Stormwater Report

Boxford, Massachusetts

Harry Lee Cole School

February 3, 2021
Revised: November 9, 2022

JOB NO: ENG20-0865

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Table of Contents

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

Checklist for Stormwater Report

A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

11/9/2022

11/9/2022

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): ____________________

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

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

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

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

☒ is within the Zone II or Interim Wellhead Protection Area

☐ is near or to other critical areas

☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

☐ involves runoff from land uses with higher potential pollutant loads.

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

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

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist (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.

Stormwater Report

November 24, 2021

Applicant/Project Name:	Town of Boxford Harry Lee Cole School
Project Address:	26 Middleton Road, Boxford, MA
Application Prepared by:	
Firm:	Weston & Sampson, Inc.
Registered PE:	James Pearson

Below is an explanation concerning Standards 1-10 as they apply to the Harry Lee Cole School project:

General:

The project applicant, the Town of Boxford, proposes a redevelopment project at the Harry Lee Cole School located at 26 Middleton Road in Boxford to improve site access and traffic circulation. Site work will include, but is not limited to grading, drainage, paving and landscaping. The site is actively used as an elementary school for the town of Boxford and will remain in use over the duration of the project. The site is predominantly developed, with a large wooded area, which contains a drinking water well, placing part of the site under Zone I well head protection. Existing topography is relatively moderate across the site, with elevations ranging from 102-FT at the northeastern portion of the site to a low of approximately 91-FT to the southeast, along Main Street. NRCS soil mapping describes the site as being a mixture of Sudbury FSL (HSG-B) and Charlton-Hollis Rock Outcrop Complex (HSG-A). Test pits conducted across the site generally support the soil mapping and can be found in Attachment C of this report.

Standard 1: No New Untreated Discharges

The proposed project will create no new untreated discharges. Total impervious area will be increased in comparison with existing conditions by approximately 5,000-SF. Approximately 57,000-SF± of impervious area will now undergo treatment via street sweeping, deep sump hooded catch basins, and subsurface treatment chambers or bio-retention areas. As such, existing stormwater discharges will meet Standard 1 to the maximum extent practicable. HydroCAD modeling of the site is provided in Attachment D.

Standard 2: Peak Rate Attenuation

Existing and proposed conditions were modeled using HydroCAD computer software and Town of Boxford rainfall data. A table, summarizing peak discharges for the 2-Yr, 10-Yr, 25-Yr , 50-Yr and 100-Yr storm events can be found in Attachment D. The proposed design is such that peak runoff volumes and peak discharge rates do not exceed pre-development rates, even in the 100-year storm scenario.

To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction, as depicted on the site plans.

Standard 3: Recharge

As a redevelopment, Standard 3 shall be met to the maximum extent practicable. Due to shallow estimated seasonal high groundwater on site and the presence of a Zone I wellhead protection area, only a single infiltration BMP is being proposed for recharge on site. The BMP is designed to capture and infiltrate the required recharge volume for the contributing subcatchments. Supporting calculations can be found in Attachment E of this report.

Standard 4: Water Quality

Standard 4 shall be met to the maximum extent practicable. Treatment practices have been designed to capture the required water quality volume and provide treatment to remove greater than 80% of total suspended solids where able. The proposed stormwater management system will present an improvement over existing conditions.

During the project, appropriate BMPs will be used to minimize sedimentation and soil erosion.

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

This site is not considered a LUHPPL, as such, Standard 5 does not apply.

Standard 6: Critical Areas

Portions of the site are located within a Zone I wellhead protection area, with the remainder of the site being located within a Zone II. Measures have been taken to ensure that adequate pretreatment is provided prior to groundwater recharge. Stormwater infiltration BMP's are located outside of the Zone I.

Standard 7: Redevelopments and Other Projects Subject to the Standards Only to the Maximum Extent Practicable

This is a redevelopment project. Stormwater standards 1, 2, 3 and 4 have been met to the maximum extent practicable.

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

A detailed Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Attachment G. To ensure that the work incorporates the performance standards recommended in the DEP's Stormwater Management Policy, necessary erosion and sedimentation control measures will be utilized during construction.

Standard 9: Operation and Maintenance Plan

An operations and maintenance plan is included in Attachment H.

Standard 10: Prohibition of Illicit Discharges

An illicit discharge compliance statement has been included in Attachment I.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including any relevant soil evaluations, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan, the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement 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

COMMONWEALTH OF MASSACHUSETTS
JAMES I.
PEARSON
CIVIL
No. 50675
REGISTERED
PROFESSIONAL ENGINEER

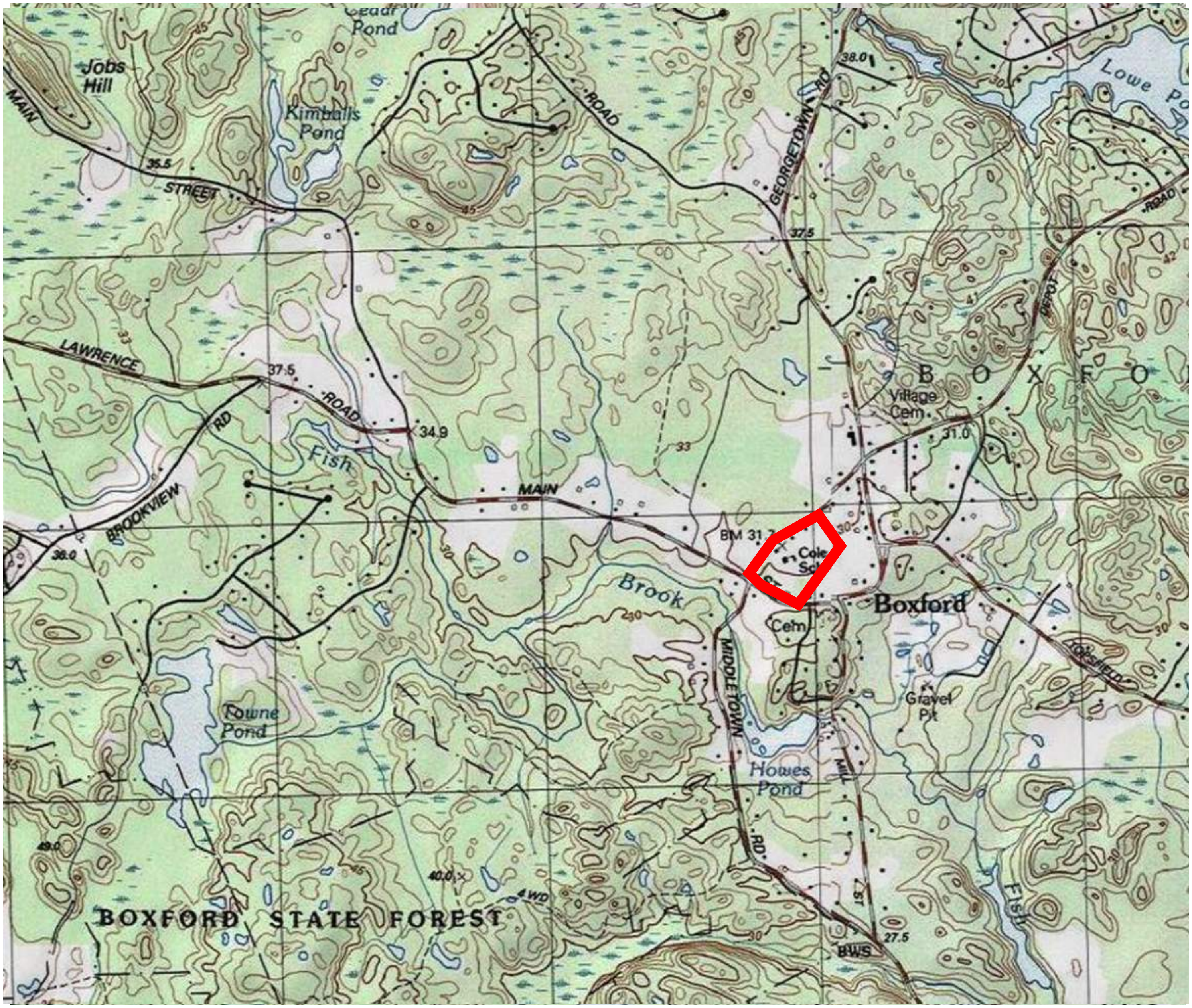
11/9/2022

11/9/2022

Signature and Date

Attachment A - Locus Map

<BOL>Path:</BOL> C:\Users\batchelder.devin\OneDrive - WESTON & SAMPSON ENGINEERS, Inc\Desktop\Boxford\GIS\Maps\Locus.mxd <BOL>User:</BOL> Batchelder.Devin <BOL>Saved:</BOL> 12/2/2020 1:35:20 PM <BOL>Opened:</BOL> 12/2/2020 1:35:59 PM



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W E
S

1,000 500 0 1,000
Feet

Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

Site Location

Attachment A

Locus Map
Harry Lee Cole School

USGS Topographic Map

Weston & Sampson

Attachment B - NRCS Soils Map, Soils Report, and HSG Classifications

Map Scale: 1:1,900 if printed on A portrait (8.5" x 11") sheet.

0 25 50 100 150 Meters

0 50 100 200 300 Feet

N

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 16, Jun 9, 2020

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

Date(s) aerial images were photographed: Sep 13, 2019—Oct 5, 2019

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
260A	Sudbury fine sandy loam, 0 to 3 percent slopes	B	6.8	69.6%
711B	Charlton-Rock outcrop-Hollis complex, 3 to 8 percent slopes	A	3.0	30.4%
Totals for Area of Interest			**9.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

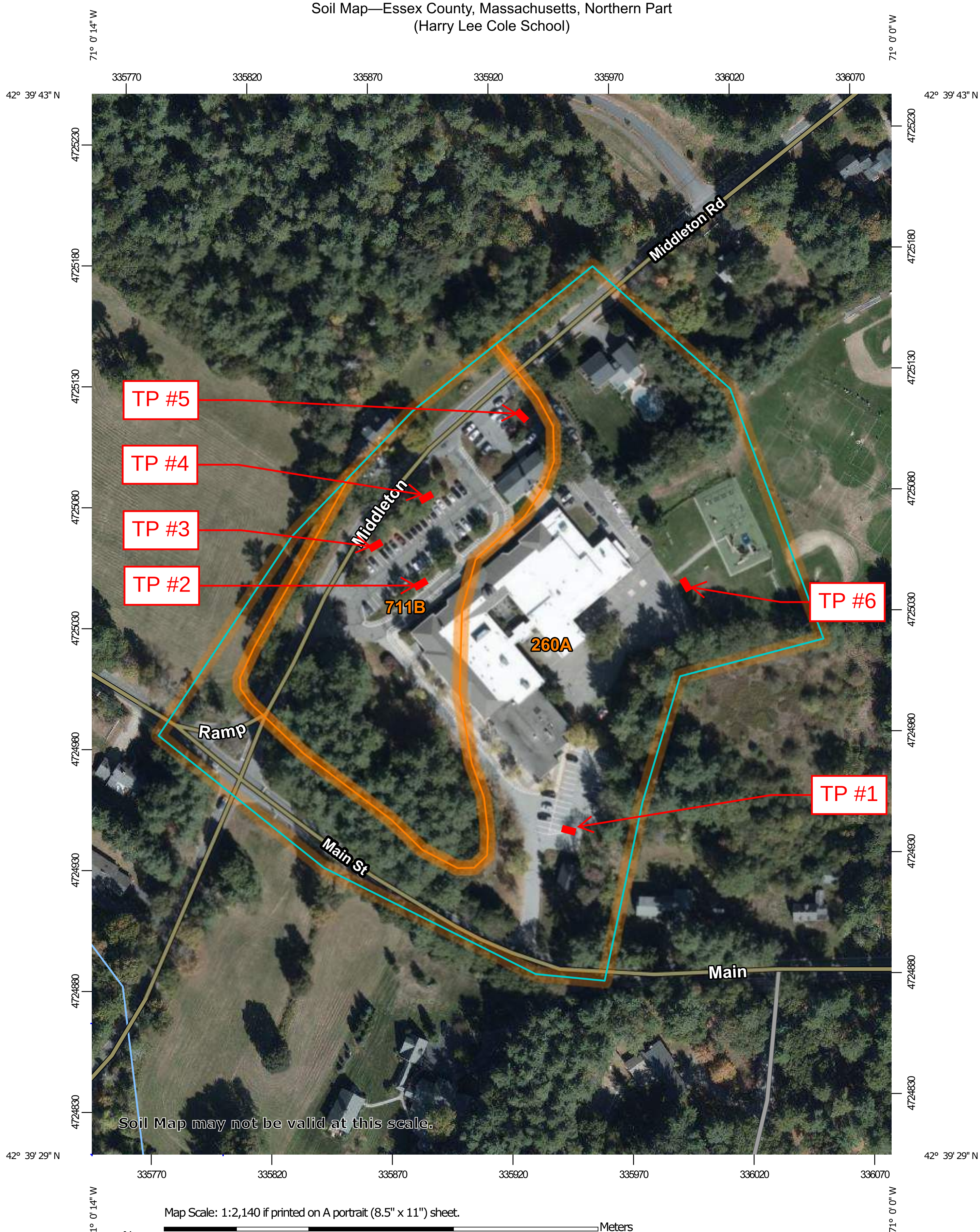
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Attachment C - Test Pit Logs & Infiltration Report

Soil Map—Essex County, Massachusetts, Northern Part
(Harry Lee Cole School)



Map Scale: 1:2,140 if printed on A portrait (8.5" x 11") sheet.

0 30 60 120 180 Meters

0 100 200 400 600 Feet

N

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

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**
LOCATION	Harry Lee Cole School, Boxford, MA			TP 1
CLIENT	Boxford, MA			GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	1/20/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE 48-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
4"	Pavement
25"	Fill 10% Gravel & 10% Cobbles
29"	Ab - Dark Brown Sandy Loam (10YR 3/3) 10% Gravel & 10% Cobbles
35"	Bw - Dark Yellowish Brown Sandy Loam (10YR 4/6) 10% Gravel & 10% Cobbles
84"	C1 - Yellowish Brown Coarse Sand (10YR 5/4) 5% Gravel
	- End of Exploration -

NOTES:

1. Redox encountered at 48-in
2. Weeping at 75-in
3. PID = 0.0PPM

TEST PIT NUMBER
TP 1

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**
LOCATION	Harry Lee Cole School, Boxford, MA			TP 1
CLIENT	Boxford, MA			GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	1/20/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE 48-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
	

NOTES:

1. Redox encountered at 48-in
2. Weeping at 75-in
3. PID = 0.0PPM

TEST PIT NUMBER
TP 1

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**
LOCATION	Harry Lee Cole School, Boxford, MA			TP 2
CLIENT	Boxford, MA			GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	1/20/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE Not Observed

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
12"	Ap - Dark Brown Sandy Loam (10YR 3/3) 5% Gravel & 5% Cobbles
14"	Bw - Dark Yellowish Brown Sandy Loam (10YR 4/6) 10% Gravel & 10% Cobbles
90"	C1 - Brownish Yellow Loamy Sand (10YR 6/6) 5% Gravel & 5% Cobbles
	- End of Exploration -

NOTES:

1. No Redox encountered
2. PID = 1.0PPM at 2-ft intervals
3. Buried telephone pole at 12-in

TEST PIT NUMBER

TP 2

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**
LOCATION	Harry Lee Cole School, Boxford, MA			TP 2
CLIENT	Boxford, MA			GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	1/20/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE Not Observed

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
	

NOTES:

1. No Redox encountered
2. PID = 1.0PPM at 2-ft intervals
3. Buried telephone pole at 12-in

TEST PIT NUMBER

TP 2

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**
LOCATION	Harry Lee Cole School, Boxford, MA			TP 3
CLIENT	Boxford, MA			GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	1/19/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE Not Observed

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
55"	PavementFill 10% Gravel & 10% Cobbles
66"	Ab - Dark Brown Sandy Loam (10YR 3/3) 10% Gravel & 10% Cobbles
76"	Bw - Dark Yellowish Brown Sandy Loam (10YR 4/6) 10% Gravel & 10% Cobbles
90"	C1 - Brownish Yellow Loamy Sand (10YR 6/6) 5% Gravel & 5% Cobbles
	- End of Exploration -

NOTES:

1. No Redox encountered
2. PID = 0.0PPM

TEST PIT NUMBER
TP 3

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**
LOCATION	Harry Lee Cole School, Boxford, MA			TP 3
CLIENT	Boxford, MA			GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	1/19/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE Not Observed

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
	

NOTES:

1. No Redox encountered
2. PID = 0.0PPM

TEST PIT NUMBER
TP 3

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865		**TEST PIT NUMBER** TP 4
LOCATION	Harry Lee Cole School, Boxford, MA		
CLIENT	Boxford, MA		GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:	ELEVATION see plan
OBSERVED BY	K. Elmy	DATE 1/19/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE	SURFACE Not Observed

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
16"	Fill
20"	Ab - Dark Brown Sandy Loam (10YR 3/3) 10% Gravel & 10% Cobbles
25"	Bw - Dark Yellowish Brown Sandy Loam (10YR 4/4) 10% Gravel & 10% Cobbles
84"	C1 - Yellowish Brown Loamy Sand (10YR 5/6) 5% Gravel & 5% Cobbles
	- End of Exploration -

NOTES:

1. No Redox encountered
2. PID = 0.0PPM

TEST PIT NUMBER
TP 4

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG				
PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**
LOCATION	Harry Lee Cole School, Boxford, MA			TP 4
CLIENT	Boxford, MA			GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	1/19/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE Not Observed

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION

NOTES:

1. No Redox encountered
2. PID = 0.0PPM

TEST PIT NUMBER
TP 4

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**	
LOCATION	Harry Lee Cole School, Boxford, MA			TP 5	
CLIENT	Boxford, MA			GROUND SURFACE	
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION	see plan
OBSERVED BY	K. Elmy	DATE	1/19/21	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	Not Observed

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
22"	Fill 10% Gravel & 10% Cobbles
28"	Ab - Dark Brown Sandy Loam (10YR 3/3) 10% Gravel & 10% Cobbles
38"	Bw - Dark Yellowish Brown Sandy Loam (10YR 4/6) 10% Gravel & 10% Cobbles
72"	C1 - Brown Loamy Sand (10YR 5/3) 5% Gravel & 5% Cobbles
	- End of Exploration -

NOTES:

1. No Redox encountered
2. PID = 0.0PPM

TEST PIT NUMBER

TP 5

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**	
LOCATION	Harry Lee Cole School, Boxford, MA			TP 5	
CLIENT	Boxford, MA			GROUND SURFACE	
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION	see plan
OBSERVED BY	K. Elmy	DATE	1/19/21	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	Not Observed

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
	

NOTES:

1. No Redox encountered
2. PID = 0.0PPM

TEST PIT NUMBER
TP 5

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**
LOCATION	Harry Lee Cole School, Boxford, MA			TP 6
CLIENT	Boxford, MA			GROUND SURFACE
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION see plan
OBSERVED BY	K. Elmy	DATE	1/19/21	DEPTH TO GROUNDWATER BELOW
CHECKED BY		DATE		SURFACE 46-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
12"	Fill 10% Gravel & 10% Cobbles
20"	Ab - Dark Brown Sandy Loam (10YR 3/3) 10% Gravel & 10% Cobbles
27"	Bw - Dark Yellowish Brown Sandy Loam (10YR 4/6) 10% Gravel & 10% Cobbles
84"	C1 - Yellowish Brown Coarse Sand (10YR 5/4) 5% Gravel & 5% Cobbles
	- End of Exploration -

NOTES:

1. Redox encountered at 46-in
2. PID = 0.0PPM

TEST PIT NUMBER
TP 6

WESTON & SAMPSON ENGINEERS, INC.

TEST PIT LOG

PROJECT NAME/NO.	Harry Lee Cole School - ENG20-0865			**TEST PIT NUMBER**	
LOCATION	Harry Lee Cole School, Boxford, MA			TP 6	
CLIENT	Boxford, MA			GROUND SURFACE	
CONTRACTOR	RE Thompson	FOREMAN:		ELEVATION	see plan
OBSERVED BY	K. Elmy	DATE	1/19/21	DEPTH TO GROUNDWATER BELOW	
CHECKED BY		DATE		SURFACE	46-in

DEPTH BELOW GROUND SURFACE (in.)	TEST PIT DIAGRAM AND SOIL DESCRIPTION
	

NOTES:

1. Redox encountered at 46-in
2. PID = 0.0PPM

TEST PIT NUMBER
TP 6

WESTON & SAMPSON ENGINEERS, INC.

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

May 12, 2021

Boxford Conservation Commission
Town of Boxford
7A Spofford Road
Boxford, Massachusetts 01921

Re: Stormwater Infiltration
Spofford Pond and Harry Lee Cole Schools

Dear Conservation Commission Members:

During a site walk on April 13, 2021, the Boxford Conservation Commission requested a letter from a Licensed Site Professional (LSP) regarding stormwater infiltration at Spofford Pond and Harry Lee Cole School properties. Weston & Sampson prepared this letter based on historical information, environmental investigations performed at the schools in 2021, and on our experience addressing infiltration issues at contaminated sites in Massachusetts. A discussion of existing conditions, recent soil and groundwater sampling results, and an LSP Opinion regarding stormwater infiltration are provided below.

Spofford Pond School

This property contains an elementary school building, a water supply well, paved parking and playground areas, athletic fields, and undeveloped woodlands. Beyond the property are forested and residential land to the north, the closed Boxford Sanitary Landfill to the northeast, athletic fields to the east, a forested portion of the Boxford Municipal Complex property to the south, and Spofford Road to the west. Across Spofford Road lies the Spofford Pond and its associated wetlands. Properties across Spofford Road include both forested and residential land. These areas are shown on Figure 1 - Environmental Resource Map.

In January 2021, as part of the design for the Project, Weston & Sampson collected one (1) soil sample (a composite of 9 samples from 9 paved areas) for disposal characterization analyses at a state-certified analytical laboratory. The results indicated the presence of low concentrations of many contaminants , including arsenic, which was detected at 14 milligrams per kilogram (mg/kg) and the contaminant concentrations were below the applicable Massachusetts Department of Environmental Protection (MassDEP) Reportable Concentration (RCS-1) under the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. Weston & Sampson did not collect groundwater from the property during this investigation, but we understand groundwater at the property is impacted by arsenic, which is treated and tested regularly in accordance with the regulations. In addition, based on our review of groundwater data for the Town of Boxford Landfill, we understand elevated concentrations of arsenic have been detected in several monitoring wells at the landfill.

Harry Lee Cole School

This property contains an elementary school building, a water supply well, the Aaron Wood administrative offices, a historical one-room schoolhouse, paved parking and playground areas, and undeveloped woodlands. Outside of the property limits is a residential property to the north, the Town of Boxford Cargill athletic fields to the northeast, forested and residential land to the east, residential land to the south, and Middleton Road to the northwest. These areas are shown on Figure 2 – Environmental Resource Map.

Similar to the Spofford Pond School site, Weston & Sampson collected one (1) soil sample (composite of soil samples from 10 locations on the paved area) for disposal characterization analyses by a state-certified analytical laboratory. The results indicated the presence of low concentrations of several contaminants except for arsenic (25 mg/kg), which exceeded the MassDEP reportable concentration of 20 mg/kg.

To further assess the extent of arsenic contamination at the property, Weston & Sampson performed additional soil sampling in February and April 2021, and shallow groundwater sampling in April 2021. The soil sampling results, summarized in Table 1 and Figure 3, show arsenic concentrations in soil exceeding 20 mg/kg at most of the locations; however, low or background concentrations of arsenic were observed in the northwestern part of the property near B-HC-6. In addition, the results of April 2021 groundwater sampling shown in Table 2, and water supply well sampling results provided by the Tri-Town Union indicate arsenic has not been detected in water at the property.

LSP Opinion

Because of the presence of arsenic in soil and groundwater at the Spofford Pond School and in nearby properties, including the landfill, we do not recommend stormwater infiltration at the Spofford School property, as the infiltration could modify the groundwater flow directions and potentially re-direct contaminated groundwater to other properties. For the Harry Lee Cole School, based on the data collected (i.e., no arsenic detection in groundwater and low concentrations of arsenic in soil near B-HC-6), we do not have any reservations with stormwater infiltration, provided it is performed in front of the school near B-HC-6.

Should you have any questions or need additional information, please do not hesitate to contact me at (978) 532-1900 or bhuniap@wseinc.com.

Sincerely,

WESTON & SAMPSON ENGINEERS, INC.

P Bhunia

Prasanta K. Bhunia, Ph.D., LSP
Principal

Attachments: Figure 1 – Spofford Pond School Environmental Resource Map
Figure 2 – Harry Lee Cole School Environmental Resource Map
Figure 3 – Plan Showing Arsenic Concentrations Harry Lee Cole School
Table 1 – Arsenic in Soil Harry Lee Cole School
Table 2 – Groundwater Analytical Results Harry Lee Cole School

\\wse03.local\WSE\Projects\MA\Boxford MA\ENG20-0865 Cole and Spofford Schools Site\06 Submissions\02 Permitting Submissions\20210514 Revised ZBA & Con Com Submission\Infiltration Opinion Letter\Boxford 2021-05-10 Draft - Infiltration Letter to Con Com.docx

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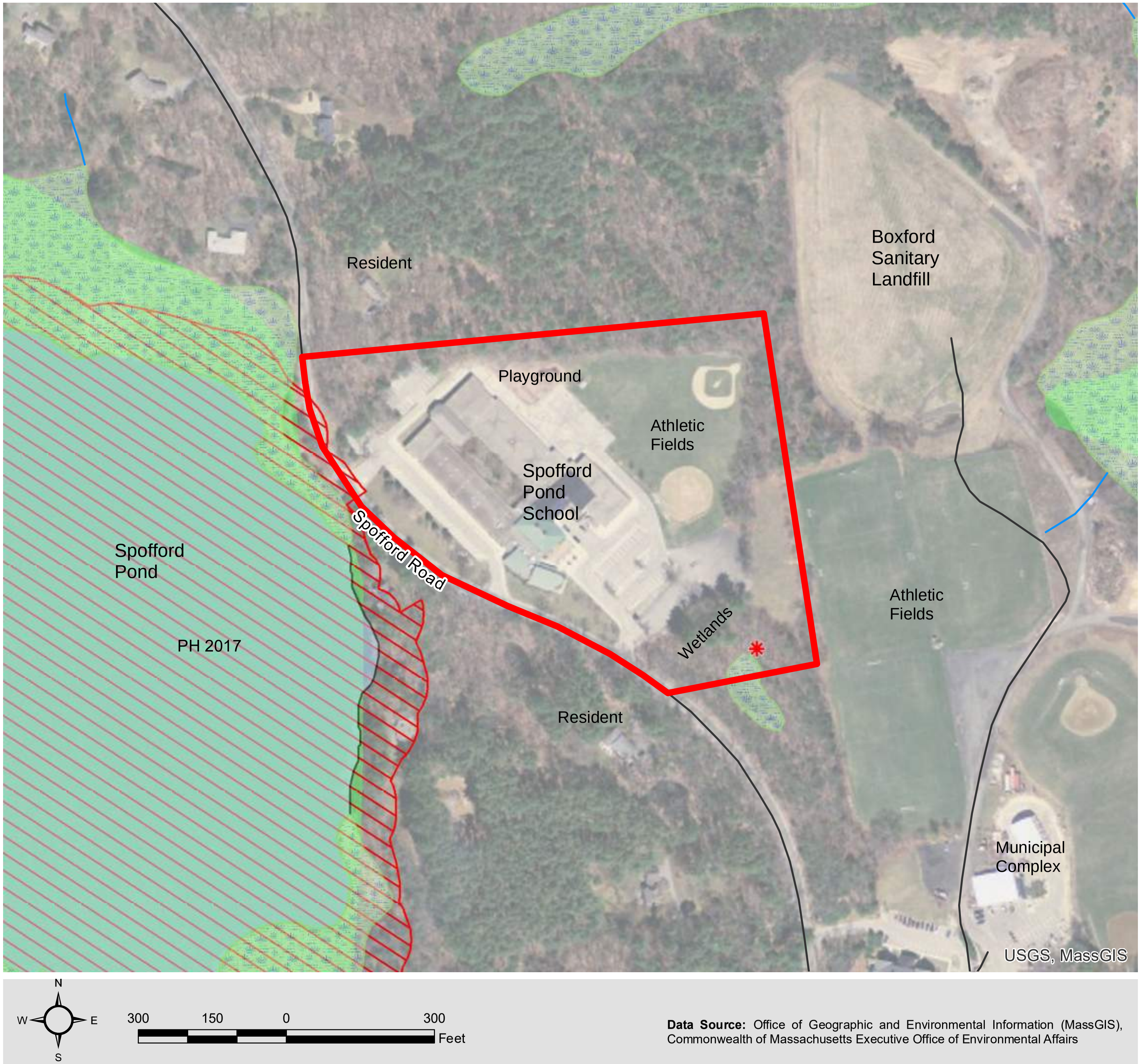


Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Spofford Pond School
- Hydrologic Connection
- Perennial Stream
- Intermittent Stream
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune

ACECs

- ACECs

NHESP Habitats

- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools

FEMA National Flood Hazard Layer

Flood Zone Designations

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- AH: 1% Annual Chance of 1-3ft Ponding, with BFE
- AO: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- VE: High Risk Coastal Area
- D: Possible But Undetermined Hazard
- X: 0.2% Annual Chance of Flooding
- X: Reduced Flood Risk due to Levee
- Area Not Included
- Area with no DFIRM - Paper FIRMs in Effect

Outstanding Resource Waters

- Public Water Supply Contributor
- ORW for ACEC
- ORW for both Water Supply and Other

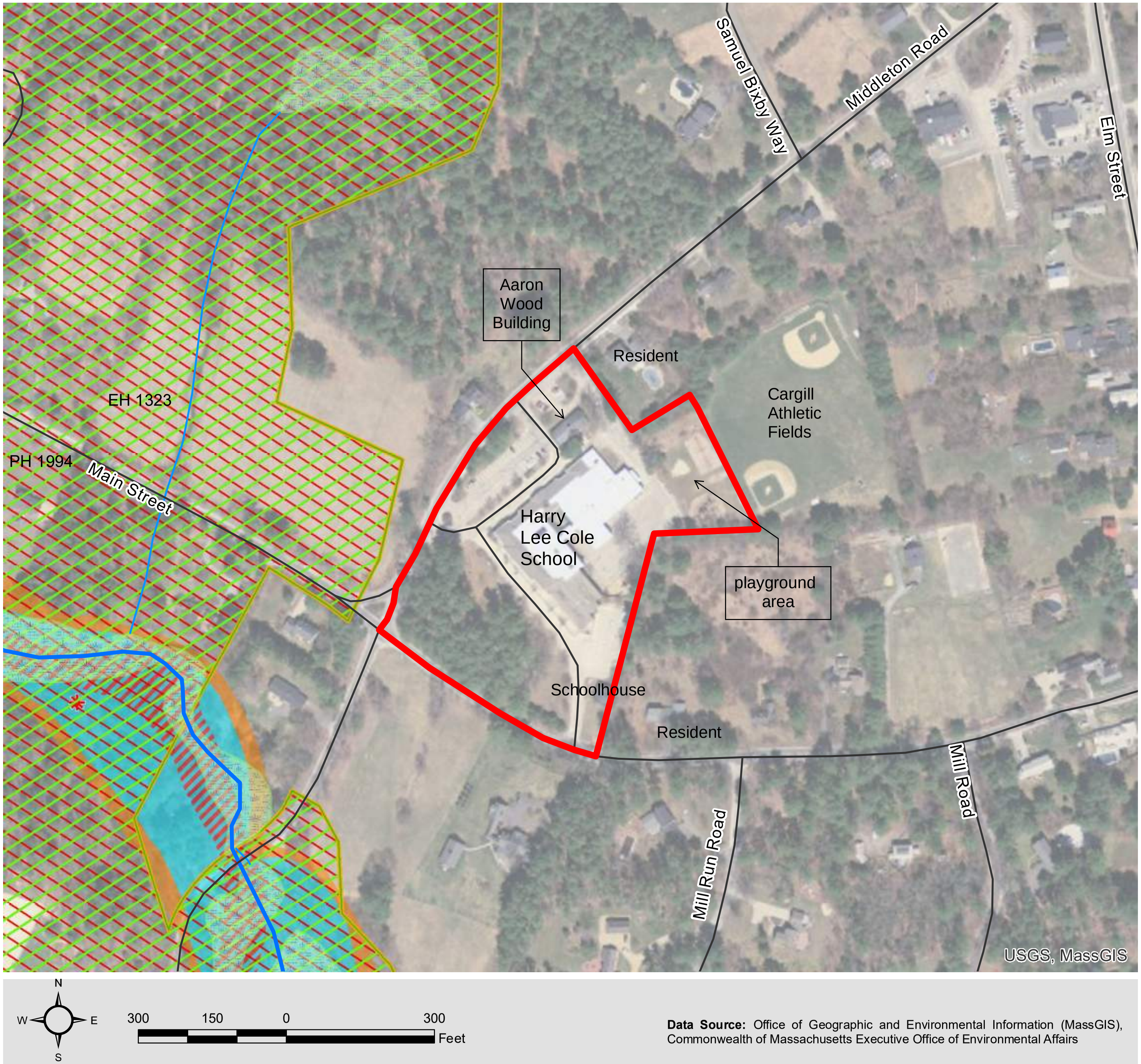
FIGURE 1

Spofford Pond School
Boxford, MA

Environmental
Resource Map

Weston & Sampson

<BOL>Path:</BOL> \\wse03.local\WSE\Depts\Water\Water Resources Group\GIS - Constraints Mapping\Boxford\Harry Lee Cole School & Spofford Pond School\26 Middleton Road\Environmental Receptor - MA.mxd <BOL>User:</BOL> GasparA <BOL>Saved:</BOL> 3/18/2020 8:37:24 AM <BOL>Opened:</BOL> 3/18/2020 8:37:48 AM



Data Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs

Legend

- Harry Lee Cole School
- Hydrologic Connection
- Perennial Stream
- Intermittent Stream
- Marsh/Bog
- Wooded marsh
- Cranberry Bog
- Salt Marsh
- Open Water
- Reservoir (with PWSID)
- Tidal Flats
- Beach/Dune

ACECs

- ACECs

NHESP Habitats

- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
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Flood Zone Designations

- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- AH: 1% Annual Chance of 1-3ft Ponding, with BFE
- AO: 1% Annual Chance of 1-3ft Sheet Flow Flooding, with Depth
- VE: High Risk Coastal Area
- D: Possible But Undetermined Hazard
- X: 0.2% Annual Chance of Flooding
- X: Reduced Flood Risk due to Levee
- Area Not Included
- Area with no DFIRM - Paper FIRMs in Effect

Outstanding Resource Waters

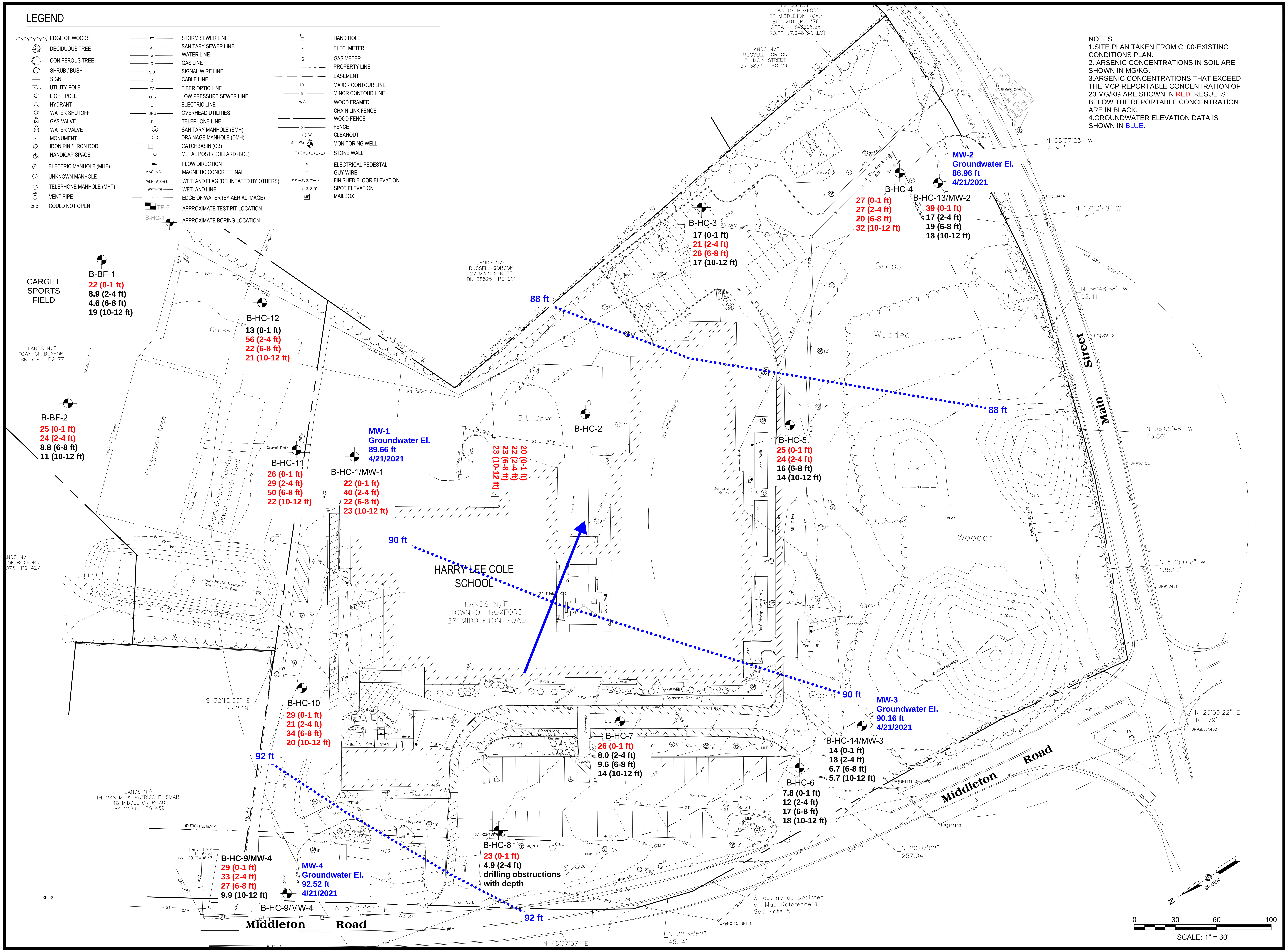
- Public Water Supply Contributor
- ORW for ACEC
- ORW for both Water Supply and Other

FIGURE 2

Harry Lee Cole School
Boxford, MA

Environmental Resource Map

Weston & Sampson



NOTES
1.SITE PLAN TAKEN FROM C100-EXISTING CONDITIONS PLAN.
2. ARSENIC CONCENTRATIONS IN SOIL ARE SHOWN IN MG/KG.
3.ARSENIC CONCENTRATIONS THAT EXCEED THE MCP REPORTABLE CONCENTRATION OF 20 MG/KG ARE SHOWN IN RED. RESULTS BELOW THE REPORTABLE CONCENTRATION ARE IN BLACK.
4.GROUNDWATER ELEVATION DATA IS SHOWN IN BLUE.

Project:
BOXFORD PUBLIC SCHOOLS SITE RENOVATION PROJECT

HARRY LEE COLE SCHOOL
26 MIDDLETON ROAD
BOXFORD, MA 01921

Weston & Sampson Engineers, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978.532.1900 800.SAMPSON
www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:
PERMITTING ONLY
NOT FOR CONSTRUCTION

Scale: AS SHOWN
Date: APRIL 7, 2021
Drawn By: EJA
Reviewed By: CB
Approved By: JIP
W&S Project No.: ENG20-0865
W&S File No.:

Drawing Title:
Figure 3
PLAN SHOWING ARSENIC CONCENTRATIONS

HARRY LEE COLE SCHOOL

Rev. 1.8 Date: 10/24/2019

Table 1
Arsenic Concentrations in Soil
2/18/2021 and 4/15-16/2021

Harry Lee Cole School
26 Middleton Road
Boxford, Massachusettts

Parameter	Sample depth (feet below pavement or ground)	MCP Reportable Concentration (RCS-1)	Comm 97 Levels for Soil Reuse		Sample Location and Concentration in mg/kg																
			Lined Landfill	Unlined Landfill	B-HC-1 /MW-1	B-HC-2	B-HC-3	B-HC-4		B-HC-5	B-HC-6	B-HC-7	B-HC-8	B-HC-9 /MW-4	B-HC-10	B-HC-11	B-HC-12	B-HC-13 /MW-2	B-HC-14 /MW-3	B-BF-1	B-BF-2
Arsenic	0 - 1	20	40	40	**22**	**20**	17	**27**	18	**25**	7.8	**26**	**23**	**29**	**29**	**26**	13	**39**	14	**22**	**25**
	2 - 4	20	40	40	**40**	**22**	**21**	**27**	~	**24**	12	8.0	4.9	**33**	**21**	**29**	**56**	17	18	8.9	**24**
	6 - 8	20	40	40	**22**	**23**	**26**	**20**	~	16	17	9.6	NA*	**27**	**34**	**50**	**22**	19	6.7	4.6	8.8
	10 - 12	20	40	40	**23**	**23**	17	**32**	~	14	18	14	NA*	9.9	**20**	**22**	**21**	18	5.7	19	11

NOTES:
1. MCP is the Massachusetts Contingency Plan, 310 CMR 40.0000
2. Concentrations at or above the Reportable Concentration (RCS-1) require 120-day notification to the MassDEP under the MCP.
3. Comm 97 levels are from MassDEP policy COMM-97-001, "Reuse and Disposal of Contaminated Soil at Massachusetts Landfills"
4. Samples B-HC-1 through B-HC-10 from 0-1 foot and 2-4 foot were collected on 2/18/2021. The remaining samples were collected on 4/15/2021 and 4/16/2021. "B-BF-#" samples were collected from the adjacent ballfield.
NA* Obstructions were encountered during drilling which prohibited sampling at these depths.
BOLD Results are equal to or greater than the MCP Reportable Concentration (RCS-1)

Table 2
Groundwater Analytical Results
April 21, 2021

Harry Lee Cole School
26 Middleton Road
Boxford, Massachusettts

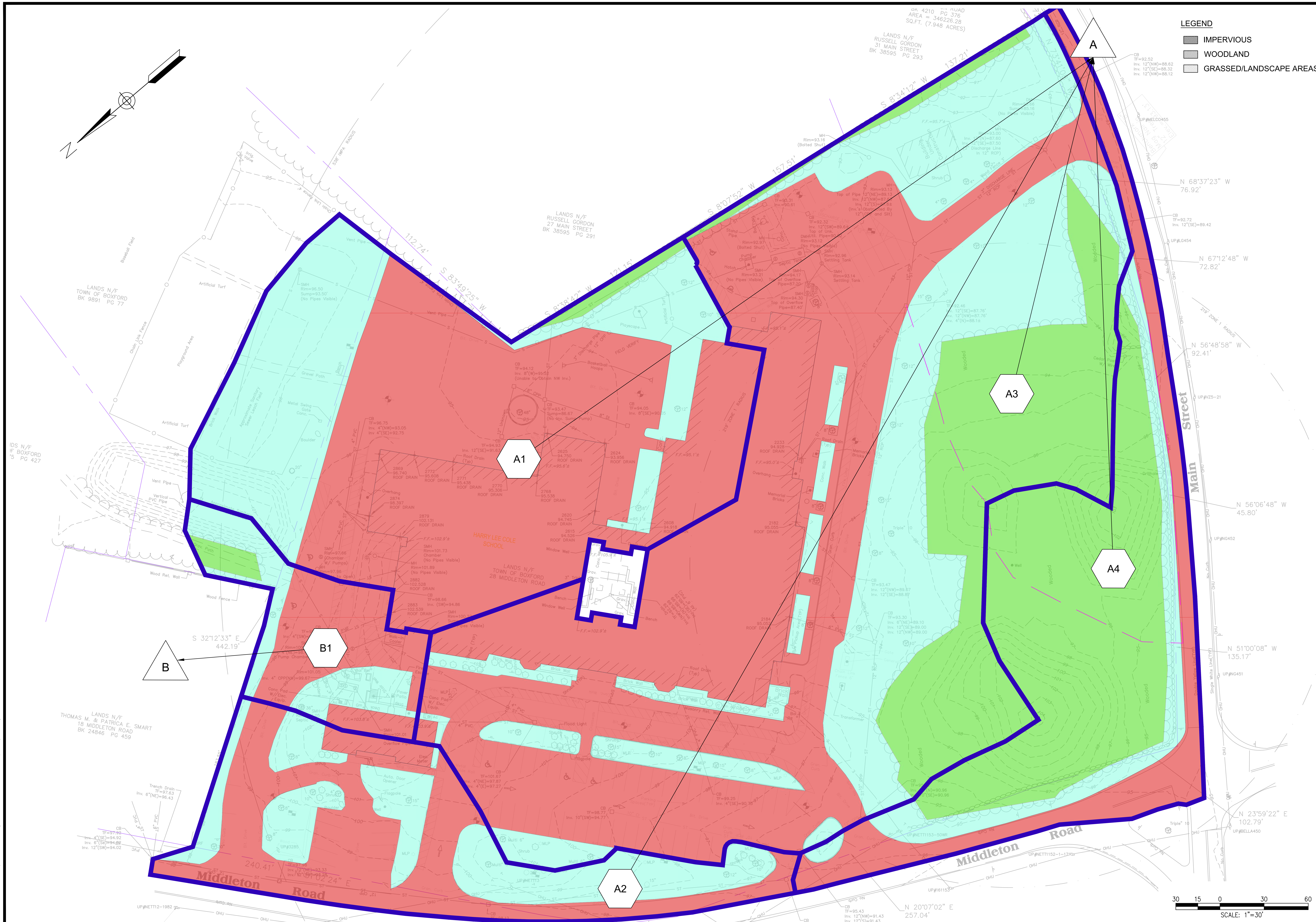
Parameter	Units	MCP Reportable Concentration		Sample Location			
		RCGW-1	RCGW-2	MW-1	MW-2	MW-3	MW-4
Dissolved Arsenic	ug/L	10	900	<0.80	<0.80	<0.80	<0.80

NOTES:
1. MCP is the Massachusetts Contingency Plan, 310 CMR 40.0000
2. Concentrations at or above the Reportable Concentration (RCGW-1 or RCGW-2) require 120-day notification to the MassDEP under the MCP.
3. Dissolved samples were field-filtered.
ug/L = micrograms per liter, or parts per billion

Attachment D - HydroCAD Reports

Harry Lee Cole School
Boxford, MA
Stormwater Discharge Summary Table
6-Oct-22

		Peak Discharge (cfs)		Runoff Volume (cf)	
Analysis Point	**24 Hr Storm**	**Pre**	**Post**	**Pre**	**Post**
A	2yr	6.62	5.42	24,565	21,916
	10yr	14.62	12.62	51,976	49,299
	25yr	20.67	18.12	73,078	70,545
	50yr	28.12	24.63	99,474	97,556
	100yr	35.17	33.17	124,811	123,662
B	2yr	0.45	0.03	1,425	182
	10yr	0.91	0.16	2,831	556
	25yr	1.25	0.27	3,872	882
	50yr	1.65	0.41	5,147	1,317
	100yr	2.02	0.56	6,351	1,752



Project:

BOXFORD PUBLIC SCHOOLS SITE RENOVATION PROJECT

TOWN OF BOXFORD, MA

Weston & Sampson

Weston & Sampson Engineers, Inc.
55 Walkers Brook Drive, Suite 100
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www.westonandsampson.com

Consultants:

Revisions:

No.	Date	Description
1	04/01/21	PER TOWN REVIEW
2	07/06/21	PER PEER REVIEW
3	08/24/21	PER REVISED LAYOUT

Seal:

Issued For:

PERMITTING
NOT FOR CONSTRUCTION

Scale: AS NOTED

Date: FEBRUARY 3, 2021

Drawn By: AKG

Reviewed By: JIP

Approved By: JRF

W&S Project No.: ENG20-0865

W&S File No.:

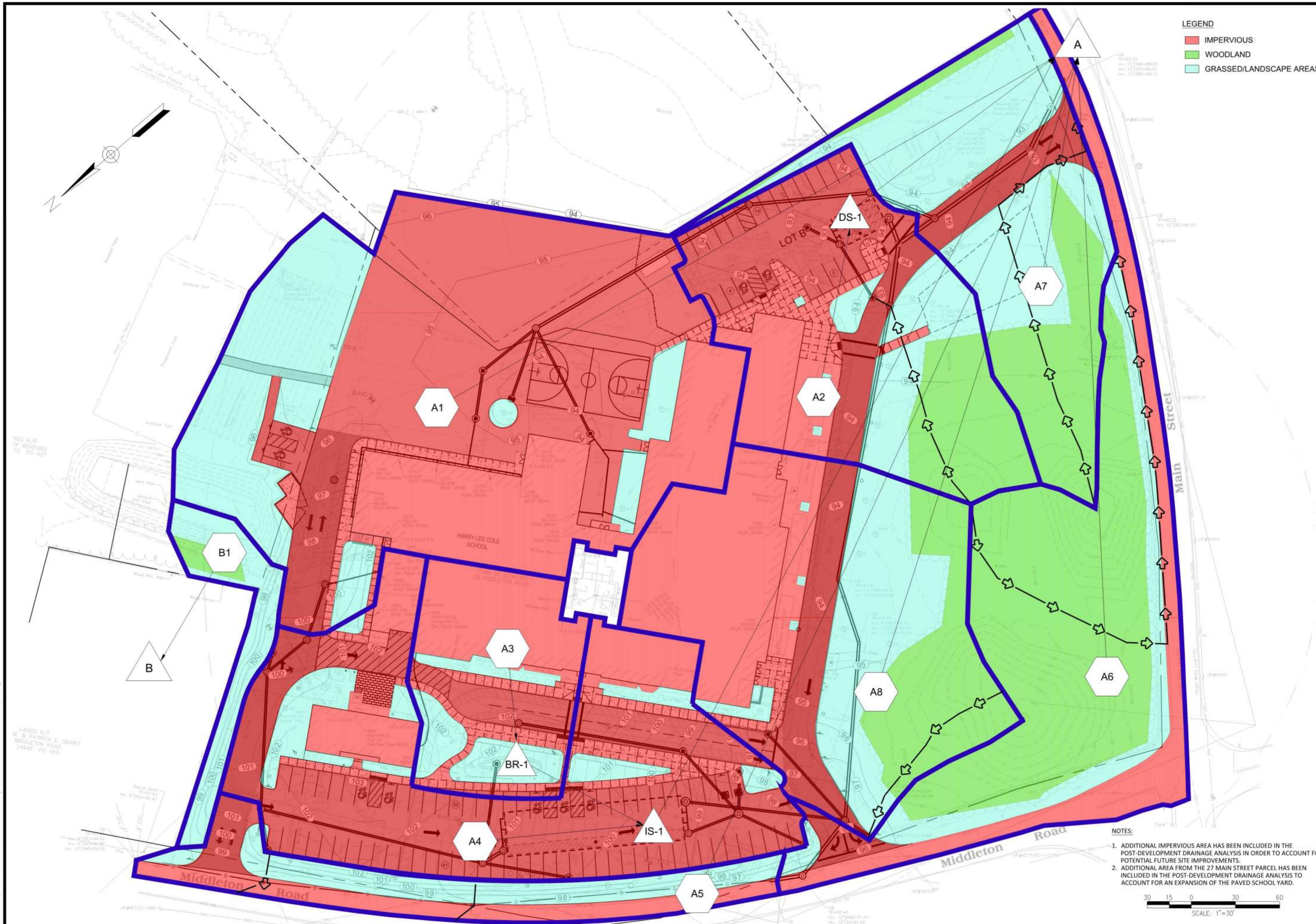
Drawing Title:

EXISTING HYDROLOGIC MAP

Sheet Number:

FIG-1

Rev. 1.6 Date: 10/24/2019



NOTES:

1. ADDITIONAL IMPERVIOUS AREA HAS BEEN INCLUDED IN THE POST-DEVELOPMENT DRAINAGE ANALYSIS IN ORDER TO ACCOUNT FOR POTENTIAL FUTURE SITE IMPROVEMENTS.
2. ADDITIONAL AREA FROM THE 27 MAIN STREET PARCEL HAS BEEN INCLUDED IN THE POST-DEVELOPMENT DRAINAGE ANALYSIS TO ACCOUNT FOR AN EXPANSION OF THE PAVED SCHOOL YARD.

Project:

BOXFORD PUBLIC SCHOOLS SITE RENOVATION PROJECT

TOWN OF BOXFORD INCORPORATED 1685 MASSACHUSETTS

TOWN OF BOXFORD, MA

Weston & Sampson

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Consultants:

Revisions:

No.	Date	Description
1	04/01/21	PER TOWN REVIEW
2	07/06/21	PER PEER REVIEW
3	08/24/21	PER REVISED LAYOUT
4	11/01/21	PER PEER REVIEW
5	10/06/22	PER REVISED LAYOUT

Seal:

Issued For:

PERMITTING NOT FOR CONSTRUCTION

Scale:	AS NOTED
Date:	FEBRUARY 3, 2021
Drawn By:	AKG
Reviewed By:	JIP
Approved By:	JRF
W&S Project No.:	ENG20-0865
W&S File No.:	

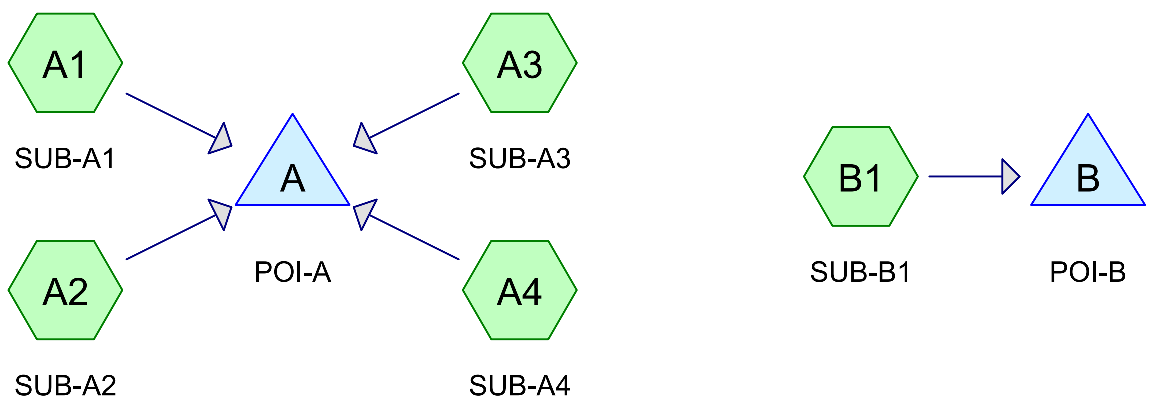
Drawing Title:

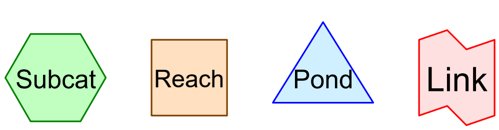
PROPOSED HYDROLOGIC MAP

Sheet Number:

FIG-2

Rev. 1.8 Date: 10/24/2019





Routing Diagram for Cole Pre-Development
Prepared by Weston & Sampson, Printed 4/6/2021
HydroCAD® 10.00-20 s/n 00455 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
34,624	39	>75% Grass cover, Good, HSG A (A2, A3, A4, B1)
56,036	61	>75% Grass cover, Good, HSG B (A1, A2, A3, A4, B1)
44,718	98	Paved Impervious, HSG A (A2, A3, A4)
65,943	98	Paved Impervious, HSG B (A1, A2, A3, A4, B1)
7,434	98	Roofs, HSG A (A2, A3, B1)
38,536	98	Roofs, HSG B (A1, A3)
33,603	30	Woods, Good, HSG A (A3, A4)
21,852	55	Woods, Good, HSG B (A1, A3, A4, B1)
302,746	**74**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
120,379	HSG A	A2, A3, A4, B1
182,367	HSG B	A1, A2, A3, A4, B1
0	HSG C	
0	HSG D	
0	Other	
302,746		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
34,624	56,036	0	0	0	90,660	>75% Grass cover, Good	
44,718	65,943	0	0	0	110,661	Paved Impervious	
7,434	38,536	0	0	0	45,970	Roofs	
33,603	21,852	0	0	0	55,455	Woods, Good	
120,379	**182,367**	**0**	**0**	**0**	**302,746**	**TOTAL AREA**	

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=70,293 sf 66.46% Impervious Runoff Depth=1.75"
Tc=6.0 min CN=86 Runoff=3.31 cfs 10,242 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,592 sf 58.29% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=75 Runoff=0.80 cfs 2,618 cf

SubcatchmentA3: SUB-A3 Runoff Area=144,484 sf 50.55% Impervious Runoff Depth=0.87"
Flow Length=152' Tc=9.3 min CN=72 Runoff=2.75 cfs 10,454 cf

SubcatchmentA4: SUB-A4 Runoff Area=44,474 sf 26.50% Impervious Runoff Depth=0.34"
Flow Length=463' Tc=12.7 min CN=59 Runoff=0.17 cfs 1,252 cf

SubcatchmentB1: SUB-B1 Runoff Area=12,903 sf 56.30% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=80 Runoff=0.45 cfs 1,425 cf

Pond A: POI-A Inflow=6.62 cfs 24,565 cf
Primary=6.62 cfs 24,565 cf

Pond B: POI-B Inflow=0.45 cfs 1,425 cf
Primary=0.45 cfs 1,425 cf

Total Runoff Area = 302,746 sf Runoff Volume = 25,991 cf Average Runoff Depth = 1.03"
48.26% Pervious = 146,115 sf 51.74% Impervious = 156,631 sf

Summary for Subcatchment A1: SUB-A1

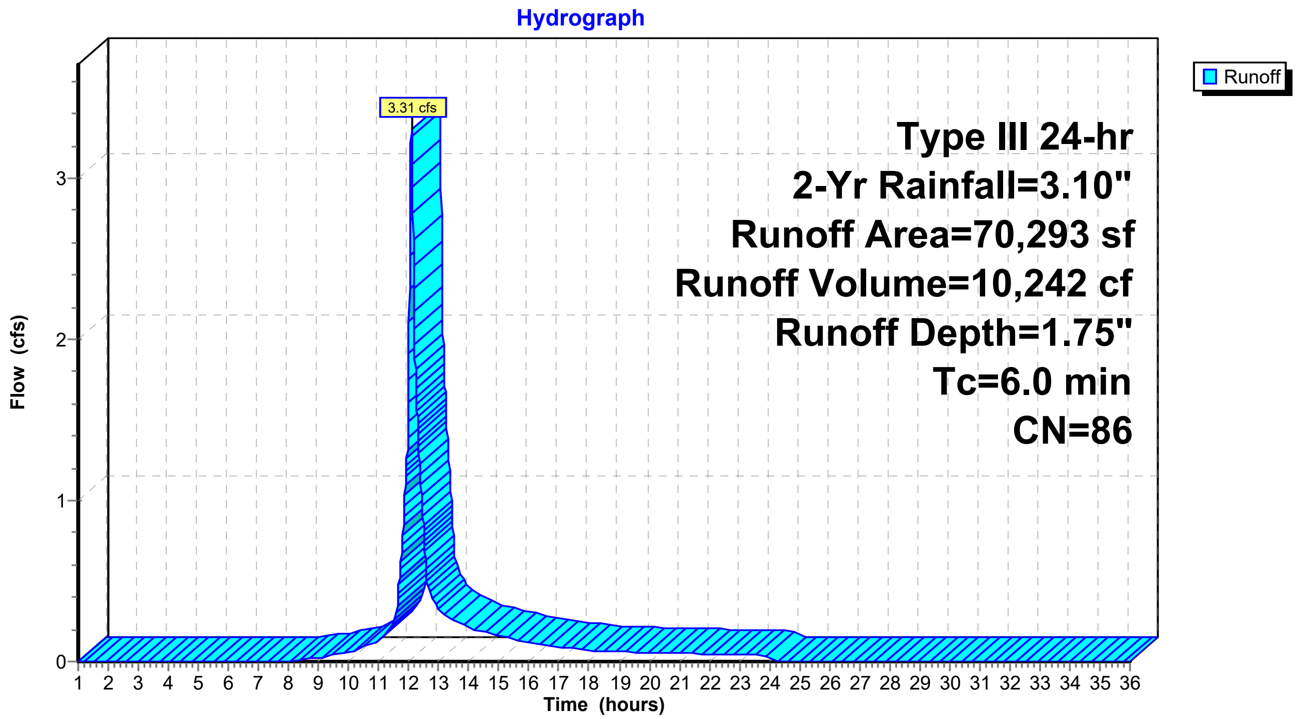
Runoff = 3.31 cfs @ 12.09 hrs, Volume= 10,242 cf, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.10"

	Area (sf)	CN	Description
*	25,439	98	Paved Impervious, HSG B
	21,280	98	Roofs, HSG B
	22,661	61	>75% Grass cover, Good, HSG B
	913	55	Woods, Good, HSG B
	70,293	86	Weighted Average
	23,574		33.54% Pervious Area
	46,719		66.46% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

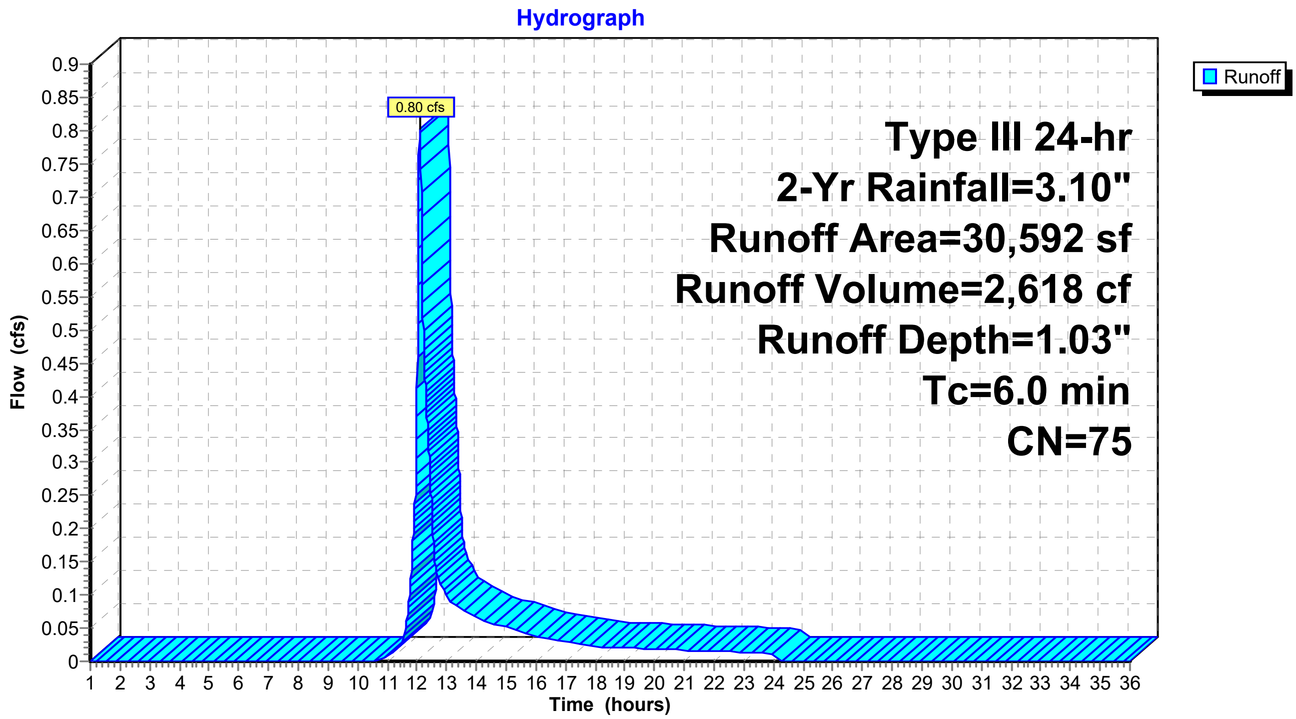
Runoff = 0.80 cfs @ 12.10 hrs, Volume= 2,618 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.10"

	Area (sf)	CN	Description
*	14,124	98	Paved Impervious, HSG A
*	2,639	98	Paved Impervious, HSG B
	1,068	98	Roofs, HSG A
	11,139	39	>75% Grass cover, Good, HSG A
	1,622	61	>75% Grass cover, Good, HSG B
	30,592	75	Weighted Average
	12,761		41.71% Pervious Area
	17,831		58.29% Impervious Area

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

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

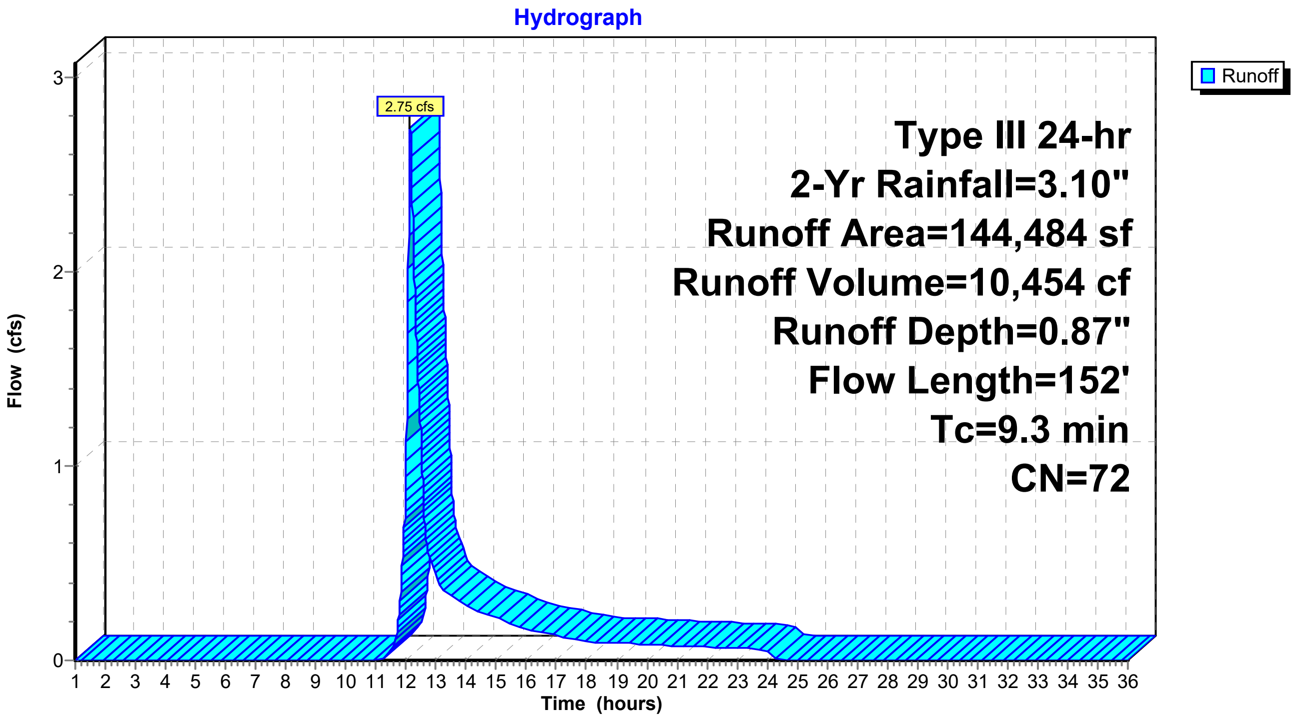
Runoff = 2.75 cfs @ 12.14 hrs, Volume= 10,454 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.10"

	Area (sf)	CN	Description
*	26,940	98	Paved Impervious, HSG A
*	23,438	98	Paved Impervious, HSG B
	20,776	39	>75% Grass cover, Good, HSG A
	23,581	61	>75% Grass cover, Good, HSG B
	19,969	30	Woods, Good, HSG A
	7,127	55	Woods, Good, HSG B
	5,397	98	Roofs, HSG A
	17,256	98	Roofs, HSG B
	144,484	72	Weighted Average
	71,453		49.45% Pervious Area
	73,031		50.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	41	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	61	0.0340	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.3	152	Total			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

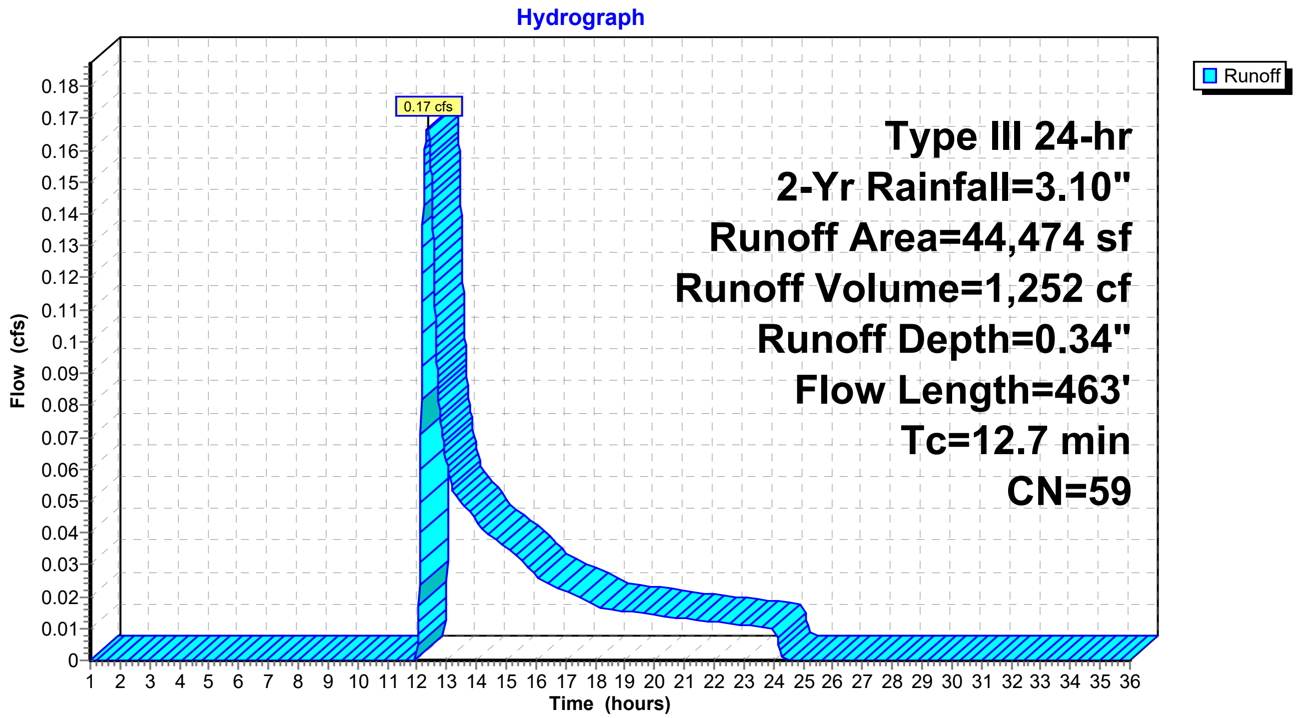
Runoff = 0.17 cfs @ 12.35 hrs, Volume= 1,252 cf, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.10"

	Area (sf)	CN	Description
*	3,654	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	2,071	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	13,634	30	Woods, Good, HSG A
	13,023	55	Woods, Good, HSG B
	44,474	59	Weighted Average
	32,688		73.50% Pervious Area
	11,786		26.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

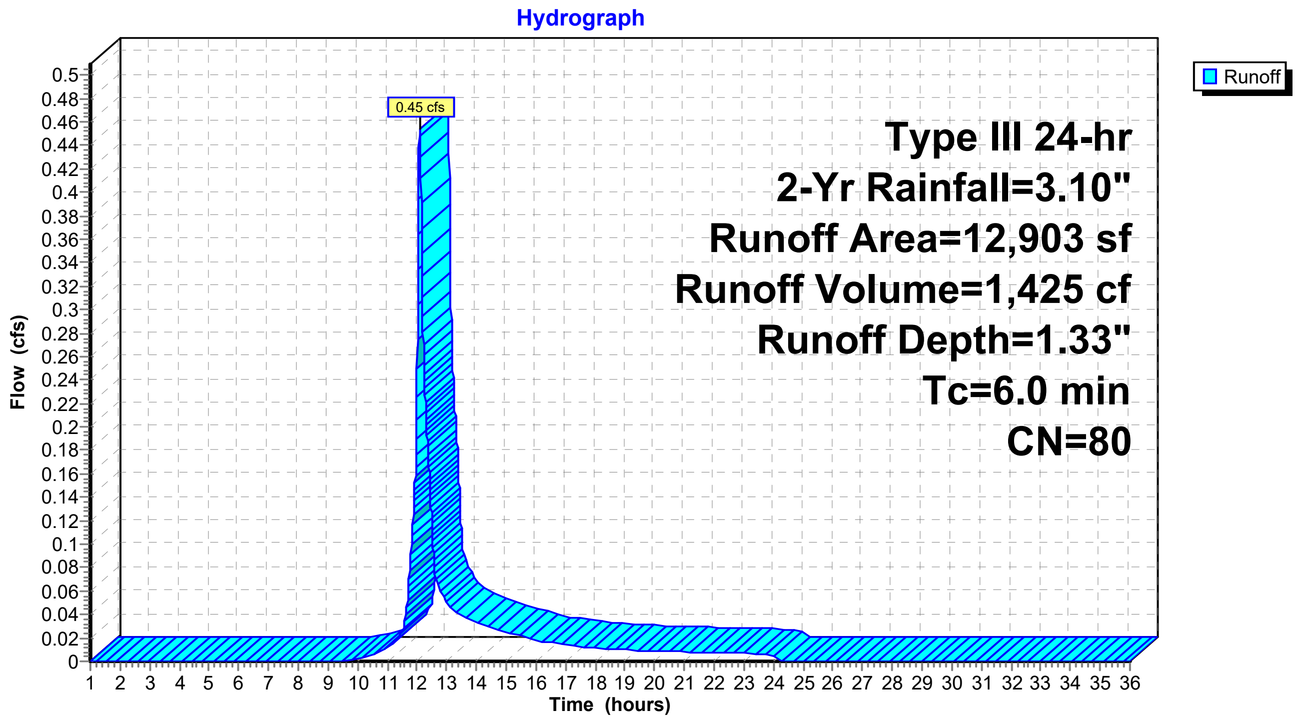
Runoff = 0.45 cfs @ 12.09 hrs, Volume= 1,425 cf, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.10"

	Area (sf)	CN	Description
*	6,295	98	Paved Impervious, HSG B
	969	98	Roofs, HSG A
	638	39	>75% Grass cover, Good, HSG A
	4,212	61	>75% Grass cover, Good, HSG B
	789	55	Woods, Good, HSG B
	12,903	80	Weighted Average
	5,639		43.70% Pervious Area
	7,264		56.30% Impervious Area

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

Subcatchment B1: SUB-B1

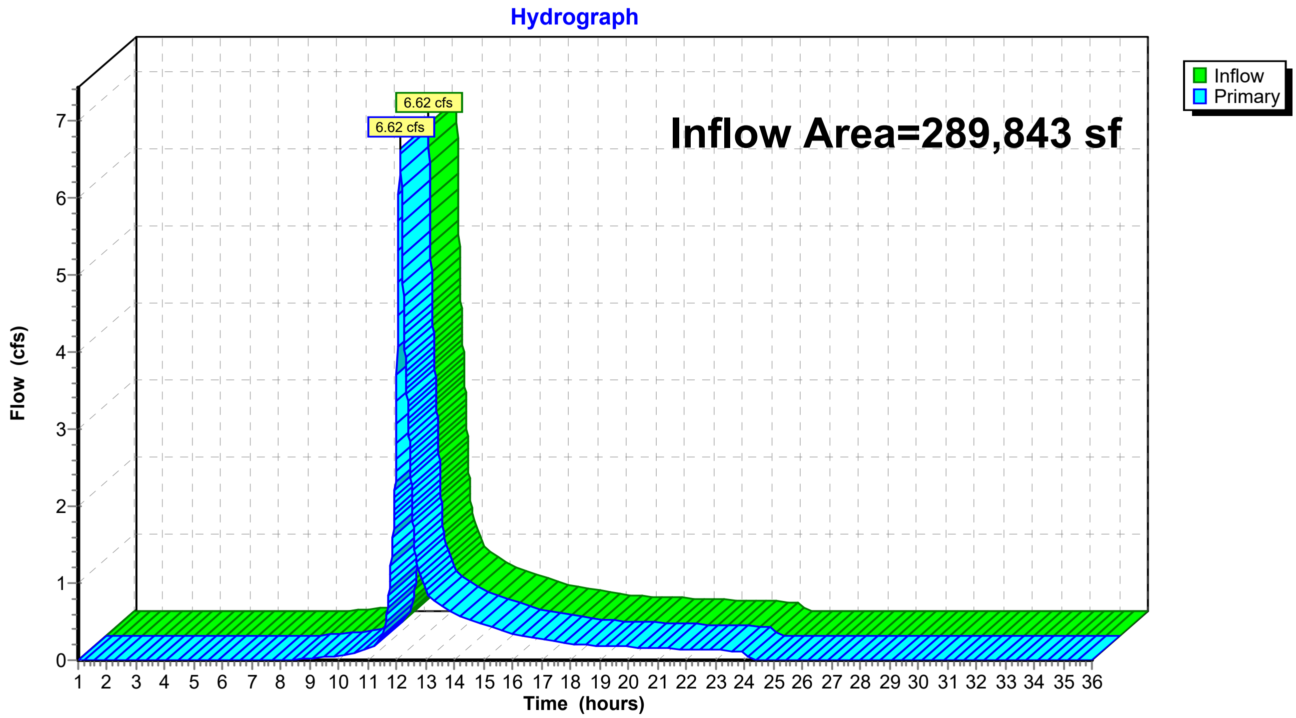


Summary for Pond A: POI-A

Inflow Area = 289,843 sf, 51.53% Impervious, Inflow Depth = 1.02" for 2-Yr event
Inflow = 6.62 cfs @ 12.11 hrs, Volume= 24,565 cf
Primary = 6.62 cfs @ 12.11 hrs, Volume= 24,565 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

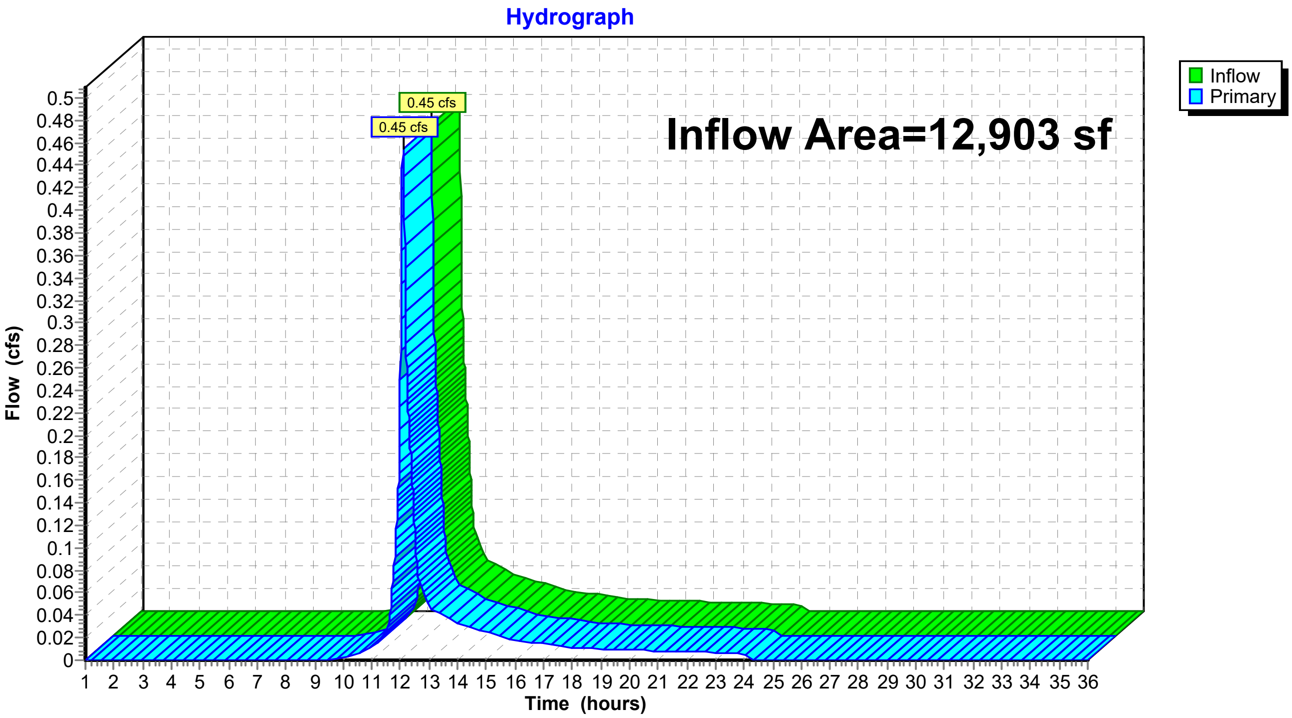


Summary for Pond B: POI-B

Inflow Area = 12,903 sf, 56.30% Impervious, Inflow Depth = 1.33" for 2-Yr event
Inflow = 0.45 cfs @ 12.09 hrs, Volume= 1,425 cf
Primary = 0.45 cfs @ 12.09 hrs, Volume= 1,425 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=70,293 sf 66.46% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=86 Runoff=5.97 cfs 18,675 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,592 sf 58.29% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=75 Runoff=1.81 cfs 5,630 cf

