DRAINAGE ANALYSIS

Prepared for Joanna Hills LLC
Joanna Hills Estates

Joanna Road
Avon, Massachusetts 02322

August 08, 2019
Revised thru October 27, 2020

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

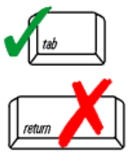
APPENDICES

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.

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

COMMONWEALTH OF MASSACHUSETTS
TRACY L.
DUARTE
CIVIL
NO. 48660
REGISTERED
PROFESSIONAL ENGINEER

10/27/2020

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 (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist 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.

1. INTRODUCTION

MBL Land Development and Permitting Corporation (MBL) has prepared this Drainage Analysis for the proposed development of the project site located at Joanna Road, Avon, Massachusetts. The purpose of the analysis is to quantitatively understand the impacts of the proposed site development on the existing hydrologic conditions and to mitigate these impacts through the implementation of a proposed stormwater management system that utilizes best management practices (BMPs) and is supported by an Operations & Maintenance Plan as well as a Long Term Pollution Prevention Plan.

2. SITE DESCRIPTION

2.1 EXISTING CONDITIONS

The project is located at the end of Joanna Road, off of Page Street, in Avon, Massachusetts. The site is referenced as Block 3, Plot 15 on Assessors Map C7 and contains a total of 29.37 acres. The existing site consists woodlands and forested wetland areas. A minority of the site is located within a Flood Zone A, and the majority of the site is located within a Flood Zone X, as shown on FEMA flood insurance FIRM Map No. 25021C0218E, having an effective date of July 17, 2012. The site is not located within an Estimated Habitat of Rare Wildlife, Priority Habitat of Rare Species or near a Certified Vernal Pool according to the Massachusetts Natural Heritage Atlas, 14th Edition, effective August 2017. The site is not located within an ACEC, Outstanding Resource Water or any other Critical Area. Please refer to Figures 1-6.

2.2 PROPOSED CONDITIONS

The proposed project is a Chapter 40B development containing a total of 76 proposed units with associated site access, parking, grading, drainage and utilities including on-site subsurface disposal systems. These units are comprised of 9 single family dwellings, 11 duplexes, one 7-unit condominium building, one 10-unit condominium building and two 14-unit condominium buildings.

2.3 SOILS

The Soil Conservation Survey for Norfolk County indicates that the site is located within Soil Map Units 420B: Canton Fine Sandy Loam (Hydrologic Soil Group (HSG) B), 424D: Canton Fine Sandy Loam (HSG A), 424B: Canton Fine Sandy Loam (HSG A), 302C: Montauk Fine Sandy Loam (HSG C), 302B: Montauk Fine Sandy Loam (HSG C), and 71B: Ridgebury Fine Sandy Loam (HSG D). Please refer to Figure 6 – Soils Map.

2.4 SITE TOPOGRAPHY

The existing topography slopes easterly from Page Street down Joanna Road and into the site. Within the site, stormwater runoff splits from the center of the site and flows either northerly or southerly towards the bordering vegetated wetlands on-site. Slopes on-site vary anywhere from 1 to 25%.

3. DRAINAGE CALCULATIONS

To mitigate the quality and quantity of stormwater runoff discharging from the site, a stormwater management system has been designed to collect, treat and control flows leaving the site. The proposed stormwater management system consists a series of deep sump hooded catch basins, pipes and manholes, which will collect and convey stormwater runoff to proposed water quality units and vegetated infiltration basins. The proposed infiltration basins have been designed to store the required recharge volume and have riprap overflow spillways. Also where feasible roof recharge systems were added to recharge roof runoff. These system consist of Cultec 330XLHD Chambers designed to recharge to entire 100-year storm. The stormwater management system has been designed to reduce peak flow rates from existing to the proposed conditions for all storm events. From an environmentally sensitive perspective, the aforementioned measures result in a design that promotes on-site groundwater recharge while preserving the natural hydrologic conditions.

A detailed hydrologic analysis of the stormwater management system was completed to evaluate its performance and document compliance with the Massachusetts Stormwater Standards. MBL has prepared the following drainage system calculations for the proposed site development.

3.1 HYDROLOGIC ANALYSIS

The Soil Conservation Service (SCS) Unit Hydrograph methodology was utilized to develop a hydrologic model of the site. MBL utilized HydroCAD Version 10.0 software, developed by HydroCAD Software Solutions, LLC to analyze the site hydrology. The program calculates peak rates of runoff and runoff volume based on selected rainfall events. Contributing watershed areas were identified and soils, surface cover, watershed slope, and flow paths were evaluated to develop the necessary HydroCAD model input parameters. A minimum Time of Concentration (Tc) of (6) minutes was used in the calculations.

Drainage calculations were performed for the Existing and Proposed Conditions for the 24-hour 2, 10, 25 and 100-year Type III storm events. The total rainfall for each of the storm events was based upon TP-40 data. The total rainfall values used in the hydrologic modeling are shown in the following table:

Table 1: Table Design Rainfall Data			
2-year, 24-hour storm	10-year, 24-hour storm	25-year, 24-hour storm	100-year, 24-hour storm
3.20 inches	4.70 inches	5.50 inches	6.70 inches

3.1.1 Design Points

To compare the difference between the existing and proposed peak flow rates, the existing and proposed watershed areas were delineated. Design points for each watershed were determined by flow paths from the hydraulically most distance point of the watershed. These parameters were utilized to calculate the times of concentration which were modeled. The same Design Points were analyzed for both the existing and proposed conditions. For this project, the design points that were identified are as follows:

- Wetlands North
- Wetlands South
- Wetlands South East
- ILSF

3.1.2 Existing Hydrology

The existing site was broken into watershed areas, each discharging to one of the design points. The existing watershed areas are shown on the attached Figure 7 entitled, “Existing Conditions Drainage Map”. The hydrographs for each watershed were generated to develop the peak discharge rates for the 24-hour, 2, 10, 25 and 100-year storm events for the existing site conditions.

3.1.3 Proposed Hydrology

The site was broken into watersheds for the proposed analysis, each discharging to one of the same design points. The proposed watershed areas, are shown on the attached Figure 8 entitled “Proposed Conditions Drainage Map”. The hydrographs for each watershed were generated and routed through the proposed BMPs to develop the peak discharge rates for the 24-hour 2, 10, 25 and 100-year storm events for the proposed site conditions.

3.1.4 Peak Discharge Rates

Tables 2 and 3 below summarizes the Pre- and Post-Development peak discharge rates for each Design Point. As depicted in the tables, the Post-Development peak rate of discharge does not increase over Pre-Development peak rate for all storm events analyzed.

Table 2: Pre-Development Peak Discharge Rates

Storm Frequency	Existing Peak Runoff (cfs)			
	Wetlands North	Wetlands South	ILSF	Wetlands Southeast
2	0.18	3.14	0.00	0.09
10	2.95	7.12	0.07	1.44
25	5.88	9.47	0.18	2.89
100	11.70	13.16	0.46	5.81

Table 3: Post-Development Peak Discharge Rates				
Storm Frequency	Proposed Peak Runoff (cfs)			
	Wetlands North	Wetlands South	ILSF	Wetlands Southeast
2	0.18	2.80	0.00	0.09
10	1.73	5.40	0.06	0.70
25	3.23	6.85	0.13	1.21
100	10.29	9.08	0.29	5.20

3.2 HYDRAULIC ANALYSIS

Portions of the stormwater closed (underground piping) drainage system discharging to the BMPs were designed to convey the 25-year storm event. Pipe capacity and peak discharge rates for the closed drainage system were calculated using a Manning's Formula spreadsheet.

The closed drainage system, as designed, is capable of conveying the design flow as calculated, as well as maintaining a design velocity of between 2.0 feet per second (fps) and 10.0 fps for pipe capacity full conditions. The closed drainage system analysis for the proposed system is depicted in Appendix B.

4. BEST MANAGEMENT PRACTICES

The Massachusetts Stormwater Standards requires 80% removal rate over an average annual basis, for Total Suspended Solids (TSS) contained in stormwater runoff. The water quality volume or “first flush” is defined as the volume obtained by multiplying one-half inch (½”) times the impervious surface area of the contributing drainage area. Water quality volume calculations are provided in Appendix D. When this volume is incorporated into properly designed BMPs an 80% reduction of average annual TSS loading will result. The following Best Management Practices will be employed for the project.

4.1 DEEP SUMP HOODED CATCH BASINS

Deep sump hooded catch basins are proposed for pretreatment. 25% TSS credit has been taken for the deep sump hooded catch basins.

4.2 WATER QUALITY UNITS

Stormceptor STC 2400 Water Quality Units are proposed for TSS removal. Please see Appendix D for the manufacturer’s TSS removal calculations for the proposed water quality units.

4.3 INFILTRATION BASINS

The proposed infiltration basins will achieve a TSS removal rate of 80% while promoting groundwater recharge on-site.

4.4 SUBSUFRACE RECHARGE CHAMBERS

Cultec 330XLHD Subsurface Recharge Chambers are proposed to recharge roof runoff for the 100-yr storm on-site.

5. STORMWATER MANAGEMENT STANDARDS COMPLIANCE

The proposed best management practices (BMPs) selection and their placement within the treatment train of the stormwater management system has been strategically planned and designed as prescribed by the Massachusetts Stormwater Management Handbook. The following addresses how the project complies with Standards 1-10 as set forth in the Massachusetts Stormwater Handbook:

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.

There are no new untreated discharges to or that will cause erosion in wetlands or waters of the Commonwealth. All stormwater runoff from impervious surfaces is designed to be collected and treated prior to discharging.

Standard 2

Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates.

The stormwater management system has been designed so that the proposed peak discharge rates are less than the existing peak discharge rates for the 2-year, 10-year, 25-year and 100-year 24-hour storm events (see Tables 2 & 3 of this report). Supporting documentation such as HydroCAD reports and required computations are located in Appendix A.

Standard 3

Loss of annual recharge to groundwater shall be eliminated or minimized with environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance.

The proposed stormwater management system has been designed to collect stormwater runoff and recharge it back into the ground on-site. The soils on-site are conducive to recharge. Supporting documentation such as Required Recharge Volume Calculations can be found in Appendix C and Soil Logs can be found in Appendix J.

Standard 4

Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

The required removal of 80% TSS has been achieved by a series of BMP's including deep sump hooded catch basins, stormceptor water quality units and vegetated infiltration basins. Computations and documentation are provided in Appendix D.

Standard 5

For land uses with higher potential 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.

The site is not a land use with higher potential pollutant load, per the regulations.

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.

The site does not discharge to a Zone II, IPWA or 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 stormwater best management practice requirements of Standards 4, 5, and 6. Existing Stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. This project could be considered a redevelopment.

The site is not a redevelopment project.

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.

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is located in Appendix E.

Standard 9

A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

A Long-Term Operation and Maintenance Plan (O&M Plan) for the site stormwater management facilities can be found in Appendix G and a Long-Term Pollution Prevention Plan (LPPP) is located in Appendix F.

Standard 10

All illicit discharges to the stormwater management system are prohibited.

An Illicit Discharge Compliance Statement has been provided in Appendix H.

6. LOW IMPACT DESIGN (LID) MEASURES

In accordance with the Massachusetts Stormwater Standards, Low Impact Design (LID) measures were evaluated and incorporated into the on-site drainage design where feasible.

No Disturbance to any Wetland Resource Areas

No proposed work is located within the existing BVW.

Site Design Practices

In order to minimize disturbance, multi-family condominium and duplex buildings are proposed instead of single-family homes where possible. This allows for housing units to be constructed in close proximity which reducing the length of the associated roadway.

Reduced Impervious Area

This LID measure does not apply because this site is not a redevelopment.

Minimizing Disturbance to Existing Trees and Shrubs

This LID measure could not be implemented due to the disturbance of the existing woods on-site.

Use of “Country Drainage” Versus Curb and Gutter Conveyance and Pipe

This LID measure could not be implemented due the project’s reduced lot areas and close proximity to wetlands.

Bioretention Cells

This LID measure was not implemented because of the amount of fill that would be required to construct the Bioretention Cell as specified while also maintaining the necessary 2 feet of groundwater separation.

Constructed Stormwater Wetlands

This LID measure was not implemented due to the necessary area required to construct the Stormwater Wetlands.

Tree Box Filter

This LID measure was not implemented because there is no room for street trees within the proposed right-of-way for the project.

Water Quality Swale

This LID measure was not implemented because of the projects reduced lot areas and proximity to the wetlands and given the design requirements of water quality swales, there is no location on-site that is feasible for constructing a swale.

Grass Channel

This LID measure was not implemented because of the projects reduced lot areas and proximity to the wetlands and given the design requirements of water quality swales, there is no location on-site that is feasible for constructing a swale.

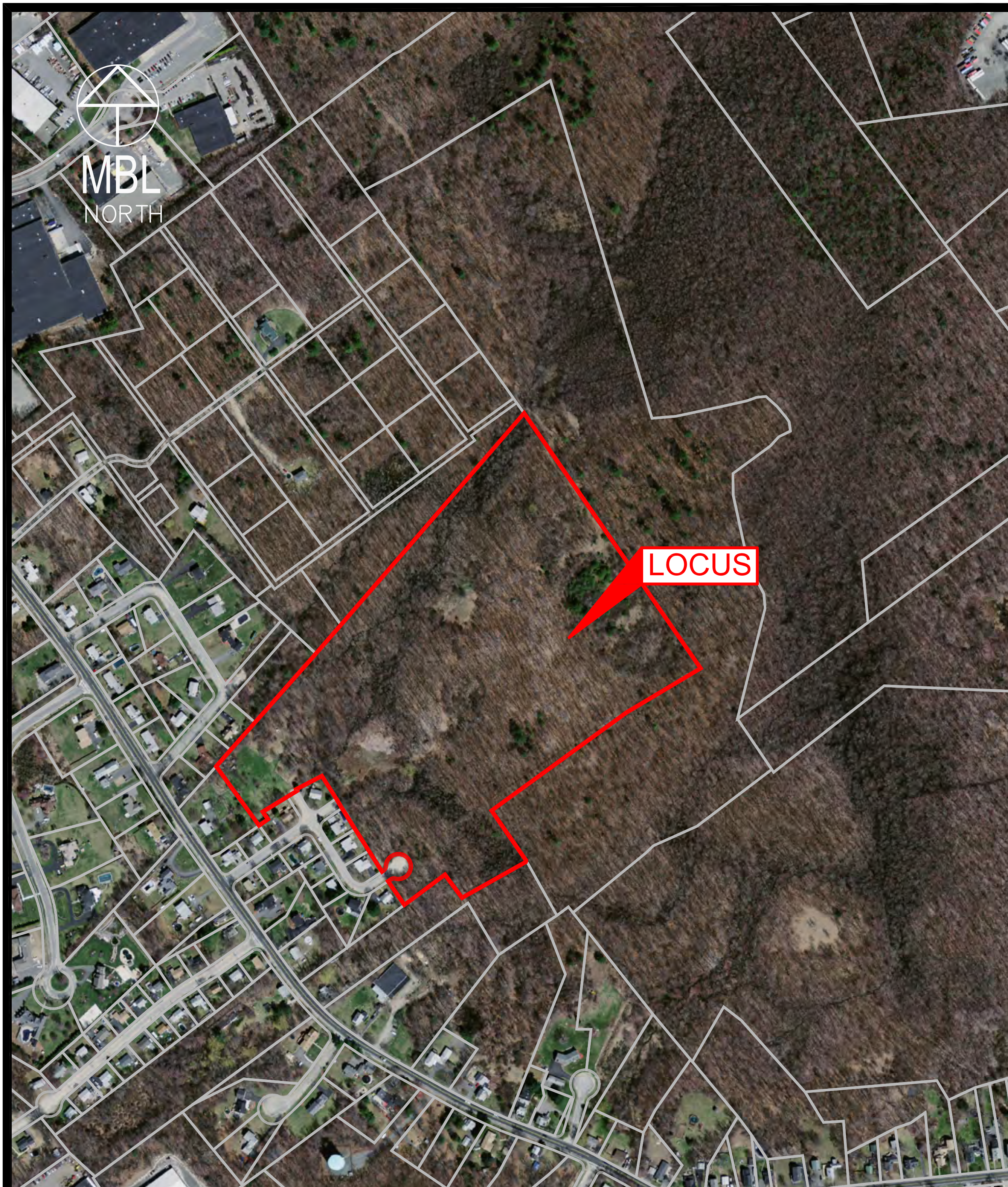
Green Roof

This LID measure was not implemented because the proposed single family, duplex, and multi-family buildings have designs that are not conducive to green roof construction.

7. CONCLUSION

The proposed site development will not increase the peak rate of runoff from the existing conditions for all modeled storm events. This has been accomplished by implementing BMPs that will enhance the quality of stormwater runoff while also introducing infiltration to a previously uncontrolled site. The proposed stormwater management system has been designed to meet all 10 of the Massachusetts Stormwater Management Standards.

Figure 1: Aerial Map



NOTE: INFORMATION ON THIS PLAN OBTAINED FROM MASSGIS USGS COLOR ORTHO IMAGERY 2008/2009.

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AERIAL MAP

JOANNA HILLS ESTATES
ASSESSORS MAP C7-3 & PLOT 15

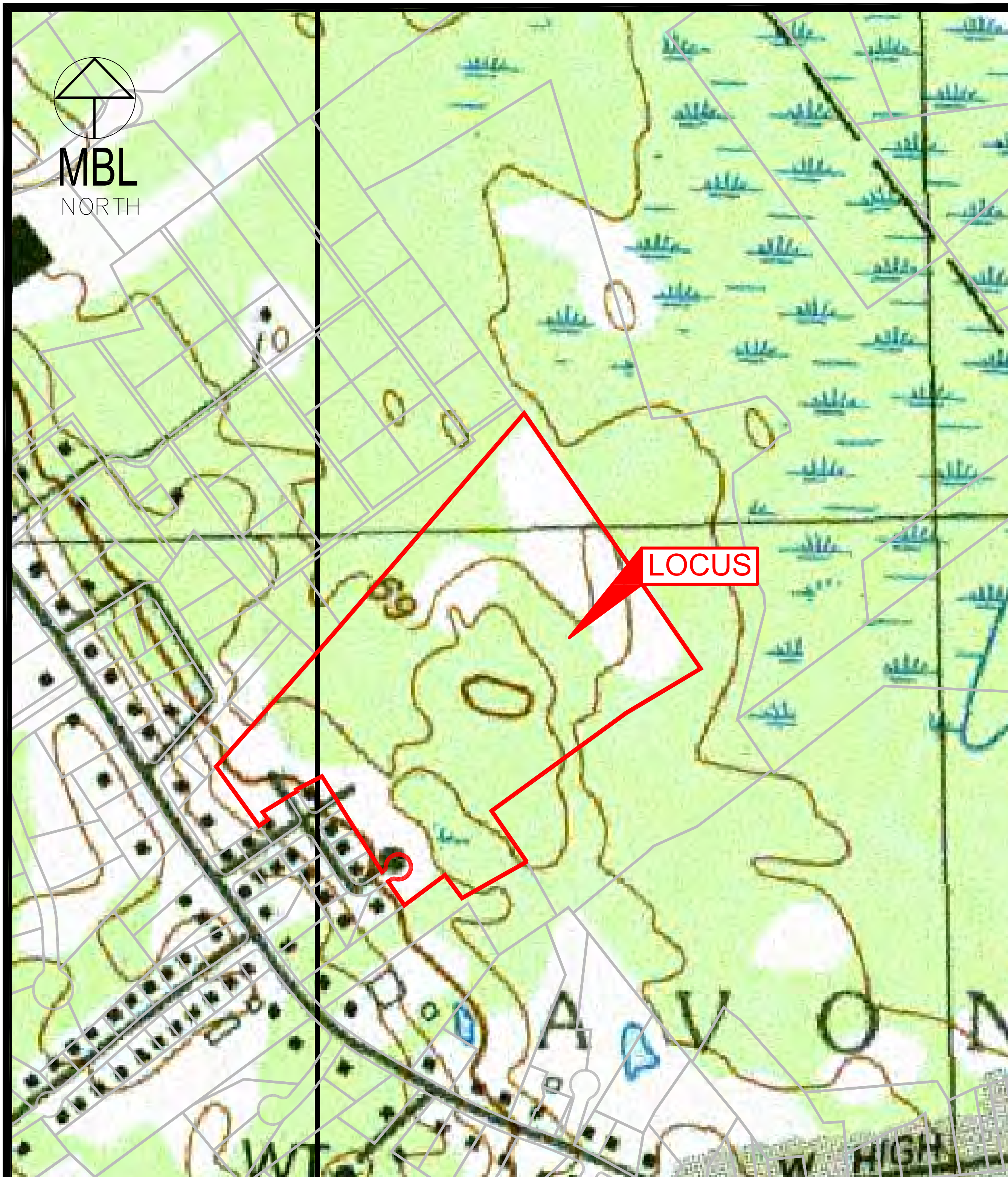
AVON MASSACHUSETTS

PROJ. No:	2016-002
DATE:	8/8/2019
SCALE:	1"=500'

FIGURE 1

X:\2016\002\CIVIL\DESIGN\DRAINAGE\2016-002 Drainage Figures.dwg 8/8/2019 9:50:09 AM EDT

Figure 2: USGS Topographic Map



NOTE: INFORMATION ON THIS PLAN OBTAINED FROM MASSGIS SCANNED 1:25,000 USGS TOPOGRAPHIC QUAD IMAGES, JUNE 2001.

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USGS TOPOGRAPHIC MAP

JOANNA HILLS ESTATES
ASSESSORS MAP C7-3 & PLOT 15

AVON MASSACHUSETTS

PROJ. No:	2016-002
DATE:	8/8/2019
SCALE:	1"=500'

FIGURE 2

X:\2016\002\CIVIL\DESIGN\DRAINAGE\2016-002 Drainage Figures.dwg 8/8/2019 9:50:09 AM EDT

Figure 3: Flood Insurance Rate Map

ZONE X, AREAS BETWEEN THE LIMITS OF THE 100-YEAR AND 500-YEAR FLOODS

ZONE A, AREAS OF THE 100-YEAR, BASE FLOOD ELEVATION NOT DETERMINED

FLOODWAY AREAS IN ZONE AE

NOTE: FLOOD BOUNDARY INFORMATION SHOWN OBTAINED FROM FEMA FIRM MAP FOR COMMUNITY PANEL NO. 250021C0218E HAVING AN EFFECTIVE DATE OF JULY 17, 2012.

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FLOOD INSURANCE RATE MAP

JOANNA HILLS ESTATES
ASSESSORS MAP C7-3 & PLOT 15

AVON MASSACHUSETTS

PROJ. No:	2016-002
DATE:	8/8/2019
SCALE:	1"=500'

FIGURE 3

X:\2016\002\CIVIL\DESIGN\DRAINAGE\2016-002 Drainage Figures.dwg 8/8/2019 9:50:09 AM EDT

Figure 4: Natural Heritage Map

ESTIMATED HABITATS OF RARE WILDLIFE

PRIORITY HABITATS OF RARE SPECIES

CERTIFIED VERNAL POOL

NOTE: INFORMATION ON THIS PLAN OBTAINED FROM THE 14TH EDITION OF THE MASSACHUSETTS NATURAL HERITAGE ATLAS DATED AUGUST 1, 2017.

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NATURAL HERITAGE MAP

JOANNA HILLS ESTATES
ASSESSORS MAP C7-3 & PLOT 15

AVON MASSACHUSETTS

PROJ. No:	2016-002
DATE:	8/8/2019
SCALE:	1"=500'

FIGURE 4

X:\2016\002\CIVIL\DESIGN\DRAINAGE\2016-002 Drainage Figures.dwg 8/8/2019 9:50:09 AM EDT

Figure 5: Critical Areas

AREAS OF CRITICAL ENVIRONMENTAL CONCERN

WELLHEAD PROTECTION AREAS

OUTSTANDING RESOURCE WATERS

NOTE: INFORMATION ON THIS PLAN OBTAINED FROM MASS GIS DATABASE ACEC, IPWA, ZONE II AND OUTSTANDING RESOURCE WATERS DATA LAYER. THE LOCUS IS NOT LOCATED WITHIN A CRITICAL AREA.

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CRITICAL AREAS

JOANNA HILLS ESTATES
ASSESSORS MAP C7-3 & PLOT 15

AVON MASSACHUSETTS

PROJ. No:	2016-002
DATE:	8/8/2019
SCALE:	1"=500'

FIGURE 5

X:\2016\002\CIVIL\DESIGN\DRAINAGE\2016-002 Drainage Figures.dwg 8/8/2019 9:50:09 AM EDT

Figure 6: Soils Map

NOTE: INFORMATION ON THIS PLAN OBTAINED FROM MASS GIS NRCS SSURGO-CERTIFIED SOILS DATA LAYER.

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SOILS MAP

JOANNA HILLS ESTATES
ASSESSORS MAP C7-3 & PLOT 15

AVON MASSACHUSETTS

PROJ. No:	2016-002
DATE:	8/8/2019
SCALE:	1"=300'

FIGURE 6

X:\2016\002\CIVIL\DESIGN\DRAINAGE\2016-002 Drainage Figures.dwg 8/8/2019 9:50:09 AM EDT

Figure 7: Existing Conditions Drainage Map

				PROJ. MANAGER:	MBL
				CHIEF DESIGNER:	MBL
				REVIEWED BY:	DATE
2	10/27/2020	REVISIONS PER TOWN & CONSULTANT COMMENTS	TLD		
1	3/10/2020	REVISIONS PER TOWN & CONSULTANT COMMENTS	TLD		
No.	DATE	DESCRIPTION	BY		

REVISIONS

SEAL

SEAL

PREPARED FOR

JOANNA HILLS LLC
32 NORFOLK AVENUE

SOUTH EASTON MASSACHUSETTS

SCALE:
HORZ.: 1"=80'
VERT.:
DATUM:
HORZ.:
VERT.:

80 40 0 80
GRAPHIC SCALE

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SITE PLANS

EXISTING CONDITIONS DRAINAGE MAP
CHAPTER 40B - JOANNA HILLS ESTATES
ASSESSORS MAP C7, BLOCK 3 & PLOT 15

AVON MASSACHUSETTS

PROJ. No.: 2016-002
DATE: AUGUST 8, 2019

FIG. 7

X:\2016\002\CIVIL\DESIGN\DRAINAGE\2016-002 Pre Map Rev.dwg 10/27/2020 5:27:36 PM EDT

UCS: MS VIEW: LMAN: CTB:

Figure 8: Proposed Conditions Drainage Map

NOTE:

1. WHEN NO FLOWPATH IS SHOWN, A MINIMUM TIME OF CONCENTRATION OF 6 MINUTES WAS UTILIZED.

No.	DATE	DESCRIPTION	BY
2	10/27/2020	REVISIONS PER TOWN & CONSULTANT COMMENTS	TLD
1	3/10/2020	REVISIONS PER TOWN & CONSULTANT COMMENTS	TLD

REVISIONS

PROJ. MANAGER:	MBL
CHIEF DESIGNER:	MBL
REVIEWED BY:	DATE

SEAL

SEAL

PREPARED FOR

JOANNA HILLS LLC
32 NORFOLK AVENUE

SOUTH EASTON MASSACHUSETTS

SCALE:
HORZ.: 1"=80'
VERT.:
DATUM:
HORZ.:
VERT.:
80 40 0 80
GRAPHIC SCALE

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SITE PLANS

PROPOSED CONDITIONS DRAINAGE MAP
CHAPTER 40B - JOANNA HILLS ESTATES
ASSESSORS MAP C7, BLOCK 3 & PLOT 15

AVON MASSACHUSETTS

PROJ. No.: 2016-002
DATE: AUGUST 8, 2019

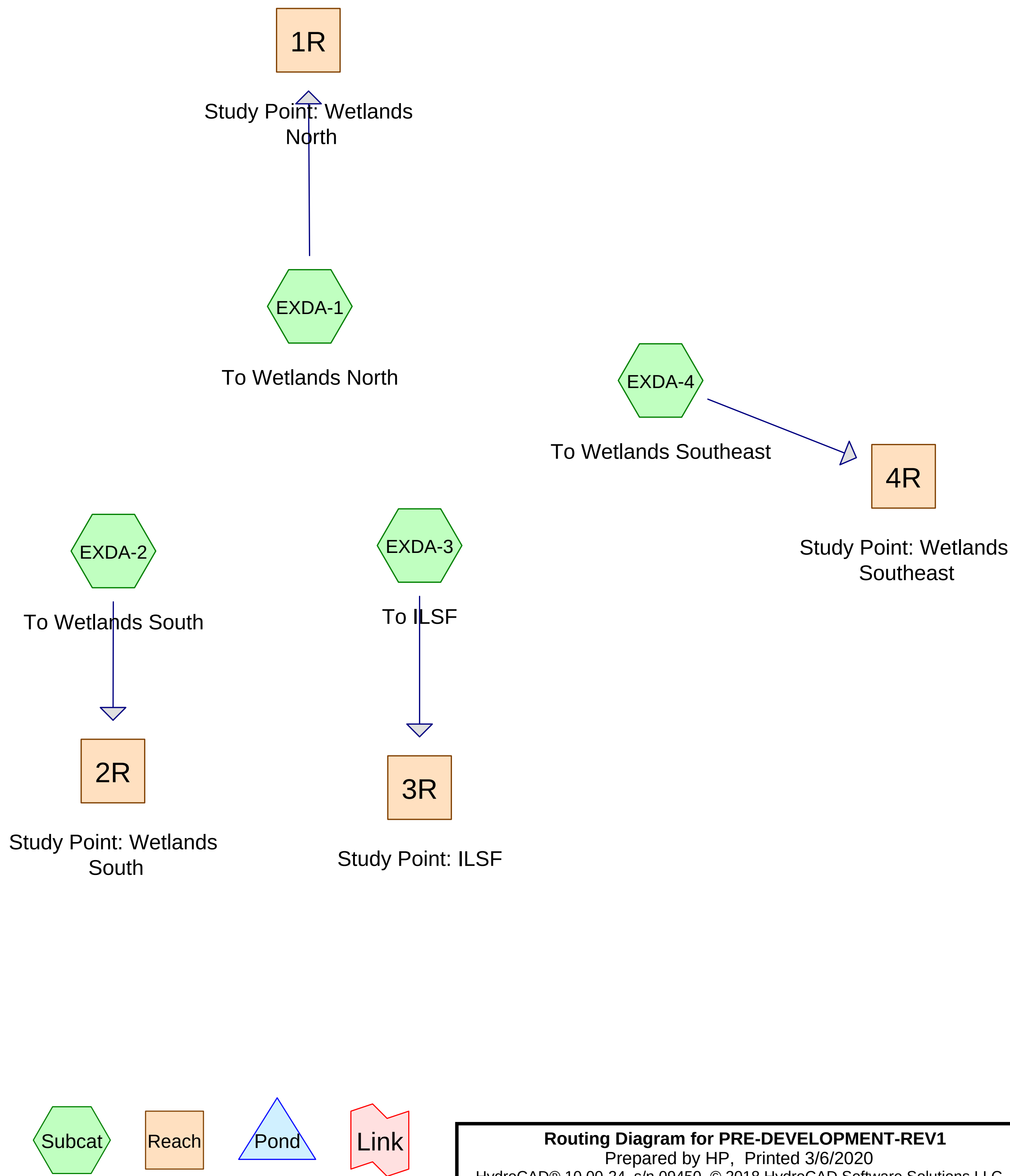
FIG. 8

X:\2016\002\CIVIL\DESIGN\DRAINAGE\2016-002 Post Map Rev1.dwg 10/27/2020 5:17:47 PM EDT

UCS: MS VIEW: LMAN: CTB:

