



**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

**STORMWATER MANAGEMENT REPORT AND  
ACCOMPANYING NOTICE OF INTENT**

**MARSHALL SIMONDS MIDDLE SCHOOL  
ATHLETIC FIELDS RENOVATION PROJECT**

**114 WINN STREET  
BURLINGTON, MA 01803**

**Prepared For:**

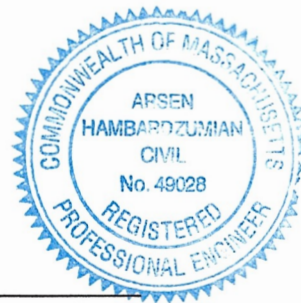
**Burlington Public Schools  
123 Cambridge Street  
Burlington, MA 01803**

**Submitted By:**

**Nesra Engineering, LLC  
111 Washington Street  
Plainville, MA 02762  
JN 240018**

**Prepared by:**

 **P.E.**  
**Arsen Hambardzumian, P.E.**



**February – 2025**

**TABLE OF CONTENTS**

- 1.0 Project Description
- 2.0 Background Data
- 3.0 Stormwater Management Concepts
  - 3.1 Post Development Conditions Hydraulic Sub-Areas
- 4.0 Compliance With Stormwater Standards
  - 4.1 Untreated Stormwater (Standard 1)
  - 4.2 Post Development Peak Rates (Standard 2)
    - 4.2.1 Existing Conditions
    - 4.2.2 Proposed Conditions
    - 4.2.3 Peak Rate Summary
  - 4.3 Recharge to Groundwater (Standard 3)
  - 4.4 Removal of TSS (Standard 4)
  - 4.5 Land Uses With Higher Potential Pollutant Loads (Standard 5)
  - 4.6 Critical Areas (Standard 6 – Water Quality Treatments)
  - 4.7 Redevelopment (Standard 7)
  - 4.8 Erosion and Sedimentation Controls (Standard 8)
  - 4.9 Operations and Maintenance (O&M) Plan (Standard 9)
  - 4.10 Illicit Discharge Compliance Statement (Standard 10)
  - 4.11 Floodplain (310 CMR 10.57)

**ATTACHMENTS**

- Attachment A: Checklist for Stormwater Report
- Attachment B: Figures
- Attachment C: Pre-Development Watershed and Surface Types
- Attachment D: Pre-Development Graphic Generated by Hydro-CAD
- Attachment E: Pre-Development Hydrology
- Attachment F: Post-Development Watershed and Surface Types
- Attachment G: Post-Development Graphic Generated by HydroCAD
- Attachment H: Post-Development Hydrology
- Attachment I: Permeability/Conductivity Calculation
- Attachment J: Rainfall Frequency Data (NOAA)
- Attachment K: Total Suspended Solids (TSS) Calculation Sheet
- Attachment L: Stormwater Pollution Prevention Plan (SWPPP)
- Attachment M: Operations and Maintenance Plan (O&M)

## 1.0 Project Description

The natural turf athletic fields at Marshall Simonds School are located to the north of the Middle School building, east of the 400-meter running track and inset turf field, and are bordered by resource areas to the north and east. The current facility includes natural grass athletic fields, perimeter fencing, netting, and lighting. Electrical and drainage utilities are installed below the surface to provide power for the lighting system and facilitate stormwater drainage. A pedestrian pathway connects Mooney Road to the rear parking area at the middle school, with additional walkways linking the school to the existing track and field facility. However, the existing walkways do not currently meet ADA/AAB regulations.

The proposed project involves upgrading the athletic fields with state-of-the-art synthetic turf, new lighting, two scoreboards, and perimeter walkways. The two fields will be separated by removable netting along the center, with additional netting along the end lines for ball safety. The project will also include ADA/AAB-compliant routes from the fields to the school building and improved pedestrian pathways to Mooney Road. Terraced seating will be provided along the hillside, and ADA/AAB-compliant parking will be located adjacent to the school.

Currently, the grass fields are sloped at 1.5% from the southern corner to the north and east. The site is outside of the 100-year floodplain.

According to the Massachusetts Natural Heritage Maps, there are no certified vernal pools located in close proximity to the project site. The same database indicates that there are no priority habitats of rare species or estimated habitats of rare wildlife located on or near the project site. Similarly, there are no areas of critical environmental concern (ACEC) or outstanding resource waters (ORW) located on or near the project site.

According to the Soil Conservation Service's "Soil Map," the historical soils on-site are as follows:

- **Udorthents-Urban Land Complex (656)** (indicating filled soils) – 90% of the site.
- **Whitman fine sandy loam (73B)** – 10% of the site.

Udorthents-Urban Land Complex is typically categorized as hydrologic soil group D. Whitman fine sandy loam is also categorized as hydrologic soil group D.

Additional information is provided in the wetland report completed by our wetland specialist, dated January 6, 2025, and included in the Notice of Intent application under a separate cover.

## 2.0 Background Data

Topographic conditions are based on survey data acquired by Nesra Engineering, LLC. Bordering vegetated wetlands and river front flags were placed by a wetlands consultant and the locations shown on the plans for these flags were field surveyed by Nesra Engineering, LLC. Field survey equipment used was a Leica GS18 GNSS receiver with a CS20 data collector, as well as a Leica

TS16 robotic total station. The topographic survey is on the North American Vertical Datum (NAVD 88) and the horizontal datum is on the NAD83 Massachusetts State Planes, Mainland Zone, US Foot (MA83F) coordinate system.

Resource area delineation has been performed by Nesra's wetland consultant, Stephen Chmiel. The Delineation Report is dated January 6, 2025, and is included in the Notice of Intent application under a separate cover

### **3.0 Stormwater Management Concepts**

The project is designed to comply with the Massachusetts Stormwater Management Guidelines. A minor disturbance to **1,400 square feet** of existing wetlands is proposed, with **5,000 square feet** of wetland replication planned in adjacent areas.

#### **3.1 Hydraulic Sub Areas**

In the **pre-development** condition, the site consists of four distinct sub-catchment areas within the analyzed limits. These areas discharge runoff to two locations along the adjacent resource areas. Two of the sub-catchment areas drain into catch basins that outlet to the resource areas, while the remaining two areas sheet flow directly to the wetlands located to the north and west of the site.

In the **post-development** condition, the same sub-catchment areas remain; however, a portion of the runoff is intercepted by the synthetic turf, which directs flow to the base stone layer. This layer provides storage, promotes infiltration, and delays outflow. Effectively, the synthetic turf outfield functions as a retention and infiltration basin. As a result, the proposed development enhances site drainage and improves overall hydrologic conditions.

### **4.0 Compliance With Stormwater Standards**

#### **4.1 Untreated Stormwater (Standard 1)**

The project is designed so that new stormwater conveyances (outfall/discharges) do not discharge untreated stormwater into, or cause erosion to, the wetland.

#### **4.2 Post-Development Peak Rates (Standard 2)**

A hydrologic study was performed to determine the rate of runoff for the 2, 10, 25, and 100-year storm events under pre-development (existing) conditions. Unmitigated post-development rates were then computed in a similar manner. The study points for the peak rates were taken at four locations to match the outflows from the four sub-catchment areas. From this analysis, it was determined that the proposed project and its stormwater management system would not increase the peak runoff rates above existing levels. It is the intent of the stormwater management system to minimize impacts to drainage patterns,



downstream property, and wetlands while simultaneously providing water quality treatment to runoff prior to its release from the site, or discharge to wetlands.

The U.S.D.A. Soil Conservation Services (SCS) Technical Release 55 (TR-55), 1986, was used as the procedure of estimating runoff. A SCS TR-20 based computer program was used for estimating peak discharges. TR-55 is a generally accepted model for use on small sites that begin with a rainfall amount uniformly imposed on the watershed over a specified time distribution. Mass rainfall is converted to mass runoff by using a runoff curve number (CN). CN is based on soils, plant cover, impervious areas, interception, and surface storage. Runoff is then transformed into a hydrograph that depends on runoff travel time through segments of the watershed.

Development in a watershed changes its response to precipitation. The most common effects are reduced infiltration and decreased travel time, which result in significantly higher peak rates of runoff. The volume of runoff is determined primarily by the amount of precipitation and by infiltration characteristics related to soil type, antecedent rainfall, type of vegetation cover, impervious surfaces, and surface retention. Travel time is determined primarily by slope, flow length, depth of flow, and roughness of flow surfaces. Peak rates of discharge are based on the relationship of the above parameters, as well as the total drainage areas of the watershed, the location of the development in relation to the total drainage area, and the effect of any flood control works or other manmade storage. Peak rates of discharge are also influenced by the distribution of rainfall within a given storm event.

Stormwater management computations for the full-build were performed using SCS-based 'HydroCAD' for existing and proposed conditions, curve numbers, time of concentrations and unit hydrograph computations.

#### 4.2.1 Existing Conditions

Table 4.2.1 shows the curve numbers, areas and times of concentration used to develop the pre-development hydrologic model of the site.

Table 4.2.1 – Existing Conditions					
Area	Surface Cover	Curve Number (CN)	Area (Acres)	Tc (Min)	Description
Sub 1S				13.0	
(Sub A)	Grass Cover	80	1.078		Grass Lawn
Sub 2S				3.9	
(Sub B)	Impervious Areas	98*	0.120		Pathway
	Grass Cover	80*	0.347		Grass Lawn
Sub 3S				1.4	
(Sub C)	Impervious Areas	98*	0.068		Walkways/Parking
	Grass Cover	80*	0.173		Grass Lawn
Sub 4S				14.4	
(Sub D)	Impervious Areas	98*	0.071		Pathways
	Grass Field	80*	3.322		Athletic Field
	Wooded Areas	86*	0.756		Wooded Areas
* CN is based on soil Class D, as depicted on the soils map.					

#### 4.2.2 Proposed Conditions

For the analysis of the developed site, the analysis points are the same. There are four sub-catchment areas.

Table 4.2.2 shows the curve numbers, areas and times of concentration used to develop post-development hydrologic model of the site.

Table 4.2.2 – Proposed Conditions					
Area	Surface Cover	Curve Number (CN)	Area (Acres)	Tc (Min)	Description
Sub 1S				5.5	
(Sub A)	Grass Cover	80	0.187		Grass Lawn
	Impervious Areas	98*	0.066		Pathway
Sub 2S				0.7	
(Sub B)	Impervious Areas	98*	0.139		Pathway
	Grass Cover	80*	0.270		Grass Lawn
Sub 3S				1.4	
(Sub C)	Impervious Areas	98*	0.066		Walkways/Parking
	Grass Cover	80*	0.174		Grass Lawn
Sub 4S				480	
(Sub D)	Impervious Areas	98*	0.524		Pathways
	Grass Field	80*	0.911		Athletic Field
	Wooded Areas	86*	0.419		Wooded Areas
	Synthetic Turf	98*	3.179		Synthetic Turf Field
* CN is based on soil Class D, as depicted on the soils map.					

#### 4.2.3 Peak Rate Summary

Table 4.2.3. shows the peak runoff and the volume of the runoff for the existing and the developed site during 2, 10 and 100-year design storms.

Table 4.2.3 – Stormwater Runoff Volume and Peak Rate Summary				
Design Storm	Existing Runoff* (CFS)	Existing Volume* (Ac-ft)	Proposed Runoff* (CFS)	Proposed Volume* (Ac-ft)
Outfall 1 (1P)				
2-year	1.45	0.131	0.57	0.041
10-year	3.04	0.274	1.00	0.073
25-year	4.09	0.370	1.27	0.093
100-year	5.72	0.522	1.69	0.126
Outfall 2 (4P)				
2-year	6.34	0.629	1.78	1.222
10-year	13.02	1.284	3.13	1.987
25-year	17.35	1.722	3.99	2.469
100-year	24.05	2.415	5.32	3.221

The project results in increased impervious areas due to the proposed ADA/AAB accessible walkways and spectator seating areas. The rainfall within the limits of the synthetic turf field will infiltrate into the drainage stone. It will then move slowly (increased time of concentration) through the system resulting in significantly more infiltration than in the pre-existing conditions. Additionally, portions of the perimeter bituminous concrete walkway will flow into the turf base stone system as well and be infiltrated. Any excess water which builds up in the base stone will outlet through the 12" HDPE pipe towards the adjacent wetlands. Table 4.2.3 shows a reduction in the outflow rates for all Outfalls.

1. Increased Impervious Area:

- Predevelopment Impervious Area: 11,282 square feet (S.F.)
- Postdevelopment Impervious Area: 34,630 S.F.
- Increase in Impervious Area: 34,630 S.F. - 11,282 S.F. = 23,348 S.F.

2. Required Recharge Volume:

$$Rv = F \times \text{impervious area}$$

For soil group D, the recharge requirement is 0.1 inches over the impervious area as detailed in Table 2.3.2. of Massachusetts Stormwater Handbook.

NRCS HYDROLOGIC SOIL TYPE	APPROX. SOIL TEXTURE	TARGET DEPTH FACTOR (F)
A	sand	<b>0.6-inch</b>
B	loam	<b>0.35-inch</b>
C	silty loam	<b>0.25-inch</b>
D	clay	<b>0.1-inch</b>

- Recharge Volume Calculation:

Required Recharge Volume= Target Depth Factor × Impervious Area

$$23,348 \text{ S.F.} \times \frac{0.1 \text{ inches}}{12 \text{ inches per foot}} = 195 \text{ cubic feet (C.F.)}$$

3. Synthetic Turf Field Storage Capacity:

- Synthetic Turf Field Area: 138,477 S.F.
- Stone Base Depth: 12 inches
- Void Ratio: 33%
- Volume Calculation:

Total Volume of Stone Base = Field Area × Depth of Stone Base

$$= 138,477 \text{ S.F.} \times 1 \text{ foot} = 138,477 \text{ cubic feet (C.F.)}$$

Effective Storage Volume = Total Volume × Void Ratio<sup>3</sup>

$$= 138,477 \text{ C.F.} \times 0.33 = 45,697 \text{ C.F.}$$

Summary:

- The increase in the impervious area is 23,348 S.F.
- The required recharge volume for this increase is 195 C.F.
- The synthetic turf field with its stone base provides 45,697 C.F. of storage.

From these calculations, it's clear that the synthetic turf field's stone base has more than sufficient capacity (45,697 C.F.) to handle the required recharge volume (195 C.F.) for the increased impervious area, even considering the additional volumes and rates through other outfalls. This setup should effectively manage the increased runoff and improve infiltration compared to predevelopment conditions.

Greater than 4-ft of separation is maintained from the base of the athletic field to the seasonal high water table. Adequate volume is captured due to:

- Impervious surfaces flowing to the turf field.
- Large size and rapid infiltration rate of the synthetic turf field.

#### 4.4 Removal of TSS (Standard 4)

The only location for the project which may be subject to accumulation of Total Suspended Solids is the three proposed ADA/AAB Parking Spaces. TSS removal for the parking area will be accomplished using a rain garden adjacent to the parking area. Additionally, sweeping of the area will be provided in accordance with the attached operations and maintenance plan. A TSS calculation spreadsheet is provided as an attachment.

#### 4.5 Land Uses with Higher Potential Pollutant Loads (Standard 5)

The proposed use does not contain any that are listed as Land Uses with Higher Potential Pollutant Loads. The existing use as an athletic field will remain.

#### 4.6 Critical Areas (Standard 6 – Critical Areas)

The site does not lie within a critical area.

#### 4.7 Redevelopment (Standard 7)

Redevelopment projects are those that involve development, rehabilitation or expansion on previously developed sites, provided the redevelopment results in no not increase in impervious areas.

This project does not constitute a redevelopment because there is an increase in impervious areas. The net increase is 23,348 s.f.

#### 4.8 Erosion and Sedimentation Controls (Standard 8)

An Erosion and Sedimentation Control Plan is provided with the construction documents. Erosion control measures will be installed prior to any construction activity. Additionally, a NPDES Construction General Permit will be obtained through the Department of Environmental Protection. A stormwater Pollution Prevention Plan is provided in Attachment I.

#### 4.9 Operation and Maintenance (O&M) Plan (Standard 9)

An operation and maintenance plan is provided in Attachment J.

#### 4.10 Illicit Discharge Compliance Statement (Standard 10)

Per Standard 10 of the Massachusetts Department of Environmental Protection Stormwater Management Standards, there shall be no illicit discharges to the stormwater management system. The Project Manager is responsible for implementing the Operation and Maintenance Plan and overseeing activities at the facility to prevent illicit discharge to the drainage system from occurring

It is strictly prohibited to discharge any products of substances onto the ground surface or into any drainage structures, such as catch basin inlets, manholes, water quality units, forebays, basin or drainage outlets.

Should a spill occur, immediate action steps must be implemented to contain the spill, cordon off the area, clean it up immediately and dispose of it properly to prevent an illicit discharge to the stormwater management system.

#### 4.11 Floodplain (310 CMR 10.57)

The project site is not within a floodplain based on the latest FEMA maps. Flood Insurance Rate Map (FIRM) is provided as an attachment to this report.





**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

## **Attachment A**

### **Checklist for Stormwater Report**



# 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

## B. Stormwater Checklist and Certification

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

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

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

### Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



  
Signature and Date

### Checklist

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

- ☐ New development
- ☐ Redevelopment
- ☒ Mix of New Development and Redevelopment



# Checklist for Stormwater Report

---

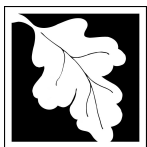
## Checklist (continued)

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

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

### Standard 1: No New Untreated Discharges

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



# Checklist for Stormwater Report

---

## Checklist (continued)

### Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - ☒ Static
  - ☐ Simple Dynamic
  - ☐ Dynamic Field<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.

---

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



# Checklist for Stormwater Report

---

## Checklist (continued)

### Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

### Standard 4: Water Quality

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

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - ☐ is within the Zone II or Interim Wellhead Protection Area
    - ☐ is near or to other critical areas
    - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - ☐ involves runoff from land uses with higher potential pollutant loads.
  - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.





# Checklist for Stormwater Report

---

## Checklist (continued)

### Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
  - ☒ The ½" or 1" Water Quality Volume or
  - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- ☒ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



# Checklist for Stormwater Report

---

## Checklist (continued)

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

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - ☐ Limited Project
  - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - ☐ Bike Path and/or Foot Path
  - ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



# Checklist for Stormwater Report

---

## Checklist (continued)

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

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☒ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - ☒ Name of the stormwater management system owners;
  - ☒ Party responsible for operation and maintenance;
  - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
  - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
  - ☒ Description and delineation of public safety features;
  - ☒ Estimated operation and maintenance budget; and
  - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

- ☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

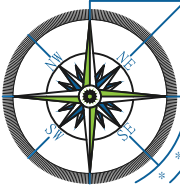



**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

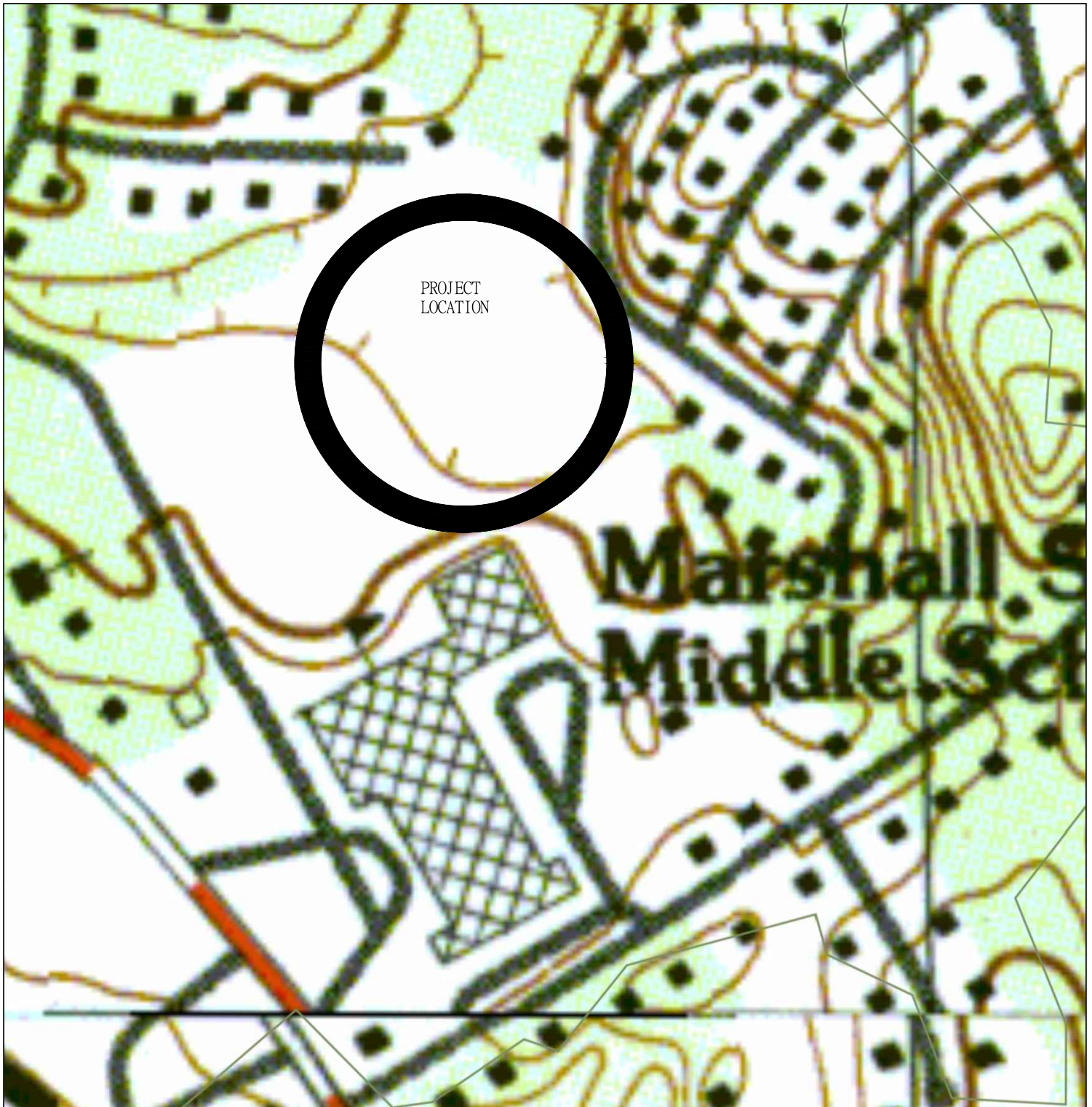
## **Attachment B**

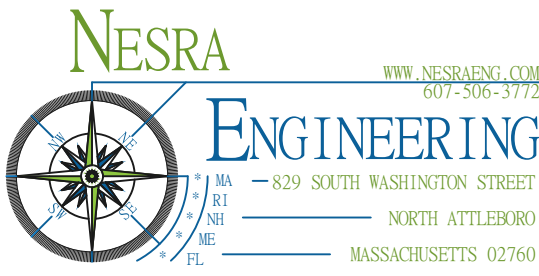
### **Figures**



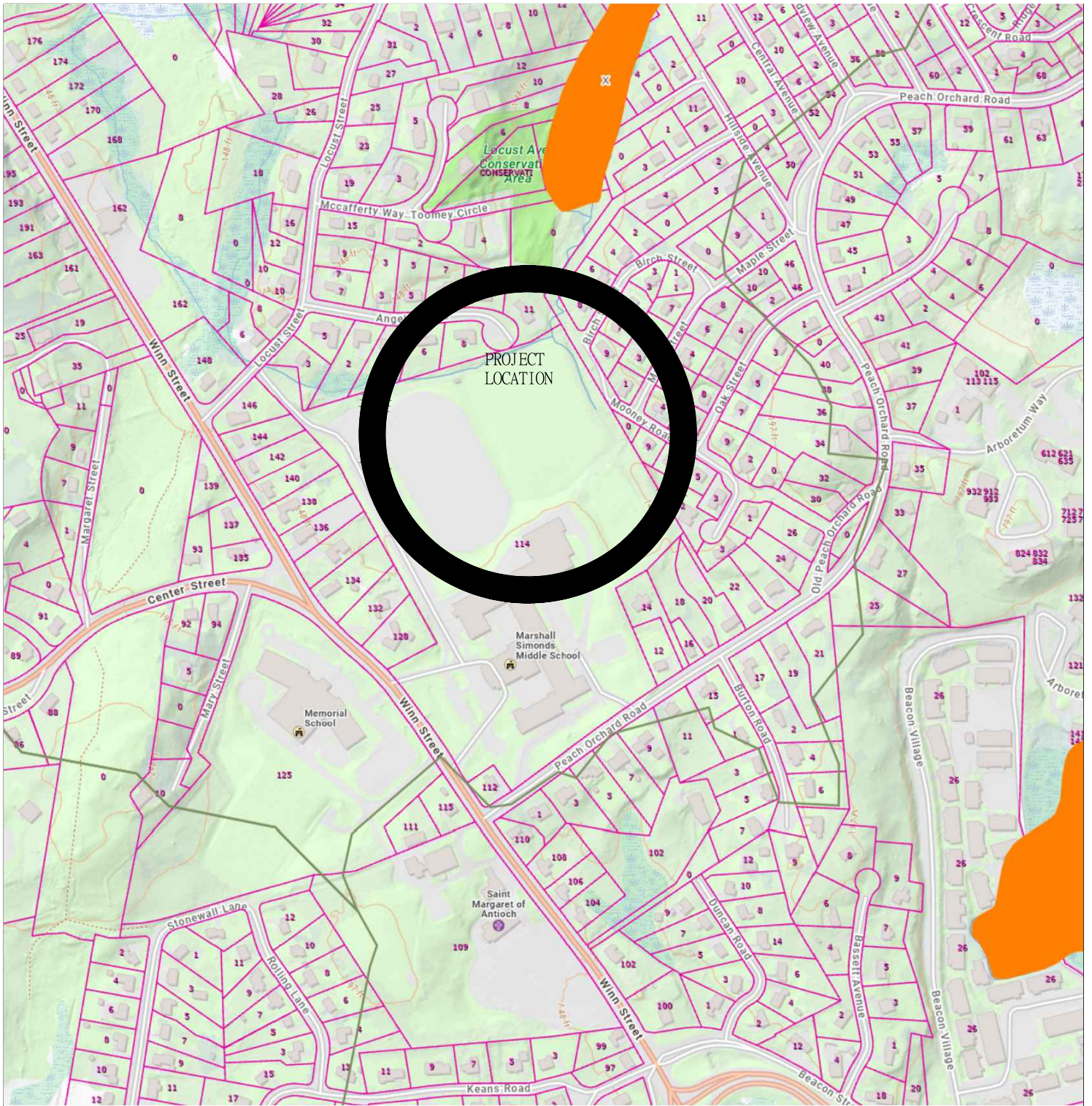
<div data-bbox="89 1675 633 1942">  <p> <a href="http://www.nesraeng.com">www.nesraeng.com</a>            607-506-3772         </p> <p> <b>ENGINEERING</b>            — 829 SOUTH WASHINGTON STREET            NORTH ATTLEBORO            MASSACHUSETTS 02760         </p> </div>	PROJECT	
	MARSHALL SIMONDS MIDDLE SCHOOL ATHLETIC FIELDS RENOVATION PROJECT BURLINGTON, MA 01803	AERIAL PHOTO
	CLIENT	
	BURLINGTON PUBLIC SCHOOLS 123 CAMBRIDGE STREET BURLINGTON, MA 01803	<div data-bbox="1063 1848 1453 1942">  </div>





 <p>www.NESRAENG.COM 607-506-3772</p> <p>— 829 SOUTH WASHINGTON STREET — NORTH ATTLEBORO — MASSACHUSETTS 02760</p>	PROJECT	
	MARSHALL SIMONDS MIDDLE SCHOOL ATHLETIC FIELDS RENOVATION PROJECT BURLINGTON, MA 01803	USGS SITE MAP
	CLIENT	
	BURLINGTON PUBLIC SCHOOLS 123 CAMBRIDGE STREET BURLINGTON, MA 01803	FIGURE 2





<div data-bbox="162 1659 324 1732" data-label="Text"> <p>NESRA</p> </div> <div data-bbox="470 1711 633 1753" data-label="Text"> <p>WWW.NESRAENG.COM 607-506-3772</p> </div> <div data-bbox="97 1732 276 1921" data-label="Image"> </div> <div data-bbox="292 1743 633 1816" data-label="Text"> <p>ENGINEERING</p> </div> <div data-bbox="292 1816 633 1921" data-label="Text"> <p>MA — 829 SOUTH WASHINGTON STREET RI — NORTH ATTLEBORO NH — MASSACHUSETTS 02760 ME FL</p> </div>	<div data-bbox="763 1648 860 1680" data-label="Text"> <p>PROJECT</p> </div> <div data-bbox="673 1669 982 1774" data-label="Text"> <p>MARSHALL SIMONDS MIDDLE SCHOOL ATHLETIC FIELDS RENOVATION PROJECT BURLINGTON, MA 01803</p> </div>	<div data-bbox="1088 1701 1412 1753" data-label="Text"> <p>FEMA FLOOD MAP</p> </div>
	<div data-bbox="763 1774 860 1806" data-label="Text"> <p>CLIENT</p> </div> <div data-bbox="690 1837 950 1921" data-label="Text"> <p>BURLINGTON PUBLIC SCHOOLS 123 CAMBRIDGE STREET BURLINGTON, MA 01803</p> </div>	<div data-bbox="1039 1827 1445 1921" data-label="Text"> <p>FIGURE 3</p> </div>





<div data-bbox="175 1661 332 1728" data-label="Text"> <p>NESRA</p> </div> <div data-bbox="483 1713 636 1753" data-label="Text"> <p>WWW.NESRAENG.COM 607-506-3772</p> </div> <div data-bbox="305 1745 636 1814" data-label="Text"> <p>ENGINEERING</p> </div> <div data-bbox="113 1732 284 1911" data-label="Image"> </div> <div data-bbox="305 1814 636 1911" data-label="Text"> <p>MA — 829 SOUTH WASHINGTON STREET RI — NORTH ATTLEBORO NH — MASSACHUSETTS 02760 ME — FL —</p> </div>	<div data-bbox="776 1648 857 1675" data-label="Section-Header"> <p>PROJECT</p> </div> <div data-bbox="683 1675 979 1770" data-label="Text"> <p>MARSHALL SIMONDS MIDDLE SCHOOL ATHLETIC FIELDS RENOVATION PROJECT BURLINGTON, MA 01803</p> </div>	<div data-bbox="1154 1698 1347 1743" data-label="Text"> <p>NHESP MAP</p> </div>
	<div data-bbox="781 1776 854 1803" data-label="Section-Header"> <p>CLIENT</p> </div> <div data-bbox="704 1837 951 1911" data-label="Text"> <p>BURLINGTON PUBLIC SCHOOLS 123 CAMBRIDGE STREET BURLINGTON, MA 01803</p> </div>	<div data-bbox="1055 1827 1437 1911" data-label="Text"> <p>FIGURE 4</p> </div>





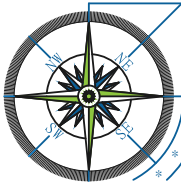
<div data-bbox="168 1654 326 1724" data-label="Text"> <p>NESRA</p> </div> <div data-bbox="472 1709 633 1749" data-label="Text"> <p>WWW.NESRAENG.COM 607-506-3772</p> </div> <div data-bbox="107 1730 282 1906" data-label="Image"> </div> <div data-bbox="300 1738 633 1808" data-label="Text"> <p>ENGINEERING</p> </div> <div data-bbox="282 1808 630 1906" data-label="Text"> <p>MA — 829 SOUTH WASHINGTON STREET RI — NORTH ATTLEBORO NH — ME — MASSACHUSETTS 02760 FL —</p> </div>	<div data-bbox="764 1644 852 1669" data-label="Section-Header"> <p>PROJECT</p> </div> <div data-bbox="673 1671 974 1764" data-label="Text"> <p>MARSHALL SIMONDS MIDDLE SCHOOL ATHLETIC FIELDS RENOVATION PROJECT BURLINGTON, MA 01803</p> </div>	<div data-bbox="1141 1694 1328 1736" data-label="Text"> <p>ACEC MAP</p> </div>
	<div data-bbox="693 1831 946 1900" data-label="Text"> <p>BURLINGTON PUBLIC SCHOOLS 123 CAMBRIDGE STREET BURLINGTON, MA 01803</p> </div>	<div data-bbox="1040 1822 1442 1906" data-label="Text"> <p>FIGURE 5</p> </div>





NESRA

WWW.NESRAENG.COM  
607-506-3772



ENGINEERING

\* MA — 829 SOUTH WASHINGTON STREET  
\* RI — NORTH ATTLEBORO  
\* NH — MASSACHUSETTS 02760  
\* ME  
\* FL

PROJECT

MARSHALL SIMONDS MIDDLE SCHOOL  
ATHLETIC FIELDS  
RENOVATION PROJECT  
BURLINGTON, MA 01803

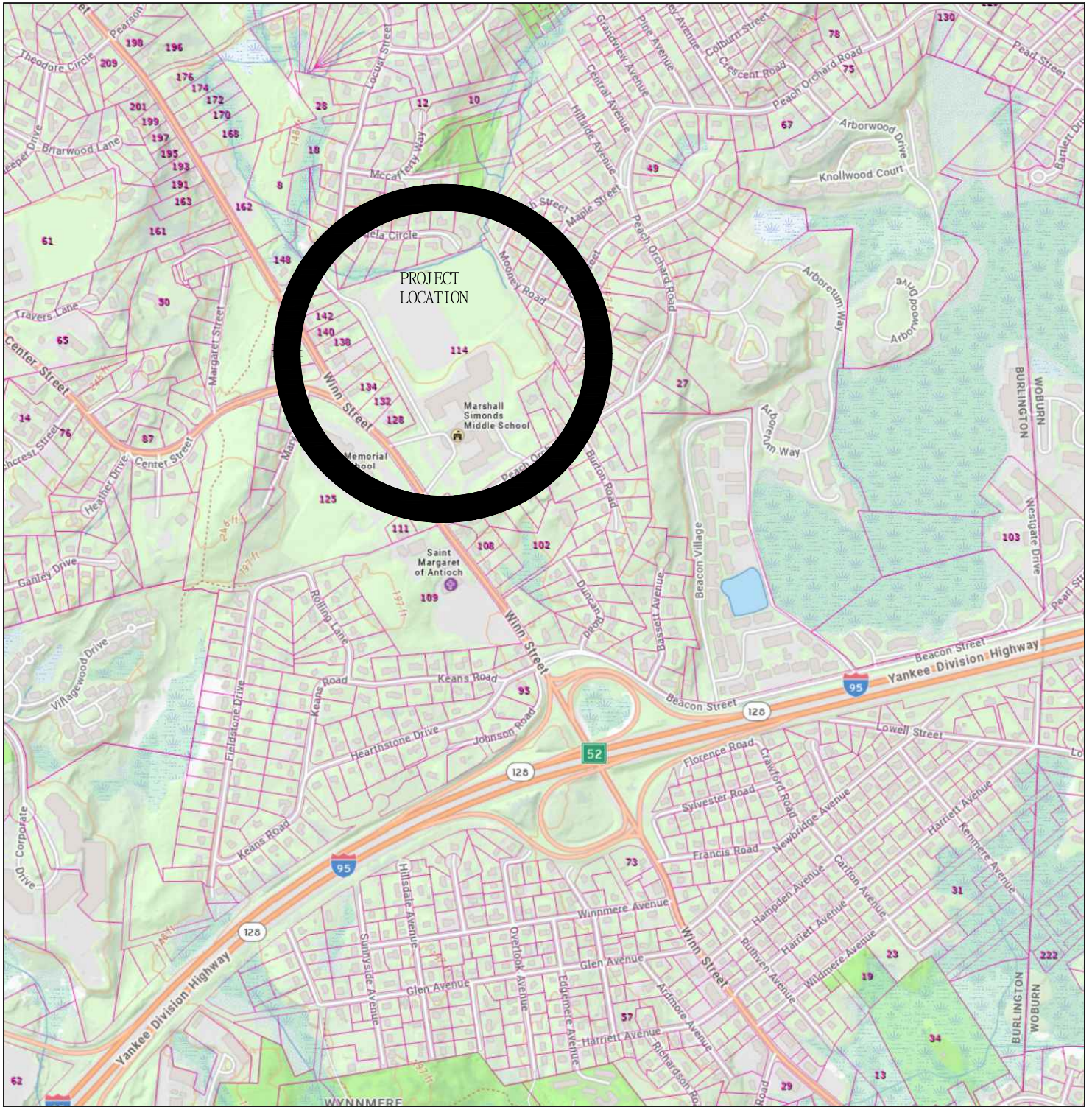
CLIENT

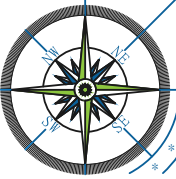
BURLINGTON PUBLIC SCHOOLS  
123 CAMBRIDGE STREET  
BURLINGTON, MA 01803

ORW MAP

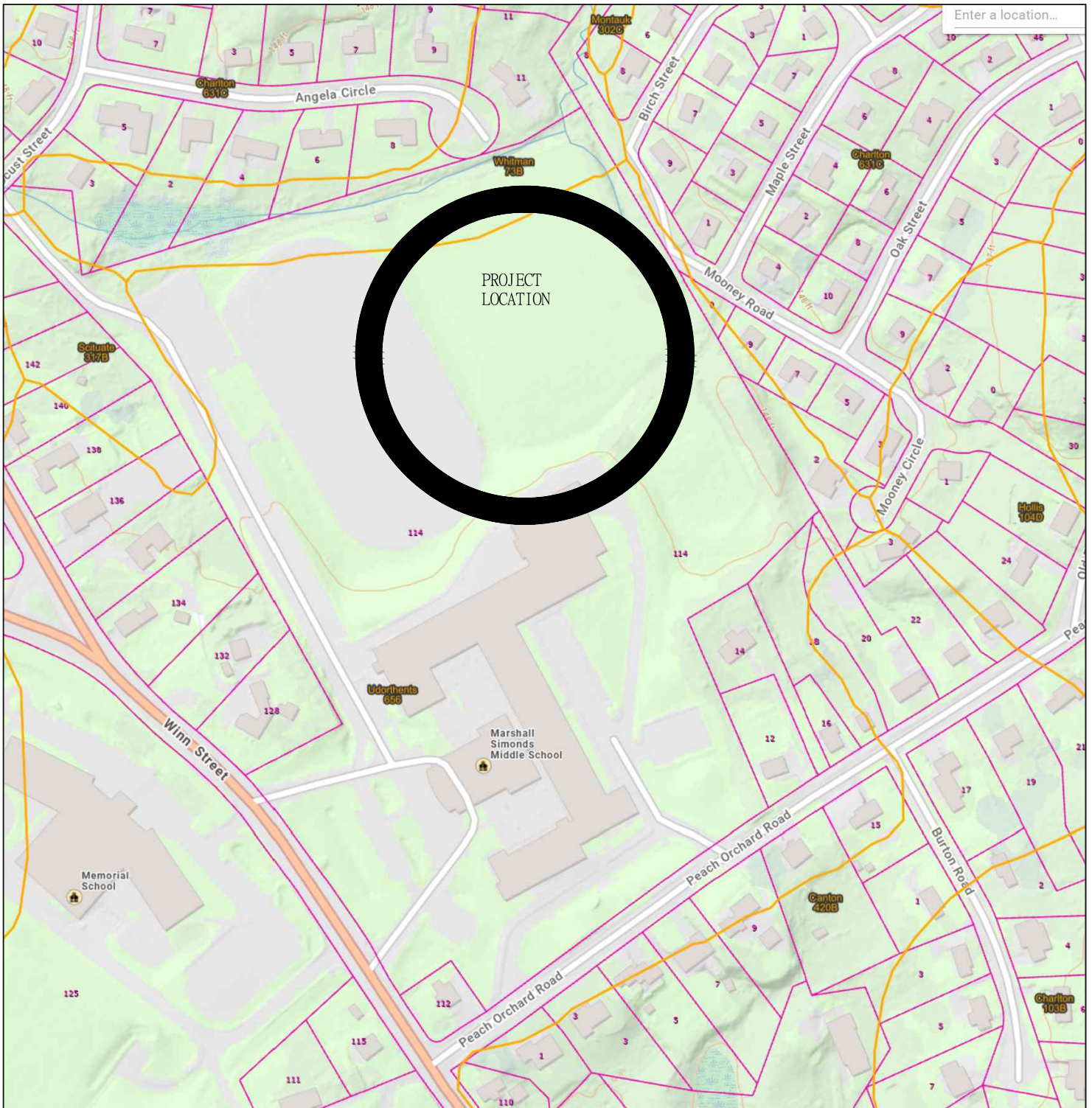
FIGURE 6





 <p> <a href="http://WWW.NESRAENG.COM">WWW.NESRAENG.COM</a>          607-506-3772          — 829 SOUTH WASHINGTON STREET          NORTH ATTLEBORO          MASSACHUSETTS 02760       </p>	<p>PROJECT</p> <p>MARSHALL SIMONDS MIDDLE SCHOOL          ATHLETIC FIELDS          RENOVATION PROJECT          BURLINGTON, MA 01803</p>	<p>PARCEL MAP</p>
	<p>CLIENT</p> <p>BURLINGTON PUBLIC SCHOOLS          123 CAMBRIDGE STREET          BURLINGTON, MA 01803</p>	<p>FIGURE 7</p>





<div data-bbox="162 1648 324 1732" data-label="Text"> <p>NESRA</p> </div> <div data-bbox="470 1711 633 1753" data-label="Text"> <p>WWW.NESRAENG.COM 607-506-3772</p> </div> <div data-bbox="105 1732 284 1921" data-label="Image"> </div> <div data-bbox="300 1743 633 1816" data-label="Text"> <p>ENGINEERING</p> </div> <div data-bbox="300 1816 633 1921" data-label="Text"> <p>* MA — 829 SOUTH WASHINGTON STREET * RI — NORTH ATTLEBORO * ME — MASSACHUSETTS 02760 * FL</p> </div>	<div data-bbox="763 1648 860 1669" data-label="Section-Header"> <p>PROJECT</p> </div> <div data-bbox="673 1669 982 1764" data-label="Text"> <p>MARSHALL SIMONDS MIDDLE SCHOOL ATHLETIC FIELDS RENOVATION PROJECT BURLINGTON, MA 01803</p> </div>	<div data-bbox="990 1690 1201 1743" data-label="Section-Header"> <p>SOILS MAP</p> </div>
	<div data-bbox="771 1774 852 1795" data-label="Section-Header"> <p>CLIENT</p> </div>	
	<div data-bbox="698 1837 950 1911" data-label="Text"> <p>BURLINGTON PUBLIC SCHOOLS 123 CAMBRIDGE STREET BURLINGTON, MA 01803</p> </div>	<div data-bbox="990 1837 1412 1921" data-label="Section-Header"> <p>FIGURE 8</p> </div>



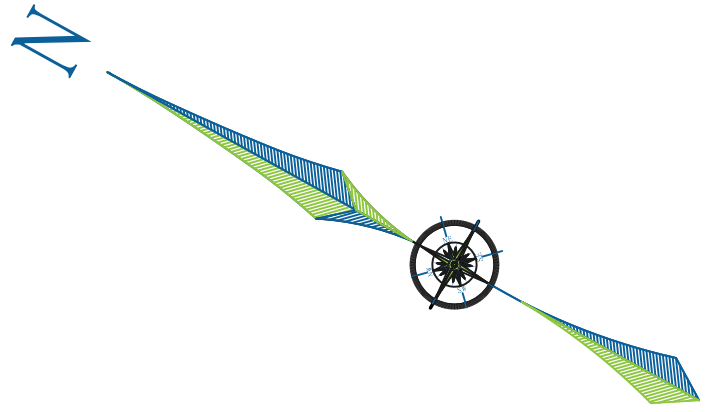


**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

## **Attachment C**

### **Pre-Development Watershed and Surface Types**

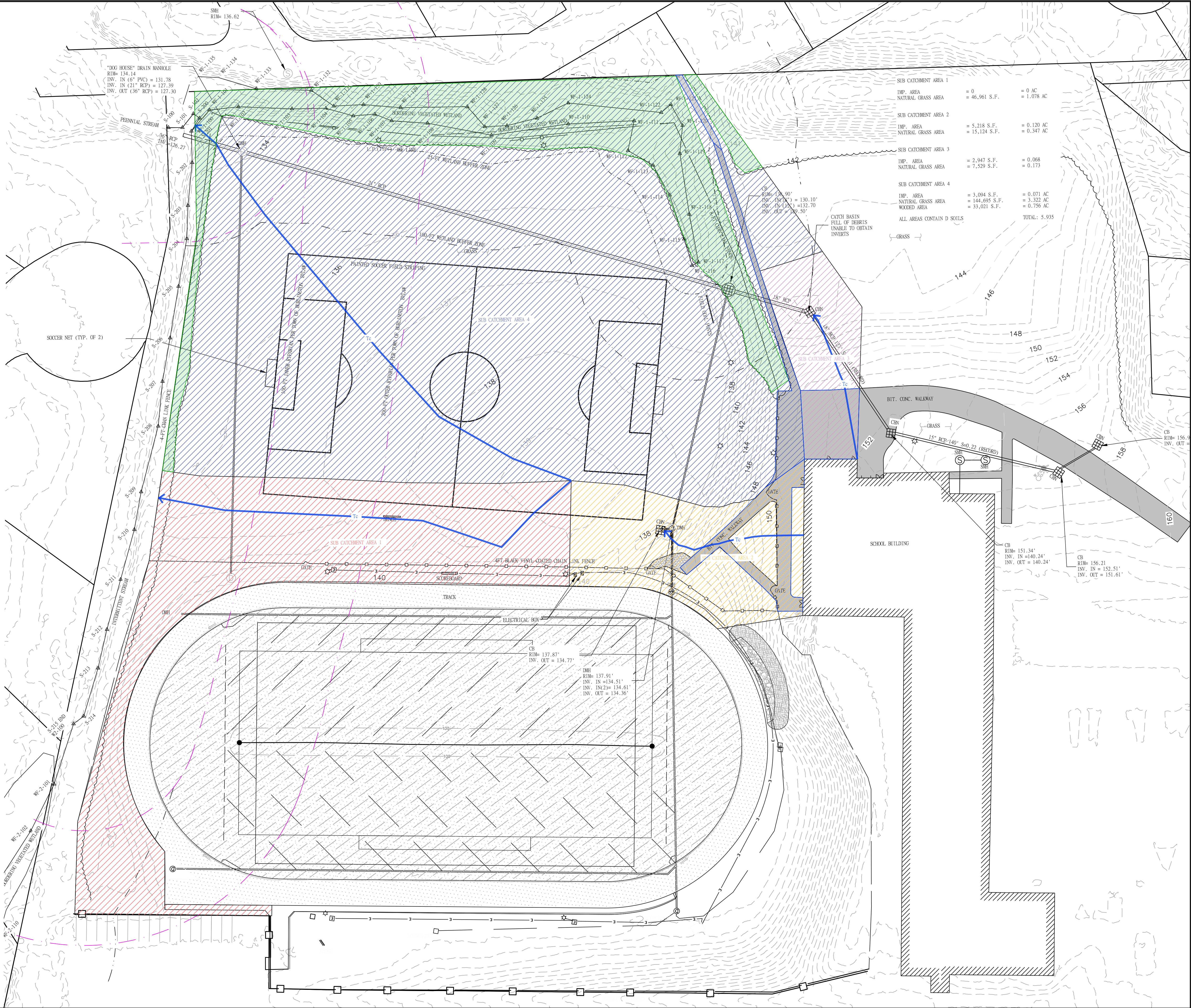
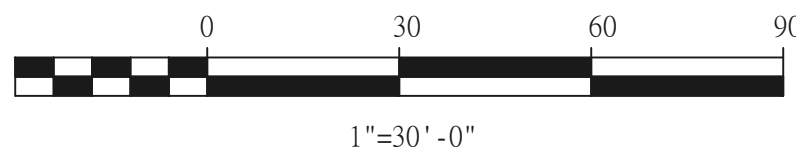




LEGEND

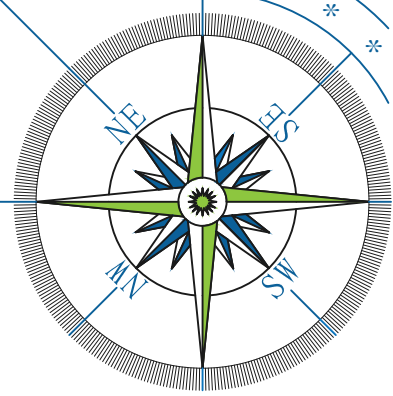
- ATHLETIC FIELD LIGHTS
- ELECTRIC HAND HOLE (EHH)
- DRAIN MANHOLE (DMH)
- CATCH BASIN (CB)
- AREA DRAIN (ADRN)
- UTILITY POLE (UP)
- GUY WIRE
- SEWER MANHOLE (SMH)
- HYDRANT (HYD)
- WATER SHUTOFF (WSO)
- WATER PIT
- TRASH RECEPTACLE
- FIELD UNDERDRAIN
- PERFORATED HDPE COLLECTOR PIPE
- SOLID DRAIN LINE
- ELECTRICAL CONDUIT
- ELECTRICAL CONDUIT
- WATER LINE
- SEWER LINE
- CHAIN LINK FENCE
- ORNAMENTAL FENCE
- MINOR CONTOURS
- MAJOR CONTOURS
- S.B. SCOREBOARD
- INV. INVERT
- DMH DRAIN MANHOLE
- CB CATCH BASIN
- R.C.P. REINFORCED CONCRETE PIPE
- PERF. PERFORATED
- HDPE HIGH DENSITY POLYETHYLENE
- B.W. BOTTOM OF WALL
- T.W. TOP OF WALL
- MON. MONUMENT
- ENC. ENCLOSURE
- F.P. FOUL POLE

NOTE:  
SURVEY COORDINATES ARE BASED ON AN ASSUMED DATUM.  
SURVEY ELEVATIONS ARE BASED ON AN ASSUMED DATUM.  
AS-BUILT INFORMATION IS COMPILED FROM ON THE GROUND TOTAL STATION SURVEY, AND RECORD PLANS PROVIDED BY THE OWNER.



