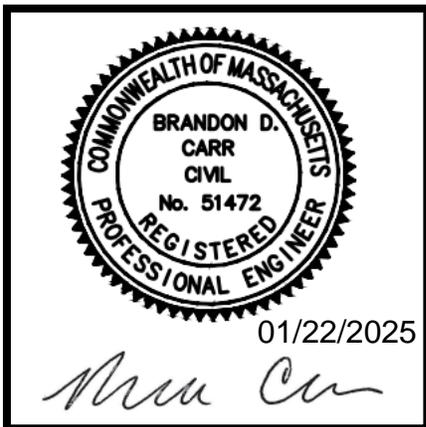
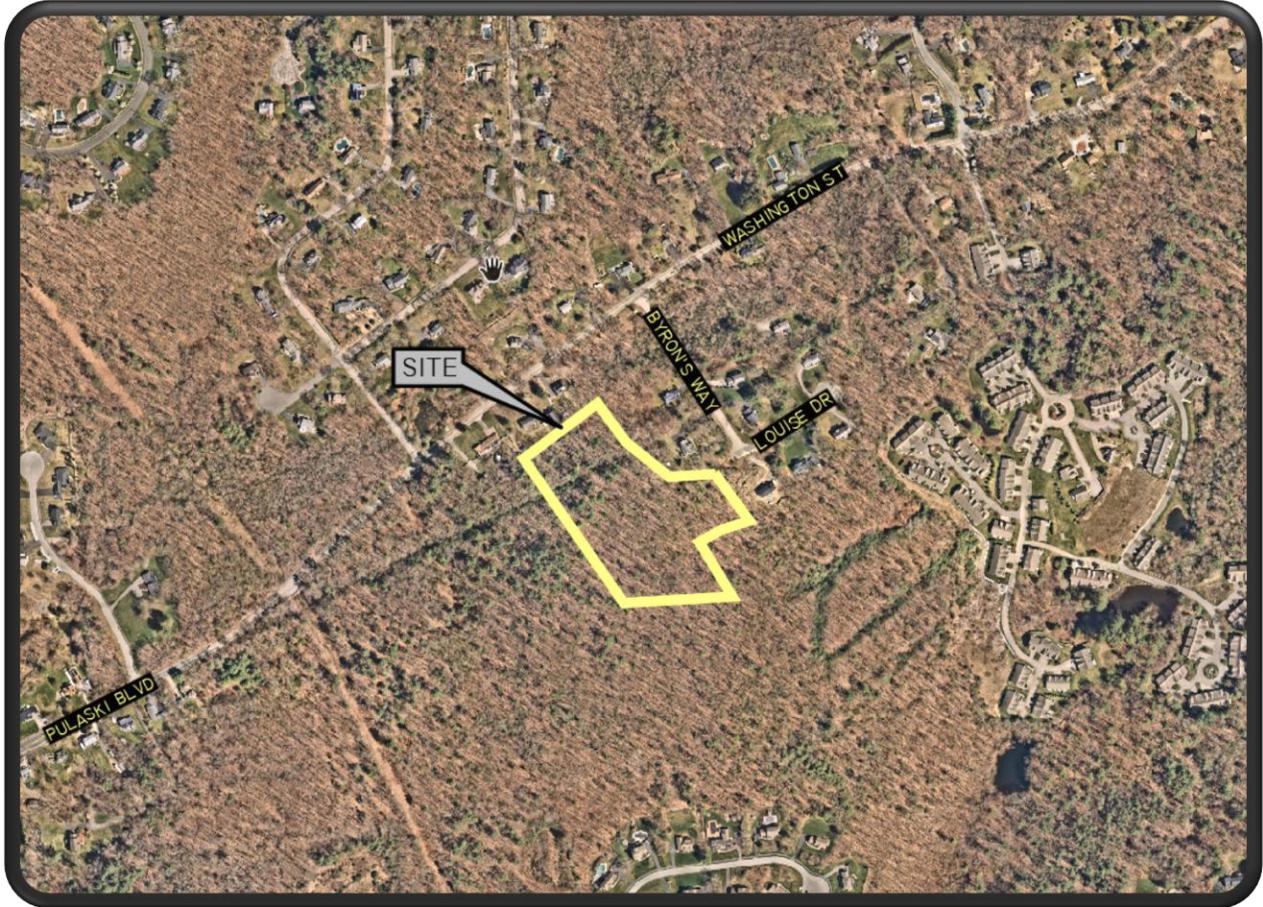




# Stormwater Management Report



## Louise Drive

Located in Franklin, MA

Applicant: Paul Longobardi

9-18-2024

Revised 1-22-2025

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## Executive Summary

On behalf of the Client, we are submitting drainage calculations for the proposed development on Louise Drive. The site is located on Assessors' Plat 339 Lots 13-16 & Assessors' Plat 349 Lot 2. The site exists today as almost entirely wooded area. The client proposes to construct a new roadway for four new homes and associated parking that will extend from the current Louise Drive. The post development stormwater will be treated for water quality using Best Management Practices (BMPs). The Site has been designed to the Massachusetts Stormwater Management Standards (MASWMS). Site constraints included a high groundwater table and crossing of a wetland.

To treat and mitigate post development flows on site, a proprietary treatment device, a series of catch basins, a sediment forebay, a sand filter, and a detention pond are utilized. The treatment train will remove TSS (total suspended solids) in accordance with the MASWMS. The infiltration / detention systems are designed to control runoff for the 2 through 100-year storm events.

This report details how the site will show no net increase in stormwater runoff from pre development to post development conditions, and how the proposed BMPs will meet the Massachusetts Stormwater Management Standards (MASWMS) and the Town of Franklin Stormwater Management Bylaw.

Pre development Conditions versus Post Development Conditions are summarized below:

### Pre Development vs. Post Development Mitigated

#### Watershed 1: (DP-1)

Conditions – Peak Flow	2-Year	10-Year	25-Year	100-Year
Pre Dev Summation	4.94	15.39	25.40	48.54
Post Dev Summation	4.44	14.76	24.98	51.68
<b>Net Change</b>	<b>-0.50</b>	<b>-0.63</b>	<b>-0.42</b>	<b>3.14</b>

All flows in cubic feet per second (cfs)

Conditions – Volume	2-Year	10-Year	25-Year	100-Year
Pre Dev Summation	0.665	1.715	2.717	5.070
Post Dev Summation	0.723	1.796	2.783	5.040
<b>Net Change</b>	<b>0.058</b>	<b>0.081</b>	<b>0.066</b>	<b>-0.030</b>

All volumes in acre-feet (ac-ft)



# 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.<sup>1</sup> 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<sup>2</sup>
- 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.

<sup>1</sup> 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.

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



# Checklist for Stormwater Report

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## 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.

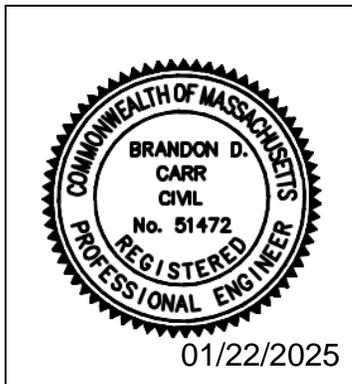
A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

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### Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



1/22/25

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

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## 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

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## 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<sup>1</sup>
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - Site is comprised solely of C and D soils and/or bedrock at the land surface
  - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - Solid Waste Landfill pursuant to 310 CMR 19.000
  - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## 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

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## 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.

N/A

### 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

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## 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

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## 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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## 1.0 Project Description

The purpose of this report is to specify a Storm Water Management System for the proposed development at 0 Louise Drive. A Stormwater System Operations and Maintenance Plan (O&M) has been prepared by DiPrete Engineering as a separate document.

The proposed development is located on Assessors' Plat 339 Lots 13-16 & Assessors' Plat 349 Lot 2 in Franklin, Massachusetts. The site is located on Louise Drive starting where it intersects with Byron's Way. The first watercourse that receives stormwater runoff downstream of the site is the Miscoe Brook.

The proposed development will include a paved roadway with provision for a future four new home subdivision and associated driveways. The future site will be serviced by private wells and private septic tanks.

Stormwater treatment and mitigation will be provided by utilizing Best Management Practices (BMPs) as established by the Massachusetts Stormwater Handbook. BMPs will consist of a proprietary treatment device, a series of catch basins, a sediment forebay, a sand filter, and a detention pond. The system has been designed to meet the MADEP Stormwater Handbook, otherwise known as the Massachusetts Stormwater Management Standards (MASWMS), and the Town of Franklin Stormwater Management Bylaws.

## 2.0 Site Conditions

### 2.1 SOILS

There are the following soil types within the analyzed area of the Site as mapped by the NRCS USDA Soil Conservation service:

Soil Symbol	Description	Hydrologic Group
103D	Charlton-Hollis-Rock outcrop complex, 15 to 20 percent slopes	B
104C	Hollis-Rock outcrop-Charlton complex, 3 to 15 percent slopes	D
302C	Montauk fine sandy loam, 8 to 15 percent slopes, extremely stony	C

The onsite soil includes 103D - Charlton-Hollis-Rock outcrop complex which is Hydrologic Group B soil due to the depth achieved in the test pits and lack of ledge shown on site in areas containing 103D soils. Other soils in and around the site include 104C – Hollis-Rock outcrop-Charlton complex, which is Hydrologic Group D soil, and 302C – Montauk fine sandy loam, which is Hydrologic Group C soil. Therefore, Hydrologic Group D has been used for modeling the 103D soil.

Site specific soil evaluations can be found in Appendix A2.1.

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## 2.2 EXISTING SITE CONDITIONS

Currently the site is wooded. Stormwater runoff from the majority of the site flows overland and discharges to the existing wetland complex to the northeast of the site.

Stormwater from the site ultimately discharges to the Miscoe Brook. None of the stormwater discharging from the site is currently treated or detained before ultimately discharging to Miscoe Brook.

Design Point 1 (DP-1) represents the existing northeast wetland complex.

## 2.3 POST SITE CONDITIONS

The proposed drainage analysis uses stormwater management systems to control and treat runoff from the proposed development. The following BMP's are proposed and have been designed to include the following elements:

- Proprietary Separator (Downstream Defender)
  - Phosphorus removal capabilities
  - 3<sup>rd</sup> party testing demonstrates over 80% removal efficiency of TSS
  - 3<sup>rd</sup> party testing demonstrates over 80% removal efficiency of oils
- Sediment Forebay
  - Pretreatment of impervious areas.
  - 2.0'-4.0' forebay depth with proposed 2:1 reinforced slopes.
  - Acts as a stormwater bypass system. The water quality storm is directed to the water quality device while other storms are bypassed.
    - Equipped with Water quality stormwater event by-pass to the water quality BMP.
  - Sandy-loam or other slower infiltrating soil to be placed under the sediment forebays to inhibit infiltration within sediment forebay in areas with high in situ infiltration rates.
- Sand Filter
  - Fully infiltrates the water quality stormwater event.
  - 2.0' of sand media mix including 6" of top soil and 1.5' of filter sand for stormwater infiltration.
- Conveyance Swale
  - Diverts water around the pond complex to not impede on the abutters
- Detention pond
  - Provides a subdrain for high water table

The above elements will be used to meet the MASWMS.

---

## 3.0 Minimum Standards

The site has been designed to meet the MASWMS. The following sections outline how the site meets or exceeds the minimum required standards.

### 3.1 Minimum Standard 1: No New Untreated Discharges

There are no new untreated discharges from the proposed development.

### 3.2 Minimum Standard 2: Peak Rate Attenuation

#### 3.2.1 Method of Analysis

USDA Soil Conservation Service Method as defined by Technical Release No. 20 (TR-20) determines Stormwater runoff rate and volume. Type III rainfall distribution is utilized. Time of concentration is determined using Technical Release No 55 (TR-55) methodology, through the computer program *HydroCAD ver. 10* by HydroCAD Software Solutions LLC.

Infiltration rates have been determined based on onsite soil evaluations. The soil evaluations were used to develop a texture class. Infiltration rates are based on Rawl's Rates. See table 2.3.3 of the Massachusetts Stormwater Handbook.

Based on the sandy loamy soil at the surface of the existing natural depression on site, an infiltration rate of 1.02 in/hr would have been used under existing conditions. Under proposed conditions, the A and B soil horizons are to be removed for the Sand filter so that the pond bottom can be set within the C soil horizon. An infiltration rate of 2.00 in/hr is used in the sand filter as proposed conditions per the MA Stormwater Handbook, V2C2 Page 59.

The 'bottom of pond' areas for open air infiltration BMPs have been modeled as CN 98, since the direct rainfall that hits the pond bottom enters the pond instantaneously without any appreciable losses.

The drainage system has been designed to mitigate all stormwater flows for the 2 through 100 year storm events. The outlets have been sized to handle the 100-year storm event and minimize potential erosion.

#### Drainage Network Design Parameters:

##### A. PIPES

- All drainage pipes are HDPE or equivalent unless otherwise noted.
- Manning's coefficient = 0.012 for HDPE Pipe
- Diameters & lengths as specified
- The 50-year design storm is utilized for the drainage pipe design and overland flow design to ensure that the drainage system contains and channels water to the BMP areas as shown on the plans.
- The rational method has been used for the closed drainage system.

##### B. STRUCTURES

- Catch basins – Pre-cast concrete with 4' sump unless otherwise noted, with inverts as specified
- Manholes – Pre-cast concrete with inverts as specified.

##### C. OPEN CHANNELS SYSTEMS (SWALES)

- All open channels systems shall be grassed channels unless otherwise noted.
- Manning's coefficient = 0.030 for grass
- Width, depth, slope and side slopes as noted on plans.
- The 100-year design storm is utilized for the open channel design to ensure that the drainage system contains and channels water to the BMP areas as shown on the plans.
- HydroCAD has been used to model the open channels/ swales. See Appendix A5.1.

### 3.2.2 Design Storm

Analysis of 2-year, 10-year, 25-year and 100-year frequency storms are included. The following 24-hour rainfall intensities are obtained from the Cornell Extreme Precipitation in New York & New England (<http://precip.eas.cornell.edu/>). Note: For design storms where the Hydrology Handbook for Conservation Commissioners (Table F-1) lists a higher intensity than the Cornell data, that intensity has been adopted in lieu of the Cornell figure.

Norfolk County.

2 year =	3.27 inches
10 year =	4.94 inches
25 year =	6.26 inches
100 year=	8.99 inches

### 3.2.3 Design Point Breakdown

The site is analyzed as 1 watershed area. In the pre development stage there are 2 sub-catchments. In the post development stage, there are 7 sub-catchments. Each watershed will demonstrate zero increase of runoff due to the proposed development. A description of each watershed and associated sub-catchments are summarized as follows, for cover types see color watershed maps located in back of this report. Numbers in parentheses ( ) indicate the HydroCAD Node Number.

#### Design Point 1:

Watershed #1 flows to Design Point 1 (DP-1)(12/119). This watershed consists of the entire site, plus upstream run on as shown on the Watershed Maps at the back of this report. The design point is the existing northeast wetland complex (12/119).

In pre development conditions there are 2 sub-catchments tributary to Design Point 1.

Pre-01 (10) collects stormwater runoff from the southeast section of the site. Water flows overland and discharges onto the neighboring abutter, which ultimately continues downstream to the existing MassDOT drainage network.

Pre-02 (11) collects stormwater runoff from the majority of the site flows overland and discharges to the existing wetland complex to the northeast of the site.

In post development conditions there are 7 sub-catchments tributary to Design Point 1.

Post-01 (100) collects runoff from the existing upland in the western central southern portion of the site, through a series of pipe network drainage structures (101, 104, 110, 111) which directs the stormwater to Pond Complex A (113, 114, 115) before being discharged to DP-1 (119) via overland flow.

Post-02 (102) collects runoff from a proposed home site and portion of the proposed roadway, through a series of pipe network drainage structures (103, 104, 110, 111) which directs the stormwater to Pond Complex A (113, 114, 115) before being discharged to DP-1 (119) via overland flow.

Post-03 (105) collects runoff from the existing upland in the western southern portion of the site, a proposed home site and southern portion of the proposed cul-de-sac through a series of pipe network drainage structures (106, 109, 110, 111) which directs the stormwater to Pond Complex A (113, 114, 115) before being discharged to DP-1 (119) via overland flow.

Post-04 (107) collects runoff from a proposed home and northern portion of the proposed cul-de-sac, through a series of pipe network drainage structures (108, 109, 110, 111) which directs the stormwater to Pond Complex A (113, 114, 115) before being discharged to DP-1 (119) via overland flow.

Post-05 (112) contains Pond Complex A. It collects runoff from a northern portion of the site and directs it via overland flow to Pond Complex A (113, 114, 115) before being discharged to DP-1 (119) via overland flow.

Post-06 (116) collects runoff from the existing upland in the eastern central southern portion of the site and directs via overland flow it through a Box Arch Culvert (117) into DP-1 (119).

Post-07 (118) contains the undetained area downgradient of Box Arch Culvert (113P). Stormwater discharges to DP-1 (119) via overland flow.

Post-08 (120) collects runoff from the existing upland in the eastern central southern portion of the site and directs via overland flow to a proprietary device (121) before reaching the existing detention pond off of Byron's Way (122).

Below is a summary of the hydrologic parameters for the pre and post development sub-catchments in Design Point-1 (119).

\*Flowing to existing detention basin

	Area (acres)	CN	Tc (min)
Pre-01	1.145	55	17.4
Pre-02	12.075	65	19.5
Post-01	2.915	67	13.3
Post-02	0.431	75	6.0
Post-03	3.008	77	17.7
Post-04	0.350	84	6.0
Post-05	0.815	65	6.5
Post-06	1.646	59	12.8
Post-07	2.896	65	12.6
Post-08*	2.409	61	17.5

### 3.2.4 Outlet Protection

The proposed BMPs and drainage systems have been designed to minimize erosion from the proposed development. Outlet structures include rip rap where specified, to encourage non erosive velocities. Per the Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas (Part III), design criteria for outlet protection should address peak runoff from the 10 year storm. Exit velocities equal to or less than 3.0 ft/s are considered non erosive.

#### Pipe Outlet Protection Calculations

In the absence of specific design data in the Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas (Part III), the design equation listed in both the Rhode Island and Connecticut SESC manuals has been used to estimate exit velocity from the riprap pads, as follows:

$$L_a = \frac{1.7Q}{D_o^{3/2}} + 8D_o$$

Where:

La = required length of riprap apron (ft)

Q = outlet pipe discharge (cfs)

Do = outlet pipe diameter (ft)

For discharges where tailwater (TW) is > 0.5 Do, the width of distant end of riprap is:

$$W = 3*Do + 0.4*La$$

For stone size, d<sub>50</sub> is determined by the following formula:

$$d_{50} = \left(\frac{0.02}{TW}\right) \left(\frac{Q}{D_o}\right)^{4/3}$$

*Source: Rhode Island Soil Erosion and Sediment Control Handbook; Connecticut Guidelines for Soil Erosion and Sediment Control Handbook*

The above equations are used to generate outlet protection parameters to promote non-erosive discharge. The table below shows a summary of the required and provided riprap pads. Note the 100 year discharges have been used, instead of the 10 year discharge. Therefore, the outlet protection pads are conservative:

#### **Outlet Protection**

Outlet	Do (ft)	100 Year Q (cfs)	La (ft) Required	W (ft) Required	d-50 (in)
FES-11	2.00	33.22	35	41	11

It should be noted that the 10 year storm is typically used for determining the above parameters, however the 100 year flow data has been used in this instance to be conservative.

Based on the equations, all proposed stone pad lengths will adequately reduce the exit velocities.

### 3.2.5 Standard 2 Conclusion

The tables below present a summary of the pre development flows vs. the mitigated post development flows. The tables show a decrease in the rate of runoff and volume for all storms included in the analysis.

#### Pre Development vs. Post Development Mitigated

##### Watershed 1: (DP-1)

Conditions – Peak Flow	2-Year	10-Year	25-Year	100-Year
Pre Dev Summation	4.94	15.39	25.40	48.54
Post Dev Summation	4.44	14.76	24.98	51.68
<b>Net Change</b>	<b>-0.50</b>	<b>-0.63</b>	<b>-0.42</b>	<b>3.14</b>

All flows in cubic feet per second (cfs)

Conditions – Volume	2-Year	10-Year	25-Year	100-Year
Pre Dev Summation	0.665	1.715	2.717	5.070
Post Dev Summation	0.723	1.796	2.783	5.040
<b>Net Change</b>	<b>0.058</b>	<b>0.081</b>	<b>0.066</b>	<b>-0.030</b>

All volumes in acre-feet (ac-ft)

As shown in the tables above, there will be no increase in stormwater runoff flow for the 2 through 25 year storm events. The 100 year storm flow has a slight increase, however the volume for the 100 year storm decreases from pre to post development. The stormwater system has been designed to provide appropriate peak rate attenuation for the 2 through 25 year storm events and reduce the volume of the 100 year storm.

---

### 3.3 Minimum Standard 3: Recharge

Recharge is analyzed per watershed based on impervious area coverage in accordance with Standard 3. Groundwater recharge is determined from the following equation:

$$R_v = F * \text{impervious area}$$

Where:  $R_v$  = Required Recharge Volume (ac-ft)  
 $F$  = Target Depth Factor based on Hydrologic Soil Group Recharge (see table below)  
 $I$  = Impervious Area (acres)

HSG	Target Depth Factor (F) (inch)
A	0.60
B	0.35
C	0.25
D	0.10

Due to the presence of Hydraulic Group D soils, the Target Depth Factor for this project is 0.10 inches for the Recharge Volume.

For each treatment system, one practice is being used to meet both Standards 3 & 4. Town requirements specify a water quality/ recharge volume of 1", which is equal to or larger than both the recharge and water quality volumes required by the MASWMS. Therefore, the town requirements overrule and 1" has been used for both recharge and water quality volumes in this analysis.

Recharge requirements will be met through the use of a sand filter(infiltrating).

Recharge has been analyzed using the Simple Dynamic (Computer Model) Method per the Massachusetts Stormwater Handbook Volume 3 Chapter 1, using HydroCAD.

The table below summarizes the required Recharge Volume for each BMP:

BMP	HSG	F (inch)	I (Acres)	$R_v$ Required (ac-ft)
A	C	1	0.669	0.0558

A hydrocad model was created for each applicable BMP system using contributing impervious area (only) and calibrating the rainfall data to produce a runoff volume equal to the Required Recharge ( $R_v$ ) volume per the table above, during the peak 2 hours of the storm. Exfiltration was set to apply to "horizontal area only".

As shown in the reported results, all stormwater is recharged without exiting the pond.

See Appendix 3.3 for all HydroCAD results.

---

## Drawdown

All infiltration BMPs are required to drain down the required recharge volume completely within 72 hours, using the following formula:

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$$

Where:

Rv = Required Storage Volume

K = Saturated Hydraulic Conductivity for "Static" and "Simple Dynamic" Methods (Rawls Rate)

Bottom Area = Bottom Area of Recharge Structure

The table below summarizes the drawdown results for each BMP:

<b>BMP</b>	<b>R<sub>v</sub></b> (cu-ft)	<b>K</b> (in/hr)	<b>Bottom Area</b> (sf)	<b>Drawdown</b> (hr)
SF-A	2428	2.0	1,407	10.3

---

### 3.4 Minimum Standard 4: Water Quality

The proposed treatment train has been designed to meet or exceed water quality requirements per Standard 4.

The stormwater management system is required to provide a minimum of 80% TSS removal per Standard 4. See Appendix A3.4 for TSS Removal Calculation Worksheets.

For water quality volume requirements, per the Massachusetts Stormwater Handbook:

The required water quality volume equals 1.0 inch of runoff times the total impervious area of the post development project site for a discharge –

- From a land use with a higher potential pollutant load
- Within an area with a rapid infiltration rate (greater than 2.4 inches per hour)
- Within a Zone II or Interim Wellhead Protection Area
- Near or to the following critical areas:
  - Outstanding Resource Waters
  - Special Resource Waters
  - Bathing beaches
  - Shellfish growing areas
  - Cold-water fisheries

For all other discharges the required water quality volume equals 0.5 inches of runoff times the total impervious area of the post development site.

However, Town/ City requirements specify a water quality/ recharge volume of 1", which is equal to or larger than both the recharge and water quality volumes required by the MASWMS. Therefore, the Town/ City requirements overrule and 1" has been adopted.

For each treatment system, one practice is being used to meet both Standards 3 & 4. Therefore, the BMPs have been sized for the larger of the Recharge/ Water Quality Volume. See Section 3.3 for more details.

The stormwater management system is also required to provide a minimum of 80% TSS removal per Standard 4.

See Appendix 3.4 for TSS & TP removal worksheets.

#### 3.4.1 Individual BMP Water Quality Requirements

Each BMP has been designed per the Massachusetts Stormwater Handbook to provide water quality treatment to the maximum extent practical.

##### Downstream Defender™ (121)

The Downstream Defender™ is a proprietary device which removes stormwater runoff sediment before stormwater is then discharged. The device also provides TP removal and was sized per the manufacturer's requirements.

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### **3.4.2 TMDL**

The proposed development site ultimately discharges stormwater to the Miscoe Brook (USGS-01103220), which has no listed impairments. Therefore, no TMDL applies to this site.

### **3.5 Minimum Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)**

The site is not considered a LUHPPL.

### **3.6 Minimum Standard 6: Critical Areas**

The site is not located within a critical resource area.

### **3.7 Minimum Standard 7: Redevelopments**

The site is not classified as a redevelopment site.

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

See the plan set and Stormwater Pollution Prevention Plan (SWPPP) for this development prepared by DiPrete Engineering.

### **3.9 Minimum Standard 9: Operation and Maintenance Plan**

See the Stormwater System Operations and Maintenance Plan prepared by DiPrete Engineering.

### **3.10 Minimum Standard 10: Prohibition of Illicit Discharges**

There are no existing or proposed illicit discharges on site. As this project is within Wetlands jurisdiction, an Illicit Discharge Compliance Statement will be submitted to the issuing authority prior to the discharge of any stormwater to post-construction BMPs.

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## 4.0 City of Franklin Stormwater Management Ordinance

This section is intended to address any additional requirements of the Town of Franklin Stormwater Management and Erosion Control Bylaw and Town of Franklin Rules and Regulations Governing the Subdivision of Land that were not covered by the MASWMS. The following sections outline how the site meets or exceeds the minimum required standards.

### 4.1 Stormwater Conveyance System

#### Drainage Network Design Parameters:

##### A. PIPES

- *All Drainpipes shall be reinforced concrete pipe (RCP) having a minimum diameter of 12 inches.*
  - DiPrete Engineering is requesting a waiver to use HDPE in lieu of RCP.
  - All proposed pipes have a diameter of 12 inches or greater.
- *The designed culverts shall be of adequate capacity to accommodate flows from a fifty (50) year storm at a minimum. The closed storm drain system shall be of adequate capacity to accommodate flows from a twenty five (25) year storm at a minimum.*
  - The 100-year design storm has been utilized for the drainage pipe design to ensure that the drainage system captures and conveys stormwater to the BMP areas as shown on the plans.

##### B. STRUCTURES

- *All catch basins are to be constructed with sumps having a minimum depth of four (4) feet.*
  - Proposed catch basins have sumps of 4 foot depth.

##### C. STANDARDS

For new development sites

- *Retain the volume of runoff equivalent to, or greater than, 1.0 inch multiplied by the total post construction impervious surface area on the site.*
- *Remove 90% of the average annual load of total suspended solids (TSS) generated from the total post-construction impervious area on the site and 60% of the average annual load of total phosphorus (TP) generated from the total post-construction impervious surface area on the site.*

See Plan Set prepared by DiPrete Engineering and HydroCAD™ calculations to follow for Drainage Network Calculations.

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## Appendix A

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## A2.1 Soil Evaluations

**Massachusetts Soil Evaluation Form**

 DE Project Number 3343-001

 Property Owner: Pam Longobardi

 Property Location: Louise Drive, Franklin

 Date of Test Hole: 05/23/2024

 Soil Evaluator: Tim Twohig

 License Number: SE14783

 Weather: Sunny to thunderstorms

 Time: 8:00

TH <sup>dth 24-1</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-4"	-	-	10YR 2/1	-	-	fsl	1 Gr	Fr	
Bw	4-36"	-	-	10YR 5/4	7.5YR 5/6	22", 5%	fsl	1 SBK	Fr	
Cd1	36-48"	5	5	2.5Y 5/2	7.5YR 5/8	36", 10%	lfs	1 PI	Fi	
Cd2	48-96"	15	15	Gley 1 5/10GY	-	-	Cb Gr lfs	1 PI	Fi	
TH <sup>dth 24-2</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-6"	-	-	10YR 2/1	-	-	fsl	1 Gr	Fr	
Bw1	6-25"	-	-	10YR 5/4	-	-	fsl	1 SBK	Fr	
Bw2	25-32"	5	-	10YR 5/4	7.5YR 5/8	28", 5%	fsl	1 SBK	Fr	
Cd1	32-60"	5	-	2.5Y 5/2	7.5YR 5/8	32", 10%	lfs	1 PI	Fi	
Cd2	60-96"	15	15	2.5Y 5/2	-	-	Cb Gr lfs	1 PI	Fi	

 TH<sup>dth 24-1</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 26" SHWT 22"

 TH<sup>dth 24-2</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 36" SHWT 28"

Comments: \_\_\_\_\_

**Massachusetts Soil Evaluation Form**

 DE Project Number 3343-001

 Property Owner: Pam Longobardi

 Property Location: Louise Drive, Franklin

 Date of Test Hole: 05/23/2024

 Soil Evaluator: Tim Twohig

 License Number: SE14783

 Weather: Sunny to thunderstorms

 Time: 8:00

TH <sub>dth 24-3</sub> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-5"	-	-	10YR 2/1	-	-	fsl	1 Gr	Fr	
Bw	5-28"	-	-	10YR 4/4	7.5YR 5/6	22", 15%	fsl	1 SBK	Fr	
Cd1	28-35"	-	-	2.5Y 5/3	7.5YR 5/8	28", 15%	lfs	1 PI	Fi	
Cd2	35-96"	15	15	5Y 4/3	-	-	Cb Gr fsl	1 PI	Fi	
TH <sub>dth 24-4</sub> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-8"	-	-	10YR 2/2	-	-	fsl	1 Gr	Fr	
Bw	8-32"	-	-	10YR 4/4	7.5YR 5/6	25", 5%	fsl	1 SBK	Fr	
Cd1	32-60"	5	-	2.5Y 5/3	7.5YR 5/8	32", 10%	fsl	1 PI	Fi	
Cd2	60-96"	15	15	2.5Y 5/3	7.5YR 5/8	60", 10%	Cb Gr lfs	1 PI	Fi	

 TH<sub>dth 24-3</sub> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 28" SHWT 22"

 TH<sub>dth 24-4</sub> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 28" SHWT 25"

 Comments: dth 24-4: Both Cd horizons have pockets of lfs and fsl

**Massachusetts Soil Evaluation Form**

 DE Project Number 3343-001

 Property Owner: Pam Longobardi

 Property Location: Louise Drive, Franklin

 Date of Test Hole: 05/23/2024

 Soil Evaluator: Tim Twohig

 License Number: SE14783

 Weather: Sunny to thunderstorms

 Time: 8:00

TH <sup>dth 24-5</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-10"	-	-	10YR 2/2	-	-	fsl	1 Gr	Fr	
Bw	10-24"	-	-	10YR 4/4	-	-	fsl	1 SBK	Fr	
Cd	24-96"	15	15	2.5Y 5/3	7.5YR 5/6	27", 5%	fsl	1 PI	Fi	
TH <sup>dth 24-6</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-2"	-	-	10YR 2/2	-	-	fsl	1 Gr	Fr	
AB	2-8"	-	-	10YR 3/3	-	-	fsl	1 SBK	Fr	
Bw	8-31"	-	-	10YR 5/4	-	-	fsl	1 SBK	Fr	
Cd1	31-60"	-	-	10YR 5/3	7.5YR 5/6	31", 5%	lfs	1 PI	Fi	
Cd2	60-84"	20	20	10YR 5/3	-	-	Cb Gr lfs	1 PI	Fi	
2C	84-96"	15	-	2.5Y 5/3	-	-	Gr cos	0 SGR	Lo	

 TH<sup>dth 24-5</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 36" SHWT 27"

 TH<sup>dth 24-6</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 77" SHWT 31"

Comments: \_\_\_\_\_

## Massachusetts Soil Evaluation Form

 DE Project Number 3343-001

 Property Owner: Pam Longobardi

 Property Location: Louise Drive, Franklin

 Date of Test Hole: 05/23/2024

 Soil Evaluator: Tim Twohig

 License Number: SE14783

 Weather: Sunny to thunderstorms

 Time: 8:00

TH <sup>dth 24-7</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-10"	-	-	10YR 2/2	-	-	fsl	1 Gr	Fr	
Bw	10-34"	-	-	10YR 5/4	-	-	fsl	1 SBK	Fr	
Cd	34-96"	10	10	2.5Y 5/3	7.5YR 5/6	34", 5%	lfs	0 M	Fi	
TH <sup>dth 24-8</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-8"	-	-	10YR 2/2	-	-	fsl	1 Gr	Fr	
Bw	8-24"	-	-	10YR 5/4	-	-	fsl	1 SBK	Fr	
Cd	24-72"	-	-	2.5Y 5/3	7.5YR 5/6	24", 5%	lfs	0 M	Fi	
2C	72-96"	-	-	2.5Y 4/3	7.5YR 5/6	-	s	0 SGR	Lo	

 TH<sup>dth 24-7</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 41" SHWT 34"

 TH<sup>dth 24-8</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 48" SHWT 24"

Comments: \_\_\_\_\_

**Massachusetts Soil Evaluation Form**

 DE Project Number 3343-001

 Property Owner: Pam Longobardi

 Property Location: Louise Drive, Franklin

 Date of Test Hole: 05/23/2024

 Soil Evaluator: Tim Twohig

 License Number: SE14783

 Weather: Sunny to thunderstorms

 Time: 8:00

TH <sup>dth 24-9</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-7"	-	-	10YR 2/2	-	-	fsl	1 Gr	Fr	
Bw	7-32"	-	-	10YR 5/4	7.5YR 5/6	28", 5%	fsl	1 SBK	Fr	
Cd	32-69"	10	10	2.5Y 5/3	2.5Y 5/2	32", 5%	fsl	0 M	Fr --> Fi	
2C	69-96"			2.5Y 5/3	-	-	ls	0 M	Fr	
TH <sup>dth 24-10</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-6"	-	-	10YR 2/2	-	-	fsl	1 Gr	Fr	
Bw	6-27"	-	-	10YR 5/4	-	-	fsl	1 SBK	Fr	
Cd1	27-67"	-	-	2.5Y 5/3	7.5YR 5/8	29", 5%	fsl	0 M	Fi	
Cd2	67-96"	15	15	2.5Y 5/3	-	-	Cb Gr fsl	0 M	Fi	

 TH<sup>dth 24-9</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth - SHWT 28"

 TH<sup>dth 24-10</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth 34" SHWT 29"