SubcatchmentA3: SUB-A3 Runoff Area=144,484 sf 50.55% Impervious Runoff Depth=1.97"
Flow Length=152' Tc=9.3 min CN=72 Runoff=6.73 cfs 23,713 cf

SubcatchmentA4: SUB-A4 Runoff Area=44,474 sf 26.50% Impervious Runoff Depth=1.07"
Flow Length=463' Tc=12.7 min CN=59 Runoff=0.87 cfs 3,958 cf

SubcatchmentB1: SUB-B1 Runoff Area=12,903 sf 56.30% Impervious Runoff Depth=2.63"
Tc=6.0 min CN=80 Runoff=0.91 cfs 2,831 cf

Pond A: POI-A Inflow=14.62 cfs 51,976 cf
Primary=14.62 cfs 51,976 cf

Pond B: POI-B Inflow=0.91 cfs 2,831 cf
Primary=0.91 cfs 2,831 cf

Total Runoff Area = 302,746 sf Runoff Volume = 54,807 cf Average Runoff Depth = 2.17"
48.26% Pervious = 146,115 sf 51.74% Impervious = 156,631 sf

Summary for Subcatchment A1: SUB-A1

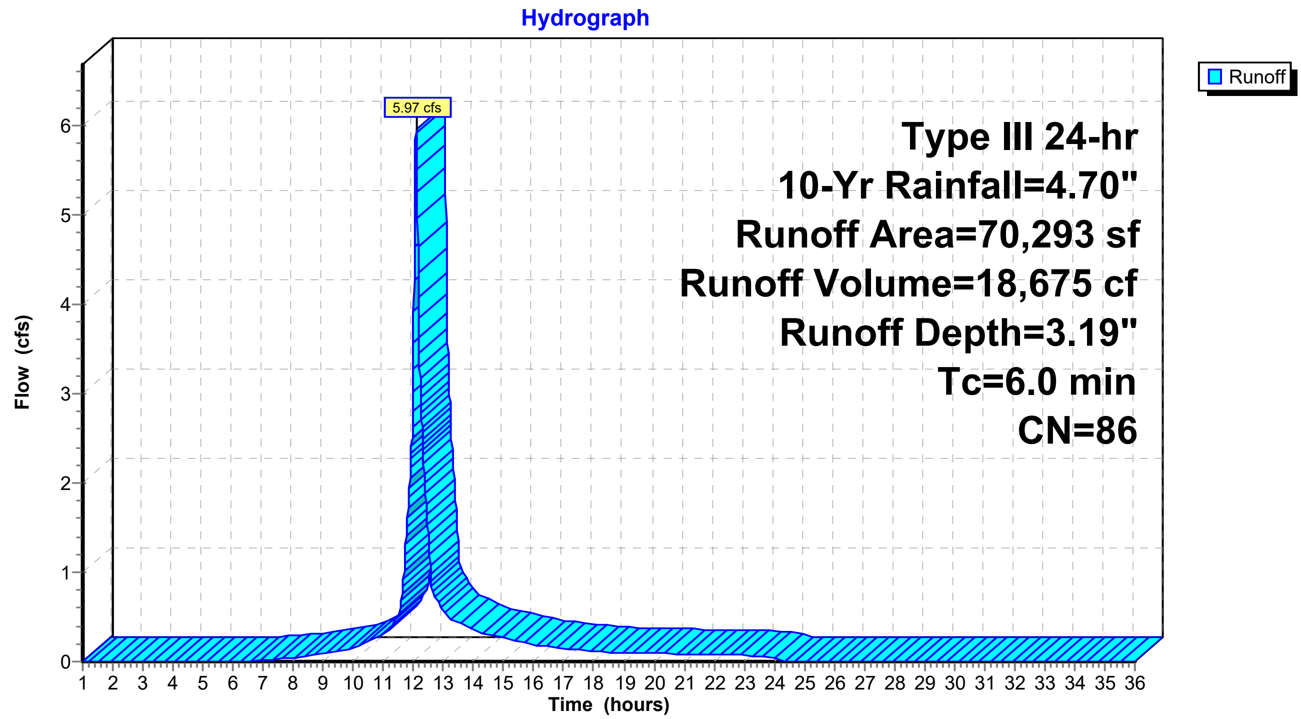
Runoff = 5.97 cfs @ 12.09 hrs, Volume= 18,675 cf, Depth= 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.70"

	Area (sf)	CN	Description
*	25,439	98	Paved Impervious, HSG B
	21,280	98	Roofs, HSG B
	22,661	61	>75% Grass cover, Good, HSG B
	913	55	Woods, Good, HSG B
	70,293	86	Weighted Average
	23,574		33.54% Pervious Area
	46,719		66.46% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

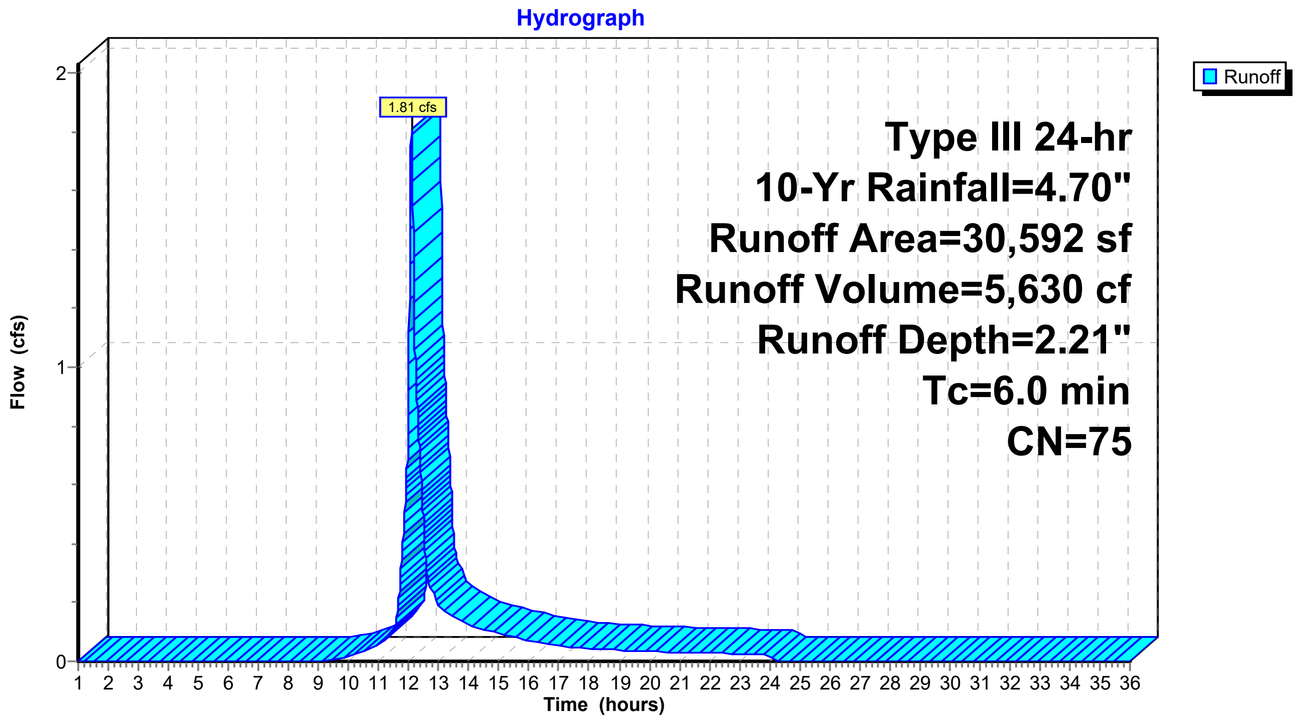
Runoff = 1.81 cfs @ 12.09 hrs, Volume= 5,630 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.70"

	Area (sf)	CN	Description
*	14,124	98	Paved Impervious, HSG A
*	2,639	98	Paved Impervious, HSG B
	1,068	98	Roofs, HSG A
	11,139	39	>75% Grass cover, Good, HSG A
	1,622	61	>75% Grass cover, Good, HSG B
	30,592	75	Weighted Average
	12,761		41.71% Pervious Area
	17,831		58.29% Impervious Area

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

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

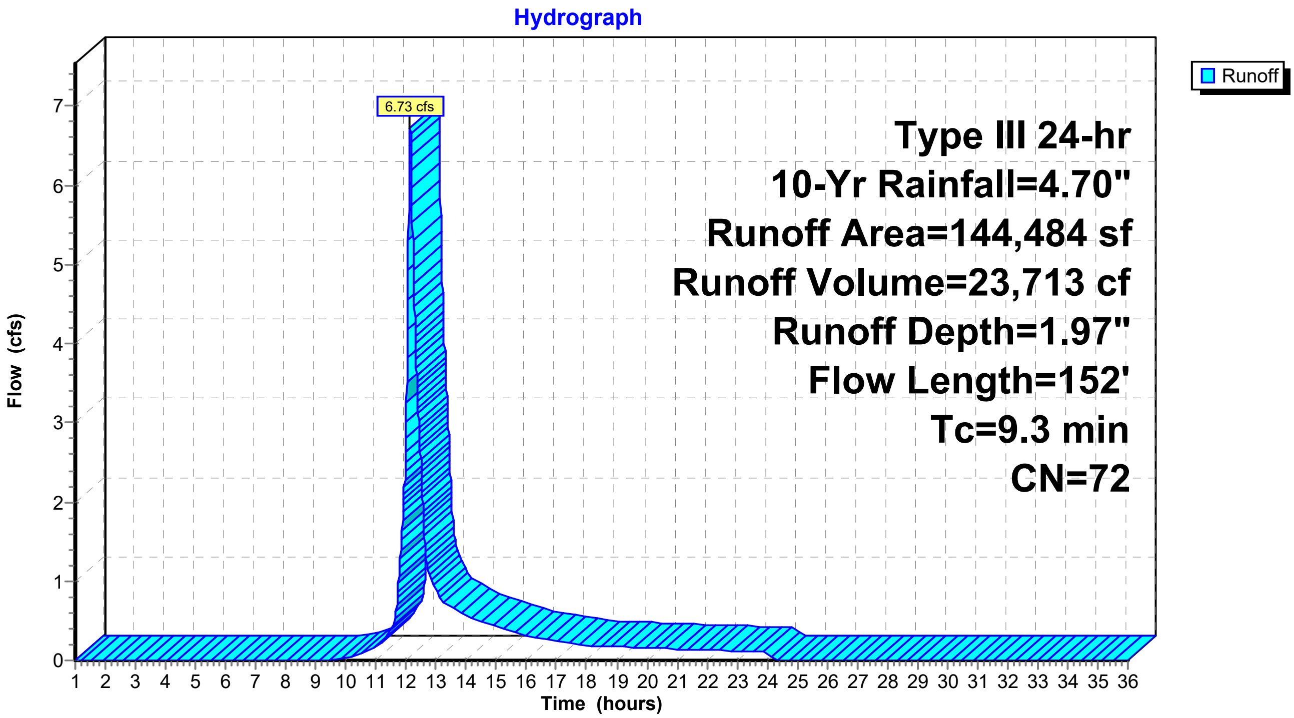
Runoff = 6.73 cfs @ 12.14 hrs, Volume= 23,713 cf, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.70"

	Area (sf)	CN	Description
*	26,940	98	Paved Impervious, HSG A
*	23,438	98	Paved Impervious, HSG B
	20,776	39	>75% Grass cover, Good, HSG A
	23,581	61	>75% Grass cover, Good, HSG B
	19,969	30	Woods, Good, HSG A
	7,127	55	Woods, Good, HSG B
	5,397	98	Roofs, HSG A
	17,256	98	Roofs, HSG B
	144,484	72	Weighted Average
	71,453		49.45% Pervious Area
	73,031		50.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	41	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	61	0.0340	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.3	152	Total			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

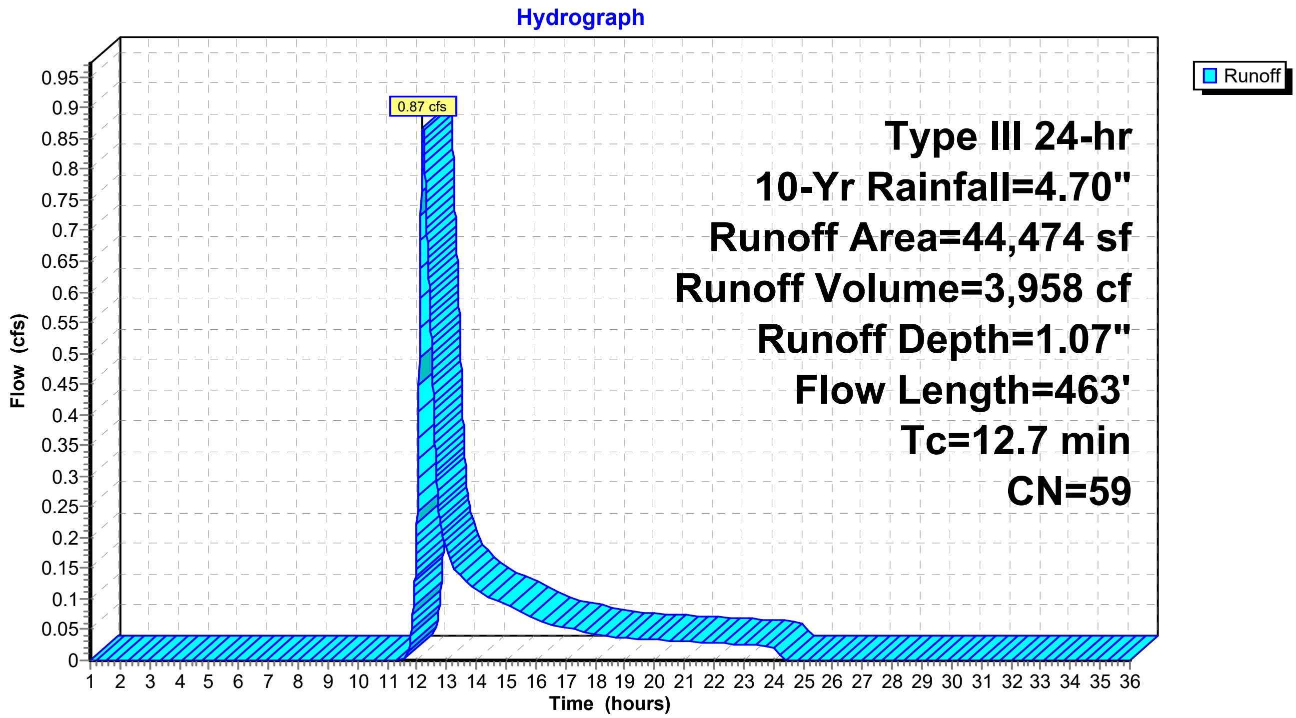
Runoff = 0.87 cfs @ 12.20 hrs, Volume= 3,958 cf, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.70"

	Area (sf)	CN	Description
*	3,654	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	2,071	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	13,634	30	Woods, Good, HSG A
	13,023	55	Woods, Good, HSG B
	44,474	59	Weighted Average
	32,688		73.50% Pervious Area
	11,786		26.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

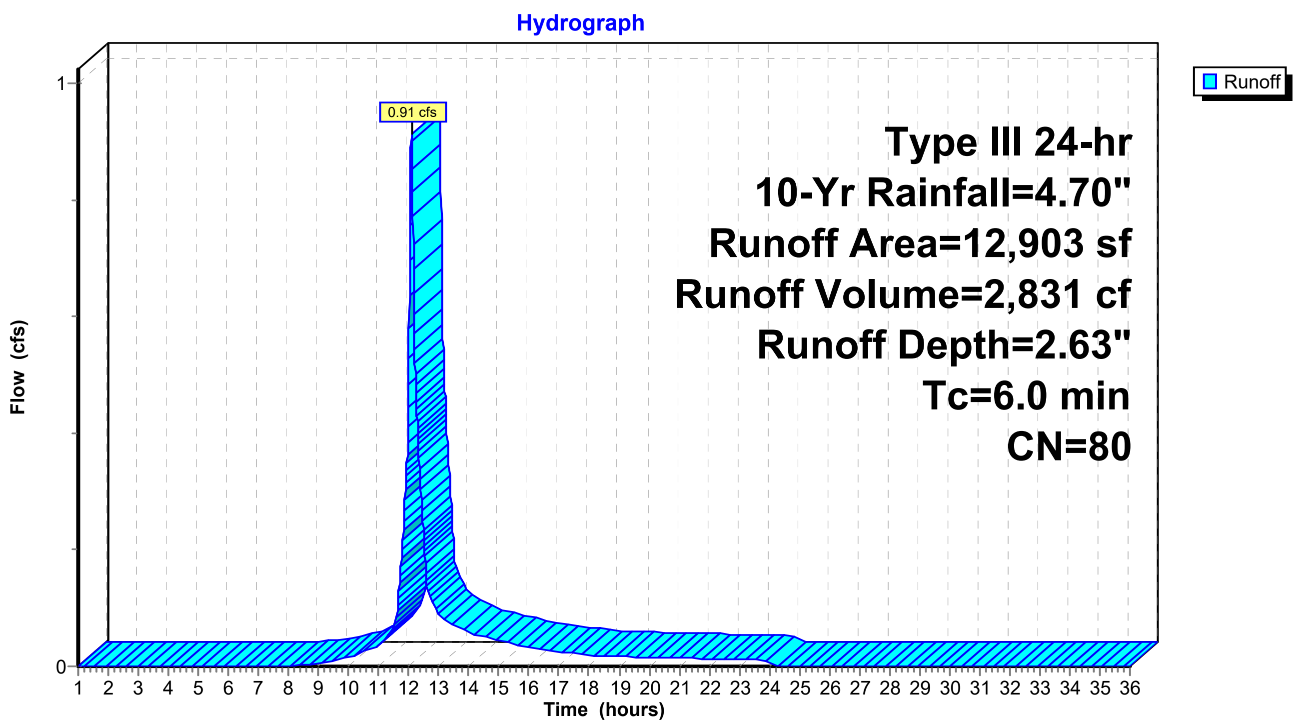
Runoff = 0.91 cfs @ 12.09 hrs, Volume= 2,831 cf, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Yr Rainfall=4.70"

	Area (sf)	CN	Description
*	6,295	98	Paved Impervious, HSG B
	969	98	Roofs, HSG A
	638	39	>75% Grass cover, Good, HSG A
	4,212	61	>75% Grass cover, Good, HSG B
	789	55	Woods, Good, HSG B
	12,903	80	Weighted Average
	5,639		43.70% Pervious Area
	7,264		56.30% Impervious Area

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

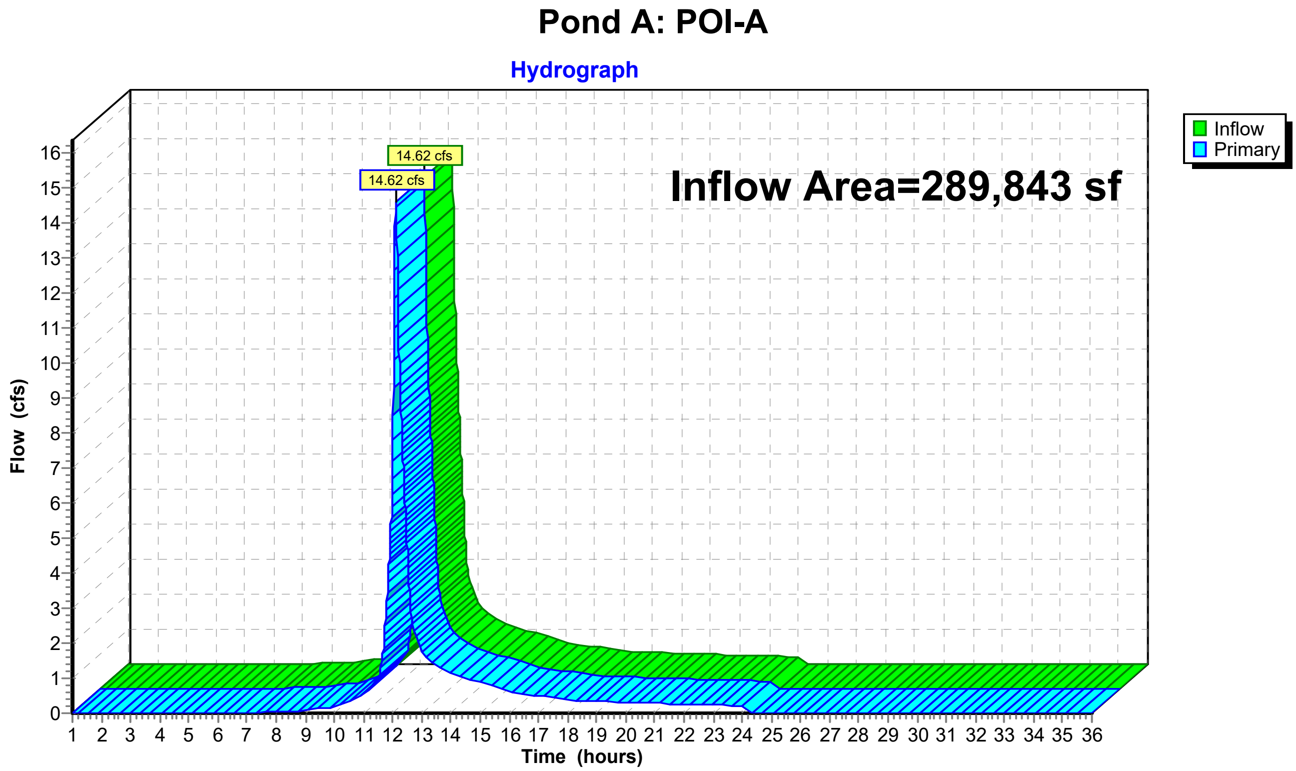
Subcatchment B1: SUB-B1



Summary for Pond A: POI-A

Inflow Area = 289,843 sf, 51.53% Impervious, Inflow Depth = 2.15" for 10-Yr event
Inflow = 14.62 cfs @ 12.11 hrs, Volume= 51,976 cf
Primary = 14.62 cfs @ 12.11 hrs, Volume= 51,976 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

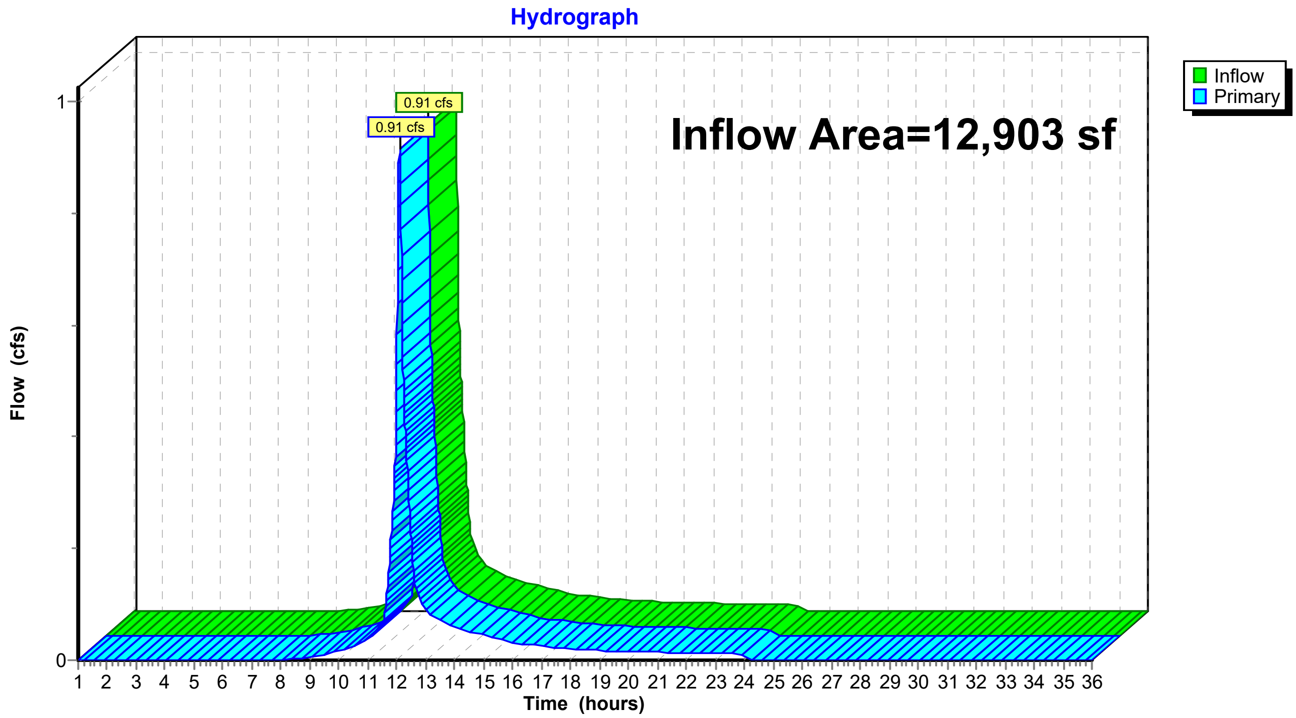


Summary for Pond B: POI-B

Inflow Area = 12,903 sf, 56.30% Impervious, Inflow Depth = 2.63" for 10-Yr event
Inflow = 0.91 cfs @ 12.09 hrs, Volume= 2,831 cf
Primary = 0.91 cfs @ 12.09 hrs, Volume= 2,831 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=70,293 sf 66.46% Impervious Runoff Depth=4.22"
Tc=6.0 min CN=86 Runoff=7.81 cfs 24,718 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,592 sf 58.29% Impervious Runoff Depth=3.11"
Tc=6.0 min CN=75 Runoff=2.56 cfs 7,934 cf

SubcatchmentA3: SUB-A3 Runoff Area=144,484 sf 50.55% Impervious Runoff Depth=2.83"
Flow Length=152' Tc=9.3 min CN=72 Runoff=9.79 cfs 34,080 cf

SubcatchmentA4: SUB-A4 Runoff Area=44,474 sf 26.50% Impervious Runoff Depth=1.71"
Flow Length=463' Tc=12.7 min CN=59 Runoff=1.52 cfs 6,346 cf

SubcatchmentB1: SUB-B1 Runoff Area=12,903 sf 56.30% Impervious Runoff Depth=3.60"
Tc=6.0 min CN=80 Runoff=1.25 cfs 3,872 cf

Pond A: POI-A Inflow=20.67 cfs 73,078 cf
Primary=20.67 cfs 73,078 cf

Pond B: POI-B Inflow=1.25 cfs 3,872 cf
Primary=1.25 cfs 3,872 cf

Total Runoff Area = 302,746 sf Runoff Volume = 76,950 cf Average Runoff Depth = 3.05"
48.26% Pervious = 146,115 sf 51.74% Impervious = 156,631 sf

Summary for Subcatchment A1: SUB-A1

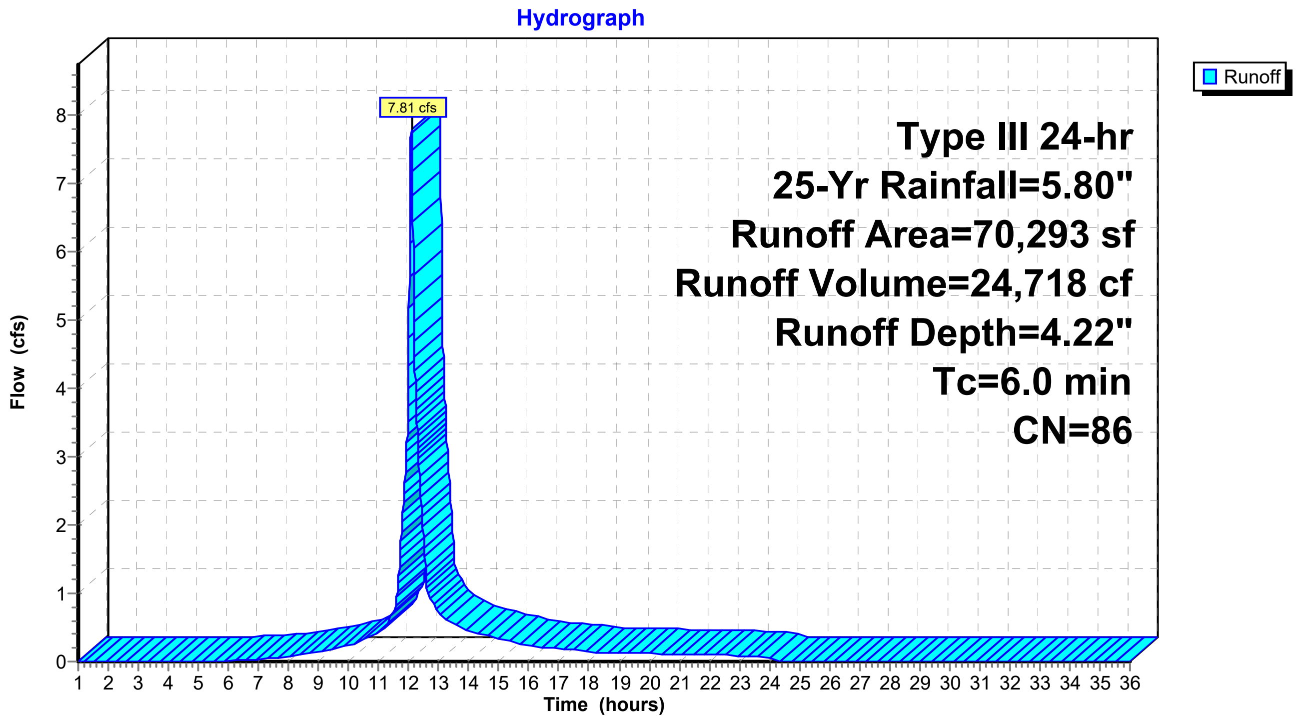
Runoff = 7.81 cfs @ 12.09 hrs, Volume= 24,718 cf, Depth= 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.80"

	Area (sf)	CN	Description
*	25,439	98	Paved Impervious, HSG B
	21,280	98	Roofs, HSG B
	22,661	61	>75% Grass cover, Good, HSG B
	913	55	Woods, Good, HSG B
	70,293	86	Weighted Average
	23,574		33.54% Pervious Area
	46,719		66.46% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

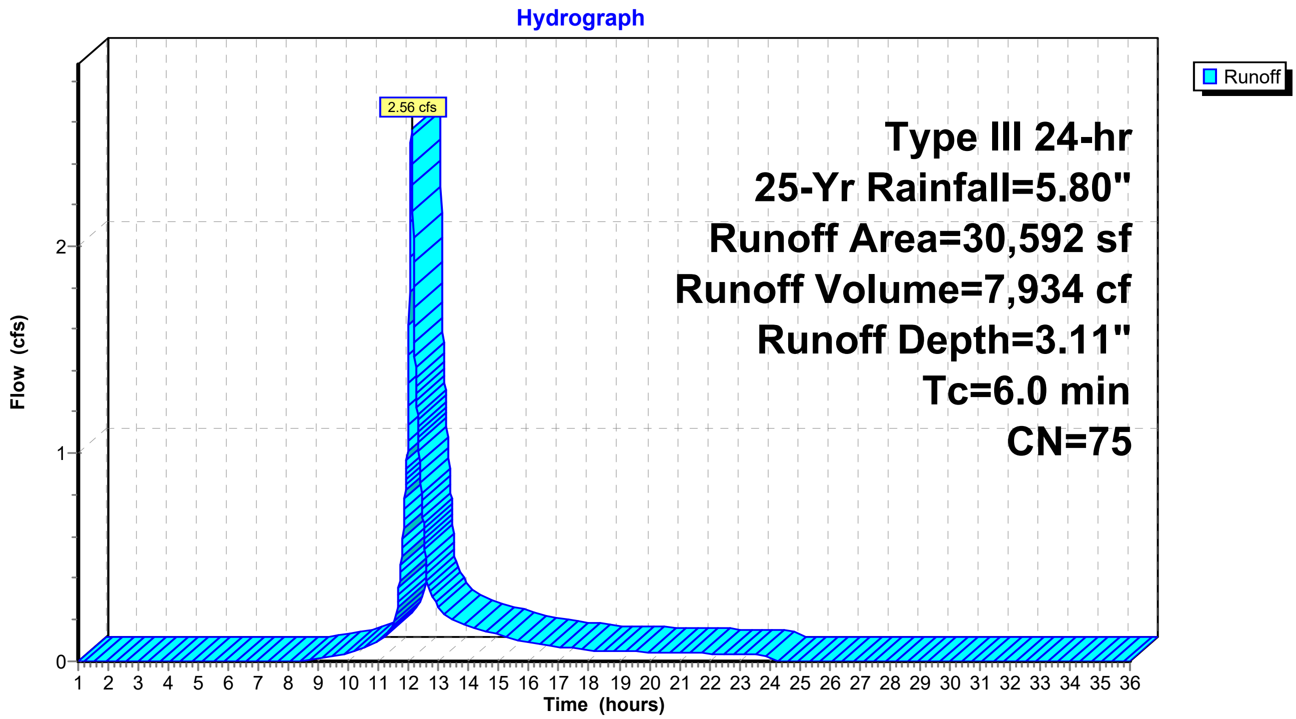
Runoff = 2.56 cfs @ 12.09 hrs, Volume= 7,934 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.80"

	Area (sf)	CN	Description
*	14,124	98	Paved Impervious, HSG A
*	2,639	98	Paved Impervious, HSG B
	1,068	98	Roofs, HSG A
	11,139	39	>75% Grass cover, Good, HSG A
	1,622	61	>75% Grass cover, Good, HSG B
	30,592	75	Weighted Average
	12,761		41.71% Pervious Area
	17,831		58.29% Impervious Area

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

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

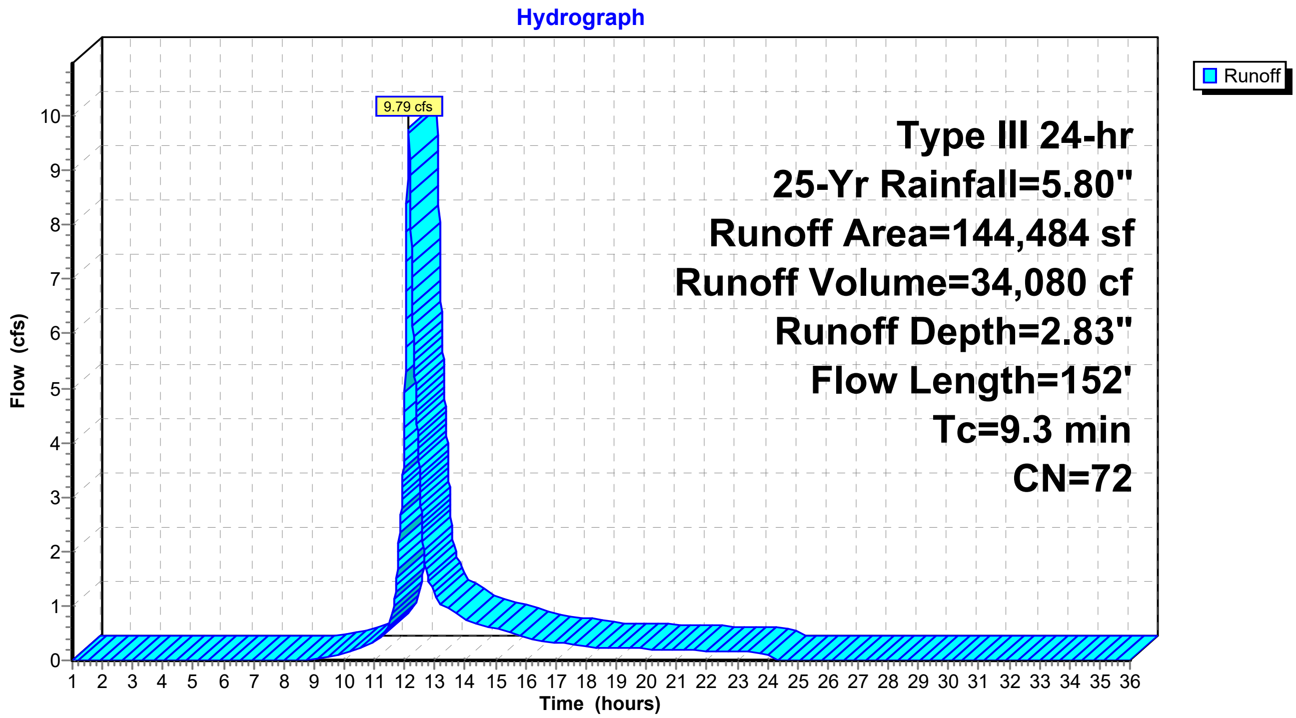
Runoff = 9.79 cfs @ 12.13 hrs, Volume= 34,080 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.80"

	Area (sf)	CN	Description
*	26,940	98	Paved Impervious, HSG A
*	23,438	98	Paved Impervious, HSG B
	20,776	39	>75% Grass cover, Good, HSG A
	23,581	61	>75% Grass cover, Good, HSG B
	19,969	30	Woods, Good, HSG A
	7,127	55	Woods, Good, HSG B
	5,397	98	Roofs, HSG A
	17,256	98	Roofs, HSG B
	144,484	72	Weighted Average
	71,453		49.45% Pervious Area
	73,031		50.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	41	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	61	0.0340	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.3	152	Total			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

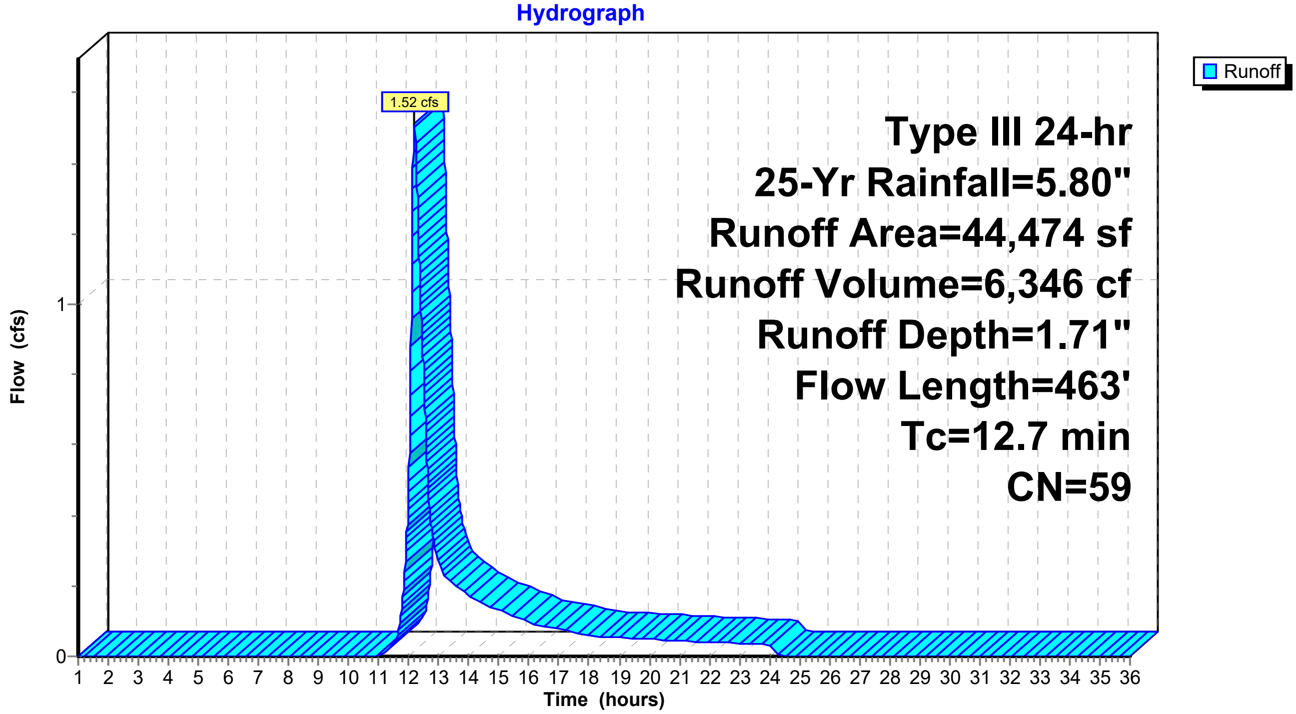
Runoff = 1.52 cfs @ 12.19 hrs, Volume= 6,346 cf, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.80"

	Area (sf)	CN	Description
*	3,654	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	2,071	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	13,634	30	Woods, Good, HSG A
	13,023	55	Woods, Good, HSG B
	44,474	59	Weighted Average
	32,688		73.50% Pervious Area
	11,786		26.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

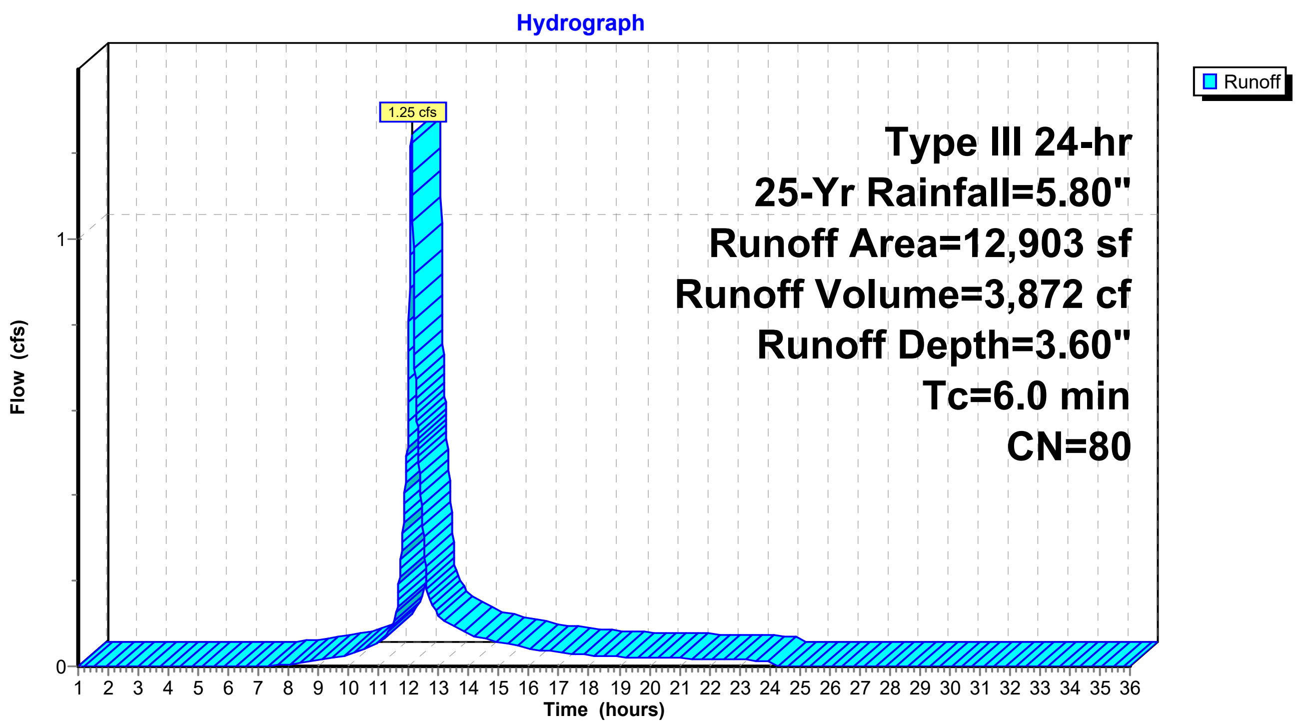
Runoff = 1.25 cfs @ 12.09 hrs, Volume= 3,872 cf, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Yr Rainfall=5.80"

	Area (sf)	CN	Description
*	6,295	98	Paved Impervious, HSG B
	969	98	Roofs, HSG A
	638	39	>75% Grass cover, Good, HSG A
	4,212	61	>75% Grass cover, Good, HSG B
	789	55	Woods, Good, HSG B
	12,903	80	Weighted Average
	5,639		43.70% Pervious Area
	7,264		56.30% Impervious Area

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

Subcatchment B1: SUB-B1

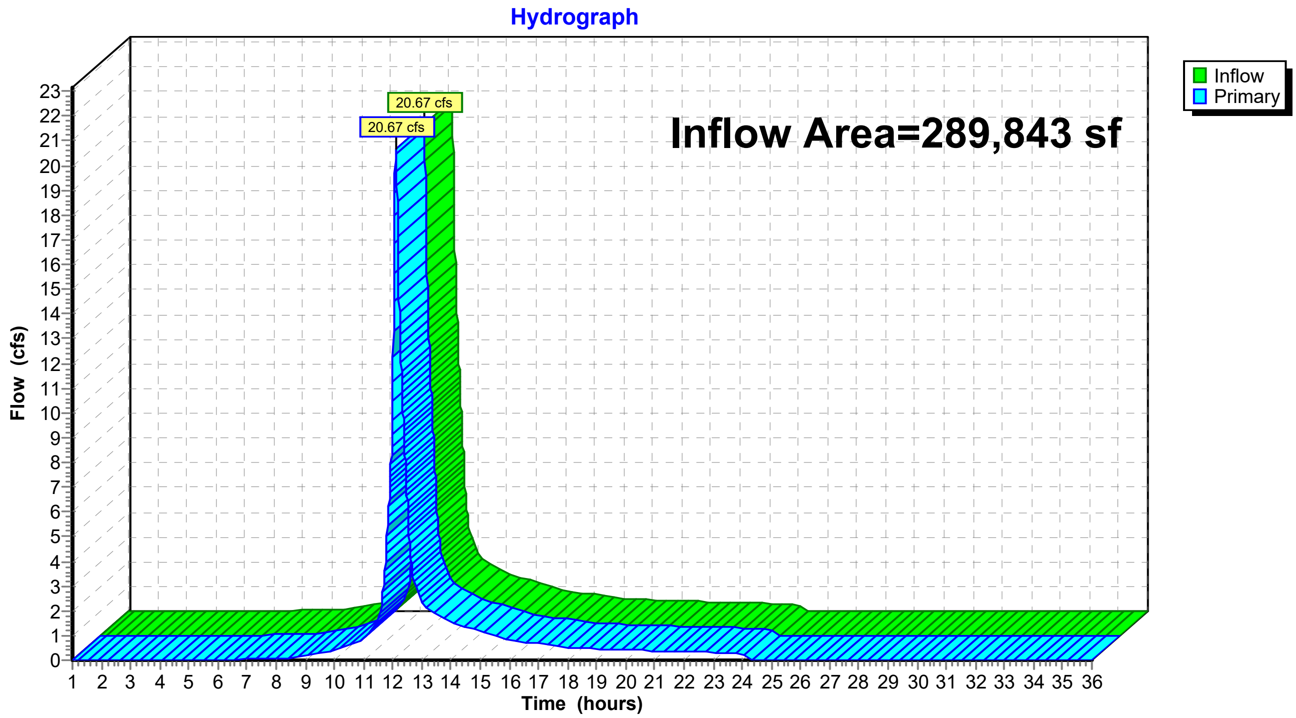


Summary for Pond A: POI-A

Inflow Area =	289,843 sf,	51.53% Impervious,	Inflow Depth = 3.03"	for 25-Yr event	
Inflow =	20.67 cfs @	12.11 hrs,	Volume=	73,078 cf	
Primary =	20.67 cfs @	12.11 hrs,	Volume=	73,078 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond A: POI-A

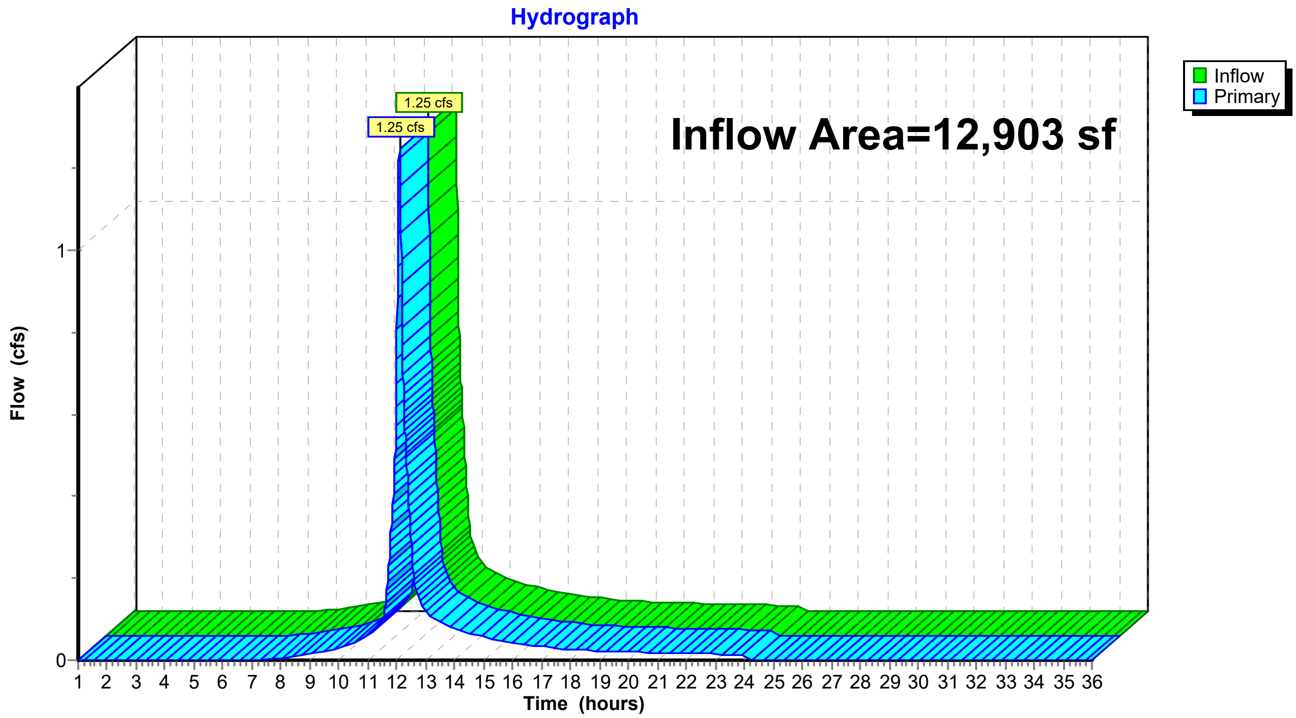


Summary for Pond B: POI-B

Inflow Area =	12,903 sf,	56.30% Impervious,	Inflow Depth = 3.60"	for 25-Yr event
Inflow =	1.25 cfs @	12.09 hrs, Volume=	3,872 cf	
Primary =	1.25 cfs @	12.09 hrs, Volume=	3,872 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=70,293 sf 66.46% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=86 Runoff=9.99 cfs 31,995 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,592 sf 58.29% Impervious Runoff Depth=4.24"
Tc=6.0 min CN=75 Runoff=3.49 cfs 10,803 cf

SubcatchmentA3: SUB-A3 Runoff Area=144,484 sf 50.55% Impervious Runoff Depth=3.91"
Flow Length=152' Tc=9.3 min CN=72 Runoff=13.60 cfs 47,131 cf

SubcatchmentA4: SUB-A4 Runoff Area=44,474 sf 26.50% Impervious Runoff Depth=2.58"
Flow Length=463' Tc=12.7 min CN=59 Runoff=2.39 cfs 9,546 cf

SubcatchmentB1: SUB-B1 Runoff Area=12,903 sf 56.30% Impervious Runoff Depth=4.79"
Tc=6.0 min CN=80 Runoff=1.65 cfs 5,147 cf

Pond A: POI-A Inflow=28.12 cfs 99,474 cf
Primary=28.12 cfs 99,474 cf

Pond B: POI-B Inflow=1.65 cfs 5,147 cf
Primary=1.65 cfs 5,147 cf

Total Runoff Area = 302,746 sf Runoff Volume = 104,621 cf Average Runoff Depth = 4.15"
48.26% Pervious = 146,115 sf 51.74% Impervious = 156,631 sf

Summary for Subcatchment A1: SUB-A1

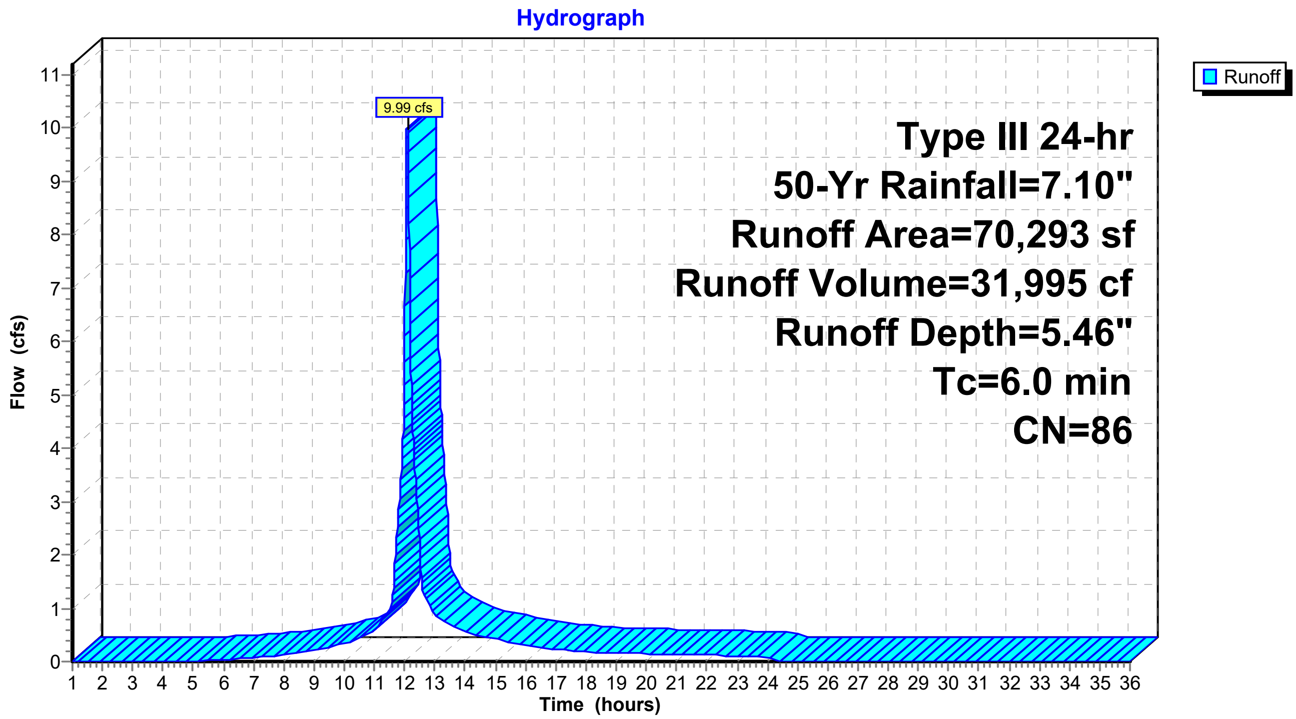
Runoff = 9.99 cfs @ 12.09 hrs, Volume= 31,995 cf, Depth= 5.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Yr Rainfall=7.10"

	Area (sf)	CN	Description
*	25,439	98	Paved Impervious, HSG B
	21,280	98	Roofs, HSG B
	22,661	61	>75% Grass cover, Good, HSG B
	913	55	Woods, Good, HSG B
	70,293	86	Weighted Average
	23,574		33.54% Pervious Area
	46,719		66.46% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

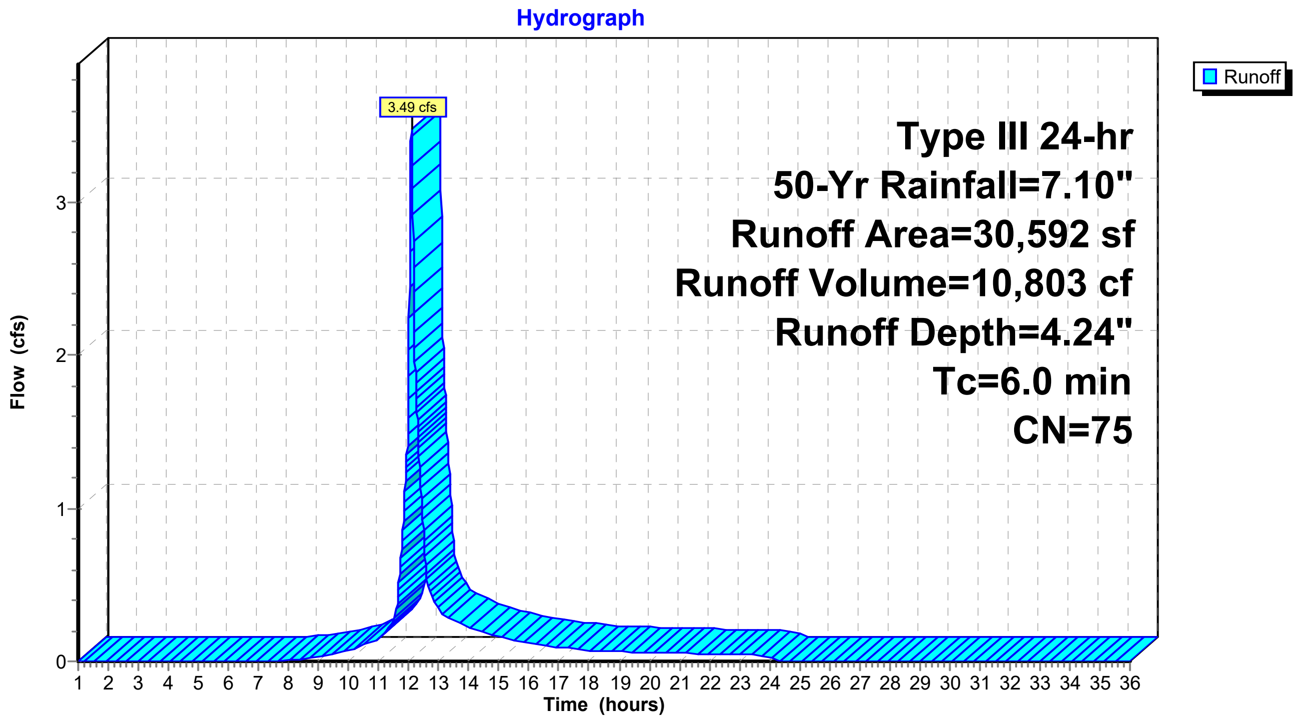
Runoff = 3.49 cfs @ 12.09 hrs, Volume= 10,803 cf, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Yr Rainfall=7.10"

	Area (sf)	CN	Description
*	14,124	98	Paved Impervious, HSG A
*	2,639	98	Paved Impervious, HSG B
	1,068	98	Roofs, HSG A
	11,139	39	>75% Grass cover, Good, HSG A
	1,622	61	>75% Grass cover, Good, HSG B
	30,592	75	Weighted Average
	12,761		41.71% Pervious Area
	17,831		58.29% Impervious Area

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

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

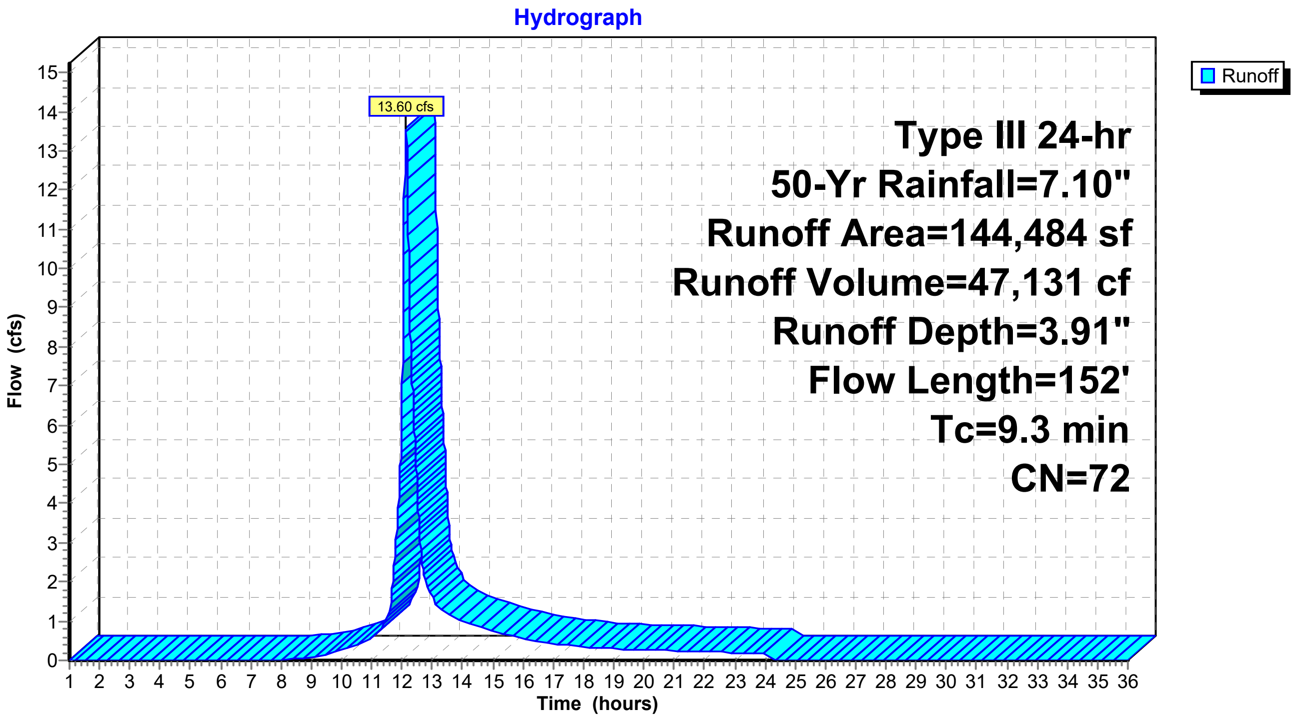
Runoff = 13.60 cfs @ 12.13 hrs, Volume= 47,131 cf, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Yr Rainfall=7.10"

	Area (sf)	CN	Description
*	26,940	98	Paved Impervious, HSG A
*	23,438	98	Paved Impervious, HSG B
	20,776	39	>75% Grass cover, Good, HSG A
	23,581	61	>75% Grass cover, Good, HSG B
	19,969	30	Woods, Good, HSG A
	7,127	55	Woods, Good, HSG B
	5,397	98	Roofs, HSG A
	17,256	98	Roofs, HSG B
	144,484	72	Weighted Average
	71,453		49.45% Pervious Area
	73,031		50.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	41	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	61	0.0340	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.3	152	Total			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

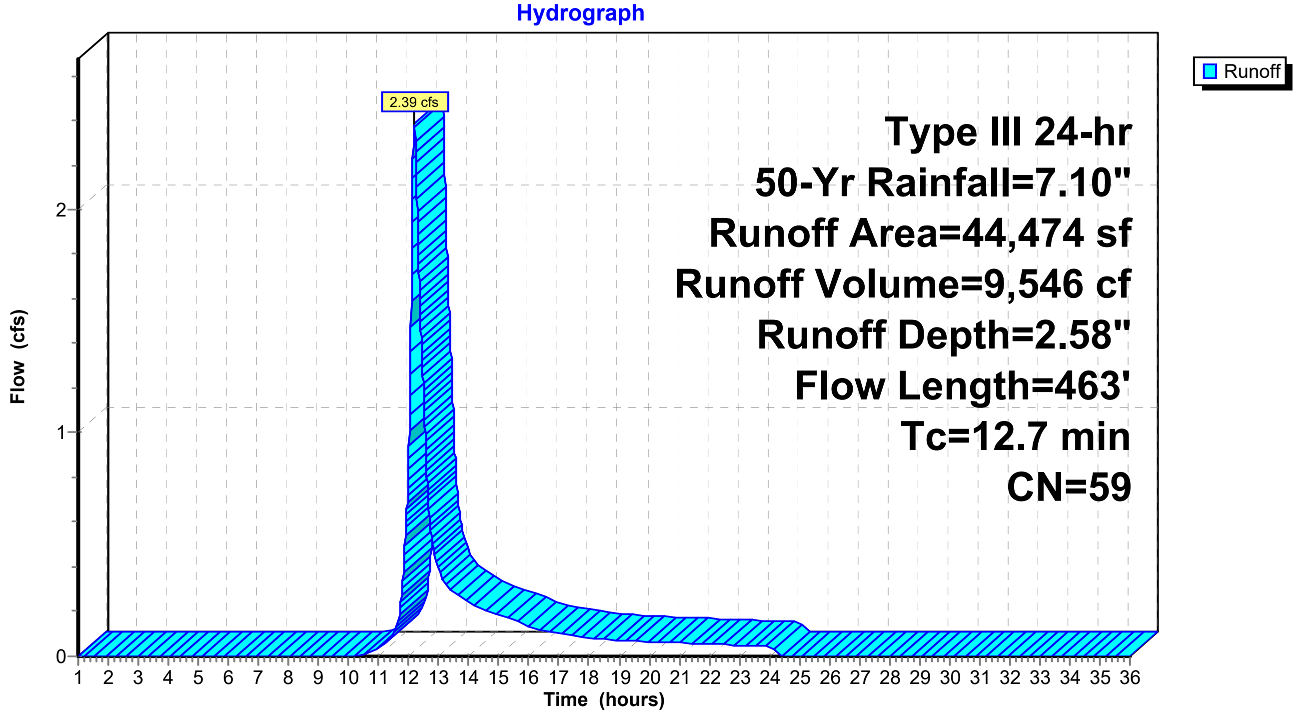
Runoff = 2.39 cfs @ 12.18 hrs, Volume= 9,546 cf, Depth= 2.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Yr Rainfall=7.10"

	Area (sf)	CN	Description
*	3,654	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	2,071	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	13,634	30	Woods, Good, HSG A
	13,023	55	Woods, Good, HSG B
	44,474	59	Weighted Average
	32,688		73.50% Pervious Area
	11,786		26.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

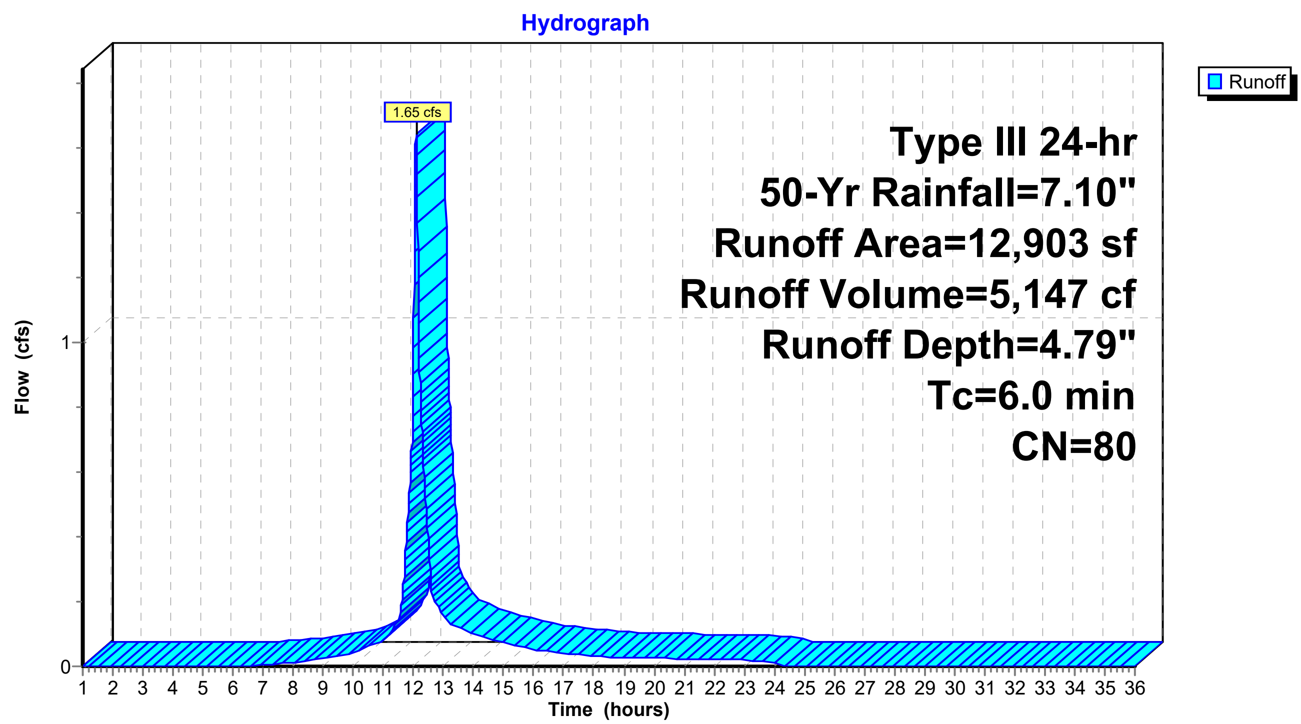
Runoff = 1.65 cfs @ 12.09 hrs, Volume= 5,147 cf, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Yr Rainfall=7.10"

	Area (sf)	CN	Description
*	6,295	98	Paved Impervious, HSG B
	969	98	Roofs, HSG A
	638	39	>75% Grass cover, Good, HSG A
	4,212	61	>75% Grass cover, Good, HSG B
	789	55	Woods, Good, HSG B
	12,903	80	Weighted Average
	5,639		43.70% Pervious Area
	7,264		56.30% Impervious Area

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

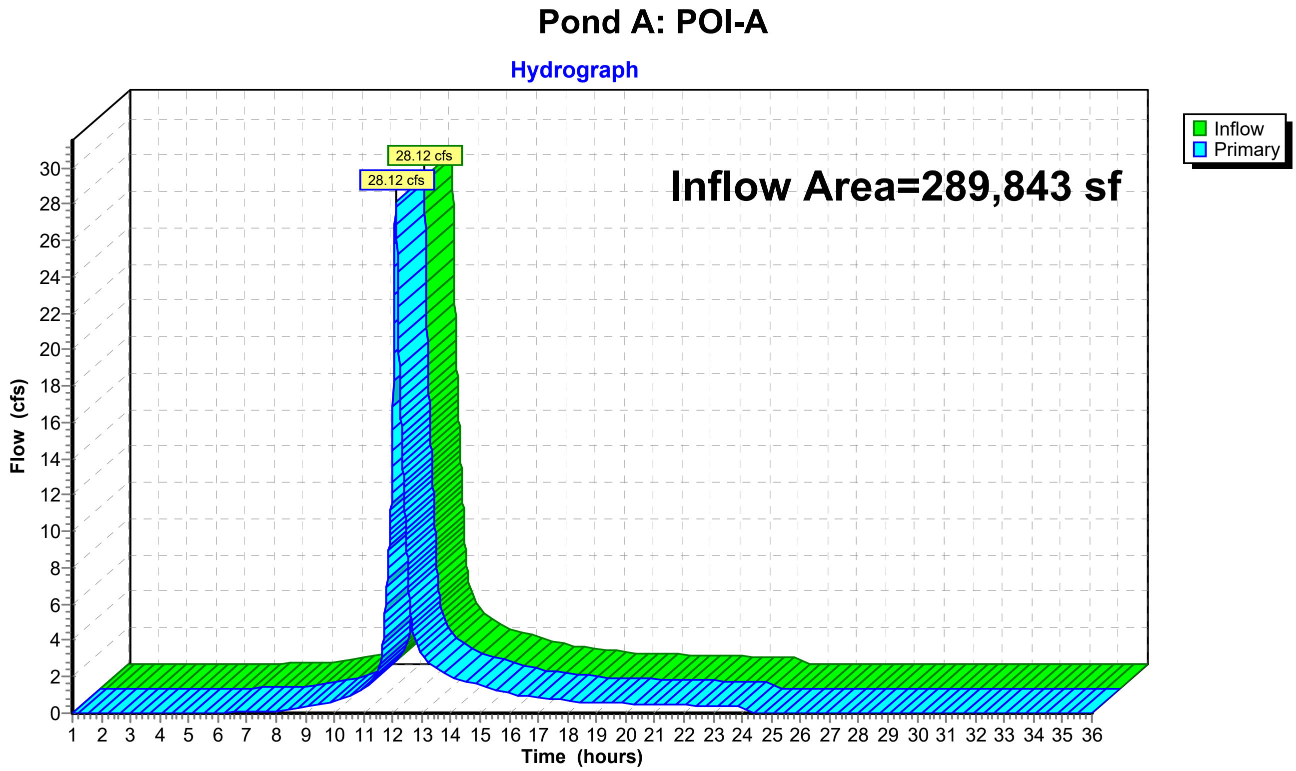
Subcatchment B1: SUB-B1



Summary for Pond A: POI-A

Inflow Area = 289,843 sf, 51.53% Impervious, Inflow Depth = 4.12" for 50-Yr event
Inflow = 28.12 cfs @ 12.11 hrs, Volume= 99,474 cf
Primary = 28.12 cfs @ 12.11 hrs, Volume= 99,474 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

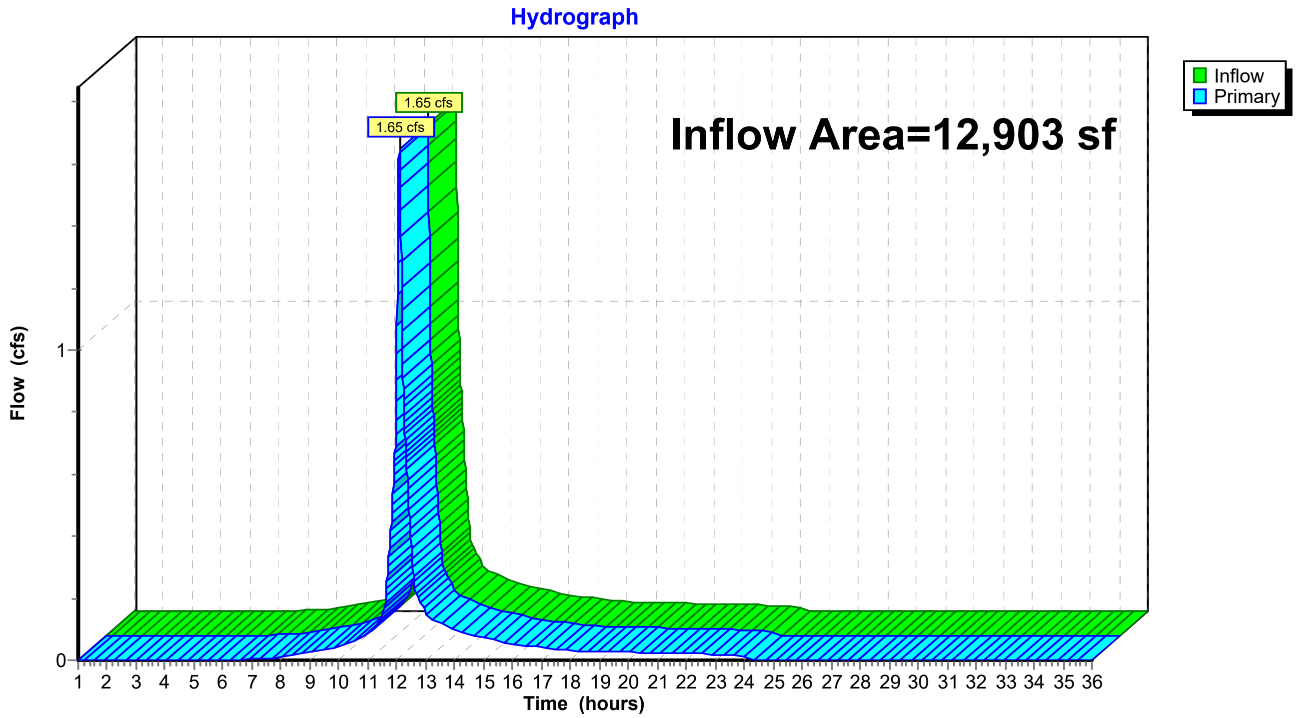


Summary for Pond B: POI-B

Inflow Area = 12,903 sf, 56.30% Impervious, Inflow Depth = 4.79" for 50-Yr event
Inflow = 1.65 cfs @ 12.09 hrs, Volume= 5,147 cf
Primary = 1.65 cfs @ 12.09 hrs, Volume= 5,147 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B



Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=70,293 sf 66.46% Impervious Runoff Depth=6.62"
Tc=6.0 min CN=86 Runoff=11.99 cfs 38,793 cf

SubcatchmentA2: SUB-A2 Runoff Area=30,592 sf 58.29% Impervious Runoff Depth=5.31"
Tc=6.0 min CN=75 Runoff=4.35 cfs 13,545 cf

SubcatchmentA3: SUB-A3 Runoff Area=144,484 sf 50.55% Impervious Runoff Depth=4.96"
Flow Length=152' Tc=9.3 min CN=72 Runoff=17.21 cfs 59,704 cf

SubcatchmentA4: SUB-A4 Runoff Area=44,474 sf 26.50% Impervious Runoff Depth=3.45"
Flow Length=463' Tc=12.7 min CN=59 Runoff=3.26 cfs 12,769 cf

SubcatchmentB1: SUB-B1 Runoff Area=12,903 sf 56.30% Impervious Runoff Depth=5.91"
Tc=6.0 min CN=80 Runoff=2.02 cfs 6,351 cf

Pond A: POI-A Inflow=35.17 cfs 124,811 cf
Primary=35.17 cfs 124,811 cf

Pond B: POI-B Inflow=2.02 cfs 6,351 cf
Primary=2.02 cfs 6,351 cf

Total Runoff Area = 302,746 sf Runoff Volume = 131,162 cf Average Runoff Depth = 5.20"
48.26% Pervious = 146,115 sf 51.74% Impervious = 156,631 sf

Summary for Subcatchment A1: SUB-A1

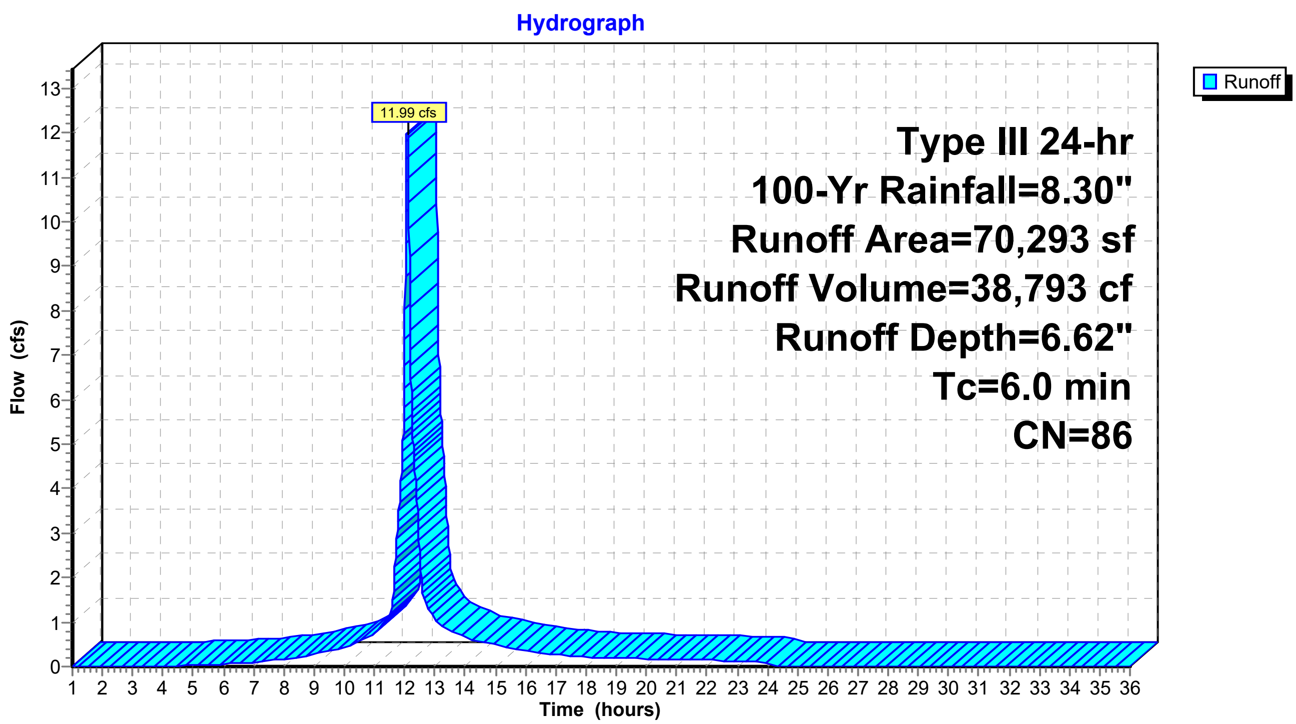
Runoff = 11.99 cfs @ 12.08 hrs, Volume= 38,793 cf, Depth= 6.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.30"

