STORMWATER MANAGEMENT REPORT

Proposed Light Industrial Development
Maple Street
Bellingham, Massachusetts 02019

Prepared for:

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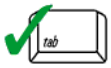
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

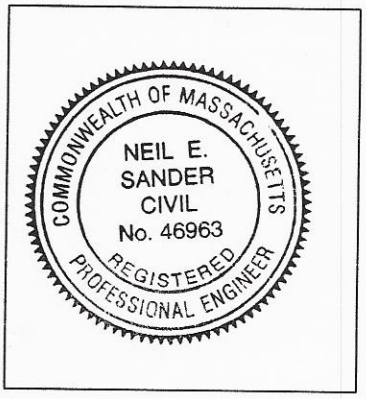
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



Neil E. Sander 2/11/24
Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

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

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

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

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

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

TABLE OF CONTENTS

INTRODUCTION

Independence Engineering, LLC (Independence) has completed a drainage analysis for the proposed light industrial development of Map 37, Lots 3 and 3A, located south of Interstate 495 and on the western side of Maple Street in Bellingham, Massachusetts, herein referred to as the "Site". The purpose of this analysis is to quantitatively understand the impacts of the proposed development of the site on the existing hydrologic conditions and to mitigate said impacts through the implementation of a stormwater management system that utilizes best management practices, is supported by an Operations and Maintenance Plan, and a Long-term Pollution Prevention Plan.

STORMWATER MANAGEMENT SYSTEM OVERVIEW

Independence has prepared this stormwater management report for the proposed project which will be located on undeveloped lots (Map 37, lots 3 and 3A) and will therefore be required to fully meet all of the stormwater standards. The proposed stormwater management system (SMS) consists of an inlet Stormceptors, roof leaders, subsurface infiltration basins, and a flared end section with rip rap scour protection.

Stormwater runoff from the majority of impervious areas will be conveyed though inlet Stormceptors, then to subsurface infiltration systems and either infiltrated or discharged through a flared end section with rip rap scour protection towards existing bordering vegetated wetland areas. The Stormceptors will promote total suspended solid (TSS) removal at approximately 86%-91%. The subsurface infiltration systems are sized to accommodate flow from the 100-year storm event, provide water treatment and attenuate the proposed peak flow rates below those of the existing conditions at all discharge points for all storm events. The subsurface infiltration facilities have been designed to accommodate and route the runoff for the 2, 10, 25, and 100-year storm events. The outlet is equipped with a flared end section that discharges into rip rap scour protection with a center plunge pool.

From an environmentally sensitive perspective, the proposed stormwater management system components and structural best management practices (BMPs) result in a low impact design that will attenuate peak flows, provide the required amount of water quality treatment volume, and promote groundwater recharge.

METHODOLOGY

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

Design Point - is the point of analysis for a catch or subcatchment area. This point must be a common point for both the existing and proposed (pre/post development) areas.

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

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

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

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

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

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

Rainfall Amounts – The following rainfall amounts were taken from TR-40 and are utilized in the hydraulic analysis of the Site.

Table 1

24-Hour Rainfall Totals

24-HOUR (TYPE III) RAINFALL AMOUNT (INCHES)				
2-Year	10-Year	25-Year	50-Year	100-Year
3.27	4.94	6.26	N/A	8.99

EXISTING CONDITIONS

Independence compiled existing drainage areas from the existing topographic survey. A site visit was conducted to evaluate the existing drainage patterns and watershed areas for the site and the areas surrounding the site. The Site currently consists of dense brush, ledge outcroppings and forested areas and topography generally slopes from the center of the site to the east toward Maple Street and to the west towards the unnamed perennial stream with a wide range of flat to steep grades towards the stream and Maple Street.

The NRCS soil survey map for the area indicates that the site is made of multiple soil types. Please refer to Table 2 and the follow-up descriptions for a summary of these soils and their general characteristics.

Table 2

Existing Soil Classifications

SOIL MAP UNIT	BRISTOL COUNTY - NORTHERN PART SOIL SURVEY MAP UNIT NAME AND DESCRIPTION	HYDROLOGIC SOIL GROUP
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	D
52	Freetown Muck, 0 to 1 percent slopes	D
104D	Hollis-Rock outcrop-Charlton complex, 15 to 35 percent slopes	C
654	Udorthents, loamy	C

10 - Scarboro and Birdsall soils, 0 to 3 percent slopes

These are deep, nearly level, very poorly drained soils in low, flat areas and in depressions on glacial outwash plains and terraces. Some areas are mostly Scarboro soils, some are mostly Birdsall soils, and some areas consist of both soils. Areas of these soils are irregular in shape and range from 6 to 50 acres. The Scarboro and Birdsall soils were mapped together because they are similar in use and management. The total acreage of this map unit is about 65 percent Scarboro soils, 15 percent Birdsall soils, and 20 percent other soils. Slopes range from 0 to 3 percent.

Typically, the surface layer of the Scarboro soils is black muck about 9 inches thick. The substratum is gray coarse sand to a depth of 60 inches or more. In some areas the substratum has more gravel or more silt.

Typically, the surface layer of the Birdsall soils is very dark gray very fine sandy loam about 8 inches thick. The subsoil is very fine sandy loam about 8 inches thick. It is light olive gray in the upper part and is gray and has faint mottles in the lower part. The substratum is gray, stratified very fine sand and silt to a depth of 60 inches or more. In some areas the substratum is greenish gray.

Included with this unit in mapping are small areas of Swansea soils in landscape positions similar to those of the Scarboro and Birdsall soils. Also included are small areas of Raynham and Walpole soils in slightly higher, convex positions. Included areas make up about 10 percent of the map unit.

Soil properties:

Permeability: Scarboro soils-Rapid or very rapid; Birdsall soils-Moderately slow.

Available water capacity: Scarboro soils-Low; Birdsall soils-High.

Soil reaction: Scarboro soils-Very strongly acid to moderately acid throughout; Birdsall soils-Very strongly acid to moderately acid throughout.

Depth to bedrock: Scarboro soils-More than 60 inches; Birdsall soils-More than 60 inches.

Depth to the seasonal high water table: Scarboro soils-1 foot above to 1 foot below the surface: Birdsall soils-0 to 1.0 foot.

Hydrologic group: Both Scarboro and Birdsall soils-D.

52 - Freetown muck, ponded, 0 to 1 percent slopes

This is a very deep, nearly level very poorly drained, organic soil in depressions and along streams and rivers. Areas are irregular in shape and range from 6 to 500 acres. Typically, the surface layer is black muck about 13 inches thick. The subsurface layer is dark brown and black muck about 16 inches thick. The bottom layer is black muck to a depth of 60 inches or more.

Included with this soil in mapping are a few small areas of Scarboro and Swansea soils near the edges of the unit. Also included are a few ponded areas. Included areas make up about 15 percent of this map unit.

Soil properties:

Permeability: Moderate or moderately rapid.

Available water capacity: Very high.

Soil reaction: Extremely acid.

Depth to bedrock: More than 60 inches.

Depth to the seasonal high water table: 0 to 1 foot below the surface.

Hydrologic group: D.

104D - Hollis-Rock outcrop-Charlton complex, 15 to 35 percent slopes

This map unit consists of moderately steep soils and areas of exposed bedrock on hills and ridges where relief is controlled by the underlying bedrock. In a typical area it is about 30 percent Hollis soil. 30 percent Rock outcrop, 25 percent Charlton soil, and 15 percent other soils. The soils and areas of exposed bedrock in this complex are intermingled so closely that it was not practical to separate them in mapping at the scale used for mapping. The shallow, somewhat excessively drained Hollis soil is on the tops of ridges or is near rock outcrops. The very deep, well drained Charlton soil is on side slopes and foot slopes. Stones and boulders 10 inches to 1 0 feet in diameter cover 0 to 15 percent of the surface. Areas are irregular in shape and range from 6 to 150 acres.

Typically, the surface layer of the Hollis soil is black fine sandy loam about 2 inches thick. The subsoil is dark yellowish brown fine sandy loam about 11 inches thick. Bedrock is at a depth of 14 inches. In some areas the substratum is pale yellow fine sandy loam. The bedrock is granite. basalt, diorite. or conglomerate.

Typically. the surface layer of the Charlton soil is black fine sandy loam about 1 inch thick. The subsurface layer is dark brown fine sandy loam about 5 inches thick. The subsoil is yellowish brown fine sandy loam about 30 inches thick. The substratum is light brownish gray sandy loam to a depth of 60 inches or more. In some areas the surface layer is very fine sandy loam. In some areas the subsoil is redder.

Included with this complex in mapping are small areas of moderately deep soils and areas of Canton soils on side slopes. Also included are small areas of seeps or wet pockets. Stones and boulders cover 1 to 15 percent of the surface. Included areas make up about 10 percent of the map unit.

Soil properties:

Permeability: Moderate or moderately rapid throughout in both Hollis and Charlton soils.

Available water capacity: Hollis soil-low; Charlton soil-moderate.

Soil reaction: Hollis soil-very strongly acid or strongly acid; Charlton soil-very strongly acid to moderately acid.

Depth to bedrock: Hollis soil-10 to 20 inches; Charlton soil-more than 60 inches.

Depth to the seasonal high water table: More than 6 feet in both Hollis and Charlton soils.

Hydrologic group: Hollis-C/D; Charlton-B.

654 - Udorthents, loamy

This map unit consists of nearly level and gently sloping areas where the original soils have been cut away or covered with a loamy fill material. Most areas have been graded to a smooth surface. Areas are dominantly on uplands but are in almost every landscape position. Areas range in size from 6 to 200 acres. Slopes are smooth or irregular, and range from D to 25 percent but are dominantly D to 5 percent.

Where the original soil has been cut away, Udorthents. loamy, typically consist of the exposed substrata of Boxford, Charlton, Newport, Paxton, Pittstown, or Woodridge soils. In areas that have been filled they consist of several soils or of one soil removed from an adjacent cut. Areas have a loamy texture, dominantly fine sandy loam. The soils in these areas are slightly darker in the uppermost 6 to 10 inches than in the underlying material, and they resemble topsoil. In many areas the fill is compact and firm when dry. Most of these areas have grass vegetation. Some areas on slopes of 15 to 25 percent do not have a vegetative cover because of erosion.

Included with this map unit are areas of Udorthents, sandy, near abandoned gravel pits and Udorthents, wet substratum, on wetlands. Also included are small areas of Urban land. These included areas make up about 20 percent of the map unit.

Soil properties:

Permeability: Moderate to slow to a depth of 10 inches and rapid to very slow below that depth.

Available water capacity· Low or moderate.

PROPOSED CONDITIONS

The proposed development consists of a 19,525 square foot industrial style building, parking and loading areas, associated utilities and grading, three proprietary treatment devices and two subsurface infiltration systems with a flared end section with scour protection and a center plunge pool.

STORMWATER MANAGEMENT STANDARDS REVIEW

As part of this drainage analysis, Independence has performed an in-depth review of the subject site for conformance with the Massachusetts Department of Environmental Protection's Stormwater Management Standards. The project is considered a development project (as defined in Standard 7) and is therefore required to meet all of the Stormwater Management Standards and improve upon existing conditions. The following is a summary of our findings relative to our review of each of the standards. Please note that the actual text of each standard is italicized for clarity.

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

The majority of impervious areas will drain to inlet Stormceptors which will provide pretreatment and TSS removal prior to recharge or discharge to the adjacent wetland areas.

The outlet to the adjacent wetlands will be equipped with a flared end section with scour protection and center plunge pool, which will dissipate flows over a larger area which slows down the velocity and therefore reduces scour, which will also enhance sediment removal prior to discharge.

STANDARD 2: *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

The pre and post development hydraulic conditions for the project Site were analyzed for the 2, 10, 25 and 100-year Type III 24-hour storm events using the aforementioned methodology (please refer to appendices A and B of this report for HydroCAD output support data). Based on these results, there is no increase in peak discharge rates for all storm events analyzed (refer to Table 3).

Table 3

Peak Rate of Runoff

Wetlands Subcatchment Area

Storm Frequency (in years)	Existing Conditions Peak Runoff (CFS)	Proposed Conditions Peak Runoff (CFS)	Percent Change Peak Runoff
2	3.65	3.09	-15.3%
10	6.58	6.25	-5.0%
25	8.93	8.63	-3.4%
100	13.78	11.75	-14.7%

Roadway Subcatchment Area

Storm Frequency (in years)	Existing Conditions Peak Runoff (CFS)	Proposed Conditions Peak Runoff (CFS)	Percent Change Peak Runoff
2	1.49	1.23	-17.5%
10	3.05	2.03	-33.4%
25	4.35	2.49	-42.8%
100	7.10	3.32	-53.2%

Off-Site Subcatchment Area

Storm Frequency (in years)	Existing Conditions Peak Runoff (CFS)	Proposed Conditions Peak Runoff (CFS)	Percent Change Peak Runoff
2	0.44	0.15	-65.9%
10	0.95	0.29	-69.5%
25	1.39	0.38	-72.5%
100	2.34	0.53	-77.4%

STANDARD 3: *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

Standard 3 requires that a minimum volume of stormwater be recharged into the ground on site. The calculated total is dependent on existing soil types and the total square feet of impervious area over each soil type. The required infiltration is achieved via proposed subsurface infiltration systems, which infiltrate 144 CF during the most intense 2 hours of a 2-year storm and 6,913 CF over the duration of this storm. Infiltration totals increase as rainfall intensities increase for the less frequent storms. Please refer to Table 4 for a summary of the calculated required minimum recharge.

Table 4
Required Minimum Recharge to Groundwater

Hydrologic Group	Volume of Recharge (inches/SF)	Total Impervious Area (SF)	Required Recharge Volume (CF)
A	0.60	N/A	N/A
B	0.35	N/A	N/A
C	0.25	44,200	921
D	0.10	N/A	N/A
	Total Required Minimum Recharge Volume:		**921 CF**
	Ratio of Total Impervious to Total Treated Impervious:		**1.11**
	Total Adjusted Minimum Recharge Volume:		**1,025 CF**

Of the total proposed impervious area, a minimum of 65% must be directed into the proposed recharge areas. The project consists of a total of 44,200 square feet of impervious area, of which 34,888 square feet is directed into subsurface infiltration systems, representing 78.9% of the total impervious area. This results in a total impervious to total impervious treated ratio of 1.11 and an adjusted minimum recharge volume of 1,025 cubic feet as presented above.

Utilizing a Rawls Rate of 0.27 inches/hour for C Soils as outlined in the Stormwater Management Standards, a simple dynamic sizing calculation was done in HydroCAD to confirm the subsurface infiltration systems provide adequate recharge volume. Additionally, calculations demonstrating that these systems are capable of drawdown in approximately 72 hours and are provided in Appendix C.

DEPTH TO SEASONAL HIGH GROUNDWATER

Evidence of seasonal high groundwater was not observed on site. Test pit locations, including depths are depicted on the existing conditions plan. Infiltration and detention basins require a minimum depth to groundwater of 2 feet unless utilized to attenuate peak flows in storms greater than or equal to the 10-year 24-hour storm event.

Subsurface infiltration systems are utilized to attenuate peak flows therefore the minimum depth to seasonal high groundwater must be 4 feet or a mounding analysis is required to ensure the minimum infiltration is achieved without the groundwater mound extending above the bottom elevation of the basin.

STANDARD 4: *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:*

a) *Suitable practices for source control and pollution prevention are identified in a Long-term Pollution Prevention Plan, and thereafter are implemented and maintained;*

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

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

TREATMENT OF SUSPENDED SOLIDS

The stormwater management system for the entirety of the lot consists of subsurface infiltration systems which receive 80% TSS removal credit respectively per the Massachusetts Stormwater Handbook (refer to Tables 5 & 6). Additionally, Stormceptors receive approximately 80% TSS removal credit as well and are utilized as pretreatment. Please note that a long-term pollution prevention plan has been developed as part of the analysis and can be found in Appendix D.

Table 5

Total Suspended Solids Removal – Subsurface Infiltration Front

BMP	TSS Removal Rate	Starting TSS Load	TSS Removed	Remaining TSS Load
Proprietary Treatment Practice	0.90	1.00	0.90	0.10
Subsurface Infiltration Structure	0.80	0.10	0.08	0.02
		Total Suspended Solids Removed:		**98%**

Total Suspended Solids Removal – Subsurface Infiltration Rear “A”

BMP	TSS Removal Rate	Starting TSS Load	TSS Removed	Remaining TSS Load
Proprietary Treatment Practice	0.91	1.00	0.91	0.09
Subsurface Infiltration Structure	0.80	0.09	0.07	0.02
		Total Suspended Solids Removed:		**98%**

Total Suspended Solids Removal – Subsurface Infiltration Rear "B"

BMP	TSS Removal Rate	Starting TSS Load	TSS Removed	Remaining TSS Load
Proprietary Treatment Practice	0.86	1.00	0.86	0.14
Subsurface Infiltration Structure	0.80	0.14	0.11	0.03
		Total Suspended Solids Removed:		**97%**

WATER QUALITY VOLUME

The required minimum Water Quality Volume for the Site is calculated as follows:

Water Quality Volume (results in cubic feet) = Total impervious area of post-development project x 0.5 inches (or 1 inch if required by the Stormwater Standards).

Water Quality Volume = 44,200 sf impervious area x 0.5 inches / 12 inches per foot = 1,842 CF

Using the recharge total for the infiltration basins and subsurface infiltration system, during the 2-year storm the basins recharge a total volume of 6,913 c.f., with an average for all storms of 9,266 c.f., therefore the system more than accommodates the minimum Water Quality Volume (refer to Table 6 for a summary of the recharge volumes by storm event). Please note that a long-term pollution prevention plan has been developed as part of the analysis and can be found in Appendix D.

Table 6

Total Recharge Volumes

Storm Event	Infiltration Basins Recharge Volume (cubic feet)
2-year	6,913
10-year	7,568
25-year	7,798
100-year	7,988
Average all Storms:	**7,567**

STANDARD 5: *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

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

STANDARD 6: *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.*

The project site is not within the Zone II or Interim Wellhead Protection Area of a public water supply and does not discharge near or to any other critical area.

STANDARD 7: *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

This project is a new development and will be required to meet all 10 of stormwater management standards. The stormwater checklist is included under the cover of this report prior to the Table of Contents.

STANDARD 8: *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

Please refer to Appendix E for the Sedimentation and Erosion Control Plan for to be implemented during the construction phase of this project.

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

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

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

Please refer to Appendix G for the Illicit Discharge Compliance Statement.

CONCLUSION/SUMMARY

Based on the HydroCAD analysis for the 2, 10, 25 and 100-year storm events, the peak rate of runoff has decreased from the existing to the proposed condition. Furthermore, widespread infiltration has been introduced thereby promoting/preserving the natural hydrologic conditions. In addition to these improvements, all 10 of the DEP Stormwater Standards have been met.

LIST OF FIGURES

EXISTING SUBCATCHMENT WETLANDS

10D

654C

52D

104D(C)

EXISTING SUBCATCHMENT OFF-SITE

EXISTING SUBCATCHMENT ROADWAY

100' BUFFER TO B.V.W.

LIMIT OF B.V.W. (FLAGGED BY OTHERS) *SURVEY NOTE 3

WETLAND FLAGS (TYPICAL)

100' INNER RIPARIAN ZONE (RIVERFRONT AREA)

100' OUTER RIPARIAN ZONE (RIVERFRONT AREA)

APPROXIMATE LOCATION UNNAMED PERENNIAL STREM

MEAN ANNUAL HIGH WATER (FLAGGED BY OTHERS)

LIMIT OF INLAND BANK ASSOCIATED W/AN UNNAMED PERENNIAL STREAM FLAGGED BY S.R.E. ON 3/3/20

EXPOSED LEDGE (TYP)

S. 71°28'06" E. 165.69'

N. 71°28'06" W. 74.36'

S. 30°03'26" W. 435.07'

S. 30°03'26" W. 136.85'

LEGEND

SUBCATCHMENT BOUNDARY

FLOWPATH

HATCH	COVER TYPE
	WOODS
	GRASS
	IMPERVIOUS
	GRAVEL/DIRT

CBN 1 R=91.62 I=88.4 12"CPP (HOLE IN HOOD)

CBN 2 R=91.61 T.O.H.=89.3 I(CBN)=88.2 12"RCP

I=79.4 48"CULVERT

I=80.8 12"RCP OUTLET @ HEADWALL

DMH 1 R=91.33 I=82.8 (H-WALL)=82 I(DMH 2)=82.8 12" RCP

I=78.9 48"CULVERT

DMH 2 R=91.67 I(DMH 1)=86.8 12"CPP I(CBN 1)=87.5 12"CPP I(CBN 2)=87.5 12"CPP I(DMH 3)=86.9 12"CPP

DMH R=98.90 I(CBN)=96.0 I(OUT)=94.8

CBN/CASCADE R=98.92 I=96.3 12" CPP

CBN R=107.67 I(IN)=104.5 I(OUT)=104.4

CBN R=107.55 I=105.1

BENCHMARK TOP SPINDLE ELEV.=107.09

CAPE COD BERM (CC)

BIT. CONC. SIDEWALK

VERT. GRAN. CURB (VGC)

EDGE OF PAVEMENT (EOP)

OVERHEAD WIRES (TYP)

SIGN POSTS

MAILBOXES

SIGN

HYDRANT

12" RCP

20' 0 20' 40'

SCALE IN FEET

NO.	DATE	REVISIONS DESCRIPTION	DR/CK

PREPARED FOR:
MAPLE STREET DEVELOPMENT LLC
330 HOPPING BROOK ROAD
HOLLISTON, MA. 01746

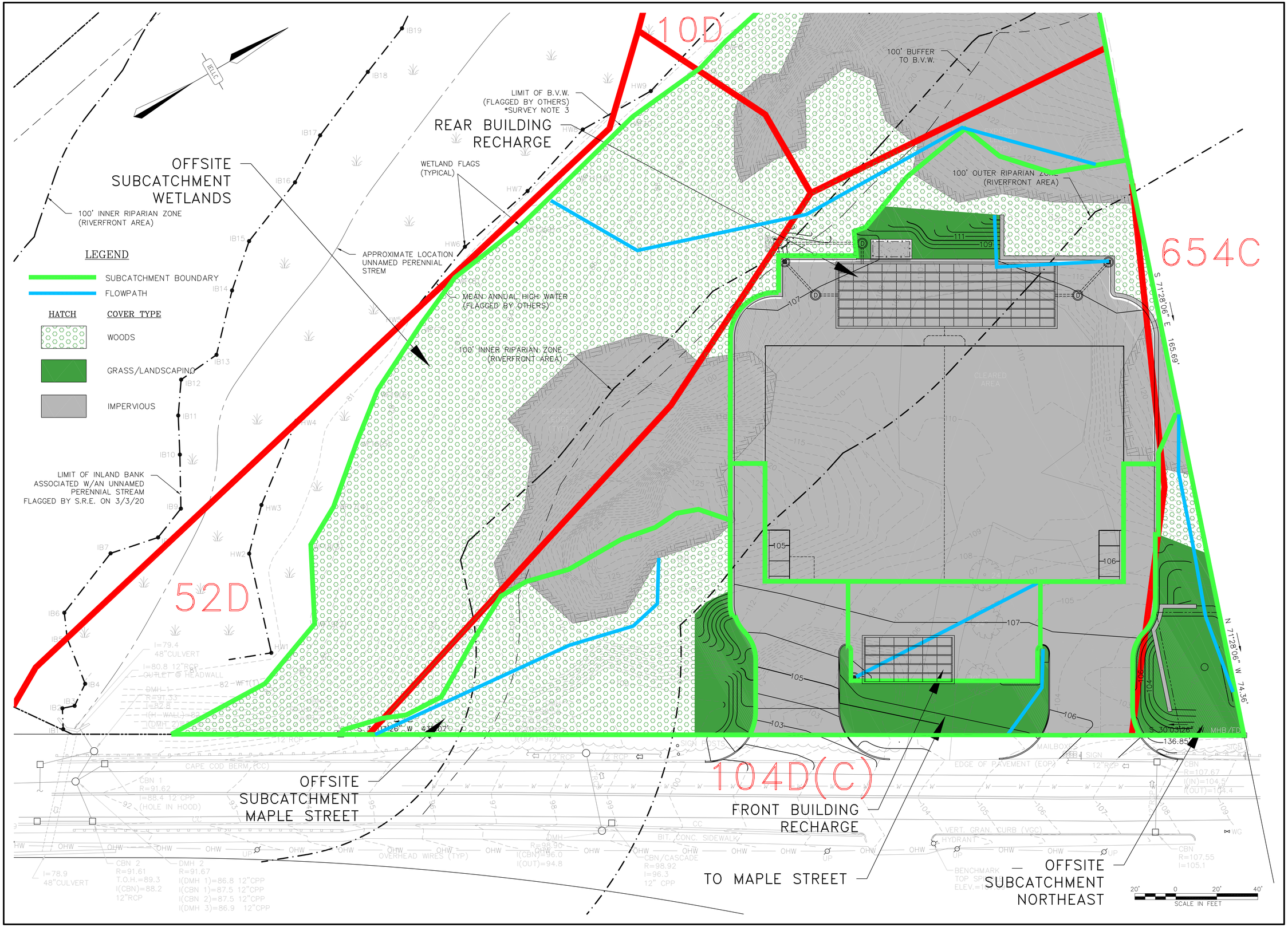
DRAWING:
EXISTING DRAINAGE AREAS PLAN

PROJECT:
LIGHT INDUSTRIAL DEVELOPMENT
0 MAPLE STREET
BELLINGHAM, MASSACHUSETTS 02019

PLAN SET:
REPORT FIGURES

DATE	2/9/2024
DESIGNED:	CHECKED:
DRAFTED:	IN CHARGE:
SCALE:	1" = 20'
PROJECT NO.	
SHEET NO.	

FIGURE 1



REVISIONS			
NO.	DATE	DESCRIPTION	DR/CK

PREPARED FOR:
MAPLE STREET DEVELOPMENT LLC
330 HOPPING BROOK ROAD
HOLLISTON, MA. 01746

DRAWING:
PROPOSED DRAINAGE AREAS PLAN

PROJECT:
LIGHT INDUSTRIAL DEVELOPMENT
0 MAPLE STREET
BELLINGHAM, MASSACHUSETTS 02019

PLAN SET:
REPORT FIGURES

DATE	2/9/2024
DESIGNED:	CHECKED:
DRAFTED:	IN CHARGE:
SCALE:	1" = 20'
PROJECT NO.	
SHEET NO.	

FIGURE 2

APPENDIX A

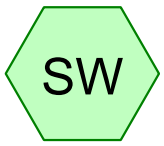
EXISTING HYDROLOGICAL CONDITIONS

2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

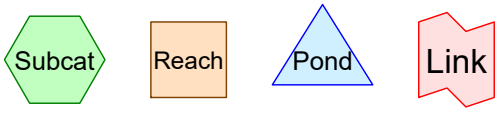
100-YEAR STORM EVENT



Subcatchment - Wetlands

Subcatchment - Roadway

Off Site Subcatchment - Northeast



Routing Diagram for 066-001 Maple Street - Existing Conditions
Prepared by Independence Engineering LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
11,889	87	Dirt roads, HSG C (OSN, SR)
14,207	98	Unconnected pavement, HSG C, Ledge (OSN, SR, SW)
18,038	98	Unconnected pavement, HSG D, Ledge (SW)
54,792	73	Woods, Fair, HSG C (OSN, SR, SW)
39,145	79	Woods, Fair, HSG D (SW)
138,071	**82**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
80,888	HSG C	OSN, SR, SW
57,183	HSG D	SW
0	Other	
138,071		**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	Subca Numb
0	0	11,889	0	0	11,889	Dirt roads	
0	0	14,207	18,038	0	32,245	Unconnected pavement	
0	0	54,792	39,145	0	93,937	Woods, Fair	
0	**0**	**80,888**	**57,183**	**0**	**138,071**	**TOTAL AREA**	

Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment OSN: Off Site Subcatchment Runoff Area=15,392 sf 1.95% Impervious Runoff Depth=1.14"
Flow Length=156' Tc=6.8 min CN=75 Runoff=0.44 cfs 1,464 cf

Subcatchment SR: Subcatchment - Runoff Area=43,226 sf 9.78% Impervious Runoff Depth=1.32"
Flow Length=275' Tc=5.8 min UI Adjusted CN=78 Runoff=1.49 cfs 4,772 cf

Subcatchment SW: Subcatchment - Runoff Area=79,453 sf 34.89% Impervious Runoff Depth=1.82"
Flow Length=259' Tc=7.5 min CN=85 Runoff=3.65 cfs 12,034 cf

Total Runoff Area = 138,071 sf Runoff Volume = 18,271 cf Average Runoff Depth = 1.59"
76.65% Pervious = 105,826 sf 23.35% Impervious = 32,245 sf

Summary for Subcatchment OSN: Off Site Subcatchment - Northeast

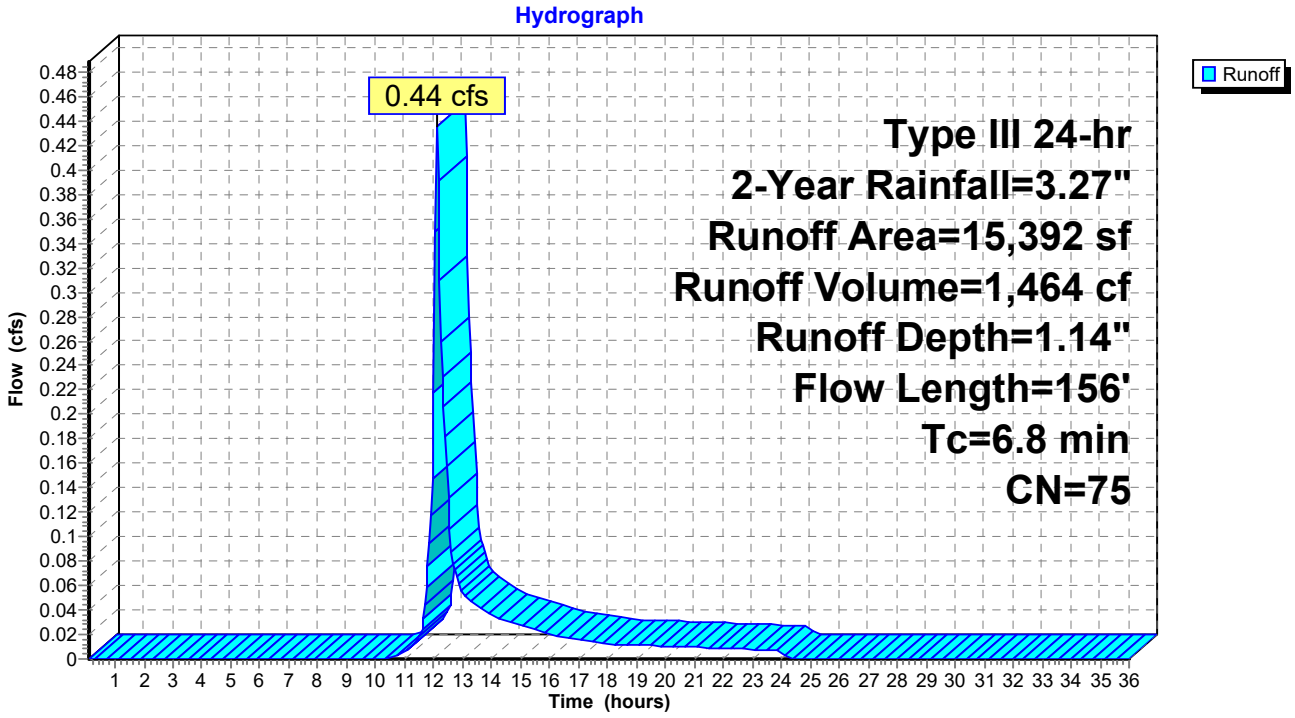
Runoff = 0.44 cfs @ 12.11 hrs, Volume= 1,464 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.27"

	Area (sf)	CN	Description
	13,474	73	Woods, Fair, HSG C
*	300	98	Unconnected pavement, HSG C, Ledge
	1,618	87	Dirt roads, HSG C
	15,392	75	Weighted Average
	15,092		98.05% Pervious Area
	300		1.95% Impervious Area
	300		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0857	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	53	0.0567	1.19		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
1.1	68	0.0442	1.05		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
6.8	156	Total			

Subcatchment OSN: Off Site Subcatchment - Northeast



Hydrograph for Subcatchment OSN: Off Site Subcatchment - Northeast

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
0.60	0.02	0.00	0.00
1.10	0.04	0.00	0.00
1.60	0.05	0.00	0.00
2.10	0.07	0.00	0.00
2.60	0.09	0.00	0.00
3.10	0.10	0.00	0.00
3.60	0.12	0.00	0.00
4.10	0.14	0.00	0.00
4.60	0.17	0.00	0.00
5.10	0.19	0.00	0.00
5.60	0.21	0.00	0.00
6.10	0.24	0.00	0.00
6.60	0.27	0.00	0.00
7.10	0.30	0.00	0.00
7.60	0.34	0.00	0.00
8.10	0.38	0.00	0.00
8.60	0.43	0.00	0.00
9.10	0.49	0.00	0.00
9.60	0.56	0.00	0.00
10.10	0.63	0.00	0.00
10.60	0.73	0.00	0.00
11.10	0.84	0.01	0.01
11.60	1.03	0.04	0.03
12.10	1.91	0.34	**0.43**
12.60	2.33	0.56	0.09
13.10	2.48	0.64	0.05
13.60	2.58	0.70	0.04
14.10	2.67	0.75	0.03
14.60	2.74	0.80	0.03
15.10	2.81	0.84	0.03
15.60	2.86	0.87	0.02
16.10	2.91	0.90	0.02
16.60	2.95	0.93	0.02
17.10	2.98	0.95	0.02
17.60	3.01	0.97	0.01
18.10	3.04	0.99	0.01
18.60	3.07	1.00	0.01
19.10	3.09	1.02	0.01
19.60	3.11	1.03	0.01
20.10	3.13	1.05	0.01
20.60	3.15	1.06	0.01
21.10	3.17	1.08	0.01
21.60	3.19	1.09	0.01
22.10	3.21	1.10	0.01
22.60	3.23	1.11	0.01
23.10	3.24	1.12	0.01
23.60	**3.26**	**1.13**	0.01
24.10	**3.27**	**1.14**	0.00
24.60	3.27	1.14	0.00
25.10	3.27	1.14	0.00
25.60	3.27	1.14	0.00
26.10	3.27	1.14	0.00
26.60	3.27	1.14	0.00
27.10	3.27	1.14	0.00
27.60	3.27	1.14	0.00
28.10	3.27	1.14	0.00
28.60	3.27	1.14	0.00
29.10	3.27	1.14	0.00
29.60	3.27	1.14	0.00
30.10	3.27	1.14	0.00
30.60	3.27	1.14	0.00
31.10	3.27	1.14	0.00
31.60	3.27	1.14	0.00
32.10	3.27	1.14	0.00
32.60	3.27	1.14	0.00
33.10	3.27	1.14	0.00
33.60	3.27	1.14	0.00
34.10	3.27	1.14	0.00
34.60	3.27	1.14	0.00
35.10	3.27	1.14	0.00
35.60	3.27	1.14	0.00

Summary for Subcatchment SR: Subcatchment - Roadway

[49] Hint: Tc<2dt may require smaller dt

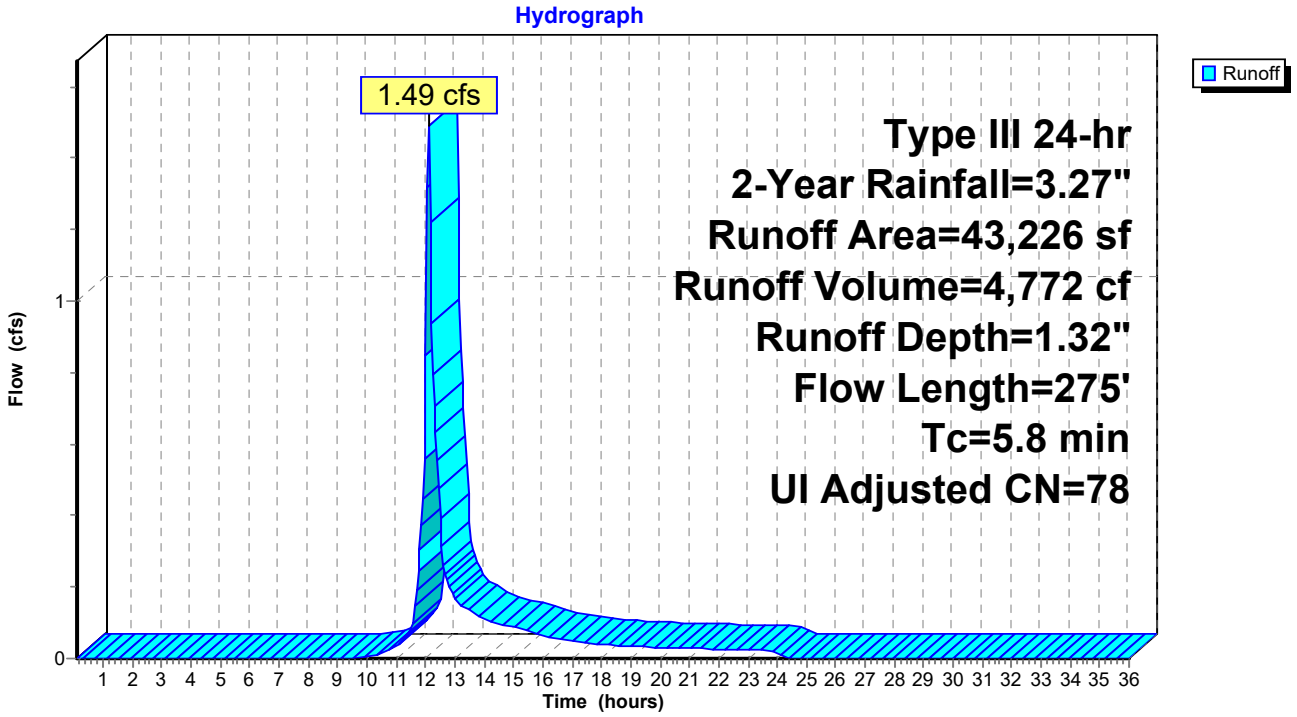
Runoff = 1.49 cfs @ 12.09 hrs, Volume= 4,772 cf, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.27"

	Area (sf)	CN	Adj	Description
	28,728	73		Woods, Fair, HSG C
*	4,227	98		Unconnected pavement, HSG C, Ledge
	10,271	87		Dirt roads, HSG C
	43,226	79	78	Weighted Average, UI Adjusted
	38,999			90.22% Pervious Area
	4,227			9.78% Impervious Area
	4,227			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	49	0.2047	0.18		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.8	123	0.0244	2.51		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
0.4	103	0.0581	3.88		**Shallow Concentrated Flow, CD** Unpaved Kv= 16.1 fps
5.8	275	Total			

Subcatchment SR: Subcatchment - Roadway



Hydrograph for Subcatchment SR: Subcatchment - Roadway

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
0.60	0.02	0.00	0.00
1.10	0.04	0.00	0.00
1.60	0.05	0.00	0.00
2.10	0.07	0.00	0.00
2.60	0.09	0.00	0.00
3.10	0.10	0.00	0.00
3.60	0.12	0.00	0.00
4.10	0.14	0.00	0.00
4.60	0.17	0.00	0.00
5.10	0.19	0.00	0.00
5.60	0.21	0.00	0.00
6.10	0.24	0.00	0.00
6.60	0.27	0.00	0.00
7.10	0.30	0.00	0.00
7.60	0.34	0.00	0.00
8.10	0.38	0.00	0.00
8.60	0.43	0.00	0.00
9.10	0.49	0.00	0.00
9.60	0.56	0.00	0.00
10.10	0.63	0.00	0.01
10.60	0.73	0.01	0.02
11.10	0.84	0.03	0.04
11.60	1.03	0.07	0.11
12.10	1.91	0.43	**1.49**
12.60	2.33	0.68	0.26
13.10	2.48	0.77	0.15
13.60	2.58	0.84	0.13
14.10	2.67	0.90	0.11
14.60	2.74	0.95	0.10
15.10	2.81	0.99	0.08
15.60	2.86	1.03	0.07
16.10	2.91	1.06	0.06
16.60	2.95	1.09	0.05
17.10	2.98	1.12	0.05
17.60	3.01	1.14	0.04
18.10	3.04	1.16	0.04
18.60	3.07	1.18	0.04
19.10	3.09	1.19	0.03
19.60	3.11	1.21	0.03
20.10	3.13	1.22	0.03
20.60	3.15	1.24	0.03
21.10	3.17	1.25	0.03
21.60	3.19	1.27	0.03
22.10	3.21	1.28	0.03
22.60	3.23	1.29	0.02
23.10	3.24	1.31	0.02
23.60	**3.26**	**1.32**	0.02
24.10	**3.27**	**1.32**	0.01
24.60	3.27	1.32	0.00
25.10	3.27	1.32	0.00
25.60	3.27	1.32	0.00
26.10	3.27	1.32	0.00
26.60	3.27	1.32	0.00
27.10	3.27	1.32	0.00
27.60	3.27	1.32	0.00
28.10	3.27	1.32	0.00
28.60	3.27	1.32	0.00
29.10	3.27	1.32	0.00
29.60	3.27	1.32	0.00
30.10	3.27	1.32	0.00
30.60	3.27	1.32	0.00
31.10	3.27	1.32	0.00
31.60	3.27	1.32	0.00
32.10	3.27	1.32	0.00
32.60	3.27	1.32	0.00
33.10	3.27	1.32	0.00
33.60	3.27	1.32	0.00
34.10	3.27	1.32	0.00
34.60	3.27	1.32	0.00
35.10	3.27	1.32	0.00
35.60	3.27	1.32	0.00

Summary for Subcatchment SW: Subcatchment - Wetlands

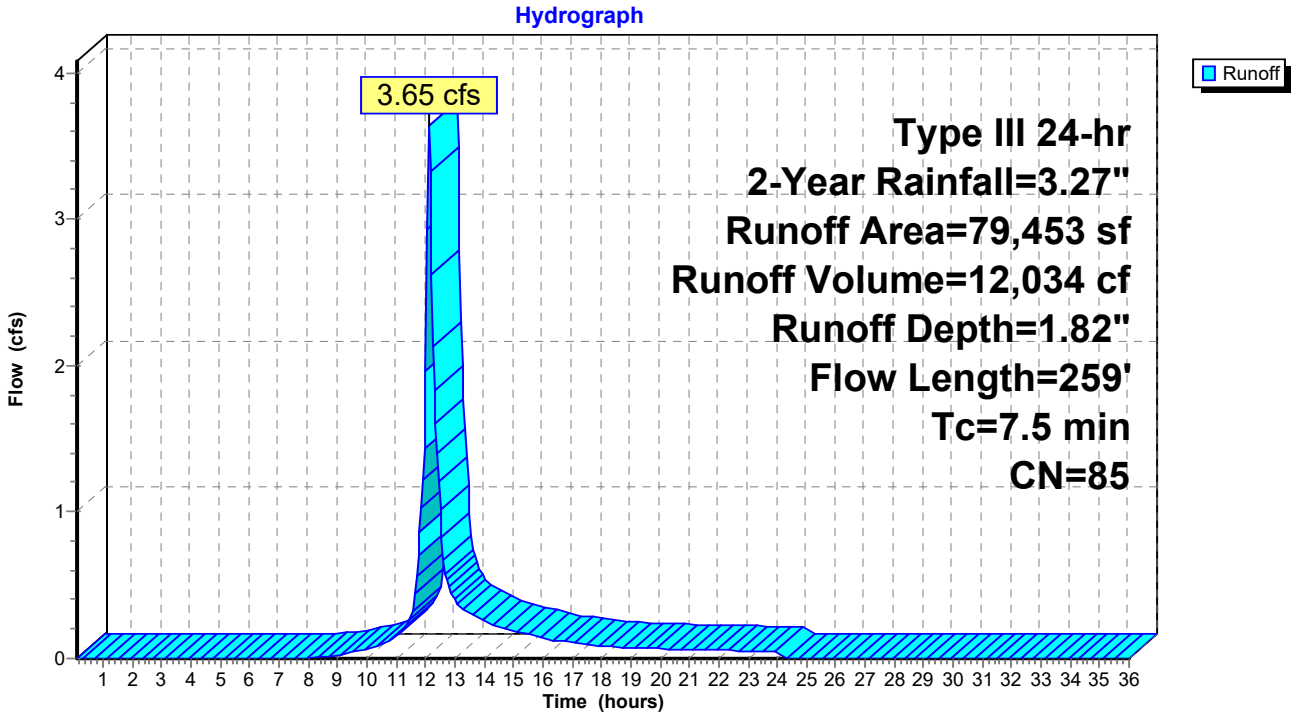
Runoff = 3.65 cfs @ 12.11 hrs, Volume= 12,034 cf, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.27"

	Area (sf)	CN	Description
	12,590	73	Woods, Fair, HSG C
*	9,680	98	Unconnected pavement, HSG C, Ledge
	39,145	79	Woods, Fair, HSG D
*	18,038	98	Unconnected pavement, HSG D, Ledge
	79,453	85	Weighted Average
	51,735		65.11% Pervious Area
	27,718		34.89% Impervious Area
	27,718		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	52	0.1535	0.16		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	65	0.1229	1.75		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.7	82	0.1716	2.07		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.7	60	0.0830	1.44		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
7.5	259	Total			

Subcatchment SW: Subcatchment - Wetlands



Hydrograph for Subcatchment SW: Subcatchment - Wetlands

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
0.60	0.02	0.00	0.00
1.10	0.04	0.00	0.00
1.60	0.05	0.00	0.00
2.10	0.07	0.00	0.00
2.60	0.09	0.00	0.00
3.10	0.10	0.00	0.00
3.60	0.12	0.00	0.00
4.10	0.14	0.00	0.00
4.60	0.17	0.00	0.00
5.10	0.19	0.00	0.00
5.60	0.21	0.00	0.00
6.10	0.24	0.00	0.00
6.60	0.27	0.00	0.00
7.10	0.30	0.00	0.00
7.60	0.34	0.00	0.00
8.10	0.38	0.00	0.00
8.60	0.43	0.00	0.01
9.10	0.49	0.01	0.03
9.60	0.56	0.02	0.05
10.10	0.63	0.04	0.07
10.60	0.73	0.07	0.11
11.10	0.84	0.11	0.16
11.60	1.03	0.19	0.35
12.10	1.91	0.73	**3.63**
12.60	2.33	1.05	0.67
13.10	2.48	1.16	0.36
13.60	2.58	1.24	0.30
14.10	2.67	1.31	0.24
14.60	2.74	1.37	0.21
15.10	2.81	1.43	0.19
15.60	2.86	1.47	0.16
16.10	2.91	1.51	0.13
16.60	2.95	1.54	0.12
17.10	2.98	1.57	0.11
17.60	3.01	1.60	0.09
18.10	3.04	1.62	0.08
18.60	3.07	1.64	0.08
19.10	3.09	1.66	0.07
19.60	3.11	1.68	0.07
20.10	3.13	1.70	0.07
20.60	3.15	1.72	0.06
21.10	3.17	1.74	0.06
21.60	3.19	1.75	0.06
22.10	3.21	1.77	0.06
22.60	3.23	1.78	0.05
23.10	3.24	1.79	0.05
23.60	**3.26**	**1.81**	0.05
24.10	**3.27**	**1.82**	0.02
24.60	3.27	1.82	0.00
25.10	3.27	1.82	0.00
25.60	3.27	1.82	0.00
26.10	3.27	1.82	0.00
26.60	3.27	1.82	0.00
27.10	3.27	1.82	0.00
27.60	3.27	1.82	0.00
28.10	3.27	1.82	0.00
28.60	3.27	1.82	0.00
29.10	3.27	1.82	0.00
29.60	3.27	1.82	0.00
30.10	3.27	1.82	0.00
30.60	3.27	1.82	0.00
31.10	3.27	1.82	0.00
31.60	3.27	1.82	0.00
32.10	3.27	1.82	0.00
32.60	3.27	1.82	0.00
33.10	3.27	1.82	0.00
33.60	3.27	1.82	0.00
34.10	3.27	1.82	0.00
34.60	3.27	1.82	0.00
35.10	3.27	1.82	0.00
35.60	3.27	1.82	0.00

Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment OSN: Off Site Subcatchment Runoff Area=15,392 sf 1.95% Impervious Runoff Depth=2.40"
Flow Length=156' Tc=6.8 min CN=75 Runoff=0.95 cfs 3,079 cf

Subcatchment SR: Subcatchment - Runoff Area=43,226 sf 9.78% Impervious Runoff Depth=2.66"
Flow Length=275' Tc=5.8 min UI Adjusted CN=78 Runoff=3.05 cfs 9,585 cf

Subcatchment SW: Subcatchment - Runoff Area=79,453 sf 34.89% Impervious Runoff Depth=3.31"
Flow Length=259' Tc=7.5 min CN=85 Runoff=6.58 cfs 21,933 cf

Total Runoff Area = 138,071 sf Runoff Volume = 34,597 cf Average Runoff Depth = 3.01"
76.65% Pervious = 105,826 sf 23.35% Impervious = 32,245 sf

Summary for Subcatchment OSN: Off Site Subcatchment - Northeast

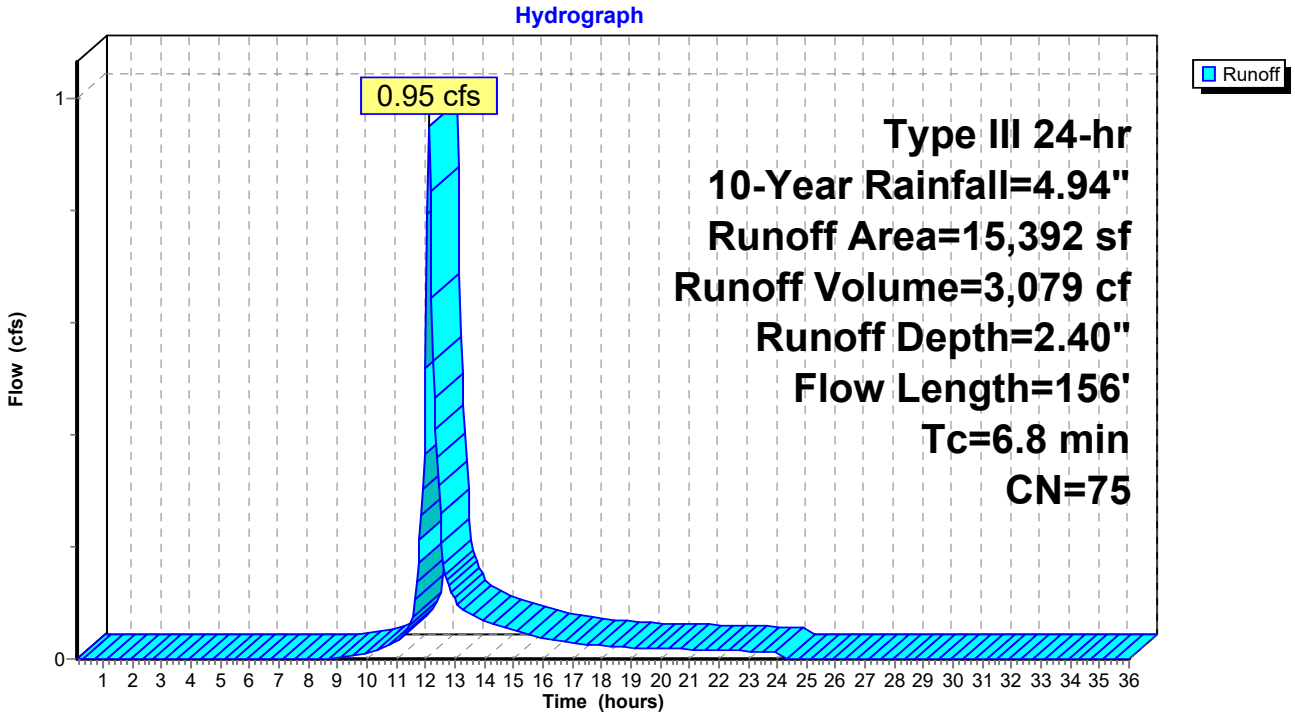
Runoff = 0.95 cfs @ 12.10 hrs, Volume= 3,079 cf, Depth= 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.94"

	Area (sf)	CN	Description
	13,474	73	Woods, Fair, HSG C
*	300	98	Unconnected pavement, HSG C, Ledge
	1,618	87	Dirt roads, HSG C
	15,392	75	Weighted Average
	15,092		98.05% Pervious Area
	300		1.95% Impervious Area
	300		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0857	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	53	0.0567	1.19		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
1.1	68	0.0442	1.05		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
6.8	156	Total			

Subcatchment OSN: Off Site Subcatchment - Northeast



Hydrograph for Subcatchment OSN: Off Site Subcatchment - Northeast

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
0.60	0.03	0.00	0.00
1.10	0.05	0.00	0.00
1.60	0.08	0.00	0.00
2.10	0.10	0.00	0.00
2.60	0.13	0.00	0.00
3.10	0.16	0.00	0.00
3.60	0.19	0.00	0.00
4.10	0.22	0.00	0.00
4.60	0.25	0.00	0.00
5.10	0.29	0.00	0.00
5.60	0.32	0.00	0.00
6.10	0.36	0.00	0.00
6.60	0.41	0.00	0.00
7.10	0.46	0.00	0.00
7.60	0.51	0.00	0.00
8.10	0.58	0.00	0.00
8.60	0.65	0.00	0.00
9.10	0.74	0.00	0.00
9.60	0.84	0.01	0.01
10.10	0.96	0.02	0.01
10.60	1.10	0.05	0.02
11.10	1.27	0.09	0.04
11.60	1.55	0.19	0.08
12.10	2.88	0.89	**0.95**
12.60	3.52	1.32	0.17
13.10	3.74	1.47	0.10
13.60	3.90	1.59	0.08
14.10	4.03	1.69	0.07
14.60	4.14	1.77	0.06
15.10	4.24	1.85	0.05
15.60	4.32	1.91	0.04
16.10	4.39	1.96	0.04
16.60	4.45	2.01	0.03
17.10	4.50	2.05	0.03
17.60	4.55	2.09	0.03
18.10	4.59	2.12	0.02
18.60	4.63	2.15	0.02
19.10	4.67	2.18	0.02
19.60	4.70	2.21	0.02
20.10	4.73	2.24	0.02
20.60	4.77	2.26	0.02
21.10	4.79	2.28	0.02
21.60	4.82	2.31	0.02
22.10	4.85	2.33	0.02
22.60	4.88	2.35	0.01
23.10	4.90	2.37	0.01
23.60	**4.92**	**2.39**	0.01
24.10	**4.94**	**2.40**	0.01
24.60	4.94	2.40	0.00
25.10	4.94	2.40	0.00
25.60	4.94	2.40	0.00
26.10	4.94	2.40	0.00
26.60	4.94	2.40	0.00
27.10	4.94	2.40	0.00
27.60	4.94	2.40	0.00
28.10	4.94	2.40	0.00
28.60	4.94	2.40	0.00
29.10	4.94	2.40	0.00
29.60	4.94	2.40	0.00
30.10	4.94	2.40	0.00
30.60	4.94	2.40	0.00
31.10	4.94	2.40	0.00
31.60	4.94	2.40	0.00
32.10	4.94	2.40	0.00
32.60	4.94	2.40	0.00
33.10	4.94	2.40	0.00
33.60	4.94	2.40	0.00
34.10	4.94	2.40	0.00
34.60	4.94	2.40	0.00
35.10	4.94	2.40	0.00
35.60	4.94	2.40	0.00

Summary for Subcatchment SR: Subcatchment - Roadway

[49] Hint: Tc<2dt may require smaller dt

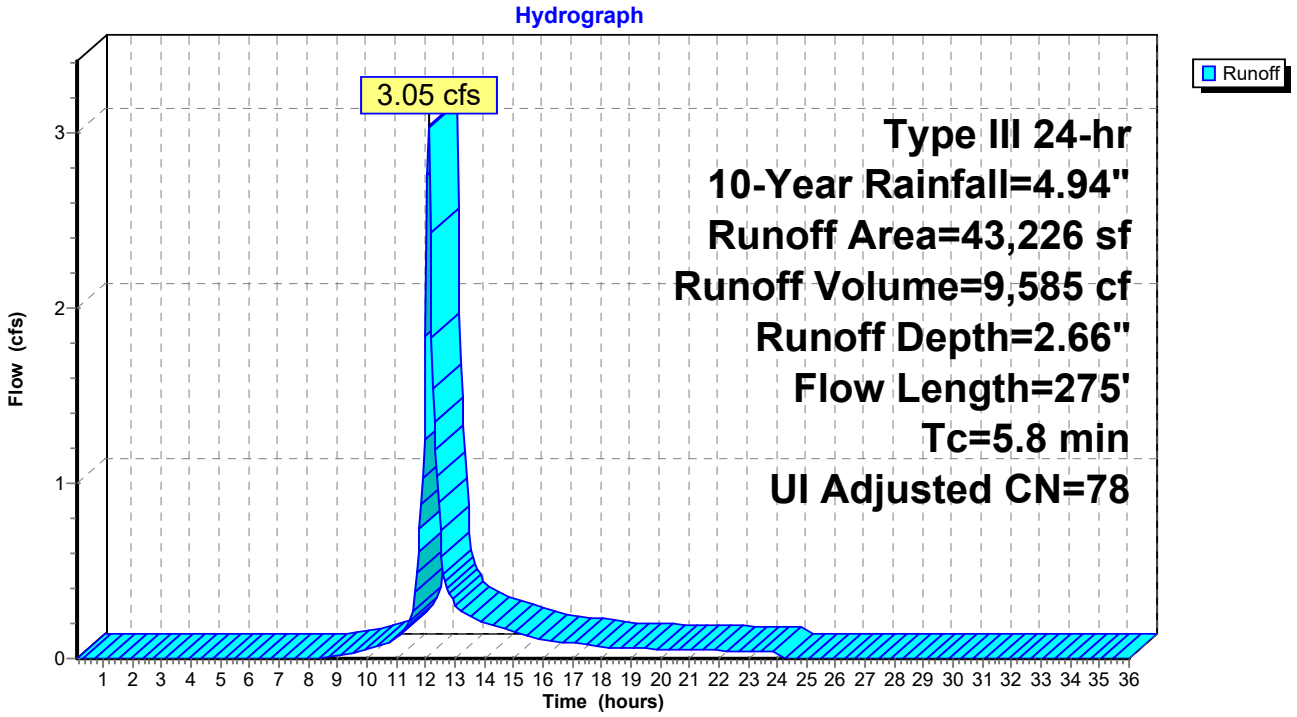
Runoff = 3.05 cfs @ 12.09 hrs, Volume= 9,585 cf, Depth= 2.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.94"

	Area (sf)	CN	Adj	Description
	28,728	73		Woods, Fair, HSG C
*	4,227	98		Unconnected pavement, HSG C, Ledge
	10,271	87		Dirt roads, HSG C
	43,226	79	78	Weighted Average, UI Adjusted
	38,999			90.22% Pervious Area
	4,227			9.78% Impervious Area
	4,227			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	49	0.2047	0.18		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.8	123	0.0244	2.51		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
0.4	103	0.0581	3.88		**Shallow Concentrated Flow, CD** Unpaved Kv= 16.1 fps
5.8	275	Total			

