STORMWATER MANAGEMENT REPORT

PROJECT SITE:
NEPONSET VILLAGE
5 PLEASANT STREET
WALPOLE, MASSACHUSETTS 02081

PREPARED FOR:
MCSHARRY BROTHERS, INC.
P.O. BOX 206
ABINGTON, MASSACHUSETTS 02351

PREPARED BY:

CONECO
Engineers & Scientists

4 First Street • Bridgewater, Massachusetts 02324

Phone: (508) 697-3191 • Fax: (508) 697-5996
E-mail: ddmitruk@coneco.com

SEPTEMBER 14, 2023
Revised January 2, 2024

TABLE OF CONTENTS

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

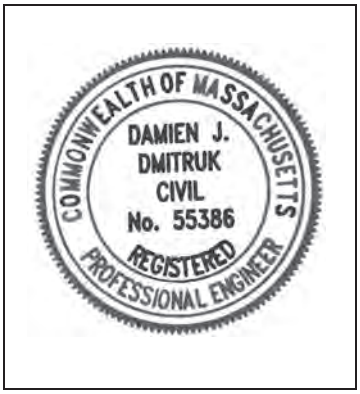
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



1/2/2024

Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

INTRODUCTION

Coneco Engineers & Scientists, Incorporated (Coneco) has completed a drainage analysis of the subject site, located at 5 Pleasant Street in Walpole, Massachusetts, the results of which are contained herein. The purpose of this analysis is to quantitatively understand the impacts of the proposed development of the project site on the existing hydrologic conditions and to mitigate said impacts through the implementation of a stormwater management system that utilizes best management practices. This design is supported by an operations and maintenance plan as well as a long-term pollution prevention plan.

DEVELOPMENT SUMMARY

The existing site is a primarily wooded undeveloped lot. The proposed project is a Chapter 40B development supported by MassHousing to include seven buildings consisting of a total of 24 condominium units. In addition to the residential units, ancillary parking, walkways, landscaping, amenity structures, utilities, and a stormwater management system will be constructed as part of the development. The associated construction period pollution prevention, clearing, grading, and paving will be performed as required for the completion of the project.

STORMWATER MANAGEMENT SYSTEM OVERVIEW

The proposed stormwater management system consists of a series of deep sump hooded catch basins, roof leaders, underground piping, drain manholes, underground infiltration chambers, and outlet control structures, which will work in combination to collect, control, and treat runoff prior to it being discharged from the site. This project is located on an undeveloped lot and has been designed to meet the Massachusetts Stormwater Management Standards.

The site's stormwater flows will be captured by roof gutter and leader systems or travel overland through drainage channels and site grading features until captured by one of the site's catch basins. Catch basin structures will include four-foot deep sumps and oil/gas separator hoods. The deep sumps are intended to remove sediment, and the hoods are intended to remove oil and gas from the stormwater prior to release. Stormwater will then travel though a system of pipes and drain manholes to infiltration chamber systems. The closed drainage system has been designed to accommodate a 25-year rainfall event.

The site has been equipped with multiple subsurface infiltration chamber systems for the control and treatment of stormwater. The infiltration chamber systems have been designed to provide water quality treatment, groundwater recharge, and attenuation of the proposed peak flow rates and volumes to that of the existing conditions or less. The inlet row of each infiltration chamber system will be wrapped in a filter fabric creating an isolation row for the system to initiate the removal of suspended solids and contain them within the initial row. Emergency overflow piping and weir manholes have been incorporated to control and facilitate the discharge of stormwater during a high magnitude storm events.

The plunge pool at the system's outlet has been designed to include a depressed center and a level outer rim. The depressed center promotes the removal of any residual sediment, while the level outer rim dissipates the energy of the stormwater by reducing flow velocities and eliminating point discharges.

From an environmentally sensitive perspective, the aforementioned measures will result in a stormwater design that enhances the introduction of surface water into the ground while preserving the site's natural hydrologic conditions.

The remainder of this report demonstrates in detail how the proposed site conditions follow the design conditions set forth by Massachusetts Stormwater Standards as well as supplying calculations based on these standards.

METHODOLOGY

Drainage calculations are performed to demonstrate that there is no increase in the rate of runoff from the subject site due to the proposed project. The rate of runoff is compared at a common point, referred to as the design point, for both the pre and post development condition (or the existing and proposed condition in the case of a redevelopment project). The hydrologic and hydraulic model created to analyze the pre and post development condition was developed using the Soil Conservation Service (SCS) Technical Release No. 20 (TR 20, SCS unit hydrograph procedures), SCS Technical Release No. 55 (TR 55, Time of Concentration (T_c) and Curve Number (CN)), SCS Technical Paper No. 40 (TP 40, rainfall intensity), and the stormwater detention facilities were modeled using the SCS Storage Indication Method.

Time of Concentration (T_c) - is the time required for stormwater runoff to travel from the most hydraulically distant point in a drainage area or subcatchment to the design point. The T_c is calculated based upon slope, distance, surface cover and type of flow. A longer time of concentration will generally result in a smaller rate of runoff.

Curve Number (CN) - represents the amount of runoff expected from a particular segment of the drainage area. A higher curve number will be less permeable and therefore a larger rate of runoff. The CN is based upon three factors: soil type, soil cover, and cover condition. The soil type is graded A to D; A soil is the post permeable, D is the least. The soil cover (e.g. - vegetated, developed, farmland or impervious) ranges from 30-98, with more permeable soil covers having a lower value. The final factor is the condition of the vegetated soil cover (good, fair or poor), where vegetated cover in good condition is the most permeable and allows the least runoff.

The Hydrologic Soil Group (HSG) for the drainage areas was determined from the Soil Conservation Service Soil Survey of Norfolk County, Massachusetts. The soil survey contains maps which depict the extent of the various soil types. A soil type overlay plan is attached as Figure 6.

Design Software - To assist in the analysis, software entitled HydroCAD, Version 10.0 (developed by HydroCAD Software Solutions, L.L.C.) was utilized. The HydroCAD program calculates the runoff based on rainfall events and watershed characteristics, and produces a runoff hydrograph (a runoff rate versus time curve). If applicable, stage-storage-discharge curves for a specific detention facility are calculated.

Peak Attenuation - The peak rate of runoff at the design points was calculated for the existing and proposed conditions for the 2, 10, 25, and 100-year, 24-hour storm events. The peak rate of runoff was compared for each storm event to determine if there was an increase from the pre to post development condition.

Runoff Volume - The total volume of runoff for the entire site was calculated for the existing and proposed conditions for the 2, 10, 25, and 100-year, 24-hour storm events. The volume of runoff was compared for each storm event to determine if there was an increase from the pre to post development condition.

EXISTING CONDITIONS

The site is a mostly wooded lot located on the northwest side of Pleasant Street, along the Norwood-Walpole town line. The lot abuts residential homes along its southern and eastern borders, a commercial lot along its northern border, and railroad tracks along its western border. Existing drainage patterns and watershed areas were established from a topographic survey. A site visit was conducted by Coneco to

confirm this analysis. Topography generally slopes from the south and southeast sides of the site to the northwest at grades of approximately 1.5 to 6.5 percent. Runoff from storm events discharges from the site along the northwestern corner of the property.

The Soil Conservation Service map for the area indicates that the site is made of four soil types. Please refer to Table 1 for a summary of these soils.

Table 1

Existing Soil Classifications

SOIL MAP UNIT	*Norfolk County SOIL SURVEY MAP UNIT NAME AND DESCRIPTION*	*HYDROLOGIC SOIL GROUP*
420B	Canton fine sandy loam, 3 to 8 percent slopes	B
602	Urban Land, 0 to 15 percent slopes	Unclassified
628C	Canton-Urban land Complex, 3 to 15 percent slopes	A
654	Udorthents, loamy	A

PROPOSED CONDITIONS

The proposed development consists of seven new condominium buildings which will provide a total of 24 residential units. To support the new residential buildings, the project will also include an access drive, parking areas, pedestrian walkways, landscaped areas, utilities connections, and stormwater management systems. The main site entrance will be at the property's frontage on Pleasant Street and the proposed emergency access road will provide a secondary ingress to the property through Maguire Park. As part of this work, the existing lot will be cleared and grubbed and all other existing onsite features will be removed from the site.

These changes increase the overall impervious area found at the site. However, the addition of underground infiltration chamber systems will promote recharge on the site and results in a reduction of the peak rate of runoff. Furthermore, with the addition of the stormwater management BMP's, the runoff will be treated prior to being discharged from the site.

STORMWATER MANAGEMENT STANDARDS REVIEW

As part of this drainage analysis, Coneco has performed an in-depth review of the subject site for conformance with the Massachusetts Department of Environmental Protection's Stormwater Management Standards. The project is a new construction project (as defined in Standard 7) within the Stormwater Management Standards. The following is a summary of our findings relative to our review of each of the standards. Please note that the actual text of each standard is italicized for clarity.

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

Stormwater shall be treated prior to release with deep sump catch basins with hoods and infiltration chambers with inlet isolation row. The deep sumps of the catch basin will capture sediment, and the hood will withhold oil and gas within the catch basin. The outlets of infiltration facilities have been designed to reduce erosion and eliminate scouring. A plunge pool will be installed at each discharge

point. The plunge pool will be lined with rip rap forming a depression which will enhance sediment removal prior to discharging runoff. It will also eliminate erosion by reducing flow velocities.

STANDARD 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 existing and proposed site conditions were analyzed for the 2, 10, 25 and 100-year 24-hour storm events using the aforementioned methodology (please refer to appendices A and B of this report for HydroCAD output support data). Due to stormwater being captured, controlled, attenuated, and infiltrated, there is no increase in peak discharge rates for all storm events analyzed (please refer to Appendix C of this report for Peak Rate of Runoff tables).

CLOSED DRAINAGE SYSTEM CALCULATIONS

Rational Method – Sizing pipes for the 25-year storm

The Rational Method was used to calculate the peak flow through the pipes, and the Manning equation was used to determine the minimum pipe size required to pass the required flow. The closed drainage system calculations determine the rate of runoff, the time of concentration and the rainfall intensity for the drainage subcatchment. The calculations were performed for a 25-year storm event. The following standards were used:

1. The Rational Formula (Q =CIA) was used to determine the flow to each structure.

   Q = Flow cubic feet per second (CFS)
   C = Runoff coefficients
   I = Rainfall Intensity (inches per hour)
   A = Drainage Area (acres)

2. The runoff coefficients used are as follows:

   Impervious (pavement and roofs) = 0.85
   Bare Ground and gravel = 0.50
   Landscape = 0.4
   Wooded = 0.2

3. The intensity for each area was determined by the Steel Formula for a 25-year frequency storm. The Steel Formula is:

   I = k/(t+b)
   I = Intensity
   k = 230 (25 yr)
   t = Time of Concentration
   b = 30 (25 yr)

4. The times of concentration were calculated using a spreadsheet which calculates flow time in the pipe with the Manning equation. A minimum time of concentration of five (5) minutes was utilized.

5. The Manning's formula was utilized to calculate the capacity of the individual pipes in the closed drainage system. The Manning's formula is:

   $$Q = (Ap)\ (1.486/n)\ (s^{1/2})\ (h^{2/3})$$

Q = Flow in CFS
Ap = Cross-sectional area of the pipe (square feet)
n = Roughness coefficient
s = slope of the pipe (ft/ft)
h = hydraulic radius = area/wetted perimeter (sf/ft)

The closed drainage system is capable of handling the design flow as calculated, as well as maintaining a design velocity of between two feet per second (fps) and ten fps. Two fps is considered "self-cleansing velocity" and will prevent the pipes from accumulating sediment. Ten fps is considered a safe maximum velocity, to reduce scouring of the pipes. Please refer to Appendix C for the closed drainage system pipe sizing calculation spreadsheet.

STANDARD 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.

Standard 3 requires that a specific volume of water be recharged to the site depending on existing soil types and the total impervious area over each soil type. Please refer to Appendix C Stormwater Management Standard 3 - Recharge Volume for a summary of the required recharge.

According to the required recharge volume calculation, the on-site infiltration systems must be designed to provide a minimum recharge volume of 2,454 cubic feet. The proposed design directs 99.3% of the impervious area within the project's subcatchment areas to recharge facilities. This prompts the need for an adjustment factor and increases the required recharge volume to 2,471 cf. Soils in the locations of the proposed infiltration facilities are adequate for infiltration as determined by exploratory test pits. The bottoms of the infiltration facilities have been designed to provide four feet of separation to seasonal high groundwater elevations. Please refer to Appendix F for the test pit soil logs. The infiltration facilities as designed will provide a total static recharge volume of 25,247 cubic feet. Please refer to Appendix C for these calculations as well as 72-hour drawdown calculations.

Coneco has used the *Static* method for sizing the infiltration BMPs. See appendix C for the related calculations.

STANDARD 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:

a) Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;

b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and

c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

The proposed stormwater management system is primarily utilized to facilitate the recharge of groundwater due to the increase of impervious area on the site. The proposed system will achieve the 80% TSS removal requirement for all surface water captured by the system. Please refer to Table 2 for a TSS removal summary.

Please note that a long term pollution prevention plan has been developed as part of the analysis and can be found in Appendix D.

TREATMENT OF SUSPENDED SOLIDS:

Runoff from non-metal roofs does not require pretreatment but will be routed to infiltration facilities equipped with isolation rows. All other impervious area, such as pavement, will meet the treatment requirements of the Stormwater Standards. Pretreatment will be provided with deep sump catch basins and isolation rows.

As some of the site's infiltration rates are greater than 2.4 in/hr, a pretreatment requirement of 44% is necessary to receive the 80% TSS removal rate for the infiltration facilities. This requirement is met by the use of isolation rows.

Catch basins will be equipped with hoods and four-foot sumps to limit sediment, oils, and grease from being discharged to the drainage system. Please refer to Table 2 – Total Suspended Solids Removal worksheet attached herein for this information.

The inlet rows of the infiltration chamber systems will be designed as isolation rows. Each isolation row of chambers will be wrapped in filter fabric, thus further filtering TSS from the stormwater. The isolation rows functions as pretreatment to the infiltration chambers, thus allowing 80% TSS removal for the systems.

Table 2

Total Suspended Solids Removal

BMP	*TSS Removal Rate*	*Starting TSS Load*	*TSS Removed*	*Remaining TSS Load*
Deep Sump Hooded Catch Basin	0.25	1.00	Pretreatment	1.00
Isolation Row	0.50	1.00	Pretreatment	1.00
Infiltration Chambers	0.80	1.00	0.80	0.20
		Total Suspended Solids Removed:		**80%**

WATER QUALITY VOLUME

See Appendix C for required water quality volume calculations based on impervious area and the *Static* method calculations for sizing of the infiltration BMPs.

STANDARD 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 project site is not a land use with higher potential pollutant loads, per the regulation.

STANDARD 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 is not within the Zone II or Interim Wellhead Protection Area of a public water supply and does not discharge near or to any other critical area. See Figure 5, Critical Areas.

STANDARD 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.

This project is considered new development and has been designed to meet all the Massachusetts Stormwater Management Standards.

STANDARD 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.

This project will disturb more than one acre of land and will therefore be required to obtain coverage under the NPDES Construction General Permit. A Stormwater Pollution Prevention Plan (SWPPP) will be required before earth-disturbing activities commence on the project site. The SWPPP will be prepared per EPA NPDES NOI guidelines and submitted under a separate cover.

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

Please refer to Appendix F for the Operation and Maintenance Plan for the proposed Stormwater Management System.

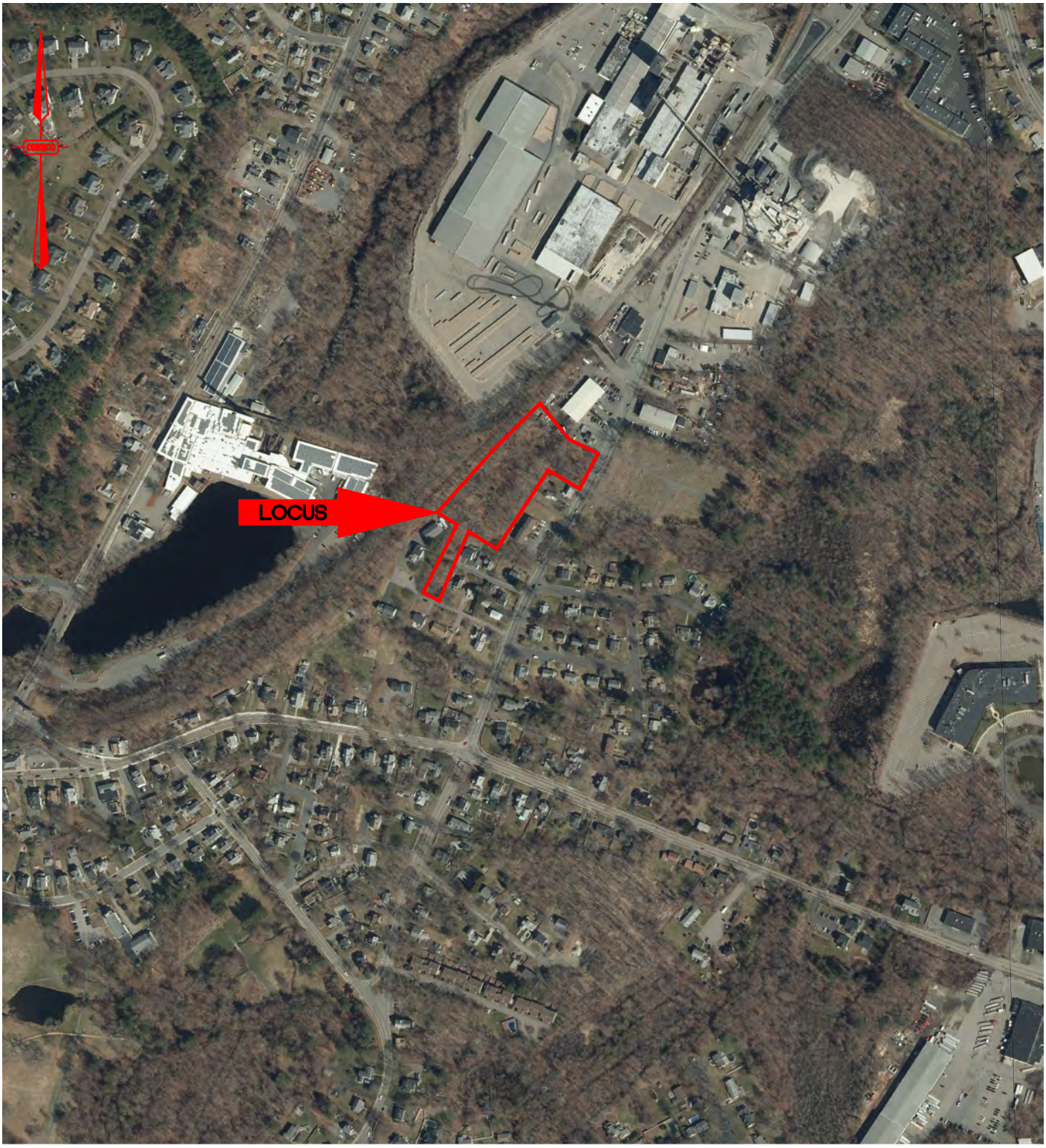
STANDARD 10: All illicit discharges to the stormwater management system are prohibited.

To our knowledge, no illicit discharges will be made to the stormwater management system. An Illicit Discharge Compliance Statement is attached in Appendix F.

CONCLUSION/SUMMARY:

Based on the HydroCAD analysis for the 2, 10, 25, and 100-year storm events, the peak rate of runoff will decrease from the existing to the proposed condition. Furthermore, stormwater will be treated prior to its discharge from the site and controlled infiltration has been introduced to previously uncontrolled areas, thereby promoting/preserving the natural hydrologic conditions. In addition to these improvements, all 10 of the DEP Stormwater Standards have been met.

LIST OF FIGURES



NOTES:

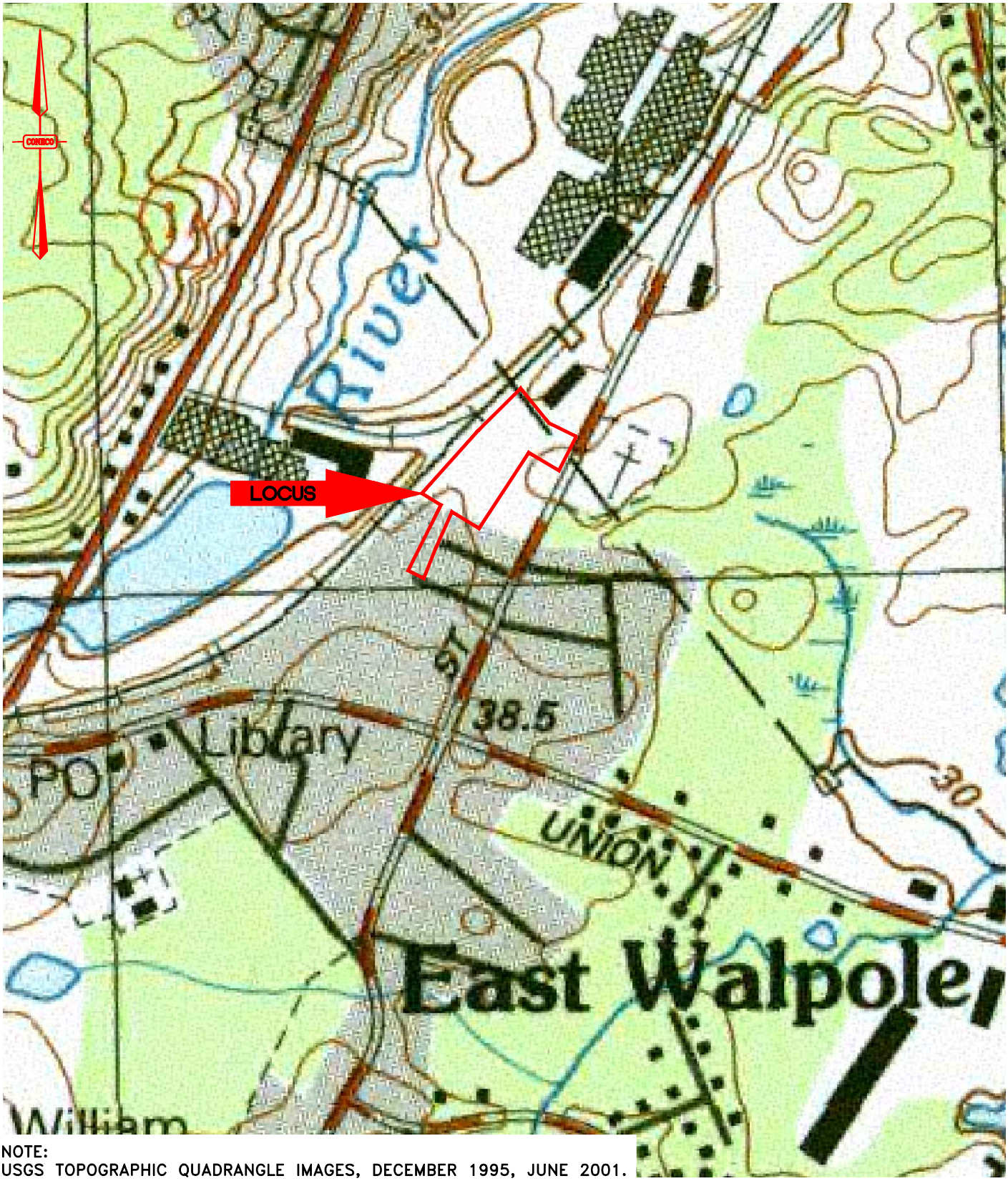
1. INFORMATION ON THESE FIGURES WERE OBTAINED FROM BUREAU OF GEOGRAPHIC INFORMATION (MASSGIS), COMMONWEALTH OF MASSACHUSETTS, EXCECUTIVE OFFICE OF TECHNOLOGY AND SECURITY SERVICES.
2. 2021 AERIAL IMAGERY, SPRING 2021.

5 PLEASENT STREET, WALPOLE, MA 02032

CONECO Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

PREPARED FOR:	PLAN SET:
NEPONSET VILLAGE, LLC	REPORT FIGURES

SCALE	DATE	PROJECT NO.	TITLE:
1" = 500'	08/30/2023	10365.0	FIGURE 1 AERIAL MAP

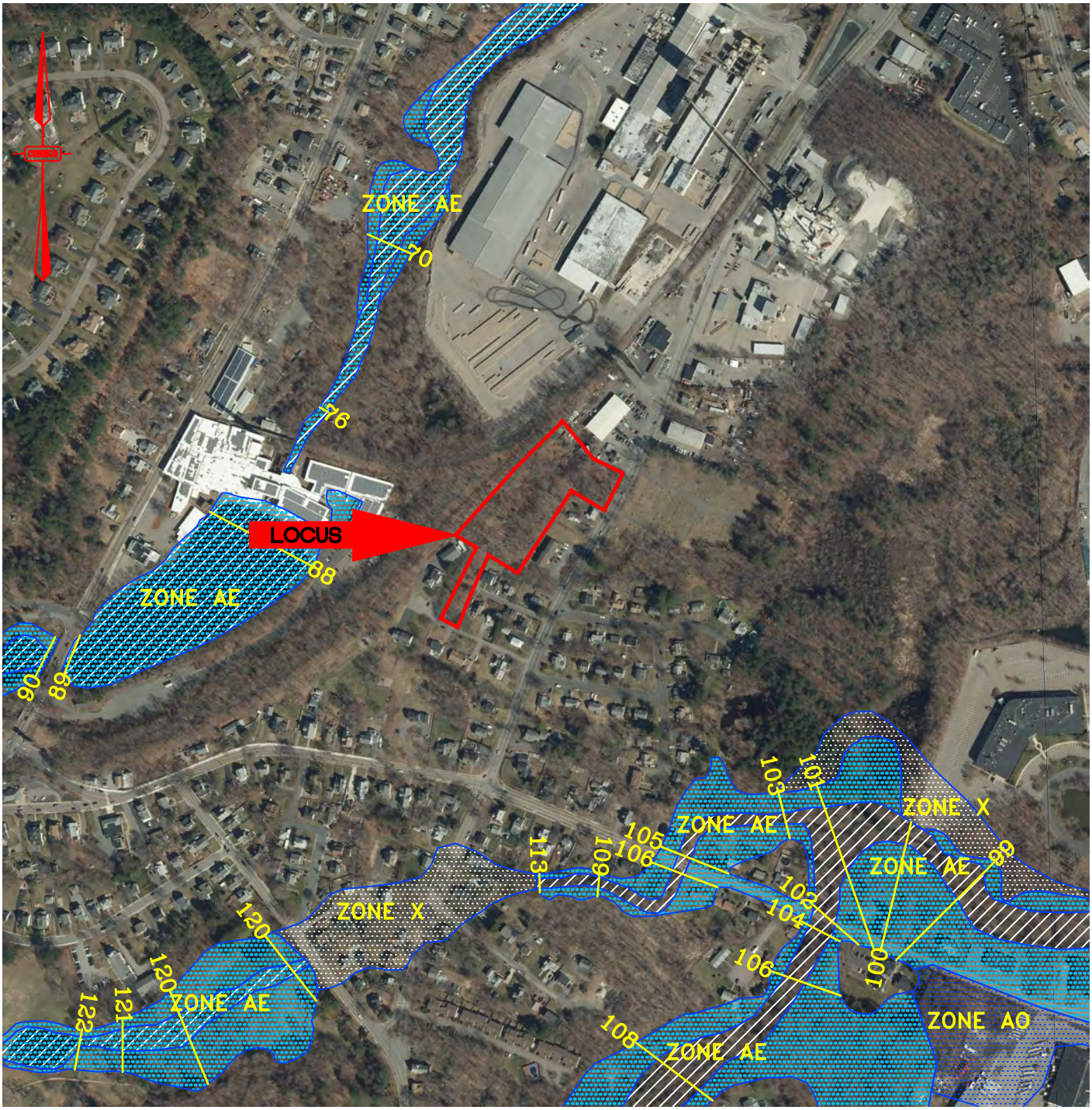


NOTE:
USGS TOPOGRAPHIC QUADRANGLE IMAGES, DECEMBER 1995, JUNE 2001.

5 PLEASENT STREET, WALPOLE, MA 02032

CONECO
Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

PREPARED FOR:	PLAN SET:		
NEPONSET VILLAGE, LLC	REPORT FIGURES		
SCALE 1" = 500'	DATE 08/30/2023	PROJECT NO. 10365.0	TITLE: FIGURE 2 USGS TOPOGRAPHIC MAP



FLOOD ZONE X, AREAS BETWEEN THE LIMITS OF 100-YEAR AND 500-YEAR FLOODS

FLOODWAY AREAS IN ZONE AE

FLOOD ZONE AE, AREAS OF 100-YEAR FLOOD, BASE FLOOD ELEVATIONS DETERMINED

FLOOD ZONE AO, AREAS OF 100-YEAR FLOOD, SHEET FLOW FLOOD DEPTHS OF 1 TO 3 FEET

NOTE:

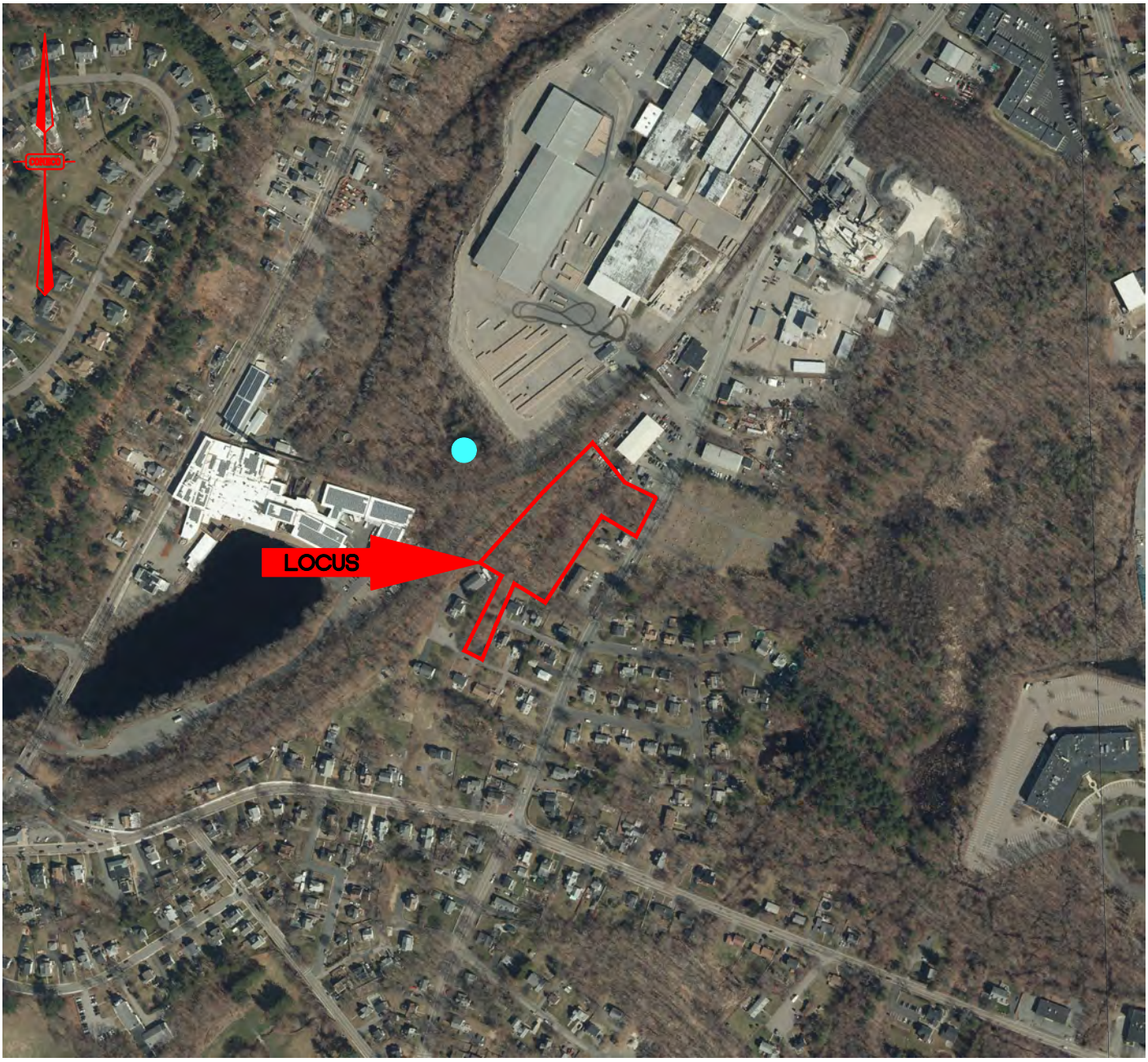
1. FEMA NATIONAL FLOOD HAZARD LAYER JULY 2017
2. FEMA FLOOD INSURANCE RATE MAP FOR NORFOLK COUNTY COMMUNITY MAP NO. 25021C0187E, EFFECTIVE JULY 17, 2012.

5 PLEASENT STREET, WALPOLE, MA 02032

CONECO
Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

PREPARED FOR:	PLAN SET:
NEPONSET VILLAGE, LLC	REPORT FIGURES

SCALE	DATE	PROJECT NO.	TITLE:
1" = 500'	08/30/2023	10365.0	FIGURE 3 FLOOD INSURANCE RATE MAP



PRIORITY HABITAT OF RARE SPECIES

ESTIMATED HABITATS OF RARE WILDLIFE

CERTIFIED VERNAL POOLS

POTENTIAL VERNAL POOLS

NOTES:

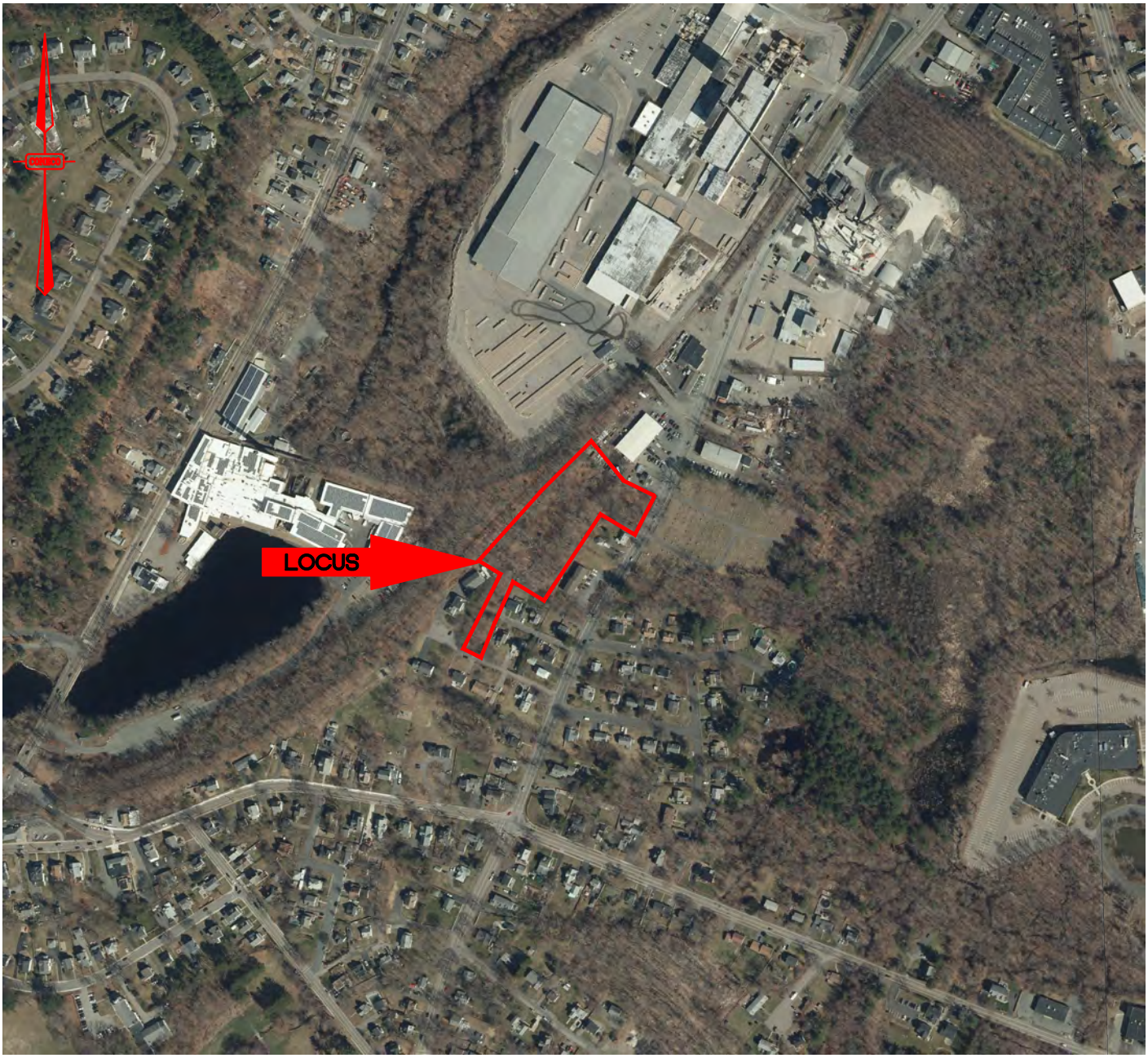
1. ESTIMATED HABITATS OF RARE WILDLIFE AND PRIORITY HABITATS OF RARE SPECIES CAME FROM MASSGIS DATABASE LAST UPDATED AUGUST 2017.
2. CERTIFIED VERNAL POOL LOCATIONS WERE TAKEN FROM MASSGIS DATABASE ON JANUARY 18, 2023. THIS DATA IS UPDATED CONTINUALLY AND SHOWN CONDITIONS MAY VARY FROM THIS DATA.
3. POTENTIAL VERNAL POOL LOCATIONS WERE TAKEN FROM MASSGIS DATABASE LAST UPDATED DECEMBER 2000.
4. THERE ARE NO ESTIMATED HABITATS OF RARE WILDLIFE, PRIORITY HABITATS OF RARE SPECIES, POTENTIAL VERNAL POOLS, OR CERTIFIED VERNAL POOLS ON THE PROJECT SITE.

5 PLEASENT STREET, WALPOLE, MA 02032

CONECO
Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

PREPARED FOR:	PLAN SET:
NEPONSET VILLAGE, LLC	REPORT FIGURES

SCALE	DATE	PROJECT NO.	TITLE:
1" = 500'	08/30/2023	10365.0	FIGURE 4 NATURAL HERITAGE MAP



AREAS OF CRITICAL ENVIRONMENTAL CONCERN

WELLHEAD PROTECTION AREAS

OUTSTANDING RESOURCE WATERS

SURFACE WATER SUPPLY PROTECTION AREAS

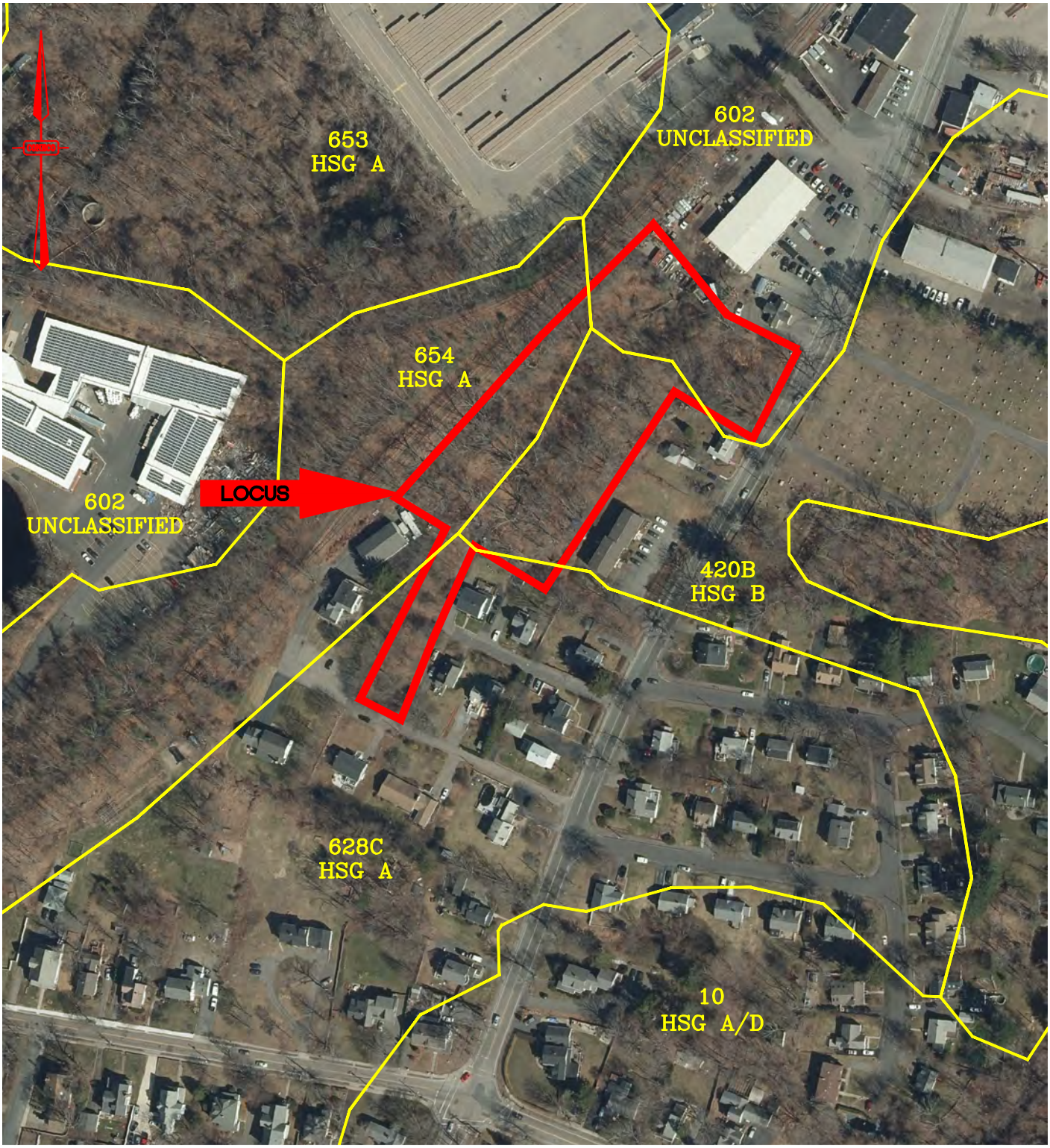
NOTES:

1. AREAS OF CRITICAL ENVIRONMENTAL CONCERN WERE TAKEN FROM MASSGIS DATABASE, LAST UPDATED APRIL 2009.
2. WELLHEAD PROTECTION AREAS WERE TAKEN FROM MASSGIS DATEBASE, LAST UPDATED FEBRUARY 2023.
3. OUTSTANDING RESOURCE WATERS WERE TAKEN FROM MASSGIS DATEBASE, LAST UPDATED MARCH 2010.
4. SURFACE WATER SUPPLY PROTECTION AREAS WERE TAKEN FROM MASSGIS DATEBASE, LAST UPDATED APRIL 2017
5. THERE ARE NO AREAS OF CRITICAL ENVIRONMENTAL CONCERN, WELLHEAD PROTECTION AREAS, OUTSTANDING RESOURCE WATERS, OR SURFACE WATER SUPPLY PROTECTION AREAS ON THIS PROJECT SITE.

5 PLEASENT STREET, WALPOLE, MA 02032

CONECO
Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

PREPARED FOR:	PLAN SET:		
NEPONSET VILLAGE, LLC	REPORT FIGURES		
SCALE 1" = 500'	DATE 08/30/2023	PROJECT NO. 10365.0	TITLE: FIGURE 5 CRITICAL AREAS



NOTE:
INFORMATION ON THIS PLAN WAS OBTAINED FROM THE MASSGIS DATABASE, NRCS SSURGO – CERTIFIED SOILS WHICH WAS LAST UPDATED NOVEMBER 2012.

5 PLEASENT STREET, WALPOLE, MA 02032

CONECO
Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

PREPARED FOR:	PLAN SET:		
NEPONSET VILLAGE, LLC	REPORT FIGURES		
SCALE 1" = 200'	DATE 08/30/2023	PROJECT NO. 10365.0	TITLE: FIGURE 6 SOIL SURVEY MAP

LEGEND

SUBCATCHMENT BOUNDARY

SOILS BOUNDARY

FLOWPATH

Existing Subcatchment: To Natural Depression
Area=120,765 s.f.
CNwt=48
Tc=10.7 min.

Existing Subcatchment: Offsite North
Area=31,642 s.f.
CNwt=38
Tc=10.3 min.

Design Point:
Onsite South

Design Edge:
Total North

654
HSG A

628C
HSG A

602
UNCLASSIFIED
(USE HSG A)

420B
HSG B

Existing Subcatchment: Onsite South
Area=16,611 s.f.
CNwt=36
Tc=14.4 min.

60' 0 60' 120'
SCALE IN FEET

REVISIONS

NO.	DATE	DESCRIPTION	DR/CK
1	11/17/23	PEER REVIEW COMMENTS	

PREPARED FOR:
NEPONSET VILLAGE, LLC
P.O. BOX 206
ABINGTON, MA 02351

DRAWING:
EXISTING DRAINAGE AREAS

PROJECT:
NEPONSET VILLAGE
5 PLEASENT STREET
WALPOLE, MA 02032

PLAN SET:
REPORT FIGURES

CONECO Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

DATE:	11/17/2023
DRAWN/ CHECK:	BTM/DJD
SCALE:	1" = 60'
PROJECT NO.	10365.0

FIGURE NO.
Figure 7

LEGEND

SUBCATCHMENT BOUNDARY

SOILS BOUNDARY

FLOWPATH

Proposed Subcatchment: Western Units
Area=4,760 s.f.
CNwt=98
Tc=6.0 min.

Proposed Subcatchment: To Natural Depression
Area=24,847 s.f.
CNwt=43
Tc=6.0 min.

654
HSG A

Proposed Subcatchment: Northern Units
Area=6,800 s.f.
CNwt=98
Tc=6.0 min.

Design Point:
Total North

Proposed Subcatchment: Onsite South
Area=9,503 s.f.
CNwt=34
Tc=14.4 min.

602
UNCLASSIFIED
(USE HSG A)

Design Point:
Onsite South

628C
HSG A

Proposed Subcatchment: Eastern Units
Area=4,760 s.f.
CNwt=98
Tc=6.0 min.

420B
HSG B

Proposed Subcatchment: To Infiltration System D
Area=101,680 s.f.
CNwt=73
Tc=6.4 min.

Proposed Subcatchment: Offsite North
Area=16,668 s.f.
CNwt=38
Tc=6.0 min.