	Area (sf)	CN	Description
*	25,439	98	Paved Impervious, HSG B
	21,280	98	Roofs, HSG B
	22,661	61	>75% Grass cover, Good, HSG B
	913	55	Woods, Good, HSG B
	70,293	86	Weighted Average
	23,574		33.54% Pervious Area
	46,719		66.46% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

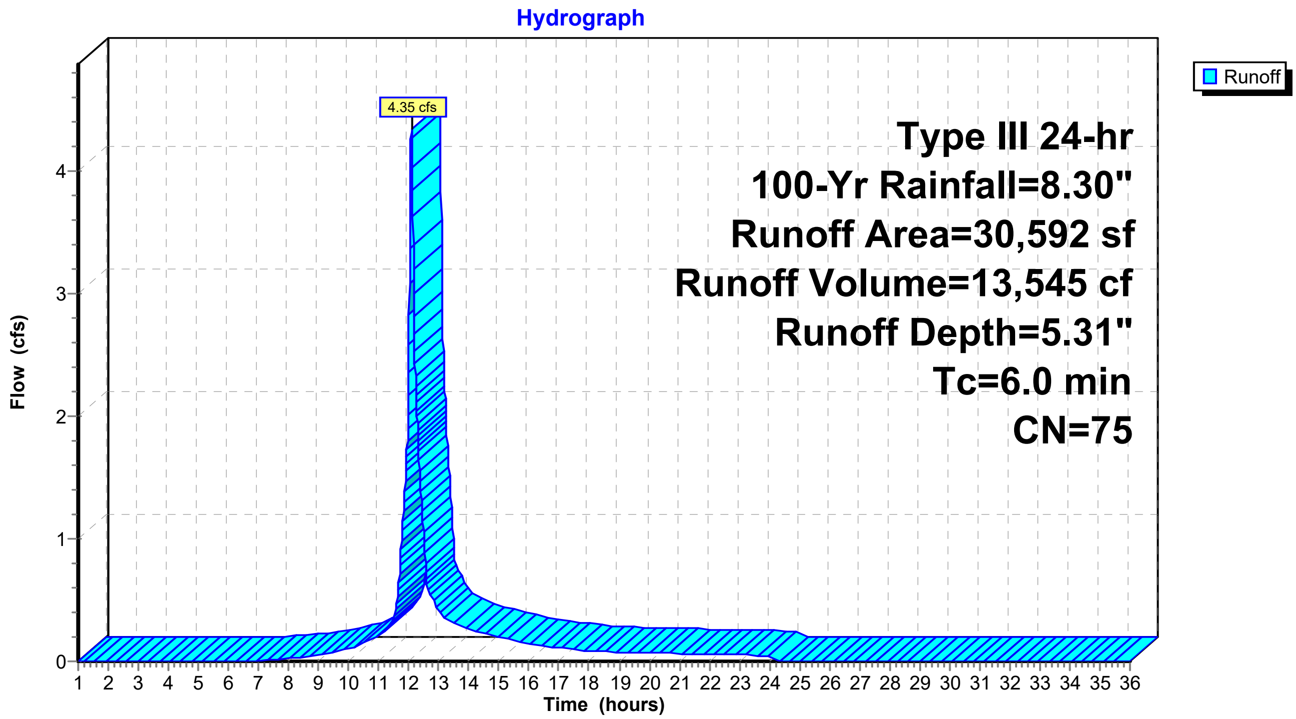
Runoff = 4.35 cfs @ 12.09 hrs, Volume= 13,545 cf, Depth= 5.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.30"

	Area (sf)	CN	Description
*	14,124	98	Paved Impervious, HSG A
*	2,639	98	Paved Impervious, HSG B
	1,068	98	Roofs, HSG A
	11,139	39	>75% Grass cover, Good, HSG A
	1,622	61	>75% Grass cover, Good, HSG B
	30,592	75	Weighted Average
	12,761		41.71% Pervious Area
	17,831		58.29% Impervious Area

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

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

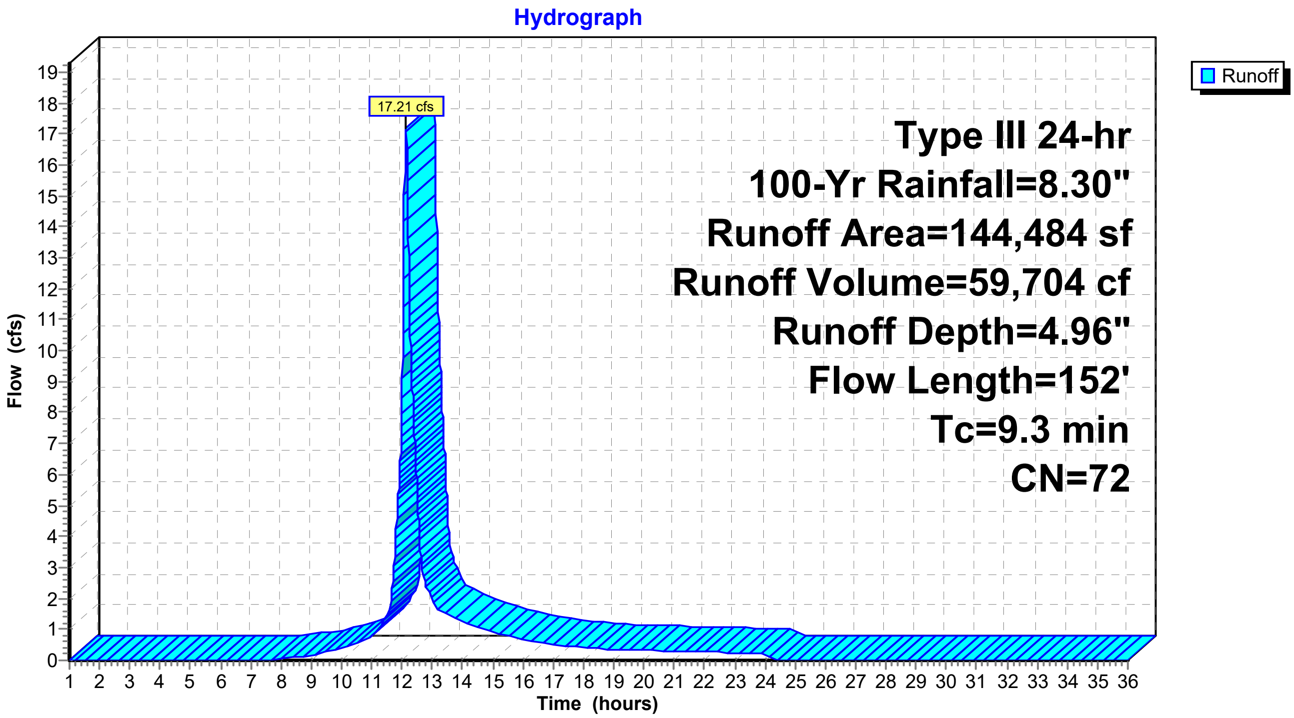
Runoff = 17.21 cfs @ 12.13 hrs, Volume= 59,704 cf, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.30"

	Area (sf)	CN	Description
*	26,940	98	Paved Impervious, HSG A
*	23,438	98	Paved Impervious, HSG B
	20,776	39	>75% Grass cover, Good, HSG A
	23,581	61	>75% Grass cover, Good, HSG B
	19,969	30	Woods, Good, HSG A
	7,127	55	Woods, Good, HSG B
	5,397	98	Roofs, HSG A
	17,256	98	Roofs, HSG B
	144,484	72	Weighted Average
	71,453		49.45% Pervious Area
	73,031		50.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	41	0.0340	0.92		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	61	0.0340	1.29		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.3	152	Total			

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

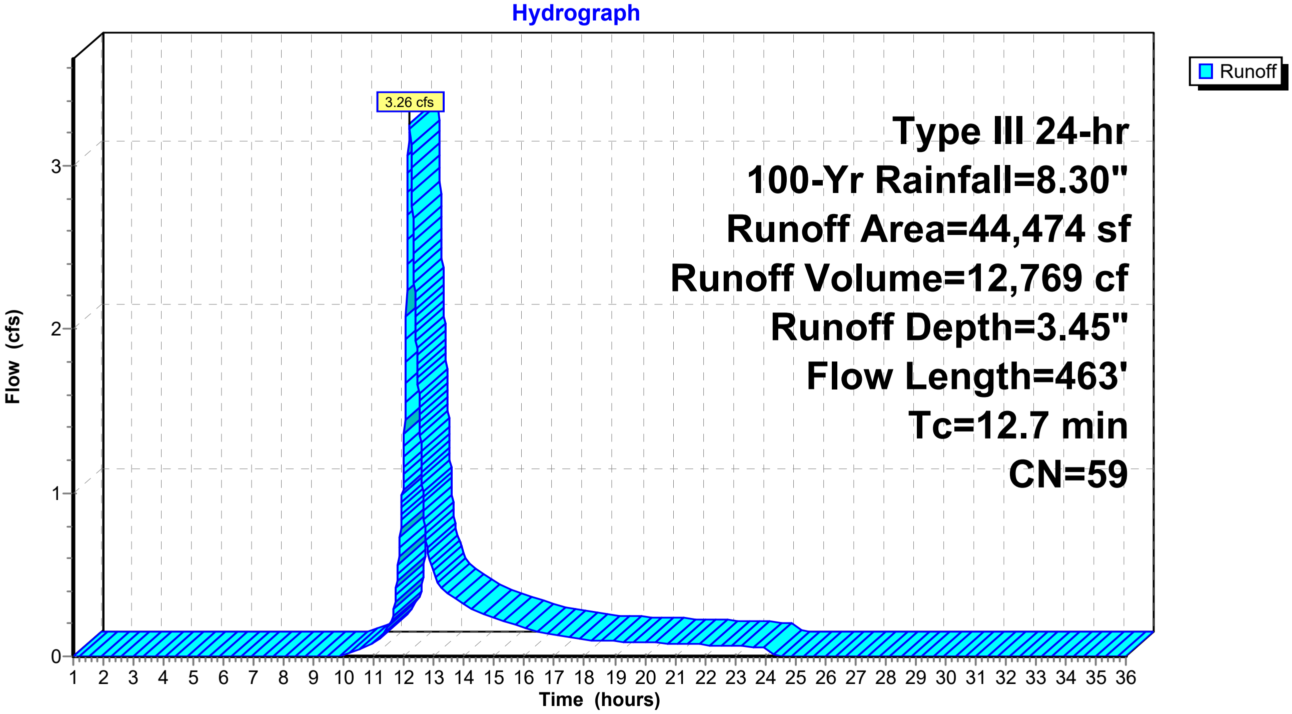
Runoff = 3.26 cfs @ 12.18 hrs, Volume= 12,769 cf, Depth= 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.30"

	Area (sf)	CN	Description
*	3,654	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	2,071	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	13,634	30	Woods, Good, HSG A
	13,023	55	Woods, Good, HSG B
	44,474	59	Weighted Average
	32,688		73.50% Pervious Area
	11,786		26.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A4: SUB-A4



Summary for Subcatchment B1: SUB-B1

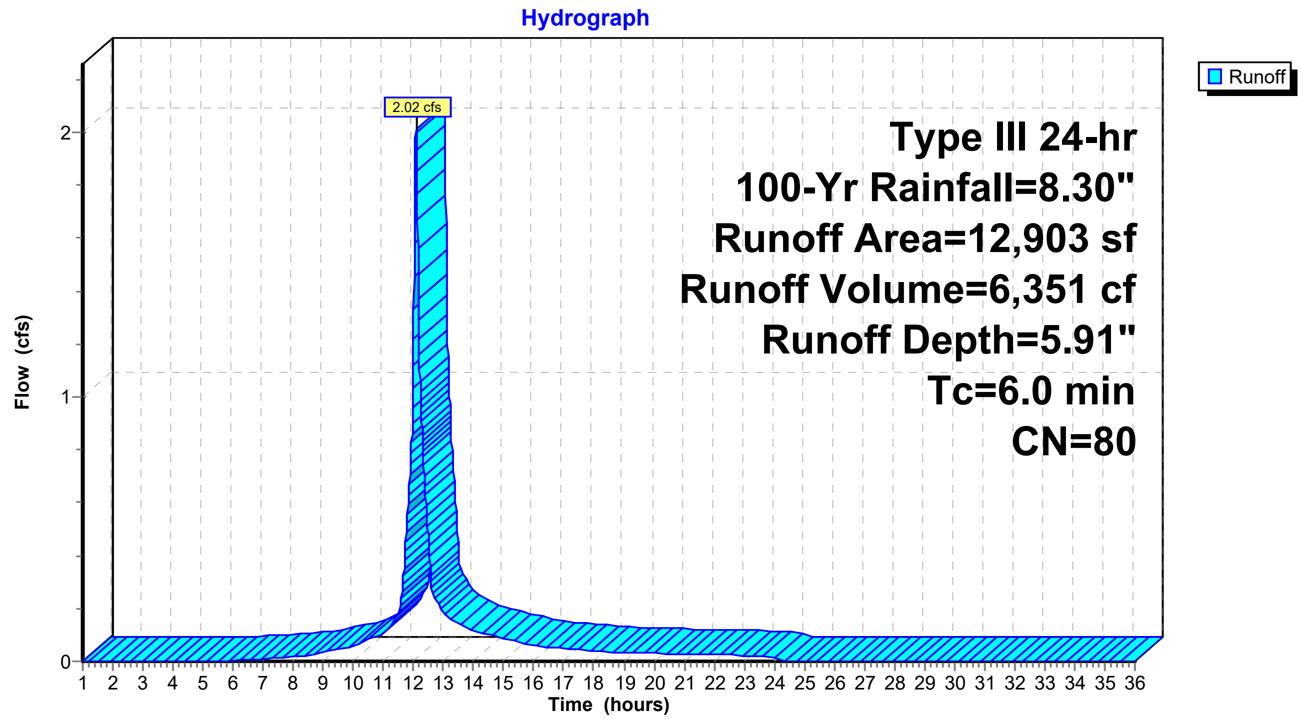
Runoff = 2.02 cfs @ 12.09 hrs, Volume= 6,351 cf, Depth= 5.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr Rainfall=8.30"

	Area (sf)	CN	Description
*	6,295	98	Paved Impervious, HSG B
	969	98	Roofs, HSG A
	638	39	>75% Grass cover, Good, HSG A
	4,212	61	>75% Grass cover, Good, HSG B
	789	55	Woods, Good, HSG B
	12,903	80	Weighted Average
	5,639		43.70% Pervious Area
	7,264		56.30% Impervious Area

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

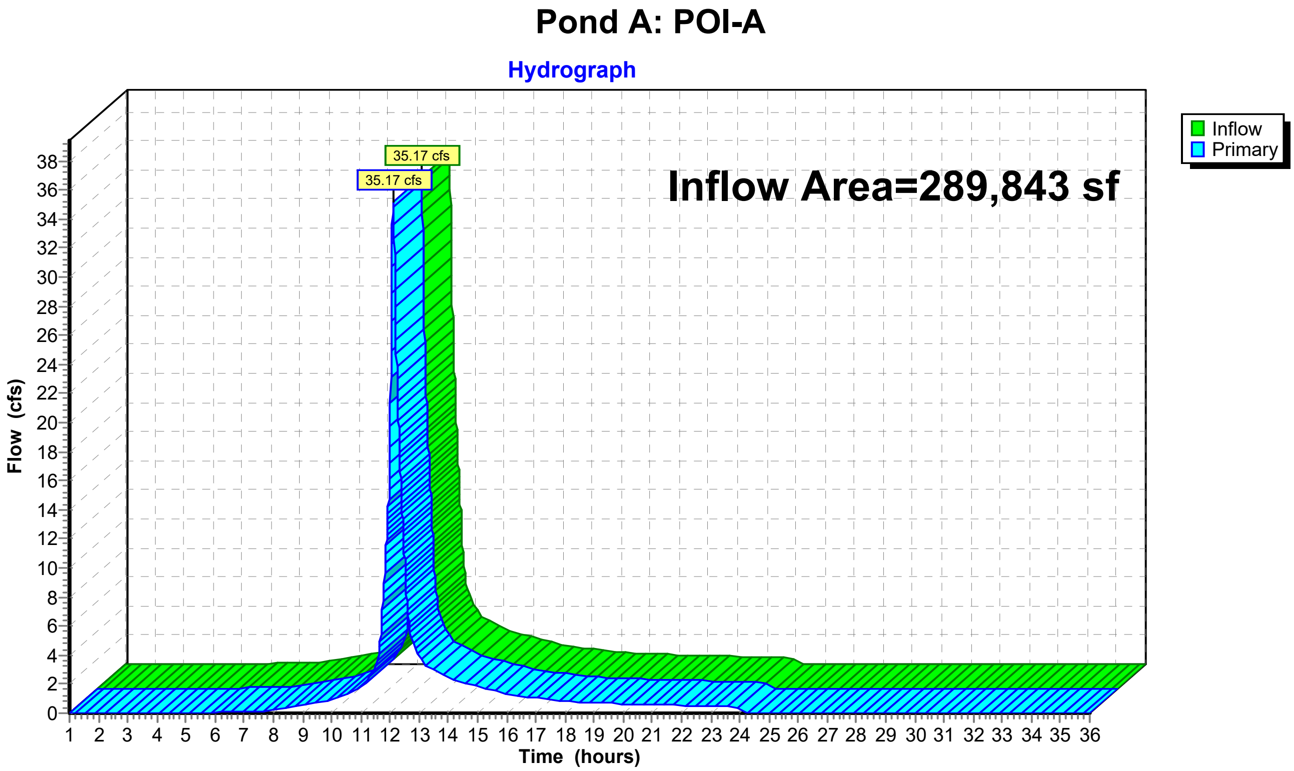
Subcatchment B1: SUB-B1



Summary for Pond A: POI-A

Inflow Area =	289,843 sf,	51.53% Impervious,	Inflow Depth = 5.17"	for 100-Yr event
Inflow =	35.17 cfs @	12.11 hrs, Volume=	124,811 cf	
Primary =	35.17 cfs @	12.11 hrs, Volume=	124,811 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

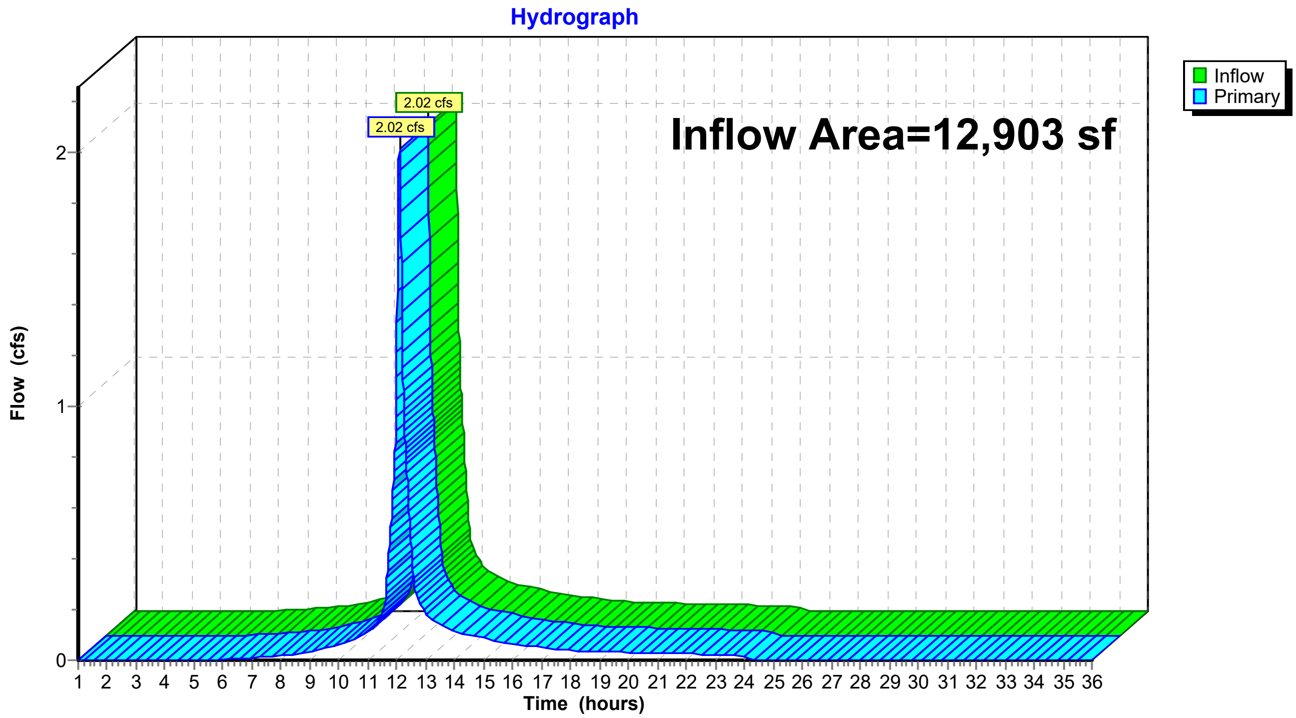


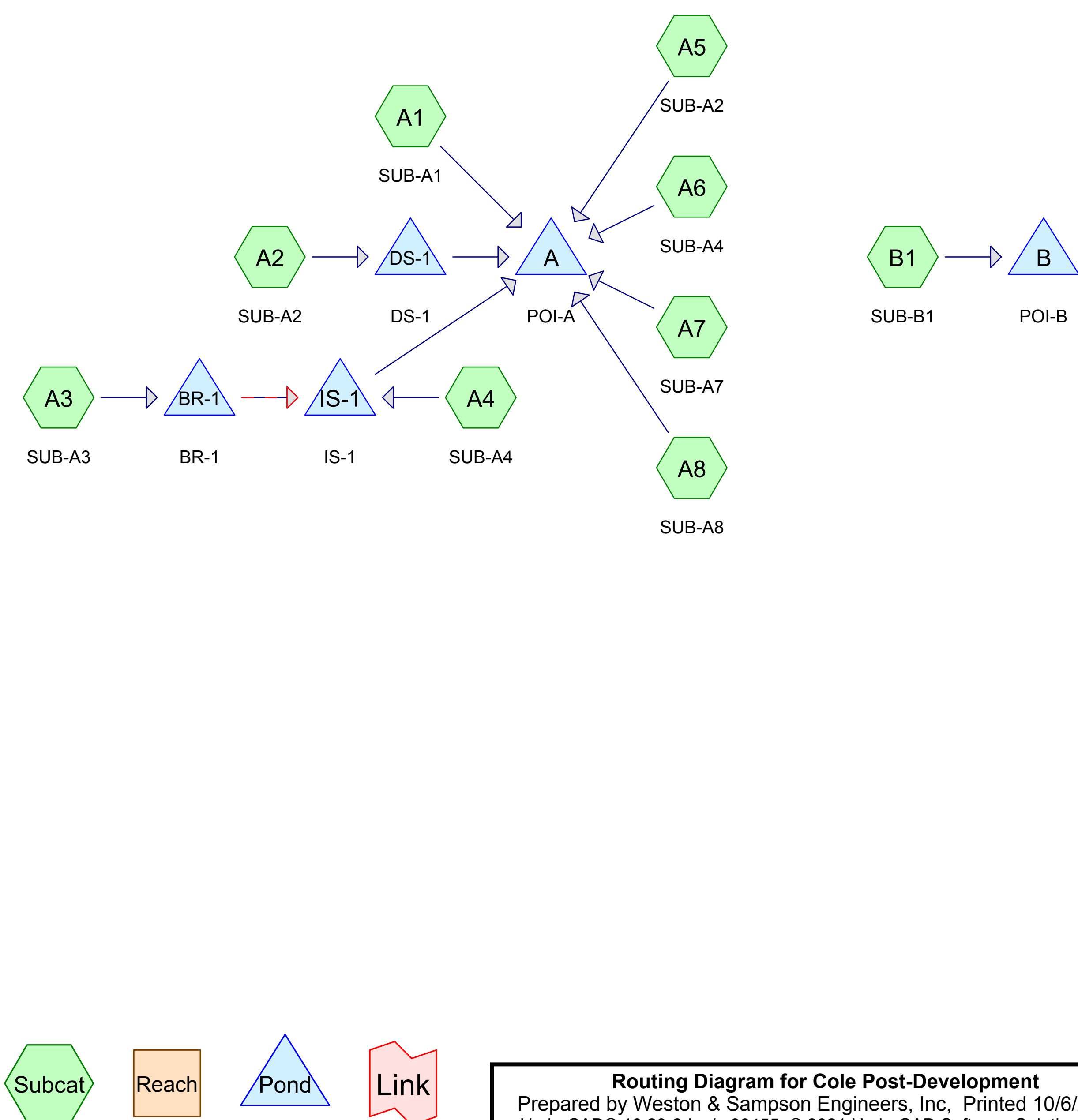
Summary for Pond B: POI-B

Inflow Area = 12,903 sf, 56.30% Impervious, Inflow Depth = 5.91" for 100-Yr event
Inflow = 2.02 cfs @ 12.09 hrs, Volume= 6,351 cf
Primary = 2.02 cfs @ 12.09 hrs, Volume= 6,351 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2

Pond B: POI-B





Routing Diagram for Cole Post-Development
Prepared by Weston & Sampson Engineers, Inc, Printed 10/6/2022

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-year	Type III 24-hr		Default	24.00	1	3.10	2
2	10-year	Type III 24-hr		Default	24.00	1	4.70	2
3	25-year	Type III 24-hr		Default	24.00	1	5.80	2
4	50-year	Type III 24-hr		Default	24.00	1	7.10	2
5	100-year	Type III 24-hr		Default	24.00	1	8.30	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
27,962	39	>75% Grass cover, Good, HSG A (A2, A3, A4, A5, A6, A7, A8)
52,120	61	>75% Grass cover, Good, HSG B (A1, A2, A3, A4, A6, A7, B1)
15,691	98	Expanded School Yard Impervious, HSG B (A1)
51,224	98	Paved Impervious, HSG A (A2, A3, A4, A5, A6, A8)
66,040	98	Paved Impervious, HSG B (A1, A2, A3, A4, A5, A6, A7, A8)
7,434	98	Roofs, HSG A (A4, A8)
38,536	98	Roofs, HSG B (A1, A2, A3, A4, A8)
33,603	30	Woods, Good, HSG A (A2, A6, A7, A8)
20,983	55	Woods, Good, HSG B (A2, A6, A7, B1)
313,593	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
120,223	HSG A	A2, A3, A4, A5, A6, A7, A8
193,370	HSG B	A1, A2, A3, A4, A5, A6, A7, A8, B1
0	HSG C	
0	HSG D	
0	Other	
313,593		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
27,962	52,120	0	0	0	80,082	>75% Grass cover, Good
0	15,691	0	0	0	15,691	Expanded School Yard Impervious
51,224	66,040	0	0	0	117,264	Paved Impervious
7,434	38,536	0	0	0	45,970	Roofs
33,603	20,983	0	0	0	54,586	Woods, Good
120,223	**193,370**	**0**	**0**	**0**	**313,593**	**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	BR-1	94.49	94.18	62.8	0.0049	0.130	0.0	12.0	0.0
2	DS-1	88.25	88.12	26.9	0.0048	0.013	0.0	24.0	0.0
3	IS-1	92.00	91.09	91.3	0.0100	0.013	0.0	12.0	0.0

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=78,085 sf 75.63% Impervious Runoff Depth=1.99"
Tc=6.0 min CN=89 Runoff=4.16 cfs 12,952 cf

SubcatchmentA2: SUB-A2 Runoff Area=35,193 sf 61.85% Impervious Runoff Depth=1.14"
Flow Length=160' Tc=8.9 min CN=77 Runoff=0.95 cfs 3,346 cf

SubcatchmentA3: SUB-A3 Runoff Area=16,500 sf 77.45% Impervious Runoff Depth=1.75"
Tc=6.0 min CN=86 Runoff=0.78 cfs 2,404 cf

SubcatchmentA4: SUB-A4 Runoff Area=45,097 sf 88.28% Impervious Runoff Depth=2.26"
Tc=6.0 min CN=92 Runoff=2.68 cfs 8,477 cf

SubcatchmentA5: SUB-A2 Runoff Area=11,510 sf 59.26% Impervious Runoff Depth=0.97"
Tc=6.0 min CN=74 Runoff=0.28 cfs 933 cf

SubcatchmentA6: SUB-A4 Runoff Area=44,811 sf 26.24% Impervious Runoff Depth=0.31"
Flow Length=463' Tc=12.7 min CN=58 Runoff=0.14 cfs 1,146 cf

SubcatchmentA7: SUB-A7 Runoff Area=31,077 sf 11.00% Impervious Runoff Depth=0.37"
Tc=6.0 min CN=60 Runoff=0.16 cfs 958 cf

SubcatchmentA8: SUB-A8 Runoff Area=45,413 sf 51.78% Impervious Runoff Depth=0.68"
Flow Length=136' Tc=7.4 min CN=68 Runoff=0.66 cfs 2,569 cf

SubcatchmentB1: SUB-B1 Runoff Area=5,907 sf 0.00% Impervious Runoff Depth=0.37"
Tc=6.0 min CN=60 Runoff=0.03 cfs 182 cf

Pond A: POI-A Inflow=5.42 cfs 21,916 cf
Primary=5.42 cfs 21,916 cf

Pond B: POI-B Inflow=0.03 cfs 182 cf
Primary=0.03 cfs 182 cf

Pond BR-1: BR-1 Peak Elev=100.85' Storage=833 cf Inflow=0.78 cfs 2,404 cf
Primary=0.63 cfs 1,594 cf Secondary=0.00 cfs 0 cf Outflow=0.63 cfs 1,594 cf

Pond DS-1: DS-1 Peak Elev=90.00' Storage=753 cf Inflow=0.95 cfs 3,346 cf
Outflow=0.46 cfs 3,345 cf

Pond IS-1: IS-1 Peak Elev=94.24' Storage=4,071 cf Inflow=2.80 cfs 10,071 cf
Discarded=0.23 cfs 10,059 cf Primary=0.00 cfs 13 cf Outflow=0.23 cfs 10,071 cf

Total Runoff Area = 313,593 sf Runoff Volume = 32,967 cf Average Runoff Depth = 1.26"
42.94% Pervious = 134,668 sf 57.06% Impervious = 178,925 sf

Summary for Subcatchment A1: SUB-A1

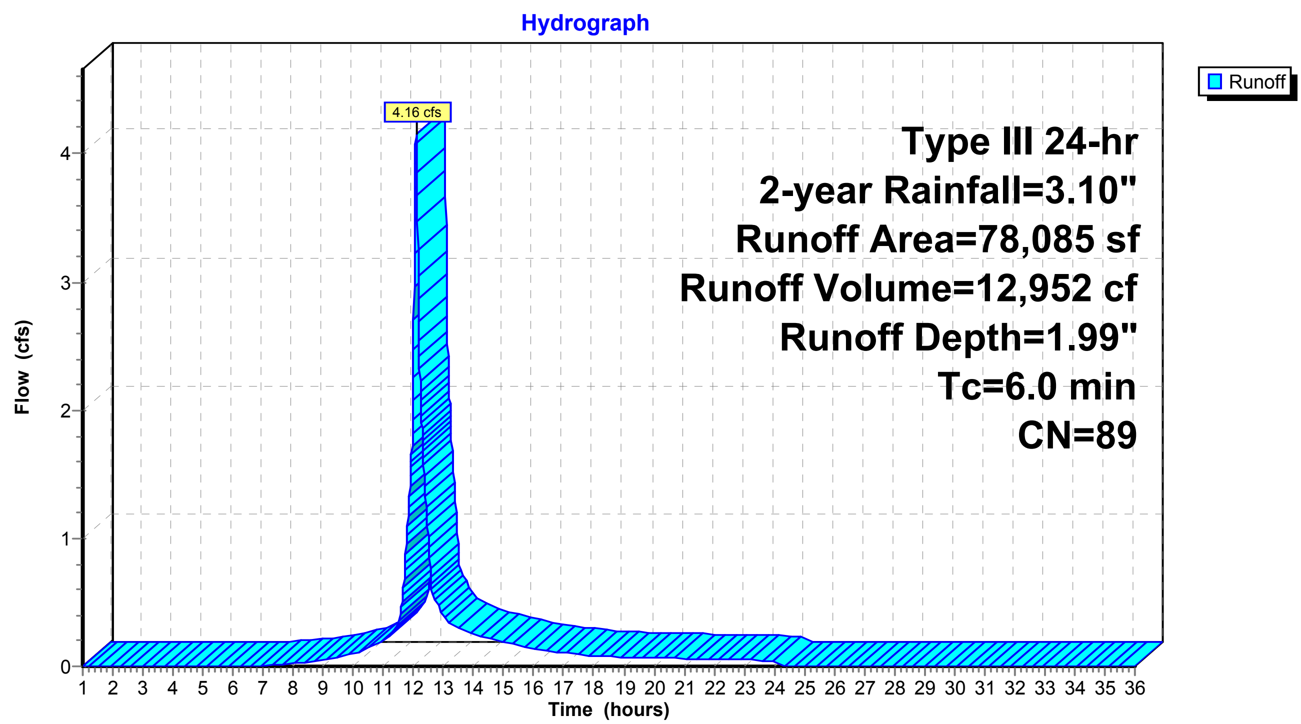
Runoff = 4.16 cfs @ 12.09 hrs, Volume= 12,952 cf, Depth= 1.99"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	27,200	98	Paved Impervious, HSG B
	16,163	98	Roofs, HSG B
	19,031	61	>75% Grass cover, Good, HSG B
*	15,691	98	Expanded School Yard Impervious, HSG B
	78,085	89	Weighted Average
	19,031		24.37% Pervious Area
	59,054		75.63% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

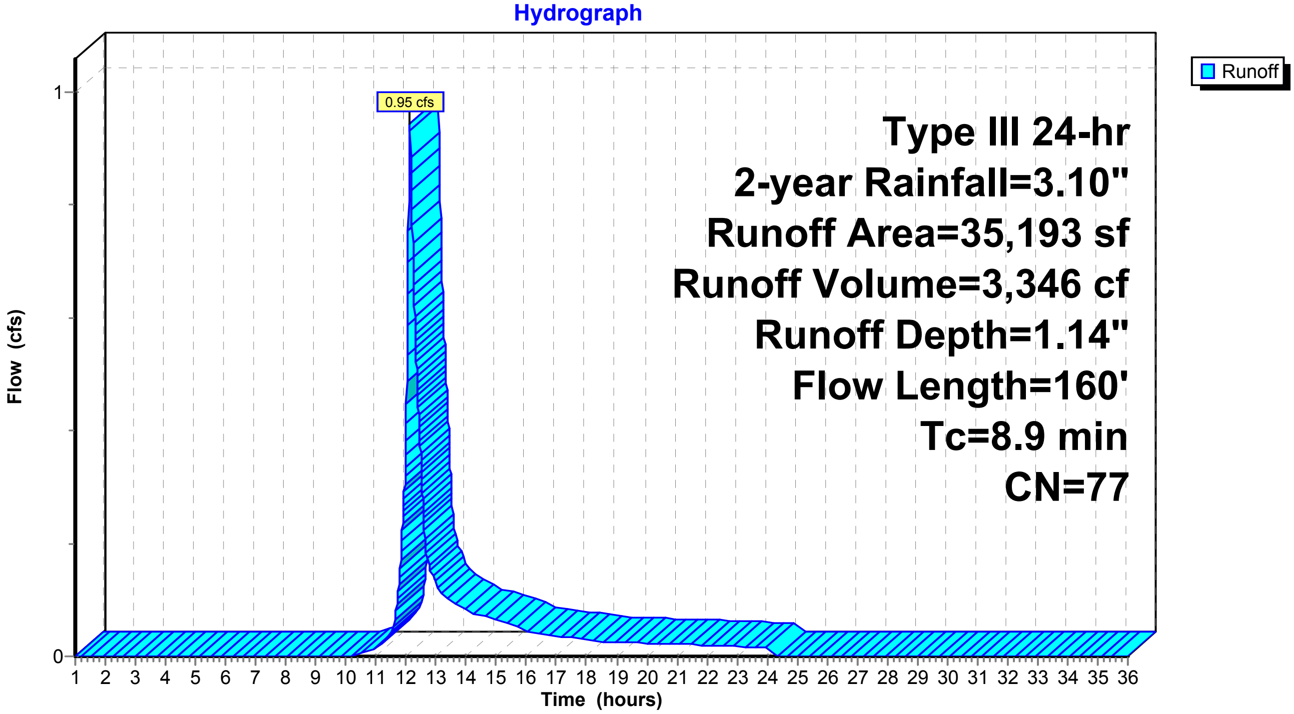
Runoff = 0.95 cfs @ 12.13 hrs, Volume= 3,346 cf, Depth= 1.14"
Routed to Pond DS-1 : DS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	23	98	Paved Impervious, HSG A
*	18,246	98	Paved Impervious, HSG B
	3,498	98	Roofs, HSG B
	1,694	39	>75% Grass cover, Good, HSG A
	4,693	61	>75% Grass cover, Good, HSG B
	6,952	30	Woods, Good, HSG A
	87	55	Woods, Good, HSG B
	35,193	77	Weighted Average
	13,426		38.15% Pervious Area
	21,767		61.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	33	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	59	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.9	160	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

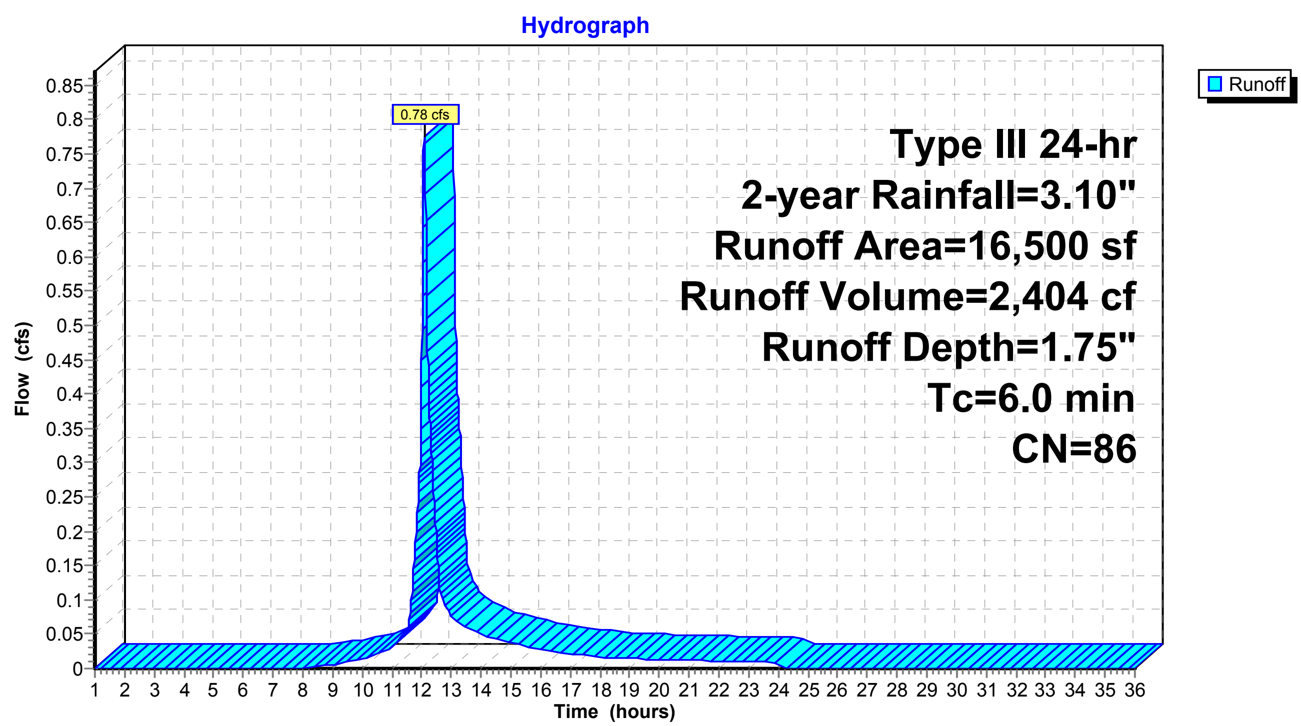
Runoff = 0.78 cfs @ 12.09 hrs, Volume= 2,404 cf, Depth= 1.75"
Routed to Pond BR-1 : BR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	4,196	98	Paved Impervious, HSG A
*	1,717	98	Paved Impervious, HSG B
	6,866	98	Roofs, HSG B
	2,808	39	>75% Grass cover, Good, HSG A
	913	61	>75% Grass cover, Good, HSG B
	16,500	86	Weighted Average
	3,721		22.55% Pervious Area
	12,779		77.45% Impervious Area

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

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

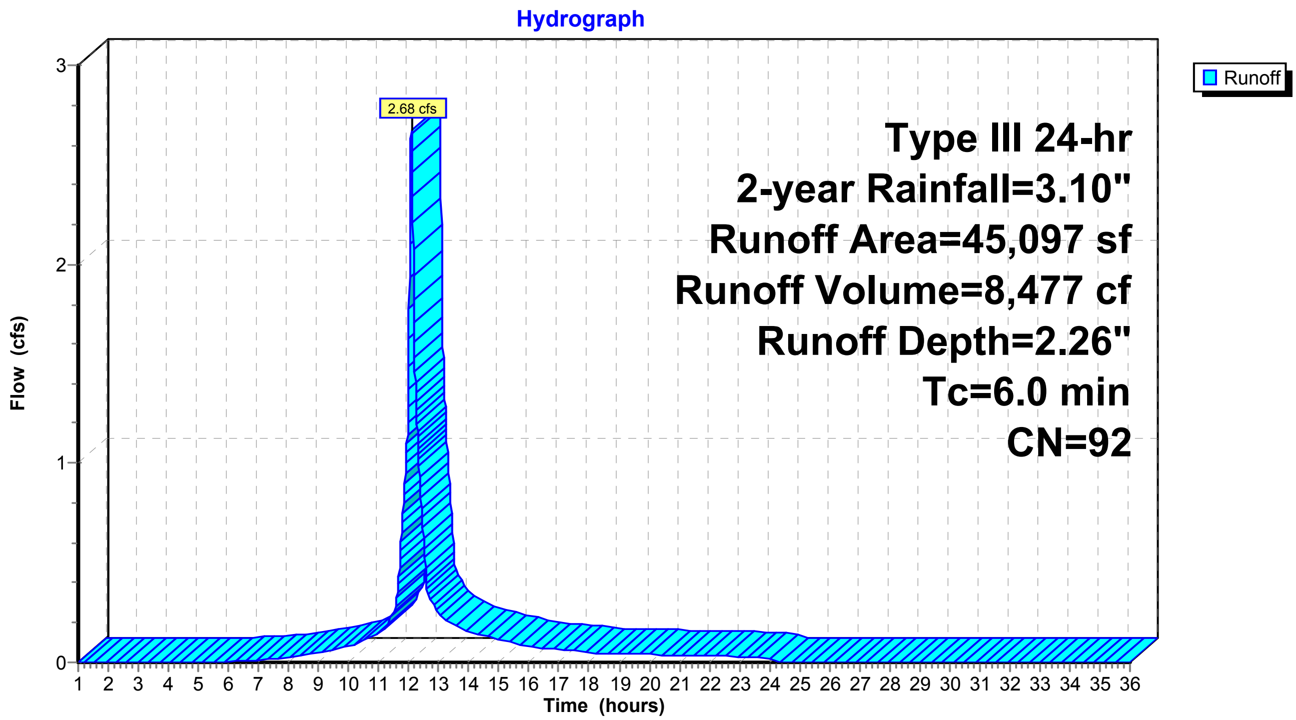
Runoff = 2.68 cfs @ 12.09 hrs, Volume= 8,477 cf, Depth= 2.26"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	28,479	98	Paved Impervious, HSG A
*	4,701	98	Paved Impervious, HSG B
	3,540	98	Roofs, HSG A
	3,092	98	Roofs, HSG B
	3,675	39	>75% Grass cover, Good, HSG A
	1,610	61	>75% Grass cover, Good, HSG B
	45,097	92	Weighted Average
	5,285		11.72% Pervious Area
	39,812		88.28% Impervious Area

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

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A2

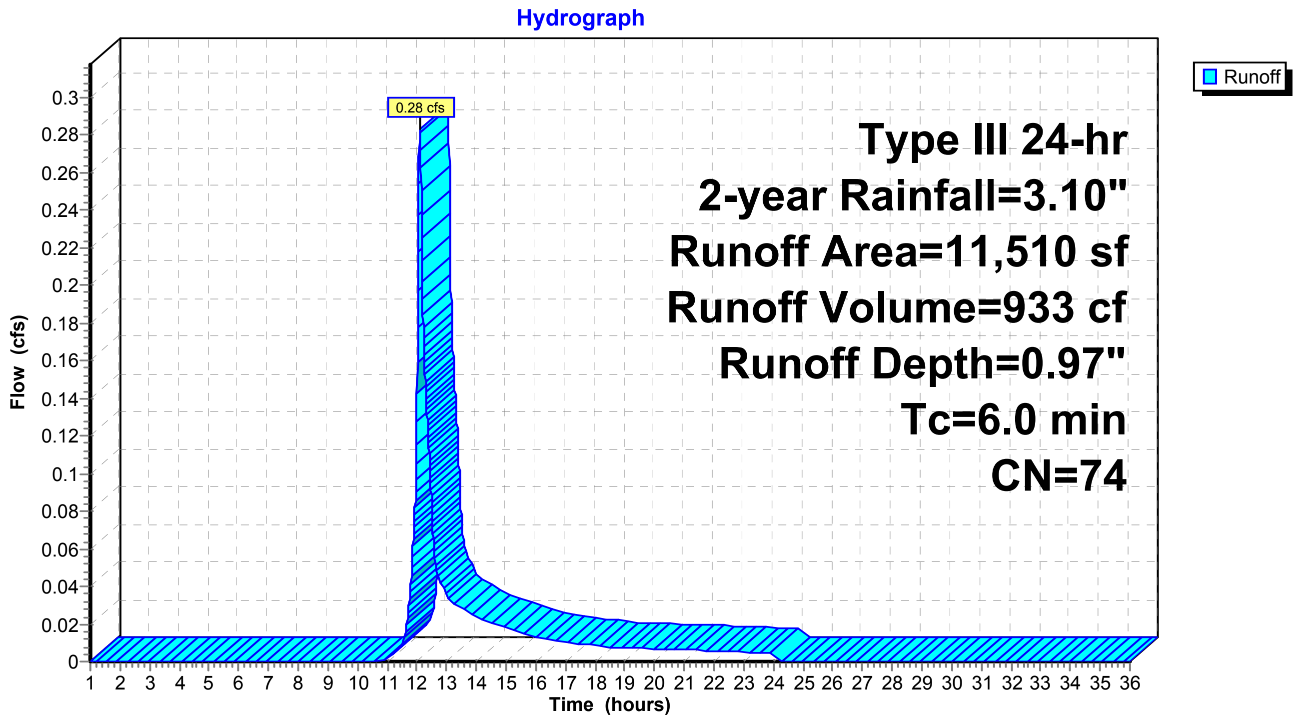
Runoff = 0.28 cfs @ 12.10 hrs, Volume= 933 cf, Depth= 0.97"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	5,725	98	Paved Impervious, HSG A
*	1,096	98	Paved Impervious, HSG B
	4,689	39	>75% Grass cover, Good, HSG A
	11,510	74	Weighted Average
	4,689		40.74% Pervious Area
	6,821		59.26% Impervious Area

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

Subcatchment A5: SUB-A2



Summary for Subcatchment A6: SUB-A4

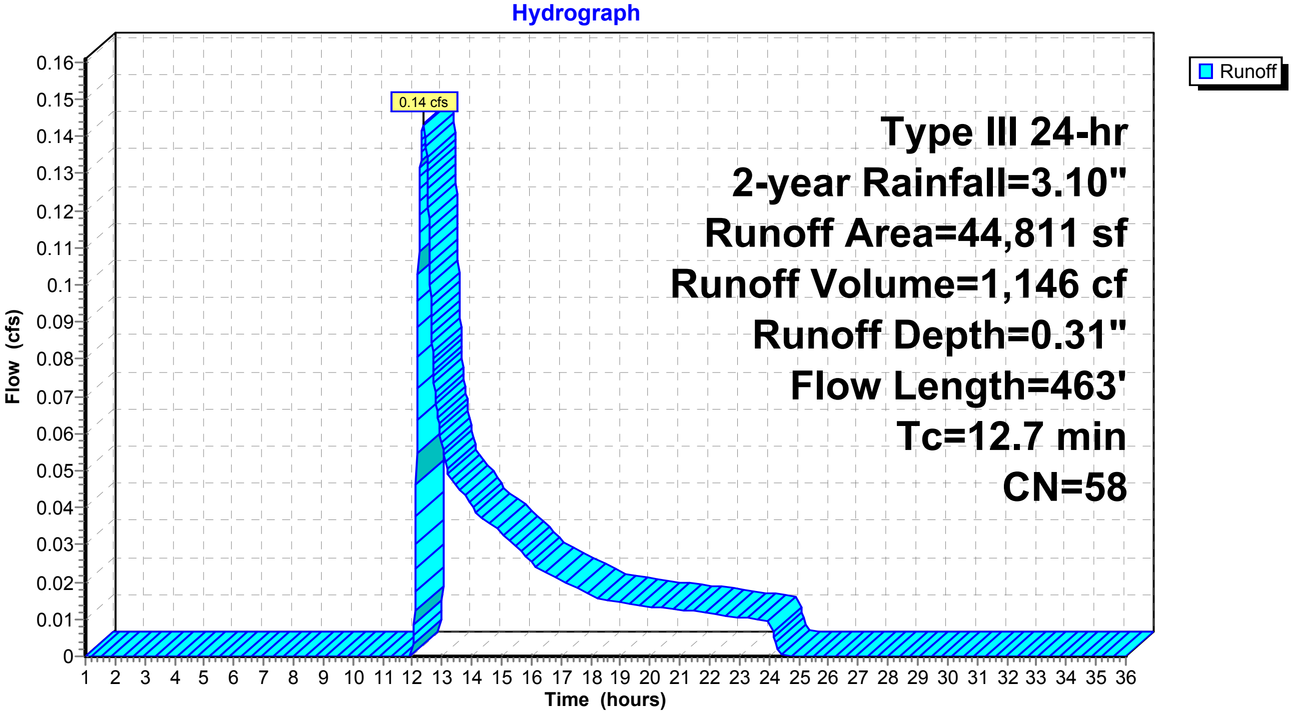
Runoff = 0.14 cfs @ 12.38 hrs, Volume= 1,146 cf, Depth= 0.31"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	3,625	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	13,635	30	Woods, Good, HSG A
	13,102	55	Woods, Good, HSG B
	2,357	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	44,811	58	Weighted Average
	33,054		73.76% Pervious Area
	11,757		26.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A6: SUB-A4



Summary for Subcatchment A7: SUB-A7

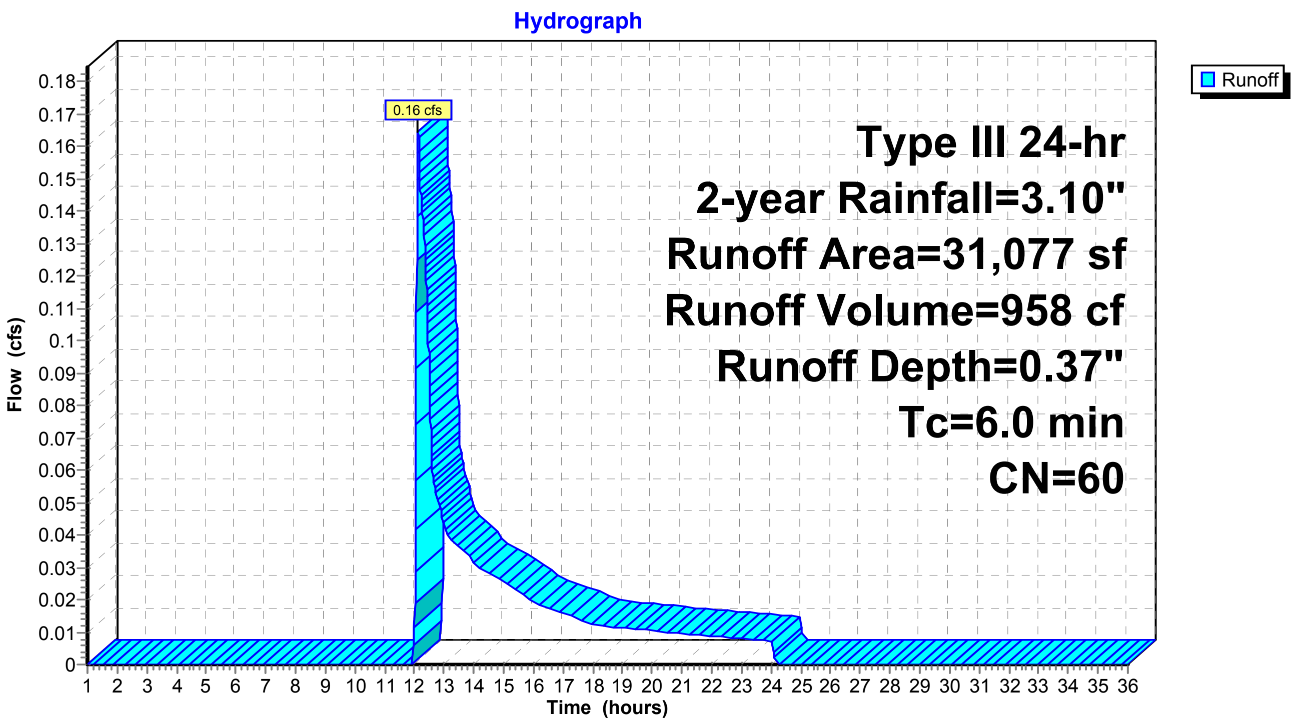
Runoff = 0.16 cfs @ 12.13 hrs, Volume= 958 cf, Depth= 0.37"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	3,420	98	Paved Impervious, HSG B
	523	39	>75% Grass cover, Good, HSG A
	16,801	61	>75% Grass cover, Good, HSG B
	3,334	30	Woods, Good, HSG A
	6,999	55	Woods, Good, HSG B
	31,077	60	Weighted Average
	27,657		89.00% Pervious Area
	3,420		11.00% Impervious Area

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

Subcatchment A7: SUB-A7



Summary for Subcatchment A8: SUB-A8

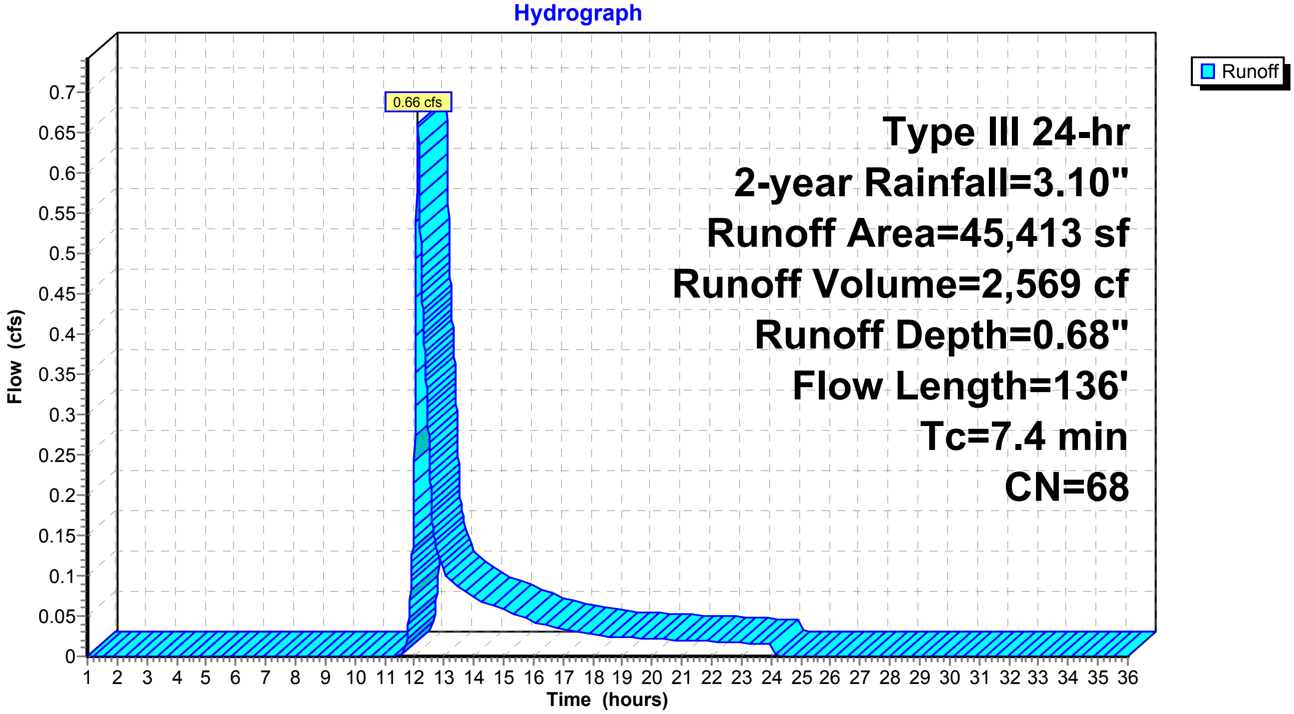
Runoff = 0.66 cfs @ 12.12 hrs, Volume= 2,569 cf, Depth= 0.68"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

	Area (sf)	CN	Description
*	9,176	98	Paved Impervious, HSG A
*	1,528	98	Paved Impervious, HSG B
	3,894	98	Roofs, HSG A
	8,917	98	Roofs, HSG B
	12,216	39	>75% Grass cover, Good, HSG A
	9,682	30	Woods, Good, HSG A
	45,413	68	Weighted Average
	21,898		48.22% Pervious Area
	23,515		51.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	52	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	34	0.0580	1.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.4	136	Total			

Subcatchment A8: SUB-A8



Summary for Subcatchment B1: SUB-B1

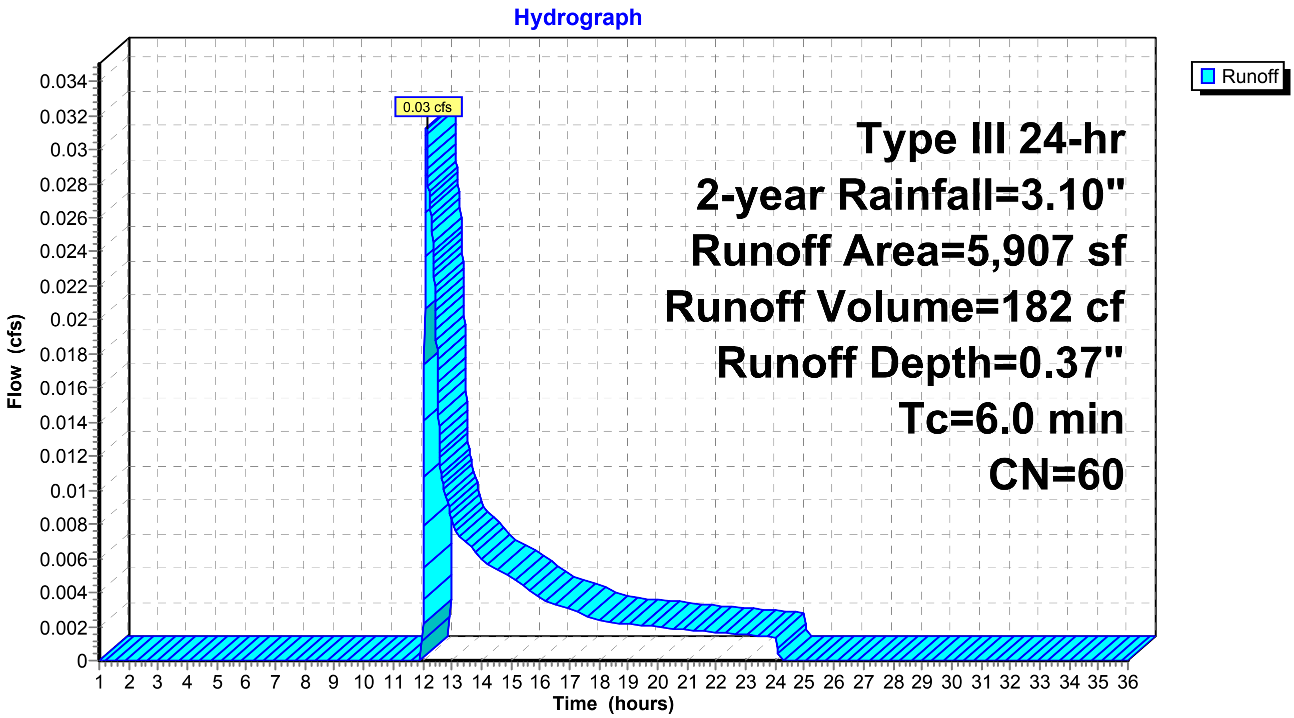
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 182 cf, Depth= 0.37"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.10"

Area (sf)	CN	Description
5,112	61	>75% Grass cover, Good, HSG B
795	55	Woods, Good, HSG B
5,907	60	Weighted Average
5,907		100.00% Pervious Area

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

Subcatchment B1: SUB-B1

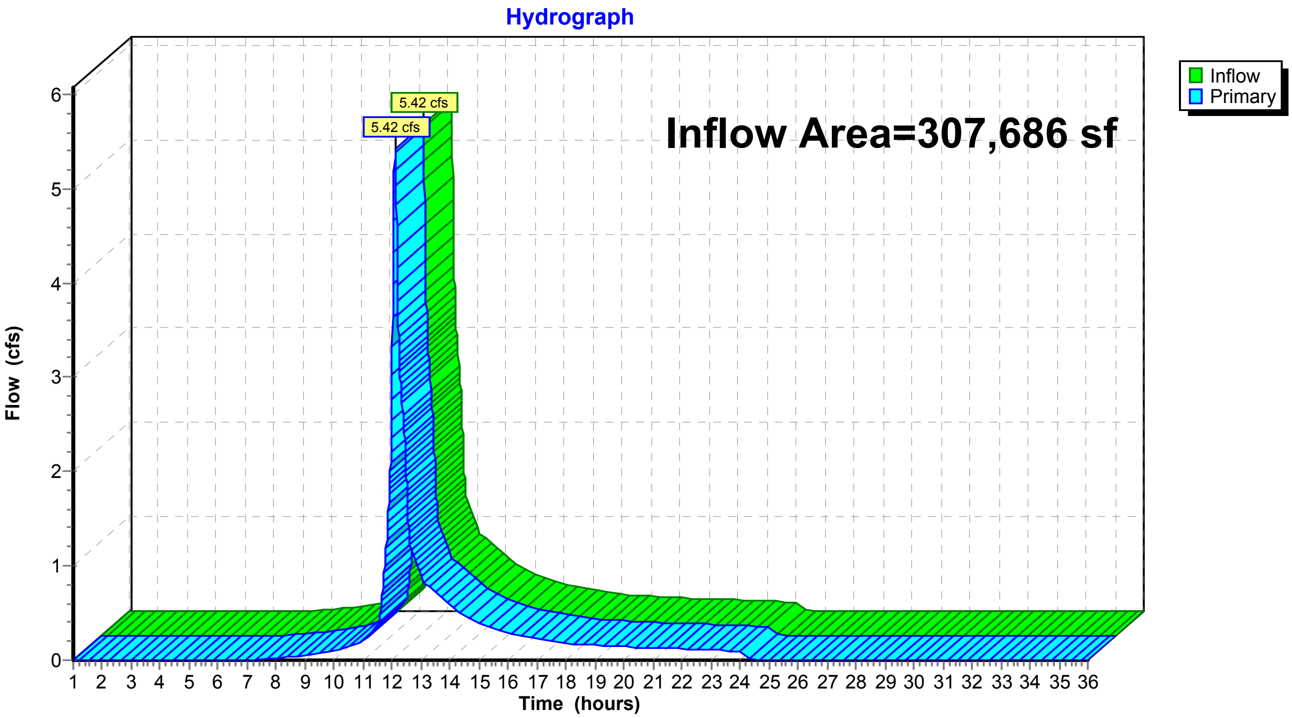


Summary for Pond A: POI-A

Inflow Area =	307,686 sf,	58.15% Impervious,	Inflow Depth = 0.85"	for 2-year event
Inflow =	5.42 cfs @	12.09 hrs, Volume=	21,916 cf	
Primary =	5.42 cfs @	12.09 hrs, Volume=	21,916 cf, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Pond A: POI-A

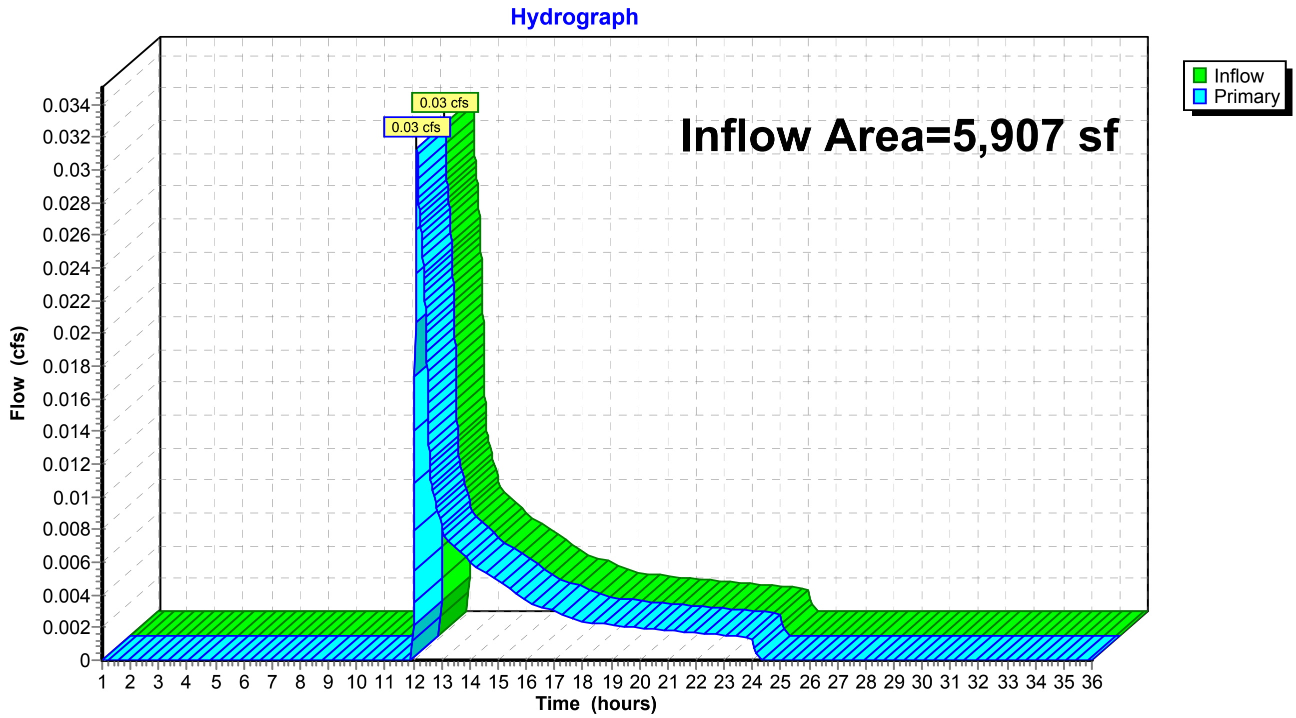


Summary for Pond B: POI-B

Inflow Area =	5,907 sf,	0.00% Impervious,	Inflow Depth = 0.37"	for 2-year event	
Inflow =	0.03 cfs @	12.13 hrs,	Volume=	182 cf	
Primary =	0.03 cfs @	12.13 hrs,	Volume=	182 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Pond B: POI-B



Summary for Pond BR-1: BR-1

Inflow Area = 16,500 sf, 77.45% Impervious, Inflow Depth = 1.75" for 2-year event
Inflow = 0.78 cfs @ 12.09 hrs, Volume= 2,404 cf
Outflow = 0.63 cfs @ 12.15 hrs, Volume= 1,594 cf, Atten= 19%, Lag= 3.7 min
Primary = 0.63 cfs @ 12.15 hrs, Volume= 1,594 cf
Routed to Pond IS-1 : IS-1
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 100.85' @ 12.15 hrs Surf.Area= 260 sf Storage= 833 cf

Plug-Flow detention time= 167.3 min calculated for 1,594 cf (66% of inflow)
Center-of-Mass det. time= 66.2 min (890.1 - 823.9)

Volume	Invert	Avail.Storage	Storage Description
#1	96.74'	1,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

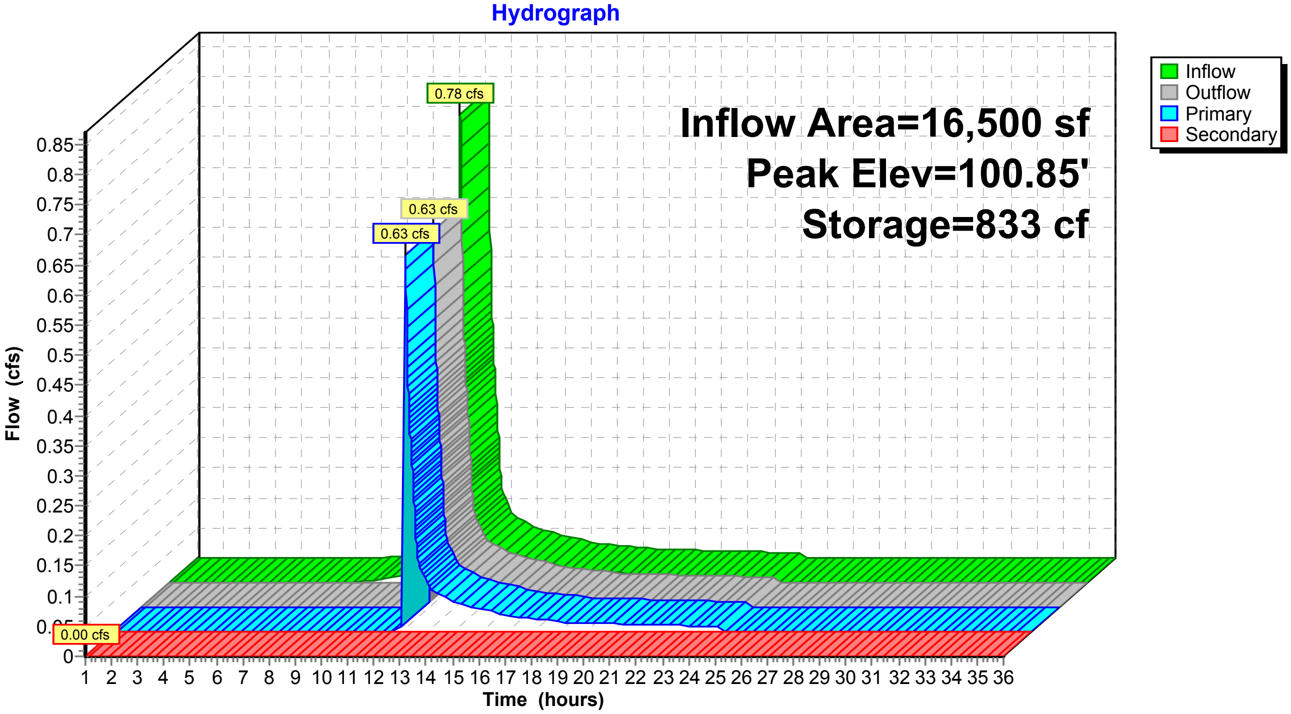
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.74	641	0.0	0	0
96.75	641	40.0	3	3
97.24	641	40.0	126	128
97.25	641	30.0	2	130
100.24	641	30.0	575	705
100.25	641	40.0	3	708
100.49	641	40.0	62	769
100.50	88	100.0	4	773
101.00	335	100.0	106	879
101.75	641	100.0	366	1,245

Device	Routing	Invert	Outlet Devices
#1	Device 2	100.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	94.49'	**12.0" Round Culvert** L= 62.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.49' / 94.18' S= 0.0049 '/' Cc= 0.900 n= 0.130, Flow Area= 0.79 sf
#3	Secondary	101.25'	**15.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.62 cfs @ 12.15 hrs HW=100.85' TW=93.57' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.62 cfs of 1.06 cfs potential flow)
  └─**1=Orifice/Grate** (Weir Controls 0.62 cfs @ 1.02 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=96.74' TW=92.50' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BR-1: BR-1


Hydrograph
Inflow
Outflow
Primary
Secondary
Inflow Area=16,500 sf
Peak Elev=100.85'
Storage=833 cf
0.78 cfs
0.63 cfs
0.63 cfs
0.00 cfs
Flow (cfs)
Time (hours)
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Pond DS-1: DS-1

Inflow Area = 35,193 sf, 61.85% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 0.95 cfs @ 12.13 hrs, Volume= 3,346 cf
Outflow = 0.46 cfs @ 12.39 hrs, Volume= 3,345 cf, Atten= 51%, Lag= 15.4 min
Primary = 0.46 cfs @ 12.39 hrs, Volume= 3,345 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 90.00' @ 12.39 hrs Surf.Area= 658 sf Storage= 753 cf

Plug-Flow detention time= 25.2 min calculated for 3,344 cf (100% of inflow)
Center-of-Mass det. time= 25.2 min (882.1 - 856.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.25'	627 cf	**20.50'W x 32.10'L x 3.50'H Field A**
			2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#2A	88.75'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1
			Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
			Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			16 Chambers in 4 Rows
		1,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	88.25'	**24.0" Round Culvert**
			L= 26.9' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 88.25' / 88.12' S= 0.0048 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	89.95'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	88.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.46 cfs @ 12.39 hrs HW=90.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.46 cfs of 8.99 cfs potential flow)
├**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.16 cfs @ 0.76 fps)
└**3=Orifice/Grate** (Orifice Controls 0.30 cfs @ 6.14 fps)

Pond DS-1: DS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

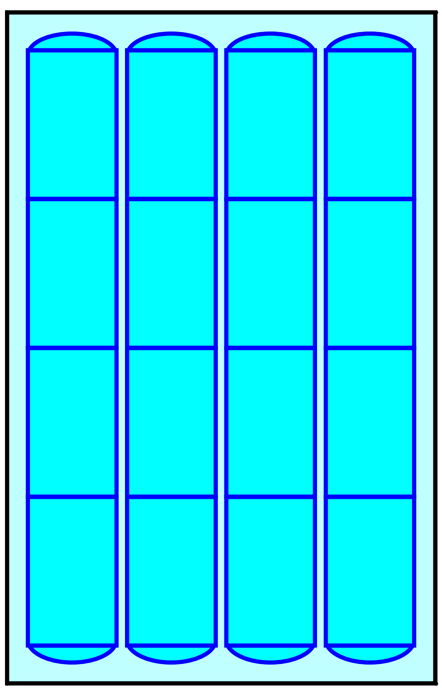
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

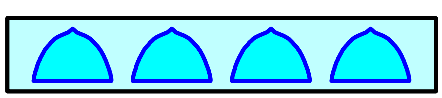
16 Chambers x 45.9 cf = 735.0 cf Chamber Storage

2,302.9 cf Field - 735.0 cf Chambers = 1,567.9 cf Stone x 40.0% Voids = 627.2 cf Stone Storage

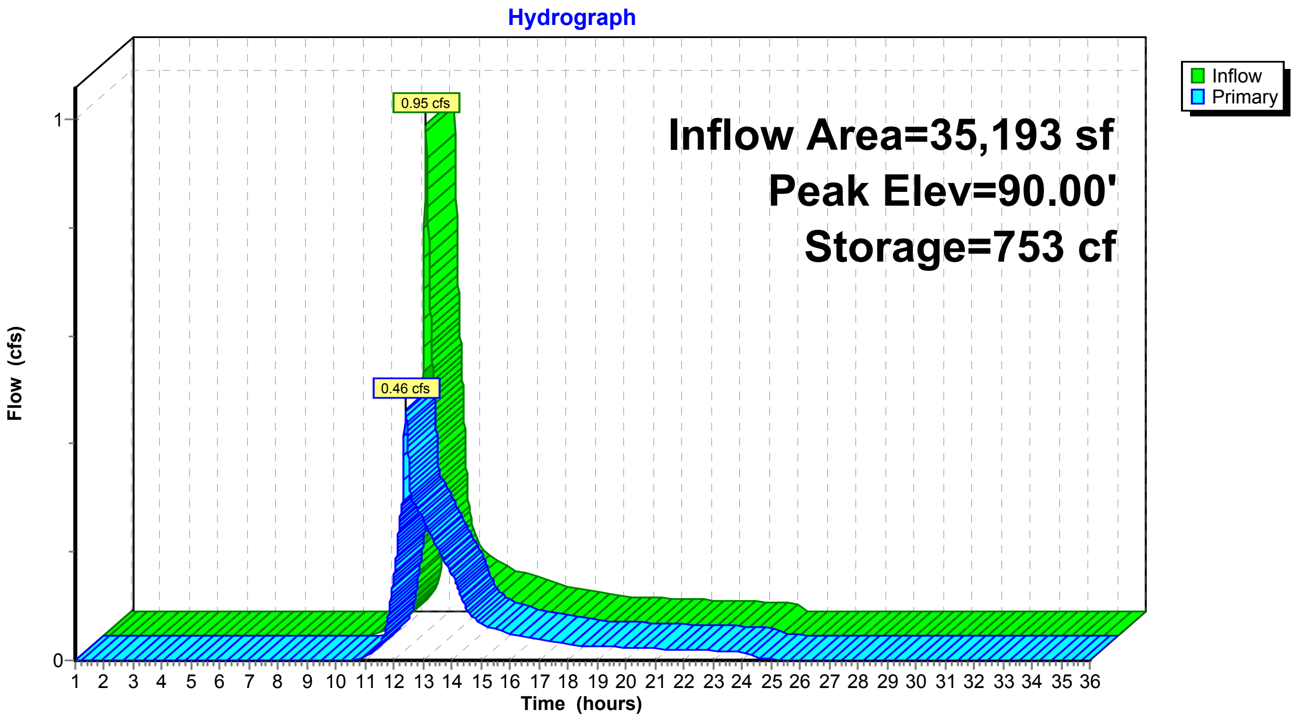
Chamber Storage + Stone Storage = 1,362.2 cf = 0.031 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 20.50' x 3.50'

16 Chambers
85.3 cy Field
58.1 cy Stone





Pond DS-1: DS-1


Hydrograph
Inflow
Primary
0.95 cfs
0.46 cfs
Inflow Area=35,193 sf
Peak Elev=90.00'
Storage=753 cf
Flow (cfs)
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Pond IS-1: IS-1

Inflow Area = 61,597 sf, 85.38% Impervious, Inflow Depth = 1.96" for 2-year event
Inflow = 2.80 cfs @ 12.14 hrs, Volume= 10,071 cf
Outflow = 0.23 cfs @ 13.67 hrs, Volume= 10,071 cf, Atten= 92%, Lag= 91.7 min
Discarded = 0.23 cfs @ 13.67 hrs, Volume= 10,059 cf
Primary = 0.00 cfs @ 13.67 hrs, Volume= 13 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 94.24' @ 13.67 hrs Surf.Area= 3,603 sf Storage= 4,071 cf

Plug-Flow detention time= 159.1 min calculated for 10,071 cf (100% of inflow)
Center-of-Mass det. time= 159.1 min (972.5 - 813.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.50'	5,063 cf	**29.92'W x 120.42'L x 5.50'H Field A** 19,814 cf Overall - 7,156 cf Embedded = 12,658 cf x 40.0% Voids
#2A	93.25'	7,156 cf	**ADS_StormTech MC-3500 d +Cap** x 64 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 64 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
		12,219 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	92.50'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	92.00'	**12.0" Round Culvert** L= 91.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.00' / 91.09' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	97.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	94.20'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.23 cfs @ 13.67 hrs HW=94.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.23 cfs)

Primary OutFlow Max=0.00 cfs @ 13.67 hrs HW=94.24' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.00 cfs of 3.94 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.67 fps)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

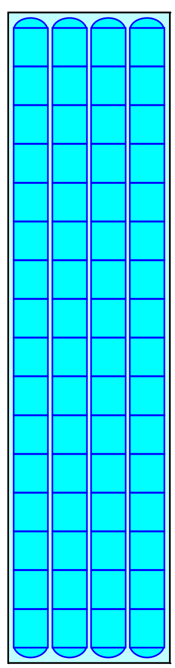
16 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 118.42' Row Length +12.0" End Stone x 2 = 120.42' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

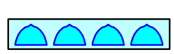
64 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 7,156.1 cf Chamber Storage