Subcatchment SR: Subcatchment - Roadway



Hydrograph for Subcatchment SR: Subcatchment - Roadway

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
0.60	0.03	0.00	0.00
1.10	0.05	0.00	0.00
1.60	0.08	0.00	0.00
2.10	0.10	0.00	0.00
2.60	0.13	0.00	0.00
3.10	0.16	0.00	0.00
3.60	0.19	0.00	0.00
4.10	0.22	0.00	0.00
4.60	0.25	0.00	0.00
5.10	0.29	0.00	0.00
5.60	0.32	0.00	0.00
6.10	0.36	0.00	0.00
6.60	0.41	0.00	0.00
7.10	0.46	0.00	0.00
7.60	0.51	0.00	0.00
8.10	0.58	0.00	0.00
8.60	0.65	0.00	0.01
9.10	0.74	0.01	0.02
9.60	0.84	0.02	0.03
10.10	0.96	0.05	0.05
10.60	1.10	0.09	0.09
11.10	1.27	0.14	0.13
11.60	1.55	0.26	0.30
12.10	2.88	1.05	**3.03**
12.60	3.52	1.52	0.48
13.10	3.74	1.68	0.28
13.60	3.90	1.81	0.24
14.10	4.03	1.91	0.19
14.60	4.14	2.00	0.17
15.10	4.24	2.08	0.15
15.60	4.32	2.15	0.13
16.10	4.39	2.20	0.11
16.60	4.45	2.25	0.10
17.10	4.50	2.30	0.09
17.60	4.55	2.33	0.08
18.10	4.59	2.37	0.07
18.60	4.63	2.40	0.06
19.10	4.67	2.43	0.06
19.60	4.70	2.46	0.06
20.10	4.73	2.49	0.05
20.60	4.77	2.51	0.05
21.10	4.79	2.54	0.05
21.60	4.82	2.56	0.05
22.10	4.85	2.58	0.04
22.60	4.88	2.61	0.04
23.10	4.90	2.63	0.04
23.60	**4.92**	**2.65**	0.04
24.10	**4.94**	**2.66**	0.01
24.60	4.94	2.66	0.00
25.10	4.94	2.66	0.00
25.60	4.94	2.66	0.00
26.10	4.94	2.66	0.00
26.60	4.94	2.66	0.00
27.10	4.94	2.66	0.00
27.60	4.94	2.66	0.00
28.10	4.94	2.66	0.00
28.60	4.94	2.66	0.00
29.10	4.94	2.66	0.00
29.60	4.94	2.66	0.00
30.10	4.94	2.66	0.00
30.60	4.94	2.66	0.00
31.10	4.94	2.66	0.00
31.60	4.94	2.66	0.00
32.10	4.94	2.66	0.00
32.60	4.94	2.66	0.00
33.10	4.94	2.66	0.00
33.60	4.94	2.66	0.00
34.10	4.94	2.66	0.00
34.60	4.94	2.66	0.00
35.10	4.94	2.66	0.00
35.60	4.94	2.66	0.00

Summary for Subcatchment SW: Subcatchment - Wetlands

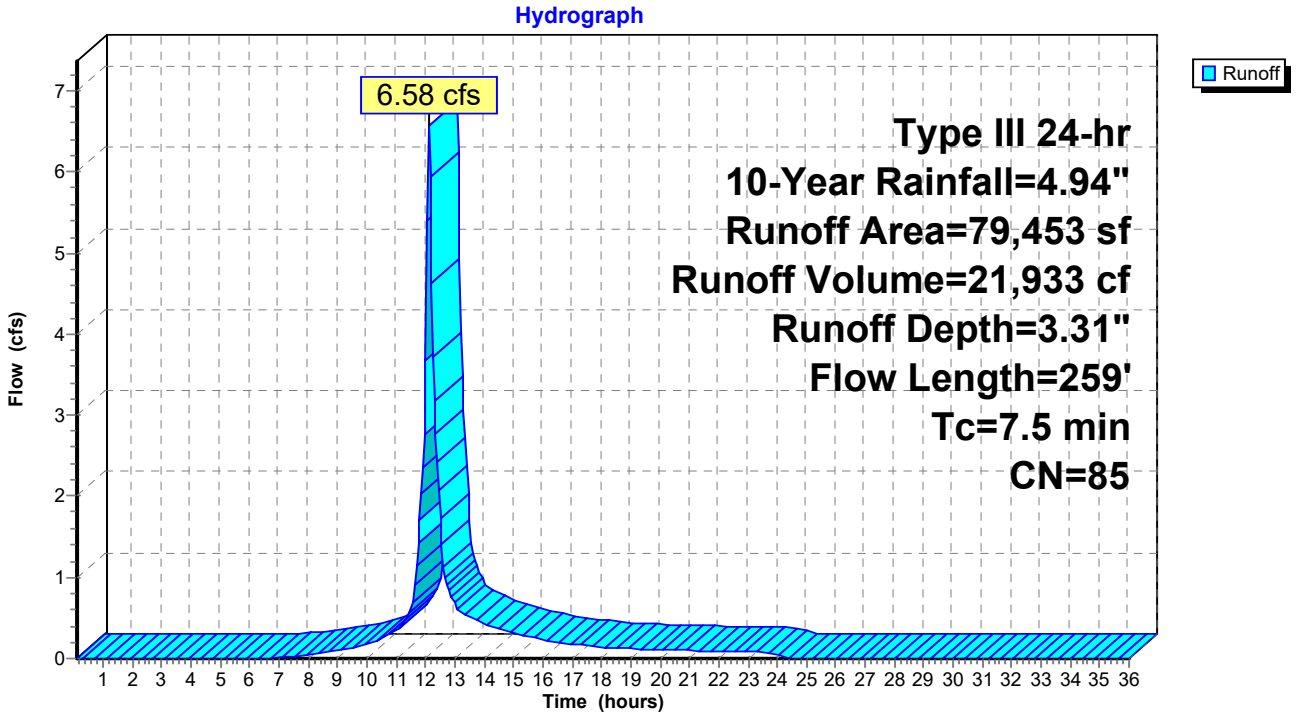
Runoff = 6.58 cfs @ 12.11 hrs, Volume= 21,933 cf, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.94"

	Area (sf)	CN	Description
	12,590	73	Woods, Fair, HSG C
*	9,680	98	Unconnected pavement, HSG C, Ledge
	39,145	79	Woods, Fair, HSG D
*	18,038	98	Unconnected pavement, HSG D, Ledge
	79,453	85	Weighted Average
	51,735		65.11% Pervious Area
	27,718		34.89% Impervious Area
	27,718		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	52	0.1535	0.16		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	65	0.1229	1.75		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.7	82	0.1716	2.07		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.7	60	0.0830	1.44		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
7.5	259	Total			

Subcatchment SW: Subcatchment - Wetlands



Hydrograph for Subcatchment SW: Subcatchment - Wetlands

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
0.60	0.03	0.00	0.00
1.10	0.05	0.00	0.00
1.60	0.08	0.00	0.00
2.10	0.10	0.00	0.00
2.60	0.13	0.00	0.00
3.10	0.16	0.00	0.00
3.60	0.19	0.00	0.00
4.10	0.22	0.00	0.00
4.60	0.25	0.00	0.00
5.10	0.29	0.00	0.00
5.60	0.32	0.00	0.00
6.10	0.36	0.00	0.00
6.60	0.41	0.00	0.01
7.10	0.46	0.01	0.02
7.60	0.51	0.01	0.03
8.10	0.58	0.03	0.05
8.60	0.65	0.04	0.07
9.10	0.74	0.07	0.11
9.60	0.84	0.11	0.15
10.10	0.96	0.15	0.19
10.60	1.10	0.22	0.27
11.10	1.27	0.32	0.37
11.60	1.55	0.49	0.73
12.10	2.88	1.49	**6.56**
12.60	3.52	2.04	1.13
13.10	3.74	2.23	0.60
13.60	3.90	2.37	0.50
14.10	4.03	2.48	0.40
14.60	4.14	2.58	0.35
15.10	4.24	2.67	0.31
15.60	4.32	2.75	0.26
16.10	4.39	2.81	0.22
16.60	4.45	2.86	0.19
17.10	4.50	2.91	0.17
17.60	4.55	2.96	0.15
18.10	4.59	2.99	0.13
18.60	4.63	3.03	0.13
19.10	4.67	3.06	0.12
19.60	4.70	3.09	0.11
20.10	4.73	3.12	0.11
20.60	4.77	3.15	0.10
21.10	4.79	3.18	0.10
21.60	4.82	3.21	0.09
22.10	4.85	3.23	0.09
22.60	4.88	3.25	0.09
23.10	4.90	3.28	0.08
23.60	**4.92**	**3.30**	0.08
24.10	**4.94**	**3.31**	0.04
24.60	4.94	3.31	0.00
25.10	4.94	3.31	0.00
25.60	4.94	3.31	0.00
26.10	4.94	3.31	0.00
26.60	4.94	3.31	0.00
27.10	4.94	3.31	0.00
27.60	4.94	3.31	0.00
28.10	4.94	3.31	0.00
28.60	4.94	3.31	0.00
29.10	4.94	3.31	0.00
29.60	4.94	3.31	0.00
30.10	4.94	3.31	0.00
30.60	4.94	3.31	0.00
31.10	4.94	3.31	0.00
31.60	4.94	3.31	0.00
32.10	4.94	3.31	0.00
32.60	4.94	3.31	0.00
33.10	4.94	3.31	0.00
33.60	4.94	3.31	0.00
34.10	4.94	3.31	0.00
34.60	4.94	3.31	0.00
35.10	4.94	3.31	0.00
35.60	4.94	3.31	0.00

Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment OSN: Off Site Subcatchment Runoff Area=15,392 sf 1.95% Impervious Runoff Depth=3.50"
Flow Length=156' Tc=6.8 min CN=75 Runoff=1.39 cfs 4,495 cf

Subcatchment SR: Subcatchment - Runoff Area=43,226 sf 9.78% Impervious Runoff Depth=3.81"
Flow Length=275' Tc=5.8 min UI Adjusted CN=78 Runoff=4.35 cfs 13,722 cf

Subcatchment SW: Subcatchment - Runoff Area=79,453 sf 34.89% Impervious Runoff Depth=4.55"
Flow Length=259' Tc=7.5 min CN=85 Runoff=8.93 cfs 30,115 cf

Total Runoff Area = 138,071 sf Runoff Volume = 48,332 cf Average Runoff Depth = 4.20"
76.65% Pervious = 105,826 sf 23.35% Impervious = 32,245 sf

Summary for Subcatchment OSN: Off Site Subcatchment - Northeast

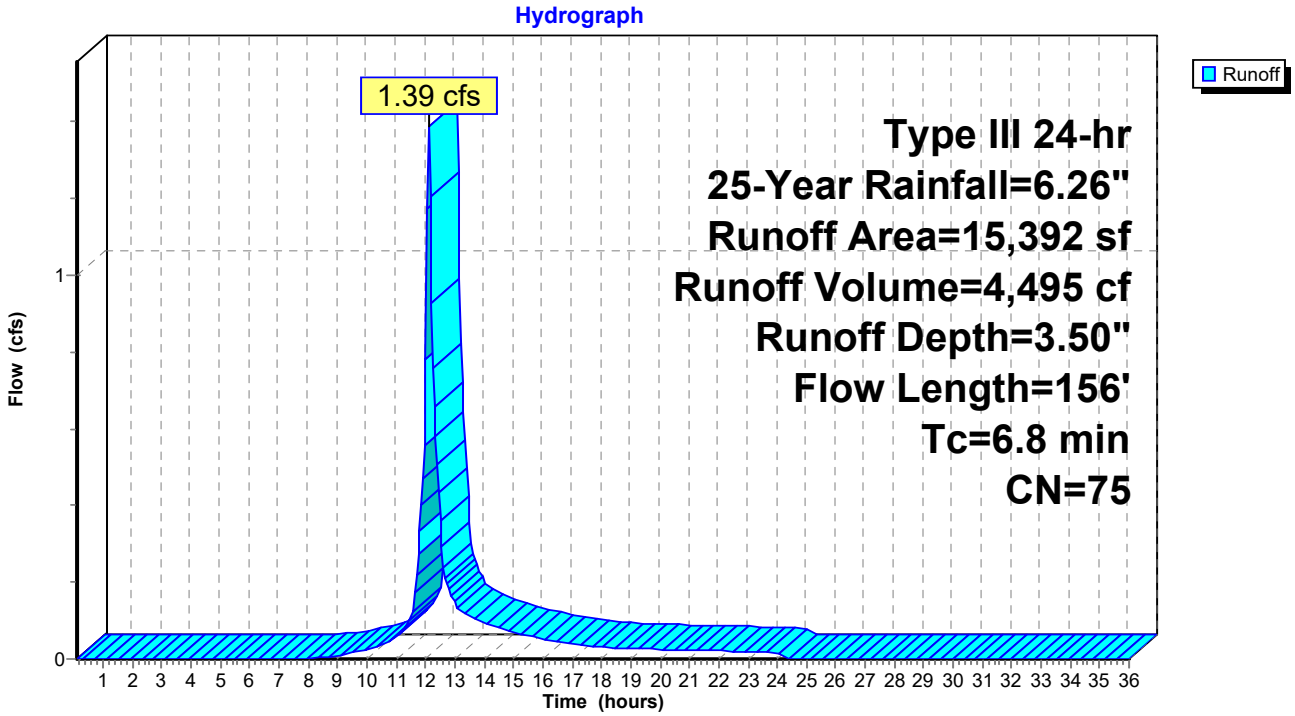
Runoff = 1.39 cfs @ 12.10 hrs, Volume= 4,495 cf, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.26"

	Area (sf)	CN	Description
	13,474	73	Woods, Fair, HSG C
*	300	98	Unconnected pavement, HSG C, Ledge
	1,618	87	Dirt roads, HSG C
	15,392	75	Weighted Average
	15,092		98.05% Pervious Area
	300		1.95% Impervious Area
	300		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0857	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	53	0.0567	1.19		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
1.1	68	0.0442	1.05		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
6.8	156	Total			

Subcatchment OSN: Off Site Subcatchment - Northeast



Hydrograph for Subcatchment OSN: Off Site Subcatchment - Northeast

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
0.60	0.04	0.00	0.00
1.10	0.07	0.00	0.00
1.60	0.10	0.00	0.00
2.10	0.13	0.00	0.00
2.60	0.16	0.00	0.00
3.10	0.20	0.00	0.00
3.60	0.24	0.00	0.00
4.10	0.28	0.00	0.00
4.60	0.32	0.00	0.00
5.10	0.36	0.00	0.00
5.60	0.41	0.00	0.00
6.10	0.46	0.00	0.00
6.60	0.52	0.00	0.00
7.10	0.58	0.00	0.00
7.60	0.65	0.00	0.00
8.10	0.73	0.00	0.00
8.60	0.82	0.01	0.01
9.10	0.94	0.02	0.01
9.60	1.07	0.04	0.02
10.10	1.21	0.08	0.03
10.60	1.39	0.13	0.04
11.10	1.61	0.21	0.06
11.60	1.97	0.37	0.14
12.10	3.66	1.41	**1.39**
12.60	4.47	2.02	0.24
13.10	4.74	2.24	0.13
13.60	4.94	2.40	0.11
14.10	5.11	2.54	0.09
14.60	5.25	2.65	0.08
15.10	5.37	2.75	0.07
15.60	5.48	2.84	0.06
16.10	5.56	2.91	0.05
16.60	5.64	2.98	0.04
17.10	5.71	3.03	0.04
17.60	5.77	3.08	0.03
18.10	5.82	3.13	0.03
18.60	5.87	3.17	0.03
19.10	5.91	3.21	0.03
19.60	5.96	3.25	0.03
20.10	6.00	3.28	0.02
20.60	6.04	3.31	0.02
21.10	6.08	3.35	0.02
21.60	6.11	3.38	0.02
22.10	6.15	3.41	0.02
22.60	6.18	3.43	0.02
23.10	6.21	3.46	0.02
23.60	**6.24**	**3.49**	0.02
24.10	**6.26**	**3.50**	0.01
24.60	6.26	3.50	0.00
25.10	6.26	3.50	0.00
25.60	6.26	3.50	0.00
26.10	6.26	3.50	0.00
26.60	6.26	3.50	0.00
27.10	6.26	3.50	0.00
27.60	6.26	3.50	0.00
28.10	6.26	3.50	0.00
28.60	6.26	3.50	0.00
29.10	6.26	3.50	0.00
29.60	6.26	3.50	0.00
30.10	6.26	3.50	0.00
30.60	6.26	3.50	0.00
31.10	6.26	3.50	0.00
31.60	6.26	3.50	0.00
32.10	6.26	3.50	0.00
32.60	6.26	3.50	0.00
33.10	6.26	3.50	0.00
33.60	6.26	3.50	0.00
34.10	6.26	3.50	0.00
34.60	6.26	3.50	0.00
35.10	6.26	3.50	0.00
35.60	6.26	3.50	0.00

Summary for Subcatchment SR: Subcatchment - Roadway

[49] Hint: Tc<2dt may require smaller dt

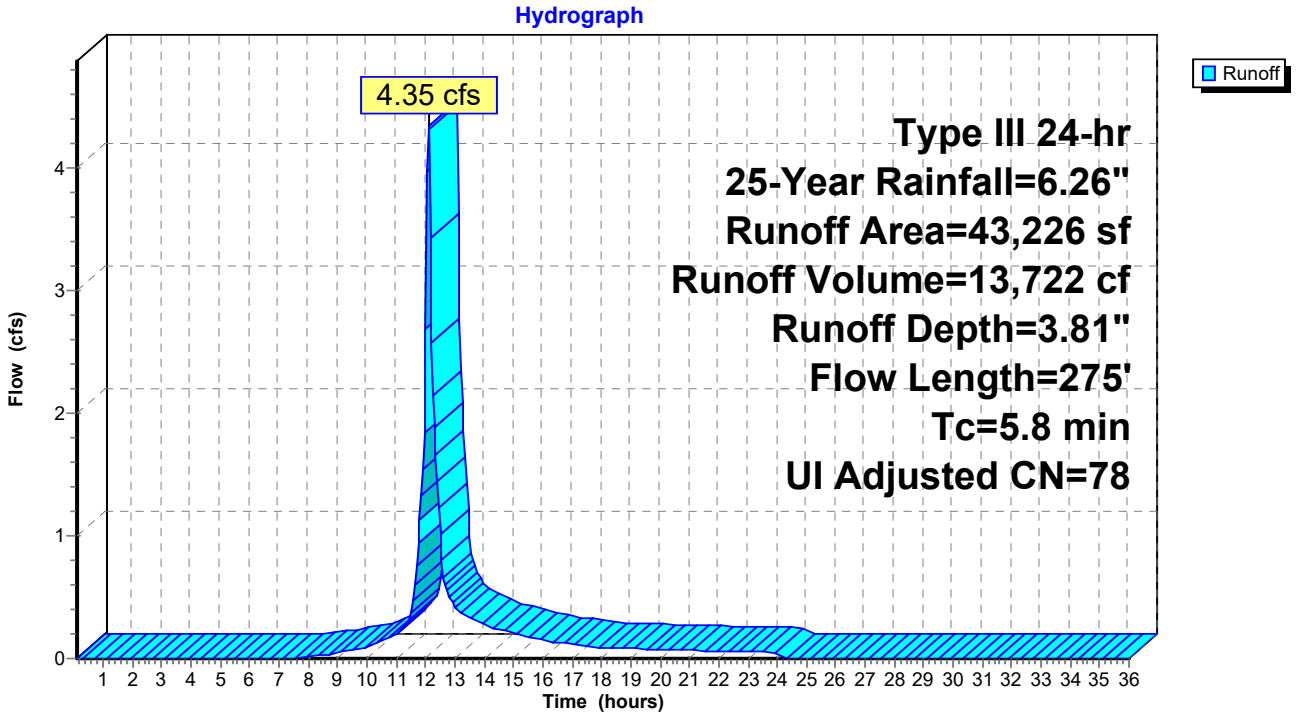
Runoff = 4.35 cfs @ 12.09 hrs, Volume= 13,722 cf, Depth= 3.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.26"

	Area (sf)	CN	Adj	Description
	28,728	73		Woods, Fair, HSG C
*	4,227	98		Unconnected pavement, HSG C, Ledge
	10,271	87		Dirt roads, HSG C
	43,226	79	78	Weighted Average, UI Adjusted
	38,999			90.22% Pervious Area
	4,227			9.78% Impervious Area
	4,227			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	49	0.2047	0.18		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.8	123	0.0244	2.51		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
0.4	103	0.0581	3.88		**Shallow Concentrated Flow, CD** Unpaved Kv= 16.1 fps
5.8	275	Total			

Subcatchment SR: Subcatchment - Roadway



Hydrograph for Subcatchment SR: Subcatchment - Roadway

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
0.60	0.04	0.00	0.00
1.10	0.07	0.00	0.00
1.60	0.10	0.00	0.00
2.10	0.13	0.00	0.00
2.60	0.16	0.00	0.00
3.10	0.20	0.00	0.00
3.60	0.24	0.00	0.00
4.10	0.28	0.00	0.00
4.60	0.32	0.00	0.00
5.10	0.36	0.00	0.00
5.60	0.41	0.00	0.00
6.10	0.46	0.00	0.00
6.60	0.52	0.00	0.00
7.10	0.58	0.00	0.00
7.60	0.65	0.00	0.01
8.10	0.73	0.01	0.02
8.60	0.82	0.02	0.03
9.10	0.94	0.04	0.05
9.60	1.07	0.08	0.07
10.10	1.21	0.12	0.10
10.60	1.39	0.19	0.15
11.10	1.61	0.28	0.21
11.60	1.97	0.47	0.46
12.10	3.66	1.62	**4.32**
12.60	4.47	2.26	0.66
13.10	4.74	2.49	0.39
13.60	4.94	2.66	0.32
14.10	5.11	2.80	0.26
14.60	5.25	2.92	0.23
15.10	5.37	3.03	0.20
15.60	5.48	3.12	0.17
16.10	5.56	3.20	0.14
16.60	5.64	3.26	0.13
17.10	5.71	3.32	0.11
17.60	5.77	3.37	0.10
18.10	5.82	3.42	0.09
18.60	5.87	3.46	0.08
19.10	5.91	3.50	0.08
19.60	5.96	3.54	0.08
20.10	6.00	3.58	0.07
20.60	6.04	3.61	0.07
21.10	6.08	3.65	0.07
21.60	6.11	3.68	0.06
22.10	6.15	3.71	0.06
22.60	6.18	3.74	0.06
23.10	6.21	3.76	0.05
23.60	**6.24**	**3.79**	0.05
24.10	**6.26**	**3.81**	0.02
24.60	6.26	3.81	0.00
25.10	6.26	3.81	0.00
25.60	6.26	3.81	0.00
26.10	6.26	3.81	0.00
26.60	6.26	3.81	0.00
27.10	6.26	3.81	0.00
27.60	6.26	3.81	0.00
28.10	6.26	3.81	0.00
28.60	6.26	3.81	0.00
29.10	6.26	3.81	0.00
29.60	6.26	3.81	0.00
30.10	6.26	3.81	0.00
30.60	6.26	3.81	0.00
31.10	6.26	3.81	0.00
31.60	6.26	3.81	0.00
32.10	6.26	3.81	0.00
32.60	6.26	3.81	0.00
33.10	6.26	3.81	0.00
33.60	6.26	3.81	0.00
34.10	6.26	3.81	0.00
34.60	6.26	3.81	0.00
35.10	6.26	3.81	0.00
35.60	6.26	3.81	0.00

Summary for Subcatchment SW: Subcatchment - Wetlands

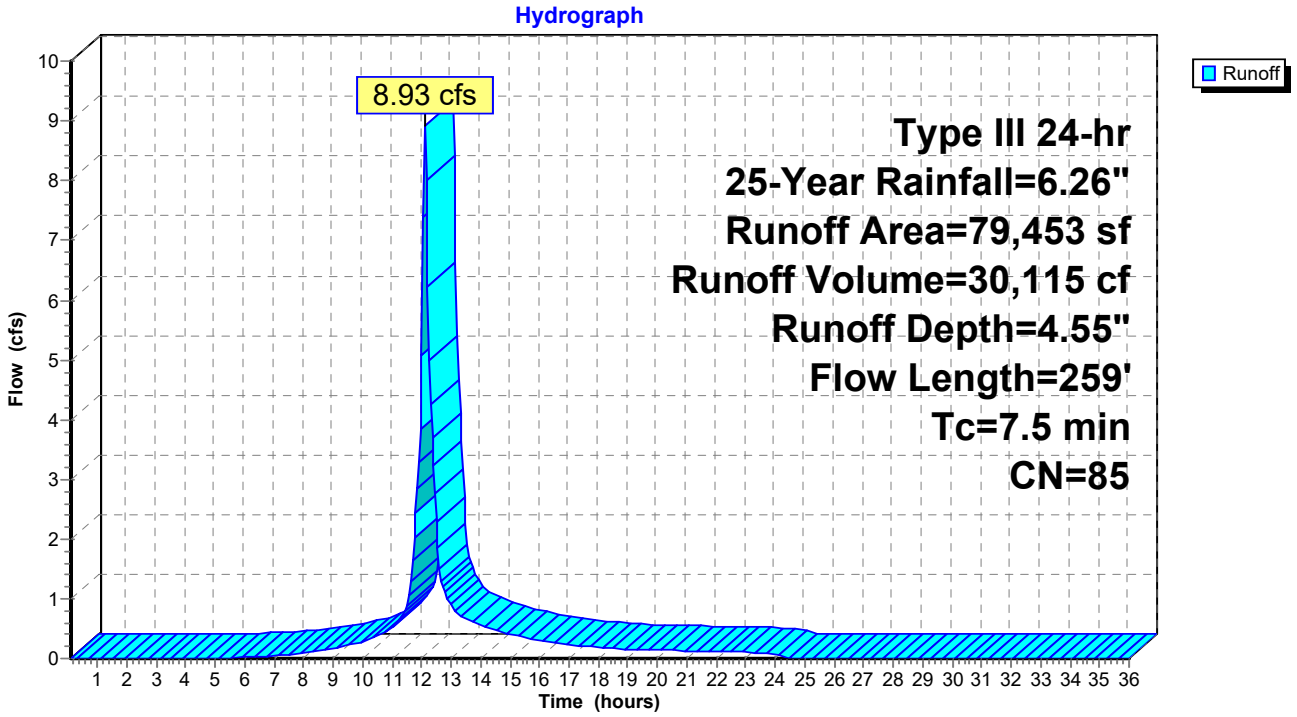
Runoff = 8.93 cfs @ 12.11 hrs, Volume= 30,115 cf, Depth= 4.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.26"

	Area (sf)	CN	Description
	12,590	73	Woods, Fair, HSG C
*	9,680	98	Unconnected pavement, HSG C, Ledge
	39,145	79	Woods, Fair, HSG D
*	18,038	98	Unconnected pavement, HSG D, Ledge
	79,453	85	Weighted Average
	51,735		65.11% Pervious Area
	27,718		34.89% Impervious Area
	27,718		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	52	0.1535	0.16		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	65	0.1229	1.75		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.7	82	0.1716	2.07		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.7	60	0.0830	1.44		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
7.5	259	Total			

Subcatchment SW: Subcatchment - Wetlands



Hydrograph for Subcatchment SW: Subcatchment - Wetlands

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
0.60	0.04	0.00	0.00
1.10	0.07	0.00	0.00
1.60	0.10	0.00	0.00
2.10	0.13	0.00	0.00
2.60	0.16	0.00	0.00
3.10	0.20	0.00	0.00
3.60	0.24	0.00	0.00
4.10	0.28	0.00	0.00
4.60	0.32	0.00	0.00
5.10	0.36	0.00	0.00
5.60	0.41	0.00	0.01
6.10	0.46	0.01	0.02
6.60	0.52	0.01	0.03
7.10	0.58	0.03	0.05
7.60	0.65	0.04	0.07
8.10	0.73	0.07	0.09
8.60	0.82	0.10	0.13
9.10	0.94	0.14	0.18
9.60	1.07	0.21	0.24
10.10	1.21	0.28	0.30
10.60	1.39	0.39	0.41
11.10	1.61	0.53	0.55
11.60	1.97	0.77	1.05
12.10	3.66	2.15	**8.91**
12.60	4.47	2.88	1.50
13.10	4.74	3.13	0.80
13.60	4.94	3.31	0.65
14.10	5.11	3.47	0.53
14.60	5.25	3.60	0.46
15.10	5.37	3.71	0.40
15.60	5.48	3.81	0.34
16.10	5.56	3.89	0.28
16.60	5.64	3.96	0.25
17.10	5.71	4.03	0.23
17.60	5.77	4.08	0.20
18.10	5.82	4.13	0.17
18.60	5.87	4.18	0.17
19.10	5.91	4.22	0.16
19.60	5.96	4.26	0.15
20.10	6.00	4.30	0.14
20.60	6.04	4.34	0.14
21.10	6.08	4.37	0.13
21.60	6.11	4.41	0.12
22.10	6.15	4.44	0.12
22.60	6.18	4.47	0.11
23.10	6.21	4.50	0.11
23.60	**6.24**	**4.53**	0.10
24.10	**6.26**	**4.55**	0.05
24.60	6.26	4.55	0.00
25.10	6.26	4.55	0.00
25.60	6.26	4.55	0.00
26.10	6.26	4.55	0.00
26.60	6.26	4.55	0.00
27.10	6.26	4.55	0.00
27.60	6.26	4.55	0.00
28.10	6.26	4.55	0.00
28.60	6.26	4.55	0.00
29.10	6.26	4.55	0.00
29.60	6.26	4.55	0.00
30.10	6.26	4.55	0.00
30.60	6.26	4.55	0.00
31.10	6.26	4.55	0.00
31.60	6.26	4.55	0.00
32.10	6.26	4.55	0.00
32.60	6.26	4.55	0.00
33.10	6.26	4.55	0.00
33.60	6.26	4.55	0.00
34.10	6.26	4.55	0.00
34.60	6.26	4.55	0.00
35.10	6.26	4.55	0.00
35.60	6.26	4.55	0.00

Time span=0.10-36.00 hrs, dt=0.05 hrs, 719 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment OSN: Off Site Subcatchment Runoff Area=15,392 sf 1.95% Impervious Runoff Depth=5.94"
Flow Length=156' Tc=6.8 min CN=75 Runoff=2.34 cfs 7,623 cf

Subcatchment SR: Subcatchment - Runoff Area=43,226 sf 9.78% Impervious Runoff Depth=6.31"
Flow Length=275' Tc=5.8 min UI Adjusted CN=78 Runoff=7.10 cfs 22,740 cf

Subcatchment SW: Subcatchment - Runoff Area=79,453 sf 34.89% Impervious Runoff Depth=7.17"
Flow Length=259' Tc=7.5 min CN=85 Runoff=13.78 cfs 47,485 cf

Total Runoff Area = 138,071 sf Runoff Volume = 77,847 cf Average Runoff Depth = 6.77"
76.65% Pervious = 105,826 sf 23.35% Impervious = 32,245 sf

Summary for Subcatchment OSN: Off Site Subcatchment - Northeast

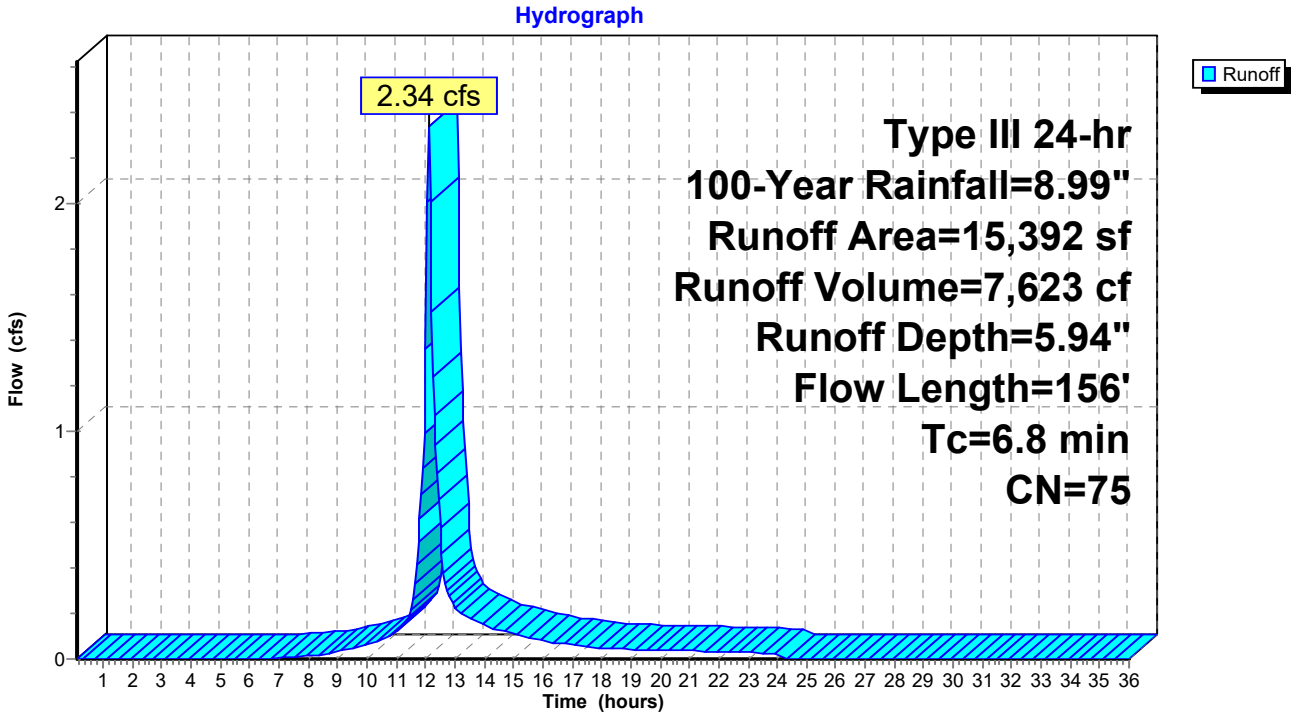
Runoff = 2.34 cfs @ 12.10 hrs, Volume= 7,623 cf, Depth= 5.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.99"

	Area (sf)	CN	Description
	13,474	73	Woods, Fair, HSG C
*	300	98	Unconnected pavement, HSG C, Ledge
	1,618	87	Dirt roads, HSG C
	15,392	75	Weighted Average
	15,092		98.05% Pervious Area
	300		1.95% Impervious Area
	300		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	35	0.0857	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	53	0.0567	1.19		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
1.1	68	0.0442	1.05		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
6.8	156	Total			

Subcatchment OSN: Off Site Subcatchment - Northeast



Hydrograph for Subcatchment OSN: Off Site Subcatchment - Northeast

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
0.60	0.05	0.00	0.00
1.10	0.10	0.00	0.00
1.60	0.14	0.00	0.00
2.10	0.19	0.00	0.00
2.60	0.24	0.00	0.00
3.10	0.29	0.00	0.00
3.60	0.34	0.00	0.00
4.10	0.40	0.00	0.00
4.60	0.46	0.00	0.00
5.10	0.52	0.00	0.00
5.60	0.59	0.00	0.00
6.10	0.66	0.00	0.00
6.60	0.74	0.00	0.00
7.10	0.83	0.01	0.01
7.60	0.93	0.02	0.01
8.10	1.05	0.04	0.02
8.60	1.18	0.07	0.02
9.10	1.34	0.11	0.04
9.60	1.53	0.18	0.05
10.10	1.74	0.26	0.07
10.60	2.00	0.38	0.09
11.10	2.32	0.55	0.13
11.60	2.83	0.85	0.26
12.10	5.25	2.65	**2.34**
12.60	6.41	3.64	0.38
13.10	6.81	3.98	0.21
13.60	7.10	4.24	0.17
14.10	7.33	4.45	0.14
14.60	7.54	4.63	0.12
15.10	7.71	4.78	0.11
15.60	7.86	4.92	0.09
16.10	7.99	5.03	0.08
16.60	8.10	5.13	0.07
17.10	8.20	5.22	0.06
17.60	8.28	5.30	0.05
18.10	8.36	5.36	0.05
18.60	8.43	5.43	0.04
19.10	8.49	5.49	0.04
19.60	8.56	5.55	0.04
20.10	8.62	5.60	0.04
20.60	8.67	5.65	0.04
21.10	8.73	5.70	0.03
21.60	8.78	5.75	0.03
22.10	8.83	5.79	0.03
22.60	8.87	5.84	0.03
23.10	8.92	5.88	0.03
23.60	**8.96**	**5.91**	0.03
24.10	**8.99**	**5.94**	0.01
24.60	8.99	5.94	0.00
25.10	8.99	5.94	0.00
25.60	8.99	5.94	0.00
26.10	8.99	5.94	0.00
26.60	8.99	5.94	0.00
27.10	8.99	5.94	0.00
27.60	8.99	5.94	0.00
28.10	8.99	5.94	0.00
28.60	8.99	5.94	0.00
29.10	8.99	5.94	0.00
29.60	8.99	5.94	0.00
30.10	8.99	5.94	0.00
30.60	8.99	5.94	0.00
31.10	8.99	5.94	0.00
31.60	8.99	5.94	0.00
32.10	8.99	5.94	0.00
32.60	8.99	5.94	0.00
33.10	8.99	5.94	0.00
33.60	8.99	5.94	0.00
34.10	8.99	5.94	0.00
34.60	8.99	5.94	0.00
35.10	8.99	5.94	0.00
35.60	8.99	5.94	0.00

Summary for Subcatchment SR: Subcatchment - Roadway

[49] Hint: Tc<2dt may require smaller dt

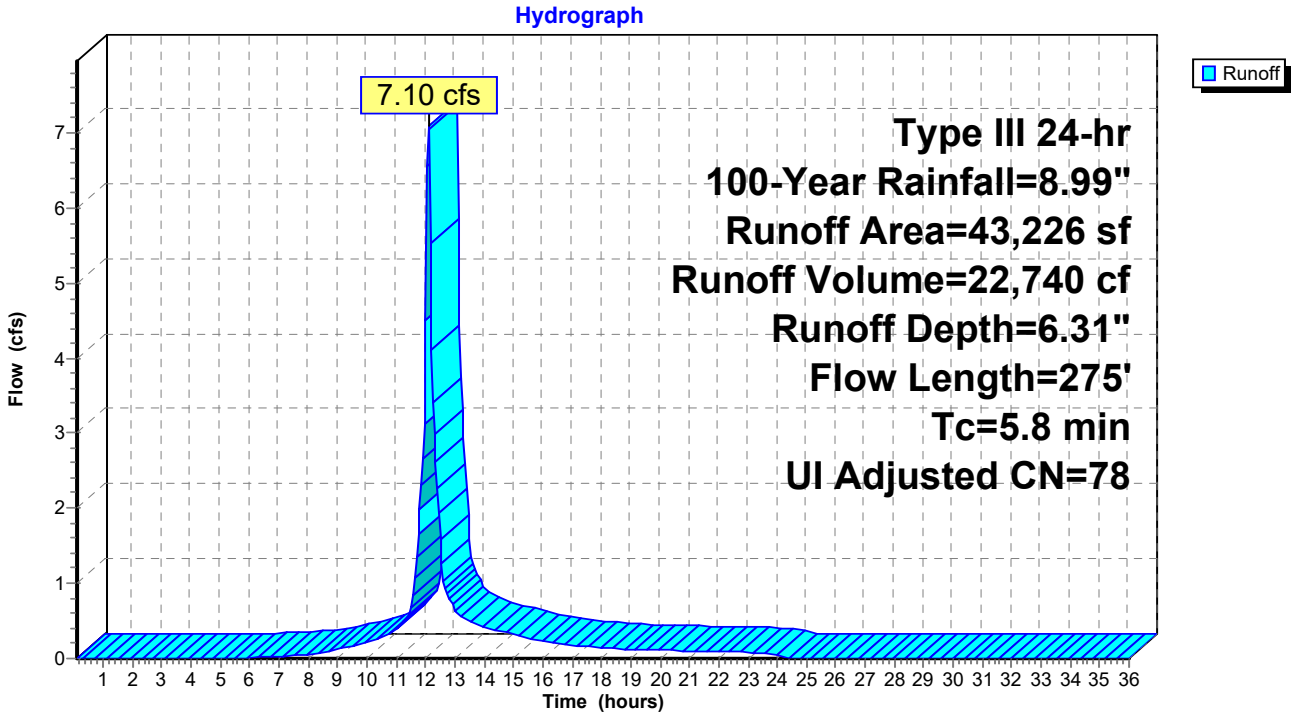
Runoff = 7.10 cfs @ 12.09 hrs, Volume= 22,740 cf, Depth= 6.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.99"

	Area (sf)	CN	Adj	Description
	28,728	73		Woods, Fair, HSG C
*	4,227	98		Unconnected pavement, HSG C, Ledge
	10,271	87		Dirt roads, HSG C
	43,226	79	78	Weighted Average, UI Adjusted
	38,999			90.22% Pervious Area
	4,227			9.78% Impervious Area
	4,227			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.6	49	0.2047	0.18		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.8	123	0.0244	2.51		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
0.4	103	0.0581	3.88		**Shallow Concentrated Flow, CD** Unpaved Kv= 16.1 fps
5.8	275	Total			

Subcatchment SR: Subcatchment - Roadway



Hydrograph for Subcatchment SR: Subcatchment - Roadway

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
0.60	0.05	0.00	0.00
1.10	0.10	0.00	0.00
1.60	0.14	0.00	0.00
2.10	0.19	0.00	0.00
2.60	0.24	0.00	0.00
3.10	0.29	0.00	0.00
3.60	0.34	0.00	0.00
4.10	0.40	0.00	0.00
4.60	0.46	0.00	0.00
5.10	0.52	0.00	0.00
5.60	0.59	0.00	0.00
6.10	0.66	0.00	0.01
6.60	0.74	0.01	0.02
7.10	0.83	0.02	0.03
7.60	0.93	0.04	0.04
8.10	1.05	0.07	0.06
8.60	1.18	0.11	0.09
9.10	1.34	0.17	0.13
9.60	1.53	0.25	0.17
10.10	1.74	0.35	0.22
10.60	2.00	0.49	0.30
11.10	2.32	0.67	0.41
11.60	2.83	1.01	0.84
12.10	5.25	2.93	**7.04**
12.60	6.41	3.95	1.03
13.10	6.81	4.30	0.60
13.60	7.10	4.56	0.50
14.10	7.33	4.78	0.40
14.60	7.54	4.96	0.36
15.10	7.71	5.13	0.31
15.60	7.86	5.26	0.26
16.10	7.99	5.38	0.22
16.60	8.10	5.48	0.20
17.10	8.20	5.57	0.17
17.60	8.28	5.65	0.15
18.10	8.36	5.72	0.13
18.60	8.43	5.79	0.13
19.10	8.49	5.85	0.12
19.60	8.56	5.91	0.12
20.10	8.62	5.96	0.11
20.60	8.67	6.02	0.10
21.10	8.73	6.07	0.10
21.60	8.78	6.11	0.10
22.10	8.83	6.16	0.09
22.60	8.87	6.20	0.09
23.10	8.92	6.24	0.08
23.60	**8.96**	**6.28**	0.08
24.10	**8.99**	**6.31**	0.02
24.60	8.99	6.31	0.00
25.10	8.99	6.31	0.00
25.60	8.99	6.31	0.00
26.10	8.99	6.31	0.00
26.60	8.99	6.31	0.00
27.10	8.99	6.31	0.00
27.60	8.99	6.31	0.00
28.10	8.99	6.31	0.00
28.60	8.99	6.31	0.00
29.10	8.99	6.31	0.00
29.60	8.99	6.31	0.00
30.10	8.99	6.31	0.00
30.60	8.99	6.31	0.00
31.10	8.99	6.31	0.00
31.60	8.99	6.31	0.00
32.10	8.99	6.31	0.00
32.60	8.99	6.31	0.00
33.10	8.99	6.31	0.00
33.60	8.99	6.31	0.00
34.10	8.99	6.31	0.00
34.60	8.99	6.31	0.00
35.10	8.99	6.31	0.00
35.60	8.99	6.31	0.00

Summary for Subcatchment SW: Subcatchment - Wetlands

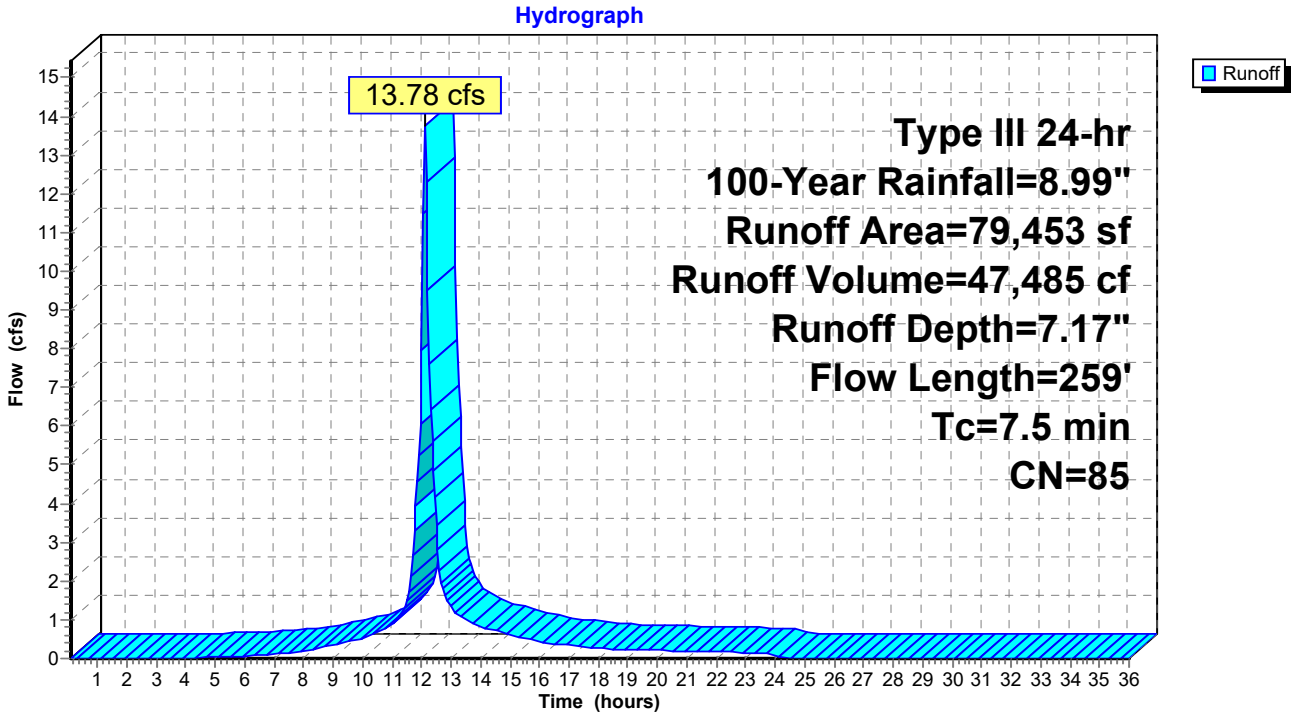
Runoff = 13.78 cfs @ 12.11 hrs, Volume= 47,485 cf, Depth= 7.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.99"

	Area (sf)	CN	Description
	12,590	73	Woods, Fair, HSG C
*	9,680	98	Unconnected pavement, HSG C, Ledge
	39,145	79	Woods, Fair, HSG D
*	18,038	98	Unconnected pavement, HSG D, Ledge
	79,453	85	Weighted Average
	51,735		65.11% Pervious Area
	27,718		34.89% Impervious Area
	27,718		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	52	0.1535	0.16		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	65	0.1229	1.75		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.7	82	0.1716	2.07		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.7	60	0.0830	1.44		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
7.5	259	Total			

Subcatchment SW: Subcatchment - Wetlands



Hydrograph for Subcatchment SW: Subcatchment - Wetlands

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
0.60	0.05	0.00	0.00
1.10	0.10	0.00	0.00
1.60	0.14	0.00	0.00
2.10	0.19	0.00	0.00
2.60	0.24	0.00	0.00
3.10	0.29	0.00	0.00
3.60	0.34	0.00	0.00
4.10	0.40	0.00	0.01
4.60	0.46	0.01	0.02
5.10	0.52	0.01	0.04
5.60	0.59	0.03	0.05
6.10	0.66	0.05	0.07
6.60	0.74	0.07	0.10
7.10	0.83	0.10	0.13
7.60	0.93	0.14	0.16
8.10	1.05	0.20	0.20
8.60	1.18	0.27	0.27
9.10	1.34	0.36	0.36
9.60	1.53	0.47	0.45
10.10	1.74	0.61	0.55
10.60	2.00	0.80	0.72
11.10	2.32	1.03	0.93
11.60	2.83	1.44	1.73
12.10	5.25	3.60	**13.75**
12.60	6.41	4.69	2.25
13.10	6.81	5.07	1.19
13.60	7.10	5.35	0.97
14.10	7.33	5.57	0.79
14.60	7.54	5.77	0.69
15.10	7.71	5.94	0.60
15.60	7.86	6.08	0.51
16.10	7.99	6.20	0.42
16.60	8.10	6.31	0.38
17.10	8.20	6.40	0.34
17.60	8.28	6.49	0.30
18.10	8.36	6.56	0.26
18.60	8.43	6.63	0.24
19.10	8.49	6.69	0.23
19.60	8.56	6.75	0.22
20.10	8.62	6.81	0.21
20.60	8.67	6.86	0.20
21.10	8.73	6.92	0.19
21.60	8.78	6.97	0.18
22.10	8.83	7.01	0.17
22.60	8.87	7.06	0.16
23.10	8.92	7.10	0.15
23.60	**8.96**	**7.14**	0.15
24.10	**8.99**	**7.17**	0.08
24.60	8.99	7.17	0.00
25.10	8.99	7.17	0.00
25.60	8.99	7.17	0.00
26.10	8.99	7.17	0.00
26.60	8.99	7.17	0.00
27.10	8.99	7.17	0.00
27.60	8.99	7.17	0.00
28.10	8.99	7.17	0.00
28.60	8.99	7.17	0.00
29.10	8.99	7.17	0.00
29.60	8.99	7.17	0.00
30.10	8.99	7.17	0.00
30.60	8.99	7.17	0.00
31.10	8.99	7.17	0.00
31.60	8.99	7.17	0.00
32.10	8.99	7.17	0.00
32.60	8.99	7.17	0.00
33.10	8.99	7.17	0.00
33.60	8.99	7.17	0.00
34.10	8.99	7.17	0.00
34.60	8.99	7.17	0.00
35.10	8.99	7.17	0.00
35.60	8.99	7.17	0.00

APPENDIX B

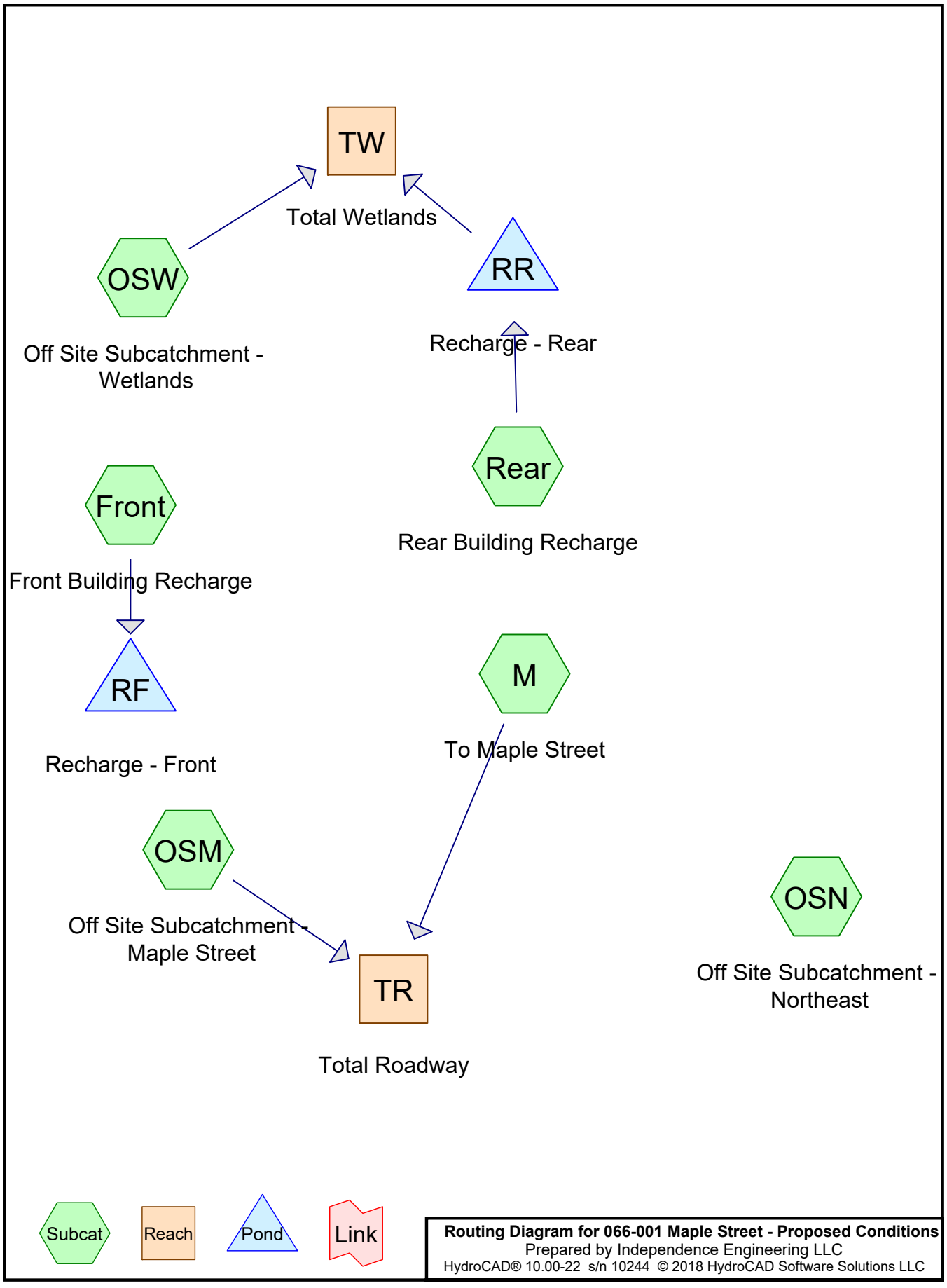
PROPOSED HYDROLOGICAL CONDITIONS

2-YEAR STORM EVENT

10-YEAR STORM EVENT

25-YEAR STORM EVENT

100-YEAR STORM EVENT



Routing Diagram for 066-001 Maple Street - Proposed Conditions
Prepared by Independence Engineering LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
9,589	74	>75% Grass cover, Good, HSG C (M, OSM, OSN, Rear)
23,039	98	Paved parking, HSG C (Front, M, Rear)
20,125	98	Roofs, HSG C (Rear)
12,331	98	Unconnected pavement, HSG C, Ledge (OSM, OSN, OSW, Rear)
1,036	98	Unconnected pavement, HSG C, Retaining Wall (M, OSN, Rear)
18,038	98	Unconnected pavement, HSG D, Ledge (OSW)
14,915	73	Woods, Fair, HSG C (OSM, OSN, OSW, Rear)
39,220	79	Woods, Fair, HSG D (OSM, OSW)
138,293	**88**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
81,035	HSG C	Front, M, OSM, OSN, OSW, Rear
57,258	HSG D	OSM, OSW
0	Other	
138,293		**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	Sub Num
0	0	9,589	0	0	9,589	>75% Grass cover, Good	
0	0	23,039	0	0	23,039	Paved parking	
0	0	20,125	0	0	20,125	Roofs	
0	0	13,367	18,038	0	31,405	Unconnected pavement	
0	0	14,915	39,220	0	54,135	Woods, Fair	
0	**0**	**81,035**	**57,258**	**0**	**138,293**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	RR	102.17	101.50	44.9	0.0149	0.013	12.0	0.0	0.0

Time span=0.10-72.00 hrs, dt=0.05 hrs, 1439 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Front: Front Building Runoff Area=4,505 sf 100.00% Impervious Runoff Depth=3.17"
Tc=5.0 min CN=98 Runoff=0.34 cfs 1,189 cf

Subcatchment M: To Maple Street Runoff Area=12,026 sf 76.27% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=92 Runoff=0.81 cfs 2,547 cf

Subcatchment OSM: Off Site Runoff Area=12,634 sf 16.39% Impervious Runoff Depth=1.23"
Flow Length=176' Tc=3.7 min UI Adjusted CN=75 Runoff=0.43 cfs 1,297 cf

Subcatchment OSN: Off Site Subcatchment - Runoff Area=4,659 sf 8.89% Impervious Runoff Depth=1.23"
Flow Length=139' Tc=4.5 min UI Adjusted CN=75 Runoff=0.15 cfs 478 cf

Subcatchment OSW: Off Site Runoff Area=67,554 sf 37.96% Impervious Runoff Depth=2.01"
Flow Length=289' Tc=10.8 min CN=86 Runoff=3.09 cfs 11,316 cf

Subcatchment Rear: Rear Building Runoff Area=36,915 sf 88.76% Impervious Runoff Depth=2.84"
Tc=5.0 min CN=95 Runoff=2.67 cfs 8,739 cf

Reach TR: Total Roadway Inflow=1.23 cfs 3,843 cf
Outflow=1.23 cfs 3,843 cf

Reach TW: Total Wetlands Inflow=3.09 cfs 14,052 cf
Outflow=3.09 cfs 14,052 cf

Pond RF: Recharge - Front Peak Elev=101.63' Storage=765 cf Inflow=0.34 cfs 1,189 cf
Outflow=0.01 cfs 1,189 cf

Pond RR: Recharge - Rear Peak Elev=102.43' Storage=4,954 cf Inflow=2.67 cfs 8,739 cf
Discarded=0.03 cfs 5,724 cf Primary=0.27 cfs 2,737 cf Outflow=0.30 cfs 8,460 cf

Total Runoff Area = 138,293 sf Runoff Volume = 25,565 cf Average Runoff Depth = 2.22"
46.08% Pervious = 63,724 sf 53.92% Impervious = 74,569 sf

Summary for Subcatchment Front: Front Building Recharge

[49] Hint: Tc<2dt may require smaller dt

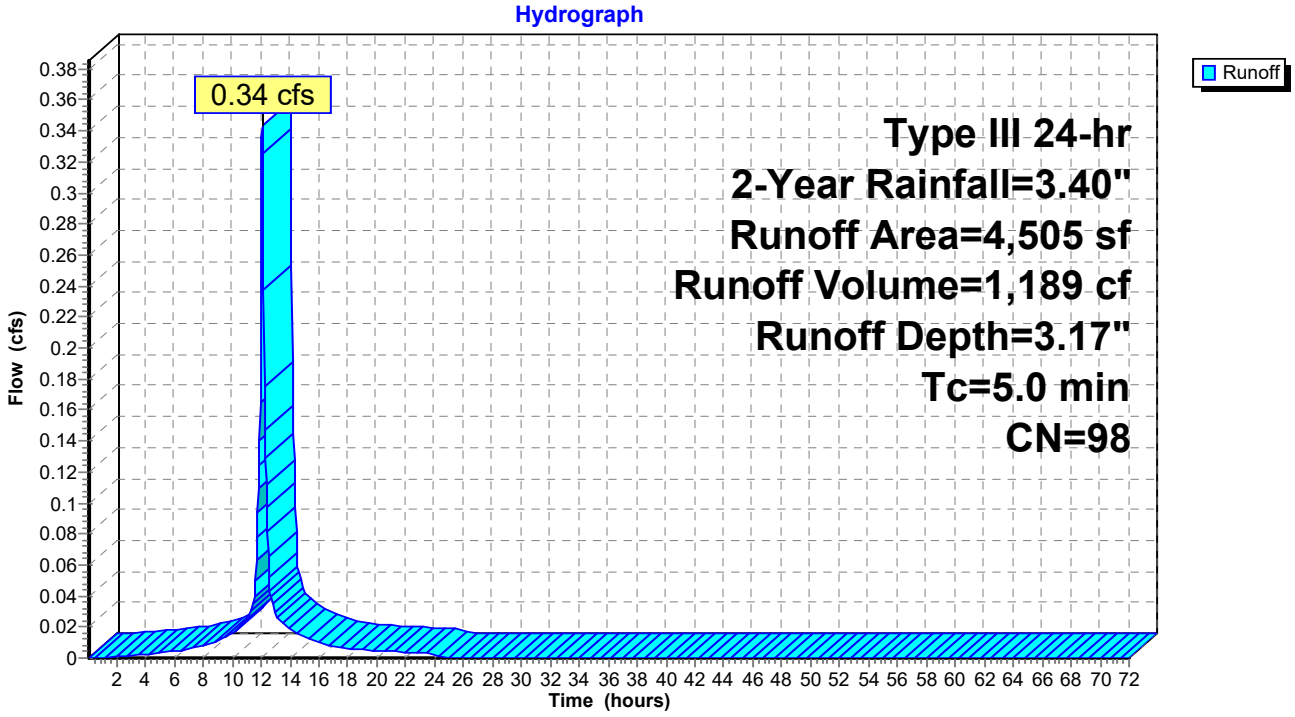
Runoff = 0.34 cfs @ 12.07 hrs, Volume= 1,189 cf, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

Area (sf)	CN	Description
4,505	98	Paved parking, HSG C
4,505		100.00% Impervious Area

