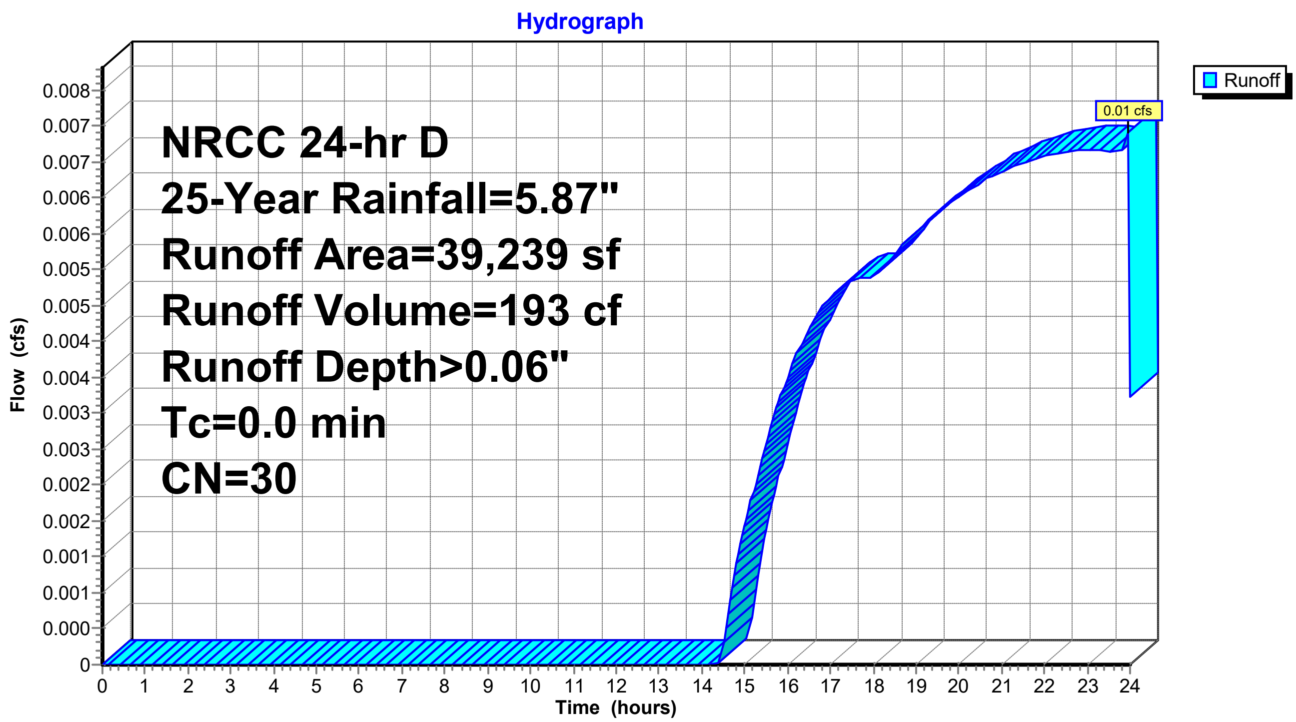
[46] Hint: Tc=0 (Instant runoff peak depends on dt)
[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 23.95 hrs, Volume= 193 cf, Depth> 0.06"
Routed to Pond 4P : Existing Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
39,239	30	Woods, Good, HSG A
39,239		100.00% Pervious Area

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

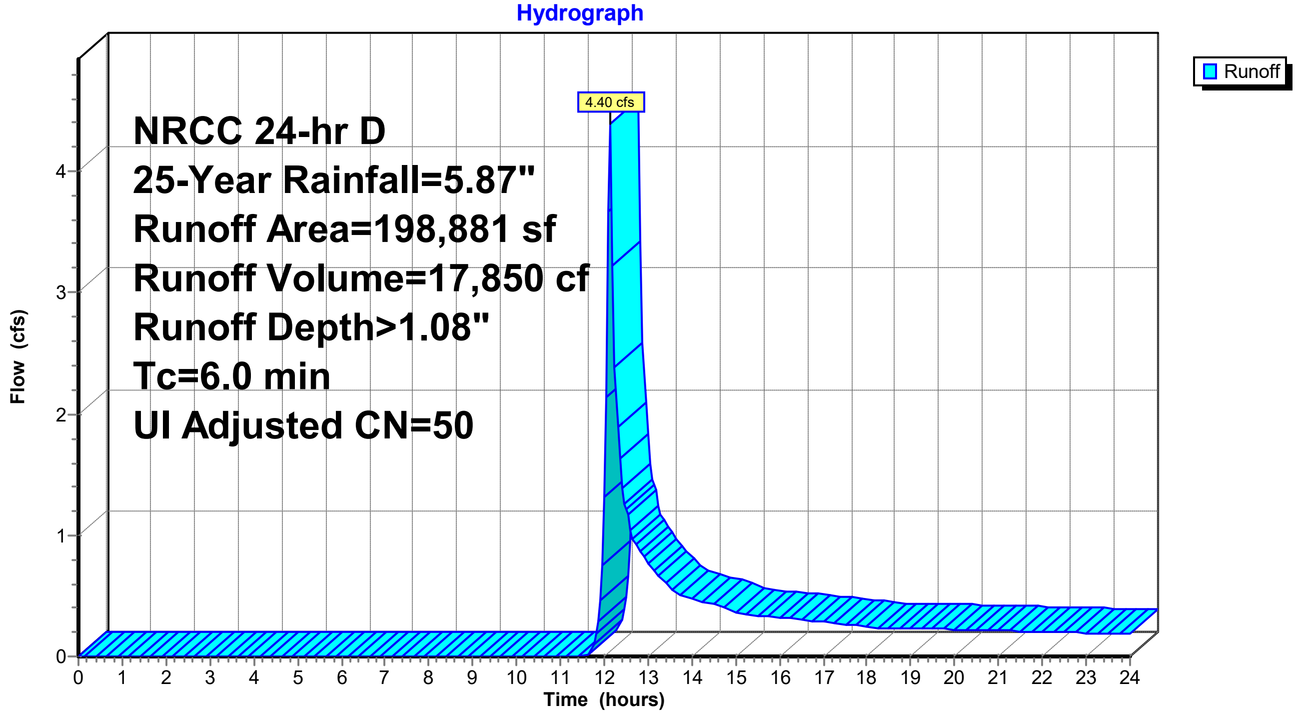
Runoff = 4.40 cfs @ 12.14 hrs, Volume= 17,850 cf, Depth> 1.08"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Adj	Description
21,040	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
60,243	30		Woods, Good, HSG A
11,413	30		Woods, Good, HSG A
5,380	30		Woods, Good, HSG A
0	39		>75% Grass cover, Good, HSG A
315	39		>75% Grass cover, Good, HSG A
1,914	39		>75% Grass cover, Good, HSG A
761	39		>75% Grass cover, Good, HSG A
10,302	39		>75% Grass cover, Good, HSG A
1,325	30		Woods, Good, HSG A
13,415	72		Dirt roads, HSG A
527	98		Unconnected pavement, HSG A
43	98		Unconnected pavement, HSG A
38	98		Unconnected pavement, HSG A
39	98		Unconnected pavement, HSG A
13,837	98		Unconnected pavement, HSG A
33	98		Unconnected pavement, HSG A
330	39		>75% Grass cover, Good, HSG A
9,969	98		Roofs, HSG A
395	98		Roofs, HSG A
1,474	98		Roofs, HSG A
2	98		Roofs, HSG A
9,863	98		Roofs, HSG A
3,360	39		>75% Grass cover, Good, HSG A
16,236	98		Paved parking, HSG A
56	98		Paved parking, HSG A
11	98		Paved parking, HSG A
11,291	39		>75% Grass cover, Good, HSG A
5,272	39		>75% Grass cover, Good, HSG A
198,881	52	50	Weighted Average, UI Adjusted
146,360			73.59% Pervious Area
52,521			26.41% Impervious Area
14,517			27.64% Unconnected

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

Runoff = 15.52 cfs @ 12.20 hrs, Volume= 64,549 cf, Depth> 2.97"
Routed to Pond 12P : Drainage Easement Ditch

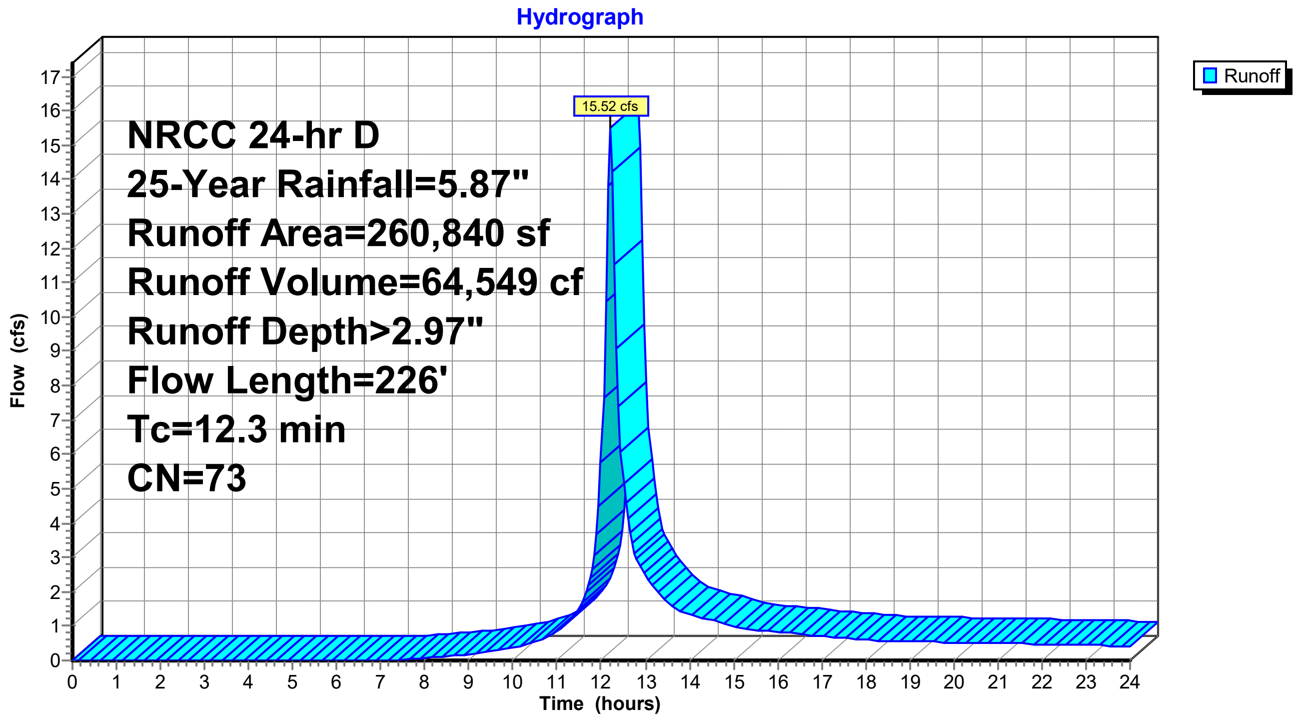
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
1	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
556	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
580	30	Woods, Good, HSG A
87	30	Woods, Good, HSG A
76	30	Woods, Good, HSG A
17	30	Woods, Good, HSG A
41	30	Woods, Good, HSG A
234	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
1,039	39	>75% Grass cover, Good, HSG A
80	30	Woods, Good, HSG A
124	39	>75% Grass cover, Good, HSG A
9,477	39	>75% Grass cover, Good, HSG A
1,324	39	>75% Grass cover, Good, HSG A
3,326	39	>75% Grass cover, Good, HSG A
197	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
849	39	>75% Grass cover, Good, HSG A
1,494	39	>75% Grass cover, Good, HSG A
488	39	>75% Grass cover, Good, HSG A
5,897	39	>75% Grass cover, Good, HSG A
207	39	>75% Grass cover, Good, HSG A
38	39	>75% Grass cover, Good, HSG A
35,199	54	1/2 acre lots, 25% imp, HSG A
2,290	54	1/2 acre lots, 25% imp, HSG A
5,803	98	Unconnected pavement, HSG A
2,360	98	Unconnected pavement, HSG A
889	98	Unconnected pavement, HSG A
715	98	Unconnected pavement, HSG A
135,515	98	Paved parking, HSG A
563	98	Unconnected pavement, HSG A
3,565	39	>75% Grass cover, Good, HSG A
2,358	30	Woods, Good, HSG A
6,778	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
1,577	39	>75% Grass cover, Good, HSG A
1,768	39	>75% Grass cover, Good, HSG A
362	39	>75% Grass cover, Good, HSG A
12,602	30	Woods, Good, HSG A
10,885	39	>75% Grass cover, Good, HSG A
4,375	30	Woods, Good, HSG A
2,426	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
348	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
2,039	39	>75% Grass cover, Good, HSG A

564	39	>75% Grass cover, Good, HSG A
591	39	>75% Grass cover, Good, HSG A
260,840	73	Weighted Average
105,623		40.49% Pervious Area
155,217		59.51% Impervious Area
10,330		6.66% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.3	15	0.0200	0.99		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	161	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.3	226	Total			

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

[73] Warning: Peak may fall outside time span

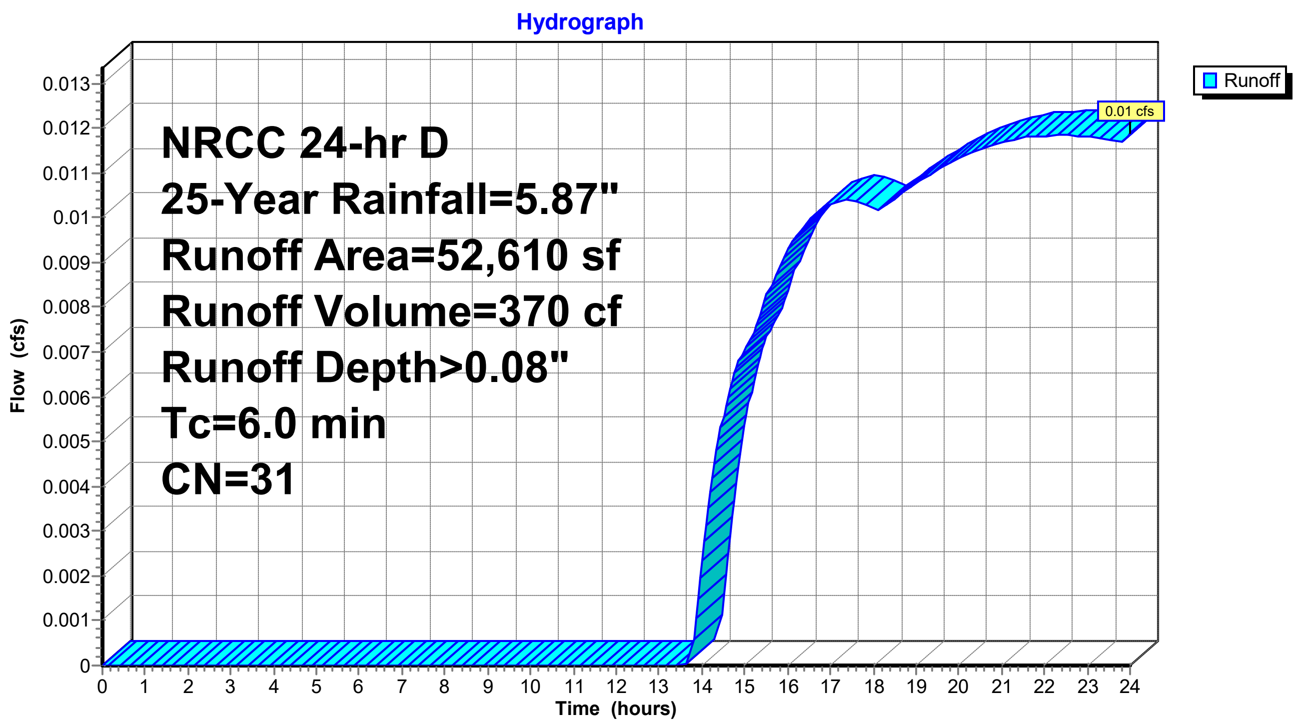
Runoff = 0.01 cfs @ 24.00 hrs, Volume= 370 cf, Depth> 0.08"
Routed to Pond 12P : Drainage Easement Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
49,207	30	Woods, Good, HSG A
72	30	Woods, Good, HSG A
2,969	39	>75% Grass cover, Good, HSG A
215	30	Woods, Good, HSG A
26	98	Unconnected pavement, HSG A
113	98	Unconnected pavement, HSG A
8	98	Paved parking, HSG A
52,610	31	Weighted Average
52,463		99.72% Pervious Area
147		0.28% Impervious Area
139		94.53% Unconnected

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

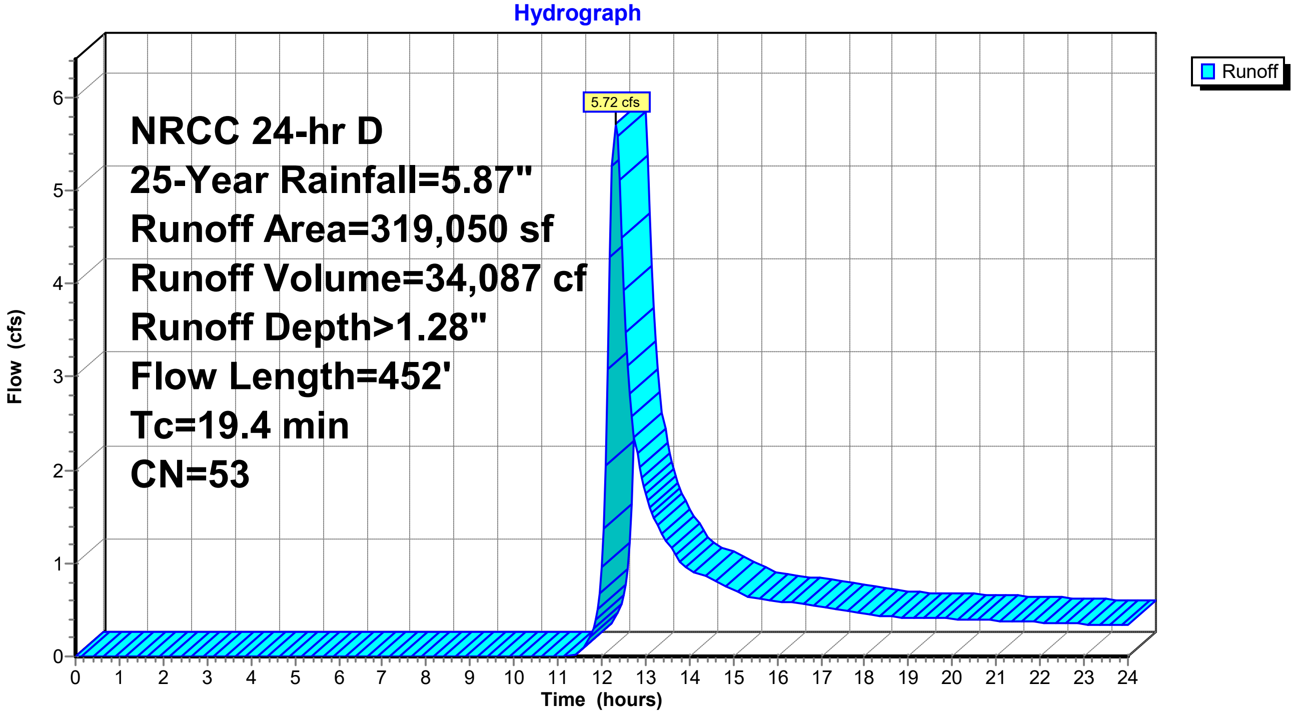
Runoff = 5.72 cfs @ 12.31 hrs, Volume= 34,087 cf, Depth> 1.28"
Routed to Pond 5P : Infiltration Basin 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
155,878	30	Woods, Good, HSG A
13,674	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
57	39	>75% Grass cover, Good, HSG A
1,057	39	>75% Grass cover, Good, HSG A
58	39	>75% Grass cover, Good, HSG A
44,905	39	>75% Grass cover, Good, HSG A
1,978	39	>75% Grass cover, Good, HSG A
665	72	Dirt roads, HSG A
1,101	98	Unconnected pavement, HSG A
7,746	98	Unconnected pavement, HSG A
26,556	98	Unconnected pavement, HSG A
12	98	Unconnected pavement, HSG A
71	98	Unconnected pavement, HSG A
210	98	Unconnected pavement, HSG A
7,456	98	Unconnected pavement, HSG A
9,916	98	Roofs, HSG A
47,139	98	Roofs, HSG A
175	98	Roofs, HSG A
395	98	Roofs, HSG A
319,050	53	Weighted Average
218,273		68.41% Pervious Area
100,778		31.59% Impervious Area
43,153		42.82% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	50	0.0240	0.07		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
2.0	76	0.0660	0.64		**Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps
1.7	79	0.0120	0.77		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0270	3.34		**Shallow Concentrated Flow, D-E** Paved Kv= 20.3 fps
3.9	220	0.0180	0.94		**Shallow Concentrated Flow, E-F** Short Grass Pasture Kv= 7.0 fps
19.4	452	Total			

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

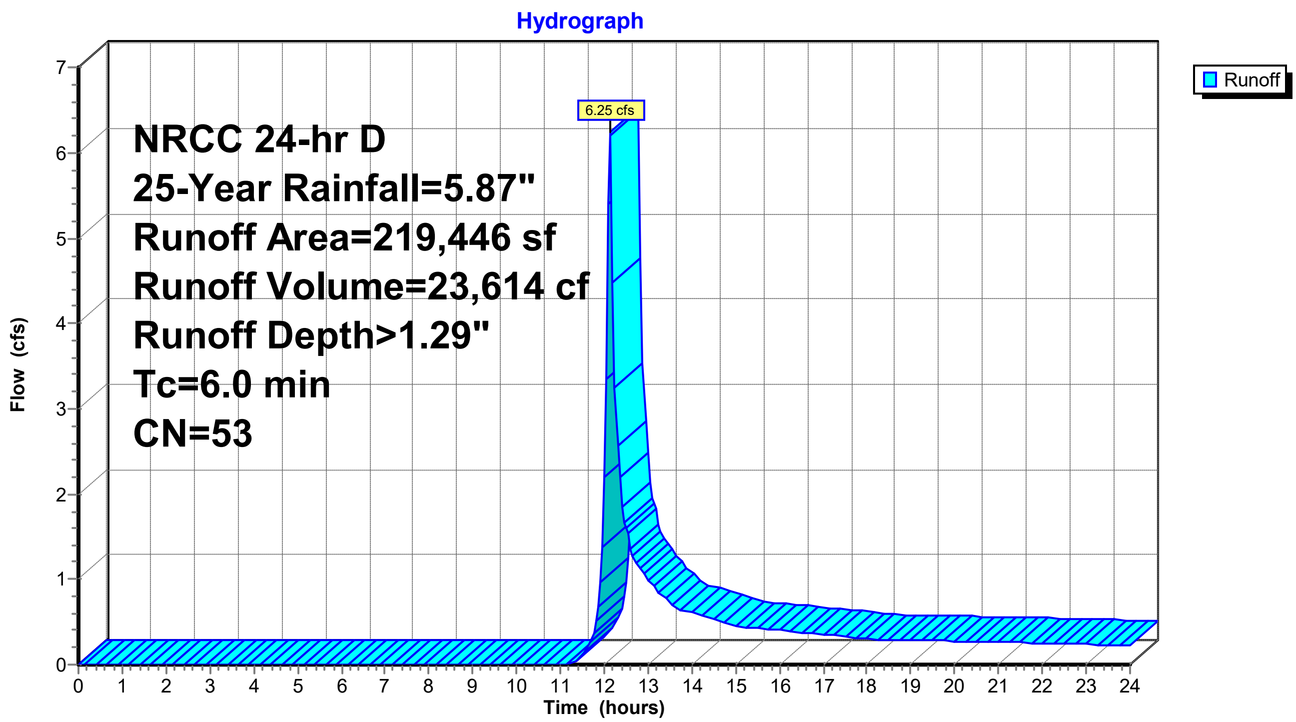
Runoff = 6.25 cfs @ 12.14 hrs, Volume= 23,614 cf, Depth> 1.29"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 25-Year Rainfall=5.87"

Area (sf)	CN	Description
103,904	54	1/2 acre lots, 25% imp, HSG A
37,219	54	1/2 acre lots, 25% imp, HSG A
5,066	39	>75% Grass cover, Good, HSG A
23,689	98	Paved parking, HSG A
49,568	30	Woods, Good, HSG A
219,446	53	Weighted Average
160,476		73.13% Pervious Area
58,969		26.87% Impervious Area

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

Subcatchment P-9: Subcat P-9



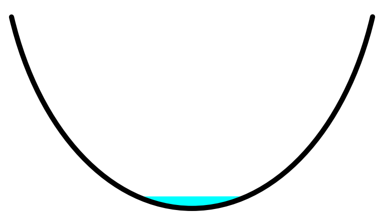
Summary for Reach 6R: VEGETATED SWALE

Inflow Area = 81,428 sf, 11.42% Impervious, Inflow Depth > 0.41" for 25-Year event
Inflow = 0.16 cfs @ 12.25 hrs, Volume= 2,764 cf
Outflow = 0.16 cfs @ 12.38 hrs, Volume= 2,745 cf, Atten= 1%, Lag= 7.9 min
Routed to Pond 3P : Underground Infiltration System 1

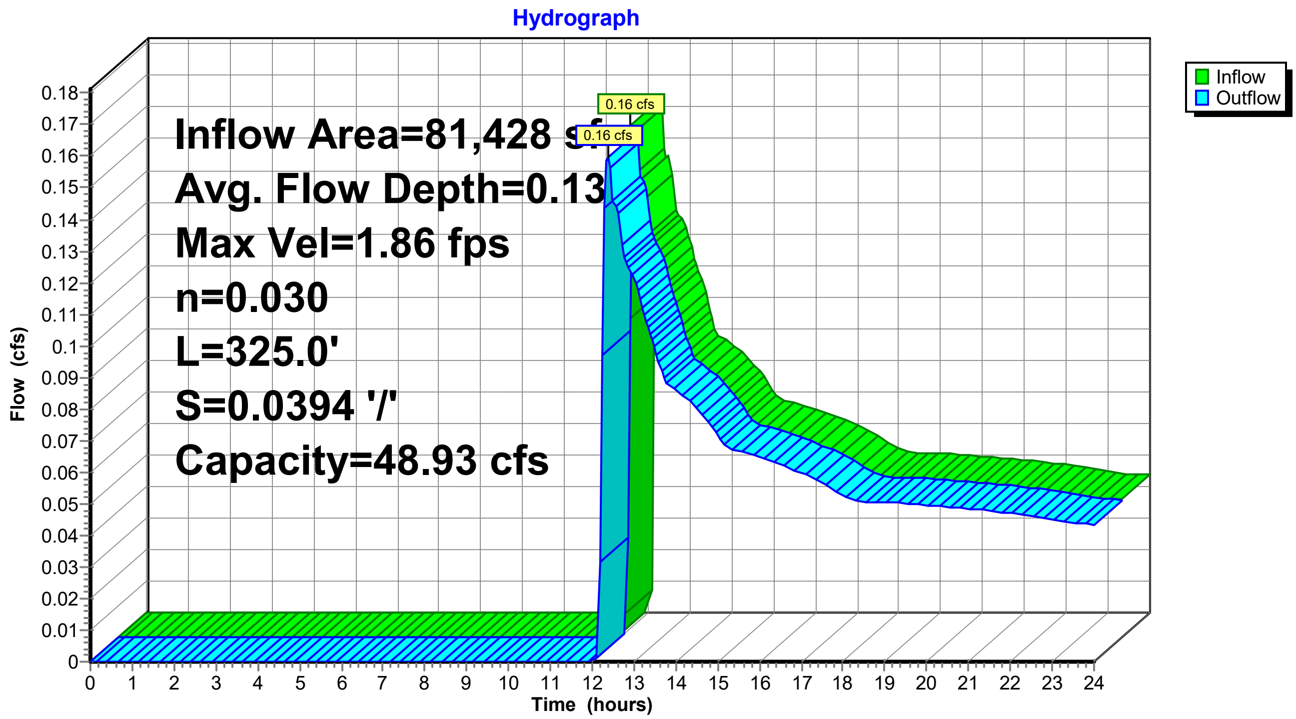
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.86 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 3.9 min

Peak Storage= 28 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.13' , Surface Width= 1.01'
Bank-Full Depth= 2.00' Flow Area= 5.3 sf, Capacity= 48.93 cfs

4.00' x 2.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 325.0' Slope= 0.0394 '/'
Inlet Invert= 193.00', Outlet Invert= 180.20'



Reach 6R: VEGETATED SWALE



Summary for Pond 1P: Infiltration Basin 1

Inflow Area = 105,988 sf, 61.00% Impervious, Inflow Depth > 3.33" for 25-Year event
Inflow = 7.57 cfs @ 12.13 hrs, Volume= 29,376 cf
Outflow = 0.47 cfs @ 14.09 hrs, Volume= 25,365 cf, Atten= 94%, Lag= 117.4 min
Discarded = 0.47 cfs @ 14.09 hrs, Volume= 25,365 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Study Point 1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP2 : Study Point 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 175.06' @ 14.09 hrs Surf.Area= 8,428 sf Storage= 11,477 cf

Plug-Flow detention time= 218.8 min calculated for 25,365 cf (86% of inflow)
Center-of-Mass det. time= 147.0 min (938.3 - 791.4)

Volume	Invert	Avail.Storage	Storage Description
#1	173.50'	36,336 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
173.50	6,319	436.0	0	0	6,319
174.00	6,981	446.0	3,324	3,324	7,055
175.00	8,346	465.0	7,653	10,977	8,505
176.00	9,768	483.0	9,048	20,025	9,944
177.00	11,247	502.0	10,499	30,523	11,512
177.50	12,008	512.0	5,813	36,336	12,358