SUB CATCHMENT AREA 1			
IMP. AREA	= 0	= 0 AC	
NATURAL GRASS AREA	= 46,961 S.F.	= 1.078 AC	
SUB CATCHMENT AREA 2			
IMP. AREA	= 5,218 S.F.	= 0.120 AC	
NATURAL GRASS AREA	= 15,124 S.F.	= 0.347 AC	
SUB CATCHMENT AREA 3			
IMP. AREA	= 2,947 S.F.	= 0.068 AC	
NATURAL GRASS AREA	= 7,529 S.F.	= 0.173 AC	
SUB CATCHMENT AREA 4			
IMP. AREA	= 3,094 S.F.	= 0.071 AC	
NATURAL GRASS AREA	= 144,695 S.F.	= 3.322 AC	
WOODED AREA	= 33,021 S.F.	= 0.756 AC	
ALL AREAS CONTAIN D SOILS		TOTAL: 5.935	

NESRA



WWW.NESRAENG.COM  
607-506-3772

ENGINEERING

MA — 829 SOUTH WASHINGTON STREET  
RI — NORTH ATTLEBORO  
NH — MASSACHUSETTS 02760  
ME —  
VT —  
FL —

PROJECT

MARSHALL SIMONDS  
MIDDLE SCHOOL  
ATHLETIC FIELDS  
RENOVATION PROJECT  
BURLINGTON, MA 01803

CLIENT

BURLINGTON PUBLIC  
SCHOOLS  
123 CAMBRIDGE STREET  
BURLINGTON, MA 01803

NO.	REVISION	DATE
-----	----------	------

SCALE - 1"=30'  
DATE - 2/10/25

PERMIT SET

PRE-DEVELOPMENT  
WATERSHED AND  
SURFACE TYPES

SK-1





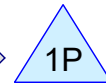
**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

**Attachment D**

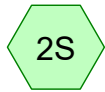
**Pre-Development Graphic Generated by Hydro-CAD**



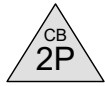
Sub-Catchment 1



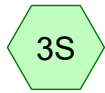
Outfall # 1 - Resource  
Area West



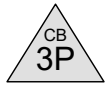
Sub-Catchment 2



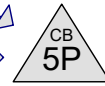
Outfall #2 to CB



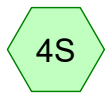
Sub-Catchment 3



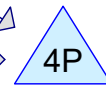
Outfall #3 to CB



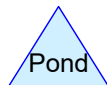
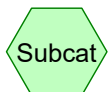
(new Pond)



Sub-Catchment 4



Outfall # 4 - Resource  
Area North Corner



#### Routing Diagram for PRE Development Analysis - MS

Prepared by {enter your company name here}, Printed 2/10/2025  
HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC



**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

## **Attachment E**

### **Pre-Development Hydrology**

## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Printed 2/10/2025

Page 2

### Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.920	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S, 4S)
0.139	98	Paved parking, HSG D (3S, 4S)
0.120	98	Unconnected pavement, HSG D (2S)
0.756	86	Woods/grass comb., Poor, HSG D (4S)
<b>5.935</b>	<b>82</b>	<b>TOTAL AREA</b>

## PRE Development Analysis - MS

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 3

### Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
5.935	HSG D	1S, 2S, 3S, 4S
0.000	Other	
<b>5.935</b>		<b>TOTAL AREA</b>

## PRE Development Analysis - MS

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 4

### Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	4.920	0.000	4.920	>75% Grass cover, Good	1S, 2S, 3S, 4S
0.000	0.000	0.000	0.139	0.000	0.139	Paved parking	3S, 4S
0.000	0.000	0.000	0.120	0.000	0.120	Unconnected pavement	2S
0.000	0.000	0.000	0.756	0.000	0.756	Woods/grass comb., Poor	4S
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>5.935</b>	<b>0.000</b>	<b>5.935</b>	<b>TOTAL AREA</b>	



## PRE Development Analysis - MS

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 5

### Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	134.36	132.70	215.0	0.0077	0.011	12.0	0.0	0.0
2	3P	133.10	131.10	75.0	0.0267	0.011	18.0	0.0	0.0
3	5P	129.50	127.39	430.0	0.0049	0.011	21.0	0.0	0.0

## PRE Development Analysis - MS

Type III 24-hr 2-Year Rainfall=3.28"

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 6

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Sub-Catchment1** Runoff Area=1.078 ac 0.00% Impervious Runoff Depth=1.46"  
Flow Length=388' Slope=0.0150 '/' Tc=13.0 min CN=80 Runoff=1.45 cfs 0.131 af

**Subcatchment2S: Sub-Catchment2** Runoff Area=0.467 ac 25.70% Impervious Runoff Depth=1.60"  
Flow Length=128' Tc=3.9 min UI Adjusted CN=82 Runoff=0.92 cfs 0.062 af

**Subcatchment3S: Sub-Catchment3** Runoff Area=0.241 ac 28.22% Impervious Runoff Depth=1.83"  
Flow Length=131' Tc=1.4 min CN=85 Runoff=0.56 cfs 0.037 af

**Subcatchment4S: Sub-Catchment4** Runoff Area=4.149 ac 1.71% Impervious Runoff Depth=1.53"  
Flow Length=460' Slope=0.0150 '/' Tc=14.4 min CN=81 Runoff=5.66 cfs 0.530 af

**Pond 1P: Outfall # 1 - Resource Area West** Inflow=1.45 cfs 0.131 af  
Primary=1.45 cfs 0.131 af

**Pond 2P: Outfall #2 to CB** Peak Elev=134.83' Inflow=0.92 cfs 0.062 af  
12.0" Round Culvert n=0.011 L=215.0' S=0.0077 '/' Outflow=0.92 cfs 0.062 af

**Pond 3P: Outfall #3 to CB** Peak Elev=133.39' Inflow=0.56 cfs 0.037 af  
18.0" Round Culvert n=0.011 L=75.0' S=0.0267 '/' Outflow=0.56 cfs 0.037 af

**Pond 4P: Outfall # 4 - Resource Area North Corner** Inflow=6.34 cfs 0.629 af  
Primary=6.34 cfs 0.629 af

**Pond 5P: (new Pond)** Peak Elev=130.03' Inflow=1.45 cfs 0.099 af  
21.0" Round Culvert n=0.011 L=430.0' S=0.0049 '/' Outflow=1.45 cfs 0.099 af

**Total Runoff Area = 5.935 ac Runoff Volume = 0.760 af Average Runoff Depth = 1.54"**  
**95.64% Pervious = 5.676 ac 4.36% Impervious = 0.259 ac**

## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 7

### Summary for Subcatchment 1S: Sub-Catchment 1

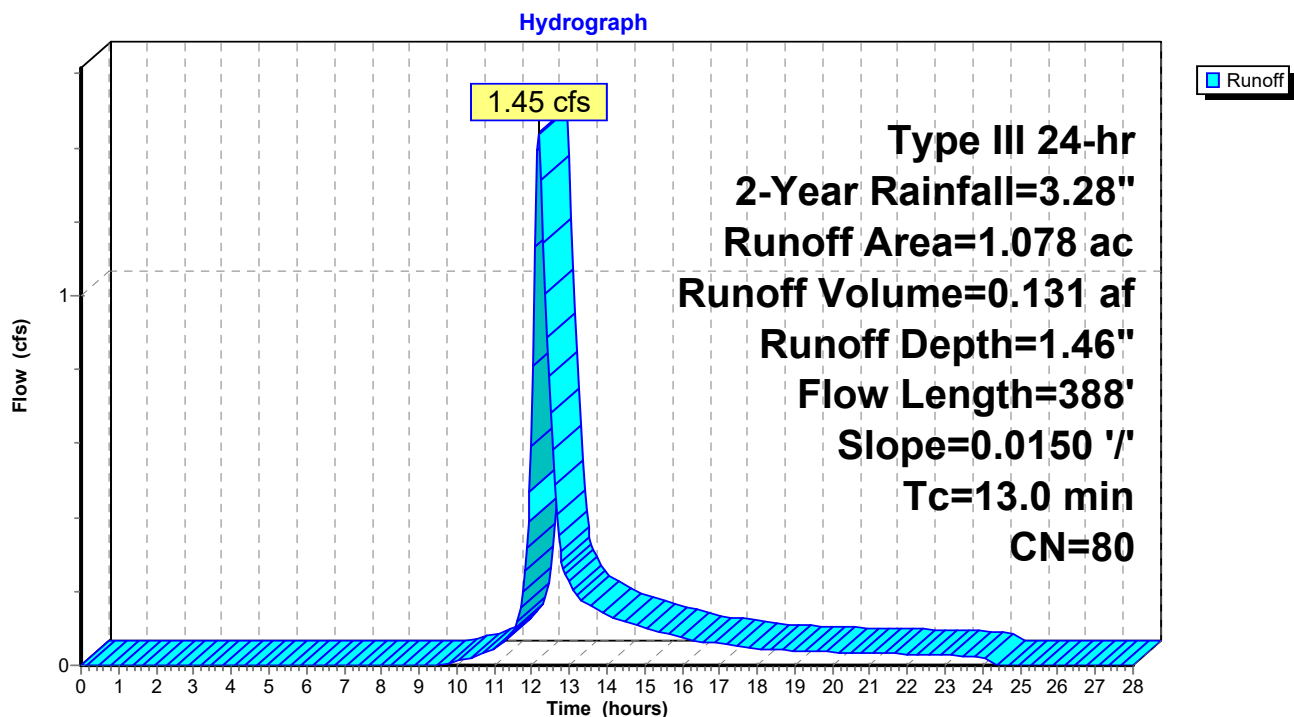
Runoff = 1.45 cfs @ 12.19 hrs, Volume= 0.131 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.28"

Area (ac)	CN	Description
1.078	80	>75% Grass cover, Good, HSG D
1.078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0150	0.13		<b>Sheet Flow, Greass Area</b> Grass: Short n= 0.150 P2= 3.10"
6.6	338	0.0150	0.86		<b>Shallow Concentrated Flow, Grass Field</b> Short Grass Pasture Kv= 7.0 fps
13.0	388	Total			

### Subcatchment 1S: Sub-Catchment 1



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 8

### Summary for Subcatchment 2S: Sub-Catchment 2

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 0.92 cfs @ 12.06 hrs, Volume= 0.062 af, Depth= 1.60"

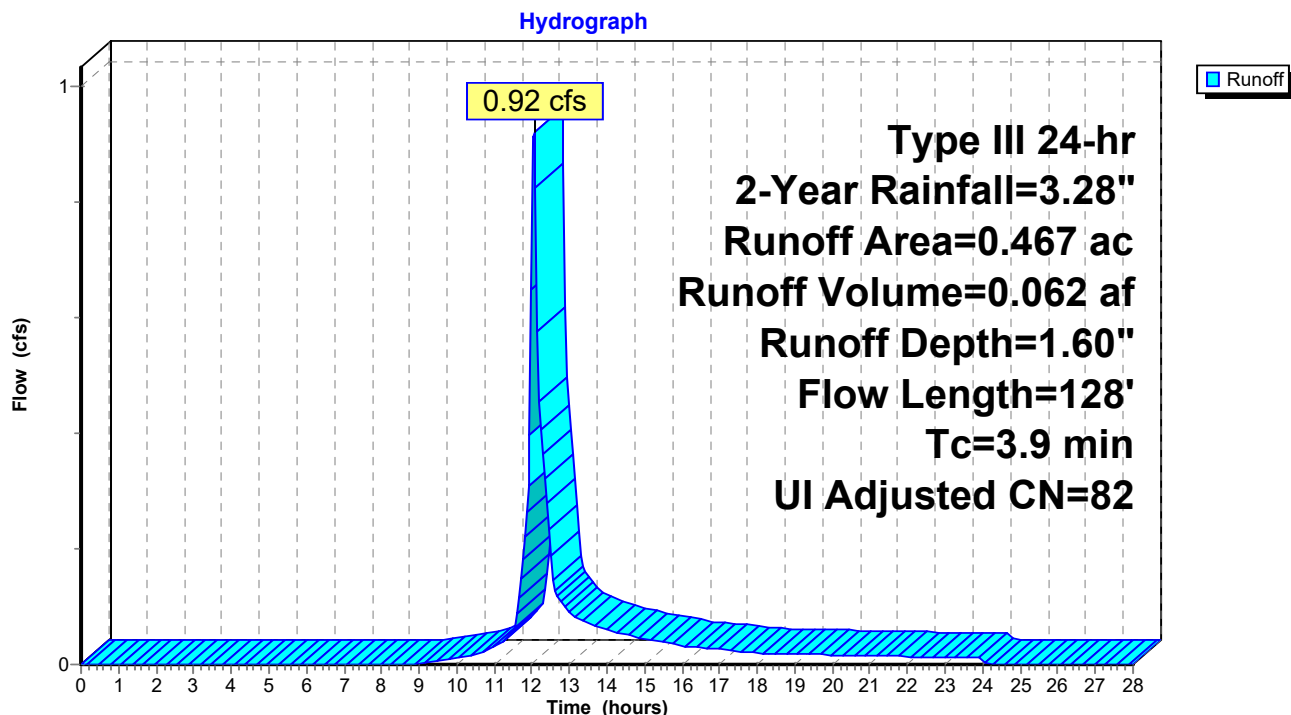
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 2-Year Rainfall=3.28"

Area (ac)	CN	Adj	Description
0.120	98		Unconnected pavement, HSG D
0.347	80		>75% Grass cover, Good, HSG D
0.467	85	82	Weighted Average, UI Adjusted
0.347			74.30% Pervious Area
0.120			25.70% Impervious Area
0.120			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		<b>Sheet Flow, Grass Hill</b> Grass: Short $n=0.150$ $P2=3.10"$
0.6	78	0.1000	2.21		<b>Shallow Concentrated Flow,</b> Short Grass Pasture $K_v=7.0$ fps
3.9	128	Total			

### Subcatchment 2S: Sub-Catchment 2



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 9

### Summary for Subcatchment 3S: Sub-Catchment 3

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 0.56 cfs @ 12.03 hrs, Volume= 0.037 af, Depth= 1.83"

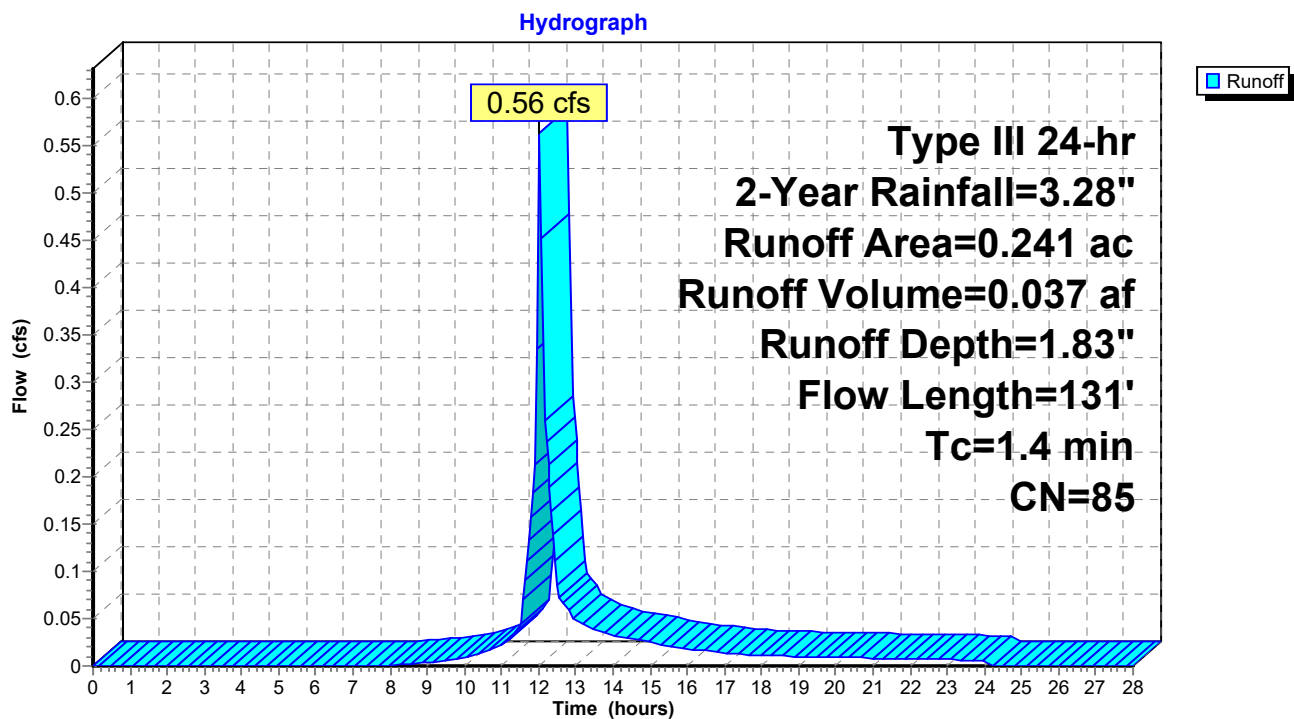
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 2-Year Rainfall=3.28"

Area (ac)	CN	Description
0.068	98	Paved parking, HSG D
0.173	80	>75% Grass cover, Good, HSG D
0.241	85	Weighted Average
0.173		71.78% Pervious Area
0.068		28.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0150	1.09		<b>Sheet Flow, Clay Infield</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.5	70	0.1300	2.52		<b>Shallow Concentrated Flow, Grass Outfield</b> Short Grass Pasture $K_v=7.0$ fps
1.4	131	Total			

### Subcatchment 3S: Sub-Catchment 3



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 10

### Summary for Subcatchment 4S: Sub-Catchment 4

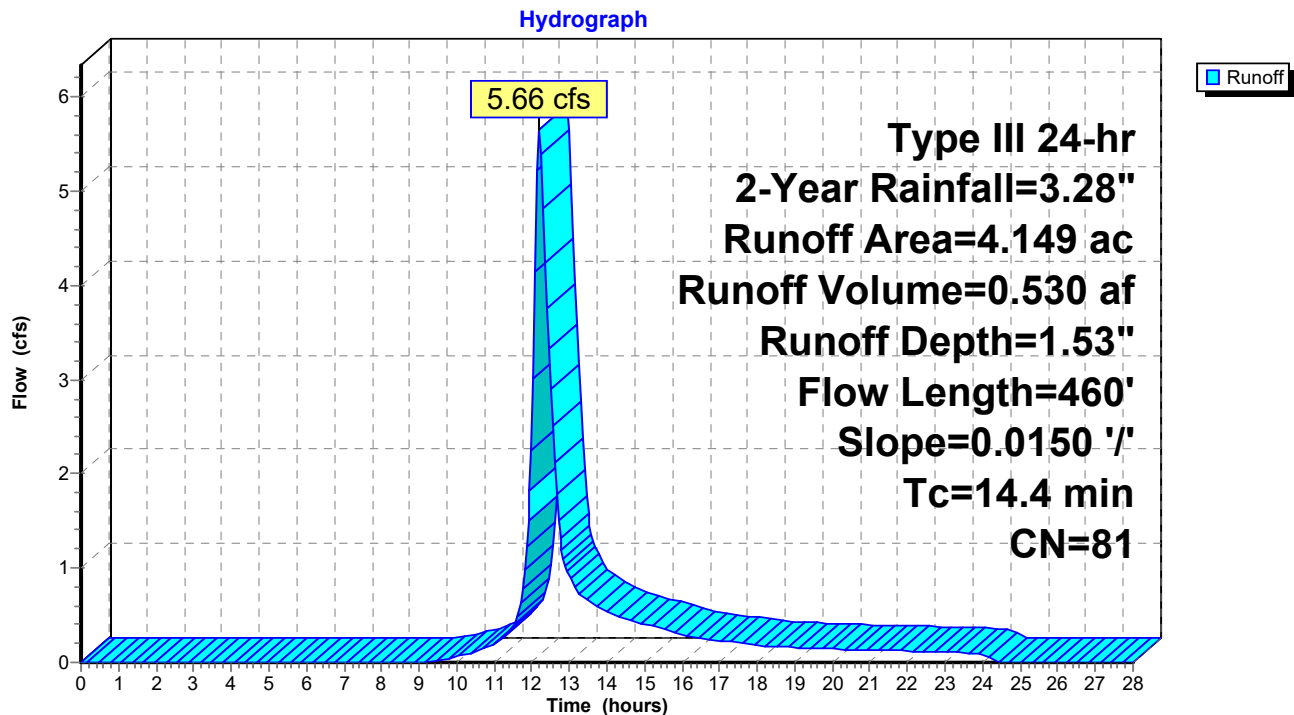
Runoff = 5.66 cfs @ 12.21 hrs, Volume= 0.530 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.28"

Area (ac)	CN	Description
0.071	98	Paved parking, HSG D
3.322	80	>75% Grass cover, Good, HSG D
0.756	86	Woods/grass comb., Poor, HSG D
4.149	81	Weighted Average
4.078		98.29% Pervious Area
0.071		1.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0150	0.13		<b>Sheet Flow, Clay Infield</b> Grass: Short n= 0.150 P2= 3.10"
8.0	410	0.0150	0.86		<b>Shallow Concentrated Flow, Grass Field</b> Short Grass Pasture Kv= 7.0 fps
14.4	460	Total			

### Subcatchment 4S: Sub-Catchment 4



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 11

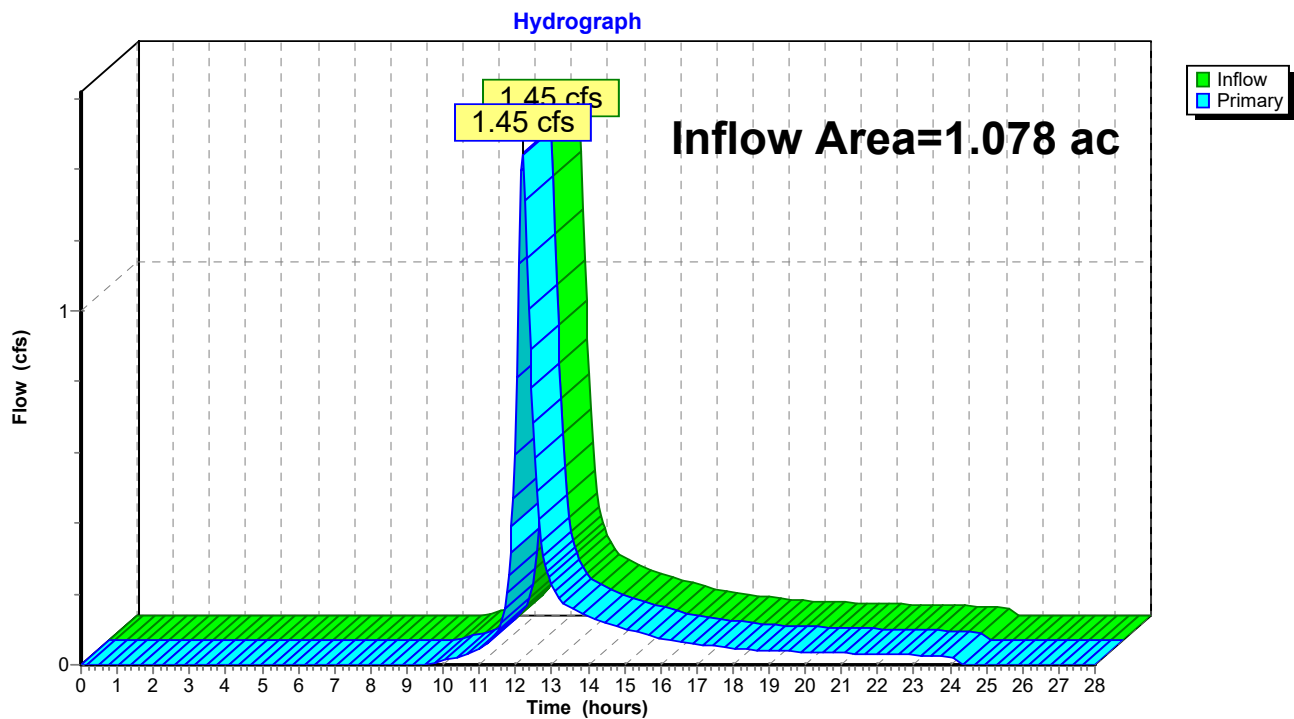
### Summary for Pond 1P: Outfall # 1 - Resource Area West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.078 ac, 0.00% Impervious, Inflow Depth = 1.46" for 2-Year event  
Inflow = 1.45 cfs @ 12.19 hrs, Volume= 0.131 af  
Primary = 1.45 cfs @ 12.19 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

### Pond 1P: Outfall # 1 - Resource Area West



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 12

### Summary for Pond 2P: Outfall #2 to CB

[57] Hint: Peaked at 134.83' (Flood elevation advised)

Inflow Area = 0.467 ac, 25.70% Impervious, Inflow Depth = 1.60" for 2-Year event  
Inflow = 0.92 cfs @ 12.06 hrs, Volume= 0.062 af  
Outflow = 0.92 cfs @ 12.06 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min  
Primary = 0.92 cfs @ 12.06 hrs, Volume= 0.062 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

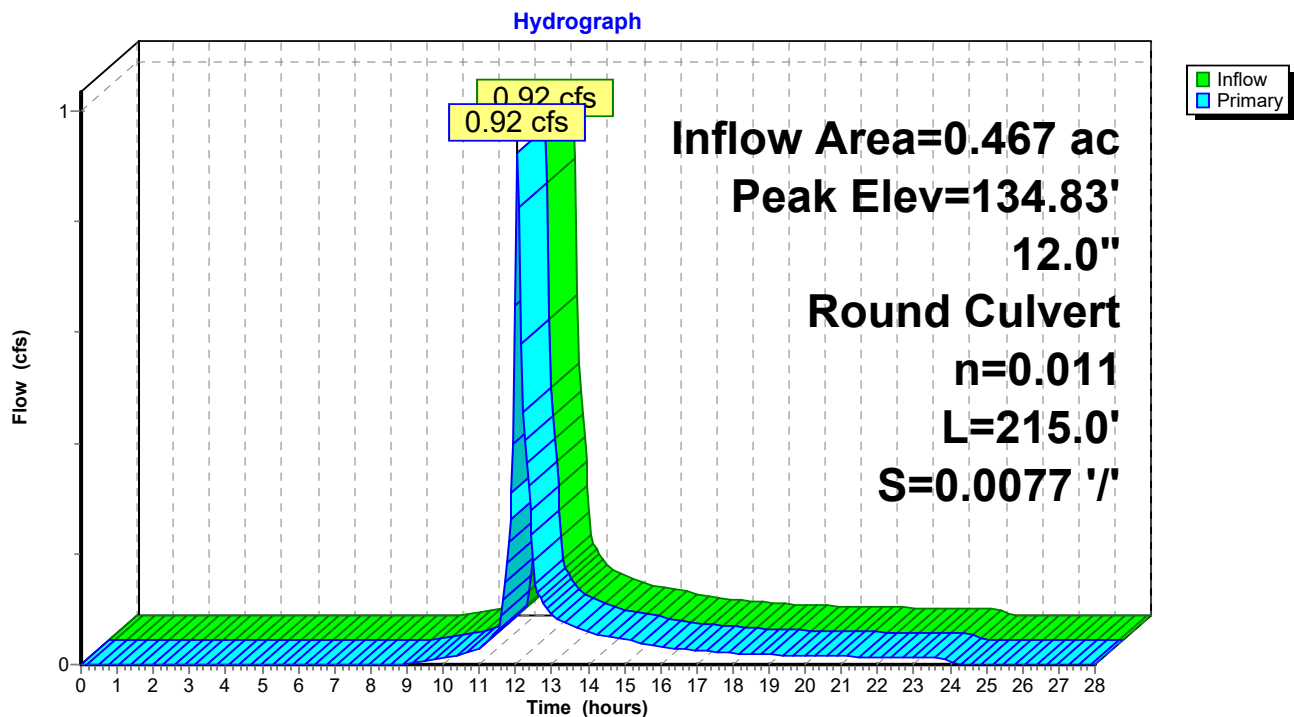
Peak Elev= 134.83' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.36'	<b>12.0" Round Culvert</b> L= 215.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 134.36' / 132.70' S= 0.0077 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

**Primary OutFlow** Max=0.89 cfs @ 12.06 hrs HW=134.82' (Free Discharge)

↑1=Culvert (Barrel Controls 0.89 cfs @ 3.74 fps)

### Pond 2P: Outfall #2 to CB





## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 13

### Summary for Pond 3P: Outfall #3 to CB

[57] Hint: Peaked at 133.39' (Flood elevation advised)

Inflow Area = 0.241 ac, 28.22% Impervious, Inflow Depth = 1.83" for 2-Year event  
Inflow = 0.56 cfs @ 12.03 hrs, Volume= 0.037 af  
Outflow = 0.56 cfs @ 12.03 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min  
Primary = 0.56 cfs @ 12.03 hrs, Volume= 0.037 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

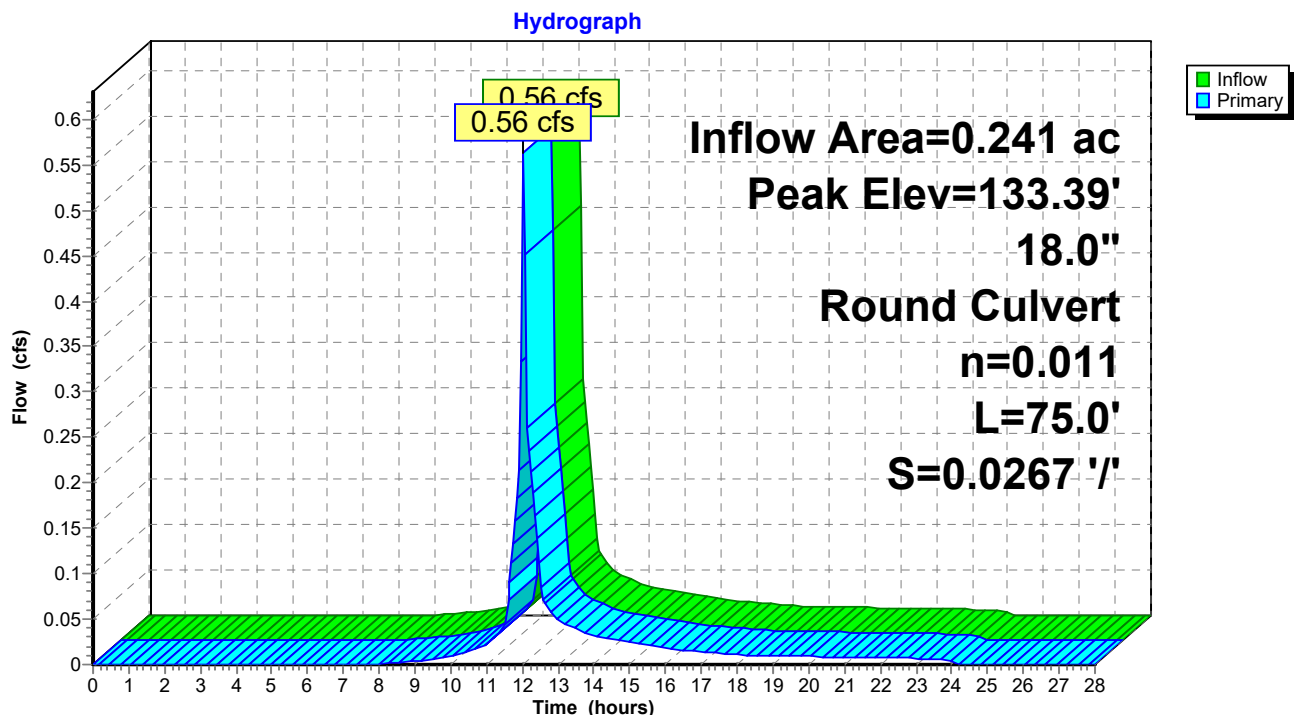
Peak Elev= 133.39' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.10'	<b>18.0" Round Culvert</b> L= 75.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 133.10' / 131.10' S= 0.0267 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=0.54 cfs @ 12.03 hrs HW=133.39' (Free Discharge)

↑1=Culvert (Inlet Controls 0.54 cfs @ 2.28 fps)

### Pond 3P: Outfall #3 to CB



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 14

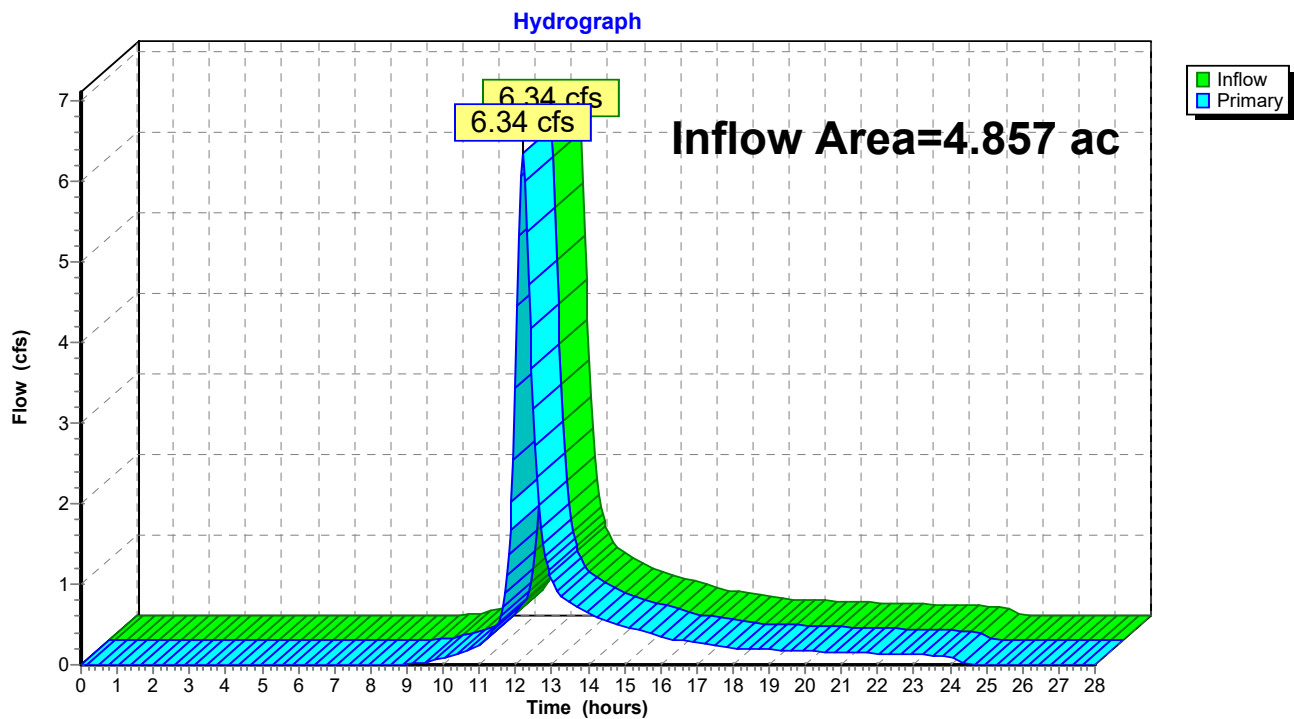
### Summary for Pond 4P: Outfall # 4 - Resource Area North Corner

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.857 ac, 5.33% Impervious, Inflow Depth = 1.55" for 2-Year event  
Inflow = 6.34 cfs @ 12.20 hrs, Volume= 0.629 af  
Primary = 6.34 cfs @ 12.20 hrs, Volume= 0.629 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

### Pond 4P: Outfall # 4 - Resource Area North Corner



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.28"

Printed 2/10/2025

Page 15

### Summary for Pond 5P: (new Pond)

[57] Hint: Peaked at 130.03' (Flood elevation advised)

Inflow Area = 0.708 ac, 26.55% Impervious, Inflow Depth = 1.68" for 2-Year event  
Inflow = 1.45 cfs @ 12.05 hrs, Volume= 0.099 af  
Outflow = 1.45 cfs @ 12.05 hrs, Volume= 0.099 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.45 cfs @ 12.05 hrs, Volume= 0.099 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

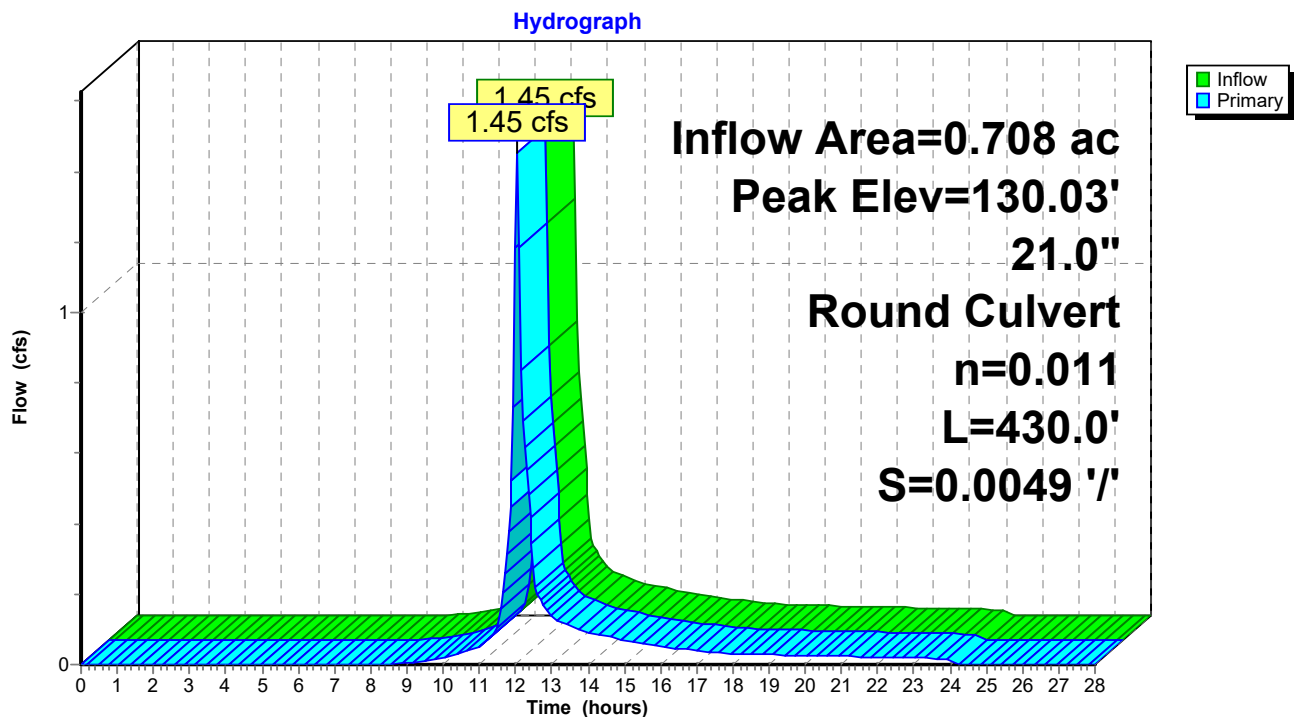
Peak Elev= 130.03' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.50'	<b>21.0" Round Culvert</b> L= 430.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 129.50' / 127.39' S= 0.0049 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 2.41 sf

**Primary OutFlow** Max=1.45 cfs @ 12.05 hrs HW=130.03' (Free Discharge)

↑1=Culvert (Barrel Controls 1.45 cfs @ 3.53 fps)

### Pond 5P: (new Pond)



## PRE Development Analysis - MS

Type III 24-hr 10-Year Rainfall=5.18"

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 16

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Sub-Catchment1** Runoff Area=1.078 ac 0.00% Impervious Runoff Depth=3.05"  
Flow Length=388' Slope=0.0150 '/ Tc=13.0 min CN=80 Runoff=3.04 cfs 0.274 af

**Subcatchment2S: Sub-Catchment2** Runoff Area=0.467 ac 25.70% Impervious Runoff Depth=3.24"  
Flow Length=128' Tc=3.9 min UI Adjusted CN=82 Runoff=1.86 cfs 0.126 af

**Subcatchment3S: Sub-Catchment3** Runoff Area=0.241 ac 28.22% Impervious Runoff Depth=3.53"  
Flow Length=131' Tc=1.4 min CN=85 Runoff=1.08 cfs 0.071 af

**Subcatchment4S: Sub-Catchment4** Runoff Area=4.149 ac 1.71% Impervious Runoff Depth=3.14"  
Flow Length=460' Slope=0.0150 '/ Tc=14.4 min CN=81 Runoff=11.69 cfs 1.087 af

**Pond 1P: Outfall # 1 - Resource Area West** Inflow=3.04 cfs 0.274 af  
Primary=3.04 cfs 0.274 af

**Pond 2P: Outfall #2 to CB** Peak Elev=135.06' Inflow=1.86 cfs 0.126 af  
12.0" Round Culvert n=0.011 L=215.0' S=0.0077 '/ Outflow=1.86 cfs 0.126 af

**Pond 3P: Outfall #3 to CB** Peak Elev=133.51' Inflow=1.08 cfs 0.071 af  
18.0" Round Culvert n=0.011 L=75.0' S=0.0267 '/ Outflow=1.08 cfs 0.071 af

**Pond 4P: Outfall # 4 - Resource Area North Corner** Inflow=13.02 cfs 1.284 af  
Primary=13.02 cfs 1.284 af

**Pond 5P: (new Pond)** Peak Elev=130.26' Inflow=2.87 cfs 0.197 af  
21.0" Round Culvert n=0.011 L=430.0' S=0.0049 '/ Outflow=2.87 cfs 0.197 af

**Total Runoff Area = 5.935 ac Runoff Volume = 1.558 af Average Runoff Depth = 3.15"**  
**95.64% Pervious = 5.676 ac 4.36% Impervious = 0.259 ac**

## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 17

### Summary for Subcatchment 1S: Sub-Catchment 1

Runoff = 3.04 cfs @ 12.18 hrs, Volume= 0.274 af, Depth= 3.05"

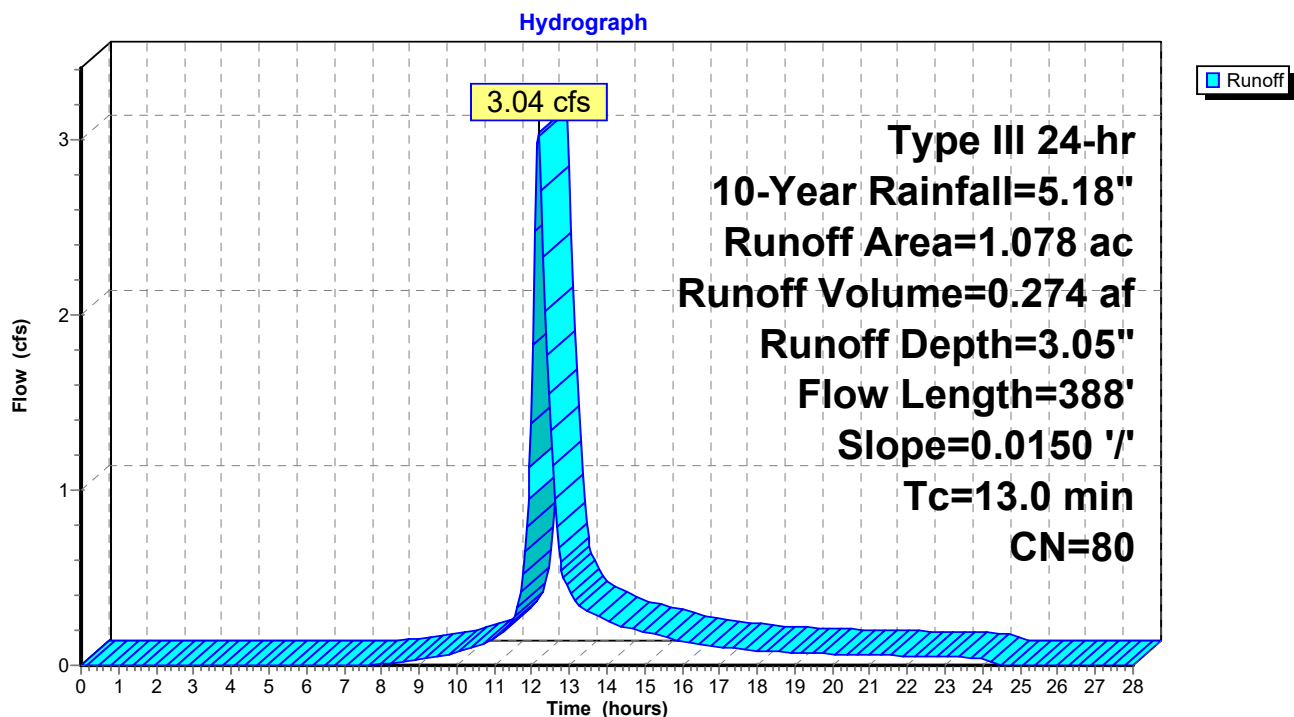
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=5.18"

Area (ac)	CN	Description
1.078	80	>75% Grass cover, Good, HSG D
1.078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0150	0.13		<b>Sheet Flow, Greass Area</b> Grass: Short n= 0.150 P2= 3.10"
6.6	338	0.0150	0.86		<b>Shallow Concentrated Flow, Grass Field</b> Short Grass Pasture Kv= 7.0 fps
13.0	388	Total			

### Subcatchment 1S: Sub-Catchment 1



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 18

### Summary for Subcatchment 2S: Sub-Catchment 2

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.86 cfs @ 12.06 hrs, Volume= 0.126 af, Depth= 3.24"

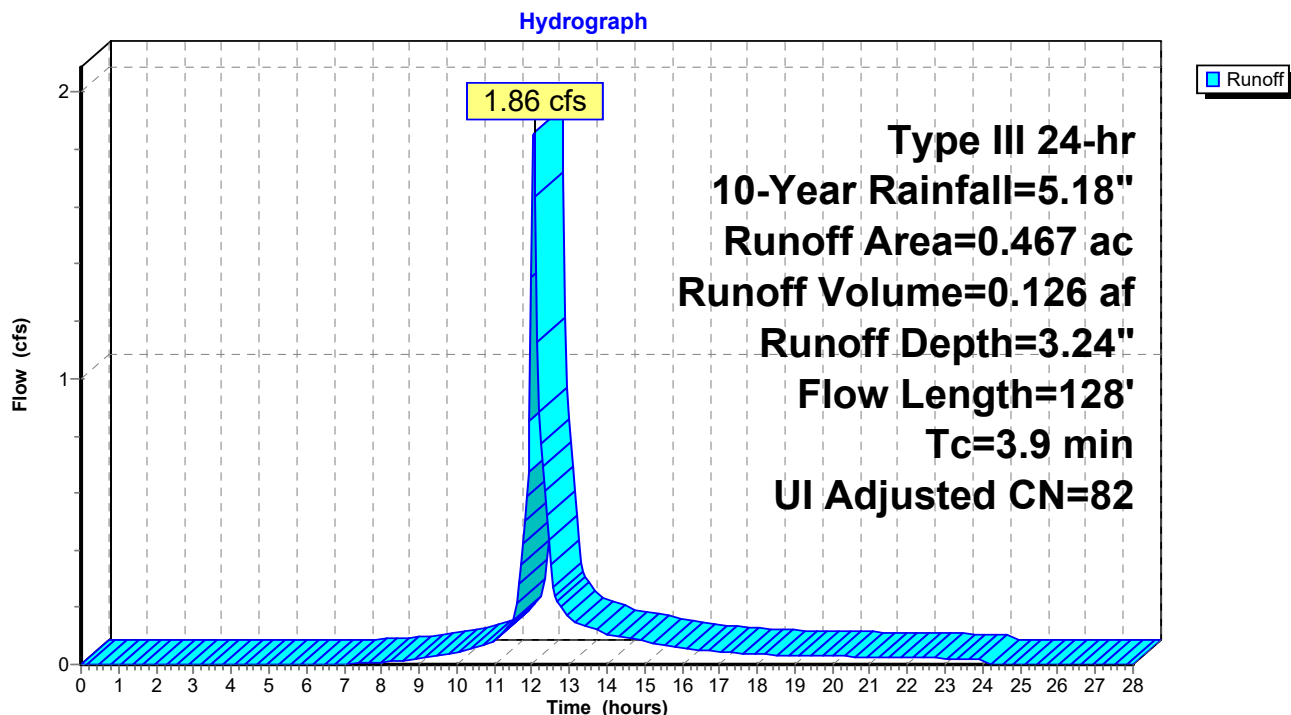
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 10-Year Rainfall=5.18"

Area (ac)	CN	Adj	Description
0.120	98		Unconnected pavement, HSG D
0.347	80		>75% Grass cover, Good, HSG D
0.467	85	82	Weighted Average, UI Adjusted
0.347			74.30% Pervious Area
0.120			25.70% Impervious Area
0.120			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		<b>Sheet Flow, Grass Hill</b> Grass: Short $n=0.150$ $P2=3.10"$
0.6	78	0.1000	2.21		<b>Shallow Concentrated Flow,</b> Short Grass Pasture $K_v=7.0$ fps
3.9	128	Total			

### Subcatchment 2S: Sub-Catchment 2





## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 19

### Summary for Subcatchment 3S: Sub-Catchment 3

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.08 cfs @ 12.02 hrs, Volume= 0.071 af, Depth= 3.53"

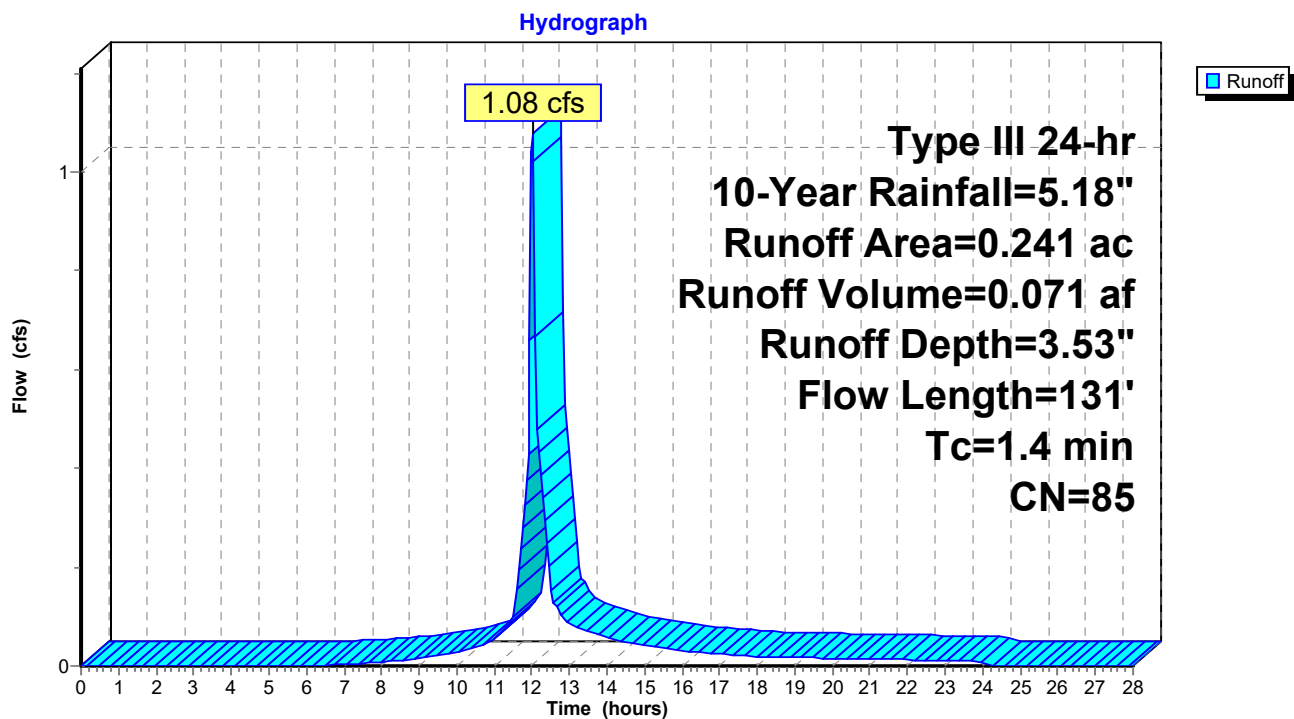
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 10-Year Rainfall=5.18"

Area (ac)	CN	Description
0.068	98	Paved parking, HSG D
0.173	80	>75% Grass cover, Good, HSG D
0.241	85	Weighted Average
0.173		71.78% Pervious Area
0.068		28.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0150	1.09		<b>Sheet Flow, Clay Infield</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.5	70	0.1300	2.52		<b>Shallow Concentrated Flow, Grass Outfield</b> Short Grass Pasture $K_v=7.0$ fps
1.4	131	Total			

### Subcatchment 3S: Sub-Catchment 3



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 20

### Summary for Subcatchment 4S: Sub-Catchment 4

Runoff = 11.69 cfs @ 12.20 hrs, Volume= 1.087 af, Depth= 3.14"

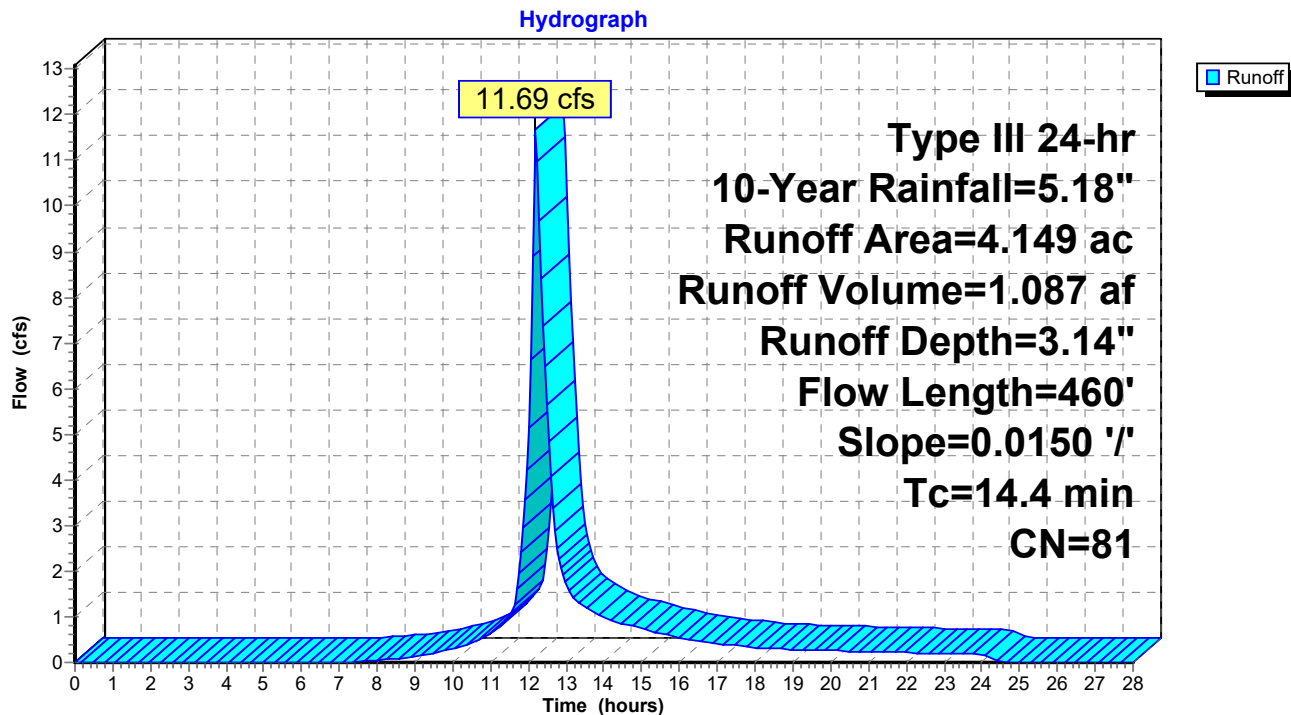
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=5.18"

Area (ac)	CN	Description
0.071	98	Paved parking, HSG D
3.322	80	>75% Grass cover, Good, HSG D
0.756	86	Woods/grass comb., Poor, HSG D
4.149	81	Weighted Average
4.078		98.29% Pervious Area
0.071		1.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0150	0.13		<b>Sheet Flow, Clay Infield</b> Grass: Short n= 0.150 P2= 3.10"
8.0	410	0.0150	0.86		<b>Shallow Concentrated Flow, Grass Field</b> Short Grass Pasture Kv= 7.0 fps
14.4	460	Total			

### Subcatchment 4S: Sub-Catchment 4



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 21

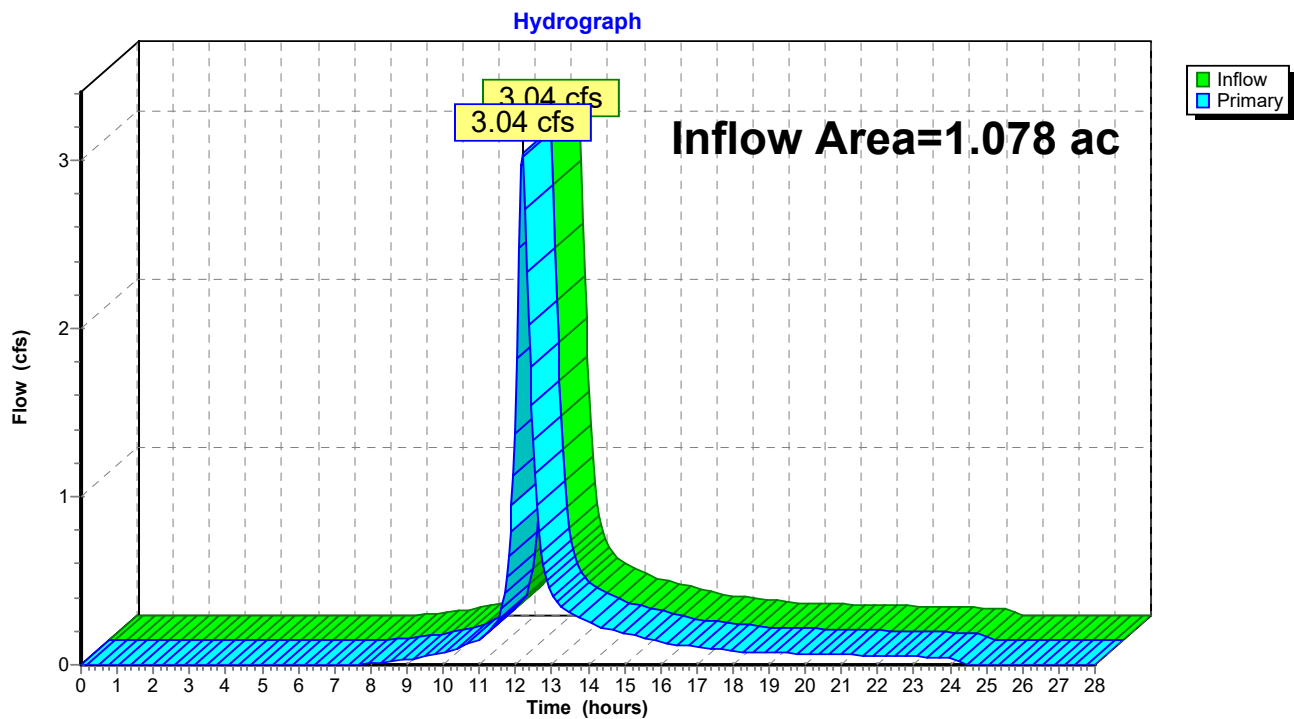
### Summary for Pond 1P: Outfall # 1 - Resource Area West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.078 ac, 0.00% Impervious, Inflow Depth = 3.05" for 10-Year event  
Inflow = 3.04 cfs @ 12.18 hrs, Volume= 0.274 af  
Primary = 3.04 cfs @ 12.18 hrs, Volume= 0.274 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

### Pond 1P: Outfall # 1 - Resource Area West



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 22

### Summary for Pond 2P: Outfall #2 to CB

[57] Hint: Peaked at 135.06' (Flood elevation advised)

Inflow Area = 0.467 ac, 25.70% Impervious, Inflow Depth = 3.24" for 10-Year event  
Inflow = 1.86 cfs @ 12.06 hrs, Volume= 0.126 af  
Outflow = 1.86 cfs @ 12.06 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.86 cfs @ 12.06 hrs, Volume= 0.126 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

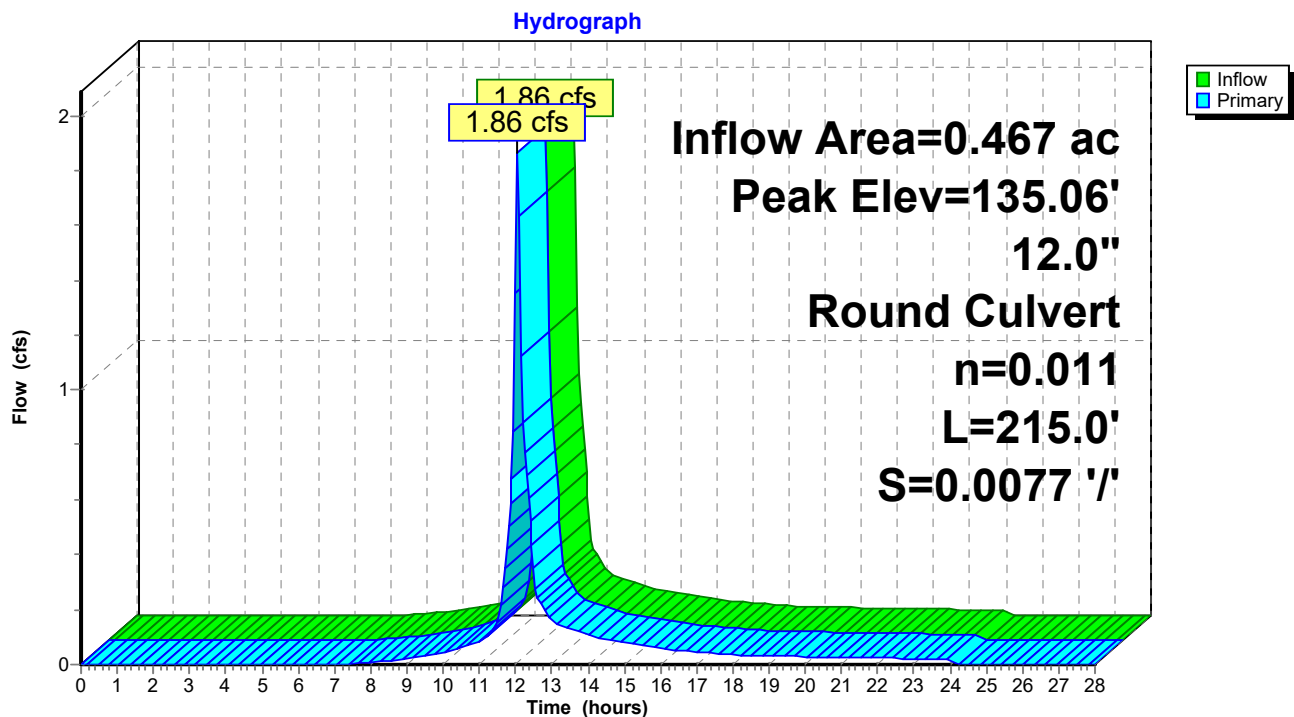
Peak Elev= 135.06' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.36'	<b>12.0" Round Culvert</b> L= 215.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 134.36' / 132.70' S= 0.0077 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.81 cfs @ 12.06 hrs HW=135.04' (Free Discharge)

