Stormwater Report

Town of Groton
Improvements at Cow Pond Brook Fields

Cow Pond Brook Fields
599 Cow Pond Brook Road
Groton, MA, 01450

Owner:
Town of Groton
173 Main Street
Groton, MA 01450

Submitted To:
Town of Groton
Earth Removal Stormwater
Advisory Council
173 Main Street
Groton, MA 01450

Civil Engineer/ Landscape Architect:
Activitas, Inc.
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Dedham, MA 02026
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Westford, MA 01886
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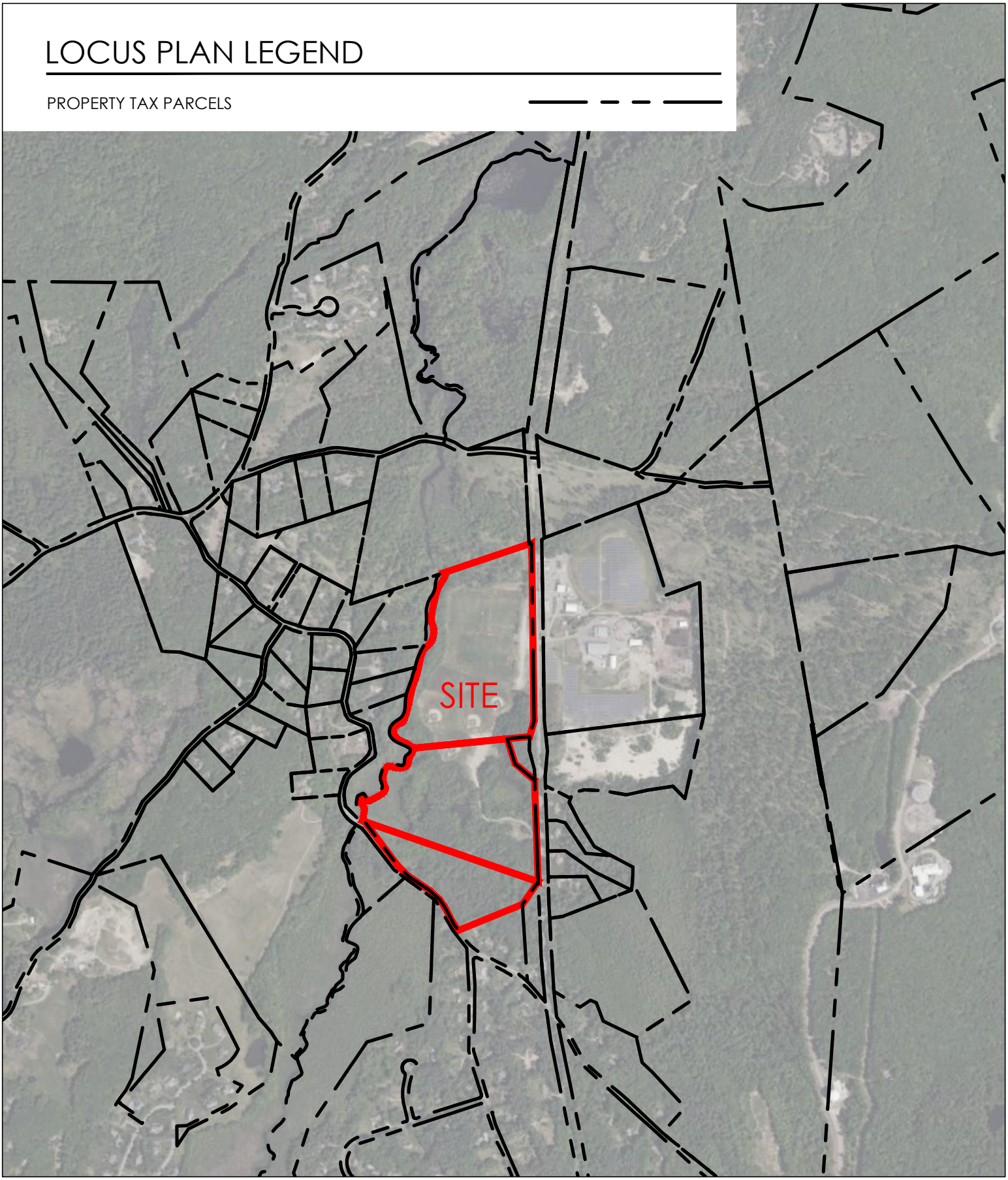
380 Lowell Street, Suite 101
Wakefield, MA 01880
(781) 245-2500

February 02, 2026

Site Locus Map

LOCUS PLAN LEGEND

PROPERTY TAX PARCELS



ACTIVITAS
landscape architecture | civil engineering
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TOWN OF GROTON

Groton, MA

COW POND BROOK PARK RENOVATIONS

PROJECT NO.: 24051.00
REFERENCE SHEET: SURVEY
PHASE: PERMITTING DOCUMENTS
DATE: FEBRUARY 02, 2026
SCALE: 1" = 1000'-0"

SKETCH NO. LOCUS

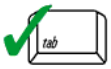
Massachusetts Stormwater Report Checklist

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

[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

M E Buczynski 2/2/2026

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.

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Project Overview

The Town of Groton is proposing renovations to Groton's Cow Pond Brook Fields located at 599 Cow Pond Brook Road, Groton, MA. Work will include:

- Formalized bituminous concrete parking lot
- New bituminous concrete driveways
- New poured-in-place playground
- Relocated Youth Baseball Field
- ADA accessible porous pavement walkways
- ADA accessible walkways
- Stormwater improvements
- Landscape improvements
- NHESP Species Habitat Restoration and Development

Compliance with Stormwater Standards

The Town of Groton utilizes the policy, criteria and information including specifications and standards of the Massachusetts Department of Environmental Protection Stormwater Handbook (MA Stormwater Handbook dated 2/2008) and the Groton Code Stormwater Management – Low Impact Development Regulations (adopted by the Earth Removal Advisory Committee 4/14/15). The proposed project is considered new development under the Stormwater Standards. The project has been designed in accordance with the "Massachusetts Stormwater Handbook" and the Town of Groton's Earth Removal Advisory Committee Stormwater Design Criteria (Chapter 356, Article II).

LID Measures

Key features of Low Impact Development (LID) stormwater management systems include implementing practices that maintain a site's existing hydrology, using decentralized practices to manage stormwater close to the source of generation, and maximizing onsite infiltration to reduce runoff and landscape watering requirements.

The following LID techniques Best Management Practices are specified in the proposed development program to mitigate the increase in stormwater runoff from the site.
BMPs Used:

- No disturbance to any Wetland Resource Areas

Standard 1: No New Untreated Discharges

The MA Stormwater Handbook requires that projects demonstrate that there are no new untreated discharges and that new discharges will not cause erosion or scour to downstream wetlands or water of the Commonwealth.

Computations and strategies shown for Standards 4 through 6 in this report demonstrate that there will be no new untreated discharges from the site.

Standard 2: Peak Rate Attenuation

Standard 2 requires that stormwater management systems be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates for the 2-yr and 10-yr storm events and shows no downstream flooding in the 100-year event (via no increase in peak rate). The Town of Groton's Stormwater Design Criteria requires that stormwater management systems be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates for the 2-yr, 10-yr, and 25-yr storm events. The following section outlines the procedure

for determining the peak rates and volumes for the existing condition as well as the methods for attenuating the peak flows and volumes in the proposed condition.

2.1 Methodology

2.1.1 Hydrologic Model Description

The drainage analysis was performed using the Soil Conservation Service (SCS) TR-55 and TR-20 methodologies and the computer program HydroCAD 10.20-5c by HydroCAD Software Solutions, LLC.

2.1.2 Soil Conditions

The National Resources Conservation Service (NRCS) soil report identifies the majority of soils within the area of analysis as Quonset sandy loamy and Udorthents, sandy with Carver loamy coarse sand and gravel pits located at the edge of the area of study as noted in Table 1 below. With the presence of Quonset sandy loamy; Udorthents, sandy; Carver loamy coarse sand; and gravel pits, infiltration rates are high, and the soil has been assigned to Soil Group A in the hydrologic model based on NRCS soil report. Test pits performed on site confirmed the soil groups on site. The test pit logs and NCRS soil report can be found in the Attachments section of this report.

Table 1: NRCS Soil Types

Map Designation	Soil Name	Soil Group
52A	Freetown muck, 0 to 1 percent slopes	B/D
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D
259B	Carver loamy coarse sand, 3 to 8 percent slopes	A
259C	Carver loamy coarse sand, 8 to 15 percent slopes	A
262B	Quonset sandy loamy, 3 to 8 percent slopes	A
262C	Quonset sandy loamy, 8 to 15 percent slopes	A
262D	Quonset sandy loamy, 15 to 25 percent slopes	A
600	Pits, gravel	
653	Udorthents, sandy	

2.1.3 Design Storms

The analysis was performed on the 2-, 10-, 25-, and 100-year frequency rainfall events. The events were based on the 24-hour Type-III duration storms.

2.1.4 Time of Concentration

Time of Concentration (Tc) values were calculated using Average Velocities for Overland Flow, found in SCS TR-55 Urban Hydrology for Small Watersheds. The minimum Tc used was six (6) minutes as this is the minimum that HydroCAD defaults to in the calculations.

2.1.5 Curve Numbers

Curve numbers were developed for each of the different use categories and hydrologic soil group types within each sub-area. The curve numbers were based on the SCS TR-55 methodology and are included in the HydroCAD input and output found in the Attachments Section.

2.1.6 Rainfall

Rainfall data is taken from the NOAA Atlas 14 Precipitation Frequency Data Sever for the project location. The following depths were used in the HydroCAD model for the 2-, 10-, 25-, and 100-yr storm events:

Table 2: Rainfall Data

Storm Event	Rainfall Depth
2-yr	3.13"
10-yr	4.83"
25-yr	5.89"
100-yr	7.52"

2.2. Existing Conditions

The Cow Pond Brook Fields Area of Analysis is a 27.92-acre area containing natural grass athletic fields (rectangular and diamond), grassed areas, and gravel parking. The area is bordered by wooded areas to the north, and south, Cow Pond Brook to the west, and Cow Pond Brook Road to the east. The existing site is an old gravel pit that has been the home of the Town of Groton's athletic and recreation programs for years. The existing topography within the site is relatively flat, and infiltration rates are high. The natural grass athletic fields are at an elevation of around 195.00 and are surrounded by mounds of existing earth that create a bowl effect within the site. In accordance with the Town of Groton's Stormwater Design Criteria, ground covers on the property have been modeled in accordance with the values from Table 2 'Approved CN Values for the SCS Methods (TR-20, TR-55)'.

2.2.1 Existing Drainage Areas

The existing project area contains three subcatchment areas, Sub-1, Sub-2, and Sub-3. Due to the existing flat topography, quickly draining soils, and the mounded areas along the edges of the site, runoff is infiltrated within the natural topography of the subcatchment. While a Discharge Point is included in the HydroCAD model, in all storms through the 100- year storm, the runoff rate and volume of DP-1 is 0. This shows that all runoff infiltrates on-site and there is no runoff leaving the site. The calculations do also show that in all storms ponding is visible on the surface during the storm event. See the Pre-Development Plan Attachment (Fig. 1).

Sub-1 is a 10.303 ac area that contains rectangular natural grass athletic fields, grassed areas, an asphalt driveway, portions of a gravel parking lot, and wooded areas. Runoff flows overland from the existing driveway, gravel parking lot, and grassed areas to low spots in the grassed areas. In all storms, runoff is infiltrated and there is no outlet. Pond 1P (North Pond) in the HydroCAD model represents the low areas within the subcatchment that water has the potential to pond within while waiting to infiltrate. The model was developed in this way to help identify up to what size storm the existing site does NOT see ponding.

Sub-2 is a 5.198 ac area that contains portions of rectangular natural grass athletic fields, grassed areas, portions of a gravel parking lot, and wooded areas. Runoff flows overland from the slopes adjacent to Cow Pond Brook Road to the low spots at the grassed areas adjacent to the gravel parking lot. Runoff from the rectangular natural grass fields travels overland to low spots in the grassed areas. Pond 2P (West Pond) in the HydroCAD model represents the low areas within the subcatchment that water has

the potential to pond within while waiting to infiltrate. The model was developed in this way to help identify up to what size storm the existing site does NOT see ponding. In smaller storms, runoff is infiltrated within these low spots. In larger storms, runoff that overflows these low spots flows to the low spots within subcatchment-1, Pond-1P.

Sub-3 is a 12.424 ac area that contains natural grass athletic fields (youth baseball diamonds), grassed areas, portions of a gravel parking lot, and wooded areas. Runoff flows overland from the slopes adjacent to Cow Pond Brook Road to the low spots at the grassed areas adjacent to the gravel parking lot. Runoff from the natural grass fields travels overland to low spots in the grassed areas. Pond 3P (Southern Pond) in the HydroCAD model represents the low areas within the subcatchment that water has the potential to pond within while waiting to infiltrate. The model was developed in this way to help identify up to what size storm the existing site does NOT see ponding. In smaller storms, runoff is infiltrated within these low spots. In larger storms, runoff that overflows these low spots flows to the low spots within subcatchment-1, Pond 1P.

To summarize, in the existing conditions no runoff leaves the site. All runoff infiltrates within the site although in the existing conditions there is surface ponding in the subcatchment areas. This means that in terms of Standard 2 of the Stormwater Standards (Peak Rate Attenuation) in the proposed conditions, all runoff must infiltrate within the site. The question from a design standpoint therefore becomes to what storm do we require no ponding at the site? Since the Groton regulations note compliance for the 25-year storm, the 25-year storm has been designed to in order to alleviate potential for ponding in the parking lot subcatchment areas.

2.3 Proposed Conditions

The proposed work consists of the construction of a new parking area, new ADA accessible walkways between the natural grass athletic fields and at the parking lot area, construction of a new playground area, installation of new stormwater BMPs, relocated Youth Baseball Field and associated amenities, new athletic lighting at a Youth Baseball Field, NHESP species habitat improvements, and other landscape improvements.

2.3.1 Proposed Drainage Areas

The proposed project area contains seven (7) drainage areas, Sub-10, Sub-21, Sub-22, Sub-23, Sub-24, Sub-25, and Sub-30. Similar to the existing conditions, the majority of the runoff is infiltrated within the natural topography or proposed infiltration basins within the proposed subcatchments. For the intent of the model, the areas of porous pavement walkways and poured-in-place playground surfacing have been modeled with a CN of 1 because these are fully permeable surfaces meaning that runoff falling onto these surfaces will drain vertically and infiltrate without any runoff generation.

While a Discharge Point is included in the HydroCAD model, in all storms through the 100- year storm, the runoff rate and volume of DP-1 is 0. This shows that all runoff infiltrates on-site and there is no runoff leaving the site. In the new parking areas, there will be no surface ponding within the 25-year storm. In storms larger than the 25-year there is a potential for ponding within the parking area. However, sizing the infiltration basins to handle a larger storm does not make fiscal sense as ponding in these lots will not affect other areas and cars will not likely be at the site in such extreme conditions. In subcatchments that remain mostly untouched, any surface ponding will mimic existing conditions. See the Post-Development Plan Attachment (Fig. 2).

Sub-10 is a 12.188 ac area that consists of cement concrete walkways, playgrounds, storage shed, natural grassed athletic fields, and porous pavement walkways providing accessible routes between the athletic fields and parking lot. Runoff flows overland to low spots in the grassed areas (Pond 1PE). Runoff is infiltrated and there is no outlet.

Sub-21 is a 1.154 ac area that consists of the northern portions of the bituminous concrete parking lot and driveway as well as maintained grassed slopes between the parking lot and Cow Pond Brook Road. Runoff flows overland to a low spot in the parking lot where it is collected by a catch basin. The catch basin outlets to a water quality unit before it is conveyed in a drainage pipe to a subsurface infiltration system beneath the parking lot (Pond 21P). Runoff is infiltrated and there is no surface ponding in the 25-year storm event. In larger storms (greater than 25-year), runoff that overflows the subsurface infiltration basin flows into the site (Pond 1P) to the existing grassed areas for further infiltration similar to existing conditions.

Sub-22 is a 1.020 ac area that consists of the northern central portions of the bituminous concrete parking lot and driveway as well as maintained grassed slopes between the parking lot and Cow Pond Brook Road. Runoff flows overland to a low spot in the parking lot where it is collected by a catch basin. The catch basin outlets to a water quality unit before it is conveyed in a drainage pipe to a subsurface infiltration system beneath the parking lot (Pond 22P). Runoff is infiltrated and there is no surface ponding in the 25-year storm event. In larger storms (greater than 25-year), runoff that overflows the subsurface infiltration basin flows into the site (Pond 1P) to the existing grassed areas for further infiltration similar to existing conditions.

Sub-23 is a 2.156 ac area that consists of the central portions of the bituminous concrete parking lot and driveway as well as maintained grassed slopes and wooded areas between the parking lot and Cow Pond Brook Road. Runoff flows overland to a low spot in the parking lot where it is collected by a catch basin. The catch basin outlets to a water quality unit before it is conveyed in a drainage pipe to a subsurface infiltration system beneath the parking lot (Pond 23P). Runoff is infiltrated and there is no surface ponding in the 25-year storm event. In larger storms (greater than 25-year), runoff that overflows the subsurface infiltration basin flows into the site (Pond 3P) to the existing grassed areas for further infiltration similar to existing conditions.

Sub-24 is a 0.569 ac area that consists of the southern central portions of the bituminous concrete parking lot and driveway as well as maintained grassed slopes and wooded areas between the parking lot and Cow Pond Brook Road. Runoff flows overland to a low spot in the parking lot where it is collected by a catch basin. The catch basin outlets to a water quality unit before it is conveyed in a drainage pipe to a subsurface infiltration system beneath the parking lot (Pond 24P). Runoff is infiltrated and there is no surface ponding in the 25-year storm event. In larger storms (greater than 25-year), runoff that overflows the subsurface infiltration basin flows into the site (Pond 3P) to the existing grassed areas for further infiltration similar to existing conditions.

Sub-25 is a 2.042 ac area that consists of the southern portions of the bituminous concrete parking lot and driveway, an emergency vehicle access gravel drive, maintained grassed slopes, and wooded areas between the parking lot and Cow Pond Brook Road. Runoff flows overland to low spots in the parking lot where it is collected by catch basins. The catch basins outlets to a drain manhole which conveys the runoff through a drainpipe to a water quality unit before it is conveyed in a drainage pipe to a subsurface infiltration system beneath the parking lot (Pond 25P). Runoff is infiltrated and there is no surface ponding in the 25-year storm event. In larger storms (greater than 25-year), runoff that overflows the subsurface infiltration basin flows into the site (Pond 3P) to the existing grassed areas for further infiltration similar to existing conditions.

Sub-30 is an 8.796 ac area that consists of cement concrete walkways, natural grass athletic fields (diamonds), storage buildings, dugouts, press boxes, field houses, and porous pavement walkways providing accessible routes between the athletic fields and parking lot. Runoff flows overland to low spots in the grassed areas (Pond 3PE). Runoff is infiltrated and there is no outlet.

Ponds 21P, 22P, 23P, 24P, and 25P are subsurface chamber systems sized to infiltrate runoff from the parking lot areas. The chambers systems have been sized so there is no surface ponding in the 25-year storm event.

Table 3: Existing & Proposed Conditions Takeoff Areas (SF)

	Impervious CN=98	Infield Mix CN=89	Gravel CN=76	Grass CN=68	Woods/Brush Good CN=30	Porous Pavement/ Playground CN=1*	Total Area	Weighted CN
SUB-1	0.054 ac	-	0.042 ac	9.581 ac	0.626 ac	-	10.303 ac	66
SUB-2	0.112 ac	-	0.289 ac	3.987 ac	0.809 ac	-	5.198 ac	63
SUB-3	0.516 ac	0.530 ac	0.626 ac	7.109 ac	4.094 ac	-	12.424 ac	57
EX-TOTAL	**0.682 ac**	**0.530 ac**	**0.957 ac**	**20.677 ac**	**5.529 ac**	-	**27.925 ac**	
PR-10	0.219 ac	-	-	10.956 ac	0.605 ac	0.408 ac	12.188 ac	64
PR-21	0.668 ac	-	-	0.485 ac	-	-	1.154 ac	85
PR-22	0.604 ac	-	-	0.416 ac	-	-	1.020 ac	80
PR-23	0.462 ac	-	-	0.454 ac	1.240 ac	-	2.156 ac	53
PR-24	0.213 ac	-	-	0.051 ac	0.304 ac	-	0.569 ac	59
PR-25	0.754 ac	-	-	0.097 ac	1.191 ac	-	2.042 ac	57
PR-30	0.243 ac	0.525 ac	0.082 ac	6.272 ac	1.403 ac	0.271 ac	8.796 ac	62
PR-Total	**3.163 ac**	**0.525 ac**	**0.082 ac**	**18.731 ac**	**4.743 ac**	**0.679 ac**	**27.925 ac**	

*Recall above that Porous Pavement and Poured-in-place playground surfacing has been designed to handle itself and therefore been assigned a CN of 1.

2.4 Peak Discharge Runoff Rates

The peak rates were calculated for the 2-,10-, 25- and 100-year storm events under the existing and proposed conditions to compare. Table 4 summarizes the rates of runoff and shows that no runoff is leaving the site.

Table 4: Summary of Runoff Rates (cfs)

		2 Year	10 Year	25 Year	100 Year
DISCHARGE POINTS	DP-1E	0.00	0.00	0.00	0.00
	DP-1P	0.00	0.00	0.00	0.00

More relevant for this project is a comparison of the potential for ponding in the existing and proposed conditions within the site. The following table compares the ponding elevation of Pond 1 and Pond 3 (open grass areas) in the existing and proposed conditions. Note that Pond 2 is replaced with the subsurface systems in the proposed conditions. As shown in the table, low areas in the existing conditions see water ponding in the 2-yr, 10-yr, and 25-yr storm events. The proposed conditions mimic the existing hydrology of the site and therefore ponding is seen the 2-yr, 10-yr, and 25-yr storm events. The ponding seen in the proposed conditions is minimally increased in comparison to the ponding seen in the existing conditions, and with infiltration rates on site being high, this small increase in ponding is considered negligible and therefore the intent of this standard is met.

Table 5: Summary of Existing and Proposed Ponding Elevations

		2 Year	10 Year	25 Year
POND 1P; EXISTING	BOTTOM ELEV.	194.25	194.25	194.25
	TOP ELEV.	196.00	196.00	196.00
	PEAK ELEV.	194.83	194.98	195.09
POND 1P; PROPOSED	BOTTOM ELEV.	194.50	194.50	194.50
	TOP ELEV.	196.00	196.00	196.00
	PEAK ELEV.	194.85	195.04	195.17
POND 3P; EXISTING	BOTTOM ELEV.	195.00	195.00	195.00
	TOP ELEV.	196.00	196.00	196.00
	PEAK ELEV.	195.01	195.03	195.10
POND 3P; PROPOSED	BOTTOM ELEV.	194.50	194.50	194.50
	TOP ELEV.	196.00	196.00	196.00
	PEAK ELEV.	194.92	195.09	195.15

In the ponds associated with the parking lot subsurface conditions, it is also important to show that in the 25-year storm and below there is not runoff leaving those systems (aka ponding) meeting the intent of the design.

Standard 3: Stormwater Recharge

3.1 Stormwater Recharge

As no stormwater leaves the site, it is all infiltrated and therefore all recharged, this Standard is met.

3.2 Drawdown Time

The MA Stormwater Handbook requires that recharge volume have a drawdown time of 72 hours or less. The time required to dewater a recharge system may be estimated by the following equation:

$$Time_{drawdown} = \frac{V_{RS}}{(K)\ x\ \left(\frac{1ft}{12in}\right) x\ (A_R)}$$

$$V_{RS} = Volume\ of\ recharge\ storage\ system\ (cf)$$

$$K = Rawls\ Rate\ \left(\frac{in}{hr}\right)$$

$$A_R = Surface\ area\ of\ recharge\ system\ (sf)$$

The drawdown time of the Pond 21P system (assuming full capacity) is calculated as the following:

$$Time_{drawdown} = \frac{4{,}879\ cf}{\left(\frac{8.27\ in}{hr}\right) x\ \left(\frac{1\ ft}{12\ in}\right) x\ (5{,}009\ sf)}$$

$$Time_{drawdown} = 1.41\ hours$$

The drawdown time of the Pond 22P system (assuming full capacity) is calculated as the following:

$$Time_{drawdown} = \frac{3{,}833\ cf}{\left(\frac{8.27\ in}{hr}\right) x\ \left(\frac{1\ ft}{12\ in}\right) x\ (3{,}920\ sf)}$$

$$Time_{drawdown} = 1.42\ hours$$

The drawdown time of the Pond 23P system (assuming full capacity) is calculated as the following:

$$Time_{drawdown} = \frac{2{,}526\ cf}{\left(\frac{8.27\ in}{hr}\right) x\ \left(\frac{1\ ft}{12\ in}\right) x\ (2{,}613\ sf)}$$

$$Time_{drawdown} = 1.40\ hours$$

The drawdown time of the Pond 24P system (assuming full capacity) is calculated as the following:

$$Time_{drawdown} = \frac{969\ cf}{\left(\frac{8.27\ in}{hr}\right) x\ \left(\frac{1\ ft}{12\ in}\right) x\ (1{,}022\ sf)}$$

$$Time_{drawdown} = 1.37\ hours$$

The drawdown time of the Pond 25P system (assuming full capacity) is calculated as the following:

$$Time_{drawdown} = \frac{3{,}190\ cf}{\left(\frac{8.27\ in}{hr}\right) x\ \left(\frac{1\ ft}{12\ in}\right) x\ (3{,}268\ sf)}$$

$$Time_{drawdown} = 1.41\ hours$$

The drawdown time for Pond-21P, Pond-22P, Pond-23P, Pond-24P, and Pond-25P are under the 72-hour maximum and therefore this standard is met.

Standard 4: Required Water Quality Volumes

Stormwater management standards will be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). The MA Stormwater Handbook states that this standard is met when:

1. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan and thereafter are implemented and maintained.

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

3. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook

It is also important to note that there are areas of the site designated as ACEC, but none of that area overlaps the areas of the proposed parking lot. As such the 1" pretreatment criteria does not apply.

The MA Stormwater Handbook does not provide guidance in differentiating between a typical development project which would likely have roadways, driveways, and parking lots, which generate greater amounts of TSS, and a landscape project that proposes to renovate natural grass athletic fields and install accessible pedestrian walkways that will not be treated in the winter. The proposed project has both conditions of a typical development project (parking area) and a landscape project.

Typical Development Areas:

The proposed parking area will be paved and is anticipated to generate TSS. Runoff from the parking area will be routed through deep sump catch basins and water quality units (Stormceptor or equivalent) prior to flowing into the underground detention systems. All pretreatment and treatment occurs through the deep sump catch basins and the water quality unit and all runoff is treated to 80% prior to flowing to the infiltration basins. As such the infiltration basins are not providing TSS removal and the infiltration rate of the basins can utilize the excessively draining soils. The TSS Removal Worksheet for the parking areas can be found in the Appendix.

The water quality units will be sized to treat the required water quality volume which is calculated below. There is a water quality unit before the inflow to every subsurface infiltration system.

$$Parking\ Area\ Impervious\ Area = \ 117{,}655\ sf$$

$$Required\ Water\ Quality\ Volume = (0.5\ in) * \left(\frac{1ft}{12in}\right) * (117{,}655\ sf)$$

$$Required\ Water\ Quality\ Volume = 4{,}902\ cf$$

Landscape Areas:

The athletic fields and adjacent porous pavement walkways will not generate TSS loads comparable to a typical development project, which is what the Stormwater Handbook is aimed at regulating. The Town of Groton does not anticipate treating the porous pavement or cement concrete walkways in this project and vehicle use on any of the surfaces will be limited to maintenance vehicles which will access these surfaces on a minimal basis. In consideration of the impervious surface type and use, runoff from these surfaces already meet the intent of Standard 4. Standard 4 is therefore met without additional treatment of runoff from these surfaces.

A long-term pollution prevention plan is required to identify practices taken for source control and pollution prevention. This information has been provided as a part of the Operation and Maintenance Plan and can be found in the Attachments Section.

Standard 5: Land Uses with Higher Potential Pollutant Loads

This project is not considered a land use with Higher Potential Pollutant loads therefore Standard 5 is not applicable to this project.

Standard 6: Critical Areas

While the Petapawag ACEC overlays a portion of the site and Cow Pond Brook (not the area of the parking lots), Cow Pond Brook is not listed within the MA Surface Water Quality Standards and is therefore not an outstanding resource water. As such the project area is not considered a critical area.

Standard 7: Redevelopment

For the purposes of the Stormwater Management Standards, redevelopment projects are defined to include development, rehabilitation, and expansion on previously developed sites provided the redevelopment results in no net increase in impervious area. The project proposes a net increase in impervious area on site. As such, the project has been designed in full compliance with the Massachusetts Stormwater Standards.

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

Construction period pollution prevention and erosion and sedimentation control will be implemented at the project site to control construction related impacts during construction and land disturbance activities. Refer to the Site Preparation Plan for location of erosion and sediment controls.

Standard 9: Operation and Maintenance Plan

The proposed project is owned by the Town of Groton. Stormwater structures and other stormwater best management practices should be maintained as directed in the Operations and Maintenance Plan. An Operation and Maintenance Plan has been included as an attachment.

Standard 10: Prohibition of Illicit Discharges

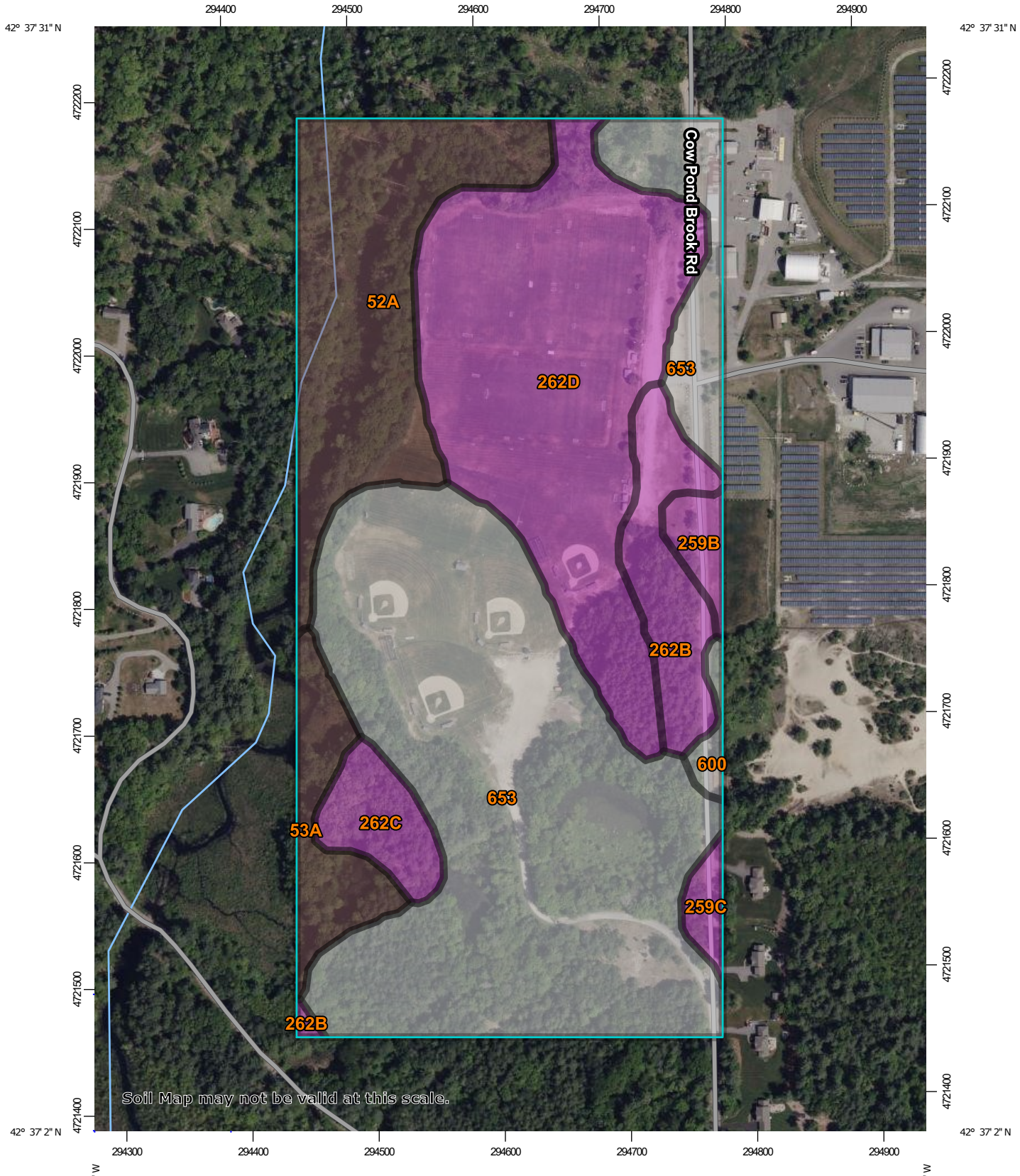
Illicit Discharge Compliance Statement

"Per the requirements of Standard 10 of the Massachusetts Stormwater Management Standards it shall be stated that No Illicit Discharges exist at Cow Pond Brook Park located at 599 Cow Pond Brook Road, Groton, Massachusetts."

Attachments:

NRCS Soil Report/Test Pit Logs
Pre-Development Plan
Post-Development Plan
Rainfall Information
HydroCAD Report – Peak Rate and Volume
Mounding Analysis
TSS Calculations
Operation & Maintenance Plan
Stormwater Pollution Prevention Plan (SWPPP)

NRCS Soil Report/Test Pit Logs



Map Scale: 1:4,250 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 25, Sep 5, 2025

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

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

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	B/D	9.2	15.2%
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	2.6	4.2%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	A	0.8	1.3%
259C	Carver loamy coarse sand, 8 to 15 percent slopes	A	0.6	1.0%
262B	Quonset sandy loam, 3 to 8 percent slopes	A	3.2	5.3%
262C	Quonset sandy loam, 8 to 15 percent slopes	A	1.8	3.0%
262D	Quonset sandy loam, 15 to 25 percent slopes	A	15.3	25.2%
600	Pits, gravel		0.5	0.8%
653	Udorthents, sandy		26.7	43.9%
Totals for Area of Interest			**60.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Nashoba Associated Boards of Health
Environmental Health Service
30 Central Avenue, Ayer, Ma. 01432

SOIL EVALUATION/GROUNDWATER TESTING
(usually March – April)
Appointment Date 11/6/2025

Appointment Time 8:45am

PERCOLATION TESTING/SOIL EVALUATION
(usually after June 1st)
Appointment Date _____

Appointment Time _____

REQUEST FOR LOT TESTING MUST BE SUBMITTED BETWEEN JAN. 1- MARCH 31 ONLY

Type of Testing
- [X] New Lot
- [ ] Retest of New Lot
- [ ] Retest (>30 min/in add $110)
- [ ] Upgrade Failed System
- [ ] Increase Flow/Use

$550.00/site up to 999 gpd
Consult Fee Schedule for Larger Systems

There is a 15% processing charge on all refunds

Town Groton Assessor's Map # 248 Parcel # 40
Street Location Cow Pond Brook Road Lot# _____
Directions to Property At exisitng soccer and baseball parking lot areas (start at soccer)

THIS APPLICATION MUST BE ACCOMPANIED BY A PLAN OF THE LOT

New	Existing
[ ]	[ ] Dwelling
[ ]	[ ] Business
[ ]	[ ] Industrial
[ ]	[X] Other
[ ]	[ ] Restaurant

Number of Bedrooms _____ Water Supply [ ] Public [ ] Well
Number of Employees _____ Square Feet of Floor Space _____
Describe _____ Food Service [ ] yes [ ] no
Number of Seats _____
This is for soil evaluation associated w/ proposed stormwater design for Rec Field Parking and Accessibility Improvements

Name of Engineer Megan Buczynski, P.E. Telephone 781-375-8663
Lot Size _____ Has property been surveyed? [X] yes [ ] no Previously tested? [ ] yes [X] no
If yes, please give dates, and by whom _____
Owner's Name Town of Groton c/o Town Manager, Mark Haddad Telephone 978-448-1100
Address 173 Main Street, Groton, MA 01450
Email mhaddad@grotonma.gov

Applicant's Name(**must be owner or prospective owner**) Mark Haddad, Groton Town Manager
Address 173 Main Street, Groton, MA 01450 Telephone 978-448-1100
Daytime Telephone Number _____ [X] Business [ ] Residence

The information given above is, to the best of my knowledge and belief, true and correct. I have read the accompanying lot testing information sheet.

Date 11/4/2025 Signature of Applicant M Buczynski

(978) 772-3335 (800) 427-9762 FAX (978) 772-4947


Proposed Test Pit Locations
Google Earth
Image © 2025 Airbus
400 ft
N

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 (Hole #) | 11/6/2025 (Date) | 9am (Time) | sunny, high 30s (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Gravel Parking Lot (e.g., woodland, agricultural field, vacant lot, etc.) | n/a; gravel (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | <1% (Slope (%))

Description of Location: Test pit located within northern parking area near soccer fields

2. Soil Parent Material: _____ | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-18	A	Fill / gravel			Cnc : Dpl:						
18-41	B1	M/F sand	10YR 5/6		Cnc : Dpl:						
41-43	B2	gravel layer			Cnc : Dpl:						
43-52	B3	gravel		43"	Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Redo features for SHGW 43"; standing water at 50"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 (Hole #) | 11/6/2025 (Date) | 9:30am (Time) | sunny, high 30s (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Gravel Parking Lot (e.g., woodland, agricultural field, vacant lot, etc.) | n/a; gravel (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | <1% (Slope (%))

Description of Location: Test pit located within northern parking area near soccer fields

2. Soil Parent Material: _____ | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-13	A	Fill / gravel			Cnc : Dpl:						
13-19	B1	Fine sand	10YR 5/6		Cnc : Dpl:						
19-32	B2	M/F Sand			Cnc : Dpl:						
32-57	B3	coarse gravel		39"	Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Redo features for SHGW 39"; standing water at 57"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 3 (Hole #) | 11/6/2025 (Date) | 10:00 am (Time) | sunny, high 30s (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Gravel Parking Lot (e.g., woodland, agricultural field, vacant lot, etc.) | n/a; gravel (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | <1% (Slope (%))

Description of Location: Test pit located within southern parking area near youth baseball fields

2. Soil Parent Material: _____ | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-14	A	Fill / gravel			Cnc : Dpl:						
14-23	B1	Med.sand	10YR 5/6		Cnc : Dpl:						
23-35	B2	coarse sand			Cnc : Dpl:						
32-57	B3	coarse sand		45"	Cnc : Dpl:						
52-65	B4	Cobbles			Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Redo features for SHGW 45"; weeping at 50"; standing water at 65"

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 4 (Hole #) | 11/6/2025 (Date) | 10:30 am (Time) | sunny, high 30s (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Gravel Parking Lot (e.g., woodland, agricultural field, vacant lot, etc.) | n/a; gravel (Vegetation) | _____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | <1% (Slope (%))

Description of Location: Test pit located within southern parking area near youth baseball fields

2. Soil Parent Material: _____ | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body _____ feet | Drainage Way _____ feet | Wetlands _____ feet
Property Line _____ feet | Drinking Water Well _____ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-9	A	topsoil			Cnc : Dpl:						
9-25	B1	fill			Cnc : Dpl:						
25-31	B2	coarse sand			Cnc : Dpl:						
31-45	B3	coarse sand / med.		45"	Cnc : Dpl:						
45-55	B4	coarse sand			Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Redo features for SHGW 45"; weeping at 45"; standing water at 55"

Pre-Development Plan

EXISTING WATERSHED PLAN NOTES

1. EXISTING CONDITIONS INFORMATION IS REPRODUCED FROM THE SURVEY PREPARED BY REED LAND SURVEYING INC., 109 RHODE ISLAND ROAD, SUITE 4A LAKEVILLE, MA, DATED DECEMBER 9, 2024.

EXISTING WATERSHED PLAN LEGEND

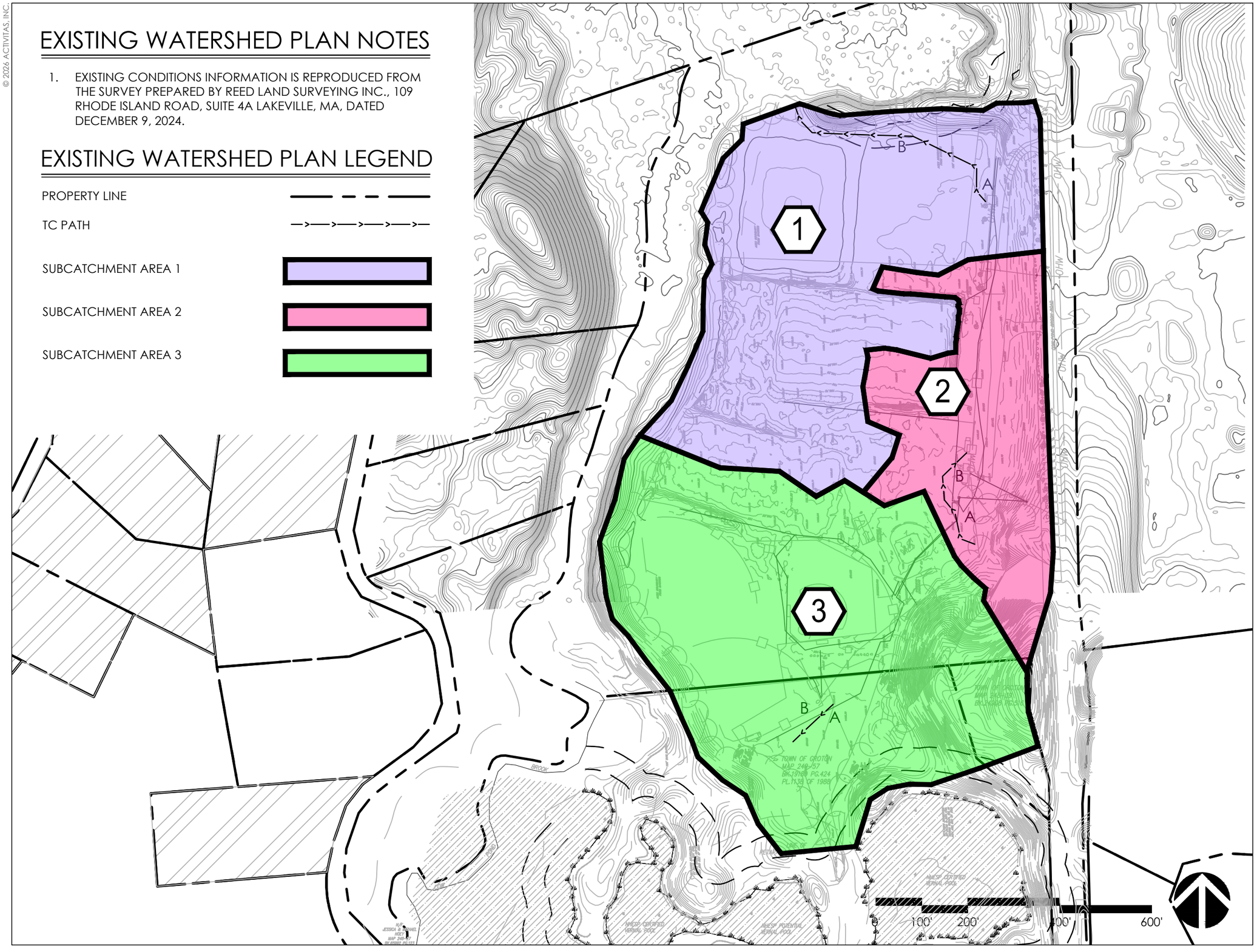
PROPERTY LINE

TC PATH

SUBCATCHMENT AREA 1

SUBCATCHMENT AREA 2

SUBCATCHMENT AREA 3



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NOTES:

TOWN OF GROTON
Groton, MA

COW POND BROOK PARK RENOVATIONS

WATERSHED MAP - EXISTING CONDITIONS

PROJECT NO.: 24051.00
REFERENCE SHEET: SURVEY
PHASE: PERMITTING DOCUMENTS
DATE: 2026 FEBRUARY 02
SCALE: AS SHOWN

SKETCH NO. WS-EX

Post-Development Plan

PROPOSED WATERSHED PLAN NOTES

1. EXISTING CONDITIONS INFORMATION IS REPRODUCED FROM THE SURVEY PREPARED BY REED LAND SURVEYING INC., 109 RHODE ISLAND ROAD, SUITE 4A LAKEVILLE, MA, DATED DECEMBER 9, 2024.

PROPOSED WATERSHED PLAN LEGEND

PROPERTY LINE

TC PATH

SUBCATCHMENT AREA 10

SUBCATCHMENT AREA 21

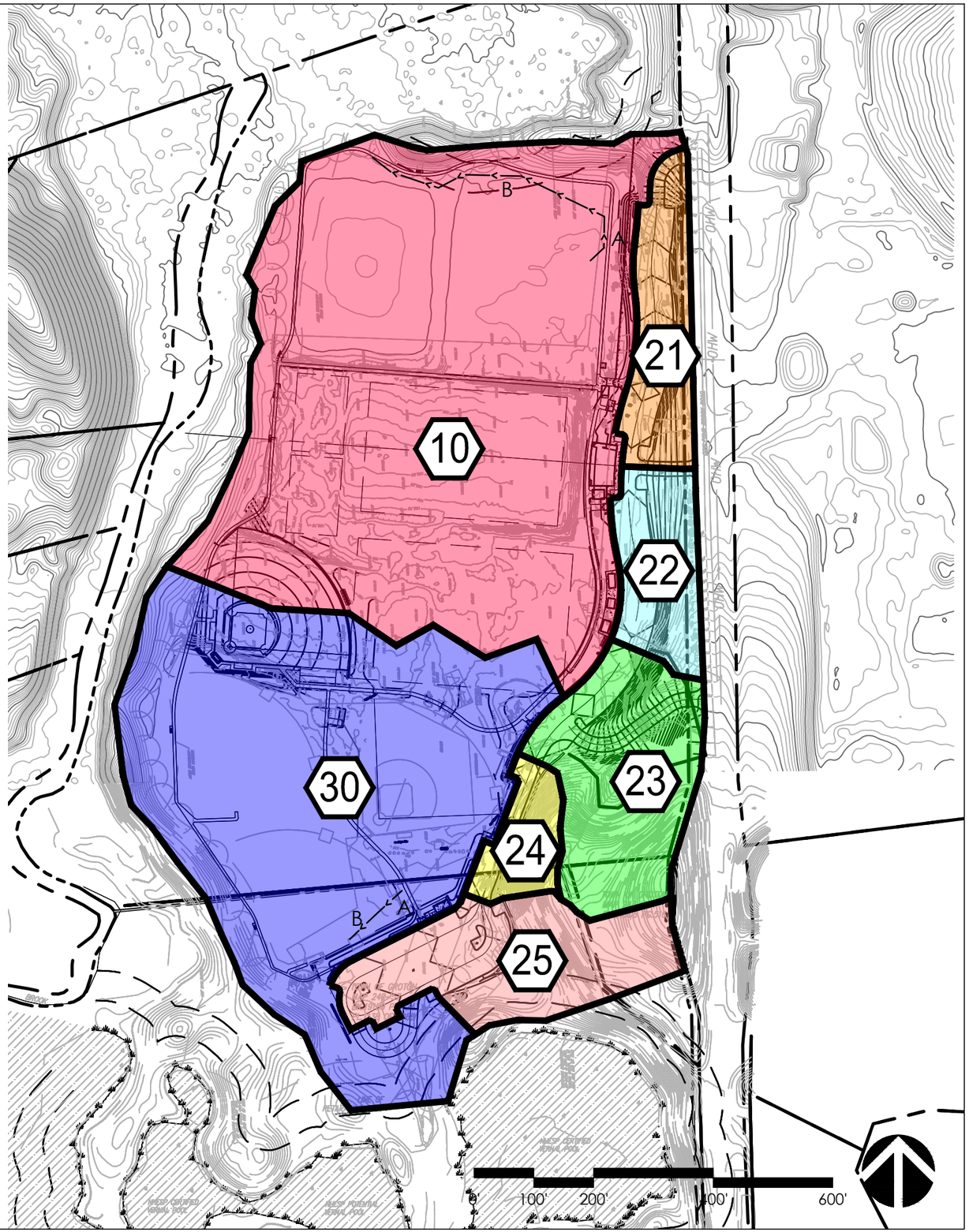
SUBCATCHMENT AREA 22

SUBCATCHMENT AREA 23

SUBCATCHMENT AREA 24

SUBCATCHMENT AREA 25

SUBCATCHMENT AREA 30



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NOTES:

TOWN OF GROTON
Groton, MA

COW POND BROOK PARK RENOVATIONS

WATERSHED MAP - PROPOSED CONDITIONS

PROJECT NO.: 24051.00
REFERENCE SHEET: L2.1
PHASE: PERMITTING DOCUMENTS
DATE: 2026 FEBRUARY 02
SCALE: AS SHOWN

SKETCH NO. WS-PR

Rainfall Information

NOAA Atlas 14, Volume 10, Version 3
Location name: Groton, Massachusetts, USA*
Latitude: 42.6224°, Longitude: -71.5039°
Elevation: 195 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Ortan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.322 (0.259-0.401)	0.381 (0.305-0.474)	0.477 (0.380-0.596)	0.555 (0.440-0.698)	0.664 (0.508-0.868)	0.745 (0.558-0.994)	0.832 (0.602-1.15)	0.932 (0.633-1.30)	1.08 (0.702-1.56)	1.20 (0.762-1.76)
10-min	0.457 (0.367-0.569)	0.539 (0.432-0.672)	0.674 (0.538-0.842)	0.786 (0.623-0.987)	0.941 (0.720-1.23)	1.06 (0.790-1.41)	1.18 (0.853-1.62)	1.32 (0.897-1.85)	1.53 (0.995-2.20)	1.70 (1.08-2.50)
15-min	0.537 (0.431-0.669)	0.635 (0.509-0.791)	0.794 (0.634-0.992)	0.926 (0.734-1.16)	1.11 (0.847-1.45)	1.24 (0.930-1.66)	1.39 (1.00-1.91)	1.55 (1.06-2.17)	1.80 (1.17-2.59)	2.01 (1.27-2.94)
30-min	0.734 (0.589-0.914)	0.868 (0.695-1.08)	1.09 (0.867-1.36)	1.27 (1.00-1.59)	1.52 (1.16-1.98)	1.70 (1.27-2.27)	1.90 (1.38-2.62)	2.13 (1.44-2.98)	2.47 (1.60-3.55)	2.75 (1.74-4.03)
60-min	0.931 (0.747-1.16)	1.10 (0.882-1.37)	1.38 (1.10-1.72)	1.61 (1.29-2.02)	1.92 (1.47-2.51)	2.16 (1.62-2.88)	2.41 (1.74-3.32)	2.70 (1.84-3.78)	3.13 (2.04-4.51)	3.49 (2.21-5.12)
2-hr	1.17 (0.946-1.45)	1.41 (1.14-1.74)	1.80 (1.44-2.23)	2.12 (1.69-2.64)	2.56 (1.97-3.33)	2.89 (2.18-3.84)	3.24 (2.37-4.47)	3.67 (2.50-5.10)	4.32 (2.82-6.19)	4.88 (3.10-7.11)
3-hr	1.34 (1.09-1.65)	1.62 (1.32-2.00)	2.09 (1.68-2.58)	2.47 (1.98-3.07)	3.00 (2.32-3.90)	3.39 (2.57-4.50)	3.82 (2.81-5.26)	4.34 (2.96-6.01)	5.14 (3.36-7.33)	5.83 (3.71-8.46)
6-hr	1.70 (1.38-2.07)	2.07 (1.69-2.53)	2.68 (2.17-3.28)	3.18 (2.56-3.92)	3.87 (3.02-4.99)	4.38 (3.34-5.78)	4.94 (3.66-6.77)	5.63 (3.86-7.74)	6.70 (4.39-9.49)	7.62 (4.86-11.0)
12-hr	2.14 (1.76-2.60)	2.60 (2.14-3.16)	3.37 (2.75-4.10)	4.00 (3.25-4.90)	4.87 (3.82-6.23)	5.51 (4.22-7.20)	6.21 (4.61-8.44)	7.07 (4.86-9.65)	8.39 (5.52-11.8)	9.54 (6.10-13.6)
24-hr	2.56 (2.12-3.09)	3.13 (2.59-3.78)	4.06 (3.34-4.91)	4.83 (3.95-5.87)	5.89 (4.64-7.48)	6.67 (5.14-8.66)	7.52 (5.61-10.1)	8.56 (5.92-11.6)	10.2 (6.71-14.2)	11.5 (7.41-16.4)
2-day	2.93 (2.45-3.51)	3.60 (3.00-4.31)	4.69 (3.89-5.64)	5.60 (4.61-6.76)	6.84 (5.43-8.64)	7.76 (6.02-10.0)	8.77 (6.58-11.7)	10.0 (6.94-13.4)	11.9 (7.87-16.5)	13.5 (8.70-19.0)
3-day	3.21 (2.69-3.83)	3.93 (3.28-4.68)	5.09 (4.24-6.09)	6.06 (5.01-7.28)	7.40 (5.88-9.28)	8.38 (6.51-10.7)	9.45 (7.10-12.6)	10.8 (7.48-14.4)	12.7 (8.45-17.6)	14.5 (9.32-20.3)
4-day	3.47 (2.92-4.12)	4.21 (3.54-5.01)	5.42 (4.53-6.46)	6.42 (5.33-7.70)	7.80 (6.22-9.76)	8.83 (6.87-11.3)	9.93 (7.47-13.2)	11.3 (7.86-15.0)	13.3 (8.84-18.3)	15.0 (9.70-21.0)
7-day	4.19 (3.54-4.95)	4.97 (4.19-5.87)	6.24 (5.24-7.40)	7.30 (6.09-8.69)	8.75 (7.01-10.8)	9.83 (7.67-12.4)	11.0 (8.26-14.4)	12.3 (8.64-16.4)	14.4 (9.58-19.6)	16.1 (10.4-22.3)
10-day	4.86 (4.13-5.72)	5.67 (4.80-6.67)	6.98 (5.88-8.24)	8.06 (6.75-9.57)	9.56 (7.66-11.8)	10.7 (8.35-13.4)	11.9 (8.92-15.4)	13.2 (9.28-17.4)	15.2 (10.1-20.6)	16.8 (10.9-23.2)
20-day	6.86 (5.86-8.01)	7.72 (6.59-9.02)	9.13 (7.76-10.7)	10.3 (8.69-12.1)	11.9 (9.61-14.5)	13.1 (10.3-16.3)	14.4 (10.8-18.3)	15.7 (11.1-20.5)	17.4 (11.7-23.5)	18.8 (12.2-25.8)
30-day	8.52 (7.31-9.90)	9.43 (8.08-11.0)	10.9 (9.32-12.7)	12.2 (10.3-14.3)	13.9 (11.2-16.7)	15.2 (11.9-18.6)	16.5 (12.3-20.8)	17.8 (12.6-23.1)	19.4 (13.1-26.0)	20.5 (13.4-28.1)
45-day	10.6 (9.12-12.2)	11.6 (9.95-13.4)	13.2 (11.3-15.3)	14.5 (12.3-16.9)	16.3 (13.2-19.6)	17.8 (14.0-21.6)	19.1 (14.3-23.8)	20.4 (14.5-26.4)	21.9 (14.8-29.2)	22.9 (15.0-31.2)
60-day	12.3 (10.7-14.2)	13.4 (11.5-15.4)	15.0 (12.9-17.4)	16.5 (14.0-19.1)	18.4 (15.0-22.0)	19.9 (15.7-24.2)	21.4 (16.0-26.5)	22.6 (16.2-29.2)	24.1 (16.3-32.1)	25.0 (16.4-34.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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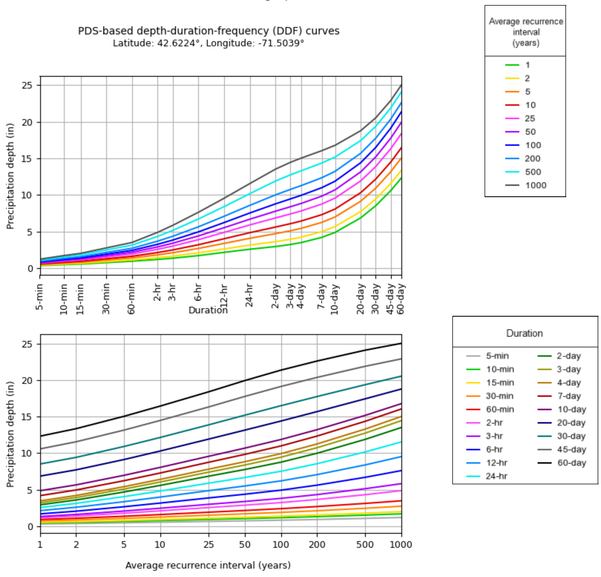
PF graphical



NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Thu Oct 30 17:14:19 2025

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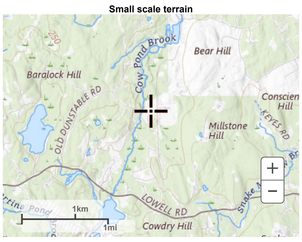
Maps & aerials

Small scale terrain



Large scale terrain

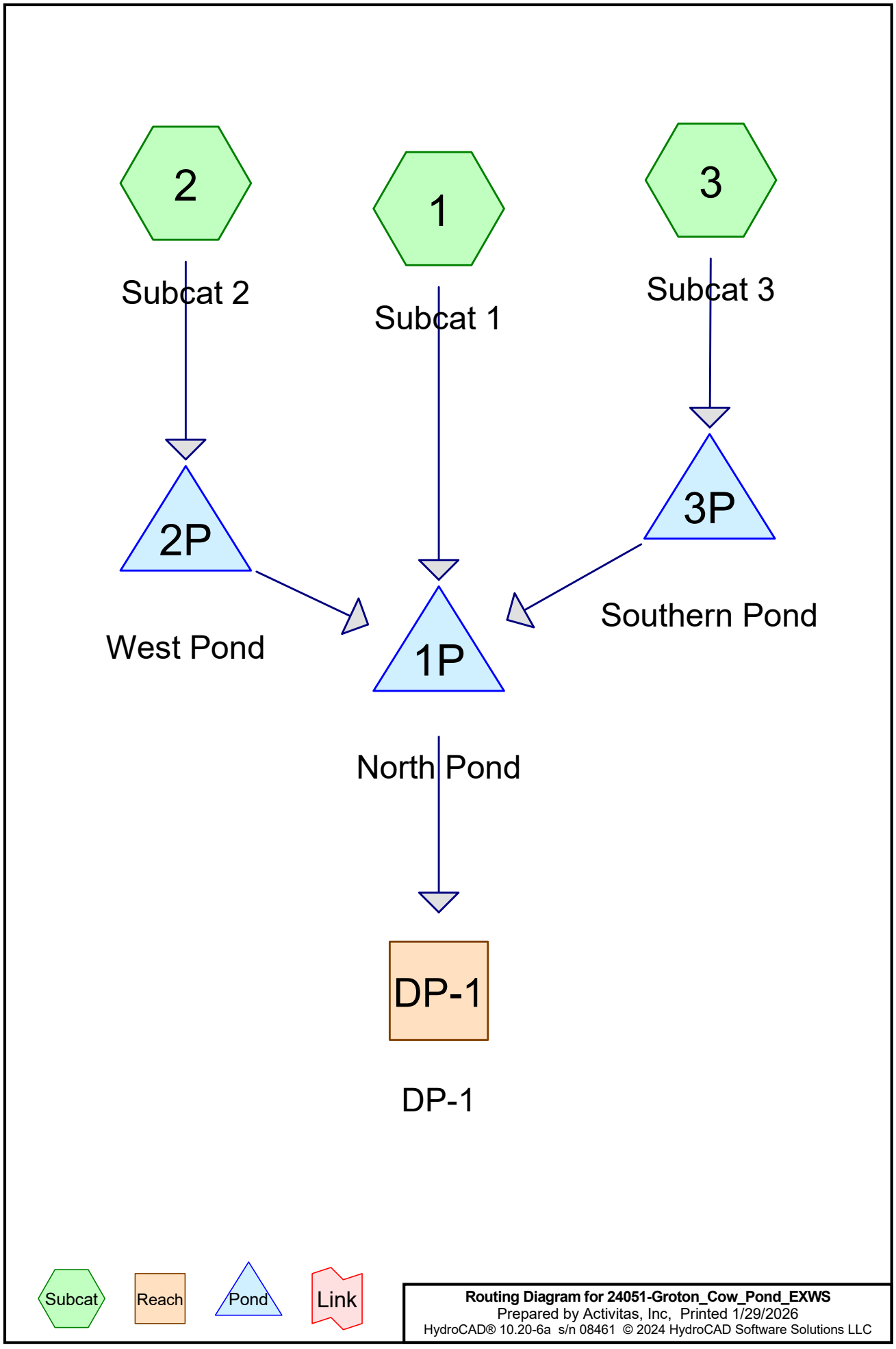
Large scale map

Large scale aerial

Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

HydroCAD Report – Peak Rate and Volume



Routing Diagram for 24051-Groton_Cow_Pond_EXWS
Prepared by Activitas, Inc, Printed 1/29/2026

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.13	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.83	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.89	2
4	100-Year	Type III 24-hr		Default	24.00	1	7.52	2

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=10.303 ac 0.53% Impervious Runoff Depth=0.61"
Flow Length=528' Tc=24.7 min CN=66 Runoff=3.63 cfs 0.522 af

Subcatchment 2: Subcat 2 Runoff Area=5.198 ac 2.15% Impervious Runoff Depth=0.49"
Flow Length=256' Tc=16.4 min CN=63 Runoff=1.51 cfs 0.212 af

Subcatchment 3: Subcat 3 Runoff Area=12.424 ac 4.16% Impervious Runoff Depth=0.29"
Flow Length=119' Tc=11.3 min CN=57 Runoff=1.56 cfs 0.297 af

Reach DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: North Pond Peak Elev=194.83' Storage=1,399 cf Inflow=3.63 cfs 0.522 af
Discarded=3.31 cfs 0.522 af Primary=0.00 cfs 0.000 af Outflow=3.31 cfs 0.522 af

Pond 2P: West Pond Peak Elev=195.56' Storage=325 cf Inflow=1.51 cfs 0.212 af
Discarded=1.34 cfs 0.212 af Primary=0.00 cfs 0.000 af Outflow=1.34 cfs 0.212 af

Pond 3P: Southern Pond Peak Elev=195.01' Storage=206 cf Inflow=1.56 cfs 0.297 af
Discarded=1.54 cfs 0.297 af Primary=0.00 cfs 0.000 af Outflow=1.54 cfs 0.297 af

Total Runoff Area = 27.925 ac Runoff Volume = 1.030 af Average Runoff Depth = 0.44"
97.56% Pervious = 27.242 ac 2.44% Impervious = 0.683 ac

Summary for Subcatchment 1: Subcat 1

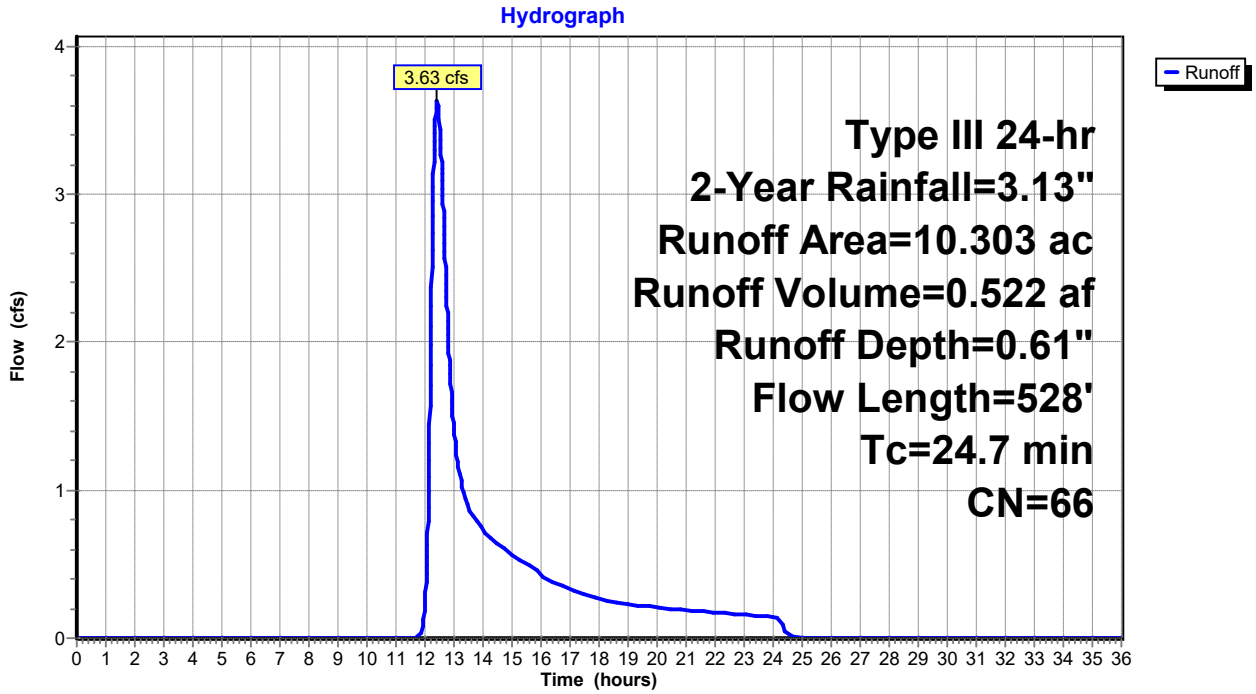
Runoff = 3.63 cfs @ 12.43 hrs, Volume= 0.522 af, Depth= 0.61"
Routed to Pond 1P : North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

Area (ac)	CN	Description
9.581	68	<50% Grass cover, Poor, HSG A
0.042	76	Gravel roads, HSG A
0.054	98	Paved parking, HSG A
0.626	30	Woods, Good, HSG A
10.303	66	Weighted Average
10.248		99.47% Pervious Area
0.054		0.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0133	0.12		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
18.0	478	0.0040	0.44		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
24.7	528	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

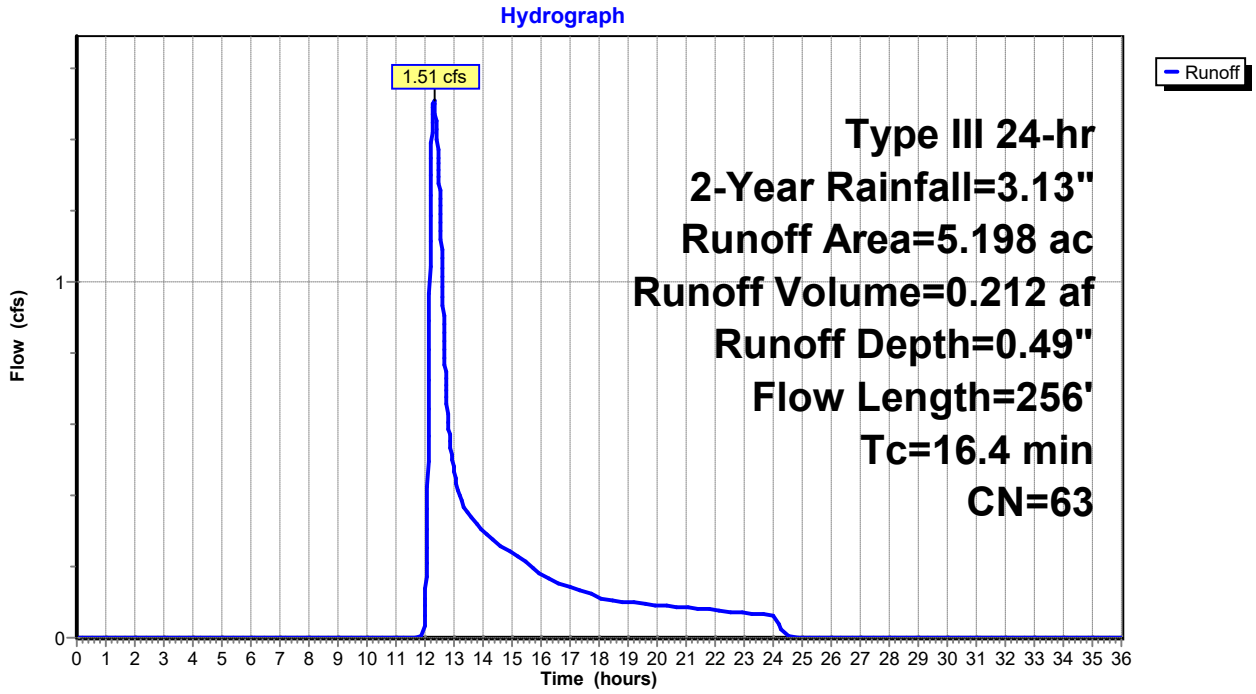
Runoff = 1.51 cfs @ 12.30 hrs, Volume= 0.212 af, Depth= 0.49"
Routed to Pond 2P : West Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

Area (ac)	CN	Description
3.987	68	<50% Grass cover, Poor, HSG A
0.289	76	Gravel roads, HSG A
0.081	98	Paved parking, HSG A
0.031	98	Roofs, HSG A
0.809	30	Woods, Good, HSG A
5.198	63	Weighted Average
5.086		97.85% Pervious Area
0.112		2.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0068	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
0.9	51	0.0170	0.91		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
6.7	155	0.0030	0.38		**Shallow Concentrated Flow, C** Short Grass Pasture Kv= 7.0 fps
16.4	256	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

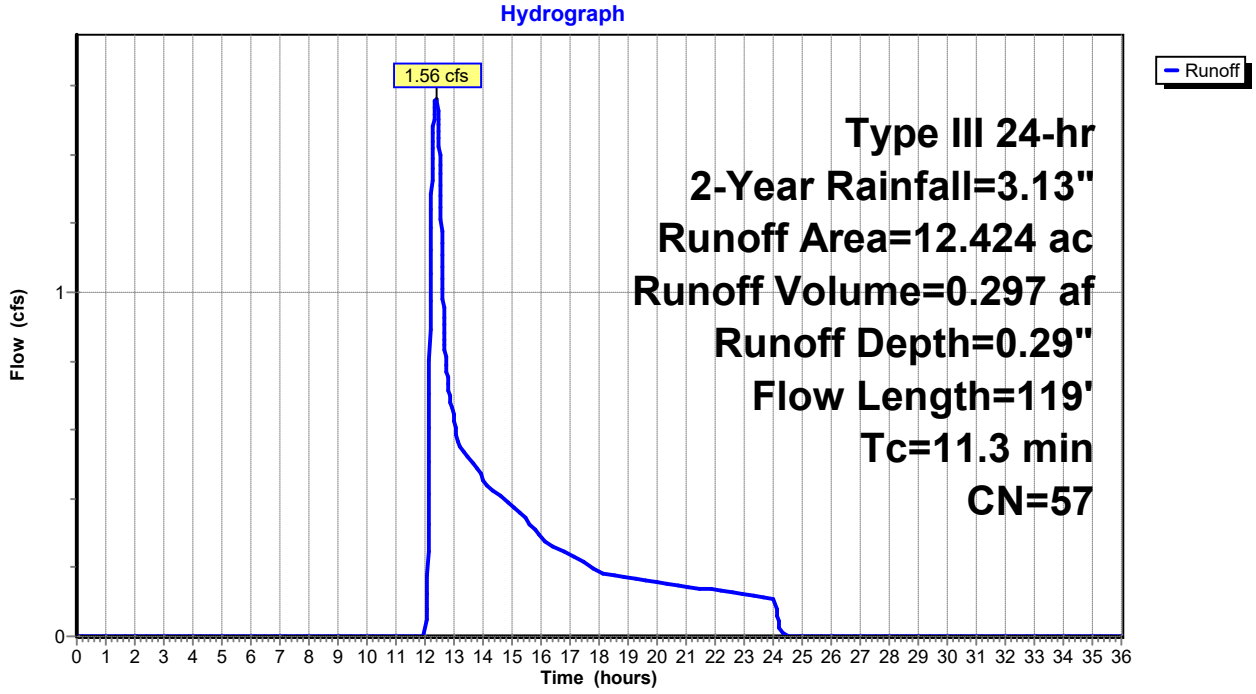
Runoff = 1.56 cfs @ 12.39 hrs, Volume= 0.297 af, Depth= 0.29"
Routed to Pond 3P : Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

Area (ac)	CN	Description
7.109	68	<50% Grass cover, Poor, HSG A
0.626	76	Gravel roads, HSG A
0.066	98	Roofs, HSG A
0.530	89	Urban commercial, 85% imp, HSG A
4.094	30	Woods, Good, HSG A
12.424	57	Weighted Average
11.908		95.84% Pervious Area
0.516		4.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0076	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
2.9	69	0.0032	0.40		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
11.3	119	Total			

Subcatchment 3: Subcat 3

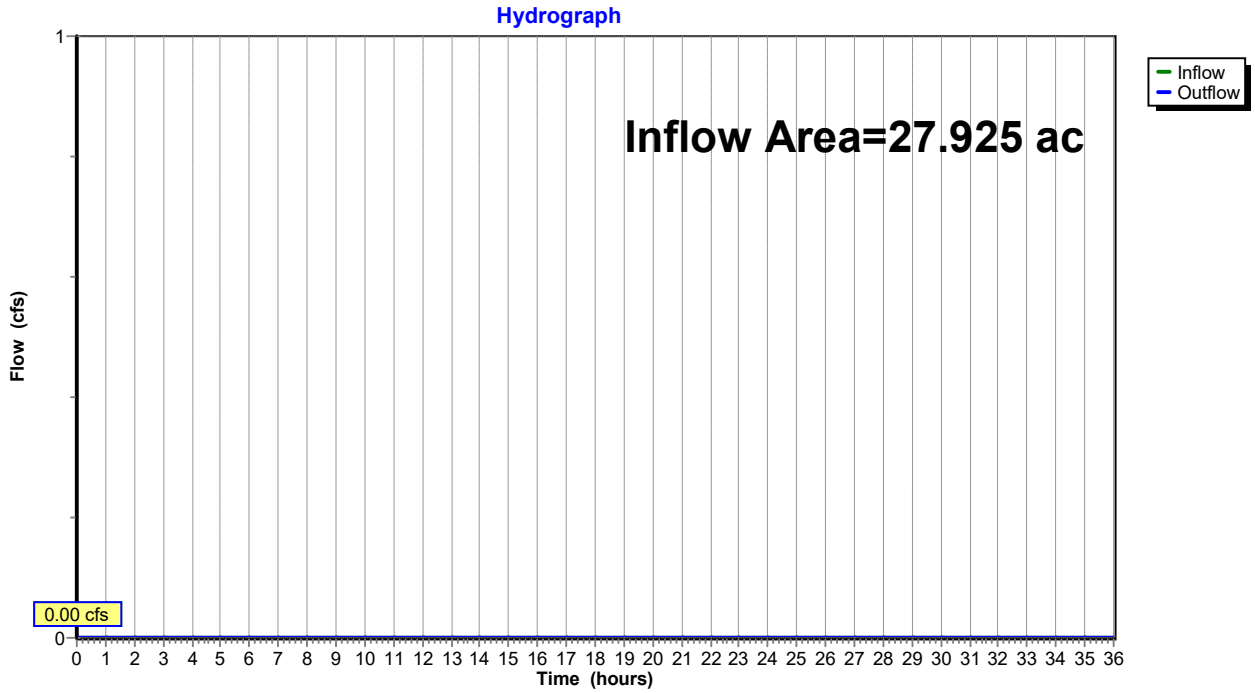


Summary for Reach DP-1: DP-1

Inflow Area = 27.925 ac, 2.44% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



Summary for Pond 1P: North Pond

Inflow Area = 27.925 ac, 2.44% Impervious, Inflow Depth = 0.22" for 2-Year event
Inflow = 3.63 cfs @ 12.43 hrs, Volume= 0.522 af
Outflow = 3.31 cfs @ 12.55 hrs, Volume= 0.522 af, Atten= 9%, Lag= 7.3 min
Discarded = 3.31 cfs @ 12.55 hrs, Volume= 0.522 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 194.83' @ 12.55 hrs Surf.Area= 17,296 sf Storage= 1,399 cf

Plug-Flow detention time= 12.3 min calculated for 0.522 af (100% of inflow)
Center-of-Mass det. time= 12.3 min (922.9 - 910.5)

Volume	Invert	Avail.Storage	Storage Description
#1	194.25'	136,562 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		136,563 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.25	256	0	0
194.50	1,038	162	162
194.75	2,487	441	602
195.00	48,456	6,368	6,970
195.25	76,548	15,626	22,596
195.50	115,903	24,056	46,652
195.75	160,142	34,506	81,158
196.00	283,094	55,405	136,562