Comments: \_\_\_\_\_

**Massachusetts Soil Evaluation Form**

 DE Project Number 3343-001

 Property Owner: Pam Longobardi

 Property Location: Louise Drive, Franklin

 Date of Test Hole: 05/23/2024

 Soil Evaluator: Tim Twohig

 License Number: SE14783

 Weather: Sunny to thunderstorms

 Time: 8:00

TH <sup>dth 24-11</sup> Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				
A	0-5"	-	-	10YR 3/2	-	-	fsl	1 Gr	Fr	
Bw	5-27"	-	-	10YR 5/4	-	-	fsl	1 SBK	Fr	
Cd1	27-48"	-		2.5Y 5/3	7.5YR 5/6	27", 5%	fsl	0 M	Fi	
Cd2	48-96"	10	10	5Y 4/1	-	-	fsl	1 PI	Fi	
TH Horizon	Depth	Coarse Fragment % by Vol.		Soil Colors - Moist (Munsell)		Re-Dox	Soil Texture (USDA)	Soil Structure	Soil Consistence (Moist)	Other
		Gravel	Cobbles & Stones	Matrix	Re-Dox Features	Depth, Percent				

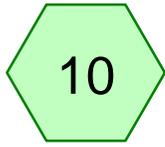
 TH<sup>dth 24-11</sup> Fill Depth - Total Depth 96" Impervious/Limiting Layer Depth - GW Seepage Depth - SHWT 27"

TH \_\_\_\_\_ Fill Depth \_\_\_\_\_ Total Depth \_\_\_\_\_ Impervious/Limiting Layer Depth \_\_\_\_\_ GW Seepage Depth \_\_\_\_\_ SHWT \_\_\_\_\_

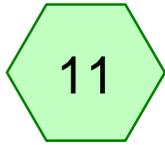
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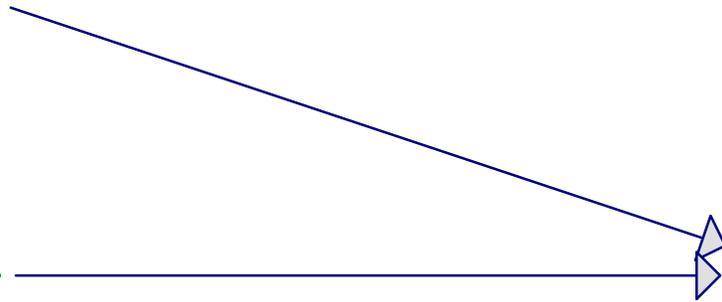
### A3.2.1 HydroCAD Node Diagram



WPre-01



WPre-02



DP-1 Northeast Wetland



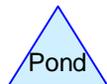
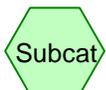
Pipe



Ex Detention Pond



DP-1 Northeast Ex Detention Pond



Routing Diagram for 3343-001-ALLS-EHCD-INHS  
Prepared by DiPrete Engineering, Printed 1/22/2025  
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**3343-001-ALLS-EHCD-INHS**

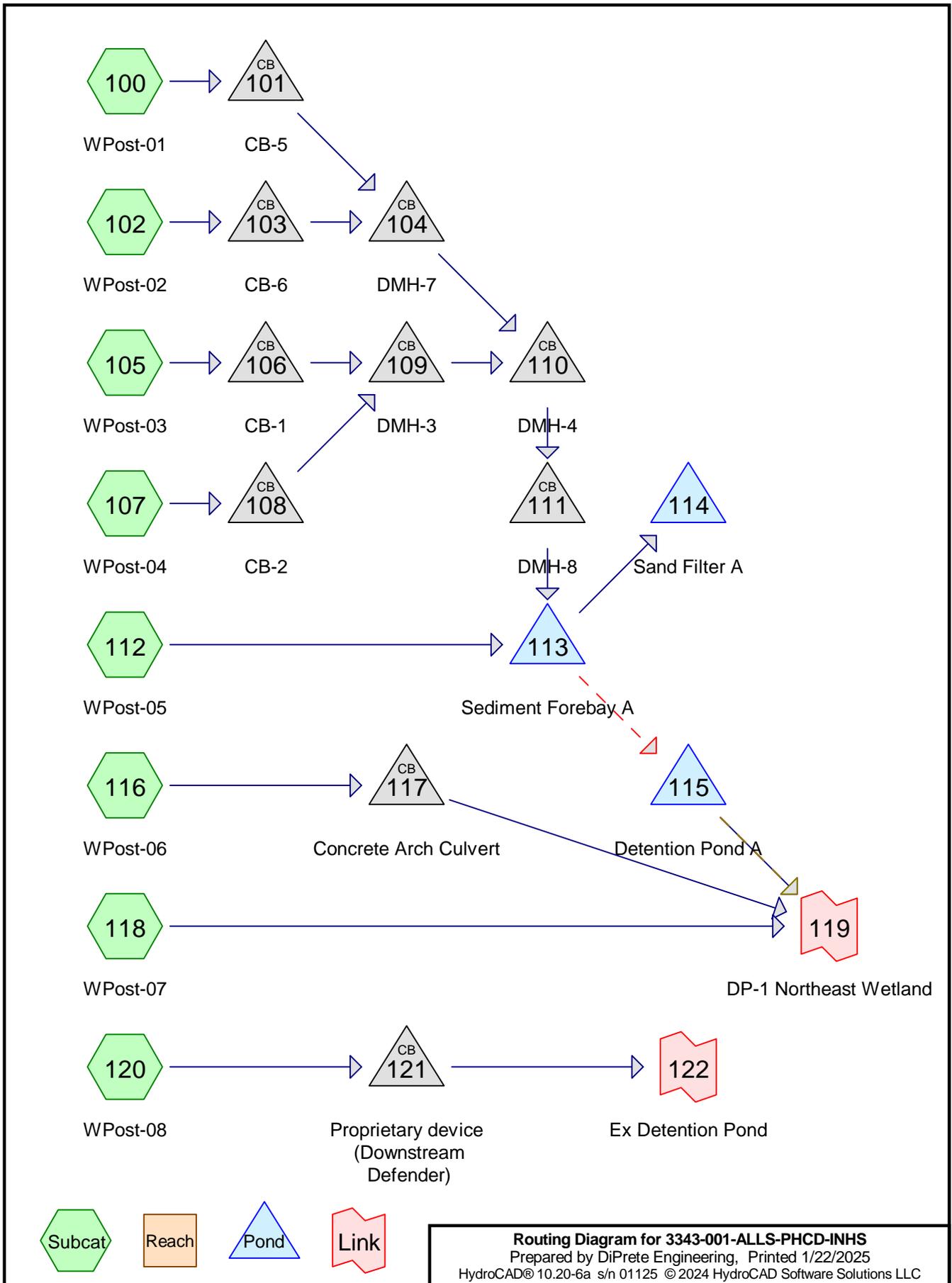
Prepared by DiPrete Engineering  
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Printed 1/22/2025

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**Area Listing (all nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
0.143	74	>75% Grass cover, Good, HSG C (11)
7.146	55	Woods, Good, HSG B (10, 11)
1.601	70	Woods, Good, HSG C (11)
4.330	77	Woods, Good, HSG D (10, 11)
<b>13.220</b>	<b>64</b>	<b>TOTAL AREA</b>



**3343-001-ALLS-PHCD-INHS**

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**Area Listing (selected nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
1.902	61	>75% Grass cover, Good, HSG B (100, 102, 105, 107, 112, 116, 118, 120)
0.726	74	>75% Grass cover, Good, HSG C (112, 118)
0.043	80	>75% Grass cover, Good, HSG D (100, 102, 105, 116, 118)
0.677	98	Impervious, HSG B (100, 102, 105, 107, 118, 120)
0.016	98	Impervious, HSG D (100, 102, 118, 120)
0.220	98	Roofs, HSG B (102, 105, 107, 118, 120)
0.000	98	Water Surface, 0% imp, HSG B (112)
0.022	98	Water Surface, 0% imp, HSG C (112)
5.586	55	Woods, Good, HSG B (100, 105, 107, 112, 116, 118, 120)
0.996	70	Woods, Good, HSG C (112, 118)
4.272	77	Woods, Good, HSG D (100, 105, 116, 118, 120)
<b>14.460</b>	<b>67</b>	<b>TOTAL AREA</b>

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### A3.2.2 HydroCAD 2-Year Storm Analysis

**3343-001-ALLS-EHCD-INHS**

Type III 24-hr 2-Year Rainfall=3.27"

Prepared by DiPrete Engineering

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: WPre-01**

Runoff Area=1.145 ac 0.00% Impervious Runoff Depth=0.27"  
Flow Length=1,097' Tc=17.4 min CN=55 Runoff=0.12 cfs 0.026 af

**Subcatchment 11: WPre-02**

Runoff Area=12.075 ac 0.00% Impervious Runoff Depth=0.63"  
Flow Length=1,700' Tc=19.5 min CN=65 Runoff=4.85 cfs 0.639 af

**Link 12: DP-1 Northeast Wetland**

Inflow=4.94 cfs 0.665 af  
Primary=4.94 cfs 0.665 af

**Reach 21: Pipe**

Avg. Flow Depth=0.00' Max Vel=0.00 fps  
15.00" Round Pipe n=0.012 L=374.0' S=0.0914 '/ Capacity=21.16 cfs Outflow=0.00 cfs 0.000 af

**Pond 23: Ex Detention Pond**

Peak Elev=329.00' Storage=0 cf Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

**Link 24: DP-1 Northeast Ex Detention Pond**

Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 2-Year Rainfall=3.27"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: WPost-01** Runoff Area=2.915 ac 2.56% Impervious Runoff Depth=0.72"  
 Flow Length=818' Tc=13.3 min CN=67 Runoff=1.63 cfs 0.176 af

**Pond 101: CB-5** Peak Elev=375.70' Inflow=1.63 cfs 0.176 af  
 18.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=1.63 cfs 0.176 af

**Subcatchment 102: WPost-02** Runoff Area=0.431 ac 38.14% Impervious Runoff Depth=1.14"  
 Tc=6.0 min CN=75 Runoff=0.55 cfs 0.041 af

**Pond 103: CB-6** Peak Elev=375.65' Inflow=0.55 cfs 0.041 af  
 15.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=0.55 cfs 0.041 af

**Pond 104: DMH-7** Peak Elev=375.04' Inflow=1.99 cfs 0.217 af  
 24.00" Round Culvert n=0.012 L=48.0' S=0.0100 '/ Outflow=1.99 cfs 0.217 af

**Subcatchment 105: WPost-03** Runoff Area=3.008 ac 7.15% Impervious Runoff Depth=1.26"  
 Flow Length=1,237' Tc=17.7 min CN=77 Runoff=3.06 cfs 0.316 af

**Pond 106: CB-1** Peak Elev=376.12' Inflow=3.06 cfs 0.316 af  
 24.00" Round Culvert n=0.012 L=21.0' S=0.0100 '/ Outflow=3.06 cfs 0.316 af

**Subcatchment 107: WPost-04** Runoff Area=0.350 ac 61.18% Impervious Runoff Depth=1.74"  
 Tc=6.0 min CN=84 Runoff=0.72 cfs 0.051 af

**Pond 108: CB-2** Peak Elev=377.05' Inflow=0.72 cfs 0.051 af  
 10.00" Round Culvert n=0.012 L=201.0' S=0.0010 '/ Outflow=0.72 cfs 0.051 af

**Pond 109: DMH-3** Peak Elev=375.83' Inflow=3.42 cfs 0.367 af  
 24.00" Round Culvert n=0.012 L=52.0' S=0.0200 '/ Outflow=3.42 cfs 0.367 af

**Pond 110: DMH-4** Peak Elev=373.82' Inflow=5.35 cfs 0.584 af  
 36.00" Round Culvert n=0.013 L=227.0' S=0.0758 '/ Outflow=5.35 cfs 0.584 af

**Pond 111: DMH-8** Peak Elev=359.81' Inflow=5.35 cfs 0.584 af  
 36.00" Round Culvert n=0.013 L=17.6' S=0.0114 '/ Outflow=5.48 cfs 0.584 af

**Subcatchment 112: WPost-05** Runoff Area=0.825 ac 0.00% Impervious Runoff Depth=0.63"  
 Flow Length=160' Tc=6.5 min CN=65 Runoff=0.48 cfs 0.044 af

**Pond 113: Sediment Forebay A** Peak Elev=359.78' Storage=1,559 cf Inflow=5.83 cfs 0.628 af  
 Primary=0.99 cfs 0.112 af Secondary=4.70 cfs 0.515 af Outflow=5.69 cfs 0.628 af

**Pond 114: Sand Filter A** Peak Elev=359.73' Storage=1,859 cf Inflow=0.99 cfs 0.112 af  
 Outflow=0.07 cfs 0.112 af

**Pond 115: Detention Pond A** Peak Elev=350.68' Storage=3,327 cf Inflow=4.70 cfs 0.515 af  
 Primary=3.31 cfs 0.516 af Secondary=0.00 cfs 0.000 af Outflow=3.31 cfs 0.516 af

**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 2-Year Rainfall=3.27"

Printed 1/22/2025

**Subcatchment 116: WPost-06**

Runoff Area=1.646 ac 0.00% Impervious Runoff Depth=0.40"  
Flow Length=786' Tc=12.8 min CN=59 Runoff=0.35 cfs 0.055 af

**Pond 117: Concrete Arch Culvert**

Peak Elev=377.76' Inflow=0.35 cfs 0.055 af  
174.00" x 36.00", R=150.00" Arch Culvert n=0.012 L=40.5' S=0.0968 '/ Outflow=0.35 cfs 0.055 af

**Subcatchment 118: WPost-07**

Runoff Area=2.886 ac 0.00% Impervious Runoff Depth=0.63"  
Flow Length=434' Tc=12.6 min CN=65 Runoff=1.36 cfs 0.153 af

**Link 119: DP-1 Northeast Wetland**

Inflow=4.44 cfs 0.723 af  
Primary=4.44 cfs 0.723 af

**Subcatchment 120: WPost-08**

Runoff Area=2.398 ac 10.19% Impervious Runoff Depth=0.47"  
Flow Length=1,156' Tc=17.5 min CN=61 Runoff=0.63 cfs 0.094 af

**Pond 121: Proprietary device (Downstream Defender)**

Peak Elev=362.39' Inflow=0.63 cfs 0.094 af  
15.00" Round Culvert n=0.012 L=100.0' S=0.1200 '/ Outflow=0.63 cfs 0.094 af

**Link 122: Ex Detention Pond**

Inflow=0.63 cfs 0.094 af  
Primary=0.63 cfs 0.094 af

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### A3.2.3 HydroCAD 10-Year Storm Analysis

**3343-001-ALLS-EHCD-INHS**

Type III 24-hr 10-Year Rainfall=4.94"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: WPre-01**

Runoff Area=1.145 ac 0.00% Impervious Runoff Depth=0.95"  
Flow Length=1,097' Tc=17.4 min CN=55 Runoff=0.71 cfs 0.091 af

**Subcatchment 11: WPre-02**

Runoff Area=12.075 ac 0.00% Impervious Runoff Depth=1.61"  
Flow Length=1,700' Tc=19.5 min CN=65 Runoff=14.67 cfs 1.624 af

**Link 12: DP-1 Northeast Wetland**

Inflow=15.39 cfs 1.715 af  
Primary=15.39 cfs 1.715 af

**Reach 21: Pipe**

Avg. Flow Depth=0.00' Max Vel=0.00 fps  
15.00" Round Pipe n=0.012 L=374.0' S=0.0914 '/' Capacity=21.16 cfs Outflow=0.00 cfs 0.000 af

**Pond 23: Ex Detention Pond**

Peak Elev=329.00' Storage=0 cf Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

**Link 24: DP-1 Northeast Ex Detention Pond**

Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 10-Year Rainfall=4.94"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: WPost-01** Runoff Area=2.915 ac 2.56% Impervious Runoff Depth=1.76"  
 Flow Length=818' Tc=13.3 min CN=67 Runoff=4.57 cfs 0.428 af

**Pond 101: CB-5** Peak Elev=376.32' Inflow=4.57 cfs 0.428 af  
 18.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=4.57 cfs 0.428 af

**Subcatchment 102: WPost-02** Runoff Area=0.431 ac 38.14% Impervious Runoff Depth=2.40"  
 Tc=6.0 min CN=75 Runoff=1.21 cfs 0.086 af

**Pond 103: CB-6** Peak Elev=375.88' Inflow=1.21 cfs 0.086 af  
 15.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=1.21 cfs 0.086 af

**Pond 104: DMH-7** Peak Elev=375.53' Inflow=5.35 cfs 0.514 af  
 24.00" Round Culvert n=0.012 L=48.0' S=0.0100 '/ Outflow=5.35 cfs 0.514 af

**Subcatchment 105: WPost-03** Runoff Area=3.008 ac 7.15% Impervious Runoff Depth=2.57"  
 Flow Length=1,237' Tc=17.7 min CN=77 Runoff=6.42 cfs 0.645 af

**Pond 106: CB-1** Peak Elev=376.71' Inflow=6.42 cfs 0.645 af  
 24.00" Round Culvert n=0.012 L=21.0' S=0.0100 '/ Outflow=6.42 cfs 0.645 af

**Subcatchment 107: WPost-04** Runoff Area=0.350 ac 61.18% Impervious Runoff Depth=3.22"  
 Tc=6.0 min CN=84 Runoff=1.31 cfs 0.094 af

**Pond 108: CB-2** Peak Elev=377.72' Inflow=1.31 cfs 0.094 af  
 10.00" Round Culvert n=0.012 L=201.0' S=0.0010 '/ Outflow=1.31 cfs 0.094 af

**Pond 109: DMH-3** Peak Elev=376.29' Inflow=7.06 cfs 0.739 af  
 24.00" Round Culvert n=0.012 L=52.0' S=0.0200 '/ Outflow=7.06 cfs 0.739 af

**Pond 110: DMH-4** Peak Elev=374.35' Inflow=12.24 cfs 1.253 af  
 36.00" Round Culvert n=0.013 L=227.0' S=0.0758 '/ Outflow=12.24 cfs 1.253 af

**Pond 111: DMH-8** Peak Elev=360.22' Inflow=12.24 cfs 1.253 af  
 36.00" Round Culvert n=0.013 L=17.6' S=0.0114 '/ Outflow=12.40 cfs 1.253 af

**Subcatchment 112: WPost-05** Runoff Area=0.825 ac 0.00% Impervious Runoff Depth=1.61"  
 Flow Length=160' Tc=6.5 min CN=65 Runoff=1.46 cfs 0.111 af

**Pond 113: Sediment Forebay A** Peak Elev=360.05' Storage=1,754 cf Inflow=13.38 cfs 1.364 af  
 Primary=0.70 cfs 0.121 af Secondary=12.65 cfs 1.243 af Outflow=13.19 cfs 1.364 af

**Pond 114: Sand Filter A** Peak Elev=360.03' Storage=2,408 cf Inflow=0.70 cfs 0.121 af  
 Outflow=0.07 cfs 0.121 af

**Pond 115: Detention Pond A** Peak Elev=352.03' Storage=7,285 cf Inflow=12.65 cfs 1.243 af  
 Primary=10.37 cfs 1.243 af Secondary=0.00 cfs 0.000 af Outflow=10.37 cfs 1.243 af

**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 10-Year Rainfall=4.94"

Printed 1/22/2025

**Subcatchment 116: WPost-06**

Runoff Area=1.646 ac 0.00% Impervious Runoff Depth=1.20"  
Flow Length=786' Tc=12.8 min CN=59 Runoff=1.61 cfs 0.165 af

**Pond 117: Concrete Arch Culvert**

Peak Elev=377.83' Inflow=1.61 cfs 0.165 af  
174.00" x 36.00", R=150.00" Arch Culvert n=0.012 L=40.5' S=0.0968 '/ Outflow=1.61 cfs 0.165 af

**Subcatchment 118: WPost-07**

Runoff Area=2.886 ac 0.00% Impervious Runoff Depth=1.61"  
Flow Length=434' Tc=12.6 min CN=65 Runoff=4.15 cfs 0.388 af

**Link 119: DP-1 Northeast Wetland**

Inflow=14.76 cfs 1.796 af  
Primary=14.76 cfs 1.796 af

**Subcatchment 120: WPost-08**

Runoff Area=2.398 ac 10.19% Impervious Runoff Depth=1.33"  
Flow Length=1,156' Tc=17.5 min CN=61 Runoff=2.40 cfs 0.266 af

**Pond 121: Proprietary device (Downstream Defender)**

Peak Elev=362.84' Inflow=2.40 cfs 0.266 af  
15.00" Round Culvert n=0.012 L=100.0' S=0.1200 '/ Outflow=2.40 cfs 0.266 af

**Link 122: Ex Detention Pond**

Inflow=2.40 cfs 0.266 af  
Primary=2.40 cfs 0.266 af

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### A3.2.4 HydroCAD 25-Year Storm Analysis

**3343-001-ALLS-EHCD-INHS**

Type III 24-hr 25-Year Rainfall=6.26"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: WPre-01**

Runoff Area=1.145 ac 0.00% Impervious Runoff Depth=1.67"  
Flow Length=1,097' Tc=17.4 min CN=55 Runoff=1.43 cfs 0.159 af

**Subcatchment 11: WPre-02**

Runoff Area=12.075 ac 0.00% Impervious Runoff Depth=2.54"  
Flow Length=1,700' Tc=19.5 min CN=65 Runoff=23.97 cfs 2.558 af

**Link 12: DP-1 Northeast Wetland**

Inflow=25.40 cfs 2.717 af  
Primary=25.40 cfs 2.717 af

**Reach 21: Pipe**

Avg. Flow Depth=0.00' Max Vel=0.00 fps  
15.00" Round Pipe n=0.012 L=374.0' S=0.0914 '/' Capacity=21.16 cfs Outflow=0.00 cfs 0.000 af

**Pond 23: Ex Detention Pond**

Peak Elev=329.00' Storage=0 cf Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

**Link 24: DP-1 Northeast Ex Detention Pond**

Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 25-Year Rainfall=6.26"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: WPost-01** Runoff Area=2.915 ac 2.56% Impervious Runoff Depth=2.73"  
 Flow Length=818' Tc=13.3 min CN=67 Runoff=7.28 cfs 0.663 af

**Pond 101: CB-5** Peak Elev=377.07' Inflow=7.28 cfs 0.663 af  
 18.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=7.28 cfs 0.663 af

**Subcatchment 102: WPost-02** Runoff Area=0.431 ac 38.14% Impervious Runoff Depth=3.50"  
 Tc=6.0 min CN=75 Runoff=1.77 cfs 0.126 af

**Pond 103: CB-6** Peak Elev=376.06' Inflow=1.77 cfs 0.126 af  
 15.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=1.77 cfs 0.126 af

**Pond 104: DMH-7** Peak Elev=375.89' Inflow=8.44 cfs 0.789 af  
 24.00" Round Culvert n=0.012 L=48.0' S=0.0100 '/ Outflow=8.44 cfs 0.789 af

**Subcatchment 105: WPost-03** Runoff Area=3.008 ac 7.15% Impervious Runoff Depth=3.71"  
 Flow Length=1,237' Tc=17.7 min CN=77 Runoff=9.27 cfs 0.929 af

**Pond 106: CB-1** Peak Elev=377.26' Inflow=9.27 cfs 0.929 af  
 24.00" Round Culvert n=0.012 L=21.0' S=0.0100 '/ Outflow=9.27 cfs 0.929 af

**Subcatchment 107: WPost-04** Runoff Area=0.350 ac 61.18% Impervious Runoff Depth=4.44"  
 Tc=6.0 min CN=84 Runoff=1.79 cfs 0.130 af

**Pond 108: CB-2** Peak Elev=378.40' Inflow=1.79 cfs 0.130 af  
 10.00" Round Culvert n=0.012 L=201.0' S=0.0010 '/ Outflow=1.79 cfs 0.130 af

**Pond 109: DMH-3** Peak Elev=376.66' Inflow=10.15 cfs 1.059 af  
 24.00" Round Culvert n=0.012 L=52.0' S=0.0200 '/ Outflow=10.15 cfs 1.059 af

**Pond 110: DMH-4** Peak Elev=374.73' Inflow=18.28 cfs 1.847 af  
 36.00" Round Culvert n=0.013 L=227.0' S=0.0758 '/ Outflow=18.28 cfs 1.847 af

**Pond 111: DMH-8** Peak Elev=360.62' Inflow=18.28 cfs 1.847 af  
 36.00" Round Culvert n=0.013 L=17.6' S=0.0114 '/ Outflow=18.45 cfs 1.847 af

**Subcatchment 112: WPost-05** Runoff Area=0.825 ac 0.00% Impervious Runoff Depth=2.54"  
 Flow Length=160' Tc=6.5 min CN=65 Runoff=2.37 cfs 0.175 af

**Pond 113: Sediment Forebay A** Peak Elev=360.25' Storage=1,920 cf Inflow=20.04 cfs 2.022 af  
 Primary=0.84 cfs 0.126 af Secondary=19.14 cfs 1.896 af Outflow=19.86 cfs 2.022 af

**Pond 114: Sand Filter A** Peak Elev=360.19' Storage=2,734 cf Inflow=0.84 cfs 0.126 af  
 Outflow=0.07 cfs 0.126 af

**Pond 115: Detention Pond A** Peak Elev=352.64' Storage=9,652 cf Inflow=19.14 cfs 1.896 af  
 Primary=17.01 cfs 1.896 af Secondary=0.00 cfs 0.000 af Outflow=17.01 cfs 1.896 af

**3343-001-ALLS-PHCD-INHS**

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Type III 24-hr 25-Year Rainfall=6.26"

Printed 1/22/2025

**Subcatchment 116: WPost-06**

Runoff Area=1.646 ac 0.00% Impervious Runoff Depth=2.01"  
Flow Length=786' Tc=12.8 min CN=59 Runoff=2.92 cfs 0.275 af

**Pond 117: Concrete Arch Culvert**

Peak Elev=377.88' Inflow=2.92 cfs 0.275 af  
174.00" x 36.00", R=150.00" Arch Culvert n=0.012 L=40.5' S=0.0968 '/ Outflow=2.92 cfs 0.275 af

**Subcatchment 118: WPost-07**

Runoff Area=2.886 ac 0.00% Impervious Runoff Depth=2.54"  
Flow Length=434' Tc=12.6 min CN=65 Runoff=6.79 cfs 0.611 af

**Link 119: DP-1 Northeast Wetland**

Inflow=24.98 cfs 2.783 af  
Primary=24.98 cfs 2.783 af

**Subcatchment 120: WPost-08**

Runoff Area=2.398 ac 10.19% Impervious Runoff Depth=2.18"  
Flow Length=1,156' Tc=17.5 min CN=61 Runoff=4.16 cfs 0.436 af

**Pond 121: Proprietary device (Downstream Defender)**

Peak Elev=363.26' Inflow=4.16 cfs 0.436 af  
15.00" Round Culvert n=0.012 L=100.0' S=0.1200 '/ Outflow=4.16 cfs 0.436 af

**Link 122: Ex Detention Pond**

Inflow=4.16 cfs 0.436 af  
Primary=4.16 cfs 0.436 af

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### A3.2.5 HydroCAD 100-Year Storm Analysis

**3343-001-ALLS-EHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: WPre-01**

Runoff Area=1.145 ac 0.00% Impervious Runoff Depth=3.48"  
Flow Length=1,097' Tc=17.4 min CN=55 Runoff=3.23 cfs 0.332 af

**Subcatchment 11: WPre-02**

Runoff Area=12.075 ac 0.00% Impervious Runoff Depth=4.71"  
Flow Length=1,700' Tc=19.5 min CN=65 Runoff=45.34 cfs 4.738 af

**Link 12: DP-1 Northeast Wetland**

Inflow=48.54 cfs 5.070 af  
Primary=48.54 cfs 5.070 af

**Reach 21: Pipe**

Avg. Flow Depth=0.00' Max Vel=0.00 fps  
15.00" Round Pipe n=0.012 L=374.0' S=0.0914 '/' Capacity=21.16 cfs Outflow=0.00 cfs 0.000 af

**Pond 23: Ex Detention Pond**

Peak Elev=329.00' Storage=0 cf Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

**Link 24: DP-1 Northeast Ex Detention Pond**

Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af

**3343-001-ALLS-EHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

Prepared by DiPrete Engineering

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**Summary for Subcatchment 10: WPre-01**

Runoff = 3.23 cfs @ 12.25 hrs, Volume= 0.332 af, Depth= 3.48"

Routed to Link 12 : DP-1 Northeast Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
1.143	55	Woods, Good, HSG B
0.002	77	Woods, Good, HSG D
1.145	55	Weighted Average
1.145		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0580	0.12		<b>Sheet Flow, A</b> Woods: Light underbrush n= 0.400 P2= 3.27"
3.5	997	0.0868	4.74		<b>Shallow Concentrated Flow, B</b> Unpaved Kv= 16.1 fps
17.4	1,097	Total			

**Summary for Subcatchment 11: WPre-02**

Runoff = 45.34 cfs @ 12.28 hrs, Volume= 4.738 af, Depth= 4.71"

Routed to Link 12 : DP-1 Northeast Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.143	74	>75% Grass cover, Good, HSG C
6.003	55	Woods, Good, HSG B
1.601	70	Woods, Good, HSG C
4.328	77	Woods, Good, HSG D
12.075	65	Weighted Average
12.075		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0630	0.12		<b>Sheet Flow, A</b> Woods: Light underbrush n= 0.400 P2= 3.27"
6.1	1,600	0.0738	4.37		<b>Shallow Concentrated Flow, B</b> Unpaved Kv= 16.1 fps
19.5	1,700	Total			

**Summary for Link 12: DP-1 Northeast Wetland**

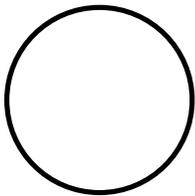
Inflow Area = 13.220 ac, 0.00% Impervious, Inflow Depth = 4.60" for 100-Year event  
 Inflow = 48.54 cfs @ 12.27 hrs, Volume= 5.070 af  
 Primary = 48.54 cfs @ 12.27 hrs, Volume= 5.070 af, Atten= 0%, Lag= 0.0 min

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

**Summary for Reach 21: Pipe**

Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 21.16 cfs

15.00" Round Pipe  
 n= 0.012 Concrete pipe, finished  
 Length= 374.0' Slope= 0.0914 '/'  
 Inlet Invert= 366.20', Outlet Invert= 332.00'



**Summary for Pond 23: Ex Detention Pond**

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Link 24 : DP-1 Northeast Ex Detention Pond  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Link 24 : DP-1 Northeast Ex Detention Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 329.00' @ 0.00 hrs Surf.Area= 2,512 sf Storage= 0 cf

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

Volume	Invert	Avail.Storage	Storage Description
#1	329.00'	35,024 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
329.00	2,512	0	0
330.00	4,191	3,352	3,352
331.00	5,001	4,596	7,948
332.00	5,806	5,404	13,351
333.00	6,734	6,270	19,621
334.00	8,024	7,379	27,000
335.00	8,024	8,024	35,024

**3343-001-ALLS-EHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

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Device	Routing	Invert	Outlet Devices
#1	Primary	329.50'	<b>12.00" Round 12" RCP</b> L= 30.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 329.50' / 329.50' S= 0.0000 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#2	Secondary	330.50'	<b>Overflow Weir, Cv= 2.62 (C= 3.28)</b> Head (feet) 0.00 4.00 Width (feet) 0.00 31.00

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=329.00' TW=0.00' (Dynamic Tailwater)

↑**1=12" RCP** ( Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=329.00' TW=0.00' (Dynamic Tailwater)

↑**2=Overflow Weir** ( Controls 0.00 cfs)

**Summary for Link 24: DP-1 Northeast Ex Detention Pond**

Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: WPost-01** Runoff Area=2.915 ac 2.56% Impervious Runoff Depth=4.96"  
 Flow Length=818' Tc=13.3 min CN=67 Runoff=13.42 cfs 1.204 af

**Pond 101: CB-5** Peak Elev=381.12' Inflow=13.42 cfs 1.204 af  
 18.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=13.42 cfs 1.204 af

**Subcatchment 102: WPost-02** Runoff Area=0.431 ac 38.14% Impervious Runoff Depth=5.94"  
 Tc=6.0 min CN=75 Runoff=2.98 cfs 0.214 af

**Pond 103: CB-6** Peak Elev=377.29' Inflow=2.98 cfs 0.214 af  
 15.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=2.98 cfs 0.214 af

**Pond 104: DMH-7** Peak Elev=377.13' Inflow=15.38 cfs 1.418 af  
 24.00" Round Culvert n=0.012 L=48.0' S=0.0100 '/ Outflow=15.38 cfs 1.418 af

**Subcatchment 105: WPost-03** Runoff Area=3.008 ac 7.15% Impervious Runoff Depth=6.19"  
 Flow Length=1,237' Tc=17.7 min CN=77 Runoff=15.32 cfs 1.551 af

**Pond 106: CB-1** Peak Elev=379.54' Inflow=15.32 cfs 1.551 af  
 24.00" Round Culvert n=0.012 L=21.0' S=0.0100 '/ Outflow=15.32 cfs 1.551 af

**Subcatchment 107: WPost-04** Runoff Area=0.350 ac 61.18% Impervious Runoff Depth=7.05"  
 Tc=6.0 min CN=84 Runoff=2.78 cfs 0.206 af

**Pond 108: CB-2** Peak Elev=380.51' Inflow=2.78 cfs 0.206 af  
 10.00" Round Culvert n=0.012 L=201.0' S=0.0010 '/ Outflow=2.78 cfs 0.206 af

**Pond 109: DMH-3** Peak Elev=377.89' Inflow=16.70 cfs 1.757 af  
 24.00" Round Culvert n=0.012 L=52.0' S=0.0200 '/ Outflow=16.70 cfs 1.757 af

**Pond 110: DMH-4** Peak Elev=375.50' Inflow=31.54 cfs 3.175 af  
 36.00" Round Culvert n=0.013 L=227.0' S=0.0758 '/ Outflow=31.54 cfs 3.175 af

**Pond 111: DMH-8** Peak Elev=361.73' Inflow=31.54 cfs 3.175 af  
 36.00" Round Culvert n=0.013 L=17.6' S=0.0114 '/ Outflow=31.76 cfs 3.175 af

**Subcatchment 112: WPost-05** Runoff Area=0.825 ac 0.00% Impervious Runoff Depth=4.71"  
 Flow Length=160' Tc=6.5 min CN=65 Runoff=4.48 cfs 0.324 af

**Pond 113: Sediment Forebay A** Peak Elev=360.61' Storage=2,230 cf Inflow=34.80 cfs 3.498 af  
 Primary=1.10 cfs 0.135 af Secondary=33.57 cfs 3.363 af Outflow=34.56 cfs 3.498 af

**Pond 114: Sand Filter A** Peak Elev=360.48' Storage=3,342 cf Inflow=1.10 cfs 0.135 af  
 Outflow=0.07 cfs 0.135 af

**Pond 115: Detention Pond A** Peak Elev=353.26' Storage=12,428 cf Inflow=33.57 cfs 3.363 af  
 Primary=22.62 cfs 3.181 af Secondary=10.60 cfs 0.182 af Outflow=33.22 cfs 3.363 af

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Type III 24-hr 100-Year Rainfall=8.99"

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**Subcatchment 116: WPost-06**

Runoff Area=1.646 ac 0.00% Impervious Runoff Depth=3.97"  
Flow Length=786' Tc=12.8 min CN=59 Runoff=6.07 cfs 0.545 af

**Pond 117: Concrete Arch Culvert**

Peak Elev=377.98' Inflow=6.07 cfs 0.545 af  
174.00" x 36.00", R=150.00" Arch Culvert n=0.012 L=40.5' S=0.0968 '/ Outflow=6.07 cfs 0.545 af

**Subcatchment 118: WPost-07**

Runoff Area=2.886 ac 0.00% Impervious Runoff Depth=4.71"  
Flow Length=434' Tc=12.6 min CN=65 Runoff=12.86 cfs 1.133 af