APPENDIX A: HYDROLOGIC ANALYSIS

Pre-Development HydroCAD Analysis



Routing Diagram for PRE-DEVELOPMENT-REV1
Prepared by HP, Printed 3/6/2020
HydroCAD® 10.00-24 s/n 09450 © 2018 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "TP-40-Rain.txt" for 446 MA Norfolk
Rainfall events imported from "TP-40-Rain.txt" for 446 MA Norfolk
Defined 10 rainfall events from MA_AVON_JOANNA-HILL IDF
Rainfall events imported from "TP-40-Rain.txt" for 446 MA Norfolk

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
16,367	54	1/2 acre lots, 25% imp, HSG A (EXDA-1, EXDA-2)
85,848	80	1/2 acre lots, 25% imp, HSG C (EXDA-1, EXDA-2)
8,713	72	Dirt roads, HSG A (EXDA-1, EXDA-2)
10,398	82	Dirt roads, HSG B (EXDA-1)
3,926	89	Dirt roads, HSG D (EXDA-1, EXDA-2)
14,448	98	Imprevious (EXDA-2)
427,394	30	Woods, Good, HSG A (EXDA-1, EXDA-2, EXDA-3, EXDA-4)
161,474	55	Woods, Good, HSG B (EXDA-1, EXDA-4)
43,474	70	Woods, Good, HSG C (EXDA-1, EXDA-2)
220,640	77	Woods, Good, HSG D (EXDA-1, EXDA-2, EXDA-3, EXDA-4)
992,682	**53**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
452,474	HSG A	EXDA-1, EXDA-2, EXDA-3, EXDA-4
171,872	HSG B	EXDA-1, EXDA-4
129,322	HSG C	EXDA-1, EXDA-2
224,566	HSG D	EXDA-1, EXDA-2, EXDA-3, EXDA-4
14,448	Other	EXDA-2
992,682		**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	Subcat Numbe
16,367	0	85,848	0	0	102,215	1/2 acre lots, 25% imp	
8,713	10,398	0	3,926	0	23,037	Dirt roads	
0	0	0	0	14,448	14,448	Imprevious	
427,394	161,474	43,474	220,640	0	852,982	Woods, Good	
452,474	**171,872**	**129,322**	**224,566**	**14,448**	**992,682**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EXDA-1: To Wetlands North Runoff Area=522,468 sf 3.37% Impervious Runoff Depth>0.08"
Flow Length=277' Tc=17.1 min CN=49 Runoff=0.18 cfs 3,605 cf

Subcatchment EXDA-2: To Wetlands Runoff Area=180,342 sf 12.42% Impervious Runoff Depth>0.84"
Flow Length=281' Tc=14.7 min CN=72 Runoff=3.14 cfs 12,629 cf

Subcatchment EXDA-3: To ILSF Runoff Area=36,928 sf 0.00% Impervious Runoff Depth>0.01"
Flow Length=85' Tc=14.4 min CN=43 Runoff=0.00 cfs 37 cf

Subcatchment EXDA-4: To Wetlands Runoff Area=252,944 sf 0.00% Impervious Runoff Depth>0.08"
Flow Length=445' Tc=16.2 min CN=49 Runoff=0.09 cfs 1,747 cf

Reach 1R: Study Point: Wetlands North Inflow=0.18 cfs 3,605 cf
Outflow=0.18 cfs 3,605 cf

Reach 2R: Study Point: Wetlands South Inflow=3.14 cfs 12,629 cf
Outflow=3.14 cfs 12,629 cf

Reach 3R: Study Point: ILSF Inflow=0.00 cfs 37 cf
Outflow=0.00 cfs 37 cf

Reach 4R: Study Point: Wetlands Southeast Inflow=0.09 cfs 1,747 cf
Outflow=0.09 cfs 1,747 cf

Total Runoff Area = 992,682 sf Runoff Volume = 18,018 cf Average Runoff Depth = 0.22"
95.97% Pervious = 952,680 sf 4.03% Impervious = 40,002 sf

Summary for Subcatchment EXDA-1: To Wetlands North

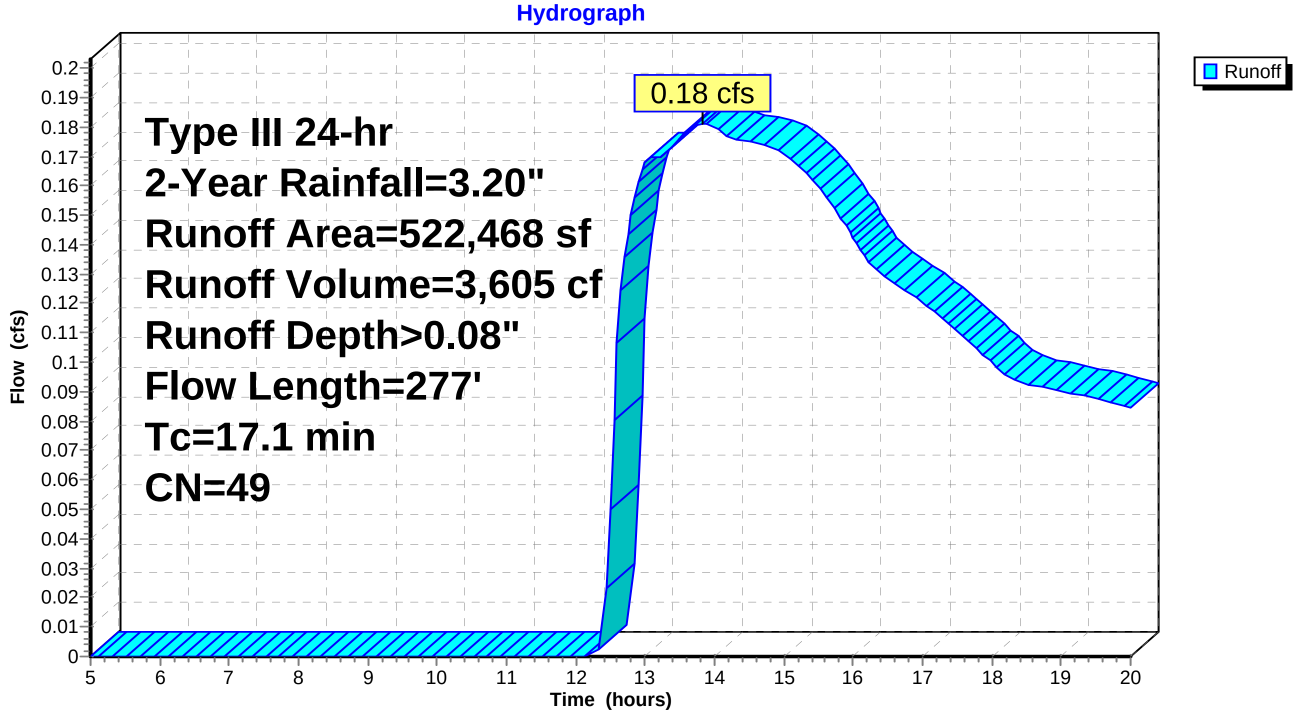
Runoff = 0.18 cfs @ 13.83 hrs, Volume= 3,605 cf, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
240,432	30	Woods, Good, HSG A
135,597	55	Woods, Good, HSG B
21,426	70	Woods, Good, HSG C
34,114	77	Woods, Good, HSG D
60,214	80	1/2 acre lots, 25% imp, HSG C
10,171	54	1/2 acre lots, 25% imp, HSG A
7,805	72	Dirt roads, HSG A
10,398	82	Dirt roads, HSG B
2,311	89	Dirt roads, HSG D
522,468	49	Weighted Average
504,872		96.63% Pervious Area
17,596		3.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	227	0.0802	4.56		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.1	277	Total			

Subcatchment EXDA-1: To Wetlands North



Summary for Subcatchment EXDA-2: To Wetlands South

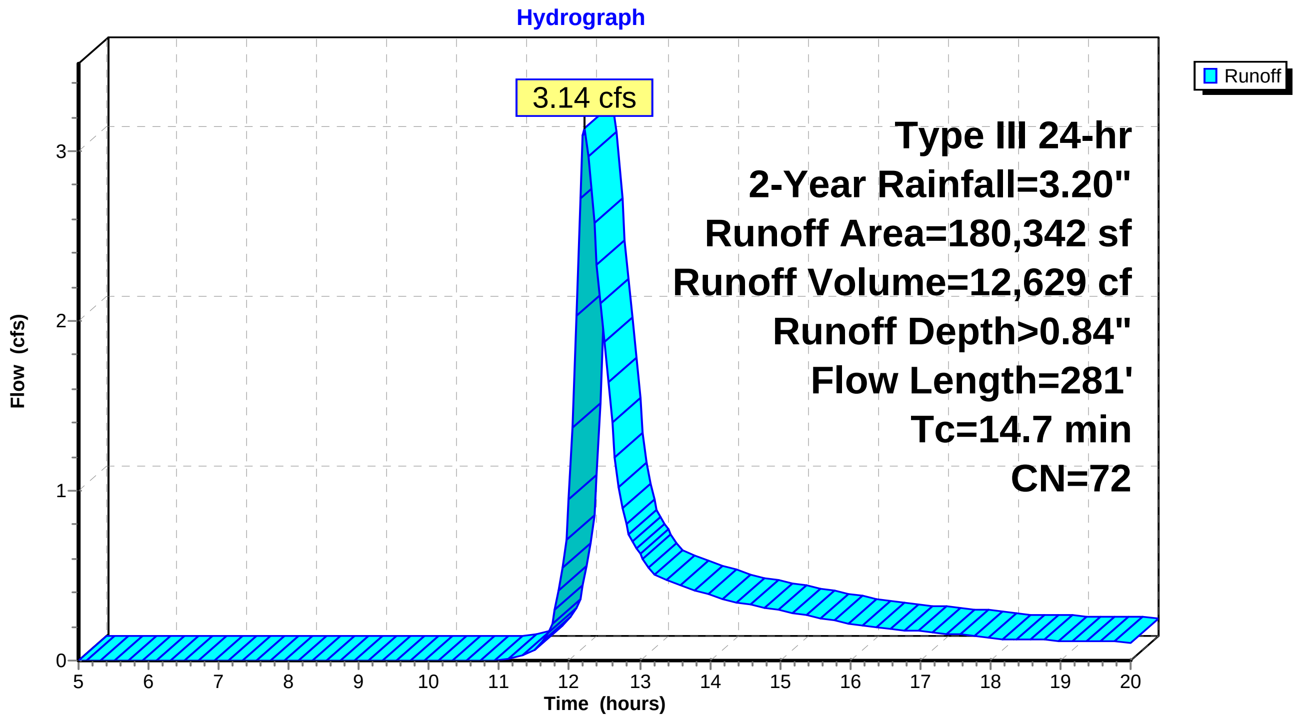
Runoff = 3.14 cfs @ 12.22 hrs, Volume= 12,629 cf, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
	21,719	30	Woods, Good, HSG A
	22,048	70	Woods, Good, HSG C
	87,774	77	Woods, Good, HSG D
*	14,448	98	Imprevious
	6,196	54	1/2 acre lots, 25% imp, HSG A
	25,634	80	1/2 acre lots, 25% imp, HSG C
	908	72	Dirt roads, HSG A
	1,615	89	Dirt roads, HSG D
	180,342	72	Weighted Average
	157,937		87.58% Pervious Area
	22,406		12.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	50	0.0160	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	231	0.0397	3.21		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
14.7	281	Total			

Subcatchment EXDA-2: To Wetlands South



Summary for Subcatchment EXDA-3: To ILSF

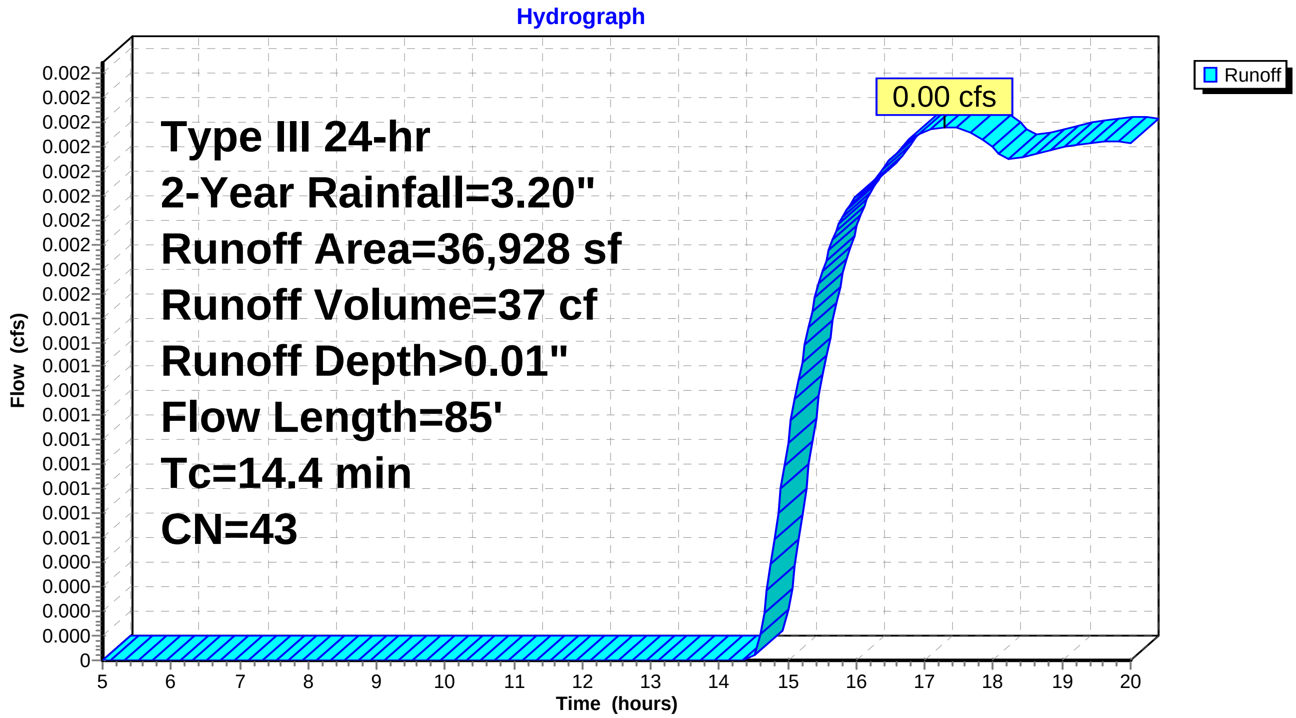
Runoff = 0.00 cfs @ 17.28 hrs, Volume= 37 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
26,428	30	Woods, Good, HSG A
10,500	77	Woods, Good, HSG D
36,928	43	Weighted Average
36,928		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	35	0.0350	3.01		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
14.4	85	Total			

Subcatchment EXDA-3: To ILSF



Summary for Subcatchment EXDA-4: To Wetlands Southeast

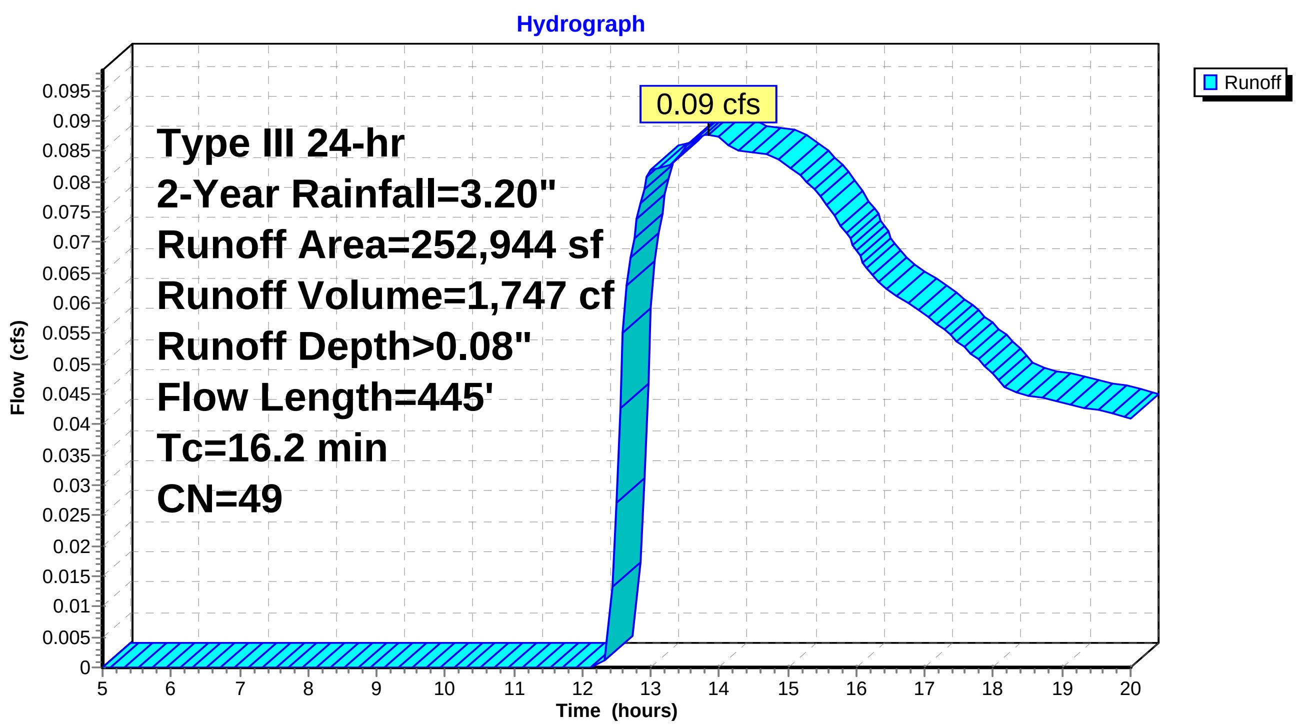
Runoff = 0.09 cfs @ 13.83 hrs, Volume= 1,747 cf, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
138,815	30	Woods, Good, HSG A
25,877	55	Woods, Good, HSG B
88,252	77	Woods, Good, HSG D
252,944	49	Weighted Average
252,944		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	50	0.0180	0.06		**Sheet Flow, AB**
					Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	395	0.0150	1.97		**Shallow Concentrated Flow, BC**
					Unpaved Kv= 16.1 fps
16.2	445	Total			

Subcatchment EXDA-4: To Wetlands Southeast

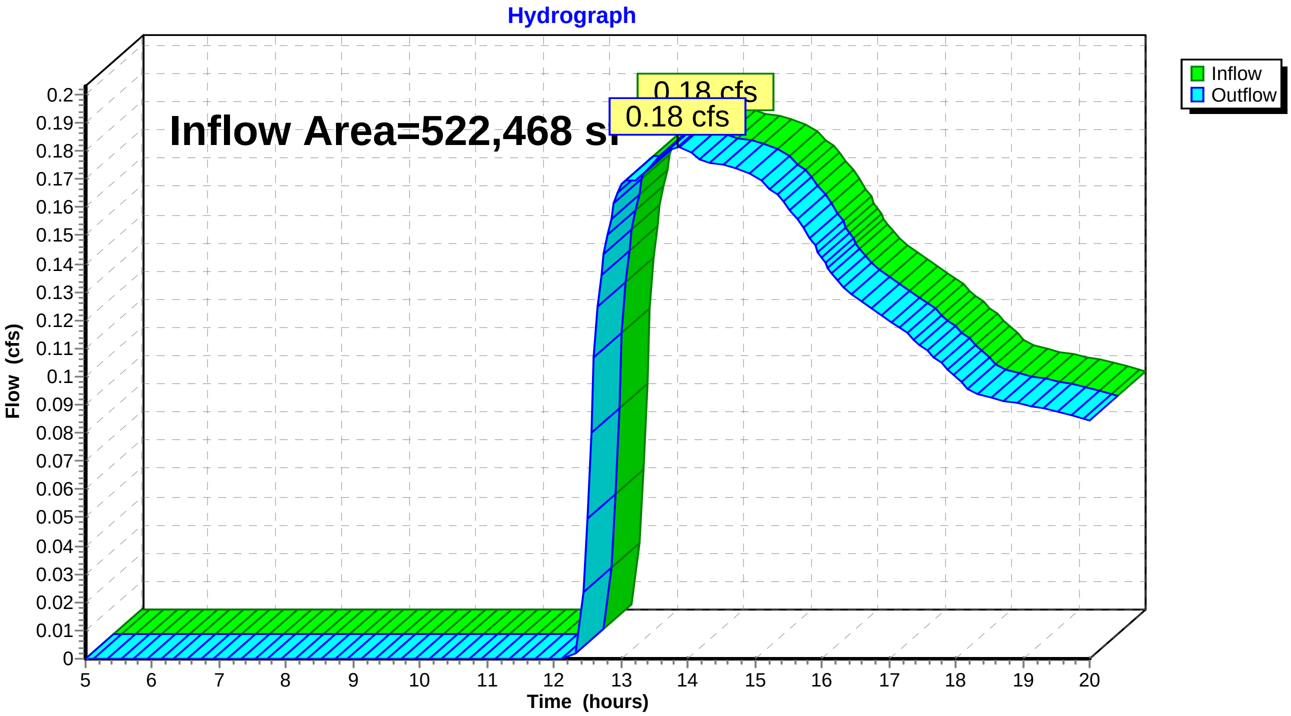


Summary for Reach 1R: Study Point: Wetlands North

Inflow Area =	522,468 sf,	3.37% Impervious, Inflow Depth > 0.08"	for 2-Year event
Inflow =	0.18 cfs @	13.83 hrs, Volume=	3,605 cf
Outflow =	0.18 cfs @	13.83 hrs, Volume=	3,605 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 1R: Study Point: Wetlands North

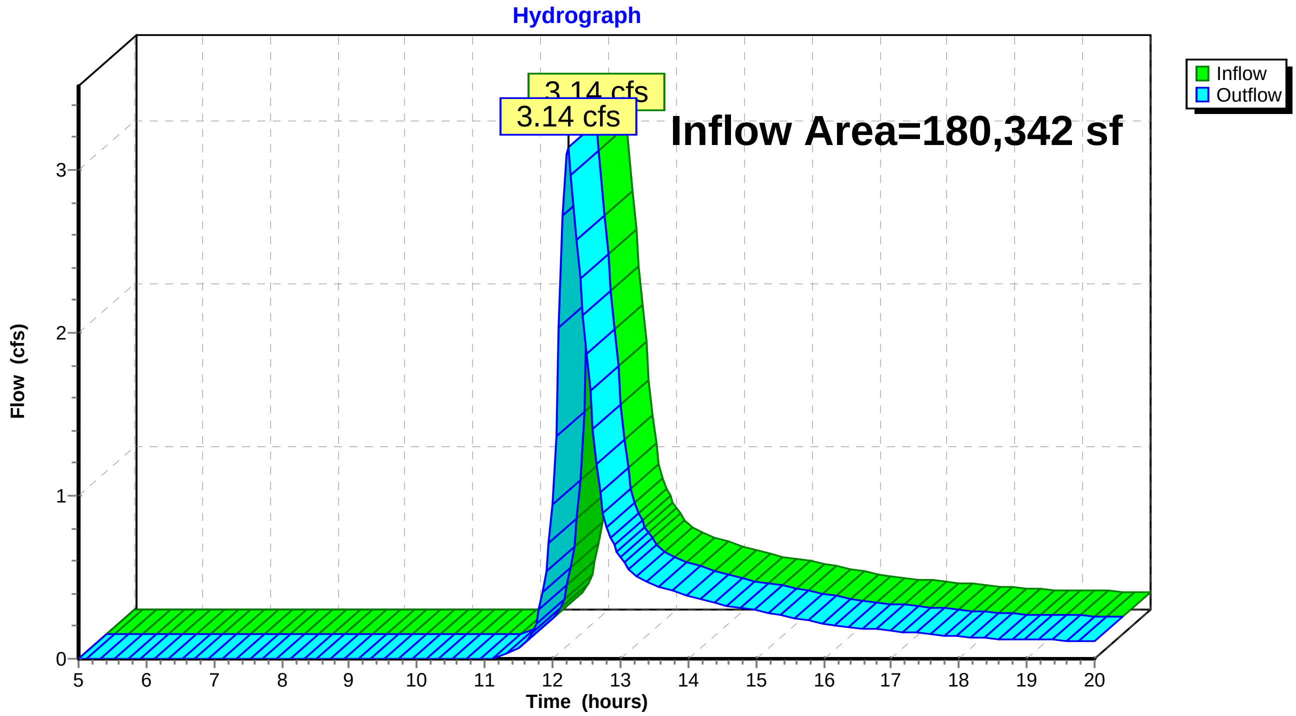


Summary for Reach 2R: Study Point: Wetlands South

Inflow Area = 180,342 sf, 12.42% Impervious, Inflow Depth > 0.84" for 2-Year event
Inflow = 3.14 cfs @ 12.22 hrs, Volume= 12,629 cf
Outflow = 3.14 cfs @ 12.22 hrs, Volume= 12,629 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 2R: Study Point: Wetlands South

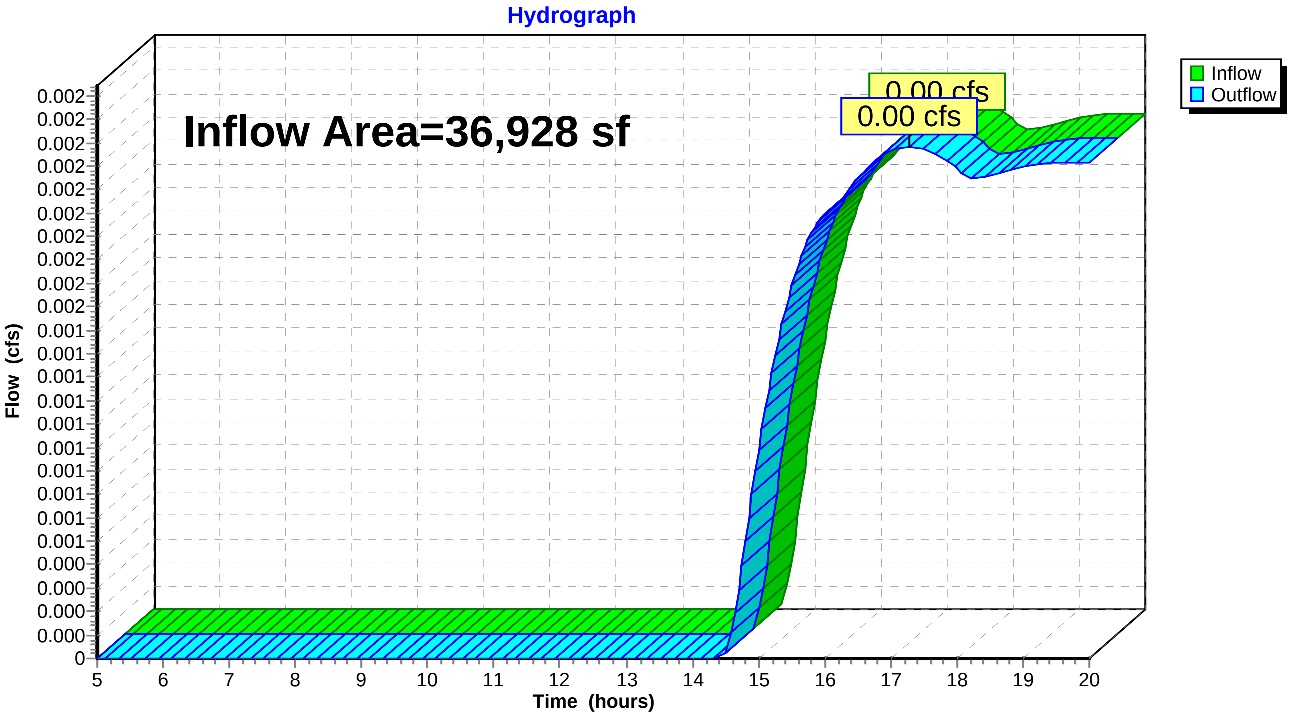


Summary for Reach 3R: Study Point: ILSF

Inflow Area = 36,928 sf, 0.00% Impervious, Inflow Depth > 0.01" for 2-Year event
Inflow = 0.00 cfs @ 17.28 hrs, Volume= 37 cf
Outflow = 0.00 cfs @ 17.28 hrs, Volume= 37 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

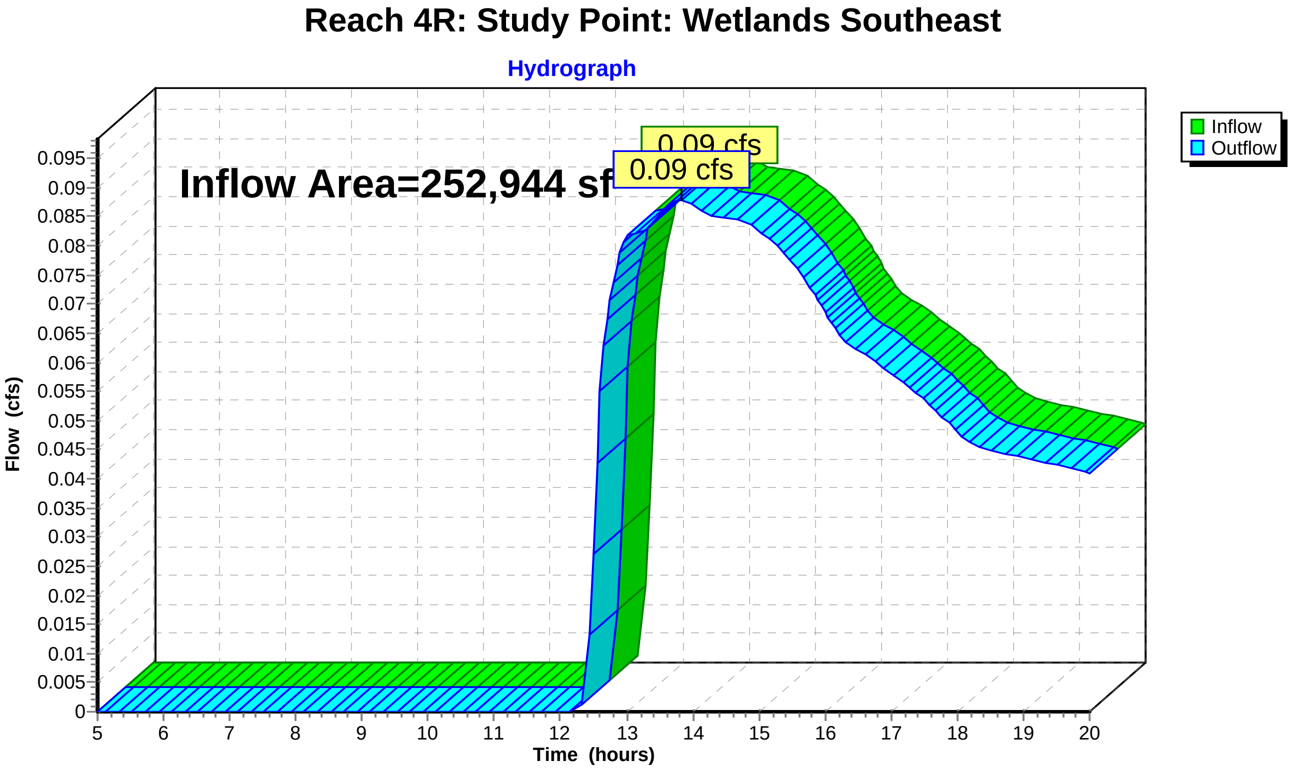
Reach 3R: Study Point: ILSF



Summary for Reach 4R: Study Point: Wetlands Southeast

Inflow Area =	252,944 sf,	0.00% Impervious,	Inflow Depth > 0.08"	for 2-Year event
Inflow =	0.09 cfs @	13.83 hrs, Volume=	1,747 cf	
Outflow =	0.09 cfs @	13.83 hrs, Volume=	1,747 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EXDA-1: To Wetlands North Runoff Area=522,468 sf 3.37% Impervious Runoff Depth>0.45"
Flow Length=277' Tc=17.1 min CN=49 Runoff=2.95 cfs 19,601 cf