↑1=Culvert (Barrel Controls 1.81 cfs @ 4.46 fps)

### Pond 2P: Outfall #2 to CB



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 23

### Summary for Pond 3P: Outfall #3 to CB

[57] Hint: Peaked at 133.51' (Flood elevation advised)

Inflow Area = 0.241 ac, 28.22% Impervious, Inflow Depth = 3.53" for 10-Year event  
Inflow = 1.08 cfs @ 12.02 hrs, Volume= 0.071 af  
Outflow = 1.08 cfs @ 12.02 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.08 cfs @ 12.02 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

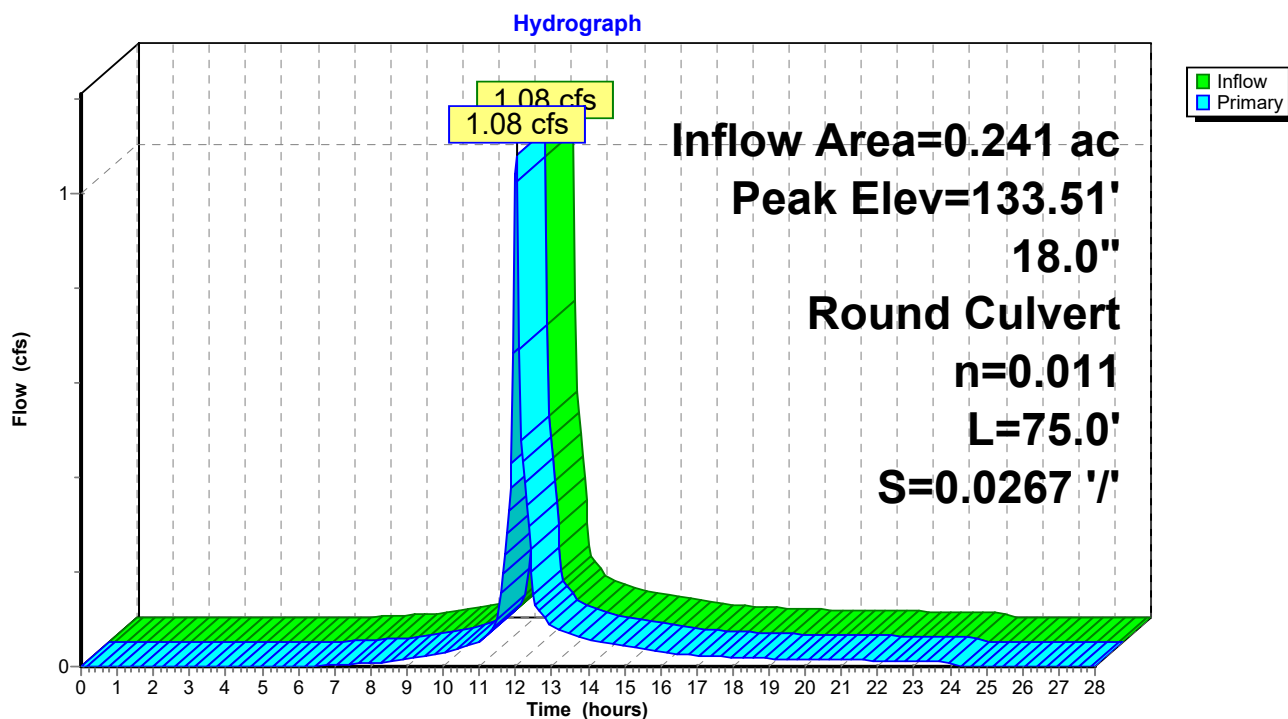
Peak Elev= 133.51' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.10'	<b>18.0" Round Culvert</b> L= 75.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 133.10' / 131.10' S= 0.0267 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=1.03 cfs @ 12.02 hrs HW=133.50' (Free Discharge)

↑1=Culvert (Inlet Controls 1.03 cfs @ 2.70 fps)

### Pond 3P: Outfall #3 to CB



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 24

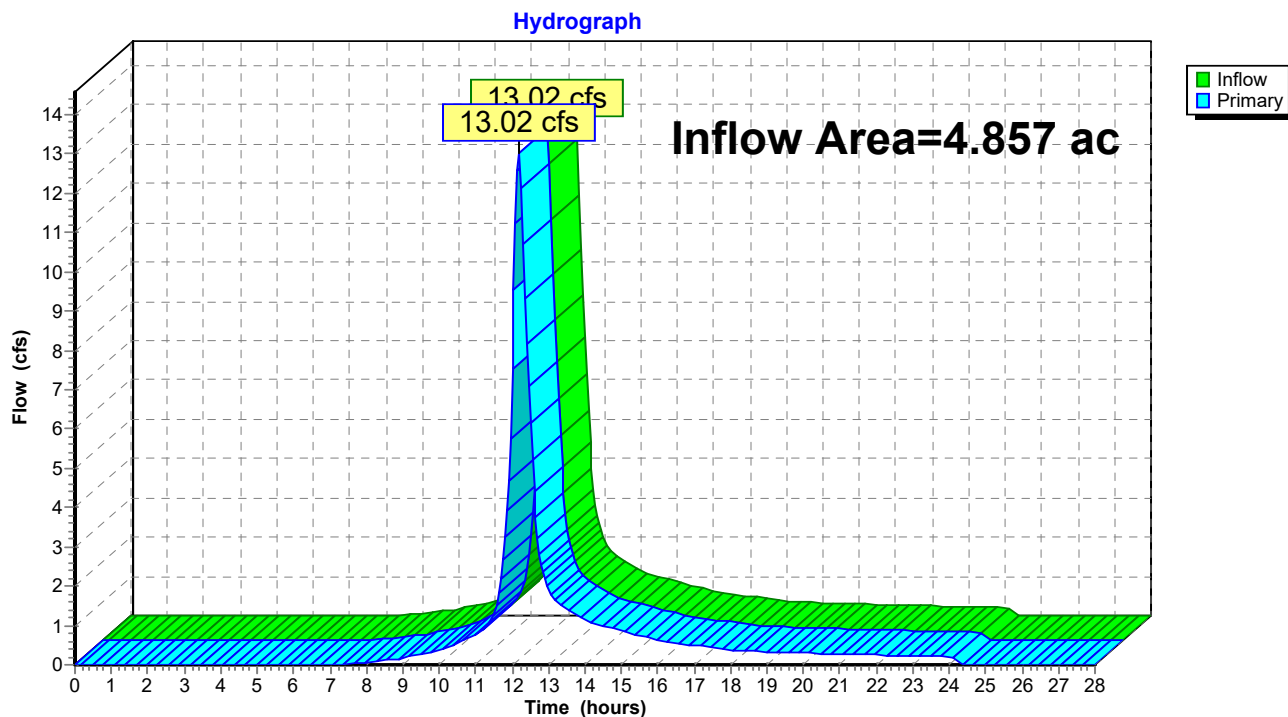
### Summary for Pond 4P: Outfall # 4 - Resource Area North Corner

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.857 ac, 5.33% Impervious, Inflow Depth = 3.17" for 10-Year event  
Inflow = 13.02 cfs @ 12.19 hrs, Volume= 1.284 af  
Primary = 13.02 cfs @ 12.19 hrs, Volume= 1.284 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

### Pond 4P: Outfall # 4 - Resource Area North Corner



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.18"

Printed 2/10/2025

Page 25

### Summary for Pond 5P: (new Pond)

[57] Hint: Peaked at 130.26' (Flood elevation advised)

Inflow Area = 0.708 ac, 26.55% Impervious, Inflow Depth = 3.34" for 10-Year event  
Inflow = 2.87 cfs @ 12.05 hrs, Volume= 0.197 af  
Outflow = 2.87 cfs @ 12.05 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.0 min  
Primary = 2.87 cfs @ 12.05 hrs, Volume= 0.197 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

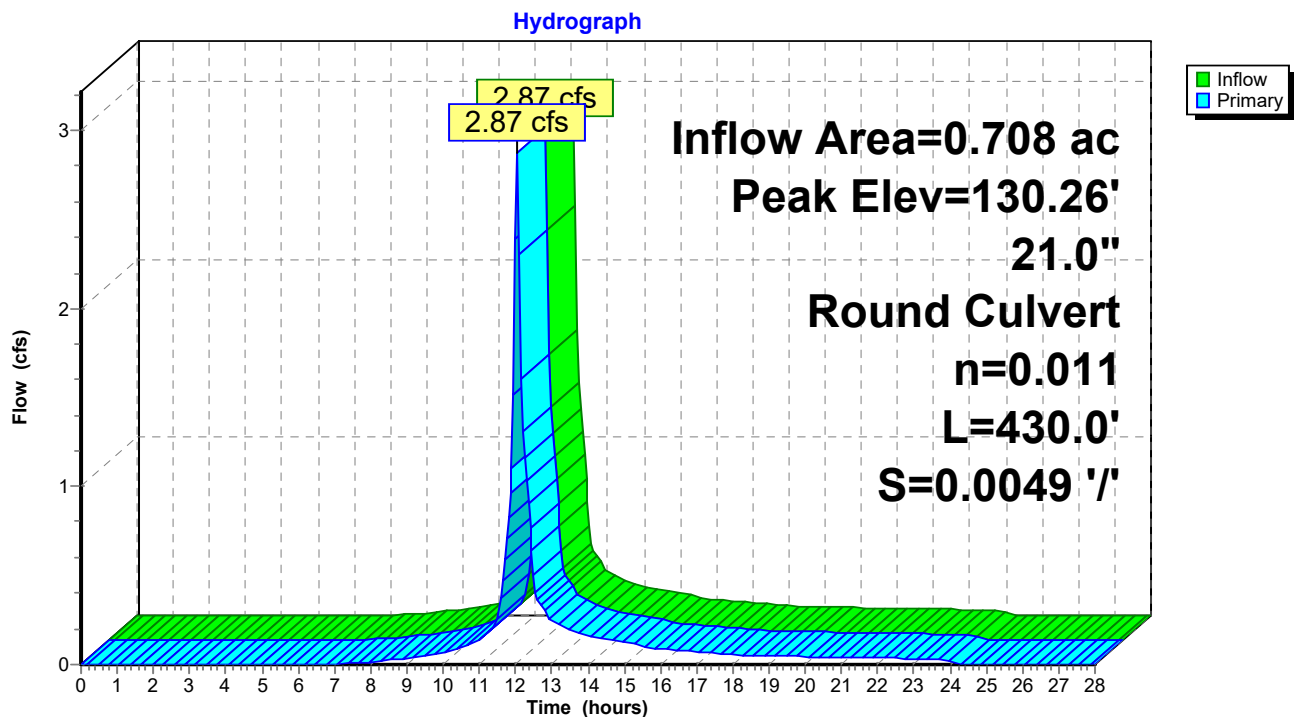
Peak Elev= 130.26' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.50'	<b>21.0" Round Culvert</b> L= 430.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 129.50' / 127.39' S= 0.0049 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 2.41 sf

**Primary OutFlow** Max=2.85 cfs @ 12.05 hrs HW=130.25' (Free Discharge)

↑1=Culvert (Barrel Controls 2.85 cfs @ 4.24 fps)

### Pond 5P: (new Pond)





## PRE Development Analysis - MS

Type III 24-hr 25-Year Rainfall=6.37"

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 26

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Sub-Catchment1** Runoff Area=1.078 ac 0.00% Impervious Runoff Depth=4.12"  
Flow Length=388' Slope=0.0150 '/' Tc=13.0 min CN=80 Runoff=4.09 cfs 0.370 af

**Subcatchment2S: Sub-Catchment2** Runoff Area=0.467 ac 25.70% Impervious Runoff Depth=4.33"  
Flow Length=128' Tc=3.9 min UI Adjusted CN=82 Runoff=2.47 cfs 0.168 af

**Subcatchment3S: Sub-Catchment3** Runoff Area=0.241 ac 28.22% Impervious Runoff Depth=4.65"  
Flow Length=131' Tc=1.4 min CN=85 Runoff=1.41 cfs 0.093 af

**Subcatchment4S: Sub-Catchment4** Runoff Area=4.149 ac 1.71% Impervious Runoff Depth=4.22"  
Flow Length=460' Slope=0.0150 '/' Tc=14.4 min CN=81 Runoff=15.61 cfs 1.460 af

**Pond 1P: Outfall # 1 - Resource Area West** Inflow=4.09 cfs 0.370 af  
Primary=4.09 cfs 0.370 af

**Pond 2P: Outfall #2 to CB** Peak Elev=135.20' Inflow=2.47 cfs 0.168 af  
12.0" Round Culvert n=0.011 L=215.0' S=0.0077 '/' Outflow=2.47 cfs 0.168 af

**Pond 3P: Outfall #3 to CB** Peak Elev=133.58' Inflow=1.41 cfs 0.093 af  
18.0" Round Culvert n=0.011 L=75.0' S=0.0267 '/' Outflow=1.41 cfs 0.093 af

**Pond 4P: Outfall # 4 - Resource Area North Corner** Inflow=17.35 cfs 1.722 af  
Primary=17.35 cfs 1.722 af

**Pond 5P: (new Pond)** Peak Elev=130.38' Inflow=3.78 cfs 0.262 af  
21.0" Round Culvert n=0.011 L=430.0' S=0.0049 '/' Outflow=3.78 cfs 0.262 af

**Total Runoff Area = 5.935 ac Runoff Volume = 2.092 af Average Runoff Depth = 4.23"**  
**95.64% Pervious = 5.676 ac 4.36% Impervious = 0.259 ac**

## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 27

### Summary for Subcatchment 1S: Sub-Catchment 1

Runoff = 4.09 cfs @ 12.18 hrs, Volume= 0.370 af, Depth= 4.12"

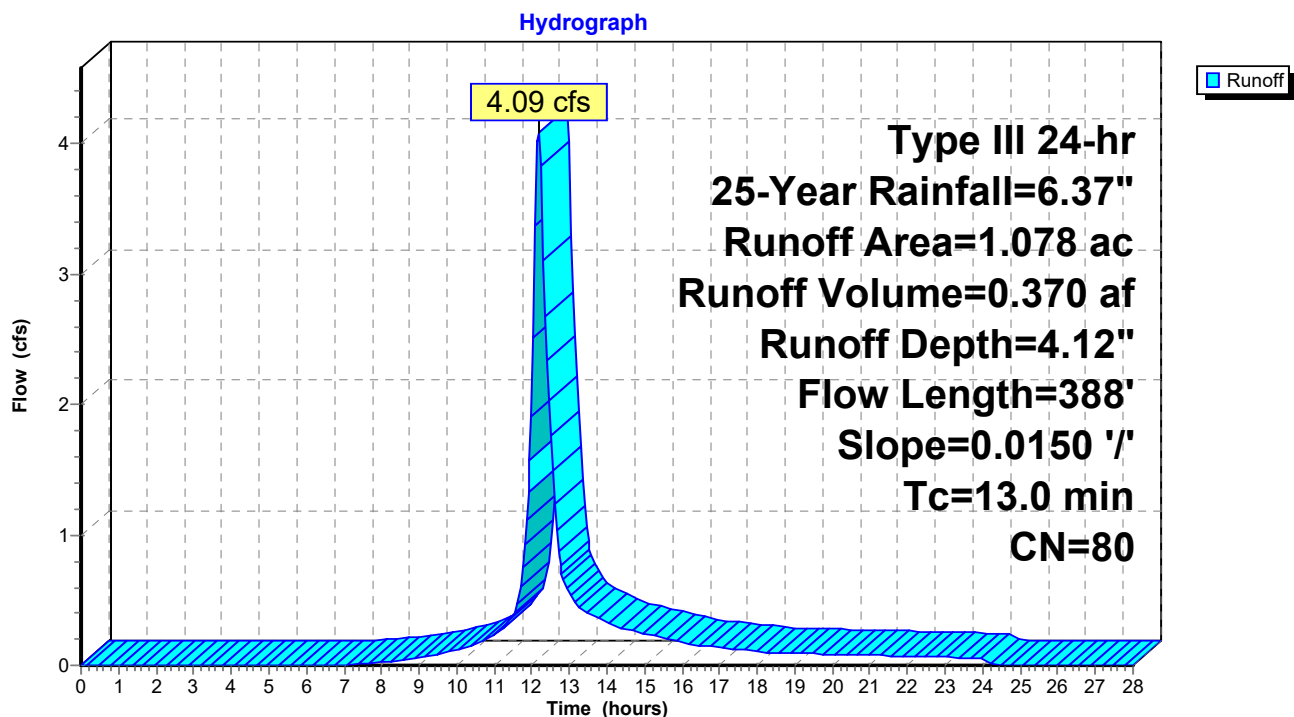
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.37"

Area (ac)	CN	Description
1.078	80	>75% Grass cover, Good, HSG D
1.078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0150	0.13		<b>Sheet Flow, Greass Area</b> Grass: Short n= 0.150 P2= 3.10"
6.6	338	0.0150	0.86		<b>Shallow Concentrated Flow, Grass Field</b> Short Grass Pasture Kv= 7.0 fps
13.0	388	Total			

### Subcatchment 1S: Sub-Catchment 1



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 28

### Summary for Subcatchment 2S: Sub-Catchment 2

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 2.47 cfs @ 12.06 hrs, Volume= 0.168 af, Depth= 4.33"

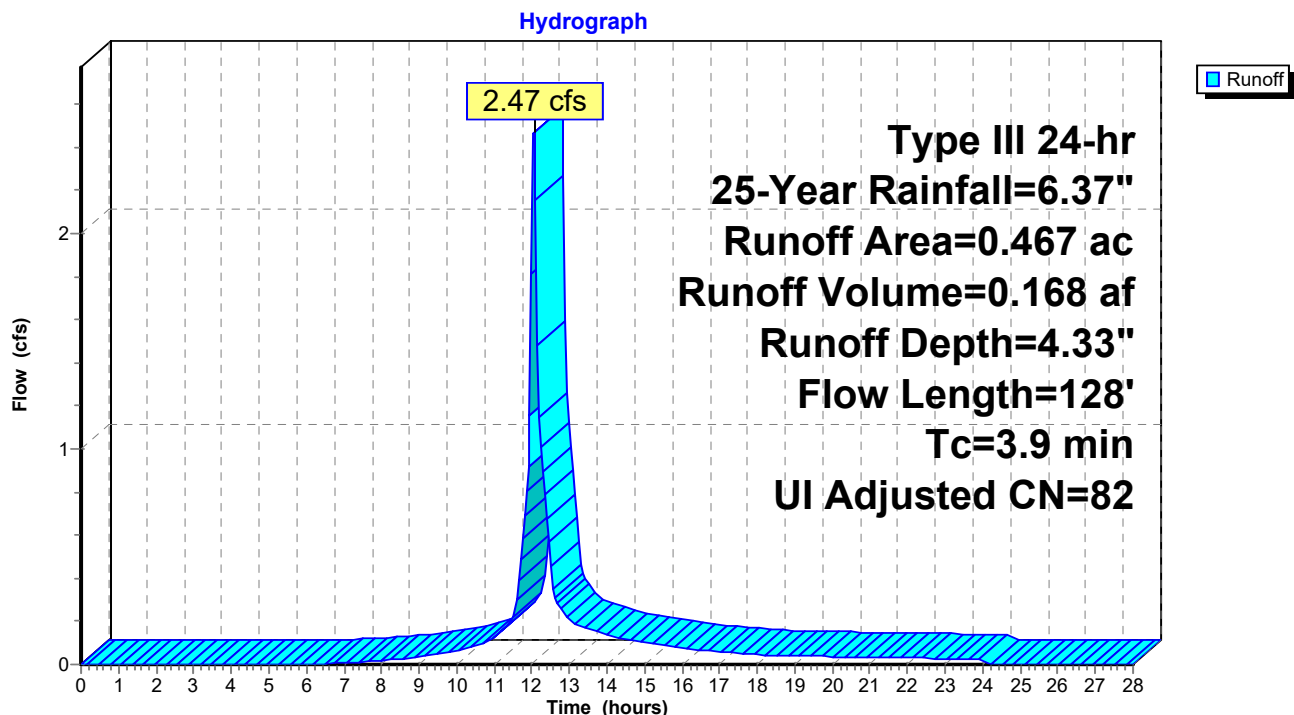
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 25-Year Rainfall=6.37"

Area (ac)	CN	Adj	Description
0.120	98		Unconnected pavement, HSG D
0.347	80		>75% Grass cover, Good, HSG D
0.467	85	82	Weighted Average, UI Adjusted
0.347			74.30% Pervious Area
0.120			25.70% Impervious Area
0.120			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		<b>Sheet Flow, Grass Hill</b> Grass: Short $n=0.150$ $P2=3.10"$
0.6	78	0.1000	2.21		<b>Shallow Concentrated Flow,</b> Short Grass Pasture $K_v=7.0$ fps
3.9	128	Total			

### Subcatchment 2S: Sub-Catchment 2



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 29

### Summary for Subcatchment 3S: Sub-Catchment 3

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.41 cfs @ 12.02 hrs, Volume= 0.093 af, Depth= 4.65"

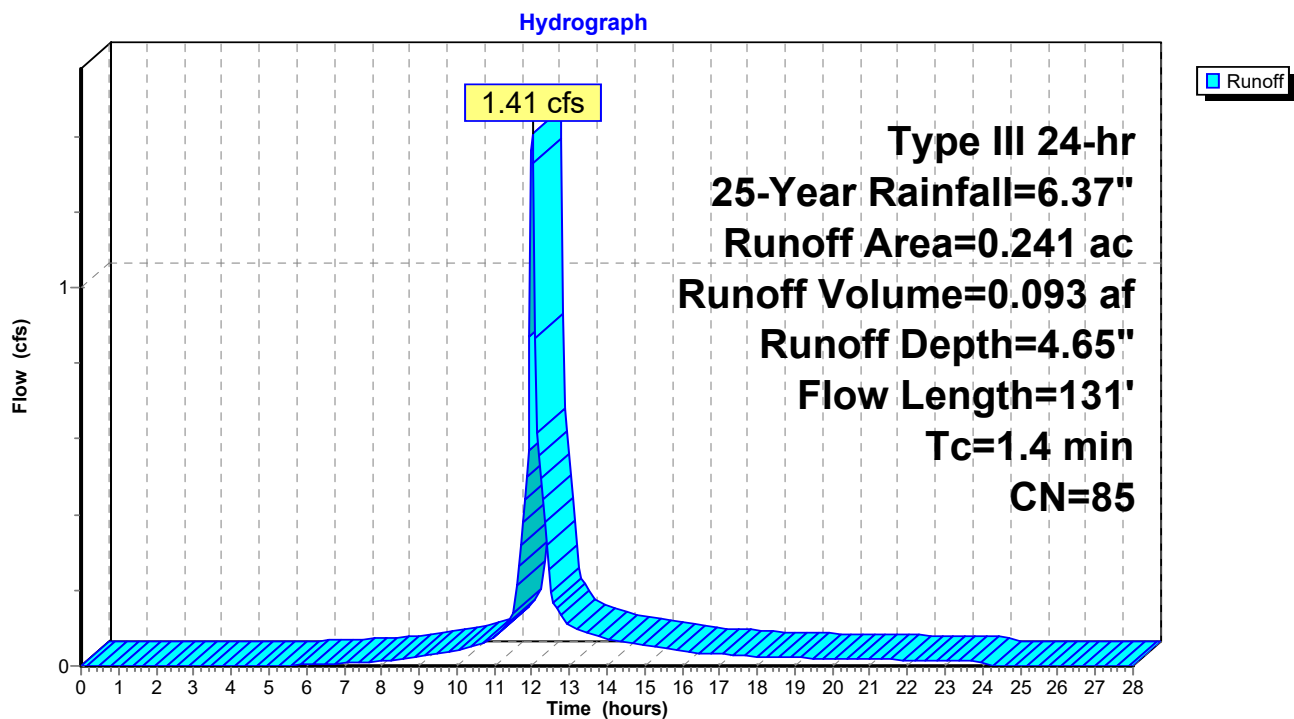
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 25-Year Rainfall=6.37"

Area (ac)	CN	Description
0.068	98	Paved parking, HSG D
0.173	80	>75% Grass cover, Good, HSG D
0.241	85	Weighted Average
0.173		71.78% Pervious Area
0.068		28.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0150	1.09		<b>Sheet Flow, Clay Infield</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.5	70	0.1300	2.52		<b>Shallow Concentrated Flow, Grass Outfield</b> Short Grass Pasture $K_v=7.0$ fps
1.4	131	Total			

### Subcatchment 3S: Sub-Catchment 3



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 30

### Summary for Subcatchment 4S: Sub-Catchment 4

Runoff = 15.61 cfs @ 12.20 hrs, Volume= 1.460 af, Depth= 4.22"

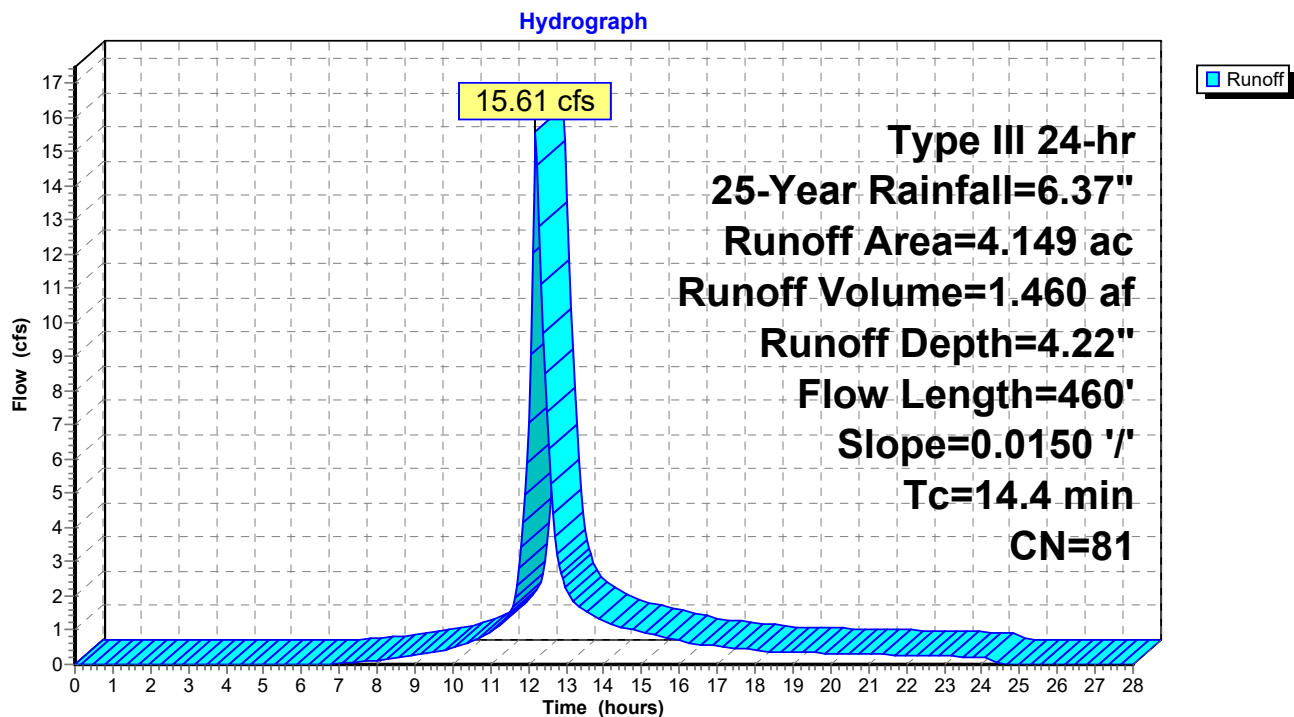
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.37"

Area (ac)	CN	Description
0.071	98	Paved parking, HSG D
3.322	80	>75% Grass cover, Good, HSG D
0.756	86	Woods/grass comb., Poor, HSG D
4.149	81	Weighted Average
4.078		98.29% Pervious Area
0.071		1.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0150	0.13		<b>Sheet Flow, Clay Infield</b> Grass: Short n= 0.150 P2= 3.10"
8.0	410	0.0150	0.86		<b>Shallow Concentrated Flow, Grass Field</b> Short Grass Pasture Kv= 7.0 fps
14.4	460	Total			

### Subcatchment 4S: Sub-Catchment 4



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 31

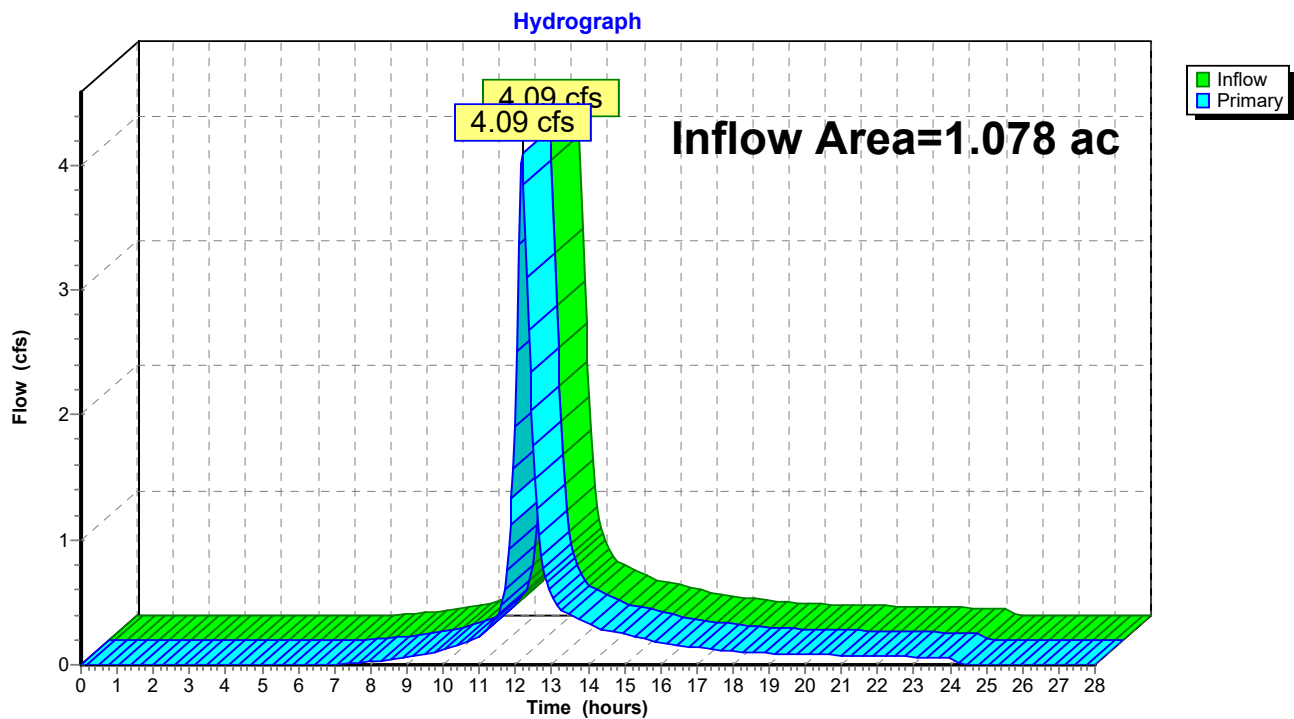
### Summary for Pond 1P: Outfall # 1 - Resource Area West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.078 ac, 0.00% Impervious, Inflow Depth = 4.12" for 25-Year event  
Inflow = 4.09 cfs @ 12.18 hrs, Volume= 0.370 af  
Primary = 4.09 cfs @ 12.18 hrs, Volume= 0.370 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

### Pond 1P: Outfall # 1 - Resource Area West



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 32

### Summary for Pond 2P: Outfall #2 to CB

[57] Hint: Peaked at 135.20' (Flood elevation advised)

Inflow Area = 0.467 ac, 25.70% Impervious, Inflow Depth = 4.33" for 25-Year event  
Inflow = 2.47 cfs @ 12.06 hrs, Volume= 0.168 af  
Outflow = 2.47 cfs @ 12.06 hrs, Volume= 0.168 af, Atten= 0%, Lag= 0.0 min  
Primary = 2.47 cfs @ 12.06 hrs, Volume= 0.168 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

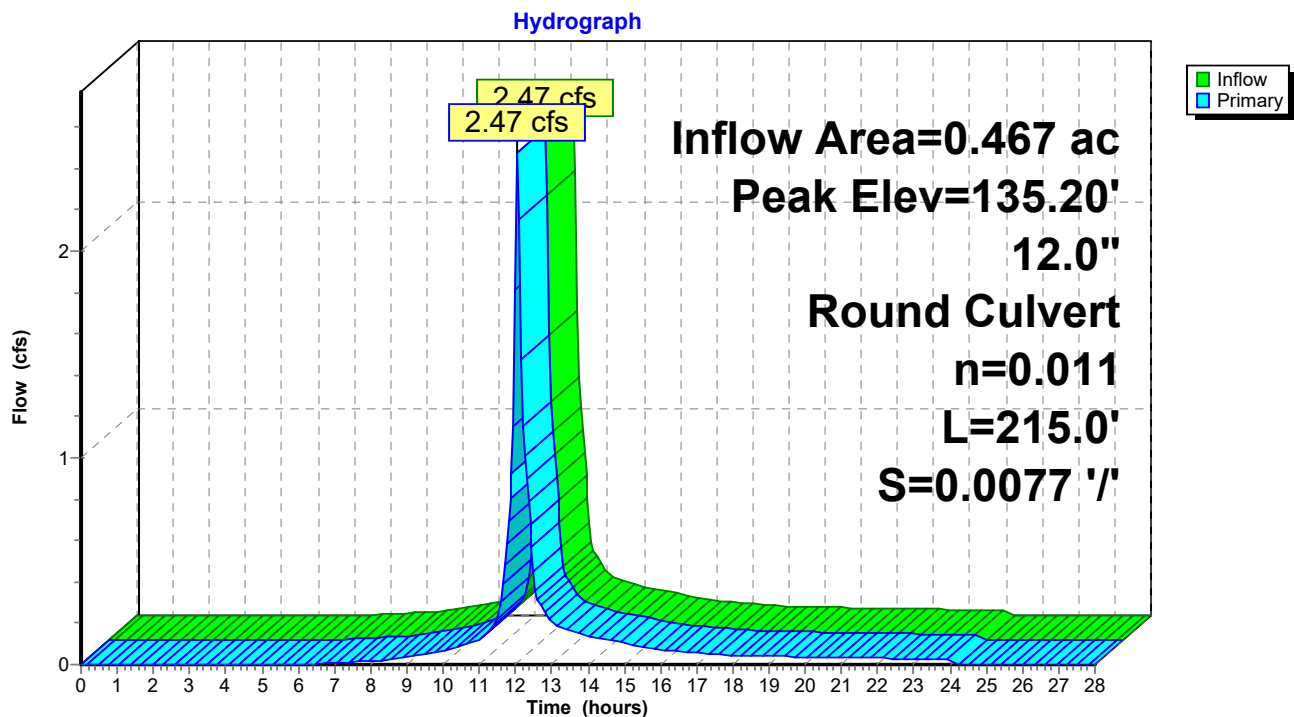
Peak Elev= 135.20' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.36'	<b>12.0" Round Culvert</b> L= 215.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 134.36' / 132.70' S= 0.0077 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.40 cfs @ 12.06 hrs HW=135.18' (Free Discharge)

↑1=Culvert (Barrel Controls 2.40 cfs @ 4.74 fps)

### Pond 2P: Outfall #2 to CB





## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 33

### Summary for Pond 3P: Outfall #3 to CB

[57] Hint: Peaked at 133.58' (Flood elevation advised)

Inflow Area = 0.241 ac, 28.22% Impervious, Inflow Depth = 4.65" for 25-Year event  
Inflow = 1.41 cfs @ 12.02 hrs, Volume= 0.093 af  
Outflow = 1.41 cfs @ 12.02 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.41 cfs @ 12.02 hrs, Volume= 0.093 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

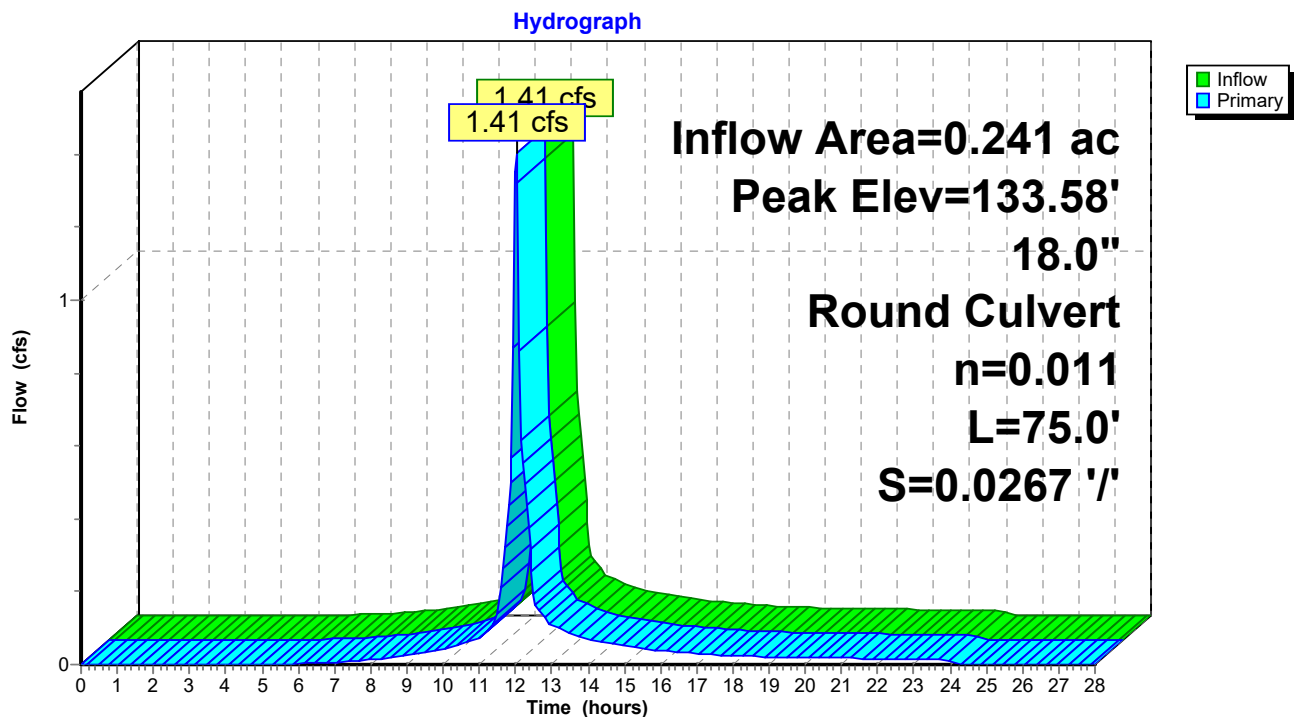
Peak Elev= 133.58' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.10'	<b>18.0" Round Culvert</b> L= 75.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 133.10' / 131.10' S= 0.0267 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=1.34 cfs @ 12.02 hrs HW=133.56' (Free Discharge)

↑1=Culvert (Inlet Controls 1.34 cfs @ 2.90 fps)

### Pond 3P: Outfall #3 to CB



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 34

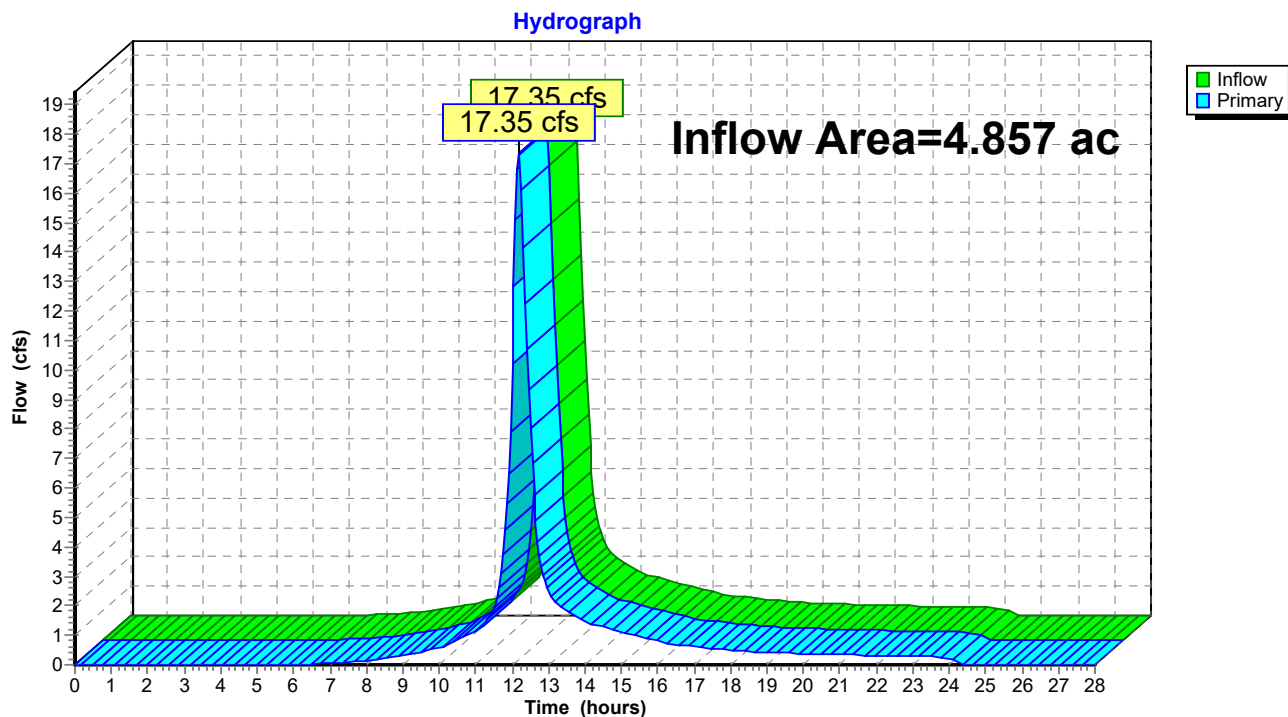
### Summary for Pond 4P: Outfall # 4 - Resource Area North Corner

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.857 ac, 5.33% Impervious, Inflow Depth = 4.25" for 25-Year event  
Inflow = 17.35 cfs @ 12.19 hrs, Volume= 1.722 af  
Primary = 17.35 cfs @ 12.19 hrs, Volume= 1.722 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

### Pond 4P: Outfall # 4 - Resource Area North Corner



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.37"

Printed 2/10/2025

Page 35

### Summary for Pond 5P: (new Pond)

[57] Hint: Peaked at 130.38' (Flood elevation advised)

Inflow Area = 0.708 ac, 26.55% Impervious, Inflow Depth = 4.44" for 25-Year event  
Inflow = 3.78 cfs @ 12.05 hrs, Volume= 0.262 af  
Outflow = 3.78 cfs @ 12.05 hrs, Volume= 0.262 af, Atten= 0%, Lag= 0.0 min  
Primary = 3.78 cfs @ 12.05 hrs, Volume= 0.262 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

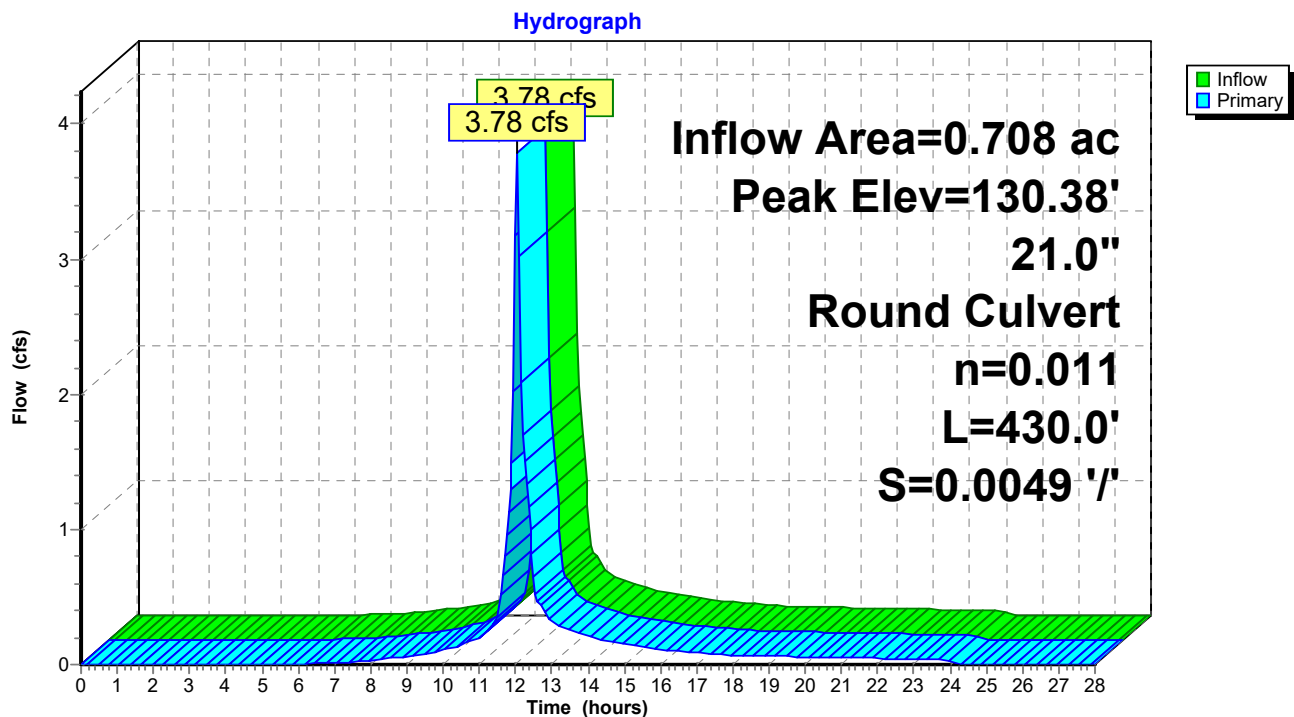
Peak Elev= 130.38' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.50'	<b>21.0" Round Culvert</b> L= 430.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 129.50' / 127.39' S= 0.0049 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 2.41 sf

**Primary OutFlow** Max=3.75 cfs @ 12.05 hrs HW=130.37' (Free Discharge)

↑1=Culvert (Barrel Controls 3.75 cfs @ 4.56 fps)

### Pond 5P: (new Pond)



## PRE Development Analysis - MS

Type III 24-hr 100-Year Rainfall=8.20"

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 36

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Sub-Catchment1** Runoff Area=1.078 ac 0.00% Impervious Runoff Depth=5.81"  
Flow Length=388' Slope=0.0150 '/' Tc=13.0 min CN=80 Runoff=5.72 cfs 0.522 af

**Subcatchment2S: Sub-Catchment2** Runoff Area=0.467 ac 25.70% Impervious Runoff Depth=6.05"  
Flow Length=128' Tc=3.9 min UI Adjusted CN=82 Runoff=3.41 cfs 0.235 af

**Subcatchment3S: Sub-Catchment3** Runoff Area=0.241 ac 28.22% Impervious Runoff Depth=6.41"  
Flow Length=131' Tc=1.4 min CN=85 Runoff=1.91 cfs 0.129 af

**Subcatchment4S: Sub-Catchment4** Runoff Area=4.149 ac 1.71% Impervious Runoff Depth=5.93"  
Flow Length=460' Slope=0.0150 '/' Tc=14.4 min CN=81 Runoff=21.68 cfs 2.051 af

**Pond 1P: Outfall # 1 - Resource Area West** Inflow=5.72 cfs 0.522 af  
Primary=5.72 cfs 0.522 af

**Pond 2P: Outfall #2 to CB** Peak Elev=135.43' Inflow=3.41 cfs 0.235 af  
12.0" Round Culvert n=0.011 L=215.0' S=0.0077 '/' Outflow=3.41 cfs 0.235 af

**Pond 3P: Outfall #3 to CB** Peak Elev=133.66' Inflow=1.91 cfs 0.129 af  
18.0" Round Culvert n=0.011 L=75.0' S=0.0267 '/' Outflow=1.91 cfs 0.129 af

**Pond 4P: Outfall # 4 - Resource Area North Corner** Inflow=24.05 cfs 2.415 af  
Primary=24.05 cfs 2.415 af

**Pond 5P: (new Pond)** Peak Elev=130.55' Inflow=5.18 cfs 0.364 af  
21.0" Round Culvert n=0.011 L=430.0' S=0.0049 '/' Outflow=5.18 cfs 0.364 af

**Total Runoff Area = 5.935 ac Runoff Volume = 2.937 af Average Runoff Depth = 5.94"**  
**95.64% Pervious = 5.676 ac 4.36% Impervious = 0.259 ac**



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 37

### Summary for Subcatchment 1S: Sub-Catchment 1

Runoff = 5.72 cfs @ 12.18 hrs, Volume= 0.522 af, Depth= 5.81"

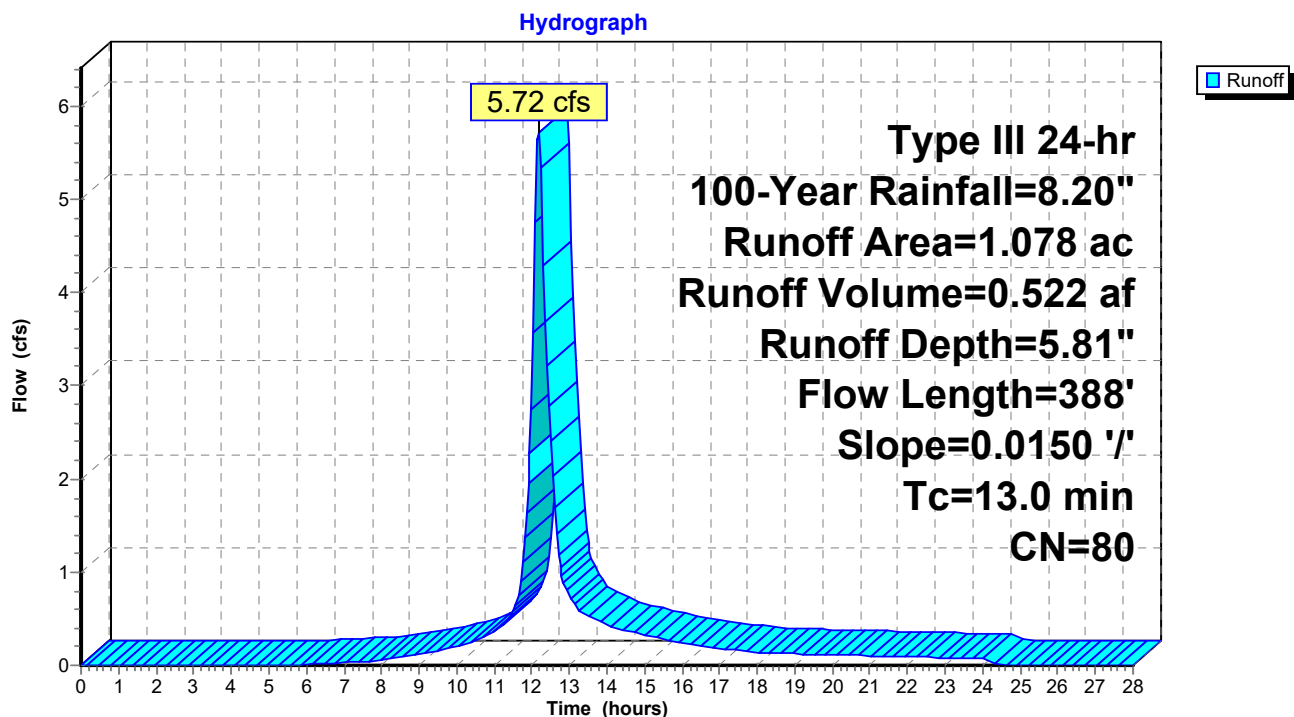
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=8.20"

Area (ac)	CN	Description
1.078	80	>75% Grass cover, Good, HSG D
1.078		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0150	0.13		<b>Sheet Flow, Greass Area</b> Grass: Short n= 0.150 P2= 3.10"
6.6	338	0.0150	0.86		<b>Shallow Concentrated Flow, Grass Field</b> Short Grass Pasture Kv= 7.0 fps
13.0	388	Total			

### Subcatchment 1S: Sub-Catchment 1



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 38

### Summary for Subcatchment 2S: Sub-Catchment 2

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 3.41 cfs @ 12.06 hrs, Volume= 0.235 af, Depth= 6.05"

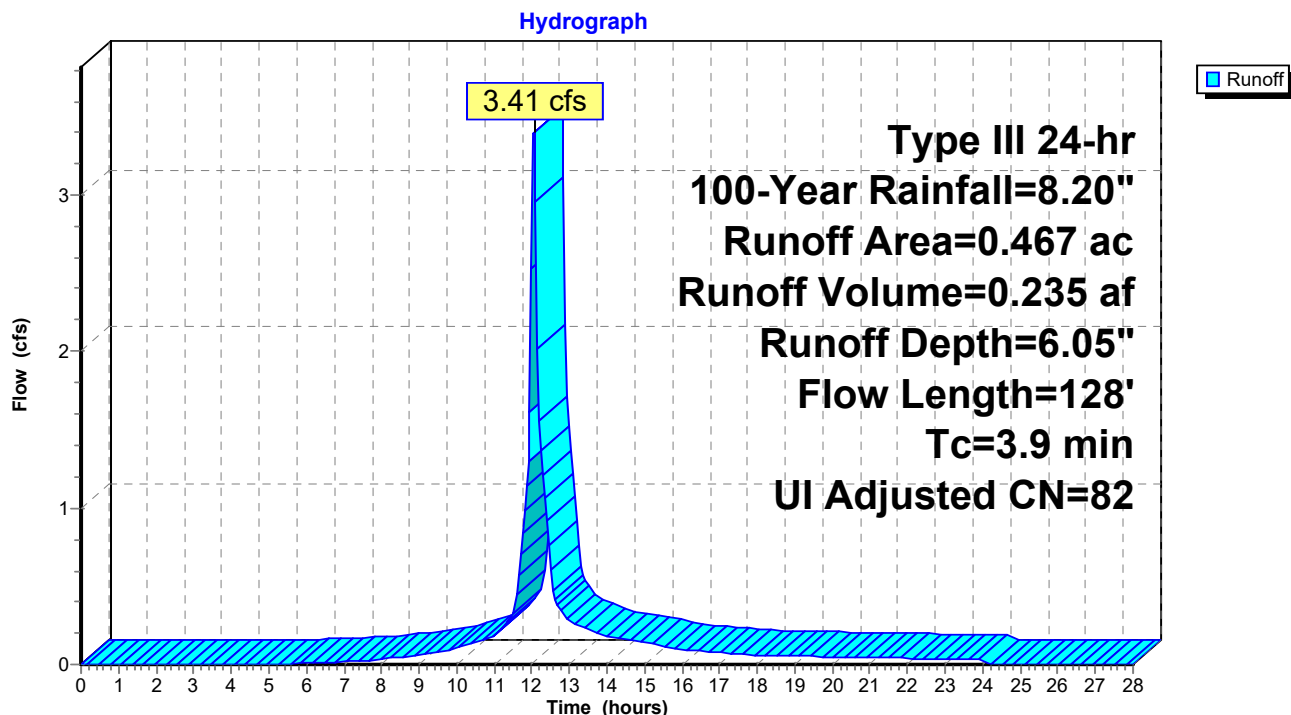
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 100-Year Rainfall=8.20"