**Link 119: DP-1 Northeast Wetland**

Inflow=51.68 cfs 5.041 af  
Primary=51.68 cfs 5.041 af

**Subcatchment 120: WPost-08**

Runoff Area=2.398 ac 10.19% Impervious Runoff Depth=4.22"  
Flow Length=1,156' Tc=17.5 min CN=61 Runoff=8.36 cfs 0.842 af

**Pond 121: Proprietary device (Downstream Defender)**

Peak Elev=365.20' Inflow=8.36 cfs 0.842 af  
15.00" Round Culvert n=0.012 L=100.0' S=0.1200 '/ Outflow=8.36 cfs 0.842 af

**Link 122: Ex Detention Pond**

Inflow=8.36 cfs 0.842 af  
Primary=8.36 cfs 0.842 af

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

Prepared by DiPrete Engineering

Printed 1/22/2025

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**Summary for Subcatchment 100: WPost-01**

Runoff = 13.42 cfs @ 12.19 hrs, Volume= 1.204 af, Depth= 4.96"  
 Routed to Pond 101 : CB-5

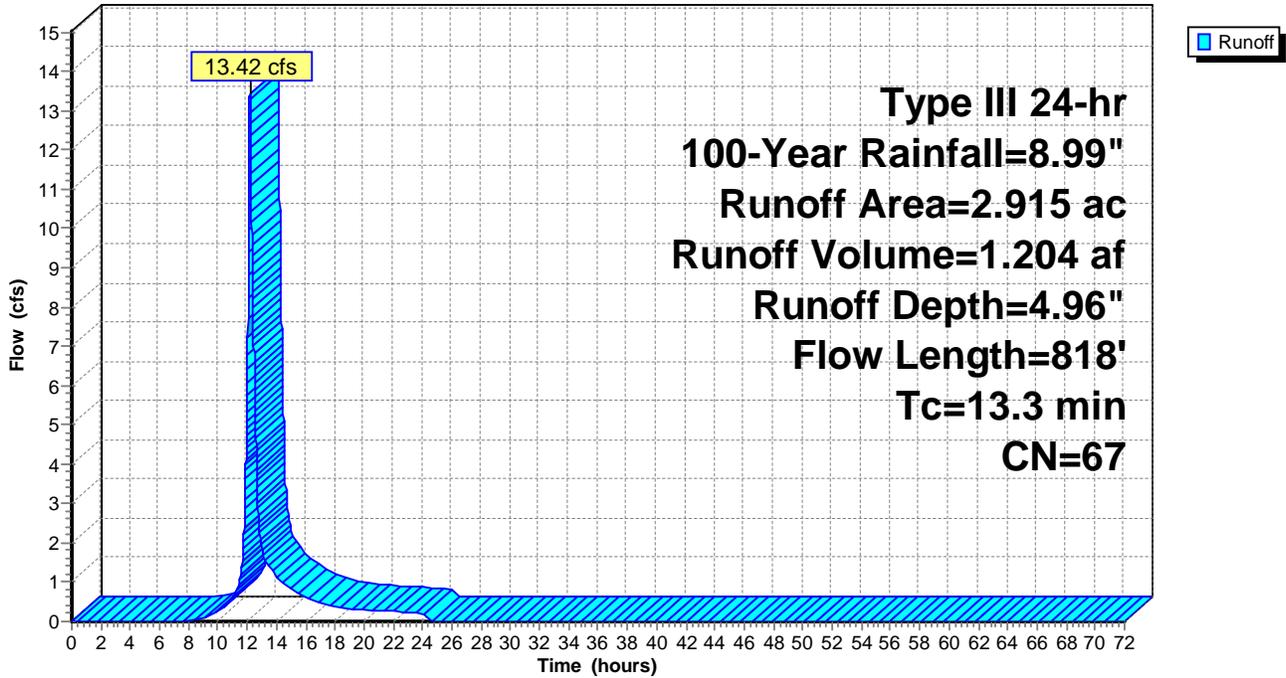
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.163	61	>75% Grass cover, Good, HSG B
0.002	80	>75% Grass cover, Good, HSG D
0.069	98	Impervious, HSG B
0.005	98	Impervious, HSG D
1.242	55	Woods, Good, HSG B
1.434	77	Woods, Good, HSG D
2.915	67	Weighted Average
2.841	66	97.44% Pervious Area
0.075	98	2.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.1130	0.16		<b>Sheet Flow, A</b>
					Woods: Light underbrush n= 0.400 P2= 3.27"
2.4	677	0.0852	4.70		<b>Shallow Concentrated Flow, B</b>
					Unpaved Kv= 16.1 fps
0.3	41	0.0170	2.65		<b>Shallow Concentrated Flow, C - Paved</b>
					Paved Kv= 20.3 fps
13.3	818	Total			

Subcatchment 100: WPost-01

Hydrograph



**3343-001-ALLS-PHCD-INHS**

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Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Subcatchment 100: WPost-01**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	54.00	8.99	4.96	0.00
1.00	0.09	0.00	0.00	55.00	8.99	4.96	0.00
2.00	0.18	0.00	0.00	56.00	8.99	4.96	0.00
3.00	0.28	0.00	0.00	57.00	8.99	4.96	0.00
4.00	0.39	0.00	0.00	58.00	8.99	4.96	0.00
5.00	0.51	0.00	0.00	59.00	8.99	4.96	0.00
6.00	0.65	0.00	0.00	60.00	8.99	4.96	0.00
7.00	0.81	0.00	0.00	61.00	8.99	4.96	0.00
8.00	1.02	0.00	0.00	62.00	8.99	4.96	0.00
9.00	1.31	0.02	0.09	63.00	8.99	4.96	0.00
10.00	1.70	0.09	0.26	64.00	8.99	4.96	0.00
11.00	2.25	0.26	0.61	65.00	8.99	4.96	0.00
12.00	4.49	1.46	<b>5.78</b>	66.00	8.99	4.96	0.00
13.00	6.74	3.10	<b>1.91</b>	67.00	8.99	4.96	0.00
14.00	7.29	3.54	1.15	68.00	8.99	4.96	0.00
15.00	7.68	3.86	0.86	69.00	8.99	4.96	0.00
16.00	7.97	4.09	0.62	70.00	8.99	4.96	0.00
17.00	8.18	4.27	0.49	71.00	8.99	4.96	0.00
18.00	8.34	4.41	0.38	72.00	8.99	4.96	0.00
19.00	8.48	4.52	0.33				
20.00	8.60	4.63	0.30				
21.00	8.72	4.72	0.27				
22.00	8.82	4.81	0.25				
23.00	8.91	4.89	0.22				
24.00	<b>8.99</b>	<b>4.96</b>	0.20				
25.00	8.99	4.96	0.00				
26.00	8.99	4.96	0.00				
27.00	8.99	4.96	0.00				
28.00	8.99	4.96	0.00				
29.00	8.99	4.96	0.00				
30.00	8.99	4.96	0.00				
31.00	8.99	4.96	0.00				
32.00	8.99	4.96	0.00				
33.00	8.99	4.96	0.00				
34.00	8.99	4.96	0.00				
35.00	8.99	4.96	0.00				
36.00	8.99	4.96	0.00				
37.00	8.99	4.96	0.00				
38.00	8.99	4.96	0.00				
39.00	8.99	4.96	0.00				
40.00	8.99	4.96	0.00				
41.00	8.99	4.96	0.00				
42.00	8.99	4.96	0.00				
43.00	8.99	4.96	0.00				
44.00	8.99	4.96	0.00				
45.00	8.99	4.96	0.00				
46.00	8.99	4.96	0.00				
47.00	8.99	4.96	0.00				
48.00	8.99	4.96	0.00				
49.00	8.99	4.96	0.00				
50.00	8.99	4.96	0.00				
51.00	8.99	4.96	0.00				
52.00	8.99	4.96	0.00				
53.00	8.99	4.96	0.00				

**Summary for Pond 101: CB-5**

Inflow Area = 2.915 ac, 2.56% Impervious, Inflow Depth = 4.96" for 100-Year event  
 Inflow = 13.42 cfs @ 12.19 hrs, Volume= 1.204 af  
 Outflow = 13.42 cfs @ 12.19 hrs, Volume= 1.204 af, Atten= 0%, Lag= 0.0 min  
 Primary = 13.42 cfs @ 12.19 hrs, Volume= 1.204 af  
 Routed to Pond 104 : DMH-7

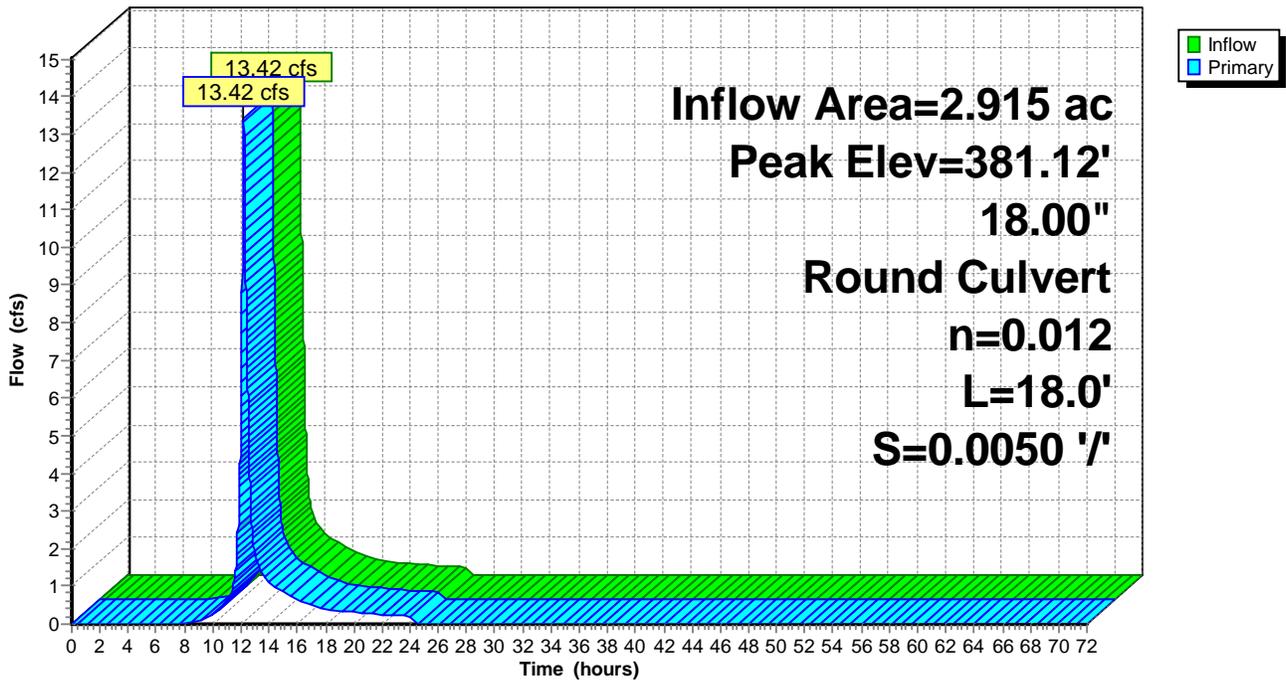
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 381.12' @ 12.19 hrs

Device #1	Routing	Invert	Outlet Devices
	Primary	374.97'	<b>18.00" Round Pipe</b> L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 374.97' / 374.88' S= 0.0050 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf

**Primary OutFlow** Max=13.41 cfs @ 12.19 hrs HW=381.11' TW=377.12' (Dynamic Tailwater)  
 ↳ **1=Pipe** (Inlet Controls 13.41 cfs @ 7.59 fps)

**Pond 101: CB-5**

Hydrograph



**Hydrograph for Pond 101: CB-5**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	374.97	0.00	54.00	0.00	374.97	0.00
1.00	0.00	374.97	0.00	55.00	0.00	374.97	0.00
2.00	0.00	374.97	0.00	56.00	0.00	374.97	0.00
3.00	0.00	374.97	0.00	57.00	0.00	374.97	0.00
4.00	0.00	374.97	0.00	58.00	0.00	374.97	0.00
5.00	0.00	374.97	0.00	59.00	0.00	374.97	0.00
6.00	0.00	374.97	0.00	60.00	0.00	374.97	0.00
7.00	0.00	374.97	0.00	61.00	0.00	374.97	0.00
8.00	0.00	374.99	0.00	62.00	0.00	374.97	0.00
9.00	0.09	375.13	0.09	63.00	0.00	374.97	0.00
10.00	0.26	375.24	0.26	64.00	0.00	374.97	0.00
11.00	0.61	375.40	0.61	65.00	0.00	374.97	0.00
12.00	<b>5.78</b>	<b>376.56</b>	<b>5.78</b>	66.00	0.00	374.97	0.00
13.00	<b>1.91</b>	<b>375.77</b>	<b>1.91</b>	67.00	0.00	374.97	0.00
14.00	1.15	375.57	1.15	68.00	0.00	374.97	0.00
15.00	0.86	375.48	0.86	69.00	0.00	374.97	0.00
16.00	0.62	375.40	0.62	70.00	0.00	374.97	0.00
17.00	0.49	375.35	0.49	71.00	0.00	374.97	0.00
18.00	0.38	375.30	0.38	72.00	0.00	374.97	0.00
19.00	0.33	375.28	0.33				
20.00	0.30	375.26	0.30				
21.00	0.27	375.25	0.27				
22.00	0.25	375.23	0.25				
23.00	0.22	375.22	0.22				
24.00	0.20	375.20	0.20				
25.00	0.00	374.97	0.00				
26.00	0.00	374.97	0.00				
27.00	0.00	374.97	0.00				
28.00	0.00	374.97	0.00				
29.00	0.00	374.97	0.00				
30.00	0.00	374.97	0.00				
31.00	0.00	374.97	0.00				
32.00	0.00	374.97	0.00				
33.00	0.00	374.97	0.00				
34.00	0.00	374.97	0.00				
35.00	0.00	374.97	0.00				
36.00	0.00	374.97	0.00				
37.00	0.00	374.97	0.00				
38.00	0.00	374.97	0.00				
39.00	0.00	374.97	0.00				
40.00	0.00	374.97	0.00				
41.00	0.00	374.97	0.00				
42.00	0.00	374.97	0.00				
43.00	0.00	374.97	0.00				
44.00	0.00	374.97	0.00				
45.00	0.00	374.97	0.00				
46.00	0.00	374.97	0.00				
47.00	0.00	374.97	0.00				
48.00	0.00	374.97	0.00				
49.00	0.00	374.97	0.00				
50.00	0.00	374.97	0.00				
51.00	0.00	374.97	0.00				
52.00	0.00	374.97	0.00				
53.00	0.00	374.97	0.00				

**Summary for Subcatchment 102: WPost-02**

Runoff = 2.98 cfs @ 12.09 hrs, Volume= 0.214 af, Depth= 5.94"  
 Routed to Pond 103 : CB-6

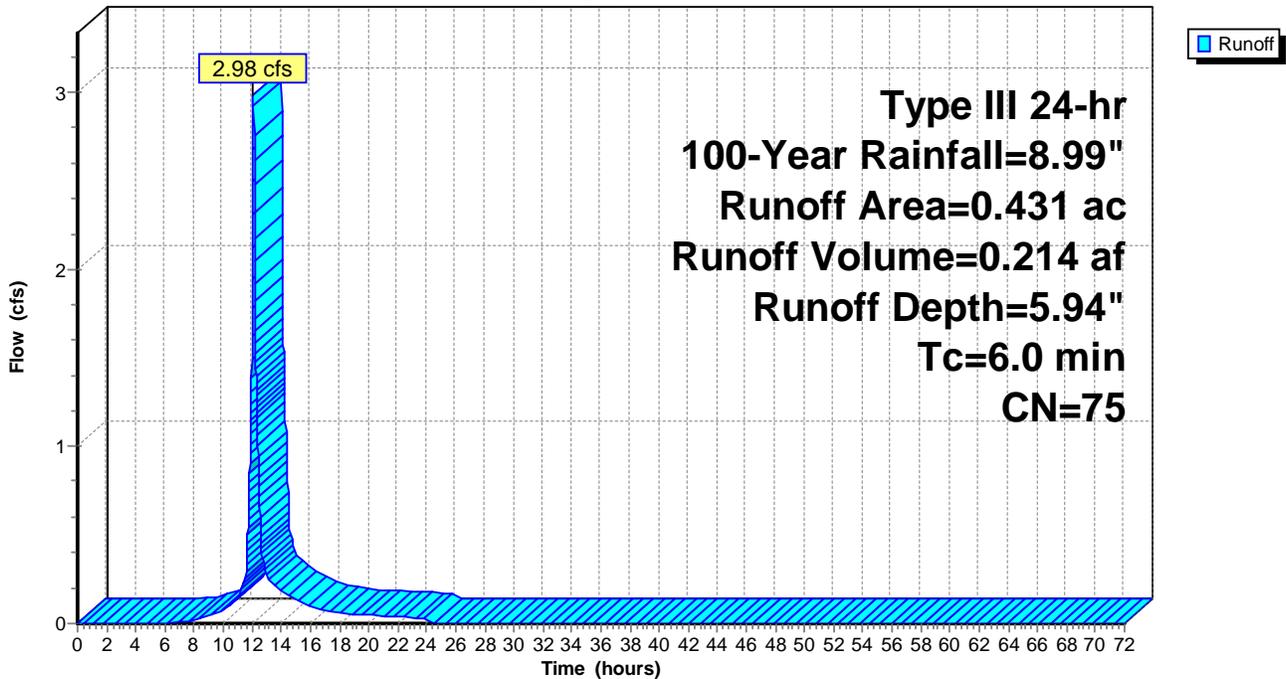
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.266	61	>75% Grass cover, Good, HSG B
0.001	80	>75% Grass cover, Good, HSG D
0.100	98	Impervious, HSG B
0.004	98	Impervious, HSG D
0.060	98	Roofs, HSG B
0.431	75	Weighted Average
0.267	61	61.86% Pervious Area
0.164	98	38.14% Impervious Area

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

**Subcatchment 102: WPost-02**

Hydrograph



**3343-001-ALLS-PHCD-INHS**

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Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Subcatchment 102: WPost-02**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	54.00	8.99	5.94	0.00
1.00	0.09	0.00	0.00	55.00	8.99	5.94	0.00
2.00	0.18	0.00	0.00	56.00	8.99	5.94	0.00
3.00	0.28	0.00	0.00	57.00	8.99	5.94	0.00
4.00	0.39	0.00	0.00	58.00	8.99	5.94	0.00
5.00	0.51	0.00	0.00	59.00	8.99	5.94	0.00
6.00	0.65	0.00	0.00	60.00	8.99	5.94	0.00
7.00	0.81	0.01	0.01	61.00	8.99	5.94	0.00
8.00	1.02	0.03	0.02	62.00	8.99	5.94	0.00
9.00	1.31	0.10	0.04	63.00	8.99	5.94	0.00
10.00	1.70	0.24	0.08	64.00	8.99	5.94	0.00
11.00	2.25	0.51	0.15	65.00	8.99	5.94	0.00
12.00	4.49	2.05	<b>1.78</b>	66.00	8.99	5.94	0.00
13.00	6.74	3.92	<b>0.28</b>	67.00	8.99	5.94	0.00
14.00	7.29	4.41	0.18	68.00	8.99	5.94	0.00
15.00	7.68	4.75	0.14	69.00	8.99	5.94	0.00
16.00	7.97	5.01	0.10	70.00	8.99	5.94	0.00
17.00	8.18	5.20	0.08	71.00	8.99	5.94	0.00
18.00	8.34	5.35	0.06	72.00	8.99	5.94	0.00
19.00	8.48	5.48	0.05				
20.00	8.60	5.59	0.05				
21.00	8.72	5.69	0.04				
22.00	8.82	5.78	0.04				
23.00	8.91	5.87	0.03				
24.00	<b>8.99</b>	<b>5.94</b>	0.03				
25.00	8.99	5.94	0.00				
26.00	8.99	5.94	0.00				
27.00	8.99	5.94	0.00				
28.00	8.99	5.94	0.00				
29.00	8.99	5.94	0.00				
30.00	8.99	5.94	0.00				
31.00	8.99	5.94	0.00				
32.00	8.99	5.94	0.00				
33.00	8.99	5.94	0.00				
34.00	8.99	5.94	0.00				
35.00	8.99	5.94	0.00				
36.00	8.99	5.94	0.00				
37.00	8.99	5.94	0.00				
38.00	8.99	5.94	0.00				
39.00	8.99	5.94	0.00				
40.00	8.99	5.94	0.00				
41.00	8.99	5.94	0.00				
42.00	8.99	5.94	0.00				
43.00	8.99	5.94	0.00				
44.00	8.99	5.94	0.00				
45.00	8.99	5.94	0.00				
46.00	8.99	5.94	0.00				
47.00	8.99	5.94	0.00				
48.00	8.99	5.94	0.00				
49.00	8.99	5.94	0.00				
50.00	8.99	5.94	0.00				
51.00	8.99	5.94	0.00				
52.00	8.99	5.94	0.00				
53.00	8.99	5.94	0.00				

**Summary for Pond 103: CB-6**

Inflow Area = 0.431 ac, 38.14% Impervious, Inflow Depth = 5.94" for 100-Year event  
 Inflow = 2.98 cfs @ 12.09 hrs, Volume= 0.214 af  
 Outflow = 2.98 cfs @ 12.09 hrs, Volume= 0.214 af, Atten= 0%, Lag= 0.0 min  
 Primary = 2.98 cfs @ 12.09 hrs, Volume= 0.214 af  
 Routed to Pond 104 : DMH-7

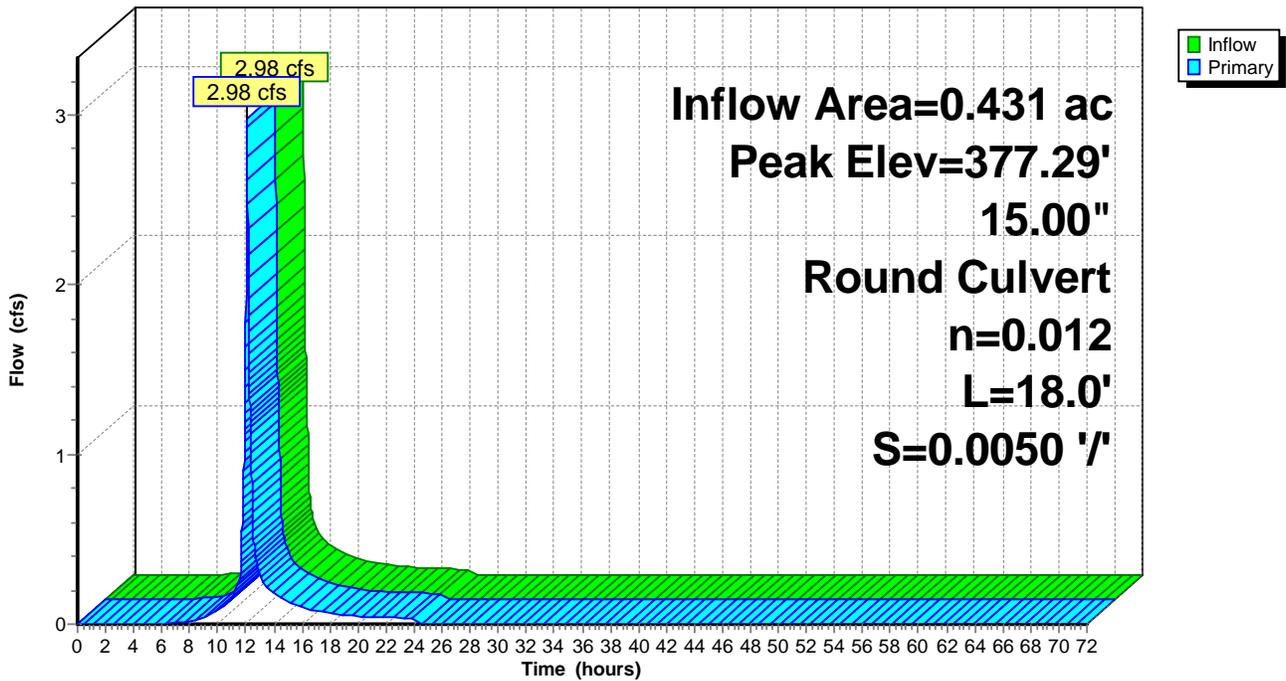
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 377.29' @ 12.18 hrs

Device #1	Routing	Invert	Outlet Devices
	Primary	375.22'	<b>15.00" Round Pipe</b> L= 18.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 375.22' / 375.13' S= 0.0050 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf

**Primary OutFlow** Max=2.54 cfs @ 12.09 hrs HW=376.82' TW=376.52' (Dynamic Tailwater)  
 ↳ **1=Pipe** (Inlet Controls 2.54 cfs @ 2.07 fps)

**Pond 103: CB-6**

Hydrograph



**Hydrograph for Pond 103: CB-6**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	375.22	0.00	54.00	0.00	375.22	0.00
1.00	0.00	375.22	0.00	55.00	0.00	375.22	0.00
2.00	0.00	375.22	0.00	56.00	0.00	375.22	0.00
3.00	0.00	375.22	0.00	57.00	0.00	375.22	0.00
4.00	0.00	375.22	0.00	58.00	0.00	375.22	0.00
5.00	0.00	375.22	0.00	59.00	0.00	375.22	0.00
6.00	0.00	375.22	0.00	60.00	0.00	375.22	0.00
7.00	0.01	375.26	0.01	61.00	0.00	375.22	0.00
8.00	0.02	375.29	0.02	62.00	0.00	375.22	0.00
9.00	0.04	375.33	0.04	63.00	0.00	375.22	0.00
10.00	0.08	375.37	0.08	64.00	0.00	375.22	0.00
11.00	0.15	375.43	0.15	65.00	0.00	375.22	0.00
12.00	<b>1.78</b>	<b>376.05</b>	<b>1.78</b>	66.00	0.00	375.22	0.00
13.00	<b>0.28</b>	<b>375.52</b>	<b>0.28</b>	67.00	0.00	375.22	0.00
14.00	0.18	375.45	0.18	68.00	0.00	375.22	0.00
15.00	0.14	375.42	0.14	69.00	0.00	375.22	0.00
16.00	0.10	375.39	0.10	70.00	0.00	375.22	0.00
17.00	0.08	375.37	0.08	71.00	0.00	375.22	0.00
18.00	0.06	375.35	0.06	72.00	0.00	375.22	0.00
19.00	0.05	375.35	0.05				
20.00	0.05	375.34	0.05				
21.00	0.04	375.33	0.04				
22.00	0.04	375.33	0.04				
23.00	0.03	375.32	0.03				
24.00	0.03	375.32	0.03				
25.00	0.00	375.22	0.00				
26.00	0.00	375.22	0.00				
27.00	0.00	375.22	0.00				
28.00	0.00	375.22	0.00				
29.00	0.00	375.22	0.00				
30.00	0.00	375.22	0.00				
31.00	0.00	375.22	0.00				
32.00	0.00	375.22	0.00				
33.00	0.00	375.22	0.00				
34.00	0.00	375.22	0.00				
35.00	0.00	375.22	0.00				
36.00	0.00	375.22	0.00				
37.00	0.00	375.22	0.00				
38.00	0.00	375.22	0.00				
39.00	0.00	375.22	0.00				
40.00	0.00	375.22	0.00				
41.00	0.00	375.22	0.00				
42.00	0.00	375.22	0.00				
43.00	0.00	375.22	0.00				
44.00	0.00	375.22	0.00				
45.00	0.00	375.22	0.00				
46.00	0.00	375.22	0.00				
47.00	0.00	375.22	0.00				
48.00	0.00	375.22	0.00				
49.00	0.00	375.22	0.00				
50.00	0.00	375.22	0.00				
51.00	0.00	375.22	0.00				
52.00	0.00	375.22	0.00				
53.00	0.00	375.22	0.00				

**Summary for Pond 104: DMH-7**

Inflow Area = 3.347 ac, 7.15% Impervious, Inflow Depth = 5.08" for 100-Year event  
 Inflow = 15.38 cfs @ 12.17 hrs, Volume= 1.418 af  
 Outflow = 15.38 cfs @ 12.17 hrs, Volume= 1.418 af, Atten= 0%, Lag= 0.0 min  
 Primary = 15.38 cfs @ 12.17 hrs, Volume= 1.418 af  
 Routed to Pond 110 : DMH-4

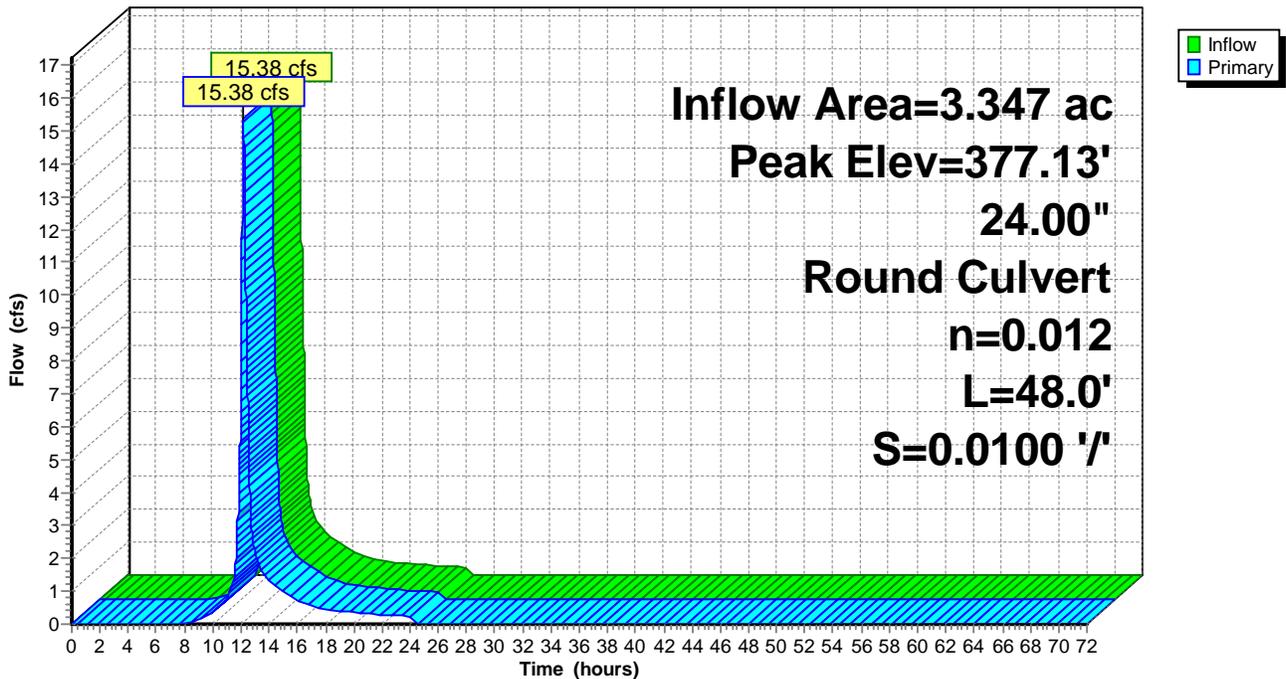
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 377.13' @ 12.18 hrs

Device #1	Routing	Invert	Outlet Devices
	Primary	374.38'	<b>24.00" Round Pipe</b> L= 48.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 374.38' / 373.90' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf

**Primary OutFlow** Max=15.27 cfs @ 12.17 hrs HW=377.11' TW=375.47' (Dynamic Tailwater)  
 ↳ **1=Pipe** (Inlet Controls 15.27 cfs @ 4.86 fps)

**Pond 104: DMH-7**

Hydrograph



**Hydrograph for Pond 104: DMH-7**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	374.38	0.00	54.00	0.00	374.38	0.00
1.00	0.00	374.38	0.00	55.00	0.00	374.38	0.00
2.00	0.00	374.38	0.00	56.00	0.00	374.38	0.00
3.00	0.00	374.38	0.00	57.00	0.00	374.38	0.00
4.00	0.00	374.38	0.00	58.00	0.00	374.38	0.00
5.00	0.00	374.38	0.00	59.00	0.00	374.38	0.00
6.00	0.00	374.38	0.00	60.00	0.00	374.38	0.00
7.00	0.01	374.41	0.01	61.00	0.00	374.38	0.00
8.00	0.02	374.44	0.02	62.00	0.00	374.38	0.00
9.00	0.13	374.54	0.13	63.00	0.00	374.38	0.00
10.00	0.34	374.64	0.34	64.00	0.00	374.38	0.00
11.00	0.76	374.78	0.76	65.00	0.00	374.38	0.00
12.00	<b>7.56</b>	<b>375.79</b>	<b>7.56</b>	66.00	0.00	374.38	0.00
13.00	<b>2.19</b>	<b>375.08</b>	<b>2.19</b>	67.00	0.00	374.38	0.00
14.00	1.32	374.91	1.32	68.00	0.00	374.38	0.00
15.00	1.00	374.84	1.00	69.00	0.00	374.38	0.00
16.00	0.72	374.77	0.72	70.00	0.00	374.38	0.00
17.00	0.56	374.72	0.56	71.00	0.00	374.38	0.00
18.00	0.44	374.68	0.44	72.00	0.00	374.38	0.00
19.00	0.38	374.66	0.38				
20.00	0.34	374.65	0.34				
21.00	0.31	374.63	0.31				
22.00	0.29	374.62	0.29				
23.00	0.26	374.61	0.26				
24.00	0.23	374.60	0.23				
25.00	0.00	374.38	0.00				
26.00	0.00	374.38	0.00				
27.00	0.00	374.38	0.00				
28.00	0.00	374.38	0.00				
29.00	0.00	374.38	0.00				
30.00	0.00	374.38	0.00				
31.00	0.00	374.38	0.00				
32.00	0.00	374.38	0.00				
33.00	0.00	374.38	0.00				
34.00	0.00	374.38	0.00				
35.00	0.00	374.38	0.00				
36.00	0.00	374.38	0.00				
37.00	0.00	374.38	0.00				
38.00	0.00	374.38	0.00				
39.00	0.00	374.38	0.00				
40.00	0.00	374.38	0.00				
41.00	0.00	374.38	0.00				
42.00	0.00	374.38	0.00				
43.00	0.00	374.38	0.00				
44.00	0.00	374.38	0.00				
45.00	0.00	374.38	0.00				
46.00	0.00	374.38	0.00				
47.00	0.00	374.38	0.00				
48.00	0.00	374.38	0.00				
49.00	0.00	374.38	0.00				
50.00	0.00	374.38	0.00				
51.00	0.00	374.38	0.00				
52.00	0.00	374.38	0.00				
53.00	0.00	374.38	0.00				

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

Prepared by DiPrete Engineering

Printed 1/22/2025

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**Summary for Subcatchment 105: WPost-03**

Runoff = 15.32 cfs @ 12.24 hrs, Volume= 1.551 af, Depth= 6.19"  
 Routed to Pond 106 : CB-1