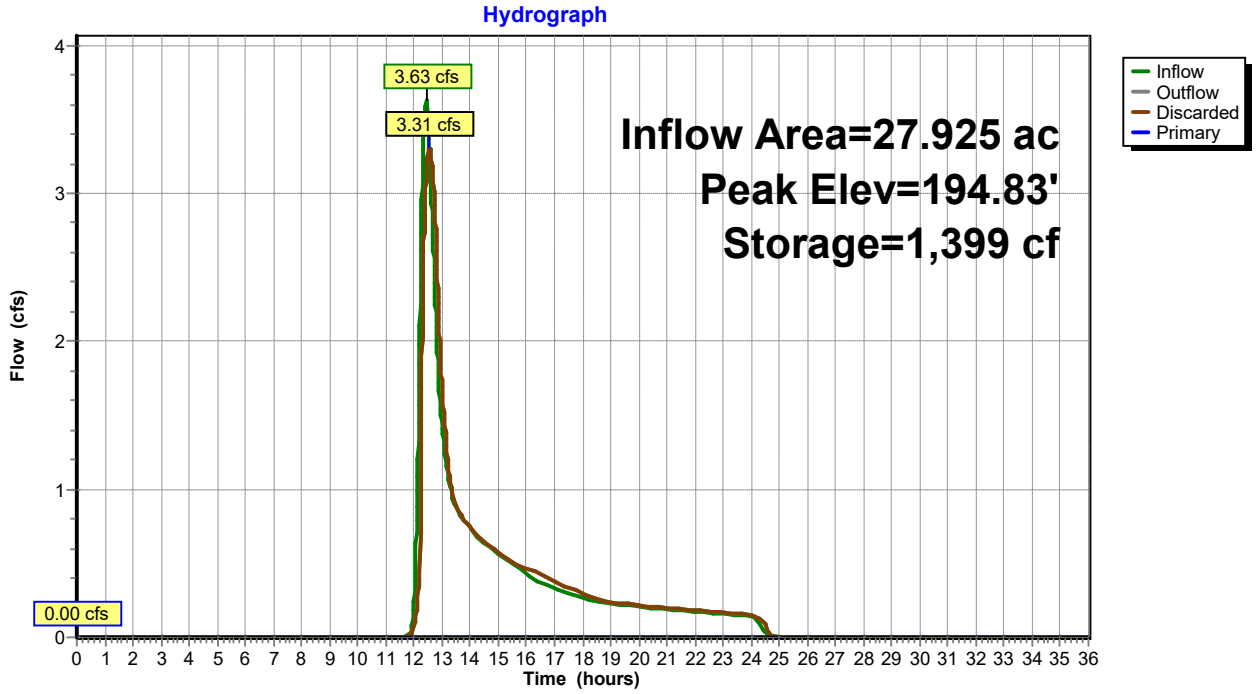
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.00'	**60.0' long x 30.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

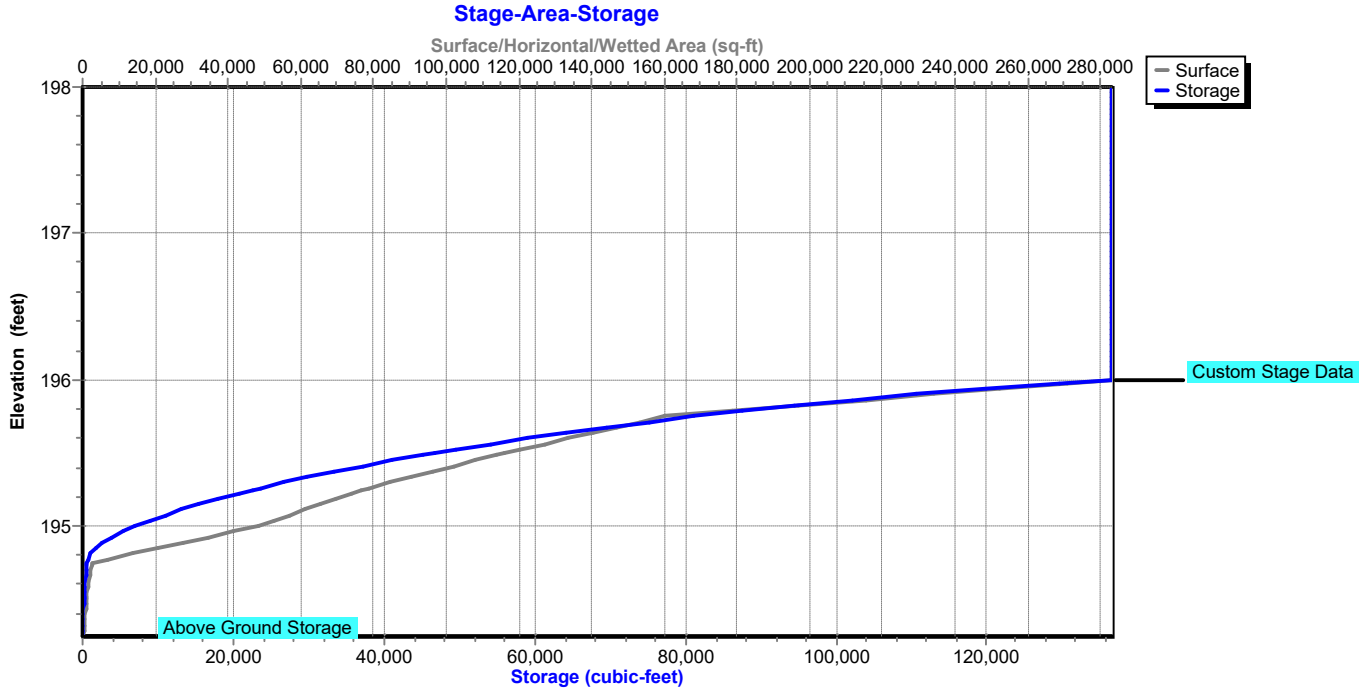
Discarded OutFlow Max=3.31 cfs @ 12.55 hrs HW=194.83' (Free Discharge)
1=Exfiltration (Exfiltration Controls 3.31 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.25' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: North Pond



Pond 1P: North Pond



Summary for Pond 2P: West Pond

Inflow Area = 5.198 ac, 2.15% Impervious, Inflow Depth = 0.49" for 2-Year event
Inflow = 1.51 cfs @ 12.30 hrs, Volume= 0.212 af
Outflow = 1.34 cfs @ 12.46 hrs, Volume= 0.212 af, Atten= 11%, Lag= 9.3 min
Discarded = 1.34 cfs @ 12.46 hrs, Volume= 0.212 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1P : North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.56' @ 12.46 hrs Surf.Area= 6,979 sf Storage= 325 cf

Plug-Flow detention time= 2.2 min calculated for 0.211 af (100% of inflow)
Center-of-Mass det. time= 2.3 min (919.0 - 916.7)

Volume	Invert	Avail.Storage	Storage Description
#1	195.50'	10,426 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,427 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.50	3,096	0	0
195.75	18,137	2,654	2,654
196.00	44,039	7,772	10,426

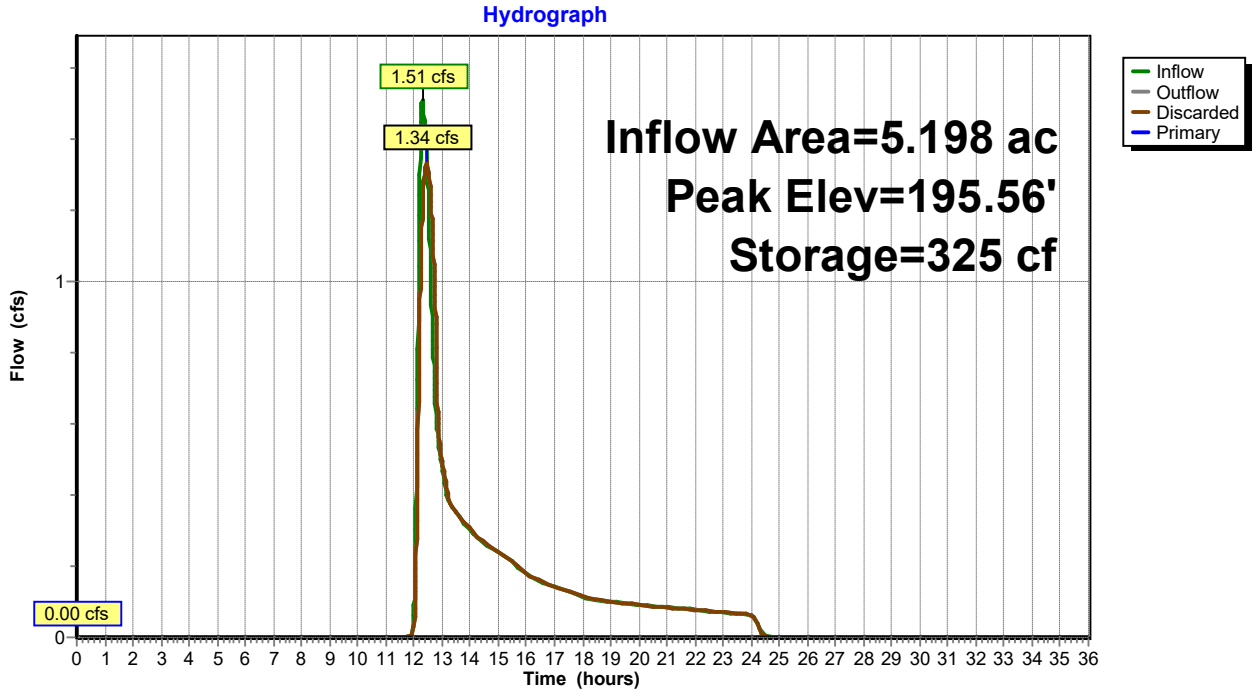
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**5.0' long x 90.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	195.50'	**8.270 in/hr Exfiltration over Surface area**

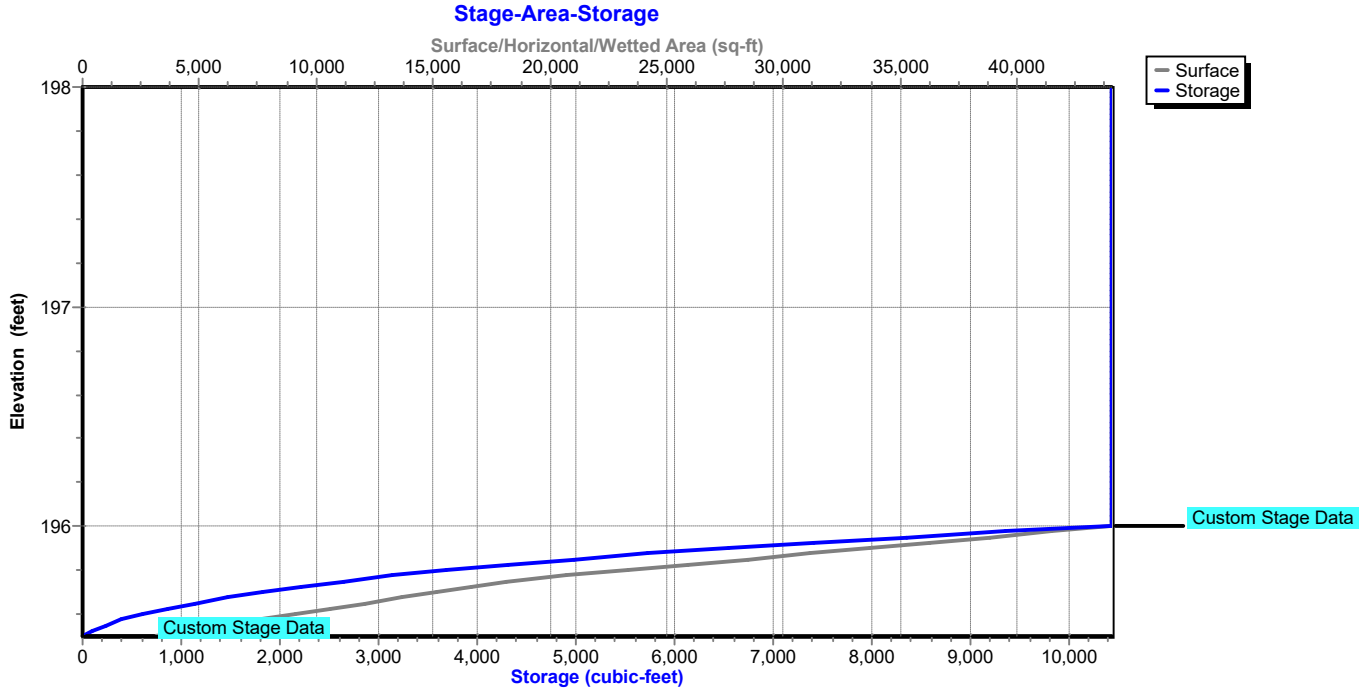
Discarded OutFlow Max=1.34 cfs @ 12.46 hrs HW=195.56' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 1.34 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: West Pond



Pond 2P: West Pond



Summary for Pond 3P: Southern Pond

Inflow Area = 12.424 ac, 4.16% Impervious, Inflow Depth = 0.29" for 2-Year event
Inflow = 1.56 cfs @ 12.39 hrs, Volume= 0.297 af
Outflow = 1.54 cfs @ 12.42 hrs, Volume= 0.297 af, Atten= 1%, Lag= 1.9 min
Discarded = 1.54 cfs @ 12.42 hrs, Volume= 0.297 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1P : North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.01' @ 12.42 hrs Surf.Area= 40,675 sf Storage= 206 cf

Plug-Flow detention time= 2.4 min calculated for 0.297 af (100% of inflow)
Center-of-Mass det. time= 2.4 min (951.0 - 948.6)

Volume	Invert	Avail.Storage	Storage Description
#1	195.00'	144,371 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		144,372 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.00	39,376	0	0
195.25	102,350	17,716	17,716
195.50	150,033	31,548	49,264
195.75	184,191	41,778	91,042
196.00	242,447	53,330	144,371

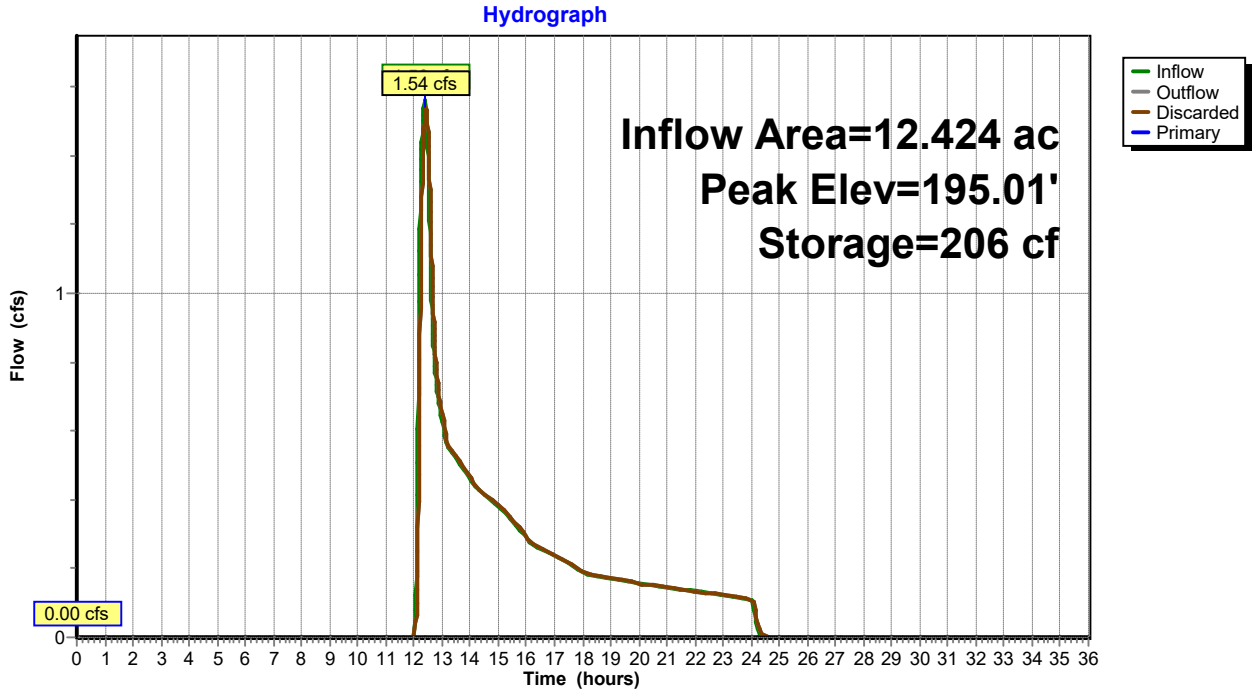
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**30.0' long x 60.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	195.00'	**8.270 in/hr Exfiltration over Surface area**

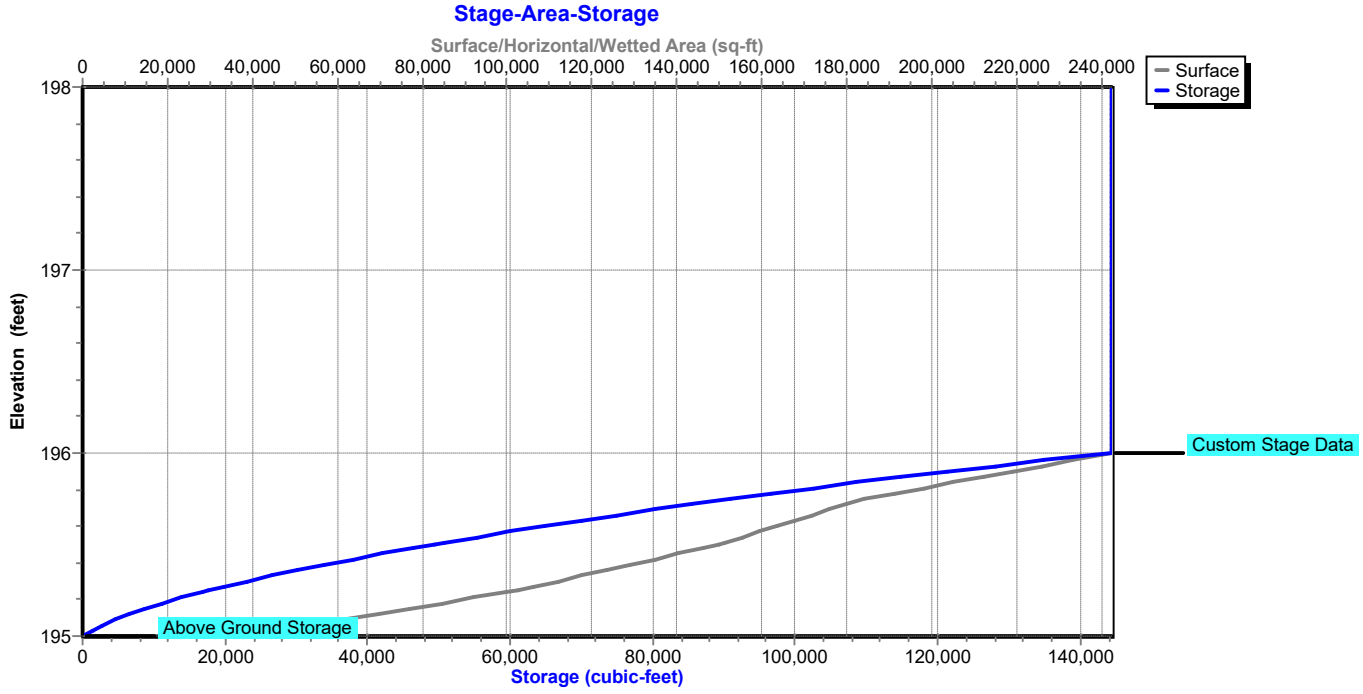
Discarded OutFlow Max=7.79 cfs @ 12.42 hrs HW=195.01' (Free Discharge)
2=Exfiltration (Exfiltration Controls 7.79 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 3P: Southern Pond



Pond 3P: Southern Pond



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=10.303 ac 0.53% Impervious Runoff Depth=1.61"
Flow Length=528' Tc=24.7 min CN=66 Runoff=11.40 cfs 1.385 af

Subcatchment 2: Subcat 2 Runoff Area=5.198 ac 2.15% Impervious Runoff Depth=1.40"
Flow Length=256' Tc=16.4 min CN=63 Runoff=5.71 cfs 0.607 af

Subcatchment 3: Subcat 3 Runoff Area=12.424 ac 4.16% Impervious Runoff Depth=1.02"
Flow Length=119' Tc=11.3 min CN=57 Runoff=10.12 cfs 1.051 af

Reach DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: North Pond Peak Elev=194.98' Storage=6,263 cf Inflow=11.40 cfs 1.385 af
Discarded=8.75 cfs 1.385 af Primary=0.00 cfs 0.000 af Outflow=8.75 cfs 1.385 af

Pond 2P: West Pond Peak Elev=195.77' Storage=3,037 cf Inflow=5.71 cfs 0.607 af
Discarded=3.87 cfs 0.607 af Primary=0.00 cfs 0.000 af Outflow=3.87 cfs 0.607 af

Pond 3P: Southern Pond Peak Elev=195.03' Storage=1,454 cf Inflow=10.12 cfs 1.051 af
Discarded=9.15 cfs 1.051 af Primary=0.00 cfs 0.000 af Outflow=9.15 cfs 1.051 af

Total Runoff Area = 27.925 ac Runoff Volume = 3.043 af Average Runoff Depth = 1.31"
97.56% Pervious = 27.242 ac 2.44% Impervious = 0.683 ac

Summary for Subcatchment 1: Subcat 1

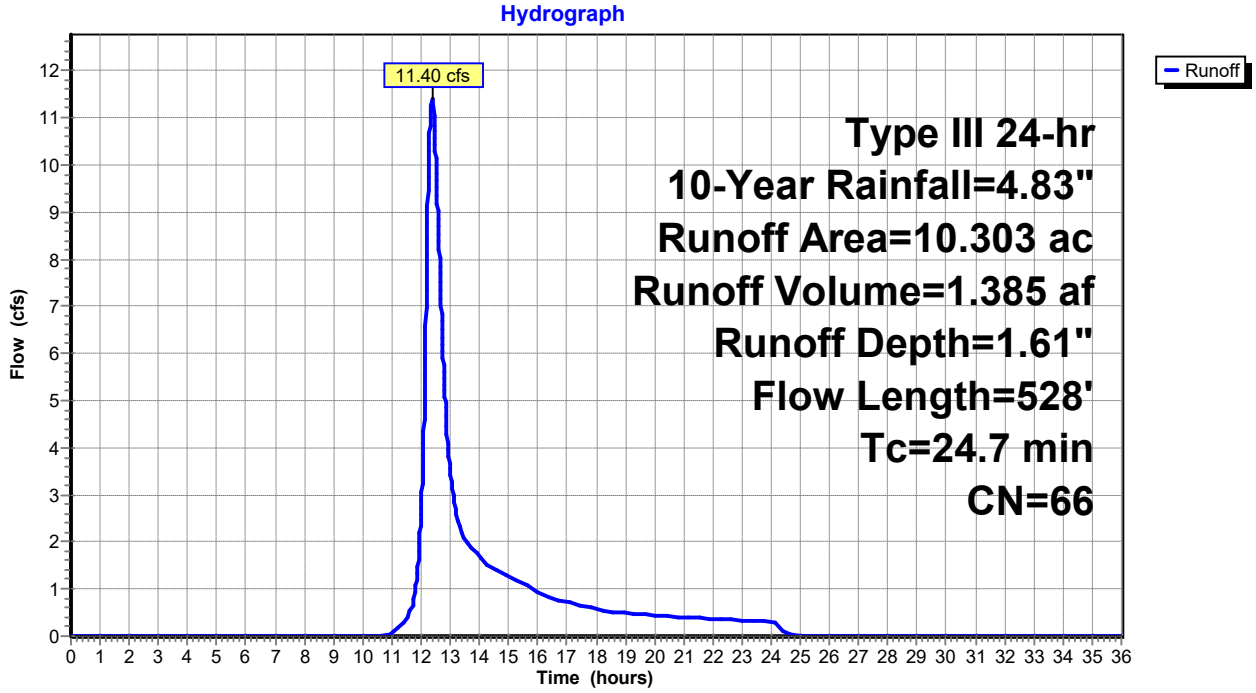
Runoff = 11.40 cfs @ 12.38 hrs, Volume= 1.385 af, Depth= 1.61"
Routed to Pond 1P : North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (ac)	CN	Description
9.581	68	<50% Grass cover, Poor, HSG A
0.042	76	Gravel roads, HSG A
0.054	98	Paved parking, HSG A
0.626	30	Woods, Good, HSG A
10.303	66	Weighted Average
10.248		99.47% Pervious Area
0.054		0.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0133	0.12		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
18.0	478	0.0040	0.44		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
24.7	528	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

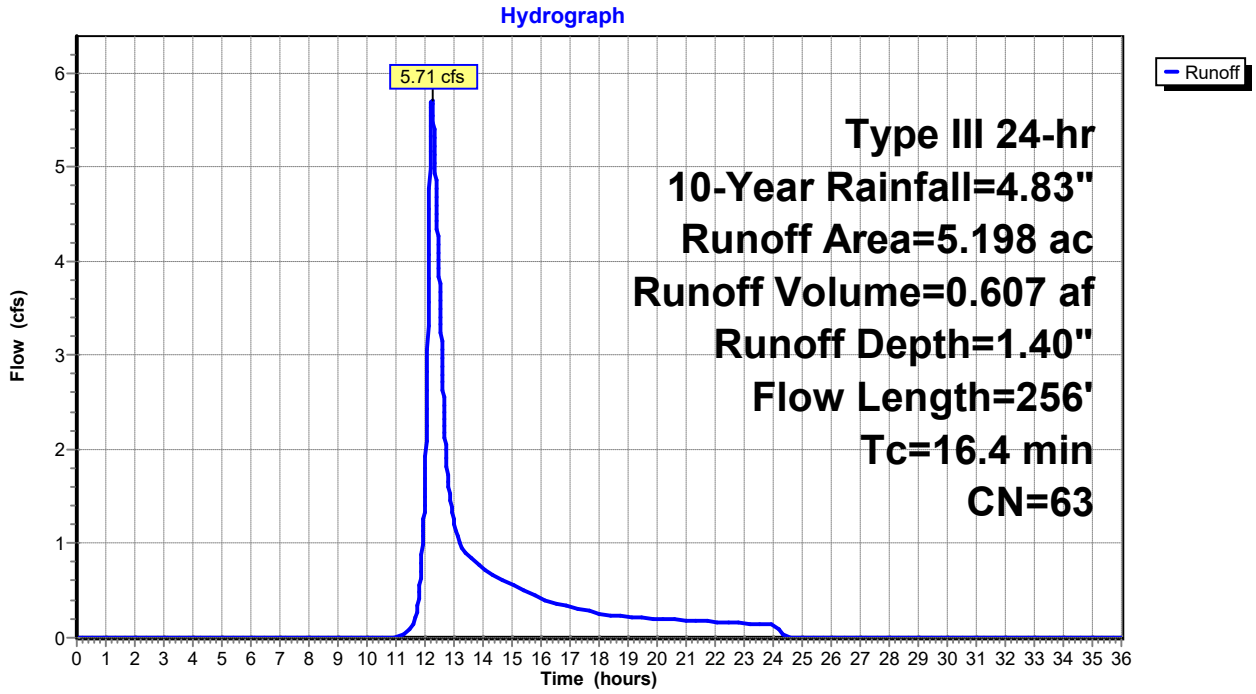
Runoff = 5.71 cfs @ 12.25 hrs, Volume= 0.607 af, Depth= 1.40"
Routed to Pond 2P : West Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (ac)	CN	Description
3.987	68	<50% Grass cover, Poor, HSG A
0.289	76	Gravel roads, HSG A
0.081	98	Paved parking, HSG A
0.031	98	Roofs, HSG A
0.809	30	Woods, Good, HSG A
5.198	63	Weighted Average
5.086		97.85% Pervious Area
0.112		2.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0068	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
0.9	51	0.0170	0.91		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
6.7	155	0.0030	0.38		**Shallow Concentrated Flow, C** Short Grass Pasture Kv= 7.0 fps
16.4	256	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

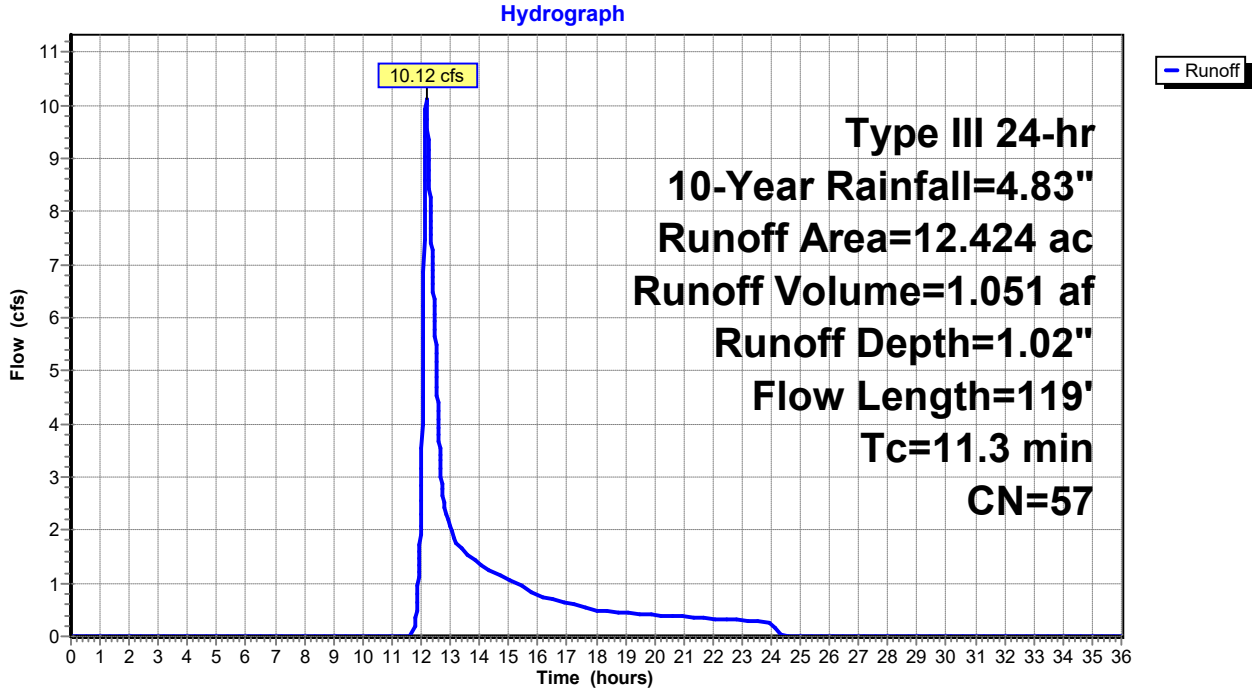
Runoff = 10.12 cfs @ 12.18 hrs, Volume= 1.051 af, Depth= 1.02"
Routed to Pond 3P : Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (ac)	CN	Description
7.109	68	<50% Grass cover, Poor, HSG A
0.626	76	Gravel roads, HSG A
0.066	98	Roofs, HSG A
0.530	89	Urban commercial, 85% imp, HSG A
4.094	30	Woods, Good, HSG A
12.424	57	Weighted Average
11.908		95.84% Pervious Area
0.516		4.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0076	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
2.9	69	0.0032	0.40		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
11.3	119	Total			

Subcatchment 3: Subcat 3

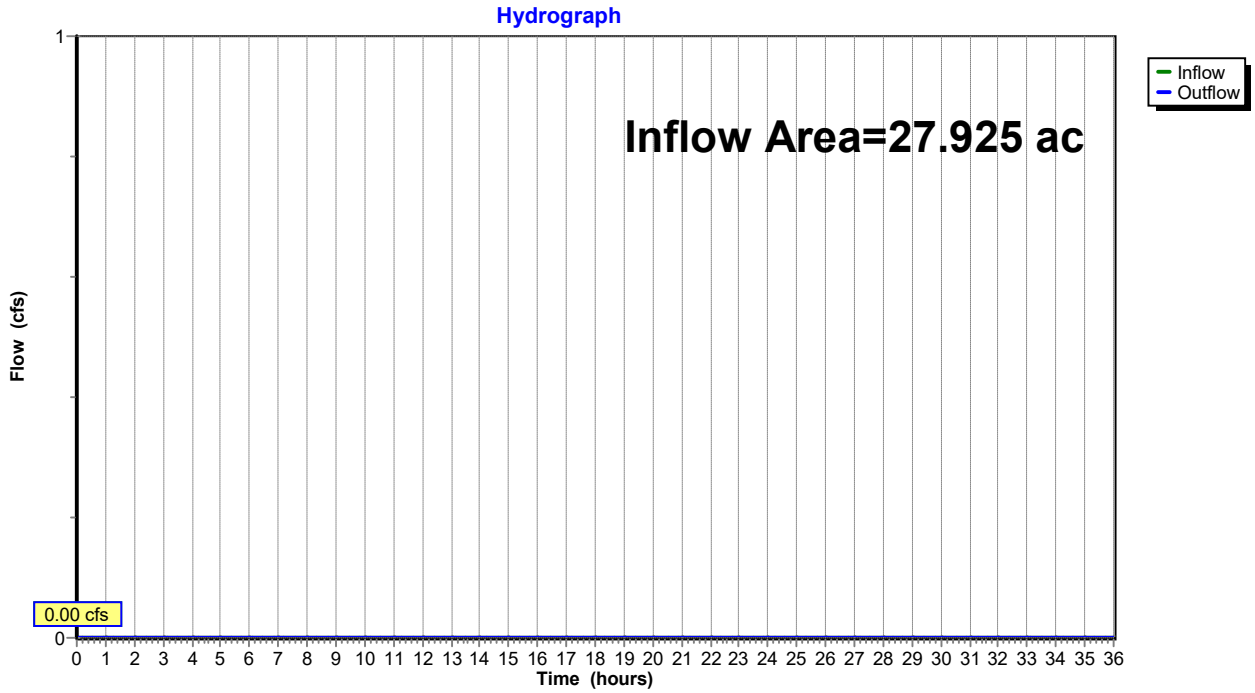


Summary for Reach DP-1: DP-1

Inflow Area = 27.925 ac, 2.44% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



Summary for Pond 1P: North Pond

Inflow Area = 27.925 ac, 2.44% Impervious, Inflow Depth = 0.60" for 10-Year event
Inflow = 11.40 cfs @ 12.38 hrs, Volume= 1.385 af
Outflow = 8.75 cfs @ 12.59 hrs, Volume= 1.385 af, Atten= 23%, Lag= 12.7 min
Discarded = 8.75 cfs @ 12.59 hrs, Volume= 1.385 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 194.98' @ 12.59 hrs Surf.Area= 45,694 sf Storage= 6,263 cf

Plug-Flow detention time= 11.6 min calculated for 1.384 af (100% of inflow)
Center-of-Mass det. time= 11.6 min (889.2 - 877.6)

Volume	Invert	Avail.Storage	Storage Description
#1	194.25'	136,562 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		136,563 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.25	256	0	0
194.50	1,038	162	162
194.75	2,487	441	602
195.00	48,456	6,368	6,970
195.25	76,548	15,626	22,596
195.50	115,903	24,056	46,652
195.75	160,142	34,506	81,158
196.00	283,094	55,405	136,562

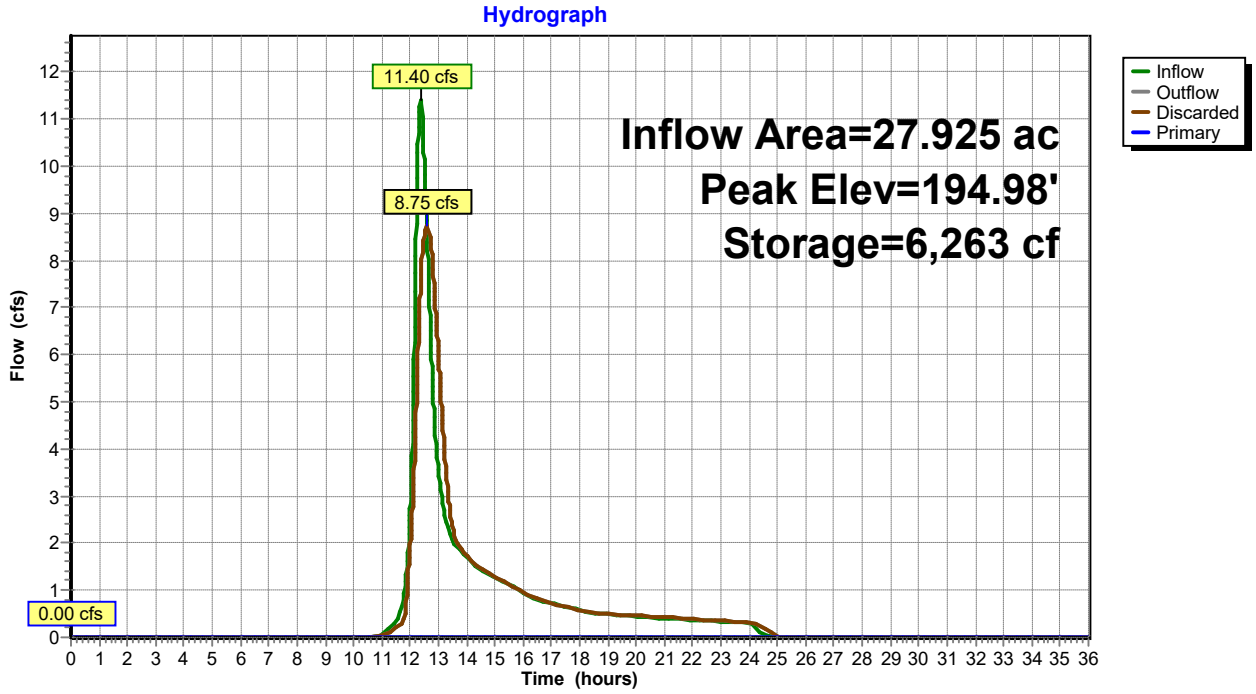
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.00'	**60.0' long x 30.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

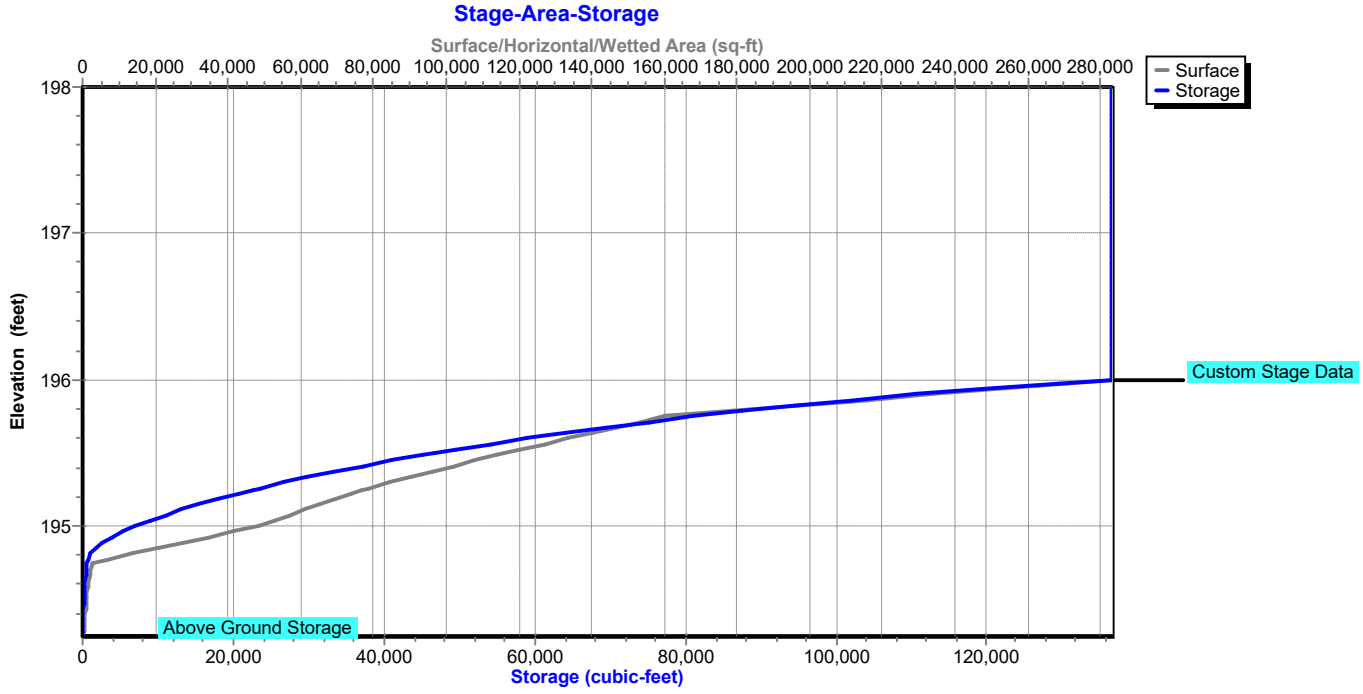
Discarded OutFlow Max=8.75 cfs @ 12.59 hrs HW=194.98' (Free Discharge)
1=Exfiltration (Exfiltration Controls 8.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.25' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: North Pond



Pond 1P: North Pond



Summary for Pond 2P: West Pond

Inflow Area = 5.198 ac, 2.15% Impervious, Inflow Depth = 1.40" for 10-Year event
Inflow = 5.71 cfs @ 12.25 hrs, Volume= 0.607 af
Outflow = 3.87 cfs @ 12.49 hrs, Volume= 0.607 af, Atten= 32%, Lag= 14.3 min
Discarded = 3.87 cfs @ 12.49 hrs, Volume= 0.607 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1P : North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.77' @ 12.49 hrs Surf.Area= 20,206 sf Storage= 3,037 cf

Plug-Flow detention time= 6.0 min calculated for 0.607 af (100% of inflow)
Center-of-Mass det. time= 6.0 min (884.4 - 878.4)

Volume	Invert	Avail.Storage	Storage Description
#1	195.50'	10,426 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,427 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.50	3,096	0	0
195.75	18,137	2,654	2,654
196.00	44,039	7,772	10,426

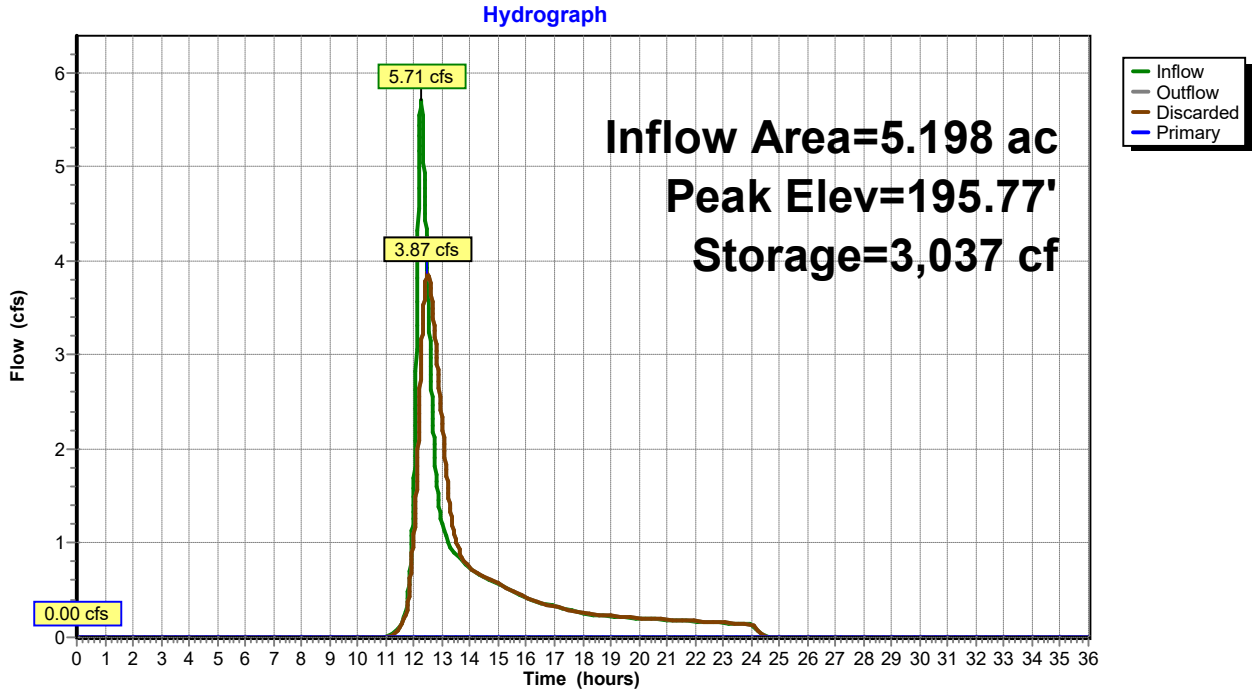
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**5.0' long x 90.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	195.50'	**8.270 in/hr Exfiltration over Surface area**

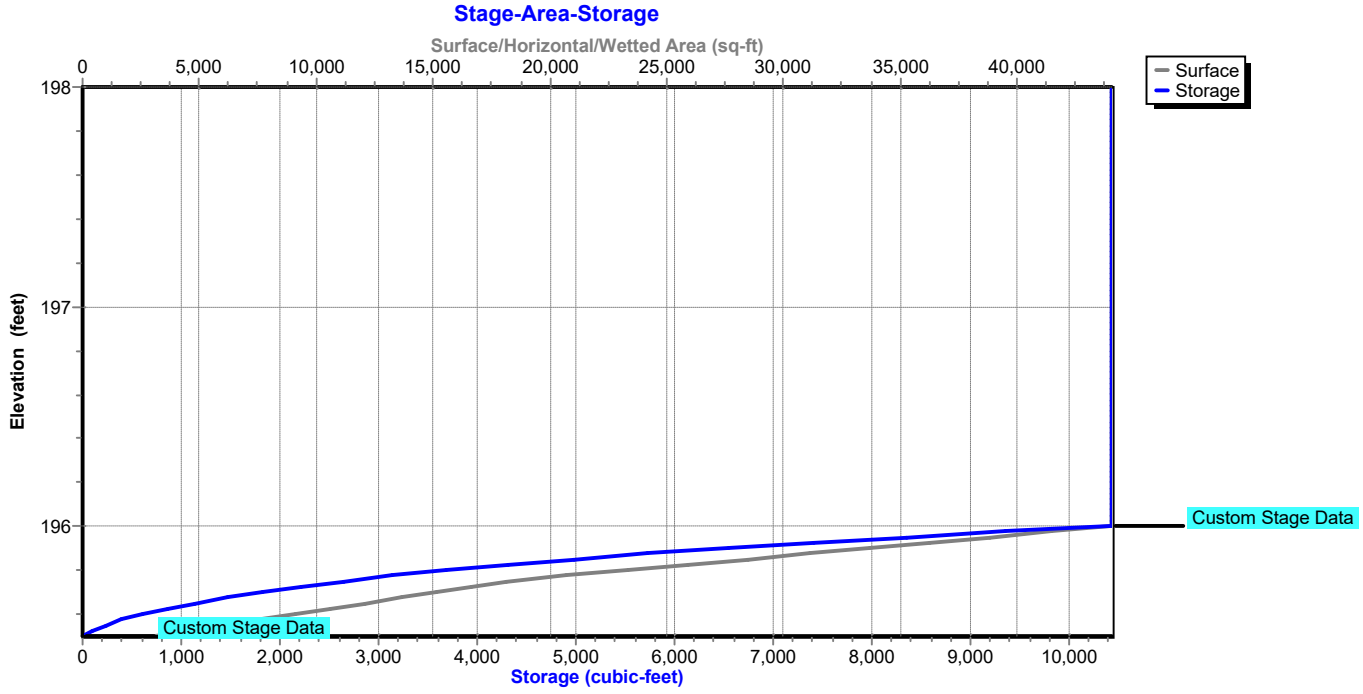
Discarded OutFlow Max=3.87 cfs @ 12.49 hrs HW=195.77' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 3.87 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: West Pond



Pond 2P: West Pond



Summary for Pond 3P: Southern Pond

Inflow Area = 12.424 ac, 4.16% Impervious, Inflow Depth = 1.02" for 10-Year event
Inflow = 10.12 cfs @ 12.18 hrs, Volume= 1.051 af
Outflow = 9.15 cfs @ 12.25 hrs, Volume= 1.051 af, Atten= 10%, Lag= 4.0 min
Discarded = 9.15 cfs @ 12.25 hrs, Volume= 1.051 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1P : North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.03' @ 12.25 hrs Surf.Area= 47,783 sf Storage= 1,454 cf

Plug-Flow detention time= 2.4 min calculated for 1.051 af (100% of inflow)
Center-of-Mass det. time= 2.4 min (895.7 - 893.3)

Volume	Invert	Avail.Storage	Storage Description
#1	195.00'	144,371 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		144,372 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.00	39,376	0	0
195.25	102,350	17,716	17,716
195.50	150,033	31,548	49,264
195.75	184,191	41,778	91,042
196.00	242,447	53,330	144,371

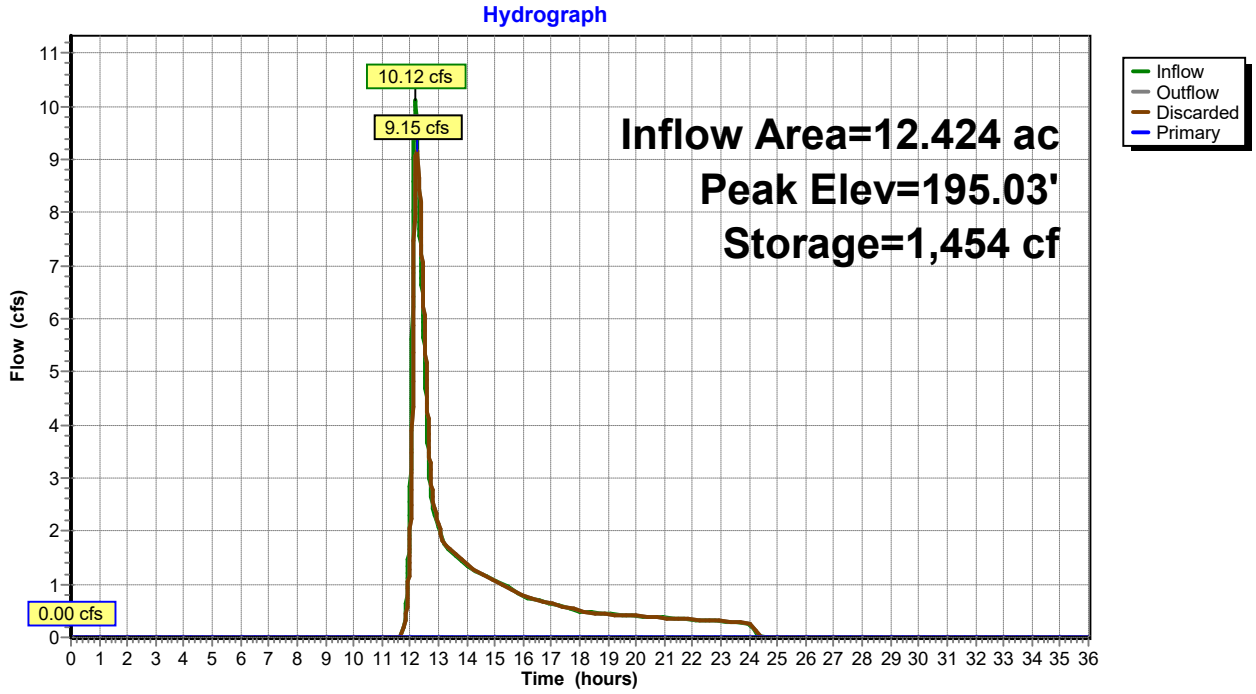
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**30.0' long x 60.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	195.00'	**8.270 in/hr Exfiltration over Surface area**

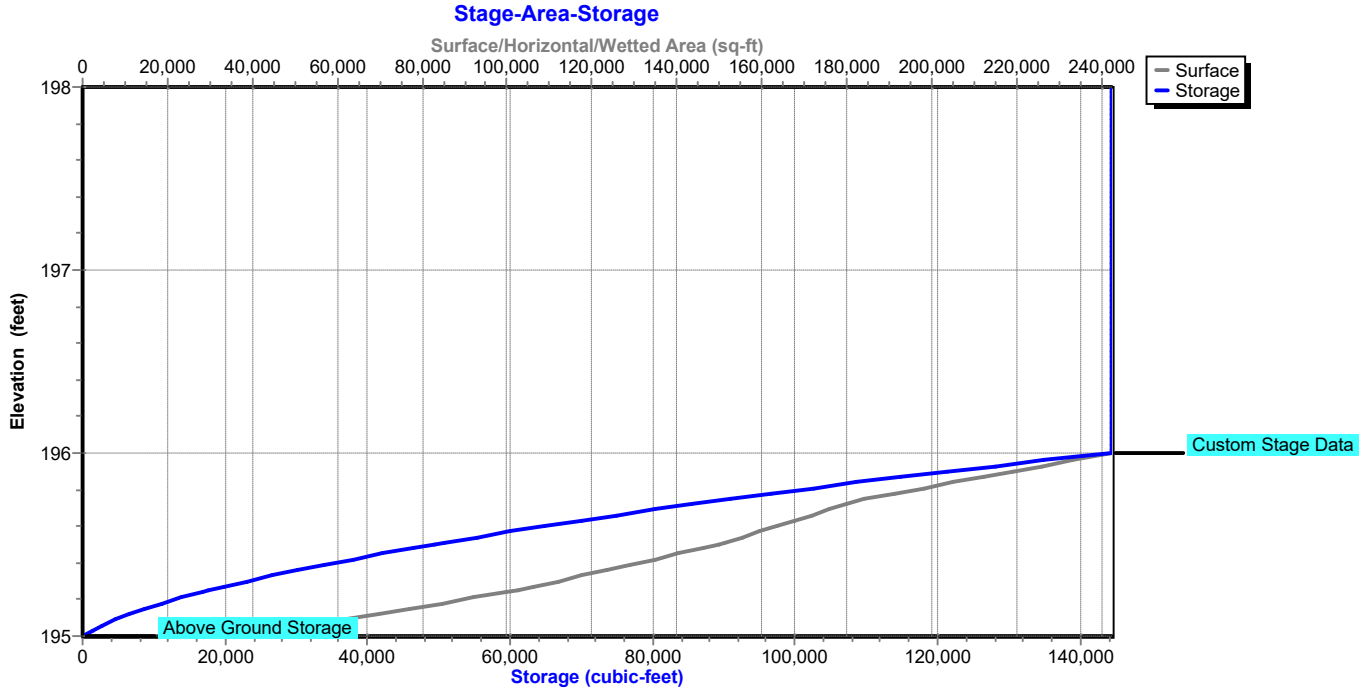
Discarded OutFlow Max=9.15 cfs @ 12.25 hrs HW=195.03' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 9.15 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.00' (Free Discharge)
↑└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Southern Pond



Pond 3P: Southern Pond



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=10.303 ac 0.53% Impervious Runoff Depth=2.36"
Flow Length=528' Tc=24.7 min CN=66 Runoff=17.13 cfs 2.025 af

Subcatchment 2: Subcat 2 Runoff Area=5.198 ac 2.15% Impervious Runoff Depth=2.10"
Flow Length=256' Tc=16.4 min CN=63 Runoff=8.96 cfs 0.910 af

Subcatchment 3: Subcat 3 Runoff Area=12.424 ac 4.16% Impervious Runoff Depth=1.61"
Flow Length=119' Tc=11.3 min CN=57 Runoff=17.73 cfs 1.667 af

Reach DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: North Pond Peak Elev=195.09' Storage=11,995 cf Inflow=17.13 cfs 2.025 af
Discarded=11.29 cfs 2.025 af Primary=0.00 cfs 0.000 af Outflow=11.29 cfs 2.025 af

Pond 2P: West Pond Peak Elev=195.86' Storage=5,422 cf Inflow=8.96 cfs 0.910 af
Discarded=5.75 cfs 0.910 af Primary=0.00 cfs 0.000 af Outflow=5.75 cfs 0.910 af

Pond 3P: Southern Pond Peak Elev=195.10' Storage=5,216 cf Inflow=17.73 cfs 1.667 af
Discarded=12.37 cfs 1.667 af Primary=0.00 cfs 0.000 af Outflow=12.37 cfs 1.667 af

Total Runoff Area = 27.925 ac Runoff Volume = 4.601 af Average Runoff Depth = 1.98"
97.56% Pervious = 27.242 ac 2.44% Impervious = 0.683 ac

Summary for Subcatchment 1: Subcat 1

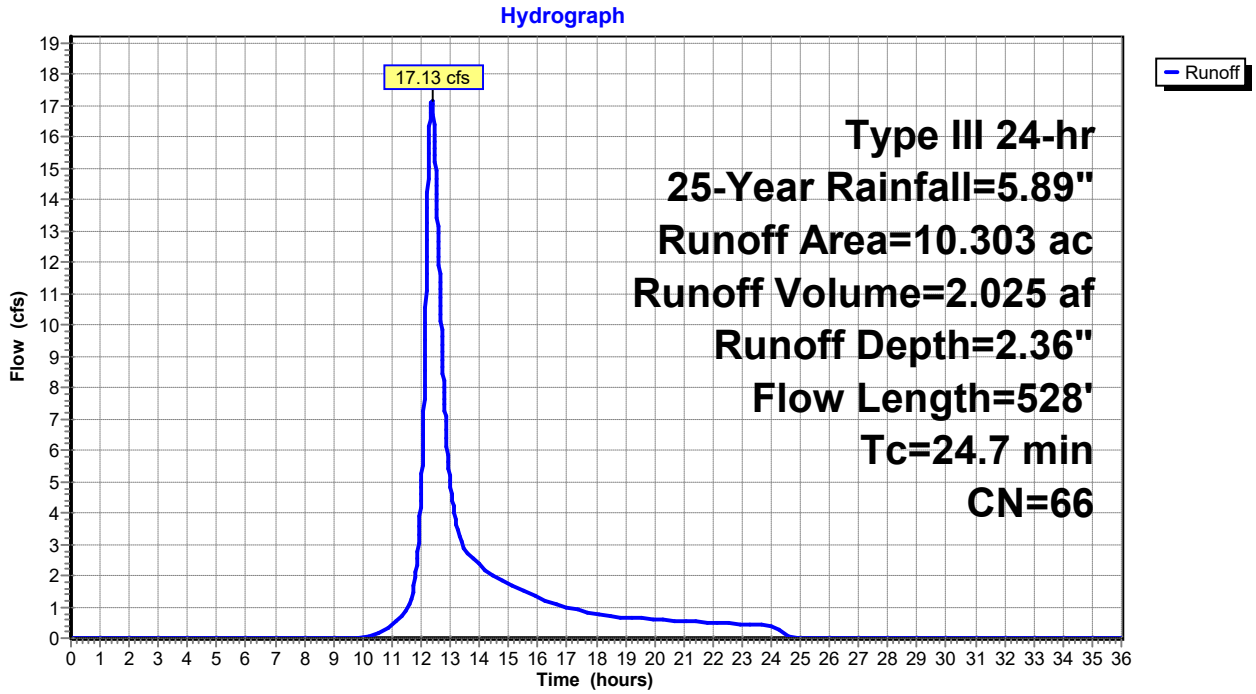
Runoff = 17.13 cfs @ 12.37 hrs, Volume= 2.025 af, Depth= 2.36"
Routed to Pond 1P : North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

Area (ac)	CN	Description
9.581	68	<50% Grass cover, Poor, HSG A
0.042	76	Gravel roads, HSG A
0.054	98	Paved parking, HSG A
0.626	30	Woods, Good, HSG A
10.303	66	Weighted Average
10.248		99.47% Pervious Area
0.054		0.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0133	0.12		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
18.0	478	0.0040	0.44		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
24.7	528	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

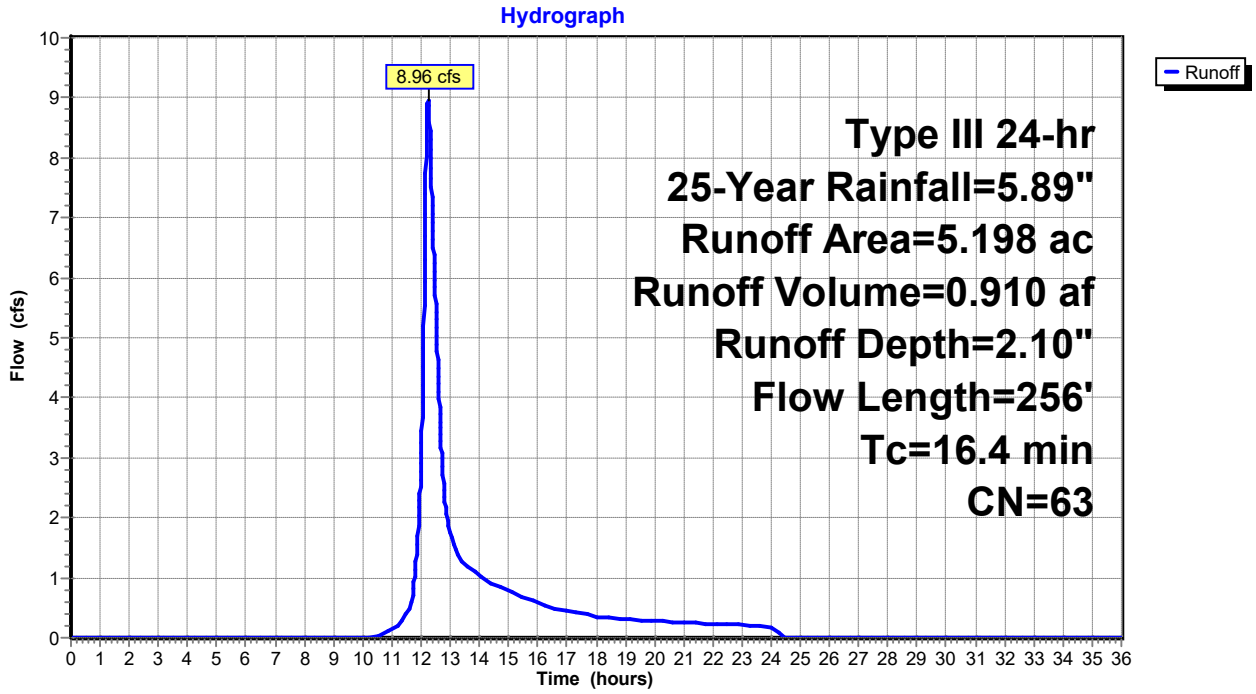
Runoff = 8.96 cfs @ 12.23 hrs, Volume= 0.910 af, Depth= 2.10"
Routed to Pond 2P : West Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

Area (ac)	CN	Description
3.987	68	<50% Grass cover, Poor, HSG A
0.289	76	Gravel roads, HSG A
0.081	98	Paved parking, HSG A
0.031	98	Roofs, HSG A
0.809	30	Woods, Good, HSG A
5.198	63	Weighted Average
5.086		97.85% Pervious Area
0.112		2.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0068	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
0.9	51	0.0170	0.91		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
6.7	155	0.0030	0.38		**Shallow Concentrated Flow, C** Short Grass Pasture Kv= 7.0 fps
16.4	256	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

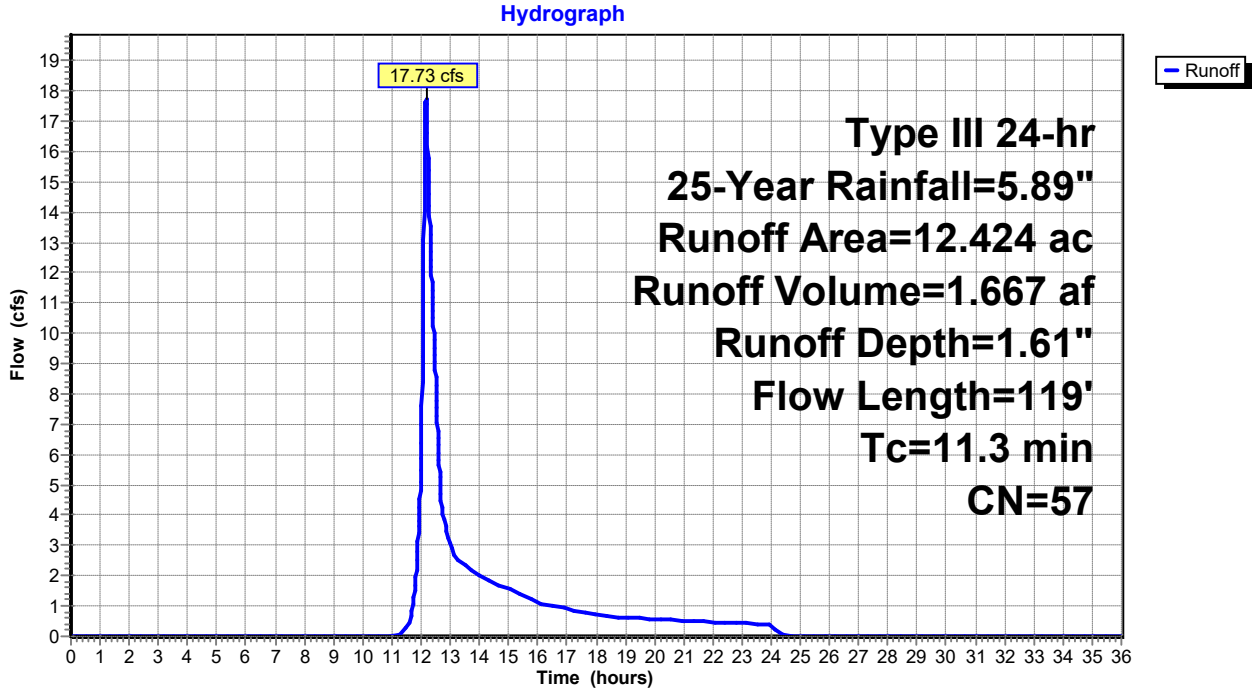
Runoff = 17.73 cfs @ 12.17 hrs, Volume= 1.667 af, Depth= 1.61"
Routed to Pond 3P : Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

Area (ac)	CN	Description
7.109	68	<50% Grass cover, Poor, HSG A
0.626	76	Gravel roads, HSG A
0.066	98	Roofs, HSG A
0.530	89	Urban commercial, 85% imp, HSG A
4.094	30	Woods, Good, HSG A
12.424	57	Weighted Average
11.908		95.84% Pervious Area
0.516		4.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0076	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
2.9	69	0.0032	0.40		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
11.3	119	Total			

Subcatchment 3: Subcat 3

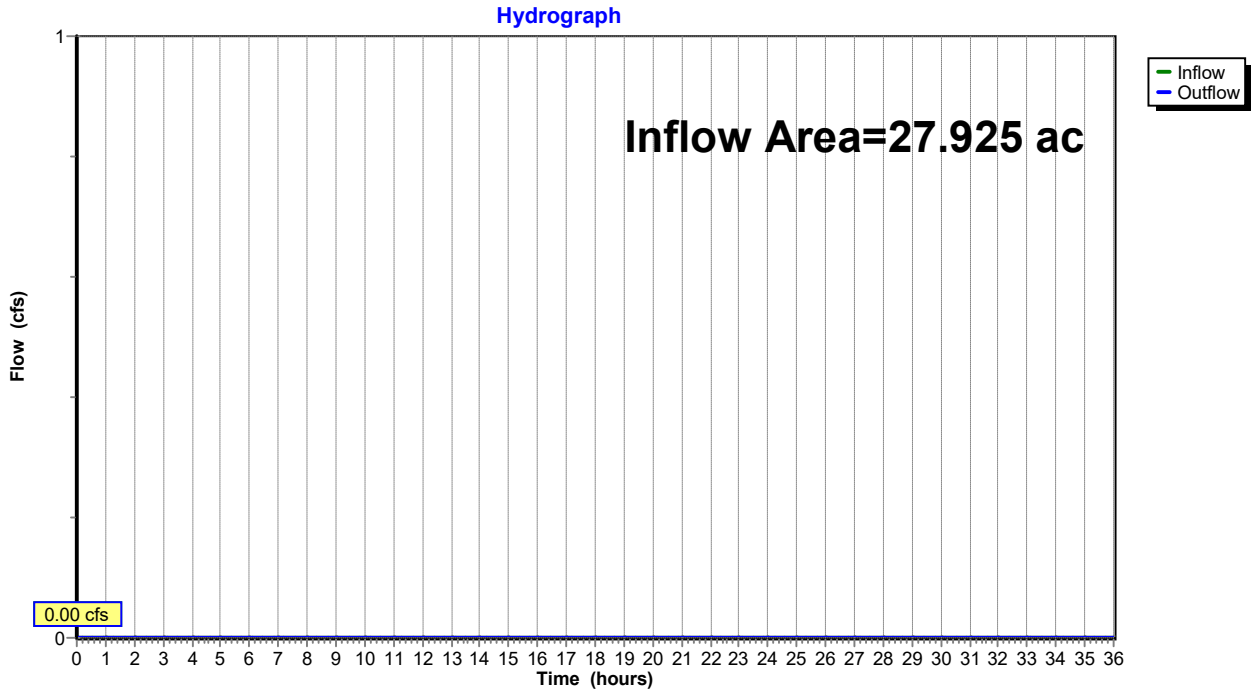


Summary for Reach DP-1: DP-1

Inflow Area = 27.925 ac, 2.44% Impervious, Inflow Depth = 0.00" for 25-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



Summary for Pond 1P: North Pond

Inflow Area = 27.925 ac, 2.44% Impervious, Inflow Depth = 0.87" for 25-Year event
Inflow = 17.13 cfs @ 12.37 hrs, Volume= 2.025 af
Outflow = 11.29 cfs @ 12.64 hrs, Volume= 2.025 af, Atten= 34%, Lag= 16.7 min
Discarded = 11.29 cfs @ 12.64 hrs, Volume= 2.025 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.09' @ 12.64 hrs Surf.Area= 58,968 sf Storage= 11,995 cf

Plug-Flow detention time= 12.7 min calculated for 2.025 af (100% of inflow)
Center-of-Mass det. time= 12.7 min (878.8 - 866.1)

Volume	Invert	Avail.Storage	Storage Description
#1	194.25'	136,562 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		136,563 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.25	256	0	0
194.50	1,038	162	162
194.75	2,487	441	602
195.00	48,456	6,368	6,970
195.25	76,548	15,626	22,596
195.50	115,903	24,056	46,652
195.75	160,142	34,506	81,158
196.00	283,094	55,405	136,562

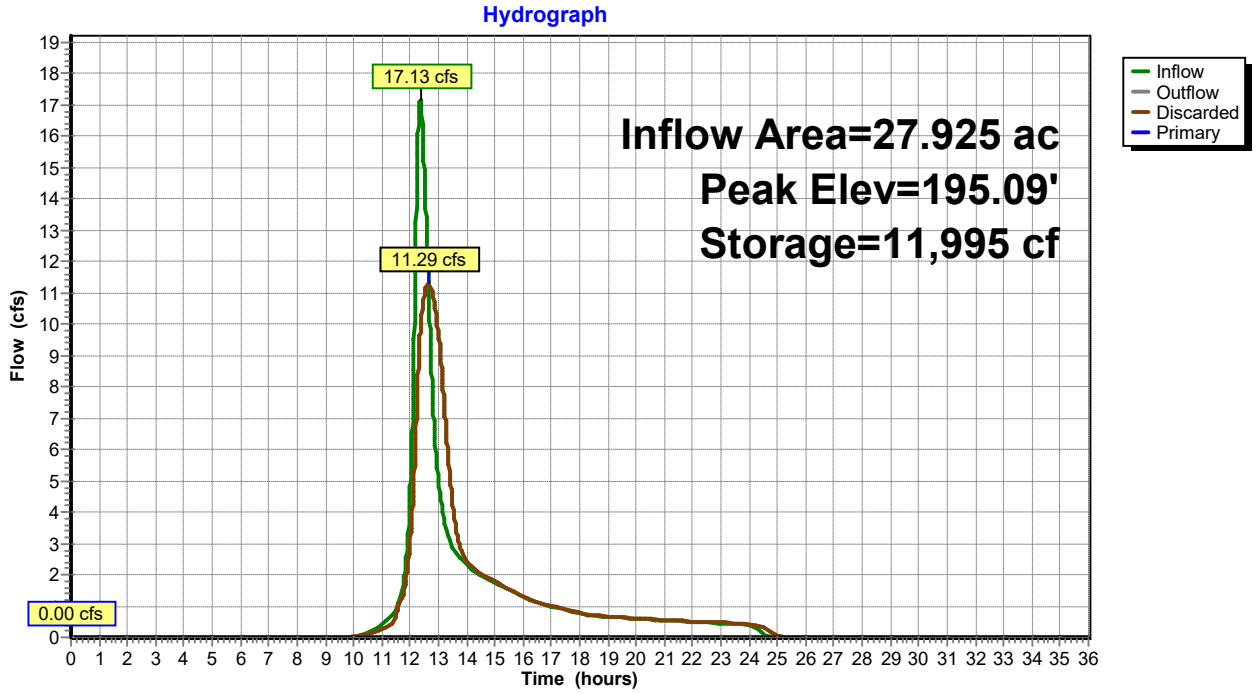
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.00'	**60.0' long x 30.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

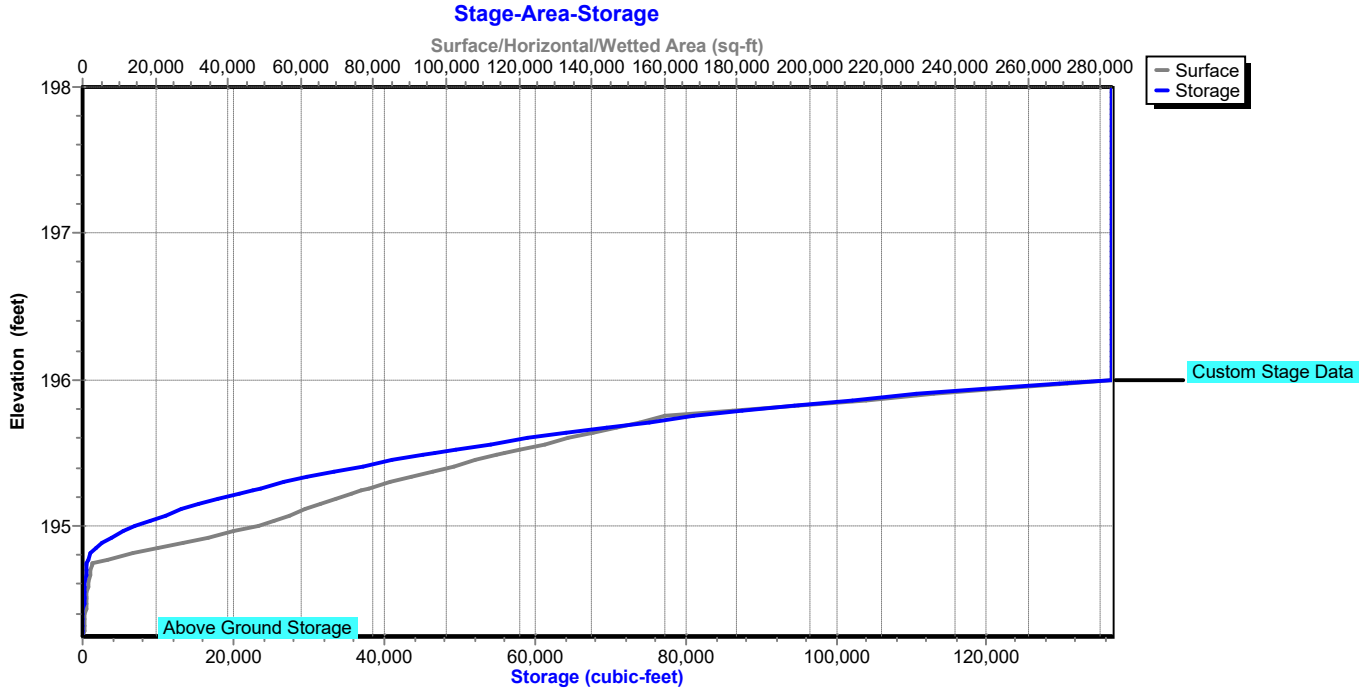
Discarded OutFlow Max=11.29 cfs @ 12.64 hrs HW=195.09' (Free Discharge)
1=Exfiltration (Exfiltration Controls 11.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.25' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: North Pond



Pond 1P: North Pond



Summary for Pond 2P: West Pond

Inflow Area = 5.198 ac, 2.15% Impervious, Inflow Depth = 2.10" for 25-Year event
Inflow = 8.96 cfs @ 12.23 hrs, Volume= 0.910 af
Outflow = 5.75 cfs @ 12.49 hrs, Volume= 0.910 af, Atten= 36%, Lag= 15.1 min
Discarded = 5.75 cfs @ 12.49 hrs, Volume= 0.910 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1P : North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.86' @ 12.49 hrs Surf.Area= 30,042 sf Storage= 5,422 cf

Plug-Flow detention time= 7.8 min calculated for 0.909 af (100% of inflow)
Center-of-Mass det. time= 7.8 min (873.6 - 865.8)

Volume	Invert	Avail.Storage	Storage Description
#1	195.50'	10,426 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,427 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.50	3,096	0	0
195.75	18,137	2,654	2,654
196.00	44,039	7,772	10,426

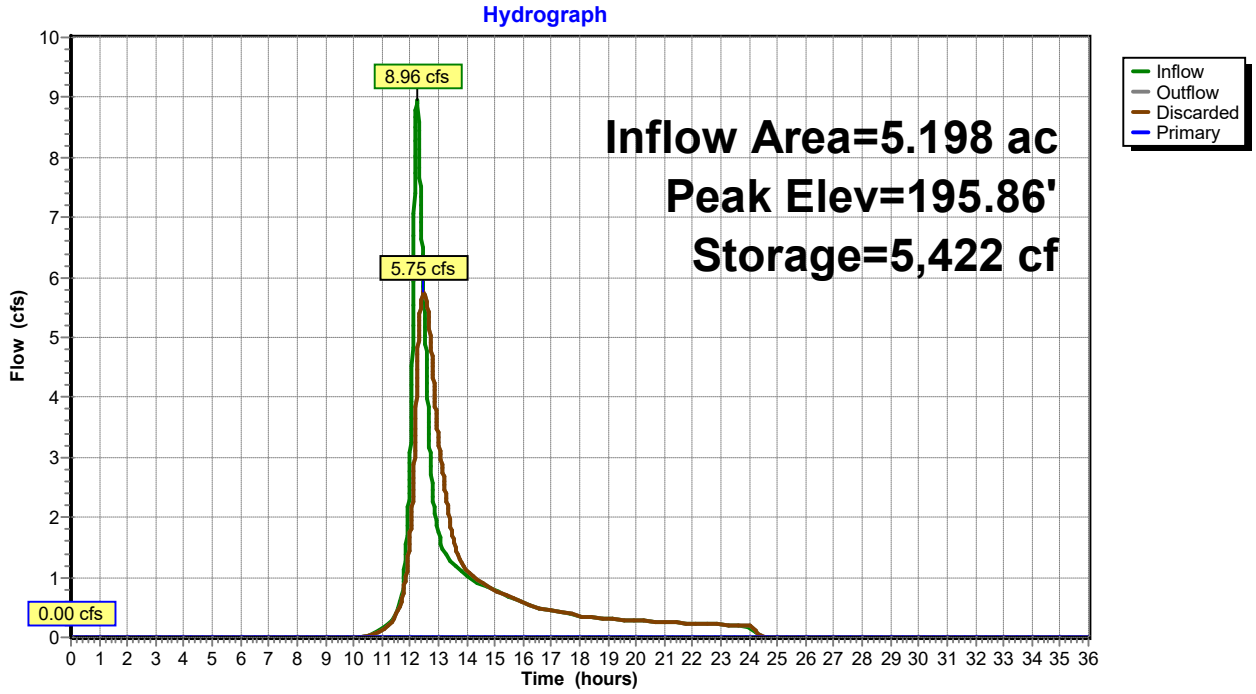
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**5.0' long x 90.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	195.50'	**8.270 in/hr Exfiltration over Surface area**