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

Subcatchment Front: Front Building Recharge



Hydrograph for Subcatchment Front: Front Building Recharge

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.04	0.00	0.00
2.10	0.07	0.00	0.00
3.10	0.11	0.02	0.00
4.10	0.15	0.04	0.00
5.10	0.20	0.07	0.00
6.10	0.25	0.11	0.00
7.10	0.31	0.16	0.01
8.10	0.40	0.23	0.01
9.10	0.51	0.33	0.01
10.10	0.66	0.47	0.02
11.10	0.88	0.67	**0.03**
12.10	1.99	1.76	**0.33**
13.10	2.57	2.34	0.03
14.10	2.77	2.54	0.02
15.10	2.92	2.69	0.01
16.10	3.02	2.79	0.01
17.10	3.10	2.87	0.01
18.10	3.16	2.93	0.01
19.10	3.21	2.98	0.01
20.10	3.26	3.03	0.00
21.10	3.30	3.07	0.00
22.10	3.34	3.11	0.00
23.10	**3.37**	**3.14**	0.00
24.10	**3.40**	**3.17**	0.00
25.10	3.40	3.17	0.00
26.10	3.40	3.17	0.00
27.10	3.40	3.17	0.00
28.10	3.40	3.17	0.00
29.10	3.40	3.17	0.00
30.10	3.40	3.17	0.00
31.10	3.40	3.17	0.00
32.10	3.40	3.17	0.00
33.10	3.40	3.17	0.00
34.10	3.40	3.17	0.00
35.10	3.40	3.17	0.00
36.10	3.40	3.17	0.00
37.10	3.40	3.17	0.00
38.10	3.40	3.17	0.00
39.10	3.40	3.17	0.00
40.10	3.40	3.17	0.00
41.10	3.40	3.17	0.00
42.10	3.40	3.17	0.00
43.10	3.40	3.17	0.00
44.10	3.40	3.17	0.00
45.10	3.40	3.17	0.00
46.10	3.40	3.17	0.00
47.10	3.40	3.17	0.00
48.10	3.40	3.17	0.00
49.10	3.40	3.17	0.00
50.10	3.40	3.17	0.00
51.10	3.40	3.17	0.00
52.10	3.40	3.17	0.00
53.10	3.40	3.17	0.00
54.10	3.40	3.17	0.00
55.10	3.40	3.17	0.00
56.10	3.40	3.17	0.00
57.10	3.40	3.17	0.00
58.10	3.40	3.17	0.00
59.10	3.40	3.17	0.00
60.10	3.40	3.17	0.00
61.10	3.40	3.17	0.00
62.10	3.40	3.17	0.00
63.10	3.40	3.17	0.00
64.10	3.40	3.17	0.00
65.10	3.40	3.17	0.00
66.10	3.40	3.17	0.00
67.10	3.40	3.17	0.00
68.10	3.40	3.17	0.00
69.10	3.40	3.17	0.00
70.10	3.40	3.17	0.00
71.10	3.40	3.17	0.00

Summary for Subcatchment M: To Maple Street

[49] Hint: Tc<2dt may require smaller dt

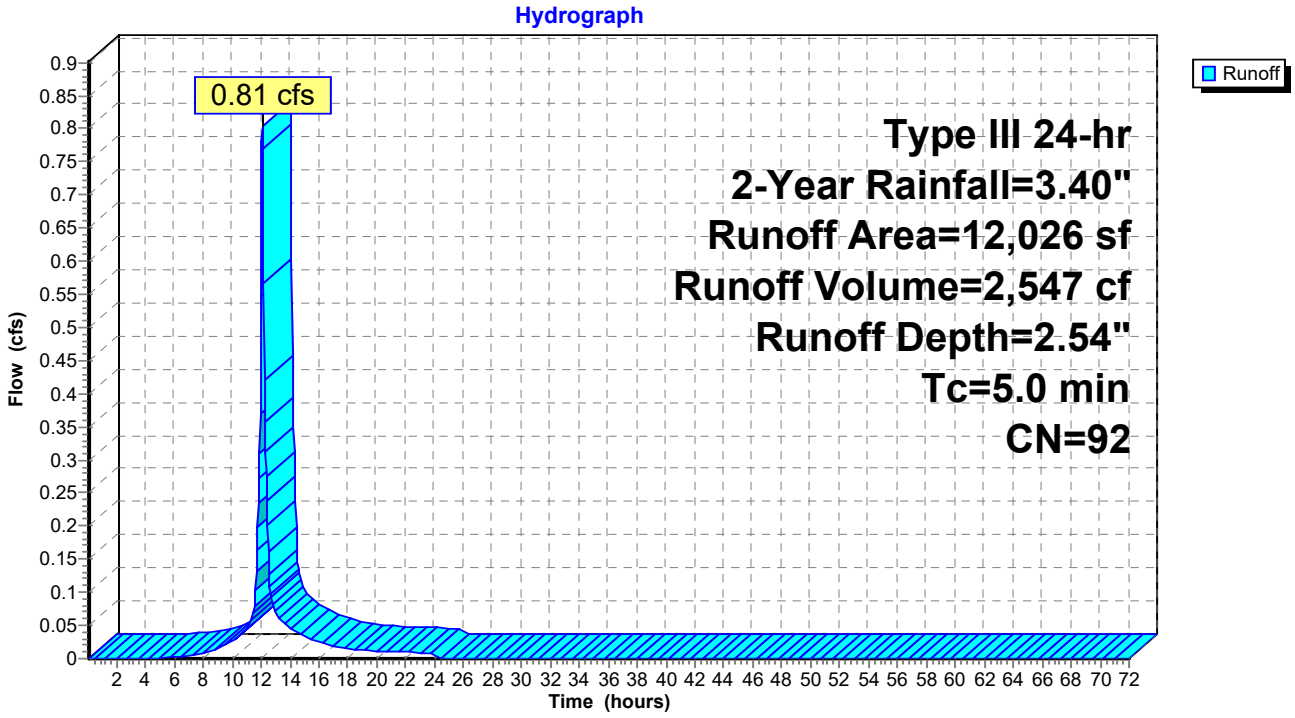
Runoff = 0.81 cfs @ 12.07 hrs, Volume= 2,547 cf, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
	8,954	98	Paved parking, HSG C
	2,854	74	>75% Grass cover, Good, HSG C
*	218	98	Unconnected pavement, HSG C, Retaining Wall
	12,026	92	Weighted Average
	2,854		23.73% Pervious Area
	9,172		76.27% Impervious Area
	218		2.38% Unconnected

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

Subcatchment M: To Maple Street



Hydrograph for Subcatchment M: To Maple Street

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.04	0.00	0.00
2.10	0.07	0.00	0.00
3.10	0.11	0.00	0.00
4.10	0.15	0.00	0.00
5.10	0.20	0.00	0.00
6.10	0.25	0.01	0.00
7.10	0.31	0.02	0.01
8.10	0.40	0.05	0.01
9.10	0.51	0.09	0.02
10.10	0.66	0.17	0.03
11.10	0.88	0.31	**0.05**
12.10	1.99	1.22	**0.77**
13.10	2.57	1.76	0.06
14.10	2.77	1.95	0.04
15.10	2.92	2.08	0.03
16.10	3.02	2.18	0.02
17.10	3.10	2.26	0.02
18.10	3.16	2.31	0.01
19.10	3.21	2.36	0.01
20.10	3.26	2.41	0.01
21.10	3.30	2.45	0.01
22.10	3.34	2.48	0.01
23.10	**3.37**	**2.51**	0.01
24.10	**3.40**	**2.54**	0.00
25.10	3.40	2.54	0.00
26.10	3.40	2.54	0.00
27.10	3.40	2.54	0.00
28.10	3.40	2.54	0.00
29.10	3.40	2.54	0.00
30.10	3.40	2.54	0.00
31.10	3.40	2.54	0.00
32.10	3.40	2.54	0.00
33.10	3.40	2.54	0.00
34.10	3.40	2.54	0.00
35.10	3.40	2.54	0.00
36.10	3.40	2.54	0.00
37.10	3.40	2.54	0.00
38.10	3.40	2.54	0.00
39.10	3.40	2.54	0.00
40.10	3.40	2.54	0.00
41.10	3.40	2.54	0.00
42.10	3.40	2.54	0.00
43.10	3.40	2.54	0.00
44.10	3.40	2.54	0.00
45.10	3.40	2.54	0.00
46.10	3.40	2.54	0.00
47.10	3.40	2.54	0.00
48.10	3.40	2.54	0.00
49.10	3.40	2.54	0.00
50.10	3.40	2.54	0.00
51.10	3.40	2.54	0.00
52.10	3.40	2.54	0.00
53.10	3.40	2.54	0.00
54.10	3.40	2.54	0.00
55.10	3.40	2.54	0.00
56.10	3.40	2.54	0.00
57.10	3.40	2.54	0.00
58.10	3.40	2.54	0.00
59.10	3.40	2.54	0.00
60.10	3.40	2.54	0.00
61.10	3.40	2.54	0.00
62.10	3.40	2.54	0.00
63.10	3.40	2.54	0.00
64.10	3.40	2.54	0.00
65.10	3.40	2.54	0.00
66.10	3.40	2.54	0.00
67.10	3.40	2.54	0.00
68.10	3.40	2.54	0.00
69.10	3.40	2.54	0.00
70.10	3.40	2.54	0.00
71.10	3.40	2.54	0.00

Summary for Subcatchment OSM: Off Site Subcatchment - Maple Street

[49] Hint: Tc<2dt may require smaller dt

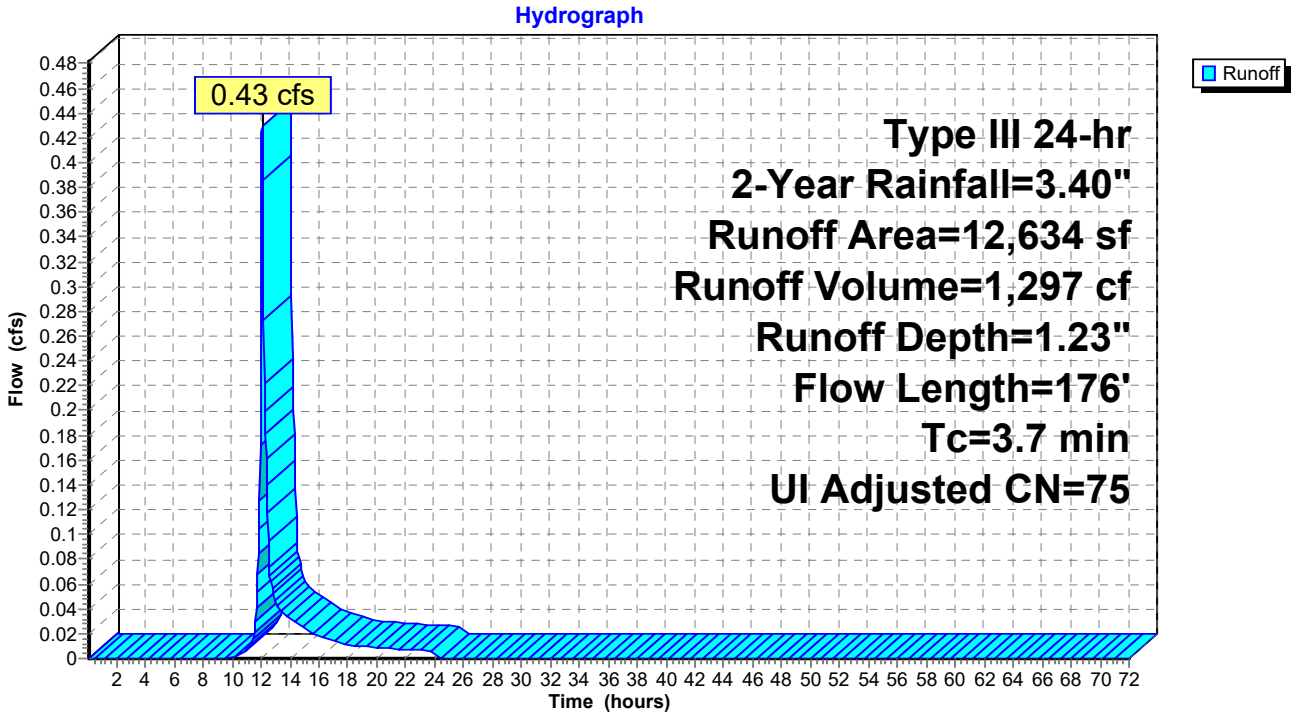
Runoff = 0.43 cfs @ 12.06 hrs, Volume= 1,297 cf, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Adj	Description
	8,723	73		Woods, Fair, HSG C
	75	79		Woods, Fair, HSG D
*	2,071	98		Unconnected pavement, HSG C, Ledge
	1,765	74		>75% Grass cover, Good, HSG C
	12,634	77	75	Weighted Average, UI Adjusted
	10,563			83.61% Pervious Area
	2,071			16.39% Impervious Area
	2,071			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	23	0.3085	0.18		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	49	0.0816	1.43		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.9	104	0.1440	1.90		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
3.7	176	Total			

Subcatchment OSM: Off Site Subcatchment - Maple Street



Hydrograph for Subcatchment OSM: Off Site Subcatchment - Maple Street

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.04	0.00	0.00
2.10	0.07	0.00	0.00
3.10	0.11	0.00	0.00
4.10	0.15	0.00	0.00
5.10	0.20	0.00	0.00
6.10	0.25	0.00	0.00
7.10	0.31	0.00	0.00
8.10	0.40	0.00	0.00
9.10	0.51	0.00	0.00
10.10	0.66	0.00	0.00
11.10	0.88	0.01	**0.01**
12.10	1.99	0.37	**0.39**
13.10	2.57	0.69	0.04
14.10	2.77	0.82	0.03
15.10	2.92	0.91	0.02
16.10	3.02	0.97	0.02
17.10	3.10	1.03	0.01
18.10	3.16	1.07	0.01
19.10	3.21	1.10	0.01
20.10	3.26	1.13	0.01
21.10	3.30	1.16	0.01
22.10	3.34	1.19	0.01
23.10	**3.37**	**1.21**	0.01
24.10	**3.40**	**1.23**	0.00
25.10	3.40	1.23	0.00
26.10	3.40	1.23	0.00
27.10	3.40	1.23	0.00
28.10	3.40	1.23	0.00
29.10	3.40	1.23	0.00
30.10	3.40	1.23	0.00
31.10	3.40	1.23	0.00
32.10	3.40	1.23	0.00
33.10	3.40	1.23	0.00
34.10	3.40	1.23	0.00
35.10	3.40	1.23	0.00
36.10	3.40	1.23	0.00
37.10	3.40	1.23	0.00
38.10	3.40	1.23	0.00
39.10	3.40	1.23	0.00
40.10	3.40	1.23	0.00
41.10	3.40	1.23	0.00
42.10	3.40	1.23	0.00
43.10	3.40	1.23	0.00
44.10	3.40	1.23	0.00
45.10	3.40	1.23	0.00
46.10	3.40	1.23	0.00
47.10	3.40	1.23	0.00
48.10	3.40	1.23	0.00
49.10	3.40	1.23	0.00
50.10	3.40	1.23	0.00
51.10	3.40	1.23	0.00
52.10	3.40	1.23	0.00
53.10	3.40	1.23	0.00
54.10	3.40	1.23	0.00
55.10	3.40	1.23	0.00
56.10	3.40	1.23	0.00
57.10	3.40	1.23	0.00
58.10	3.40	1.23	0.00
59.10	3.40	1.23	0.00
60.10	3.40	1.23	0.00
61.10	3.40	1.23	0.00
62.10	3.40	1.23	0.00
63.10	3.40	1.23	0.00
64.10	3.40	1.23	0.00
65.10	3.40	1.23	0.00
66.10	3.40	1.23	0.00
67.10	3.40	1.23	0.00
68.10	3.40	1.23	0.00
69.10	3.40	1.23	0.00
70.10	3.40	1.23	0.00
71.10	3.40	1.23	0.00

Summary for Subcatchment OSN: Off Site Subcatchment - Northeast

[49] Hint: Tc<2dt may require smaller dt

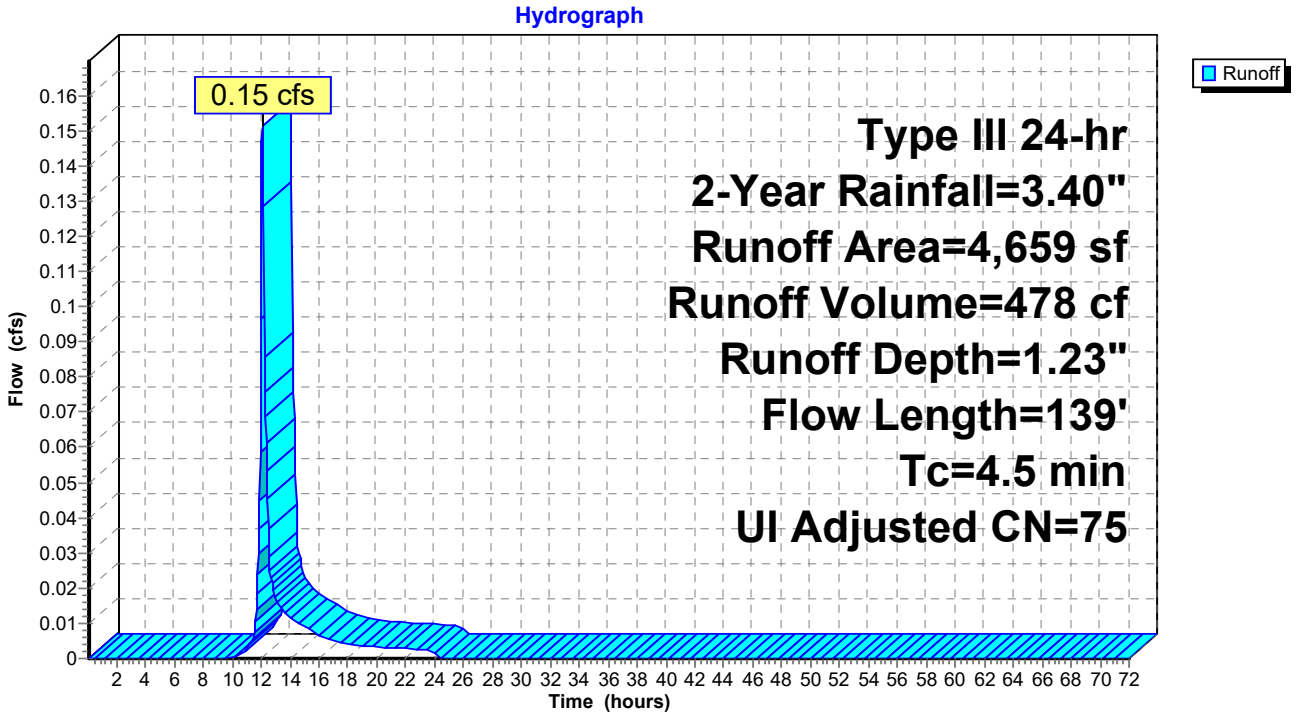
Runoff = 0.15 cfs @ 12.08 hrs, Volume= 478 cf, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Adj	Description
	678	73		Woods, Fair, HSG C
	3,567	74		>75% Grass cover, Good, HSG C
*	140	98		Unconnected pavement, HSG C, Retaining Wall
*	274	98		Unconnected pavement, HSG C, Ledge
	4,659	76	75	Weighted Average, UI Adjusted
	4,245			91.11% Pervious Area
	414			8.89% Impervious Area
	414			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	28	0.1250	0.13		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.5	72	0.2431	2.47		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.4	39	0.0508	1.58		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
4.5	139	Total			

Subcatchment OSN: Off Site Subcatchment - Northeast



Hydrograph for Subcatchment OSN: Off Site Subcatchment - Northeast

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.04	0.00	0.00
2.10	0.07	0.00	0.00
3.10	0.11	0.00	0.00
4.10	0.15	0.00	0.00
5.10	0.20	0.00	0.00
6.10	0.25	0.00	0.00
7.10	0.31	0.00	0.00
8.10	0.40	0.00	0.00
9.10	0.51	0.00	0.00
10.10	0.66	0.00	0.00
11.10	0.88	0.01	0.00
12.10	1.99	0.37	**0.15**
13.10	2.57	0.69	0.02
14.10	2.77	0.82	0.01
15.10	2.92	0.91	0.01
16.10	3.02	0.97	0.01
17.10	3.10	1.03	0.01
18.10	3.16	1.07	0.00
19.10	3.21	1.10	0.00
20.10	3.26	1.13	0.00
21.10	3.30	1.16	0.00
22.10	3.34	1.19	0.00
23.10	**3.37**	**1.21**	0.00
24.10	**3.40**	**1.23**	0.00
25.10	3.40	1.23	0.00
26.10	3.40	1.23	0.00
27.10	3.40	1.23	0.00
28.10	3.40	1.23	0.00
29.10	3.40	1.23	0.00
30.10	3.40	1.23	0.00
31.10	3.40	1.23	0.00
32.10	3.40	1.23	0.00
33.10	3.40	1.23	0.00
34.10	3.40	1.23	0.00
35.10	3.40	1.23	0.00
36.10	3.40	1.23	0.00
37.10	3.40	1.23	0.00
38.10	3.40	1.23	0.00
39.10	3.40	1.23	0.00
40.10	3.40	1.23	0.00
41.10	3.40	1.23	0.00
42.10	3.40	1.23	0.00
43.10	3.40	1.23	0.00
44.10	3.40	1.23	0.00
45.10	3.40	1.23	0.00
46.10	3.40	1.23	0.00
47.10	3.40	1.23	0.00
48.10	3.40	1.23	0.00
49.10	3.40	1.23	0.00
50.10	3.40	1.23	0.00
51.10	3.40	1.23	0.00
52.10	3.40	1.23	0.00
53.10	3.40	1.23	0.00
54.10	3.40	1.23	0.00
55.10	3.40	1.23	0.00
56.10	3.40	1.23	0.00
57.10	3.40	1.23	0.00
58.10	3.40	1.23	0.00
59.10	3.40	1.23	0.00
60.10	3.40	1.23	0.00
61.10	3.40	1.23	0.00
62.10	3.40	1.23	0.00
63.10	3.40	1.23	0.00
64.10	3.40	1.23	0.00
65.10	3.40	1.23	0.00
66.10	3.40	1.23	0.00
67.10	3.40	1.23	0.00
68.10	3.40	1.23	0.00
69.10	3.40	1.23	0.00
70.10	3.40	1.23	0.00
71.10	3.40	1.23	0.00

Summary for Subcatchment OSW: Off Site Subcatchment - Wetlands

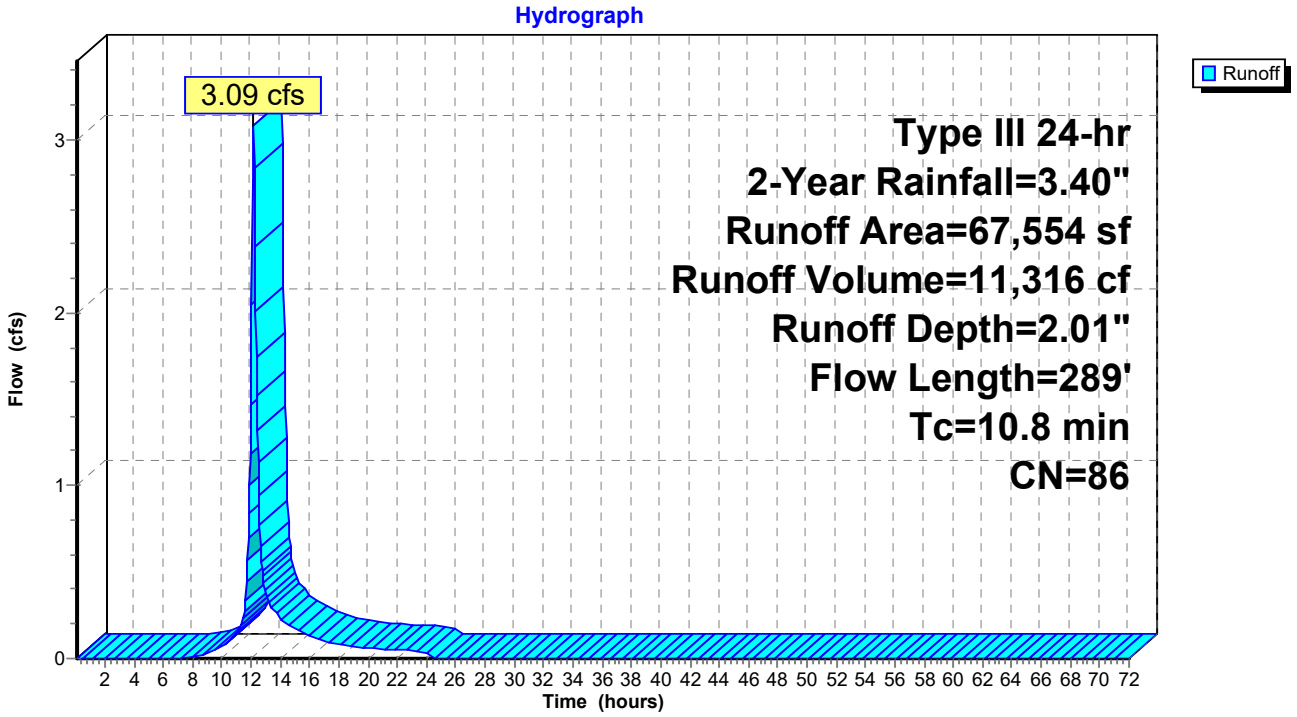
Runoff = 3.09 cfs @ 12.15 hrs, Volume= 11,316 cf, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
	2,768	73	Woods, Fair, HSG C
	39,145	79	Woods, Fair, HSG D
*	7,603	98	Unconnected pavement, HSG C, Ledge
*	18,038	98	Unconnected pavement, HSG D, Ledge
	67,554	86	Weighted Average
	41,913		62.04% Pervious Area
	25,641		37.96% Impervious Area
	25,641		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	68	0.0739	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	87	0.1957	2.21		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.5	85	0.3077	2.77		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.5	49	0.1231	1.75		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
10.8	289	Total			

Subcatchment OSW: Off Site Subcatchment - Wetlands



Hydrograph for Subcatchment OSW: Off Site Subcatchment - Wetlands

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.04	0.00	0.00
2.10	0.07	0.00	0.00
3.10	0.11	0.00	0.00
4.10	0.15	0.00	0.00
5.10	0.20	0.00	0.00
6.10	0.25	0.00	0.00
7.10	0.31	0.00	0.00
8.10	0.40	0.00	0.01
9.10	0.51	0.02	0.03
10.10	0.66	0.06	0.07
11.10	0.88	0.14	0.16
12.10	1.99	0.84	**2.77**
13.10	2.57	1.30	**0.35**
14.10	2.77	1.47	0.23
15.10	2.92	1.59	0.17
16.10	3.02	1.68	0.12
17.10	3.10	1.75	0.10
18.10	3.16	1.80	0.08
19.10	3.21	1.85	0.07
20.10	3.26	1.89	0.06
21.10	3.30	1.92	0.06
22.10	3.34	1.96	0.05
23.10	**3.37**	**1.99**	0.05
24.10	**3.40**	**2.01**	0.03
25.10	3.40	2.01	0.00
26.10	3.40	2.01	0.00
27.10	3.40	2.01	0.00
28.10	3.40	2.01	0.00
29.10	3.40	2.01	0.00
30.10	3.40	2.01	0.00
31.10	3.40	2.01	0.00
32.10	3.40	2.01	0.00
33.10	3.40	2.01	0.00
34.10	3.40	2.01	0.00
35.10	3.40	2.01	0.00
36.10	3.40	2.01	0.00
37.10	3.40	2.01	0.00
38.10	3.40	2.01	0.00
39.10	3.40	2.01	0.00
40.10	3.40	2.01	0.00
41.10	3.40	2.01	0.00
42.10	3.40	2.01	0.00
43.10	3.40	2.01	0.00
44.10	3.40	2.01	0.00
45.10	3.40	2.01	0.00
46.10	3.40	2.01	0.00
47.10	3.40	2.01	0.00
48.10	3.40	2.01	0.00
49.10	3.40	2.01	0.00
50.10	3.40	2.01	0.00
51.10	3.40	2.01	0.00
52.10	3.40	2.01	0.00
53.10	3.40	2.01	0.00
54.10	3.40	2.01	0.00
55.10	3.40	2.01	0.00
56.10	3.40	2.01	0.00
57.10	3.40	2.01	0.00
58.10	3.40	2.01	0.00
59.10	3.40	2.01	0.00
60.10	3.40	2.01	0.00
61.10	3.40	2.01	0.00
62.10	3.40	2.01	0.00
63.10	3.40	2.01	0.00
64.10	3.40	2.01	0.00
65.10	3.40	2.01	0.00
66.10	3.40	2.01	0.00
67.10	3.40	2.01	0.00
68.10	3.40	2.01	0.00
69.10	3.40	2.01	0.00
70.10	3.40	2.01	0.00
71.10	3.40	2.01	0.00

Summary for Subcatchment Rear: Rear Building Recharge

[49] Hint: Tc<2dt may require smaller dt

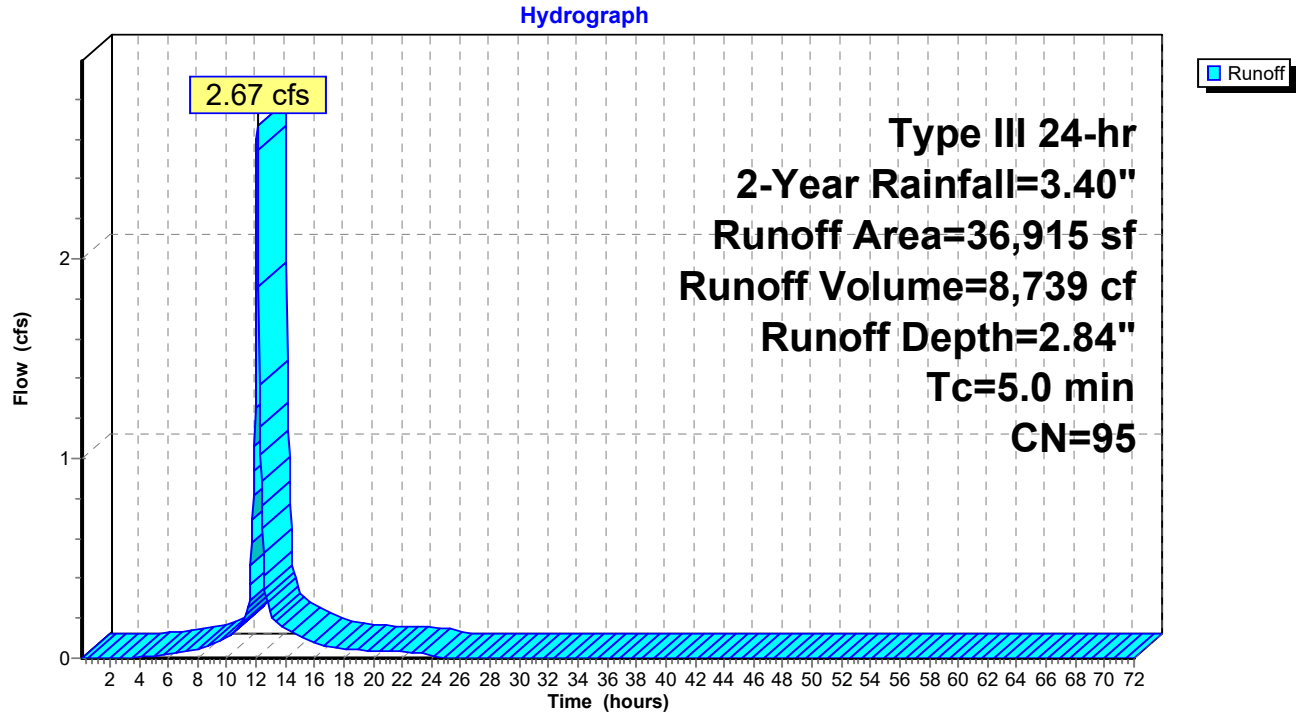
Runoff = 2.67 cfs @ 12.07 hrs, Volume= 8,739 cf, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.40"

	Area (sf)	CN	Description
	2,746	73	Woods, Fair, HSG C
*	2,383	98	Unconnected pavement, HSG C, Ledge
	20,125	98	Roofs, HSG C
	9,580	98	Paved parking, HSG C
*	678	98	Unconnected pavement, HSG C, Retaining Wall
	1,403	74	>75% Grass cover, Good, HSG C
	36,915	95	Weighted Average
	4,149		11.24% Pervious Area
	32,766		88.76% Impervious Area
	3,061		9.34% Unconnected

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

Subcatchment Rear: Rear Building Recharge



Hydrograph for Subcatchment Rear: Rear Building Recharge

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.04	0.00	0.00
2.10	0.07	0.00	0.00
3.10	0.11	0.00	0.00
4.10	0.15	0.00	0.01
5.10	0.20	0.01	0.01
6.10	0.25	0.03	0.02
7.10	0.31	0.06	0.03
8.10	0.40	0.10	0.04
9.10	0.51	0.17	0.07
10.10	0.66	0.28	0.11
11.10	0.88	0.46	**0.18**
12.10	1.99	1.47	**2.54**
13.10	2.57	2.04	0.21
14.10	2.77	2.23	0.14
15.10	2.92	2.37	0.11
16.10	3.02	2.47	0.07
17.10	3.10	2.55	0.06
18.10	3.16	2.61	0.05
19.10	3.21	2.66	0.04
20.10	3.26	2.70	0.04
21.10	3.30	2.74	0.03
22.10	3.34	2.78	0.03
23.10	**3.37**	**2.81**	0.03
24.10	**3.40**	**2.84**	0.01
25.10	3.40	2.84	0.00
26.10	3.40	2.84	0.00
27.10	3.40	2.84	0.00
28.10	3.40	2.84	0.00
29.10	3.40	2.84	0.00
30.10	3.40	2.84	0.00
31.10	3.40	2.84	0.00
32.10	3.40	2.84	0.00
33.10	3.40	2.84	0.00
34.10	3.40	2.84	0.00
35.10	3.40	2.84	0.00
36.10	3.40	2.84	0.00
37.10	3.40	2.84	0.00
38.10	3.40	2.84	0.00
39.10	3.40	2.84	0.00
40.10	3.40	2.84	0.00
41.10	3.40	2.84	0.00
42.10	3.40	2.84	0.00
43.10	3.40	2.84	0.00
44.10	3.40	2.84	0.00
45.10	3.40	2.84	0.00
46.10	3.40	2.84	0.00
47.10	3.40	2.84	0.00
48.10	3.40	2.84	0.00
49.10	3.40	2.84	0.00
50.10	3.40	2.84	0.00
51.10	3.40	2.84	0.00
52.10	3.40	2.84	0.00
53.10	3.40	2.84	0.00
54.10	3.40	2.84	0.00
55.10	3.40	2.84	0.00
56.10	3.40	2.84	0.00
57.10	3.40	2.84	0.00
58.10	3.40	2.84	0.00
59.10	3.40	2.84	0.00
60.10	3.40	2.84	0.00
61.10	3.40	2.84	0.00
62.10	3.40	2.84	0.00
63.10	3.40	2.84	0.00
64.10	3.40	2.84	0.00
65.10	3.40	2.84	0.00
66.10	3.40	2.84	0.00
67.10	3.40	2.84	0.00
68.10	3.40	2.84	0.00
69.10	3.40	2.84	0.00
70.10	3.40	2.84	0.00
71.10	3.40	2.84	0.00

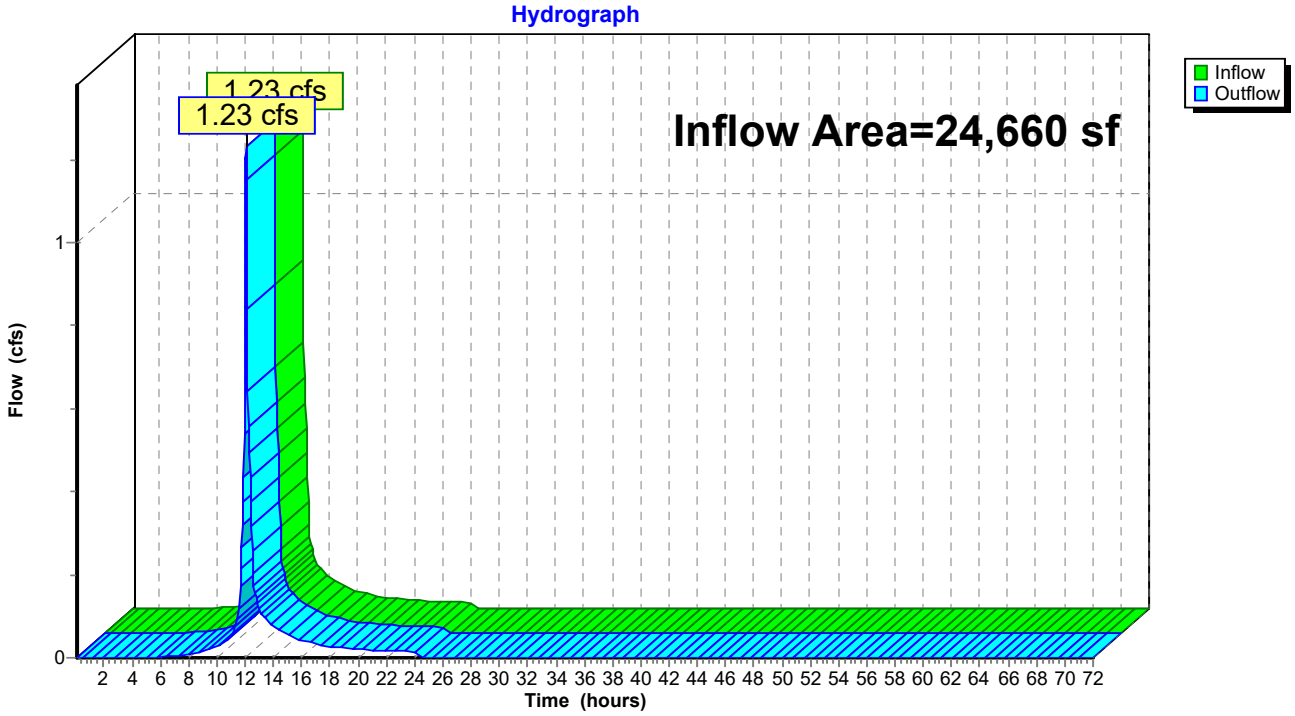
Summary for Reach TR: Total Roadway

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

Inflow Area = 24,660 sf, 45.59% Impervious, Inflow Depth = 1.87" for 2-Year event
Inflow = 1.23 cfs @ 12.07 hrs, Volume= 3,843 cf
Outflow = 1.23 cfs @ 12.07 hrs, Volume= 3,843 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Reach TR: Total Roadway



Hydrograph for Reach TR: Total Roadway

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.10	0.00		0.00
1.10	0.00		0.00
2.10	0.00		0.00
3.10	0.00		0.00
4.10	0.00		0.00
5.10	0.00		0.00
6.10	0.00		0.00
7.10	0.01		0.01
8.10	0.01		0.01
9.10	0.02		0.02
10.10	0.03		0.03
11.10	**0.06**		**0.06**
12.10	**1.15**		**1.15**
13.10	0.11		0.11
14.10	0.07		0.07
15.10	0.06		0.06
16.10	0.04		0.04
17.10	0.03		0.03
18.10	0.03		0.03
19.10	0.02		0.02
20.10	0.02		0.02
21.10	0.02		0.02
22.10	0.02		0.02
23.10	0.02		0.02
24.10	0.00		0.00
25.10	0.00		0.00
26.10	0.00		0.00
27.10	0.00		0.00
28.10	0.00		0.00
29.10	0.00		0.00
30.10	0.00		0.00
31.10	0.00		0.00
32.10	0.00		0.00
33.10	0.00		0.00
34.10	0.00		0.00
35.10	0.00		0.00
36.10	0.00		0.00
37.10	0.00		0.00
38.10	0.00		0.00
39.10	0.00		0.00
40.10	0.00		0.00
41.10	0.00		0.00
42.10	0.00		0.00
43.10	0.00		0.00
44.10	0.00		0.00
45.10	0.00		0.00
46.10	0.00		0.00
47.10	0.00		0.00
48.10	0.00		0.00
49.10	0.00		0.00
50.10	0.00		0.00
51.10	0.00		0.00
52.10	0.00		0.00
53.10	0.00		0.00
54.10	0.00		0.00
55.10	0.00		0.00
56.10	0.00		0.00
57.10	0.00		0.00
58.10	0.00		0.00
59.10	0.00		0.00
60.10	0.00		0.00
61.10	0.00		0.00
62.10	0.00		0.00
63.10	0.00		0.00
64.10	0.00		0.00
65.10	0.00		0.00
66.10	0.00		0.00
67.10	0.00		0.00
68.10	0.00		0.00
69.10	0.00		0.00
70.10	0.00		0.00
71.10	0.00		0.00

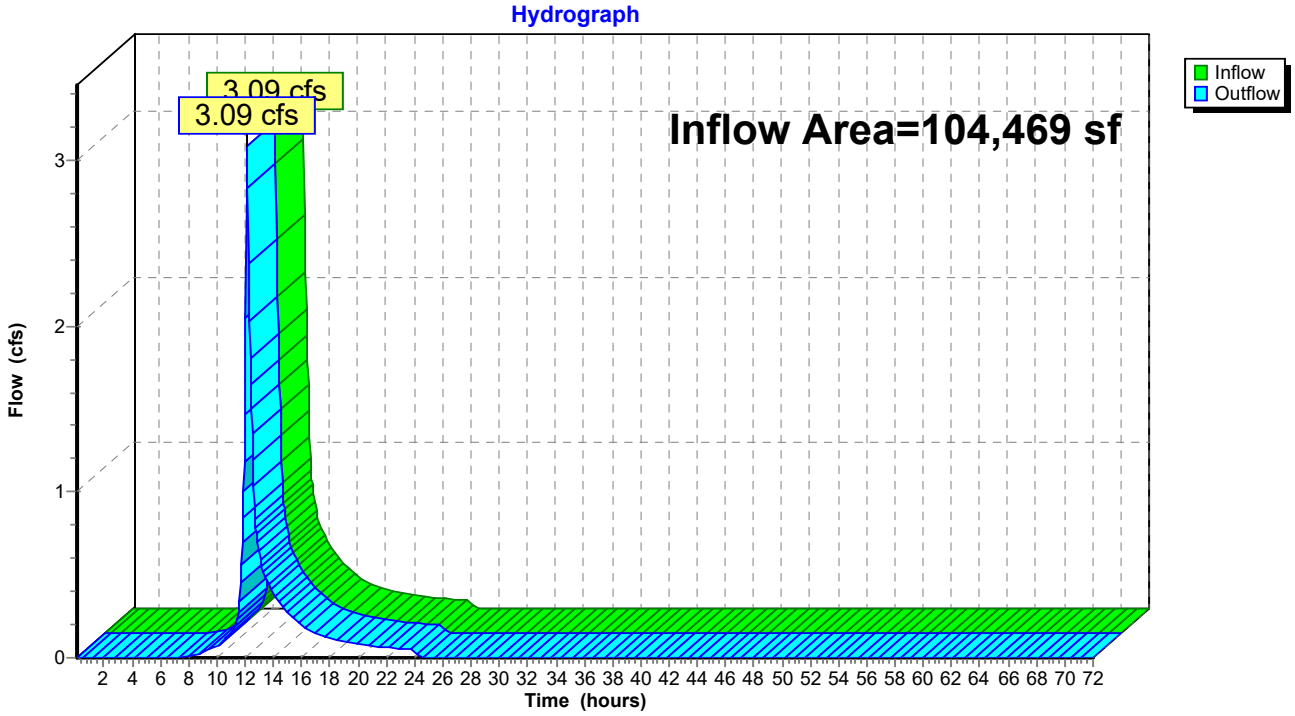
Summary for Reach TW: Total Wetlands

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

Inflow Area = 104,469 sf, 55.91% Impervious, Inflow Depth = 1.61" for 2-Year event
Inflow = 3.09 cfs @ 12.15 hrs, Volume= 14,052 cf
Outflow = 3.09 cfs @ 12.15 hrs, Volume= 14,052 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Reach TW: Total Wetlands



Hydrograph for Reach TW: Total Wetlands

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.10	0.00		0.00
1.10	0.00		0.00
2.10	0.00		0.00
3.10	0.00		0.00
4.10	0.00		0.00
5.10	0.00		0.00
6.10	0.00		0.00
7.10	0.00		0.00
8.10	0.01		0.01
9.10	0.03		0.03
10.10	0.07		0.07
11.10	0.16		0.16
12.10	**2.77**		**2.77**
13.10	**0.58**		**0.58**
14.10	0.37		0.37
15.10	0.27		0.27
16.10	0.19		0.19
17.10	0.15		0.15
18.10	0.11		0.11
19.10	0.09		0.09
20.10	0.08		0.08
21.10	0.07		0.07
22.10	0.06		0.06
23.10	0.05		0.05
24.10	0.04		0.04
25.10	0.00		0.00
26.10	0.00		0.00
27.10	0.00		0.00
28.10	0.00		0.00
29.10	0.00		0.00
30.10	0.00		0.00
31.10	0.00		0.00
32.10	0.00		0.00
33.10	0.00		0.00
34.10	0.00		0.00
35.10	0.00		0.00
36.10	0.00		0.00
37.10	0.00		0.00
38.10	0.00		0.00
39.10	0.00		0.00
40.10	0.00		0.00
41.10	0.00		0.00
42.10	0.00		0.00
43.10	0.00		0.00
44.10	0.00		0.00
45.10	0.00		0.00
46.10	0.00		0.00
47.10	0.00		0.00
48.10	0.00		0.00
49.10	0.00		0.00
50.10	0.00		0.00
51.10	0.00		0.00
52.10	0.00		0.00
53.10	0.00		0.00
54.10	0.00		0.00
55.10	0.00		0.00
56.10	0.00		0.00
57.10	0.00		0.00
58.10	0.00		0.00
59.10	0.00		0.00
60.10	0.00		0.00
61.10	0.00		0.00
62.10	0.00		0.00
63.10	0.00		0.00
64.10	0.00		0.00
65.10	0.00		0.00
66.10	0.00		0.00
67.10	0.00		0.00
68.10	0.00		0.00
69.10	0.00		0.00
70.10	0.00		0.00
71.10	0.00		0.00

Summary for Pond RF: Recharge - Front

Inflow Area = 4,505 sf,100.00% Impervious, Inflow Depth = 3.17" for 2-Year event
Inflow = 0.34 cfs @ 12.07 hrs, Volume= 1,189 cf
Outflow = 0.01 cfs @ 16.98 hrs, Volume= 1,189 cf, Atten= 98%, Lag= 294.6 min
Discarded = 0.01 cfs @ 16.98 hrs, Volume= 1,189 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Peak Elev= 101.63' @ 16.98 hrs Surf.Area= 1,061 sf Storage= 765 cf

Plug-Flow detention time= 909.8 min calculated for 1,188 cf (100% of inflow)
Center-of-Mass det. time= 910.3 min (1,664.5 - 754.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.52'	840 cf	**23.58'W x 45.00'L x 3.21'H Field A** 3,405 cf Overall - 1,305 cf Embedded = 2,099 cf x 40.0% Voids
#2A	101.02'	1,305 cf	**Cultec R-280HD** x 30 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 5 rows
		2,145 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.52'	**0.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 16.98 hrs HW=101.63' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond RF: Recharge - Front - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 5 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

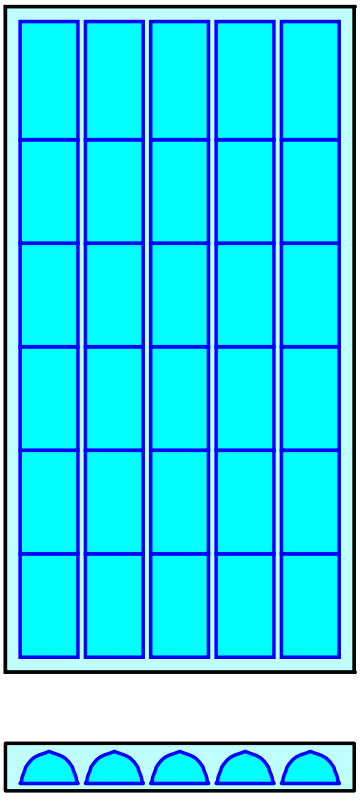
6 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 43.00' Row Length +12.0" End Stone x 2 = 45.00' Base Length
5 Rows x 47.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 23.58' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

30 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 5 Rows = 1,305.4 cf Chamber Storage

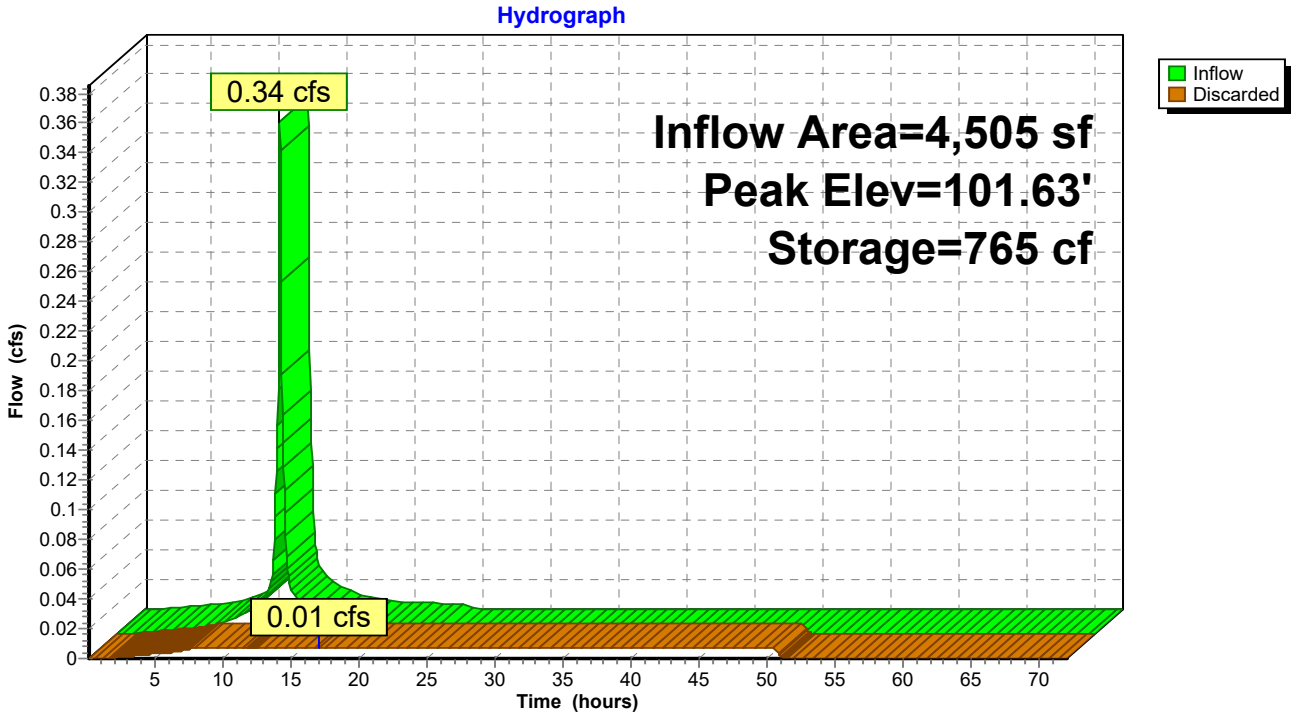
3,404.8 cf Field - 1,305.4 cf Chambers = 2,099.4 cf Stone x 40.0% Voids = 839.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,145.2 cf = 0.049 af
Overall Storage Efficiency = 63.0%
Overall System Size = 45.00' x 23.58' x 3.21'

30 Chambers
126.1 cy Field
77.8 cy Stone



Pond RF: Recharge - Front



Hydrograph for Pond RF: Recharge - Front

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Discarded (cfs)
0.10	0.00	0	100.52	0.00
2.60	0.00	1	100.52	0.00
5.10	0.00	2	100.53	0.00
7.60	0.01	4	100.53	0.01
10.10	**0.02**	45	100.63	0.01
12.60	**0.04**	626	101.48	0.01
15.10	0.01	**749**	**101.62**	**0.01**
17.60	0.01	**763**	**101.63**	**0.01**
20.10	0.00	743	101.61	0.01
22.60	0.00	712	101.57	0.01
25.10	0.00	662	101.52	0.01
27.60	0.00	594	101.44	0.01
30.10	0.00	528	101.37	0.01
32.60	0.00	462	101.29	0.01
35.10	0.00	397	101.22	0.01
37.60	0.00	332	101.15	0.01
40.10	0.00	267	101.08	0.01
42.60	0.00	204	101.00	0.01
45.10	0.00	141	100.85	0.01
47.60	0.00	79	100.71	0.01
50.10	0.00	19	100.56	0.01
52.60	0.00	0	100.52	0.00
55.10	0.00	0	100.52	0.00
57.60	0.00	0	100.52	0.00
60.10	0.00	0	100.52	0.00
62.60	0.00	0	100.52	0.00
65.10	0.00	0	100.52	0.00
67.60	0.00	0	100.52	0.00
70.10	0.00	0	100.52	0.00

Summary for Pond RR: Recharge - Rear

Inflow Area = 36,915 sf, 88.76% Impervious, Inflow Depth = 2.84" for 2-Year event
Inflow = 2.67 cfs @ 12.07 hrs, Volume= 8,739 cf
Outflow = 0.30 cfs @ 12.72 hrs, Volume= 8,460 cf, Atten= 89%, Lag= 38.9 min
Discarded = 0.03 cfs @ 12.72 hrs, Volume= 5,724 cf
Primary = 0.27 cfs @ 12.72 hrs, Volume= 2,737 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Peak Elev= 102.43' @ 12.72 hrs Surf.Area= 3,501 sf Storage= 4,954 cf

Plug-Flow detention time= 1,083.8 min calculated for 8,454 cf (97% of inflow)
Center-of-Mass det. time= 1,066.0 min (1,844.2 - 778.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.46'	2,691 cf	**32.42'W x 108.00'L x 3.21'H Field A** 11,232 cf Overall - 4,505 cf Embedded = 6,727 cf x 40.0% Voids
#2A	100.96'	4,505 cf	**Cultec R-280HD** x 105 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 7 rows
		7,196 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	102.17'	**12.0" Round Culvert** L= 44.9' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.17' / 101.50' S= 0.0149 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	100.46'	**0.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.03 cfs @ 12.72 hrs HW=102.43' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.27 cfs @ 12.72 hrs HW=102.43' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.27 cfs @ 1.72 fps)

Pond RR: Recharge - Rear - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 7 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

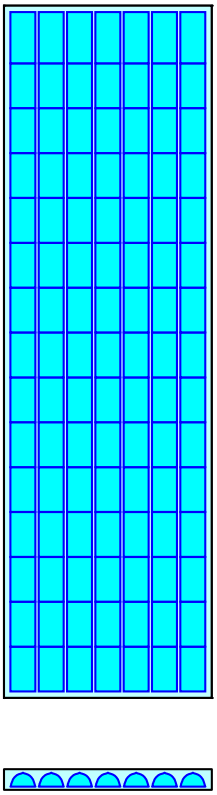
15 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 106.00' Row Length +12.0" End Stone x 2 = 108.00' Base Length
7 Rows x 47.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 32.42' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

105 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 7 Rows = 4,505.2 cf Chamber Storage

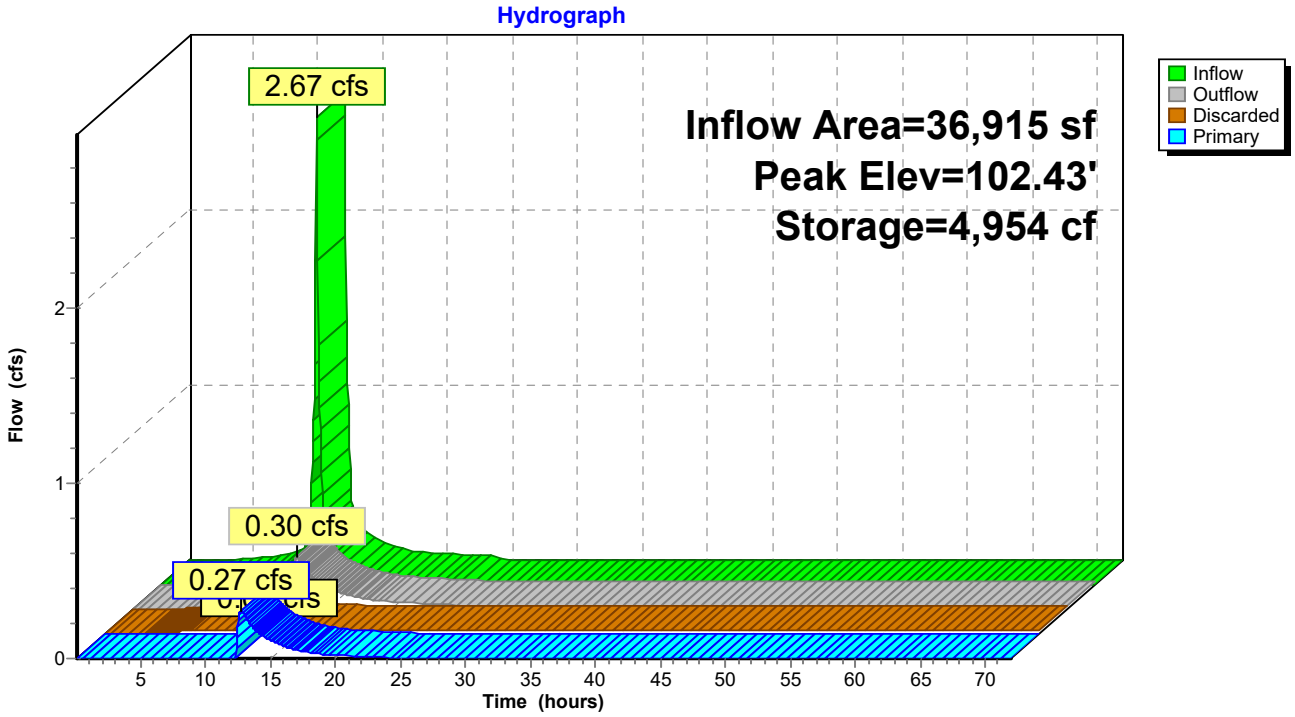
11,232.4 cf Field - 4,505.2 cf Chambers = 6,727.1 cf Stone x 40.0% Voids = 2,690.9 cf Stone Storage

Chamber Storage + Stone Storage = 7,196.1 cf = 0.165 af
Overall Storage Efficiency = 64.1%
Overall System Size = 108.00' x 32.42' x 3.21'

105 Chambers
416.0 cy Field
249.2 cy Stone



Pond RR: Recharge - Rear



Hydrograph for Pond RR: Recharge - Rear

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.10	0.00	0	100.46	0.00	0.00	0.00
2.60	0.00	0	100.46	0.00	0.00	0.00
5.10	0.01	7	100.46	0.01	0.01	0.00
7.60	0.04	41	100.49	0.02	0.02	0.00
10.10	**0.11**	452	100.78	0.02	0.02	0.00
12.60	**0.34**	**4,945**	**102.42**	**0.29**	**0.03**	**0.27**
15.10	0.11	**4,684**	**102.32**	**0.13**	**0.03**	**0.10**
17.60	0.05	4,533	102.27	0.07	0.03	0.04
20.10	0.04	4,449	102.23	0.04	0.02	0.02
22.60	0.03	4,400	102.22	0.03	0.02	0.01
25.10	0.00	4,273	102.17	0.02	0.02	0.00
27.60	0.00	4,050	102.09	0.02	0.02	0.00
30.10	0.00	3,828	102.01	0.02	0.02	0.00
32.60	0.00	3,607	101.93	0.02	0.02	0.00
35.10	0.00	3,387	101.85	0.02	0.02	0.00
37.60	0.00	3,169	101.78	0.02	0.02	0.00
40.10	0.00	2,952	101.70	0.02	0.02	0.00
42.60	0.00	2,736	101.63	0.02	0.02	0.00
45.10	0.00	2,521	101.56	0.02	0.02	0.00
47.60	0.00	2,307	101.49	0.02	0.02	0.00
50.10	0.00	2,095	101.41	0.02	0.02	0.00
52.60	0.00	1,883	101.35	0.02	0.02	0.00
55.10	0.00	1,673	101.28	0.02	0.02	0.00
57.60	0.00	1,463	101.21	0.02	0.02	0.00
60.10	0.00	1,255	101.14	0.02	0.02	0.00
62.60	0.00	1,048	101.07	0.02	0.02	0.00
65.10	0.00	842	101.01	0.02	0.02	0.00
67.60	0.00	637	100.91	0.02	0.02	0.00
70.10	0.00	434	100.77	0.02	0.02	0.00