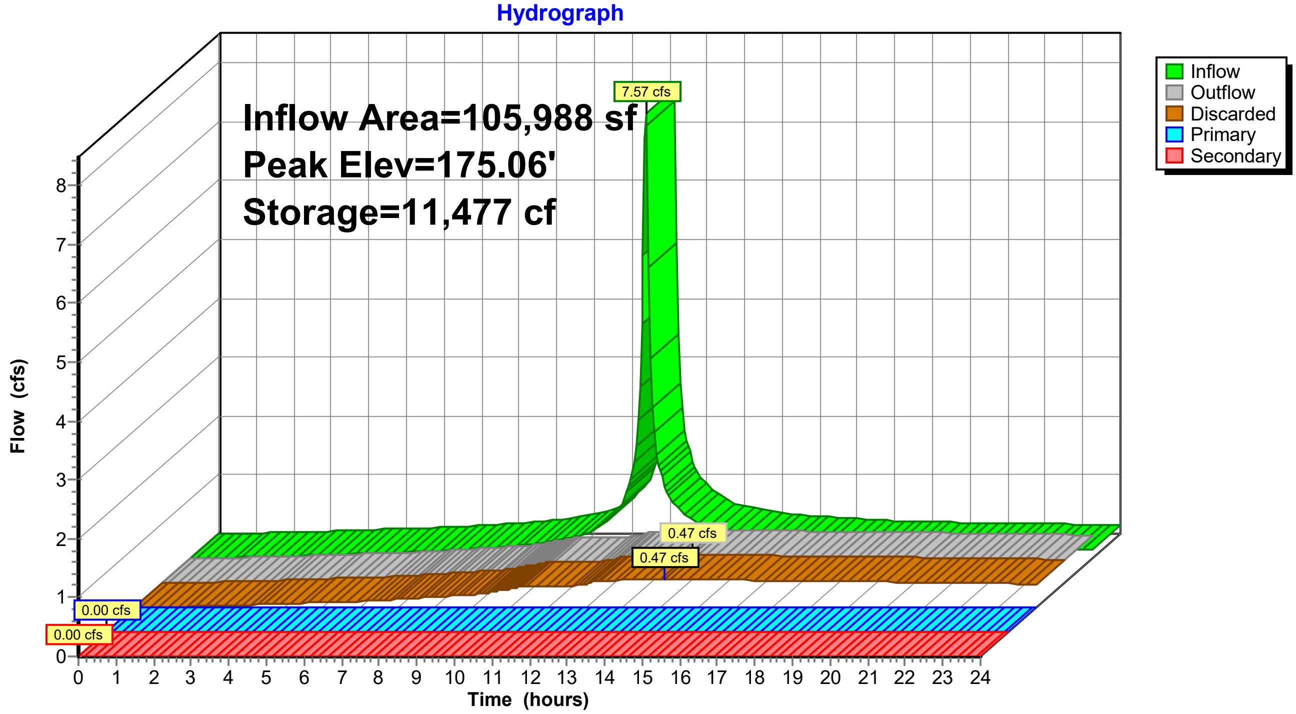
Device	Routing	Invert	Outlet Devices
#1	Secondary	173.40'	**12.0" Round Culvert** L= 252.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 173.40' / 169.50' S= 0.0155 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	176.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	176.50'	**13.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Discarded	173.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.47 cfs @ 14.09 hrs HW=175.06' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.47 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=173.50' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=173.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 0.03 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin 1



Summary for Pond 2P: Infiltration Basin 2

[79] Warning: Submerged Pond 3P Primary device # 1 OUTLET by 0.77'

Inflow Area = 935,284 sf, 40.53% Impervious, Inflow Depth > 0.23" for 25-Year event
Inflow = 4.34 cfs @ 12.13 hrs, Volume= 17,573 cf
Outflow = 0.40 cfs @ 13.37 hrs, Volume= 17,501 cf, Atten= 91%, Lag= 74.7 min
Discarded = 0.40 cfs @ 13.37 hrs, Volume= 17,501 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP3 : Study Point 3

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 176.27' @ 13.37 hrs Surf.Area= 7,194 sf Storage= 5,262 cf

Plug-Flow detention time= 101.6 min calculated for 17,501 cf (100% of inflow)
Center-of-Mass det. time= 99.0 min (901.6 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	175.50'	33,751 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

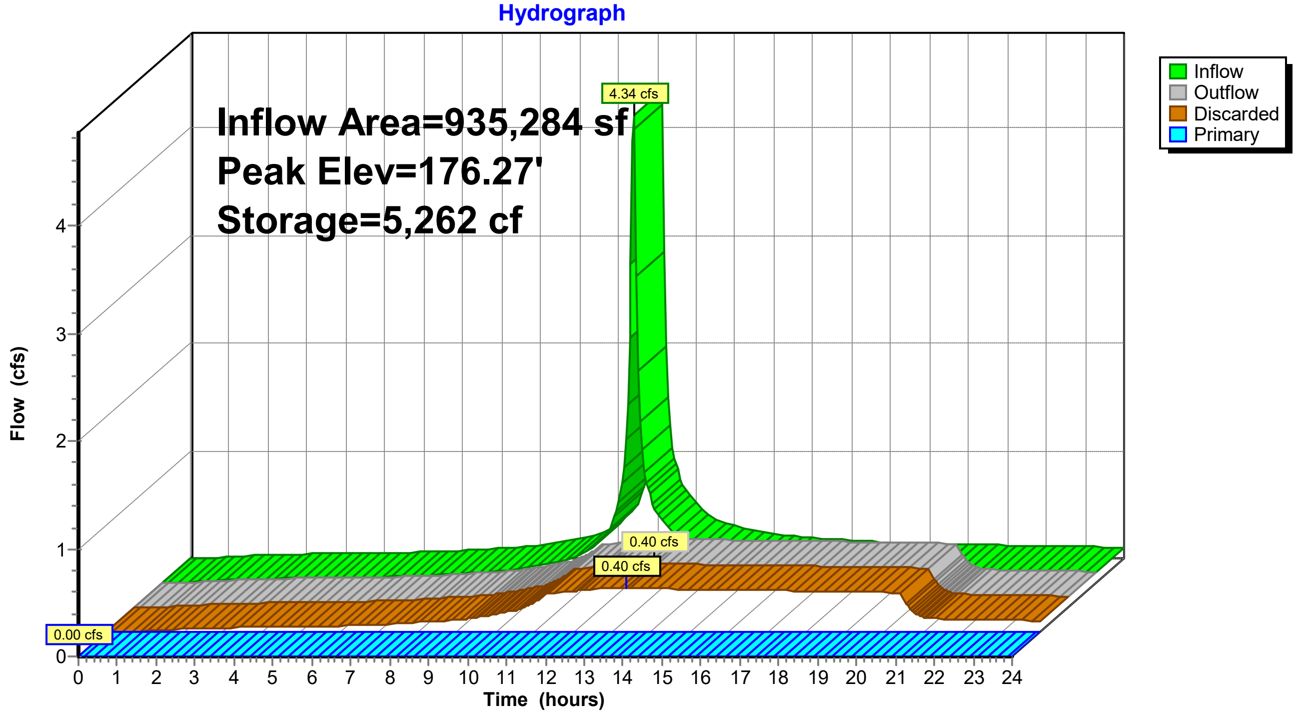
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
175.50	6,483	301.0	0	0	6,483
176.00	6,941	310.0	3,355	3,355	6,946
177.00	7,900	329.0	7,415	10,771	7,964
178.00	8,915	348.0	8,402	19,173	9,042
179.00	9,987	367.0	9,446	28,619	10,181
179.50	10,544	376.0	5,132	33,751	10,744

Device	Routing	Invert	Outlet Devices
#1	Primary	175.40'	**12.0" Round Culvert** L= 63.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 175.40' / 173.00' S= 0.0378 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	178.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	178.50'	**13.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Discarded	175.50'	**2.410 in/hr Exfiltration over Surface area**
#5	Primary	178.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.40 cfs @ 13.37 hrs HW=176.27' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.50' (Free Discharge)
├─**1=Culvert** (Passes 0.00 cfs of 0.03 cfs potential flow)
│ └─**2=Orifice/Grate** (Controls 0.00 cfs)
├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin 2



Summary for Pond 3P: Underground Infiltration System 1

Inflow Area = 519,328 sf, 46.31% Impervious, Inflow Depth > 2.42" for 25-Year event
Inflow = 27.35 cfs @ 12.13 hrs, Volume= 104,604 cf
Outflow = 1.59 cfs @ 11.20 hrs, Volume= 87,548 cf, Atten= 94%, Lag= 0.0 min
Discarded = 1.59 cfs @ 11.20 hrs, Volume= 87,548 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 2P : Infiltration Basin 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 173.26' @ 14.75 hrs Surf.Area= 28,516 sf Storage= 39,457 cf

Plug-Flow detention time= 223.1 min calculated for 87,366 cf (84% of inflow)
Center-of-Mass det. time= 141.0 min (966.8 - 825.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	171.25'	14,193 cf	**37.58'W x 238.18'L x 6.75'H Field A**
			60,422 cf Overall - 24,939 cf Embedded = 35,483 cf x 40.0% Voids
#2A	172.00'	24,939 cf	**ADS_StormTech MC-7200 +Cap** x 140 Inside #1
			Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
			Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
			140 Chambers in 4 Rows
			Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
#3B	171.25'	16,906 cf	**37.58'W x 284.32'L x 6.75'H Field B**
			72,128 cf Overall - 29,863 cf Embedded = 42,264 cf x 40.0% Voids
#4B	172.00'	29,863 cf	**ADS_StormTech MC-7200 +Cap** x 168 Inside #3
			Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
			Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
			168 Chambers in 4 Rows
			Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
#5C	171.25'	6,107 cf	**28.50'W x 132.71'L x 6.75'H Field C**
			25,530 cf Overall - 10,262 cf Embedded = 15,268 cf x 40.0% Voids
#6C	172.00'	10,262 cf	**ADS_StormTech MC-7200 +Cap** x 57 Inside #5
			Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
			Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
			57 Chambers in 3 Rows
			Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf
#7D	171.25'	8,180 cf	**28.50'W x 178.85'L x 6.75'H Field D**
			34,406 cf Overall - 13,955 cf Embedded = 20,451 cf x 40.0% Voids
#8D	172.00'	13,955 cf	**ADS_StormTech MC-7200 +Cap** x 78 Inside #7
			Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
			Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
			78 Chambers in 3 Rows
			Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf
#9	173.47'	68 cf	**4.00'D x 5.45'H Vertical Cone/Cylinder** -Impervious
		124,474 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard
Storage Group D created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	176.35'	**12.0" Round Culvert** L= 82.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 176.35' / 175.50' S= 0.0104 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	177.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	171.25'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.59 cfs @ 11.20 hrs HW=171.33' (Free Discharge)
└─**3=Exfiltration** (Exfiltration Controls 1.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=171.25' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

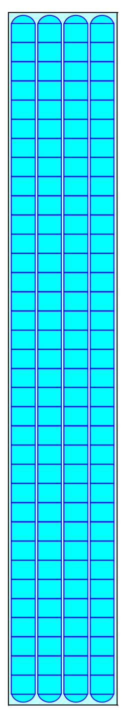
35 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 236.17' Row Length +12.0" End Stone x 2 = 238.18' Base Length
4 Rows x 100.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 37.58' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

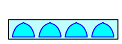
140 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 4 Rows = 24,938.6 cf Chamber Storage

60,422.0 cf Field - 24,938.6 cf Chambers = 35,483.4 cf Stone x 40.0% Voids = 14,193.4 cf Stone Storage

Chamber Storage + Stone Storage = 39,132.0 cf = 0.898 af
Overall Storage Efficiency = 64.8%
Overall System Size = 238.18' x 37.58' x 6.75'

140 Chambers
2,237.9 cy Field
1,314.2 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field B

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

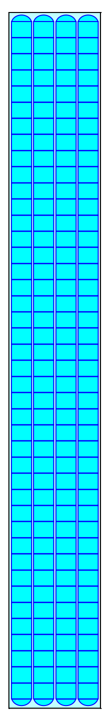
42 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 282.32' Row Length +12.0" End Stone x 2 = 284.32' Base Length
4 Rows x 100.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 37.58' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

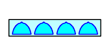
168 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 4 Rows = 29,863.1 cf Chamber Storage

72,127.6 cf Field - 29,863.1 cf Chambers = 42,264.5 cf Stone x 40.0% Voids = 16,905.8 cf Stone Storage

Chamber Storage + Stone Storage = 46,768.9 cf = 1.074 af
Overall Storage Efficiency = 64.8%
Overall System Size = 284.32' x 37.58' x 6.75'

168 Chambers
2,671.4 cy Field
1,565.4 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field C

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

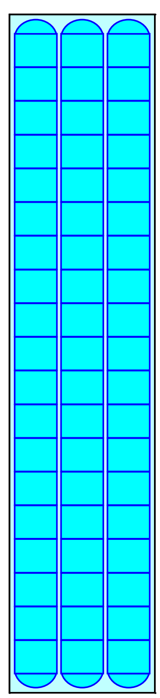
19 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 130.71' Row Length +12.0" End Stone x 2 = 132.71' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

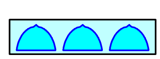
57 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 3 Rows = 10,261.9 cf Chamber Storage

25,529.8 cf Field - 10,261.9 cf Chambers = 15,267.9 cf Stone x 40.0% Voids = 6,107.1 cf Stone Storage

Chamber Storage + Stone Storage = 16,369.1 cf = 0.376 af
Overall Storage Efficiency = 64.1%
Overall System Size = 132.71' x 28.50' x 6.75'

57 Chambers
945.5 cy Field
565.5 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field D

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

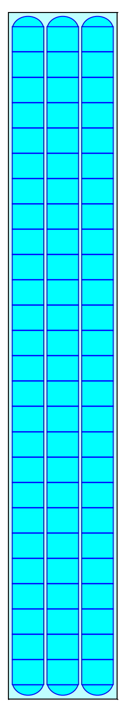
26 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 176.85' Row Length +12.0" End Stone x 2 = 178.85' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

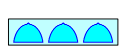
78 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 3 Rows = 13,955.3 cf Chamber Storage

34,406.3 cf Field - 13,955.3 cf Chambers = 20,451.0 cf Stone x 40.0% Voids = 8,180.4 cf Stone Storage

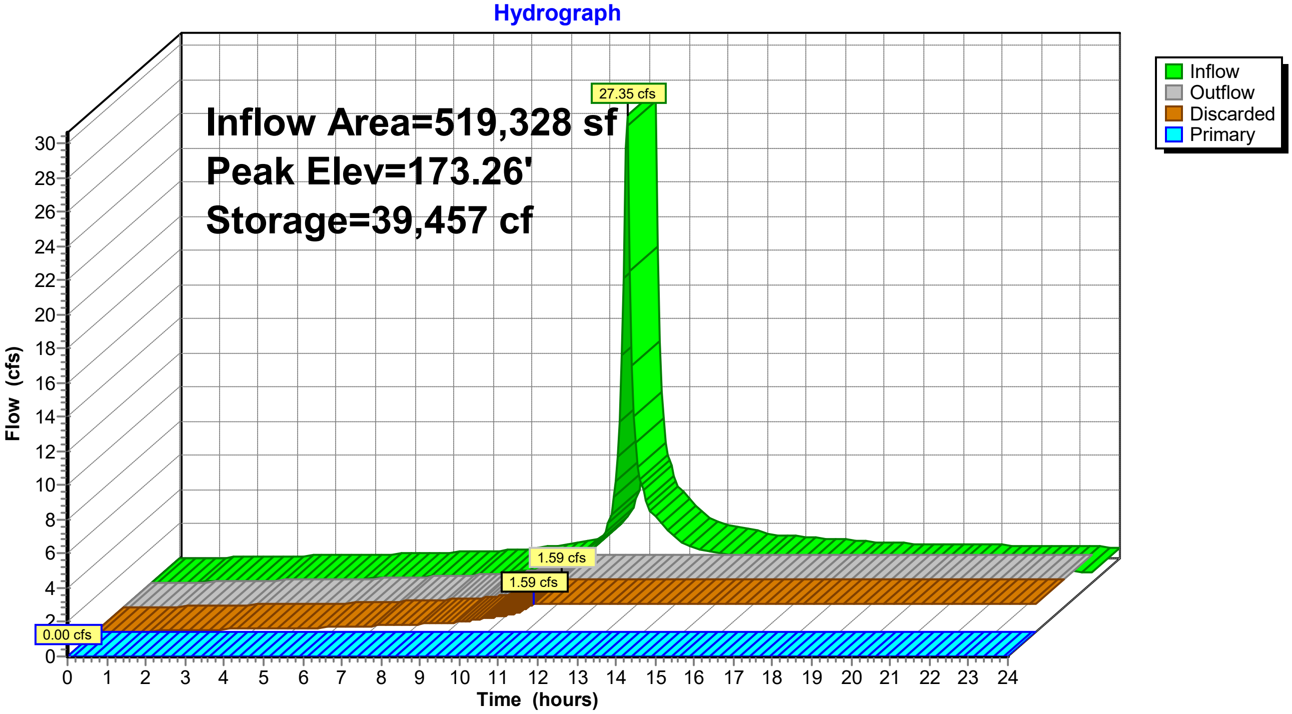
Chamber Storage + Stone Storage = 22,135.7 cf = 0.508 af
Overall Storage Efficiency = 64.3%
Overall System Size = 178.85' x 28.50' x 6.75'

78 Chambers
1,274.3 cy Field
757.4 cy Stone





Pond 3P: Underground Infiltration System 1



Summary for Pond 4P: Existing Ditch 1

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth > 0.06" for 25-Year event
Inflow = 0.01 cfs @ 23.95 hrs, Volume= 193 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 193.58' @ 24.00 hrs Surf.Area= 638 sf Storage= 192 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

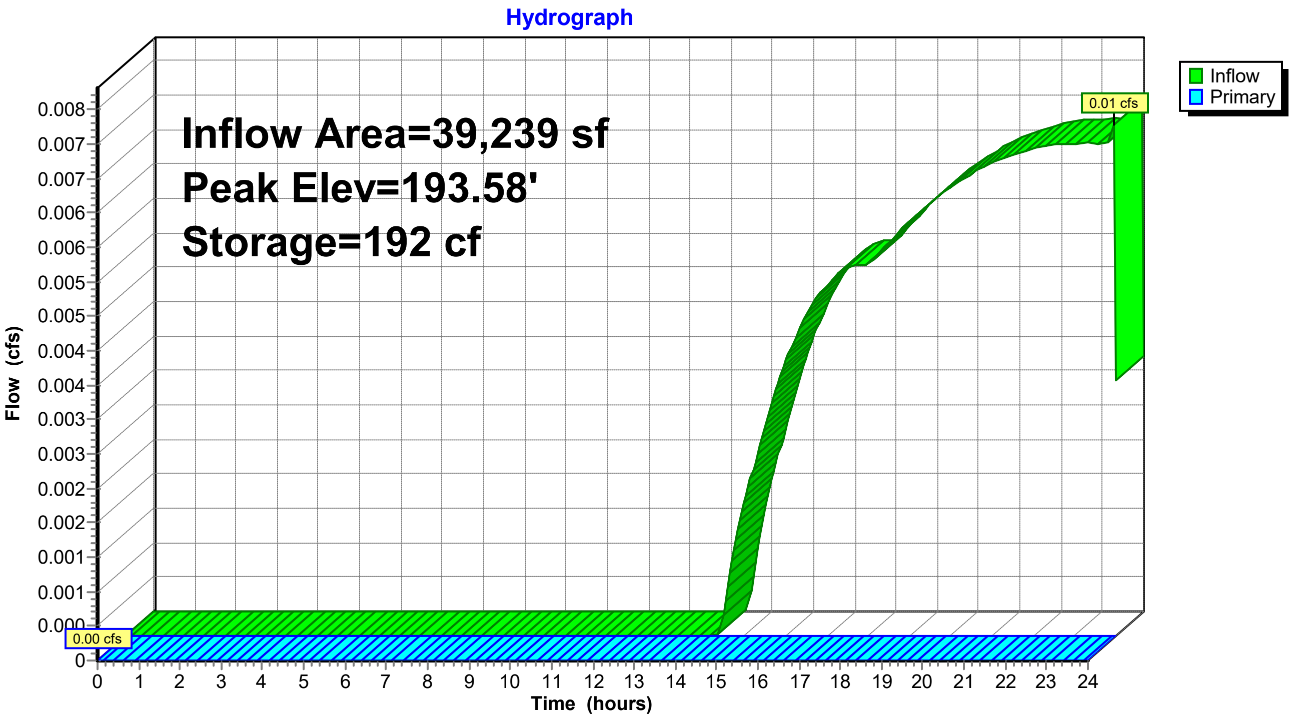
Volume	Invert	Avail.Storage	Storage Description
#1	193.00'	17,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.00	30	0	0
194.00	1,087	559	559
195.00	2,356	1,722	2,280
196.00	3,959	3,158	5,438
197.00	5,956	4,958	10,395
198.00	8,319	7,138	17,533

Device	Routing	Invert	Outlet Devices
#1	Primary	197.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=193.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Existing Ditch 1



Summary for Pond 5P: Infiltration Basin 3

[92] Warning: Device #1 is above defined storage

Inflow Area = 319,050 sf, 31.59% Impervious, Inflow Depth > 1.28" for 25-Year event
Inflow = 5.72 cfs @ 12.31 hrs, Volume= 34,087 cf
Outflow = 0.59 cfs @ 16.05 hrs, Volume= 23,328 cf, Atten= 90%, Lag= 224.3 min
Discarded = 0.59 cfs @ 16.05 hrs, Volume= 23,328 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 2P : Infiltration Basin 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 171.83' @ 16.05 hrs Surf.Area= 10,640 sf Storage= 14,547 cf

Plug-Flow detention time= 279.4 min calculated for 23,280 cf (68% of inflow)
Center-of-Mass det. time= 153.8 min (1,085.0 - 931.2)

Volume	Invert	Avail.Storage	Storage Description
#1	167.25'	98,738 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

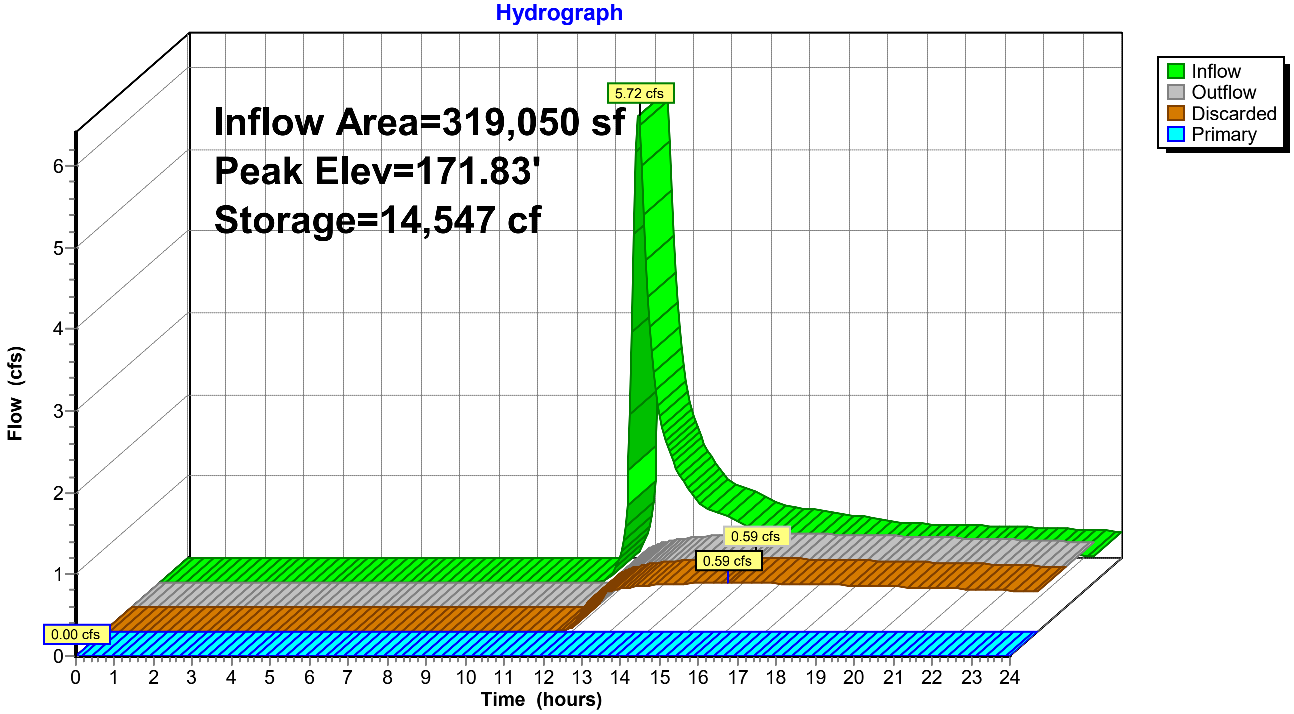
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.25	10	10.0	0	0	10
168.00	123	56.0	42	42	253
169.00	749	153.0	392	434	1,870
170.00	3,236	269.0	1,847	2,281	5,771
171.00	6,972	361.0	4,986	7,267	10,394
172.00	11,470	482.0	9,128	16,395	18,522
173.00	16,453	631.0	13,887	30,282	31,730
174.00	20,831	887.0	18,599	48,881	62,664
175.00	25,123	931.0	22,944	71,825	69,094
176.00	28,744	1,007.0	26,913	98,738	80,855

Device	Routing	Invert	Outlet Devices
#1	Primary	179.00'	**20.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	167.25'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.59 cfs @ 16.05 hrs HW=171.83' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=167.25' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 5P: Infiltration Basin 3



Summary for Pond 12P: Drainage Easement Ditch

Inflow Area = 313,450 sf, 49.57% Impervious, Inflow Depth > 2.49" for 25-Year event
Inflow = 15.52 cfs @ 12.20 hrs, Volume= 64,918 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 185.78' @ 24.00 hrs Surf.Area= 12,540 sf Storage= 64,875 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

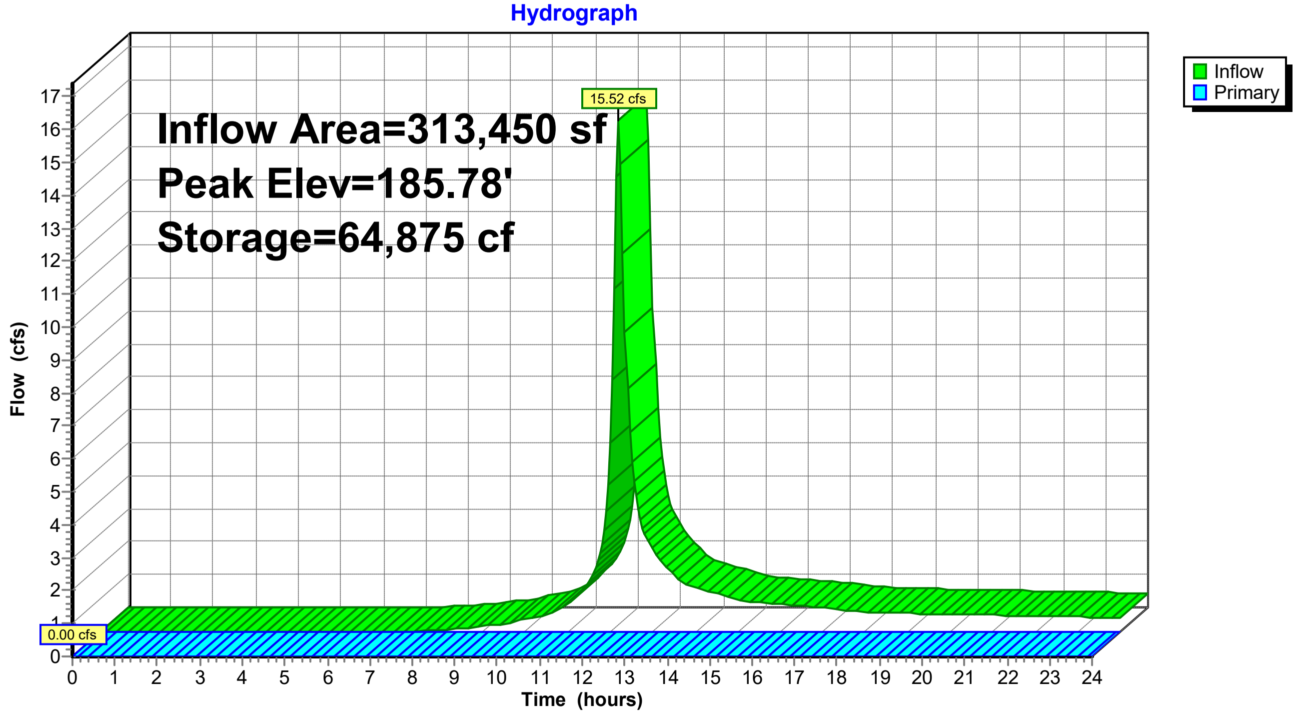
Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	223,106 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
175.00	395	0	0
176.00	1,346	871	871
177.00	2,592	1,969	2,840
178.00	3,425	3,009	5,848
179.00	4,340	3,883	9,731
180.00	5,326	4,833	14,564
181.00	6,375	5,851	20,414
182.00	7,498	6,937	27,351
183.00	8,708	8,103	35,454
184.00	10,008	9,358	44,812
185.00	11,390	10,699	55,511
186.00	12,859	12,125	67,635
187.00	14,373	13,616	81,251
188.00	15,934	15,154	96,405
189.00	17,547	16,741	113,145
190.00	19,261	18,404	131,549
191.00	21,004	20,133	151,682
192.00	22,805	21,905	173,586
193.00	24,735	23,770	197,356
194.00	26,764	25,750	223,106

Device	Routing	Invert	Outlet Devices
#1	Primary	193.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