Subcatchment EXDA-2: To Wetlands Runoff Area=180,342 sf 12.42% Impervious Runoff Depth>1.81"
Flow Length=281' Tc=14.7 min CN=72 Runoff=7.12 cfs 27,195 cf

Subcatchment EXDA-3: To ILSF Runoff Area=36,928 sf 0.00% Impervious Runoff Depth>0.22"
Flow Length=85' Tc=14.4 min CN=43 Runoff=0.07 cfs 686 cf

Subcatchment EXDA-4: To Wetlands Runoff Area=252,944 sf 0.00% Impervious Runoff Depth>0.45"
Flow Length=445' Tc=16.2 min CN=49 Runoff=1.44 cfs 9,496 cf

Reach 1R: Study Point: Wetlands North Inflow=2.95 cfs 19,601 cf
Outflow=2.95 cfs 19,601 cf

Reach 2R: Study Point: Wetlands South Inflow=7.12 cfs 27,195 cf
Outflow=7.12 cfs 27,195 cf

Reach 3R: Study Point: ILSF Inflow=0.07 cfs 686 cf
Outflow=0.07 cfs 686 cf

Reach 4R: Study Point: Wetlands Southeast Inflow=1.44 cfs 9,496 cf
Outflow=1.44 cfs 9,496 cf

Total Runoff Area = 992,682 sf Runoff Volume = 56,977 cf Average Runoff Depth = 0.69"
95.97% Pervious = 952,680 sf 4.03% Impervious = 40,002 sf

Summary for Subcatchment EXDA-1: To Wetlands North

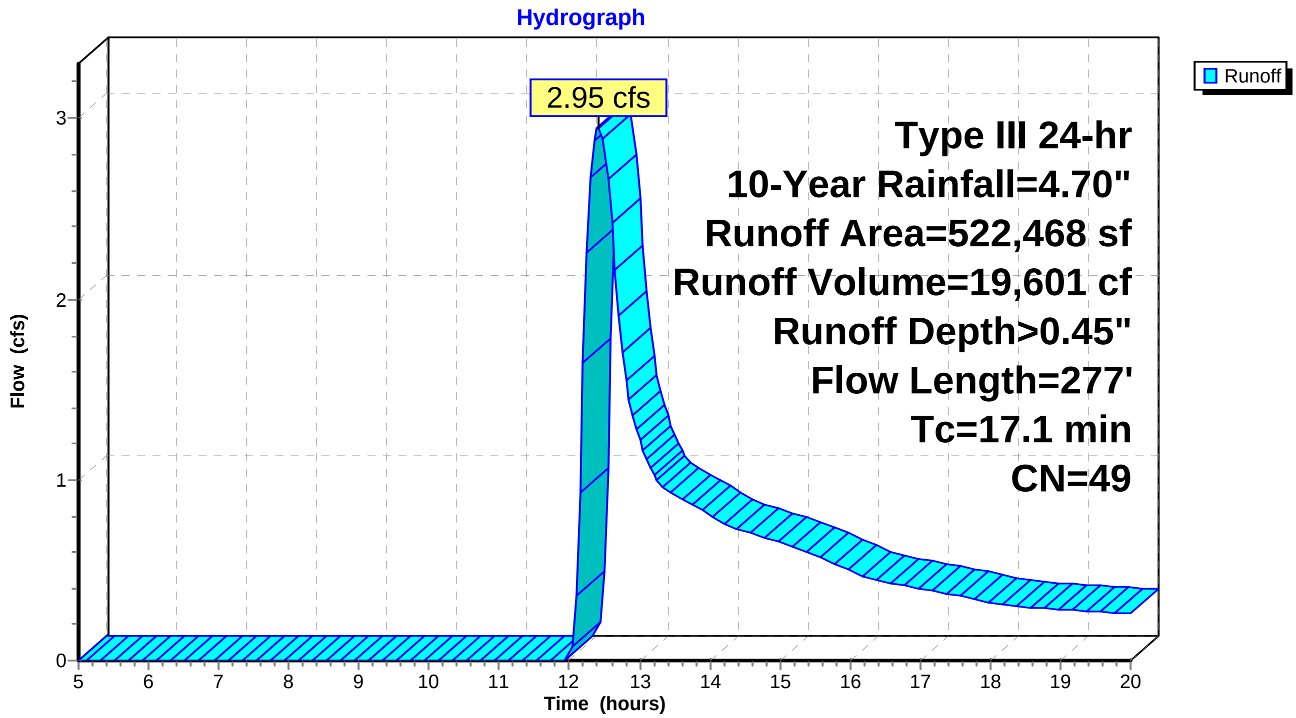
Runoff = 2.95 cfs @ 12.42 hrs, Volume= 19,601 cf, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
240,432	30	Woods, Good, HSG A
135,597	55	Woods, Good, HSG B
21,426	70	Woods, Good, HSG C
34,114	77	Woods, Good, HSG D
60,214	80	1/2 acre lots, 25% imp, HSG C
10,171	54	1/2 acre lots, 25% imp, HSG A
7,805	72	Dirt roads, HSG A
10,398	82	Dirt roads, HSG B
2,311	89	Dirt roads, HSG D
522,468	49	Weighted Average
504,872		96.63% Pervious Area
17,596		3.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	227	0.0802	4.56		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.1	277	Total			

Subcatchment EXDA-1: To Wetlands North



Summary for Subcatchment EXDA-2: To Wetlands South

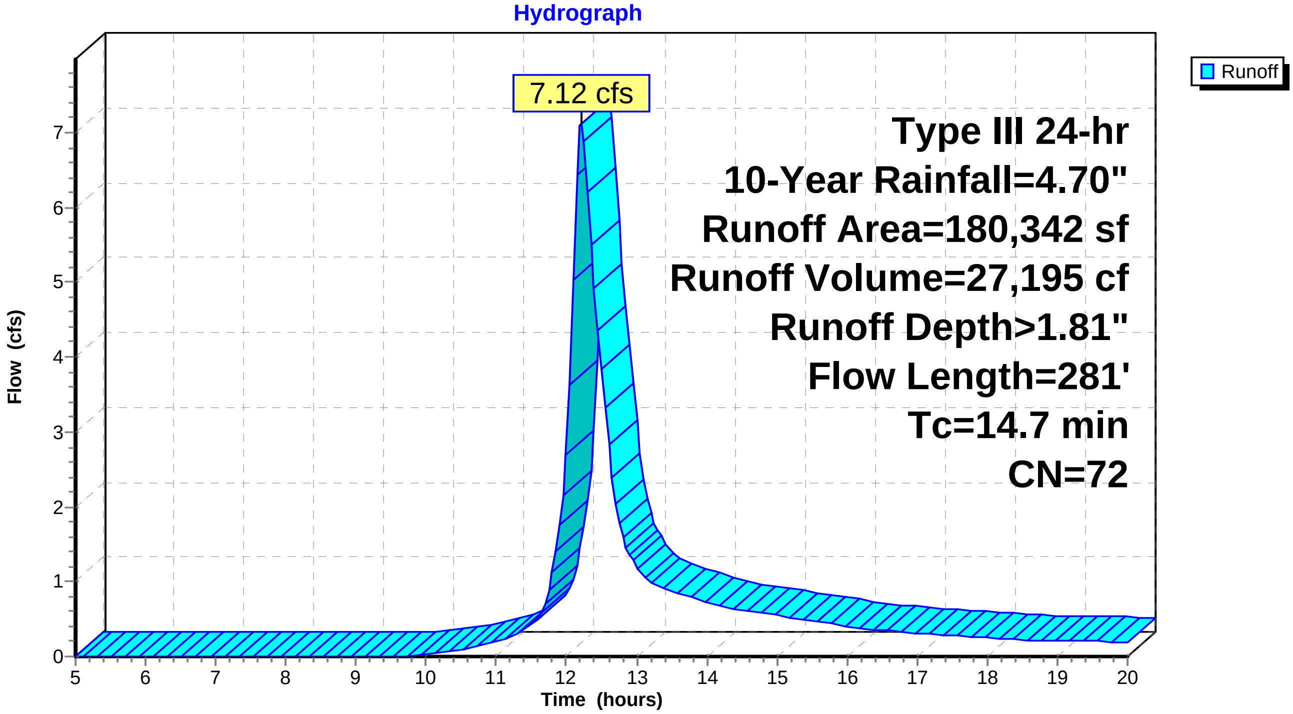
Runoff = 7.12 cfs @ 12.21 hrs, Volume= 27,195 cf, Depth> 1.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	21,719	30	Woods, Good, HSG A
	22,048	70	Woods, Good, HSG C
	87,774	77	Woods, Good, HSG D
*	14,448	98	Imprevious
	6,196	54	1/2 acre lots, 25% imp, HSG A
	25,634	80	1/2 acre lots, 25% imp, HSG C
	908	72	Dirt roads, HSG A
	1,615	89	Dirt roads, HSG D
	180,342	72	Weighted Average
	157,937		87.58% Pervious Area
	22,406		12.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	50	0.0160	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	231	0.0397	3.21		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
14.7	281	Total			

Subcatchment EXDA-2: To Wetlands South



Summary for Subcatchment EXDA-3: To ILSF

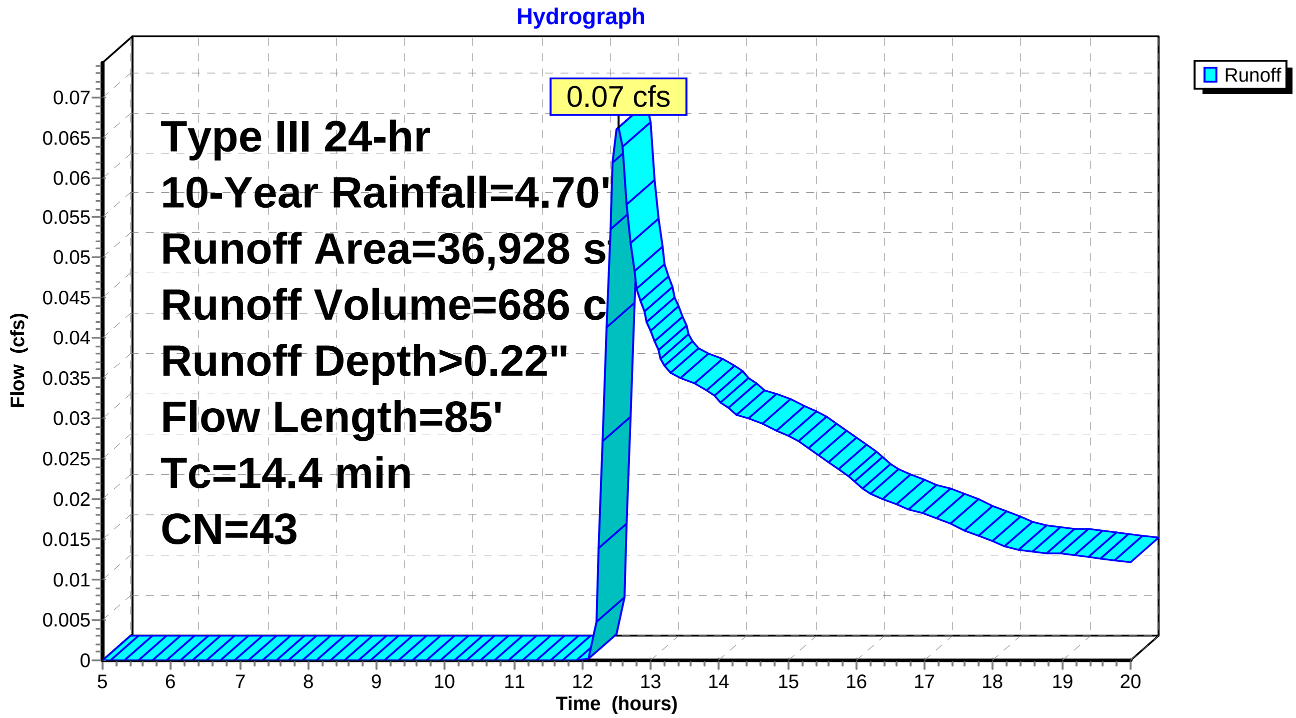
Runoff = 0.07 cfs @ 12.52 hrs, Volume= 686 cf, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
26,428	30	Woods, Good, HSG A
10,500	77	Woods, Good, HSG D
36,928	43	Weighted Average
36,928		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	35	0.0350	3.01		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
14.4	85	Total			

Subcatchment EXDA-3: To ILSF



Summary for Subcatchment EXDA-4: To Wetlands Southeast

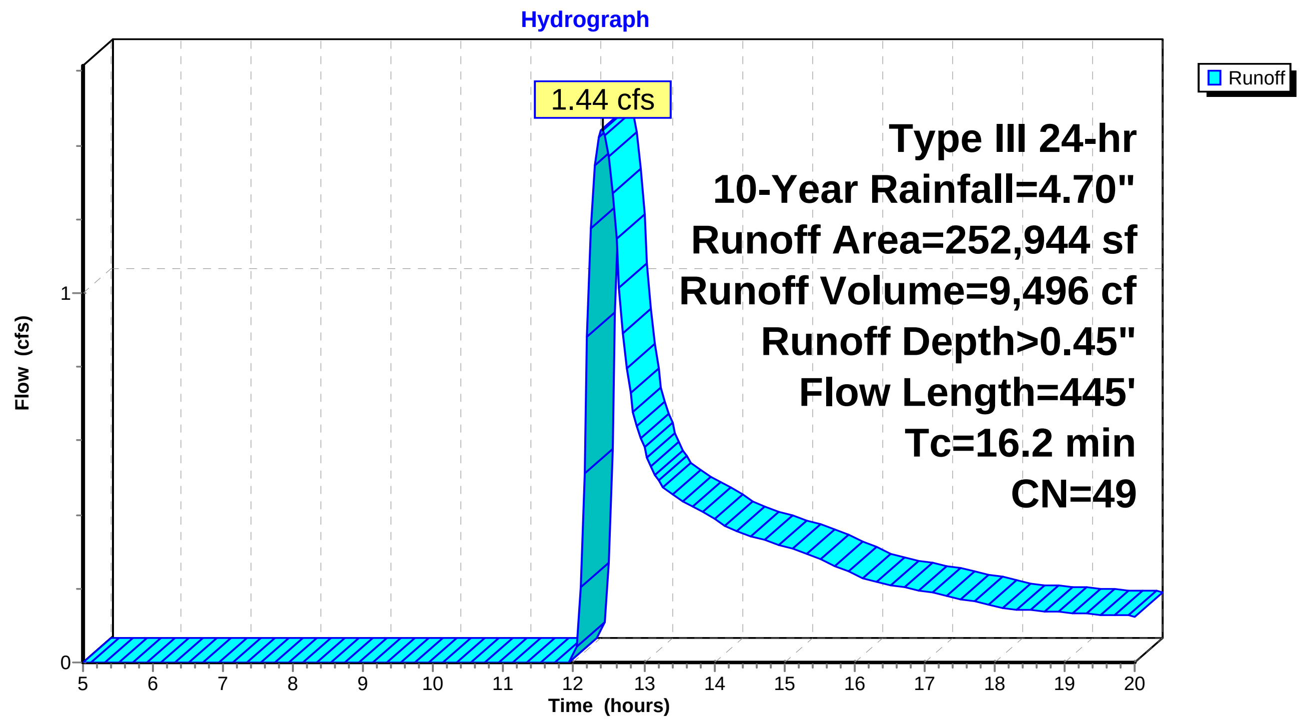
Runoff = 1.44 cfs @ 12.40 hrs, Volume= 9,496 cf, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
138,815	30	Woods, Good, HSG A
25,877	55	Woods, Good, HSG B
88,252	77	Woods, Good, HSG D
252,944	49	Weighted Average
252,944		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	50	0.0180	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	395	0.0150	1.97		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
16.2	445	Total			

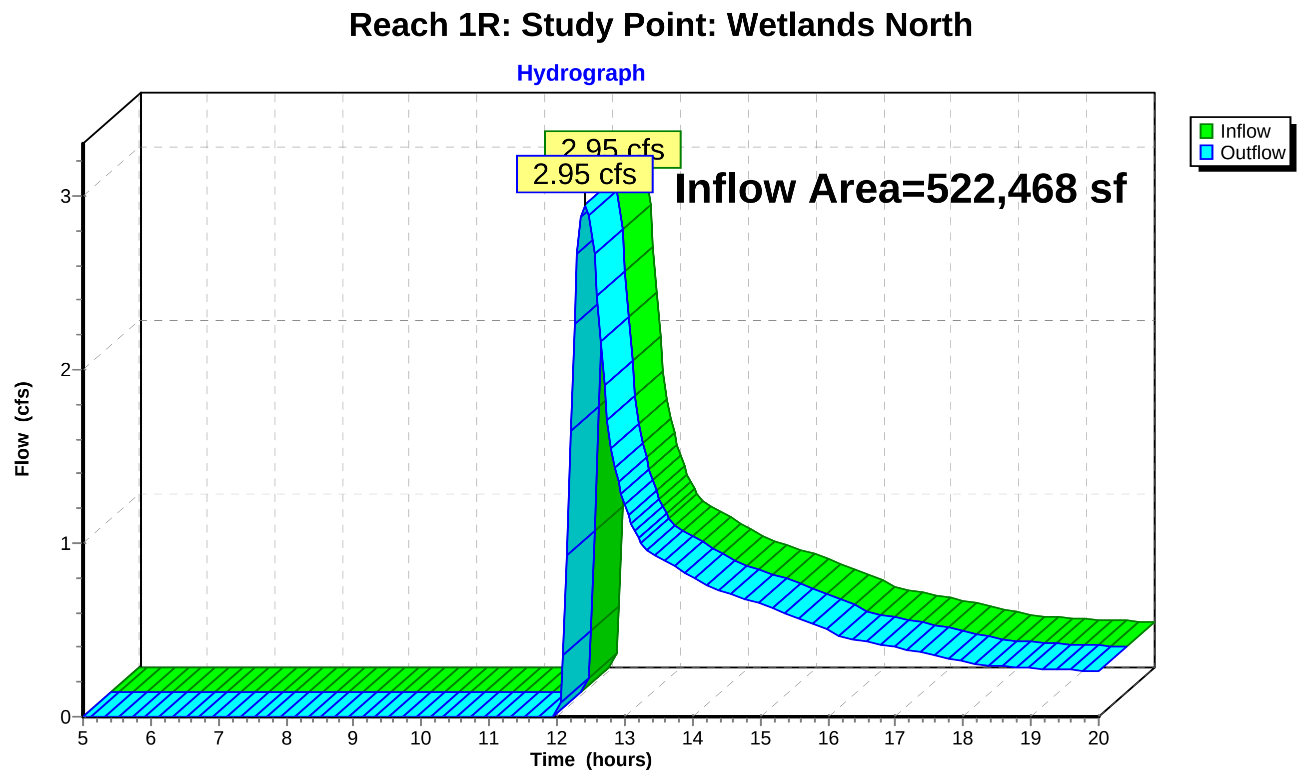
Subcatchment EXDA-4: To Wetlands Southeast



Summary for Reach 1R: Study Point: Wetlands North

Inflow Area =	522,468 sf,	3.37% Impervious, Inflow Depth > 0.45"	for 10-Year event
Inflow =	2.95 cfs @ 12.42 hrs, Volume=	19,601 cf	
Outflow =	2.95 cfs @ 12.42 hrs, Volume=	19,601 cf, Atten= 0%, Lag= 0.0 min	

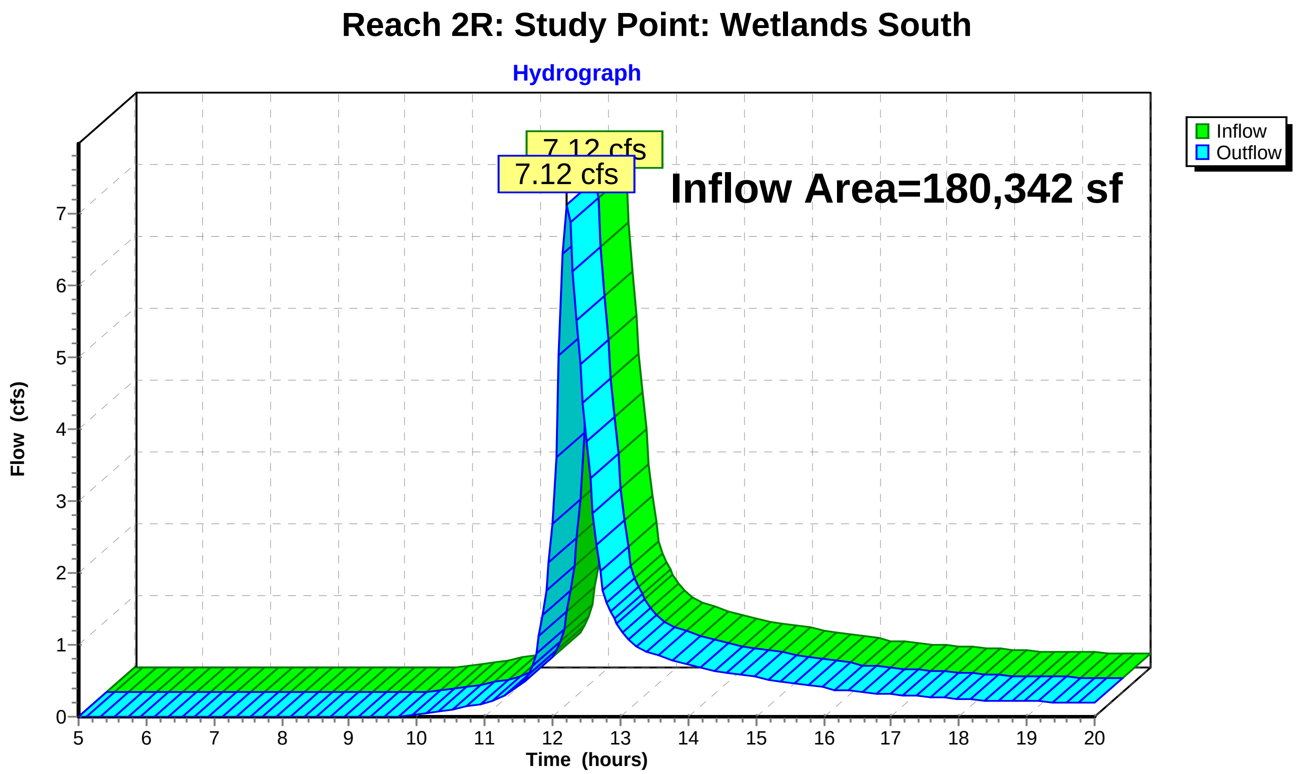
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Reach 2R: Study Point: Wetlands South

Inflow Area = 180,342 sf, 12.42% Impervious, Inflow Depth > 1.81" for 10-Year event
Inflow = 7.12 cfs @ 12.21 hrs, Volume= 27,195 cf
Outflow = 7.12 cfs @ 12.21 hrs, Volume= 27,195 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

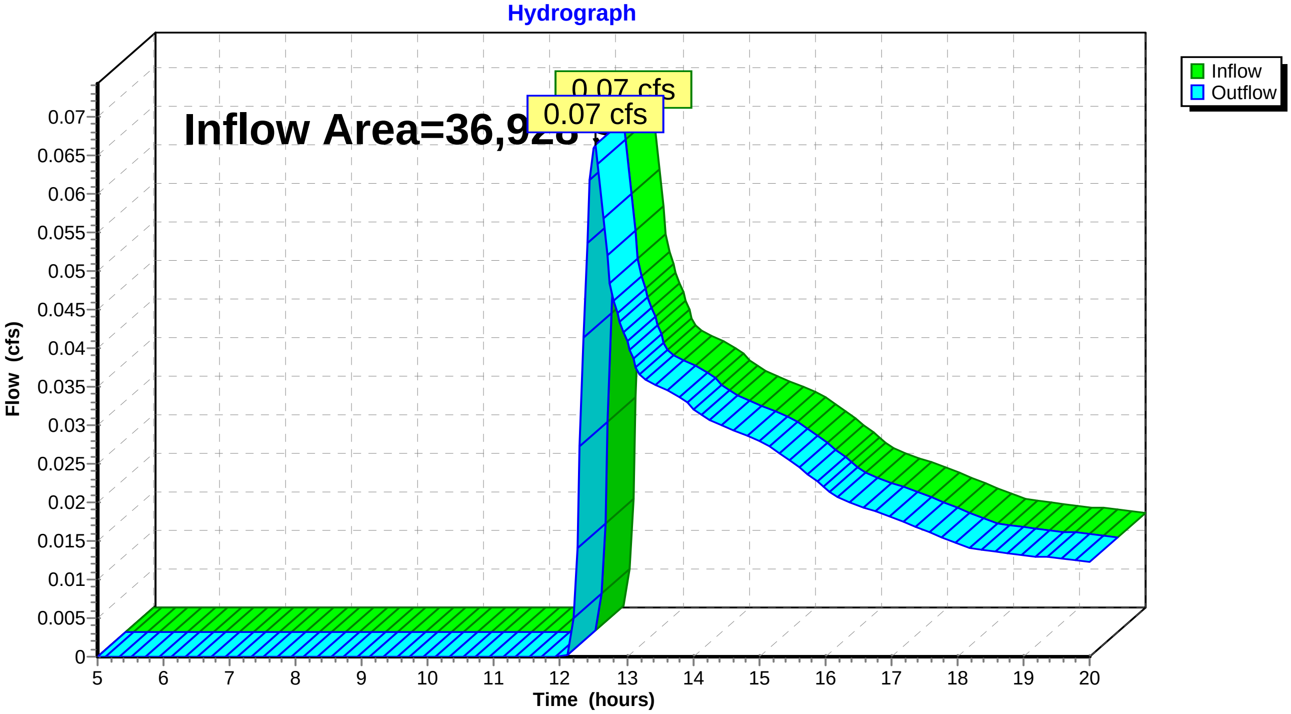


Summary for Reach 3R: Study Point: ILSF

Inflow Area = 36,928 sf, 0.00% Impervious, Inflow Depth > 0.22" for 10-Year event
Inflow = 0.07 cfs @ 12.52 hrs, Volume= 686 cf
Outflow = 0.07 cfs @ 12.52 hrs, Volume= 686 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 3R: Study Point: ILSF

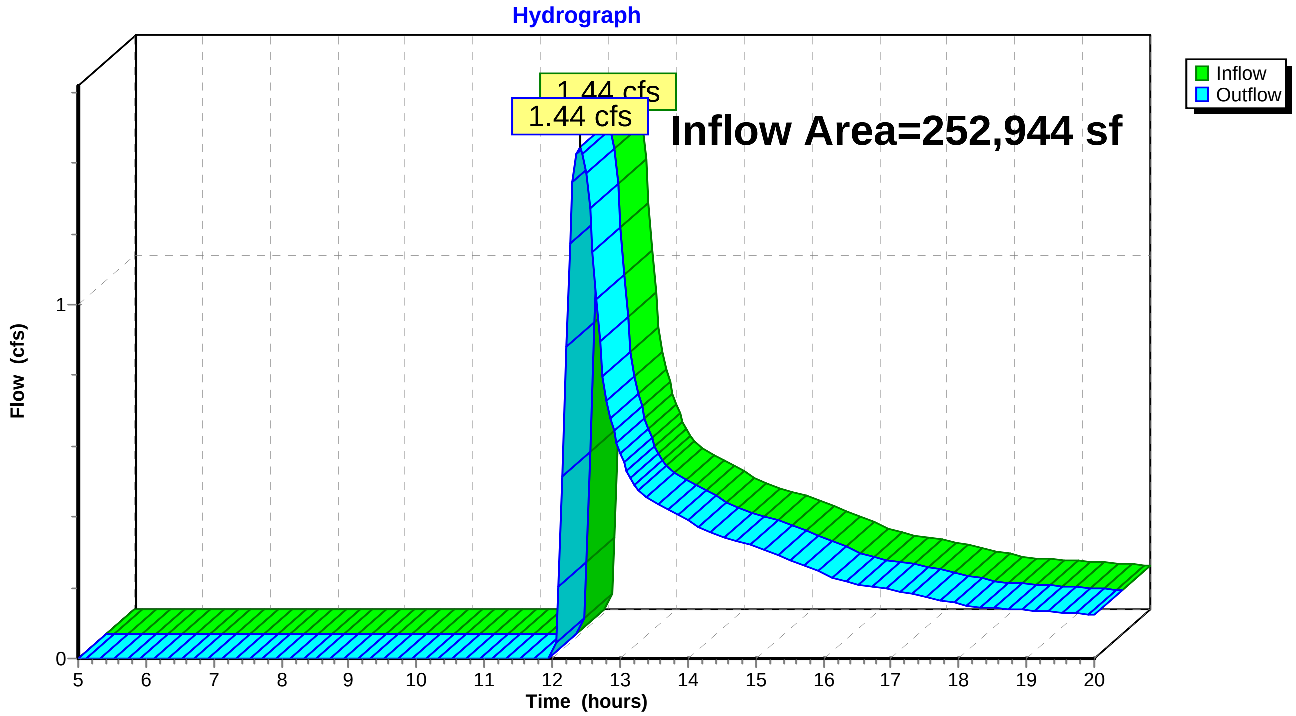


Summary for Reach 4R: Study Point: Wetlands Southeast

Inflow Area = 252,944 sf, 0.00% Impervious, Inflow Depth > 0.45" for 10-Year event
Inflow = 1.44 cfs @ 12.40 hrs, Volume= 9,496 cf
Outflow = 1.44 cfs @ 12.40 hrs, Volume= 9,496 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 4R: Study Point: Wetlands Southeast



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EXDA-1: To Wetlands North Runoff Area=522,468 sf 3.37% Impervious Runoff Depth>1.26"
Flow Length=277' Tc=17.1 min CN=49 Runoff=11.70 cfs 54,931 cf

Subcatchment EXDA-2: To Wetlands Runoff Area=180,342 sf 12.42% Impervious Runoff Depth>3.32"
Flow Length=281' Tc=14.7 min CN=72 Runoff=13.16 cfs 49,871 cf

Subcatchment EXDA-3: To ILSF Runoff Area=36,928 sf 0.00% Impervious Runoff Depth>0.82"
Flow Length=85' Tc=14.4 min CN=43 Runoff=0.46 cfs 2,537 cf

Subcatchment EXDA-4: To Wetlands Runoff Area=252,944 sf 0.00% Impervious Runoff Depth>1.26"
Flow Length=445' Tc=16.2 min CN=49 Runoff=5.81 cfs 26,607 cf

Reach 1R: Study Point: Wetlands North Inflow=11.70 cfs 54,931 cf
Outflow=11.70 cfs 54,931 cf

Reach 2R: Study Point: Wetlands South Inflow=13.16 cfs 49,871 cf
Outflow=13.16 cfs 49,871 cf

Reach 3R: Study Point: ILSF Inflow=0.46 cfs 2,537 cf
Outflow=0.46 cfs 2,537 cf

Reach 4R: Study Point: Wetlands Southeast Inflow=5.81 cfs 26,607 cf
Outflow=5.81 cfs 26,607 cf

Total Runoff Area = 992,682 sf Runoff Volume = 133,946 cf Average Runoff Depth = 1.62"
95.97% Pervious = 952,680 sf 4.03% Impervious = 40,002 sf