ARBOR COURT

MAGUIRE PARK
(Public)

PLEASANT STREET

60' 0 60' 120'
SCALE IN FEET

REVISIONS

NO.	DATE	DESCRIPTION	DR/CK
1	11/17/23	PEER REVIEW COMMENTS	BTM/DJD
2	12/27/23	TOWN COMMENTS	MSD/DJD

PREPARED FOR:
NEPONSET VILLAGE, LLC
P.O. BOX 206
ABINGTON, MA 02351

DRAWING:
PROPOSED DRAINAGE AREAS

PROJECT:
NEPONSET VILLAGE
5 PLEASENT STREET
WALPOLE, MA 02032

PLAN SET:
REPORT FIGURES

CONECO Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

DATE:	11/17/2023
DRAWN/ CHECK:	BTM/DJD
SCALE:	1" = 60'
PROJECT NO.	10365.0

FIGURE NO.
Figure 8

APPENDIX A

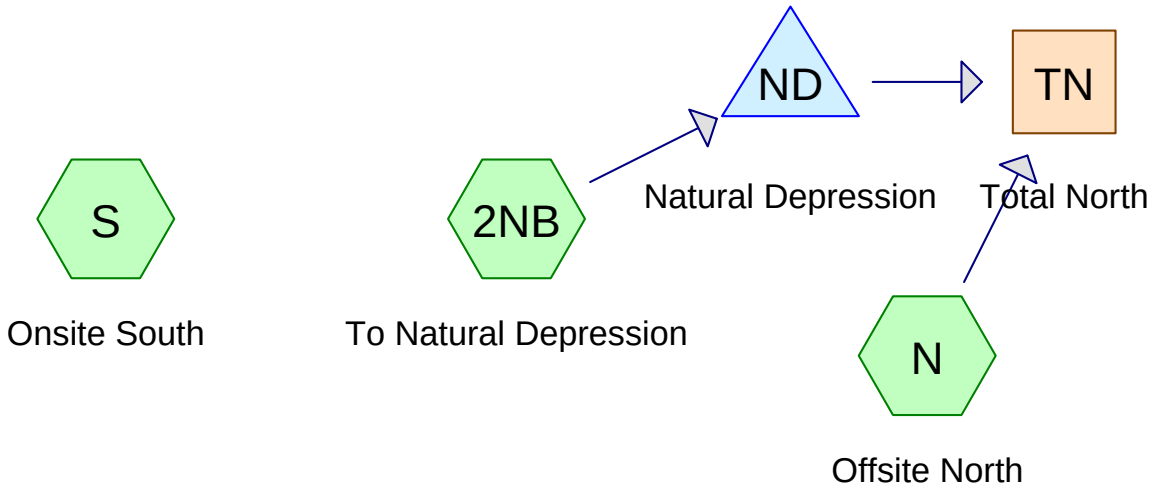
EXISTING HYDROLOGICAL CONDITIONS

2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

100-YEAR STORM EVENT



Subcat Reach Pond Link

Routing Diagram for 10365 - Pleasant Street - Walpole -Existing Condition

Prepared by Coneco Engineers & Scientists, Printed 12/27/2023

Summary for Subcatchment 2NB: To Natural Depression

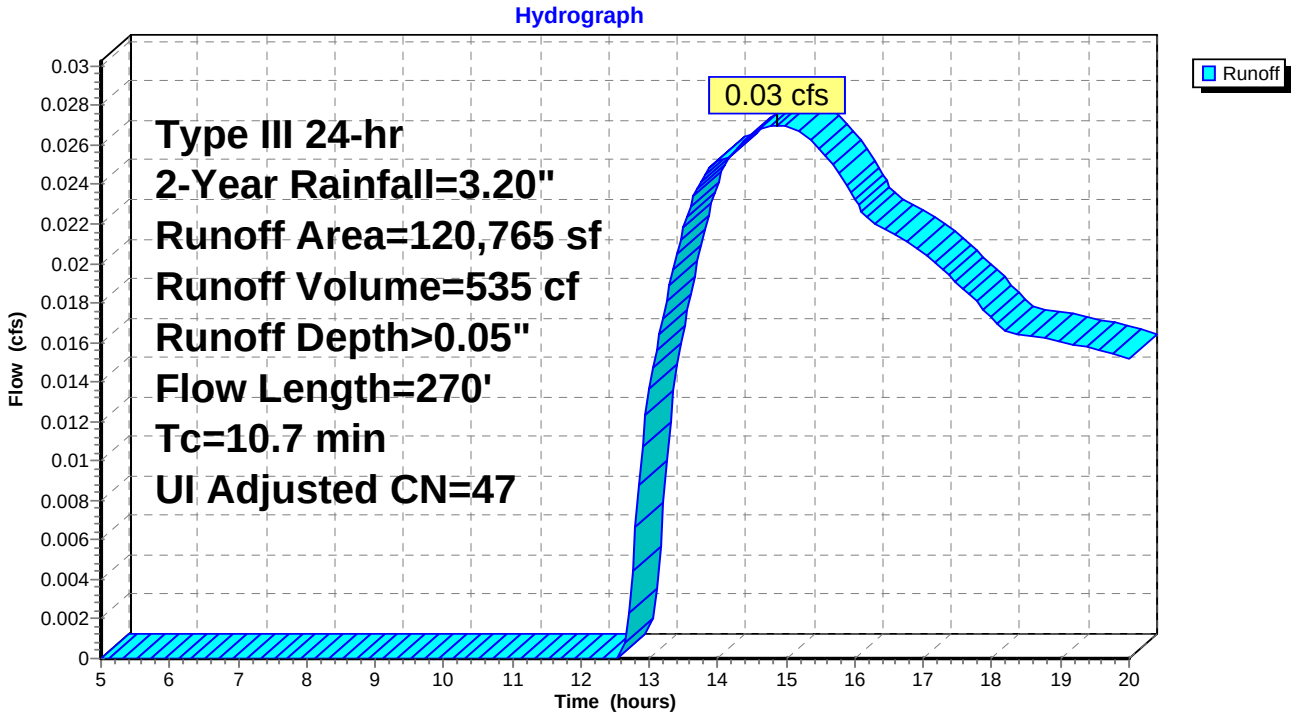
Runoff = 0.03 cfs @ 14.87 hrs, Volume= 535 cf, Depth> 0.05"

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

Area (sf)	CN	Adj	Description
35,288	30		Woods, Good, HSG A
16,322	39		>75% Grass cover, Good, HSG A
1,290	98		Unconnected pavement, HSG A
45,809	55		Woods, Good, HSG B
19,907	61		>75% Grass cover, Good, HSG B
2,149	98		Unconnected roofs, HSG B
120,765	48	47	Weighted Average, UI Adjusted
117,326			97.15% Pervious Area
3,439			2.85% Impervious Area
3,439			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, AB-Grass** Grass: Short n= 0.150 P2= 3.20"
1.1	76	0.0533	1.15		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
5.3	144	0.0083	0.46		**Shallow Concentrated Flow, CD-Woods** Woodland Kv= 5.0 fps
10.7	270	Total			

Subcatchment 2NB: To Natural Depression



Summary for Subcatchment N: Offsite North

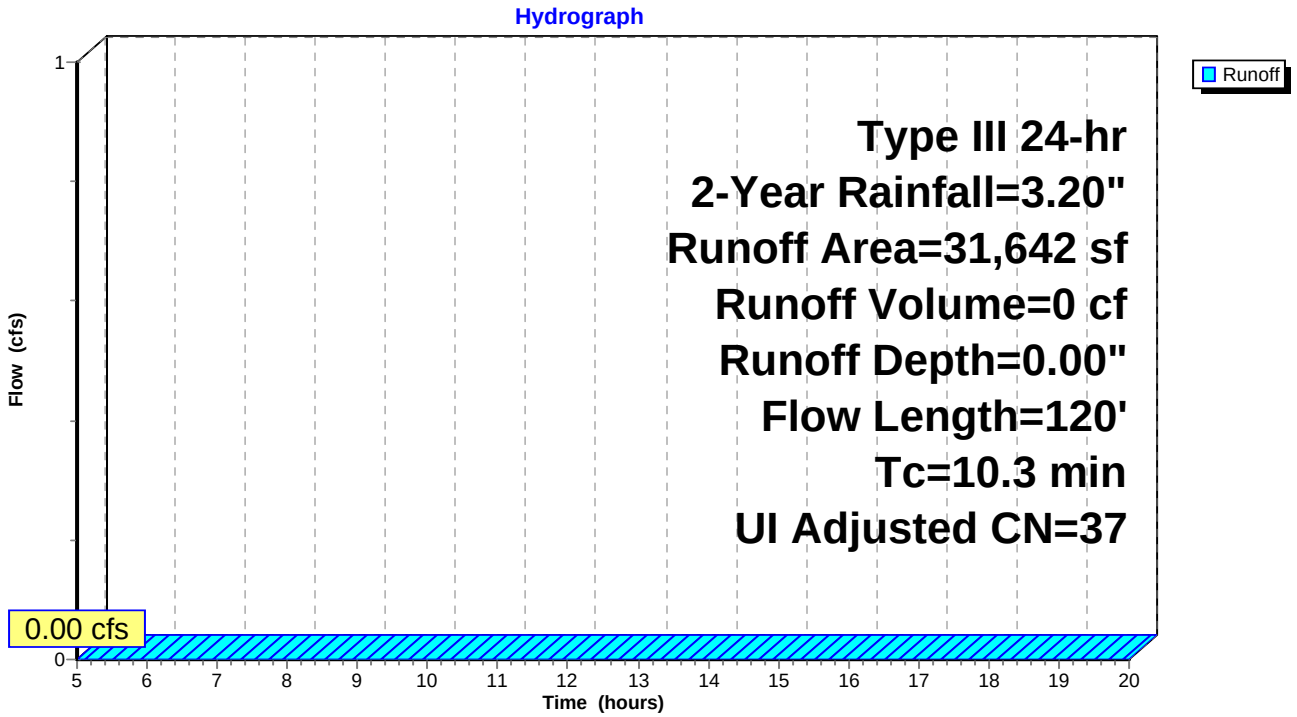
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

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

Area (sf)	CN	Adj	Description
25,134	30		Woods, Good, HSG A
2,727	39		>75% Grass cover, Good, HSG A
3,154	85		Gravel roads, HSG B
627	98		Unconnected pavement, HSG A
31,642	38	37	Weighted Average, UI Adjusted
31,015			98.02% Pervious Area
627			1.98% Impervious Area
627			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	70	0.0500	1.12		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
10.3	120	Total			

Subcatchment N: Offsite North



Summary for Subcatchment S: Onsite South

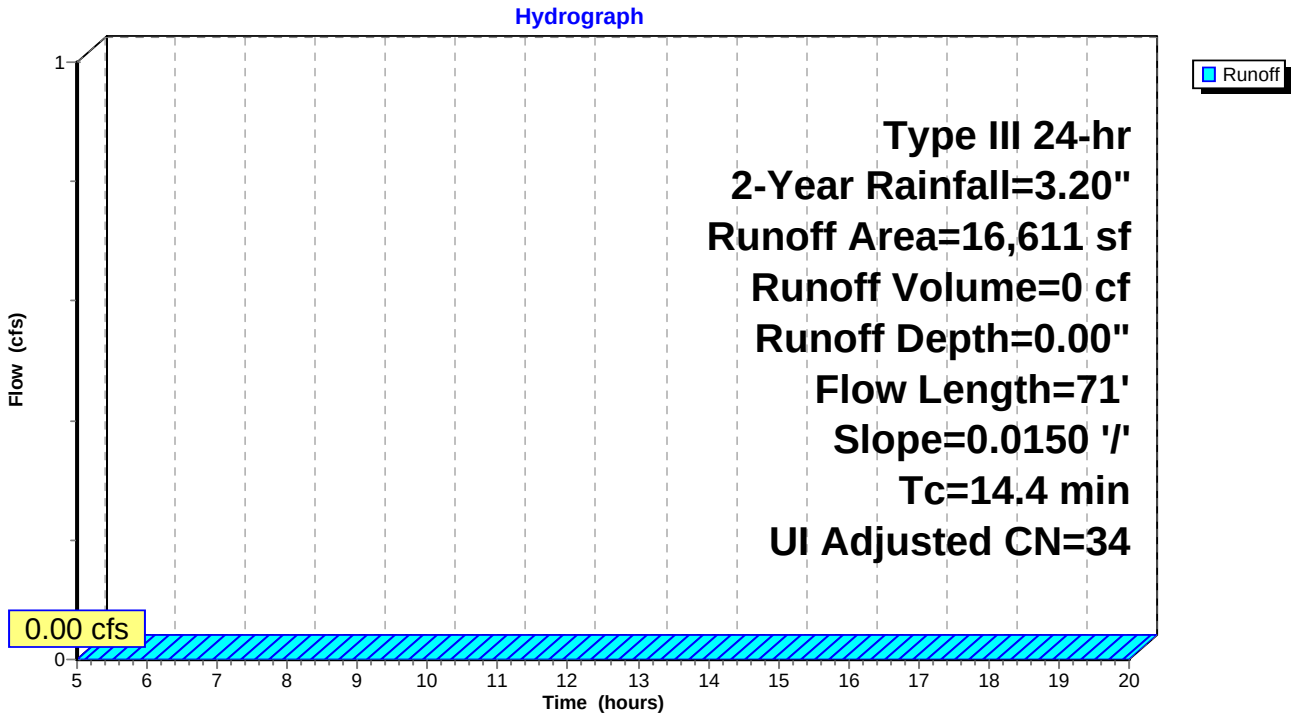
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

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

Area (sf)	CN	Adj	Description
13,154	30		Woods, Good, HSG A
2,356	39		>75% Grass cover, Good, HSG A
1,033	98		Unconnected roofs, HSG A
68	55		Woods, Good, HSG B
16,611	36	34	Weighted Average, UI Adjusted
15,578			93.78% Pervious Area
1,033			6.22% Impervious Area
1,033			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

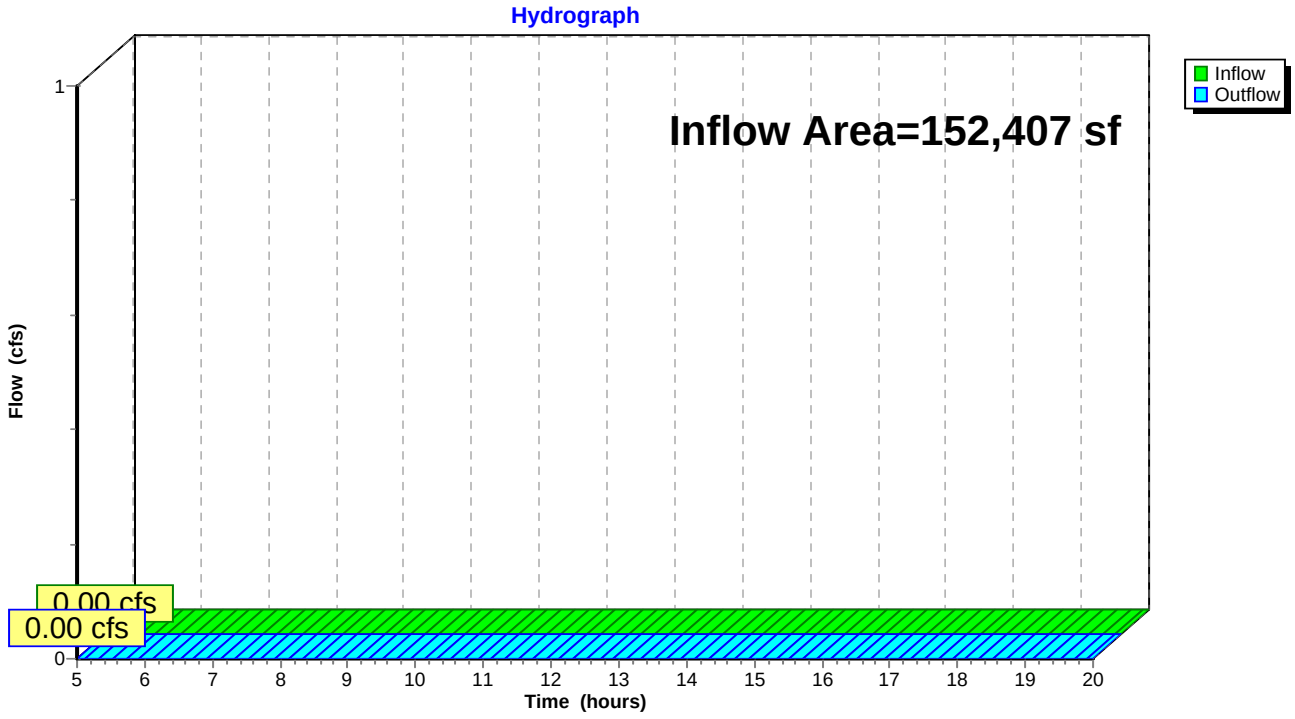


Summary for Reach TN: Total North

Inflow Area = 152,407 sf, 2.67% 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

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ND: Natural Depression

Inflow Area = 120,765 sf, 2.85% Impervious, Inflow Depth > 0.05" for 2-Year event
Inflow = 0.03 cfs @ 14.87 hrs, Volume= 535 cf
Outflow = 0.02 cfs @ 15.87 hrs, Volume= 474 cf, Atten= 11%, Lag= 60.0 min
Discarded = 0.02 cfs @ 15.87 hrs, Volume= 474 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.01' @ 15.87 hrs Surf.Area= 472 sf Storage= 89 cf

Plug-Flow detention time= 57.4 min calculated for 473 cf (88% of inflow)
Center-of-Mass det. time= 32.0 min (1,001.7 - 969.6)

Volume	Invert	Avail.Storage	Storage Description
#1	108.00'	15,537 cf	**Custom Stage Data (Irregular)**Listed below

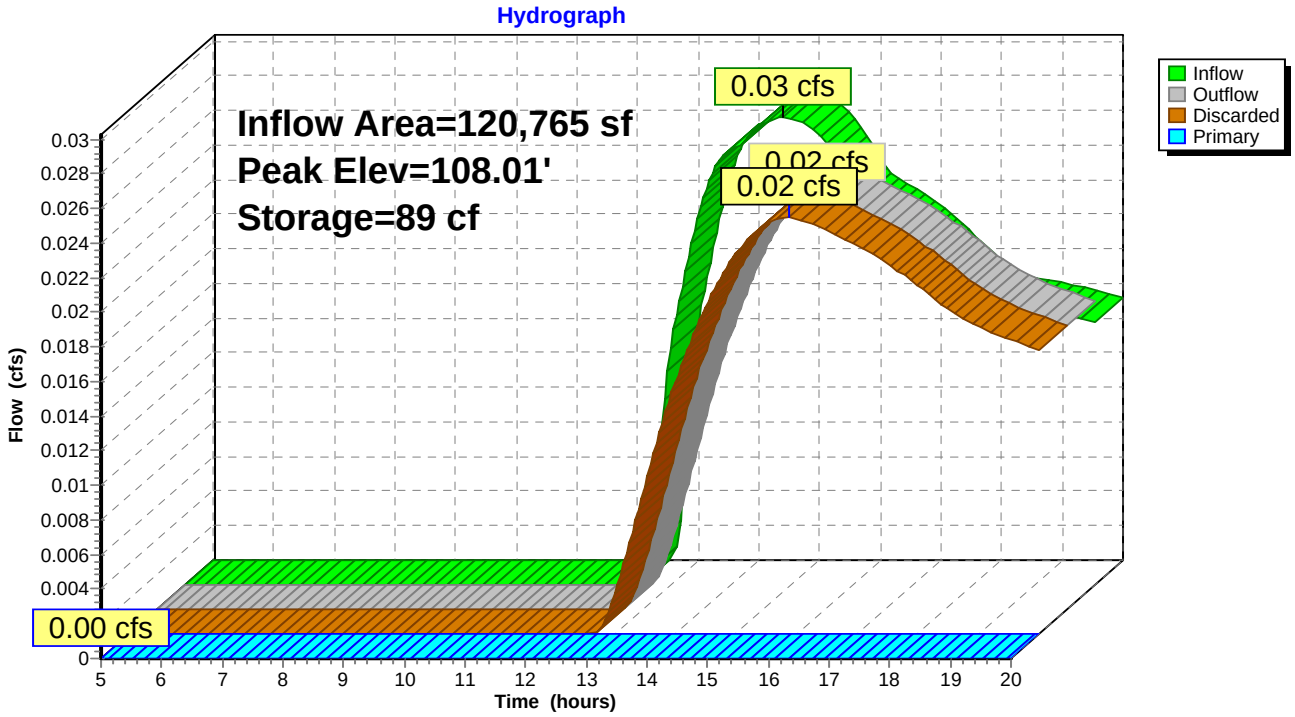
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
108.00	235	88.4	0	0	235
109.00	22,339	964.5	8,288	8,288	73,643
109.30	26,033	945.2	7,249	15,537	76,590

Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**2.0' 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
#2	Discarded	108.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 15.87 hrs HW=108.01' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0
108.02	677	166
108.04	1,119	332
108.06	1,561	497
108.08	2,003	663
108.10	2,445	829
108.12	2,887	995
108.14	3,330	1,160
108.16	3,772	1,326
108.18	4,214	1,492
108.20	4,656	1,658
108.22	5,098	1,823
108.24	5,540	1,989
108.26	5,982	2,155
108.28	6,424	2,321
108.30	6,866	2,487
108.32	7,308	2,652
108.34	7,750	2,818
108.36	8,192	2,984
108.38	8,635	3,150
108.40	9,077	3,315
108.42	9,519	3,481
108.44	9,961	3,647
108.46	10,403	3,813
108.48	10,845	3,978
108.50	11,287	4,144
108.52	11,729	4,310
108.54	12,171	4,476
108.56	12,613	4,642
108.58	13,055	4,807
108.60	13,497	4,973
108.62	13,939	5,139
108.64	14,382	5,305
108.66	14,824	5,470
108.68	15,266	5,636
108.70	15,708	5,802
108.72	16,150	5,968
108.74	16,592	6,133
108.76	17,034	6,299
108.78	17,476	6,465
108.80	17,918	6,631
108.82	18,360	6,796
108.84	18,802	6,962
108.86	19,244	7,128
108.88	19,687	7,294
108.90	20,129	7,460
108.92	20,571	7,625
108.94	21,013	7,791
108.96	21,455	7,957
108.98	21,897	8,123
109.00	22,339	8,288
109.02	22,585	8,772
109.04	22,832	9,255
109.06	23,078	9,738
109.08	23,324	10,221
109.10	23,570	10,705
109.12	23,817	11,188
109.14	24,063	11,671
109.16	24,309	12,154
109.18	24,555	12,638
109.20	24,802	13,121
109.22	25,048	13,604
109.24	25,294	14,087
109.26	25,540	14,571
109.28	25,787	15,054
109.30	**26,033**	**15,537**

Summary for Subcatchment 2NB: To Natural Depression

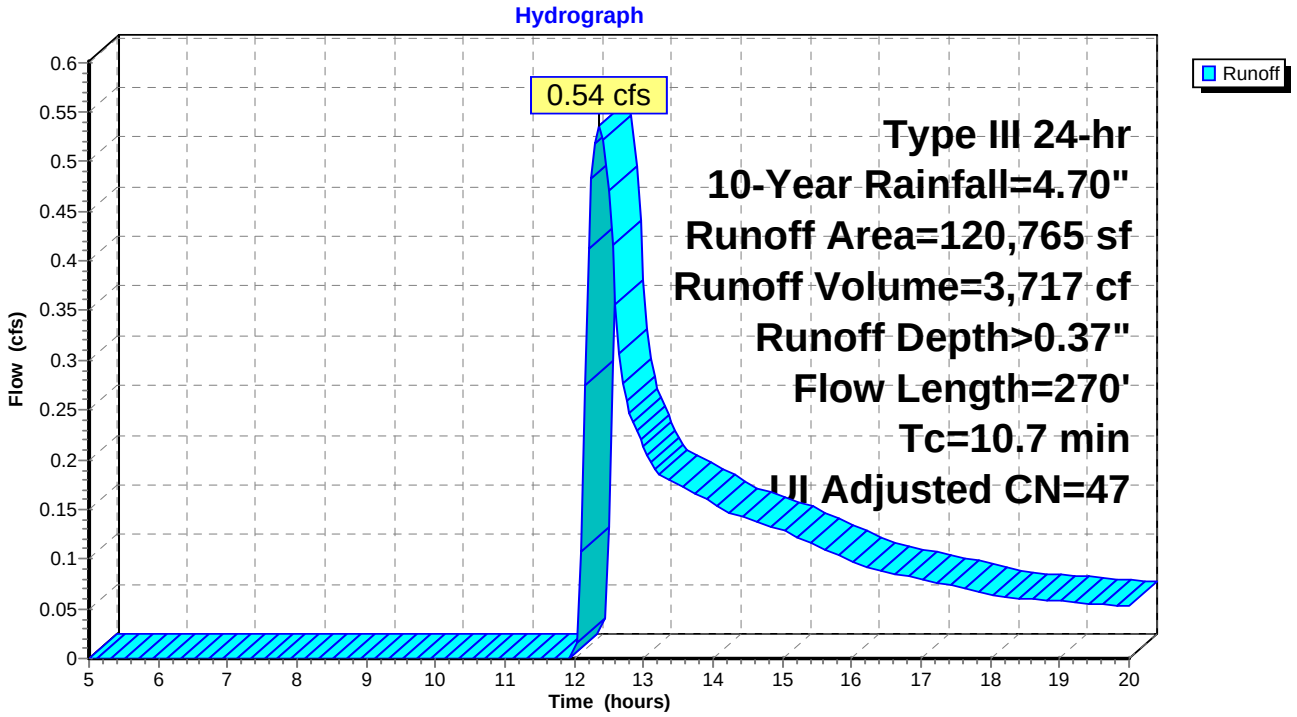
Runoff = 0.54 cfs @ 12.37 hrs, Volume= 3,717 cf, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Adj	Description
35,288	30		Woods, Good, HSG A
16,322	39		>75% Grass cover, Good, HSG A
1,290	98		Unconnected pavement, HSG A
45,809	55		Woods, Good, HSG B
19,907	61		>75% Grass cover, Good, HSG B
2,149	98		Unconnected roofs, HSG B
120,765	48	47	Weighted Average, UI Adjusted
117,326			97.15% Pervious Area
3,439			2.85% Impervious Area
3,439			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, AB-Grass** Grass: Short n= 0.150 P2= 3.20"
1.1	76	0.0533	1.15		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
5.3	144	0.0083	0.46		**Shallow Concentrated Flow, CD-Woods** Woodland Kv= 5.0 fps
10.7	270	Total			

Subcatchment 2NB: To Natural Depression



Summary for Subcatchment N: Offsite North

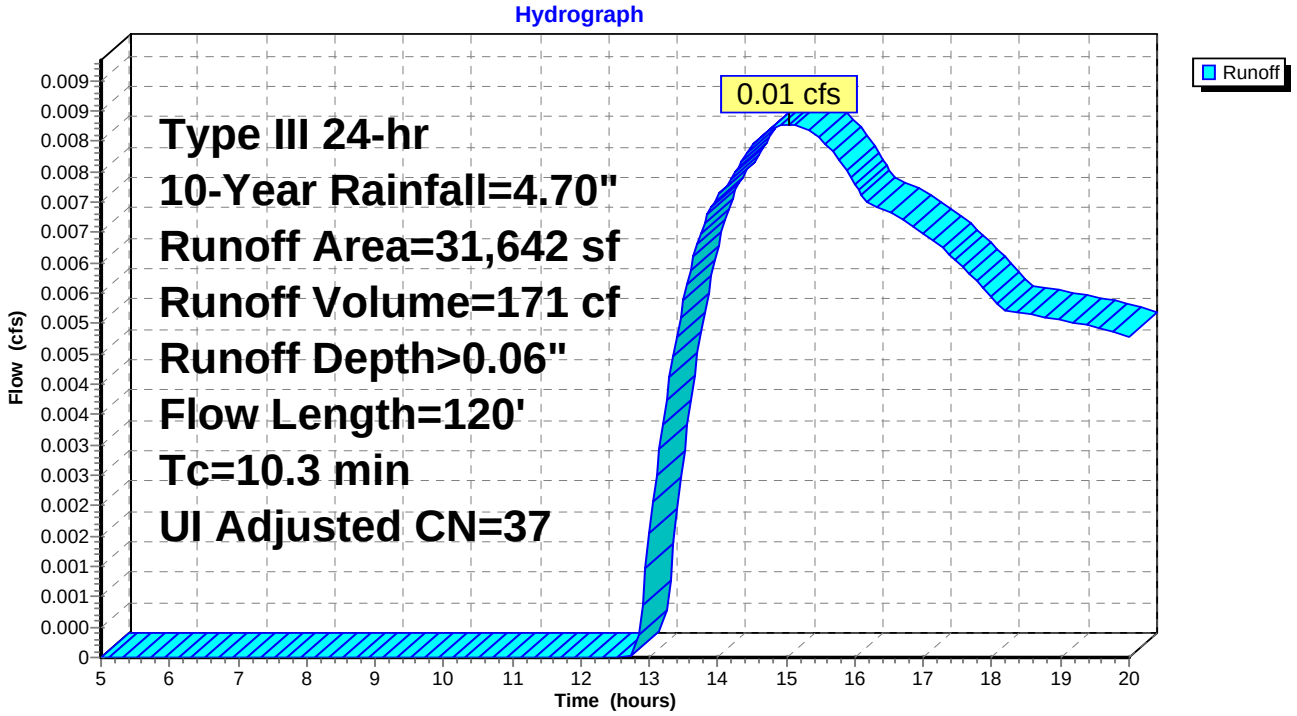
Runoff = 0.01 cfs @ 15.04 hrs, Volume= 171 cf, Depth> 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Adj	Description
25,134	30		Woods, Good, HSG A
2,727	39		>75% Grass cover, Good, HSG A
3,154	85		Gravel roads, HSG B
627	98		Unconnected pavement, HSG A
31,642	38	37	Weighted Average, UI Adjusted
31,015			98.02% Pervious Area
627			1.98% Impervious Area
627			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	70	0.0500	1.12		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
10.3	120	Total			

Subcatchment N: Offsite North



Summary for Subcatchment S: Onsite South

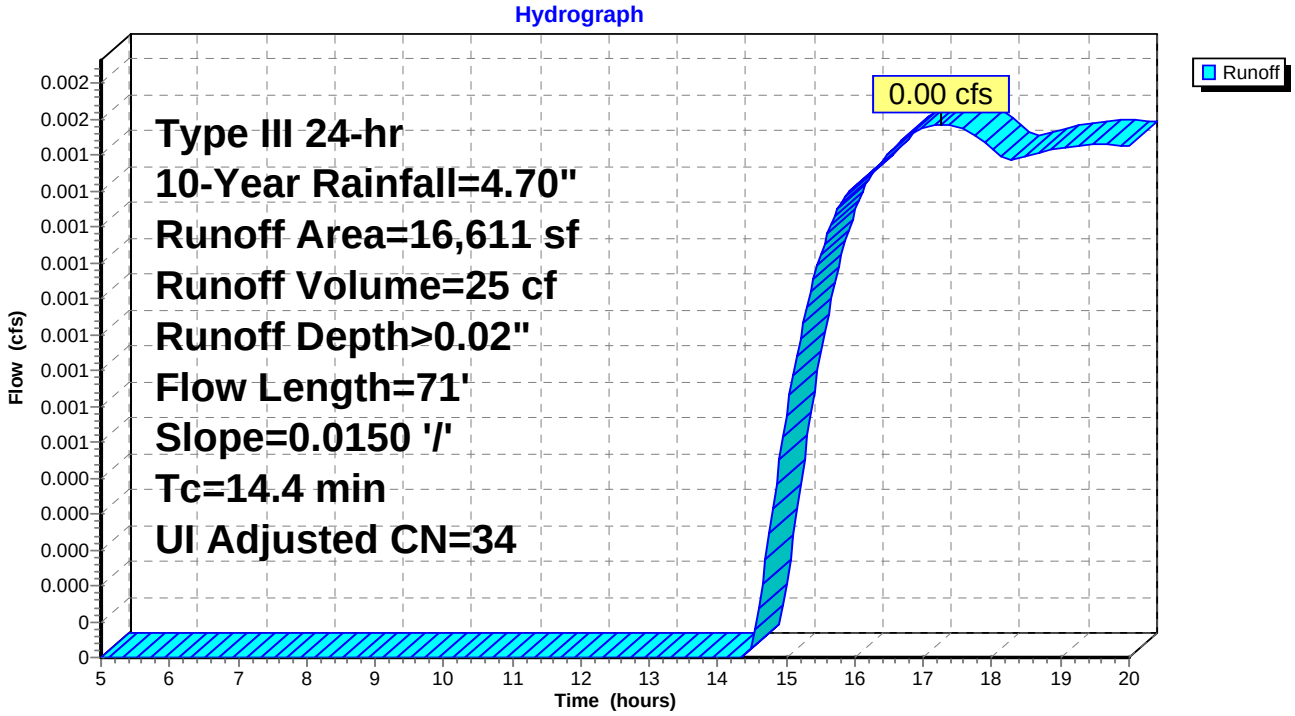
Runoff = 0.00 cfs @ 17.25 hrs, Volume= 25 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Adj	Description
13,154	30		Woods, Good, HSG A
2,356	39		>75% Grass cover, Good, HSG A
1,033	98		Unconnected roofs, HSG A
68	55		Woods, Good, HSG B
16,611	36	34	Weighted Average, UI Adjusted
15,578			93.78% Pervious Area
1,033			6.22% Impervious Area
1,033			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

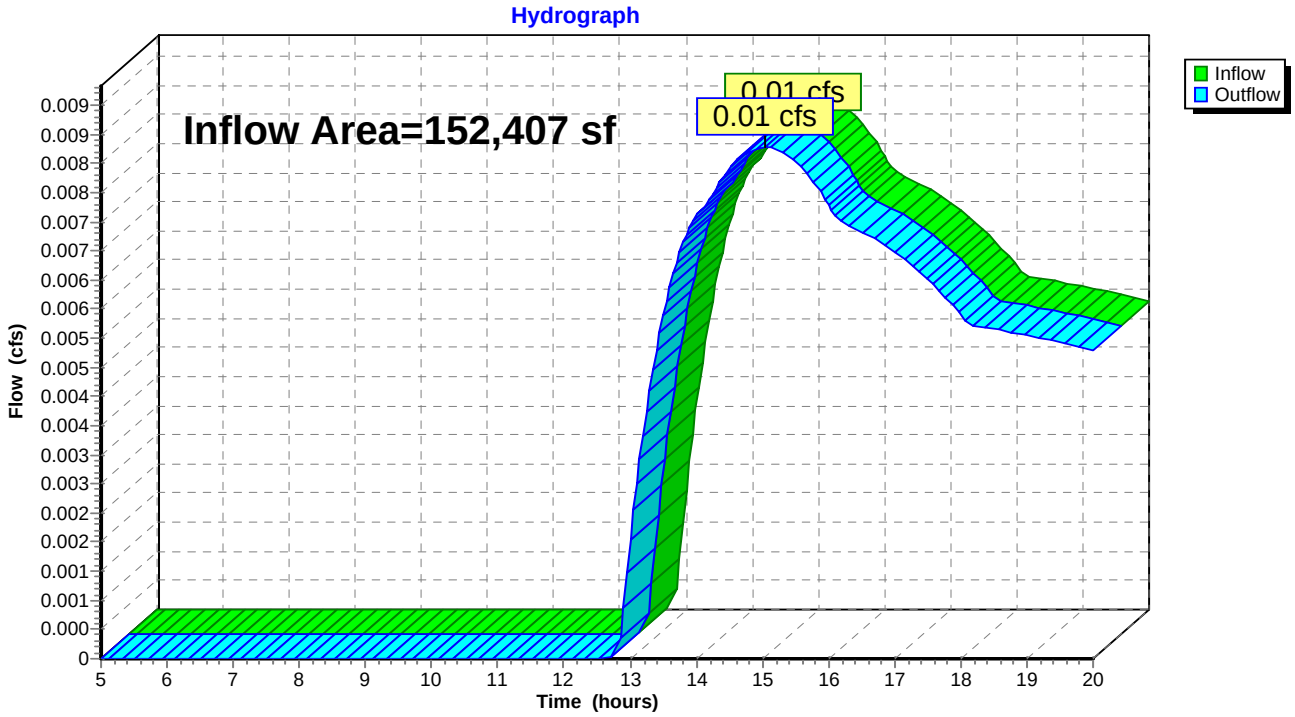


Summary for Reach TN: Total North

Inflow Area = 152,407 sf, 2.67% Impervious, Inflow Depth > 0.01" for 10-Year event
Inflow = 0.01 cfs @ 15.04 hrs, Volume= 171 cf
Outflow = 0.01 cfs @ 15.04 hrs, Volume= 171 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ND: Natural Depression

Inflow Area = 120,765 sf, 2.85% Impervious, Inflow Depth > 0.37" for 10-Year event
Inflow = 0.54 cfs @ 12.37 hrs, Volume= 3,717 cf
Outflow = 0.16 cfs @ 13.98 hrs, Volume= 3,334 cf, Atten= 71%, Lag= 97.0 min
Discarded = 0.16 cfs @ 13.98 hrs, Volume= 3,334 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.12' @ 13.98 hrs Surf.Area= 2,795 sf Storage= 960 cf

Plug-Flow detention time= 92.9 min calculated for 3,323 cf (89% of inflow)
Center-of-Mass det. time= 62.7 min (943.5 - 880.8)

Volume	Invert	Avail.Storage	Storage Description
#1	108.00'	15,537 cf	**Custom Stage Data (Irregular)** Listed below

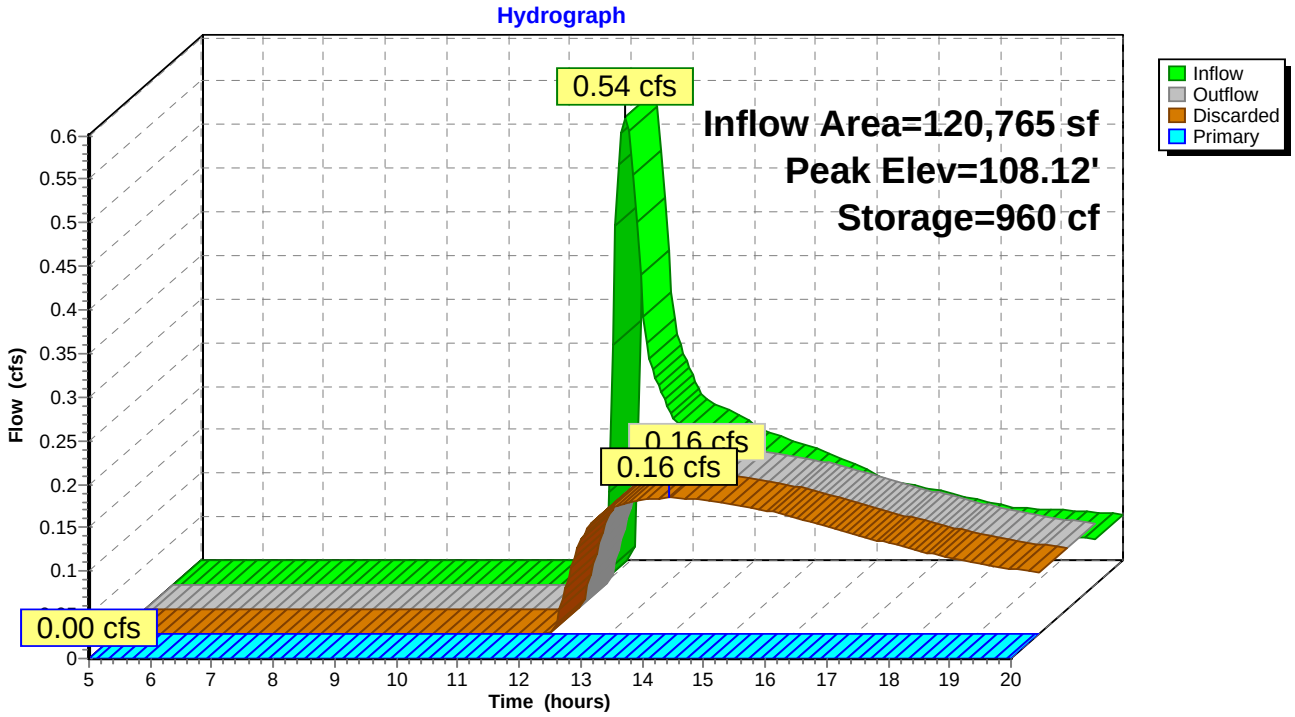
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
108.00	235	88.4	0	0	235
109.00	22,339	964.5	8,288	8,288	73,643
109.30	26,033	945.2	7,249	15,537	76,590

Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**2.0' 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
#2	Discarded	108.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.16 cfs @ 13.98 hrs HW=108.12' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0
108.02	677	166
108.04	1,119	332
108.06	1,561	497
108.08	2,003	663
108.10	2,445	829
108.12	2,887	995
108.14	3,330	1,160
108.16	3,772	1,326
108.18	4,214	1,492
108.20	4,656	1,658
108.22	5,098	1,823
108.24	5,540	1,989
108.26	5,982	2,155
108.28	6,424	2,321
108.30	6,866	2,487
108.32	7,308	2,652
108.34	7,750	2,818
108.36	8,192	2,984
108.38	8,635	3,150
108.40	9,077	3,315
108.42	9,519	3,481
108.44	9,961	3,647
108.46	10,403	3,813
108.48	10,845	3,978
108.50	11,287	4,144
108.52	11,729	4,310
108.54	12,171	4,476
108.56	12,613	4,642
108.58	13,055	4,807
108.60	13,497	4,973
108.62	13,939	5,139
108.64	14,382	5,305
108.66	14,824	5,470
108.68	15,266	5,636
108.70	15,708	5,802
108.72	16,150	5,968
108.74	16,592	6,133
108.76	17,034	6,299
108.78	17,476	6,465
108.80	17,918	6,631
108.82	18,360	6,796
108.84	18,802	6,962
108.86	19,244	7,128
108.88	19,687	7,294
108.90	20,129	7,460
108.92	20,571	7,625
108.94	21,013	7,791
108.96	21,455	7,957
108.98	21,897	8,123
109.00	22,339	8,288
109.02	22,585	8,772
109.04	22,832	9,255
109.06	23,078	9,738
109.08	23,324	10,221
109.10	23,570	10,705
109.12	23,817	11,188
109.14	24,063	11,671
109.16	24,309	12,154
109.18	24,555	12,638
109.20	24,802	13,121
109.22	25,048	13,604
109.24	25,294	14,087
109.26	25,540	14,571
109.28	25,787	15,054
109.30	**26,033**	**15,537**

Summary for Subcatchment 2NB: To Natural Depression

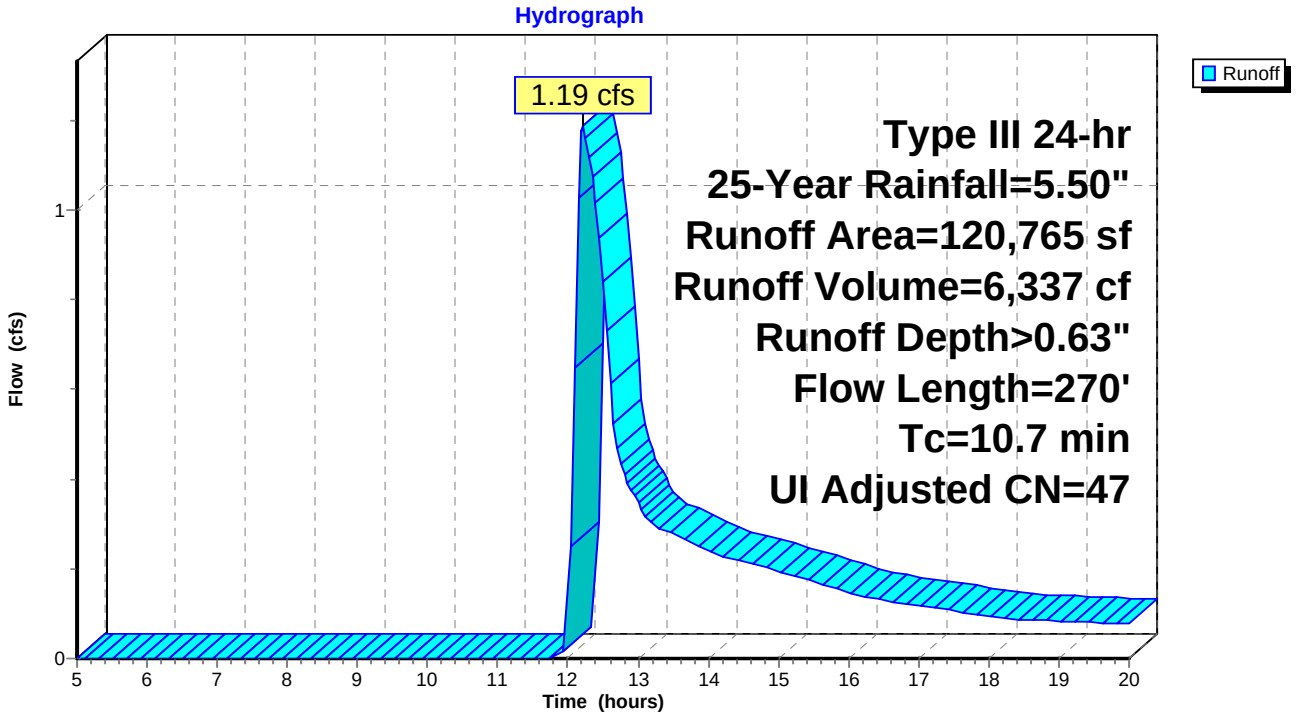
Runoff = 1.19 cfs @ 12.22 hrs, Volume= 6,337 cf, Depth> 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Adj	Description
35,288	30		Woods, Good, HSG A
16,322	39		>75% Grass cover, Good, HSG A
1,290	98		Unconnected pavement, HSG A
45,809	55		Woods, Good, HSG B
19,907	61		>75% Grass cover, Good, HSG B
2,149	98		Unconnected roofs, HSG B
120,765	48	47	Weighted Average, UI Adjusted
117,326			97.15% Pervious Area
3,439			2.85% Impervious Area
3,439			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, AB-Grass** Grass: Short n= 0.150 P2= 3.20"
1.1	76	0.0533	1.15		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
5.3	144	0.0083	0.46		**Shallow Concentrated Flow, CD-Woods** Woodland Kv= 5.0 fps
10.7	270	Total			

Subcatchment 2NB: To Natural Depression



Summary for Subcatchment N: Offsite North

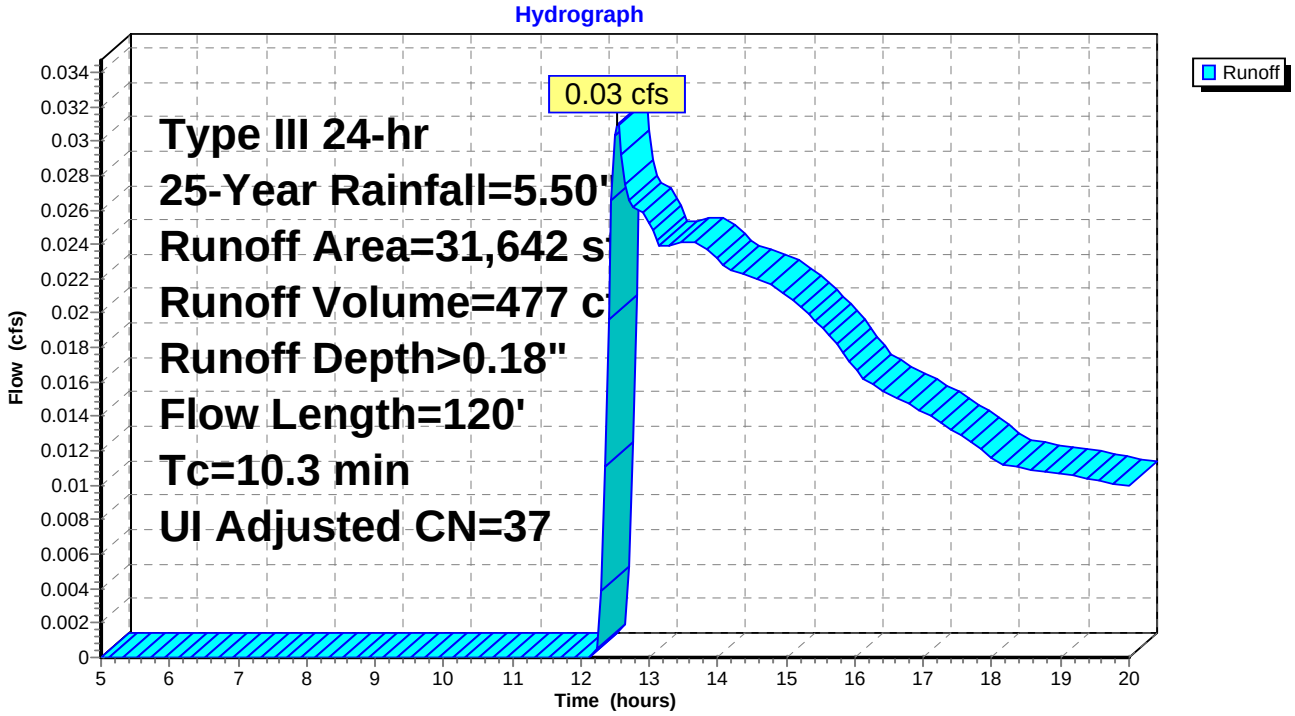
Runoff = 0.03 cfs @ 12.54 hrs, Volume= 477 cf, Depth> 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Adj	Description
25,134	30		Woods, Good, HSG A
2,727	39		>75% Grass cover, Good, HSG A
3,154	85		Gravel roads, HSG B
627	98		Unconnected pavement, HSG A
31,642	38	37	Weighted Average, UI Adjusted
31,015			98.02% Pervious Area
627			1.98% Impervious Area
627			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	70	0.0500	1.12		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
10.3	120	Total			

Subcatchment N: Offsite North



Summary for Subcatchment S: Onsite South

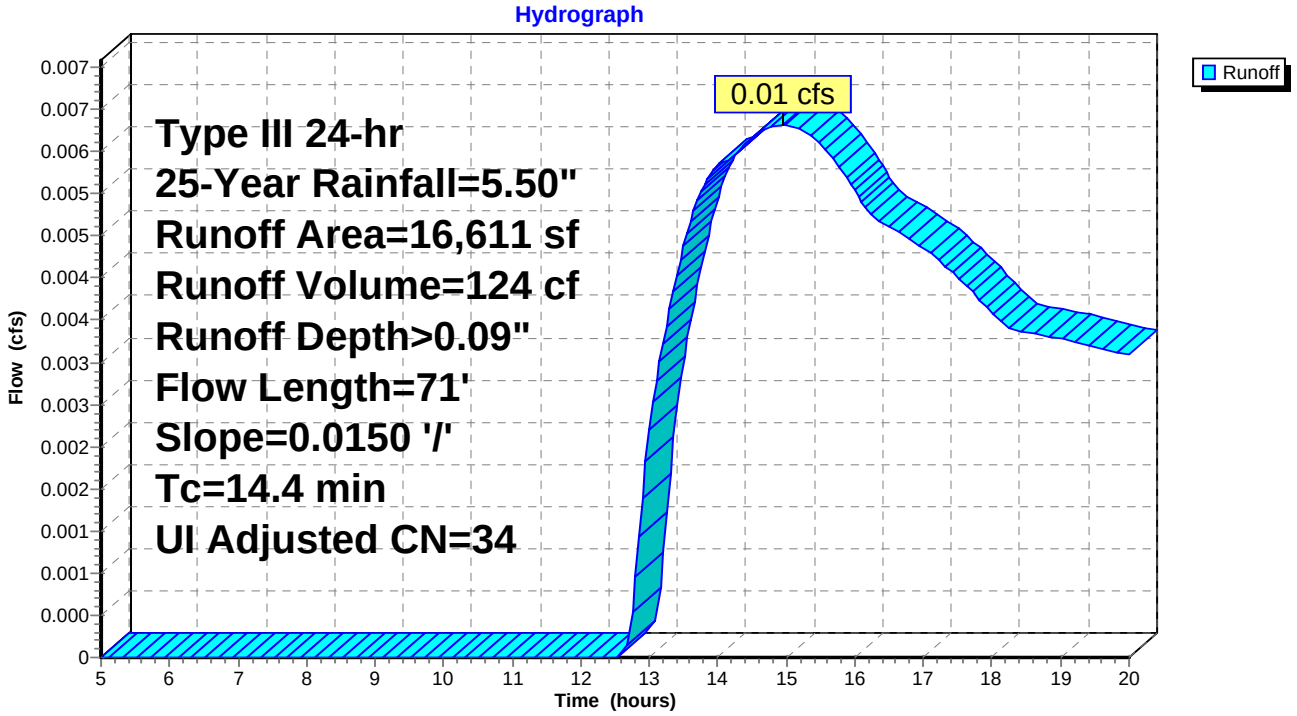
Runoff = 0.01 cfs @ 14.94 hrs, Volume= 124 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Adj	Description
13,154	30		Woods, Good, HSG A
2,356	39		>75% Grass cover, Good, HSG A
1,033	98		Unconnected roofs, HSG A
68	55		Woods, Good, HSG B
16,611	36	34	Weighted Average, UI Adjusted
15,578			93.78% Pervious Area
1,033			6.22% Impervious Area
1,033			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

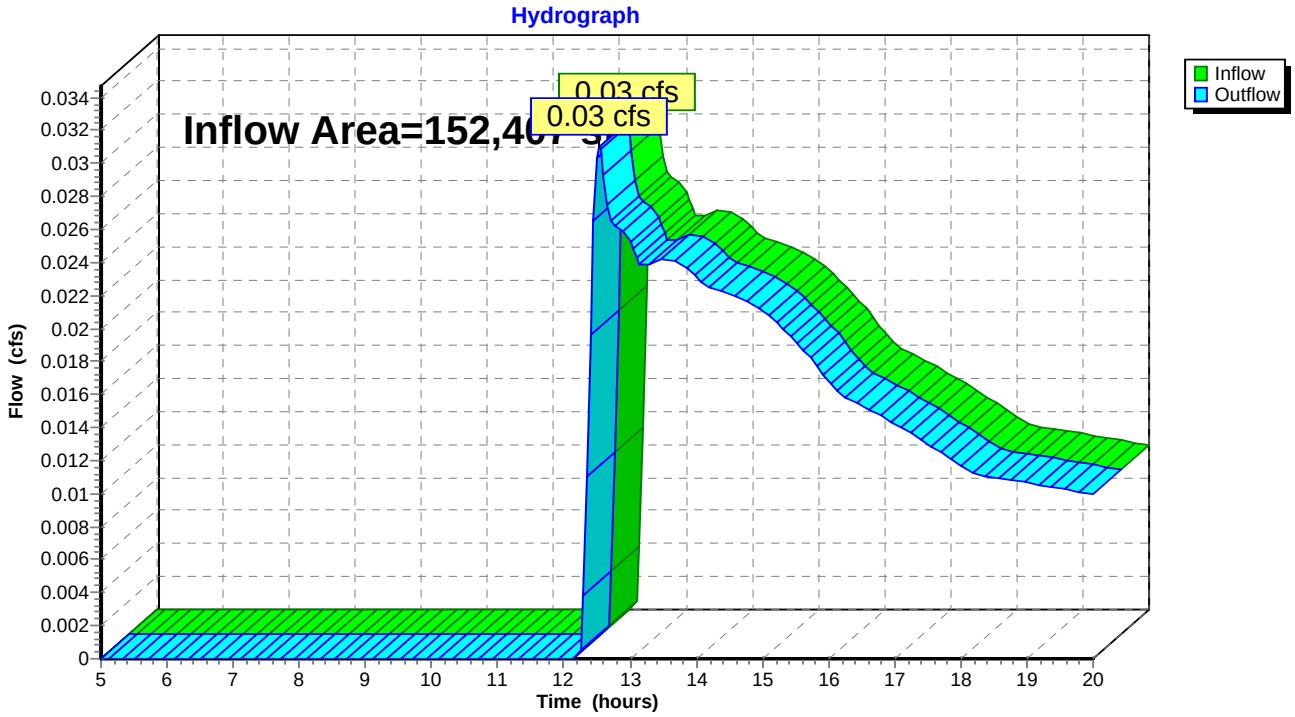


Summary for Reach TN: Total North

Inflow Area = 152,407 sf, 2.67% Impervious, Inflow Depth > 0.04" for 25-Year event
Inflow = 0.03 cfs @ 12.54 hrs, Volume= 477 cf
Outflow = 0.03 cfs @ 12.54 hrs, Volume= 477 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ND: Natural Depression

Inflow Area = 120,765 sf, 2.85% Impervious, Inflow Depth > 0.63" for 25-Year event
Inflow = 1.19 cfs @ 12.22 hrs, Volume= 6,337 cf
Outflow = 0.29 cfs @ 13.35 hrs, Volume= 5,719 cf, Atten= 76%, Lag= 68.0 min
Discarded = 0.29 cfs @ 13.35 hrs, Volume= 5,719 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.22' @ 13.35 hrs Surf.Area= 5,148 sf Storage= 1,842 cf

Plug-Flow detention time= 97.8 min calculated for 5,719 cf (90% of inflow)
Center-of-Mass det. time= 68.1 min (930.8 - 862.7)

Volume	Invert	Avail.Storage	Storage Description
#1	108.00'	15,537 cf	**Custom Stage Data (Irregular)** Listed below

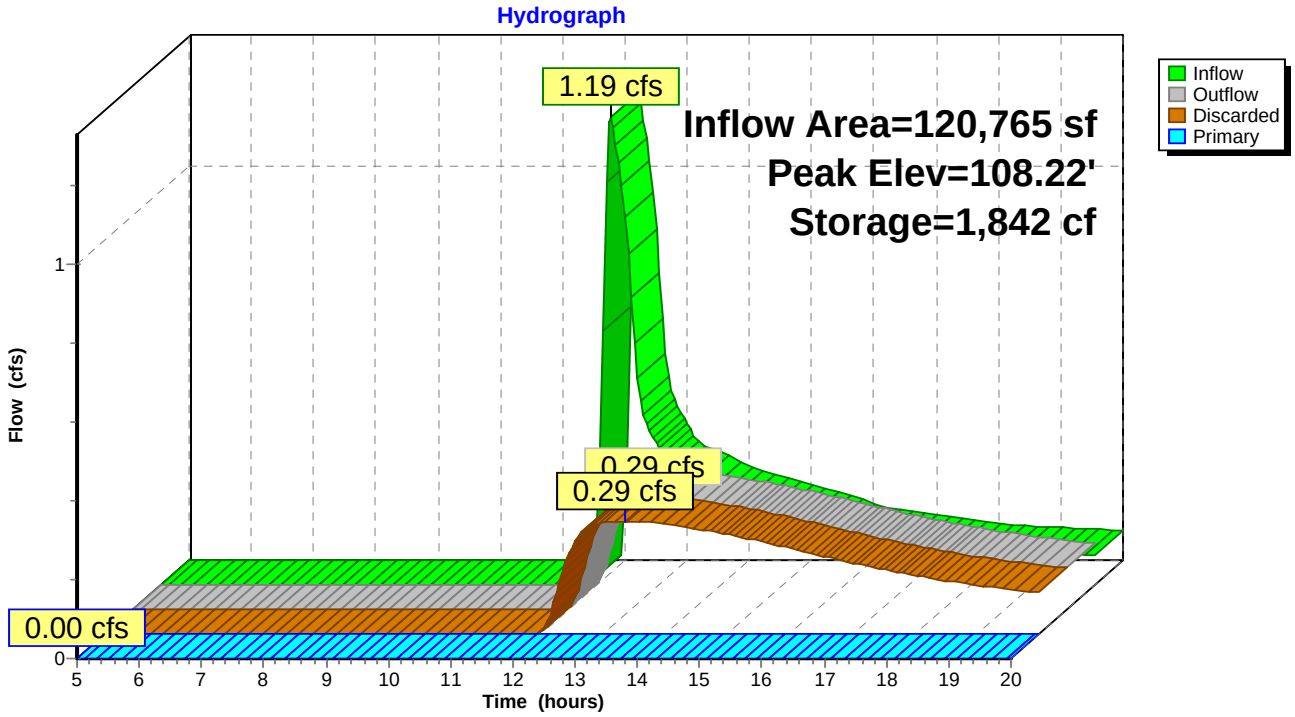
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
108.00	235	88.4	0	0	235
109.00	22,339	964.5	8,288	8,288	73,643
109.30	26,033	945.2	7,249	15,537	76,590

Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**2.0' 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
#2	Discarded	108.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.29 cfs @ 13.35 hrs HW=108.22' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0
108.02	677	166
108.04	1,119	332
108.06	1,561	497
108.08	2,003	663
108.10	2,445	829
108.12	2,887	995
108.14	3,330	1,160
108.16	3,772	1,326
108.18	4,214	1,492
108.20	4,656	1,658
108.22	5,098	1,823
108.24	5,540	1,989
108.26	5,982	2,155
108.28	6,424	2,321
108.30	6,866	2,487
108.32	7,308	2,652
108.34	7,750	2,818
108.36	8,192	2,984
108.38	8,635	3,150
108.40	9,077	3,315
108.42	9,519	3,481
108.44	9,961	3,647
108.46	10,403	3,813
108.48	10,845	3,978
108.50	11,287	4,144
108.52	11,729	4,310
108.54	12,171	4,476
108.56	12,613	4,642
108.58	13,055	4,807
108.60	13,497	4,973
108.62	13,939	5,139
108.64	14,382	5,305
108.66	14,824	5,470
108.68	15,266	5,636
108.70	15,708	5,802
108.72	16,150	5,968
108.74	16,592	6,133
108.76	17,034	6,299
108.78	17,476	6,465
108.80	17,918	6,631
108.82	18,360	6,796
108.84	18,802	6,962
108.86	19,244	7,128
108.88	19,687	7,294
108.90	20,129	7,460
108.92	20,571	7,625
108.94	21,013	7,791
108.96	21,455	7,957
108.98	21,897	8,123
109.00	22,339	8,288
109.02	22,585	8,772
109.04	22,832	9,255
109.06	23,078	9,738
109.08	23,324	10,221
109.10	23,570	10,705
109.12	23,817	11,188
109.14	24,063	11,671
109.16	24,309	12,154
109.18	24,555	12,638
109.20	24,802	13,121
109.22	25,048	13,604
109.24	25,294	14,087
109.26	25,540	14,571
109.28	25,787	15,054
109.30	**26,033**	**15,537**