Time span=0.10-72.00 hrs, dt=0.05 hrs, 1439 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Front: Front Building Runoff Area=4,505 sf 100.00% Impervious Runoff Depth=4.56"
Tc=5.0 min CN=98 Runoff=0.49 cfs 1,713 cf

Subcatchment M: To Maple Street Runoff Area=12,026 sf 76.27% Impervious Runoff Depth=3.89"
Tc=5.0 min CN=92 Runoff=1.21 cfs 3,903 cf

Subcatchment OSM: Off Site Runoff Area=12,634 sf 16.39% Impervious Runoff Depth=2.29"
Flow Length=176' Tc=3.7 min UI Adjusted CN=75 Runoff=0.82 cfs 2,409 cf

Subcatchment OSN: Off Site Subcatchment - Runoff Area=4,659 sf 8.89% Impervious Runoff Depth=2.29"
Flow Length=139' Tc=4.5 min UI Adjusted CN=75 Runoff=0.29 cfs 888 cf

Subcatchment OSW: Off Site Runoff Area=67,554 sf 37.96% Impervious Runoff Depth=3.28"
Flow Length=289' Tc=10.8 min CN=86 Runoff=4.99 cfs 18,469 cf

Subcatchment Rear: Rear Building Runoff Area=36,915 sf 88.76% Impervious Runoff Depth=4.22"
Tc=5.0 min CN=95 Runoff=3.89 cfs 12,986 cf

Reach TR: Total Roadway Inflow=2.03 cfs 6,312 cf
Outflow=2.03 cfs 6,312 cf

Reach TW: Total Wetlands Inflow=6.25 cfs 25,280 cf
Outflow=6.25 cfs 25,280 cf

Pond RF: Recharge - Front Peak Elev=102.14' Storage=1,201 cf Inflow=0.49 cfs 1,713 cf
Outflow=0.01 cfs 1,713 cf

Pond RR: Recharge - Rear Peak Elev=102.84' Storage=5,947 cf Inflow=3.89 cfs 12,986 cf
Discarded=0.03 cfs 5,855 cf Primary=1.57 cfs 6,811 cf Outflow=1.60 cfs 12,666 cf

Total Runoff Area = 138,293 sf Runoff Volume = 40,369 cf Average Runoff Depth = 3.50"
46.08% Pervious = 63,724 sf 53.92% Impervious = 74,569 sf

Summary for Subcatchment Front: Front Building Recharge

[49] Hint: Tc<2dt may require smaller dt

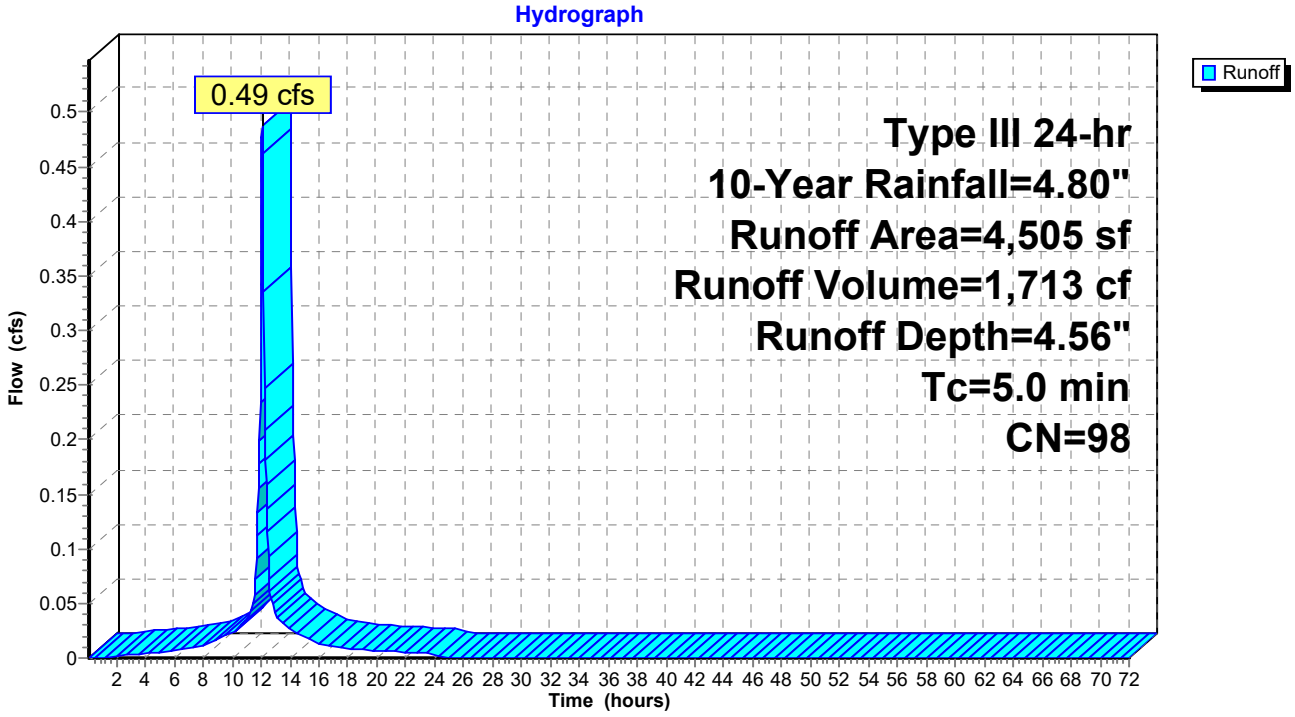
Runoff = 0.49 cfs @ 12.07 hrs, Volume= 1,713 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
4,505	98	Paved parking, HSG C
4,505		100.00% Impervious Area

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

Subcatchment Front: Front Building Recharge



Hydrograph for Subcatchment Front: Front Building Recharge

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.05	0.00	0.00
2.10	0.10	0.01	0.00
3.10	0.15	0.04	0.00
4.10	0.21	0.08	0.00
5.10	0.28	0.13	0.01
6.10	0.35	0.19	0.01
7.10	0.44	0.27	0.01
8.10	0.56	0.37	0.01
9.10	0.72	0.52	0.02
10.10	0.93	0.72	0.02
11.10	1.24	1.02	**0.04**
12.10	2.80	2.57	**0.46**
13.10	3.63	3.40	0.04
14.10	3.92	3.68	0.02
15.10	4.12	3.88	0.02
16.10	4.27	4.03	0.01
17.10	4.38	4.14	0.01
18.10	4.46	4.23	0.01
19.10	4.53	4.30	0.01
20.10	4.60	4.36	0.01
21.10	4.66	4.42	0.01
22.10	4.71	4.48	0.01
23.10	**4.76**	**4.52**	0.00
24.10	**4.80**	**4.56**	0.00
25.10	4.80	4.56	0.00
26.10	4.80	4.56	0.00
27.10	4.80	4.56	0.00
28.10	4.80	4.56	0.00
29.10	4.80	4.56	0.00
30.10	4.80	4.56	0.00
31.10	4.80	4.56	0.00
32.10	4.80	4.56	0.00
33.10	4.80	4.56	0.00
34.10	4.80	4.56	0.00
35.10	4.80	4.56	0.00
36.10	4.80	4.56	0.00
37.10	4.80	4.56	0.00
38.10	4.80	4.56	0.00
39.10	4.80	4.56	0.00
40.10	4.80	4.56	0.00
41.10	4.80	4.56	0.00
42.10	4.80	4.56	0.00
43.10	4.80	4.56	0.00
44.10	4.80	4.56	0.00
45.10	4.80	4.56	0.00
46.10	4.80	4.56	0.00
47.10	4.80	4.56	0.00
48.10	4.80	4.56	0.00
49.10	4.80	4.56	0.00
50.10	4.80	4.56	0.00
51.10	4.80	4.56	0.00
52.10	4.80	4.56	0.00
53.10	4.80	4.56	0.00
54.10	4.80	4.56	0.00
55.10	4.80	4.56	0.00
56.10	4.80	4.56	0.00
57.10	4.80	4.56	0.00
58.10	4.80	4.56	0.00
59.10	4.80	4.56	0.00
60.10	4.80	4.56	0.00
61.10	4.80	4.56	0.00
62.10	4.80	4.56	0.00
63.10	4.80	4.56	0.00
64.10	4.80	4.56	0.00
65.10	4.80	4.56	0.00
66.10	4.80	4.56	0.00
67.10	4.80	4.56	0.00
68.10	4.80	4.56	0.00
69.10	4.80	4.56	0.00
70.10	4.80	4.56	0.00
71.10	4.80	4.56	0.00

Summary for Subcatchment M: To Maple Street

[49] Hint: Tc<2dt may require smaller dt

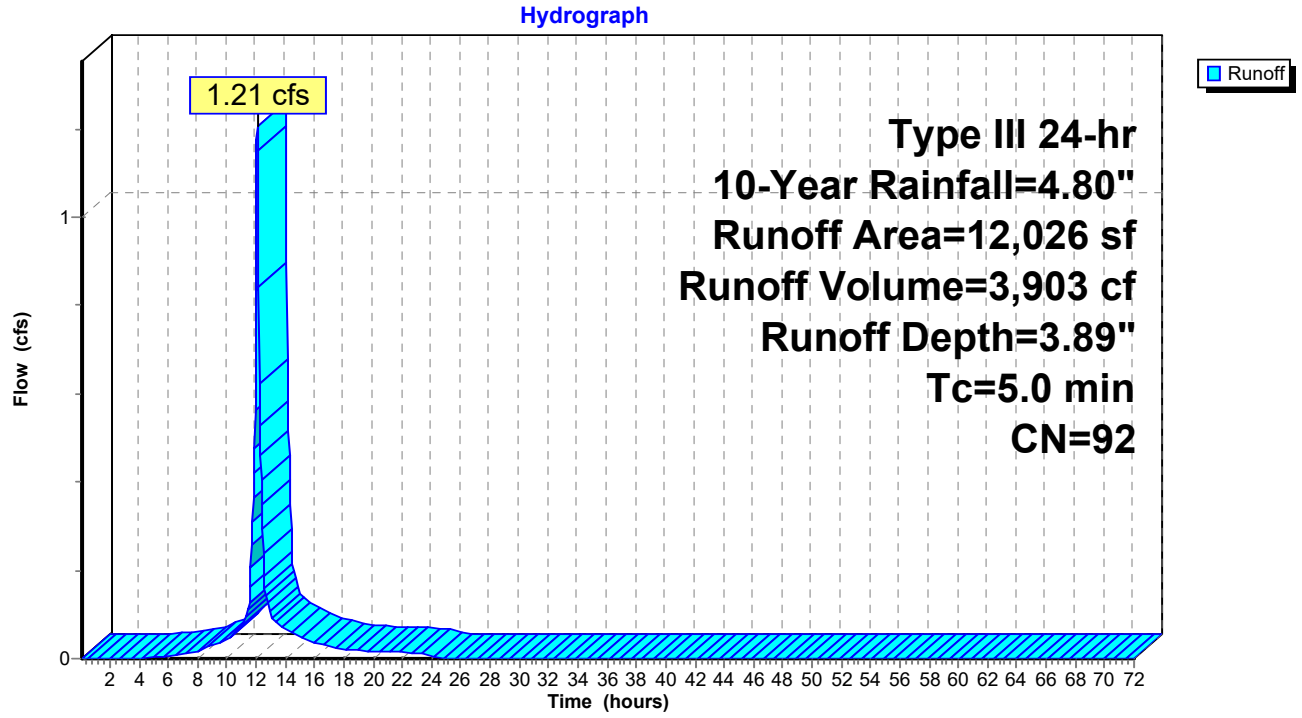
Runoff = 1.21 cfs @ 12.07 hrs, Volume= 3,903 cf, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	8,954	98	Paved parking, HSG C
	2,854	74	>75% Grass cover, Good, HSG C
*	218	98	Unconnected pavement, HSG C, Retaining Wall
	12,026	92	Weighted Average
	2,854		23.73% Pervious Area
	9,172		76.27% Impervious Area
	218		2.38% Unconnected

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

Subcatchment M: To Maple Street



Hydrograph for Subcatchment M: To Maple Street

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.05	0.00	0.00
2.10	0.10	0.00	0.00
3.10	0.15	0.00	0.00
4.10	0.21	0.00	0.00
5.10	0.28	0.01	0.00
6.10	0.35	0.03	0.01
7.10	0.44	0.06	0.01
8.10	0.56	0.12	0.02
9.10	0.72	0.21	0.03
10.10	0.93	0.35	0.05
11.10	1.24	0.58	**0.08**
12.10	2.80	1.98	**1.15**
13.10	3.63	2.77	0.09
14.10	3.92	3.04	0.06
15.10	4.12	3.23	0.05
16.10	4.27	3.37	0.03
17.10	4.38	3.48	0.03
18.10	4.46	3.57	0.02
19.10	4.53	3.64	0.02
20.10	4.60	3.70	0.02
21.10	4.66	3.76	0.02
22.10	4.71	3.81	0.01
23.10	**4.76**	**3.86**	0.01
24.10	**4.80**	**3.89**	0.00
25.10	4.80	3.89	0.00
26.10	4.80	3.89	0.00
27.10	4.80	3.89	0.00
28.10	4.80	3.89	0.00
29.10	4.80	3.89	0.00
30.10	4.80	3.89	0.00
31.10	4.80	3.89	0.00
32.10	4.80	3.89	0.00
33.10	4.80	3.89	0.00
34.10	4.80	3.89	0.00
35.10	4.80	3.89	0.00
36.10	4.80	3.89	0.00
37.10	4.80	3.89	0.00
38.10	4.80	3.89	0.00
39.10	4.80	3.89	0.00
40.10	4.80	3.89	0.00
41.10	4.80	3.89	0.00
42.10	4.80	3.89	0.00
43.10	4.80	3.89	0.00
44.10	4.80	3.89	0.00
45.10	4.80	3.89	0.00
46.10	4.80	3.89	0.00
47.10	4.80	3.89	0.00
48.10	4.80	3.89	0.00
49.10	4.80	3.89	0.00
50.10	4.80	3.89	0.00
51.10	4.80	3.89	0.00
52.10	4.80	3.89	0.00
53.10	4.80	3.89	0.00
54.10	4.80	3.89	0.00
55.10	4.80	3.89	0.00
56.10	4.80	3.89	0.00
57.10	4.80	3.89	0.00
58.10	4.80	3.89	0.00
59.10	4.80	3.89	0.00
60.10	4.80	3.89	0.00
61.10	4.80	3.89	0.00
62.10	4.80	3.89	0.00
63.10	4.80	3.89	0.00
64.10	4.80	3.89	0.00
65.10	4.80	3.89	0.00
66.10	4.80	3.89	0.00
67.10	4.80	3.89	0.00
68.10	4.80	3.89	0.00
69.10	4.80	3.89	0.00
70.10	4.80	3.89	0.00
71.10	4.80	3.89	0.00

Summary for Subcatchment OSM: Off Site Subcatchment - Maple Street

[49] Hint: Tc<2dt may require smaller dt

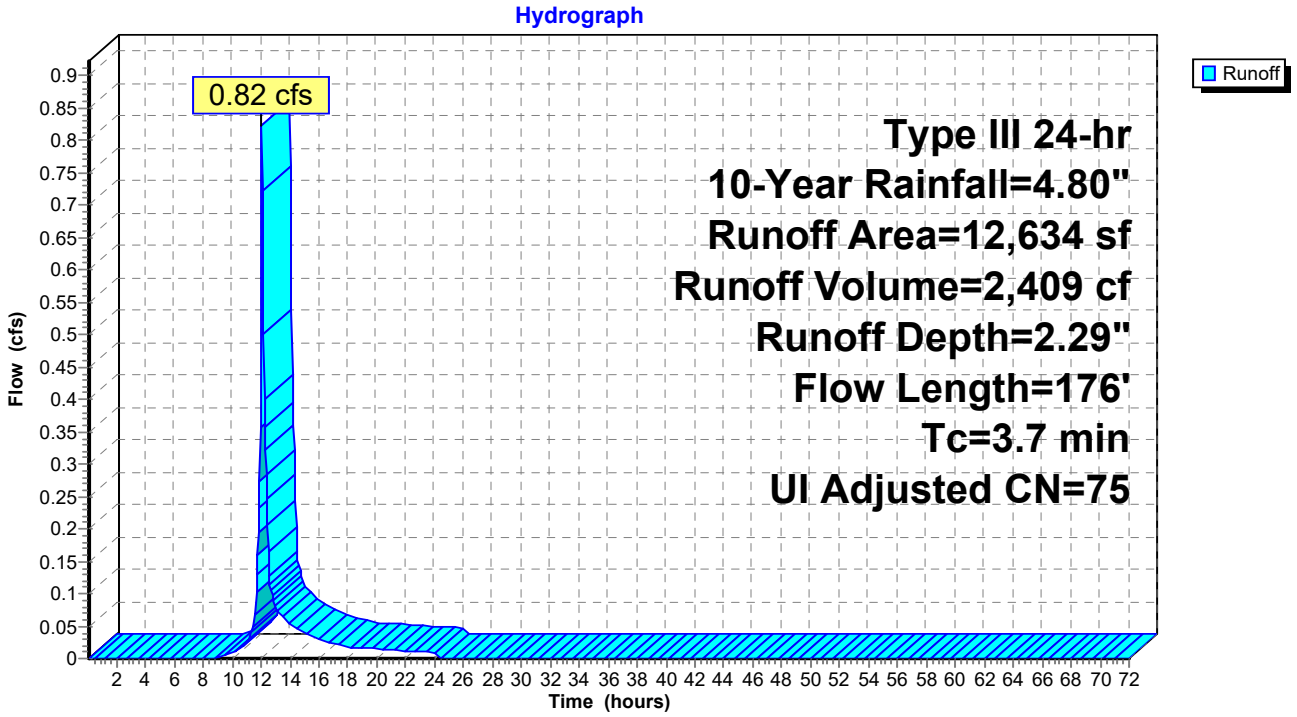
Runoff = 0.82 cfs @ 12.06 hrs, Volume= 2,409 cf, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Adj	Description
	8,723	73		Woods, Fair, HSG C
	75	79		Woods, Fair, HSG D
*	2,071	98		Unconnected pavement, HSG C, Ledge
	1,765	74		>75% Grass cover, Good, HSG C
	12,634	77	75	Weighted Average, UI Adjusted
	10,563			83.61% Pervious Area
	2,071			16.39% Impervious Area
	2,071			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	23	0.3085	0.18		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	49	0.0816	1.43		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.9	104	0.1440	1.90		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
3.7	176	Total			

Subcatchment OSM: Off Site Subcatchment - Maple Street



Hydrograph for Subcatchment OSM: Off Site Subcatchment - Maple Street

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.05	0.00	0.00
2.10	0.10	0.00	0.00
3.10	0.15	0.00	0.00
4.10	0.21	0.00	0.00
5.10	0.28	0.00	0.00
6.10	0.35	0.00	0.00
7.10	0.44	0.00	0.00
8.10	0.56	0.00	0.00
9.10	0.72	0.00	0.00
10.10	0.93	0.02	0.01
11.10	1.24	0.08	**0.03**
12.10	2.80	0.83	**0.72**
13.10	3.63	1.40	0.07
14.10	3.92	1.60	0.05
15.10	4.12	1.76	0.04
16.10	4.27	1.87	0.03
17.10	4.38	1.95	0.02
18.10	4.46	2.02	0.02
19.10	4.53	2.08	0.02
20.10	4.60	2.13	0.01
21.10	4.66	2.18	0.01
22.10	4.71	2.22	0.01
23.10	**4.76**	**2.26**	0.01
24.10	**4.80**	**2.29**	0.00
25.10	4.80	2.29	0.00
26.10	4.80	2.29	0.00
27.10	4.80	2.29	0.00
28.10	4.80	2.29	0.00
29.10	4.80	2.29	0.00
30.10	4.80	2.29	0.00
31.10	4.80	2.29	0.00
32.10	4.80	2.29	0.00
33.10	4.80	2.29	0.00
34.10	4.80	2.29	0.00
35.10	4.80	2.29	0.00
36.10	4.80	2.29	0.00
37.10	4.80	2.29	0.00
38.10	4.80	2.29	0.00
39.10	4.80	2.29	0.00
40.10	4.80	2.29	0.00
41.10	4.80	2.29	0.00
42.10	4.80	2.29	0.00
43.10	4.80	2.29	0.00
44.10	4.80	2.29	0.00
45.10	4.80	2.29	0.00
46.10	4.80	2.29	0.00
47.10	4.80	2.29	0.00
48.10	4.80	2.29	0.00
49.10	4.80	2.29	0.00
50.10	4.80	2.29	0.00
51.10	4.80	2.29	0.00
52.10	4.80	2.29	0.00
53.10	4.80	2.29	0.00
54.10	4.80	2.29	0.00
55.10	4.80	2.29	0.00
56.10	4.80	2.29	0.00
57.10	4.80	2.29	0.00
58.10	4.80	2.29	0.00
59.10	4.80	2.29	0.00
60.10	4.80	2.29	0.00
61.10	4.80	2.29	0.00
62.10	4.80	2.29	0.00
63.10	4.80	2.29	0.00
64.10	4.80	2.29	0.00
65.10	4.80	2.29	0.00
66.10	4.80	2.29	0.00
67.10	4.80	2.29	0.00
68.10	4.80	2.29	0.00
69.10	4.80	2.29	0.00
70.10	4.80	2.29	0.00
71.10	4.80	2.29	0.00

Summary for Subcatchment OSN: Off Site Subcatchment - Northeast

[49] Hint: Tc<2dt may require smaller dt

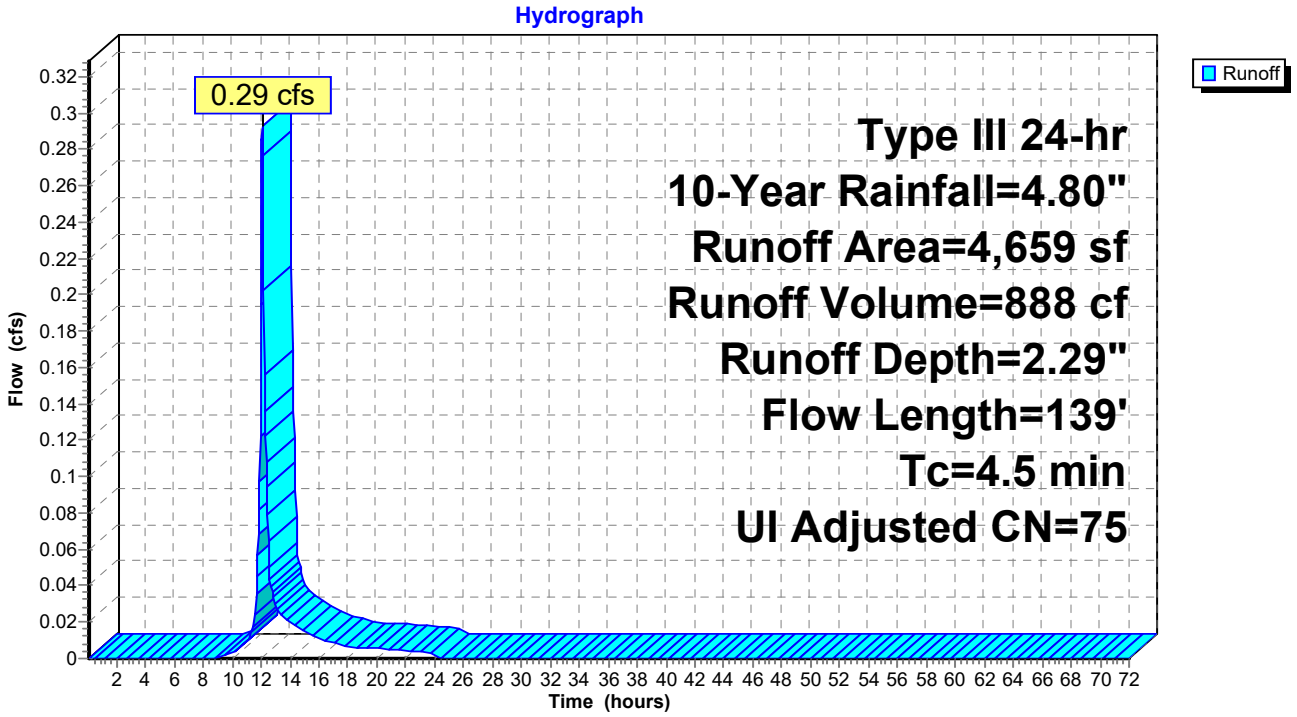
Runoff = 0.29 cfs @ 12.07 hrs, Volume= 888 cf, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Adj	Description
	678	73		Woods, Fair, HSG C
	3,567	74		>75% Grass cover, Good, HSG C
*	140	98		Unconnected pavement, HSG C, Retaining Wall
*	274	98		Unconnected pavement, HSG C, Ledge
	4,659	76	75	Weighted Average, UI Adjusted
	4,245			91.11% Pervious Area
	414			8.89% Impervious Area
	414			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	28	0.1250	0.13		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.5	72	0.2431	2.47		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.4	39	0.0508	1.58		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
4.5	139	Total			

Subcatchment OSN: Off Site Subcatchment - Northeast



Hydrograph for Subcatchment OSN: Off Site Subcatchment - Northeast

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.05	0.00	0.00
2.10	0.10	0.00	0.00
3.10	0.15	0.00	0.00
4.10	0.21	0.00	0.00
5.10	0.28	0.00	0.00
6.10	0.35	0.00	0.00
7.10	0.44	0.00	0.00
8.10	0.56	0.00	0.00
9.10	0.72	0.00	0.00
10.10	0.93	0.02	0.00
11.10	1.24	0.08	**0.01**
12.10	2.80	0.83	**0.28**
13.10	3.63	1.40	0.03
14.10	3.92	1.60	0.02
15.10	4.12	1.76	0.01
16.10	4.27	1.87	0.01
17.10	4.38	1.95	0.01
18.10	4.46	2.02	0.01
19.10	4.53	2.08	0.01
20.10	4.60	2.13	0.01
21.10	4.66	2.18	0.00
22.10	4.71	2.22	0.00
23.10	**4.76**	**2.26**	0.00
24.10	**4.80**	**2.29**	0.00
25.10	4.80	2.29	0.00
26.10	4.80	2.29	0.00
27.10	4.80	2.29	0.00
28.10	4.80	2.29	0.00
29.10	4.80	2.29	0.00
30.10	4.80	2.29	0.00
31.10	4.80	2.29	0.00
32.10	4.80	2.29	0.00
33.10	4.80	2.29	0.00
34.10	4.80	2.29	0.00
35.10	4.80	2.29	0.00
36.10	4.80	2.29	0.00
37.10	4.80	2.29	0.00
38.10	4.80	2.29	0.00
39.10	4.80	2.29	0.00
40.10	4.80	2.29	0.00
41.10	4.80	2.29	0.00
42.10	4.80	2.29	0.00
43.10	4.80	2.29	0.00
44.10	4.80	2.29	0.00
45.10	4.80	2.29	0.00
46.10	4.80	2.29	0.00
47.10	4.80	2.29	0.00
48.10	4.80	2.29	0.00
49.10	4.80	2.29	0.00
50.10	4.80	2.29	0.00
51.10	4.80	2.29	0.00
52.10	4.80	2.29	0.00
53.10	4.80	2.29	0.00
54.10	4.80	2.29	0.00
55.10	4.80	2.29	0.00
56.10	4.80	2.29	0.00
57.10	4.80	2.29	0.00
58.10	4.80	2.29	0.00
59.10	4.80	2.29	0.00
60.10	4.80	2.29	0.00
61.10	4.80	2.29	0.00
62.10	4.80	2.29	0.00
63.10	4.80	2.29	0.00
64.10	4.80	2.29	0.00
65.10	4.80	2.29	0.00
66.10	4.80	2.29	0.00
67.10	4.80	2.29	0.00
68.10	4.80	2.29	0.00
69.10	4.80	2.29	0.00
70.10	4.80	2.29	0.00
71.10	4.80	2.29	0.00

Summary for Subcatchment OSW: Off Site Subcatchment - Wetlands

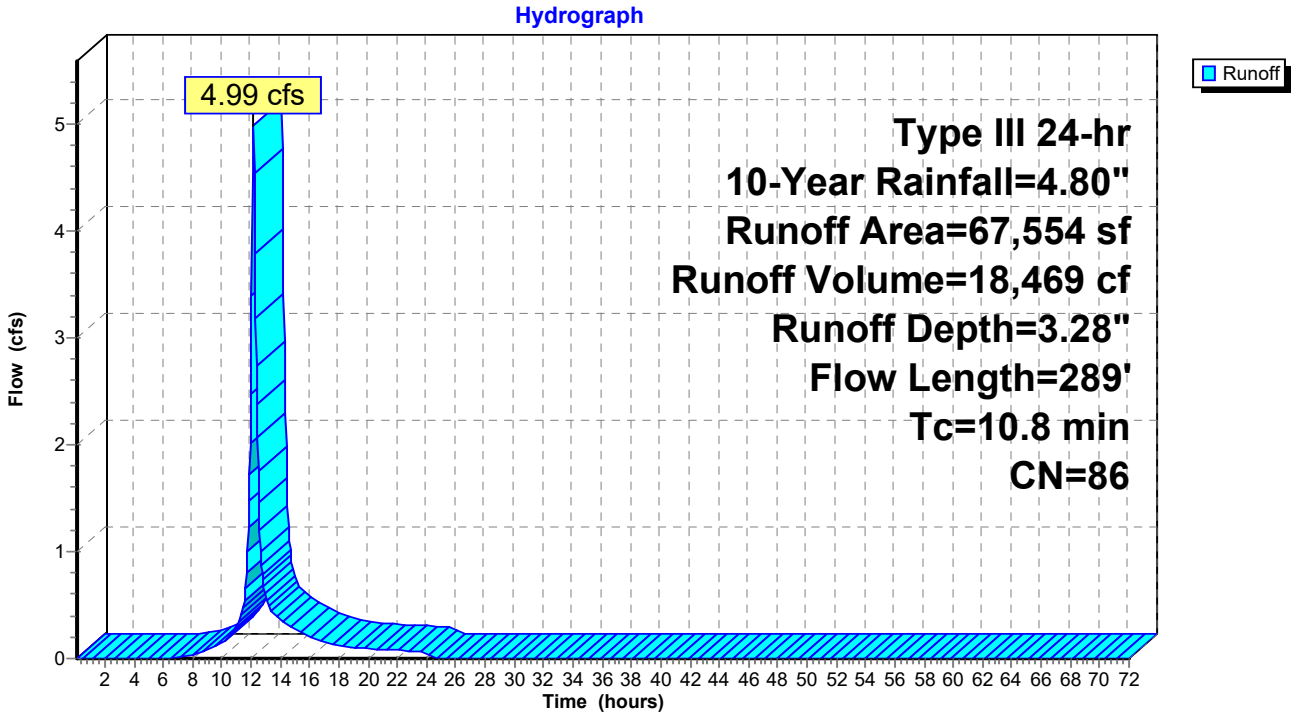
Runoff = 4.99 cfs @ 12.15 hrs, Volume= 18,469 cf, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	2,768	73	Woods, Fair, HSG C
	39,145	79	Woods, Fair, HSG D
*	7,603	98	Unconnected pavement, HSG C, Ledge
*	18,038	98	Unconnected pavement, HSG D, Ledge
	67,554	86	Weighted Average
	41,913		62.04% Pervious Area
	25,641		37.96% Impervious Area
	25,641		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	68	0.0739	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	87	0.1957	2.21		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.5	85	0.3077	2.77		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.5	49	0.1231	1.75		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
10.8	289	Total			

Subcatchment OSW: Off Site Subcatchment - Wetlands



Hydrograph for Subcatchment OSW: Off Site Subcatchment - Wetlands

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.05	0.00	0.00
2.10	0.10	0.00	0.00
3.10	0.15	0.00	0.00
4.10	0.21	0.00	0.00
5.10	0.28	0.00	0.00
6.10	0.35	0.00	0.00
7.10	0.44	0.01	0.02
8.10	0.56	0.03	0.04
9.10	0.72	0.08	0.09
10.10	0.93	0.16	0.16
11.10	1.24	0.33	0.31
12.10	2.80	1.50	**4.52**
13.10	3.63	2.22	**0.53**
14.10	3.92	2.47	0.34
15.10	4.12	2.65	0.26
16.10	4.27	2.79	0.18
17.10	4.38	2.89	0.15
18.10	4.46	2.97	0.11
19.10	4.53	3.04	0.10
20.10	4.60	3.10	0.09
21.10	4.66	3.15	0.08
22.10	4.71	3.20	0.08
23.10	**4.76**	**3.24**	0.07
24.10	**4.80**	**3.28**	0.05
25.10	4.80	3.28	0.00
26.10	4.80	3.28	0.00
27.10	4.80	3.28	0.00
28.10	4.80	3.28	0.00
29.10	4.80	3.28	0.00
30.10	4.80	3.28	0.00
31.10	4.80	3.28	0.00
32.10	4.80	3.28	0.00
33.10	4.80	3.28	0.00
34.10	4.80	3.28	0.00
35.10	4.80	3.28	0.00
36.10	4.80	3.28	0.00
37.10	4.80	3.28	0.00
38.10	4.80	3.28	0.00
39.10	4.80	3.28	0.00
40.10	4.80	3.28	0.00
41.10	4.80	3.28	0.00
42.10	4.80	3.28	0.00
43.10	4.80	3.28	0.00
44.10	4.80	3.28	0.00
45.10	4.80	3.28	0.00
46.10	4.80	3.28	0.00
47.10	4.80	3.28	0.00
48.10	4.80	3.28	0.00
49.10	4.80	3.28	0.00
50.10	4.80	3.28	0.00
51.10	4.80	3.28	0.00
52.10	4.80	3.28	0.00
53.10	4.80	3.28	0.00
54.10	4.80	3.28	0.00
55.10	4.80	3.28	0.00
56.10	4.80	3.28	0.00
57.10	4.80	3.28	0.00
58.10	4.80	3.28	0.00
59.10	4.80	3.28	0.00
60.10	4.80	3.28	0.00
61.10	4.80	3.28	0.00
62.10	4.80	3.28	0.00
63.10	4.80	3.28	0.00
64.10	4.80	3.28	0.00
65.10	4.80	3.28	0.00
66.10	4.80	3.28	0.00
67.10	4.80	3.28	0.00
68.10	4.80	3.28	0.00
69.10	4.80	3.28	0.00
70.10	4.80	3.28	0.00
71.10	4.80	3.28	0.00

Summary for Subcatchment Rear: Rear Building Recharge

[49] Hint: Tc<2dt may require smaller dt

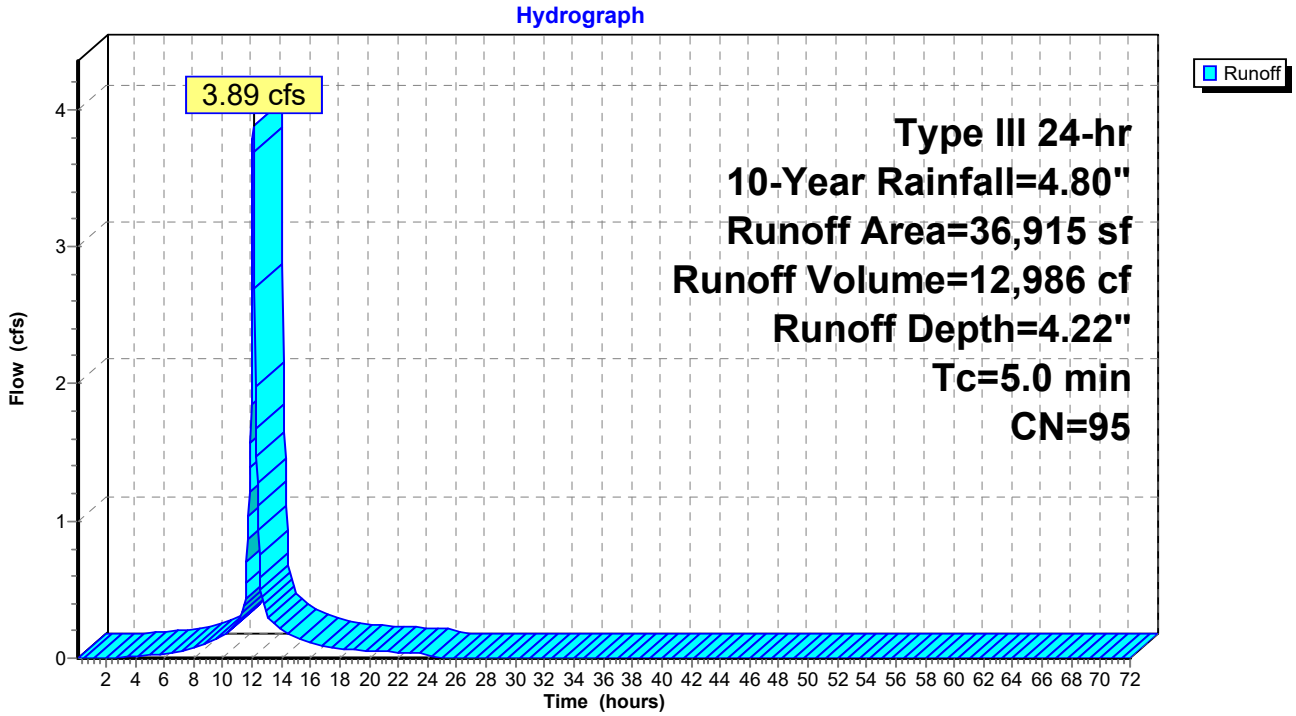
Runoff = 3.89 cfs @ 12.07 hrs, Volume= 12,986 cf, Depth= 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (sf)	CN	Description
	2,746	73	Woods, Fair, HSG C
*	2,383	98	Unconnected pavement, HSG C, Ledge
	20,125	98	Roofs, HSG C
	9,580	98	Paved parking, HSG C
*	678	98	Unconnected pavement, HSG C, Retaining Wall
	1,403	74	>75% Grass cover, Good, HSG C
	36,915	95	Weighted Average
	4,149		11.24% Pervious Area
	32,766		88.76% Impervious Area
	3,061		9.34% Unconnected

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

Subcatchment Rear: Rear Building Recharge



Hydrograph for Subcatchment Rear: Rear Building Recharge

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.00	0.00	0.00
1.10	0.05	0.00	0.00
2.10	0.10	0.00	0.00
3.10	0.15	0.00	0.01
4.10	0.21	0.02	0.02
5.10	0.28	0.04	0.03
6.10	0.35	0.08	0.04
7.10	0.44	0.13	0.05
8.10	0.56	0.21	0.08
9.10	0.72	0.33	0.12
10.10	0.93	0.50	0.17
11.10	1.24	0.77	**0.28**
12.10	2.80	2.26	**3.69**
13.10	3.63	3.07	0.29
14.10	3.92	3.35	0.20
15.10	4.12	3.55	0.15
16.10	4.27	3.69	0.11
17.10	4.38	3.80	0.08
18.10	4.46	3.89	0.06
19.10	4.53	3.96	0.06
20.10	4.60	4.02	0.05
21.10	4.66	4.08	0.05
22.10	4.71	4.14	0.04
23.10	**4.76**	**4.18**	0.04
24.10	**4.80**	**4.22**	0.01
25.10	4.80	4.22	0.00
26.10	4.80	4.22	0.00
27.10	4.80	4.22	0.00
28.10	4.80	4.22	0.00
29.10	4.80	4.22	0.00
30.10	4.80	4.22	0.00
31.10	4.80	4.22	0.00
32.10	4.80	4.22	0.00
33.10	4.80	4.22	0.00
34.10	4.80	4.22	0.00
35.10	4.80	4.22	0.00
36.10	4.80	4.22	0.00
37.10	4.80	4.22	0.00
38.10	4.80	4.22	0.00
39.10	4.80	4.22	0.00
40.10	4.80	4.22	0.00
41.10	4.80	4.22	0.00
42.10	4.80	4.22	0.00
43.10	4.80	4.22	0.00
44.10	4.80	4.22	0.00
45.10	4.80	4.22	0.00
46.10	4.80	4.22	0.00
47.10	4.80	4.22	0.00
48.10	4.80	4.22	0.00
49.10	4.80	4.22	0.00
50.10	4.80	4.22	0.00
51.10	4.80	4.22	0.00
52.10	4.80	4.22	0.00
53.10	4.80	4.22	0.00
54.10	4.80	4.22	0.00
55.10	4.80	4.22	0.00
56.10	4.80	4.22	0.00
57.10	4.80	4.22	0.00
58.10	4.80	4.22	0.00
59.10	4.80	4.22	0.00
60.10	4.80	4.22	0.00
61.10	4.80	4.22	0.00
62.10	4.80	4.22	0.00
63.10	4.80	4.22	0.00
64.10	4.80	4.22	0.00
65.10	4.80	4.22	0.00
66.10	4.80	4.22	0.00
67.10	4.80	4.22	0.00
68.10	4.80	4.22	0.00
69.10	4.80	4.22	0.00
70.10	4.80	4.22	0.00
71.10	4.80	4.22	0.00

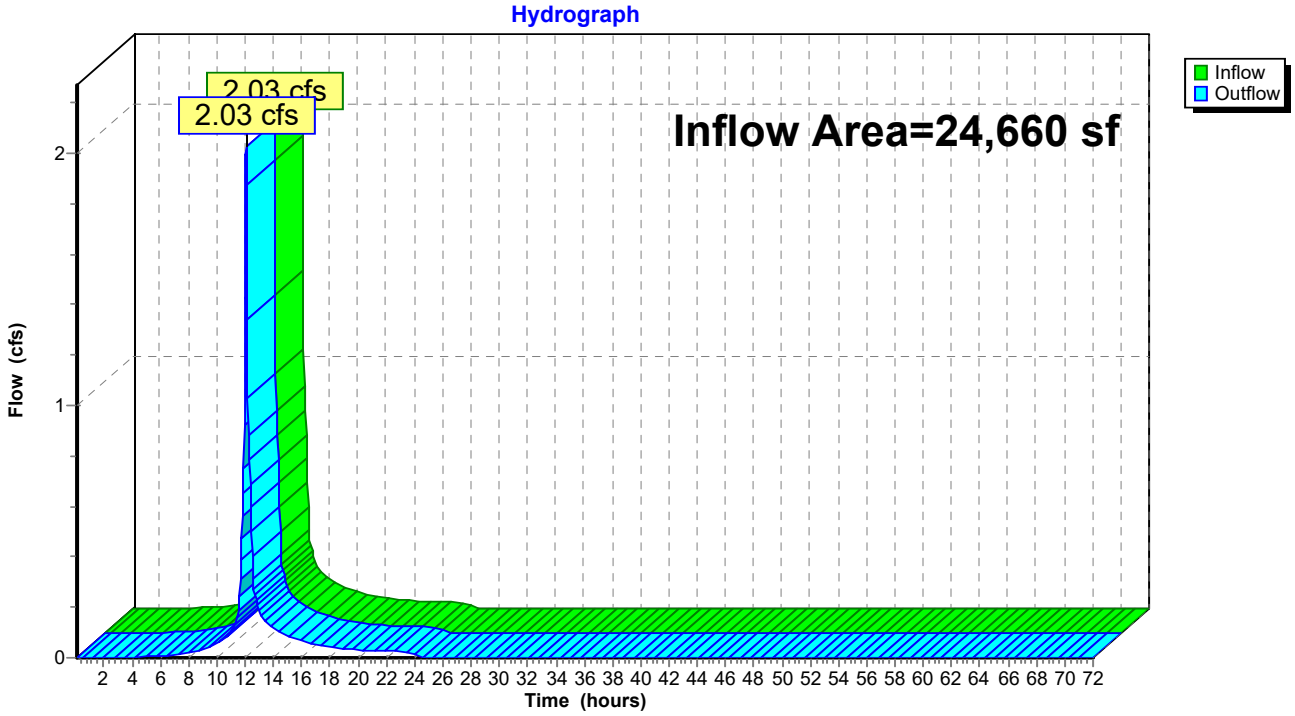
Summary for Reach TR: Total Roadway

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

Inflow Area = 24,660 sf, 45.59% Impervious, Inflow Depth = 3.07" for 10-Year event
Inflow = 2.03 cfs @ 12.07 hrs, Volume= 6,312 cf
Outflow = 2.03 cfs @ 12.07 hrs, Volume= 6,312 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Reach TR: Total Roadway



Hydrograph for Reach TR: Total Roadway

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.10	0.00		0.00	53.10	0.00		0.00
1.10	0.00		0.00	54.10	0.00		0.00
2.10	0.00		0.00	55.10	0.00		0.00
3.10	0.00		0.00	56.10	0.00		0.00
4.10	0.00		0.00	57.10	0.00		0.00
5.10	0.00		0.00	58.10	0.00		0.00
6.10	0.01		0.01	59.10	0.00		0.00
7.10	0.01		0.01	60.10	0.00		0.00
8.10	0.02		0.02	61.10	0.00		0.00
9.10	0.03		0.03	62.10	0.00		0.00
10.10	0.06		0.06	63.10	0.00		0.00
11.10	**0.11**		**0.11**	64.10	0.00		0.00
12.10	**1.87**		**1.87**	65.10	0.00		0.00
13.10	0.17		0.17	66.10	0.00		0.00
14.10	0.11		0.11	67.10	0.00		0.00
15.10	0.09		0.09	68.10	0.00		0.00
16.10	0.06		0.06	69.10	0.00		0.00
17.10	0.05		0.05	70.10	0.00		0.00
18.10	0.04		0.04	71.10	0.00		0.00
19.10	0.03		0.03				
20.10	0.03		0.03				
21.10	0.03		0.03				
22.10	0.03		0.03				
23.10	0.02		0.02				
24.10	0.00		0.00				
25.10	0.00		0.00				
26.10	0.00		0.00				
27.10	0.00		0.00				
28.10	0.00		0.00				
29.10	0.00		0.00				
30.10	0.00		0.00				
31.10	0.00		0.00				
32.10	0.00		0.00				
33.10	0.00		0.00				
34.10	0.00		0.00				
35.10	0.00		0.00				
36.10	0.00		0.00				
37.10	0.00		0.00				
38.10	0.00		0.00				
39.10	0.00		0.00				
40.10	0.00		0.00				
41.10	0.00		0.00				
42.10	0.00		0.00				
43.10	0.00		0.00				
44.10	0.00		0.00				
45.10	0.00		0.00				
46.10	0.00		0.00				
47.10	0.00		0.00				
48.10	0.00		0.00				
49.10	0.00		0.00				
50.10	0.00		0.00				
51.10	0.00		0.00				
52.10	0.00		0.00				

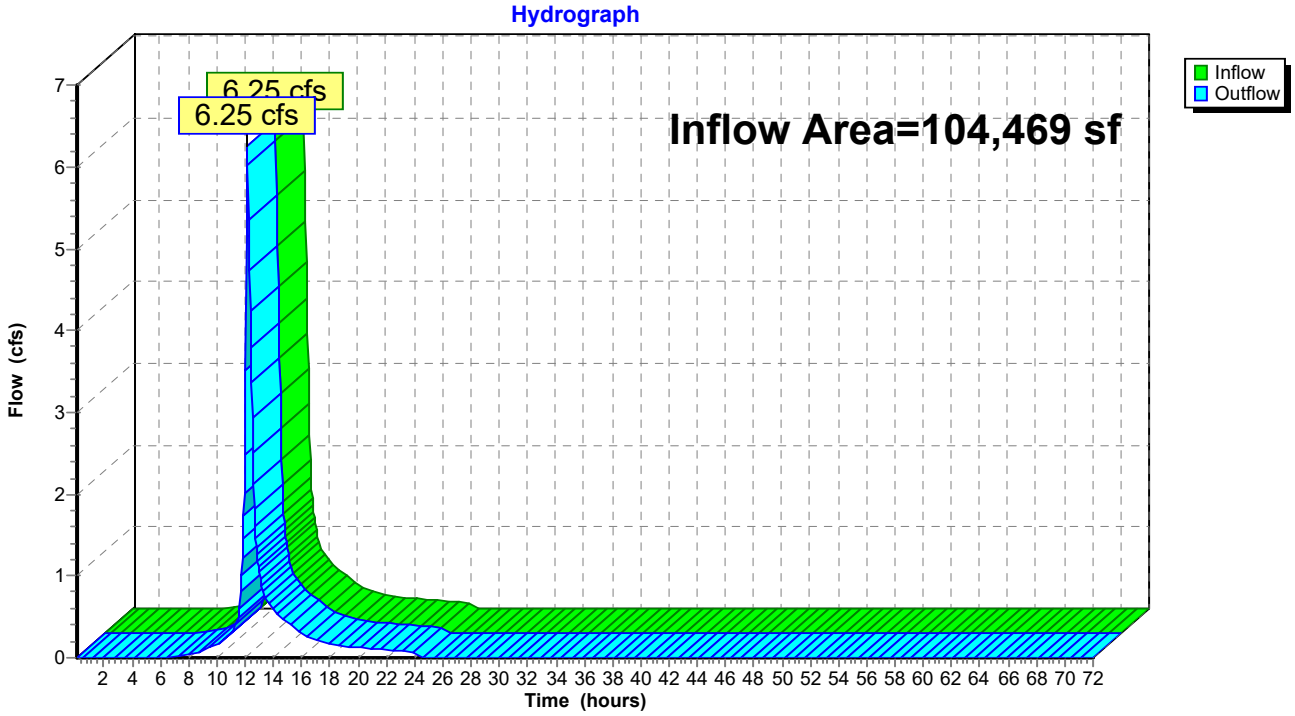
Summary for Reach TW: Total Wetlands

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

Inflow Area = 104,469 sf, 55.91% Impervious, Inflow Depth = 2.90" for 10-Year event
Inflow = 6.25 cfs @ 12.17 hrs, Volume= 25,280 cf
Outflow = 6.25 cfs @ 12.17 hrs, Volume= 25,280 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Reach TW: Total Wetlands



Hydrograph for Reach TW: Total Wetlands

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.10	0.00		0.00
1.10	0.00		0.00
2.10	0.00		0.00
3.10	0.00		0.00
4.10	0.00		0.00
5.10	0.00		0.00
6.10	0.00		0.00
7.10	0.02		0.02
8.10	0.04		0.04
9.10	0.09		0.09
10.10	0.16		0.16
11.10	0.31		0.31
12.10	**5.14**		**5.14**
13.10	**0.94**		**0.94**
14.10	0.55		0.55
15.10	0.41		0.41
16.10	0.29		0.29
17.10	0.22		0.22
18.10	0.17		0.17
19.10	0.14		0.14
20.10	0.12		0.12
21.10	0.11		0.11
22.10	0.10		0.10
23.10	0.09		0.09
24.10	0.06		0.06
25.10	0.00		0.00
26.10	0.00		0.00
27.10	0.00		0.00
28.10	0.00		0.00
29.10	0.00		0.00
30.10	0.00		0.00
31.10	0.00		0.00
32.10	0.00		0.00
33.10	0.00		0.00
34.10	0.00		0.00
35.10	0.00		0.00
36.10	0.00		0.00
37.10	0.00		0.00
38.10	0.00		0.00
39.10	0.00		0.00
40.10	0.00		0.00
41.10	0.00		0.00
42.10	0.00		0.00
43.10	0.00		0.00
44.10	0.00		0.00
45.10	0.00		0.00
46.10	0.00		0.00
47.10	0.00		0.00
48.10	0.00		0.00
49.10	0.00		0.00
50.10	0.00		0.00
51.10	0.00		0.00
52.10	0.00		0.00
53.10	0.00		0.00
54.10	0.00		0.00
55.10	0.00		0.00
56.10	0.00		0.00
57.10	0.00		0.00
58.10	0.00		0.00
59.10	0.00		0.00
60.10	0.00		0.00
61.10	0.00		0.00
62.10	0.00		0.00
63.10	0.00		0.00
64.10	0.00		0.00
65.10	0.00		0.00
66.10	0.00		0.00
67.10	0.00		0.00
68.10	0.00		0.00
69.10	0.00		0.00
70.10	0.00		0.00
71.10	0.00		0.00

Summary for Pond RF: Recharge - Front

Inflow Area = 4,505 sf,100.00% Impervious, Inflow Depth = 4.56" for 10-Year event
Inflow = 0.49 cfs @ 12.07 hrs, Volume= 1,713 cf
Outflow = 0.01 cfs @ 18.08 hrs, Volume= 1,713 cf, Atten= 98%, Lag= 360.4 min
Discarded = 0.01 cfs @ 18.08 hrs, Volume= 1,713 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Peak Elev= 102.14' @ 18.08 hrs Surf.Area= 1,061 sf Storage= 1,201 cf

Plug-Flow detention time= 1,361.3 min calculated for 1,712 cf (100% of inflow)
Center-of-Mass det. time= 1,362.2 min (2,110.0 - 747.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.52'	840 cf	**23.58'W x 45.00'L x 3.21'H Field A** 3,405 cf Overall - 1,305 cf Embedded = 2,099 cf x 40.0% Voids
#2A	101.02'	1,305 cf	**Cultec R-280HD** x 30 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 5 rows
		2,145 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.52'	**0.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 18.08 hrs HW=102.14' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond RF: Recharge - Front - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 5 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

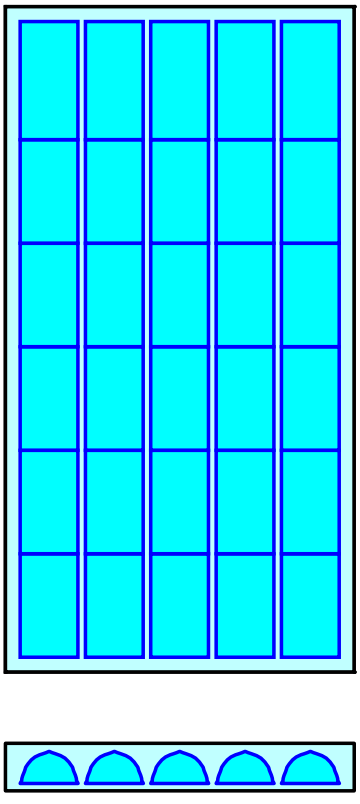
6 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 43.00' Row Length +12.0" End Stone x 2 = 45.00' Base Length
5 Rows x 47.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 23.58' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

30 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 5 Rows = 1,305.4 cf Chamber Storage

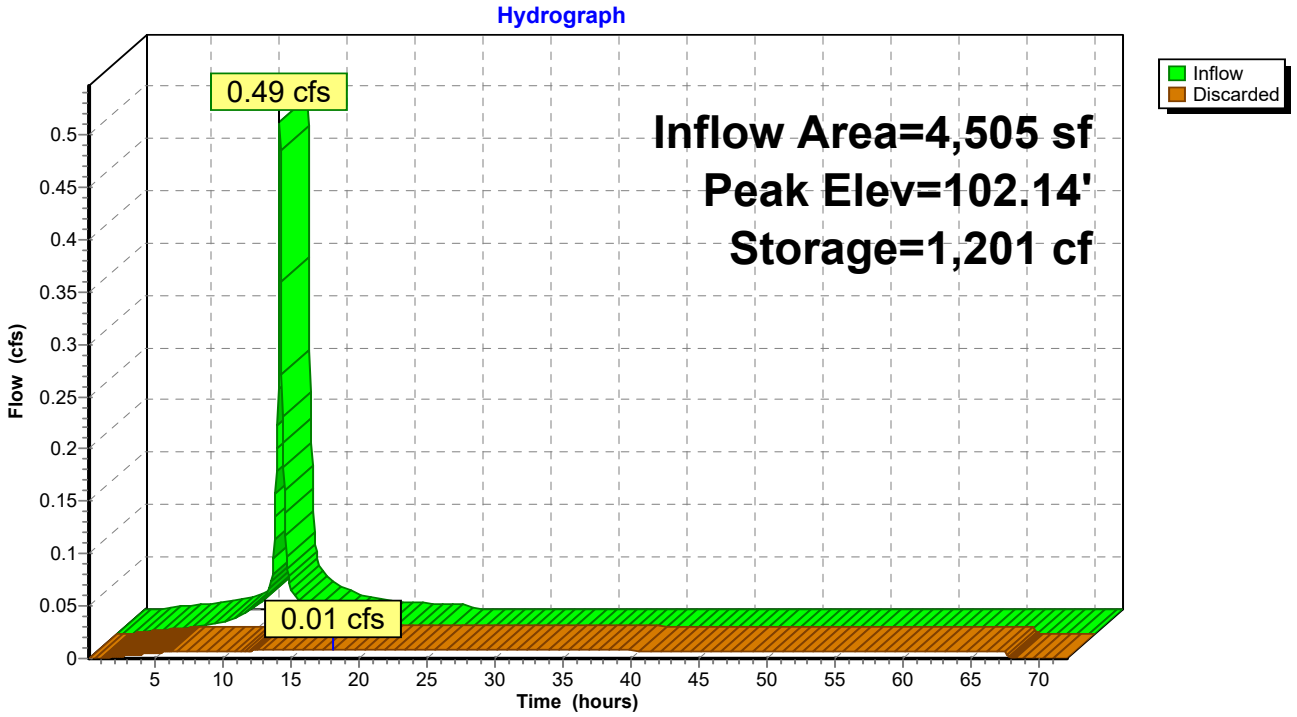
3,404.8 cf Field - 1,305.4 cf Chambers = 2,099.4 cf Stone x 40.0% Voids = 839.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,145.2 cf = 0.049 af
Overall Storage Efficiency = 63.0%
Overall System Size = 45.00' x 23.58' x 3.21'

30 Chambers
126.1 cy Field
77.8 cy Stone



Pond RF: Recharge - Front



Hydrograph for Pond RF: Recharge - Front

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Discarded (cfs)
0.10	0.00	0	100.52	0.00
2.60	0.00	2	100.52	0.00
5.10	0.01	4	100.53	0.01
7.60	0.01	15	100.56	0.01
10.10	**0.02**	104	100.76	0.01
12.60	**0.06**	956	101.85	0.01
15.10	0.02	1,156	102.09	0.01
17.60	0.01	**1,200**	**102.14**	**0.01**
20.10	0.01	**1,195**	**102.14**	**0.01**
22.60	0.01	1,175	102.11	0.01
25.10	0.00	1,128	102.06	0.01
27.60	0.00	1,057	101.97	0.01
30.10	0.00	986	101.89	0.01
32.60	0.00	916	101.81	0.01
35.10	0.00	847	101.73	0.01
37.60	0.00	778	101.65	0.01
40.10	0.00	710	101.57	0.01
42.60	0.00	643	101.49	0.01
45.10	0.00	576	101.42	0.01
47.60	0.00	509	101.35	0.01
50.10	0.00	444	101.27	0.01
52.60	0.00	378	101.20	0.01
55.10	0.00	314	101.13	0.01
57.60	0.00	250	101.06	0.01
60.10	0.00	186	100.96	0.01
62.60	0.00	123	100.81	0.01
65.10	0.00	62	100.67	0.01
67.60	0.00	2	100.53	0.00
70.10	0.00	0	100.52	0.00

Summary for Pond RR: Recharge - Rear

Inflow Area = 36,915 sf, 88.76% Impervious, Inflow Depth = 4.22" for 10-Year event
Inflow = 3.89 cfs @ 12.07 hrs, Volume= 12,986 cf
Outflow = 1.60 cfs @ 12.27 hrs, Volume= 12,666 cf, Atten= 59%, Lag= 12.0 min
Discarded = 0.03 cfs @ 12.27 hrs, Volume= 5,855 cf
Primary = 1.57 cfs @ 12.27 hrs, Volume= 6,811 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Peak Elev= 102.84' @ 12.27 hrs Surf.Area= 3,501 sf Storage= 5,947 cf

Plug-Flow detention time= 746.7 min calculated for 12,666 cf (98% of inflow)
Center-of-Mass det. time= 731.4 min (1,499.8 - 768.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.46'	2,691 cf	**32.42'W x 108.00'L x 3.21'H Field A** 11,232 cf Overall - 4,505 cf Embedded = 6,727 cf x 40.0% Voids
#2A	100.96'	4,505 cf	**Cultec R-280HD** x 105 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 7 rows
		7,196 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	102.17'	**12.0" Round Culvert** L= 44.9' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.17' / 101.50' S= 0.0149 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	100.46'	**0.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.03 cfs @ 12.27 hrs HW=102.84' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.56 cfs @ 12.27 hrs HW=102.84' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.56 cfs @ 2.79 fps)

Pond RR: Recharge - Rear - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 7 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