Area (ac)	CN	Adj	Description
0.120	98		Unconnected pavement, HSG D
0.347	80		>75% Grass cover, Good, HSG D
0.467	85	82	Weighted Average, UI Adjusted
0.347			74.30% Pervious Area
0.120			25.70% Impervious Area
0.120			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	50	0.0800	0.25		<b>Sheet Flow, Grass Hill</b> Grass: Short $n=0.150$ $P2=3.10"$
0.6	78	0.1000	2.21		<b>Shallow Concentrated Flow,</b> Short Grass Pasture $K_v=7.0$ fps
3.9	128	Total			

### Subcatchment 2S: Sub-Catchment 2



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 39

### Summary for Subcatchment 3S: Sub-Catchment 3

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.91 cfs @ 12.02 hrs, Volume= 0.129 af, Depth= 6.41"

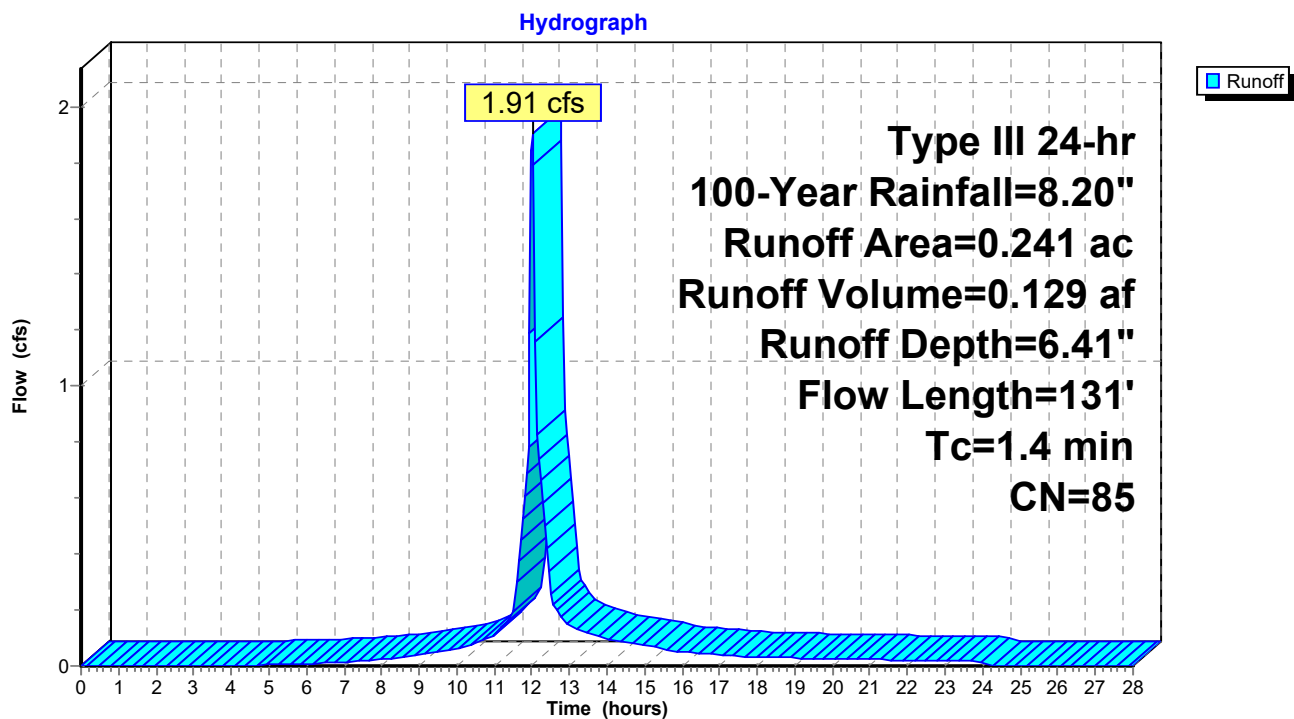
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 100-Year Rainfall=8.20"

Area (ac)	CN	Description
0.068	98	Paved parking, HSG D
0.173	80	>75% Grass cover, Good, HSG D
0.241	85	Weighted Average
0.173		71.78% Pervious Area
0.068		28.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0150	1.09		Sheet Flow, Clay Infield
					Smooth surfaces n= 0.011 P2= 3.10"
0.5	70	0.1300	2.52		Shallow Concentrated Flow, Grass Outfield
					Short Grass Pasture Kv= 7.0 fps
1.4	131	Total			

### Subcatchment 3S: Sub-Catchment 3



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 40

### Summary for Subcatchment 4S: Sub-Catchment 4

Runoff = 21.68 cfs @ 12.20 hrs, Volume= 2.051 af, Depth= 5.93"

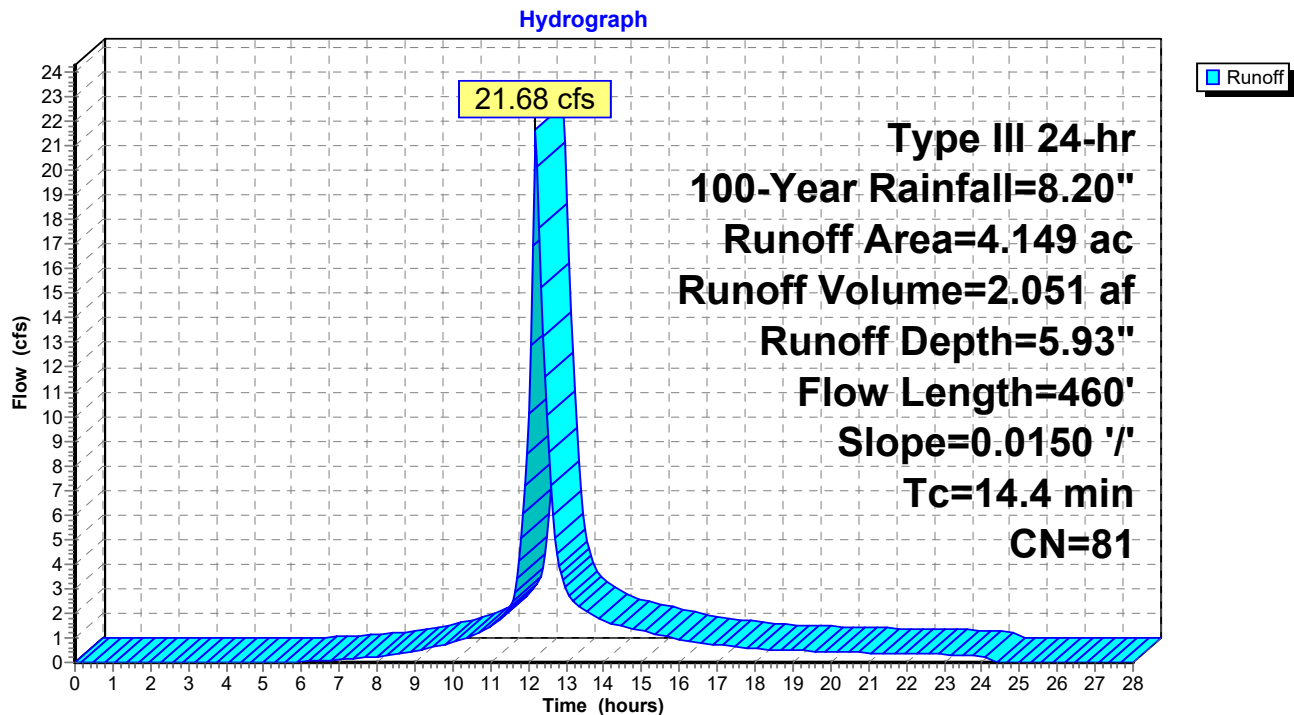
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=8.20"

Area (ac)	CN	Description
0.071	98	Paved parking, HSG D
3.322	80	>75% Grass cover, Good, HSG D
0.756	86	Woods/grass comb., Poor, HSG D
4.149	81	Weighted Average
4.078		98.29% Pervious Area
0.071		1.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0150	0.13		<b>Sheet Flow, Clay Infield</b> Grass: Short n= 0.150 P2= 3.10"
8.0	410	0.0150	0.86		<b>Shallow Concentrated Flow, Grass Field</b> Short Grass Pasture Kv= 7.0 fps
14.4	460	Total			

### Subcatchment 4S: Sub-Catchment 4





## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 41

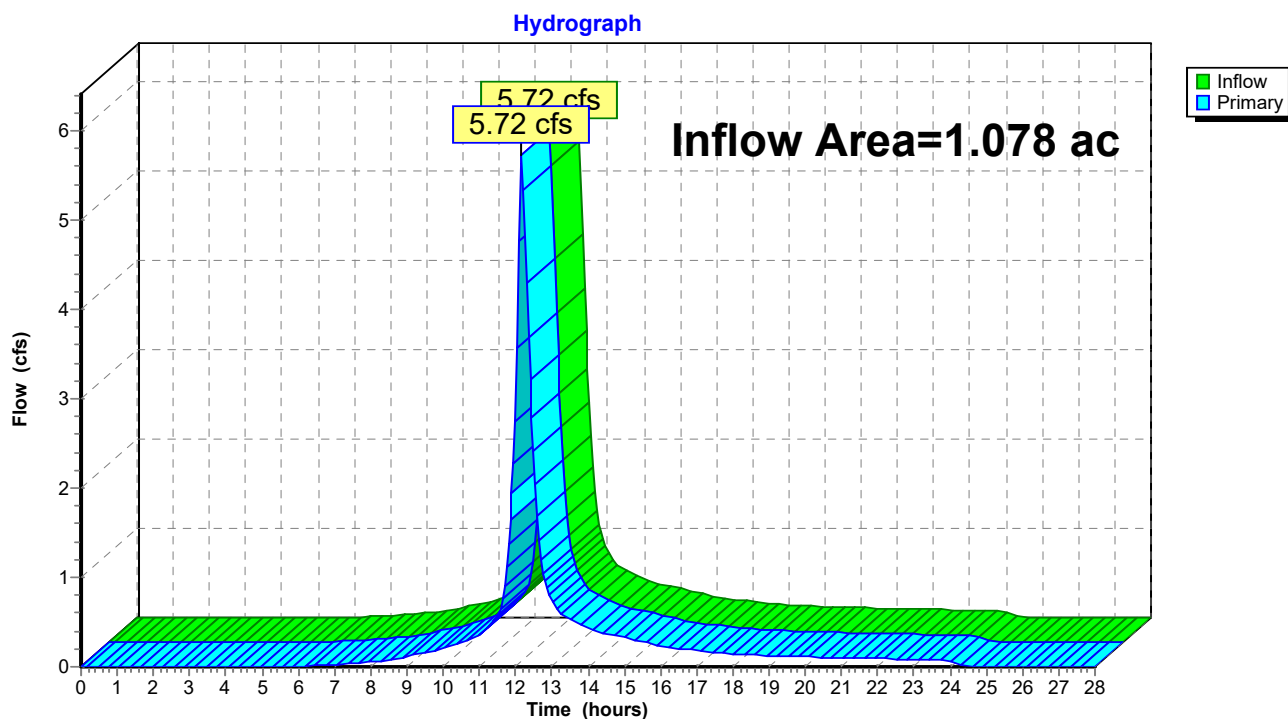
### Summary for Pond 1P: Outfall # 1 - Resource Area West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.078 ac, 0.00% Impervious, Inflow Depth = 5.81" for 100-Year event  
Inflow = 5.72 cfs @ 12.18 hrs, Volume= 0.522 af  
Primary = 5.72 cfs @ 12.18 hrs, Volume= 0.522 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

### Pond 1P: Outfall # 1 - Resource Area West



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 42

### Summary for Pond 2P: Outfall #2 to CB

[57] Hint: Peaked at 135.43' (Flood elevation advised)

Inflow Area = 0.467 ac, 25.70% Impervious, Inflow Depth = 6.05" for 100-Year event  
Inflow = 3.41 cfs @ 12.06 hrs, Volume= 0.235 af  
Outflow = 3.41 cfs @ 12.06 hrs, Volume= 0.235 af, Atten= 0%, Lag= 0.0 min  
Primary = 3.41 cfs @ 12.06 hrs, Volume= 0.235 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

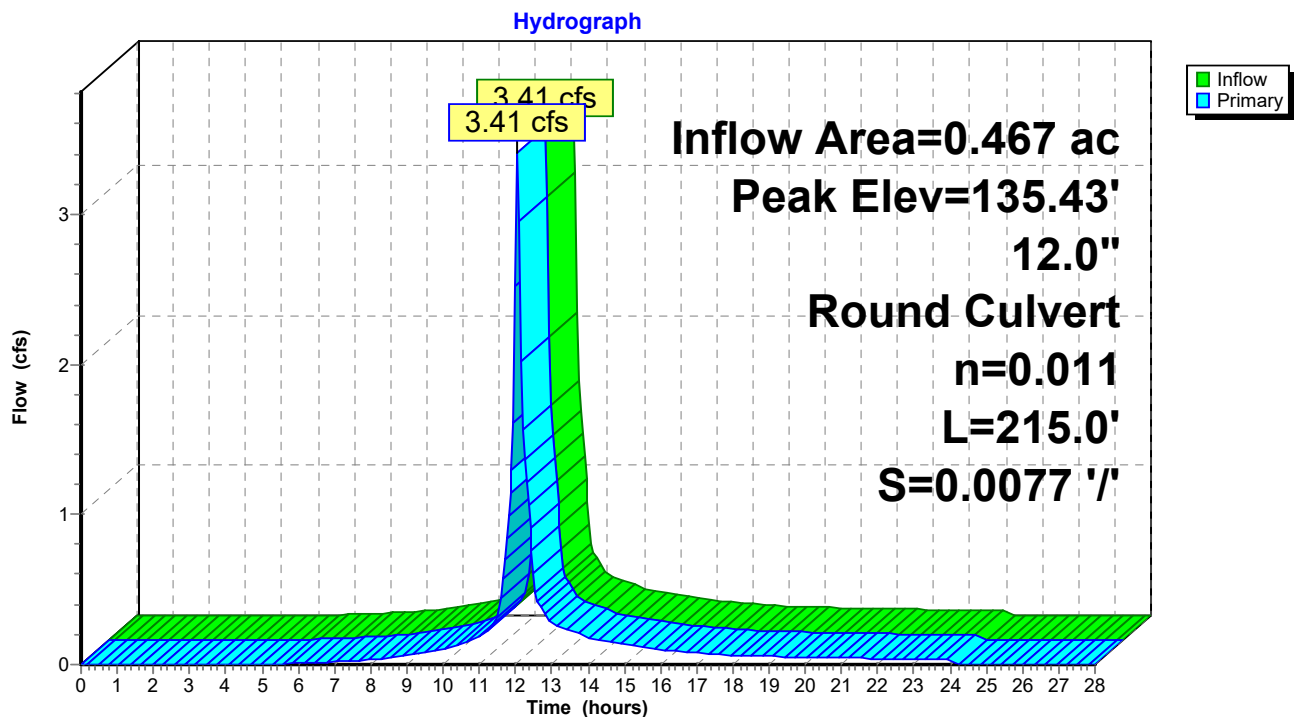
Peak Elev= 135.43' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.36'	<b>12.0" Round Culvert</b> L= 215.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 134.36' / 132.70' S= 0.0077 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.32 cfs @ 12.06 hrs HW=135.41' (Free Discharge)

↑1=Culvert (Barrel Controls 3.32 cfs @ 5.01 fps)

### Pond 2P: Outfall #2 to CB



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 43

### Summary for Pond 3P: Outfall #3 to CB

[57] Hint: Peaked at 133.66' (Flood elevation advised)

Inflow Area = 0.241 ac, 28.22% Impervious, Inflow Depth = 6.41" for 100-Year event  
Inflow = 1.91 cfs @ 12.02 hrs, Volume= 0.129 af  
Outflow = 1.91 cfs @ 12.02 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.91 cfs @ 12.02 hrs, Volume= 0.129 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

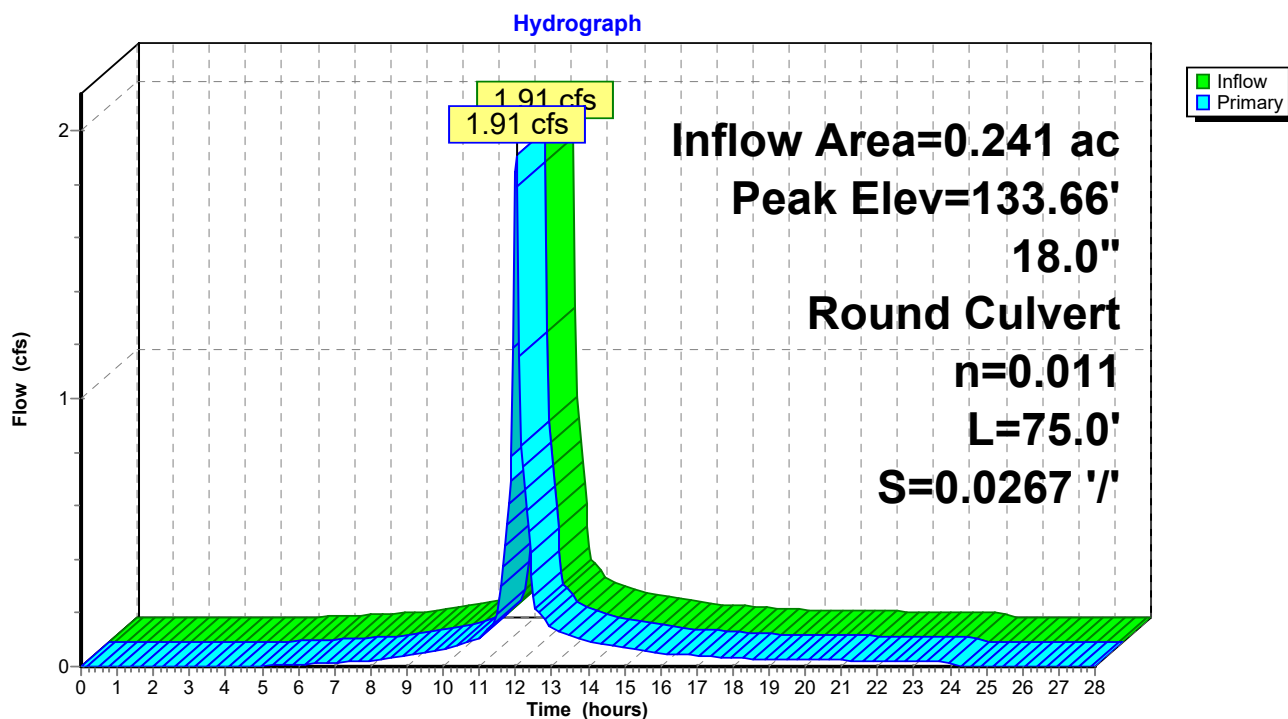
Peak Elev= 133.66' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.10'	<b>18.0" Round Culvert</b> L= 75.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 133.10' / 131.10' S= 0.0267 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=1.82 cfs @ 12.02 hrs HW=133.64' (Free Discharge)

↑1=Culvert (Inlet Controls 1.82 cfs @ 3.14 fps)

### Pond 3P: Outfall #3 to CB



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 44

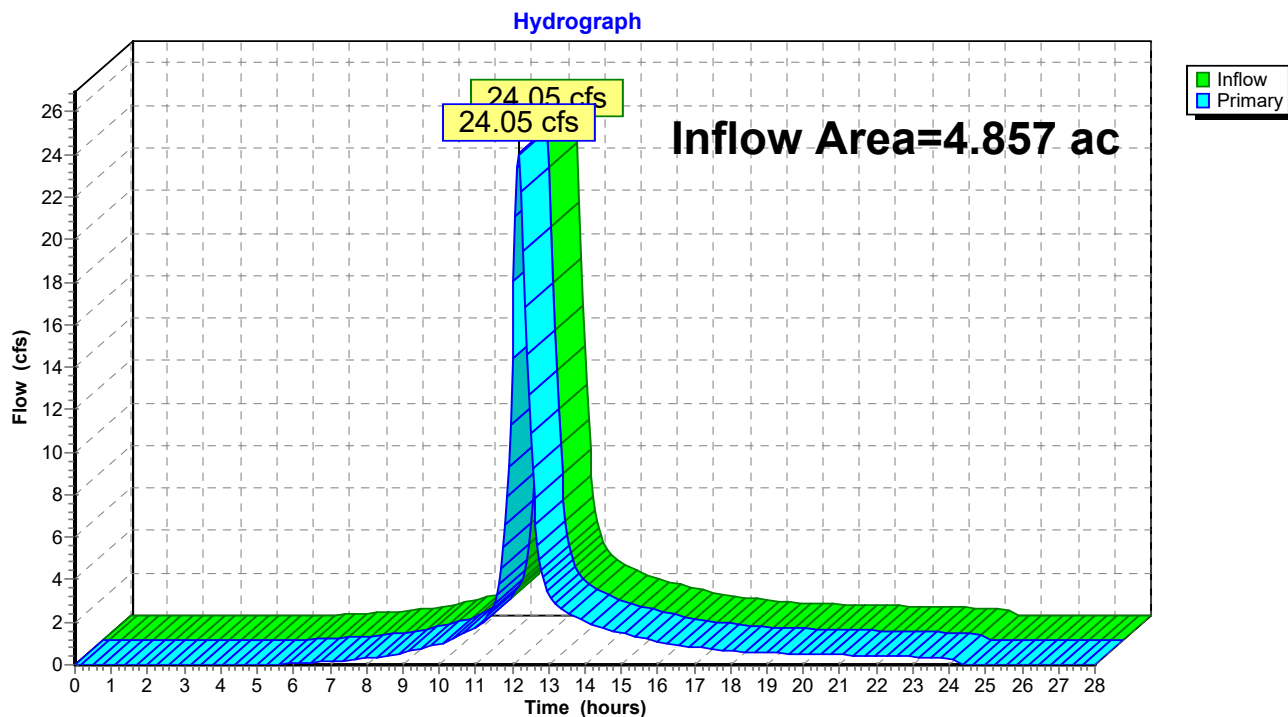
### Summary for Pond 4P: Outfall # 4 - Resource Area North Corner

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 4.857 ac, 5.33% Impervious, Inflow Depth = 5.97" for 100-Year event  
Inflow = 24.05 cfs @ 12.19 hrs, Volume= 2.415 af  
Primary = 24.05 cfs @ 12.19 hrs, Volume= 2.415 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

### Pond 4P: Outfall # 4 - Resource Area North Corner



## PRE Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=8.20"

Printed 2/10/2025

Page 45

### Summary for Pond 5P: (new Pond)

[57] Hint: Peaked at 130.55' (Flood elevation advised)

Inflow Area = 0.708 ac, 26.55% Impervious, Inflow Depth = 6.17" for 100-Year event  
Inflow = 5.18 cfs @ 12.05 hrs, Volume= 0.364 af  
Outflow = 5.18 cfs @ 12.05 hrs, Volume= 0.364 af, Atten= 0%, Lag= 0.0 min  
Primary = 5.18 cfs @ 12.05 hrs, Volume= 0.364 af

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

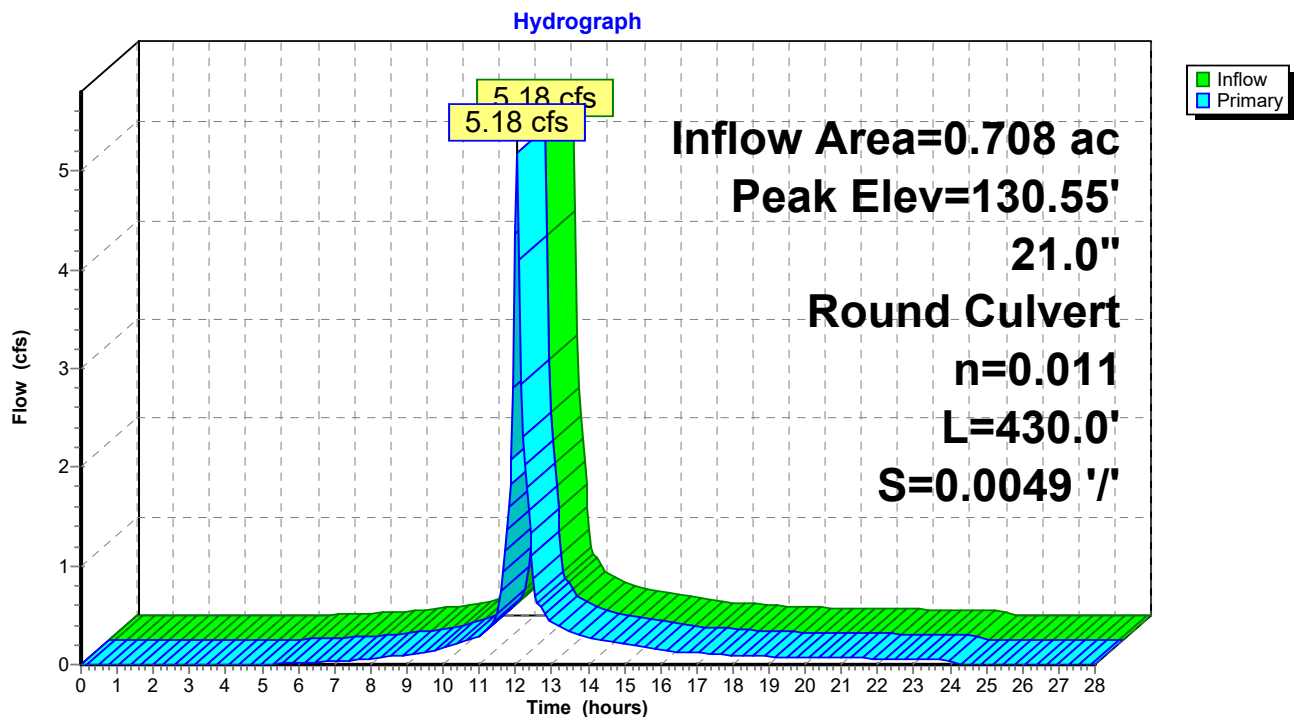
Peak Elev= 130.55' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.50'	<b>21.0" Round Culvert</b> L= 430.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 129.50' / 127.39' S= 0.0049 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 2.41 sf

**Primary OutFlow** Max=5.12 cfs @ 12.05 hrs HW=130.54' (Free Discharge)

1=Culvert (Barrel Controls 5.12 cfs @ 4.93 fps)

### Pond 5P: (new Pond)





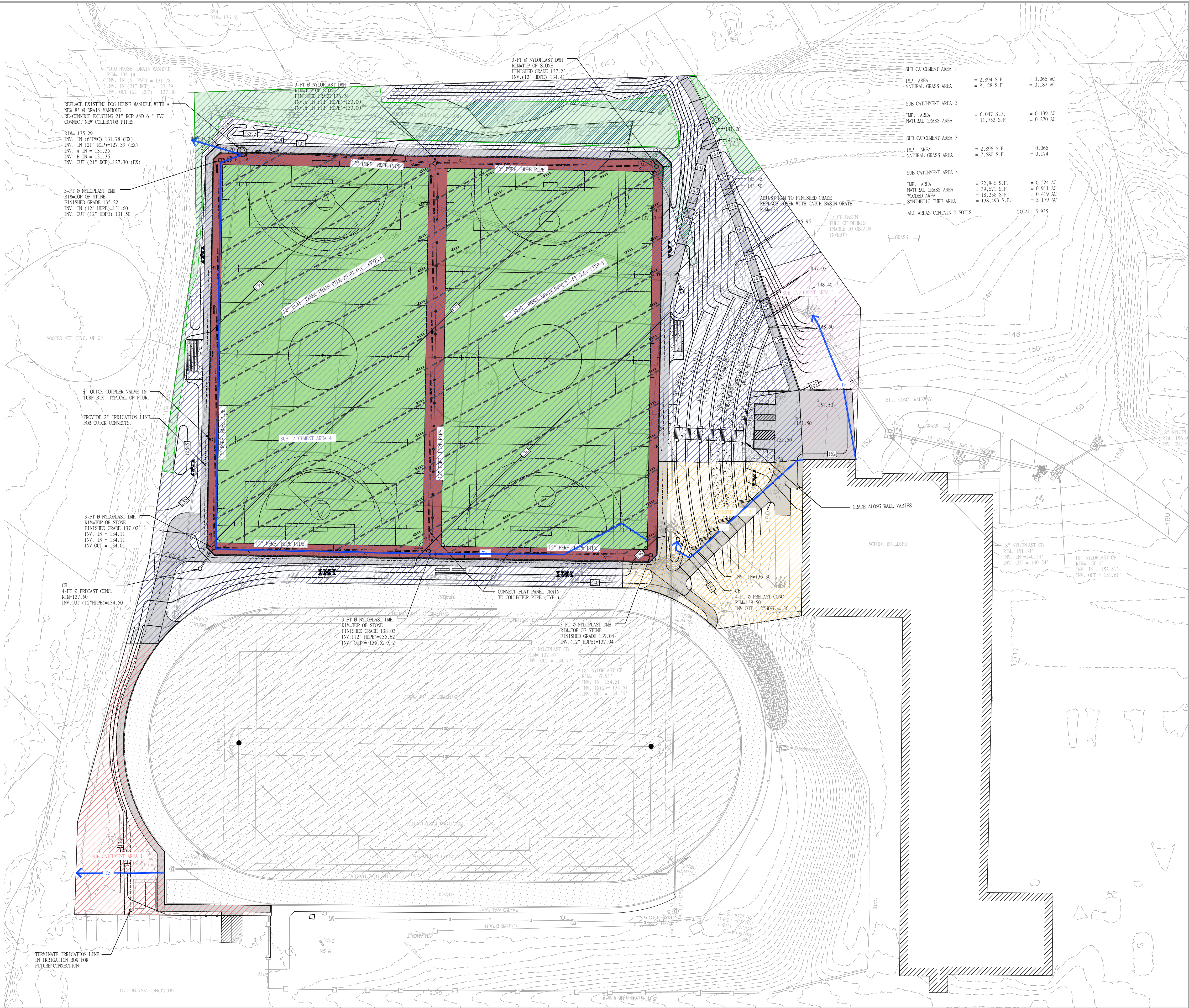
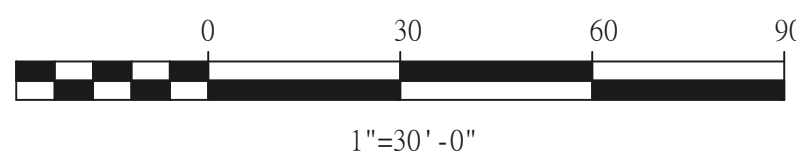
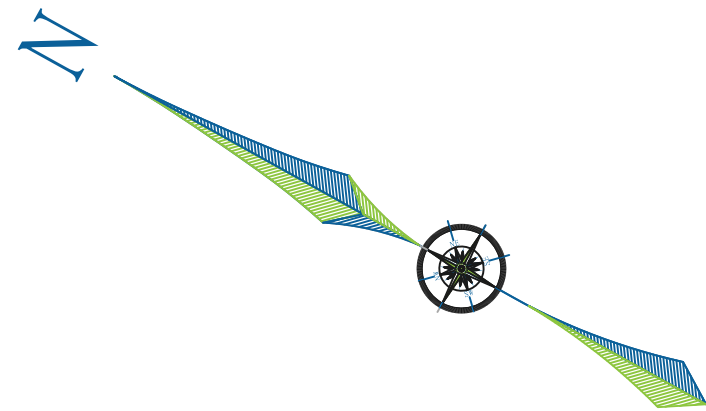


**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

## **Attachment F**

### **Post-Development Watershed and Surface Types**





www.nesraeng.com  
607-506-3772

NESRA

ENGINEERING

MA — 829 SOUTH WASHINGTON STREET  
RI — NORTH ATTLEBORO  
NH —  
ME —  
FL —

PROJECT  
MARSHALL SIMONDS  
MIDDLE SCHOOL  
BRUSH FIELD  
RENOVATION PROJECT  
BURLINGTON, MA 01803

CLIENT  
BURLINGTON PUBLIC  
SCHOOLS  
123 CAMBRIDGE STREET  
BURLINGTON, MA 01803

NO.	REVISION	DATE

SCALE - 1"=30'  
DATE - 2/10/25

PROFESSIONAL SEAL

POST-DEVELOPMENT  
WATERSHED AND  
SURFACE TYPES

SK-2

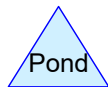
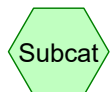
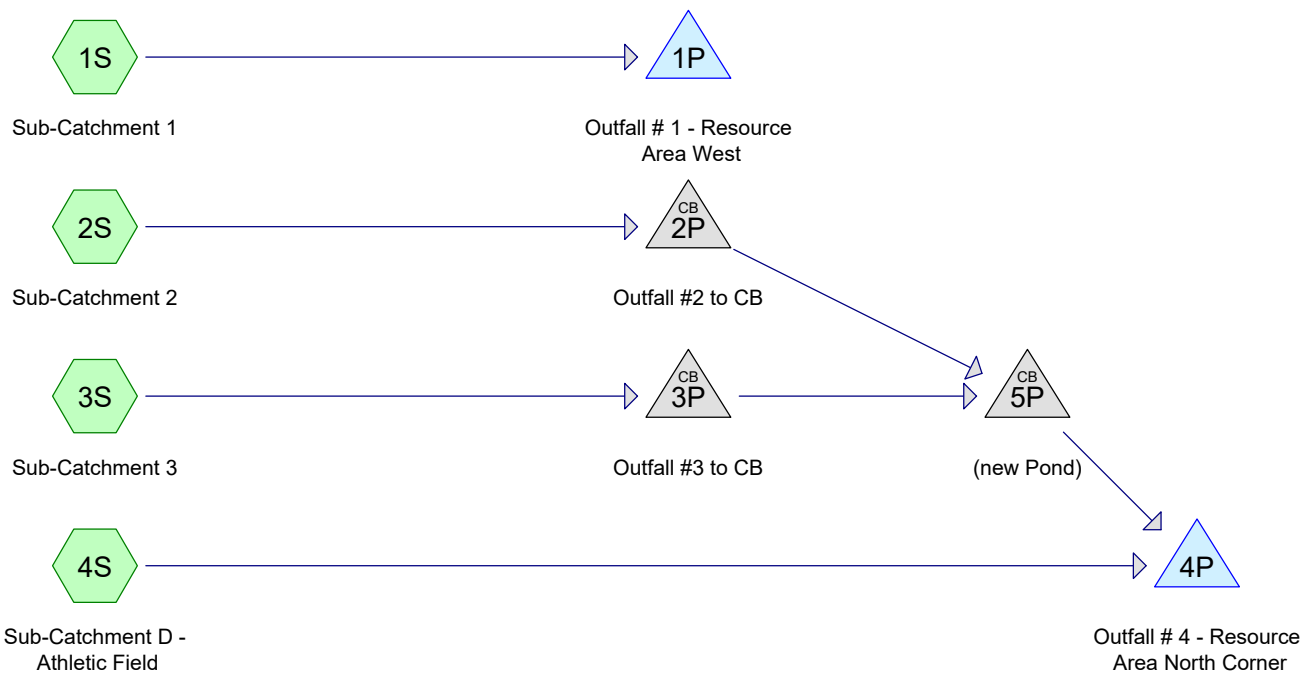




**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

**Attachment G**

**Post-Development Graphic Generated by Hydro-CAD**





**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

## **Attachment H**

### **Post-Development Hydrology**



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Printed 2/10/2025

Page 2

### Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.542	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S, 4S)
0.656	98	Paved parking, HSG D (1S, 3S, 4S)
3.179	98	Synthetic Turf (4S)
0.139	98	Unconnected pavement, HSG D (2S)
0.419	83	Woods, Poor, HSG D (4S)
<b>5.935</b>	<b>92</b>	<b>TOTAL AREA</b>

## Post Development Analysis - MS

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 3

### Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
2.756	HSG D	1S, 2S, 3S, 4S
3.179	Other	4S
<b>5.935</b>		<b>TOTAL AREA</b>

## Post Development Analysis - MS

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 4

### Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	1.542	0.000	1.542	>75% Grass cover, Good	1S, 2S, 3S, 4S
0.000	0.000	0.000	0.656	0.000	0.656	Paved parking	1S, 3S, 4S
0.000	0.000	0.000	0.000	3.179	3.179	Synthetic Turf	4S
0.000	0.000	0.000	0.139	0.000	0.139	Unconnected pavement	2S
0.000	0.000	0.000	0.419	0.000	0.419	Woods, Poor	4S
<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>2.756</b>	<b>3.179</b>	<b>5.935</b>	<b>TOTAL AREA</b>	

## Post Development Analysis - MS

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 5

### Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	134.36	132.70	215.0	0.0077	0.011	12.0	0.0	0.0
2	3P	133.10	131.10	75.0	0.0267	0.011	18.0	0.0	0.0
3	5P	129.50	127.39	430.0	0.0049	0.011	21.0	0.0	0.0

## Post Development Analysis - MS

Type III 24-hr 2-Year Rainfall=3.42"

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 6

Time span=0.00-42.00 hrs, dt=0.05 hrs, 841 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Sub-Catchment1** Runoff Area=0.253 ac 26.09% Impervious Runoff Depth=1.95"  
Flow Length=77' Slope=0.0520 '/' Tc=5.5 min CN=85 Runoff=0.57 cfs 0.041 af

**Subcatchment2S: Sub-Catchment2** Runoff Area=0.409 ac 33.99% Impervious Runoff Depth=2.03"  
Flow Length=153' Tc=0.7 min CN=86 Runoff=1.10 cfs 0.069 af

**Subcatchment3S: Sub-Catchment3** Runoff Area=0.240 ac 27.50% Impervious Runoff Depth=1.95"  
Flow Length=131' Tc=1.4 min CN=85 Runoff=0.60 cfs 0.039 af

**Subcatchment4S: Sub-CatchmentD -** Runoff Area=5.033 ac 73.57% Impervious Runoff Depth>2.66"  
Tc=480.0 min CN=93 Runoff=1.43 cfs 1.114 af

**Pond 1P: Outfall # 1 - Resource Area West** Inflow=0.57 cfs 0.041 af  
Primary=0.57 cfs 0.041 af

**Pond 2P: Outfall #2 to CB** Peak Elev=134.87' Inflow=1.10 cfs 0.069 af  
12.0" Round Culvert n=0.011 L=215.0' S=0.0077 '/' Outflow=1.10 cfs 0.069 af

**Pond 3P: Outfall #3 to CB** Peak Elev=133.40' Inflow=0.60 cfs 0.039 af  
18.0" Round Culvert n=0.011 L=75.0' S=0.0267 '/' Outflow=0.60 cfs 0.039 af

**Pond 4P: Outfall # 4 - Resource Area North Corner** Inflow=1.78 cfs 1.222 af  
Primary=1.78 cfs 1.222 af

**Pond 5P: (new Pond)** Peak Elev=130.07' Inflow=1.69 cfs 0.108 af  
21.0" Round Culvert n=0.011 L=430.0' S=0.0049 '/' Outflow=1.69 cfs 0.108 af

**Total Runoff Area = 5.935 ac Runoff Volume = 1.263 af Average Runoff Depth = 2.55"**  
**33.04% Pervious = 1.961 ac 66.96% Impervious = 3.974 ac**



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 7

### Summary for Subcatchment 1S: Sub-Catchment 1

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

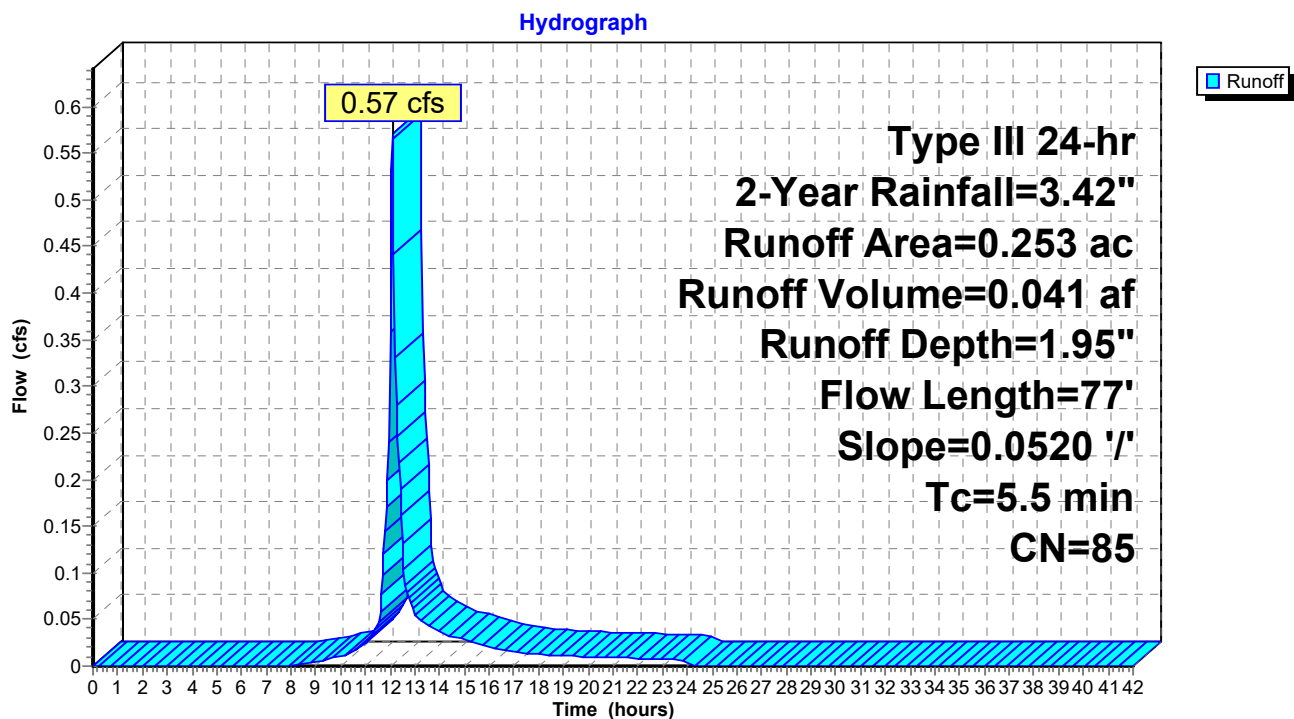
Runoff = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 2-Year Rainfall=3.42"

Area (ac)	CN	Description
0.187	80	>75% Grass cover, Good, HSG D
0.066	98	Paved parking, HSG D
0.253	85	Weighted Average
0.187		73.91% Pervious Area
0.066		26.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	77	0.0520	0.23		Sheet Flow, Grass Area
Grass: Short n= 0.150 P2= 3.10"					

### Subcatchment 1S: Sub-Catchment 1



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 8

### Summary for Subcatchment 2S: Sub-Catchment 2

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.10 cfs @ 12.01 hrs, Volume= 0.069 af, Depth= 2.03"

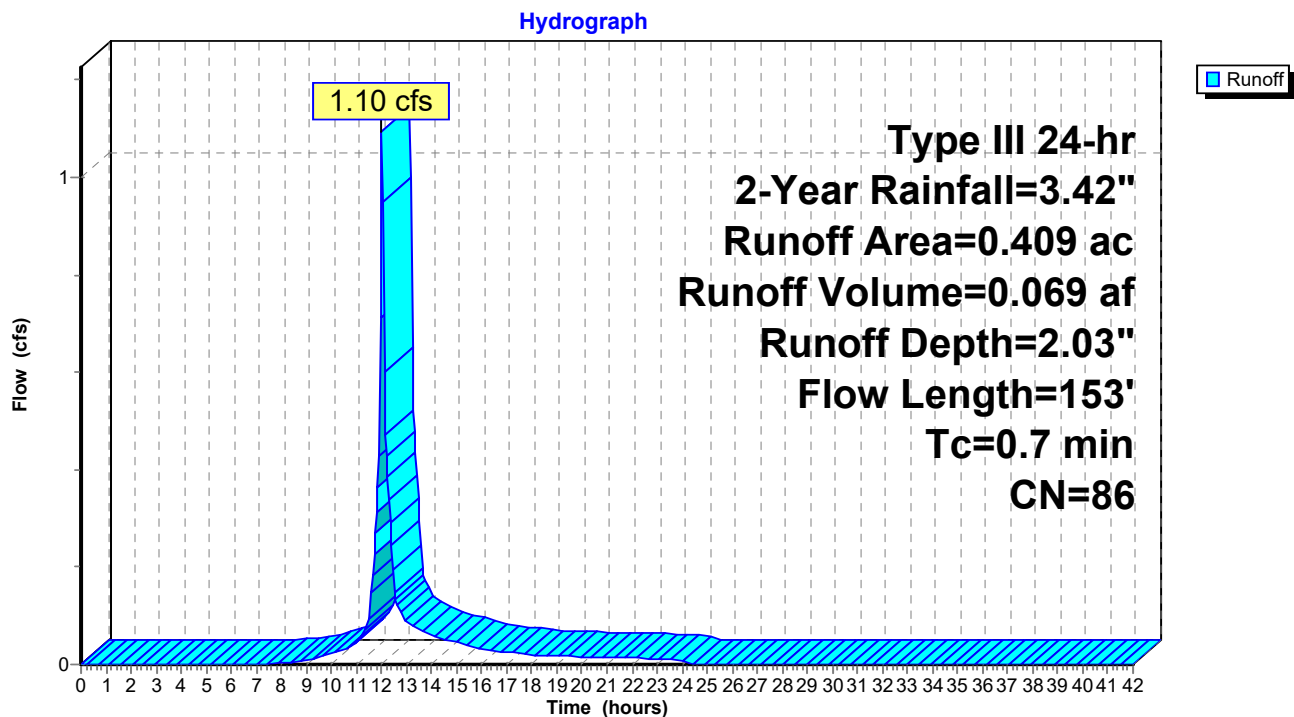
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 2-Year Rainfall=3.42"

Area (ac)	CN	Description
0.139	98	Unconnected pavement, HSG D
0.270	80	>75% Grass cover, Good, HSG D
0.409	86	Weighted Average
0.270		66.01% Pervious Area
0.139		33.99% Impervious Area
0.139		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0800	2.05		<b>Sheet Flow, Grass Hill</b> Smooth surfaces $n=0.011$ $P2=3.10''$
0.3	103	0.1000	6.42		<b>Shallow Concentrated Flow,</b> Paved $K_v=20.3$ fps
0.7	153	Total			

### Subcatchment 2S: Sub-Catchment 2



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 9

### Summary for Subcatchment 3S: Sub-Catchment 3

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 0.60 cfs @ 12.03 hrs, Volume= 0.039 af, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 2-Year Rainfall=3.42"

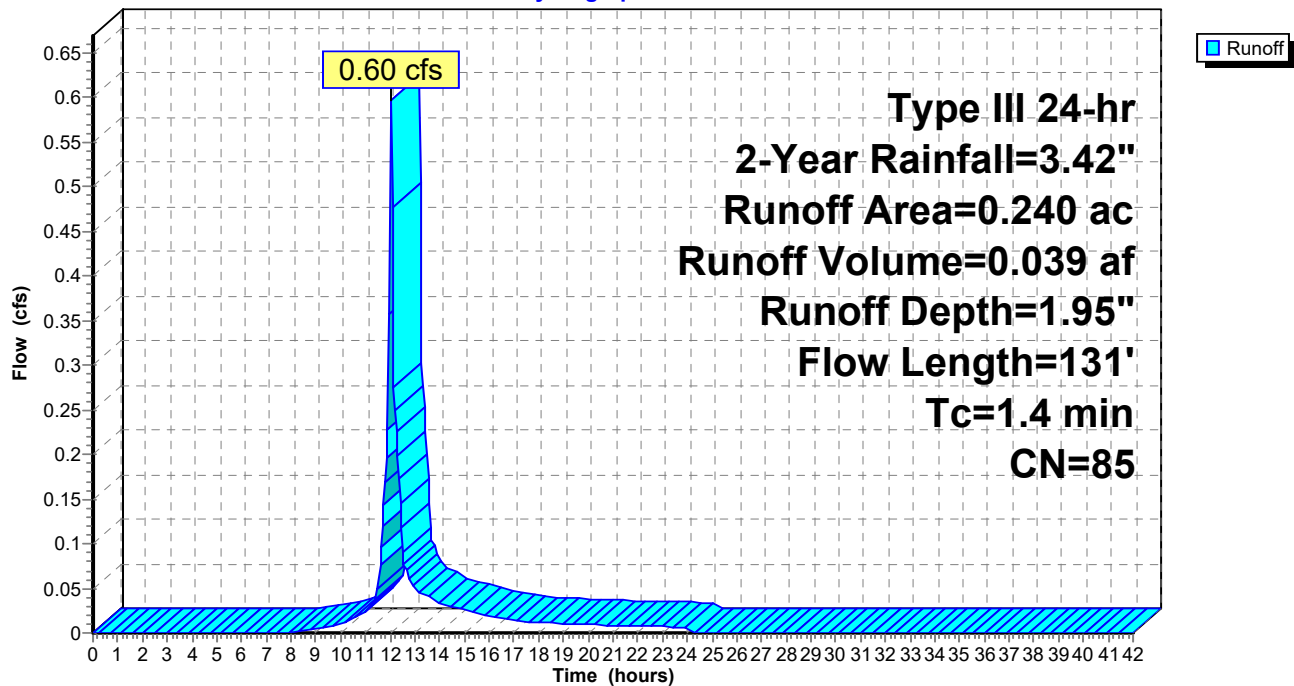
Area (ac)	CN	Description
0.066	98	Paved parking, HSG D
0.174	80	>75% Grass cover, Good, HSG D
0.240	85	Weighted Average
0.174		72.50% Pervious Area
0.066		27.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0150	1.09		<b>Sheet Flow, Clay Infield</b>
					Smooth surfaces $n=0.011$ $P2=3.10"$
0.5	70	0.1300	2.52		<b>Shallow Concentrated Flow, Grass Outfield</b>
					Short Grass Pasture $K_v=7.0$ fps
1.4	131	Total			

### Subcatchment 3S: Sub-Catchment 3

Hydrograph



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 10

### Summary for Subcatchment 4S: Sub-Catchment D - Athletic Field

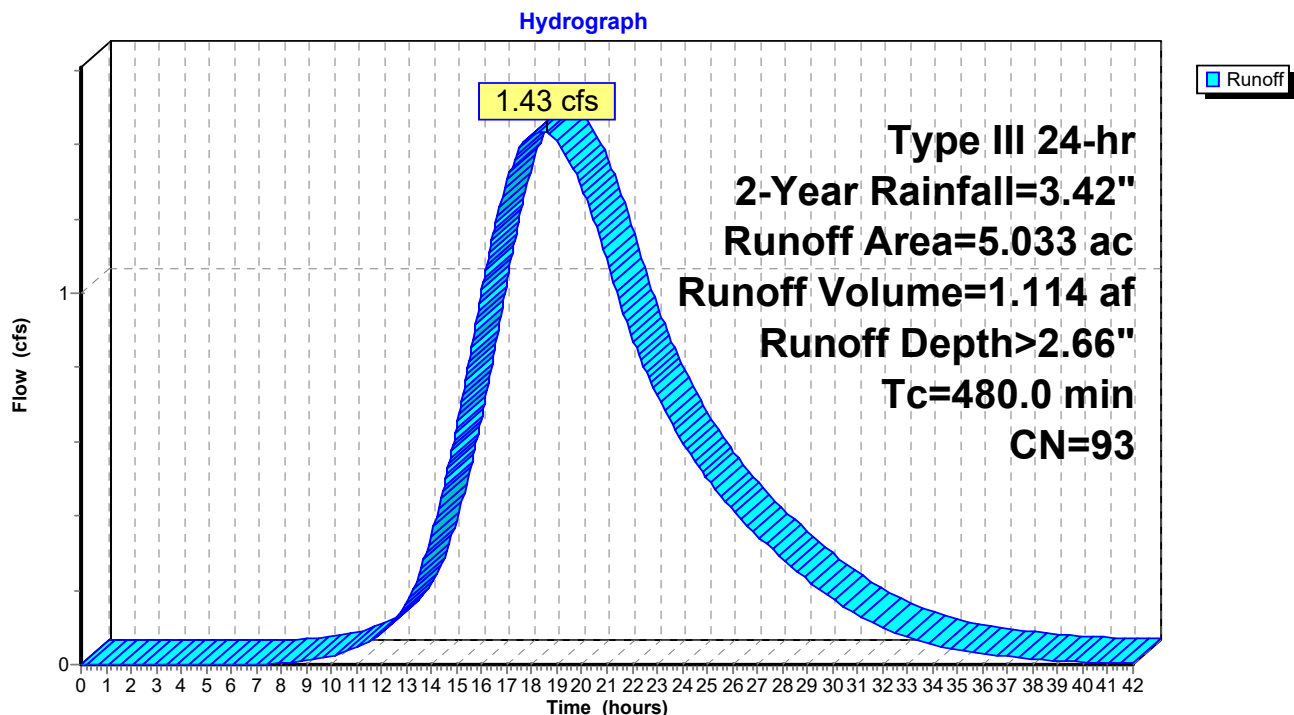
Runoff = 1.43 cfs @ 18.63 hrs, Volume= 1.114 af, Depth> 2.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.42"

Area (ac)	CN	Description
0.419	83	Woods, Poor, HSG D
0.524	98	Paved parking, HSG D
* 3.179	98	Synthetic Turf
0.911	80	>75% Grass cover, Good, HSG D
5.033	93	Weighted Average
1.330		26.43% Pervious Area
3.703		73.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
480.0					Direct Entry, Turf Field Base Stone

### Subcatchment 4S: Sub-Catchment D - Athletic Field



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 11

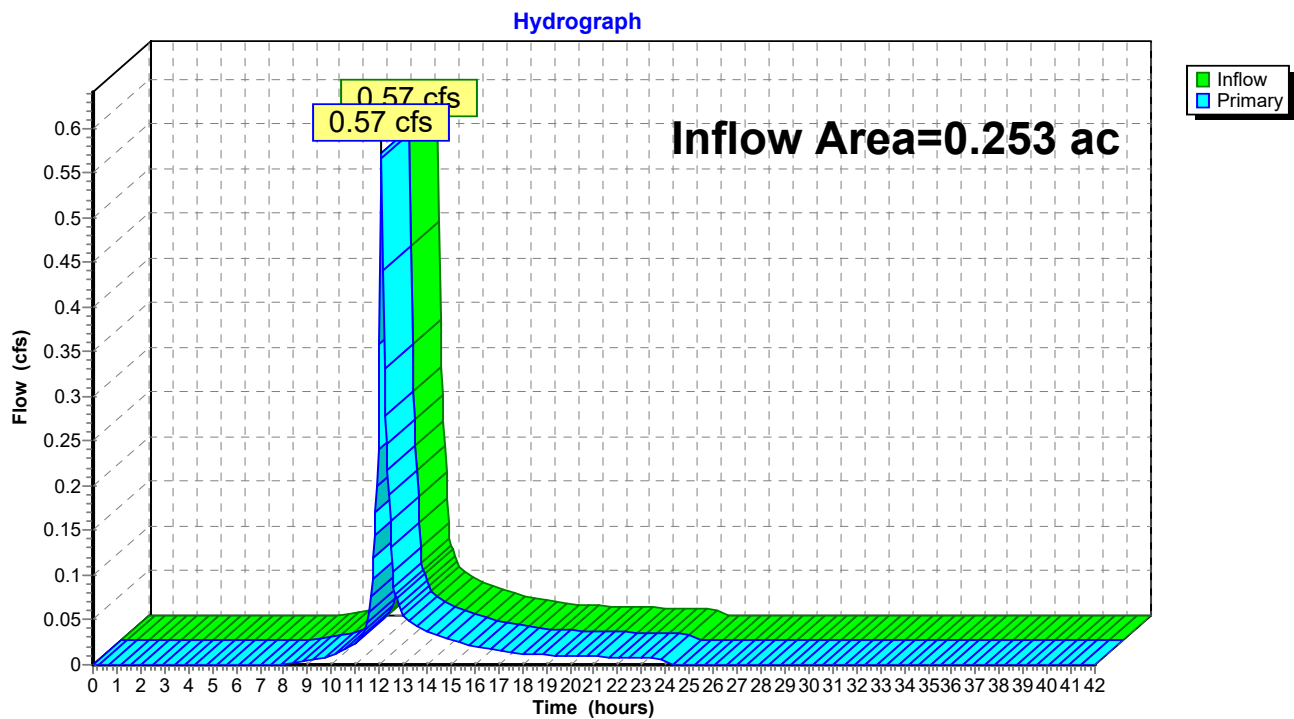
### Summary for Pond 1P: Outfall # 1 - Resource Area West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.253 ac, 26.09% Impervious, Inflow Depth = 1.95" for 2-Year event  
Inflow = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af  
Primary = 0.57 cfs @ 12.09 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