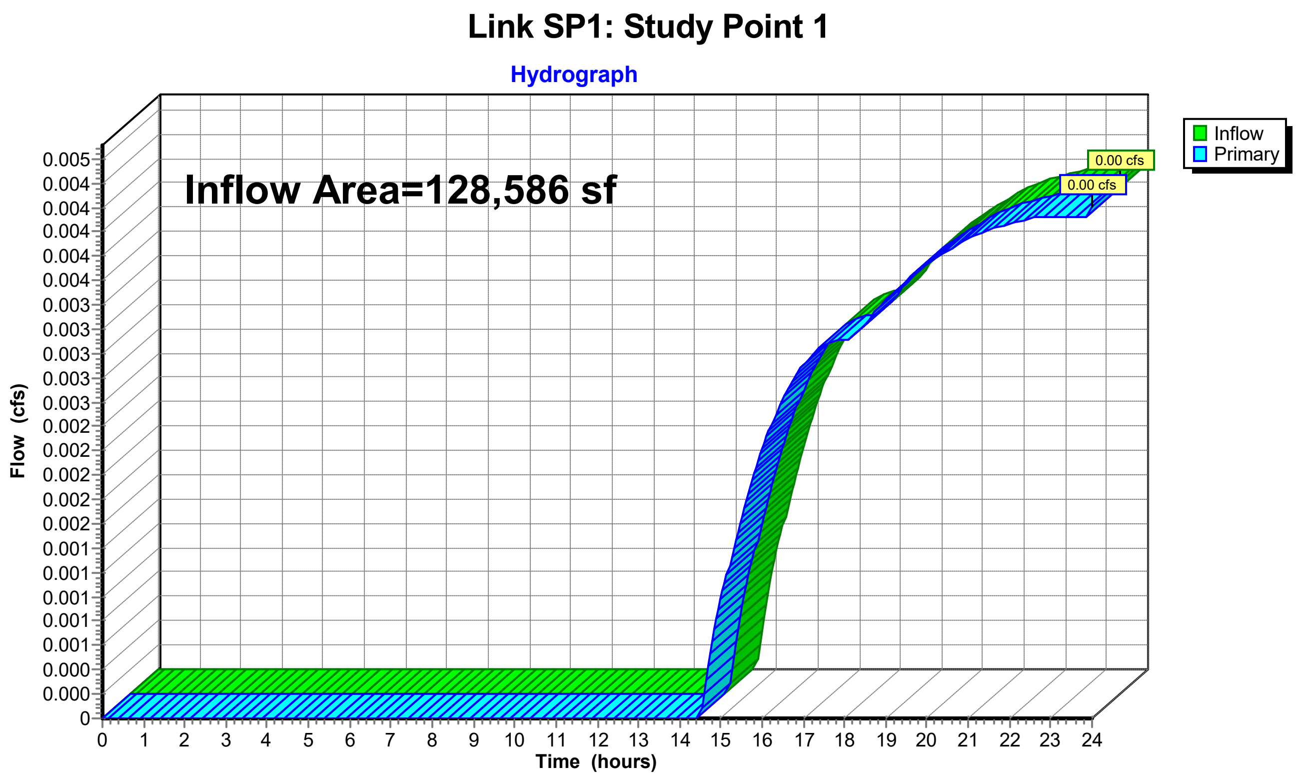
Pond 12P: Drainage Easement Ditch



Summary for Link SP1: Study Point 1

Inflow Area =	128,586 sf, 50.28% Impervious,	Inflow Depth > 0.01"	for 25-Year event
Inflow =	0.00 cfs @ 24.00 hrs, Volume=	110 cf	
Primary =	0.00 cfs @ 24.00 hrs, Volume=	110 cf, Atten= 0%, Lag= 0.0 min	

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

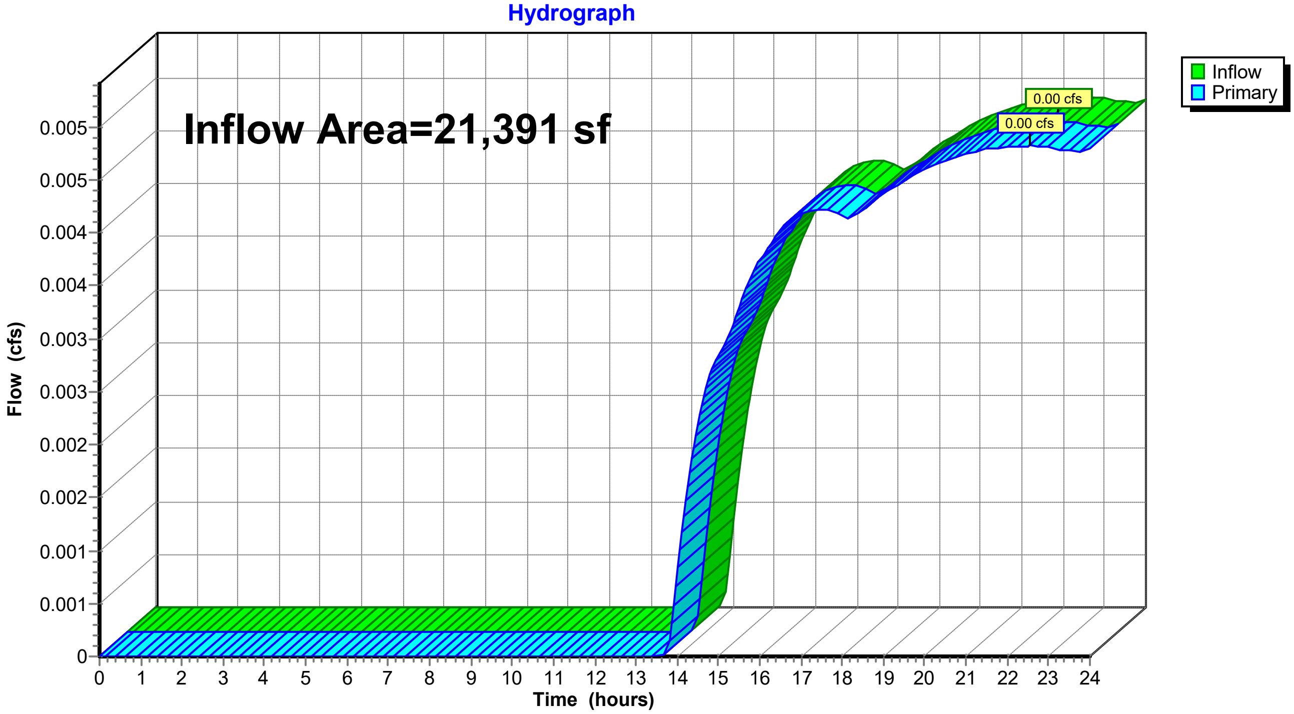


Summary for Link SP2: Study Point 2

Inflow Area = 21,391 sf, 0.00% Impervious, Inflow Depth > 0.08" for 25-Year event
Inflow = 0.00 cfs @ 22.56 hrs, Volume= 150 cf
Primary = 0.00 cfs @ 22.56 hrs, Volume= 150 cf, Atten= 0%, Lag= 0.0 min

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

Link SP2: Study Point 2

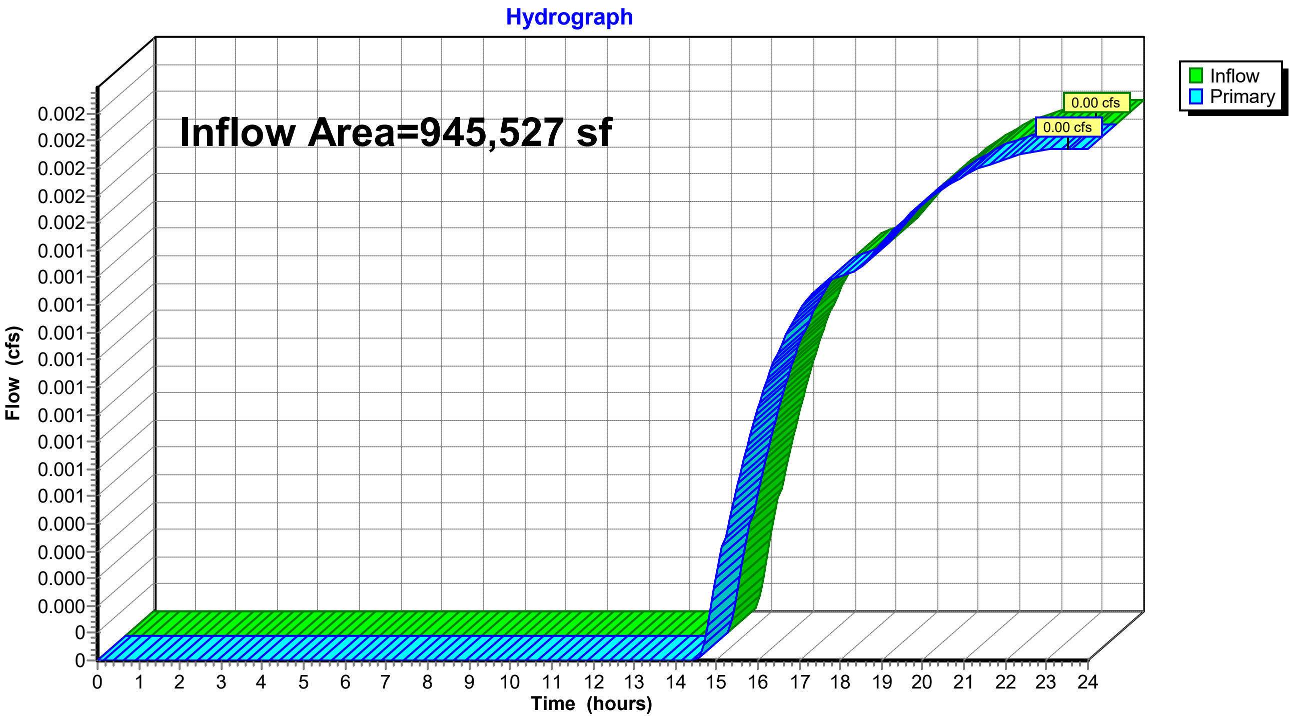


Summary for Link SP3: Study Point 3

Inflow Area = 945,527 sf, 40.09% Impervious, Inflow Depth > 0.00" for 25-Year event
Inflow = 0.00 cfs @ 23.52 hrs, Volume= 49 cf
Primary = 0.00 cfs @ 23.52 hrs, Volume= 49 cf, Atten= 0%, Lag= 0.0 min

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

Link SP3: Study Point 3

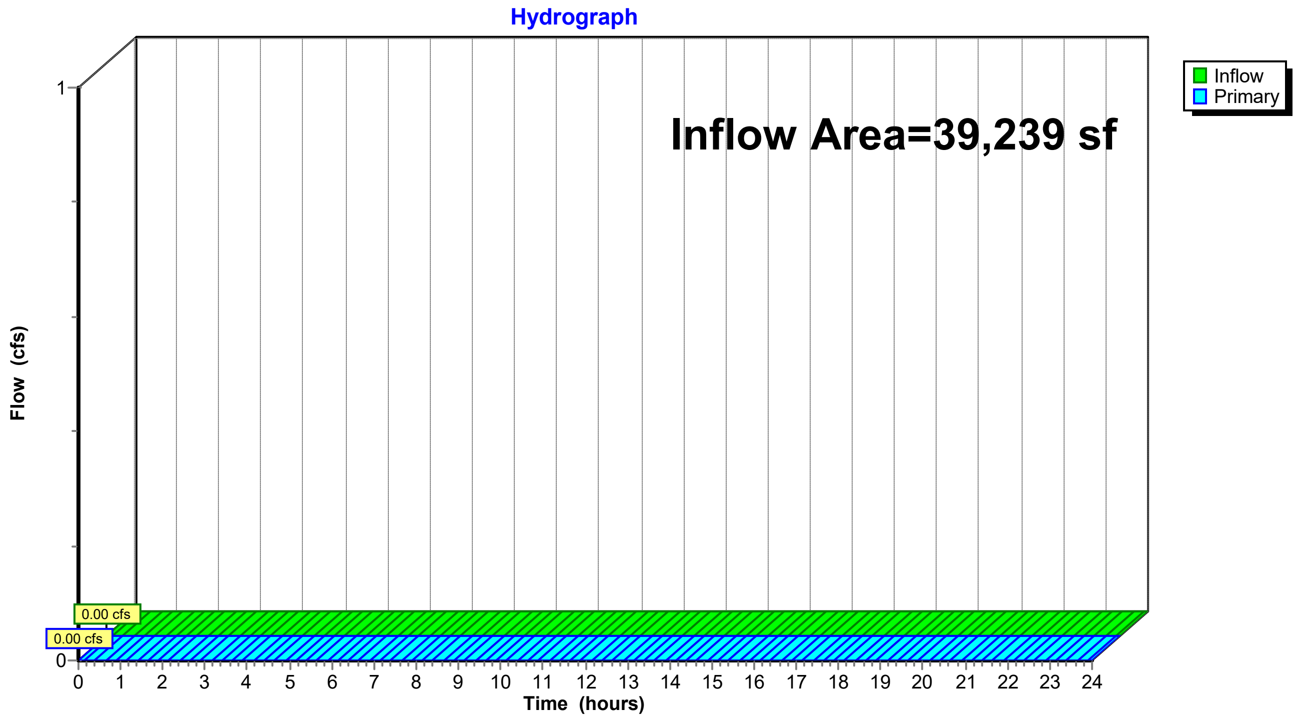


Summary for Link SP4: Study Point 4

Inflow Area =	39,239 sf,	0.00% Impervious,	Inflow Depth = 0.00"	for 25-Year event
Inflow =	0.00 cfs @	0.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP4: Study Point 4

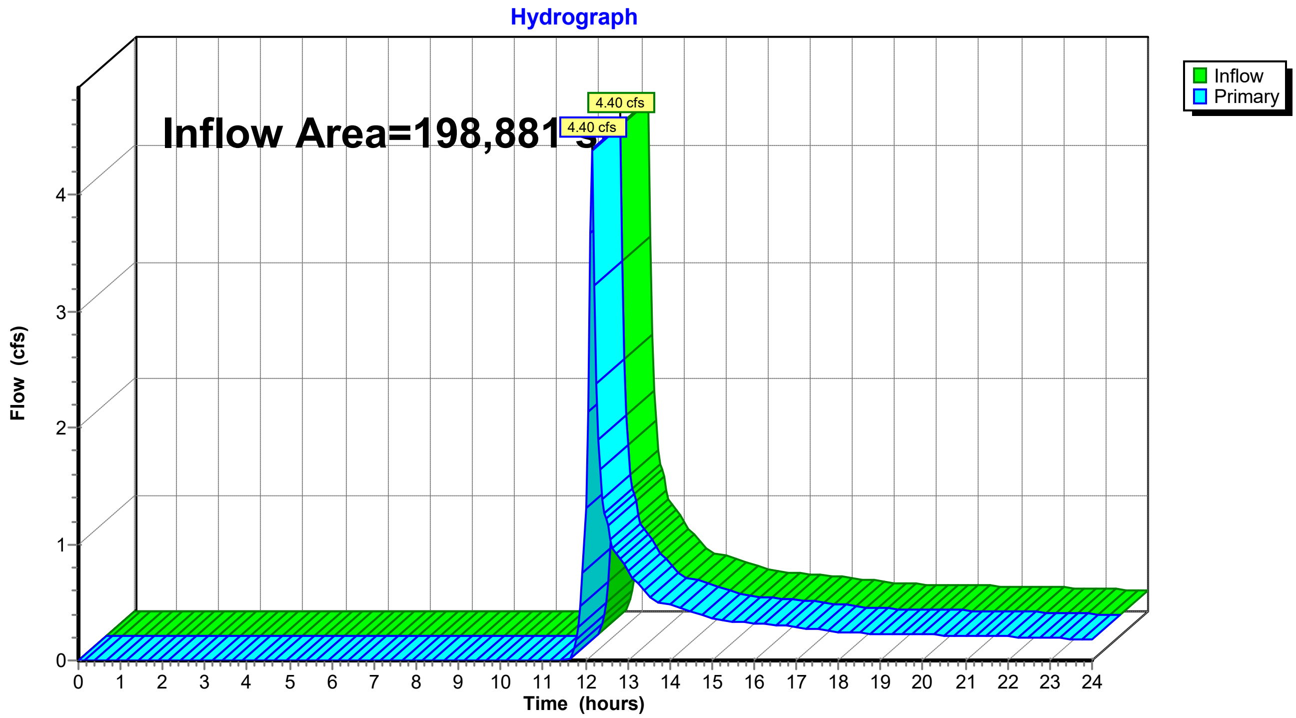


Summary for Link SP5: Study Point 5

Inflow Area =	198,881 sf, 26.41% Impervious,	Inflow Depth > 1.08"	for 25-Year event
Inflow =	4.40 cfs @ 12.14 hrs, Volume=	17,850 cf	
Primary =	4.40 cfs @ 12.14 hrs, Volume=	17,850 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP5: Study Point 5

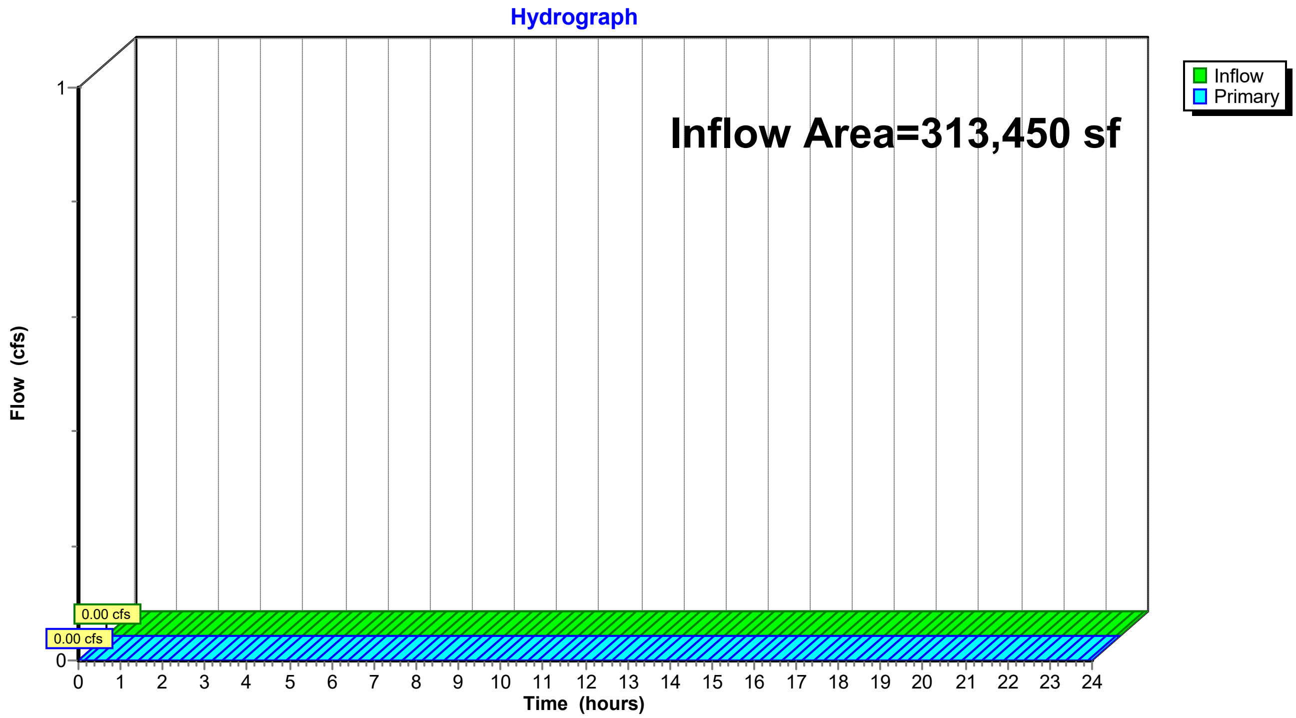


Summary for Link SP6: Study Point 6

Inflow Area =	313,450 sf,	49.57% Impervious,	Inflow Depth = 0.00"	for 25-Year event
Inflow =	0.00 cfs @	0.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP6: Study Point 6



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 P-1: Subcat P-1 Runoff Area=22,598 sf 0.00% Impervious Runoff Depth>0.50"
Tc=6.0 min CN=30 Runoff=0.04 cfs 947 cf

Subcatchment P-10: Subcat P-10 Runoff Area=81,309 sf 89.65% Impervious Runoff Depth>7.39"
Tc=6.0 min CN=92 Runoff=13.32 cfs 50,085 cf

Subcatchment P-11: Subcat P-11 Runoff Area=47,527 sf 87.57% Impervious Runoff Depth>7.27"
Tc=6.0 min CN=91 Runoff=7.73 cfs 28,801 cf

Subcatchment P-12: Subcat P-12 Runoff Area=77,507 sf 51.21% Impervious Runoff Depth>4.65"
Tc=6.0 min CN=69 Runoff=8.90 cfs 30,035 cf

Subcatchment P-13: Subcat P-13 Runoff Area=25,981 sf 100.00% Impervious Runoff Depth>8.11"
Tc=6.0 min CN=98 Runoff=4.38 cfs 17,563 cf

Subcatchment P-14: Subcat P-14 Runoff Area=22,568 sf 100.00% Impervious Runoff Depth>8.11"
Tc=6.0 min CN=98 Runoff=3.80 cfs 15,255 cf

Subcatchment P-15: Subcat P-15 Runoff Area=33,657 sf 100.00% Impervious Runoff Depth>8.11"
Tc=6.0 min CN=98 Runoff=5.67 cfs 22,752 cf

Subcatchment P-16: Subcat P-16 Runoff Area=17,787 sf 100.00% Impervious Runoff Depth>8.11"
Tc=6.0 min CN=98 Runoff=3.00 cfs 12,024 cf

Subcatchment P-17: Subcat P-17 Runoff Area=21,272 sf 65.59% Impervious Runoff Depth>5.36"
Tc=6.0 min CN=75 Runoff=2.78 cfs 9,502 cf

Subcatchment P-18: Subcat P-18 Runoff Area=40,673 sf 12.88% Impervious Runoff Depth>1.61"
Tc=6.0 min CN=42 Runoff=1.37 cfs 5,459 cf

Subcatchment P-19: Subcat P-19 Runoff Area=81,428 sf 11.42% Impervious Runoff Depth>1.31"
Tc=6.0 min UI Adjusted CN=39 Runoff=2.00 cfs 8,874 cf

Subcatchment P-2: Subcat P-2 Runoff Area=21,391 sf 0.00% Impervious Runoff Depth>0.58"
Flow Length=168' Tc=8.3 min CN=31 Runoff=0.06 cfs 1,034 cf

Subcatchment P-20: Subcat P-20 Runoff Area=53,066 sf 2.40% Impervious Runoff Depth>1.12"
Tc=0.0 min CN=37 Runoff=1.14 cfs 4,938 cf

Subcatchment P-3: Subcat P-3 Runoff Area=10,242 sf 0.00% Impervious Runoff Depth>0.50"
Flow Length=350' Slope=0.0100 '/' Tc=17.6 min CN=30 Runoff=0.02 cfs 424 cf

Subcatchment P-4: Subcat P-4 Runoff Area=39,239 sf 0.00% Impervious Runoff Depth>0.50"
Tc=0.0 min CN=30 Runoff=0.08 cfs 1,650 cf

Subcatchment P-5: Subcat P-5 Runoff Area=198,881 sf 26.41% Impervious Runoff Depth>2.47"
Tc=6.0 min UI Adjusted CN=50 Runoff=11.65 cfs 40,892 cf

Subcatchment P-6: Subcat P-6 Runoff Area=260,840 sf 59.51% Impervious Runoff Depth>5.11"
Flow Length=226' Tc=12.3 min CN=73 Runoff=26.58 cfs 111,128 cf

Subcatchment P-7: Subcat P-7 Runoff Area=52,610 sf 0.28% Impervious Runoff Depth>0.58"
Tc=6.0 min CN=31 Runoff=0.15 cfs 2,549 cf

Subcatchment P-8: Subcat P-8 Runoff Area=319,050 sf 31.59% Impervious Runoff Depth>2.78"
Flow Length=452' Tc=19.4 min CN=53 Runoff=14.01 cfs 74,044 cf

Subcatchment P-9: Subcat P-9 Runoff Area=219,446 sf 26.87% Impervious Runoff Depth>2.80"
Tc=6.0 min CN=53 Runoff=14.88 cfs 51,232 cf

Reach 6R: VEGETATED SWALE Avg. Flow Depth=0.41' Max Vel=3.83 fps Inflow=2.00 cfs 8,874 cf
n=0.030 L=325.0' S=0.0394 '/' Capacity=48.93 cfs Outflow=1.81 cfs 8,845 cf

Pond 1P: Infiltration Basin 1 Peak Elev=176.11' Storage=21,152 cf Inflow=12.07 cfs 46,284 cf
Discarded=0.55 cfs 31,666 cf Primary=0.00 cfs 0 cf Secondary=0.00 cfs 0 cf Outflow=0.55 cfs 31,666 cf

Pond 2P: Infiltration Basin 2 Peak Elev=177.07' Storage=11,357 cf Inflow=7.31 cfs 29,696 cf
Discarded=0.44 cfs 24,429 cf Primary=0.00 cfs 0 cf Outflow=0.44 cfs 24,429 cf

Pond 3P: Underground Infiltration Peak Elev=175.62' Storage=91,474 cf Inflow=48.52 cfs 180,512 cf
Discarded=1.59 cfs 95,893 cf Primary=0.00 cfs 0 cf Outflow=1.59 cfs 95,893 cf

Pond 4P: Existing Ditch 1 Peak Elev=194.71' Storage=1,649 cf Inflow=0.08 cfs 1,650 cf
Outflow=0.00 cfs 0 cf

Pond 5P: Infiltration Basin 3 Peak Elev=173.45' Storage=38,166 cf Inflow=14.01 cfs 74,044 cf
Discarded=1.02 cfs 42,353 cf Primary=0.00 cfs 0 cf Outflow=1.02 cfs 42,353 cf

Pond 12P: Drainage Easement Ditch Peak Elev=189.03' Storage=113,615 cf Inflow=26.72 cfs 113,678 cf
Outflow=0.00 cfs 0 cf

Link SP1: Study Point 1 Inflow=0.04 cfs 947 cf
Primary=0.04 cfs 947 cf

Link SP2: Study Point 2 Inflow=0.06 cfs 1,034 cf
Primary=0.06 cfs 1,034 cf

Link SP3: Study Point 3 Inflow=0.02 cfs 424 cf
Primary=0.02 cfs 424 cf

Link SP4: Study Point 4 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link SP5: Study Point 5 Inflow=11.65 cfs 40,892 cf
Primary=11.65 cfs 40,892 cf

Link SP6: Study Point 6 Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 1,647,074 sf Runoff Volume = 489,189 cf Average Runoff Depth = 3.56"
60.44% Pervious = 995,478 sf 39.56% Impervious = 651,596 sf

Summary for Subcatchment P-1: Subcat P-1

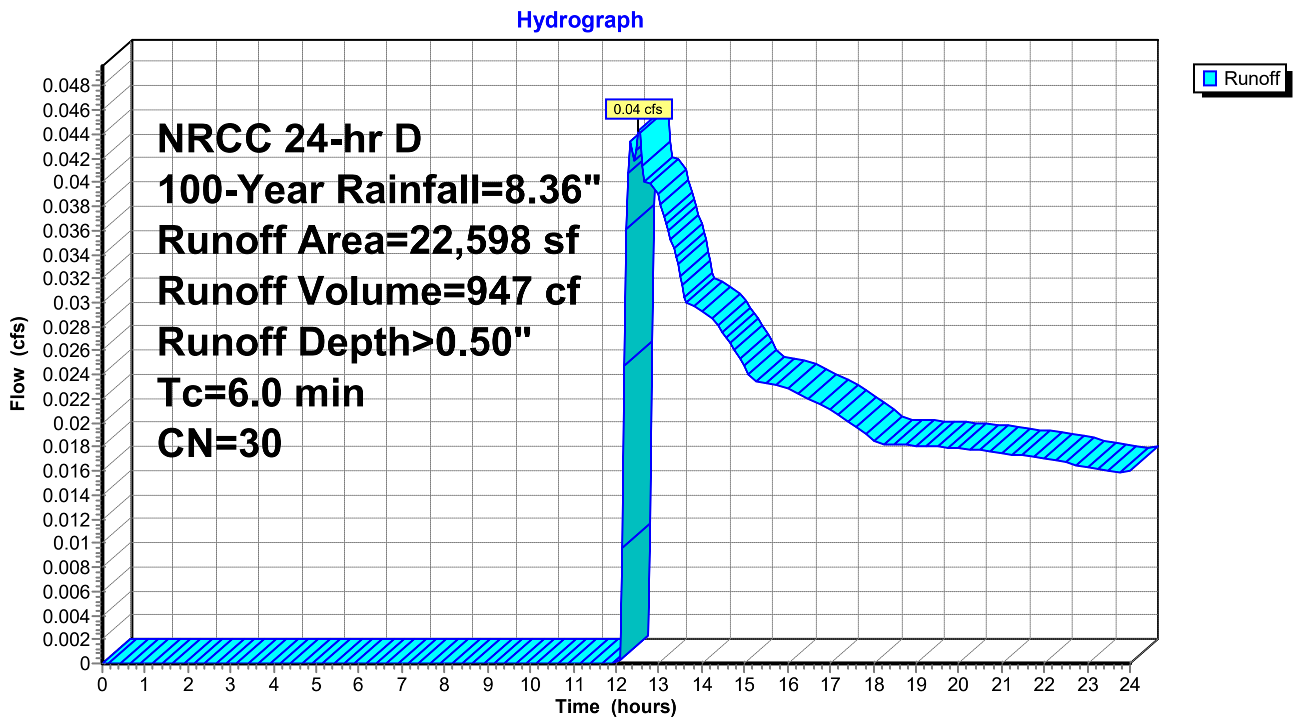
Runoff = 0.04 cfs @ 12.53 hrs, Volume= 947 cf, Depth> 0.50"
Routed to Link SP1 : Study Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
22,598	30	Woods, Good, HSG A
22,598		100.00% Pervious Area