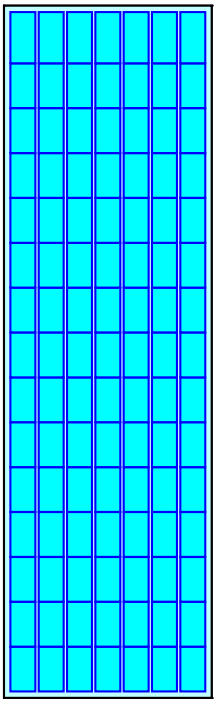
15 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 106.00' Row Length +12.0" End Stone x 2 = 108.00' Base Length
7 Rows x 47.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 32.42' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

105 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 7 Rows = 4,505.2 cf Chamber Storage

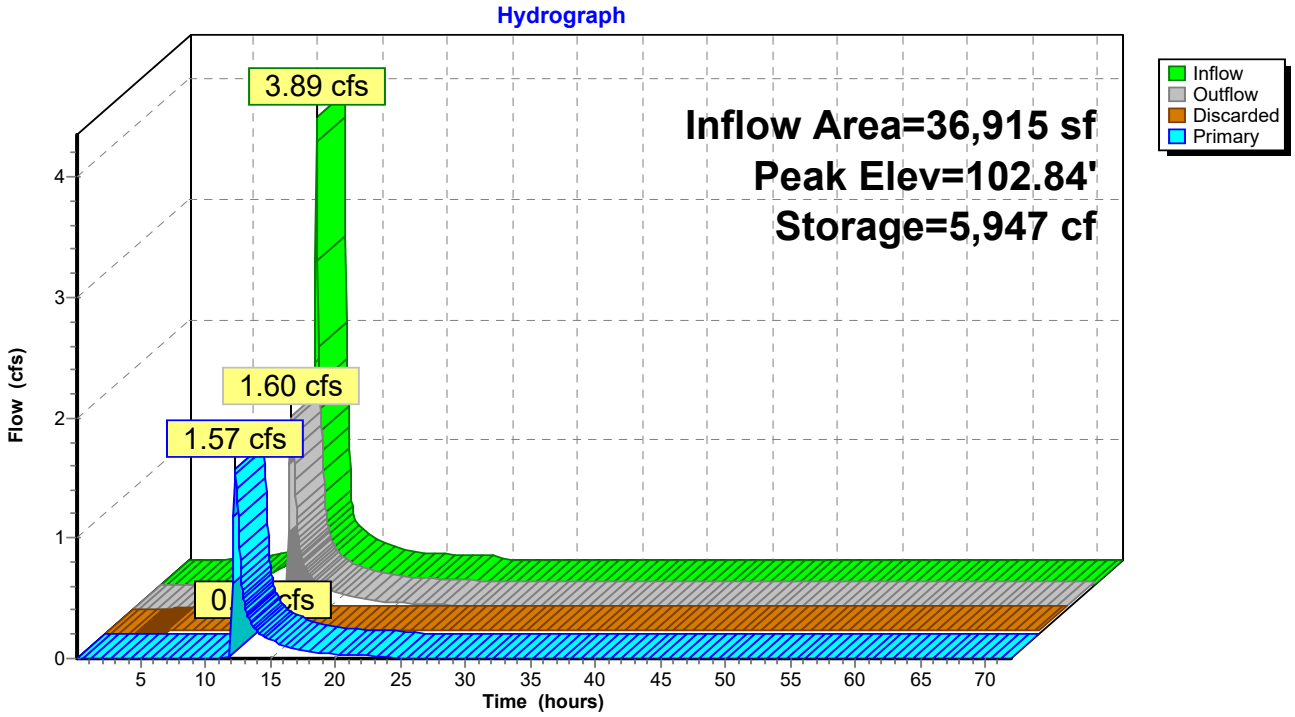
11,232.4 cf Field - 4,505.2 cf Chambers = 6,727.1 cf Stone x 40.0% Voids = 2,690.9 cf Stone Storage

Chamber Storage + Stone Storage = 7,196.1 cf = 0.165 af
Overall Storage Efficiency = 64.1%
Overall System Size = 108.00' x 32.42' x 3.21'

105 Chambers
416.0 cy Field
249.2 cy Stone



Pond RR: Recharge - Rear



Hydrograph for Pond RR: Recharge - Rear

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.10	0.00	0	100.46	0.00	0.00	0.00
2.60	0.00	1	100.46	0.00	0.00	0.00
5.10	0.03	16	100.47	0.02	0.02	0.00
7.60	0.06	193	100.60	0.02	0.02	0.00
10.10	**0.17**	**993**	**101.05**	**0.02**	**0.02**	**0.00**
12.60	**0.49**	**5,543**	**102.66**	**0.95**	**0.03**	**0.92**
15.10	0.15	4,774	102.36	0.17	0.03	0.15
17.60	0.07	4,601	102.29	0.09	0.03	0.06
20.10	0.05	4,512	102.26	0.06	0.03	0.03
22.60	0.04	4,464	102.24	0.05	0.03	0.02
25.10	0.00	4,320	102.19	0.03	0.02	0.00
27.60	0.00	4,095	102.11	0.02	0.02	0.00
30.10	0.00	3,873	102.03	0.02	0.02	0.00
32.60	0.00	3,652	101.95	0.02	0.02	0.00
35.10	0.00	3,432	101.87	0.02	0.02	0.00
37.60	0.00	3,214	101.79	0.02	0.02	0.00
40.10	0.00	2,996	101.72	0.02	0.02	0.00
42.60	0.00	2,780	101.65	0.02	0.02	0.00
45.10	0.00	2,565	101.57	0.02	0.02	0.00
47.60	0.00	2,351	101.50	0.02	0.02	0.00
50.10	0.00	2,138	101.43	0.02	0.02	0.00
52.60	0.00	1,927	101.36	0.02	0.02	0.00
55.10	0.00	1,716	101.29	0.02	0.02	0.00
57.60	0.00	1,506	101.22	0.02	0.02	0.00
60.10	0.00	1,298	101.15	0.02	0.02	0.00
62.60	0.00	1,091	101.09	0.02	0.02	0.00
65.10	0.00	884	101.02	0.02	0.02	0.00
67.60	0.00	679	100.94	0.02	0.02	0.00
70.10	0.00	476	100.80	0.02	0.02	0.00

Time span=0.10-72.00 hrs, dt=0.05 hrs, 1439 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Front: Front Building Runoff Area=4,505 sf 100.00% Impervious Runoff Depth=5.36"
Tc=5.0 min CN=98 Runoff=0.57 cfs 2,013 cf

Subcatchment M: To Maple Street Runoff Area=12,026 sf 76.27% Impervious Runoff Depth=4.68"
Tc=5.0 min CN=92 Runoff=1.43 cfs 4,687 cf

Subcatchment OSM: Off Site Runoff Area=12,634 sf 16.39% Impervious Runoff Depth=2.94"
Flow Length=176' Tc=3.7 min UI Adjusted CN=75 Runoff=1.06 cfs 3,100 cf

Subcatchment OSN: Off Site Subcatchment - Runoff Area=4,659 sf 8.89% Impervious Runoff Depth=2.94"
Flow Length=139' Tc=4.5 min UI Adjusted CN=75 Runoff=0.38 cfs 1,143 cf

Subcatchment OSW: Off Site Runoff Area=67,554 sf 37.96% Impervious Runoff Depth=4.03"
Flow Length=289' Tc=10.8 min CN=86 Runoff=6.08 cfs 22,689 cf

Subcatchment Rear: Rear Building Runoff Area=36,915 sf 88.76% Impervious Runoff Depth=5.01"
Tc=5.0 min CN=95 Runoff=4.57 cfs 15,426 cf

Reach TR: Total Roadway Inflow=2.49 cfs 7,786 cf
Outflow=2.49 cfs 7,786 cf

Reach TW: Total Wetlands Inflow=8.63 cfs 31,874 cf
Outflow=8.63 cfs 31,874 cf

Pond RF: Recharge - Front Peak Elev=102.47' Storage=1,460 cf Inflow=0.57 cfs 2,013 cf
Outflow=0.01 cfs 1,892 cf

Pond RR: Recharge - Rear Peak Elev=103.13' Storage=6,441 cf Inflow=4.57 cfs 15,426 cf
Discarded=0.03 cfs 5,906 cf Primary=2.58 cfs 9,185 cf Outflow=2.61 cfs 15,090 cf

Total Runoff Area = 138,293 sf Runoff Volume = 49,058 cf Average Runoff Depth = 4.26"
46.08% Pervious = 63,724 sf 53.92% Impervious = 74,569 sf

Summary for Subcatchment Front: Front Building Recharge

[49] Hint: Tc<2dt may require smaller dt

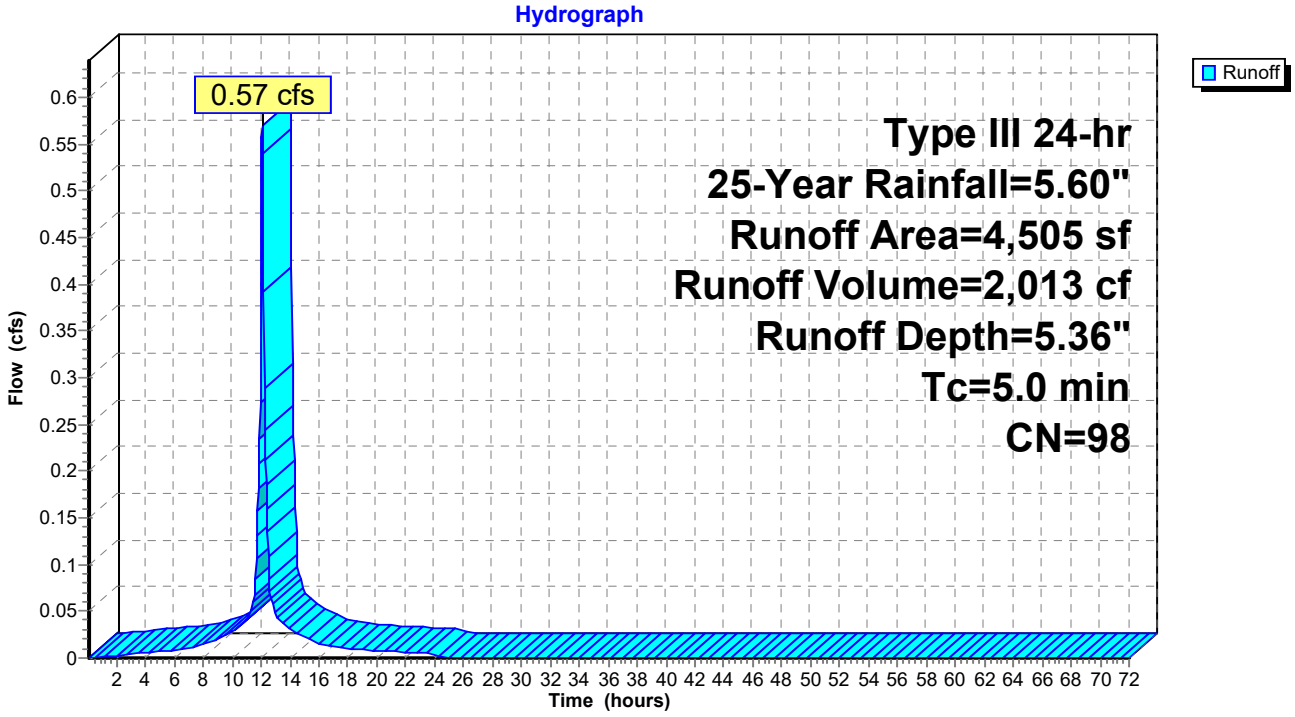
Runoff = 0.57 cfs @ 12.07 hrs, Volume= 2,013 cf, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

Area (sf)	CN	Description
4,505	98	Paved parking, HSG C
4,505		100.00% Impervious Area

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

Subcatchment Front: Front Building Recharge



Hydrograph for Subcatchment Front: Front Building Recharge

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.06	0.00	0.00
2.10	0.12	0.02	0.00
3.10	0.18	0.06	0.00
4.10	0.25	0.10	0.01
5.10	0.33	0.17	0.01
6.10	0.41	0.24	0.01
7.10	0.52	0.33	0.01
8.10	0.65	0.46	0.01
9.10	0.84	0.63	0.02
10.10	1.09	0.87	0.03
11.10	1.44	1.22	**0.04**
12.10	3.27	3.04	**0.54**
13.10	4.24	4.00	0.04
14.10	4.57	4.33	0.03
15.10	4.80	4.57	0.02
16.10	4.98	4.74	0.02
17.10	5.10	4.87	0.01
18.10	5.21	4.97	0.01
19.10	5.29	5.05	0.01
20.10	5.37	5.13	0.01
21.10	5.44	5.20	0.01
22.10	5.50	5.26	0.01
23.10	**5.55**	**5.32**	0.01
24.10	**5.60**	**5.36**	0.00
25.10	5.60	5.36	0.00
26.10	5.60	5.36	0.00
27.10	5.60	5.36	0.00
28.10	5.60	5.36	0.00
29.10	5.60	5.36	0.00
30.10	5.60	5.36	0.00
31.10	5.60	5.36	0.00
32.10	5.60	5.36	0.00
33.10	5.60	5.36	0.00
34.10	5.60	5.36	0.00
35.10	5.60	5.36	0.00
36.10	5.60	5.36	0.00
37.10	5.60	5.36	0.00
38.10	5.60	5.36	0.00
39.10	5.60	5.36	0.00
40.10	5.60	5.36	0.00
41.10	5.60	5.36	0.00
42.10	5.60	5.36	0.00
43.10	5.60	5.36	0.00
44.10	5.60	5.36	0.00
45.10	5.60	5.36	0.00
46.10	5.60	5.36	0.00
47.10	5.60	5.36	0.00
48.10	5.60	5.36	0.00
49.10	5.60	5.36	0.00
50.10	5.60	5.36	0.00
51.10	5.60	5.36	0.00
52.10	5.60	5.36	0.00
53.10	5.60	5.36	0.00
54.10	5.60	5.36	0.00
55.10	5.60	5.36	0.00
56.10	5.60	5.36	0.00
57.10	5.60	5.36	0.00
58.10	5.60	5.36	0.00
59.10	5.60	5.36	0.00
60.10	5.60	5.36	0.00
61.10	5.60	5.36	0.00
62.10	5.60	5.36	0.00
63.10	5.60	5.36	0.00
64.10	5.60	5.36	0.00
65.10	5.60	5.36	0.00
66.10	5.60	5.36	0.00
67.10	5.60	5.36	0.00
68.10	5.60	5.36	0.00
69.10	5.60	5.36	0.00
70.10	5.60	5.36	0.00
71.10	5.60	5.36	0.00

Summary for Subcatchment M: To Maple Street

[49] Hint: Tc<2dt may require smaller dt

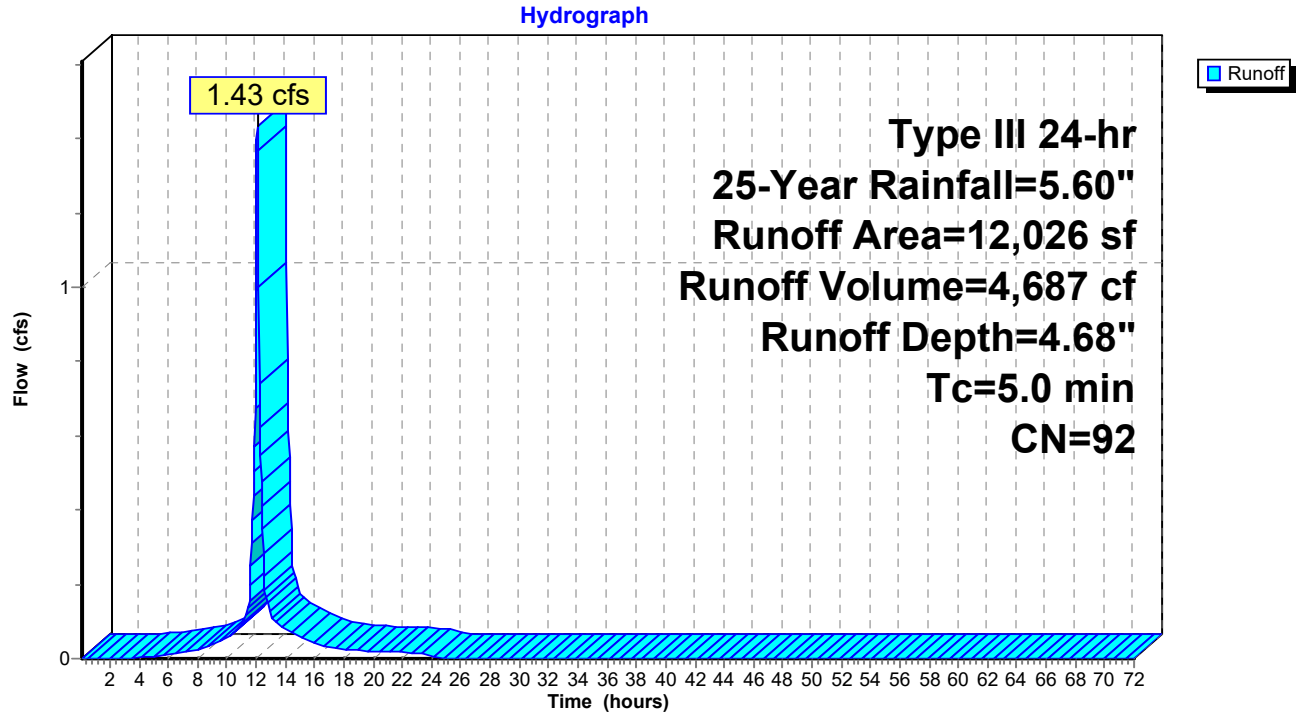
Runoff = 1.43 cfs @ 12.07 hrs, Volume= 4,687 cf, Depth= 4.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Description
	8,954	98	Paved parking, HSG C
	2,854	74	>75% Grass cover, Good, HSG C
*	218	98	Unconnected pavement, HSG C, Retaining Wall
	12,026	92	Weighted Average
	2,854		23.73% Pervious Area
	9,172		76.27% Impervious Area
	218		2.38% Unconnected

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

Subcatchment M: To Maple Street



Hydrograph for Subcatchment M: To Maple Street

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.06	0.00	0.00
2.10	0.12	0.00	0.00
3.10	0.18	0.00	0.00
4.10	0.25	0.01	0.00
5.10	0.33	0.02	0.01
6.10	0.41	0.05	0.01
7.10	0.52	0.10	0.02
8.10	0.65	0.17	0.02
9.10	0.84	0.29	0.04
10.10	1.09	0.47	0.06
11.10	1.44	0.75	**0.10**
12.10	3.27	2.42	**1.36**
13.10	4.24	3.35	0.11
14.10	4.57	3.67	0.07
15.10	4.80	3.90	0.06
16.10	4.98	4.07	0.04
17.10	5.10	4.19	0.03
18.10	5.21	4.29	0.02
19.10	5.29	4.37	0.02
20.10	5.37	4.45	0.02
21.10	5.44	4.52	0.02
22.10	5.50	4.58	0.02
23.10	**5.55**	**4.63**	0.01
24.10	**5.60**	**4.68**	0.00
25.10	5.60	4.68	0.00
26.10	5.60	4.68	0.00
27.10	5.60	4.68	0.00
28.10	5.60	4.68	0.00
29.10	5.60	4.68	0.00
30.10	5.60	4.68	0.00
31.10	5.60	4.68	0.00
32.10	5.60	4.68	0.00
33.10	5.60	4.68	0.00
34.10	5.60	4.68	0.00
35.10	5.60	4.68	0.00
36.10	5.60	4.68	0.00
37.10	5.60	4.68	0.00
38.10	5.60	4.68	0.00
39.10	5.60	4.68	0.00
40.10	5.60	4.68	0.00
41.10	5.60	4.68	0.00
42.10	5.60	4.68	0.00
43.10	5.60	4.68	0.00
44.10	5.60	4.68	0.00
45.10	5.60	4.68	0.00
46.10	5.60	4.68	0.00
47.10	5.60	4.68	0.00
48.10	5.60	4.68	0.00
49.10	5.60	4.68	0.00
50.10	5.60	4.68	0.00
51.10	5.60	4.68	0.00
52.10	5.60	4.68	0.00
53.10	5.60	4.68	0.00
54.10	5.60	4.68	0.00
55.10	5.60	4.68	0.00
56.10	5.60	4.68	0.00
57.10	5.60	4.68	0.00
58.10	5.60	4.68	0.00
59.10	5.60	4.68	0.00
60.10	5.60	4.68	0.00
61.10	5.60	4.68	0.00
62.10	5.60	4.68	0.00
63.10	5.60	4.68	0.00
64.10	5.60	4.68	0.00
65.10	5.60	4.68	0.00
66.10	5.60	4.68	0.00
67.10	5.60	4.68	0.00
68.10	5.60	4.68	0.00
69.10	5.60	4.68	0.00
70.10	5.60	4.68	0.00
71.10	5.60	4.68	0.00

Summary for Subcatchment OSM: Off Site Subcatchment - Maple Street

[49] Hint: Tc<2dt may require smaller dt

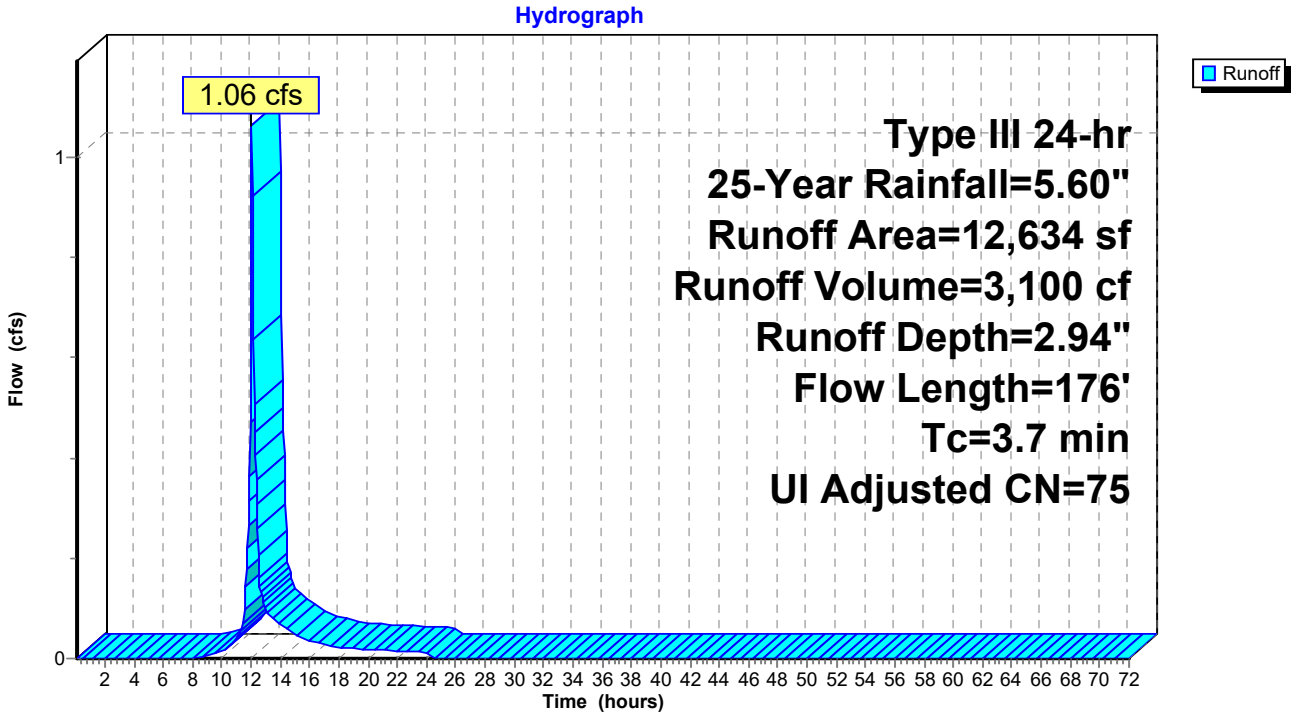
Runoff = 1.06 cfs @ 12.06 hrs, Volume= 3,100 cf, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Adj	Description
	8,723	73		Woods, Fair, HSG C
	75	79		Woods, Fair, HSG D
*	2,071	98		Unconnected pavement, HSG C, Ledge
	1,765	74		>75% Grass cover, Good, HSG C
	12,634	77	75	Weighted Average, UI Adjusted
	10,563			83.61% Pervious Area
	2,071			16.39% Impervious Area
	2,071			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	23	0.3085	0.18		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	49	0.0816	1.43		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.9	104	0.1440	1.90		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
3.7	176	Total			

Subcatchment OSM: Off Site Subcatchment - Maple Street



Hydrograph for Subcatchment OSM: Off Site Subcatchment - Maple Street

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.06	0.00	0.00
2.10	0.12	0.00	0.00
3.10	0.18	0.00	0.00
4.10	0.25	0.00	0.00
5.10	0.33	0.00	0.00
6.10	0.41	0.00	0.00
7.10	0.52	0.00	0.00
8.10	0.65	0.00	0.00
9.10	0.84	0.01	0.01
10.10	1.09	0.05	0.02
11.10	1.44	0.15	**0.04**
12.10	3.27	1.14	**0.92**
13.10	4.24	1.85	0.09
14.10	4.57	2.10	0.06
15.10	4.80	2.29	0.05
16.10	4.98	2.43	0.03
17.10	5.10	2.53	0.03
18.10	5.21	2.62	0.02
19.10	5.29	2.69	0.02
20.10	5.37	2.75	0.02
21.10	5.44	2.81	0.02
22.10	5.50	2.86	0.01
23.10	**5.55**	**2.91**	0.01
24.10	**5.60**	**2.94**	0.00
25.10	5.60	2.94	0.00
26.10	5.60	2.94	0.00
27.10	5.60	2.94	0.00
28.10	5.60	2.94	0.00
29.10	5.60	2.94	0.00
30.10	5.60	2.94	0.00
31.10	5.60	2.94	0.00
32.10	5.60	2.94	0.00
33.10	5.60	2.94	0.00
34.10	5.60	2.94	0.00
35.10	5.60	2.94	0.00
36.10	5.60	2.94	0.00
37.10	5.60	2.94	0.00
38.10	5.60	2.94	0.00
39.10	5.60	2.94	0.00
40.10	5.60	2.94	0.00
41.10	5.60	2.94	0.00
42.10	5.60	2.94	0.00
43.10	5.60	2.94	0.00
44.10	5.60	2.94	0.00
45.10	5.60	2.94	0.00
46.10	5.60	2.94	0.00
47.10	5.60	2.94	0.00
48.10	5.60	2.94	0.00
49.10	5.60	2.94	0.00
50.10	5.60	2.94	0.00
51.10	5.60	2.94	0.00
52.10	5.60	2.94	0.00
53.10	5.60	2.94	0.00
54.10	5.60	2.94	0.00
55.10	5.60	2.94	0.00
56.10	5.60	2.94	0.00
57.10	5.60	2.94	0.00
58.10	5.60	2.94	0.00
59.10	5.60	2.94	0.00
60.10	5.60	2.94	0.00
61.10	5.60	2.94	0.00
62.10	5.60	2.94	0.00
63.10	5.60	2.94	0.00
64.10	5.60	2.94	0.00
65.10	5.60	2.94	0.00
66.10	5.60	2.94	0.00
67.10	5.60	2.94	0.00
68.10	5.60	2.94	0.00
69.10	5.60	2.94	0.00
70.10	5.60	2.94	0.00
71.10	5.60	2.94	0.00

Summary for Subcatchment OSN: Off Site Subcatchment - Northeast

[49] Hint: Tc<2dt may require smaller dt

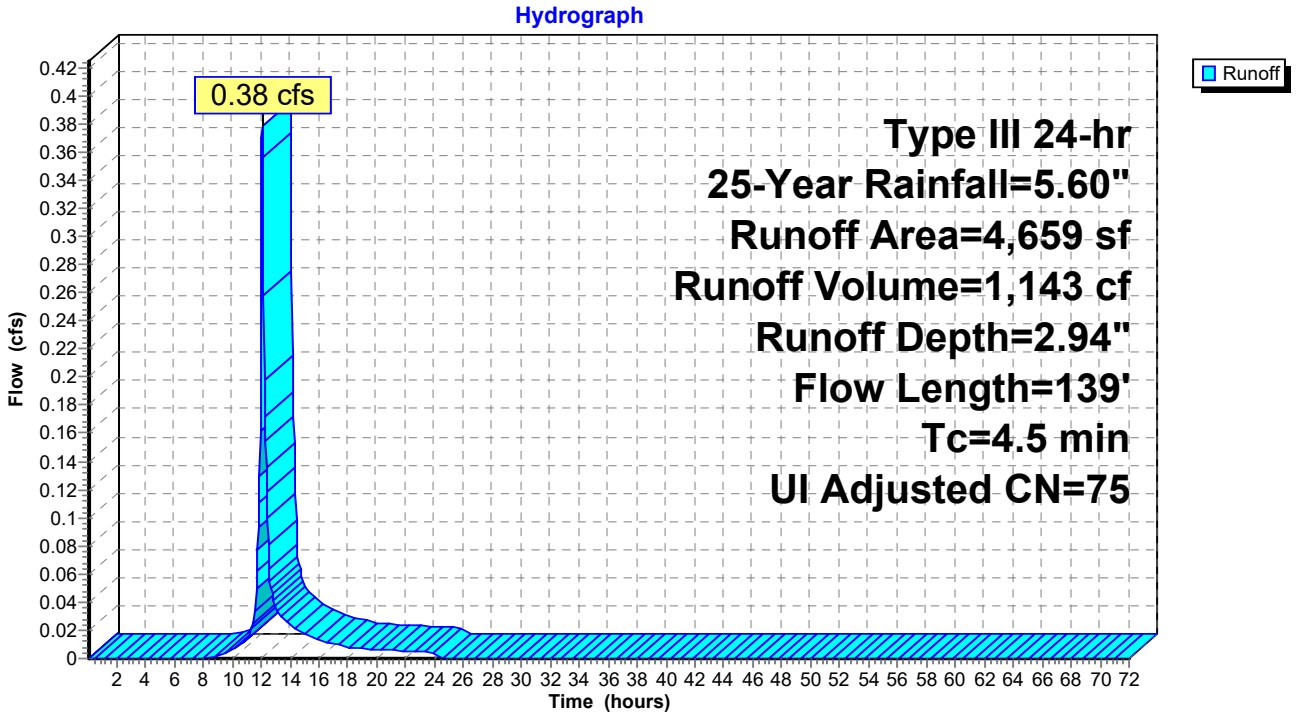
Runoff = 0.38 cfs @ 12.07 hrs, Volume= 1,143 cf, Depth= 2.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Adj	Description
	678	73		Woods, Fair, HSG C
	3,567	74		>75% Grass cover, Good, HSG C
*	140	98		Unconnected pavement, HSG C, Retaining Wall
*	274	98		Unconnected pavement, HSG C, Ledge
	4,659	76	75	Weighted Average, UI Adjusted
	4,245			91.11% Pervious Area
	414			8.89% Impervious Area
	414			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	28	0.1250	0.13		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.5	72	0.2431	2.47		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.4	39	0.0508	1.58		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
4.5	139	Total			

Subcatchment OSN: Off Site Subcatchment - Northeast



Hydrograph for Subcatchment OSN: Off Site Subcatchment - Northeast

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.06	0.00	0.00
2.10	0.12	0.00	0.00
3.10	0.18	0.00	0.00
4.10	0.25	0.00	0.00
5.10	0.33	0.00	0.00
6.10	0.41	0.00	0.00
7.10	0.52	0.00	0.00
8.10	0.65	0.00	0.00
9.10	0.84	0.01	0.00
10.10	1.09	0.05	0.01
11.10	1.44	0.15	**0.02**
12.10	3.27	1.14	**0.36**
13.10	4.24	1.85	0.03
14.10	4.57	2.10	0.02
15.10	4.80	2.29	0.02
16.10	4.98	2.43	0.01
17.10	5.10	2.53	0.01
18.10	5.21	2.62	0.01
19.10	5.29	2.69	0.01
20.10	5.37	2.75	0.01
21.10	5.44	2.81	0.01
22.10	5.50	2.86	0.01
23.10	**5.55**	**2.91**	0.00
24.10	**5.60**	**2.94**	0.00
25.10	5.60	2.94	0.00
26.10	5.60	2.94	0.00
27.10	5.60	2.94	0.00
28.10	5.60	2.94	0.00
29.10	5.60	2.94	0.00
30.10	5.60	2.94	0.00
31.10	5.60	2.94	0.00
32.10	5.60	2.94	0.00
33.10	5.60	2.94	0.00
34.10	5.60	2.94	0.00
35.10	5.60	2.94	0.00
36.10	5.60	2.94	0.00
37.10	5.60	2.94	0.00
38.10	5.60	2.94	0.00
39.10	5.60	2.94	0.00
40.10	5.60	2.94	0.00
41.10	5.60	2.94	0.00
42.10	5.60	2.94	0.00
43.10	5.60	2.94	0.00
44.10	5.60	2.94	0.00
45.10	5.60	2.94	0.00
46.10	5.60	2.94	0.00
47.10	5.60	2.94	0.00
48.10	5.60	2.94	0.00
49.10	5.60	2.94	0.00
50.10	5.60	2.94	0.00
51.10	5.60	2.94	0.00
52.10	5.60	2.94	0.00
53.10	5.60	2.94	0.00
54.10	5.60	2.94	0.00
55.10	5.60	2.94	0.00
56.10	5.60	2.94	0.00
57.10	5.60	2.94	0.00
58.10	5.60	2.94	0.00
59.10	5.60	2.94	0.00
60.10	5.60	2.94	0.00
61.10	5.60	2.94	0.00
62.10	5.60	2.94	0.00
63.10	5.60	2.94	0.00
64.10	5.60	2.94	0.00
65.10	5.60	2.94	0.00
66.10	5.60	2.94	0.00
67.10	5.60	2.94	0.00
68.10	5.60	2.94	0.00
69.10	5.60	2.94	0.00
70.10	5.60	2.94	0.00
71.10	5.60	2.94	0.00

Summary for Subcatchment OSW: Off Site Subcatchment - Wetlands

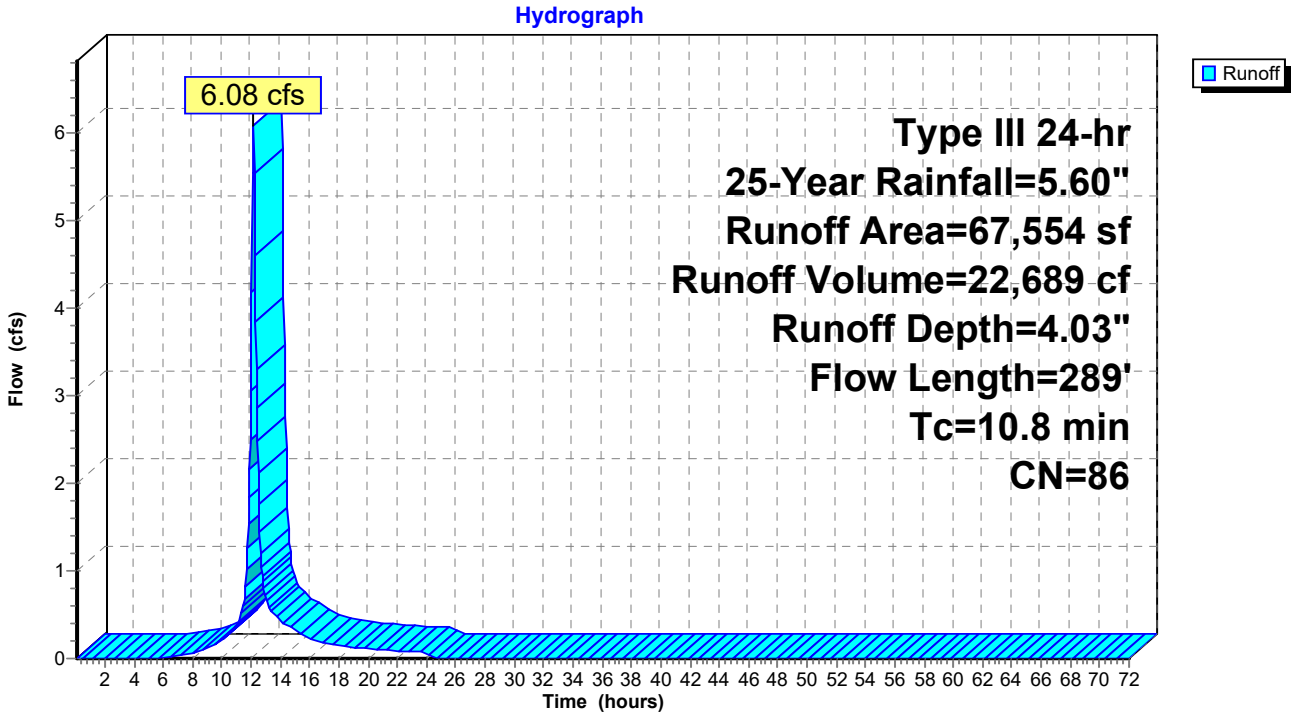
Runoff = 6.08 cfs @ 12.15 hrs, Volume= 22,689 cf, Depth= 4.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Description
	2,768	73	Woods, Fair, HSG C
	39,145	79	Woods, Fair, HSG D
*	7,603	98	Unconnected pavement, HSG C, Ledge
*	18,038	98	Unconnected pavement, HSG D, Ledge
	67,554	86	Weighted Average
	41,913		62.04% Pervious Area
	25,641		37.96% Impervious Area
	25,641		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	68	0.0739	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	87	0.1957	2.21		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.5	85	0.3077	2.77		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.5	49	0.1231	1.75		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
10.8	289	Total			

Subcatchment OSW: Off Site Subcatchment - Wetlands



Hydrograph for Subcatchment OSW: Off Site Subcatchment - Wetlands

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.06	0.00	0.00
2.10	0.12	0.00	0.00
3.10	0.18	0.00	0.00
4.10	0.25	0.00	0.00
5.10	0.33	0.00	0.00
6.10	0.41	0.00	0.01
7.10	0.52	0.02	0.03
8.10	0.65	0.05	0.07
9.10	0.84	0.12	0.13
10.10	1.09	0.24	0.22
11.10	1.44	0.46	0.40
12.10	3.27	1.90	**5.53**
13.10	4.24	2.76	**0.63**
14.10	4.57	3.07	0.41
15.10	4.80	3.28	0.31
16.10	4.98	3.44	0.22
17.10	5.10	3.56	0.17
18.10	5.21	3.66	0.13
19.10	5.29	3.74	0.12
20.10	5.37	3.81	0.11
21.10	5.44	3.88	0.10
22.10	5.50	3.93	0.09
23.10	**5.55**	**3.99**	0.08
24.10	**5.60**	**4.03**	0.06
25.10	5.60	4.03	0.00
26.10	5.60	4.03	0.00
27.10	5.60	4.03	0.00
28.10	5.60	4.03	0.00
29.10	5.60	4.03	0.00
30.10	5.60	4.03	0.00
31.10	5.60	4.03	0.00
32.10	5.60	4.03	0.00
33.10	5.60	4.03	0.00
34.10	5.60	4.03	0.00
35.10	5.60	4.03	0.00
36.10	5.60	4.03	0.00
37.10	5.60	4.03	0.00
38.10	5.60	4.03	0.00
39.10	5.60	4.03	0.00
40.10	5.60	4.03	0.00
41.10	5.60	4.03	0.00
42.10	5.60	4.03	0.00
43.10	5.60	4.03	0.00
44.10	5.60	4.03	0.00
45.10	5.60	4.03	0.00
46.10	5.60	4.03	0.00
47.10	5.60	4.03	0.00
48.10	5.60	4.03	0.00
49.10	5.60	4.03	0.00
50.10	5.60	4.03	0.00
51.10	5.60	4.03	0.00
52.10	5.60	4.03	0.00
53.10	5.60	4.03	0.00
54.10	5.60	4.03	0.00
55.10	5.60	4.03	0.00
56.10	5.60	4.03	0.00
57.10	5.60	4.03	0.00
58.10	5.60	4.03	0.00
59.10	5.60	4.03	0.00
60.10	5.60	4.03	0.00
61.10	5.60	4.03	0.00
62.10	5.60	4.03	0.00
63.10	5.60	4.03	0.00
64.10	5.60	4.03	0.00
65.10	5.60	4.03	0.00
66.10	5.60	4.03	0.00
67.10	5.60	4.03	0.00
68.10	5.60	4.03	0.00
69.10	5.60	4.03	0.00
70.10	5.60	4.03	0.00
71.10	5.60	4.03	0.00

Summary for Subcatchment Rear: Rear Building Recharge

[49] Hint: Tc<2dt may require smaller dt

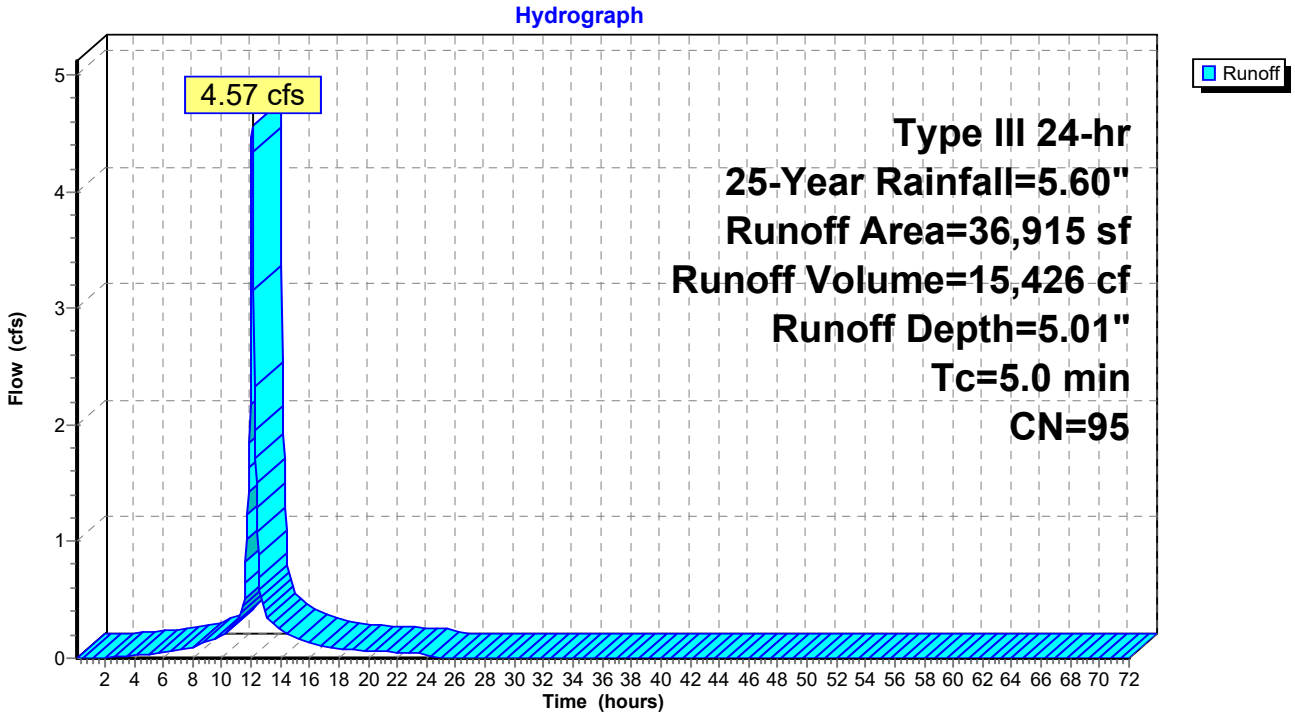
Runoff = 4.57 cfs @ 12.07 hrs, Volume= 15,426 cf, Depth= 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.60"

	Area (sf)	CN	Description
	2,746	73	Woods, Fair, HSG C
*	2,383	98	Unconnected pavement, HSG C, Ledge
	20,125	98	Roofs, HSG C
	9,580	98	Paved parking, HSG C
*	678	98	Unconnected pavement, HSG C, Retaining Wall
	1,403	74	>75% Grass cover, Good, HSG C
	36,915	95	Weighted Average
	4,149		11.24% Pervious Area
	32,766		88.76% Impervious Area
	3,061		9.34% Unconnected

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

Subcatchment Rear: Rear Building Recharge



Hydrograph for Subcatchment Rear: Rear Building Recharge

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.06	0.00	0.00
2.10	0.12	0.00	0.00
3.10	0.18	0.01	0.01
4.10	0.25	0.03	0.02
5.10	0.33	0.07	0.03
6.10	0.41	0.11	0.05
7.10	0.52	0.18	0.07
8.10	0.65	0.28	0.10
9.10	0.84	0.43	0.15
10.10	1.09	0.64	0.21
11.10	1.44	0.96	**0.33**
12.10	3.27	2.71	**4.34**
13.10	4.24	3.67	0.34
14.10	4.57	3.99	0.23
15.10	4.80	4.23	0.18
16.10	4.98	4.40	0.12
17.10	5.10	4.52	0.10
18.10	5.21	4.62	0.08
19.10	5.29	4.71	0.07
20.10	5.37	4.78	0.06
21.10	5.44	4.85	0.06
22.10	5.50	4.91	0.05
23.10	**5.55**	**4.97**	0.05
24.10	**5.60**	**5.01**	0.01
25.10	5.60	5.01	0.00
26.10	5.60	5.01	0.00
27.10	5.60	5.01	0.00
28.10	5.60	5.01	0.00
29.10	5.60	5.01	0.00
30.10	5.60	5.01	0.00
31.10	5.60	5.01	0.00
32.10	5.60	5.01	0.00
33.10	5.60	5.01	0.00
34.10	5.60	5.01	0.00
35.10	5.60	5.01	0.00
36.10	5.60	5.01	0.00
37.10	5.60	5.01	0.00
38.10	5.60	5.01	0.00
39.10	5.60	5.01	0.00
40.10	5.60	5.01	0.00
41.10	5.60	5.01	0.00
42.10	5.60	5.01	0.00
43.10	5.60	5.01	0.00
44.10	5.60	5.01	0.00
45.10	5.60	5.01	0.00
46.10	5.60	5.01	0.00
47.10	5.60	5.01	0.00
48.10	5.60	5.01	0.00
49.10	5.60	5.01	0.00
50.10	5.60	5.01	0.00
51.10	5.60	5.01	0.00
52.10	5.60	5.01	0.00
53.10	5.60	5.01	0.00
54.10	5.60	5.01	0.00
55.10	5.60	5.01	0.00
56.10	5.60	5.01	0.00
57.10	5.60	5.01	0.00
58.10	5.60	5.01	0.00
59.10	5.60	5.01	0.00
60.10	5.60	5.01	0.00
61.10	5.60	5.01	0.00
62.10	5.60	5.01	0.00
63.10	5.60	5.01	0.00
64.10	5.60	5.01	0.00
65.10	5.60	5.01	0.00
66.10	5.60	5.01	0.00
67.10	5.60	5.01	0.00
68.10	5.60	5.01	0.00
69.10	5.60	5.01	0.00
70.10	5.60	5.01	0.00
71.10	5.60	5.01	0.00

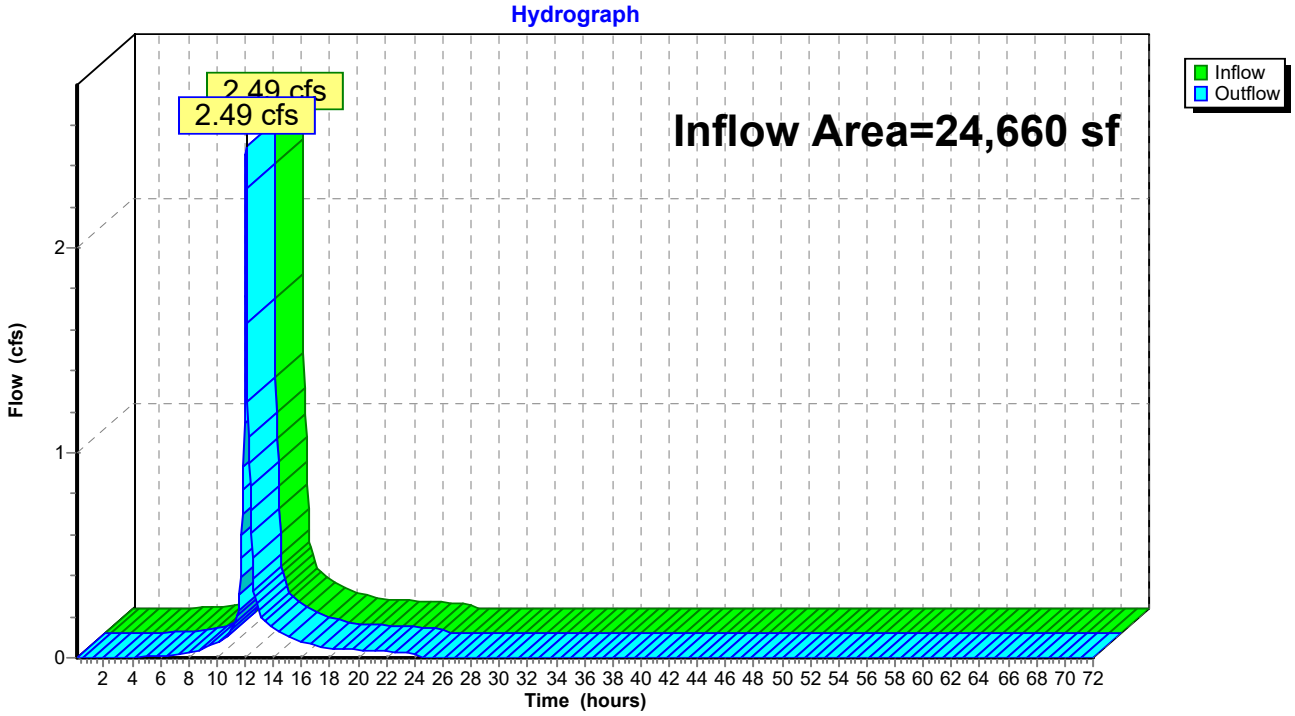
Summary for Reach TR: Total Roadway

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

Inflow Area = 24,660 sf, 45.59% Impervious, Inflow Depth = 3.79" for 25-Year event
Inflow = 2.49 cfs @ 12.07 hrs, Volume= 7,786 cf
Outflow = 2.49 cfs @ 12.07 hrs, Volume= 7,786 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Reach TR: Total Roadway



Hydrograph for Reach TR: Total Roadway

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.10	0.00		0.00
1.10	0.00		0.00
2.10	0.00		0.00
3.10	0.00		0.00
4.10	0.00		0.00
5.10	0.01		0.01
6.10	0.01		0.01
7.10	0.02		0.02
8.10	0.02		0.02
9.10	0.05		0.05
10.10	0.08		0.08
11.10	**0.14**		**0.14**
12.10	**2.29**		**2.29**
13.10	0.20		0.20
14.10	0.14		0.14
15.10	0.11		0.11
16.10	0.07		0.07
17.10	0.06		0.06
18.10	0.05		0.05
19.10	0.04		0.04
20.10	0.04		0.04
21.10	0.03		0.03
22.10	0.03		0.03
23.10	0.03		0.03
24.10	0.00		0.00
25.10	0.00		0.00
26.10	0.00		0.00
27.10	0.00		0.00
28.10	0.00		0.00
29.10	0.00		0.00
30.10	0.00		0.00
31.10	0.00		0.00
32.10	0.00		0.00
33.10	0.00		0.00
34.10	0.00		0.00
35.10	0.00		0.00
36.10	0.00		0.00
37.10	0.00		0.00
38.10	0.00		0.00
39.10	0.00		0.00
40.10	0.00		0.00
41.10	0.00		0.00
42.10	0.00		0.00
43.10	0.00		0.00
44.10	0.00		0.00
45.10	0.00		0.00
46.10	0.00		0.00
47.10	0.00		0.00
48.10	0.00		0.00
49.10	0.00		0.00
50.10	0.00		0.00
51.10	0.00		0.00
52.10	0.00		0.00
53.10	0.00		0.00
54.10	0.00		0.00
55.10	0.00		0.00
56.10	0.00		0.00
57.10	0.00		0.00
58.10	0.00		0.00
59.10	0.00		0.00
60.10	0.00		0.00
61.10	0.00		0.00
62.10	0.00		0.00
63.10	0.00		0.00
64.10	0.00		0.00
65.10	0.00		0.00
66.10	0.00		0.00
67.10	0.00		0.00
68.10	0.00		0.00
69.10	0.00		0.00
70.10	0.00		0.00
71.10	0.00		0.00

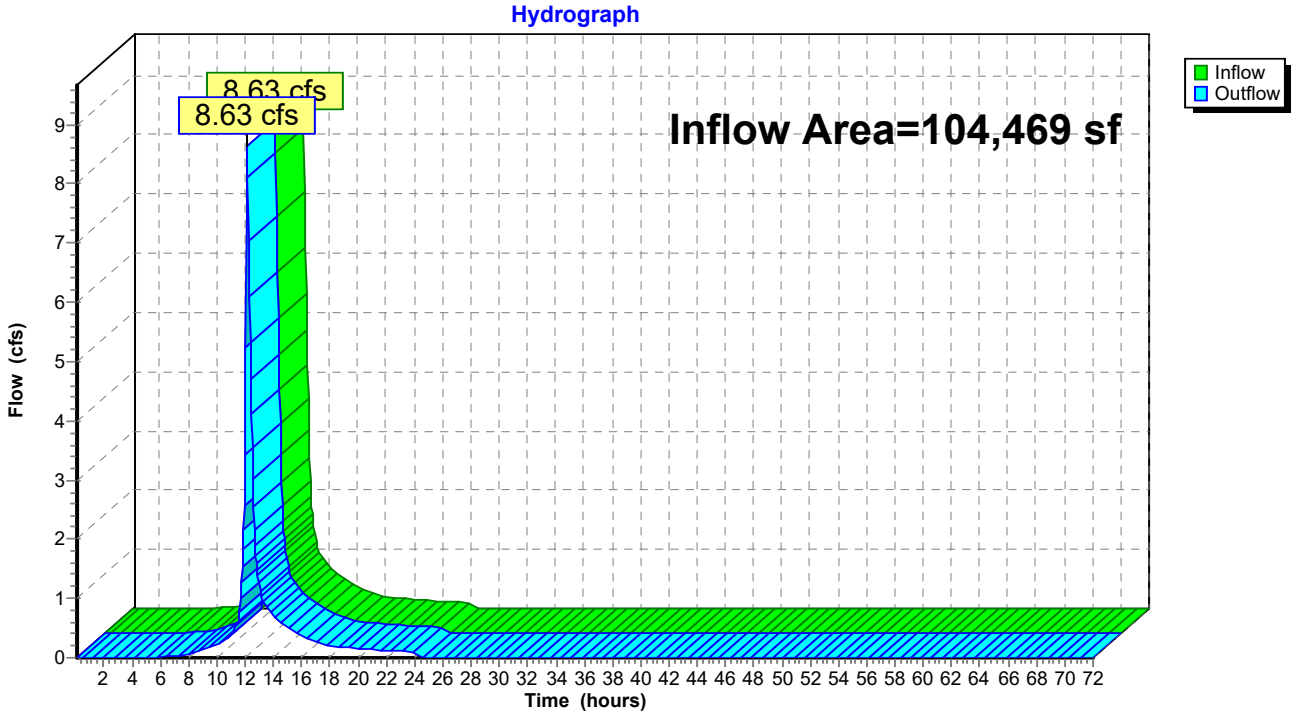
Summary for Reach TW: Total Wetlands

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

Inflow Area = 104,469 sf, 55.91% Impervious, Inflow Depth = 3.66" for 25-Year event
Inflow = 8.63 cfs @ 12.16 hrs, Volume= 31,874 cf
Outflow = 8.63 cfs @ 12.16 hrs, Volume= 31,874 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Reach TW: Total Wetlands



Hydrograph for Reach TW: Total Wetlands

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.10	0.00		0.00
1.10	0.00		0.00
2.10	0.00		0.00
3.10	0.00		0.00
4.10	0.00		0.00
5.10	0.00		0.00
6.10	0.01		0.01
7.10	0.03		0.03
8.10	0.07		0.07
9.10	0.13		0.13
10.10	0.22		0.22
11.10	0.40		0.40
12.10	**7.48**		**7.48**
13.10	**1.10**		**1.10**
14.10	0.66		0.66
15.10	0.49		0.49
16.10	0.34		0.34
17.10	0.26		0.26
18.10	0.20		0.20
19.10	0.17		0.17
20.10	0.15		0.15
21.10	0.14		0.14
22.10	0.12		0.12
23.10	0.11		0.11
24.10	0.08		0.08
25.10	0.00		0.00
26.10	0.00		0.00
27.10	0.00		0.00
28.10	0.00		0.00
29.10	0.00		0.00
30.10	0.00		0.00
31.10	0.00		0.00
32.10	0.00		0.00
33.10	0.00		0.00
34.10	0.00		0.00
35.10	0.00		0.00
36.10	0.00		0.00
37.10	0.00		0.00
38.10	0.00		0.00
39.10	0.00		0.00
40.10	0.00		0.00
41.10	0.00		0.00
42.10	0.00		0.00
43.10	0.00		0.00
44.10	0.00		0.00
45.10	0.00		0.00
46.10	0.00		0.00
47.10	0.00		0.00
48.10	0.00		0.00
49.10	0.00		0.00
50.10	0.00		0.00
51.10	0.00		0.00
52.10	0.00		0.00
53.10	0.00		0.00
54.10	0.00		0.00
55.10	0.00		0.00
56.10	0.00		0.00
57.10	0.00		0.00
58.10	0.00		0.00
59.10	0.00		0.00
60.10	0.00		0.00
61.10	0.00		0.00
62.10	0.00		0.00
63.10	0.00		0.00
64.10	0.00		0.00
65.10	0.00		0.00
66.10	0.00		0.00
67.10	0.00		0.00
68.10	0.00		0.00
69.10	0.00		0.00
70.10	0.00		0.00
71.10	0.00		0.00

Summary for Pond RF: Recharge - Front

Inflow Area = 4,505 sf,100.00% Impervious, Inflow Depth = 5.36" for 25-Year event
Inflow = 0.57 cfs @ 12.07 hrs, Volume= 2,013 cf
Outflow = 0.01 cfs @ 19.25 hrs, Volume= 1,892 cf, Atten= 99%, Lag= 430.8 min
Discarded = 0.01 cfs @ 19.25 hrs, Volume= 1,892 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Peak Elev= 102.47' @ 19.25 hrs Surf.Area= 1,061 sf Storage= 1,460 cf

Plug-Flow detention time= 1,511.0 min calculated for 1,891 cf (94% of inflow)
Center-of-Mass det. time= 1,478.0 min (2,223.3 - 745.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.52'	840 cf	**23.58'W x 45.00'L x 3.21'H Field A** 3,405 cf Overall - 1,305 cf Embedded = 2,099 cf x 40.0% Voids
#2A	101.02'	1,305 cf	**Cultec R-280HD** x 30 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 5 rows
		2,145 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.52'	**0.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 19.25 hrs HW=102.47' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond RF: Recharge - Front - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 5 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

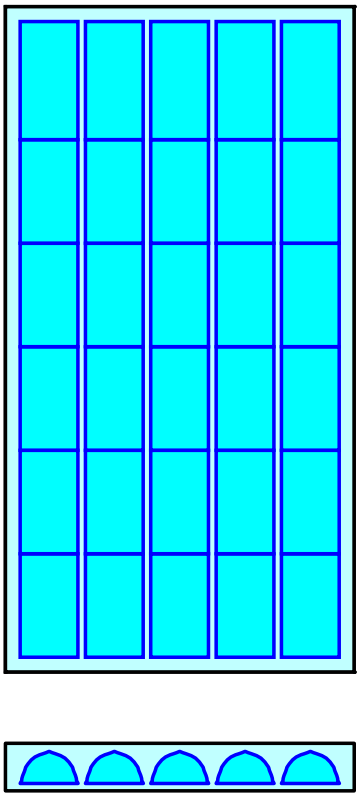
6 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 43.00' Row Length +12.0" End Stone x 2 = 45.00' Base Length
5 Rows x 47.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 23.58' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

30 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 5 Rows = 1,305.4 cf Chamber Storage