### Pond 1P: Outfall # 1 - Resource Area West





## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 12

### Summary for Pond 2P: Outfall #2 to CB

[57] Hint: Peaked at 134.87' (Flood elevation advised)

Inflow Area = 0.409 ac, 33.99% Impervious, Inflow Depth = 2.03" for 2-Year event  
Inflow = 1.10 cfs @ 12.01 hrs, Volume= 0.069 af  
Outflow = 1.10 cfs @ 12.01 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.10 cfs @ 12.01 hrs, Volume= 0.069 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

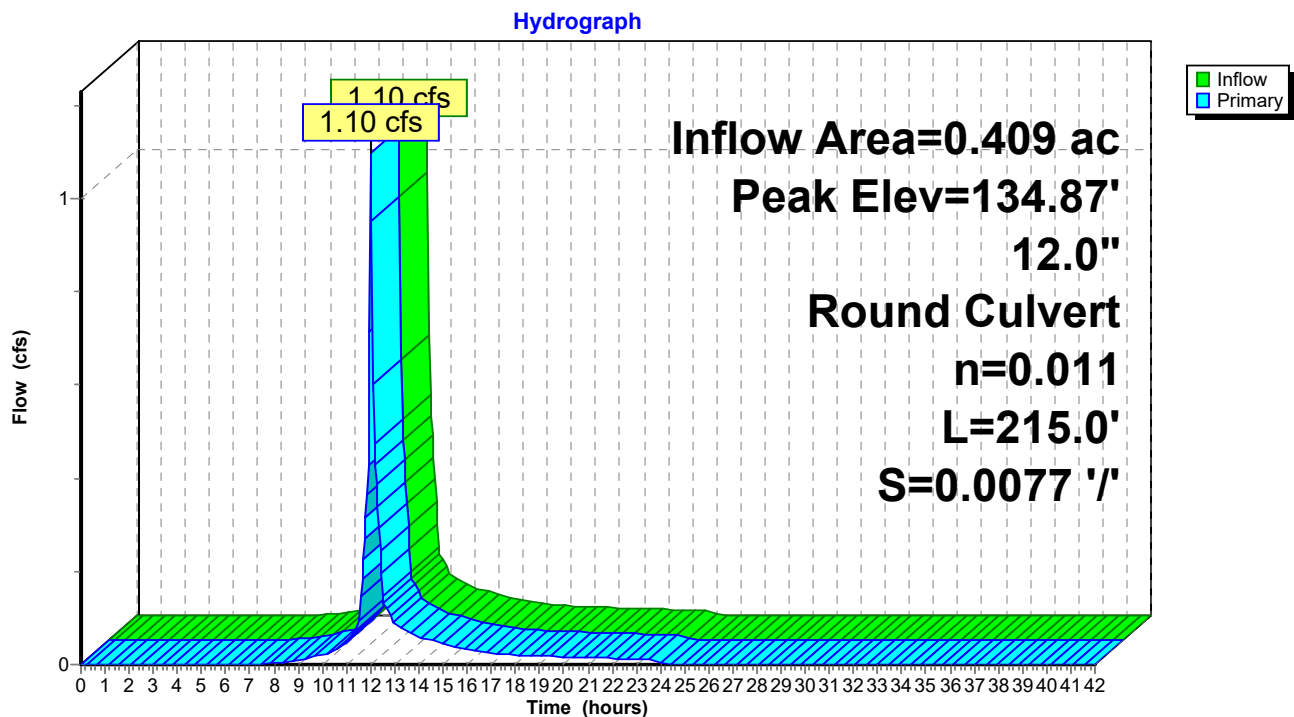
Peak Elev= 134.87' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.36'	<b>12.0" Round Culvert</b> L= 215.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 134.36' / 132.70' S= 0.0077 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.05 cfs @ 12.01 hrs HW=134.86' (Free Discharge)

↑1=Culvert (Barrel Controls 1.05 cfs @ 3.91 fps)

### Pond 2P: Outfall #2 to CB



Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 13

### Summary for Pond 3P: Outfall #3 to CB

[57] Hint: Peaked at 133.40' (Flood elevation advised)

Inflow Area = 0.240 ac, 27.50% Impervious, Inflow Depth = 1.95" for 2-Year event  
 Inflow = 0.60 cfs @ 12.03 hrs, Volume= 0.039 af  
 Outflow = 0.60 cfs @ 12.03 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.60 cfs @ 12.03 hrs, Volume= 0.039 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

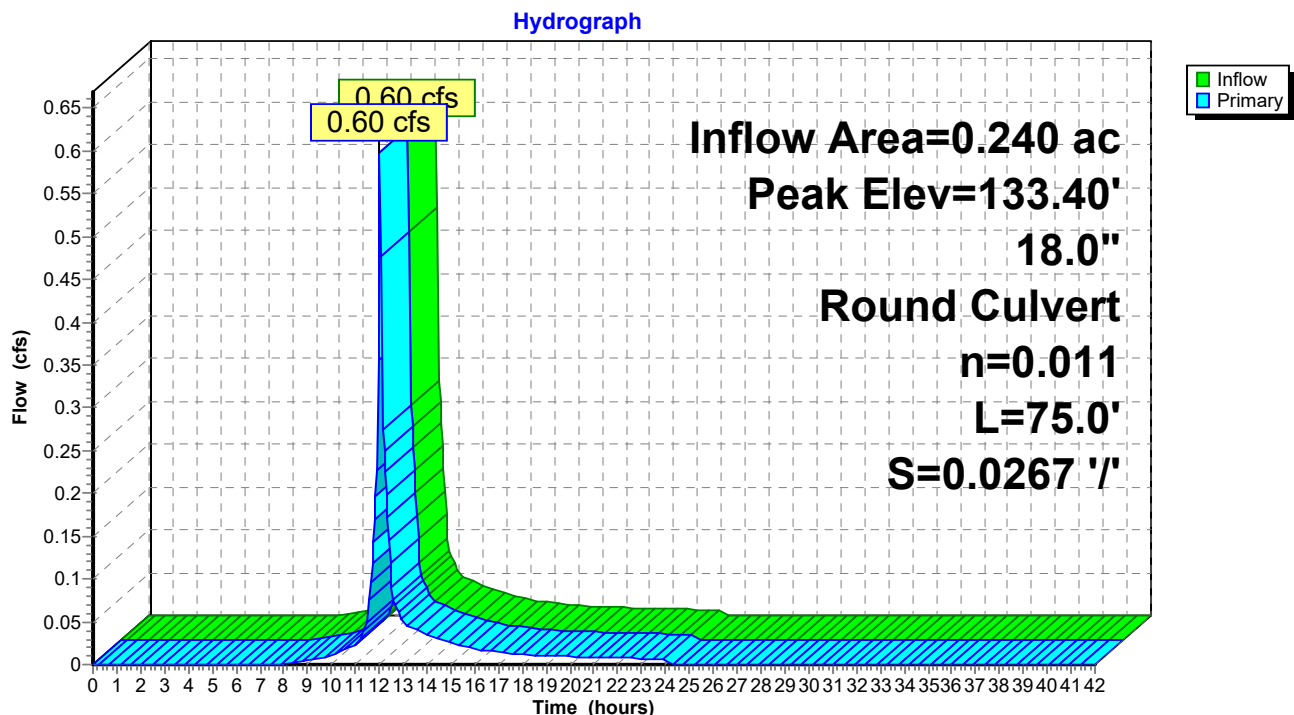
Peak Elev= 133.40' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.10'	<b>18.0" Round Culvert</b> L= 75.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 133.10' / 131.10' S= 0.0267 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=0.57 cfs @ 12.03 hrs HW=133.40' (Free Discharge)

1=Culvert (Inlet Controls 0.57 cfs @ 2.32 fps)

### Pond 3P: Outfall #3 to CB



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 14

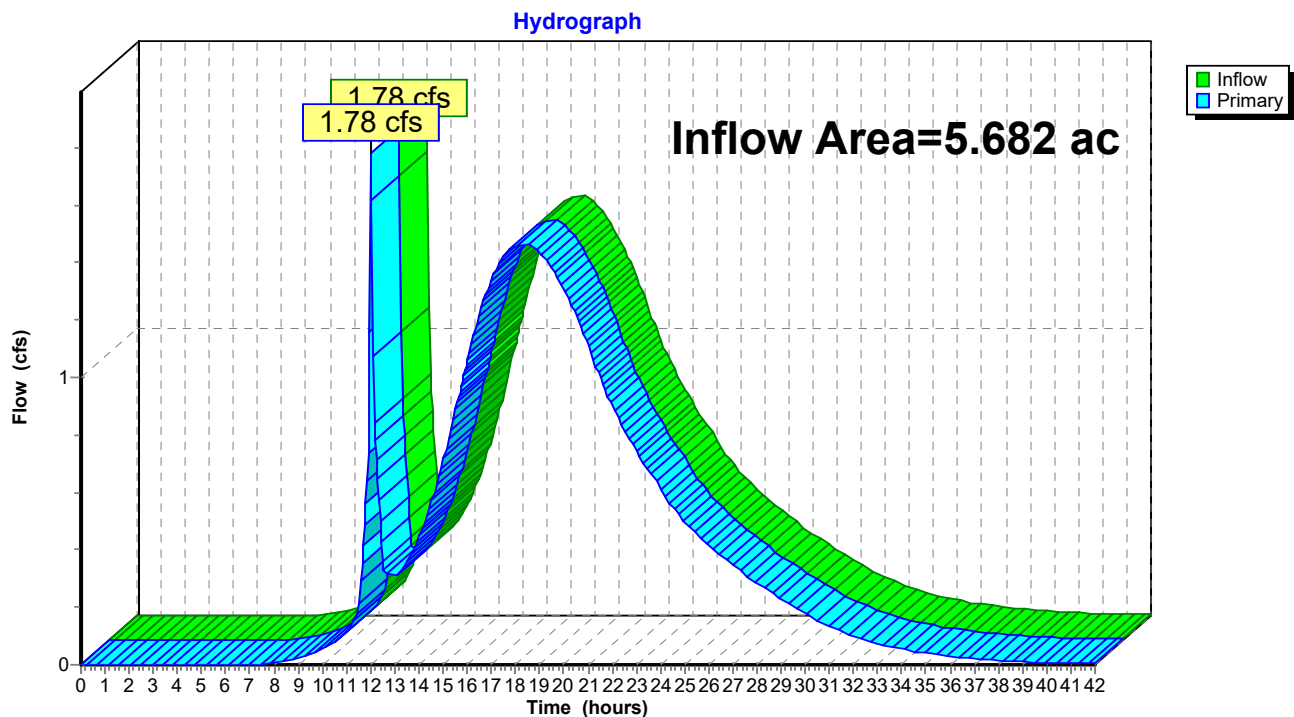
### Summary for Pond 4P: Outfall # 4 - Resource Area North Corner

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.682 ac, 68.78% Impervious, Inflow Depth > 2.58" for 2-Year event  
Inflow = 1.78 cfs @ 12.02 hrs, Volume= 1.222 af  
Primary = 1.78 cfs @ 12.02 hrs, Volume= 1.222 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

### Pond 4P: Outfall # 4 - Resource Area North Corner



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.42"

Printed 2/10/2025

Page 15

### Summary for Pond 5P: (new Pond)

[57] Hint: Peaked at 130.07' (Flood elevation advised)

Inflow Area = 0.649 ac, 31.59% Impervious, Inflow Depth = 2.00" for 2-Year event  
Inflow = 1.69 cfs @ 12.02 hrs, Volume= 0.108 af  
Outflow = 1.69 cfs @ 12.02 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.69 cfs @ 12.02 hrs, Volume= 0.108 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

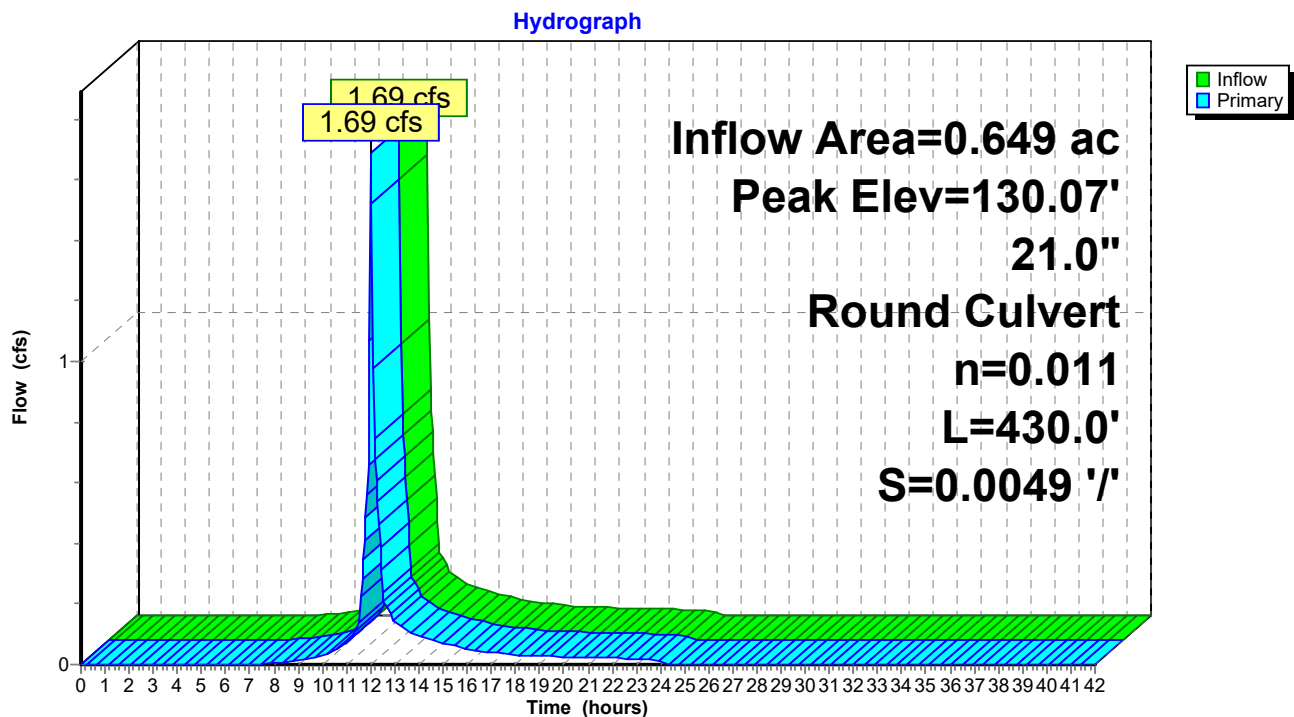
Peak Elev= 130.07' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.50'	<b>21.0" Round Culvert</b> L= 430.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 129.50' / 127.39' S= 0.0049 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 2.41 sf

**Primary OutFlow** Max=1.61 cfs @ 12.02 hrs HW=130.06' (Free Discharge)

↑1=Culvert (Barrel Controls 1.61 cfs @ 3.63 fps)

### Pond 5P: (new Pond)



## Post Development Analysis - MS

Type III 24-hr 10-Year Rainfall=5.09"

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 16

Time span=0.00-42.00 hrs, dt=0.05 hrs, 841 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Sub-Catchment1** Runoff Area=0.253 ac 26.09% Impervious Runoff Depth=3.45"  
Flow Length=77' Slope=0.0520 '/' Tc=5.5 min CN=85 Runoff=1.00 cfs 0.073 af

**Subcatchment2S: Sub-Catchment2** Runoff Area=0.409 ac 33.99% Impervious Runoff Depth=3.55"  
Flow Length=153' Tc=0.7 min CN=86 Runoff=1.89 cfs 0.121 af

**Subcatchment3S: Sub-Catchment3** Runoff Area=0.240 ac 27.50% Impervious Runoff Depth=3.45"  
Flow Length=131' Tc=1.4 min CN=85 Runoff=1.05 cfs 0.069 af

**Subcatchment4S: Sub-CatchmentD -** Runoff Area=5.033 ac 73.57% Impervious Runoff Depth>4.28"  
Tc=480.0 min CN=93 Runoff=2.29 cfs 1.797 af

**Pond 1P: Outfall # 1 - Resource Area West** Inflow=1.00 cfs 0.073 af  
Primary=1.00 cfs 0.073 af

**Pond 2P: Outfall #2 to CB** Peak Elev=135.06' Inflow=1.89 cfs 0.121 af  
12.0" Round Culvert n=0.011 L=215.0' S=0.0077 '/' Outflow=1.89 cfs 0.121 af

**Pond 3P: Outfall #3 to CB** Peak Elev=133.51' Inflow=1.05 cfs 0.069 af  
18.0" Round Culvert n=0.011 L=75.0' S=0.0267 '/' Outflow=1.05 cfs 0.069 af

**Pond 4P: Outfall # 4 - Resource Area North Corner** Inflow=3.13 cfs 1.987 af  
Primary=3.13 cfs 1.987 af

**Pond 5P: (new Pond)** Peak Elev=130.27' Inflow=2.94 cfs 0.190 af  
21.0" Round Culvert n=0.011 L=430.0' S=0.0049 '/' Outflow=2.94 cfs 0.190 af

**Total Runoff Area = 5.935 ac Runoff Volume = 2.060 af Average Runoff Depth = 4.16"**  
**33.04% Pervious = 1.961 ac 66.96% Impervious = 3.974 ac**



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 17

### Summary for Subcatchment 1S: Sub-Catchment 1

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

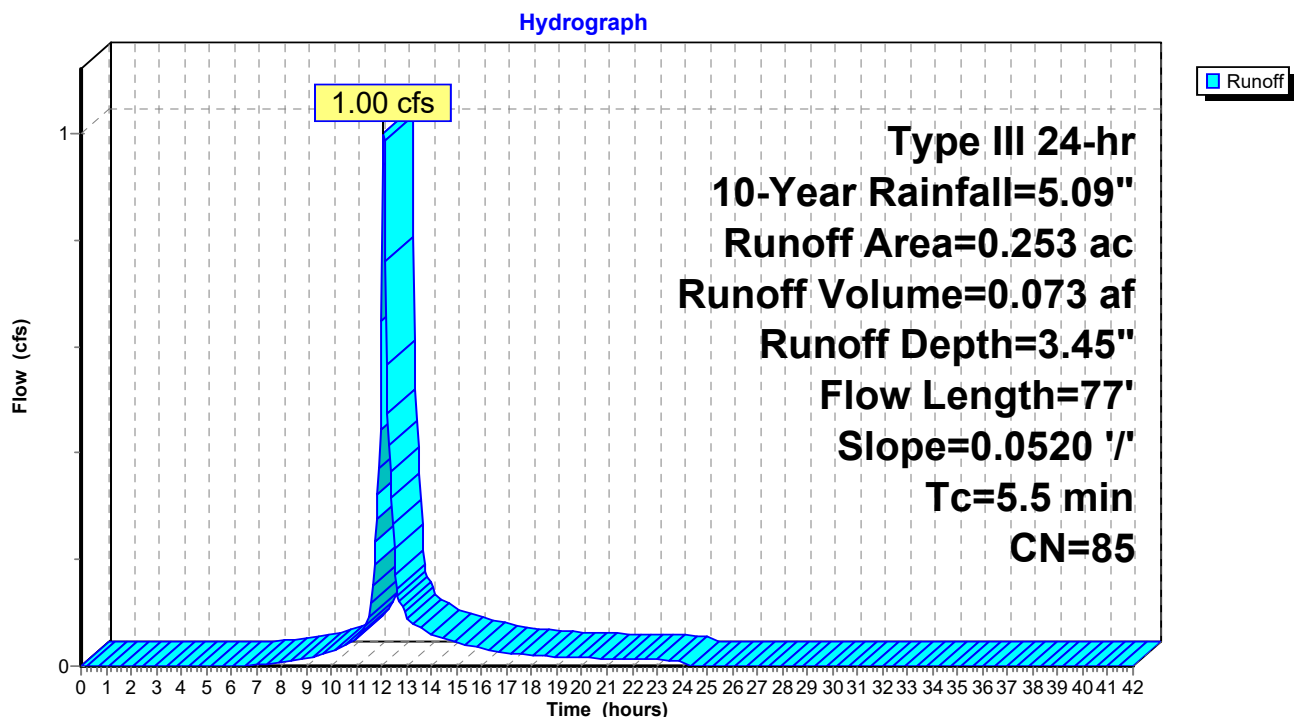
Runoff = 1.00 cfs @ 12.08 hrs, Volume= 0.073 af, Depth= 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 10-Year Rainfall=5.09"

Area (ac)	CN	Description
0.187	80	>75% Grass cover, Good, HSG D
0.066	98	Paved parking, HSG D
0.253	85	Weighted Average
0.187		73.91% Pervious Area
0.066		26.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	77	0.0520	0.23		Sheet Flow, Grass Area Grass: Short n= 0.150 P2= 3.10"

### Subcatchment 1S: Sub-Catchment 1



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 18

### Summary for Subcatchment 2S: Sub-Catchment 2

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.89 cfs @ 12.01 hrs, Volume= 0.121 af, Depth= 3.55"

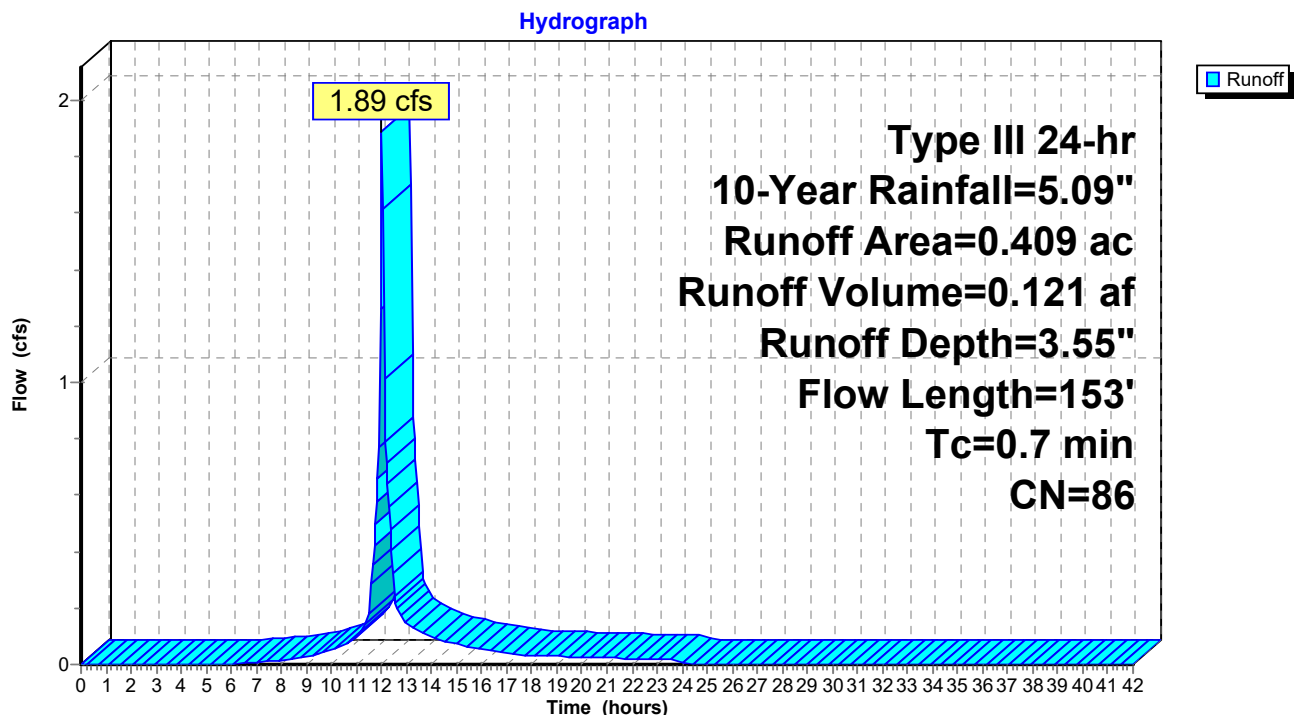
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 10-Year Rainfall=5.09"

Area (ac)	CN	Description
0.139	98	Unconnected pavement, HSG D
0.270	80	>75% Grass cover, Good, HSG D
0.409	86	Weighted Average
0.270		66.01% Pervious Area
0.139		33.99% Impervious Area
0.139		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0800	2.05		<b>Sheet Flow, Grass Hill</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.3	103	0.1000	6.42		<b>Shallow Concentrated Flow,</b> Paved $K_v=20.3$ fps
0.7	153	Total			

### Subcatchment 2S: Sub-Catchment 2



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 19

### Summary for Subcatchment 3S: Sub-Catchment 3

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.05 cfs @ 12.02 hrs, Volume= 0.069 af, Depth= 3.45"

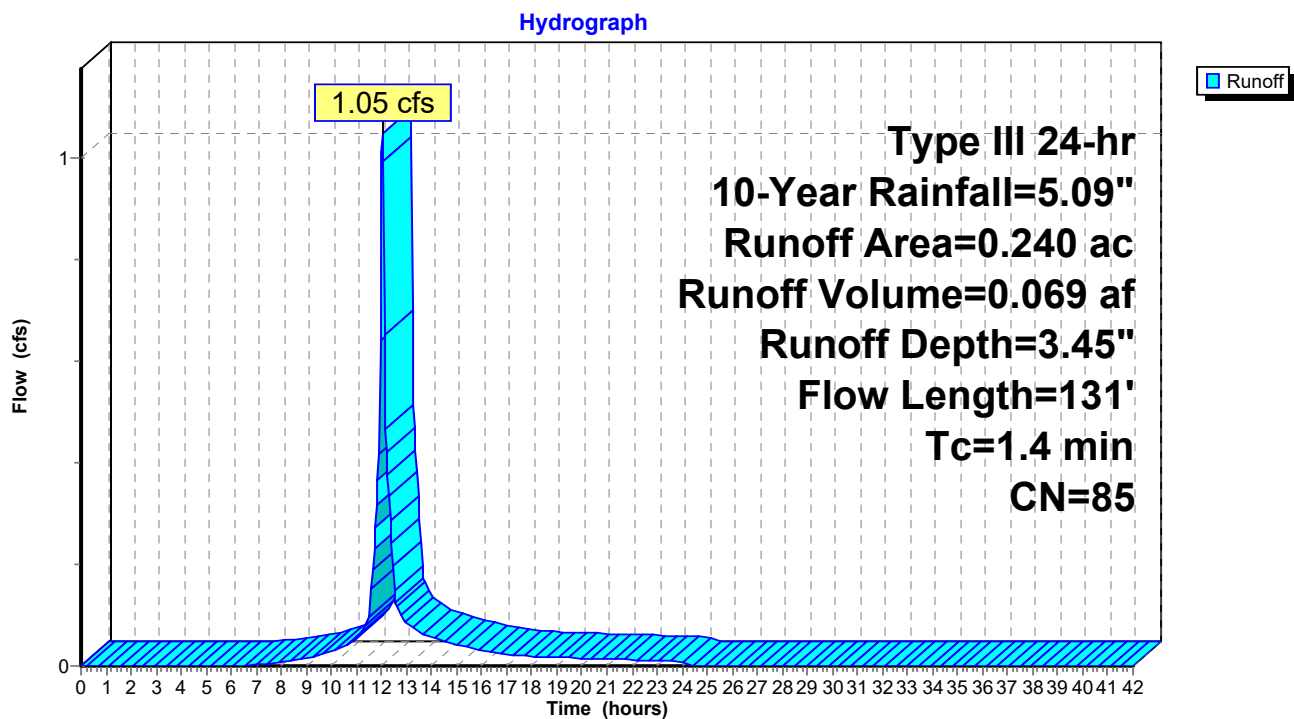
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 10-Year Rainfall=5.09"

Area (ac)	CN	Description
0.066	98	Paved parking, HSG D
0.174	80	>75% Grass cover, Good, HSG D
0.240	85	Weighted Average
0.174		72.50% Pervious Area
0.066		27.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0150	1.09		<b>Sheet Flow, Clay Infield</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.5	70	0.1300	2.52		<b>Shallow Concentrated Flow, Grass Outfield</b> Short Grass Pasture $K_v=7.0$ fps
1.4	131	Total			

### Subcatchment 3S: Sub-Catchment 3



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 20

### Summary for Subcatchment 4S: Sub-Catchment D - Athletic Field

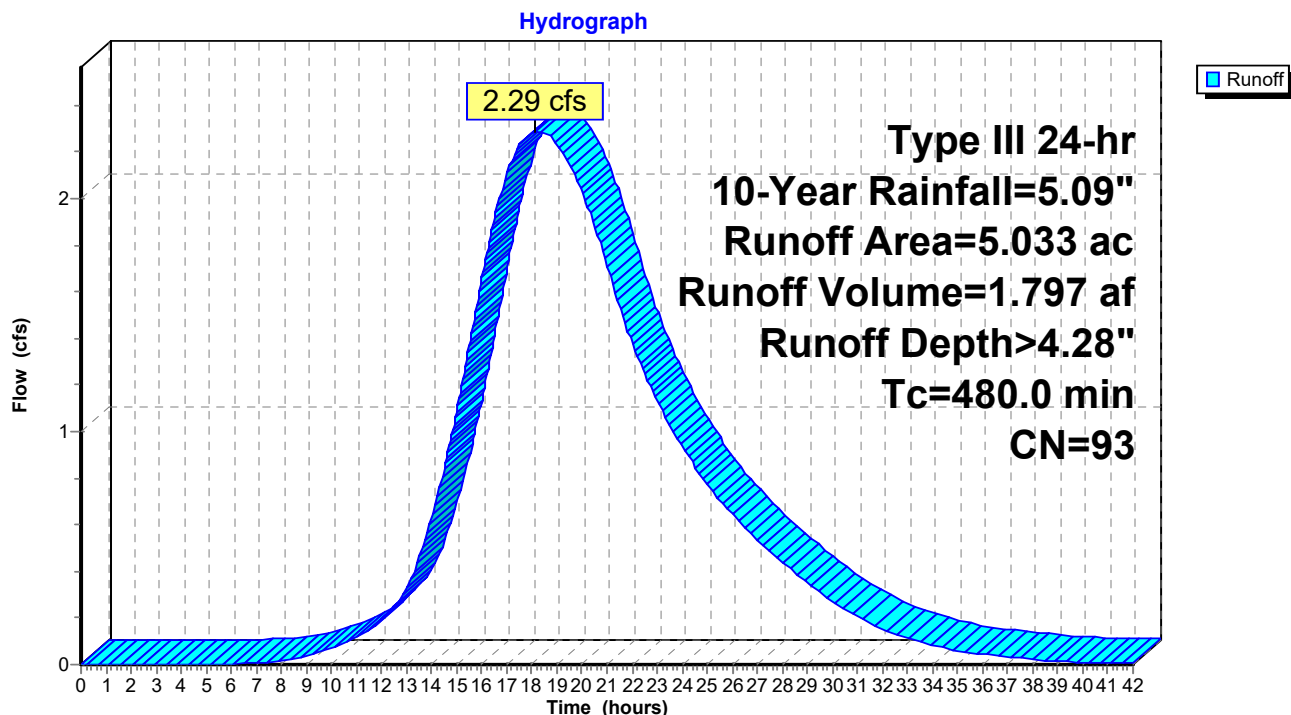
Runoff = 2.29 cfs @ 18.15 hrs, Volume= 1.797 af, Depth> 4.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=5.09"

Area (ac)	CN	Description
0.419	83	Woods, Poor, HSG D
0.524	98	Paved parking, HSG D
* 3.179	98	Synthetic Turf
0.911	80	>75% Grass cover, Good, HSG D
5.033	93	Weighted Average
1.330		26.43% Pervious Area
3.703		73.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
480.0					Direct Entry, Turf Field Base Stone

### Subcatchment 4S: Sub-Catchment D - Athletic Field



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 21

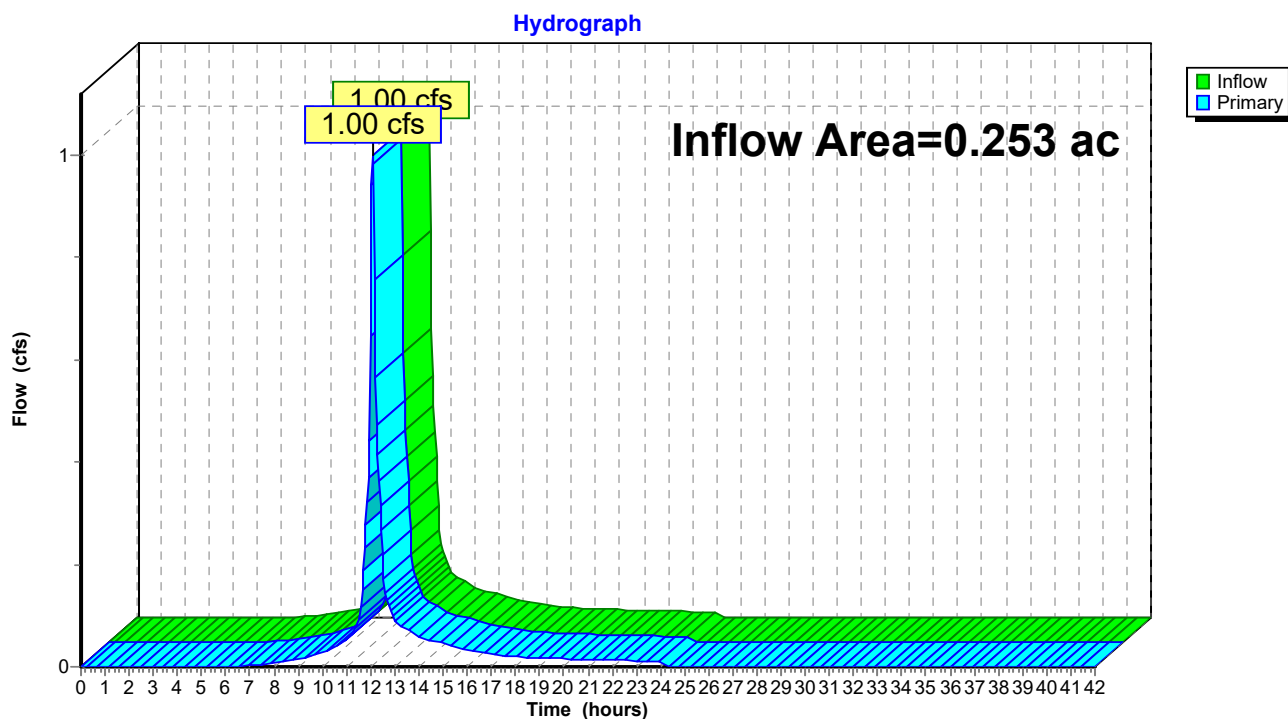
### Summary for Pond 1P: Outfall # 1 - Resource Area West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.253 ac, 26.09% Impervious, Inflow Depth = 3.45" for 10-Year event  
Inflow = 1.00 cfs @ 12.08 hrs, Volume= 0.073 af  
Primary = 1.00 cfs @ 12.08 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

### Pond 1P: Outfall # 1 - Resource Area West





## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 22

### Summary for Pond 2P: Outfall #2 to CB

[57] Hint: Peaked at 135.06' (Flood elevation advised)

Inflow Area = 0.409 ac, 33.99% Impervious, Inflow Depth = 3.55" for 10-Year event  
Inflow = 1.89 cfs @ 12.01 hrs, Volume= 0.121 af  
Outflow = 1.89 cfs @ 12.01 hrs, Volume= 0.121 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.89 cfs @ 12.01 hrs, Volume= 0.121 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

Peak Elev= 135.06' @ 12.01 hrs

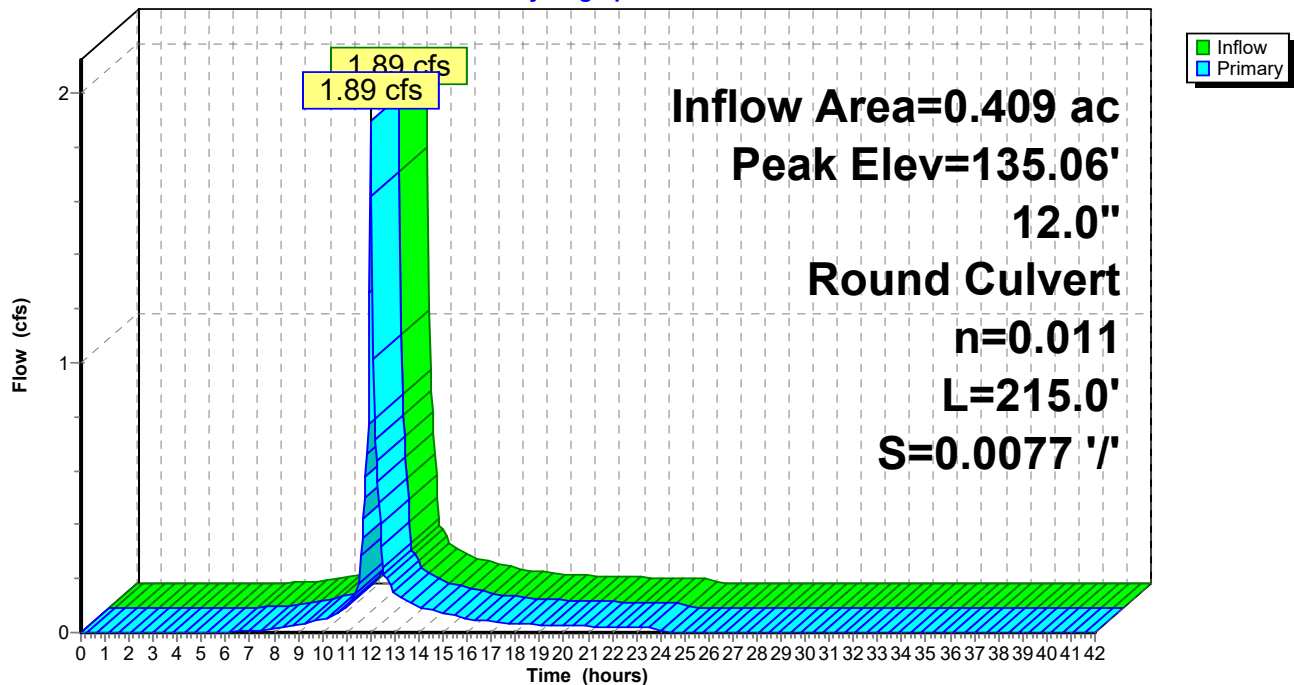
Device	Routing	Invert	Outlet Devices
#1	Primary	134.36'	<b>12.0" Round Culvert</b> L= 215.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 134.36' / 132.70' S= 0.0077 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

**Primary OutFlow** Max=1.82 cfs @ 12.01 hrs HW=135.05' (Free Discharge)

↑1=Culvert (Barrel Controls 1.82 cfs @ 4.47 fps)

### Pond 2P: Outfall #2 to CB

Hydrograph



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 23

### Summary for Pond 3P: Outfall #3 to CB

[57] Hint: Peaked at 133.51' (Flood elevation advised)

Inflow Area = 0.240 ac, 27.50% Impervious, Inflow Depth = 3.45" for 10-Year event  
Inflow = 1.05 cfs @ 12.02 hrs, Volume= 0.069 af  
Outflow = 1.05 cfs @ 12.02 hrs, Volume= 0.069 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.05 cfs @ 12.02 hrs, Volume= 0.069 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

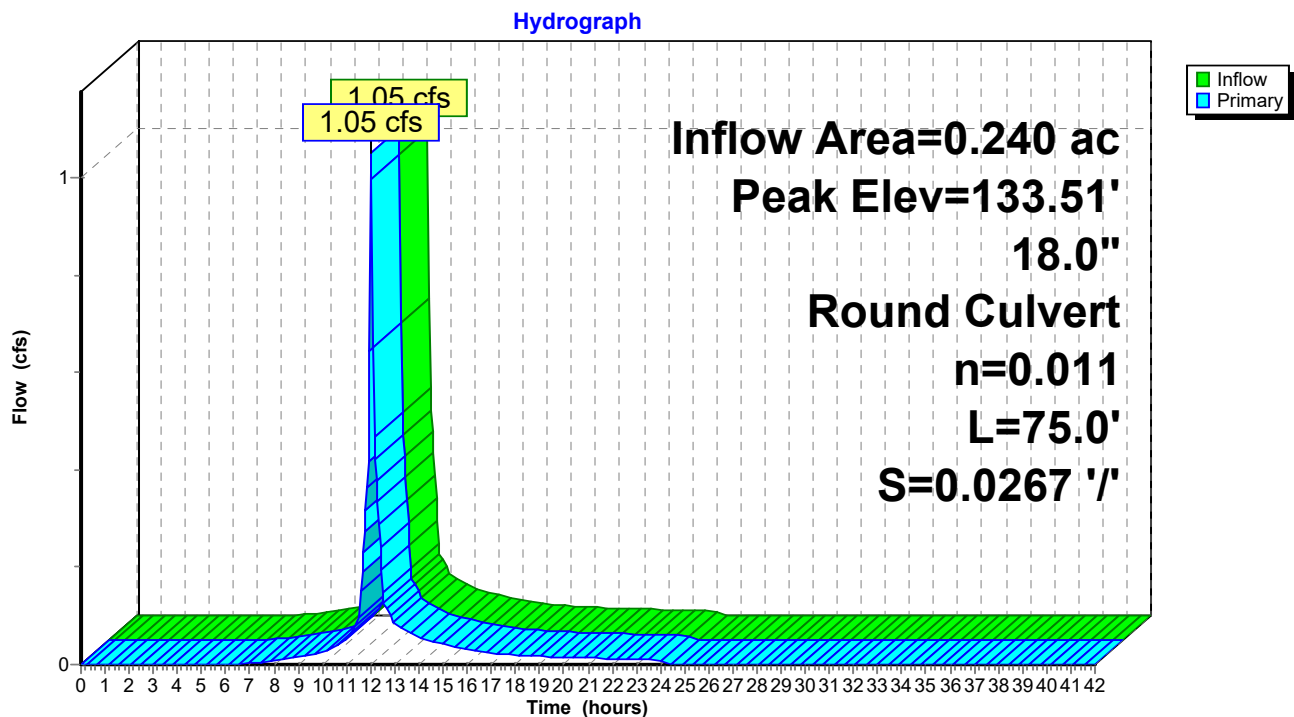
Peak Elev= 133.51' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.10'	<b>18.0" Round Culvert</b> L= 75.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 133.10' / 131.10' S= 0.0267 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=1.00 cfs @ 12.02 hrs HW=133.50' (Free Discharge)

↑1=Culvert (Inlet Controls 1.00 cfs @ 2.68 fps)

### Pond 3P: Outfall #3 to CB



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 24

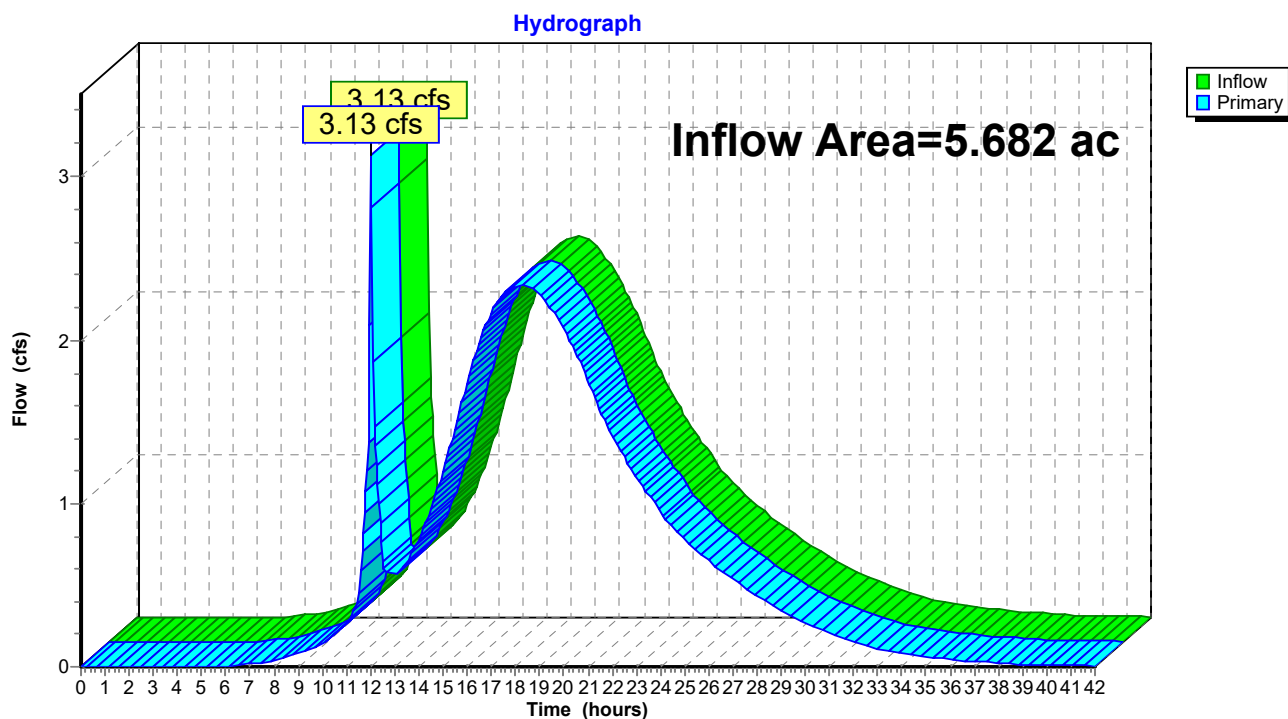
### Summary for Pond 4P: Outfall # 4 - Resource Area North Corner

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.682 ac, 68.78% Impervious, Inflow Depth > 4.20" for 10-Year event  
Inflow = 3.13 cfs @ 12.01 hrs, Volume= 1.987 af  
Primary = 3.13 cfs @ 12.01 hrs, Volume= 1.987 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

### Pond 4P: Outfall # 4 - Resource Area North Corner



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.09"

Printed 2/10/2025

Page 25

### Summary for Pond 5P: (new Pond)

[57] Hint: Peaked at 130.27' (Flood elevation advised)

Inflow Area = 0.649 ac, 31.59% Impervious, Inflow Depth = 3.51" for 10-Year event  
Inflow = 2.94 cfs @ 12.01 hrs, Volume= 0.190 af  
Outflow = 2.94 cfs @ 12.01 hrs, Volume= 0.190 af, Atten= 0%, Lag= 0.0 min  
Primary = 2.94 cfs @ 12.01 hrs, Volume= 0.190 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

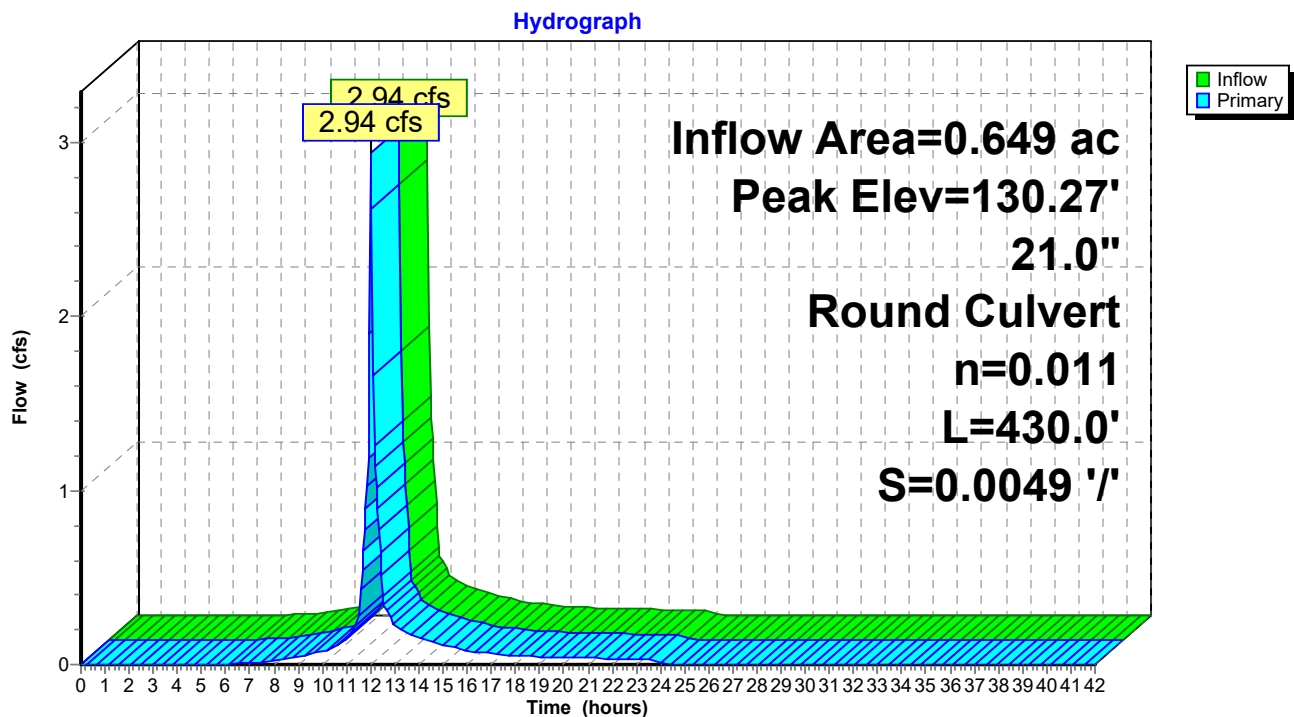
Peak Elev= 130.27' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.50'	<b>21.0" Round Culvert</b> L= 430.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 129.50' / 127.39' S= 0.0049 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 2.41 sf

**Primary OutFlow** Max=2.81 cfs @ 12.01 hrs HW=130.25' (Free Discharge)

1=Culvert (Barrel Controls 2.81 cfs @ 4.22 fps)

### Pond 5P: (new Pond)



## Post Development Analysis - MS

Type III 24-hr 25-Year Rainfall=6.13"

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 26

Time span=0.00-42.00 hrs, dt=0.05 hrs, 841 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Sub-Catchment1**      Runoff Area=0.253 ac   26.09% Impervious   Runoff Depth=4.43"  
Flow Length=77'   Slope=0.0520 '/'   Tc=5.5 min   CN=85   Runoff=1.27 cfs   0.093 af

**Subcatchment2S: Sub-Catchment2**      Runoff Area=0.409 ac   33.99% Impervious   Runoff Depth=4.53"  
Flow Length=153'   Tc=0.7 min   CN=86   Runoff=2.39 cfs   0.155 af

**Subcatchment3S: Sub-Catchment3**      Runoff Area=0.240 ac   27.50% Impervious   Runoff Depth=4.43"  
Flow Length=131'   Tc=1.4 min   CN=85   Runoff=1.34 cfs   0.089 af

**Subcatchment4S: Sub-CatchmentD -**      Runoff Area=5.033 ac   73.57% Impervious   Runoff Depth>5.31"  
Tc=480.0 min   CN=93   Runoff=2.82 cfs   2.226 af

**Pond 1P: Outfall # 1 - Resource Area West**      Inflow=1.27 cfs   0.093 af  
Primary=1.27 cfs   0.093 af

**Pond 2P: Outfall #2 to CB**      Peak Elev=135.18'   Inflow=2.39 cfs   0.155 af  
12.0" Round Culvert   n=0.011   L=215.0'   S=0.0077 '/'   Outflow=2.39 cfs   0.155 af

**Pond 3P: Outfall #3 to CB**      Peak Elev=133.56'   Inflow=1.34 cfs   0.089 af  
18.0" Round Culvert   n=0.011   L=75.0'   S=0.0267 '/'   Outflow=1.34 cfs   0.089 af

**Pond 4P: Outfall # 4 - Resource Area North Corner**      Inflow=3.99 cfs   2.469 af  
Primary=3.99 cfs   2.469 af

**Pond 5P: (new Pond)**      Peak Elev=130.37'   Inflow=3.72 cfs   0.243 af  
21.0" Round Culvert   n=0.011   L=430.0'   S=0.0049 '/'   Outflow=3.72 cfs   0.243 af

**Total Runoff Area = 5.935 ac   Runoff Volume = 2.563 af   Average Runoff Depth = 5.18"**  
**33.04% Pervious = 1.961 ac   66.96% Impervious = 3.974 ac**

## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 27

### Summary for Subcatchment 1S: Sub-Catchment 1

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

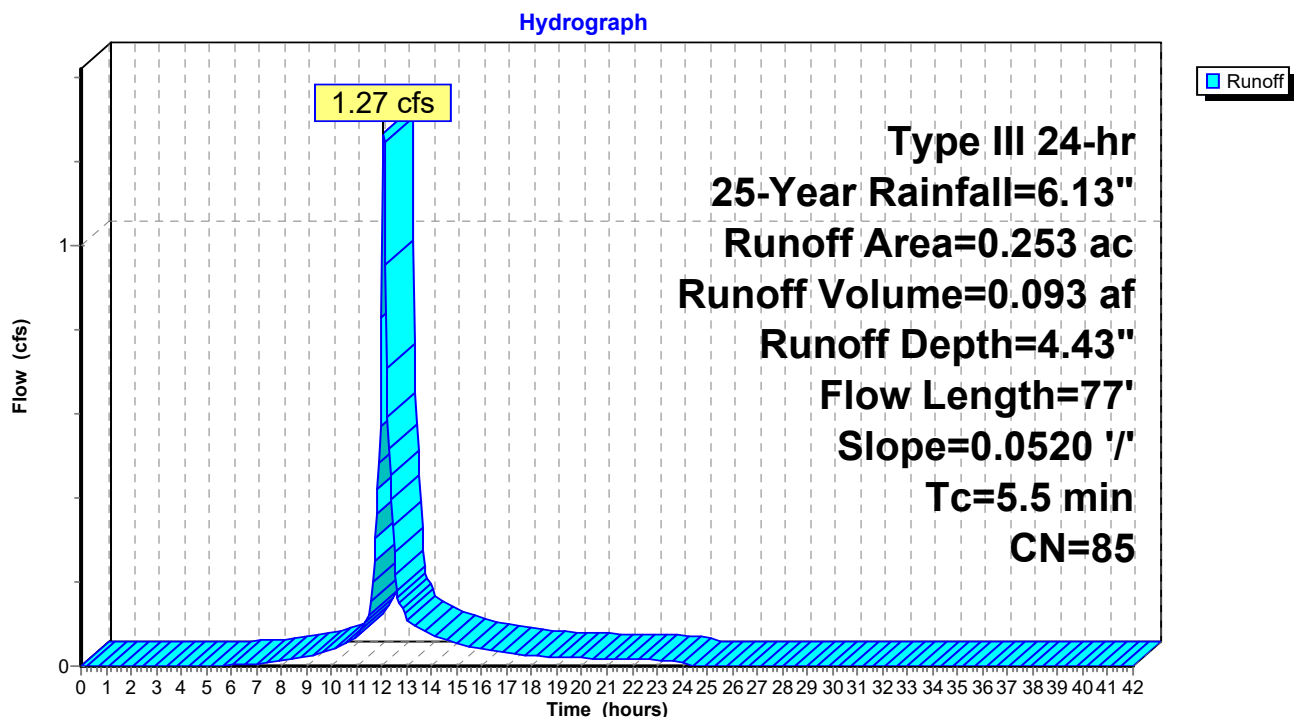
Runoff = 1.27 cfs @ 12.08 hrs, Volume= 0.093 af, Depth= 4.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 25-Year Rainfall=6.13"