Summary for Subcatchment EXDA-1: To Wetlands North

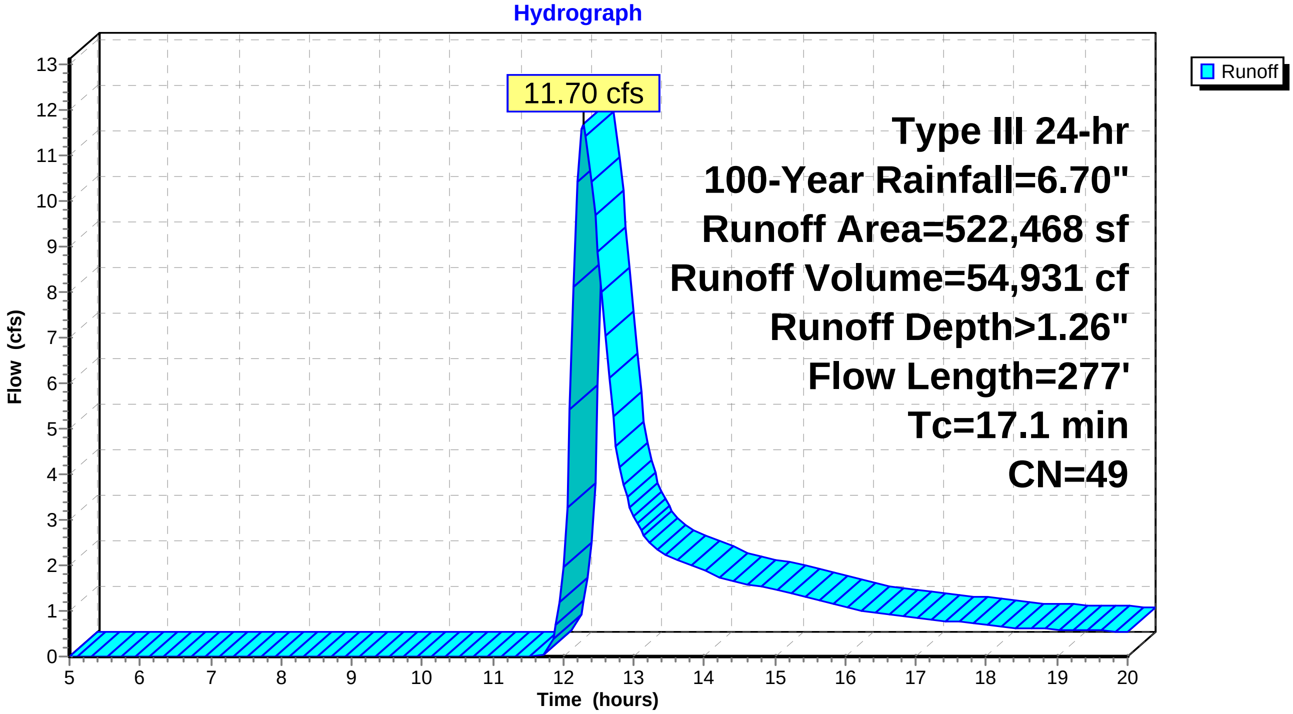
Runoff = 11.70 cfs @ 12.28 hrs, Volume= 54,931 cf, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
240,432	30	Woods, Good, HSG A
135,597	55	Woods, Good, HSG B
21,426	70	Woods, Good, HSG C
34,114	77	Woods, Good, HSG D
60,214	80	1/2 acre lots, 25% imp, HSG C
10,171	54	1/2 acre lots, 25% imp, HSG A
7,805	72	Dirt roads, HSG A
10,398	82	Dirt roads, HSG B
2,311	89	Dirt roads, HSG D
522,468	49	Weighted Average
504,872		96.63% Pervious Area
17,596		3.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	227	0.0802	4.56		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
17.1	277	Total			

Subcatchment EXDA-1: To Wetlands North



Summary for Subcatchment EXDA-2: To Wetlands South

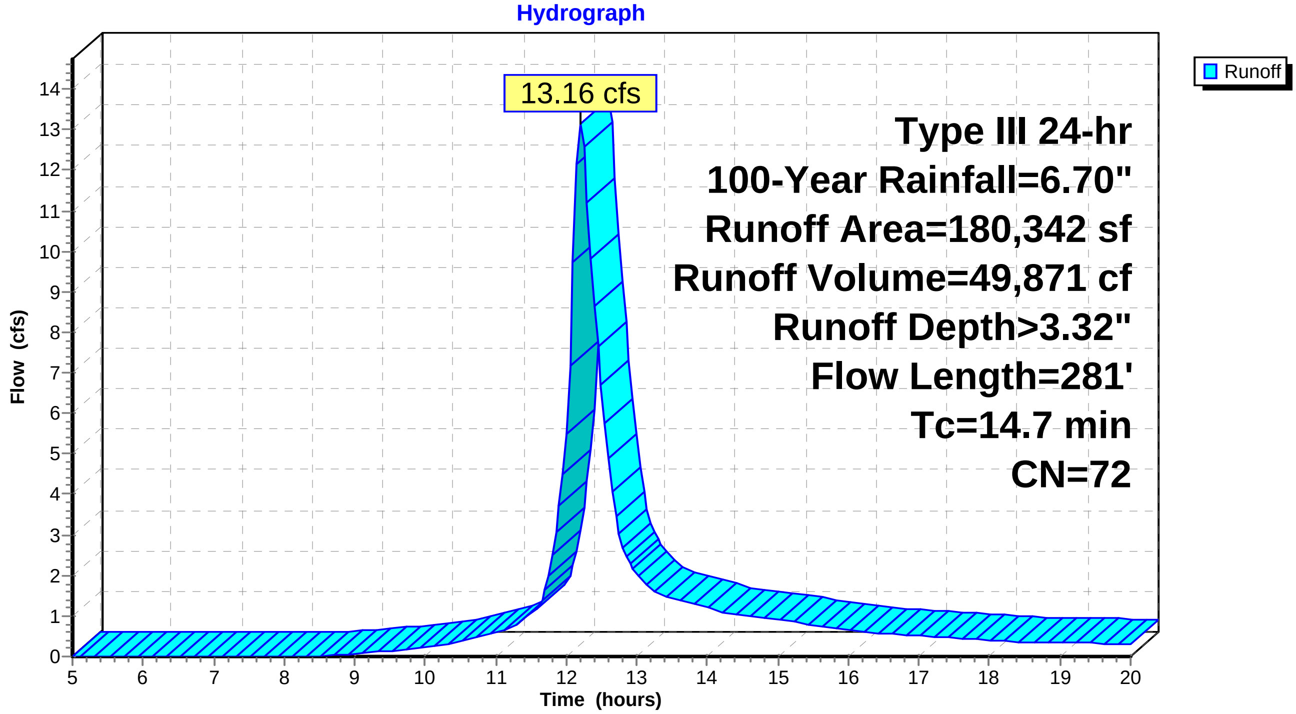
Runoff = 13.16 cfs @ 12.21 hrs, Volume= 49,871 cf, Depth> 3.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	21,719	30	Woods, Good, HSG A
	22,048	70	Woods, Good, HSG C
	87,774	77	Woods, Good, HSG D
*	14,448	98	Imprevious
	6,196	54	1/2 acre lots, 25% imp, HSG A
	25,634	80	1/2 acre lots, 25% imp, HSG C
	908	72	Dirt roads, HSG A
	1,615	89	Dirt roads, HSG D
	180,342	72	Weighted Average
	157,937		87.58% Pervious Area
	22,406		12.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	50	0.0160	0.06		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
1.2	231	0.0397	3.21		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
14.7	281	Total			

Subcatchment EXDA-2: To Wetlands South



Summary for Subcatchment EXDA-3: To ILSF

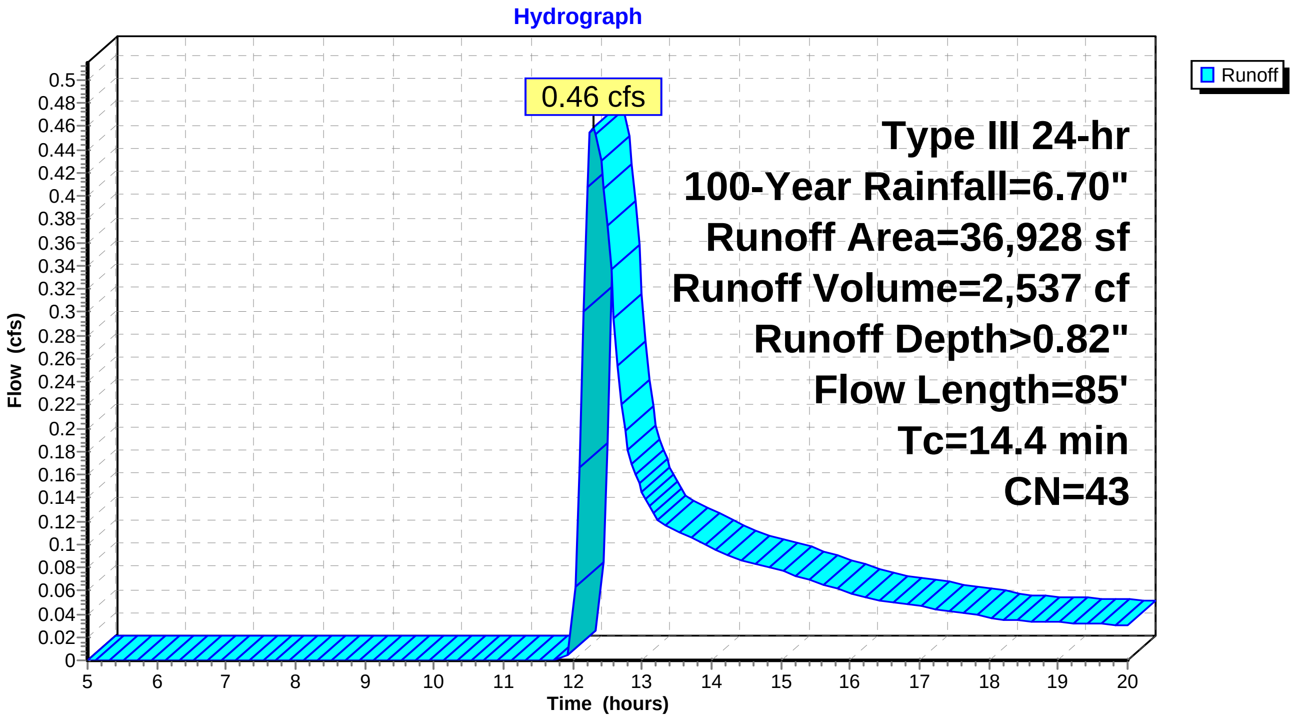
Runoff = 0.46 cfs @ 12.29 hrs, Volume= 2,537 cf, Depth> 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
26,428	30	Woods, Good, HSG A
10,500	77	Woods, Good, HSG D
36,928	43	Weighted Average
36,928		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
0.2	35	0.0350	3.01		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
14.4	85	Total			

Subcatchment EXDA-3: To ILSF



Summary for Subcatchment EXDA-4: To Wetlands Southeast

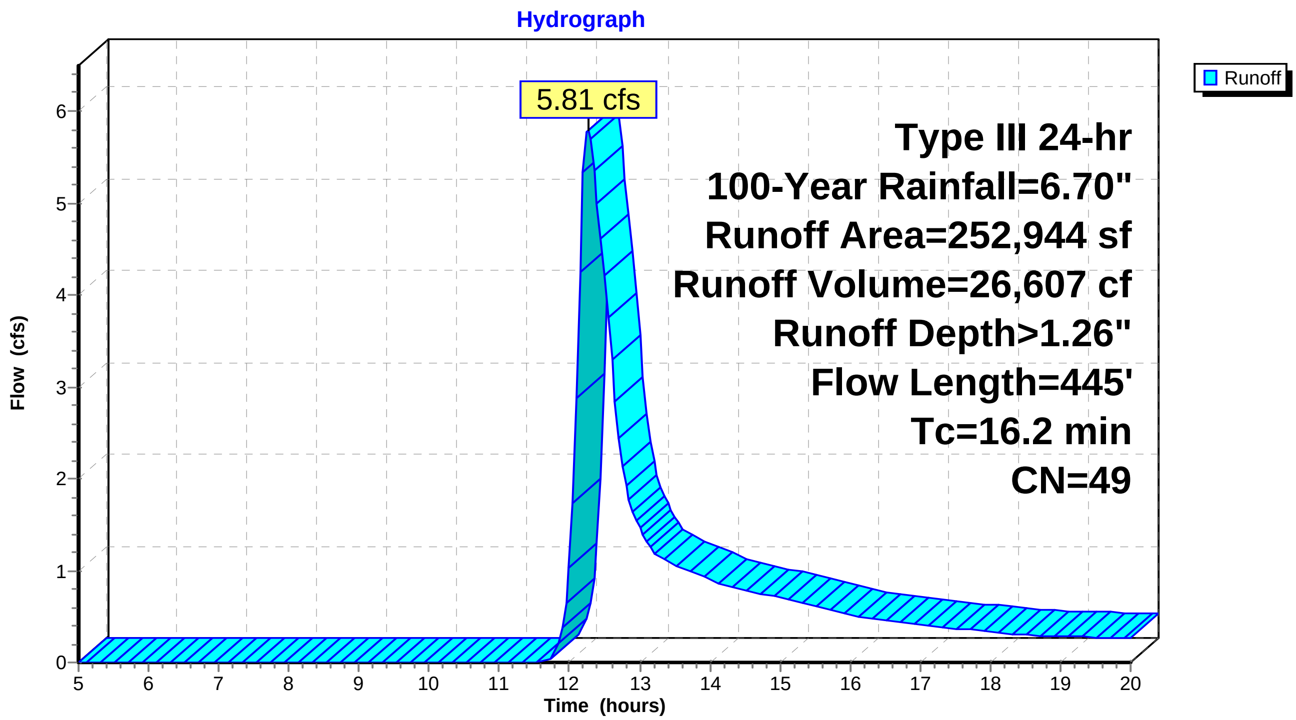
Runoff = 5.81 cfs @ 12.27 hrs, Volume= 26,607 cf, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
138,815	30	Woods, Good, HSG A
25,877	55	Woods, Good, HSG B
88,252	77	Woods, Good, HSG D
252,944	49	Weighted Average
252,944		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	50	0.0180	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	395	0.0150	1.97		**Shallow Concentrated Flow, BC** Unpaved Kv= 16.1 fps
16.2	445	Total			

Subcatchment EXDA-4: To Wetlands Southeast

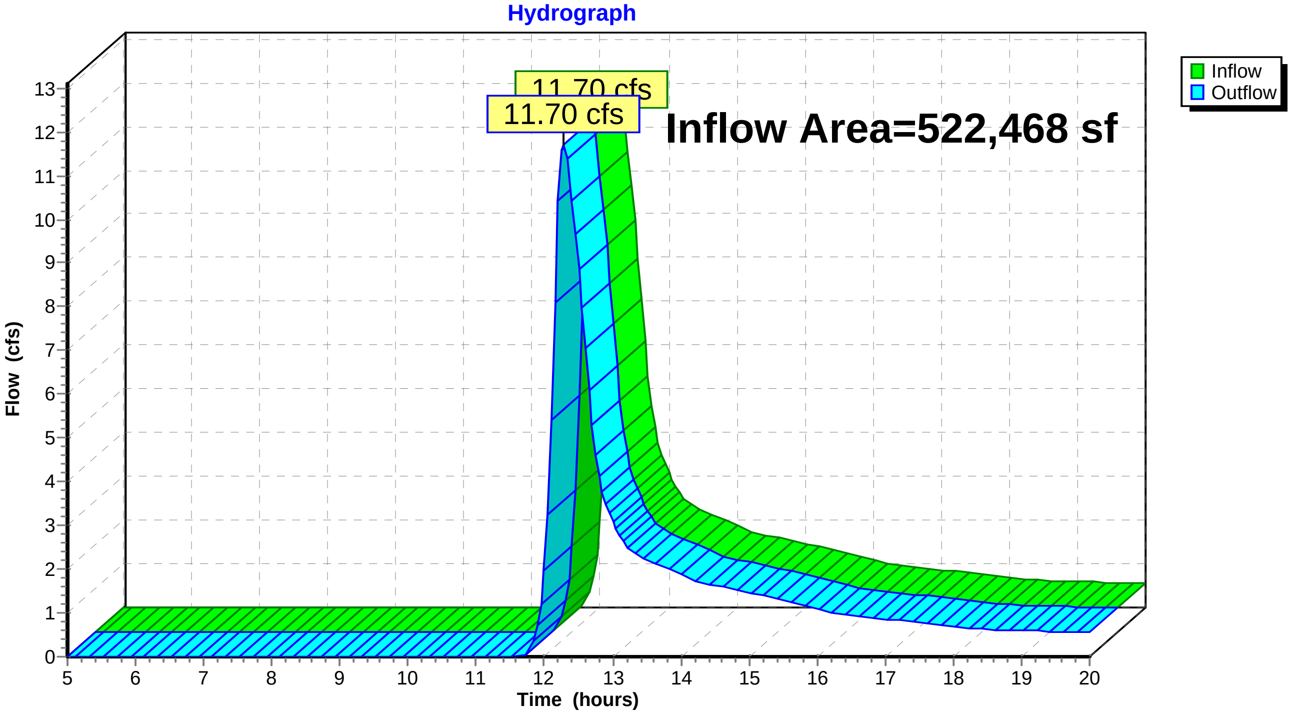


Summary for Reach 1R: Study Point: Wetlands North

Inflow Area = 522,468 sf, 3.37% Impervious, Inflow Depth > 1.26" for 100-Year event
Inflow = 11.70 cfs @ 12.28 hrs, Volume= 54,931 cf
Outflow = 11.70 cfs @ 12.28 hrs, Volume= 54,931 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

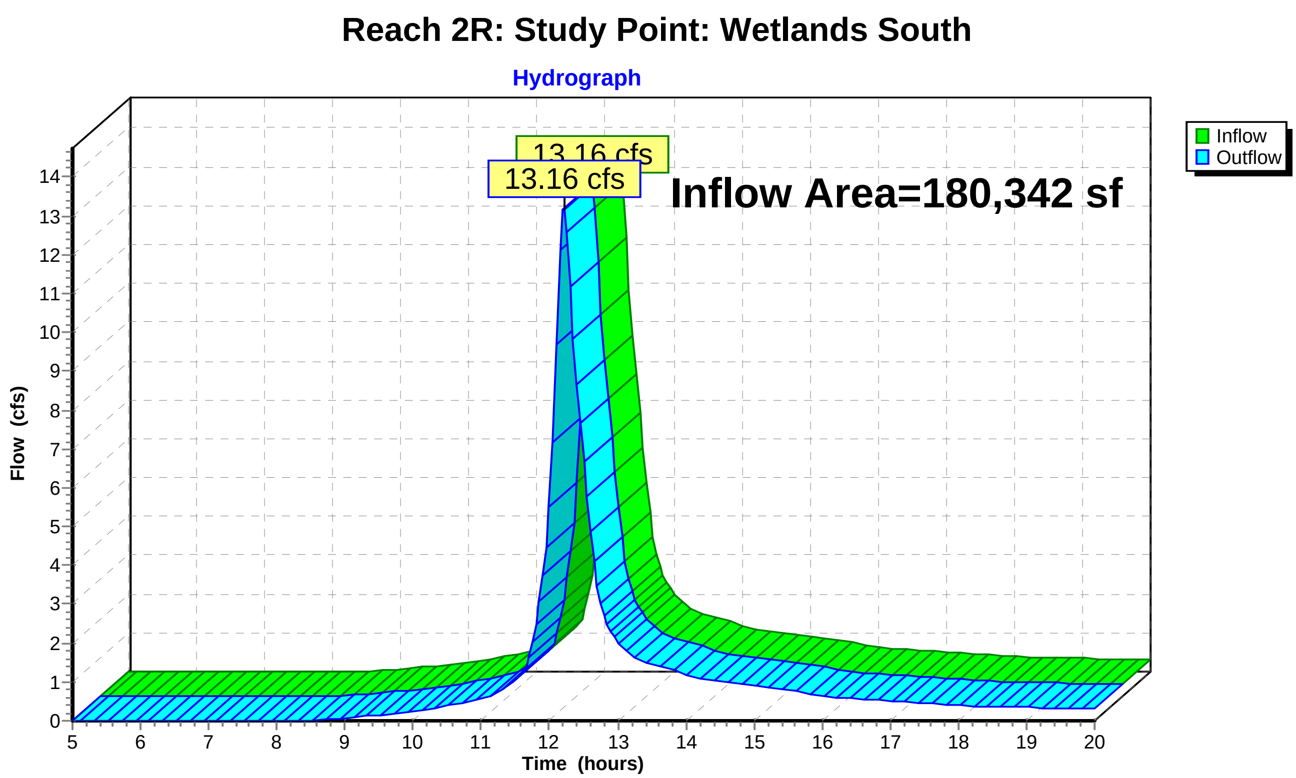
Reach 1R: Study Point: Wetlands North



Summary for Reach 2R: Study Point: Wetlands South

Inflow Area =	180,342 sf,	12.42% Impervious,	Inflow Depth > 3.32"	for 100-Year event
Inflow =	13.16 cfs @	12.21 hrs, Volume=	49,871 cf	
Outflow =	13.16 cfs @	12.21 hrs, Volume=	49,871 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

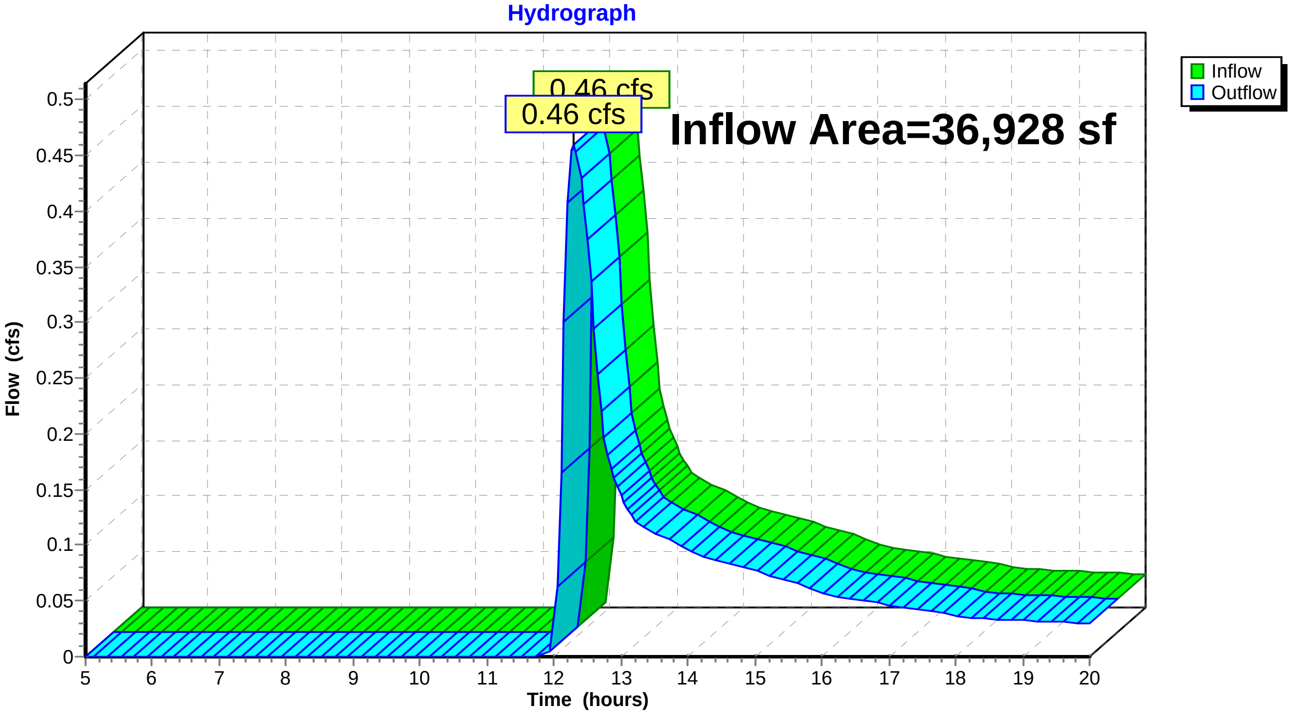


Summary for Reach 3R: Study Point: ILSF

Inflow Area = 36,928 sf, 0.00% Impervious, Inflow Depth > 0.82" for 100-Year event
Inflow = 0.46 cfs @ 12.29 hrs, Volume= 2,537 cf
Outflow = 0.46 cfs @ 12.29 hrs, Volume= 2,537 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

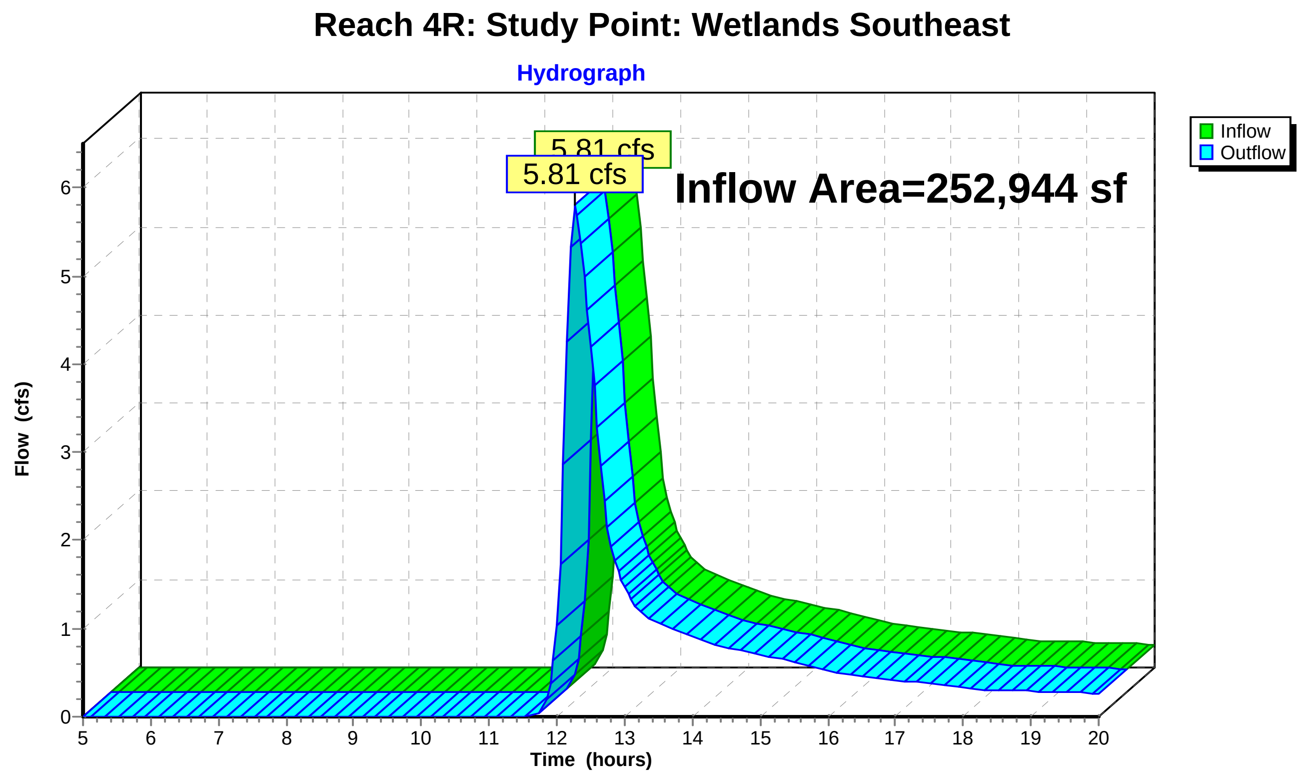
Reach 3R: Study Point: ILSF



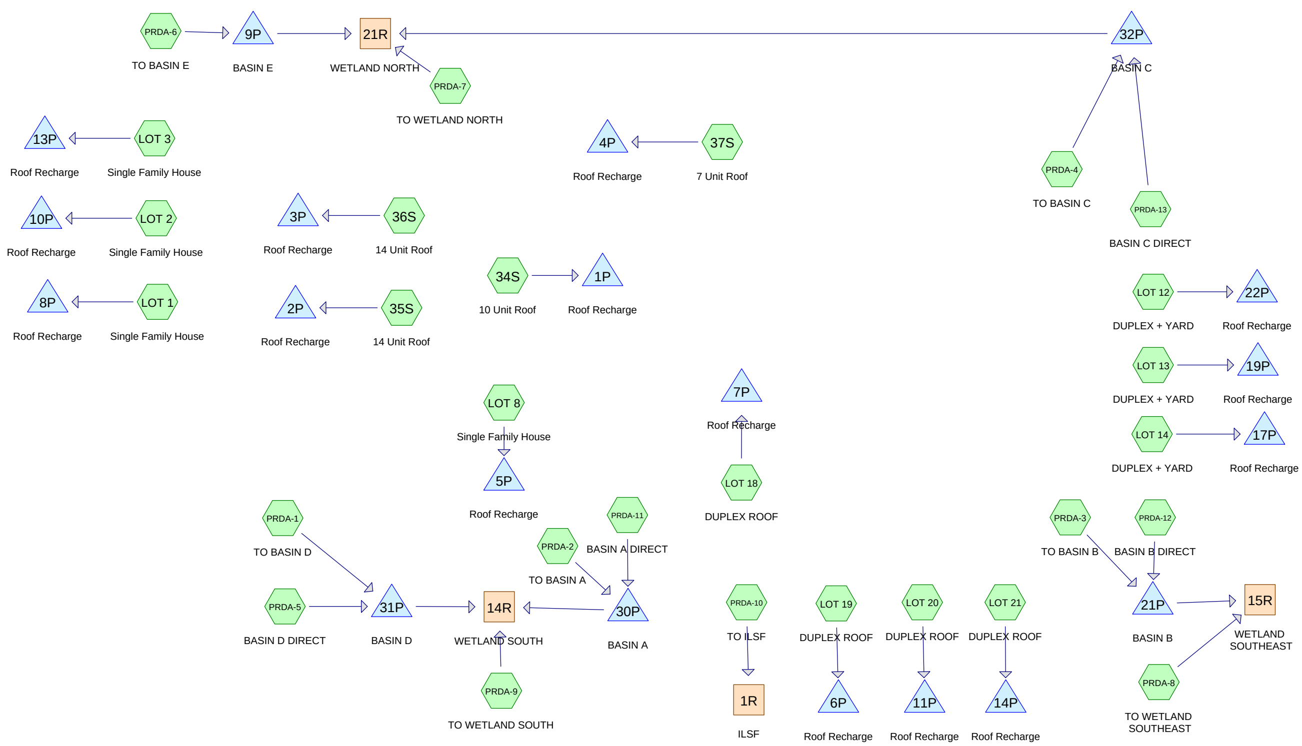
Summary for Reach 4R: Study Point: Wetlands Southeast

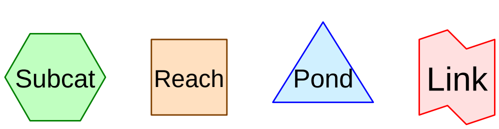
Inflow Area =	252,944 sf,	0.00% Impervious, Inflow Depth > 1.26"	for 100-Year event
Inflow =	5.81 cfs @	12.27 hrs, Volume=	26,607 cf
Outflow =	5.81 cfs @	12.27 hrs, Volume=	26,607 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Post-Development HydroCAD Analysis





Routing Diagram for POST-DEVELOPMENT-REV1
Prepared by HP, Printed 3/9/2020
HydroCAD® 10.00-24 s/n 09450 © 2018 HydroCAD Software Solutions LLC

Project Notes

Rainfall events imported from "TP-40-Rain.txt" for 446 MA Norfolk
Defined 10 rainfall events from MA_AVON_JOANNA-HILL IDF
Defined 10 rainfall events from MA_AVON_JOANNA-HILL IDF
Rainfall events imported from "TP-40-Rain.txt" for 446 MA Norfolk