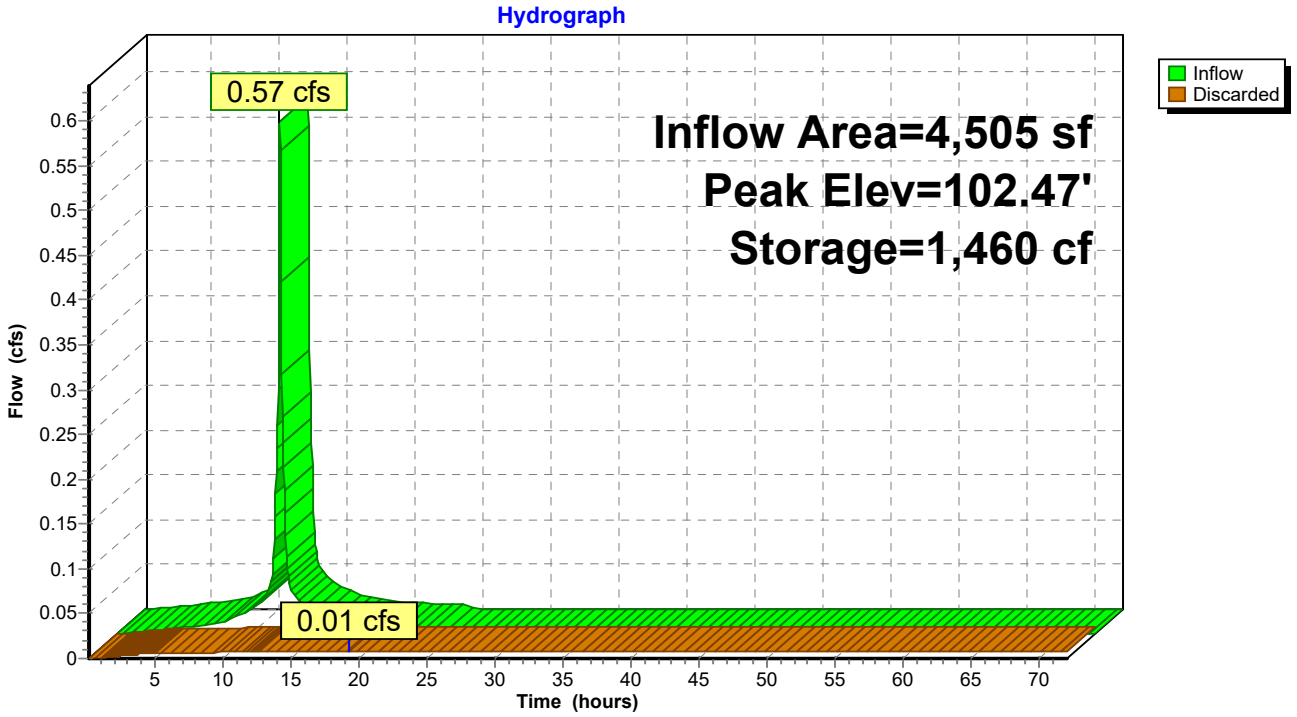
3,404.8 cf Field - 1,305.4 cf Chambers = 2,099.4 cf Stone x 40.0% Voids = 839.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,145.2 cf = 0.049 af
Overall Storage Efficiency = 63.0%
Overall System Size = 45.00' x 23.58' x 3.21'

30 Chambers
126.1 cy Field
77.8 cy Stone



Pond RF: Recharge - Front



Hydrograph for Pond RF: Recharge - Front

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Discarded (cfs)
0.10	0.00	0	100.52	0.00
2.60	0.00	2	100.52	0.00
5.10	0.01	4	100.53	0.01
7.60	0.01	28	100.59	0.01
10.10	**0.03**	143	100.86	0.01
12.60	**0.07**	1,150	102.08	0.01
15.10	0.02	1,393	102.38	0.01
17.60	0.01	**1,455**	**102.46**	**0.01**
20.10	0.01	**1,459**	**102.47**	**0.01**
22.60	0.01	1,445	102.45	0.01
25.10	0.00	1,399	102.39	0.01
27.60	0.00	1,325	102.30	0.01
30.10	0.00	1,252	102.21	0.01
32.60	0.00	1,180	102.12	0.01
35.10	0.00	1,108	102.03	0.01
37.60	0.00	1,037	101.95	0.01
40.10	0.00	967	101.87	0.01
42.60	0.00	897	101.79	0.01
45.10	0.00	828	101.71	0.01
47.60	0.00	759	101.63	0.01
50.10	0.00	691	101.55	0.01
52.60	0.00	624	101.47	0.01
55.10	0.00	557	101.40	0.01
57.60	0.00	491	101.33	0.01
60.10	0.00	426	101.25	0.01
62.60	0.00	360	101.18	0.01
65.10	0.00	296	101.11	0.01
67.60	0.00	232	101.04	0.01
70.10	0.00	169	100.92	0.01

Summary for Pond RR: Recharge - Rear

Inflow Area = 36,915 sf, 88.76% Impervious, Inflow Depth = 5.01" for 25-Year event
Inflow = 4.57 cfs @ 12.07 hrs, Volume= 15,426 cf
Outflow = 2.61 cfs @ 12.19 hrs, Volume= 15,090 cf, Atten= 43%, Lag= 7.1 min
Discarded = 0.03 cfs @ 12.19 hrs, Volume= 5,906 cf
Primary = 2.58 cfs @ 12.19 hrs, Volume= 9,185 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Peak Elev= 103.13' @ 12.19 hrs Surf.Area= 3,501 sf Storage= 6,441 cf

Plug-Flow detention time= 636.9 min calculated for 15,090 cf (98% of inflow)
Center-of-Mass det. time= 623.2 min (1,387.6 - 764.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.46'	2,691 cf	**32.42'W x 108.00'L x 3.21'H Field A** 11,232 cf Overall - 4,505 cf Embedded = 6,727 cf x 40.0% Voids
#2A	100.96'	4,505 cf	**Cultec R-280HD** x 105 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 7 rows
		7,196 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	102.17'	**12.0" Round Culvert** L= 44.9' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.17' / 101.50' S= 0.0149 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	100.46'	**0.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.03 cfs @ 12.19 hrs HW=103.12' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=2.57 cfs @ 12.19 hrs HW=103.12' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 2.57 cfs @ 3.32 fps)

Pond RR: Recharge - Rear - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 7 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

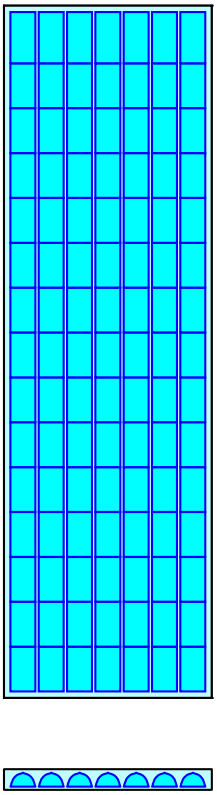
15 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 106.00' Row Length +12.0" End Stone x 2 = 108.00' Base Length
7 Rows x 47.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 32.42' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

105 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 7 Rows = 4,505.2 cf Chamber Storage

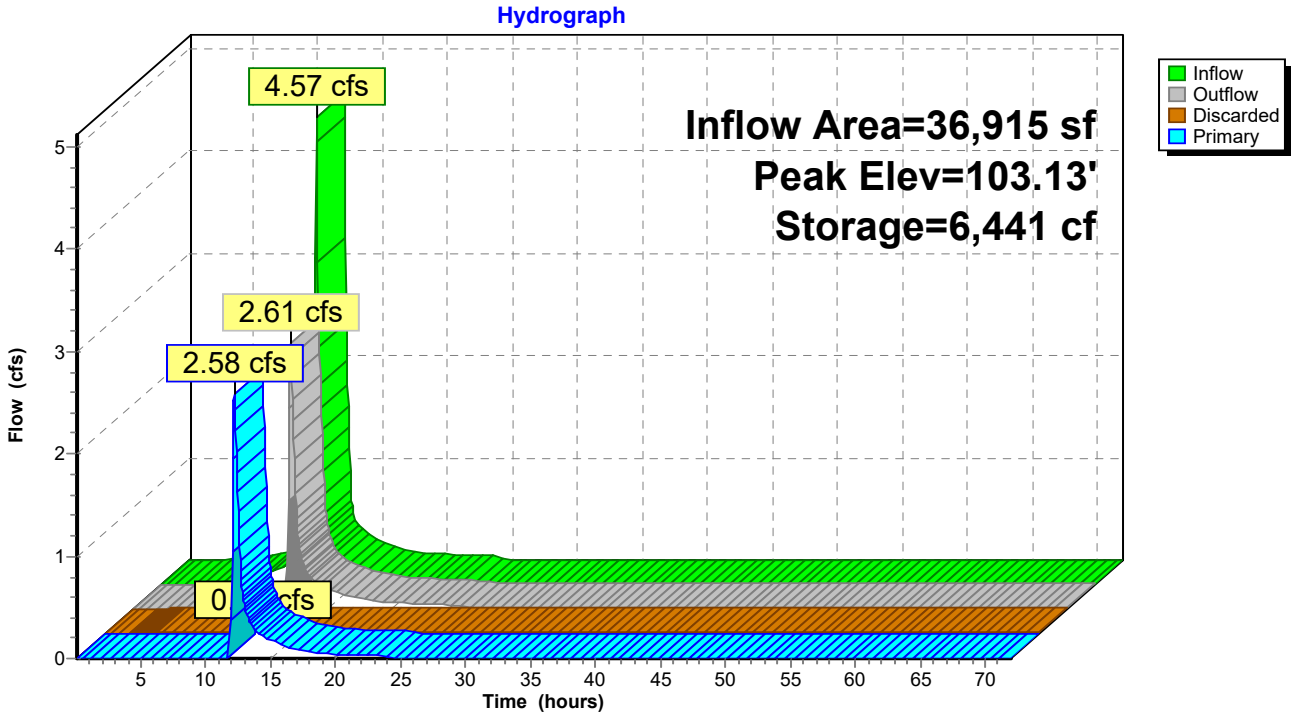
11,232.4 cf Field - 4,505.2 cf Chambers = 6,727.1 cf Stone x 40.0% Voids = 2,690.9 cf Stone Storage

Chamber Storage + Stone Storage = 7,196.1 cf = 0.165 af
Overall Storage Efficiency = 64.1%
Overall System Size = 108.00' x 32.42' x 3.21'

105 Chambers
416.0 cy Field
249.2 cy Stone



Pond RR: Recharge - Rear



Hydrograph for Pond RR: Recharge - Rear

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.10	0.00	0	100.46	0.00	0.00	0.00
2.60	0.01	3	100.46	0.00	0.00	0.00
5.10	0.03	38	100.49	0.02	0.02	0.00
7.60	0.08	324	100.69	0.02	0.02	0.00
10.10	**0.21**	**1,351**	**101.17**	**0.02**	**0.02**	**0.00**
12.60	**0.58**	**5,663**	**102.72**	**1.13**	**0.03**	**1.10**
15.10	0.18	4,818	102.37	0.20	0.03	0.18
17.60	0.09	4,634	102.30	0.10	0.03	0.08
20.10	0.06	4,542	102.27	0.07	0.03	0.04
22.60	0.05	4,493	102.25	0.05	0.03	0.03
25.10	0.00	4,337	102.19	0.03	0.02	0.00
27.60	0.00	4,112	102.11	0.02	0.02	0.00
30.10	0.00	3,889	102.03	0.02	0.02	0.00
32.60	0.00	3,668	101.95	0.02	0.02	0.00
35.10	0.00	3,448	101.88	0.02	0.02	0.00
37.60	0.00	3,230	101.80	0.02	0.02	0.00
40.10	0.00	3,012	101.72	0.02	0.02	0.00
42.60	0.00	2,796	101.65	0.02	0.02	0.00
45.10	0.00	2,581	101.58	0.02	0.02	0.00
47.60	0.00	2,367	101.51	0.02	0.02	0.00
50.10	0.00	2,154	101.43	0.02	0.02	0.00
52.60	0.00	1,942	101.36	0.02	0.02	0.00
55.10	0.00	1,731	101.30	0.02	0.02	0.00
57.60	0.00	1,522	101.23	0.02	0.02	0.00
60.10	0.00	1,313	101.16	0.02	0.02	0.00
62.60	0.00	1,106	101.09	0.02	0.02	0.00
65.10	0.00	899	101.02	0.02	0.02	0.00
67.60	0.00	694	100.96	0.02	0.02	0.00
70.10	0.00	491	100.81	0.02	0.02	0.00

Time span=0.10-72.00 hrs, dt=0.05 hrs, 1439 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Front: Front Building Runoff Area=4,505 sf 100.00% Impervious Runoff Depth=6.76"
Tc=5.0 min CN=98 Runoff=0.71 cfs 2,538 cf

Subcatchment M: To Maple Street Runoff Area=12,026 sf 76.27% Impervious Runoff Depth=6.05"
Tc=5.0 min CN=92 Runoff=1.83 cfs 6,068 cf

Subcatchment OSM: Off Site Runoff Area=12,634 sf 16.39% Impervious Runoff Depth=4.15"
Flow Length=176' Tc=3.7 min UI Adjusted CN=75 Runoff=1.50 cfs 4,369 cf

Subcatchment OSN: Off Site Subcatchment - Runoff Area=4,659 sf 8.89% Impervious Runoff Depth=4.15"
Flow Length=139' Tc=4.5 min UI Adjusted CN=75 Runoff=0.53 cfs 1,611 cf

Subcatchment OSW: Off Site Runoff Area=67,554 sf 37.96% Impervious Runoff Depth=5.37"
Flow Length=289' Tc=10.8 min CN=86 Runoff=8.00 cfs 30,206 cf

Subcatchment Rear: Rear Building Runoff Area=36,915 sf 88.76% Impervious Runoff Depth=6.41"
Tc=5.0 min CN=95 Runoff=5.77 cfs 19,706 cf

Reach TR: Total Roadway Inflow=3.32 cfs 10,437 cf
Outflow=3.32 cfs 10,437 cf

Reach TW: Total Wetlands Inflow=11.75 cfs 43,586 cf
Outflow=11.75 cfs 43,586 cf

Pond RF: Recharge - Front Peak Elev=103.21' Storage=1,926 cf Inflow=0.71 cfs 2,538 cf
Outflow=0.01 cfs 2,016 cf

Pond RR: Recharge - Rear Peak Elev=103.66' Storage=7,187 cf Inflow=5.77 cfs 19,706 cf
Discarded=0.03 cfs 5,972 cf Primary=3.77 cfs 13,380 cf Outflow=3.79 cfs 19,352 cf

Total Runoff Area = 138,293 sf Runoff Volume = 64,498 cf Average Runoff Depth = 5.60"
46.08% Pervious = 63,724 sf 53.92% Impervious = 74,569 sf

Summary for Subcatchment Front: Front Building Recharge

[49] Hint: Tc<2dt may require smaller dt

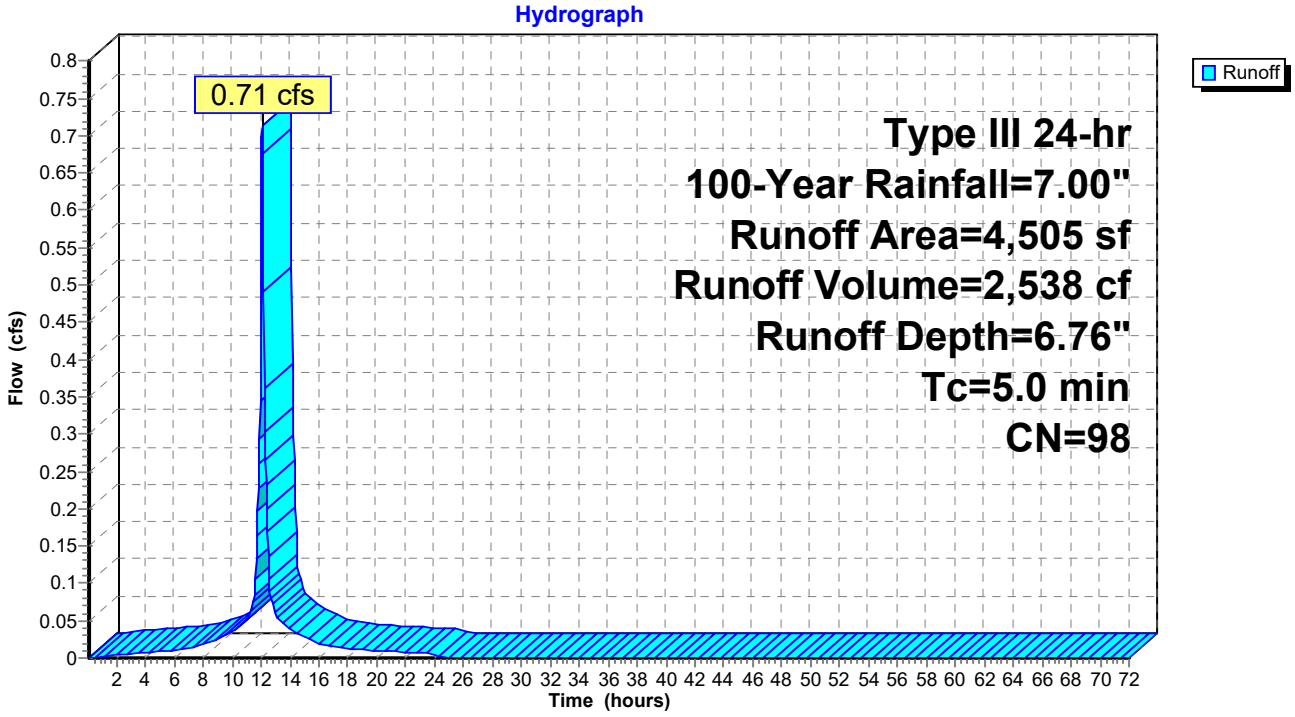
Runoff = 0.71 cfs @ 12.07 hrs, Volume= 2,538 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
4,505	98	Paved parking, HSG C
4,505		100.00% Impervious Area

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

Subcatchment Front: Front Building Recharge



Hydrograph for Subcatchment Front: Front Building Recharge

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.08	0.01	0.00
2.10	0.15	0.04	0.00
3.10	0.22	0.09	0.01
4.10	0.31	0.15	0.01
5.10	0.41	0.24	0.01
6.10	0.52	0.33	0.01
7.10	0.65	0.45	0.01
8.10	0.82	0.61	0.02
9.10	1.05	0.84	0.03
10.10	1.36	1.14	0.04
11.10	1.80	1.58	**0.05**
12.10	4.09	3.85	**0.68**
13.10	5.30	5.06	0.05
14.10	5.71	5.47	0.04
15.10	6.01	5.77	0.03
16.10	6.22	5.98	0.02
17.10	6.38	6.14	0.02
18.10	6.51	6.27	0.01
19.10	6.61	6.37	0.01
20.10	6.71	6.47	0.01
21.10	6.79	6.56	0.01
22.10	6.87	6.63	0.01
23.10	**6.94**	**6.70**	0.01
24.10	**7.00**	**6.76**	0.00
25.10	7.00	6.76	0.00
26.10	7.00	6.76	0.00
27.10	7.00	6.76	0.00
28.10	7.00	6.76	0.00
29.10	7.00	6.76	0.00
30.10	7.00	6.76	0.00
31.10	7.00	6.76	0.00
32.10	7.00	6.76	0.00
33.10	7.00	6.76	0.00
34.10	7.00	6.76	0.00
35.10	7.00	6.76	0.00
36.10	7.00	6.76	0.00
37.10	7.00	6.76	0.00
38.10	7.00	6.76	0.00
39.10	7.00	6.76	0.00
40.10	7.00	6.76	0.00
41.10	7.00	6.76	0.00
42.10	7.00	6.76	0.00
43.10	7.00	6.76	0.00
44.10	7.00	6.76	0.00
45.10	7.00	6.76	0.00
46.10	7.00	6.76	0.00
47.10	7.00	6.76	0.00
48.10	7.00	6.76	0.00
49.10	7.00	6.76	0.00
50.10	7.00	6.76	0.00
51.10	7.00	6.76	0.00
52.10	7.00	6.76	0.00
53.10	7.00	6.76	0.00
54.10	7.00	6.76	0.00
55.10	7.00	6.76	0.00
56.10	7.00	6.76	0.00
57.10	7.00	6.76	0.00
58.10	7.00	6.76	0.00
59.10	7.00	6.76	0.00
60.10	7.00	6.76	0.00
61.10	7.00	6.76	0.00
62.10	7.00	6.76	0.00
63.10	7.00	6.76	0.00
64.10	7.00	6.76	0.00
65.10	7.00	6.76	0.00
66.10	7.00	6.76	0.00
67.10	7.00	6.76	0.00
68.10	7.00	6.76	0.00
69.10	7.00	6.76	0.00
70.10	7.00	6.76	0.00
71.10	7.00	6.76	0.00

Summary for Subcatchment M: To Maple Street

[49] Hint: Tc<2dt may require smaller dt

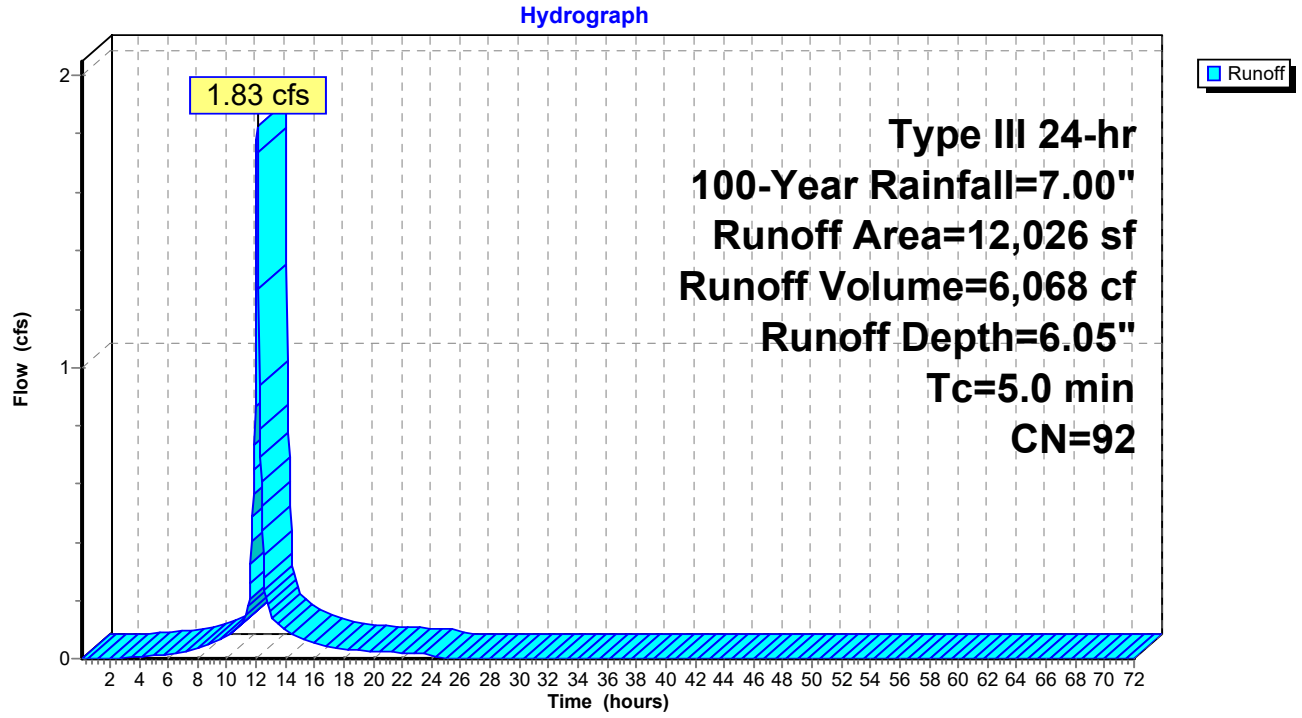
Runoff = 1.83 cfs @ 12.07 hrs, Volume= 6,068 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (sf)	CN	Description
	8,954	98	Paved parking, HSG C
	2,854	74	>75% Grass cover, Good, HSG C
*	218	98	Unconnected pavement, HSG C, Retaining Wall
	12,026	92	Weighted Average
	2,854		23.73% Pervious Area
	9,172		76.27% Impervious Area
	218		2.38% Unconnected

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

Subcatchment M: To Maple Street



Hydrograph for Subcatchment M: To Maple Street

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.08	0.00	0.00
2.10	0.15	0.00	0.00
3.10	0.22	0.00	0.00
4.10	0.31	0.02	0.01
5.10	0.41	0.05	0.01
6.10	0.52	0.10	0.01
7.10	0.65	0.17	0.02
8.10	0.82	0.27	0.03
9.10	1.05	0.44	0.05
10.10	1.36	0.68	0.08
11.10	1.80	1.06	**0.13**
12.10	4.09	3.20	**1.74**
13.10	5.30	4.38	0.14
14.10	5.71	4.79	0.09
15.10	6.01	5.07	0.07
16.10	6.22	5.29	0.05
17.10	6.38	5.44	0.04
18.10	6.51	5.57	0.03
19.10	6.61	5.67	0.03
20.10	6.71	5.77	0.02
21.10	6.79	5.85	0.02
22.10	6.87	5.93	0.02
23.10	**6.94**	**6.00**	0.02
24.10	**7.00**	**6.05**	0.00
25.10	7.00	6.05	0.00
26.10	7.00	6.05	0.00
27.10	7.00	6.05	0.00
28.10	7.00	6.05	0.00
29.10	7.00	6.05	0.00
30.10	7.00	6.05	0.00
31.10	7.00	6.05	0.00
32.10	7.00	6.05	0.00
33.10	7.00	6.05	0.00
34.10	7.00	6.05	0.00
35.10	7.00	6.05	0.00
36.10	7.00	6.05	0.00
37.10	7.00	6.05	0.00
38.10	7.00	6.05	0.00
39.10	7.00	6.05	0.00
40.10	7.00	6.05	0.00
41.10	7.00	6.05	0.00
42.10	7.00	6.05	0.00
43.10	7.00	6.05	0.00
44.10	7.00	6.05	0.00
45.10	7.00	6.05	0.00
46.10	7.00	6.05	0.00
47.10	7.00	6.05	0.00
48.10	7.00	6.05	0.00
49.10	7.00	6.05	0.00
50.10	7.00	6.05	0.00
51.10	7.00	6.05	0.00
52.10	7.00	6.05	0.00
53.10	7.00	6.05	0.00
54.10	7.00	6.05	0.00
55.10	7.00	6.05	0.00
56.10	7.00	6.05	0.00
57.10	7.00	6.05	0.00
58.10	7.00	6.05	0.00
59.10	7.00	6.05	0.00
60.10	7.00	6.05	0.00
61.10	7.00	6.05	0.00
62.10	7.00	6.05	0.00
63.10	7.00	6.05	0.00
64.10	7.00	6.05	0.00
65.10	7.00	6.05	0.00
66.10	7.00	6.05	0.00
67.10	7.00	6.05	0.00
68.10	7.00	6.05	0.00
69.10	7.00	6.05	0.00
70.10	7.00	6.05	0.00
71.10	7.00	6.05	0.00

Summary for Subcatchment OSM: Off Site Subcatchment - Maple Street

[49] Hint: Tc<2dt may require smaller dt

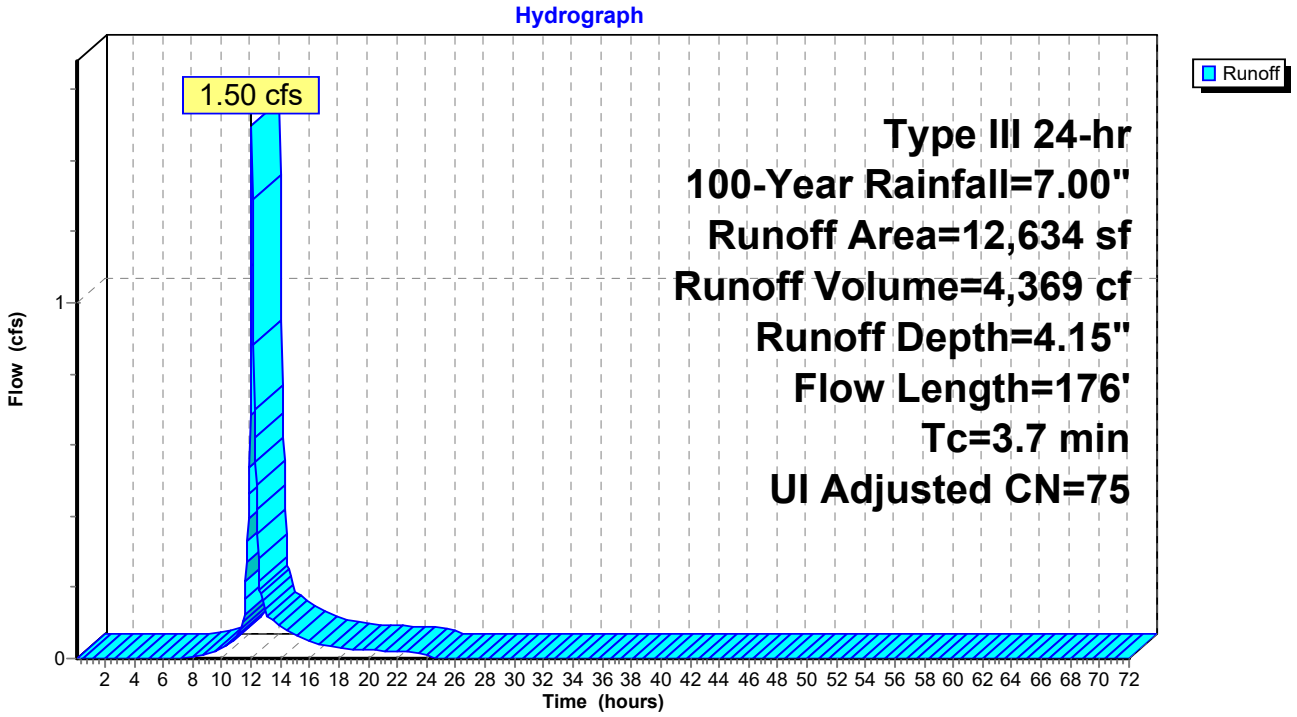
Runoff = 1.50 cfs @ 12.06 hrs, Volume= 4,369 cf, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (sf)	CN	Adj	Description
	8,723	73		Woods, Fair, HSG C
	75	79		Woods, Fair, HSG D
*	2,071	98		Unconnected pavement, HSG C, Ledge
	1,765	74		>75% Grass cover, Good, HSG C
	12,634	77	75	Weighted Average, UI Adjusted
	10,563			83.61% Pervious Area
	2,071			16.39% Impervious Area
	2,071			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	23	0.3085	0.18		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	49	0.0816	1.43		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.9	104	0.1440	1.90		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
3.7	176	Total			

Subcatchment OSM: Off Site Subcatchment - Maple Street



Hydrograph for Subcatchment OSM: Off Site Subcatchment - Maple Street

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.08	0.00	0.00
2.10	0.15	0.00	0.00
3.10	0.22	0.00	0.00
4.10	0.31	0.00	0.00
5.10	0.41	0.00	0.00
6.10	0.52	0.00	0.00
7.10	0.65	0.00	0.00
8.10	0.82	0.01	0.00
9.10	1.05	0.04	0.01
10.10	1.36	0.12	0.03
11.10	1.80	0.29	**0.07**
12.10	4.09	1.73	**1.29**
13.10	5.30	2.69	0.12
14.10	5.71	3.04	0.08
15.10	6.01	3.29	0.06
16.10	6.22	3.47	0.05
17.10	6.38	3.61	0.04
18.10	6.51	3.72	0.03
19.10	6.61	3.81	0.03
20.10	6.71	3.89	0.02
21.10	6.79	3.97	0.02
22.10	6.87	4.04	0.02
23.10	**6.94**	**4.10**	0.02
24.10	**7.00**	**4.15**	0.00
25.10	7.00	4.15	0.00
26.10	7.00	4.15	0.00
27.10	7.00	4.15	0.00
28.10	7.00	4.15	0.00
29.10	7.00	4.15	0.00
30.10	7.00	4.15	0.00
31.10	7.00	4.15	0.00
32.10	7.00	4.15	0.00
33.10	7.00	4.15	0.00
34.10	7.00	4.15	0.00
35.10	7.00	4.15	0.00
36.10	7.00	4.15	0.00
37.10	7.00	4.15	0.00
38.10	7.00	4.15	0.00
39.10	7.00	4.15	0.00
40.10	7.00	4.15	0.00
41.10	7.00	4.15	0.00
42.10	7.00	4.15	0.00
43.10	7.00	4.15	0.00
44.10	7.00	4.15	0.00
45.10	7.00	4.15	0.00
46.10	7.00	4.15	0.00
47.10	7.00	4.15	0.00
48.10	7.00	4.15	0.00
49.10	7.00	4.15	0.00
50.10	7.00	4.15	0.00
51.10	7.00	4.15	0.00
52.10	7.00	4.15	0.00
53.10	7.00	4.15	0.00
54.10	7.00	4.15	0.00
55.10	7.00	4.15	0.00
56.10	7.00	4.15	0.00
57.10	7.00	4.15	0.00
58.10	7.00	4.15	0.00
59.10	7.00	4.15	0.00
60.10	7.00	4.15	0.00
61.10	7.00	4.15	0.00
62.10	7.00	4.15	0.00
63.10	7.00	4.15	0.00
64.10	7.00	4.15	0.00
65.10	7.00	4.15	0.00
66.10	7.00	4.15	0.00
67.10	7.00	4.15	0.00
68.10	7.00	4.15	0.00
69.10	7.00	4.15	0.00
70.10	7.00	4.15	0.00
71.10	7.00	4.15	0.00

Summary for Subcatchment OSN: Off Site Subcatchment - Northeast

[49] Hint: Tc<2dt may require smaller dt

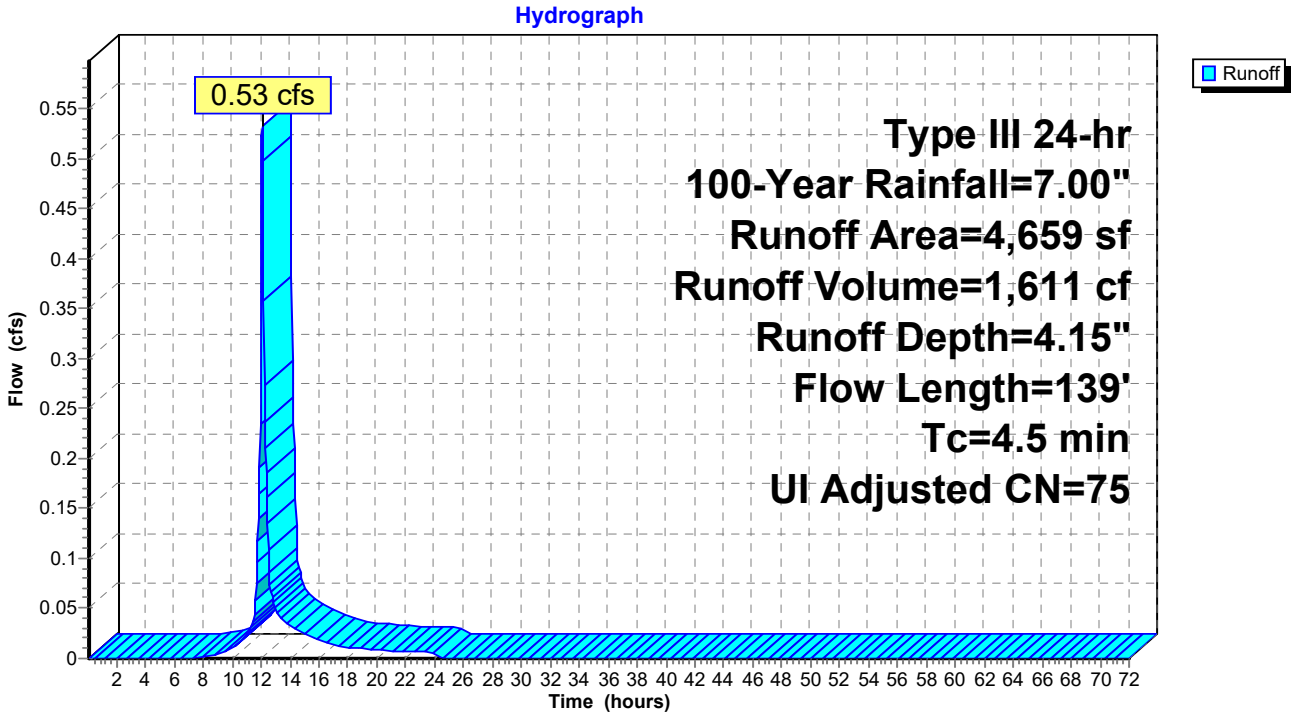
Runoff = 0.53 cfs @ 12.07 hrs, Volume= 1,611 cf, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (sf)	CN	Adj	Description
	678	73		Woods, Fair, HSG C
	3,567	74		>75% Grass cover, Good, HSG C
*	140	98		Unconnected pavement, HSG C, Retaining Wall
*	274	98		Unconnected pavement, HSG C, Ledge
	4,659	76	75	Weighted Average, UI Adjusted
	4,245			91.11% Pervious Area
	414			8.89% Impervious Area
	414			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	28	0.1250	0.13		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.5	72	0.2431	2.47		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.4	39	0.0508	1.58		**Shallow Concentrated Flow, CD** Short Grass Pasture Kv= 7.0 fps
4.5	139	Total			

Subcatchment OSN: Off Site Subcatchment - Northeast



Hydrograph for Subcatchment OSN: Off Site Subcatchment - Northeast

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.08	0.00	0.00
2.10	0.15	0.00	0.00
3.10	0.22	0.00	0.00
4.10	0.31	0.00	0.00
5.10	0.41	0.00	0.00
6.10	0.52	0.00	0.00
7.10	0.65	0.00	0.00
8.10	0.82	0.01	0.00
9.10	1.05	0.04	0.01
10.10	1.36	0.12	0.01
11.10	1.80	0.29	**0.02**
12.10	4.09	1.73	**0.50**
13.10	5.30	2.69	0.05
14.10	5.71	3.04	0.03
15.10	6.01	3.29	0.02
16.10	6.22	3.47	0.02
17.10	6.38	3.61	0.01
18.10	6.51	3.72	0.01
19.10	6.61	3.81	0.01
20.10	6.71	3.89	0.01
21.10	6.79	3.97	0.01
22.10	6.87	4.04	0.01
23.10	**6.94**	**4.10**	0.01
24.10	**7.00**	**4.15**	0.00
25.10	7.00	4.15	0.00
26.10	7.00	4.15	0.00
27.10	7.00	4.15	0.00
28.10	7.00	4.15	0.00
29.10	7.00	4.15	0.00
30.10	7.00	4.15	0.00
31.10	7.00	4.15	0.00
32.10	7.00	4.15	0.00
33.10	7.00	4.15	0.00
34.10	7.00	4.15	0.00
35.10	7.00	4.15	0.00
36.10	7.00	4.15	0.00
37.10	7.00	4.15	0.00
38.10	7.00	4.15	0.00
39.10	7.00	4.15	0.00
40.10	7.00	4.15	0.00
41.10	7.00	4.15	0.00
42.10	7.00	4.15	0.00
43.10	7.00	4.15	0.00
44.10	7.00	4.15	0.00
45.10	7.00	4.15	0.00
46.10	7.00	4.15	0.00
47.10	7.00	4.15	0.00
48.10	7.00	4.15	0.00
49.10	7.00	4.15	0.00
50.10	7.00	4.15	0.00
51.10	7.00	4.15	0.00
52.10	7.00	4.15	0.00
53.10	7.00	4.15	0.00
54.10	7.00	4.15	0.00
55.10	7.00	4.15	0.00
56.10	7.00	4.15	0.00
57.10	7.00	4.15	0.00
58.10	7.00	4.15	0.00
59.10	7.00	4.15	0.00
60.10	7.00	4.15	0.00
61.10	7.00	4.15	0.00
62.10	7.00	4.15	0.00
63.10	7.00	4.15	0.00
64.10	7.00	4.15	0.00
65.10	7.00	4.15	0.00
66.10	7.00	4.15	0.00
67.10	7.00	4.15	0.00
68.10	7.00	4.15	0.00
69.10	7.00	4.15	0.00
70.10	7.00	4.15	0.00
71.10	7.00	4.15	0.00

Summary for Subcatchment OSW: Off Site Subcatchment - Wetlands

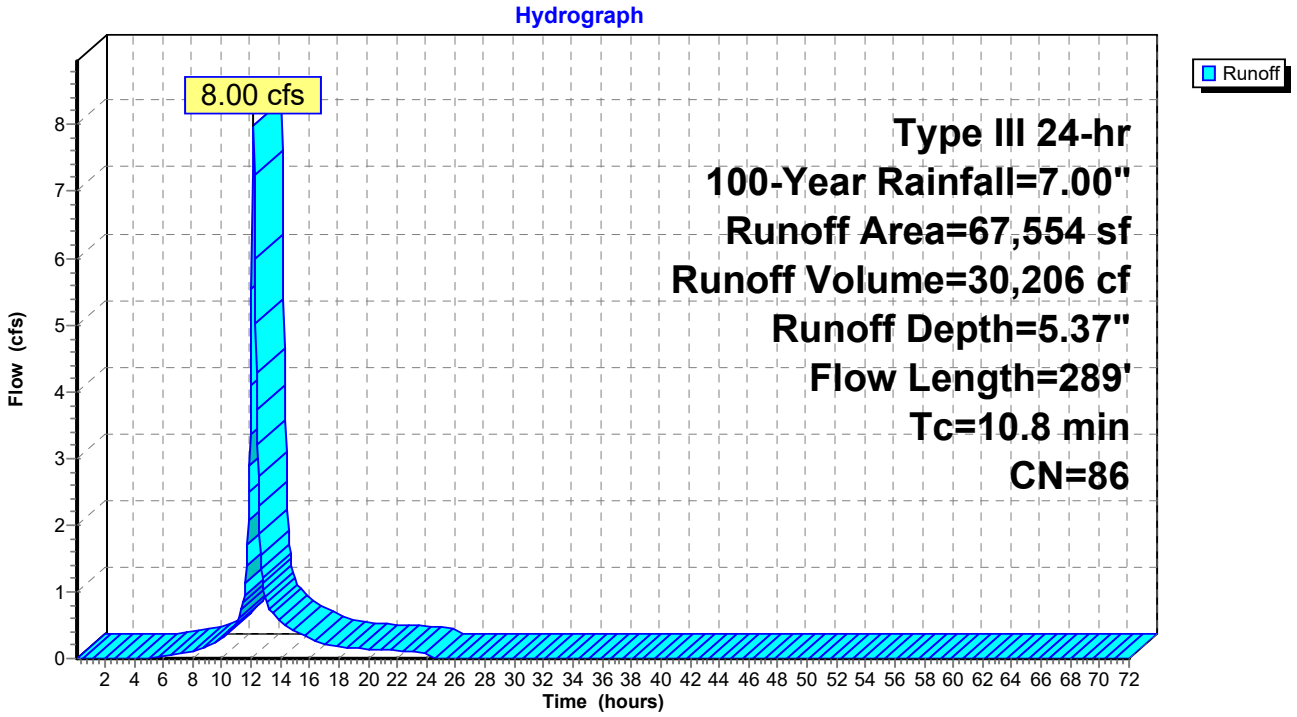
Runoff = 8.00 cfs @ 12.15 hrs, Volume= 30,206 cf, Depth= 5.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (sf)	CN	Description
	2,768	73	Woods, Fair, HSG C
	39,145	79	Woods, Fair, HSG D
*	7,603	98	Unconnected pavement, HSG C, Ledge
*	18,038	98	Unconnected pavement, HSG D, Ledge
	67,554	86	Weighted Average
	41,913		62.04% Pervious Area
	25,641		37.96% Impervious Area
	25,641		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	68	0.0739	0.12		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.40"
0.7	87	0.1957	2.21		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
0.5	85	0.3077	2.77		**Shallow Concentrated Flow, CD** Woodland Kv= 5.0 fps
0.5	49	0.1231	1.75		**Shallow Concentrated Flow, DE** Woodland Kv= 5.0 fps
10.8	289	Total			

Subcatchment OSW: Off Site Subcatchment - Wetlands



Hydrograph for Subcatchment OSW: Off Site Subcatchment - Wetlands

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.08	0.00	0.00
2.10	0.15	0.00	0.00
3.10	0.22	0.00	0.00
4.10	0.31	0.00	0.00
5.10	0.41	0.00	0.01
6.10	0.52	0.02	0.03
7.10	0.65	0.05	0.06
8.10	0.82	0.11	0.11
9.10	1.05	0.22	0.20
10.10	1.36	0.40	0.32
11.10	1.80	0.70	0.56
12.10	4.09	2.63	**7.31**
13.10	5.30	3.75	**0.82**
14.10	5.71	4.14	0.52
15.10	6.01	4.41	0.40
16.10	6.22	4.62	0.28
17.10	6.38	4.77	0.22
18.10	6.51	4.89	0.17
19.10	6.61	4.99	0.15
20.10	6.71	5.09	0.14
21.10	6.79	5.17	0.13
22.10	6.87	5.24	0.11
23.10	**6.94**	**5.31**	0.10
24.10	**7.00**	**5.37**	0.07
25.10	7.00	5.37	0.00
26.10	7.00	5.37	0.00
27.10	7.00	5.37	0.00
28.10	7.00	5.37	0.00
29.10	7.00	5.37	0.00
30.10	7.00	5.37	0.00
31.10	7.00	5.37	0.00
32.10	7.00	5.37	0.00
33.10	7.00	5.37	0.00
34.10	7.00	5.37	0.00
35.10	7.00	5.37	0.00
36.10	7.00	5.37	0.00
37.10	7.00	5.37	0.00
38.10	7.00	5.37	0.00
39.10	7.00	5.37	0.00
40.10	7.00	5.37	0.00
41.10	7.00	5.37	0.00
42.10	7.00	5.37	0.00
43.10	7.00	5.37	0.00
44.10	7.00	5.37	0.00
45.10	7.00	5.37	0.00
46.10	7.00	5.37	0.00
47.10	7.00	5.37	0.00
48.10	7.00	5.37	0.00
49.10	7.00	5.37	0.00
50.10	7.00	5.37	0.00
51.10	7.00	5.37	0.00
52.10	7.00	5.37	0.00
53.10	7.00	5.37	0.00
54.10	7.00	5.37	0.00
55.10	7.00	5.37	0.00
56.10	7.00	5.37	0.00
57.10	7.00	5.37	0.00
58.10	7.00	5.37	0.00
59.10	7.00	5.37	0.00
60.10	7.00	5.37	0.00
61.10	7.00	5.37	0.00
62.10	7.00	5.37	0.00
63.10	7.00	5.37	0.00
64.10	7.00	5.37	0.00
65.10	7.00	5.37	0.00
66.10	7.00	5.37	0.00
67.10	7.00	5.37	0.00
68.10	7.00	5.37	0.00
69.10	7.00	5.37	0.00
70.10	7.00	5.37	0.00
71.10	7.00	5.37	0.00

Summary for Subcatchment Rear: Rear Building Recharge

[49] Hint: Tc<2dt may require smaller dt

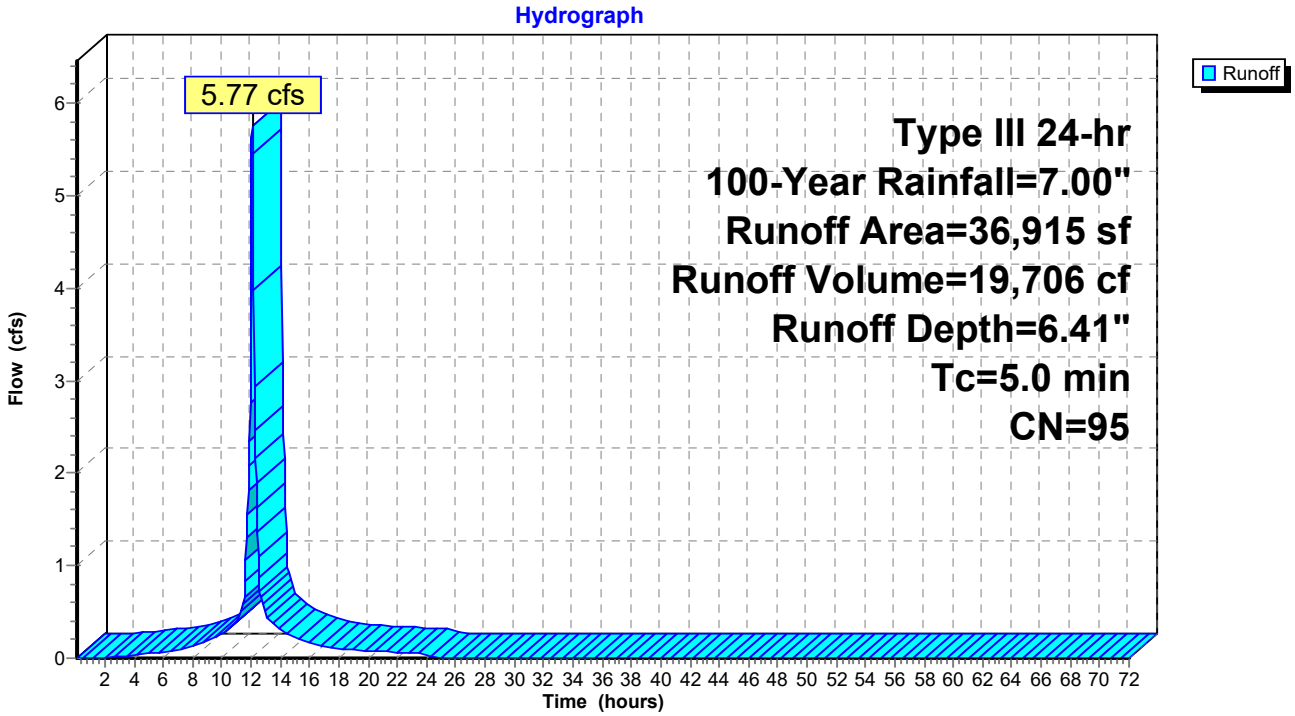
Runoff = 5.77 cfs @ 12.07 hrs, Volume= 19,706 cf, Depth= 6.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=7.00"

	Area (sf)	CN	Description
	2,746	73	Woods, Fair, HSG C
*	2,383	98	Unconnected pavement, HSG C, Ledge
	20,125	98	Roofs, HSG C
	9,580	98	Paved parking, HSG C
*	678	98	Unconnected pavement, HSG C, Retaining Wall
	1,403	74	>75% Grass cover, Good, HSG C
	36,915	95	Weighted Average
	4,149		11.24% Pervious Area
	32,766		88.76% Impervious Area
	3,061		9.34% Unconnected

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

Subcatchment Rear: Rear Building Recharge



Hydrograph for Subcatchment Rear: Rear Building Recharge

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.10	0.01	0.00	0.00
1.10	0.08	0.00	0.00
2.10	0.15	0.00	0.01
3.10	0.22	0.02	0.02
4.10	0.31	0.06	0.04
5.10	0.41	0.11	0.05
6.10	0.52	0.18	0.07
7.10	0.65	0.28	0.10
8.10	0.82	0.41	0.13
9.10	1.05	0.60	0.20
10.10	1.36	0.88	0.27
11.10	1.80	1.30	**0.43**
12.10	4.09	3.52	**5.46**
13.10	5.30	4.72	0.43
14.10	5.71	5.12	0.29
15.10	6.01	5.42	0.22
16.10	6.22	5.63	0.15
17.10	6.38	5.79	0.12
18.10	6.51	5.92	0.10
19.10	6.61	6.02	0.09
20.10	6.71	6.12	0.08
21.10	6.79	6.20	0.07
22.10	6.87	6.28	0.06
23.10	**6.94**	**6.35**	0.06
24.10	**7.00**	**6.41**	0.01
25.10	7.00	6.41	0.00
26.10	7.00	6.41	0.00
27.10	7.00	6.41	0.00
28.10	7.00	6.41	0.00
29.10	7.00	6.41	0.00
30.10	7.00	6.41	0.00
31.10	7.00	6.41	0.00
32.10	7.00	6.41	0.00
33.10	7.00	6.41	0.00
34.10	7.00	6.41	0.00
35.10	7.00	6.41	0.00
36.10	7.00	6.41	0.00
37.10	7.00	6.41	0.00
38.10	7.00	6.41	0.00
39.10	7.00	6.41	0.00
40.10	7.00	6.41	0.00
41.10	7.00	6.41	0.00
42.10	7.00	6.41	0.00
43.10	7.00	6.41	0.00
44.10	7.00	6.41	0.00
45.10	7.00	6.41	0.00
46.10	7.00	6.41	0.00
47.10	7.00	6.41	0.00
48.10	7.00	6.41	0.00
49.10	7.00	6.41	0.00
50.10	7.00	6.41	0.00
51.10	7.00	6.41	0.00
52.10	7.00	6.41	0.00
53.10	7.00	6.41	0.00
54.10	7.00	6.41	0.00
55.10	7.00	6.41	0.00
56.10	7.00	6.41	0.00
57.10	7.00	6.41	0.00
58.10	7.00	6.41	0.00
59.10	7.00	6.41	0.00
60.10	7.00	6.41	0.00
61.10	7.00	6.41	0.00
62.10	7.00	6.41	0.00
63.10	7.00	6.41	0.00
64.10	7.00	6.41	0.00
65.10	7.00	6.41	0.00
66.10	7.00	6.41	0.00
67.10	7.00	6.41	0.00
68.10	7.00	6.41	0.00
69.10	7.00	6.41	0.00
70.10	7.00	6.41	0.00
71.10	7.00	6.41	0.00

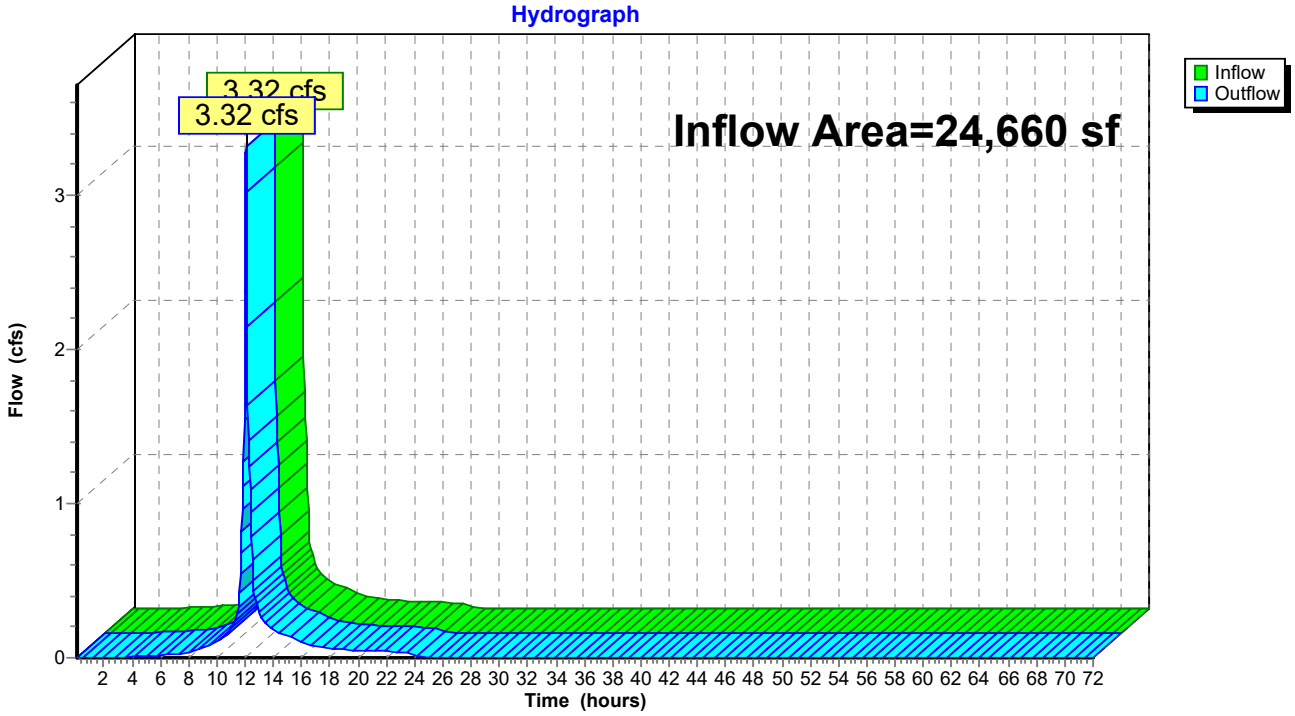
Summary for Reach TR: Total Roadway

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

Inflow Area = 24,660 sf, 45.59% Impervious, Inflow Depth = 5.08" for 100-Year event
Inflow = 3.32 cfs @ 12.06 hrs, Volume= 10,437 cf
Outflow = 3.32 cfs @ 12.06 hrs, Volume= 10,437 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Reach TR: Total Roadway



Hydrograph for Reach TR: Total Roadway

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.10	0.00		0.00
1.10	0.00		0.00
2.10	0.00		0.00
3.10	0.00		0.00
4.10	0.01		0.01
5.10	0.01		0.01
6.10	0.01		0.01
7.10	0.02		0.02
8.10	0.04		0.04
9.10	0.07		0.07
10.10	0.11		0.11
11.10	**0.20**		**0.20**
12.10	**3.03**		**3.03**
13.10	0.26		0.26
14.10	0.18		0.18
15.10	0.14		0.14
16.10	0.10		0.10
17.10	0.08		0.08
18.10	0.06		0.06
19.10	0.05		0.05
20.10	0.05		0.05
21.10	0.04		0.04
22.10	0.04		0.04
23.10	0.04		0.04
24.10	0.01		0.01
25.10	0.00		0.00
26.10	0.00		0.00
27.10	0.00		0.00
28.10	0.00		0.00
29.10	0.00		0.00
30.10	0.00		0.00
31.10	0.00		0.00
32.10	0.00		0.00
33.10	0.00		0.00
34.10	0.00		0.00
35.10	0.00		0.00
36.10	0.00		0.00
37.10	0.00		0.00
38.10	0.00		0.00
39.10	0.00		0.00
40.10	0.00		0.00
41.10	0.00		0.00
42.10	0.00		0.00
43.10	0.00		0.00
44.10	0.00		0.00
45.10	0.00		0.00
46.10	0.00		0.00
47.10	0.00		0.00
48.10	0.00		0.00
49.10	0.00		0.00
50.10	0.00		0.00
51.10	0.00		0.00
52.10	0.00		0.00
53.10	0.00		0.00
54.10	0.00		0.00
55.10	0.00		0.00
56.10	0.00		0.00
57.10	0.00		0.00
58.10	0.00		0.00
59.10	0.00		0.00
60.10	0.00		0.00
61.10	0.00		0.00
62.10	0.00		0.00
63.10	0.00		0.00
64.10	0.00		0.00
65.10	0.00		0.00
66.10	0.00		0.00
67.10	0.00		0.00
68.10	0.00		0.00
69.10	0.00		0.00
70.10	0.00		0.00
71.10	0.00		0.00

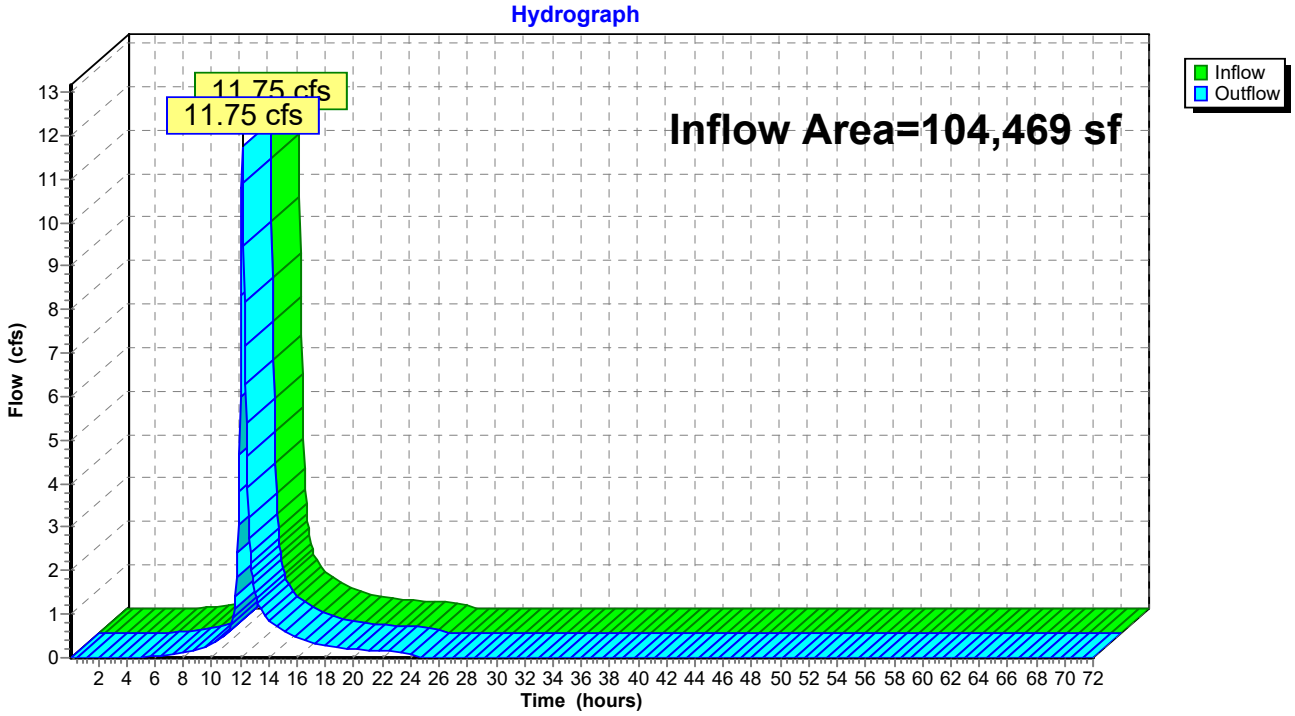
Summary for Reach TW: Total Wetlands

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

Inflow Area = 104,469 sf, 55.91% Impervious, Inflow Depth = 5.01" for 100-Year event
Inflow = 11.75 cfs @ 12.15 hrs, Volume= 43,586 cf
Outflow = 11.75 cfs @ 12.15 hrs, Volume= 43,586 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs

Reach TW: Total Wetlands



Hydrograph for Reach TW: Total Wetlands

Time (hours)	Inflow (cfs)	Elevation (feet)	Outflow (cfs)
0.10	0.00		0.00
1.10	0.00		0.00
2.10	0.00		0.00
3.10	0.00		0.00
4.10	0.00		0.00
5.10	0.01		0.01
6.10	0.03		0.03
7.10	0.06		0.06
8.10	0.11		0.11
9.10	0.20		0.20
10.10	0.32		0.32
11.10	0.56		0.56
12.10	**10.78**		**10.78**
13.10	**1.39**		**1.39**
14.10	0.83		0.83
15.10	0.62		0.62
16.10	0.44		0.44
17.10	0.34		0.34
18.10	0.26		0.26
19.10	0.22		0.22
20.10	0.20		0.20
21.10	0.18		0.18
22.10	0.16		0.16
23.10	0.14		0.14
24.10	0.10		0.10
25.10	0.00		0.00
26.10	0.00		0.00
27.10	0.00		0.00
28.10	0.00		0.00
29.10	0.00		0.00
30.10	0.00		0.00
31.10	0.00		0.00
32.10	0.00		0.00
33.10	0.00		0.00
34.10	0.00		0.00
35.10	0.00		0.00
36.10	0.00		0.00
37.10	0.00		0.00
38.10	0.00		0.00
39.10	0.00		0.00
40.10	0.00		0.00
41.10	0.00		0.00
42.10	0.00		0.00
43.10	0.00		0.00
44.10	0.00		0.00
45.10	0.00		0.00
46.10	0.00		0.00
47.10	0.00		0.00
48.10	0.00		0.00
49.10	0.00		0.00
50.10	0.00		0.00
51.10	0.00		0.00
52.10	0.00		0.00
53.10	0.00		0.00
54.10	0.00		0.00
55.10	0.00		0.00
56.10	0.00		0.00
57.10	0.00		0.00
58.10	0.00		0.00
59.10	0.00		0.00
60.10	0.00		0.00
61.10	0.00		0.00
62.10	0.00		0.00
63.10	0.00		0.00
64.10	0.00		0.00
65.10	0.00		0.00
66.10	0.00		0.00
67.10	0.00		0.00
68.10	0.00		0.00
69.10	0.00		0.00
70.10	0.00		0.00
71.10	0.00		0.00

Summary for Pond RF: Recharge - Front

Inflow Area = 4,505 sf,100.00% Impervious, Inflow Depth = 6.76" for 100-Year event
Inflow = 0.71 cfs @ 12.07 hrs, Volume= 2,538 cf
Outflow = 0.01 cfs @ 20.74 hrs, Volume= 2,016 cf, Atten= 99%, Lag= 519.9 min
Discarded = 0.01 cfs @ 20.74 hrs, Volume= 2,016 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Peak Elev= 103.21' @ 20.74 hrs Surf.Area= 1,061 sf Storage= 1,926 cf

Plug-Flow detention time= 1,548.9 min calculated for 2,016 cf (79% of inflow)
Center-of-Mass det. time= 1,469.9 min (2,212.0 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.52'	840 cf	**23.58'W x 45.00'L x 3.21'H Field A** 3,405 cf Overall - 1,305 cf Embedded = 2,099 cf x 40.0% Voids
#2A	101.02'	1,305 cf	**Cultec R-280HD** x 30 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 5 rows
		2,145 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.52'	**0.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.01 cfs @ 20.74 hrs HW=103.21' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond RF: Recharge - Front - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 5 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

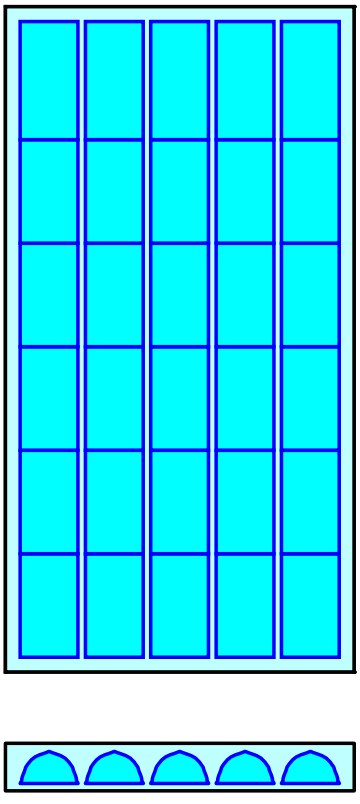
6 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 43.00' Row Length +12.0" End Stone x 2 = 45.00' Base Length
5 Rows x 47.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 23.58' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

30 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 5 Rows = 1,305.4 cf Chamber Storage

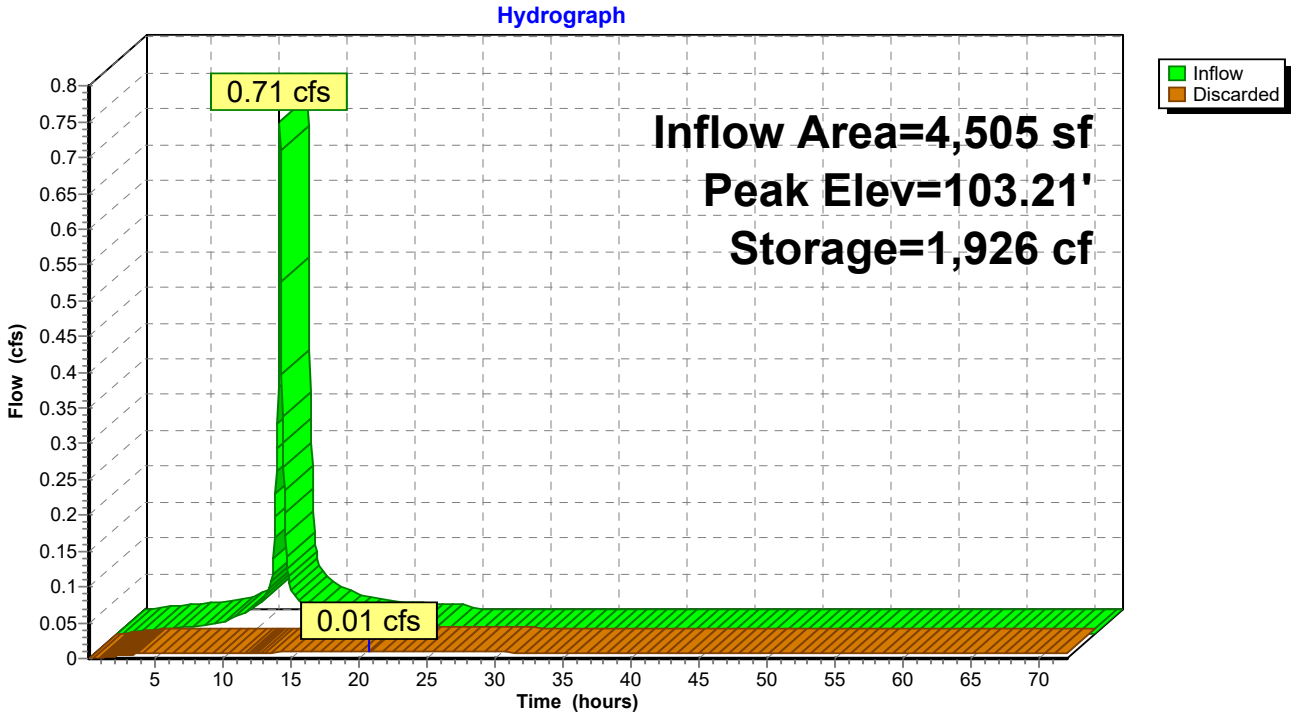
3,404.8 cf Field - 1,305.4 cf Chambers = 2,099.4 cf Stone x 40.0% Voids = 839.8 cf Stone Storage

Chamber Storage + Stone Storage = 2,145.2 cf = 0.049 af
Overall Storage Efficiency = 63.0%
Overall System Size = 45.00' x 23.58' x 3.21'

30 Chambers
126.1 cy Field
77.8 cy Stone



Pond RF: Recharge - Front



Hydrograph for Pond RF: Recharge - Front

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Discarded (cfs)
0.10	0.00	0	100.52	0.00
2.60	0.01	3	100.53	0.00
5.10	0.01	12	100.55	0.01
7.60	0.02	60	100.66	0.01
10.10	**0.04**	222	101.03	0.01
12.60	**0.09**	1,499	102.52	0.01
15.10	0.03	1,817	102.99	0.01
17.60	0.01	1,908	103.17	0.01
20.10	0.01	**1,926**	**103.21**	**0.01**
22.60	0.01	**1,921**	**103.20**	**0.01**
25.10	0.00	1,877	103.10	0.01
27.60	0.00	1,798	102.95	0.01
30.10	0.00	1,720	102.83	0.01
32.60	0.00	1,643	102.72	0.01
35.10	0.00	1,567	102.61	0.01
37.60	0.00	1,492	102.51	0.01
40.10	0.00	1,417	102.41	0.01
42.60	0.00	1,343	102.32	0.01
45.10	0.00	1,270	102.23	0.01
47.60	0.00	1,197	102.14	0.01
50.10	0.00	1,125	102.05	0.01
52.60	0.00	1,054	101.97	0.01
55.10	0.00	984	101.89	0.01
57.60	0.00	914	101.80	0.01
60.10	0.00	844	101.72	0.01
62.60	0.00	776	101.65	0.01
65.10	0.00	708	101.57	0.01
67.60	0.00	640	101.49	0.01
70.10	0.00	573	101.42	0.01

Summary for Pond RR: Recharge - Rear

Inflow Area = 36,915 sf, 88.76% Impervious, Inflow Depth = 6.41" for 100-Year event
Inflow = 5.77 cfs @ 12.07 hrs, Volume= 19,706 cf
Outflow = 3.79 cfs @ 12.16 hrs, Volume= 19,352 cf, Atten= 34%, Lag= 5.6 min
Discarded = 0.03 cfs @ 12.16 hrs, Volume= 5,972 cf
Primary = 3.77 cfs @ 12.16 hrs, Volume= 13,380 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.10-72.00 hrs, dt= 0.05 hrs
Peak Elev= 103.66' @ 12.16 hrs Surf.Area= 3,501 sf Storage= 7,187 cf

Plug-Flow detention time= 509.0 min calculated for 19,339 cf (98% of inflow)
Center-of-Mass det. time= 499.1 min (1,258.2 - 759.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	100.46'	2,691 cf	**32.42'W x 108.00'L x 3.21'H Field A** 11,232 cf Overall - 4,505 cf Embedded = 6,727 cf x 40.0% Voids
#2A	100.96'	4,505 cf	**Cultec R-280HD** x 105 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 7 rows
		7,196 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	102.17'	**12.0" Round Culvert** L= 44.9' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 102.17' / 101.50' S= 0.0149 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	100.46'	**0.270 in/hr Exfiltration over Wetted area** Phase-In= 0.01'

Discarded OutFlow Max=0.03 cfs @ 12.16 hrs HW=103.64' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=3.73 cfs @ 12.16 hrs HW=103.64' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 3.73 cfs @ 4.75 fps)

Pond RR: Recharge - Rear - Chamber Wizard Field A

Chamber Model = Cultec R-280HD (Cultec Recharger® 280HD)
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
Row Length Adjustment= +1.00' x 6.07 sf x 7 rows

47.0" Wide + 6.0" Spacing = 53.0" C-C Row Spacing

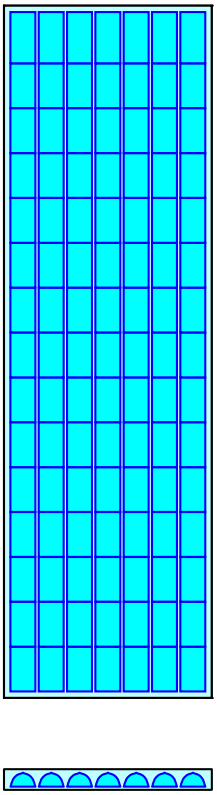
15 Chambers/Row x 7.00' Long +1.00' Row Adjustment = 106.00' Row Length +12.0" End Stone x 2 = 108.00' Base Length
7 Rows x 47.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 32.42' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

105 Chambers x 42.5 cf +1.00' Row Adjustment x 6.07 sf x 7 Rows = 4,505.2 cf Chamber Storage

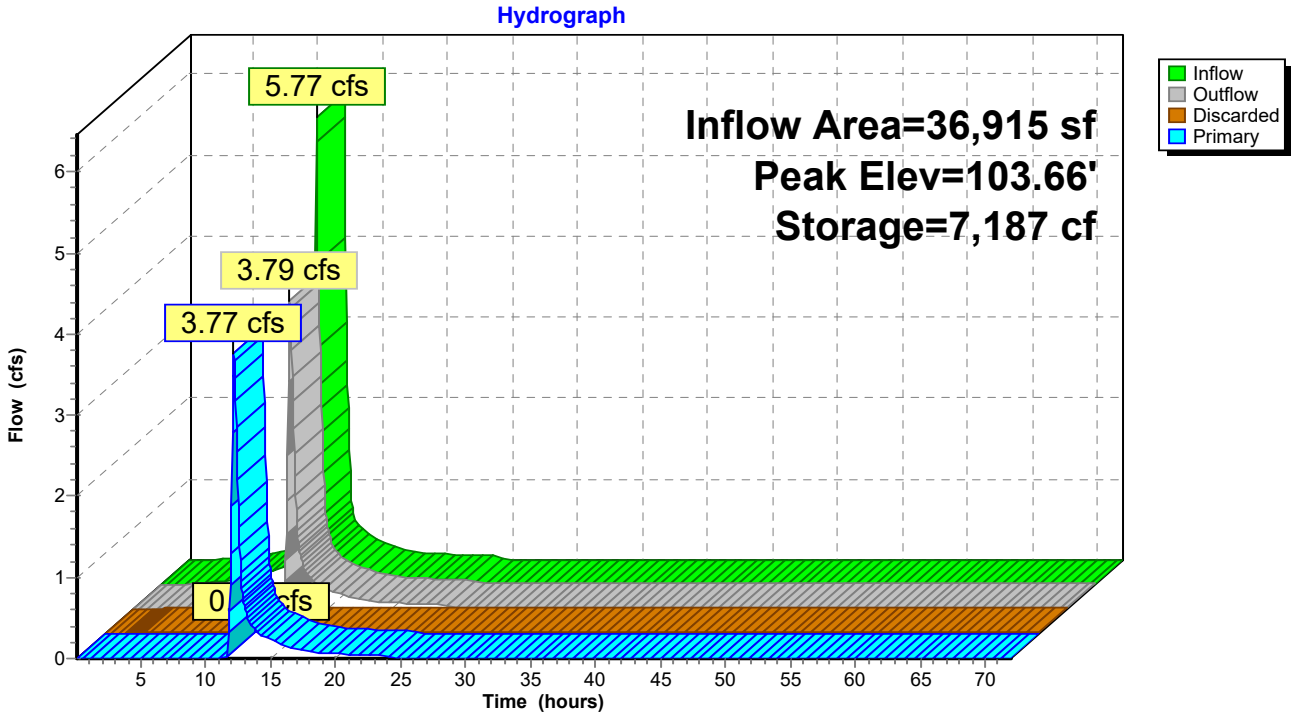
11,232.4 cf Field - 4,505.2 cf Chambers = 6,727.1 cf Stone x 40.0% Voids = 2,690.9 cf Stone Storage

Chamber Storage + Stone Storage = 7,196.1 cf = 0.165 af
Overall Storage Efficiency = 64.1%
Overall System Size = 108.00' x 32.42' x 3.21'

105 Chambers
416.0 cy Field
249.2 cy Stone



Pond RR: Recharge - Rear



Hydrograph for Pond RR: Recharge - Rear

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.10	0.00	0	100.46	0.00	0.00	0.00
2.60	0.01	8	100.47	0.01	0.01	0.00
5.10	0.05	120	100.55	0.02	0.02	0.00
7.60	0.11	602	100.89	0.02	0.02	0.00
10.10	**0.27**	**2,025**	**101.39**	**0.02**	**0.02**	**0.00**
12.60	**0.73**	**5,837**	**102.79**	**1.41**	**0.03**	**1.38**
15.10	0.22	4,888	102.40	0.25	0.03	0.22
17.60	0.11	4,685	102.32	0.13	0.03	0.10
20.10	0.08	4,588	102.29	0.08	0.03	0.06
22.60	0.06	4,536	102.27	0.07	0.03	0.04
25.10	0.00	4,360	102.20	0.03	0.02	0.00
27.60	0.00	4,132	102.12	0.02	0.02	0.00
30.10	0.00	3,910	102.04	0.02	0.02	0.00
32.60	0.00	3,688	101.96	0.02	0.02	0.00
35.10	0.00	3,468	101.88	0.02	0.02	0.00
37.60	0.00	3,249	101.81	0.02	0.02	0.00
40.10	0.00	3,032	101.73	0.02	0.02	0.00
42.60	0.00	2,815	101.66	0.02	0.02	0.00
45.10	0.00	2,600	101.58	0.02	0.02	0.00
47.60	0.00	2,386	101.51	0.02	0.02	0.00
50.10	0.00	2,173	101.44	0.02	0.02	0.00
52.60	0.00	1,961	101.37	0.02	0.02	0.00
55.10	0.00	1,750	101.30	0.02	0.02	0.00
57.60	0.00	1,541	101.23	0.02	0.02	0.00
60.10	0.00	1,332	101.16	0.02	0.02	0.00
62.60	0.00	1,125	101.10	0.02	0.02	0.00
65.10	0.00	918	101.03	0.02	0.02	0.00
67.60	0.00	713	100.96	0.02	0.02	0.00
70.10	0.00	509	100.82	0.02	0.02	0.00

APPENDIX C

STORMWATER MANAGEMENT STANDARD SUPPORT CALCULATIONS

Project Number:	066-001	**Calculations by:**	SMO
Project Name:	Industrial Development	**Date:**	2/9/2024
Project Address:	Maple Street. Bellingham	**Checked by:**	NES
Client:	Baystate	**Checked Date:**	2/9/2024

STORMWATER MANAGEMENT STANDARD 3 - RECHARGE VOLUME

	HYDROLOGIC SOIL GROUP				TOTAL
	A	B	C	D	
IMPERVIOUS AREA (S.F.)	0	0	44,200	0	**44200**
INCHES OF RUNOFF TO BE RECHARGED	0.60	0.35	0.25	0.10	
REQUIRED RECHARGE VOLUME (FT^3)	0	0	921	0	**921**

CAPTURE AREA ADJUSTMENT - ADJUSTED MINIMUM REQUIRED RECHARGE VOLUME

65% OF IMPERVIOUS AREA	28730	SF	A MINIMUM OF 65% OF IMPERVIOUS AREA MUST BE DIRECTED TO SITE RECHARGE BMPS	
TOTAL IMPERVIOUS SITE AREA DIRECTED TO RECHARGE BMP	39701	SF	89.8%	CALCULATED PERCENTAGE OF TOTAL IMPERVIOUS AREA
RATIO OF TOTAL IMPERVIOUS AREA / IMPERVIOUS AREA DIRECTED TO RECHARGE	1.11		CALCULATED RATIO IS APPLIED TO REQUIRE RECHARGE VOLUME TO DETERMINE ADJUSTED VOLUME	
ADJUSTED REQUIRED RECHARGE VOLUME	**1025**	CF	RATIO OF IMPERVIOUS AREA x REQUIRED RECHARGE VOLUME	
PROPOSED RECHARGE VOLUME	**6913**	CF	PER HYDROCAD CALCULATIONS FOR 2-YEAR STORM	

DRAWDOWN IN 72 HOURS CALCULATION

A = BOTTOM AREA OF PROPOSED LEACHING STRUCTURE
Rv = RECHARGE VOLUME
K= SATURATED HYDRAULIC CONDUCTIVITY (RAWLS RATE) = 0.27 INCHES/HOUR
VALUE IS BASED ON B HYDRAULIC SOIL GROUP

Subsurface Infiltration Facility Front

A= 1,061 SF Bottom El. 101.02
Rv= 2,016 CF 100-Year Storm Rechage total
K= 0.27 INCHES/HOUR

DRAWDOWN TIME $T = \frac{Rv}{K \times A}$ = **84.4** HOURS TO EMPTY THE RECHARGE BMP
+/-72 HOURS, SO DRAWDOWN IS OK

Subsurface Infiltration Facility Rear

A= 3,501 SF Bottom El. 100.96
Rv= 5,972 CF 100-Year Storm Rechage total
K= 0.27 INCHES/HOUR

DRAWDOWN TIME $T = \frac{Rv}{K \times A}$ = **75.8** HOURS TO EMPTY THE RECHARGE BMP
+/-72 HOURS, SO DRAWDOWN IS OK

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Baystate - Front

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proprietary Treatment Practice	0.90	**1.00**	0.90	0.10
Subsurface Infiltration Structure	0.80	0.10	0.08	0.02

Total TSS Removal = 98%

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

Project: Baystate

Prepared By: SMO

Date: 2/9/24

*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:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Baystate - Rear "A"

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proprietary Treatment Practice	0.91	**1.00**	0.91	0.09
Subsurface Infiltration Structure	0.80	0.09	0.07	0.02

Total TSS Removal = 98%

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

Project: Baystate

Prepared By: SMO

Date: 2/9/24

*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:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Baystate - Rear "B"

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Proprietary Treatment Practice	0.86	**1.00**	0.86	0.14
Subsurface Infiltration Structure	0.80	0.14	0.11	0.03

Total TSS Removal = 97%

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

Project: Baystate

Prepared By: SMO

Date: 2/9/24

*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

APPENDIX D

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

LONG-TERM POLLUTION PREVENTION PLAN

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

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

Good Housekeeping Practices

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

Provisions for Storing Materials and Waste Products Inside or Under Cover

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

Vehicle washing controls;

Vehicles shall be washed only on a concrete pad and served by an oil/grit separator. Vehicles shall not be washed if there are known contaminants being washed into the oil/grit separator.

Requirements for routine inspections and maintenance of stormwater BMPs;

BMPs shall be inspected on a monthly basis. BMPs shall be maintained per the Operations and Maintenance Plan.

Spill prevention and response plans;

First responders	Phone Numbers
• Bellingham Fire Department	911 if emergency or (508) 966-1112
• Bellingham Police Department	911 if emergency or (508) 966-5840
• Mass Department of Environmental Protection	
Emergency Response	1-888-304-1133

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

Fertilizers shall not be used within 25 feet of the wetland resource areas. Excess fertilizers shall be swept up from all impervious surfaces and not allowed to run into the drainage system.

All fertilizer, herbicides, and pesticides shall be stored at least 25 feet away from the wetland line. If stored on site, these materials should be kept in a wrapped or sealed container, and kept under cover out of the rain and snow.

Provisions for solid waste management;

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

Snow disposal and plowing plans relative to Wetland Resource Areas;

Snow shall not be stored within 25 feet of a wetland area, or within 25 feet of a drain structure which discharged to the wetlands. If it is not possible to store the snow on site, it shall be trucked away from the site, and disposed of in the same manner as described above.

Plows shall not be allowed to push snow into or towards the wetland resource areas.

Winter Road Salt and/or Sand Use and Storage restrictions

Salt will be applied only in the minimum amounts recommended by the manufacturer. Salt shall not be used within 25 feet of the wetland resource areas.

Street sweeping schedules;

Street Sweeping shall be performed on paved surfaces no less than four times per year, preferably every 3 months.

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;

Oil booms shall be kept on site in a readily accessible area in the event of an oil spill. If an oil spill occurs, the booms shall be placed and secured at the overflow spillway and in front of the entrance to the Stormceptors.

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

Per the SWPPP, annual SWPPP training shall be conducted. Training records shall be kept on file.

List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

Name	Title	Company	Phone
Rich Gordon	President	Baystate Engineering Corp,	508-893-8931
Shane Oates	Branch Manager	Independence Engineering LLC	508-245-2608

Routine Inspections and Maintenance of SMS BMP's

Routine inspections and maintenance shall be performed in accordance with the Operations and Maintenance Plan

Spill Prevention, Control and Countermeasures

Maple Street Development LLC and its subsidiaries have in place a SPCC plan for all of their assets. The plan is updated periodically and/or when necessary due to changes to the existing facility. A copy is kept onsite at all times in the event of a spill.

APPENDIX E

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN - REQUIRED BY STANDARD 8

CONSTRUCTION PERIOD POLLUTION PREVENTION PLAN AND EROSION & SEDIMENTATION CONTROL PLAN

The proposed development consists of a 19,525 square foot industrial style building, parking and loading areas, associated utilities and grading, three proprietary treatment devices and two subsurface infiltration systems with a flared end section with scour protection and a center plunge pool.

EXISTING CONDITIONS

Independence compiled existing drainage areas from the existing topographic survey. A site visit was conducted to evaluate the existing drainage patterns and watershed areas for the site and the areas surrounding the site. The Site currently consists of dense brush, ledge outcroppings and forested areas and topography generally slopes from the center of the site to the east toward Maple Street and to the west towards the unnamed perennial stream with a wide range of flat to steep grades towards the stream and Maple Street.

The NRCS soil survey map for the area indicates that the site is made of multiple soil types. Please refer to Table 2 and the follow-up descriptions for a summary of these soils and their general characteristics.

Table 2

Existing Soil Classifications

SOIL MAP UNIT	BRISTOL COUNTY - NORTHERN PART SOIL SURVEY MAP UNIT NAME AND DESCRIPTION	HYDROLOGIC SOIL GROUP
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	D
52	Freetown Muck, 0 to 1 percent slopes	D
104D	Hollis-Rock outcrop-Charlton complex, 15 to 35 percent slopes	C
654	Udorthents, loamy	C

Minimize Disturbed Area and Protect Natural Features and Soil

The erosion and sediment control (ESC) barrier line defines the limit of work and that all areas outside of the clearing line are to be protected and remain undisturbed. The ESC barrier line shall be installed prior to the start of construction and shall be inspected and maintained on a weekly basis and/or within 12 hours of a storm event >0.5".

Stabilize Soils

Soils will be stabilized by seeding. Stockpiled soils, such as top soil, will be stabilized with temporary seed no later than 14 days from the last construction activity in that area.

Permanent Seeding/ Sodding: Shall be performed upon completion of the area. These areas shall be inspected and maintained on a monthly basis and/or within 12 hours of a storm event >0.5".

Temporary Seeding/ Sodding: Shall be performed within 14 days of last construction activity in the area. These areas shall be inspected and maintained on a weekly basis and/or within 12 hours of a storm event >0.5".

Protect Slopes

Maximum allowable slopes on the project are 2:1 and these slopes will be stabilized using the methods described in the previous section.

Establish Perimeter Controls and Sediment Barriers

An erosion and sediment control barrier will be installed along the down gradient portions of project site that are to be disturbed by construction related activities. Installation will occur prior to the start of these activities and the contractor shall be aware that areas outside the erosion control barrier are to remain undisturbed. The ESC barrier shall be inspected and maintained on a weekly basis and/or within 12 hours of a storm event >0.5".

Retain Sediment On-Site

Sediment is retained on site via the aforementioned erosion and sediment control barrier. Sediment that builds up along the barrier shall be manually removed during the inspection. Completed slopes will be stabilized immediately as described above to avoid the on-going deposition of sediment against the ESC barrier.

Establish Stabilized Construction Exits

A stabilized construction site exit is proposed for the project site and will be put in place upon completion of the compost filter sock installation. Please refer to the Permitting Plans for proposed location and installation details. In addition to the stabilized construction exit, dump trucks hauling material to and from the site will be covered with a tarpaulin and the paved street adjacent to the site entrance will be manually swept as required to remove excess mud, dirt, or rock tracked from the site. The construction exit will be inspected and maintained on a weekly basis.

Material Handling and Waste Management

All solid waste materials will be collected at a minimum of once per week and stored in a covered metal dumpster rented from a licensed solid waste management company. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied as needed and the trash will be hauled to an appropriate landfill. No construction materials or stumps will be buried on-site. All personnel will be instructed regarding the correct procedure for waste disposal. All sanitary waste will be collected from the portable units a minimum of once per week by a licensed waste hauling company. More specifically, the following guidelines will be followed:

- Fertilizers will be applied only in the minimum amounts recommended by the manufacturer.
- Fertilizers will be worked into the soil to limit exposure to stormwater.
- Fertilizers shall not be used within 25 feet of the wetland resource areas. Excess fertilizers shall be swept up from all impervious surfaces and not allowed to run into the drainage system.
- Fertilizers will be stored in a covered shed and partially used bags will be transferred to a sealable bin to avoid spills.
- Any asphalt substances used onsite will be applied according to the manufacturer's recommendation.

- Sanitary waste will be collected from portable toilets a minimum of once a week to avoid overfilling.
- A covered dumpster will be used for all waste materials.
- Salt will be applied only in the minimum amounts recommended by the manufacturer.
- Salt shall not be used within 25 feet of the wetland resource areas.

Establish Proper Building Material Staging Areas

Construction materials will be stored on-site in designated material staging areas that minimize the exposure of the materials to stormwater.

Designate Concrete Truck Washout Areas

Concrete trucks will be directed to a washout area to be established outside of the 25-foot wetland buffer. Washout areas shall consist of a layer of polyurethane sheeting draped over a rectangular area built out of straw bales.

Establish Proper Equipment/Vehicle Fueling and Maintenance Practices

The following equipment/vehicle fueling and maintenance practice(s) will be implemented to control pollutants to stormwater:

- Petroleum products related to the operation of said equipment will be stored in tightly sealed containers, which will be clearly labeled.
- Spray guns will be cleaned on a disposable tarp.

Spill Prevention and Control Plan

The following guidelines will be followed to aid in the prevention and control of unanticipated spills on-site:

- Spill kits will be included with all fueling sources, if applicable, and maintenance activities.
- Materials and equipment necessary for spill cleanup will be kept onsite. Equipment will include, but not be limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, saw dust, and plastic and metal trash containers.
- All spills will be cleaned up immediately upon discovery. Spills large enough to reach the storm system will be reported to the Massachusetts DEP or National Response Center at 1-800-424-8802.

APPENDIX F

OPERATION AND MAINTENANCE PLAN - REQUIRED BY STANDARD 9

OPERATION AND MAINTENANCE PLAN

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

Unscheduled Maintenance

The following inspections and maintenance activities must be completed after each rain event in excess of two-inches (2"), or after any snow or rain event accompanied by high winds:

1. Inspect the Stormceptor inlets, flared end section and plunge pool/rip-rap apron. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlets or outlets of these systems.

2. Accumulated snow events are to be removed from all paved areas and taken off-site. Snow storage is prohibited from all stormwater management systems including Stormceptor inlets.

General Maintenance

The following inspections and maintenance activities must be completed on a regular basis as conditions warrant:

1. Maintain grassy side slopes of the site through regular mowing. Keep the grass between three and six inches (3"-6") in length. Remove the grass clippings to prevent them from deposit into the existing bordering vegetated wetlands.

2. During the fall and the spring remove any accumulated leaves and debris from the flared end section, rip-rap apron, and Stormceptor inlets.

Quarterly Maintenance

The following inspections and maintenance activities must be completed quarterly (January 15, April 15, July 15, October 15 or other acceptable quarterly dates):

1. Sweep, vacuum, or clean the roadway area to reduce the amount of sediment entering the SMS.

2. Inspect rip-rap apron, flared end structure, and Stormceptor inlets for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of these systems. Remove any accumulated sediment inside the subsurface infiltration facilities, by the use of a vacuum truck when it exceeds three-inches (3") but not less than annually.

Annual Maintenance

The following inspections and maintenance activities must be completed annually (April 15 or another acceptable date):

1. Sweep, vacuum or clean the roadway area to reduce the amount of sediment entering the SMS.

2. Remove any accumulated sediment from the rip-rap apron and flared end structure by the use of hand tools (shovels, rakes, wheelbarrows, etc.). Reset any displaced rip-rap.

Water Quality Unit Maintenance

Refer to Stormceptor® Owner's Manual found in Appendix "I" of the Stormwater Management Report for operational and maintenance information on the water quality units found on site.

Maple Street Development LLC

MAPLE STREET, BELLINGHAM, MASSACHUSETTS

Stormwater Management System Operation & Maintenance Checklist

Unscheduled Maintenance

- Inspect the Stormceptor inlets, flared end section and plunge pool/rip-rap apron. Remove any branches, trash or other large debris that could interfere with the proper operation of the inlets or outlets of these systems.

- Accumulated snow events are to be removed from all paved areas and taken off-site. Snow storage is prohibited from all stormwater management systems including Stormceptor inlets.

General Maintenance

- Maintain grassy side slopes of the site through regular mowing. Keep the grass between three and six inches (3"-6") in length. Remove the grass clippings to prevent them from deposit into the existing bordering vegetated wetlands.

- During the fall and the spring remove any accumulated leaves and debris from the flared end section, rip-rap apron, and Stormceptor inlets.

Quarterly Maintenance

- Sweep, vacuum, or clean the roadway area to reduce the amount of sediment entering the SMS.

- Inspect rip-rap apron, flared end structure, and Stormceptor inlets for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of these systems. Remove any accumulated sediment inside the subsurface infiltration facilities, by the use of a vacuum truck when it exceeds three-inches (3") but not less than annually.

Annual Maintenance

- Sweep, vacuum or clean the roadway area to reduce the amount of sediment entering the SMS.

- Remove any accumulated sediment from the rip-rap apron and flared end structure by the use of hand tools (shovels, rakes, wheelbarrows, etc.). Reset any displaced rip-rap.

Water Quality Unit Maintenance

- Refer to the Stormceptor® Owner's Manual for operational and maintenance information on the water quality units found on site.

MAPLE STREET DEVELOPMENT LLC			
MAPLE STREET, BELLINGHAM, MASSACHUSETTS			
STORMWATER MANAGEMENT SYSTEM OPERATION & MAINTENANCE LOG			
DATE	**TIME**	**MAINTENANCE ACTIVITY**	**MAINTENANCE PERFORMED, OBSERVATIONS**

APPENDIX G

ILLICIT DISCHARGE COMPLIANCE STATEMENT

February 9, 2024

Bellingham Conservation Commission
Municipal Center
10 Mechanic Street
Bellingham, MA 02019

Re: Proposed Light industrial Development
0 Maple Street, Bellingham, Massachusetts
Illicit Discharge Compliance Statement

Dear Members of the Conservation Commission:

Independence Engineering LLC (IE), on behalf of Maple Street Development LLC, is submitting this Illicit Discharge Compliance Statement for the above referenced property.

This Illicit Discharge Compliance Statement is to verify that to the best of our knowledge, no illicit discharges will exist after the proposed development has been completed.

The proposed stormwater management system consists of Stormceptors, subsurface infiltration systems and a flared end outlet with rip rap level spreader. Combined these system components provide the necessary treatment and recharge of stormwater while attenuating post development peak flows. Please refer to the "Proposed Light Industrial Development, Maple Street, Permitting Plans" prepared by Independence Engineering and Dated February 9, 2024, for plans showing the proposed stormwater management system. Additionally, the Long-term Pollution Prevention Plan contained within this Stormwater Report includes measures to prevent illicit discharges.

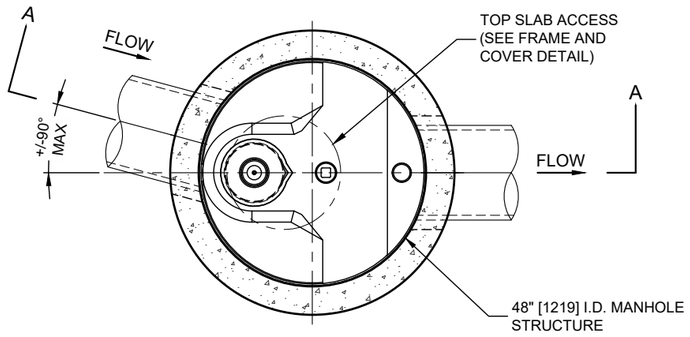
Please don't hesitate to contact me at 508-245-2608 should you have any questions and/or comments pertaining to the information contained herein or require additional information and/or further action. Thank you for your time and consideration regarding this matter.

Best Regards,
Independence Engineering LLC

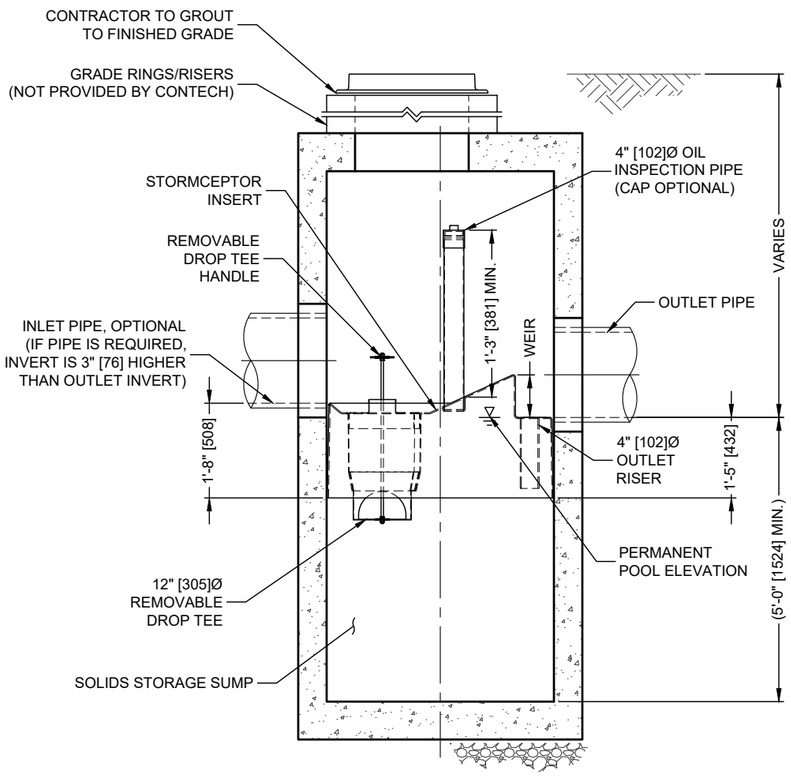
Shane M. Oates
New England Branch Manager

APPENDIX H

CONTECH STORMCEPTOR SUPPORT DATA



PLAN VIEW
TOP SLAB NOT SHOWN



SECTION A-A

Stormceptor®
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

STORMCEPTOR DESIGN NOTES

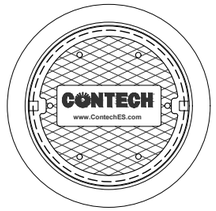
THE STANDARD STC450I CONFIGURATION WITH ROUND, SOLID FRAME AND COVER, AND INLET PIPE IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES

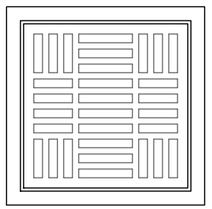
SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (cfs [L/s])			
PEAK FLOW RATE (cfs [L/s])			
RETURN PERIOD OF PEAK FLOW (yrs)			
RIM ELEVATION			
PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:



FRAME AND COVER
(MAY VARY)
NOT TO SCALE



FRAME AND GRATE
(MAY VARY)
NOT TO SCALE

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. STORMCEPTOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STORMCEPTOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. STORMCEPTOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMCEPTOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

STC450i
STORMCEPTOR
STANDARD DETAIL

I:\COMMON\CAD\TREATMENT\23 STORMCEPTOR\40 STANDARD DRAWINGS\IN PROCESS\STC450I-DTL.DWG 2/1/2019 3:12 PM

Detailed Stormceptor Sizing Report – STC Front

Project Information & Location			
Project Name	Baystate Engineering	**Project Number**	066-001
City	Bellingham	**State/ Province**	Massachusetts
Country	United States of America	**Date**	2/9/2024
Designer Information		**EOR Information (optional)**	
Name	Shane Oates	**Name**	
Company	Independence Engineering	**Company**	
Phone #	508-245-2608	**Phone #**	
Email	soates@centermountllc.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	STC Front
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	90
PSD	Fine Distribution
Rainfall Station	BOSTON WSFO AP

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	90
STC 900	94
STC 1200	94
STC 1800	94
STC 2400	96
STC 3600	96
STC 4800	97
STC 6000	97
STC 7200	98
STC 11000	99
STC 13000	99
STC 16000	99

Stormceptor
The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:
• Site parameters
• Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
• Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
• TSS load
• Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Massachusetts	**Total Number of Rainfall Events**	8140
Rainfall Station Name	BOSTON WSFO AP	**Total Rainfall (in)**	2457.1
Station ID #	0770	**Average Annual Rainfall (in)**	42.4
Coordinates	42°21'38"N, 71°0'38"W	**Total Evaporation (in)**	226.6
Elevation (ft)	20	**Total Infiltration (in)**	0.0
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	2230.5

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (acres)	0.22
Imperviousness %	100.0

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Design Details	
Stormceptor Inlet Invert Elev (ft)	
Stormceptor Outlet Invert Elev (ft)	102.31
Stormceptor Rim Elev (ft)	105.81
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	12
Pipe Material	HDPE - plastic
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	Yes

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	STC Front

Site Details

Drainage Area

Total Area (acres)	0.22
Imperviousness %	100.0

Surface Characteristics

Width (ft)	196.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

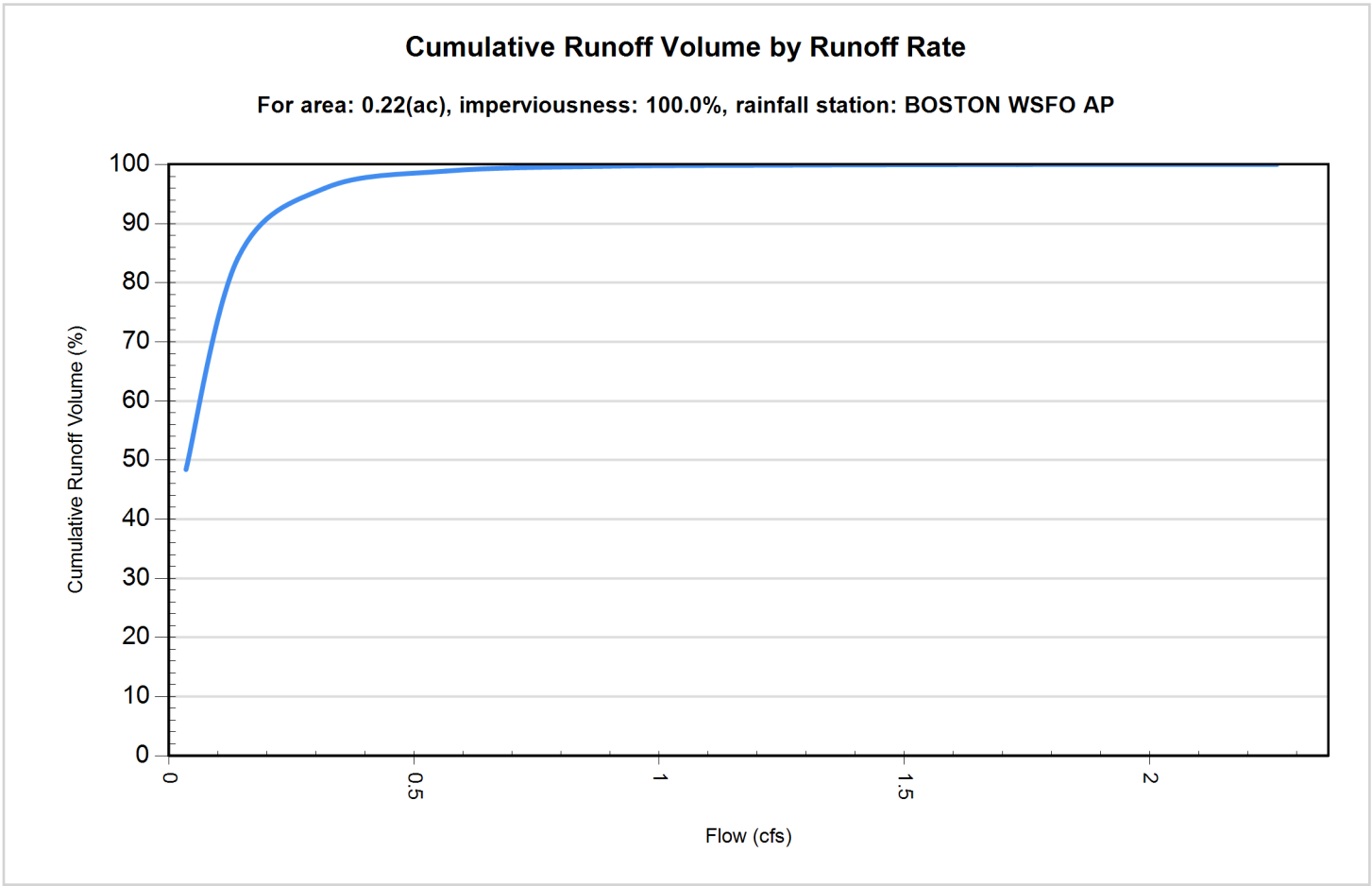
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

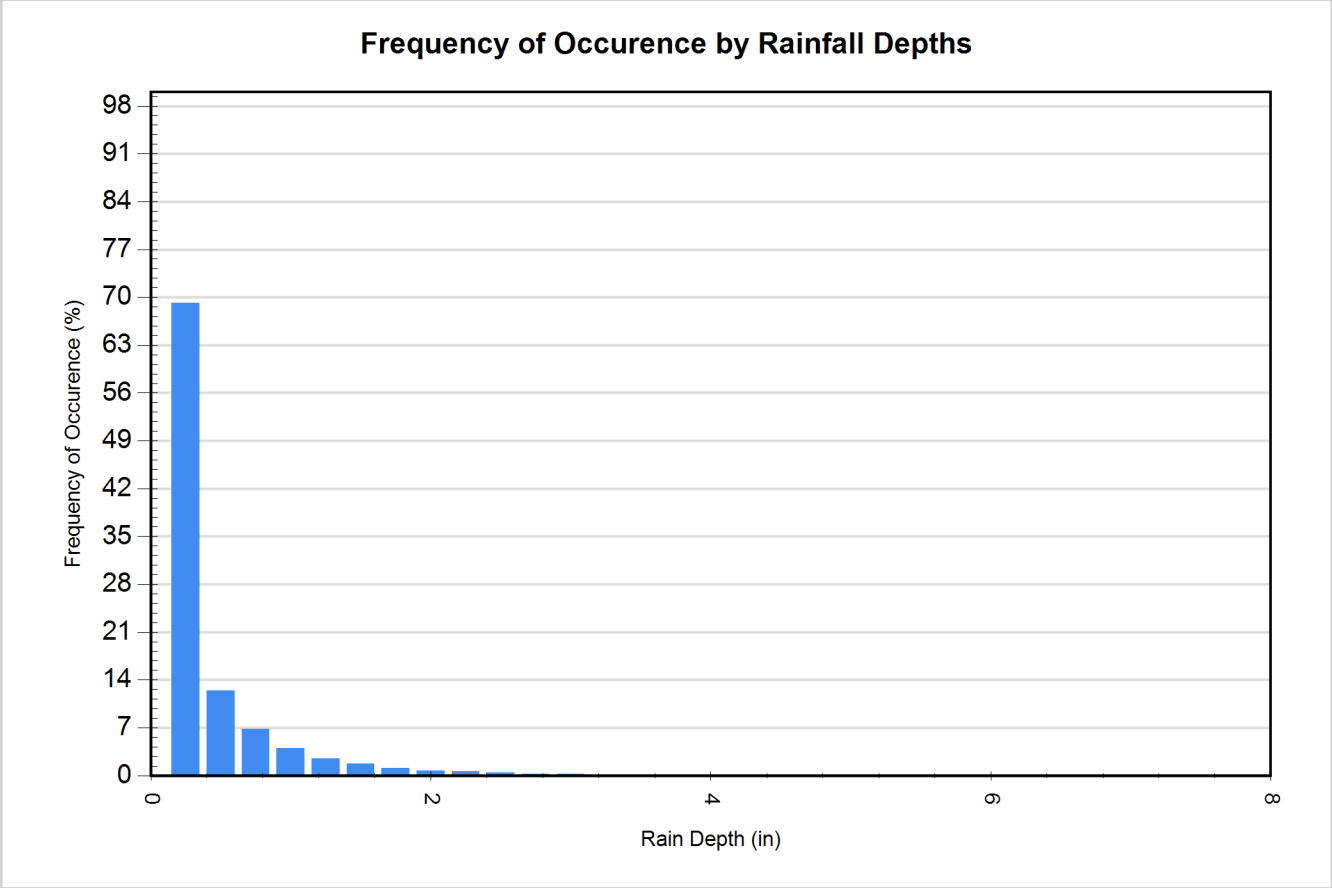
TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	**Runoff Volume (ft³)**	**Volume Over (ft³)**	**Cumulative Runoff Volume (%)**
0.035	895140	955337	48.4
0.141	1558727	291541	84.2
0.318	1776174	74012	96.0
0.565	1829818	20347	98.9
0.883	1845149	5010	99.7
1.271	1849101	1057	99.9
1.730	1850097	61	100.0
2.260	1850157	0	100.0



Rainfall Event Analysis				
Rainfall Depth (in)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (in)**	**Percentage of Annual Volume (%)**
0.25	5629	69.2	377	15.3
0.50	1007	12.4	370	15.0
0.75	550	6.8	341	13.9
1.00	322	4.0	280	11.4
1.25	201	2.5	226	9.2
1.50	137	1.7	189	7.7
1.75	89	1.1	144	5.9
2.00	57	0.7	107	4.3
2.25	48	0.6	102	4.1
2.50	29	0.4	69	2.8
2.75	16	0.2	42	1.7
3.00	17	0.2	48	2.0
3.25	7	0.1	22	0.9
3.50	4	0.0	13	0.5
3.75	5	0.1	18	0.7
4.00	4	0.0	16	0.6
4.25	2	0.0	8	0.3
4.50	2	0.0	9	0.4
4.75	2	0.0	9	0.4
5.00	4	0.0	20	0.8
5.25	1	0.0	5	0.2
5.50	0	0.0	0	0.0
5.75	3	0.0	17	0.7
6.00	0	0.0	0	0.0
6.25	1	0.0	6	0.2
6.50	1	0.0	6	0.3
6.75	1	0.0	7	0.3
7.00	0	0.0	0	0.0
7.25	1	0.0	7	0.3
7.50	0	0.0	0	0.0
7.75	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Detailed Stormceptor Sizing Report – STC Rear "A"

Project Information & Location			
Project Name	Baystate Engineering	**Project Number**	066-001
City	Bellingham	**State/ Province**	Massachusetts
Country	United States of America	**Date**	2/9/2024
Designer Information		**EOR Information (optional)**	
Name	Shane Oates	**Name**	
Company	Independence Engineering	**Company**	
Phone #	508-245-2608	**Phone #**	
Email	soates@centermountllc.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	STC Rear "A"
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	91
PSD	Fine Distribution
Rainfall Station	BOSTON WSFO AP

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	91
STC 900	94
STC 1200	95
STC 1800	95
STC 2400	96
STC 3600	97
STC 4800	97
STC 6000	98
STC 7200	98
STC 11000	99
STC 13000	99
STC 16000	99

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Massachusetts	**Total Number of Rainfall Events**	8140
Rainfall Station Name	BOSTON WSFO AP	**Total Rainfall (in)**	2457.1
Station ID #	0770	**Average Annual Rainfall (in)**	42.4
Coordinates	42°21'38"N, 71°0'38"W	**Total Evaporation (in)**	93.1
Elevation (ft)	20	**Total Infiltration (in)**	1405.2
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	958.8

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (acres)	0.43
Imperviousness %	42.0

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Design Details	
Stormceptor Inlet Invert Elev (ft)	
Stormceptor Outlet Invert Elev (ft)	102.94
Stormceptor Rim Elev (ft)	106.53
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	12
Pipe Material	HDPE - plastic
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	Yes

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	STC Rear "A"

Site Details

Drainage Area

Total Area (acres)	0.43
Imperviousness %	42.0

Surface Characteristics

Width (ft)	274.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

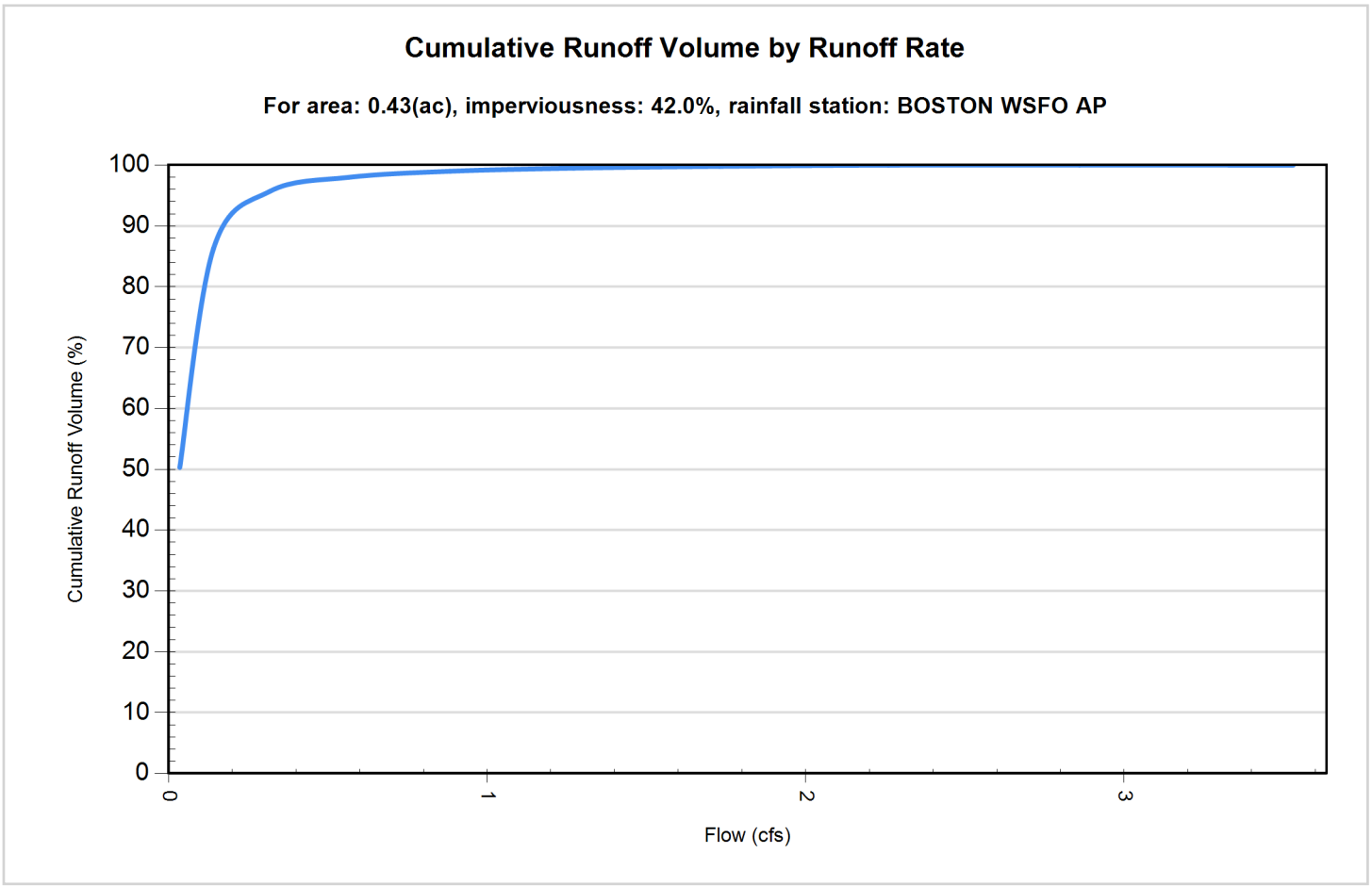
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

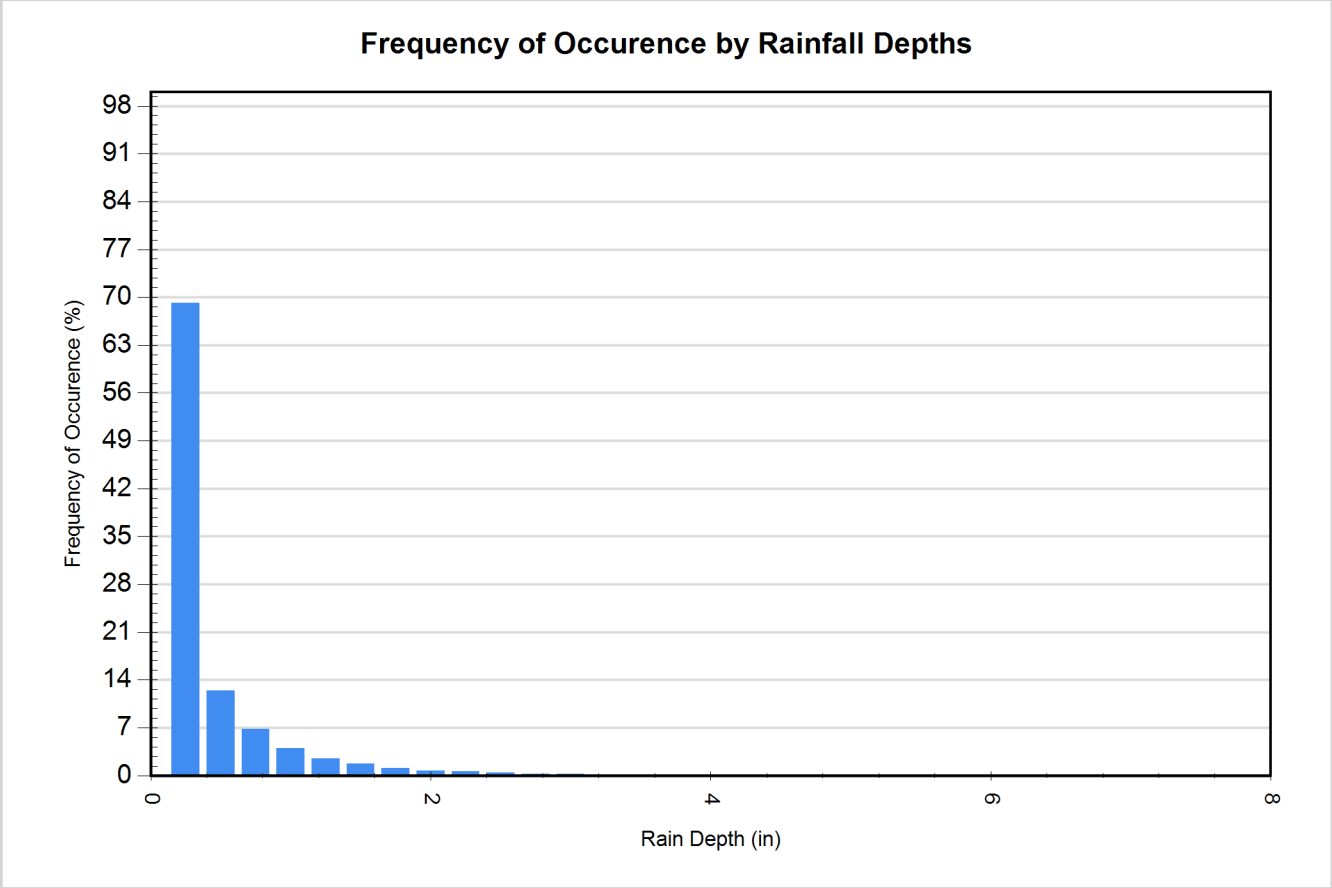
TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	780705	772384	50.3
0.141	1339617	213157	86.3
0.318	1486787	66013	95.7
0.565	1522348	30470	98.0
0.883	1537658	15166	99.0
1.271	1545628	7196	99.5
1.730	1549926	2904	99.8
2.260	1552164	667	100.0
2.860	1552641	191	100.0
3.531	1552832	0	100.0