Area (ac)	CN	Description
0.187	80	>75% Grass cover, Good, HSG D
0.066	98	Paved parking, HSG D
0.253	85	Weighted Average
0.187		73.91% Pervious Area
0.066		26.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	77	0.0520	0.23		Sheet Flow, Grass Area Grass: Short n= 0.150 P2= 3.10"

### Subcatchment 1S: Sub-Catchment 1





## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 28

### Summary for Subcatchment 2S: Sub-Catchment 2

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 2.39 cfs @ 12.01 hrs, Volume= 0.155 af, Depth= 4.53"

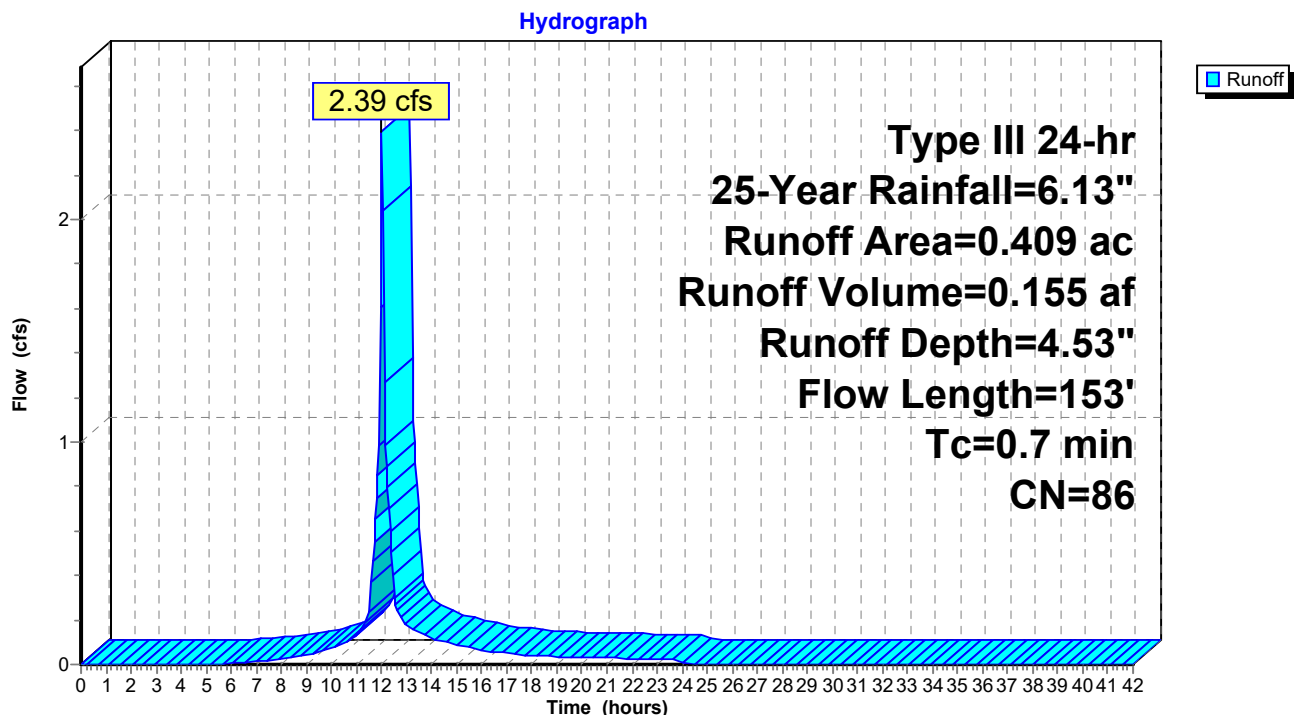
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 25-Year Rainfall=6.13"

Area (ac)	CN	Description
0.139	98	Unconnected pavement, HSG D
0.270	80	>75% Grass cover, Good, HSG D
0.409	86	Weighted Average
0.270		66.01% Pervious Area
0.139		33.99% Impervious Area
0.139		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0800	2.05		<b>Sheet Flow, Grass Hill</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.3	103	0.1000	6.42		<b>Shallow Concentrated Flow,</b> Paved $K_v=20.3$ fps
0.7	153	Total			

### Subcatchment 2S: Sub-Catchment 2



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 29

### Summary for Subcatchment 3S: Sub-Catchment 3

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.34 cfs @ 12.02 hrs, Volume= 0.089 af, Depth= 4.43"

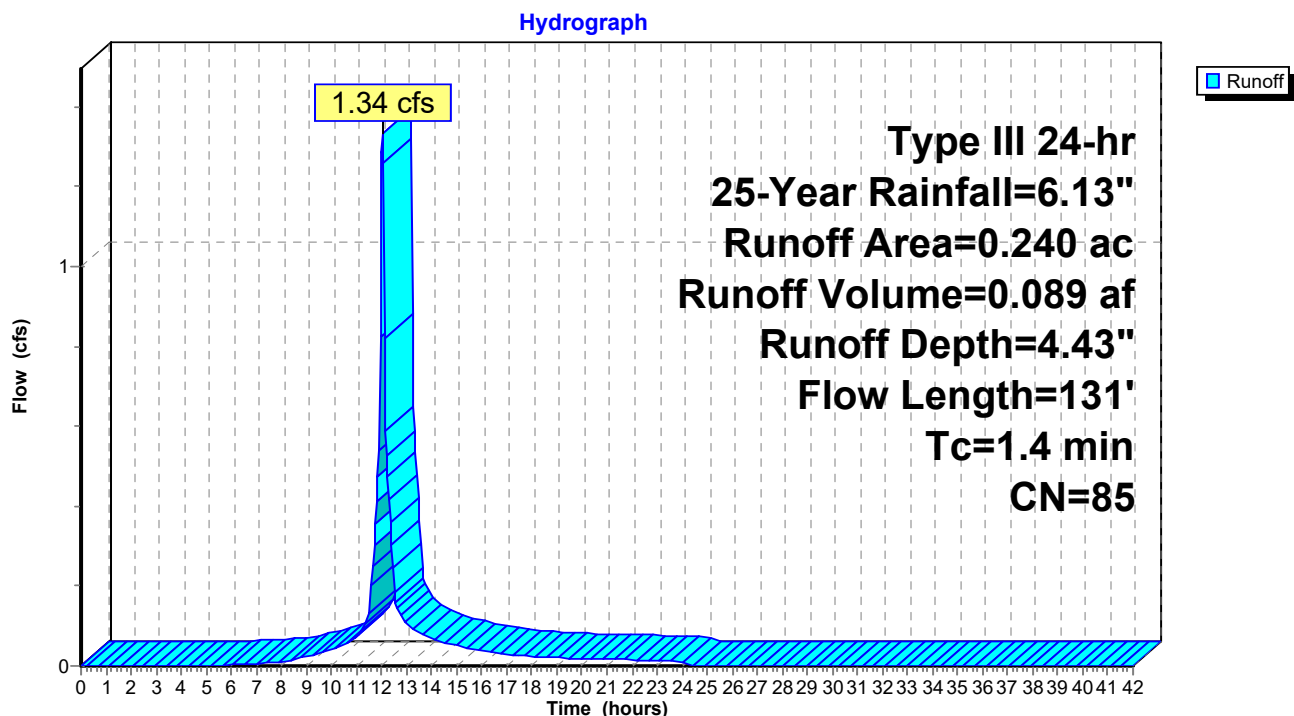
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 25-Year Rainfall=6.13"

Area (ac)	CN	Description
0.066	98	Paved parking, HSG D
0.174	80	>75% Grass cover, Good, HSG D
0.240	85	Weighted Average
0.174		72.50% Pervious Area
0.066		27.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0150	1.09		<b>Sheet Flow, Clay Infield</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.5	70	0.1300	2.52		<b>Shallow Concentrated Flow, Grass Outfield</b> Short Grass Pasture $K_v=7.0$ fps
1.4	131	Total			

### Subcatchment 3S: Sub-Catchment 3



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 30

### Summary for Subcatchment 4S: Sub-Catchment D - Athletic Field

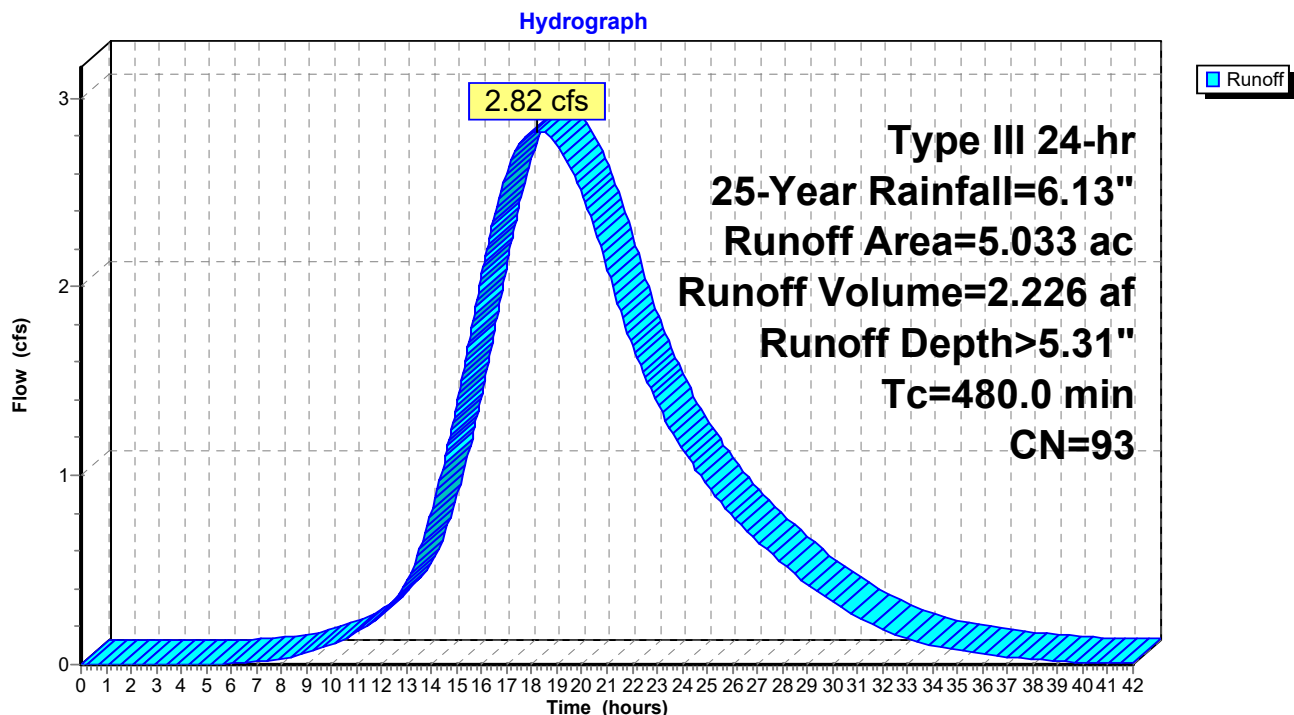
Runoff = 2.82 cfs @ 18.17 hrs, Volume= 2.226 af, Depth> 5.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.13"

Area (ac)	CN	Description
0.419	83	Woods, Poor, HSG D
0.524	98	Paved parking, HSG D
* 3.179	98	Synthetic Turf
0.911	80	>75% Grass cover, Good, HSG D
5.033	93	Weighted Average
1.330		26.43% Pervious Area
3.703		73.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
480.0					Direct Entry, Turf Field Base Stone

### Subcatchment 4S: Sub-Catchment D - Athletic Field



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 31

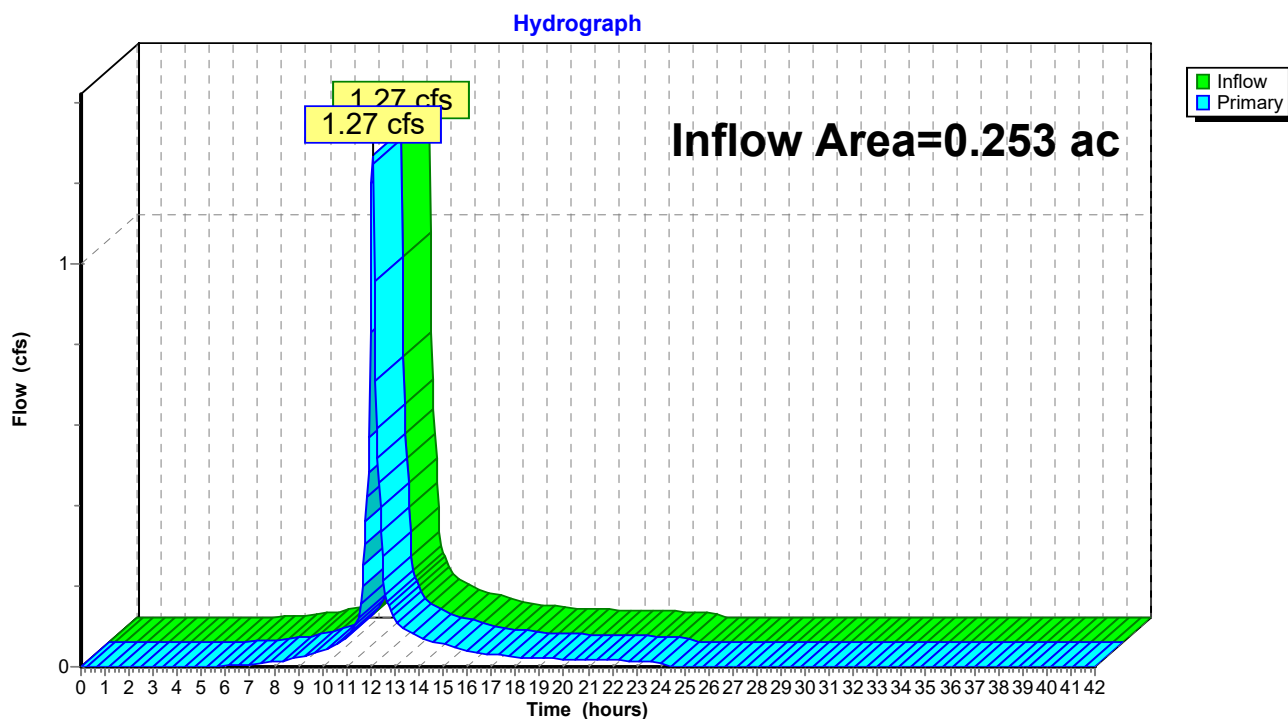
### Summary for Pond 1P: Outfall # 1 - Resource Area West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.253 ac, 26.09% Impervious, Inflow Depth = 4.43" for 25-Year event  
Inflow = 1.27 cfs @ 12.08 hrs, Volume= 0.093 af  
Primary = 1.27 cfs @ 12.08 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

### Pond 1P: Outfall # 1 - Resource Area West



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 32

### Summary for Pond 2P: Outfall #2 to CB

[57] Hint: Peaked at 135.18' (Flood elevation advised)

Inflow Area = 0.409 ac, 33.99% Impervious, Inflow Depth = 4.53" for 25-Year event  
Inflow = 2.39 cfs @ 12.01 hrs, Volume= 0.155 af  
Outflow = 2.39 cfs @ 12.01 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.0 min  
Primary = 2.39 cfs @ 12.01 hrs, Volume= 0.155 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

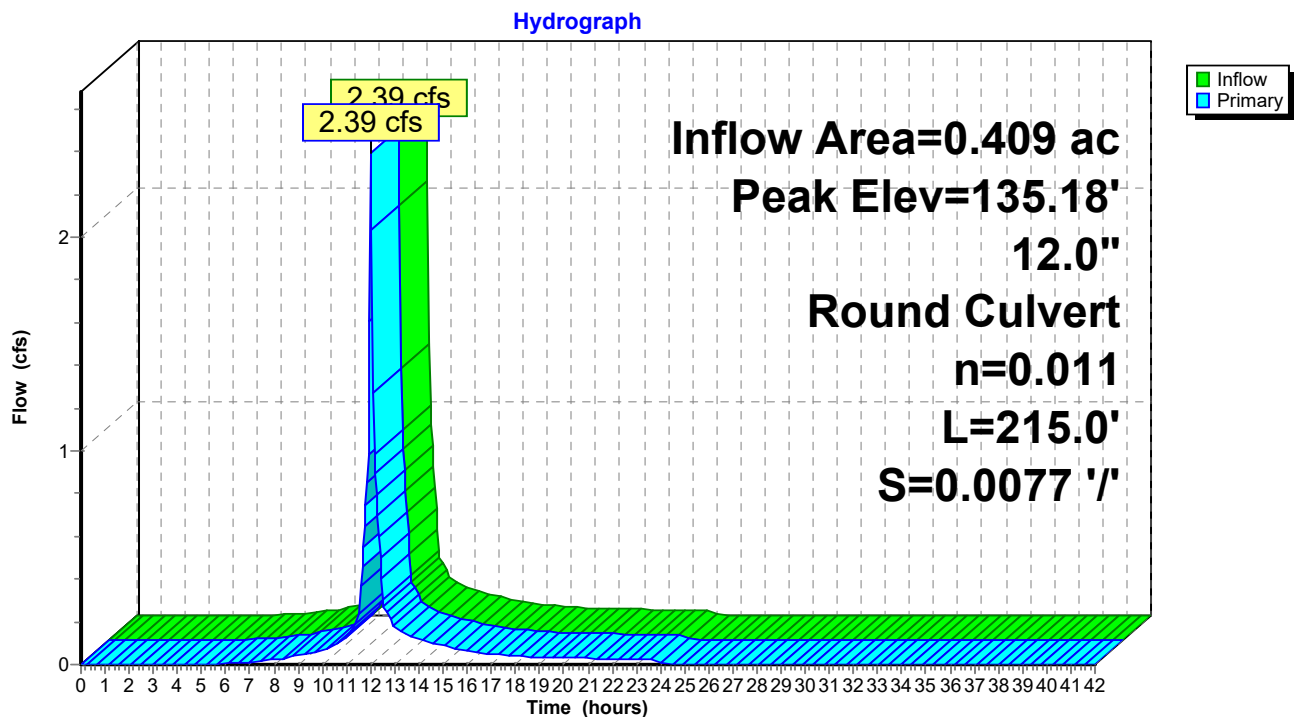
Peak Elev= 135.18' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.36'	<b>12.0" Round Culvert</b> L= 215.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 134.36' / 132.70' S= 0.0077 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

**Primary OutFlow** Max=2.31 cfs @ 12.01 hrs HW=135.16' (Free Discharge)

↑1=Culvert (Barrel Controls 2.31 cfs @ 4.70 fps)

### Pond 2P: Outfall #2 to CB



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 33

### Summary for Pond 3P: Outfall #3 to CB

[57] Hint: Peaked at 133.56' (Flood elevation advised)

Inflow Area = 0.240 ac, 27.50% Impervious, Inflow Depth = 4.43" for 25-Year event  
Inflow = 1.34 cfs @ 12.02 hrs, Volume= 0.089 af  
Outflow = 1.34 cfs @ 12.02 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.34 cfs @ 12.02 hrs, Volume= 0.089 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

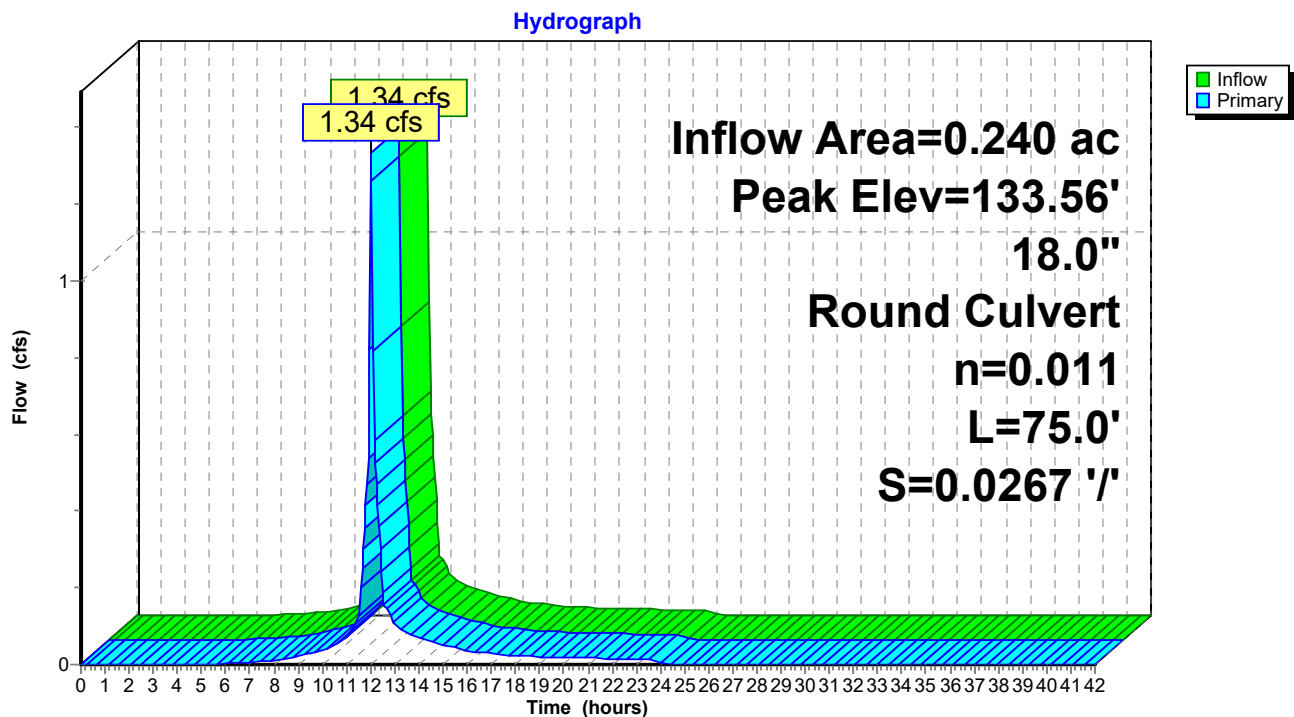
Peak Elev= 133.56' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.10'	<b>18.0" Round Culvert</b> L= 75.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 133.10' / 131.10' S= 0.0267 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=1.27 cfs @ 12.02 hrs HW=133.55' (Free Discharge)

↑1=Culvert (Inlet Controls 1.27 cfs @ 2.86 fps)

### Pond 3P: Outfall #3 to CB





## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 34

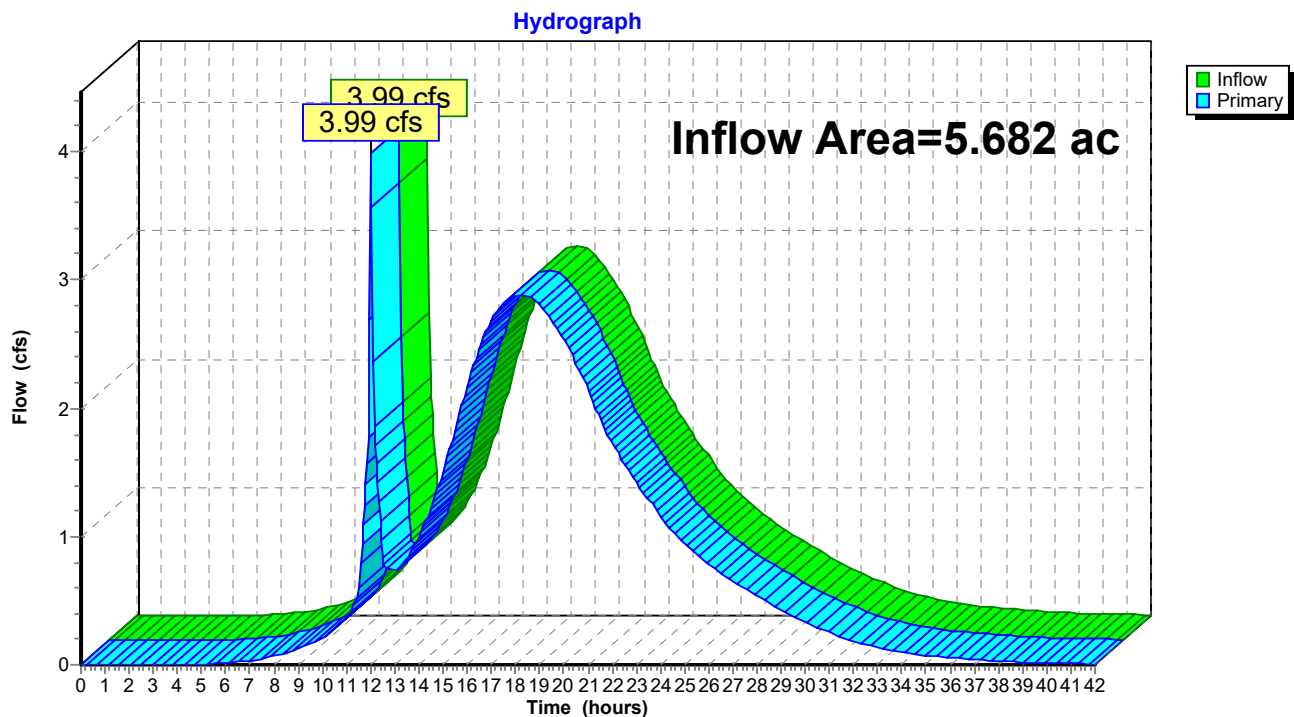
### Summary for Pond 4P: Outfall # 4 - Resource Area North Corner

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.682 ac, 68.78% Impervious, Inflow Depth > 5.22" for 25-Year event  
Inflow = 3.99 cfs @ 12.01 hrs, Volume= 2.469 af  
Primary = 3.99 cfs @ 12.01 hrs, Volume= 2.469 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

### Pond 4P: Outfall # 4 - Resource Area North Corner



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.13"

Printed 2/10/2025

Page 35

### Summary for Pond 5P: (new Pond)

[57] Hint: Peaked at 130.37' (Flood elevation advised)

Inflow Area = 0.649 ac, 31.59% Impervious, Inflow Depth = 4.49" for 25-Year event  
Inflow = 3.72 cfs @ 12.01 hrs, Volume= 0.243 af  
Outflow = 3.72 cfs @ 12.01 hrs, Volume= 0.243 af, Atten= 0%, Lag= 0.0 min  
Primary = 3.72 cfs @ 12.01 hrs, Volume= 0.243 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

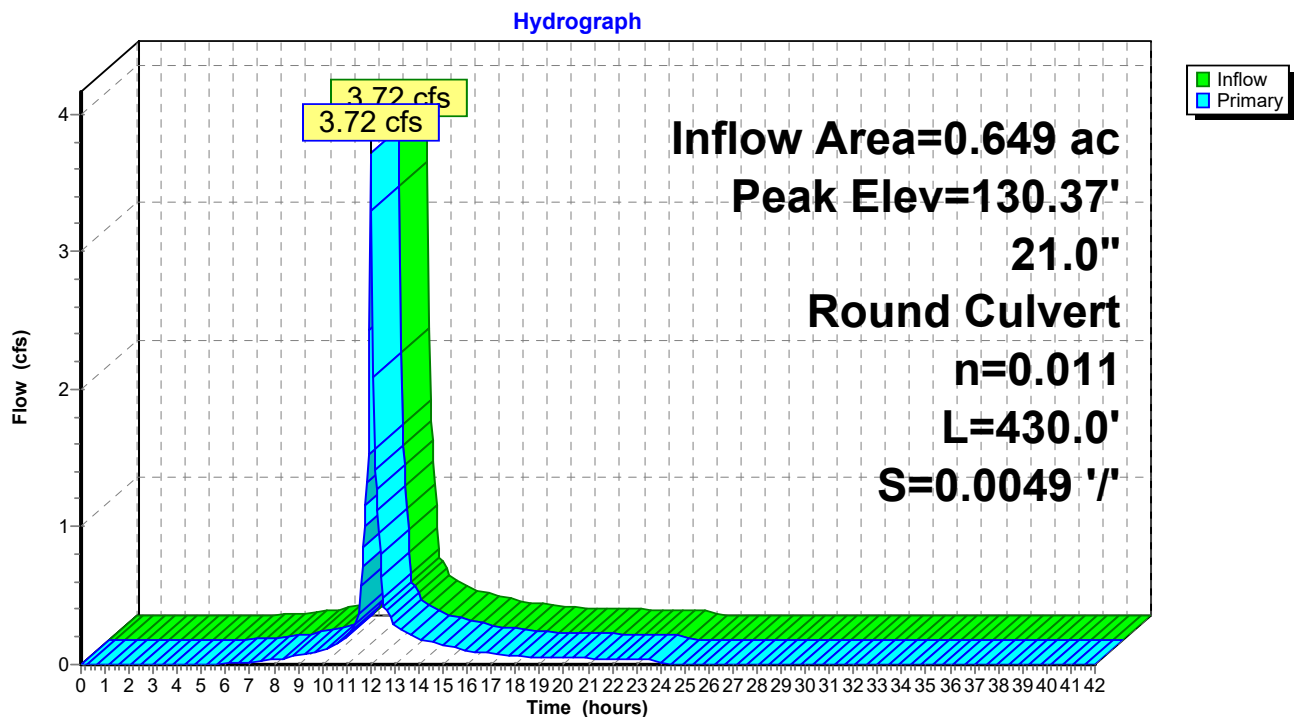
Peak Elev= 130.37' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.50'	<b>21.0" Round Culvert</b> L= 430.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 129.50' / 127.39' S= 0.0049 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 2.41 sf

**Primary OutFlow** Max=3.56 cfs @ 12.01 hrs HW=130.35' (Free Discharge)

↑1=Culvert (Barrel Controls 3.56 cfs @ 4.50 fps)

### Pond 5P: (new Pond)



## Post Development Analysis - MS

Type III 24-hr 100-Year Rainfall=7.74"

Prepared by {enter your company name here}

Printed 2/10/2025

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Page 36

Time span=0.00-42.00 hrs, dt=0.05 hrs, 841 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: Sub-Catchment1**      Runoff Area=0.253 ac   26.09% Impervious   Runoff Depth=5.96"  
Flow Length=77'   Slope=0.0520 '/   Tc=5.5 min   CN=85   Runoff=1.69 cfs   0.126 af

**Subcatchment2S: Sub-Catchment2**      Runoff Area=0.409 ac   33.99% Impervious   Runoff Depth=6.08"  
Flow Length=153'   Tc=0.7 min   CN=86   Runoff=3.16 cfs   0.207 af

**Subcatchment3S: Sub-Catchment3**      Runoff Area=0.240 ac   27.50% Impervious   Runoff Depth=5.96"  
Flow Length=131'   Tc=1.4 min   CN=85   Runoff=1.77 cfs   0.119 af

**Subcatchment4S: Sub-Catchment D -**      Runoff Area=5.033 ac   73.57% Impervious   Runoff Depth>6.90"  
Tc=480.0 min   CN=93   Runoff=3.65 cfs   2.895 af

**Pond 1P: Outfall # 1 - Resource Area West**      Inflow=1.69 cfs   0.126 af  
Primary=1.69 cfs   0.126 af

**Pond 2P: Outfall #2 to CB**      Peak Elev=135.36'   Inflow=3.16 cfs   0.207 af  
12.0" Round Culvert   n=0.011   L=215.0'   S=0.0077 '/   Outflow=3.16 cfs   0.207 af

**Pond 3P: Outfall #3 to CB**      Peak Elev=133.64'   Inflow=1.77 cfs   0.119 af  
18.0" Round Culvert   n=0.011   L=75.0'   S=0.0267 '/   Outflow=1.77 cfs   0.119 af

**Pond 4P: Outfall # 4 - Resource Area North Corner**      Inflow=5.32 cfs   3.221 af  
Primary=5.32 cfs   3.221 af

**Pond 5P: (new Pond)**      Peak Elev=130.52'   Inflow=4.92 cfs   0.326 af  
21.0" Round Culvert   n=0.011   L=430.0'   S=0.0049 '/   Outflow=4.92 cfs   0.326 af

**Total Runoff Area = 5.935 ac   Runoff Volume = 3.347 af   Average Runoff Depth = 6.77"**  
**33.04% Pervious = 1.961 ac   66.96% Impervious = 3.974 ac**

## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 37

### Summary for Subcatchment 1S: Sub-Catchment 1

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

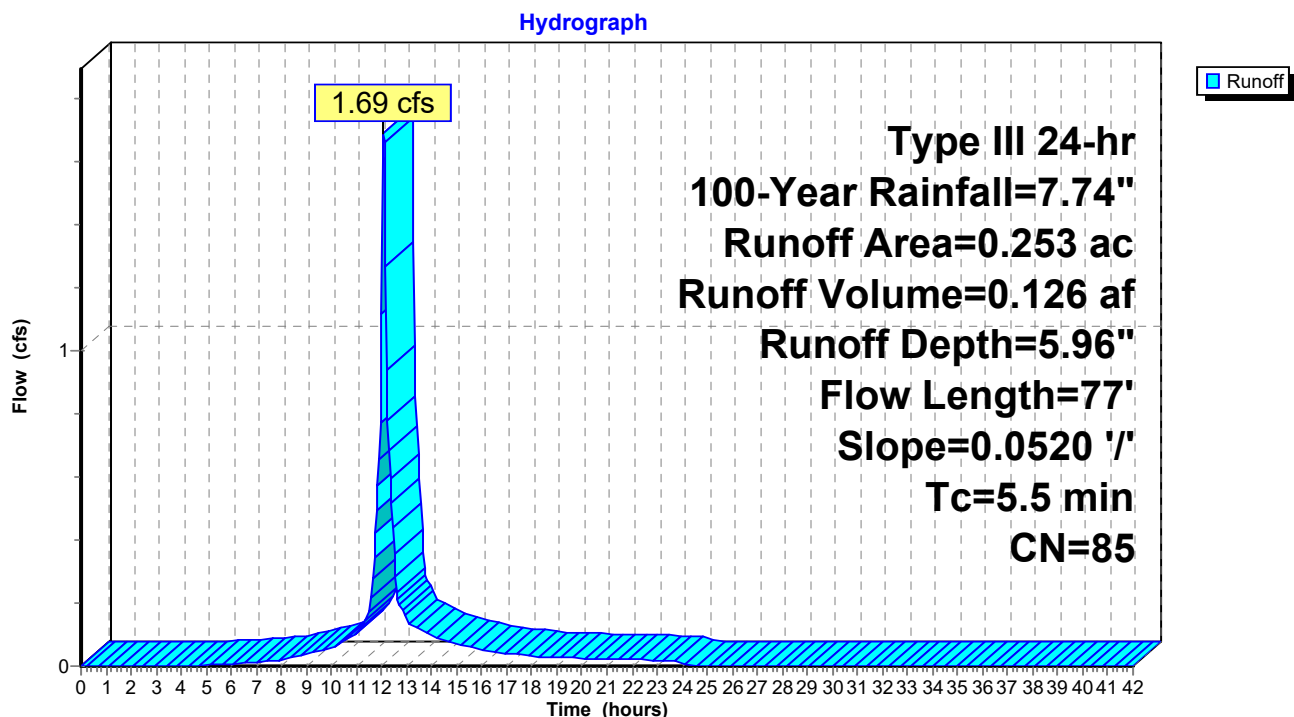
Runoff = 1.69 cfs @ 12.08 hrs, Volume= 0.126 af, Depth= 5.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 100-Year Rainfall=7.74"

Area (ac)	CN	Description
0.187	80	>75% Grass cover, Good, HSG D
0.066	98	Paved parking, HSG D
0.253	85	Weighted Average
0.187		73.91% Pervious Area
0.066		26.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	77	0.0520	0.23		Sheet Flow, Grass Area Grass: Short n= 0.150 P2= 3.10"

### Subcatchment 1S: Sub-Catchment 1



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 38

### Summary for Subcatchment 2S: Sub-Catchment 2

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 3.16 cfs @ 12.01 hrs, Volume= 0.207 af, Depth= 6.08"

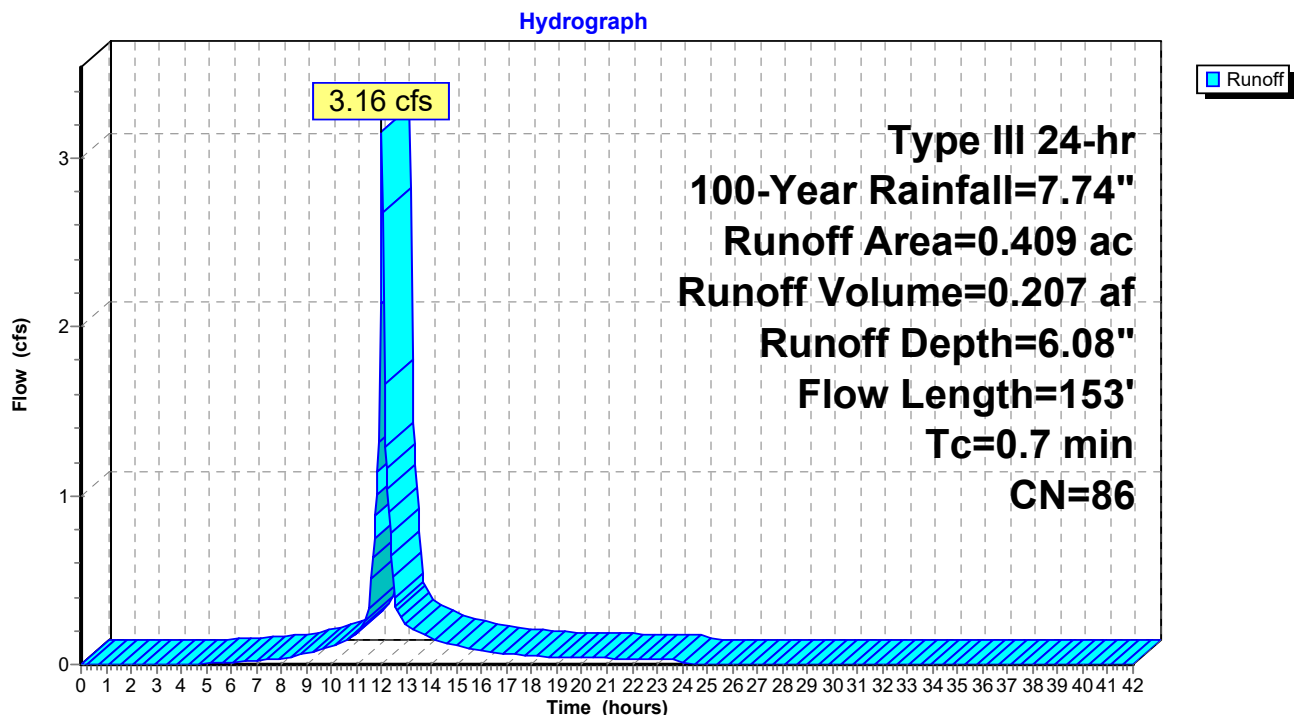
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 100-Year Rainfall=7.74"

Area (ac)	CN	Description
0.139	98	Unconnected pavement, HSG D
0.270	80	>75% Grass cover, Good, HSG D
0.409	86	Weighted Average
0.270		66.01% Pervious Area
0.139		33.99% Impervious Area
0.139		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0800	2.05		<b>Sheet Flow, Grass Hill</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.3	103	0.1000	6.42		<b>Shallow Concentrated Flow,</b> Paved $K_v=20.3$ fps
0.7	153	Total			

### Subcatchment 2S: Sub-Catchment 2



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 39

### Summary for Subcatchment 3S: Sub-Catchment 3

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 1.77 cfs @ 12.02 hrs, Volume= 0.119 af, Depth= 5.96"

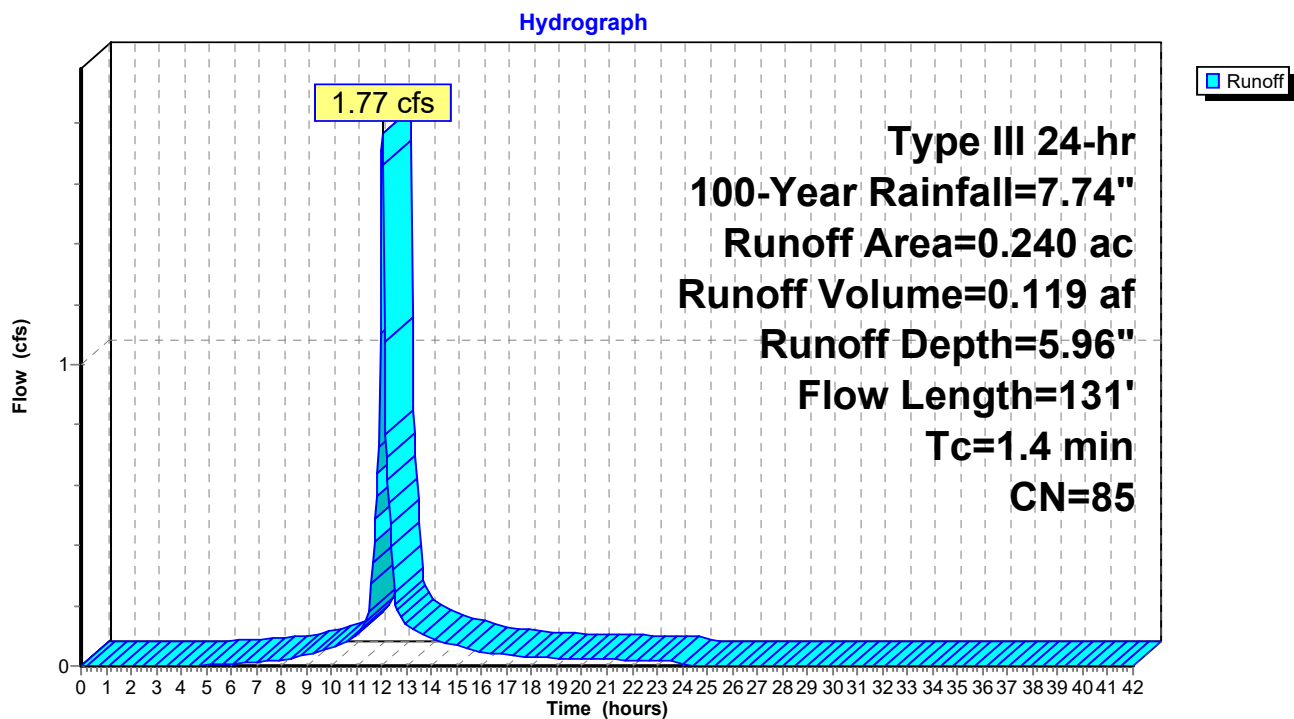
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs,  $dt=0.05$  hrs  
Type III 24-hr 100-Year Rainfall=7.74"

Area (ac)	CN	Description
0.066	98	Paved parking, HSG D
0.174	80	>75% Grass cover, Good, HSG D
0.240	85	Weighted Average
0.174		72.50% Pervious Area
0.066		27.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	61	0.0150	1.09		<b>Sheet Flow, Clay Infield</b> Smooth surfaces $n=0.011$ $P2=3.10"$
0.5	70	0.1300	2.52		<b>Shallow Concentrated Flow, Grass Outfield</b> Short Grass Pasture $K_v=7.0$ fps
1.4	131	Total			

### Subcatchment 3S: Sub-Catchment 3





## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 40

### Summary for Subcatchment 4S: Sub-Catchment D - Athletic Field

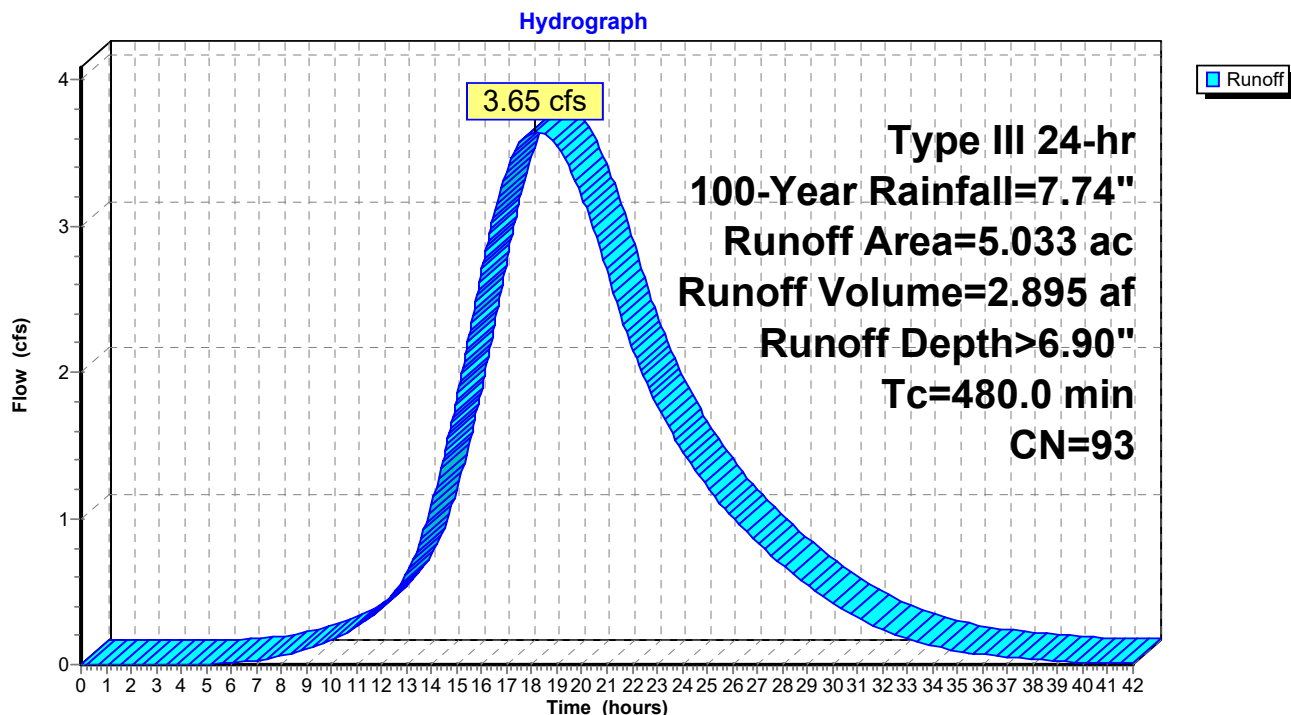
Runoff = 3.65 cfs @ 18.16 hrs, Volume= 2.895 af, Depth> 6.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=7.74"

Area (ac)	CN	Description
0.419	83	Woods, Poor, HSG D
0.524	98	Paved parking, HSG D
* 3.179	98	Synthetic Turf
0.911	80	>75% Grass cover, Good, HSG D
5.033	93	Weighted Average
1.330		26.43% Pervious Area
3.703		73.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
480.0					Direct Entry, Turf Field Base Stone

### Subcatchment 4S: Sub-Catchment D - Athletic Field



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 41

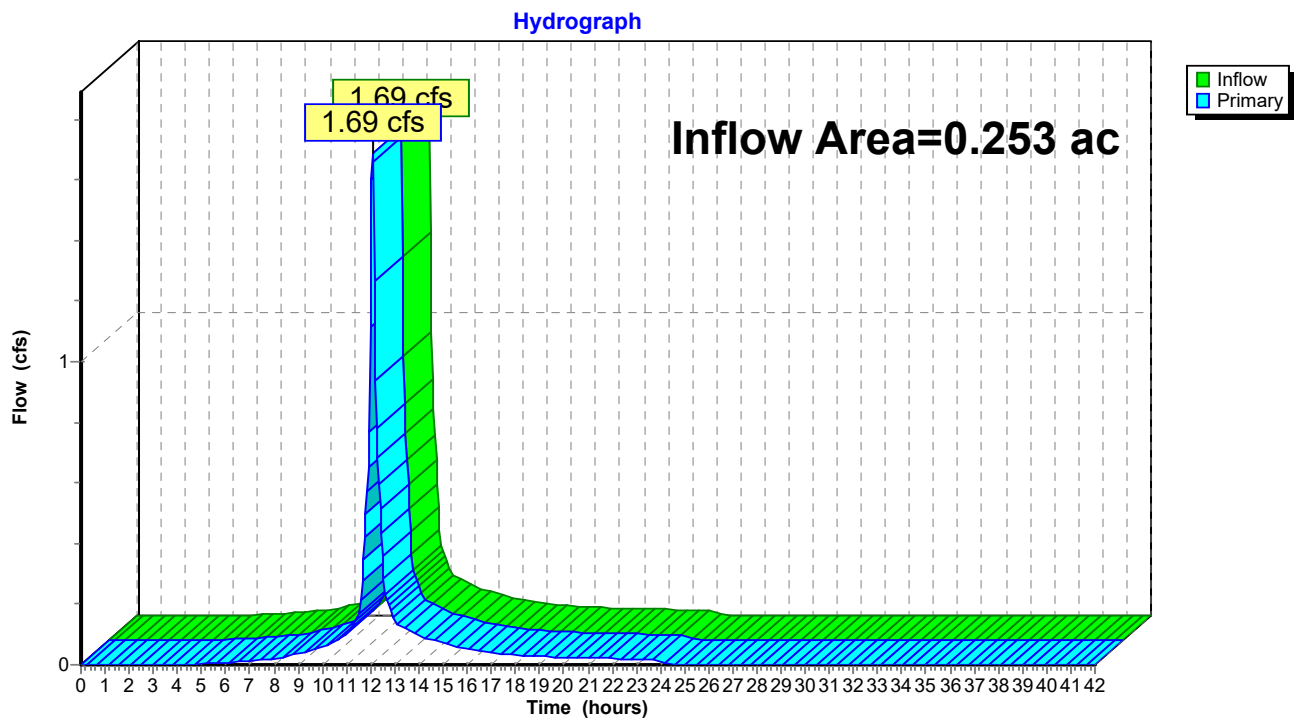
### Summary for Pond 1P: Outfall # 1 - Resource Area West

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.253 ac, 26.09% Impervious, Inflow Depth = 5.96" for 100-Year event  
Inflow = 1.69 cfs @ 12.08 hrs, Volume= 0.126 af  
Primary = 1.69 cfs @ 12.08 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

### Pond 1P: Outfall # 1 - Resource Area West



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 42

### Summary for Pond 2P: Outfall #2 to CB

[57] Hint: Peaked at 135.36' (Flood elevation advised)

Inflow Area = 0.409 ac, 33.99% Impervious, Inflow Depth = 6.08" for 100-Year event  
Inflow = 3.16 cfs @ 12.01 hrs, Volume= 0.207 af  
Outflow = 3.16 cfs @ 12.01 hrs, Volume= 0.207 af, Atten= 0%, Lag= 0.0 min  
Primary = 3.16 cfs @ 12.01 hrs, Volume= 0.207 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

Peak Elev= 135.36' @ 12.01 hrs

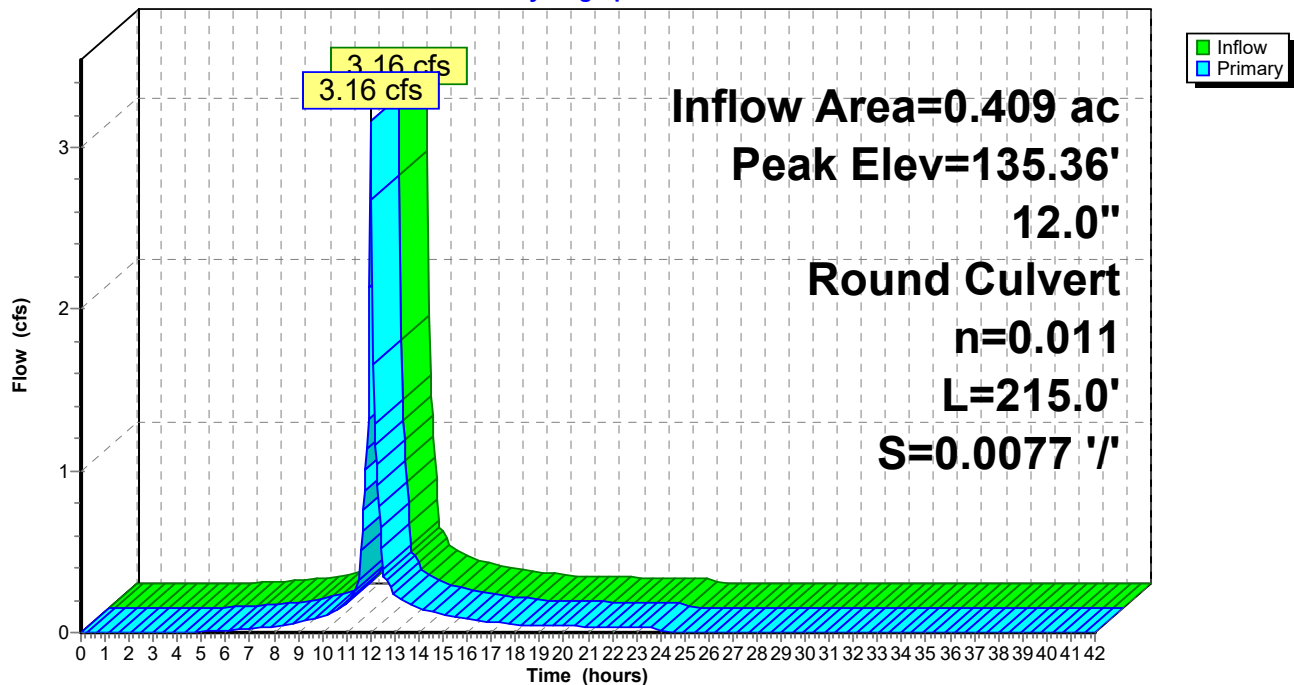
Device	Routing	Invert	Outlet Devices
#1	Primary	134.36'	<b>12.0" Round Culvert</b> L= 215.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 134.36' / 132.70' S= 0.0077 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf

**Primary OutFlow** Max=3.06 cfs @ 12.01 hrs HW=135.34' (Free Discharge)

↑1=Culvert (Barrel Controls 3.06 cfs @ 4.96 fps)

### Pond 2P: Outfall #2 to CB

Hydrograph



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 43

### Summary for Pond 3P: Outfall #3 to CB

[57] Hint: Peaked at 133.64' (Flood elevation advised)

Inflow Area = 0.240 ac, 27.50% Impervious, Inflow Depth = 5.96" for 100-Year event  
Inflow = 1.77 cfs @ 12.02 hrs, Volume= 0.119 af  
Outflow = 1.77 cfs @ 12.02 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min  
Primary = 1.77 cfs @ 12.02 hrs, Volume= 0.119 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