19,814.1 cf Field - 7,156.1 cf Chambers = 12,658.0 cf Stone x 40.0% Voids = 5,063.2 cf Stone Storage

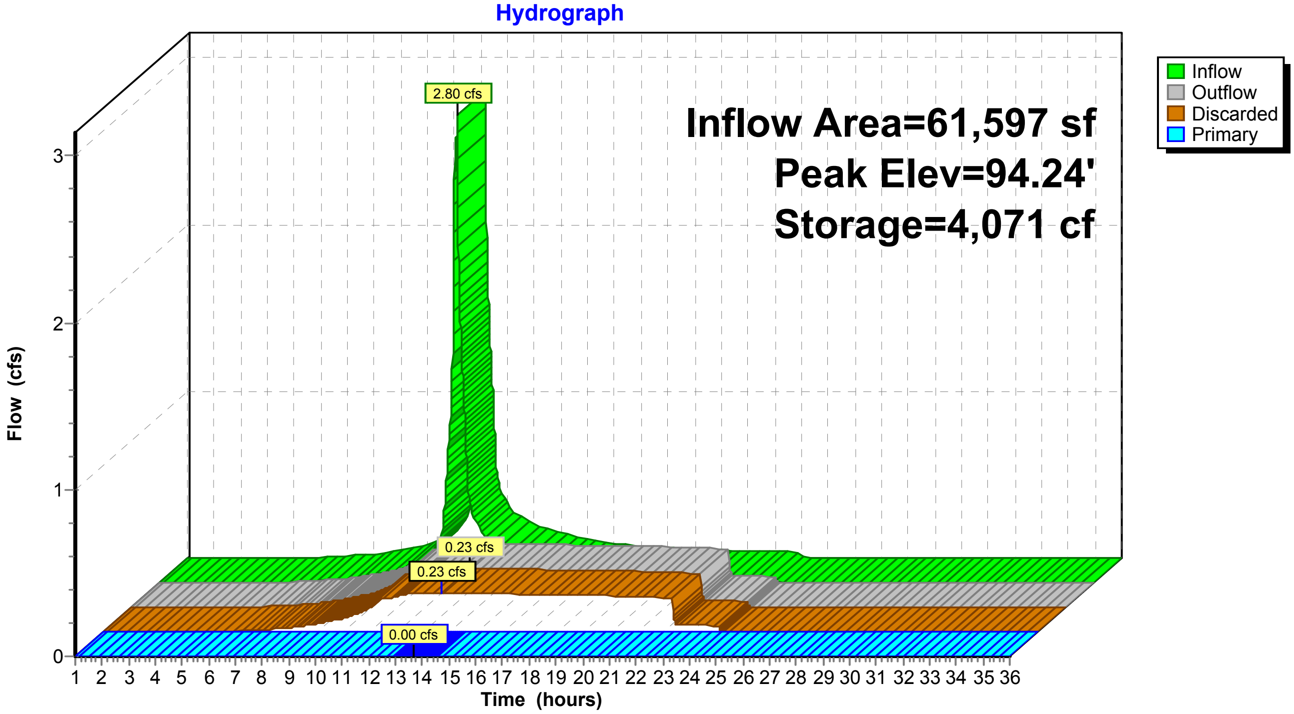
Chamber Storage + Stone Storage = 12,219.3 cf = 0.281 af
Overall Storage Efficiency = 61.7%
Overall System Size = 120.42' x 29.92' x 5.50'

64 Chambers
733.9 cy Field
468.8 cy Stone





Pond IS-1: IS-1


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=61,597 sf
Peak Elev=94.24'
Storage=4,071 cf
2.80 cfs
0.23 cfs
0.23 cfs
0.00 cfs
Flow (cfs)
0
1
2
3
Time (hours)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=78,085 sf 75.63% Impervious Runoff Depth=3.49"
Tc=6.0 min CN=89 Runoff=7.14 cfs 22,680 cf

SubcatchmentA2: SUB-A2 Runoff Area=35,193 sf 61.85% Impervious Runoff Depth=2.37"
Flow Length=160' Tc=8.9 min CN=77 Runoff=2.03 cfs 6,963 cf

SubcatchmentA3: SUB-A3 Runoff Area=16,500 sf 77.45% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=86 Runoff=1.40 cfs 4,384 cf

SubcatchmentA4: SUB-A4 Runoff Area=45,097 sf 88.28% Impervious Runoff Depth=3.80"
Tc=6.0 min CN=92 Runoff=4.39 cfs 14,268 cf

SubcatchmentA5: SUB-A2 Runoff Area=11,510 sf 59.26% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=74 Runoff=0.65 cfs 2,041 cf

SubcatchmentA6: SUB-A4 Runoff Area=44,811 sf 26.24% Impervious Runoff Depth=1.01"
Flow Length=463' Tc=12.7 min CN=58 Runoff=0.80 cfs 3,763 cf

SubcatchmentA7: SUB-A7 Runoff Area=31,077 sf 11.00% Impervious Runoff Depth=1.13"
Tc=6.0 min CN=60 Runoff=0.83 cfs 2,926 cf

SubcatchmentA8: SUB-A8 Runoff Area=45,413 sf 51.78% Impervious Runoff Depth=1.67"
Flow Length=136' Tc=7.4 min CN=68 Runoff=1.87 cfs 6,317 cf

SubcatchmentB1: SUB-B1 Runoff Area=5,907 sf 0.00% Impervious Runoff Depth=1.13"
Tc=6.0 min CN=60 Runoff=0.16 cfs 556 cf

Pond A: POI-A Inflow=12.62 cfs 49,299 cf
Primary=12.62 cfs 49,299 cf

Pond B: POI-B Inflow=0.16 cfs 556 cf
Primary=0.16 cfs 556 cf

Pond BR-1: BR-1 Peak Elev=101.15' Storage=933 cf Inflow=1.40 cfs 4,384 cf
Primary=1.09 cfs 3,573 cf Secondary=0.00 cfs 0 cf Outflow=1.09 cfs 3,573 cf

Pond DS-1: DS-1 Peak Elev=90.21' Storage=846 cf Inflow=2.03 cfs 6,963 cf
Outflow=2.01 cfs 6,962 cf

Pond IS-1: IS-1 Peak Elev=95.40' Storage=7,350 cf Inflow=5.47 cfs 17,841 cf
Discarded=0.25 cfs 13,230 cf Primary=0.43 cfs 4,612 cf Outflow=0.68 cfs 17,841 cf

Total Runoff Area = 313,593 sf Runoff Volume = 63,896 cf Average Runoff Depth = 2.45"
42.94% Pervious = 134,668 sf 57.06% Impervious = 178,925 sf

Summary for Subcatchment A1: SUB-A1

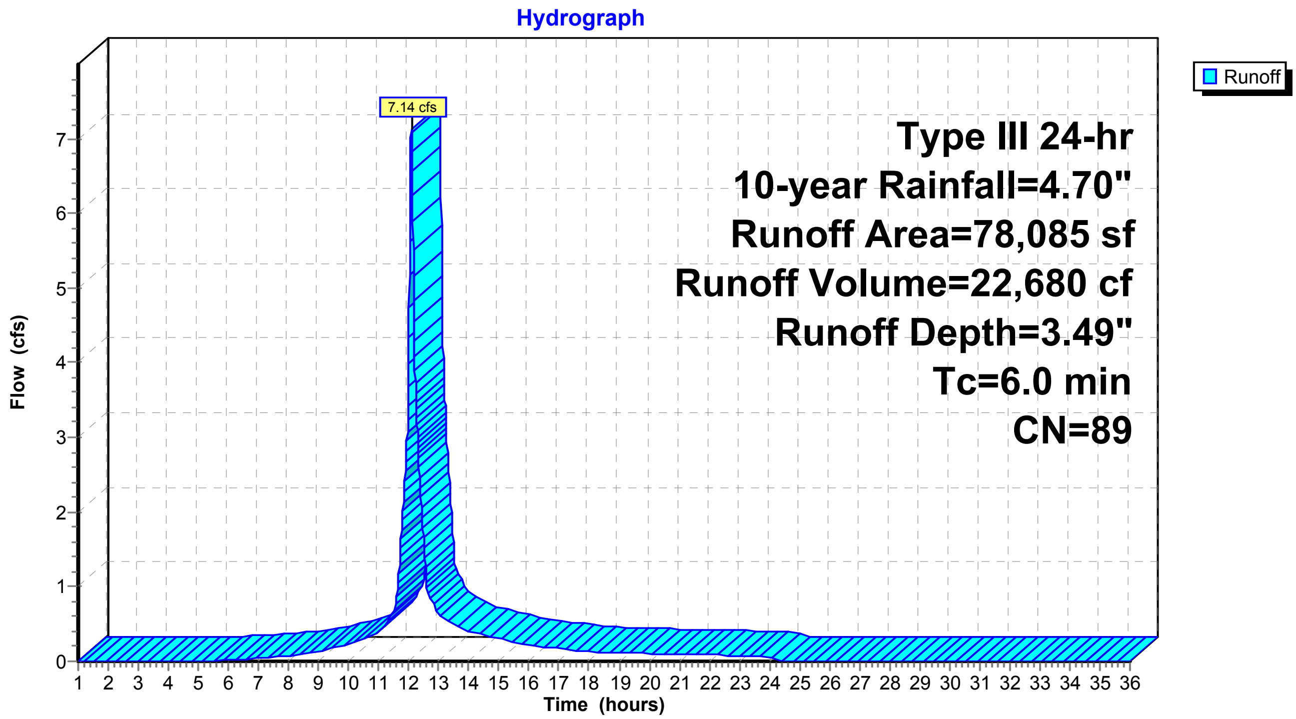
Runoff = 7.14 cfs @ 12.09 hrs, Volume= 22,680 cf, Depth= 3.49"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

	Area (sf)	CN	Description
*	27,200	98	Paved Impervious, HSG B
	16,163	98	Roofs, HSG B
	19,031	61	>75% Grass cover, Good, HSG B
*	15,691	98	Expanded School Yard Impervious, HSG B
	78,085	89	Weighted Average
	19,031		24.37% Pervious Area
	59,054		75.63% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

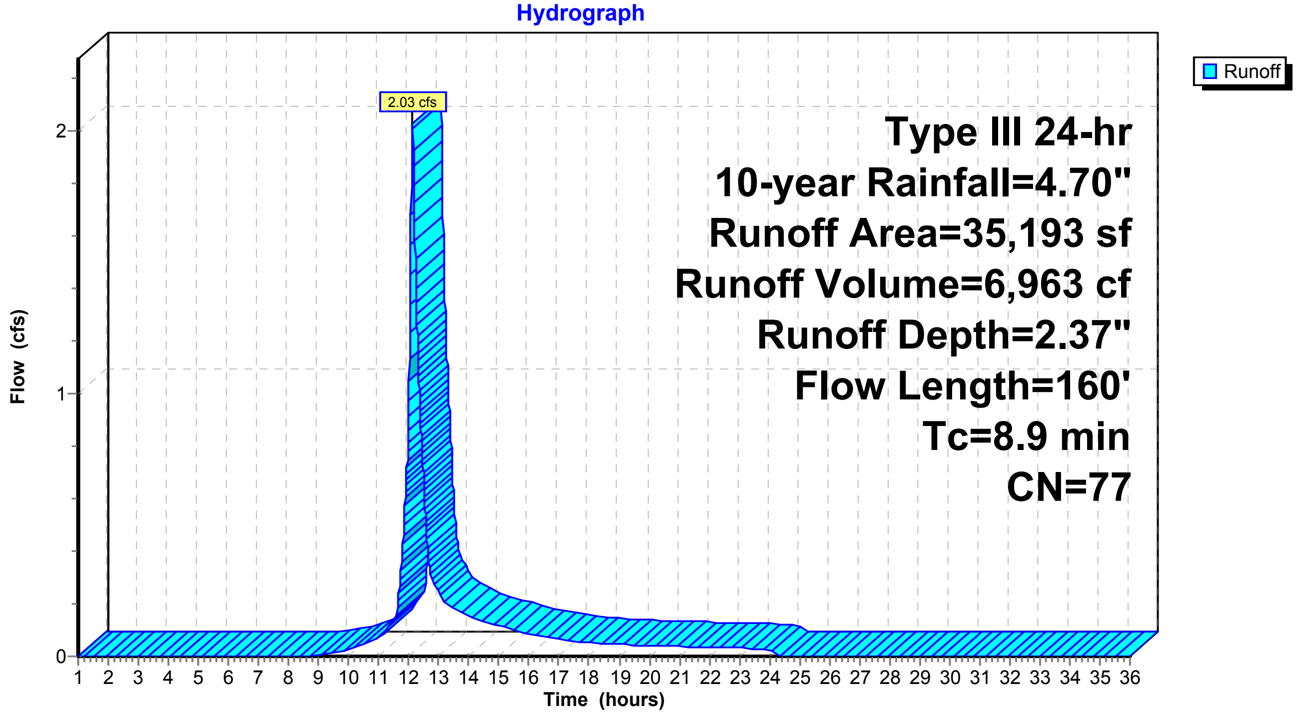
Runoff = 2.03 cfs @ 12.13 hrs, Volume= 6,963 cf, Depth= 2.37"
Routed to Pond DS-1 : DS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

	Area (sf)	CN	Description
*	23	98	Paved Impervious, HSG A
*	18,246	98	Paved Impervious, HSG B
	3,498	98	Roofs, HSG B
	1,694	39	>75% Grass cover, Good, HSG A
	4,693	61	>75% Grass cover, Good, HSG B
	6,952	30	Woods, Good, HSG A
	87	55	Woods, Good, HSG B
	35,193	77	Weighted Average
	13,426		38.15% Pervious Area
	21,767		61.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	33	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	59	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.9	160	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

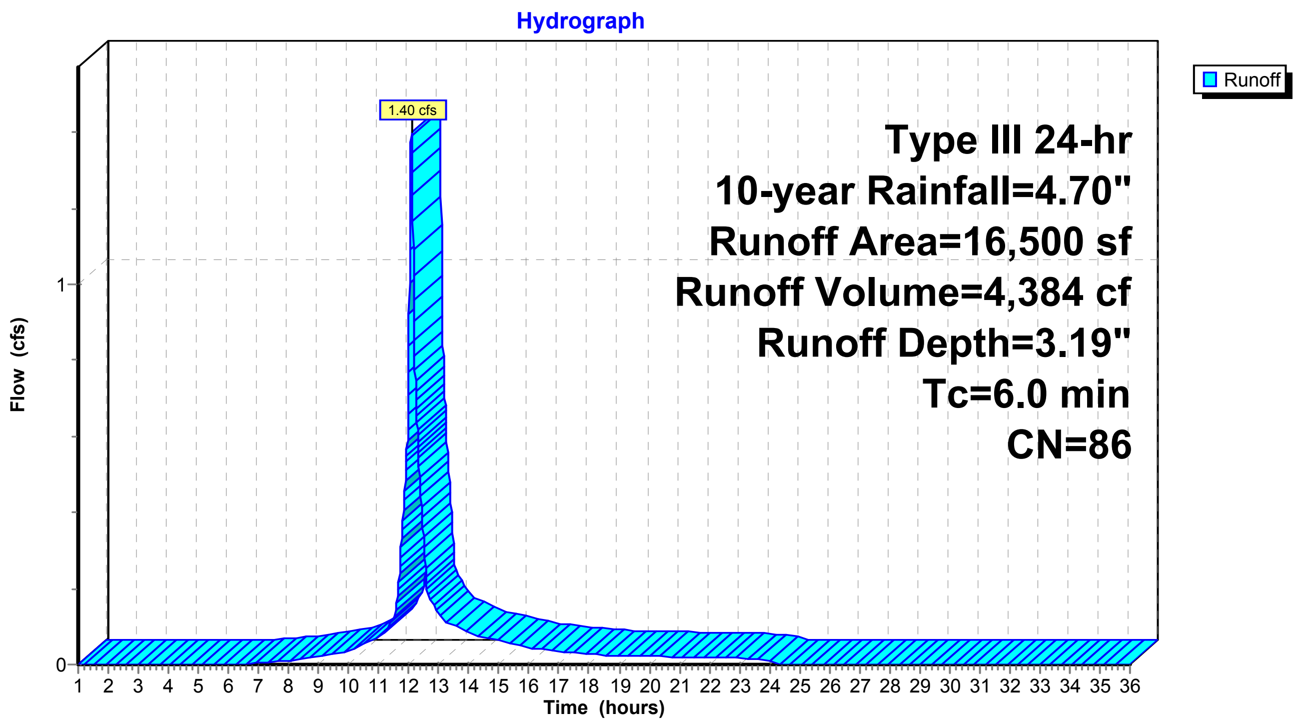
Runoff = 1.40 cfs @ 12.09 hrs, Volume= 4,384 cf, Depth= 3.19"
Routed to Pond BR-1 : BR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

	Area (sf)	CN	Description
*	4,196	98	Paved Impervious, HSG A
*	1,717	98	Paved Impervious, HSG B
	6,866	98	Roofs, HSG B
	2,808	39	>75% Grass cover, Good, HSG A
	913	61	>75% Grass cover, Good, HSG B
	16,500	86	Weighted Average
	3,721		22.55% Pervious Area
	12,779		77.45% Impervious Area

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

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

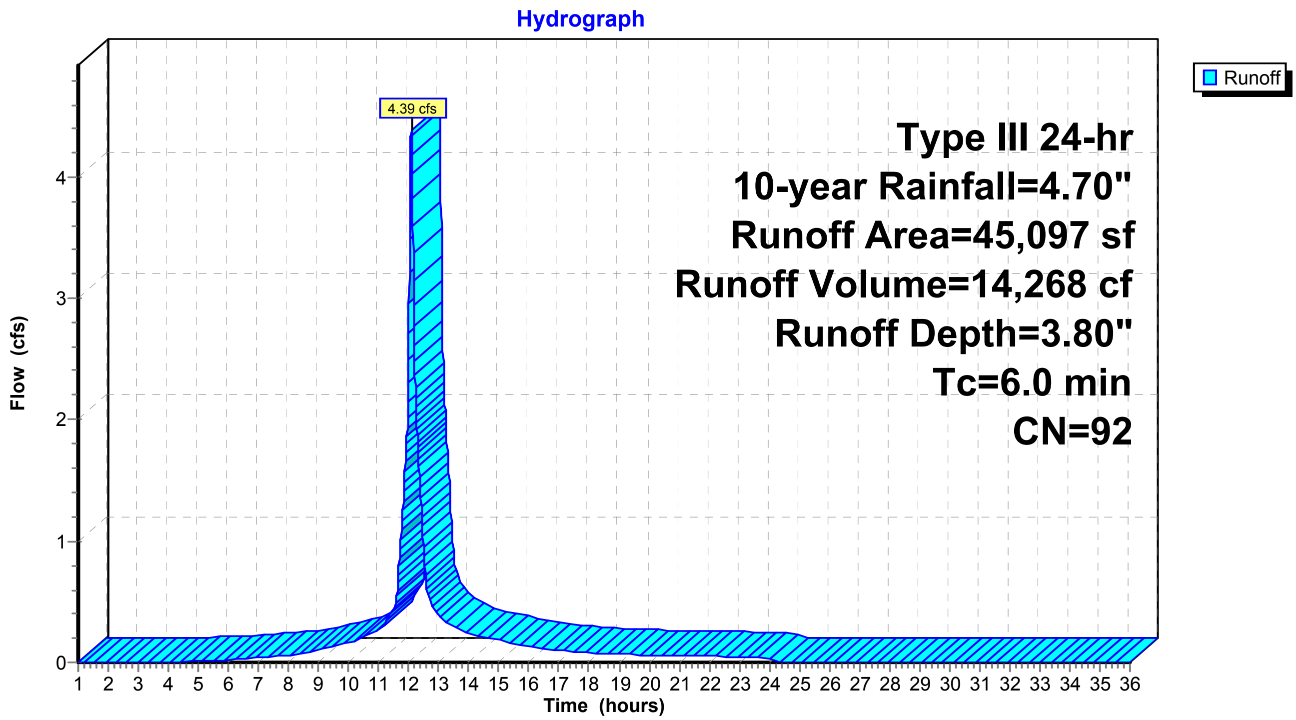
Runoff = 4.39 cfs @ 12.08 hrs, Volume= 14,268 cf, Depth= 3.80"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

	Area (sf)	CN	Description
*	28,479	98	Paved Impervious, HSG A
*	4,701	98	Paved Impervious, HSG B
	3,540	98	Roofs, HSG A
	3,092	98	Roofs, HSG B
	3,675	39	>75% Grass cover, Good, HSG A
	1,610	61	>75% Grass cover, Good, HSG B
	45,097	92	Weighted Average
	5,285		11.72% Pervious Area
	39,812		88.28% Impervious Area

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

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A2

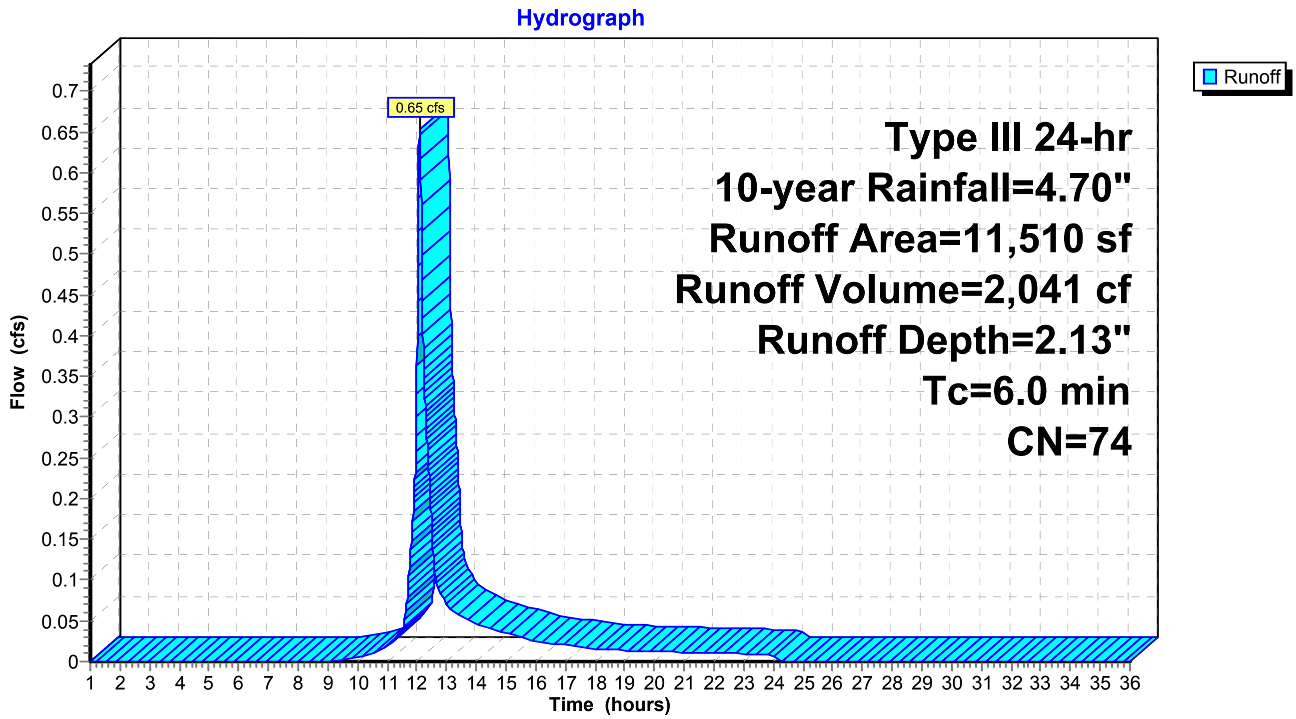
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 2,041 cf, Depth= 2.13"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

	Area (sf)	CN	Description
*	5,725	98	Paved Impervious, HSG A
*	1,096	98	Paved Impervious, HSG B
	4,689	39	>75% Grass cover, Good, HSG A
	11,510	74	Weighted Average
	4,689		40.74% Pervious Area
	6,821		59.26% Impervious Area

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

Subcatchment A5: SUB-A2



Summary for Subcatchment A6: SUB-A4

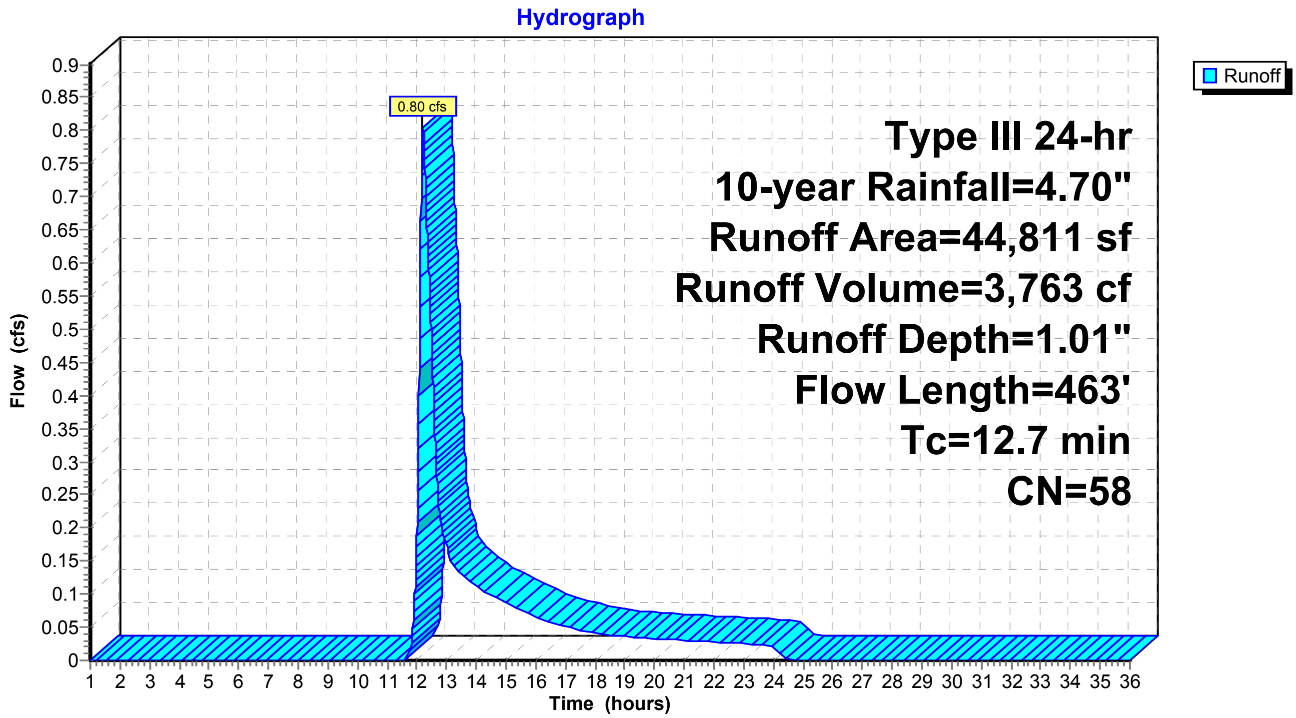
Runoff = 0.80 cfs @ 12.20 hrs, Volume= 3,763 cf, Depth= 1.01"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

	Area (sf)	CN	Description
*	3,625	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	13,635	30	Woods, Good, HSG A
	13,102	55	Woods, Good, HSG B
	2,357	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	44,811	58	Weighted Average
	33,054		73.76% Pervious Area
	11,757		26.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A6: SUB-A4



Summary for Subcatchment A7: SUB-A7

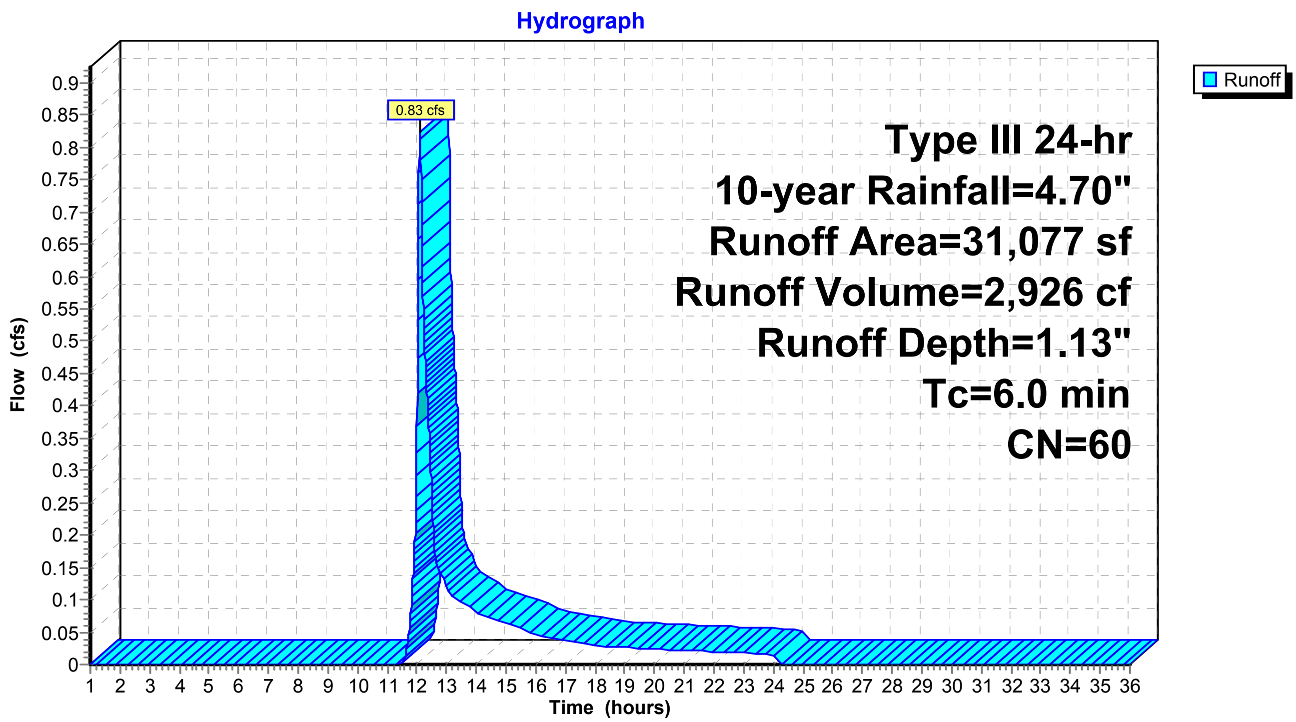
Runoff = 0.83 cfs @ 12.10 hrs, Volume= 2,926 cf, Depth= 1.13"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

	Area (sf)	CN	Description
*	3,420	98	Paved Impervious, HSG B
	523	39	>75% Grass cover, Good, HSG A
	16,801	61	>75% Grass cover, Good, HSG B
	3,334	30	Woods, Good, HSG A
	6,999	55	Woods, Good, HSG B
	31,077	60	Weighted Average
	27,657		89.00% Pervious Area
	3,420		11.00% Impervious Area

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

Subcatchment A7: SUB-A7



Summary for Subcatchment A8: SUB-A8

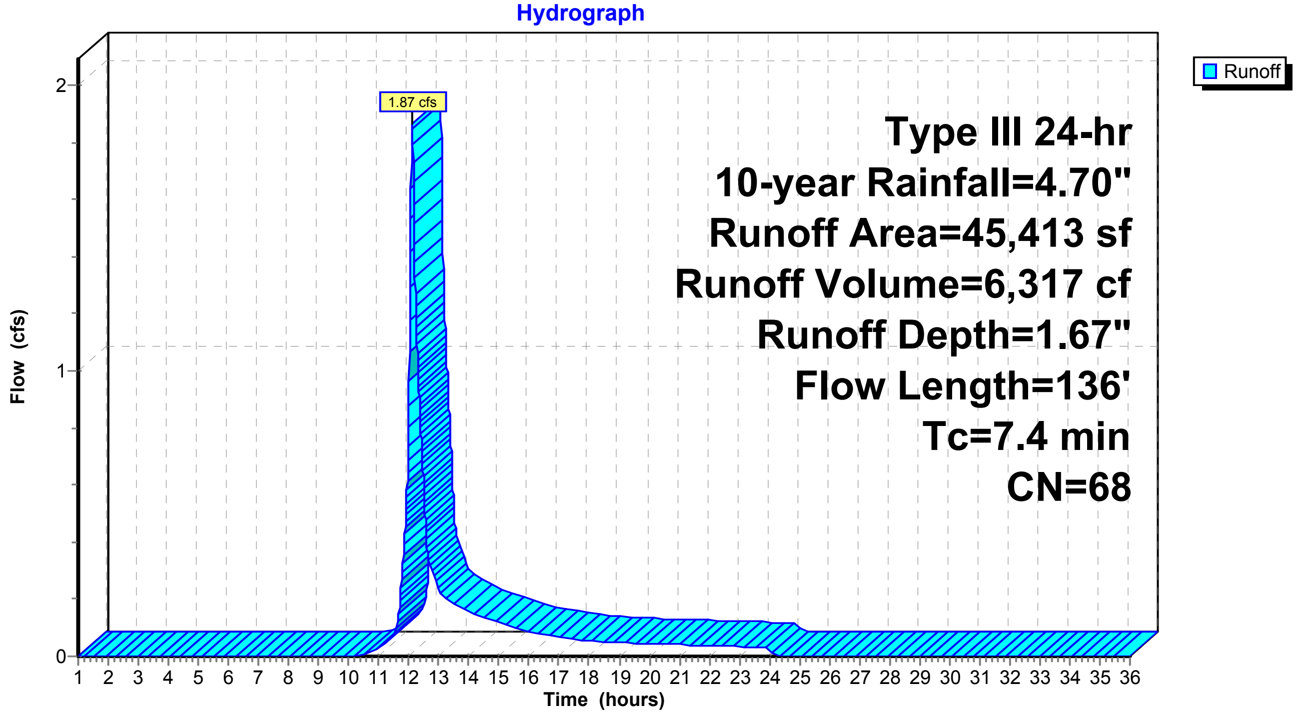
Runoff = 1.87 cfs @ 12.11 hrs, Volume= 6,317 cf, Depth= 1.67"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

	Area (sf)	CN	Description
*	9,176	98	Paved Impervious, HSG A
*	1,528	98	Paved Impervious, HSG B
	3,894	98	Roofs, HSG A
	8,917	98	Roofs, HSG B
	12,216	39	>75% Grass cover, Good, HSG A
	9,682	30	Woods, Good, HSG A
	45,413	68	Weighted Average
	21,898		48.22% Pervious Area
	23,515		51.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	52	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	34	0.0580	1.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.4	136	Total			

Subcatchment A8: SUB-A8



Summary for Subcatchment B1: SUB-B1

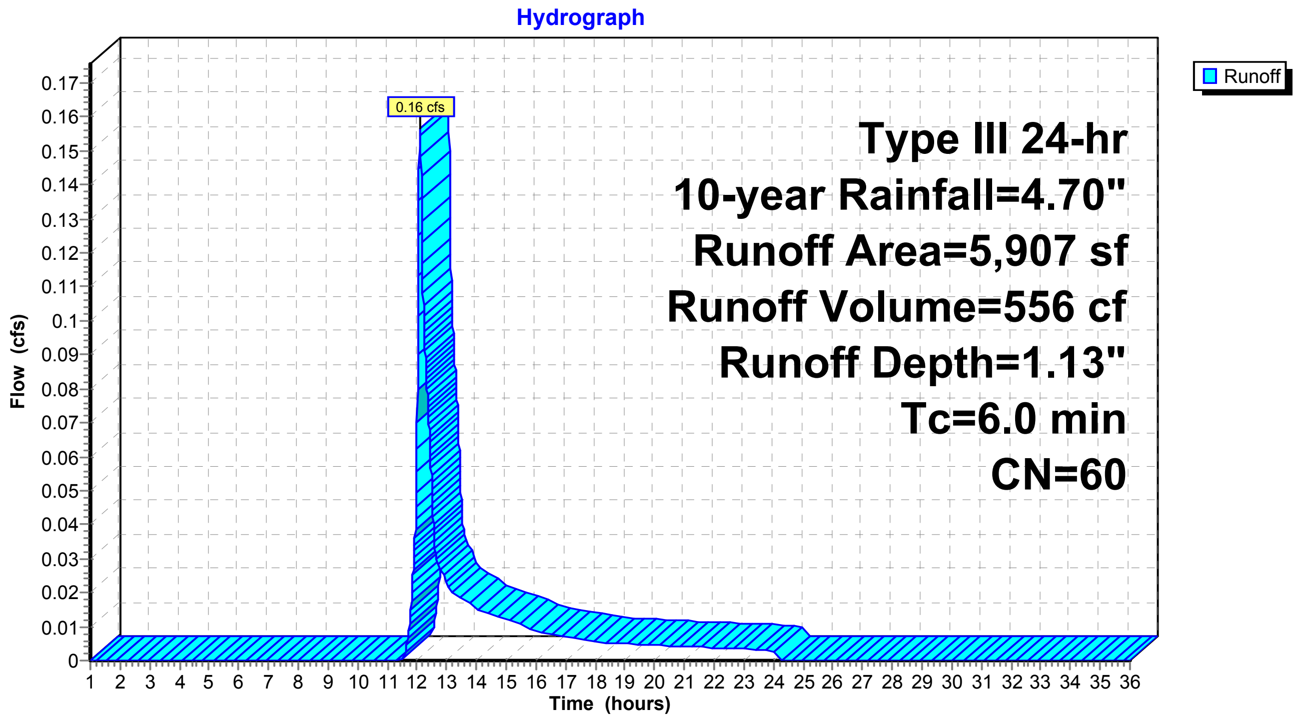
Runoff = 0.16 cfs @ 12.10 hrs, Volume= 556 cf, Depth= 1.13"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.70"

Area (sf)	CN	Description
5,112	61	>75% Grass cover, Good, HSG B
795	55	Woods, Good, HSG B
5,907	60	Weighted Average
5,907		100.00% Pervious Area

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

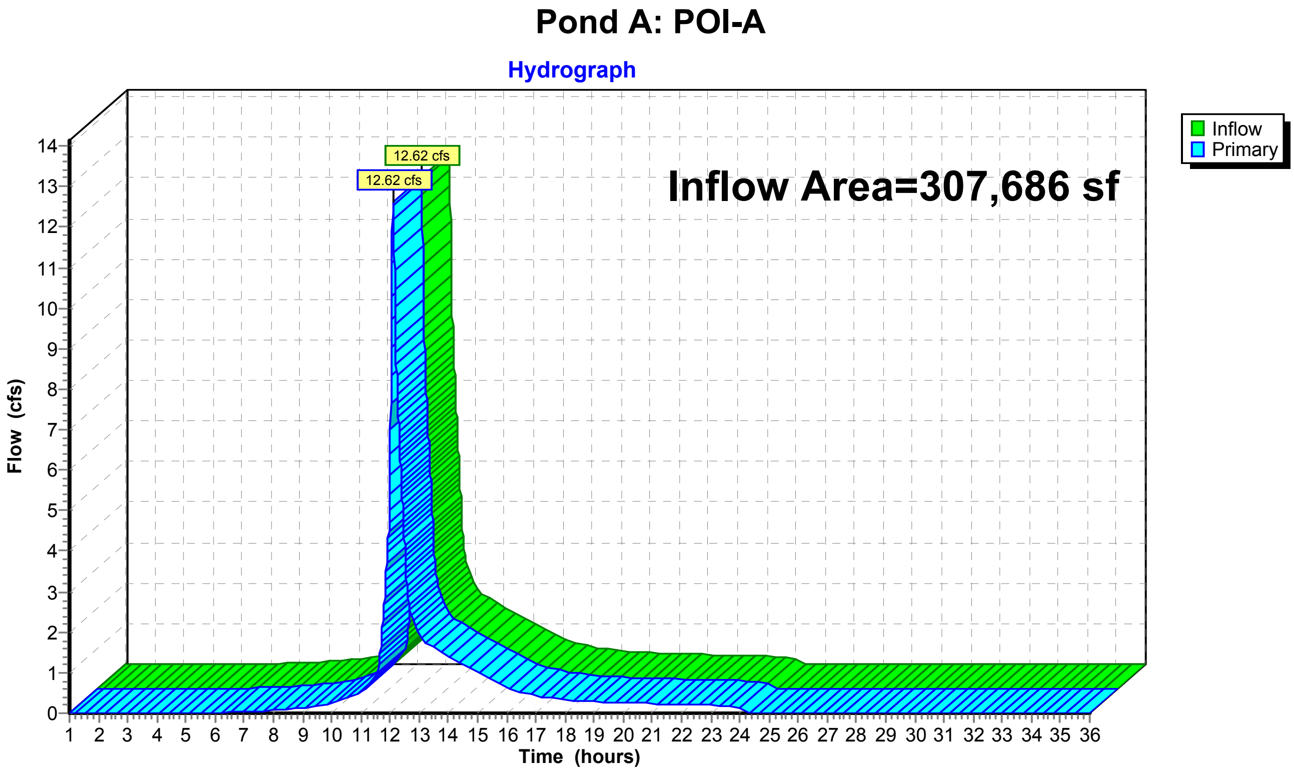
Subcatchment B1: SUB-B1



Summary for Pond A: POI-A

Inflow Area =	307,686 sf,	58.15% Impervious,	Inflow Depth = 1.92"	for 10-year event
Inflow =	12.62 cfs @	12.11 hrs, Volume=	49,299 cf	
Primary =	12.62 cfs @	12.11 hrs, Volume=	49,299 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

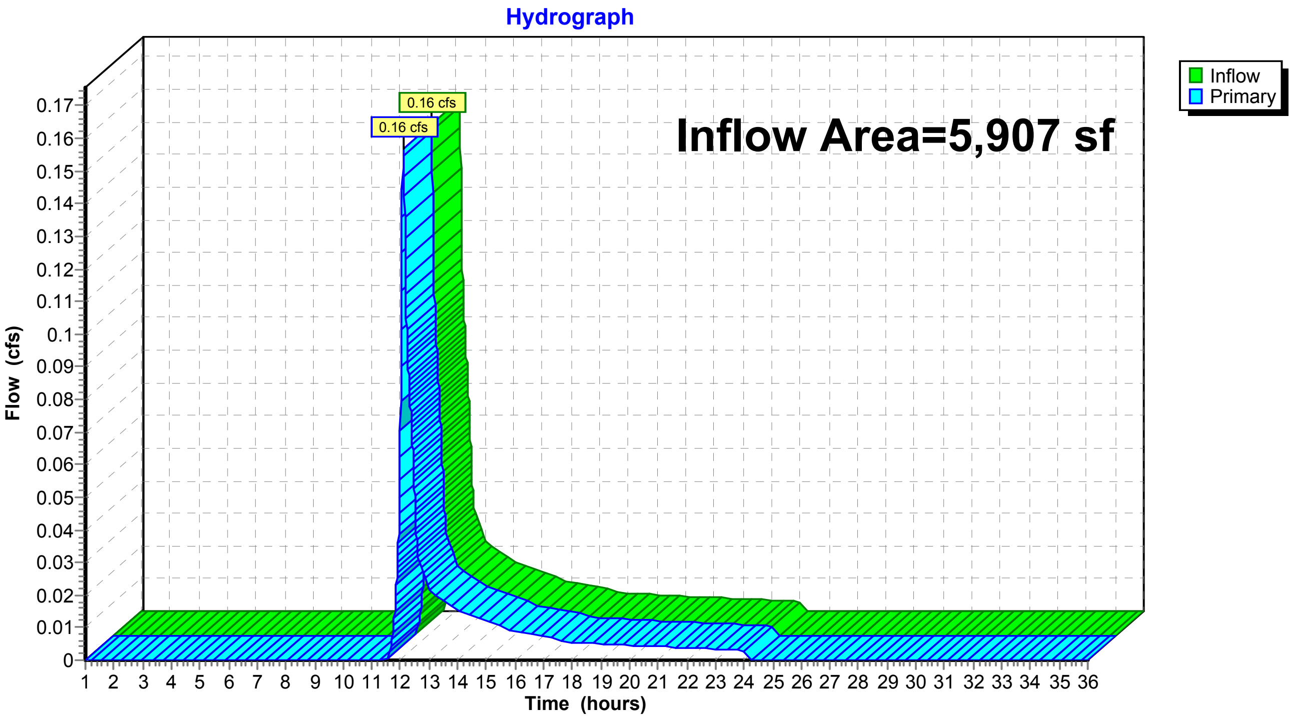


Summary for Pond B: POI-B

Inflow Area =	5,907 sf,	0.00% Impervious, Inflow Depth = 1.13"	for 10-year event
Inflow =	0.16 cfs @ 12.10 hrs,	Volume=	556 cf
Primary =	0.16 cfs @ 12.10 hrs,	Volume=	556 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Pond B: POI-B



Summary for Pond BR-1: BR-1

Inflow Area = 16,500 sf, 77.45% Impervious, Inflow Depth = 3.19" for 10-year event
Inflow = 1.40 cfs @ 12.09 hrs, Volume= 4,384 cf
Outflow = 1.09 cfs @ 12.15 hrs, Volume= 3,573 cf, Atten= 22%, Lag= 3.8 min
Primary = 1.09 cfs @ 12.15 hrs, Volume= 3,573 cf
Routed to Pond IS-1 : IS-1
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 101.15' @ 12.15 hrs Surf.Area= 396 sf Storage= 933 cf

Plug-Flow detention time= 111.1 min calculated for 3,572 cf (81% of inflow)
Center-of-Mass det. time= 38.5 min (845.3 - 806.8)

Volume	Invert	Avail.Storage	Storage Description
#1	96.74'	1,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

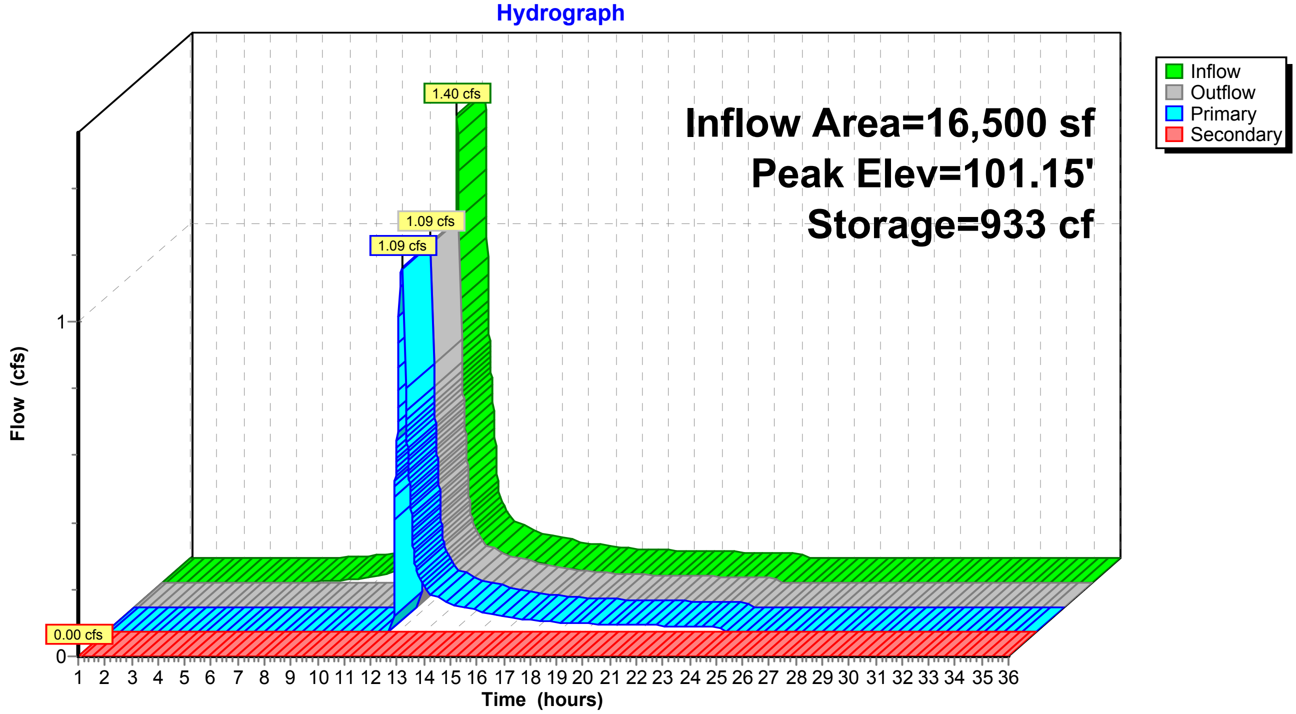
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.74	641	0.0	0	0
96.75	641	40.0	3	3
97.24	641	40.0	126	128
97.25	641	30.0	2	130
100.24	641	30.0	575	705
100.25	641	40.0	3	708
100.49	641	40.0	62	769
100.50	88	100.0	4	773
101.00	335	100.0	106	879
101.75	641	100.0	366	1,245

Device	Routing	Invert	Outlet Devices
#1	Device 2	100.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	94.49'	**12.0" Round Culvert** L= 62.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.49' / 94.18' S= 0.0049 '/' Cc= 0.900 n= 0.130, Flow Area= 0.79 sf
#3	Secondary	101.25'	**15.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.09 cfs @ 12.15 hrs HW=101.15' TW=94.51' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 1.09 cfs @ 1.39 fps)
  └─**1=Orifice/Grate** (Passes 1.09 cfs of 5.18 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=96.74' TW=92.50' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BR-1: BR-1


Hydrograph
Inflow
Outflow
Primary
Secondary
Inflow Area=16,500 sf
Peak Elev=101.15'
Storage=933 cf
1.40 cfs
1.09 cfs
1.09 cfs
0.00 cfs
Flow (cfs)
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Pond DS-1: DS-1

Inflow Area = 35,193 sf, 61.85% Impervious, Inflow Depth = 2.37" for 10-year event
Inflow = 2.03 cfs @ 12.13 hrs, Volume= 6,963 cf
Outflow = 2.01 cfs @ 12.14 hrs, Volume= 6,962 cf, Atten= 1%, Lag= 0.9 min
Primary = 2.01 cfs @ 12.14 hrs, Volume= 6,962 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 90.21' @ 12.14 hrs Surf.Area= 658 sf Storage= 846 cf

Plug-Flow detention time= 20.1 min calculated for 6,960 cf (100% of inflow)
Center-of-Mass det. time= 20.1 min (855.4 - 835.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.25'	627 cf	**20.50'W x 32.10'L x 3.50'H Field A** 2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#2A	88.75'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Chambers in 4 Rows
		1,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	88.25'	**24.0" Round Culvert** L= 26.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 88.25' / 88.12' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	89.95'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	88.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.01 cfs @ 12.14 hrs HW=90.21' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.01 cfs of 10.62 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.69 cfs @ 1.66 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.32 cfs @ 6.52 fps)

Pond DS-1: DS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

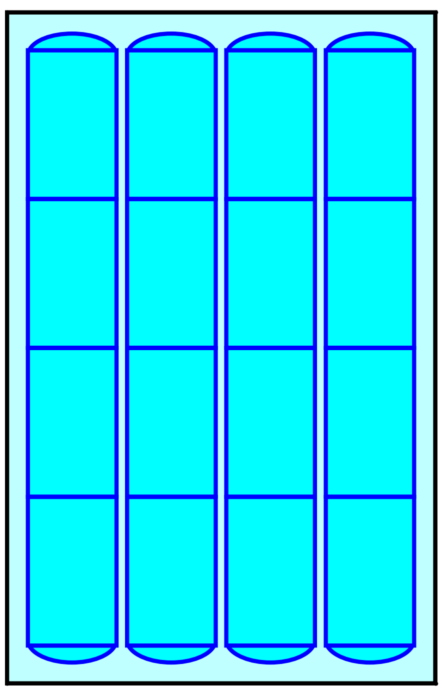
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

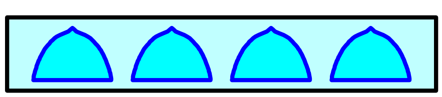
16 Chambers x 45.9 cf = 735.0 cf Chamber Storage

2,302.9 cf Field - 735.0 cf Chambers = 1,567.9 cf Stone x 40.0% Voids = 627.2 cf Stone Storage

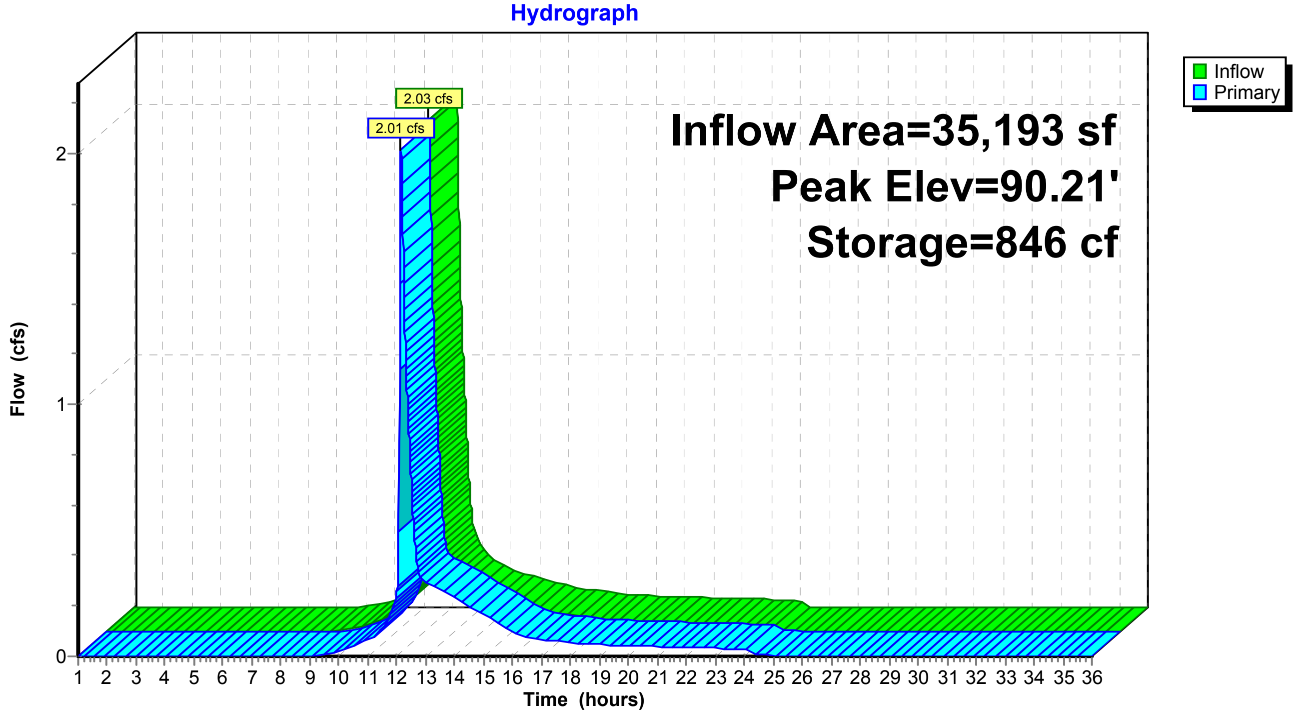
Chamber Storage + Stone Storage = 1,362.2 cf = 0.031 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 20.50' x 3.50'

16 Chambers
85.3 cy Field
58.1 cy Stone





Pond DS-1: DS-1


Hydrograph
Inflow
Primary
2.03 cfs
2.01 cfs
Inflow Area=35,193 sf
Peak Elev=90.21'
Storage=846 cf
Flow (cfs)
Time (hours)
0
1
2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Pond IS-1: IS-1

Inflow Area = 61,597 sf, 85.38% Impervious, Inflow Depth = 3.48" for 10-year event
Inflow = 5.47 cfs @ 12.09 hrs, Volume= 17,841 cf
Outflow = 0.68 cfs @ 12.72 hrs, Volume= 17,841 cf, Atten= 88%, Lag= 38.0 min
Discarded = 0.25 cfs @ 12.72 hrs, Volume= 13,230 cf
Primary = 0.43 cfs @ 12.72 hrs, Volume= 4,612 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.40' @ 12.72 hrs Surf.Area= 3,603 sf Storage= 7,350 cf

Plug-Flow detention time= 160.2 min calculated for 17,841 cf (100% of inflow)
Center-of-Mass det. time= 160.2 min (957.0 - 796.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.50'	5,063 cf	**29.92'W x 120.42'L x 5.50'H Field A** 19,814 cf Overall - 7,156 cf Embedded = 12,658 cf x 40.0% Voids
#2A	93.25'	7,156 cf	**ADS_StormTech MC-3500 d +Cap** x 64 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 64 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
		12,219 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	92.50'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	92.00'	**12.0" Round Culvert** L= 91.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.00' / 91.09' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	97.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	94.20'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.25 cfs @ 12.72 hrs HW=95.40' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.43 cfs @ 12.72 hrs HW=95.40' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.43 cfs of 5.09 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Orifice Controls 0.43 cfs @ 4.90 fps)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

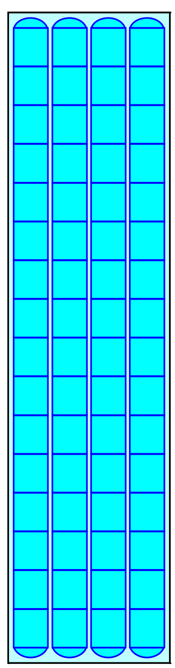
16 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 118.42' Row Length +12.0" End Stone x 2 = 120.42' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

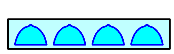
64 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 7,156.1 cf Chamber Storage

19,814.1 cf Field - 7,156.1 cf Chambers = 12,658.0 cf Stone x 40.0% Voids = 5,063.2 cf Stone Storage

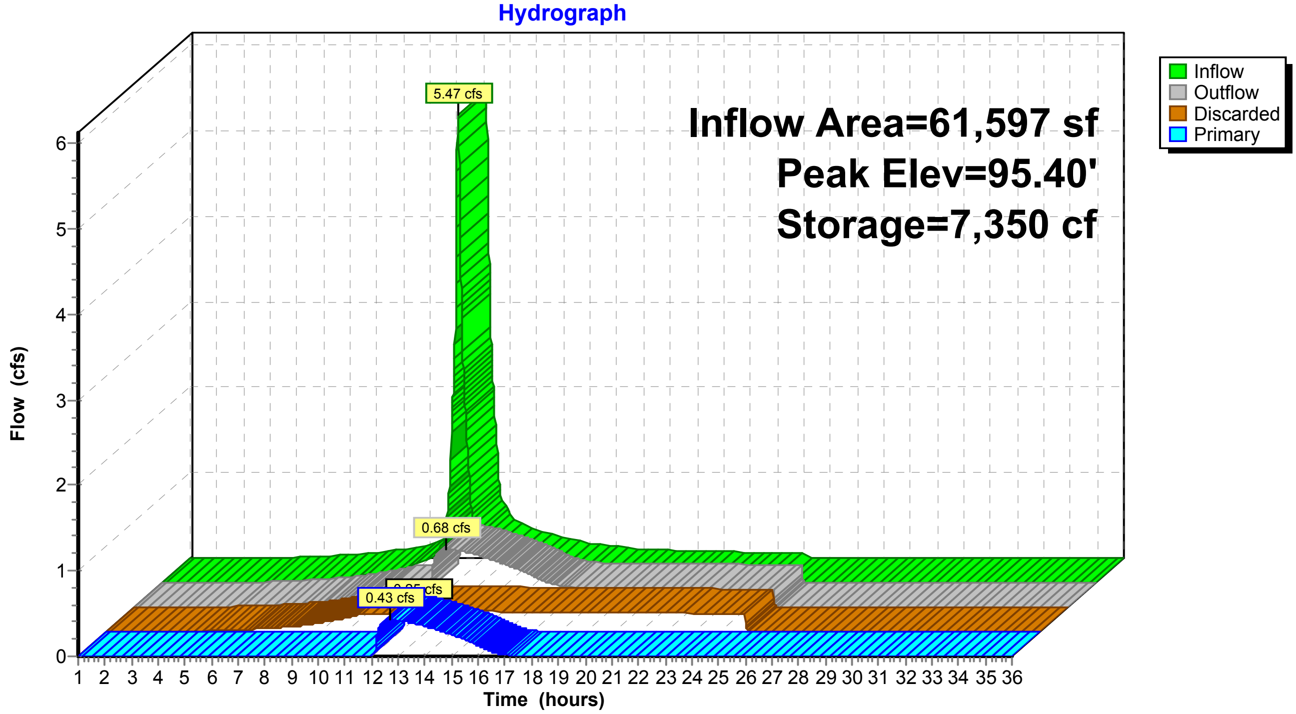
Chamber Storage + Stone Storage = 12,219.3 cf = 0.281 af
Overall Storage Efficiency = 61.7%
Overall System Size = 120.42' x 29.92' x 5.50'

64 Chambers
733.9 cy Field
468.8 cy Stone





Pond IS-1: IS-1


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=61,597 sf
Peak Elev=95.40'
Storage=7,350 cf
5.47 cfs
0.68 cfs
0.43 cfs
Flow (cfs)
Time (hours)

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=78,085 sf 75.63% Impervious Runoff Depth=4.54"
Tc=6.0 min CN=89 Runoff=9.18 cfs 29,554 cf

SubcatchmentA2: SUB-A2 Runoff Area=35,193 sf 61.85% Impervious Runoff Depth=3.31"
Flow Length=160' Tc=8.9 min CN=77 Runoff=2.83 cfs 9,693 cf

SubcatchmentA3: SUB-A3 Runoff Area=16,500 sf 77.45% Impervious Runoff Depth=4.22"
Tc=6.0 min CN=86 Runoff=1.83 cfs 5,802 cf

SubcatchmentA4: SUB-A4 Runoff Area=45,097 sf 88.28% Impervious Runoff Depth=4.87"
Tc=6.0 min CN=92 Runoff=5.56 cfs 18,313 cf

SubcatchmentA5: SUB-A2 Runoff Area=11,510 sf 59.26% Impervious Runoff Depth=3.02"
Tc=6.0 min CN=74 Runoff=0.93 cfs 2,894 cf

SubcatchmentA6: SUB-A4 Runoff Area=44,811 sf 26.24% Impervious Runoff Depth=1.63"
Flow Length=463' Tc=12.7 min CN=58 Runoff=1.44 cfs 6,100 cf

SubcatchmentA7: SUB-A7 Runoff Area=31,077 sf 11.00% Impervious Runoff Depth=1.79"
Tc=6.0 min CN=60 Runoff=1.41 cfs 4,641 cf

SubcatchmentA8: SUB-A8 Runoff Area=45,413 sf 51.78% Impervious Runoff Depth=2.47"
Flow Length=136' Tc=7.4 min CN=68 Runoff=2.83 cfs 9,341 cf

SubcatchmentB1: SUB-B1 Runoff Area=5,907 sf 0.00% Impervious Runoff Depth=1.79"
Tc=6.0 min CN=60 Runoff=0.27 cfs 882 cf

Pond A: POI-A Inflow=18.12 cfs 70,545 cf
Primary=18.12 cfs 70,545 cf

Pond B: POI-B Inflow=0.27 cfs 882 cf
Primary=0.27 cfs 882 cf

Pond BR-1: BR-1 Peak Elev=101.32' Storage=1,005 cf Inflow=1.83 cfs 5,802 cf
Primary=1.11 cfs 4,828 cf Secondary=0.65 cfs 163 cf Outflow=1.76 cfs 4,992 cf

Pond DS-1: DS-1 Peak Elev=90.28' Storage=880 cf Inflow=2.83 cfs 9,693 cf
Outflow=2.82 cfs 9,692 cf

Pond IS-1: IS-1 Peak Elev=96.54' Storage=10,035 cf Inflow=7.14 cfs 23,305 cf
Discarded=0.27 cfs 14,982 cf Primary=0.62 cfs 8,323 cf Outflow=0.89 cfs 23,305 cf

Total Runoff Area = 313,593 sf Runoff Volume = 87,220 cf Average Runoff Depth = 3.34"
42.94% Pervious = 134,668 sf 57.06% Impervious = 178,925 sf

Summary for Subcatchment A1: SUB-A1

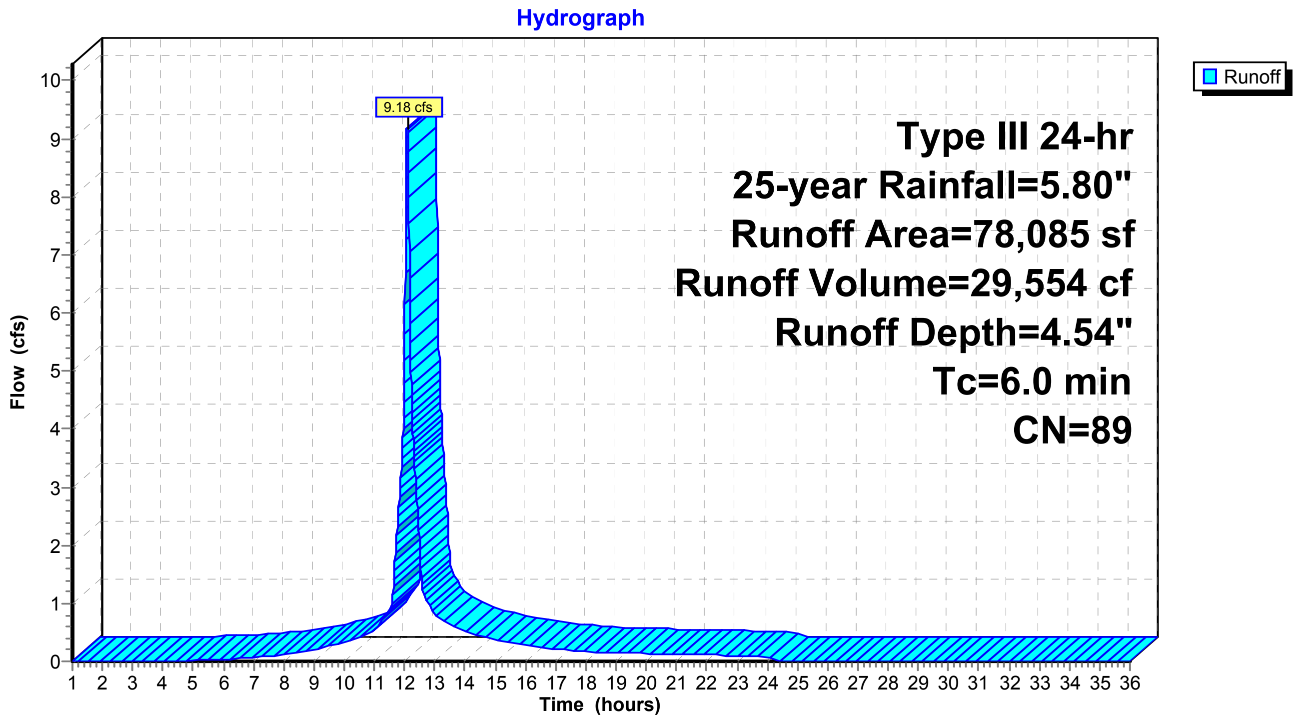
Runoff = 9.18 cfs @ 12.08 hrs, Volume= 29,554 cf, Depth= 4.54"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	27,200	98	Paved Impervious, HSG B
	16,163	98	Roofs, HSG B
	19,031	61	>75% Grass cover, Good, HSG B
*	15,691	98	Expanded School Yard Impervious, HSG B
	78,085	89	Weighted Average
	19,031		24.37% Pervious Area
	59,054		75.63% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

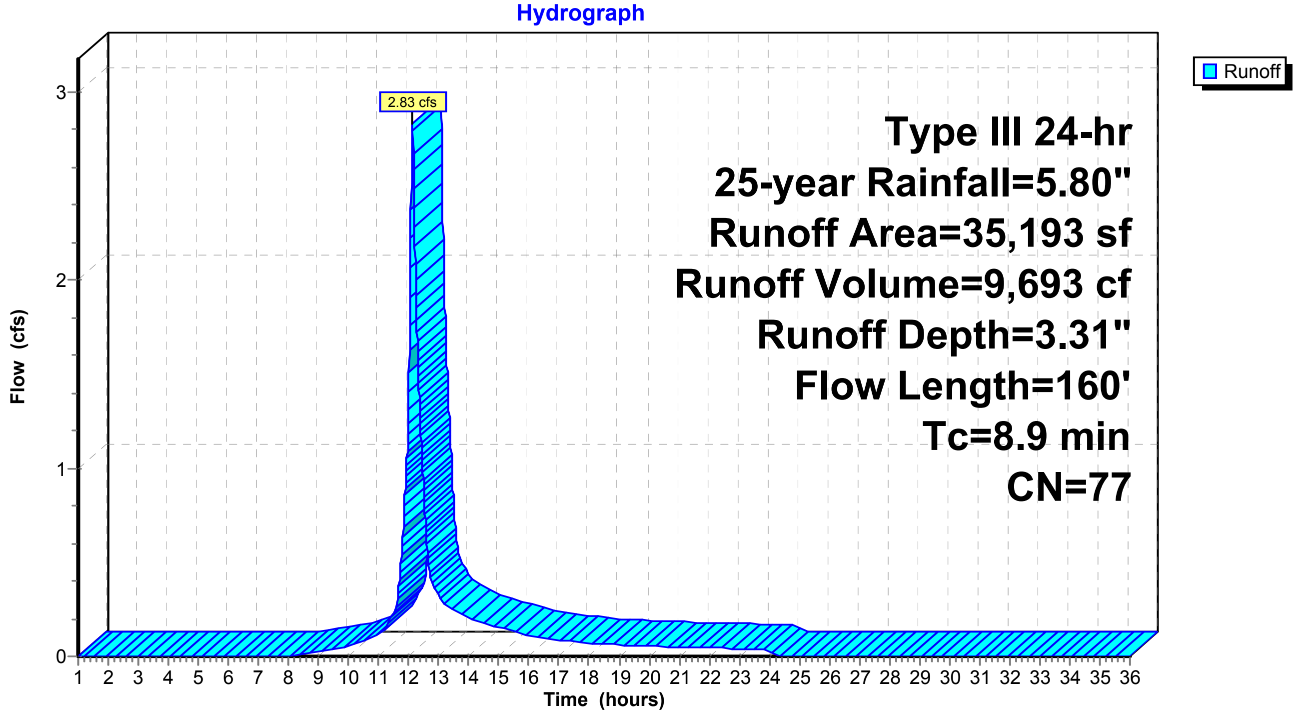
Runoff = 2.83 cfs @ 12.13 hrs, Volume= 9,693 cf, Depth= 3.31"
Routed to Pond DS-1 : DS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	23	98	Paved Impervious, HSG A
*	18,246	98	Paved Impervious, HSG B
	3,498	98	Roofs, HSG B
	1,694	39	>75% Grass cover, Good, HSG A
	4,693	61	>75% Grass cover, Good, HSG B
	6,952	30	Woods, Good, HSG A
	87	55	Woods, Good, HSG B
	35,193	77	Weighted Average
	13,426		38.15% Pervious Area
	21,767		61.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	33	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	59	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.9	160	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

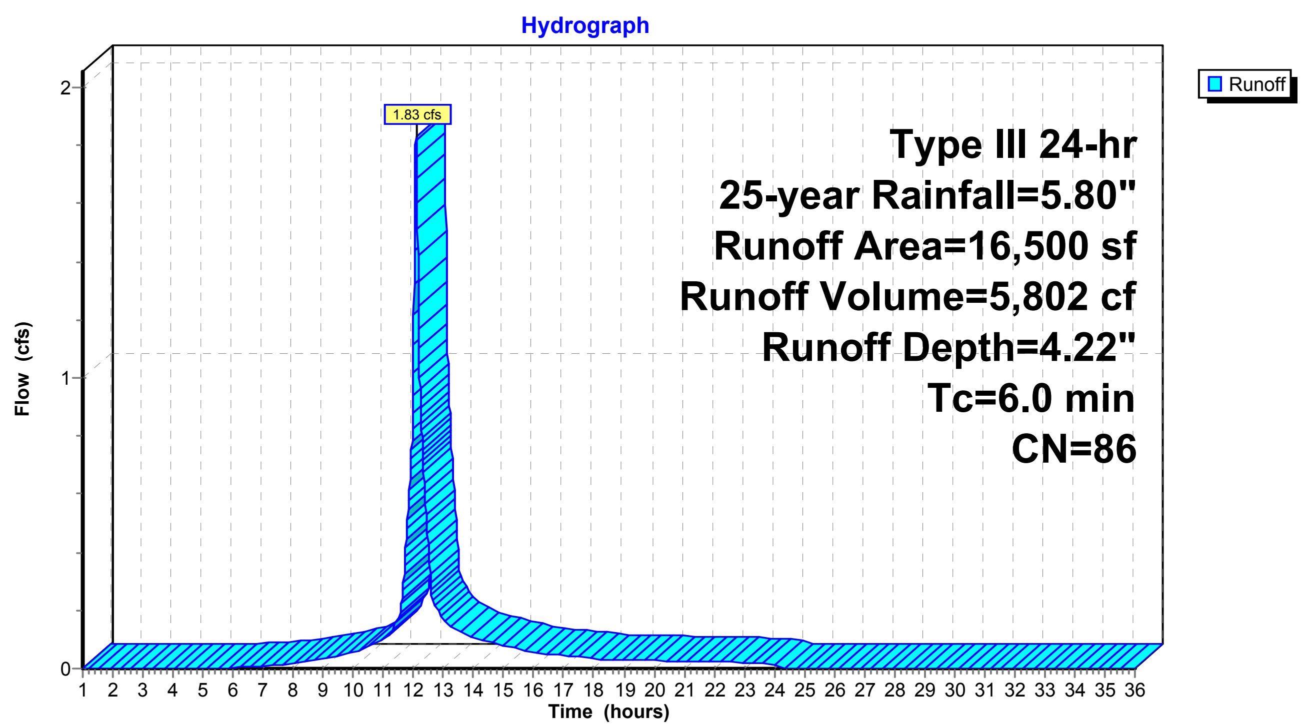
Runoff = 1.83 cfs @ 12.09 hrs, Volume= 5,802 cf, Depth= 4.22"
Routed to Pond BR-1 : BR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	4,196	98	Paved Impervious, HSG A
*	1,717	98	Paved Impervious, HSG B
	6,866	98	Roofs, HSG B
	2,808	39	>75% Grass cover, Good, HSG A
	913	61	>75% Grass cover, Good, HSG B
	16,500	86	Weighted Average
	3,721		22.55% Pervious Area
	12,779		77.45% Impervious Area

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

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

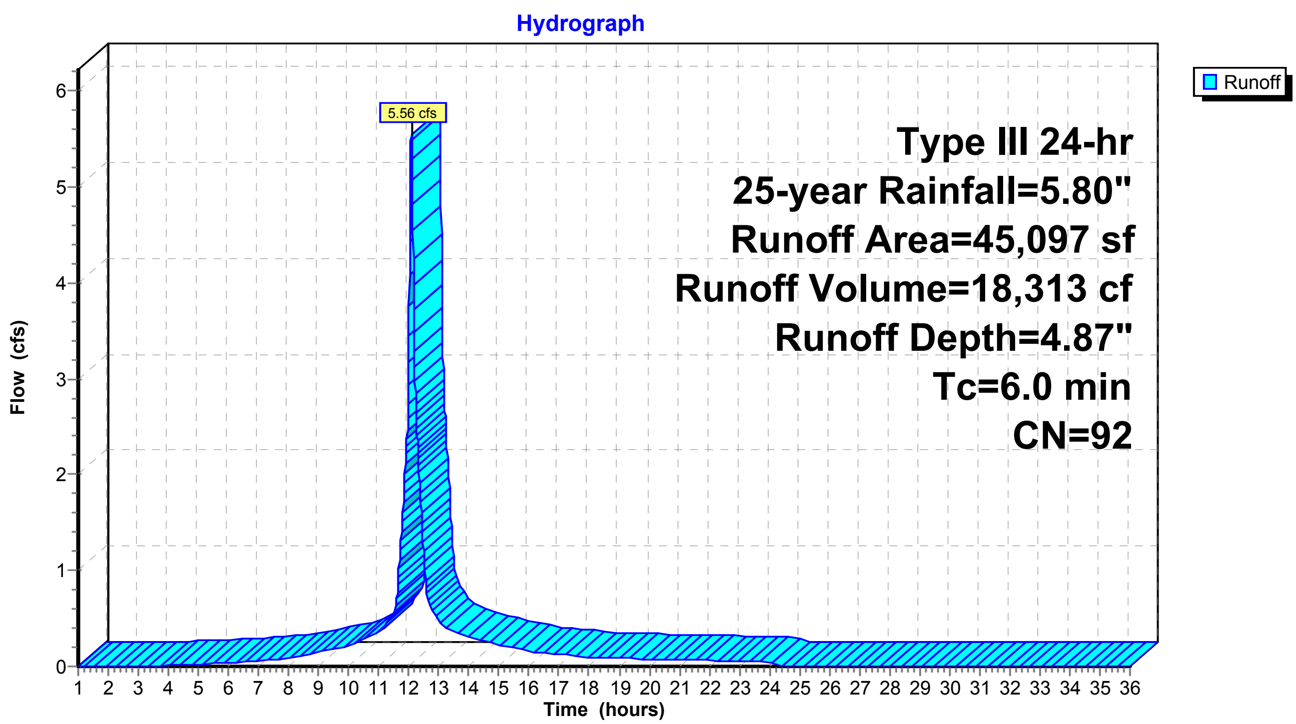
Runoff = 5.56 cfs @ 12.08 hrs, Volume= 18,313 cf, Depth= 4.87"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	28,479	98	Paved Impervious, HSG A
*	4,701	98	Paved Impervious, HSG B
	3,540	98	Roofs, HSG A
	3,092	98	Roofs, HSG B
	3,675	39	>75% Grass cover, Good, HSG A
	1,610	61	>75% Grass cover, Good, HSG B
	45,097	92	Weighted Average
	5,285		11.72% Pervious Area
	39,812		88.28% Impervious Area

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

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A2

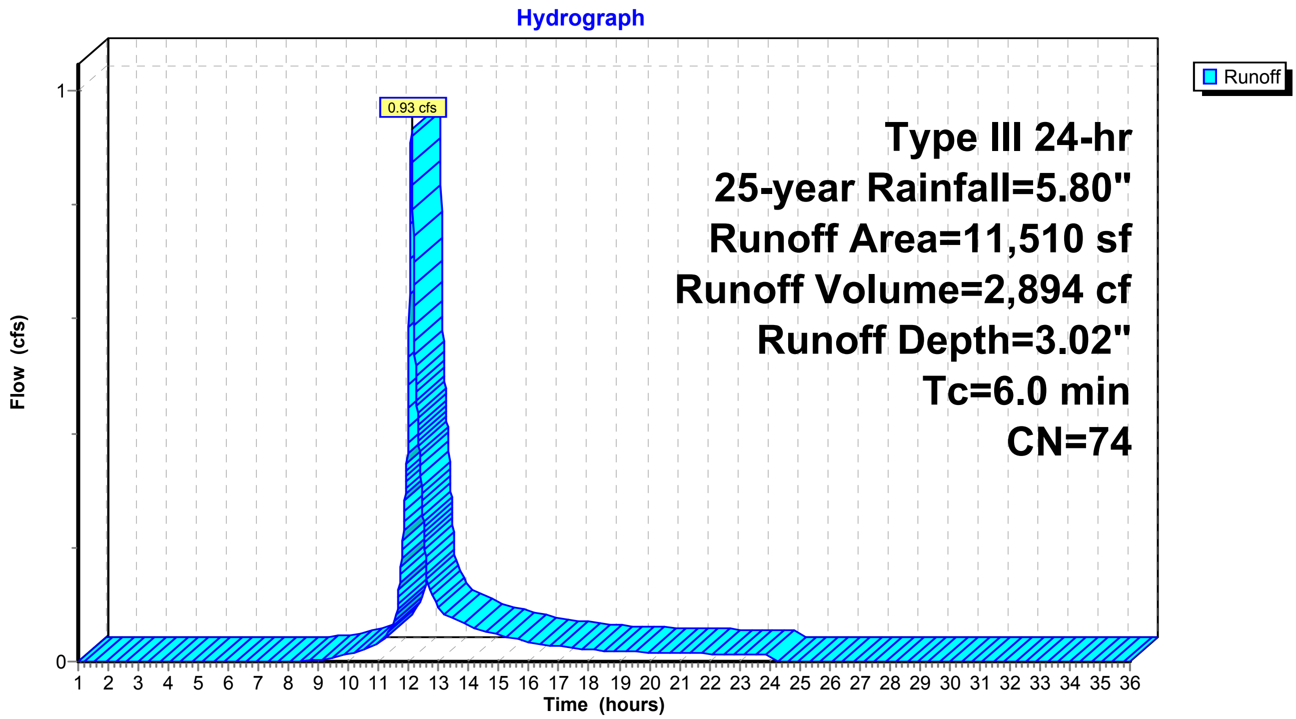
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 2,894 cf, Depth= 3.02"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	5,725	98	Paved Impervious, HSG A
*	1,096	98	Paved Impervious, HSG B
	4,689	39	>75% Grass cover, Good, HSG A
	11,510	74	Weighted Average
	4,689		40.74% Pervious Area
	6,821		59.26% Impervious Area