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

Subcatchment P-1: Subcat P-1



Summary for Subcatchment P-10: Subcat P-10

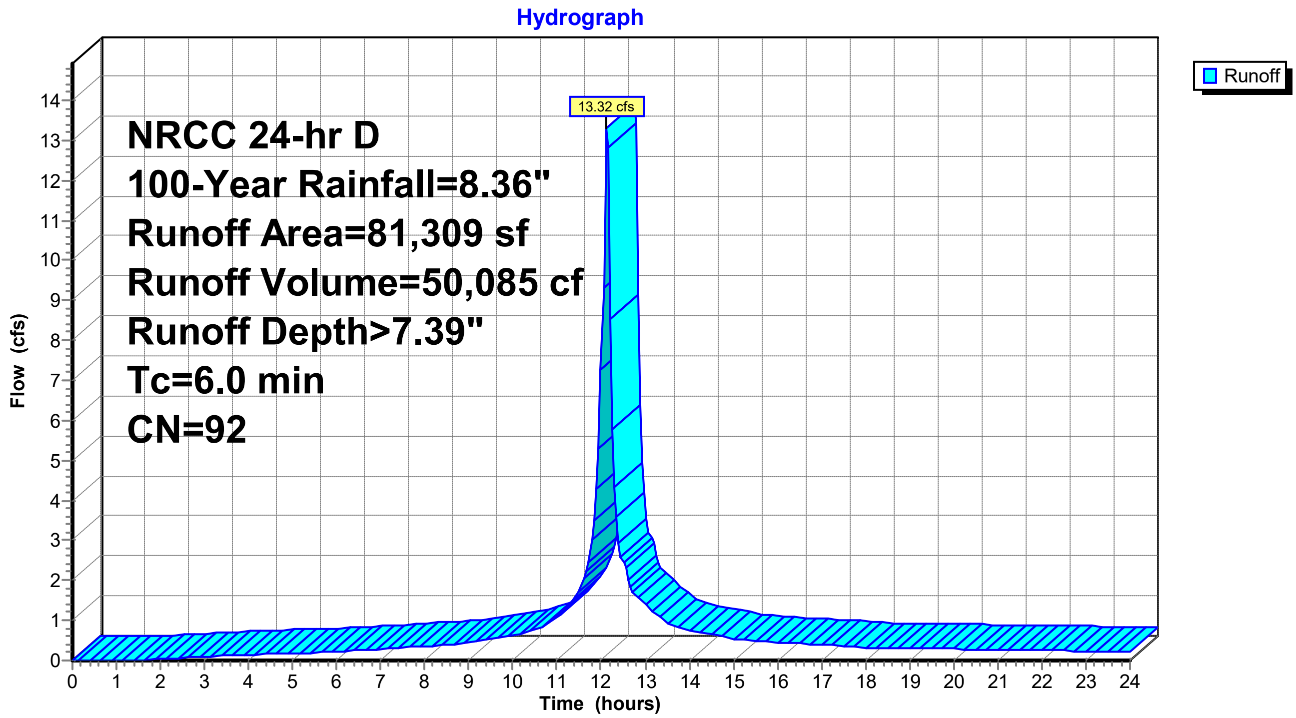
Runoff = 13.32 cfs @ 12.13 hrs, Volume= 50,085 cf, Depth> 7.39"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
72,894	98	Paved parking, HSG A
366	39	>75% Grass cover, Good, HSG A
158	39	>75% Grass cover, Good, HSG A
225	39	>75% Grass cover, Good, HSG A
204	39	>75% Grass cover, Good, HSG A
589	39	>75% Grass cover, Good, HSG A
450	39	>75% Grass cover, Good, HSG A
158	39	>75% Grass cover, Good, HSG A
71	39	>75% Grass cover, Good, HSG A
313	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
2	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
1,184	39	>75% Grass cover, Good, HSG A
969	39	>75% Grass cover, Good, HSG A
465	39	>75% Grass cover, Good, HSG A
2,238	39	>75% Grass cover, Good, HSG A
81,309	92	Weighted Average
8,415		10.35% Pervious Area
72,894		89.65% Impervious Area

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

Subcatchment P-10: Subcat P-10



Summary for Subcatchment P-11: Subcat P-11

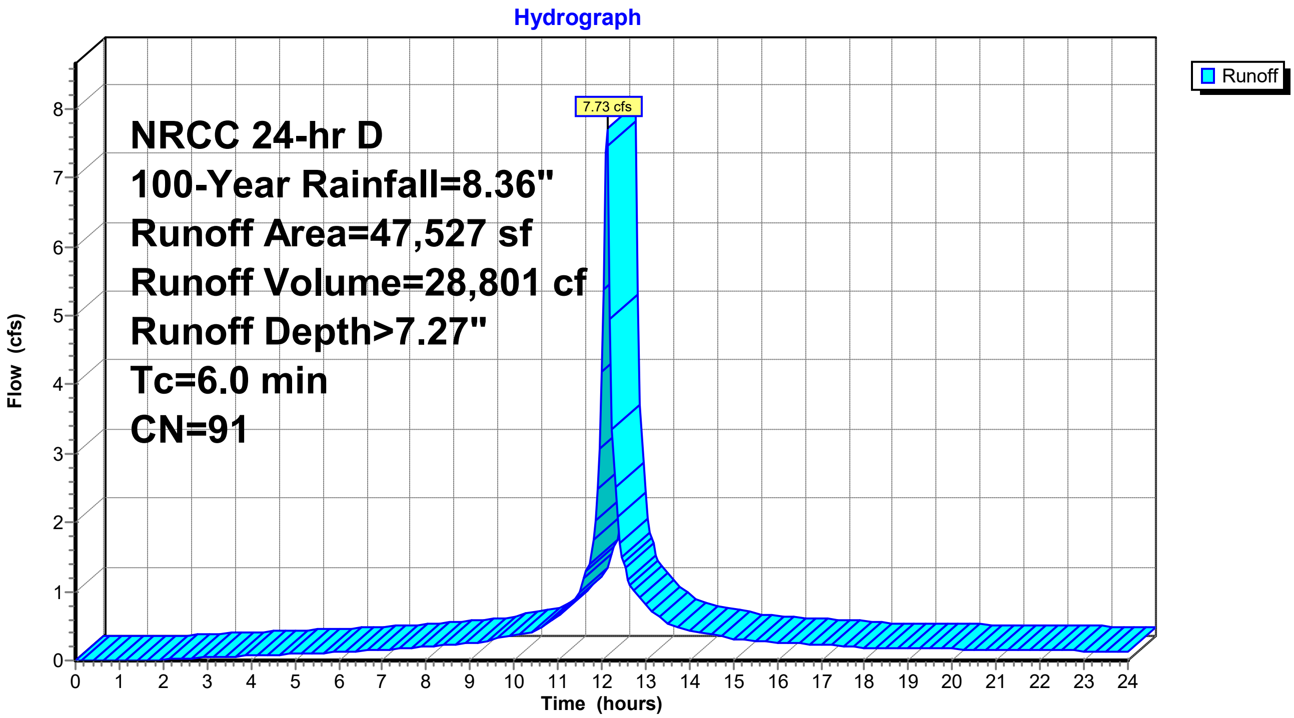
Runoff = 7.73 cfs @ 12.13 hrs, Volume= 28,801 cf, Depth> 7.27"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
41,622	98	Paved parking, HSG A
96	39	>75% Grass cover, Good, HSG A
527	39	>75% Grass cover, Good, HSG A
162	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
245	39	>75% Grass cover, Good, HSG A
492	39	>75% Grass cover, Good, HSG A
2,498	39	>75% Grass cover, Good, HSG A
314	39	>75% Grass cover, Good, HSG A
944	39	>75% Grass cover, Good, HSG A
0	30	Woods, Good, HSG A
47,527	91	Weighted Average
5,906		12.43% Pervious Area
41,622		87.57% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

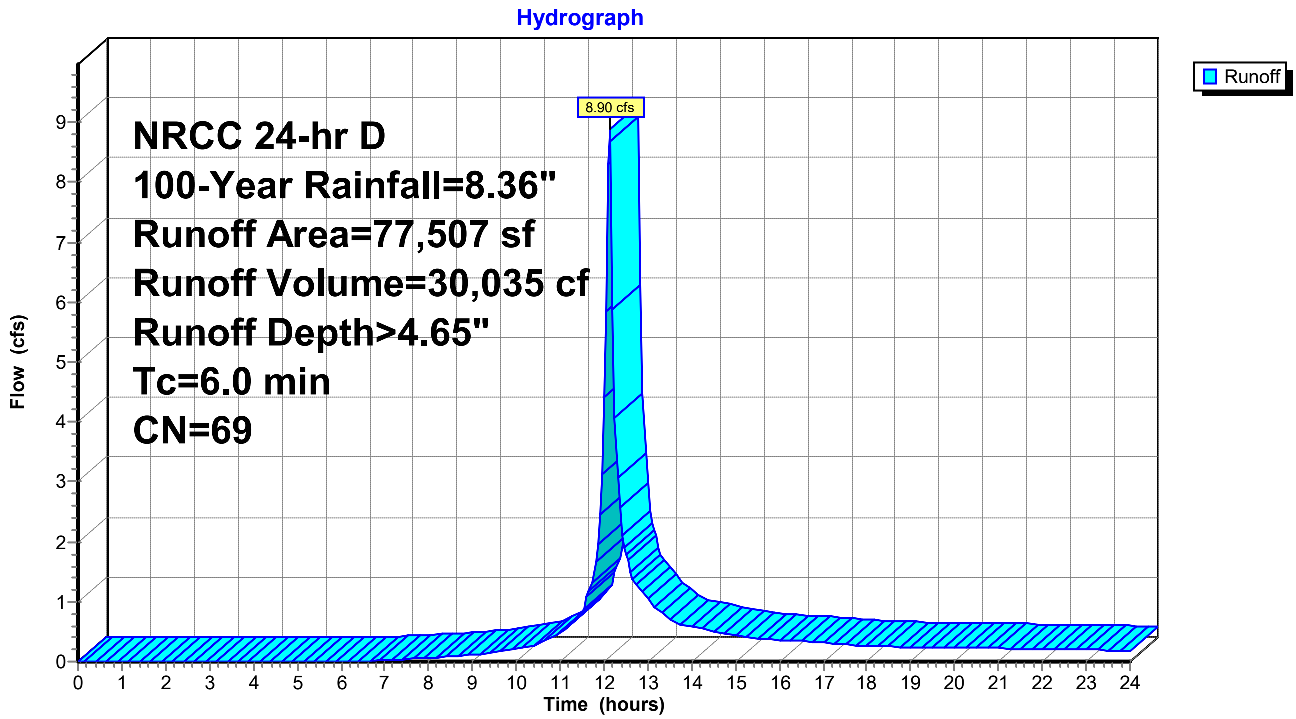
Runoff = 8.90 cfs @ 12.13 hrs, Volume= 30,035 cf, Depth> 4.65"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
0	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
164	39	>75% Grass cover, Good, HSG A
4,403	39	>75% Grass cover, Good, HSG A
2,477	39	>75% Grass cover, Good, HSG A
1,191	39	>75% Grass cover, Good, HSG A
937	39	>75% Grass cover, Good, HSG A
173	39	>75% Grass cover, Good, HSG A
191	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
241	39	>75% Grass cover, Good, HSG A
507	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
100	39	>75% Grass cover, Good, HSG A
200	39	>75% Grass cover, Good, HSG A
638	39	>75% Grass cover, Good, HSG A
442	39	>75% Grass cover, Good, HSG A
1,419	39	>75% Grass cover, Good, HSG A
1,858	39	>75% Grass cover, Good, HSG A
2,790	39	>75% Grass cover, Good, HSG A
1,695	39	>75% Grass cover, Good, HSG A
5,011	39	>75% Grass cover, Good, HSG A
90	39	>75% Grass cover, Good, HSG A
1,322	39	>75% Grass cover, Good, HSG A
1,414	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
1,339	39	>75% Grass cover, Good, HSG A
305	39	>75% Grass cover, Good, HSG A
3,810	39	>75% Grass cover, Good, HSG A
1,418	39	>75% Grass cover, Good, HSG A
349	39	>75% Grass cover, Good, HSG A
2,253	39	>75% Grass cover, Good, HSG A
39,692	98	Paved parking, HSG A
77,507	69	Weighted Average
37,815		48.79% Pervious Area
39,692		51.21% Impervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

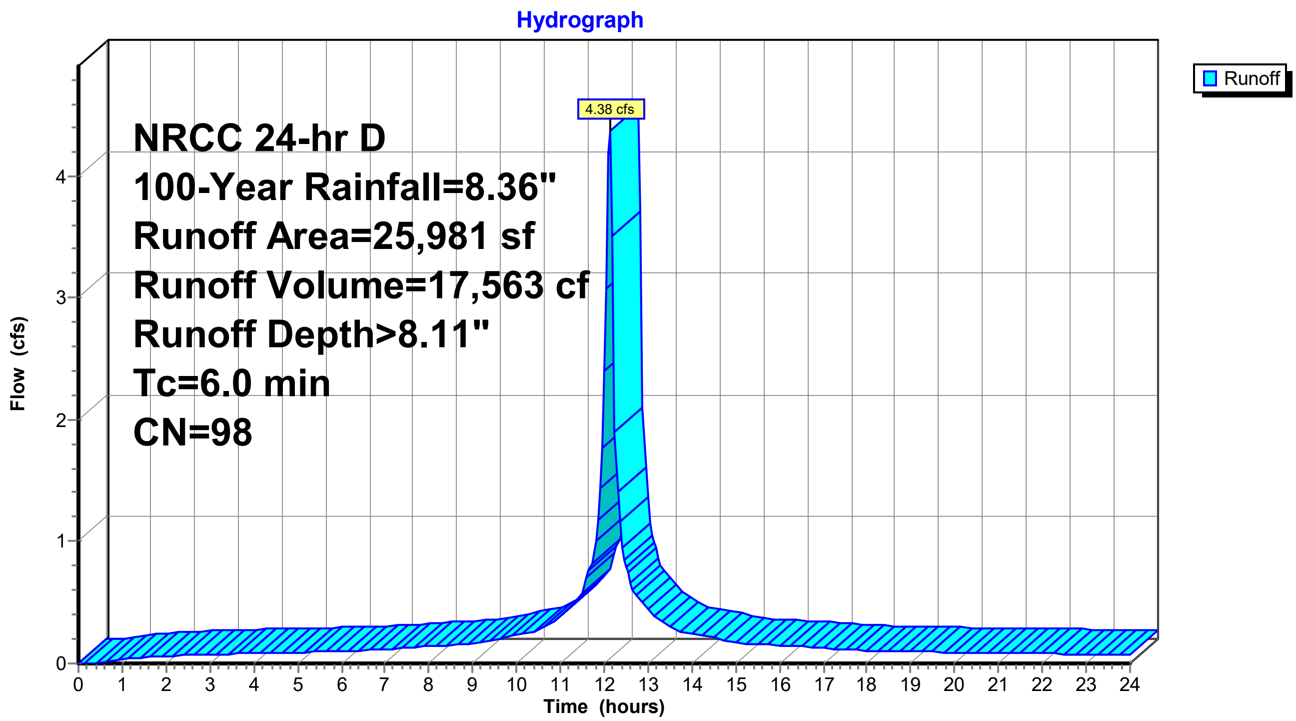
Runoff = 4.38 cfs @ 12.13 hrs, Volume= 17,563 cf, Depth> 8.11"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
25,981	98	Roofs, HSG A
25,981		100.00% Impervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

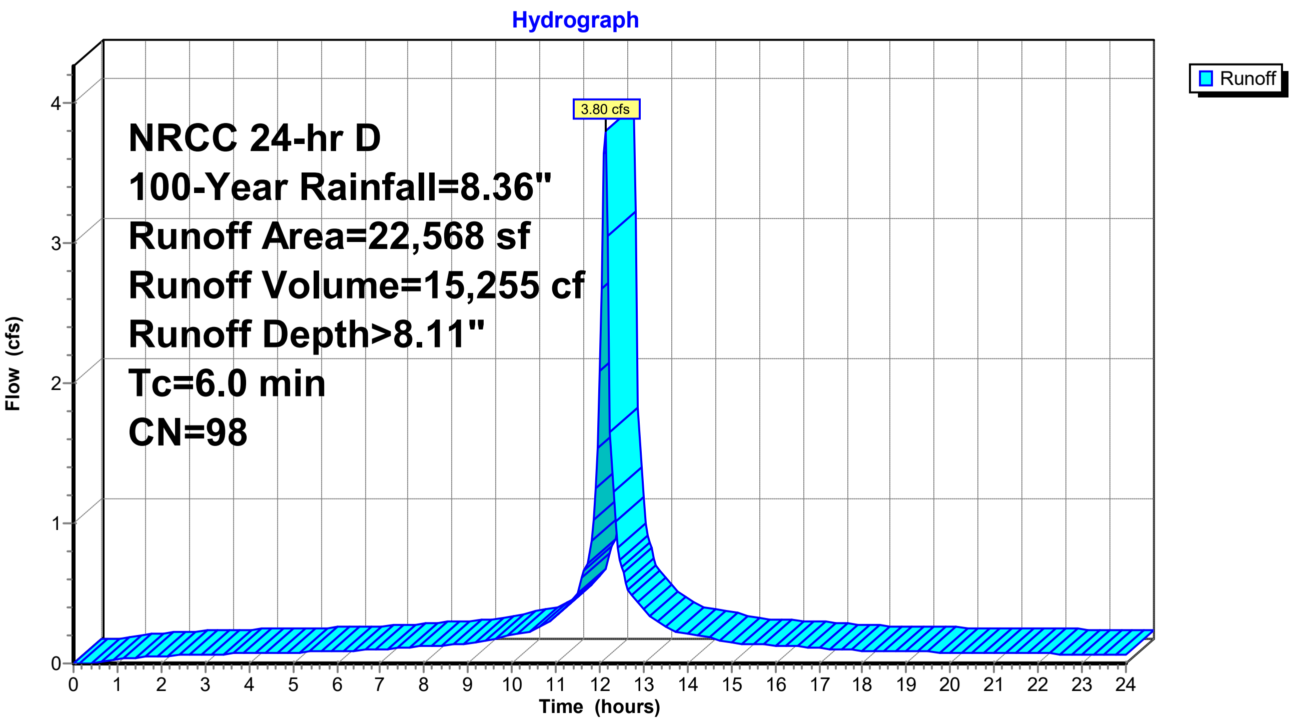
Runoff = 3.80 cfs @ 12.13 hrs, Volume= 15,255 cf, Depth> 8.11"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
22,568	98	Roofs, HSG A
22,568		100.00% Impervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

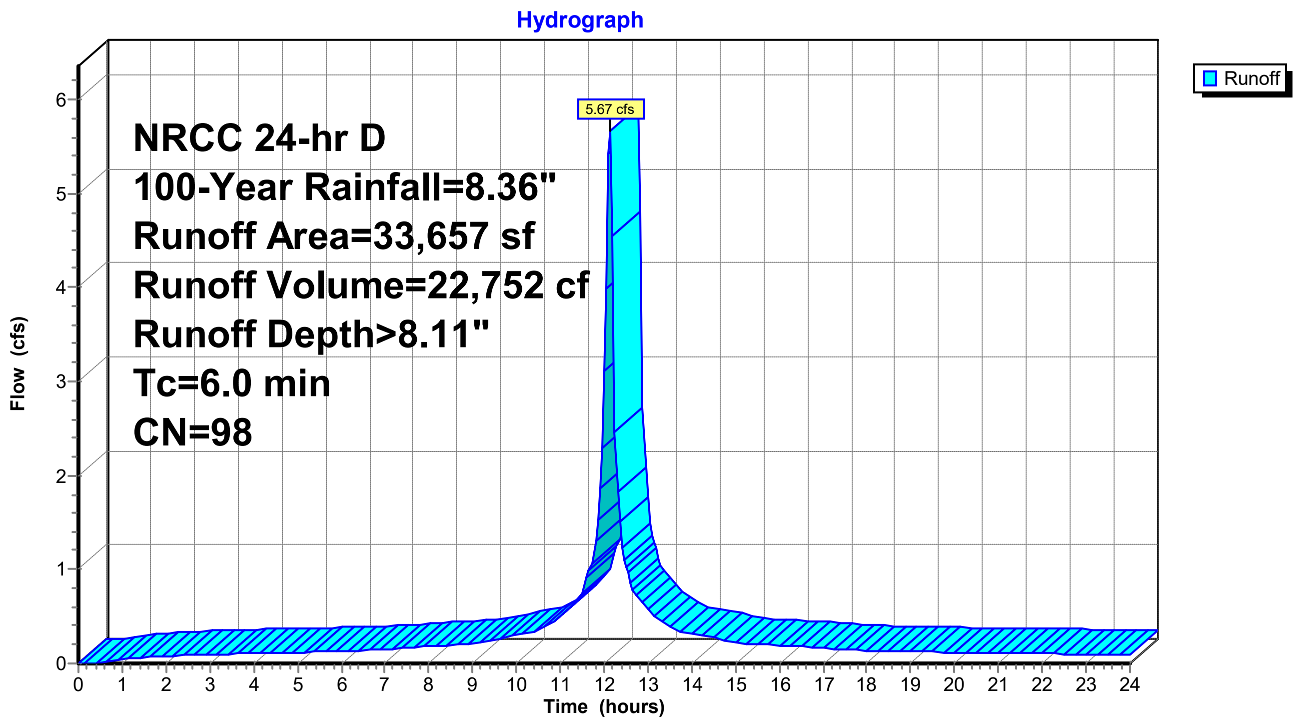
Runoff = 5.67 cfs @ 12.13 hrs, Volume= 22,752 cf, Depth> 8.11"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
33,657	98	Roofs, HSG A
33,657		100.00% Impervious Area

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

Subcatchment P-15: Subcat P-15



Summary for Subcatchment P-16: Subcat P-16

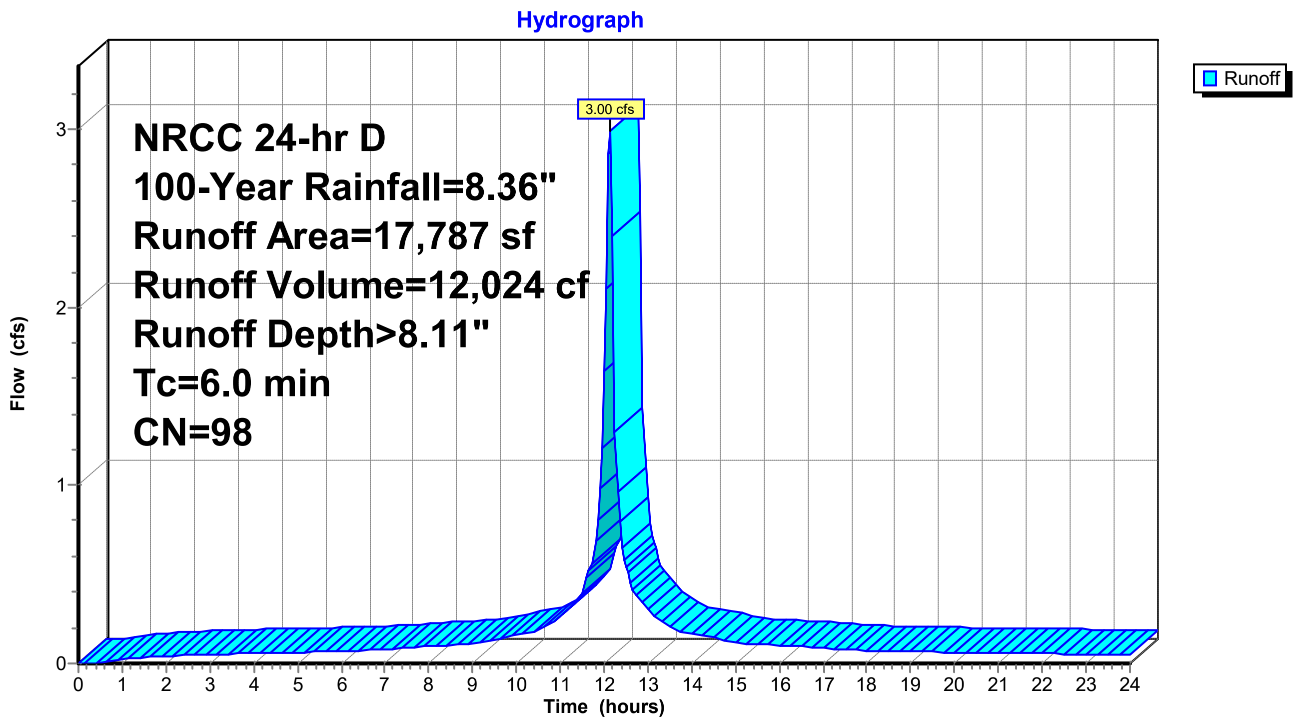
Runoff = 3.00 cfs @ 12.13 hrs, Volume= 12,024 cf, Depth> 8.11"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
17,787	98	Water Surface, HSG A
17,787		100.00% Impervious Area

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

Subcatchment P-16: Subcat P-16



Summary for Subcatchment P-17: Subcat P-17

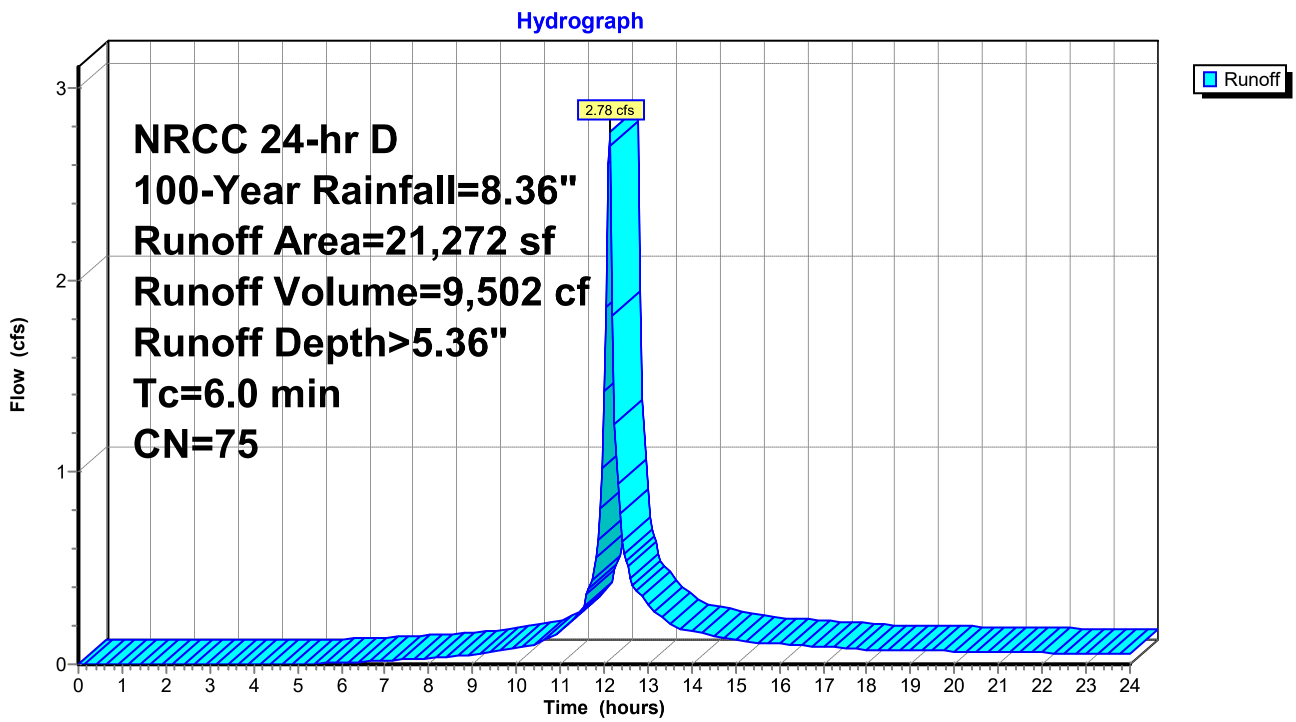
Runoff = 2.78 cfs @ 12.13 hrs, Volume= 9,502 cf, Depth> 5.36"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
13,951	98	Water Surface, HSG A
7,321	30	Woods, Good, HSG A
21,272	75	Weighted Average
7,321		34.41% Pervious Area
13,951		65.59% Impervious Area

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

Subcatchment P-17: Subcat P-17



Summary for Subcatchment P-18: Subcat P-18

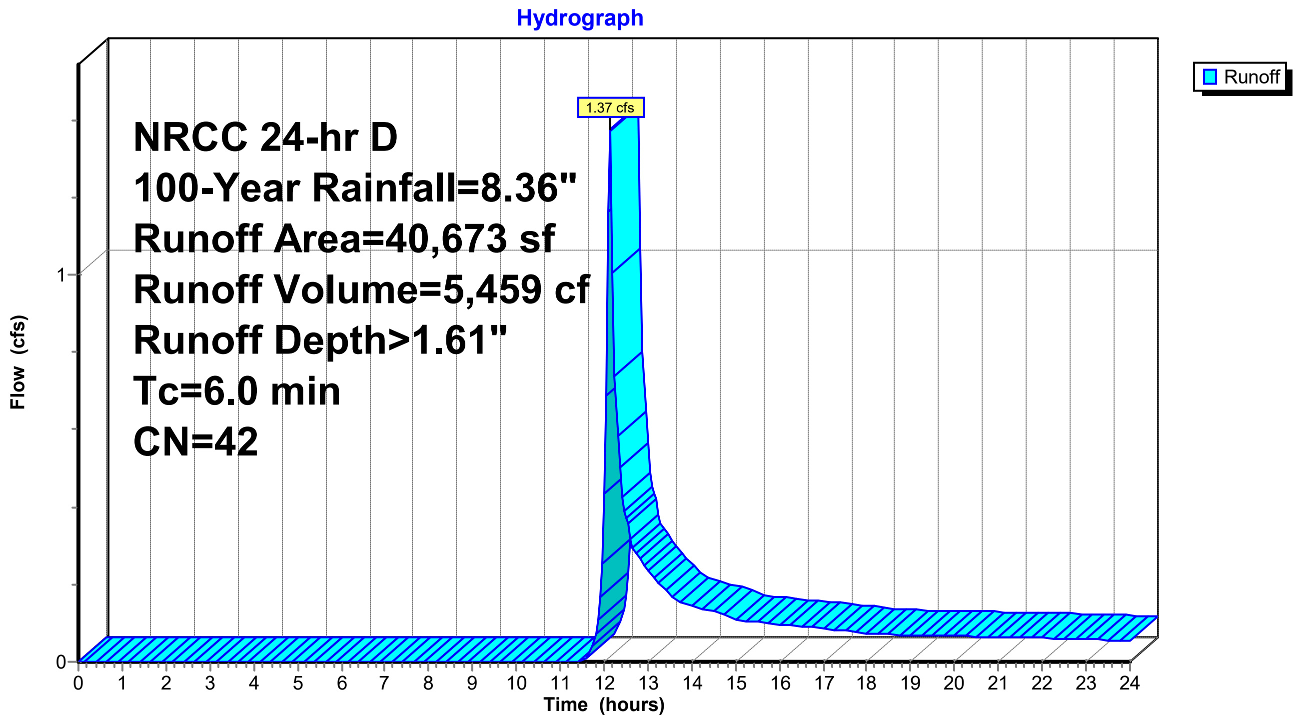
Runoff = 1.37 cfs @ 12.14 hrs, Volume= 5,459 cf, Depth> 1.61"
Routed to Pond 1P : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
20,962	54	1/2 acre lots, 25% imp, HSG A
0	98	Water Surface, HSG A
19,711	30	Woods, Good, HSG A
40,673	42	Weighted Average
35,433		87.12% Pervious Area
5,240		12.88% Impervious Area