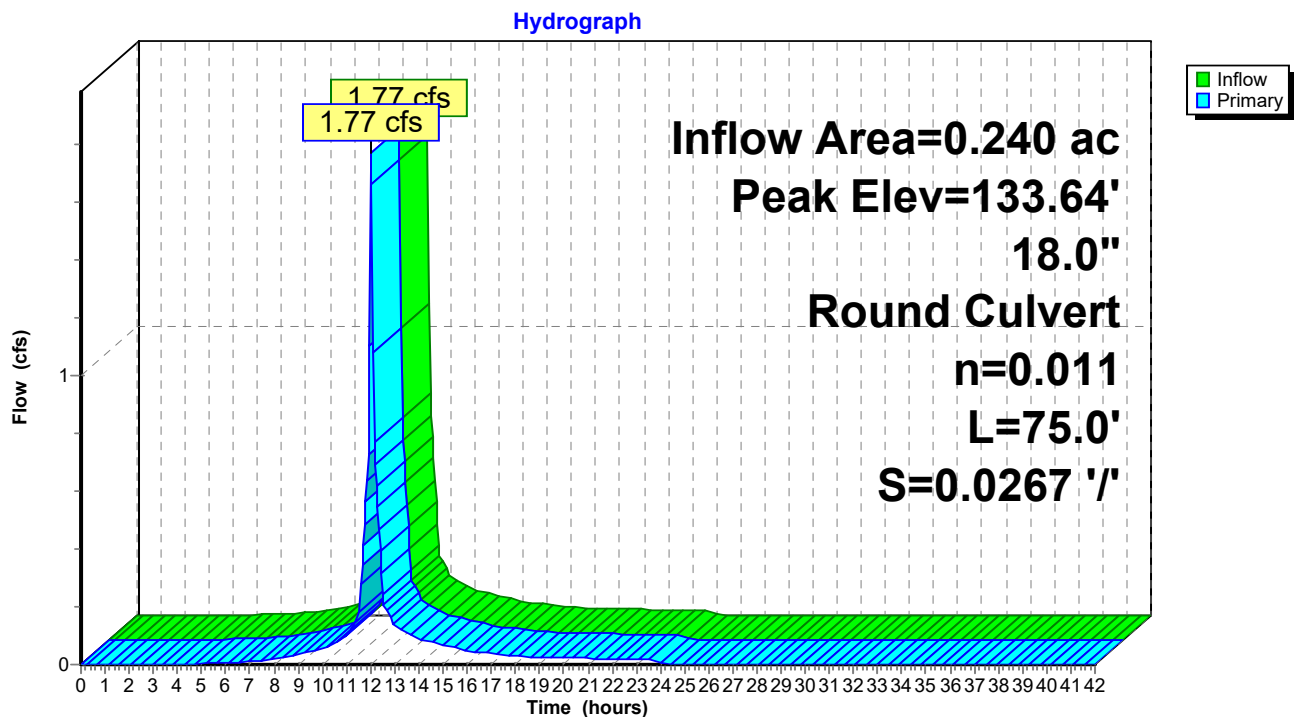
Peak Elev= 133.64' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.10'	<b>18.0" Round Culvert</b> L= 75.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 133.10' / 131.10' S= 0.0267 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

**Primary OutFlow** Max=1.69 cfs @ 12.02 hrs HW=133.62' (Free Discharge)

↑1=Culvert (Inlet Controls 1.69 cfs @ 3.08 fps)

### Pond 3P: Outfall #3 to CB



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 44

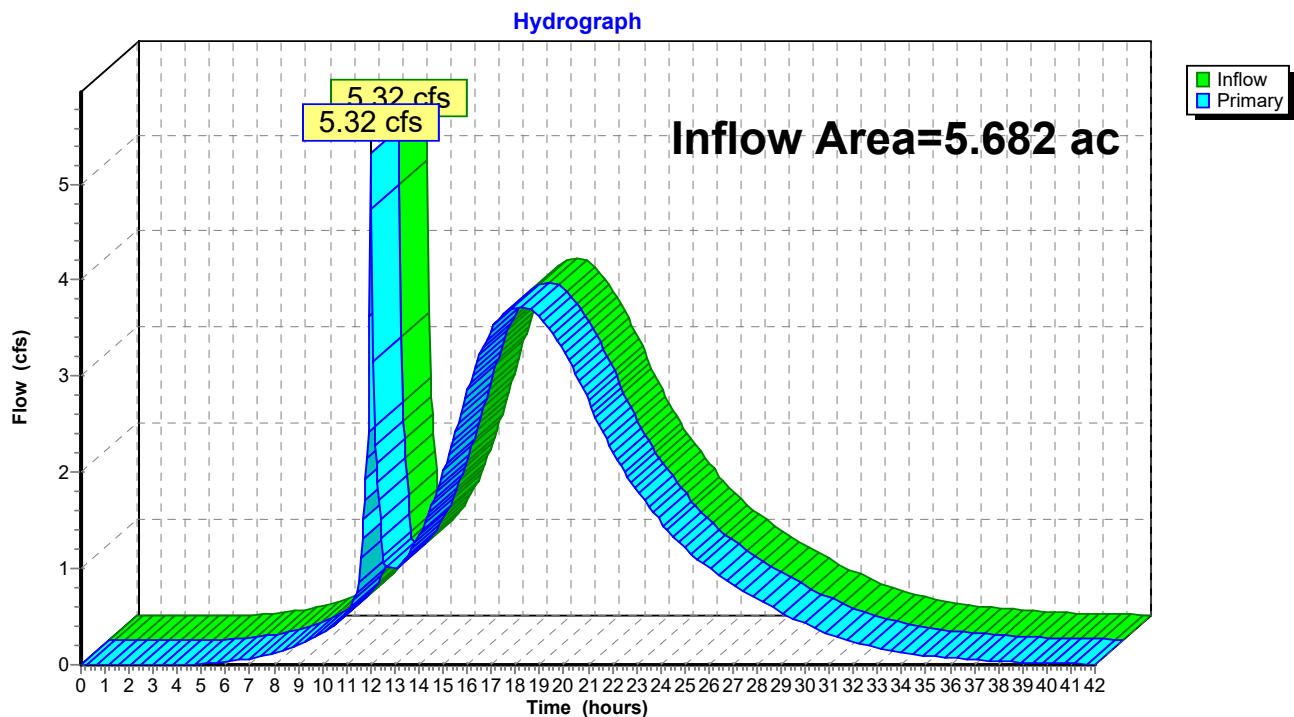
### Summary for Pond 4P: Outfall # 4 - Resource Area North Corner

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.682 ac, 68.78% Impervious, Inflow Depth > 6.80" for 100-Year event  
Inflow = 5.32 cfs @ 12.01 hrs, Volume= 3.221 af  
Primary = 5.32 cfs @ 12.01 hrs, Volume= 3.221 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

### Pond 4P: Outfall # 4 - Resource Area North Corner



## Post Development Analysis - MS

Prepared by {enter your company name here}

HydroCAD® 10.00-26 s/n 07835 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 100-Year Rainfall=7.74"

Printed 2/10/2025

Page 45

### Summary for Pond 5P: (new Pond)

[57] Hint: Peaked at 130.52' (Flood elevation advised)

Inflow Area = 0.649 ac, 31.59% Impervious, Inflow Depth = 6.04" for 100-Year event  
Inflow = 4.92 cfs @ 12.01 hrs, Volume= 0.326 af  
Outflow = 4.92 cfs @ 12.01 hrs, Volume= 0.326 af, Atten= 0%, Lag= 0.0 min  
Primary = 4.92 cfs @ 12.01 hrs, Volume= 0.326 af

Routing by Stor-Ind method, Time Span= 0.00-42.00 hrs, dt= 0.05 hrs

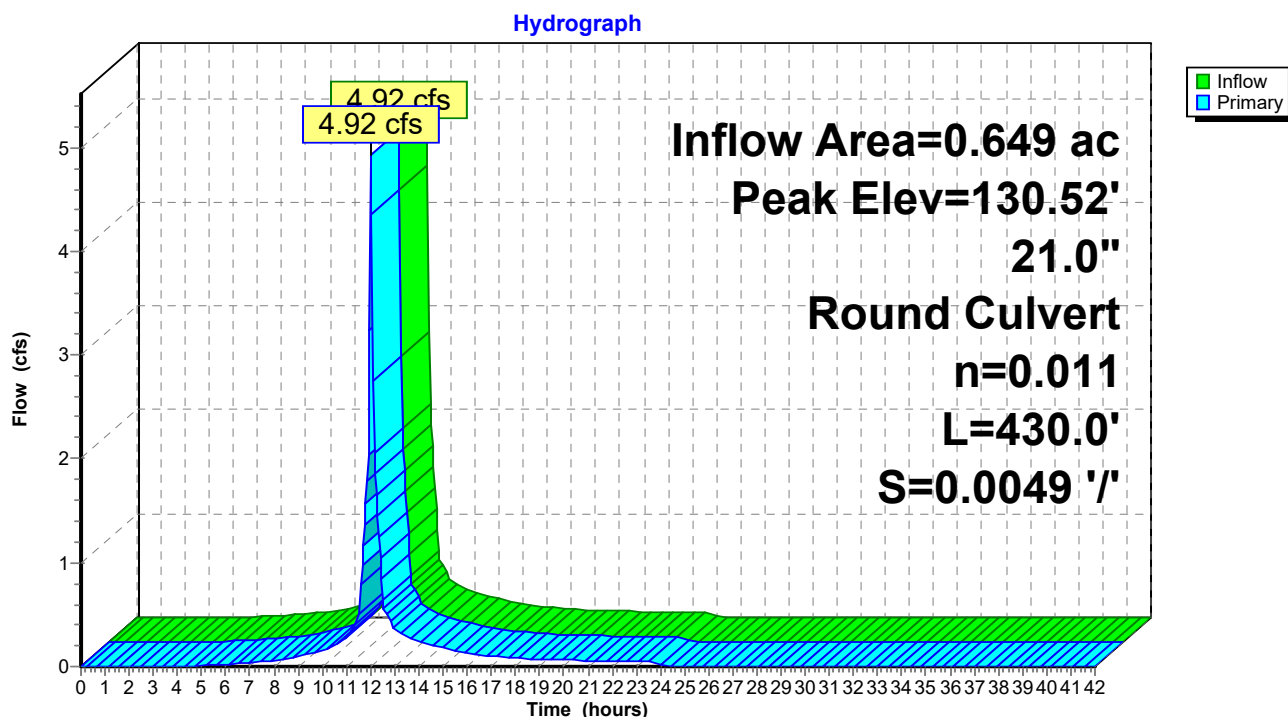
Peak Elev= 130.52' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	129.50'	<b>21.0" Round Culvert</b> L= 430.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 129.50' / 127.39' S= 0.0049 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 2.41 sf

**Primary OutFlow** Max=4.72 cfs @ 12.01 hrs HW=130.49' (Free Discharge)

↑1=Culvert (Barrel Controls 4.72 cfs @ 4.83 fps)

### Pond 5P: (new Pond)







**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

## **Attachment I**

### **Permeability/Conductivity Calculation**

## Synthetic Turf Base Stone Permeability/Conductivity Calculation

### COMPONENTS

The following table provides typical ranges of permeability (hydraulic Conductivity)

It is obtained from Essentials of Soil Mechanics and Foundations, Basic Geotechnics, 5th Edition by David F. McCarthy



Provided Range = 10 TO  $10^{-2}$  OR 10 - 0.01 (MM/SEC)

Value used for  $K$  is  $10^{-1}$  mm/sec = 0.1 mm/sec

1mm/sec=0.2ft/min  $\longrightarrow$  0.1mm/sec = 0.02 ft/min

0.02 ft/min x 12in/ft = 0.24 in/min  $\longrightarrow$  1 min = 0.24"

1" = 1min/[0.24in/min]  $\longrightarrow$  1"=4.2 min

To be conservative, we have used 2 minutes per inch (2min/in)

Table 6-2 Typical Ranges of Permeability (Hydraulic Conductivity): Water and Different Soil Types\*

Soil Type	Relative Degree of Permeability	$k$ , Coefficient of Permeability or Hydraulic Conductivity (mm/sec)**	Drainage Properties
Clean gravel	High	10 to 100	Good
Clean sand, sand and gravel mixtures	Medium	10 to $10^{-2}$	Good
Fine sands, silts	Low	$10^{-2}$ to $10^{-4}$	Fair-poor
Sand-silt-clay mixtures, glacial tills	Very low	$10^{-3}$ to $10^{-6}$	Poor-practically impervious
Homogeneous clays	Very low-practically impermeable	$<10^{-6}$	Practically impervious

\*For other fluids, values of  $k$  are expected to vary from those shown, refer Eq. 6-5.

\*\*To convert, use 1 mm/sec = 0.2 ft/min = 86.4 m/day.

The flat panel drains will be placed 20-ft on center. 20 ft x 12in/ft = 240 inches.

240 inches x 2 minutes per inch = 480 minutes



**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

## **Attachment J**

### **Rainfall Frequency Data (NOAA)**

# NOAA Rainfall Data



**NESRA**  
ENGINEERING

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.310 (0.240-0.391)	0.375 (0.291-0.473)	0.482 (0.372-0.610)	0.571 (0.438-0.727)	0.693 (0.516-0.924)	0.784 (0.574-1.07)	0.881 (0.628-1.25)	0.995 (0.668-1.43)	1.16 (0.752-1.74)	1.30 (0.826-1.99)
10-min	0.439 (0.340-0.553)	0.532 (0.412-0.671)	0.684 (0.527-0.866)	0.809 (0.621-1.03)	0.982 (0.731-1.31)	1.11 (0.812-1.52)	1.25 (0.890-1.77)	1.41 (0.948-2.03)	1.65 (1.07-2.46)	1.85 (1.17-2.81)
15-min	0.517 (0.400-0.651)	0.626 (0.484-0.789)	0.804 (0.620-1.02)	0.952 (0.730-1.21)	1.16 (0.861-1.54)	1.31 (0.955-1.78)	1.47 (1.05-2.08)	1.66 (1.11-2.39)	1.94 (1.26-2.89)	2.18 (1.38-3.31)
30-min	0.709 (0.549-0.893)	0.859 (0.665-1.08)	1.10 (0.852-1.40)	1.31 (1.00-1.67)	1.59 (1.18-2.12)	1.80 (1.32-2.46)	2.02 (1.44-2.87)	2.29 (1.54-3.30)	2.68 (1.73-4.00)	3.01 (1.90-4.58)
60-min	0.900 (0.698-1.13)	1.09 (0.845-1.38)	1.41 (1.08-1.78)	1.67 (1.28-2.12)	2.02 (1.51-2.70)	2.29 (1.68-3.12)	2.58 (1.84-3.66)	2.92 (1.96-4.20)	3.42 (2.21-5.10)	3.84 (2.43-5.85)
2-hr	1.16 (0.909-1.46)	1.42 (1.11-1.78)	1.84 (1.43-2.31)	2.19 (1.69-2.76)	2.66 (2.00-3.54)	3.02 (2.23-4.10)	3.40 (2.45-4.83)	3.87 (2.61-5.54)	4.60 (2.99-6.82)	5.23 (3.32-7.90)
3-hr	1.35 (1.06-1.69)	1.65 (1.30-2.06)	2.14 (1.67-2.68)	2.55 (1.98-3.21)	3.11 (2.35-4.12)	3.53 (2.62-4.78)	3.98 (2.88-5.64)	4.54 (3.07-6.48)	5.42 (3.52-8.00)	6.18 (3.93-9.30)
6-hr	1.74 (1.38-2.16)	2.13 (1.68-2.64)	2.77 (2.18-3.44)	3.30 (2.58-4.12)	4.02 (3.06-5.29)	4.56 (3.40-6.14)	5.14 (3.75-7.24)	5.88 (3.99-8.32)	7.02 (4.58-10.3)	8.02 (5.12-12.0)
12-hr	2.21 (1.76-2.72)	2.71 (2.15-3.33)	3.52 (2.79-4.34)	4.19 (3.30-5.20)	5.12 (3.91-6.68)	5.80 (4.35-7.75)	6.55 (4.79-9.14)	7.47 (5.09-10.5)	8.91 (5.84-12.9)	10.2 (6.50-15.0)
24-hr	2.65 (2.12-3.23)	3.28 (2.63-4.01)	4.32 (3.45-5.30)	5.18 (4.11-6.39)	6.37 (4.90-8.27)	7.24 (5.47-9.63)	8.20 (6.05-11.4)	9.41 (6.44-13.1)	11.3 (7.43-16.3)	13.0 (8.32-19.0)
2-day	3.00 (2.43-3.64)	3.80 (3.06-4.60)	5.10 (4.10-6.20)	6.17 (4.93-7.55)	7.66 (5.94-9.90)	8.73 (6.66-11.6)	9.94 (7.41-13.8)	11.5 (7.90-16.0)	14.1 (9.26-20.1)	16.3 (10.5-23.8)
3-day	3.29 (2.67-3.97)	4.14 (3.36-5.00)	5.54 (4.47-6.71)	6.70 (5.37-8.16)	8.29 (6.46-10.7)	9.45 (7.24-12.5)	10.8 (8.06-14.9)	12.5 (8.58-17.2)	15.2 (10.1-21.7)	17.7 (11.4-25.7)
4-day	3.56 (2.90-4.28)	4.44 (3.61-5.35)	5.88 (4.76-7.11)	7.08 (5.70-8.60)	8.72 (6.82-11.2)	9.92 (7.61-13.1)	11.3 (8.45-15.6)	13.0 (8.98-17.9)	15.9 (10.5-22.6)	18.5 (11.9-26.7)
7-day	4.33 (3.54-5.17)	5.24 (4.29-6.27)	6.74 (5.49-8.09)	7.98 (6.45-9.63)	9.68 (7.60-12.3)	10.9 (8.42-14.3)	12.3 (9.26-16.8)	14.1 (9.78-19.3)	17.1 (11.3-24.1)	19.7 (12.8-28.3)
10-day	5.02 (4.13-5.98)	5.96 (4.90-7.11)	7.50 (6.13-8.97)	8.77 (7.13-10.6)	10.5 (8.28-13.3)	11.8 (9.11-15.3)	13.2 (9.93-17.9)	15.0 (10.4-20.5)	17.9 (11.9-25.2)	20.5 (13.3-29.3)
20-day	7.01 (5.80-8.28)	8.04 (6.65-9.51)	9.72 (8.01-11.5)	11.1 (9.10-13.3)	13.0 (10.3-16.2)	14.5 (11.2-18.4)	16.0 (11.9-21.1)	17.8 (12.4-23.9)	20.3 (13.6-28.3)	22.5 (14.6-32.0)
30-day	8.65 (7.20-10.2)	9.75 (8.11-11.5)	11.6 (9.56-13.7)	13.0 (10.7-15.5)	15.1 (11.9-18.6)	16.7 (12.8-21.0)	18.3 (13.5-23.8)	20.0 (14.0-26.7)	22.3 (15.0-30.9)	24.2 (15.8-34.2)
45-day	10.7 (8.98-12.6)	11.9 (9.95-14.0)	13.9 (11.5-16.3)	15.4 (12.8-18.3)	17.6 (14.0-21.6)	19.4 (14.9-24.1)	21.0 (15.6-27.0)	22.7 (16.0-30.2)	24.9 (16.7-34.2)	26.4 (17.3-37.2)
60-day	12.5 (10.5-14.6)	13.8 (11.5-16.1)	15.8 (13.2-18.5)	17.5 (14.5-20.6)	19.8 (15.7-24.1)	21.6 (16.7-26.8)	23.3 (17.2-29.7)	25.0 (17.6-33.1)	27.0 (18.2-37.1)	28.4 (18.6-39.9)



**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

**Attachment K**

**Total Suspended Solids (TSS) Calculation Sheet**

## 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: 114 Winn Street, Burlington, MA

TSS Removal Calculation Worksheet	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)
	Street Sweeping - 5%	0.05	1.00	0.05	0.95
	Rain Garden	0.90	0.95	0.86	0.10
	Deep Sump and Hooded Catch Basin	0.25	0.10	0.02	0.07
		0.00	0.07	0.00	0.07
		0.00	0.07	0.00	0.07

Total TSS Removal =

93%

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

Project: Marshall Simonds  
Prepared By: AH  
Date: 2/10/2025

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





**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

**Attachment L**

**Stormwater Pollution Prevention Plan (SWPPP)**

## **Stormwater Pollution Prevention Plan**

### **For:**

Marshall Simonds Middle School  
Athletic Fields Renovation Project  
114 Winn Street  
Burlington, MA 01803

### **Operator(s):**

T.B.P.

### **SWPPP Contact(s):**

Nesra Engineering, LLC  
Hip Aguilera  
111 Washington St.  
Plainville, MA 02762  
508-723-2403  
HA@NersaEng.com

### **SWPPP Preparation Date:**

2/12/25

*Estimated Project Dates:*

**Project Start Date:** Spring 2025  
**Project Completion Date:** Fall 2025

## Contents

---

<b>SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING .....</b>	<b>1</b>
1.1 Project/Site Information.....	1
1.2 Contact Information/Responsible Parties .....	2
1.3 Nature and Sequence of Construction Activity .....	3
1.4 Soils, Slopes, Vegetation, and Current Drainage Patterns.....	4
1.5 Construction Site Estimates .....	5
1.6 Receiving Waters.....	6
1.7 Site Features and Sensitive Areas to be Protected .....	7
1.8 Potential Sources of Pollution.....	7
1.9 Endangered Species Certification.....	9
1.10 Historic Preservation.....	9
1.11 Applicable Federal, Tribal, State or Local Programs .....	10
1.12 Maps.....	10
<b>SECTION 2: EROSION AND SEDIMENT CONTROL BMPs.....</b>	<b>10</b>
2.1 Minimize Disturbed Area and Protect Natural Features and Soil.....	12
2.2 Phase Construction Activity .....	13
2.3 Control Stormwater Flowing onto and through the Project.....	14
2.4 Stabilize Soils.....	15
2.5 Protect Slopes.....	15
2.6 Protect Storm Drain Inlets .....	16
2.7 Establish Perimeter Controls and Sediment Barriers.....	17
2.8 Retain Sediment On-Site.....	17
2.9 Establish Stabilized Construction Exits .....	18
2.10 Additional BMPs .....	<b>Error! Bookmark not defined.</b>
<b>SECTION 3: GOOD HOUSEKEEPING BMPs .....</b>	<b>18</b>
3.1 Material Handling and Waste Management .....	19
3.2 Establish Proper Building Material Staging Areas .....	20
3.3 Designate Washout Areas.....	20
3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices .....	21
3.5 Control Equipment/Vehicle Washing.....	21
3.6 Spill Prevention and Control Plan.....	22
3.7 Any Additional BMPs.....	22
3.8 Allowable Non-Stormwater Discharge Management.....	23
<b>SECTION 4: SELECTING POST-CONSTRUCTION BMPs .....</b>	<b>25</b>
<b>SECTION 5: INSPECTIONS .....</b>	<b>27</b>
5.1 Inspections .....	27
5.2 Delegation of Authority .....	29
5.3 Corrective Action Log .....	29
<b>SECTION 6: RECORDKEEPING AND TRAINING .....</b>	<b>30</b>
6.1 Recordkeeping .....	30
6.2 Log of Changes to the SWPPP .....	30
6.3 Training.....	31

<b>SECTION 7: FINAL STABILIZATION.....</b>	<b>32</b>
<b>SECTION 8: CERTIFICATION AND NOTIFICATION.....</b>	<b>33</b>
<b>SWPPP APPENDICES .....</b>	<b>34</b>
Appendix A – General Location Map	
Appendix B – Site Maps	
Appendix C – Construction General Permit	
Appendix D – NOI and Acknowledgement Letter from EPA/State	
Appendix E – Inspection Reports Template	
Appendix F – Corrective Action Log (or in Part 5.3) Template	
Appendix G – SWPPP Amendment Log (or in Part 6.2)	
Appendix H – Subcontractor Certifications/Agreements	
Appendix I – Grading and Stabilization Activities Log (or in Part 6.1)	
Appendix J – Training Log Template	
Appendix K – Delegation of Authority	
Appendix L – Additional Information (i.e., Endangered Species and Historic Preservation Documentation, Soil Report)	

## SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING

### 1.1 Project/Site Information

**Instructions:**

- In this section, you can gather some basic site information that will be helpful to you later when you file for permit coverage.
- For more information, see *Developing Your Stormwater Pollution Prevention Plan: A SWPPP Guide for Construction Sites* (also known as the *SWPPP Guide*), Chapter 2
- Detailed information on determining your site's latitude and longitude can be found at [www.epa.gov/npdes/stormwater/latlong](http://www.epa.gov/npdes/stormwater/latlong)

Project/Site Name: Marshall Simonds Middle School Athletic Fields Renovation Project

Project Street/Location: 114 Winn Street

City: Burlington State: MA ZIP Code: 01803

County or Similar Subdivision: Middlesex

Latitude/Longitude (Use **one** of three possible formats, and specify method)

Latitude:

1. \_\_ ° \_\_ ' \_\_ " N (degrees, minutes, seconds)

2. \_\_ ° \_\_ . \_\_ ' N (degrees, minutes, decimal)

3. 42.503213 ° N (decimal)

Longitude:

1. \_\_ ° \_\_ ' \_\_ " W (degrees, minutes, seconds)

2. \_\_ ° \_\_ . \_\_ ' W (degrees, minutes, decimal)

3. -71.180758 ° W (decimal)

Method for determining latitude/longitude:

☐ USGS topographic map (specify scale: \_\_\_\_\_)

☐ EPA Web site ☒ GPS

☒ Other (please specify): LatLong.net/Google Maps

Is the project located in Indian country? ☐ Yes ☒ No

If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable." \_\_\_\_\_

Is this project considered a federal facility? ☐ Yes ☒ No

NPDES project or permit tracking number\*: T.B.P.

\*(This is the unique identifying number assigned to your project by your permitting authority after you have applied for coverage under the appropriate National Pollutant Discharge Elimination System (NPDES) construction general permit.)

## **1.2 Contact Information/Responsible Parties**

**Instructions:**

- List the operator(s), project managers, stormwater contact(s), and person or organization that prepared the SWPPP. Indicate respective responsibilities, where appropriate.
- Also, list subcontractors expected to work on-site. Notify subcontractors of stormwater requirements applicable to their work.
- See *SWPPP Guide*, Chapter 2.B.

**Operator(s):**

T.B.P.

**Project Manager(s) or Site Supervisor(s):**

T.B.P.

**SWPPP Contact(s):**

Nesra Engineering, LLC  
Hip Aguilera  
111 Washington St.  
Plainville, MA 02762  
508-723-2403  
HA@NersaEng.com

**This SWPPP was Prepared by:**

Nesra Engineering, LLC  
Hip Aguilera  
111 Washington St.  
Plainville, MA 02762  
508-723-2403  
HA@NersaEng.com

**Subcontractor(s):**

T.B.P.

**Emergency 24-Hour Contact:**

T.B.P.



### **1.3 Nature and Sequence of Construction Activity**

**Instructions:**

- Briefly describe the nature of the construction activity and approximate time frames (one or more paragraphs, depending on the nature and complexity of the project).
- For more information, see *SWPPP Guide*, Chapter 3.A.

Describe the general scope of the work for the project, major phases of construction, etc:

Overall scope of work includes:

- Construction fencing and temporary and permanent erosion/sediment control measures.
- Inlet protection at all catch basins.
- Site preparation and earthwork.
- Excess soil to be properly stockpiled, erosion control measures applied to stabilize, and or removed from site as needed.
- Remove and properly dispose all structures, asphalt, fencing, and other items directly called out in the Drawings and Contract Documents.
- Perform utility work, including drainage and electrical as specified.
- Installation of lighting, concrete curbing, concrete pads, and portable bleachers, seat walls, etc.
- Pavement and surfacing to include bituminous concrete paving for walkways.
- Install synthetic turf field.
- Install athletic structures and appurtenances.
- Place topsoil, fertilizing, and seeding, etc. as indicated in the Drawings and Contract Documents.
- Inspect and maintain grading, erosion control and sediment control practices weekly and immediately after rainstorms with more than ½ inch precipitation in 24 hrs.
- Maintenance of all erosion and sediment control components and installation of additional erosion and sediment control components shall be an ongoing practice and in strict accordance with the contract specifications.

Demolition:

- Work includes demolition, including but not limited to the removal of existing asphalt, concrete pavement, fencing, and other amenities specified in the Drawings.
- Strip, remove, and dispose of grass and topsoil as indicated on Demolition and Erosion control plan. For any topsoil stockpiled on site, associated erosion control measures, like mulch, are to be installed. Excess soil material from site will be removed as needed.
- Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option and in full compliance with all applicable disposal regulations.

Construction:

- Work entails enhanced drainage, two new synthetic turf fields, new ADA parking lot,

ADA walkways, seating, and various appurtenances.

- The new drainage system is designed to enhance stormwater management by both increasing water storage capacity and reducing flow rates. Key components include:
  - Enhanced Storage Capacity: An additional 12 inches of dense-graded stone will be installed beneath the field to significantly increase the volume of water that can be stored.
  - Efficient Conveyance: Laterally installed HDPE perforated pipes, in combination with strategically placed collector pipes, will channel runoff more effectively.
  - System Optimization: Cleaning and upgrading existing drain structures, including the perimeter trench drain system, will further reduce the rate of flow and improve overall drainage.

What is the function of the construction activity?

☐ Residential    ☐ Commercial    ☐ Industrial    ☐ Road Construction    ☐ Linear Utility  
☒ Other (please specify): **Athletic Fields**

Estimated Project Start Date: **Spring 2025**

Estimated Project Completion Date: **Fall 2025**

## **1.4 Soils, Slopes, Vegetation, and Current Drainage Patterns**

### **Instructions:**

- Describe the existing soil conditions at the construction site including soil types, slopes and slope lengths, drainage patterns, and other topographic features that might affect erosion and sediment control.
- Also, note any historic site contamination evident from existing site features and known past usage of the site.
- This information should also be included on your site maps (See *SWPPP Guide*, Chapter 3.C.).
- For more information, see *SWPPP Guide*, Chapter 3.A.

Soil type(s):

According to USDA Natural Resources Conservation Services Web Soil Survey and National Cooperative Soil Survey the site consists of approximately of:

- Udorthents-Urban Land Complex (656) (indicating filled soils) – 90% of the site.
- Whitman fine sandy loam (73B) – 10% of the site.

Slopes (describe current slopes and note any changes due to grading or fill activities):

Typical site slopes range from 1 to 3 percent. The area has been leveled in the past for use as athletic fields.

Drainage Patterns (describe current drainage patterns and note any changes due to grading or fill activities):

Currently, runoff originates from the south side of the property and flows northward across the parcel. Stormwater from the building and parking lot divides into two main paths: one portion flows northeast into a vegetated grass field before discharging into a catch basin, while the remainder moves north and northwest over a grassy hill and into a wetland categorized as a wood swamp deciduous wetland by MassDEP—adjacent to walking path that leads to the School. Additional runoff from the field continues north, eventually emptying into a linear wetland along the property's northern and eastern sections.

The proposed construction will include an approximately 12" drainage layer under the synthetic turf field, perforated lateral pipes, and 12" perforated collector pipes. Additionally there will be a rain garden installed to capture stormwater from the proposed ADA parking lot to treat the surface runoff.

Grading activity is proposed to modify the site slopes to 1 percent. The proposed grading will channel the surface water to each of the athletic field while allowing interception into collector pipes in stone trenches.

Vegetation:

Existing vegetation is lined with natural grass, primarily a mix of cool-season grasses such as Kentucky bluegrass and fescue. No tree clearing is anticipated, and appropriate tree protection measures will be implemented for trees designated to be preserved, as indicated in the plans. Any invasive species within the limit of work will be removed. In areas where seeding is to take place, the grass mix will consist of native grasses, such as Kentucky bluegrass and fescue.

## **1.5 Construction Site Estimates**

### **Instructions:**

- Estimate the area to be disturbed by excavation, grading, or other construction activities, including dedicated off-site borrow and fill areas.
- Calculate the percentage of impervious surface area before and after construction
- Calculate the runoff coefficients before and after construction.
- For more information, see *SWPPP Guide*, Chapter 3.A and Appendix C.

The following are estimates of the construction site.

Total project area: 5.9 acres

Construction site area to be disturbed: 4.66 acres

## 1.6 Receiving Waters

### Instructions:

- List the waterbody(s) that would receive stormwater from your site, including streams, rivers, lakes, coastal waters, and wetlands. Describe each as clearly as possible, such as *Mill Creek, a tributary to the Potomac River*, and so on.
- Indicate the location of all waters, including wetlands, on the site map.
- Note any stream crossings, if applicable.
- List the storm sewer system or drainage system that stormwater from your site could discharge to and the waterbody(s) that it ultimately discharges to.
- If any of the waterbodies above are impaired and/or subject to Total Maximum Daily Loads (TMDLs), please list the pollutants causing the impairment and any specific requirements in the TMDL(s) that are applicable to construction sites. Your SWPPP should specifically include measures to prevent the discharge of these pollutants.
- For more information, see *SWPPP Guide*, Chapter 3.A and 3.B.
- Also, for more information and a list of TMDL contacts and links by state, visit [www.epa.gov/npdes/stormwater/tmdl](http://www.epa.gov/npdes/stormwater/tmdl).

Description of receiving waters:

- 1) The receiving water for the Marshall Simonds Middle School stormwater system is Maple Meadow Brook, an intermittent waterbody located along the northern perimeter of the site. It serves as the primary conduit for stormwater flowing through the wetlands before discharging off-site. Maple Meadow Brook is characterized by its seasonal flow, draining from west to east, and it plays a critical role in managing runoff from the property.

Description of storm sewer systems:

Existing storm sewer system consists of a catch basins and drain manholes located on both the east and west areas of the site. They eventually tie into a pipe that flows towards the north end of the parcel, where it empties into the nearby wetlands and into Maple Meadow Brook.

Description of impaired waters or waters subject to TMDLs: N/A

No impaired or TMDLs were listed.

## **1.7 Site Features and Sensitive Areas to be Protected**

### **Instructions:**

- Describe unique site features including streams, stream buffers, wetlands, specimen trees, natural vegetation, steep slopes, or highly erodible soils that are to be preserved.
- Describe measures to protect these features.
- Include these features and areas on your site maps.
- For more information, see *SWPPP Guide*, Chapter 3.A and 3.B.

The existing stormwater system at Marshall Simonds Middle School handles runoff primarily from the south side of the property. Water flows from the building and parking lot areas, with part of it moving northeast toward a vegetated grass field, where it discharges into a catch basin. The remainder of the runoff flows north and northwest over a grassy hill and enters a deciduous wood swamp wetland near the school's walking path. Water from the athletic fields moves further north, where it drains into a linear wetland located along the property's northern and eastern perimeters. This system includes intermittent water features such as Maple Meadow Brook, which runs along the northern boundary of the site. Current runoff patterns rely heavily on natural water flow into wetlands and a catch basin, with limited infrastructure in place to manage flow rates and storage capacity. The wetlands are less than approximately less than 50FT from the edge of the exiting field.

The limits of the construction site to the north and east will have a hay bale installed prior to start of construction to protect with migration of silts and sand. Additionally existing catch basins and drainage outlets will be protected with hay bales. Only areas within the limits of the construction fence will be disturbed.

## **1.8 Potential Sources of Pollution**

### **Instructions:**

- Identify and list all potential sources of sediment, which may reasonably be expected to affect the quality of stormwater discharges from the construction site.
- Identify and list all potential sources of pollution, other than sediment, which may reasonably be expected to affect the quality of stormwater discharges from the construction site.
- For more information, see *SWPPP Guide*, Chapter 3.A.

Potential sources of sediment to stormwater runoff:

Clearing, grading, excavation and un-stabilized areas; Paving operations, Demolition and debris

disposal; Dewatering operations; Landscaping operations.

Potential pollutants and sources, other than sediment, to stormwater runoff:

Trade Name Material	Stormwater Pollutants	Location
Pesticides (insecticides, fungicides, herbicides, rodenticides)	Chlorinated hydrocarbons, organophosphates, carbonates, arsenic	Herbicides used for noxious weed control
Fertilizer	Nitrogen, Phosphorous	Newly seeded areas
Asphalt	Oil, petroleum distillates	Walkways
Concrete	Limestone, sand, pH, chromium	Curbing, foundations, slabs
Curing compounds	Naphtha	Curbing, foundations, slabs
Hydraulic oil/fluids	Mineral oil	Leaks or broken hoses from equipment
Gasoline	Benzene, ethyl benzene, toluene, xylene, MTBE	Secondary containment / staging area
Diesel Fuel	Petroleum distillate, oil and grease, naphthalene, xylenes	Secondary containment / staging area
Kerosene	Coal oil, petroleum distillates	Secondary containment / staging area
Antifreeze/coolant	Ethylene glycol, propylene glycol, heavy metals	Leaks or broken hoses from equipment
Sanitary toilets	Bacteria, parasites, and viruses	Staging area

## 1.9 Endangered Species Certification

### Instructions:

- Before beginning construction, determine whether endangered or threatened species or their critical habitats are on or near your site.
- Adapt this section as needed for state or tribal endangered species requirements and, if applicable, document any measures deemed necessary to protect endangered or threatened species or their critical habitats.
- For more information on this topic, see *SWPPP Guide*, Chapter 3.B.
- Additional information on Endangered Species Act (ESA) provisions is at [www.epa.gov/npdes/stormwater/esa](http://www.epa.gov/npdes/stormwater/esa)

Are endangered or threatened species and critical habitats on or near the project area?

☐ Yes      ☒ No

Describe how this determination was made:

[The latest Natural Heritage & Endangered Species Program Atlas for Estimated and Priority Habitat of Rare Species.](#)

## 1.10 Historic Preservation

### Instructions:

- Before you begin construction, you should review federal and any applicable state, local, or tribal historic preservation laws and determine if there are historic sites on or near your project. If so, you might need to make adjustments to your construction plans or to your stormwater controls to ensure that these historic sites are not damaged.
- For more information, see *SWPPP Guide*, Chapter 3.B or contact your state or tribal historic preservation officer.

Are there any historic sites on or near the construction site?

☐ Yes      ☒ No

Describe how this determination was made:

[Review of the Inventory of Historic and Archaeological Assets of the Commonwealth.](#)



## **1.11 Applicable Federal, Tribal, State or Local Programs**

**Instructions:**

- Note other applicable federal, tribal, state or local soil and erosion control and stormwater management requirements that apply to your construction site.

The Contractor will obtain copies of any local and state regulations that are applicable to stormwater management, erosion control and pollution minimization at the job site and will comply with such regulations. The contractor will comply with all conditions of the NPDES Construction General Permit, including the conditions related to maintaining the SWPPP and evidence of compliance with the SWPPP at the job site and allow regulatory personnel access to the job site and to records in order to determine compliance.

## **1.12 Maps**

**Instructions:**

- Attach site maps. For most projects, a series of site maps is recommended. The first should show the undeveloped site and its current features. An additional map or maps should be created to show the developed site or for more complicated sites show the major phases of development.

**These maps should include the following:**

- Direction(s) of stormwater flow and approximate slopes before and after major grading activities;
- Areas and timing of soil disturbance;
- Areas that will not be disturbed;
- Natural features to be preserved;
- Locations of major structural and non-structural BMPs identified in the SWPPP;
- Locations and timing of stabilization measures;
- Locations of off-site material, waste, borrow, or equipment storage areas;
- Locations of all waters of the United States, including wetlands;
- Locations where stormwater discharges to a surface water;
- Locations of storm drain inlets; and
- Areas where final stabilization has been accomplished.
- For more information, see *SWPPP Guide*, Chapter 3.C.

Include the site maps with the SWPPP.

All maps are attached in the Appendix.

## SECTION 2: EROSION AND SEDIMENT CONTROL BMPs

### Instructions:

- Describe the BMPs that will be implemented to control pollutants in stormwater discharges. For each major activity identified, do the following
  - ✓ Clearly describe appropriate control measures.
  - ✓ Describe the general sequence during the construction process in which the measures will be implemented.
  - ✓ Describe the maintenance and inspection procedures that will be used for that specific BMP.
  - ✓ Include protocols, thresholds, and schedules for cleaning, repairing, or replacing damaged or failing BMPs.
  - ✓ Identify staff responsible for maintaining BMPs.
  - ✓ (If your SWPPP is shared by multiple operators, indicate the operator responsible for each BMP.)
- Categorize each BMP under one of the following 10 areas of BMP activity as described below:
  - 2.1 Minimize disturbed area and protect natural features and soil**
  - 2.2 Phase Construction Activity**
  - 2.3 Control Stormwater flowing onto and through the project**
  - 2.4 Stabilize Soils**
  - 2.5 Protect Slopes**
  - 2.6 Protect Storm Drain Inlets**
  - 2.7 Establish Perimeter Controls and Sediment Barriers**
  - 2.8 Retain Sediment On-Site and Control Dewatering Practices**
  - 2.9 Establish Stabilized Construction Exits**
  - 2.10 Any Additional BMPs**
- Note the location of each BMP on your site map(s).
- For any structural BMPs, you should provide design specifications and details and refer to them. Attach them as appendices to the SWPPP or within the text of the SWPPP.
- For more information, see *SWPPP Guide*, Chapter 4.
- Consult your state's design manual or one of those listed in Appendix D of the *SWPPP Guide*.
- For more information or ideas on BMPs, see EPA's National Menu of BMPs  
<http://www.epa.gov/npdes/stormwater/menuofbmps>

The Erosion and Sediment Control Plans represent the suggested best management practices proposed for the project. The Contractor's approach to controlling stormwater runoff from the site may vary. If different erosion and sedimentation control is used by the contractor, the changes will be noted in the appropriate section in the appendix.

The use of erosion and sediment controls are mandatory and must be employed to minimize impacts to adjacent areas during construction. If sediment escapes the construction site, off-site

accumulations of sediment must be removed at a frequency sufficient to minimize off-site impacts.

The control practices which are required to minimize stormwater pollution during construction must remain functional until disturbed areas have been stabilized. Erosion control products are to be installed and maintained in accordance with manufacturer's specifications and good engineering practices.

## **2.1 Minimize Disturbed Area and Protect Natural Features and Soil**

**BMP Description:** The disturbed area will be limited to the construction area shown on the plans. All areas outside of the construction limits will be preserved. The limits of construction will be marked out with 6-ft chain link temporary fencing. The supports for the fabric will be placed on the ground and weighted down.

<b>Installation Schedule:</b>	The temporary construction fence will be installed before construction begins at the site
<b>Maintenance and Inspection:</b>	The perimeter construction fence will be inspected weekly to ensure there has not been any breach in the fencing.
<b>Responsible Staff:</b>	Contractor

**BMP Description:** Topsoil stripped from the immediate construction area will be stockpiled as identified on the plans. The stockpiles will be in areas that will not interfere with construction phases and at least 15 feet away from area of concentrated flows or pavement. The slopes of the stockpile will be roughened by equipment and will not exceed 2:1 to prevent erosion. A silt fence will be installed around the stockpile as necessary.

<b>Installation Schedule:</b>	Topsoil stockpiles will be established during grading activities. The temporary erosion controls will be installed immediately after the stockpile has been placed.
<b>Maintenance and Inspection:</b>	The area will be inspected weekly for erosion and immediately after storm events. Areas on or around the stockpile that have eroded
<b>Responsible Staff:</b>	Contractor

The contractor is responsible for the maintenance and repair of all erosion control devices on-site. All erosion control devices will be regularly inspected. At no time will silt-laden water be allowed to enter sensitive areas. Any runoff from disturbed surfaces will be directed through a sedimentation process prior to being discharged to the existing on site drainage system.

Additional erosion control techniques proposed include hay bale barriers, inlet sediment traps, a stabilized construction entrance, temporary diversion channels, and temporary sedimentation

ponds when applicable. During the growing season, slope stabilization will be achieved by applying topsoil followed by seeding and mulching as soon as final grades are achieved. Organic mulching, jute netting, geo-textiles, or a combination will be used to stabilize slopes completed outside of the growing season.

## **2.2 Phase Construction Activity**

### **Instructions:**

- Describe the intended construction sequencing and timing of major activities, including any opportunities for phasing grading and stabilization activities to minimize the overall amount of disturbed soil that will be subject to potential erosion at one time. Also, describe opportunities for timing grading and stabilization so that all or a majority of the soil disturbance occurs during a time of year with less erosion potential (i.e., during the dry or less windy season). (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 2.) It might be useful to develop a separate, detailed site map for each phase of construction.
- Also, see EPA's *Construction Sequencing BMP Fact Sheet* at [http://www.epa.gov/npdes/stormwater/menuofbmps/construction/cons\\_seq](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/cons_seq)

The project is anticipated to be constructed in one general phase. The following is a broad outline of the sequence of the major activities that disturb the soil at the site.

1. Install construction fencing around the limits of work.
2. Install hay bales around the proposed work areas, which are upgradient of sensitive areas such as wetlands, watercourses, and adjacent properties.
3. Install hay bales and/or filter bags around all existing drainage structures.
4. Install stabilized construction entrance.
5. Perform clearing, grubbing, and topsoil removal as specified.
6. Dust on site shall be minimized by spraying water on dry areas on the site. The use of oils and other petroleum base or toxic liquids for dust suppression is prohibited.
7. Stabilize denuded areas and stockpiles within 14 days of last construction activity in that area.
8. Begin site grading operations.
9. Begin installation of all underground utility lines and chambers as shown on the plans with appropriate erosion control measures to eliminate silt from entering the pipe systems.

10. Installation of bituminous concrete pavement and concrete pads.
11. Installation of synthetic turf field.
12. Remove hay bales and silt fencing only after exposed surfaces are stabilized.
13. Remove temporary construction exists only prior to cleaning up these areas.

## **2.3 Control Stormwater Flowing onto and through the Project**

**Instructions:**

- Describe structural practices (e.g., diversions, berms, ditches, storage basins) including design specifications and details used to divert flows from exposed soils, retain or detain flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 3.)

**BMP Description:** Earth Dikes may be constructed horizontally along the uphill perimeter of the southern slope to convey stormwater away from the project site. The dike may be constructed of compacted soil and have a top width of 4 feet, a height of 2 feet and 2:1 side slopes.

<b>Installation Schedule:</b>	Earth dikes will be installed if necessary, prior to anticipated storm events.
<b>Maintenance and Inspection:</b>	Earth dikes will be inspected after each storm event and washouts are to be fixed upon discovery.
<b>Responsible Staff:</b>	Contractor

**BMP Description:** Diversion Channels may be used to intercept and divert runoff which flows onto and through the project site. These diversions will minimize the development of concentrated runoff down slopes, which would produce gully erosion. Diversions will also be used to collect runoff from construction areas and convey it to temporary sediment basins or traps.

<b>Installation Schedule:</b>	Temporary diversions will be installed as needed and will remain in place until slopes are stabilized or graded level. If vegetation of the diversion channel is required to avoid erosion of the channel, the channel will be temporarily stabilized to ensure viability of the grass seed.
<b>Maintenance and Inspection:</b>	The diversions will be inspected weekly and maintained as necessary to prevent erosion.
<b>Responsible Staff:</b>	Contractor

## 2.4 Stabilize Soils

### Instructions:

- Describe controls (e.g., interim seeding with native vegetation, hydroseeding) to stabilize exposed soils where construction activities have temporarily or permanently ceased. Also describe measures to control dust generation. Avoid using impervious surfaces for stabilization whenever possible. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 4.)
- Also, see EPA's *Seeding BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/seeding](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/seeding)

**BMP Description:** Temporary soil stabilization will be achieved using rip rap, filter fabric, Geotextile or hydro-seeding. The contractor will not disturb more area than can be stabilized within 14 days unless the area is to remain active.

<input type="checkbox"/> <b>Permanent</b>	<input checked="" type="checkbox"/> <b>Temporary</b>
<b>Installation Schedule:</b>	All disturbed surfaces will be stabilized a minimum of 14 days after construction in any portion of the project site is completed or is temporarily halted, unless additional construction is intended to be initiated within 21 days.
<b>Maintenance and Inspection:</b>	Stabilization devices will be inspected weekly and maintained as necessary to prevent washouts.
<b>Responsible Staff:</b>	Contractor

**BMP Description:** All disturbed areas not under structures will be seeded and maintained until the seed has taken hold.

<input checked="" type="checkbox"/> <b>Permanent</b>	<input type="checkbox"/> <b>Temporary</b>
<b>Installation Schedule:</b>	All disturbed surfaces will be stabilized a minimum of 14 days after construction in any portion of the project site is completed.
<b>Maintenance and Inspection:</b>	The grass will be inspected and bare spots will be reseeded.
<b>Responsible Staff:</b>	Contractor

## 2.5 Protect Slopes

### Instructions:

- Describe controls (e.g., erosion control blankets, tackifiers) including design specifications and details that will be implemented to protect all slopes. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 5.)
- Also, see EPA's *Geotextiles BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/geotextiles](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/geotextiles)

**BMP Description:** Slopes greater than three to one horizontal to vertical will be stabilized with seed, organic mulch, jute fabric, or rip-rap, as appropriate, to prevent erosion during construction.

<b>Installation Schedule:</b>	Slope stabilization measures will be taken once slopes of 3:1 or greater are created.
<b>Maintenance and Inspection:</b>	Slopes will be inspected after storm events to make sure erosion has not taken place. If areas of erosion are discovered, additional measures will be taken to prevent future erosion. After disturbed areas have been stabilized, the temporary erosion control measures will be removed and accumulated sediment will be removed and disposed of properly.
<b>Responsible Staff:</b>	Contractor

## 2.6 Protect Storm Drain Inlets

### Instructions:

- Describe controls (e.g., inserts, rock-filled bags, or block and gravel) including design specifications and details that will be implemented to protect all inlets receiving stormwater from the project during the entire project. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 6.)
- Also, see EPA's *Storm Drain Inlet Protection BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/storm\\_drain](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/storm_drain)

**BMP Description:** Hay bale sediment traps will be installed at drainage structures to prevent sediment from entering the structures.

<b>Installation Schedule:</b>	Hay bales will be installed around catch basins and drainage structure inlets prior to start of construction
<b>Maintenance and Inspection:</b>	Hay bales will be replaced if sufficient sediment is accumulated where it may enter the drainage system. BMP will be inspected weekly and after each storm event.
<b>Responsible Staff:</b>	Contractor

**BMP Description:** As an alternate to hay bales, silt sacks may be installed on drainage structures to prevent migration of silt in to the structures.

<b>Installation Schedule:</b>	Silt sacks will be installed prior to any construction activity.
<b>Maintenance and Inspection:</b>	Silt sacks will be inspected weekly and after all storm events. They will be removed and cleaned as necessary.



## 2.7 Establish Perimeter Controls and Sediment Barriers

### Instructions:

- Describe structural practices (e.g., silt fences or fiber rolls) including design specifications and details to filter and trap sediment before it leaves the construction site. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 7.)
- Also see, EPA's *Silt Fence BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/silt\\_fences](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/silt_fences), or *Fiber Rolls BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/fiber\\_rolls](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/fiber_rolls)

**BMP Description:** Hay bales will be installed on the west, north and east sides of the construction site per approved plans. The existing and proposed slopes channel surface runoff to these areas; therefore installation of hay bales is only necessary for that area.

<b>Installation Schedule:</b>	Hay bales will be installed prior to start of construction activity.
<b>Maintenance and Inspection:</b>	Hay bales will be inspected weekly and replaced as necessary to prevent silt migration.
<b>Responsible Staff:</b>	Contractor

## 2.8 Retain Sediment On-Site

### Instructions:

- Describe sediment control practices (e.g., sediment trap or sediment basin), including design specifications and details (volume, dimensions, outlet structure) that will be implemented at the construction site to retain sediments on-site. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 8.)
- Also, see EPA's *Sediment Basin BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/sediment\\_basins](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/sediment_basins)

**BMP Description:** Hay bales on the down grade of the project site will function to retain sediment on site.

<b>Installation Schedule:</b>	Hay bales will be installed prior to construction activity.
<b>Maintenance and Inspection:</b>	They will be inspected weekly and repaired and cleaned as necessary.
<b>Responsible Staff:</b>	Contractor

**BMP Description:** A stone trench will be installed which will intercept runoff, remove solids and allow the runoff to infiltrate prior to releasing the excess runoff in to the installed drain lines.

<b>Installation Schedule:</b>	Stone trench will be installed during the drainage installation for the site.
<b>Maintenance and Inspection:</b>	The trench will be inspected weekly and maintained as necessary to prevent migration of the sediment in to the perforated pipes.

<b>Responsible Staff:</b>	Contractor
---------------------------	------------

## 2.9 Establish Stabilized Construction Exits

### Instructions:

- Describe location(s) of vehicle entrance(s) and exit(s), procedures to remove accumulated sediment off-site (e.g., vehicle tracking), and stabilization practices (e.g., stone pads or wash racks or both) to minimize off-site vehicle tracking of sediments and discharges to stormwater. (For more information, see *SWPPP Guide*, Chapter 4, ESC Principle 9.)
- Also, see EPA's *Construction Entrances BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/cons\\_entrance](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/cons_entrance)

**BMP Description:** A stone construction exit will be installed to trap sediment and dirt off the construction vehicle tires.

<b>Installation Schedule:</b>	Construction entrance/exit will be installed during the initial phases of construction
<b>Maintenance and Inspection:</b>	The area will be inspected weekly, and additional stone will be placed as necessary.
<b>Responsible Staff:</b>	Contractor

## SECTION 3: GOOD HOUSEKEEPING BMPs

### Instructions:

- Describe the key good housekeeping and pollution prevention (P2) BMPs that will be implemented to control pollutants in stormwater.
- Categorize each good housekeeping and pollution prevention (P2) BMP under one of the following seven categories:
  - 3.1 Material Handling and Waste Management**
  - 3.2 Establish Proper Building Material Staging Areas**
  - 3.3 Designate Washout Areas**
  - 3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices**
  - 3.5 Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing**
  - 3.6 Spill Prevention and Control Plan**
  - 3.7 Any Additional BMPs**
- For more information, see *SWPPP Guide*, Chapter 5.
- Consult your state's design manual or resources in Appendix D of the *SWPPP Guide*.
- For more information or ideas on BMPs, see EPA's National Menu of BMPs <http://www.epa.gov/npdes/stormwater/menuofbmps>

### 3.1 Material Handling and Waste Management

**Instructions:**

- Describe measures (e.g., trash disposal, sanitary wastes, recycling, and proper material handling) to prevent the discharge of solid materials to receiving waters, except as authorized by a permit issued under section 404 of the CWA (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 1.)
- Also, see EPA's *General Construction Site Waste Management BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/cons\\_wasteman](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/cons_wasteman)

**BMP Description:** All waste materials will be collected and disposed of in metal dumpsters in the staging area. Dumpsters will be placed away from stormwater conveyance and drains, and meet all local and state solid-waste management regulations. Only trash and construction debris from the site will be deposited in the dumpsters.

<b>Installation Schedule:</b>	Trash dumpsters will be installed once the staging area has been established.
<b>Maintenance and Inspection:</b>	The dumpsters will be inspected weekly and immediately after storm events. The dumpster will be emptied weekly. If trash and construction debris are exceeding the dumpsters capacity, the dumpster will be emptied more frequently.
<b>Responsible Staff:</b>	Contractor

**BMP Description:** Temporary sanitary facilities (portable toilets) will be provided at the site in the staging area. The toilets will be away from concentrated flow paths and traffic flow and will have collection pans underneath as secondary containment.

<b>Installation Schedule:</b>	The portable toilets will be brought to the site once the staging area has been established.
<b>Maintenance and Inspection:</b>	All sanitary waste will be collected from the portable toilets a minimum of once per week by a sanitary service. The toilets will be inspected weekly for evidence of leaking holding tanks. Toilets with leaking holding tanks will be removed from the site and replaced with new portable toilets.
<b>Responsible Staff:</b>	Contractor

### 3.2 Establish Proper Building Material Staging Areas

**Instructions:**

- Describe construction materials expected to be stored on-site and procedures for storage of materials to minimize exposure of the materials to stormwater. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 2.)

**BMP Description:** Construction equipment and maintenance material will be stored at the staging area and materials storage area. They should be elevated on wood blocks or pallets to minimize contact with runoff.

<b>Installation Schedule:</b>	The staging and materials storage area will be installed after grading. Material will be stored as it is delivered to the site
<b>Maintenance and Inspection:</b>	Storage area will be inspected weekly and after storm events. Storage areas will be kept clean, and organized. Materials will be kept elevated on wood blocks or pallets.
<b>Responsible Staff:</b>	Contractor

### 3.3 Designate Washout Areas

**Instructions:**

- Describe location(s) and controls to eliminate the potential for discharges from washout areas for concrete mixers, paint, stucco, and so on. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 3.)
- Also, see EPA's *Concrete Washout BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/concrete\\_wash](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/concrete_wash)

**BMP Description:** Wheel Wash Stations will be provided adjacent to the construction entrance which leads directly to public ways.