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

Subcatchment A5: SUB-A2



Summary for Subcatchment A6: SUB-A4

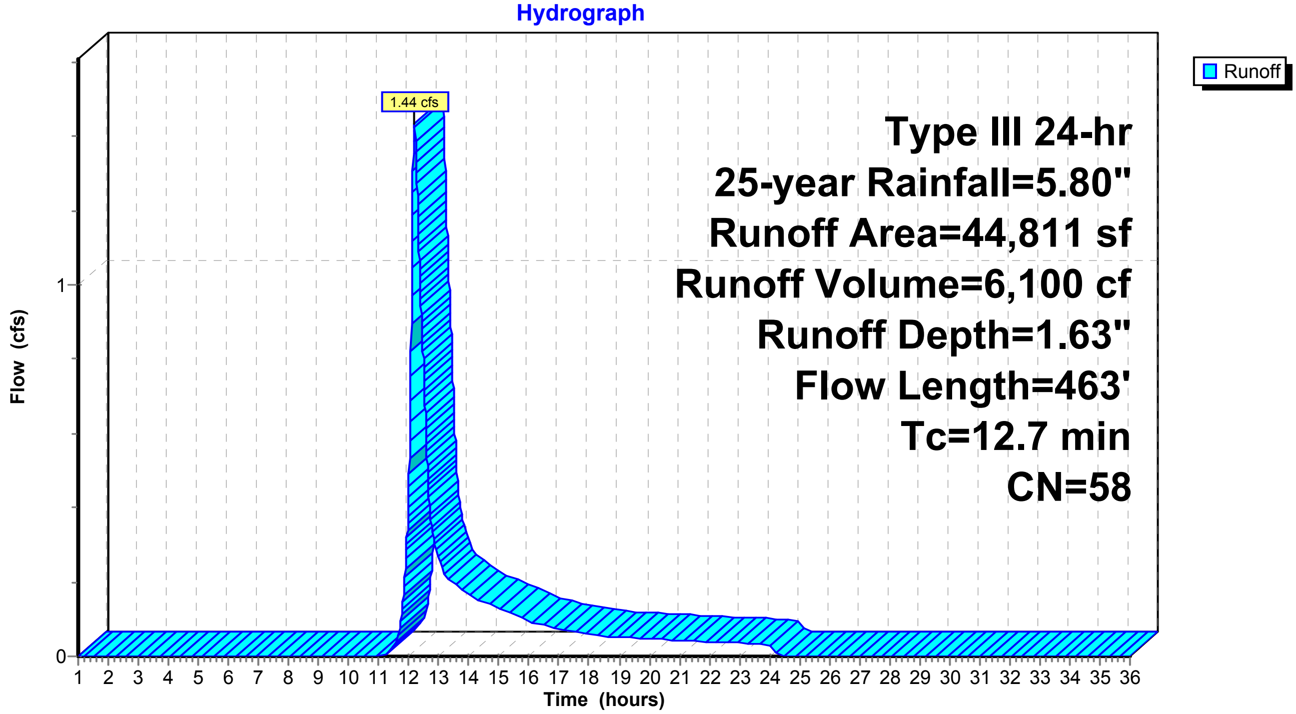
Runoff = 1.44 cfs @ 12.19 hrs, Volume= 6,100 cf, Depth= 1.63"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	3,625	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	13,635	30	Woods, Good, HSG A
	13,102	55	Woods, Good, HSG B
	2,357	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	44,811	58	Weighted Average
	33,054		73.76% Pervious Area
	11,757		26.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A6: SUB-A4



Summary for Subcatchment A7: SUB-A7

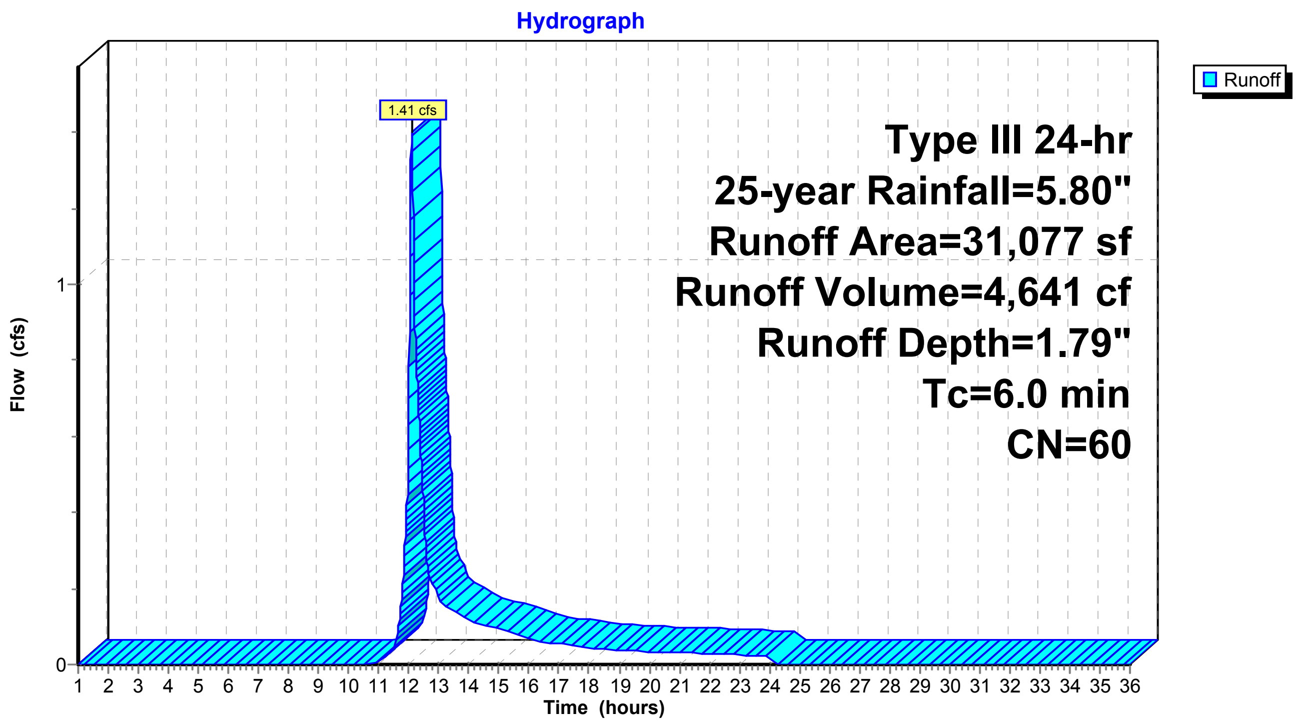
Runoff = 1.41 cfs @ 12.10 hrs, Volume= 4,641 cf, Depth= 1.79"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	3,420	98	Paved Impervious, HSG B
	523	39	>75% Grass cover, Good, HSG A
	16,801	61	>75% Grass cover, Good, HSG B
	3,334	30	Woods, Good, HSG A
	6,999	55	Woods, Good, HSG B
	31,077	60	Weighted Average
	27,657		89.00% Pervious Area
	3,420		11.00% Impervious Area

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

Subcatchment A7: SUB-A7



Summary for Subcatchment A8: SUB-A8

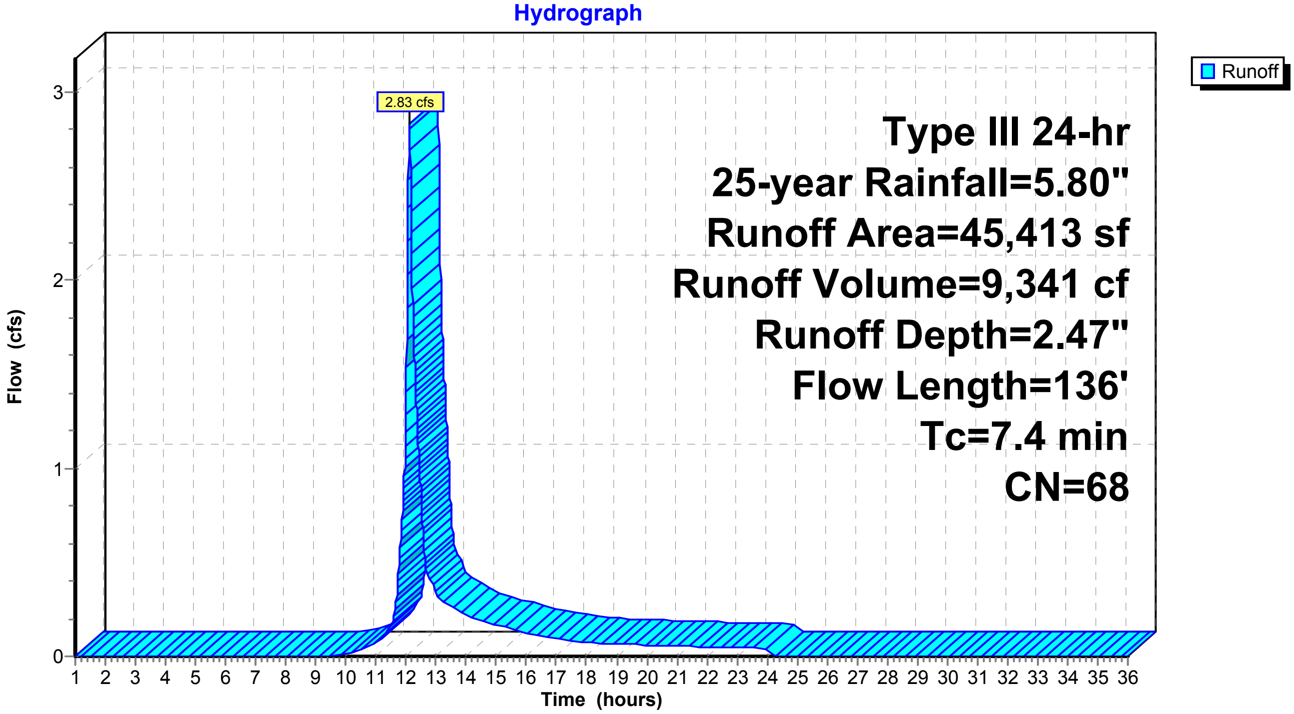
Runoff = 2.83 cfs @ 12.11 hrs, Volume= 9,341 cf, Depth= 2.47"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

	Area (sf)	CN	Description
*	9,176	98	Paved Impervious, HSG A
*	1,528	98	Paved Impervious, HSG B
	3,894	98	Roofs, HSG A
	8,917	98	Roofs, HSG B
	12,216	39	>75% Grass cover, Good, HSG A
	9,682	30	Woods, Good, HSG A
	45,413	68	Weighted Average
	21,898		48.22% Pervious Area
	23,515		51.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	52	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	34	0.0580	1.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.4	136	Total			

Subcatchment A8: SUB-A8



Summary for Subcatchment B1: SUB-B1

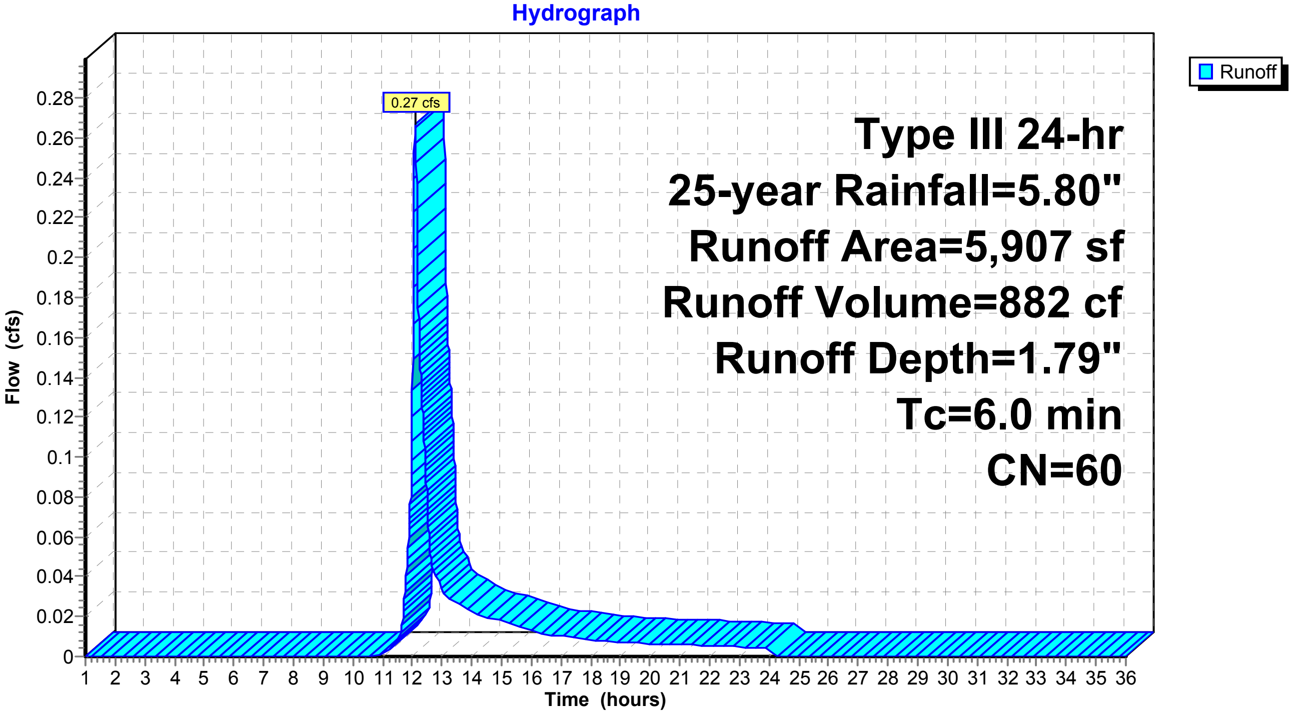
Runoff = 0.27 cfs @ 12.10 hrs, Volume= 882 cf, Depth= 1.79"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=5.80"

Area (sf)	CN	Description
5,112	61	>75% Grass cover, Good, HSG B
795	55	Woods, Good, HSG B
5,907	60	Weighted Average
5,907		100.00% Pervious Area

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

Subcatchment B1: SUB-B1

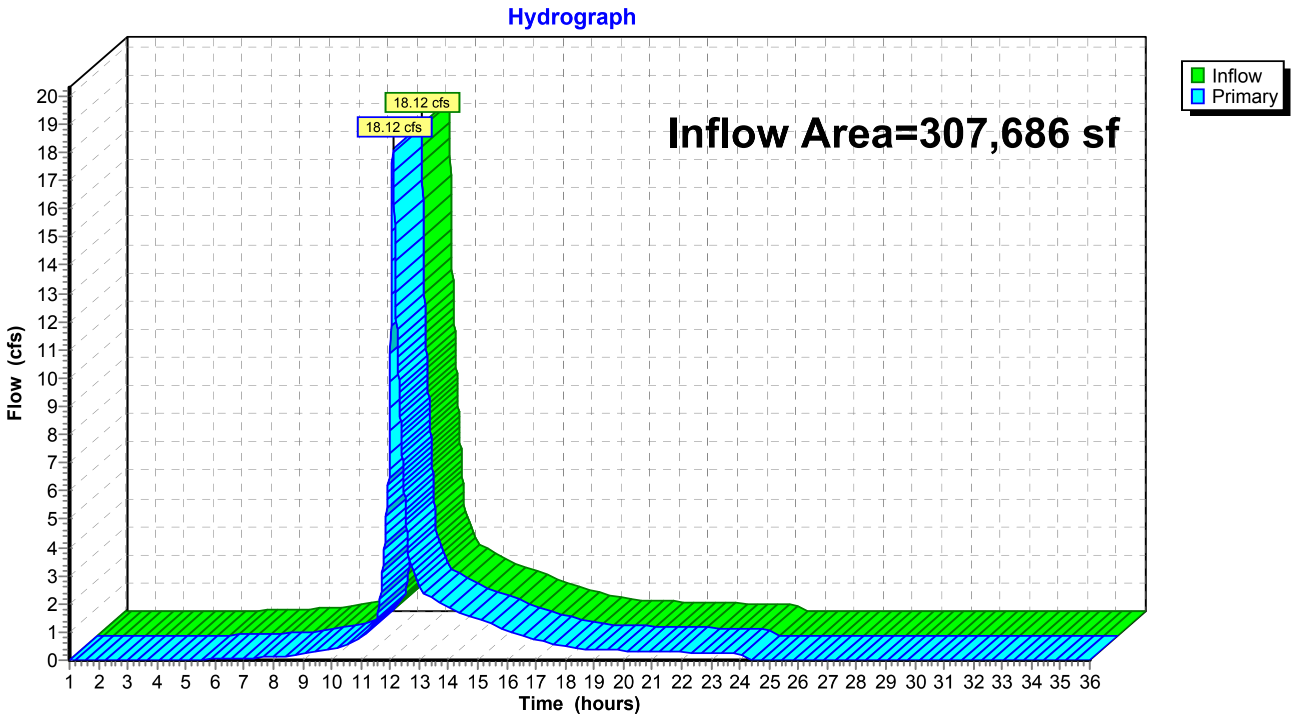


Summary for Pond A: POI-A

Inflow Area =	307,686 sf,	58.15% Impervious,	Inflow Depth = 2.75"	for 25-year event	
Inflow =	18.12 cfs @	12.10 hrs, Volume=	70,545 cf		
Primary =	18.12 cfs @	12.10 hrs, Volume=	70,545 cf,	Atten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Pond A: POI-A

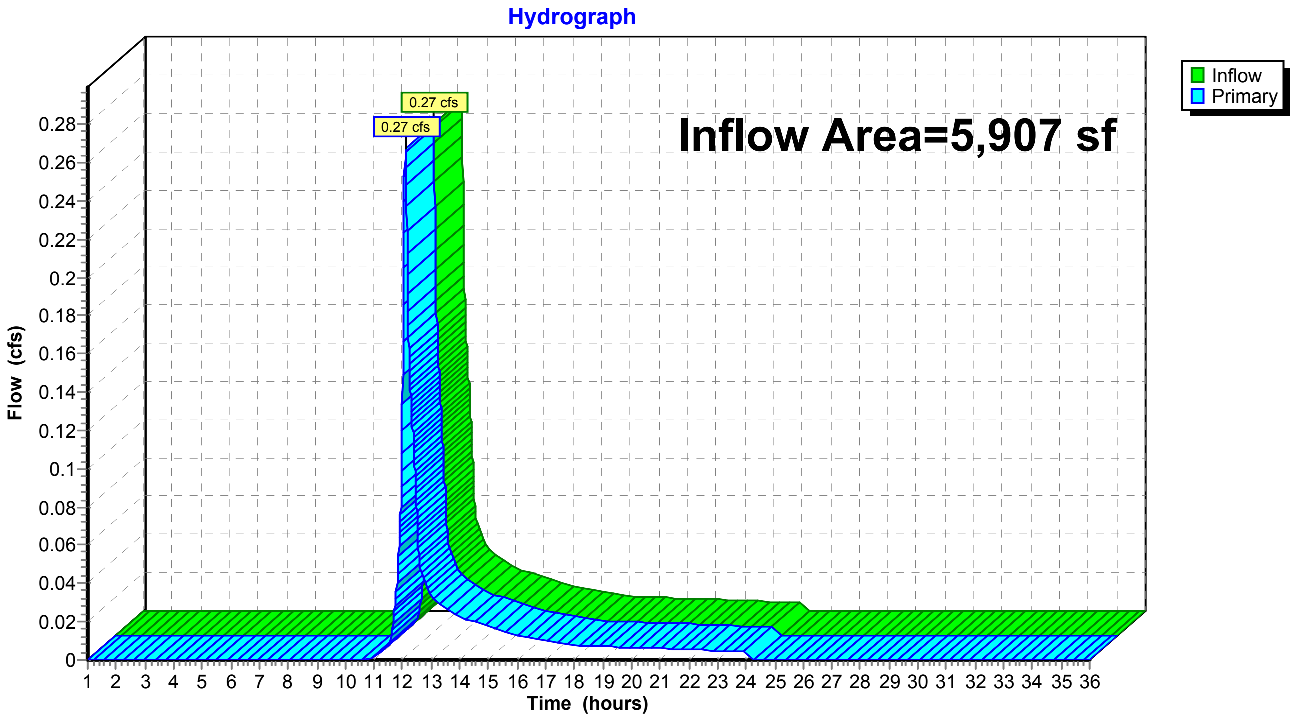


Summary for Pond B: POI-B

Inflow Area =	5,907 sf,	0.00% Impervious,	Inflow Depth = 1.79"	for 25-year event
Inflow =	0.27 cfs @	12.10 hrs, Volume=	882 cf	
Primary =	0.27 cfs @	12.10 hrs, Volume=	882 cf,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Pond B: POI-B



Summary for Pond BR-1: BR-1

Inflow Area = 16,500 sf, 77.45% Impervious, Inflow Depth = 4.22" for 25-year event
Inflow = 1.83 cfs @ 12.09 hrs, Volume= 5,802 cf
Outflow = 1.76 cfs @ 12.11 hrs, Volume= 4,992 cf, Atten= 4%, Lag= 1.6 min
Primary = 1.11 cfs @ 12.11 hrs, Volume= 4,828 cf
Routed to Pond IS-1 : IS-1
Secondary = 0.65 cfs @ 12.11 hrs, Volume= 163 cf
Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 101.32' @ 12.11 hrs Surf.Area= 464 sf Storage= 1,005 cf

Plug-Flow detention time= 94.4 min calculated for 4,990 cf (86% of inflow)
Center-of-Mass det. time= 33.5 min (832.4 - 798.9)

Volume	Invert	Avail.Storage	Storage Description
#1	96.74'	1,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

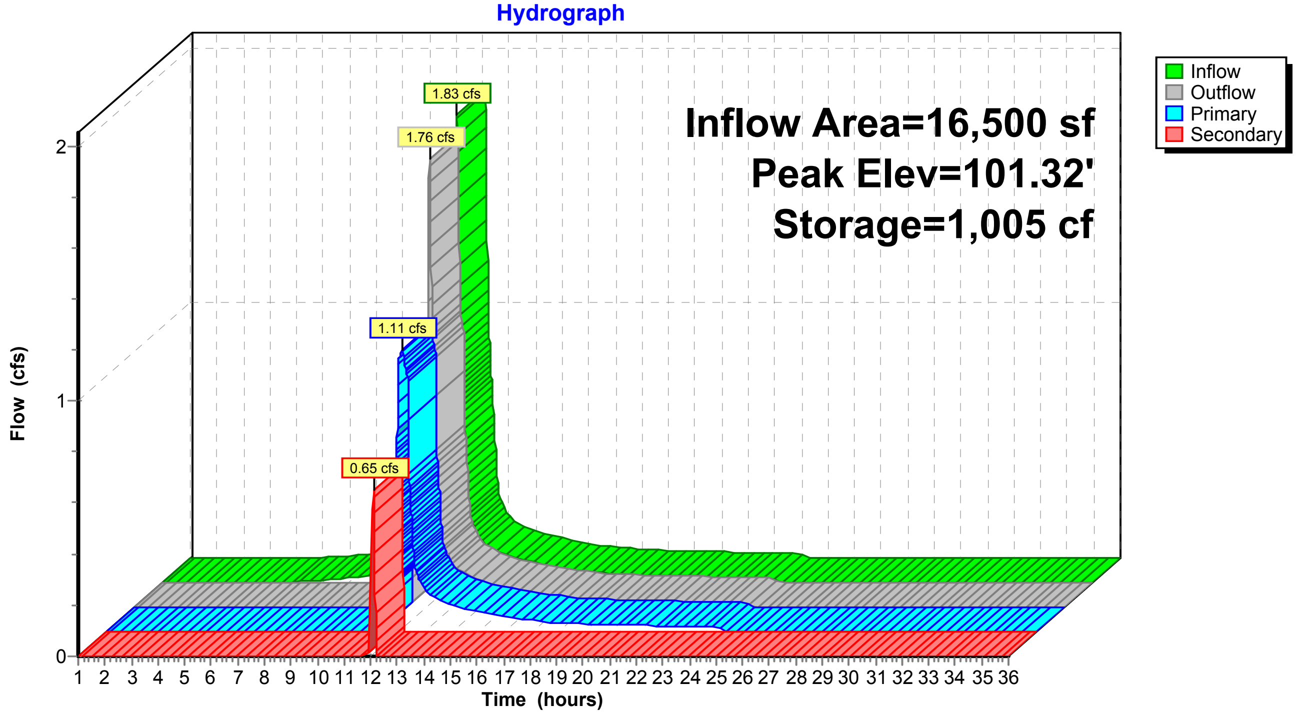
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.74	641	0.0	0	0
96.75	641	40.0	3	3
97.24	641	40.0	126	128
97.25	641	30.0	2	130
100.24	641	30.0	575	705
100.25	641	40.0	3	708
100.49	641	40.0	62	769
100.50	88	100.0	4	773
101.00	335	100.0	106	879
101.75	641	100.0	366	1,245

Device	Routing	Invert	Outlet Devices
#1	Device 2	100.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	94.49'	**12.0" Round Culvert** L= 62.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.49' / 94.18' S= 0.0049 '/' Cc= 0.900 n= 0.130, Flow Area= 0.79 sf
#3	Secondary	101.25'	**15.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.11 cfs @ 12.11 hrs HW=101.32' TW=94.97' (Dynamic Tailwater)
└─**2=Culvert** (Barrel Controls 1.11 cfs @ 1.41 fps)
  └─**1=Orifice/Grate** (Passes 1.11 cfs of 8.76 cfs potential flow)

Secondary OutFlow Max=0.64 cfs @ 12.11 hrs HW=101.32' TW=94.97' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.64 cfs @ 0.64 fps)

Pond BR-1: BR-1


Hydrograph
Inflow Area=16,500 sf
Peak Elev=101.32'
Storage=1,005 cf
1.83 cfs
1.76 cfs
1.11 cfs
0.65 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Pond DS-1: DS-1

Inflow Area = 35,193 sf, 61.85% Impervious, Inflow Depth = 3.31" for 25-year event
Inflow = 2.83 cfs @ 12.13 hrs, Volume= 9,693 cf
Outflow = 2.82 cfs @ 12.14 hrs, Volume= 9,692 cf, Atten= 1%, Lag= 0.7 min
Primary = 2.82 cfs @ 12.14 hrs, Volume= 9,692 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 90.28' @ 12.14 hrs Surf.Area= 658 sf Storage= 880 cf

Plug-Flow detention time= 18.8 min calculated for 9,692 cf (100% of inflow)
Center-of-Mass det. time= 18.7 min (844.4 - 825.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.25'	627 cf	**20.50'W x 32.10'L x 3.50'H Field A**
			2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#2A	88.75'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1
			Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
			Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			16 Chambers in 4 Rows
		1,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	88.25'	**24.0" Round Culvert**
			L= 26.9' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 88.25' / 88.12' S= 0.0048 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	89.95'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	88.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.81 cfs @ 12.14 hrs HW=90.28' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.81 cfs of 11.22 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Weir Controls 2.49 cfs @ 1.89 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.33 cfs @ 6.65 fps)

Pond DS-1: DS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

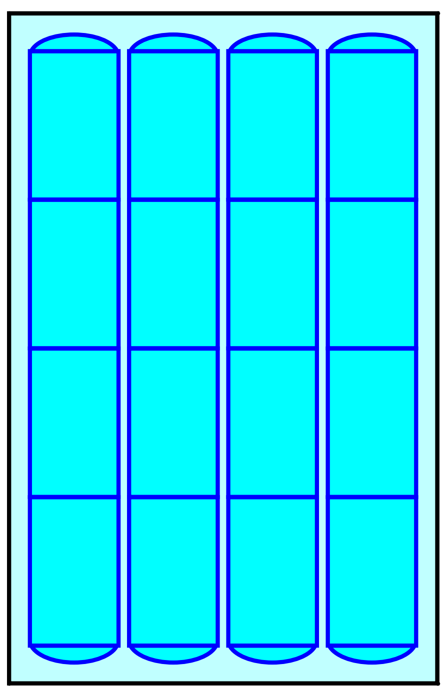
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

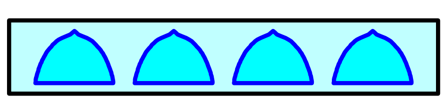
16 Chambers x 45.9 cf = 735.0 cf Chamber Storage

2,302.9 cf Field - 735.0 cf Chambers = 1,567.9 cf Stone x 40.0% Voids = 627.2 cf Stone Storage

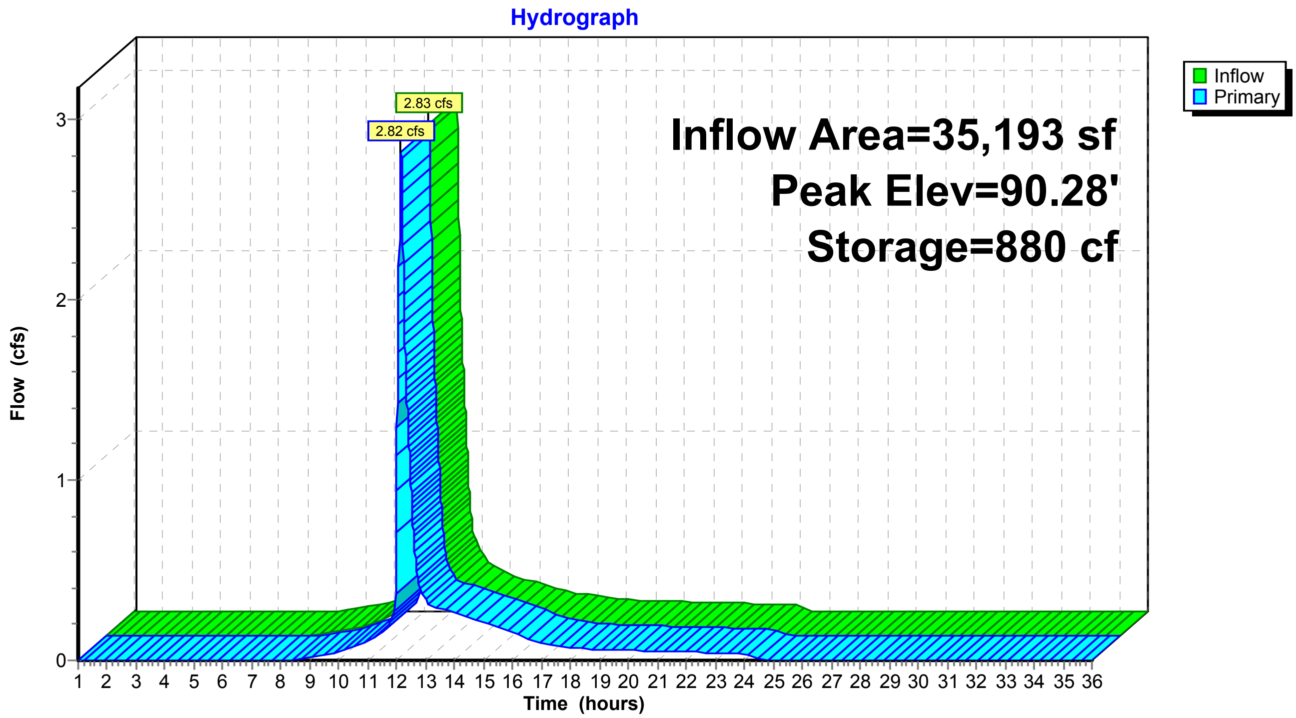
Chamber Storage + Stone Storage = 1,362.2 cf = 0.031 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 20.50' x 3.50'

16 Chambers
85.3 cy Field
58.1 cy Stone





Pond DS-1: DS-1


Hydrograph
Inflow
Primary
2.83 cfs
2.82 cfs
Inflow Area=35,193 sf
Peak Elev=90.28'
Storage=880 cf
Flow (cfs)
0
1
2
3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Pond IS-1: IS-1

Inflow Area = 61,597 sf, 85.38% Impervious, Inflow Depth = 4.54" for 25-year event
Inflow = 7.14 cfs @ 12.10 hrs, Volume= 23,305 cf
Outflow = 0.89 cfs @ 12.68 hrs, Volume= 23,305 cf, Atten= 88%, Lag= 34.6 min
Discarded = 0.27 cfs @ 12.68 hrs, Volume= 14,982 cf
Primary = 0.62 cfs @ 12.68 hrs, Volume= 8,323 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 96.54' @ 12.68 hrs Surf.Area= 3,603 sf Storage= 10,035 cf

Plug-Flow detention time= 164.8 min calculated for 23,298 cf (100% of inflow)
Center-of-Mass det. time= 164.8 min (954.6 - 789.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.50'	5,063 cf	**29.92'W x 120.42'L x 5.50'H Field A**
			19,814 cf Overall - 7,156 cf Embedded = 12,658 cf x 40.0% Voids
#2A	93.25'	7,156 cf	**ADS_StormTech MC-3500 d +Cap** x 64 Inside #1
			Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
			Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
			64 Chambers in 4 Rows
			Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
		12,219 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	92.50'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	92.00'	**12.0" Round Culvert**
			L= 91.3' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 92.00' / 91.09' S= 0.0100 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	97.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	94.20'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.27 cfs @ 12.68 hrs HW=96.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.27 cfs)

Primary OutFlow Max=0.62 cfs @ 12.68 hrs HW=96.54' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.62 cfs of 6.00 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Orifice Controls 0.62 cfs @ 7.10 fps)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

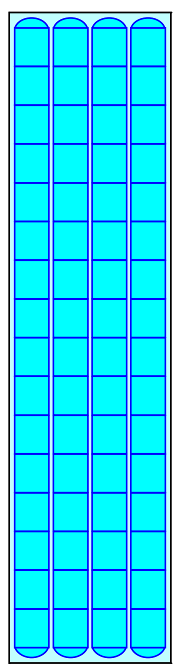
16 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 118.42' Row Length +12.0" End Stone x 2 = 120.42' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

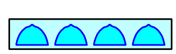
64 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 7,156.1 cf Chamber Storage

19,814.1 cf Field - 7,156.1 cf Chambers = 12,658.0 cf Stone x 40.0% Voids = 5,063.2 cf Stone Storage

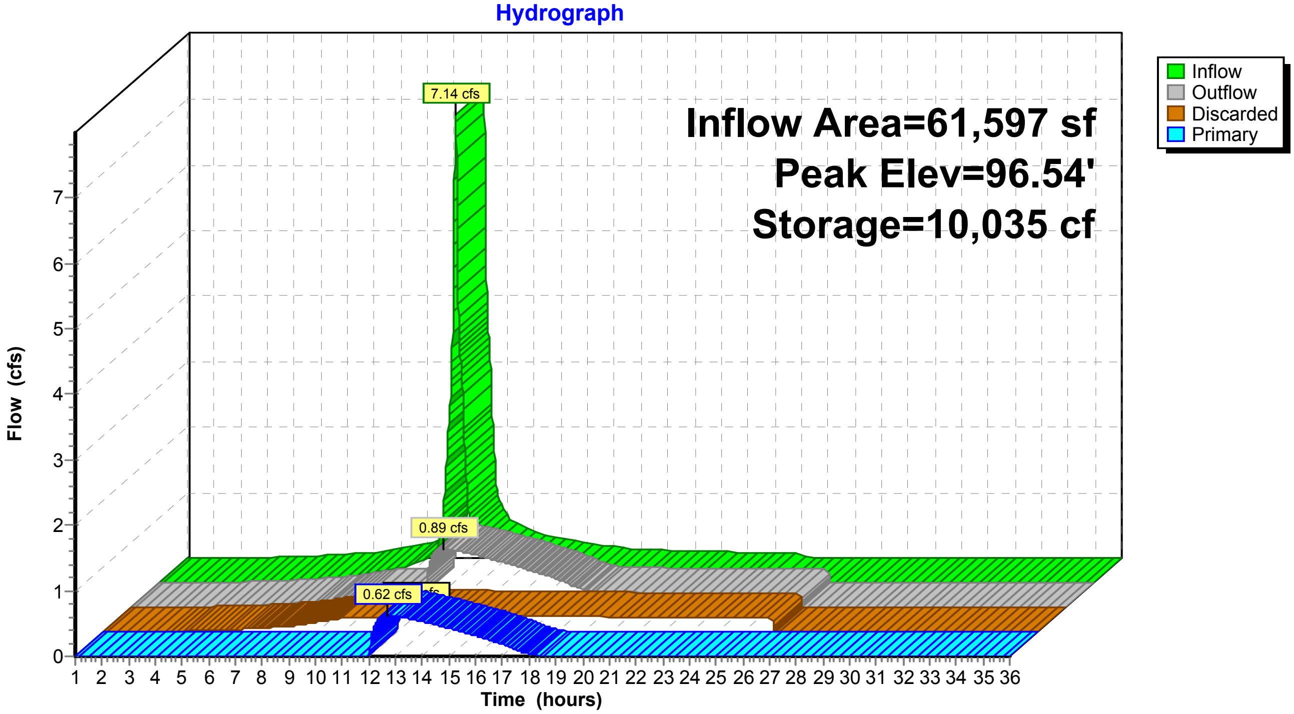
Chamber Storage + Stone Storage = 12,219.3 cf = 0.281 af
Overall Storage Efficiency = 61.7%
Overall System Size = 120.42' x 29.92' x 5.50'

64 Chambers
733.9 cy Field
468.8 cy Stone





Pond IS-1: IS-1


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=61,597 sf
Peak Elev=96.54'
Storage=10,035 cf
7.14 cfs
0.89 cfs
0.62 cfs
Flow (cfs)
0
1
2
3
4
5
6
7
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=78,085 sf 75.63% Impervious Runoff Depth=5.81"
Tc=6.0 min CN=89 Runoff=11.58 cfs 37,778 cf

SubcatchmentA2: SUB-A2 Runoff Area=35,193 sf 61.85% Impervious Runoff Depth=4.46"
Flow Length=160' Tc=8.9 min CN=77 Runoff=3.81 cfs 13,068 cf

SubcatchmentA3: SUB-A3 Runoff Area=16,500 sf 77.45% Impervious Runoff Depth=5.46"
Tc=6.0 min CN=86 Runoff=2.34 cfs 7,510 cf

SubcatchmentA4: SUB-A4 Runoff Area=45,097 sf 88.28% Impervious Runoff Depth=6.15"
Tc=6.0 min CN=92 Runoff=6.92 cfs 23,125 cf

SubcatchmentA5: SUB-A2 Runoff Area=11,510 sf 59.26% Impervious Runoff Depth=4.13"
Tc=6.0 min CN=74 Runoff=1.28 cfs 3,961 cf

SubcatchmentA6: SUB-A4 Runoff Area=44,811 sf 26.24% Impervious Runoff Depth=2.48"
Flow Length=463' Tc=12.7 min CN=58 Runoff=2.30 cfs 9,251 cf

SubcatchmentA7: SUB-A7 Runoff Area=31,077 sf 11.00% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=60 Runoff=2.18 cfs 6,927 cf

SubcatchmentA8: SUB-A8 Runoff Area=45,413 sf 51.78% Impervious Runoff Depth=3.49"
Flow Length=136' Tc=7.4 min CN=68 Runoff=4.05 cfs 13,212 cf

SubcatchmentB1: SUB-B1 Runoff Area=5,907 sf 0.00% Impervious Runoff Depth=2.67"
Tc=6.0 min CN=60 Runoff=0.41 cfs 1,317 cf

Pond A: POI-A Inflow=24.63 cfs 97,556 cf
Primary=24.63 cfs 97,556 cf

Pond B: POI-B Inflow=0.41 cfs 1,317 cf
Primary=0.41 cfs 1,317 cf

Pond BR-1: BR-1 Peak Elev=101.35' Storage=1,023 cf Inflow=2.34 cfs 7,510 cf
Primary=1.11 cfs 6,105 cf Secondary=1.25 cfs 595 cf Outflow=2.33 cfs 6,700 cf

Pond DS-1: DS-1 Peak Elev=90.37' Storage=916 cf Inflow=3.81 cfs 13,068 cf
Outflow=3.79 cfs 13,067 cf

Pond IS-1: IS-1 Peak Elev=97.35' Storage=11,276 cf Inflow=9.24 cfs 29,825 cf
Discarded=0.28 cfs 16,466 cf Primary=3.33 cfs 13,360 cf Outflow=3.61 cfs 29,825 cf

Total Runoff Area = 313,593 sf Runoff Volume = 116,149 cf Average Runoff Depth = 4.44"
42.94% Pervious = 134,668 sf 57.06% Impervious = 178,925 sf

Summary for Subcatchment A1: SUB-A1

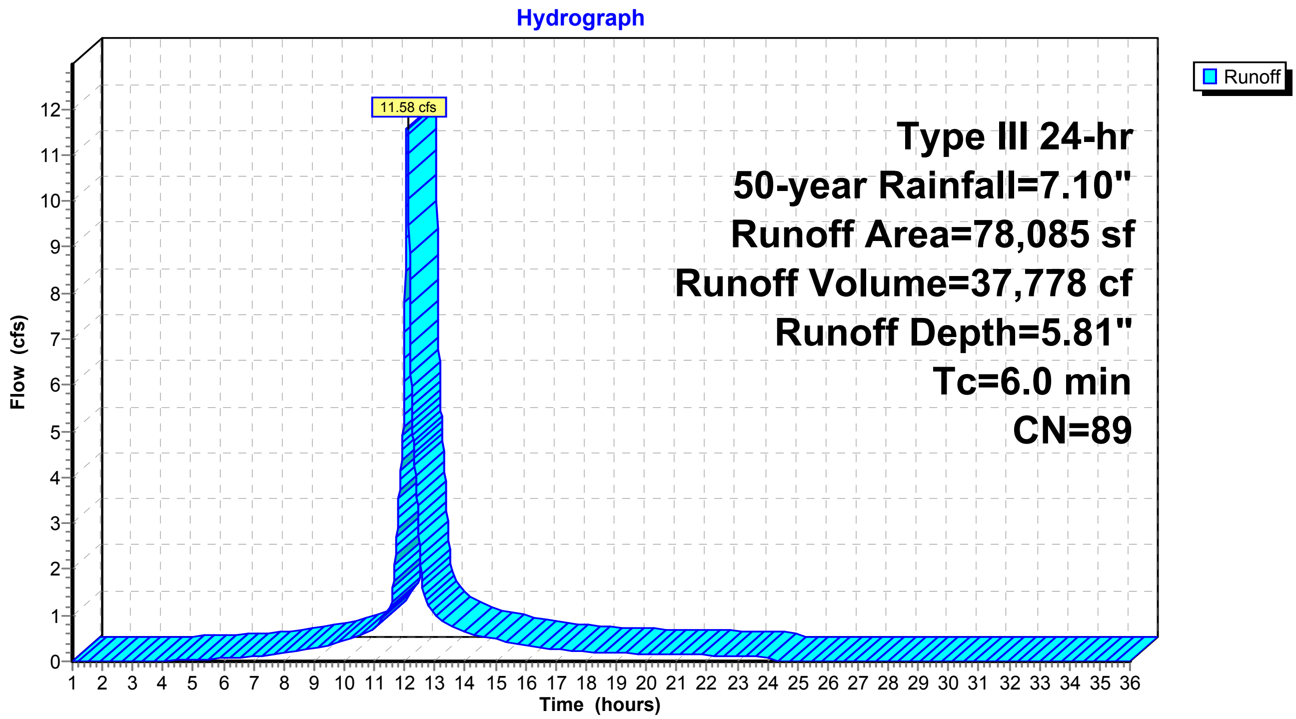
Runoff = 11.58 cfs @ 12.08 hrs, Volume= 37,778 cf, Depth= 5.81"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

	Area (sf)	CN	Description
*	27,200	98	Paved Impervious, HSG B
	16,163	98	Roofs, HSG B
	19,031	61	>75% Grass cover, Good, HSG B
*	15,691	98	Expanded School Yard Impervious, HSG B
	78,085	89	Weighted Average
	19,031		24.37% Pervious Area
	59,054		75.63% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

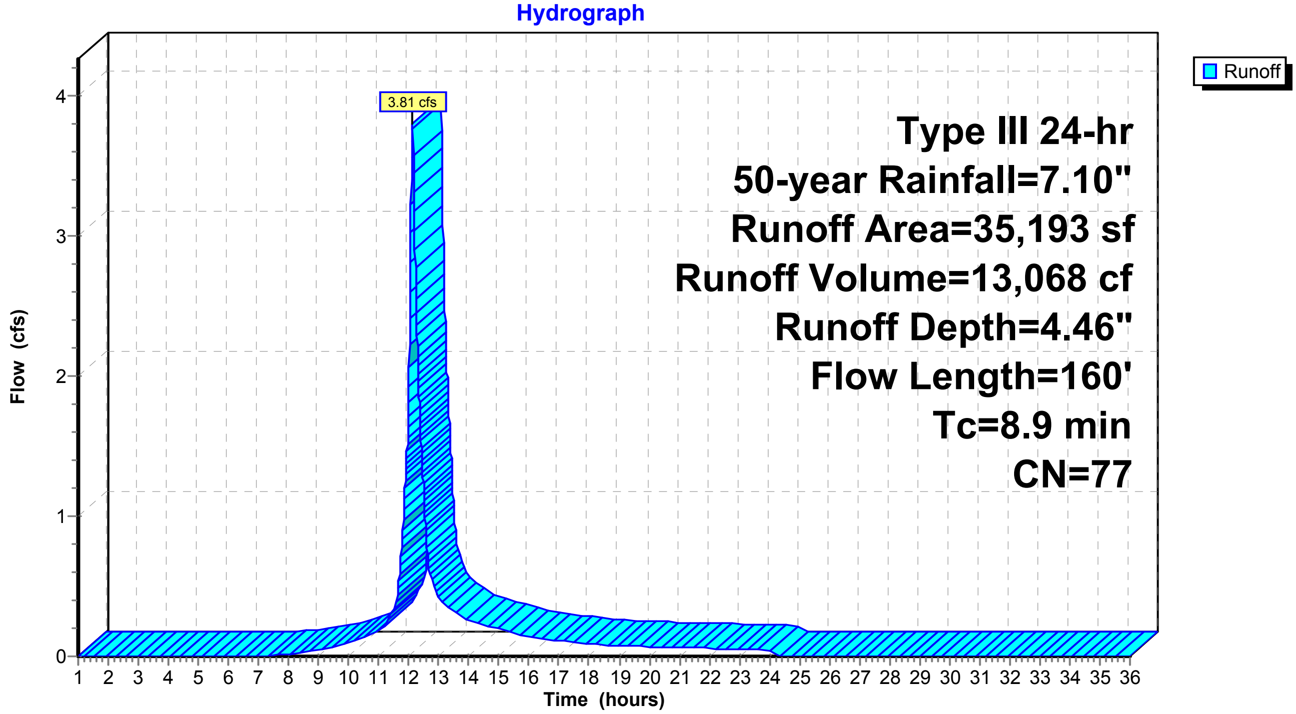
Runoff = 3.81 cfs @ 12.12 hrs, Volume= 13,068 cf, Depth= 4.46"
Routed to Pond DS-1 : DS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

	Area (sf)	CN	Description
*	23	98	Paved Impervious, HSG A
*	18,246	98	Paved Impervious, HSG B
	3,498	98	Roofs, HSG B
	1,694	39	>75% Grass cover, Good, HSG A
	4,693	61	>75% Grass cover, Good, HSG B
	6,952	30	Woods, Good, HSG A
	87	55	Woods, Good, HSG B
	35,193	77	Weighted Average
	13,426		38.15% Pervious Area
	21,767		61.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	33	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	59	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.9	160	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

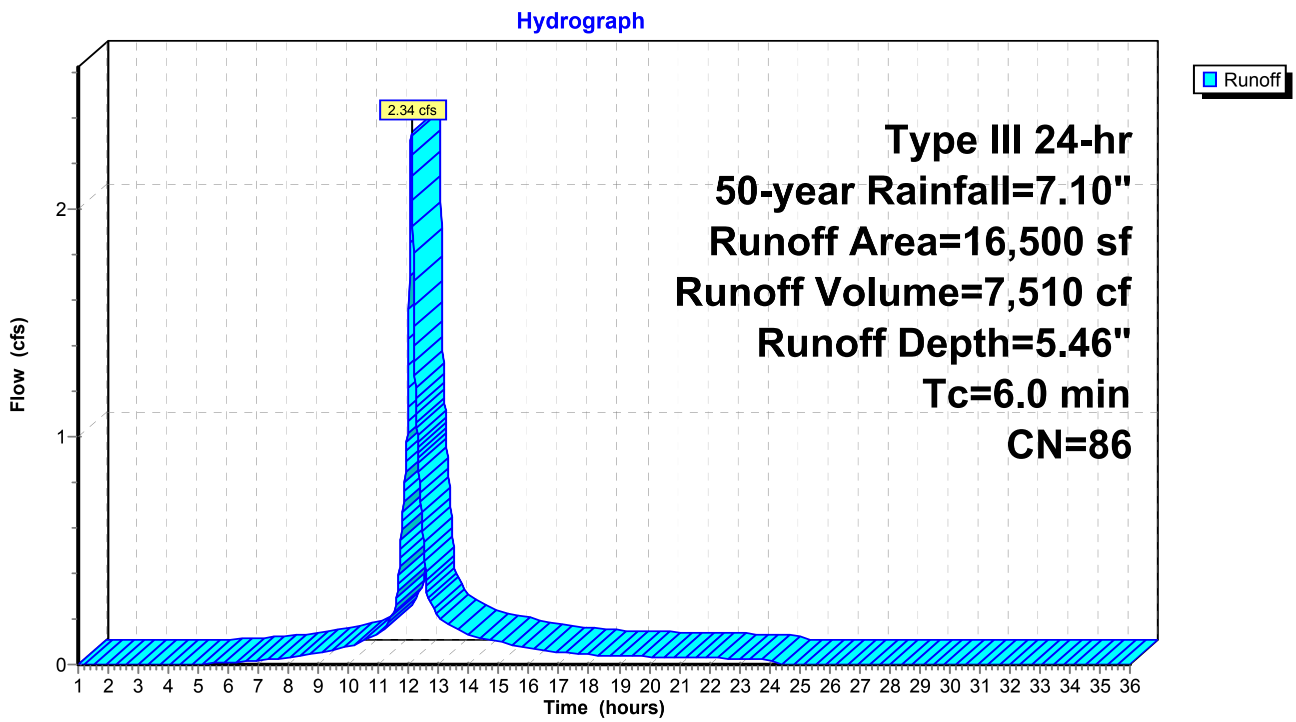
Runoff = 2.34 cfs @ 12.09 hrs, Volume= 7,510 cf, Depth= 5.46"
Routed to Pond BR-1 : BR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

	Area (sf)	CN	Description
*	4,196	98	Paved Impervious, HSG A
*	1,717	98	Paved Impervious, HSG B
	6,866	98	Roofs, HSG B
	2,808	39	>75% Grass cover, Good, HSG A
	913	61	>75% Grass cover, Good, HSG B
	16,500	86	Weighted Average
	3,721		22.55% Pervious Area
	12,779		77.45% Impervious Area

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

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

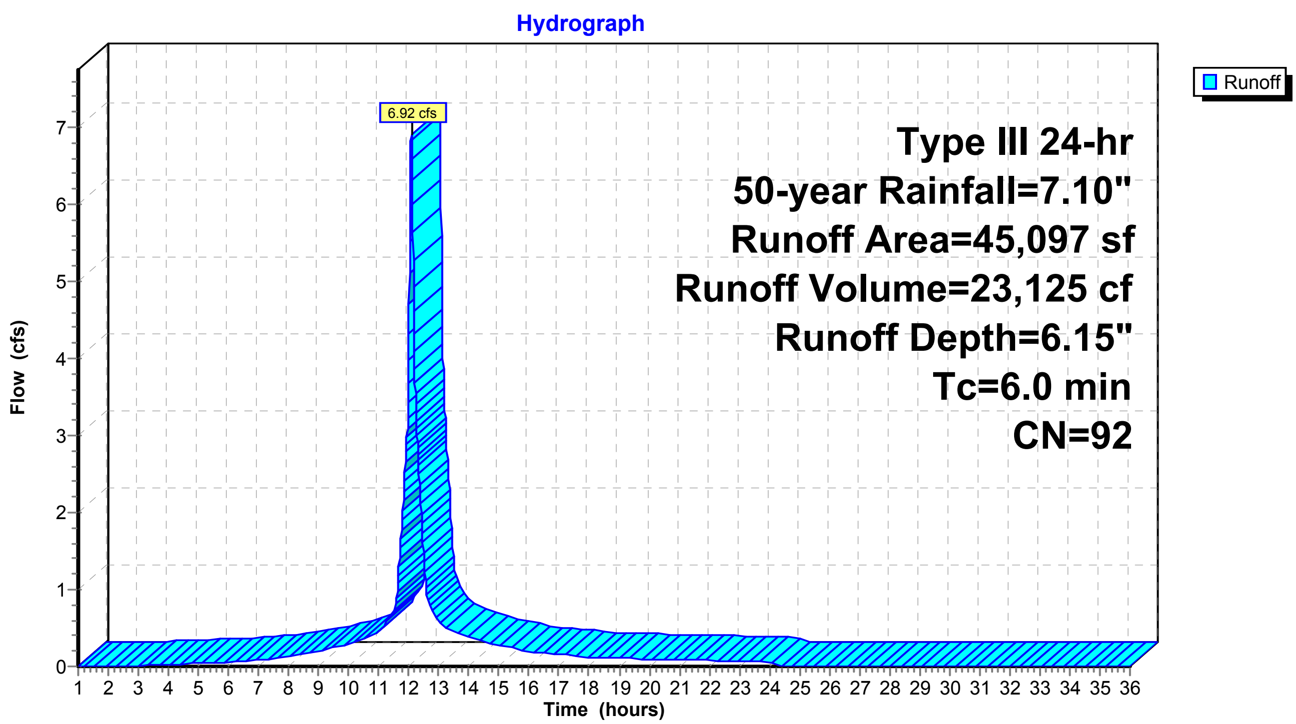
Runoff = 6.92 cfs @ 12.08 hrs, Volume= 23,125 cf, Depth= 6.15"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

	Area (sf)	CN	Description
*	28,479	98	Paved Impervious, HSG A
*	4,701	98	Paved Impervious, HSG B
	3,540	98	Roofs, HSG A
	3,092	98	Roofs, HSG B
	3,675	39	>75% Grass cover, Good, HSG A
	1,610	61	>75% Grass cover, Good, HSG B
	45,097	92	Weighted Average
	5,285		11.72% Pervious Area
	39,812		88.28% Impervious Area

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

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A2

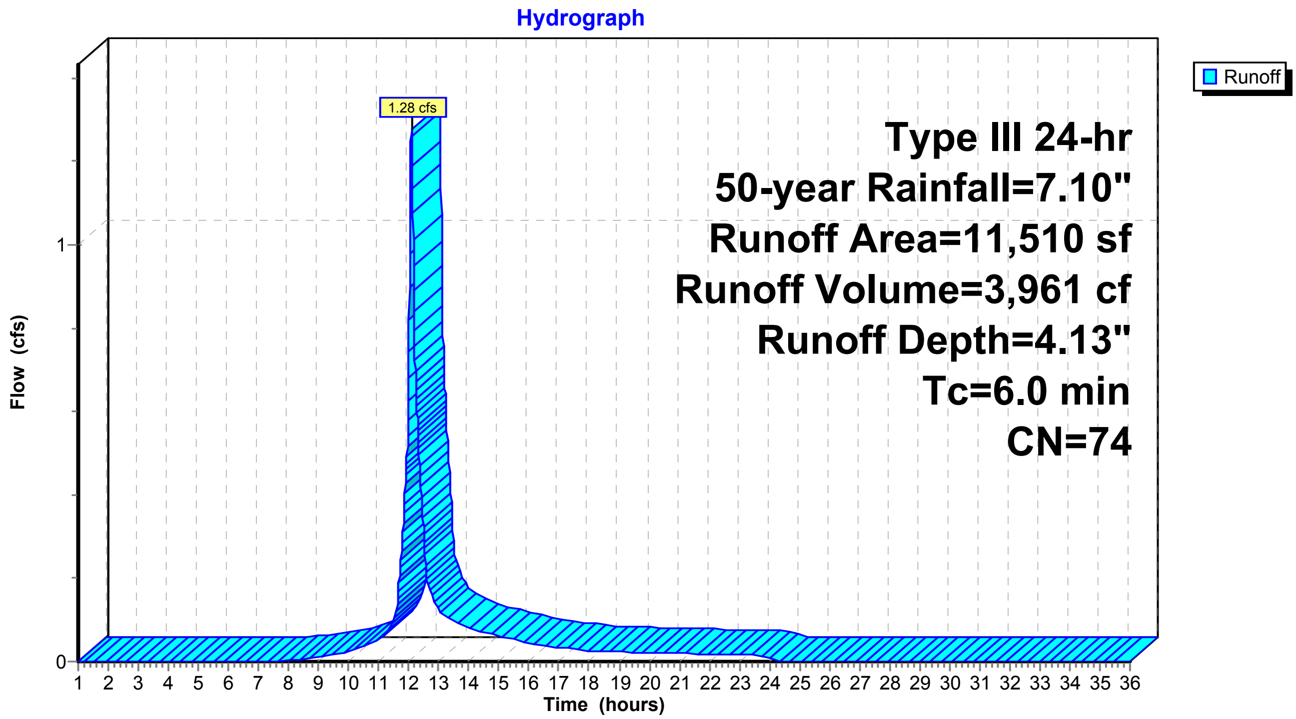
Runoff = 1.28 cfs @ 12.09 hrs, Volume= 3,961 cf, Depth= 4.13"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

	Area (sf)	CN	Description
*	5,725	98	Paved Impervious, HSG A
*	1,096	98	Paved Impervious, HSG B
	4,689	39	>75% Grass cover, Good, HSG A
	11,510	74	Weighted Average
	4,689		40.74% Pervious Area
	6,821		59.26% Impervious Area

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

Subcatchment A5: SUB-A2



Summary for Subcatchment A6: SUB-A4

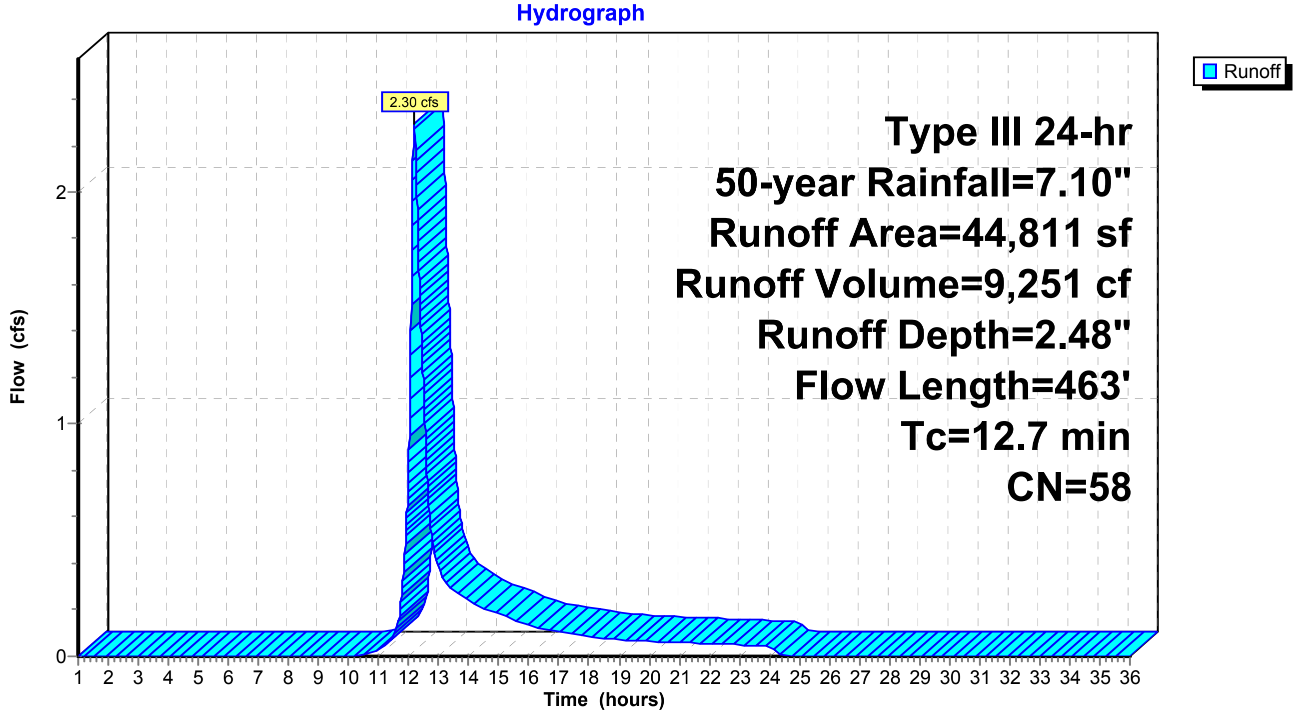
Runoff = 2.30 cfs @ 12.18 hrs, Volume= 9,251 cf, Depth= 2.48"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

	Area (sf)	CN	Description
*	3,625	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	13,635	30	Woods, Good, HSG A
	13,102	55	Woods, Good, HSG B
	2,357	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	44,811	58	Weighted Average
	33,054		73.76% Pervious Area
	11,757		26.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A6: SUB-A4



Summary for Subcatchment A7: SUB-A7

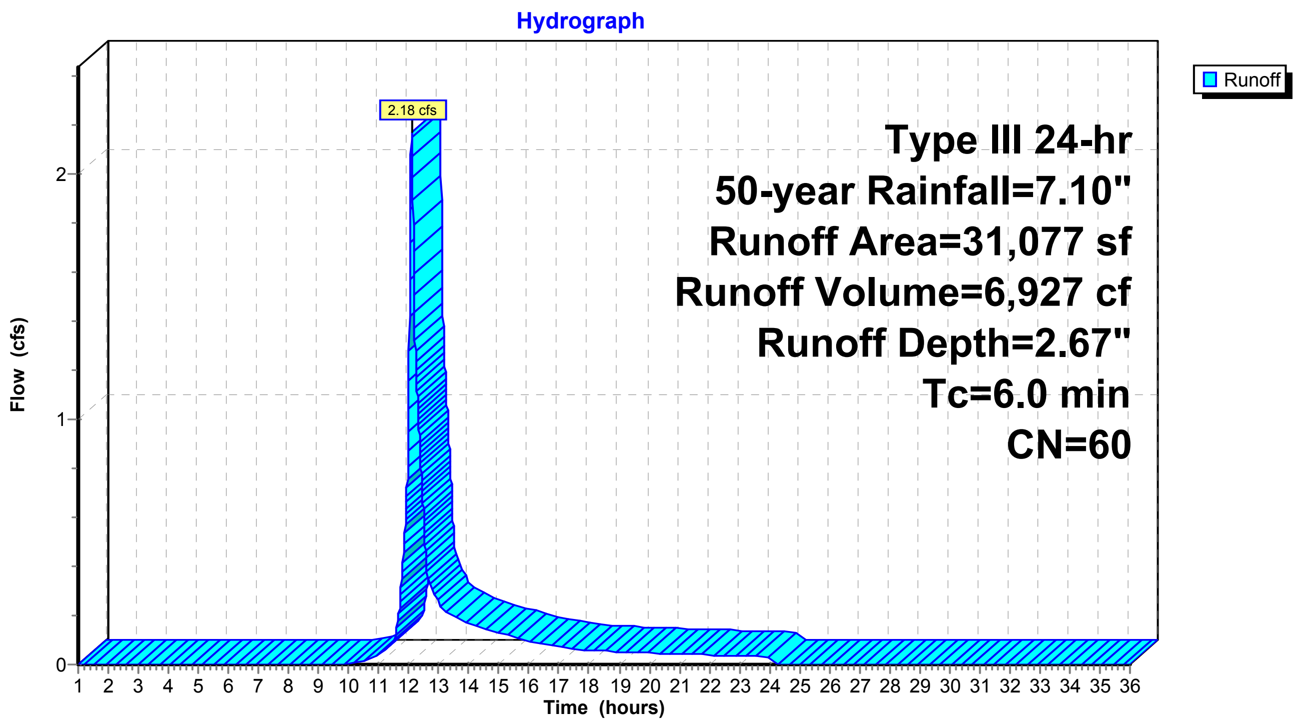
Runoff = 2.18 cfs @ 12.09 hrs, Volume= 6,927 cf, Depth= 2.67"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

	Area (sf)	CN	Description
*	3,420	98	Paved Impervious, HSG B
	523	39	>75% Grass cover, Good, HSG A
	16,801	61	>75% Grass cover, Good, HSG B
	3,334	30	Woods, Good, HSG A
	6,999	55	Woods, Good, HSG B
	31,077	60	Weighted Average
	27,657		89.00% Pervious Area
	3,420		11.00% Impervious Area

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

Subcatchment A7: SUB-A7



Summary for Subcatchment A8: SUB-A8

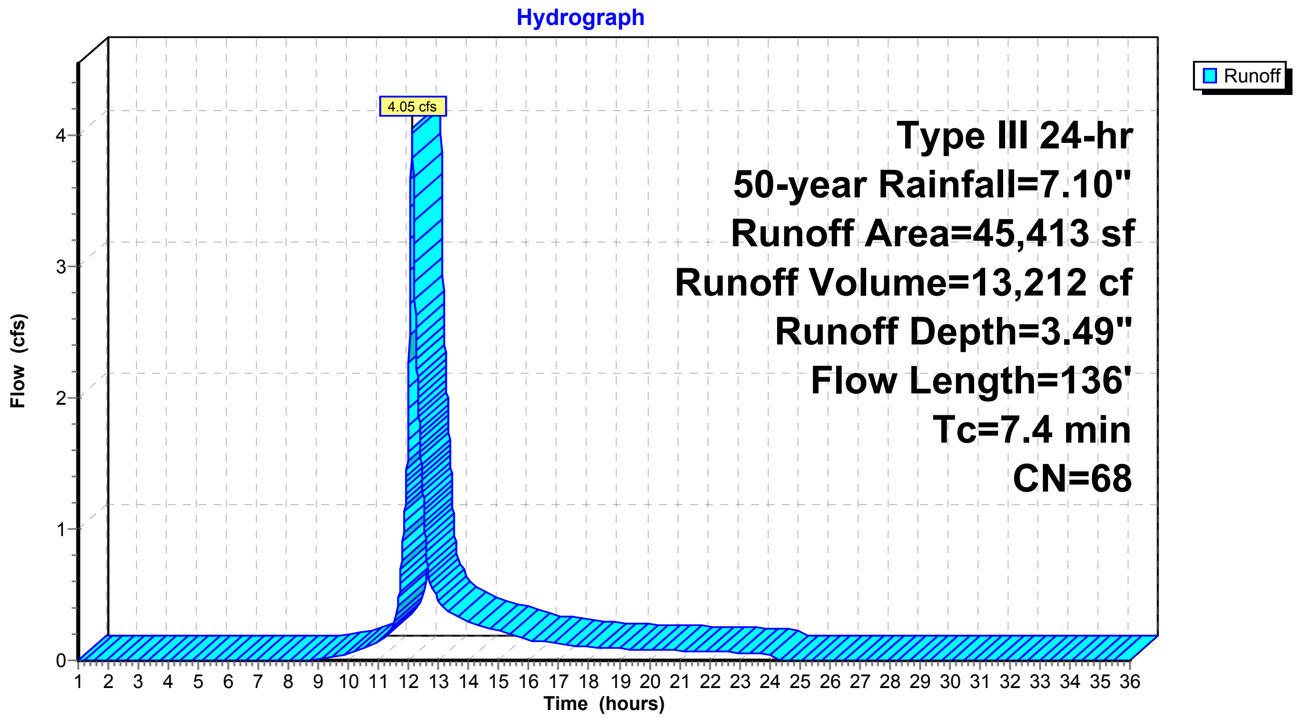
Runoff = 4.05 cfs @ 12.11 hrs, Volume= 13,212 cf, Depth= 3.49"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

	Area (sf)	CN	Description
*	9,176	98	Paved Impervious, HSG A
*	1,528	98	Paved Impervious, HSG B
	3,894	98	Roofs, HSG A
	8,917	98	Roofs, HSG B
	12,216	39	>75% Grass cover, Good, HSG A
	9,682	30	Woods, Good, HSG A
	45,413	68	Weighted Average
	21,898		48.22% Pervious Area
	23,515		51.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	52	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	34	0.0580	1.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.4	136	Total			

Subcatchment A8: SUB-A8



Summary for Subcatchment B1: SUB-B1

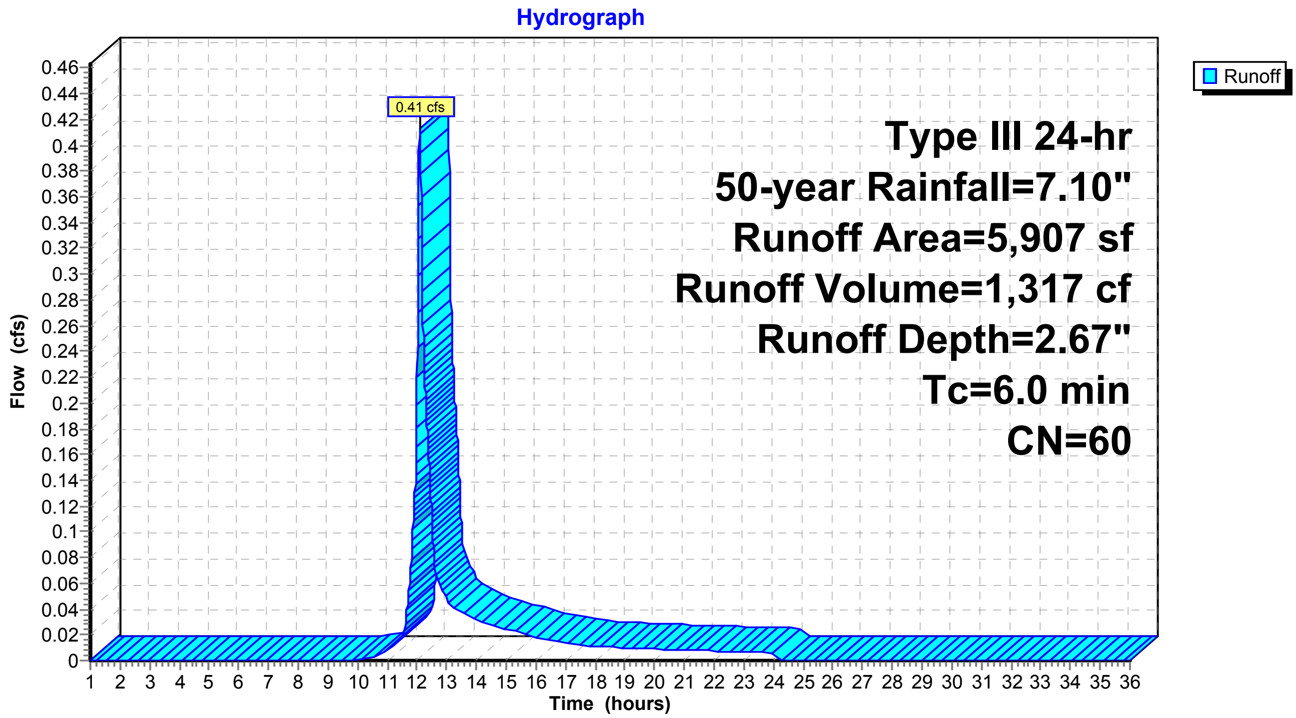
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,317 cf, Depth= 2.67"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-year Rainfall=7.10"

Area (sf)	CN	Description
5,112	61	>75% Grass cover, Good, HSG B
795	55	Woods, Good, HSG B
5,907	60	Weighted Average
5,907		100.00% Pervious Area

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

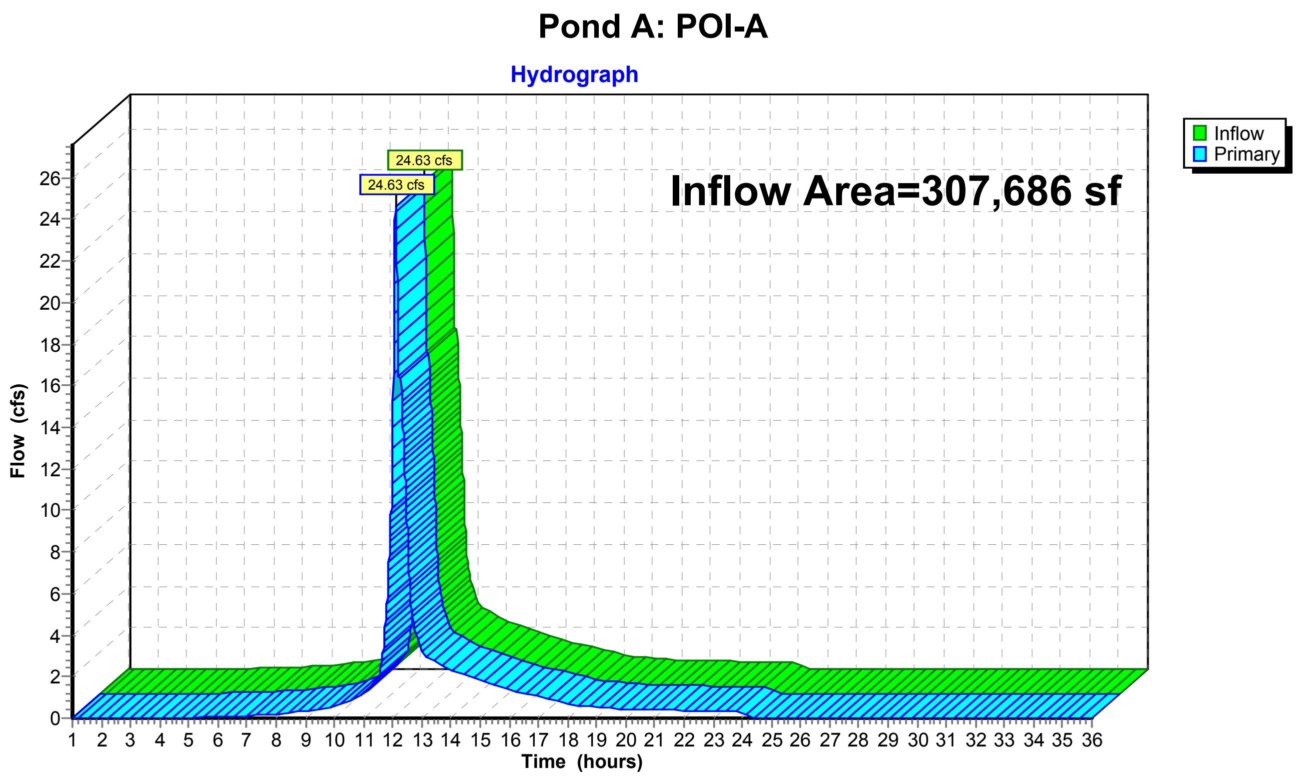
Subcatchment B1: SUB-B1



Summary for Pond A: POI-A

Inflow Area =	307,686 sf,	58.15% Impervious,	Inflow Depth = 3.80"	for 50-year event	
Inflow =	24.63 cfs @	12.10 hrs, Volume=	97,556 cf		
Primary =	24.63 cfs @	12.10 hrs, Volume=	97,556 cf,	Atten= 0%,	Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

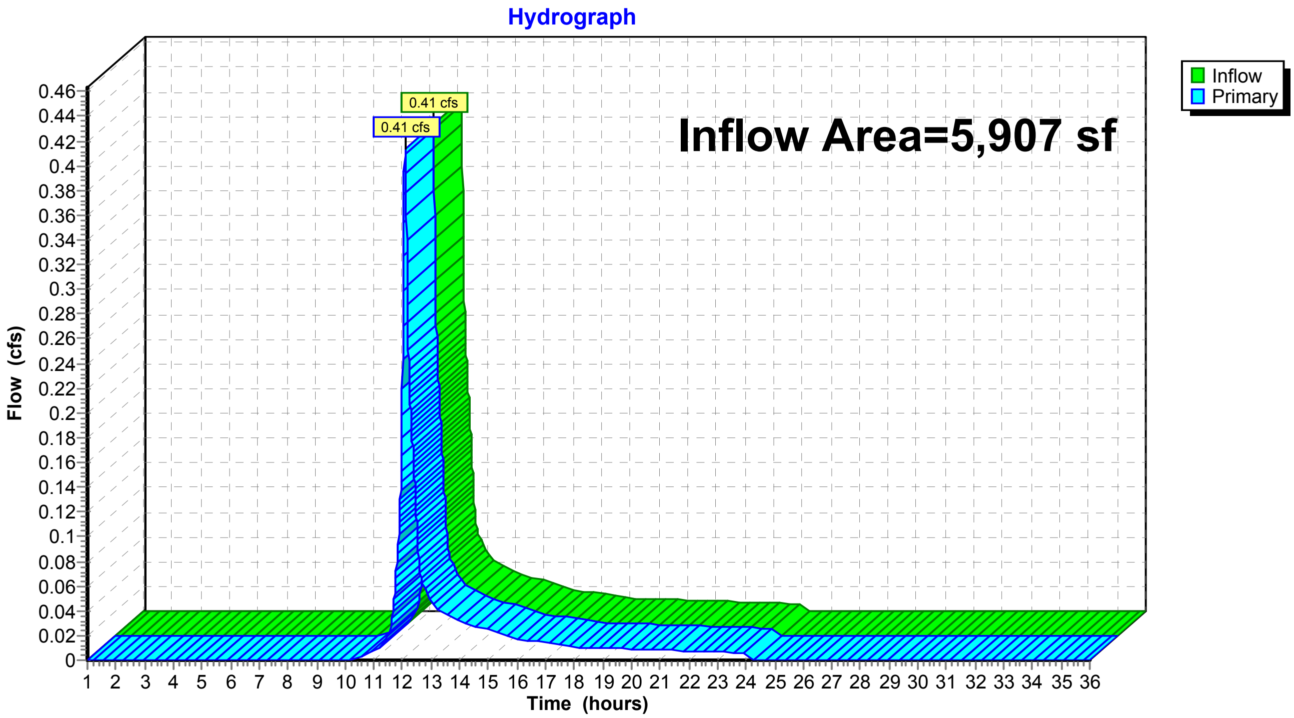


Summary for Pond B: POI-B

Inflow Area = 5,907 sf, 0.00% Impervious, Inflow Depth = 2.67" for 50-year event
Inflow = 0.41 cfs @ 12.09 hrs, Volume= 1,317 cf
Primary = 0.41 cfs @ 12.09 hrs, Volume= 1,317 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

Pond B: POI-B



Summary for Pond BR-1: BR-1

Inflow Area = 16,500 sf, 77.45% Impervious, Inflow Depth = 5.46" for 50-year event
Inflow = 2.34 cfs @ 12.09 hrs, Volume= 7,510 cf
Outflow = 2.33 cfs @ 12.09 hrs, Volume= 6,700 cf, Atten= 1%, Lag= 0.5 min
Primary = 1.11 cfs @ 12.06 hrs, Volume= 6,105 cf
Routed to Pond IS-1 : IS-1
Secondary = 1.25 cfs @ 12.10 hrs, Volume= 595 cf
Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 101.35' @ 12.10 hrs Surf.Area= 479 sf Storage= 1,023 cf

Plug-Flow detention time= 81.3 min calculated for 6,700 cf (89% of inflow)
Center-of-Mass det. time= 30.0 min (821.8 - 791.8)

Volume	Invert	Avail.Storage	Storage Description
#1	96.74'	1,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