Summary for Subcatchment 2NB: To Natural Depression

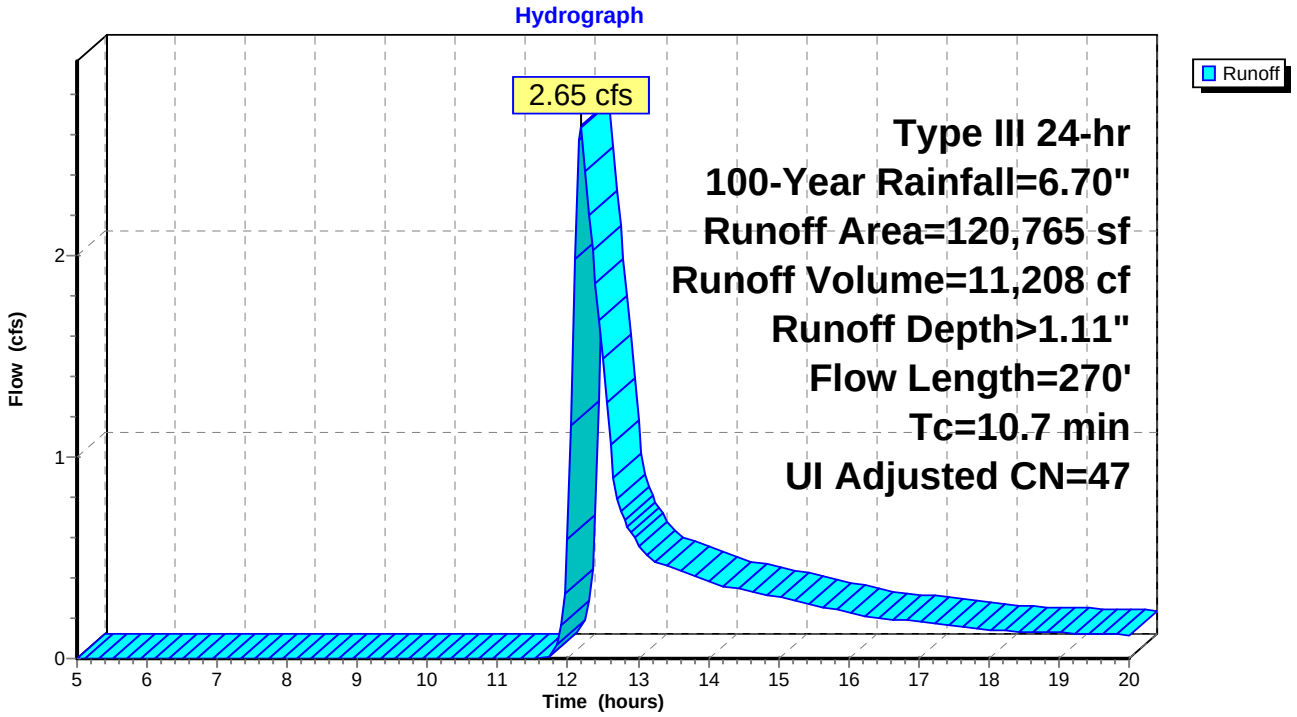
Runoff = 2.65 cfs @ 12.19 hrs, Volume= 11,208 cf, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Adj	Description
35,288	30		Woods, Good, HSG A
16,322	39		>75% Grass cover, Good, HSG A
1,290	98		Unconnected pavement, HSG A
45,809	55		Woods, Good, HSG B
19,907	61		>75% Grass cover, Good, HSG B
2,149	98		Unconnected roofs, HSG B
120,765	48	47	Weighted Average, UI Adjusted
117,326			97.15% Pervious Area
3,439			2.85% Impervious Area
3,439			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, AB-Grass** Grass: Short n= 0.150 P2= 3.20"
1.1	76	0.0533	1.15		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
5.3	144	0.0083	0.46		**Shallow Concentrated Flow, CD-Woods** Woodland Kv= 5.0 fps
10.7	270	Total			

Subcatchment 2NB: To Natural Depression



Summary for Subcatchment N: Offsite North

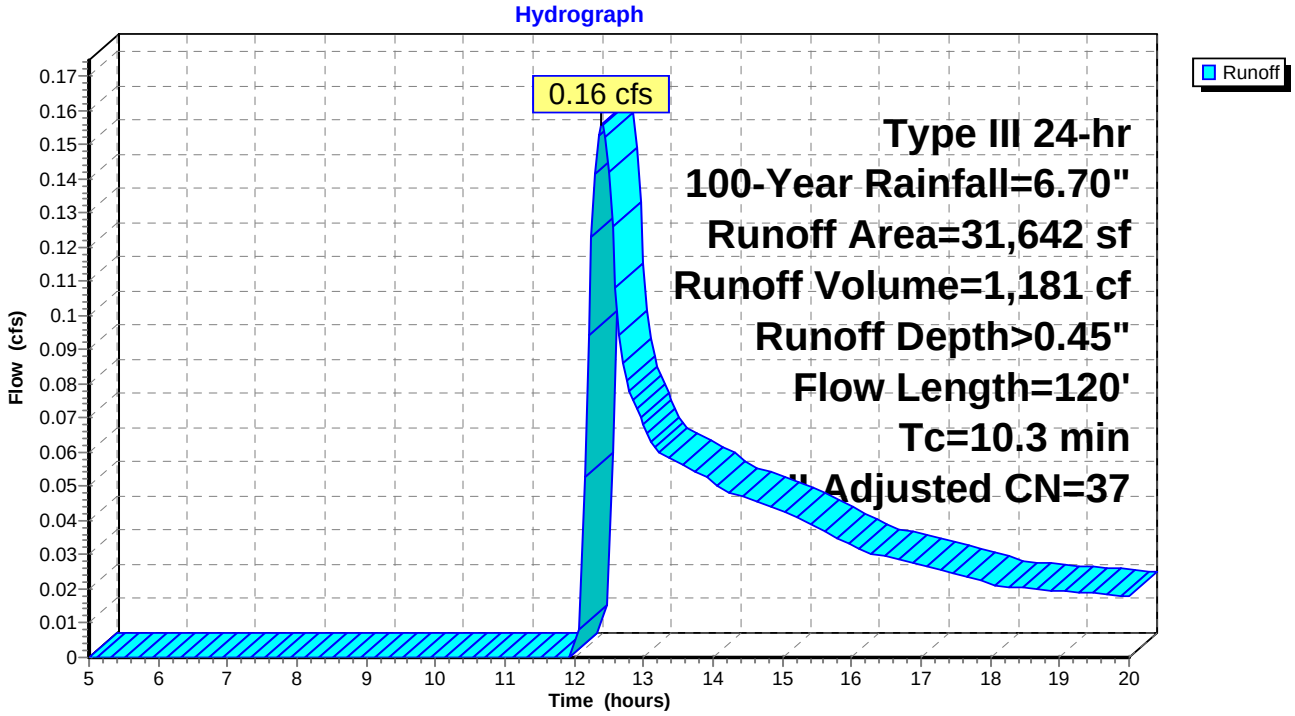
Runoff = 0.16 cfs @ 12.40 hrs, Volume= 1,181 cf, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Adj	Description
25,134	30		Woods, Good, HSG A
2,727	39		>75% Grass cover, Good, HSG A
3,154	85		Gravel roads, HSG B
627	98		Unconnected pavement, HSG A
31,642	38	37	Weighted Average, UI Adjusted
31,015			98.02% Pervious Area
627			1.98% Impervious Area
627			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
1.0	70	0.0500	1.12		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
10.3	120	Total			

Subcatchment N: Offsite North



Summary for Subcatchment S: Onsite South

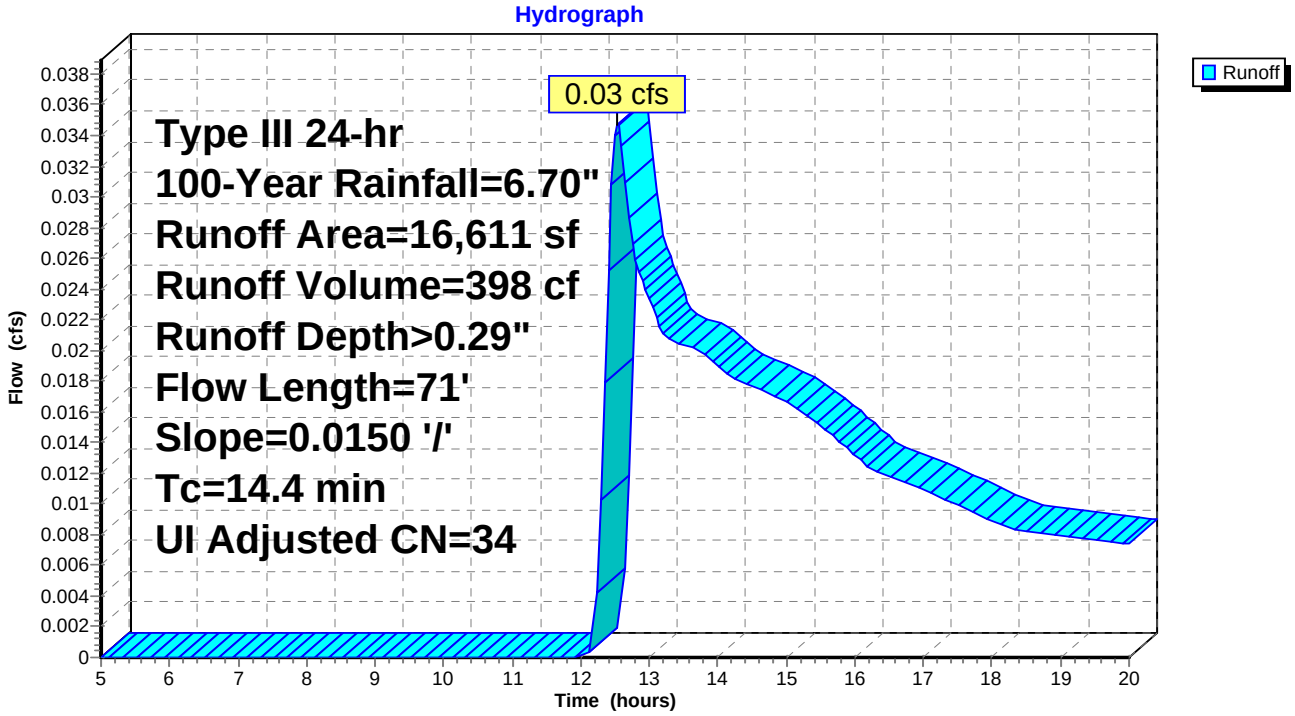
Runoff = 0.03 cfs @ 12.54 hrs, Volume= 398 cf, Depth> 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Adj	Description
13,154	30		Woods, Good, HSG A
2,356	39		>75% Grass cover, Good, HSG A
1,033	98		Unconnected roofs, HSG A
68	55		Woods, Good, HSG B
16,611	36	34	Weighted Average, UI Adjusted
15,578			93.78% Pervious Area
1,033			6.22% Impervious Area
1,033			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South

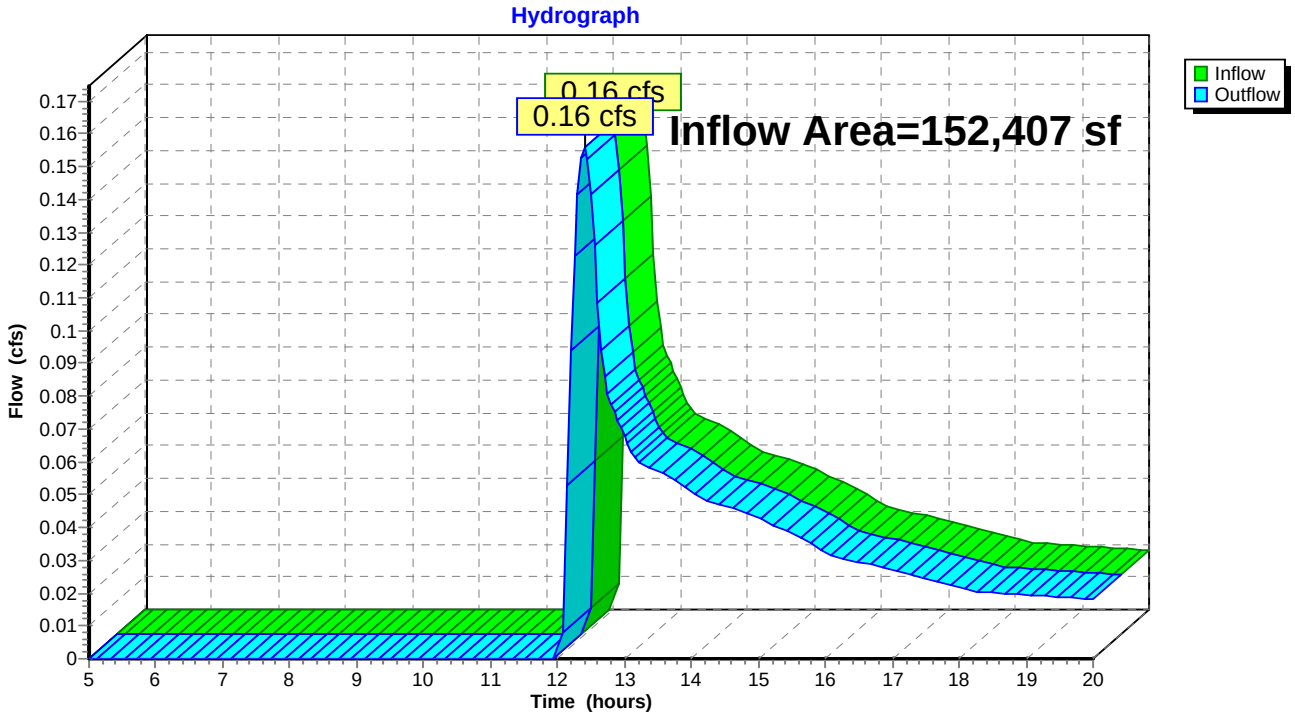


Summary for Reach TN: Total North

Inflow Area = 152,407 sf, 2.67% Impervious, Inflow Depth > 0.09" for 100-Year event
Inflow = 0.16 cfs @ 12.40 hrs, Volume= 1,181 cf
Outflow = 0.16 cfs @ 12.40 hrs, Volume= 1,181 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ND: Natural Depression

Inflow Area = 120,765 sf, 2.85% Impervious, Inflow Depth > 1.11" for 100-Year event
Inflow = 2.65 cfs @ 12.19 hrs, Volume= 11,208 cf
Outflow = 0.56 cfs @ 13.02 hrs, Volume= 10,197 cf, Atten= 79%, Lag= 49.9 min
Discarded = 0.56 cfs @ 13.02 hrs, Volume= 10,197 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.45' @ 13.02 hrs Surf.Area= 10,118 sf Storage= 3,706 cf

Plug-Flow detention time= 101.0 min calculated for 10,197 cf (91% of inflow)
Center-of-Mass det. time= 72.6 min (918.7 - 846.1)

Volume	Invert	Avail.Storage	Storage Description
#1	108.00'	15,537 cf	**Custom Stage Data (Irregular)**Listed below

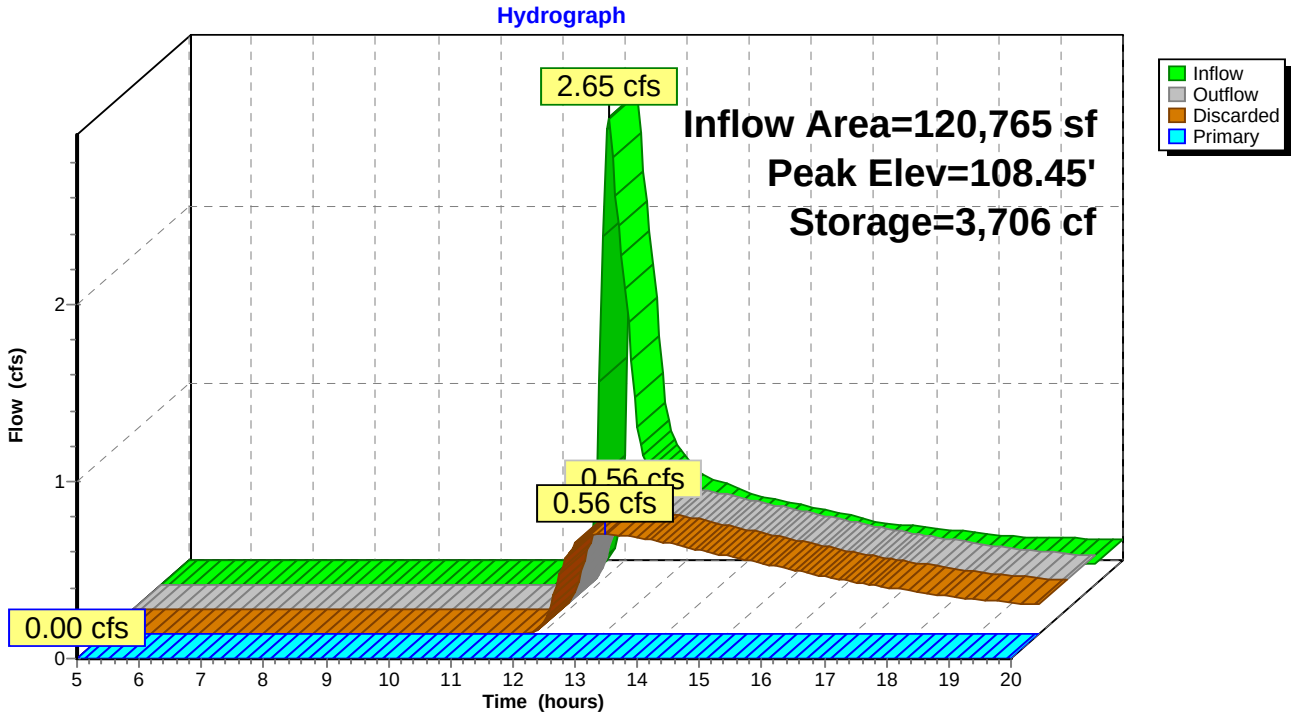
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
108.00	235	88.4	0	0	235
109.00	22,339	964.5	8,288	8,288	73,643
109.30	26,033	945.2	7,249	15,537	76,590

Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**2.0' 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
#2	Discarded	108.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.56 cfs @ 13.02 hrs HW=108.45' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.56 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0
108.02	677	166
108.04	1,119	332
108.06	1,561	497
108.08	2,003	663
108.10	2,445	829
108.12	2,887	995
108.14	3,330	1,160
108.16	3,772	1,326
108.18	4,214	1,492
108.20	4,656	1,658
108.22	5,098	1,823
108.24	5,540	1,989
108.26	5,982	2,155
108.28	6,424	2,321
108.30	6,866	2,487
108.32	7,308	2,652
108.34	7,750	2,818
108.36	8,192	2,984
108.38	8,635	3,150
108.40	9,077	3,315
108.42	9,519	3,481
108.44	9,961	3,647
108.46	10,403	3,813
108.48	10,845	3,978
108.50	11,287	4,144
108.52	11,729	4,310
108.54	12,171	4,476
108.56	12,613	4,642
108.58	13,055	4,807
108.60	13,497	4,973
108.62	13,939	5,139
108.64	14,382	5,305
108.66	14,824	5,470
108.68	15,266	5,636
108.70	15,708	5,802
108.72	16,150	5,968
108.74	16,592	6,133
108.76	17,034	6,299
108.78	17,476	6,465
108.80	17,918	6,631
108.82	18,360	6,796
108.84	18,802	6,962
108.86	19,244	7,128
108.88	19,687	7,294
108.90	20,129	7,460
108.92	20,571	7,625
108.94	21,013	7,791
108.96	21,455	7,957
108.98	21,897	8,123
109.00	22,339	8,288
109.02	22,585	8,772
109.04	22,832	9,255
109.06	23,078	9,738
109.08	23,324	10,221
109.10	23,570	10,705
109.12	23,817	11,188
109.14	24,063	11,671
109.16	24,309	12,154
109.18	24,555	12,638
109.20	24,802	13,121
109.22	25,048	13,604
109.24	25,294	14,087
109.26	25,540	14,571
109.28	25,787	15,054
109.30	**26,033**	**15,537**

APPENDIX B

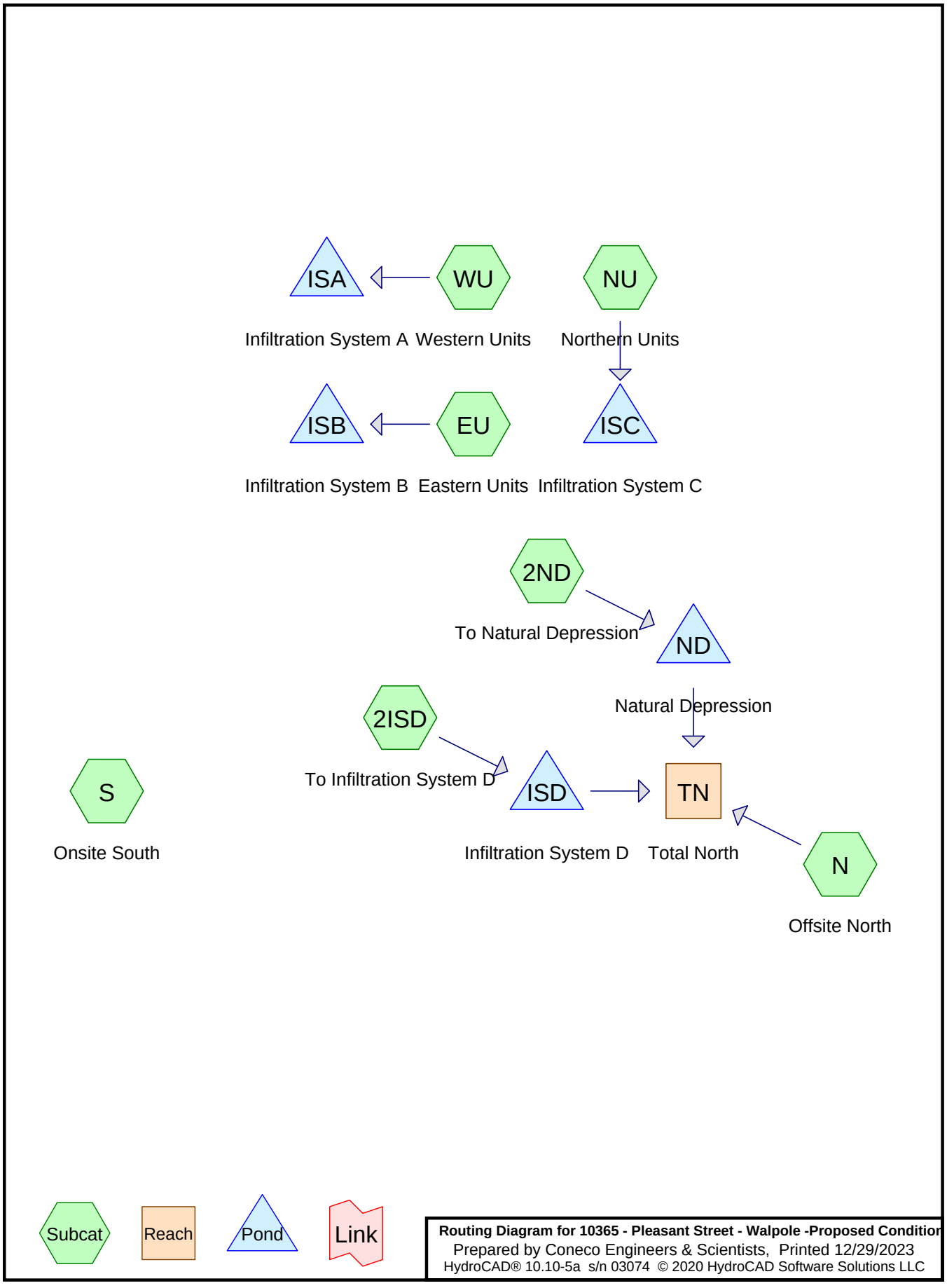
PROPOSED HYDROLOGICAL CONDITIONS

2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

100-YEAR STORM EVENT


ISA
WU
NU
Infiltration System A
Western Units
Northern Units
ISB
EU
ISC
Infiltration System B
Eastern Units
Infiltration System C
2ND
To Natural Depression
ND
Natural Depression
2ISD
To Infiltration System D
S
ISD
TN
Onsite South
Infiltration System D
Total North
N
Offsite North
Subcat
Reach
Pond
Link
Routing Diagram for 10365 - Pleasant Street - Walpole -Proposed Condition
Prepared by Coneco Engineers & Scientists, Printed 12/29/2023
HydroCAD® 10.10-5a s/n 03074 © 2020 HydroCAD Software Solutions LLC

Summary for Subcatchment 2ISD: To Infiltration System D

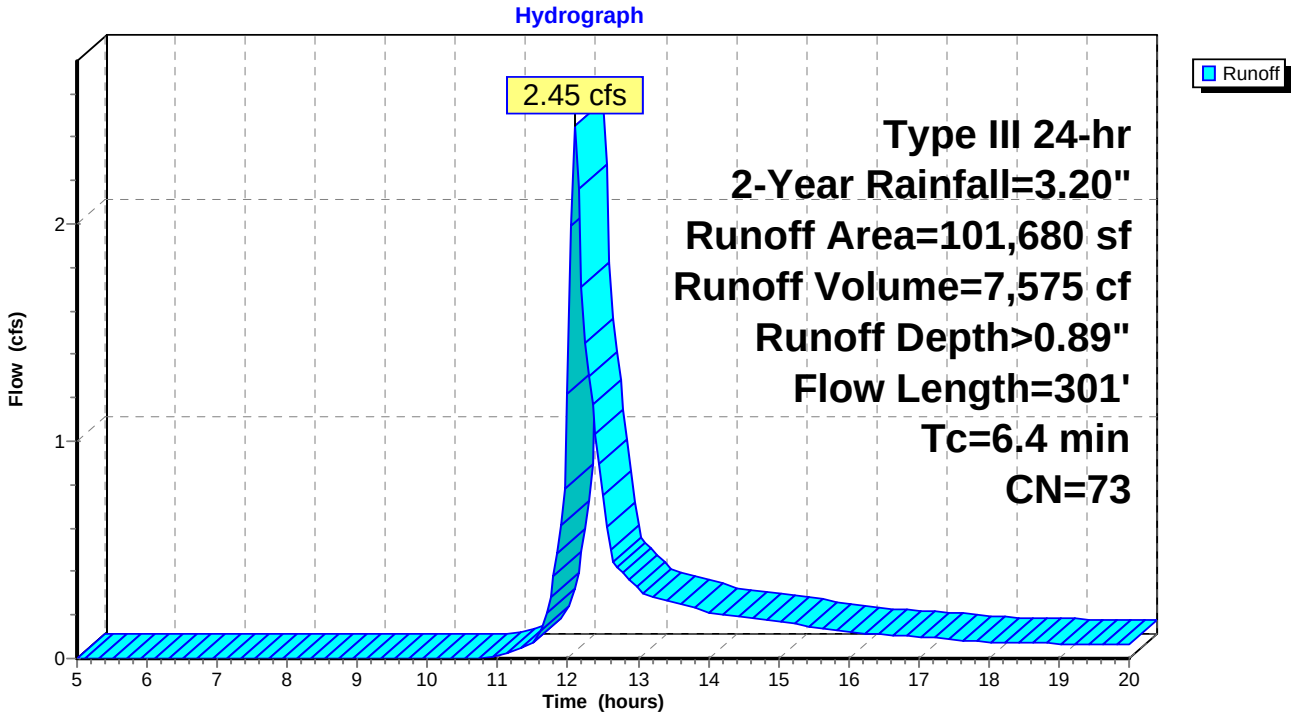
Runoff = 2.45 cfs @ 12.11 hrs, Volume= 7,575 cf, Depth> 0.89"

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

Area (sf)	CN	Description
3,068	30	Woods, Good, HSG A
15,416	39	>75% Grass cover, Good, HSG A
21,166	98	Paved parking, HSG A
1,960	55	Woods, Good, HSG B
35,957	61	>75% Grass cover, Good, HSG B
973	96	Gravel surface, HSG B
23,140	98	Paved parking, HSG B
101,680	73	Weighted Average
57,374		56.43% Pervious Area
44,306		43.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Grass AB** Grass: Short n= 0.150 P2= 3.20"
1.6	115	0.0300	1.21		**Shallow Concentrated Flow, Grass BC** Short Grass Pasture Kv= 7.0 fps
0.5	136	0.0100	4.54	3.56	**Pipe Channel, Pipe CD** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
6.4	301	Total			

Subcatchment 2ISD: To Infiltration System D



Summary for Subcatchment 2ND: To Natural Depression

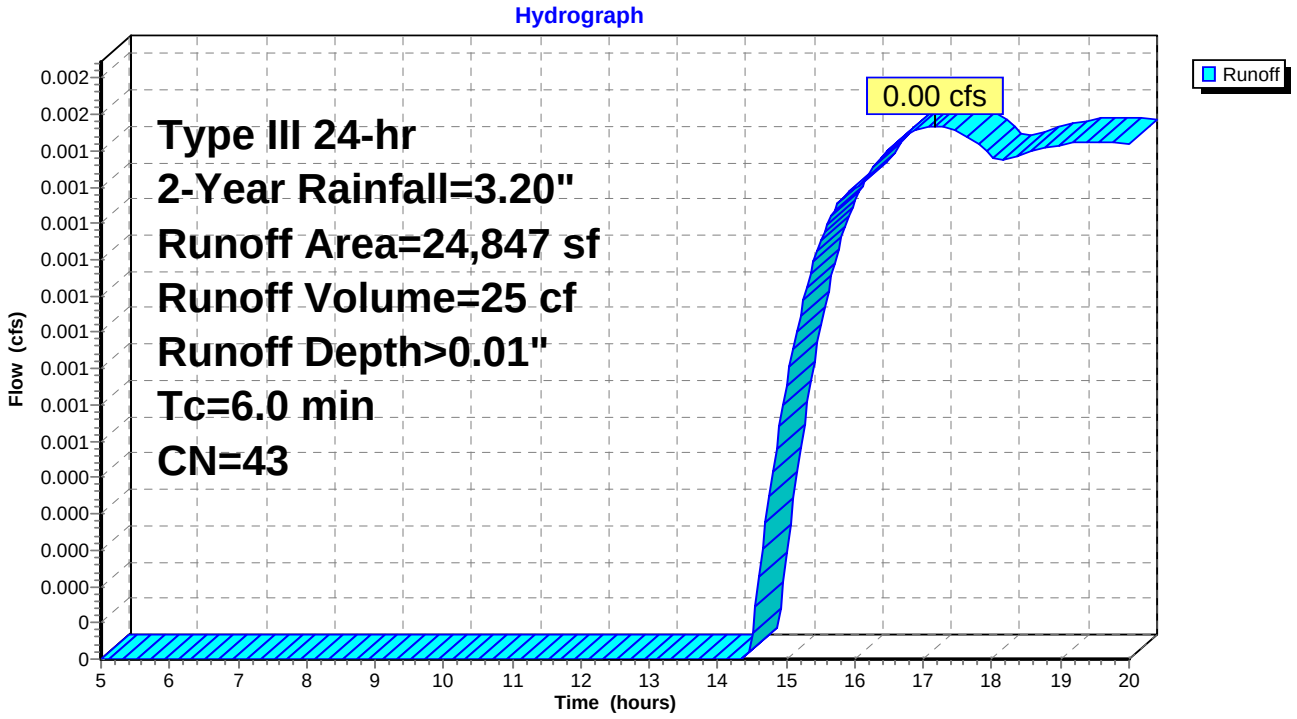
Runoff = 0.00 cfs @ 17.17 hrs, Volume= 25 cf, Depth> 0.01"

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

Area (sf)	CN	Description
4,045	30	Woods, Good, HSG A
18,342	39	>75% Grass cover, Good, HSG A
1,946	96	Gravel surface, HSG A
253	98	Paved parking, HSG A
261	61	>75% Grass cover, Good, HSG B
24,847	43	Weighted Average
24,594		98.98% Pervious Area
253		1.02% Impervious Area

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

Subcatchment 2ND: To Natural Depression



Summary for Subcatchment EU: Eastern Units

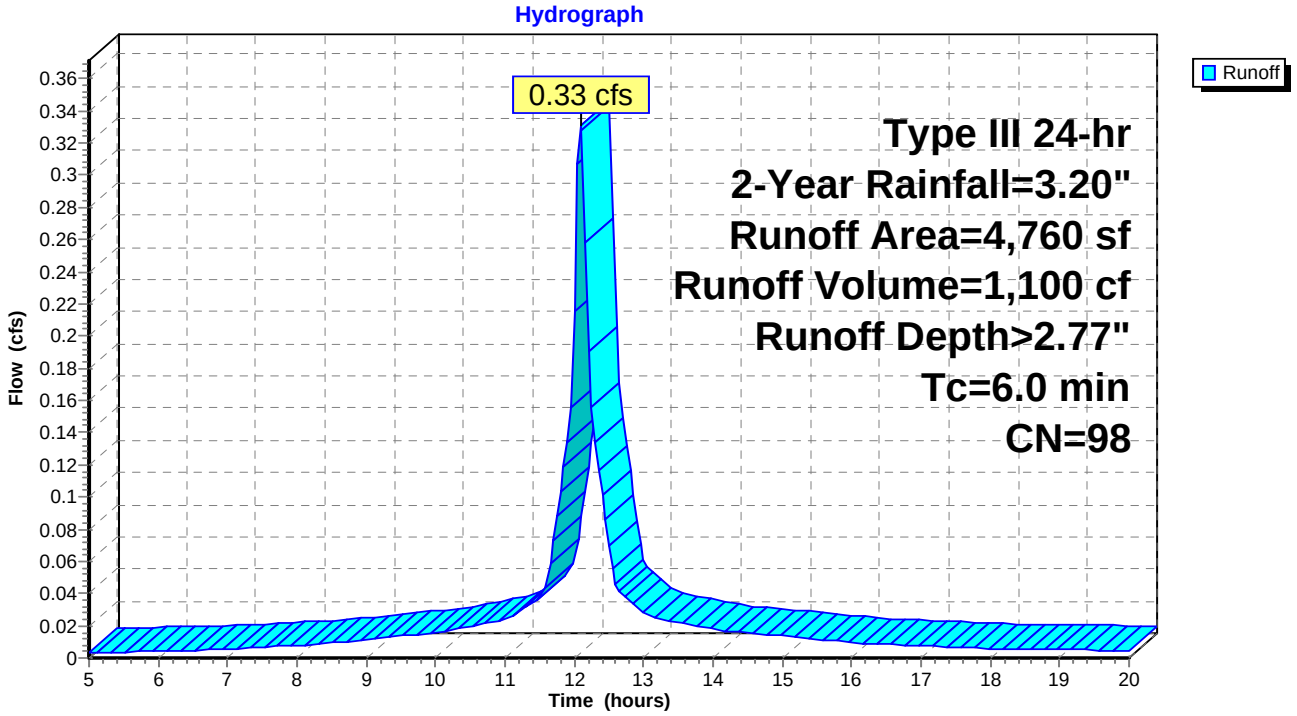
Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf, Depth> 2.77"

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

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment EU: Eastern Units



Summary for Subcatchment N: Offsite North

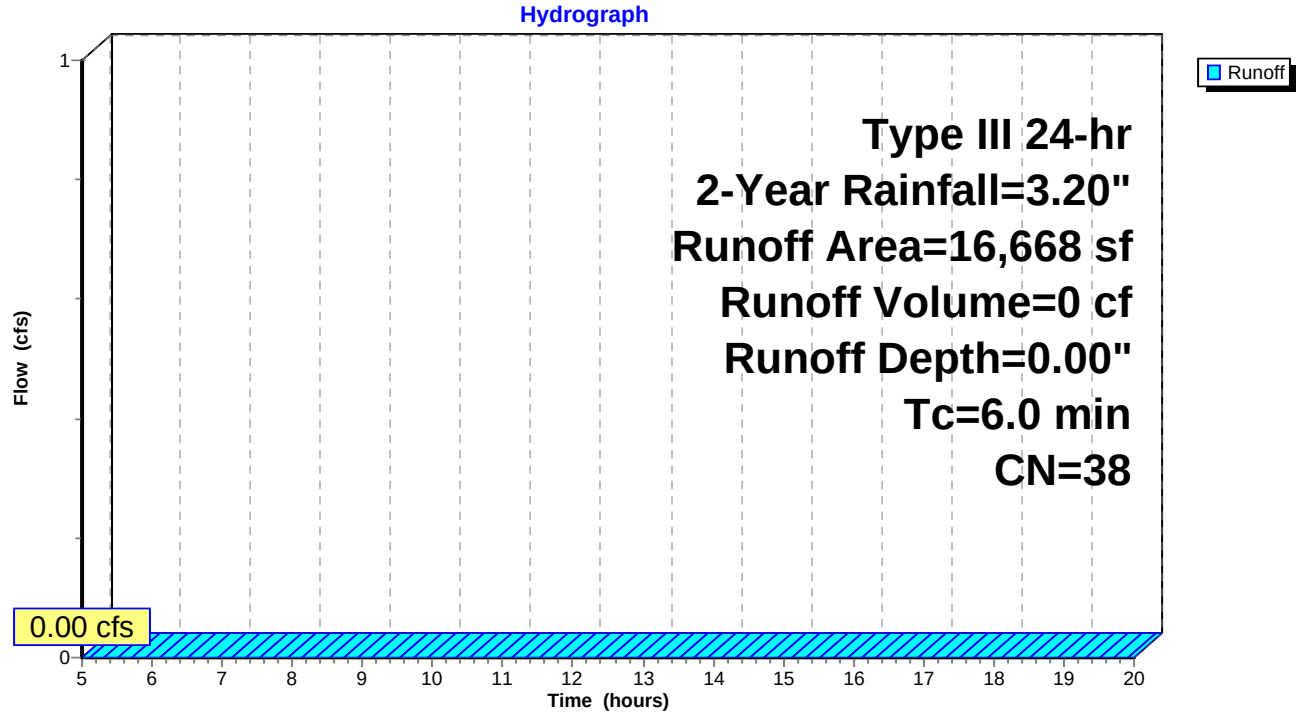
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

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

Area (sf)	CN	Description
4,653	30	Woods, Good, HSG A
11,477	39	>75% Grass cover, Good, HSG A
417	96	Gravel surface, HSG A
121	98	Paved parking, HSG A
16,668	38	Weighted Average
16,547		99.27% Pervious Area
121		0.73% Impervious Area

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

Subcatchment N: Offsite North



Summary for Subcatchment NU: Northern Units

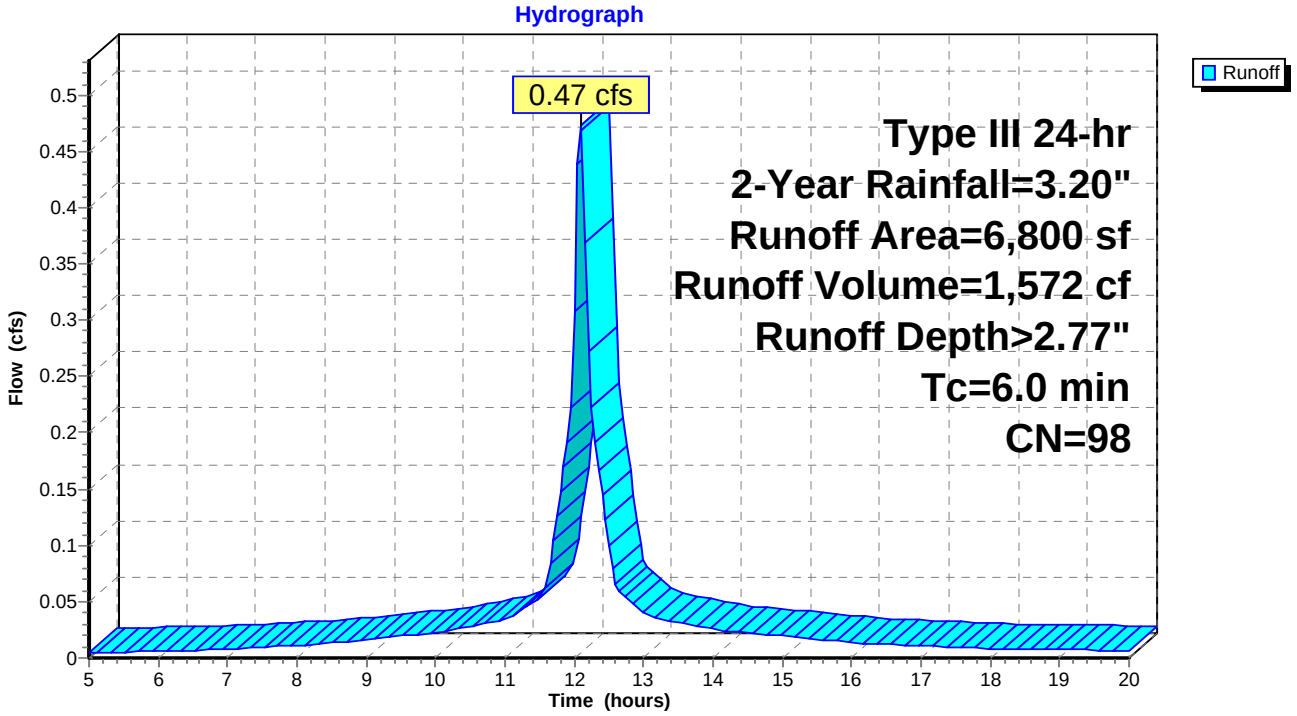
Runoff = 0.47 cfs @ 12.09 hrs, Volume= 1,572 cf, Depth> 2.77"

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

Area (sf)	CN	Description
6,800	98	Roofs, HSG D
6,800		100.00% Impervious Area

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

Subcatchment NU: Northern Units



Summary for Subcatchment S: Onsite South

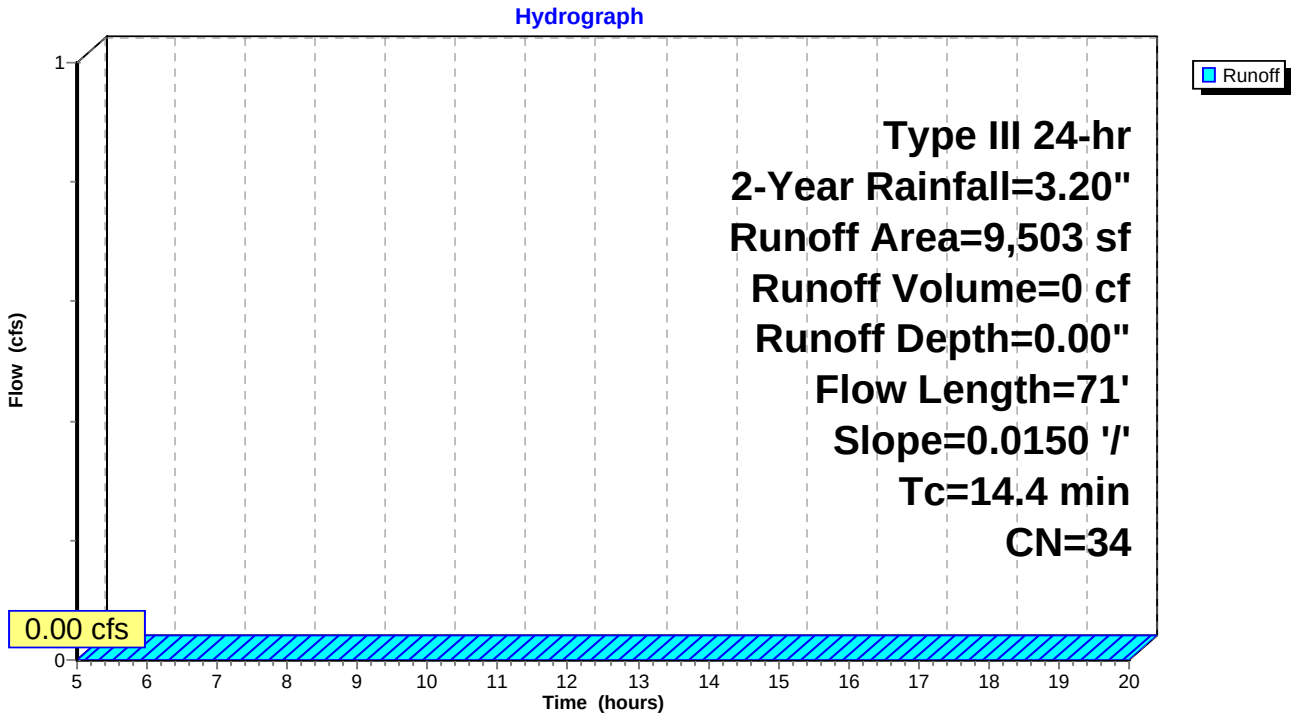
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

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

Area (sf)	CN	Description
5,286	30	Woods, Good, HSG A
4,154	39	>75% Grass cover, Good, HSG A
63	98	Unconnected roofs, HSG A
9,503	34	Weighted Average
9,440		99.34% Pervious Area
63		0.66% Impervious Area
63		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South



Summary for Subcatchment WU: Western Units

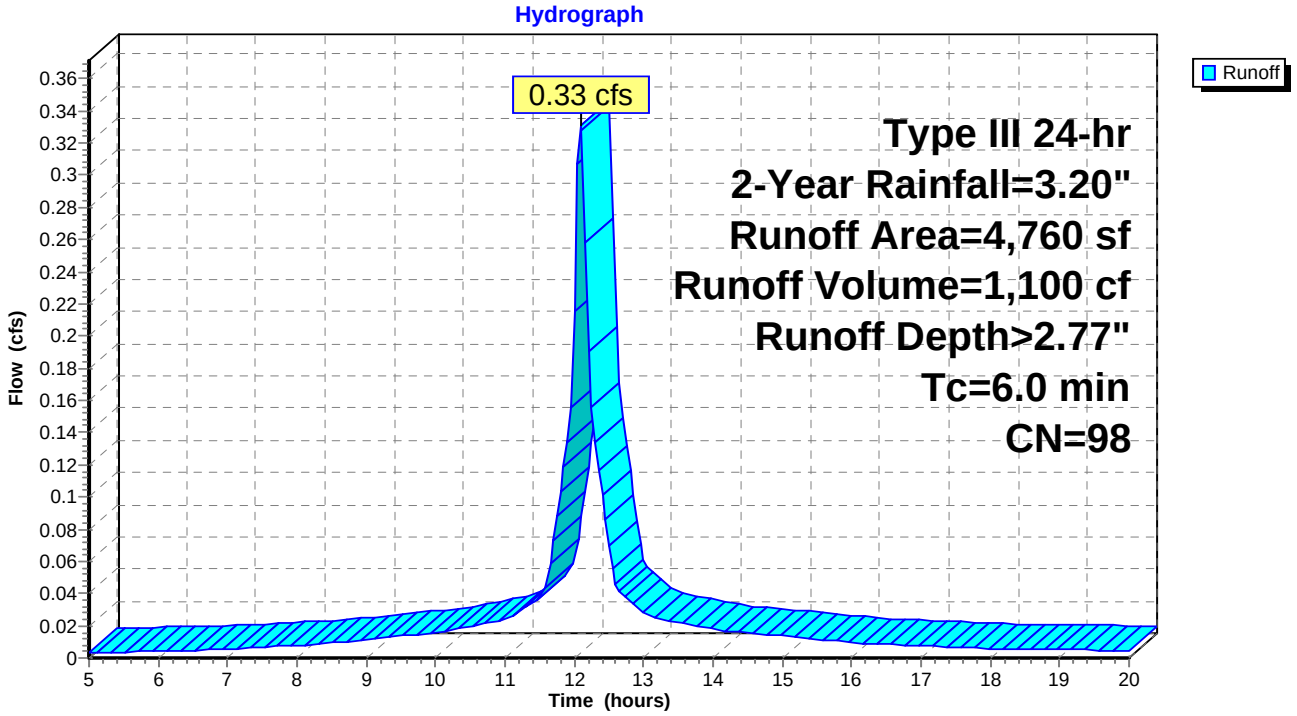
Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf, Depth> 2.77"

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

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment WU: Western Units

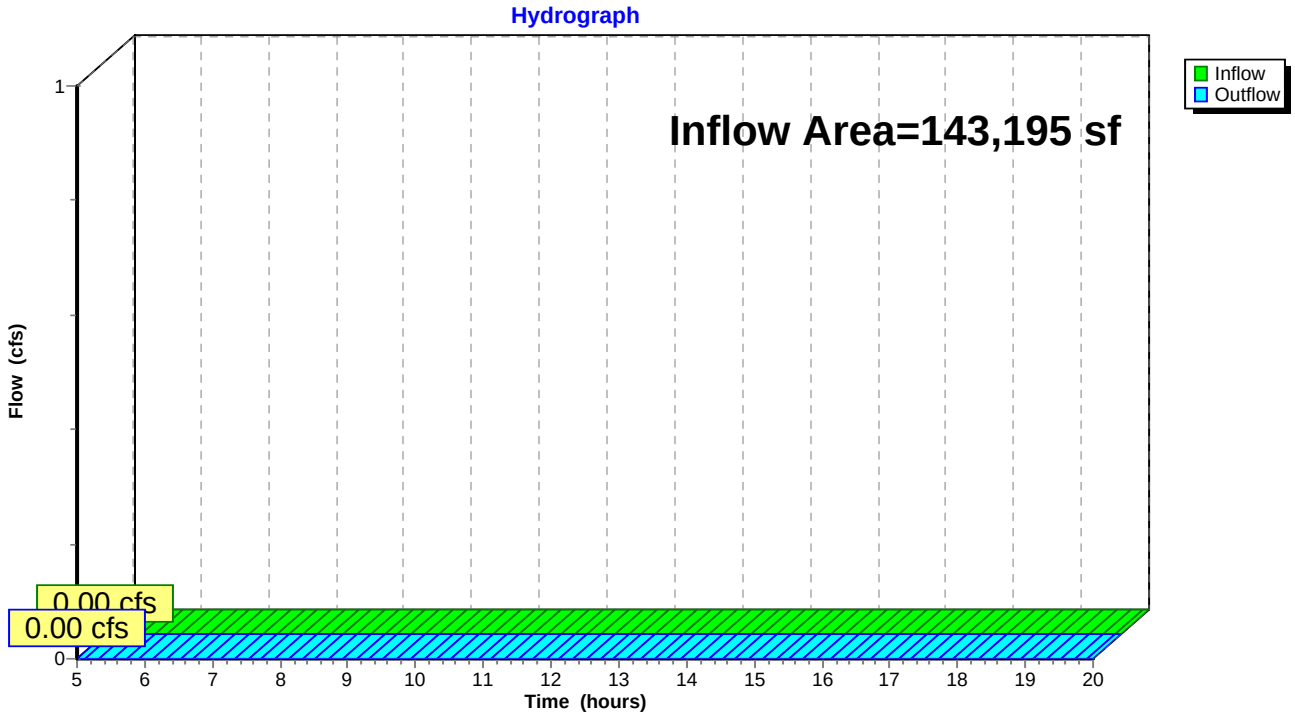


Summary for Reach TN: Total North

Inflow Area = 143,195 sf, 31.20% 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

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ISA: Infiltration System A

Inflow Area = 4,760 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
Outflow = 0.08 cfs @ 11.80 hrs, Volume= 1,100 cf, Atten= 75%, Lag= 0.0 min
Discarded = 0.08 cfs @ 11.80 hrs, Volume= 1,100 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 106.92' @ 12.46 hrs Surf.Area= 430 sf Storage= 232 cf

Plug-Flow detention time= 14.4 min calculated for 1,100 cf (100% of inflow)
Center-of-Mass det. time= 14.2 min (752.7 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	391 cf	**11.17'W x 38.50'L x 3.54'H Field A** 1,523 cf Overall - 544 cf Embedded = 979 cf x 40.0% Voids
#2A	106.50'	544 cf	**Cultec R-330XLHD** x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		935 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 11.80 hrs HW=106.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.08 cfs)

Pond ISA: Infiltration System A - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

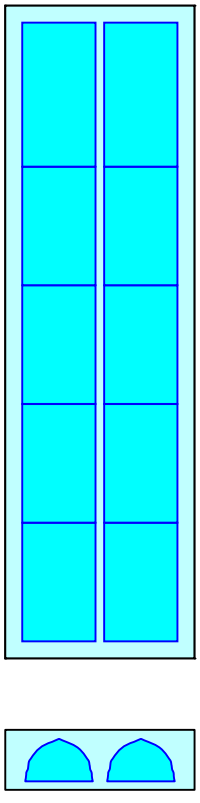
5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +12.0" End Stone x 2 = 38.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 543.9 cf Chamber Storage

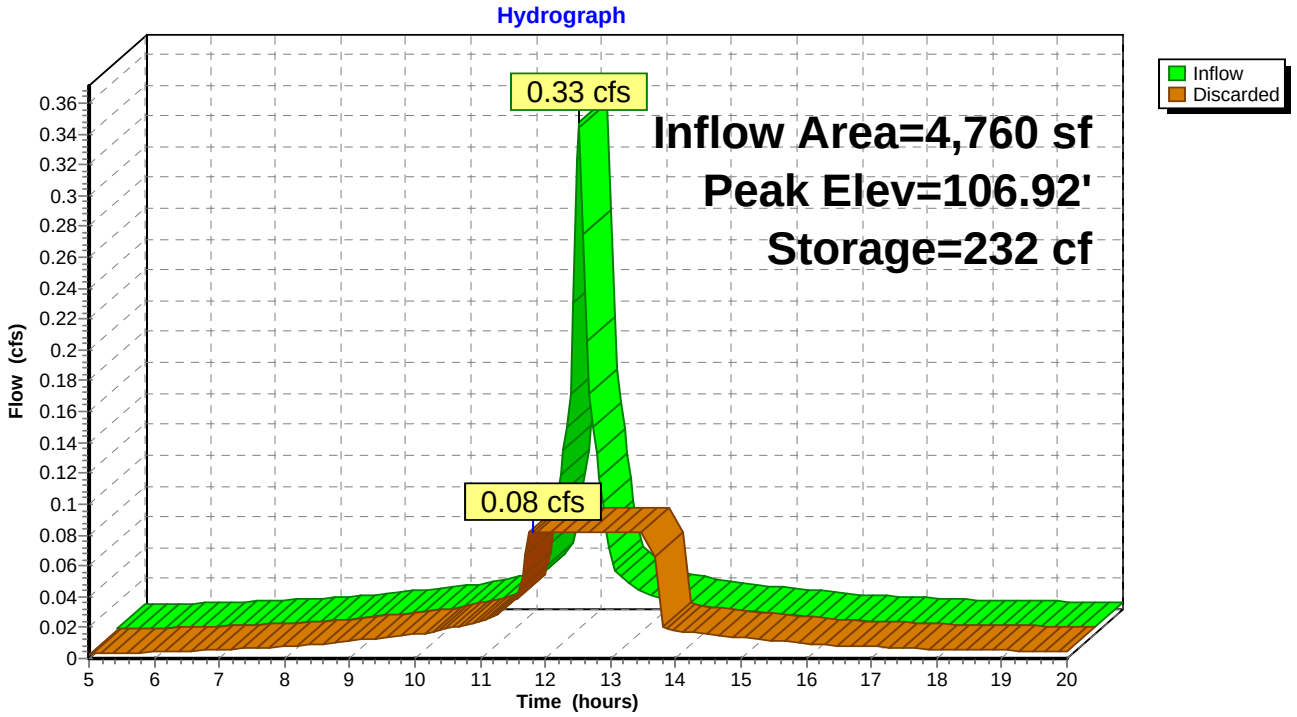
1,522.6 cf Field - 543.9 cf Chambers = 978.7 cf Stone x 40.0% Voids = 391.5 cf Stone Storage