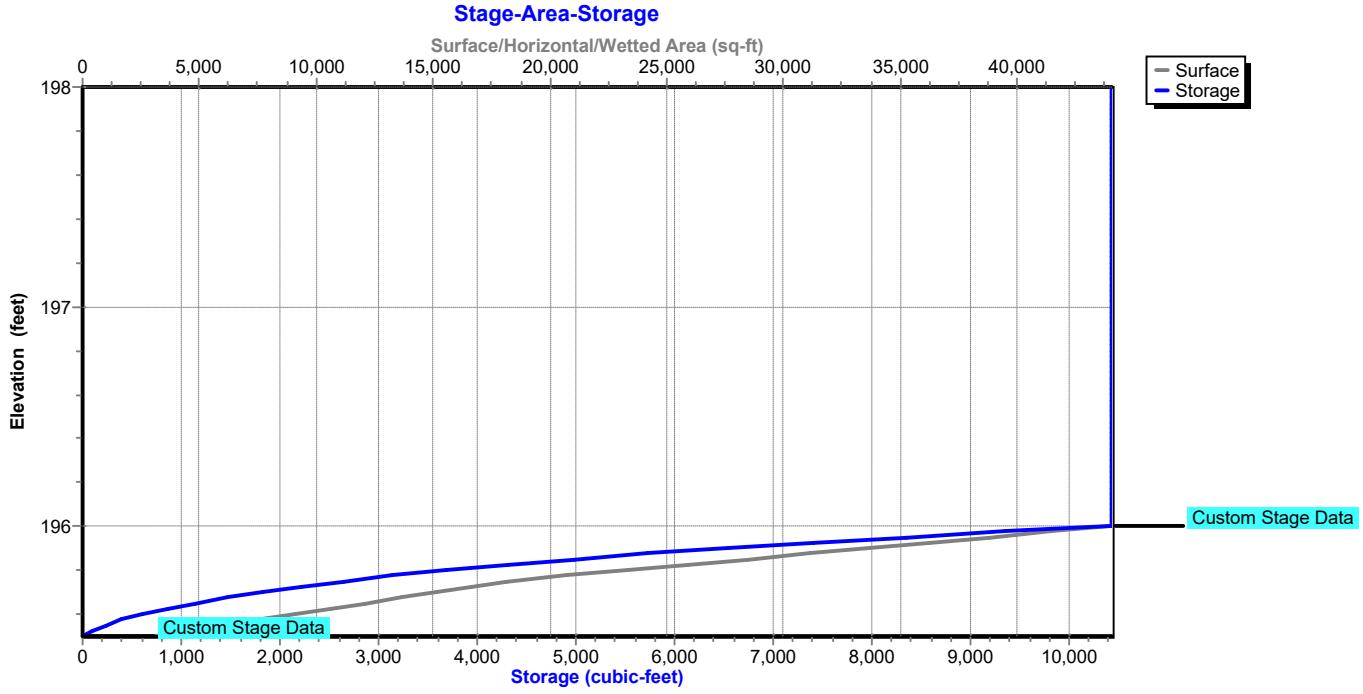
Discarded OutFlow Max=5.75 cfs @ 12.49 hrs HW=195.86' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 5.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: West Pond



Pond 2P: West Pond



Summary for Pond 3P: Southern Pond

Inflow Area = 12.424 ac, 4.16% Impervious, Inflow Depth = 1.61" for 25-Year event
Inflow = 17.73 cfs @ 12.17 hrs, Volume= 1.667 af
Outflow = 12.37 cfs @ 12.34 hrs, Volume= 1.667 af, Atten= 30%, Lag= 10.3 min
Discarded = 12.37 cfs @ 12.34 hrs, Volume= 1.667 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1P : North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.10' @ 12.34 hrs Surf.Area= 64,640 sf Storage= 5,216 cf

Plug-Flow detention time= 3.5 min calculated for 1.666 af (100% of inflow)
Center-of-Mass det. time= 3.5 min (880.9 - 877.4)

Volume	Invert	Avail.Storage	Storage Description
#1	195.00'	144,371 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		144,372 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.00	39,376	0	0
195.25	102,350	17,716	17,716
195.50	150,033	31,548	49,264
195.75	184,191	41,778	91,042
196.00	242,447	53,330	144,371

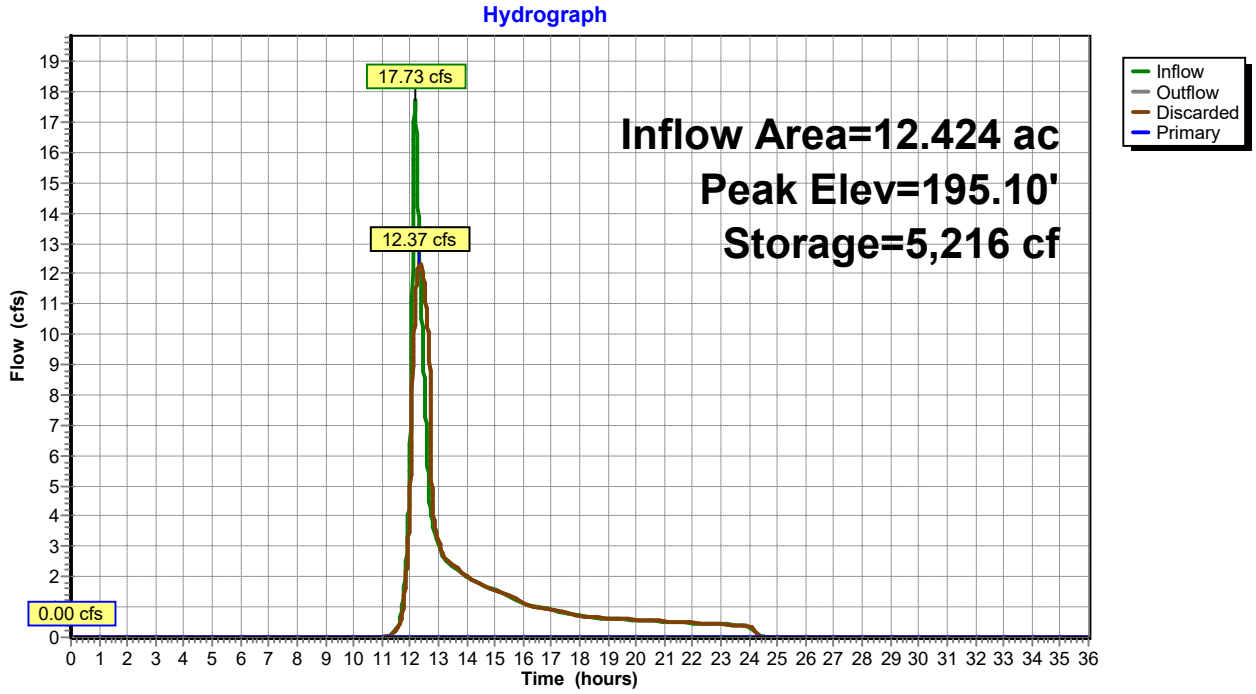
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**30.0' long x 60.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	195.00'	**8.270 in/hr Exfiltration over Surface area**

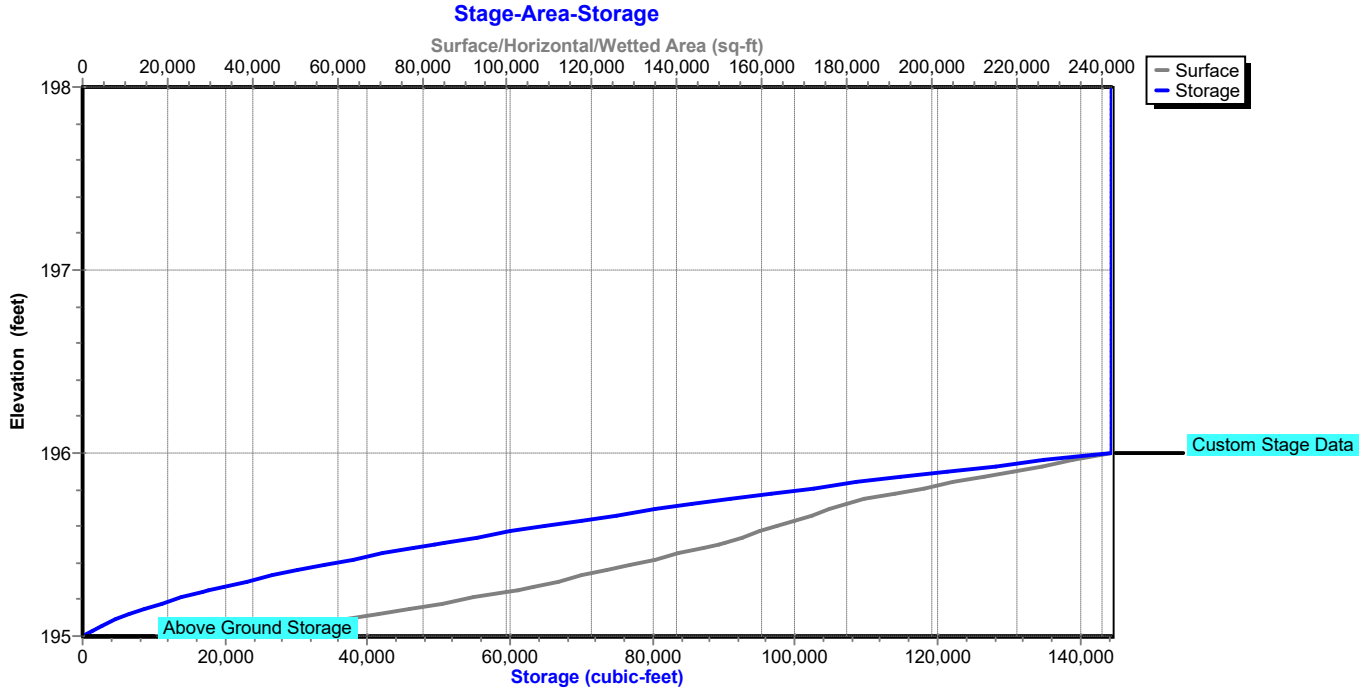
Discarded OutFlow Max=12.37 cfs @ 12.34 hrs HW=195.10' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 12.37 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.00' (Free Discharge)
↑└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Southern Pond



Pond 3P: Southern Pond



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=10.303 ac 0.53% Impervious Runoff Depth=3.62"
Flow Length=528' Tc=24.7 min CN=66 Runoff=26.76 cfs 3.106 af

Subcatchment 2: Subcat 2 Runoff Area=5.198 ac 2.15% Impervious Runoff Depth=3.30"
Flow Length=256' Tc=16.4 min CN=63 Runoff=14.48 cfs 1.427 af

Subcatchment 3: Subcat 3 Runoff Area=12.424 ac 4.16% Impervious Runoff Depth=2.67"
Flow Length=119' Tc=11.3 min CN=57 Runoff=31.22 cfs 2.760 af

Reach DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1P: North Pond Peak Elev=195.27' Storage=23,899 cf Inflow=26.76 cfs 3.106 af
Discarded=15.16 cfs 3.106 af Primary=0.00 cfs 0.000 af Outflow=15.16 cfs 3.106 af

Pond 2P: West Pond Peak Elev=196.00' Storage=10,290 cf Inflow=14.48 cfs 1.427 af
Discarded=8.37 cfs 1.427 af Primary=0.00 cfs 0.000 af Outflow=8.37 cfs 1.427 af

Pond 3P: Southern Pond Peak Elev=195.22' Storage=14,409 cf Inflow=31.22 cfs 2.760 af
Discarded=17.97 cfs 2.760 af Primary=0.00 cfs 0.000 af Outflow=17.97 cfs 2.760 af

Total Runoff Area = 27.925 ac Runoff Volume = 7.294 af Average Runoff Depth = 3.13"
97.56% Pervious = 27.242 ac 2.44% Impervious = 0.683 ac

Summary for Subcatchment 1: Subcat 1

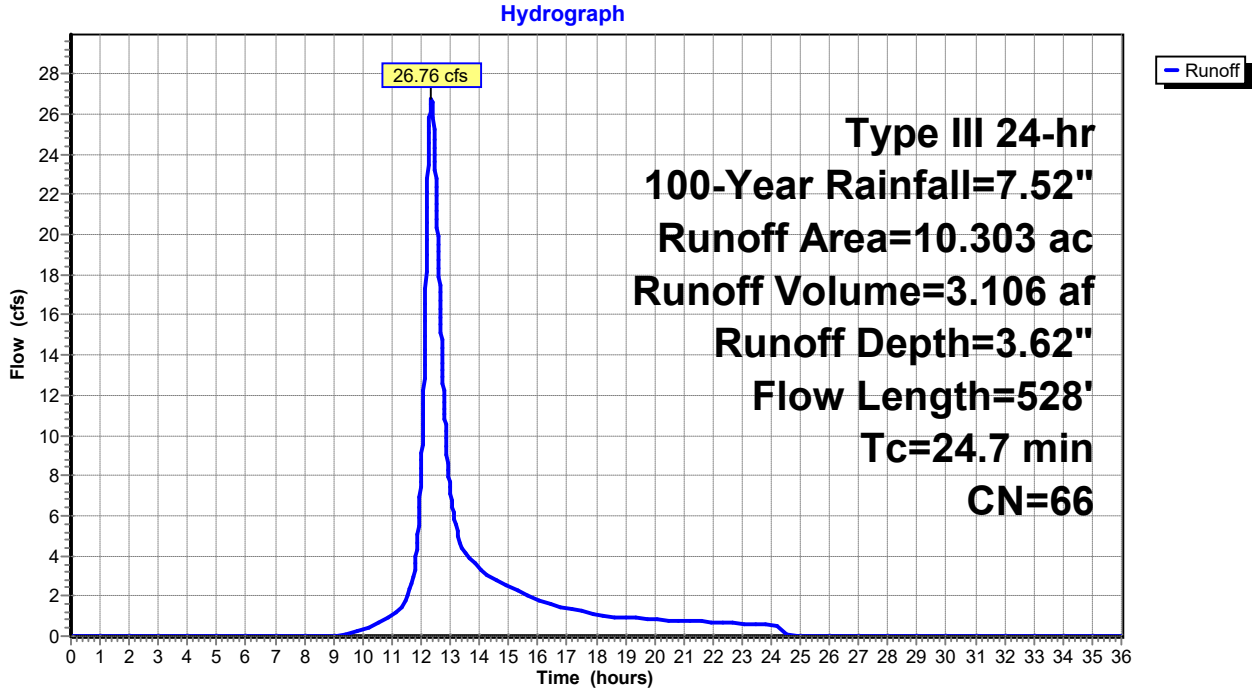
Runoff = 26.76 cfs @ 12.35 hrs, Volume= 3.106 af, Depth= 3.62"
Routed to Pond 1P : North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

Area (ac)	CN	Description
9.581	68	<50% Grass cover, Poor, HSG A
0.042	76	Gravel roads, HSG A
0.054	98	Paved parking, HSG A
0.626	30	Woods, Good, HSG A
10.303	66	Weighted Average
10.248		99.47% Pervious Area
0.054		0.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0133	0.12		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
18.0	478	0.0040	0.44		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
24.7	528	Total			

Subcatchment 1: Subcat 1



Summary for Subcatchment 2: Subcat 2

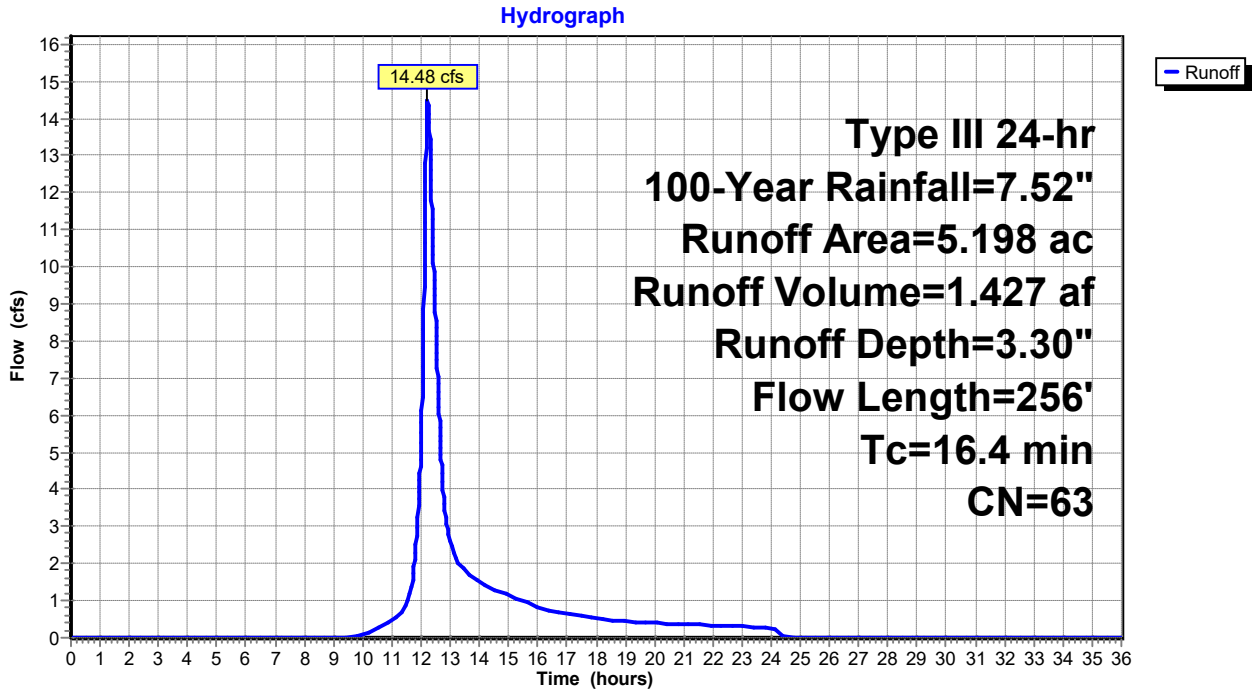
Runoff = 14.48 cfs @ 12.23 hrs, Volume= 1.427 af, Depth= 3.30"
Routed to Pond 2P : West Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

Area (ac)	CN	Description
3.987	68	<50% Grass cover, Poor, HSG A
0.289	76	Gravel roads, HSG A
0.081	98	Paved parking, HSG A
0.031	98	Roofs, HSG A
0.809	30	Woods, Good, HSG A
5.198	63	Weighted Average
5.086		97.85% Pervious Area
0.112		2.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0068	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
0.9	51	0.0170	0.91		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
6.7	155	0.0030	0.38		**Shallow Concentrated Flow, C** Short Grass Pasture Kv= 7.0 fps
16.4	256	Total			

Subcatchment 2: Subcat 2



Summary for Subcatchment 3: Subcat 3

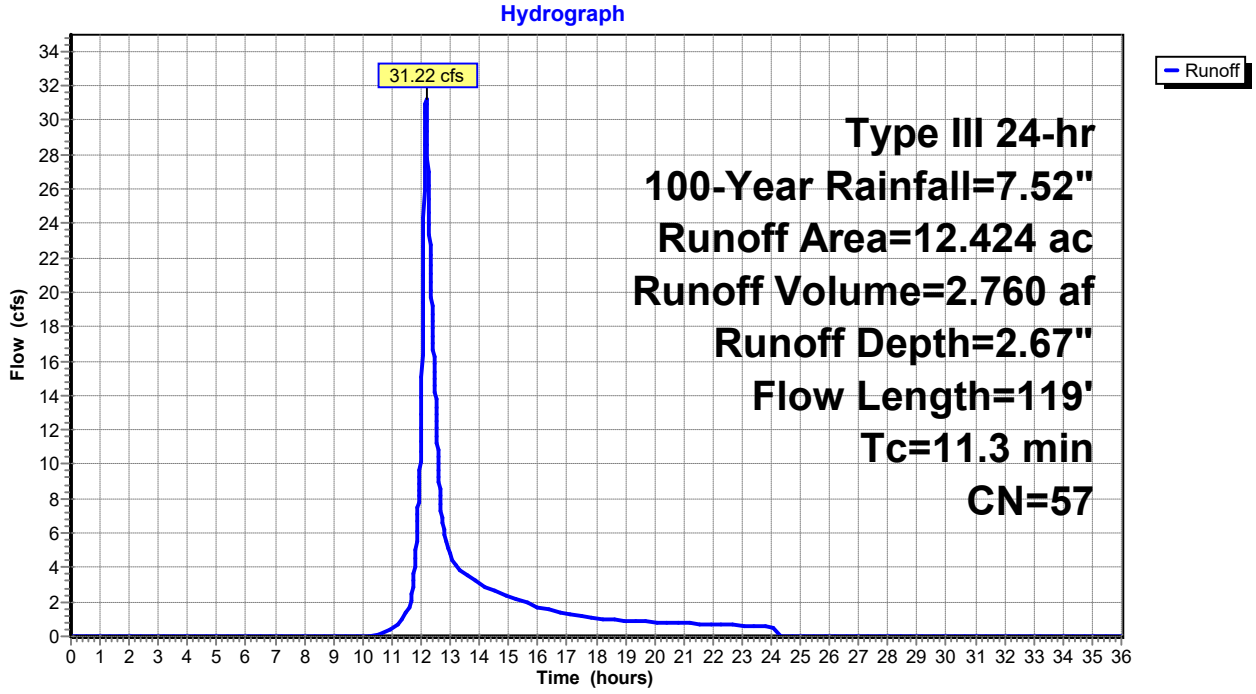
Runoff = 31.22 cfs @ 12.17 hrs, Volume= 2.760 af, Depth= 2.67"
Routed to Pond 3P : Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

Area (ac)	CN	Description
7.109	68	<50% Grass cover, Poor, HSG A
0.626	76	Gravel roads, HSG A
0.066	98	Roofs, HSG A
0.530	89	Urban commercial, 85% imp, HSG A
4.094	30	Woods, Good, HSG A
12.424	57	Weighted Average
11.908		95.84% Pervious Area
0.516		4.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0076	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
2.9	69	0.0032	0.40		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
11.3	119	Total			

Subcatchment 3: Subcat 3

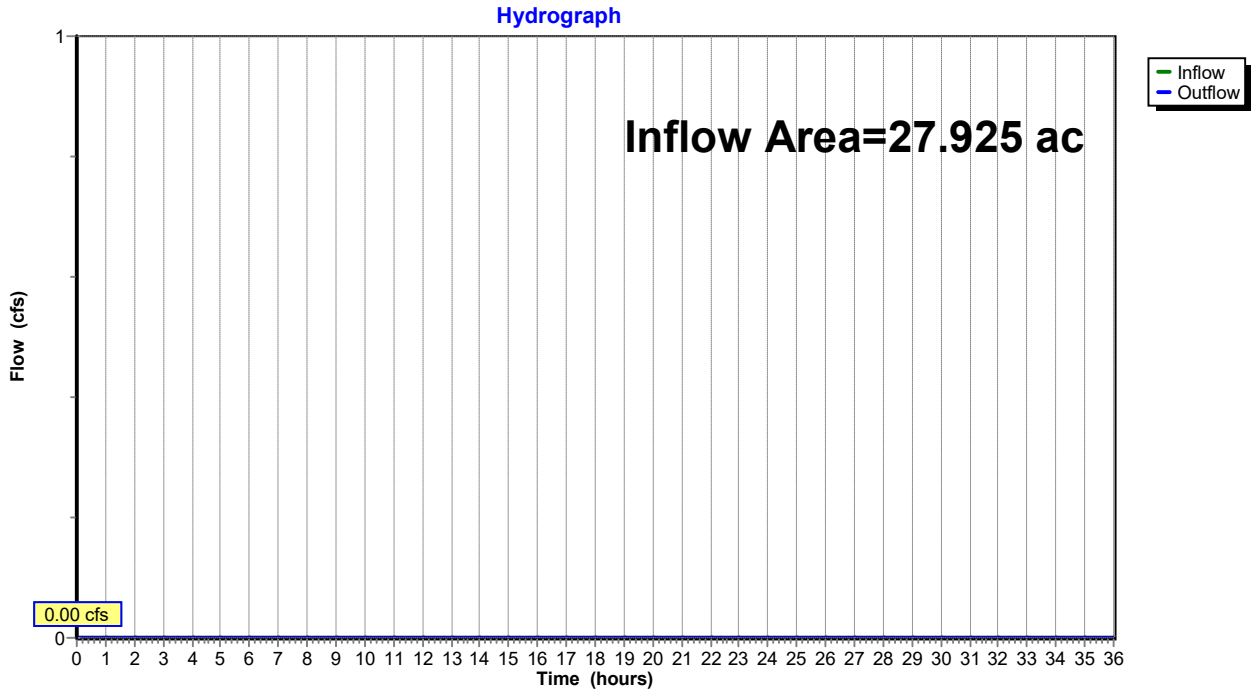


Summary for Reach DP-1: DP-1

Inflow Area = 27.925 ac, 2.44% Impervious, Inflow Depth = 0.00" for 100-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



Summary for Pond 1P: North Pond

Inflow Area = 27.925 ac, 2.44% Impervious, Inflow Depth = 1.33" for 100-Year event
Inflow = 26.76 cfs @ 12.35 hrs, Volume= 3.106 af
Outflow = 15.16 cfs @ 12.69 hrs, Volume= 3.106 af, Atten= 43%, Lag= 20.4 min
Discarded = 15.16 cfs @ 12.69 hrs, Volume= 3.106 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.27' @ 12.69 hrs Surf.Area= 79,182 sf Storage= 23,899 cf

Plug-Flow detention time= 15.5 min calculated for 3.106 af (100% of inflow)
Center-of-Mass det. time= 15.5 min (869.0 - 853.5)

Volume	Invert	Avail.Storage	Storage Description
#1	194.25'	136,562 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		136,563 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.25	256	0	0
194.50	1,038	162	162
194.75	2,487	441	602
195.00	48,456	6,368	6,970
195.25	76,548	15,626	22,596
195.50	115,903	24,056	46,652
195.75	160,142	34,506	81,158
196.00	283,094	55,405	136,562

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

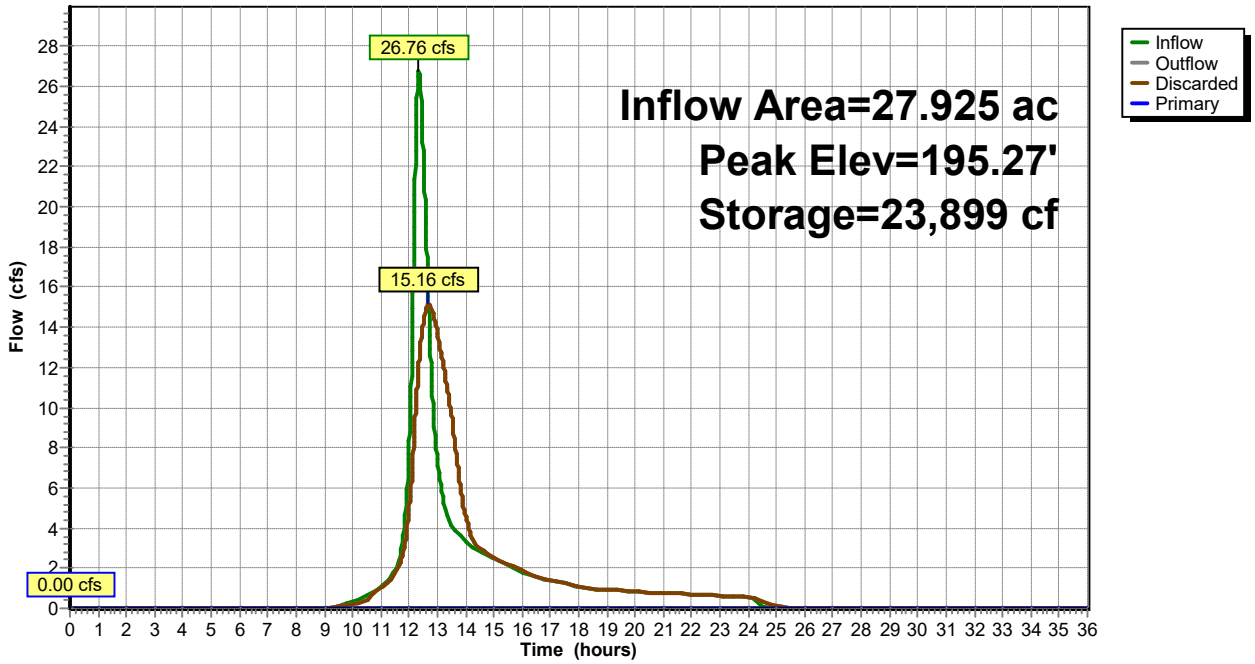
Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.00'	**60.0' long x 30.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=15.16 cfs @ 12.69 hrs HW=195.27' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 15.16 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.25' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

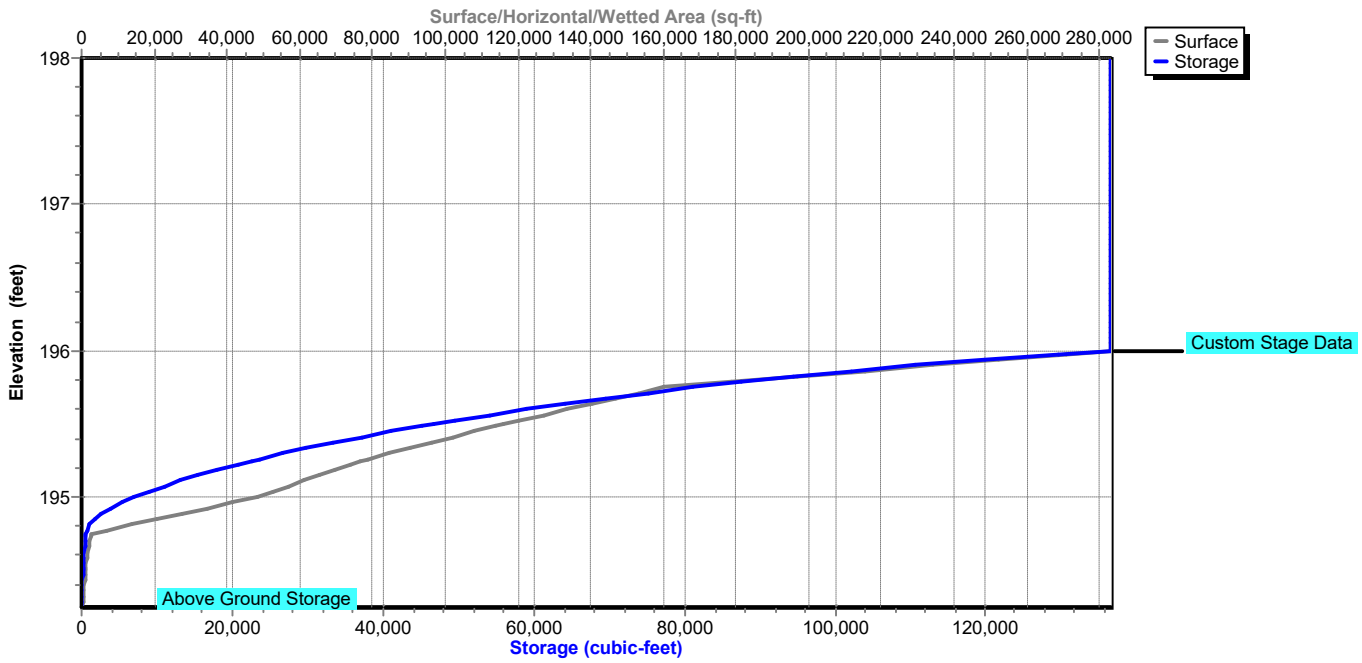
Pond 1P: North Pond

Hydrograph



Pond 1P: North Pond

Stage-Area-Storage



Summary for Pond 2P: West Pond

Inflow Area = 5.198 ac, 2.15% Impervious, Inflow Depth = 3.30" for 100-Year event
Inflow = 14.48 cfs @ 12.23 hrs, Volume= 1.427 af
Outflow = 8.37 cfs @ 12.51 hrs, Volume= 1.427 af, Atten= 42%, Lag= 16.7 min
Discarded = 8.37 cfs @ 12.51 hrs, Volume= 1.427 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1P : North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 196.00' @ 12.51 hrs Surf.Area= 43,718 sf Storage= 10,290 cf

Plug-Flow detention time= 10.5 min calculated for 1.427 af (100% of inflow)
Center-of-Mass det. time= 10.5 min (862.9 - 852.4)

Volume	Invert	Avail.Storage	Storage Description
#1	195.50'	10,426 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		10,427 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.50	3,096	0	0
195.75	18,137	2,654	2,654
196.00	44,039	7,772	10,426

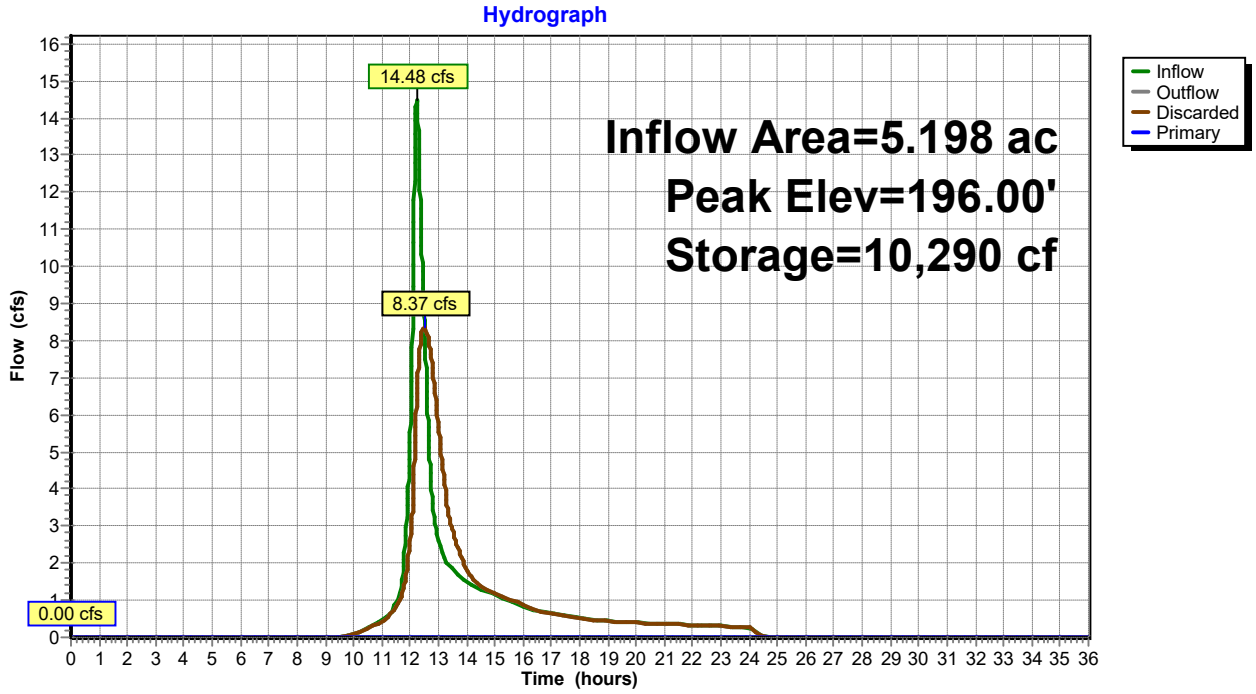
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**5.0' long x 90.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	195.50'	**8.270 in/hr Exfiltration over Surface area**

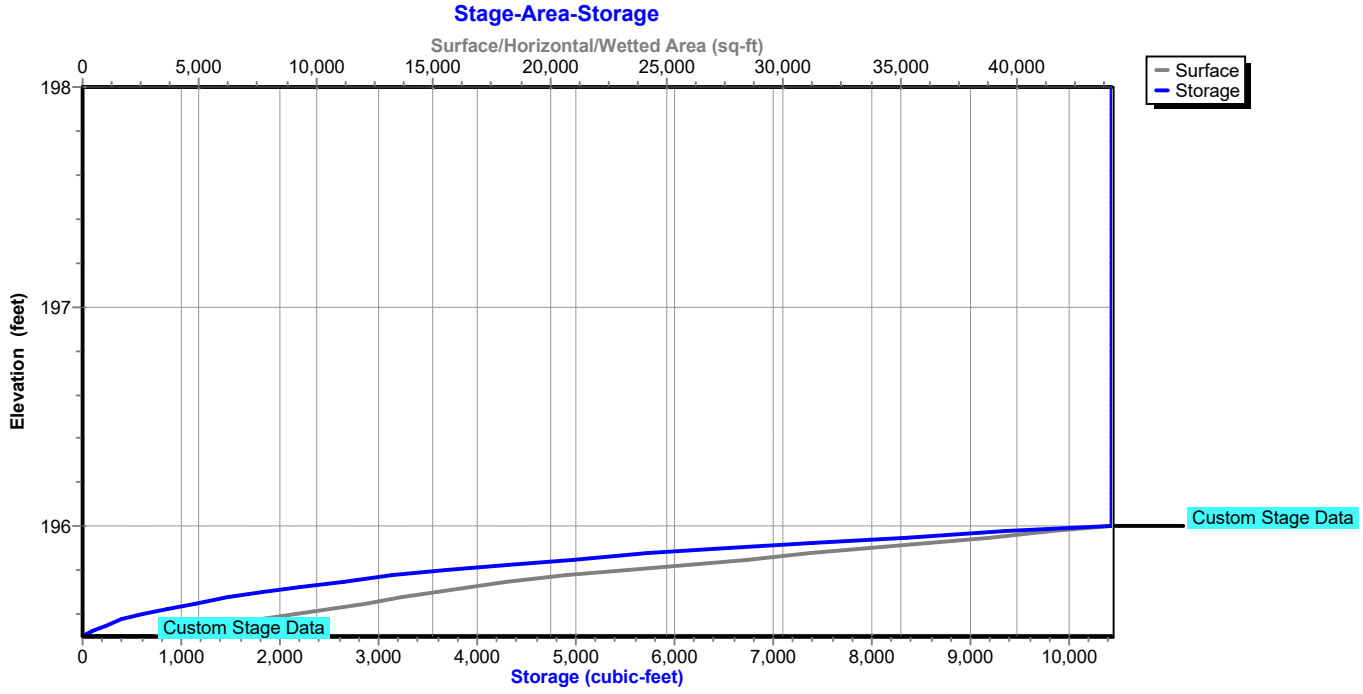
Discarded OutFlow Max=8.37 cfs @ 12.51 hrs HW=196.00' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 8.37 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: West Pond



Pond 2P: West Pond



Summary for Pond 3P: Southern Pond

Inflow Area = 12.424 ac, 4.16% Impervious, Inflow Depth = 2.67" for 100-Year event
Inflow = 31.22 cfs @ 12.17 hrs, Volume= 2.760 af
Outflow = 17.97 cfs @ 12.40 hrs, Volume= 2.760 af, Atten= 42%, Lag= 13.9 min
Discarded = 17.97 cfs @ 12.40 hrs, Volume= 2.760 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1P : North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.22' @ 12.40 hrs Surf.Area= 93,859 sf Storage= 14,409 cf

Plug-Flow detention time= 5.8 min calculated for 2.759 af (100% of inflow)
Center-of-Mass det. time= 5.8 min (867.3 - 861.5)

Volume	Invert	Avail.Storage	Storage Description
#1	195.00'	144,371 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		144,372 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.00	39,376	0	0
195.25	102,350	17,716	17,716
195.50	150,033	31,548	49,264
195.75	184,191	41,778	91,042
196.00	242,447	53,330	144,371

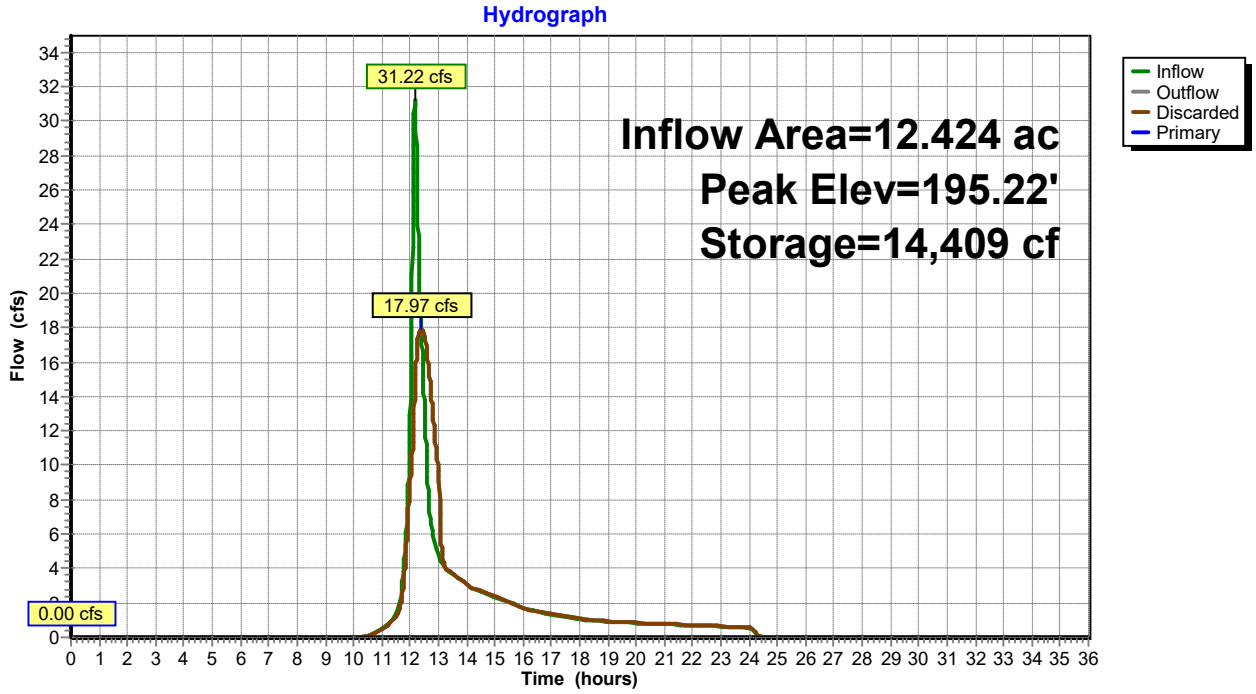
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**30.0' long x 60.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	195.00'	**8.270 in/hr Exfiltration over Surface area**

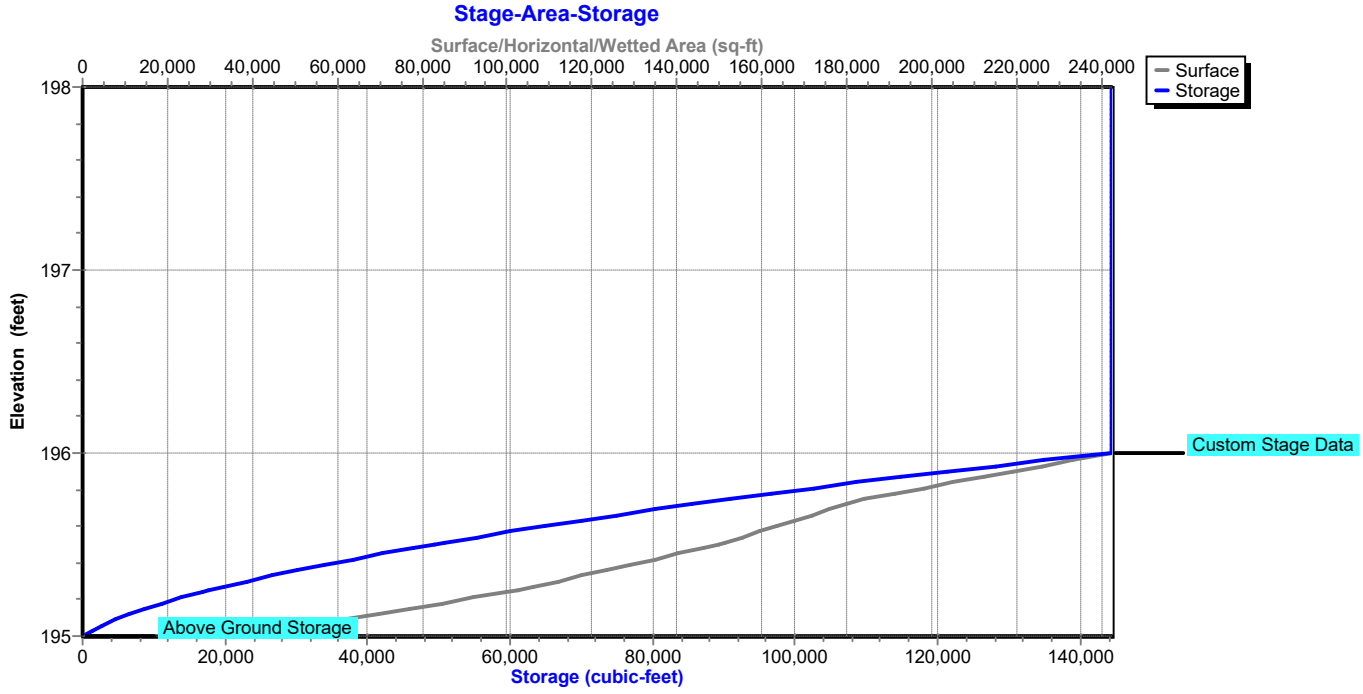
Discarded OutFlow Max=17.97 cfs @ 12.40 hrs HW=195.22' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 17.97 cfs)

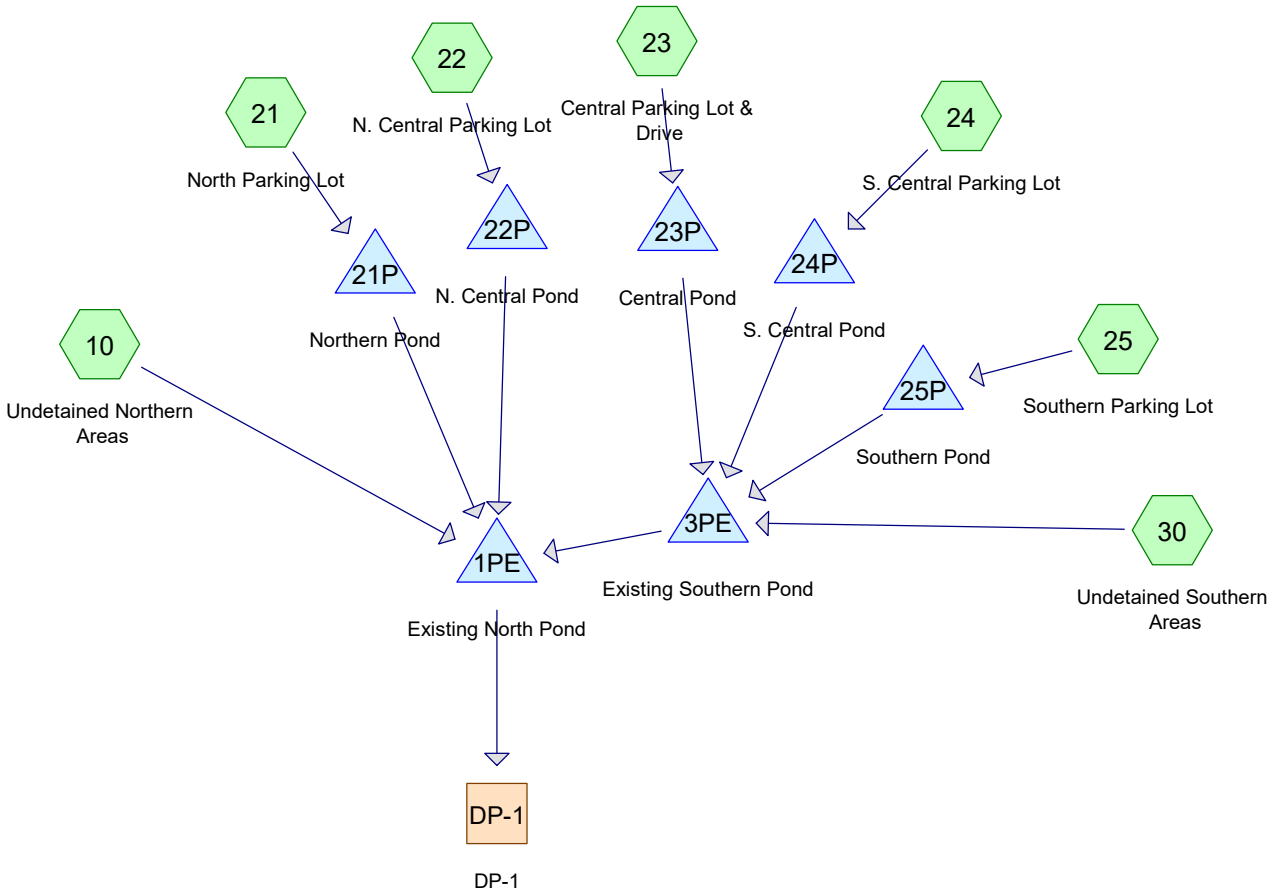
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.00' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Southern Pond



Pond 3P: Southern Pond





Subcat Reach Pond Link

Routing Diagram for 24051-Groton_Cow_Pond_PRWS
Prepared by Activitas, Inc, Printed 1/30/2026

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.13	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.83	2
3	25-Year	Type III 24-hr		Default	24.00	1	5.89	2
4	100-Year	Type III 24-hr		Default	24.00	1	7.52	2

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10: Undetained Northern Runoff Area=12.188 ac 1.80% Impervious Runoff Depth=0.53"
Flow Length=528' Tc=24.7 min CN=64 Runoff=3.47 cfs 0.535 af

Subcatchment 21: North Parking Lot Runoff Area=1.154 ac 57.94% Impervious Runoff Depth=1.70"
Tc=6.0 min CN=85 Runoff=2.30 cfs 0.163 af

Subcatchment 22: N. Central Parking Runoff Area=1.020 ac 40.80% Impervious Runoff Depth=1.35"
Tc=6.0 min CN=80 Runoff=1.59 cfs 0.115 af

Subcatchment 23: Central Parking Lot Runoff Area=2.156 ac 21.44% Impervious Runoff Depth=0.18"
Tc=6.0 min CN=53 Runoff=0.12 cfs 0.032 af

Subcatchment 24: S. Central Parking Runoff Area=0.569 ac 37.48% Impervious Runoff Depth=0.35"
Tc=6.0 min CN=59 Runoff=0.11 cfs 0.017 af

Subcatchment 25: Southern Parking Lot Runoff Area=2.042 ac 36.92% Impervious Runoff Depth=0.29"
Tc=6.0 min CN=57 Runoff=0.27 cfs 0.049 af

Subcatchment 30: Undetained Southern Runoff Area=8.796 ac 7.84% Impervious Runoff Depth=0.45"
Flow Length=119' Tc=11.3 min CN=62 Runoff=2.49 cfs 0.331 af

Reach DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1PE: Existing North Pond Peak Elev=194.85' Storage=1,107 cf Inflow=3.47 cfs 0.535 af
Discarded=3.17 cfs 0.535 af Primary=0.00 cfs 0.000 af Outflow=3.17 cfs 0.535 af

Pond 3PE: Existing Southern Pond Peak Elev=194.92' Storage=1,344 cf Inflow=2.49 cfs 0.331 af
Discarded=1.76 cfs 0.331 af Primary=0.00 cfs 0.000 af Outflow=1.76 cfs 0.331 af

Pond 21P: Northern Pond Peak Elev=195.26' Storage=0.018 af Inflow=2.30 cfs 0.163 af
Discarded=0.96 cfs 0.163 af Primary=0.00 cfs 0.000 af Outflow=0.96 cfs 0.163 af

Pond 22P: N. Central Pond Peak Elev=195.14' Storage=0.011 af Inflow=1.59 cfs 0.115 af
Discarded=0.75 cfs 0.115 af Primary=0.00 cfs 0.000 af Outflow=0.75 cfs 0.115 af

Pond 23P: Central Pond Peak Elev=194.76' Storage=0.000 af Inflow=0.12 cfs 0.032 af
Discarded=0.12 cfs 0.032 af Primary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.032 af

Pond 24P: S. Central Pond Peak Elev=194.26' Storage=4 cf Inflow=0.11 cfs 0.017 af
Discarded=0.11 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.017 af

Pond 25P: Southern Pond Peak Elev=193.26' Storage=13 cf Inflow=0.27 cfs 0.049 af
Discarded=0.27 cfs 0.049 af Primary=0.00 cfs 0.000 af Outflow=0.27 cfs 0.049 af

Total Runoff Area = 27.925 ac Runoff Volume = 1.242 af Average Runoff Depth = 0.53"
87.74% Pervious = 24.503 ac 12.26% Impervious = 3.422 ac

Summary for Subcatchment 10: Undetained Northern Areas

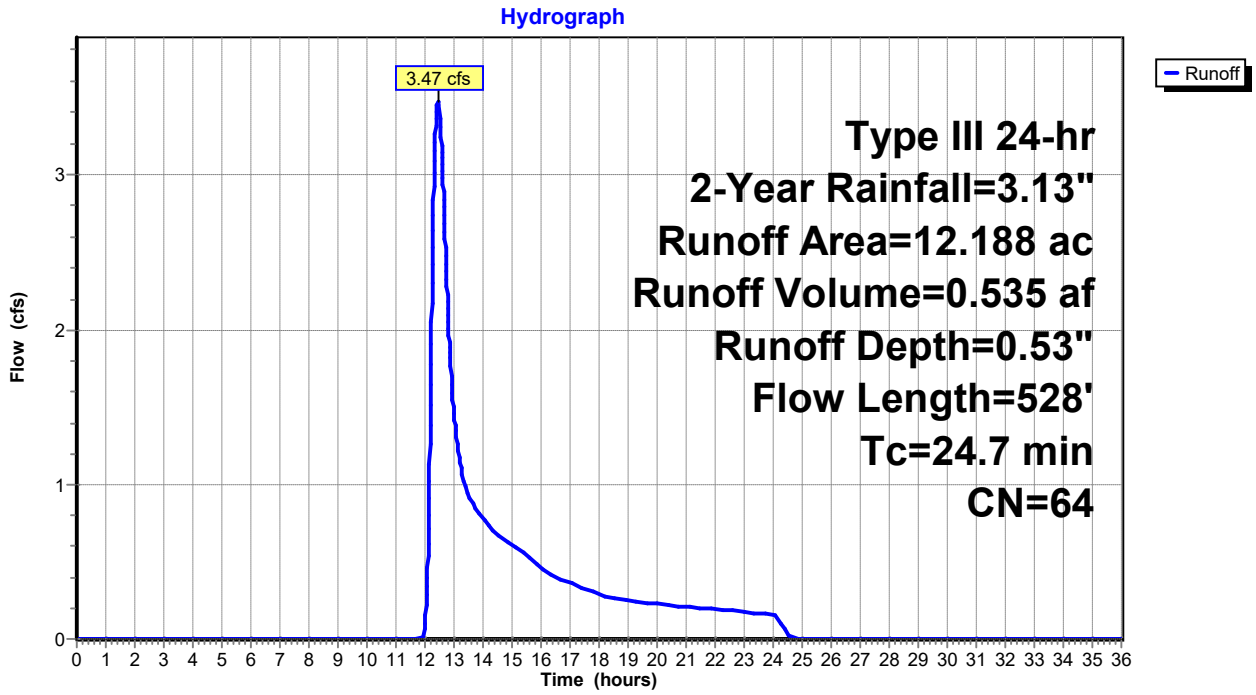
Runoff = 3.47 cfs @ 12.44 hrs, Volume= 0.535 af, Depth= 0.53"
Routed to Pond 1PE : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

	Area (ac)	CN	Description
	10.956	68	<50% Grass cover, Poor, HSG A
*	0.408	1	Porous Walks&Playgrounds, Good, HSG A
	0.191	98	Paved parking, HSG A
	0.018	98	Roofs, HSG A
	0.010	98	Unconnected roofs, HSG A
	0.000	89	Urban commercial, 85% imp, HSG A
	0.605	30	Woods, Good, HSG A
	12.188	64	Weighted Average
	11.969		98.20% Pervious Area
	0.219		1.80% Impervious Area
	0.010		4.57% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0133	0.12		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
18.0	478	0.0040	0.44		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
24.7	528	Total			

Subcatchment 10: Undetained Northern Areas



Summary for Subcatchment 21: North Parking Lot

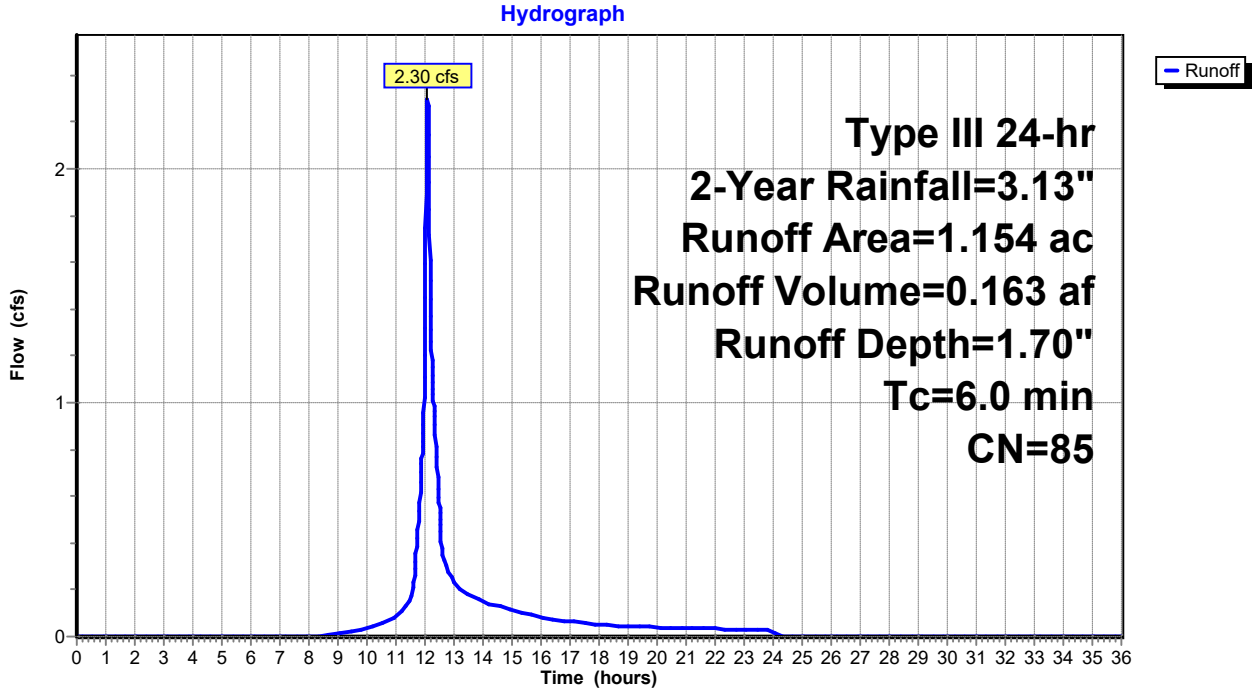
Runoff = 2.30 cfs @ 12.09 hrs, Volume= 0.163 af, Depth= 1.70"
Routed to Pond 21P : Northern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

Area (ac)	CN	Description
0.485	68	<50% Grass cover, Poor, HSG A
0.668	98	Paved parking, HSG A
1.154	85	Weighted Average
0.485		42.06% Pervious Area
0.668		57.94% Impervious Area

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

Subcatchment 21: North Parking Lot



Summary for Subcatchment 22: N. Central Parking Lot

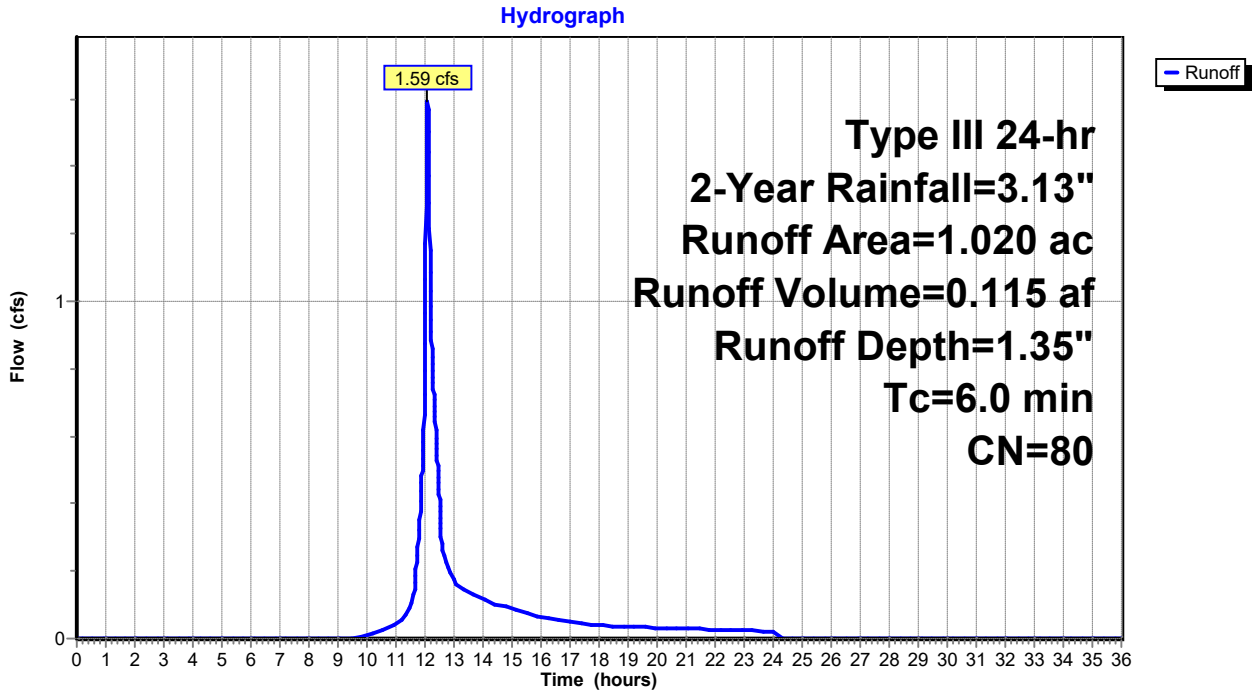
Runoff = 1.59 cfs @ 12.09 hrs, Volume= 0.115 af, Depth= 1.35"
Routed to Pond 22P : N. Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

Area (ac)	CN	Description
0.604	68	<50% Grass cover, Poor, HSG A
0.416	98	Paved parking, HSG A
1.020	80	Weighted Average
0.604		59.20% Pervious Area
0.416		40.80% Impervious Area

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

Subcatchment 22: N. Central Parking Lot



Summary for Subcatchment 23: Central Parking Lot & Drive

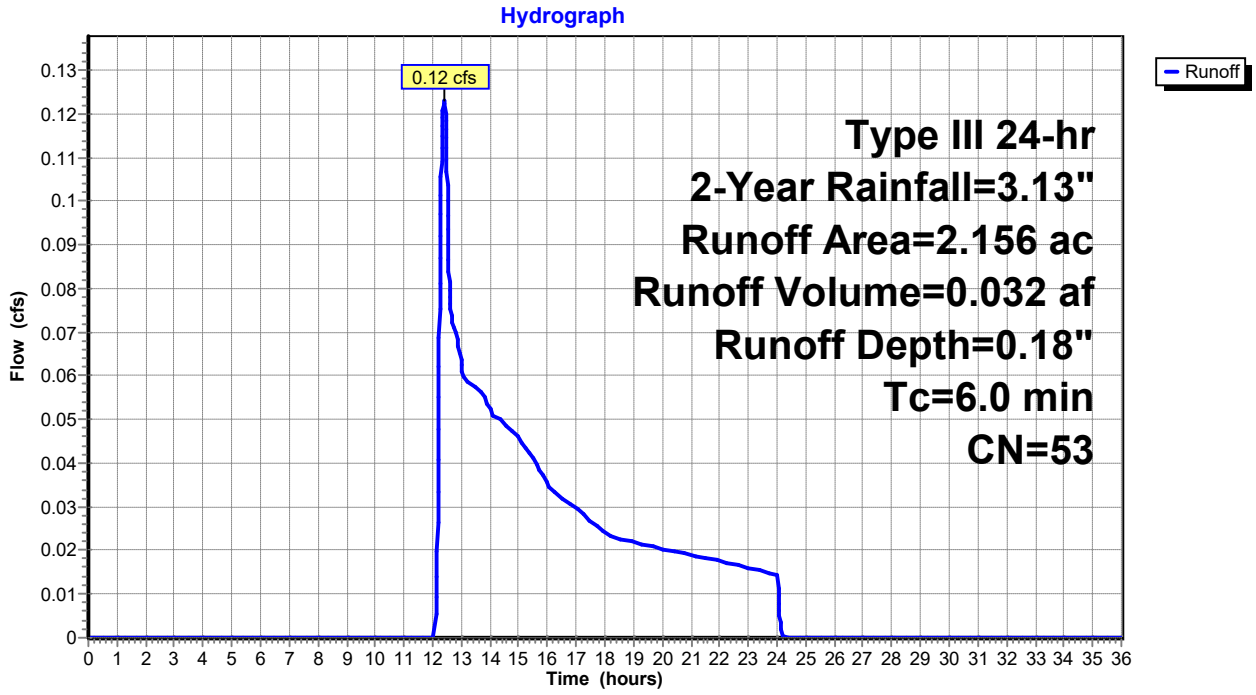
Runoff = 0.12 cfs @ 12.40 hrs, Volume= 0.032 af, Depth= 0.18"
Routed to Pond 23P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

Area (ac)	CN	Description
0.454	68	<50% Grass cover, Poor, HSG A
0.462	98	Paved parking, HSG A
1.240	30	Woods, Good, HSG A
2.156	53	Weighted Average
1.694		78.56% Pervious Area
0.462		21.44% Impervious Area

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

Subcatchment 23: Central Parking Lot & Drive



Summary for Subcatchment 24: S. Central Parking Lot

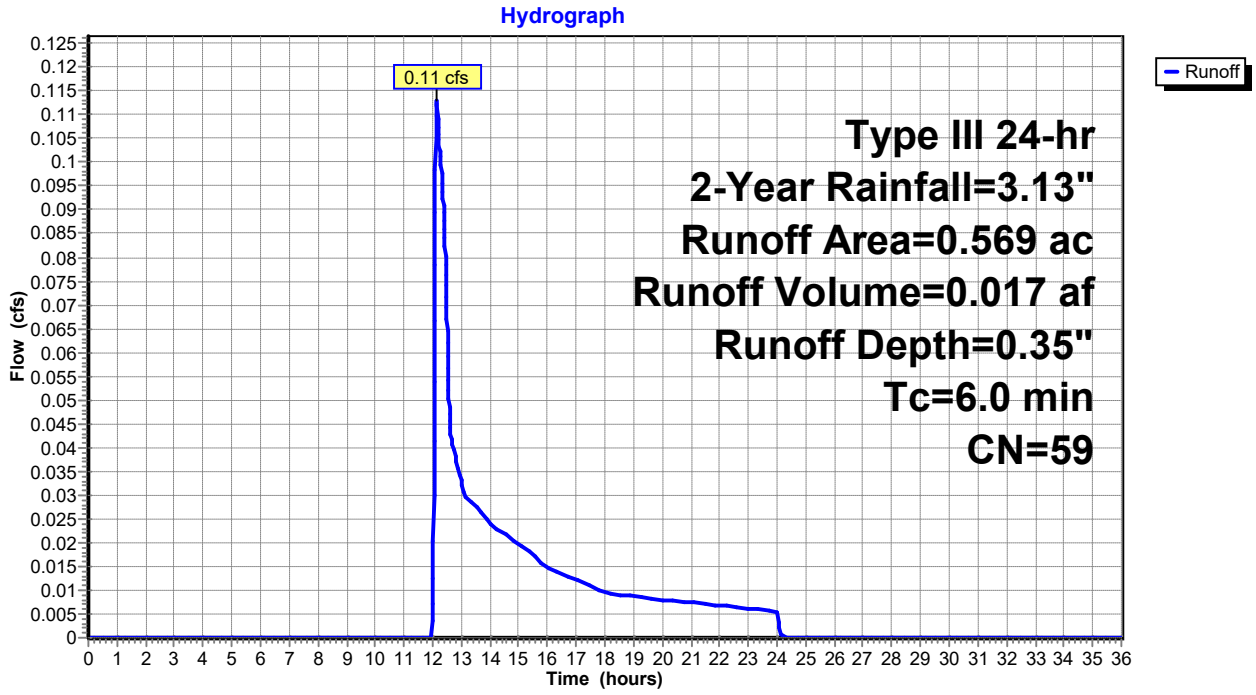
Runoff = 0.11 cfs @ 12.14 hrs, Volume= 0.017 af, Depth= 0.35"
Routed to Pond 24P : S. Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

Area (ac)	CN	Description
0.051	68	<50% Grass cover, Poor, HSG A
0.213	98	Paved parking, HSG A
0.304	30	Woods, Good, HSG A
0.569	59	Weighted Average
0.356		62.52% Pervious Area
0.213		37.48% Impervious Area

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

Subcatchment 24: S. Central Parking Lot



Summary for Subcatchment 25: Southern Parking Lot

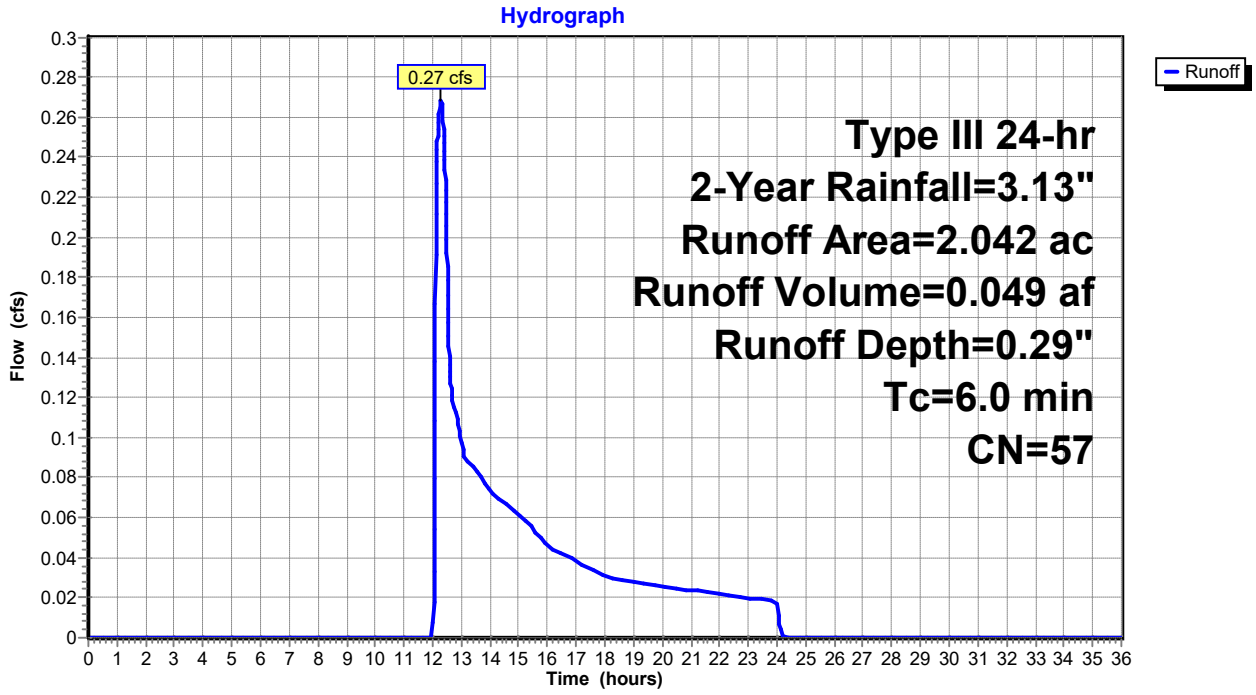
Runoff = 0.27 cfs @ 12.30 hrs, Volume= 0.049 af, Depth= 0.29"
Routed to Pond 25P : Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

Area (ac)	CN	Description
0.097	68	<50% Grass cover, Poor, HSG A
0.754	98	Paved parking, HSG A
1.191	30	Woods, Good, HSG A
2.042	57	Weighted Average
1.288		63.08% Pervious Area
0.754		36.92% Impervious Area

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

Subcatchment 25: Southern Parking Lot



Summary for Subcatchment 30: Undetained Southern Areas

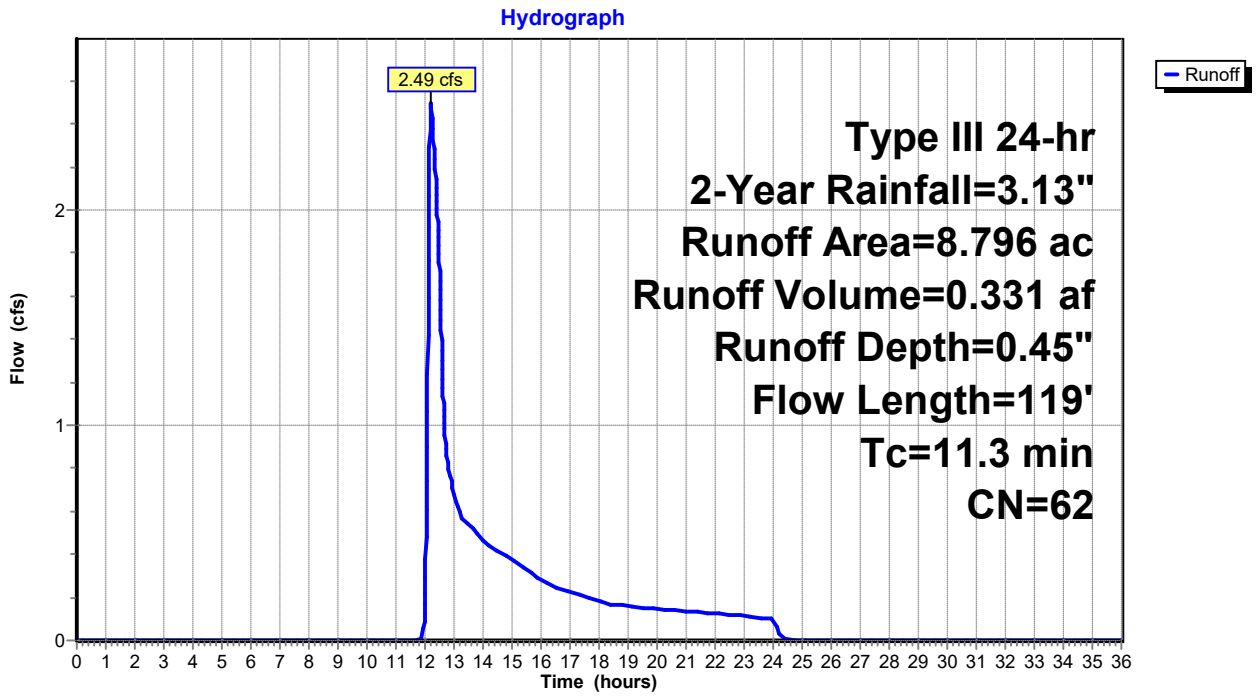
Runoff = 2.49 cfs @ 12.21 hrs, Volume= 0.331 af, Depth= 0.45"
Routed to Pond 3PE : Existing Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.13"

	Area (ac)	CN	Description
	6.272	68	<50% Grass cover, Poor, HSG A
*	0.271	1	PorousWalks&Playgrounds, Good, HSG A
	0.082	76	Gravel roads, HSG A
	0.151	98	Paved parking, HSG A
	0.025	98	Roofs, HSG A
	0.067	98	Unconnected roofs, HSG A
	0.525	89	Urban commercial, 85% imp, HSG A
	1.403	30	Woods, Good, HSG A
	8.796	62	Weighted Average
	8.107		92.16% Pervious Area
	0.689		7.84% Impervious Area
	0.067		9.72% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0076	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
2.9	69	0.0032	0.40		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
11.3	119	Total			

Subcatchment 30: Undetained Southern Areas

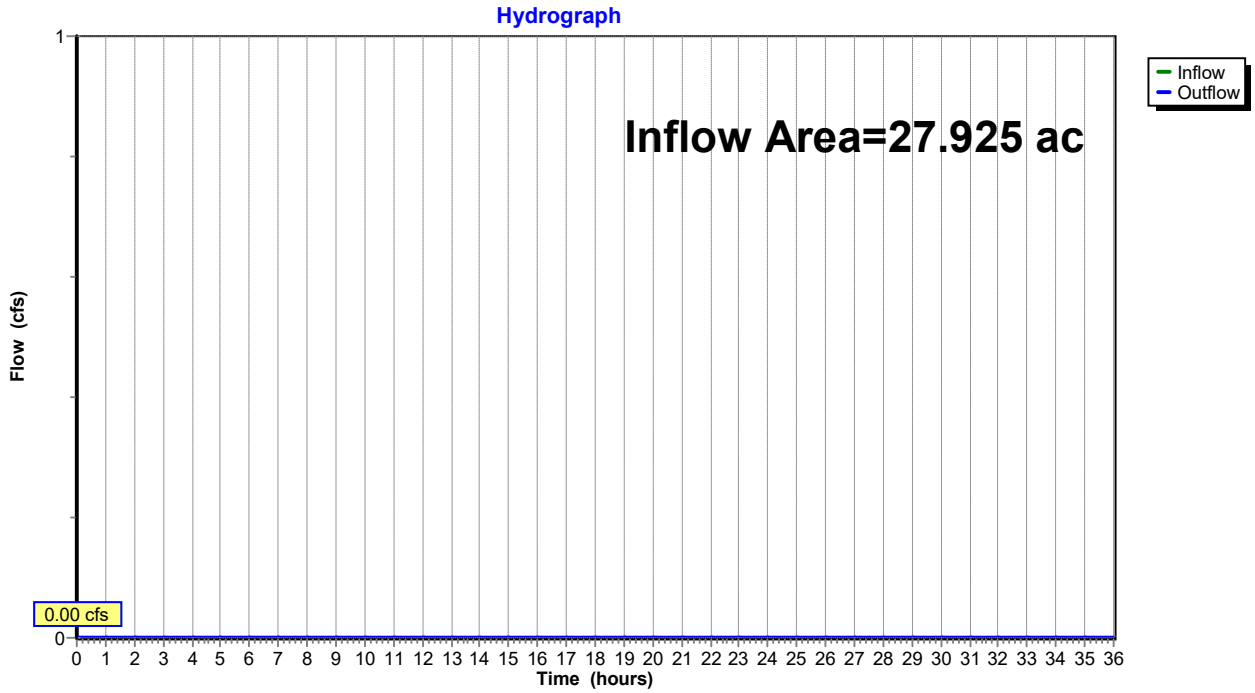


Summary for Reach DP-1: DP-1

Inflow Area = 27.925 ac, 12.26% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