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
16,595	54	1/2 acre lots, 25% imp, HSG A (PRDA-1, PRDA-6, PRDA-7)
86,361	80	1/2 acre lots, 25% imp, HSG C (PRDA-1, PRDA-5, PRDA-6, PRDA-7, PRDA-9)
226,878	39	>75% Grass cover, Good, HSG A (PRDA-1, PRDA-10, PRDA-12, PRDA-3, PRDA-4, PRDA-5, PRDA-6, PRDA-7, PRDA-8, PRDA-9)
94,170	61	>75% Grass cover, Good, HSG B (LOT 12, PRDA-13, PRDA-3, PRDA-4, PRDA-7)
24,520	74	>75% Grass cover, Good, HSG C (PRDA-1, PRDA-5, PRDA-6, PRDA-7)
98,291	80	>75% Grass cover, Good, HSG D (LOT 12, LOT 13, LOT 14, PRDA-1, PRDA-10, PRDA-11, PRDA-12, PRDA-3, PRDA-4, PRDA-5, PRDA-6, PRDA-7, PRDA-8, PRDA-9)
432	96	Gravel surface, HSG C (PRDA-5)
76,926	98	IMPERVIOUS (PRDA-2, PRDA-3, PRDA-6, PRDA-9)
178,461	98	Impervious (34S, 35S, 36S, 37S, LOT 1, LOT 12, LOT 13, LOT 14, LOT 18, LOT 19, LOT 2, LOT 20, LOT 21, LOT 3, LOT 8, PRDA-1, PRDA-4, PRDA-5)
18,387	98	Roofs, HSG A (PRDA-3, PRDA-6)
4,929	98	Roofs, HSG B (PRDA-4)
9,227	98	Water Surface, HSG A (PRDA-5)
19,611	98	Water Surface, HSG B (PRDA-11, PRDA-13)
13,399	98	Water Surface, HSG D (PRDA-12, PRDA-6)
36,216	30	Woods, Good, HSG A (PRDA-10, PRDA-7, PRDA-8)
23,645	70	Woods, Good, HSG C (PRDA-5, PRDA-7, PRDA-9)
63,256	77	Woods, Good, HSG D (PRDA-10, PRDA-5, PRDA-7, PRDA-8, PRDA-9)
1,378	98	impervious (PRDA-7)
992,682	**72**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
307,303	HSG A	PRDA-1, PRDA-10, PRDA-12, PRDA-3, PRDA-4, PRDA-5, PRDA-6, PRDA-7, PRDA-8, PRDA-9
118,710	HSG B	LOT 12, PRDA-11, PRDA-13, PRDA-3, PRDA-4, PRDA-7
134,958	HSG C	PRDA-1, PRDA-5, PRDA-6, PRDA-7, PRDA-9
174,946	HSG D	LOT 12, LOT 13, LOT 14, PRDA-1, PRDA-10, PRDA-11, PRDA-12, PRDA-3, PRDA-4, PRDA-5, PRDA-6, PRDA-7, PRDA-8, PRDA-9
256,765	Other	34S, 35S, 36S, 37S, LOT 1, LOT 12, LOT 13, LOT 14, LOT 18, LOT 19, LOT 2, LOT 20, LOT 21, LOT 3, LOT 8, PRDA-1, PRDA-2, PRDA-3, PRDA-4, PRDA-5, PRDA-6, PRDA-7, PRDA-9
992,682		**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
16,595	0	86,361	0	0	102,956	1/2 acre lots, 25% imp	
226,878	94,170	24,520	98,291	0	443,859	>75% Grass cover, Good	
0	0	432	0	0	432	Gravel surface	
0	0	0	0	76,926	76,926	IMPERVIOUS	
0	0	0	0	178,461	178,461	Impervious	
18,387	4,929	0	0	0	23,316	Roofs	
9,227	19,611	0	13,399	0	42,237	Water Surface	
36,216	0	23,645	63,256	0	123,117	Woods, Good	
0	0	0	0	1,378	1,378	impervious	
307,303	**118,710**	**134,958**	**174,946**	**256,765**	**992,682**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 34S: 10 Unit Roof Runoff Area=10,448 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.73 cfs 2,415 cf

Subcatchment 35S: 14 Unit Roof Runoff Area=13,061 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.91 cfs 3,019 cf

Subcatchment 36S: 14 Unit Roof Runoff Area=13,061 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.91 cfs 3,019 cf

Subcatchment 37S: 7 Unit Roof Runoff Area=7,296 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.51 cfs 1,686 cf

Subcatchment LOT 1: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.08 cfs 277 cf

Subcatchment LOT 12: DUPLEX + YARD Runoff Area=11,373 sf 43.34% Impervious Runoff Depth>1.17"
Tc=6.0 min CN=78 Runoff=0.38 cfs 1,110 cf

Subcatchment LOT 13: DUPLEX + YARD Runoff Area=11,720 sf 42.06% Impervious Runoff Depth>1.87"
Tc=6.0 min CN=88 Runoff=0.61 cfs 1,828 cf

Subcatchment LOT 14: DUPLEX + YARD Runoff Area=13,086 sf 37.67% Impervious Runoff Depth>1.79"
Tc=6.0 min CN=87 Runoff=0.66 cfs 1,953 cf

Subcatchment LOT 18: DUPLEX ROOF Runoff Area=4,929 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.34 cfs 1,139 cf

Subcatchment LOT 19: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.28 cfs 938 cf

Subcatchment LOT 2: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.08 cfs 277 cf

Subcatchment LOT 20: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.28 cfs 938 cf

Subcatchment LOT 21: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.28 cfs 938 cf

Subcatchment LOT 3: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.08 cfs 277 cf

Subcatchment LOT 8: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>2.77"
Tc=6.0 min CN=98 Runoff=0.08 cfs 277 cf

Subcatchment PRDA-1: TO BASIN D Runoff Area=51,731 sf 56.02% Impervious Runoff Depth>1.36"
Tc=6.0 min CN=81 Runoff=1.99 cfs 5,860 cf

Subcatchment PRDA-10: TO ILSF Runoff Area=14,656 sf 0.00% Impervious Runoff Depth>0.05"
Flow Length=85' Tc=15.0 min CN=47 Runoff=0.00 cfs 64 cf

Subcatchment PRDA-11: BASIN A DIRECT Runoff Area=8,000 sf 49.79% Impervious Runoff Depth>1.96"
Tc=0.0 min CN=89 Runoff=0.51 cfs 1,305 cf

Subcatchment PRDA-12: BASIN B DIRECT Runoff Area=16,454 sf 45.11% Impervious Runoff Depth>1.17"
Tc=6.0 min CN=78 Runoff=0.54 cfs 1,606 cf

Subcatchment PRDA-13: BASIN C DIRECT Runoff Area=31,453 sf 49.69% Impervious Runoff Depth>1.23"
Tc=6.0 min CN=79 Runoff=1.09 cfs 3,230 cf

Subcatchment PRDA-2: TO BASIN A Runoff Area=10,459 sf 100.00% Impervious Runoff Depth>2.77"
Tc=0.0 min CN=98 Runoff=0.85 cfs 2,418 cf

Subcatchment PRDA-3: TO BASIN B Runoff Area=151,241 sf 36.39% Impervious Runoff Depth>0.57"
Flow Length=520' Tc=13.1 min CN=66 Runoff=1.66 cfs 7,199 cf

Subcatchment PRDA-4: TO BASIN C Runoff Area=156,821 sf 48.34% Impervious Runoff Depth>0.94"
Flow Length=370' Tc=10.4 min CN=74 Runoff=3.54 cfs 12,342 cf

Subcatchment PRDA-5: BASIN D DIRECT Runoff Area=38,283 sf 32.09% Impervious Runoff Depth>1.49"
Tc=6.0 min CN=83 Runoff=1.62 cfs 4,768 cf

Subcatchment PRDA-6: TO BASIN E Runoff Area=135,239 sf 32.90% Impervious Runoff Depth>0.95"
Tc=6.0 min CN=74 Runoff=3.52 cfs 10,664 cf

Subcatchment PRDA-7: TO WETLAND Runoff Area=149,386 sf 2.80% Impervious Runoff Depth>0.14"
Tc=6.0 min CN=52 Runoff=0.18 cfs 1,755 cf

Subcatchment PRDA-8: TO WETLAND Runoff Area=46,646 sf 0.00% Impervious Runoff Depth>0.19"
Tc=6.0 min CN=54 Runoff=0.09 cfs 724 cf

Subcatchment PRDA-9: TO WETLAND Runoff Area=80,362 sf 11.49% Impervious Runoff Depth>1.23"
Tc=6.0 min CN=79 Runoff=2.80 cfs 8,252 cf

Reach 1R: ILSF Inflow=0.00 cfs 64 cf
Outflow=0.00 cfs 64 cf

Reach 14R: WETLAND SOUTH Inflow=2.80 cfs 8,252 cf
Outflow=2.80 cfs 8,252 cf

Reach 15R: WETLAND SOUTHEAST Inflow=0.09 cfs 724 cf
Outflow=0.09 cfs 724 cf

Reach 21R: WETLAND NORTH Inflow=0.18 cfs 1,755 cf
Outflow=0.18 cfs 1,755 cf

Pond 1P: Roof Recharge Peak Elev=0.88' Storage=801 cf Inflow=0.73 cfs 2,415 cf
Outflow=0.09 cfs 2,412 cf

Pond 2P: Roof Recharge Peak Elev=0.98' Storage=1,366 cf Inflow=0.91 cfs 3,019 cf
Outflow=0.06 cfs 2,385 cf

Pond 3P: Roof Recharge Peak Elev=0.98' Storage=1,366 cf Inflow=0.91 cfs 3,019 cf
Outflow=0.06 cfs 2,385 cf

Pond 4P: Roof Recharge Peak Elev=1.00' Storage=762 cf Inflow=0.51 cfs 1,686 cf
Outflow=0.03 cfs 1,341 cf

Pond 5P: Roof Recharge Peak Elev=1.04' Storage=120 cf Inflow=0.08 cfs 277 cf
Outflow=0.01 cfs 244 cf

Pond 6P: Roof Recharge Peak Elev=0.77' Storage=378 cf Inflow=0.28 cfs 938 cf
Outflow=0.02 cfs 924 cf

Pond 7P: Roof Recharge Peak Elev=0.93' Storage=493 cf Inflow=0.34 cfs 1,139 cf
Outflow=0.03 cfs 987 cf

Pond 8P: Roof Recharge Peak Elev=1.04' Storage=120 cf Inflow=0.08 cfs 277 cf
Outflow=0.01 cfs 244 cf

Pond 9P: BASIN E Peak Elev=238.98' Storage=5,062 cf Inflow=3.52 cfs 10,664 cf
Discarded=0.28 cfs 8,057 cf Primary=0.00 cfs 0 cf Outflow=0.28 cfs 8,057 cf

Pond 10P: Roof Recharge Peak Elev=1.04' Storage=120 cf Inflow=0.08 cfs 277 cf
Outflow=0.01 cfs 244 cf

Pond 11P: Roof Recharge Peak Elev=0.77' Storage=378 cf Inflow=0.28 cfs 938 cf
Outflow=0.02 cfs 924 cf

Pond 13P: Roof Recharge Peak Elev=1.04' Storage=120 cf Inflow=0.08 cfs 277 cf
Outflow=0.01 cfs 244 cf

Pond 14P: Roof Recharge Peak Elev=0.82' Storage=390 cf Inflow=0.28 cfs 938 cf
Outflow=0.02 cfs 870 cf

Pond 17P: Roof Recharge Peak Elev=0.93' Storage=945 cf Inflow=0.66 cfs 1,953 cf
Outflow=0.04 cfs 1,500 cf

Pond 19P: Roof Recharge Peak Elev=0.96' Storage=681 cf Inflow=0.61 cfs 1,828 cf
Outflow=0.08 cfs 1,825 cf

Pond 21P: BASIN B Peak Elev=226.10' Storage=3,195 cf Inflow=1.99 cfs 8,805 cf
Discarded=0.31 cfs 8,740 cf Primary=0.00 cfs 0 cf Outflow=0.31 cfs 8,740 cf

Pond 22P: Roof Recharge Peak Elev=0.80' Storage=504 cf Inflow=0.38 cfs 1,110 cf
Outflow=0.03 cfs 948 cf

Pond 30P: BASIN A Peak Elev=238.99' Storage=1,376 cf Inflow=1.36 cfs 3,723 cf
Discarded=0.17 cfs 3,715 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 3,715 cf

Pond 31P: BASIN D Peak Elev=239.67' Storage=4,022 cf Inflow=3.62 cfs 10,629 cf
Discarded=0.53 cfs 10,593 cf Primary=0.00 cfs 0 cf Outflow=0.53 cfs 10,593 cf

Pond 32P: BASIN C Peak Elev=224.77' Storage=5,663 cf Inflow=4.44 cfs 15,572 cf
Discarded=0.85 cfs 15,510 cf Primary=0.00 cfs 0 cf Outflow=0.85 cfs 15,510 cf

Total Runoff Area = 992,682 sf Runoff Volume = 80,281 cf Average Runoff Depth = 0.97"
64.94% Pervious = 644,625 sf 35.06% Impervious = 348,057 sf

Summary for Subcatchment 34S: 10 Unit Roof

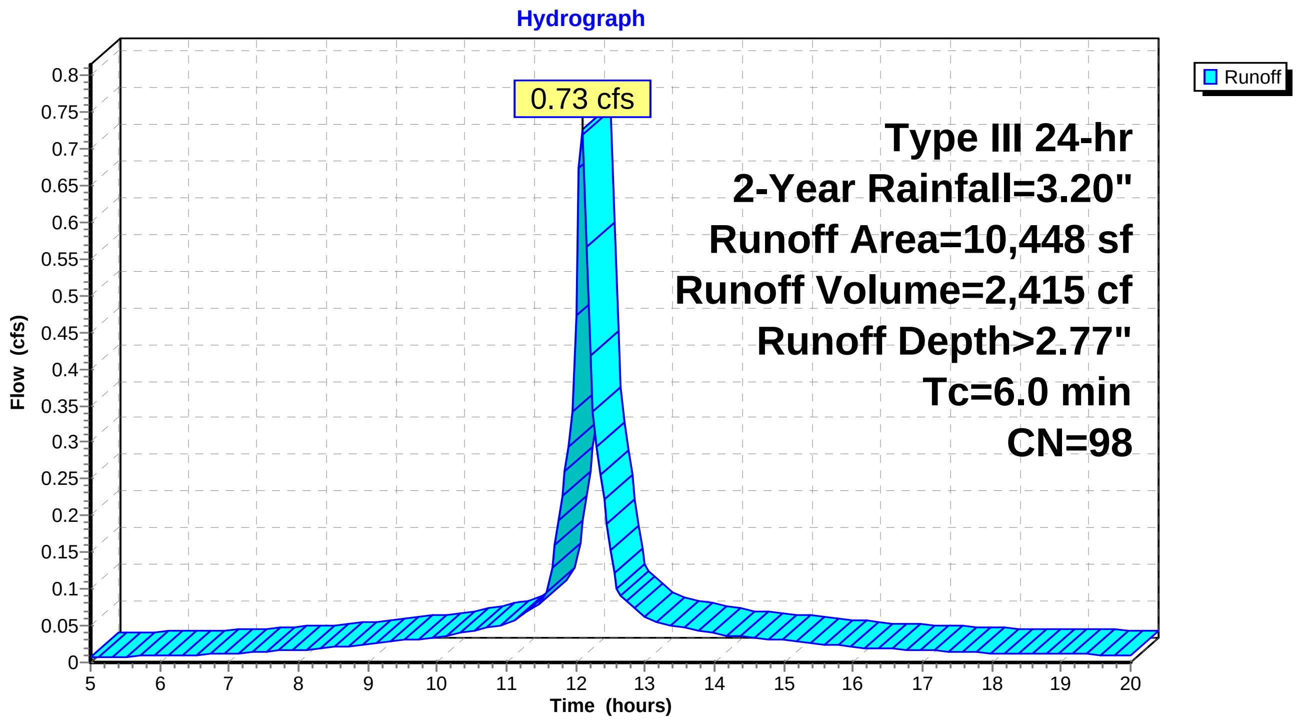
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 2,415 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	10,448	98	Impervious
	10,448		100.00% Impervious Area

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

Subcatchment 34S: 10 Unit Roof



Summary for Subcatchment 35S: 14 Unit Roof

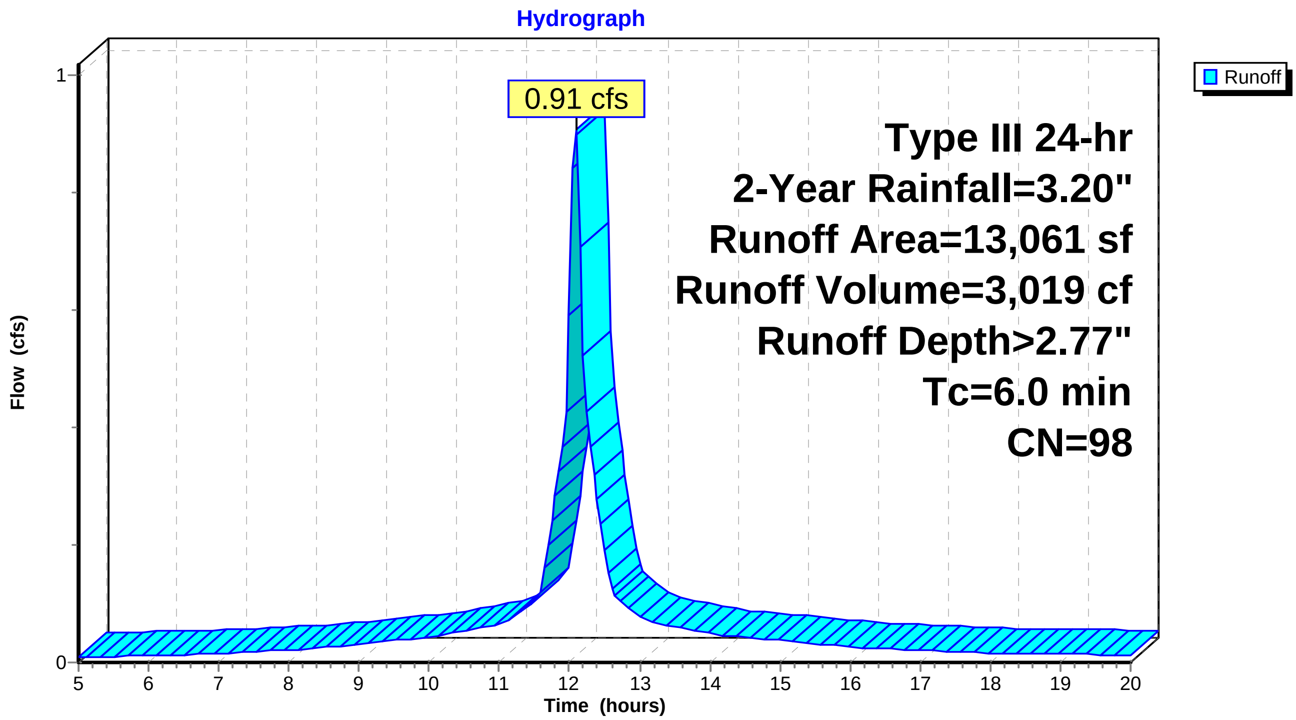
Runoff = 0.91 cfs @ 12.09 hrs, Volume= 3,019 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	13,061	98	Impervious
	13,061		100.00% Impervious Area

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

Subcatchment 35S: 14 Unit Roof



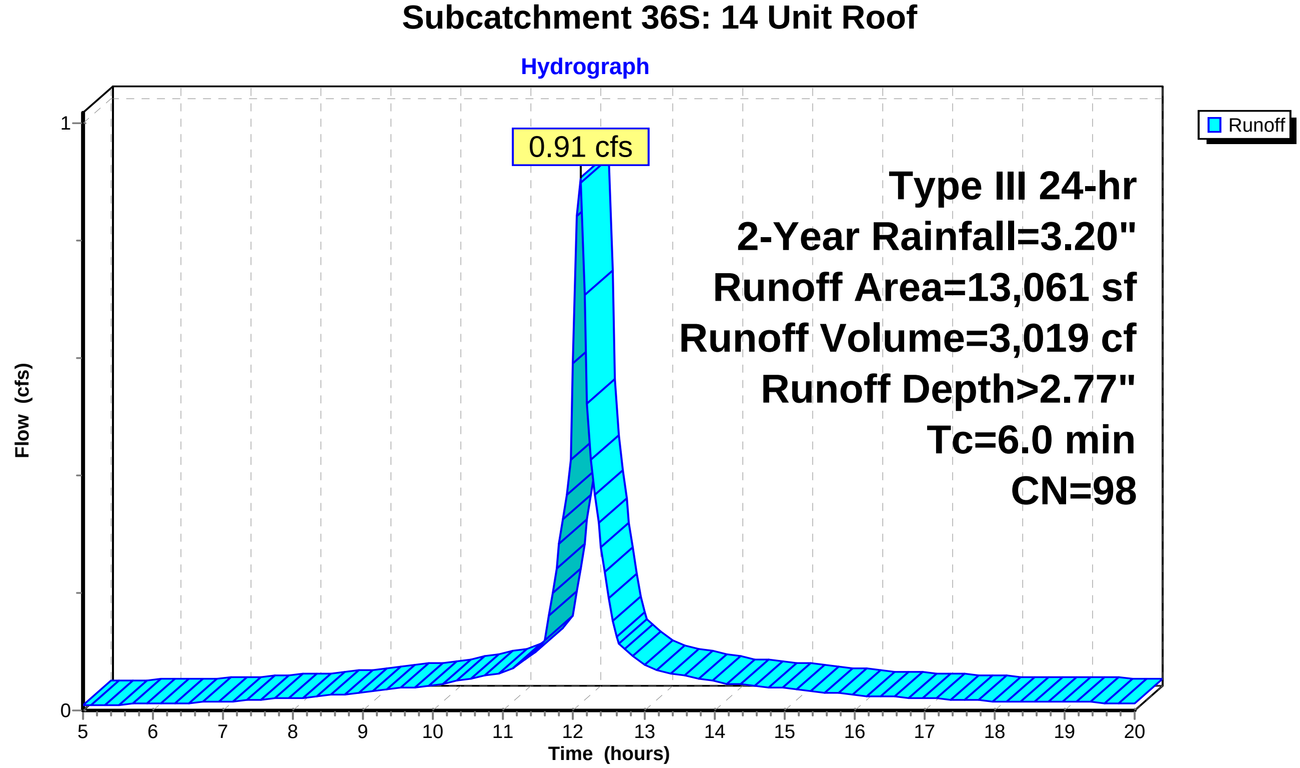
Summary for Subcatchment 36S: 14 Unit Roof

Runoff = 0.91 cfs @ 12.09 hrs, Volume= 3,019 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	13,061	98	Impervious
	13,061		100.00% Impervious Area

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



Summary for Subcatchment 37S: 7 Unit Roof

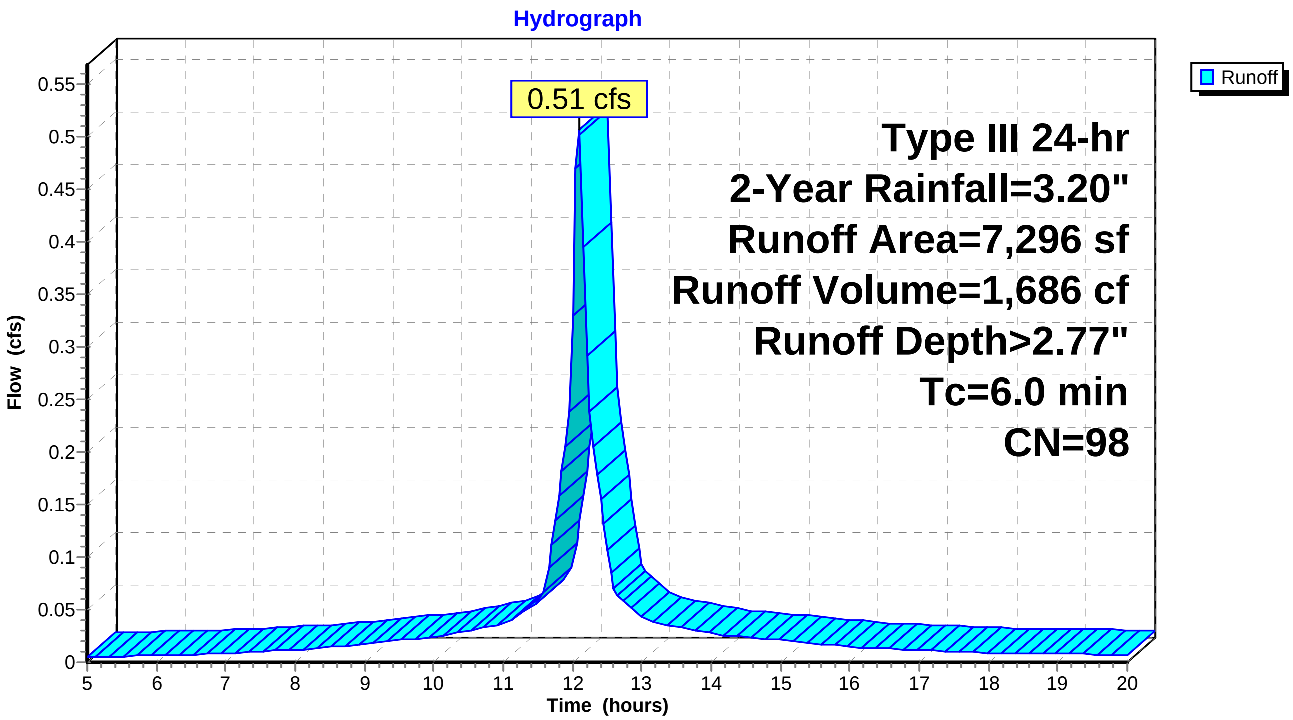
Runoff = 0.51 cfs @ 12.09 hrs, Volume= 1,686 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	7,296	98	Impervious
	7,296		100.00% Impervious Area

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

Subcatchment 37S: 7 Unit Roof



Summary for Subcatchment LOT 1: Single Family House

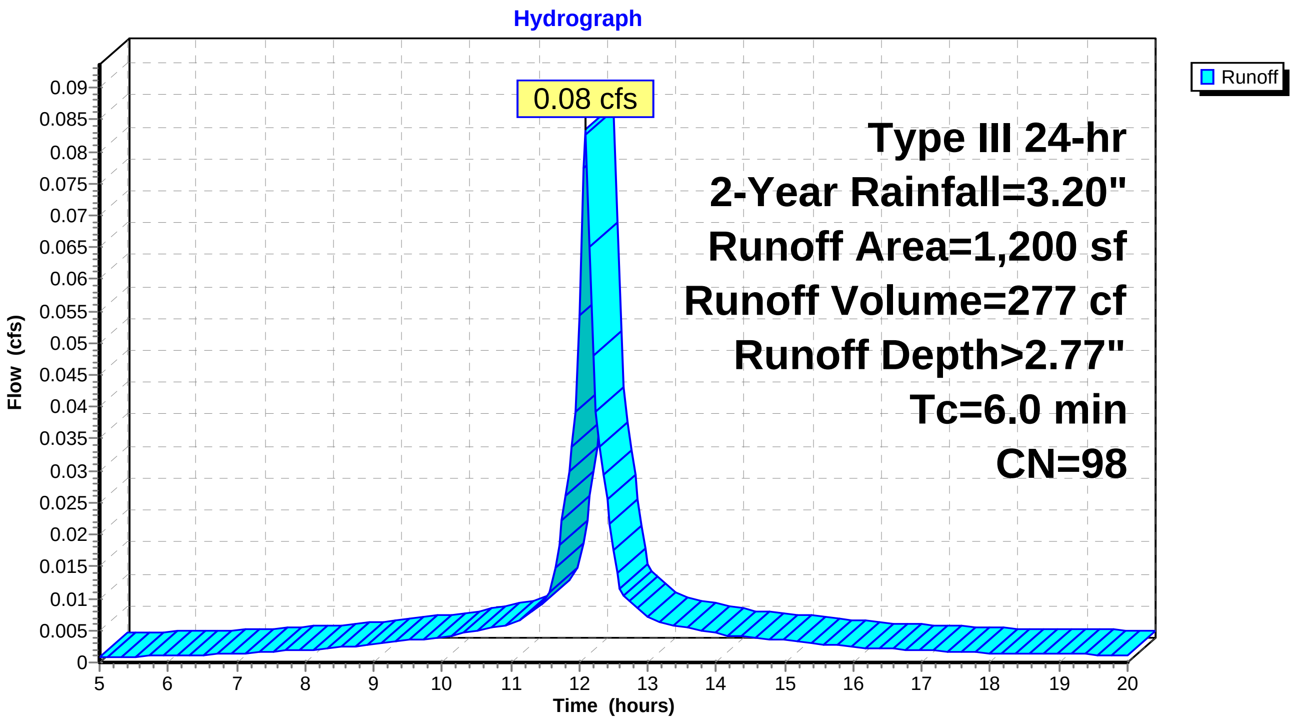
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 277 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 1: Single Family House



Summary for Subcatchment LOT 12: DUPLEX + YARD

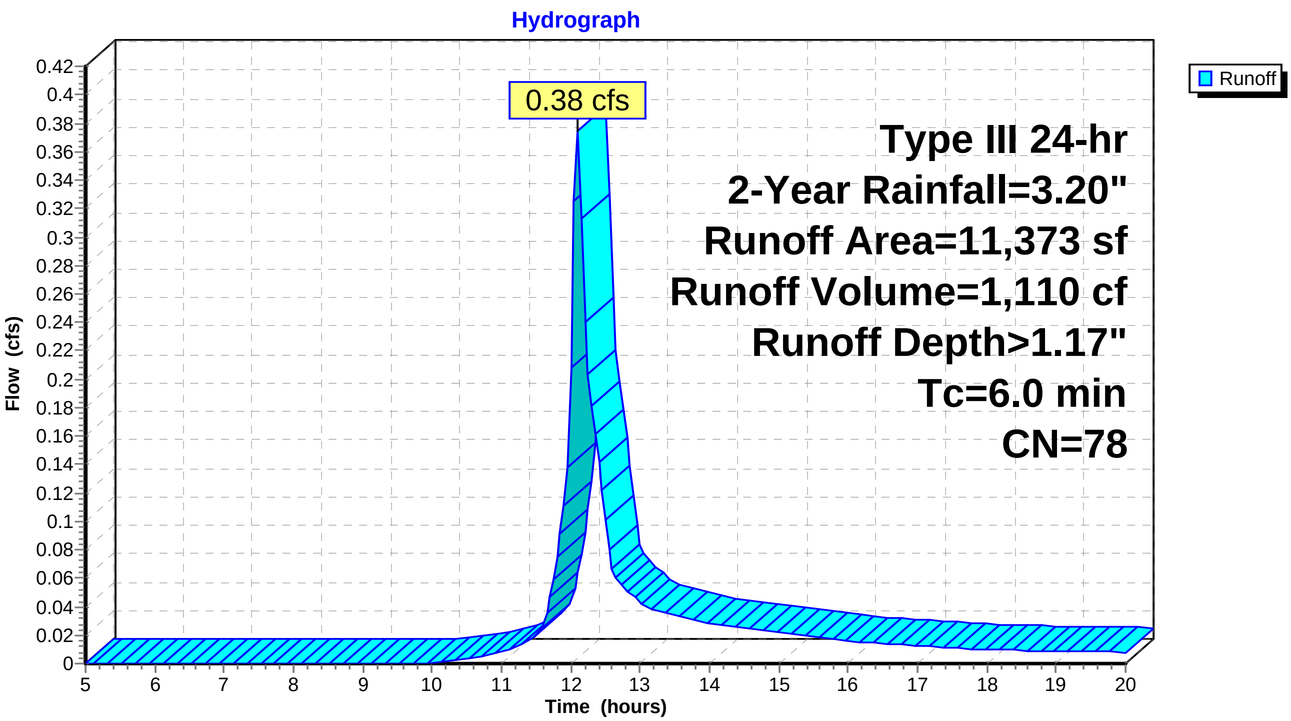
Runoff = 0.38 cfs @ 12.10 hrs, Volume= 1,110 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	490	80	>75% Grass cover, Good, HSG D
	5,954	61	>75% Grass cover, Good, HSG B
	11,373	78	Weighted Average
	6,444		56.66% Pervious Area
	4,929		43.34% Impervious Area