Chamber Storage + Stone Storage = 935.4 cf = 0.021 af
Overall Storage Efficiency = 61.4%
Overall System Size = 38.50' x 11.17' x 3.54'

10 Chambers
56.4 cy Field
36.2 cy Stone



Pond ISA: Infiltration System A



Stage-Area-Storage for Pond ISA: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	**430**	0
106.05	430	9
106.10	430	17
106.15	430	26
106.20	430	34
106.25	430	43
106.30	430	52
106.35	430	60
106.40	430	69
106.45	430	77
106.50	430	86
106.55	430	103
106.60	430	121
106.65	430	138
106.70	430	155
106.75	430	172
106.80	430	189
106.85	430	206
106.90	430	223
106.95	430	240
107.00	430	257
107.05	430	275
107.10	430	291
107.15	430	308
107.20	430	325
107.25	430	342
107.30	430	358
107.35	430	375
107.40	430	391
107.45	430	408
107.50	430	424
107.55	430	441
107.60	430	457
107.65	430	474
107.70	430	490
107.75	430	506
107.80	430	522
107.85	430	538
107.90	430	554
107.95	430	570
108.00	430	585
108.05	430	600
108.10	430	616
108.15	430	631
108.20	430	645
108.25	430	660
108.30	430	675
108.35	430	689
108.40	430	703
108.45	430	717
108.50	430	730
108.55	430	743
108.60	430	756
108.65	430	769
108.70	430	781
108.75	430	792
108.80	430	803
108.85	430	814
108.90	430	824
108.95	430	833
109.00	430	842
109.05	430	851
109.10	430	859
109.15	430	868
109.20	430	877
109.25	430	885
109.30	430	894
109.35	430	902
109.40	430	911
109.45	430	920
109.50	430	**928**

Summary for Pond ISB: Infiltration System B

Inflow Area = 4,760 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
Outflow = 0.03 cfs @ 11.45 hrs, Volume= 1,099 cf, Atten= 90%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.45 hrs, Volume= 1,099 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 106.61' @ 12.87 hrs Surf.Area= 586 sf Storage= 403 cf

Plug-Flow detention time= 90.9 min calculated for 1,099 cf (100% of inflow)
Center-of-Mass det. time= 90.2 min (828.8 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.50'	530 cf	**11.17'W x 52.50'L x 3.54'H Field A** 2,076 cf Overall - 753 cf Embedded = 1,324 cf x 40.0% Voids
#2A	106.00'	753 cf	**Cultec R-330XLHD** x 14 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.45 hrs HW=105.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond ISB: Infiltration System B - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

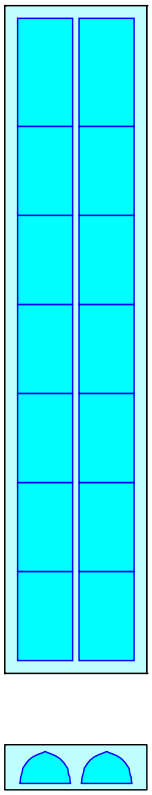
7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

14 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 752.6 cf Chamber Storage

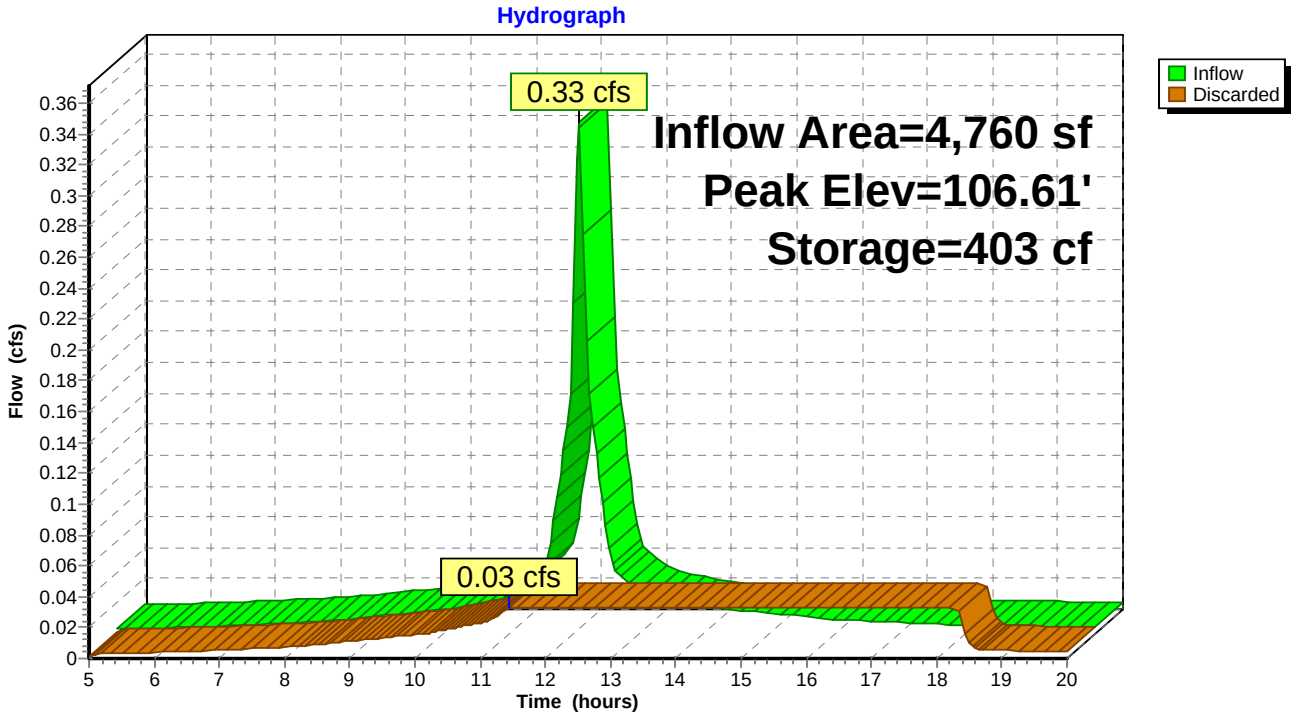
2,076.3 cf Field - 752.6 cf Chambers = 1,323.8 cf Stone x 40.0% Voids = 529.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,282.1 cf = 0.029 af
Overall Storage Efficiency = 61.7%
Overall System Size = 52.50' x 11.17' x 3.54'

14 Chambers
76.9 cy Field
49.0 cy Stone



Pond ISB: Infiltration System B



Stage-Area-Storage for Pond ISB: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.50	**586**	0
105.55	586	12
105.60	586	23
105.65	586	35
105.70	586	47
105.75	586	59
105.80	586	70
105.85	586	82
105.90	586	94
105.95	586	106
106.00	586	117
106.05	586	141
106.10	586	165
106.15	586	188
106.20	586	212
106.25	586	235
106.30	586	259
106.35	586	282
106.40	586	306
106.45	586	329
106.50	586	353
106.55	586	376
106.60	586	399
106.65	586	423
106.70	586	446
106.75	586	468
106.80	586	491
106.85	586	514
106.90	586	537
106.95	586	559
107.00	586	582
107.05	586	605
107.10	586	627
107.15	586	650
107.20	586	672
107.25	586	694
107.30	586	717
107.35	586	738
107.40	586	760
107.45	586	781
107.50	586	803
107.55	586	824
107.60	586	844
107.65	586	865
107.70	586	885
107.75	586	906
107.80	586	925
107.85	586	945
107.90	586	964
107.95	586	983
108.00	586	1,002
108.05	586	1,020
108.10	586	1,037
108.15	586	1,055
108.20	586	1,071
108.25	586	1,087
108.30	586	1,102
108.35	586	1,116
108.40	586	1,130
108.45	586	1,143
108.50	586	1,155
108.55	586	1,167
108.60	586	1,178
108.65	586	1,190
108.70	586	1,202
108.75	586	1,214
108.80	586	1,225
108.85	586	1,237
108.90	586	1,249
108.95	586	1,261
109.00	586	**1,272**

Summary for Pond ISC: Infiltration System C

Inflow Area = 6,800 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.47 cfs @ 12.09 hrs, Volume= 1,572 cf
Outflow = 0.03 cfs @ 10.70 hrs, Volume= 1,189 cf, Atten= 94%, Lag= 0.0 min
Discarded = 0.03 cfs @ 10.70 hrs, Volume= 1,189 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 105.50' @ 13.80 hrs Surf.Area= 1,190 sf Storage= 723 cf

Plug-Flow detention time= 161.5 min calculated for 1,184 cf (75% of inflow)
Center-of-Mass det. time= 101.2 min (839.8 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	578 cf	**20.83'W x 31.50'L x 3.54'H Field A** 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#2A	105.00'	879 cf	**Cultec R-330XLHD** x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
#3B	104.50'	479 cf	**30.50'W x 17.50'L x 3.54'H Field B** 1,890 cf Overall - 693 cf Embedded = 1,197 cf x 40.0% Voids
#4B	105.00'	693 cf	**Cultec R-330XLHD** x 12 Inside #3 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		2,629 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 10.70 hrs HW=104.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond ISC: Infiltration System C - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

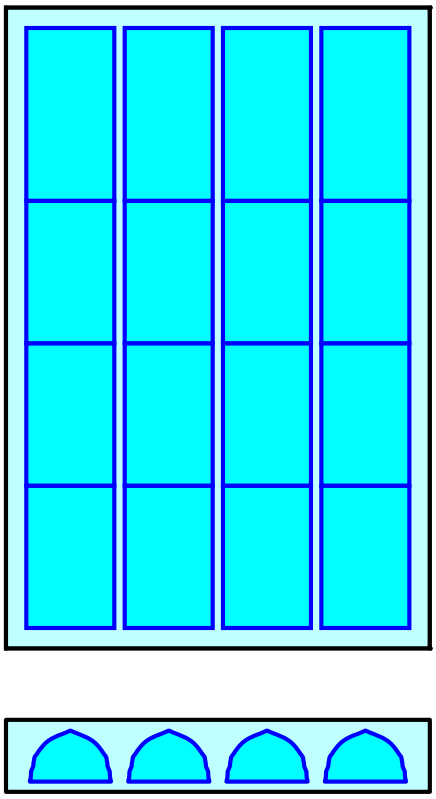
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%
Overall System Size = 31.50' x 20.83' x 3.54'

16 Chambers
86.1 cy Field
53.5 cy Stone



Pond ISC: Infiltration System C - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

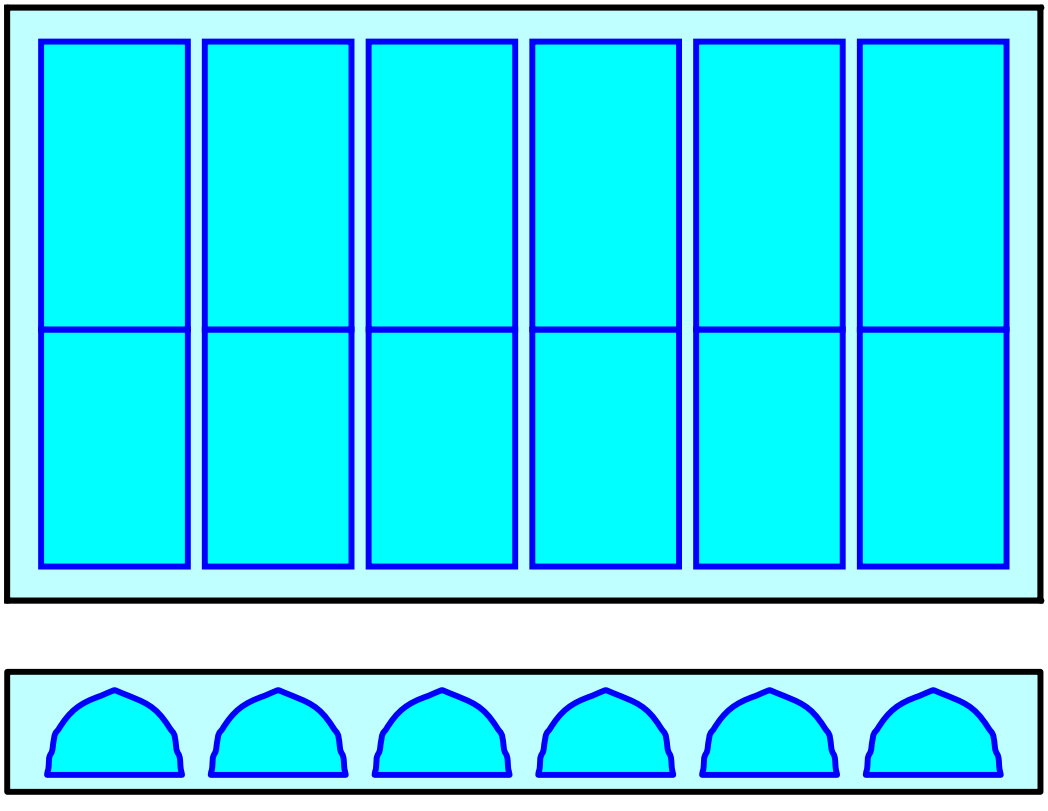
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 692.9 cf Chamber Storage

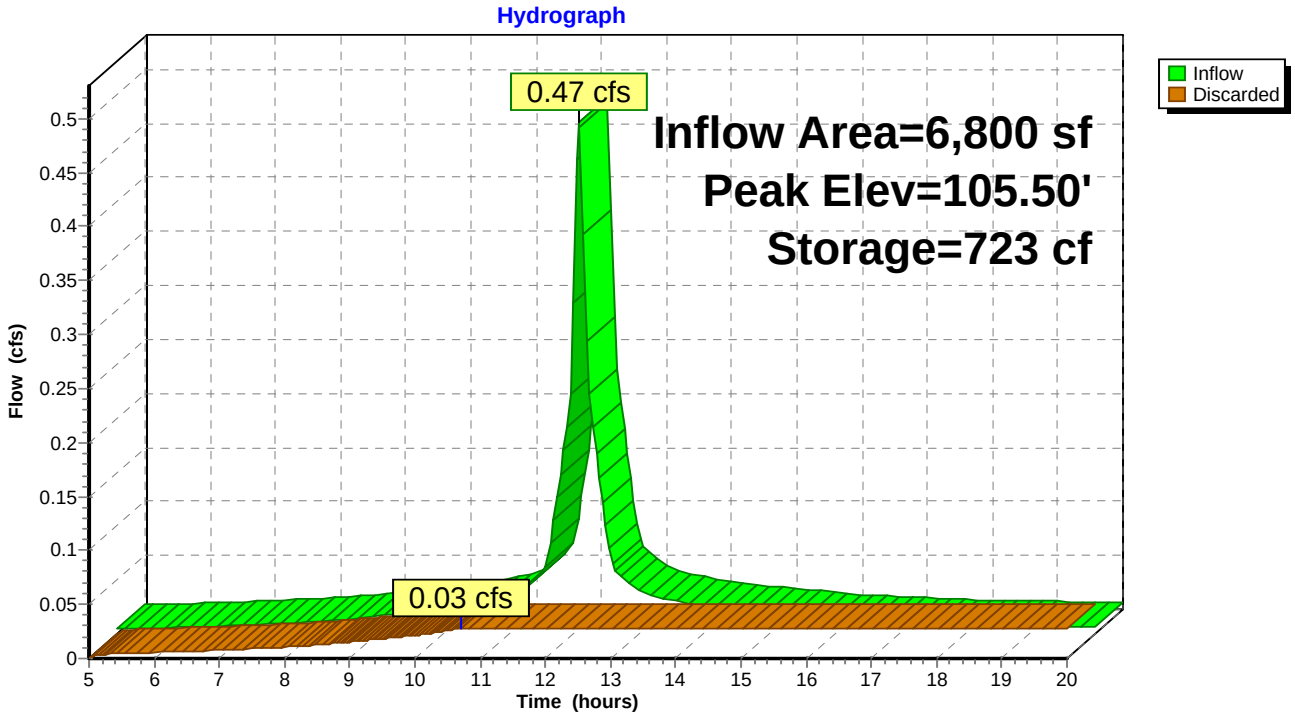
1,890.4 cf Field - 692.9 cf Chambers = 1,197.4 cf Stone x 40.0% Voids = 479.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,171.9 cf = 0.027 af
Overall Storage Efficiency = 62.0%
Overall System Size = 17.50' x 30.50' x 3.54'

12 Chambers
70.0 cy Field
44.3 cy Stone



Pond ISC: Infiltration System C



Stage-Area-Storage for Pond ISC: Infiltration System C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	**1,190**	0
104.55	1,190	24
104.60	1,190	48
104.65	1,190	71
104.70	1,190	95
104.75	1,190	119
104.80	1,190	143
104.85	1,190	167
104.90	1,190	190
104.95	1,190	214
105.00	1,190	238
105.05	1,190	287
105.10	1,190	336
105.15	1,190	385
105.20	1,190	433
105.25	1,190	482
105.30	1,190	530
105.35	1,190	578
105.40	1,190	627
105.45	1,190	675
105.50	1,190	723
105.55	1,190	771
105.60	1,190	819
105.65	1,190	867
105.70	1,190	914
105.75	1,190	961
105.80	1,190	1,008
105.85	1,190	1,055
105.90	1,190	1,102
105.95	1,190	1,149
106.00	1,190	1,195
106.05	1,190	1,242
106.10	1,190	1,288
106.15	1,190	1,334
106.20	1,190	1,381
106.25	1,190	1,426
106.30	1,190	1,472
106.35	1,190	1,517
106.40	1,190	1,561
106.45	1,190	1,605
106.50	1,190	1,649
106.55	1,190	1,692
106.60	1,190	1,735
106.65	1,190	1,777
106.70	1,190	1,819
106.75	1,190	1,860
106.80	1,190	1,901
106.85	1,190	1,941
106.90	1,190	1,981
106.95	1,190	2,020
107.00	1,190	2,058
107.05	1,190	2,095
107.10	1,190	2,131
107.15	1,190	2,166
107.20	1,190	2,200
107.25	1,190	2,233
107.30	1,190	2,263
107.35	1,190	2,293
107.40	1,190	2,320
107.45	1,190	2,347
107.50	1,190	2,371
107.55	1,190	2,395
107.60	1,190	2,419
107.65	1,190	2,443
107.70	1,190	2,466
107.75	1,190	2,490
107.80	1,190	2,514
107.85	1,190	2,538
107.90	1,190	2,562
107.95	1,190	2,585
108.00	1,190	**2,609**

Summary for Pond ISD: Infiltration System D

Inflow Area = 101,680 sf, 43.57% Impervious, Inflow Depth > 0.89" for 2-Year event
Inflow = 2.45 cfs @ 12.11 hrs, Volume= 7,575 cf
Outflow = 0.21 cfs @ 11.85 hrs, Volume= 6,431 cf, Atten= 91%, Lag= 0.0 min
Discarded = 0.21 cfs @ 11.85 hrs, Volume= 6,431 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 105.70' @ 14.02 hrs Surf.Area= 8,993 sf Storage= 3,351 cf

Plug-Flow detention time= 172.1 min calculated for 6,410 cf (85% of inflow)
Center-of-Mass det. time= 127.8 min (948.9 - 821.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.00'	7,412 cf	**54.67'W x 164.50'L x 3.54'H Field A** 31,849 cf Overall - 13,319 cf Embedded = 18,530 cf x 40.0% Voids
#2A	105.50'	13,319 cf	**Cultec R-330XLHD** x 253 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 11 rows
		20,731 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	105.94'	**12.0" Round Culvert** L= 94.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 105.94' / 105.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	106.49'	**12.0" Round Culvert** L= 35.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 106.49' / 106.14' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Device 3	107.34'	**12.0" Round Culvert** L= 65.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 107.34' / 106.69' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#5	Device 4	108.45'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Discarded OutFlow Max=0.21 cfs @ 11.85 hrs HW=105.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=105.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Culvert** (Controls 0.00 cfs)
└**4=Culvert** (Controls 0.00 cfs)
└**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ISD: Infiltration System D - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 11 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

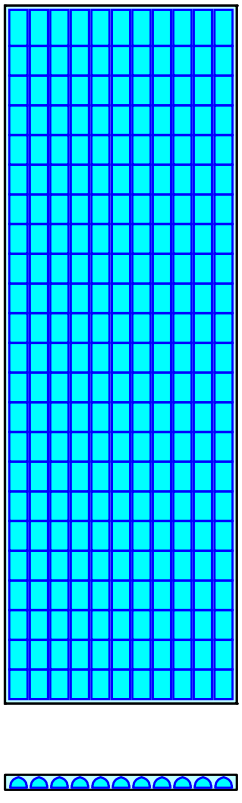
23 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 162.50' Row Length +12.0" End Stone x 2 = 164.50' Base Length
11 Rows x 52.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 54.67' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

253 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 11 Rows = 13,318.7 cf Chamber Storage

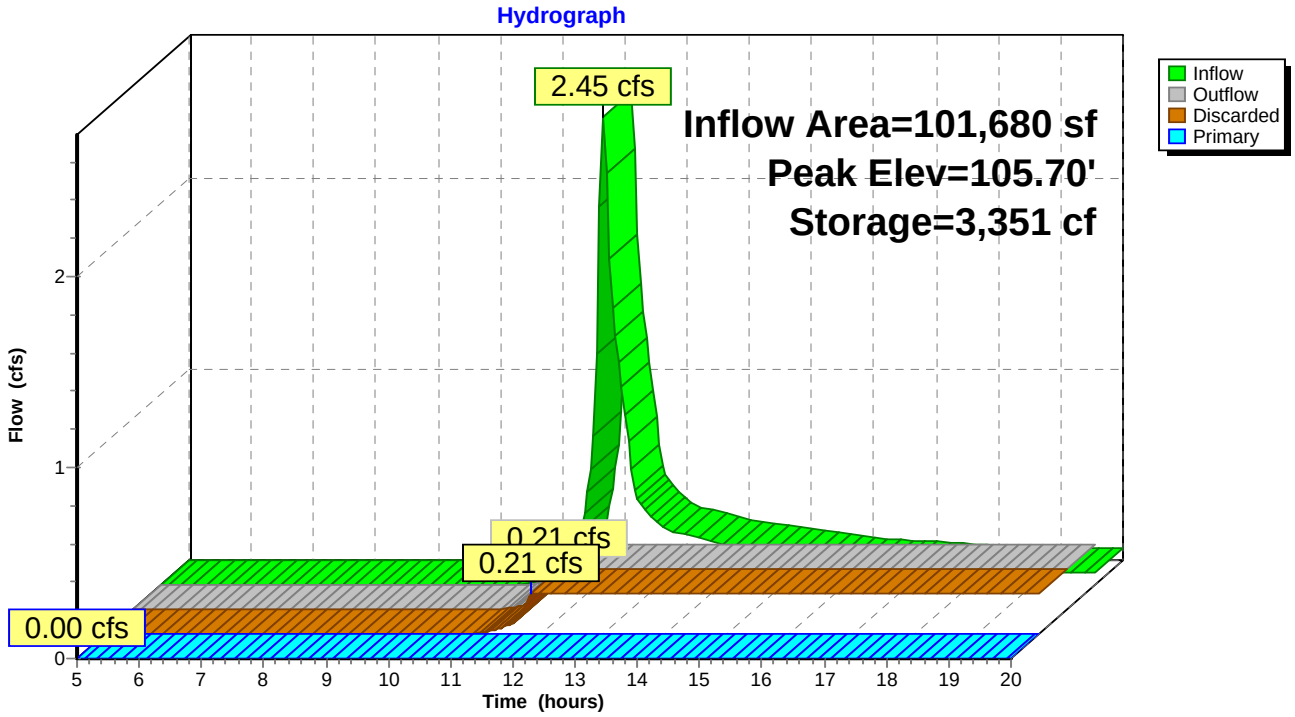
31,849.0 cf Field - 13,318.7 cf Chambers = 18,530.4 cf Stone x 40.0% Voids = 7,412.1 cf Stone Storage

Chamber Storage + Stone Storage = 20,730.8 cf = 0.476 af
Overall Storage Efficiency = 65.1%
Overall System Size = 164.50' x 54.67' x 3.54'

253 Chambers
1,179.6 cy Field
686.3 cy Stone



Pond ISD: Infiltration System D



Stage-Area-Storage for Pond ISD: Infiltration System D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.00	**8,993**	0
105.05	8,993	180
105.10	8,993	360
105.15	8,993	540
105.20	8,993	719
105.25	8,993	899
105.30	8,993	1,079
105.35	8,993	1,259
105.40	8,993	1,439
105.45	8,993	1,619
105.50	8,993	1,799
105.55	8,993	2,192
105.60	8,993	2,584
105.65	8,993	2,974
105.70	8,993	3,364
105.75	8,993	3,753
105.80	8,993	4,141
105.85	8,993	4,529
105.90	8,993	4,917
105.95	8,993	5,304
106.00	8,993	5,691
106.05	8,993	6,077
106.10	8,993	6,461
106.15	8,993	6,843
106.20	8,993	7,222
106.25	8,993	7,599
106.30	8,993	7,974
106.35	8,993	8,350
106.40	8,993	8,724
106.45	8,993	9,098
106.50	8,993	9,472
106.55	8,993	9,844
106.60	8,993	10,216
106.65	8,993	10,586
106.70	8,993	10,955
106.75	8,993	11,322
106.80	8,993	11,685
106.85	8,993	12,044
106.90	8,993	12,399
106.95	8,993	12,751
107.00	8,993	13,099
107.05	8,993	13,443
107.10	8,993	13,784
107.15	8,993	14,121
107.20	8,993	14,453
107.25	8,993	14,782
107.30	8,993	15,105
107.35	8,993	15,423
107.40	8,993	15,736
107.45	8,993	16,043
107.50	8,993	16,343
107.55	8,993	16,636
107.60	8,993	16,921
107.65	8,993	17,197
107.70	8,993	17,463
107.75	8,993	17,716
107.80	8,993	17,956
107.85	8,993	18,181
107.90	8,993	18,394
107.95	8,993	18,594
108.00	8,993	18,782
108.05	8,993	18,962
108.10	8,993	19,142
108.15	8,993	19,322
108.20	8,993	19,502
108.25	8,993	19,682
108.30	8,993	19,862
108.35	8,993	20,041
108.40	8,993	20,221
108.45	8,993	20,401
108.50	8,993	**20,581**

Summary for Pond ND: Natural Depression

Inflow Area = 24,847 sf, 1.02% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.00 cfs @ 17.17 hrs, Volume= 25 cf
Outflow = 0.00 cfs @ 17.60 hrs, Volume= 23 cf, Atten= 2%, Lag= 25.4 min
Discarded = 0.00 cfs @ 17.60 hrs, Volume= 23 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.00' @ 17.60 hrs Surf.Area= 240 sf Storage= 2 cf

Plug-Flow detention time= 23.9 min calculated for 23 cf (91% of inflow)
Center-of-Mass det. time= 11.2 min (1,062.8 - 1,051.6)

Volume	Invert	Avail.Storage	Storage Description
#1	108.00'	3,293 cf	**Custom Stage Data (Irregular)**Listed below

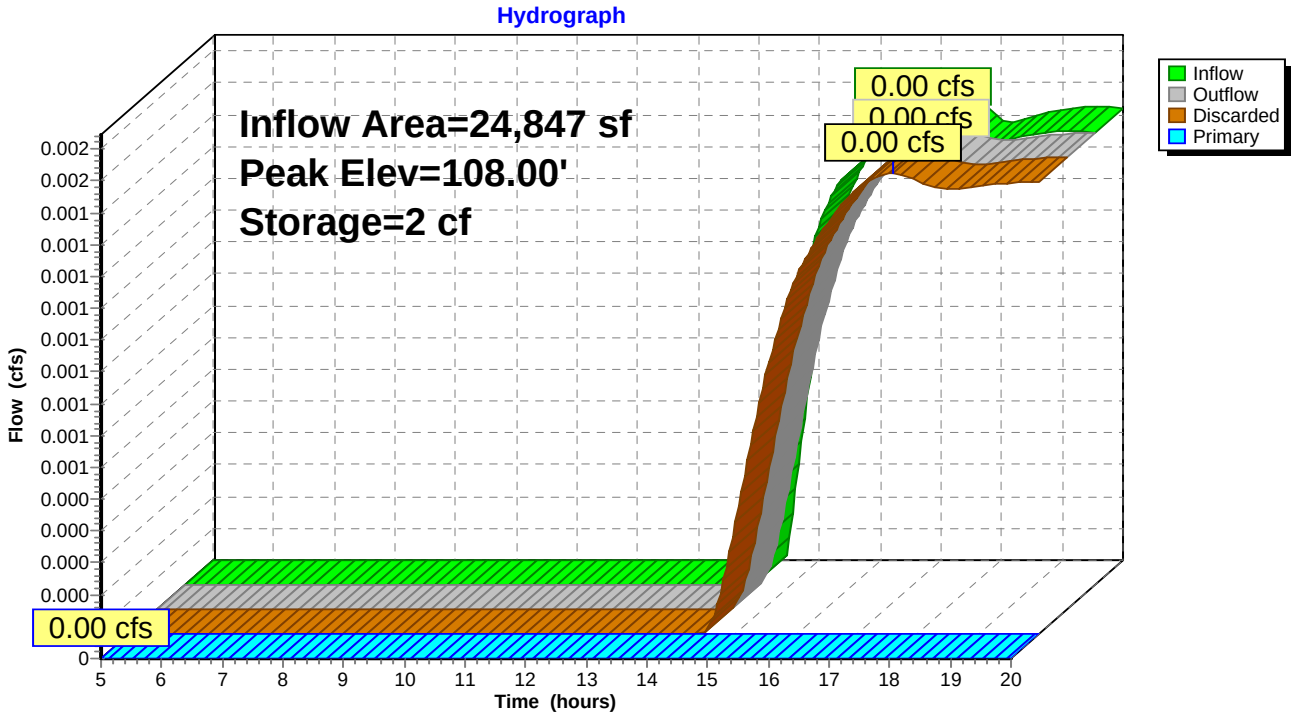
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
108.00	235	88.4	0	0	235
109.00	4,354	655.7	1,867	1,867	33,829
109.30	5,162	671.6	1,426	3,293	35,520

Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**2.0' 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
#2	Discarded	108.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 17.60 hrs HW=108.00' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0
108.02	317	37
108.04	400	75
108.06	482	112
108.08	565	149
108.10	647	187
108.12	729	224
108.14	812	261
108.16	894	299
108.18	976	336
108.20	1,059	373
108.22	1,141	411
108.24	1,224	448
108.26	1,306	485
108.28	1,388	523
108.30	1,471	560
108.32	1,553	597
108.34	1,635	635
108.36	1,718	672
108.38	1,800	709
108.40	1,883	747
108.42	1,965	784
108.44	2,047	821
108.46	2,130	859
108.48	2,212	896
108.50	2,295	933
108.52	2,377	971
108.54	2,459	1,008
108.56	2,542	1,045
108.58	2,624	1,083
108.60	2,706	1,120
108.62	2,789	1,157
108.64	2,871	1,195
108.66	2,954	1,232
108.68	3,036	1,269
108.70	3,118	1,307
108.72	3,201	1,344
108.74	3,283	1,381
108.76	3,365	1,419
108.78	3,448	1,456
108.80	3,530	1,493
108.82	3,613	1,531
108.84	3,695	1,568
108.86	3,777	1,605
108.88	3,860	1,643
108.90	3,942	1,680
108.92	4,024	1,717
108.94	4,107	1,755
108.96	4,189	1,792
108.98	4,272	1,830
109.00	4,354	1,867
109.02	4,408	1,962
109.04	4,462	2,057
109.06	4,516	2,152
109.08	4,569	2,247
109.10	4,623	2,342
109.12	4,677	2,437
109.14	4,731	2,532
109.16	4,785	2,627
109.18	4,839	2,722
109.20	4,893	2,817
109.22	4,947	2,912
109.24	5,000	3,007
109.26	5,054	3,102
109.28	5,108	3,197
109.30	**5,162**	**3,293**

Summary for Subcatchment 2ISD: To Infiltration System D

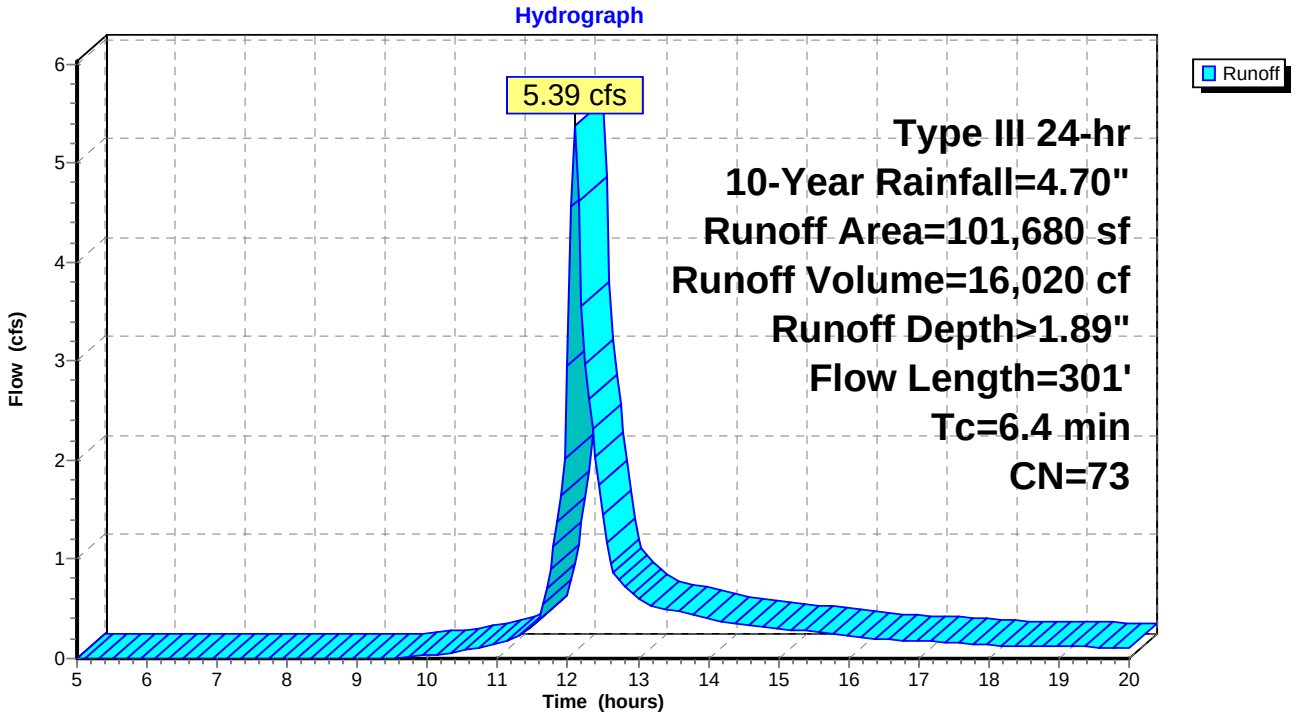
Runoff = 5.39 cfs @ 12.10 hrs, Volume= 16,020 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
3,068	30	Woods, Good, HSG A
15,416	39	>75% Grass cover, Good, HSG A
21,166	98	Paved parking, HSG A
1,960	55	Woods, Good, HSG B
35,957	61	>75% Grass cover, Good, HSG B
973	96	Gravel surface, HSG B
23,140	98	Paved parking, HSG B
101,680	73	Weighted Average
57,374		56.43% Pervious Area
44,306		43.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Grass AB** Grass: Short n= 0.150 P2= 3.20"
1.6	115	0.0300	1.21		**Shallow Concentrated Flow, Grass BC** Short Grass Pasture Kv= 7.0 fps
0.5	136	0.0100	4.54	3.56	**Pipe Channel, Pipe CD** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
6.4	301	Total			

Subcatchment 2ISD: To Infiltration System D



Summary for Subcatchment 2ND: To Natural Depression

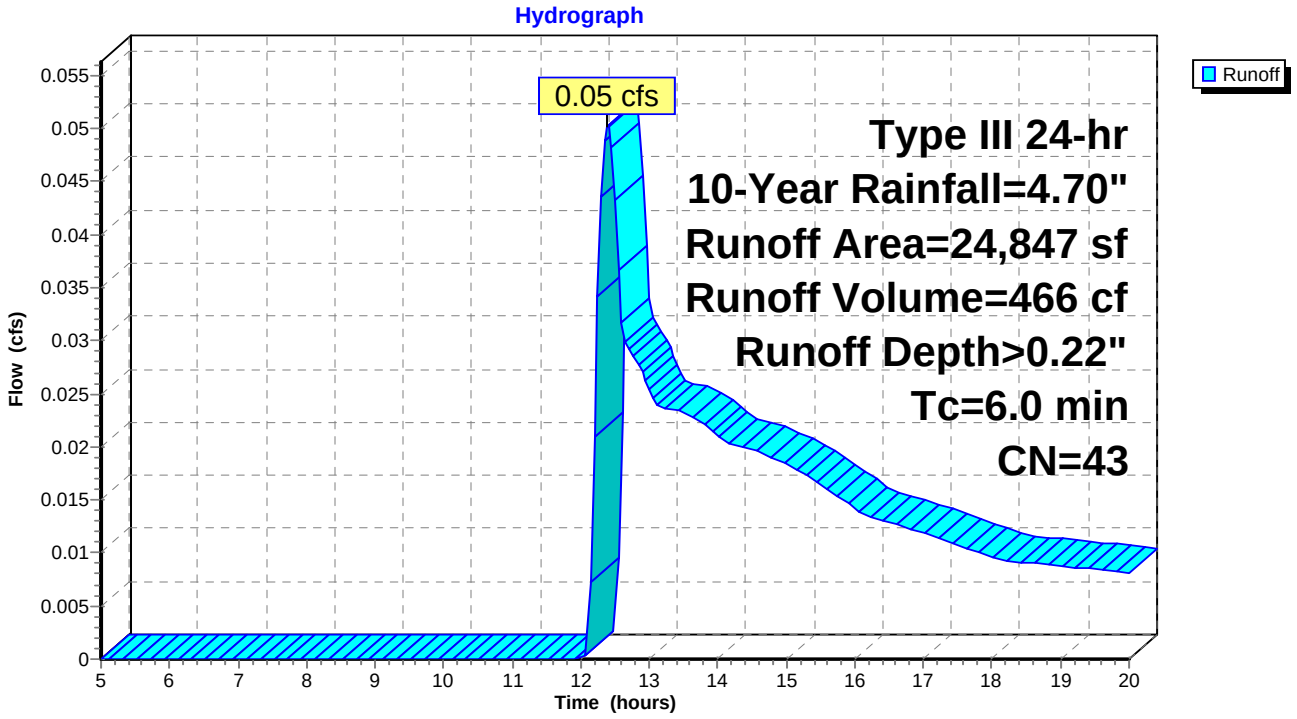
Runoff = 0.05 cfs @ 12.39 hrs, Volume= 466 cf, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
4,045	30	Woods, Good, HSG A
18,342	39	>75% Grass cover, Good, HSG A
1,946	96	Gravel surface, HSG A
253	98	Paved parking, HSG A
261	61	>75% Grass cover, Good, HSG B
24,847	43	Weighted Average
24,594		98.98% Pervious Area
253		1.02% Impervious Area

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

Subcatchment 2ND: To Natural Depression



Summary for Subcatchment EU: Eastern Units

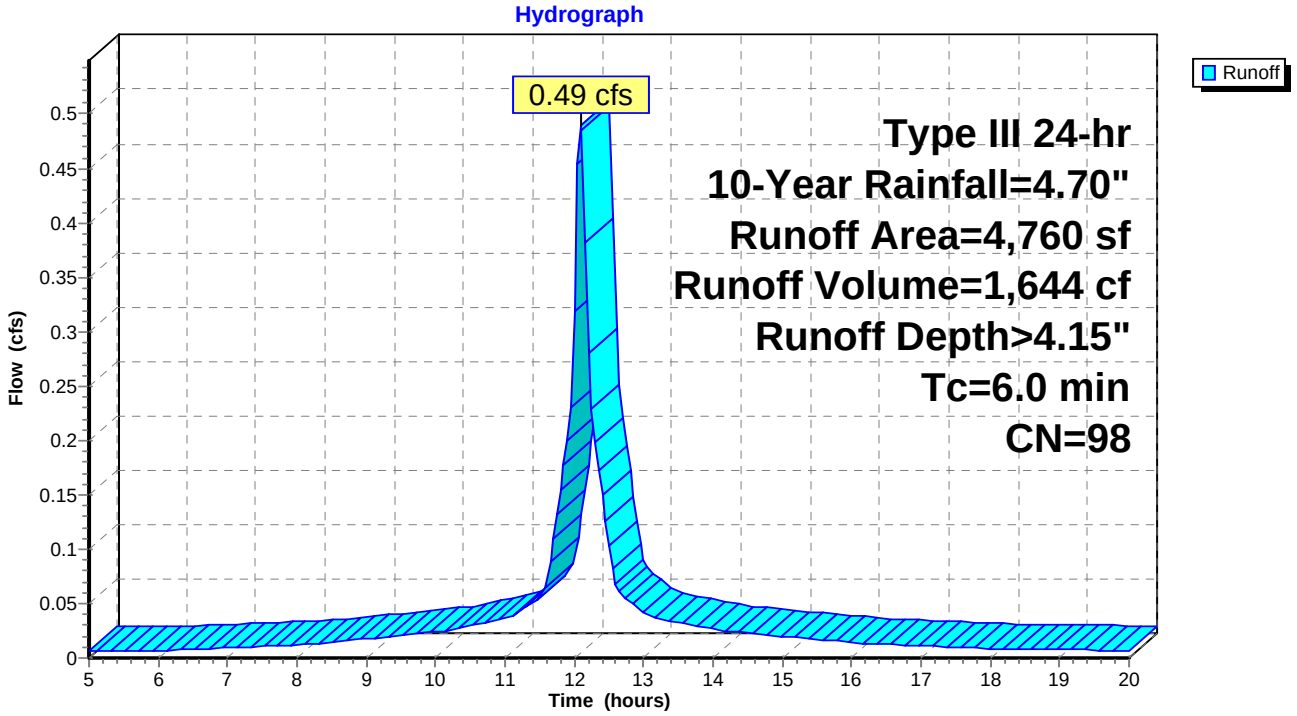
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,644 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment EU: Eastern Units



Summary for Subcatchment N: Offsite North

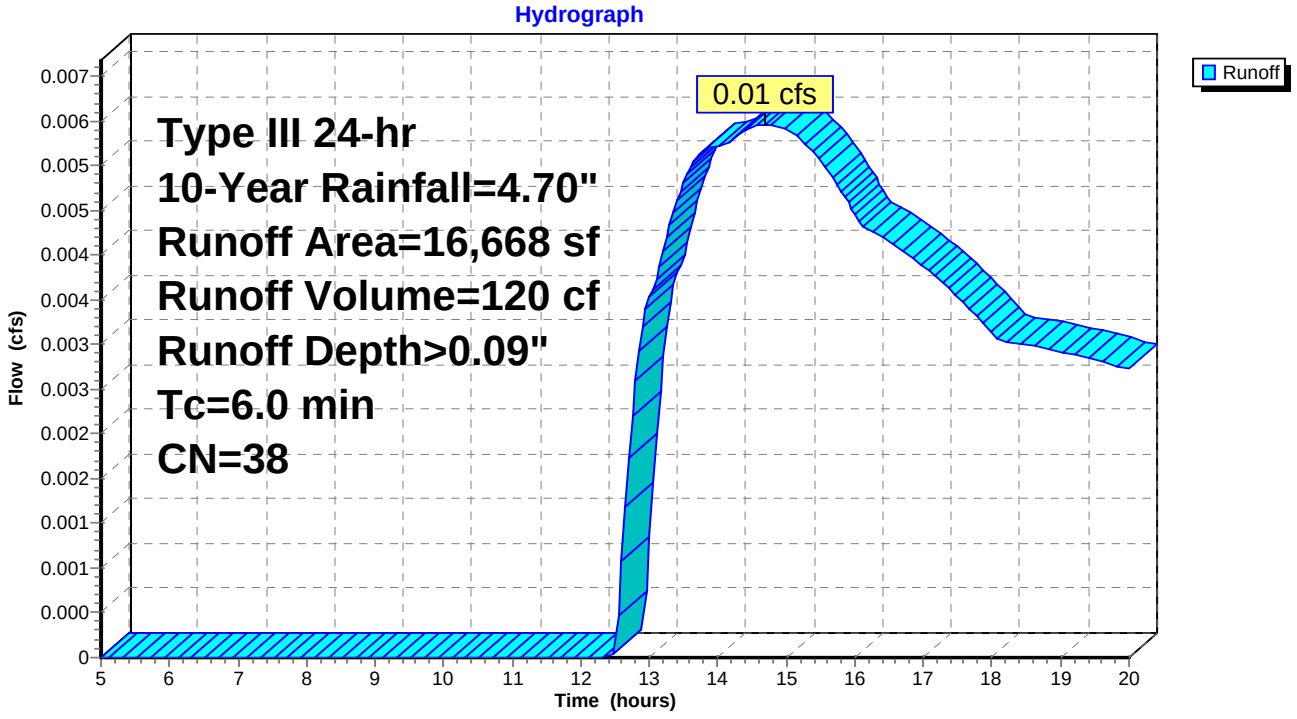
Runoff = 0.01 cfs @ 14.70 hrs, Volume= 120 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
4,653	30	Woods, Good, HSG A
11,477	39	>75% Grass cover, Good, HSG A
417	96	Gravel surface, HSG A
121	98	Paved parking, HSG A
16,668	38	Weighted Average
16,547		99.27% Pervious Area
121		0.73% Impervious Area

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

Subcatchment N: Offsite North



Summary for Subcatchment NU: Northern Units

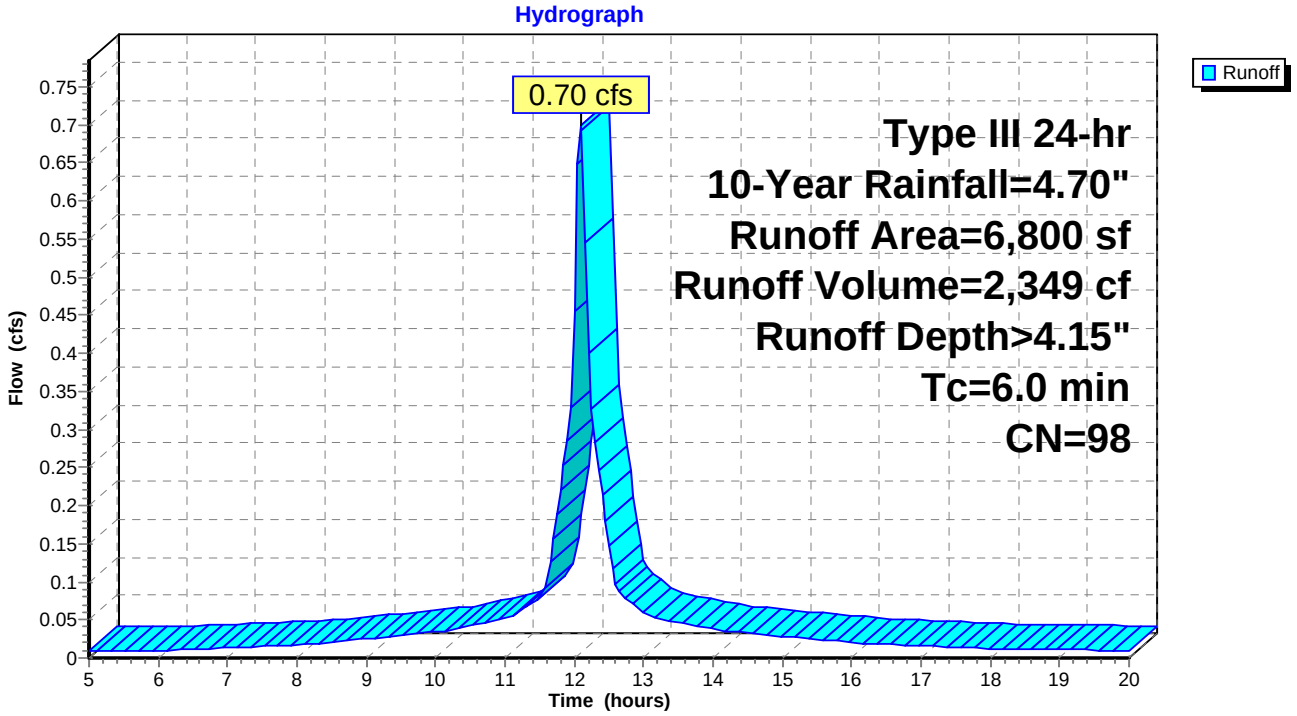
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,349 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
6,800	98	Roofs, HSG D
6,800		100.00% Impervious Area

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

Subcatchment NU: Northern Units



Summary for Subcatchment S: Onsite South

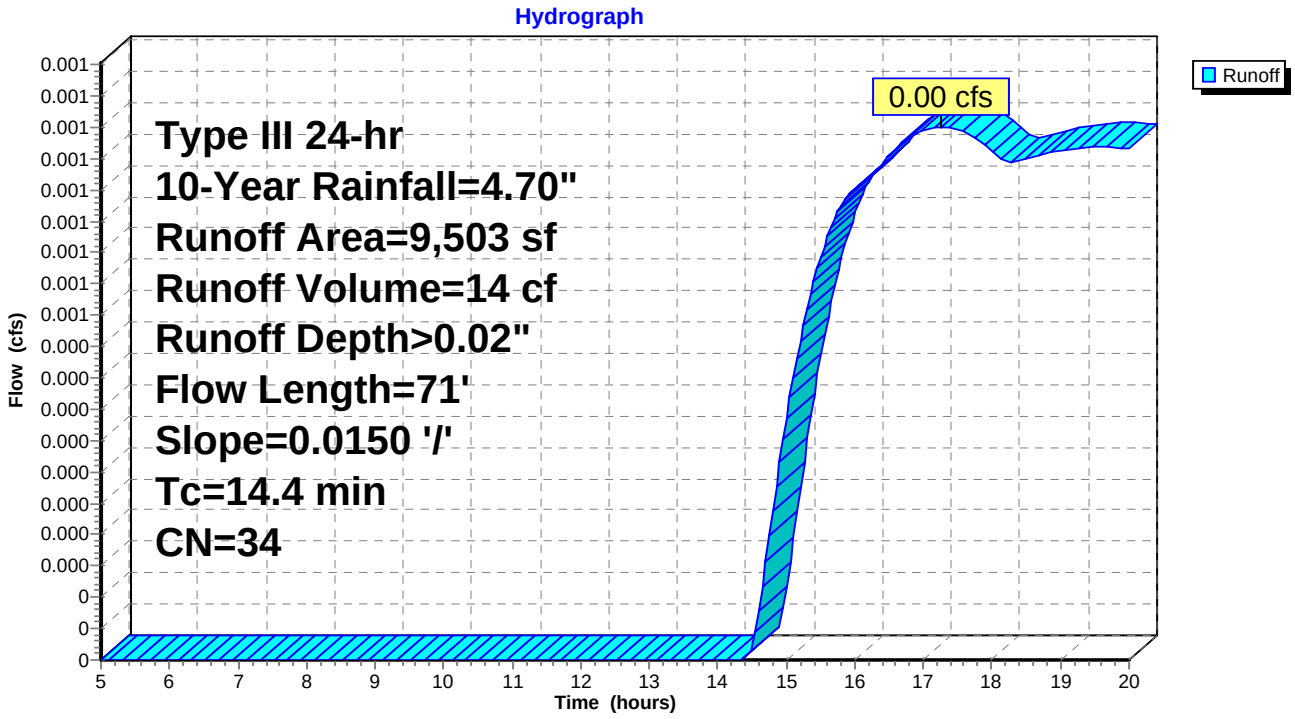
Runoff = 0.00 cfs @ 17.25 hrs, Volume= 14 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
5,286	30	Woods, Good, HSG A
4,154	39	>75% Grass cover, Good, HSG A
63	98	Unconnected roofs, HSG A
9,503	34	Weighted Average
9,440		99.34% Pervious Area
63		0.66% Impervious Area
63		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South



Summary for Subcatchment WU: Western Units

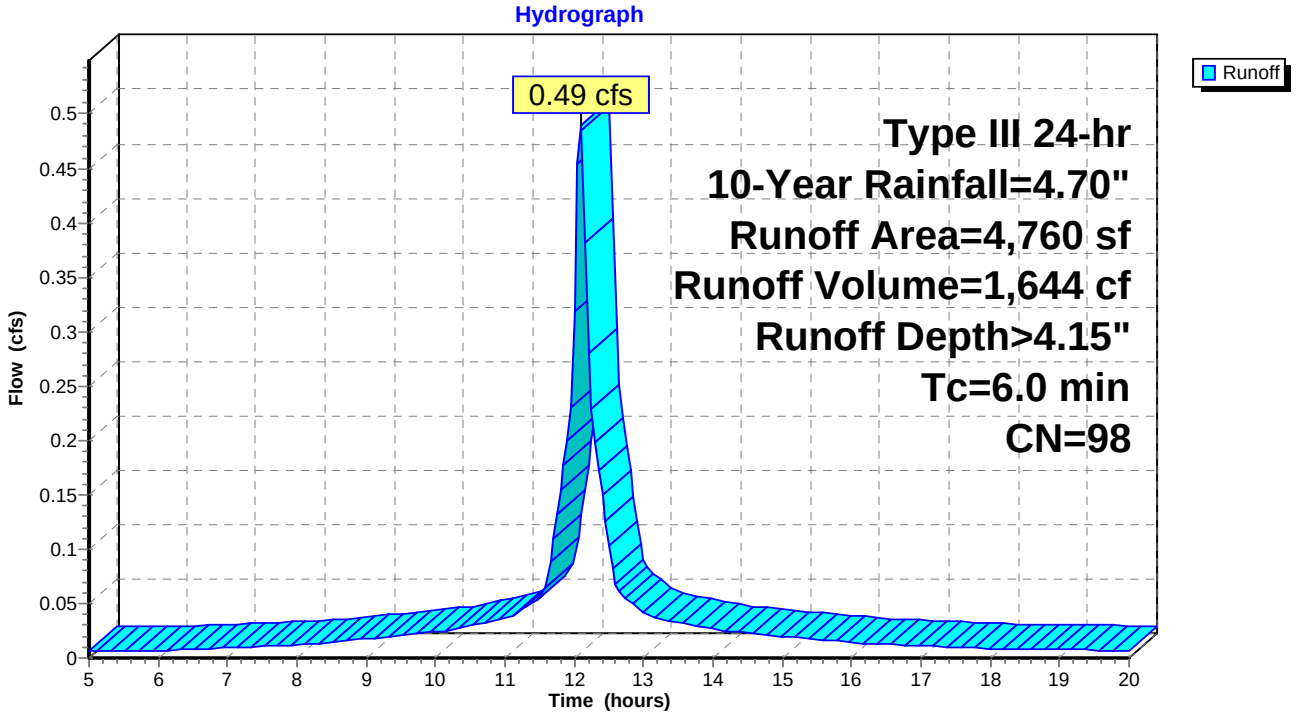
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,644 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment WU: Western Units