Summary for Pond 1PE: Existing North Pond

Inflow Area = 27.925 ac, 12.26% Impervious, Inflow Depth = 0.23" for 2-Year event
Inflow = 3.47 cfs @ 12.44 hrs, Volume= 0.535 af
Outflow = 3.17 cfs @ 12.58 hrs, Volume= 0.535 af, Atten= 9%, Lag= 8.3 min
Discarded = 3.17 cfs @ 12.58 hrs, Volume= 0.535 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 194.85' @ 12.58 hrs Surf.Area= 16,544 sf Storage= 1,107 cf

Plug-Flow detention time= 6.7 min calculated for 0.535 af (100% of inflow)
Center-of-Mass det. time= 6.7 min (926.2 - 919.5)

Volume	Invert	Avail.Storage	Storage Description
#1	194.50'	128,718 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		128,719 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.50	63	0	0
194.75	1,643	213	213
195.00	39,556	5,150	5,363
195.25	73,196	14,094	19,457
195.50	110,604	22,975	42,432
195.75	162,562	34,146	76,578
196.00	254,556	52,140	128,718

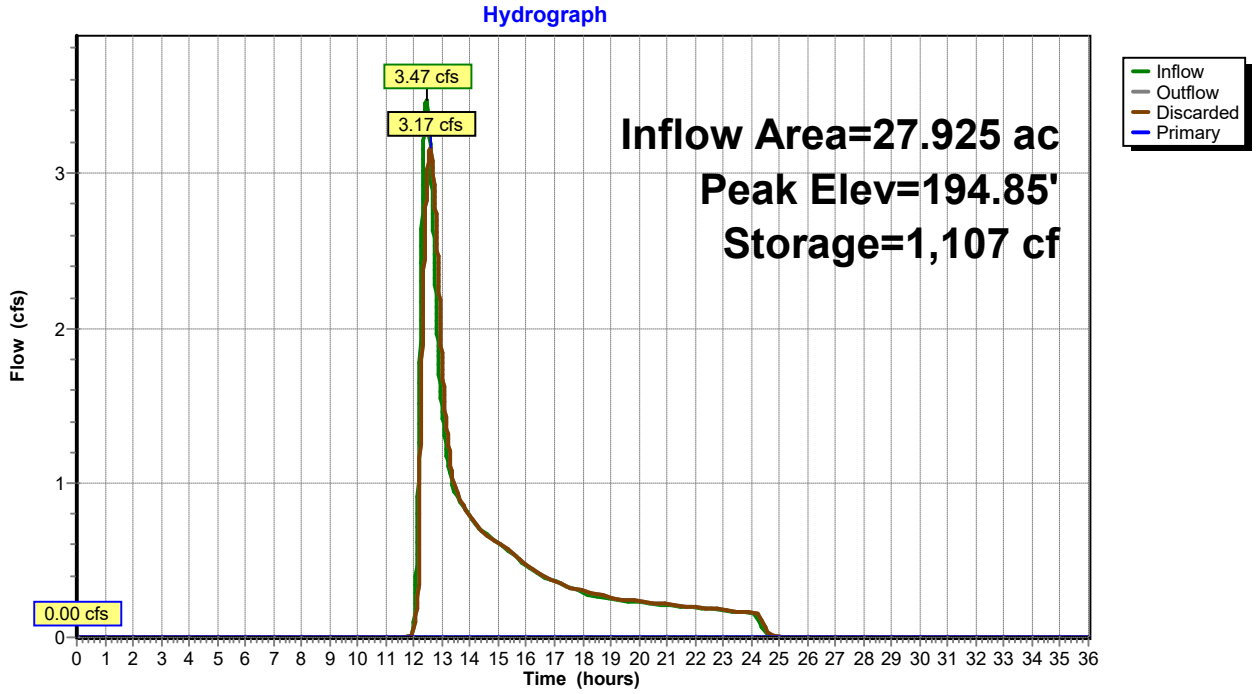
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.00'	**60.0' long x 30.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

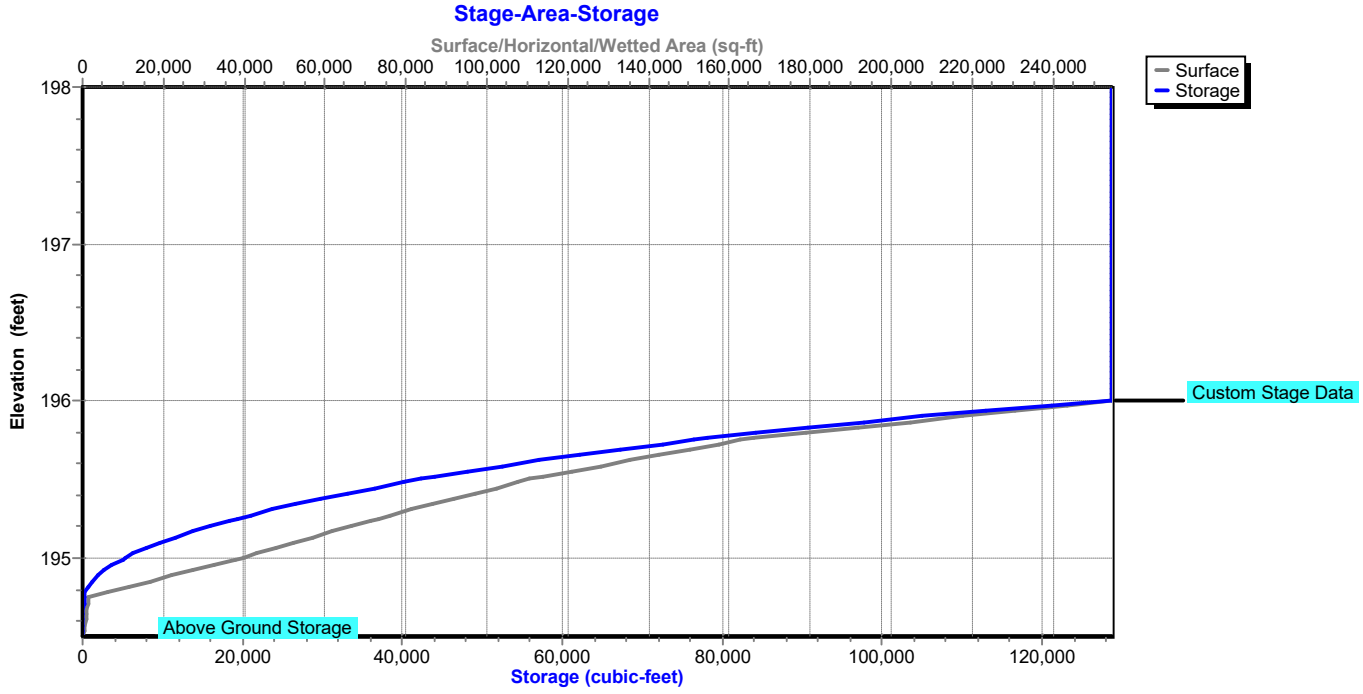
Discarded OutFlow Max=3.17 cfs @ 12.58 hrs HW=194.85' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 3.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1PE: Existing North Pond



Pond 1PE: Existing North Pond



Summary for Pond 3PE: Existing Southern Pond

Inflow Area = 13.563 ac, 15.62% Impervious, Inflow Depth = 0.29" for 2-Year event
Inflow = 2.49 cfs @ 12.21 hrs, Volume= 0.331 af
Outflow = 1.76 cfs @ 12.49 hrs, Volume= 0.331 af, Atten= 30%, Lag= 16.7 min
Discarded = 1.76 cfs @ 12.49 hrs, Volume= 0.331 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 194.92' @ 12.49 hrs Surf.Area= 9,169 sf Storage= 1,344 cf

Plug-Flow detention time= 8.7 min calculated for 0.331 af (100% of inflow)
Center-of-Mass det. time= 8.7 min (925.8 - 917.1)

Volume	Invert	Avail.Storage	Storage Description
#1	194.50'	118,206 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		118,207 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.50	227	0	0
194.75	2,564	349	349
195.00	12,299	1,858	2,207
195.25	89,207	12,688	14,895
195.50	118,288	25,937	40,832
195.75	143,996	32,786	73,617
196.00	212,712	44,589	118,206

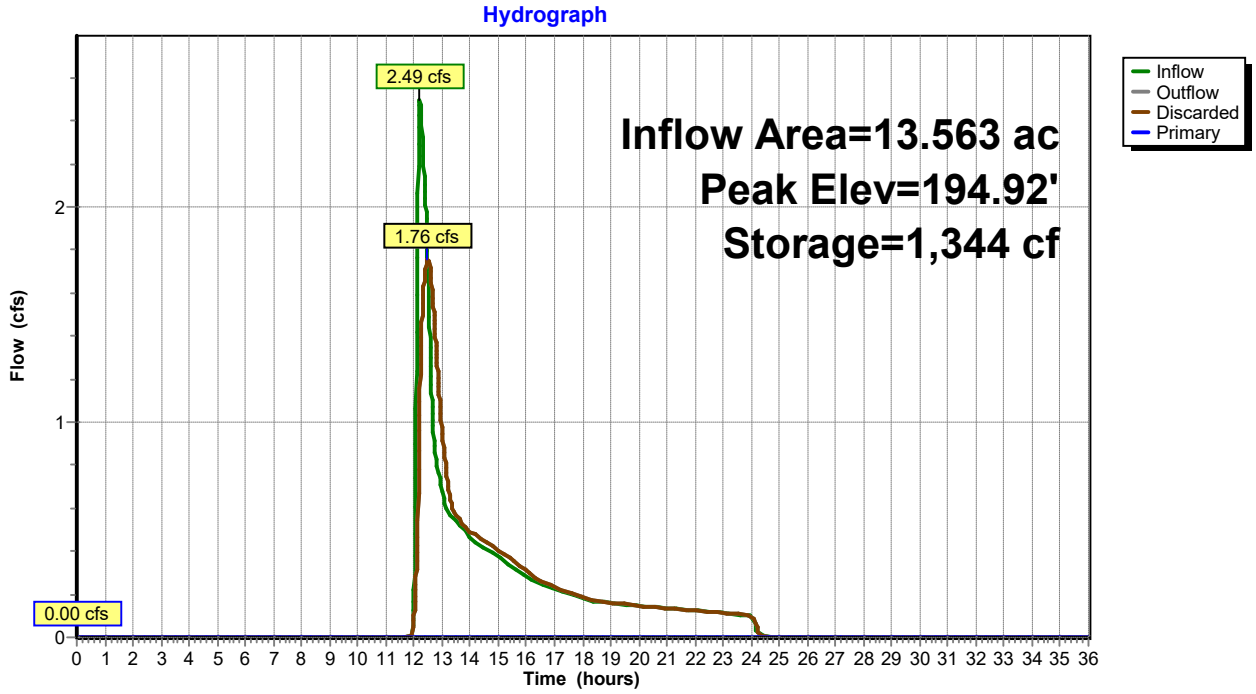
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**30.0' long x 60.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	194.50'	**8.270 in/hr Exfiltration over Surface area**

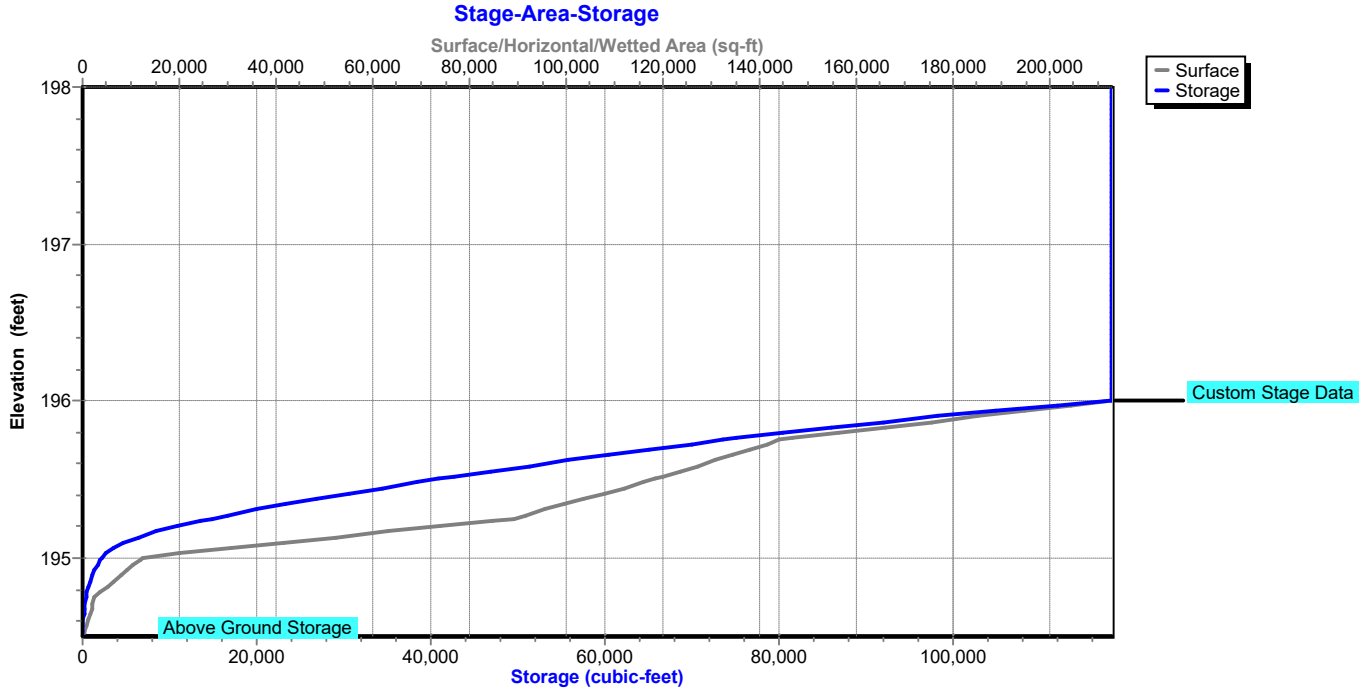
Discarded OutFlow Max=1.76 cfs @ 12.49 hrs HW=194.92' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 1.76 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3PE: Existing Southern Pond



Pond 3PE: Existing Southern Pond



Summary for Pond 21P: Northern Pond

Inflow Area = 1.154 ac, 57.94% Impervious, Inflow Depth = 1.70" for 2-Year event
Inflow = 2.30 cfs @ 12.09 hrs, Volume= 0.163 af
Outflow = 0.96 cfs @ 11.97 hrs, Volume= 0.163 af, Atten= 58%, Lag= 0.0 min
Discarded = 0.96 cfs @ 11.97 hrs, Volume= 0.163 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 195.26' @ 12.32 hrs Surf.Area= 0.115 ac Storage= 0.018 af

Plug-Flow detention time= 3.9 min calculated for 0.163 af (100% of inflow)
Center-of-Mass det. time= 3.9 min (831.0 - 827.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.052 af	**125.00'W x 40.00'L x 2.04'H Field A** 0.234 af Overall - 0.060 af Embedded = 0.174 af x 30.0% Voids
#2A	195.25'	0.060 af	**Cultec C-100HD** x 185 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 37 rows
		0.112 af	Total Available Storage

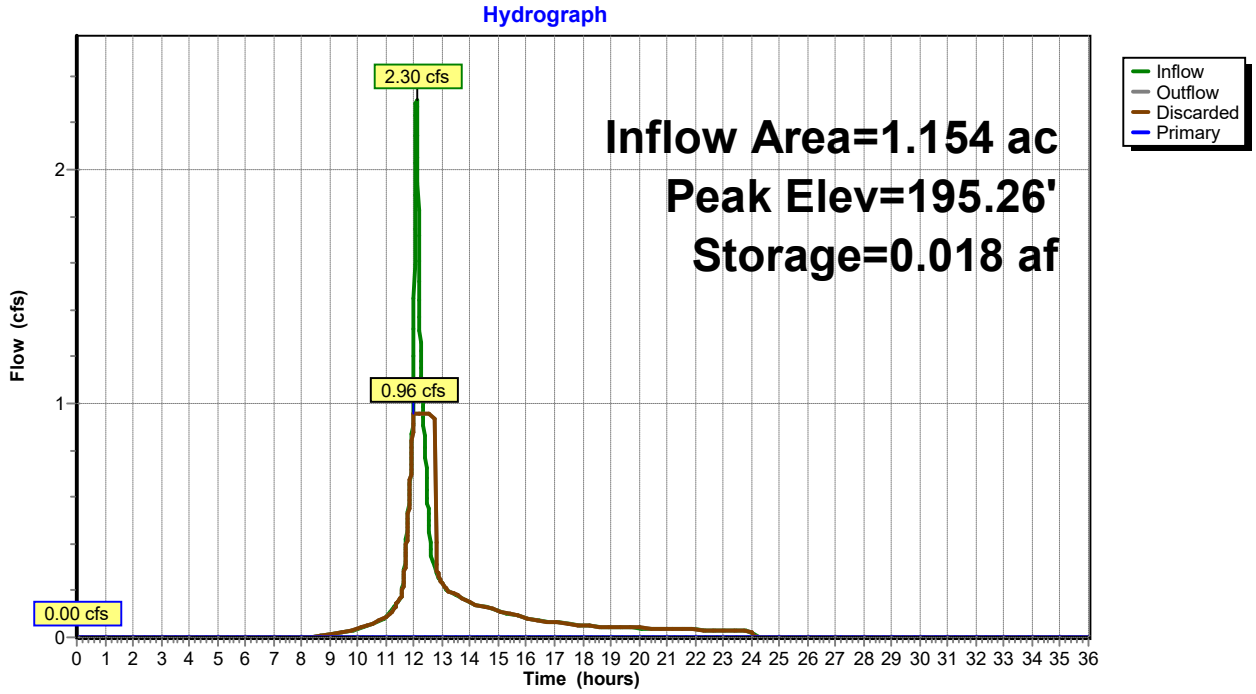
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

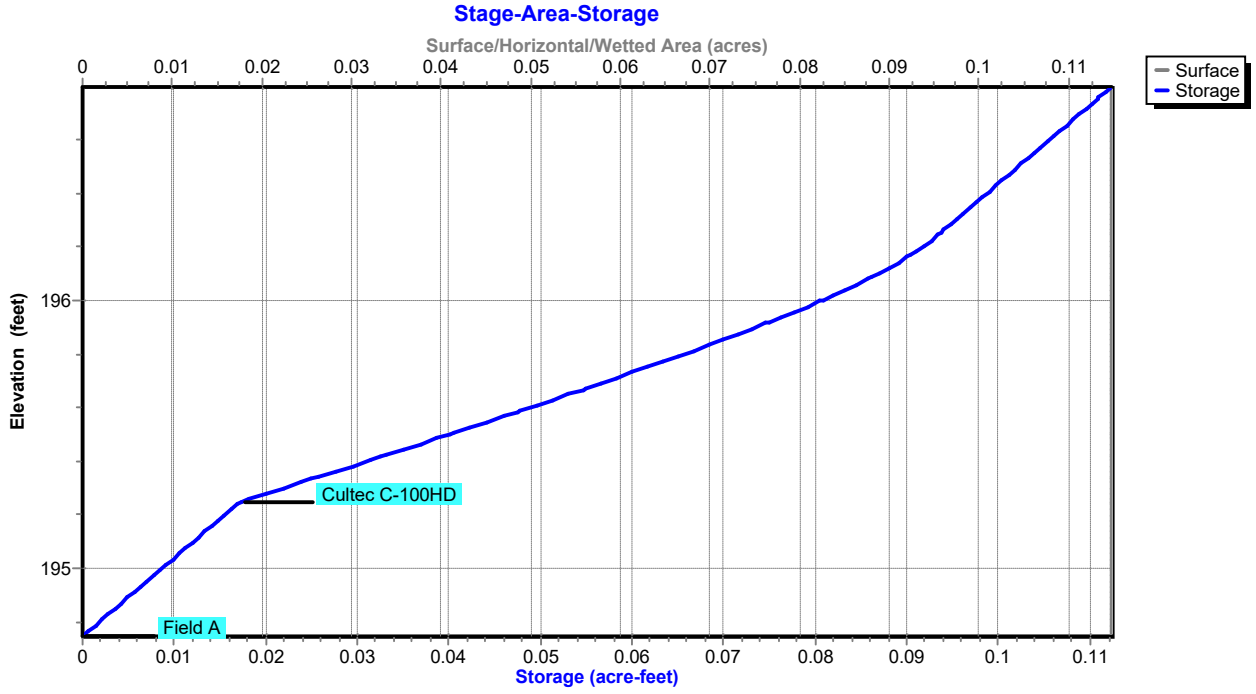
Discarded OutFlow Max=0.96 cfs @ 11.97 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 21P: Northern Pond



Pond 21P: Northern Pond



Summary for Pond 22P: N. Central Pond

Inflow Area = 1.020 ac, 40.80% Impervious, Inflow Depth = 1.35" for 2-Year event
Inflow = 1.59 cfs @ 12.09 hrs, Volume= 0.115 af
Outflow = 0.75 cfs @ 12.00 hrs, Volume= 0.115 af, Atten= 53%, Lag= 0.0 min
Discarded = 0.75 cfs @ 12.00 hrs, Volume= 0.115 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 195.14' @ 12.29 hrs Surf.Area= 0.090 ac Storage= 0.011 af

Plug-Flow detention time= 2.9 min calculated for 0.115 af (100% of inflow)
Center-of-Mass det. time= 2.9 min (846.8 - 843.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.041 af	**98.33'W x 40.00'L x 2.04'H Field A** 0.184 af Overall - 0.047 af Embedded = 0.137 af x 30.0% Voids
#2A	195.25'	0.047 af	**Cultec C-100HD** x 145 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 29 rows
		0.088 af	Total Available Storage

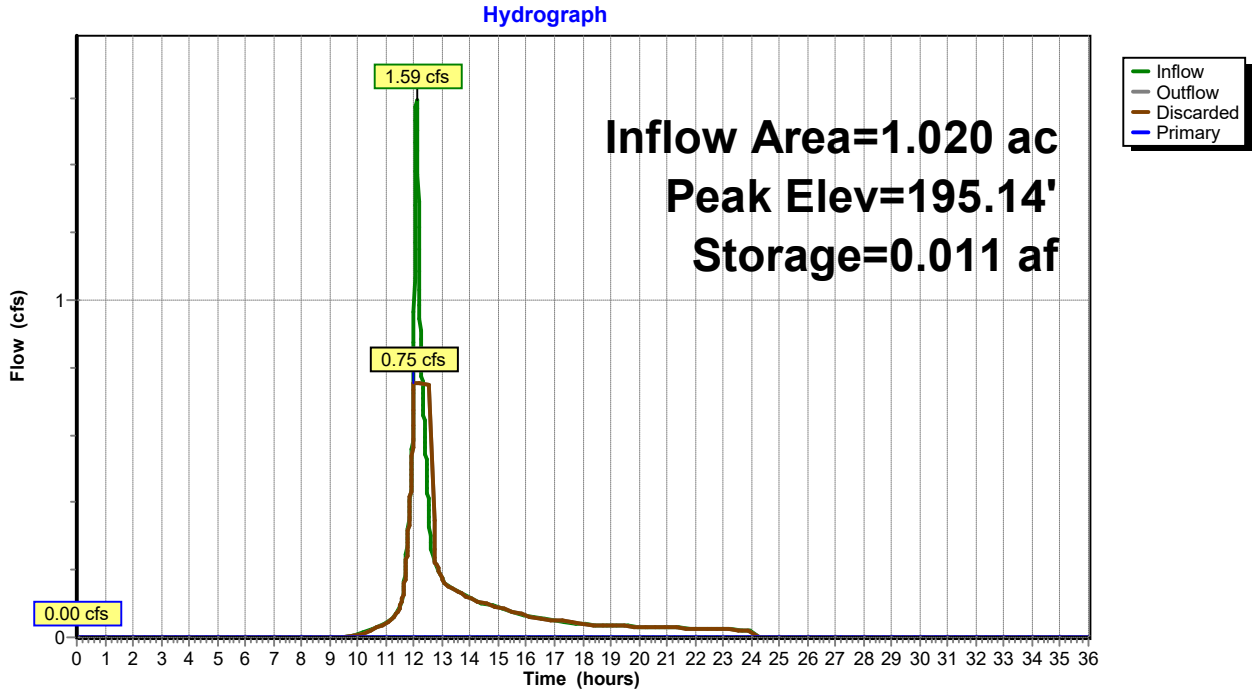
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

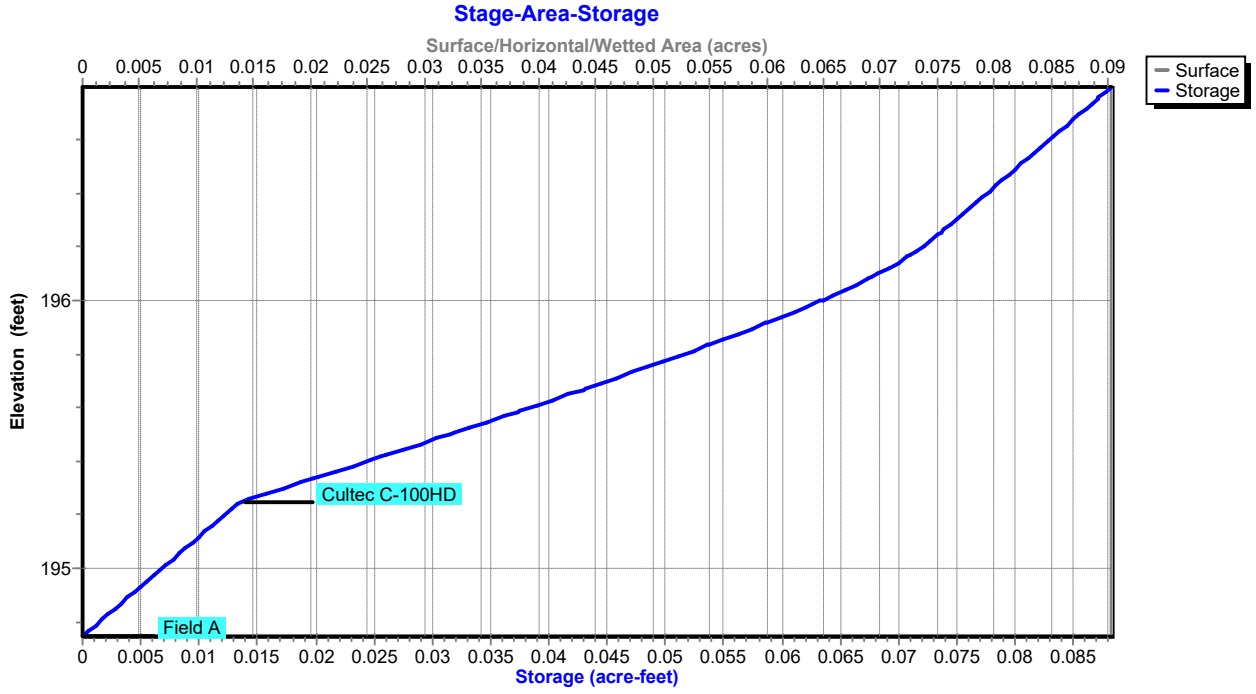
Discarded OutFlow Max=0.75 cfs @ 12.00 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 22P: N. Central Pond



Pond 22P: N. Central Pond



Summary for Pond 23P: Central Pond

Inflow Area = 2.156 ac, 21.44% Impervious, Inflow Depth = 0.18" for 2-Year event
Inflow = 0.12 cfs @ 12.40 hrs, Volume= 0.032 af
Outflow = 0.12 cfs @ 12.41 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.6 min
Discarded = 0.12 cfs @ 12.41 hrs, Volume= 0.032 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 194.76' @ 12.41 hrs Surf.Area= 0.060 ac Storage= 0.000 af

Plug-Flow detention time= 0.5 min calculated for 0.032 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (980.4 - 979.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.027 af	**65.00'W x 40.00'L x 2.04'H Field A** 0.122 af Overall - 0.031 af Embedded = 0.091 af x 30.0% Voids
#2A	195.25'	0.031 af	**Cultec C-100HD** x 95 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 19 rows
		0.058 af	Total Available Storage

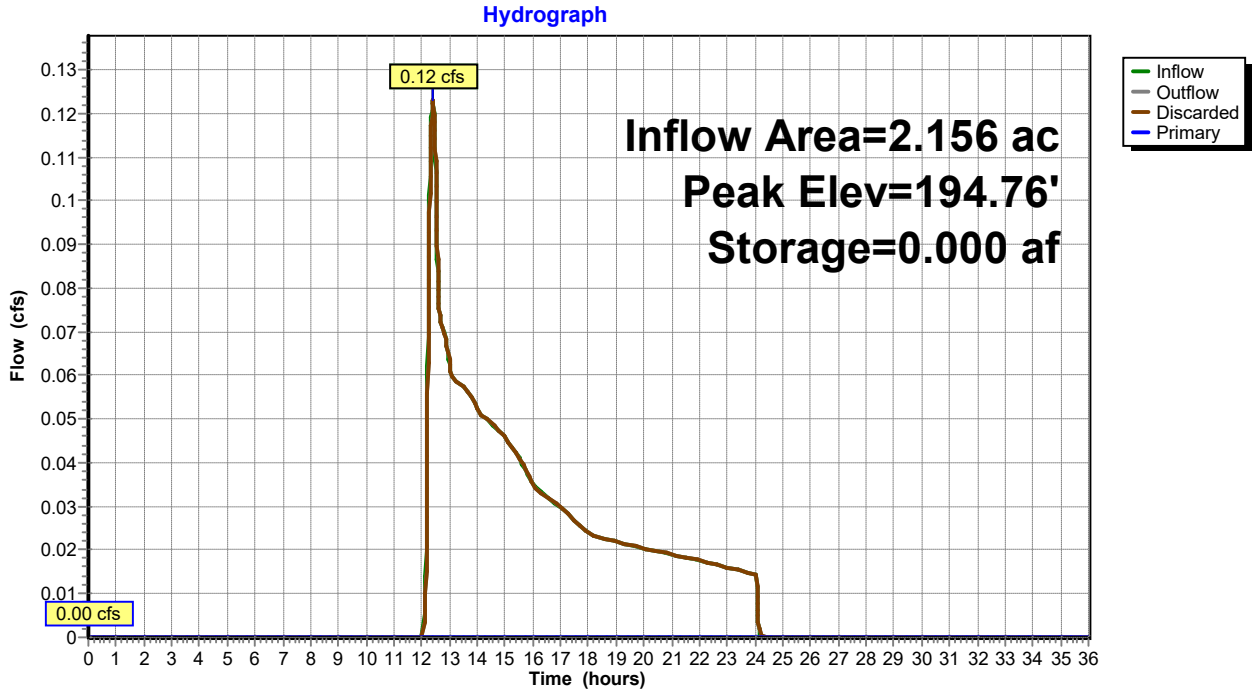
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.77'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

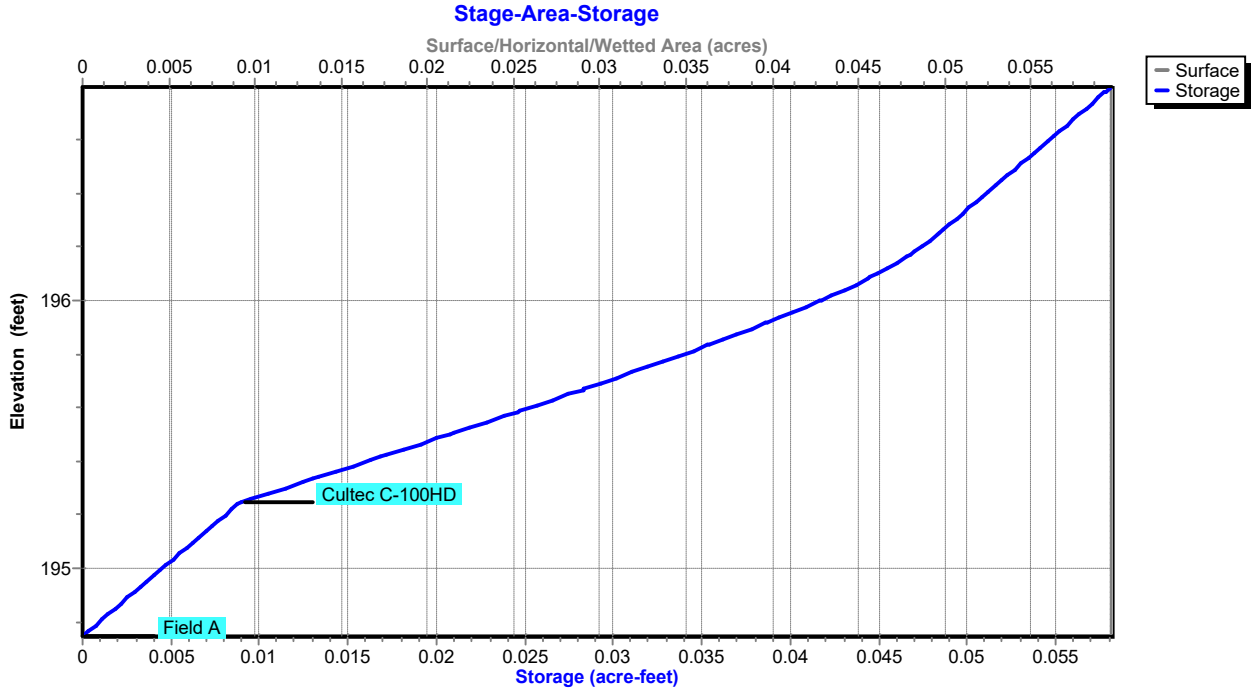
Discarded OutFlow Max=0.50 cfs @ 12.41 hrs HW=194.76' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 23P: Central Pond



Pond 23P: Central Pond



Summary for Pond 24P: S. Central Pond

Inflow Area = 0.569 ac, 37.48% Impervious, Inflow Depth = 0.35" for 2-Year event
Inflow = 0.11 cfs @ 12.14 hrs, Volume= 0.017 af
Outflow = 0.11 cfs @ 12.15 hrs, Volume= 0.017 af, Atten= 1%, Lag= 0.8 min
Discarded = 0.11 cfs @ 12.15 hrs, Volume= 0.017 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 4
Peak Elev= 194.26' @ 12.15 hrs Surf.Area= 1,021 sf Storage= 4 cf

Plug-Flow detention time= 0.7 min calculated for 0.017 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (930.4 - 929.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.25'	478 cf	**58.33'W x 17.50'L x 2.04'H Field A** 2,084 cf Overall - 491 cf Embedded = 1,594 cf x 30.0% Voids
#2A	194.75'	491 cf	**Cultec C-100HD** x 34 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 17 rows
#3	196.29'	0 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		969 cf	Total Available Storage

Storage Group A created with Chamber Wizard

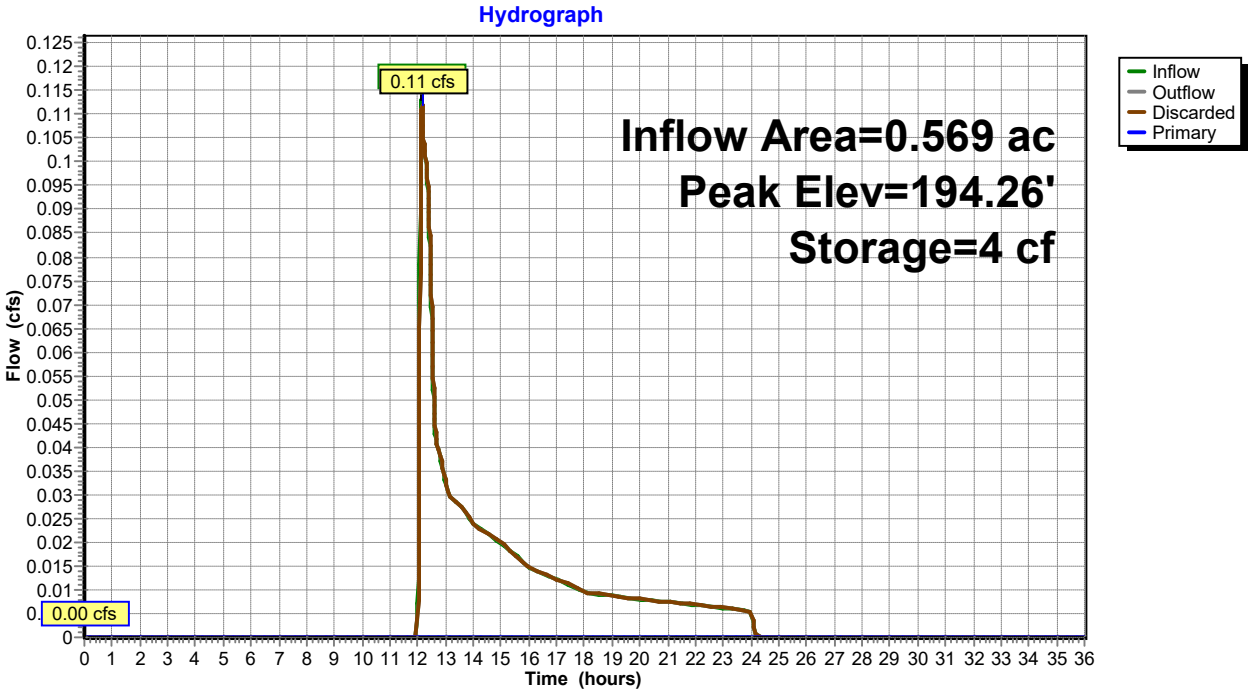
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.29	0	0	0
196.80	1	0	0

Device	Routing	Invert	Outlet Devices
#0	Primary	196.80'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

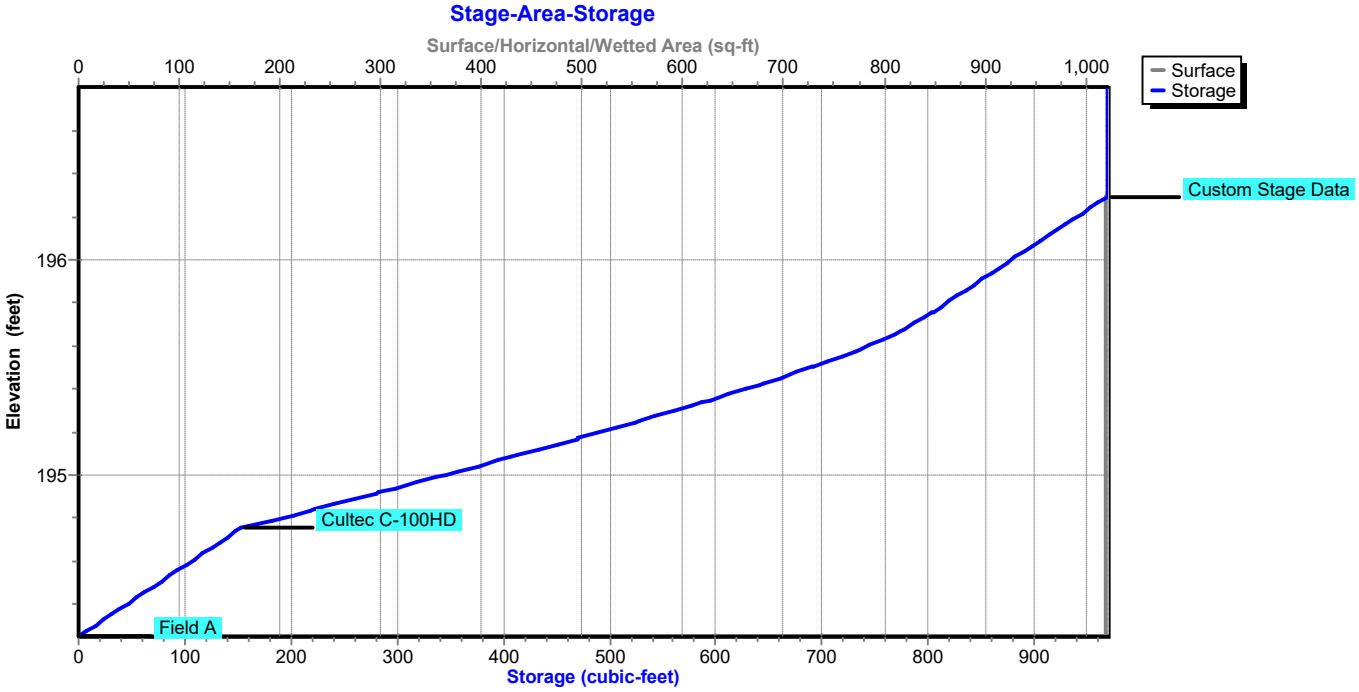
Discarded OutFlow Max=0.20 cfs @ 12.15 hrs HW=194.26' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.25' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 24P: S. Central Pond



Pond 24P: S. Central Pond



Summary for Pond 25P: Southern Pond

Inflow Area = 2.042 ac, 36.92% Impervious, Inflow Depth = 0.29" for 2-Year event
Inflow = 0.27 cfs @ 12.30 hrs, Volume= 0.049 af
Outflow = 0.27 cfs @ 12.31 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.7 min
Discarded = 0.27 cfs @ 12.31 hrs, Volume= 0.049 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 193.26' @ 12.31 hrs Surf.Area= 3,267 sf Storage= 13 cf

Plug-Flow detention time= 0.8 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (944.5 - 943.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.25'	1,492 cf	**81.67'W x 40.00'L x 2.04'H Field A** 6,669 cf Overall - 1,698 cf Embedded = 4,972 cf x 30.0% Voids
#2A	193.75'	1,698 cf	**Cultec C-100HD** x 120 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 24 rows
#3	195.29'	0 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3,190 cf	Total Available Storage

Storage Group A created with Chamber Wizard

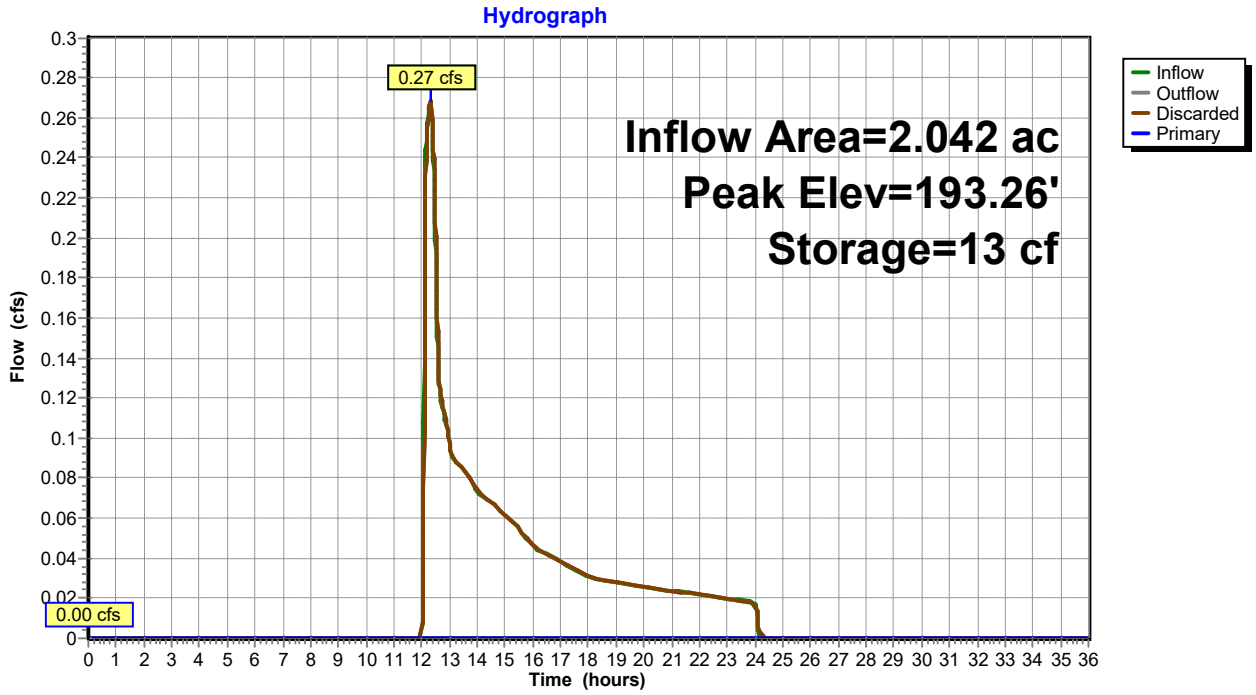
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.29	0	0	0
196.25	1	0	0

Device	Routing	Invert	Outlet Devices
#0	Primary	196.25'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	193.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	195.37'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#3	Primary	195.54'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#4	Primary	196.22'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#5	Primary	196.22'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

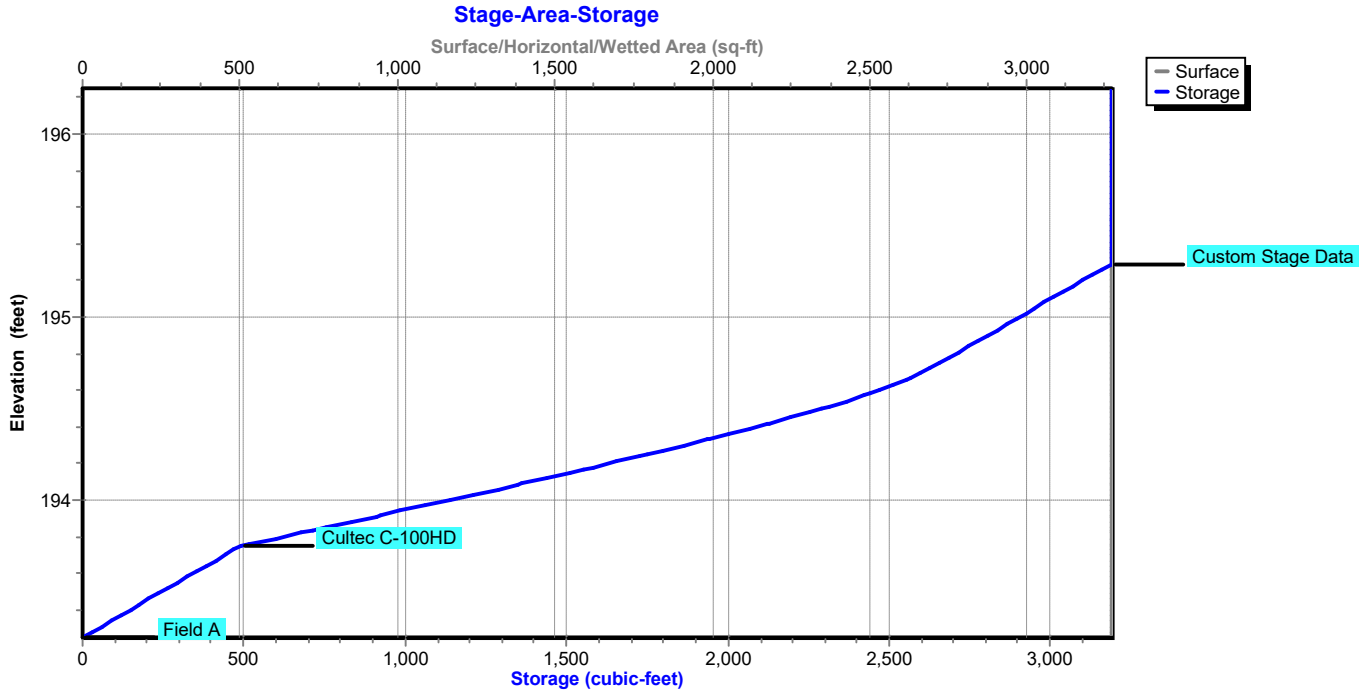
Discarded OutFlow Max=0.63 cfs @ 12.31 hrs HW=193.26' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.63 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=193.25' (Free Discharge)
├─**2=Orifice/Grate** (Controls 0.00 cfs)
├─**3=Orifice/Grate** (Controls 0.00 cfs)
├─**4=Orifice/Grate** (Controls 0.00 cfs)
└─**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 25P: Southern Pond



Pond 25P: Southern Pond



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10: Undetained Northern Runoff Area=12.188 ac 1.80% Impervious Runoff Depth=1.47"
Flow Length=528' Tc=24.7 min CN=64 Runoff=12.07 cfs 1.494 af

Subcatchment 21: North Parking Lot Runoff Area=1.154 ac 57.94% Impervious Runoff Depth=3.21"
Tc=6.0 min CN=85 Runoff=4.31 cfs 0.309 af

Subcatchment 22: N. Central Parking Runoff Area=1.020 ac 40.80% Impervious Runoff Depth=2.75"
Tc=6.0 min CN=80 Runoff=3.28 cfs 0.233 af

Subcatchment 23: Central Parking Lot Runoff Area=2.156 ac 21.44% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=53 Runoff=1.41 cfs 0.141 af

Subcatchment 24: S. Central Parking Runoff Area=0.569 ac 37.48% Impervious Runoff Depth=1.14"
Tc=6.0 min CN=59 Runoff=0.66 cfs 0.054 af

Subcatchment 25: Southern Parking Lot Runoff Area=2.042 ac 36.92% Impervious Runoff Depth=1.02"
Tc=6.0 min CN=57 Runoff=2.01 cfs 0.173 af

Subcatchment 30: Undetained Southern Runoff Area=8.796 ac 7.84% Impervious Runoff Depth=1.33"
Flow Length=119' Tc=11.3 min CN=62 Runoff=10.44 cfs 0.978 af

Reach DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1PE: Existing North Pond Peak Elev=195.04' Storage=7,224 cf Inflow=12.07 cfs 1.494 af
Discarded=8.70 cfs 1.494 af Primary=0.00 cfs 0.000 af Outflow=8.70 cfs 1.494 af

Pond 3PE: Existing Southern Pond Peak Elev=195.09' Storage=4,624 cf Inflow=10.44 cfs 0.978 af
Discarded=7.75 cfs 0.978 af Primary=0.00 cfs 0.000 af Outflow=7.75 cfs 0.978 af

Pond 21P: Northern Pond Peak Elev=195.87' Storage=0.071 af Inflow=4.31 cfs 0.309 af
Discarded=0.96 cfs 0.309 af Primary=0.00 cfs 0.000 af Outflow=0.96 cfs 0.309 af

Pond 22P: N. Central Pond Peak Elev=195.82' Storage=0.053 af Inflow=3.28 cfs 0.233 af
Discarded=0.75 cfs 0.233 af Primary=0.00 cfs 0.000 af Outflow=0.75 cfs 0.233 af

Pond 23P: Central Pond Peak Elev=195.47' Storage=0.019 af Inflow=1.41 cfs 0.141 af
Discarded=0.50 cfs 0.141 af Primary=0.00 cfs 0.000 af Outflow=0.50 cfs 0.141 af

Pond 24P: S. Central Pond Peak Elev=195.08' Storage=405 cf Inflow=0.66 cfs 0.054 af
Discarded=0.20 cfs 0.054 af Primary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.054 af

Pond 25P: Southern Pond Peak Elev=194.03' Storage=1,224 cf Inflow=2.01 cfs 0.173 af
Discarded=0.63 cfs 0.173 af Primary=0.00 cfs 0.000 af Outflow=0.63 cfs 0.173 af

Total Runoff Area = 27.925 ac Runoff Volume = 3.382 af Average Runoff Depth = 1.45"
87.74% Pervious = 24.503 ac 12.26% Impervious = 3.422 ac

Summary for Subcatchment 10: Undetained Northern Areas

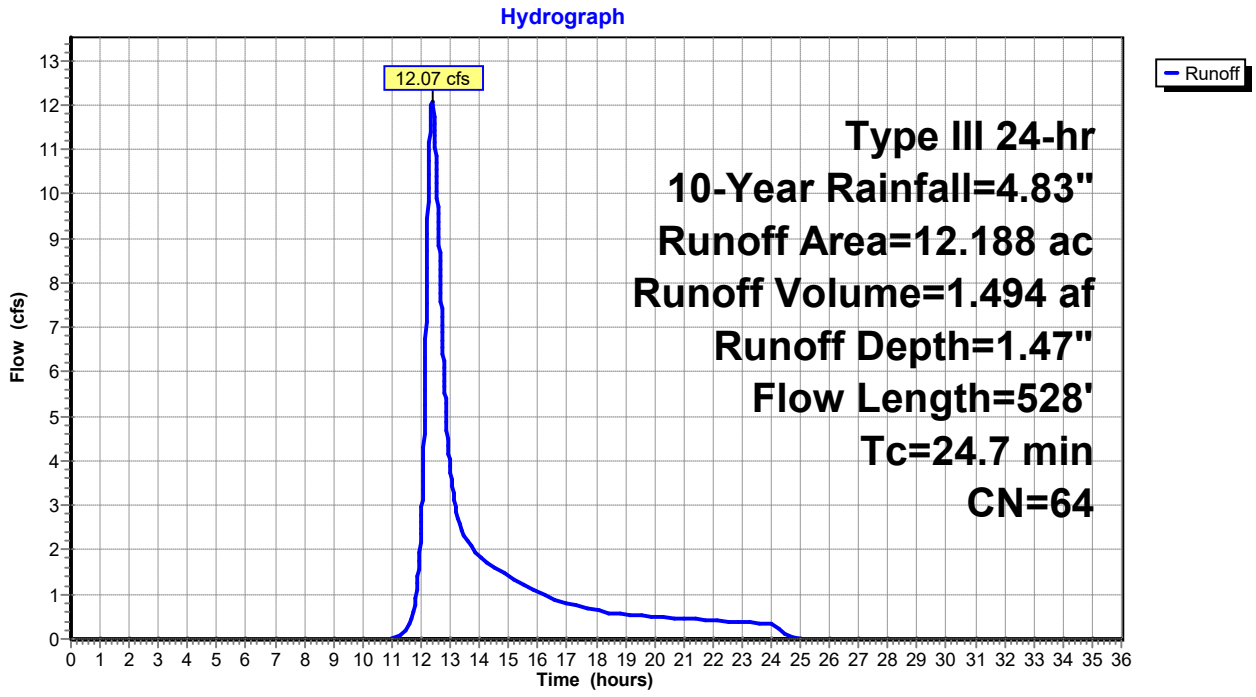
Runoff = 12.07 cfs @ 12.38 hrs, Volume= 1.494 af, Depth= 1.47"
Routed to Pond 1PE : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

	Area (ac)	CN	Description
	10.956	68	<50% Grass cover, Poor, HSG A
*	0.408	1	Porous Walks&Playgrounds, Good, HSG A
	0.191	98	Paved parking, HSG A
	0.018	98	Roofs, HSG A
	0.010	98	Unconnected roofs, HSG A
	0.000	89	Urban commercial, 85% imp, HSG A
	0.605	30	Woods, Good, HSG A
	12.188	64	Weighted Average
	11.969		98.20% Pervious Area
	0.219		1.80% Impervious Area
	0.010		4.57% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0133	0.12		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
18.0	478	0.0040	0.44		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
24.7	528	Total			

Subcatchment 10: Undetained Northern Areas



Summary for Subcatchment 21: North Parking Lot

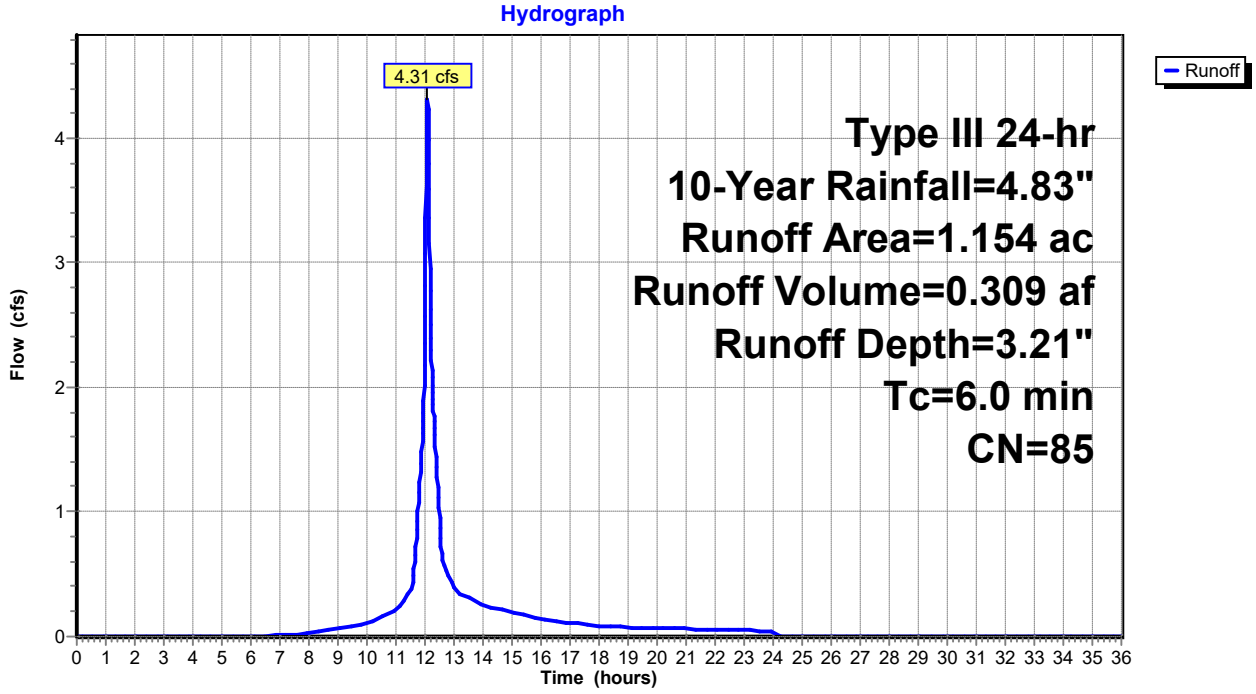
Runoff = 4.31 cfs @ 12.09 hrs, Volume= 0.309 af, Depth= 3.21"
Routed to Pond 21P : Northern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.485	68	<50% Grass cover, Poor, HSG A
0.668	98	Paved parking, HSG A
1.154	85	Weighted Average
0.485		42.06% Pervious Area
0.668		57.94% Impervious Area

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

Subcatchment 21: North Parking Lot



Summary for Subcatchment 22: N. Central Parking Lot

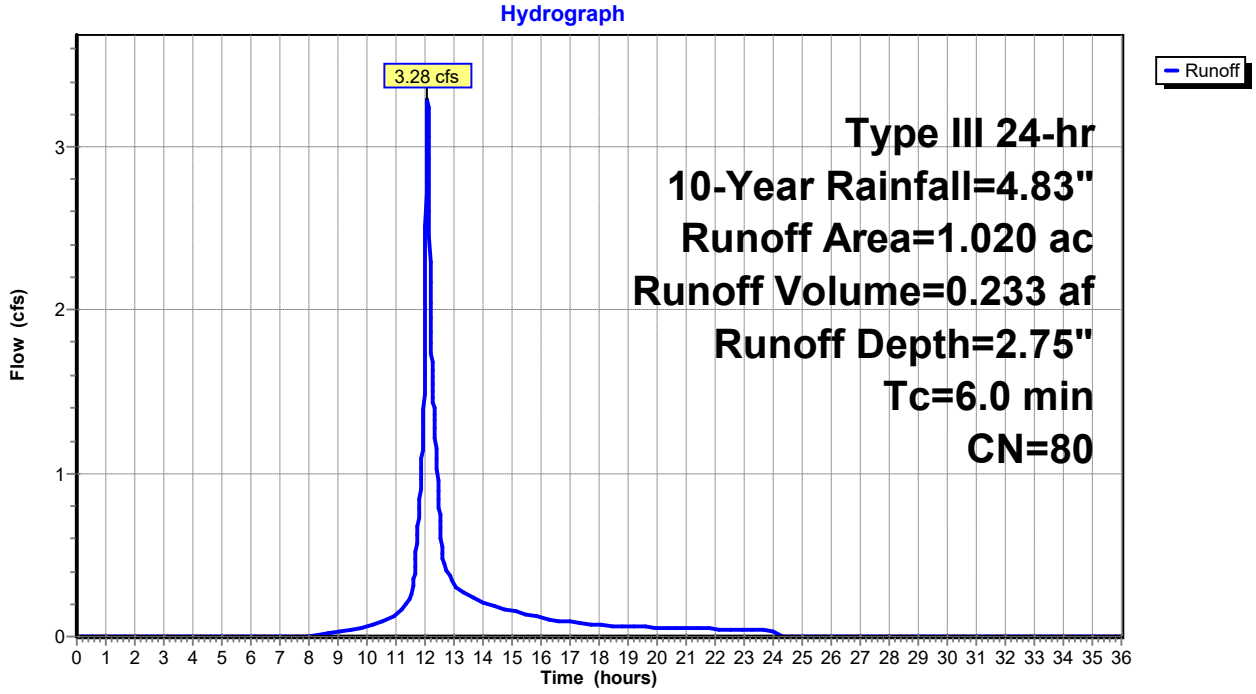
Runoff = 3.28 cfs @ 12.09 hrs, Volume= 0.233 af, Depth= 2.75"
Routed to Pond 22P : N. Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.604	68	<50% Grass cover, Poor, HSG A
0.416	98	Paved parking, HSG A
1.020	80	Weighted Average
0.604		59.20% Pervious Area
0.416		40.80% Impervious Area

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

Subcatchment 22: N. Central Parking Lot



Summary for Subcatchment 23: Central Parking Lot & Drive

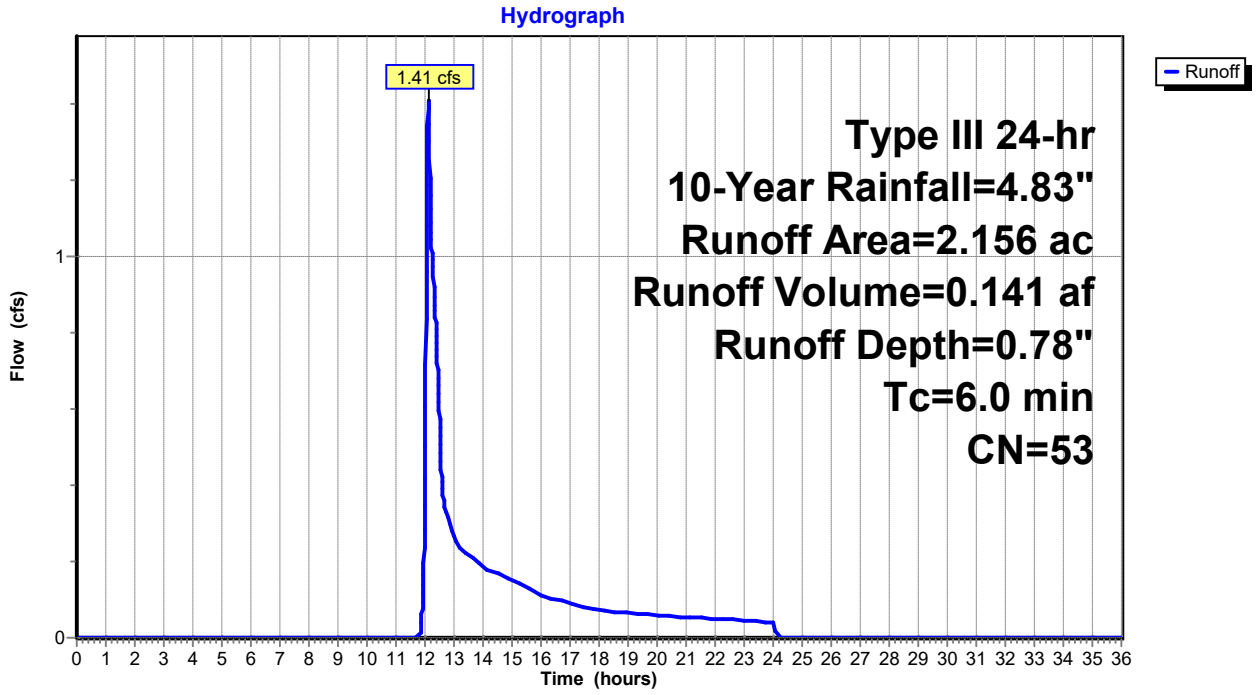
Runoff = 1.41 cfs @ 12.11 hrs, Volume= 0.141 af, Depth= 0.78"
Routed to Pond 23P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.454	68	<50% Grass cover, Poor, HSG A
0.462	98	Paved parking, HSG A
1.240	30	Woods, Good, HSG A
2.156	53	Weighted Average
1.694		78.56% Pervious Area
0.462		21.44% Impervious Area

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

Subcatchment 23: Central Parking Lot & Drive



Summary for Subcatchment 24: S. Central Parking Lot

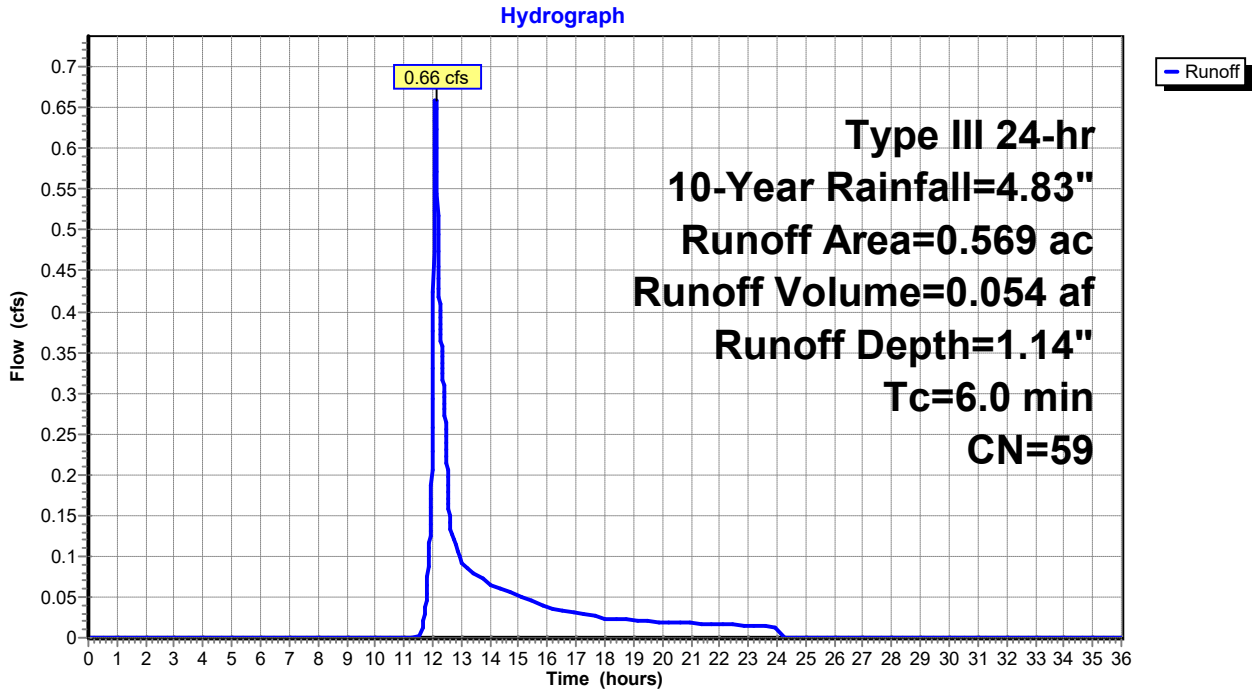
Runoff = 0.66 cfs @ 12.10 hrs, Volume= 0.054 af, Depth= 1.14"
Routed to Pond 24P : S. Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.051	68	<50% Grass cover, Poor, HSG A
0.213	98	Paved parking, HSG A
0.304	30	Woods, Good, HSG A
0.569	59	Weighted Average
0.356		62.52% Pervious Area
0.213		37.48% Impervious Area

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

Subcatchment 24: S. Central Parking Lot



Summary for Subcatchment 25: Southern Parking Lot

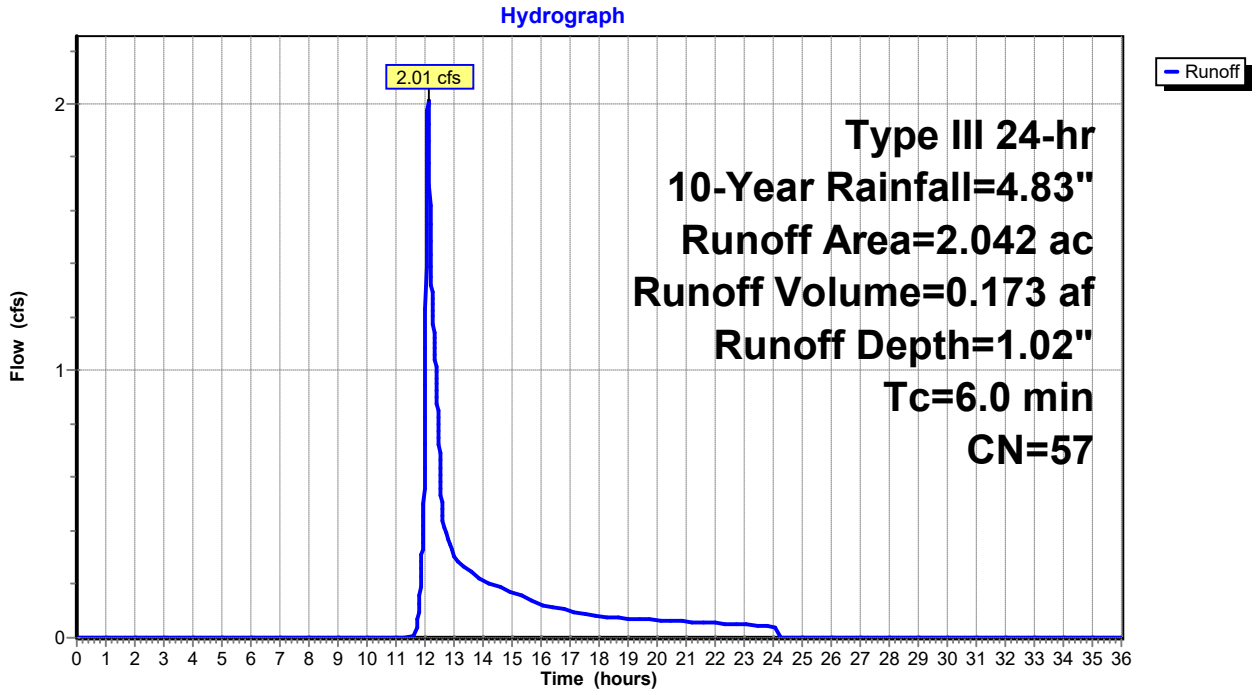
Runoff = 2.01 cfs @ 12.10 hrs, Volume= 0.173 af, Depth= 1.02"
Routed to Pond 25P : Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

Area (ac)	CN	Description
0.097	68	<50% Grass cover, Poor, HSG A
0.754	98	Paved parking, HSG A
1.191	30	Woods, Good, HSG A
2.042	57	Weighted Average
1.288		63.08% Pervious Area
0.754		36.92% Impervious Area

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

Subcatchment 25: Southern Parking Lot



Summary for Subcatchment 30: Undetained Southern Areas

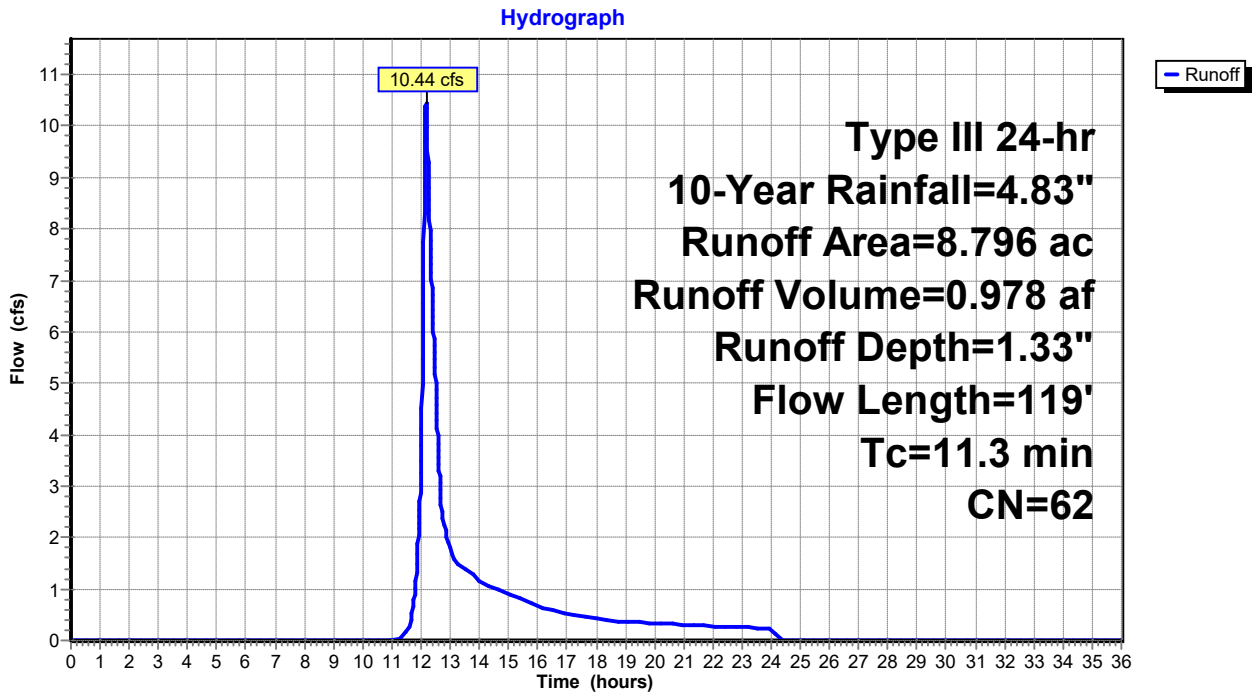
Runoff = 10.44 cfs @ 12.17 hrs, Volume= 0.978 af, Depth= 1.33"
Routed to Pond 3PE : Existing Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.83"

	Area (ac)	CN	Description
	6.272	68	<50% Grass cover, Poor, HSG A
*	0.271	1	PorousWalks&Playgrounds, Good, HSG A
	0.082	76	Gravel roads, HSG A
	0.151	98	Paved parking, HSG A
	0.025	98	Roofs, HSG A
	0.067	98	Unconnected roofs, HSG A
	0.525	89	Urban commercial, 85% imp, HSG A
	1.403	30	Woods, Good, HSG A
	8.796	62	Weighted Average
	8.107		92.16% Pervious Area
	0.689		7.84% Impervious Area
	0.067		9.72% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0076	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
2.9	69	0.0032	0.40		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
11.3	119	Total			

Subcatchment 30: Undetained Southern Areas

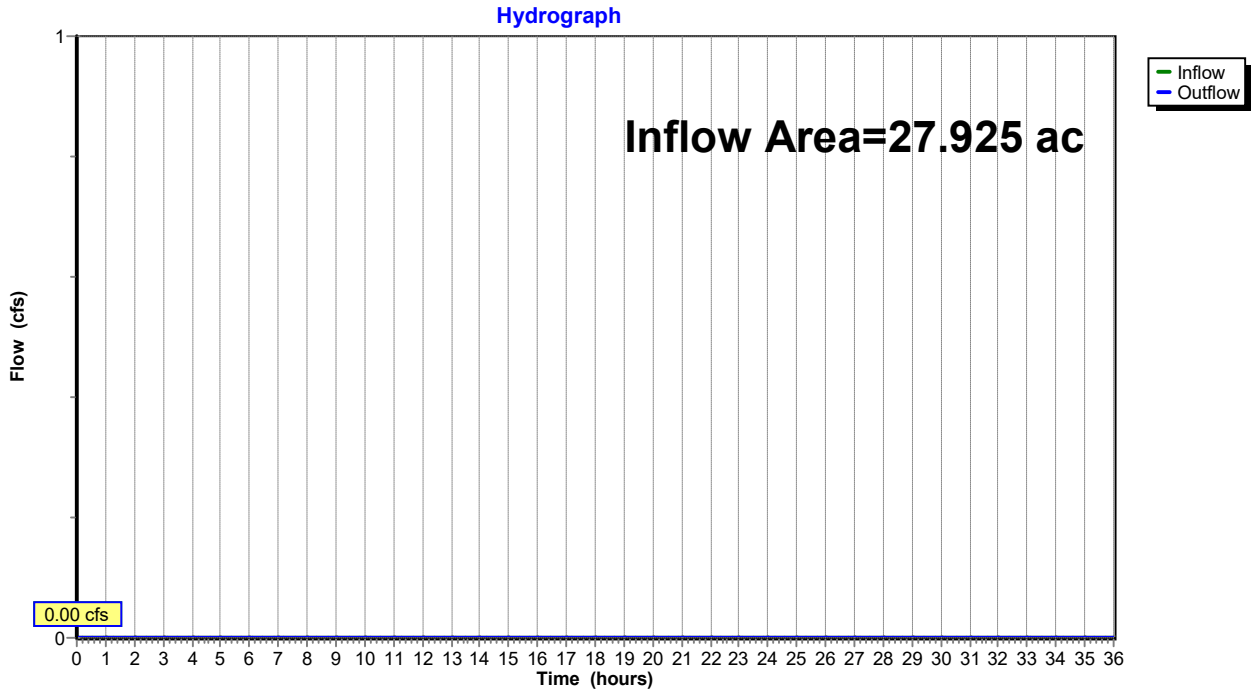


Summary for Reach DP-1: DP-1

Inflow Area = 27.925 ac, 12.26% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