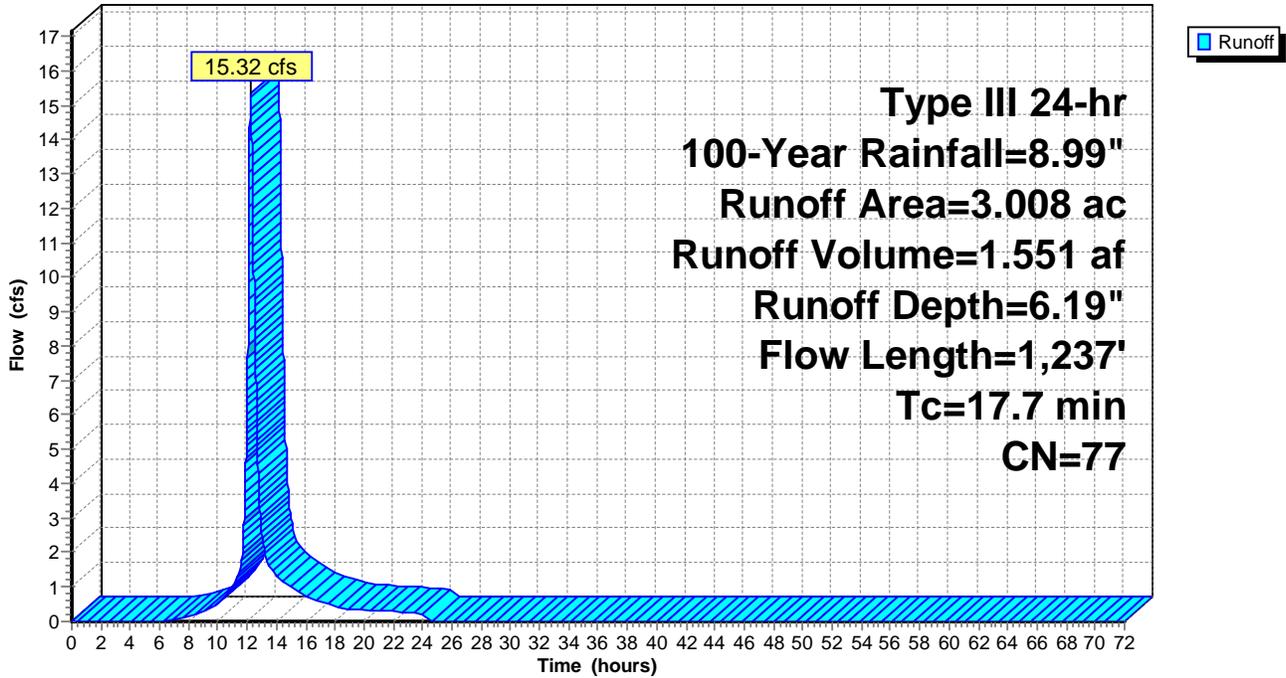
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.283	61	>75% Grass cover, Good, HSG B
0.021	80	>75% Grass cover, Good, HSG D
0.165	98	Impervious, HSG B
0.050	98	Roofs, HSG B
0.068	55	Woods, Good, HSG B
2.420	77	Woods, Good, HSG D
3.008	77	Weighted Average
2.793	75	92.85% Pervious Area
0.215	98	7.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.4	100	0.0630	0.12		<b>Sheet Flow, A</b>
					Woods: Light underbrush n= 0.400 P2= 3.27"
3.5	898	0.0697	4.25		<b>Shallow Concentrated Flow, B</b>
					Unpaved Kv= 16.1 fps
0.8	239	0.0623	5.07		<b>Shallow Concentrated Flow, C - Paved</b>
					Paved Kv= 20.3 fps
17.7	1,237	Total			

Subcatchment 105: WPost-03

Hydrograph



**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

HydroCAD® 10.20-6a s/n 01125 © 2024 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Subcatchment 105: WPost-03**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	54.00	8.99	6.19	0.00
1.00	0.09	0.00	0.00	55.00	8.99	6.19	0.00
2.00	0.18	0.00	0.00	56.00	8.99	6.19	0.00
3.00	0.28	0.00	0.00	57.00	8.99	6.19	0.00
4.00	0.39	0.00	0.00	58.00	8.99	6.19	0.00
5.00	0.51	0.00	0.00	59.00	8.99	6.19	0.00
6.00	0.65	0.00	0.00	60.00	8.99	6.19	0.00
7.00	0.81	0.01	0.06	61.00	8.99	6.19	0.00
8.00	1.02	0.05	0.14	62.00	8.99	6.19	0.00
9.00	1.31	0.14	0.30	63.00	8.99	6.19	0.00
10.00	1.70	0.30	0.54	64.00	8.99	6.19	0.00
11.00	2.25	0.59	1.00	65.00	8.99	6.19	0.00
12.00	4.49	2.21	<b>6.49</b>	66.00	8.99	6.19	0.00
13.00	6.74	4.14	<b>2.51</b>	67.00	8.99	6.19	0.00
14.00	7.29	4.63	1.37	68.00	8.99	6.19	0.00
15.00	7.68	4.98	1.01	69.00	8.99	6.19	0.00
16.00	7.97	5.24	0.73	70.00	8.99	6.19	0.00
17.00	8.18	5.44	0.56	71.00	8.99	6.19	0.00
18.00	8.34	5.59	0.44	72.00	8.99	6.19	0.00
19.00	8.48	5.72	0.38				
20.00	8.60	5.83	0.34				
21.00	8.72	5.93	0.31				
22.00	8.82	6.03	0.28				
23.00	8.91	6.11	0.25				
24.00	<b>8.99</b>	<b>6.19</b>	0.22				
25.00	8.99	6.19	0.00				
26.00	8.99	6.19	0.00				
27.00	8.99	6.19	0.00				
28.00	8.99	6.19	0.00				
29.00	8.99	6.19	0.00				
30.00	8.99	6.19	0.00				
31.00	8.99	6.19	0.00				
32.00	8.99	6.19	0.00				
33.00	8.99	6.19	0.00				
34.00	8.99	6.19	0.00				
35.00	8.99	6.19	0.00				
36.00	8.99	6.19	0.00				
37.00	8.99	6.19	0.00				
38.00	8.99	6.19	0.00				
39.00	8.99	6.19	0.00				
40.00	8.99	6.19	0.00				
41.00	8.99	6.19	0.00				
42.00	8.99	6.19	0.00				
43.00	8.99	6.19	0.00				
44.00	8.99	6.19	0.00				
45.00	8.99	6.19	0.00				
46.00	8.99	6.19	0.00				
47.00	8.99	6.19	0.00				
48.00	8.99	6.19	0.00				
49.00	8.99	6.19	0.00				
50.00	8.99	6.19	0.00				
51.00	8.99	6.19	0.00				
52.00	8.99	6.19	0.00				
53.00	8.99	6.19	0.00				

**Summary for Pond 106: CB-1**

Inflow Area = 3.008 ac, 7.15% Impervious, Inflow Depth = 6.19" for 100-Year event  
 Inflow = 15.32 cfs @ 12.24 hrs, Volume= 1.551 af  
 Outflow = 15.32 cfs @ 12.24 hrs, Volume= 1.551 af, Atten= 0%, Lag= 0.0 min  
 Primary = 15.32 cfs @ 12.24 hrs, Volume= 1.551 af  
 Routed to Pond 109 : DMH-3

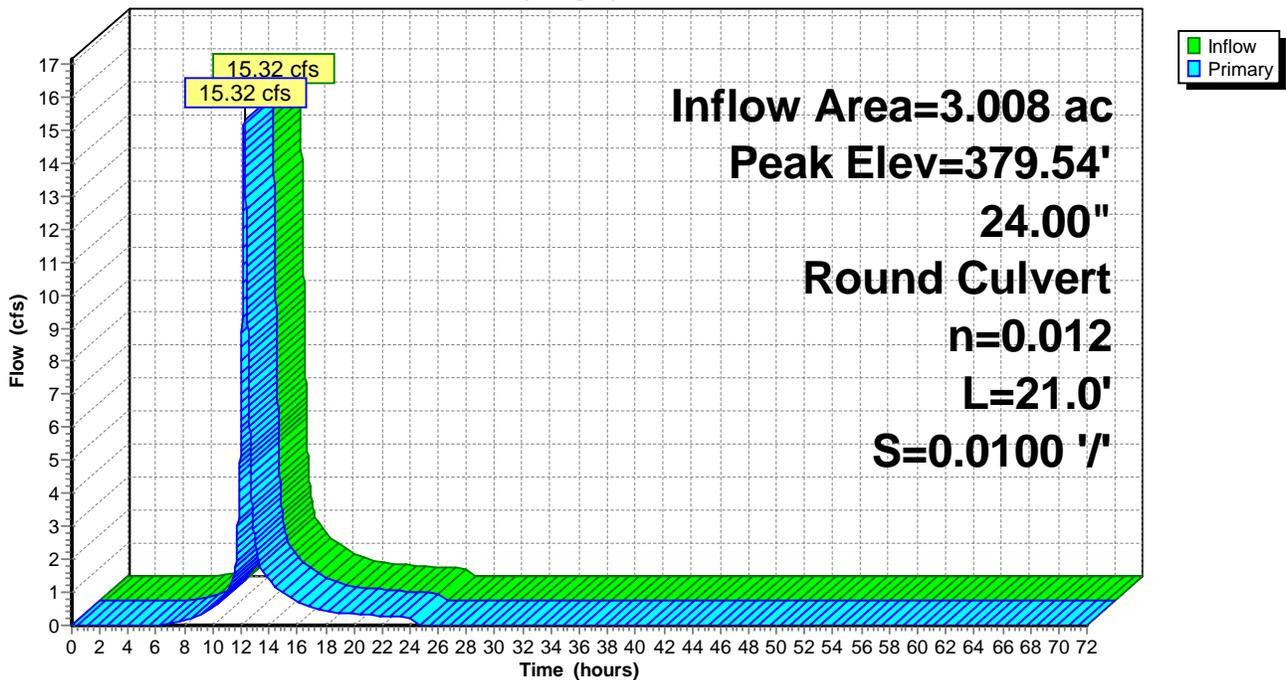
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 379.54' @ 12.24 hrs  
 Flood Elev= 381.95'

Device #1	Routing	Invert	Outlet Devices
	Primary	375.15'	<b>24.00" Round Pipe</b> L= 21.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 375.15' / 374.94' S= 0.0100 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf

**Primary OutFlow** Max=15.35 cfs @ 12.24 hrs HW=379.54' TW=377.89' (Dynamic Tailwater)  
 ↑**1=Pipe** (Inlet Controls 15.35 cfs @ 4.89 fps)

**Pond 106: CB-1**

Hydrograph



**Hydrograph for Pond 106: CB-1**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	375.15	0.00	54.00	0.00	375.15	0.00
1.00	0.00	375.15	0.00	55.00	0.00	375.15	0.00
2.00	0.00	375.15	0.00	56.00	0.00	375.15	0.00
3.00	0.00	375.15	0.00	57.00	0.00	375.15	0.00
4.00	0.00	375.15	0.00	58.00	0.00	375.15	0.00
5.00	0.00	375.15	0.00	59.00	0.00	375.15	0.00
6.00	0.00	375.18	0.00	60.00	0.00	375.15	0.00
7.00	0.06	375.26	0.06	61.00	0.00	375.15	0.00
8.00	0.14	375.32	0.14	62.00	0.00	375.15	0.00
9.00	0.30	375.41	0.30	63.00	0.00	375.15	0.00
10.00	0.54	375.51	0.54	64.00	0.00	375.15	0.00
11.00	1.00	375.66	1.00	65.00	0.00	375.15	0.00
12.00	<b>6.49</b>	<b>376.77</b>	<b>6.49</b>	66.00	0.00	375.15	0.00
13.00	<b>2.51</b>	<b>376.02</b>	<b>2.51</b>	67.00	0.00	375.15	0.00
14.00	1.37	375.76	1.37	68.00	0.00	375.15	0.00
15.00	1.01	375.66	1.01	69.00	0.00	375.15	0.00
16.00	0.73	375.57	0.73	70.00	0.00	375.15	0.00
17.00	0.56	375.51	0.56	71.00	0.00	375.15	0.00
18.00	0.44	375.46	0.44	72.00	0.00	375.15	0.00
19.00	0.38	375.44	0.38				
20.00	0.34	375.42	0.34				
21.00	0.31	375.41	0.31				
22.00	0.28	375.39	0.28				
23.00	0.25	375.38	0.25				
24.00	0.22	375.37	0.22				
25.00	0.00	375.15	0.00				
26.00	0.00	375.15	0.00				
27.00	0.00	375.15	0.00				
28.00	0.00	375.15	0.00				
29.00	0.00	375.15	0.00				
30.00	0.00	375.15	0.00				
31.00	0.00	375.15	0.00				
32.00	0.00	375.15	0.00				
33.00	0.00	375.15	0.00				
34.00	0.00	375.15	0.00				
35.00	0.00	375.15	0.00				
36.00	0.00	375.15	0.00				
37.00	0.00	375.15	0.00				
38.00	0.00	375.15	0.00				
39.00	0.00	375.15	0.00				
40.00	0.00	375.15	0.00				
41.00	0.00	375.15	0.00				
42.00	0.00	375.15	0.00				
43.00	0.00	375.15	0.00				
44.00	0.00	375.15	0.00				
45.00	0.00	375.15	0.00				
46.00	0.00	375.15	0.00				
47.00	0.00	375.15	0.00				
48.00	0.00	375.15	0.00				
49.00	0.00	375.15	0.00				
50.00	0.00	375.15	0.00				
51.00	0.00	375.15	0.00				
52.00	0.00	375.15	0.00				
53.00	0.00	375.15	0.00				

**Summary for Subcatchment 107: WPost-04**

Runoff = 2.78 cfs @ 12.08 hrs, Volume= 0.206 af, Depth= 7.05"  
 Routed to Pond 108 : CB-2

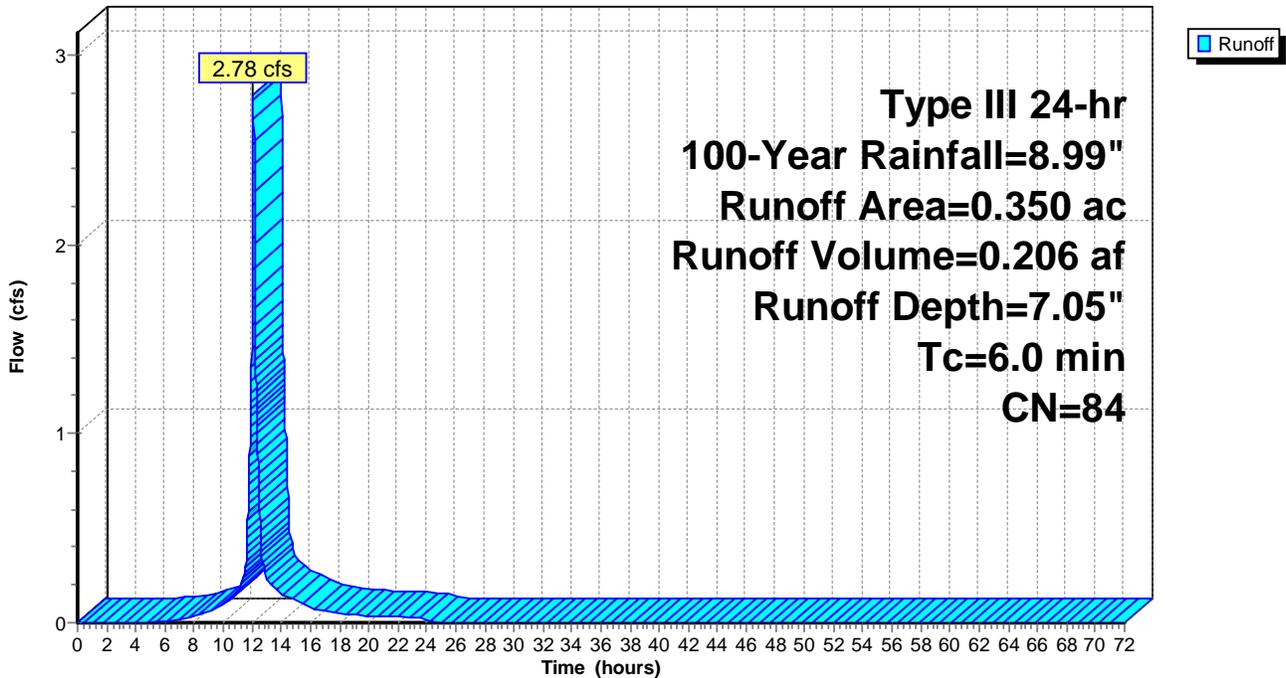
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.135	61	>75% Grass cover, Good, HSG B
0.154	98	Impervious, HSG B
0.060	98	Roofs, HSG B
0.001	55	Woods, Good, HSG B
0.350	84	Weighted Average
0.136	61	38.82% Pervious Area
0.214	98	61.18% Impervious Area

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

**Subcatchment 107: WPost-04**

Hydrograph



**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

HydroCAD® 10.20-6a s/n 01125 © 2024 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Subcatchment 107: WPost-04**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	54.00	8.99	7.05	0.00
1.00	0.09	0.00	0.00	55.00	8.99	7.05	0.00
2.00	0.18	0.00	0.00	56.00	8.99	7.05	0.00
3.00	0.28	0.00	0.00	57.00	8.99	7.05	0.00
4.00	0.39	0.00	0.00	58.00	8.99	7.05	0.00
5.00	0.51	0.01	0.01	59.00	8.99	7.05	0.00
6.00	0.65	0.03	0.01	60.00	8.99	7.05	0.00
7.00	0.81	0.08	0.02	61.00	8.99	7.05	0.00
8.00	1.02	0.16	0.04	62.00	8.99	7.05	0.00
9.00	1.31	0.30	0.06	63.00	8.99	7.05	0.00
10.00	1.70	0.54	0.10	64.00	8.99	7.05	0.00
11.00	2.25	0.92	0.17	65.00	8.99	7.05	0.00
12.00	4.49	2.81	<b>1.71</b>	66.00	8.99	7.05	0.00
13.00	6.74	4.90	<b>0.24</b>	67.00	8.99	7.05	0.00
14.00	7.29	5.42	0.15	68.00	8.99	7.05	0.00
15.00	7.68	5.79	0.12	69.00	8.99	7.05	0.00
16.00	7.97	6.06	0.08	70.00	8.99	7.05	0.00
17.00	8.18	6.26	0.07	71.00	8.99	7.05	0.00
18.00	8.34	6.42	0.05	72.00	8.99	7.05	0.00
19.00	8.48	6.56	0.04				
20.00	8.60	6.68	0.04				
21.00	8.72	6.78	0.04				
22.00	8.82	6.88	0.03				
23.00	8.91	6.97	0.03				
24.00	<b>8.99</b>	<b>7.05</b>	0.03				
25.00	8.99	7.05	0.00				
26.00	8.99	7.05	0.00				
27.00	8.99	7.05	0.00				
28.00	8.99	7.05	0.00				
29.00	8.99	7.05	0.00				
30.00	8.99	7.05	0.00				
31.00	8.99	7.05	0.00				
32.00	8.99	7.05	0.00				
33.00	8.99	7.05	0.00				
34.00	8.99	7.05	0.00				
35.00	8.99	7.05	0.00				
36.00	8.99	7.05	0.00				
37.00	8.99	7.05	0.00				
38.00	8.99	7.05	0.00				
39.00	8.99	7.05	0.00				
40.00	8.99	7.05	0.00				
41.00	8.99	7.05	0.00				
42.00	8.99	7.05	0.00				
43.00	8.99	7.05	0.00				
44.00	8.99	7.05	0.00				
45.00	8.99	7.05	0.00				
46.00	8.99	7.05	0.00				
47.00	8.99	7.05	0.00				
48.00	8.99	7.05	0.00				
49.00	8.99	7.05	0.00				
50.00	8.99	7.05	0.00				
51.00	8.99	7.05	0.00				
52.00	8.99	7.05	0.00				
53.00	8.99	7.05	0.00				

**Summary for Pond 108: CB-2**

Inflow Area = 0.350 ac, 61.18% Impervious, Inflow Depth = 7.05" for 100-Year event  
 Inflow = 2.78 cfs @ 12.08 hrs, Volume= 0.206 af  
 Outflow = 2.78 cfs @ 12.08 hrs, Volume= 0.206 af, Atten= 0%, Lag= 0.0 min  
 Primary = 2.78 cfs @ 12.08 hrs, Volume= 0.206 af  
 Routed to Pond 109 : DMH-3

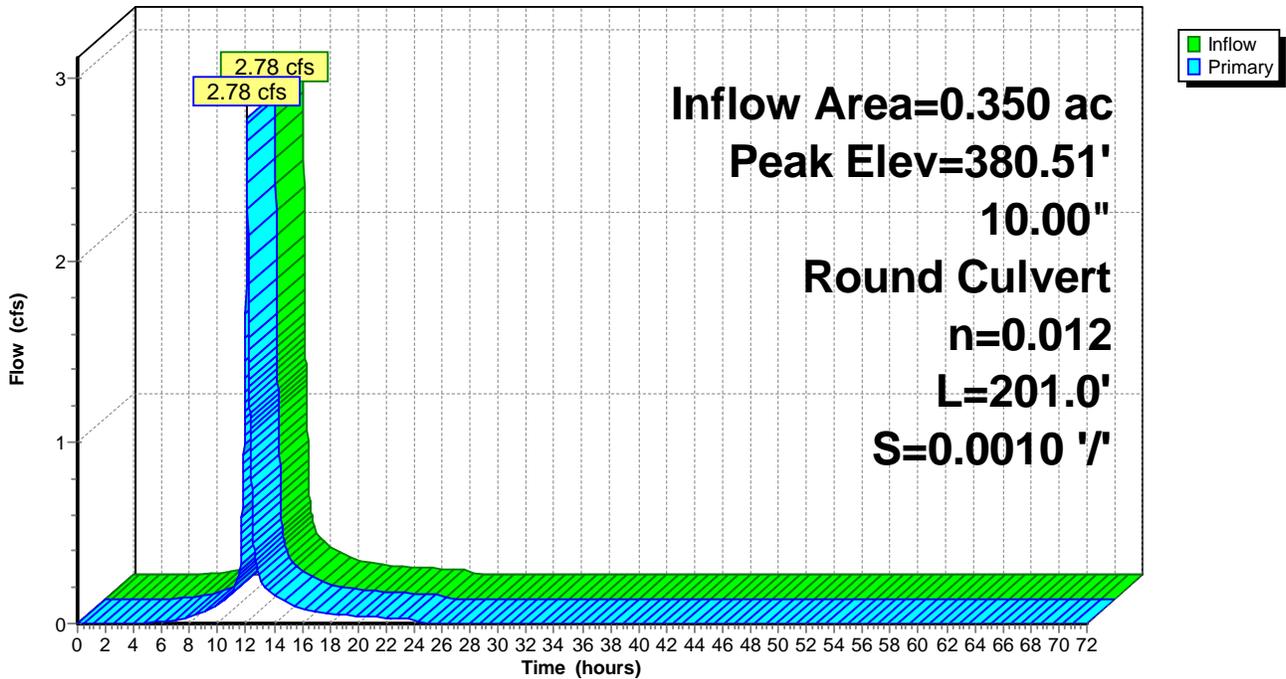
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 380.51' @ 12.09 hrs  
 Flood Elev= 381.86'

Device #1	Routing	Invert	Outlet Devices
	Primary	376.31'	<b>10.00" Round Pipe</b> L= 201.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 376.31' / 376.10' S= 0.0010 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.55 sf

**Primary OutFlow** Max=2.75 cfs @ 12.08 hrs HW=380.48' TW=377.02' (Dynamic Tailwater)  
 ↳ **1=Pipe** (Outlet Controls 2.75 cfs @ 5.05 fps)

**Pond 108: CB-2**

Hydrograph



**Hydrograph for Pond 108: CB-2**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	376.31	0.00	54.00	0.00	376.31	0.00
1.00	0.00	376.31	0.00	55.00	0.00	376.31	0.00
2.00	0.00	376.31	0.00	56.00	0.00	376.31	0.00
3.00	0.00	376.31	0.00	57.00	0.00	376.31	0.00
4.00	0.00	376.31	0.00	58.00	0.00	376.31	0.00
5.00	0.01	376.37	0.01	59.00	0.00	376.31	0.00
6.00	0.01	376.40	0.01	60.00	0.00	376.31	0.00
7.00	0.02	376.43	0.02	61.00	0.00	376.31	0.00
8.00	0.04	376.47	0.04	62.00	0.00	376.31	0.00
9.00	0.06	376.52	0.06	63.00	0.00	376.31	0.00
10.00	0.10	376.57	0.10	64.00	0.00	376.31	0.00
11.00	0.17	376.64	0.17	65.00	0.00	376.31	0.00
12.00	<b>1.71</b>	<b>378.27</b>	<b>1.71</b>	66.00	0.00	376.31	0.00
13.00	<b>0.24</b>	<b>376.72</b>	<b>0.24</b>	67.00	0.00	376.31	0.00
14.00	0.15	376.63	0.15	68.00	0.00	376.31	0.00
15.00	0.12	376.59	0.12	69.00	0.00	376.31	0.00
16.00	0.08	376.55	0.08	70.00	0.00	376.31	0.00
17.00	0.07	376.52	0.07	71.00	0.00	376.31	0.00
18.00	0.05	376.50	0.05	72.00	0.00	376.31	0.00
19.00	0.04	376.49	0.04				
20.00	0.04	376.48	0.04				
21.00	0.04	376.47	0.04				
22.00	0.03	376.46	0.03				
23.00	0.03	376.46	0.03				
24.00	0.03	376.45	0.03				
25.00	0.00	376.31	0.00				
26.00	0.00	376.31	0.00				
27.00	0.00	376.31	0.00				
28.00	0.00	376.31	0.00				
29.00	0.00	376.31	0.00				
30.00	0.00	376.31	0.00				
31.00	0.00	376.31	0.00				
32.00	0.00	376.31	0.00				
33.00	0.00	376.31	0.00				
34.00	0.00	376.31	0.00				
35.00	0.00	376.31	0.00				
36.00	0.00	376.31	0.00				
37.00	0.00	376.31	0.00				
38.00	0.00	376.31	0.00				
39.00	0.00	376.31	0.00				
40.00	0.00	376.31	0.00				
41.00	0.00	376.31	0.00				
42.00	0.00	376.31	0.00				
43.00	0.00	376.31	0.00				
44.00	0.00	376.31	0.00				
45.00	0.00	376.31	0.00				
46.00	0.00	376.31	0.00				
47.00	0.00	376.31	0.00				
48.00	0.00	376.31	0.00				
49.00	0.00	376.31	0.00				
50.00	0.00	376.31	0.00				
51.00	0.00	376.31	0.00				
52.00	0.00	376.31	0.00				
53.00	0.00	376.31	0.00				

**Summary for Pond 109: DMH-3**

Inflow Area = 3.358 ac, 12.79% Impervious, Inflow Depth = 6.28" for 100-Year event  
 Inflow = 16.70 cfs @ 12.23 hrs, Volume= 1.757 af  
 Outflow = 16.70 cfs @ 12.23 hrs, Volume= 1.757 af, Atten= 0%, Lag= 0.0 min  
 Primary = 16.70 cfs @ 12.23 hrs, Volume= 1.757 af  
 Routed to Pond 110 : DMH-4

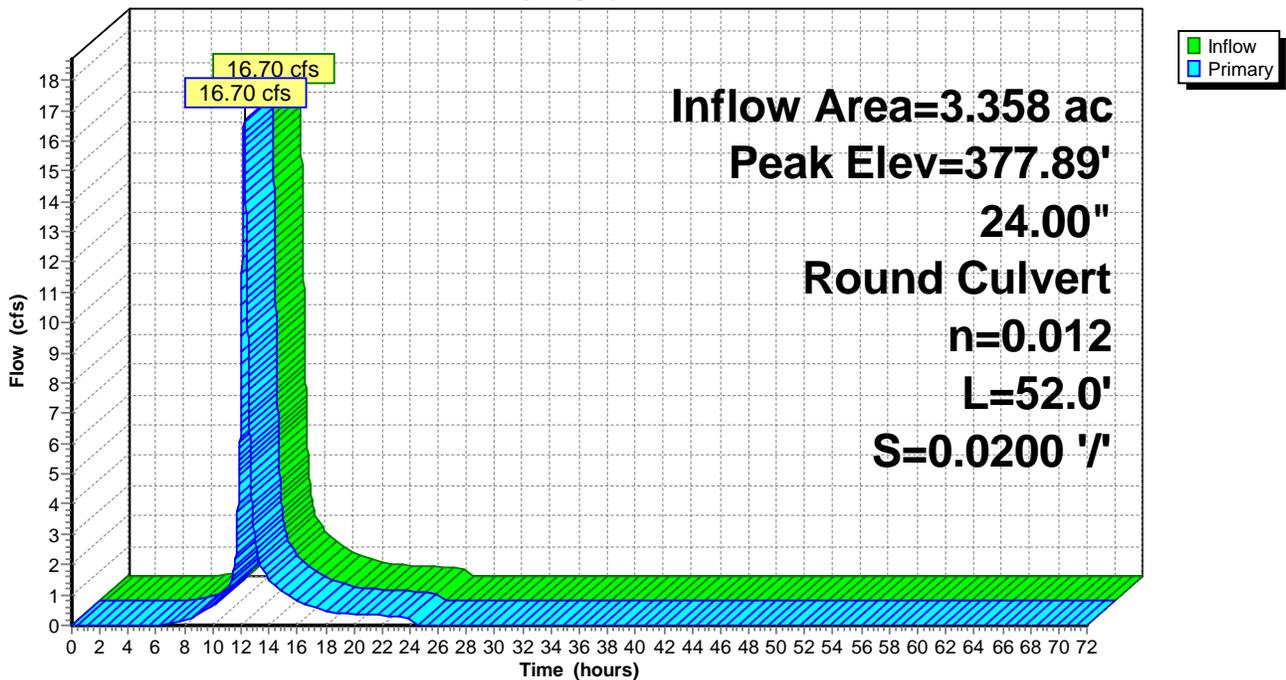
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 377.89' @ 12.23 hrs  
 Flood Elev= 381.55'

Device #	Routing	Invert	Outlet Devices
#1	Primary	374.94'	<b>24.00" Round Pipe</b> L= 52.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 374.94' / 373.90' S= 0.0200 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf

**Primary OutFlow** Max=16.69 cfs @ 12.23 hrs HW=377.89' TW=375.47' (Dynamic Tailwater)  
 ↑**1=Pipe** (Inlet Controls 16.69 cfs @ 5.31 fps)

**Pond 109: DMH-3**

Hydrograph



**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

HydroCAD® 10.20-6a s/n 01125 © 2024 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Pond 109: DMH-3**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	374.94	0.00	54.00	0.00	374.94	0.00
1.00	0.00	374.94	0.00	55.00	0.00	374.94	0.00
2.00	0.00	374.94	0.00	56.00	0.00	374.94	0.00
3.00	0.00	374.94	0.00	57.00	0.00	374.94	0.00
4.00	0.00	374.94	0.00	58.00	0.00	374.94	0.00
5.00	0.01	374.97	0.01	59.00	0.00	374.94	0.00
6.00	0.02	375.00	0.02	60.00	0.00	374.94	0.00
7.00	0.08	375.06	0.08	61.00	0.00	374.94	0.00
8.00	0.17	375.13	0.17	62.00	0.00	374.94	0.00
9.00	0.36	375.21	0.36	63.00	0.00	374.94	0.00
10.00	0.64	375.31	0.64	64.00	0.00	374.94	0.00
11.00	1.17	375.44	1.17	65.00	0.00	374.94	0.00
12.00	<b>8.20</b>	<b>376.43</b>	<b>8.20</b>	66.00	0.00	374.94	0.00
13.00	<b>2.76</b>	<b>375.73</b>	<b>2.76</b>	67.00	0.00	374.94	0.00
14.00	1.52	375.51	1.52	68.00	0.00	374.94	0.00
15.00	1.13	375.43	1.13	69.00	0.00	374.94	0.00
16.00	0.81	375.35	0.81	70.00	0.00	374.94	0.00
17.00	0.63	375.30	0.63	71.00	0.00	374.94	0.00
18.00	0.49	375.26	0.49	72.00	0.00	374.94	0.00
19.00	0.42	375.23	0.42				
20.00	0.38	375.22	0.38				
21.00	0.34	375.21	0.34				
22.00	0.31	375.19	0.31				
23.00	0.28	375.18	0.28				
24.00	0.25	375.17	0.25				
25.00	0.00	374.94	0.00				
26.00	0.00	374.94	0.00				
27.00	0.00	374.94	0.00				
28.00	0.00	374.94	0.00				
29.00	0.00	374.94	0.00				
30.00	0.00	374.94	0.00				
31.00	0.00	374.94	0.00				
32.00	0.00	374.94	0.00				
33.00	0.00	374.94	0.00				
34.00	0.00	374.94	0.00				
35.00	0.00	374.94	0.00				
36.00	0.00	374.94	0.00				
37.00	0.00	374.94	0.00				
38.00	0.00	374.94	0.00				
39.00	0.00	374.94	0.00				
40.00	0.00	374.94	0.00				
41.00	0.00	374.94	0.00				
42.00	0.00	374.94	0.00				
43.00	0.00	374.94	0.00				
44.00	0.00	374.94	0.00				
45.00	0.00	374.94	0.00				
46.00	0.00	374.94	0.00				
47.00	0.00	374.94	0.00				
48.00	0.00	374.94	0.00				
49.00	0.00	374.94	0.00				
50.00	0.00	374.94	0.00				
51.00	0.00	374.94	0.00				
52.00	0.00	374.94	0.00				
53.00	0.00	374.94	0.00				

**Summary for Pond 110: DMH-4**

Inflow Area = 6.705 ac, 9.97% Impervious, Inflow Depth = 5.68" for 100-Year event  
 Inflow = 31.54 cfs @ 12.19 hrs, Volume= 3.175 af  
 Outflow = 31.54 cfs @ 12.19 hrs, Volume= 3.175 af, Atten= 0%, Lag= 0.0 min  
 Primary = 31.54 cfs @ 12.19 hrs, Volume= 3.175 af  
 Routed to Pond 111 : DMH-8

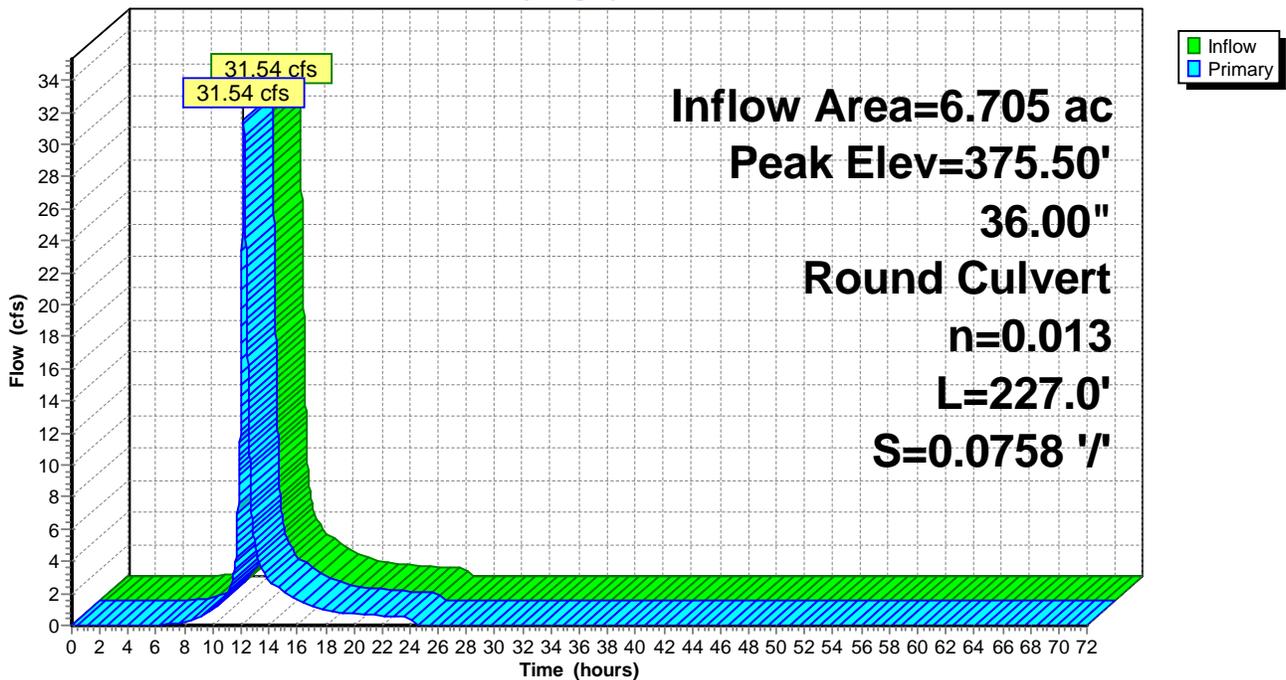
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 375.50' @ 12.19 hrs