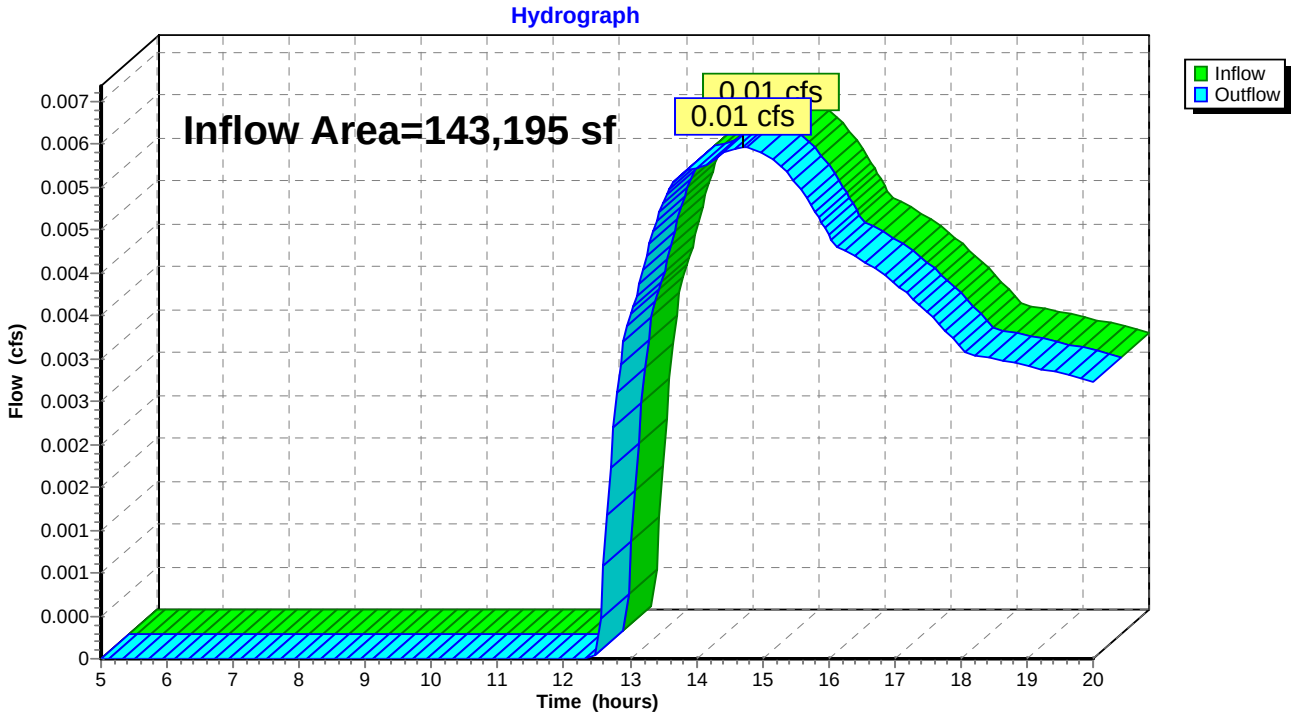


Summary for Reach TN: Total North

Inflow Area = 143,195 sf, 31.20% Impervious, Inflow Depth > 0.01" for 10-Year event
Inflow = 0.01 cfs @ 14.70 hrs, Volume= 120 cf
Outflow = 0.01 cfs @ 14.70 hrs, Volume= 120 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ISA: Infiltration System A

Inflow Area = 4,760 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,644 cf
Outflow = 0.08 cfs @ 11.70 hrs, Volume= 1,644 cf, Atten= 83%, Lag= 0.0 min
Discarded = 0.08 cfs @ 11.70 hrs, Volume= 1,644 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 107.60' @ 12.55 hrs Surf.Area= 430 sf Storage= 457 cf

Plug-Flow detention time= 32.3 min calculated for 1,638 cf (100% of inflow)
Center-of-Mass det. time= 31.9 min (767.4 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	391 cf	**11.17'W x 38.50'L x 3.54'H Field A** 1,523 cf Overall - 544 cf Embedded = 979 cf x 40.0% Voids
#2A	106.50'	544 cf	**Cultec R-330XLHD** x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		935 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 11.70 hrs HW=106.05' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Pond ISA: Infiltration System A - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

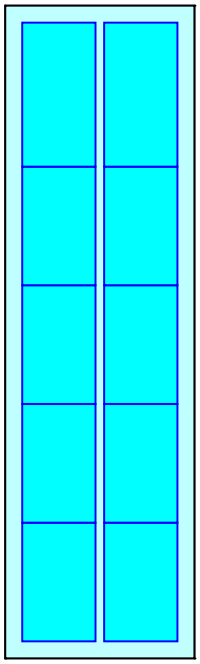
5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +12.0" End Stone x 2 = 38.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

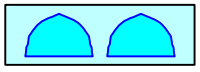
10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 543.9 cf Chamber Storage

1,522.6 cf Field - 543.9 cf Chambers = 978.7 cf Stone x 40.0% Voids = 391.5 cf Stone Storage

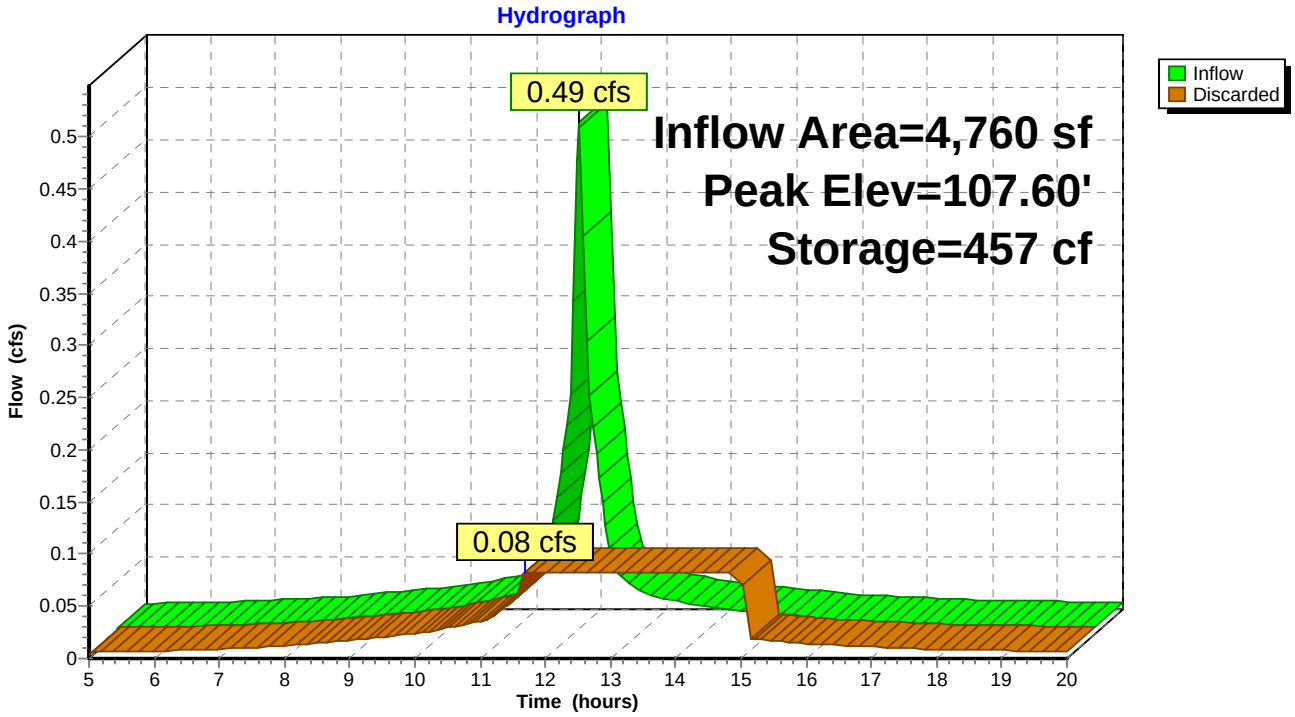
Chamber Storage + Stone Storage = 935.4 cf = 0.021 af
Overall Storage Efficiency = 61.4%
Overall System Size = 38.50' x 11.17' x 3.54'

10 Chambers
56.4 cy Field
36.2 cy Stone





Pond ISA: Infiltration System A



Stage-Area-Storage for Pond ISA: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	**430**	0
106.05	430	9
106.10	430	17
106.15	430	26
106.20	430	34
106.25	430	43
106.30	430	52
106.35	430	60
106.40	430	69
106.45	430	77
106.50	430	86
106.55	430	103
106.60	430	121
106.65	430	138
106.70	430	155
106.75	430	172
106.80	430	189
106.85	430	206
106.90	430	223
106.95	430	240
107.00	430	257
107.05	430	275
107.10	430	291
107.15	430	308
107.20	430	325
107.25	430	342
107.30	430	358
107.35	430	375
107.40	430	391
107.45	430	408
107.50	430	424
107.55	430	441
107.60	430	457
107.65	430	474
107.70	430	490
107.75	430	506
107.80	430	522
107.85	430	538
107.90	430	554
107.95	430	570
108.00	430	585
108.05	430	600
108.10	430	616
108.15	430	631
108.20	430	645
108.25	430	660
108.30	430	675
108.35	430	689
108.40	430	703
108.45	430	717
108.50	430	730
108.55	430	743
108.60	430	756
108.65	430	769
108.70	430	781
108.75	430	792
108.80	430	803
108.85	430	814
108.90	430	824
108.95	430	833
109.00	430	842
109.05	430	851
109.10	430	859
109.15	430	868
109.20	430	877
109.25	430	885
109.30	430	894
109.35	430	902
109.40	430	911
109.45	430	920
109.50	430	**928**

Summary for Pond ISB: Infiltration System B

Inflow Area = 4,760 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,644 cf
Outflow = 0.03 cfs @ 10.85 hrs, Volume= 1,378 cf, Atten= 93%, Lag= 0.0 min
Discarded = 0.03 cfs @ 10.85 hrs, Volume= 1,378 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 107.27' @ 13.50 hrs Surf.Area= 586 sf Storage= 703 cf

Plug-Flow detention time= 152.2 min calculated for 1,373 cf (83% of inflow)
Center-of-Mass det. time= 104.7 min (840.2 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.50'	530 cf	**11.17'W x 52.50'L x 3.54'H Field A** 2,076 cf Overall - 753 cf Embedded = 1,324 cf x 40.0% Voids
#2A	106.00'	753 cf	**Cultec R-330XLHD** x 14 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 10.85 hrs HW=105.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond ISB: Infiltration System B - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

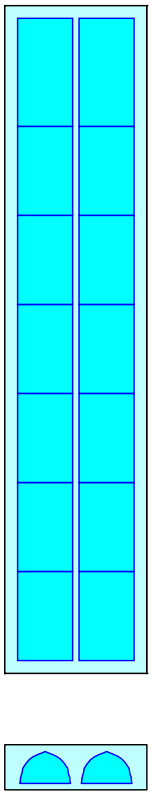
7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

14 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 752.6 cf Chamber Storage

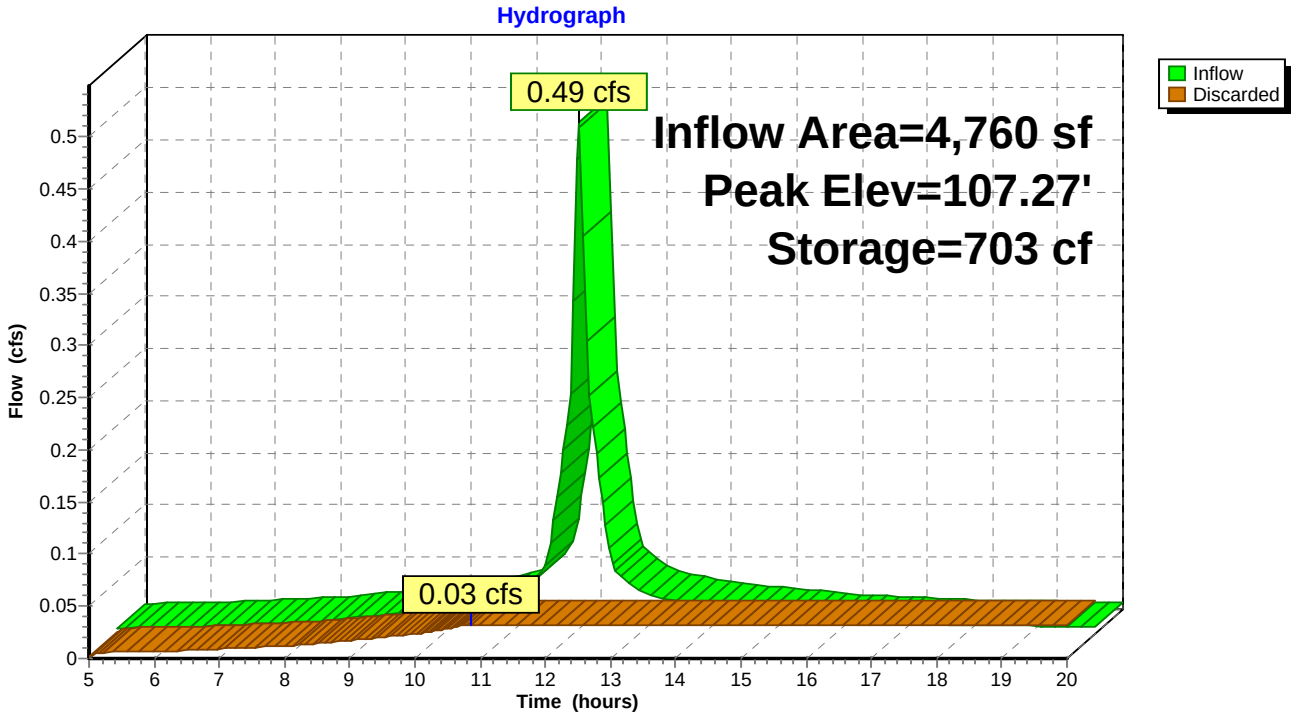
2,076.3 cf Field - 752.6 cf Chambers = 1,323.8 cf Stone x 40.0% Voids = 529.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,282.1 cf = 0.029 af
Overall Storage Efficiency = 61.7%
Overall System Size = 52.50' x 11.17' x 3.54'

14 Chambers
76.9 cy Field
49.0 cy Stone



Pond ISB: Infiltration System B



Stage-Area-Storage for Pond ISB: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.50	**586**	0
105.55	586	12
105.60	586	23
105.65	586	35
105.70	586	47
105.75	586	59
105.80	586	70
105.85	586	82
105.90	586	94
105.95	586	106
106.00	586	117
106.05	586	141
106.10	586	165
106.15	586	188
106.20	586	212
106.25	586	235
106.30	586	259
106.35	586	282
106.40	586	306
106.45	586	329
106.50	586	353
106.55	586	376
106.60	586	399
106.65	586	423
106.70	586	446
106.75	586	468
106.80	586	491
106.85	586	514
106.90	586	537
106.95	586	559
107.00	586	582
107.05	586	605
107.10	586	627
107.15	586	650
107.20	586	672
107.25	586	694
107.30	586	717
107.35	586	738
107.40	586	760
107.45	586	781
107.50	586	803
107.55	586	824
107.60	586	844
107.65	586	865
107.70	586	885
107.75	586	906
107.80	586	925
107.85	586	945
107.90	586	964
107.95	586	983
108.00	586	1,002
108.05	586	1,020
108.10	586	1,037
108.15	586	1,055
108.20	586	1,071
108.25	586	1,087
108.30	586	1,102
108.35	586	1,116
108.40	586	1,130
108.45	586	1,143
108.50	586	1,155
108.55	586	1,167
108.60	586	1,178
108.65	586	1,190
108.70	586	1,202
108.75	586	1,214
108.80	586	1,225
108.85	586	1,237
108.90	586	1,249
108.95	586	1,261
109.00	586	**1,272**

Summary for Pond ISC: Infiltration System C

Inflow Area = 6,800 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 2,349 cf
Outflow = 0.03 cfs @ 9.50 hrs, Volume= 1,302 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.03 cfs @ 9.50 hrs, Volume= 1,302 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 106.09' @ 15.04 hrs Surf.Area= 1,190 sf Storage= 1,275 cf

Plug-Flow detention time= 160.2 min calculated for 1,297 cf (55% of inflow)
Center-of-Mass det. time= 73.8 min (809.3 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	578 cf	**20.83'W x 31.50'L x 3.54'H Field A** 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#2A	105.00'	879 cf	**Cultec R-330XLHD** x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
#3B	104.50'	479 cf	**30.50'W x 17.50'L x 3.54'H Field B** 1,890 cf Overall - 693 cf Embedded = 1,197 cf x 40.0% Voids
#4B	105.00'	693 cf	**Cultec R-330XLHD** x 12 Inside #3 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		2,629 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 9.50 hrs HW=104.54' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond ISC: Infiltration System C - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

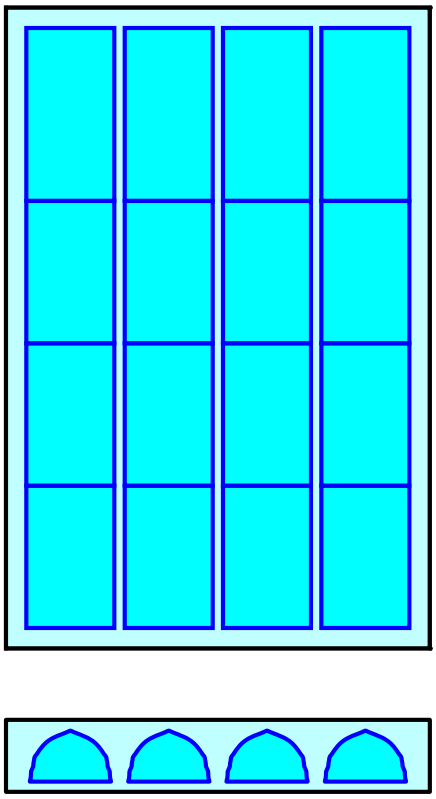
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%
Overall System Size = 31.50' x 20.83' x 3.54'

16 Chambers
86.1 cy Field
53.5 cy Stone



Pond ISC: Infiltration System C - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

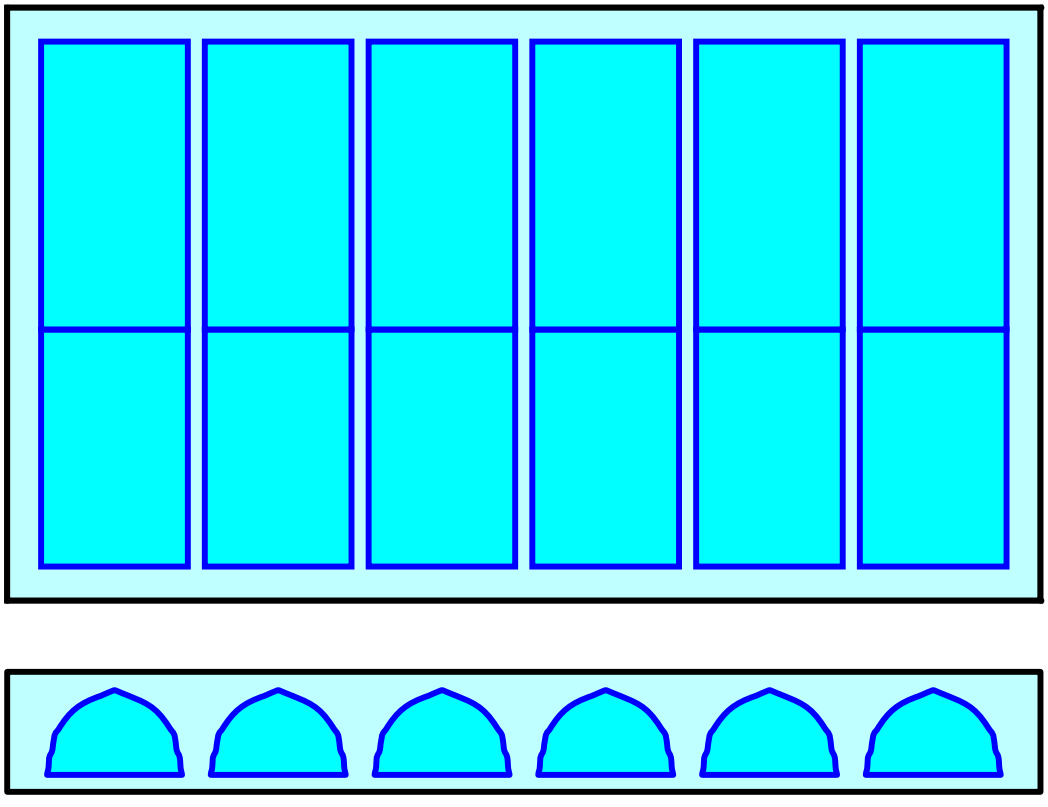
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 692.9 cf Chamber Storage

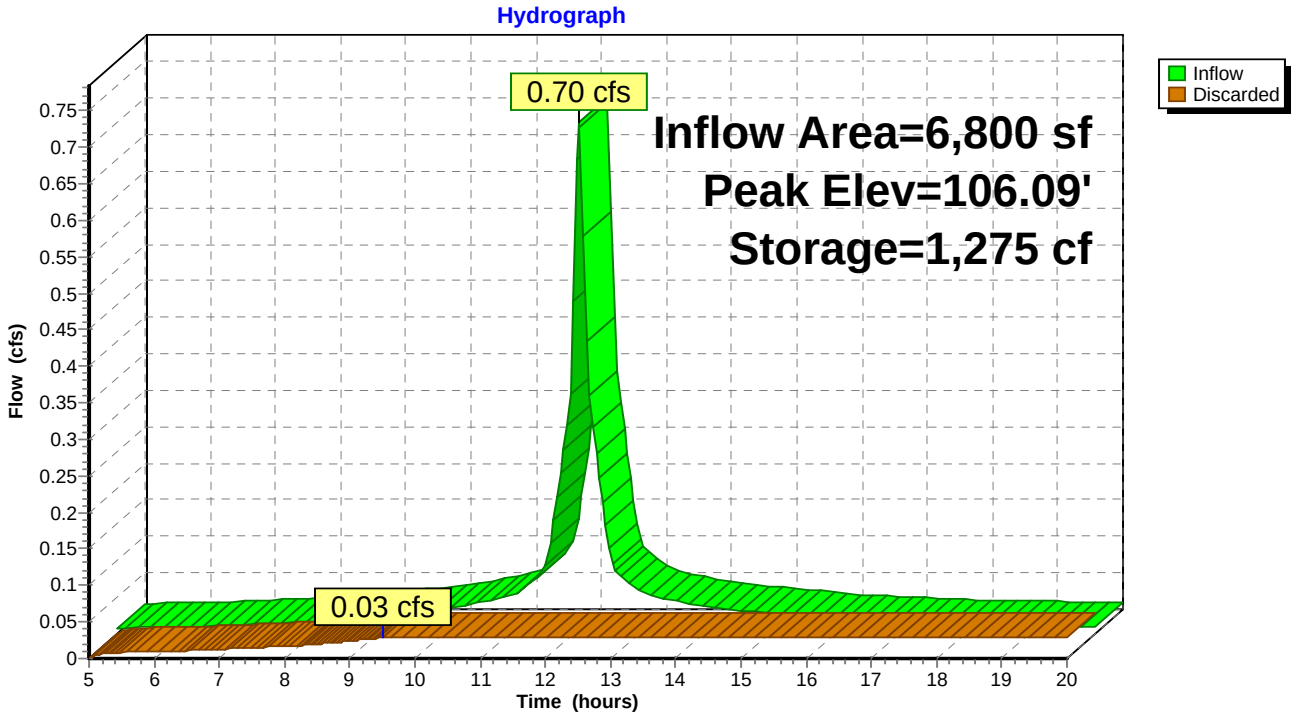
1,890.4 cf Field - 692.9 cf Chambers = 1,197.4 cf Stone x 40.0% Voids = 479.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,171.9 cf = 0.027 af
Overall Storage Efficiency = 62.0%
Overall System Size = 17.50' x 30.50' x 3.54'

12 Chambers
70.0 cy Field
44.3 cy Stone



Pond ISC: Infiltration System C



Stage-Area-Storage for Pond ISC: Infiltration System C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	**1,190**	0
104.55	1,190	24
104.60	1,190	48
104.65	1,190	71
104.70	1,190	95
104.75	1,190	119
104.80	1,190	143
104.85	1,190	167
104.90	1,190	190
104.95	1,190	214
105.00	1,190	238
105.05	1,190	287
105.10	1,190	336
105.15	1,190	385
105.20	1,190	433
105.25	1,190	482
105.30	1,190	530
105.35	1,190	578
105.40	1,190	627
105.45	1,190	675
105.50	1,190	723
105.55	1,190	771
105.60	1,190	819
105.65	1,190	867
105.70	1,190	914
105.75	1,190	961
105.80	1,190	1,008
105.85	1,190	1,055
105.90	1,190	1,102
105.95	1,190	1,149
106.00	1,190	1,195
106.05	1,190	1,242
106.10	1,190	1,288
106.15	1,190	1,334
106.20	1,190	1,381
106.25	1,190	1,426
106.30	1,190	1,472
106.35	1,190	1,517
106.40	1,190	1,561
106.45	1,190	1,605
106.50	1,190	1,649
106.55	1,190	1,692
106.60	1,190	1,735
106.65	1,190	1,777
106.70	1,190	1,819
106.75	1,190	1,860
106.80	1,190	1,901
106.85	1,190	1,941
106.90	1,190	1,981
106.95	1,190	2,020
107.00	1,190	2,058
107.05	1,190	2,095
107.10	1,190	2,131
107.15	1,190	2,166
107.20	1,190	2,200
107.25	1,190	2,233
107.30	1,190	2,263
107.35	1,190	2,293
107.40	1,190	2,320
107.45	1,190	2,347
107.50	1,190	2,371
107.55	1,190	2,395
107.60	1,190	2,419
107.65	1,190	2,443
107.70	1,190	2,466
107.75	1,190	2,490
107.80	1,190	2,514
107.85	1,190	2,538
107.90	1,190	2,562
107.95	1,190	2,585
108.00	1,190	**2,609**

Summary for Pond ISD: Infiltration System D

Inflow Area = 101,680 sf, 43.57% Impervious, Inflow Depth > 1.89" for 10-Year event
Inflow = 5.39 cfs @ 12.10 hrs, Volume= 16,020 cf
Outflow = 0.21 cfs @ 11.40 hrs, Volume= 7,086 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.21 cfs @ 11.40 hrs, Volume= 7,086 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 106.55' @ 16.08 hrs Surf.Area= 8,993 sf Storage= 9,865 cf

Plug-Flow detention time= 205.5 min calculated for 7,062 cf (44% of inflow)
Center-of-Mass det. time= 118.2 min (922.5 - 804.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.00'	7,412 cf	**54.67'W x 164.50'L x 3.54'H Field A** 31,849 cf Overall - 13,319 cf Embedded = 18,530 cf x 40.0% Voids
#2A	105.50'	13,319 cf	**Cultec R-330XLHD** x 253 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 11 rows
		20,731 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	105.94'	**12.0" Round Culvert** L= 94.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 105.94' / 105.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	106.49'	**12.0" Round Culvert** L= 35.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 106.49' / 106.14' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Device 3	107.34'	**12.0" Round Culvert** L= 65.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 107.34' / 106.69' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#5	Device 4	108.45'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Discarded OutFlow Max=0.21 cfs @ 11.40 hrs HW=105.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=105.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Culvert** (Controls 0.00 cfs)
└**4=Culvert** (Controls 0.00 cfs)
└**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ISD: Infiltration System D - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 11 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

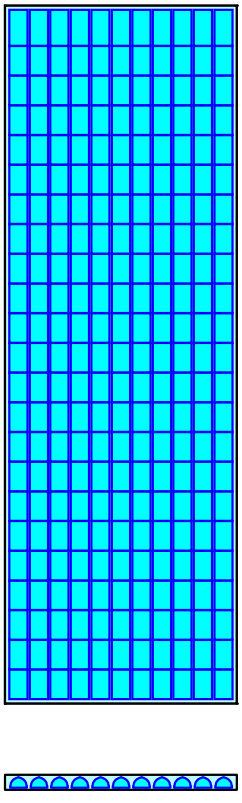
23 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 162.50' Row Length +12.0" End Stone x 2 = 164.50' Base Length
11 Rows x 52.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 54.67' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

253 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 11 Rows = 13,318.7 cf Chamber Storage

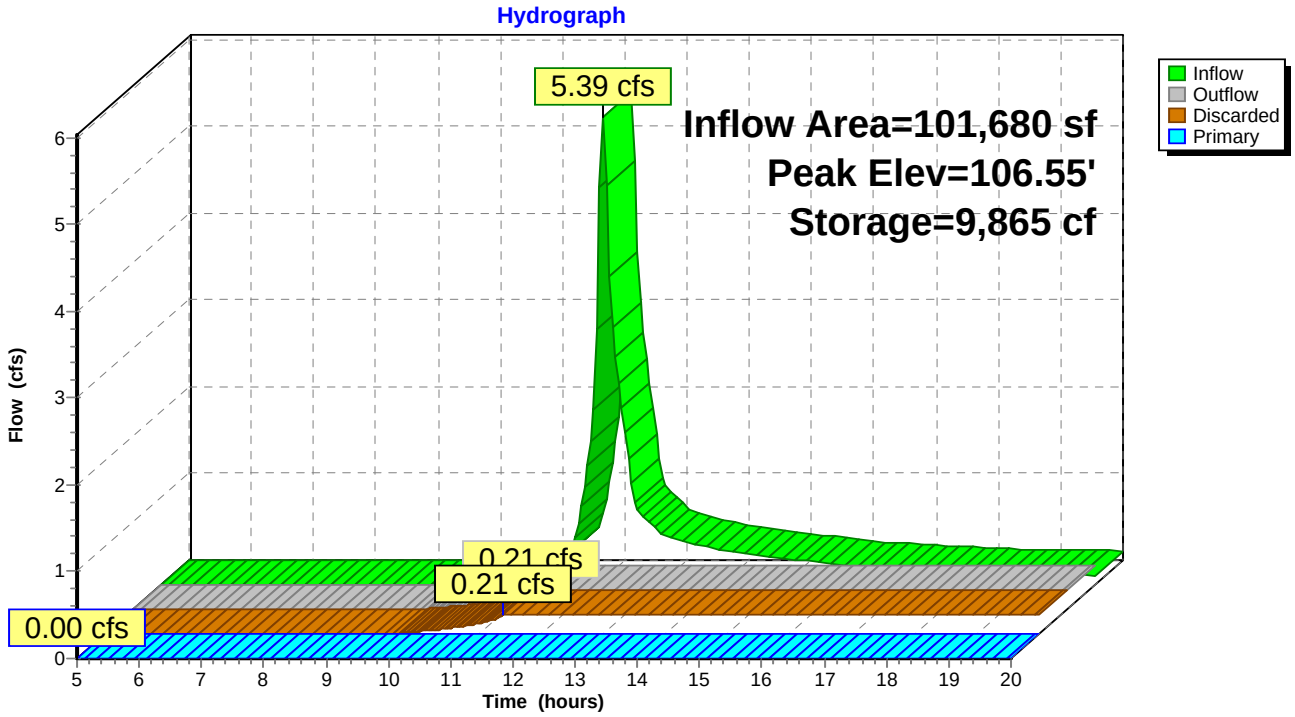
31,849.0 cf Field - 13,318.7 cf Chambers = 18,530.4 cf Stone x 40.0% Voids = 7,412.1 cf Stone Storage

Chamber Storage + Stone Storage = 20,730.8 cf = 0.476 af
Overall Storage Efficiency = 65.1%
Overall System Size = 164.50' x 54.67' x 3.54'

253 Chambers
1,179.6 cy Field
686.3 cy Stone



Pond ISD: Infiltration System D



Stage-Area-Storage for Pond ISD: Infiltration System D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.00	**8,993**	0
105.05	8,993	180
105.10	8,993	360
105.15	8,993	540
105.20	8,993	719
105.25	8,993	899
105.30	8,993	1,079
105.35	8,993	1,259
105.40	8,993	1,439
105.45	8,993	1,619
105.50	8,993	1,799
105.55	8,993	2,192
105.60	8,993	2,584
105.65	8,993	2,974
105.70	8,993	3,364
105.75	8,993	3,753
105.80	8,993	4,141
105.85	8,993	4,529
105.90	8,993	4,917
105.95	8,993	5,304
106.00	8,993	5,691
106.05	8,993	6,077
106.10	8,993	6,461
106.15	8,993	6,843
106.20	8,993	7,222
106.25	8,993	7,599
106.30	8,993	7,974
106.35	8,993	8,350
106.40	8,993	8,724
106.45	8,993	9,098
106.50	8,993	9,472
106.55	8,993	9,844
106.60	8,993	10,216
106.65	8,993	10,586
106.70	8,993	10,955
106.75	8,993	11,322
106.80	8,993	11,685
106.85	8,993	12,044
106.90	8,993	12,399
106.95	8,993	12,751
107.00	8,993	13,099
107.05	8,993	13,443
107.10	8,993	13,784
107.15	8,993	14,121
107.20	8,993	14,453
107.25	8,993	14,782
107.30	8,993	15,105
107.35	8,993	15,423
107.40	8,993	15,736
107.45	8,993	16,043
107.50	8,993	16,343
107.55	8,993	16,636
107.60	8,993	16,921
107.65	8,993	17,197
107.70	8,993	17,463
107.75	8,993	17,716
107.80	8,993	17,956
107.85	8,993	18,181
107.90	8,993	18,394
107.95	8,993	18,594
108.00	8,993	18,782
108.05	8,993	18,962
108.10	8,993	19,142
108.15	8,993	19,322
108.20	8,993	19,502
108.25	8,993	19,682
108.30	8,993	19,862
108.35	8,993	20,041
108.40	8,993	20,221
108.45	8,993	20,401
108.50	8,993	**20,581**

Summary for Pond ND: Natural Depression

Inflow Area = 24,847 sf, 1.02% Impervious, Inflow Depth > 0.22" for 10-Year event
Inflow = 0.05 cfs @ 12.39 hrs, Volume= 466 cf
Outflow = 0.02 cfs @ 13.99 hrs, Volume= 453 cf, Atten= 58%, Lag= 95.9 min
Discarded = 0.02 cfs @ 13.99 hrs, Volume= 453 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.03' @ 13.99 hrs Surf.Area= 378 sf Storage= 65 cf

Plug-Flow detention time= 39.4 min calculated for 451 cf (97% of inflow)
Center-of-Mass det. time= 31.4 min (935.7 - 904.3)

Volume	Invert	Avail.Storage	Storage Description
#1	108.00'	3,293 cf	**Custom Stage Data (Irregular)** Listed below

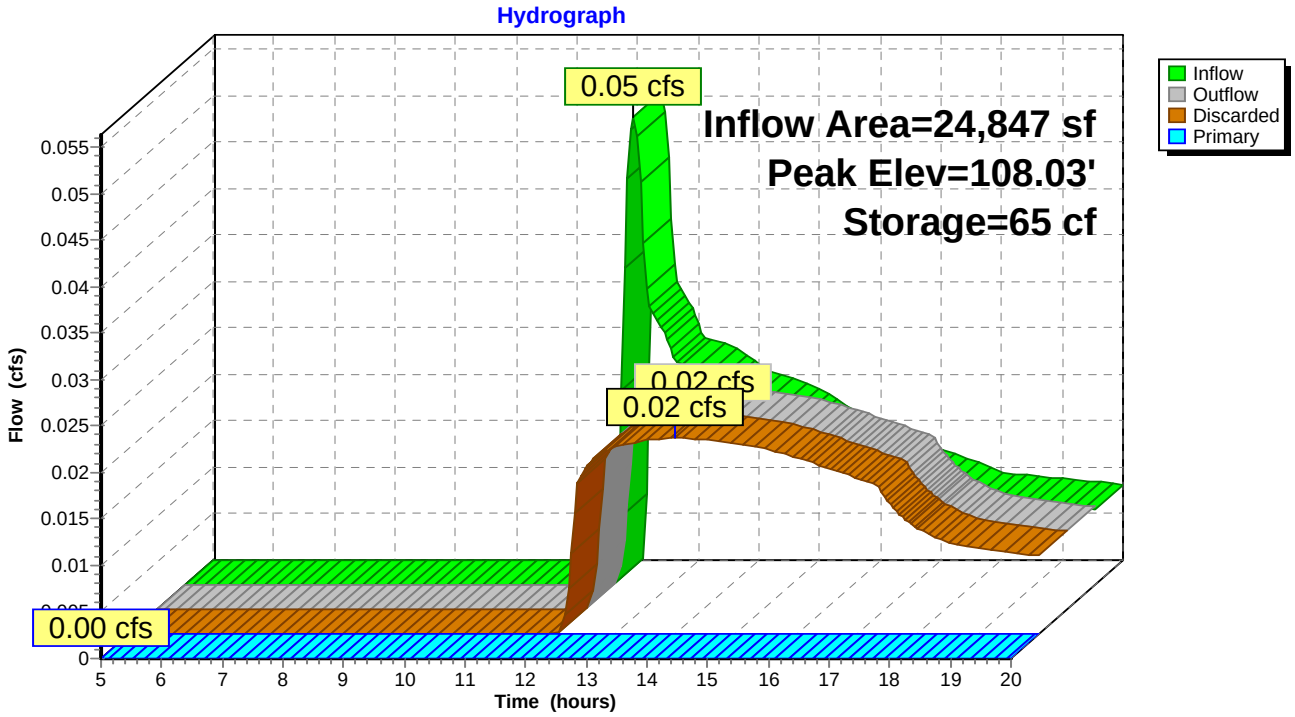
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
108.00	235	88.4	0	0	235
109.00	4,354	655.7	1,867	1,867	33,829
109.30	5,162	671.6	1,426	3,293	35,520

Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**2.0' 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
#2	Discarded	108.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 13.99 hrs HW=108.03' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0
108.02	317	37
108.04	400	75
108.06	482	112
108.08	565	149
108.10	647	187
108.12	729	224
108.14	812	261
108.16	894	299
108.18	976	336
108.20	1,059	373
108.22	1,141	411
108.24	1,224	448
108.26	1,306	485
108.28	1,388	523
108.30	1,471	560
108.32	1,553	597
108.34	1,635	635
108.36	1,718	672
108.38	1,800	709
108.40	1,883	747
108.42	1,965	784
108.44	2,047	821
108.46	2,130	859
108.48	2,212	896
108.50	2,295	933
108.52	2,377	971
108.54	2,459	1,008
108.56	2,542	1,045
108.58	2,624	1,083
108.60	2,706	1,120
108.62	2,789	1,157
108.64	2,871	1,195
108.66	2,954	1,232
108.68	3,036	1,269
108.70	3,118	1,307
108.72	3,201	1,344
108.74	3,283	1,381
108.76	3,365	1,419
108.78	3,448	1,456
108.80	3,530	1,493
108.82	3,613	1,531
108.84	3,695	1,568
108.86	3,777	1,605
108.88	3,860	1,643
108.90	3,942	1,680
108.92	4,024	1,717
108.94	4,107	1,755
108.96	4,189	1,792
108.98	4,272	1,830
109.00	4,354	1,867
109.02	4,408	1,962
109.04	4,462	2,057
109.06	4,516	2,152
109.08	4,569	2,247
109.10	4,623	2,342
109.12	4,677	2,437
109.14	4,731	2,532
109.16	4,785	2,627
109.18	4,839	2,722
109.20	4,893	2,817
109.22	4,947	2,912
109.24	5,000	3,007
109.26	5,054	3,102
109.28	5,108	3,197
109.30	**5,162**	**3,293**

Summary for Subcatchment 2ISD: To Infiltration System D

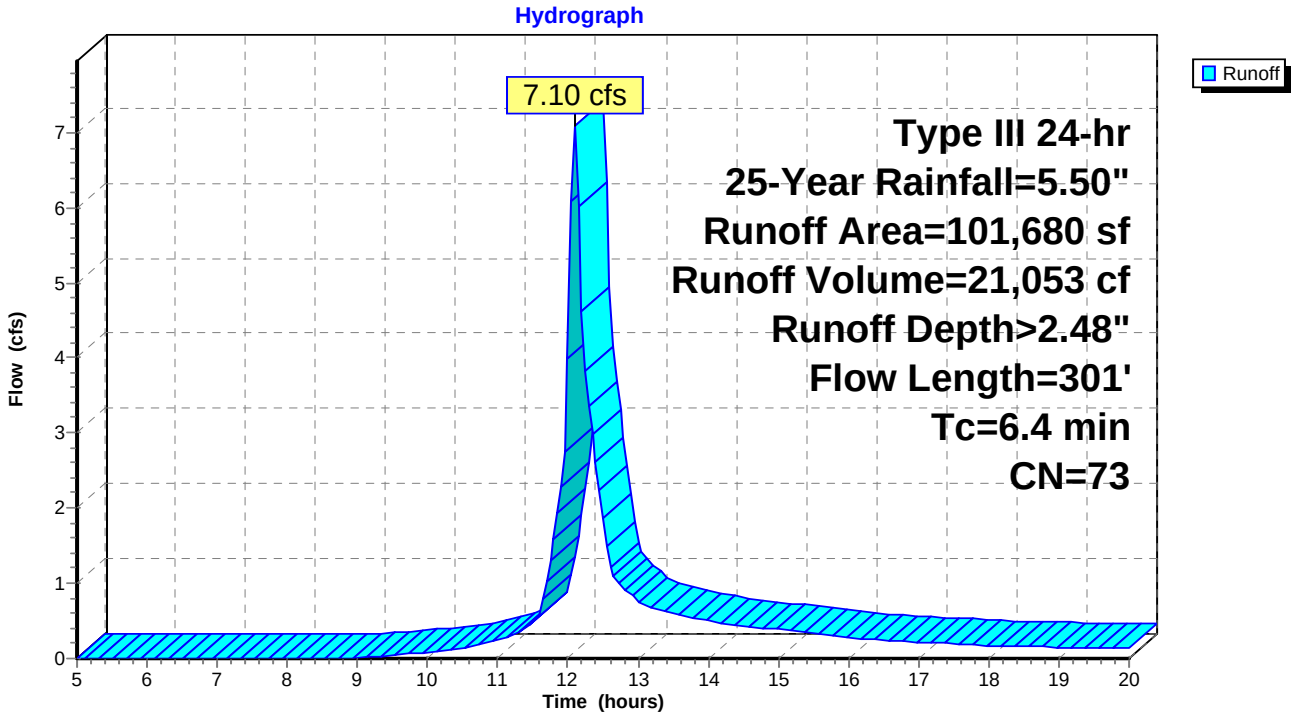
Runoff = 7.10 cfs @ 12.10 hrs, Volume= 21,053 cf, Depth> 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
3,068	30	Woods, Good, HSG A
15,416	39	>75% Grass cover, Good, HSG A
21,166	98	Paved parking, HSG A
1,960	55	Woods, Good, HSG B
35,957	61	>75% Grass cover, Good, HSG B
973	96	Gravel surface, HSG B
23,140	98	Paved parking, HSG B
101,680	73	Weighted Average
57,374		56.43% Pervious Area
44,306		43.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Grass AB** Grass: Short n= 0.150 P2= 3.20"
1.6	115	0.0300	1.21		**Shallow Concentrated Flow, Grass BC** Short Grass Pasture Kv= 7.0 fps
0.5	136	0.0100	4.54	3.56	**Pipe Channel, Pipe CD** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
6.4	301	Total			

Subcatchment 2ISD: To Infiltration System D



Summary for Subcatchment 2ND: To Natural Depression

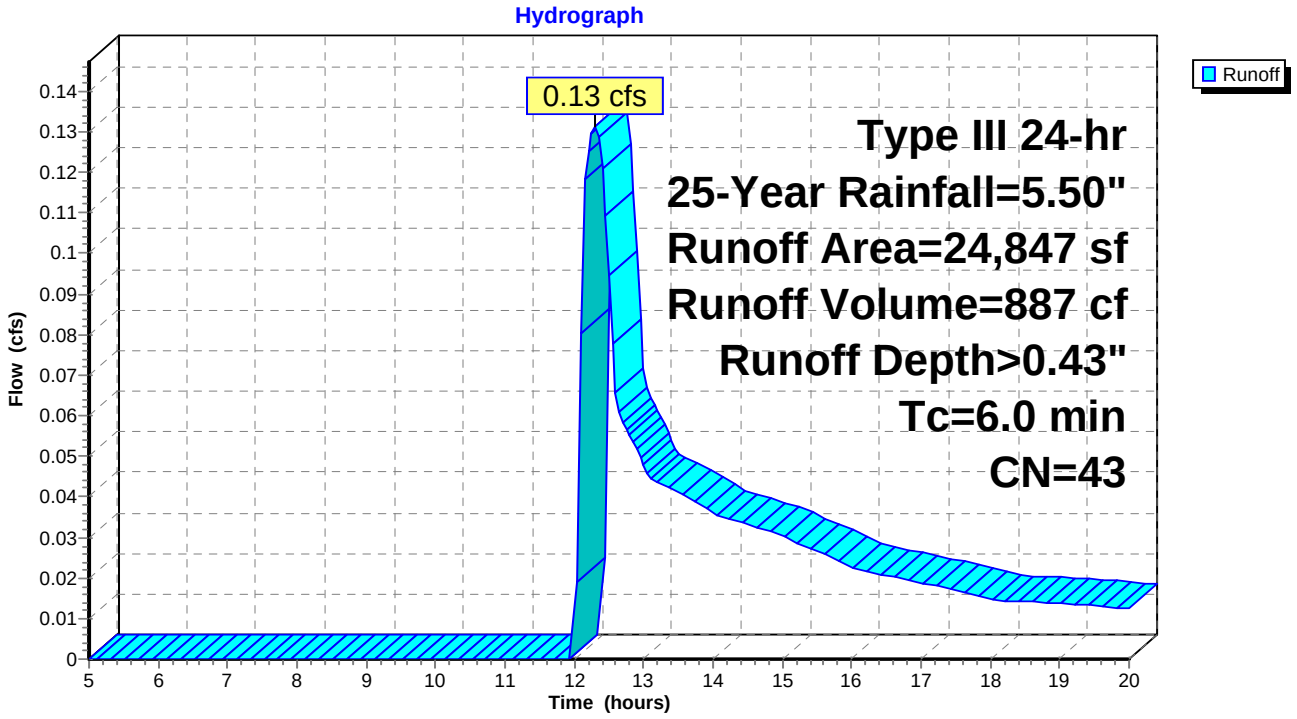
Runoff = 0.13 cfs @ 12.29 hrs, Volume= 887 cf, Depth> 0.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
4,045	30	Woods, Good, HSG A
18,342	39	>75% Grass cover, Good, HSG A
1,946	96	Gravel surface, HSG A
253	98	Paved parking, HSG A
261	61	>75% Grass cover, Good, HSG B
24,847	43	Weighted Average
24,594		98.98% Pervious Area
253		1.02% Impervious Area

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

Subcatchment 2ND: To Natural Depression



Summary for Subcatchment EU: Eastern Units

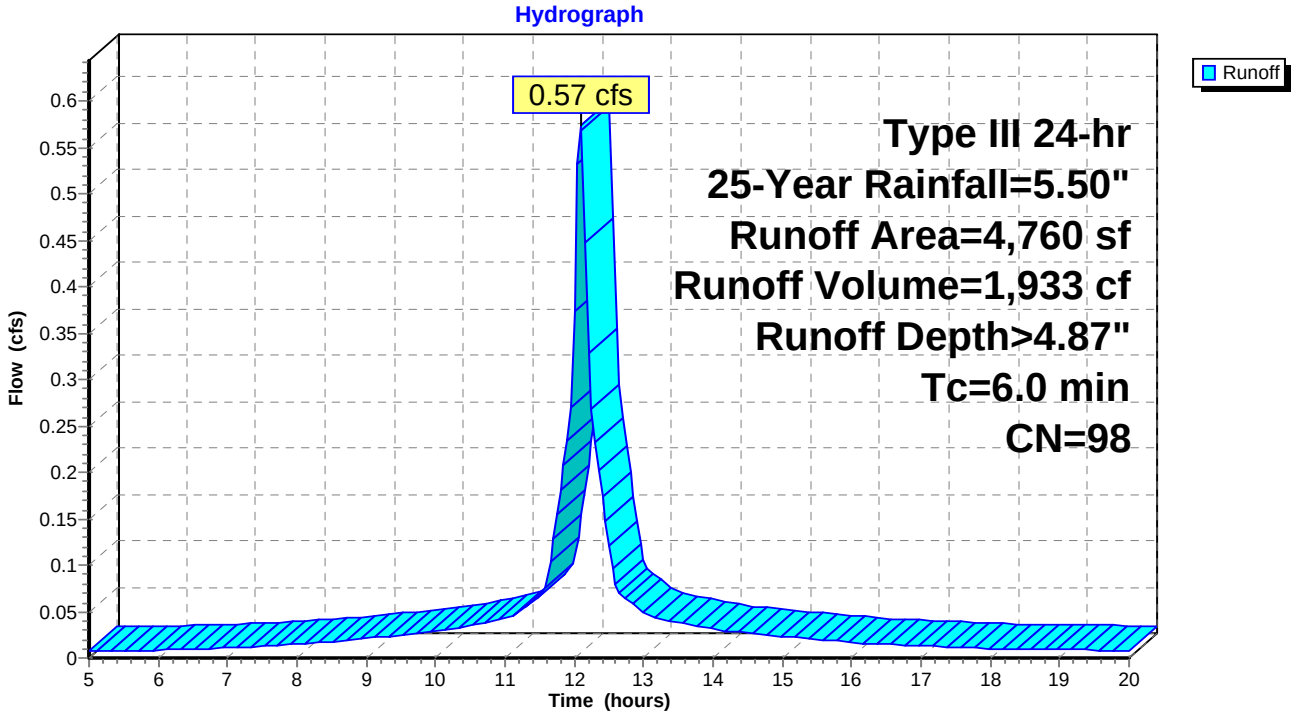
Runoff = 0.57 cfs @ 12.09 hrs, Volume= 1,933 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment EU: Eastern Units



Summary for Subcatchment N: Offsite North

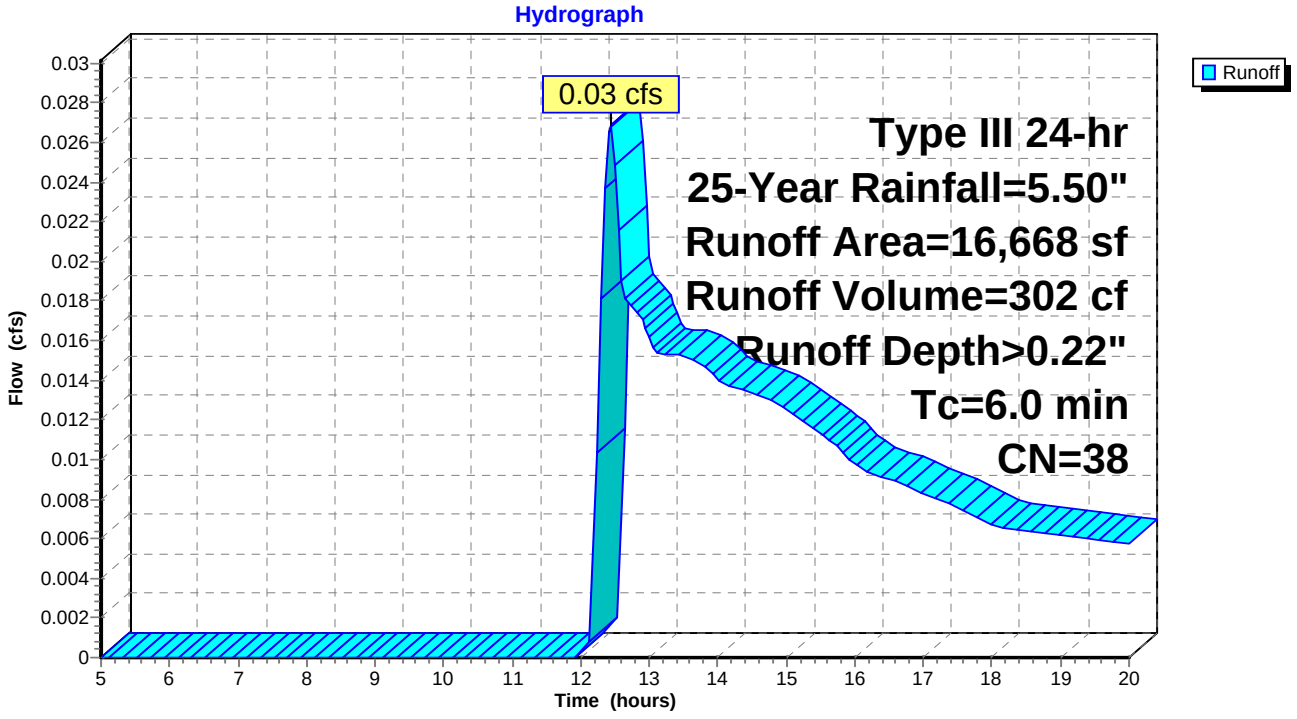
Runoff = 0.03 cfs @ 12.43 hrs, Volume= 302 cf, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
4,653	30	Woods, Good, HSG A
11,477	39	>75% Grass cover, Good, HSG A
417	96	Gravel surface, HSG A
121	98	Paved parking, HSG A
16,668	38	Weighted Average
16,547		99.27% Pervious Area
121		0.73% Impervious Area