Summary for Pond 1PE: Existing North Pond

Inflow Area = 27.925 ac, 12.26% Impervious, Inflow Depth = 0.64" for 10-Year event
Inflow = 12.07 cfs @ 12.38 hrs, Volume= 1.494 af
Outflow = 8.70 cfs @ 12.63 hrs, Volume= 1.494 af, Atten= 28%, Lag= 15.0 min
Discarded = 8.70 cfs @ 12.63 hrs, Volume= 1.494 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.04' @ 12.63 hrs Surf.Area= 45,446 sf Storage= 7,224 cf

Plug-Flow detention time= 8.5 min calculated for 1.494 af (100% of inflow)
Center-of-Mass det. time= 8.5 min (891.8 - 883.2)

Volume	Invert	Avail.Storage	Storage Description
#1	194.50'	128,718 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		128,719 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.50	63	0	0
194.75	1,643	213	213
195.00	39,556	5,150	5,363
195.25	73,196	14,094	19,457
195.50	110,604	22,975	42,432
195.75	162,562	34,146	76,578
196.00	254,556	52,140	128,718

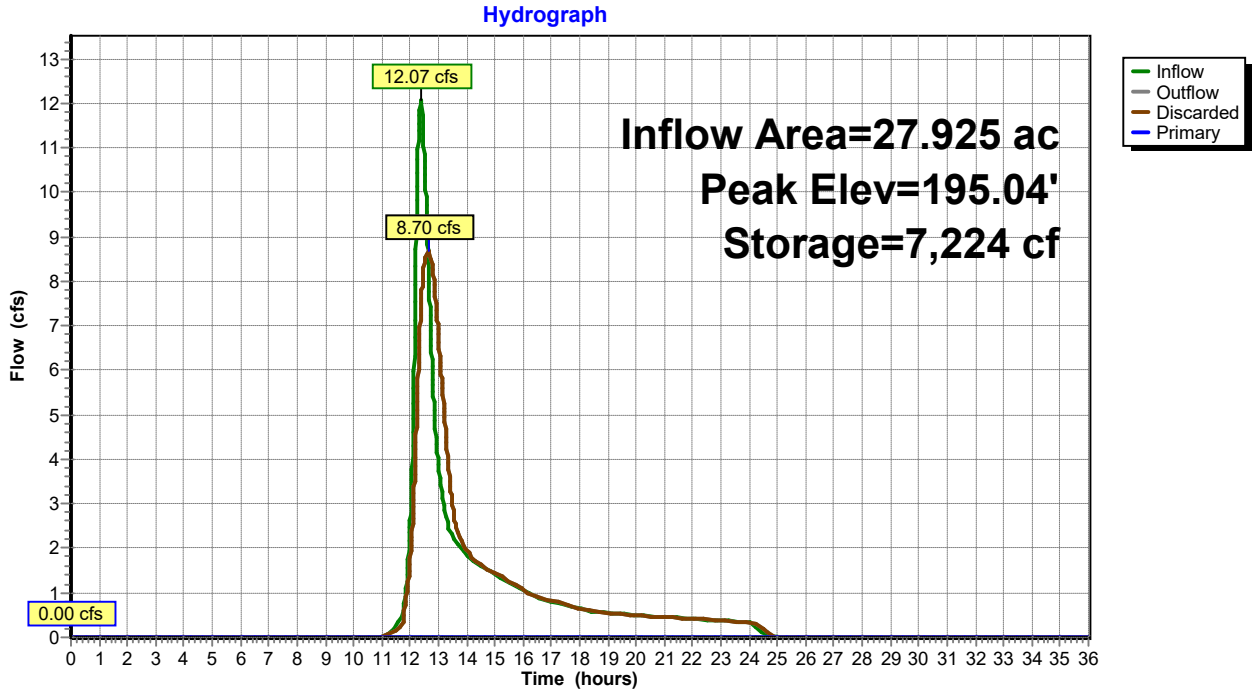
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.00'	**60.0' long x 30.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

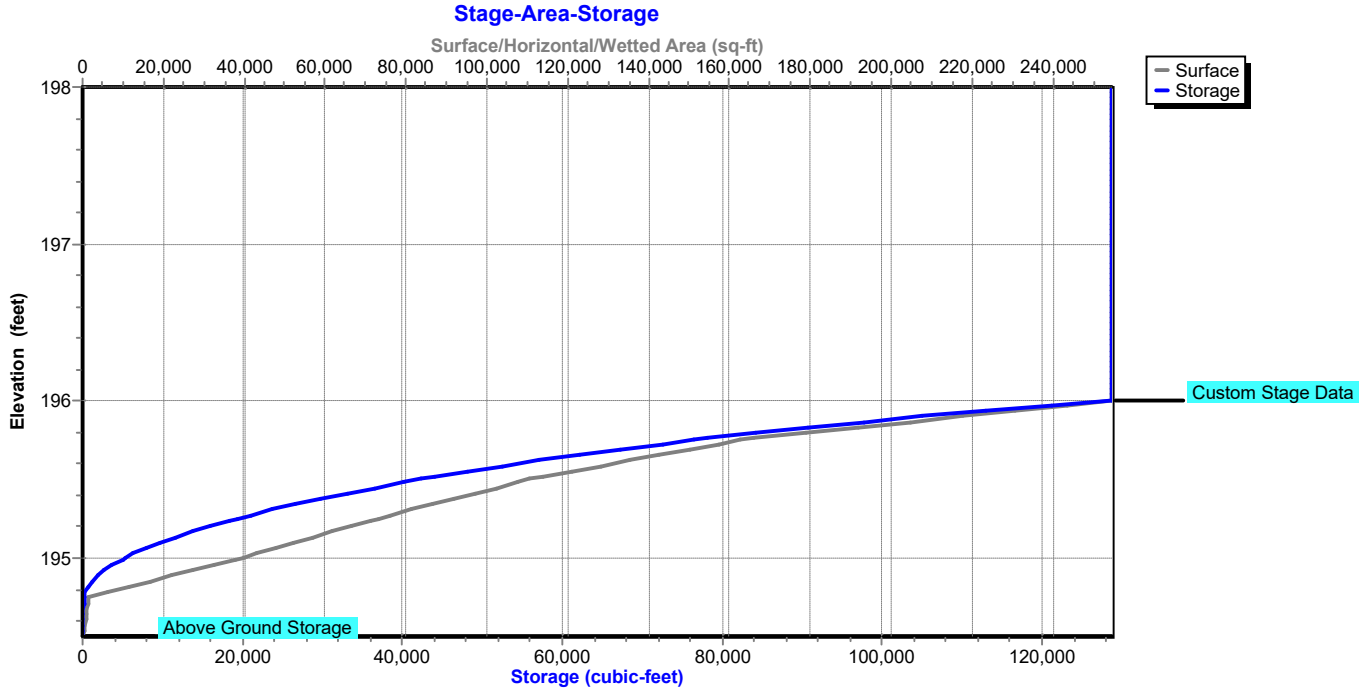
Discarded OutFlow Max=8.70 cfs @ 12.63 hrs HW=195.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 8.70 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1PE: Existing North Pond



Pond 1PE: Existing North Pond



Summary for Pond 3PE: Existing Southern Pond

Inflow Area = 13.563 ac, 15.62% Impervious, Inflow Depth = 0.87" for 10-Year event
Inflow = 10.44 cfs @ 12.17 hrs, Volume= 0.978 af
Outflow = 7.75 cfs @ 12.31 hrs, Volume= 0.978 af, Atten= 26%, Lag= 8.5 min
Discarded = 7.75 cfs @ 12.31 hrs, Volume= 0.978 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.09' @ 12.31 hrs Surf.Area= 40,479 sf Storage= 4,624 cf

Plug-Flow detention time= 10.6 min calculated for 0.978 af (100% of inflow)
Center-of-Mass det. time= 10.6 min (887.3 - 876.7)

Volume	Invert	Avail.Storage	Storage Description
#1	194.50'	118,206 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		118,207 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.50	227	0	0
194.75	2,564	349	349
195.00	12,299	1,858	2,207
195.25	89,207	12,688	14,895
195.50	118,288	25,937	40,832
195.75	143,996	32,786	73,617
196.00	212,712	44,589	118,206

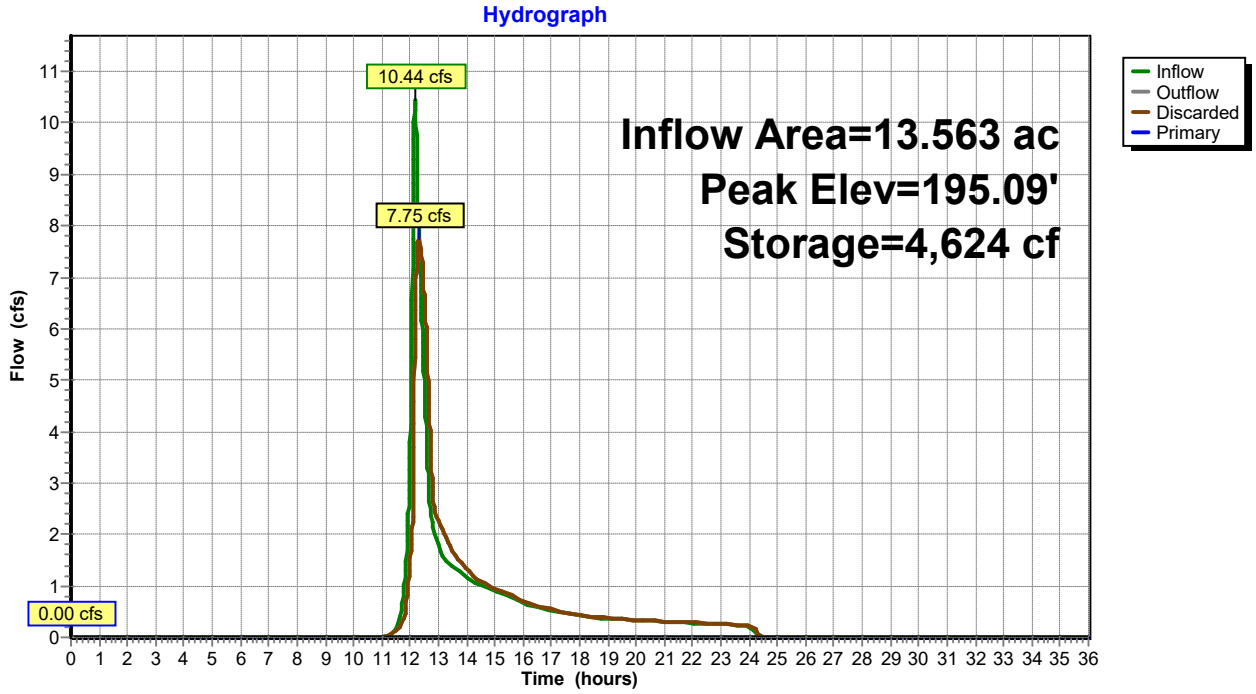
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**30.0' long x 60.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	194.50'	**8.270 in/hr Exfiltration over Surface area**

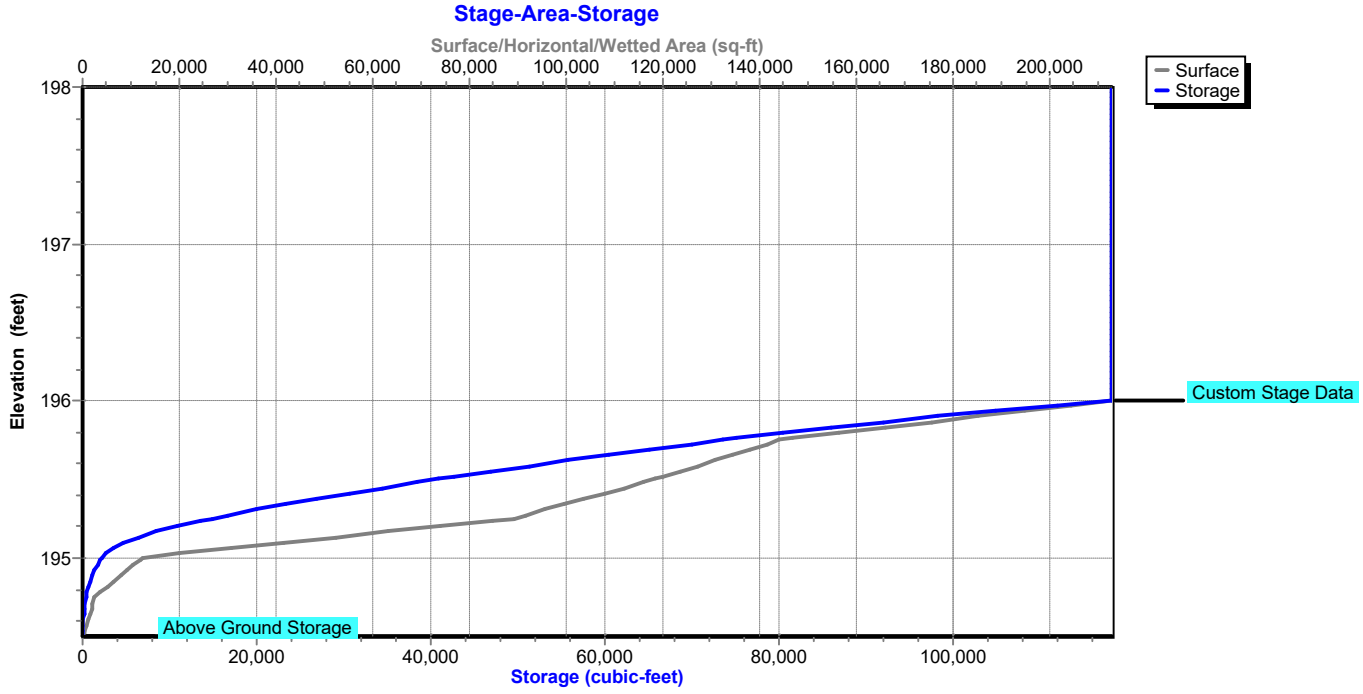
Discarded OutFlow Max=7.75 cfs @ 12.31 hrs HW=195.09' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 7.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3PE: Existing Southern Pond



Pond 3PE: Existing Southern Pond



Summary for Pond 21P: Northern Pond

Inflow Area = 1.154 ac, 57.94% Impervious, Inflow Depth = 3.21" for 10-Year event
Inflow = 4.31 cfs @ 12.09 hrs, Volume= 0.309 af
Outflow = 0.96 cfs @ 11.77 hrs, Volume= 0.309 af, Atten= 78%, Lag= 0.0 min
Discarded = 0.96 cfs @ 11.77 hrs, Volume= 0.309 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 195.87' @ 12.50 hrs Surf.Area= 0.115 ac Storage= 0.071 af

Plug-Flow detention time= 17.3 min calculated for 0.309 af (100% of inflow)
Center-of-Mass det. time= 17.3 min (826.2 - 808.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.052 af	**125.00'W x 40.00'L x 2.04'H Field A** 0.234 af Overall - 0.060 af Embedded = 0.174 af x 30.0% Voids
#2A	195.25'	0.060 af	**Cultec C-100HD** x 185 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 37 rows
		0.112 af	Total Available Storage

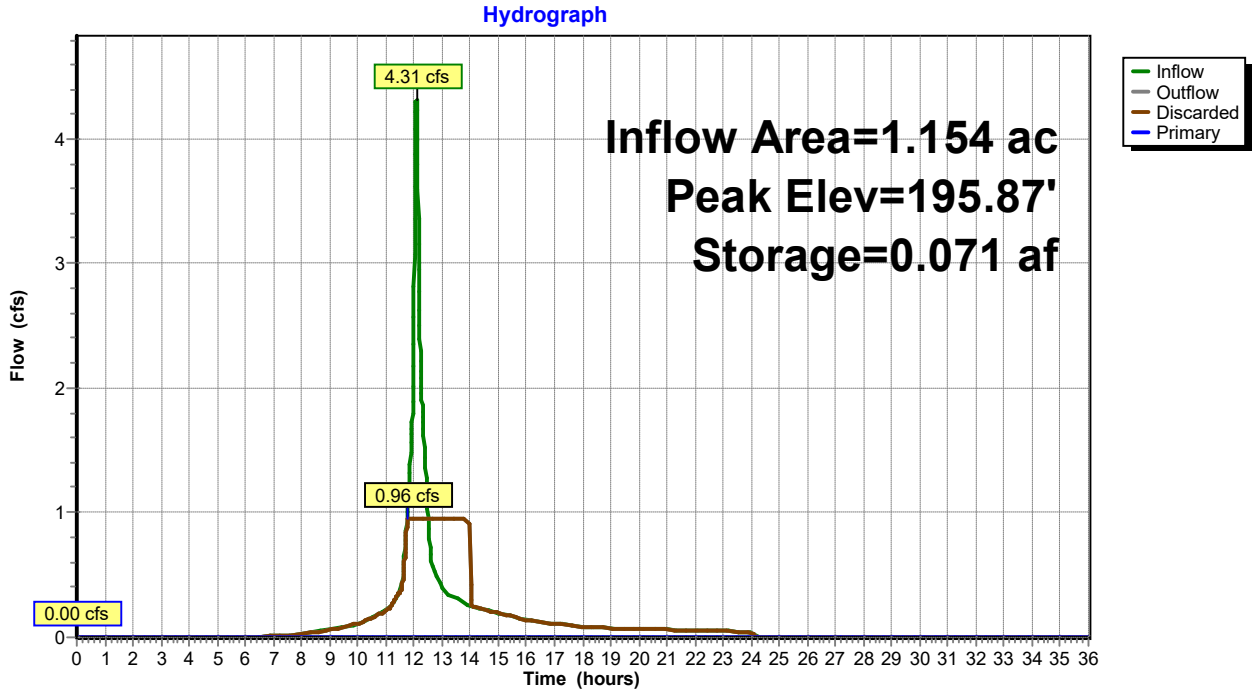
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

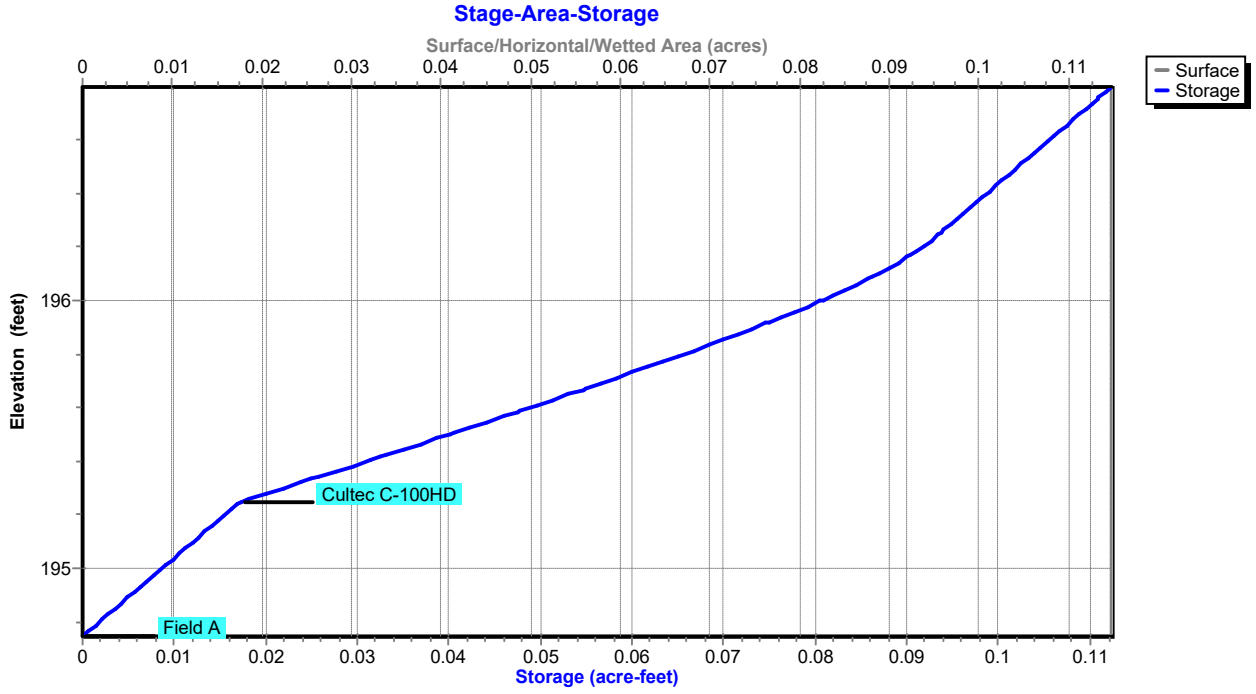
Discarded OutFlow Max=0.96 cfs @ 11.77 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 21P: Northern Pond



Pond 21P: Northern Pond



Summary for Pond 22P: N. Central Pond

Inflow Area = 1.020 ac, 40.80% Impervious, Inflow Depth = 2.75" for 10-Year event
Inflow = 3.28 cfs @ 12.09 hrs, Volume= 0.233 af
Outflow = 0.75 cfs @ 11.80 hrs, Volume= 0.233 af, Atten= 77%, Lag= 0.0 min
Discarded = 0.75 cfs @ 11.80 hrs, Volume= 0.233 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 195.82' @ 12.51 hrs Surf.Area= 0.090 ac Storage= 0.053 af

Plug-Flow detention time= 16.6 min calculated for 0.233 af (100% of inflow)
Center-of-Mass det. time= 16.6 min (839.9 - 823.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.041 af	**98.33'W x 40.00'L x 2.04'H Field A** 0.184 af Overall - 0.047 af Embedded = 0.137 af x 30.0% Voids
#2A	195.25'	0.047 af	**Cultec C-100HD** x 145 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 29 rows
		0.088 af	Total Available Storage

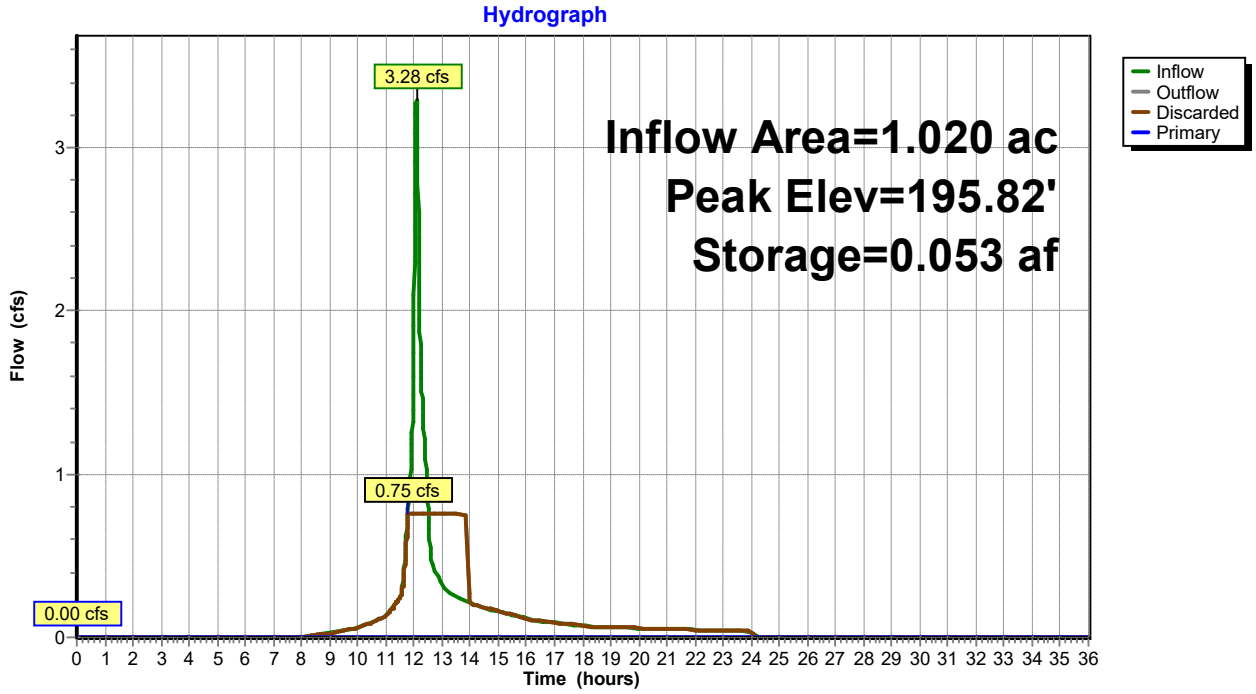
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

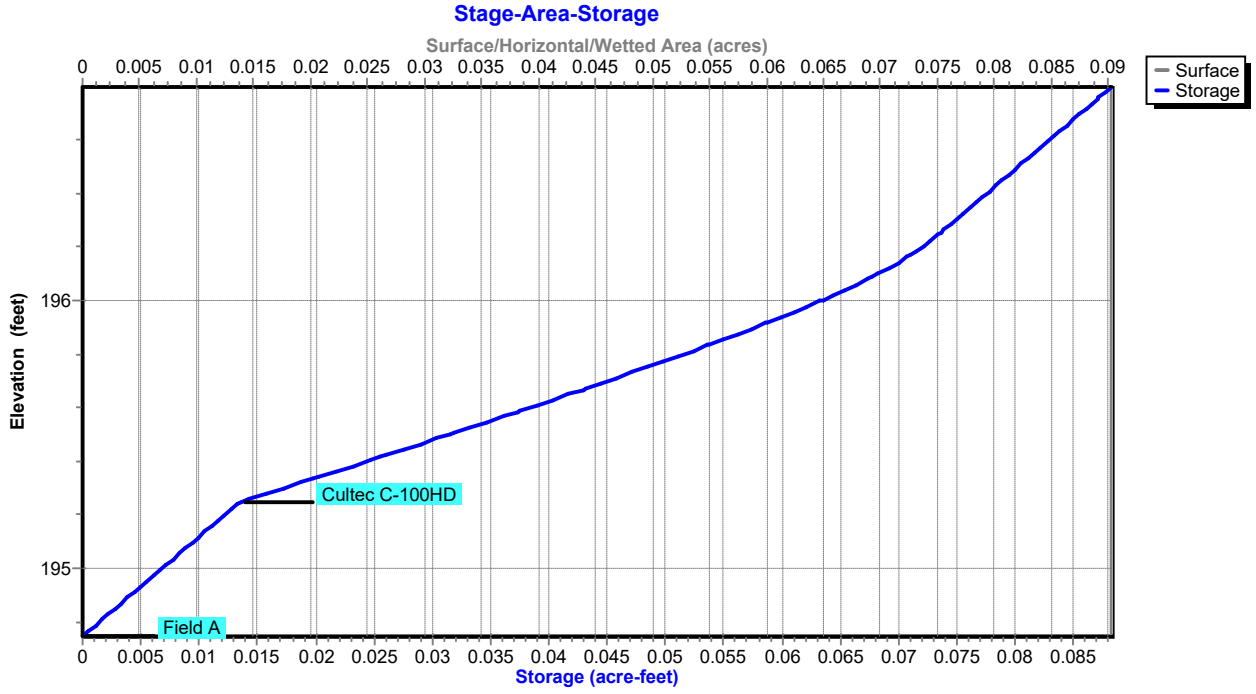
Discarded OutFlow Max=0.75 cfs @ 11.80 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 22P: N. Central Pond



Pond 22P: N. Central Pond



Summary for Pond 23P: Central Pond

Inflow Area = 2.156 ac, 21.44% Impervious, Inflow Depth = 0.78" for 10-Year event
Inflow = 1.41 cfs @ 12.11 hrs, Volume= 0.141 af
Outflow = 0.50 cfs @ 12.02 hrs, Volume= 0.141 af, Atten= 65%, Lag= 0.0 min
Discarded = 0.50 cfs @ 12.02 hrs, Volume= 0.141 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 195.47' @ 12.53 hrs Surf.Area= 0.060 ac Storage= 0.019 af

Plug-Flow detention time= 7.9 min calculated for 0.141 af (100% of inflow)
Center-of-Mass det. time= 7.9 min (912.5 - 904.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.027 af	**65.00'W x 40.00'L x 2.04'H Field A** 0.122 af Overall - 0.031 af Embedded = 0.091 af x 30.0% Voids
#2A	195.25'	0.031 af	**Cultec C-100HD** x 95 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 19 rows
		0.058 af	Total Available Storage

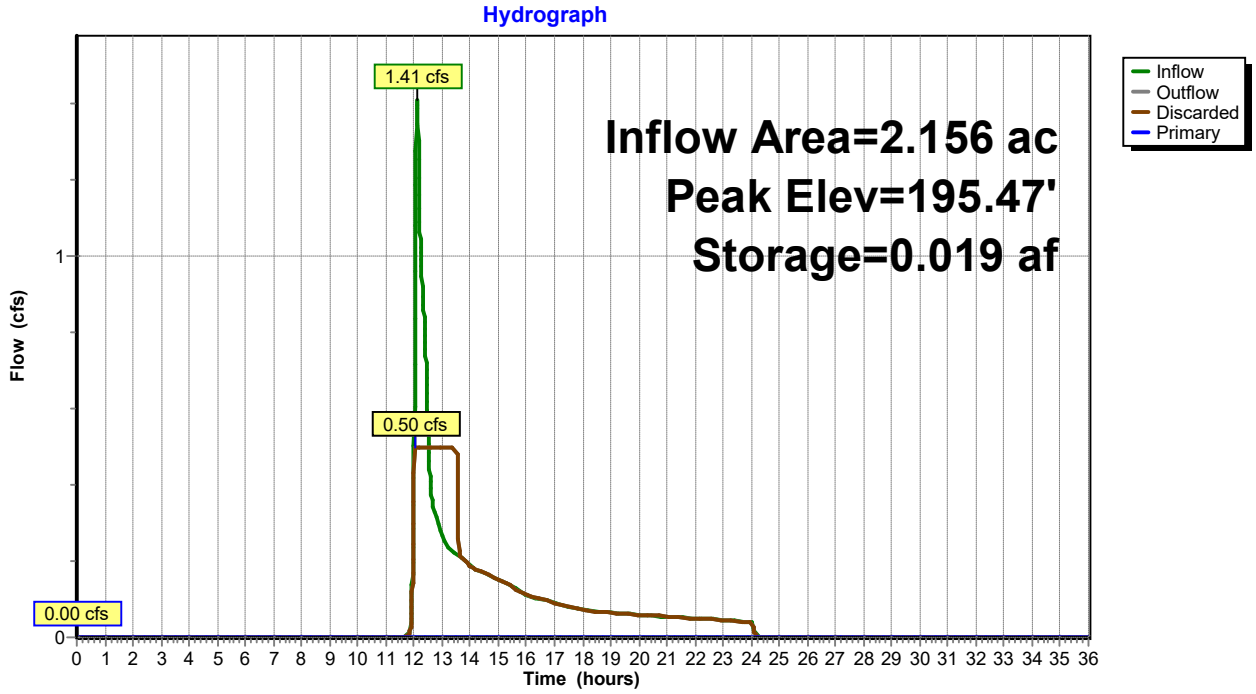
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.77'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

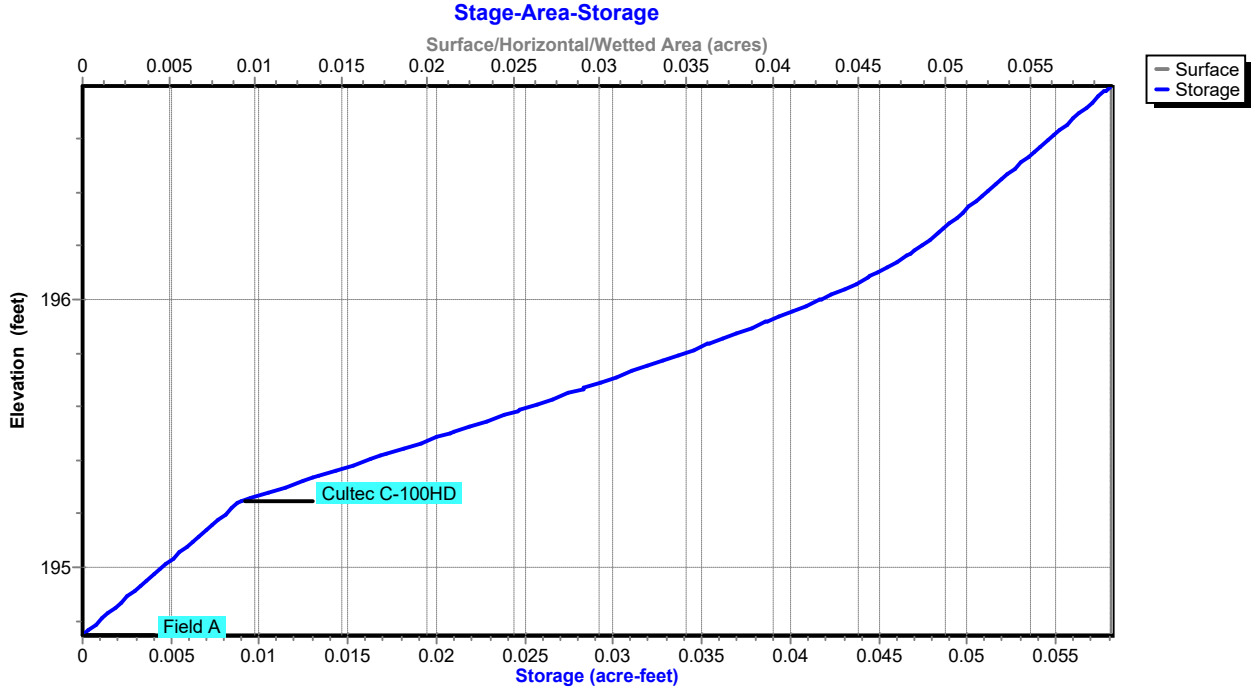
Discarded OutFlow Max=0.50 cfs @ 12.02 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 23P: Central Pond



Pond 23P: Central Pond



Summary for Pond 24P: S. Central Pond

Inflow Area = 0.569 ac, 37.48% Impervious, Inflow Depth = 1.14" for 10-Year event
Inflow = 0.66 cfs @ 12.10 hrs, Volume= 0.054 af
Outflow = 0.20 cfs @ 11.98 hrs, Volume= 0.054 af, Atten= 70%, Lag= 0.0 min
Discarded = 0.20 cfs @ 11.98 hrs, Volume= 0.054 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 4
Peak Elev= 195.08' @ 12.52 hrs Surf.Area= 1,021 sf Storage= 405 cf

Plug-Flow detention time= 10.8 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 10.7 min (892.1 - 881.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.25'	478 cf	**58.33'W x 17.50'L x 2.04'H Field A** 2,084 cf Overall - 491 cf Embedded = 1,594 cf x 30.0% Voids
#2A	194.75'	491 cf	**Cultec C-100HD** x 34 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 17 rows
#3	196.29'	0 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		969 cf	Total Available Storage

Storage Group A created with Chamber Wizard

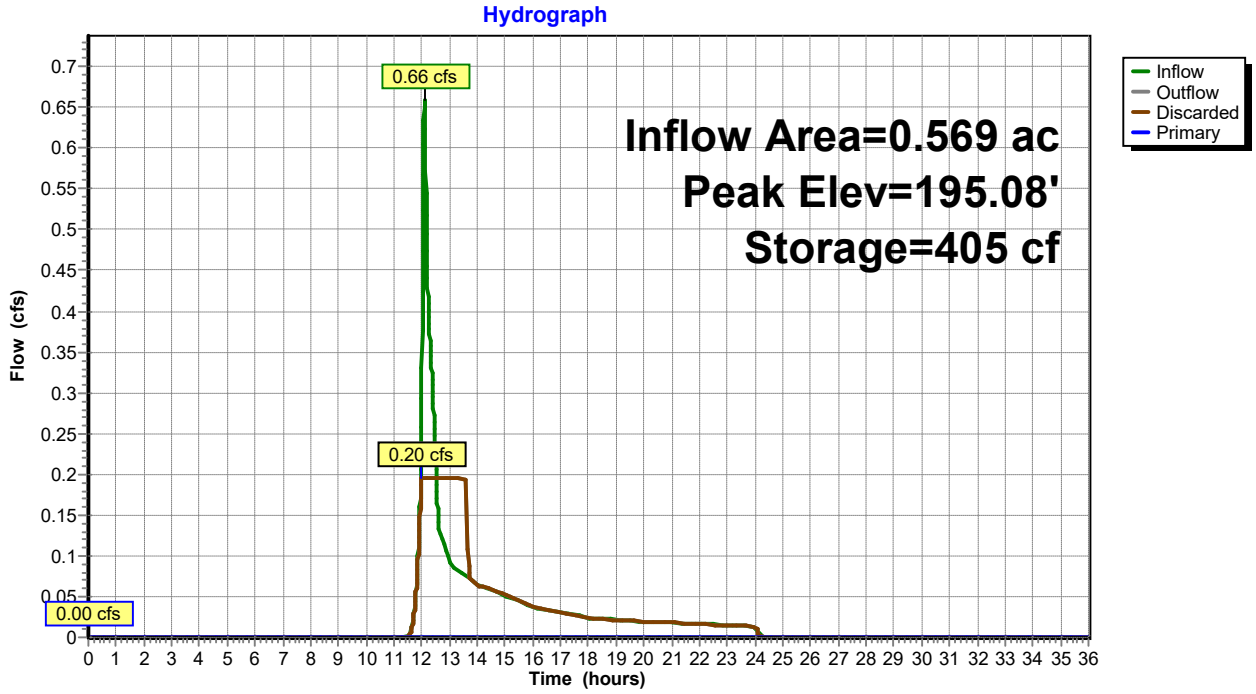
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.29	0	0	0
196.80	1	0	0

Device	Routing	Invert	Outlet Devices
#0	Primary	196.80'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

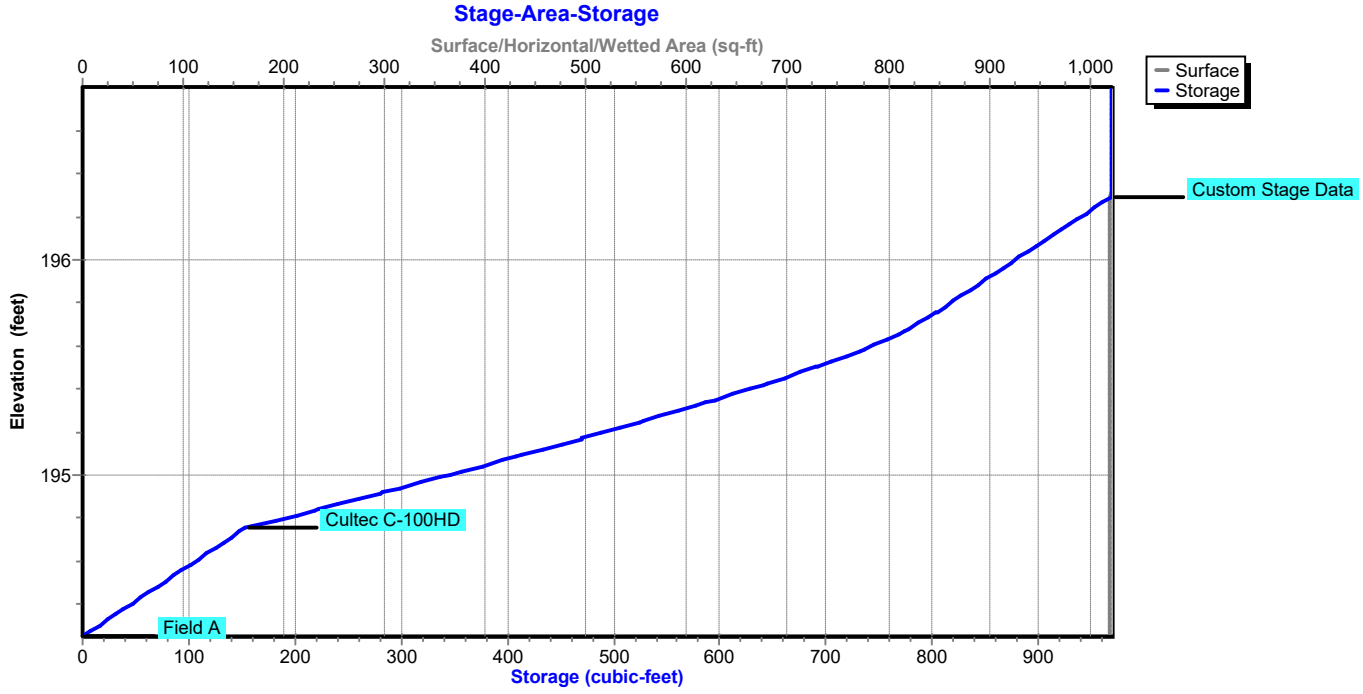
Discarded OutFlow Max=0.20 cfs @ 11.98 hrs HW=194.28' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.25' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 24P: S. Central Pond



Pond 24P: S. Central Pond



Summary for Pond 25P: Southern Pond

Inflow Area = 2.042 ac, 36.92% Impervious, Inflow Depth = 1.02" for 10-Year event
Inflow = 2.01 cfs @ 12.10 hrs, Volume= 0.173 af
Outflow = 0.63 cfs @ 12.00 hrs, Volume= 0.173 af, Atten= 69%, Lag= 0.0 min
Discarded = 0.63 cfs @ 12.00 hrs, Volume= 0.173 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 194.03' @ 12.52 hrs Surf.Area= 3,267 sf Storage= 1,224 cf

Plug-Flow detention time= 10.0 min calculated for 0.173 af (100% of inflow)
Center-of-Mass det. time= 10.0 min (898.3 - 888.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.25'	1,492 cf	**81.67'W x 40.00'L x 2.04'H Field A** 6,669 cf Overall - 1,698 cf Embedded = 4,972 cf x 30.0% Voids
#2A	193.75'	1,698 cf	**Cultec C-100HD** x 120 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 24 rows
#3	195.29'	0 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3,190 cf	Total Available Storage

Storage Group A created with Chamber Wizard

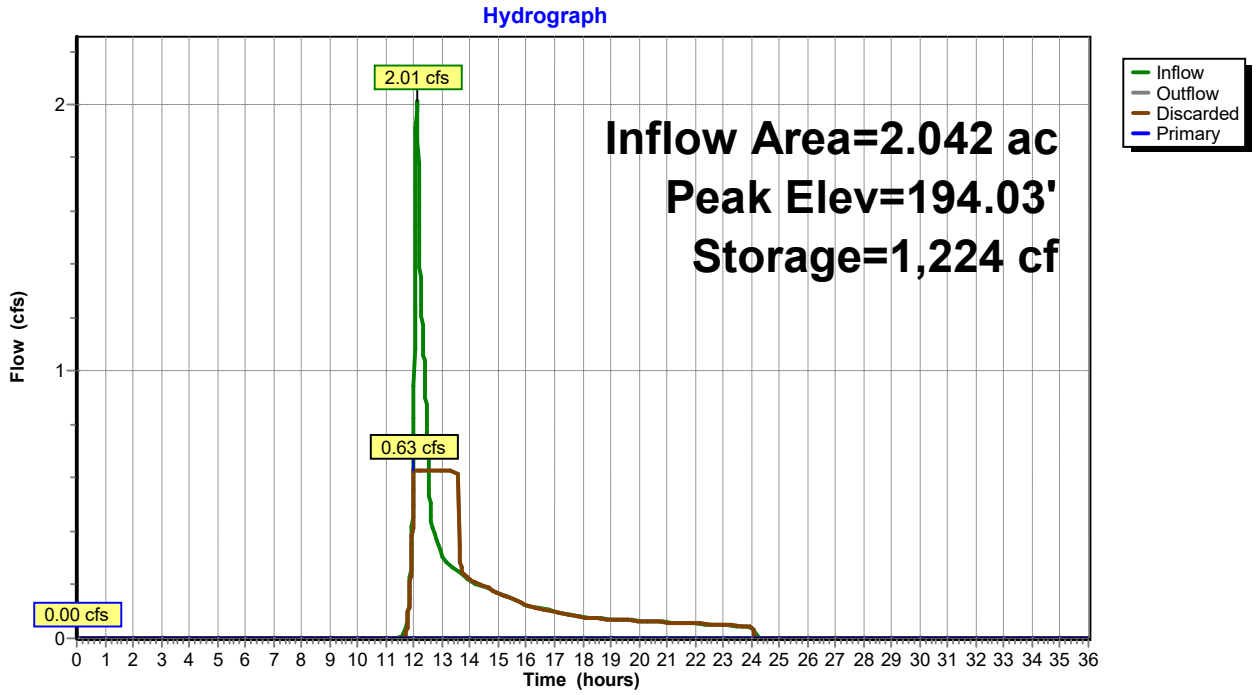
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.29	0	0	0
196.25	1	0	0

Device	Routing	Invert	Outlet Devices
#0	Primary	196.25'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	193.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	195.37'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#3	Primary	195.54'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#4	Primary	196.22'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#5	Primary	196.22'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

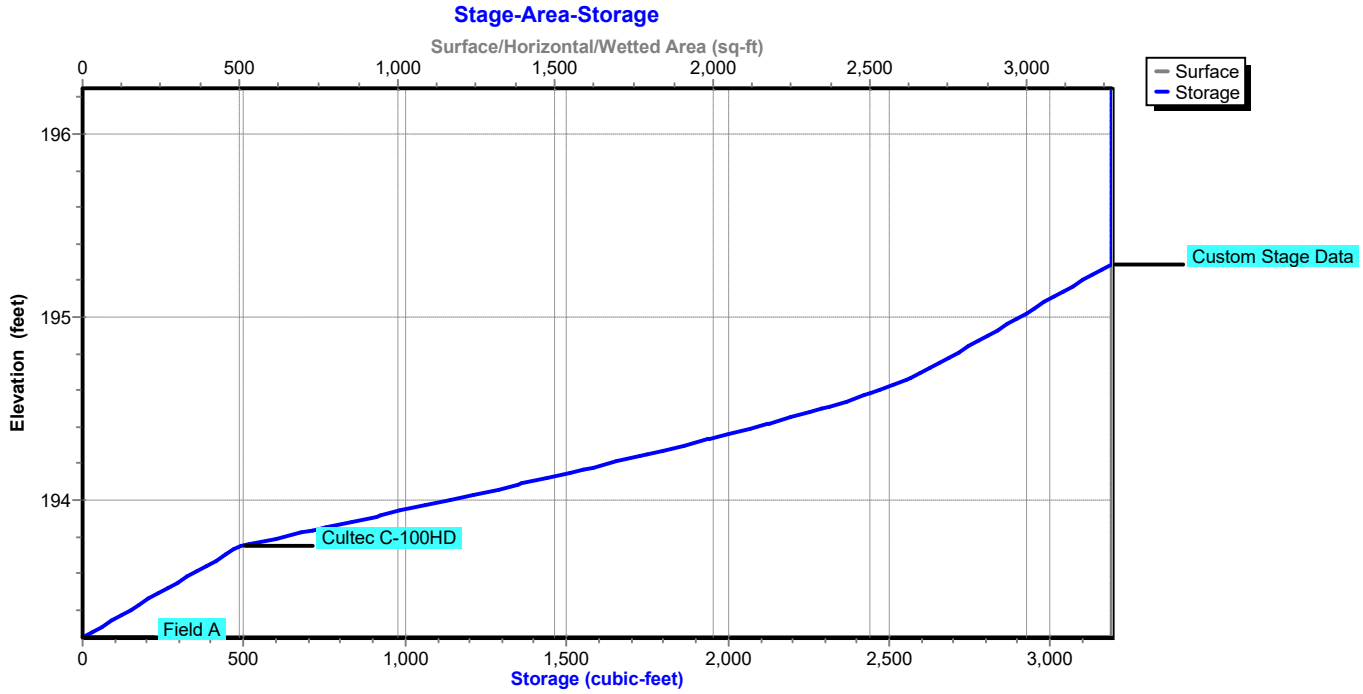
Discarded OutFlow Max=0.63 cfs @ 12.00 hrs HW=193.29' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.63 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=193.25' (Free Discharge)
├**2=Orifice/Grate** (Controls 0.00 cfs)
├**3=Orifice/Grate** (Controls 0.00 cfs)
├**4=Orifice/Grate** (Controls 0.00 cfs)
└**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 25P: Southern Pond



Pond 25P: Southern Pond



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10: Undetained Northern Runoff Area=12.188 ac 1.80% Impervious Runoff Depth=2.19"
Flow Length=528' Tc=24.7 min CN=64 Runoff=18.58 cfs 2.220 af

Subcatchment 21: North Parking Lot Runoff Area=1.154 ac 57.94% Impervious Runoff Depth=4.20"
Tc=6.0 min CN=85 Runoff=5.58 cfs 0.404 af

Subcatchment 22: N. Central Parking Runoff Area=1.020 ac 40.80% Impervious Runoff Depth=3.68"
Tc=6.0 min CN=80 Runoff=4.39 cfs 0.313 af

Subcatchment 23: Central Parking Lot Runoff Area=2.156 ac 21.44% Impervious Runoff Depth=1.31"
Tc=6.0 min CN=53 Runoff=2.79 cfs 0.234 af

Subcatchment 24: S. Central Parking Runoff Area=0.569 ac 37.48% Impervious Runoff Depth=1.77"
Tc=6.0 min CN=59 Runoff=1.10 cfs 0.084 af

Subcatchment 25: Southern Parking Lot Runoff Area=2.042 ac 36.92% Impervious Runoff Depth=1.61"
Tc=6.0 min CN=57 Runoff=3.51 cfs 0.274 af

Subcatchment 30: Undetained Southern Runoff Area=8.796 ac 7.84% Impervious Runoff Depth=2.02"
Flow Length=119' Tc=11.3 min CN=62 Runoff=16.60 cfs 1.477 af

Reach DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1PE: Existing North Pond Peak Elev=195.17' Storage=13,963 cf Inflow=18.58 cfs 2.220 af
Discarded=11.92 cfs 2.220 af Primary=0.00 cfs 0.000 af Outflow=11.92 cfs 2.220 af

Pond 3PE: Existing Southern Pond Peak Elev=195.15' Storage=7,733 cf Inflow=16.60 cfs 1.477 af
Discarded=11.41 cfs 1.477 af Primary=0.00 cfs 0.000 af Outflow=11.41 cfs 1.477 af

Pond 21P: Northern Pond Peak Elev=196.75' Storage=0.111 af Inflow=5.58 cfs 0.404 af
Discarded=0.96 cfs 0.404 af Primary=0.00 cfs 0.000 af Outflow=0.96 cfs 0.404 af

Pond 22P: N. Central Pond Peak Elev=196.74' Storage=0.087 af Inflow=4.39 cfs 0.313 af
Discarded=0.75 cfs 0.313 af Primary=0.00 cfs 0.000 af Outflow=0.75 cfs 0.313 af

Pond 23P: Central Pond Peak Elev=196.77' Storage=0.058 af Inflow=2.79 cfs 0.234 af
Discarded=0.50 cfs 0.234 af Primary=0.00 cfs 0.000 af Outflow=0.50 cfs 0.234 af

Pond 24P: S. Central Pond Peak Elev=196.22' Storage=947 cf Inflow=1.10 cfs 0.084 af
Discarded=0.20 cfs 0.084 af Primary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.084 af

Pond 25P: Southern Pond Peak Elev=195.15' Storage=3,046 cf Inflow=3.51 cfs 0.274 af
Discarded=0.63 cfs 0.274 af Primary=0.00 cfs 0.000 af Outflow=0.63 cfs 0.274 af

Total Runoff Area = 27.925 ac Runoff Volume = 5.006 af Average Runoff Depth = 2.15"
87.74% Pervious = 24.503 ac 12.26% Impervious = 3.422 ac

Summary for Subcatchment 10: Undetained Northern Areas

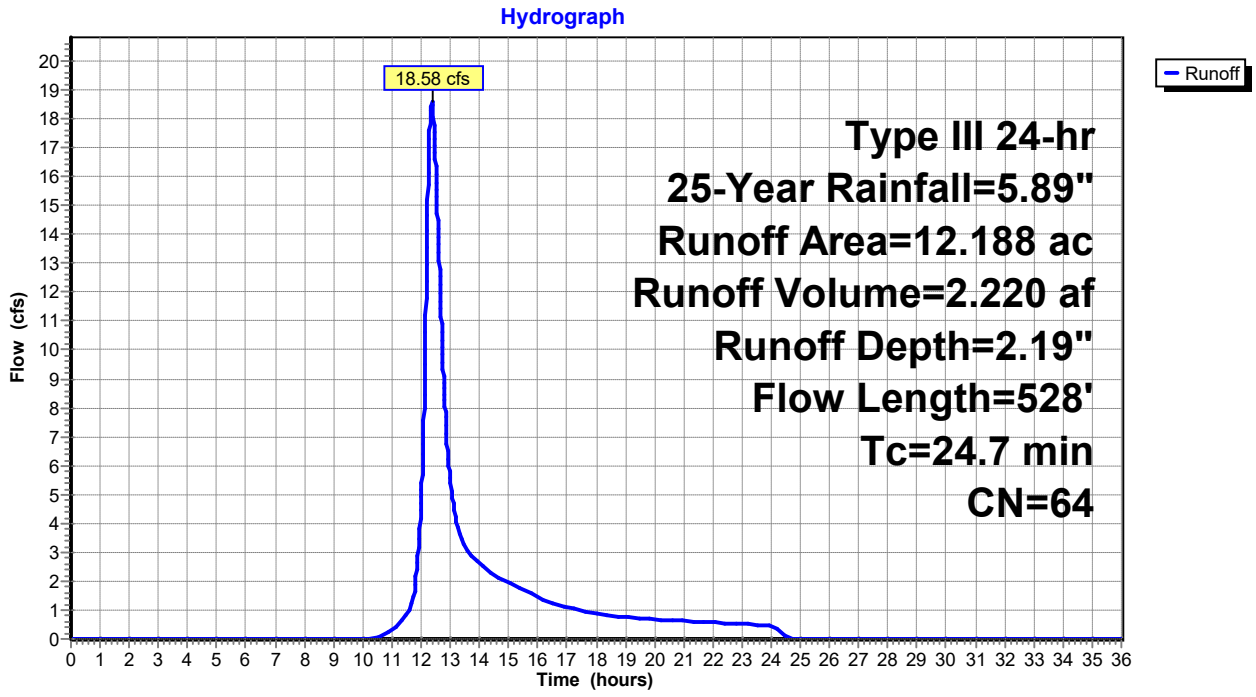
Runoff = 18.58 cfs @ 12.37 hrs, Volume= 2.220 af, Depth= 2.19"
Routed to Pond 1PE : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

	Area (ac)	CN	Description
	10.956	68	<50% Grass cover, Poor, HSG A
*	0.408	1	Porous Walks&Playgrounds, Good, HSG A
	0.191	98	Paved parking, HSG A
	0.018	98	Roofs, HSG A
	0.010	98	Unconnected roofs, HSG A
	0.000	89	Urban commercial, 85% imp, HSG A
	0.605	30	Woods, Good, HSG A
	12.188	64	Weighted Average
	11.969		98.20% Pervious Area
	0.219		1.80% Impervious Area
	0.010		4.57% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0133	0.12		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
18.0	478	0.0040	0.44		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
24.7	528	Total			

Subcatchment 10: Undetained Northern Areas



Summary for Subcatchment 21: North Parking Lot

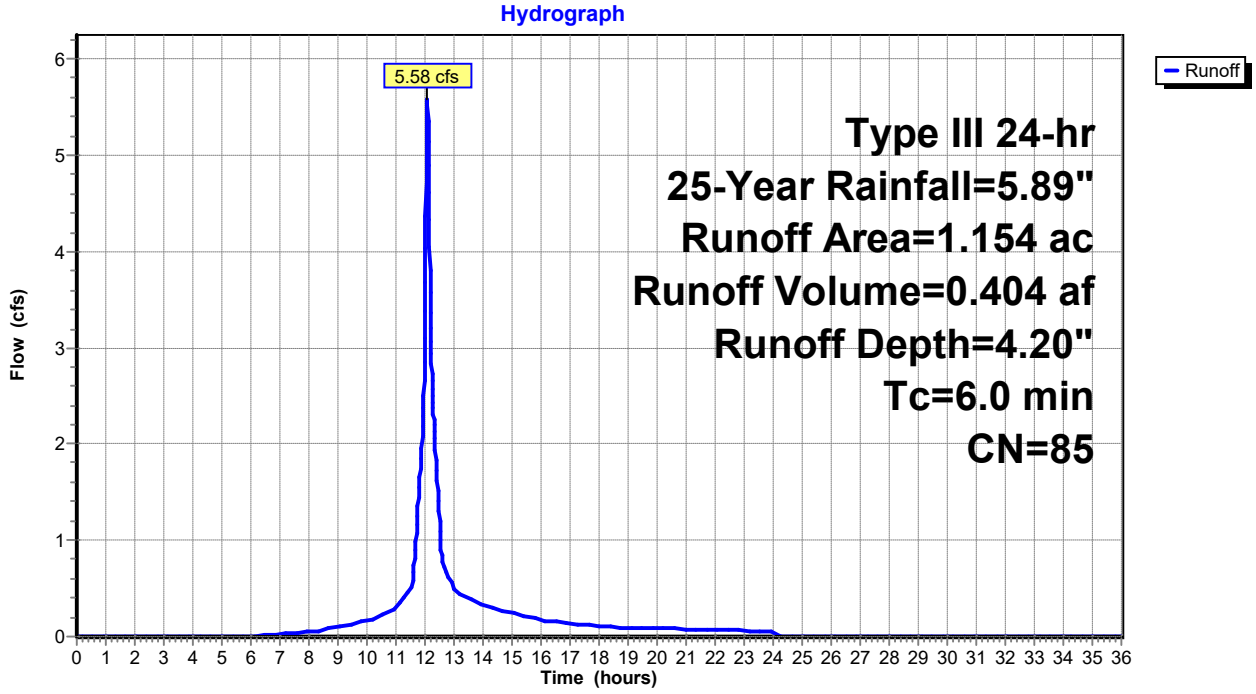
Runoff = 5.58 cfs @ 12.09 hrs, Volume= 0.404 af, Depth= 4.20"
Routed to Pond 21P : Northern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

Area (ac)	CN	Description
0.485	68	<50% Grass cover, Poor, HSG A
0.668	98	Paved parking, HSG A
1.154	85	Weighted Average
0.485		42.06% Pervious Area
0.668		57.94% Impervious Area

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

Subcatchment 21: North Parking Lot



Summary for Subcatchment 22: N. Central Parking Lot

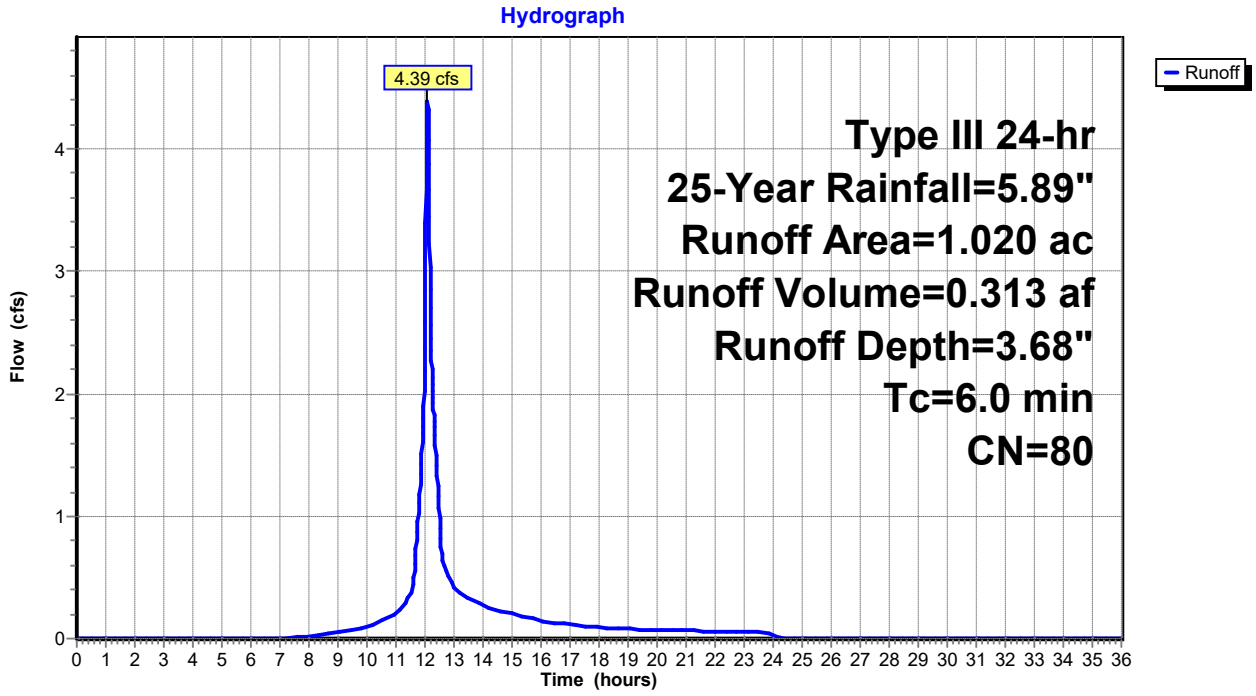
Runoff = 4.39 cfs @ 12.09 hrs, Volume= 0.313 af, Depth= 3.68"
Routed to Pond 22P : N. Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

Area (ac)	CN	Description
0.604	68	<50% Grass cover, Poor, HSG A
0.416	98	Paved parking, HSG A
1.020	80	Weighted Average
0.604		59.20% Pervious Area
0.416		40.80% Impervious Area

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

Subcatchment 22: N. Central Parking Lot



Summary for Subcatchment 23: Central Parking Lot & Drive

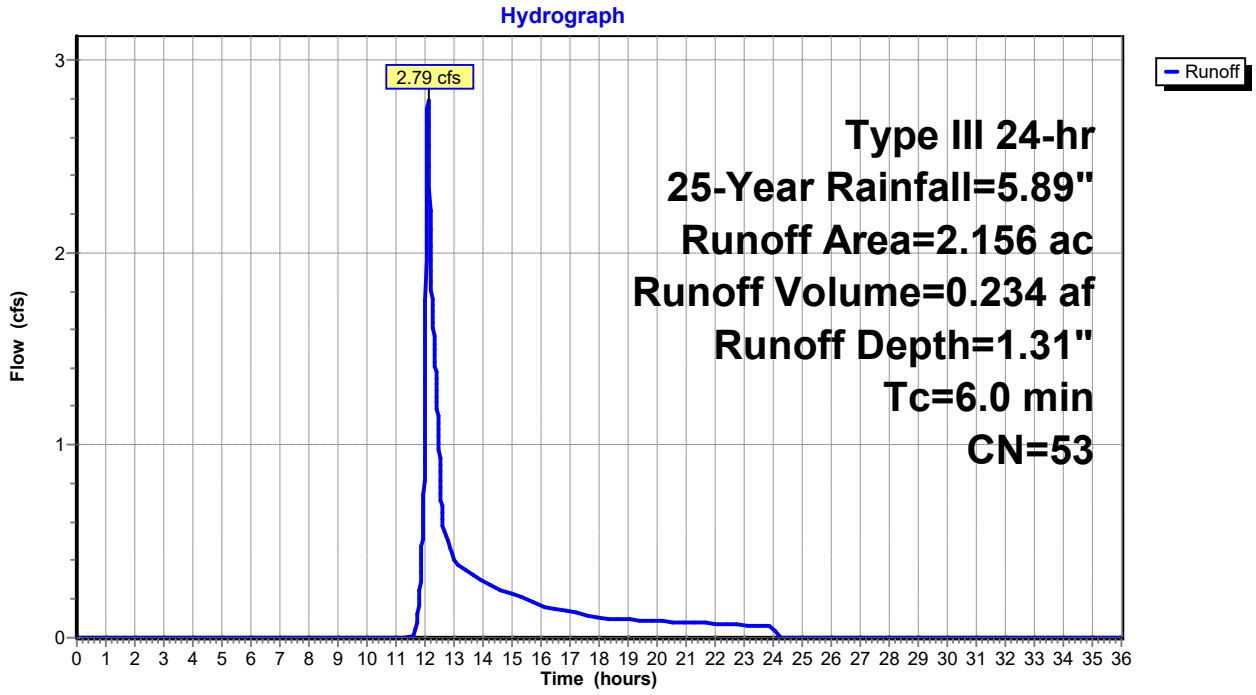
Runoff = 2.79 cfs @ 12.10 hrs, Volume= 0.234 af, Depth= 1.31"
Routed to Pond 23P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

Area (ac)	CN	Description
0.454	68	<50% Grass cover, Poor, HSG A
0.462	98	Paved parking, HSG A
1.240	30	Woods, Good, HSG A
2.156	53	Weighted Average
1.694		78.56% Pervious Area
0.462		21.44% Impervious Area

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

Subcatchment 23: Central Parking Lot & Drive



Summary for Subcatchment 24: S. Central Parking Lot

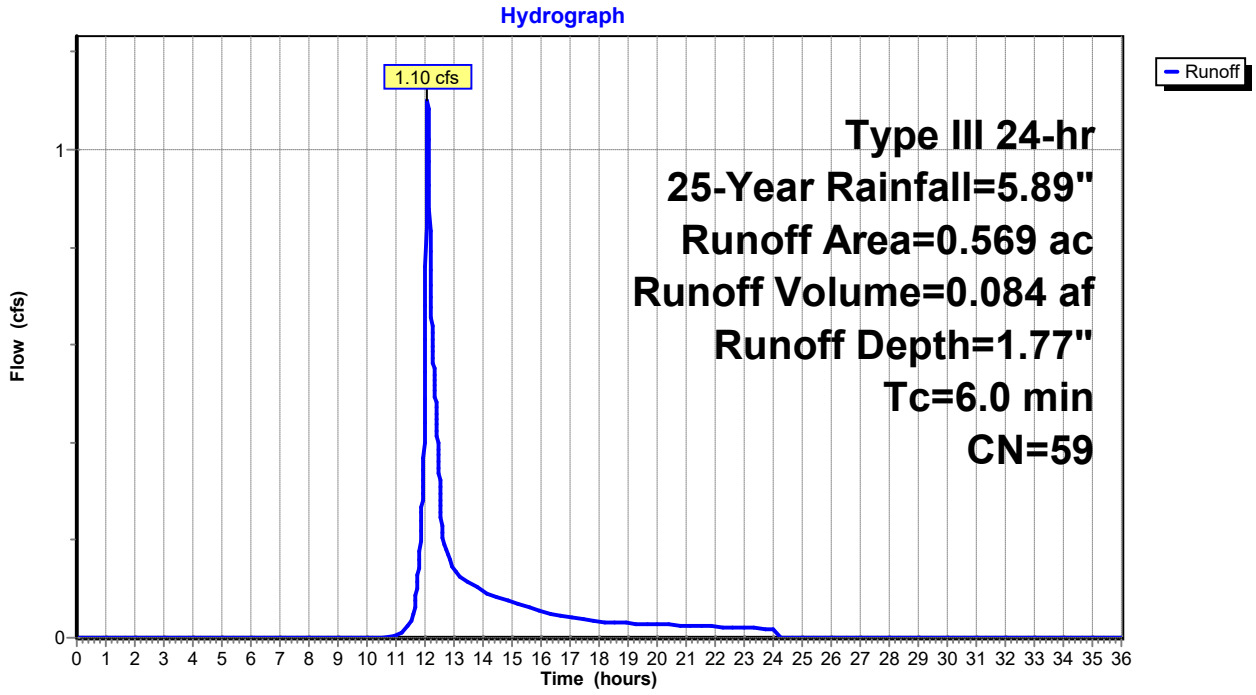
Runoff = 1.10 cfs @ 12.10 hrs, Volume= 0.084 af, Depth= 1.77"
Routed to Pond 24P : S. Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

Area (ac)	CN	Description
0.051	68	<50% Grass cover, Poor, HSG A
0.213	98	Paved parking, HSG A
0.304	30	Woods, Good, HSG A
0.569	59	Weighted Average
0.356		62.52% Pervious Area
0.213		37.48% Impervious Area

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

Subcatchment 24: S. Central Parking Lot



Summary for Subcatchment 25: Southern Parking Lot

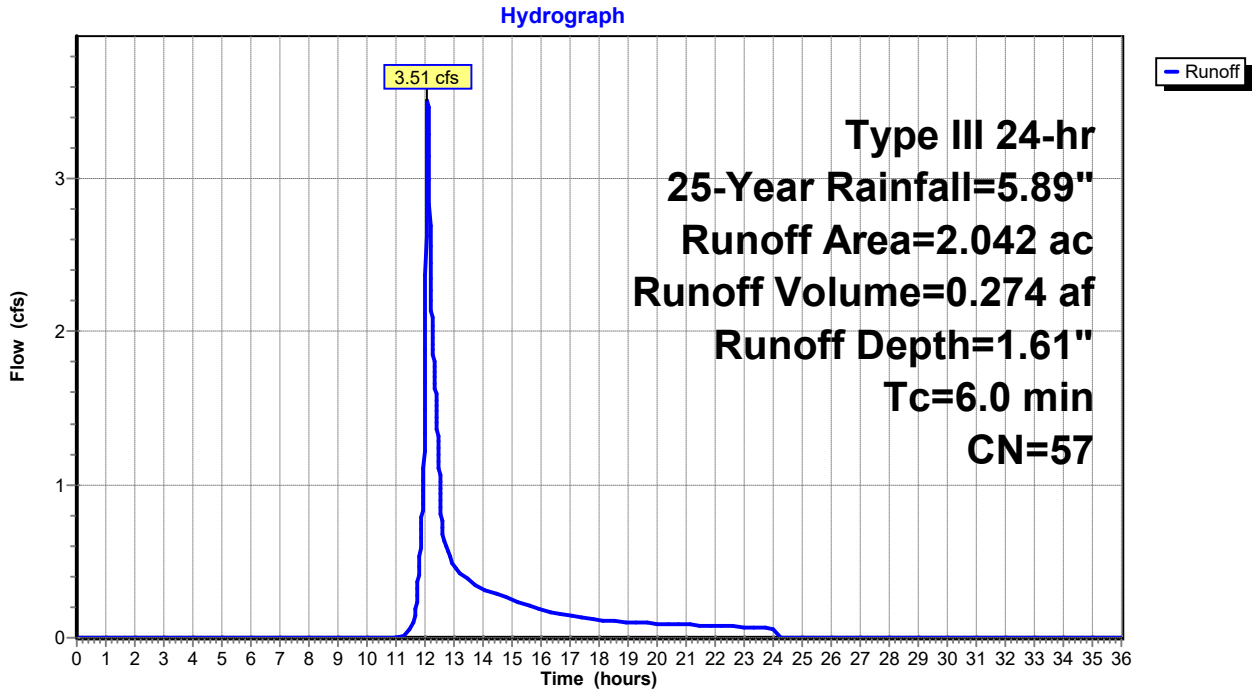
Runoff = 3.51 cfs @ 12.10 hrs, Volume= 0.274 af, Depth= 1.61"
Routed to Pond 25P : Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

Area (ac)	CN	Description
0.097	68	<50% Grass cover, Poor, HSG A
0.754	98	Paved parking, HSG A
1.191	30	Woods, Good, HSG A
2.042	57	Weighted Average
1.288		63.08% Pervious Area
0.754		36.92% Impervious Area

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

Subcatchment 25: Southern Parking Lot



Summary for Subcatchment 30: Undetained Southern Areas

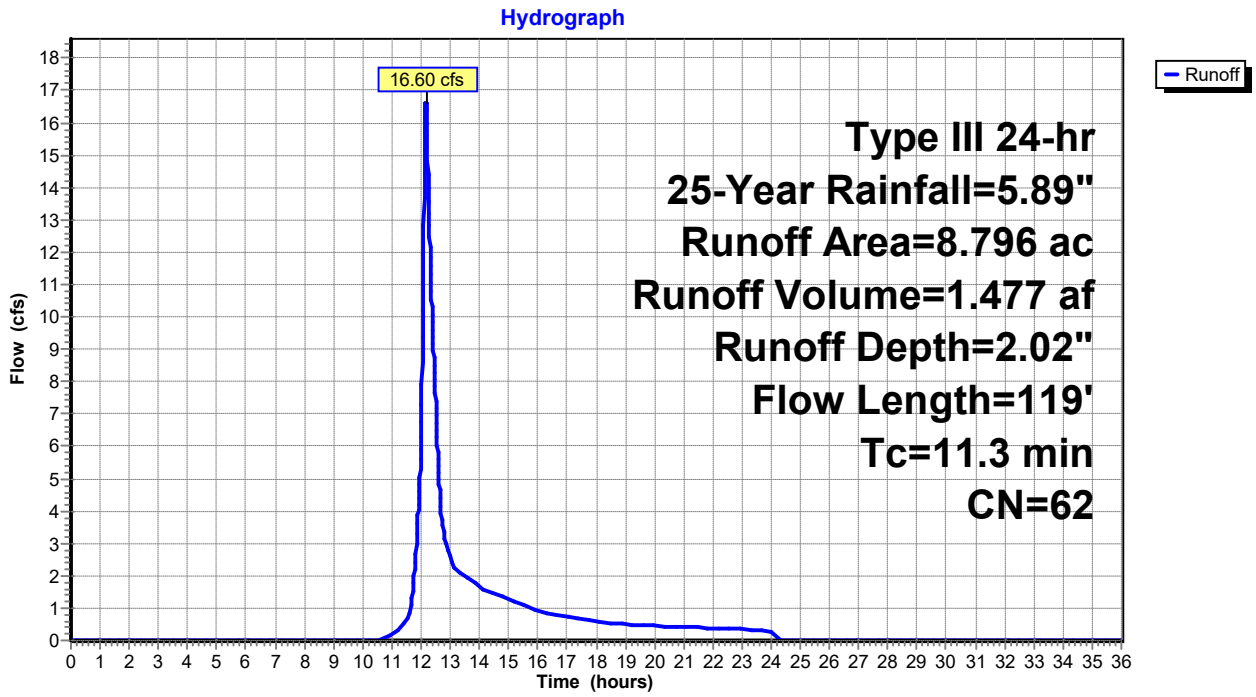
Runoff = 16.60 cfs @ 12.17 hrs, Volume= 1.477 af, Depth= 2.02"
Routed to Pond 3PE : Existing Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=5.89"

	Area (ac)	CN	Description
	6.272	68	<50% Grass cover, Poor, HSG A
*	0.271	1	PorousWalks&Playgrounds, Good, HSG A
	0.082	76	Gravel roads, HSG A
	0.151	98	Paved parking, HSG A
	0.025	98	Roofs, HSG A
	0.067	98	Unconnected roofs, HSG A
	0.525	89	Urban commercial, 85% imp, HSG A
	1.403	30	Woods, Good, HSG A
	8.796	62	Weighted Average
	8.107		92.16% Pervious Area
	0.689		7.84% Impervious Area
	0.067		9.72% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0076	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
2.9	69	0.0032	0.40		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
11.3	119	Total			

Subcatchment 30: Undetained Southern Areas

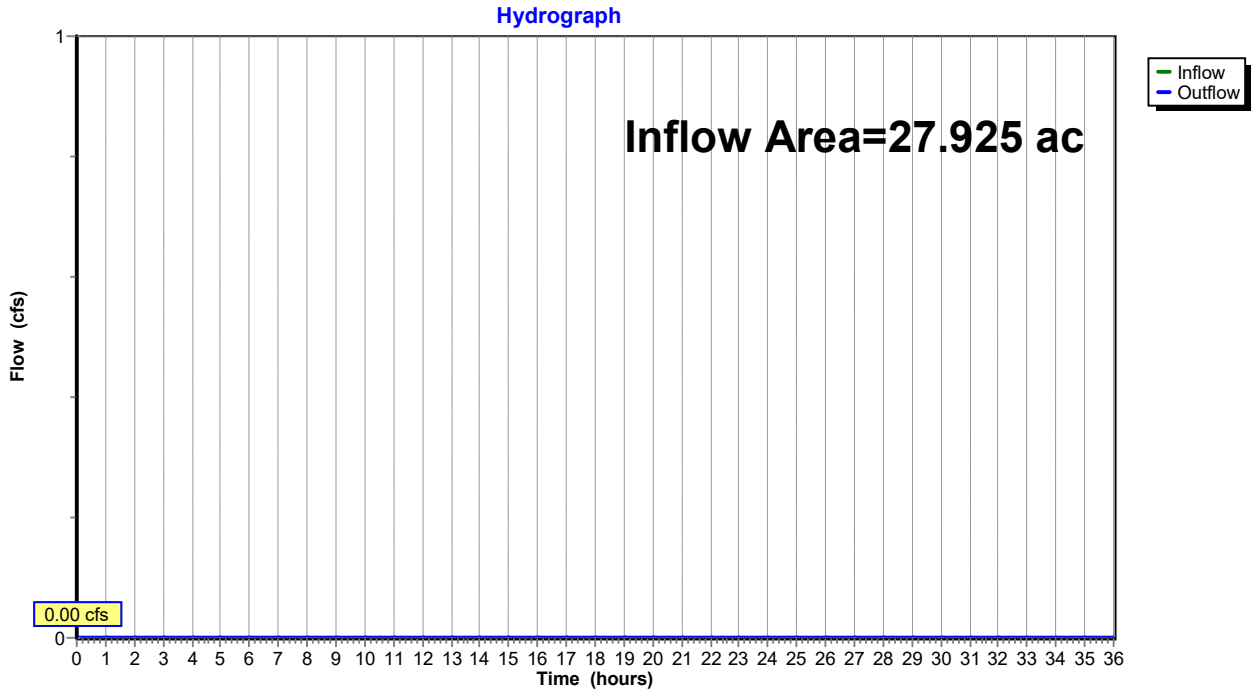


Summary for Reach DP-1: DP-1

Inflow Area = 27.925 ac, 12.26% Impervious, Inflow Depth = 0.00" for 25-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



Summary for Pond 1PE: Existing North Pond

Inflow Area = 27.925 ac, 12.26% Impervious, Inflow Depth = 0.95" for 25-Year event
Inflow = 18.58 cfs @ 12.37 hrs, Volume= 2.220 af
Outflow = 11.92 cfs @ 12.66 hrs, Volume= 2.220 af, Atten= 36%, Lag= 17.5 min
Discarded = 11.92 cfs @ 12.66 hrs, Volume= 2.220 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.17' @ 12.66 hrs Surf.Area= 62,282 sf Storage= 13,963 cf

Plug-Flow detention time= 10.7 min calculated for 2.219 af (100% of inflow)
Center-of-Mass det. time= 10.7 min (881.7 - 871.0)