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

Subcatchment P-18: Subcat P-18



Summary for Subcatchment P-19: Subcat P-19

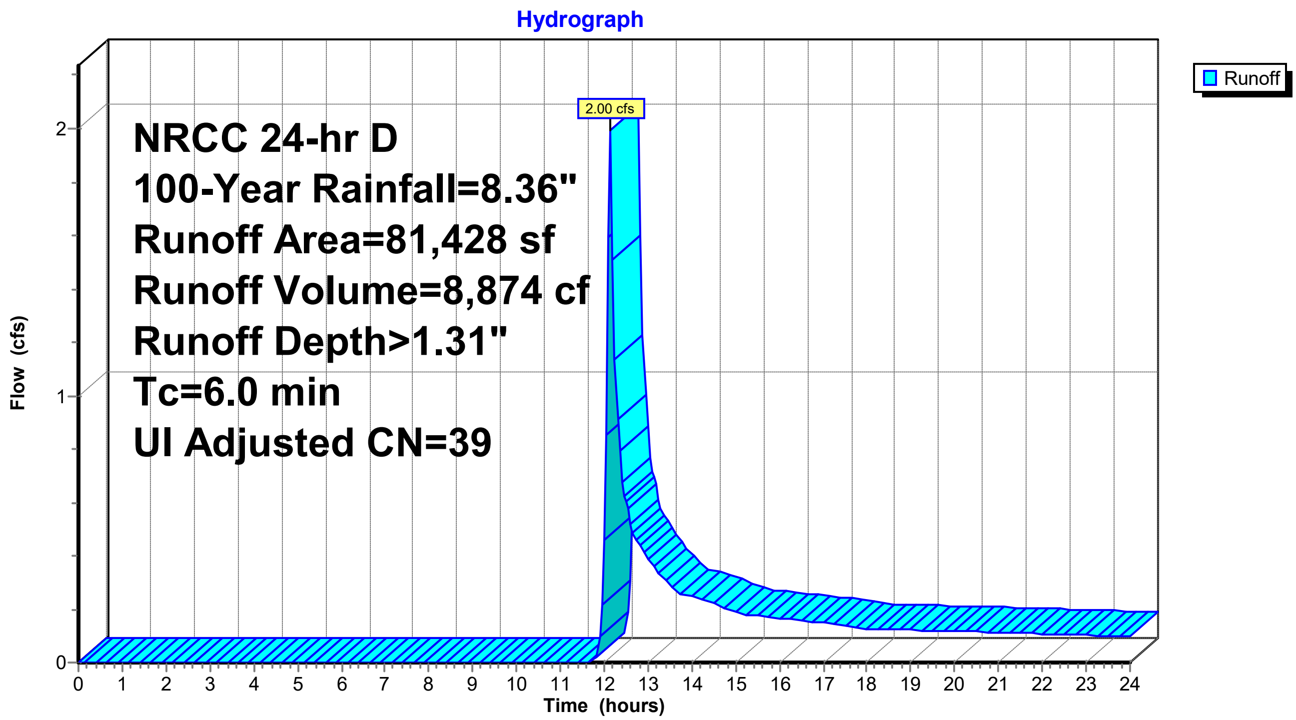
Runoff = 2.00 cfs @ 12.15 hrs, Volume= 8,874 cf, Depth> 1.31"
Routed to Reach 6R : VEGETATED SWALE

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Adj	Description
28,826	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
6,878	39		>75% Grass cover, Good, HSG A
44	98		Unconnected pavement, HSG A
61	98		Unconnected pavement, HSG A
9,162	98		Unconnected pavement, HSG A
30	98		Unconnected pavement, HSG A
36,428	39		>75% Grass cover, Good, HSG A
81,428	43	39	Weighted Average, UI Adjusted
72,131			88.58% Pervious Area
9,296			11.42% Impervious Area
9,296			100.00% Unconnected

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

Subcatchment P-19: Subcat P-19



Summary for Subcatchment P-2: Subcat P-2

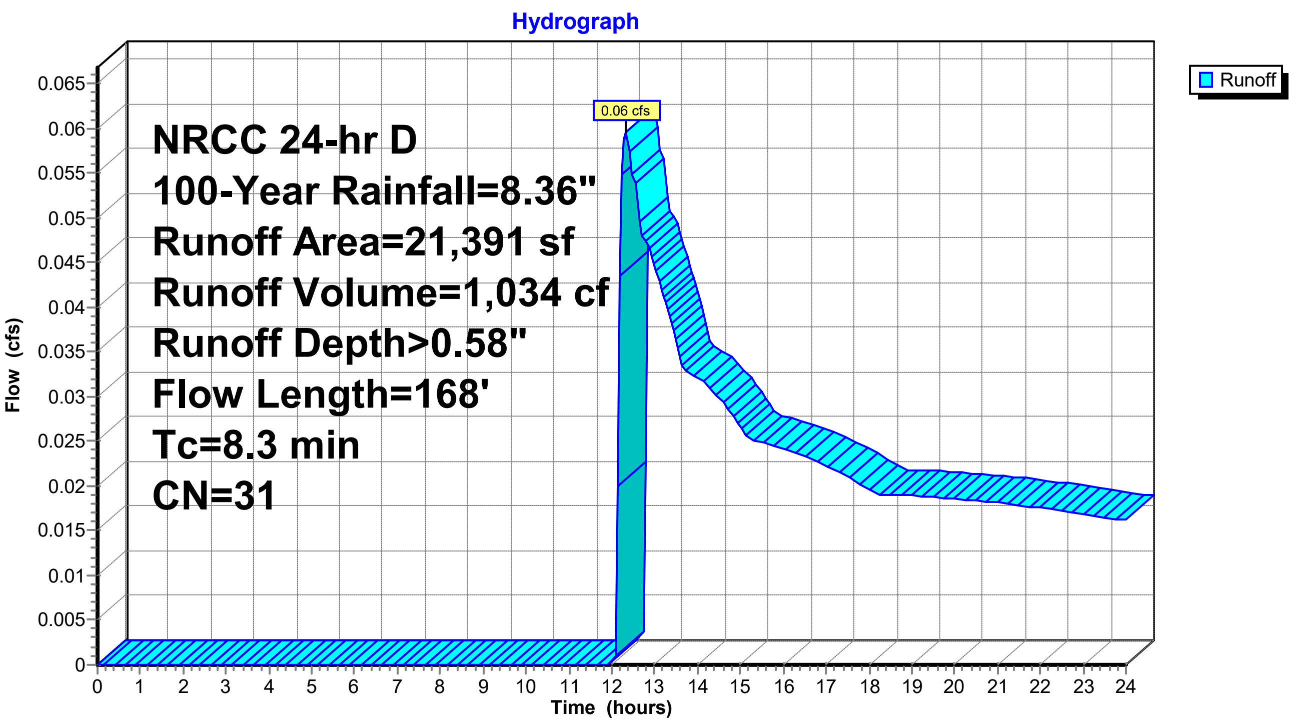
Runoff = 0.06 cfs @ 12.34 hrs, Volume= 1,034 cf, Depth> 0.58"
Routed to Link SP2 : Study Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
1,942	39	>75% Grass cover, Good, HSG A
19,449	30	Woods, Good, HSG A
21,391	31	Weighted Average
21,391		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.09"
0.7	118	0.1440	2.66		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
8.3	168	Total			

Subcatchment P-2: Subcat P-2



Summary for Subcatchment P-20: Subcat P-20

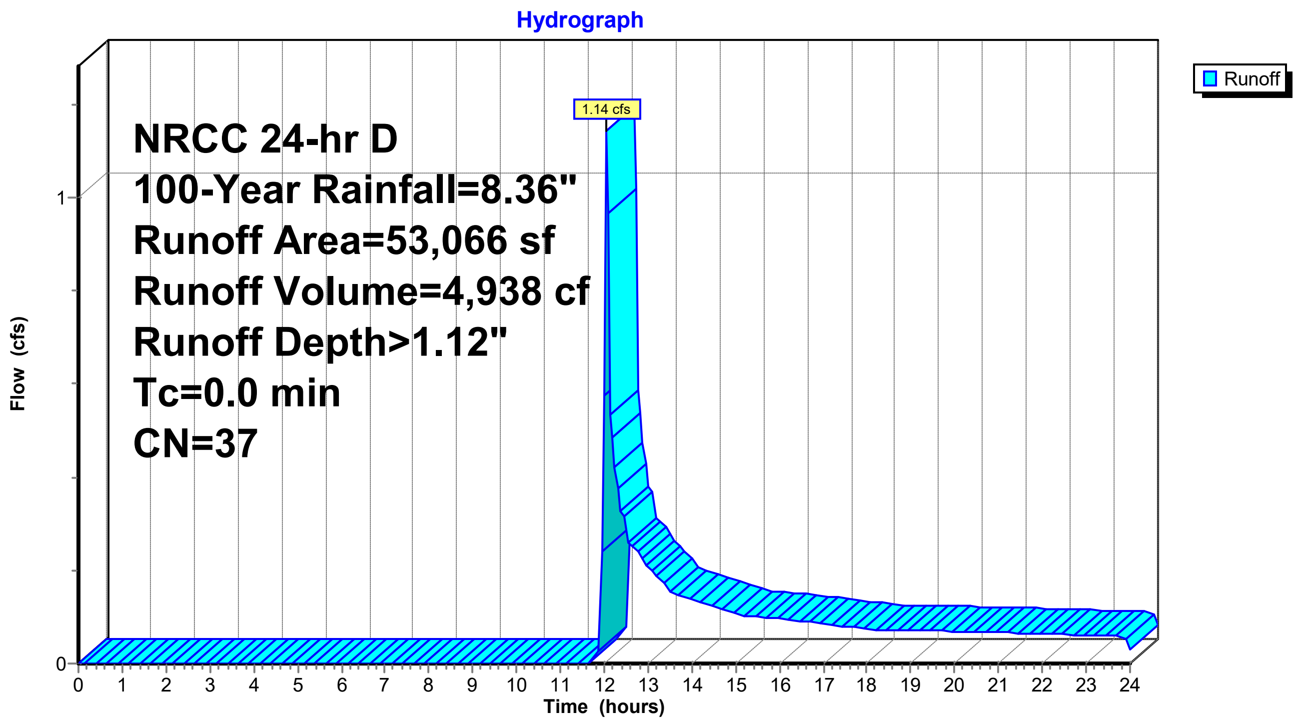
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.14 cfs @ 12.06 hrs, Volume= 4,938 cf, Depth> 1.12"
Routed to Pond 2P : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
22,364	30	Woods, Good, HSG A
8	30	Woods, Good, HSG A
29,421	39	>75% Grass cover, Good, HSG A
1,273	98	Roofs, HSG A
53,066	37	Weighted Average
51,793		97.60% Pervious Area
1,273		2.40% Impervious Area

Subcatchment P-20: Subcat P-20



Summary for Subcatchment P-3: Subcat P-3

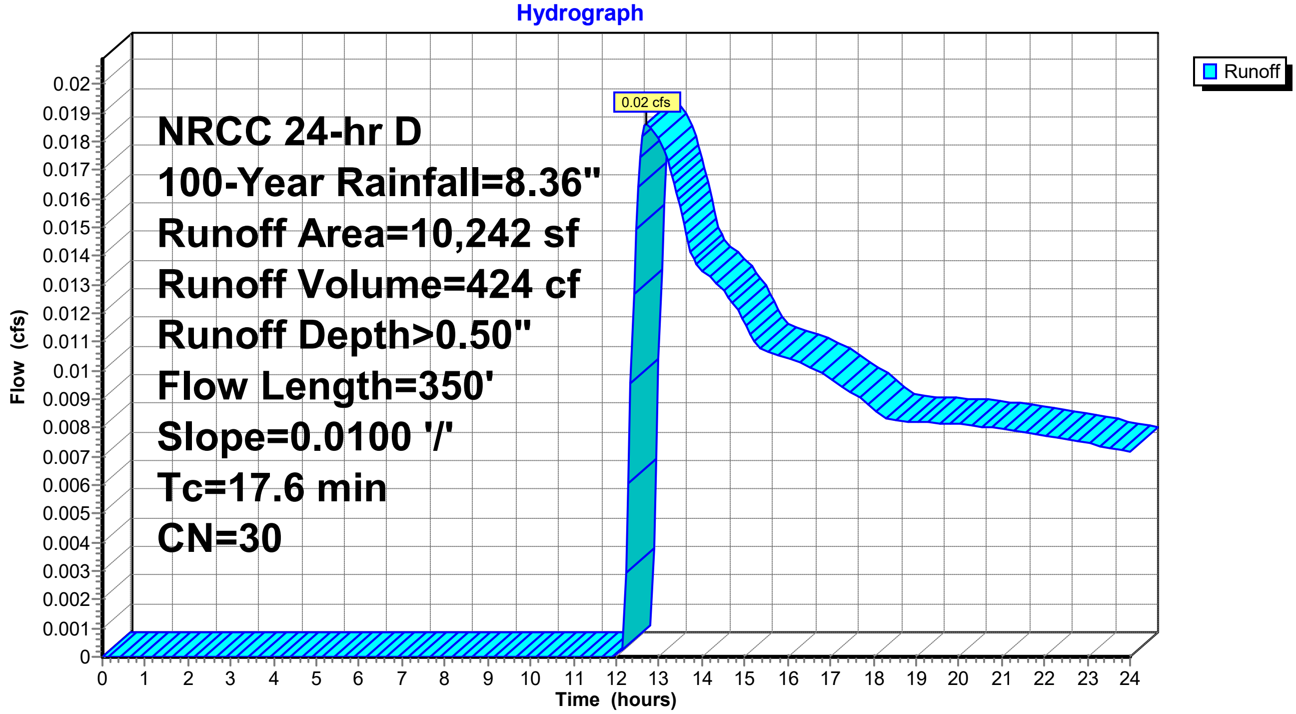
Runoff = 0.02 cfs @ 12.70 hrs, Volume= 424 cf, Depth> 0.50"
Routed to Link SP3 : Study Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
6	39	>75% Grass cover, Good, HSG A
10,236	30	Woods, Good, HSG A
10,242	30	Weighted Average
10,242		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.09"
10.0	300	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.6	350	Total			

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

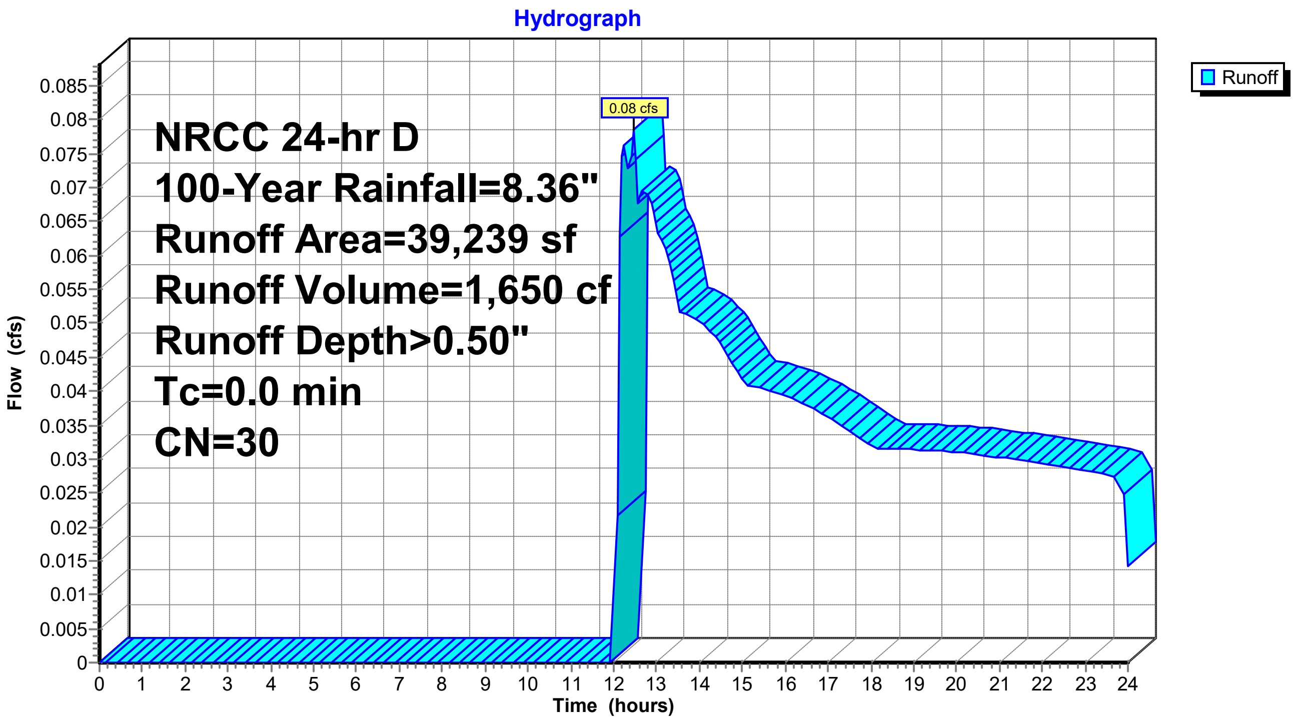
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.08 cfs @ 12.45 hrs, Volume= 1,650 cf, Depth> 0.50"
Routed to Pond 4P : Existing Ditch 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
39,239	30	Woods, Good, HSG A
39,239		100.00% Pervious Area

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

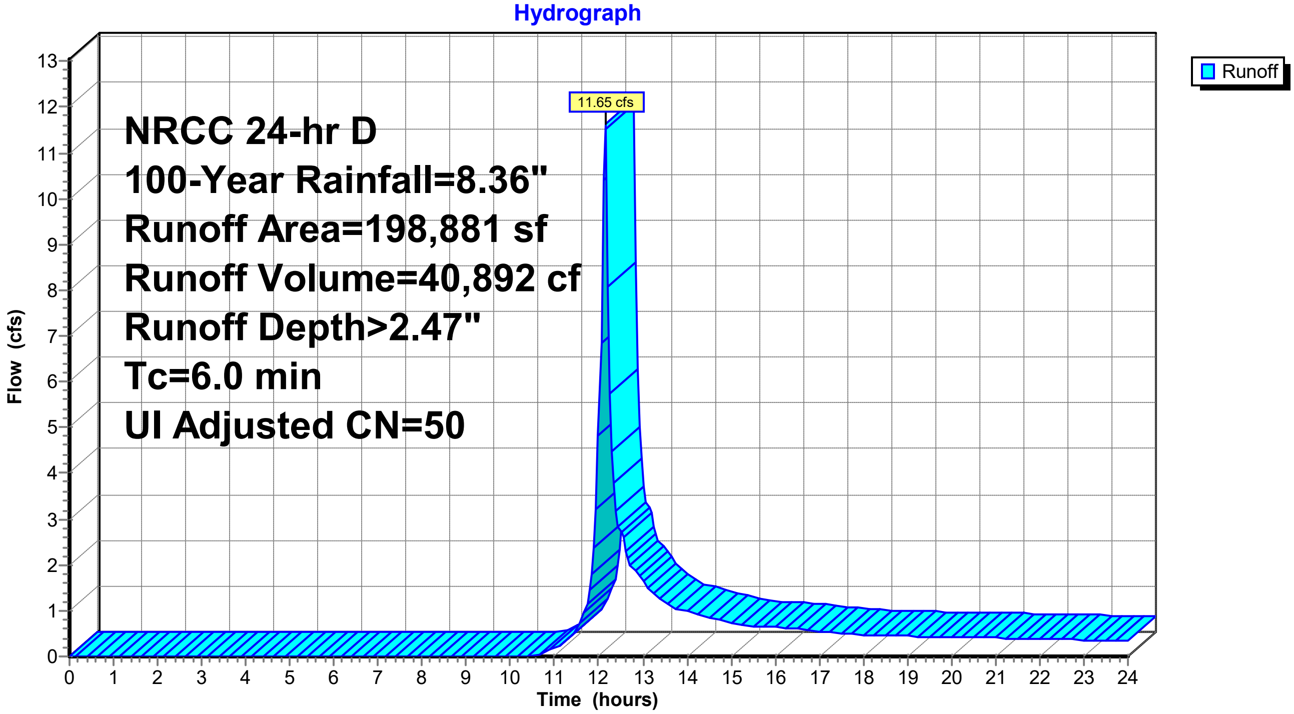
Runoff = 11.65 cfs @ 12.14 hrs, Volume= 40,892 cf, Depth> 2.47"
Routed to Link SP5 : Study Point 5

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Adj	Description
21,040	30		Woods, Good, HSG A
0	30		Woods, Good, HSG A
60,243	30		Woods, Good, HSG A
11,413	30		Woods, Good, HSG A
5,380	30		Woods, Good, HSG A
0	39		>75% Grass cover, Good, HSG A
315	39		>75% Grass cover, Good, HSG A
1,914	39		>75% Grass cover, Good, HSG A
761	39		>75% Grass cover, Good, HSG A
10,302	39		>75% Grass cover, Good, HSG A
1,325	30		Woods, Good, HSG A
13,415	72		Dirt roads, HSG A
527	98		Unconnected pavement, HSG A
43	98		Unconnected pavement, HSG A
38	98		Unconnected pavement, HSG A
39	98		Unconnected pavement, HSG A
13,837	98		Unconnected pavement, HSG A
33	98		Unconnected pavement, HSG A
330	39		>75% Grass cover, Good, HSG A
9,969	98		Roofs, HSG A
395	98		Roofs, HSG A
1,474	98		Roofs, HSG A
2	98		Roofs, HSG A
9,863	98		Roofs, HSG A
3,360	39		>75% Grass cover, Good, HSG A
16,236	98		Paved parking, HSG A
56	98		Paved parking, HSG A
11	98		Paved parking, HSG A
11,291	39		>75% Grass cover, Good, HSG A
5,272	39		>75% Grass cover, Good, HSG A
198,881	52	50	Weighted Average, UI Adjusted
146,360			73.59% Pervious Area
52,521			26.41% Impervious Area
14,517			27.64% Unconnected

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

Runoff = 26.58 cfs @ 12.20 hrs, Volume= 111,128 cf, Depth> 5.11"
Routed to Pond 12P : Drainage Easement Ditch

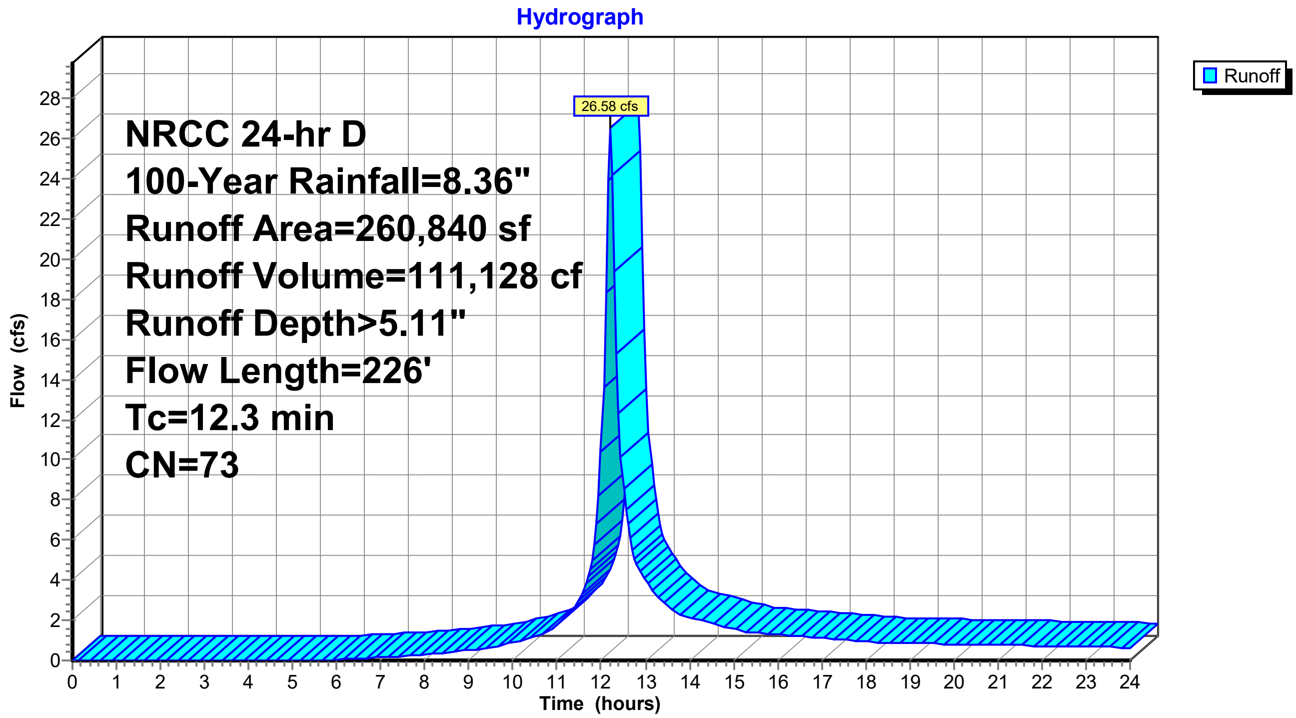
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
1	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
556	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
580	30	Woods, Good, HSG A
87	30	Woods, Good, HSG A
76	30	Woods, Good, HSG A
17	30	Woods, Good, HSG A
41	30	Woods, Good, HSG A
234	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
1,039	39	>75% Grass cover, Good, HSG A
80	30	Woods, Good, HSG A
124	39	>75% Grass cover, Good, HSG A
9,477	39	>75% Grass cover, Good, HSG A
1,324	39	>75% Grass cover, Good, HSG A
3,326	39	>75% Grass cover, Good, HSG A
197	39	>75% Grass cover, Good, HSG A
103	39	>75% Grass cover, Good, HSG A
849	39	>75% Grass cover, Good, HSG A
1,494	39	>75% Grass cover, Good, HSG A
488	39	>75% Grass cover, Good, HSG A
5,897	39	>75% Grass cover, Good, HSG A
207	39	>75% Grass cover, Good, HSG A
38	39	>75% Grass cover, Good, HSG A
35,199	54	1/2 acre lots, 25% imp, HSG A
2,290	54	1/2 acre lots, 25% imp, HSG A
5,803	98	Unconnected pavement, HSG A
2,360	98	Unconnected pavement, HSG A
889	98	Unconnected pavement, HSG A
715	98	Unconnected pavement, HSG A
135,515	98	Paved parking, HSG A
563	98	Unconnected pavement, HSG A
3,565	39	>75% Grass cover, Good, HSG A
2,358	30	Woods, Good, HSG A
6,778	39	>75% Grass cover, Good, HSG A
281	39	>75% Grass cover, Good, HSG A
1,577	39	>75% Grass cover, Good, HSG A
1,768	39	>75% Grass cover, Good, HSG A
362	39	>75% Grass cover, Good, HSG A
12,602	30	Woods, Good, HSG A
10,885	39	>75% Grass cover, Good, HSG A
4,375	30	Woods, Good, HSG A
2,426	39	>75% Grass cover, Good, HSG A
1	39	>75% Grass cover, Good, HSG A
348	39	>75% Grass cover, Good, HSG A
366	39	>75% Grass cover, Good, HSG A
384	39	>75% Grass cover, Good, HSG A
2,039	39	>75% Grass cover, Good, HSG A

564	39	>75% Grass cover, Good, HSG A
591	39	>75% Grass cover, Good, HSG A
260,840	73	Weighted Average
105,623		40.49% Pervious Area
155,217		59.51% Impervious Area
10,330		6.66% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.09"
0.3	15	0.0200	0.99		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
1.3	161	0.0100	2.03		**Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps
12.3	226	Total			