Device #	Routing	Invert	Outlet Devices
1	Primary	372.90'	<b>36.00" Round Culvert</b> L= 227.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 372.90' / 355.70' S= 0.0758 '/ Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf

**Primary OutFlow** Max=31.53 cfs @ 12.19 hrs HW=375.50' TW=361.72' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Inlet Controls 31.53 cfs @ 4.84 fps)

**Pond 110: DMH-4**

Hydrograph



**Hydrograph for Pond 110: DMH-4**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	372.90	0.00	54.00	0.00	372.90	0.00
1.00	0.00	372.90	0.00	55.00	0.00	372.90	0.00
2.00	0.00	372.90	0.00	56.00	0.00	372.90	0.00
3.00	0.00	372.90	0.00	57.00	0.00	372.90	0.00
4.00	0.00	372.90	0.00	58.00	0.00	372.90	0.00
5.00	0.01	372.93	0.01	59.00	0.00	372.90	0.00
6.00	0.02	372.95	0.02	60.00	0.00	372.90	0.00
7.00	0.08	373.01	0.08	61.00	0.00	372.90	0.00
8.00	0.19	373.07	0.19	62.00	0.00	372.90	0.00
9.00	0.49	373.17	0.49	63.00	0.00	372.90	0.00
10.00	0.98	373.28	0.98	64.00	0.00	372.90	0.00
11.00	1.92	373.44	1.92	65.00	0.00	372.90	0.00
12.00	<b>15.75</b>	<b>374.57</b>	<b>15.75</b>	66.00	0.00	372.90	0.00
13.00	<b>4.95</b>	<b>373.79</b>	<b>4.95</b>	67.00	0.00	372.90	0.00
14.00	2.84	373.56	2.84	68.00	0.00	372.90	0.00
15.00	2.12	373.47	2.12	69.00	0.00	372.90	0.00
16.00	1.53	373.38	1.53	70.00	0.00	372.90	0.00
17.00	1.19	373.32	1.19	71.00	0.00	372.90	0.00
18.00	0.92	373.27	0.92	72.00	0.00	372.90	0.00
19.00	0.80	373.25	0.80				
20.00	0.72	373.23	0.72				
21.00	0.66	373.21	0.66				
22.00	0.60	373.20	0.60				
23.00	0.54	373.18	0.54				
24.00	0.48	373.17	0.48				
25.00	0.00	372.90	0.00				
26.00	0.00	372.90	0.00				
27.00	0.00	372.90	0.00				
28.00	0.00	372.90	0.00				
29.00	0.00	372.90	0.00				
30.00	0.00	372.90	0.00				
31.00	0.00	372.90	0.00				
32.00	0.00	372.90	0.00				
33.00	0.00	372.90	0.00				
34.00	0.00	372.90	0.00				
35.00	0.00	372.90	0.00				
36.00	0.00	372.90	0.00				
37.00	0.00	372.90	0.00				
38.00	0.00	372.90	0.00				
39.00	0.00	372.90	0.00				
40.00	0.00	372.90	0.00				
41.00	0.00	372.90	0.00				
42.00	0.00	372.90	0.00				
43.00	0.00	372.90	0.00				
44.00	0.00	372.90	0.00				
45.00	0.00	372.90	0.00				
46.00	0.00	372.90	0.00				
47.00	0.00	372.90	0.00				
48.00	0.00	372.90	0.00				
49.00	0.00	372.90	0.00				
50.00	0.00	372.90	0.00				
51.00	0.00	372.90	0.00				
52.00	0.00	372.90	0.00				
53.00	0.00	372.90	0.00				

**Summary for Pond 111: DMH-8**

Inflow Area = 6.705 ac, 9.97% Impervious, Inflow Depth = 5.68" for 100-Year event  
 Inflow = 31.54 cfs @ 12.19 hrs, Volume= 3.175 af  
 Outflow = 31.76 cfs @ 12.19 hrs, Volume= 3.175 af, Atten= 0%, Lag= 0.0 min  
 Primary = 31.76 cfs @ 12.19 hrs, Volume= 3.175 af  
 Routed to Pond 113 : Sediment Forebay A

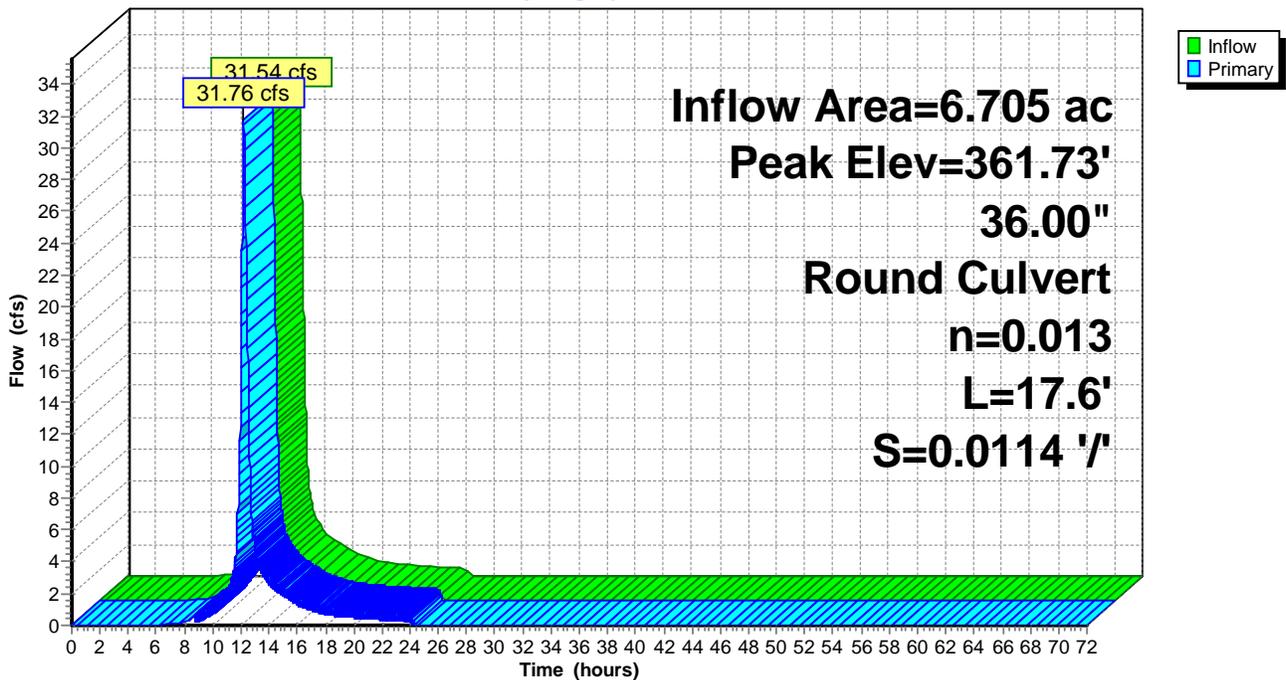
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 361.73' @ 12.19 hrs

Device #	Routing	Invert	Outlet Devices
#1	Primary	355.70'	<b>36.00" Round Culvert</b> L= 17.6' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 355.70' / 355.50' S= 0.0114 '/' Cc= 0.900 n= 0.013 Concrete pipe, bends & connections, Flow Area= 7.07 sf

**Primary OutFlow** Max=31.74 cfs @ 12.19 hrs HW=361.73' TW=360.61' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Inlet Controls 31.74 cfs @ 4.49 fps)

**Pond 111: DMH-8**

Hydrograph



**Hydrograph for Pond 111: DMH-8**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	355.70	0.00	54.00	0.00	359.00	0.00
1.00	0.00	358.70	0.00	55.00	0.00	359.00	0.00
2.00	0.00	359.00	0.00	56.00	0.00	359.00	0.00
3.00	0.00	359.00	0.00	57.00	0.00	359.00	0.00
4.00	0.00	359.00	0.00	58.00	0.00	359.00	0.00
5.00	0.01	359.00	0.01	59.00	0.00	359.00	0.00
6.00	0.02	359.04	0.02	60.00	0.00	359.00	0.00
7.00	0.08	359.15	0.01	61.00	0.00	359.00	0.00
8.00	0.19	359.26	0.05	62.00	0.00	359.00	0.00
9.00	0.49	359.44	0.26	63.00	0.00	359.00	0.00
10.00	0.98	359.56	0.75	64.00	0.00	359.00	0.00
11.00	1.92	359.64	1.70	65.00	0.00	359.00	0.00
12.00	<b>15.75</b>	<b>360.42</b>	<b>15.53</b>	66.00	0.00	359.00	0.00
13.00	<b>4.95</b>	<b>359.84</b>	<b>4.72</b>	67.00	0.00	359.00	0.00
14.00	2.84	359.71	2.62	68.00	0.00	359.00	0.00
15.00	2.12	359.66	1.90	69.00	0.00	359.00	0.00
16.00	1.53	359.62	1.30	70.00	0.00	359.00	0.00
17.00	1.19	359.59	0.96	71.00	0.00	359.00	0.00
18.00	0.92	359.57	0.70	72.00	0.00	359.00	0.00
19.00	0.80	359.56	0.58				
20.00	0.72	359.55	0.50				
21.00	0.66	359.54	0.43				
22.00	0.60	359.53	0.37				
23.00	0.54	359.53	0.31				
24.00	0.48	359.52	0.25				
25.00	0.00	355.70	0.00				
26.00	0.00	359.30	0.00				
27.00	0.00	359.18	0.00				
28.00	0.00	359.06	0.00				
29.00	0.00	359.00	0.00				
30.00	0.00	359.00	0.00				
31.00	0.00	359.00	0.00				
32.00	0.00	359.00	0.00				
33.00	0.00	359.00	0.00				
34.00	0.00	359.00	0.00				
35.00	0.00	359.00	0.00				
36.00	0.00	359.00	0.00				
37.00	0.00	359.00	0.00				
38.00	0.00	359.00	0.00				
39.00	0.00	359.00	0.00				
40.00	0.00	359.00	0.00				
41.00	0.00	359.00	0.00				
42.00	0.00	359.00	0.00				
43.00	0.00	359.00	0.00				
44.00	0.00	359.00	0.00				
45.00	0.00	359.00	0.00				
46.00	0.00	359.00	0.00				
47.00	0.00	359.00	0.00				
48.00	0.00	359.00	0.00				
49.00	0.00	359.00	0.00				
50.00	0.00	359.00	0.00				
51.00	0.00	359.00	0.00				
52.00	0.00	359.00	0.00				
53.00	0.00	359.00	0.00				

**Summary for Subcatchment 112: WPost-05**

Runoff = 4.48 cfs @ 12.10 hrs, Volume= 0.324 af, Depth= 4.71"  
 Routed to Pond 113 : Sediment Forebay A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-Year Rainfall=8.99"

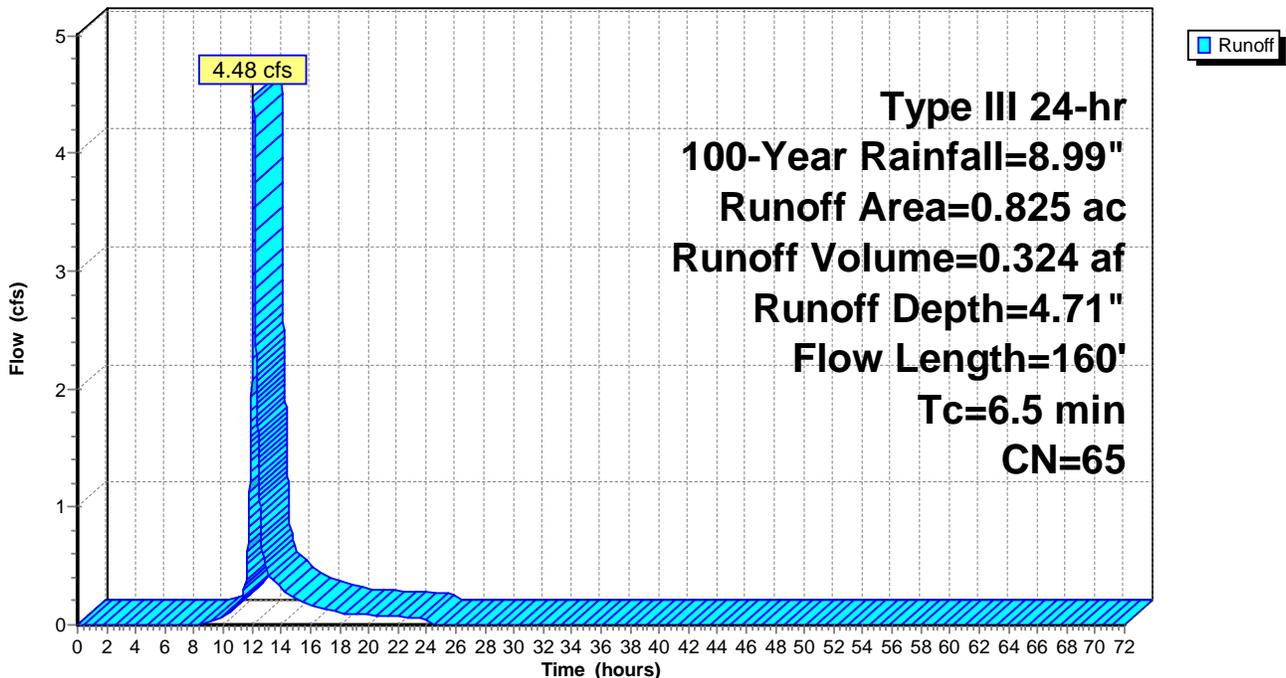
Area (ac)	CN	Description
0.298	61	>75% Grass cover, Good, HSG B
0.271	74	>75% Grass cover, Good, HSG C
0.000	98	Water Surface, 0% imp, HSG B
0.022	98	Water Surface, 0% imp, HSG C
0.230	55	Woods, Good, HSG B
0.005	70	Woods, Good, HSG C
0.825	65	Weighted Average
0.825	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	100	0.1520	0.27		<b>Sheet Flow, A</b>
					Grass: Dense n= 0.240 P2= 3.27"
0.2	60	0.0716	4.31		<b>Shallow Concentrated Flow, B</b>
					Unpaved Kv= 16.1 fps
6.5	160	Total			

**Subcatchment 112: WPost-05**

Hydrograph



**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Subcatchment 112: WPost-05**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	54.00	8.99	4.71	0.00
1.00	0.09	0.00	0.00	55.00	8.99	4.71	0.00
2.00	0.18	0.00	0.00	56.00	8.99	4.71	0.00
3.00	0.28	0.00	0.00	57.00	8.99	4.71	0.00
4.00	0.39	0.00	0.00	58.00	8.99	4.71	0.00
5.00	0.51	0.00	0.00	59.00	8.99	4.71	0.00
6.00	0.65	0.00	0.00	60.00	8.99	4.71	0.00
7.00	0.81	0.00	0.00	61.00	8.99	4.71	0.00
8.00	1.02	0.00	0.00	62.00	8.99	4.71	0.00
9.00	1.31	0.01	0.02	63.00	8.99	4.71	0.00
10.00	1.70	0.06	0.07	64.00	8.99	4.71	0.00
11.00	2.25	0.21	0.16	65.00	8.99	4.71	0.00
12.00	4.49	1.33	<b>2.46</b>	66.00	8.99	4.71	0.00
13.00	6.74	2.90	<b>0.47</b>	67.00	8.99	4.71	0.00
14.00	7.29	3.33	0.30	68.00	8.99	4.71	0.00
15.00	7.68	3.64	0.23	69.00	8.99	4.71	0.00
16.00	7.97	3.87	0.16	70.00	8.99	4.71	0.00
17.00	8.18	4.04	0.13	71.00	8.99	4.71	0.00
18.00	8.34	4.17	0.10	72.00	8.99	4.71	0.00
19.00	8.48	4.29	0.09				
20.00	8.60	4.39	0.08				
21.00	8.72	4.48	0.07				
22.00	8.82	4.56	0.07				
23.00	8.91	4.64	0.06				
24.00	<b>8.99</b>	<b>4.71</b>	0.05				
25.00	8.99	4.71	0.00				
26.00	8.99	4.71	0.00				
27.00	8.99	4.71	0.00				
28.00	8.99	4.71	0.00				
29.00	8.99	4.71	0.00				
30.00	8.99	4.71	0.00				
31.00	8.99	4.71	0.00				
32.00	8.99	4.71	0.00				
33.00	8.99	4.71	0.00				
34.00	8.99	4.71	0.00				
35.00	8.99	4.71	0.00				
36.00	8.99	4.71	0.00				
37.00	8.99	4.71	0.00				
38.00	8.99	4.71	0.00				
39.00	8.99	4.71	0.00				
40.00	8.99	4.71	0.00				
41.00	8.99	4.71	0.00				
42.00	8.99	4.71	0.00				
43.00	8.99	4.71	0.00				
44.00	8.99	4.71	0.00				
45.00	8.99	4.71	0.00				
46.00	8.99	4.71	0.00				
47.00	8.99	4.71	0.00				
48.00	8.99	4.71	0.00				
49.00	8.99	4.71	0.00				
50.00	8.99	4.71	0.00				
51.00	8.99	4.71	0.00				
52.00	8.99	4.71	0.00				
53.00	8.99	4.71	0.00				

**Summary for Pond 113: Sediment Forebay A**

Inflow Area = 7.530 ac, 8.88% Impervious, Inflow Depth = 5.58" for 100-Year event  
 Inflow = 34.80 cfs @ 12.17 hrs, Volume= 3.498 af  
 Outflow = 34.56 cfs @ 12.18 hrs, Volume= 3.498 af, Atten= 1%, Lag= 0.7 min  
 Primary = 1.10 cfs @ 12.12 hrs, Volume= 0.135 af  
 Routed to Pond 114 : Sand Filter A  
 Secondary = 33.57 cfs @ 12.19 hrs, Volume= 3.363 af  
 Routed to Pond 115 : Detention Pond A

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Automatic Starting Elev= 359.00' Surf.Area= 565 sf Storage= 1,052 cf  
 Peak Elev= 360.61' @ 12.19 hrs Surf.Area= 877 sf Storage= 2,230 cf (1,178 cf above start)

Plug-Flow detention time= 9.7 min calculated for 3.474 af (99% of inflow)  
 Center-of-Mass det. time= 3.0 min ( 824.1 - 821.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	356.00'	3,071 cf	<b>Ponding Storage (Prismatic)</b> Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
356.00	162	0	0
358.00	405	567	567
359.00	565	485	1,052
359.10	582	57	1,109
360.00	750	599	1,709
361.00	959	855	2,563
361.50	1,071	508	3,071

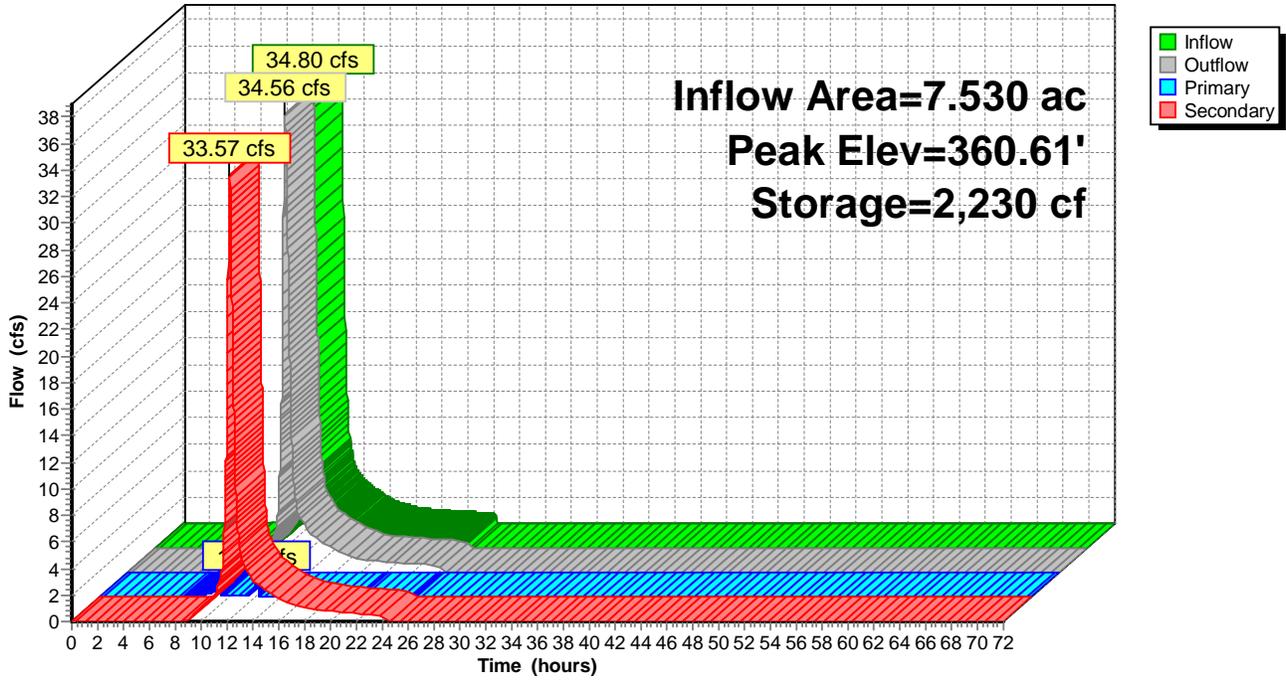
Device	Routing	Invert	Outlet Devices
#1	Primary	359.00'	<b>6.00" Round Culvert X 2.00</b> L= 24.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 359.00' / 359.00' S= 0.0000 '/ Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#2	Secondary	359.45'	<b>10.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

**Primary OutFlow** Max=1.07 cfs @ 12.12 hrs HW=360.55' TW=360.23' (Dynamic Tailwater)  
 ↑1=Culvert (Outlet Controls 1.07 cfs @ 2.72 fps)

**Secondary OutFlow** Max=33.55 cfs @ 12.19 hrs HW=360.61' TW=353.25' (Dynamic Tailwater)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 33.55 cfs @ 2.89 fps)

### Pond 113: Sediment Forebay A

Hydrograph



**Hydrograph for Pond 113: Sediment Forebay A**

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	1,052	359.00	0.00	0.00	0.00
2.00	0.00	1,052	359.00	0.00	0.00	0.00
4.00	0.00	1,052	359.00	0.00	0.00	0.00
6.00	0.02	1,086	359.06	0.00	0.00	0.00
8.00	0.05	1,222	359.27	0.17	0.17	0.00
10.00	0.82	1,418	359.56	1.04	0.09	0.95
12.00	<b>17.99</b>	<b>1,863</b>	<b>360.18</b>	<b>17.57</b>	<b>0.74</b>	<b>16.83</b>
14.00	<b>2.92</b>	<b>1,510</b>	<b>359.70</b>	<b>3.16</b>	<b>0.00</b>	<b>3.16</b>
16.00	1.46	1,454	359.62	1.70	0.00	1.70
18.00	0.80	1,422	359.57	1.03	0.00	1.03
20.00	0.58	1,409	359.55	0.83	0.03	0.79
22.00	0.44	1,398	359.53	0.67	0.06	0.61
24.00	0.31	1,390	359.52	0.53	0.06	0.47
26.00	0.00	1,247	359.31	0.02	0.02	0.00
28.00	0.00	1,111	359.10	0.02	0.02	0.00
30.00	0.00	1,074	359.04	0.00	0.00	0.00
32.00	0.00	1,067	359.03	0.00	0.00	0.00
34.00	0.00	1,064	359.02	0.00	0.00	0.00
36.00	0.00	1,062	359.02	0.00	0.00	0.00
38.00	0.00	1,061	359.02	0.00	0.00	0.00
40.00	0.00	1,060	359.01	0.00	0.00	0.00
42.00	0.00	1,059	359.01	0.00	0.00	0.00
44.00	0.00	1,059	359.01	0.00	0.00	0.00
46.00	0.00	1,058	359.01	0.00	0.00	0.00
48.00	0.00	1,058	359.01	0.00	0.00	0.00
50.00	0.00	1,058	359.01	0.00	0.00	0.00
52.00	0.00	1,057	359.01	0.00	0.00	0.00
54.00	0.00	1,057	359.01	0.00	0.00	0.00
56.00	0.00	1,057	359.01	0.00	0.00	0.00
58.00	0.00	1,057	359.01	0.00	0.00	0.00
60.00	0.00	1,057	359.01	0.00	0.00	0.00
62.00	0.00	1,056	359.01	0.00	0.00	0.00
64.00	0.00	1,056	359.01	0.00	0.00	0.00
66.00	0.00	1,056	359.01	0.00	0.00	0.00
68.00	0.00	1,056	359.01	0.00	0.00	0.00
70.00	0.00	1,056	359.01	0.00	0.00	0.00
72.00	0.00	1,056	359.01	0.00	0.00	0.00

**Summary for Pond 114: Sand Filter A**

Inflow Area = 7.530 ac, 8.88% Impervious, Inflow Depth = 0.22" for 100-Year event  
 Inflow = 1.10 cfs @ 12.12 hrs, Volume= 0.135 af  
 Outflow = 0.07 cfs @ 7.33 hrs, Volume= 0.135 af, Atten= 94%, Lag= 0.0 min  
 Discarded = 0.07 cfs @ 7.33 hrs, Volume= 0.135 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 360.48' @ 12.32 hrs Surf.Area= 1,407 sf Storage= 3,342 cf

Plug-Flow detention time= 381.2 min calculated for 0.135 af (100% of inflow)  
 Center-of-Mass det. time= 381.2 min ( 1,150.7 - 769.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	359.00'	3,855 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
#2	357.00'	696 cf	<b>Sand/Loam (Prismatic)</b> Listed below (Recalc)
			2,111 cf Overall x 33.0% Voids
		4,551 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
359.00	1,407	0	0
359.10	1,455	143	143
359.45	1,629	540	683
360.00	1,915	975	1,657
361.00	2,480	2,198	3,855

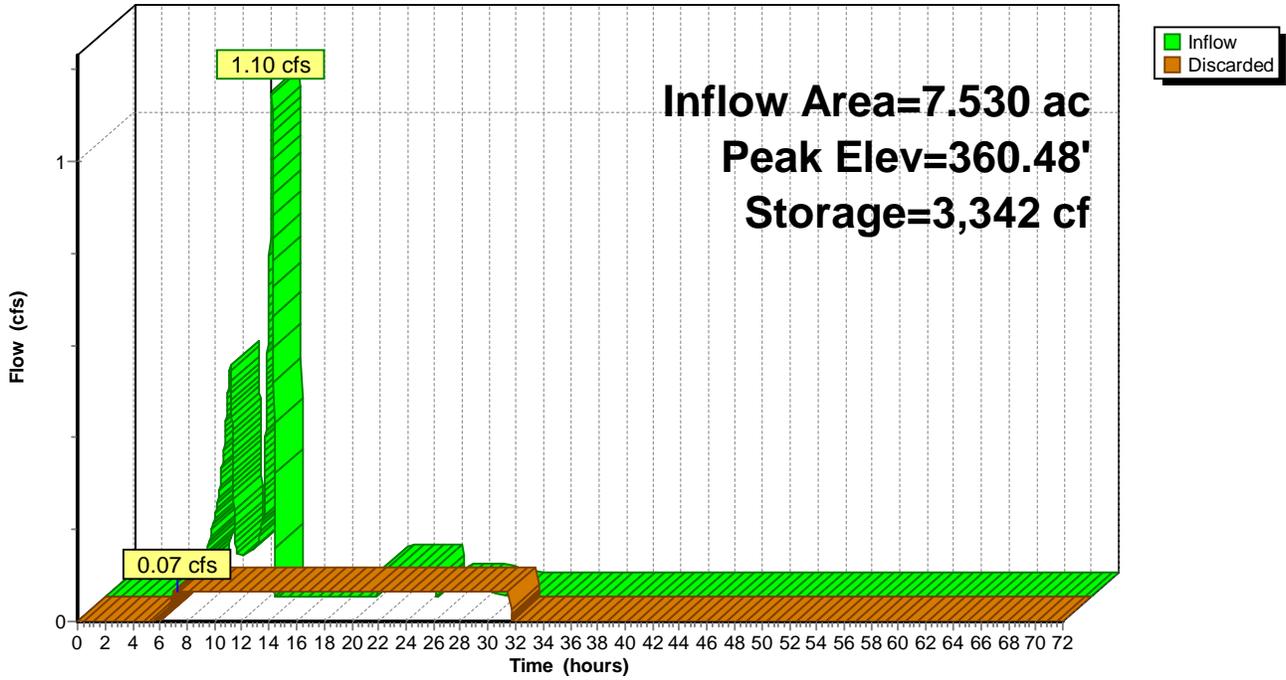
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
357.00	1,407	0	0
358.50	1,407	2,111	2,111

Device	Routing	Invert	Outlet Devices
#1	Discarded	357.00'	<b>2.000 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.07 cfs @ 7.33 hrs HW=357.04' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

### Pond 114: Sand Filter A

Hydrograph



**Hydrograph for Pond 114: Sand Filter A**

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Discarded (cfs)
0.00	0.00	0	357.00	0.00
2.00	0.00	0	357.00	0.00
4.00	0.00	0	357.00	0.00
6.00	0.00	0	357.00	<b>0.00</b>
8.00	0.17	183	357.39	<b>0.07</b>
10.00	0.09	1,564	359.56	0.07
12.00	<b>0.74</b>	<b>2,425</b>	<b>360.04</b>	0.07
14.00	<b>0.00</b>	<b>2,949</b>	<b>360.30</b>	0.07
16.00	0.00	2,480	360.07	0.07
18.00	0.00	2,011	359.82	0.07
20.00	0.03	1,543	359.55	0.07
22.00	0.06	1,516	359.53	0.07
24.00	0.06	1,494	359.52	0.07
26.00	0.02	1,149	359.31	0.07
28.00	0.02	816	359.08	0.07
30.00	0.00	384	357.83	0.07
32.00	0.00	0	357.00	0.00
34.00	0.00	0	357.00	0.00
36.00	0.00	0	357.00	0.00
38.00	0.00	0	357.00	0.00
40.00	0.00	0	357.00	0.00
42.00	0.00	0	357.00	0.00
44.00	0.00	0	357.00	0.00
46.00	0.00	0	357.00	0.00
48.00	0.00	0	357.00	0.00
50.00	0.00	0	357.00	0.00
52.00	0.00	0	357.00	0.00
54.00	0.00	0	357.00	0.00
56.00	0.00	0	357.00	0.00
58.00	0.00	0	357.00	0.00
60.00	0.00	0	357.00	0.00
62.00	0.00	0	357.00	0.00
64.00	0.00	0	357.00	0.00
66.00	0.00	0	357.00	0.00
68.00	0.00	0	357.00	0.00
70.00	0.00	0	357.00	0.00
72.00	0.00	0	357.00	0.00

**Summary for Pond 115: Detention Pond A**

Inflow = 33.57 cfs @ 12.19 hrs, Volume= 3.363 af  
 Outflow = 33.22 cfs @ 12.22 hrs, Volume= 3.363 af, Atten= 1%, Lag= 1.8 min  
 Primary = 22.62 cfs @ 12.22 hrs, Volume= 3.181 af  
     Routed to Link 119 : DP-1 Northeast Wetland  
 Secondary = 10.60 cfs @ 12.22 hrs, Volume= 0.182 af  
     Routed to Link 119 : DP-1 Northeast Wetland

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 353.26' @ 12.22 hrs Surf.Area= 4,795 sf Storage= 12,428 cf

Plug-Flow detention time= 10.5 min calculated for 3.363 af (100% of inflow)  
 Center-of-Mass det. time= 10.5 min ( 836.8 - 826.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	348.00'	16,248 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
348.00	237	0	0
350.00	1,717	1,954	1,954
352.00	3,516	5,233	7,187
354.00	5,545	9,061	16,248

Device	Routing	Invert	Outlet Devices
#1	Primary	342.50'	<b>18.00" Round Culvert</b> L= 68.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 342.50' / 338.00' S= 0.0662 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	347.00'	<b>6.00" Vert. Low Flow 6"</b> C= 0.600 Limited to weir flow at low heads
#3	Device 1	349.70'	<b>6.00" W x 12.00" H Vert. Orifice/Grate 2 yr</b> C= 0.600 Limited to weir flow at low heads
#4	Device 1	350.80'	<b>15.00" W x 12.00" H Vert. Orifice/Grate 10 yr</b> C= 0.600 Limited to weir flow at low heads
#5	Device 1	352.00'	<b>30.00" W x 8.00" H Vert. Orifice/Grate 25 yr</b> C= 0.600 Limited to weir flow at low heads
#6	Secondary	353.00'	<b>30.0' long x 14.0' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.64 2.67 2.70 2.65 2.64 2.65 2.65 2.63