Volume	Invert	Avail.Storage	Storage Description
#1	194.50'	128,718 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		128,719 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.50	63	0	0
194.75	1,643	213	213
195.00	39,556	5,150	5,363
195.25	73,196	14,094	19,457
195.50	110,604	22,975	42,432
195.75	162,562	34,146	76,578
196.00	254,556	52,140	128,718

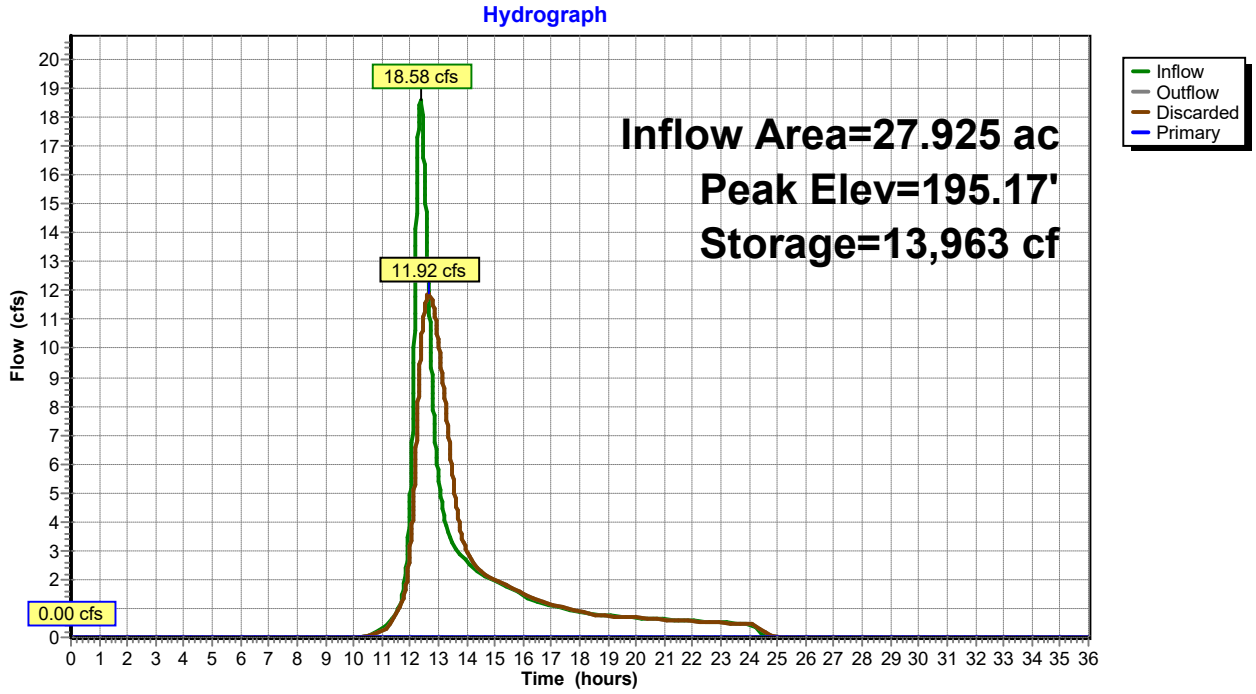
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.00'	**60.0' long x 30.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

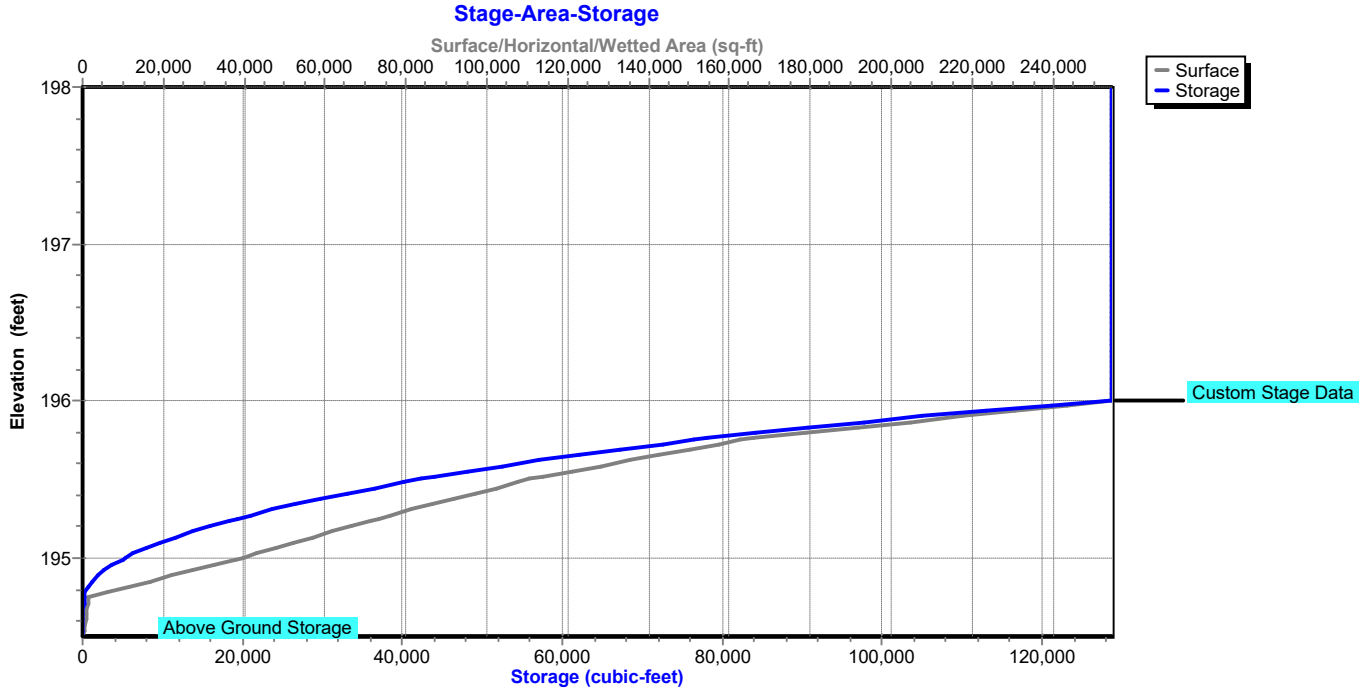
Discarded OutFlow Max=11.92 cfs @ 12.66 hrs HW=195.17' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 11.92 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1PE: Existing North Pond



Pond 1PE: Existing North Pond



Summary for Pond 3PE: Existing Southern Pond

Inflow Area = 13.563 ac, 15.62% Impervious, Inflow Depth = 1.31" for 25-Year event
Inflow = 16.60 cfs @ 12.17 hrs, Volume= 1.477 af
Outflow = 11.41 cfs @ 12.33 hrs, Volume= 1.477 af, Atten= 31%, Lag= 9.5 min
Discarded = 11.41 cfs @ 12.33 hrs, Volume= 1.477 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.15' @ 12.33 hrs Surf.Area= 59,592 sf Storage= 7,733 cf

Plug-Flow detention time= 11.3 min calculated for 1.477 af (100% of inflow)
Center-of-Mass det. time= 11.3 min (874.9 - 863.7)

Volume	Invert	Avail.Storage	Storage Description
#1	194.50'	118,206 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		118,207 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.50	227	0	0
194.75	2,564	349	349
195.00	12,299	1,858	2,207
195.25	89,207	12,688	14,895
195.50	118,288	25,937	40,832
195.75	143,996	32,786	73,617
196.00	212,712	44,589	118,206

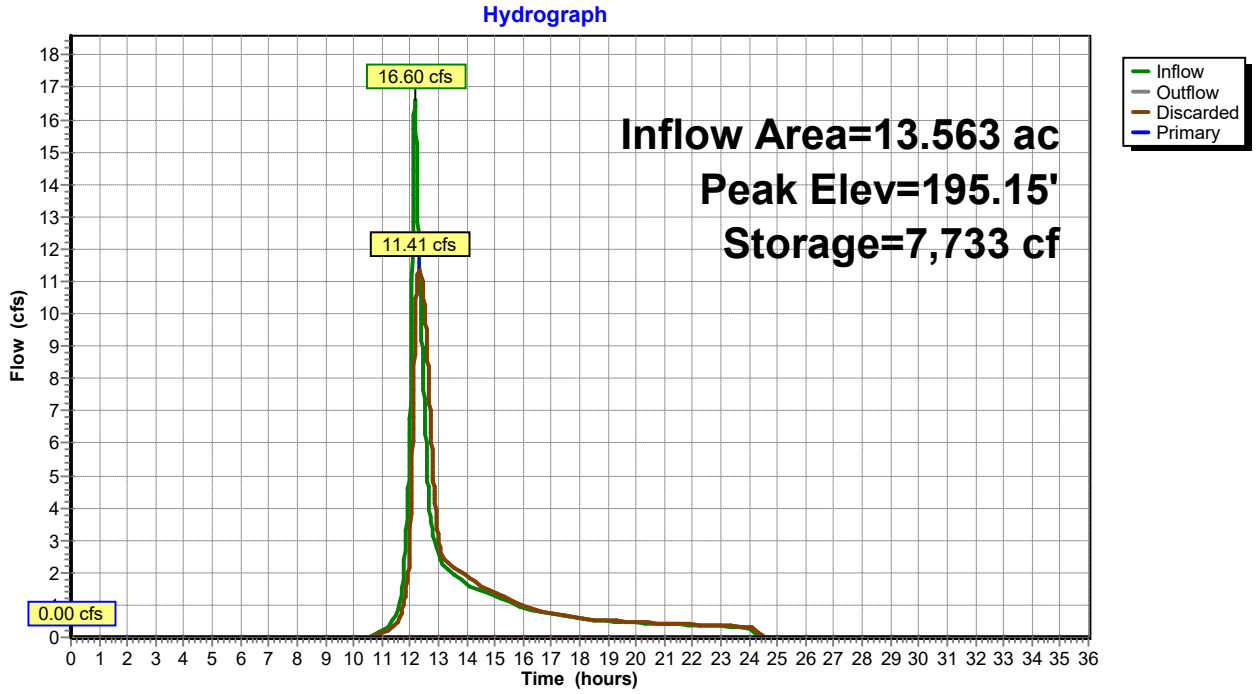
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**30.0' long x 60.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	194.50'	**8.270 in/hr Exfiltration over Surface area**

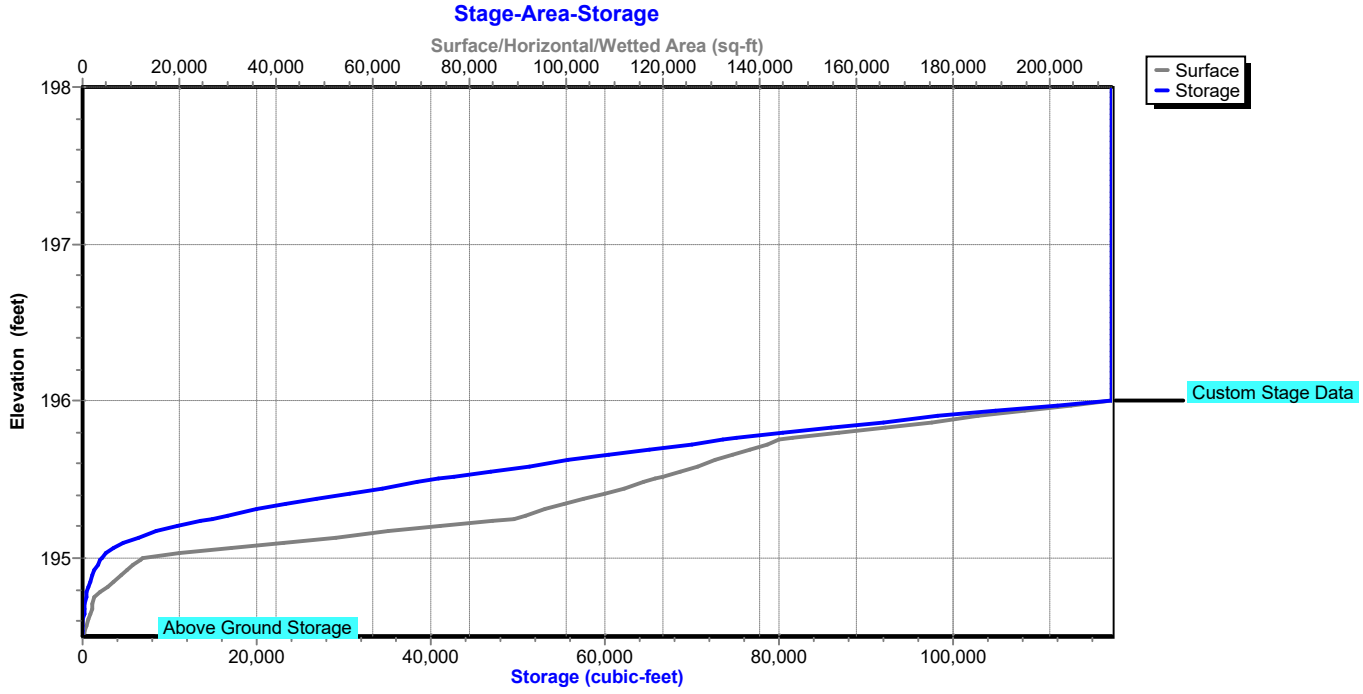
Discarded OutFlow Max=11.41 cfs @ 12.33 hrs HW=195.15' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 11.41 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3PE: Existing Southern Pond



Pond 3PE: Existing Southern Pond



Summary for Pond 21P: Northern Pond

Inflow Area = 1.154 ac, 57.94% Impervious, Inflow Depth = 4.20" for 25-Year event
Inflow = 5.58 cfs @ 12.09 hrs, Volume= 0.404 af
Outflow = 0.96 cfs @ 11.69 hrs, Volume= 0.404 af, Atten= 83%, Lag= 0.0 min
Discarded = 0.96 cfs @ 11.69 hrs, Volume= 0.404 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 196.75' @ 12.55 hrs Surf.Area= 0.115 ac Storage= 0.111 af

Plug-Flow detention time= 29.9 min calculated for 0.404 af (100% of inflow)
Center-of-Mass det. time= 29.9 min (831.2 - 801.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.052 af	**125.00'W x 40.00'L x 2.04'H Field A** 0.234 af Overall - 0.060 af Embedded = 0.174 af x 30.0% Voids
#2A	195.25'	0.060 af	**Cultec C-100HD** x 185 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 37 rows
		0.112 af	Total Available Storage

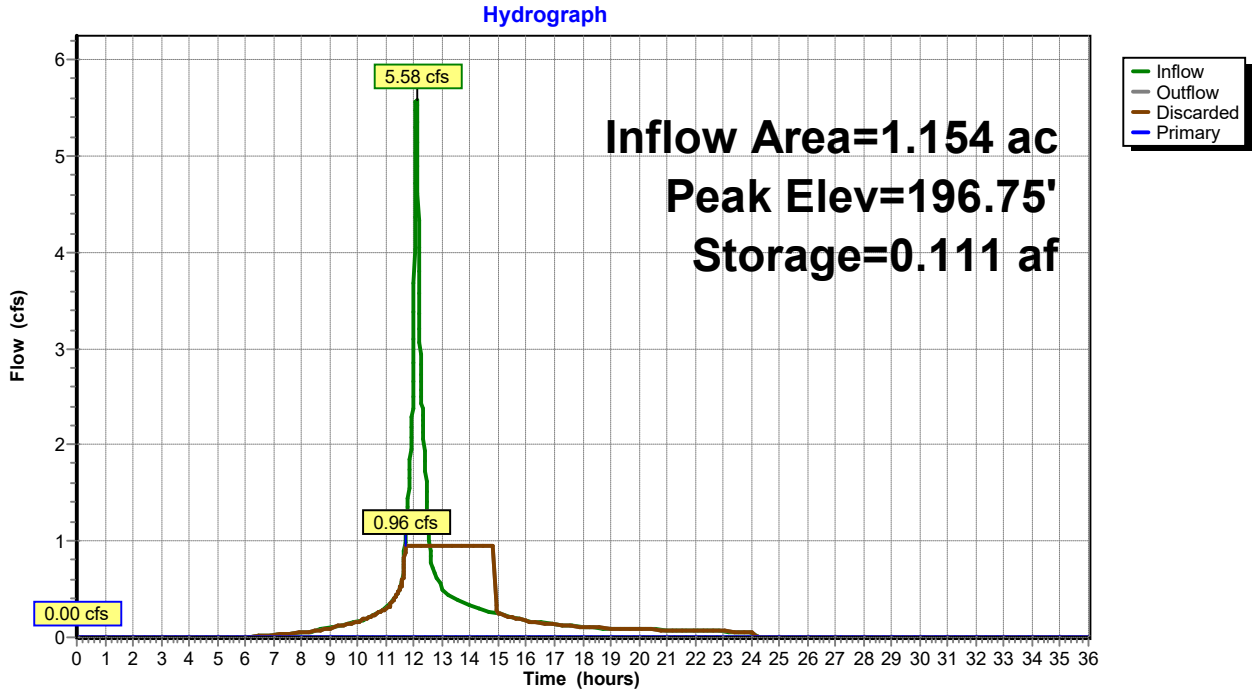
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

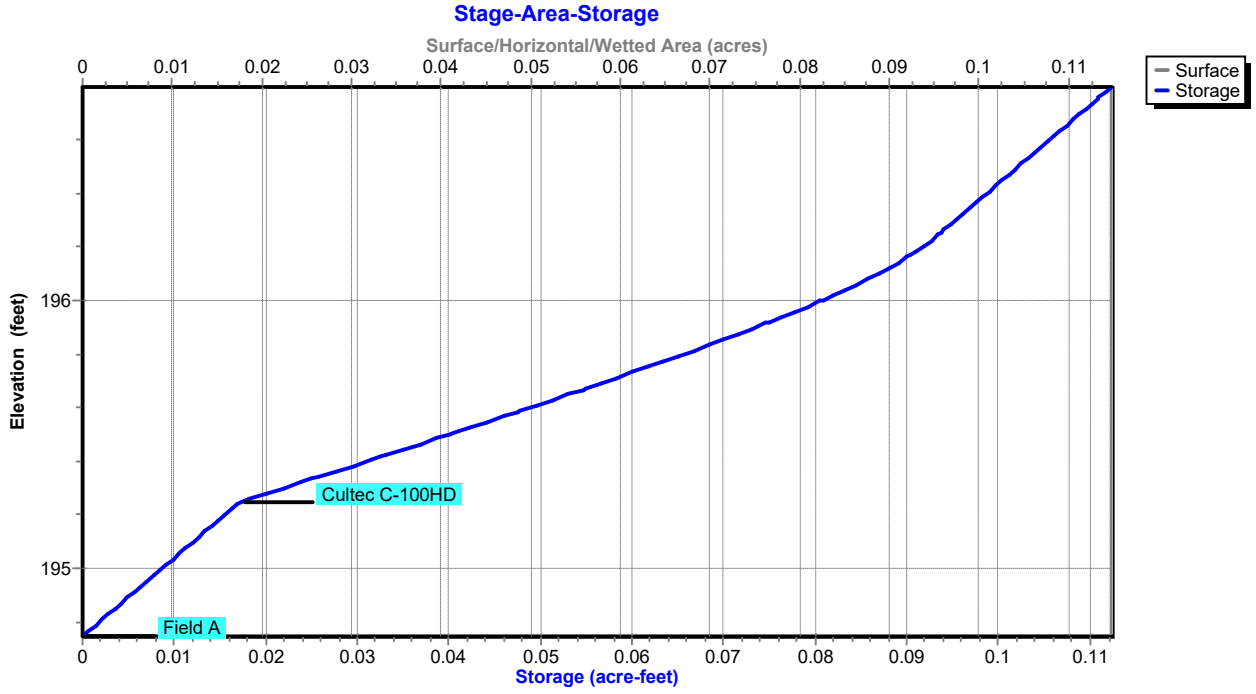
Discarded OutFlow Max=0.96 cfs @ 11.69 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 21P: Northern Pond



Pond 21P: Northern Pond



Summary for Pond 22P: N. Central Pond

Inflow Area = 1.020 ac, 40.80% Impervious, Inflow Depth = 3.68" for 25-Year event
Inflow = 4.39 cfs @ 12.09 hrs, Volume= 0.313 af
Outflow = 0.75 cfs @ 11.71 hrs, Volume= 0.313 af, Atten= 83%, Lag= 0.0 min
Discarded = 0.75 cfs @ 11.71 hrs, Volume= 0.313 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 196.74' @ 12.56 hrs Surf.Area= 0.090 ac Storage= 0.087 af

Plug-Flow detention time= 30.9 min calculated for 0.313 af (100% of inflow)
Center-of-Mass det. time= 30.9 min (845.8 - 814.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.041 af	**98.33'W x 40.00'L x 2.04'H Field A** 0.184 af Overall - 0.047 af Embedded = 0.137 af x 30.0% Voids
#2A	195.25'	0.047 af	**Cultec C-100HD** x 145 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 29 rows
		0.088 af	Total Available Storage

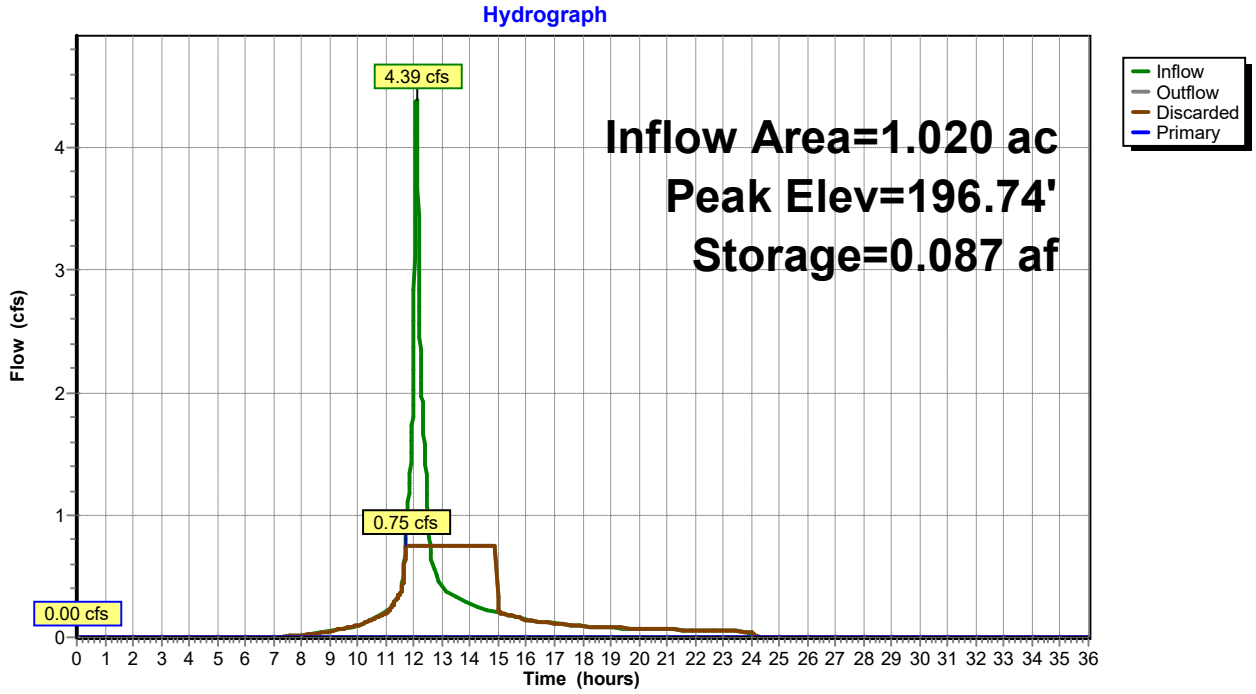
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

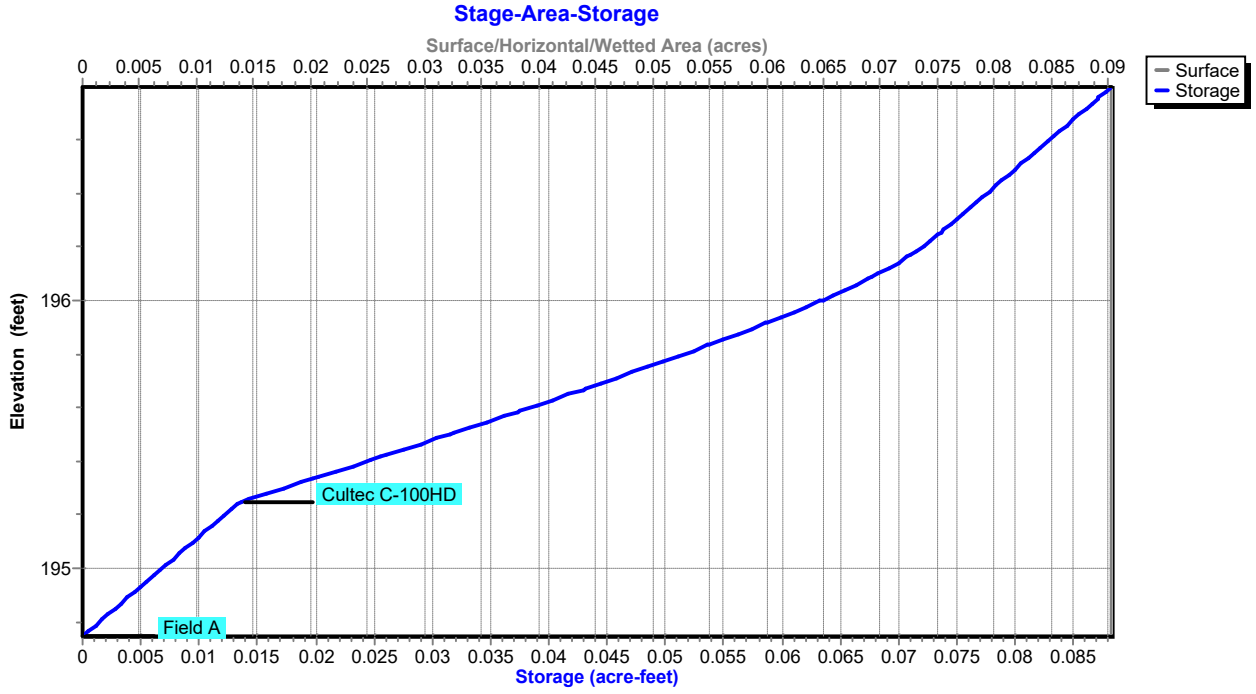
Discarded OutFlow Max=0.75 cfs @ 11.71 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 22P: N. Central Pond



Pond 22P: N. Central Pond



Summary for Pond 23P: Central Pond

Inflow Area = 2.156 ac, 21.44% Impervious, Inflow Depth = 1.31" for 25-Year event
Inflow = 2.79 cfs @ 12.10 hrs, Volume= 0.234 af
Outflow = 0.50 cfs @ 11.92 hrs, Volume= 0.234 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.50 cfs @ 11.92 hrs, Volume= 0.234 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 196.77' @ 12.81 hrs Surf.Area= 0.060 ac Storage= 0.058 af

Plug-Flow detention time= 37.0 min calculated for 0.234 af (100% of inflow)
Center-of-Mass det. time= 37.0 min (922.1 - 885.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.027 af	**65.00'W x 40.00'L x 2.04'H Field A** 0.122 af Overall - 0.031 af Embedded = 0.091 af x 30.0% Voids
#2A	195.25'	0.031 af	**Cultec C-100HD** x 95 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 19 rows
		0.058 af	Total Available Storage

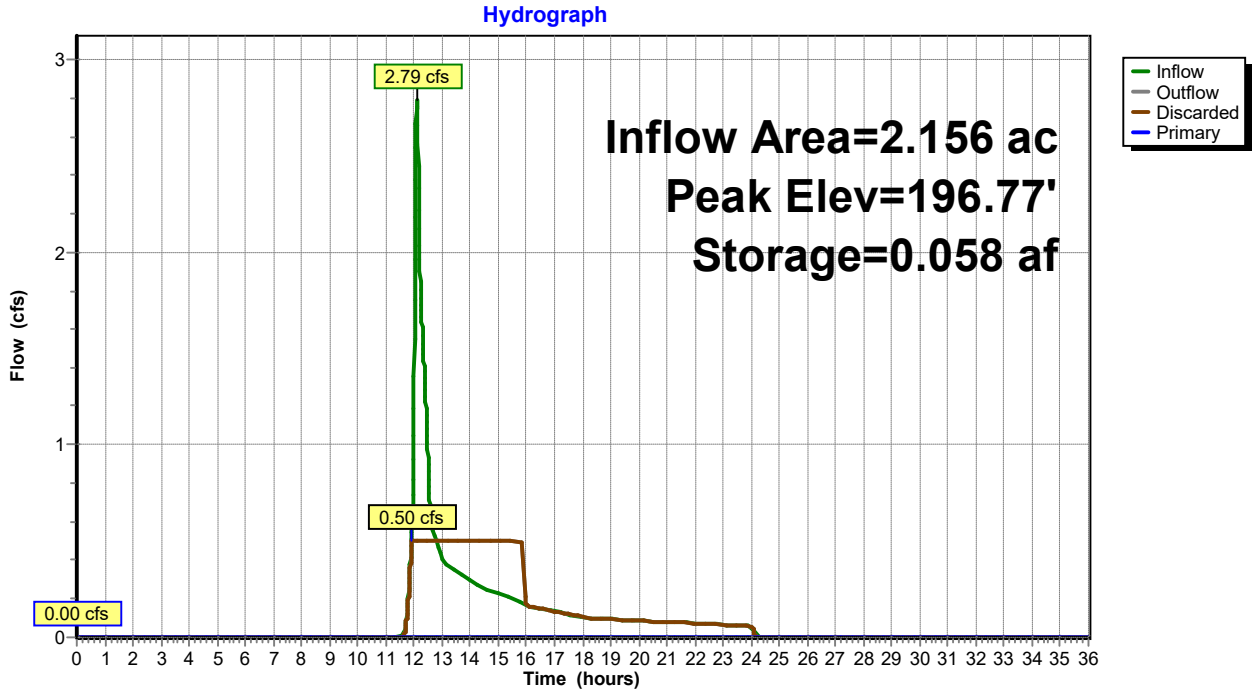
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.77'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

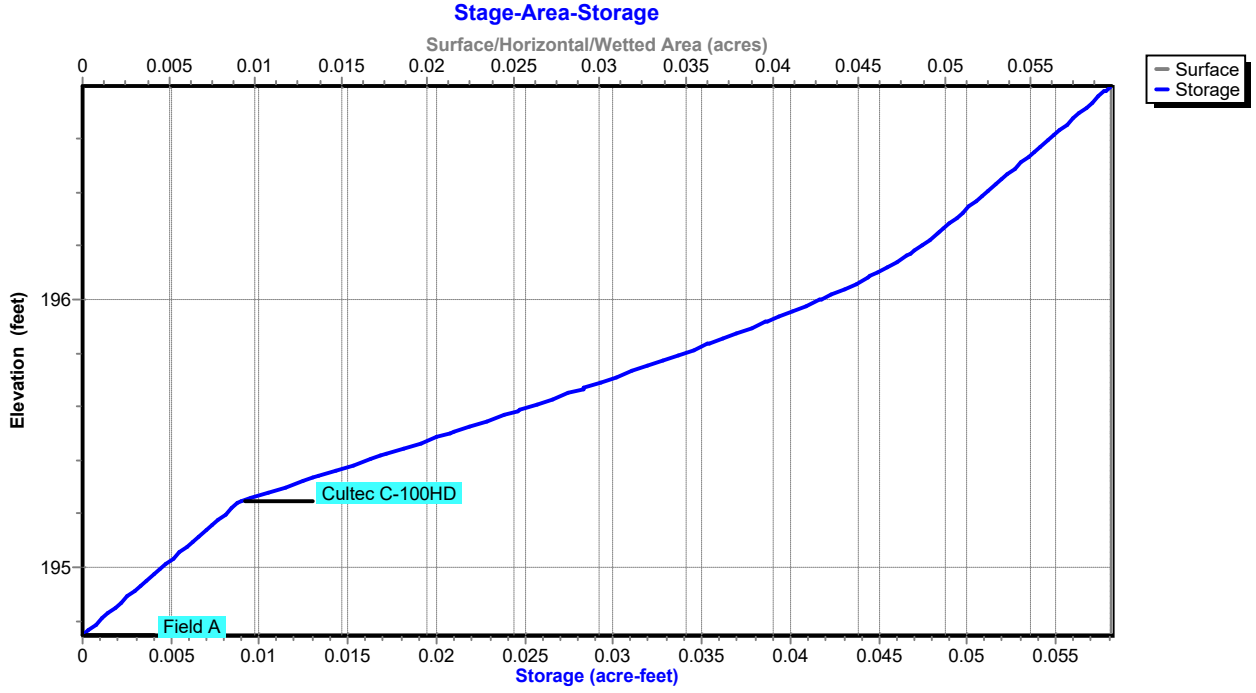
Discarded OutFlow Max=0.50 cfs @ 11.92 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.75' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 23P: Central Pond



Pond 23P: Central Pond



Summary for Pond 24P: S. Central Pond

Inflow Area = 0.569 ac, 37.48% Impervious, Inflow Depth = 1.77" for 25-Year event
Inflow = 1.10 cfs @ 12.10 hrs, Volume= 0.084 af
Outflow = 0.20 cfs @ 11.85 hrs, Volume= 0.084 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.20 cfs @ 11.85 hrs, Volume= 0.084 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 4
Peak Elev= 196.22' @ 12.64 hrs Surf.Area= 1,021 sf Storage= 947 cf

Plug-Flow detention time= 33.3 min calculated for 0.084 af (100% of inflow)
Center-of-Mass det. time= 33.3 min (900.0 - 866.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.25'	478 cf	**58.33'W x 17.50'L x 2.04'H Field A** 2,084 cf Overall - 491 cf Embedded = 1,594 cf x 30.0% Voids
#2A	194.75'	491 cf	**Cultec C-100HD** x 34 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 17 rows
#3	196.29'	0 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		969 cf	Total Available Storage

Storage Group A created with Chamber Wizard

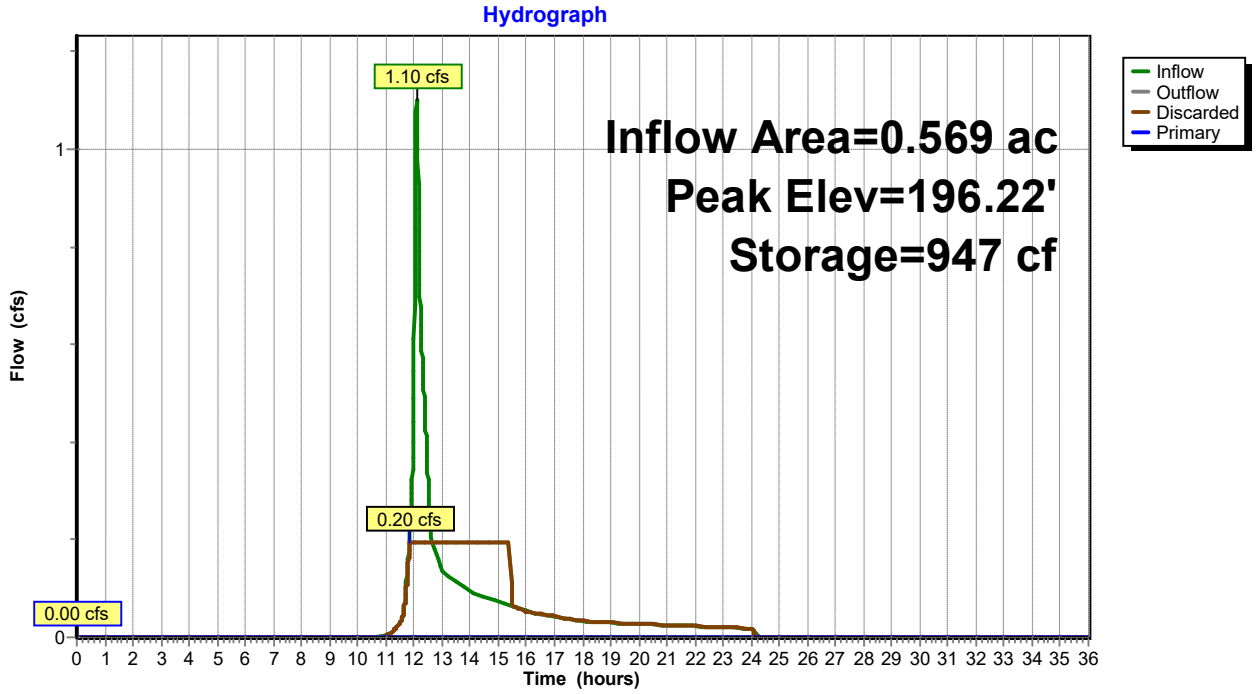
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.29	0	0	0
196.80	1	0	0

Device	Routing	Invert	Outlet Devices
#0	Primary	196.80'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

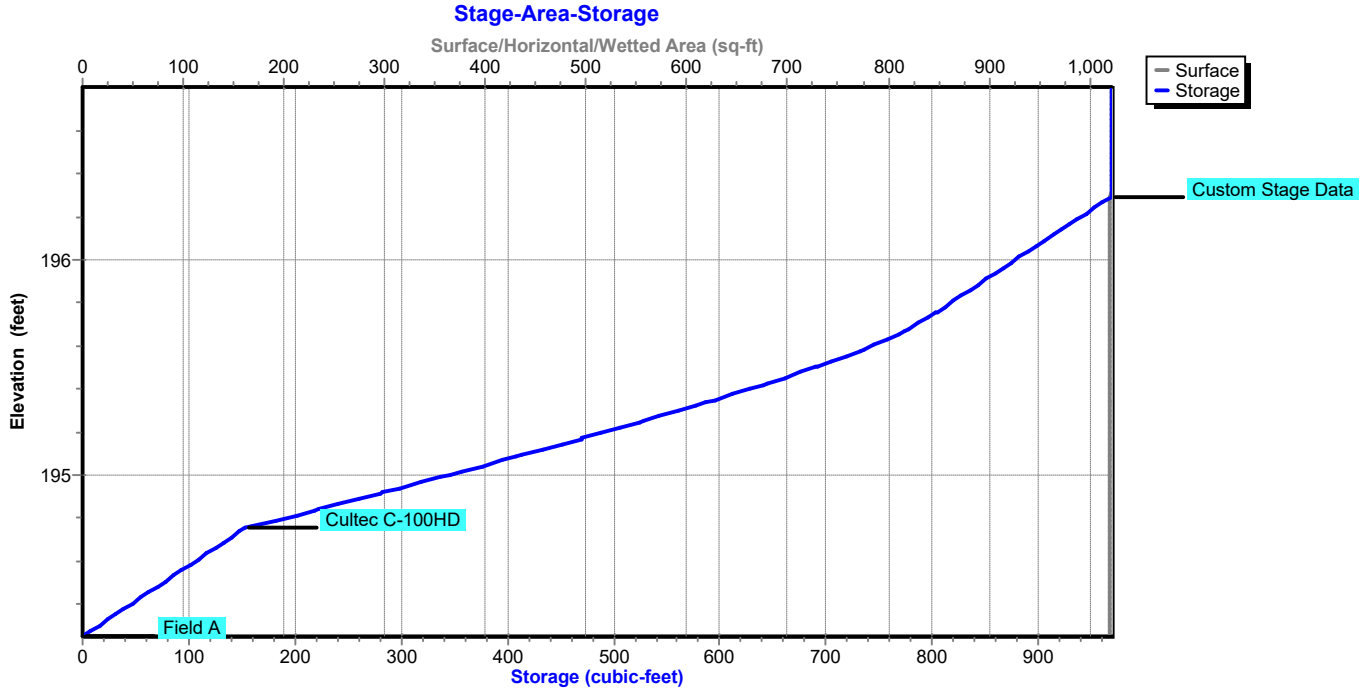
Discarded OutFlow Max=0.20 cfs @ 11.85 hrs HW=194.28' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.25' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 24P: S. Central Pond



Pond 24P: S. Central Pond



Summary for Pond 25P: Southern Pond

Inflow Area = 2.042 ac, 36.92% Impervious, Inflow Depth = 1.61" for 25-Year event
Inflow = 3.51 cfs @ 12.10 hrs, Volume= 0.274 af
Outflow = 0.63 cfs @ 11.87 hrs, Volume= 0.274 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.63 cfs @ 11.87 hrs, Volume= 0.274 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.15' @ 12.67 hrs Surf.Area= 3,267 sf Storage= 3,046 cf

Plug-Flow detention time= 34.1 min calculated for 0.274 af (100% of inflow)
Center-of-Mass det. time= 34.1 min (906.5 - 872.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.25'	1,492 cf	**81.67'W x 40.00'L x 2.04'H Field A** 6,669 cf Overall - 1,698 cf Embedded = 4,972 cf x 30.0% Voids
#2A	193.75'	1,698 cf	**Cultec C-100HD** x 120 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 24 rows
#3	195.29'	0 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3,190 cf	Total Available Storage

Storage Group A created with Chamber Wizard

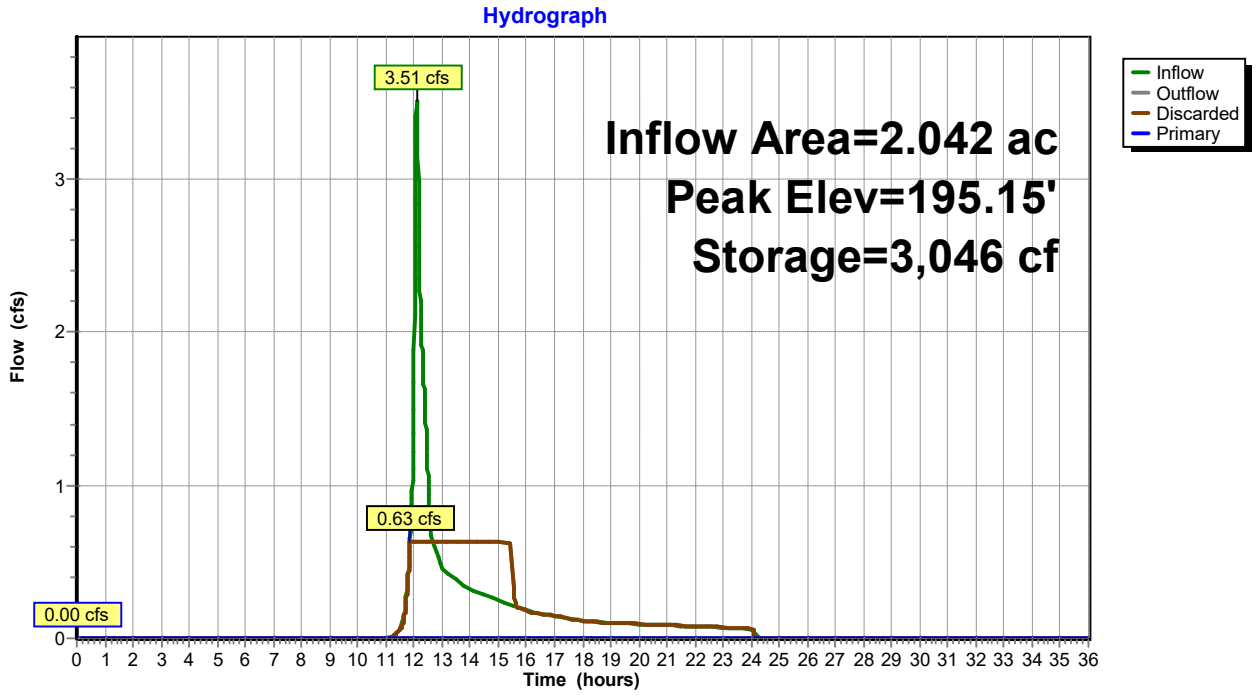
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.29	0	0	0
196.25	1	0	0

Device	Routing	Invert	Outlet Devices
#0	Primary	196.25'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	193.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	195.37'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#3	Primary	195.54'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#4	Primary	196.22'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#5	Primary	196.22'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

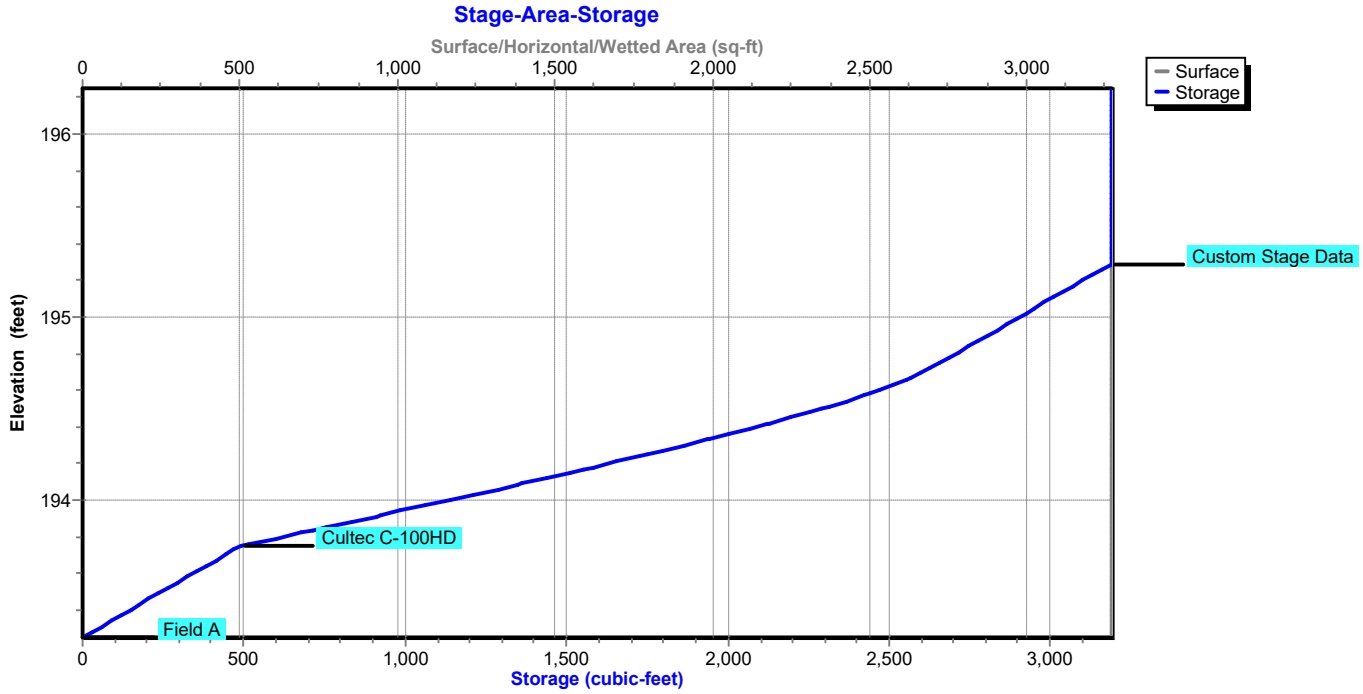
Discarded OutFlow Max=0.63 cfs @ 11.87 hrs HW=193.28' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.63 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=193.25' (Free Discharge)
├**2=Orifice/Grate** (Controls 0.00 cfs)
├**3=Orifice/Grate** (Controls 0.00 cfs)
├**4=Orifice/Grate** (Controls 0.00 cfs)
└**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 25P: Southern Pond



Pond 25P: Southern Pond



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 10: Undetained Northern Runoff Area=12.188 ac 1.80% Impervious Runoff Depth=3.40"
Flow Length=528' Tc=24.7 min CN=64 Runoff=29.63 cfs 3.456 af

Subcatchment 21: North Parking Lot Runoff Area=1.154 ac 57.94% Impervious Runoff Depth=5.75"
Tc=6.0 min CN=85 Runoff=7.53 cfs 0.553 af

Subcatchment 22: N. Central Parking Runoff Area=1.020 ac 40.80% Impervious Runoff Depth=5.18"
Tc=6.0 min CN=80 Runoff=6.11 cfs 0.440 af

Subcatchment 23: Central Parking Lot Runoff Area=2.156 ac 21.44% Impervious Runoff Depth=2.26"
Tc=6.0 min CN=53 Runoff=5.32 cfs 0.406 af

Subcatchment 24: S. Central Parking Runoff Area=0.569 ac 37.48% Impervious Runoff Depth=2.87"
Tc=6.0 min CN=59 Runoff=1.87 cfs 0.136 af

Subcatchment 25: Southern Parking Lot Runoff Area=2.042 ac 36.92% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=57 Runoff=6.15 cfs 0.454 af

Subcatchment 30: Undetained Southern Runoff Area=8.796 ac 7.84% Impervious Runoff Depth=3.19"
Flow Length=119' Tc=11.3 min CN=62 Runoff=27.12 cfs 2.337 af

Reach DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 1PE: Existing North Pond Peak Elev=195.38' Storage=30,547 cf Inflow=33.10 cfs 3.577 af
Discarded=17.83 cfs 3.577 af Primary=0.00 cfs 0.000 af Outflow=17.83 cfs 3.577 af

Pond 3PE: Existing Southern Pond Peak Elev=195.29' Storage=18,990 cf Inflow=38.04 cfs 2.544 af
Discarded=18.07 cfs 2.544 af Primary=0.00 cfs 0.000 af Outflow=18.07 cfs 2.544 af

Pond 21P: Northern Pond Peak Elev=196.79' Storage=0.112 af Inflow=7.53 cfs 0.553 af
Discarded=0.96 cfs 0.488 af Primary=4.32 cfs 0.065 af Outflow=5.28 cfs 0.553 af

Pond 22P: N. Central Pond Peak Elev=196.79' Storage=0.088 af Inflow=6.11 cfs 0.440 af
Discarded=0.75 cfs 0.383 af Primary=4.05 cfs 0.057 af Outflow=4.80 cfs 0.440 af

Pond 23P: Central Pond Peak Elev=196.79' Storage=0.058 af Inflow=5.32 cfs 0.406 af
Discarded=0.50 cfs 0.313 af Primary=4.68 cfs 0.093 af Outflow=5.18 cfs 0.406 af

Pond 24P: S. Central Pond Peak Elev=196.80' Storage=969 cf Inflow=1.87 cfs 0.136 af
Discarded=0.20 cfs 0.110 af Primary=1.59 cfs 0.026 af Outflow=1.78 cfs 0.136 af

Pond 25P: Southern Pond Peak Elev=196.16' Storage=3,190 cf Inflow=6.15 cfs 0.454 af
Discarded=0.63 cfs 0.365 af Primary=5.62 cfs 0.088 af Outflow=6.25 cfs 0.453 af

Total Runoff Area = 27.925 ac Runoff Volume = 7.782 af Average Runoff Depth = 3.34"
87.74% Pervious = 24.503 ac 12.26% Impervious = 3.422 ac

Summary for Subcatchment 10: Undetained Northern Areas

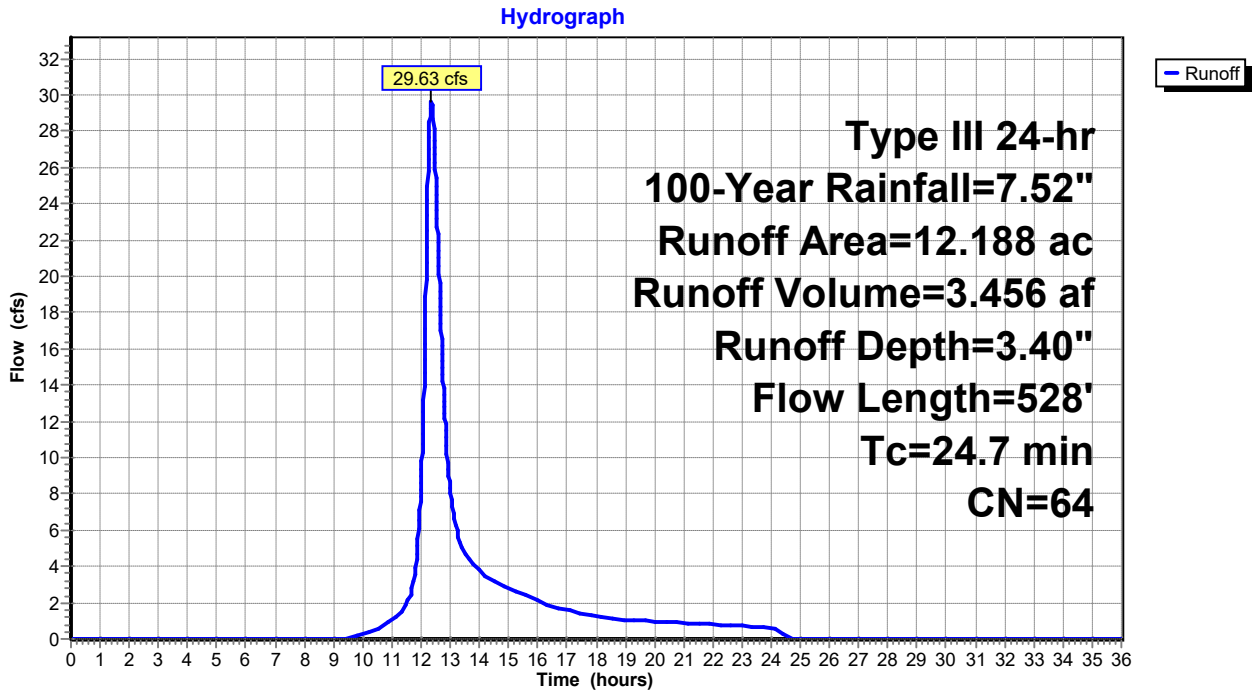
Runoff = 29.63 cfs @ 12.35 hrs, Volume= 3.456 af, Depth= 3.40"
Routed to Pond 1PE : Existing North Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

	Area (ac)	CN	Description
	10.956	68	<50% Grass cover, Poor, HSG A
*	0.408	1	Porous Walks&Playgrounds, Good, HSG A
	0.191	98	Paved parking, HSG A
	0.018	98	Roofs, HSG A
	0.010	98	Unconnected roofs, HSG A
	0.000	89	Urban commercial, 85% imp, HSG A
	0.605	30	Woods, Good, HSG A
	12.188	64	Weighted Average
	11.969		98.20% Pervious Area
	0.219		1.80% Impervious Area
	0.010		4.57% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	50	0.0133	0.12		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
18.0	478	0.0040	0.44		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
24.7	528	Total			

Subcatchment 10: Undetained Northern Areas



Summary for Subcatchment 21: North Parking Lot

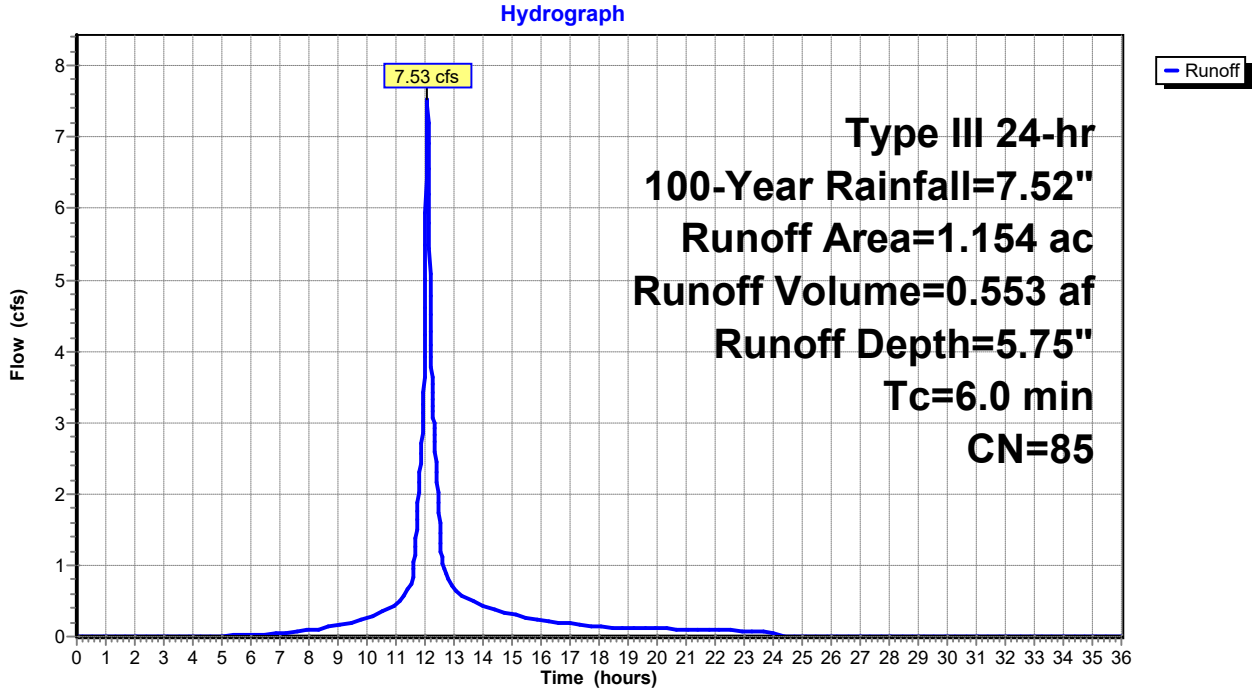
Runoff = 7.53 cfs @ 12.09 hrs, Volume= 0.553 af, Depth= 5.75"
Routed to Pond 21P : Northern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

Area (ac)	CN	Description
0.485	68	<50% Grass cover, Poor, HSG A
0.668	98	Paved parking, HSG A
1.154	85	Weighted Average
0.485		42.06% Pervious Area
0.668		57.94% Impervious Area

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

Subcatchment 21: North Parking Lot



Summary for Subcatchment 22: N. Central Parking Lot

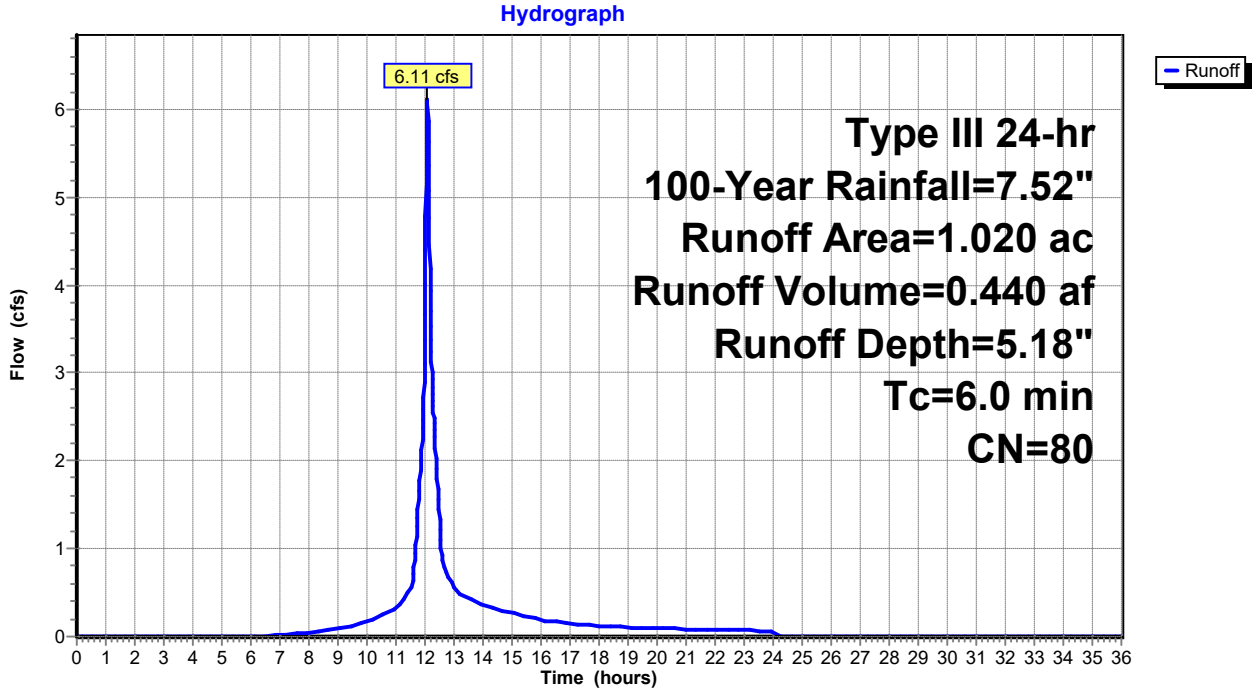
Runoff = 6.11 cfs @ 12.09 hrs, Volume= 0.440 af, Depth= 5.18"
Routed to Pond 22P : N. Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

Area (ac)	CN	Description
0.604	68	<50% Grass cover, Poor, HSG A
0.416	98	Paved parking, HSG A
1.020	80	Weighted Average
0.604		59.20% Pervious Area
0.416		40.80% Impervious Area

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

Subcatchment 22: N. Central Parking Lot



Summary for Subcatchment 23: Central Parking Lot & Drive

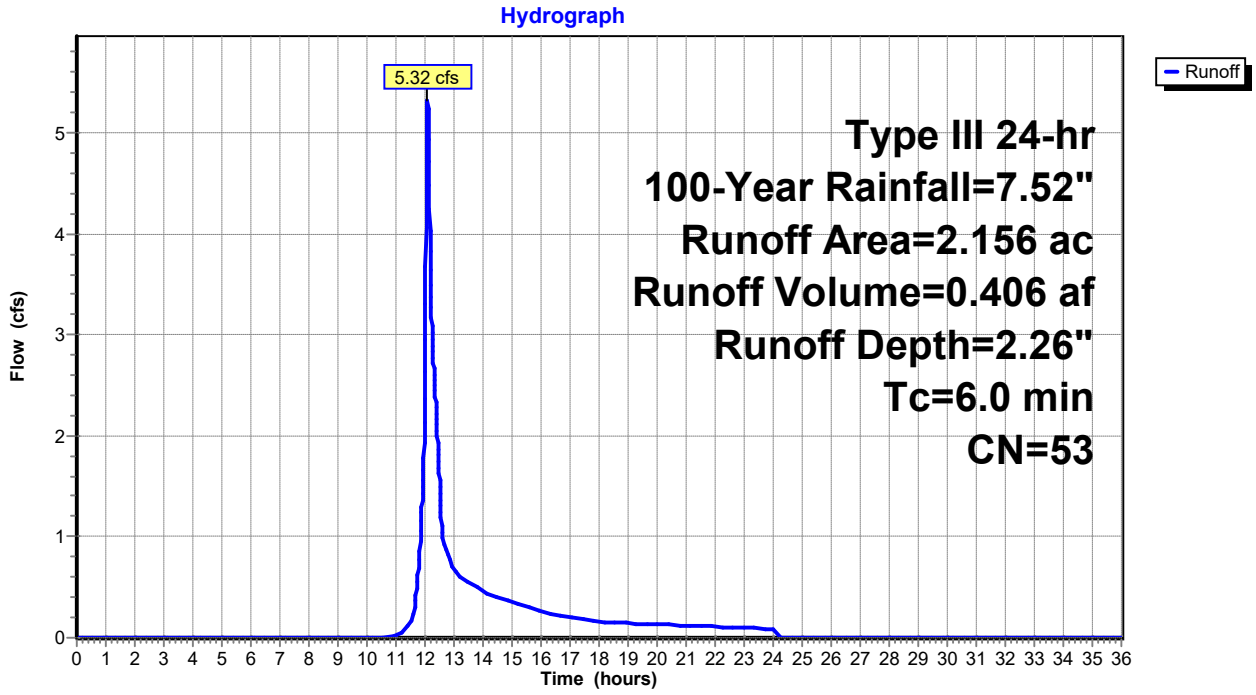
Runoff = 5.32 cfs @ 12.10 hrs, Volume= 0.406 af, Depth= 2.26"
Routed to Pond 23P : Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

Area (ac)	CN	Description
0.454	68	<50% Grass cover, Poor, HSG A
0.462	98	Paved parking, HSG A
1.240	30	Woods, Good, HSG A
2.156	53	Weighted Average
1.694		78.56% Pervious Area
0.462		21.44% Impervious Area

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

Subcatchment 23: Central Parking Lot & Drive



Summary for Subcatchment 24: S. Central Parking Lot

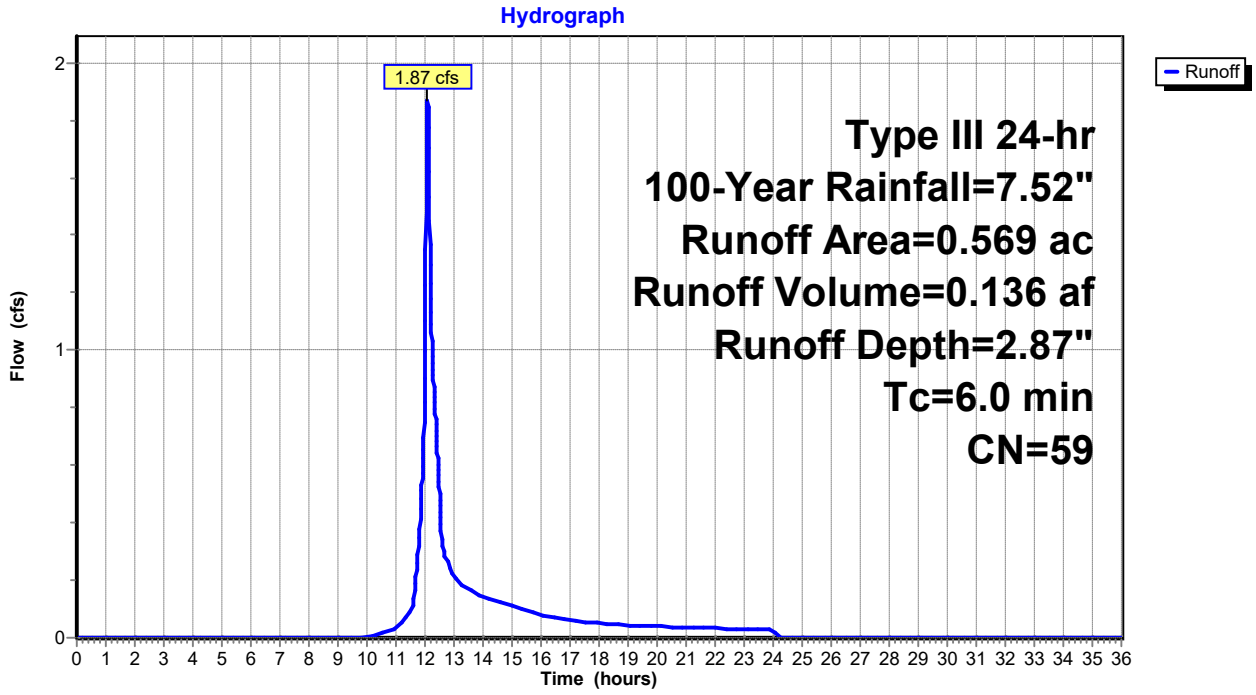
Runoff = 1.87 cfs @ 12.09 hrs, Volume= 0.136 af, Depth= 2.87"
Routed to Pond 24P : S. Central Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

Area (ac)	CN	Description
0.051	68	<50% Grass cover, Poor, HSG A
0.213	98	Paved parking, HSG A
0.304	30	Woods, Good, HSG A
0.569	59	Weighted Average
0.356		62.52% Pervious Area
0.213		37.48% Impervious Area

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

Subcatchment 24: S. Central Parking Lot



Summary for Subcatchment 25: Southern Parking Lot

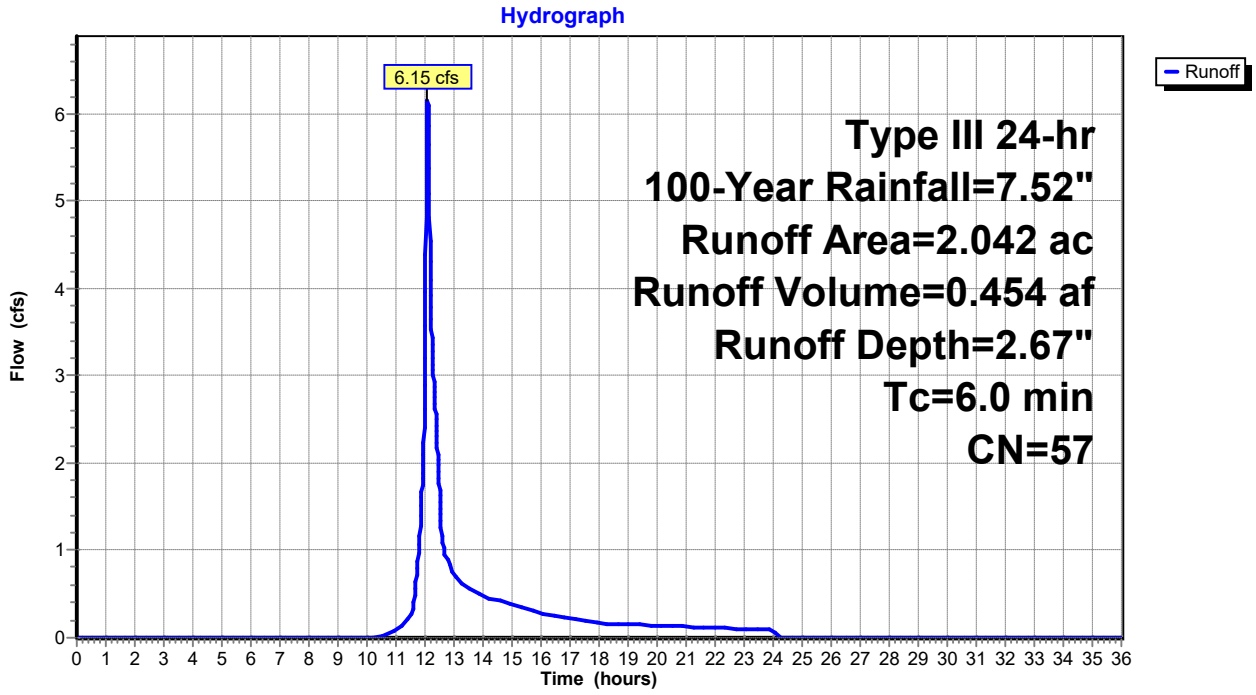
Runoff = 6.15 cfs @ 12.09 hrs, Volume= 0.454 af, Depth= 2.67"
Routed to Pond 25P : Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

Area (ac)	CN	Description
0.097	68	<50% Grass cover, Poor, HSG A
0.754	98	Paved parking, HSG A
1.191	30	Woods, Good, HSG A
2.042	57	Weighted Average
1.288		63.08% Pervious Area
0.754		36.92% Impervious Area

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

Subcatchment 25: Southern Parking Lot



Summary for Subcatchment 30: Undetained Southern Areas

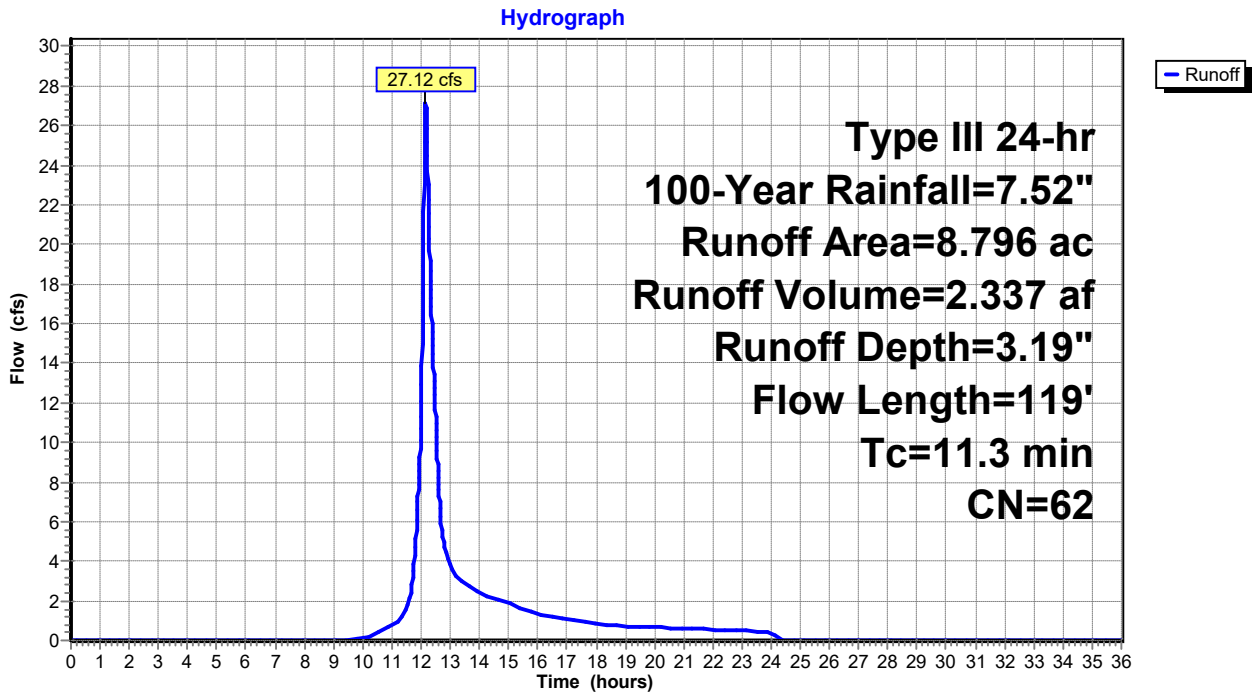
Runoff = 27.12 cfs @ 12.16 hrs, Volume= 2.337 af, Depth= 3.19"
Routed to Pond 3PE : Existing Southern Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=7.52"

	Area (ac)	CN	Description
	6.272	68	<50% Grass cover, Poor, HSG A
*	0.271	1	PorousWalks&Playgrounds, Good, HSG A
	0.082	76	Gravel roads, HSG A
	0.151	98	Paved parking, HSG A
	0.025	98	Roofs, HSG A
	0.067	98	Unconnected roofs, HSG A
	0.525	89	Urban commercial, 85% imp, HSG A
	1.403	30	Woods, Good, HSG A
	8.796	62	Weighted Average
	8.107		92.16% Pervious Area
	0.689		7.84% Impervious Area
	0.067		9.72% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	50	0.0076	0.10		**Sheet Flow, A** Grass: Short n= 0.150 P2= 3.13"
2.9	69	0.0032	0.40		**Shallow Concentrated Flow, B** Short Grass Pasture Kv= 7.0 fps
11.3	119	Total			

Subcatchment 30: Undetained Southern Areas

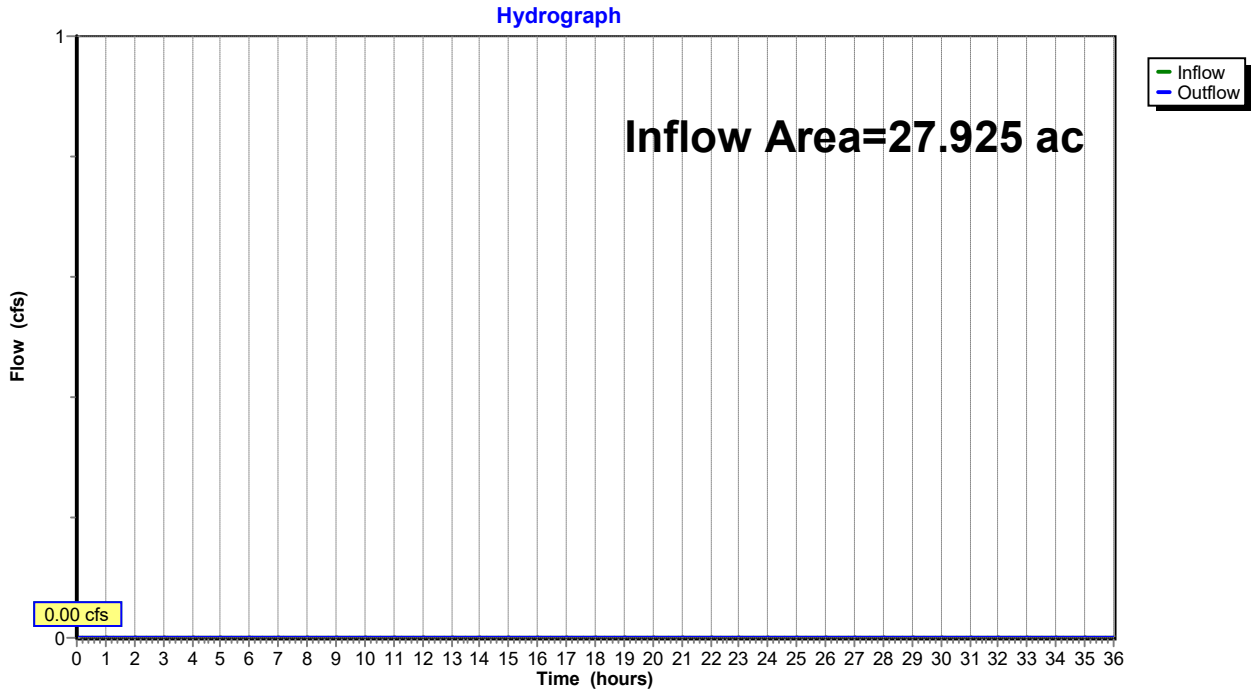


Summary for Reach DP-1: DP-1

Inflow Area = 27.925 ac, 12.26% Impervious, Inflow Depth = 0.00" for 100-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach DP-1: DP-1



Summary for Pond 1PE: Existing North Pond

Inflow Area = 27.925 ac, 12.26% Impervious, Inflow Depth = 1.54" for 100-Year event
Inflow = 33.10 cfs @ 12.32 hrs, Volume= 3.577 af
Outflow = 17.83 cfs @ 12.67 hrs, Volume= 3.577 af, Atten= 46%, Lag= 21.0 min
Discarded = 17.83 cfs @ 12.67 hrs, Volume= 3.577 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.38' @ 12.67 hrs Surf.Area= 93,148 sf Storage= 30,547 cf

Plug-Flow detention time= 15.4 min calculated for 3.577 af (100% of inflow)
Center-of-Mass det. time= 15.4 min (869.2 - 853.8)

Volume	Invert	Avail.Storage	Storage Description
#1	194.50'	128,718 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		128,719 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.50	63	0	0
194.75	1,643	213	213
195.00	39,556	5,150	5,363
195.25	73,196	14,094	19,457
195.50	110,604	22,975	42,432
195.75	162,562	34,146	76,578
196.00	254,556	52,140	128,718