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

Subcatchment N: Offsite North



Summary for Subcatchment NU: Northern Units

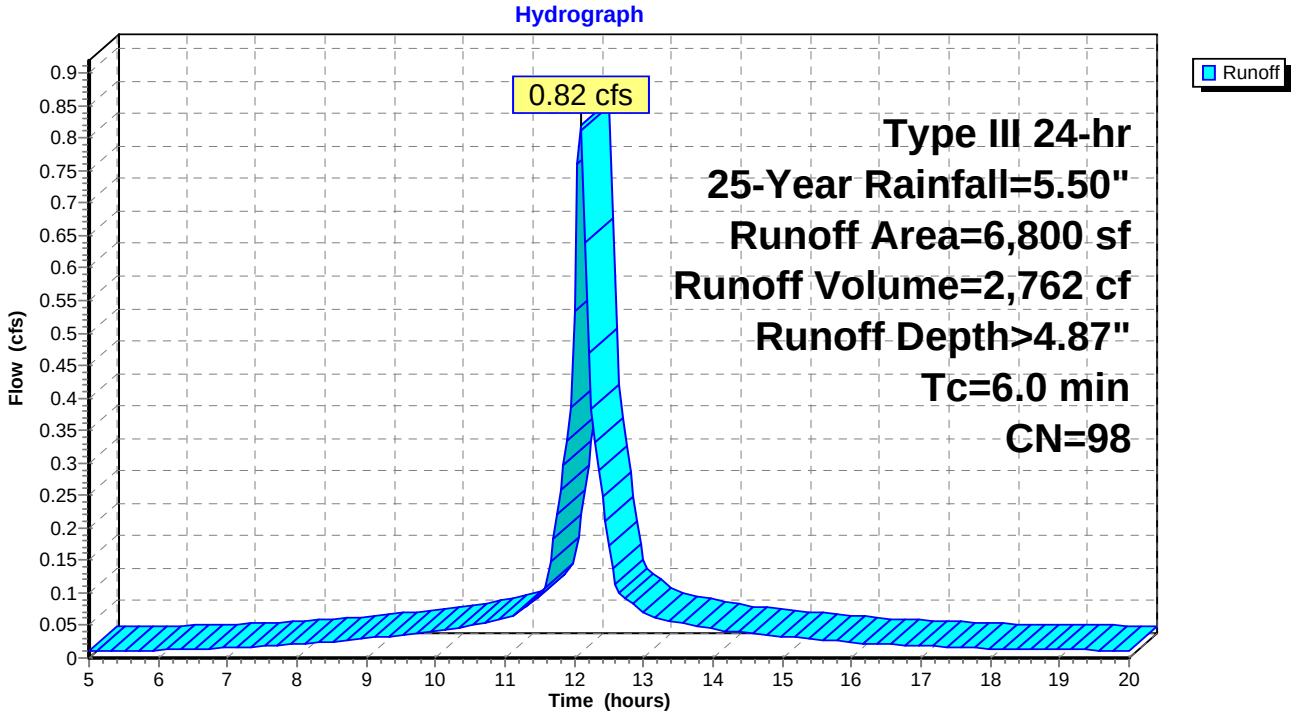
Runoff = 0.82 cfs @ 12.09 hrs, Volume= 2,762 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
6,800	98	Roofs, HSG D
6,800		100.00% Impervious Area

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

Subcatchment NU: Northern Units



Summary for Subcatchment S: Onsite South

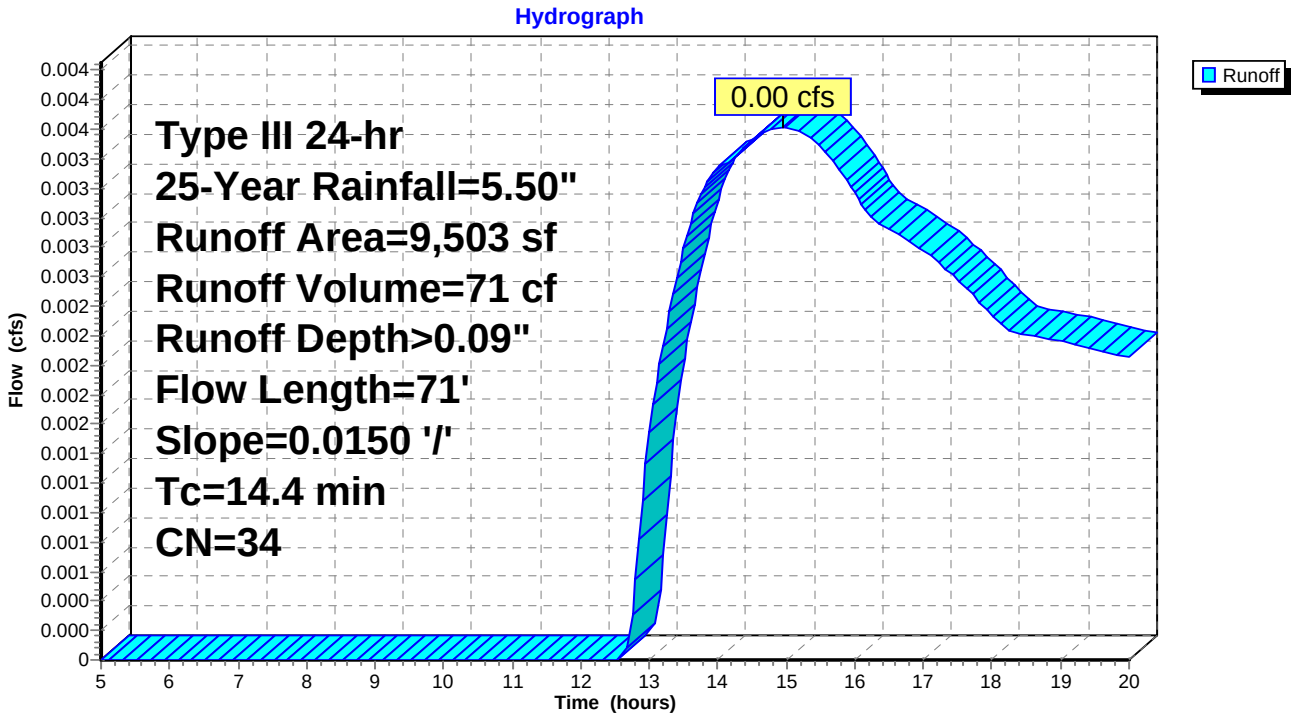
Runoff = 0.00 cfs @ 14.94 hrs, Volume= 71 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
5,286	30	Woods, Good, HSG A
4,154	39	>75% Grass cover, Good, HSG A
63	98	Unconnected roofs, HSG A
9,503	34	Weighted Average
9,440		99.34% Pervious Area
63		0.66% Impervious Area
63		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South



Summary for Subcatchment WU: Western Units

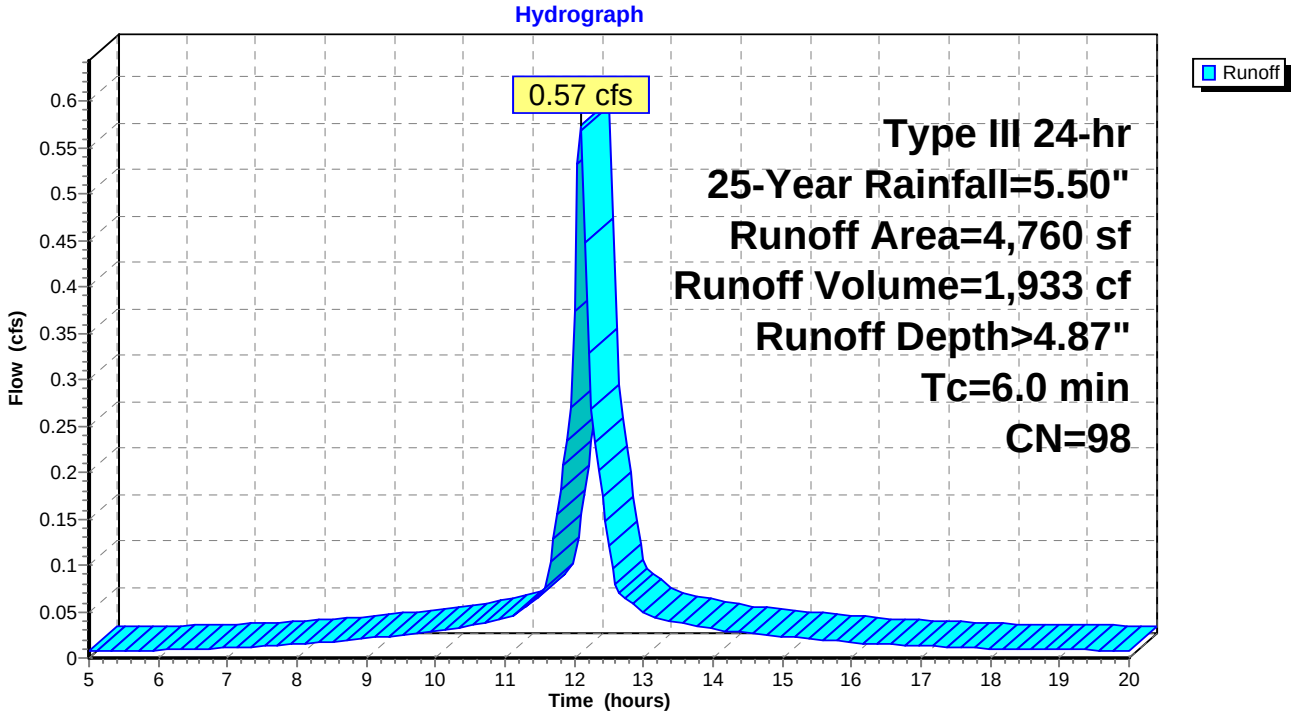
Runoff = 0.57 cfs @ 12.09 hrs, Volume= 1,933 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment WU: Western Units

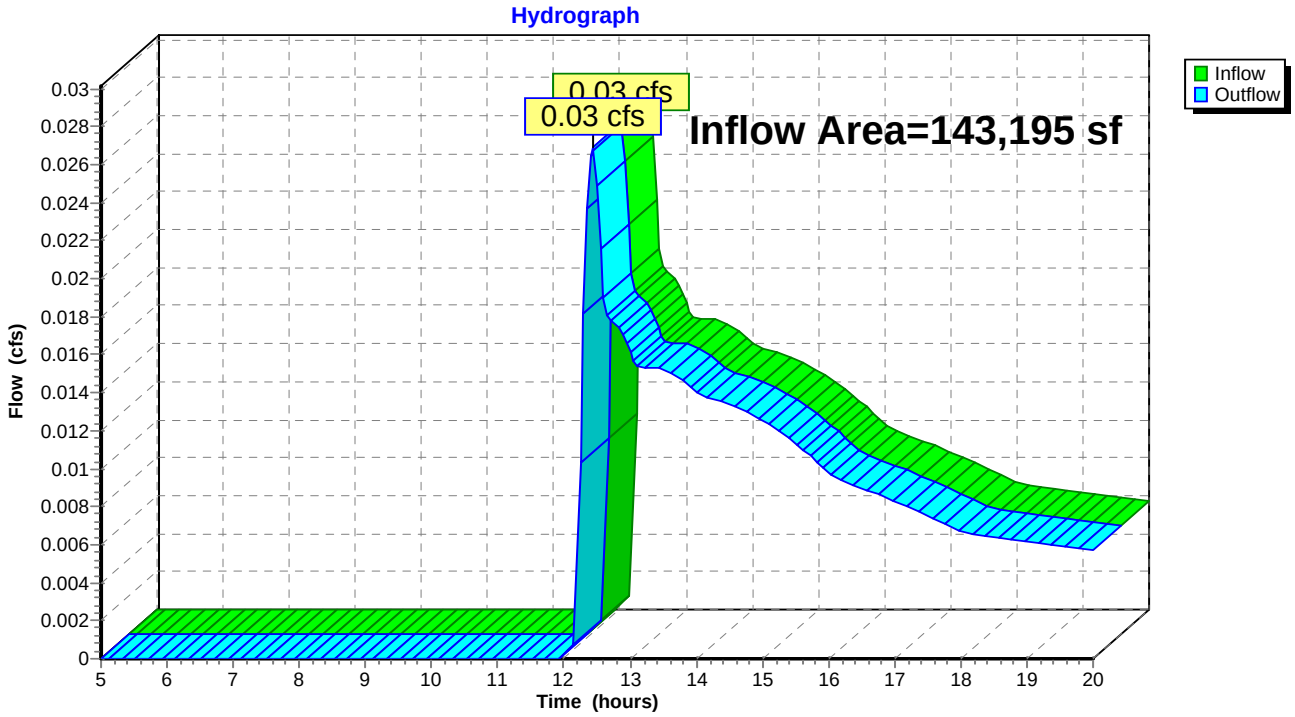


Summary for Reach TN: Total North

Inflow Area = 143,195 sf, 31.20% Impervious, Inflow Depth > 0.03" for 25-Year event
Inflow = 0.03 cfs @ 12.43 hrs, Volume= 302 cf
Outflow = 0.03 cfs @ 12.43 hrs, Volume= 302 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ISA: Infiltration System A

Inflow Area = 4,760 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 1,933 cf
Outflow = 0.08 cfs @ 11.65 hrs, Volume= 1,933 cf, Atten= 86%, Lag= 0.0 min
Discarded = 0.08 cfs @ 11.65 hrs, Volume= 1,933 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 107.99' @ 12.59 hrs Surf.Area= 430 sf Storage= 583 cf

Plug-Flow detention time= 43.7 min calculated for 1,933 cf (100% of inflow)
Center-of-Mass det. time= 43.5 min (778.0 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	391 cf	**11.17'W x 38.50'L x 3.54'H Field A** 1,523 cf Overall - 544 cf Embedded = 979 cf x 40.0% Voids
#2A	106.50'	544 cf	**Cultec R-330XLHD** x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		935 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 11.65 hrs HW=106.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.08 cfs)

Pond ISA: Infiltration System A - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

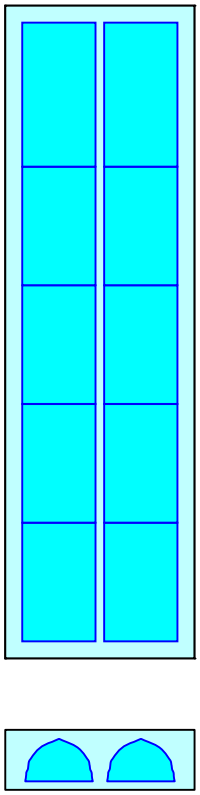
5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +12.0" End Stone x 2 = 38.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 543.9 cf Chamber Storage

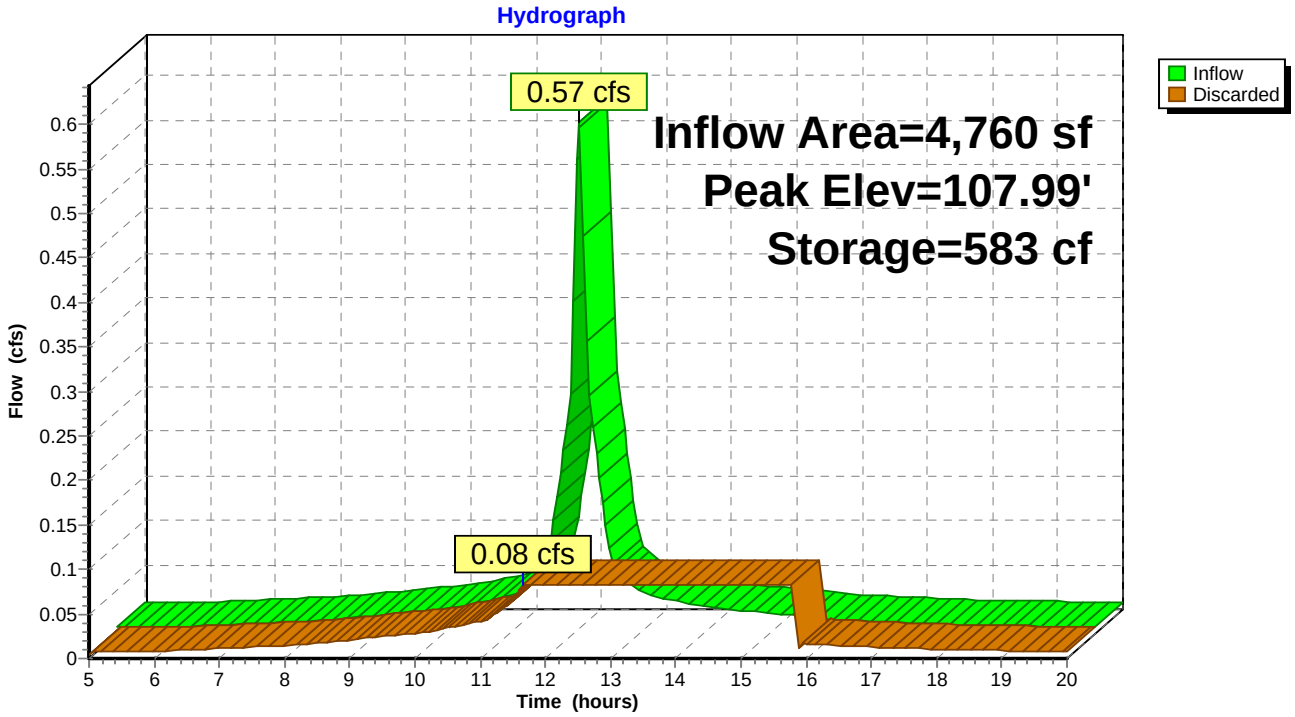
1,522.6 cf Field - 543.9 cf Chambers = 978.7 cf Stone x 40.0% Voids = 391.5 cf Stone Storage

Chamber Storage + Stone Storage = 935.4 cf = 0.021 af
Overall Storage Efficiency = 61.4%
Overall System Size = 38.50' x 11.17' x 3.54'

10 Chambers
56.4 cy Field
36.2 cy Stone



Pond ISA: Infiltration System A



Stage-Area-Storage for Pond ISA: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	**430**	0
106.05	430	9
106.10	430	17
106.15	430	26
106.20	430	34
106.25	430	43
106.30	430	52
106.35	430	60
106.40	430	69
106.45	430	77
106.50	430	86
106.55	430	103
106.60	430	121
106.65	430	138
106.70	430	155
106.75	430	172
106.80	430	189
106.85	430	206
106.90	430	223
106.95	430	240
107.00	430	257
107.05	430	275
107.10	430	291
107.15	430	308
107.20	430	325
107.25	430	342
107.30	430	358
107.35	430	375
107.40	430	391
107.45	430	408
107.50	430	424
107.55	430	441
107.60	430	457
107.65	430	474
107.70	430	490
107.75	430	506
107.80	430	522
107.85	430	538
107.90	430	554
107.95	430	570
108.00	430	585
108.05	430	600
108.10	430	616
108.15	430	631
108.20	430	645
108.25	430	660
108.30	430	675
108.35	430	689
108.40	430	703
108.45	430	717
108.50	430	730
108.55	430	743
108.60	430	756
108.65	430	769
108.70	430	781
108.75	430	792
108.80	430	803
108.85	430	814
108.90	430	824
108.95	430	833
109.00	430	842
109.05	430	851
109.10	430	859
109.15	430	868
109.20	430	877
109.25	430	885
109.30	430	894
109.35	430	902
109.40	430	911
109.45	430	920
109.50	430	**928**

Summary for Pond ISB: Infiltration System B

Inflow Area = 4,760 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 1,933 cf
Outflow = 0.03 cfs @ 10.45 hrs, Volume= 1,430 cf, Atten= 94%, Lag= 0.0 min
Discarded = 0.03 cfs @ 10.45 hrs, Volume= 1,430 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 107.70' @ 13.88 hrs Surf.Area= 586 sf Storage= 887 cf

Plug-Flow detention time= 157.2 min calculated for 1,429 cf (74% of inflow)
Center-of-Mass det. time= 93.5 min (828.1 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.50'	530 cf	**11.17'W x 52.50'L x 3.54'H Field A** 2,076 cf Overall - 753 cf Embedded = 1,324 cf x 40.0% Voids
#2A	106.00'	753 cf	**Cultec R-330XLHD** x 14 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 10.45 hrs HW=105.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond ISB: Infiltration System B - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

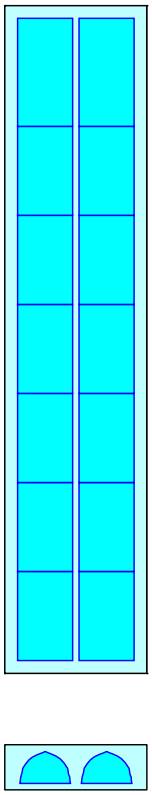
7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

14 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 752.6 cf Chamber Storage

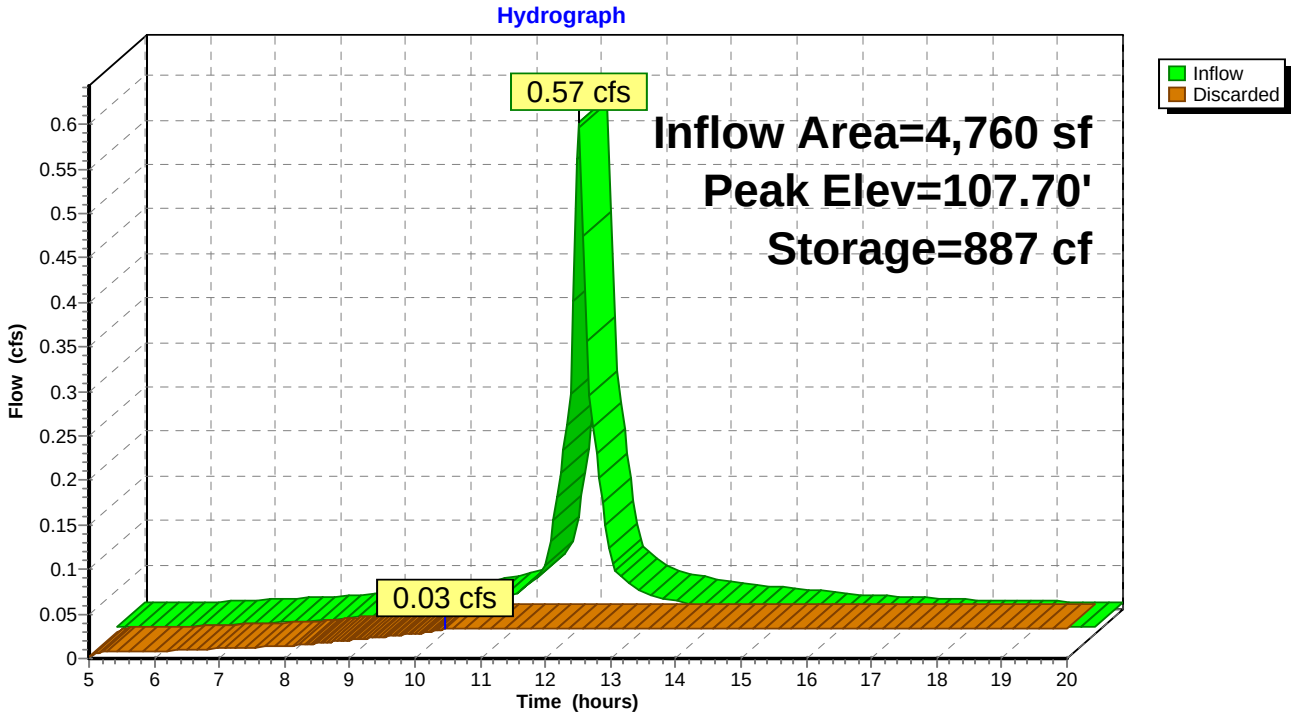
2,076.3 cf Field - 752.6 cf Chambers = 1,323.8 cf Stone x 40.0% Voids = 529.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,282.1 cf = 0.029 af
Overall Storage Efficiency = 61.7%
Overall System Size = 52.50' x 11.17' x 3.54'

14 Chambers
76.9 cy Field
49.0 cy Stone



Pond ISB: Infiltration System B



Stage-Area-Storage for Pond ISB: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.50	**586**	0
105.55	586	12
105.60	586	23
105.65	586	35
105.70	586	47
105.75	586	59
105.80	586	70
105.85	586	82
105.90	586	94
105.95	586	106
106.00	586	117
106.05	586	141
106.10	586	165
106.15	586	188
106.20	586	212
106.25	586	235
106.30	586	259
106.35	586	282
106.40	586	306
106.45	586	329
106.50	586	353
106.55	586	376
106.60	586	399
106.65	586	423
106.70	586	446
106.75	586	468
106.80	586	491
106.85	586	514
106.90	586	537
106.95	586	559
107.00	586	582
107.05	586	605
107.10	586	627
107.15	586	650
107.20	586	672
107.25	586	694
107.30	586	717
107.35	586	738
107.40	586	760
107.45	586	781
107.50	586	803
107.55	586	824
107.60	586	844
107.65	586	865
107.70	586	885
107.75	586	906
107.80	586	925
107.85	586	945
107.90	586	964
107.95	586	983
108.00	586	1,002
108.05	586	1,020
108.10	586	1,037
108.15	586	1,055
108.20	586	1,071
108.25	586	1,087
108.30	586	1,102
108.35	586	1,116
108.40	586	1,130
108.45	586	1,143
108.50	586	1,155
108.55	586	1,167
108.60	586	1,178
108.65	586	1,190
108.70	586	1,202
108.75	586	1,214
108.80	586	1,225
108.85	586	1,237
108.90	586	1,249
108.95	586	1,261
109.00	586	**1,272**

Summary for Pond ISC: Infiltration System C

Inflow Area = 6,800 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 2,762 cf
Outflow = 0.03 cfs @ 9.00 hrs, Volume= 1,344 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.03 cfs @ 9.00 hrs, Volume= 1,344 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 106.45' @ 15.53 hrs Surf.Area= 1,190 sf Storage= 1,603 cf

Plug-Flow detention time= 161.4 min calculated for 1,339 cf (48% of inflow)
Center-of-Mass det. time= 63.4 min (798.0 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	578 cf	**20.83'W x 31.50'L x 3.54'H Field A** 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#2A	105.00'	879 cf	**Cultec R-330XLHD** x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
#3B	104.50'	479 cf	**30.50'W x 17.50'L x 3.54'H Field B** 1,890 cf Overall - 693 cf Embedded = 1,197 cf x 40.0% Voids
#4B	105.00'	693 cf	**Cultec R-330XLHD** x 12 Inside #3 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		2,629 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 9.00 hrs HW=104.54' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond ISC: Infiltration System C - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

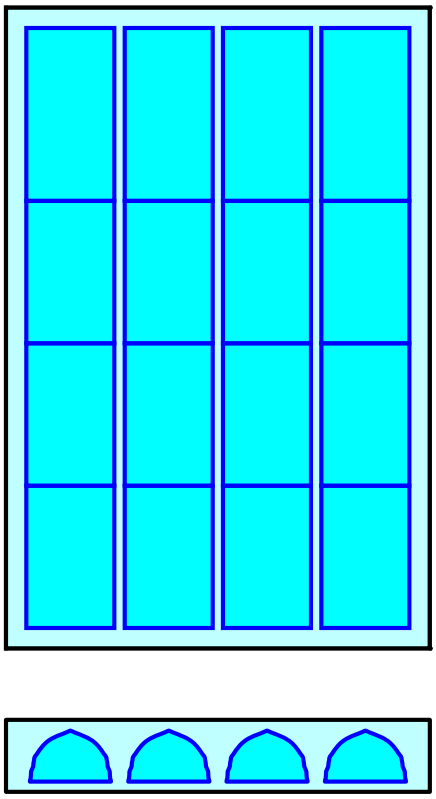
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%
Overall System Size = 31.50' x 20.83' x 3.54'

16 Chambers
86.1 cy Field
53.5 cy Stone



Pond ISC: Infiltration System C - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

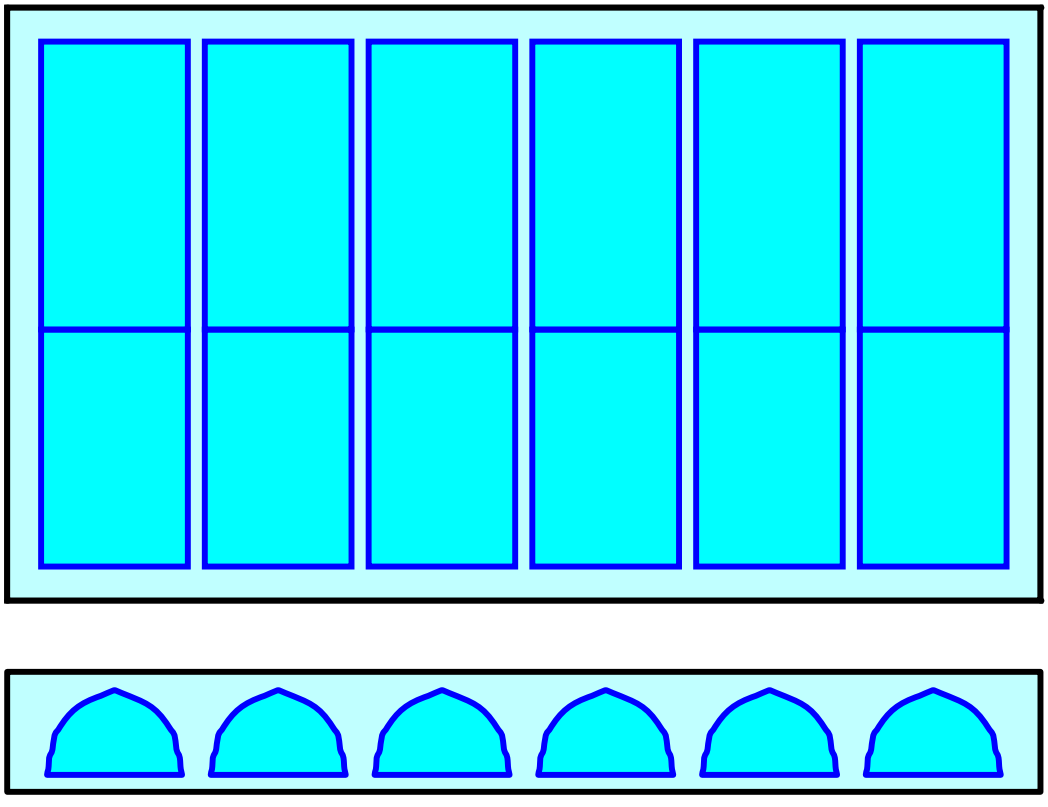
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 692.9 cf Chamber Storage

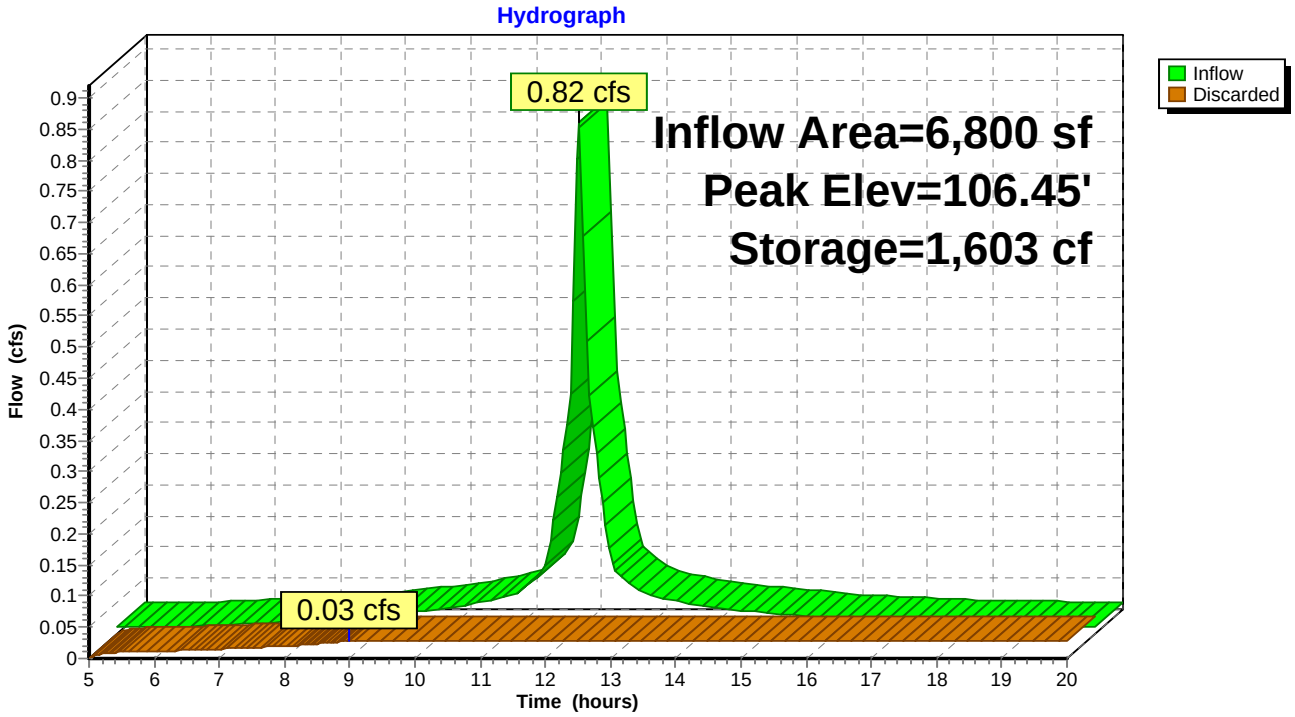
1,890.4 cf Field - 692.9 cf Chambers = 1,197.4 cf Stone x 40.0% Voids = 479.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,171.9 cf = 0.027 af
Overall Storage Efficiency = 62.0%
Overall System Size = 17.50' x 30.50' x 3.54'

12 Chambers
70.0 cy Field
44.3 cy Stone



Pond ISC: Infiltration System C



Stage-Area-Storage for Pond ISC: Infiltration System C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	**1,190**	0
104.55	1,190	24
104.60	1,190	48
104.65	1,190	71
104.70	1,190	95
104.75	1,190	119
104.80	1,190	143
104.85	1,190	167
104.90	1,190	190
104.95	1,190	214
105.00	1,190	238
105.05	1,190	287
105.10	1,190	336
105.15	1,190	385
105.20	1,190	433
105.25	1,190	482
105.30	1,190	530
105.35	1,190	578
105.40	1,190	627
105.45	1,190	675
105.50	1,190	723
105.55	1,190	771
105.60	1,190	819
105.65	1,190	867
105.70	1,190	914
105.75	1,190	961
105.80	1,190	1,008
105.85	1,190	1,055
105.90	1,190	1,102
105.95	1,190	1,149
106.00	1,190	1,195
106.05	1,190	1,242
106.10	1,190	1,288
106.15	1,190	1,334
106.20	1,190	1,381
106.25	1,190	1,426
106.30	1,190	1,472
106.35	1,190	1,517
106.40	1,190	1,561
106.45	1,190	1,605
106.50	1,190	1,649
106.55	1,190	1,692
106.60	1,190	1,735
106.65	1,190	1,777
106.70	1,190	1,819
106.75	1,190	1,860
106.80	1,190	1,901
106.85	1,190	1,941
106.90	1,190	1,981
106.95	1,190	2,020
107.00	1,190	2,058
107.05	1,190	2,095
107.10	1,190	2,131
107.15	1,190	2,166
107.20	1,190	2,200
107.25	1,190	2,233
107.30	1,190	2,263
107.35	1,190	2,293
107.40	1,190	2,320
107.45	1,190	2,347
107.50	1,190	2,371
107.55	1,190	2,395
107.60	1,190	2,419
107.65	1,190	2,443
107.70	1,190	2,466
107.75	1,190	2,490
107.80	1,190	2,514
107.85	1,190	2,538
107.90	1,190	2,562
107.95	1,190	2,585
108.00	1,190	**2,609**

Summary for Pond ISD: Infiltration System D

Inflow Area = 101,680 sf, 43.57% Impervious, Inflow Depth > 2.48" for 25-Year event
Inflow = 7.10 cfs @ 12.10 hrs, Volume= 21,053 cf
Outflow = 0.21 cfs @ 11.05 hrs, Volume= 7,477 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.21 cfs @ 11.05 hrs, Volume= 7,477 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 107.15' @ 17.12 hrs Surf.Area= 8,993 sf Storage= 14,098 cf

Plug-Flow detention time= 201.0 min calculated for 7,477 cf (36% of inflow)
Center-of-Mass det. time= 108.8 min (907.0 - 798.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.00'	7,412 cf	**54.67'W x 164.50'L x 3.54'H Field A** 31,849 cf Overall - 13,319 cf Embedded = 18,530 cf x 40.0% Voids
#2A	105.50'	13,319 cf	**Cultec R-330XLHD** x 253 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 11 rows
		20,731 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	105.94'	**12.0" Round Culvert** L= 94.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 105.94' / 105.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	106.49'	**12.0" Round Culvert** L= 35.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 106.49' / 106.14' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Device 3	107.34'	**12.0" Round Culvert** L= 65.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 107.34' / 106.69' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#5	Device 4	108.45'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Discarded OutFlow Max=0.21 cfs @ 11.05 hrs HW=105.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=105.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Culvert** (Controls 0.00 cfs)
└**4=Culvert** (Controls 0.00 cfs)
└**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ISD: Infiltration System D - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 11 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

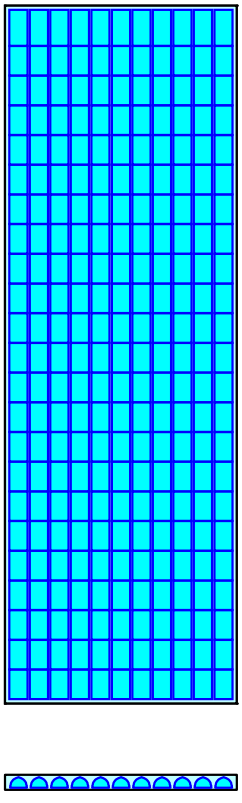
23 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 162.50' Row Length +12.0" End Stone x 2 = 164.50' Base Length
11 Rows x 52.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 54.67' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

253 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 11 Rows = 13,318.7 cf Chamber Storage

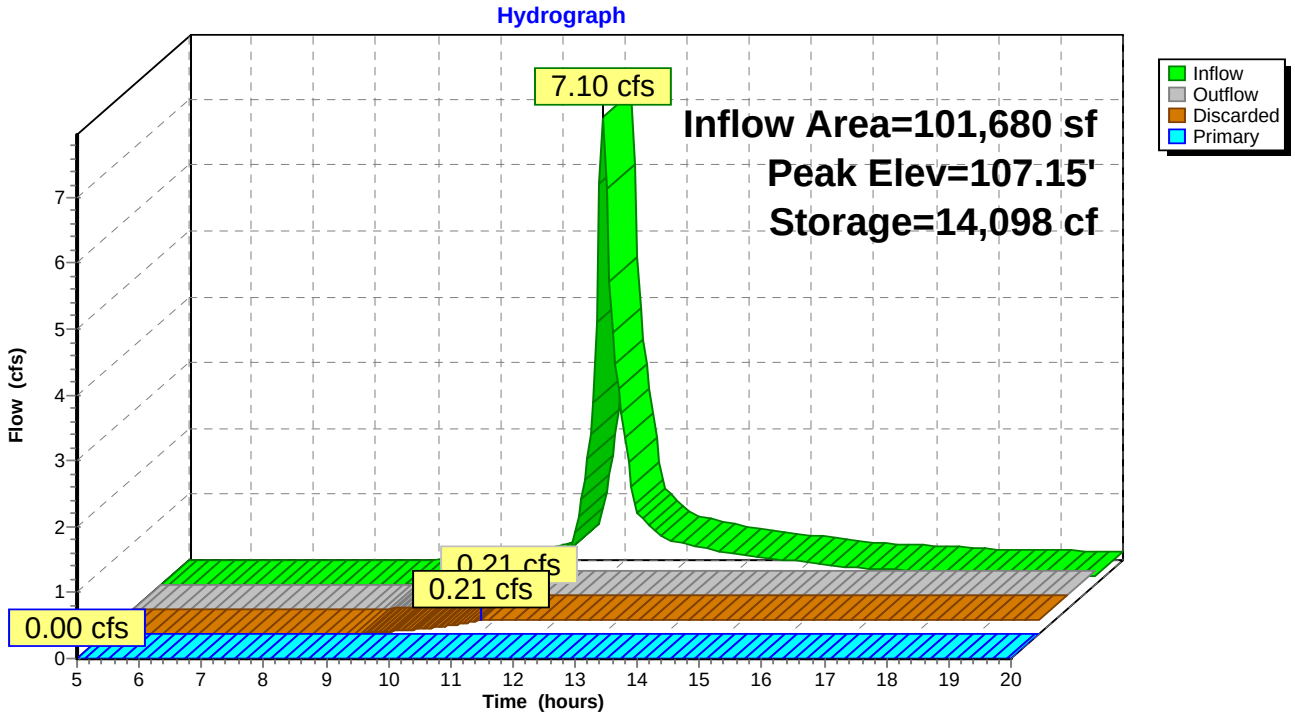
31,849.0 cf Field - 13,318.7 cf Chambers = 18,530.4 cf Stone x 40.0% Voids = 7,412.1 cf Stone Storage

Chamber Storage + Stone Storage = 20,730.8 cf = 0.476 af
Overall Storage Efficiency = 65.1%
Overall System Size = 164.50' x 54.67' x 3.54'

253 Chambers
1,179.6 cy Field
686.3 cy Stone



Pond ISD: Infiltration System D



Stage-Area-Storage for Pond ISD: Infiltration System D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.00	**8,993**	0
105.05	8,993	180
105.10	8,993	360
105.15	8,993	540
105.20	8,993	719
105.25	8,993	899
105.30	8,993	1,079
105.35	8,993	1,259
105.40	8,993	1,439
105.45	8,993	1,619
105.50	8,993	1,799
105.55	8,993	2,192
105.60	8,993	2,584
105.65	8,993	2,974
105.70	8,993	3,364
105.75	8,993	3,753
105.80	8,993	4,141
105.85	8,993	4,529
105.90	8,993	4,917
105.95	8,993	5,304
106.00	8,993	5,691
106.05	8,993	6,077
106.10	8,993	6,461
106.15	8,993	6,843
106.20	8,993	7,222
106.25	8,993	7,599
106.30	8,993	7,974
106.35	8,993	8,350
106.40	8,993	8,724
106.45	8,993	9,098
106.50	8,993	9,472
106.55	8,993	9,844
106.60	8,993	10,216
106.65	8,993	10,586
106.70	8,993	10,955
106.75	8,993	11,322
106.80	8,993	11,685
106.85	8,993	12,044
106.90	8,993	12,399
106.95	8,993	12,751
107.00	8,993	13,099
107.05	8,993	13,443
107.10	8,993	13,784
107.15	8,993	14,121
107.20	8,993	14,453
107.25	8,993	14,782
107.30	8,993	15,105
107.35	8,993	15,423
107.40	8,993	15,736
107.45	8,993	16,043
107.50	8,993	16,343
107.55	8,993	16,636
107.60	8,993	16,921
107.65	8,993	17,197
107.70	8,993	17,463
107.75	8,993	17,716
107.80	8,993	17,956
107.85	8,993	18,181
107.90	8,993	18,394
107.95	8,993	18,594
108.00	8,993	18,782
108.05	8,993	18,962
108.10	8,993	19,142
108.15	8,993	19,322
108.20	8,993	19,502
108.25	8,993	19,682
108.30	8,993	19,862
108.35	8,993	20,041
108.40	8,993	20,221
108.45	8,993	20,401
108.50	8,993	**20,581**

Summary for Pond ND: Natural Depression

Inflow Area = 24,847 sf, 1.02% Impervious, Inflow Depth > 0.43" for 25-Year event
Inflow = 0.13 cfs @ 12.29 hrs, Volume= 887 cf
Outflow = 0.04 cfs @ 13.80 hrs, Volume= 849 cf, Atten= 71%, Lag= 90.5 min
Discarded = 0.04 cfs @ 13.80 hrs, Volume= 849 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.11' @ 13.80 hrs Surf.Area= 689 sf Storage= 206 cf

Plug-Flow detention time= 74.6 min calculated for 849 cf (96% of inflow)
Center-of-Mass det. time= 61.1 min (939.3 - 878.2)

Volume	Invert	Avail.Storage	Storage Description
#1	108.00'	3,293 cf	**Custom Stage Data (Irregular)** Listed below

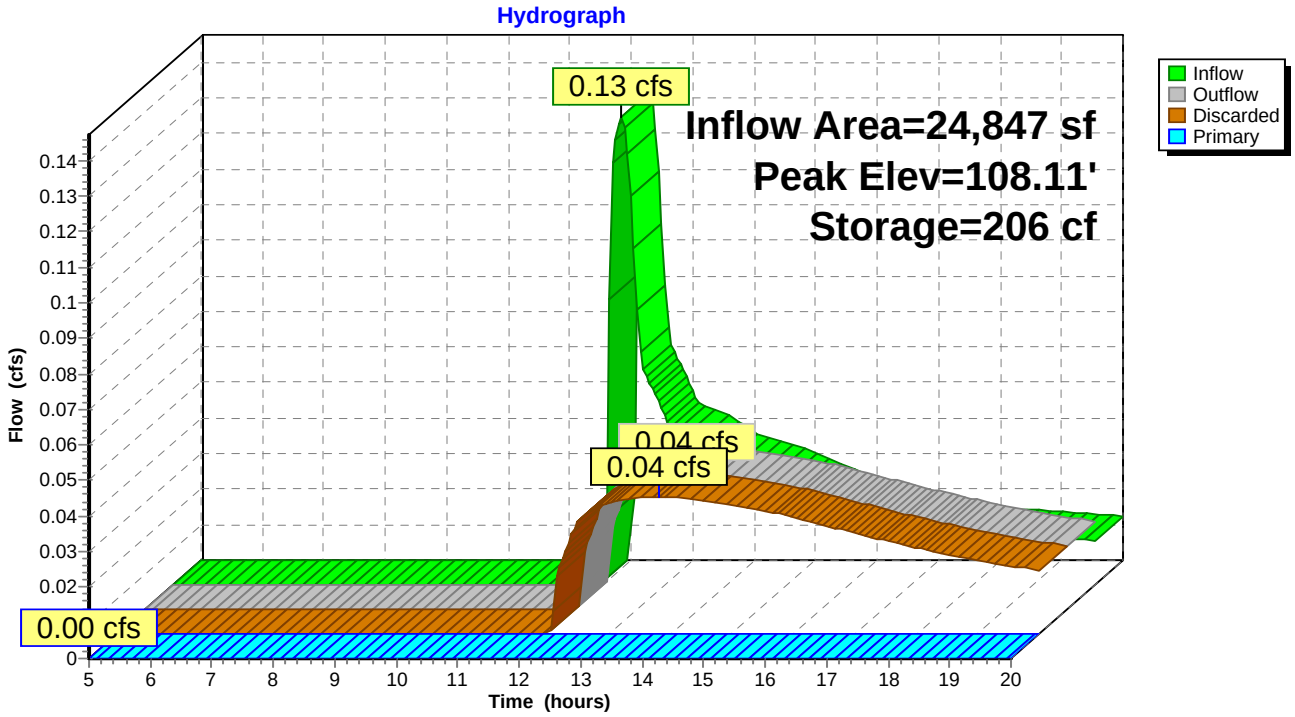
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
108.00	235	88.4	0	0	235
109.00	4,354	655.7	1,867	1,867	33,829
109.30	5,162	671.6	1,426	3,293	35,520

Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**2.0' 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
#2	Discarded	108.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 13.80 hrs HW=108.11' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0
108.02	317	37
108.04	400	75
108.06	482	112
108.08	565	149
108.10	647	187
108.12	729	224
108.14	812	261
108.16	894	299
108.18	976	336
108.20	1,059	373
108.22	1,141	411
108.24	1,224	448
108.26	1,306	485
108.28	1,388	523
108.30	1,471	560
108.32	1,553	597
108.34	1,635	635
108.36	1,718	672
108.38	1,800	709
108.40	1,883	747
108.42	1,965	784
108.44	2,047	821
108.46	2,130	859
108.48	2,212	896
108.50	2,295	933
108.52	2,377	971
108.54	2,459	1,008
108.56	2,542	1,045
108.58	2,624	1,083
108.60	2,706	1,120
108.62	2,789	1,157
108.64	2,871	1,195
108.66	2,954	1,232
108.68	3,036	1,269
108.70	3,118	1,307
108.72	3,201	1,344
108.74	3,283	1,381
108.76	3,365	1,419
108.78	3,448	1,456
108.80	3,530	1,493
108.82	3,613	1,531
108.84	3,695	1,568
108.86	3,777	1,605
108.88	3,860	1,643
108.90	3,942	1,680
108.92	4,024	1,717
108.94	4,107	1,755
108.96	4,189	1,792
108.98	4,272	1,830
109.00	4,354	1,867
109.02	4,408	1,962
109.04	4,462	2,057
109.06	4,516	2,152
109.08	4,569	2,247
109.10	4,623	2,342
109.12	4,677	2,437
109.14	4,731	2,532
109.16	4,785	2,627
109.18	4,839	2,722
109.20	4,893	2,817
109.22	4,947	2,912
109.24	5,000	3,007
109.26	5,054	3,102
109.28	5,108	3,197
109.30	**5,162**	**3,293**

Summary for Subcatchment 2ISD: To Infiltration System D

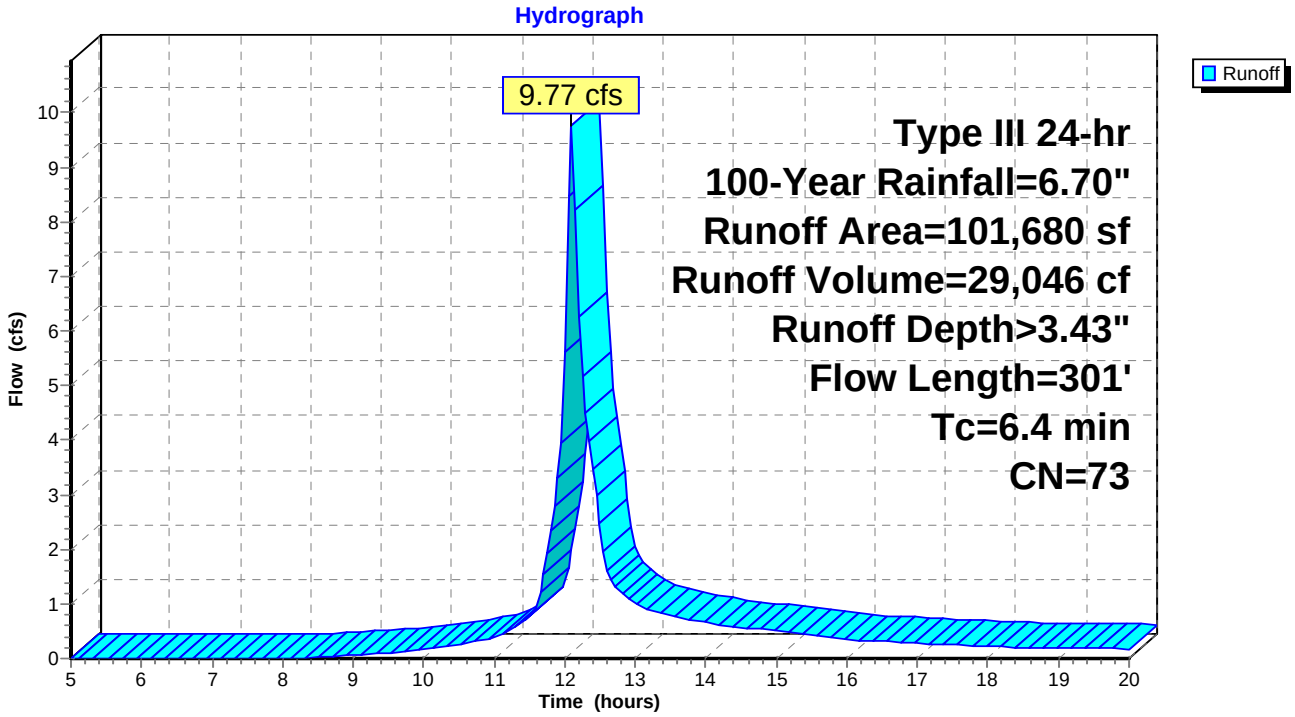
Runoff = 9.77 cfs @ 12.10 hrs, Volume= 29,046 cf, Depth> 3.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
3,068	30	Woods, Good, HSG A
15,416	39	>75% Grass cover, Good, HSG A
21,166	98	Paved parking, HSG A
1,960	55	Woods, Good, HSG B
35,957	61	>75% Grass cover, Good, HSG B
973	96	Gravel surface, HSG B
23,140	98	Paved parking, HSG B
101,680	73	Weighted Average
57,374		56.43% Pervious Area
44,306		43.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Grass AB** Grass: Short n= 0.150 P2= 3.20"
1.6	115	0.0300	1.21		**Shallow Concentrated Flow, Grass BC** Short Grass Pasture Kv= 7.0 fps
0.5	136	0.0100	4.54	3.56	**Pipe Channel, Pipe CD** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
6.4	301	Total			

Subcatchment 2ISD: To Infiltration System D



Summary for Subcatchment 2ND: To Natural Depression

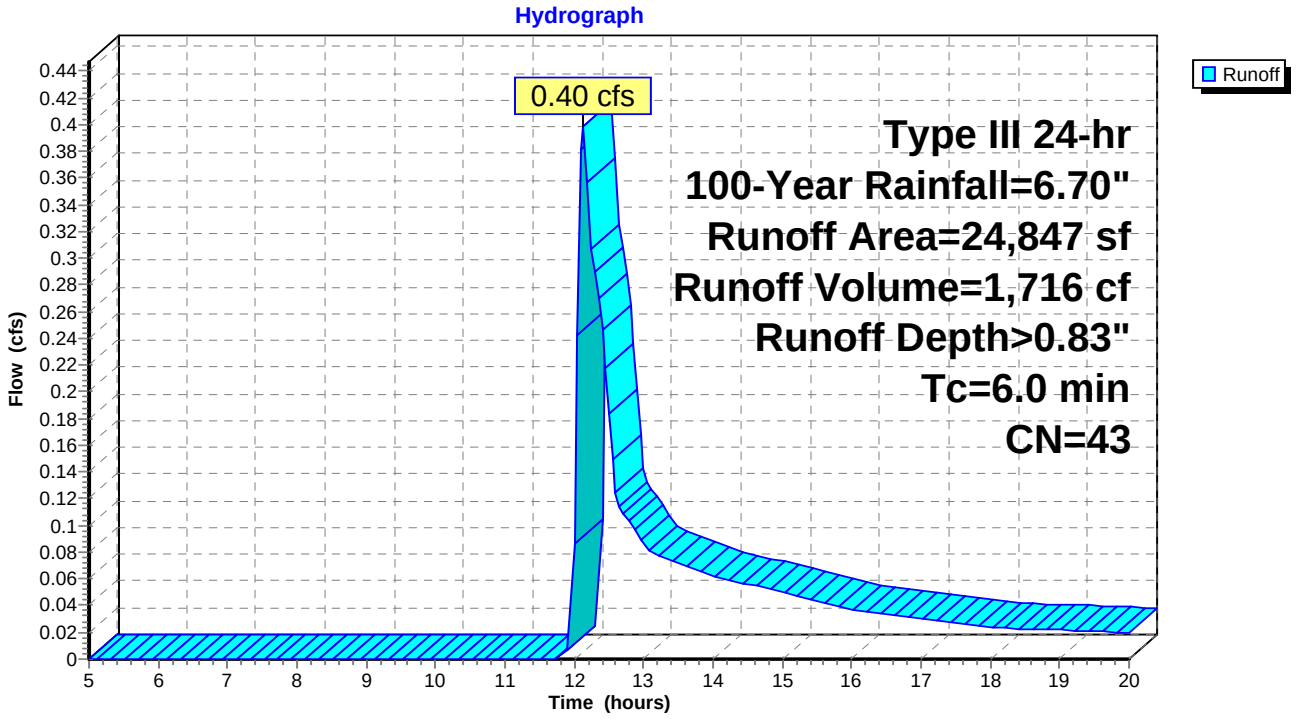
Runoff = 0.40 cfs @ 12.12 hrs, Volume= 1,716 cf, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,045	30	Woods, Good, HSG A
18,342	39	>75% Grass cover, Good, HSG A
1,946	96	Gravel surface, HSG A
253	98	Paved parking, HSG A
261	61	>75% Grass cover, Good, HSG B
24,847	43	Weighted Average
24,594		98.98% Pervious Area
253		1.02% Impervious Area