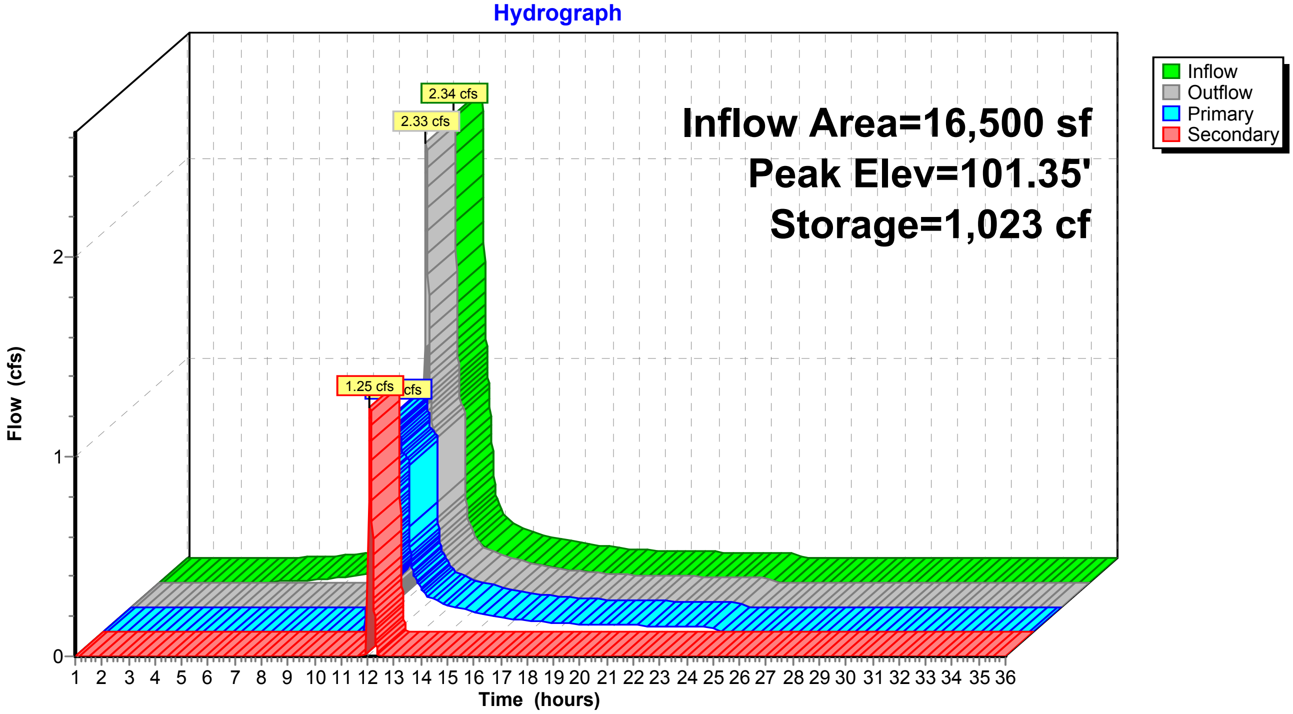
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.74	641	0.0	0	0
96.75	641	40.0	3	3
97.24	641	40.0	126	128
97.25	641	30.0	2	130
100.24	641	30.0	575	705
100.25	641	40.0	3	708
100.49	641	40.0	62	769
100.50	88	100.0	4	773
101.00	335	100.0	106	879
101.75	641	100.0	366	1,245

Device	Routing	Invert	Outlet Devices
#1	Device 2	100.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	94.49'	**12.0" Round Culvert** L= 62.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.49' / 94.18' S= 0.0049 '/' Cc= 0.900 n= 0.130, Flow Area= 0.79 sf
#3	Secondary	101.25'	**15.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.10 cfs @ 12.06 hrs HW=101.32' TW=95.27' (Dynamic Tailwater)
2=Culvert (Outlet Controls 1.10 cfs @ 1.40 fps)
1=Orifice/Grate (Passes 1.10 cfs of 8.77 cfs potential flow)

Secondary OutFlow Max=1.25 cfs @ 12.10 hrs HW=101.35' TW=95.71' (Dynamic Tailwater)
3=Broad-Crested Rectangular Weir (Weir Controls 1.25 cfs @ 0.80 fps)

Pond BR-1: BR-1


Hydrograph
Inflow Area=16,500 sf
Peak Elev=101.35'
Storage=1,023 cf
2.34 cfs
2.33 cfs
1.25 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond DS-1: DS-1

Inflow Area = 35,193 sf, 61.85% Impervious, Inflow Depth = 4.46" for 50-year event
Inflow = 3.81 cfs @ 12.12 hrs, Volume= 13,068 cf
Outflow = 3.79 cfs @ 12.13 hrs, Volume= 13,067 cf, Atten= 1%, Lag= 0.6 min
Primary = 3.79 cfs @ 12.13 hrs, Volume= 13,067 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 90.37' @ 12.13 hrs Surf.Area= 658 sf Storage= 916 cf

Plug-Flow detention time= 17.5 min calculated for 13,063 cf (100% of inflow)
Center-of-Mass det. time= 17.6 min (834.8 - 817.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.25'	627 cf	**20.50'W x 32.10'L x 3.50'H Field A** 2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#2A	88.75'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Chambers in 4 Rows
		1,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	88.25'	**24.0" Round Culvert** L= 26.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 88.25' / 88.12' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	89.95'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	88.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.78 cfs @ 12.13 hrs HW=90.37' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.78 cfs of 11.86 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Weir Controls 3.45 cfs @ 2.11 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.33 cfs @ 6.80 fps)

Pond DS-1: DS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

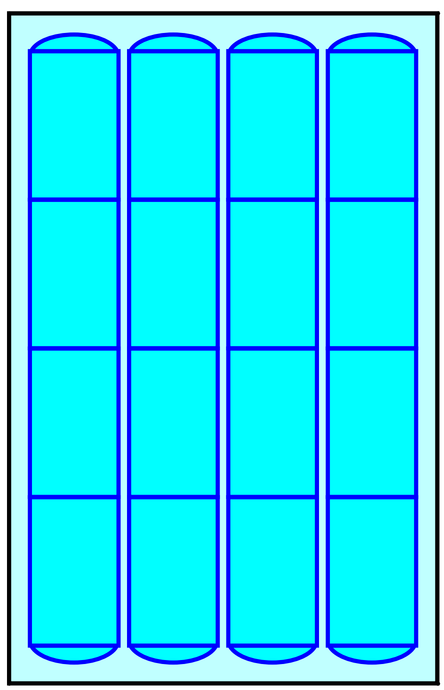
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

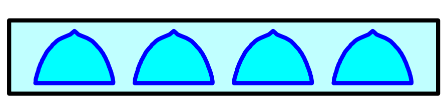
16 Chambers x 45.9 cf = 735.0 cf Chamber Storage

2,302.9 cf Field - 735.0 cf Chambers = 1,567.9 cf Stone x 40.0% Voids = 627.2 cf Stone Storage

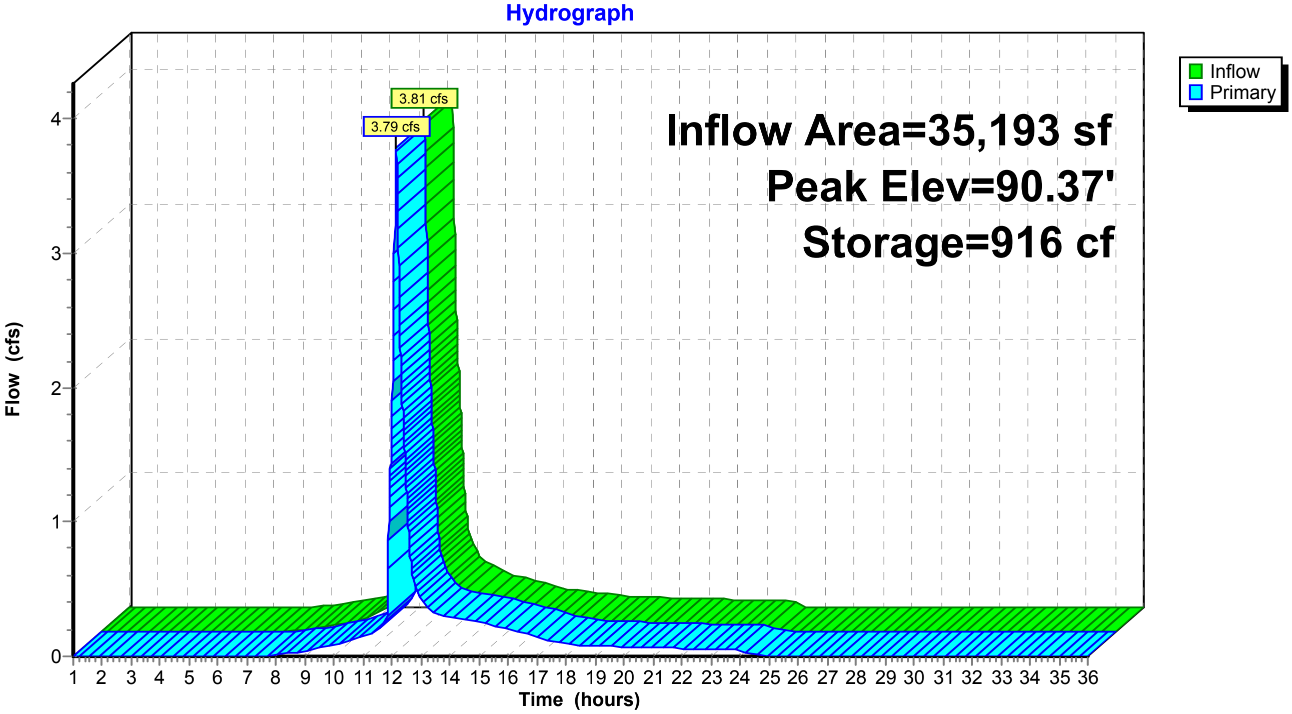
Chamber Storage + Stone Storage = 1,362.2 cf = 0.031 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 20.50' x 3.50'

16 Chambers
85.3 cy Field
58.1 cy Stone





Pond DS-1: DS-1


Hydrograph
3.81 cfs
3.79 cfs
Inflow Area=35,193 sf
Peak Elev=90.37'
Storage=916 cf
Inflow
Primary
Flow (cfs)
0
1
2
3
4
Time (hours)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Pond IS-1: IS-1

Inflow Area = 61,597 sf, 85.38% Impervious, Inflow Depth = 5.81" for 50-year event
Inflow = 9.24 cfs @ 12.09 hrs, Volume= 29,825 cf
Outflow = 3.61 cfs @ 12.31 hrs, Volume= 29,825 cf, Atten= 61%, Lag= 13.7 min
Discarded = 0.28 cfs @ 12.31 hrs, Volume= 16,466 cf
Primary = 3.33 cfs @ 12.31 hrs, Volume= 13,360 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 97.35' @ 12.31 hrs Surf.Area= 3,603 sf Storage= 11,276 cf

Plug-Flow detention time= 152.8 min calculated for 29,817 cf (100% of inflow)
Center-of-Mass det. time= 152.8 min (936.3 - 783.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.50'	5,063 cf	**29.92'W x 120.42'L x 5.50'H Field A**
			19,814 cf Overall - 7,156 cf Embedded = 12,658 cf x 40.0% Voids
#2A	93.25'	7,156 cf	**ADS_StormTech MC-3500 d +Cap** x 64 Inside #1
			Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
			Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
			64 Chambers in 4 Rows
			Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
		12,219 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	92.50'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	92.00'	**12.0" Round Culvert**
			L= 91.3' CPP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 92.00' / 91.09' S= 0.0100 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	97.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	94.20'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.28 cfs @ 12.31 hrs HW=97.34' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=3.33 cfs @ 12.31 hrs HW=97.34' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 3.33 cfs of 6.57 cfs potential flow)
  ├─**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.60 cfs @ 1.92 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.73 cfs @ 8.31 fps)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

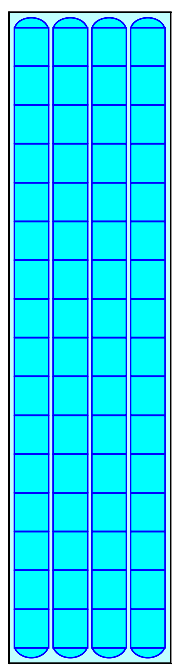
16 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 118.42' Row Length +12.0" End Stone x 2 = 120.42' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

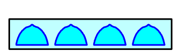
64 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 7,156.1 cf Chamber Storage

19,814.1 cf Field - 7,156.1 cf Chambers = 12,658.0 cf Stone x 40.0% Voids = 5,063.2 cf Stone Storage

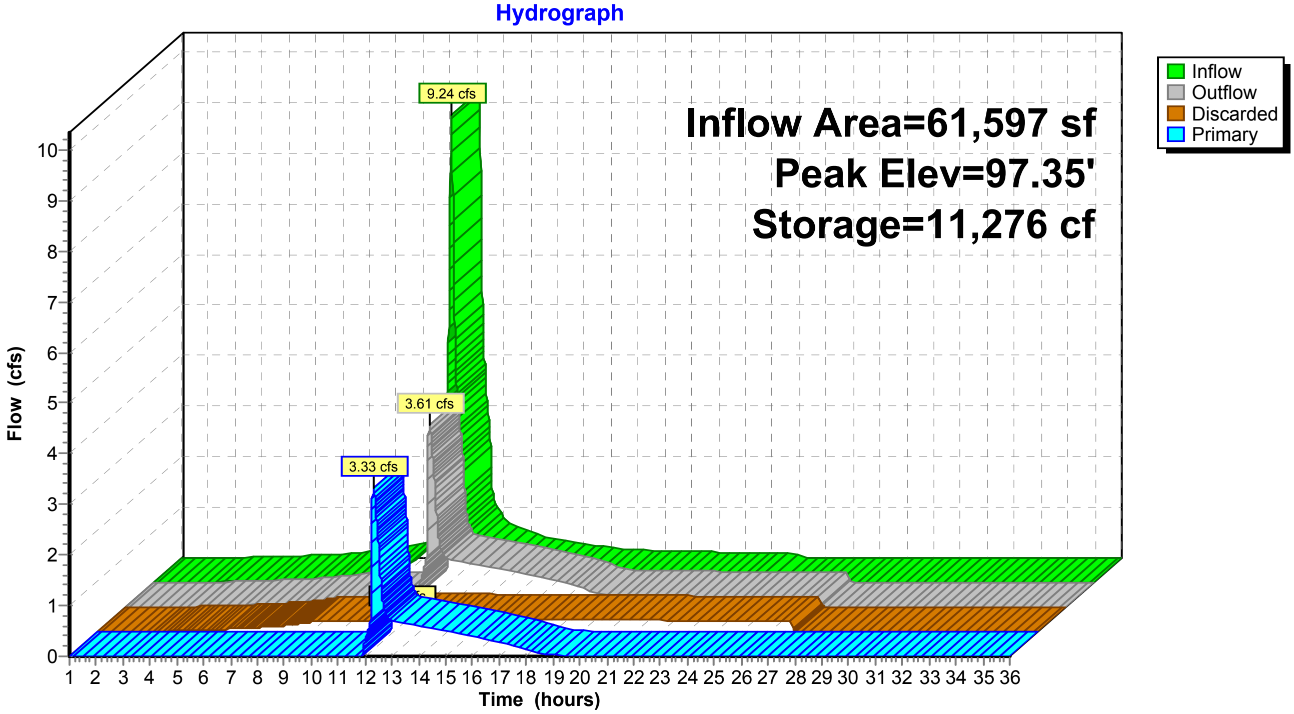
Chamber Storage + Stone Storage = 12,219.3 cf = 0.281 af
Overall Storage Efficiency = 61.7%
Overall System Size = 120.42' x 29.92' x 5.50'

64 Chambers
733.9 cy Field
468.8 cy Stone





Pond IS-1: IS-1


Hydrograph
9.24 cfs
3.61 cfs
3.33 cfs
Inflow Area=61,597 sf
Peak Elev=97.35'
Storage=11,276 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=78,085 sf 75.63% Impervious Runoff Depth=6.98"
Tc=6.0 min CN=89 Runoff=13.78 cfs 45,428 cf

SubcatchmentA2: SUB-A2 Runoff Area=35,193 sf 61.85% Impervious Runoff Depth=5.55"
Flow Length=160' Tc=8.9 min CN=77 Runoff=4.72 cfs 16,277 cf

SubcatchmentA3: SUB-A3 Runoff Area=16,500 sf 77.45% Impervious Runoff Depth=6.62"
Tc=6.0 min CN=86 Runoff=2.81 cfs 9,106 cf

SubcatchmentA4: SUB-A4 Runoff Area=45,097 sf 88.28% Impervious Runoff Depth=7.34"
Tc=6.0 min CN=92 Runoff=8.18 cfs 27,587 cf

SubcatchmentA5: SUB-A2 Runoff Area=11,510 sf 59.26% Impervious Runoff Depth=5.19"
Tc=6.0 min CN=74 Runoff=1.60 cfs 4,983 cf

SubcatchmentA6: SUB-A4 Runoff Area=44,811 sf 26.24% Impervious Runoff Depth=3.33"
Flow Length=463' Tc=12.7 min CN=58 Runoff=3.16 cfs 12,439 cf

SubcatchmentA7: SUB-A7 Runoff Area=31,077 sf 11.00% Impervious Runoff Depth=3.56"
Tc=6.0 min CN=60 Runoff=2.94 cfs 9,219 cf

SubcatchmentA8: SUB-A8 Runoff Area=45,413 sf 51.78% Impervious Runoff Depth=4.49"
Flow Length=136' Tc=7.4 min CN=68 Runoff=5.23 cfs 16,986 cf

SubcatchmentB1: SUB-B1 Runoff Area=5,907 sf 0.00% Impervious Runoff Depth=3.56"
Tc=6.0 min CN=60 Runoff=0.56 cfs 1,752 cf

Pond A: POI-A Inflow=33.17 cfs 123,662 cf
Primary=33.17 cfs 123,662 cf

Pond B: POI-B Inflow=0.56 cfs 1,752 cf
Primary=0.56 cfs 1,752 cf

Pond BR-1: BR-1 Peak Elev=101.38' Storage=1,037 cf Inflow=2.81 cfs 9,106 cf
Primary=1.08 cfs 7,176 cf Secondary=1.80 cfs 1,120 cf Outflow=2.79 cfs 8,296 cf

Pond DS-1: DS-1 Peak Elev=90.44' Storage=946 cf Inflow=4.72 cfs 16,277 cf
Outflow=4.70 cfs 16,277 cf

Pond IS-1: IS-1 Peak Elev=97.63' Storage=11,693 cf Inflow=10.96 cfs 35,882 cf
Discarded=0.29 cfs 17,552 cf Primary=6.77 cfs 18,330 cf Outflow=7.05 cfs 35,882 cf

Total Runoff Area = 313,593 sf Runoff Volume = 143,778 cf Average Runoff Depth = 5.50"
42.94% Pervious = 134,668 sf 57.06% Impervious = 178,925 sf

Summary for Subcatchment A1: SUB-A1

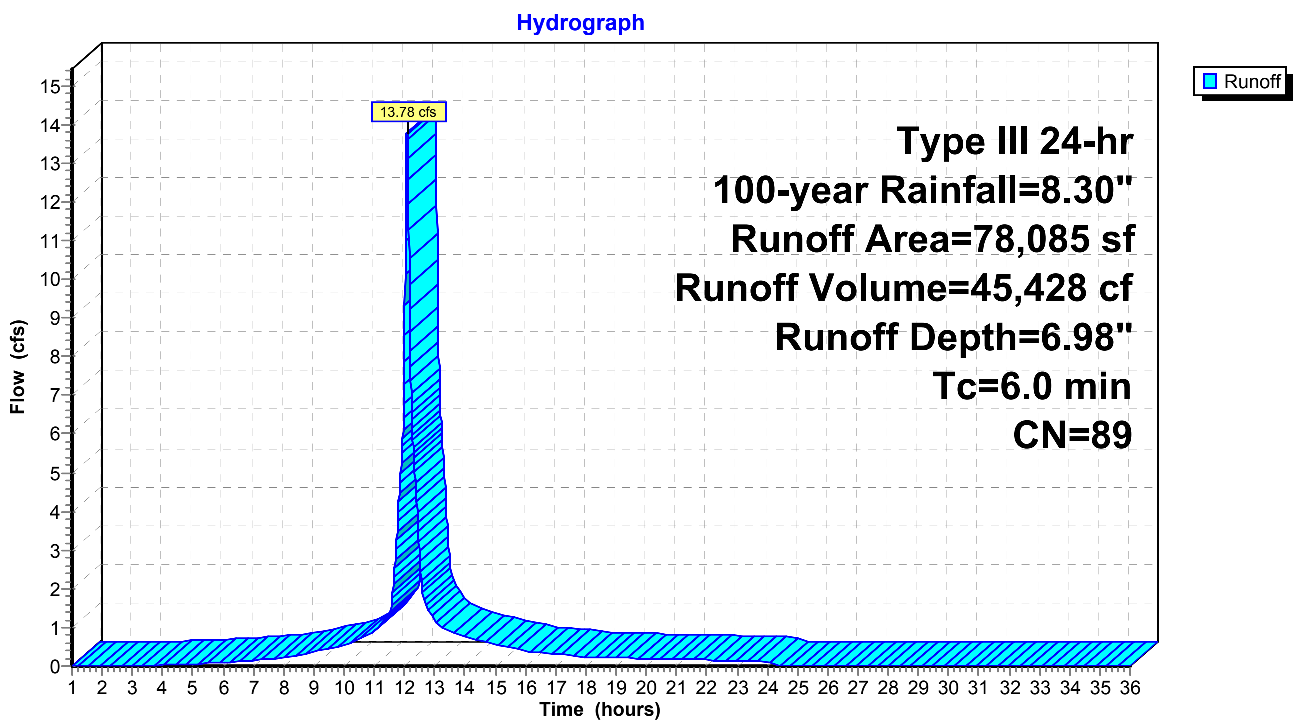
Runoff = 13.78 cfs @ 12.08 hrs, Volume= 45,428 cf, Depth= 6.98"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

	Area (sf)	CN	Description
*	27,200	98	Paved Impervious, HSG B
	16,163	98	Roofs, HSG B
	19,031	61	>75% Grass cover, Good, HSG B
*	15,691	98	Expanded School Yard Impervious, HSG B
	78,085	89	Weighted Average
	19,031		24.37% Pervious Area
	59,054		75.63% Impervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

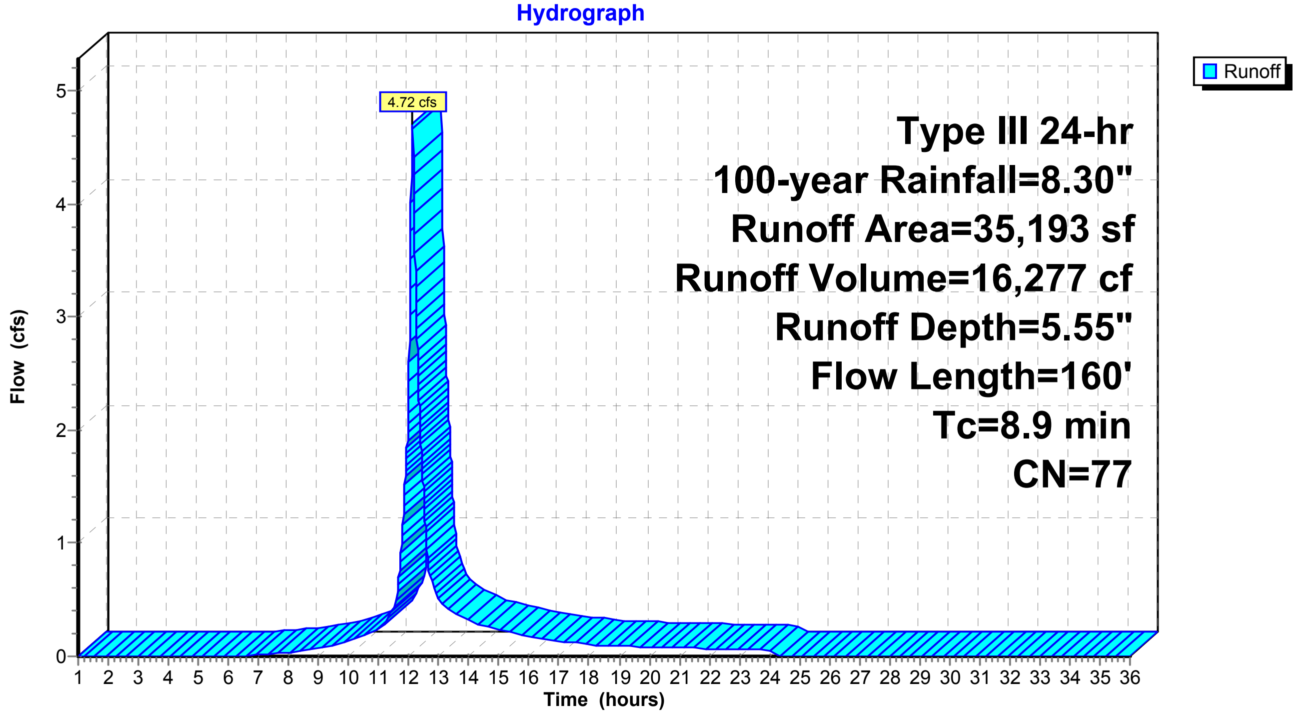
Runoff = 4.72 cfs @ 12.12 hrs, Volume= 16,277 cf, Depth= 5.55"
Routed to Pond DS-1 : DS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

	Area (sf)	CN	Description
*	23	98	Paved Impervious, HSG A
*	18,246	98	Paved Impervious, HSG B
	3,498	98	Roofs, HSG B
	1,694	39	>75% Grass cover, Good, HSG A
	4,693	61	>75% Grass cover, Good, HSG B
	6,952	30	Woods, Good, HSG A
	87	55	Woods, Good, HSG B
	35,193	77	Weighted Average
	13,426		38.15% Pervious Area
	21,767		61.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	33	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	59	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.9	160	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

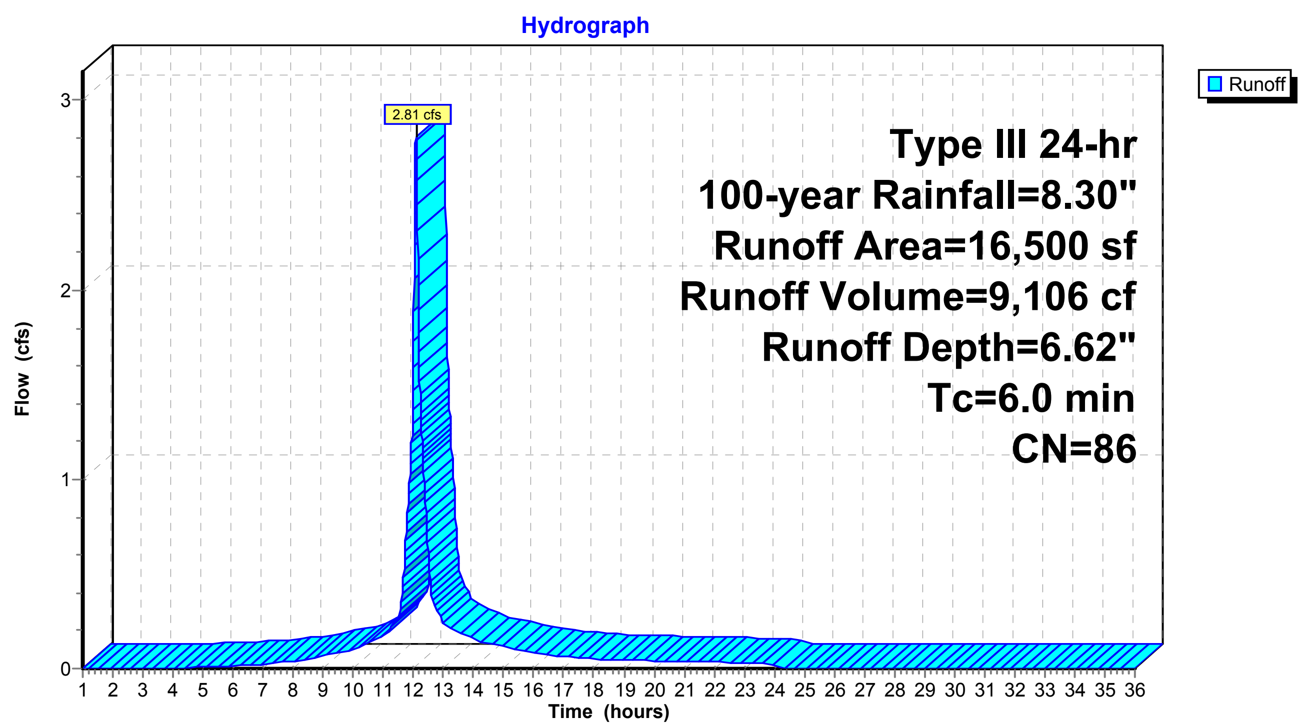
Runoff = 2.81 cfs @ 12.08 hrs, Volume= 9,106 cf, Depth= 6.62"
Routed to Pond BR-1 : BR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

	Area (sf)	CN	Description
*	4,196	98	Paved Impervious, HSG A
*	1,717	98	Paved Impervious, HSG B
	6,866	98	Roofs, HSG B
	2,808	39	>75% Grass cover, Good, HSG A
	913	61	>75% Grass cover, Good, HSG B
	16,500	86	Weighted Average
	3,721		22.55% Pervious Area
	12,779		77.45% Impervious Area

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

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

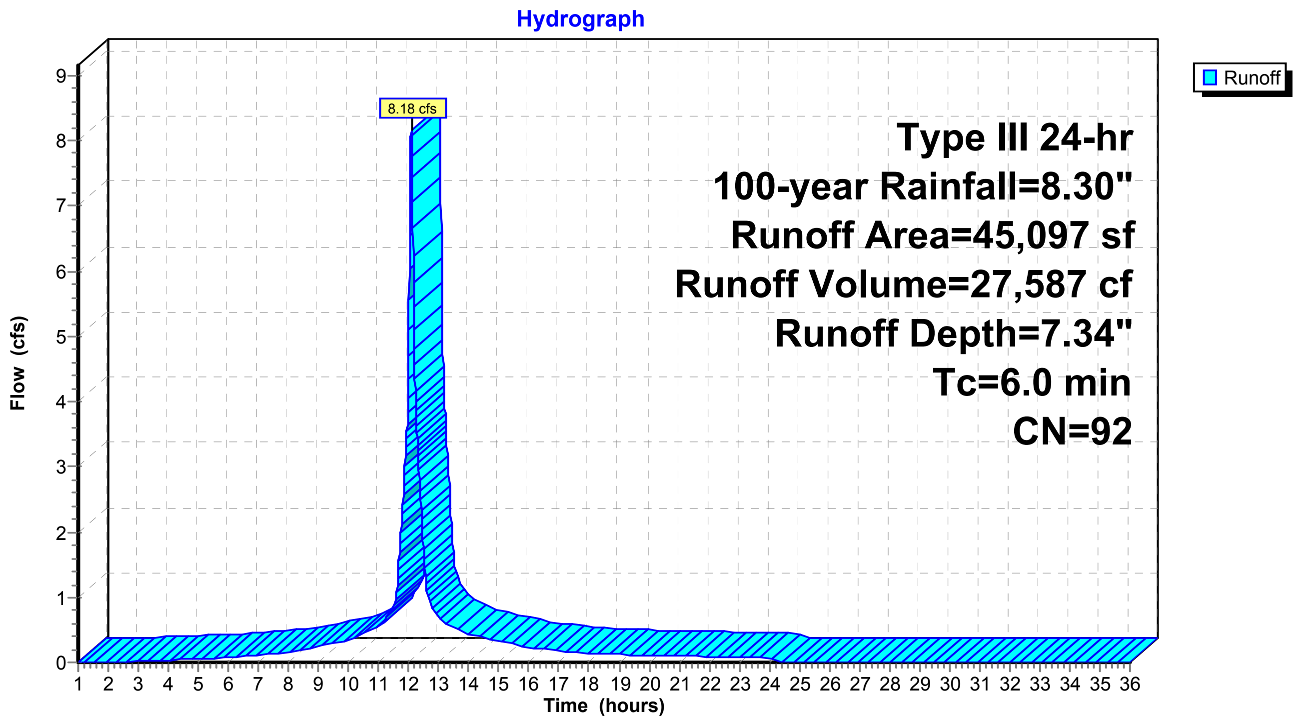
Runoff = 8.18 cfs @ 12.08 hrs, Volume= 27,587 cf, Depth= 7.34"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

	Area (sf)	CN	Description
*	28,479	98	Paved Impervious, HSG A
*	4,701	98	Paved Impervious, HSG B
	3,540	98	Roofs, HSG A
	3,092	98	Roofs, HSG B
	3,675	39	>75% Grass cover, Good, HSG A
	1,610	61	>75% Grass cover, Good, HSG B
	45,097	92	Weighted Average
	5,285		11.72% Pervious Area
	39,812		88.28% Impervious Area

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

Subcatchment A4: SUB-A4



Summary for Subcatchment A5: SUB-A2

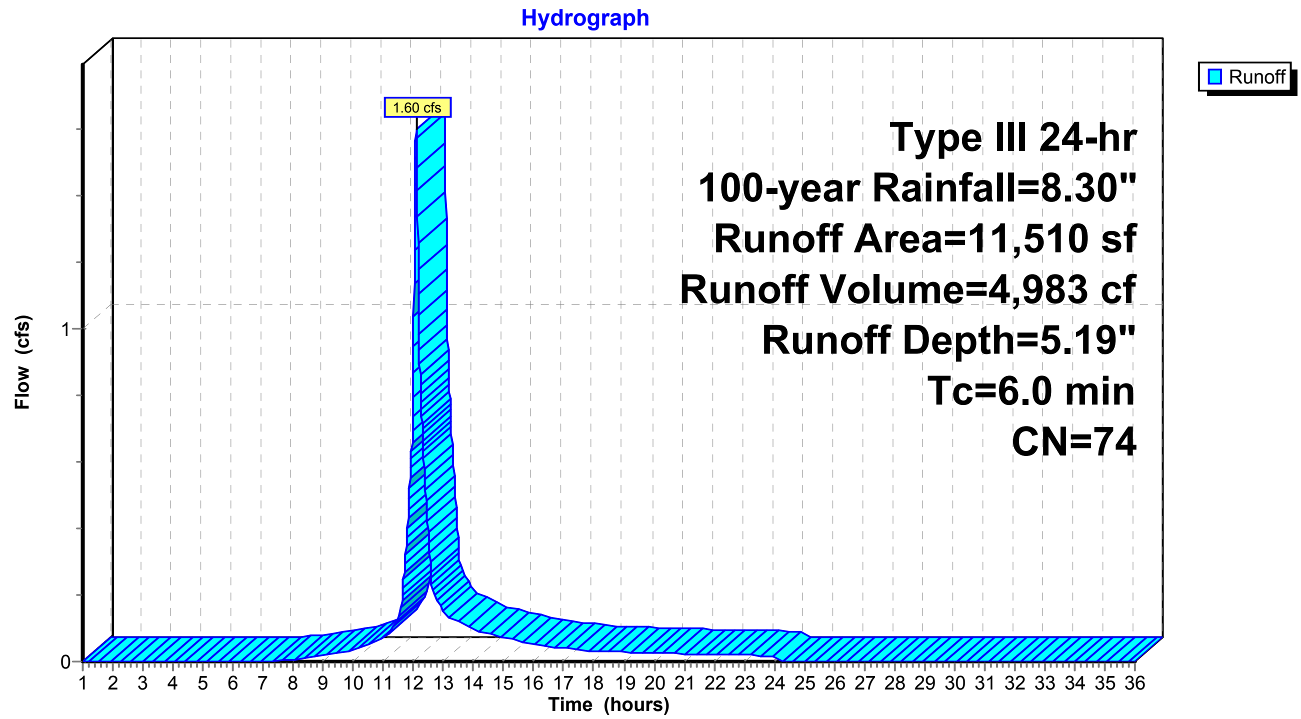
Runoff = 1.60 cfs @ 12.09 hrs, Volume= 4,983 cf, Depth= 5.19"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

	Area (sf)	CN	Description
*	5,725	98	Paved Impervious, HSG A
*	1,096	98	Paved Impervious, HSG B
	4,689	39	>75% Grass cover, Good, HSG A
	11,510	74	Weighted Average
	4,689		40.74% Pervious Area
	6,821		59.26% Impervious Area

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

Subcatchment A5: SUB-A2



Summary for Subcatchment A6: SUB-A4

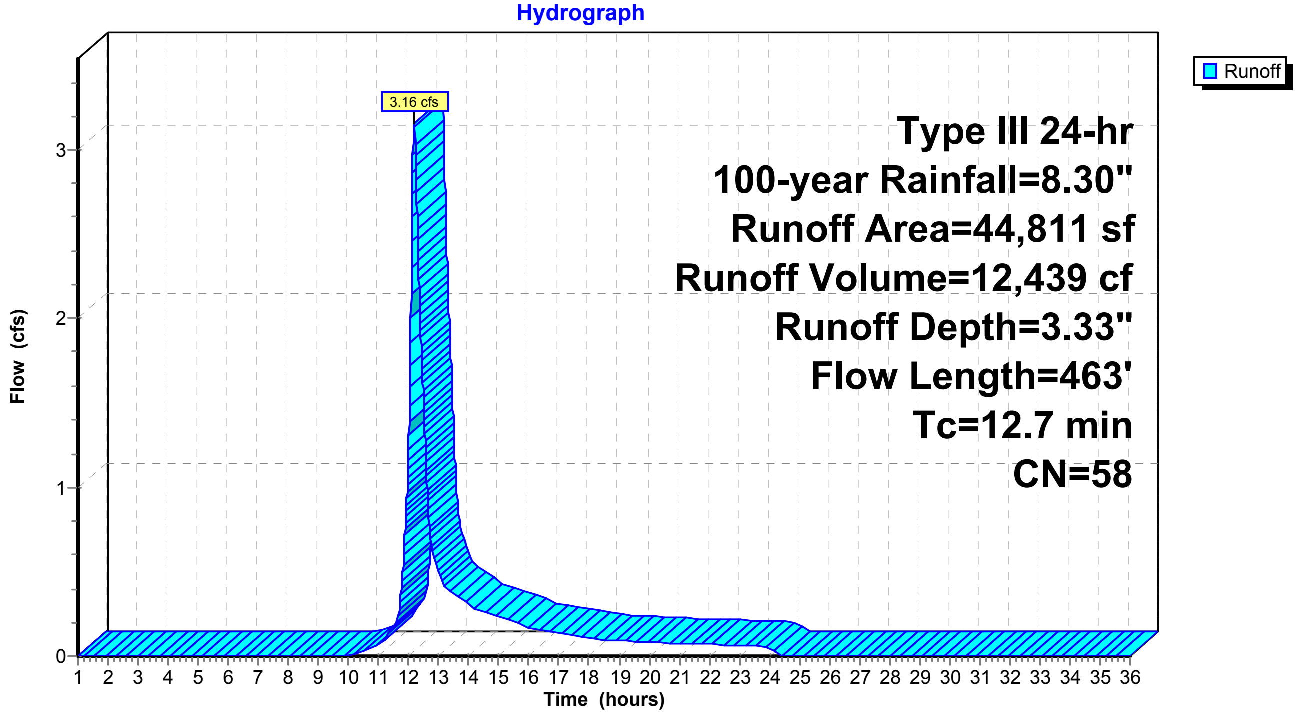
Runoff = 3.16 cfs @ 12.18 hrs, Volume= 12,439 cf, Depth= 3.33"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

	Area (sf)	CN	Description
*	3,625	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	13,635	30	Woods, Good, HSG A
	13,102	55	Woods, Good, HSG B
	2,357	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	44,811	58	Weighted Average
	33,054		73.76% Pervious Area
	11,757		26.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Subcatchment A6: SUB-A4



Summary for Subcatchment A7: SUB-A7

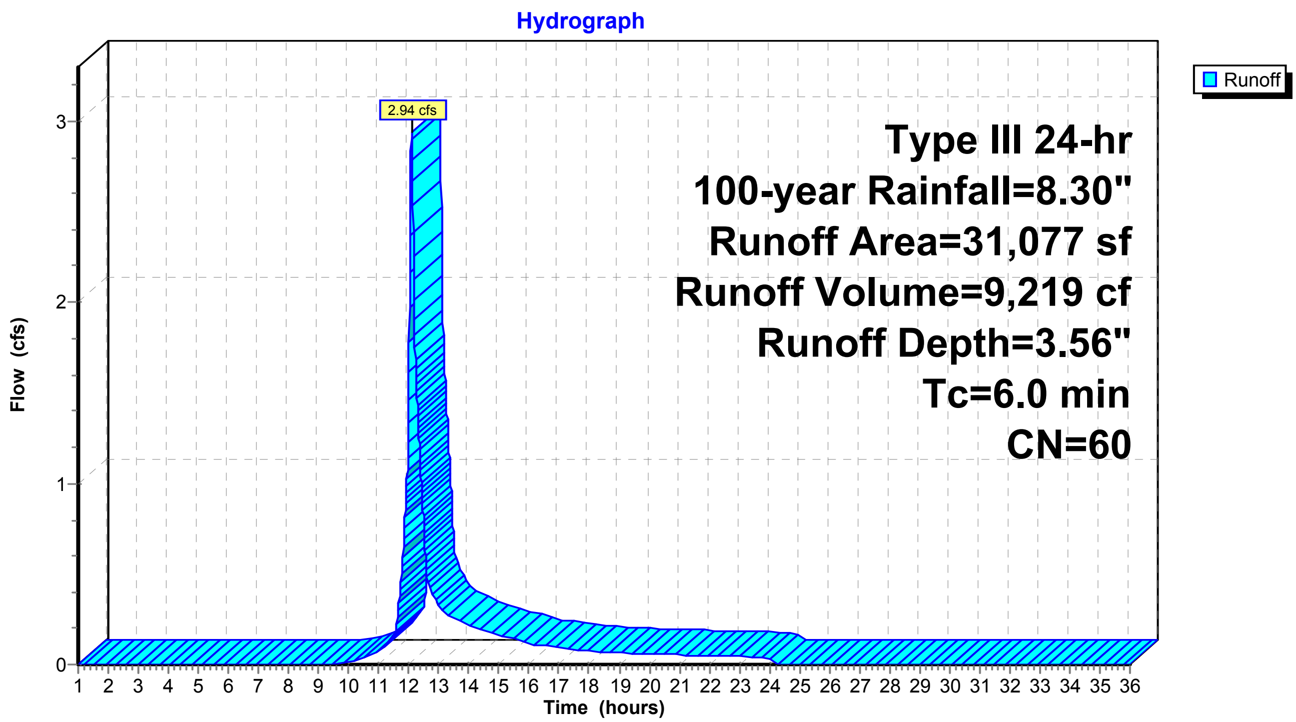
Runoff = 2.94 cfs @ 12.09 hrs, Volume= 9,219 cf, Depth= 3.56"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

	Area (sf)	CN	Description
*	3,420	98	Paved Impervious, HSG B
	523	39	>75% Grass cover, Good, HSG A
	16,801	61	>75% Grass cover, Good, HSG B
	3,334	30	Woods, Good, HSG A
	6,999	55	Woods, Good, HSG B
	31,077	60	Weighted Average
	27,657		89.00% Pervious Area
	3,420		11.00% Impervious Area

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

Subcatchment A7: SUB-A7



Summary for Subcatchment A8: SUB-A8

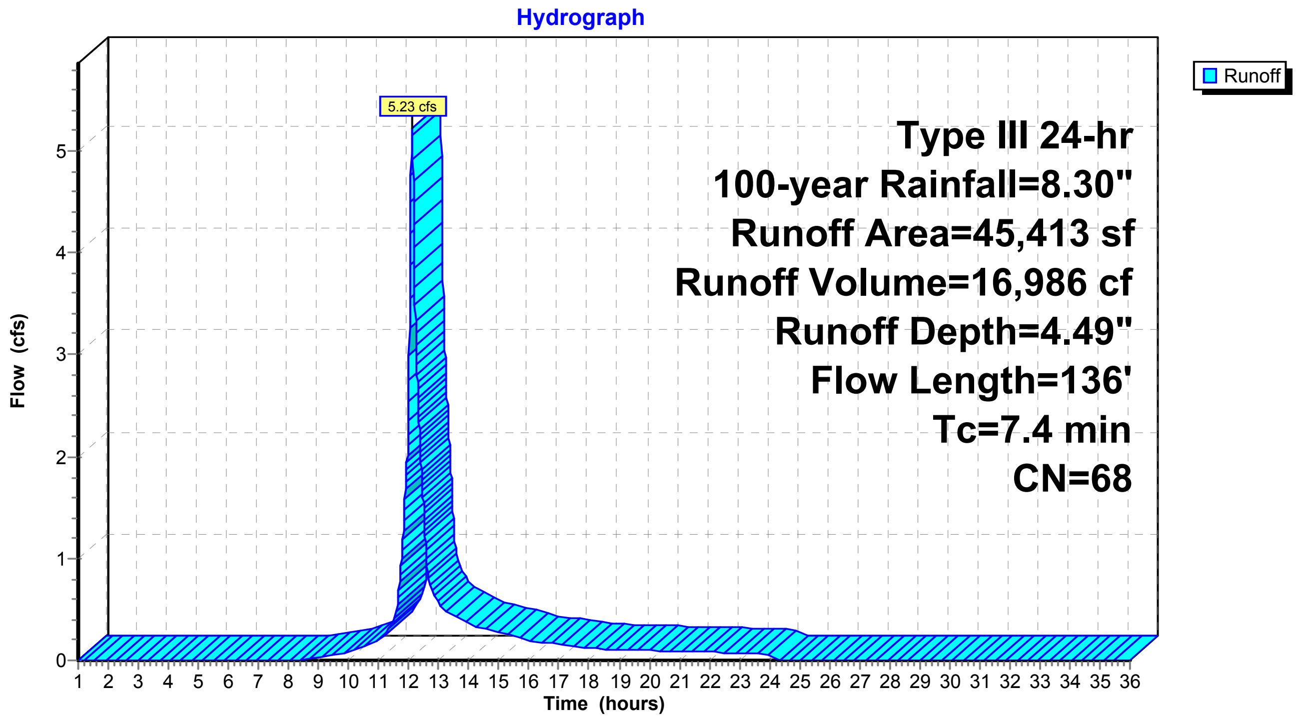
Runoff = 5.23 cfs @ 12.11 hrs, Volume= 16,986 cf, Depth= 4.49"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

	Area (sf)	CN	Description
*	9,176	98	Paved Impervious, HSG A
*	1,528	98	Paved Impervious, HSG B
	3,894	98	Roofs, HSG A
	8,917	98	Roofs, HSG B
	12,216	39	>75% Grass cover, Good, HSG A
	9,682	30	Woods, Good, HSG A
	45,413	68	Weighted Average
	21,898		48.22% Pervious Area
	23,515		51.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	52	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	34	0.0580	1.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.4	136	Total			

Subcatchment A8: SUB-A8



Summary for Subcatchment B1: SUB-B1

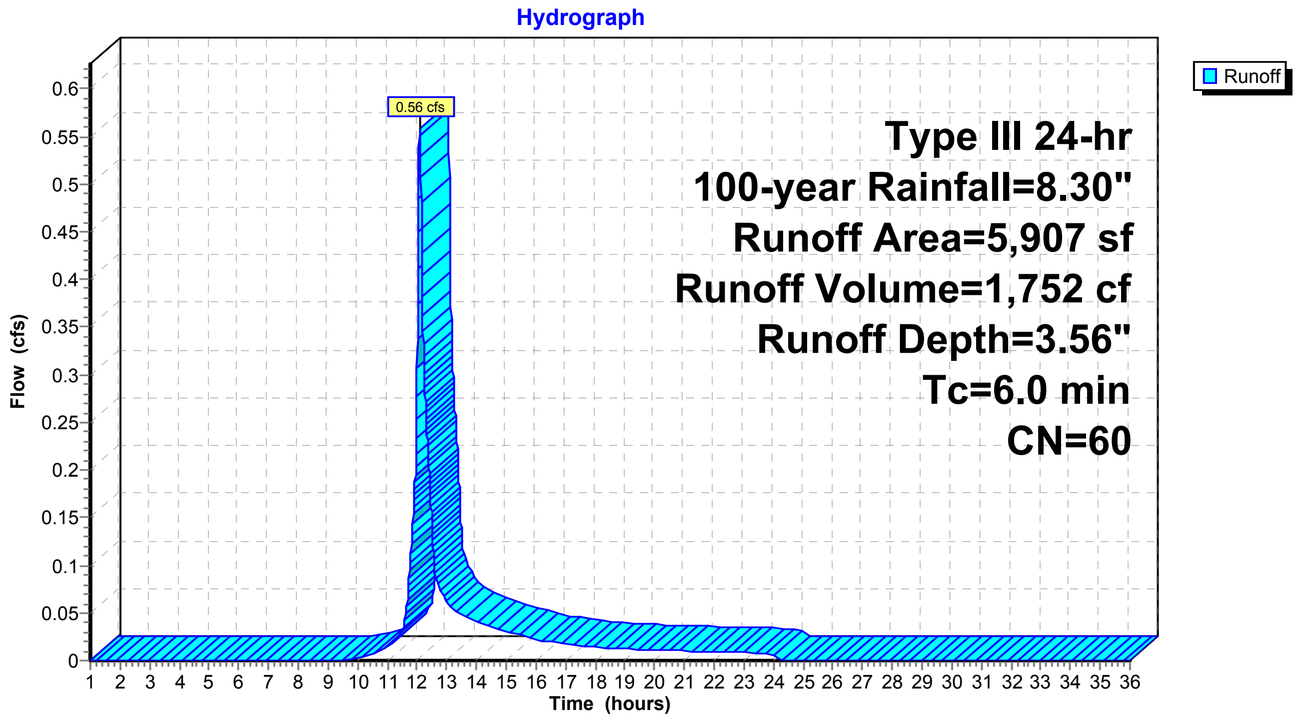
Runoff = 0.56 cfs @ 12.09 hrs, Volume= 1,752 cf, Depth= 3.56"
Routed to Pond B : POI-B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=8.30"

Area (sf)	CN	Description
5,112	61	>75% Grass cover, Good, HSG B
795	55	Woods, Good, HSG B
5,907	60	Weighted Average
5,907		100.00% Pervious Area

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

Subcatchment B1: SUB-B1

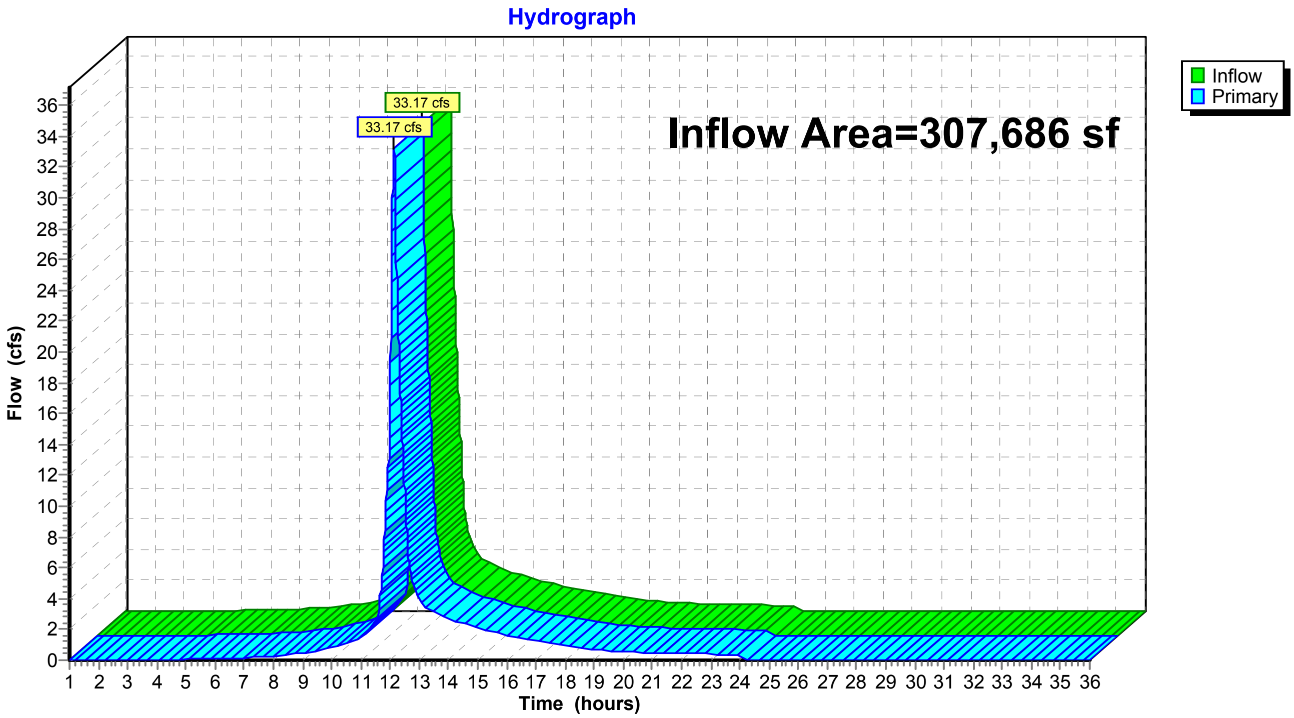


Summary for Pond A: POI-A

Inflow Area =	307,686 sf,	58.15% Impervious,	Inflow Depth = 4.82"	for 100-year event
Inflow =	33.17 cfs @	12.14 hrs, Volume=	123,662 cf	
Primary =	33.17 cfs @	12.14 hrs, Volume=	123,662 cf, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs

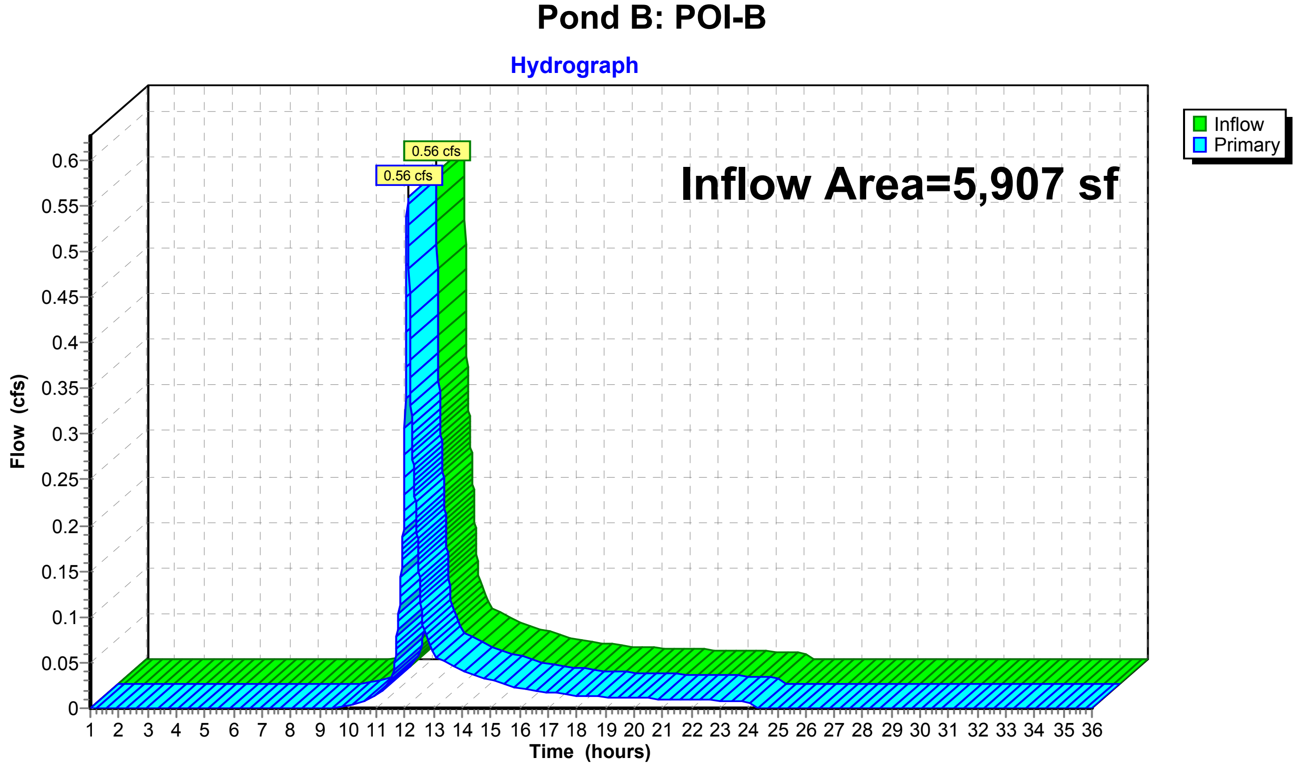
Pond A: POI-A



Summary for Pond B: POI-B

Inflow Area = 5,907 sf, 0.00% Impervious, Inflow Depth = 3.56" for 100-year event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 1,752 cf
Primary = 0.56 cfs @ 12.09 hrs, Volume= 1,752 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs



Summary for Pond BR-1: BR-1

Inflow Area = 16,500 sf, 77.45% Impervious, Inflow Depth = 6.62" for 100-year event
Inflow = 2.81 cfs @ 12.08 hrs, Volume= 9,106 cf
Outflow = 2.79 cfs @ 12.09 hrs, Volume= 8,296 cf, Atten= 1%, Lag= 0.4 min
Primary = 1.08 cfs @ 11.97 hrs, Volume= 7,176 cf
Routed to Pond IS-1 : IS-1
Secondary = 1.80 cfs @ 12.10 hrs, Volume= 1,120 cf
Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 101.38' @ 12.10 hrs Surf.Area= 491 sf Storage= 1,037 cf

Plug-Flow detention time= 72.2 min calculated for 8,293 cf (91% of inflow)
Center-of-Mass det. time= 27.6 min (814.2 - 786.6)

Volume	Invert	Avail.Storage	Storage Description
#1	96.74'	1,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

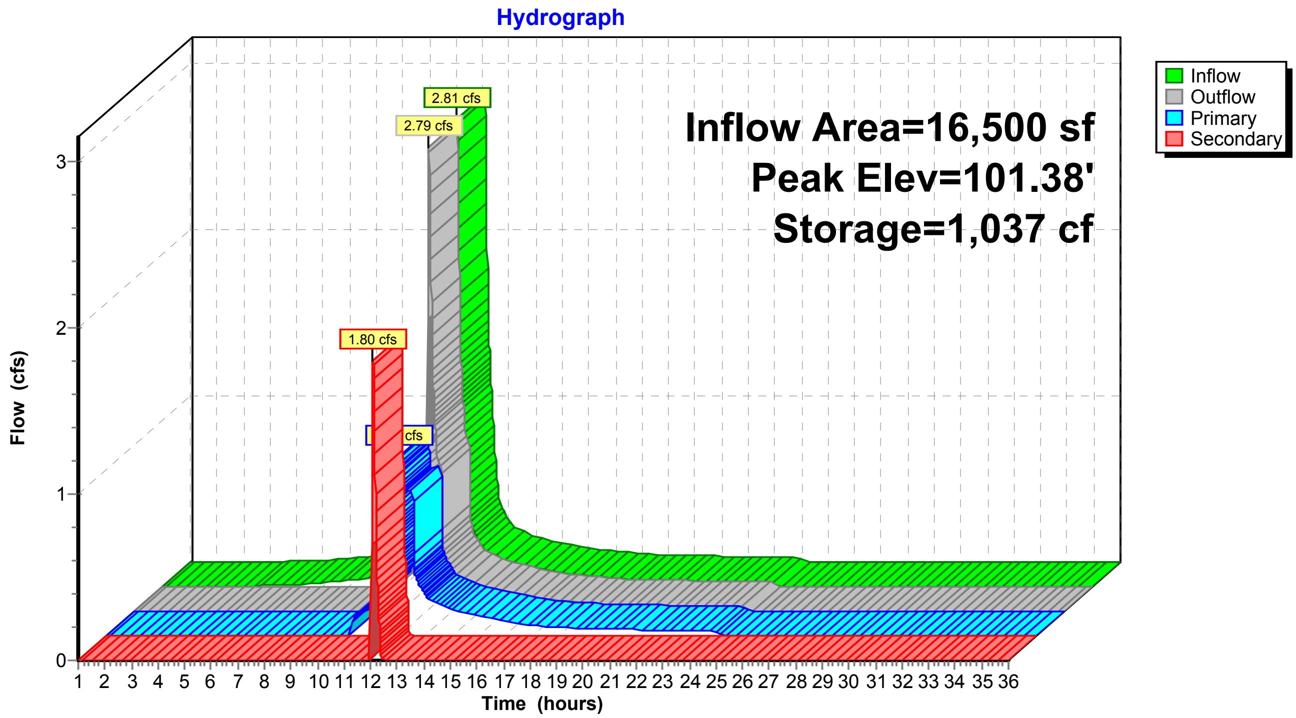
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.74	641	0.0	0	0
96.75	641	40.0	3	3
97.24	641	40.0	126	128
97.25	641	30.0	2	130
100.24	641	30.0	575	705
100.25	641	40.0	3	708
100.49	641	40.0	62	769
100.50	88	100.0	4	773
101.00	335	100.0	106	879
101.75	641	100.0	366	1,245

Device	Routing	Invert	Outlet Devices
#1	Device 2	100.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	94.49'	**12.0" Round Culvert** L= 62.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.49' / 94.18' S= 0.0049 '/' Cc= 0.900 n= 0.130, Flow Area= 0.79 sf
#3	Secondary	101.25'	**15.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.07 cfs @ 11.97 hrs HW=100.99' TW=95.24' (Dynamic Tailwater)
└─**2=Culvert** (Outlet Controls 1.07 cfs @ 1.36 fps)
  └─**1=Orifice/Grate** (Passes 1.07 cfs of 2.40 cfs potential flow)

Secondary OutFlow Max=1.80 cfs @ 12.10 hrs HW=101.38' TW=96.72' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 1.80 cfs @ 0.91 fps)

Pond BR-1: BR-1


Hydrograph
Inflow
Outflow
Primary
Secondary
Inflow Area=16,500 sf
Peak Elev=101.38'
Storage=1,037 cf
2.81 cfs
2.79 cfs
1.80 cfs
cfs
Flow (cfs)
Time (hours)
0
1
2
3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Pond DS-1: DS-1

Inflow Area = 35,193 sf, 61.85% Impervious, Inflow Depth = 5.55" for 100-year event
Inflow = 4.72 cfs @ 12.12 hrs, Volume= 16,277 cf
Outflow = 4.70 cfs @ 12.13 hrs, Volume= 16,277 cf, Atten= 0%, Lag= 0.5 min
Primary = 4.70 cfs @ 12.13 hrs, Volume= 16,277 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 90.44' @ 12.13 hrs Surf.Area= 658 sf Storage= 946 cf

Plug-Flow detention time= 16.9 min calculated for 16,277 cf (100% of inflow)
Center-of-Mass det. time= 16.8 min (827.8 - 811.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.25'	627 cf	**20.50'W x 32.10'L x 3.50'H Field A** 2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#2A	88.75'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Chambers in 4 Rows
		1,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	88.25'	**24.0" Round Culvert** L= 26.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 88.25' / 88.12' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	89.95'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	88.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.69 cfs @ 12.13 hrs HW=90.44' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 4.69 cfs of 12.40 cfs potential flow)
  ├─**2=Sharp-Crested Rectangular Weir** (Weir Controls 4.36 cfs @ 2.29 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.34 cfs @ 6.92 fps)

Pond DS-1: DS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

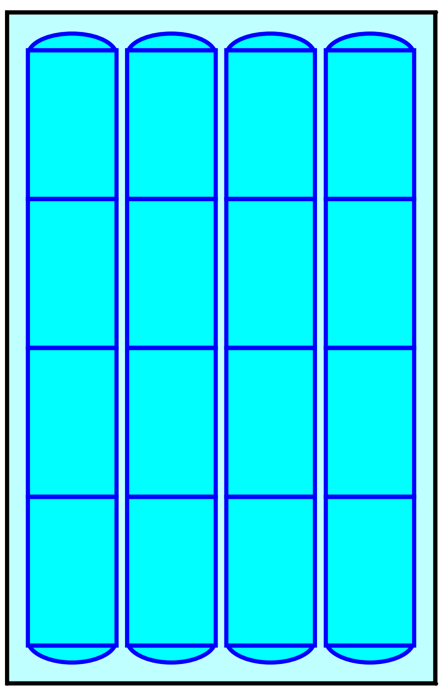
4 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 30.10' Row Length +12.0" End Stone x 2 = 32.10' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

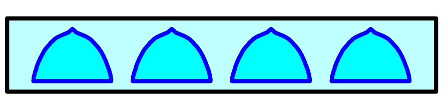
16 Chambers x 45.9 cf = 735.0 cf Chamber Storage

2,302.9 cf Field - 735.0 cf Chambers = 1,567.9 cf Stone x 40.0% Voids = 627.2 cf Stone Storage

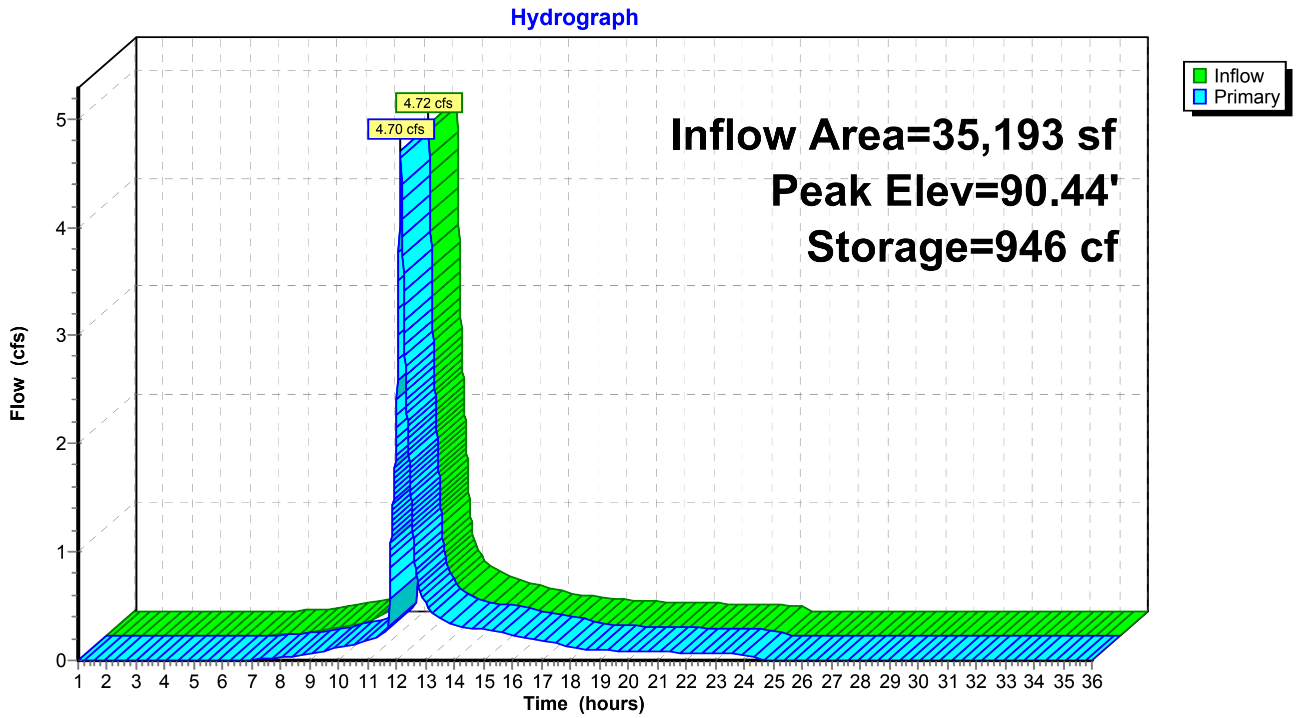
Chamber Storage + Stone Storage = 1,362.2 cf = 0.031 af
Overall Storage Efficiency = 59.2%
Overall System Size = 32.10' x 20.50' x 3.50'

16 Chambers
85.3 cy Field
58.1 cy Stone





Pond DS-1: DS-1


Hydrograph
Inflow
Primary
4.72 cfs
4.70 cfs
Inflow Area=35,193 sf
Peak Elev=90.44'
Storage=946 cf
Flow (cfs)
0
1
2
3
4
5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Pond IS-1: IS-1

Inflow Area = 61,597 sf, 85.38% Impervious, Inflow Depth = 6.99" for 100-year event
Inflow = 10.96 cfs @ 12.09 hrs, Volume= 35,882 cf
Outflow = 7.05 cfs @ 12.18 hrs, Volume= 35,882 cf, Atten= 36%, Lag= 5.6 min
Discarded = 0.29 cfs @ 12.18 hrs, Volume= 17,552 cf
Primary = 6.77 cfs @ 12.18 hrs, Volume= 18,330 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 97.63' @ 12.18 hrs Surf.Area= 3,603 sf Storage= 11,693 cf

Plug-Flow detention time= 140.4 min calculated for 35,882 cf (100% of inflow)
Center-of-Mass det. time= 140.4 min (919.2 - 778.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.50'	5,063 cf	**29.92'W x 120.42'L x 5.50'H Field A** 19,814 cf Overall - 7,156 cf Embedded = 12,658 cf x 40.0% Voids
#2A	93.25'	7,156 cf	**ADS_StormTech MC-3500 d +Cap**x 64 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 64 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
		12,219 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	92.50'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	92.00'	**12.0" Round Culvert** L= 91.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.00' / 91.09' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	97.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	94.20'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.29 cfs @ 12.18 hrs HW=97.63' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=6.76 cfs @ 12.18 hrs HW=97.63' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 6.76 cfs @ 8.61 fps)
  ├─**3=Sharp-Crested Rectangular Weir** (Passes < 6.39 cfs potential flow)
  └─**4=Orifice/Grate** (Passes < 0.76 cfs potential flow)

Pond IS-1: IS-1 - Chamber Wizard Field A

Chamber Model = ADS_StormTechMC-3500 d +Cap (ADS StormTech®MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

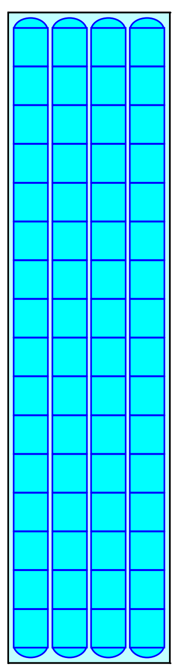
16 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 118.42' Row Length +12.0" End Stone x 2 = 120.42' Base Length
4 Rows x 77.0" Wide + 9.0" Spacing x 3 + 12.0" Side Stone x 2 = 29.92' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

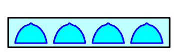
64 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 4 Rows = 7,156.1 cf Chamber Storage

19,814.1 cf Field - 7,156.1 cf Chambers = 12,658.0 cf Stone x 40.0% Voids = 5,063.2 cf Stone Storage

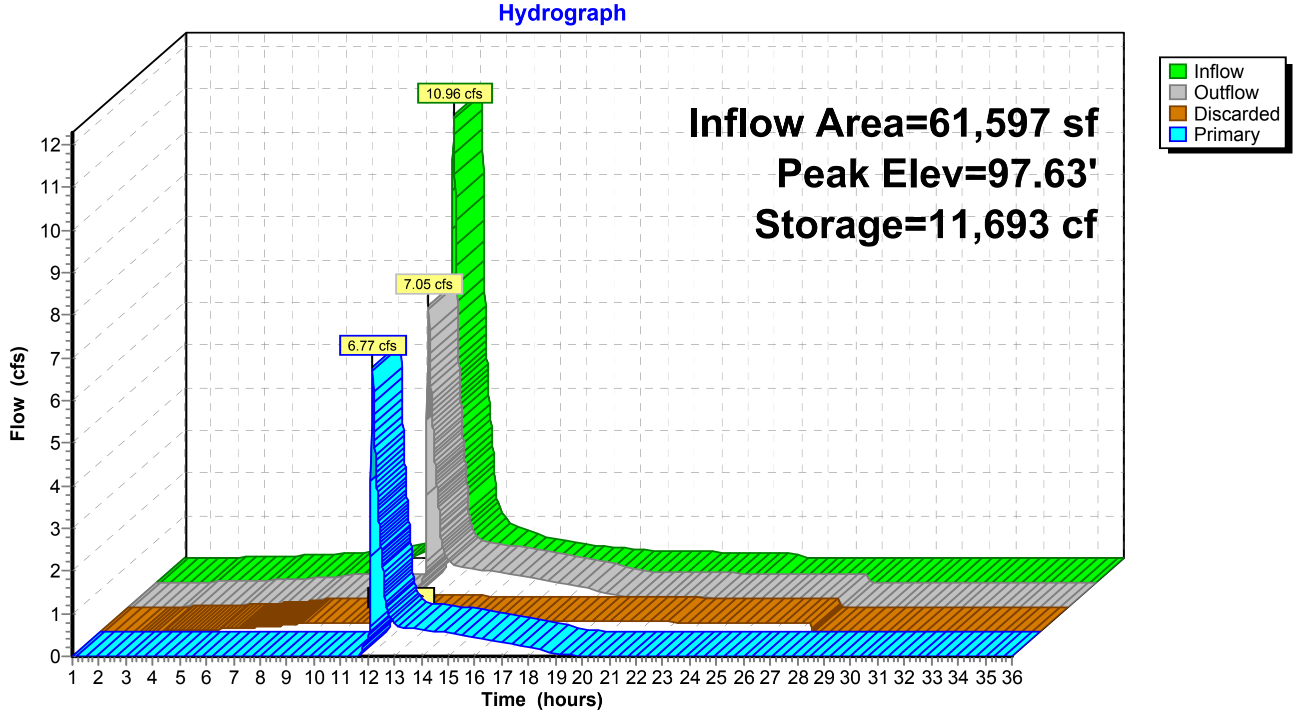
Chamber Storage + Stone Storage = 12,219.3 cf = 0.281 af
Overall Storage Efficiency = 61.7%
Overall System Size = 120.42' x 29.92' x 5.50'

64 Chambers
733.9 cy Field
468.8 cy Stone





Pond IS-1: IS-1


Hydrograph
Inflow
Outflow
Discarded
Primary
Inflow Area=61,597 sf
Peak Elev=97.63'
Storage=11,693 cf
10.96 cfs
7.05 cfs
6.77 cfs
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Attachment E - Calculations

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: Subcatchment A1

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75

Total TSS Removal = 25%

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

Project: Harry Lee Cole School
Prepared By: Aaron Guazzaloca
Date: 7/6/2021

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

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

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: Subcatchment A2

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Subsurface Infiltration Structure	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

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

Project: Harry Lee Cole School
Prepared By: Aaron Guazzaloca
Date: 7/6/2021

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

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

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: Subcatchment A3

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Bioretention Area	**0.90**	**1.00**	**0.90**	**0.10**
Subsurface Infiltration Structure	**0.80**	**0.10**	**0.08**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**
	0.00	**0.02**	**0.00**	**0.02**

Total TSS Removal = 98%

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

Project: **Harry Lee Cole School**
Prepared By: **Dylan Erickson**
Date: **11/24/2021**

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

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

Mass. Dept. of Environmental Protection

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: Subcatchment A4

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Subsurface Infiltration Structure	**0.80**	**0.75**	**0.60**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**
	0.00	**0.15**	**0.00**	**0.15**

Total TSS Removal = 85%

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

Project: **Harry Lee Cole School**
Prepared By: **Aaron Guazzaloca**
Date: **7/6/2021**

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

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

Mass. Dept. of Environmental Protection

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: Subcatchment A8

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75
	0.00	0.75	0.00	0.75

Total TSS Removal = **25%**

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

Project: **Harry Lee Cole School**
Prepared By: **Aaron Guazzaloca**
Date: **7/6/2021**

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

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

Project: Harry Lee Cole School

Prepared By: DKE
Checked By: JIP
Date: 11/24/21

OUTLET PROTECTION SIZING CALCULATION SHEET

Design Criteria

$$L_A = \frac{1.8Q}{Do^{1.5}} + 7Do$$

$$W_1 = 3Do$$

$$W_2 = 3Do + L_A$$

$$d_{50} = \frac{0.02}{Tw} \times \frac{Q^{1.33}}{Do}$$

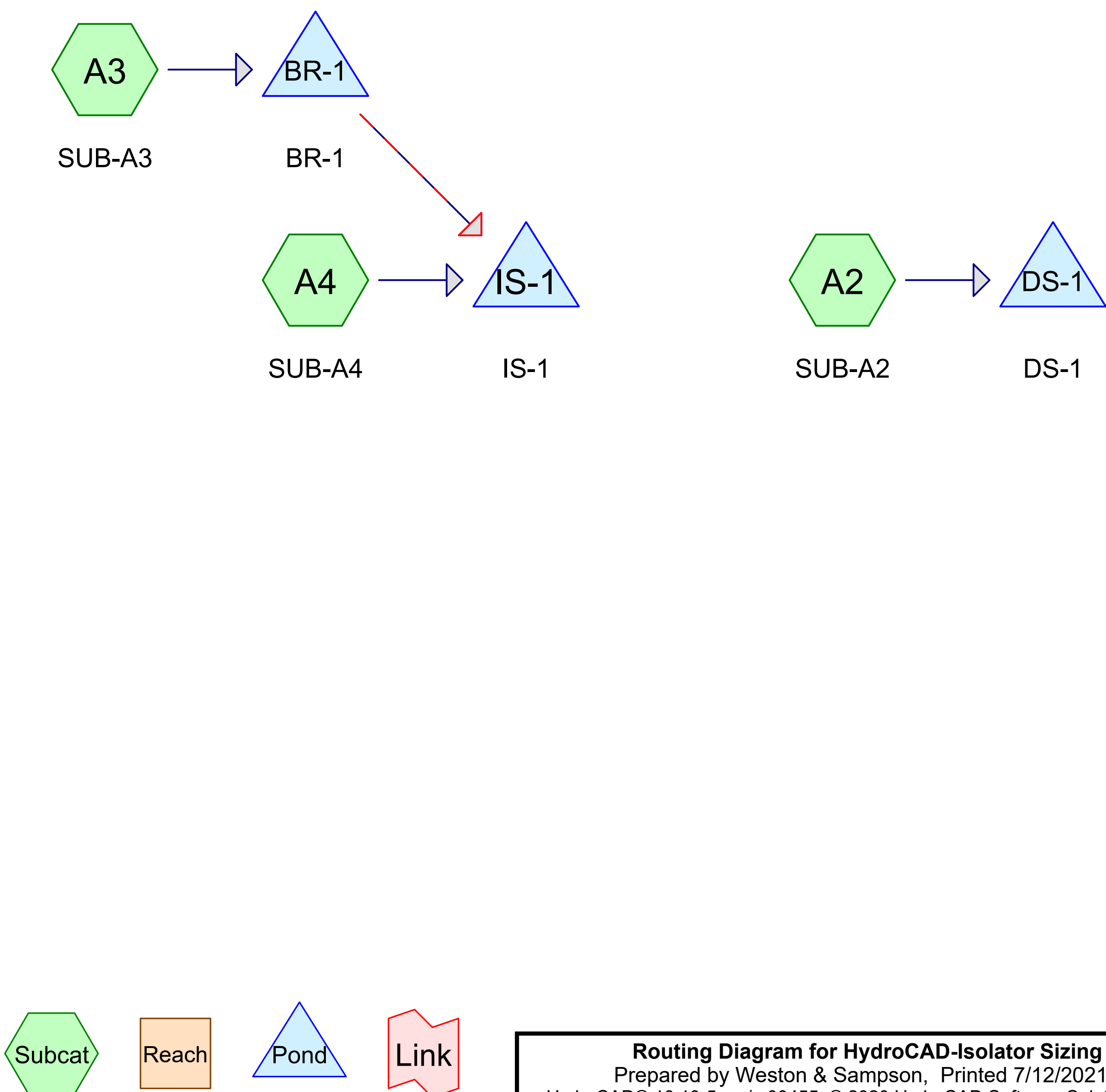
Where,

L_A = the length of the apron (Ft.)
W_1 = the width of apron at outlet of the pipe or width of channel (Ft.)
W_2 = the width of the downstream end of the apron (Ft.)
d_{50} = the median stone diameter (Ft.)
Q = the discharge from the pipe during the 10-year storm event (CFS)
Do = the diameter of the pipe or width of the box culvert (FT)
Tw = the tailwater depth above the invert of the pipe (Ft.)