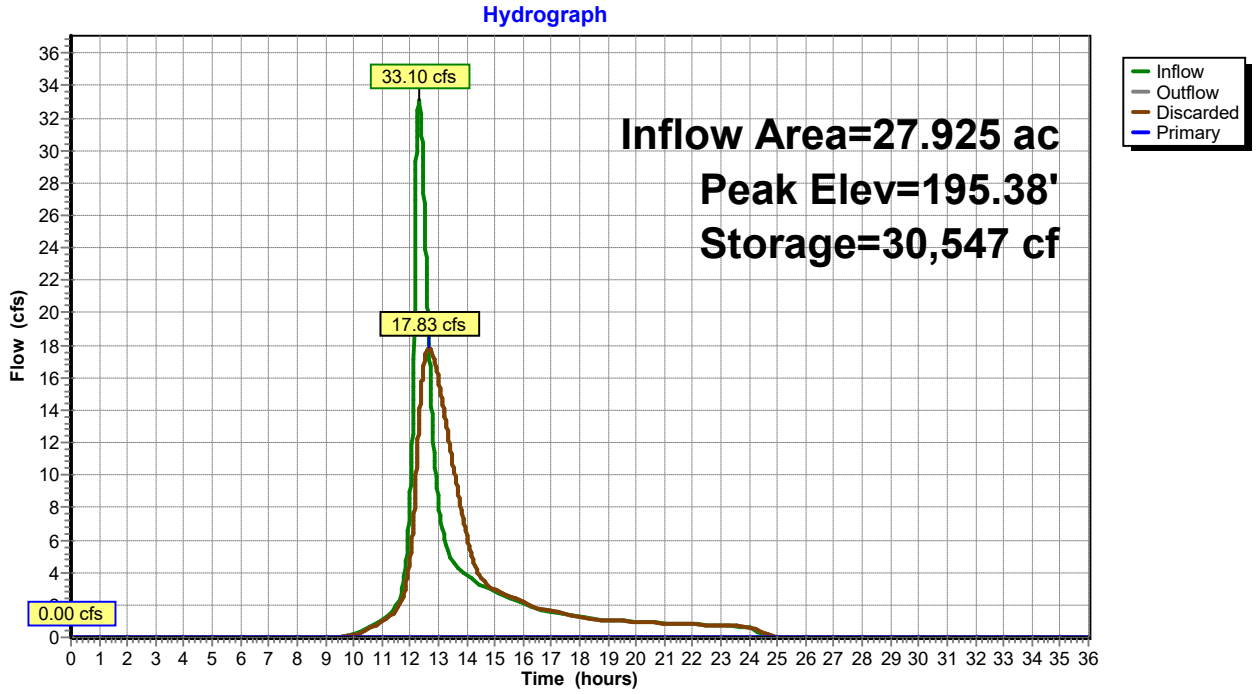
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.00'	**60.0' long x 30.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

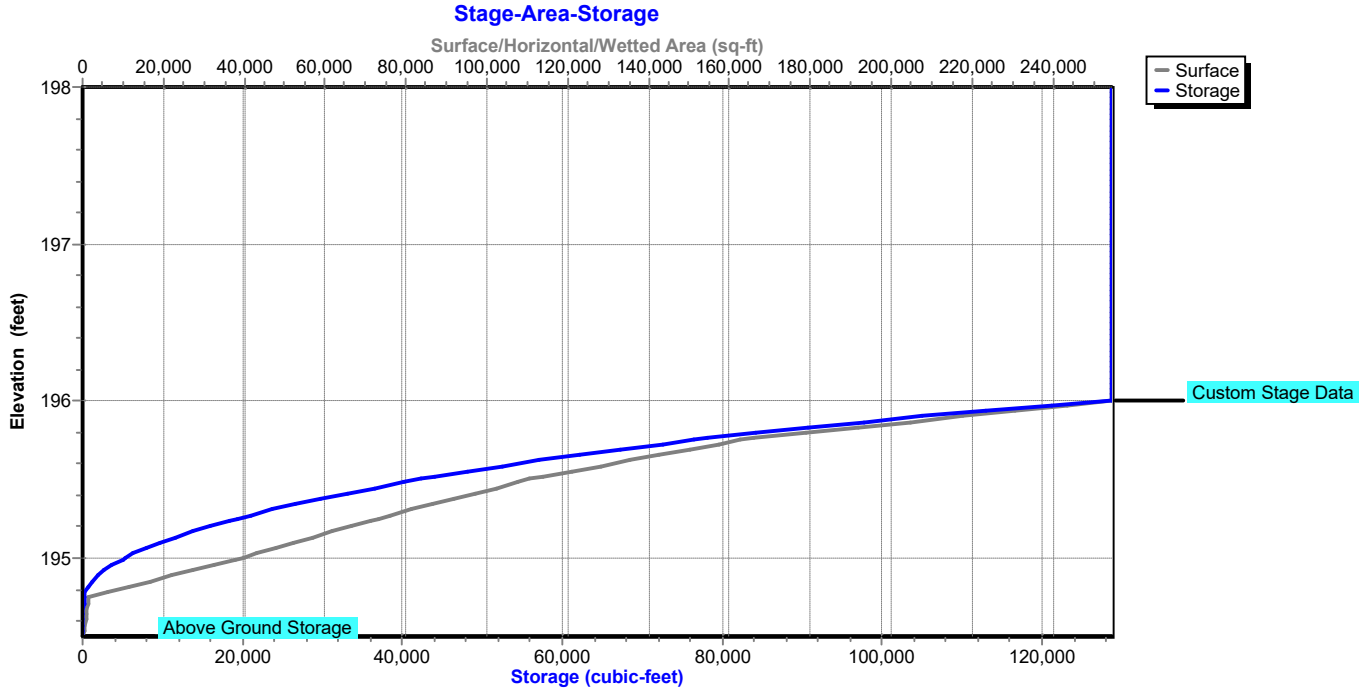
Discarded OutFlow Max=17.83 cfs @ 12.67 hrs HW=195.38' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 17.83 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1PE: Existing North Pond



Pond 1PE: Existing North Pond



Summary for Pond 3PE: Existing Southern Pond

Inflow Area = 13.563 ac, 15.62% Impervious, Inflow Depth = 2.25" for 100-Year event
Inflow = 38.04 cfs @ 12.15 hrs, Volume= 2.544 af
Outflow = 18.07 cfs @ 12.41 hrs, Volume= 2.544 af, Atten= 53%, Lag= 15.9 min
Discarded = 18.07 cfs @ 12.41 hrs, Volume= 2.544 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 195.29' @ 12.41 hrs Surf.Area= 94,396 sf Storage= 18,990 cf

Plug-Flow detention time= 13.1 min calculated for 2.543 af (100% of inflow)
Center-of-Mass det. time= 13.1 min (854.3 - 841.2)

Volume	Invert	Avail.Storage	Storage Description
#1	194.50'	118,206 cf	**Above Ground Storage (Prismatic)** Listed below (Recalc)
#2	196.00'	1 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		118,207 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
194.50	227	0	0
194.75	2,564	349	349
195.00	12,299	1,858	2,207
195.25	89,207	12,688	14,895
195.50	118,288	25,937	40,832
195.75	143,996	32,786	73,617
196.00	212,712	44,589	118,206

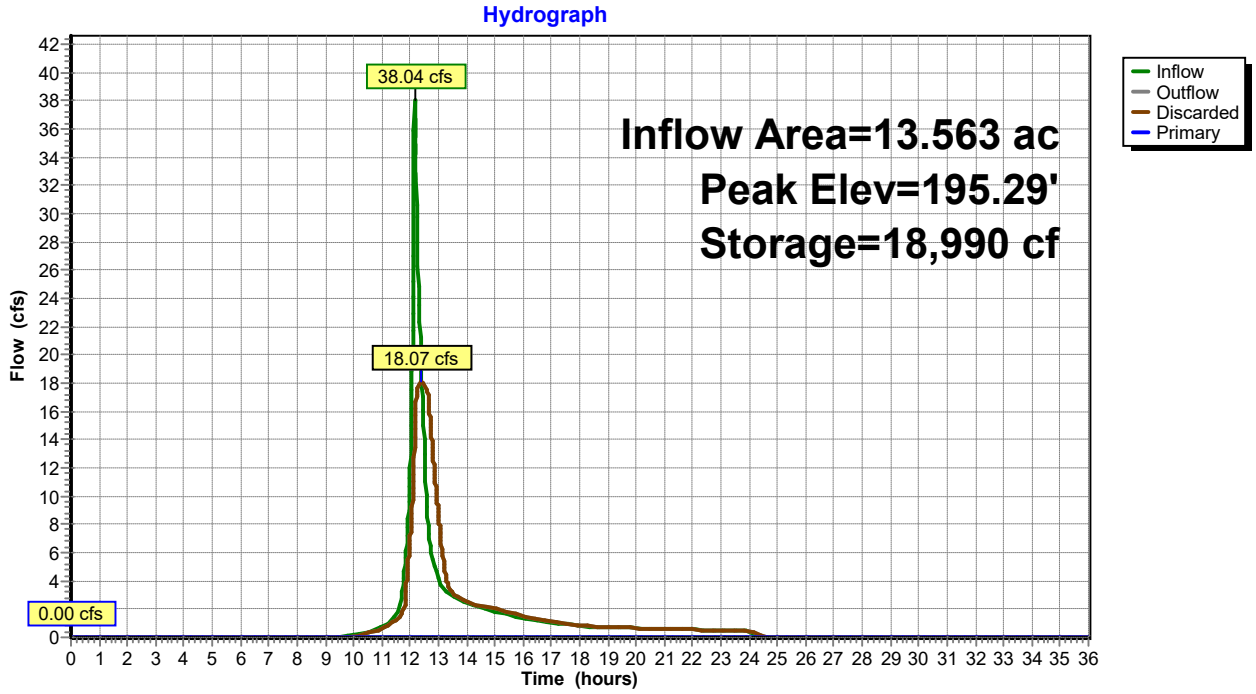
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	0	0	0
198.00	1	1	1

Device	Routing	Invert	Outlet Devices
#0	Primary	198.00'	**Automatic Storage Overflow** (Discharged without head)
#1	Primary	196.00'	**30.0' long x 60.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	194.50'	**8.270 in/hr Exfiltration over Surface area**

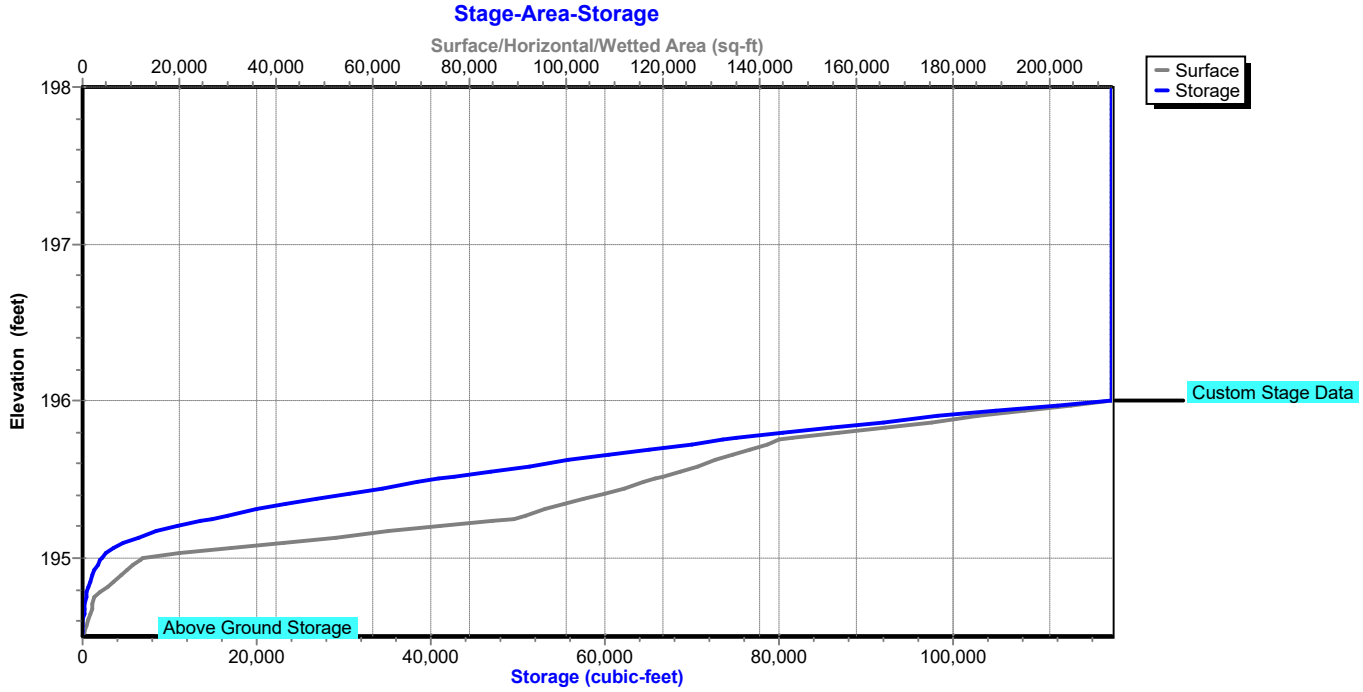
Discarded OutFlow Max=18.07 cfs @ 12.41 hrs HW=195.29' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 18.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=194.50' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3PE: Existing Southern Pond



Pond 3PE: Existing Southern Pond



Summary for Pond 21P: Northern Pond

Inflow Area = 1.154 ac, 57.94% Impervious, Inflow Depth = 5.75" for 100-Year event
Inflow = 7.53 cfs @ 12.09 hrs, Volume= 0.553 af
Outflow = 5.28 cfs @ 12.17 hrs, Volume= 0.553 af, Atten= 30%, Lag= 4.9 min
Discarded = 0.96 cfs @ 11.62 hrs, Volume= 0.488 af
Primary = 4.32 cfs @ 12.17 hrs, Volume= 0.065 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 196.79' @ 12.16 hrs Surf.Area= 0.115 ac Storage= 0.112 af

Plug-Flow detention time= 27.7 min calculated for 0.553 af (100% of inflow)
Center-of-Mass det. time= 27.7 min (820.3 - 792.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.052 af	**125.00'W x 40.00'L x 2.04'H Field A** 0.234 af Overall - 0.060 af Embedded = 0.174 af x 30.0% Voids
#2A	195.25'	0.060 af	**Cultec C-100HD** x 185 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 37 rows
		0.112 af	Total Available Storage

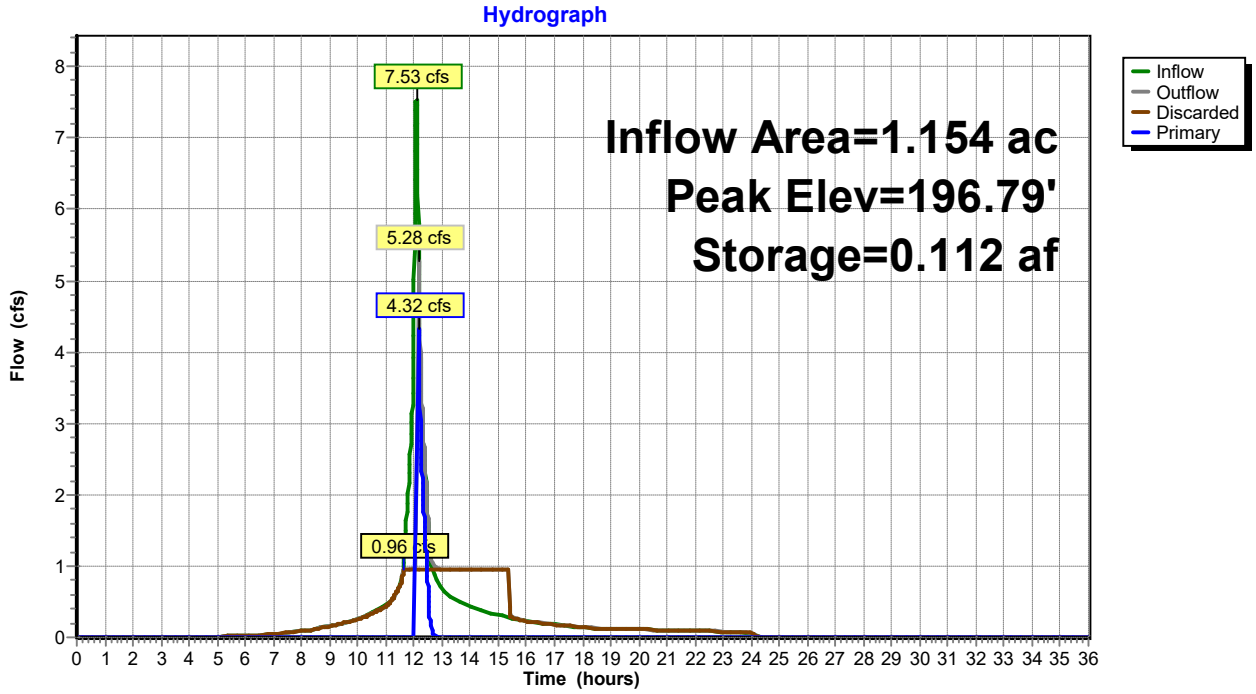
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

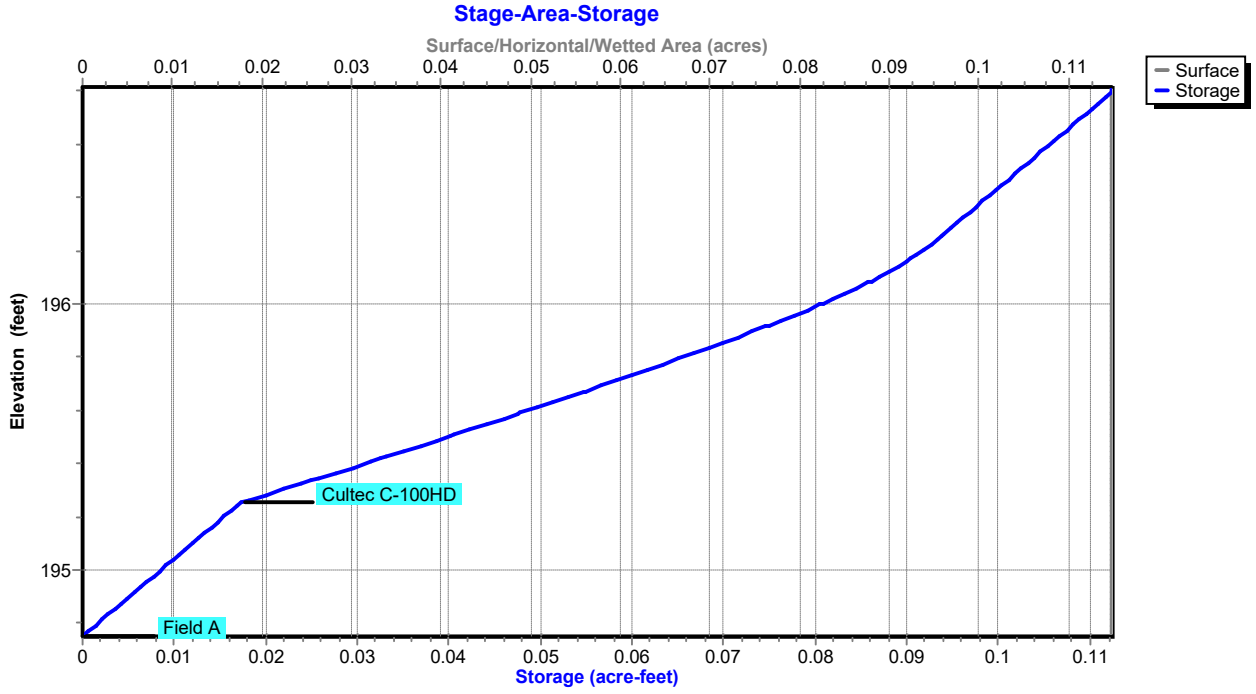
Discarded OutFlow Max=0.96 cfs @ 11.62 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.96 cfs)

Primary OutFlow Max=0.22 cfs @ 12.17 hrs HW=196.79' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 0.22 cfs @ 0.67 fps)

Pond 21P: Northern Pond



Pond 21P: Northern Pond



Summary for Pond 22P: N. Central Pond

Inflow Area = 1.020 ac, 40.80% Impervious, Inflow Depth = 5.18" for 100-Year event
Inflow = 6.11 cfs @ 12.09 hrs, Volume= 0.440 af
Outflow = 4.80 cfs @ 12.16 hrs, Volume= 0.440 af, Atten= 21%, Lag= 4.7 min
Discarded = 0.75 cfs @ 11.63 hrs, Volume= 0.383 af
Primary = 4.05 cfs @ 12.16 hrs, Volume= 0.057 af
Routed to Pond 1PE : Existing North Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 196.79' @ 12.15 hrs Surf.Area= 0.090 ac Storage= 0.088 af

Plug-Flow detention time= 28.6 min calculated for 0.440 af (100% of inflow)
Center-of-Mass det. time= 28.6 min (833.9 - 805.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.041 af	**98.33'W x 40.00'L x 2.04'H Field A** 0.184 af Overall - 0.047 af Embedded = 0.137 af x 30.0% Voids
#2A	195.25'	0.047 af	**Cultec C-100HD** x 145 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 29 rows
		0.088 af	Total Available Storage

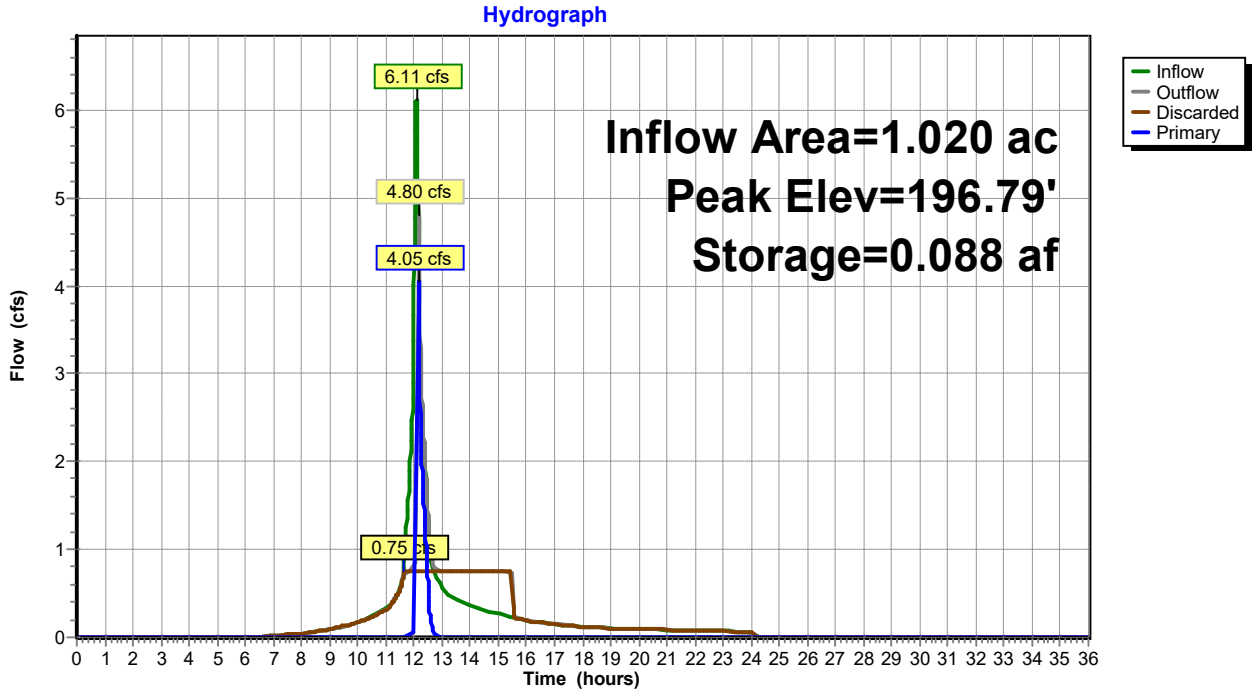
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

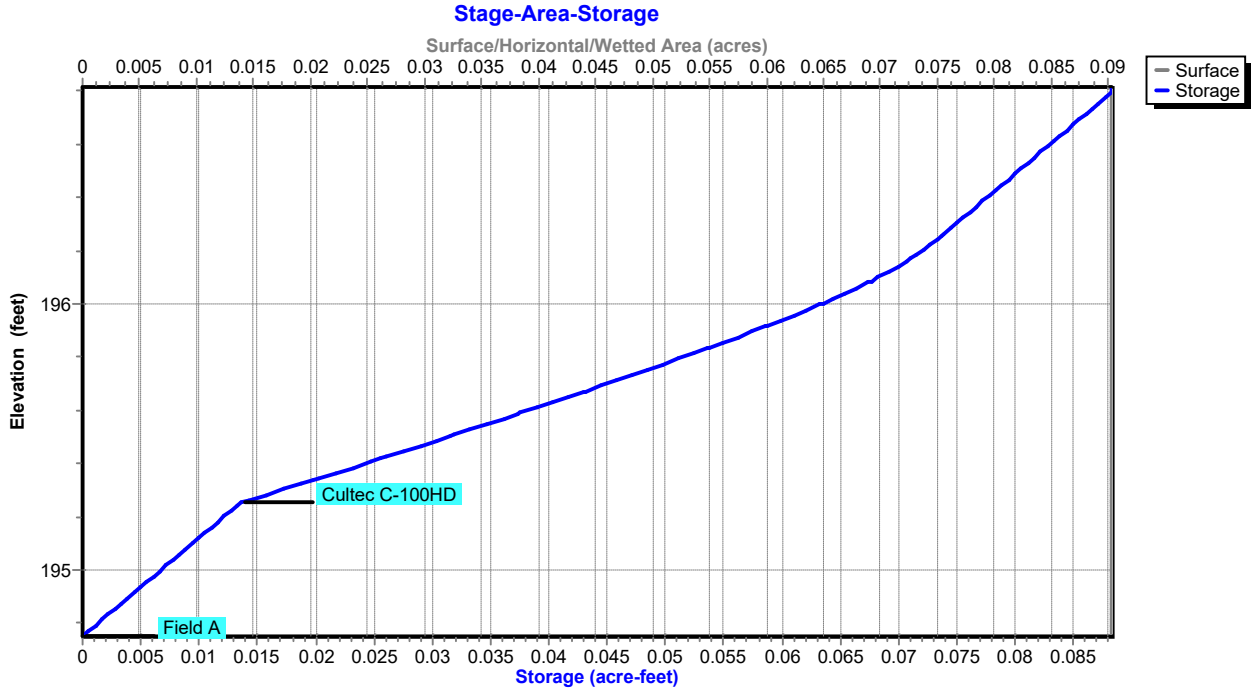
Discarded OutFlow Max=0.75 cfs @ 11.63 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.75 cfs)

Primary OutFlow Max=0.22 cfs @ 12.16 hrs HW=196.79' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 0.22 cfs @ 0.67 fps)

Pond 22P: N. Central Pond



Pond 22P: N. Central Pond



Summary for Pond 23P: Central Pond

Inflow Area = 2.156 ac, 21.44% Impervious, Inflow Depth = 2.26" for 100-Year event
Inflow = 5.32 cfs @ 12.10 hrs, Volume= 0.406 af
Outflow = 5.18 cfs @ 12.14 hrs, Volume= 0.406 af, Atten= 3%, Lag= 2.8 min
Discarded = 0.50 cfs @ 11.73 hrs, Volume= 0.313 af
Primary = 4.68 cfs @ 12.14 hrs, Volume= 0.093 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 196.79' @ 12.13 hrs Surf.Area= 0.060 ac Storage= 0.058 af

Plug-Flow detention time= 35.3 min calculated for 0.406 af (100% of inflow)
Center-of-Mass det. time= 35.3 min (902.0 - 866.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.75'	0.027 af	**65.00'W x 40.00'L x 2.04'H Field A** 0.122 af Overall - 0.031 af Embedded = 0.091 af x 30.0% Voids
#2A	195.25'	0.031 af	**Cultec C-100HD** x 95 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 19 rows
		0.058 af	Total Available Storage

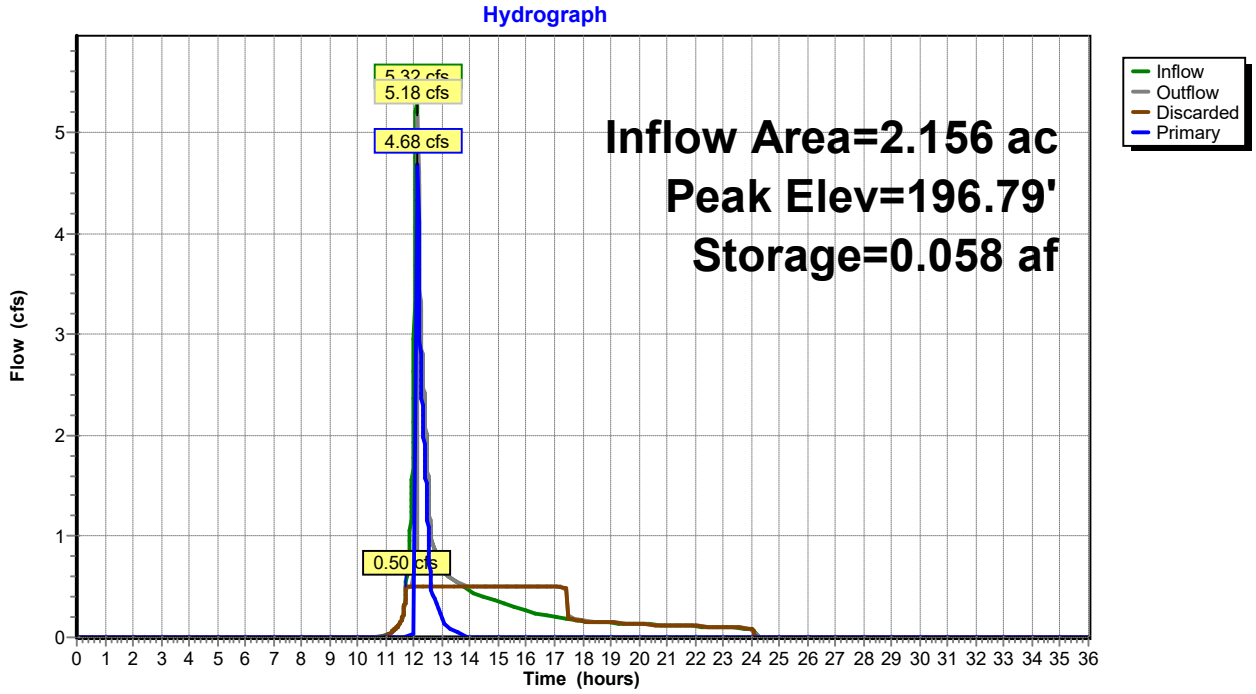
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Primary	196.79'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.75'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.77'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

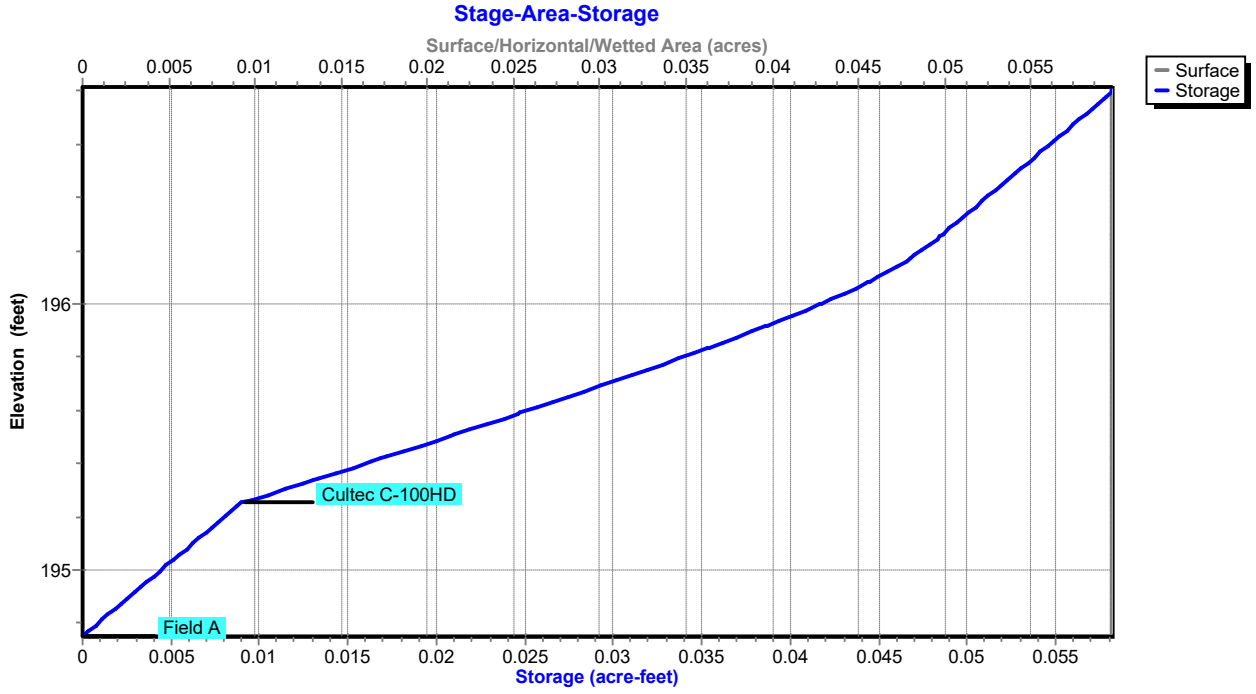
Discarded OutFlow Max=0.50 cfs @ 11.73 hrs HW=194.77' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.08 cfs @ 12.14 hrs HW=196.79' (Free Discharge)
↑—**2=Orifice/Grate** (Weir Controls 0.08 cfs @ 0.48 fps)

Pond 23P: Central Pond



Pond 23P: Central Pond



Summary for Pond 24P: S. Central Pond

Inflow Area = 0.569 ac, 37.48% Impervious, Inflow Depth = 2.87" for 100-Year event
Inflow = 1.87 cfs @ 12.09 hrs, Volume= 0.136 af
Outflow = 1.78 cfs @ 12.14 hrs, Volume= 0.136 af, Atten= 5%, Lag= 3.1 min
Discarded = 0.20 cfs @ 12.14 hrs, Volume= 0.110 af
Primary = 1.59 cfs @ 12.14 hrs, Volume= 0.026 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 4
Peak Elev= 196.80' @ 12.14 hrs Surf.Area= 1,022 sf Storage= 969 cf

Plug-Flow detention time= 34.5 min calculated for 0.136 af (100% of inflow)
Center-of-Mass det. time= 32.9 min (884.7 - 851.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	194.25'	478 cf	**58.33'W x 17.50'L x 2.04'H Field A** 2,084 cf Overall - 491 cf Embedded = 1,594 cf x 30.0% Voids
#2A	194.75'	491 cf	**Cultec C-100HD** x 34 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 17 rows
#3	196.29'	0 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		969 cf	Total Available Storage

Storage Group A created with Chamber Wizard

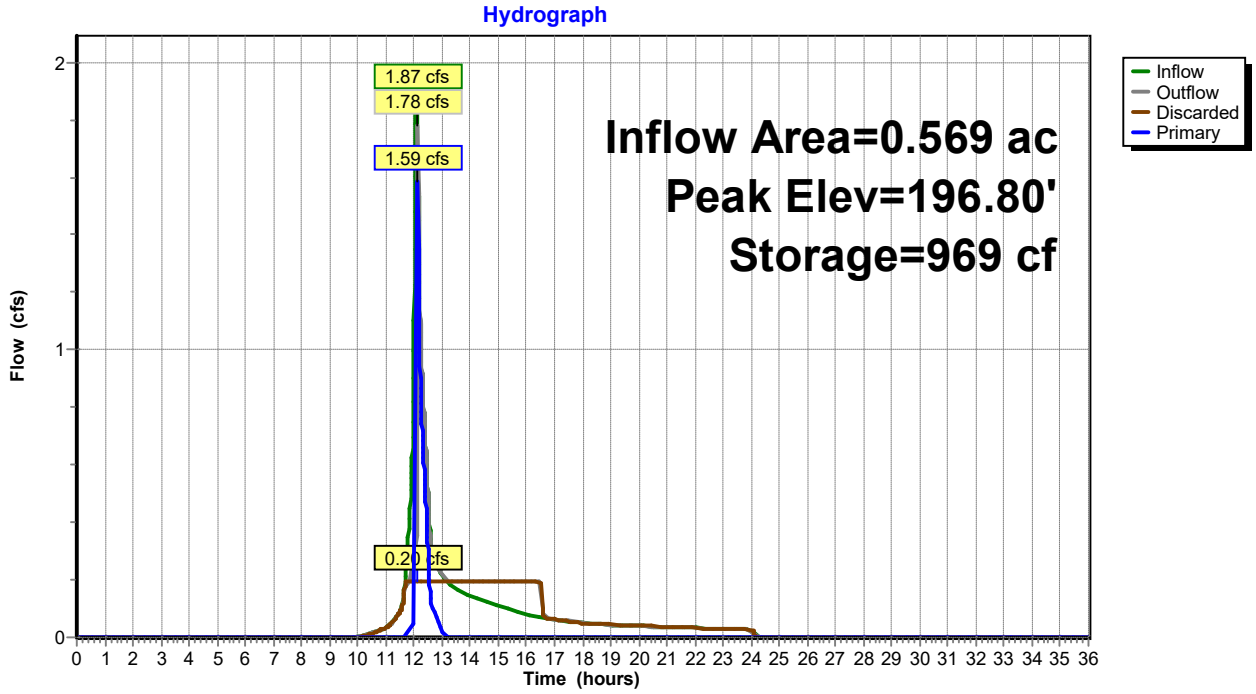
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.29	0	0	0
196.80	1	0	0

Device	Routing	Invert	Outlet Devices
#0	Primary	196.80'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	194.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	196.75'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

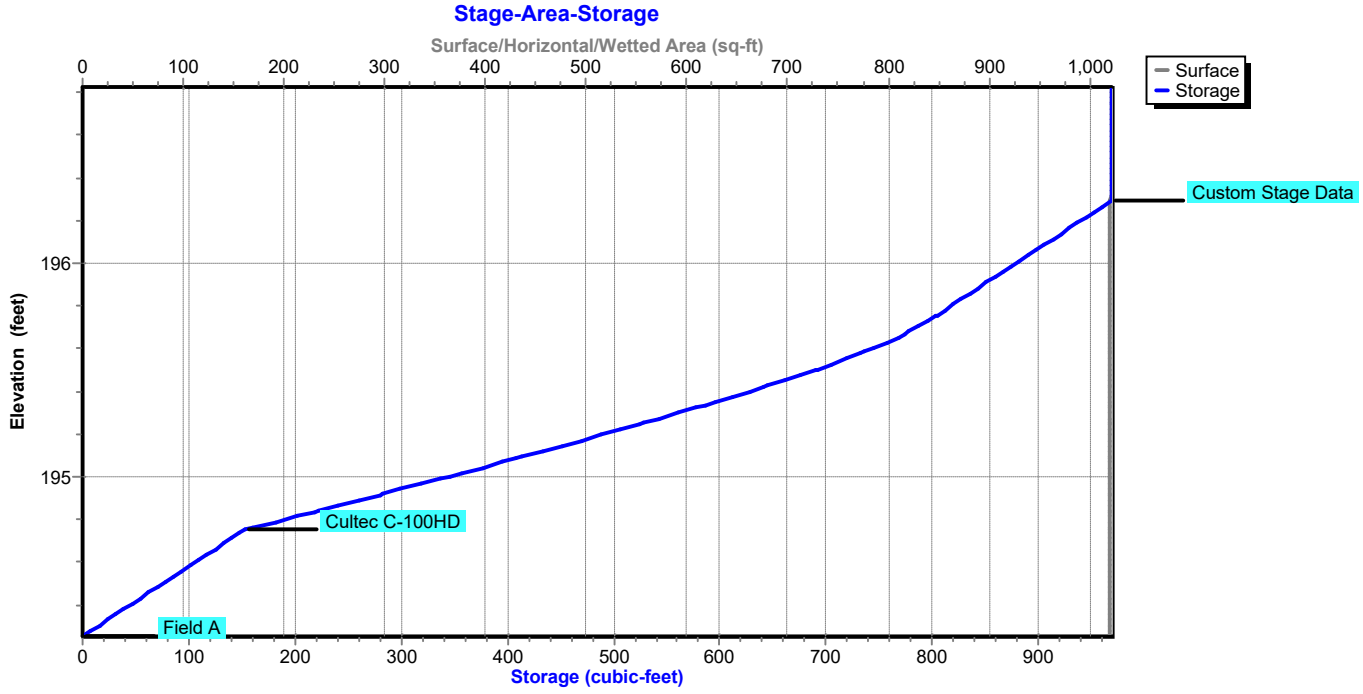
Discarded OutFlow Max=0.20 cfs @ 12.14 hrs HW=196.80' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.29 cfs @ 12.14 hrs HW=196.80' (Free Discharge)
↑**2=Orifice/Grate** (Weir Controls 0.29 cfs @ 0.73 fps)

Pond 24P: S. Central Pond



Pond 24P: S. Central Pond



Summary for Pond 25P: Southern Pond

Inflow Area = 2.042 ac, 36.92% Impervious, Inflow Depth = 2.67" for 100-Year event
Inflow = 6.15 cfs @ 12.09 hrs, Volume= 0.454 af
Outflow = 6.25 cfs @ 12.15 hrs, Volume= 0.453 af, Atten= 0%, Lag= 3.3 min
Discarded = 0.63 cfs @ 12.15 hrs, Volume= 0.365 af
Primary = 5.62 cfs @ 12.15 hrs, Volume= 0.088 af
Routed to Pond 3PE : Existing Southern Pond

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 196.16' @ 12.15 hrs Surf.Area= 3,268 sf Storage= 3,190 cf

Plug-Flow detention time= 36.0 min calculated for 0.453 af (100% of inflow)
Center-of-Mass det. time= 34.8 min (891.3 - 856.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	193.25'	1,492 cf	**81.67'W x 40.00'L x 2.04'H Field A** 6,669 cf Overall - 1,698 cf Embedded = 4,972 cf x 30.0% Voids
#2A	193.75'	1,698 cf	**Cultec C-100HD** x 120 Inside #1 Effective Size= 32.1"W x 12.0"H => 1.86 sf x 7.50'L = 14.0 cf Overall Size= 36.0"W x 12.5"H x 8.00'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.86 sf x 24 rows
#3	195.29'	0 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3,190 cf	Total Available Storage

Storage Group A created with Chamber Wizard

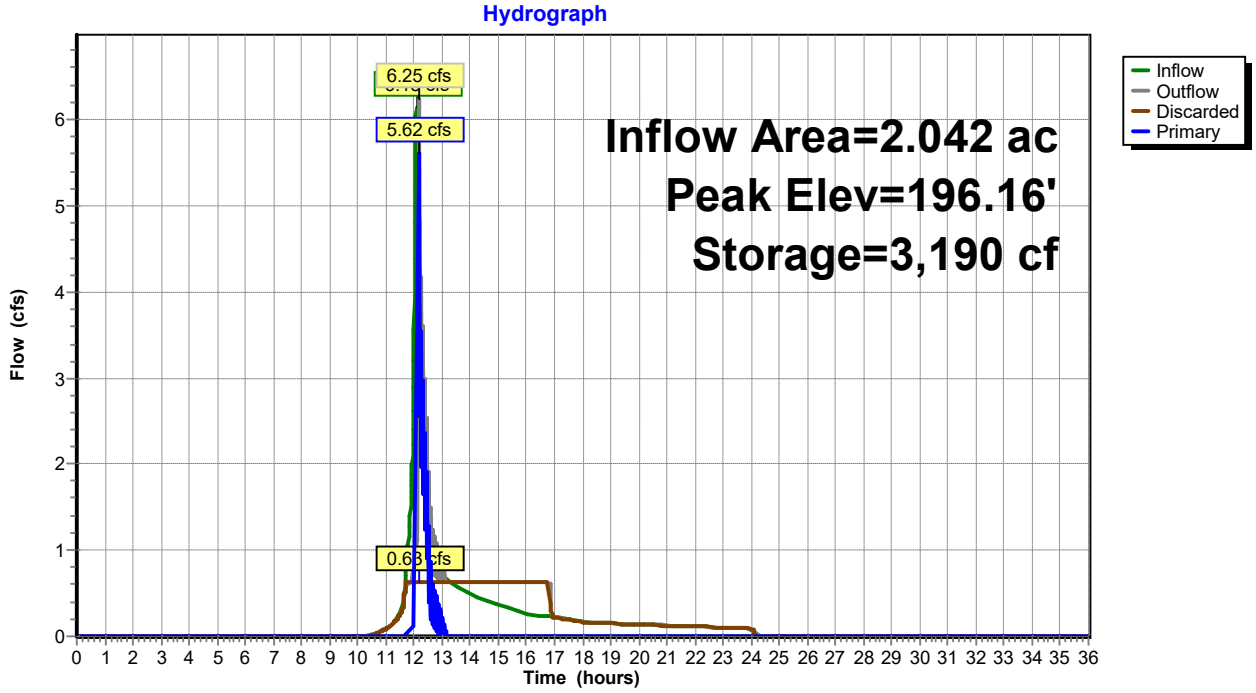
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.29	0	0	0
196.25	1	0	0

Device	Routing	Invert	Outlet Devices
#0	Primary	196.25'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	193.25'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	195.37'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#3	Primary	195.54'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#4	Primary	196.22'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads
#5	Primary	196.22'	**2.0" x 2.0" Horiz. Orifice/Grate X 5.00 columns** X 5 rows C= 0.600 in 24.0" x 24.0" Grate (17% open area) Limited to weir flow at low heads

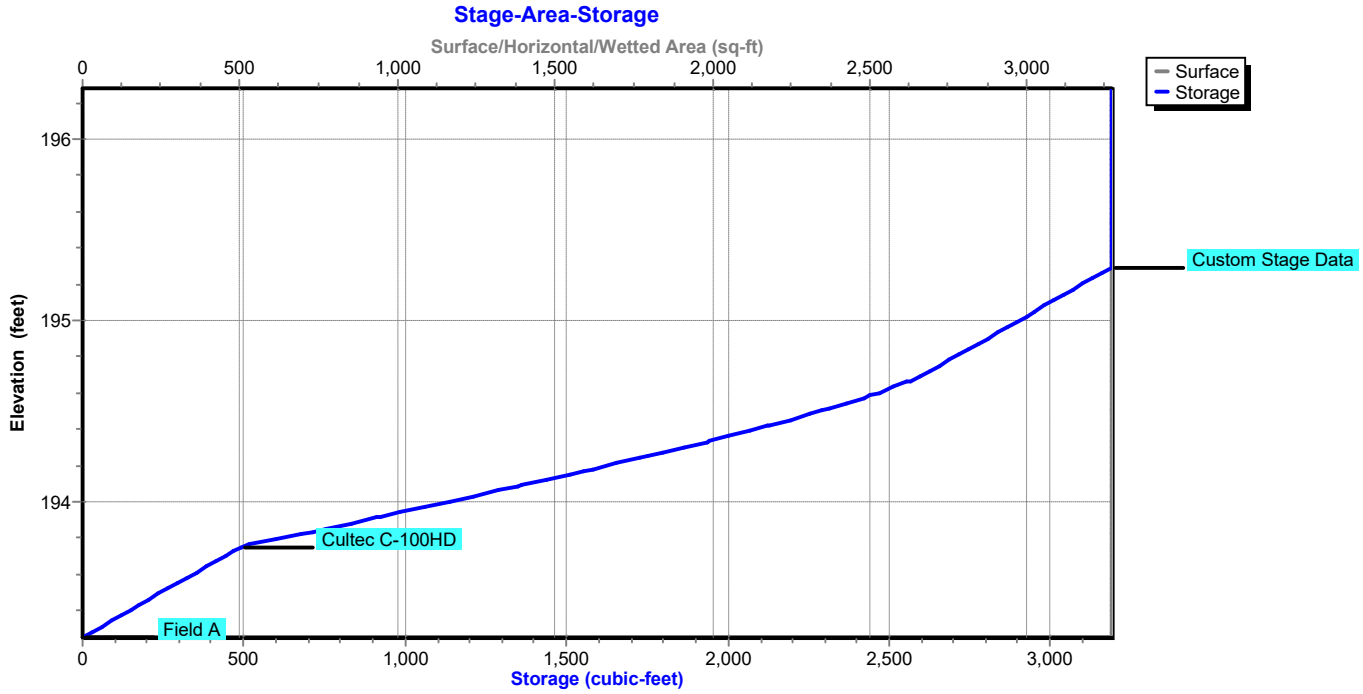
Discarded OutFlow Max=0.63 cfs @ 12.15 hrs HW=196.15' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.63 cfs)

Primary OutFlow Max=5.57 cfs @ 12.15 hrs HW=196.15' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 2.95 cfs @ 4.25 fps)
├**3=Orifice/Grate** (Orifice Controls 2.61 cfs @ 3.76 fps)
├**4=Orifice/Grate** (Controls 0.00 cfs)
└**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 25P: Southern Pond



Pond 25P: Southern Pond



Mounding Analysis

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

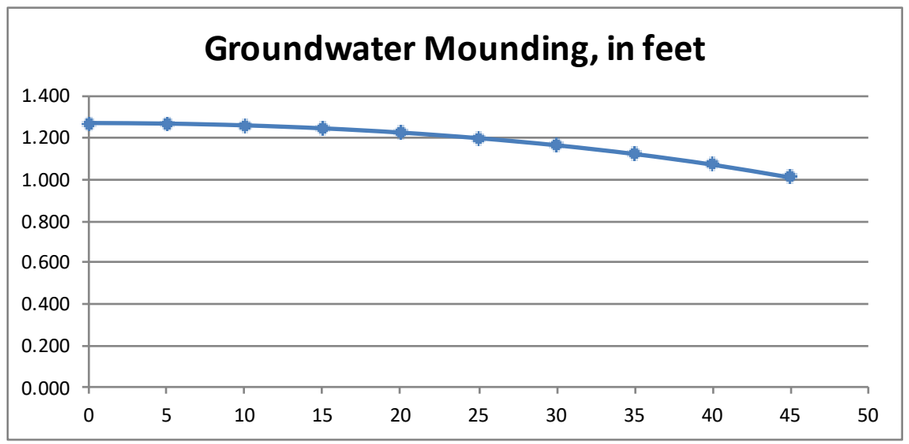
Input Values

1.1710	***R***	**Recharge (infiltration) rate (feet/day)**
0.230	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
109.41	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
62.500	**x**	**1/2 length of basin (x direction, in feet)**
20.000	**y**	**1/2 width of basin (y direction, in feet)**
3.000	**t**	**duration of infiltration period (days)**
10.000	**hi(0)**	**initial thickness of saturated zone (feet)**

11.271	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.271	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.271	0
1.268	5
1.260	10
1.246	15
1.225	20
1.198	25
1.164	30
1.122	35
1.071	40
1.009	45

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

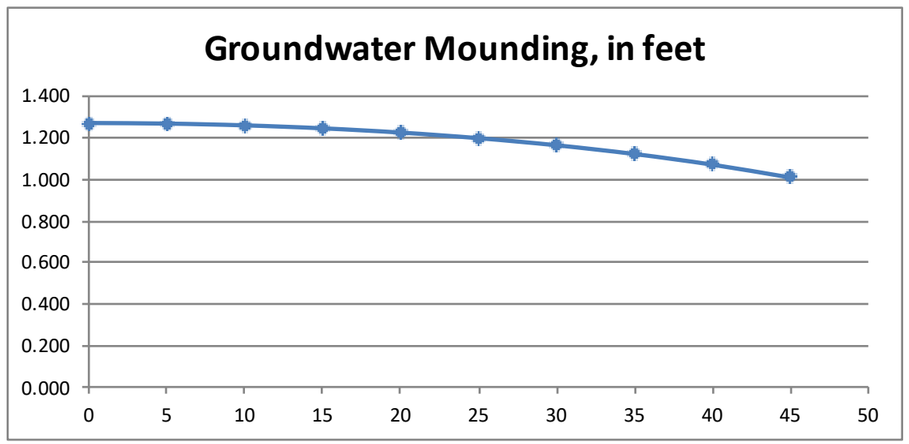
Input Values

1.1593	***R***	**Recharge (infiltration) rate (feet/day)**
0.230	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
109.41	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
49.165	**x**	**1/2 length of basin (x direction, in feet)**
20.000	**y**	**1/2 width of basin (y direction, in feet)**
3.000	**t**	**duration of infiltration period (days)**
10.000	**hi(0)**	**initial thickness of saturated zone (feet)**

11.271	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.271	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.271	0
1.268	5
1.260	10
1.246	15
1.225	20
1.198	25
1.164	30
1.122	35
1.071	40
1.009	45

Re-Calculate Now



Disclaimer

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use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

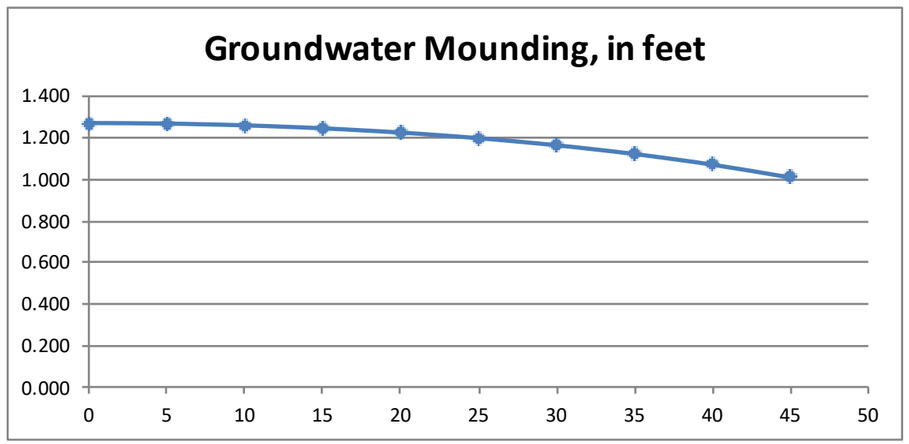
Input Values

1.3000	***R***	**Recharge (infiltration) rate (feet/day)**
0.230	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
109.41	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
32.500	**x**	**1/2 length of basin (x direction, in feet)**
20.000	**y**	**1/2 width of basin (y direction, in feet)**
3.000	**t**	**duration of infiltration period (days)**
10.000	**hi(0)**	**initial thickness of saturated zone (feet)**

11.271	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.271	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.271	0
1.268	5
1.260	10
1.246	15
1.225	20
1.198	25
1.164	30
1.122	35
1.071	40
1.009	45

Re-Calculate Now



Disclaimer

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use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table

inch/hour	**feet/day**
0.67	1.33
2.00	4.00

hours	**days**
36	1.50

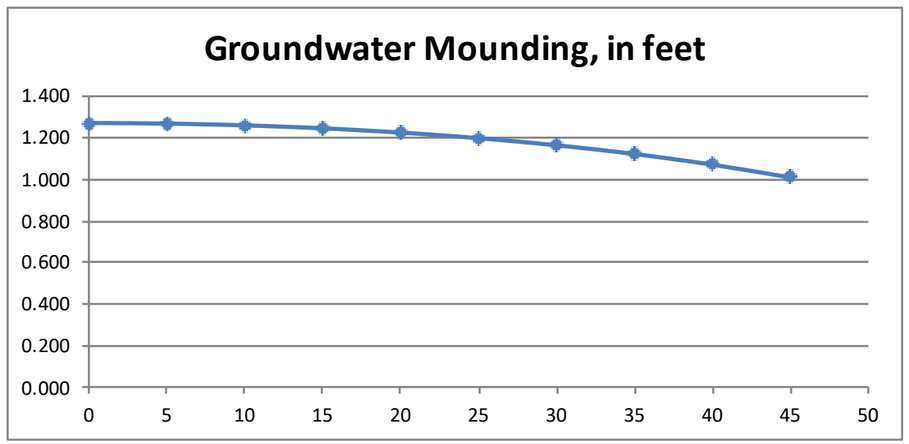
In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

Input Values		
1.1945	***R***	**Recharge (infiltration) rate (feet/day)**
0.230	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
109.41	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
29.165	**x**	**1/2 length of basin (x direction, in feet)**
8.750	**y**	**1/2 width of basin (y direction, in feet)**
3.000	**t**	**duration of infiltration period (days)**
10.000	**hi(0)**	**initial thickness of saturated zone (feet)**

11.271	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.271	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
1.271	**0**
1.268	**5**
1.260	**10**
1.246	**15**
1.225	**20**
1.198	**25**
1.164	**30**
1.122	**35**
1.071	**40**
1.009	**45**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table

	inch/hour	**feet/day**
	0.67	1.33
	2.00	4.00
hours		**days**
	36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

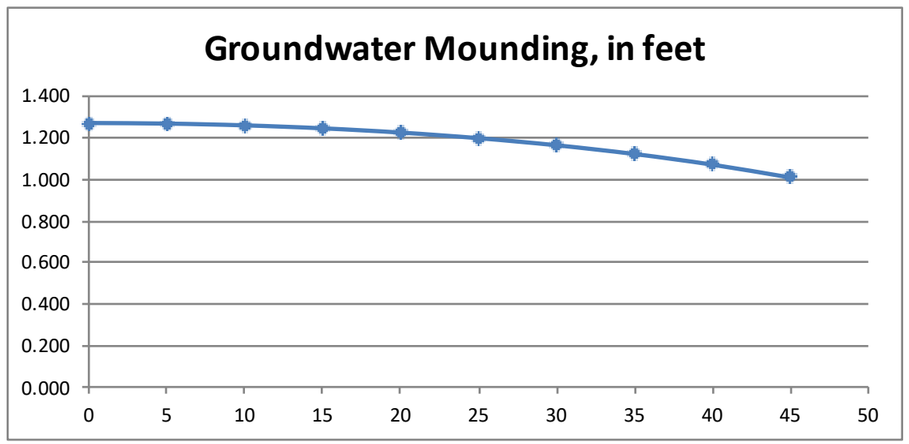
Input Values

1.2177	***R***	**Recharge (infiltration) rate (feet/day)**
0.230	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
109.41	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
40.835	**x**	**1/2 length of basin (x direction, in feet)**
20.000	**y**	**1/2 width of basin (y direction, in feet)**
3.000	**t**	**duration of infiltration period (days)**
10.000	**hi(0)**	**initial thickness of saturated zone (feet)**

11.271	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.271	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
1.271	**0**
1.268	**5**
1.260	**10**
1.246	**15**
1.225	**20**
1.198	**25**
1.164	**30**
1.122	**35**
1.071	**40**
1.009	**45**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

TSS Calculations

TOTAL SUSPENDED SOLIDS (TSS) REMOVAL WORKSHEET

Project: Groton Cow Pond Brook Park
Date: February 2, 2026
Revised:
Project No: 24051
Location: Groton, MA

Prepared By: BJM
Checked By: MEB

Legend:

Discharge Location: DP-1

BMP	B TSS Removal Rate	C Starting TSS Load	D Amount Removed (BxC)	E Remaining Load (C-D)	F TSS Removal Rate
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75	25%
Water Quality Unit	0.75	0.75	0.56	0.19	81%
	0.00	0.19	0.00	0.19	81%
	0.00	0.19	0.00	0.19	81%

Total TSS Removal = 81%

Operations & Maintenance Plan (O&M)

(Refer to separate attachment)

Draft Stormwater Pollution Prevention Plan (SWPPP)

(Refer to separate attachment)

Operation and Maintenance Plan

Town of Groton
Improvements at Cow Pond Brook Fields

Cow Pond Brook Fields
599 Cow Pond Brook Road
Groton, MA, 01450

Owner:
Town of Groton
173 Main Street
Groton, MA 01450

Submitted To:
Town of Groton
Earth Removal Stormwater
Advisory Council
173 Main Street
Groton, MA 01450

Civil Engineer/ Landscape Architect:
Activitas, Inc.
70 Milton Street
Dedham, MA 02026
(781) 355-7040

Surveyor:
LandTech Consultants, Inc.
454 Groton Road
Westford, MA 01886
(978) 692-6100

Wetland Scientist:
LEC Environmental Consultants, Inc.
380 Lowell Street, Suite 101
Wakefield, MA 01880
(781) 245-2500

February 02, 2026

Table of Contents

1.0 Operation and Maintenance Plan

The Town of Groton Cow Pond Brook Fields project site is subject to Standard 9 - Operation and Maintenance Plan of the Massachusetts Stormwater Handbook. This Operation and Maintenance Plan details management recommendations for long-term pollution prevention.

The area to be renovated is the existing Cow Pond Brook Fields located on Cow Pond Brook Road. The project scope is limited to an area of approximately 27.95 acres. The project consists of constructing a new parking lot, new cement concrete walkways, renovated natural grass athletic fields, new porous pavement walkways providing ADA accessible routes from the parking lot to the natural grass athletic fields, installation of stormwater BMPs, and landscape improvements.

The surfacing types within the limit of work consist of bituminous concrete, cement concrete, bituminous asphalt, and grassed areas.

1.1 Subsurface Detention System

The subsurface chamber system should be inspected monthly within the first year of installation and annually thereafter. Inspections should begin with upstream structures for signs of sediment or other debris and standing water in the upstream manhole. Use of a pipe camera is recommended to inspect the pipes and chambers. The recharge system has been designed with inspection ports at the end of each row of chambers. If warranted, sections of the parking lot should be removed, and inspection ports accessed.

- 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.
- The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.
- Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

Debris removed from the stormwater management system shall be disposed of in accordance with state and local guidance.

1.2 Catch Basins

Catch basins on site will have sumps a minimum of 4 feet deep and hooded outlets to trap debris, sediment, and floating contaminants. Catch basins should be cleaned twice per year. Catch basins should be checked after every storm event, typically within 72 hours after the end of the rainfall event.

- Record all maintenance and repairs. Submit reports every year for compliance.
- Inspect all catch basins after every storm (or at least four times a year) and at the end of the foliage and snow-removal seasons.
- If sediment is more than six inches deep and/or there are floatable pollutants, they will be removed from the basin and disposed of.
- During colder periods, basin grates shall be kept free of ice and snow.
- During warmer periods, basin grates shall be kept free of leaves, litter, sand, and other debris.

1.3 Water Quality Unit Maintenance

See Appendix for an example of water quality unit maintenance manual.

1.4 Vegetated Areas Maintenance

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the function of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.

- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.

1.5 Porous Pavement

Continued cleaning of porous pavement is critical to prevent clogging. To keep the surface clean, frequent vacuum sweeping along with jet washing of asphalt and concrete pavement is required. No winter sanding shall be conducted on the porous surface.

- Post signs identifying porous pavement areas.
- Minimize salt use during winter months.
- No winter sanding allowed.
- Keep landscaped areas well maintained to prevent soil from being transported onto the pavement.
- Clean the surface using vacuum sweeping machines monthly.
- Regularly monitor the paving surface to make sure it drains properly after storms.
- Never reseal or repave with impermeable materials.
- Inspect the surface annually for deterioration or spalling.

1.6 Spill Prevention and Control Plan

The Property Owner will be responsible for training of people in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with stormwater discharges. If such contact occurs, the stormwater discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated stormwater.

In order to minimize the potential for a spill of hazardous materials to come into contact with stormwater, the following steps will be implemented:

1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.
2. The minimum practical quantity of all such materials will be kept on the site.
3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dustpans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the maintenance area of the site.
4. Manufacturers recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

In the event of a spill, the following procedures should be followed:

1. All spills will be cleaned up immediately after discovery.
2. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substances.
3. The Owner will be notified immediately.
4. Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill.

The Property Owner will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and other applicable areas onsite.

2.0 Appendices

2.1 Operations and Maintenance Logs

Inspection for Year: _____

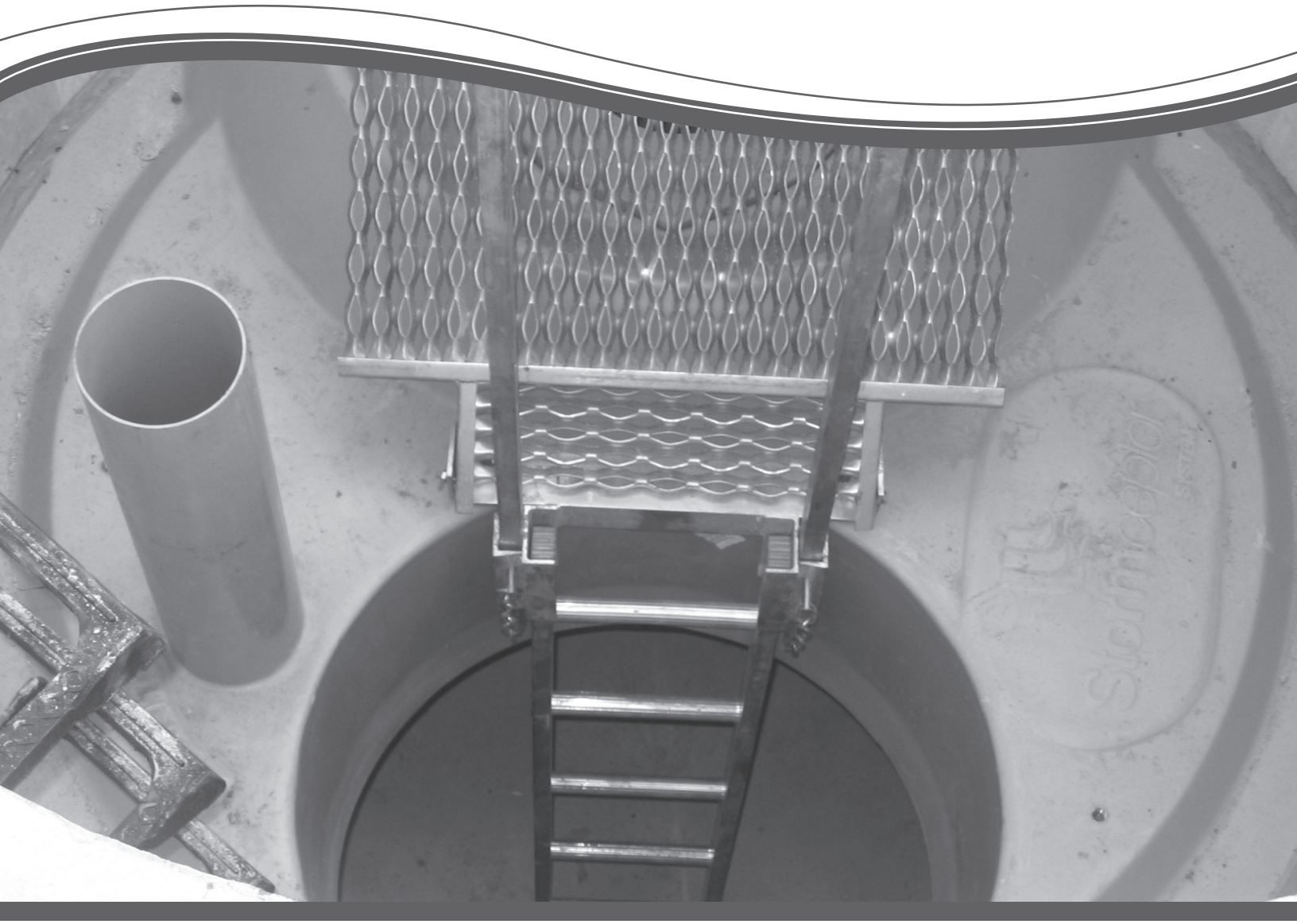
NOTE: See Operations and Maintenance Plan for details of inspection requirements.

Structural Best Management Practice	Action	Date Completed	Comments	Completed By	Action	Date Completed	Comments	Completed By
Subsurface Detention System	Inspect				Clean (if required—See Plan for details.)			
Catch Basin	Inspect				Clean (if required—See Plan for details.)			
Water Quality Unit	Inspect				Clean (if required – See Plan for details.)			
Porous Pavement	Inspect				Clean (if required – See Plan for details.)			

2.2 Example Water Quality Unit Maintenance Manual

CONTECH®
ENGINEERED SOLUTIONS

Stormceptor® STC
Operation and Maintenance Guide



Stormceptor® STC

Stormceptor Design Notes

- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.

Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences			
Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in. (75 mm)	1 in. (25 mm)	3 in. (75 mm)
Multiple inlet pipes	3 in. (75 mm)	3 in. (75 mm)	Only one inlet pipe.

Maximum inlet and outlet pipe diameters:

Inlet/Outlet Configuration	Inlet Unit STC 450i	In-Line Unit STC 900 to STC 7200	Series* STC 11000 to STC 16000
Straight Through	24 inch (600 mm)	42 inch (1050 mm)	60 inch (1500 mm)
Bend (90 degrees)	18 inch (450 mm)	33 inch (825 mm)	33 inch (825 mm)

- The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to crown is 2 feet (0.6 m)
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
- Top of grade elevation
- Stormceptor inlet and outlet pipe diameters and invert elevations
- Standing water elevation
- Stormceptor head loss, K = 1.3 (for submerged condition, K = 4)

Stormceptor® STC

OPERATION AND MAINTENANCE GUIDE
Table of Content

1. About Stormceptor

The Stormceptor® STC (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

1.1. Patent Information

The Stormceptor technology is protected by the following patents:

- Australia Patent No. 693,164 • 693,164 • 707,133 • 729,096 • 779401
- Austrian Patent No. 289647
- Canadian Patent No 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- China Patent No 1168439
- Denmark DK 711879
- German DE 69534021
- Indonesian Patent No 16688
- Japan Patent No 9-11476 (Pending)
- Korea 10-2000-0026101 (Pending)
- Malaysia Patent No PI9701737 (Pending)
- New Zealand Patent No 314646
- United States Patent No 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- Stormceptor OSR Patent Pending • Stormceptor LCS Patent Pending

2. Stormceptor Design Overview

2.1. Design Philosophy

The patented Stormceptor System has been designed to focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum AASHTO HS-20)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18" (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

3. Key Operation Features

3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{6_H} = \frac{Q}{A_S}$$

Where:

v_{SC} = critical settling velocity, ft/s (m/s)

H = tank depth, ft (m)

$Ø_H$ = hydraulic detention time, ft/s (m/s)

Q = volumetric flow rate, ft3/s (m3/s)

A_S = surface area, ft^2 (m^2)

(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (457 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall into the surrounding soils.

4. Stormceptor Product Line

4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

Table 1. Stormceptor Models

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Maximum Sediment Capacity ft^3 (L)
STC 450i	470 (1,780)	86 (330)	46 (1,302)
STC 900	952 (3,600)	251 (950)	89 (2,520)
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)
STC 11000	11,194 (42,370)	2,797 (10, 590)	1,086 (30,752)
STC 13000	13,348 (50,530)	2,797 (10, 590)	1,374 (38,907)
STC 16000	15,918 (60,260)	3,055 (11, 560)	1,677 (47,487)

NOTE: Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

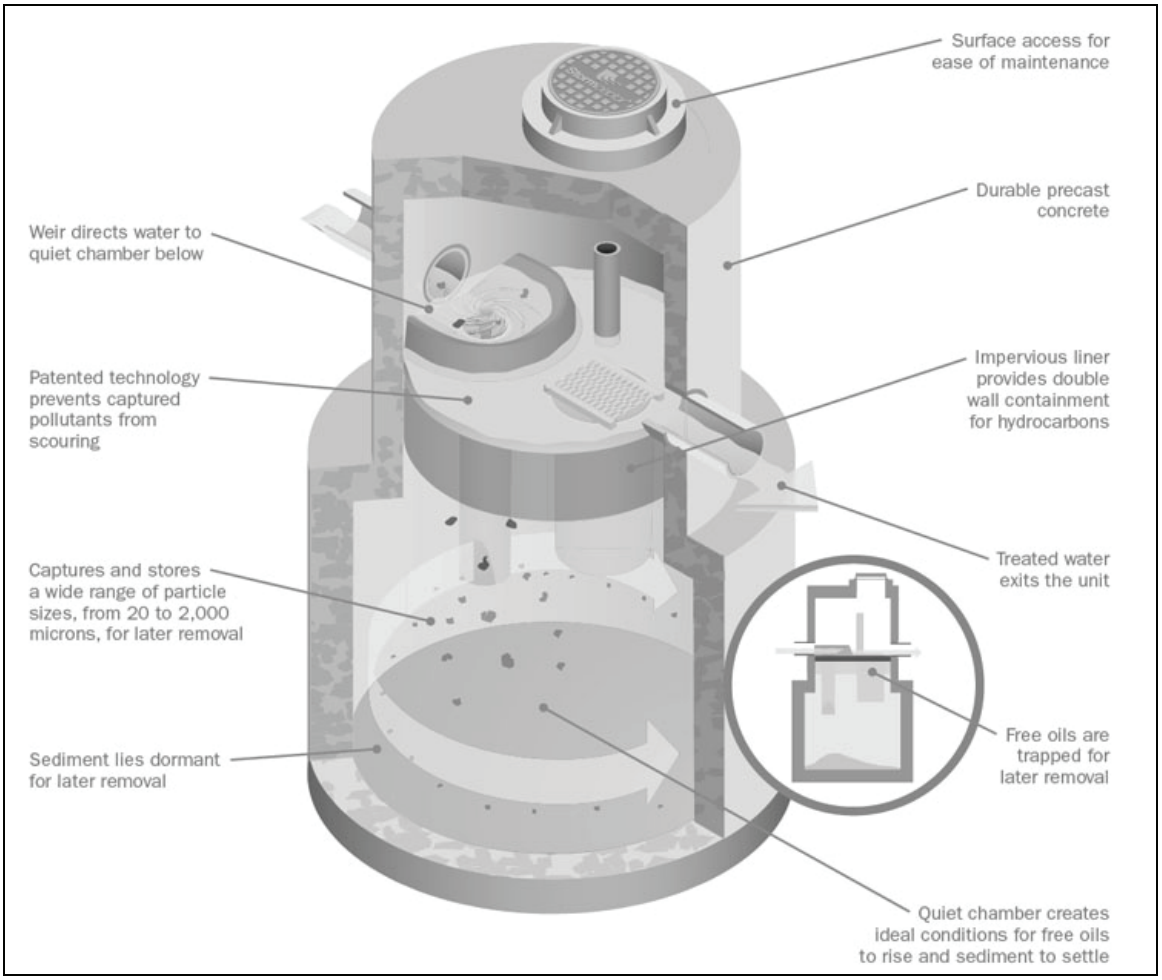


Figure 1. Inline Stormceptor

Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

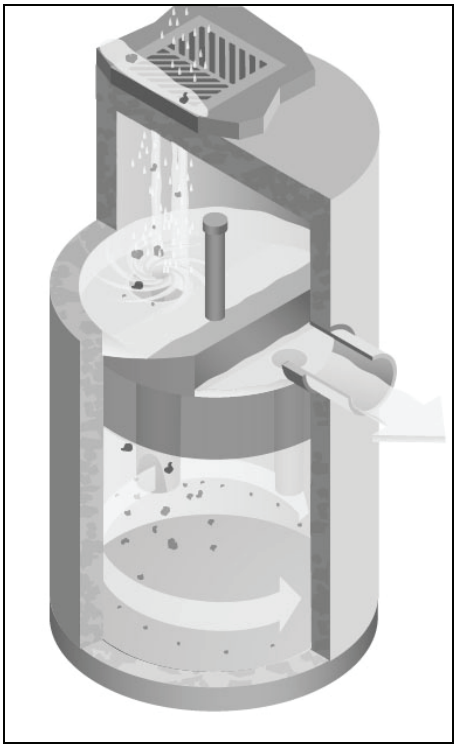


Figure 2. Inlet Stormceptor

4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

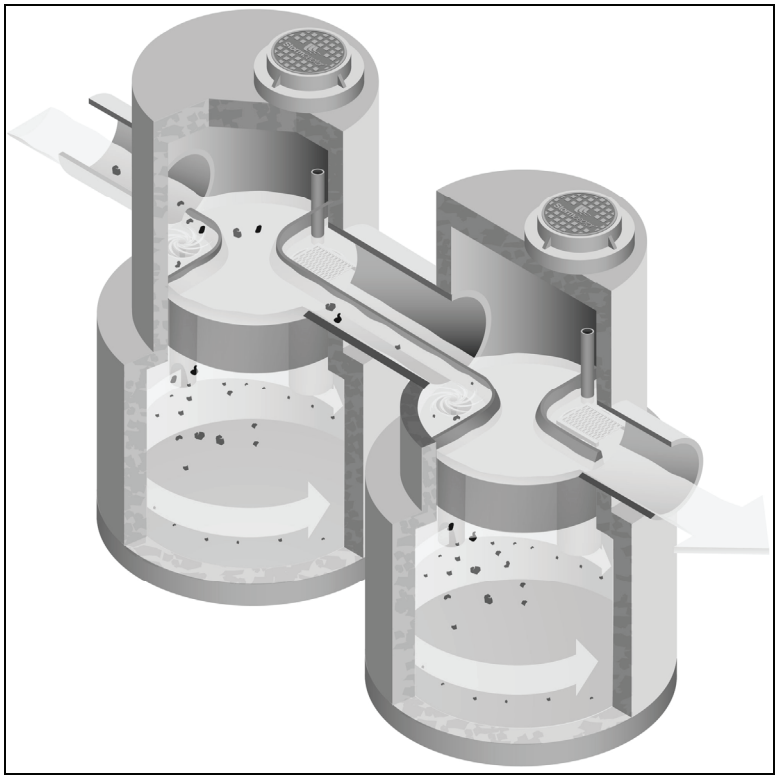


Figure 3. Series System

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

STEP 1 – Project Details

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

STEP 2 – Site Details

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

STEP 3 – Upstream Attenuation

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

STEP 4 – Particle Size Distribution

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

Table 2. Fine Distribution

Particle Size	Distribution	Specific Gravity
20	20%	1.3
60	20%	1.8
150	20%	2.2
400	20%	2.65
2000	20%	2.65

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

STEP 5 – Rainfall Records

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

STEP 6 – Summary

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

STEP 7 – Sizing Summary

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge). The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
    - » The hydrology of the local area is properly and accurately incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
    - » The distribution of TSS with the hydrology is properly and accurately considered in the sizing
    - » Particle size distribution is properly considered in the sizing
    - » The sizing can be optimized for TSS removal
    - » The cost benefit of alternate TSS removal criteria can be easily assessed
    - » The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit www.imbriumsystems.com to download a free copy of the program.