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

Subcatchment 2ND: To Natural Depression



Summary for Subcatchment EU: Eastern Units

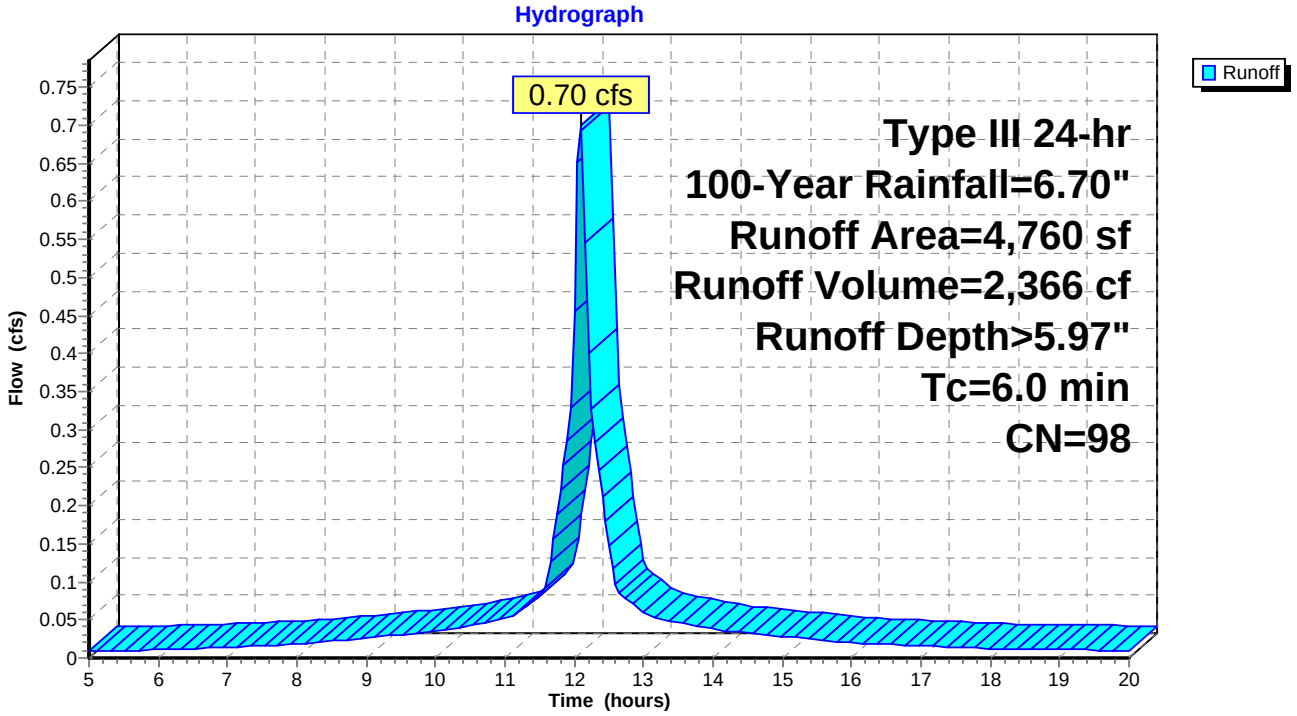
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,366 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment EU: Eastern Units



Summary for Subcatchment N: Offsite North

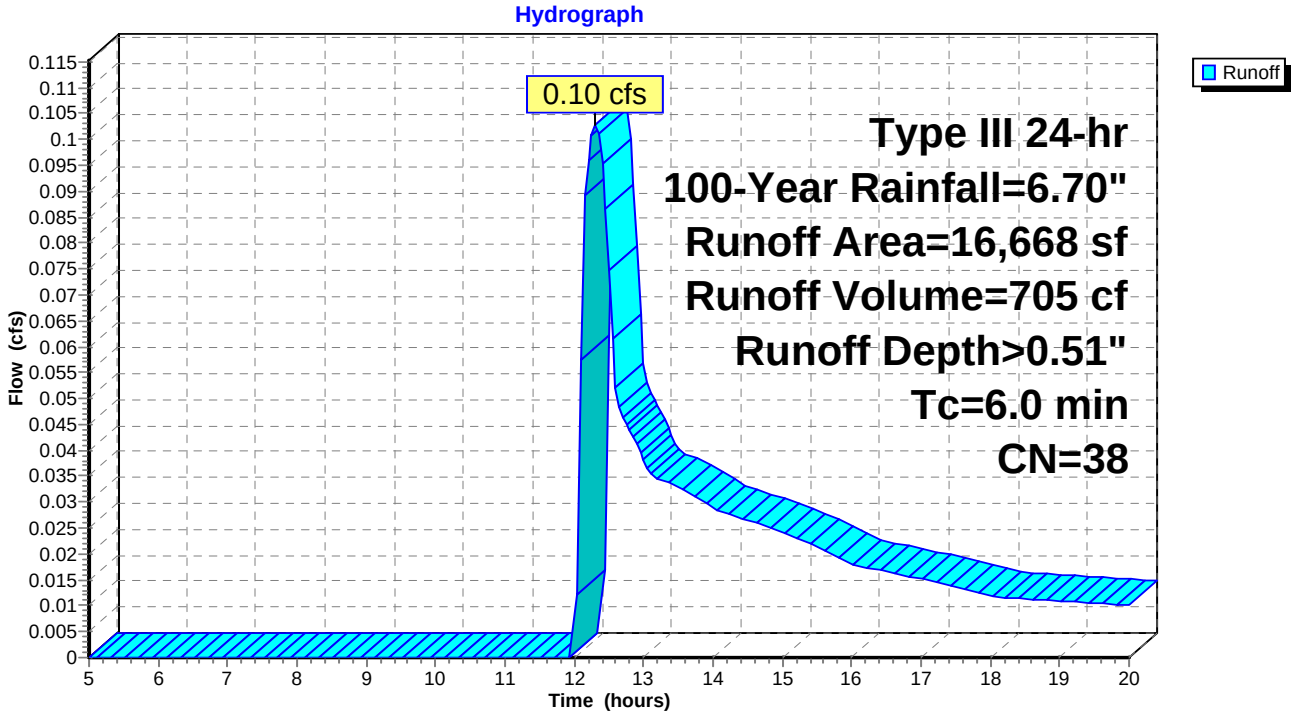
Runoff = 0.10 cfs @ 12.30 hrs, Volume= 705 cf, Depth> 0.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,653	30	Woods, Good, HSG A
11,477	39	>75% Grass cover, Good, HSG A
417	96	Gravel surface, HSG A
121	98	Paved parking, HSG A
16,668	38	Weighted Average
16,547		99.27% Pervious Area
121		0.73% Impervious Area

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

Subcatchment N: Offsite North



Summary for Subcatchment NU: Northern Units

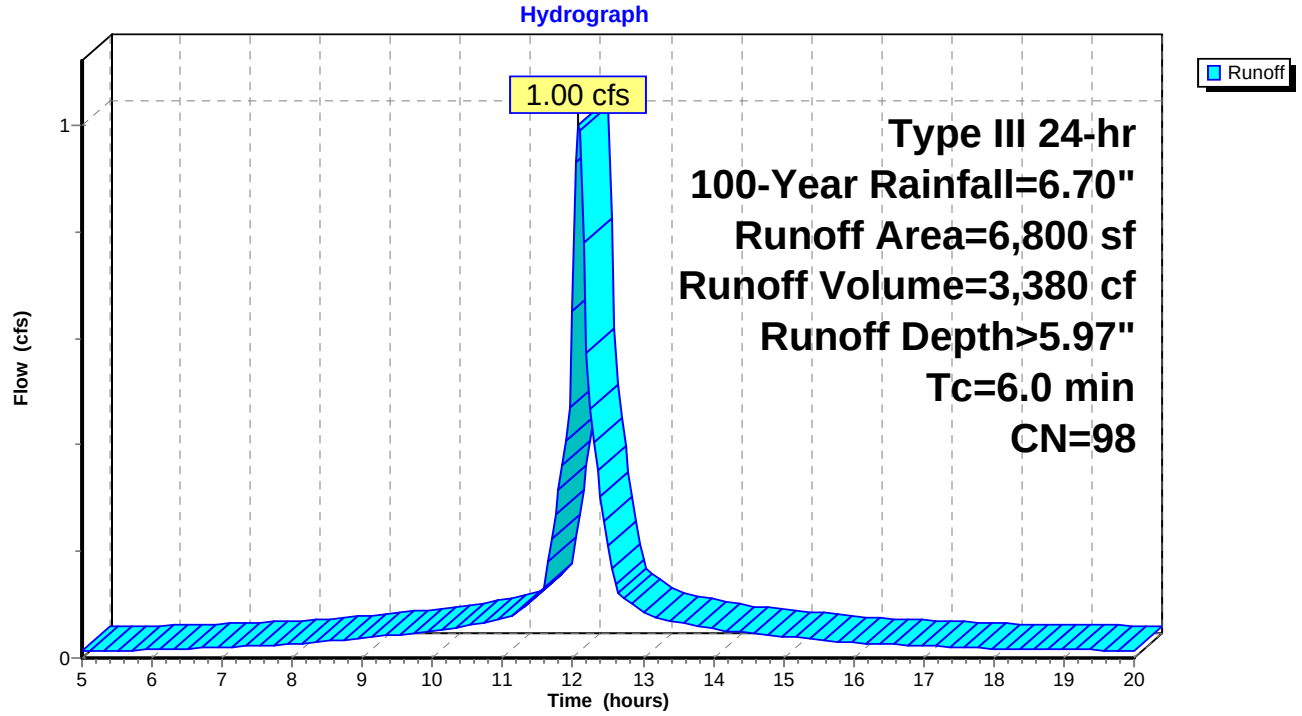
Runoff = 1.00 cfs @ 12.09 hrs, Volume= 3,380 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
6,800	98	Roofs, HSG D
6,800		100.00% Impervious Area

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

Subcatchment NU: Northern Units



Summary for Subcatchment S: Onsite South

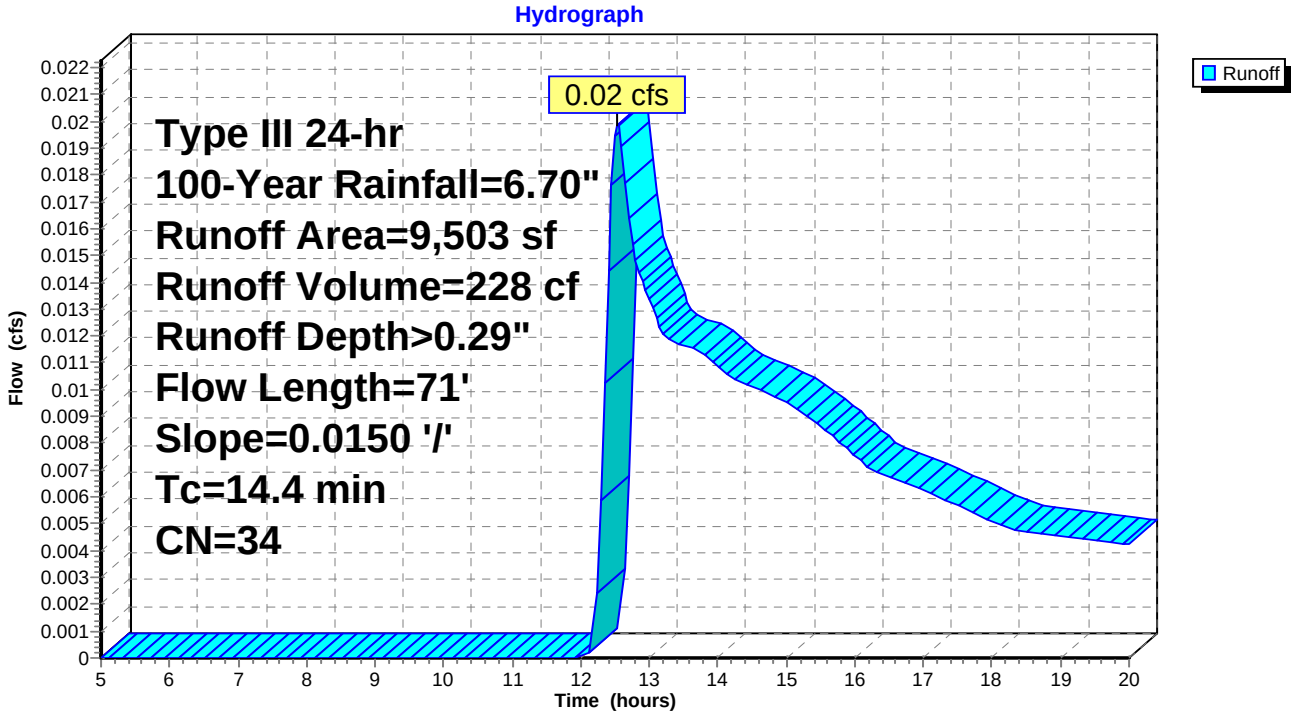
Runoff = 0.02 cfs @ 12.54 hrs, Volume= 228 cf, Depth> 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
5,286	30	Woods, Good, HSG A
4,154	39	>75% Grass cover, Good, HSG A
63	98	Unconnected roofs, HSG A
9,503	34	Weighted Average
9,440		99.34% Pervious Area
63		0.66% Impervious Area
63		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	50	0.0150	0.06		**Sheet Flow, AB-Woods** Woods: Light underbrush n= 0.400 P2= 3.20"
0.6	21	0.0150	0.61		**Shallow Concentrated Flow, BC-Woods** Woodland Kv= 5.0 fps
14.4	71	Total			

Subcatchment S: Onsite South



Summary for Subcatchment WU: Western Units

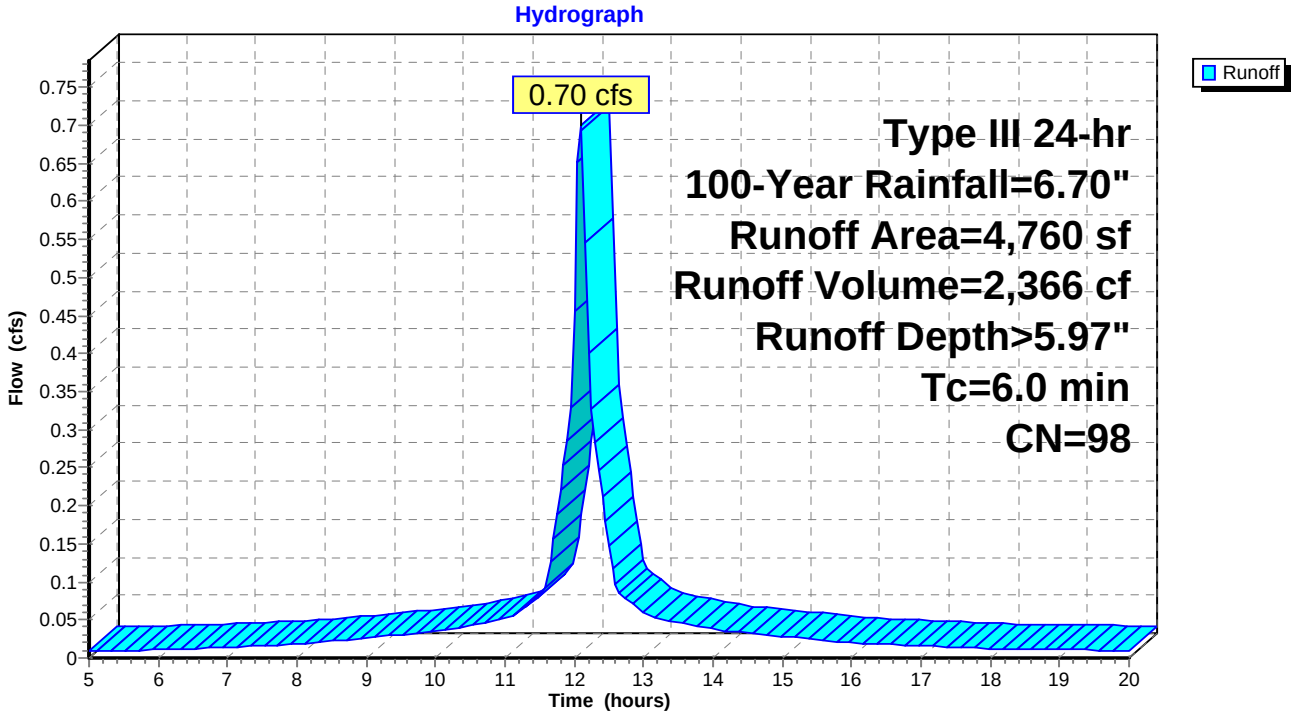
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 2,366 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
4,760	98	Roofs, HSG D
4,760		100.00% Impervious Area

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

Subcatchment WU: Western Units

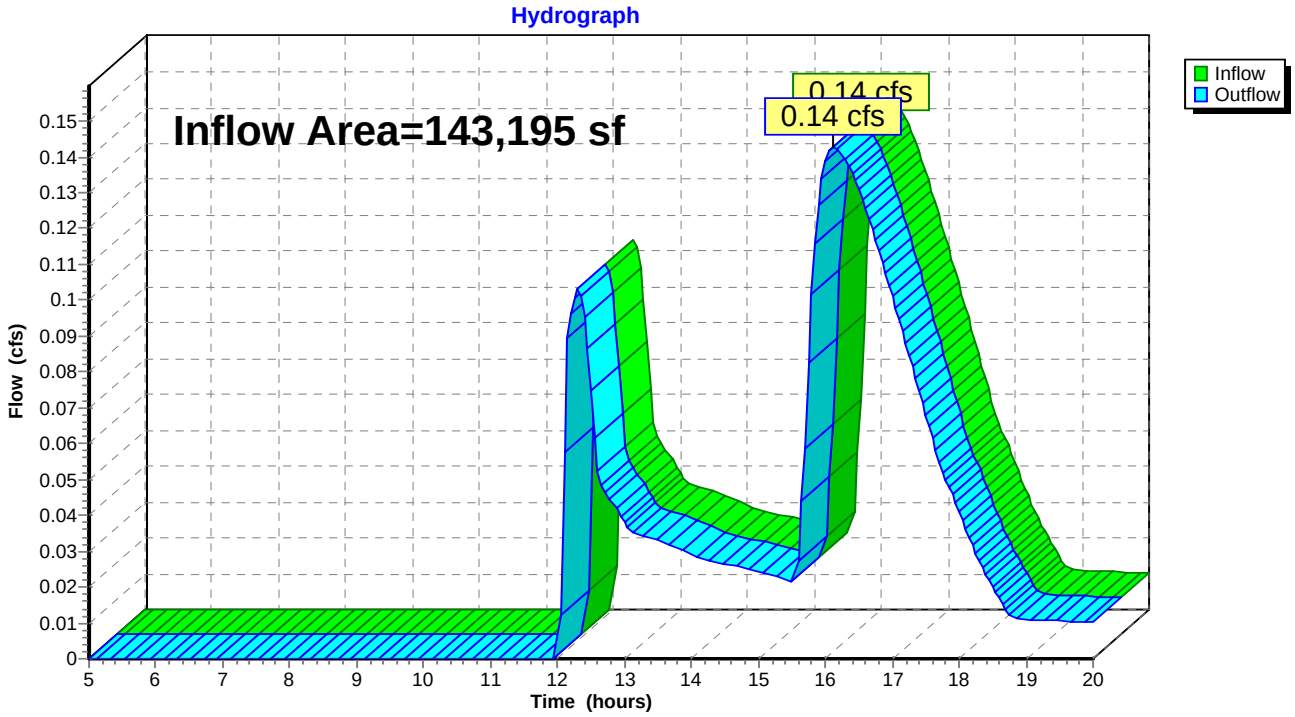


Summary for Reach TN: Total North

Inflow Area = 143,195 sf, 31.20% Impervious, Inflow Depth > 0.12" for 100-Year event
Inflow = 0.14 cfs @ 16.13 hrs, Volume= 1,449 cf
Outflow = 0.14 cfs @ 16.13 hrs, Volume= 1,449 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach TN: Total North



Summary for Pond ISA: Infiltration System A

Inflow Area = 4,760 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 2,366 cf
Outflow = 0.08 cfs @ 11.55 hrs, Volume= 2,365 cf, Atten= 88%, Lag= 0.0 min
Discarded = 0.08 cfs @ 11.55 hrs, Volume= 2,365 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.70' @ 12.69 hrs Surf.Area= 430 sf Storage= 780 cf

Plug-Flow detention time= 63.1 min calculated for 2,365 cf (100% of inflow)
Center-of-Mass det. time= 62.8 min (796.5 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	106.00'	391 cf	**11.17'W x 38.50'L x 3.54'H Field A** 1,523 cf Overall - 544 cf Embedded = 979 cf x 40.0% Voids
#2A	106.50'	544 cf	**Cultec R-330XLHD** x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		935 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	106.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 11.55 hrs HW=106.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Pond ISA: Infiltration System A - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

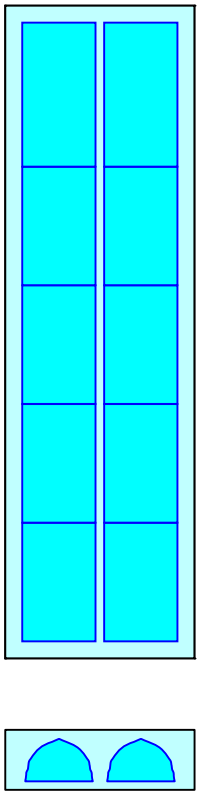
5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +12.0" End Stone x 2 = 38.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 543.9 cf Chamber Storage

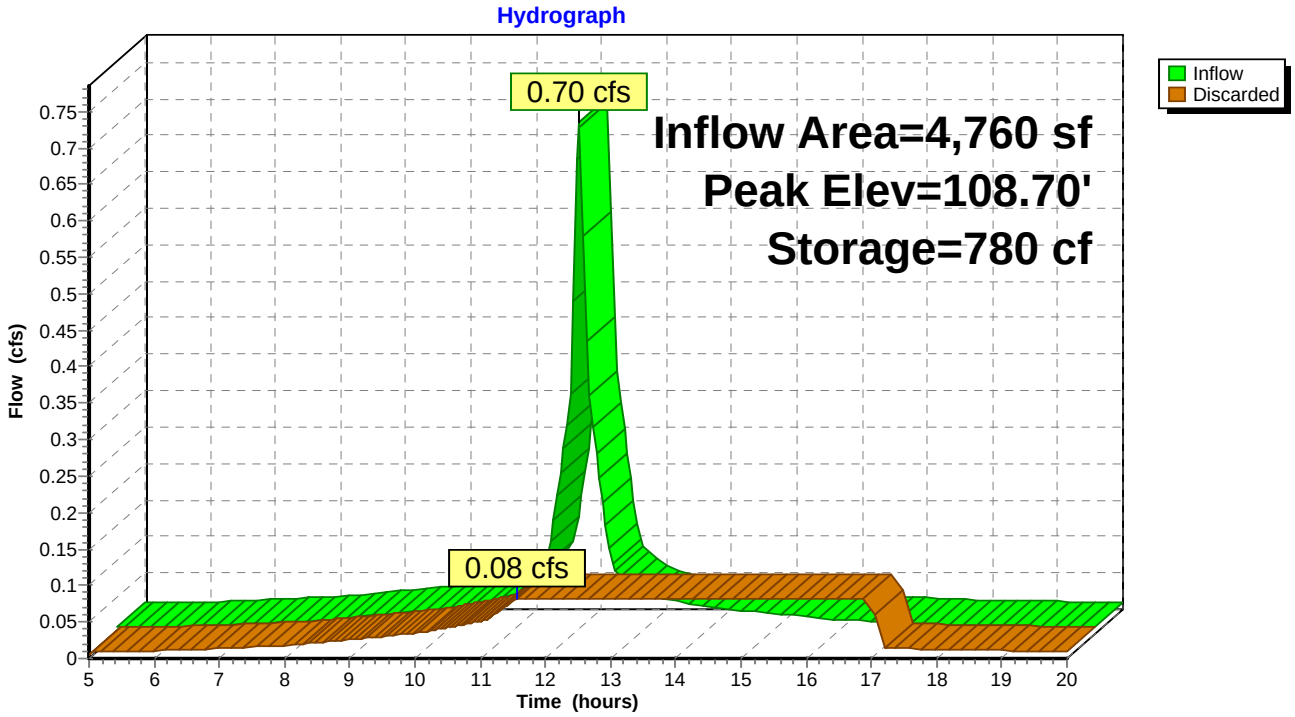
1,522.6 cf Field - 543.9 cf Chambers = 978.7 cf Stone x 40.0% Voids = 391.5 cf Stone Storage

Chamber Storage + Stone Storage = 935.4 cf = 0.021 af
Overall Storage Efficiency = 61.4%
Overall System Size = 38.50' x 11.17' x 3.54'

10 Chambers
56.4 cy Field
36.2 cy Stone



Pond ISA: Infiltration System A



Stage-Area-Storage for Pond ISA: Infiltration System A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
106.00	**430**	0
106.05	430	9
106.10	430	17
106.15	430	26
106.20	430	34
106.25	430	43
106.30	430	52
106.35	430	60
106.40	430	69
106.45	430	77
106.50	430	86
106.55	430	103
106.60	430	121
106.65	430	138
106.70	430	155
106.75	430	172
106.80	430	189
106.85	430	206
106.90	430	223
106.95	430	240
107.00	430	257
107.05	430	275
107.10	430	291
107.15	430	308
107.20	430	325
107.25	430	342
107.30	430	358
107.35	430	375
107.40	430	391
107.45	430	408
107.50	430	424
107.55	430	441
107.60	430	457
107.65	430	474
107.70	430	490
107.75	430	506
107.80	430	522
107.85	430	538
107.90	430	554
107.95	430	570
108.00	430	585
108.05	430	600
108.10	430	616
108.15	430	631
108.20	430	645
108.25	430	660
108.30	430	675
108.35	430	689
108.40	430	703
108.45	430	717
108.50	430	730
108.55	430	743
108.60	430	756
108.65	430	769
108.70	430	781
108.75	430	792
108.80	430	803
108.85	430	814
108.90	430	824
108.95	430	833
109.00	430	842
109.05	430	851
109.10	430	859
109.15	430	868
109.20	430	877
109.25	430	885
109.30	430	894
109.35	430	902
109.40	430	911
109.45	430	920
109.50	430	**928**

Summary for Pond ISB: Infiltration System B

Inflow Area = 4,760 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 2,366 cf
Outflow = 0.03 cfs @ 9.85 hrs, Volume= 1,496 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.03 cfs @ 9.85 hrs, Volume= 1,496 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.63' @ 14.50 hrs Surf.Area= 586 sf Storage= 1,186 cf

Plug-Flow detention time= 155.7 min calculated for 1,491 cf (63% of inflow)
Center-of-Mass det. time= 79.4 min (813.1 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.50'	530 cf	**11.17'W x 52.50'L x 3.54'H Field A** 2,076 cf Overall - 753 cf Embedded = 1,324 cf x 40.0% Voids
#2A	106.00'	753 cf	**Cultec R-330XLHD** x 14 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,282 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.50'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 9.85 hrs HW=105.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond ISB: Infiltration System B - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

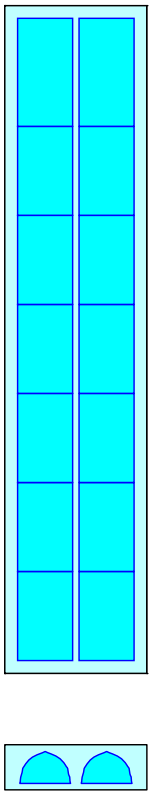
7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

14 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 752.6 cf Chamber Storage

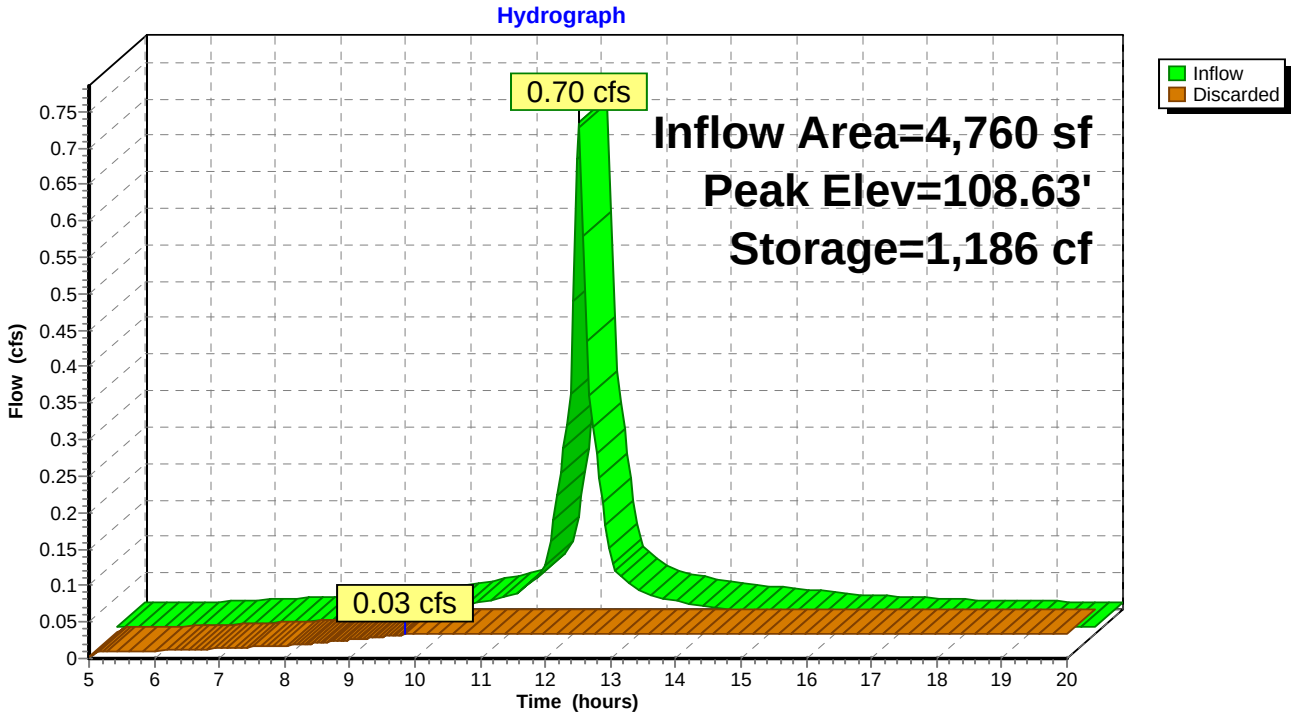
2,076.3 cf Field - 752.6 cf Chambers = 1,323.8 cf Stone x 40.0% Voids = 529.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,282.1 cf = 0.029 af
Overall Storage Efficiency = 61.7%
Overall System Size = 52.50' x 11.17' x 3.54'

14 Chambers
76.9 cy Field
49.0 cy Stone



Pond ISB: Infiltration System B



Stage-Area-Storage for Pond ISB: Infiltration System B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.50	**586**	0
105.55	586	12
105.60	586	23
105.65	586	35
105.70	586	47
105.75	586	59
105.80	586	70
105.85	586	82
105.90	586	94
105.95	586	106
106.00	586	117
106.05	586	141
106.10	586	165
106.15	586	188
106.20	586	212
106.25	586	235
106.30	586	259
106.35	586	282
106.40	586	306
106.45	586	329
106.50	586	353
106.55	586	376
106.60	586	399
106.65	586	423
106.70	586	446
106.75	586	468
106.80	586	491
106.85	586	514
106.90	586	537
106.95	586	559
107.00	586	582
107.05	586	605
107.10	586	627
107.15	586	650
107.20	586	672
107.25	586	694
107.30	586	717
107.35	586	738
107.40	586	760
107.45	586	781
107.50	586	803
107.55	586	824
107.60	586	844
107.65	586	865
107.70	586	885
107.75	586	906
107.80	586	925
107.85	586	945
107.90	586	964
107.95	586	983
108.00	586	1,002
108.05	586	1,020
108.10	586	1,037
108.15	586	1,055
108.20	586	1,071
108.25	586	1,087
108.30	586	1,102
108.35	586	1,116
108.40	586	1,130
108.45	586	1,143
108.50	586	1,155
108.55	586	1,167
108.60	586	1,178
108.65	586	1,190
108.70	586	1,202
108.75	586	1,214
108.80	586	1,225
108.85	586	1,237
108.90	586	1,249
108.95	586	1,261
109.00	586	**1,272**

Summary for Pond ISC: Infiltration System C

Inflow Area = 6,800 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 1.00 cfs @ 12.09 hrs, Volume= 3,380 cf
Outflow = 0.03 cfs @ 8.45 hrs, Volume= 1,395 cf, Atten= 97%, Lag= 0.0 min
Discarded = 0.03 cfs @ 8.45 hrs, Volume= 1,395 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 107.08' @ 16.04 hrs Surf.Area= 1,190 sf Storage= 2,117 cf

Plug-Flow detention time= 165.4 min calculated for 1,389 cf (41% of inflow)
Center-of-Mass det. time= 50.9 min (784.6 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	104.50'	578 cf	**20.83'W x 31.50'L x 3.54'H Field A** 2,324 cf Overall - 879 cf Embedded = 1,445 cf x 40.0% Voids
#2A	105.00'	879 cf	**Cultec R-330XLHD** x 16 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
#3B	104.50'	479 cf	**30.50'W x 17.50'L x 3.54'H Field B** 1,890 cf Overall - 693 cf Embedded = 1,197 cf x 40.0% Voids
#4B	105.00'	693 cf	**Cultec R-330XLHD** x 12 Inside #3 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows
		2,629 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.50'	**1.020 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 8.45 hrs HW=104.54' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond ISC: Infiltration System C - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

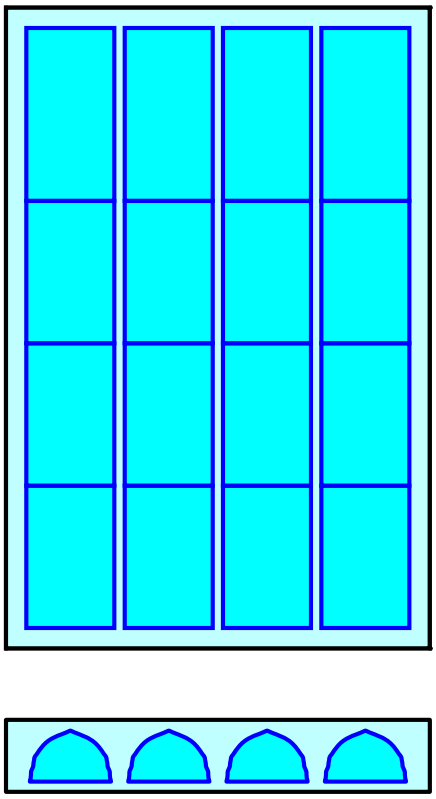
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

16 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 879.2 cf Chamber Storage

2,324.2 cf Field - 879.2 cf Chambers = 1,445.0 cf Stone x 40.0% Voids = 578.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,457.2 cf = 0.033 af
Overall Storage Efficiency = 62.7%
Overall System Size = 31.50' x 20.83' x 3.54'

16 Chambers
86.1 cy Field
53.5 cy Stone



Pond ISC: Infiltration System C - Chamber Wizard Field B

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 6 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

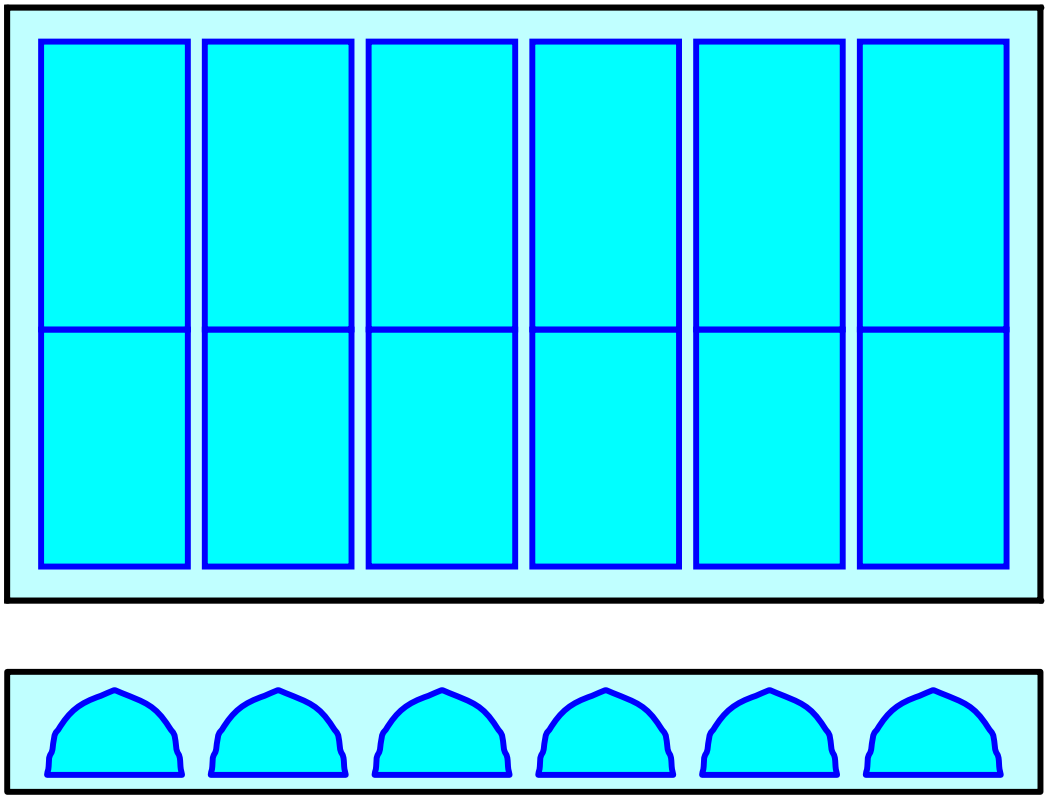
2 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 15.50' Row Length +12.0" End Stone x 2 = 17.50' Base Length
6 Rows x 52.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.50' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

12 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 6 Rows = 692.9 cf Chamber Storage

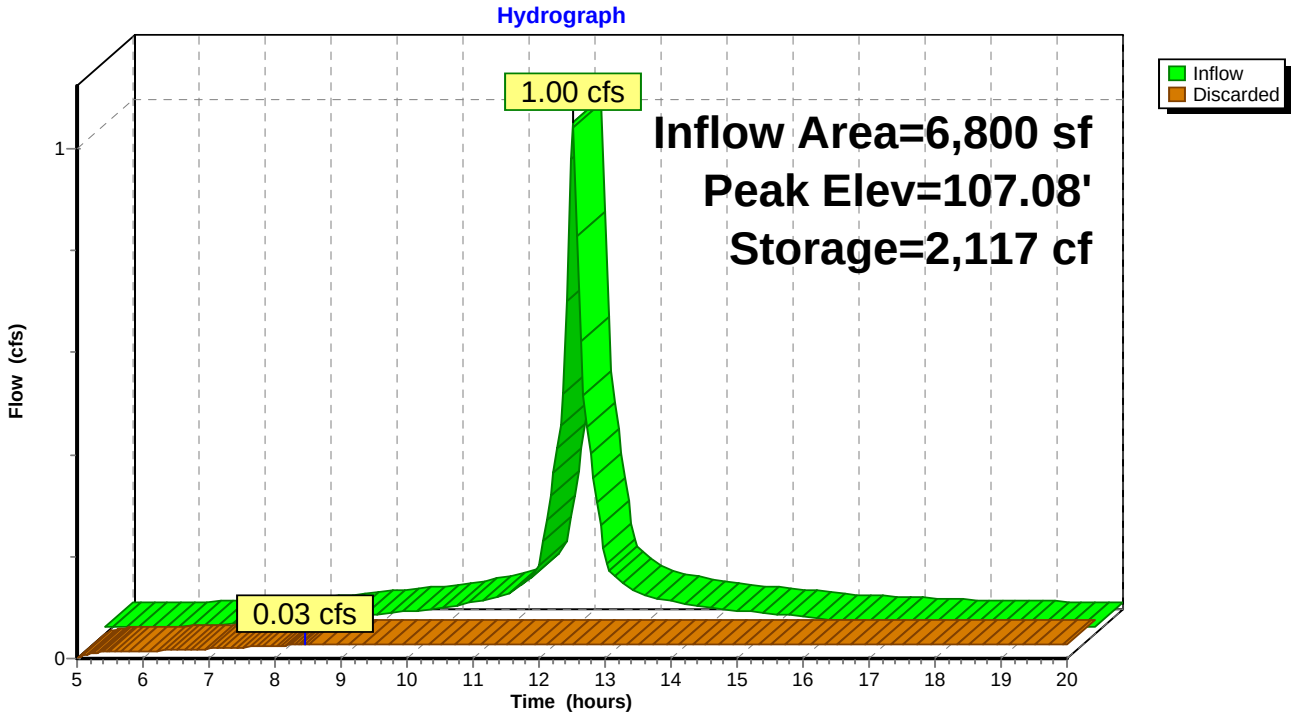
1,890.4 cf Field - 692.9 cf Chambers = 1,197.4 cf Stone x 40.0% Voids = 479.0 cf Stone Storage

Chamber Storage + Stone Storage = 1,171.9 cf = 0.027 af
Overall Storage Efficiency = 62.0%
Overall System Size = 17.50' x 30.50' x 3.54'

12 Chambers
70.0 cy Field
44.3 cy Stone



Pond ISC: Infiltration System C



Stage-Area-Storage for Pond ISC: Infiltration System C

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
104.50	**1,190**	0
104.55	1,190	24
104.60	1,190	48
104.65	1,190	71
104.70	1,190	95
104.75	1,190	119
104.80	1,190	143
104.85	1,190	167
104.90	1,190	190
104.95	1,190	214
105.00	1,190	238
105.05	1,190	287
105.10	1,190	336
105.15	1,190	385
105.20	1,190	433
105.25	1,190	482
105.30	1,190	530
105.35	1,190	578
105.40	1,190	627
105.45	1,190	675
105.50	1,190	723
105.55	1,190	771
105.60	1,190	819
105.65	1,190	867
105.70	1,190	914
105.75	1,190	961
105.80	1,190	1,008
105.85	1,190	1,055
105.90	1,190	1,102
105.95	1,190	1,149
106.00	1,190	1,195
106.05	1,190	1,242
106.10	1,190	1,288
106.15	1,190	1,334
106.20	1,190	1,381
106.25	1,190	1,426
106.30	1,190	1,472
106.35	1,190	1,517
106.40	1,190	1,561
106.45	1,190	1,605
106.50	1,190	1,649
106.55	1,190	1,692
106.60	1,190	1,735
106.65	1,190	1,777
106.70	1,190	1,819
106.75	1,190	1,860
106.80	1,190	1,901
106.85	1,190	1,941
106.90	1,190	1,981
106.95	1,190	2,020
107.00	1,190	2,058
107.05	1,190	2,095
107.10	1,190	2,131
107.15	1,190	2,166
107.20	1,190	2,200
107.25	1,190	2,233
107.30	1,190	2,263
107.35	1,190	2,293
107.40	1,190	2,320
107.45	1,190	2,347
107.50	1,190	2,371
107.55	1,190	2,395
107.60	1,190	2,419
107.65	1,190	2,443
107.70	1,190	2,466
107.75	1,190	2,490
107.80	1,190	2,514
107.85	1,190	2,538
107.90	1,190	2,562
107.95	1,190	2,585
108.00	1,190	**2,609**

Summary for Pond ISD: Infiltration System D

Inflow Area = 101,680 sf, 43.57% Impervious, Inflow Depth > 3.43" for 100-Year event
Inflow = 9.77 cfs @ 12.10 hrs, Volume= 29,046 cf
Outflow = 0.34 cfs @ 16.14 hrs, Volume= 8,760 cf, Atten= 97%, Lag= 242.6 min
Discarded = 0.21 cfs @ 10.45 hrs, Volume= 8,016 cf
Primary = 0.13 cfs @ 16.14 hrs, Volume= 744 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.49' @ 16.14 hrs Surf.Area= 8,993 sf Storage= 20,557 cf

Plug-Flow detention time= 202.6 min calculated for 8,760 cf (30% of inflow)
Center-of-Mass det. time= 104.9 min (895.7 - 790.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	105.00'	7,412 cf	**54.67'W x 164.50'L x 3.54'H Field A** 31,849 cf Overall - 13,319 cf Embedded = 18,530 cf x 40.0% Voids
#2A	105.50'	13,319 cf	**Cultec R-330XLHD** x 253 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 11 rows
		20,731 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	105.94'	**12.0" Round Culvert** L= 94.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 105.94' / 105.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	106.49'	**12.0" Round Culvert** L= 35.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 106.49' / 106.14' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Device 3	107.34'	**12.0" Round Culvert** L= 65.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 107.34' / 106.69' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#5	Device 4	108.45'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Discarded OutFlow Max=0.21 cfs @ 10.45 hrs HW=105.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.12 cfs @ 16.14 hrs HW=108.49' (Free Discharge)
└**2=Culvert** (Passes 0.12 cfs of 4.61 cfs potential flow)
└**3=Culvert** (Passes 0.12 cfs of 4.09 cfs potential flow)
└**4=Culvert** (Passes 0.12 cfs of 2.70 cfs potential flow)
└**5=Sharp-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.68 fps)

Pond ISD: Infiltration System D - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 11 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

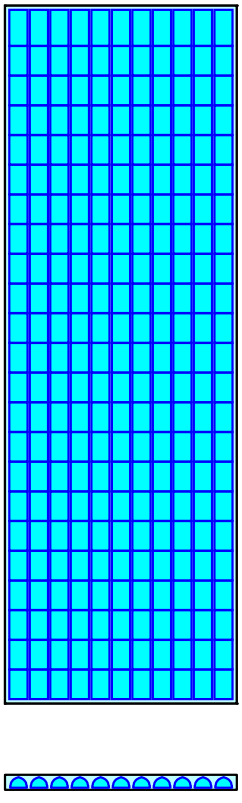
23 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 162.50' Row Length +12.0" End Stone x 2 = 164.50' Base Length
11 Rows x 52.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 54.67' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

253 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 11 Rows = 13,318.7 cf Chamber Storage

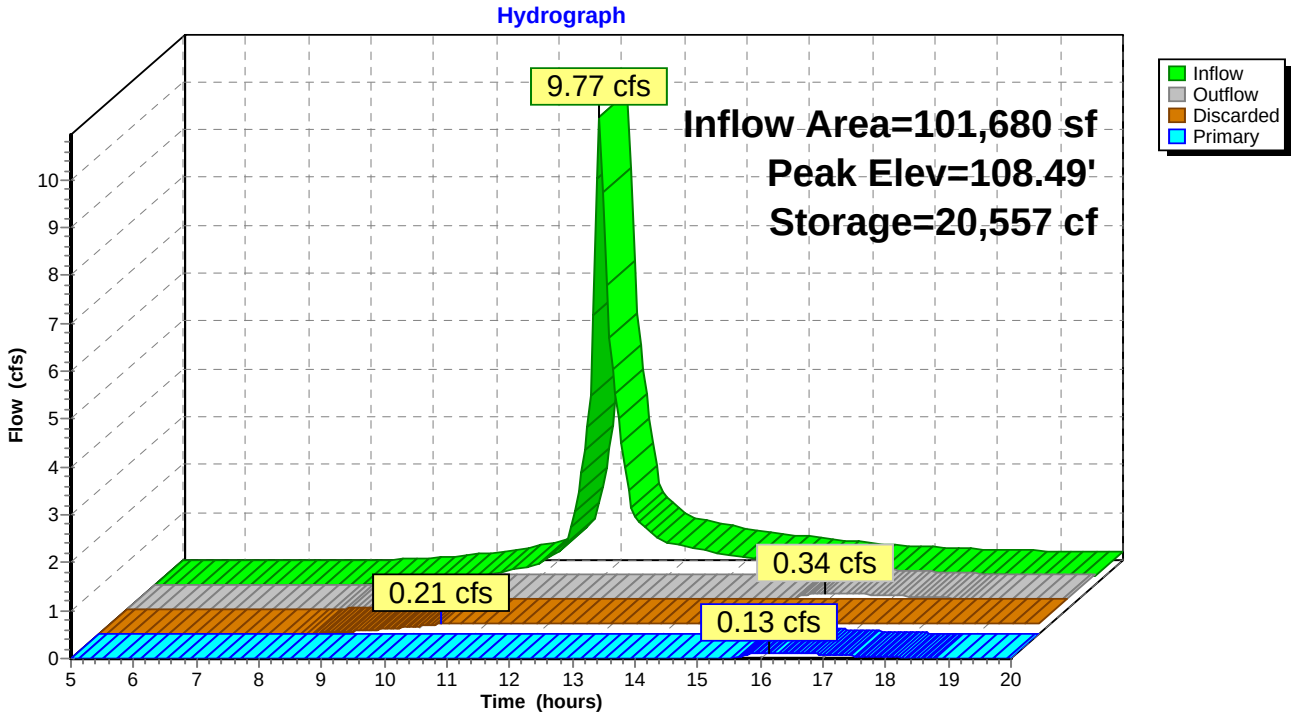
31,849.0 cf Field - 13,318.7 cf Chambers = 18,530.4 cf Stone x 40.0% Voids = 7,412.1 cf Stone Storage

Chamber Storage + Stone Storage = 20,730.8 cf = 0.476 af
Overall Storage Efficiency = 65.1%
Overall System Size = 164.50' x 54.67' x 3.54'

253 Chambers
1,179.6 cy Field
686.3 cy Stone



Pond ISD: Infiltration System D



Stage-Area-Storage for Pond ISD: Infiltration System D

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
105.00	**8,993**	0
105.05	8,993	180
105.10	8,993	360
105.15	8,993	540
105.20	8,993	719
105.25	8,993	899
105.30	8,993	1,079
105.35	8,993	1,259
105.40	8,993	1,439
105.45	8,993	1,619
105.50	8,993	1,799
105.55	8,993	2,192
105.60	8,993	2,584
105.65	8,993	2,974
105.70	8,993	3,364
105.75	8,993	3,753
105.80	8,993	4,141
105.85	8,993	4,529
105.90	8,993	4,917
105.95	8,993	5,304
106.00	8,993	5,691
106.05	8,993	6,077
106.10	8,993	6,461
106.15	8,993	6,843
106.20	8,993	7,222
106.25	8,993	7,599
106.30	8,993	7,974
106.35	8,993	8,350
106.40	8,993	8,724
106.45	8,993	9,098
106.50	8,993	9,472
106.55	8,993	9,844
106.60	8,993	10,216
106.65	8,993	10,586
106.70	8,993	10,955
106.75	8,993	11,322
106.80	8,993	11,685
106.85	8,993	12,044
106.90	8,993	12,399
106.95	8,993	12,751
107.00	8,993	13,099
107.05	8,993	13,443
107.10	8,993	13,784
107.15	8,993	14,121
107.20	8,993	14,453
107.25	8,993	14,782
107.30	8,993	15,105
107.35	8,993	15,423
107.40	8,993	15,736
107.45	8,993	16,043
107.50	8,993	16,343
107.55	8,993	16,636
107.60	8,993	16,921
107.65	8,993	17,197
107.70	8,993	17,463
107.75	8,993	17,716
107.80	8,993	17,956
107.85	8,993	18,181
107.90	8,993	18,394
107.95	8,993	18,594
108.00	8,993	18,782
108.05	8,993	18,962
108.10	8,993	19,142
108.15	8,993	19,322
108.20	8,993	19,502
108.25	8,993	19,682
108.30	8,993	19,862
108.35	8,993	20,041
108.40	8,993	20,221
108.45	8,993	20,401
108.50	8,993	**20,581**

Summary for Pond ND: Natural Depression

Inflow Area = 24,847 sf, 1.02% Impervious, Inflow Depth > 0.83" for 100-Year event
Inflow = 0.40 cfs @ 12.12 hrs, Volume= 1,716 cf
Outflow = 0.08 cfs @ 13.28 hrs, Volume= 1,581 cf, Atten= 81%, Lag= 69.1 min
Discarded = 0.08 cfs @ 13.28 hrs, Volume= 1,581 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 108.27' @ 13.28 hrs Surf.Area= 1,367 sf Storage= 513 cf

Plug-Flow detention time= 98.4 min calculated for 1,576 cf (92% of inflow)
Center-of-Mass det. time= 73.5 min (929.5 - 856.0)

Volume	Invert	Avail.Storage	Storage Description
#1	108.00'	3,293 cf	**Custom Stage Data (Irregular)** Listed below

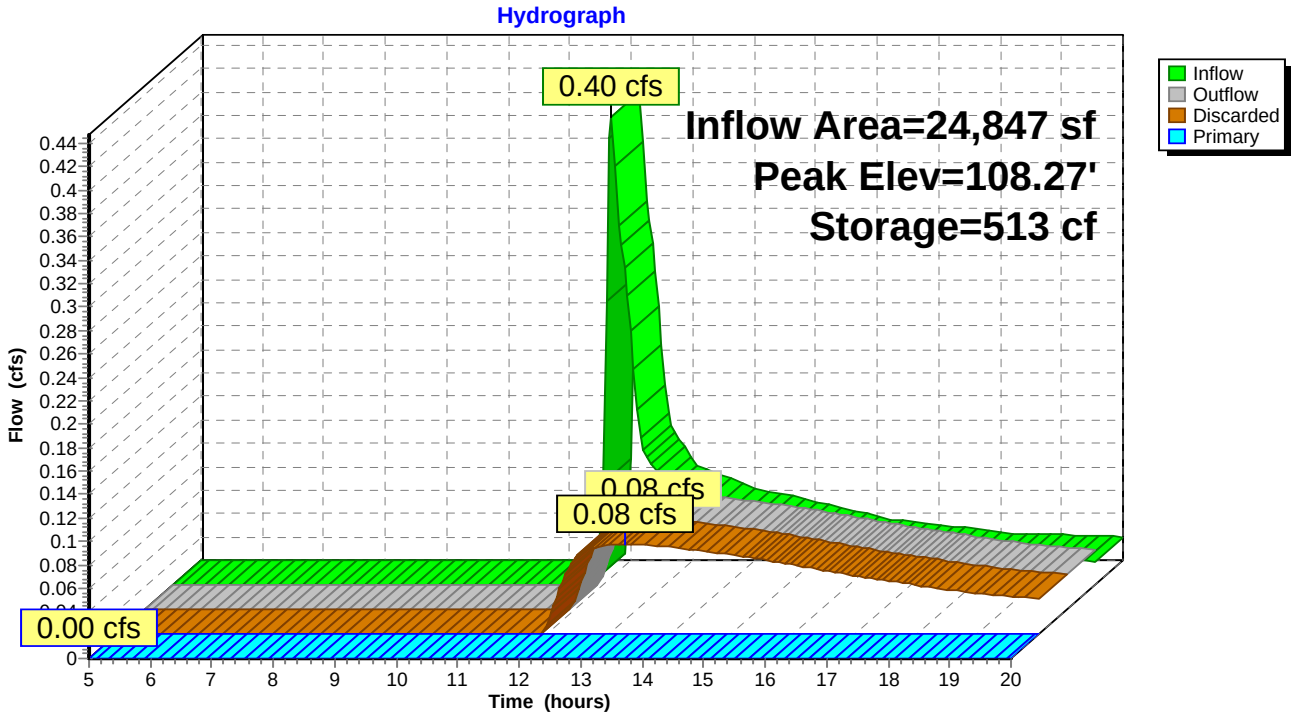
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
108.00	235	88.4	0	0	235
109.00	4,354	655.7	1,867	1,867	33,829
109.30	5,162	671.6	1,426	3,293	35,520

Device	Routing	Invert	Outlet Devices
#1	Primary	109.00'	**2.0' 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
#2	Discarded	108.00'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.08 cfs @ 13.28 hrs HW=108.27' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=108.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond ND: Natural Depression



Stage-Area-Storage for Pond ND: Natural Depression

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
108.00	235	0
108.02	317	37
108.04	400	75
108.06	482	112
108.08	565	149
108.10	647	187
108.12	729	224
108.14	812	261
108.16	894	299
108.18	976	336
108.20	1,059	373
108.22	1,141	411
108.24	1,224	448
108.26	1,306	485
108.28	1,388	523
108.30	1,471	560
108.32	1,553	597
108.34	1,635	635
108.36	1,718	672
108.38	1,800	709
108.40	1,883	747
108.42	1,965	784
108.44	2,047	821
108.46	2,130	859
108.48	2,212	896
108.50	2,295	933
108.52	2,377	971
108.54	2,459	1,008
108.56	2,542	1,045
108.58	2,624	1,083
108.60	2,706	1,120
108.62	2,789	1,157
108.64	2,871	1,195
108.66	2,954	1,232
108.68	3,036	1,269
108.70	3,118	1,307
108.72	3,201	1,344
108.74	3,283	1,381
108.76	3,365	1,419
108.78	3,448	1,456
108.80	3,530	1,493
108.82	3,613	1,531
108.84	3,695	1,568
108.86	3,777	1,605
108.88	3,860	1,643
108.90	3,942	1,680
108.92	4,024	1,717
108.94	4,107	1,755
108.96	4,189	1,792
108.98	4,272	1,830
109.00	4,354	1,867
109.02	4,408	1,962
109.04	4,462	2,057
109.06	4,516	2,152
109.08	4,569	2,247
109.10	4,623	2,342
109.12	4,677	2,437
109.14	4,731	2,532
109.16	4,785	2,627
109.18	4,839	2,722
109.20	4,893	2,817
109.22	4,947	2,912
109.24	5,000	3,007
109.26	5,054	3,102
109.28	5,108	3,197
109.30	**5,162**	**3,293**

APPENDIX C

DRAINAGE SYSTEM CALCULATIONS

STORMWATER MANAGEMENT STANDARD 2 – PEAK RATE OF RUNOFF

STORMWATER MANAGEMENT STANDARD 3 – RECHARGE VOLUME

DRAWDOWN CALCULATIONS

STORMWATER MANAGEMENT STANDARD 4 – WATER QUALITY VOLUME

CLOSED DRAINAGE SYSTEM/PIPE SIZING CALCULATIONS

CONECO
Engineers & Scientists

Project Number:	10365.0	**Date:**	December 27, 2023
Project Name:	Neponset Village	**Calculations by:**	BTM
Project Address:	5 Pleasant St.	**Calculations date:**	December 27, 2023
Client:	McSharry Brothers, Inc.	**Checked by:**	DJD
Location:	Walpole, Massachusetts	**Checked Date:**	December 27, 2023

STORMWATER MANAGEMENT STANDARD 2 - PEAK RATE OF RUNOFF

ONSITE SOUTH

DESIGN STORM (YEAR)	EXISTING PEAK RUNOFF (CFS)	PROPOSEDPEAK RUNOFF (CFS)	REDUCTION IN PEAK RUNOFF
2	0.00	0.00	N/A
10	0.00	0.00	N/A
25	0.01	0.00	100.0%
100	0.03	0.02	33.3%

TOTAL NORTH

DESIGN STORM (YEAR)	EXISTING PEAK RUNOFF (CFS)	PROPOSEDPEAK RUNOFF (CFS)	REDUCTION IN PEAK RUNOFF
2	0.00	0.00	N/A
10	0.01	0.01	0.0%
25	0.03	0.03	0.0%
100	0.16	0.14	12.5%

NOTE: PEAK RATES AND VOLUMES SHOWN WERE TAKEN FROM THE EXISTING AND PROPOSED HYDROCAD ANALYSES.