Outlet	Q (10 Yr) (CFS)	Do (Ft.)	Barrels	Min. L_A (Ft.)	Min. W_1 (Ft.)	Min. W_2 (Ft.)	Tw (Ft.)	Min.d_{50} (Ft.)	Velocity (FPS)	Req'd V>2.5 fps
Scupper	**1.40**	**4.0**	**1**	28.3	12.0	40.3	**0.10**	0.08	0.11	No

Notes:

1. The velocity for each outlet was generated using HydroCAD



Routing Diagram for HydroCAD-Isolator Sizing
Prepared by Weston & Sampson, Printed 7/12/2021

Summary for Subcatchment A2: SUB-A2

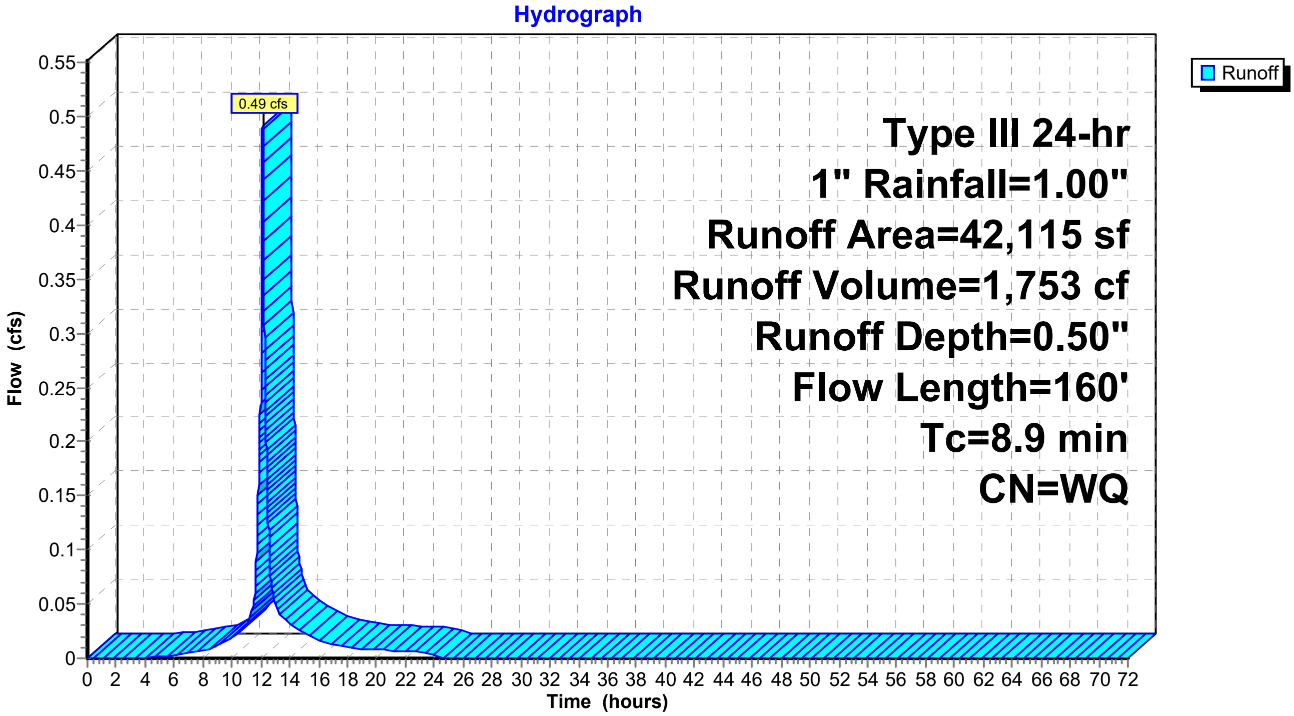
Runoff = 0.49 cfs @ 12.12 hrs, Volume= 1,753 cf, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1" Rainfall=1.00"

	Area (sf)	CN	Description
*	594	98	Paved Impervious, HSG A
*	19,475	98	Paved Impervious, HSG B
	6,526	98	Roofs, HSG B
	3,099	39	>75% Grass cover, Good, HSG A
	4,693	61	>75% Grass cover, Good, HSG B
	7,641	30	Woods, Good, HSG A
	87	55	Woods, Good, HSG B
	42,115		Weighted Average
	15,520		36.85% Pervious Area
	26,595		63.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.24"
0.5	33	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	59	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.9	160	Total			

Subcatchment A2: SUB-A2



Summary for Subcatchment A3: SUB-A3

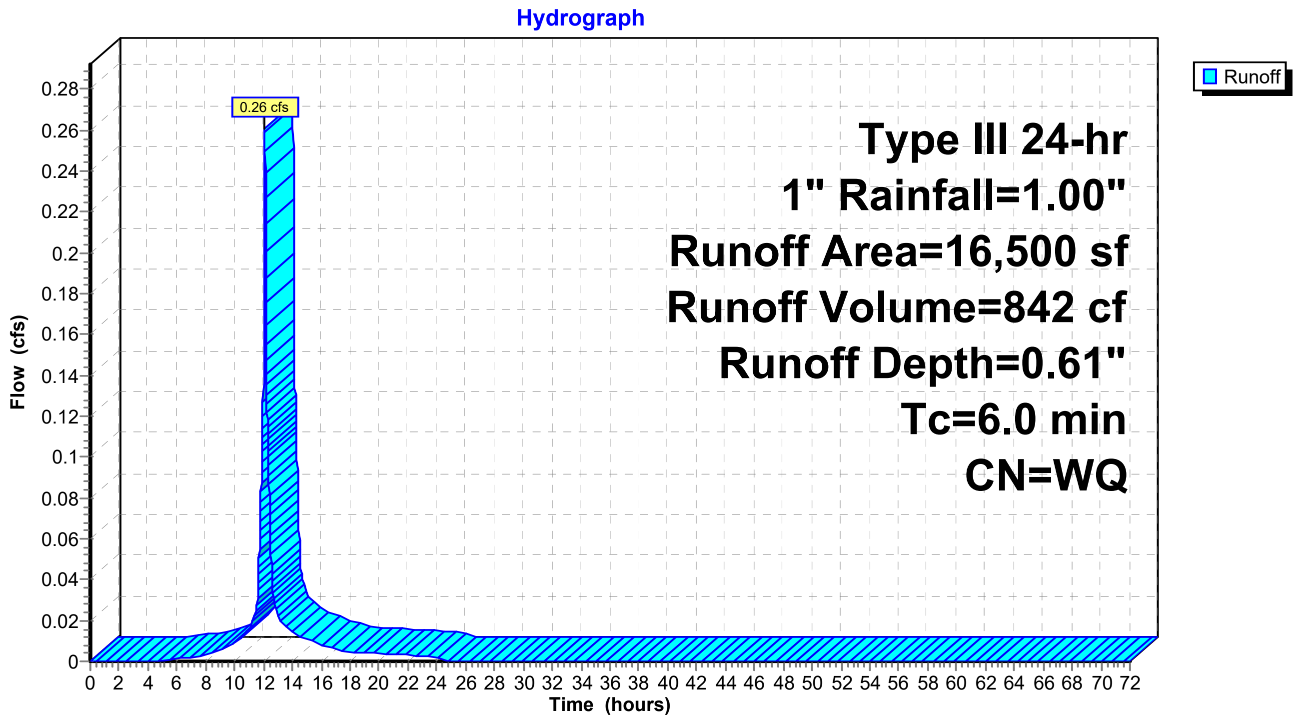
Runoff = 0.26 cfs @ 12.08 hrs, Volume= 842 cf, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1" Rainfall=1.00"

	Area (sf)	CN	Description
*	4,196	98	Paved Impervious, HSG A
*	1,717	98	Paved Impervious, HSG B
	6,866	98	Roofs, HSG B
	2,808	39	>75% Grass cover, Good, HSG A
	913	61	>75% Grass cover, Good, HSG B
	16,500		Weighted Average
	3,721		22.55% Pervious Area
	12,779		77.45% Impervious Area

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

Subcatchment A3: SUB-A3



Summary for Subcatchment A4: SUB-A4

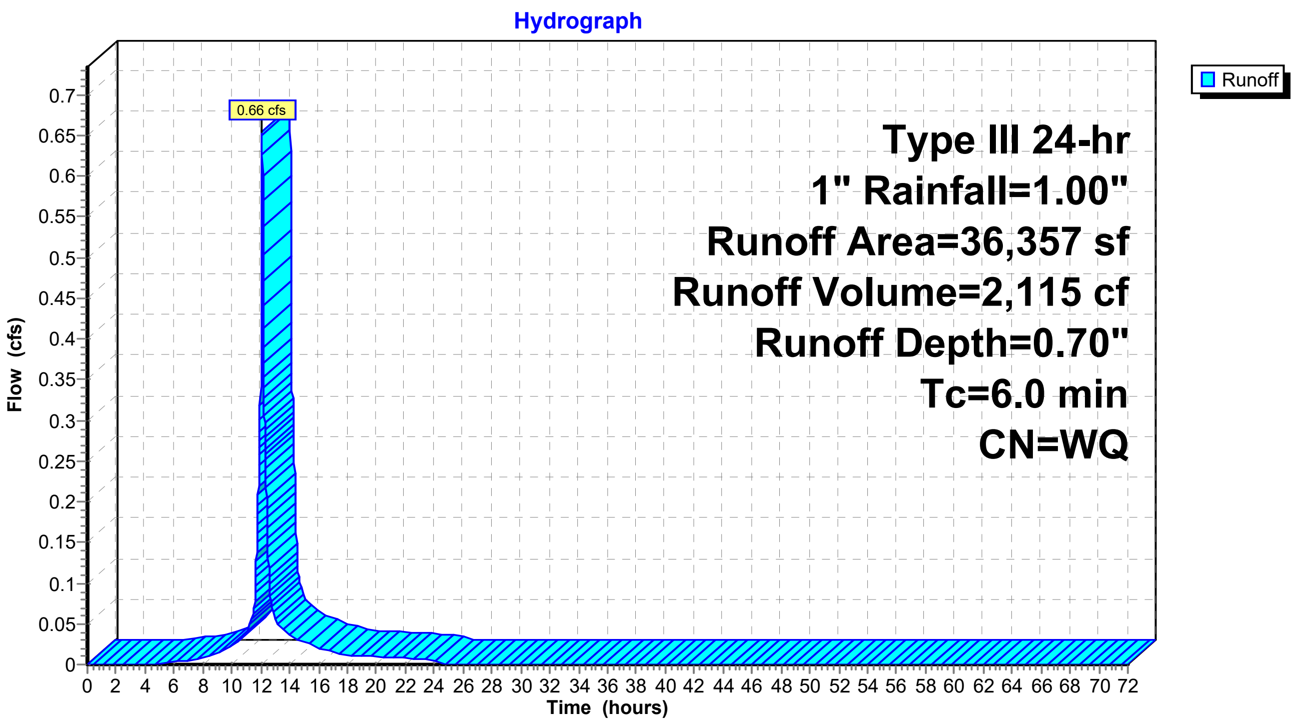
Runoff = 0.66 cfs @ 12.08 hrs, Volume= 2,115 cf, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 1" Rainfall=1.00"

	Area (sf)	CN	Description
*	26,170	98	Paved Impervious, HSG A
*	2,118	98	Paved Impervious, HSG B
	2,557	98	Roofs, HSG A
	1,248	98	Roofs, HSG B
	2,569	39	>75% Grass cover, Good, HSG A
	1,695	61	>75% Grass cover, Good, HSG B
	36,357		Weighted Average
	4,264		11.73% Pervious Area
	32,093		88.27% Impervious Area

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

Subcatchment A4: SUB-A4



Summary for Pond BR-1: BR-1

Inflow Area = 16,500 sf, 77.45% Impervious, Inflow Depth = 0.61" for 1" event
Inflow = 0.26 cfs @ 12.08 hrs, Volume= 842 cf
Outflow = 0.00 cfs @ 21.28 hrs, Volume= 32 cf, Atten= 99%, Lag= 551.7 min
Primary = 0.00 cfs @ 21.28 hrs, Volume= 32 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 100.75' @ 21.28 hrs Surf.Area= 213 sf Storage= 811 cf

Plug-Flow detention time= 906.4 min calculated for 32 cf (4% of inflow)
Center-of-Mass det. time= 564.9 min (1,352.8 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	96.74'	1,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

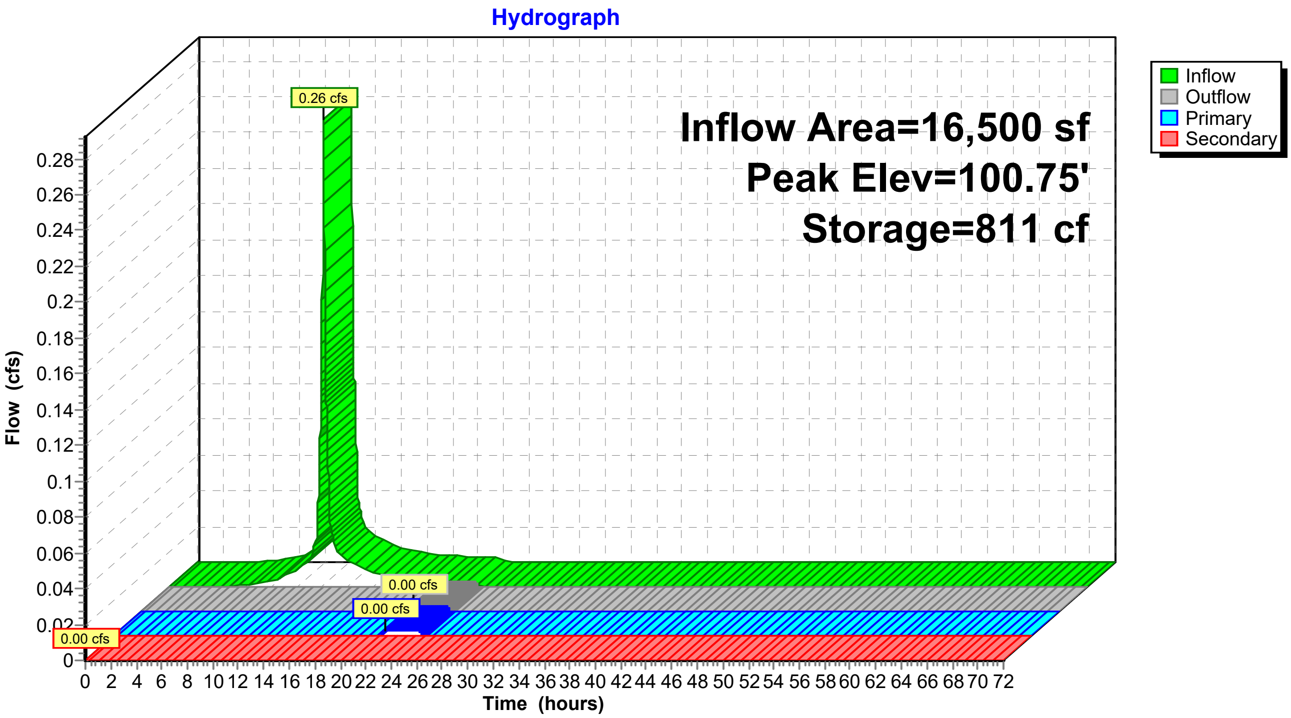
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.74	641	0.0	0	0
96.75	641	40.0	3	3
97.24	641	40.0	126	128
97.25	641	30.0	2	130
100.24	641	30.0	575	705
100.25	641	40.0	3	708
100.49	641	40.0	62	769
100.50	88	100.0	4	773
101.00	335	100.0	106	879
101.75	641	100.0	366	1,245

Device	Routing	Invert	Outlet Devices
#1	Device 2	100.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	94.49'	**12.0" Round Culvert** L= 62.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.49' / 94.18' S= 0.0049 '/' Cc= 0.900 n= 0.130, Flow Area= 0.79 sf
#3	Secondary	101.25'	**15.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.00 cfs @ 21.28 hrs HW=100.75' TW=92.75' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.00 cfs of 1.05 cfs potential flow)
  └─**1=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.18 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.74' TW=92.75' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond BR-1: BR-1


Hydrograph
0.26 cfs
Inflow Area=16,500 sf
Peak Elev=100.75'
Storage=811 cf
Inflow
Outflow
Primary
Secondary
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28

Summary for Pond DS-1: DS-1

Inflow Area = 42,115 sf, 63.15% Impervious, Inflow Depth = 0.50" for 1" event
Inflow = 0.49 cfs @ 12.12 hrs, Volume= 1,753 cf
Outflow = 0.23 cfs @ 12.34 hrs, Volume= 1,753 cf, Atten= 54%, Lag= 13.2 min
Primary = 0.23 cfs @ 12.34 hrs, Volume= 1,753 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 89.30' @ 12.34 hrs Surf.Area= 397 sf Storage= 228 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.8 min (795.4 - 790.6)

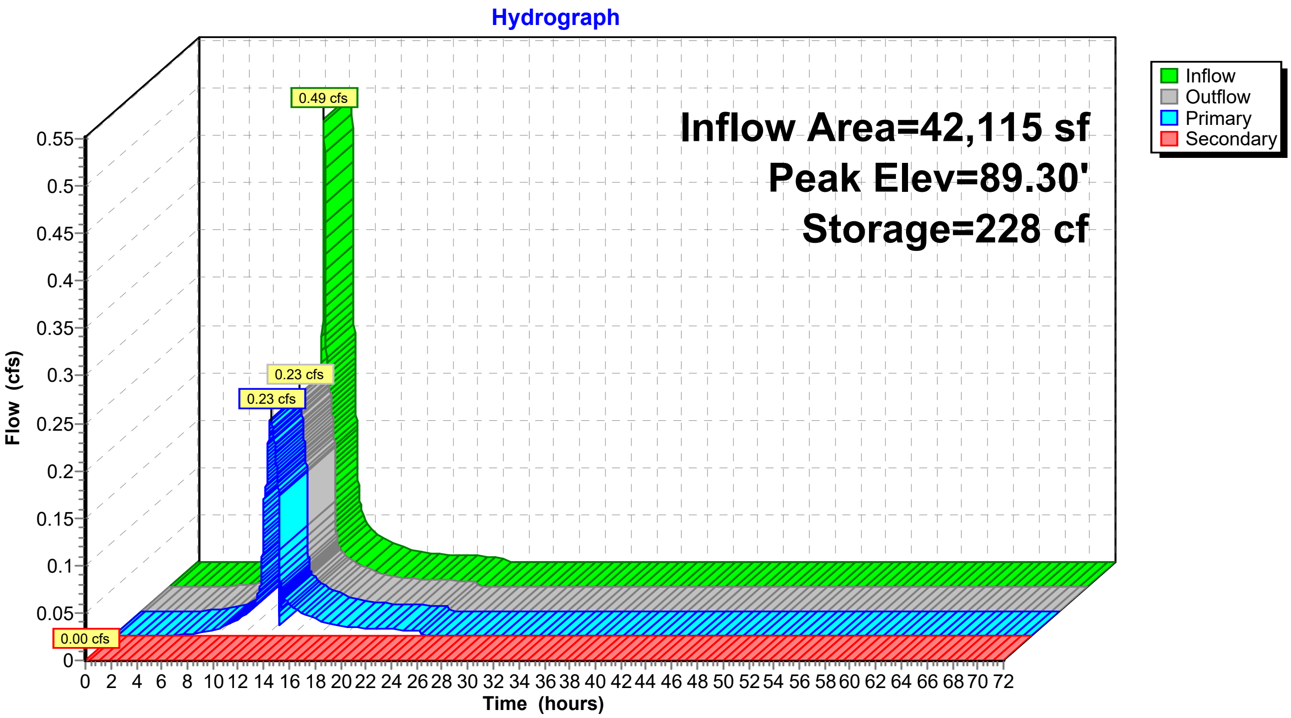
Volume	Invert	Avail.Storage	Storage Description
#1	88.75'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

Device	Routing	Invert	Outlet Devices
#1	Primary	88.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 1	88.75'	**0.20 cfs Exfiltration X 16.00 at all elevations** Phase-In= 0.01'
#3	Secondary	89.95'	**12.0" Round Culvert** L= 15.2' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 89.95' / 89.95' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.23 cfs @ 12.34 hrs HW=89.30' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.23 cfs @ 4.64 fps)
  └─**2=Exfiltration** (Passes 0.23 cfs of 3.20 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=88.75' (Free Discharge)
└─**3=Culvert** (Controls 0.00 cfs)

Pond DS-1: DS-1


Hydrograph
0.49 cfs
0.23 cfs
0.23 cfs
0.00 cfs
Inflow Area=42,115 sf
Peak Elev=89.30'
Storage=228 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0.55
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72

Summary for Pond IS-1: IS-1

Inflow Area = 52,857 sf, 84.89% Impervious, Inflow Depth = 0.49" for 1" event
Inflow = 0.66 cfs @ 12.08 hrs, Volume= 2,147 cf
Outflow = 0.66 cfs @ 12.08 hrs, Volume= 2,147 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.66 cfs @ 12.08 hrs, Volume= 2,147 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 92.75' @ 0.00 hrs Surf.Area= 685 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (796.3 - 796.3)

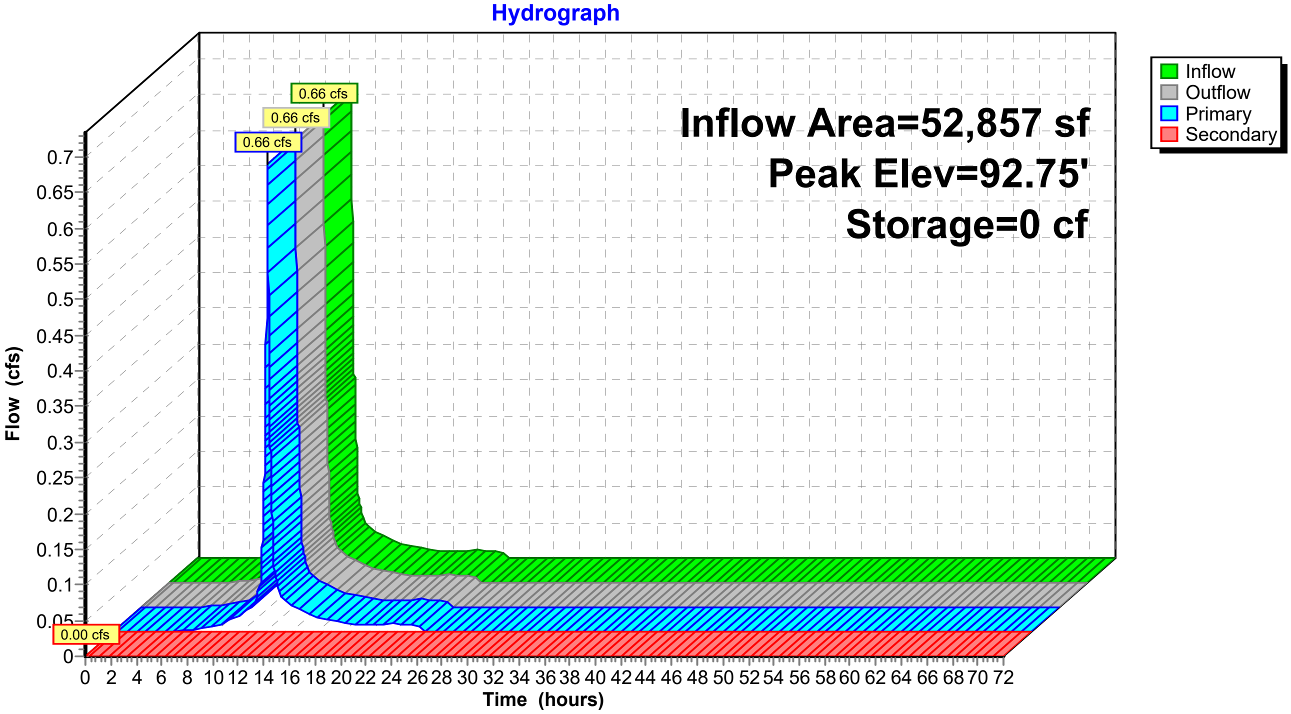
Volume	Invert	Avail.Storage	Storage Description
#1	92.75'	1,789 cf	**ADS_StormTech MC-3500 d +Cap** x 16 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap Cap Storage= +14.9 cf x 2 x 1 rows = 29.8 cf

Device	Routing	Invert	Outlet Devices
#1	Primary	92.75'	**0.30 cfs Exfiltration X 16.00 at all elevations** Phase-In= 0.01'
#2	Secondary	93.50'	**12.0" Round Culvert** L= 24.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 93.50' / 93.50' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=92.75' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 4.80 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=92.75' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Pond IS-1: IS-1


Hydrograph
Inflow
Outflow
Primary
Secondary
Inflow Area=52,857 sf
Peak Elev=92.75'
Storage=0 cf
0.66 cfs
0.66 cfs
0.66 cfs
0.00 cfs
Flow (cfs)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
0.65
0.7
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72
Time (hours)

STATE OF MAINE
DEPARTMENT OF
ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

PAUL MERCER
COMMISSIONER

July 29, 2016

StormTech, A Division of ADS, Inc.
70 Inwood Road, Suite 3
Rocky Hill, CT 06067
ATTN: David Mailhot P.E.

Dear Mr. Mailhot,

This letter replaces the letter dated March 22, 2016. It includes a slight modification in section 1 to clarify sizing requirements.

The Stormtech Isolator Row was approved by the Department of Environmental Protection (Department) in September 2009 for use as a pre-treatment row before a subsurface underdrained filter system as described in Chapter 7.3 of Volume III of the Maine Stormwater Management Best Management Practice Manual. The sizing, installation, and maintenance criteria provided in this letter replace the ones given in Chapter 7.3 of Volume III of the Maine Stormwater Management BMP Manual. The Department still authorizes the use of the StormTech Isolator Row as a pre-treatment row meeting the requirements of the General Standards (Section 4.C.) of the Stormwater Management Rules (Chapter 500) provided the system is sized, installed, and maintained in accordance with the following provisions:

1. The number of chambers within the Isolator Row pre-treatment structure must treat, without overflowing, the one-year 24-hour peak flow from the structure's drainage area. To determine the number of chambers, the one-year peak flow rate must be divided by the specific flow rate of the chamber. The acceptable flow rate for each of the Isolator Row chamber sizes are as follow:

Chamber size	Flow Rate
SC-310	0.1 cfs
SC-740 or DC-780	0.2 cfs
MC-3500	0.3 cfs

   Additional pre-treatment rows may be added based on site conditions and chamber bed layout provided each row is provided with access manhole and control structures.
2. The Isolator Row must be part of a stormwater management system that conforms to all the requirements of Chapter 7.3 of the Stormwater Management Manual and be fitted with an overflow that bypasses the pretreatment Isolator Row only when the one-year 24-hour peak flow is exceeded, and discharges to a stable outlet or is directed to a detention system/structure that will provide necessary flood storage.
3. The Isolator Row shall be underlain with a bottom surface consisting of two layers of ADS 315 woven geotextile or equivalent; and be covered with one layer of ADS 601T non-woven geotextile or equivalent.
4. The Isolator Row does not provide for the removal of hydrocarbons and should be preceded by a device or practice that will serve this function if the area draining to the Isolator Row is

a likely source of hydrocarbons (i.e. parking lots, roads, drive-through commercial enterprises).
5. The Isolator Row must include an access at both ends for the removal of accumulated sediment and debris.
6. The first year of system maintenance must be provided by the manufacturer to ensure that the system is operating according to the established specifications.
7. Prior to construction, a five-year binding inspection and maintenance contract must be provided for review and approval by the Department, and must be renewed before contract expiration. The contract will be with a professional with knowledge of erosion and stormwater control, including a detailed working knowledge of the proposed system.
8. The overall stormwater management design must meet all Department criteria and sizing specifications and will be reviewed and approved by the Department prior to use.
9. Each project must be reviewed and approved by the manufacturer for proposed use, layout and sizing of the pre-treatment row and for conformance with their design specifications.
10. The pre-treatment row must be installed under the manufacturer's representative supervision.
11. This approval is conditional to on-the-ground experience confirming that the StormTech Isolator Row system's pollutant removal efficiency is appropriate. The "permit shield" provision (Section 14) of the Chapter 500 rules will apply, and the Department will not require the replacement of the system if, with proper maintenance, pollutant removals do not satisfy the General Standard Best Management Practices.

We look forward to working with you as these stormwater management structures are installed on new projects. Questions concerning this decision should be directed to Marianne Hubert at (207) 215-6485 or Jeff Dennis at (207) 215-6376.

Sincerely,

Mark R Bergeron

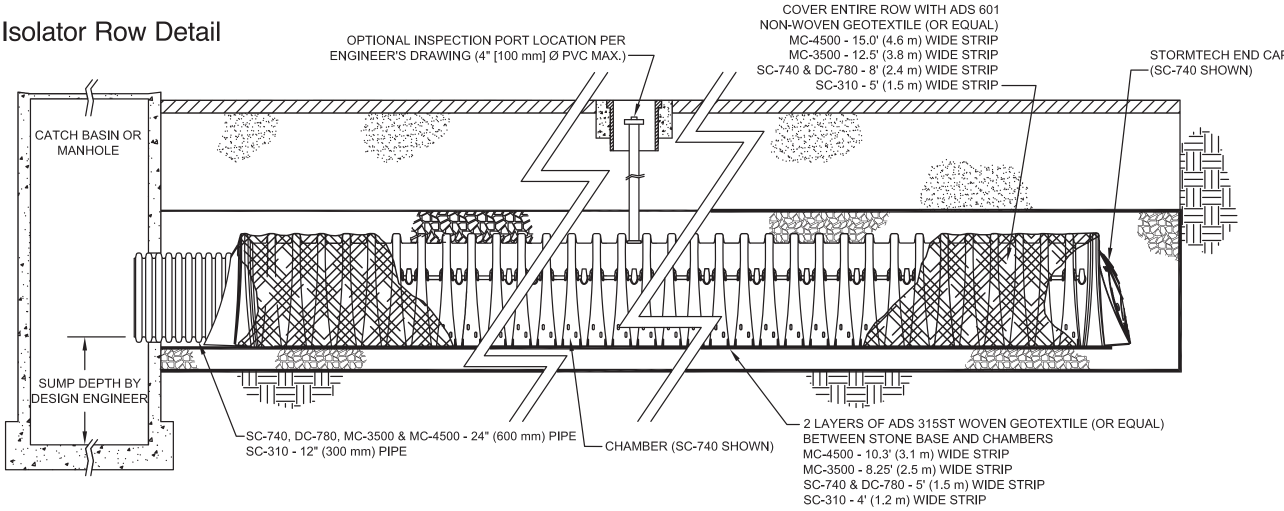
Mark Bergeron, P.E.
Director
Bureau of Land Resources

Cc: Don Witherill, Maine DEP
Gregg Novick, Stormwater Compliance LLC
John Whitehouse, Advanced Drainage Systems, Inc.

StormTech and Stormwater Quality

StormTech's patented Isolator™ Row is a row of chambers wrapped in a geotextile which filters the stormwater trapping pollutants in the row. The Isolator Row provides a way to inspect and maintain the system.

Isolator Row Detail



Note: For many applications, the non-woven geotextile over the DC-780, MC-3500 and MC-4500 Isolator Row chambers can be eliminated or substituted with the AASHTO Class 1 woven geotextile. Contact your StormTech representative for assistance.

Isolator Row Field Verification Testing at the University of New Hampshire Stormwater Center

- Field testing (TARP tier II protocol) of the Isolator Row has been ongoing since December 2006.
- Removal efficiencies for TSS have improved as the filter cake has built up on the bottom fabric of the Isolator Row.
- Current data shows a TSS removal efficiency which exceeds 80%.

Removal Efficiency Results:

- Total Suspended Solids = 80%
- Phosphorous = 49%
- Total Petroleum Hydrocarbons = 90%
- Zinc = 53%

This system achieves a removal efficiency of 80% for TSS which meets most municipal recommended levels for water quality treatment.

Inspection and Maintenance

The Isolator Row can be inspected through the upstream manhole or optional inspection port.

Maintenance is easily accomplished with the JetVac process.

The frequency of inspection and maintenance varies by location. Contact StormTech for assistance with inspection and maintenance scheduling.

Subsurface Stormwater Management

Technical Memo

Pages: 3

To: Ed Pisowicz

From: Ken Sanok, P.E.

Cc: Engineering Department, Technical Services, StormTech Regional Product Managers

Date: 03/5/2010

Subject: Design Guidance for the Isolator Row Weir

Isolator Row

The Isolator Row is typically designed to treat the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. While the "first flush" will have the highest TSS, nutrient and hydrocarbon loading the unique design of the Isolator Row system continues to filter throughout the entire storm event. An upstream manhole/diversion structure not only provides access to the Isolator Row but typically includes a high flow weir such that the stormwater flow rates or volumes that exceed the capacity of the Isolator Row chambers overtop the weir and discharge through a manifold to the remainder of the chamber bed. There are several methods to divert the "first flush" into the Isolator Row (weirs, varying pipe inverts, etc.). This memo addresses the design of a weir for the Isolator Row diversion structure.

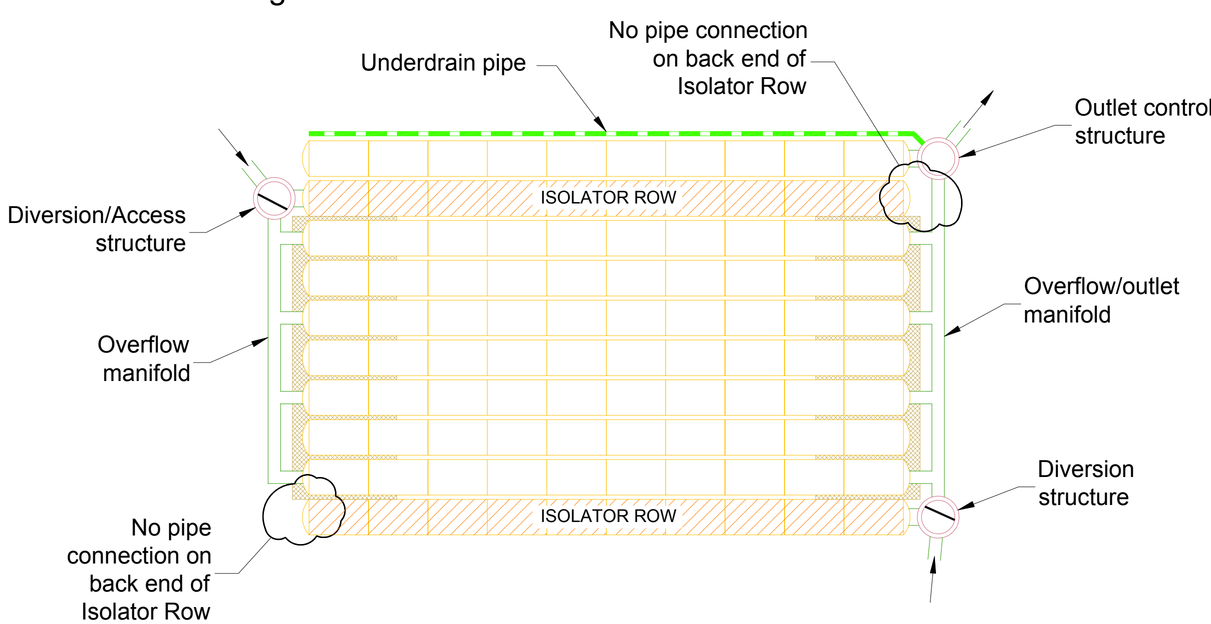


Figure 1 Typical StormTech Chamber Layout with Isolator Row

Structure Placement

The diversion/access structure must be placed directly in front of the Isolator Row and must be connected by a 24" pipe to the SC-740, DC-780 and MC-3500 chambers and a 12" pipe to the SC-310 chamber. The structure will typically have a weir installed and a minimum size of 48 inches is recommended to allow access to the Isolator Row. The design engineer may select a smaller size structure for shallow systems with low flow rates. The actual size of the structure will vary based on the weir design, pipe sizes, pipe angles and design flow rate.

Diversion Weir

The weir is situated to divert the runoff initially into the Isolator Row. The maximum weir crest elevation is determined by subtracting the head required to pass the peak flow from the maximum allowable water surface elevation. Typically the weir crest elevation ranges from the midpoint of the chamber up to the top of the chamber (see figure 2). The design of the weir is performed in several steps. The desired sized structure is drawn on the engineer's plans with the pipe connections. A weir is drawn in and the length is determined. The design engineer then determines the allowable water surface elevation over the weir crest in the structure (typically it is set at the same elevation as the top of the stone above the chambers). The weir crest elevation is then estimated. Start by assuming the elevation of the weir crest is at the same elevation as the top of the chambers. Thus the approach head (H) is the distance from the weir crest to the allowable water surface elevation.

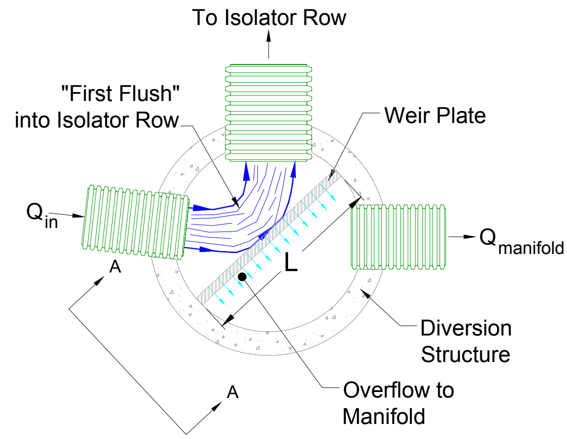


Figure 2A, Plan View of Diversion Structure

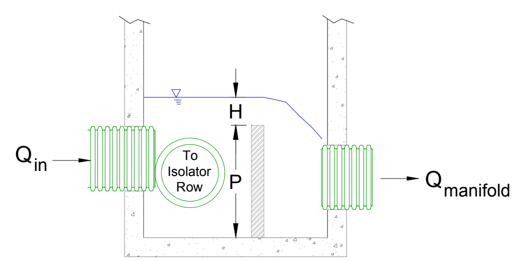


Figure 2B, Section A_A of Diversion Structure

The equation of a sharp crested weir can be written as follows [1]:

$$Q = C\sqrt{2g}\,LH^{3/2}$$

$$C = 0.40 + 0.05\frac{H}{P}$$

Q = flow rate (cfs)
C = discharge coefficient
L = length of weir (ft)
H = approach head on the crest (ft)
P = height of crest above channel bottom (ft)
g = gravity (32.2 ft/s^2)

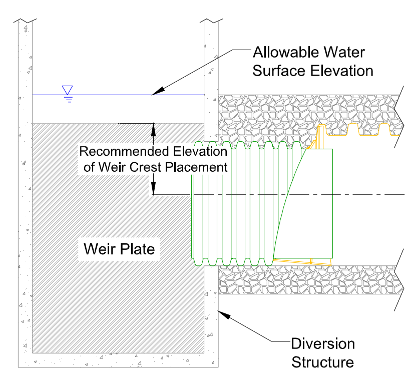


Figure 2C, Profile of Diversion Structure and Isolator Row

The flow over the weir can be calculated using these equations. This calculated flow is then compared to the design flow rate entering the structure. If this calculated flow is greater than the design flow rate then the weir is sufficient to pass the flows. If not, then the weir crest can be lowered and the calculations repeated. As mentioned previously StormTech recommends the weir crest be set between the top of the chamber and the midpoint of the chamber (see figure 2C). If the lowered crest cannot met the design flow rate a larger structure can be analyzed which allows for a longer weir crest.

<u>Other Considerations</u>

StormTech does not have any specifications for the material or structural design of the weir. It is the responsibility of the design engineer to ensure a material/design selected is adequate for the project design parameters. StormTech has found that aluminum weirs work well as the Isolator Row diversion weir.

Due to the confined nature of the structures it is possible that the weir will be suppressed and/or contracted. The design engineer must be aware of this and incorporate it into the design if deemed necessary.

[1] Cassidy, J.J, Chaudhry, M.H., and Roberson, J.A., Hydraulic Engineering, 1st ed., Houghton Mifflin, Boston, 1988

Project:	Harry Lee Cole School
Location:	Boxford, MA
Client:	Town of Boxford
Project Number:	ENG20-0865
Prepared By:	AKG
Date:	April 7, 2021

Standard 3: Recharge Calculations (Static Method)

Area 1 Infiltration Chambers (2P)

Hydrologic Soils Group:	A	B	C	D		
Total Impervious Area (AC):	0.8313	0.3749	0.0000	0.0000	1.21	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	1,811	476	0	0	2,287	CF
Volume Below Lowest Outlet:					3,956	CF
Elevation of Lowest Invert:					94.20	

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	2.41	IN/HR
Bottom Area of Infiltration Basin:	3,602	SF
Drawdown Time:	5.5	HRS

Boxford MA - Harry Lee Cole School
Water Quality Volume Calculation
April 7, 2021

Required Water Quality Storage
Proposed Paved Area sf x 1" x 1'/12"= Required WQ Storage CF

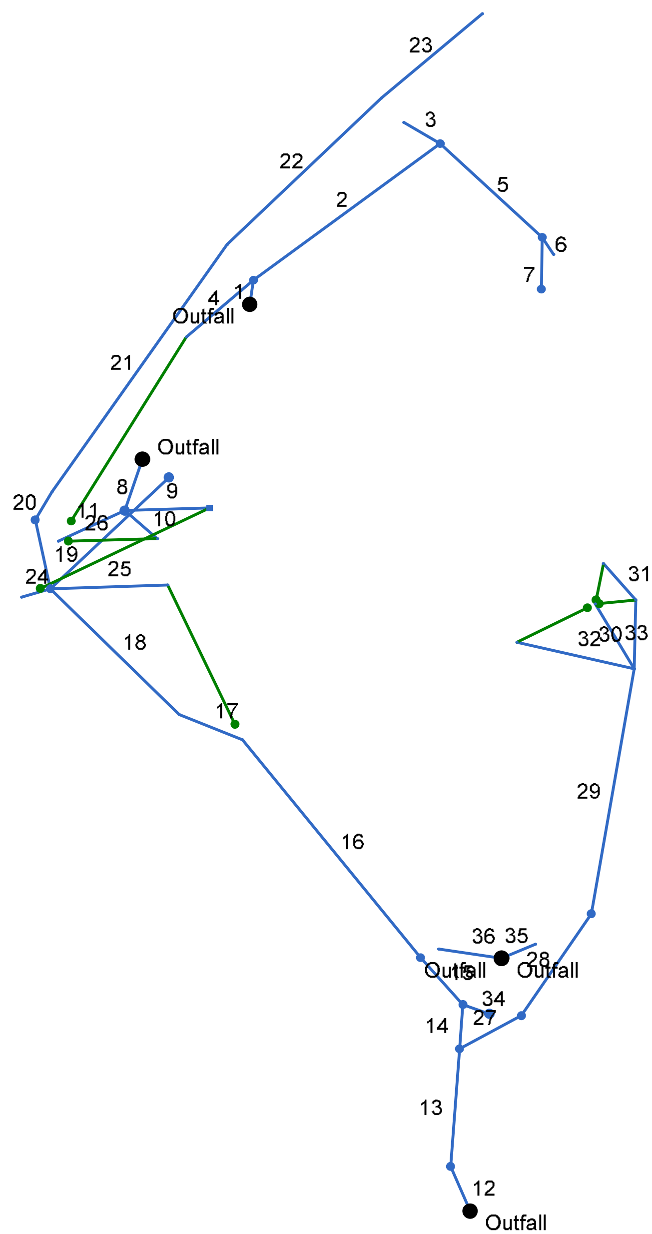
Location	Impervious Area (sqft)	Required WQ Storage (cf)	Provided WQ Storage (cf)	Description
Parking Lot A	39,093	3,258	3,956	Infiltration System (IS-1)

Stage-Area-Storage for Pond IS-1: IS-1 (continued)

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
93.54	3,915	1,971	94.06	4,072	3,540
93.55	3,918	2,001	94.07	4,075	3,570
93.56	3,921	2,032	94.08	4,078	3,600
93.57	3,924	2,062	94.09	4,081	3,629
93.58	3,927	2,093	94.10	4,084	3,659
93.59	3,930	2,123	94.11	4,087	3,689
93.60	3,933	2,154	94.12	4,090	3,719
93.61	3,936	2,184	94.13	4,093	3,748
93.62	3,939	2,215	94.14	4,096	3,778
93.63	3,942	2,245	94.15	4,099	3,808
93.64	3,945	2,275	94.16	4,102	3,837
93.65	3,948	2,306	94.17	4,105	3,867
93.66	3,951	2,336	94.18	4,108	3,897
93.67	3,954	2,366	94.19	4,111	3,926
93.68	3,957	2,397	94.20	4,114	3,956
93.69	3,960	2,427	94.21	4,117	3,985
93.70	3,963	2,457	94.22	4,120	4,015
93.71	3,966	2,488	94.23	4,123	4,044
93.72	3,969	2,518	94.24	4,126	4,074
93.73	3,972	2,548	94.25	4,129	4,103
93.74	3,975	2,579	94.26	4,132	4,133
93.75	3,978	2,609	94.27	4,135	4,162
93.76	3,981	2,639	94.28	4,138	4,192
93.77	3,984	2,669	94.29	4,141	4,221
93.78	3,987	2,700	94.30	4,144	4,251
93.79	3,990	2,730	94.31	4,147	4,280
93.80	3,993	2,760	94.32	4,150	4,309
93.81	3,996	2,790	94.33	4,153	4,339
93.82	3,999	2,820	94.34	4,156	4,368
93.83	4,002	2,850	94.35	4,159	4,397
93.84	4,005	2,881	94.36	4,162	4,427
93.85	4,008	2,911	94.37	4,165	4,456
93.86	4,011	2,941	94.38	4,168	4,485
93.87	4,014	2,971	94.39	4,171	4,514
93.88	4,017	3,001	94.40	4,174	4,544
93.89	4,021	3,031	94.41	4,177	4,573
93.90	4,024	3,061	94.42	4,180	4,602
93.91	4,027	3,091	94.43	4,183	4,631
93.92	4,030	3,121	94.44	4,186	4,660
93.93	4,033	3,151	94.45	4,189	4,689
93.94	4,036	3,181	94.46	4,192	4,718
93.95	4,039	3,211	94.47	4,195	4,748
93.96	4,042	3,241	94.48	4,198	4,777
93.97	4,045	3,271	94.49	4,201	4,806
93.98	4,048	3,301	94.50	4,204	4,835
93.99	4,051	3,331	94.51	4,207	4,864
94.00	4,054	3,361	94.52	4,210	4,893
94.01	4,057	3,391	94.53	4,213	4,922
94.02	4,060	3,421	94.54	4,216	4,951
94.03	4,063	3,451	94.55	4,219	4,979
94.04	4,066	3,480	94.56	4,222	5,008
94.05	4,069	3,510	94.57	4,225	5,037

VOLUME BELOW
LOWEST OUTLET

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 11-09-22 Cole School.stm	Number of lines: 36	Date: 11/9/2022

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	DMH-05	Manhole	100.98	Cir	4.00	4.00	18	Cir	94.08	12 12	Cir Cir	94.26 96.49
2	DMH-04	Manhole	101.17	Cir	4.00	4.00	12	Cir	94.88	12 12	Cir Cir	97.84 94.98
3	CB-02	Grate	101.20	Rect	0.00	4.00	12	Cir	98.00			
4	CB-03	Grate	100.02	Rect	0.00	4.00	12	Cir	96.80			
5	DMH-03	Manhole	99.94	Cir	4.00	4.00	12	Cir	95.35	12 12	Cir Cir	96.43 95.45
6	CB-01	Grate	99.70	Rect	0.00	4.00	12	Cir	96.50			
7	DMH-02	Manhole	100.35	Cir	4.00	4.00	12	Cir	95.59			
8	DMH-06	Manhole	98.53	Cir	5.00	5.00	12	Cir	94.22	12 12 12	Cir Cir Cir	95.37 94.54 94.41
9	CB-05	Grate	98.90	Rect	4.00	4.00	12	Cir	96.22			
10	CB-14	Grate	0.17	Rect	0.00	4.00	12	Cir	94.69			
11	CB-04	Grate	97.65	Rect	0.00	4.00	12	Cir	94.65			
12	EDMH-02	Manhole	93.00	Cir	4.00	4.00	24	Cir	87.41	24	Cir	87.51
13	DMH-16	Manhole	94.13	Cir	4.00	4.00	24	Cir	87.91	24 18	Cir Cir	87.91 88.16
14	EDMH-01	Manhole	94.15	Cir	4.00	4.00	24	Cir	88.06	24 24	Cir Cir	88.38 88.16
15	DMH-11	Manhole	93.09	Cir	4.00	4.00	24	Cir	88.59	18	Cir	88.97
16	ECB-06	Grate	93.50	Rect	0.00	4.00	18	Cir	89.91	18	Cir	90.01
17	ECB-05	Grate	93.30	Rect	0.00	4.00	18	Cir	90.24	18	Cir	90.34
18	DMH-10	Manhole	97.13	Cir	4.00	4.00	18	Cir	90.94	18 12 12 12	Cir Cir Cir Cir	91.14 93.10 92.50 91.07

Project File: 11-09-22 Cole School.stm	Number of Structures: 36	Run Date: 11/9/2022

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure Shape	Structure Length (ft)	Structure Width (ft)	Line Out Size (in)	Line Out Shape	Line Out Invert (ft)	Line In Size (in)	Line In Shape	Line In Invert (ft)
19	DMH-09	Manhole	93.59	Cir	4.00	4.00	18	Cir	91.38	18	Cir	91.48
20	ECB-04	Grate	96.29	Rect	0.00	4.00	18	Cir	91.59	12	Cir	91.69
21	ECB-03	Grate	98.12	Rect	0.00	4.00	12	Cir	92.42	12	Cir	92.67
22	ECB-02	Grate	97.98	Rect	0.00	4.00	12	Cir	93.28	12	Cir	93.33
23	ECB-01	Grate	97.92	Rect	0.00	4.00	12	Cir	94.02			
24	CB-06	Grate	96.40	Rect	0.00	4.00	12	Cir	93.20			
25	CB-13	Grate	98.43	Rect	0.00	4.00	12	Cir	92.90			
26	OCS-1	Manhole	99.19	Cir	5.00	5.00	12	Cir	92.00			
27	DMH-13	Manhole	93.80	Cir	4.00	4.00	18	Cir	88.40	18	Cir	88.45
28	DMH-12	Manhole	93.40	Cir	4.00	4.00	18	Cir	88.92	18	Cir	88.97
29	DMH-15	Manhole	94.25	Cir	0.00	0.00	18	Cir	89.80	12 12 12	Cir Cir Cir	90.31 90.31 90.31
30	CB-10	Grate	94.46	Rect	0.00	4.00	12	Cir	90.55	12	Cir	90.66
31	CB-09	Grate	94.71	Rect	0.00	4.00	12	Cir	90.82			
32	CB-12	Grate	93.96	Rect	0.00	4.00	12	Cir	90.73			
33	CB-11	Grate	94.80	Rect	0.00	4.00	12	Cir	90.55			
34	OCS-3	Manhole	94.03	Cir	5.00	5.00	24	Cir	88.25			
35	CB-08	Grate	92.85	Rect	0.00	4.00	12	Cir	89.55			
36	CB-07	Grate	92.80	Cir	0.00	0.00	12	Cir	89.60			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	P-09	2.59	18	Cir	16.270	94.00	94.08	0.492	95.40	94.69	n/a	94.69	End	Manhole
2	P-07	1.71	12	Cir	154.986	94.26	94.88	0.400	94.84	95.46	0.20	95.66	1	Manhole
3	P-05	0.59	12	Cir	28.176	97.84	98.00	0.568	98.13	98.32	n/a	98.32	2	Grate
4	P-08	0.88	12	Cir	59.098	96.49	96.80	0.525	96.86	97.19	0.15	97.19	1	Grate
5	P-04	1.12	12	Cir	92.888	94.98	95.35	0.398	95.66	95.80	0.13	95.93	2	Manhole
6	P-03	0.93	12	Cir	13.696	96.43	96.50	0.511	96.81	96.90	n/a	96.90	5	Grate
7	P-02	0.19	12	Cir	34.750	95.45	95.59	0.403	95.93	95.93	0.01	95.94	5	Manhole
8	P-10	2.09	12	Cir	36.516	94.04	94.22	0.493	95.40*	95.49*	0.11	95.60	End	Manhole
9	P-14	0.85	12	Cir	56.801	95.37	96.22	1.496	95.65	96.61	n/a	96.61	8	Grate
10	P-12	0.24	12	Cir	28.732	94.54	94.69	0.522	95.60	95.60	0.00	95.60	8	Grate
11	P-11	1.00	12	Cir	48.958	94.41	94.65	0.490	95.60	95.63	0.03	95.65	8	Grate
12	P-29	12.30	24	Cir	32.661	87.25	87.41	0.490	88.71	88.67	n/a	88.67	End	Manhole
13	P-35	12.30	24	Cir	79.301	87.51	87.91	0.504	88.68	89.17	n/a	89.17	12	Manhole
14	P-28	6.30	24	Cir	29.970	87.91	88.06	0.500	89.17	88.95	n/a	88.95	13	Manhole
15	P-27	4.29	24	Cir	42.386	88.38	88.59	0.495	89.03	89.32	0.04	89.32	14	Manhole
16	P-26	4.29	18	Cir	188.632	88.97	89.91	0.498	89.71	90.70	0.26	90.70	15	Grate
17	P-25	1.73	18	Cir	45.591	90.01	90.24	0.504	90.70	90.73	n/a	90.73 j	16	Grate
18	P-24	1.73	18	Cir	120.733	90.34	90.94	0.497	90.79	91.43	0.18	91.43	17	Manhole
19	P-18	0.94	18	Cir	47.432	91.14	91.38	0.506	91.47	91.74	0.09	91.74	18	Manhole
20	P-17	0.94	18	Cir	21.946	91.48	91.59	0.501	91.81	91.95	0.06	91.95	19	Grate
21	EP-03	0.67	12	Cir	203.304	91.69	92.42	0.359	92.11	92.84	0.04	92.87	20	Grate
22	EP-02	0.49	12	Cir	142.781	92.67	93.28	0.427	92.96	93.57	0.05	93.57	21	Grate
23	EP-01	0.18	12	Cir	87.875	93.33	94.02	0.785	93.57	94.19	n/a	94.19 j	22	Grate
24	P-16	0.19	12	Cir	20.203	93.10	93.20	0.495	93.27	93.38	0.06	93.38	18	Grate

Project File: 11-09-22 Cole School.stm | Number of lines: 36 | Run Date: 11/9/2022

NOTES: Known Qs only ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	P-36	0.10	12	Cir	78.495	92.50	92.90	0.510	92.63	93.03	0.04	93.03	18	Grate
26	P-15	0.50	12	Cir	109.009	91.07	92.00	0.853	91.43	92.29	n/a	92.29 j	18	Manhole
27	P-22	6.00	18	Cir	47.090	88.16	88.40	0.510	89.17	89.35	n/a	89.35 j	13	Manhole
28	P-21	6.00	18	Cir	82.774	88.45	88.92	0.568	89.35	89.87	n/a	89.87	27	Manhole
29	P-34	6.00	18	Cir	166.974	88.97	89.80	0.497	89.88	90.75	n/a	90.75	28	Manhole
30	P-31	3.00	12	Cir	46.265	90.31	90.55	0.519	91.12	91.36	0.33	91.69	29	Grate
31	P-30	1.50	12	Cir	32.689	90.66	90.82	0.489	91.69	91.72	0.06	91.78	30	Grate
32	P-32	1.50	12	Cir	80.548	90.31	90.73	0.521	90.81	91.25	0.21	91.25	29	Grate
33	P-33	1.50	12	Cir	50.814	90.31	90.55	0.472	90.82	91.07	0.21	91.07	29	Grate
34	P-23	2.01	24	Cir	18.762	88.16	88.25	0.480	88.95	88.74	n/a	88.74	14	Manhole
35	P-20	1.53	12	Cir	24.696	89.43	89.55	0.486	90.21	90.07	n/a	90.07	End	Grate
36	P-19	0.83	12	Cir	42.539	89.39	89.60	0.494	90.21	89.98	0.14	89.98	End	Grate

Project File: 11-09-22 Cole School.stm | Number of lines: 36 | Run Date: 11/9/2022

NOTES: Known Qs only ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	DMH-05	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
2	DMH-04	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
3	CB-02	0.59*	0.00	0.59	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	-0.05	1.41	0.20	1.41	3.0	Off
4	CB-03	0.88*	0.00	0.64	0.24	Grate	0.0	0.00	0.00	2.00	2.00	0.023	2.00	0.020	0.020	0.013	0.11	5.44	0.07	3.33	0.0	11
5	DMH-03	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
6	CB-01	0.93*	0.00	0.93	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.03	1.91	0.28	1.91	3.0	Off
7	DMH-02	0.19*	0.00	0.00	0.19	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
8	DMH-06	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
9	CB-05	0.85*	0.00	0.64	0.21	Grate	0.0	0.00	0.00	2.00	2.00	0.030	2.00	0.020	0.020	0.013	0.10	5.11	0.06	3.02	0.0	24
10	CB-14	0.24*	0.00	0.22	0.02	Grate	0.0	0.00	0.00	2.00	2.00	0.023	2.00	0.020	0.020	0.013	0.07	3.35	0.02	1.25	0.0	11
11	CB-04	1.00*	0.25	1.25	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.06	3.21	0.31	3.21	3.0	Off
12	EDMH-02	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
13	DMH-16	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
14	EDMH-01	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
15	DMH-11	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
16	ECB-06	2.56*	0.00	2.56	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.17	8.36	0.42	8.36	3.0	Off
17	ECB-05	0.00	0.00	0.00	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	-0.67	0.00	0.00	0.00	8.0	Off
18	DMH-10	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
19	DMH-09	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
20	ECB-04	0.27*	0.02	0.25	0.03	Grate	0.0	0.00	0.00	2.00	2.00	0.015	2.00	0.020	0.020	0.013	0.08	3.88	0.04	1.76	0.0	Off
21	ECB-03	0.18*	0.04	0.20	0.02	Grate	0.0	0.00	0.00	2.00	2.00	0.015	2.00	0.020	0.020	0.013	0.07	3.53	0.03	1.39	0.0	20
22	ECB-02	0.31*	0.01	0.28	0.04	Grate	0.0	0.00	0.00	2.00	2.00	0.015	2.00	0.020	0.020	0.013	0.08	4.04	0.04	1.90	0.0	21
23	ECB-01	0.18*	0.00	0.17	0.01	Grate	0.0	0.00	0.00	2.00	2.00	0.015	2.00	0.020	0.020	0.013	0.07	3.25	0.02	1.14	0.0	22

Project File: 11-09-22 Cole School.stm | Number of lines: 36 | Run Date: 11/9/2022

NOTES: Inlet N-Values = 0.016; Known Qs only; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
24	CB-06	0.19*	0.21	0.36	0.03	Grate	0.0	0.00	0.00	2.00	2.00	0.055	2.00	0.020	0.020	0.013	0.07	3.44	0.03	1.38	0.0	Off
25	CB-13	0.10*	0.00	0.10	0.00	Grate	0.0	0.00	0.00	2.00	2.00	0.080	2.00	0.020	0.020	0.013	0.04	1.91	0.00	0.01	0.0	16
26	OCS-1	0.50*	0.00	0.00	0.50	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
27	DMH-13	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
28	DMH-12	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
29	DMH-15	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
30	CB-10	1.50*	0.00	0.93	0.57	Grate	0.0	0.00	0.00	2.00	2.00	0.015	2.00	0.020	0.020	0.013	0.14	7.20	0.10	5.02	0.0	33
31	CB-09	1.50*	0.00	0.93	0.57	Grate	0.0	0.00	0.00	2.00	2.00	0.015	2.00	0.020	0.020	0.013	0.14	7.20	0.10	5.02	0.0	33
32	CB-12	1.50*	0.00	0.93	0.57	Grate	0.0	0.00	0.00	2.00	2.00	0.015	2.00	0.020	0.020	0.013	0.14	7.20	0.10	5.02	0.0	33
33	CB-11	1.50*	1.72	3.22	0.00	Grate	0.0	0.00	8.00	4.00	2.00	Sag	2.00	0.020	0.020	0.000	0.16	7.85	0.41	7.85	3.0	Off
34	OCS-3	2.01*	0.00	0.00	2.01	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
35	CB-08	1.53*	0.00	1.53	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.050	0.020	0.000	0.24	9.16	0.24	9.16	0.0	Off
36	CB-07	0.83*	0.00	0.83	0.00	Grate	0.0	0.00	4.00	2.00	2.00	Sag	2.00	0.050	0.020	0.000	0.18	5.92	0.18	5.92	0.0	Off

Project File: 11-09-22 Cole School.stm	Number of lines: 36	Run Date: 11/9/2022

NOTES: Inlet N-Values = 0.016; Known Qs only; * Indicates Known Q added. All curb inlets are throat.

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
1	18	2.59	94.00	95.40	1.40	0.67	1.51	0.23	95.63	0.000	16.270	94.08	94.69	0.61**	0.67	3.84	0.23	94.92	0.000	0.000	n/a	1.00	n/a
2	12	1.71	94.26	94.84	0.58*	0.48	3.60	0.20	95.04	0.400	154.986	94.88	95.46	0.58	0.48	3.60	0.20	95.66	0.400	0.400	0.620	1.00	0.20
3	12	0.59	97.84	98.13	0.29*	0.19	3.09	0.12	98.25	0.000	28.176	98.00	98.32	0.32**	0.22	2.73	0.12	98.44	0.000	0.000	n/a	1.00	n/a
4	12	0.88	96.49	96.86	0.37*	0.26	3.36	0.15	97.00	0.000	59.098	96.80	97.19	0.39**	0.29	3.07	0.15	97.34	0.000	0.000	n/a	1.00	0.15
5	12	1.12	94.98	95.66	0.68	0.34	1.96	0.06	95.72	0.107	92.888	95.35	95.80	0.45**	0.34	3.29	0.17	95.97	0.416	0.262	0.243	0.78	0.13
6	12	0.93	96.43	96.81	0.38*	0.28	3.38	0.15	96.96	0.000	13.696	96.50	96.90	0.40**	0.30	3.13	0.15	97.06	0.000	0.000	n/a	1.00	n/a
7	12	0.19	95.45	95.93	0.48	0.37	0.51	0.00	95.93	0.009	34.750	95.59	95.93	0.34	0.24	0.80	0.01	95.94	0.032	0.021	0.007	1.00	0.01
8	12	2.09	94.04	95.40	1.00	0.79	2.66	0.11	95.51	0.247	36.516	94.22	95.49	1.00	0.79	2.66	0.11	95.60	0.247	0.247	0.090	1.00	0.11
9	12	0.85	95.37	95.65	0.27*	0.18	4.84	0.14	95.79	0.000	56.801	96.22	96.61	0.39**	0.28	3.04	0.14	96.75	0.000	0.000	n/a	1.00	n/a
10	12	0.24	94.54	95.60	1.00	0.79	0.31	0.00	95.60	0.003	28.732	94.69	95.60	0.91	0.75	0.32	0.00	95.60	0.003	0.003	0.001	1.00	0.00
11	12	1.00	94.41	95.60	1.00	0.79	1.27	0.03	95.63	0.056	48.958	94.65	95.63	0.98	0.78	1.28	0.03	95.65	0.050	0.053	0.026	1.00	0.03
12	24	12.30	87.25	88.71	1.46	2.08	5.01	0.54	89.25	0.000	32.661	87.41	88.67	1.26**	2.08	5.90	0.54	89.21	0.000	0.000	n/a	0.52	n/a
13	24	12.30	87.51	88.68	1.17*	1.91	6.43	0.54	89.22	0.000	79.301	87.91	89.17	1.26**	2.08	5.90	0.54	89.71	0.000	0.000	n/a	0.87	n/a
14	24	6.30	87.91	89.17	1.26	1.35	3.02	0.34	89.51	0.000	29.970	88.06	88.95	0.89**	1.35	4.68	0.34	89.29	0.000	0.000	n/a	1.00	n/a
15	24	4.29	88.38	89.03	0.65*	0.88	4.85	0.27	89.30	0.000	42.386	88.59	89.32	0.73**	1.03	4.16	0.27	89.59	0.000	0.000	n/a	0.15	0.04
16	18	4.29	88.97	89.71	0.74*	0.87	4.93	0.32	90.03	0.000	188.632	89.91	90.70	0.79**	0.95	4.52	0.32	91.02	0.000	0.000	n/a	0.81	0.26
17	18	1.73	90.01	90.70	0.69	0.51	2.17	0.18	90.88	0.000	45.591	90.24	90.73 j	0.49**	0.51	3.41	0.18	90.91	0.000	0.000	n/a	0.66	0.12
18	18	1.73	90.34	90.79	0.45*	0.45	3.85	0.18	90.97	0.000	120.733	90.94	91.43	0.49**	0.51	3.41	0.18	91.61	0.000	0.000	n/a	1.00	0.18
19	18	0.94	91.14	91.47	0.33*	0.29	3.25	0.13	91.60	0.000	47.432	91.38	91.74	0.36**	0.33	2.87	0.13	91.87	0.000	0.000	n/a	0.73	0.09
20	18	0.94	91.48	91.81	0.33*	0.29	3.24	0.13	91.94	0.000	21.946	91.59	91.95	0.36**	0.33	2.87	0.13	92.08	0.000	0.000	n/a	0.50	0.06
21	12	0.67	91.69	92.11	0.42*	0.31	2.17	0.07	92.18	0.359	203.304	92.42	92.84	0.42	0.31	2.17	0.07	92.91	0.360	0.359	0.731	0.50	0.04
22	12	0.49	92.67	92.96	0.29*	0.19	2.65	0.10	93.06	0.000	142.781	93.28	93.57	0.29**	0.19	2.59	0.10	93.67	0.000	0.000	n/a	0.50	0.05

Project File: 11-09-22 Cole School.stm | Number of lines: 36 | Run Date: 11/9/2022

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

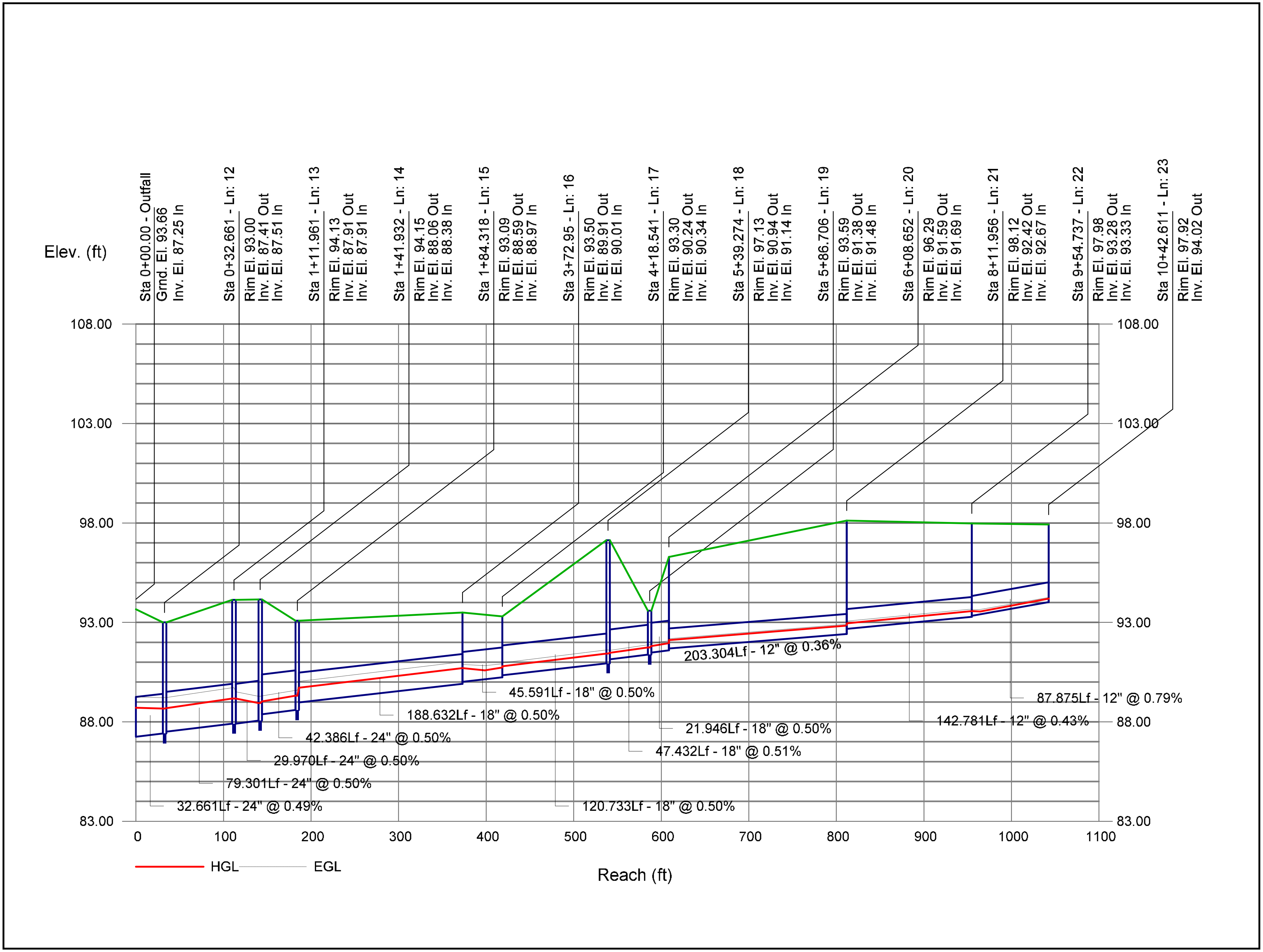
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
	(in)	(cfs)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	(ft)	Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)	(K)	(ft)
23	12	0.18	93.33	93.57	0.24	0.09	1.24	0.06	93.63	0.000	87.875	94.02	94.19 j	0.17**	0.09	1.97	0.06	94.25	0.000	0.000	n/a	1.00	0.06
24	12	0.19	93.10	93.27	0.17*	0.09	2.11	0.06	93.33	0.000	20.203	93.20	93.38	0.18**	0.10	2.00	0.06	93.44	0.000	0.000	n/a	1.00	0.06
25	12	0.10	92.50	92.63	0.13*	0.06	1.76	0.04	92.67	0.000	78.495	92.90	93.03	0.13**	0.06	1.69	0.04	93.07	0.000	0.000	n/a	1.00	0.04
26	12	0.50	91.07	91.43	0.36	0.19	1.93	0.11	91.54	0.000	109.009	92.00	92.29 j	0.29**	0.19	2.61	0.11	92.40	0.000	0.000	n/a	1.00	n/a
27	18	6.00	88.16	89.17	1.01	1.17	4.74	0.41	89.58	0.000	47.090	88.40	89.35 j	0.95**	1.17	5.12	0.41	89.75	0.000	0.000	n/a	0.51	n/a
28	18	6.00	88.45	89.35	0.90	1.10	5.46	0.41	89.75	0.000	82.774	88.92	89.87	0.95**	1.17	5.12	0.41	90.27	0.000	0.000	n/a	0.47	n/a
29	18	6.00	88.97	89.88	0.91*	1.13	5.33	0.41	90.29	0.000	166.974	89.80	90.75	0.95**	1.17	5.12	0.41	91.15	0.000	0.000	n/a	1.00	n/a
30	12	3.00	90.31	91.12	0.81*	0.68	4.40	0.30	91.42	0.519	46.265	90.55	91.36	0.81	0.68	4.40	0.30	91.66	0.519	0.519	0.240	1.09	0.33
31	12	1.50	90.66	91.69	1.00	0.79	1.91	0.06	91.75	0.127	32.689	90.82	91.72	0.90	0.75	2.01	0.06	91.78	0.112	0.119	0.039	1.00	0.06
32	12	1.50	90.31	90.81	0.50*	0.39	3.86	0.21	91.01	0.000	80.548	90.73	91.25	0.52**	0.41	3.65	0.21	91.46	0.000	0.000	n/a	1.00	0.21
33	12	1.50	90.31	90.82	0.51*	0.40	3.71	0.21	91.03	0.000	50.814	90.55	91.07	0.52**	0.41	3.65	0.21	91.28	0.000	0.000	n/a	1.00	0.21
34	24	2.01	88.16	88.95	0.79	0.60	1.75	0.17	89.12	0.000	18.762	88.25	88.74	0.49**	0.60	3.35	0.17	88.92	0.000	0.000	n/a	1.00	n/a
35	12	1.53	89.43	90.21	0.78	0.42	2.33	0.21	90.42	0.000	24.696	89.55	90.07	0.52**	0.42	3.67	0.21	90.28	0.000	0.000	n/a	1.00	n/a
36	12	0.83	89.39	90.21	0.82	0.27	1.20	0.14	90.35	0.000	42.539	89.60	89.98	0.38**	0.27	3.02	0.14	90.12	0.000	0.000	n/a	1.00	0.14

Project File: 11-09-22 Cole School.stm | Number of lines: 36 | Run Date: 11/9/2022

Notes: * depth assumed; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Storm Sewer Profile

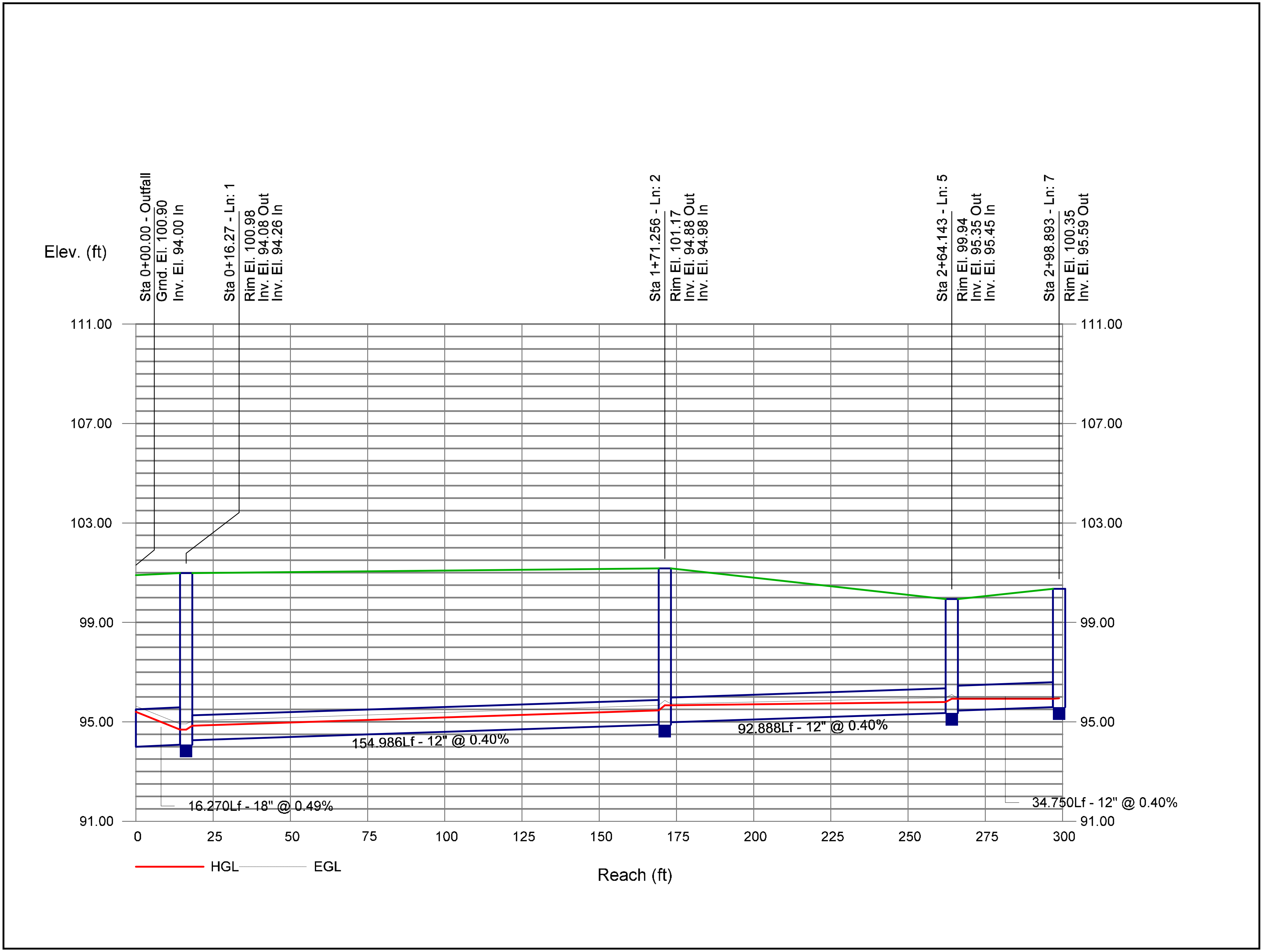
Proj. file: 11-09-22 Cole School.stm



Storm Sewers

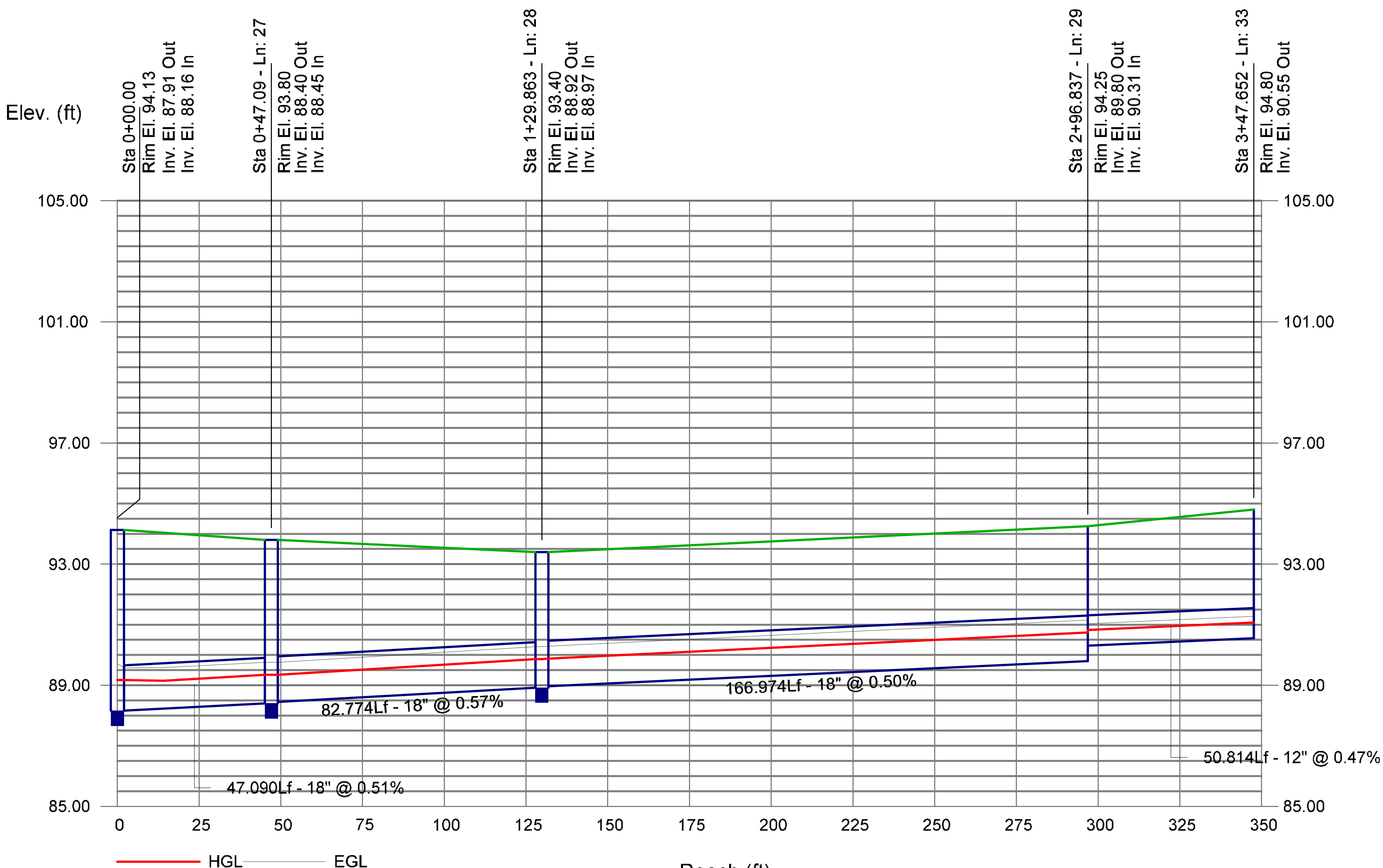
Storm Sewer Profile

Proj. file: 11-09-22 Cole School.stm



Storm Sewer Profile

Proj. file: 11-09-22 Cole School.stm



Summary for Subcatchment A2: SUB-A2

Runoff = 2.34 cfs @ 12.13 hrs, Volume= 7,988 cf, Depth= 2.72"
Routed to Pond DS-1 : DS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	23	98	Paved Impervious, HSG A
*	18,246	98	Paved Impervious, HSG B
	3,498	98	Roofs, HSG B
	1,694	39	>75% Grass cover, Good, HSG A
	4,693	61	>75% Grass cover, Good, HSG B
	6,952	30	Woods, Good, HSG A
	87	55	Woods, Good, HSG B
	35,193	77	Weighted Average
	13,426		38.15% Pervious Area
	21,767		61.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	33	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	59	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.9	160	Total			

Summary for Subcatchment A3: SUB-A3

Runoff = 1.57 cfs @ 12.09 hrs, Volume= 4,921 cf, Depth= 3.58"
Routed to Pond BR-1 : BR-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	4,196	98	Paved Impervious, HSG A
*	1,717	98	Paved Impervious, HSG B
	6,866	98	Roofs, HSG B
	2,808	39	>75% Grass cover, Good, HSG A
	913	61	>75% Grass cover, Good, HSG B
	16,500	86	Weighted Average
	3,721		22.55% Pervious Area
	12,779		77.45% Impervious Area

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

Summary for Subcatchment A4: SUB-A4

Runoff = 4.84 cfs @ 12.08 hrs, Volume= 15,809 cf, Depth= 4.21"
Routed to Pond IS-1 : IS-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	28,479	98	Paved Impervious, HSG A
*	4,701	98	Paved Impervious, HSG B
	3,540	98	Roofs, HSG A
	3,092	98	Roofs, HSG B
	3,675	39	>75% Grass cover, Good, HSG A
	1,610	61	>75% Grass cover, Good, HSG B
	45,097	92	Weighted Average
	5,285		11.72% Pervious Area
	39,812		88.28% Impervious Area