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

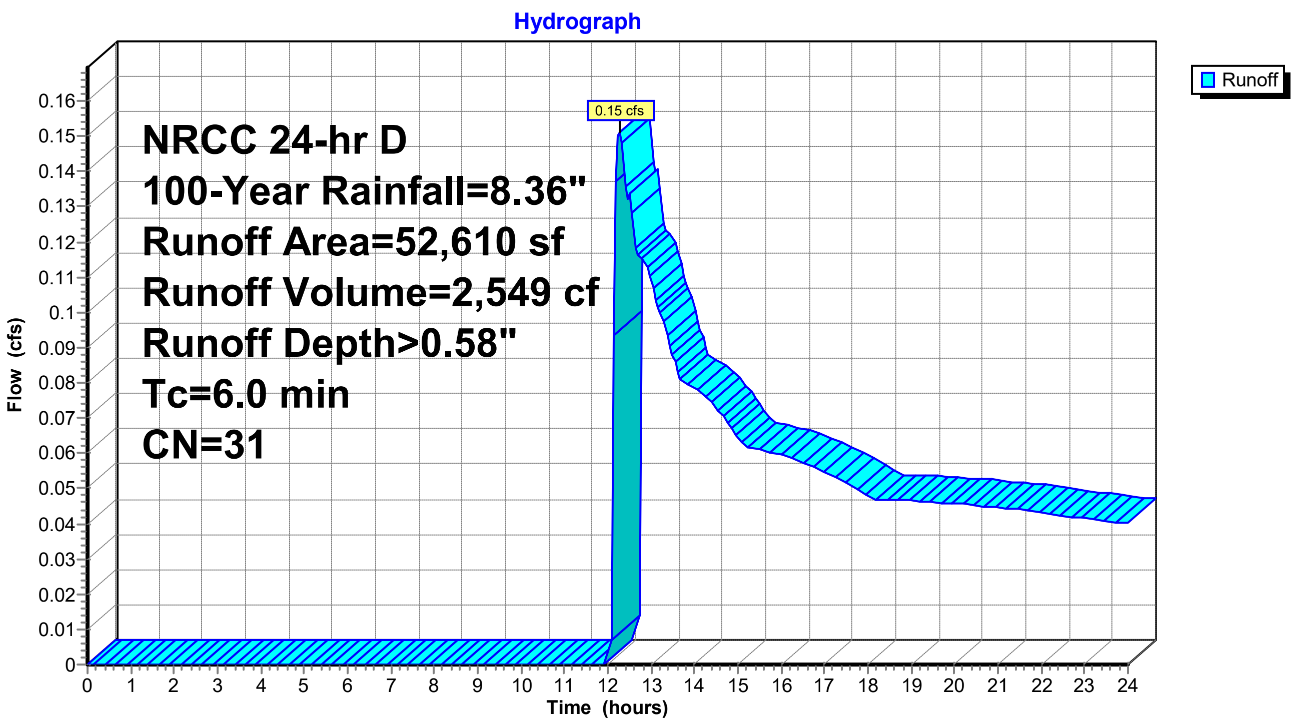
Runoff = 0.15 cfs @ 12.27 hrs, Volume= 2,549 cf, Depth> 0.58"
Routed to Pond 12P : Drainage Easement Ditch

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
49,207	30	Woods, Good, HSG A
72	30	Woods, Good, HSG A
2,969	39	>75% Grass cover, Good, HSG A
215	30	Woods, Good, HSG A
26	98	Unconnected pavement, HSG A
113	98	Unconnected pavement, HSG A
8	98	Paved parking, HSG A
52,610	31	Weighted Average
52,463		99.72% Pervious Area
147		0.28% Impervious Area
139		94.53% Unconnected

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

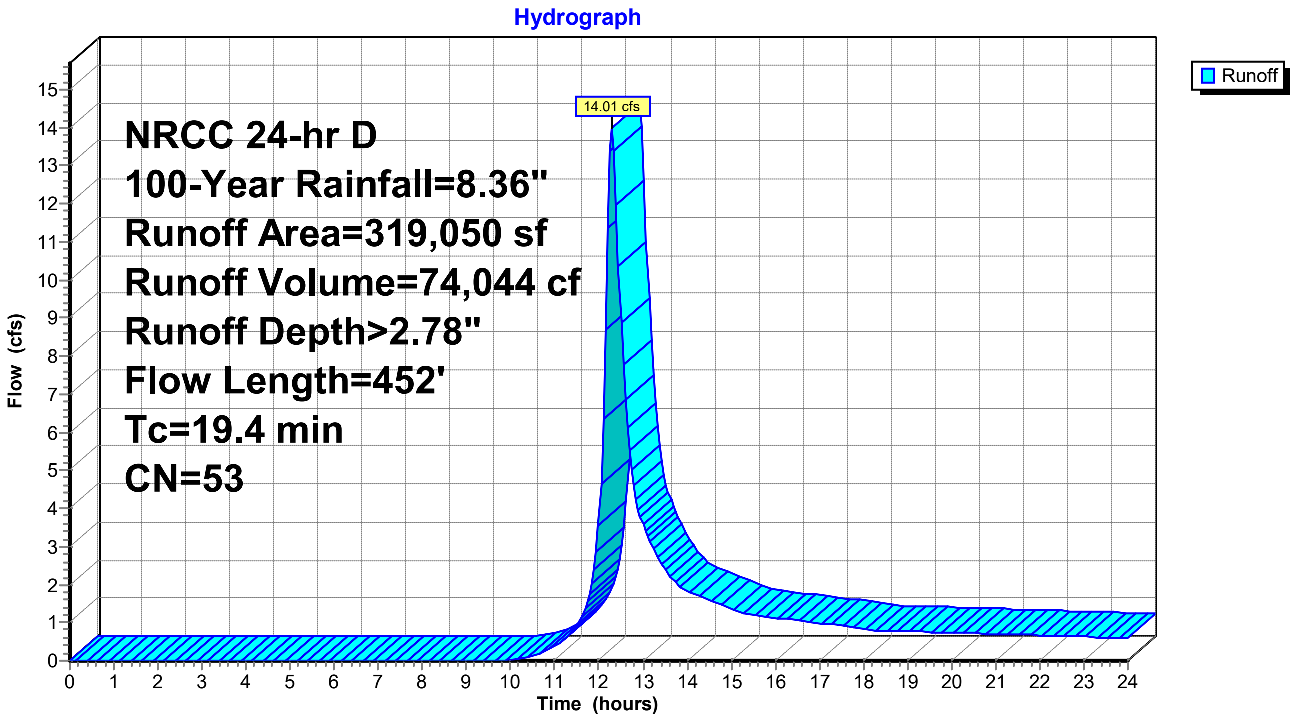
Runoff = 14.01 cfs @ 12.30 hrs, Volume= 74,044 cf, Depth> 2.78"
Routed to Pond 5P : Infiltration Basin 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
155,878	30	Woods, Good, HSG A
13,674	30	Woods, Good, HSG A
0	30	Woods, Good, HSG A
57	39	>75% Grass cover, Good, HSG A
1,057	39	>75% Grass cover, Good, HSG A
58	39	>75% Grass cover, Good, HSG A
44,905	39	>75% Grass cover, Good, HSG A
1,978	39	>75% Grass cover, Good, HSG A
665	72	Dirt roads, HSG A
1,101	98	Unconnected pavement, HSG A
7,746	98	Unconnected pavement, HSG A
26,556	98	Unconnected pavement, HSG A
12	98	Unconnected pavement, HSG A
71	98	Unconnected pavement, HSG A
210	98	Unconnected pavement, HSG A
7,456	98	Unconnected pavement, HSG A
9,916	98	Roofs, HSG A
47,139	98	Roofs, HSG A
175	98	Roofs, HSG A
395	98	Roofs, HSG A
319,050	53	Weighted Average
218,273		68.41% Pervious Area
100,778		31.59% Impervious Area
43,153		42.82% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	50	0.0240	0.07		**Sheet Flow, A-B**
					Woods: Light underbrush n= 0.400 P2= 3.09"
2.0	76	0.0660	0.64		**Shallow Concentrated Flow, B-C**
					Forest w/Heavy Litter Kv= 2.5 fps
1.7	79	0.0120	0.77		**Shallow Concentrated Flow, C-D**
					Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0270	3.34		**Shallow Concentrated Flow, D-E**
					Paved Kv= 20.3 fps
3.9	220	0.0180	0.94		**Shallow Concentrated Flow, E-F**
					Short Grass Pasture Kv= 7.0 fps
19.4	452	Total			

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

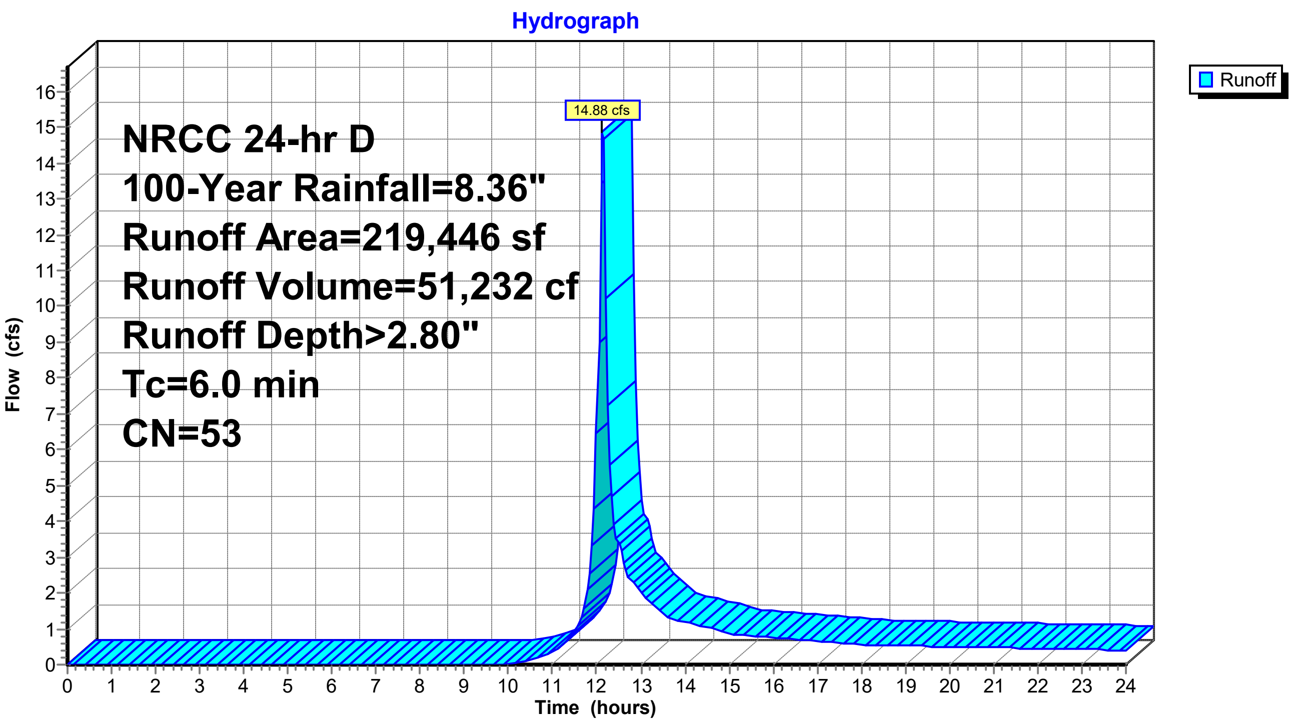
Runoff = 14.88 cfs @ 12.14 hrs, Volume= 51,232 cf, Depth> 2.80"
Routed to Pond 3P : Underground Infiltration System 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
NRCC 24-hr D 100-Year Rainfall=8.36"

Area (sf)	CN	Description
103,904	54	1/2 acre lots, 25% imp, HSG A
37,219	54	1/2 acre lots, 25% imp, HSG A
5,066	39	>75% Grass cover, Good, HSG A
23,689	98	Paved parking, HSG A
49,568	30	Woods, Good, HSG A
219,446	53	Weighted Average
160,476		73.13% Pervious Area
58,969		26.87% Impervious Area

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

Subcatchment P-9: Subcat P-9



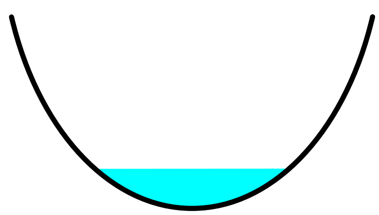
Summary for Reach 6R: VEGETATED SWALE

Inflow Area = 81,428 sf, 11.42% Impervious, Inflow Depth > 1.31" for 100-Year event
Inflow = 2.00 cfs @ 12.15 hrs, Volume= 8,874 cf
Outflow = 1.81 cfs @ 12.19 hrs, Volume= 8,845 cf, Atten= 10%, Lag= 2.8 min
Routed to Pond 3P : Underground Infiltration System 1

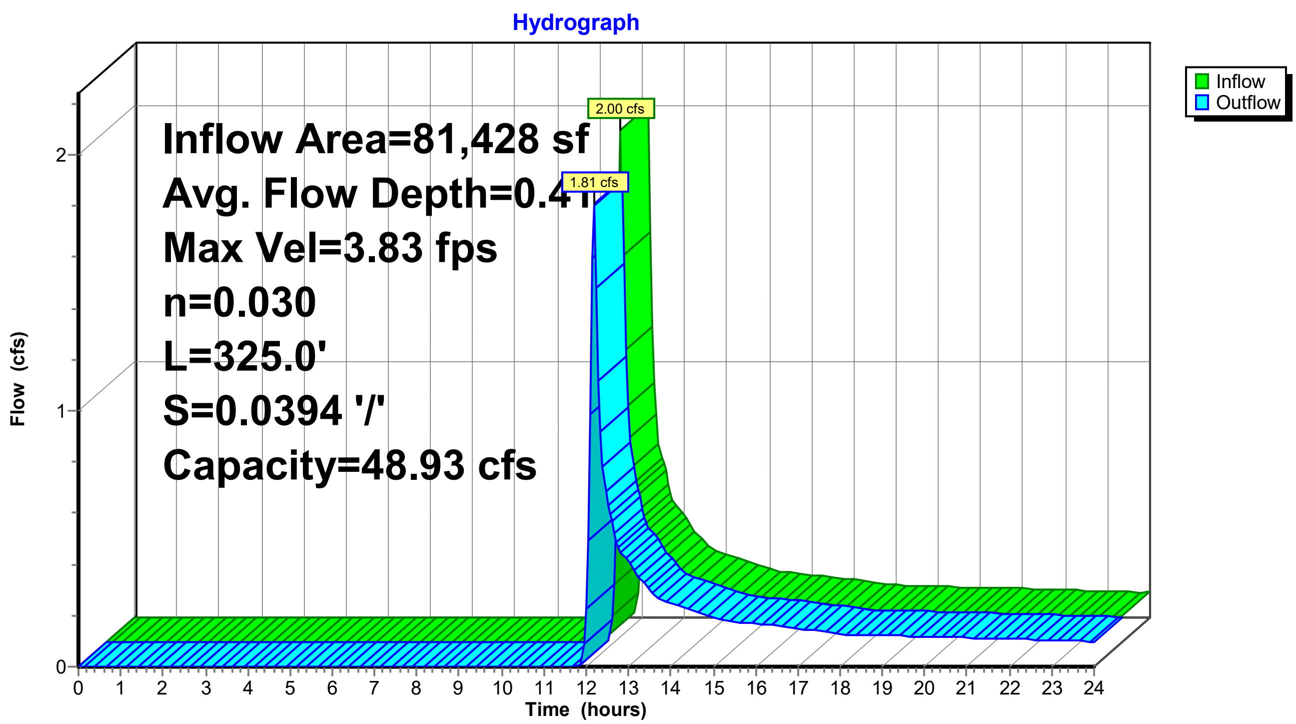
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.83 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.88 fps, Avg. Travel Time= 2.9 min

Peak Storage= 162 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 1.82'
Bank-Full Depth= 2.00' Flow Area= 5.3 sf, Capacity= 48.93 cfs

4.00' x 2.00' deep Parabolic Channel, n= 0.030 Earth, grassed & winding
Length= 325.0' Slope= 0.0394 '/'
Inlet Invert= 193.00', Outlet Invert= 180.20'



Reach 6R: VEGETATED SWALE



Summary for Pond 1P: Infiltration Basin 1

Inflow Area = 105,988 sf, 61.00% Impervious, Inflow Depth > 5.24" for 100-Year event
Inflow = 12.07 cfs @ 12.13 hrs, Volume= 46,284 cf
Outflow = 0.55 cfs @ 14.96 hrs, Volume= 31,666 cf, Atten= 95%, Lag= 170.1 min
Discarded = 0.55 cfs @ 14.96 hrs, Volume= 31,666 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP1 : Study Point 1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP2 : Study Point 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 176.11' @ 14.96 hrs Surf.Area= 9,932 sf Storage= 21,152 cf

Plug-Flow detention time= 256.8 min calculated for 31,600 cf (68% of inflow)
Center-of-Mass det. time= 131.9 min (918.6 - 786.7)

Volume	Invert	Avail.Storage	Storage Description
#1	173.50'	36,336 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
173.50	6,319	436.0	0	0	6,319
174.00	6,981	446.0	3,324	3,324	7,055
175.00	8,346	465.0	7,653	10,977	8,505
176.00	9,768	483.0	9,048	20,025	9,944
177.00	11,247	502.0	10,499	30,523	11,512
177.50	12,008	512.0	5,813	36,336	12,358

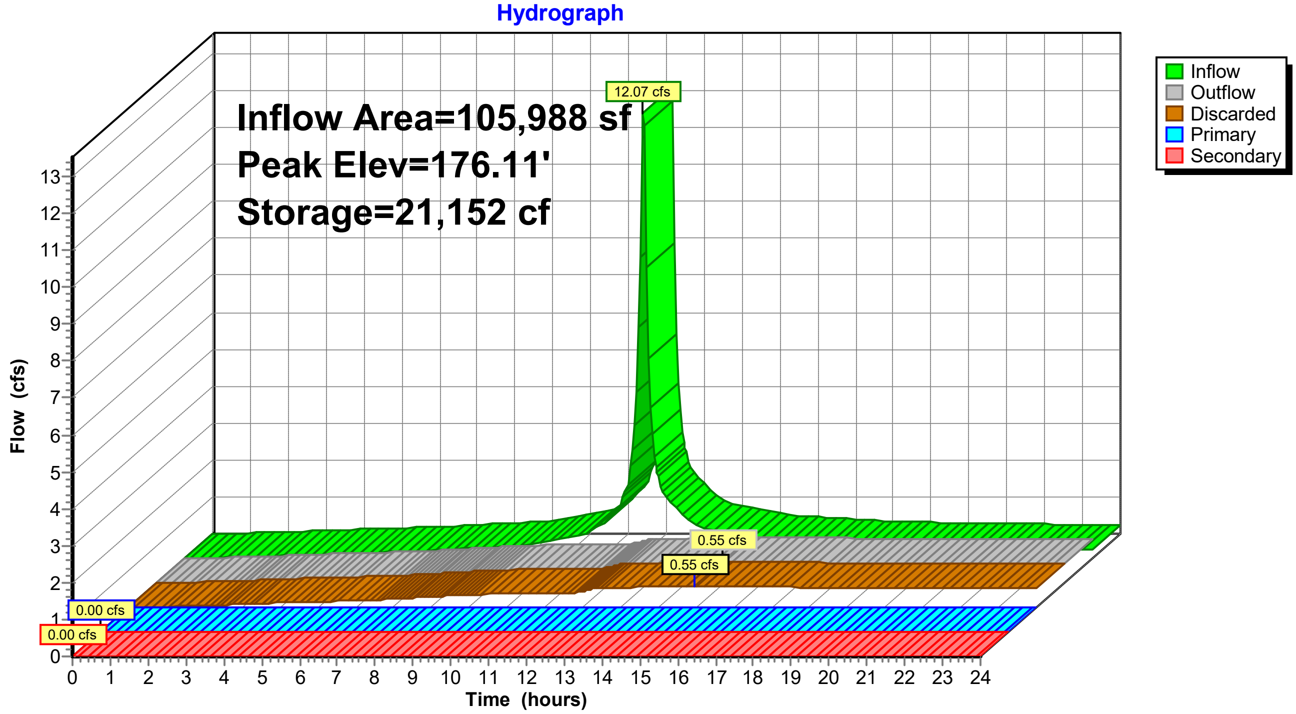
Device	Routing	Invert	Outlet Devices
#1	Secondary	173.40'	**12.0" Round Culvert** L= 252.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 173.40' / 169.50' S= 0.0155 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	176.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	176.50'	**13.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Discarded	173.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.55 cfs @ 14.96 hrs HW=176.11' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.55 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=173.50' (Free Discharge)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=173.50' (Free Discharge)
└─**1=Culvert** (Passes 0.00 cfs of 0.03 cfs potential flow)
  └─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin 1



Summary for Pond 2P: Infiltration Basin 2

[79] Warning: Submerged Pond 3P Primary device # 1 INLET by 0.72'

Inflow Area = 935,284 sf, 40.53% Impervious, Inflow Depth > 0.38" for 100-Year event
Inflow = 7.31 cfs @ 12.12 hrs, Volume= 29,696 cf
Outflow = 0.44 cfs @ 14.59 hrs, Volume= 24,429 cf, Atten= 94%, Lag= 148.4 min
Discarded = 0.44 cfs @ 14.59 hrs, Volume= 24,429 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP3 : Study Point 3

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 177.07' @ 14.59 hrs Surf.Area= 7,973 sf Storage= 11,357 cf

Plug-Flow detention time= 224.3 min calculated for 24,378 cf (82% of inflow)
Center-of-Mass det. time= 135.4 min (941.1 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	175.50'	33,751 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

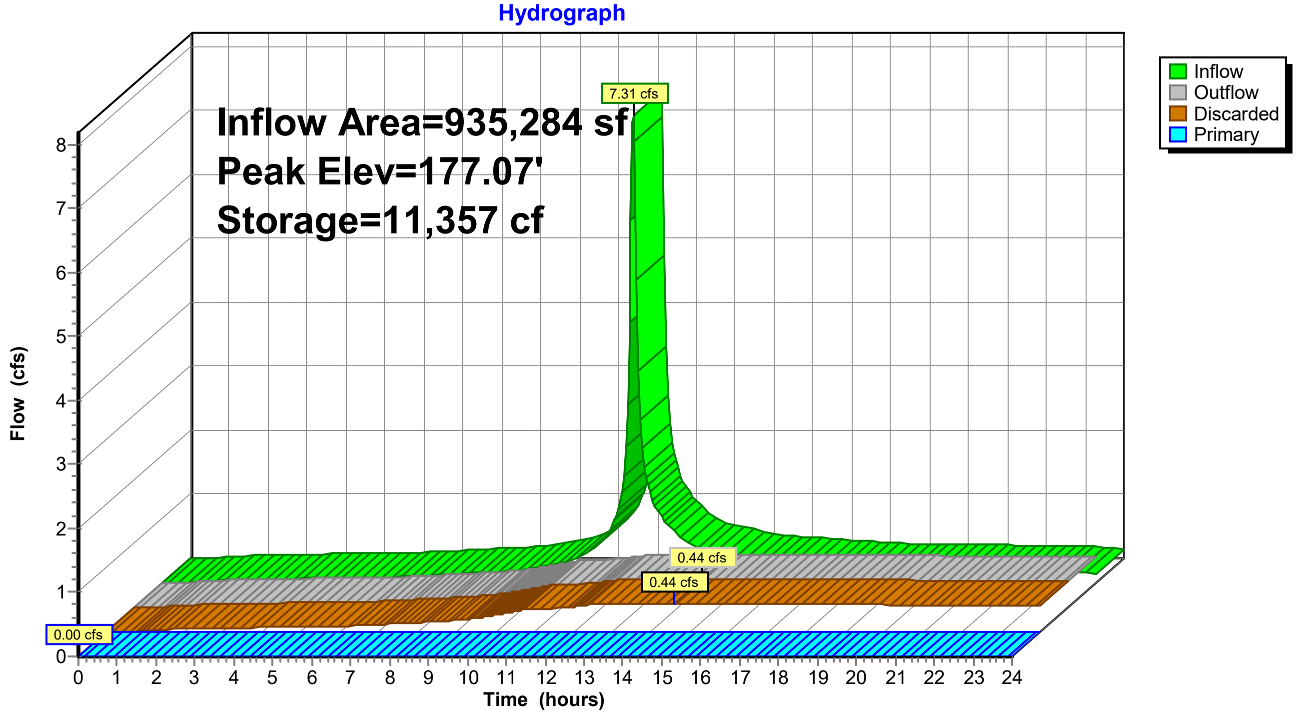
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
175.50	6,483	301.0	0	0	6,483
176.00	6,941	310.0	3,355	3,355	6,946
177.00	7,900	329.0	7,415	10,771	7,964
178.00	8,915	348.0	8,402	19,173	9,042
179.00	9,987	367.0	9,446	28,619	10,181
179.50	10,544	376.0	5,132	33,751	10,744

Device	Routing	Invert	Outlet Devices
#1	Primary	175.40'	**12.0" Round Culvert** L= 63.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 175.40' / 173.00' S= 0.0378 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	178.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	178.50'	**13.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Discarded	175.50'	**2.410 in/hr Exfiltration over Surface area**
#5	Primary	178.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.44 cfs @ 14.59 hrs HW=177.07' (Free Discharge)
└─**4=Exfiltration** (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.50' (Free Discharge)
├─**1=Culvert** (Passes 0.00 cfs of 0.03 cfs potential flow)
│ └─**2=Orifice/Grate** (Controls 0.00 cfs)
├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin 2



Summary for Pond 3P: Underground Infiltration System 1

Inflow Area = 519,328 sf, 46.31% Impervious, Inflow Depth > 4.17" for 100-Year event
Inflow = 48.52 cfs @ 12.13 hrs, Volume= 180,512 cf
Outflow = 1.59 cfs @ 10.40 hrs, Volume= 95,893 cf, Atten= 97%, Lag= 0.0 min
Discarded = 1.59 cfs @ 10.40 hrs, Volume= 95,893 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 2P : Infiltration Basin 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 175.62' @ 17.73 hrs Surf.Area= 28,516 sf Storage= 91,474 cf

Plug-Flow detention time= 258.5 min calculated for 95,694 cf (53% of inflow)
Center-of-Mass det. time= 102.2 min (922.8 - 820.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	171.25'	14,193 cf	**37.58'W x 238.18'L x 6.75'H Field A** 60,422 cf Overall - 24,939 cf Embedded = 35,483 cf x 40.0% Voids
#2A	172.00'	24,939 cf	**ADS_StormTech MC-7200 +Cap** x 140 Inside #1 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 140 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
#3B	171.25'	16,906 cf	**37.58'W x 284.32'L x 6.75'H Field B** 72,128 cf Overall - 29,863 cf Embedded = 42,264 cf x 40.0% Voids
#4B	172.00'	29,863 cf	**ADS_StormTech MC-7200 +Cap** x 168 Inside #3 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 168 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
#5C	171.25'	6,107 cf	**28.50'W x 132.71'L x 6.75'H Field C** 25,530 cf Overall - 10,262 cf Embedded = 15,268 cf x 40.0% Voids
#6C	172.00'	10,262 cf	**ADS_StormTech MC-7200 +Cap** x 57 Inside #5 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 57 Chambers in 3 Rows Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf
#7D	171.25'	8,180 cf	**28.50'W x 178.85'L x 6.75'H Field D** 34,406 cf Overall - 13,955 cf Embedded = 20,451 cf x 40.0% Voids
#8D	172.00'	13,955 cf	**ADS_StormTech MC-7200 +Cap** x 78 Inside #7 Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap 78 Chambers in 3 Rows Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf
#9	173.47'	68 cf	**4.00'D x 5.45'H Vertical Cone/Cylinder** -Impervious
		124,474 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard
Storage Group C created with Chamber Wizard
Storage Group D created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	176.35'	**12.0" Round Culvert** L= 82.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 176.35' / 175.50' S= 0.0104 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	177.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	171.25'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.59 cfs @ 10.40 hrs HW=171.33' (Free Discharge)
└—**3=Exfiltration** (Exfiltration Controls 1.59 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=171.25' (Free Discharge)
└—**1=Culvert** (Controls 0.00 cfs)
  └—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

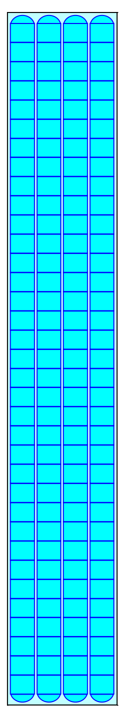
35 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 236.17' Row Length +12.0" End Stone x 2 = 238.18' Base Length
4 Rows x 100.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 37.58' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

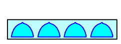
140 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 4 Rows = 24,938.6 cf Chamber Storage

60,422.0 cf Field - 24,938.6 cf Chambers = 35,483.4 cf Stone x 40.0% Voids = 14,193.4 cf Stone Storage

Chamber Storage + Stone Storage = 39,132.0 cf = 0.898 af
Overall Storage Efficiency = 64.8%
Overall System Size = 238.18' x 37.58' x 6.75'

140 Chambers
2,237.9 cy Field
1,314.2 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field B

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

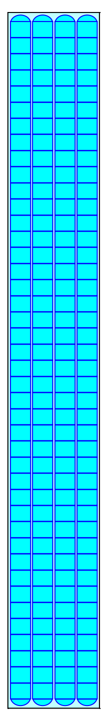
42 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 282.32' Row Length +12.0" End Stone x 2 = 284.32' Base Length
4 Rows x 100.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 37.58' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

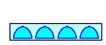
168 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 4 Rows = 29,863.1 cf Chamber Storage

72,127.6 cf Field - 29,863.1 cf Chambers = 42,264.5 cf Stone x 40.0% Voids = 16,905.8 cf Stone Storage

Chamber Storage + Stone Storage = 46,768.9 cf = 1.074 af
Overall Storage Efficiency = 64.8%
Overall System Size = 284.32' x 37.58' x 6.75'

168 Chambers
2,671.4 cy Field
1,565.4 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field C

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

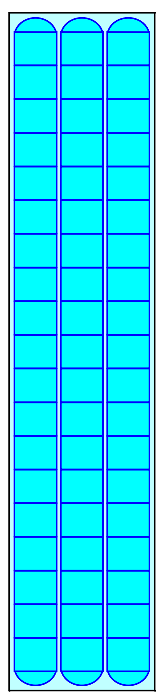
19 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 130.71' Row Length +12.0" End Stone x 2 = 132.71' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

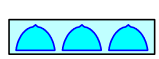
57 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 3 Rows = 10,261.9 cf Chamber Storage

25,529.8 cf Field - 10,261.9 cf Chambers = 15,267.9 cf Stone x 40.0% Voids = 6,107.1 cf Stone Storage

Chamber Storage + Stone Storage = 16,369.1 cf = 0.376 af
Overall Storage Efficiency = 64.1%
Overall System Size = 132.71' x 28.50' x 6.75'