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

Subcatchment LOT 12: DUPLEX + YARD



Summary for Subcatchment LOT 13: DUPLEX + YARD

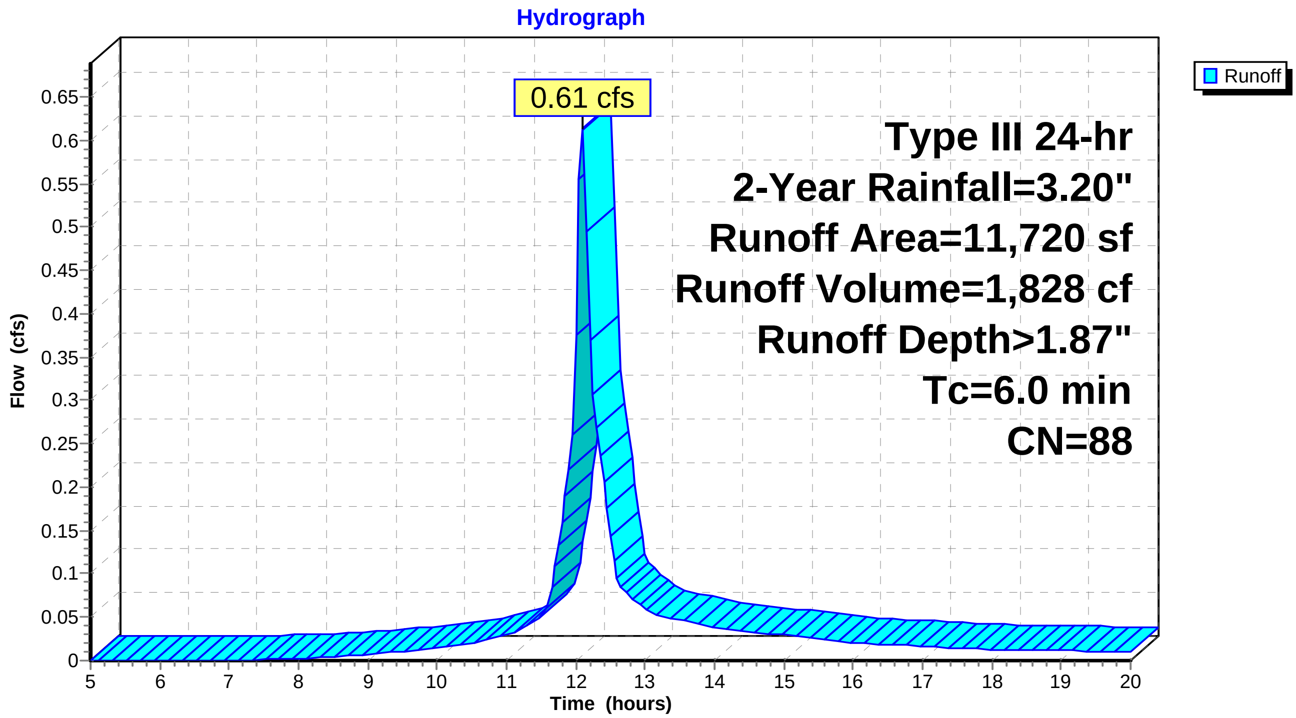
Runoff = 0.61 cfs @ 12.09 hrs, Volume= 1,828 cf, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	6,791	80	>75% Grass cover, Good, HSG D
	11,720	88	Weighted Average
	6,791		57.94% Pervious Area
	4,929		42.06% Impervious Area

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

Subcatchment LOT 13: DUPLEX + YARD



Summary for Subcatchment LOT 14: DUPLEX + YARD

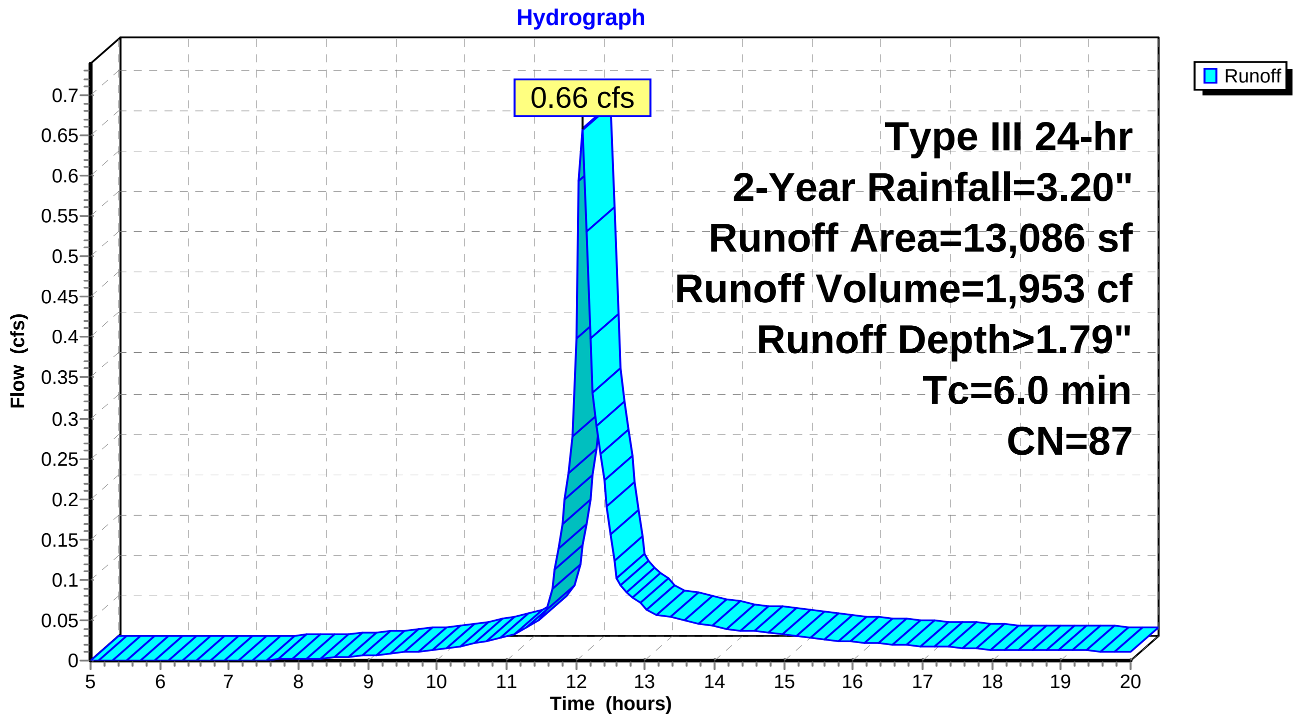
Runoff = 0.66 cfs @ 12.09 hrs, Volume= 1,953 cf, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	8,157	80	>75% Grass cover, Good, HSG D
	13,086	87	Weighted Average
	8,157		62.33% Pervious Area
	4,929		37.67% Impervious Area

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

Subcatchment LOT 14: DUPLEX + YARD



Summary for Subcatchment LOT 18: DUPLEX ROOF

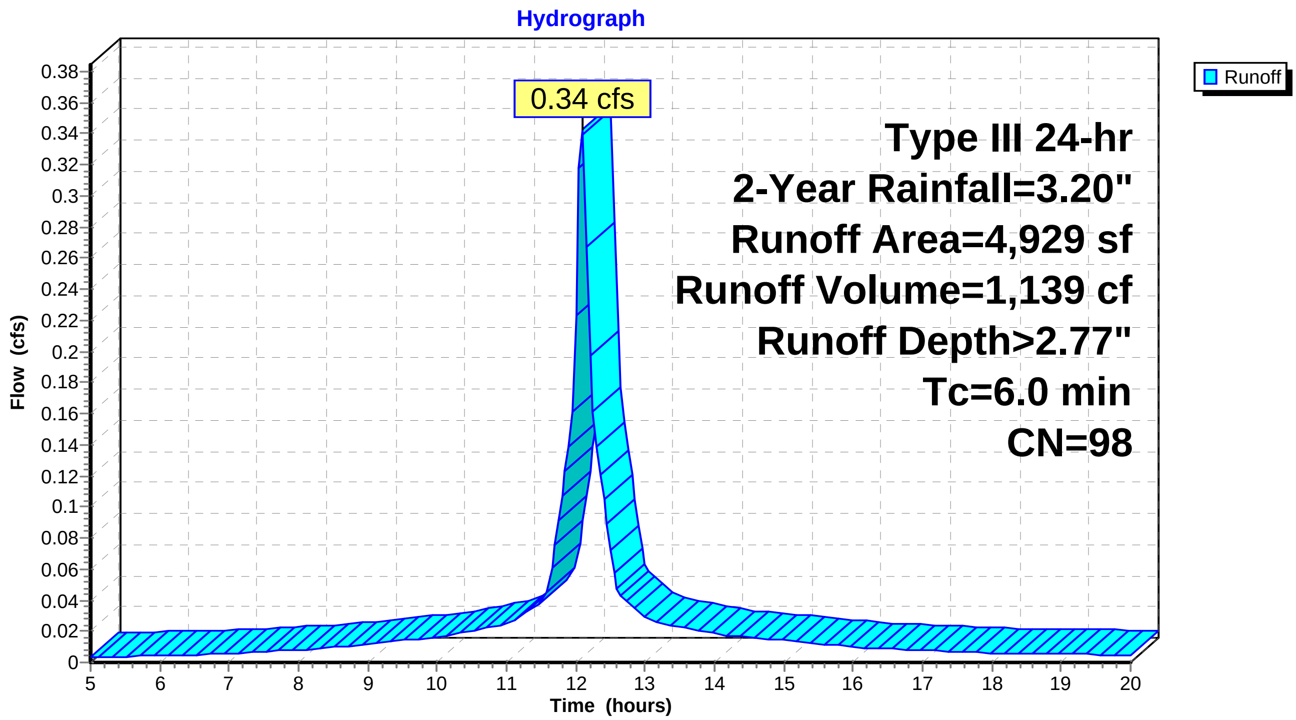
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 1,139 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	4,929		100.00% Impervious Area

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

Subcatchment LOT 18: DUPLEX ROOF



Summary for Subcatchment LOT 19: DUPLEX ROOF

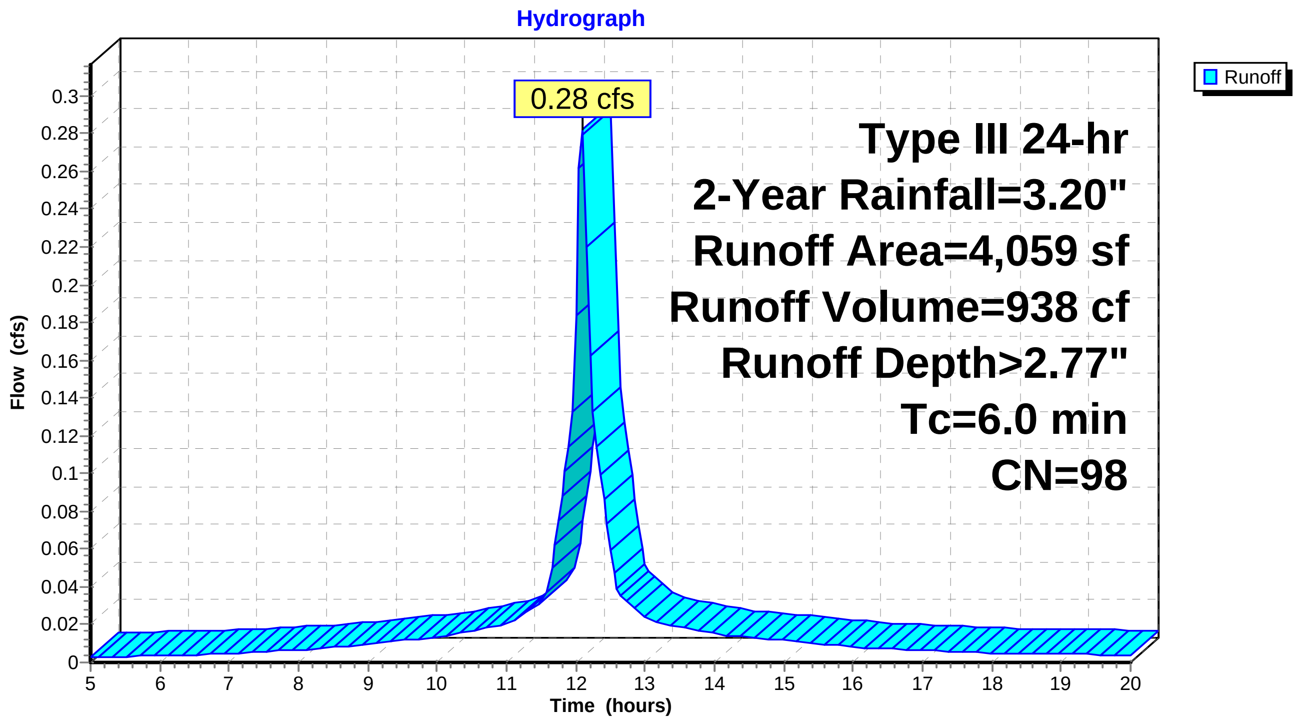
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 938 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 19: DUPLEX ROOF



Summary for Subcatchment LOT 2: Single Family House

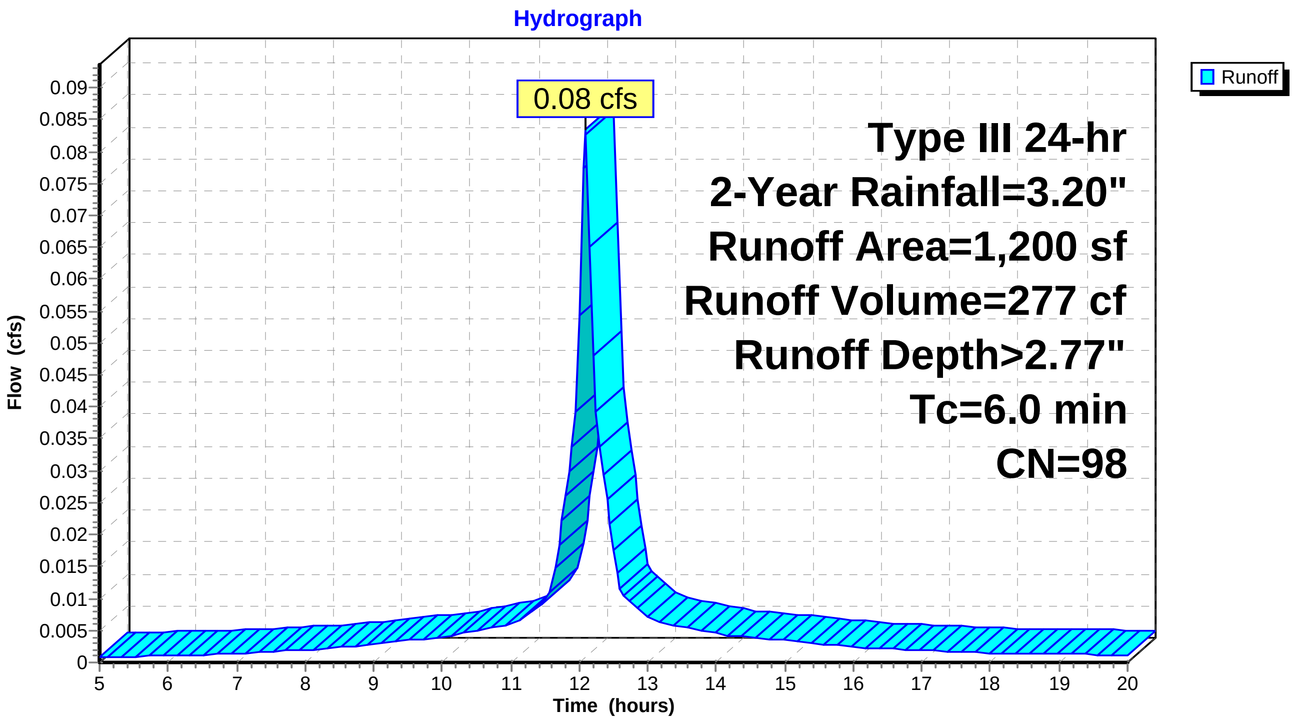
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 277 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 2: Single Family House



Summary for Subcatchment LOT 20: DUPLEX ROOF

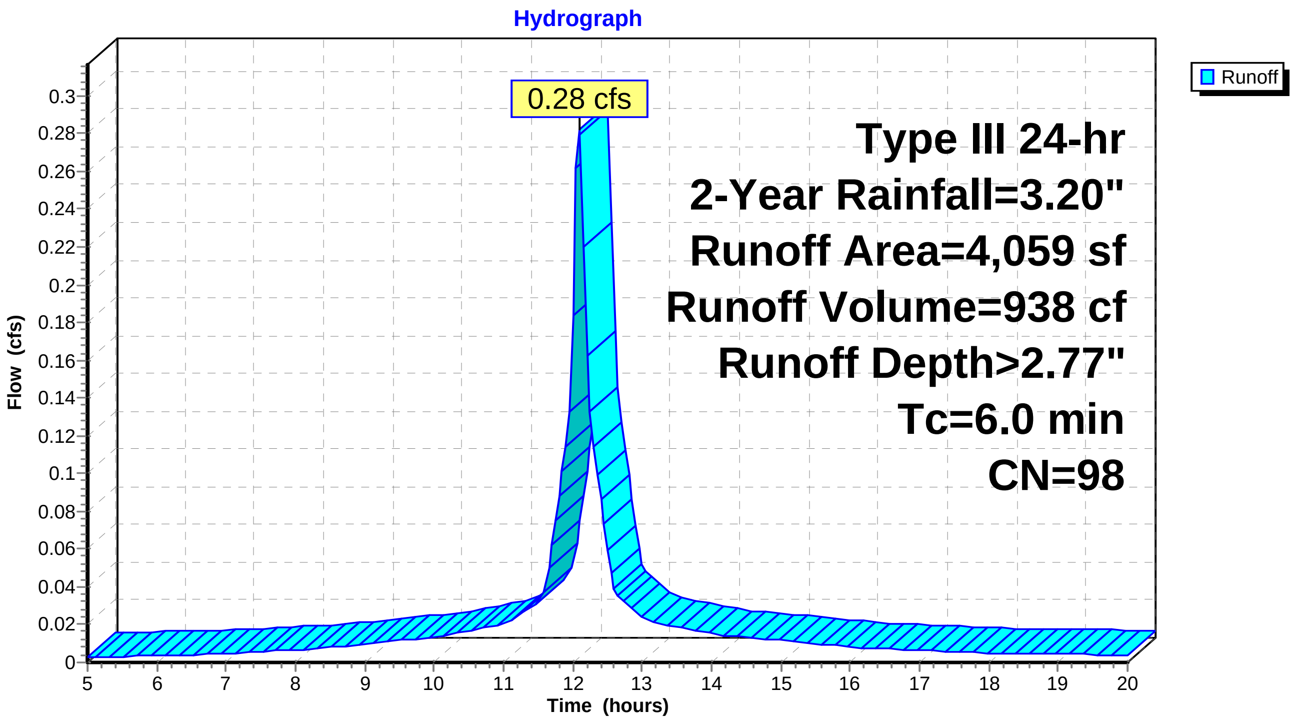
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 938 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 20: DUPLEX ROOF



Summary for Subcatchment LOT 21: DUPLEX ROOF

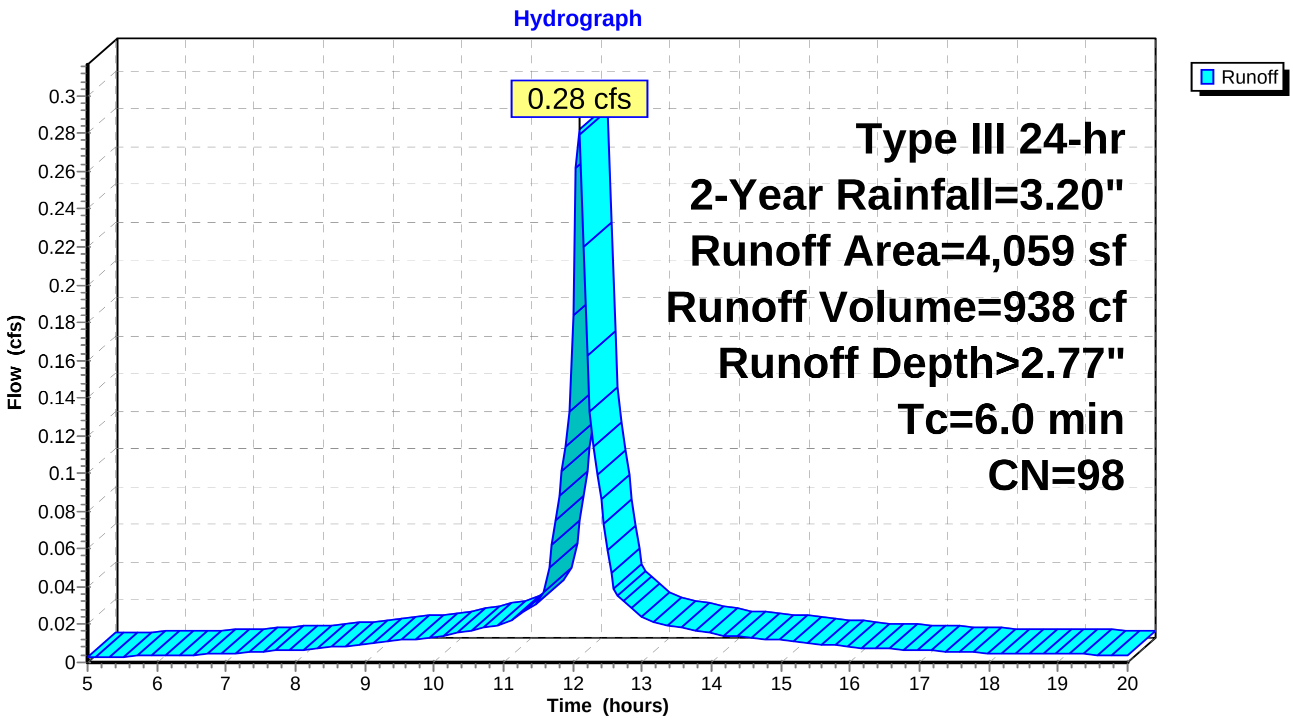
Runoff = 0.28 cfs @ 12.09 hrs, Volume= 938 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 21: DUPLEX ROOF



Summary for Subcatchment LOT 3: Single Family House

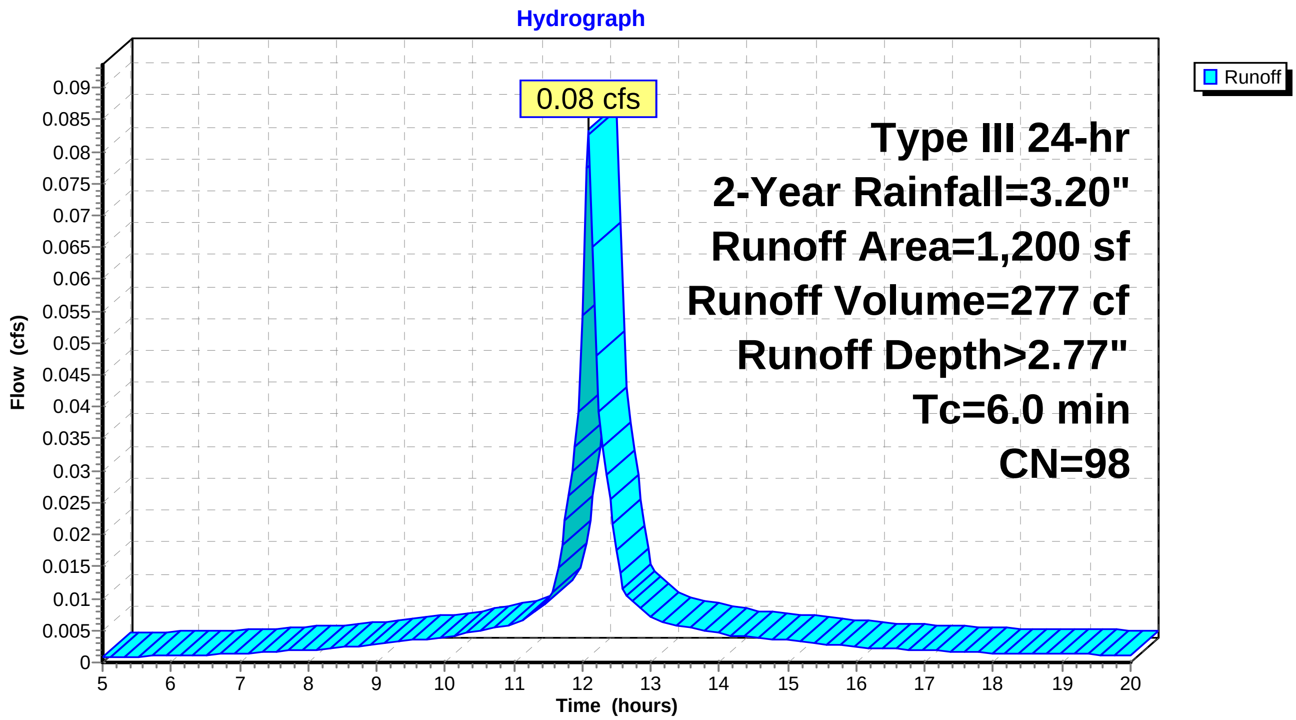
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 277 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 3: Single Family House



Summary for Subcatchment LOT 8: Single Family House

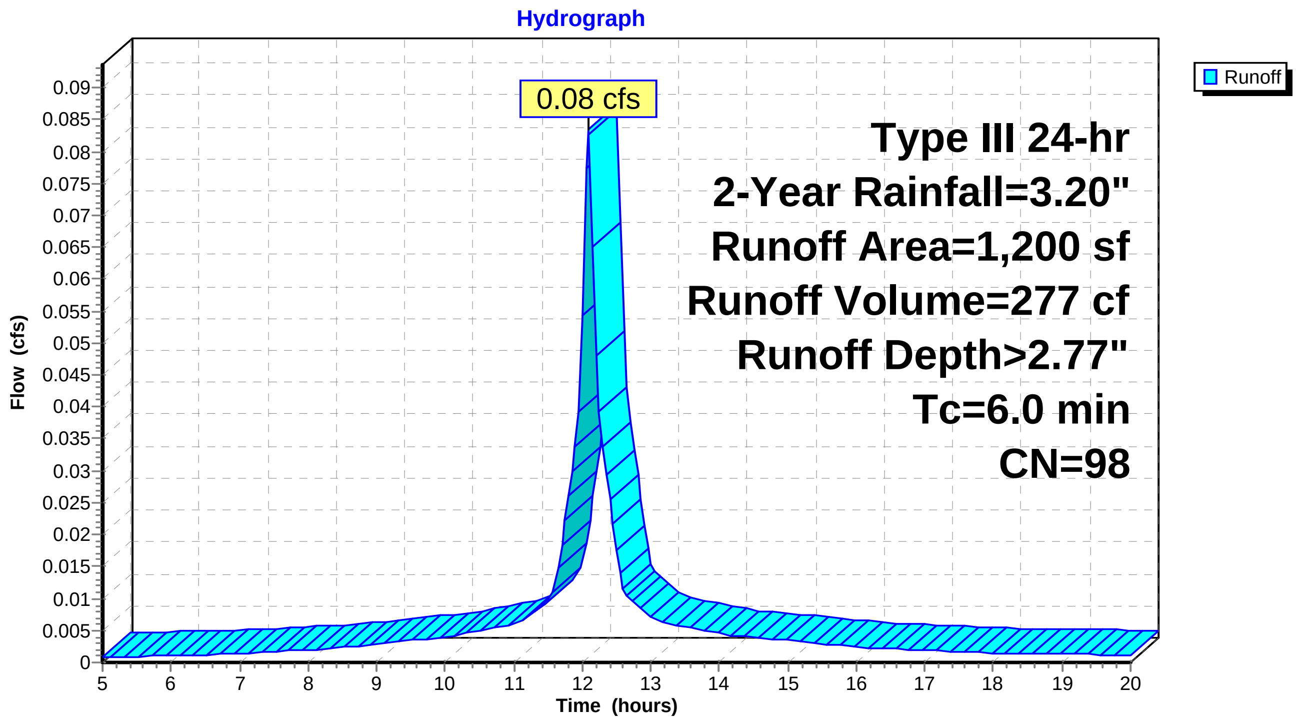
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 277 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 8: Single Family House



Summary for Subcatchment PRDA-1: TO BASIN D

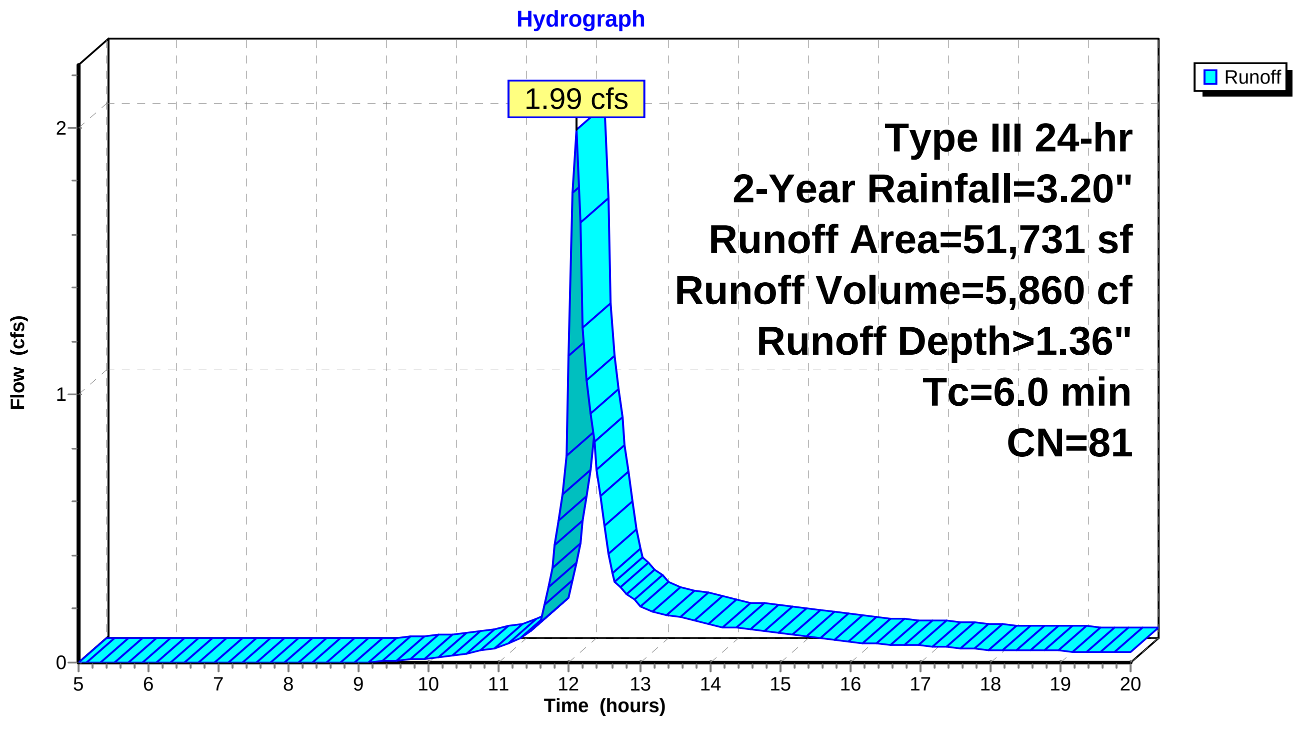
Runoff = 1.99 cfs @ 12.10 hrs, Volume= 5,860 cf, Depth> 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	25,896	98	Impervious
	6,014	54	1/2 acre lots, 25% imp, HSG A
	6,314	80	1/2 acre lots, 25% imp, HSG C
	6,846	39	>75% Grass cover, Good, HSG A
	462	74	>75% Grass cover, Good, HSG C
	6,199	80	>75% Grass cover, Good, HSG D
	51,731	81	Weighted Average
	22,753		43.98% Pervious Area
	28,978		56.02% Impervious Area