Rainfall Event Analysis				
Rainfall Depth (in)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (in)**	**Percentage of Annual Volume (%)**
0.25	5629	69.2	377	15.3
0.50	1007	12.4	370	15.0
0.75	550	6.8	341	13.9
1.00	322	4.0	280	11.4
1.25	201	2.5	226	9.2
1.50	137	1.7	189	7.7
1.75	89	1.1	144	5.9
2.00	57	0.7	107	4.3
2.25	48	0.6	102	4.1
2.50	29	0.4	69	2.8
2.75	16	0.2	42	1.7
3.00	17	0.2	48	2.0
3.25	7	0.1	22	0.9
3.50	4	0.0	13	0.5
3.75	5	0.1	18	0.7
4.00	4	0.0	16	0.6
4.25	2	0.0	8	0.3
4.50	2	0.0	9	0.4
4.75	2	0.0	9	0.4
5.00	4	0.0	20	0.8
5.25	1	0.0	5	0.2
5.50	0	0.0	0	0.0
5.75	3	0.0	17	0.7
6.00	0	0.0	0	0.0
6.25	1	0.0	6	0.2
6.50	1	0.0	6	0.3
6.75	1	0.0	7	0.3
7.00	0	0.0	0	0.0
7.25	1	0.0	7	0.3
7.50	0	0.0	0	0.0
7.75	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Detailed Stormceptor Sizing Report – STC Rear "B"

Project Information & Location			
Project Name	Baystate Engineering	**Project Number**	066-001
City	Bellingham	**State/ Province**	Massachusetts
Country	United States of America	**Date**	2/9/2024
Designer Information		**EOR Information (optional)**	
Name	Shane Oates	**Name**	
Company	Independence Engineering	**Company**	
Phone #	508-245-2608	**Phone #**	
Email	soates@centermountllc.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	STC Rear "B"
Recommended Stormceptor Model	STC 450i
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	86
PSD	Fine Distribution
Rainfall Station	BOSTON WSFO AP

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	86
STC 900	90
STC 1200	90
STC 1800	91
STC 2400	93
STC 3600	94
STC 4800	95
STC 6000	95
STC 7200	96
STC 11000	97
STC 13000	98
STC 16000	98

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Massachusetts	**Total Number of Rainfall Events**	8140
Rainfall Station Name	BOSTON WSFO AP	**Total Rainfall (in)**	2457.1
Station ID #	0770	**Average Annual Rainfall (in)**	42.4
Coordinates	42°21'38"N, 71°0'38"W	**Total Evaporation (in)**	93.1
Elevation (ft)	20	**Total Infiltration (in)**	1405.2
Years of Rainfall Data	58	**Total Rainfall that is Runoff (in)**	958.8

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (acres)	0.43
Imperviousness %	42.0

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Design Details	
Stormceptor Inlet Invert Elev (ft)	
Stormceptor Outlet Invert Elev (ft)	102.94
Stormceptor Rim Elev (ft)	106.44
Normal Water Level Elevation (ft)	
Pipe Diameter (in)	12
Pipe Material	HDPE - plastic
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	Yes

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
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150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	STC Rear "B"

Site Details

Drainage Area

Total Area (acres)	0.43
Imperviousness %	42.0

Surface Characteristics

Width (ft)	274.00
Slope %	2
Impervious Depression Storage (in)	0.02
Pervious Depression Storage (in)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (in/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	

Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters

Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (cfs)	Runoff Volume (ft³)	Volume Over (ft³)	Cumulative Runoff Volume (%)
0.035	780705	772384	50.3
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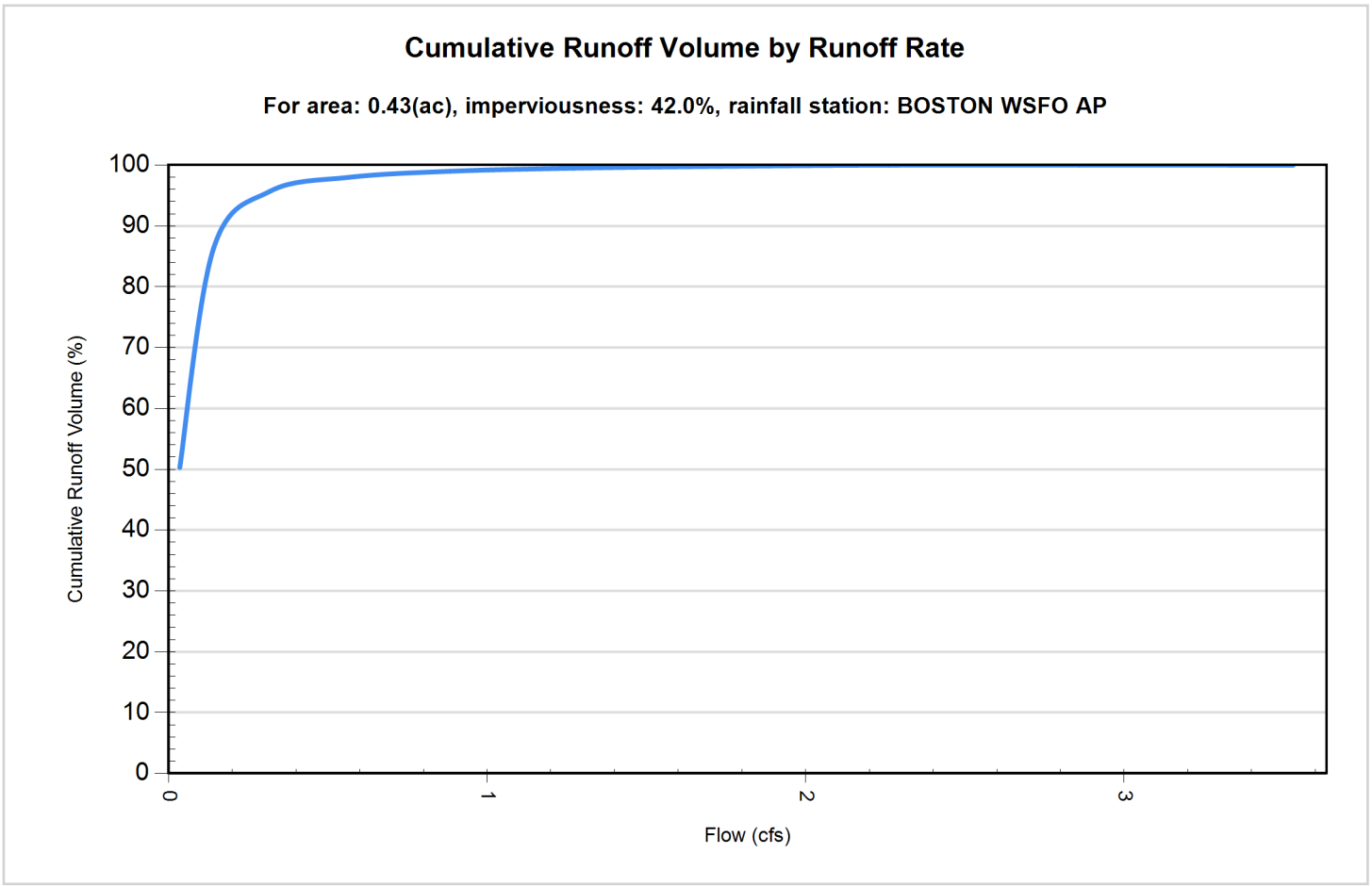

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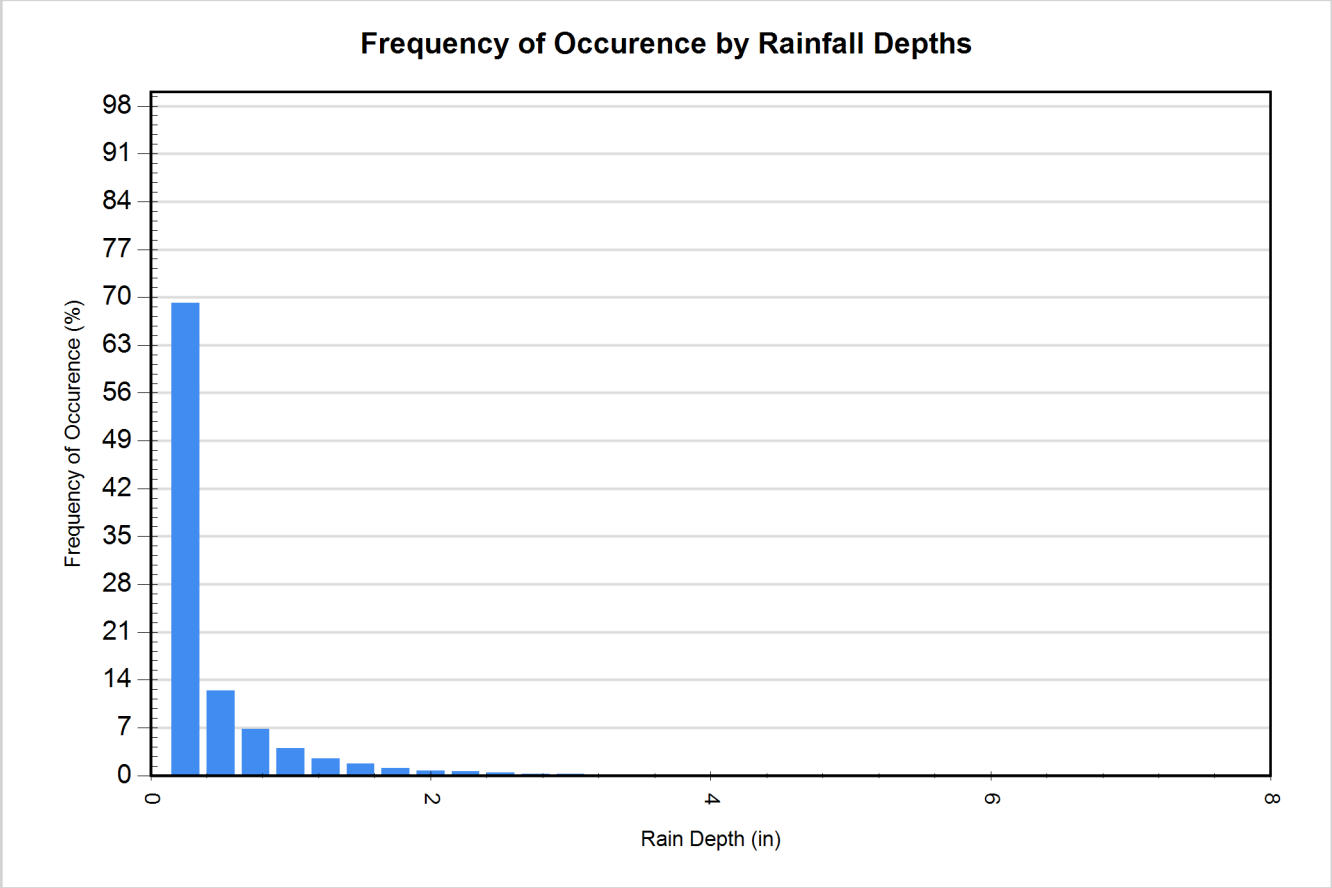
6.25	1	0.0	6	0.2
6.50	1	0.0	6	0.3
6.75	1	0.0	7	0.3
7.00	0	0.0	0	0.0
7.25	1	0.0	7	0.3
7.50	0	0.0	0	0.0
7.75	0	0.0	0	0.0



For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Stormceptor® STC

Stormceptor STC is the recognized leader in stormwater treatment, offering a range of versatile treatment systems that effectively remove pollutants from stormwater and snowmelt runoff. Stormceptor is flexibly designed to protect waterways from hazardous material spills and stormwater pollution, including suspended sediment, free oils, and other pollutants that attach to particles, no matter how fierce the storm.

Stormceptor's scour prevention technology ensures pollutants are captured and contained during all rainfall events.

Ideal uses

- Sediment (TSS) removal
- Spill control
- Debris and small floatables capture
- Pretreatment for filtration, detention/retention systems, ponds, wetlands, Low Impact Development (LID), green infrastructure, and water-sensitive urban design

Learn More:
www.ContechES.com/stormceptor

Proven performance

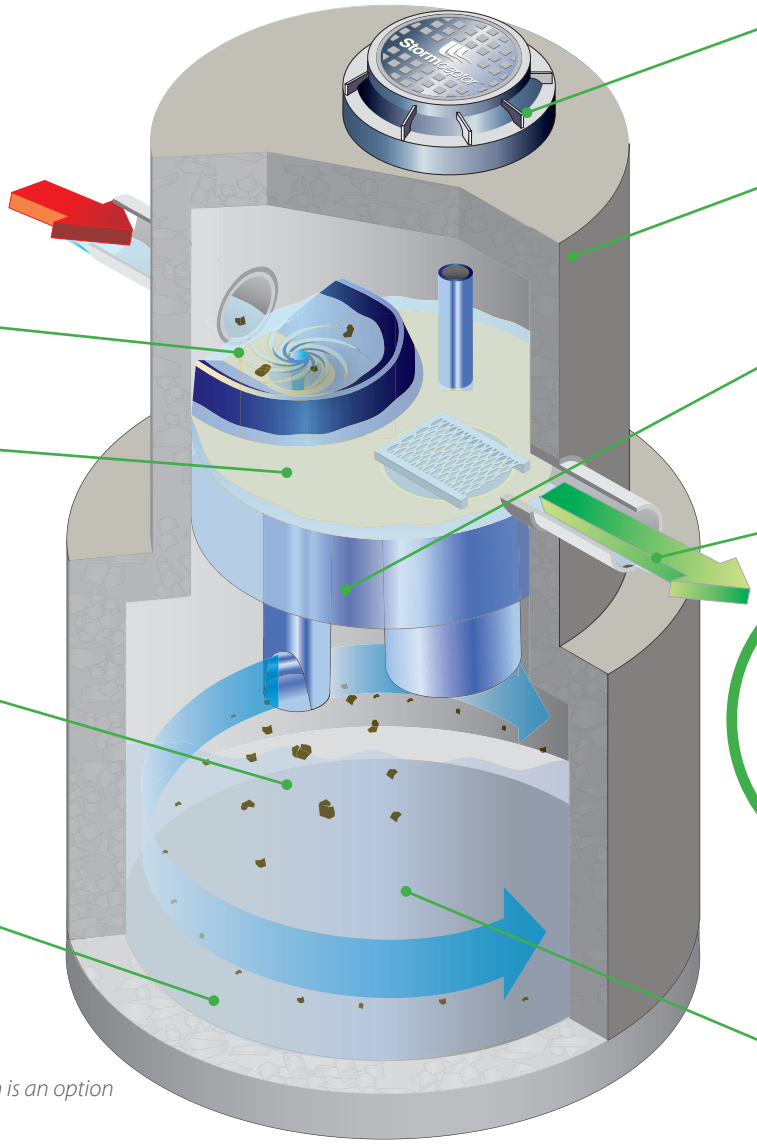
With more than 20 years of industry experience, Stormceptor has been performance tested and verified by some of the most stringent technology evaluation programs in North America.

- NJCAT
- Washington ECOLOGY
- EN858 Class 2

FEATURE	BENEFIT
Patented scour prevention technology	Superior pollutant removal and retention
Can take the place of a conventional junction or inlet structure	Eliminates the need for additional structures
Minimal drop between inlet and outlet	Site flexibility
Multiple inlets can connect to a single unit	Design flexibility
3rd party tested and verified performance (Sediment & Oil)	Eliminates the need for a separate bypass structure

With over 40,000 units operating worldwide, Stormceptor performs and protects every day, in every storm.

Stormceptor® STC



Surface access for ease of maintenance

Durable precast concrete

Impervious liner provides double wall containment for hydrocarbons

Treated water exits the unit

Free oils are trapped for later removal

Weir directs water into lower chamber

Patented technology prevents captured pollutant from scouring

Captures and stores a wide range of particle sizes, from 20 to 2,000 microns, for later removal

Sediment lies dormant for later removal

Quiescent chamber creates ideal conditions for free oils to rise and sediment to settle

* *Fiberglass construction is an option*

EASY TO INSTALL

Small footprint saves time and money with limited disruption to your site.

SEAMLESS

Minimal drop between inlet and outlet pipes makes Stormceptor ideal for retrofits and new development projects.

FLEXIBLE

Multiple inlets can connect to a single unit. Can be used as a bend structure.

A calm treatment environment

SECTION (_____)
STORM WATER TREATMENT DEVICE

1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the Stormceptor® by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 The Contractor shall furnish all labor, equipment and materials necessary to install the storm water treatment device(s) (SWTD) and appurtenances specified in the Drawings and these specifications.

1.3 The manufacturer of the SWTD shall be one that is regularly engaged in the engineering design and production of systems deployed for the treatment of storm water runoff for at least five (5) years and which have a history of successful production, acceptable to the Engineer. In accordance with the Drawings, the SWTD(s) shall be a Stormceptor® device manufactured by:

Contech Engineered Solutions LLC
9025 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.4 Related Sections

1.4.1 Section 02240: Dewatering
1.4.2 Section 02260: Excavation Support and Protection
1.4.3 Section 02315: Excavation and Fill
1.4.4 Section 02340: Soil Stabilization

1.5 All components shall be subject to inspection by the engineer at the place of manufacture and/or installation. All components are subject to being rejected or identified for repair if the quality of materials and manufacturing do not comply with the requirements of this specification. Components which have been identified as defective may be subject for repair where final acceptance of the component is contingent on the discretion of the Engineer.

1.6 The manufacturer shall guarantee the SWTD components against all manufacturer originated defects in materials or workmanship for a period of twelve (12) months from the date the components are delivered to the owner for installation. The manufacturer shall upon its determination repair, correct or replace any manufacturer originated defects advised in writing to the manufacturer within the referenced warranty period. The use of SWTD components shall be limited to the application for which it was specifically designed.

1.7 The SWTD manufacturer shall submit to the Engineer of Record a “Manufacturer’s Performance Certification” certifying that each SWTD is capable of achieving the specified removal efficiencies listed in these specifications.

1.8 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

2.0 MATERIALS

2.1 Housing unit of stormwater treatment device shall be constructed of pre-cast or cast-in-place concrete, no exceptions. Precast concrete components shall conform to applicable sections of ASTM C 478, ASTM C 857 and ASTM C 858 and the following:

- 2.1.1 Concrete shall achieve a minimum 28-day compressive strength of 4,000 pounds per square-inch (psi);
- 2.1.2 Unless otherwise noted, the precast concrete sections shall be designed to withstand lateral earth and AASHTO H-20 traffic loads;
- 2.1.3 Cement shall be Type III Portland Cement conforming to ASTM C 150;
- 2.1.4 Aggregates shall conform to ASTM C 33;
- 2.1.5 Reinforcing steel shall be deformed billet-steel bars, welded steel wire or deformed welded steel wire conforming to ASTM A 615, A 185, or A 497.
- 2.1.6 Joints shall be sealed with preformed joint sealing compound conforming to ASTM C 990.
- 2.1.7 Shipping of components shall not be initiated until a minimum compressive strength of 4,000 psi is attained or five (5) calendar days after fabrication has expired, whichever occurs first.

2.2 Internal Components and appurtenances shall conform to the following:

- 2.2.1 Hardware shall be manufactured of Type 316 stainless steel conforming to ASTM A 320;
- 2.2.2 Fiberglass components shall conform to applicable sections of ASTM D-4097
- 2.2.3 Access system(s) conform to the following:
- 2.2.4 Manhole castings shall be designed to withstand AASHTO H-20 loadings and manufactured of cast-iron conforming to ASTM A 48 Class 30.
- 2.2.5 Ladder rungs to be provided upon request
- 2.2.6 An aluminum safety grate shall be installed within the chamber of the unit

3.0 PERFORMANCE

3.1 The HDS device shall remove oil and sediment from stormwater during frequent wet weather events and retain these pollutants within the device for later removal.

3.2 The HDS device shall be engineered, designed and sized to treat a minimum of 90 percent of the annual runoff volume using a widely accepted continuous simulation runoff model which uses rainfall data records which includes antecedent conditions as well as rainfall periods. Rainfall records should be comprised of 15-years of rainfall data or a longer continuous period if available for a given location, but in all cases at least a minimum of 5-years continuous rainfall.

3.3 The HDS device shall be capable of removing the Engineer-specified total suspended solids (TSS) load, without scouring previously captured pollutants.

3.4 The HDS device shall be sized to remove the Engineer-specified total suspended sediment (TSS) load using the particle size distribution (PSD) in Table 3.5, in addition to adhering to sections 3.2 & 3.4 of this specification. No alternative PSDs or deviations from Table 3.5 shall be accepted.

Table 3.5 – Particle Size Distribution		
Particle Size Distribution to be used to size HDS		
Particle Diameter (Micron)	% by Mass of All Particles	Specific Gravity
1000	**5%**	**2.65**
500	**5%**	**2.65**
250	**15%**	**2.65**
150	**15%**	**2.65**
100	**10%**	**2.65**
75	**5%**	**2.65**
50	**10%**	**2.65**
20	**15%**	**2.65**
8	**10%**	**2.65**
5	**5%**	**2.65**
2	**5%**	**2.65**

4.0 EXECUTION

4.1 The contractor shall exercise care in the storage and handling of the SWTD components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be borne by the contractor.

4.2 The SWTD shall be installed in accordance with the manufacturer's recommendations and related sections of the contract documents. The manufacturer shall provide the contractor installation instructions and offer on-site guidance during the important stages of the installation as identified by the manufacturer at no additional expense. A minimum of 72 hours' notice shall be provided to the manufacturer prior to their performance of the services included under this subsection.

4.3 The contractor shall fill all voids associated with lifting provisions provided by the manufacturer. These voids shall be filled with non-shrinking grout providing a finished surface consistent with adjacent surfaces. The contractor shall trim all protruding lifting provisions flush with the adjacent concrete surface in a manner, which leaves no sharp points or edges.

4.4 The contractor shall removal all loose material and pooling water from the SWTD prior to the transfer of operational responsibility to the Owner.

TABLE 1: Storm Water Treatment Device Storage Capacities

STC Model	Hydrocarbon Storage Capacity (gal)	Sediment Capacity (ft3)	EOS Model	Hydrocarbon Storage Capacity (gal)
450	86	46	4-175	175
900	251	89	9-365	365
1200	251	127	12-590	591
1800	251	207	18-1000	1198
2400	840	205	24-1400	1457
3600	840	373	36-1700	1773
4800	909	543	48-2000	2005
6000	909	687	60-2500	2514
7200	1059	839	72-3400	3418
11000*	2797	1089	110-5000*	5023
13000*	2797	1374	130-6000*	6041
16000*	3055	1677	160-7800*	7850

**Consist of two chamber structures in series*

END OF SECTION

TESTING SUMMARY

Massachusetts Strategic Envirotechnology Partnership (STEP) Program

Stormceptor® Report

Summary: The Massachusetts STEP Program has completed a six month thorough evaluation of the function and performance tests of the Stormceptor® System. Upon the completion of the evaluation and verification program, which occurred during the end of December 1997, the STEP Program summarized its findings which are listed below:

- Performance data available demonstrates that the Stormceptor® can provide TSS removal rates of 77% when sized according to the "Sensitive Area" criteria.
- Evidence suggests that the Stormceptor® System may be capable of achieving TSS removal rates between 89% and 99% under certain climate conditions and land use intensity when sized accordingly.
- Performance data available suggest that the Stormceptor® System can provide TSS removal rates of 52% when sized according to the "Treatment Train" criteria.
- Use of the Stormceptor® System as a stand alone device may be justified when sized according to the Sensitive Area criteria.
- The Stormceptor® System is useful for new and retrofit installations in Standard 7 of DEP's Stormwater Management Policy and Standards (DEP and CZM 1997), especially where space is limited
- The Stormceptor® System is also suited for secondary sediment control from construction related sediment loads specified in Standard 8 of DEP's Stormwater Management Policy and Standards

In March 1997, the Massachusetts Department of Environmental Protection (DEP) issued Stormwater Management Standards* to address both qualitative and quantitative controls to protect waters of the Commonwealth of Massachusetts from impacts of untreated stormwater runoff. Local Conservation Commissions will implement DEP's new Stormwater Policy through the Standards. The Standards establish the level of required controls that can be achieved primarily through the installation of Best Management Practices (BMPs).

Opportunities exist for the use of innovative stormwater technologies such as the Stormceptor® System especially in areas where site constraints are very difficult to install the more typical BMP's such as retention ponds. With the increase in the use of innovative technologies, DEP has entered into an agreement with the Commonwealth's Strategic Envirotechnology Partnership (STEP) Program to allow for the verification of the function and performance of stormwater innovative systems. Upon verification by the STEP Program, local Conservation Commissions are allowed to accept the use of the innovative systems. DEP also allows for independent verification by local conservation commissions. The Massachusetts STEP is part of a six-state partnership for Environmental Technology including Illinois, California, Pennsylvania, New Jersey and New York.

In summary, the Massachusetts STEP Program reports that the Stormceptor® System "should be capable of providing an effective solution for treatment of stormwater runoff" (STEP Technology Assessment, Draft Report, December 1997**).

Stormceptor®

TECHNICAL SHEET

Stormceptor has TARP covered

TARP Tier I Approval Verifies Stormceptor's Superior Performance

What is TARP?

TARP (Technology Acceptance and Reciprocity Partnership) was established in 2000 as a standardized method of evaluating the performance of stormwater treatment technologies.

The TARP program is a three-tiered process that includes rigorous laboratory testing, field tests and regulatory permits. TARP standards are currently recognized by eight participating states - New Jersey, California, Illinois, Maryland, Massachusetts, New York, Pennsylvania and Virginia.

What does TARP do?

TARP's certification program provides scientific data on stormwater technologies and related performance claims, which helps:

- Regulators and engineers make sound decisions when addressing stormwater treatment needs.
- Spread technology performance data quickly, giving jurisdictions an opportunity to better meet their water quality objectives.

How was Stormceptor recognized by TARP?

In February 2005, Stormceptor received TARP Tier I interim certification from the New Jersey Department of Environmental Protection (NJDEP), verifying Stormceptor's ability to perform beyond normal operational capacity during extreme rainfall.

What does TARP test for?

TARP Tier I focused on the removal of total suspended solids (TSS) and scour testing under various operating rates and sediment loadings. Seven stormwater treatment technologies were tested, including the Stormceptor System.

Particle Size Distribution (PSD) testing

Stormceptor was one of only two units tested to utilize the NJDEP PSD testing – treating a sample of particles between one and 1,000 microns. Instead of following TARP standards, the other technologies opted to test a preferred particle size range that best suited their unit's performance (see TARP Tier I – Hydrodynamic Comparison Results) – testing coarser, larger particles that are easier to remove.

Of the devices tested, Stormceptor removed the broadest range of pollutants.

Total Suspended Solids (TSS) removal efficiency

TARP protocol required testing at varying TSS concentrations – 100 mg/L, 200 mg/L, 300 mg/L, with the unit filled to 50% of the recommended capacity before maintenance.

How did Stormceptor perform?

Of all the technologies tested, Stormceptor recorded the highest TSS removal while removing a significant portion of clay and fine silts (NJDEP PSD).

Stormceptor:	75% TSS removal, tested with NJDEP fine PSD
High Efficiency CDS:	73.7%, tested with a much coarser PSD than NJDEP PSD
Downstream Defender:	70%, tested with sand particles
VortSentry:	69%, tested with sand particles
Vortechs:	64%, tested with a much coarser PSD than NJDEP PSD
Aquaswirl:	60%, tested with sand particles
BaySaver:	51%, tested with NJDEP fine PSD

Not only did Stormceptor record the highest TSS removal, it did so removing NJDEP's specified PSD, meaning it removed both a higher percentage as well as a broader range of particles than the other technologies.

Scour test results

Stormceptor was one of only two technologies that completed the scour test as mandated by NJDEP. **Tests demonstrated Stormceptor did not scour with the unit loaded to design capacity.**

The calm *during* the storm

Stormceptor removes more pollutants from stormwater than any other separator. Stormceptor does not scour as the flow rate increases, maintaining a continuous positive treatment of suspended solids. Stormceptor is designed to remove a wide range of particles, as well as free oils, heavy metals and nutrients that attach to fine sediment. Units can also be designed to remove a specific particle size distribution.

With over 18,000 units operating worldwide, Stormceptor protects waterways every day in every storm.

TARP TIER I - Hydrodynamic Comparison Results[1]

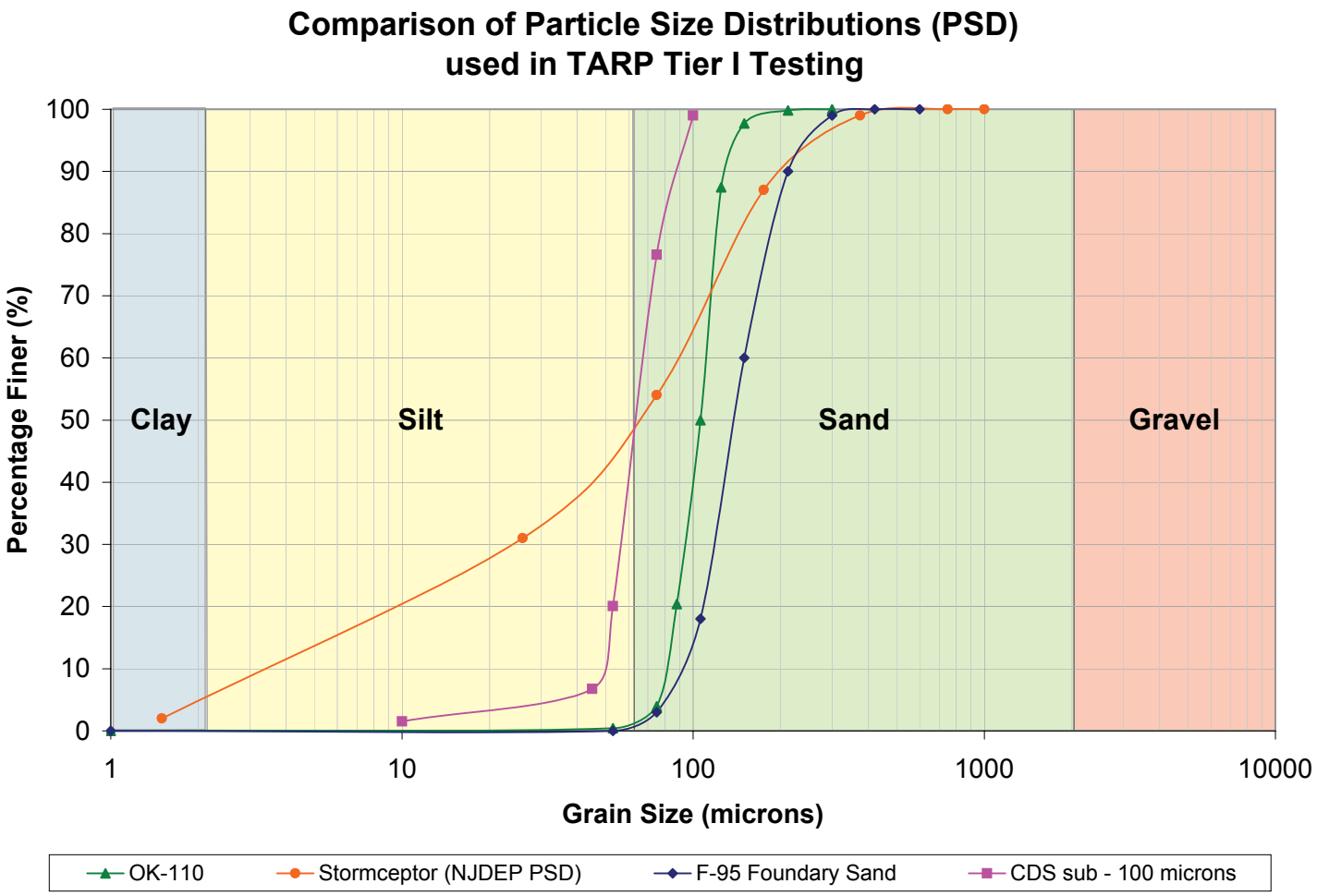
DESCRIPTION			HYDRODYNAMIC DEVICES						
			Stormceptor	High Efficiency CDS	Downstream Defender	VortSentry	Vortechs	Aquaswirl	Baysaver System
MODEL TESTED		Model ID	**STC 900**	New Design: PMSU20_20_6 (tank diameter incr. by 1 foot, diff. baffle arrangement)	4-FT	VS40	Model 2000	AS-3	1K
		Treatment Chamber Diameter (ID)	**6 ft**	6 ft	4 ft	4 ft	4 ft	2.5 ft	2 ft
		Marketed Water Quality Peak Flow Treatment Capacity	**n/a** [2]	1.1 cfs (31.1 L/s)	3.0 cfs (85 L/s)	1.1 cfs (31.1 L/s)	2.8 cfs (79.3 L/s)	1.8 cfs (51 L/s)	2.4 cfs (68 L/s)
		100% Operating Rate Tested	**0.64 cfs (18 L/s)**	1.1 cfs (31.1 L/s)	1.1 cfs (31.1 L/s)	1.1 cfs (31.1 L/s)	1.12 cfs (32 L/s) **(40 % of Original)**	0.9 cfs (30.6 L/s) **(60 % of Original)**	1.1 cfs (31 L/s) **(46 % of Original)**
		Original Physical Design Tested	**YES**	**NO** (New Design: Increased Tank Volume & Changed Baffle Arrangement)	YES	YES	YES	YES	YES
NJCAT VERIFICATION	PARTICLE SIZE USED	Used NJCAT Specified PSD	**YES**	**NO**	**NO**	**NO**	**NO**	**NO**	YES
		PSD Range	**NJCAT PSD Tested**	10-100 µm (i.e. fines washed out of sediment samples used via plankton nets)	53 - 300 µm	53 - 300 µm	38 - 75 µm	50 - 150 µm	NJCAT PSD Tested
		PSD Name		**sub-100 PSD**	**F-95 Sand**	**F-95 Sand**		**OK-110**	
			Refer to Particle Size Distribution (PSD) Chart for details & differences between the distributions used						
	TSS REMOVAL RESULTS	100% Operating Rate Tested	**YES**	YES	YES	YES	**NO** (Up to **40%** of operating rate tested)	**NO** (Up to **60%** of operating rate tested)	**NO** (Up to **46%** of operating rate tested)
		125% Operating Rate Tested	**YES**	**NO**	YES	YES	**NO**	**NO**	**NO**
		Pre-loaded unit at 50% Sediment Capacity prior to evaluating performance	**YES**	**NO**	**NO**	YES	**NO**	**NO**	YES
		NJCAT Verification For TSS Removal	**75 % TSS** (up to 125% of operating rate)	**73.7 % TSS** (up to 100% of operating rate)	**70 % TSS** (up to 125% of operating rate)	**69 % TSS** (up to 125% of operating rate)	**64 % TSS** (up to **40%** of operating rate)	**60 % TSS** (up to **60%** of operating rate)	**51 % TSS** (up to **46%** of operating rate)
	SCOUR TEST RESULTS	Scour Test Performed	**YES**	**NO**	**NO**	YES	**NO**	**NO**	Yes - in second chamber only
		50% Sediment Loading Capacity at 125% Operating Rate	**NO SCOUR** **0 ppm**	**Not Tested**	**Not Tested**	NO SCOUR 0 ppm	**Not Tested**	**Not Tested**	SCOUR 11 ppm
		100% Sediment Loading Capacity at 125% Operating Rate (Level were maintenance is recommended)	**NO SCOUR** [3] **3 ppm**	**Not Tested**	**Not Tested**	SCOUR 8 ppm	**Not Tested**	**Not Tested**	SCOUR 16 ppm
TARP TIER I NJDEP INTERIM APPROVAL		NJDEP Accepted NJCAT Verified Value for TSS Removal	**Interim Approval set at 50% TSS**	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS	Interim Approval set at 50% TSS
		Original Design Approved by NJDEP	**YES**	**NO** Only the "new" high efficiency design can be used. Original CDS design not approved.	YES	YES	**NO** Must reduce original flow capacity marketed in literature by 60%.	**NO** Must reduce original flow capacity marketed in literature by 50%.	**NO** Must reduce original flow capacity marketed in literature by 54%; Must increase tank surface area by 44% to 79% for design safety.

1. The Technology Acceptance and Reciprocity Partnership (TARP) is a workgroup of the Environmental Council of States (ECOS) that was originally made up of California, Illinois, Maryland, Massachusetts, New Jersey, New York, Pennsylvania and Virginia. Source of all NJDEP & TARP documented information: www.state.nj.us/dep/dsr/bscit/CertifiedMain.htm .

2. Stormceptor is marketed and designed to achieve water quality objectives, rather than sizing primarily for flow-based criteria.

3. Indicated in the NJDEP interim-certification letter (Feb. 15, 2005) which can be obtained from the below web link, Stormceptor did not scour at a 125% operating rate and 100% unit sediment loading. 3 ppm is considered to be within the tolerance of the testing error.

For NJDEP Interim Certified Stormwater Technologies go to: **http://www.state.nj.us/dep/dsr/bscit/CertifiedMain.htm**



TIER I - Lab Testing Protocol

1. Measure TSS Removal Efficiency

- Influent concentrations: 100, 200, 300 mg/L
- Five operating rates (25, 50, 75, 100, 125%)
- 50% pre-loaded with sediment

2. Measure Scouring / Re-suspension

- 50% and 100% pre-loaded at 125% operating rate

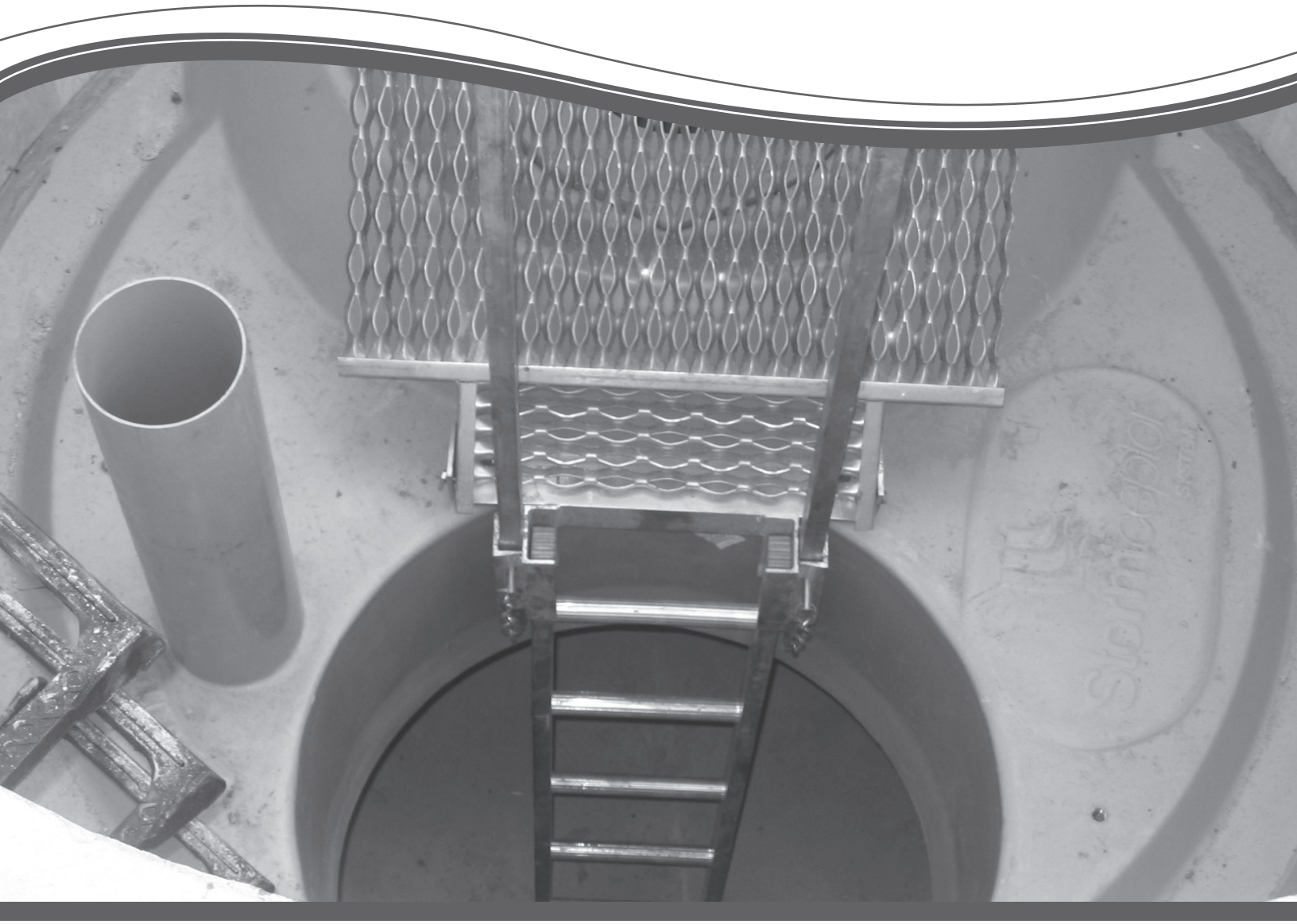
3. Utilize Pre-defined NJDEP Particle Size Distribution

- 5% clay / 40% silt / 55% sand

Source of all NJDEP and TARP documented information, go to: http://www.state.nj.us/dep/dsr/bscit/CertifiedMain.htm

CONTECH®
ENGINEERED SOLUTIONS

Stormceptor® STC
Operation and Maintenance Guide



Stormceptor® STC

Stormceptor Design Notes

- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.

Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences			
Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in. (75 mm)	1 in. (25 mm)	3 in. (75 mm)
Multiple inlet pipes	3 in. (75 mm)	3 in. (75 mm)	Only one inlet pipe.

Maximum inlet and outlet pipe diameters:

Inlet/Outlet Configuration	Inlet Unit STC 450i	In-Line Unit STC 900 to STC 7200	Series* STC 11000 to STC 16000
Straight Through	24 inch (600 mm)	42 inch (1050 mm)	60 inch (1500 mm)
Bend (90 degrees)	18 inch (450 mm)	33 inch (825 mm)	33 inch (825 mm)

- The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to crown is 2 feet (0.6 m)
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
- Top of grade elevation
- Stormceptor inlet and outlet pipe diameters and invert elevations
- Standing water elevation
- Stormceptor head loss, K = 1.3 (for submerged condition, K = 4)

Stormceptor® STC

OPERATION AND MAINTENANCE GUIDE
Table of Content

1. About Stormceptor

The Stormceptor® STC (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

1.1. Patent Information

The Stormceptor technology is protected by the following patents:

- Australia Patent No. 693,164 • 693,164 • 707,133 • 729,096 • 779401
- Austrian Patent No. 289647
- Canadian Patent No 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- China Patent No 1168439
- Denmark DK 711879
- German DE 69534021
- Indonesian Patent No 16688
- Japan Patent No 9-11476 (Pending)
- Korea 10-2000-0026101 (Pending)
- Malaysia Patent No PI9701737 (Pending)
- New Zealand Patent No 314646
- United States Patent No 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- Stormceptor OSR Patent Pending • Stormceptor LCS Patent Pending

2. Stormceptor Design Overview

2.1. Design Philosophy

The patented Stormceptor System has been designed to focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum AASHTO HS-20)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18" (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

3. Key Operation Features

3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{6_H} = \frac{Q}{A_S}$$

Where:

v_{SC} = critical settling velocity, ft/s (m/s)

H = tank depth, ft (m)

$Ø_H$ = hydraulic detention time, ft/s (m/s)

Q = volumetric flow rate, ft3/s (m3/s)

A_S = surface area, ft^2 (m^2)

(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (457 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall into the surrounding soils.

4. Stormceptor Product Line

4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

Table 1. Stormceptor Models

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Maximum Sediment Capacity ft^3 (L)
STC 450i	470 (1,780)	86 (330)	46 (1,302)
STC 900	952 (3,600)	251 (950)	89 (2,520)
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)
STC 11000	11,194 (42,370)	2,797 (10, 590)	1,086 (30,752)
STC 13000	13,348 (50,530)	2,797 (10, 590)	1,374 (38,907)
STC 16000	15,918 (60,260)	3,055 (11, 560)	1,677 (47,487)

NOTE: Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

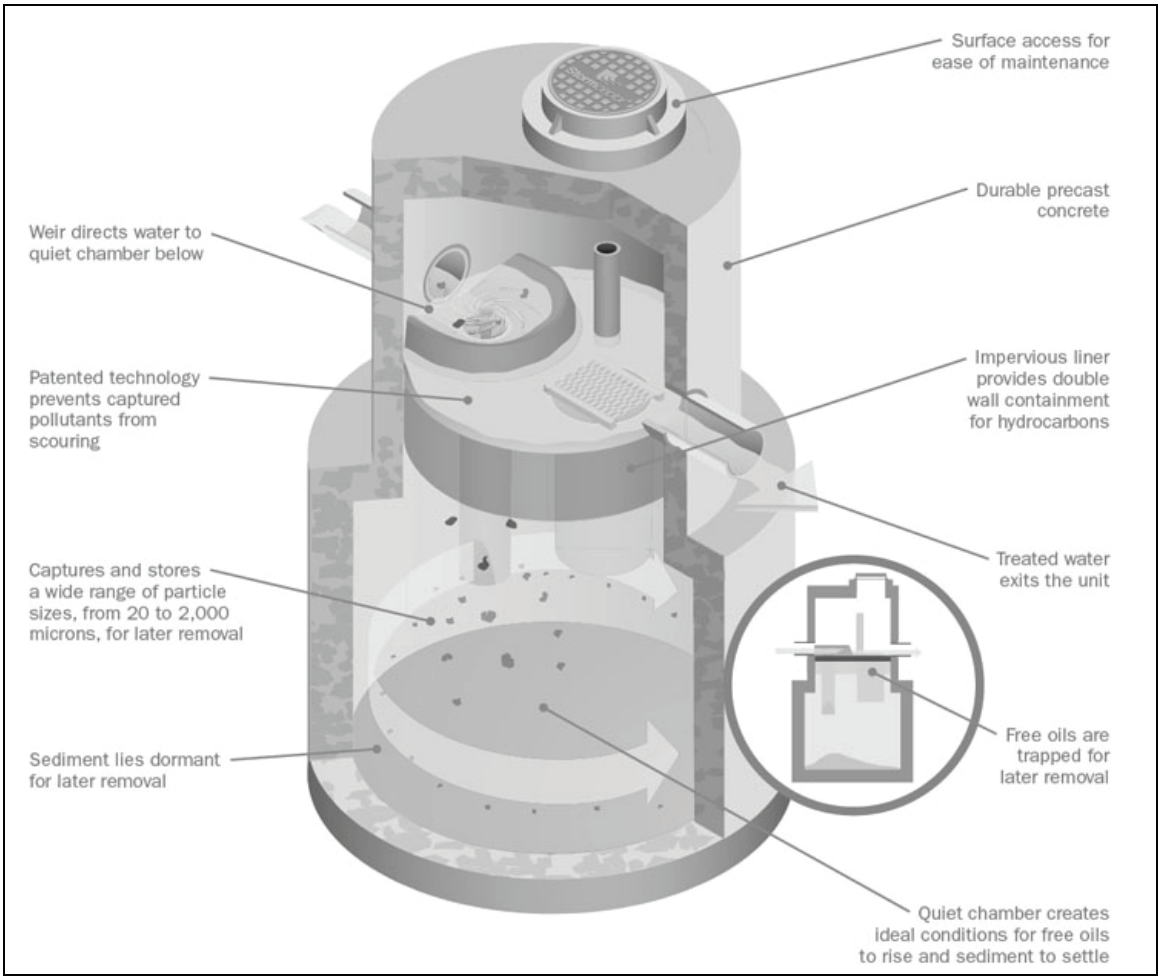


Figure 1. Inline Stormceptor

Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

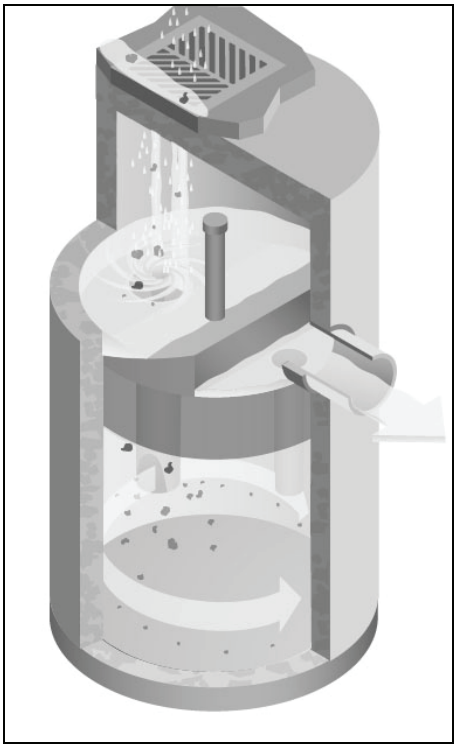


Figure 2. Inlet Stormceptor

4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

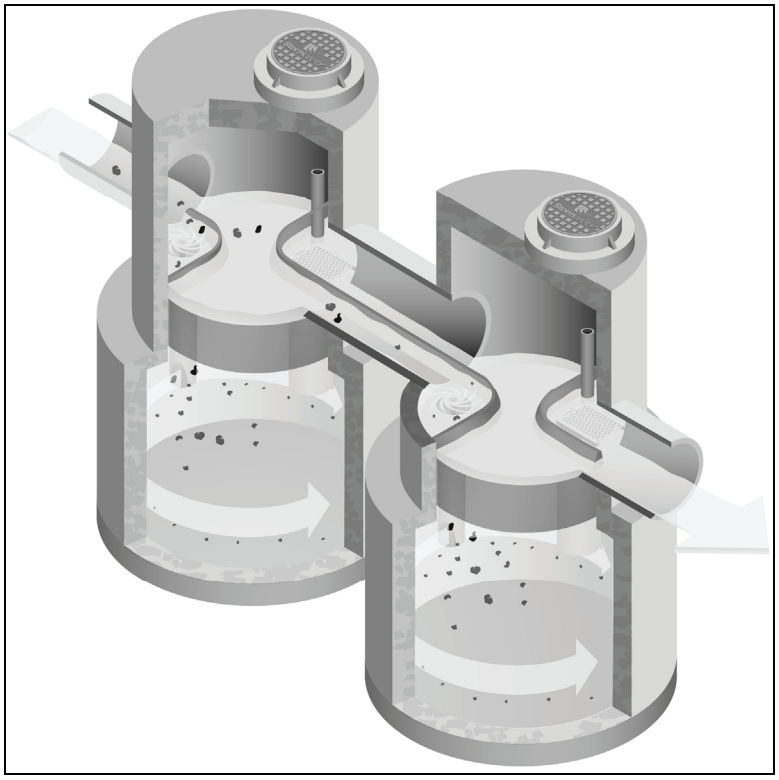


Figure 3. Series System

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

STEP 1 – Project Details

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

STEP 2 – Site Details

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

STEP 3 – Upstream Attenuation

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

STEP 4 – Particle Size Distribution

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

Table 2. Fine Distribution

Particle Size	Distribution	Specific Gravity
20	20%	1.3
60	20%	1.8
150	20%	2.2
400	20%	2.65
2000	20%	2.65

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

STEP 5 – Rainfall Records

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

STEP 6 – Summary

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

STEP 7 – Sizing Summary

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge). The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
    - » The hydrology of the local area is properly and accurately incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
    - » The distribution of TSS with the hydrology is properly and accurately considered in the sizing
    - » Particle size distribution is properly considered in the sizing
    - » The sizing can be optimized for TSS removal
    - » The cost benefit of alternate TSS removal criteria can be easily assessed
    - » The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit www.imbriumsystems.com to download a free copy of the program.

5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

Typical Sites

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

Unstable Sites

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting a proper unit sized for such unstable sites.

6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

'Spill Capture' describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil

level alarm is designed to trigger at approximately 85% of the unit's available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection.

The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

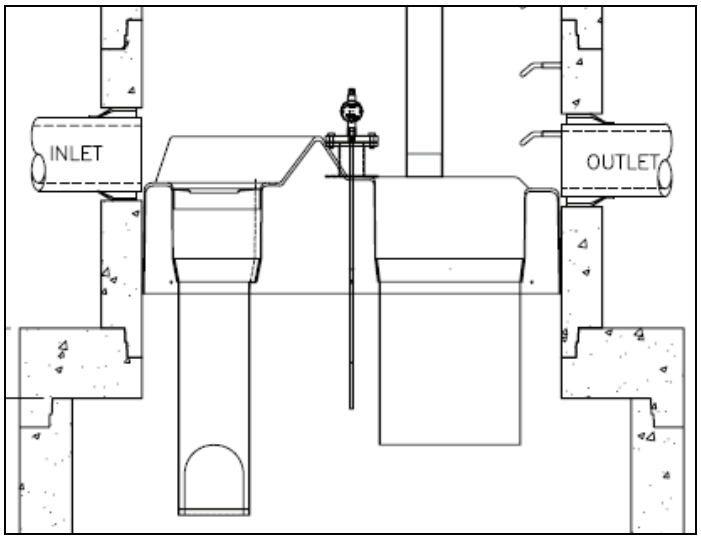


Figure 4. Oil level alarm

6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

7.1. Installation Depth Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters

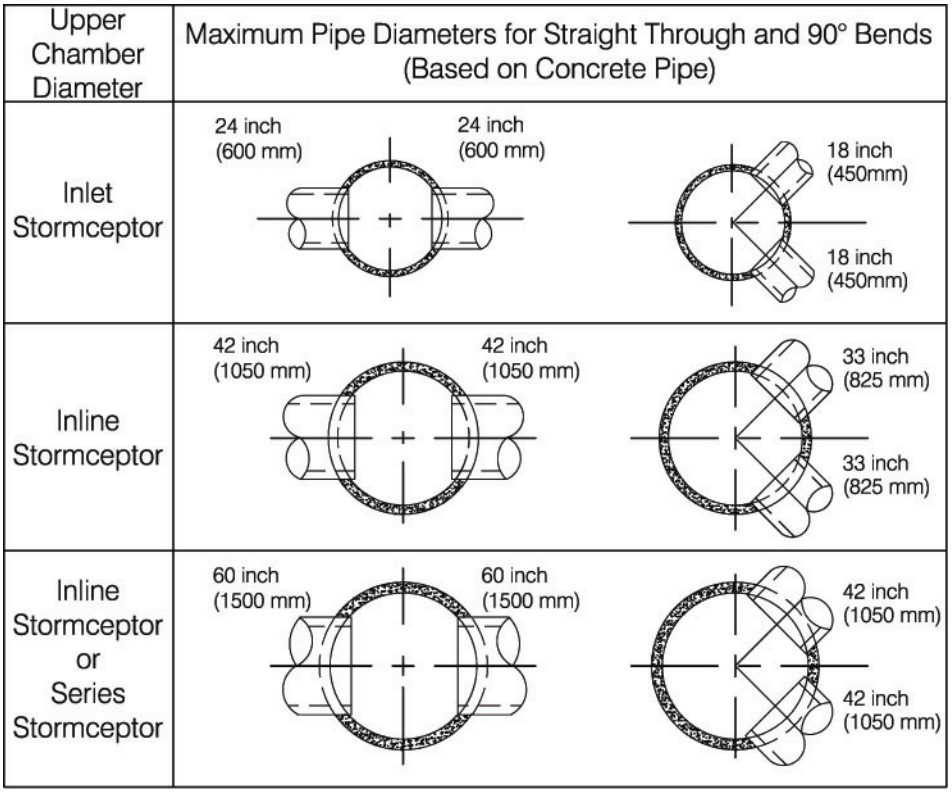


Figure 5. Maximum pipe diameters for straight through and bend applications

*The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations of the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

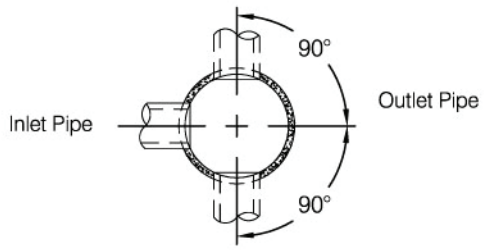
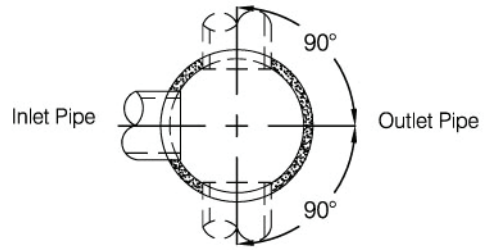
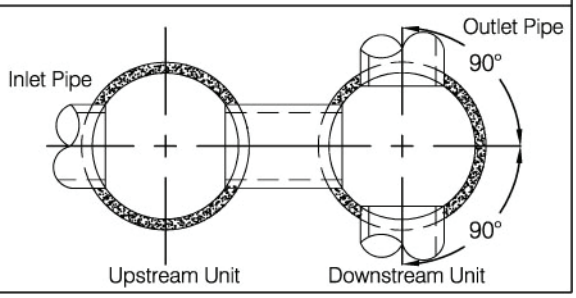
Stormceptor System	Maximum Bend Configurations
Inlet Stormceptor	
Inline Stormceptor	
Series Stormceptor	

Figure 6. Maximum bend angles

7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

Table 3. Recommended Drops Between Inlet and Outlet Pipe Inverts

Number of Inlet Pipes	Inlet System	In-Line System	Series System
1	3 inches (75 mm)	1 inch (25 mm)	3 inches (75 mm)
>1	3 inches (75 mm)	3 inches (75 mm)	Not Applicable

7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (AASHTO HS- 20). When the project requires live loads greater than HS-20, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life- cycle maintenance cost.

7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a manhole. The K value for calculating minor losses is approximately 1.3 (minor loss = k*1.3v2/2g).

However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

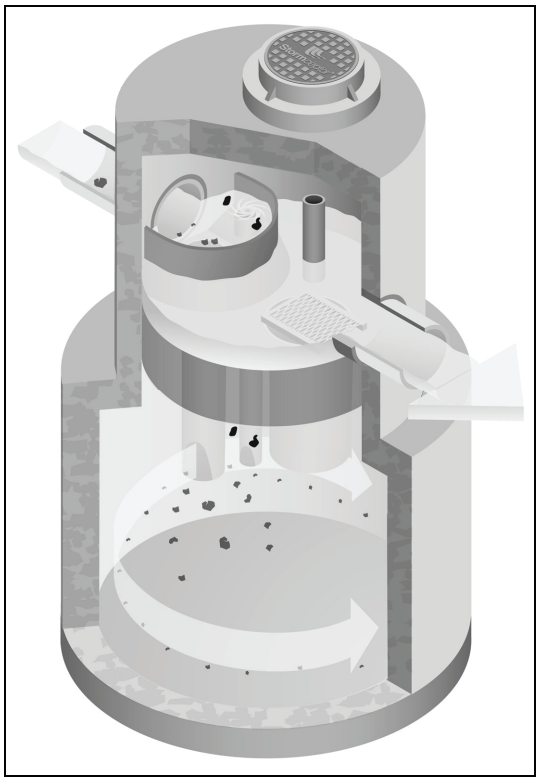


Figure 7. Submerged Stormceptor

8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between "approved alternatives". The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (Ontario MOE, 1994).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection was followed.
- City of Indianapolis – full scale testing of an STC 900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, or local specifications for the installation of manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

10.2. Backfilling

Backfill material should conform to state highway or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway or local specifications.

11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well- established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

Particle Size	Specific Gravity
Model	Sediment Depth inches (mm)
450i	8 (200)
900	8 (200)
1200	10 (250)
1800	15 (381)
2400	12 (300)
3600	17 (430)
4800	15 (380)
6000	18 (460)
7200	15 (381)
11000	17 (380)
13000	20 (500)
16000	17 (380)
* based on 15% of the Stormceptor unit's total storage	

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

SUPPORT

Drawings and specifications are available at www.ContechES.com.

Site-specific design support is available from our engineers.

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