**Primary OutFlow** Max=22.62 cfs @ 12.22 hrs HW=353.26' TW=0.00' (Dynamic Tailwater)

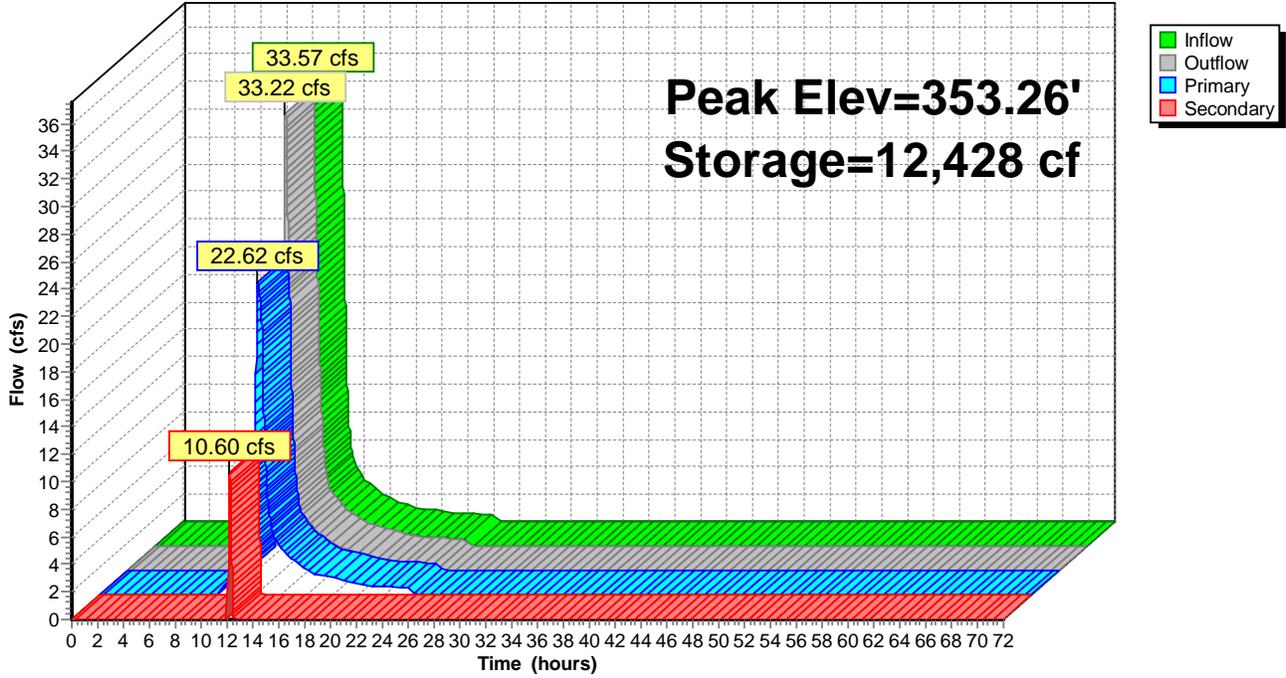
- ↑ **1=Culvert** (Passes 22.62 cfs of 23.75 cfs potential flow)
- ↑ **2=Low Flow 6"** (Orifice Controls 2.32 cfs @ 11.80 fps)
- ↑ **3=Orifice/Grate 2 yr** (Orifice Controls 4.21 cfs @ 8.41 fps)
- ↑ **4=Orifice/Grate 10 yr** (Orifice Controls 8.40 cfs @ 6.72 fps)
- ↑ **5=Orifice/Grate 25 yr** (Orifice Controls 7.69 cfs @ 4.61 fps)

**Secondary OutFlow** Max=10.59 cfs @ 12.22 hrs HW=353.26' TW=0.00' (Dynamic Tailwater)

- ↑ **6=Broad-Crested Rectangular Weir** (Weir Controls 10.59 cfs @ 1.35 fps)

### Pond 115: Detention Pond A

Hydrograph



**Hydrograph for Pond 115: Detention Pond A**

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	348.00	0.00	0.00	0.00
2.00	0.00	0	348.00	0.00	0.00	0.00
4.00	0.00	0	348.00	0.00	0.00	0.00
6.00	0.00	0	348.00	0.00	0.00	0.00
8.00	0.00	0	348.00	0.00	0.00	0.00
10.00	0.95	32	348.11	0.88	0.88	0.00
12.00	<b>16.83</b>	<b>7,343</b>	<b>352.04</b>	<b>10.49</b>	<b>10.49</b>	<b>0.00</b>
14.00	<b>3.16</b>	<b>3,511</b>	<b>350.76</b>	<b>3.49</b>	<b>3.49</b>	<b>0.00</b>
16.00	1.70	2,008	350.03	1.88	1.88	0.00
18.00	1.03	675	349.07	1.27	1.27	0.00
20.00	0.79	0	348.00	0.80	0.80	0.00
22.00	0.61	0	348.00	0.61	0.61	0.00
24.00	0.47	0	348.00	0.47	0.47	0.00
26.00	0.00	0	348.00	0.00	0.00	0.00
28.00	0.00	0	348.00	0.00	0.00	0.00
30.00	0.00	0	348.00	0.00	0.00	0.00
32.00	0.00	0	348.00	0.00	0.00	0.00
34.00	0.00	0	348.00	0.00	0.00	0.00
36.00	0.00	0	348.00	0.00	0.00	0.00
38.00	0.00	0	348.00	0.00	0.00	0.00
40.00	0.00	0	348.00	0.00	0.00	0.00
42.00	0.00	0	348.00	0.00	0.00	0.00
44.00	0.00	0	348.00	0.00	0.00	0.00
46.00	0.00	0	348.00	0.00	0.00	0.00
48.00	0.00	0	348.00	0.00	0.00	0.00
50.00	0.00	0	348.00	0.00	0.00	0.00
52.00	0.00	0	348.00	0.00	0.00	0.00
54.00	0.00	0	348.00	0.00	0.00	0.00
56.00	0.00	0	348.00	0.00	0.00	0.00
58.00	0.00	0	348.00	0.00	0.00	0.00
60.00	0.00	0	348.00	0.00	0.00	0.00
62.00	0.00	0	348.00	0.00	0.00	0.00
64.00	0.00	0	348.00	0.00	0.00	0.00
66.00	0.00	0	348.00	0.00	0.00	0.00
68.00	0.00	0	348.00	0.00	0.00	0.00
70.00	0.00	0	348.00	0.00	0.00	0.00
72.00	0.00	0	348.00	0.00	0.00	0.00

**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Summary for Subcatchment 116: WPost-06**

Runoff = 6.07 cfs @ 12.18 hrs, Volume= 0.545 af, Depth= 3.97"

Routed to Pond 117 : Concrete Arch Culvert

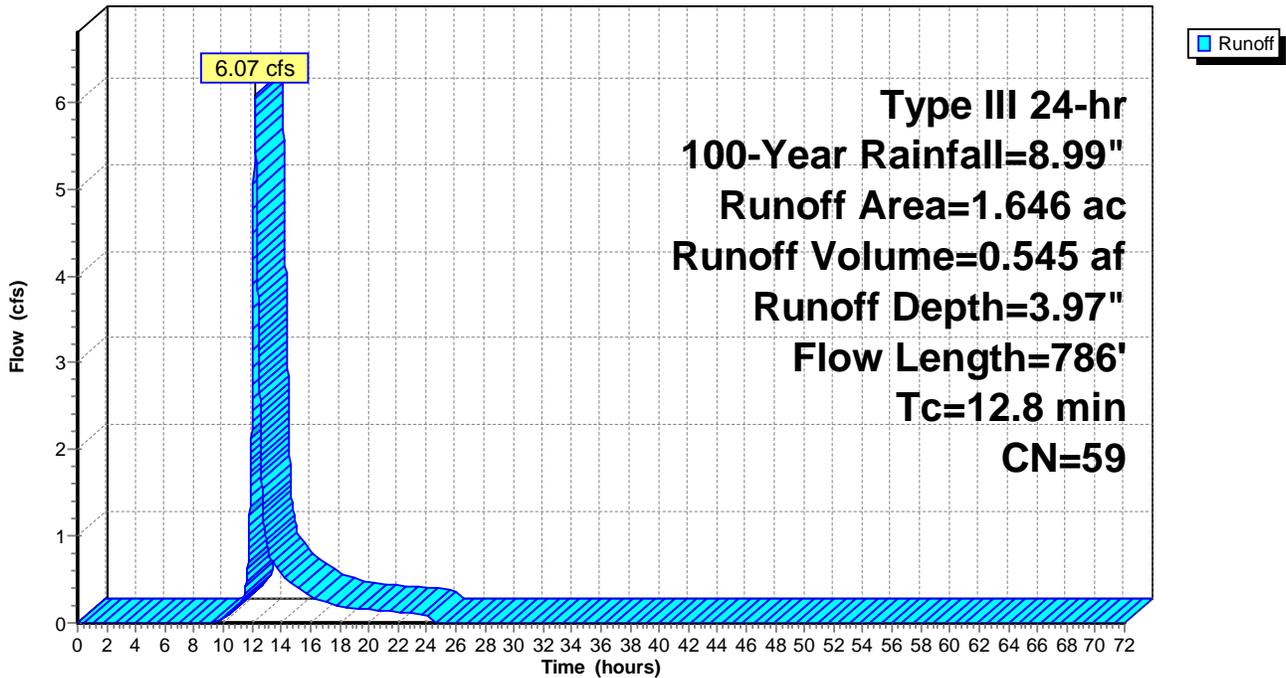
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.014	61	>75% Grass cover, Good, HSG B
0.013	80	>75% Grass cover, Good, HSG D
1.319	55	Woods, Good, HSG B
0.301	77	Woods, Good, HSG D
1.646	59	Weighted Average
1.646	59	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.1230	0.16		<b>Sheet Flow, A</b>
					Woods: Light underbrush n= 0.400 P2= 3.27"
2.5	686	0.0833	4.65		<b>Shallow Concentrated Flow, B</b>
					Unpaved Kv= 16.1 fps
12.8	786	Total			

**Subcatchment 116: WPost-06**

Hydrograph



**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Subcatchment 116: WPost-06**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	54.00	8.99	3.97	0.00
1.00	0.09	0.00	0.00	55.00	8.99	3.97	0.00
2.00	0.18	0.00	0.00	56.00	8.99	3.97	0.00
3.00	0.28	0.00	0.00	57.00	8.99	3.97	0.00
4.00	0.39	0.00	0.00	58.00	8.99	3.97	0.00
5.00	0.51	0.00	0.00	59.00	8.99	3.97	0.00
6.00	0.65	0.00	0.00	60.00	8.99	3.97	0.00
7.00	0.81	0.00	0.00	61.00	8.99	3.97	0.00
8.00	1.02	0.00	0.00	62.00	8.99	3.97	0.00
9.00	1.31	0.00	0.00	63.00	8.99	3.97	0.00
10.00	1.70	0.01	0.04	64.00	8.99	3.97	0.00
11.00	2.25	0.09	0.19	65.00	8.99	3.97	0.00
12.00	4.49	0.96	<b>2.45</b>	66.00	8.99	3.97	0.00
13.00	6.74	2.33	<b>0.92</b>	67.00	8.99	3.97	0.00
14.00	7.29	2.71	0.56	68.00	8.99	3.97	0.00
15.00	7.68	2.99	0.43	69.00	8.99	3.97	0.00
16.00	7.97	3.20	0.31	70.00	8.99	3.97	0.00
17.00	8.18	3.35	0.24	71.00	8.99	3.97	0.00
18.00	8.34	3.48	0.19	72.00	8.99	3.97	0.00
19.00	8.48	3.58	0.17				
20.00	8.60	3.67	0.15				
21.00	8.72	3.76	0.14				
22.00	8.82	3.84	0.13				
23.00	8.91	3.91	0.11				
24.00	<b>8.99</b>	<b>3.97</b>	0.10				
25.00	8.99	3.97	0.00				
26.00	8.99	3.97	0.00				
27.00	8.99	3.97	0.00				
28.00	8.99	3.97	0.00				
29.00	8.99	3.97	0.00				
30.00	8.99	3.97	0.00				
31.00	8.99	3.97	0.00				
32.00	8.99	3.97	0.00				
33.00	8.99	3.97	0.00				
34.00	8.99	3.97	0.00				
35.00	8.99	3.97	0.00				
36.00	8.99	3.97	0.00				
37.00	8.99	3.97	0.00				
38.00	8.99	3.97	0.00				
39.00	8.99	3.97	0.00				
40.00	8.99	3.97	0.00				
41.00	8.99	3.97	0.00				
42.00	8.99	3.97	0.00				
43.00	8.99	3.97	0.00				
44.00	8.99	3.97	0.00				
45.00	8.99	3.97	0.00				
46.00	8.99	3.97	0.00				
47.00	8.99	3.97	0.00				
48.00	8.99	3.97	0.00				
49.00	8.99	3.97	0.00				
50.00	8.99	3.97	0.00				
51.00	8.99	3.97	0.00				
52.00	8.99	3.97	0.00				
53.00	8.99	3.97	0.00				

**Summary for Pond 117: Concrete Arch Culvert**

Inflow Area = 1.646 ac, 0.00% Impervious, Inflow Depth = 3.97" for 100-Year event  
 Inflow = 6.07 cfs @ 12.18 hrs, Volume= 0.545 af  
 Outflow = 6.07 cfs @ 12.18 hrs, Volume= 0.545 af, Atten= 0%, Lag= 0.0 min  
 Primary = 6.07 cfs @ 12.18 hrs, Volume= 0.545 af  
 Routed to Link 119 : DP-1 Northeast Wetland

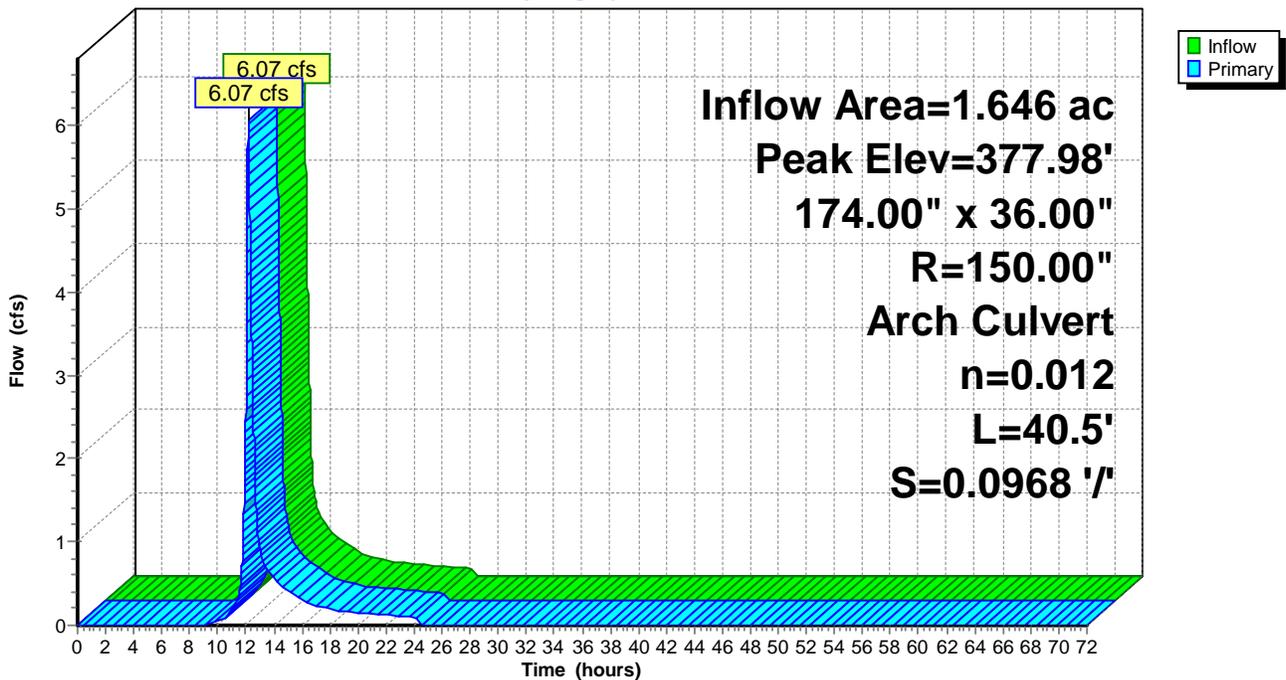
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 377.98' @ 12.18 hrs

Device #1	Routing	Invert	Outlet Devices
	Primary	377.72'	<b>174.00" W x 36.00" H, R=150.00" Arch Culvert</b> L= 40.5' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 377.72' / 373.80' S= 0.0968 '/ Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 32.75 sf

**Primary OutFlow** Max=6.07 cfs @ 12.18 hrs HW=377.98' TW=0.00' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Inlet Controls 6.07 cfs @ 1.63 fps)

**Pond 117: Concrete Arch Culvert**

Hydrograph



**Hydrograph for Pond 117: Concrete Arch Culvert**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	377.72	0.00	54.00	0.00	377.72	0.00
1.00	0.00	377.72	0.00	55.00	0.00	377.72	0.00
2.00	0.00	377.72	0.00	56.00	0.00	377.72	0.00
3.00	0.00	377.72	0.00	57.00	0.00	377.72	0.00
4.00	0.00	377.72	0.00	58.00	0.00	377.72	0.00
5.00	0.00	377.72	0.00	59.00	0.00	377.72	0.00
6.00	0.00	377.72	0.00	60.00	0.00	377.72	0.00
7.00	0.00	377.72	0.00	61.00	0.00	377.72	0.00
8.00	0.00	377.72	0.00	62.00	0.00	377.72	0.00
9.00	0.00	377.72	0.00	63.00	0.00	377.72	0.00
10.00	0.04	377.73	0.04	64.00	0.00	377.72	0.00
11.00	0.19	377.74	0.19	65.00	0.00	377.72	0.00
12.00	<b>2.45</b>	<b>377.86</b>	<b>2.45</b>	66.00	0.00	377.72	0.00
13.00	<b>0.92</b>	<b>377.79</b>	<b>0.92</b>	67.00	0.00	377.72	0.00
14.00	0.56	377.77	0.56	68.00	0.00	377.72	0.00
15.00	0.43	377.76	0.43	69.00	0.00	377.72	0.00
16.00	0.31	377.75	0.31	70.00	0.00	377.72	0.00
17.00	0.24	377.75	0.24	71.00	0.00	377.72	0.00
18.00	0.19	377.74	0.19	72.00	0.00	377.72	0.00
19.00	0.17	377.74	0.17				
20.00	0.15	377.74	0.15				
21.00	0.14	377.74	0.14				
22.00	0.13	377.74	0.13				
23.00	0.11	377.74	0.11				
24.00	0.10	377.74	0.10				
25.00	0.00	377.72	0.00				
26.00	0.00	377.72	0.00				
27.00	0.00	377.72	0.00				
28.00	0.00	377.72	0.00				
29.00	0.00	377.72	0.00				
30.00	0.00	377.72	0.00				
31.00	0.00	377.72	0.00				
32.00	0.00	377.72	0.00				
33.00	0.00	377.72	0.00				
34.00	0.00	377.72	0.00				
35.00	0.00	377.72	0.00				
36.00	0.00	377.72	0.00				
37.00	0.00	377.72	0.00				
38.00	0.00	377.72	0.00				
39.00	0.00	377.72	0.00				
40.00	0.00	377.72	0.00				
41.00	0.00	377.72	0.00				
42.00	0.00	377.72	0.00				
43.00	0.00	377.72	0.00				
44.00	0.00	377.72	0.00				
45.00	0.00	377.72	0.00				
46.00	0.00	377.72	0.00				
47.00	0.00	377.72	0.00				
48.00	0.00	377.72	0.00				
49.00	0.00	377.72	0.00				
50.00	0.00	377.72	0.00				
51.00	0.00	377.72	0.00				
52.00	0.00	377.72	0.00				
53.00	0.00	377.72	0.00				

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

Prepared by DiPrete Engineering

Printed 1/22/2025

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**Summary for Subcatchment 118: WPost-07**

Runoff = 12.86 cfs @ 12.17 hrs, Volume= 1.133 af, Depth= 4.71"  
 Routed to Link 119 : DP-1 Northeast Wetland

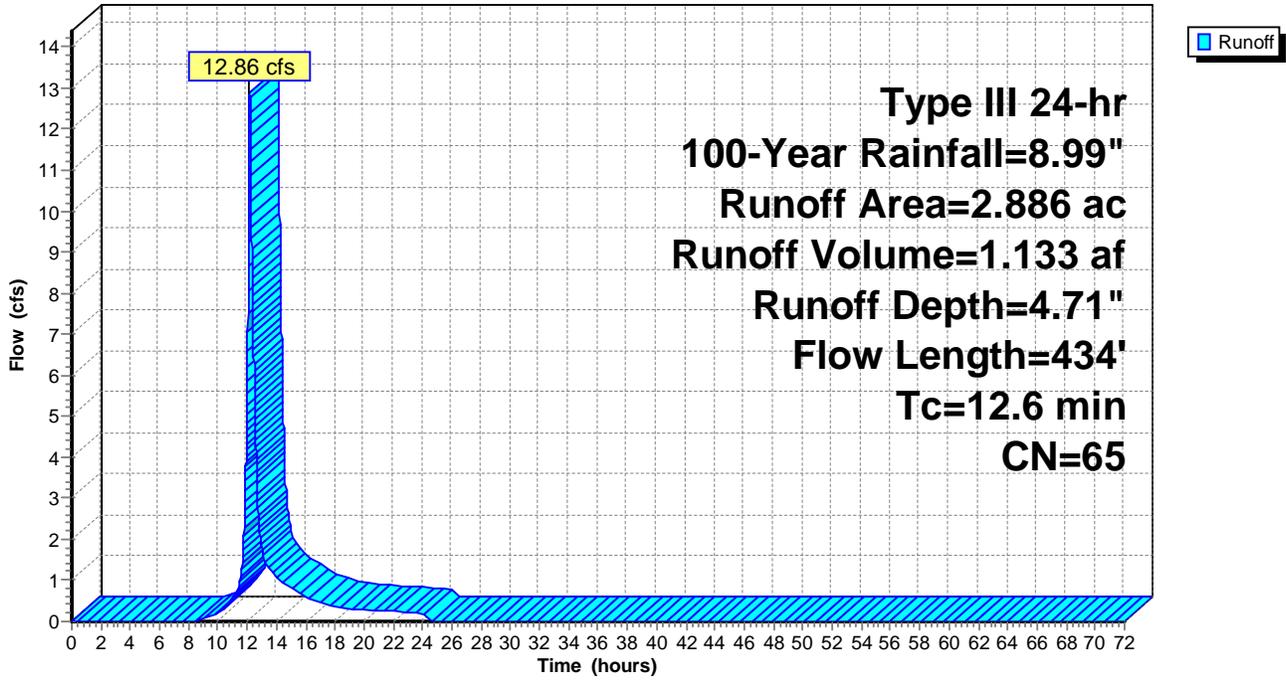
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.261	61	>75% Grass cover, Good, HSG B
0.456	74	>75% Grass cover, Good, HSG C
0.006	80	>75% Grass cover, Good, HSG D
0.000	98	Impervious, HSG B
0.000	98	Impervious, HSG D
0.000	98	Roofs, HSG B
1.058	55	Woods, Good, HSG B
0.991	70	Woods, Good, HSG C
0.114	77	Woods, Good, HSG D
2.886	65	Weighted Average
2.886	65	100.00% Pervious Area
0.000	98	0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0900	0.14		<b>Sheet Flow, A</b>
					Woods: Light underbrush n= 0.400 P2= 3.27"
1.0	334	0.1107	5.36		<b>Shallow Concentrated Flow, B</b>
					Unpaved Kv= 16.1 fps
12.6	434	Total			

Subcatchment 118: WPost-07

Hydrograph



**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Subcatchment 118: WPost-07**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	54.00	8.99	4.71	0.00
1.00	0.09	0.00	0.00	55.00	8.99	4.71	0.00
2.00	0.18	0.00	0.00	56.00	8.99	4.71	0.00
3.00	0.28	0.00	0.00	57.00	8.99	4.71	0.00
4.00	0.39	0.00	0.00	58.00	8.99	4.71	0.00
5.00	0.51	0.00	0.00	59.00	8.99	4.71	0.00
6.00	0.65	0.00	0.00	60.00	8.99	4.71	0.00
7.00	0.81	0.00	0.00	61.00	8.99	4.71	0.00
8.00	1.02	0.00	0.00	62.00	8.99	4.71	0.00
9.00	1.31	0.01	0.06	63.00	8.99	4.71	0.00
10.00	1.70	0.06	0.21	64.00	8.99	4.71	0.00
11.00	2.25	0.21	0.54	65.00	8.99	4.71	0.00
12.00	4.49	1.33	<b>5.55</b>	66.00	8.99	4.71	0.00
13.00	6.74	2.90	<b>1.81</b>	67.00	8.99	4.71	0.00
14.00	7.29	3.33	1.10	68.00	8.99	4.71	0.00
15.00	7.68	3.64	0.83	69.00	8.99	4.71	0.00
16.00	7.97	3.87	0.60	70.00	8.99	4.71	0.00
17.00	8.18	4.04	0.47	71.00	8.99	4.71	0.00
18.00	8.34	4.17	0.36	72.00	8.99	4.71	0.00
19.00	8.48	4.29	0.32				
20.00	8.60	4.39	0.29				
21.00	8.72	4.48	0.26				
22.00	8.82	4.56	0.24				
23.00	8.91	4.64	0.21				
24.00	<b>8.99</b>	<b>4.71</b>	0.19				
25.00	8.99	4.71	0.00				
26.00	8.99	4.71	0.00				
27.00	8.99	4.71	0.00				
28.00	8.99	4.71	0.00				
29.00	8.99	4.71	0.00				
30.00	8.99	4.71	0.00				
31.00	8.99	4.71	0.00				
32.00	8.99	4.71	0.00				
33.00	8.99	4.71	0.00				
34.00	8.99	4.71	0.00				
35.00	8.99	4.71	0.00				
36.00	8.99	4.71	0.00				
37.00	8.99	4.71	0.00				
38.00	8.99	4.71	0.00				
39.00	8.99	4.71	0.00				
40.00	8.99	4.71	0.00				
41.00	8.99	4.71	0.00				
42.00	8.99	4.71	0.00				
43.00	8.99	4.71	0.00				
44.00	8.99	4.71	0.00				
45.00	8.99	4.71	0.00				
46.00	8.99	4.71	0.00				
47.00	8.99	4.71	0.00				
48.00	8.99	4.71	0.00				
49.00	8.99	4.71	0.00				
50.00	8.99	4.71	0.00				
51.00	8.99	4.71	0.00				
52.00	8.99	4.71	0.00				
53.00	8.99	4.71	0.00				

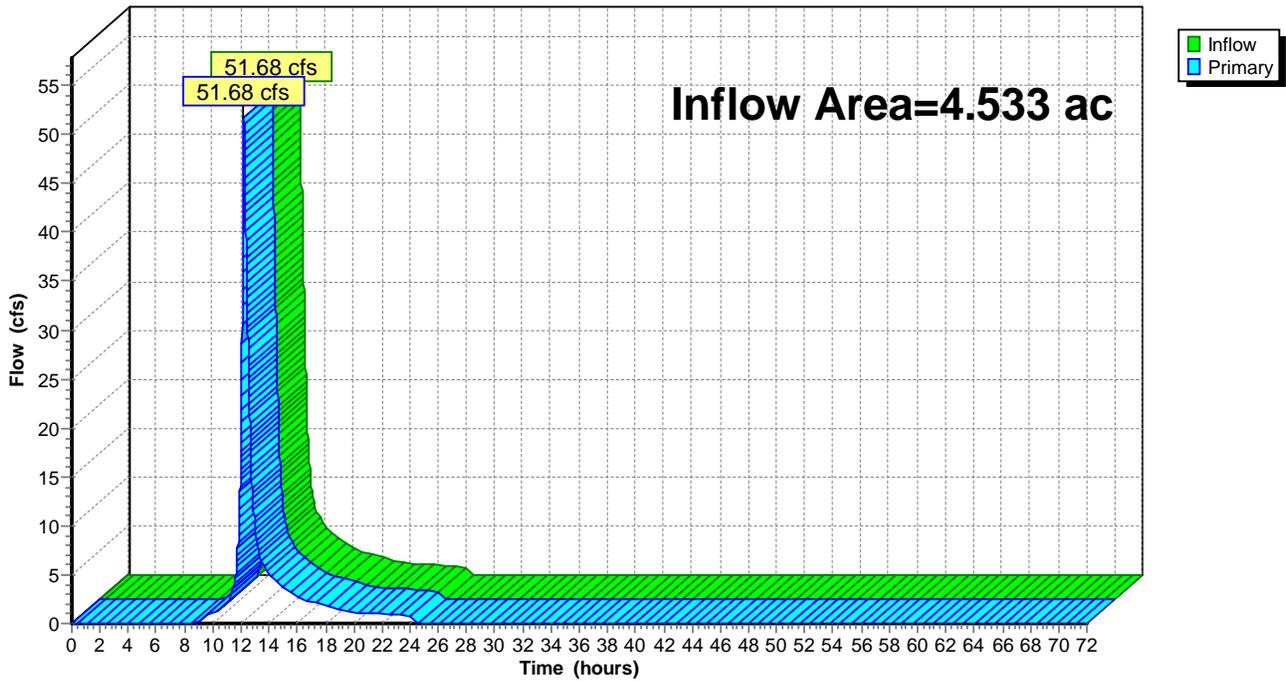
### Summary for Link 119: DP-1 Northeast Wetland

Inflow Area = 4.533 ac, 0.00% Impervious, Inflow Depth = 13.34" for 100-Year event  
Inflow = 51.68 cfs @ 12.20 hrs, Volume= 5.041 af  
Primary = 51.68 cfs @ 12.20 hrs, Volume= 5.041 af, Atten= 0%, Lag= 0.0 min

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

### Link 119: DP-1 Northeast Wetland

Hydrograph



**Hydrograph for Link 119: DP-1 Northeast Wetland**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	<b>0.00</b>	0.00	54.00	0.00	0.00	0.00
1.00	0.00	0.00	0.00	55.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	56.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	57.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	58.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	59.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	61.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	62.00	0.00	0.00	0.00
9.00	0.06	0.00	0.06	63.00	0.00	0.00	0.00
10.00	1.13	0.00	1.13	64.00	0.00	0.00	0.00
11.00	2.10	0.00	2.10	65.00	0.00	0.00	0.00
12.00	<b>18.49</b>	0.00	<b>18.49</b>	66.00	0.00	0.00	0.00
13.00	<b>9.77</b>	0.00	<b>9.77</b>	67.00	0.00	0.00	0.00
14.00	5.15	0.00	5.15	68.00	0.00	0.00	0.00
15.00	3.79	0.00	3.79	69.00	0.00	0.00	0.00
16.00	2.79	0.00	2.79	70.00	0.00	0.00	0.00
17.00	2.19	0.00	2.19	71.00	0.00	0.00	0.00
18.00	1.83	0.00	1.83	72.00	0.00	0.00	0.00
19.00	1.44	0.00	1.44				
20.00	1.24	0.00	1.24				
21.00	1.07	0.00	1.07				
22.00	0.97	0.00	0.97				
23.00	0.87	0.00	0.87				
24.00	0.76	0.00	0.76				
25.00	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
27.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
29.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
31.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
33.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
35.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
37.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
39.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
41.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
43.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
45.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
47.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
49.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
51.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
53.00	0.00	0.00	0.00				

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

Prepared by DiPrete Engineering

Printed 1/22/2025

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**Summary for Subcatchment 120: WPost-08**

Runoff = 8.36 cfs @ 12.24 hrs, Volume= 0.842 af, Depth= 4.22"

Routed to Pond 121 : Proprietary device (Downstream Defender)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

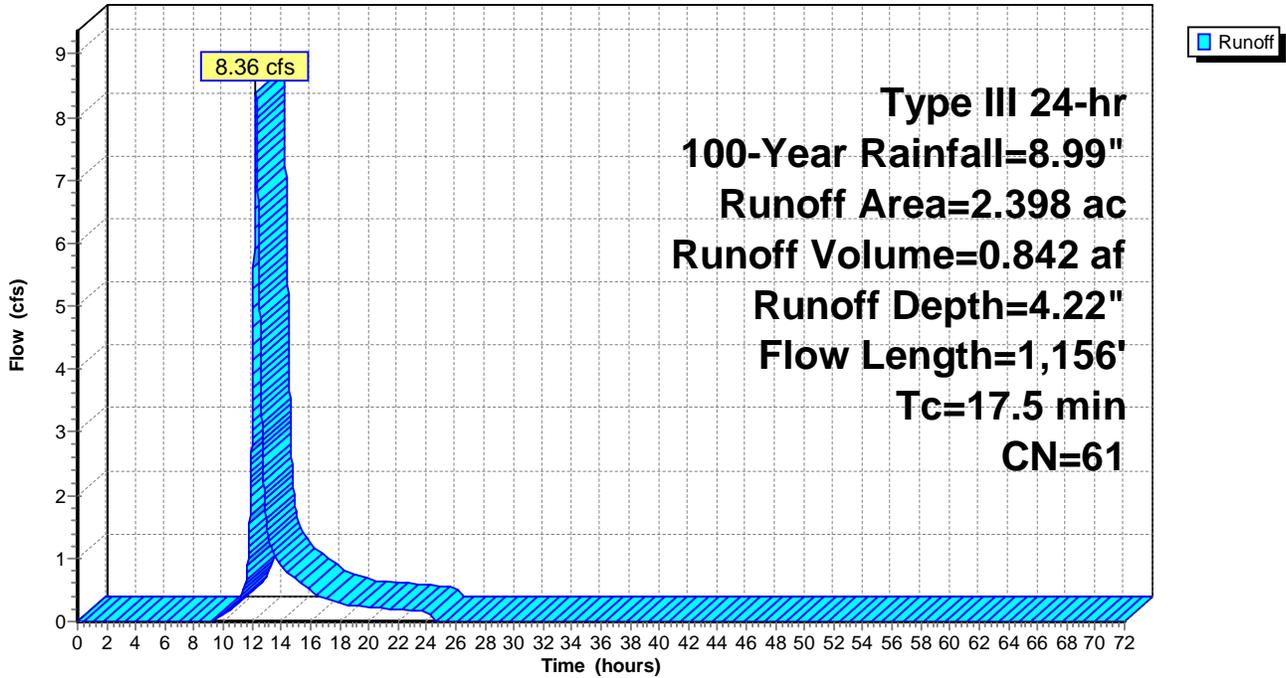
Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.483	61	>75% Grass cover, Good, HSG B
0.189	98	Impervious, HSG B
0.006	98	Impervious, HSG D
0.050	98	Roofs, HSG B
1.668	55	Woods, Good, HSG B
0.002	77	Woods, Good, HSG D
2.398	61	Weighted Average
2.153	56	89.81% Pervious Area
0.244	98	10.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0580	0.12		<b>Sheet Flow, A</b>
					Woods: Light underbrush n= 0.400 P2= 3.27"
2.9	824	0.0856	4.71		<b>Shallow Concentrated Flow, B</b>
					Unpaved Kv= 16.1 fps
0.7	232	0.0849	5.91		<b>Shallow Concentrated Flow, C</b>
					Paved Kv= 20.3 fps
17.5	1,156	Total			

Subcatchment 120: WPost-08

Hydrograph



**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 100-Year Rainfall=8.99"

Printed 1/22/2025

**Hydrograph for Subcatchment 120: WPost-08**

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.00	54.00	8.99	4.22	0.00
1.00	0.09	0.00	0.00	55.00	8.99	4.22	0.00
2.00	0.18	0.00	0.00	56.00	8.99	4.22	0.00
3.00	0.28	0.00	0.00	57.00	8.99	4.22	0.00
4.00	0.39	0.00	0.00	58.00	8.99	4.22	0.00
5.00	0.51	0.00	0.00	59.00	8.99	4.22	0.00
6.00	0.65	0.00	0.00	60.00	8.99	4.22	0.00
7.00	0.81	0.00	0.00	61.00	8.99	4.22	0.00
8.00	1.02	0.00	0.00	62.00	8.99	4.22	0.00
9.00	1.31	0.00	0.00	63.00	8.99	4.22	0.00
10.00	1.70	0.03	0.09	64.00	8.99	4.22	0.00
11.00	2.25	0.13	0.30	65.00	8.99	4.22	0.00
12.00	4.49	1.08	<b>3.04</b>	66.00	8.99	4.22	0.00
13.00	6.74	2.52	<b>1.56</b>	67.00	8.99	4.22	0.00
14.00	7.29	2.91	0.88	68.00	8.99	4.22	0.00
15.00	7.68	3.20	0.66	69.00	8.99	4.22	0.00
16.00	7.97	3.42	0.48	70.00	8.99	4.22	0.00
17.00	8.18	3.58	0.37	71.00	8.99	4.22	0.00
18.00	8.34	3.71	0.29	72.00	8.99	4.22	0.00
19.00	8.48	3.81	0.25				
20.00	8.60	3.91	0.23				
21.00	8.72	4.00	0.21				
22.00	8.82	4.08	0.19				
23.00	8.91	4.15	0.17				
24.00	<b>8.99</b>	<b>4.22</b>	0.15				
25.00	8.99	4.22	0.00				
26.00	8.99	4.22	0.00				
27.00	8.99	4.22	0.00				
28.00	8.99	4.22	0.00				
29.00	8.99	4.22	0.00				
30.00	8.99	4.22	0.00				
31.00	8.99	4.22	0.00				
32.00	8.99	4.22	0.00				
33.00	8.99	4.22	0.00				
34.00	8.99	4.22	0.00				
35.00	8.99	4.22	0.00				
36.00	8.99	4.22	0.00				
37.00	8.99	4.22	0.00				
38.00	8.99	4.22	0.00				
39.00	8.99	4.22	0.00				
40.00	8.99	4.22	0.00				
41.00	8.99	4.22	0.00				
42.00	8.99	4.22	0.00				
43.00	8.99	4.22	0.00				
44.00	8.99	4.22	0.00				
45.00	8.99	4.22	0.00				
46.00	8.99	4.22	0.00				
47.00	8.99	4.22	0.00				
48.00	8.99	4.22	0.00				
49.00	8.99	4.22	0.00				
50.00	8.99	4.22	0.00				
51.00	8.99	4.22	0.00				
52.00	8.99	4.22	0.00				
53.00	8.99	4.22	0.00				