57 Chambers
945.5 cy Field
565.5 cy Stone





Pond 3P: Underground Infiltration System 1 - Chamber Wizard Field D

Chamber Model = ADS_StormTech MC-7200 +Cap (ADS StormTech® MC-7200 with cap volume)
Effective Size= 91.2"W x 60.0"H => 26.68 sf x 6.59'L = 175.9 cf
Overall Size= 100.0"W x 60.0"H x 6.95'L with 0.36' Overlap
Cap Storage= 39.5 cf x 2 x 3 rows = 237.0 cf

100.0" Wide + 9.0" Spacing = 109.0" C-C Row Spacing

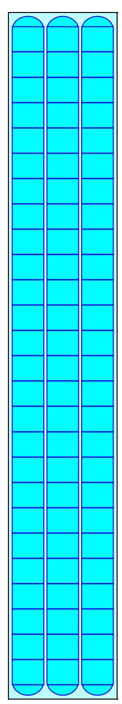
26 Chambers/Row x 6.59' Long +2.73' Cap Length x 2 = 176.85' Row Length +12.0" End Stone x 2 = 178.85' Base Length
3 Rows x 100.0" Wide + 9.0" Spacing x 2 + 12.0" Side Stone x 2 = 28.50' Base Width
9.0" Stone Base + 60.0" Chamber Height + 12.0" Stone Cover = 6.75' Field Height

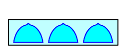
78 Chambers x 175.9 cf + 39.5 cf Cap Volume x 2 x 3 Rows = 13,955.3 cf Chamber Storage

34,406.3 cf Field - 13,955.3 cf Chambers = 20,451.0 cf Stone x 40.0% Voids = 8,180.4 cf Stone Storage

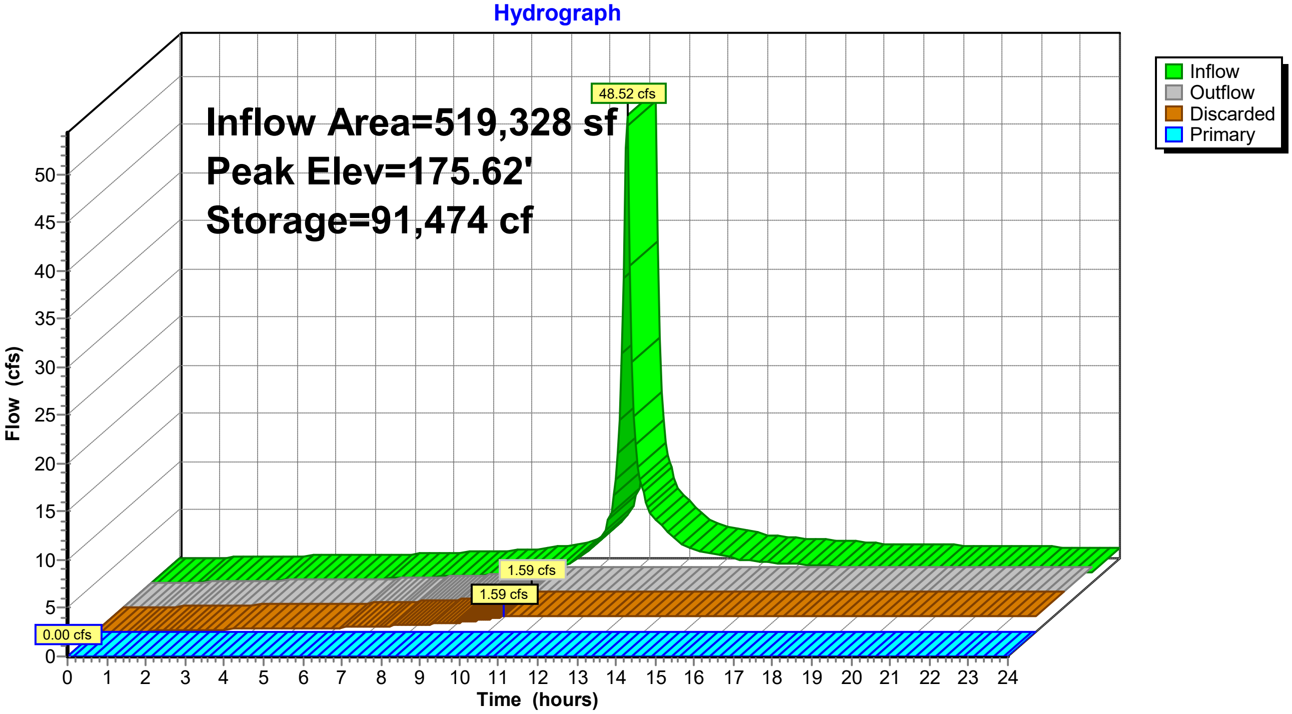
Chamber Storage + Stone Storage = 22,135.7 cf = 0.508 af
Overall Storage Efficiency = 64.3%
Overall System Size = 178.85' x 28.50' x 6.75'

78 Chambers
1,274.3 cy Field
757.4 cy Stone





Pond 3P: Underground Infiltration System 1



Summary for Pond 4P: Existing Ditch 1

Inflow Area = 39,239 sf, 0.00% Impervious, Inflow Depth > 0.50" for 100-Year event
Inflow = 0.08 cfs @ 12.45 hrs, Volume= 1,650 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP4 : Study Point 4

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 194.71' @ 24.00 hrs Surf.Area= 1,987 sf Storage= 1,649 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

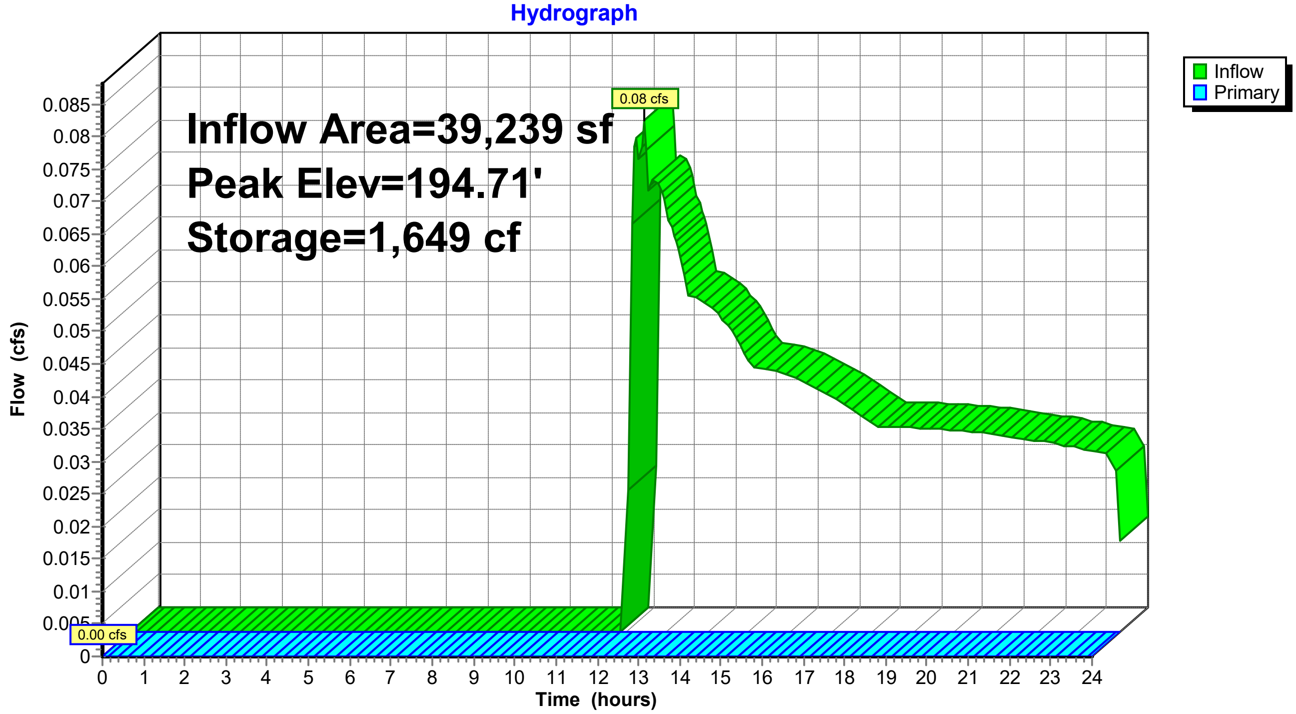
Volume	Invert	Avail.Storage	Storage Description
#1	193.00'	17,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
193.00	30	0	0
194.00	1,087	559	559
195.00	2,356	1,722	2,280
196.00	3,959	3,158	5,438
197.00	5,956	4,958	10,395
198.00	8,319	7,138	17,533

Device	Routing	Invert	Outlet Devices
#1	Primary	197.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=193.00' (Free Discharge)
└—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Existing Ditch 1



Summary for Pond 5P: Infiltration Basin 3

[92] Warning: Device #1 is above defined storage

Inflow Area = 319,050 sf, 31.59% Impervious, Inflow Depth > 2.78" for 100-Year event
Inflow = 14.01 cfs @ 12.30 hrs, Volume= 74,044 cf
Outflow = 1.02 cfs @ 16.76 hrs, Volume= 42,353 cf, Atten= 93%, Lag= 267.8 min
Discarded = 1.02 cfs @ 16.76 hrs, Volume= 42,353 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 2P : Infiltration Basin 2

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 173.45' @ 16.76 hrs Surf.Area= 18,372 sf Storage= 38,166 cf

Plug-Flow detention time= 327.5 min calculated for 42,265 cf (57% of inflow)
Center-of-Mass det. time= 182.6 min (1,082.9 - 900.3)

Volume	Invert	Avail.Storage	Storage Description
#1	167.25'	98,738 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

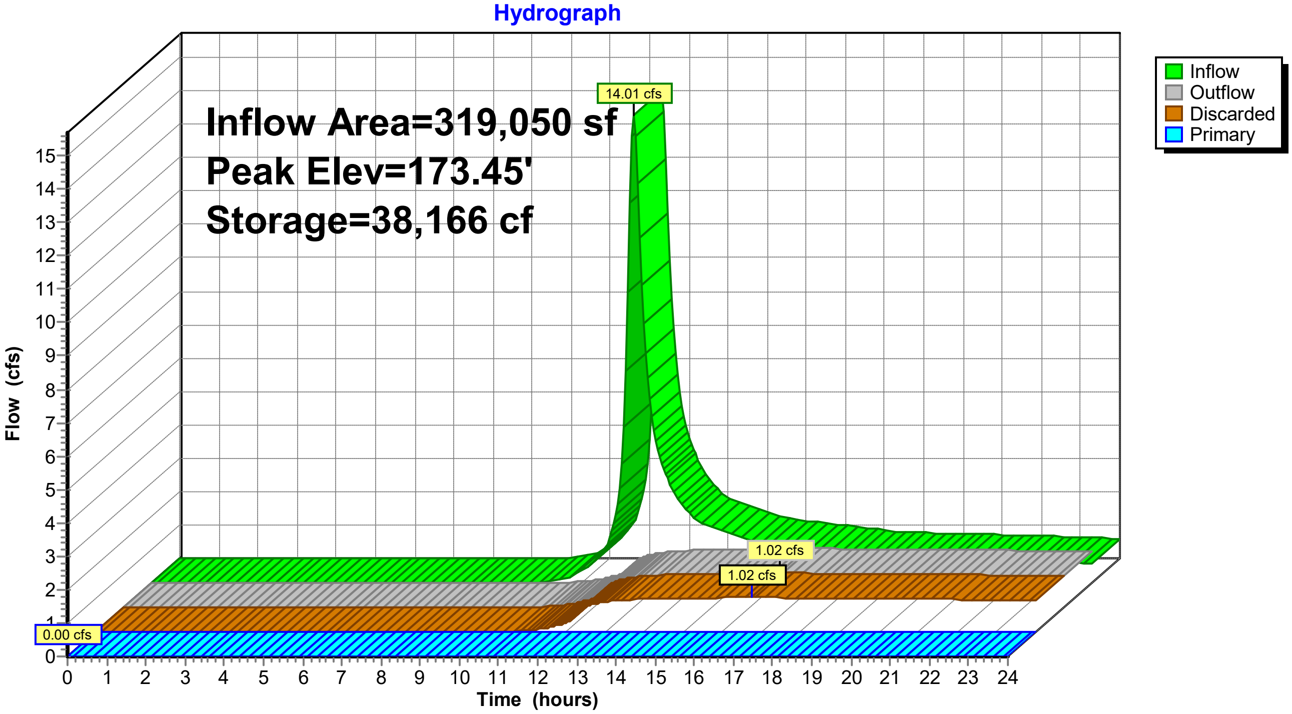
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
167.25	10	10.0	0	0	10
168.00	123	56.0	42	42	253
169.00	749	153.0	392	434	1,870
170.00	3,236	269.0	1,847	2,281	5,771
171.00	6,972	361.0	4,986	7,267	10,394
172.00	11,470	482.0	9,128	16,395	18,522
173.00	16,453	631.0	13,887	30,282	31,730
174.00	20,831	887.0	18,599	48,881	62,664
175.00	25,123	931.0	22,944	71,825	69,094
176.00	28,744	1,007.0	26,913	98,738	80,855

Device	Routing	Invert	Outlet Devices
#1	Primary	179.00'	**20.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	167.25'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=1.02 cfs @ 16.76 hrs HW=173.45' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 1.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=167.25' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: Infiltration Basin 3



Summary for Pond 12P: Drainage Easement Ditch

Inflow Area = 313,450 sf, 49.57% Impervious, Inflow Depth > 4.35" for 100-Year event
Inflow = 26.72 cfs @ 12.20 hrs, Volume= 113,678 cf
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP6 : Study Point 6

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 189.03' @ 24.00 hrs Surf.Area= 17,593 sf Storage= 113,615 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

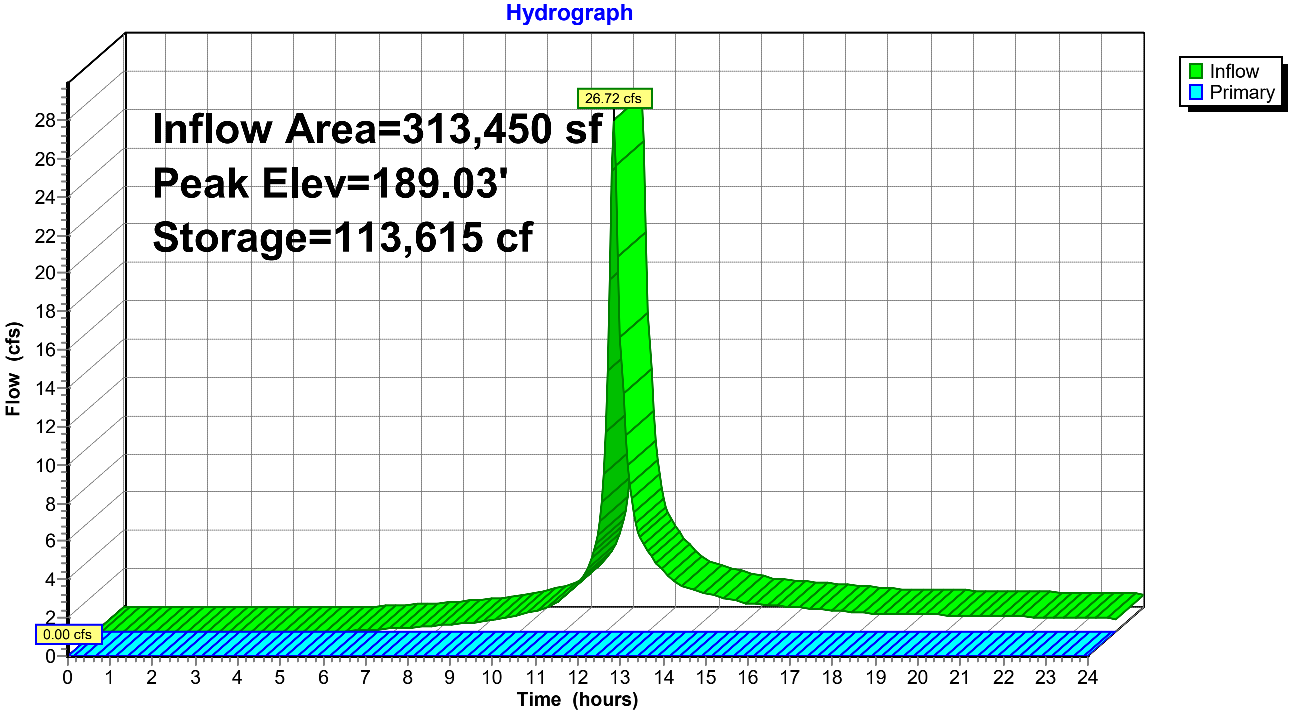
Volume	Invert	Avail.Storage	Storage Description
#1	175.00'	223,106 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
175.00	395	0	0
176.00	1,346	871	871
177.00	2,592	1,969	2,840
178.00	3,425	3,009	5,848
179.00	4,340	3,883	9,731
180.00	5,326	4,833	14,564
181.00	6,375	5,851	20,414
182.00	7,498	6,937	27,351
183.00	8,708	8,103	35,454
184.00	10,008	9,358	44,812
185.00	11,390	10,699	55,511
186.00	12,859	12,125	67,635
187.00	14,373	13,616	81,251
188.00	15,934	15,154	96,405
189.00	17,547	16,741	113,145
190.00	19,261	18,404	131,549
191.00	21,004	20,133	151,682
192.00	22,805	21,905	173,586
193.00	24,735	23,770	197,356
194.00	26,764	25,750	223,106

Device	Routing	Invert	Outlet Devices
#1	Primary	193.90'	**20.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=175.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 12P: Drainage Easement Ditch

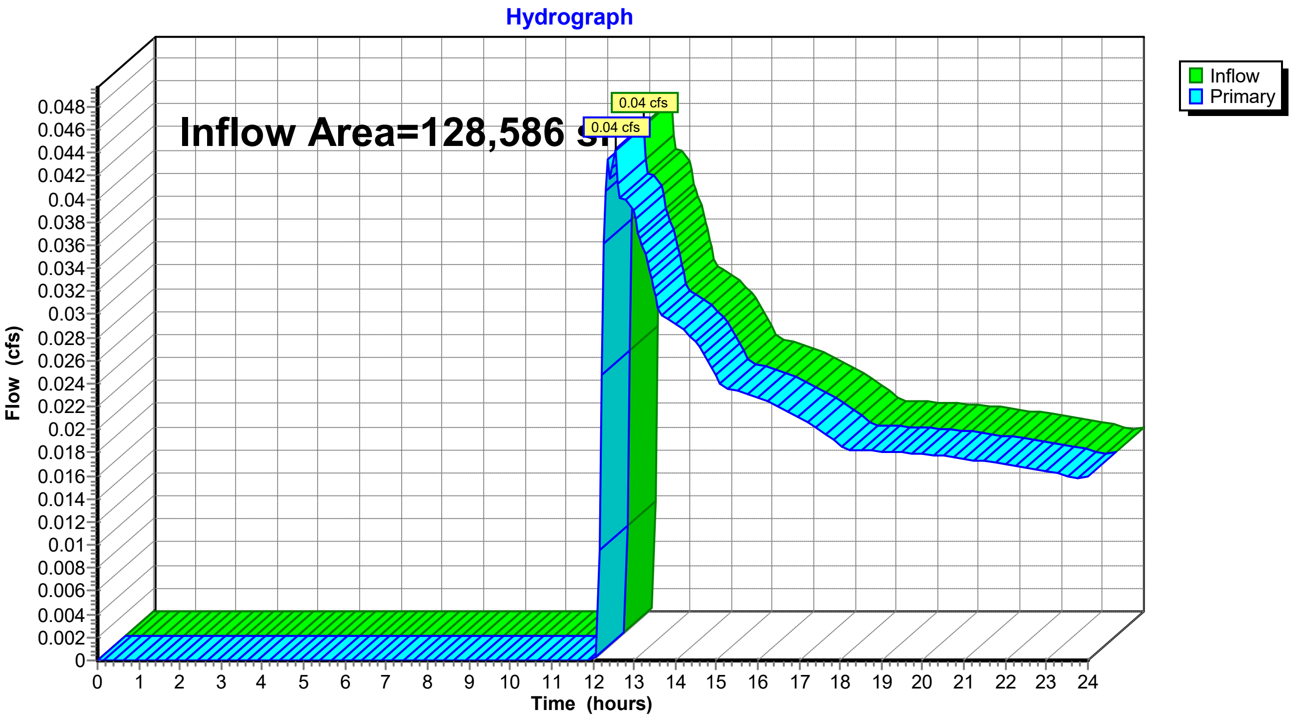


Summary for Link SP1: Study Point 1

Inflow Area = 128,586 sf, 50.28% Impervious, Inflow Depth > 0.09" for 100-Year event
Inflow = 0.04 cfs @ 12.53 hrs, Volume= 947 cf
Primary = 0.04 cfs @ 12.53 hrs, Volume= 947 cf, Atten= 0%, Lag= 0.0 min

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

Link SP1: Study Point 1

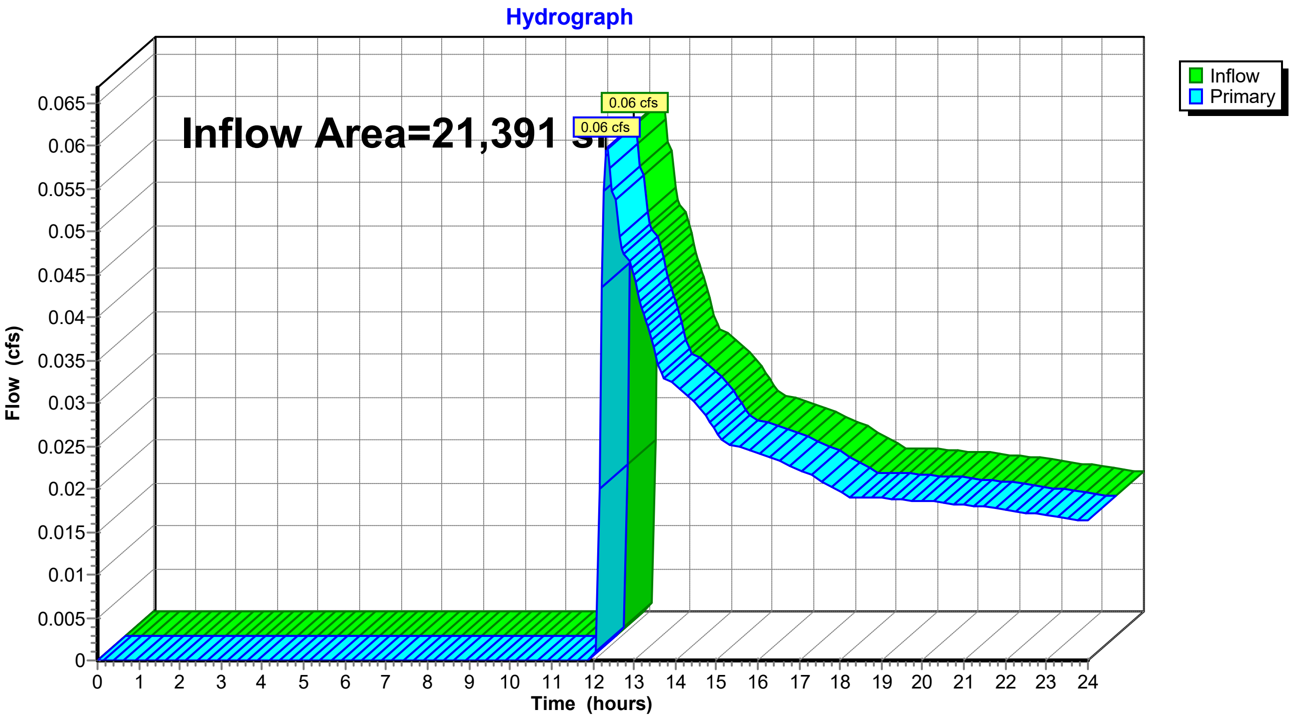


Summary for Link SP2: Study Point 2

Inflow Area = 21,391 sf, 0.00% Impervious, Inflow Depth > 0.58" for 100-Year event
Inflow = 0.06 cfs @ 12.34 hrs, Volume= 1,034 cf
Primary = 0.06 cfs @ 12.34 hrs, Volume= 1,034 cf, Atten= 0%, Lag= 0.0 min

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

Link SP2: Study Point 2

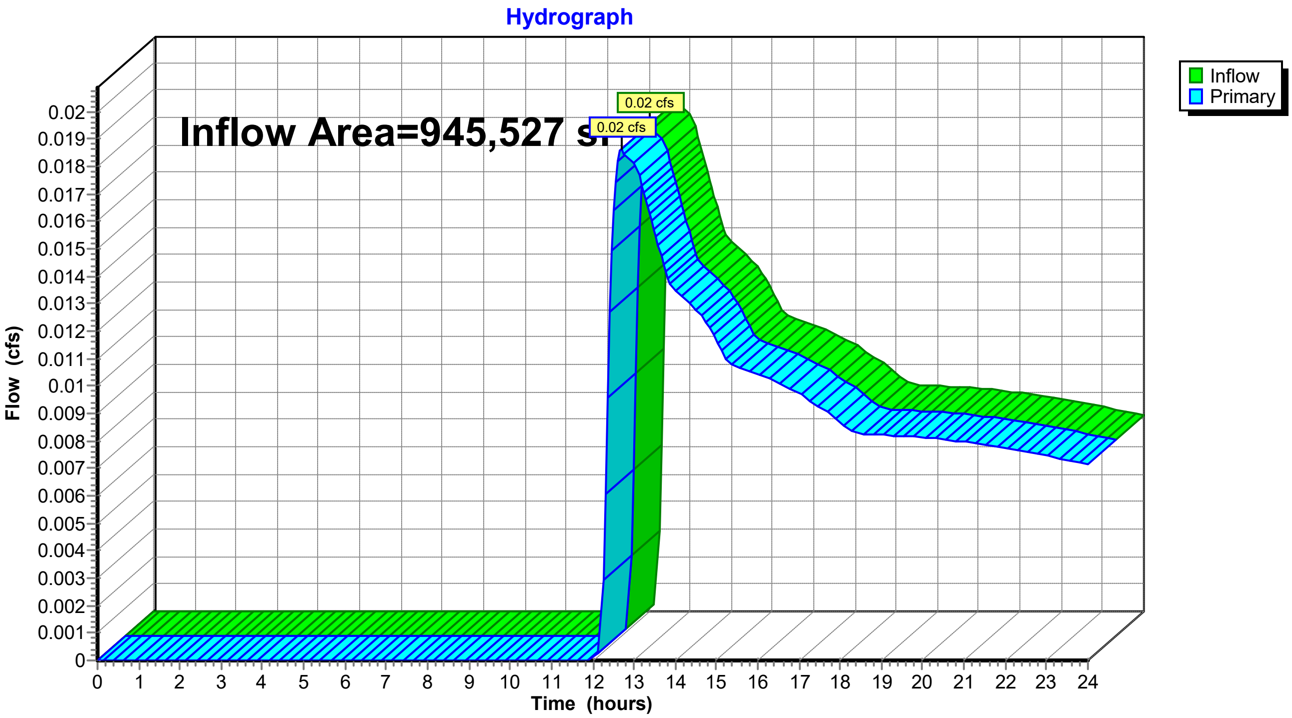


Summary for Link SP3: Study Point 3

Inflow Area =	945,527 sf,	40.09% Impervious,	Inflow Depth > 0.01"	for 100-Year event	
Inflow =	0.02 cfs @	12.70 hrs,	Volume=	424 cf	
Primary =	0.02 cfs @	12.70 hrs,	Volume=	424 cf,	Atten= 0%, Lag= 0.0 min

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

Link SP3: Study Point 3

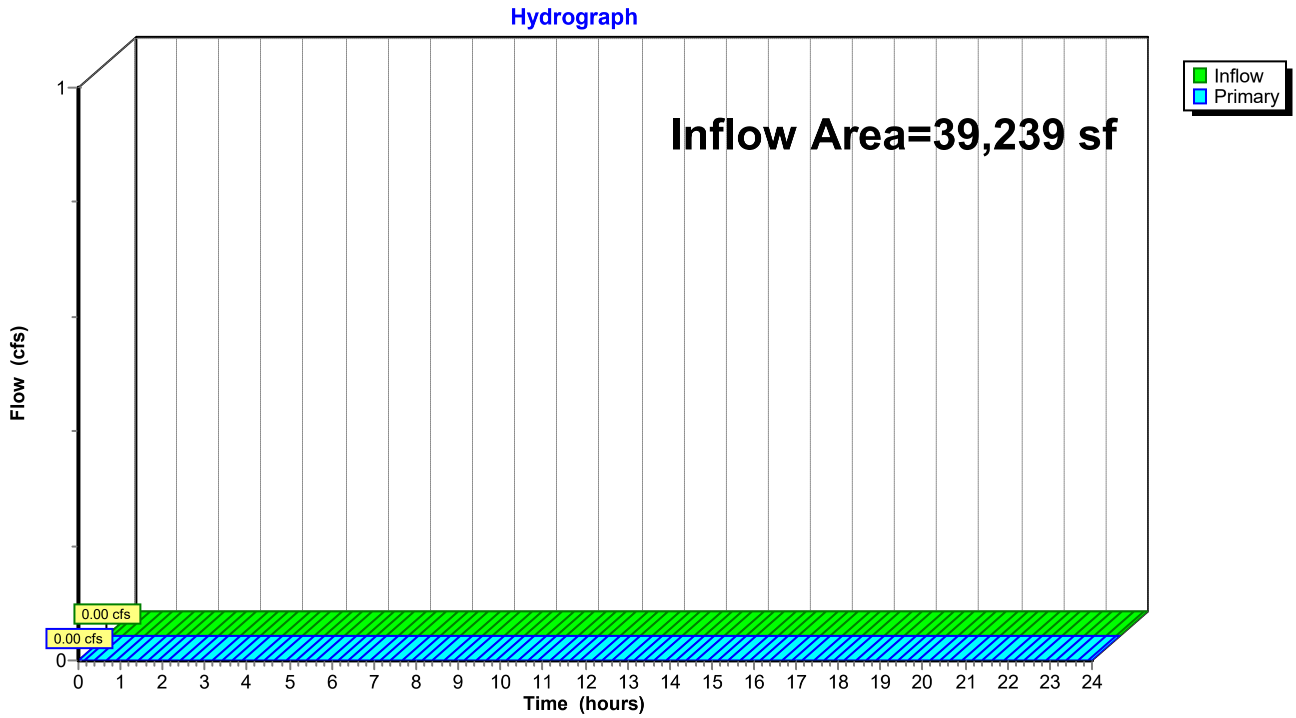


Summary for Link SP4: Study Point 4

Inflow Area =	39,239 sf,	0.00% Impervious,	Inflow Depth = 0.00"	for 100-Year event
Inflow =	0.00 cfs @	0.00 hrs, Volume=	0 cf	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0 cf, Atten= 0%, Lag= 0.0 min	