CONECO
Engineers & Scientists

Project Number:	10365.0	**Date:**	December 27, 2023
Project Name:	Neponset Village	**Calculations by:**	BTM
Project Address:	5 Pleasant St.	**Calculations date:**	December 27, 2023
Client:	McSharry Brothers, Inc.	**Checked by:**	DJD
Location:	Walpole, Massachusetts	**Checked Date:**	December 27, 2023

STORMWATER MANAGEMENT STANDARD 3 - RECHARGE VOLUME

	HYDROLOGIC SOIL GROUP				TOTAL
	A	B	C	D	
IMPERVIOUS AREA (S.F.)	32,281	28,782	0	0	61,063
INCHES OF RUNOFF TO BE RECHARGED	0.60	0.35	0.25	0.10	
REQUIRED RECHARGE VOLUME (FT^3)	1,614	839	0	0	**2,454**

CAPTURE AREA ADJUSTMENT - ADJUSTED MINIMUM REQUIRED RECHARGE VOLUME

MINIMUM OF 65% OF IMPERVIOUS AREA MUST BE DIRECTED TO THE RECHARGE BMP; 65 % IS =	39,691	SF		
IMPERVIOUS SITE AREA DRAINING TO BMP =	60,626	SF	99.3%	PERCENTAGE OF IMPERVIOUS AREA DIVERTED TO INFILTRATION FACILITY
RATIO OF TOTAL IMPERVIOUS AREA TO IMPERVIOUS AREA DRAINING TO RECHARGE BMP =	1.01		= TOTAL IMPERVIOUS AREA / IMPERVIOUS AREA DRAINING TO THE RECHARGE AREA	
ADJUSTED REQUIRED RECHARGE VOLUME=	**2,471**	CF	= RATIO OF IMPERVIOUS AREA x REQUIRED RECHARGE VOLUME	
PROPOSED RECHARGE VOLUME	**25,247**	CF	TOTAL AVAILABLE STATIC RECHARGE VOLUME	

CONECO
Engineers & Scientists

Project Number:	10365.0	**Date:**	December 27, 2023
Project Name:	Neponset Village	**Calculations by:**	BTM
Project Address:	5 Pleasant St.	**Calculations date:**	December 27, 2023
Client:	McSharry Brothers, Inc.	**Checked by:**	DJD
Location:	Walpole, Massachusetts	**Checked Date:**	December 27, 2023

PROPOSED DRAWDOWN FOR RECHARGE STRUCTURES

Infiltration Basin IS-A

A = AREA OF PROPOSED LEACHING STRUCTURE	430	SQ. FT.
Rv = STORAGE VOLUME =	935	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	8.27	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

DRAWDOWN TIME $T = \frac{Rv}{K \times A}$ = **3.2** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

Infiltration Basin IS-B

A = AREA OF PROPOSED LEACHING STRUCTURE	586	SQ. FT.
Rv = STORAGE VOLUME =	1,282	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	2.41	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

DRAWDOWN TIME $T = \frac{Rv}{K \times A}$ = **10.9** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

Infiltration Basin IS-C

A = AREA OF PROPOSED LEACHING STRUCTURE	1,190	SQ. FT.
Rv = STORAGE VOLUME =	2,629	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	1.02	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

DRAWDOWN TIME $T = \frac{Rv}{K \times A}$ = **26.0** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

Infiltration Basin IS-D

A = AREA OF PROPOSED LEACHING STRUCTURE	8,993	SQ. FT.
Rv = STORAGE VOLUME =	20,401	CU. FT.
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = VALUE IS BASED ON A HYDRAULIC SOIL GROUP	1.02	INCHES/HOUR
T = ALLOWABLE DRAWDOWN DURING PEAK (USE 2 HRS) =	72	HRS

DRAWDOWN TIME $T = \frac{Rv}{K \times A}$ = **26.7** HOURS TO EMPTY THE RECHARGE BMP
<72 HOURS, SO DRAWDOWN IS OK

CONECO
Engineers & Scientists

Project Number:	10365.0	**Date:**	December 27, 2023
Project Name:	Neponset Village	**Calculations by:**	BTM
Project Address:	5 Pleasant St.	**Calculations date:**	December 27, 2023
Client:	McSharry Brothers, Inc.	**Checked by:**	DJD
Location:	Walpole, Massachusetts	**Checked Date:**	December 27, 2023

STORMWATER MANAGEMENT STANDARD 4 - WATER QUALITY VOLUME

	DEPTH TO TREAT (IN.)	IMPERVIOUS AREA (SF)	WATER VOLUME (CF)
Infiltration System A (IS-A)	1	4,760	397
Infiltration System B (IS-B)	1	4,760	397
Infiltration System C (IS-C)	0.5	6,800	283
Infiltration System D (IS-D)	0.5	44,306	1,846
Natural Depression	0.5	253	11
Onsite South	0.5	63	3
Offsite North	0.5	121	5
NET WATER QUALITY VOLUME			**2,941**

CONECO
Engineers, Scientists & Surveyors

Project Number: 10365
Client: Mcsharry Brothers, INC
Project Name: Neponsett Village
Project Address: 5 Pleasant Street
Location: Walpole, MA

Calculations by: BTM
Calculations Date: 12/22/2023
Checked By: DJD
Checked Date: 12/22/2023

TO INFILTRATION CHAMBER SYSTEM A - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc L/V (MIN)
WS RD-A1	LANDSCAPED	0.000		0.400								From: RD-A1	Out:													
	IMPERVIOUS	0.055		0.850										HDPE	6	183	0.20	0.125	0.010	0.013	**0.56**	**2.86**	0.53	0.87	2.49	1.23
			0.055	0.850	0.046		6.00	NONE	6.00	6.39	**0.3**	To: IS-A	In:													
WS RD-A2	LANDSCAPED	0.000		0.400								From: RD-A2	Out:													
	IMPERVIOUS	0.055		0.850										HDPE	6	178	0.20	0.125	0.010	0.013	**0.56**	**2.86**	0.53	0.87	2.49	1.19
			0.055	0.850	0.046		6.00	NONE	6.00	6.39	**0.3**	To: IS-A	In:													

CONECO
Engineers, Scientists & Surveyors

Project Number: 10365
Client: Mcsharry Brothers, INC
Project Name: Neponsett Village
Project Address: 5 Pleasant Street
Location: Walpole, MA

Calculations by: BTM
Calculations Date: 12/22/2023
Checked By: DJD
Checked Date: 12/22/2023

TO INFILTRATION CHAMBER SYSTEM B - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc L/V (MIN)
WS RD-B1	LANDSCAPED	0.000		0.400								From: RD-B1	Out:													
	IMPERVIOUS	0.055		0.850										HDPE	6	191	0.20	0.125	0.010	0.013	**0.56**	**2.86**	0.53	0.87	2.49	1.28
			0.055	0.850	0.046		6.00	NONE	6.00	6.39	**0.30**	To: IS-B	In:													
WS RD-B2	LANDSCAPED	0.000		0.400								From: RD-B2	Out:													
	IMPERVIOUS	0.055		0.850										HDPE	6	184	0.20	0.125	0.010	0.013	**0.56**	**2.86**	0.53	0.87	2.49	1.23
			0.055	0.850	0.046		6.00	NONE	6.00	6.39	**0.30**	To: IS-B	In:													

CONECO
Engineers, Scientists & Surveyors

Project Number: 10365
Client: Mcsharry Brothers, INC
Project Name: Neponsett Village
Project Address: 5 Pleasant Street
Location: Walpole, MA

Calculations by: BTM
Calculations Date: 12/22/2023
Checked By: DJD
Checked Date: 12/22/2023

TO INFILTRATION CHAMBER SYSTEM C - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS RD-C1	LANDSCAPED	0.000		0.400								From: RD-C1	Out:													
	IMPERVIOUS	0.078		0.850										HDPE	6	248	0.20	0.125	0.010	0.013	**0.56**	**2.86**	0.76	0.97	2.76	1.50
			0.078	0.850	0.066		6.00	NONE	6.00	6.39	**0.42**	To: IS-C	In:													
WS RD-C2	LANDSCAPED	0.000		0.400								From: RD-C2	Out:													
	IMPERVIOUS	0.078		0.850										HDPE	6	304	0.20	0.125	0.010	0.013	**0.56**	**2.86**	0.76	0.97	2.76	1.84
			0.078	0.850	0.066		6.00	NONE	6.00	6.39	**0.42**	To: IS-C	In:													
RD-C3 **TO** **IS-C**						0.133	6.39	1.84	8.23	6.02	0.80	From: RD-C3	Out:													
												To: IS-C	In:	HDPE	8	27	0.35	0.166667	0.010	0.013	1.21	3.46	0.66	0.93	3.21	0.14

CONECO
Engineers, Scientists & Surveyors

Project Number: 10365
Client: Mcsharry Brothers, INC
Project Name: Neponsett Village
Project Address: 5 Pleasant Street
Location: Walpole, MA

Calculations by: BTM
Calculations Date: 12/22/2023
Checked By: DJD
Checked Date: 12/22/2023

TO INFILTRATION CHAMBER SYSTEM D - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-D1	LANDSCAPED	0.486		0.400								From: CB-D1	Out:													
	IMPERVIOUS	0.039		0.850										HDPE	12	121	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.29	0.73	4.69	0.43
			0.525	0.434	0.228		6.00	NONE	6.00	6.39	**1.46**	To: DMH-D1	In:													
												From: DMH-D1	Out:													
DMH-D1 TO	**IS-D**					0.228	6.00	0.43	6.43	6.31	1.44			HDPE	12	11	0.79	0.25	0.020	0.013	5.04	6.42	0.29	0.73	4.67	0.04
												To: IS-D	In:													
WS CB-D2	LANDSCAPED	0.059		0.400								From: CB-D2	Out:													
	IMPERVIOUS	0.237		0.850										HDPE	12	29	0.79	0.250	0.010	0.013	**3.56**	**4.54**	0.40	0.80	3.65	0.13
			0.296	0.760	0.225		6.00	NONE	6.00	6.39	**1.44**	To: DMH-D2	In:													
WS CB-D3	LANDSCAPED	0.561		0.400								From: CB-D3	Out:													
	IMPERVIOUS	0.198		0.850										HDPE	12	26	0.79	0.250	0.010	0.013	**3.56**	**4.54**	0.70	0.95	4.29	0.10
			0.759	0.518	0.393		6.00	NONE	6.00	6.39	**2.51**	To: DMH-D2	In:													
												From: DMH-D2	Out:													
DMH-D2 TO	**IS-D**					0.618	6.00	0.13	6.13	6.37	3.93			HDPE	12	5	0.79	0.25	0.020	0.013	5.04	6.42	0.78	0.97	6.25	0.01
												To: IS-D	In:													
WS CB-D4	LANDSCAPED	0.070		0.400								From: CB-D4	Out:													
	IMPERVIOUS	0.217		0.850										HDPE	12	54	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.27	0.72	4.59	0.20
			0.287	0.740	0.212		6.00	NONE	6.00	6.39	**1.36**	To: DMH-D5	In:													
												From: DMH-D5	Out:													
DMH-D5 TO	**IS-D**					0.212	6.00	0.20	6.20	6.35	1.35			HDPE	12	2	0.79	0.25	0.020	0.013	5.04	6.42	0.27	0.71	4.58	0.01
												To: IS-D	In:													
WS CB-D5	LANDSCAPED	0.031		0.400								From: CB-D5	Out:													
	IMPERVIOUS	0.172		0.850										HDPE	12	68	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.20	0.66	4.22	0.27
			0.204	0.781	0.159		6.00	NONE	6.00	6.39	**1.02**	To: DMH-D3	In:													
WS CB-D6	LANDSCAPED	0.103		0.400								From: CB-D6	Out:													
	IMPERVIOUS	0.163		0.850										HDPE	12	63	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.23	0.68	4.37	0.24
			0.266	0.675	0.180		6.00	NONE	6.00	6.39	**1.15**	To: DMH-D3	In:													
												From: DMH-D3	Out:													
DMH-D3 TO	**DMH-D4**					0.339	6.00	0.27	6.27	6.34	2.15			HDPE	12	17	0.79	0.25	0.030	0.013	6.17	7.86	0.35	0.77	6.06	0.05
												To: DMH-D4	In:													
												From: DMH-D4	Out:													
DMH-D4 TO	**IS-D**					0.339	6.27	0.05	6.32	6.33	2.14			HDPE	12	5	0.79	0.25	0.030	0.013	6.17	7.86	0.35	0.77	6.05	0.01
												To: IS-D	In:													

APPENDIX D

LONG TERM POLLUTION PREVENTION PLAN – REQUIRED BY STANDARDS 4-6

LONG TERM POLLUTION PREVENTION PLAN

To keep the Stormwater Management System (SMS) functioning properly and to ensure that the stormwater Total Suspended Solids (TSS) are reduced, a long-term pollution prevention is required. The owner/operator of the facility is responsible for the adherence to this long-term plan. The following is a guideline of the specific requirements of the plan to maintain the long term viability of the stormwater management system.

The Stormwater Pollution Prevention Plan for the site addresses many of the items in the Long Term Pollution Prevention Plan.

Good Housekeeping Practices

Residents, contractors, and facility managers shall be instructed in the importance of not spilling fluids and chemicals such as oil, antifreeze, etc. onto the bare ground. All areas exposed to the weather shall be kept clean.

Provisions for Storing Materials and Waste Products Inside or Under Cover

Liquid waste products shall be captured when draining from vehicles, and stored in sealed containers under cover until they are disposed of. Waste products shall be disposed of in a legal manner, at a state licensed recycling center or landfill.

Motor Vehicle controls

Repair, maintenance, and washing of motor vehicles is prohibited from being performed on the property.

Requirements for routine inspections and maintenance of stormwater BMPs

BMPs shall be inspected and maintained per the Operations and Maintenance Plan.

Spill prevention and response plans

Due to the residential use of the property, commercial and industrial storage of hazardous materials are not anticipated to be stored on the property. In the event of a resident spilling hazardous materials, they should contact the homeowner's association and call the numbers listed below for assistance in containing the spill. Contractors bringing equipment onto the site that may contain hazardous materials shall have oil booms kept on site in a readily accessible area that has been demarcated and indicated to the personal on site (site maintenance shed or other approved alternative). If an oil spill occurs, the booms shall be placed and secured in front of the entrance to the drainage inlets (catch basins) and along the outer edge of the plunge pool outlets. Oil booms should remain in place until the system has been cleaned and inspected. Oil booms should be inspected once a year. All used and damaged booms should be replaced immediately. Refer to manufacturer's instructions on the lifespan of the oil booms.

First responders	Phone Numbers
• Walpole Fire Department	911 if emergency or (508) 668-0260
• Walpole Police Department	911 if emergency or (508) 668-1212
• Mass Department of Environmental Protection	
Emergency Response	1-888-304-1133

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

All fertilizer, herbicides, and pesticides shall be used in accordance with the manufacturer guidelines. Excess materials shall be swept up from all impervious surfaces and not allowed to run into the drainage system. All fertilizer, herbicides, and pesticides shall be stored in a wrapped or sealed container and kept under cover out of the rain and snow.

Pet waste management

Owners of pets shall be responsible for removal and disposal of their own pet's waste.

Provisions for solid waste management

Solid waste shall be collected at a minimum of once per week and disposed of in an appropriate dumpster or garbage truck. Waste shall be disposed of in a legal manner, at a state licensed recycling center or landfill.

Snow disposal and plowing plans relative to Wetland Resource Areas

Where possible, snow shall be placed onto grassed and landscaped areas adjacent to the area it was removed from. During snow events in which excessive snow cannot be stored within open landscaped areas, snow shall be stored in the designated "Overburden Snow Stockpile Area" as indicated on the Site Plans. During extreme snow events, in which snow cannot be stored on site, snow will be trucked off and disposed of in a legal manner.

Street sweeping schedule

Street sweeping shall be performed on paved surfaces no less than once per year, preferably in the spring months.

Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan.

Training shall be conducted during the incoming of all new site residents and the hiring of site maintenance contractors. Training shall be performed by the owner of the property or a qualified representative. Training records shall be kept on file.

APPENDIX E

OPERATION AND MAINTENANCE PLAN - REQUIRED BY STANDARD 9

OPERATION AND MAINTENANCE PLAN

NEPONSET VILLAGE

5 Pleasant Street, Walpole, Massachusetts

OWNER NAME:	Neponset Village, LLC
ADDRESS:	4 First Street, Bridgewater, MA 02324
TEL. NUMBER:	(508) 962-6291

To keep the Stormwater Management System (SMS) functioning properly and to ensure that the Total Suspended Solids (TSS) are reduced, periodic maintenance is required. The owner/operator of the facility is responsible for the periodic maintenance requirements of the SMS. Neponset Village, LLC is the owner and will be the party responsible for the maintenance of the SMS. The following is a guideline of the specific maintenance schedules and tasks required to keep the SMS functioning properly.

- Deep Sump Catch Basins
  - General Maintenance
    - Remove any accumulated debris from the grates during the fall and spring.
  - Quarterly Maintenance
    - Inspect sumps for accumulated sediment. If sediment has reached a depth of eighteen inches (18”), remove via clamshell bucket or vacuum truck and dispose of removed materials per local, state, and federal regulations.
  - Annual Maintenance
    - Inspect hood to ensure that it is properly secured.
    - Remove accumulated sediment via clamshell bucket or vacuum truck and dispose of removed materials per local, state, and federal regulations.
- Infiltration Chambers W/ Isolator Row
  - Semi-Annual
    - Inspect subsurface infiltration facilities twice a year by measuring the depth from grade to the top of the base stone/fabric within the chambers. Use a sampling device (I.e. Spoon or clamshell) to check for accumulated sediment within the isolation row.
  - General Maintenance
    - Accumulated sediment shall not exceed 3” of buildup within the system. Clean accumulated sediment within the isolation row with the use of jetwash, vacuum systems, and hand tools. (Reverse high pressure spay nozzles and a minimum 100’ long retractable hose may be required for the cleaning of the system.)
    - Inspect and maintain unit in accordance with the manufacturer’s operation and maintenance guidelines.
- Plunge Pools/Splash Pads
  - General Maintenance
    - During the fall and the spring remove any accumulated leaves or large debris.
  - Annual Maintenance
    - Check for signs of erosion and repair as needed.
    - Remove any branches, trash, or other large debris that could interfere with the proper operation of the inlet or outlet of the basin. Remove any accumulated sediment, by the use of hand tools (shovels, rakes, wheelbarrows, etc.) when it exceeds three inches (3”) but not less than annually.

Neponset Village, LLC			
Neponset Village			
5 Pleasant St, Walpole, MA			
STORMWATER MANAGEMENT SYSTEM OPERATION & MAINTENANCE LOG			
DATE	**TIME**	**MAINTENANCE ACTIVITY**	**MAINTENANCE PERFORMED, OBSERVATIONS**

REVISIONS			
NO.	DATE	DESCRIPTION	DR/CK

PREPARED FOR:
NEPONSET VILLAGE LLC
4 FIRST STREET
BRIDGEWATER, MASSACHUSETTS 02324

DRAWING:
DRAINAGE FACILITY LOCATIONS

PROJECT:
NEPONSET VILLAGE
5 PLEASANT STREET
WALPOLE, MASSACHUSETTS 02081

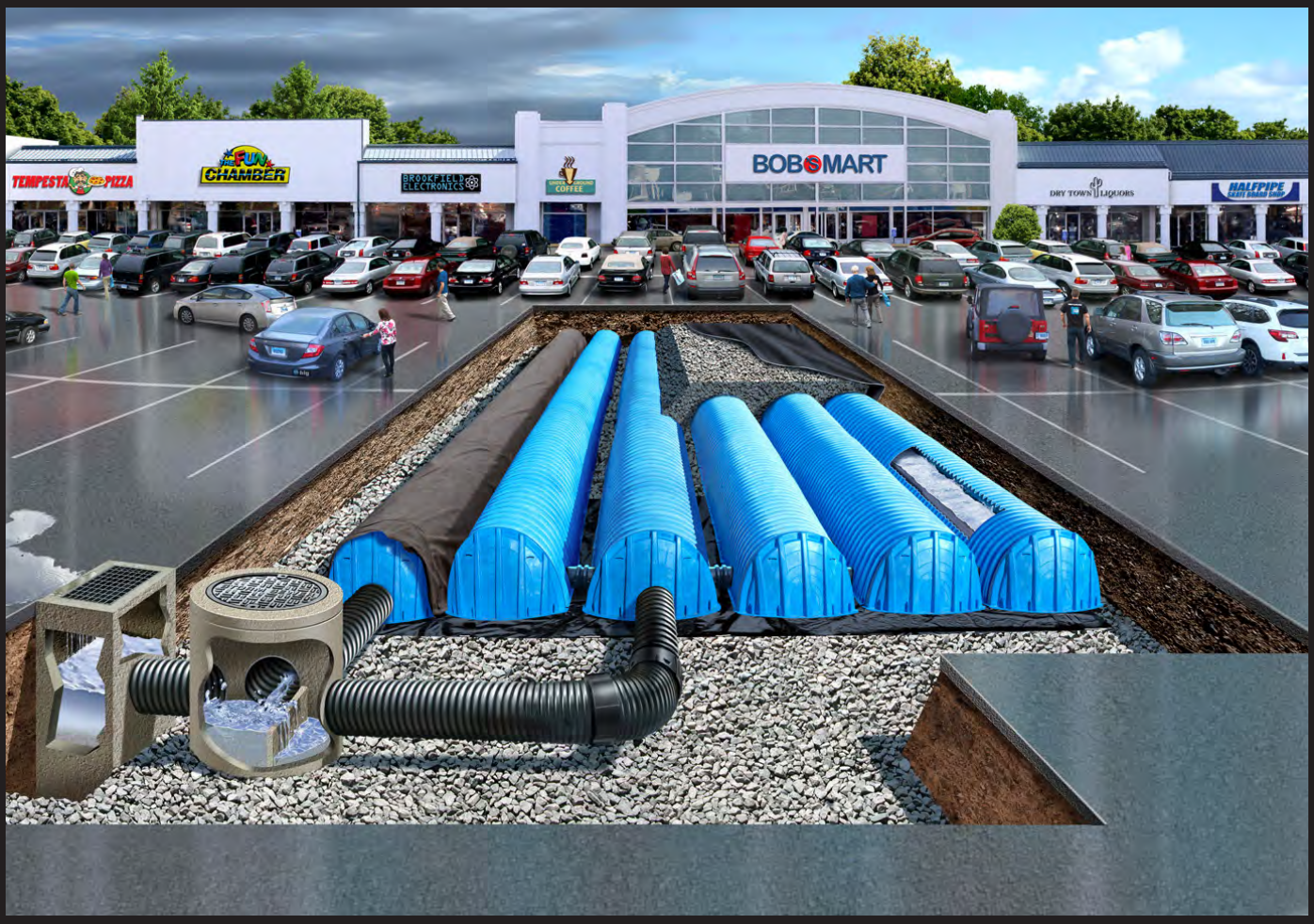
PLAN SET:
DRAINAGE REPORT
OPERATIONS AND MAINTENANCE

CONECO
Engineers & Scientists
PHONE: 800-548-3355 WEBSITE: www.coneco.com

DATE	12/22/2023		
DESIGNED:	DJD	CHECKED:	DJD
DRAFTED:	DJD	IN CHARGE:	DJD
SCALE:	1" = 30'		
PROJECT NO.	10365.0		
SHEET NO.	1		

CULTEC SEPARATOR™ ROW

WATER QUALITY SYSTEM



OPERATION & MAINTENANCE GUIDE

FOR CULTEC STORMWATER MANAGEMENT SYSTEMS

GLOBE VERIFIED VÉRIFIÉ

STORMWATER MANAGEMENT SOLUTIONS

CULTEC®

Published by
CULTEC, Inc.
P.O. Box 280
878 Federal Road
Brookfield, Connecticut 06804 USA
www.cultec.com

Disclaimers:
The drawings, photographs and illustrations shown in this document are for illustrative purposes only and are not necessarily to scale.
Actual designs may vary.

CULTEC reserves the right to make design and/or specification changes at any time without notice at CULTEC's sole discretion.

CULTEC is not responsible for typographical errors.

Protected by one or more of the following patents:
Protected by one or more of the following patents:
U.S. Patents 6,129,482; 6,322,288; 6,854,925; 7,226,241; 7,806,627; 8,366,346; 8,425,148; and others; U.S. Designs D613819; D638,095; D668,318 and others; Canadian Patent 2,591,255 and others; Community Designs 1092191; 1745209; and others.

Contact Information:
For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at custservice@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CLT043 02-22
Feb 2022

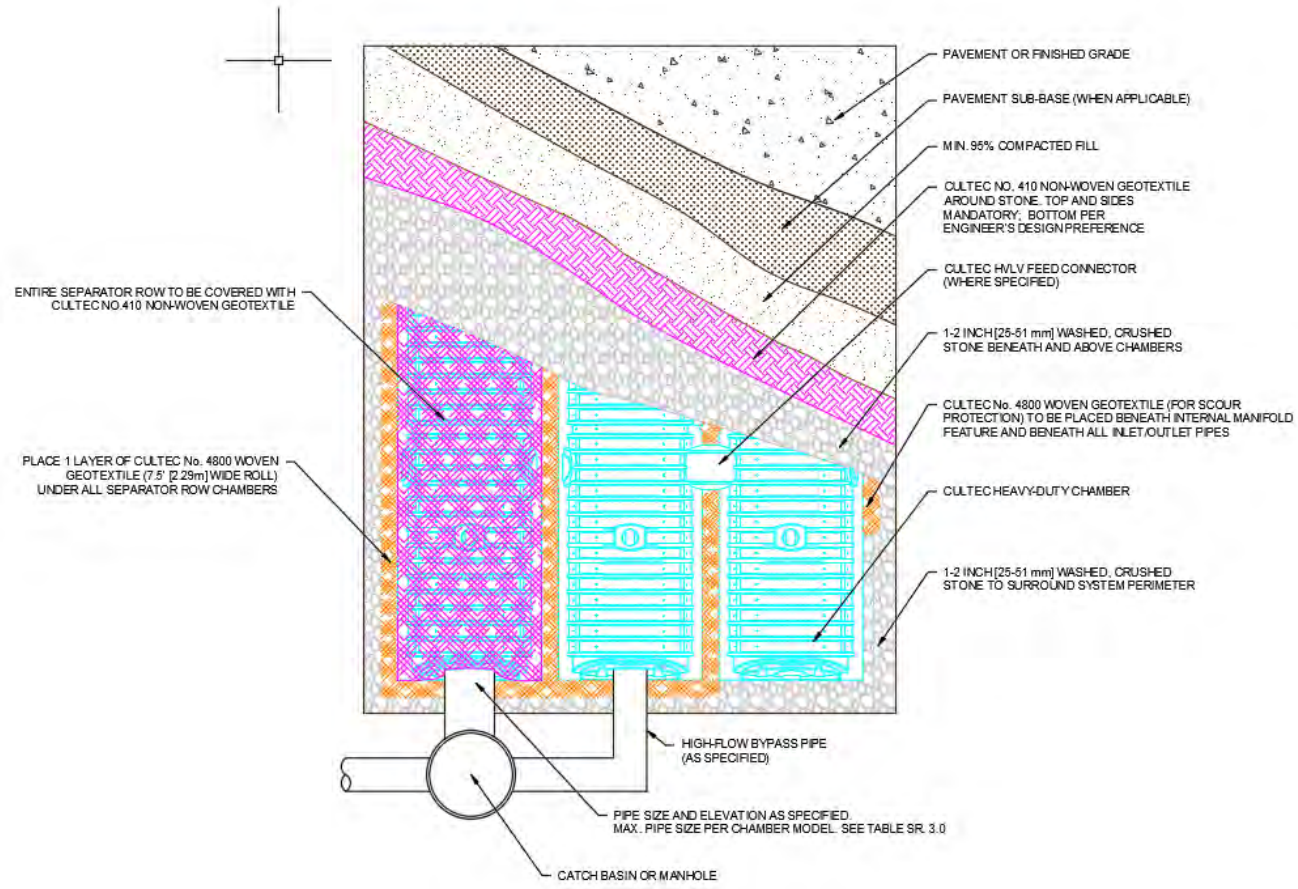
Introduction

CULTEC's Separator™ Row is an inexpensive means of removing Total Suspended Solids from the CULTEC chamber system, as well as providing easier access for inspection and maintenance. The Separator Row is designed to capture the First Flush of a rain event and is typically included as part of the "Treatment Train" for water quality.

The CULTEC Separator Row is a row of CULTEC Contactor or Recharger Chambers that are surrounded on all sides by filter fabric. One layer of CULTEC No. 4800™ Woven Geotextile are placed between the clean foundation stone and the chamber feet. The chambers are then completely wrapped with CULTEC No. 410™ non-woven geotextile. This configuration is designed to trap any sediment and/or debris that may pass through the upstream water-quality structures and into the chamber system.

A manhole is typically located adjacent to the separator row for ease of inspection and maintenance. This manhole is placed upstream of the system and can include a high-flow bypass pipe to pass peak-flows onto adjacent rows of chambers. The upstream manhole is designed with a sump to trap heavier sediment and allow for proper cleaning of the Separator Row. A JetVac process with a high pressure water nozzle is introduced down the Separator Row via the access manhole to clean all sediment and debris from the Separator Row. Captured pollutants are flushed into the sumped access manhole for vacuuming, and the process is repeated until the Separator Row is completely free of sediment and debris.

The Separator Row performance has been tested and verified to the protocols and procedures as defined by Environmental Technology Verification (ETV) Canada to achieve 80% TSS removal.



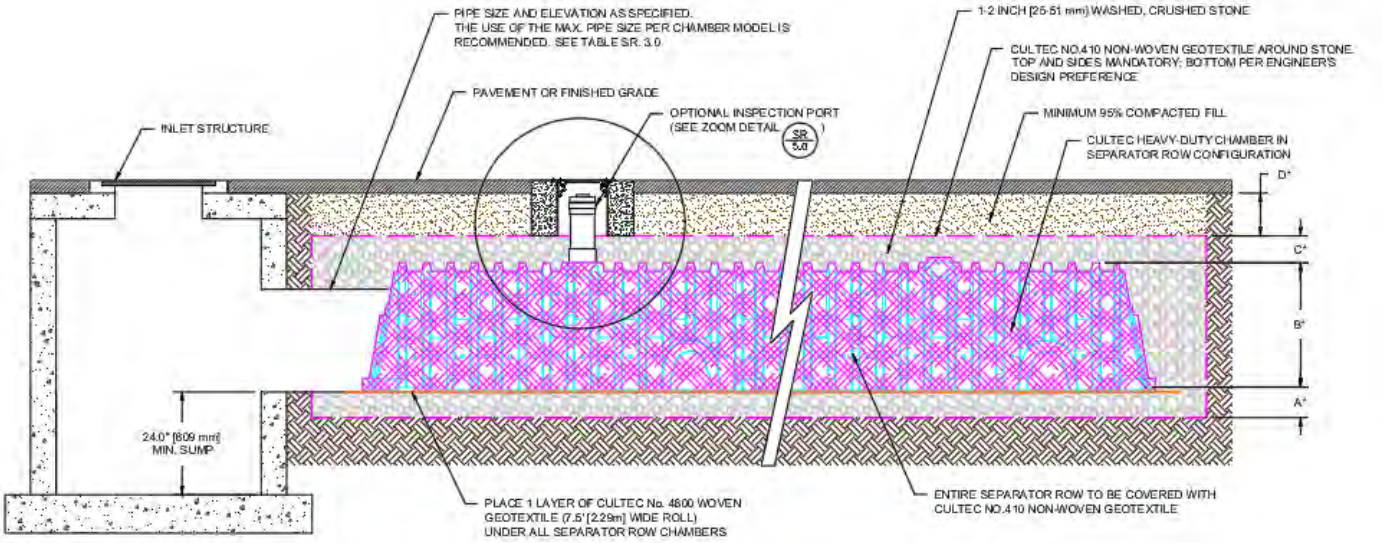
Design

There is no single design to achieve a high level of water quality. The CULTEC Separator Row should be designed as part of an overall best management practices water quality system. Pre-treatment devices such as sump catch basins, inlet baffles and proprietary oil-grit separators and filter systems can all be incorporated upstream of the CULTEC Separator Row. Sumped access/diversion manholes should be installed directly upstream of the Separator Row.

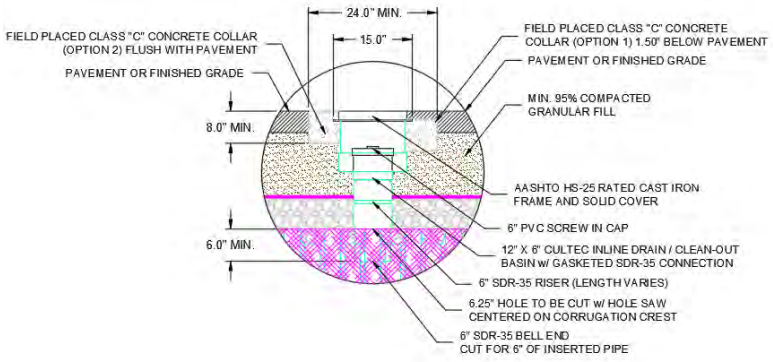
The following is a list of recommended design practices to ensure proper maintenance for the life of the system:

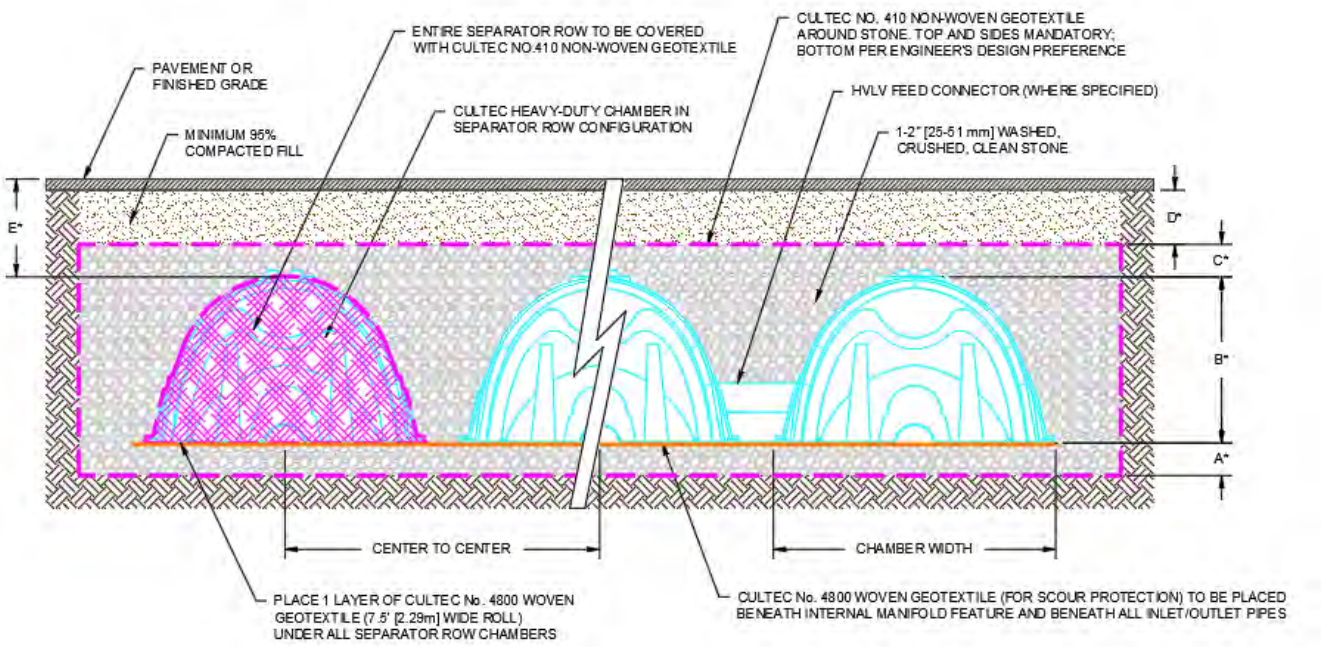
- Install sumped access/diversion manholes, including a minimum 24” (600 mm) sump, directly upstream of the Separator Row.
- Include a high-flow bypass pipe to divert peak flows that exceed the capacity of the Separator Row to adjacent rows.
- Connect the access manhole to the Separator Row with the largest diameter pipe allowable based on the CULTEC chamber model used.
- Maintain a minimum distance between the access manhole and the Separator Row to promote efficient maintenance.
- Include at least one inspection port per Separator Row for periodic inspection.

Note: Typical JetVac maintenance reels have a maximum of 400 feet (121.9 m) of available hose. Consider this when designing the length of the CULTEC Separator Rows.



*SEE SR 3.0 - CROSS SECTION TABLE REFERENCE





*SEE SR 3.0 - CROSS SECTION TABLE REFERENCE

Table SR 3.0

	Description	Contactor 100HD	Recharger 150XLHD	Recharger 280HD	Recharger 330XLHD	Recharger 360HD	Recharger 902HD
A	Min. depth of stone base	6″ 152 mm	6″ 152 mm	6″ 152 mm	6″ 152 mm	6″ 152 mm	9″ 229 m
B	Chamber height	12.5″ 318 mm	18.5″ 470 mm	26.5″ 673 mm	30.5″ 775 mm	36″ 914 mm	48″ 1219 mm
C	Min. depth of stone required above units for traffic applications	6″ 152 mm	6″ 152 mm	6″ 152 mm	6″ 152 mm	6″ 152 mm	12″ 305 mm
D	Min. depth required of 95% compacted fill for paved traffic application	8″ 203 mm	8″ 203 mm	8″ 203 mm	10″ 254 mm	12″ 305 mm	12″ 305 mm
E	Max. depth of cover allowed above crown of chamber	12′ 3.65 m	12′ 3.65 m	12′ 3.65 m	12′ 3.65 m	12′ 3.65 m	8.5′ 2.59 m
	Max. allowable pipe size into chamber end wall/end cap	10″ 250 mm	12″ 300 mm	18″ 450 mm	24″ 600 mm	24″ 600 mm	24″ 600 mm

Inspection and Maintenance

CULTEC recommends inspection of the Separator Row to be performed every six months for the first year of service. Future inspection frequency can be adjusted based upon previous inspection observations. However annual inspections are recommended. Inspection of the Separator Row can be achieved via an inspection port riser installed during construction. This inspection port riser will connect the top of the Separator Row chambers to finished grade with a removable lid. Alternatively the Separator Row may be inspected via the manhole(s) located at the end(s) of the Separator Row. However this method of inspection requires confined space entry. If entry into the manhole is required, all local and OSHA rules for confined space entries must be strictly followed.

To inspect:

- Remove the inspection port lid from the floor box frame.
- Remove the riser pipe cap.
- With a flashlight and stadia rod, measure the depth of sediment.
- Record results in a maintenance log.
- When depth of sediment exceeds 3” (76 mm), use the JetVac procedure described below.

The JetVac process utilizes a high pressure water nozzle controlled from the surface. The high pressure nozzle is introduced down the Separator Row via the access manhole(s). The high pressure water cleans all sediment and debris from the Separator Row as the nozzle is retrieved. Captured pollutants are flushed into the sumped access manhole for vacuuming. This process is repeated until the Separator Row is completely free of sediment and debris. A small diameter culvert cleaning nozzle is recommended for this procedure.

High pressure water nozzle

Cleaning Separator Row and pipes with high pressure water nozzle

SEPARATOR ROW: Separator Row prior to cleaning

ADJACENT ROW: When the Separator Row is working properly, the adjacent rows will not show signs of sediment.

Inspection and Maintenance Record

Date	Mode of Access	Frequency	Depth of Sediment	Actions	Expenses	Inspector	Notes
Ex.	Inspection Port	Semi-annually	2″	Measure sediment depth with stadia rod. Visually inspect	$100	DPG	Depth of Sediment was measured via Northeast Inspection Port Adjacent to MH-1. Sediment depth was found to be 2″. No further action required at this time.
Ex.	Access Manhole	Annually					

CULTEC, Inc.
878 Federal Road • P.O. Box 280 • Brookfield, CT 06804 USA
P: (203) 775-4416 • Toll Free: 1(800) 4-CULTEC • www.cultec.com

RETENTION • DETENTION • INFILTRATION • WATER QUALITY

CONTACTOR® & RECHARGER®

STORMWATER MANAGEMENT SOLUTIONS

OPERATION & MAINTENANCE GUIDELINES

FOR CULTEC STORMWATER MANAGEMENT SYSTEMS

CULTEC®

Published by
CULTEC
P.O. Box 280
878 Federal Road
Brookfield, Connecticut 06804 USA
www.cultec.com

Disclaimers:
The drawings, photographs and illustrations shown in this document are for illustrative purposes only and are not necessarily to scale.
Actual designs may vary.

CULTEC reserves the right to make design and/or specification changes at any time without notice at CULTEC's sole discretion.

Protected by one or more of the following patents owned by Cultec:
U.S. Patents 6,129,482; 6,322,288; 6,854,925; 7,226,241; 7,806,627; 8,366,346; 8,425,148; U.S. Designs D613,819; D638,095; D668,318; Canadian Patent 2,450,565; 2,591,255; Canadian Designs 129144; 135983; 159073; 160977; and/or other U.S. or Foreign Patent(s) or Patent(s) Pending.

Contact Information:
For general information on our other products and services, please contact our offices within the United States at (800)428-5832, (203)775-4416 ext. 202, or e-mail us at CT-CustomerService@cultec.com.

For technical support, please call (203)775-4416 ext. 203 or e-mail CT-Tech@cultec.com.

Visit www.cultec.com/downloads.html for Product Downloads and CAD details.

Doc ID: CLT057 11-23
November 2023

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pretreatment device). CCTV inspection of this row can be deployed through this access port to deter mine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. Manhole Access
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. StormFilter Access
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC at 1-800-428-5832.

WQMP
Operation & Maintenance (O&M) Plan

Project Name:_____

Prepared for:

Project Name: _____

Address:_____

City, State Zip:_____

Prepared on:

Date:_____

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

Appendix ___

BMP SITE PLAN

Site plan is preferred on minimum 11” by 17” colored sheets, as long as legible.

BMP OPERATION & MAINTENANCE LOG

Project Name: _____

Today's Date:_____

Name of Person Performing Activity (Printed):_____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Month 1	Date:	
□ Month 2	Date:	
□ Month 3	Date:	
□ Month 4	Date	
□ Month 5	Date:	
□ Month 6	Date:	
□ Month 7	Date:	
□ Month 8	Date:	
□ Month 9	Date:	
□ Month 10	Date:	
□ Month 11	Date:	
□ Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Year 1	Date:	
□ Year 4	Date:	
□ Year 7	Date:	
□ Year 10	Date:	
□ Year 13	Date:	
□ Year 16	Date:	
□ Year 19	Date:	
□ Year 22	Date:	

Major Maintenance

	Frequency		Action
Inlets and Outlets	**Every 3 years**		Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
			Notes
	□ Year 1	Date:	
	□ Year 4	Date:	
	□ Year 7	Date:	
	□ Year 10	Date:	
	□ Year 13	Date:	
	□ Year 16	Date:	
	□ Year 19	Date:	
	□ Year 22	Date:	
	Spring and Fall		Check inlet and outlets for clogging and remove any debris, as required.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
CULTEC Stormwater Chambers	**2 years after commissioning**		□ Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
			Notes
	□ Year 2	Date:	

Major Maintenance

	Frequency		Action
CULTEC Stormwater Chambers	**9 years after commissioning every 9 years following**		□ Clean stormwater management chambers and feed connectors of any debris. □ Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
			Notes
	□ Year 9	Date:	
	□ Year 18	Date:	
	□ Year 27	Date:	
	□ Year 36	Date:	
	45 years after commissioning		□ Clean stormwater management chambers and feed connectors of any debris. □ Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. □ Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. □ Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. □ Attain the appropriate approvals as required. □ Establish a new operation and maintenance schedule.
			Notes
	□ Year 45	Date:	

Major Maintenance

	Frequency		Action
Surrounding Site	**Monthly in 1st year**		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Month 1	Date:	
	□ Month 2	Date:	
	□ Month 3	Date:	
	□ Month 4	Date:	
	□ Month 5	Date:	
	□ Month 6	Date:	
	□ Month 7	Date:	
	□ Month 8	Date:	
	□ Month 9	Date:	
	□ Month 10	Date:	
	□ Month 11	Date:	
	□ Month 12	Date:	
	Spring and Fall		□ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	Yearly		□ Confirm that no unauthorized modifications have been performed to the site.
			Notes
	□ Year 1	Date:	
	□ Year 2	Date:	
	□ Year 3	Date:	
	□ Year 4	Date:	
	□ Year 5	Date:	
	□ Year 6	Date:	
	□ Year 7	Date:	

CULTEC
878 Federal Road • P.O. Box 280 • Brookfield, CT 06804 USA
P: (203) 775-4416 • Toll Free: 1(800) 4-CULTEC • www.cultec.com

RETENTION • DETENTION • INFILTRATION • WATER QUALITY

APPENDIX F

ILLICIT DISCHARGE COMPLIANCE STATEMENT- REQUIRED BY STANDARD 10

Illicit Discharge Compliance Statement

Responsibility:

The Owner is responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy, the USEPA NPDES Construction General Permit and responsible for identifying and eliminating illicit discharges (as defined by the USEPA).

OWNER NAME:	Neponset Village, LLC
ADDRESS:	5 Pleasant St
	Walpole, MA, 02081
TEL. NUMBER:	(508) 697-3191

Engineer's Compliance Statement:

To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and show that these systems do not allow the entry of any illicit discharges into the stormwater management system. The plans also show any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater systems.

Damien J. Dmitruk, P.E.
Civil Engineer

APPENDIX G

SOIL LOGS

Job No.: 10365.0
Client: Neponset Village LLC
Site Location: 5 Pleasant St., Walpole, MA
Land Use: Vacant lot
Parent Material:
Water Resource Conditions: Normal: Above: Below:

Soil Evaluator: Brannon McMullen, E.I.T.
Witness: Carl Balduf, P.E.
Excavator: ADH Contracting
Date: August 31, 2019
Weather: Sunny, 75˚

TP # 1

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-2	O				Depth		Mottling	N/E
2-8	Ap	Course Sand	10YR 5/4		0-15 Min.			
8-28	Bw	Course Sand	10YR 3/4	10% Gravel, 25% Cob./Stones	15-30 Min.		Weeping	N/E
28-126	C1	Coarse Sand	10YR 4/3	20% Cob./Stones	30-45 Min.			
126-176	C2	Sand			45-60 Min.		Standing	N/E
					60-75 Min.			

Rate 8.27 "/hr

TP # 2

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-5	O				Depth		Mottling	N/E
5-11	Ap	Loamy Sand	10YR 5/2		0-15 Min.			
11-40	Bw	Loamy Sand	10YR 4/4		15-30 Min.		Weeping	139"
40-102	C1	Loamy Sand	10YR 6/4		30-45 Min.			
102-140	C2	Loamy Sand			45-60 Min.		Standing	N/E
					60-75 Min.			

Rate 2.41 "/hr

TP # 3

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-6	O				Depth		Mottling	N/E
6-11	Ap	Loamy Sand	10YR 4/6		0-15 Min.			
11-41	Bw	Loamy Sand	10YR 5/6		15-30 Min.		Weeping	N/E
41-68	C1	Loamy Sand	10YR 6/1		30-45 Min.			
68-102	C2	Loamy Sand	10YR 6/4	10% Gravel, 10% Cob./Stones	45-60 Min.		Standing	N/E
102-142	C3	Sandy Loam		10% Gravel, 10% Cob./Stones	60-75 Min.			

Rate 2.41 "/hr

TP # 4

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-108	Fill				Depth		Mottling	N/E
108-141	C	Sandy Loam			0-15 Min.			
					15-30 Min.		Weeping	N/E
					30-45 Min.			
					45-60 Min.		Standing	N/E
					60-75 Min.			

Rate 1.02 "/hr

TP # 5

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-5	O				Depth		Mottling	N/E
5-14	Ap	Sandy Loam	10YR 5/2		0-15 Min.			
14-41	Bw	Sandy Loam	10YR 4/3		15-30 Min.		Weeping	N/E
41-60	C1	Sandy Loam	10YR 4/4		30-45 Min.			
60-128	C2	Sandy Loam			45-60 Min.		Standing	N/E
					60-75 Min.			

Rate 1.02 "/hr

TP # 7

Depth	Horizon	Texture	Color	Comments	Infiltration Test		Groundwater	
0-14	A	Sandy Loam	10YR 5/2		Depth		Mottling	N/E
14-31	Bw	Sandy Loam	10YR 4/4		0-15 Min.			
31-128	C1	Sandy Loam	10YR 3/4		15-30 Min.		Weeping	N/E
					30-45 Min.			
					45-60 Min.		Standing	N/E
					60-75 Min.			

Rate 2.41 "/hr