**Summary for Pond 121: Proprietary device (Downstream Defender)**

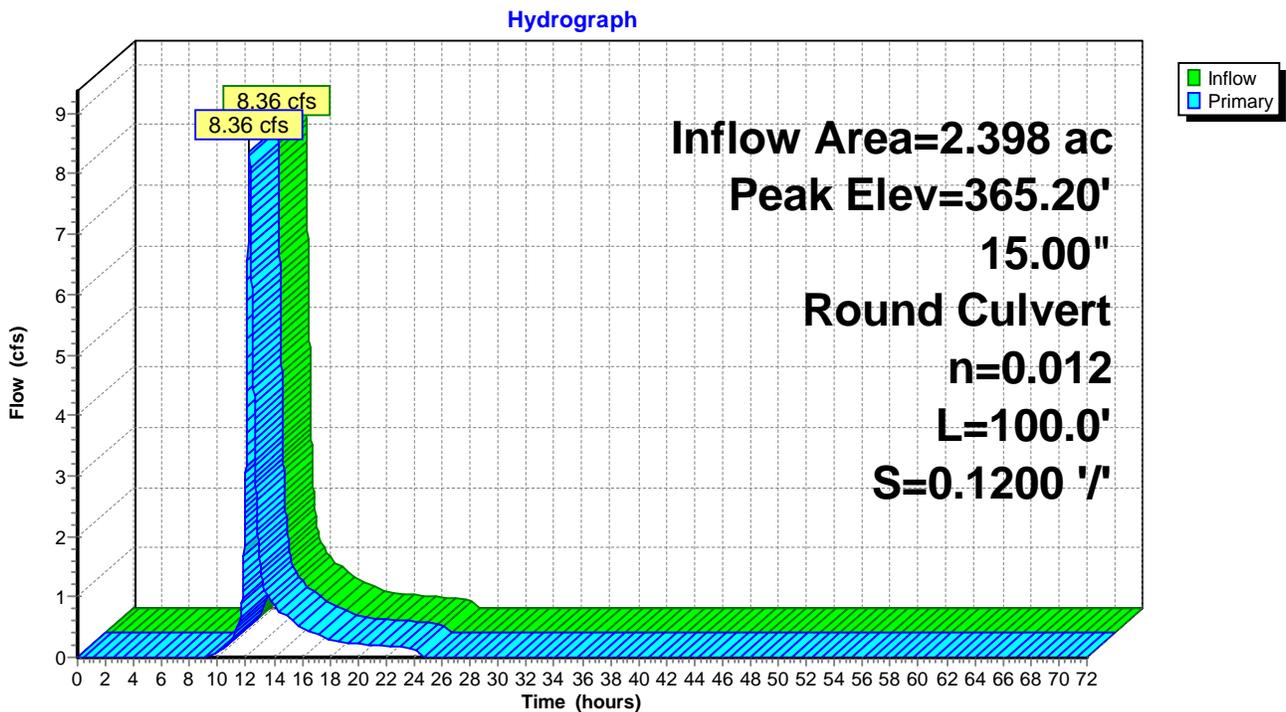
Inflow Area = 2.398 ac, 10.19% Impervious, Inflow Depth = 4.22" for 100-Year event  
 Inflow = 8.36 cfs @ 12.24 hrs, Volume= 0.842 af  
 Outflow = 8.36 cfs @ 12.24 hrs, Volume= 0.842 af, Atten= 0%, Lag= 0.0 min  
 Primary = 8.36 cfs @ 12.24 hrs, Volume= 0.842 af  
 Routed to Link 122 : Ex Detention Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 365.20' @ 12.24 hrs

Device #1	Routing	Invert	Outlet Devices
	Primary	362.00'	<b>15.00" Round Culvert</b> L= 100.0' CMP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 362.00' / 350.00' S= 0.1200 '/ Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf

**Primary OutFlow** Max=8.36 cfs @ 12.24 hrs HW=365.20' TW=0.00' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Inlet Controls 8.36 cfs @ 6.81 fps)

**Pond 121: Proprietary device (Downstream Defender)**



**Hydrograph for Pond 121: Proprietary device (Downstream Defender)**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	362.00	0.00	54.00	0.00	362.00	0.00
1.00	0.00	362.00	0.00	55.00	0.00	362.00	0.00
2.00	0.00	362.00	0.00	56.00	0.00	362.00	0.00
3.00	0.00	362.00	0.00	57.00	0.00	362.00	0.00
4.00	0.00	362.00	0.00	58.00	0.00	362.00	0.00
5.00	0.00	362.00	0.00	59.00	0.00	362.00	0.00
6.00	0.00	362.00	0.00	60.00	0.00	362.00	0.00
7.00	0.00	362.00	0.00	61.00	0.00	362.00	0.00
8.00	0.00	362.00	0.00	62.00	0.00	362.00	0.00
9.00	0.00	362.00	0.00	63.00	0.00	362.00	0.00
10.00	0.09	362.14	0.09	64.00	0.00	362.00	0.00
11.00	0.30	362.27	0.30	65.00	0.00	362.00	0.00
12.00	<b>3.04</b>	<b>362.97</b>	<b>3.04</b>	66.00	0.00	362.00	0.00
13.00	<b>1.56</b>	<b>362.65</b>	<b>1.56</b>	67.00	0.00	362.00	0.00
14.00	0.88	362.47	0.88	68.00	0.00	362.00	0.00
15.00	0.66	362.41	0.66	69.00	0.00	362.00	0.00
16.00	0.48	362.34	0.48	70.00	0.00	362.00	0.00
17.00	0.37	362.30	0.37	71.00	0.00	362.00	0.00
18.00	0.29	362.26	0.29	72.00	0.00	362.00	0.00
19.00	0.25	362.24	0.25				
20.00	0.23	362.23	0.23				
21.00	0.21	362.22	0.21				
22.00	0.19	362.21	0.19				
23.00	0.17	362.20	0.17				
24.00	0.15	362.19	0.15				
25.00	0.00	362.00	0.00				
26.00	0.00	362.00	0.00				
27.00	0.00	362.00	0.00				
28.00	0.00	362.00	0.00				
29.00	0.00	362.00	0.00				
30.00	0.00	362.00	0.00				
31.00	0.00	362.00	0.00				
32.00	0.00	362.00	0.00				
33.00	0.00	362.00	0.00				
34.00	0.00	362.00	0.00				
35.00	0.00	362.00	0.00				
36.00	0.00	362.00	0.00				
37.00	0.00	362.00	0.00				
38.00	0.00	362.00	0.00				
39.00	0.00	362.00	0.00				
40.00	0.00	362.00	0.00				
41.00	0.00	362.00	0.00				
42.00	0.00	362.00	0.00				
43.00	0.00	362.00	0.00				
44.00	0.00	362.00	0.00				
45.00	0.00	362.00	0.00				
46.00	0.00	362.00	0.00				
47.00	0.00	362.00	0.00				
48.00	0.00	362.00	0.00				
49.00	0.00	362.00	0.00				
50.00	0.00	362.00	0.00				
51.00	0.00	362.00	0.00				
52.00	0.00	362.00	0.00				
53.00	0.00	362.00	0.00				

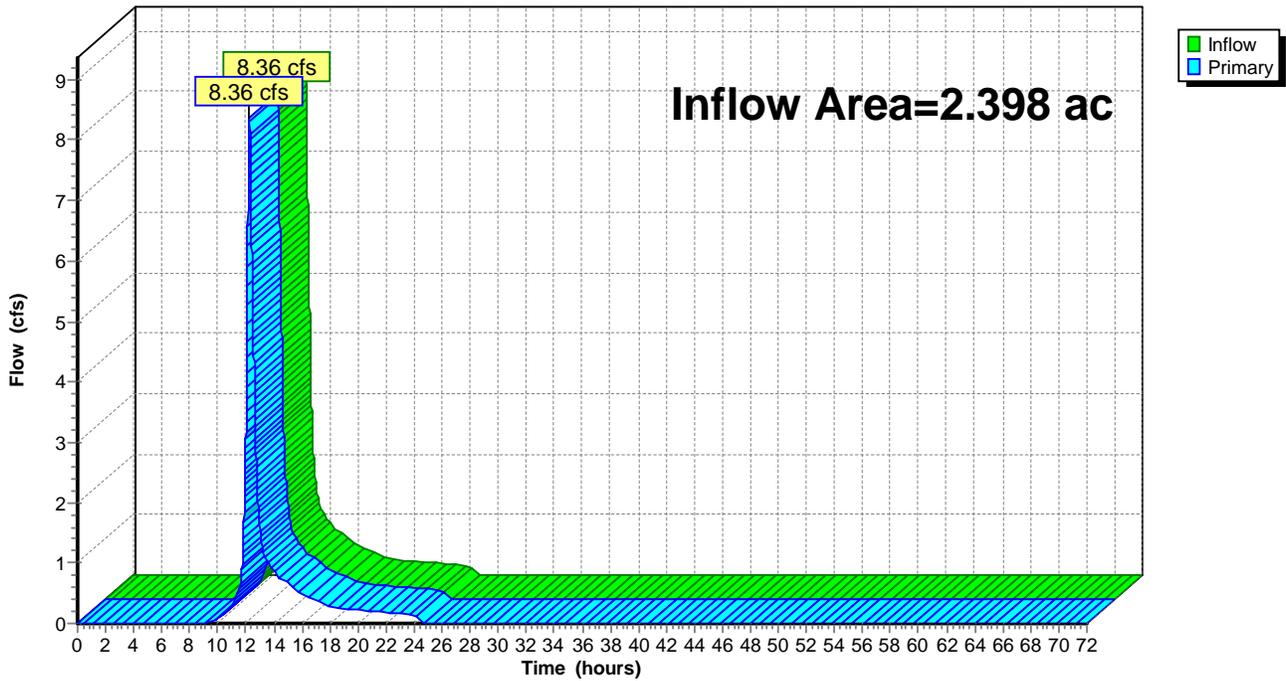
### Summary for Link 122: Ex Detention Pond

Inflow Area = 2.398 ac, 10.19% Impervious, Inflow Depth = 4.22" for 100-Year event  
Inflow = 8.36 cfs @ 12.24 hrs, Volume= 0.842 af  
Primary = 8.36 cfs @ 12.24 hrs, Volume= 0.842 af, Atten= 0%, Lag= 0.0 min

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

### Link 122: Ex Detention Pond

Hydrograph



**Hydrograph for Link 122: Ex Detention Pond**

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.00	<b>0.00</b>	0.00	54.00	0.00	0.00	0.00
1.00	0.00	0.00	0.00	55.00	0.00	0.00	0.00
2.00	0.00	0.00	0.00	56.00	0.00	0.00	0.00
3.00	0.00	0.00	0.00	57.00	0.00	0.00	0.00
4.00	0.00	0.00	0.00	58.00	0.00	0.00	0.00
5.00	0.00	0.00	0.00	59.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	60.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	61.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	62.00	0.00	0.00	0.00
9.00	0.00	0.00	0.00	63.00	0.00	0.00	0.00
10.00	0.09	0.00	0.09	64.00	0.00	0.00	0.00
11.00	0.30	0.00	0.30	65.00	0.00	0.00	0.00
12.00	<b>3.04</b>	0.00	<b>3.04</b>	66.00	0.00	0.00	0.00
13.00	<b>1.56</b>	0.00	<b>1.56</b>	67.00	0.00	0.00	0.00
14.00	0.88	0.00	0.88	68.00	0.00	0.00	0.00
15.00	0.66	0.00	0.66	69.00	0.00	0.00	0.00
16.00	0.48	0.00	0.48	70.00	0.00	0.00	0.00
17.00	0.37	0.00	0.37	71.00	0.00	0.00	0.00
18.00	0.29	0.00	0.29	72.00	0.00	0.00	0.00
19.00	0.25	0.00	0.25				
20.00	0.23	0.00	0.23				
21.00	0.21	0.00	0.21				
22.00	0.19	0.00	0.19				
23.00	0.17	0.00	0.17				
24.00	0.15	0.00	0.15				
25.00	0.00	0.00	0.00				
26.00	0.00	0.00	0.00				
27.00	0.00	0.00	0.00				
28.00	0.00	0.00	0.00				
29.00	0.00	0.00	0.00				
30.00	0.00	0.00	0.00				
31.00	0.00	0.00	0.00				
32.00	0.00	0.00	0.00				
33.00	0.00	0.00	0.00				
34.00	0.00	0.00	0.00				
35.00	0.00	0.00	0.00				
36.00	0.00	0.00	0.00				
37.00	0.00	0.00	0.00				
38.00	0.00	0.00	0.00				
39.00	0.00	0.00	0.00				
40.00	0.00	0.00	0.00				
41.00	0.00	0.00	0.00				
42.00	0.00	0.00	0.00				
43.00	0.00	0.00	0.00				
44.00	0.00	0.00	0.00				
45.00	0.00	0.00	0.00				
46.00	0.00	0.00	0.00				
47.00	0.00	0.00	0.00				
48.00	0.00	0.00	0.00				
49.00	0.00	0.00	0.00				
50.00	0.00	0.00	0.00				
51.00	0.00	0.00	0.00				
52.00	0.00	0.00	0.00				
53.00	0.00	0.00	0.00				

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### A3.3 Water Quality Storm Analysis

**3343-001-ALLS-EHCD-INHS**

Type III 24-hr WQ Storm Rainfall=1.20"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 10: WPre-01**

Runoff Area=1.145 ac 0.00% Impervious Runoff Depth=0.00"  
Flow Length=1,097' Tc=17.4 min CN=55/0 Runoff=0.00 cfs 0.000 af

**Subcatchment 11: WPre-02**

Runoff Area=12.075 ac 0.00% Impervious Runoff Depth=0.00"  
Flow Length=1,700' Tc=19.5 min CN=65/0 Runoff=0.01 cfs 0.003 af

**Link 12: DP-1 Northeast Wetland**

Inflow=0.01 cfs 0.003 af  
Primary=0.01 cfs 0.003 af

**Reach 21: Pipe**

Avg. Flow Depth=0.00' Max Vel=0.00 fps  
15.00" Round Pipe n=0.012 L=374.0' S=0.0914 '/ Capacity=21.16 cfs Outflow=0.00 cfs 0.000 af

**Pond 23: Ex Detention Pond**

Peak Elev=329.00' Storage=0 cf Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

**Link 24: DP-1 Northeast Ex Detention Pond**

Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr WQ Storm Rainfall=1.20"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: WPost-01** Runoff Area=2.915 ac 2.56% Impervious Runoff Depth=0.03"  
 Flow Length=818' Tc=13.3 min CN=66/98 Runoff=0.07 cfs 0.007 af

**Pond 101: CB-5** Peak Elev=375.10' Inflow=0.07 cfs 0.007 af  
 18.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=0.07 cfs 0.007 af

**Subcatchment 102: WPost-02** Runoff Area=0.431 ac 38.14% Impervious Runoff Depth=0.38"  
 Tc=6.0 min CN=61/98 Runoff=0.18 cfs 0.014 af

**Pond 103: CB-6** Peak Elev=375.46' Inflow=0.18 cfs 0.014 af  
 15.00" Round Culvert n=0.012 L=18.0' S=0.0050 '/ Outflow=0.18 cfs 0.014 af

**Pond 104: DMH-7** Peak Elev=374.60' Inflow=0.23 cfs 0.021 af  
 24.00" Round Culvert n=0.012 L=48.0' S=0.0100 '/ Outflow=0.23 cfs 0.021 af

**Subcatchment 105: WPost-03** Runoff Area=3.008 ac 7.15% Impervious Runoff Depth=0.14"  
 Flow Length=1,237' Tc=17.7 min CN=75/98 Runoff=0.18 cfs 0.035 af

**Pond 106: CB-1** Peak Elev=375.35' Inflow=0.18 cfs 0.035 af  
 24.00" Round Culvert n=0.012 L=21.0' S=0.0100 '/ Outflow=0.18 cfs 0.035 af

**Subcatchment 107: WPost-04** Runoff Area=0.350 ac 61.18% Impervious Runoff Depth=0.60"  
 Tc=6.0 min CN=61/98 Runoff=0.23 cfs 0.018 af

**Pond 108: CB-2** Peak Elev=376.71' Inflow=0.23 cfs 0.018 af  
 10.00" Round Culvert n=0.012 L=201.0' S=0.0010 '/ Outflow=0.23 cfs 0.018 af

**Pond 109: DMH-3** Peak Elev=375.21' Inflow=0.35 cfs 0.052 af  
 24.00" Round Culvert n=0.012 L=52.0' S=0.0200 '/ Outflow=0.35 cfs 0.052 af

**Pond 110: DMH-4** Peak Elev=373.19' Inflow=0.58 cfs 0.073 af  
 36.00" Round Culvert n=0.013 L=227.0' S=0.0758 '/ Outflow=0.58 cfs 0.073 af

**Pond 111: DMH-8** Peak Elev=359.45' Inflow=0.58 cfs 0.073 af  
 36.00" Round Culvert n=0.013 L=17.6' S=0.0114 '/ Outflow=0.62 cfs 0.073 af

**Subcatchment 112: WPost-05** Runoff Area=0.825 ac 0.00% Impervious Runoff Depth=0.00"  
 Flow Length=160' Tc=6.5 min CN=65/0 Runoff=0.00 cfs 0.000 af

**Pond 113: Sediment Forebay A** Peak Elev=359.45' Storage=1,341 cf Inflow=0.62 cfs 0.073 af  
 Primary=0.48 cfs 0.073 af Secondary=0.00 cfs 0.000 af Outflow=0.48 cfs 0.073 af

**Pond 114: Sand Filter A** Peak Elev=359.22' Storage=1,017 cf Inflow=0.48 cfs 0.073 af  
 Outflow=0.07 cfs 0.073 af

**Pond 115: Detention Pond A** Peak Elev=348.00' Storage=0 cf Inflow=0.00 cfs 0.000 af  
 Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr WQ Storm Rainfall=1.20"

Prepared by DiPrete Engineering

Printed 1/22/2025

HydroCAD® 10.20-6a s/n 01125 © 2024 HydroCAD Software Solutions LLC

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**Subcatchment 116: WPost-06**

Runoff Area=1.646 ac 0.00% Impervious Runoff Depth=0.00"  
Flow Length=786' Tc=12.8 min CN=59/0 Runoff=0.00 cfs 0.000 af

**Pond 117: Concrete Arch Culvert**

Peak Elev=377.72' Inflow=0.00 cfs 0.000 af  
174.00" x 36.00", R=150.00" Arch Culvert n=0.012 L=40.5' S=0.0968 '/' Outflow=0.00 cfs 0.000 af

**Subcatchment 118: WPost-07**

Runoff Area=2.886 ac 0.00% Impervious Runoff Depth=0.00"  
Flow Length=434' Tc=12.6 min CN=65/98 Runoff=0.00 cfs 0.001 af

**Link 119: DP-1 Northeast Wetland**

Inflow=0.00 cfs 0.001 af  
Primary=0.00 cfs 0.001 af

**Subcatchment 120: WPost-08**

Runoff Area=2.398 ac 10.19% Impervious Runoff Depth=0.10"  
Flow Length=1,156' Tc=17.5 min CN=56/98 Runoff=0.19 cfs 0.020 af

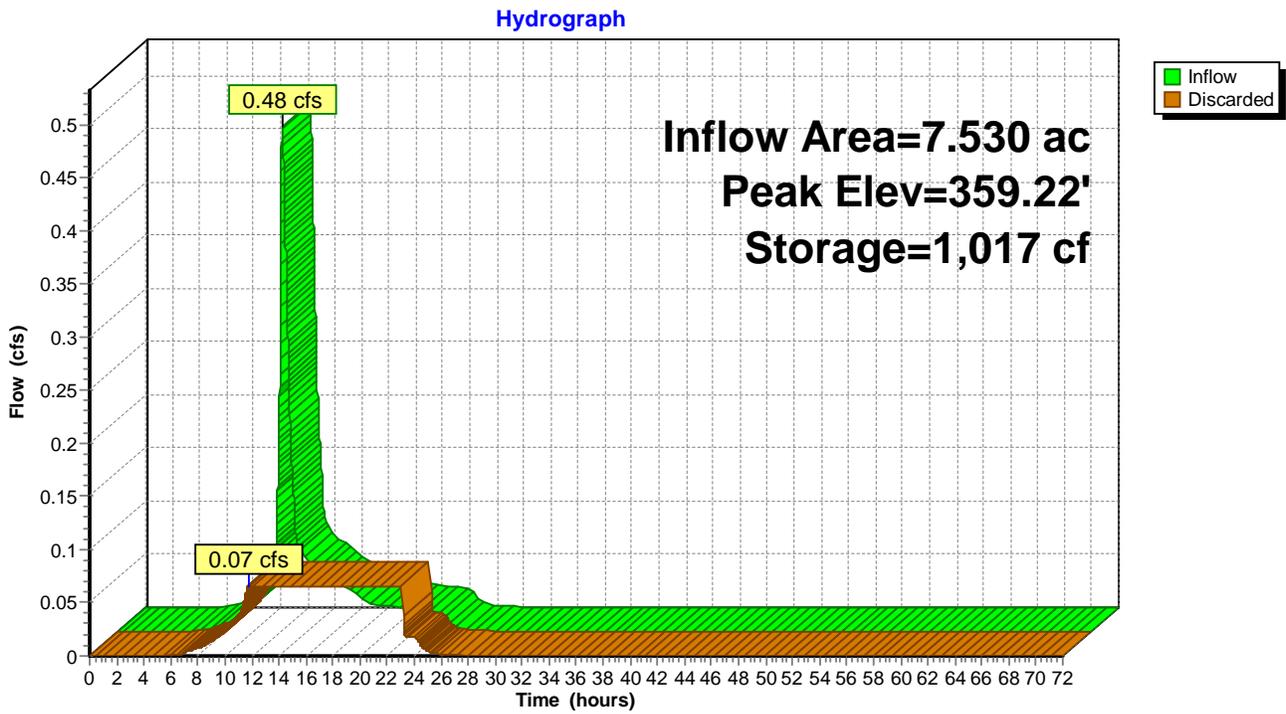
**Pond 121: Proprietary device (Downstream Defender)**

Peak Elev=362.21' Inflow=0.19 cfs 0.020 af  
15.00" Round Culvert n=0.012 L=100.0' S=0.1200 '/' Outflow=0.19 cfs 0.020 af

**Link 122: Ex Detention Pond**

Inflow=0.19 cfs 0.020 af  
Primary=0.19 cfs 0.020 af

Pond 114: Sand Filter A



**Hydrograph for Pond 114: Sand Filter A**

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Discarded (cfs)
0.00	0.00	0	357.00	0.00
2.00	0.00	0	357.00	0.00
4.00	0.00	0	357.00	0.00
6.00	0.00	0	357.00	0.00
8.00	0.01	1	357.00	0.01
10.00	0.02	2	357.00	<b>0.02</b>
12.00	<b>0.23</b>	86	357.19	<b>0.07</b>
14.00	<b>0.07</b>	<b>1,015</b>	<b>359.22</b>	0.07
16.00	0.05	<b>967</b>	<b>359.19</b>	0.07
18.00	0.03	792	359.07	0.07
20.00	0.02	513	358.10	0.07
22.00	0.02	205	357.44	0.07
24.00	0.02	1	357.00	0.02
26.00	0.00	0	357.00	0.00
28.00	0.00	0	357.00	0.00
30.00	0.00	0	357.00	0.00
32.00	0.00	0	357.00	0.00
34.00	0.00	0	357.00	0.00
36.00	0.00	0	357.00	0.00
38.00	0.00	0	357.00	0.00
40.00	0.00	0	357.00	0.00
42.00	0.00	0	357.00	0.00
44.00	0.00	0	357.00	0.00
46.00	0.00	0	357.00	0.00
48.00	0.00	0	357.00	0.00
50.00	0.00	0	357.00	0.00
52.00	0.00	0	357.00	0.00
54.00	0.00	0	357.00	0.00
56.00	0.00	0	357.00	0.00
58.00	0.00	0	357.00	0.00
60.00	0.00	0	357.00	0.00
62.00	0.00	0	357.00	0.00
64.00	0.00	0	357.00	0.00
66.00	0.00	0	357.00	0.00
68.00	0.00	0	357.00	0.00
70.00	0.00	0	357.00	0.00
72.00	0.00	0	357.00	0.00

---

### A3.4 TSS & TP Removal Calculations Worksheets and Downstream Defender Details

**INSTRUCTIONS:**

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

Version 1, Automated: Mar. 4, 2008

Location:

	B	C	D	E	F
	BMP <sup>1</sup>	TSS Removal Rate <sup>1</sup>	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
<b>TSS Removal Calculation Worksheet</b>	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	Sand Filter	0.80	0.75	0.60	0.15
	Extended Dry Detention Basin	0.50	0.15	0.08	0.08
		0.00	0.08	0.00	0.08
		0.00	0.08	0.00	0.08

**Total TSS Removal =**

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

Project:   
 Prepared By:   
 Date:

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

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

**Louise Drive  
 Pollutant Loading Calculations - Pre-Development - Total Phosphorus  
 Annual RainFall**

<i>Watershed</i>	<i>Land Use</i>	<i>Area</i> (acres)	<i>Loading</i> (lb/ac/yr)	<i>Total Loading</i> lbs/year
<b>Site</b>	Open Land/Agriculture	13.22	1.52	20.1
				<b>20.1</b>

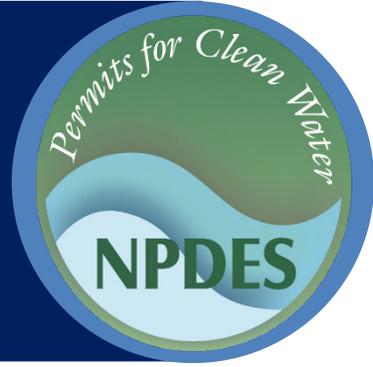
Louise Drive  
 Pollutant Loading Calculations - Post Development -Total Phosphorus  
 Annual RainFall

Watershed	Land Use	Area (acres)	Impervious (%)	Runoff Coef., Rv (lb/ac/yr)	Concentration (lb/ac/yr)	Catch Basins 0%	Sand Filter 50%	Downstream Defender 30%	Ext Dry Detention Basin 68%	Pollutant Removal Efficiencies		Loading
										Overall Efficiency (%)	Resultant Conc. (mg/l)	Total Loading lbs/year
North Watershed	Highway	1.45	58.2%	0.57	1.34	0%	50%		68%	84%	0.21	0.3
	Medium Density Res (MDR)	11.77	2.8%	0.08	1.96	0%	50%		68%	84%	0.31	3.7
											<b>Total Loading</b>	<b>4.0</b>
											Pre Loading	20.09
											Difference	(16.09)
											%	<b>80%</b>



# Stormwater Best Management Practice

## Dry Detention Ponds



**Minimum Measure:** Post Construction Stormwater Management in New Development and Redevelopment  
**Subcategory:** Retention/Detention

### Description

Dry detention ponds (also called dry ponds, extended detention basins, detention ponds and extended detention ponds) are basins that detain stormwater for some minimum time (e.g., 24 hours) to allow particles and pollutants to settle and reduce peak flow rates. They do not have large permanent pools of water—unlike wet ponds—though they often have small pools at the inlet and outlet of the basin. Although dry detention ponds were once popular for flood control, they are less so now, given their limited ability to provide water quality treatment.

### Applicability

Dry detention ponds have traditionally been one of the most widely used stormwater controls. They are appropriate for detaining stormwater from large drainage areas (typically 10 or more acres). They require a large area to construct, so other stormwater controls are more appropriate for smaller sites (see [Grassed Swales](#), [Infiltration Basin](#), [Infiltration Trench](#), [Bioretention \(Rain Gardens\)](#), [Permeable Pavements](#), or [Green Roofs](#)). If pollutant removal efficiency is an important consideration, dry detention ponds may not be the most appropriate choice.



Dry detention pond with security fencing.  
Credit: Jared Richardson for USEPA, 2012

### Regional Applicability

Dry detention ponds can work in all regions of the United States. Design engineers might need to make minor changes in cold or arid climates or in regions with karst (i.e., limestone) topography.

### Stormwater Hot Spots

Dry detention ponds can accept flow from stormwater hot spots, but to do so need a liner or significant separation from groundwater.

### Stormwater Retrofit

As noted above, dry detention ponds were common stormwater controls in the past but have become less popular given their limited ability to address water quality concerns (see “Limitations” below). They can be useful stormwater retrofit options, though, given their existing prevalence and the fact that they already offer certain stormwater management benefits such as flood control. In retrofit scenarios, it is possible to modify these facilities to incorporate features that address additional objectives such as water quality treatment and channel protection. This could be a more cost-effective option than constructing an entirely new stormwater control—as could combining a dry detention basin with other

Common Terms
<p><b>Stormwater hot spots</b> are areas where land use or activities generate highly contaminated stormwater discharges, with pollutant concentrations exceeding those typically found in stormwater. Examples include gas stations, vehicle repair areas and waste storage areas.</p>
<p>A <b>stormwater retrofit</b> is a stormwater management practice (usually structural) put into place after development or construction of a stormwater control to improve water quality, protect downstream channels, reduce flooding or meet other specific objectives that did not exist at the time of original construction.</p>

stormwater treatment options to address water quality impacts.

### Cold Water (Trout) Streams

Dry detention ponds can increase the temperature of stormwater they receive (UNHSC, 2011). Generally, the only way to mitigate this effect is to decrease the detention time. Alternative stormwater controls may therefore be more appropriate in areas discharging to cold water streams.

### Siting Considerations

Designers need to ensure that the dry detention pond is feasible at the site in question. This section provides basic guidelines for siting dry detention ponds.

### Drainage Area

In general, dry detention ponds are appropriate for sites with a minimum area of 10 acres. On smaller sites, it can be challenging to provide proper discharge control because the orifice diameter at the outlet needed to control relatively small storms becomes very small and thus prone to clogging (City of Portland, 2016). For smaller sites, [green infrastructure](#) practices and [on-lot treatment controls](#) are better options given their smaller footprint and effectiveness.

### Slope

Dry detention ponds can operate at sites with slopes up to about 15 percent. The local slope needs to be relatively flat: this allows the pond's side slopes to be reasonably flat, which keeps safety risks low.

There is no minimum slope requirement, though there needs to be enough elevation drop from the pond inlet to the pond outlet to ensure that flow can move through the system.

### Soils

Dry detention ponds can function with almost all soils and geology, with minor design adjustments for karst areas or in rapidly percolating soils such as sand. In such areas, extended detention ponds need impermeable liners to prevent groundwater contamination or sinkhole formation.

### Standing Water

To limit standing water, the base of the extended detention facility should not intersect the groundwater table. The persistence of standing water for more than 3 days in dry detention facilities makes them ideal breeding grounds for mosquitoes (Metzger et al., 2002).

### Design Considerations

Specific designs may vary considerably, depending on site constraints, preferences of the designer or community, or local regulations. Common recommended features fall into five basic categories: pretreatment, treatment, conveyance, maintenance reduction and landscaping. For any project, design engineers should follow local requirements.

### Pretreatment

Removing coarse sediment particles from stormwater before they reach the large permanent pool reduces a pond's maintenance burden. Pretreatment features help settle out these particles. For a pond, the appropriate pretreatment feature is a sediment forebay, a small pool at the entrance to the pond (typically about 10 percent of the volume of water that the pond will treat for pollutant removal).

### Treatment

Treatment design features enhance a stormwater control's ability to remove pollutants. To allow for enough settling time, the pond should be large enough to detain the volume of stormwater it treats for between 12 and 48 hours. Designing dry ponds with a high length-to-width ratio (i.e., at least 1.5:1) and incorporating other design features to maximize the flow path effectively increases the detention time in the system by keeping flow from short-circuiting the pond. Designing ponds with relatively flat side slopes can also help to lengthen the effective flow path. Last, as dry detention ponds alone do not provide a high degree of pollutant removal, adding filtration at the outlet improves water quality before discharging to receiving waters.

### Conveyance

The conveyance system should carry stormwater to and from dry ponds safely, in a manner that minimizes erosion potential. It is also important to stabilize the outfall of pond systems to prevent scouring. To convey

low flows through the system, designers should incorporate a small, shallow pilot channel, as well as an emergency spillway to safely convey water from large floods. To help mitigate the warming of water at the outlet channel, designers should provide shade around the channel at the pond outlet, if possible.

### Maintenance Reduction

Stormwater controls need regular maintenance. Design features can ease this maintenance burden. In a dry detention pond, a micropool at the outlet can prevent resuspension of sediment and outlet clogging. A good design includes maintenance access to the forebay and micropool.

Another design feature that can reduce maintenance needs is a non-clogging outlet. Typical examples include a reverse-slope pipe or a weir outlet with a trash rack. A reverse-slope pipe draws from below the permanent pool, extending in a reverse angle up to the riser, and determines the water elevation of the micropool. Because these outlets draw water from below the level of the permanent pool, floating debris is less likely to clog them.

### Landscaping

Designers should maintain a vegetated buffer around the dry detention pond and should select plants within the detention zone (i.e., the portion of the pond up to the elevation where it detains stormwater) that can withstand both wet and dry periods.

### Storage Pipes and Tanks

Another variation of the dry detention pond design is the use of storage tanks, storage pipes or underground vaults. This approach is most common in urban environments on small sites with limited opportunity to provide flood control—where underground storage for a

large drainage area would generally be costly. Because the drainage area contributing to tank or pipe storage is typically small, the outlet diameter needed to reduce the flow from very small storms would be very small. A very small outlet diameter, along with the underground location of the tanks or pipes, creates the chance that debris will build up in the outlet and cause maintenance problems.

### Arid or Semiarid Climates

In arid and semiarid regions, design engineers might need to make changes to conserve scarce water resources. Any landscaping plans should prescribe drought-tolerant vegetation wherever possible. In addition, the design engineer can replace the wet forebay with an alternative dry pretreatment, such as a detention cell. In regions with distinct wet and dry seasons—as in many arid regions—detention ponds can have recreation uses in the dry season (e.g., as ball fields).

### Cold Climates

In cold climates, some additional design features can help to treat spring snowmelt. One such modification is to increase the volume available for detention to help treat this relatively large flow event. As well, it may be necessary to remove sediment from the forebay more often than in warmer climates (see “Maintenance Considerations” below for guidelines) to account for sedimentation due to road sanding.