<b>Installation Schedule:</b>	Wheel wash stations will be installed after the stabilized construction entrance.
<b>Maintenance and Inspection:</b>	Vehicles will be inspected as they leave the construction site, and the wheels will be washed as necessary to minimize migration of soils on to public ways.
<b>Responsible Staff:</b>	Contractor

**BMP Description:** Concrete Washouts will be accomplished in specific areas which have been diked and prepared to prevent contact with stormwater runoff. Waste generated from concrete wash water shall not be allowed to flow into drainage ways, inlets, receiving waters or any

location other than the designated concrete washout area.

<b>Installation Schedule:</b>	Concrete washout stations shall be prepared prior to concrete work on site.
<b>Maintenance and Inspection:</b>	The hardened residue from the concrete washout dike areas will be disposed of in the same manner as other non-hazardous construction waste materials or may be broken up and used on site as deemed appropriate by the Contractor.
<b>Responsible Staff:</b>	Contractor.

### **3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices**

**BMP Description:** Equipment fuel storage and refueling operations will be in an upland area at a horizontal distance greater than 100 feet from any recourse boundary. The fueling areas will include secondary containment. Fueling will be done near the staging area, away from any resource and buffer zones.

<b>Installation Schedule:</b>	Fueling station will be prepared prior to any fueling operations on site.
<b>Maintenance and Inspection:</b>	The area will be inspected and cleaned weekly.
<b>Responsible Staff:</b>	Contractor.

### **3.5 Control Equipment/Vehicle Washing**

**Instructions:**

- Describe equipment/vehicle washing practices that will be implemented to control pollutants to stormwater. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 5.)
- Also, see EPA's *Vehicle Maintenance and Washing Areas BMP Fact Sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/vehicle\\_maintain](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/vehicle_maintain)

**BMP Description:** *N/A*

<b>Installation Schedule:</b>	
<b>Maintenance and Inspection:</b>	
<b>Responsible Staff:</b>	

Vehicle Washing will be done off site.

### 3.6 Spill Prevention and Control Plan

**Instructions:**

- Describe the spill prevention and control plan to include ways to reduce the chance of spills, stop the source of spills, contain and clean up spills, dispose of materials contaminated by spills, and train personnel responsible for spill prevention and control. (For more information, see *SWPPP Guide*, Chapter 5, P2 Principle 6.)
- Also, see EPA's *Spill Prevention and Control Plan BMP Fact sheet* at [www.epa.gov/npdes/stormwater/menuofbmps/construction/spill\\_control](http://www.epa.gov/npdes/stormwater/menuofbmps/construction/spill_control)

1. Employee Training: All employees will be trained via biweekly tailgate sessions
2. Vehicle Maintenance: Vehicles and equipment will be maintained off-site. All vehicles and equipment including subcontractor vehicles will be checked for leaking oil and fluids. Vehicles leaking fluids will not be allowed on-site.
3. Spill Kits: Spill kits will be within the materials storage area and concrete washout areas.
4. Spills: All spills will be cleaned up immediately upon discovery. Spent absorbent materials and rags will be hauled off-site immediately after the spill is cleaned up for disposal at and appropriate landfill. Spills large enough to discharge to surface water will be reported to the appropriate federal, state and or local government agency.
5. Material safety data sheets, material inventory, and emergency contact information will be maintained at the site project trailer.

The spill prevention and control procedures will be implemented once construction begins on-site. All personnel will be instructed during tailgate training sessions, regarding the correct procedure for spill prevention and control.

### 3.7 Any Additional BMPs

**Instructions:**

- Describe any additional BMPs that do not fit into the above categories. Indicate the problem they are intended to address.

**BMP Description:** *N/A*

<b>Installation Schedule:</b>	
<b>Maintenance and Inspection:</b>	
<b>Responsible Staff:</b>	

**BMP Description:** *N/A*

<b>Installation Schedule:</b>	
<b>Maintenance and Inspection:</b>	
<b>Responsible Staff:</b>	

### 3.8 Allowable Non-Stormwater Discharge Management

**Instructions:**

- Identify all allowable sources of non-stormwater discharges that are not identified. The allowable non-stormwater discharges identified might include the following (see your permit for an exact list):
  - ✓ Waters used to wash vehicles where detergents are not used
  - ✓ Water used to control dust
  - ✓ Potable water including uncontaminated water line flushings
  - ✓ Routine external building wash down that does not use detergents
  - ✓ Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used
  - ✓ Uncontaminated air conditioning or compressor condensate
  - ✓ Uncontaminated ground water or spring water
  - ✓ Foundation or footing drains where flows are not contaminated with process materials such as solvents
  - ✓ Uncontaminated excavation dewatering
  - ✓ Landscape irrigation
- Identify measures used to eliminate or reduce these discharges and the BMPs used to prevent them from becoming contaminated.
- For more information, see *SWPPP Guide*, Chapter 3.A.

List allowable non-stormwater discharges and the measures used to eliminate or reduce them and to prevent them from becoming contaminated:

Certain types of discharges are allowed under the NPDES General Permit for Construction Activity, and it's the intent of this SWPPP to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come into contact with the water prior to or after its discharge. The control measures that have been outlined previous in this SWPPP will be strictly followed to ensure that no contamination of these non-stormwater discharges take place. The following non-stormwater discharges that may occur from the job site include:



1. Discharge from fire-fighting activity
2. Fire Hydrant flushing.
3. Waters used to wash vehicles where detergent are not used.
4. Waters used to control dust in accordance with off-site vehicle tracking
5. Potable water including uncontaminated water line flushing.
6. Routine external building wash down that does not use detergents.
7. Pavement wash water where spills or leaks of toxic or hazardous materials have not occurred and where detergents are not used.
8. Uncontaminated air conditioner compressor condensate.
9. Uncontaminated ground water or spring water.
10. Foundation or footing drains where flows are not contaminated with process materials such as solvents.
11. Uncontaminated excavation dewatering.
12. Landscape irrigation.

## SECTION 4: SELECTING POST-CONSTRUCTION BMPs

### Instructions:

- Describe all post-construction stormwater management measures that will be installed during the construction process to control pollutants in stormwater discharges after construction operations have been completed. Examples of post-construction BMPs include the following:
  - ✓ Biofilters
  - ✓ Detention/retention devices
  - ✓ Earth dikes, drainage swales, and lined ditches
  - ✓ Infiltration basins
  - ✓ Porous pavement
  - ✓ Other proprietary permanent structural BMPs
  - ✓ Outlet protection/velocity dissipation devices
  - ✓ Slope protection
  - ✓ Vegetated strips and/or swales
- Identify any applicable federal, state, local, or tribal requirements for design or installation.
- Describe how low-impact designs or smart growth considerations have been incorporated into the design.
- For any structural BMPs, you should have design specifications and details and refer to them. Attach them as appendices to the SWPPP or within the text of the SWPPP.
- For more information on this topic, see your state's stormwater manual.
- You might also want to consult one of the references listed in Appendix D of the *SWPPP Guide*.
- Visit the post-construction section of EPA's Menu of BMPs at: [www.epa.gov/npes/menuofbmps](http://www.epa.gov/npes/menuofbmps)

**BMP Description:** There are drainage structures, catch basins, drain manholes on site. It is important to inspect these structures to ensure they do not become clogged. After site construction is completed, drainage structures should be inspected at regular intervals and after heavy storms.

<b>Installation Schedule:</b>	N/A
<b>Maintenance and Inspection:</b>	Manholes should be inspected twice a year to remove any intrusions and ensure proper flow. Catch basins and storm clean-out structures should be cleaned of any debris 4 times a year and after heavy storms.
<b>Responsible Staff:</b>	Owner

**BMP Description:** A Rain Garden is a depressed area in the landscape that collects rainwater from a driveway or street and allows it to soak into the ground. Rain gardens are planted with native grasses and flowering perennials designed to filter and reduce runoff. No rain gardens are proposed at this site.

<b>Installation Schedule:</b>	The rain garden will be installed early in the construction phase to
-------------------------------	--

	provide pre-treatment of the ADA parking lot once it is built.
<b><i>Maintenance and Inspection:</i></b>	<p><u>Years 1 &amp; 2:</u> New rain gardens will need to be watered for the first one or two years until the garden is established. Apply mulch twice per year until groundcover establishes. After the first season, it may be obvious what plants were successful and what plants do not work for your rain garden. Weeding will be needed the first two years. Remove weeds by hand, including their roots.</p> <p><u>Years 3+:</u> In the third year and beyond, the native grasses, sedges, rushes, and wildflowers will begin to mature and will outcompete the weeds. Weeding isolated patches might still be needed on occasion. After each growing season, the stems and seed heads can be left for winter interest, wildlife cover and bird food. Once spring arrives and new growth is 4-6-inches tall, cut all tattered plants back. If the growth is thick, hand-cut the largest plants and then use a string trimmer to reduce the planting back to a height of six to eight inches. Dead plant material can also be removed with a string trimmer or weed whacker (scythe) and composted or disposed of as appropriate.</p> <p>Then, rake up and compost or properly dispose of the dead plant material. If the mower deck won't rise that high, use a string trimmer or weed-eater to cut the stems at a height of 6-8 inches.</p> <p>On thicker stems, such as cup plant, goldenrods and some asters, a string trimmer may not be strong enough. For these, use hand clippers or pruning shears to cut the individual stems.</p> <p>Since the rain garden serves the purpose of catchment, sediment will tend to accumulate within the garden. Remove sediment as necessary. Core aerate or cultivate bare areas annually if surface becomes clogged with fine sediments. Replant or seed if there are areas of exposed soil. Replace dead or diseased plantings. Evaluate the health of native plantings. Plant more of the successful species in the rain garden as necessary. Replace rocks that may be diverting flow out of the garden.</p>
<b><i>Responsible Staff:</i></b>	Owner

## SECTION 5: INSPECTIONS

### 5.1 *Inspections*

#### Instructions:

- Identify the individual(s) responsible for conducting inspections and describe their qualifications. Reference or attach the inspection form that will be used.
- Describe the frequency that inspections will occur at your site including any correlations to storm frequency and intensity.
- Note that inspection details for particular BMPs should be included in Sections 2 and 3.
- You should also document the repairs and maintenance that you undertake as a result of your inspections. These actions can be documented in the corrective action log described in Part 5.3 below.
- For more on this topic, see *SWPPP Guide*, Chapters 6 and 8.
- Also, see suggested inspection form in Appendix B of the *SWPPP Guide*.

- 1. *Inspection Personnel:*** Identify the person(s) who will be responsible for conducting inspections and describe their qualifications:

Construction personnel will conduct inspections as identified in the inspection and maintenance section of each BMP. Personnel will be trained during tailgate session on the proper inspection and maintenance of the BMPs.

If specified, a representative from Nesra Engineering, LLC will make routine site visits and conduct inspections of the BMPs during the construction process. Additional inspections will be conducted by Nesra after significant storm events during the construction phase.

**2. *Inspection Schedule and Procedures:***

Describe the inspection schedules and procedures you have developed for your site (include frequency of inspections for each BMP or group of BMPs, indicate when you will inspect, e.g., before/during/and after rain events, spot inspections):

Describe the general procedures for correcting problems when they are identified. Include responsible staff and time frames for making corrections:

Attach a copy of the inspection report you will use for your site.

As stated above inspections will be conducted by both the contractor's construction personnel and Nesra Engineering LLC representative. Contractor personnel will conduct inspections as required by the Maintenance and Inspection section of each BMP. In addition Nesra's representative will conduct routine inspections.

If a problem is noted during the inspection, a copy of the inspection form will be provided to the Contractor, who will be responsible for correcting the issue that day. In subsequent inspections the area will be re-inspected and corrections will be noted.

A copy of the inspection report to be used is included in the appendix section.

## 5.2 Delegation of Authority

**Instructions:**

- Identify the individual(s) or specifically describe the position where the construction site operator has delegated authority for the purposes of signing inspection reports, certifications, or other information.
- Attach the delegation of authority form that will be used.
- For more on this topic, see *SWPPP Guide*, Chapter 7.

**Duly Authorized Representative(s) or Position(s):**

Nesra Engineering, LLC  
Hip Aguilera  
111 Washington St.  
Plainville, MA 02762  
508-723-2403  
HA@NersaEng.com

A copy of the signed delegation of authority form is attached in Appendix K.

## 5.3 Corrective Action Log

**Instructions:**

- Create here, or as an attachment, a corrective action log. This log should describe repair, replacement, and maintenance of BMPs undertaken as a result of the inspections and maintenance procedures described above. Actions related to the findings of inspections should reference the specific inspection report.
- This log should describe actions taken, date completed, and note the person that completed the work.

Corrective Action Log:

A Copy of the corrective log is included in the Appendix.



## SECTION 6: RECORDKEEPING AND TRAINING

### 6.1 *Recordkeeping*

#### **Instructions:**

- The following is a list of records you should keep at your project site available for inspectors to review:
- Dates of grading, construction activity, and stabilization (which is covered in Sections 2 and 3)
- A copy of the construction general permit (attach)
- The signed and certified NOI form or permit application form (attach)
- A copy of the letter from EPA or/the state notifying you of their receipt of your complete NOI/application (attach)
- Inspection reports (attach)
- Records relating to endangered species and historic preservation (attach)
- Check your permit for additional details
- For more on this subject, see *SWPPP Guide*, Chapter 6.C.

Records will be retained for a minimum period of at least 3 years after the permit is terminated.

Date(s) when major grading activities occur:

T.B.P.

Date(s) when construction activities temporarily or permanently cease on a portion of the site:

T.B.P.

Date(s) when an area is either temporarily or permanently stabilized:

T.B.P.

### 6.2 *Log of Changes to the SWPPP*

#### **Instructions:**

- Create a log here, or as an attachment, of changes and updates to the SWPPP. You should include additions of new BMPs, replacement of failed BMPs, significant changes in the activities or their timing on the project, changes in personnel, changes in inspection and maintenance procedures, updates to site maps, and so on.

Log of changes and updates to the SWPPP

No changes as of 2/12/25.

### 6.3 Training

**Instructions:**

- Training your staff and subcontractors is an effective BMP. As with the other steps you take to prevent stormwater problems at your site, you should document the training that you conduct for your staff, for those with specific stormwater responsibilities (e.g. installing, inspecting, and maintaining BMPs), and for subcontractors.
- Include dates, number of attendees, subjects covered, and length of training.
- For more on this subject, see *SWPPP Guide*, Chapter 8.

Individual(s) Responsible for Training:

Contractor. Additional info T.B.P.

Describe Training Conducted:

- General stormwater and BMP awareness training for staff and subcontractors:
- Detailed training for staff and subcontractors with specific stormwater responsibilities:

## SECTION 7: FINAL STABILIZATION

### Instructions:

- Describe procedures for final stabilization. If you complete major construction activities on part of your site, you can document your final stabilization efforts for that portion of the site. Many permits will allow you to then discontinue inspection activities in these areas (be sure to check your permit for exact requirements). You can amend or add to this section as areas of your project are finally stabilized.
- Update your site plans to indicate areas that have achieved final stabilization.
- Note that dates for areas that have achieved final stabilization should be included in Section 6, Part 6.1 of this SWPPP.
- For more on this topic, see *SWPPP Guide*, Chapter 9.

**BMP Description:** Installation and establishment of hydroseeded areas outside of the limits of the athletic field

<b>Installation Schedule:</b>	After installation of the drainage improvements, structures specified in the contract documents and final grading.
<b>Maintenance and Inspection:</b>	Maintenance and inspection of the installed natural turf areas will be in accordance with the design drawings and specifications.
<b>Responsible Staff:</b>	Contractor

## SECTION 8: CERTIFICATION AND NOTIFICATION

**Instructions:**

- The SWPPP should be signed and certified by the construction operator(s). Attach a copy of the NOI and permit authorization letter received from EPA or the state in Appendix D.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## **SWPPP APPENDICES**

Attach the following documentation to the SWPPP:

***Appendix A – General Location Map***

***Appendix B – Site Maps***

***Appendix C – Construction General Permit***

***Appendix D – NOI and Acknowledgement Letter from EPA/State***

***Appendix E – Inspection Reports Template***

***Appendix F – Corrective Action Log (or in Part 5.3)***

***Appendix G – SWPPP Amendment Log (or in Part 6.2)***

***Appendix H – Subcontractor Certifications/Agreements***

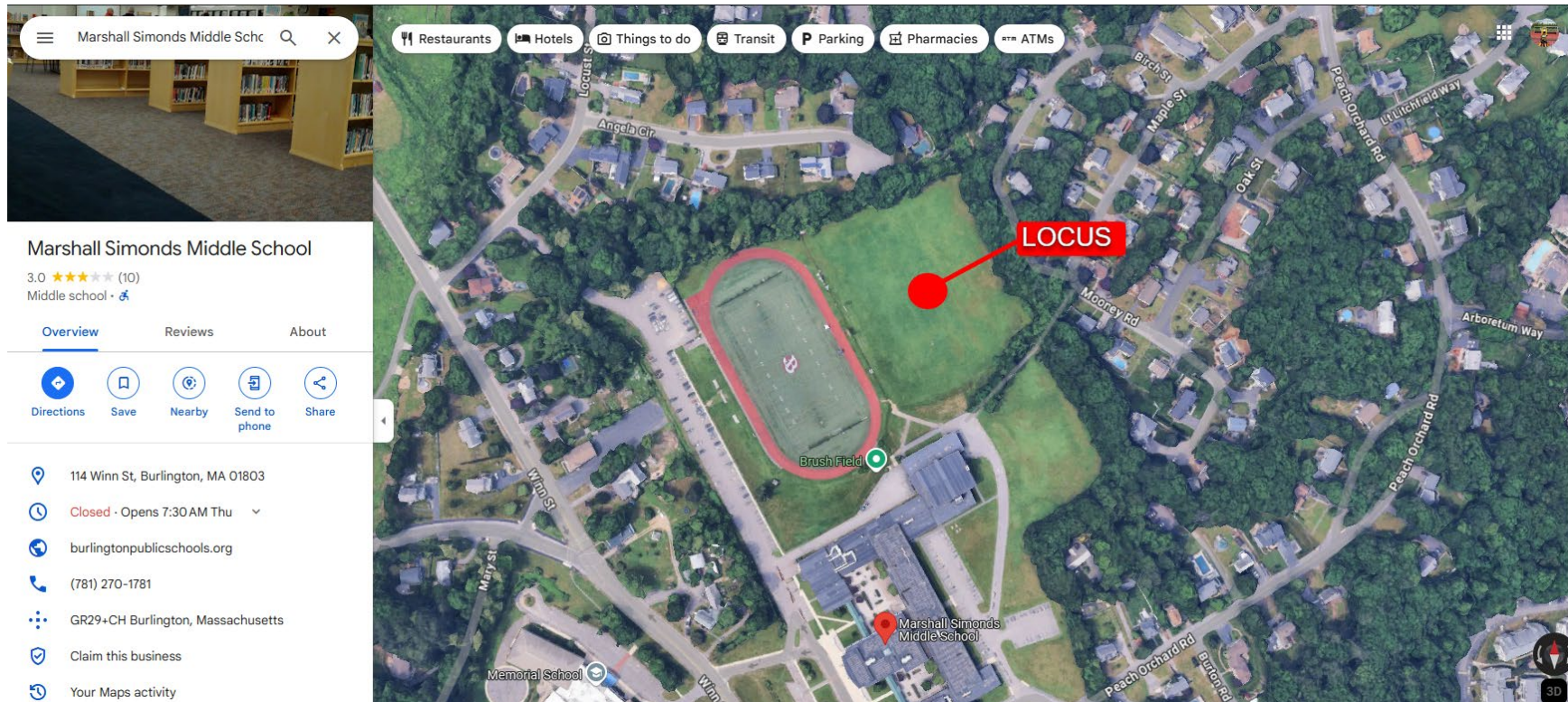
***Appendix I – Grading and Stabilization Activities Log (or in Part 6.1)***

***Appendix J – Training Log***

***Appendix K – Delegation of Authority***

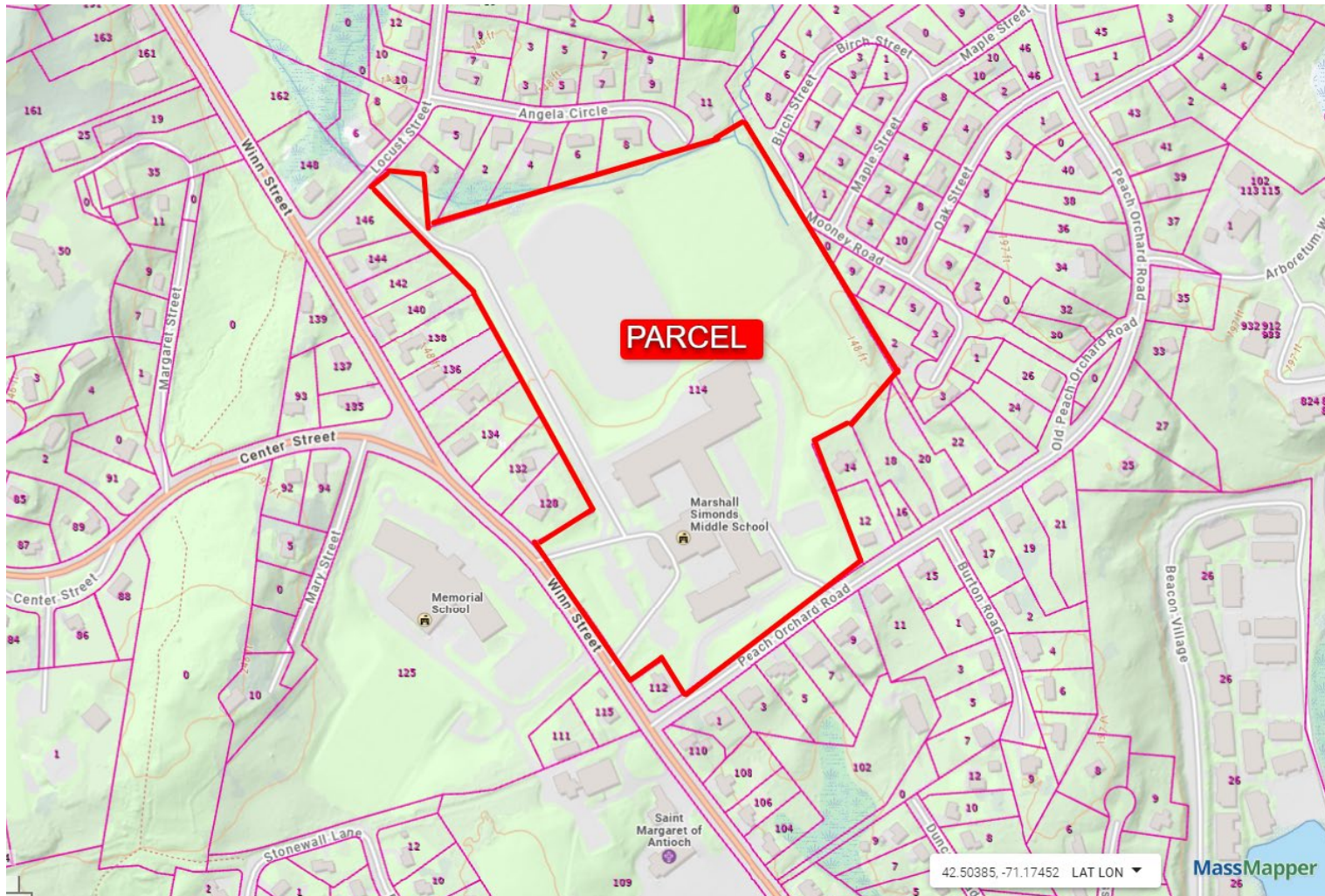
***Appendix L – Additional Information (i.e., Endangered Species and Historic Preservation Documentation, Soil Report)***

## Appendix A – General Location Map





## Appendix B – Site Maps



## Appendix C – Construction General Permit

*To be provided by the contractor.*

## Appendix D – NOI and Acknowledgement Letter from EPA/State

- *T.B.P.*

## Appendix E – Inspection Reports

# Stormwater Construction Site Inspection Report

### *General Information*

Project Name:

Location:

Date of Inspection:

Start/End Time:

Inspector's Name:

Inspector's Title: P.E.

Inspector's Contact Information:

Describe present phase of construction:

Type of Inspection:

☐ Regular

☐ Pre-storm event

☐ During storm event

☐ Post-storm event

### *Weather Information*

Has there been a storm event since the last inspection? ☐ Yes ☐ No If yes, provide:

Storm Start Date & Time:

Storm Duration (hrs):

Approximate Amount of Precipitation (in):

Weather at time of this inspection?

☐ Clear   ☐ Cloudy   ☐ Rain   ☐ Sleet   ☐ Fog   ☐ Snowing   ☐ High Winds :

☐ Other:

Temperature:

Have any discharges occurred since the last inspection?   ☐ Yes   ☐ No

If yes, describe:

Are there any discharges at the time of inspection?   ☐ Yes   ☐ No

If yes, describe:

*Overall Site Issues*

*General site locations/issues assessed during inspection.*

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1. All inactive slopes and disturbed areas have been stabilized.	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2. Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
3. Are all sanitary waste receptacles placed in secondary containment and free of leaks?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	



4. Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
5. Are discharge points and receiving waters free of any sediment deposits?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
6. Are storm drain inlets properly protected?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
7. Is the construction exit preventing sediment from being tracked into the street?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
8. Is trash/litter from work areas collected and placed in covered dumpsters?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
9. Are vehicle and equipment fueling,	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?			
10. Are materials that are potential stormwater contaminants stored inside or under cover?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
11. Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
12. (Other)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	N/A

*Certification Statement*

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

---

*Signature of Inspector*

*Date*

[illegible]

[illegible]

## Appendix H – Subcontractor Certifications/Agreements

### SUBCONTRACTOR CERTIFICATION STORMWATER POLLUTION PREVENTION PLAN

Project Number: \_\_\_\_\_

Project Title: \_\_\_\_\_

Operator(s): \_\_\_\_\_

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

**I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the BMPs and practices described in the SWPPP.**

This certification is hereby signed in reference to the above named project:

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Type of construction service to be provided: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_



[illegible]

## Appendix J – SWPPP Training Log

### Stormwater Pollution Prevention Training Log

Project Name: \_\_\_\_\_

Project Location: \_\_\_\_\_

Instructor's Name(s): \_\_\_\_\_

Instructor's Title(s): \_\_\_\_\_

Course Location: \_\_\_\_\_ Date: \_\_\_\_\_

Course Length (hours): \_\_\_\_\_

Stormwater Training Topic: *(check as appropriate)*

- ☐ Erosion Control BMPs      ☐ Emergency Procedures  
☐ Sediment Control BMPs      ☐ Good Housekeeping BMPs  
☐ Non-Stormwater BMPs

Specific Training Objective: \_\_\_\_\_  
\_\_\_\_\_

Attendee Roster: *(attach additional pages as necessary)*

No.	Name of Attendee	Company
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

## Appendix K – Delegation of Authority Form

### Delegation of Authority

I, \_\_\_\_\_ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the \_\_\_\_\_ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

\_\_\_\_\_ (name of person or position)  
\_\_\_\_\_ (company)  
\_\_\_\_\_ (address)  
\_\_\_\_\_ (city, state, zip)  
\_\_\_\_\_ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in \_\_\_\_\_ (Reference State Permit), and that the designee above meets the definition of a “duly authorized representative” as set forth in \_\_\_\_\_ (Reference State Permit).

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

**Name:** \_\_\_\_\_

**Company:** \_\_\_\_\_

**Title:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

## Appendix L – Additional Information



United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

A product of the National  
Cooperative Soil Survey,  
a joint effort of the United  
States Department of  
Agriculture and other  
Federal agencies, State  
agencies including the  
Agricultural Experiment  
Stations, and local  
participants

# Custom Soil Resource Report for **Middlesex County, Massachusetts**

## **Marshall Simonds Athletic Fields Renovation Project**



# Preface

---

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



# Contents

---

<b>Preface</b> .....	2
<b>How Soil Surveys Are Made</b> .....	5
<b>Soil Map</b> .....	8
Soil Map.....	9
Legend.....	10
Map Unit Legend.....	11
Map Unit Descriptions.....	11
Middlesex County, Massachusetts.....	13
73B—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony...	13
631C—Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky.....	14
656—Udorthents-Urban land complex.....	17
<b>References</b> .....	19

# How Soil Surveys Are Made

---

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

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

## Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

---

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


# Custom Soil Resource Report Soil Map



# Custom Soil Resource Report


## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)


### Soils


 Soil Map Unit Polygons


 Soil Map Unit Lines


 Soil Map Unit Points

### Special Point Features

 Blowout

 Borrow Pit


 Clay Spot


 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot


 Sinkhole


 Slide or Slip

 Sodic Spot


 Spoil Area

 Stony Spot


 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

### Water Features

 Streams and Canals


### Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts  
Survey Area Data: Version 24, Aug 27, 2024

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

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

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



## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	1.7	21.9%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	0.0	0.0%
656	Udorthents-Urban land complex	6.1	78.1%
<b>Totals for Area of Interest</b>		<b>7.9</b>	<b>100.0%</b>

## Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

## Middlesex County, Massachusetts

### 73B—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony

#### Map Unit Setting

*National map unit symbol:* 2w695  
*Elevation:* 0 to 1,580 feet  
*Mean annual precipitation:* 36 to 71 inches  
*Mean annual air temperature:* 39 to 55 degrees F  
*Frost-free period:* 140 to 240 days  
*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Whitman, extremely stony, and similar soils:* 81 percent  
*Minor components:* 19 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Whitman, Extremely Stony

##### Setting

*Landform:* Drumlins, ground moraines, hills, drainageways, depressions  
*Landform position (two-dimensional):* Toeslope  
*Landform position (three-dimensional):* Base slope  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

##### Typical profile

*Oi - 0 to 1 inches:* peat  
*A - 1 to 10 inches:* fine sandy loam  
*Bg - 10 to 17 inches:* gravelly fine sandy loam  
*Cdg - 17 to 61 inches:* fine sandy loam

##### Properties and qualities

*Slope:* 0 to 3 percent  
*Surface area covered with cobbles, stones or boulders:* 9.0 percent  
*Depth to restrictive feature:* 7 to 38 inches to densic material  
*Drainage class:* Very poorly drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)  
*Depth to water table:* About 0 to 6 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* Frequent  
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)  
*Available water supply, 0 to 60 inches:* Low (about 3.0 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 7s  
*Hydrologic Soil Group:* D  
*Ecological site:* F144AY041MA - Very Wet Till Depressions  
*Hydric soil rating:* Yes

**Minor Components**

**Ridgebury, extremely stony**

*Percent of map unit:* 10 percent  
*Landform:* Drumlins, depressions, ground moraines, hills, drainageways  
*Landform position (two-dimensional):* Footslope, toeslope  
*Landform position (three-dimensional):* Head slope, base slope  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

**Scarboro**

*Percent of map unit:* 5 percent  
*Landform:* Drainageways, depressions, outwash terraces, outwash deltas  
*Landform position (three-dimensional):* Tread  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

**Swansea**

*Percent of map unit:* 3 percent  
*Landform:* Marshes, bogs, swamps  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Hydric soil rating:* Yes

**Woodbridge, extremely stony**

*Percent of map unit:* 1 percent  
*Landform:* Ground moraines, hills, drumlins  
*Landform position (two-dimensional):* Summit, backslope, footslope  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

**631C—Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky**

**Map Unit Setting**

*National map unit symbol:* vr1g  
*Elevation:* 0 to 1,000 feet  
*Mean annual precipitation:* 32 to 54 inches  
*Mean annual air temperature:* 43 to 54 degrees F  
*Frost-free period:* 110 to 240 days  
*Farmland classification:* Not prime farmland

**Map Unit Composition**

*Charlton and similar soils:* 45 percent  
*Urban land:* 35 percent  
*Hollis and similar soils:* 10 percent

## Custom Soil Resource Report

*Minor components: 10 percent*

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Charlton

#### Setting

*Landform: Ground moraines, drumlins*

*Landform position (two-dimensional): Backslope*

*Landform position (three-dimensional): Side slope*

*Down-slope shape: Linear*

*Across-slope shape: Convex*

*Parent material: Friable loamy eolian deposits over friable loamy basal till derived from granite and gneiss*

#### Typical profile

*H1 - 0 to 5 inches: fine sandy loam*

*H2 - 5 to 22 inches: sandy loam*

*H3 - 22 to 65 inches: gravelly sandy loam*

#### Properties and qualities

*Slope: 3 to 15 percent*

*Depth to restrictive feature: More than 80 inches*

*Drainage class: Well drained*

*Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)*

*Depth to water table: More than 80 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Available water supply, 0 to 60 inches: Moderate (about 7.3 inches)*

#### Interpretive groups

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 3e*

*Hydrologic Soil Group: A*

*Ecological site: F144AY034CT - Well Drained Till Uplands*

*Hydric soil rating: No*

### Description of Urban Land

#### Setting

*Landform position (two-dimensional): Footslope*

*Landform position (three-dimensional): Base slope*

*Down-slope shape: Linear*

*Across-slope shape: Linear*

*Parent material: Excavated and filled land*

### Description of Hollis

#### Setting

*Landform: Hillslopes, ridges*

*Landform position (two-dimensional): Backslope*

*Landform position (three-dimensional): Side slope*

*Down-slope shape: Linear*

*Across-slope shape: Convex*

*Parent material: Friable, shallow loamy basal till over granite and gneiss*

#### Typical profile

*H1 - 0 to 2 inches: fine sandy loam*

## Custom Soil Resource Report

*H2 - 2 to 14 inches: fine sandy loam*

*H3 - 14 to 18 inches: unweathered bedrock*

### Properties and qualities

*Slope: 3 to 15 percent*

*Surface area covered with cobbles, stones or boulders: 9.0 percent*

*Depth to restrictive feature: 8 to 20 inches to lithic bedrock*

*Drainage class: Well drained*

*Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)*

*Depth to water table: More than 80 inches*

*Frequency of flooding: None*

*Frequency of ponding: None*

*Available water supply, 0 to 60 inches: Very low (about 2.0 inches)*

### Interpretive groups

*Land capability classification (irrigated): None specified*

*Land capability classification (nonirrigated): 6s*

*Hydrologic Soil Group: D*

*Ecological site: F144AY033MA - Shallow Dry Till Uplands*

*Hydric soil rating: No*

### Minor Components

#### Canton

*Percent of map unit: 4 percent*

*Landform: Hills*

*Landform position (two-dimensional): Backslope, toeslope*

*Landform position (three-dimensional): Side slope, base slope*

*Down-slope shape: Linear*

*Across-slope shape: Convex*

*Hydric soil rating: No*

#### Udorthents, loamy

*Percent of map unit: 2 percent*

*Hydric soil rating: No*

#### Rock outcrop

*Percent of map unit: 2 percent*

*Landform: Ledges*

*Landform position (two-dimensional): Summit*

*Landform position (three-dimensional): Head slope*

*Down-slope shape: Concave*

*Across-slope shape: Concave*

#### Scituate

*Percent of map unit: 1 percent*

*Landform: Hillslopes, depressions*

*Landform position (two-dimensional): Summit, toeslope*

*Landform position (three-dimensional): Head slope, base slope*

*Down-slope shape: Linear*

*Across-slope shape: Concave*

*Hydric soil rating: No*

#### Montauk

*Percent of map unit: 1 percent*

*Landform: Hillslopes*

*Landform position (two-dimensional): Summit, shoulder*

*Landform position (three-dimensional):* Head slope, nose slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

## **656—Udorthents-Urban land complex**

### **Map Unit Setting**

*National map unit symbol:* 995k  
*Elevation:* 0 to 3,000 feet  
*Mean annual precipitation:* 32 to 54 inches  
*Mean annual air temperature:* 43 to 54 degrees F  
*Frost-free period:* 110 to 240 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Udorthents and similar soils:* 45 percent  
*Urban land:* 35 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Udorthents**

#### **Setting**

*Parent material:* Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

#### **Properties and qualities**

*Slope:* 0 to 15 percent  
*Depth to restrictive feature:* More than 80 inches  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None

### **Description of Urban Land**

#### **Setting**

*Landform position (two-dimensional):* Footslope  
*Landform position (three-dimensional):* Base slope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Parent material:* Excavated and filled land

### **Minor Components**

#### **Canton**

*Percent of map unit:* 10 percent



## Custom Soil Resource Report

*Landform:* Hills

*Landform position (two-dimensional):* Backslope, toeslope

*Landform position (three-dimensional):* Side slope, base slope

*Down-slope shape:* Linear

*Across-slope shape:* Convex

*Hydric soil rating:* No

### **Merrimac**

*Percent of map unit:* 5 percent

*Landform:* Terraces, plains

*Landform position (two-dimensional):* Shoulder

*Landform position (three-dimensional):* Tread, rise

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Hydric soil rating:* No

### **Paxton**

*Percent of map unit:* 5 percent

*Landform:* Hillslopes

*Landform position (two-dimensional):* Summit, backslope

*Landform position (three-dimensional):* Head slope, side slope

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Hydric soil rating:* No

# References

---

- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_054262](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262)
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053577](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577)
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053580](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580)
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2\\_053374](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374)
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

## Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_052290.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf)



**Nesra Engineering, LLC**  
111 Washington Street, Unit 2A  
Plainville, MA 02762

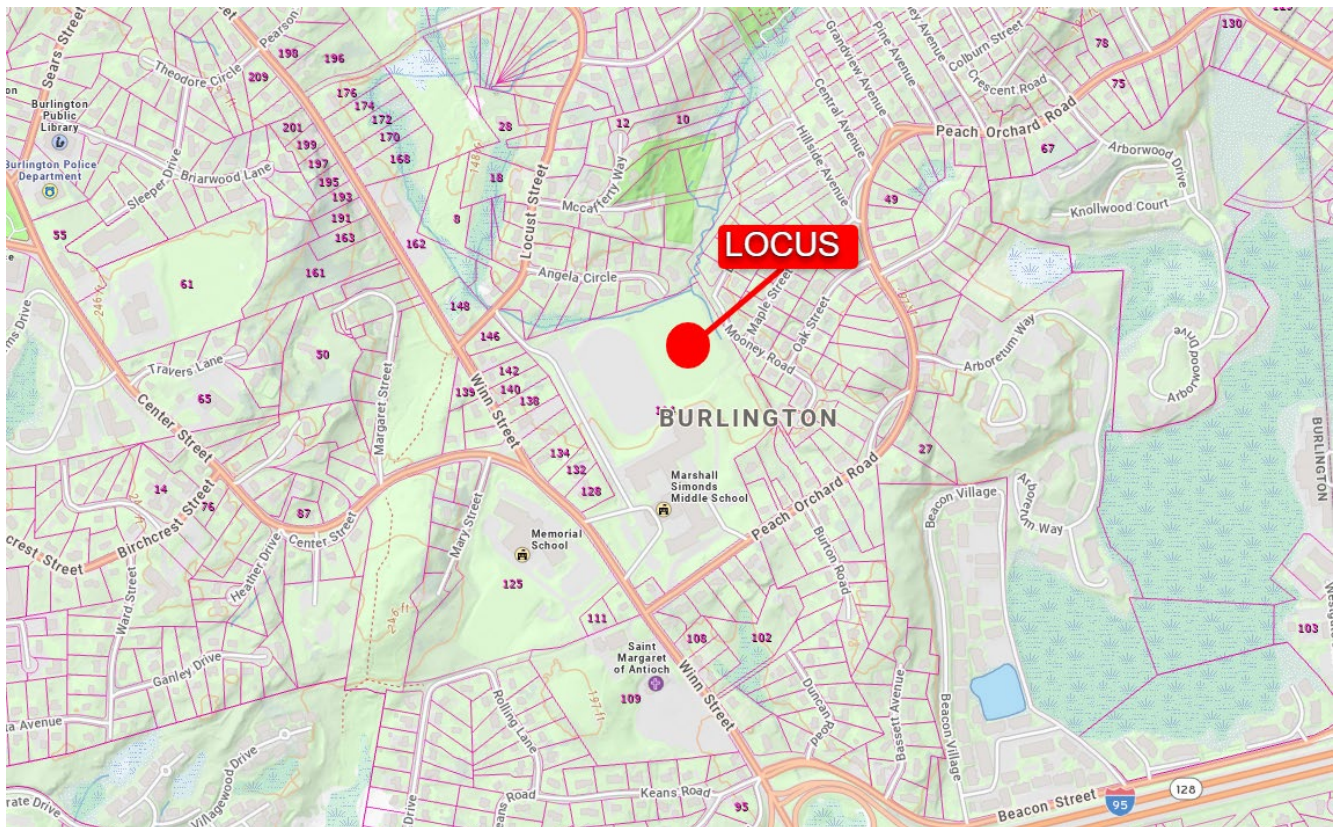
**Attachment M**

**Operations and Maintenance Plan (O&M Plan)**

## Stormwater Operations and Maintenance Plan

### Marshall Simonds Middle School Athletic Fields Renovation Project

#### Burlington, MA



## Overview

The following Long Term Stormwater Operations and Maintenance plan has been completed as required by the NPDES Construction General Permit, the associated Stormwater Pollution Prevention Plan (SWPPP), and Federal, State, Local regulatory guidelines, as well as common civil engineering practices. All of which will be submitted by the contractor prior to start of construction and reviewed by Nesra Engineering LLC.

The purpose and intent of this Long-Term Stormwater Operations and Maintenance plan is to provide additional project-specific information related to the effective stormwater management implementation, operations and maintenance of stormwater measures. The information provided herein is intended to provide the operational and maintenance basis of all stormwater measures on-site, subject to updates, amendments, or revisions, as necessary. The property owner shall be notified in writing of this plan and be provided with a copy, along with a complete set of the approved project drawings depicting all stormwater elements.

The following outline is a basic summary of the stormwater operations and maintenance plan key elements:

## Section A

### Introduction

1. Purpose
2. Responsible Parties
3. Temporary Stormwater Measures
4. Permanent Stormwater Measures
5. Estimated Annual Costs

## Section B

### Stormwater Operations

1. Material and Equipment Storage
2. Stormwater Systems
3. Stormwater Operations and Maintenance
4. Source Control / Preventing Illicit Discharges

## Section C

### Stormwater Maintenance

1. Management, Training, and Certification
2. Observation Log
3. Correction Action Log

## Section A

### Introduction

The project involves renovating the existing grass fields adjacent to Marshall Simonds Middle School, located at 114 Winn Street in Burlington, MA 01803. The proposed improvements include replacing the natural grass with a new, synthetic turf athletic surface. Additional enhancements include upgraded athletic field lighting, terraced seating, three new ADA-compliant parking spaces, and the installation of new fencing, accessible walkways, and various site amenities. The overall drainage is being enhanced through a multi-pronged approach. This includes adding an extra 12 inches of drainage stone, installing perforated flat panel drains and collector pipes, and repairing or replacing specific existing drain structures. Additionally, stormwater from the new ADA parking area will be pre-treated as it is directed into a rain garden, then flowing through a vegetated filter strip where it finally enters a deep sump catch basin.

Currently, runoff originates from the south side of the property and flows northward across the parcel. Stormwater from the building and parking lot divides into two main paths: one portion flows northeast into a vegetated grass field before discharging into a catch basin, while the remainder moves north and northwest over a grassy hill and into a wetland categorized as a wood swamp deciduous wetland by MassDEP—adjacent to walking path that leads to the School. Additional runoff from the field continues north, eventually emptying into a linear wetland along the property's northern and eastern sections.

### Purpose

The purpose of this Stormwater Operations and Maintenance Plan is to (1) identify the primary differences between temporary and permanent stormwater measures, proper operations, and system maintenance and (2) ensure the inspection of the system removal of accumulated sediments, oils, and debris, and the implementation of corrective action as well as record-keeping activities. The ongoing responsibility resides on the Owner(s), its successors, and assigns. Adequate maintenance is defined in this document in good working condition.

Stormwater management facilities are commonly installed in development projects such as the proposed renovation of the Winch Tennis Courts. The complexity and goals of these systems vary with the nature of the receiving waters as well as the type of change/renovation proposed. In general, stormwater runoff from areas may contain contaminants which can have an adverse impact on receiving waters. The installation of stormwater management systems that are properly designed, installed, and maintained can significantly reduce the non-point discharge from construction and developed areas. These measures are particularly important to the project in sensitive water bodies. The temporary and permanent stormwater measures are further described in the permit plans, construction documents, and Stormwater Pollution Prevention Plan.

The stormwater management system can protect and enhance the stormwater runoff water quality through the removal of sediments and pollutants, and source control significantly reduces the number of pollutants entering the system.

This Long-Term Stormwater Management System Operations and Maintenance (O&M) Manual shall be implemented to ensure that the stormwater management system functions as designed. The Owner possesses the primary responsibility for overseeing and implementing the O&M plan and assigning a person or persons who will be responsible for the proper operation and maintenance of the stormwater structures.

Included in this manual is an overall site plan which identifies the locations of the key components of the stormwater management system and a log for tracking the inspections and maintenance.



## Owner(s) & Responsible Parties

Name: Burlington Public Schools

Address: 123 Cambridge St.

Town: Barrington

State: MA

Contact: 01803

Telephone: 781-238-5690

Email: T.B.P.

The Owner may sell, re-assign, or transfer ownership at any time, but not prior to the creation, documentation, and establishment of a successor. In the event the project ownership is sold, re-assigned or transferred, the stormwater operation and maintenance responsibilities shall also be transferred to the new Owner.

## Temporary Stormwater Measures

Temporary stormwater measures are all those structural or non-structural practices intended to reduce or eliminate stormwater degradation and site erosion during active or inactive construction activities. Specifically, these temporary stormwater measures are purposefully chosen, sized and placed in such a manner that will result in stormwater and soil erosion mitigation. Ultimately, the monitoring and successful operations of all temporary stormwater measures shall be the Owner and Site Contractor's responsibility.

The proposed temporary stormwater measures are as follows (reasonable guide, not limited too):

- ❖ Stabilized construction entrance
- ❖ Hay Bales
- ❖ Silt Fence
- ❖ Silt Sock
- ❖ Material Stockpile Stabilization
- ❖ Mulching or Hydroseed or Erosion Control Blankets or Crushed Gravel Cover (travel lanes)
- ❖ Temporary Sediment Basins (where needed)
- ❖ Leaching Catch Basin Inlet Protection with Silt Sacks

All temporary stormwater measures costs are the responsibility of the Owner and Site Contractor. The Owner, Developer (if applicable), and Site Contractor are responsible to operate, maintain, replace or replace all temporary stormwater measures until the project is completely stabilized.

## Permanent Stormwater Measures

Permanent stormwater measures are all those structural or non-structural practices intended to reduce or eliminate stormwater degradation and site erosion following construction completion, site stabilization, and property occupancy. Specifically, these permanent measures are purposefully chosen, sized and placed in such a manner that will result in measurable stormwater quality, volume and velocity controls. Ultimately, the monitoring and successful operations of all permanent stormwater measures shall initially be the Contractor's responsibility. Once the site is completely stable, the stormwater system(s) are one hundred (100) percent complete and fully functional, as designed and approved, the Contractor may transfer operational and maintenance responsibilities to the financially responsible entity.

It is highly recommended that a trained third-party stormwater agent is contracted by the Owner or property manager to operate and maintain the stormwater system. Any and all such contractual arrangements will be added to the final Stormwater Operations and Maintenance Plan, as an addendum with continual updates, business registrations, certifications, and proper insurances, as applicable.

The proposed Project's permanent stormwater measures and structures are as follows:

- ❖ Street Cleaning
- ❖ Vegetated Filter Strips
- ❖ Deep Sump Hooded Catch Basin
- ❖ Rain Garden

## Estimated Annual Costs

The estimated annual stormwater operation and maintenance cost is \$2,500.00, during normal years and may spike to as much as \$4,500 every fifth year, depending on the use of mechanical equipment or material replacement. It is anticipated this plan will be fully implemented by the Town or a single company specializing in the stormwater maintenance of street and catch basin cleaning.

## Section B

### Stormwater Operations

This section provides additional project-specific permanent (fully occupied, stabilized site, functional systems) stormwater O&M information, including the equipment storage during construction, snow management, stormwater systems, and general site operations and maintenance. All temporary measures, prior to full ownership transfer will be the Contractor's responsibility.

### Material and Equipment Storage

Material and equipment storage will be done in a safe and proper manner during all construction activities. Landscape contractors, pest management contractors and general maintenance staff shall follow all applicable product manufacturers, state and federal guidelines for the storage and handling of materials and chemicals on site.

All debris shall be collected and disposed of offsite in a legal manner. Temporary snow storage may be permitted, in accordance with the approved permit plans in the pre-determined locations only. Yard waste and snow are prohibited from being deposited in, near or adjacent to the onsite stormwater resources.

After the construction phase is completed, it is anticipated that the Owner, Contractor, or HOA (if applicable) will contract all services and not have any onsite facilities to store property operational or maintenance material or equipment.

### Stormwater Systems

The permanent stormwater systems are proven, reliable and effective stormwater treatment, storage and infiltration practices. The site is strategically graded to mimic the pre-development natural drainage patterns and therefore maintains several individual and separate drainage systems. At the proposed new ADA parking area, runoff will be collected at the rain garden where excess runoff will then flow over a vegetated strip of grass before it is discharged

into a deep sump hooded catch basin. On the field side, stormwater will flow through dense graded stone and into lateral flat panel drainpipes where waters are pushed towards collector pipes around the perimeter of the proposed field. Excess water will empty into the existing drainage system where it will outflow as it currently does into the existing wetlands to the north of the property.

The system is designed to reduce pollutants in stormwater runoff and reduce the peak rate of discharge for all storms up to and including the 100-year storm. Collectively, the selected stormwater systems will meet or exceed local, state, and federal requirements when operated, monitored, and maintained properly.

### Stormwater Operations and Maintenance

The permanent onsite drainage systems operations and maintenance can be self-performed by the Town, or assigned party/entity responsible. Typically, a long-term contract is established with industry-specific trained and licensed professionals capable of operating, inspecting, and maintaining the site-specific designed stormwater system.

In general, good housekeeping, common sense, responsible site operations, and timely maintenance include the following activities:

- **Site Maintenance:** The site and all its components shall be kept in a neat, orderly, and clean fashion. Routine upkeep shall be performed by either the Public Works Department, Owner's representatives, Property Management Staff, and/or their assigned.. Typical site maintenance activities shall include, but not be limited to responsible construction practices, road sweeping, using a vacuum sweeper and landscape management including intensive spring and fall season cleaning.
- **Trash Disposal:** After construction is completed, all common waste materials will be (1) the Town's responsibility. (1) The Town will be responsible for trash disposal according to their predetermined pick-up trash pick-up schedule.
- **Spill Control & Containment:** Spill control practices will be followed to minimize stormwater contamination from vehicle oil and petroleum leaks during the construction phase.

### ❖ Stormwater Management System Maintenance

- **Post Construction:**
  - Contractor will monitor and provide maintenance of the proposed stormwater management system until such time as the Town accepts the project and final close-out of the project is achieved.
- **Street Sweeping:**
  - It should be noted the adjacent road to the parking lot (Locust St.) has a low potential for accumulation of total suspended solids due to the use after construction is completed. The Town/School may need to provide mechanical sweeping based on their predetermined schedule.
  - Street sweeping to be performed in the parking areas at least 2 times per year. Once in the spring and again in the fall.
- **Vegetated Filter Strips**
  - Year 1

- Conduct semi-annual inspections during the 1<sup>st</sup> year.
- Inspect the level of the area for sediment buildup and the vegetation for signs of erosion, bare areas, and overall health. established.
- Regular, frequent mowing of the grass is required.
- Remove sediment from the toe of slope or level spreader, and reseed bare spots as necessary.
- Periodically, remove sediment that accumulates near the top of the strip to maintain the appropriate slope and prevent formation of a “berm” that could impede the distribution of runoff as sheet flow.
- Years 2+
  - Conduct annual inspections after the 1<sup>st</sup> year.
  - Perform all other maintenance outlined in Year 1.

- **Deep Sump Hooded Catch Basins**

- Year 1+
  - Conduct inspections at least four times per year. Remove any intrusions and ensure proper flow.
  - Cleaning shall occur at least four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.
  - Rehabilitate the basin as needed if it fails due to clogging.

- **Rain Gardens**

- Year 1 & 2
  - Irrigated for the first 1 to 2 years until the garden is established.
  - Apply mulch twice per year until groundcover establishes.
  - Weeding needed the 1st two years. Remove weeds by hand, including the roots.
- Years 3+
  - Native grasses, sedges, rushes, and wildflowers will begin to mature and will outcompete the weeds.
  - Once spring arrives, and the new growth is 4-6 inches tall, cut all tattered plants back. If the growth is really thick, hand-cut the largest plants and use a string trimmer to reduce plantings back to a height of six to eight inches.
  - Dispose of dead plant material.

## Source Control & Preventing Illicit Discharges

The following source control and pollution prevention measures shall be employed on the site to prevent contamination of stormwater runoff:

- Illicit discharges and unauthorized connections or discharge to the drainage system, rain garden, and catch basins are strictly prohibited.
- Apply fertilizers and pesticides sparingly to prevent wash-off.
- Use of slow-release nitrogen and low phosphorus fertilizers is required.
- If applicable, no fertilization or pesticide application in or near any wetland resource areas
- If applicable, store any chemicals used during construction process under cover.
- No coal tar-based pavement sealants are to be used on site.

## Section C

### Management, Training, and Certification

This section will provide additional project-specific stormwater maintenance information, including management, training and certifications, observation log, correction action log, and project representative BMP library.

Permanent stormwater systems are to be monitored, operated, and maintained by trained individuals, certified in stormwater management practices. Either the Contractor, Developer, HOA (if applicable) or Property Management staff may become trained and certified or utilize a professional contractor with the appropriate training and certifications, capable of responsible stormwater systems operation and maintenance compliance.

The Contractor, Owner, HOA (if applicable) or Property Management shall maintain current records of stormwater management training and certifications of all, as typically required and performed within the SWPPP documentation.

### Observation Log

The Contractor, Owner, or Property Management and/or their stormwater consultants are responsible for completing stormwater observation logs in compliance with state and local stormwater compliance regulations, in addition to the suggested manufacturer specifications.

### Correction Action Log

When required and as necessary, corrective action logs shall be prepared. The purpose and intent of correction action logs are to document stormwater occurrences that require additional, amended, or revised stormwater measures than those approved/permitted devices in operation.

Stormwater measures may require corrective action logs. The creation, documentation and corrective action log reporting shall be the Contractor, Owner, HOA or Property Management's and/or their stormwater consultant(s) responsibility.

### Compliance and Certification Statement

To the best of my knowledge and understanding, the undersigned recognizes the validity and importance of compliance with the Stormwater Operations and Maintenance Plan, as generally outlined and described herein. The undersigned further agrees to participate in the advancement and notification of this document and all future interested parties or entities responsible for the effective and meaningful operations and maintenance of both temporary and permanent stormwater systems.

---

Contractor (Company, Name and Title)

Date

---

Owner (Name and Title)

Date



## **APPENDIX**

### Stormwater Management System Operation and Maintenance Forms



# STORMWATER MANAGEMENT SYSTEM

## OPERATIONS AND MAINTENANCE MANUAL

### VEGETATED FILTER STRIPS

Inspection Date	Satisfactory			Location	Maintenance Needed and Description	Implementation Date of Maintenance
	Yes	No	N/A			

Name of Inspector: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_

STORMWATER MANAGEMENT SYSTEM  
 OPERATIONS AND MAINTENANCE MANUAL  
 DEEP SUMP HOODED CATCH BASINS

Inspection Date	Satisfactory			Location	Maintenance Needed and Description	Implementation Date of Maintenance
	Yes	No	N/A			

Name of Inspector: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_

STORMWATER MANAGEMENT SYSTEM  
 OPERATIONS AND MAINTENANCE MANUAL  
 RAIN GARDEN

Inspection Date	Satisfactory			Location	Maintenance Needed and Description	Implementation Date of Maintenance
	Yes	No	N/A			

Name of Inspector: \_\_\_\_\_ Title: \_\_\_\_\_

Signature: \_\_\_\_\_