5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

Typical Sites

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

Unstable Sites

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting a proper unit sized for such unstable sites.

6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

'Spill Capture' describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil

level alarm is designed to trigger at approximately 85% of the unit's available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection.

The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

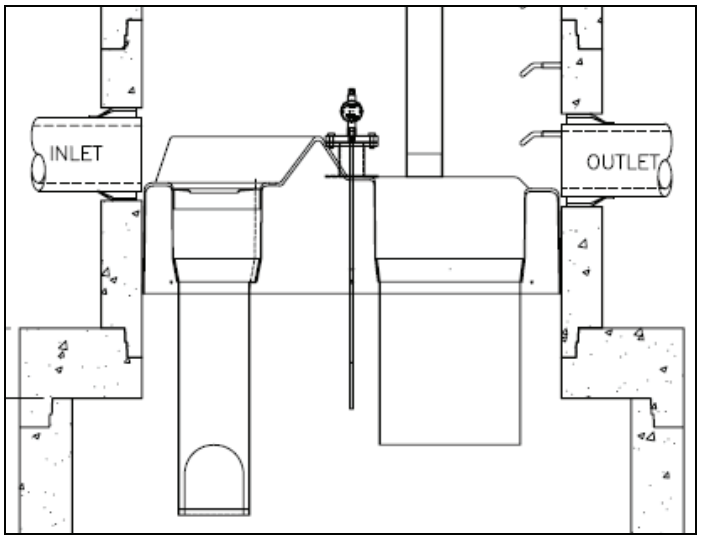


Figure 4. Oil level alarm

6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

7.1. Installation Depth Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters

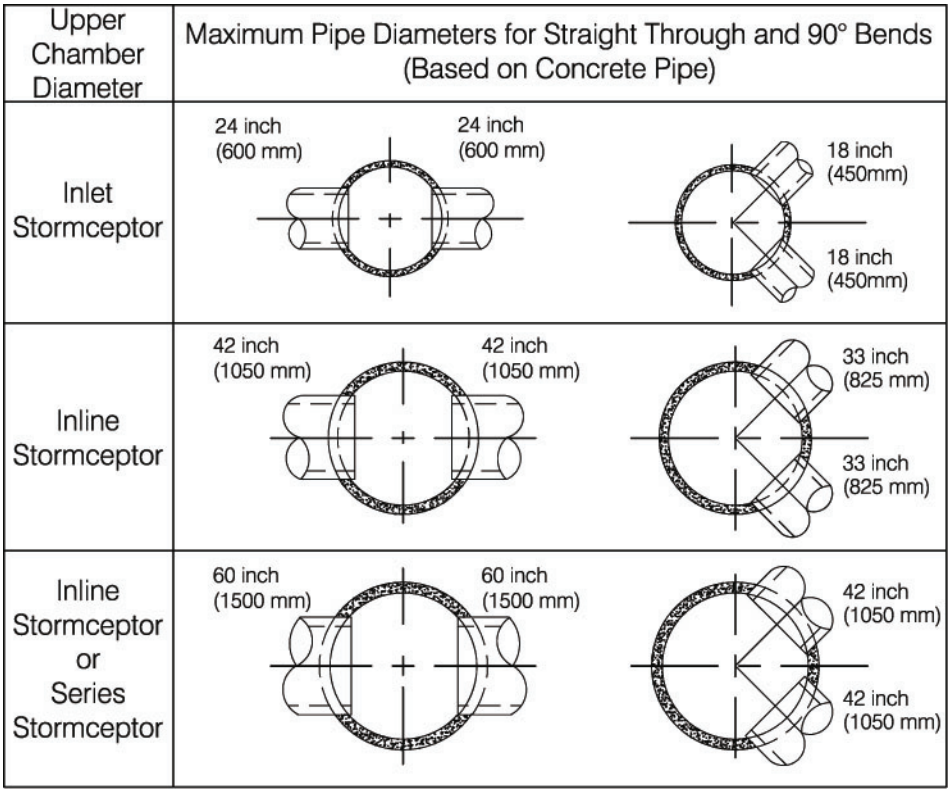


Figure 5. Maximum pipe diameters for straight through and bend applications

*The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations of the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

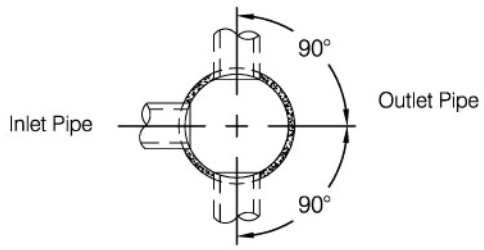
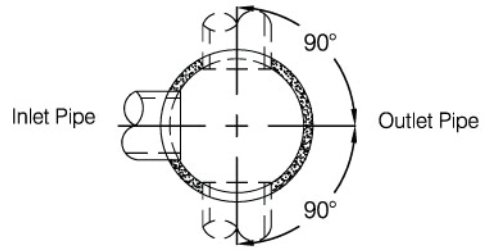
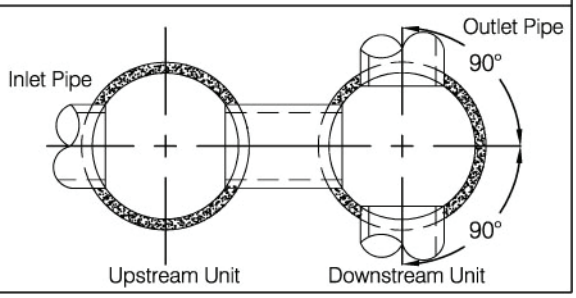
Stormceptor System	Maximum Bend Configurations
Inlet Stormceptor	
Inline Stormceptor	
Series Stormceptor	

Figure 6. Maximum bend angles

7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

Table 3. Recommended Drops Between Inlet and Outlet Pipe Inverts

Number of Inlet Pipes	Inlet System	In-Line System	Series System
1	3 inches (75 mm)	1 inch (25 mm)	3 inches (75 mm)
>1	3 inches (75 mm)	3 inches (75 mm)	Not Applicable

7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (AASHTO HS- 20). When the project requires live loads greater than HS-20, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life- cycle maintenance cost.

7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a manhole. The K value for calculating minor losses is approximately 1.3 (minor loss = k*1.3v2/2g).

However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

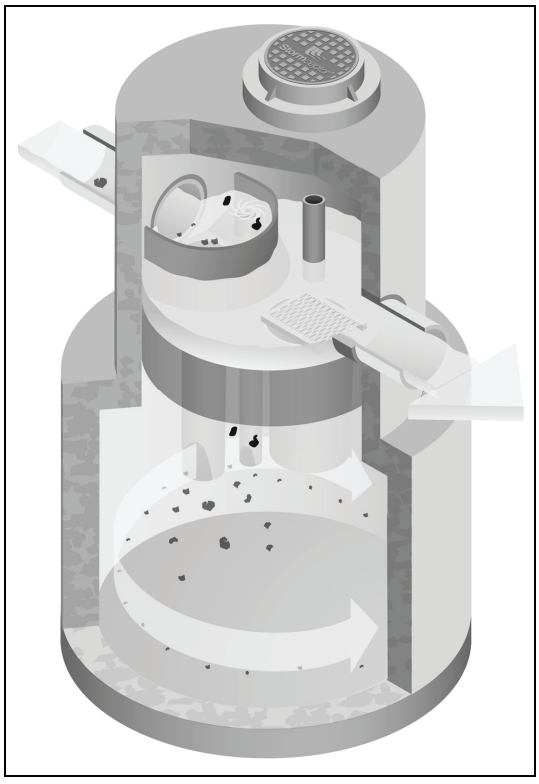


Figure 7. Submerged Stormceptor

8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between "approved alternatives". The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (Ontario MOE, 1994).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection was followed.
- City of Indianapolis – full scale testing of an STC 900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, or local specifications for the installation of manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

10.2. Backfilling

Backfill material should conform to state highway or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway or local specifications.

11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well- established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

Particle Size	Specific Gravity
Model	Sediment Depth inches (mm)
450i	8 (200)
900	8 (200)
1200	10 (250)
1800	15 (381)
2400	12 (300)
3600	17 (430)
4800	15 (380)
6000	18 (460)
7200	15 (381)
11000	17 (380)
13000	20 (500)
16000	17 (380)
* based on 15% of the Stormceptor unit's total storage	

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

SUPPORT

Drawings and specifications are available at www.ContechES.com.

Site-specific design support is available from our engineers.

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

CONTECH ENGINEERED SOLUTIONS
800-925-5240
www.ContechES.com

Stormwater Pollution Prevention Plan

Town of Groton
Cow Pond Brook Park Renovations

Cow Pond Brook Park
599 Cow Pond Brook Road
Groton, MA, 01450

February 02, 2026

Table of Contents

1.0 Contact Information/Responsible Parties

1.1 Operator(s)/Subcontractor(s)

Operator(s): **TBD**

Subcontractor(s): **TBD**

Emergency 24-Hour Contact: **TBD**

1.2 Stormwater Team

Site Operator/General Contractor:

TBD

Civil Engineer:

Activitas, Inc.
70 Milton Street
Dedham, MA 02026
(781)326-2600

2.0 Site Evaluation, Assessment, and Planning

2.1 Project/Site Information

Project/Site Name: Cow Pond Brook Park Renovations
Project Street/Location: 599 Cow Pond Brook Road
City: Groton
State: Massachusetts
Zip Code: 01450
County or Similar Subdivision: Middlesex

Latitude:
1. 42° 37' 24" N (degrees, minutes, seconds)

Longitude:
1. 71° 30' 08" W (degrees, minutes, seconds)

Method for determining latitude/longitude:
☐ USGS topographic map (specify scale: _____)
☐ EPA Web site
☐ GPS
☒ Other (please specify): Google Earth

Horizontal Reference Datum:
☐ NAD 27 ☒ NAD 83 or WGS 84 ☐ Unknown

Is the project/site located on Indian country lands, or located on a property of religious or cultural significance to an Indian tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property:

If you are conducting earth-disturbing activities in response to a public emergency, document the cause of the public emergency *(e.g., natural disaster, extreme flooding conditions)*, information substantiating its occurrence *(e.g., state disaster declaration)*, and a description of the construction necessary to reestablish effective public services:

Are you applying for permit coverage as a "federal operator" as defined in Appendix A of the 2012 CGP? ☐ Yes ☒ No

2.2 Discharge Information

Does your project/site discharge Stormwater into a Municipal Separate Storm Sewer System (MS4)?
☐ Yes ☒ No
Are there any surface waters that are located within 50 feet of your construction disturbances?
☐ Yes ☒ No

Table 1 - Names of Receiving Waters

Name(s) of the first surface water that receives stormwater directly from your site and/or from the MS4 (note: multiple rows provided where your site has more than one point of discharge that flows to different surface waters)
1.
2.
3.
4.
5.
6.

Table 2 - Impaired Waters/TMDLs

	Is this surface water listed as "impaired"?	If you answered yes, then answer the following:			
		What pollutant(s) are causing the impairment?	Has a TMDL been completed?	Title of the TMDL document	Pollutant(s) for which there is a TMDL
1.	☐ YES ☐ NO	Dissolved Oxygen; Fecal Coliform; pH, Low	☐ YES ☐ NO		
2.	☐ YES ☐ NO		☐ YES ☐ NO		
3.	☐ YES ☐ NO		☐ YES ☐ NO		
4.	☐ YES ☐ NO		☐ YES ☐ NO		
5.	☐ YES ☐ NO		☐ YES ☐ NO		
6.	☐ YES ☐ NO		☐ YES ☐ NO		

Describe the method(s) you used to determine whether or not your project/site discharges to an impaired water:
Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle

Table 3 - Tier 2, 2.5, or 3 Waters

	Is this surface water designated as Tier 2, Tier 2.5, or Tier 3 water? (See Appendix F)	If you answered yes, specify which Tier (2, 2.5, or 3) the surface water is designated as?
1.	☐ YES ☒ NO	
2.	☐ YES ☐ NO	
3.	☐ YES ☐ NO	
4.	☐ YES ☐ NO	
5.	☐ YES ☐ NO	
6.	☐ YES ☐ NO	

2.3 Nature of the Construction Activity

General Description of Project:
The Town of Groton is proposing renovations to Groton's Cow Pond Brook Fields located at 599 Cow Pond Brook Road, Groton, MA. Work will include:

- Formalized bituminous concrete parking lot
- New bituminous concrete driveways
- New poured-in-place playground
- Relocated Youth Baseball Field
- ADA accessible porous pavement walkways
- ADA accessible walkways
- Stormwater improvements
- Landscape improvements
- NHESP Species Habitat Restoration and Development

Size of Construction Project:

Total Project Area: 20.07 acres

Construction Support Activities:

The following major support activities are anticipated as part of the project:

- Concrete/Paving Washout Stations
- Staging of Delivered Materials
- Staging of Excavated Materials
- Vehicle and Equipment Fueling
- Wheel Wash Stations

Site Operator is responsible for the determination of the locations and for the conditions of these and any other required Support Activities. All Support Activities shall be in full compliance with all local and State Requirements including the Order of Conditions, Stormwater Permit, and Site Plan Review approvals issued by the Town of Groton included in Appendix. General requirements are listed below:

Material Staging Areas:
Construction equipment, materials and debris, shall be stored in a location clearly designated as such. Gravel bag berms, or other protective barriers shall be installed around the perimeter to designate the area. Hand tools and small equipment and materials shall be stored in a watertight shipping container that shall be secured after hours.

Non-hazardous building materials such as packing materials (wood, plastic and glass), and construction scrap materials (brick, wood, steel, metal and pipe cuttings) shall be stored in a separate covered facility. All hazardous materials such as oil-filters, petroleum products, paints and solvents, and equipment maintenance fluids shall be stored in a structurally sound, sealed and clearly labeled area. Large items, such as framing materials, turf, or structural materials shall be elevated, when possible, to limit the contact with stormwater run-off.

Staging of soils and other like materials shall be done in such a manner to minimize the potential for stormwater runoff to be impacted. When feasible, piles shall be covered. All piles shall have proactive barriers installed to prevent sediment and other solids from being conveyed with stormwater run-off to

downstream infrastructure or surface waters. All piles shall be located a minimum of 100 feet from a wetland area or surface water unless otherwise allowed in the Order of Conditions.

Vehicle and Equipment Fueling:
Vehicles anticipated on-site include excavators, bulldozers, front-end loaders, concrete trucks and paving equipment. All major maintenance operations will be performed off-site. Vehicle fueling for site equipment will occur in designated areas. Fueling areas shall be located a minimum of 100-feet from a wetland or surface water and in compliance with the Order of Conditions. Fueling area shall include secondary containment with drip pans and spill pads readily available. Fueling areas shall be cleaned and inspected weekly.

2.4 Sequence and Estimated Dates of Construction Activities

The project is intended to commence July 2026 and continue through July 2027. A general description of the sequence of work is provided below.

Site Preparation:
Contractor will mobilize to the project site and install temporary fencing as required to secure the location. The Contractor will stake the locations of the erosion control measures. Following installation of erosion control measures and review and approval by the Town of Groton, site preparation will commence and will include protection of existing vegetation and wooded area to remain, removal of existing site equipment, removal of existing vegetation as shown on the plans, removal of existing gravel parking lot and walkway materials and stripping and stockpiling of the existing topsoil. All erosion control and site protection measures will be completed prior to the commencement of earthmoving activities. Erosion Control measures shall be installed and inspected as required by all local, state and federal regulations.

Earthwork and Site Grading:
Earthwork operations include rough grading the site to bring the site to proposed subgrade; and completion of excavation, crushing and reinstallation of materials from the dumping area. Earthmoving activities shall be scheduled to minimize the amount of time that areas are to remain disturbed. Any disturbed areas where construction activity will cease for more than 14 days shall be re-established or protected with erosion control measures.

Subsurface Infrastructure:
Following completion of subgrading activities, the Contractor will install all subsurface infrastructure which includes but may not be limited to new drainage infrastructure.

Surface Work:
Contractor shall install surface materials of various profiles as shown on the plans and details.

Final Completion and Clean-up:
Upon completion of the surfacing and structure installation, consistent with the contract documents, the contractor will work to finalize construction and clean up the site. All disturbed areas shall be seeded or sodded and all un-needed equipment, storage and materials removed from the site. Entire site and adjacent areas shall be inspected and all waste and debris will be removed and surfaces cleaned of construction impacts.

All erosion control measures and site protection measures shall remain in place until all areas are stabilized and approval is given from the appropriate municipal agencies or Owner's Representative.

2.5 Allowable Non-Stormwater Discharges

Table 4 - List of Allowable Non-Stormwater Discharges Present at the Site

Type of Allowable Non-Stormwater Discharge	**Likely to be Present at Your Site?**
Discharges from emergency fire-fighting activities	☐ YES ☒ NO
Fire hydrant flushings	☐ YES ☒ NO
Landscape irrigation	☒ YES ☐ NO
Waters used to wash vehicles and equipment	☒ YES ☐ NO
Water used to control dust	☒ YES ☐ NO
Potable water including uncontaminated water line flushings	☒ YES ☐ NO
Routine external building wash down	☐ YES ☒ NO
Pavement wash waters	☒ YES ☐ NO
Uncontaminated air conditioning or compressor condensate	☐ YES ☒ NO
Uncontaminated, non-turbid discharges of ground water or spring water	☐ YES ☒ NO
Foundation or footing drains	☐ YES ☒ NO
Construction dewatering water	☐ YES ☒ NO

2.6 Site Maps

See Appendix for Project Drawings

3.0 Documentation of Compliance with Other Federal Requirements

3.1 Endangered Species Protection

Eligibility Criterion
Under which criterion listed in Appendix D are you eligible for coverage under this permit?
☐ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **F**

Supporting Documentation
Provide documentation for the applicable eligibility criterion you select in Appendix D, as follows:
For criterion A, indicate the basis for your determination that no federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in your site's action area (as defined in Appendix A of the permit). Check the applicable source of information you relied upon:

- ☐ Specific communication with staff of the U.S. Fish & Wildlife Service or National Marine Fisheries Service.
- ☐ Publicly available species list.
- ☐ Other source:

For criterion B, provide the Tracking Number from the other operator's notification of permit authorization:

Provide a brief summary of the basis used by the other operator for selecting criterion A, B, C, D, E, or F:

Also, provide a brief summary of the basis used for determining that your site's discharges and discharge-related activities are not likely to adversely affect listed species or critical habitat:

For criterion D, E, or F, attach copies of any letters or other communication between you and the U.S. Fish & Wildlife Service or National Marine Fisheries Service concluding consultation or coordination activities.

3.2 Historic Preservation

The project site lies on property that is currently operating as recreational space and prior to that was a gravel pit. It is unlikely that any historically significant artifacts and/or property exist on-site, as they would have been identified when the area was originally disturbed to build the existing facilities.

Do you plan on installing any of the following stormwater controls at your site?

- ☐ Dike
- ☐ Berm
- ☐ Catch Basin
- ☐ Pond
- ☒ Stormwater Conveyance Channel (e.g., ditch, trench, perimeter drain, swale, etc.)
- ☐ Culvert
- ☒ Other type of ground-disturbing stormwater control: Underground infiltration system

If yes, have prior surveys or evaluations conducted on the site already determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties?

☐ YES ☒ NO

If no, have you determined that your installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties?

☒ YES ☐ NO

If yes, provide documentation of the basis for your determination.

Massachusetts Historical Commission MACRIS maps are provided, and historic indications have not been found within the project areas.

If no, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond to you within 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties?

☐ YES ☐ NO

If yes, describe the nature of their response:

☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions.

☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls.

☐ Other:

3.3 Safe Drinking Water Act Underground Injection Control Requirements

Do you plan to install any of the following controls?

The Town of Groton is reviewing the drainage infrastructure. When the various permits are approved and available it can be found in the Appendix.

☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☐ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow

☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, provide documentation of communication with State Agency or EPA Region Office:

4.0 Erosion and Sediment Controls

4.1 Natural Buffers or Equivalent Sediment Controls

Buffer Compliance Alternatives

Are there any surface waters within 50 feet of your project's earth disturbances? ☐ YES ☒ NO

(Note: If no, no further documentation is required for the SWPPP)

Check the compliance alternative that you have chosen:

☒ I will provide and maintain a 50-foot undisturbed natural buffer.

☐ I will provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by additional erosion and sediment controls, which in combination achieves the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

- Width of Natural Buffer to be Retained:
- Describe additional erosion and sediment controls to be used in combination with the natural buffer area:
- Model or tool used to estimate sediment load reductions:
- Calculations:

☐ It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore I will implement erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

- Rationale for concluding that it is infeasible to provide and maintain a natural buffer of any size:
- Describe additional erosion and sediment controls to be used in combination with natural buffer area.
- Model or tool used to estimate sediment load reductions:
- Calculations:

☐ I qualify for one of the exceptions in Part 2.1.2.1.e. (If you have checked this box, provide information on the applicable buffer exception that applies, below.)

Buffer Exceptions

Which of the following exceptions to the buffer requirements applies to your site?

☐ There is no discharge of stormwater to the surface water that is located 50 feet from my construction disturbances.

☐ No natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for this project.

☐ For a "linear project", site constraints (e.g., limited right-of-way) make it infeasible for me to meet any of the CGP Part 2.1.2.1.a compliance alternatives.

☐ The project qualifies as "small residential lot" construction.
For Alternative 1:
- Width of natural buffer to be retained:
- Describe how you will comply with these requirements:

For Alternative 2:
- Assigned risk level:
- Predominant soil type at site:
- Average slope at site:
- Describe how you will comply with these requirements:

☐ Buffer disturbances are authorized under a CWA Section 404 permit.
Describe any earth disturbances that will occur within buffer area:

☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail).
Describe any earth disturbances that will occur within the buffer area:

4.2 Perimeter Controls

General

The contractor will install, inspect and maintain perimeter erosion and sediment controls adequate to mitigate impacts from site surface runoff. At a minimum, controls will be installed as shown on the project drawings, please see Appendix A. Additional perimeter controls shall be installed as required to control runoff from the site.

General construction practices to minimize the amount of sediments and control site runoff off will be followed. Practices include:

- Hay bale check dams will be used on roadways to divert runoff onto stabilized areas.
- If intense rainfall is predicted before all tributary areas are stabilized, erosion control measures will be reinforced for the duration of the storm. Downstream areas will be inspected and any sediment removed at the end of the storm.
- Unfiltered water will not be allowed to enter pipes from unstabilized surfaces.
- Trench excavation will be limited to the minimum length required for daily pipe installation. All trenches will be backfilled as soon as possible. The ends of pipes will be closed nightly with plywood.
- During construction of the site, silt-laden waters should be intercepted prior to reaching the subsurface detention / infiltration beds. Any gross depositions of materials on paved surfaces will be removed.
- All paved areas will be vacuum swept after paving operation and excavation are complete.

Specific Perimeter Controls

<u>Silt Fence /Hay Bale / Straw Wattle Barriers</u>

Installation/Intent:

Erosion control barriers (silt fences, hay bales, straw wattles, silt (compost) sock) will be installed prior to the start of construction. These barriers will remain in place until all tributary surfaces have been fully stabilized.

Hay bale/silt sock barriers will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site. In areas where high runoff velocities or high sediment loads are expected, silt fencing may be installed adjacent to the hay bale barriers. This semi-permeable barrier made of a synthetic porous fabric will provide additional protection. The silt fences and hay bale barrier will be replaced as determined by periodic field inspection. The underside of hay bales will be kept in close contact with the earth and reset as necessary. Hay bale barriers and siltation fences will be maintained and cleaned until slopes have healthy stands of grass.

Maintenance Requirements:

1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep. Sediment deposits shall be disposed of off- site, in a location and manner which will not cause sediment nuisance elsewhere.

2. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.

3. Hay bales shall be inspected frequently and maintained or replaced as required to maintain both their effectiveness and essentially their original condition. Underside of bales shall be kept in close contact with the earth below at all times, as required to prevent water from washing beneath bales.

Drain System Protection

Installation/Intent:

Hay bale sediment traps or silt sacks will be installed at drainage structures and maintained and cleaned until slopes have healthy stands of grass or final surface is stabilized. Drain manholes and storm drainpipes will be cleaned of sediment and debris after the completion of construction. Sediment collected in structures will be disposed of properly and covered, if stored on-site.

Maintenance Requirements:

1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep or is impacting the function of the device.

4.3 Sediment Track-Out

General

The contractor will install, inspect and maintain a stabilized construction entrance and wheel wash station for the duration of the project to minimize sediment tracking onto impervious surfaces and public ways.

Maintenance Requirements:

1. Conditions at the exit from the site shall be inspected, at a minimum of, at the start and finish of each workday. Any sediment tracks or accumulation shall be cleaned by means of sweeping, vacuuming, or brushing/shoveling. Hosing or sweeping of sediment into stormwater conveyance infrastructure not intended for sediment control is prohibited.

2. Entrance shall be top dressed with new stone as required to maintain effectiveness. Additional locations may also be considered if sediment tracking becomes an issue.

4.4 Stockpiled Sediment of Soil

General

The contractor shall take steps to minimize the amount of soils and materials that are stock piled on-site. All stockpiles shall be outside the 100' BVW buffer. Materials not intended for installation or re-use shall be removed from the site in a timely manner. Materials stockpiles shall be located to minimize potential for runoff impacts, generally away from the surface waters and drainage inlets. In advance of significant rainstorms, considerations for additional protection, including covering the piles, shall be made.

Specific Stockpile Controls

Perimeter Protection

Installation/Intent:

As soil/material stockpiles are needed they shall have perimeter protection of hay bales, straw wattles and/or silt fence.

Maintenance Requirements:

1. Conditions at the stockpile shall be inspected, at a minimum of, at the start and finish of each workday and after a significant rain event. Any sediment accumulation shall be cleaned by means of sweeping, vacuuming, or brushing/shoveling. Hosing or sweeping of sediment into stormwater conveyance infrastructure not intended for sediment control is prohibited.

4.5 Minimize Dust

General

Contractor shall take steps to minimize the amount of dust created by construction activities. Dust control should be expected whenever un-stabilized surfaces are present. Contractor shall expect dust conditions to be worse during summer months or periods of extended dry weather.

Specific Dust Controls

Water Controls

Installation/Intent:

As required the contractor shall use on-site water or water trucks to control nuisance dust on-site.

Maintenance Requirements:

1. N/A

4.6 Minimize the Disturbance of Steep Slopes

General

Disturbance to steep slopes as part of the project shall be minimal. The contractor shall minimize the amount of time any disturbed steep slopes are left un-stabilized and should be aware of any weather conditions that may increase the chances of slope wash-out and take necessary precautions to prevent this condition.

4.7 Topsoil

General

The project includes the conversion of an existing grass areas to paved walkways and parking areas. The existing topsoil within the proposed areas of work will be used to regrade disturbed areas within the limit of work. If excess topsoil is generated it will be removed from the site.

4.8 Soil Compaction

General

The site operator is a specialized contractor that understands the implications of operating heavy machinery in areas that are intended for infiltration or to remain pervious. Subcontractors will be educated on the intent of the site design and instructed accordingly.

4.9 Storm Drain Inlets

General

Silt sacks or hay bale protection shall be installed at all drainage inlets in the general vicinity of the project site.

Specific Storm Drain Inlet Controls

Silt Sacks/Hay bale Protection

Installation/Intent:

Silt stacks or hay bale sediment traps will be installed at drainage structures and maintained and cleaned until slopes have healthy stands of grass. Drain manholes and storm drainpipes will be cleaned of sediment and debris after the completion of construction. Sediment collected in structures will be disposed of properly and covered, if stored on-site.

4.10 Constructed Stormwater Conveyance Channels

General

No constructed stormwater conveyance channels are anticipated for this project.

4.11 Sediment Basins

General

No temporary sediment basins are anticipated to be required for construction of the project. If on-site conditions require that either be required, the contractor shall coordinate with the design engineer to size and locate these systems appropriately.

4.12 Chemical Treatment

General

No treatment chemicals are anticipated for use on the project site. Should the contractor need to use a chemical treatment, the items below shall be completed/addressed.

Soil Types
List all the soil types (including soil types expected to be found in fill material) that are expected to be exposed during construction and that will be discharged to locations where chemicals will be applied:

N/A

Treatment Chemicals
List all treatment chemicals that will be used at the site and explain why these chemicals are suited to the soil characteristics:

N/A

Describe the dosage of all treatment chemicals you will use at the site or the methodology you will use to determine dosage:

N/A

Provide information from any applicable Material Safety Data Sheets (MSDS):

N/A

Describe how each of the chemicals will stored:

N/A

Include references to applicable state or local requirements affecting the use of treatment chemicals, and copies of applicable manufacturer's specifications regarding the use of your specific treatment chemicals and/or chemical treatment systems:

N/A

Special Controls for Cationic Treatment Chemicals
If you have been authorized by your applicable Regional Office to use cationic treatment chemicals, include the official EPA authorization letter or other communication, and identify the specific controls and implementation procedures you are required to implement to ensure that your use of cationic treatment chemicals will not lead to a violation of water quality standards:

N/A

Schematic Drawings of Stormwater Controls/Chemical Treatment Systems
Provide schematic drawings of any chemically-enhanced stormwater controls or chemical treatment systems to be used for application of treatment chemicals:

N/A

Training
Describe the training that personnel who handle and apply chemicals have received prior to permit coverage, or will receive prior to the use of treatment chemicals:

N/A

4.13 Dewatering Practices

General
Dewatering operations are not anticipated. Should dewatering be required, the following practices shall be followed:

1. The contractor shall coordinate dewatering with all local, state, and federal agencies and obtain all required permits.
2. The contractor shall control the grading in areas under construction on the site so that the surface of the ground will properly slope to prevent accumulation of water in excavated areas and adjacent properties.
3. The contractor shall excavate interceptor swales and ditches as necessary prior to the start of major earthmoving operations to ensure minimal erosion and to keep areas as free from surface water as possible.
4. Should surface, groundwater or precipitation be encountered during the operations, the contractor shall furnish and operate pumps or other equipment and provide all necessary piping to keep all excavations clear of water at all times and shall be responsible for any damage to work or adjacent properties for such water. All piping exposed above surface for this use, shall be properly covered to allow foot traffic and vehicles to pass without obstruction.
5. The contractor shall verify that the construction and/or operation of a dewatering system will not adversely affect any well, pond, stream, structure, utility, etc., on or adjacent to the area being dewatered.

4.14 Other Stormwater Controls

General
Contractor shall provide information below about any other stormwater controls that are implemented during construction that are not described above.

4.15 Site Stabilization

Site Stabilization Practice

☒ *Vegetative* ☐ *Non-Vegetative*
☐ *Temporary* ☐ *Permanent*

Description of Practice

Areas of disturbed soils that do not receive a final surface treatment as part of the project will be loamed and seeded. A hydroseed mix with pre-emergent will be applied to these areas. Depending on the final vegetation type (maintained versus naturalized) different seed mixes will be used accordingly.

Installation

Schedule for seed mix timing is to be determined and will be submitted with the final SWPPP report.

Maintenance Requirements: Sodded areas will be irrigated to ensure proper root growth. Hydroseeded areas will be watered as needed and re-seeded as need to establish a healthy strand of grass.

5.0 Pollution Prevention Standards

5.1 Potential Sources of Pollution

Construction Site Pollutants

Pollutant-Generating Activity	Pollutants or Pollutant Constituents	Location on Site (Or reference SWPPP site map)
Clearing/Grading/Earthwork	Sediment	Refer to Project Drawings
Paving Operations	Sediment, trash, oils	Refer to Project Drawings
Material Delivery/Storage	Sediment, oils, solids, chemicals	Site Entrance/Staging Area
Solid Waste	Solids	Contractor Staging Area
Spills	Sediment, Nutrients, Oils, Trash, Other Chemicals	
Vehicle Maintenance/Storage	Sediment, Oils, Chemicals	Contractor Staging Area
Landscape Operations	Sediment, Nutrients, Bacteria	Refer to Project Drawings
Sanitary Facilities	Sediment, Bacteria, Nutrients	Contractor Staging Area

5.2 Spill Prevention and Response

The contractor will train all personnel in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with stormwater discharges. If such contact occurs, the stormwater discharge will be contained on-site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated stormwater. It shall be the responsibility of the job site superintendent to properly train all personnel in spill prevention and clean up procedures.

Spill prevention and Response Procedures

In order to minimize the potential for a spill of hazardous materials to come into contact with stormwater, the following steps will be implemented:

1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.
2. During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An 'infiltration area' is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposed of storage and handling of these materials.
3. The minimum practical quantity of all such materials will be kept on the job site.
4. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing power, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.

Manufacturers recommended methods for spill clean-up will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and supplies.

In the event of a spill, the following procedures should be followed:

1. All spills will be cleaned up immediately after discovery.
2. The spill area will be kept well-ventilated, and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.
3. The project manager and the Engineer of Record will be notified immediately.
4. Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill.
5. **The Groton Fire Department will be contacted: Call 911**
6. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to prevent the recurrence of such releases and to respond to such releases.

The job site superintendent will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the office trailer on-site.

5.3 Fueling and Maintenance of Equipment or Vehicles

General

Vehicles that remain on-site throughout the construction permit, including excavators, bulldozers, frontend loaders and concrete trucks may be fueled on-site.

Inspect construction vehicles daily, and repair any leaks immediately. Dispose of all used oil, antifreeze, solvents and other automotive-related chemicals according to manufacturer instructions. These wastes require special handling and disposal. Used oil, antifreeze, and some solvents can be recycled at designated facilities, but other chemicals must be disposed of at a hazardous waste disposal site.

Vehicle maintenance operations produce substantial amounts of hazardous and other wastes that require regular disposal. Clean up spills and dispose of cleanup materials immediately. Inspect equipment and storage containers regularly to identify leaks or signs of deterioration.

Specific Pollution Prevention Practices

The contractor shall take steps to ensure the following:

- Provide a covered, paved area dedicated to vehicle maintenance
- Ensure that the areas are properly connected to a storm drain system
- Prevent hazardous chemical leaks by properly maintaining vehicles and equipment
- Refer to a spill prevention and cleanup plan
- Properly cover and provide secondary containment for fuel drums and toxic materials
- Properly dispose of vehicle wastes

Maintenance Requirements:

Vehicle maintenance operations produce substantial amounts of hazardous and other wastes that require regular disposal. Clean up spills and dispose of cleanup materials immediately. Inspect equipment and storage containers regularly to identify leaks or signs of deterioration.

5.4 Washing of Equipment or Vehicles

General

Designate special paved areas for vehicle repair. To direct washwater to sanitary sewer systems or other treatment facilities, ensure that vehicle washing areas are impervious and are bermed. Use blowers or vacuums instead of water to remove dry materials from vehicles if possible. Because water alone can remove most dirt adequately, use high-pressure water spray without detergents at vehicle washing areas. If you must use detergents, avoid phosphate- or organic-based cleansers to reduce nutrient enrichment and biological oxygen demand in wastewater. Use only biodegradable products that are free of halogenated solvents. Clearly mark all washing areas, and inform workers that all washing must occur in this area. Do not perform other activities, such as vehicle repairs, in the wash area.

Maintenance Requirements:

Maintenance of vehicle wash areas is minimal.

5.5 Storage, Handling, and Disposal of Construction Products, Materials, and Waste

General

The project will result in construction and domestic debris and waste. Contractor shall provide facilities to properly handle and dispose of waste with considerations for health and safety of the employees and adjacent school uses.

Specific Pollution Prevention Practices

- Designate a waste collection area on site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a water body.
- Ensure that containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible.
- Schedule waste collection to prevent the containers for overfilling.
- Clean up spills immediately. For hazardous materials, follow cleanup instructions on the package. Use an absorbent material such as sawdust or kitty litter to contain the spill.
- During the demolition phase of construction, provide extra containers and schedule more frequent pickups.
- Collect, remove and dispose of all construction site wastes at authorized disposal areas. Contact a local environmental agency to identify these disposal sites.

Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials

General

The proposed project is the construction of a natural grass athletic fields, fertilizers will be required to maintain grass growth. Pesticides, herbicides, and fungicides may also be required.

Specific Pollution Prevention Practices

Where materials are required, the contractor shall:

- Follow all federal, state, and local regulations that apply to the use, handling, or disposal of pesticides and fertilizers.
- Do not handle the materials any more than necessary.
- Store pesticides and fertilizers in a dry, covered area.
- Construct berms or dikes to contain stored pesticides and fertilizers in case of spillage.
- Follow the recommended application rates and methods.
- Have equipment and absorbent materials available in storage and application areas to contain and clean up any spills that occur.

Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals

General

As previously stated, on-site fueling shall be limited to the few vehicles that are to remain on-site. Other fluids shall not be stored on-site with all maintenance on vehicles being completed at off-site locations.

Specific Pollution Prevention Practices

If storage of petroleum products is required:

- *Store new and used petroleum products for vehicles in covered areas with berms or dikes in place to contain any spills.*
- *Immediately contain and clean up any spills with absorbent materials.*
- *Have equipment available in fuel storage areas and in vehicles to contain and clean up any spills that occur.*

Hazardous or Toxic Waste

General

It is anticipated that the project will result in minimal amounts of toxic or hazardous waste.

Specific Pollution Prevention Practices

In the case hazardous or toxic materials are present, the contractor shall:

- *Consult with local waste management authorities about the requirements for disposing of hazardous materials.*
- *To prevent leaks, empty and clean hazardous waste containers before disposing of them.*
- *Never remove the original product label from the container because it contains important safety information. Follow the manufacturer's recommended method of disposal, which should be printed on the label.*
- *Never mix excess products when disposing of them, unless specifically recommended by the manufacture.*

To ensure the proper disposal of contaminated soils that have been exposed to and still contain hazardous substances, consult with state or local solid waste regulatory agencies or private firms. Some landfills might accept contaminated soils, but they require laboratory tests first. Any disposal of contaminated soils shall be coordinated with the Project Engineer, LSP and shall conform to all State and Local Regulations.

Construction and Domestic Waste

General

The project will result in construction and domestic debris and waste. Contractor shall provide facilities to properly handle and dispose of waste with considerations for health and safety of employees and adjacent school uses.

Specific Pollution Prevention Practices

The contractor shall:

- Designate a waste collection area on site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a water body.
- Ensure that containers have lids so they can be covered before periods of rain, and keep containers in a covered area whenever possible.
- Schedule waste collection to prevent the containers for overfilling.
- Clean up spills immediately. For hazardous materials, follow cleanup instructions on the package. Use an absorbent material such as sawdust or kitty litter to contain the spill.
- During the demolition phase of construction, provide extra containers and schedule more frequent pickups.

- Collect, remove and dispose of all construction site wastes at authorized disposal areas. Contact a local environmental agency to identify these disposal sites.

Sanitary Waste

General

Temporary facilities shall be provided by the contractor for on-site use by employees. Facilities shall be located in areas to minimize the potential for impacting stormwater runoff quality. The facilities shall have routine inspections and shall be scheduled for waste collection as needed.

Washing of Applicators and Containers Used for Paint, Concrete, or Other Materials

General

Minimal washout is anticipated on the project site.

Specific Pollution Prevention Practices

If washout is required, the contractor shall:

- Direct all wash water into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation.
- Handle washout or cleanout wastes as follows:
  1. Do not dump liquid wastes in storm sewers;
  2. Dispose of liquid wastes in accordance with applicable requirements in Part 2.3.3.3; and
  3. Remove and dispose of hardened concrete waste consistent with handling of other construction wastes in Part 2.3.3.3; and locate any washout or cleanout activities as far away as possible from surface waters and stormwater inlets or conveyances, and, to the extent practicable, designate areas to be used for these activities and conduct such activities only in these areas.

Maintenance of the washout is to include removal of hardened concrete. The facility shall have sufficient volume to contain all the concrete waste resulting from washout and a minimum freeboard of 1 foot. Facility shall not be filled beyond 95% capacity and shall be cleaned out once 75% full unless a new facility is constructed.

Other Pollution Prevention Practices

General

Contractor shall provide information below about any other pollution prevention practices that are implemented during construction that are not described above.

6.0 Inspection and Corrective Action

6.1 Inspection Personnel and Procedures

Personnel Responsible for Inspections: TBD

Inspection Schedule: TBD

Rain Gauge Location: TBD

Reductions in Inspection Frequency
For the reduction in inspections resulting from stabilization: TBD

For the reduction in inspections in arid, semi-arid, or drought-stricken areas: TBD

For the reduction in inspections due to frozen conditions: TBD

Inspection Report Forms: See Appendix

6.2 Corrective Action

Personnel Responsible for Corrective Actions: TBD

Corrective Action Forms: See Appendix

6.3 Delegation of Authority

Duly Authorized Representative(s) or Positions(s): TBD

7.0 Training

Table 5 - Documentation for the Completion of Training

Name	Date Training Completed

8.0 Certification and Notification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

SWPPP Appendices

Appendix A Site Maps

See attached design documents.

Appendix B Copy of 2022 CGP

CGP shall be provided as part of the Stormwater Pollution Prevention Plan (we are doing this to save paper as part of the permitting submissions).

Appendix C NOI and EPA Authorization Email

To be provided once submitted.

Appendix D Inspection Form

Inspection Report Template – Field Version

Purpose
This Inspection Report Template (or "template") was designed to assist you in preparing inspection reports for EPA's 2012 Construction General Permit (CGP). If you are covered under the 2012 CGP, this template will enable you to create an inspection report form that is customized to the specific circumstances of your project and that complies with the minimum reporting requirements of Part 4.1.7 of the permit. Note that the use of this form is optional; you may use your own inspection report form provided it includes the minimum information required in Part 4.1.7 of the CGP.

If you are covered under a state CGP, this template may be helpful in developing a form that can be used for that permit; however it will need to be modified to meet the specific requirements of that permit. If your permitting authority requires you to use a specific inspection report form, you should not use this form.

Notes:
While EPA has made every effort to ensure the accuracy of all instructions and guidance contained in the Inspection Report Template, the actual obligations of regulated construction activities are determined by the relevant provisions of the permit, not by the template. In the event of a conflict between the Inspection Report Template and any corresponding provision of the 2012 CGP, you must abide by the requirements in the permit. EPA welcomes comments on the Inspection Report Template at any time and will consider those comments in any future revision of this document. You may contact EPA for CGP-related inquiries at cgp@epa.gov.

Overview of Inspection Requirements
Construction operators covered under the 2012 CGP are subject to the following requirements in Part 4:

Inspection Frequency (see Part 4.1.4)
You are required to conduct inspections either:
- Once every 7 calendar days; or
- Once every 14 calendar days and within 24 hours of a storm event of 0.25 inches or greater.

Your inspection frequency is increased if the site discharges to a sensitive water. See Part 4.1.3. Your inspection frequency may be decreased to account for stabilized areas, or for arid, semi-arid, or drought-stricken conditions, or for frozen conditions. See Part 4.1.4.

Areas That Need to Be Inspected (see Part 4.1.5)
During each inspection, you must inspect the following areas of your site:
- Cleared, graded, or excavated areas of the site;
- Stormwater controls (e.g., perimeter controls, sediment basins, inlets, exit points etc.) and pollution prevention practices (e.g., pollution prevention practices for vehicle fueling/maintenance and washing, construction product storage, handling, and disposal, etc.) at the site;
- Material, waste, or borrow areas covered by the permit, and equipment storage and maintenance areas;
- Areas where stormwater flows within the site;
- Stormwater discharge points; and
- Areas where stabilization has been implemented.

What to Check For During Your Inspection (see Part 4.1.6)
During your site inspection, you are required to check:
- Whether stormwater controls or pollution prevention practices require maintenance or corrective action, or whether new or modified controls are required;
- For the presence of conditions that could lead to spills, leaks, or other pollutant accumulations and discharges;
- Whether there are visible signs of erosion and sediment accumulation at points of discharge and to the channels and streambanks that are in the immediate vicinity of the discharge;
- If a stormwater discharge is occurring at the time of the inspection, whether there are obvious, visual signs of pollutant discharges; and
- If any permit violations have occurred on the site.

Inspection Reports (see Part 4.1.7)
Within 24 hours of completing each inspection, you are required to complete an inspection report that includes:

- Date of inspection;
- Names and titles of persons conducting the inspection;
- Summary of inspection findings;
- Rain gauge or weather station readings if your inspection is triggered by the 0.25 inch storm threshold; and
- If you determine that a portion of your site is unsafe to access for the inspection, documentation of what conditions prevented the inspection and where these conditions occurred on the site

Instructions for Using This Template

This Field Version of the Inspection Report Template is intended to be used in the field and filled out by hand. If you will be filling out the Inspection Report Template electronically (i.e., you will be typing in your findings), please use the Electronic Version of the Inspection Report Template available at www.epa.gov/npdes/stormwater/swppp. The Electronic Version includes text fields with instructions for what to enter.

Keep in mind that this document is a template and not an "off-the-shelf" inspection report that is ready to use without some modification. You must first customize this form to include the specifics of your project in order for it to be useable for your inspection reports. Once you have entered all of your site-specific information into these fields, you may print out this form for use in the field to complete inspection reports.

The following tips for using this template will help you ensure that the minimum permit requirements are met:

- **Review the inspection requirements.** Before you start developing your inspection report form, read the CGP's Part 4 inspection requirements. This will ensure that you have a working understanding of the permit's underlying inspection requirements.
- **Complete all required text fields.** Fill out all text fields. Only by filling out all fields will the template be compliant with the requirements of the permit. (Note: Where you do not need the number of rows provided in the template form for your inspection, you may leave those rows blank. Or, if you need more space to document your findings, you may add an additional sheet.)
- **Use your site map to document inspection findings.** In several places in the template, you are directed to specify the location of certain features of your site, including where stormwater controls are installed and where you will be stabilizing exposed soil. You are also asked to fill in location information for unsafe conditions and the locations of any discharges occurring during your inspections. Where you are asked for location information, EPA encourages you to reference the point on your SWPPP site map that corresponds to the requested location on the inspection form. Using the site map as a tool in this way will help you conduct efficient inspections, will assist you in evaluating problems found, and will ensure proper documentation.
- **Sign and certify each inspection report.** Each inspection report must be signed and certified by the permittee to be considered complete. Where your inspections are carried out by a contractor or subcontractor, it is recommended that you also have the form signed and certified by the inspector, in addition to the signature and certification required of the permitted operator. The template includes a signature block for both parties.
- **Include the inspection form with your SWPPP.** Once your form is complete, make sure to include a copy of the inspection form in your SWPPP in accordance with Part 7.2.12.4 of the CGP.
- **Retain copies of all inspection reports with your records.** You must also retain in your records copies of all inspection reports in accordance with the requirements in Part 4.1.7.3 of the 2012 CGP. These reports must be retained for at least 3 years from the date your permit coverage expires or is terminated.

Section-by-Section Instructions

You will find specific instructions corresponding to each section of the report form on the reverse side of each page. These instructions provide you with more details in terms of what EPA expects to be documented in these reports.

General Information (see reverse for instructions)					
Name of Project		**CGP Tracking No.**		**Inspection Date**	

Inspector Name, Title & Contact Information	
Present Phase of Construction	
Inspection Location (if multiple inspections are required, specify location where this inspection is being conducted)	

Inspection Frequency *(Note: you may be subject to different inspection frequencies in different areas of the site. Check all that apply.)*

Standard Frequency: ☐ Weekly ☐ Every 14 days and within 24 hours of a 0.25" rain

Increased Frequency: ☐ Every 7 days and within 24 hours of a 0.25" rain (for areas of sites discharging to sediment or nutrient-impaired waters or to waters designated as Tier 2, Tier 2.5, or Tier 3)

Reduced Frequency:

- ☐ Once per month (for stabilized areas)
- ☐ Once per month and within 24 hours of a 0.25" rain (for arid, semi-arid, or drought-stricken areas during seasonally dry periods or during drought)
- ☐ Once per month (for frozen conditions where earth-disturbing activities are being conducted)

Was this inspection triggered by a 0.25" storm event? ☐ Yes ☐ No

If yes, how did you determined whether a 0.25" storm event has occurred?

☐ Rain gauge on site ☐ Weather station representative of site. Specify weather station source:

Total rainfall amount that triggered the inspection (in inches)**:**

Unsafe Conditions for Inspection

Did you determine that any portion of your site was unsafe for inspection per CGP Part 4.1.5? ☐ Yes ☐ No

If "yes", complete the following:

- Describe the conditions that prevented you from conducting the inspection in this location:

- Location(s) where conditions were found:

Instructions for Filling Out "General Information" Section

Name of Project
Enter the name for the project.

CGP Tracking No.
Enter the tracking number that was assigned to your NOI application for permit coverage.

Inspection Date
Enter the date you conducted the inspection.

Inspector Name, Title & Contact Information
Provide the name of the person(s) (either a member of your company's staff or a contractor or subcontractor) that conducted this inspection. Provide the inspector's name, title, and contact information as directed in the form.

Present Phase of Construction
If this project is being completed in more than one phase, indicate which phase it is currently in.

Inspection Location
If your project has multiple locations where you conduct separate inspections, specify the location where this inspection is being conducted. If only one inspection is conducted for your entire project, enter "Entire Site." If necessary, complete additional inspection report forms for each separate inspection location.

Inspection Frequency
Check the box that describes the inspection frequency that applies to you. Note that you may be subject to different inspection frequencies in different areas of your site. If your project does not discharge to a "sensitive water" (i.e., a water impaired for sediment or nutrients, or listed as Tier 2, 2.5, or 3 by your state or tribe) and you are not affected by any of the circumstances described in CGP Part 4.1.4, then you can choose your frequency based on CGP Part 4.1.2 – either weekly, or every other week and within 24 hrs of a 0.25 in storm event. For any portion of your site that discharges to a sensitive water, your inspection frequency for that area is fixed under CGP Part 4.1.3 at weekly and within 24 hrs of a 0.25 inch storm event. If portions of your site are stabilized, are located in arid, semi-arid, or drought-stricken areas, or are subject to frozen conditions, consult CGP Part 4.1.4 for the applicable inspection frequency. Check all the inspection frequencies that apply to your project.

Was This Inspection Triggered by a 0.25 Inch Storm Event?
If you were required to conduct this inspection because of a 0.25 inch (or greater) rain event, indicate whether you relied on an on-site rain gauge or a nearby weather station (and where the weather station is located). Also, specify the total amount of rainfall for this specific storm event.

Unsafe Conditions for Inspection
Inspections are not required where a portion of the site or the entire site is subject to unsafe conditions. See CGP Part 4.1.5. These conditions should not regularly occur, and should not be consistently present on a site. Generally, unsafe conditions are those that render the site (or a portion of it) inaccessible or that would pose a significant probability of injury to applicable personnel. Examples could include severe storm or flood conditions, high winds, and downed electrical wires.

If your site, or a portion of it, is affected by unsafe conditions during the time of your inspection, provide a description of the conditions that prevented you from conducting the inspection and what parts of the site were affected. If the entire site was considered unsafe, specify the location as "Entire site"

Condition and Effectiveness of Erosion and Sediment (E&S) Controls (CGP Part 2.1) (see reverse for instructions)				
Type/Location of E&S Control [Add an additional sheet if necessary]	**Repairs or Other Maintenance Needed?***	**Corrective Action Required?***	**Date on Which Maintenance or Corrective Action First Identified?**	**Notes**
1.	☐Yes ☐No	☐Yes ☐No		
2.	☐Yes ☐No	☐Yes ☐No		
3.	☐Yes ☐No	☐Yes ☐No		
4.	☐Yes ☐No	☐Yes ☐No		
5.	☐Yes ☐No	☐Yes ☐No		
6.	☐Yes ☐No	☐Yes ☐No		
7.	☐Yes ☐No	☐Yes ☐No		
8.	☐Yes ☐No	☐Yes ☐No		
9.	☐Yes ☐No	☐Yes ☐No		
10.	☐Yes ☐No	☐Yes ☐No		

*** Note:** The permit differentiates between conditions requiring repairs and maintenance, and those requiring corrective action. The permit requires maintenance in order to keep controls in effective operating condition and requires repairs if controls are not operating as intended. Corrective actions are triggered only for specific, more serious conditions, which include: 1) A required stormwater control was never installed, was installed incorrectly, or not in accordance with the requirements in Part 2 and/or 3; 2) You become aware that the stormwater controls you have installed and are maintaining are not effective enough for the discharge to meet applicable water quality standards or applicable requirements in Part 3.1; 3) One of the prohibited discharges in Part 2.3.1 is occurring or has occurred; or 4) EPA requires corrective actions as a result of a permit violation found during an inspection carried out under Part 4.2. If a condition on your site requires a corrective action, you must also fill out a corrective action form found at www.epa.gov/npdes/stormwater/swppp. See Part 5 of the permit for more information.

Instructions for Filling Out the "Erosion and Sediment Control" Table

Type and Location of E&S Controls
Provide a list of all erosion and sediment (E&S) controls that your SWPPP indicates will be installed and implemented at your site. This list must include at a minimum all E&S controls required by CGP Part 2.1.2. Include also any natural buffers established under CGP Part 2.1.2.1. Buffer requirements apply if your project's earth-disturbing activities will occur within 50 feet of a surface water. You may group your E&S controls on your form if you have several of the same type of controls (e.g., you may group "Inlet Protection Measures", "Perimeter Controls", and "Stockpile Controls" together on one line), but if there are any problems with a specific control, you must separately identify the location of the control, whether repairs or maintenance or corrective action are necessary, and in the notes section you must describe the specifics about the problem you observed.

Repairs or Other Maintenance Needed?
Answer "yes" if the E&S control requires a repair of any kind (due to normal wear and tear, or as a result of damage) or requires maintenance in order for the control to continue operating effectively. At a minimum, maintenance is required in the following specific instances: (1) for perimeter controls, whenever sediment has accumulated to ½ or more the above-ground height of the control (CGP Part 2.1.2.2.b); (2) where sediment has been tracked-out onto the surface of off-site streets or other paved areas (CGP Part 2.1.2.3.d); (3) for inlet protection measures, when sediment accumulates, the filter becomes clogged, and/or performance is compromised (CGP Part 2.1.2.9.b); and (4) for sediment basins, as necessary to maintain at least ½ of the design capacity of the basin (CGP Part 2.1.3.2.b). Note: In many cases, "yes" answers are expected and indicate a project with an active operation and maintenance program. You should also answer "yes" if work to fix the problem is still ongoing from the previous inspection.

Corrective Action Needed?
Answer "yes" if during your inspection you found any of the following conditions to be present (CGP, Part 5.2.1): (1) a required E&S control was never installed, was installed incorrectly, or not in accordance with the corresponding CGP Part 2 or 3 requirement; (2) you become aware that the inadequacy of the E&S control has led to an exceedance of an applicable water quality standard; or (3) EPA requires corrective action for an E&S control as a result of a permit violation found during an inspection carried out under Part 4.2. If you answer "yes", you must take corrective action and complete a corrective action report, found at www.epa.gov/npdes/stormwater/swppp. Note: You should answer "yes" if work to fix the problem from a previous inspection is still ongoing.

Date on Which Maintenance or Corrective Action First Identified?
Provide the date on which the condition that triggered the need for maintenance or corrective action was first identified. If the condition was just discovered during this inspection, enter the inspection date. If the condition is a carryover from a previous inspection, enter the original date of the condition's discovery.

Notes
For each E&S control and the area immediately surrounding it, note whether the control is properly installed and whether it appears to be working to minimize sediment discharge. Describe any problem conditions you observed such as the following, and why you think they occurred as well as actions (e.g., repairs, maintenance, or corrective action) you will take or have taken to fix the problem:

1. Failure to install or to properly install a required E&S control
2. Damage or destruction to an E&S control caused by vehicles, equipment, or personnel, a storm event, or other event
3. Mud or sediment deposits found downslope from E&S controls
4. Sediment tracked out onto paved areas by vehicles leaving construction site
5. Noticeable erosion at discharge outlets or at adjacent streambanks or channels
6. Erosion of the site's sloped areas (e.g., formation of rills or gullies)
7. E&S control is no longer working due to lack of maintenance

For buffer areas, make note of whether they are marked off as required, whether there are signs of construction disturbance within the buffer, which is prohibited under the CGP, and whether there are visible signs of erosion resulting from discharges through the area.

If repairs, maintenance, or corrective action is required, briefly note the reason. If repairs, maintenance, or corrective action have been completed, make a note of the date it was completed and what was done. *If corrective action is required, note that you will need to complete a separate corrective action report describing the condition and your work to fix the problem*.

Condition and Effectiveness of Pollution Prevention (P2) Practices (CGP Part 2.3) (see reverse for instructions)				
Type/Location of P2 Practices [Add an additional sheet if necessary]	**Repairs or Other Maintenance Needed?***	**Corrective Action Required?***	**Date on Which Maintenance or Corrective Action First Identified?**	**Notes**
1.	☐Yes ☐No	☐Yes ☐No		
2.	☐Yes ☐No	☐Yes ☐No		
3.	☐Yes ☐No	☐Yes ☐No		
4.	☐Yes ☐No	☐Yes ☐No		
5.	☐Yes ☐No	☐Yes ☐No		
6.	☐Yes ☐No	☐Yes ☐No		
7.	☐Yes ☐No	☐Yes ☐No		
8.	☐Yes ☐No	☐Yes ☐No		
9.	☐Yes ☐No	☐Yes ☐No		
10.	☐Yes ☐No	☐Yes ☐No		

*** Note:** The permit differentiates between conditions requiring repairs and maintenance, and those requiring corrective action. The permit requires maintenance in order to keep controls in effective operating condition and requires repairs if controls are not operating as intended. Corrective actions are triggered only for specific, more serious conditions, which include: 1) A required stormwater control was never installed, was installed incorrectly, or not in accordance with the requirements in Part 2 and/or 3; 2) You become aware that the stormwater controls you have installed and are maintaining are not effective enough for the discharge to meet applicable water quality standards or applicable requirements in Part 3.1; 3) One of the prohibited discharges in Part 2.3.1 is occurring or has occurred; or 4) EPA requires corrective actions as a result of a permit violation found during an inspection carried out under Part 4.2. If a condition on your site requires a corrective action, you must also fill out a corrective action form found at www.epa.gov/npdes/stormwater/swppp. See Part 5 of the permit for more information.

Instructions for Filling Out the "Pollution Prevention (P2) Practice" Table

Type and Location of P2 Controls
Provide a list of all pollution prevention (P2) practices that are implemented at your site. This list must include all P2 practices required by Part 2.3.3, and those that are described in your SWPPP.

Repairs or Other Maintenance Needed?
Answer "yes" if the P2 practice requires a repair of any kind (due to normal wear and tear, or as a result of damage) or requires maintenance in order for the control to continue operating effectively. Note: In many cases, "yes" answers are expected and indicate a project with an active operation and maintenance program.

Corrective Action Needed?
Answer "yes" if during your inspection you found any of the following conditions to be present (CGP, Part 5.2.1): (1) a required P2 practice was never installed, was installed incorrectly, or not in accordance with the corresponding CGP Part 2 requirement; (2) you become aware that the inadequacy of the P2 practice has led to an exceedance of an applicable water quality standard; (3) one of the "prohibited discharges" listed in CGP Part 2.3.1 is occurring or has occurred, or (4) EPA requires corrective action for a P2 practice as a result of a permit violation found during an inspection carried out under Part 4.2. If you answer "yes", you must take corrective action and complete a corrective action report (see www.epa.gov/npdes/stormwater/swppp). Note: You should answer "yes" if work to fix the problem from a previous inspection is still ongoing.

Date on Which Maintenance or Corrective Action First Identified?
Provide the date on which the condition that triggered the need for maintenance or corrective action was first identified. If the condition was just discovered during this inspection, enter the inspection date. If the condition is a carryover from a previous inspection, enter the original date of the condition's discovery.

Notes
For each P2 control and the area immediately surrounding it, note whether the control is properly installed, whether it appears to be working to minimize or eliminate pollutant discharges, and whether maintenance or corrective action is required. Describe problem conditions you observed such as the following, and why you think they occurred, as well as actions you will take or have taken to fix the problem:

1. Failure to install or to properly install a required P2 control
2. Damage or destruction to a P2 control caused by vehicles, equipment, or personnel, or a storm event
3. Evidence of a spill, leak, or other type of pollutant discharge, or failure to have properly cleaned up a previous spill, leak, or other type of pollutant discharge
4. Spill response supplies are absent, insufficient, or not where they are supposed to be located
5. Improper storage, handling, or disposal of chemicals, building materials or products, fuels, or wastes
6. P2 practice is no longer working due to lack of maintenance

If repairs, maintenance, or corrective action is required, briefly note the reason. If repairs, maintenance, or corrective action have been completed, make a note of the date it was completed and what was done. *If corrective action is required, note that you will need to complete a separate corrective action report describing the condition and your work to fix the problem*.

Stabilization of Exposed Soil (CGP Part 2.2) (see reverse for instructions)			
Stabilization Area **[Add an additional sheet if necessary]**	**Stabilization Method**	**Have You Initiated Stabilization?**	**Notes**
1.		☐ YES ☐ NO If yes, provide date:	
2.		☐ YES ☐ NO If yes, provide date:	
3.		☐ YES ☐ NO If yes, provide date:	
4.		☐ YES ☐ NO If yes, provide date:	
5.		☐ YES ☐ NO If yes, provide date:	

Description of Discharges (CGP Part 4.1.6.6) (see reverse for instructions)	
Was a stormwater discharge or other discharge occurring from any part of your site at the time of the inspection? ☐ Yes ☐ No **If "yes", provide the following information for each point of discharge:**	
Discharge Location **[Add an additional sheet if necessary]**	**Observations**
1.	Describe the discharge: At points of discharge and the channels and banks of surface waters in the immediate vicinity, are there any visible signs of erosion and/or sediment accumulation that can be attributed to your discharge? ☐ Yes ☐ No If yes, describe what you see, specify the location(s) where these conditions were found, and indicate whether modification, maintenance, or corrective action is needed to resolve the issue:
2.	Describe the discharge: At points of discharge and the channels and banks of surface waters in the immediate vicinity, are there any visible signs of erosion and/or sediment accumulation that can be attributed to your discharge? ☐ Yes ☐ No If yes, describe what you see, specify the location(s) where these conditions were found, and indicate whether modification, maintenance, or corrective action is needed to resolve the issue:

Instructions for Filling Out the "Stabilization of Exposed Soil" Table

Stabilization Area
List all areas where soil stabilization is required to begin because construction work in that area has permanently stopped or temporarily stopped (i.e., work will stop for 14 or more days), and all areas where stabilization has been implemented.

Stabilization Method
For each area, specify the method of stabilization (e.g., hydroseed, sod, planted vegetation, erosion control blanket, mulch, rock).

Have You Initiated Stabilization
For each area, indicate whether stabilization has been initiated.

Notes
For each area where stabilization has been initiated, describe the progress that has been made, and what additional actions are necessary to complete stabilization. Note the effectiveness of stabilization in preventing erosion. If stabilization has been initiated but not completed, make a note of the date it is to be completed. If stabilization has been completed, make a note of the date it was completed. If stabilization has not yet been initiated, make a note of the date it is to be initiated, and the date it is to be completed.

Instructions for Filling Out the "Description of Discharges" Table

You are only required to complete this section if a discharge is occurring at the time of the inspection.

Was a Stormwater Discharge Occurring From Any Part of Your Site At The Time of the Inspection?
During your inspection, examine all points of discharge from your site, and determine whether a discharge is occurring. If there is a discharge, answer "yes" and complete the questions below regarding the specific discharge. If there is not a discharge, answer "no" and skip to the next page.

Discharge Location (repeat as necessary if there are multiple points of discharge)
Location of discharge. Specify the location on your site where the discharge is occurring. The location may be an outlet from a stormwater control or constructed stormwater channel, a discharge into a storm sewer inlet, or a specific point on the site. Be as specific as possible; it is recommended that you refer to a precise point on your site map.

Describe the discharge. Include a specific description of any noteworthy characteristics of the discharge such as color; odor; floating, settled, or suspended solids; foam; oil sheen; and other obvious pollution indicators.

Are there visible signs of erosion or sediment accumulation? At each point of discharge and the channel and streambank in the immediate vicinity, visually assess whether there are any obvious signs of erosion and/or sediment accumulation that can be attributed to your discharge. If you answer "yes", include a description in the space provided of the erosion and sediment deposition that you have found, specify where on the site or in the surface water it is found, and indicate whether modification, maintenance, or corrective action is needed to resolve the issue.

Contractor or Subcontractor Certification and Signature
(see reverse for instructions)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Contractor or Subcontractor: _____ **Date:**

Printed Name and Affiliation: _____

Certification and Signature by Permittee
(see reverse for instructions)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Permittee or "Duly Authorized Representative": _____ **Date:**

Printed Name and Affiliation: _____

Instructions for Signature/Certification

Each inspection report must be signed and certified to be considered complete.

Contractor or Subcontractor Signature and Certification
Where a contractor or subcontractor is relied on to carry out the inspection and complete the inspection report, you should require the inspector to sign and certify each report. Note that this does not relieve the permitted operator of the requirement to sign and certify the inspection report as well.

Signature and Certification by Permittee
At a minimum, the inspection report must be signed by either (1) the person who signed the NOI, or (2) a duly authorized representative of that person. The following requirements apply to scenarios (1) and (2):

If the signatory will be the person who signed the NOI for permit coverage, as a reminder, that person must be one of the following types of individuals:

- *For a corporation*: A responsible corporate officer. For the purpose of this subsection, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- *For a partnership or sole proprietorship*: A general partner or the proprietor, respectively.
- *For a municipality, state, federal, or other public agency*: Either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

If the signatory will be a duly authorized representative, the following requirements must be met:

- The authorization is made in writing by the person who signed the NOI (see above);
- The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
- The signed and dated written authorization is included in the SWPPP. A copy must be submitted to EPA, if requested.

Appendix E Corrective Action Form

Corrective Action Report Form – Electronic Version

Purpose
This Corrective Action Report Form is designed to assist you in preparing corrective action reports for EPA's 2012 Construction General Permit (CGP). If you are covered under EPA's 2012 CGP, this form will enable you to create a corrective action report that complies with the minimum reporting requirements of Part 5.4 of the permit.

You are only required to fill out this form if one of the corrective action triggering conditions in Part 5.2.1 or 5.3 occurs on your site. Routine maintenance and repairs are generally not considered to be a corrective action triggering condition. Corrective actions are triggered only for specific, more serious conditions that are identified below in the "Overview of Corrective Action Requirements."

If you are covered under a state CGP, this form may be helpful in developing a report that can be used for that permit; however it will need to be modified to meet the specific requirements of the permit. If your permitting authority requires you to use a specific corrective action report form, you should not use this form.

Notes
While EPA has made every effort to ensure the accuracy of all instructions and guidance contained in the Corrective Action Report Form, the actual obligations of regulated construction activities are determined by the relevant provisions of the permit, not by the form. In the event of a conflict between the Corrective Action Report Form and any corresponding provision of the 2012 CGP, you must abide by the requirements in the permit. EPA welcomes comments on the Corrective Action Report Form at any time and will consider those comments in any future revision of this document. You may contact EPA for CGP-related inquiries at cgp@epa.gov.

Overview of Corrective Action Requirements
Construction operators covered under the 2012 CGP are required to conduct corrective actions and report on progress made in correcting the problem condition(s) in accordance with the following requirements:

Corrective Action Triggering Conditions (Parts 5.2.1 and 5.3)
Corrective action is required whenever any of the following conditions occur at your site:

- A required stormwater control was never installed, was installed incorrectly, or not in accordance with the requirements in Part 2 and/or 3;
- The stormwater controls (e.g., erosion and sediment controls or pollution prevention controls) that have been installed and maintained are not effective enough for the discharge to meet applicable water quality standards or applicable requirements in Part 3.1 of the permit;
- A Part 2.3.1 prohibited discharge has occurred or is occurring; or
- Any corrective actions required by EPA as a result of permit violations found during an inspection carried out under Part 4.2.

Deadlines for Completing Corrective Actions (Part 5.2.1)
You must complete corrective action (e.g., installing and making operational any new or modified control, correcting errors in installation, preventing, mitigating, or cleaning up spills or leaks making repairs) by no later than 7 calendar days from the time of discovery of the condition. If infeasible to complete the installation or repair within 7 calendar days, you must document why it is infeasible and document your schedule for completing the corrective action as soon as practicable.

Deadlines for Documenting Corrective Actions in a Report (Part 5.4)
You are required to complete a corrective action report for each of corrective action you take in accordance with the following deadlines.

- Within 24 hours of discovering the occurrence of a corrective action triggering condition, you must document the following:
  - The condition identified at your site;

- The nature of the condition identified; and
- The date and time of the condition identified and how it was identified

- Within 7 calendar days of discovering a triggering condition, you must document the following:
  - Any follow-up actions taken to review the design, installation, and maintenance of stormwater controls, including the dates such actions occurred;
  - A summary of stormwater controls modifications taken or to be taken, including a schedule of activities necessary to implement changes, and the date the modifications are completed or expected to be completed; and
  - Notice of whether SWPPP modifications are required as a result of the condition identified or corrective action.

Instructions for Using This Report Form
This Electronic Version of the Corrective Action Report Form is intended to be filled out electronically. If you will be filling out the Corrective Action Report Form by hand (i.e., you will be filling this form out in the field), please use the Field Version of the Corrective Action Report Form available at www.epa.gov/npdes/stormwater/swppp.

The following tips for using this form will help you ensure that the minimum permit requirements are met:

- **Review the corrective action requirements.** Before you fill out this corrective action report form, read the CGP's Part 5 corrective action requirements. This will ensure that you have a working understanding of the permit's underlying corrective action requirements.

- **Complete a separate report for each condition that triggers corrective action.** For each triggering condition on your site, you will need to fill out a separate corrective action report form.

- **Complete all required text fields.** Fill out all text fields (marked with blue font). Only by filling out all fields will the form be compliant with the requirements of the permit. (Note: Where you do not need the number of rows provided in the corrective action report form, you may delete these as you see fit. Or, if you need more space to document your findings, you may insert additional rows.) Specific instructions on what information to include in each text field is included in each text field. The fields were developed so that the instructions disappear once you start typing.
- **Sign and certify each corrective action report.** Each corrective action report form must be signed and certified by the permittee to be considered complete. Where your corrective actions are carried out by a contractor or subcontractor, it is recommended that you also have the form signed and certified by the inspector, in addition to the signature and certification required of the permitted operator. The form includes a signature block for both parties.
- **Include the corrective action report form with your SWPPP.** Once your form is complete, make sure to include a copy of the corrective action report form in your SWPPP in accordance with Part 7.2.12.4 of the CGP.
- **Retain copies of all corrective action reports with your records.** You must retain copies of your corrective action reports in your records in accordance with the requirements in Part 5.4.4 of the 2012 CGP. These reports must be retained for at least 3 years from the date your permit coverage expires or is terminated.

Section-by-Section Instructions
You will find specific instructions corresponding to each section of the report form at the end of this form. These instructions were written in order to provide you with more details in terms of what EPA expects to be documented in these reports.

Corrective Action Report for [Insert project name]
Date: [Insert Today's Date: _ _ / _ _ / _ _]

Section A – Initial Report (CGP Part 5.4.1)

(Complete this section within 24 hours of discovering the condition that triggered corrective action)

Date problem first discovered: [Enter date]

Time discovered: [Enter time]

Name and contact information of individual completing this form: [Enter the individual's name, title, and contact information (company name, address, email, and phone).]

What site conditions triggered the requirement to conduct corrective action *(check the box that applies)*:

- ☐ A required stormwater control was never installed, was installed incorrectly, or not in accordance with the requirements in Part 2 and/or 3
- ☐ The stormwater controls that have been installed and maintained are not effective enough for the discharge to meet applicable water quality standards or applicable requirements in Part 3.1 of the permit
- ☐ A Part 2.3.1 prohibited discharge has occurred or is occurring
- ☐ EPA requires corrective action as a result of permit violations found during an EPA inspection carried out under Part 4.2

Provide a description of the problem: [Provide description of the specific problem that triggered the need for corrective action, and the specific location where it was found. If you have already provided this explanation in an inspection report, you can refer to that report.]

Deadline for completing corrective action: [Enter date that is either: (1) no more than 7 calendar days after the date you discovered the problem, or (2) if it is infeasible to complete work within the first 7 days, enter the date that is as soon as practicable following the 7th day.]

If your estimated date of completion falls after the 7-day deadline, explain (1) why you believe it is infeasible to complete work within 7 days, and (2) why the date you have established for making the new or modified stormwater control operational is the soonest practicable timeframe: [Enter text here]

Section B – Corrective Action Progress (CGP Part 5.4.2)

(Complete this section no later than 7 calendar days after discovering the condition that triggered corrective action)

Section B.1 – Why the Problem Occurred

Cause(s) of Problem (insert additional rows if applicable)	How This Was Determined and the Date You Determined the Cause
1. [State what you determined to be the cause of the problem]	[Specify what you did to come to your conclusion] [Enter date]
2. [State what you determined to be the cause of the problem]	[Specify what you did to come to your conclusion] [Enter date]

Section B.2 – Stormwater Control Modifications to be Implemented to Correct the Problem

List of Stormwater Control Modification(s) Needed to Correct Problem (insert additional rows if applicable)	Date of Completion	SWPPP Update Necessary?	Notes
1. [Specific modification to be implemented]	[Enter date]	☐Yes ☐No [If yes, specify date SWPPP modified]	[Enter text here]
2. [Specific modification to be implemented]	[Enter date]	☐Yes ☐No [If yes, specify date SWPPP modified]	[Enter text here]

Section C – Certification and Signature (CGP Part 5.4.3)

Section C.1 – Certification and Signature by Contractor or Subcontractor

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Contractor or Subcontractor: _____ **Date:**

Printed Name and Affiliation: _____

Section C.2 – Certification and Signature by Permittee

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Permittee or "Duly Authorized Representative": _____ **Date:**

Printed Name and Affiliation: _____

Instructions for Filling Out the Initial Report (Section A) on Page 1

You must complete Section A of the report form within 24 hours of discovering the condition that triggered corrective action

Date/Time Problem First Discovered
Specify the date on which the triggering condition was first discovered. Also specify the time of the discovery.

Name/Contact Information
Provide the individual's name, title, and contact information as directed in the form.

Site Condition That Triggered Corrective Action
Under the CGP, corrective action is required when one of 3 triggering conditions occurs at your site. See CGP Parts 5.2.1 5.3. Check the box that corresponds to the condition that triggered this corrective action.

Description of the Site Condition
Provide a summary description of the condition you found that triggered corrective action under CGP Part 5.2.1. and the specific location where it was found. Be as specific as possible about the location; it is recommended that you refer to a precise point on your site map. If you have already provided this explanation in an inspection report, you can refer to that report.

Deadline for Completing Corrective Action
This deadline is fixed in CGP Part 5.2.1. For all projects, the deadline is either: (1) no more than 7 calendar days after the date you discovered the problem, or (2) if it is infeasible to complete work within the first 7 days, as soon as practicable following the 7th day. If your estimated date of completion falls after the 7-day deadline consistent with (2), above, explain (a) why you believe it is infeasible to complete work within 7 days, and (b) why the date you have established for making the new or modified stormwater control operational is the soonest practicable timeframe:

Instructions for Filling Out the Corrective Action Progress Table (Section B) on Page 1

You must complete Section B of the report form no later than 7 calendar days after discovering the condition that triggered corrective action.

Section B.1 – Why the Problem Occurred
After you have had the opportunity to examine the problem more closely, provide details as to what you believe to be the cause of the problem, and specify the follow-up actions you took (along with the dates of such actions) to diagnose the problem. This is consistent with CGP Part 5.4.2.1.

Section B.2 – Stormwater Control Modifications to be Implemented
Provide a list of modifications you plan to make to your stormwater controls to correct the problem and the date you completed such work. Keep in mind that your work must be completed within the timeline specified in Section A for the completion of corrective action work.

Also, if a SWPPP modification is necessary consistent with Part 7.4.1.1 in order to reflect changes implemented at your site, indicate the date you modified your SWPPP. Keep in mind that SWPPP changes must be made within 7 days of discovering the problem that triggered this corrective action.

Space is provided for you to include additional notes or observations regarding the change that you implemented at your site to correct the problem.

Instructions for Signature and Certification (Section C) on Page 2

Each corrective action report must be signed and certified to be considered complete.

Section C.1 – Contractor or Subcontractor Signature and Certification
Where a contractor or subcontractor is relied on to complete this report and the associated corrective action, you should require the individual(s) to sign and certify each report. Note that this does not relieve you of the requirement to sign and certify the report as well.

Section C.2 – Signature and Certification by Permittee
At a minimum, the corrective action report form must be signed by either (1) the person who signed the NOI, or (2) a duly authorized representative of that person. The following requirements apply to scenarios (1) and (2):

If the signatory will be the person who signed the NOI for permit coverage, as a reminder, that person must be one of the following types of individuals:

- *For a corporation*: A responsible corporate officer. For the purpose of this subsection, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- *For a partnership or sole proprietorship*: A general partner or the proprietor, respectively.
- *For a municipality, state, federal, or other public agency*: Either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

If the signatory will be a duly authorized representative, the following requirements must be met:

- The authorization is made in writing by the person who signed the NOI (see above);
- The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
- The signed and dated written authorization is included in the SWPPP. A copy must be submitted to EPA, if requested.

Appendix F SWPPP Amendment Log

SWPPP Amendment Log

No.	Description of the Amendment	Date of Amendment	Amendment Prepared By

Appendix G Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of Construction Service to be Provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____

Appendix H Grading and Stabilization Activities Log

Date Grading Activity Initiated	Description of Grading Activity	Description of Stabilization Measure and Location	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures Initiated

Appendix I Training Log

Stormwater Pollution Prevention Training Log

Project Name: _____

Project Location: _____

Instructor's Name(s): _____

Instructors Title(s): _____

Course Location: _____ Date: _____

Course Length (hours): _____

Stormwater Training Topic: (check as appropriate)

Sediment and Erosion Controls

Emergency Procedures

Stabilization Controls

Inspections/Corrective Actions

Pollution Prevention Measures

Specific Training Objective: _____

_____

_____

Attendee Roster: (attach additional pages as necessary)

No.	Name of Attendee	Company
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
16.		
17.		

Appendix J Delegation of Authority

Delegation of Authority

I, _____(name), herby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)

_____ (company)

_____ (address)

_____ (city, state, zip)

_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____