### Maintenance Considerations

In addition to incorporating features into the dry detention pond design to minimize maintenance, site operators will need to carry out some regular maintenance and inspection practices. Table 1 outlines some of these practices.

Table 1. Typical maintenance activities for dry ponds

Activity	Schedule
<ul style="list-style-type: none"> <li>■ Note erosion of pond banks or bottom</li> </ul>	Semiannual inspection
<ul style="list-style-type: none"> <li>■ Inspect for damage to the embankment</li> <li>■ Monitor for sediment accumulation in the facility and forebay</li> <li>■ Examine to ensure that inlet and outlet devices are free of debris and operational</li> </ul>	Annual inspection
<ul style="list-style-type: none"> <li>■ Repair undercut or eroded areas</li> <li>■ Mow side slopes</li> <li>■ Manage pesticide and nutrients</li> <li>■ Remove litter and debris</li> </ul>	Standard maintenance
<ul style="list-style-type: none"> <li>■ Seed or sod to restore dead or damaged ground cover</li> </ul>	Annual maintenance (as needed)
<ul style="list-style-type: none"> <li>■ Monitor sediment accumulations in the forebay; remove sediment when the forebay capacity has been reduced by 50 percent</li> </ul>	2- to 7-year maintenance
<ul style="list-style-type: none"> <li>■ Monitor sediment accumulations; remove sediment when the pond volume has been reduced by 25 percent</li> </ul>	25- to 50-year maintenance

Source: Modified from MPCA, 2017

## Limitations

Although dry detention ponds are widely applicable, they have some limitations that might make other stormwater controls preferable:

- Dry detention ponds have limited water quality treatment capacity compared to other structural stormwater controls and are ineffective at removing soluble pollutants (see “Effectiveness”).
- Dry extended detention ponds may become a nuisance due to mosquito breeding if improperly maintained or if shallow pools of water form for more than 3 days.
- Dry ponds may detract from the value of a home (see “Cost Considerations”).

Dry detention ponds on their own only provide peak flow reduction and do little to control stormwater volume, which could result in adverse downstream impacts.

## Effectiveness

Structural stormwater controls can achieve four broad resource protection goals: flood control, channel protection, groundwater recharge and pollutant removal. Dry detention basins can provide flood control and channel protection, as well as some limited pollutant removal. They are not typically designed to provide groundwater recharge (for a similar control that does provide groundwater recharge, see [Infiltration Basin](#)). However, some infiltration to surrounding soils may occur, particularly in soils with high infiltration rates.

### Flood Control

One objective of stormwater controls can be to reduce the flood hazard associated with large storm events by reducing the peak flow associated with these storms. One of the main purposes of dry detention basins is to slow stormwater and reduce peak flow rates. Dry detention ponds therefore provide effective flood control, especially in conjunction with other peak flow reduction controls throughout a watershed.

## Channel Protection

One result of urbanization is the geomorphic changes that occur in response to modified hydrology. Traditionally, dry detention basins have provided control of the 2-year storm for channel protection. However, it appears that this control has been relatively ineffective for channel protection. Research suggests that control of a smaller storm, such as the 1-year storm, might be more appropriate (MacRae, 1996; Tillinghast et al., 2011). Most current channel protection standards are based on the 1-year storm event (e.g., MDE, 2009).

## Pollutant Removal

Dry detention basins provide some pollutant removal, provided that the design features described in the “Siting Considerations” and “Design Considerations” sections are incorporated. Although they are effective at removing some pollutants through settling, they are less effective at removing soluble pollutants because of the absence of a permanent pool. Pollutant loading information for dry detention basins provided by the New Hampshire Department of Environmental Services allows for an assumed removal efficiency of 80 percent for total suspended solids, 55 percent for total nitrogen removal and 68 percent for total phosphorus removal (NHDES, 2011).

## Cost Considerations<sup>1</sup>

The construction costs associated with dry detention ponds can range considerably depending on the type of construction and size. Adjusted for inflation, a reported range for dry detention ponds and dry extended detention ponds is \$45,000 to \$80,000 per acre of impervious surface treated (King & Hagan, 2011). As with most other stormwater controls, economies of scale suggest that larger systems are at the lower end of this range.

Maintenance costs can be slightly higher than comparable wet ponds, mostly due to the greater area needing regular mowing. For ponds, the annual cost of routine maintenance is typically about 2 to 6 percent of the construction cost (King & Hagan, 2011). Alternatively, a community can estimate the cost of the maintenance activities outlined in the maintenance section.

Another economic concern associated with dry ponds is that they can detract from the value of adjacent properties, especially compared to wet ponds and mixed recreational use stormwater facilities (Lee & Li, 2009). One study found that dry ponds detract from the perceived value of adjacent homes by between 3 and 10 percent (Emmerling-Dinovo, 1995).

### Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

<sup>1</sup> Prices updated to 2019 dollars. Inflation rates obtained from the Bureau of Labor Statistics CPI Inflation Calculator website: <https://data.bls.gov/cgi-bin/cpicalc.pl>.

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### Disclaimer

*This fact sheet is intended to be used for informational purposes only. These examples and references are not intended to be comprehensive and do not preclude the use of other technically sound practices. State or local requirements may apply.*

# Downstream Defender®

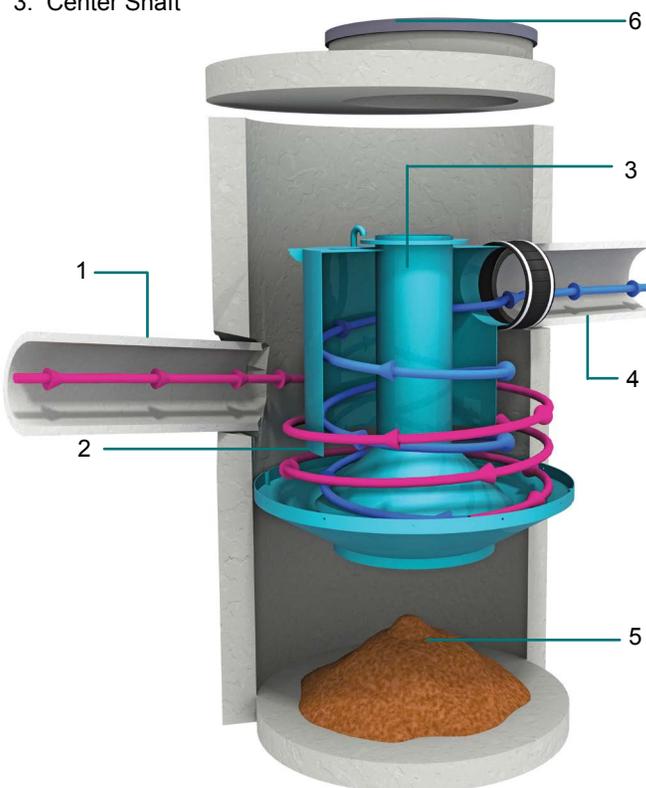
## High-Level Treatment in a Small Footprint

### Product Profile

The Downstream Defender® is an advanced vortex separator used to treat stormwater runoff in pretreatment or stand-alone applications. Its unique flow-modifying internal components distinguish the Downstream Defender® from conventional and simple swirl separators that typically bypass untreated peak flows to prevent washout of captured pollutants. Its wide treatment flow range, low headloss, small footprint and low-profile make it a compact and economical solution for capturing nonpoint source pollution.

### Components

- |                                    |                          |
|------------------------------------|--------------------------|
| 1. Inlet to Precast Vortex Chamber | 4. Outlet Pipe           |
| 2. Cylindrical Baffle              | 5. Sediment Storage Sump |
| 3. Center Shaft                    | 6. Access Lid            |



**Fig.1** The Downstream Defender® has internal components designed to maximize pollutant capture and minimize pollutant washout.

### Applications

- Removal of total suspended solids (TSS), floatable trash and petroleum products from stormwater runoff
- New construction or redevelopment of commercial and residential sites
- Pollutant hotspots such as maintenance yards, parking lots, gas stations, streets, highways, airports and transportation hubs
- Site constrained LID or green infrastructure based developments
- LEED® development projects

### Advantages

- Special internal components maximize pollutant capture and minimize footprint, headloss and washout
- Captures and retains a wide range of TSS particles
- High peak treatment flow rates
- Treats the entire storm with no washout or untreated bypass flows
- Low maintenance requirements - no dredging required, and no screens or media to block
- Variable inlet/outlet angles for ease of site layout

### How it Works

Advanced hydrodynamic vortex separation is a complex hydraulic process that augments gravity separation with low-energy rotary forces. The flow modifying internal components used in the Downstream Defender® harness the energy from vortex flow and maximize the time for separation to occur while deflecting high scour velocities (**Fig.1**).

Polluted stormwater is introduced tangentially into the side of the precast vortex chamber to establish rotational flow. A cylindrical baffle with an inner center shaft creates an outer (**magenta arrow**) and inner (**blue arrow**) spiraling column of flow and ensures maximum residence time for pollutant travel between the inlet and outlet.

Oil, trash and other floating pollutants are captured and stored on the surface of the outer spiraling column. Low energy vortex motion directs sediment into the protected sump region. Only after following a long three-dimensional flow path is the treated stormwater discharged from the outlet pipe. Maintenance ports at ground level provide access for easy inspection and clean-out.

# Downstream Defender®

## Drainage Profile

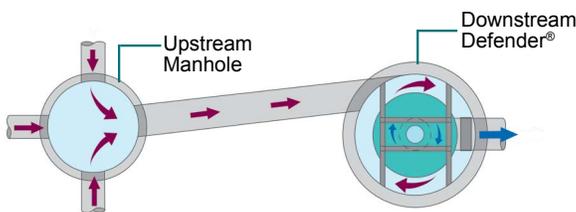
The Downstream Defender® is designed with a submerged tangential inlet to minimize turbulence within the device. Turbulence increases system headlosses and reduces performance by keeping pollutant particles in suspension.

The inlet elevation of the Downstream Defender® is located one inlet pipe diameter lower than the elevation of the outlet invert (**Fig.2**). This arrangement ensures that influent flows are introduced to the treatment chamber quiescently below the water surface elevation, minimizing turbulence.

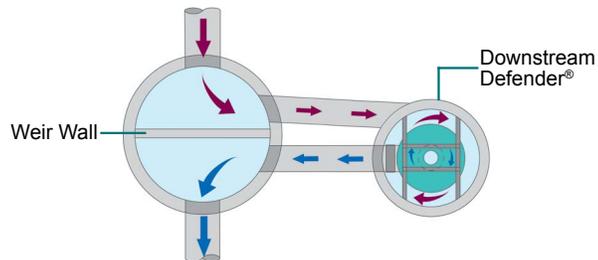
The unique flow-modifying internal components also minimize hydraulic losses. There are no internal weirs or orifices; large clear openings ensure low headloss at peak flow rates with little risk of blockages that cause upstream flooding.

## Sizing & Design

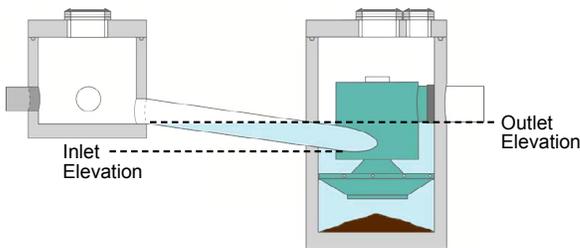
The Downstream Defender® can be used to meet a wide range of stormwater treatment objectives. It is available in 5 precast models that fit easily into the drainage network (**Table 1**). Selection and layout of the appropriate Downstream Defender® model depends on site hydraulics, site constraints and local regulations. Both online (**Fig.3a**) and offline (**Fig.3b**) configurations are common.



**Fig.3a** The Downstream Defender® in an online configuration.



**Fig.3b** The Downstream Defender® in an offline configuration.



**Fig.2** The Downstream Defender® has a submerged inlet that reduces headloss and improves efficiency of pollutant capture.

**Table 1.** Downstream Defender® Design Chart.

Model Number and Diameter		Peak Treatment Flow Rate		Maximum Pipe Diameter		Oil Storage Capacity		Sediment Storage Capacity		Minimum Distance from Outlet Invert to Top of Rim		Standard Height from Outlet Invert to Sump Floor	
(ft)	(m)	(cfs)	(L/s)	(in)	(mm)	(gal)	(L)	(yd <sup>3</sup> )	(m <sup>3</sup> )	(ft)	(m)	(ft)	(m)
4	1.2	3.0	85	12	300	70	265	0.70	0.53	2.8	0.85	4.1	1.25
6	1.8	8.0	227	18	450	216	818	2.10	1.61	3.2	0.98	5.9	1.80
8	2.4	15.0	425	24	600	540	2,044	4.65	3.56	4.2	1.28	7.7	2.35
10	3.0	25.0	708	30	750	1,050	3,975	8.70	6.65	5.0	1.52	9.4	2.85
12*	3.7	38.0	1,076	36	900	1,770	6,700	14.70	11.24	5.6	1.71	11.2	3.41

\*Not available in all areas. Contact Hydro International for details.

## Inspection and Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.



Call 1 (800) 848-2706 to schedule an inspection and cleanout or learn more at [hydro-int.com/service](http://hydro-int.com/service)



### Free Stormwater Sizing Tool

This simple online tool will recommend the best separator, model size and online/offline arrangement based on site-specific data entered by the user.

Go to [hydro-int.com/sizing](http://hydro-int.com/sizing) to access the tool.

July 7, 2020

To Whom It May Concern:

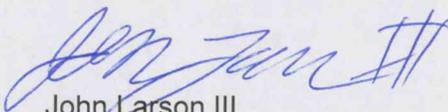
**RE: Downstream Defender® Removal Efficiency**

Regarding Downstream Defenders operating under submerged condition, I offer the following comments: A tail water condition in a detention system or pond will not adversely impact the operation of a Downstream Defender. An online Downstream Defender does not contain internal flow control devices (weirs or orifices) that will be bypassed by a rising tail water; consequently, any flow that passes through the Downstream Defender will be treated. In cases where there is the potential for a large reverse flow, such as a tidal condition in a large diameter main line pipe, we would recommend a back-flow preventer. In situations where the Downstream Defender is discharging to a submerged condition such as underground storage or a detention pond a backflow preventer is not required. This is because the water level in downstream storage tends to rise slowly and gradually submerge the upstream pipe network rather than generate large reverse flow rates.

For offline systems, we set the weir in the diversion structure to divert the first flush to an offline treatment unit under the assumption that the downstream storage is empty and available to accept the first flush. Alternatively, we can set the weir relative to a design tail water condition as required. In most cases, downstream storage is assumed to be empty and available to accept the first flush flow. After the first flush is diverted to downstream storage and as water levels start to rise and submerge the weir, the differential head across the treatment unit typically starts to decrease diverting less flow to an offline unit. The same thing occurs in treatment devices that may be placed online but have an internal bypass. Typically, by the time the weir is fully submerged the storage system is full and the first flush flow has already been adequately treated.

If you have any questions please do not hesitate to call us. We would be happy to assist you.

Signature,  
Hydro International



John Larson III  
Senior Project Engineer

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# State of New Jersey

CHRIS CHRISTIE  
*Governor*

KIM GUADAGNO  
*Lt. Governor*

## DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Nonpoint Pollution Control  
Division of Water Quality

401-02B

Post Office Box 420

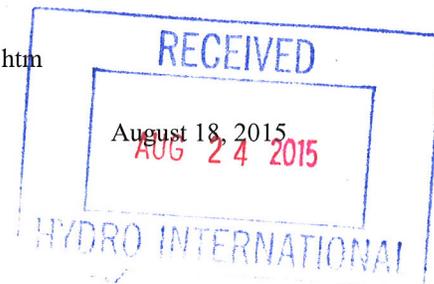
Trenton, New Jersey 08625-0420

609-633-7021 Fax: 609-777-0432

[http://www.state.nj.us/dep/dwq/bnpc\\_home.htm](http://www.state.nj.us/dep/dwq/bnpc_home.htm)

BOB MARTIN  
*Commissioner*

Lisa Lemont, CPSWQ  
Business Development Manager  
Hydro International (Stormwater)  
94 Hutchins Drive  
Portland, ME 04102



Re: Revised MTD Lab Certification for the Downstream Defender Stormwater Treatment Device  
By Hydro International

### **TSS Removal Rate 50%**

Dear Ms. Lemont:

This letter supersedes the previous certification letter dated January 21, 2015. Hydro International requested a new verification for the Downstream Defender Stormwater Treatment Device from the New Jersey Corporation for Advanced Technology (NJCAT) based on enhanced Maximum Treatment Flow Rate (MTRF).

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Hydro International has requested a Laboratory Certification for the Downstream Defender Stormwater Treatment Device.

The projects falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

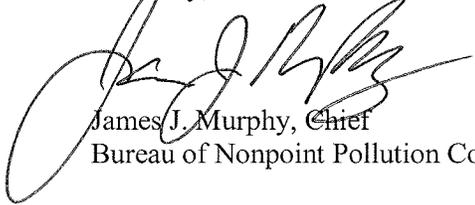
NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at <http://www.njcat.org/verification-process/technology-verification-database.html>.

**The NJDEP certifies the use of the Downstream Defender Stormwater Treatment Device by Hydro International at a TSS removal rate of 50% when designed, operated and maintained in accordance with the information provided in the Verification Appendix.**

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance of the New Jersey Stormwater Best Management Practices Manual.

If you have any questions regarding the above information, please contact Mr. Titus Magnanao of my office at (609) 633-7021.

Sincerely,

A handwritten signature in black ink, appearing to read "James J. Murphy". The signature is fluid and cursive, with a large initial "J" and "M".

James J. Murphy, Chief  
Bureau of Nonpoint Pollution Control

C: Chron File  
Richard Magee, NJCAT  
Madhu Guru, DLUR  
Ravi Patraju, NJDEP  
Titus Magnanao, BNPC

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## A 4.1 Drainage Network Hydraulic Calculations

Structure	Area	Inlet Time	Intensity	Runoff C	Q=Cia	Q Carry over	Q Captured	Q Bypassed	Bypass Structure	Inlet Type	Curb Opening	Curb Opening	Grate Length	Grate Width	Depth	Spread
	(sf)	(min)	(in/hr)	(C)	(cfs)	(cfs)	(cfs)	(cfs)			(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
1	131,009	17.7	3.48	0.25	2.64	0	1.43	1.20	5	Grate inlet	---	---	2	2	0.168	8.421
2	15,261	6	6.287	0.65	1.44	0	0.92	0.52	6	Grate inlet	---	---	2	2	0.134	6.72
5	126,994	13.32	4.142	0.22	2.68	1.204	3.88	0.00	---	Grate inlet	---	---	4	2	0.317	15.846
6	18,787	6	6.287	0.5	1.37	0.521	1.89	0.00	---	Grate inlet	---	---	4	2	0.204	10.179
15	6,542	6	6.287	0.58	0.55	0	0.46	0.10	---	Grate inlet	---	---	2	2	0.087	4.344
20	99,129	17.52	3.487	0.26	2.08	0	1.26	0.82	---	Grate inlet	---	---	2	2	0.143	7.143



Pipe Analysis

Pipe ID	Pipe Length	Pipe Size	Pipe Slope	Flow Rate	Capacity Full	Velocity	Invert Down	Invert Up
	(ft)	(in)	(%)	(cfs)	(cfs)	(ft/s)	(Ft)	(ft)
8 - 9	17.61	36	1.14%	7.9	77.09	7.0	356.00	356.20
4 - 8	227.91	36	7.35%	8.0	196.04	13.6	356.20	372.90
3 - 4	51.84	24	2.00%	4.3	34.69	7.5	373.90	374.94
1 - 3	20.85	24	1.00%	3.3	24.53	5.4	374.94	375.15
2 - 3	20.65	15	1.00%	1.8	7.01	4.8	375.69	375.89
7 - 4	48.34	24	1.00%	4.4	24.53	5.9	373.90	374.38
5 - 7	17.98	18	0.50%	3.3	8.05	4.3	374.88	374.97
6 - 7	17.98	15	0.50%	1.7	4.95	3.7	375.13	375.22
17 - 18	27.80	15	1.50%	1.2	8.58	4.9	360.93	361.35
15 - 17	22.23	12	1.50%	0.3	4.73	3.3	362.17	362.50
20 - 17	10.29	12	1.50%	1.0	4.73	4.8	361.35	361.50



Pipe Analysis

Pipe ID	Pipe Length	Pipe Size	Pipe Slope	Flow Rate	Capacity Full	Velocity	Invert Down	Invert Up
	(ft)	(in)	(%)	(cfs)	(cfs)	(ft/s)	(Ft)	(ft)
8 - 9	17.61	36	1.14%	10.7	77.09	7.7	356.00	356.20
4 - 8	227.91	36	7.35%	10.8	196.04	14.9	356.20	372.90
3 - 4	51.84	24	2.00%	5.8	34.69	8.2	373.90	374.94
1 - 3	20.85	24	1.00%	4.4	24.53	5.9	374.94	375.15
2 - 3	20.65	15	1.00%	2.3	7.01	5.1	375.69	375.89
7 - 4	48.34	24	1.00%	6.0	24.53	6.4	373.90	374.38
5 - 7	17.98	18	0.50%	4.5	8.05	4.7	374.88	374.97
6 - 7	17.98	15	0.50%	2.2	4.95	3.9	375.13	375.22
17 - 18	27.80	15	1.50%	1.2	8.58	4.9	360.93	361.35
15 - 17	22.23	12	1.50%	0.3	4.73	3.3	362.17	362.50
20 - 17	10.29	12	1.50%	1.0	4.73	4.8	361.35	361.50



# DiPrete Engineering

Engineers • Planners • Surveyors

Project Name: Louise Drive Extension 100-Year Storm

Project Number: 3343-001 Date: 1/13/2025

## HGL at Structure

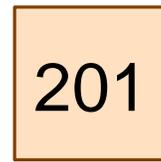
Structure	Rim Elevation (ft)	HGL Elevation (ft)	Rim-HGL (ft)
9	359.42	0.00	N/A
8	361.08	359.67	1.41
4	380.91	373.38	7.54
3	381.95	376.81	5.14
1	382.03	376.36	5.68
2	382.06	376.50	5.56
7	380.26	376.81	3.45
5	379.96	376.86	3.10
6	379.96	376.88	3.08
19	6.99	0.00	N/A
17	6.03	0.00	N/A
21	6.03	0.00	N/A

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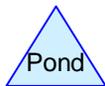
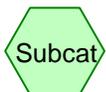
**A 5.1 Open Channel Calculations HydroCAD 100-Year Storm Analysis**



WPost-07 Node



swale north of pond



**Routing Diagram for 3343-001-ALLS-PHCD-INHS**  
Prepared by DiPrete Engineering, Printed 1/22/2025  
HydroCAD® 10.20-6a s/n 01125 © 2024 HydroCAD Software Solutions LLC

**3343-001-ALLS-PHCD-INHS**

Prepared by DiPrete Engineering

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Printed 1/22/2025

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**Area Listing (selected nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
0.298	74	>75% Grass cover, Good, HSG C (200)
0.244	80	>75% Grass cover, Good, HSG D (200)
1.260	70	Woods, Good, HSG C (200)
1.094	77	Woods, Good, HSG D (200)

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

Prepared by DiPrete Engineering

Printed 1/22/2025

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 200: WPost-07 Node**

Runoff Area=2.896 ac 0.00% Impervious Runoff Depth=5.82"  
Flow Length=434' Tc=12.6 min CN=74 Runoff=15.90 cfs 1.405 af

**Reach 201: swale north of pond**

Avg. Flow Depth=0.98' Max Vel=4.10 fps Inflow=15.90 cfs 1.405 af  
n=0.058 L=238.0' S=0.0588 1' Capacity=16.61 cfs Outflow=15.81 cfs 1.405 af

**3343-001-ALLS-PHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.99"

Prepared by DiPrete Engineering

Printed 1/22/2025

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**Summary for Subcatchment 200: WPost-07 Node**

Runoff = 15.90 cfs @ 12.17 hrs, Volume= 1.405 af, Depth= 5.82"

Routed to Reach 201 : swale north of pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Type III 24-hr 100-Year Rainfall=8.99"

Area (ac)	CN	Description
0.298	74	>75% Grass cover, Good, HSG C
0.244	80	>75% Grass cover, Good, HSG D
0.000	98	Impervious, HSG D
0.000	98	Roofs, HSG D
1.260	70	Woods, Good, HSG C
1.094	77	Woods, Good, HSG D
2.896	74	Weighted Average
2.896	74	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.6	100	0.0900	0.14		<b>Sheet Flow, A</b>
					Woods: Light underbrush n= 0.400 P2= 3.27"
1.0	334	0.1107	5.36		<b>Shallow Concentrated Flow, B</b>
					Unpaved Kv= 16.1 fps
12.6	434	Total			

**Summary for Reach 201: swale north of pond**

Inflow Area = 2.896 ac, 0.00% Impervious, Inflow Depth = 5.82" for 100-Year event

Inflow = 15.90 cfs @ 12.17 hrs, Volume= 1.405 af

Outflow = 15.81 cfs @ 12.18 hrs, Volume= 1.405 af, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Max. Velocity= 4.10 fps, Min. Travel Time= 1.0 min

Avg. Velocity = 1.54 fps, Avg. Travel Time= 2.6 min

Peak Storage= 918 cf @ 12.18 hrs

Average Depth at Peak Storage= 0.98', Surface Width= 6.88'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 16.61 cfs

1.00' x 1.00' deep channel, n= 0.058

Side Slope Z-value= 3.0 ' Top Width= 7.00'

Length= 238.0' Slope= 0.0588 ' /'

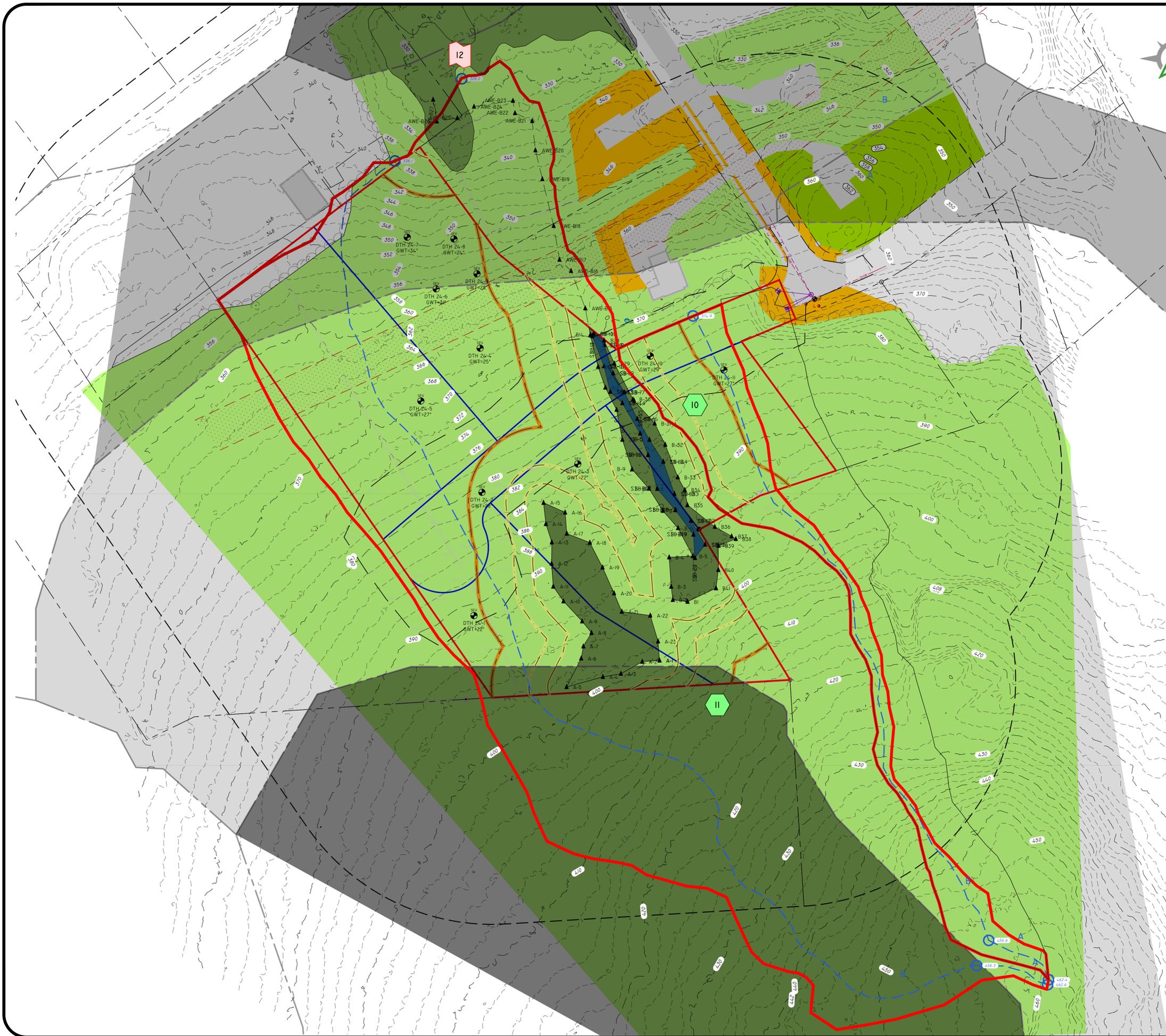
Inlet Invert= 352.00', Outlet Invert= 338.00'



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## Watershed Maps

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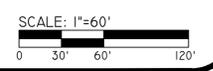


**LEGEND**

- WOODS - A SOILS
- WOODS - B SOILS
- WOODS - C SOILS
- WOODS - D SOILS
- GRASS - A SOILS
- GRASS - B SOILS
- GRASS - C SOILS
- GRASS - D SOILS
- GRAVEL - A SOILS
- GRAVEL - B SOILS
- GRAVEL - C SOILS
- GRAVEL - D SOILS
- IMPERVIOUS
- BRUSH - A SOILS
- BRUSH - B SOILS
- BRUSH - C SOILS
- BRUSH - D SOILS
- WATER

**LEGEND**

- TC LINE WITH ELEVATIONS 
- SUBCATCHMENT AREA 
- SOIL BOUNDARY 
- REACH 
- SUBCATCHMENT 
- DRAINAGE POND/BIO RETENTION/SAND FILTER/INFILTRATING SWALE 
- DRAINAGE STRUCTURE/POND WITH INSIGNIFICANT STORAGE 
- REACH/SWALE 
- DESIGN POINT 

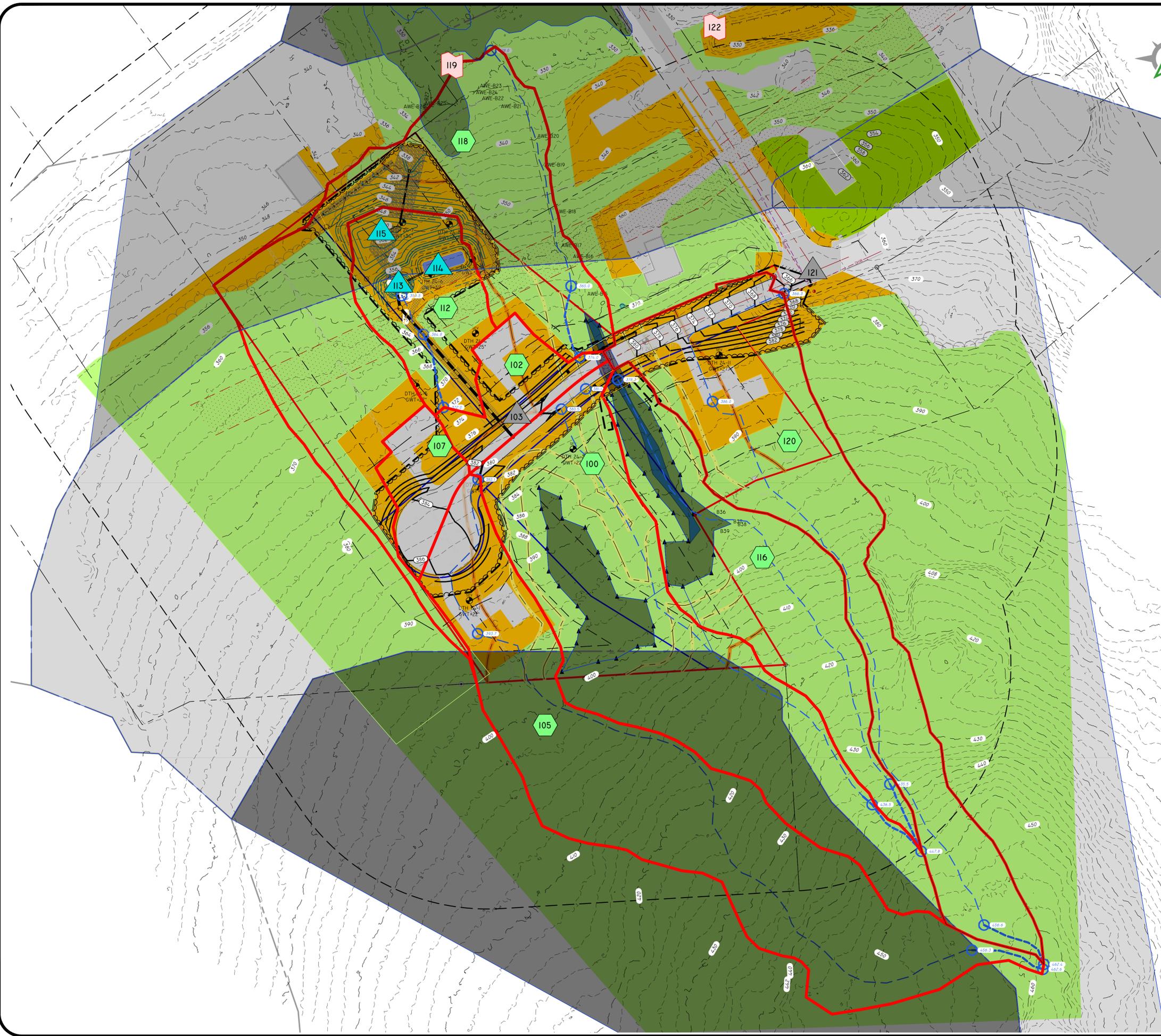


PRE-DEVELOPMENT WATERSHED MAP  
LOUISE DRIVE



Two Stafford Court, Cranston, RI 02920  
TEL: 401-943-1000 FAX: 401-464-6006 WWW.DIPRETE-ENG.COM  
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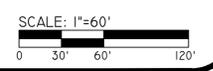


**LEGEND**

- WOODS - A SOILS
- WOODS - B SOILS
- WOODS - C SOILS
- WOODS - D SOILS
- GRASS - A SOILS
- GRASS - B SOILS
- GRASS - C SOILS
- GRASS - D SOILS
- GRAVEL - A SOILS
- GRAVEL - B SOILS
- GRAVEL - C SOILS
- GRAVEL - D SOILS
- IMPERVIOUS
- BRUSH - A SOILS
- BRUSH - B SOILS
- BRUSH - C SOILS
- BRUSH - D SOILS
- WATER

**LEGEND**

- TC LINE WITH ELEVATIONS
- SUBCATCHMENT AREA
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- DRAINAGE POND/BIO RETENTION/SAND FILTER/INFILTRATING SWALE
- DRAINAGE STRUCTURE/POND WITH INSIGNIFICANT STORAGE
- REACH/SWALE
- DESIGN POINT



POST-DEVELOPMENT WATERSHED MAP  
LOUISE DRIVE



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