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

Subcatchment PRDA-1: TO BASIN D



Summary for Subcatchment PRDA-10: TO ILSF

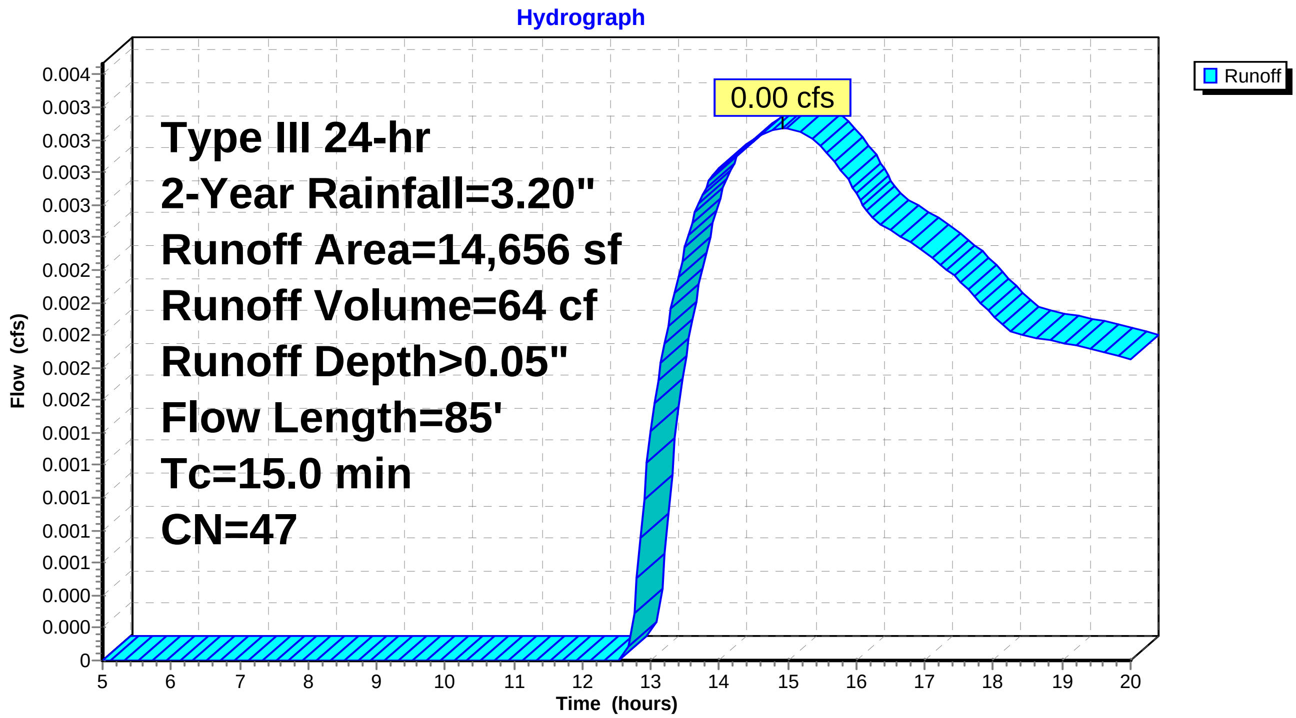
Runoff = 0.00 cfs @ 14.92 hrs, Volume= 64 cf, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
1,166	39	>75% Grass cover, Good, HSG A
2,000	80	>75% Grass cover, Good, HSG D
8,622	30	Woods, Good, HSG A
2,868	77	Woods, Good, HSG D
14,656	47	Weighted Average
14,656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	35	0.0220	0.74		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
15.0	85	Total			

Subcatchment PRDA-10: TO ILSF



Summary for Subcatchment PRDA-11: BASIN A DIRECT

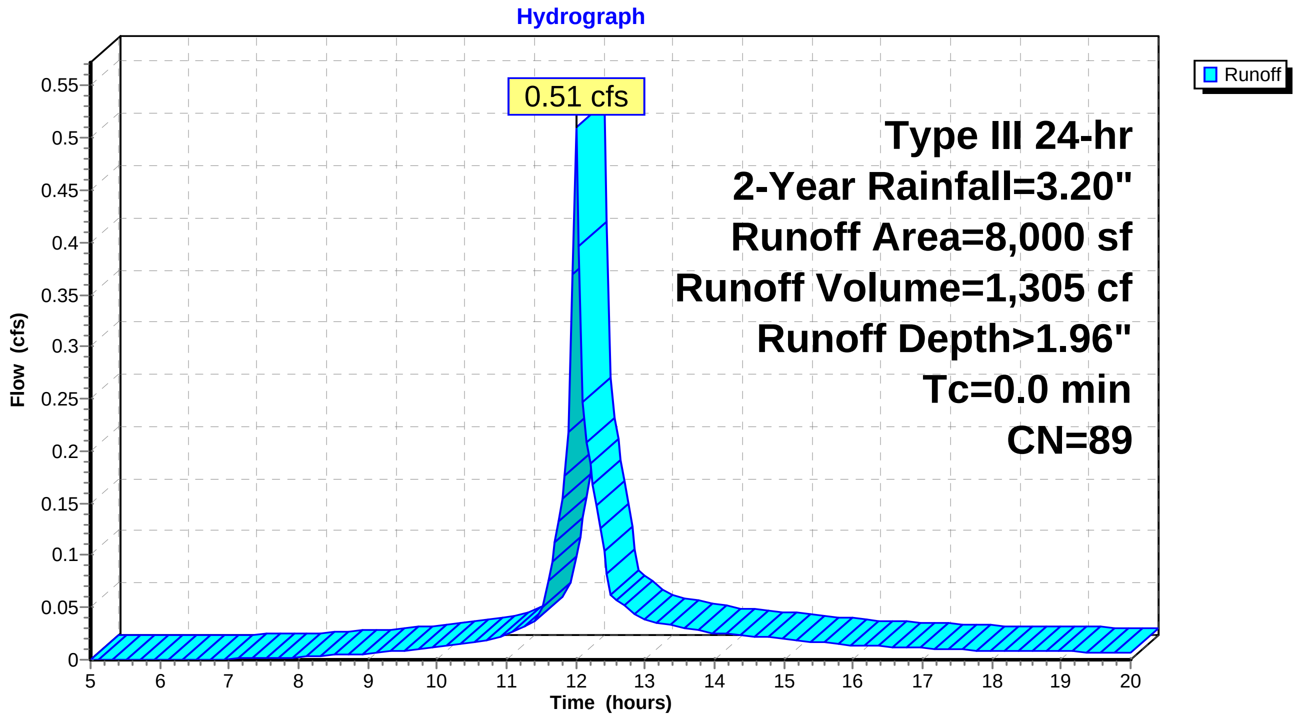
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.51 cfs @ 12.00 hrs, Volume= 1,305 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,983	98	Water Surface, HSG B
4,017	80	>75% Grass cover, Good, HSG D
8,000	89	Weighted Average
4,017		50.21% Pervious Area
3,983		49.79% Impervious Area

Subcatchment PRDA-11: BASIN A DIRECT



Summary for Subcatchment PRDA-12: BASIN B DIRECT

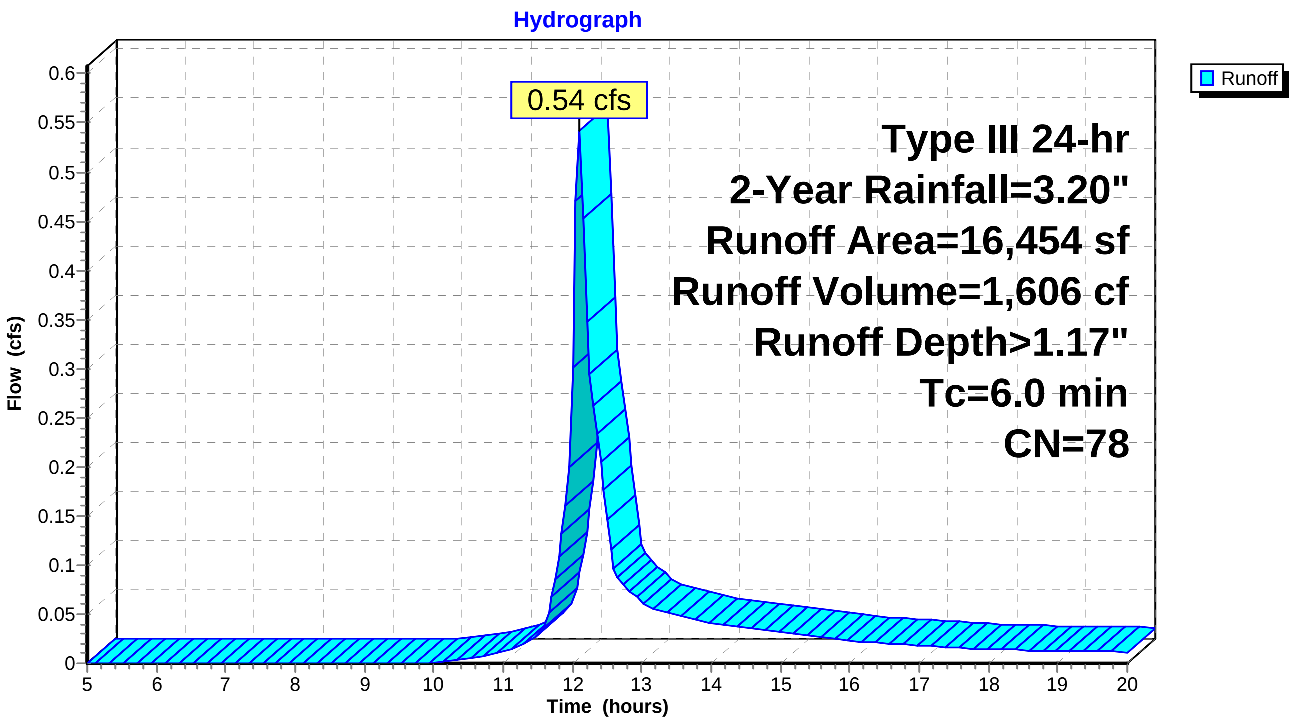
Runoff = 0.54 cfs @ 12.10 hrs, Volume= 1,606 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
7,423	98	Water Surface, HSG D
5,050	80	>75% Grass cover, Good, HSG D
3,981	39	>75% Grass cover, Good, HSG A
16,454	78	Weighted Average
9,031		54.89% Pervious Area
7,423		45.11% Impervious Area

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

Subcatchment PRDA-12: BASIN B DIRECT



Summary for Subcatchment PRDA-13: BASIN C DIRECT

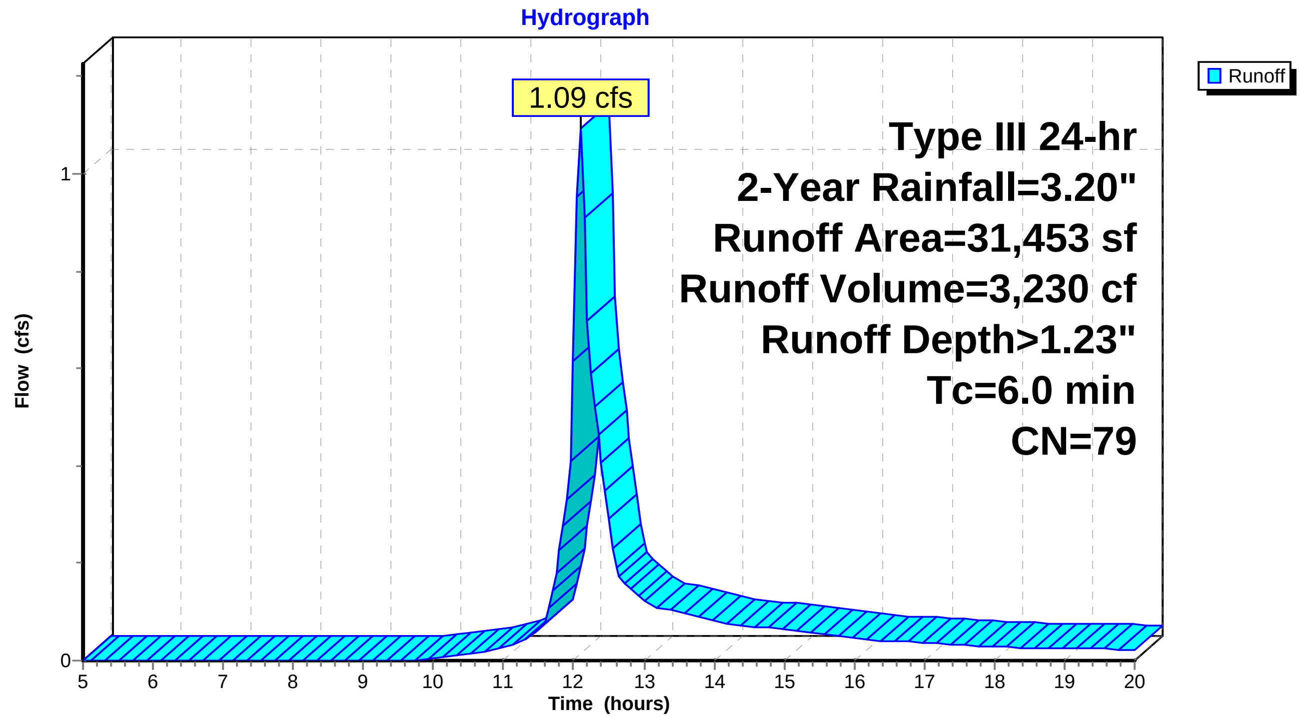
Runoff = 1.09 cfs @ 12.10 hrs, Volume= 3,230 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
15,825	61	>75% Grass cover, Good, HSG B
15,628	98	Water Surface, HSG B
31,453	79	Weighted Average
15,825		50.31% Pervious Area
15,628		49.69% Impervious Area

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

Subcatchment PRDA-13: BASIN C DIRECT



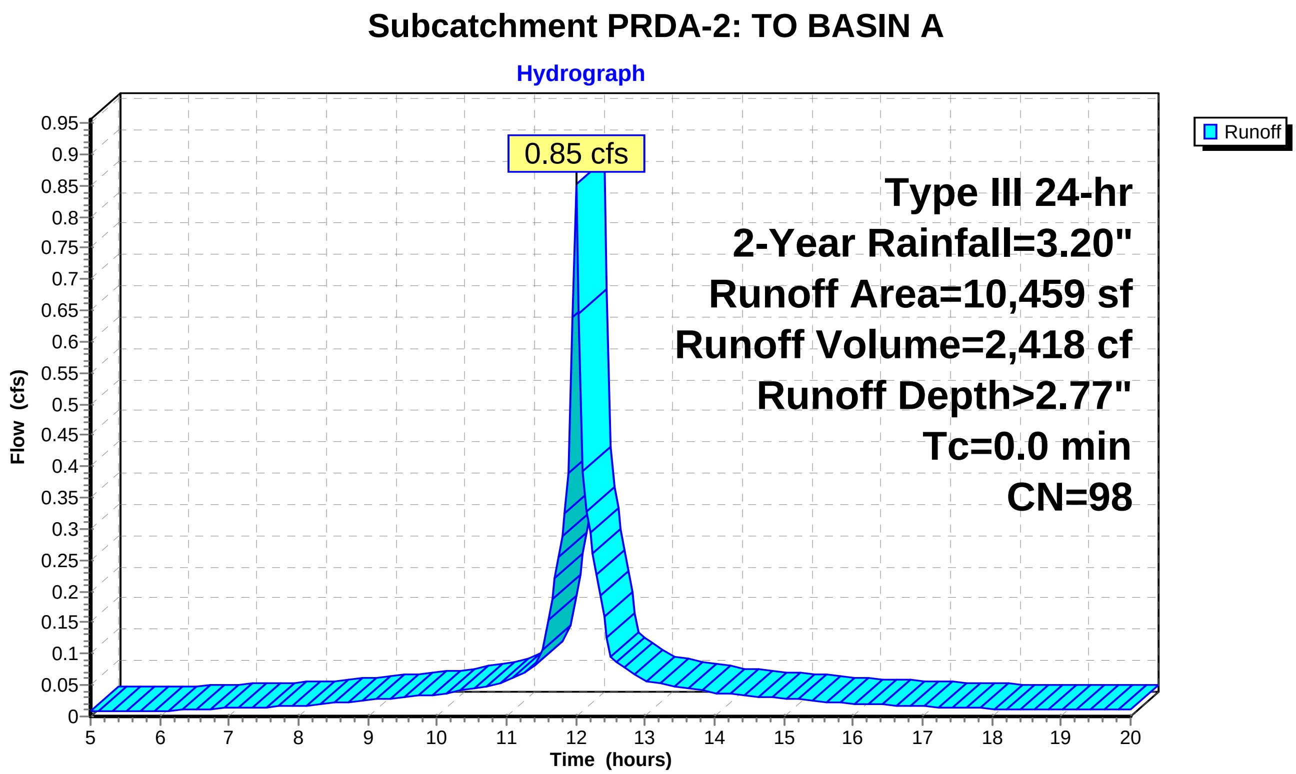
Summary for Subcatchment PRDA-2: TO BASIN A

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.85 cfs @ 12.00 hrs, Volume= 2,418 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	10,459	98	IMPERVIOUS
	10,459		100.00% Impervious Area



Summary for Subcatchment PRDA-3: TO BASIN B

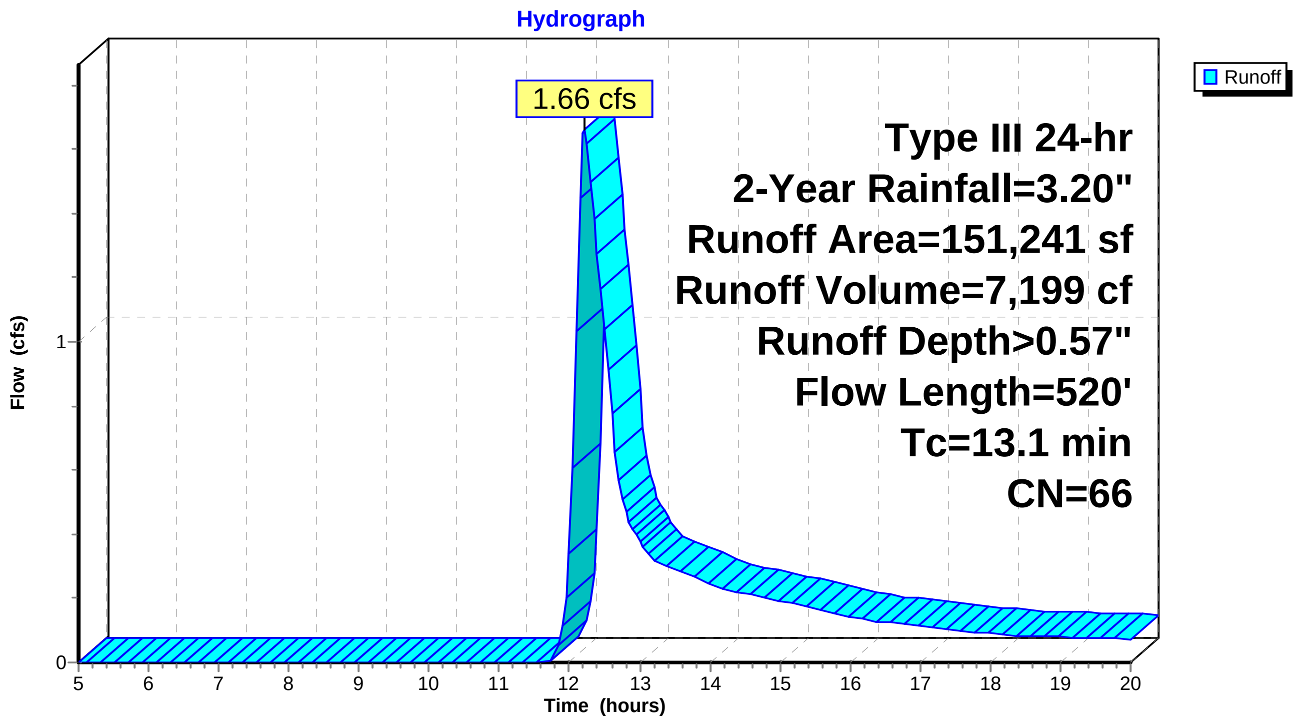
Runoff = 1.66 cfs @ 12.22 hrs, Volume= 7,199 cf, Depth> 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	40,248	98	IMPERVIOUS
	14,787	98	Roofs, HSG A
	77,313	39	>75% Grass cover, Good, HSG A
	92	61	>75% Grass cover, Good, HSG B
	18,801	80	>75% Grass cover, Good, HSG D
	151,241	66	Weighted Average
	96,206		63.61% Pervious Area
	55,035		36.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0380	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
6.5	406	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	64	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.1	520	Total			

Subcatchment PRDA-3: TO BASIN B



Summary for Subcatchment PRDA-4: TO BASIN C

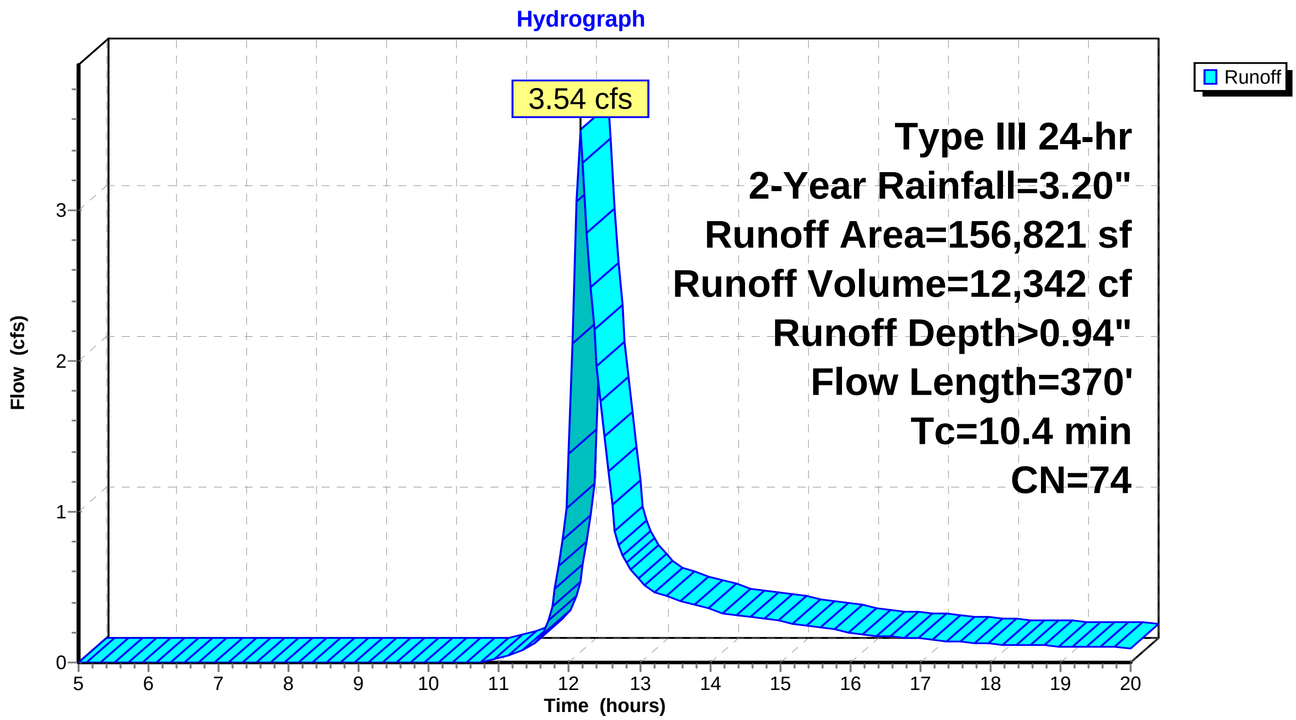
Runoff = 3.54 cfs @ 12.16 hrs, Volume= 12,342 cf, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	70,874	98	Impervious
	4,929	98	Roofs, HSG B
	35,430	39	>75% Grass cover, Good, HSG A
	44,834	61	>75% Grass cover, Good, HSG B
	754	80	>75% Grass cover, Good, HSG D
	156,821	74	Weighted Average
	81,018		51.66% Pervious Area
	75,803		48.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0320	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
3.1	217	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	103	0.0270	3.34		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.4	370	Total			

Subcatchment PRDA-4: TO BASIN C



Summary for Subcatchment PRDA-5: BASIN D DIRECT

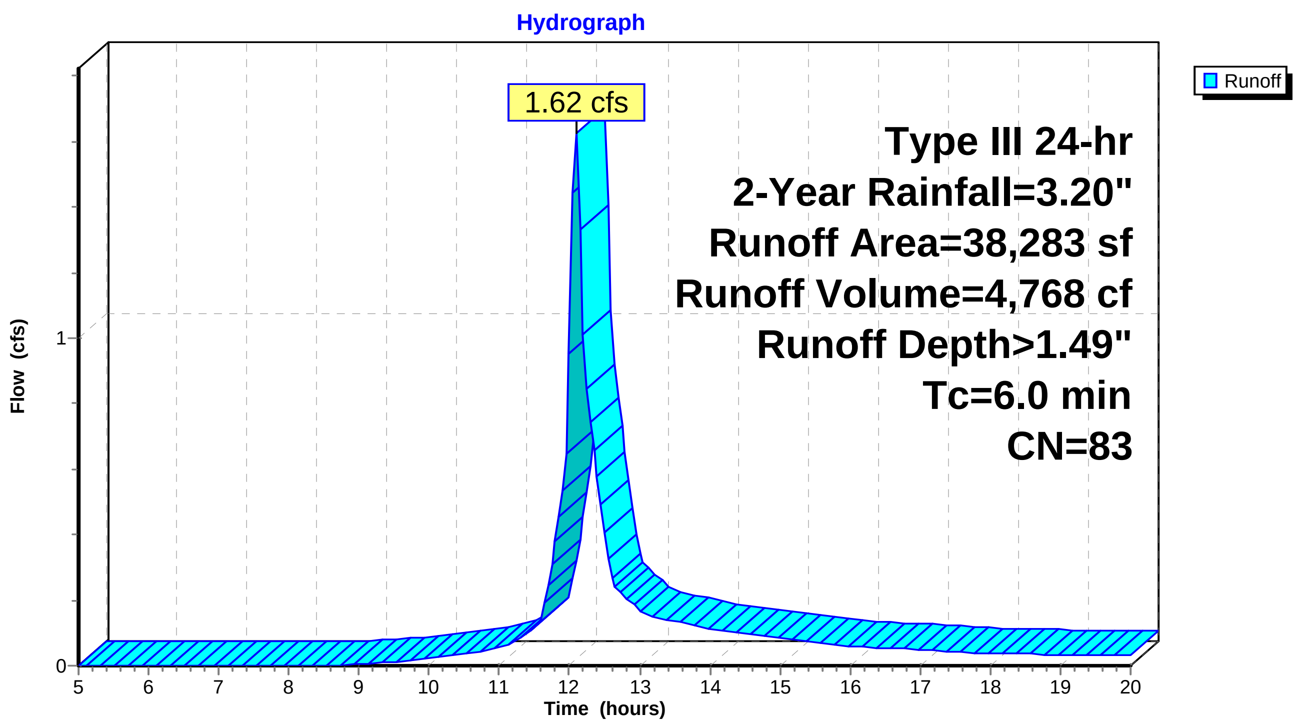
Runoff = 1.62 cfs @ 12.09 hrs, Volume= 4,768 cf, Depth> 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	1,132	98	Impervious
	7,697	80	1/2 acre lots, 25% imp, HSG C
	374	39	>75% Grass cover, Good, HSG A
	7,237	74	>75% Grass cover, Good, HSG C
	6,781	80	>75% Grass cover, Good, HSG D
	9,227	98	Water Surface, HSG A
	4,080	77	Woods, Good, HSG D
	1,323	70	Woods, Good, HSG C
	432	96	Gravel surface, HSG C
	38,283	83	Weighted Average
	26,000		67.91% Pervious Area
	12,283		32.09% Impervious Area

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

Subcatchment PRDA-5: BASIN D DIRECT



Summary for Subcatchment PRDA-6: TO BASIN E

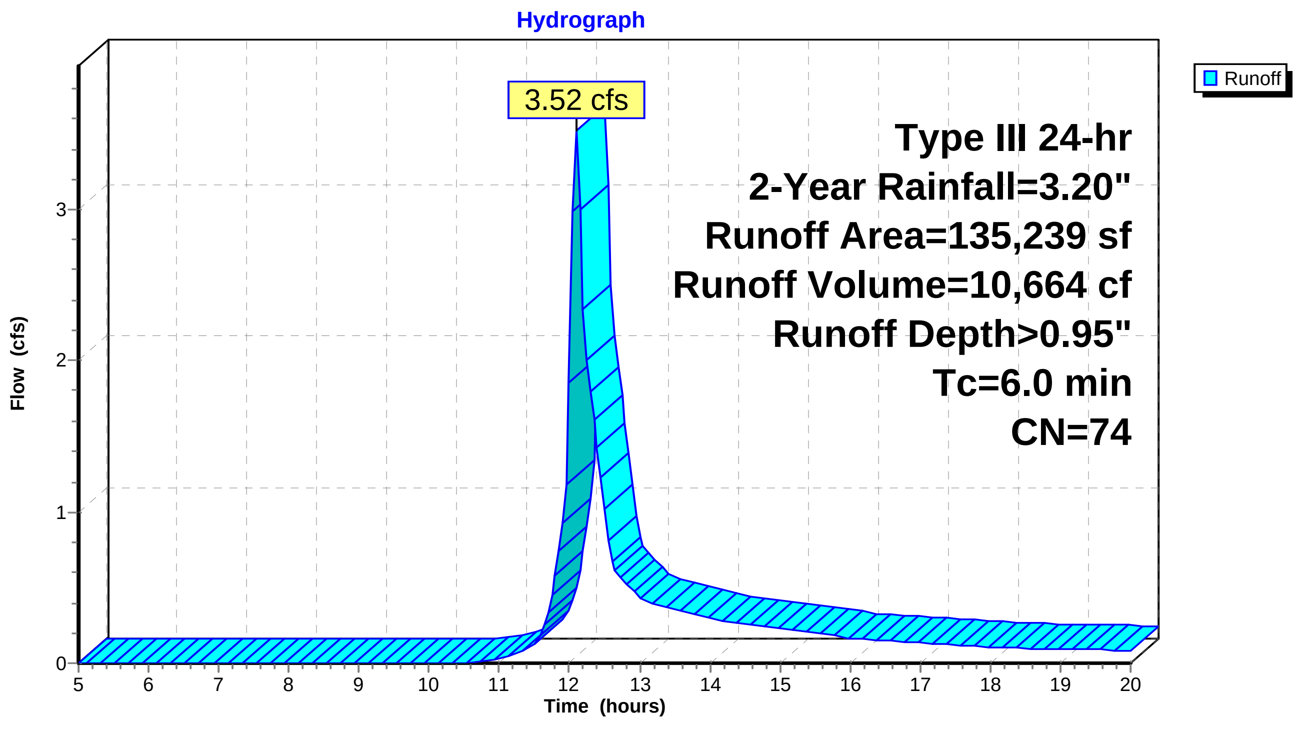
Runoff = 3.52 cfs @ 12.10 hrs, Volume= 10,664 cf, Depth> 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
*	19,869	98	IMPERVIOUS
	57,855	80	1/2 acre lots, 25% imp, HSG C
	2,327	54	1/2 acre lots, 25% imp, HSG A
	3,600	98	Roofs, HSG A
	27,519	39	>75% Grass cover, Good, HSG A
	16,283	74	>75% Grass cover, Good, HSG C
	1,810	80	>75% Grass cover, Good, HSG D
	5,976	98	Water Surface, HSG D
	135,239	74	Weighted Average
	90,749		67.10% Pervious Area
	44,491		32.90% Impervious Area