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

Link SP4: Study Point 4

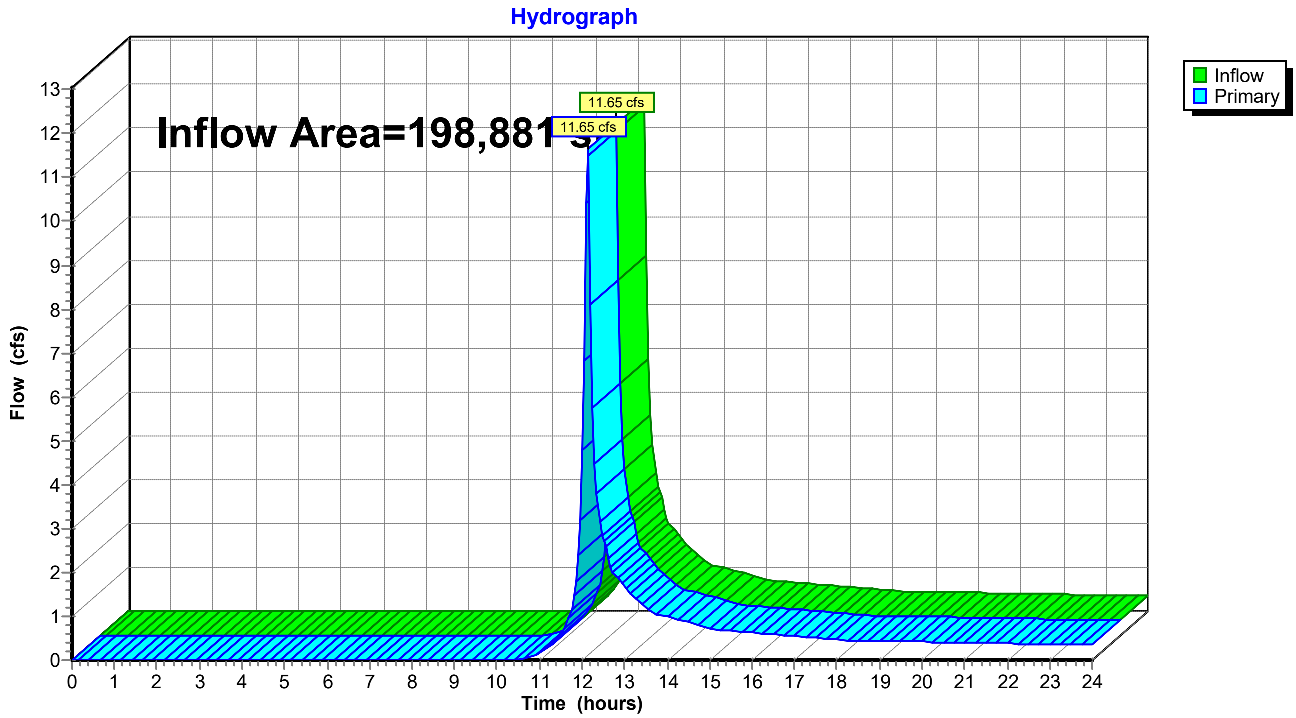


Summary for Link SP5: Study Point 5

Inflow Area = 198,881 sf, 26.41% Impervious, Inflow Depth > 2.47" for 100-Year event
Inflow = 11.65 cfs @ 12.14 hrs, Volume= 40,892 cf
Primary = 11.65 cfs @ 12.14 hrs, Volume= 40,892 cf, Atten= 0%, Lag= 0.0 min

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

Link SP5: Study Point 5

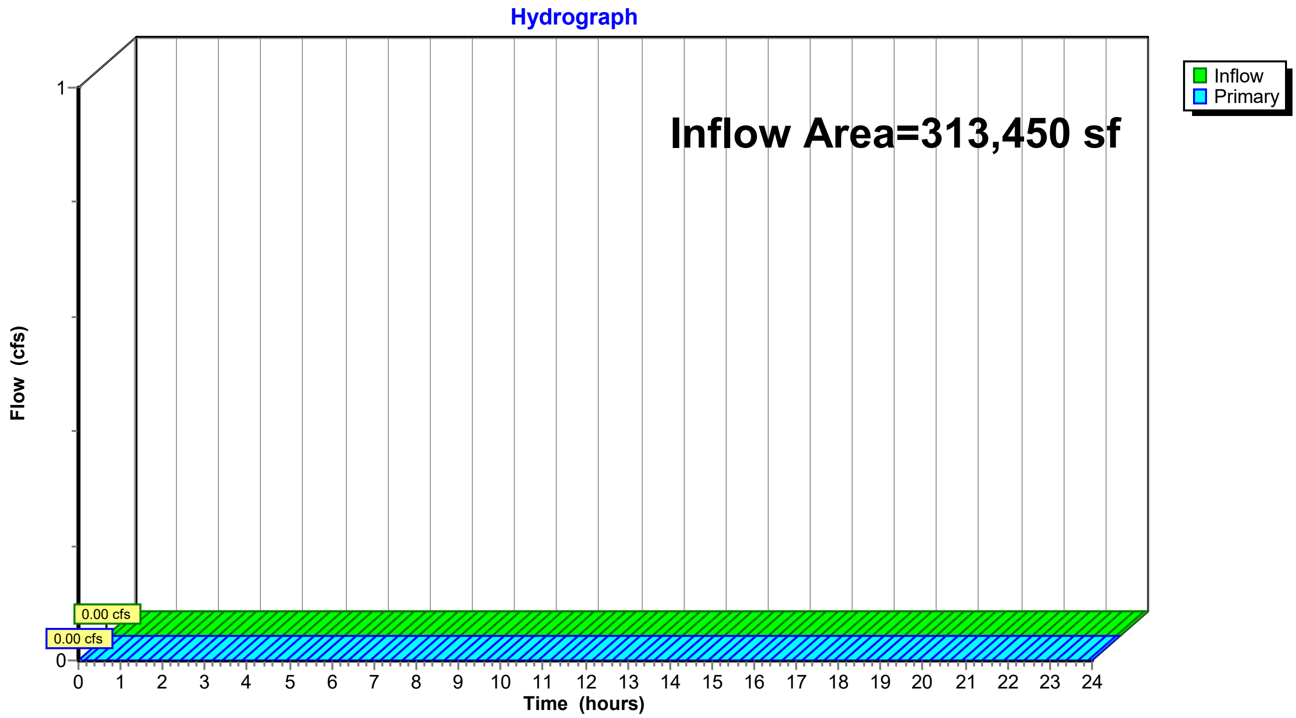


Summary for Link SP6: Study Point 6

Inflow Area = 313,450 sf, 49.57% Impervious, Inflow Depth = 0.00" for 100-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

Link SP6: Study Point 6



DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1-888-DIG-SAFE
1-888-344-7233

LEGEND

EXISTING WATERSHED	
SCS SOILS BOUNDARY	A B
Tc FLOW PATH	
SUBCATCHMENT LABEL	E-1
SUBCATCHMENT BOUNDARY	
FLOW DIRECTION	

NOTES:

1. THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR IT'S REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
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4. ALL EXISTING AND PROPOSED COVER TYPES SHALL BE CONSIDERED "GOOD" FOR MODELING PURPOSES UNLESS OTHERWISE NOTED.
5. TOTAL SITE WATERSHED AREA IS 33.73± ACRES.
6. MINIMUM TIME OF CONCENTRATION IS 5.0 MINUTES.

STUDY POINT 6
INFILTRATE ON SITE

STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	0 CF
25YR STORM	0.00 CFS	0 CF
100YR STORM	0.00 CFS	0 CF

STUDY POINT 5
FLOW OFF SITE

STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.05 CFS	1,198 CF
10YR STORM	1.62 CFS	7,380 CF
25YR STORM	4.40 CFS	14,923 CF
100YR STORM	11.65 CFS	35,395 CF

GRAPHIC SCALE
50 0 25 50 100 200
(IN FEET)
1 inch = 50 ft.

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:
THE PINEBROOK GROUP
275 FOREST RIDGE ROAD
CONCORD, MA 01742

PROJECT:
THE RESIDENCES AT THOREAU
275 FOREST RIDGE ROAD
CONCORD, MA 01742

PROJECT NO.	3172-01	DATE:	12/20/2023
SCALE:	1" = 50'	DWG. NAME:	C-3172-01
DESIGNED BY:	BP	CHECKED BY:	TJW

PREPARED BY:
ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
PROPOSED WATERSHED PLAN	PWS-1A

N:\PROJECTS\3172-01\CIVIL\DRAWINGS\CURRENT\C-3172-01 – WATERSHED-PROPOSED.DWG

DIG SAFE

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1-888-DIG-SAFE
1-888-344-7233

NOTES:

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5. TOTAL SITE WATERSHED AREA IS 33.73± ACRES.
6. MINIMUM TIME OF CONCENTRATION IS 5.0 MINUTES.

STUDY POINT 2
FLOW OFF SITE

STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	3 CF
25YR STORM	0.00 CFS	150 CF
100YR STORM	0.06 CFS	1,034 CF

STUDY POINT 1
FLOW OFF SITE

STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	0 CF
25YR STORM	0.00 CFS	0 CF
100YR STORM	0.04 CFS	947 CF

STUDY POINT 3
FLOW OFF SITE

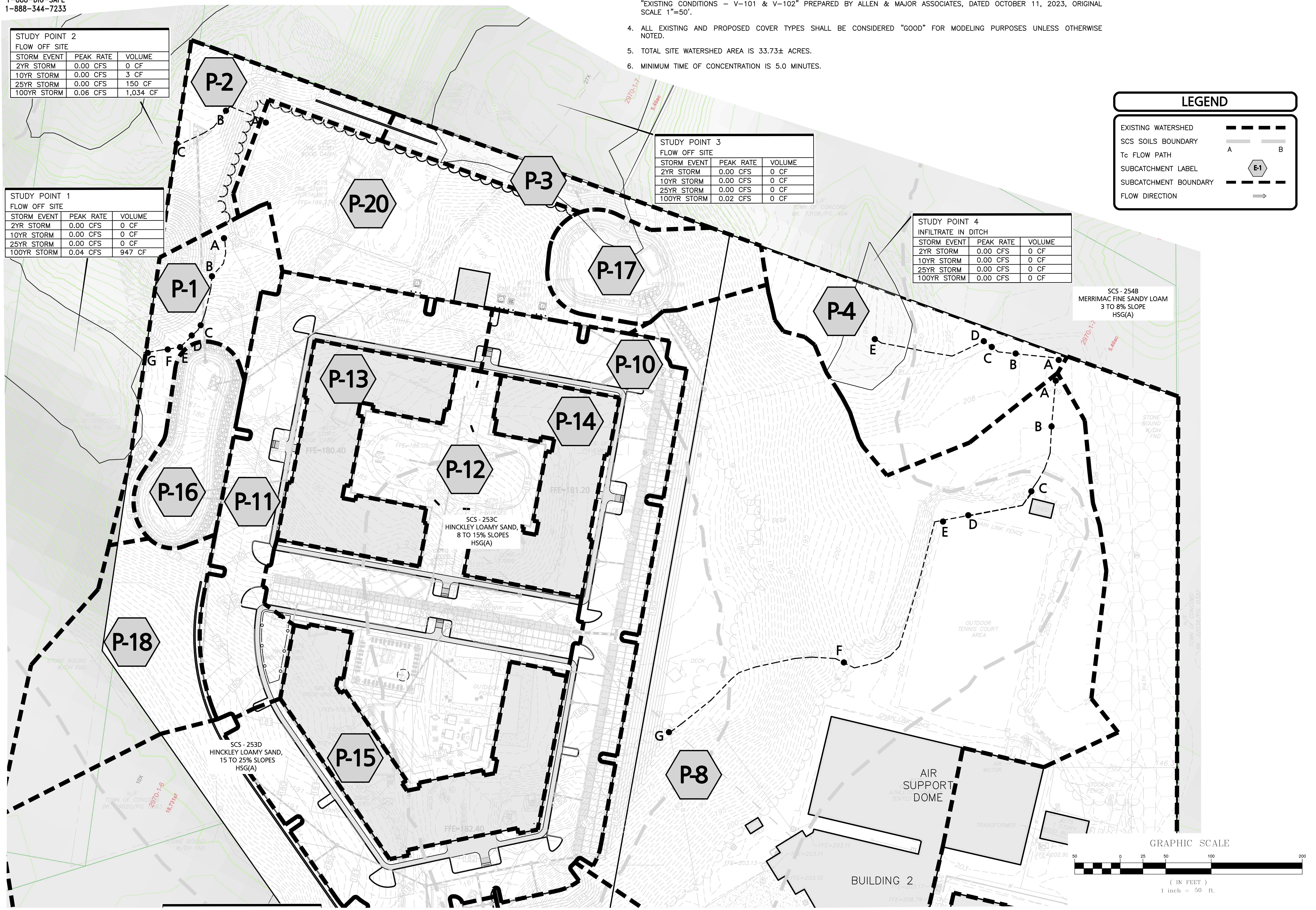
STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	0 CF
25YR STORM	0.00 CFS	0 CF
100YR STORM	0.02 CFS	0 CF

STUDY POINT 4
INFILTRATE IN DITCH

STORM EVENT	PEAK RATE	VOLUME
2YR STORM	0.00 CFS	0 CF
10YR STORM	0.00 CFS	0 CF
25YR STORM	0.00 CFS	0 CF
100YR STORM	0.00 CFS	0 CF

LEGEND

EXISTING WATERSHED
SCS SOILS BOUNDARY (A, B)
Tc FLOW PATH
SUBCATCHMENT LABEL (E-1)
SUBCATCHMENT BOUNDARY
FLOW DIRECTION



N:\PROJECTS\3172-01\CIVIL\DRAWINGS\CURRENT\C-3172-01 – WATERSHED-PROPOSED.DWG

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:
THE PINEBROOK GROUP
275 FOREST RIDGE ROAD
CONCORD, MA 01742

PROJECT:
THE RESIDENCES AT THOREAU
275 FOREST RIDGE ROAD
CONCORD, MA 01742

PROJECT NO.	3172-01	DATE:	12/20/2023
SCALE:	1" = 50'	DWG. NAME:	C-3172-01
DESIGNED BY:	BP	CHECKED BY:	TJW

PREPARED BY:

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environmental consulting ◆ landscape architecture
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FAX: (781) 935-2896
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

DRAWING TITLE: PROPOSED WATERSHED PLAN

SHEET No. PWS-1B

SECTION 6.0 - APPENDIX

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point	
Smoothing	Yes
State	
Location	
Latitude	42.437 degrees North
Longitude	71.421 degrees West
Elevation	60 feet
Date/Time	Wed Dec 06 2023 16:48:21 GMT-0500 (Eastern Standard Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.70	0.88	1.10	1yr	0.76	1.04	1.28	1.61	2.04	2.59	2.82	1yr	2.29	2.71	3.17	3.85	4.49	1yr
2yr	0.34	0.53	0.66	0.87	1.09	1.37	2yr	0.94	1.26	1.59	1.99	2.48	3.10	3.42	2yr	2.75	3.29	3.79	4.52	5.15	2yr
5yr	0.41	0.63	0.80	1.07	1.36	1.73	5yr	1.18	1.58	2.00	2.51	3.13	3.89	4.34	5yr	3.44	4.17	4.80	5.72	6.41	5yr
10yr	0.46	0.72	0.91	1.24	1.61	2.06	10yr	1.39	1.87	2.40	3.00	3.73	4.62	5.19	10yr	4.09	4.99	5.73	6.83	7.57	10yr
25yr	0.55	0.87	1.10	1.52	2.01	2.59	25yr	1.74	2.33	3.02	3.79	4.71	5.80	6.59	25yr	5.13	6.34	7.26	8.64	9.45	25yr
50yr	0.61	0.98	1.26	1.77	2.38	3.10	50yr	2.06	2.76	3.63	4.55	5.63	6.90	7.89	50yr	6.10	7.59	8.68	10.32	11.17	50yr
100yr	0.70	1.14	1.47	2.08	2.83	3.70	100yr	2.44	3.27	4.33	5.44	6.71	8.20	9.47	100yr	7.26	9.10	10.38	12.34	13.21	100yr
200yr	0.80	1.31	1.70	2.43	3.35	4.42	200yr	2.89	3.88	5.18	6.50	8.01	9.76	11.35	200yr	8.63	10.92	12.42	14.75	15.63	200yr
500yr	0.97	1.59	2.07	3.01	4.21	5.58	500yr	3.63	4.86	6.56	8.24	10.13	12.29	14.45	500yr	10.87	13.90	15.76	18.70	19.53	500yr

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.35	0.42	0.57	0.70	0.80	1yr	0.61	0.78	1.06	1.44	1.74	2.27	2.34	1yr	2.01	2.25	2.69	3.49	4.13	1yr
2yr	0.33	0.50	0.62	0.84	1.04	1.24	2yr	0.89	1.21	1.42	1.85	2.37	2.99	3.32	2yr	2.65	3.19	3.68	4.36	5.03	2yr
5yr	0.38	0.58	0.72	0.99	1.26	1.46	5yr	1.09	1.43	1.69	2.20	2.81	3.60	4.00	5yr	3.19	3.84	4.43	5.34	5.99	5yr
10yr	0.42	0.65	0.80	1.12	1.45	1.65	10yr	1.25	1.61	1.84	2.49	3.17	4.12	4.60	10yr	3.65	4.42	5.09	5.89	6.85	10yr
25yr	0.48	0.73	0.91	1.30	1.71	1.93	25yr	1.48	1.88	2.12	2.93	3.73	4.96	5.56	25yr	4.39	5.35	6.10	6.98	8.17	25yr
50yr	0.53	0.80	1.00	1.43	1.93	2.18	50yr	1.66	2.13	2.36	3.32	4.21	5.71	6.41	50yr	5.05	6.17	7.03	7.95	9.35	50yr
100yr	0.58	0.87	1.09	1.57	2.16	2.46	100yr	1.86	2.41	2.63	3.22	4.76	6.58	7.42	100yr	5.82	7.14	8.08	9.02	10.73	100yr
200yr	0.63	0.95	1.21	1.75	2.43	2.77	200yr	2.10	2.71	2.94	3.54	5.41	7.63	8.61	200yr	6.75	8.28	9.33	10.21	12.33	200yr
500yr	0.72	1.07	1.38	2.00	2.85	3.25	500yr	2.46	3.18	3.39	4.00	6.41	9.28	10.54	500yr	8.21	10.14	11.33	12.03	14.85	500yr

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.32	0.49	0.60	0.80	0.99	1.17	1yr	0.85	1.15	1.35	1.78	2.22	2.80	3.06	1yr	2.48	2.94	3.49	4.37	4.91	1yr
2yr	0.37	0.56	0.69	0.94	1.16	1.35	2yr	1.00	1.32	1.56	2.05	2.61	3.23	3.57	2yr	2.86	3.44	3.97	4.71	5.29	2yr
5yr	0.44	0.68	0.85	1.16	1.48	1.78	5yr	1.27	1.74	2.00	2.57	3.24	4.24	4.68	5yr	3.75	4.50	5.18	6.13	6.87	5yr
10yr	0.53	0.81	1.00	1.40	1.81	2.20	10yr	1.56	2.15	2.54	3.10	3.88	5.20	5.77	10yr	4.60	5.54	6.38	7.63	8.38	10yr
25yr	0.67	1.02	1.27	1.81	2.39	2.90	25yr	2.06	2.84	3.38	3.97	4.92	6.83	7.61	25yr	6.04	7.32	8.42	10.07	10.89	25yr
50yr	0.80	1.22	1.52	2.19	2.95	3.59	50yr	2.54	3.51	4.19	4.80	5.89	8.39	9.38	50yr	7.43	9.02	10.39	12.44	13.29	50yr
100yr	0.97	1.46	1.84	2.65	3.64	4.43	100yr	3.14	4.33	5.21	6.64	7.06	10.32	11.57	100yr	9.13	11.13	12.81	15.38	16.22	100yr
200yr	1.17	1.75	2.22	3.22	4.49	5.48	200yr	3.87	5.36	6.48	8.19	8.45	12.69	14.26	200yr	11.23	13.72	15.79	19.04	19.81	200yr
500yr	1.50	2.23	2.87	4.16	5.92	7.21	500yr	5.11	7.05	8.65	10.86	10.72	16.63	18.80	500yr	14.72	18.08	20.83	25.27	25.76	500yr

Powered by ACIS

Manning's Roughness Coefficients ("n")

Conduit	Manning's Coefficients
Closed Conduits	
Asbestos-Cement Pipe	0.011 to 0.015
Brick	0.013 to 0.017
Cast Iron Pipe	
Cement-lined and seal-coated	0.011 to 0.015
Concrete (Monolithic)	
Smooth forms	0.012 to 0.014
Rough forms	0.015 to 0.017
Concrete Pipe	0.011 to 0.015
Corrugated-Metal Pipe (1/2 - STUL 34470 2 1/2-inch corrgtn.)	
Plain	0.022 to 0.026
Paved invert	0.018 to 0.022
Spun asphalt-lined	0.011 to 0.015
Plastic Pipe (Smooth)	0.011 to 0.015
Vitrified Clay	
Pipes	0.011 to 0.015
Liner channels	0.013 to 0.017
Open Channels	
Lined Channels	
Asphalt	0.013 to 0.017
Brick	0.012 to 0.018
Concrete	0.011 to 0.020
Rubble or riprap	0.020 to 0.035
Vegetal	0.030 to 0.040
Excavated or Dredged	
Earth, straight and uniform	0.020 to 0.030
Earth, winding, fairly uniform	0.025 to 0.040
Rock	0.030 to 0.045
Unmaintained	0.050 to 0.140
Natural Channels (minor streams, top width at flood state < 100 feet)	
Fairly regular section	0.030 to 0.070
Irregular section with pools	0.040 to 0.100

Source: Design and Construction of Sanitary and Storm Sewers, American Society of Civil Engineers and the Water Pollution Control Federation, 1969.

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

Middlesex County, Massachusetts

October 31, 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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Contents

How Soil Surveys Are Made

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

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

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

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

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

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Soil Map

Map Scale: 1:5,450 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

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
253B	Hinckley loamy sand, 3 to 8 percent slopes	2.5	3.8%
253C	Hinckley loamy sand, 8 to 15 percent slopes	4.4	6.9%
253D	Hinckley loamy sand, 15 to 25 percent slopes	32.3	50.5%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	5.7	9.0%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	14.7	23.0%
255B	Windsor loamy sand, 3 to 8 percent slopes	2.9	4.5%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	0.6	0.9%
653	Udorthents, sandy	0.9	1.3%
654	Udorthents, loamy	0.0	0.1%
Totals for Area of Interest		**64.0**	**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.

Middlesex County, Massachusetts

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

Map Unit Setting

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

Map Unit Composition

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

Description of Hinckley

Setting

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

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

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

Sudbury

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

Agawam

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

253C—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent

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

Description of Hinckley

Setting

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

Typical profile

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

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

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

Minor Components

Sudbury

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

Merrimac

Percent of map unit: 5 percent

Landform: Kames, outwash plains, outwash terraces, moraines, eskers
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

253D—Hinckley loamy sand, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2svmc
Elevation: 0 to 1,460 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Hinckley

Setting

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

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand

Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

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

Minor Components

Merrimac

Percent of map unit: 8 percent
Landform: Eskers, outwash terraces, kames, outwash plains, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Kames, kame terraces, moraines, eskers, outwash deltas, outwash terraces, outwash plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Eskers, kame terraces, outwash deltas, moraines, outwash plains, outwash terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Convex, concave, linear
Across-slope shape: Convex, concave, linear
Hydric soil rating: No

254A—Merrimac fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tyqr
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Stream terraces, outwash terraces, outwash plains, moraines, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear

Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Windsor

Percent of map unit: 3 percent
Landform: Outwash terraces, dunes, deltas, outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash terraces, moraines, stream terraces, eskers, kames, outwash plains
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Windsor

Setting

Landform: Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Eskers
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Crest, side slope, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Windsor

Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, crest, side slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

653—Udorthents, sandy

Map Unit Setting

National map unit symbol: vr1k
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udorthents, Sandy

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Unnamed

Percent of map unit: 5 percent

Udorthents, loamy

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

Urban land

Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

654—Udorthents, loamy

Map Unit Setting

National map unit symbol: vr1l
Elevation: 0 to 3,000 feet
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Udorthents, Loamy

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Minor Components

Udorthents, sandy

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

Udorthents, wet substratum

Percent of map unit: 5 percent
Hydric soil rating: Yes

Urban land

Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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

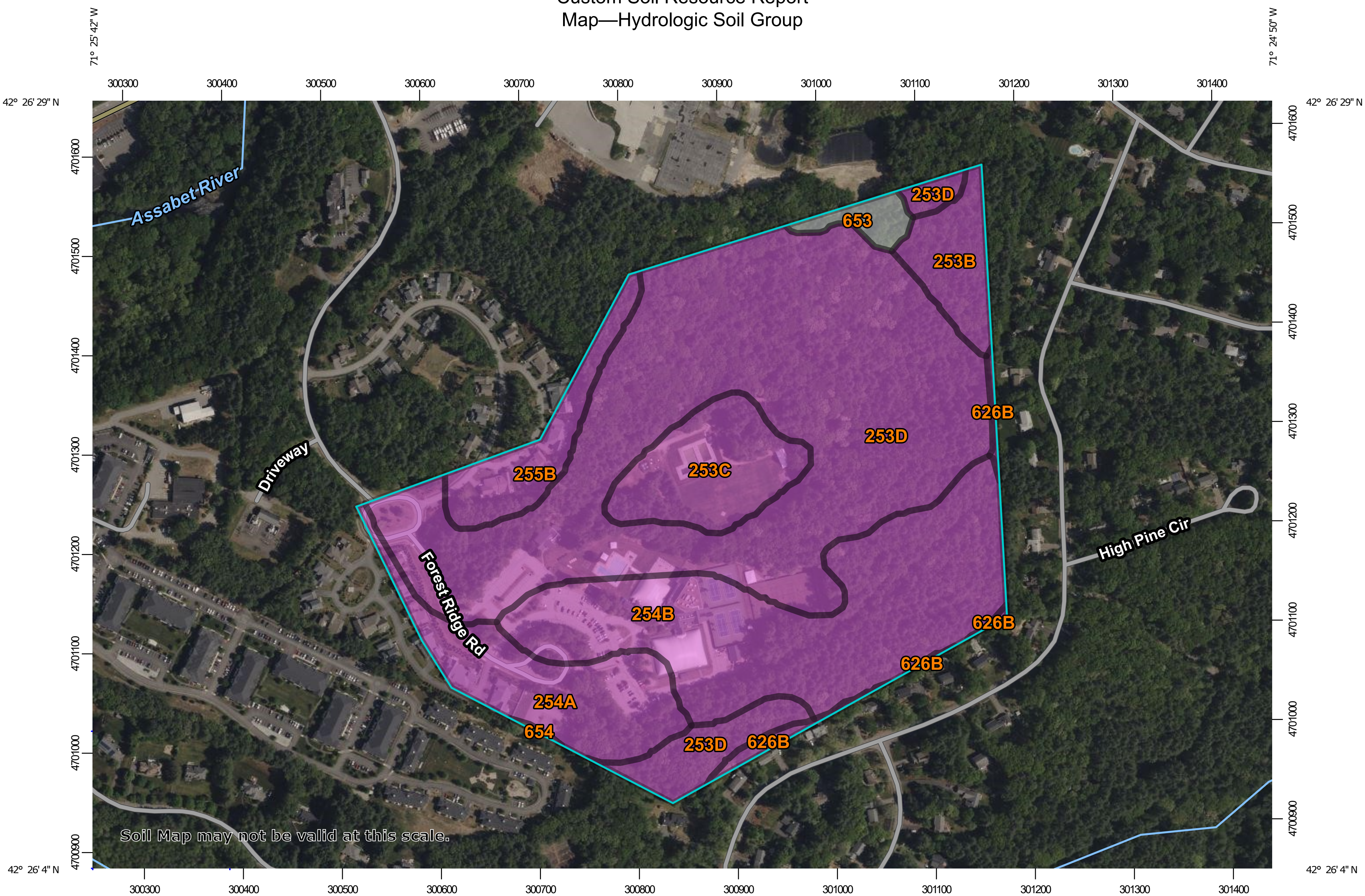
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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

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

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

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



Map Scale: 1:5,450 if printed on A landscape (11" x 8.5") sheet.

0 50 100 200 300 Meters

0 250 500 1000 1500 Feet

N

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 23, Sep 12, 2023

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
253B	Hinckley loamy sand, 3 to 8 percent slopes	A	2.5	3.8%
253C	Hinckley loamy sand, 8 to 15 percent slopes	A	4.4	6.9%
253D	Hinckley loamy sand, 15 to 25 percent slopes	A	32.3	50.5%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	A	5.7	9.0%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	14.7	23.0%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	2.9	4.5%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	0.6	0.9%
653	Udorthents, sandy		0.9	1.3%
654	Udorthents, loamy		0.0	0.1%
Totals for Area of Interest			**64.0**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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