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

Summary for Subcatchment CB-01: CB-01

Runoff = 0.93 cfs @ 12.09 hrs, Volume= 2,913 cf, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	849	98	Paved Impervious, HSG A
*	4,591	98	Paved Impervious, HSG B
	1,178	98	Roofs, HSG A
	481	98	Roofs, HSG B
	1,047	39	>75% Grass cover, Good, HSG A
	1,621	61	>75% Grass cover, Good, HSG B
	9,767	86	Weighted Average
	2,668		27.32% Pervious Area
	7,099		72.68% Impervious Area

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

Summary for Subcatchment CB-02: CB-02

Runoff = 0.59 cfs @ 12.09 hrs, Volume= 1,886 cf, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	4,323	98	Paved Impervious, HSG A
	625	98	Roofs, HSG A
	722	39	>75% Grass cover, Good, HSG A
	5,670	90	Weighted Average
	722		12.73% Pervious Area
	4,948		87.27% Impervious Area

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

Summary for Subcatchment CB-03: CB-03

Runoff = 0.88 cfs @ 12.08 hrs, Volume= 3,048 cf, Depth= 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	7,042	98	Paved Impervious, HSG A
	455	98	Roofs, HSG A
	175	39	>75% Grass cover, Good, HSG A
	7,672	97	Weighted Average
	175		2.28% Pervious Area
	7,497		97.72% Impervious Area

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

Summary for Subcatchment CB-04: CB-04

Runoff = 1.00 cfs @ 12.08 hrs, Volume= 3,538 cf, Depth> 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	8,644	98	Paved Impervious, HSG A
	52	39	>75% Grass cover, Good, HSG A
	8,696	98	Weighted Average
	52		0.60% Pervious Area
	8,644		99.40% Impervious Area

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

Summary for Subcatchment CB-05: CB-05

Runoff = 0.59 cfs @ 12.08 hrs, Volume= 1,928 cf, Depth= 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	2,101	98	Paved Impervious, HSG A
*	137	98	Paved Impervious, HSG B
	1,275	98	Roofs, HSG A
	1,465	98	Roofs, HSG B
	522	39	>75% Grass cover, Good, HSG A
	5,500	92	Weighted Average
	522		9.49% Pervious Area
	4,978		90.51% Impervious Area

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

Summary for Subcatchment CB-06: CB-06

Runoff = 0.19 cfs @ 12.13 hrs, Volume= 768 cf, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	3,011	98	Paved Impervious, HSG A
	1,950	39	>75% Grass cover, Good, HSG A
	3,900	30	Woods, Good, HSG A
	8,861	55	Weighted Average
	5,850		66.02% Pervious Area
	3,011		33.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	52	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	34	0.0580	1.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.4	136	Total			

Summary for Subcatchment CB-07: CB-07

Runoff = 0.83 cfs @ 12.13 hrs, Volume= 3,020 cf, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	23	98	Paved Impervious, HSG A
*	6,419	98	Paved Impervious, HSG B
	2,185	98	Roofs, HSG B
	1,694	39	>75% Grass cover, Good, HSG A
	4,482	61	>75% Grass cover, Good, HSG B
	6,952	30	Woods, Good, HSG A
	87	55	Woods, Good, HSG B
	21,842	64	Weighted Average
	13,215		60.50% Pervious Area
	8,627		39.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.5	33	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	59	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	18	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.9	160	Total			

Summary for Subcatchment CB-08: CB-08

Runoff = 1.53 cfs @ 12.08 hrs, Volume= 5,303 cf, Depth= 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	11,827	98	Paved Impervious, HSG B
	1,313	98	Roofs, HSG B
	211	61	>75% Grass cover, Good, HSG B
	13,351	97	Weighted Average
	211		1.58% Pervious Area
	13,140		98.42% Impervious Area

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

Summary for Subcatchment CB-09: CB-09

Runoff = 1.50 cfs @ 12.09 hrs, Volume= 4,718 cf, Depth= 3.58"
Routed to nonexistent node A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	6,800	98	Paved Impervious, HSG B
	4,041	98	Roofs, HSG B
	4,758	61	>75% Grass cover, Good, HSG B
	218	55	Woods, Good, HSG B
	15,817	86	Weighted Average
	4,976		31.46% Pervious Area
	10,841		68.54% Impervious Area

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

Summary for Subcatchment CB-10: CB-10

Runoff = 1.50 cfs @ 12.09 hrs, Volume= 4,718 cf, Depth= 3.58"
Routed to nonexistent node A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	6,800	98	Paved Impervious, HSG B
	4,041	98	Roofs, HSG B
	4,758	61	>75% Grass cover, Good, HSG B
	218	55	Woods, Good, HSG B
	15,817	86	Weighted Average
	4,976		31.46% Pervious Area
	10,841		68.54% Impervious Area

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

Summary for Subcatchment CB-11: CB-11

Runoff = 1.50 cfs @ 12.09 hrs, Volume= 4,718 cf, Depth= 3.58"
Routed to nonexistent node A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	6,800	98	Paved Impervious, HSG B
	4,041	98	Roofs, HSG B
	4,758	61	>75% Grass cover, Good, HSG B
	218	55	Woods, Good, HSG B
	15,817	86	Weighted Average
	4,976		31.46% Pervious Area
	10,841		68.54% Impervious Area

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

Summary for Subcatchment CB-12: CB-12

Runoff = 1.50 cfs @ 12.09 hrs, Volume= 4,718 cf, Depth= 3.58"
Routed to nonexistent node A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	6,800	98	Paved Impervious, HSG B
	4,041	98	Roofs, HSG B
	4,758	61	>75% Grass cover, Good, HSG B
	218	55	Woods, Good, HSG B
	15,817	86	Weighted Average
	4,976		31.46% Pervious Area
	10,841		68.54% Impervious Area

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

Summary for Subcatchment CB-13: CB-13

Runoff = 0.10 cfs @ 12.09 hrs, Volume= 319 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

Area (sf)	CN	Description
878	98	Paved parking, HSG A
362	39	>75% Grass cover, Good, HSG A
1,240	81	Weighted Average
362		29.19% Pervious Area
878		70.81% Impervious Area

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

Summary for Subcatchment CB-14: CB-14

Runoff = 0.24 cfs @ 12.09 hrs, Volume= 741 cf, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

Area (sf)	CN	Description
1,996	98	Paved parking, HSG A
561	39	>75% Grass cover, Good, HSG A
2,557	85	Weighted Average
561		21.94% Pervious Area
1,996		78.06% Impervious Area

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

Summary for Subcatchment DMH-02: DMH-02

Runoff = 0.19 cfs @ 12.08 hrs, Volume= 672 cf, Depth> 4.88"
Routed to nonexistent node A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

Area (sf)	CN	Description
1,652	98	Roofs, HSG B
1,652		100.00% Impervious Area

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

Summary for Subcatchment DMH-07: DMH-07

Runoff = 0.26 cfs @ 12.08 hrs, Volume= 921 cf, Depth> 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

Area (sf)	CN	Description
2,264	98	Roofs, HSG B
2,264		100.00% Impervious Area

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

Summary for Subcatchment ECB-01: ECB-01

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 588 cf, Depth= 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	1,816	98	Paved Impervious, HSG A
	2,081	39	>75% Grass cover, Good, HSG A
	3,897	66	Weighted Average
	2,081		53.40% Pervious Area
	1,816		46.60% Impervious Area

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

Summary for Subcatchment ECB-02: ECB-02

Runoff = 0.31 cfs @ 12.09 hrs, Volume= 971 cf, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	1,347	98	Paved Impervious, HSG A
*	1,096	98	Paved Impervious, HSG B
	463	39	>75% Grass cover, Good, HSG A
	350	61	>75% Grass cover, Good, HSG B
	3,256	86	Weighted Average
	813		24.97% Pervious Area
	2,443		75.03% Impervious Area

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

Summary for Subcatchment ECB-03: ECB-03

Runoff = 0.18 cfs @ 12.09 hrs, Volume= 588 cf, Depth= 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	1,816	98	Paved Impervious, HSG A
	2,081	39	>75% Grass cover, Good, HSG A
	3,897	66	Weighted Average
	2,081		53.40% Pervious Area
	1,816		46.60% Impervious Area

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

Summary for Subcatchment ECB-04: ECB-04

Runoff = 0.27 cfs @ 12.09 hrs, Volume= 861 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	2,560	98	Paved Impervious, HSG A
	2,300	39	>75% Grass cover, Good, HSG A
	4,860	70	Weighted Average
	2,300		47.33% Pervious Area
	2,560		52.67% Impervious Area

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

Summary for Subcatchment ECB-05: ECB-05

Runoff = 0.00 cfs @ 14.99 hrs, Volume= 85 cf, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

Area (sf)	CN	Description
5,906	39	>75% Grass cover, Good, HSG A
4,418	30	Woods, Good, HSG A
10,324	35	Weighted Average
10,324		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	52	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	34	0.0580	1.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.4	136	Total			

Summary for Subcatchment ECB-06: ECB-06

Runoff = 2.56 cfs @ 12.10 hrs, Volume= 8,403 cf, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	8,452	98	Paved Impervious, HSG A
*	1,528	98	Paved Impervious, HSG B
	3,894	98	Roofs, HSG A
	8,917	98	Roofs, HSG B
	4,825	39	>75% Grass cover, Good, HSG A
	1,368	30	Woods, Good, HSG A
	28,984	85	Weighted Average
	6,193		21.37% Pervious Area
	22,791		78.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
0.7	52	0.0570	1.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	34	0.0580	1.69		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.4	136	Total			

Summary for Subcatchment ECB-07: ECB-07

Runoff = 0.65 cfs @ 12.10 hrs, Volume= 2,222 cf, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	3,420	98	Paved Impervious, HSG B
	523	39	>75% Grass cover, Good, HSG A
	6,591	61	>75% Grass cover, Good, HSG B
	3,334	30	Woods, Good, HSG A
	5,567	55	Woods, Good, HSG B
	19,435	60	Weighted Average
	16,015		82.40% Pervious Area
	3,420		17.60% Impervious Area

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

Summary for Subcatchment ECB-08: ECB-08

Runoff = 1.04 cfs @ 12.20 hrs, Volume= 4,613 cf, Depth= 1.24"
Routed to nonexistent node A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.12"

	Area (sf)	CN	Description
*	3,625	98	Paved Impervious, HSG A
*	8,132	98	Paved Impervious, HSG B
	13,635	30	Woods, Good, HSG A
	13,102	55	Woods, Good, HSG B
	2,357	39	>75% Grass cover, Good, HSG A
	3,960	61	>75% Grass cover, Good, HSG B
	44,811	58	Weighted Average
	33,054		73.76% Pervious Area
	11,757		26.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
2.5	120	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.4	293	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.7	463	Total			

Summary for Pond BR-1: BR-1

Inflow Area = 16,500 sf, 77.45% Impervious, Inflow Depth = 3.58" for 10-year event
Inflow = 1.57 cfs @ 12.09 hrs, Volume= 4,921 cf
Outflow = 1.28 cfs @ 12.14 hrs, Volume= 4,111 cf, Atten= 18%, Lag= 3.5 min
Primary = 1.10 cfs @ 12.14 hrs, Volume= 4,089 cf
Routed to Pond IS-1 : IS-1
Secondary = 0.17 cfs @ 12.14 hrs, Volume= 22 cf
Routed to Pond IS-1 : IS-1

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 101.28' @ 12.14 hrs Surf.Area= 448 sf Storage= 987 cf

Plug-Flow detention time= 104.0 min calculated for 4,111 cf (84% of inflow)
Center-of-Mass det. time= 36.2 min (839.7 - 803.5)

Volume	Invert	Avail.Storage	Storage Description
#1	96.74'	1,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.74	641	0.0	0	0
96.75	641	40.0	3	3
97.24	641	40.0	126	128
97.25	641	30.0	2	130
100.24	641	30.0	575	705
100.25	641	40.0	3	708
100.49	641	40.0	62	769
100.50	88	100.0	4	773
101.00	335	100.0	106	879
101.75	641	100.0	366	1,245

Device	Routing	Invert	Outlet Devices
#1	Device 2	100.75'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	94.49'	**12.0" Round Culvert** L= 62.8' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 94.49' / 94.18' S= 0.0049 '/' Cc= 0.900 n= 0.130, Flow Area= 0.79 sf
#3	Secondary	101.25'	**15.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.10 cfs @ 12.14 hrs HW=101.28' TW=94.74' (Dynamic Tailwater)
2=Culvert (Barrel Controls 1.10 cfs @ 1.40 fps)
1=Orifice/Grate (Passes 1.10 cfs of 7.86 cfs potential flow)

Secondary OutFlow Max=0.16 cfs @ 12.14 hrs HW=101.28' TW=94.74' (Dynamic Tailwater)
3=Broad-Crested Rectangular Weir (Weir Controls 0.16 cfs @ 0.41 fps)

Summary for Pond DS-1: DS-1

Inflow Area = 35,193 sf, 61.85% Impervious, Inflow Depth = 2.72" for 10-year event
Inflow = 2.34 cfs @ 12.13 hrs, Volume= 7,988 cf
Outflow = 2.28 cfs @ 12.15 hrs, Volume= 7,987 cf, Atten= 2%, Lag= 1.4 min
Primary = 2.28 cfs @ 12.15 hrs, Volume= 7,987 cf
Routed to nonexistent node A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 91.53' @ 12.15 hrs Surf.Area= 658 sf Storage= 1,303 cf

Plug-Flow detention time= 26.5 min calculated for 7,987 cf (100% of inflow)
Center-of-Mass det. time= 26.4 min (857.7 - 831.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	88.25'	627 cf	**20.50'W x 32.10'L x 3.50'H Field A** 2,303 cf Overall - 735 cf Embedded = 1,568 cf x 40.0% Voids
#2A	88.75'	735 cf	**ADS_StormTech SC-740 +Cap** x 16 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 16 Chambers in 4 Rows
		1,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	88.25'	**18.0" Round Culvert** L= 26.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 88.25' / 88.12' S= 0.0048 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	91.25'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	88.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.28 cfs @ 12.15 hrs HW=91.53' (Free Discharge)
└─**1=Culvert** (Passes 2.28 cfs of 10.67 cfs potential flow)
├─**2=Sharp-Crested Rectangular Weir** (Weir Controls 1.86 cfs @ 1.72 fps)
└─**3=Orifice/Grate** (Orifice Controls 0.42 cfs @ 8.55 fps)

Summary for Pond IS-1: IS-1

Inflow Area = 61,597 sf, 85.38% Impervious, Inflow Depth = 3.88" for 10-year event
Inflow = 5.93 cfs @ 12.09 hrs, Volume= 19,920 cf
Outflow = 0.76 cfs @ 12.70 hrs, Volume= 19,920 cf, Atten= 87%, Lag= 36.9 min
Discarded = 0.26 cfs @ 12.70 hrs, Volume= 13,920 cf
Primary = 0.50 cfs @ 12.70 hrs, Volume= 5,999 cf
Routed to nonexistent node A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 95.80' @ 12.70 hrs Surf.Area= 3,603 sf Storage= 8,356 cf

Plug-Flow detention time= 161.6 min calculated for 19,914 cf (100% of inflow)

Center-of-Mass det. time= 161.6 min (955.5 - 793.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	92.50'	5,063 cf	**29.92'W x 120.42'L x 5.50'H Field A** 19,814 cf Overall - 7,156 cf Embedded = 12,658 cf x 40.0% Voids
#2A	93.25'	7,156 cf	**ADS_StormTech MC-3500 d +Cap** x 64 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 64 Chambers in 4 Rows Cap Storage= 14.9 cf x 2 x 4 rows = 119.2 cf
		12,219 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	92.50'	**2.410 in/hr Exfiltration over Wetted area** Phase-In= 0.01'
#2	Primary	92.00'	**12.0" Round Culvert** L= 91.3' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 92.00' / 91.09' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	97.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 2	94.20'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.26 cfs @ 12.70 hrs HW=95.80' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.26 cfs)

Primary OutFlow Max=0.50 cfs @ 12.70 hrs HW=95.80' (Free Discharge)
└─**2=Culvert** (Passes 0.50 cfs of 5.42 cfs potential flow)
 ├─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
 └─**4=Orifice/Grate** (Orifice Controls 0.50 cfs @ 5.75 fps)

55 Walkers Brook Drive, Suite 100, Reading, MA 01867
Tel: 978.532.1900

MEMORANDUM

FROM: James Pearson PE

DATE: October 6, 2022

SUBJECT: Temporary Stormwater Basin Sizing for 27 Main Street

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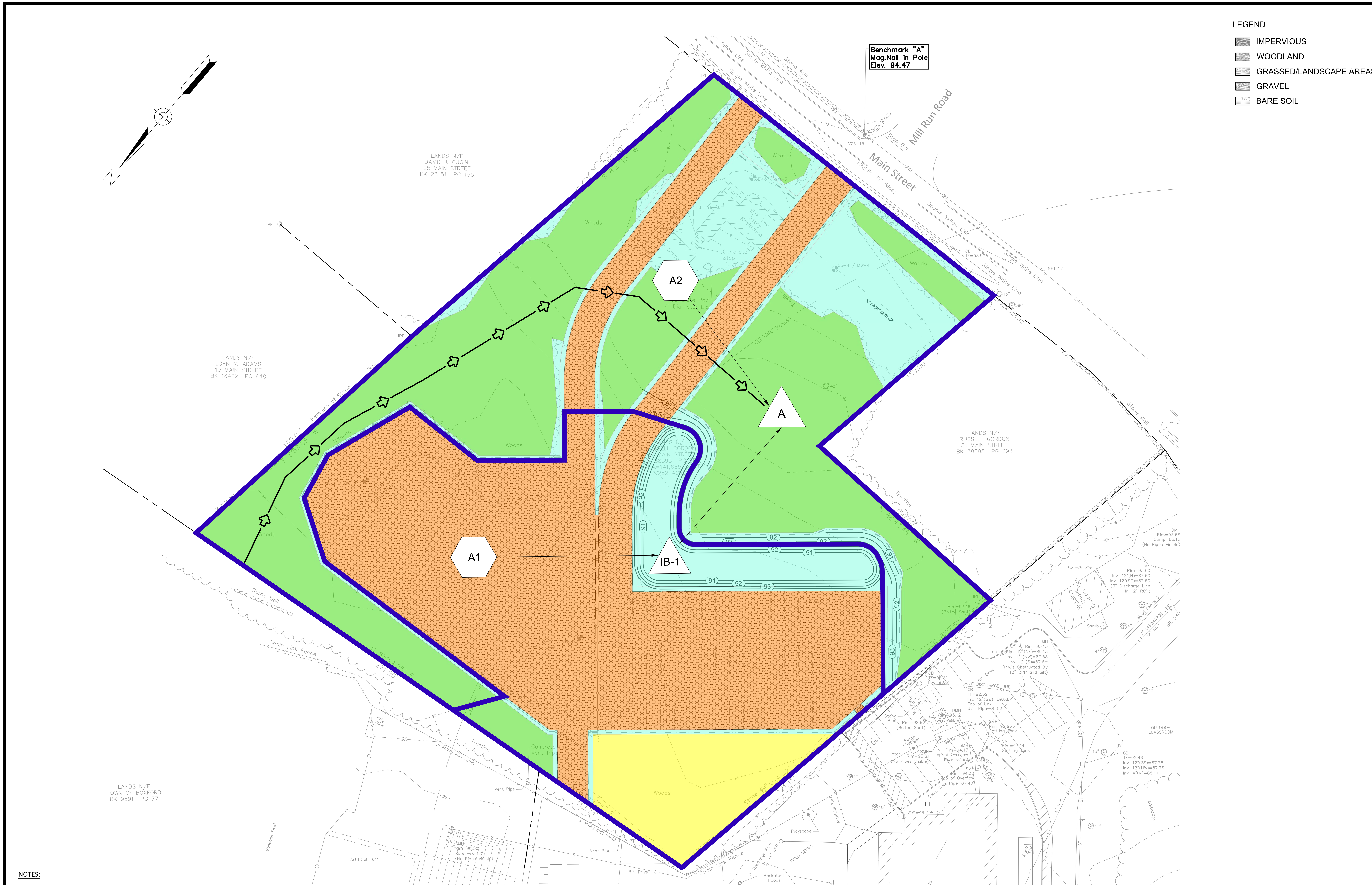
The scope of the Harry Lee Cole school redevelopment has been expanded to incorporate land located adjacent to the school property at 27 Main Street. The purpose of this expanded scope is to provide temporary parking for school staff and a construction staging area to be used during construction of site improvements.

To control sediment and stormwater run-off during construction of the site, a temporary stormwater basin has been proposed. The analysis of this parcel was conducted using HydroCAD and the temporary basin has been designed to capture and infiltrate the 2-year storm event. Although the analysis of storm events larger than the 2-year have not been provided, the temporary stormwater basin will mitigate peak discharges and run-off volume up to and including the 10-year storm event. A hydrologic map, summary of peak discharges and run-off volume, and HydroCAD calculations for the 2-year storm event are included on the following pages.

Harry Lee Cole School - 27 Main St Parcel
Boxford, MA
Stormwater Discharge Summary Table
6-Oct-22

		Peak Discharge (cfs)		Runoff Volume (cf)	
Analysis Point	**24 Hr Storm**	**Pre**	**Post**	**Pre**	**Post**
A	2yr	0.32	0.28	3,272	2,308



NOTES:

1. THIS ANALYSIS IS PROVIDED TO DEMONSTRATE SIZING OF A TEMPORARY STORMWATER BASIN FOR THE 2-YEAR STORM EVENT TO PROVIDE EROSION AND SEDIMENT CONTROL FOR THE CONSTRUCTION OF TEMPORARY PARKING AND CONSTRUCTION STAGING AREAS.
2. A PORTION OF 27 MAIN STREET WILL BE UTILIZED FOR AN EXPANSION OF THE PAVED SCHOOL YARD. THIS AREA IS PRESENTED AS BARE SOIL ON BOTH THIS HYDROLOGIC MAP, AND IN THE HYDROCAD CALCULATIONS. THIS IS DONE TO PROVIDE A CONSERVATIVE ANALYSIS OF THE STORMWATER RUNOFF ON SITE.

30 15 0 30 60
SCALE: 1"=30'

Project:
BOXFORD PUBLIC SCHOOLS SITE RENOVATION PROJECT

TOWN OF BOXFORD, MA

Weston & Sampson
Weston & Sampson Engineers, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
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Consultants:

Revisions:

No.	Date	Description

Seal:

Issued For:
PERMITTING NOT FOR CONSTRUCTION

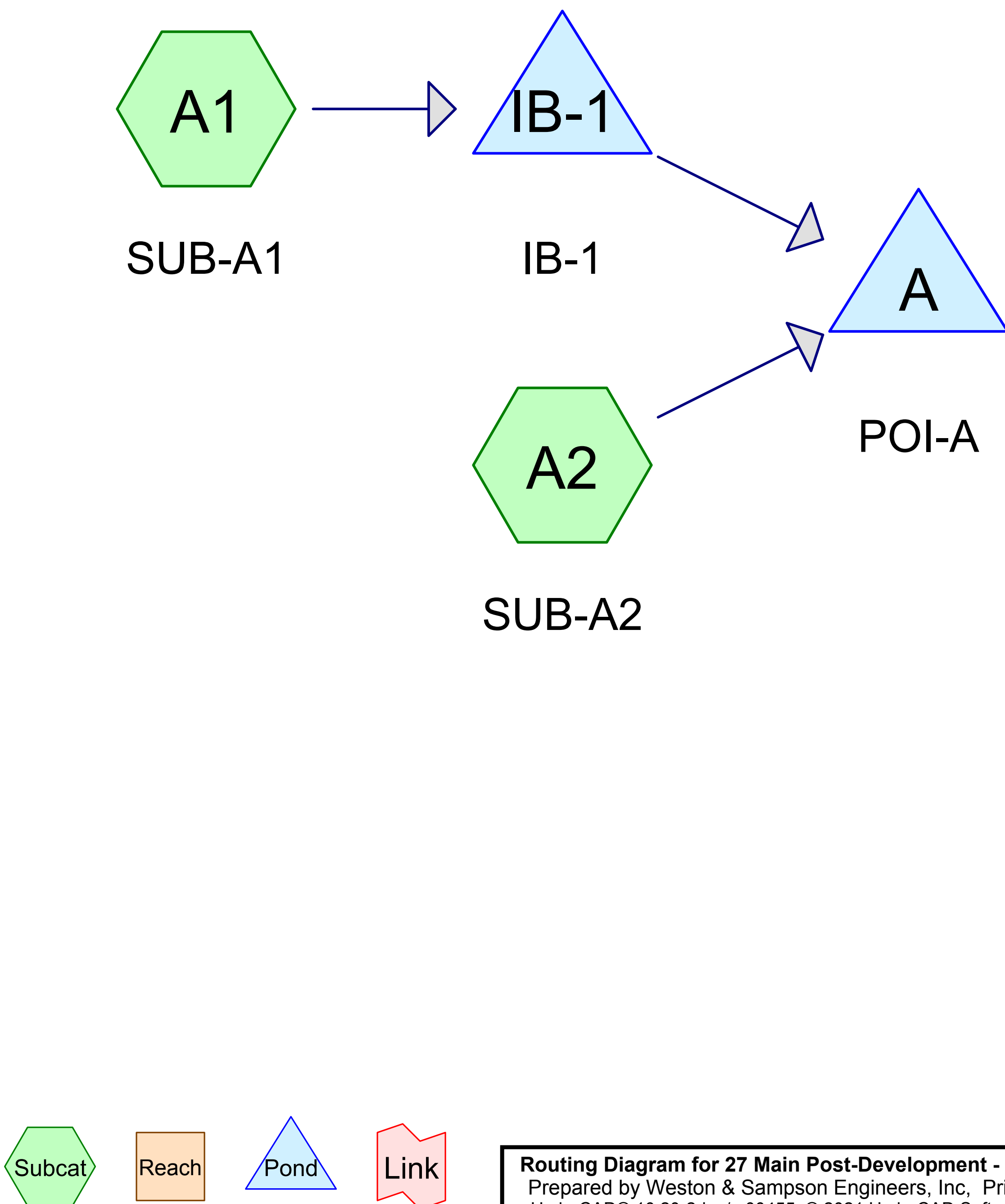
Scale: AS NOTED
Date: OCTOBER 6, 2022
Drawn By: AKG
Reviewed By: JIP
Approved By: JIP

W&S Project No.: ENG20-0865
W&S File No.:

Drawing Title:
PROPOSED HYDROLOGIC MAP FOR TEMPORARY BASIN SIZING

Sheet Number:
FIG-2A

Rev. 1.8 Date: 10/24/2019



Routing Diagram for 27 Main Post-Development - Temporary Basin
Prepared by Weston & Sampson Engineers, Inc, Printed 11/8/2022

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
23,704	61	>75% Grass cover, Good, HSG B (A1, A2)
8,306	86	Bare soil, HSG B (A1)
53,057	85	Gravel, HSG B (A1, A2)
54,034	55	Woods, Good, HSG B (A1, A2)
139,101	**69**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
139,101	HSG B	A1, A2
0	HSG C	
0	HSG D	
0	Other	
139,101		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	23,704	0	0	0	23,704	>75% Grass cover, Good	
0	8,306	0	0	0	8,306	Bare soil	
0	53,057	0	0	0	53,057	Gravel	
0	54,034	0	0	0	54,034	Woods, Good	
0	**139,101**	**0**	**0**	**0**	**139,101**	**TOTAL AREA**	

Time span=1.00-36.00 hrs, dt=0.01 hrs, 3501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentA1: SUB-A1 Runoff Area=64,272 sf 0.00% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=80 Runoff=2.26 cfs 7,099 cf

SubcatchmentA2: SUB-A2 Runoff Area=74,829 sf 0.00% Impervious Runoff Depth=0.37"
Flow Length=438' Tc=25.6 min CN=60 Runoff=0.28 cfs 2,308 cf

Pond A: POI-A Inflow=0.28 cfs 2,308 cf
Primary=0.28 cfs 2,308 cf

Pond IB-1: IB-1 Peak Elev=91.52' Storage=3,856 cf Inflow=2.26 cfs 7,099 cf
Discarded=0.10 cfs 7,100 cf Primary=0.00 cfs 0 cf Outflow=0.10 cfs 7,100 cf

Total Runoff Area = 139,101 sf Runoff Volume = 9,407 cf Average Runoff Depth = 0.81"
100.00% Pervious = 139,101 sf 0.00% Impervious = 0 sf

Summary for Subcatchment A1: SUB-A1

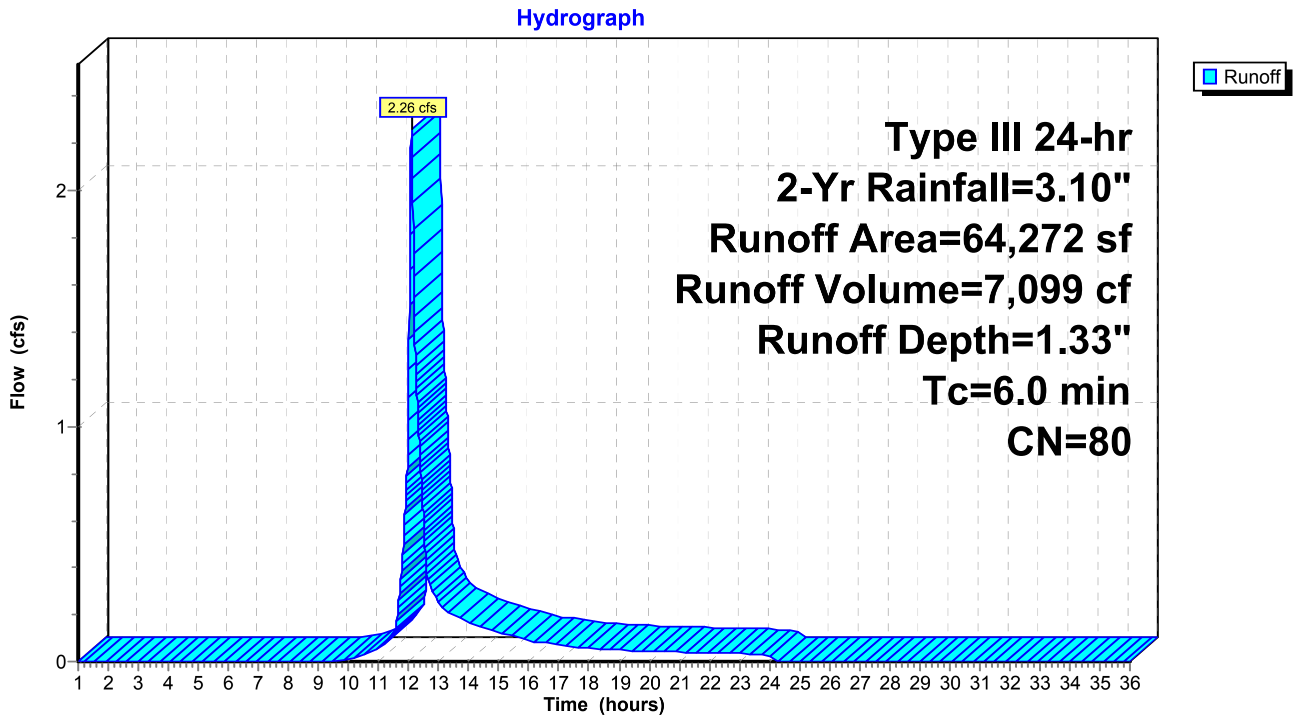
Runoff = 2.26 cfs @ 12.09 hrs, Volume= 7,099 cf, Depth= 1.33"
Routed to Pond IB-1 : IB-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.10"

	Area (sf)	CN	Description
	3,283	55	Woods, Good, HSG B
*	43,934	85	Gravel, HSG B
	8,749	61	>75% Grass cover, Good, HSG B
*	8,306	86	Bare soil, HSG B
	64,272	80	Weighted Average
	64,272		100.00% Pervious Area

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

Subcatchment A1: SUB-A1



Summary for Subcatchment A2: SUB-A2

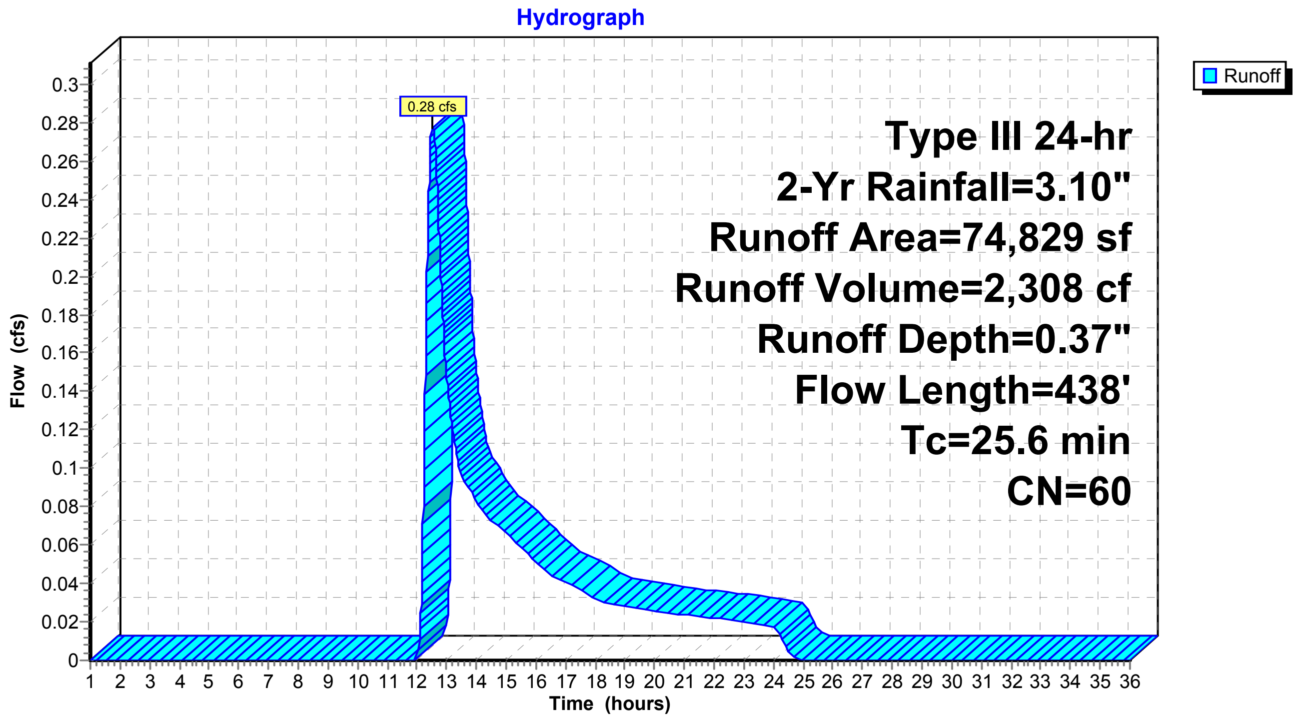
Runoff = 0.28 cfs @ 12.54 hrs, Volume= 2,308 cf, Depth= 0.37"
Routed to Pond A : POI-A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Yr Rainfall=3.10"

	Area (sf)	CN	Description
	50,751	55	Woods, Good, HSG B
*	9,123	85	Gravel, HSG B
	14,955	61	>75% Grass cover, Good, HSG B
	74,829	60	Weighted Average
	74,829		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.30"
9.3	197	0.0050	0.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	46	0.0430	1.04		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	30	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.5	45	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	28	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.4	42	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
25.6	438	Total			

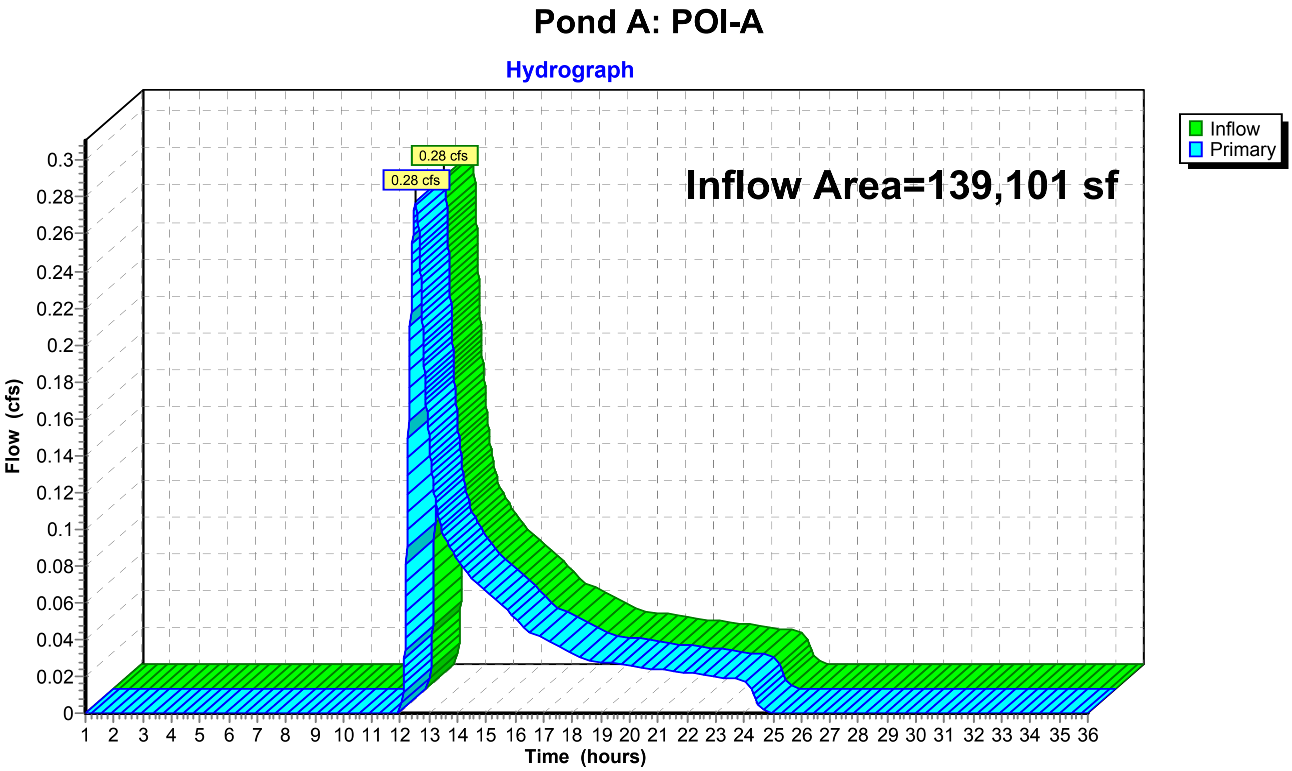
Subcatchment A2: SUB-A2



Summary for Pond A: POI-A

Inflow Area = 139,101 sf, 0.00% Impervious, Inflow Depth = 0.20" for 2-Yr event
Inflow = 0.28 cfs @ 12.54 hrs, Volume= 2,308 cf
Primary = 0.28 cfs @ 12.54 hrs, Volume= 2,308 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2



Summary for Pond IB-1: IB-1

Inflow Area = 64,272 sf, 0.00% Impervious, Inflow Depth = 1.33" for 2-Yr event
Inflow = 2.26 cfs @ 12.09 hrs, Volume= 7,099 cf
Outflow = 0.10 cfs @ 15.72 hrs, Volume= 7,100 cf, Atten= 96%, Lag= 217.4 min
Discarded = 0.10 cfs @ 15.72 hrs, Volume= 7,100 cf
Primary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to Pond A : POI-A

Routing by Dyn-Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 91.52' @ 15.72 hrs Surf.Area= 4,258 sf Storage= 3,856 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 418.9 min (1,263.3 - 844.4)

Volume	Invert	Avail.Storage	Storage Description
#1	90.50'	8,494 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

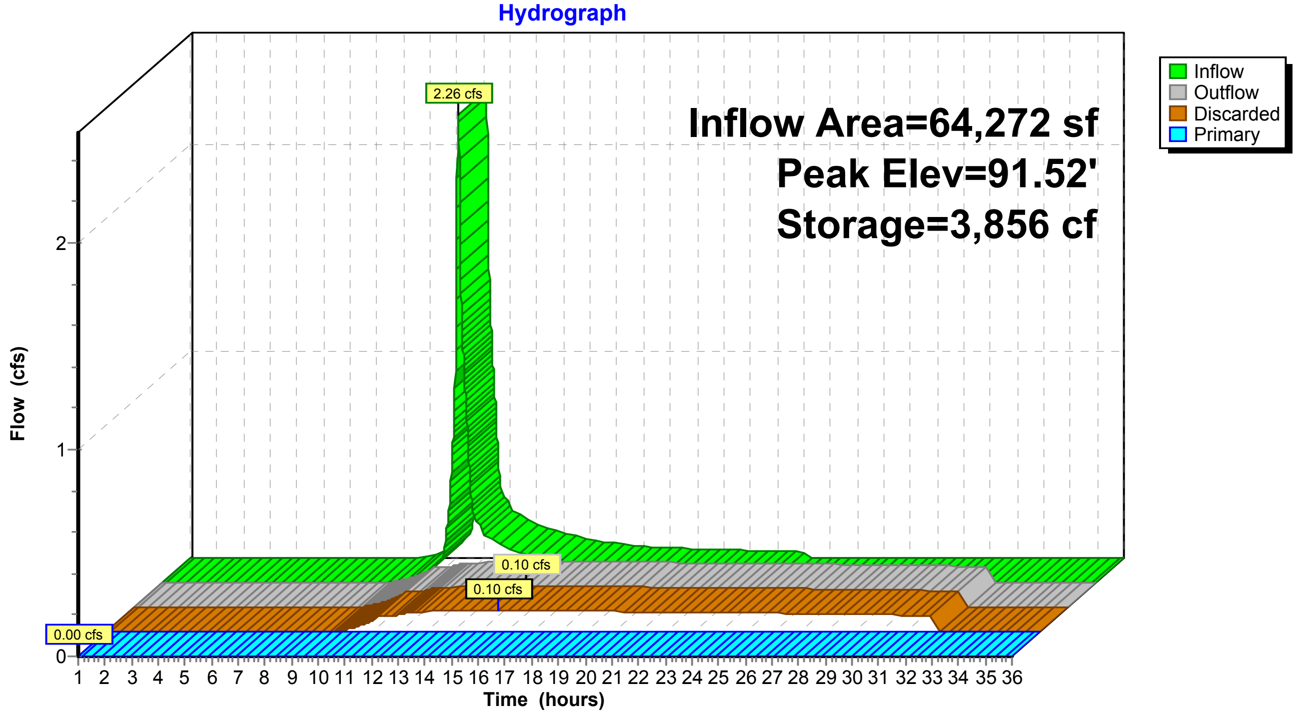
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.50	3,309	0	0
91.50	4,240	3,775	3,775
92.50	5,198	4,719	8,494

Device	Routing	Invert	Outlet Devices
#1	Discarded	90.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	92.00'	**20.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Discarded OutFlow Max=0.10 cfs @ 15.72 hrs HW=91.52' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 1.00 hrs HW=90.50' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: IB-1


Hydrograph
2.26 cfs
0.10 cfs
0.10 cfs
0.00 cfs
Inflow Area=64,272 sf
Peak Elev=91.52'
Storage=3,856 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)

Attachment F - Long Term Pollution Prevention Plan

Long Term Pollution Prevention Plan
Harry Lee Cole School
Boxford, MA

To meet the requirements of Standard 4 of the Massachusetts Stormwater Handbook, this Long Term Pollution Prevention Plan is provided to identify the proper procedures of practices for source control and pollution prevention.

Storage and Handling of Oil and other Hazardous Materials

Any hazardous materials that will be used ancillary to the school will be stored inside, or off site.

Spill Prevention/Response

Spill kits will be kept on site, and spills shall be cleaned up immediately. Spills of any hazardous material over 10 gallons will be reported to the Massachusetts Department of Environmental Protection within 24 hours.

Operation and Maintenance of Stormwater Control Structures

Included in Attachment H of this appendix is the Operation and Maintenance plan for this site, which includes street sweeping of the paved areas and periodic cleaning of stormwater structures. The town will be responsible for the implementation of the plan.

Landscaping

The landscaped areas will be maintained by the town. Use of fertilizers, herbicides, and pesticides shall be allowed for all vegetated areas on site. If kept on site, all chemicals shall be stored under cover. Any storage for fertilizers, herbicides and pesticides shall not be located within 100 feet of any wetland or within proximity to the stormwater management system where spills could enter the storm drain system.

Septic System

There will be no new onsite septic facilities. The sewer facilities currently in use for the existing building on site shall be retained.

Vehicle Washing

Vehicle washing shall not be performed on site. Vehicles can be rinsed with a high volume of water at low pressure. This is considered dust water by the DEP and accounts for what may be rinsed off of the vehicle when it rains. Pre-treatment BMP’s downstream of these activities will include deep-sump hooded catch basins.

Non-Hazardous Waste Management/Good Housekeeping Practices

All non-hazardous waste shall be stored in designated trash or recycling containers onsite for periodic collection by the local trash collector. The town shall have maintenance staff who monitor the site for the accumulation of trash. Any trash that is seen onsite shall immediately be collected and placed into designated trash or recycling containers. The town's maintenance staff shall inspect the site once per week at minimum.

Prohibition of Illicit Discharges

Illicit discharges to the onsite stormwater management system shall be strictly prohibited. Illicit discharges are defined as any direct or indirect non-stormwater discharge to the onsite stormwater system. Requirements related to Illicit Discharges are further detailed in the attached Illicit Discharge Compliance Statement.

De-icing & Snow Disposal

The operation will utilize salt and sand to treat the paved surfaces of the site during snow and ice events. Use of salt shall be restricted in areas where stormwater drains to the bioretention area. Snow will be temporarily stored within peripheral areas of the site and allowed to melt and drain back to onsite stormwater systems. When needed, snow shall be removed from the site and disposed of in accordance with all local, state and federal regulations. Snow storage shall be prohibited within all wetlands and wetland buffer zones.

Winter Sand/Salt Use & Storage

Any sand and/or salt to be used for de-icing purposes shall be stored inside or under cover and stabilized to prevent the discharge into nearby wetlands or waterbodies.

Emergency Contact Information

Owner/Operator:
Tri-Town School Union
Stephen Clifford
Director of Facilities
26 Middleton Road
Boxford, MA 01921

Engineer:
James Pearson, P.E.
Weston & Sampson, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978-532-1900

Attachment G - Construction Period Pollution and Erosion and Sedimentation Control Plan

Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan

SECTION 1: Introduction

The project applicant, the Town of Boxford, proposes a redevelopment project at the Harry Lee Cole School located at 26 Middleton Road in Boxford to improve site access and traffic circulation. Site work will include, but is not limited to grading, drainage, paving and landscaping.

As part of this project, this "Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan" has been created to ensure that onsite erosion is prevented and sediment is controlled to prevent it from leaving the site.

SECTION 2: Construction Period Pollution Prevention Measures

Best Management Practices (BMPs) will be utilized as Construction Period Pollution Prevention Measures to reduce potential pollutants and prevent any off-site discharge. The objectives of the BMPs for construction activity are to minimize the disturbed areas, stabilize any disturbed areas, control the site perimeter and retain sediment. Both erosion and sedimentation controls and non-stormwater best management measures will be used to minimize site disturbance and ensure compliance with the performance standards of the WPA and Stormwater Standards. Measures will be taken to minimize the area disturbed by construction activities to reduce the potential for soil erosion and stormwater pollution problems. All pollution prevention and erosion control measures which are required on the site plans and in the SWPPP shall be followed along with the guidance in this document. In addition, good housekeeping measures will be followed for the day-to-day operation of the construction site under the control of the contractor to minimize the impact of construction. This section describes the control practices that will be in place during construction activities. All recommended control practices will comply with the standards set in the MA DEP Stormwater Policy Handbook.

2.1 Minimize Disturbed Area and Protect Natural Features and Soil

In order to minimize disturbed areas all work will be completed within well-defined work limits. These work limits are shown on the construction plans. The Contractor shall not disturb native vegetation in the undisturbed wooded area without prior approval from the Engineer. The Contractor will be responsible to make sure that all workers know the proper work limits and do not extend their work into the undisturbed areas. The protective measures are described in more detail in the following sections.

2.2 Control Stormwater Flowing onto and through the project

All construction areas adjacent to drainage features will be lined with compost filter tubes and silt fence. The tubes and silt fence will be inspected daily and accumulated silt will be removed as appropriate. In addition, any storage of material will require a second level of protection by surrounding the areas with another row of compost filter tubes. A stabilized construction entrance/exit is proposed so that equipment visiting the site can remove any accumulated dirt and mud from vehicles to prevent tracking the mud onto public roads.

2.3 Stabilize Soils

The Contractor shall limit the area of land which is exposed and free from vegetation during construction. In areas where the period of exposure will be greater than two (2) months, mulching, the use of erosion control mats, or other protective measures shall be provided as specified.

The Contractor shall take account of the conditions of the soil where erosion control seeding will take place to ensure that materials used for re-vegetation are adaptive to the sediment control.

Following the completion of construction, embankment areas will be finished with topsoil and seed. Slopes in excess of 3H:1V will be stabilized with erosion matting to prevent erosion during the interim period in which vegetation is being established. The overland areas of the proposed construction staging areas will also be re-seeded.

2.4 Proper storage and cover of any stockpiles

The location of the Contractor's storage areas for equipment and/or materials shall be upon cleared portions of the job site or areas to be cleared as a part of this project and shall require written approval of the Engineer.

Adequate measures for erosion and sediment control such as the placement of compost filter tubes around the downstream perimeter of stockpiles shall be employed to protect any downstream areas from siltation.

The Engineer may designate a particular area or areas where the Contractor may store materials used in his operations.

2.5 Perimeter Controls and Sediment Barriers

Erosion control lines as described in Section 5 will be utilized to ensure that no sedimentation occurs outside the perimeter of the work area.

2.6 Storm Drain Inlet Protection

Storm drain inlets will be protected from sediment.

2.7 Retain Sediment On-Site

The Contractor will be responsible to monitor all erosion control measures. Whenever necessary the Contractor will clear all sediment from the compost filter tubes and silt fence that have been silted up during construction. Daily monitoring should be conducted using the attached Monitoring Form.

The following good housekeeping practices will be followed on-site during the construction project.

2.8 Material Handling and Waste Management

All materials stored on-site will be stored in a neat, orderly manner in appropriate containers. All materials will be kept in their original containers with the original manufacturer's label. Substances will not be mixed with one another unless recommended by the manufacturer.

All waste materials will be collected and stored in a securely lidded metal container from a licensed management company. The waste and any construction debris from the site will be hauled off-site daily and disposed of properly. The contractor will be responsible for all waste removal. Manufacturer's recommendations for proper use and disposal will be followed for all materials. Sanitary waste will be collected from the portable units a minimum of once a week, by a licensed sanitary waste management contractor.

2.9 Designated Washout Areas

The Contractor shall perform washout into contained areas designated for that purpose to prevent cement-laden water from leaving the site.

2.10 Proper Equipment/Vehicle Fueling and Maintenance Practices

On-site vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the risk of leakage. To ensure that leaks on stored equipment do not contaminate the site, oil-absorbing mats will be placed under all equipment during storage. Regular fueling and service of the equipment may be performed using approved methods and with care taken to minimize chance of spills. Any petroleum products will be stored in tightly sealed containers that are clearly labeled.

2.11 Equipment/Vehicle Washing

The Contractor will be responsible to ensure that no equipment is washed on-site.

SECTION 3: Spill Prevention and Control Plan

The Contractor will be responsible for preventing spills in accordance with the project specifications and applicable federal, state and local regulations. The Contractor will identify a properly trained site employee, involved with the day-to-day site operations to be the spill prevention and cleanup coordinator. The name(s) of the responsible spill personnel will be posted on-site. Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator.

3.1 Spill Control Equipment

Spill control/containment equipment will be kept in the Work Area. Materials and equipment necessary for spill cleanup will be kept either in the Work Area or in an otherwise accessible on-site location. Equipment and materials will include, but not be limited to, absorbent booms/mats, brooms, dust pans, mops, rags, gloves, goggles, sand, plastic and metal containers specifically for this purpose. It is the responsibility of the Contractor to ensure the inventory will be readily accessible and maintained.

3.2 Notification

All workers will be directed to inform the on-site supervisor of a spill event. The supervisor will assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures. Primary notification of a spill should be made to the local Fire Department and Police Departments. Secondary Notification will be to the certified cleanup contractor if deemed necessary by Fire and/or Police personnel. The third level of notification is to the DEP. The specific cleanup contractor to be used will be identified by the Contractor prior to commencement of construction activities.

3.3 Spill Containment and Clean-Up Measures

Spills will be contained with granular sorbent material, sand, sorbent pads, booms or all of the above to prevent spreading. Certified cleanup contractors should complete spill cleanup. The material manufacturer's recommended methods for spill cleanup will be clearly posted and on-site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

3.4 Hazardous Materials Spill Report

The Contractor will report and record any spill. The spill report will present a description of the release, including the quantity and type of material, date of the spill, circumstances leading to the release, location of spill, response actions and personnel, documentation of notifications and corrective measures implemented to prevent reoccurrence.

This document does not relieve the Contractor of the Federal reporting requirements of 40 CFR Part 110, 40 CFR Part 117, 40 CFR Part 302 and the State requirements specified under the Massachusetts Contingency Plan (M.C.P) relating to spills or other releases of oils or hazardous substances. Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a twenty-four (24) hour period, the Contractor is required to comply with the response requirements of the above mentioned regulations. Spills of oil or hazardous material in excess of the reportable quantity will be reported to the National Response Center (NRC).

SECTION 4: Contact Information/Responsible Parties

Owner/Operator:
Tri-Town School Union
Stephen Clifford
Director of Facilities
26 Middleton Road
Boxford, MA 01921
978-887-0771

Engineer:
James Pearson, P.E.
Weston & Sampson, Inc.
55 Walkers Brook Drive, Suite 100
Reading, MA 01867
978-532-1900

Site Inspector:
TBD

Contractor:
TBD

SECTION 5: Erosion and Sedimentation Control

Erosion and Sedimentation Controls are shown on the project plans. A Stormwater Pollution Prevention Plan (SWPPP) will be required for this project in accordance with EPA regulations. The contractor shall refer to the SWPPP for additional requirements.

SECTION 6: Site Development Plans

A full set of site development plans are included with this submittal.

SECTION 7: Operation and Maintenance of Erosion Control

If there is a failure to the controls the Contractor, under the supervision of the Engineer, will be required to stop work until the failure is repaired.

Periodically throughout the work, whenever the Engineer deems it necessary, the sediment that has been deposited against the controls will be removed to ensure that the controls are working properly.

SECTION 8: Inspection Schedule

During construction the erosion and sedimentation controls will be inspected daily. Once the Contractor is selected, an on site inspector will be selected to work closely with the Engineer to insure that all erosion and sedimentation controls are in place and working properly. An Inspection Form is included.

Inspection Form

Inspected By:______________________________ Date: ________Time:________

YES	NO	DOES NOT APPLY	ITEM
			Do any erosion/siltation control measures require repair or clean out to maintain adequate function?
			Is there any evidence that sediment is leaving the site and entering the wetlands?
			Are any temporary soil stockpiles or construction materials located in non-approved areas?
			Are on-site construction traffic routes, parking, and storage of equipment and supplies located in areas not specifically designed for them?
			Is there any evidence that sediment is entering subsurface stormwater chamber systems?

Specific location, current weather conditions, and action to be taken:

____

____

____

____

____

____

Other Comments:

____

____

____

Pending the actions noted above I certify that the site is in compliance with the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan.

Signature:________________________________Date: ______________________

Attachment H - Operations and Maintenance Plan

1.0 Introduction

The following document has been written to comply with the stormwater guidelines set forth by the Massachusetts Department of Environmental Protection (MassDEP). The intent of these guidelines is to encourage Low Impact Development techniques to improve the quality of the stormwater runoff. These techniques, also known as Best Management Practices (BMPs) collect, store, and treat the runoff before discharging to adjacent environmental resources.

2.0 Purpose

This Operation and Maintenance Plan (O&M Plan) is intended to provide a mechanism for the consistent inspection and maintenance of each BMP installed on the project site. Included in this O&M Plan is a description of each BMP type and an inspection form for each BMP. The Town of Boxford is the owner and operator of the system and is responsible for its upkeep and maintenance. This work will be funded on an annual basis through the owner's operating budget.

In the event the Owner sells the property, it is the Owner's responsibility to transfer this plan as well as the design plans, shop drawings, as-built plans, and past three years of operation and maintenance records to the new property owner.

3.0 BMP Description and Locations

3.1 Street Sweeping

Street sweeping consists of using a sweeper machine to clean impervious areas of accumulated sediment, debris, and trash at paved areas.

3.2 Deep Sump Catch Basins

Deep sump catch basins utilizing catch basin hoods will be located throughout the site and used as pre-treatment before entering the infiltration systems or other Town stormwater infrastructure. The deep sump catch basins are designed to remove trash, debris, hydrocarbons, and coarse sediment from the stormwater runoff.

3.3 Stormtech Isolator Row

The subsurface chamber systems will contain a Stormtech Isolator Row for TSS removal. The Isolator Row consists of Stormtech stormwater chambers wrapped in geotextile fabric.

3.4 Stormtech Subsurface Chamber System

The subsurface chamber systems use infiltration or detention to mitigate peak runoff rates from the site. The structure also significantly mitigates TSS.

3.5 Outlet Control Structure

The outlet control structures are used to control discharges from captured stormwater. They release the water in a controlled manner to control peak discharges.

3.6 Drain Manholes

Drain Manholes will be located throughout the site and used to convey and redirect stormwater collected from deep sump catch basins. They allow for access, connection points, and change-in-direction points in the underground drainage system.

3.7 Bioretention Area

Bioretention areas mitigate peak runoff rates and filter stormwater to provide treatment, significantly reducing TSS as well as phosphorus, nitrogen and heavy metals. The bioretention area also includes pre-treatment devices to reduce TSS prior to entering the ponding area.

4.0 Inspection, Maintenance Checklist and Schedule

4.1 Street Sweeping

Street sweeping shall be performed on all impervious surfaces on a quarterly average, with sweeping performed primarily in the spring and fall. Street sweeping shall be performed using a high efficiency vacuum street sweeping machine or a regenerative air sweeper. A mechanical rotary broom sweeper may be used if sweeping is performed on a monthly basis.

In the event of contamination by a spill or other means, all street sweeping cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000 and handled as hazardous waste.

In the absence of evidence of contamination, street sweeping cleanings may be taken to a landfill or other facility permitted by MassDEP to accept Solid Waste without any prior approval by MassDEP. Please note that current MassDEP regulations prevent landfills from accepting materials that contain free-draining liquids.

4.2 Deep Sump Catch Basins and Outlet Control Structures

Inspect and/or clean catch basin and outlet control structures at least four times per year and at the end of foliage and snow removal seasons. Sediments must be removed 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. The structures should be cleaned a minimum of four times per year regardless of the amount of sediment in the basin. If catch basins are found to be filled to capacity with sediment during a cleaning, the frequency of cleaning shall be increased. Catch basins and outlet control structures shall be cleaned with clamshell buckets or by hand tools where necessary. Catch basin hoods shall be inspected annually. Open and close the access hatch and flush or rod the anti-siphon device to ensure proper operation.

In the event of contamination by a spill or other means, all cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000 and handled as hazardous waste.

In the absence of evidence of contamination, catch basin cleanings may be taken to a landfill or other facility permitted by MassDEP to accept Solid Waste without any prior approval by MassDEP. Please note that current MassDEP regulations prevent landfills from accepting materials that contain free-draining liquids.

4.3 Stormtech Isolator Row

Stormtech Isolator Rows shall be inspected every six months for the first year, then timed thereafter based upon the depth of sediment build up witnessed in the previous inspections. Inspection ports shall be located strategically throughout the isolator row system. When sediment is observed, the depth shall be recorded with a stadia rod, and when that average depth across the chambers reaches 3-inches, the system shall be cleaned out.

Cleaning is performed through the Jet-vac process whereby the chambers are washed with a high-pressure water system and the captured pollutants are then vacuumed out.

Refer to the attached Stormtech Isolator Row Operations and Maintenance document for additional information.

4.4 Stormtech Subsurface Chamber System

Stormtech subsurface chambers shall be inspected every three months for the first year, then timed thereafter based upon the depth of sediment build up witnessed in the previous inspections. Inspection ports shall be located strategically throughout the isolator row system. When sediment is observed, the depth shall be recorded with a stadia rod, and when that average depth across the isolator row reached 3-inches, the system shall be cleaned out.

Cleaning is performed through the Jet-vac process whereby the isolator chambers are washed with a high-pressure water system and the captured pollutants are then vacuumed out.

Refer to the attached Stormtech Operations and Maintenance document for additional information.

4.5 Drain Manholes

Inspect and/or clean drain manholes at least four times per year while inspecting the catch basins. Remove all accumulated sediments and debris, and dispose of in accordance with local, state, and federal regulations. Drain Manholes shall be cleaned with clamshell buckets or by hand tools where necessary.

In the event of contamination by a spill or other means, all cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000 and handled as hazardous waste.

In the absence of evidence of contamination, manhole cleanings may be taken to a landfill or other facility permitted by MassDEP to accept Solid Waste without any prior approval by MassDEP. Please note that current MassDEP regulations prevent landfills from accepting materials that contain free-draining liquids.

4.6 Inspections and Record Keeping

- An inspection form should be filled out each and every time maintenance work is performed.

- A binder should be kept at the facility that contains all of the completed inspection forms and any other related materials.

- A review of all Operation & Maintenance actions should take place annually to ensure that these Stormwater BMPs are being taken care of in the manner illustrated in this Operation & Maintenance Plan.

- All operation and maintenance log forms for the last three years, at a minimum, shall be kept on site at the facility.

- The inspection and maintenance schedule may be refined in the future based on the findings and results of this operation and maintenance program or policy.

4.7 Bioretention Area

Premature failure of bioretention areas is a significant problem caused by lack of regular maintenance. Careful attention must be paid while plantings are being established and seasonal landscaping maintenance is required thereafter. Maintenance shall be conducted in accordance with the following schedule:

Activity	Time of Year	Frequency
Inspect & remove trash	Year round	Monthly
Mulch	Spring	Annually
Remove dead vegetation	Fall or Spring	Annually
Replace dead vegetation	Spring	Annually
Prune	Spring or Fall	Annually
Replace entire media & all vegetation	Late Spring/early Summer	As needed*

*Paying careful attention to pretreatment and operation & maintenance can extend the life of the soil media

Basin inspection should include checking for rilling, gullying and other signs of erosion. When encountered, repairs shall be made immediately. Debris and litter should be removed while inspecting for erosion.

Care must be taken to maintain the plants in the basin. Salt use must be restricted where runoff flows to the bioretention areas to maintain the plantings.

Pre-treatment for the bioretention area includes a stone diaphragm and a grassed filter strip. The stone diaphragm must be cleaned of debris on a monthly basis and also checked for sediment accumulation annually or whenever excessive ponding is witnessed. The stone must be removed from the trench, and all sediment removed by hand. Grassed filter strips should be checked for rilling, gullying and erosion. When encountered, repair immediately. Remove all litter and debris and mow on a regular basis while performing regular landscape maintenance.

5 Stormwater Management System Owner/Responsible Party

The stormwater management system shall be owned and maintained by the following party or its future designee/assigns:

Tri-Town School Union
Stephen Clifford – Director of Facilities
26 Middleton Road
Boxford, MA 01921

This operation and Maintenance Plan will be recorded with the registry of deeds so that current and future owners are aware of the requirement for proper operation and maintenance of the onsite stormwater system.

6 General Good Housekeeping Practices

All non-hazardous waste shall be stored in designated trash or recycling containers onsite for periodic collection by the local trash collector. The owner shall have maintenance staff who monitor the site for the accumulation of trash. Any trash that is seen onsite shall immediately be collected and placed into designated trash or recycling containers. The owner's maintenance staff shall make an inspection of the site once per week at minimum.

7 Estimated Operations and Maintenance Budget

The estimated budget for annual operations and maintenance of this stormwater system is $2,000 per year.

Harry Lee Cole School
Permanent BMP Inspection Checklist

Street Sweeping

Frequency: Quarterly average, primarily in the spring and fall if using a high efficiency vacuum sweeper or regenerative air sweeper. Monthly, if using a mechanical rotary broom sweeper.

Location: Parking Areas, Driveways and Roadway

Inspected By: __________________ Date: _____________

Observations: _____________________________________
____
____

Actions Taken: _____________________________________
____
____

Instructions: Sweep all impervious areas, including parking lots, driveways, and roadways using high efficiency vacuum street sweeping machine, regenerative air sweeper, or mechanical rotary broom sweeper. All trash, debris, and sediments should be disposed of in accordance with local, state, and federal regulations.

Deep Sump Catch Basins & Outlet Control Structures

Frequency:	Inspect and clean deep sump catch basins and outlet control structures in March, June, September and December.
Structure Number:	______________________________
Inspected By:	______________ Date: __________
Observations:	______________________________ ______________________________ ______________________________
Actions Taken:	______________________________ ______________________________ ______________________________
Instructions:	Clean units four times per year or whenever the depth of the deposits is greater than or equal to one half the depth from the bottom of the invert to the lowest pipe in the structure. Open and close hood and check anti-siphon vent for clogging.

Subsurface Chamber System & Isolator Row

Frequency: Inspect and clean chamber system and isolator row every six months for the first year and annually thereafter.

Structure Number: ____________________________________

Inspected By: __________________ Date: _____________

Observations: ____________________________________
____
____

Actions Taken: ____________________________________
____
____

Instructions: Clean the system whenever the depth of the deposits averages three inches in depth across the bottom of the chambers. Inspect chambers via manholes or inspection ports. Use reverse water jet to pull sediment back into manhole. Remove sediment, trash and debris as noted above. Refer to StormTech maintenance documentation on isolator rows for more information.

Drain Manholes

Frequency: Inspect and clean drain manholes in March, June, September and December.

Structure Number: ____________________________________

Inspected By: __________________ Date: _____________

Observations: ____________________________________
____
____

Actions Taken: ____________________________________
____
____

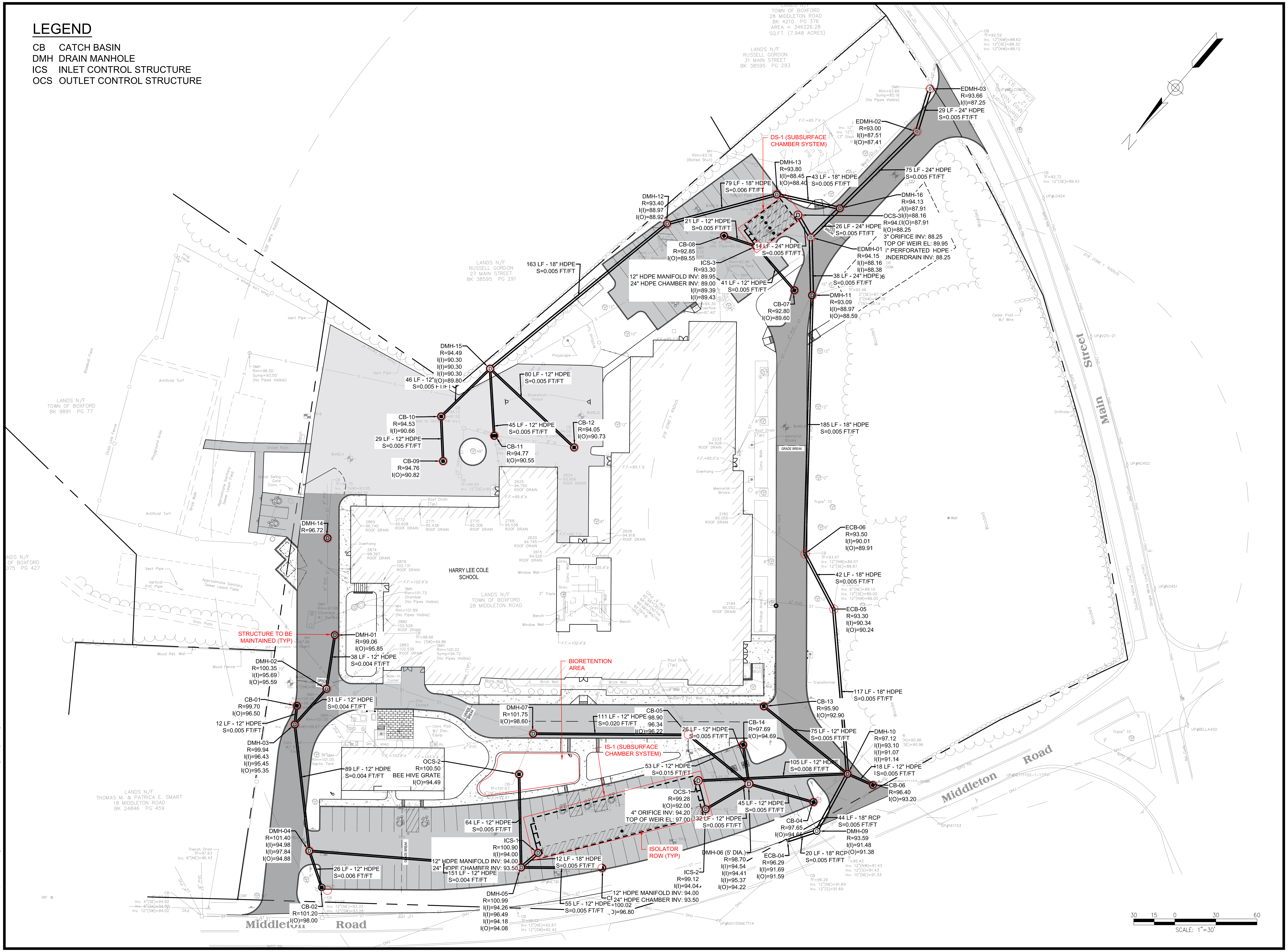
Instructions: Clean units four times per year at a minimum, or whenever catch basins are inspected. Remove sediment and debris. All debris, and sediments should be disposed of in accordance with local, state, and federal regulations. Drain Manholes shall be cleaned with clamshell buckets or by hand tools where necessary.

Bioretention Area & Pre-treament Devices

Frequency:	Inspect and clean monthly. Perform seasonal landscaping maintenance twice a year.
Structure Number:	________________________________
Inspected By:	_______________ Date: ___________
Observations:	________________________________ ________________________________ ________________________________
Actions Taken:	________________________________ ________________________________ ________________________________
Instructions:	Remove accumulated trash and debris. Remove sediment and re-mulch bare spots as needed in basin. Inspect pipe inlets for damage, erosion or blockage, remove blockage as needed, repair erosion where needed. Remove and replace dead vegetation and prune as needed. Mow the grassed filter strip at a minimum of once a month while removing trash and debris. On an annual basis, or when excessive ponding is witnessed, remove sediment from the stone strip/diaphragm. All stone must be removed from the trench and sediment removed by hand. All trash, debris, and sediments should be disposed of in accordance with local, state, and federal regulations.

LEGEND

CB	CATCH BASIN
DMH	DRAIN MANHOLE
ICS	INLET CONTROL STRUCTURE
OCS	OUTLET CONTROL STRUCTURE



Project:
BOXFORD PUBLIC SCHOOLS SITE RENOVATION PROJECT

TOWN OF BOXFORD INCORPORATED 1685 MASSACHUSETTS

TOWN OF BOXFORD
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StormTech®
Detention • Retention • Water Quality
An ADS company

Isolator® Row O&M Manual

*THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™*

THE ISOLATOR® ROW

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

THE ISOLATOR ROW
The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

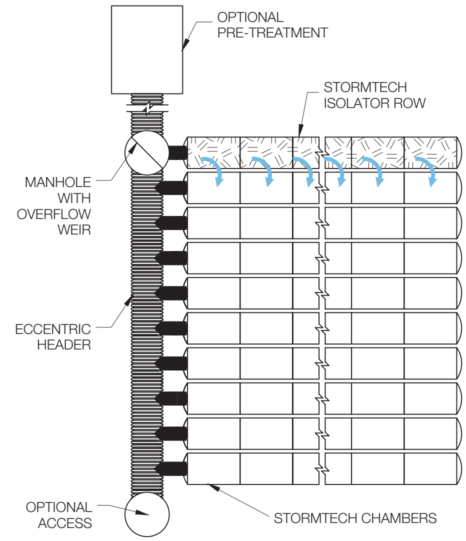
The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed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

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

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

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

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

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

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

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

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

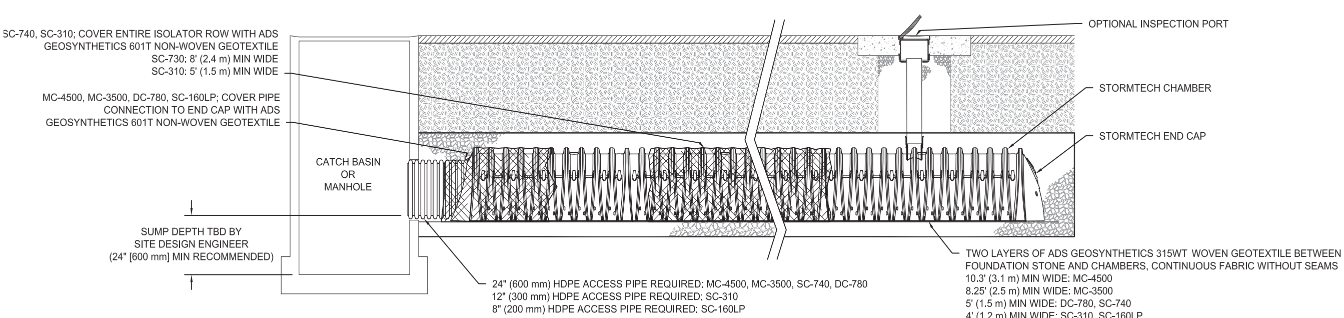
MAINTENANCE

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

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

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.

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

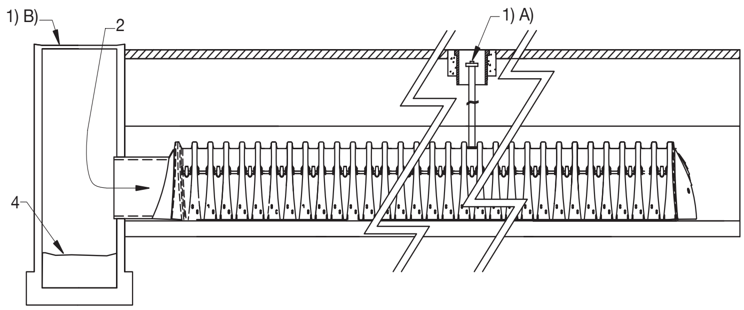
B) All Isolator Rows
  i. Remove cover from manhole at upstream end of Isolator Row
  ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering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

STEP 2
Clean out Isolator Row using the JetVac process.

A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
B) Apply multiple passes of JetVac until backflush water is clean
C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings: Fixed point to chamber bottom (1)	Stadia Rod Readings: Fixed point to top of sediment (2)	Sediment Depth (1)–(2)	Observations/Actions	Inspector
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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Detention • Retention • Water Quality
A division of ADS

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4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

Attachment I – Illicit Discharge Compliance Statement

Illicit Discharge Compliance Statement

Section I – Purpose/Intent

The purpose of this document is to provide for the health, safety, and general welfare of the citizens of Massachusetts through the regulation of non-stormwater discharges into existing outstanding resource areas near the site to the maximum extent practicable, as required by federal and state law. To the best of our knowledge and belief, there are no illicit discharges occurring under existing conditions on this site within the meaning expressed under Standard 10 of the Massachusetts Stormwater Handbook. This document establishes methods for controlling the introduction of pollutants into existing outstanding resource areas to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process.

Section II - Definitions

For the purposes of this statement, the following shall mean:

Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, general good housekeeping practices, pollution prevention and educational practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants directly or indirectly to stormwater, receiving waters, or stormwater conveyance systems. BMPs also include treatment practices, operating procedures, and practices to control site runoff, spillage or leaks, sludge or water disposal, or drainage from raw materials storage.

Clean Water Act: The federal Water Pollution Control Act (33 U.S.C § 1251 et seq.), and any subsequent amendments thereto.

Construction Activity: Activities subject to the Massachusetts Erosion and Sedimentation Control Act or NPDES Construction Permits. Such activities include but are not limited to clearing and grubbing, grading, excavating, and demolition.

Hazardous Materials: Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Illegal Connection: An illegal connection is defined as either of the following:

a. Any pipe, open channel, drain or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the outstanding resource area including but not limited to any conveyances which allow any non-stormwater discharge including sewage, process wastewater, and wash water, regardless of whether said drain or connection has been previously allowed, permitted, or approved by an authorized enforcement agency; or
b. Any pipe, open channel, drain or conveyance connected to the Town of Boxford storm water treatment system which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Illicit Discharge: Any direct or indirect non-stormwater discharge to the Town of Boxford stormwater treatment system, except as exempted in Section III of this ordinance.

Industrial Activity: Activities subject to NPDES Industrial Permits as defined in 40CFR, Section 122.26 (b) (14).

National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit: A permit issued by MassDEP under authority delegated pursuant to 33 USC § 1342 (b) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Town of Boxford Stormwater Treatment System: Any facility, owned or maintained by the Town of Boxford, designed or used for collecting and/or conveying stormwater, including but not limited to roads with drainage systems, Town of Boxford streets, curbs, gutters, inlets, catch basins, piped storm drains, pumping facilities, infiltration, retention and detention basins, natural and man-made or altered drainage channels, reservoirs, and other drainage structures.

Non-Stormwater Discharge: Any discharge to the storm drain system that is not composed entirely of stormwater.

Person: Any individual, association, organization, partnership, firm, joint venture, public or private corporation, trust, estate, commission, board, public or private institution, utility, cooperative, city, county or other political subdivision of the State, interstate body, or any other legal entity.

Pollutant: Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; petroleum hydrocarbons; automotive fluids; cooking grease; detergents (biodegradable or otherwise); degreasers; cleaning chemicals; non-hazardous liquid and solid wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; liquid and solid wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; concrete and cement; and noxious or offensive matter of any kind.

Pollution: Contamination or other alteration of any water's physical, chemical, or biological properties by addition of any constituent including but not limited to a change in temperature, taste, color, turbidity, or odor of such waters, or the discharge of any liquid, gaseous, solid, radioactive, or other substance into any such waters as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to the public health, safety, welfare, or environment, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

Premises: Any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Stormwater: Any surface flow, runoff, and drainage consisting entirely of water from any form of natural precipitation and resulting from such precipitation.

Wastewater: Any water or other liquid discharged from a facility, that has been used, as for washing, flushing, or in a manufacturing process, and so contains waste products.

Section III - Prohibitions

Prohibition of Illicit Discharges:

No person shall throw, drain, or otherwise discharge, cause or allow others under its control to throw, drain, or otherwise discharge into the Town of Boxford stormwater treatment system or watercourses any materials, including but not limited to, any pollutants or waters containing any pollutants, other than stormwater. It is to the best knowledge and belief of the project proponent that no illicit discharges currently exist at the project site. The commencement, conduct or continuance of any illicit discharge to the storm drain system is prohibited except as described as follows:

1. Water line flushing performed by a government agency, other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, natural riparian habitat or wetland flows, and any other water source not containing pollutants;

2. Discharges or flows from fire fighting, and other discharges specified in writing by the Town of Boxford as being necessary to protect public health and safety;

3. Dye testing is an allowable discharge, but requires notification to the Town of Boxford prior to the time of the test;

4. Any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for a discharge to the Town of Boxford stormwater treatment system.

Section IV - Industrial or Construction Activity Discharges

Any person subject to an industrial or construction activity NPDES stormwater discharge permit shall comply with all provisions of such permit. Proof of compliance with said permit may be required in a form acceptable to the Town of Boxford prior to allowing discharges to the Town of Boxford stormwater treatment system.

Section V - Notification of Spills and Accidental Discharges

Notwithstanding other requirements of law, as soon as any person responsible for a facility, activity or operation, or responsible for emergency response for a facility, activity or operation has information of any known or suspected release of pollutants or non-stormwater discharges from that facility, activity, or operation which are resulting or may result in illicit discharges or pollutants discharging into stormwater, the Town of Boxford stormwater treatment system, State Waters, or Waters of the U.S., said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release so as to minimize the effects of the discharge. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the Town of Boxford in person or by phone no later than the next business day, including the nature, quantity and time of occurrence of the discharge. Notifications in person or by phone shall be confirmed by written notice, via certified mail return receipt requested addressed to the Town of Boxford within three (3) business days of the initial notice. If the discharge of prohibited materials emanates from a commercial or industrial establishment, the owner or operator of such establishment shall also retain an on-site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

IN WITNESS WHEREOF the parties hereto have executed copies of this Agreement on the ______ day of **____________________, ______.**

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