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

Subcatchment PRDA-6: TO BASIN E



Summary for Subcatchment PRDA-7: TO WETLAND NORTH

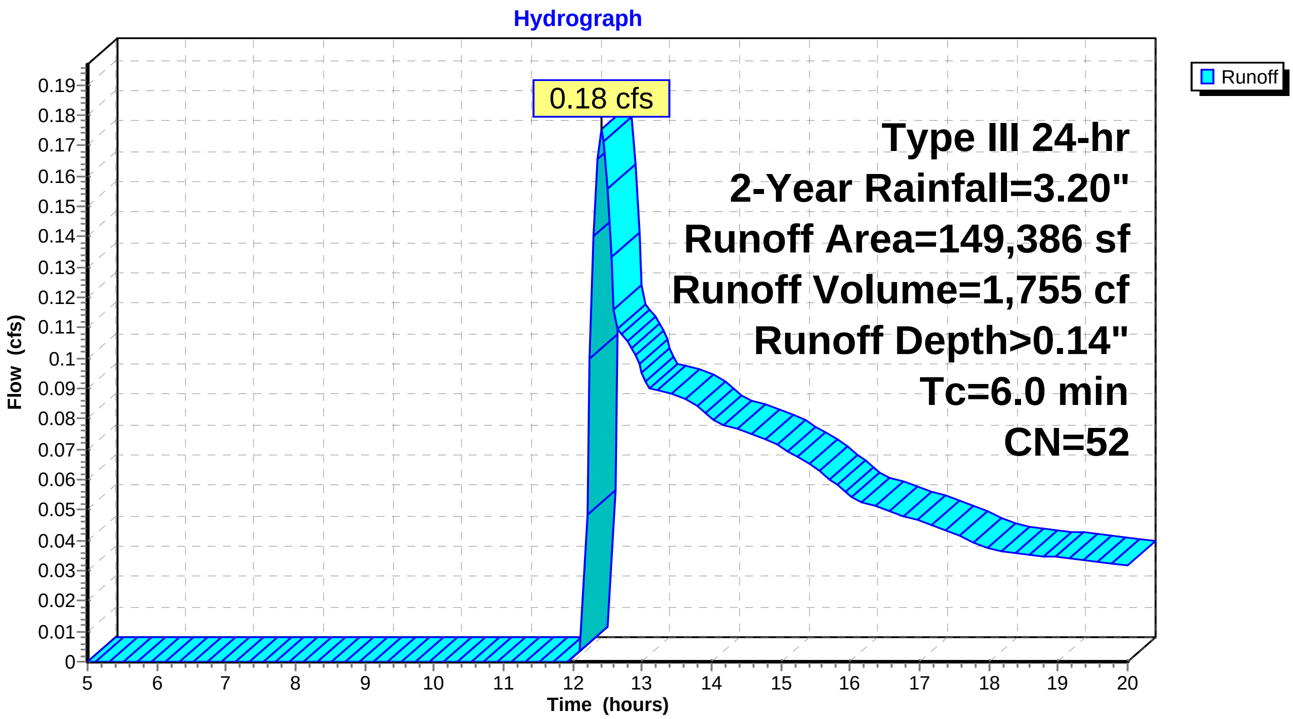
Runoff = 0.18 cfs @ 12.41 hrs, Volume= 1,755 cf, Depth> 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
	2,951	80	1/2 acre lots, 25% imp, HSG C
	8,254	54	1/2 acre lots, 25% imp, HSG A
	52,416	39	>75% Grass cover, Good, HSG A
	27,465	61	>75% Grass cover, Good, HSG B
	538	74	>75% Grass cover, Good, HSG C
	9,934	80	>75% Grass cover, Good, HSG D
	22,059	30	Woods, Good, HSG A
	14,418	70	Woods, Good, HSG C
	9,973	77	Woods, Good, HSG D
*	1,378	98	impervious
	149,386	52	Weighted Average
	145,207		97.20% Pervious Area
	4,179		2.80% Impervious Area

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

Subcatchment PRDA-7: TO WETLAND NORTH



Summary for Subcatchment PRDA-8: TO WETLAND SOUTHEAST

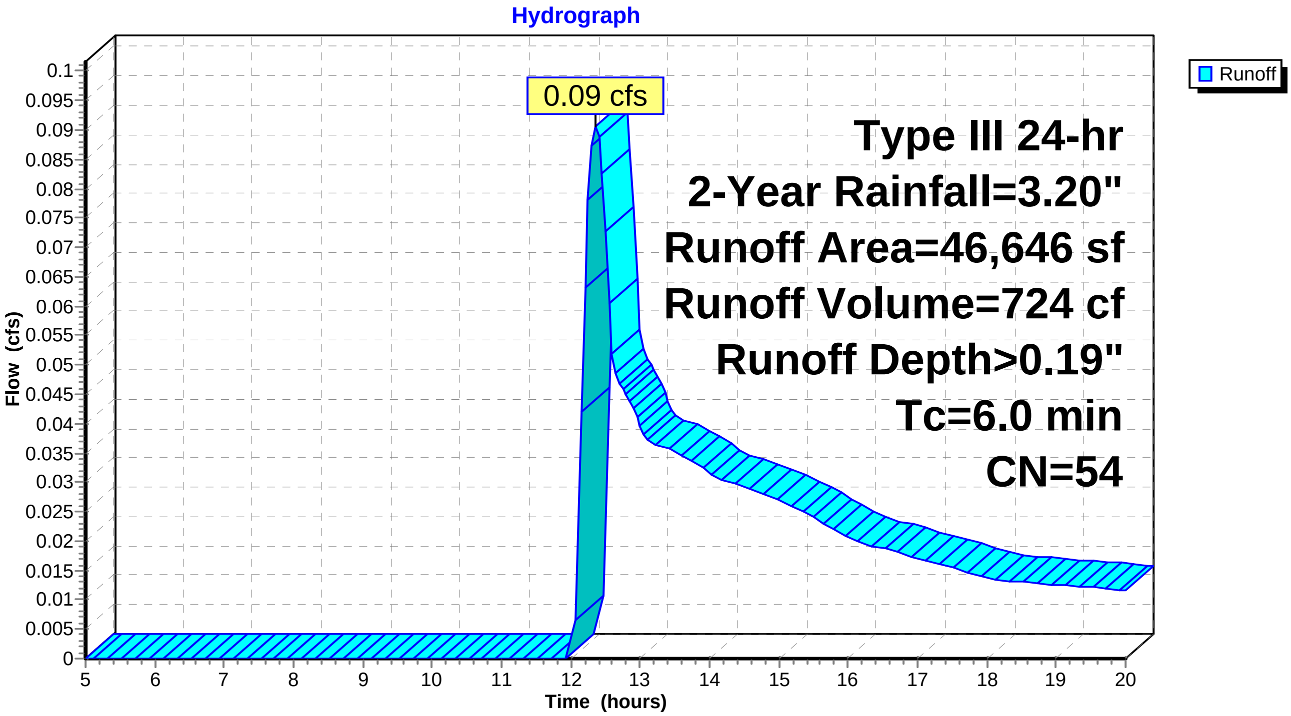
Runoff = 0.09 cfs @ 12.36 hrs, Volume= 724 cf, Depth> 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
21,559	39	>75% Grass cover, Good, HSG A
7,434	80	>75% Grass cover, Good, HSG D
12,118	77	Woods, Good, HSG D
5,535	30	Woods, Good, HSG A
46,646	54	Weighted Average
46,646		100.00% Pervious Area

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

Subcatchment PRDA-8: TO WETLAND SOUTHEAST



Summary for Subcatchment PRDA-9: TO WETLAND SOUTH

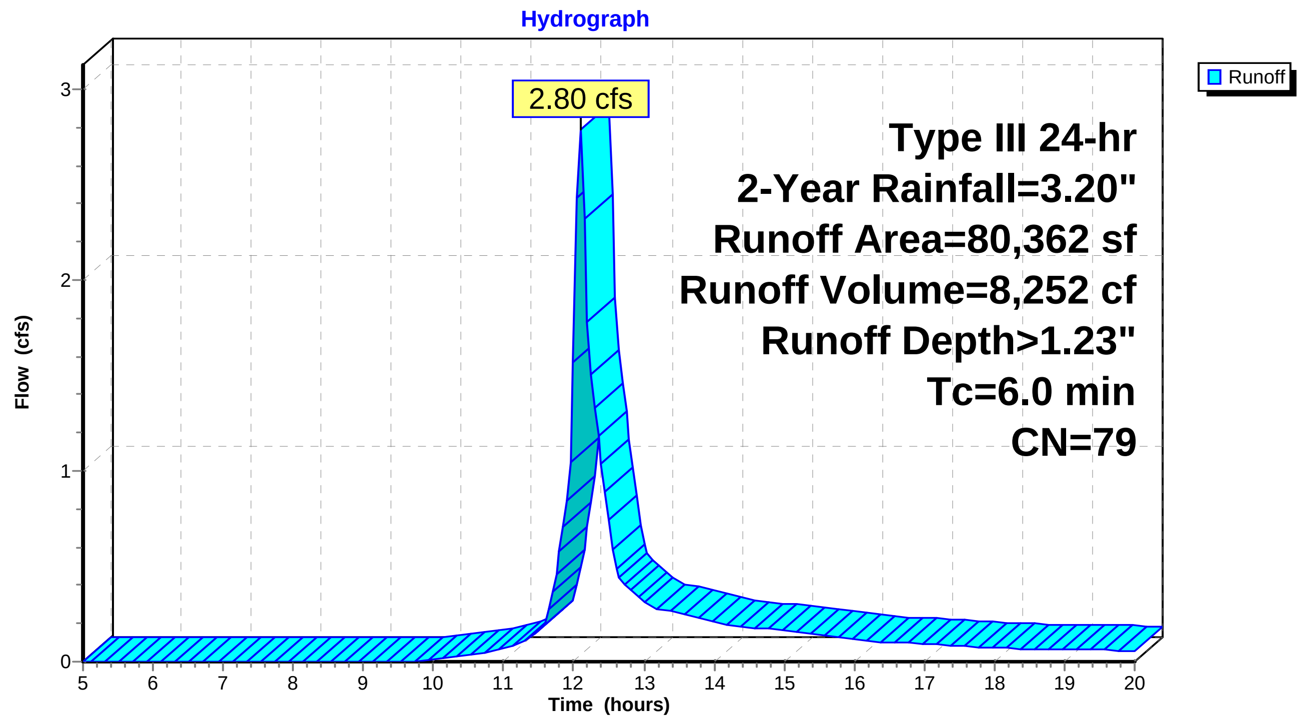
Runoff = 2.80 cfs @ 12.10 hrs, Volume= 8,252 cf, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

	Area (sf)	CN	Description
	274	39	>75% Grass cover, Good, HSG A
	20,073	80	>75% Grass cover, Good, HSG D
	7,904	70	Woods, Good, HSG C
	34,217	77	Woods, Good, HSG D
	11,544	80	1/2 acre lots, 25% imp, HSG C
*	6,350	98	IMPERVIOUS
	80,362	79	Weighted Average
	71,126		88.51% Pervious Area
	9,236		11.49% Impervious Area

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

Subcatchment PRDA-9: TO WETLAND SOUTH

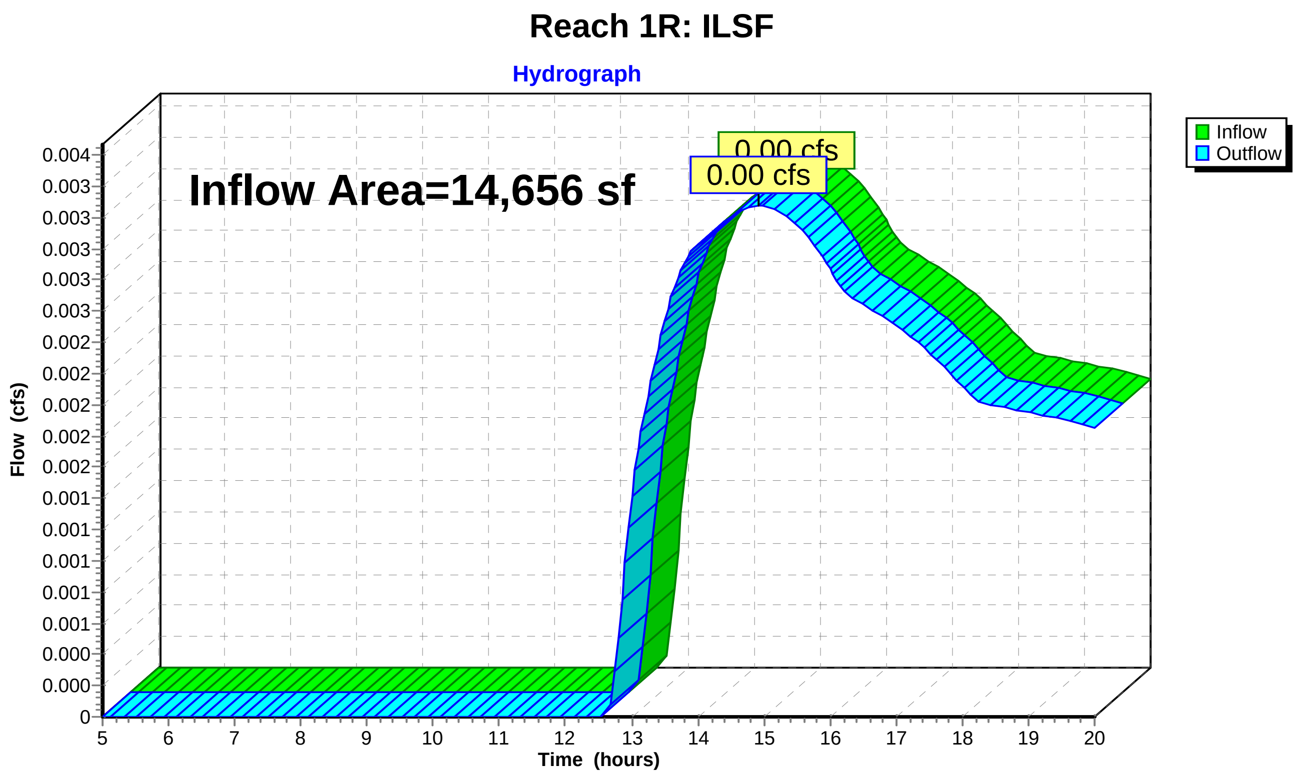


Summary for Reach 1R: ILSF

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

Inflow Area = 14,656 sf, 0.00% Impervious, Inflow Depth > 0.05" for 2-Year event
Inflow = 0.00 cfs @ 14.92 hrs, Volume= 64 cf
Outflow = 0.00 cfs @ 14.92 hrs, Volume= 64 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

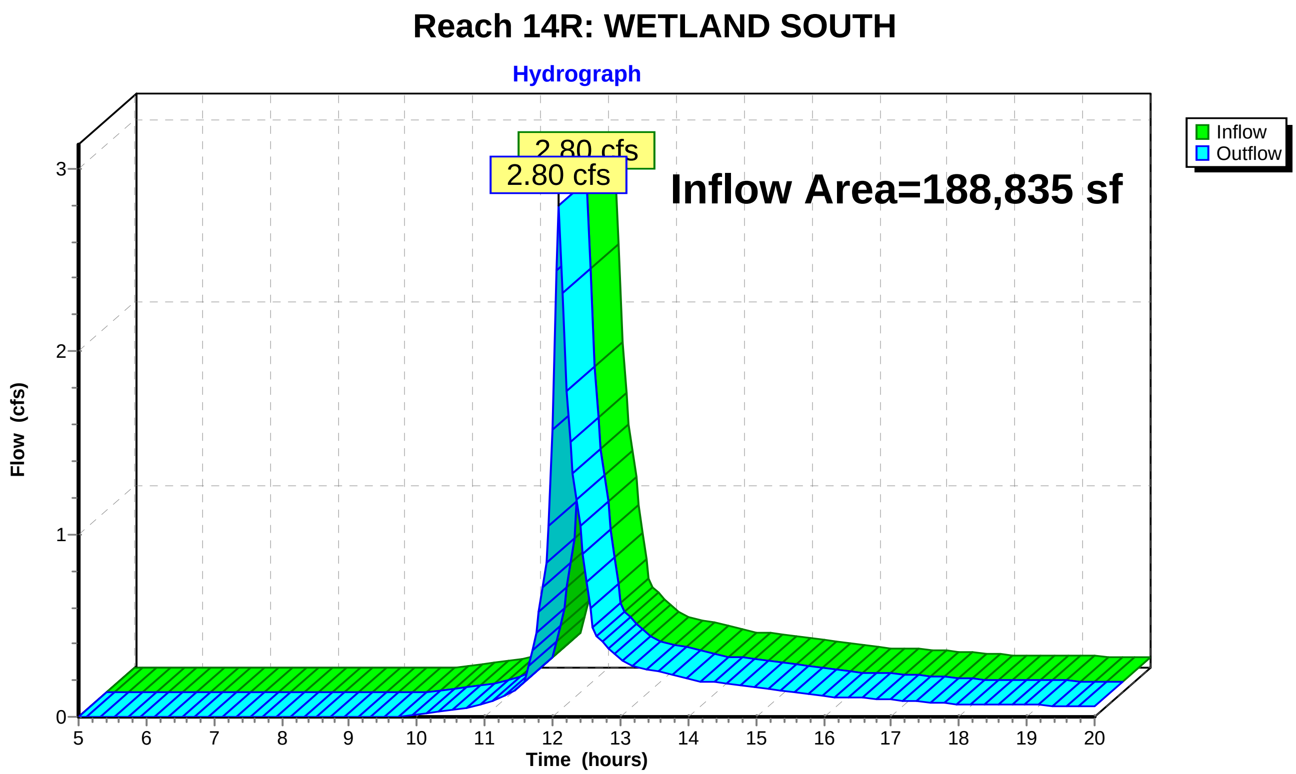


Summary for Reach 14R: WETLAND SOUTH

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

Inflow Area =	188,835 sf,	34.39% Impervious,	Inflow Depth > 0.52"	for 2-Year event
Inflow =	2.80 cfs @	12.10 hrs, Volume=	8,252 cf	
Outflow =	2.80 cfs @	12.10 hrs, Volume=	8,252 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

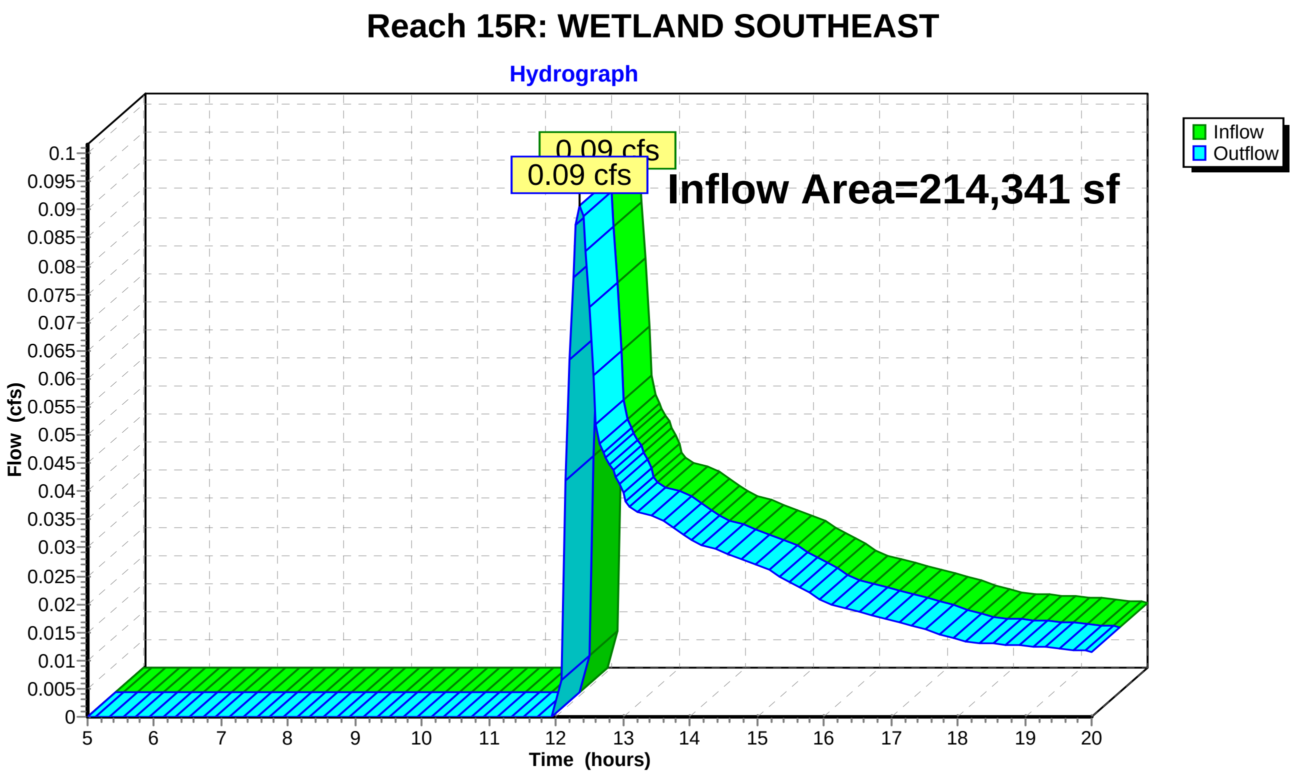


Summary for Reach 15R: WETLAND SOUTHEAST

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

Inflow Area =	214,341 sf, 29.14% Impervious,	Inflow Depth > 0.04"	for 2-Year event
Inflow =	0.09 cfs @ 12.36 hrs, Volume=	724 cf	
Outflow =	0.09 cfs @ 12.36 hrs, Volume=	724 cf, Atten= 0%, Lag= 0.0 min	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



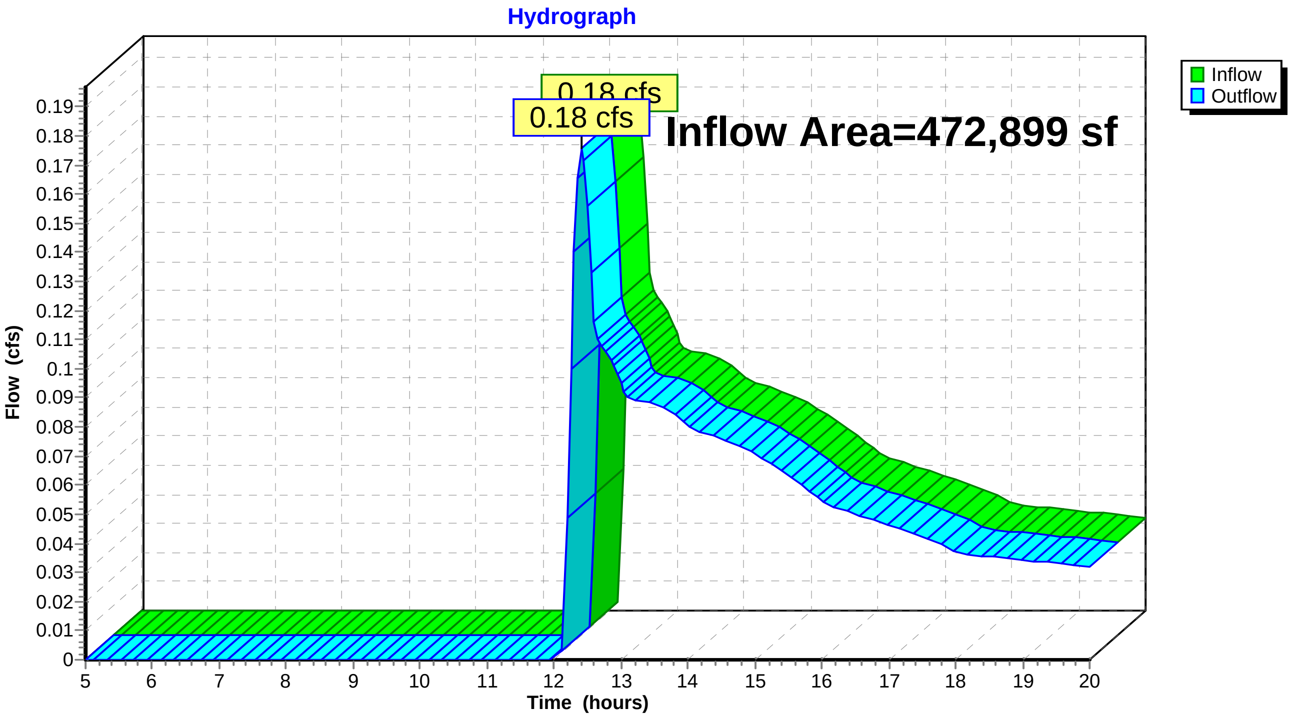
Summary for Reach 21R: WETLAND NORTH

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

Inflow Area = 472,899 sf, 29.63% Impervious, Inflow Depth > 0.04" for 2-Year event
Inflow = 0.18 cfs @ 12.41 hrs, Volume= 1,755 cf
Outflow = 0.18 cfs @ 12.41 hrs, Volume= 1,755 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 21R: WETLAND NORTH



Summary for Pond 1P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 10,448 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 2,415 cf
Outflow = 0.09 cfs @ 12.63 hrs, Volume= 2,412 cf, Atten= 87%, Lag= 32.4 min
Discarded = 0.09 cfs @ 12.63 hrs, Volume= 2,412 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.88' @ 12.63 hrs Surf.Area= 1,531 sf Storage= 801 cf

Plug-Flow detention time= 58.6 min calculated for 2,412 cf (100% of inflow)
Center-of-Mass det. time= 58.0 min (796.5 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,317 cf	**20.83'W x 73.50'L x 3.54'H Field A**
			5,423 cf Overall - 2,131 cf Embedded = 3,292 cf x 40.0% Voids
#2A	0.50'	2,131 cf	**Cultec R-330XLHD** x 40 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		3,448 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.09 cfs @ 12.63 hrs HW=0.88' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 1P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

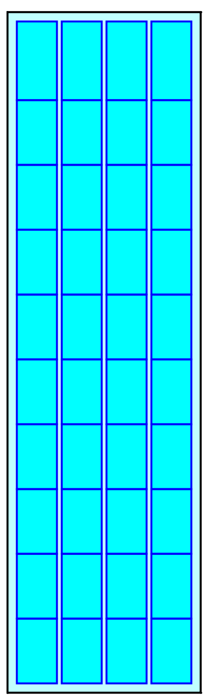
10 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 71.50' Row Length +12.0" End Stone x 2 = 73.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

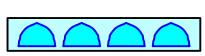
40 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 2,131.0 cf Chamber Storage

5,423.2 cf Field - 2,131.0 cf Chambers = 3,292.2 cf Stone x 40.0% Voids = 1,316.9 cf Stone Storage

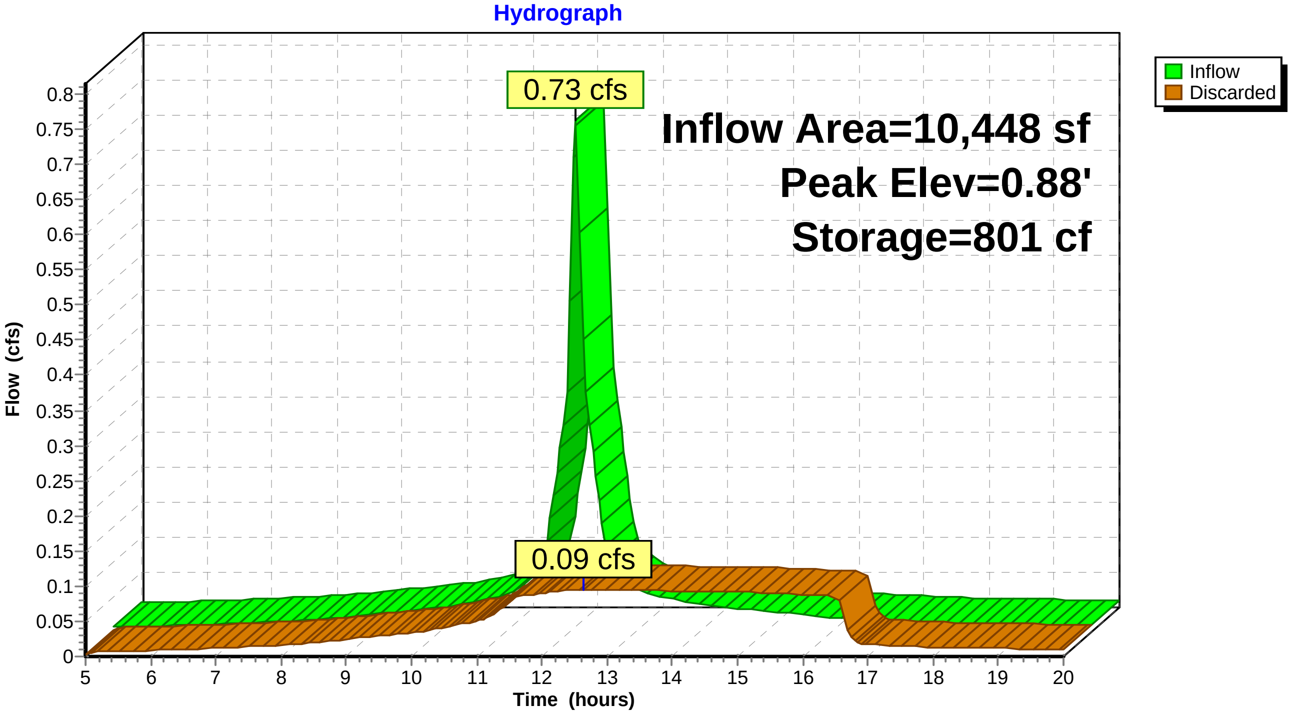
Chamber Storage + Stone Storage = 3,447.9 cf = 0.079 af
Overall Storage Efficiency = 63.6%
Overall System Size = 73.50' x 20.83' x 3.54'

40 Chambers
200.9 cy Field
121.9 cy Stone





Pond 1P: Roof Recharge



Summary for Pond 2P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 13,061 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.91 cfs @ 12.09 hrs, Volume= 3,019 cf
Outflow = 0.06 cfs @ 13.61 hrs, Volume= 2,385 cf, Atten= 94%, Lag= 91.4 min
Discarded = 0.06 cfs @ 13.61 hrs, Volume= 2,385 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.98' @ 13.61 hrs Surf.Area= 2,246 sf Storage= 1,366 cf

Plug-Flow detention time= 161.1 min calculated for 2,376 cf (79% of inflow)
Center-of-Mass det. time= 105.7 min (844.3 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,907 cf	**25.67'W x 87.50'L x 3.54'H Field A** 7,954 cf Overall - 3,185 cf Embedded = 4,769 cf x 40.0% Voids
#2A	0.50'	3,185 cf	**Cultec R-330XLHD** x 60 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		5,093 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.06 cfs @ 13.61 hrs HW=0.98' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 2P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

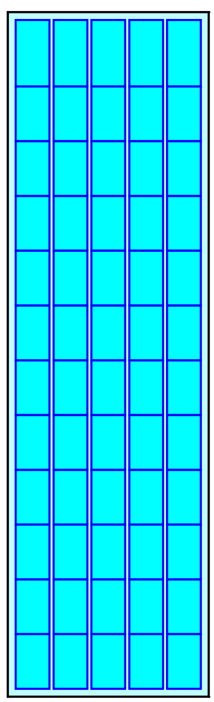
12 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 85.50' Row Length +12.0" End Stone x 2 = 87.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

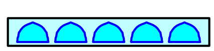
60 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 3,185.3 cf Chamber Storage

7,954.0 cf Field - 3,185.3 cf Chambers = 4,768.7 cf Stone x 40.0% Voids = 1,907.5 cf Stone Storage

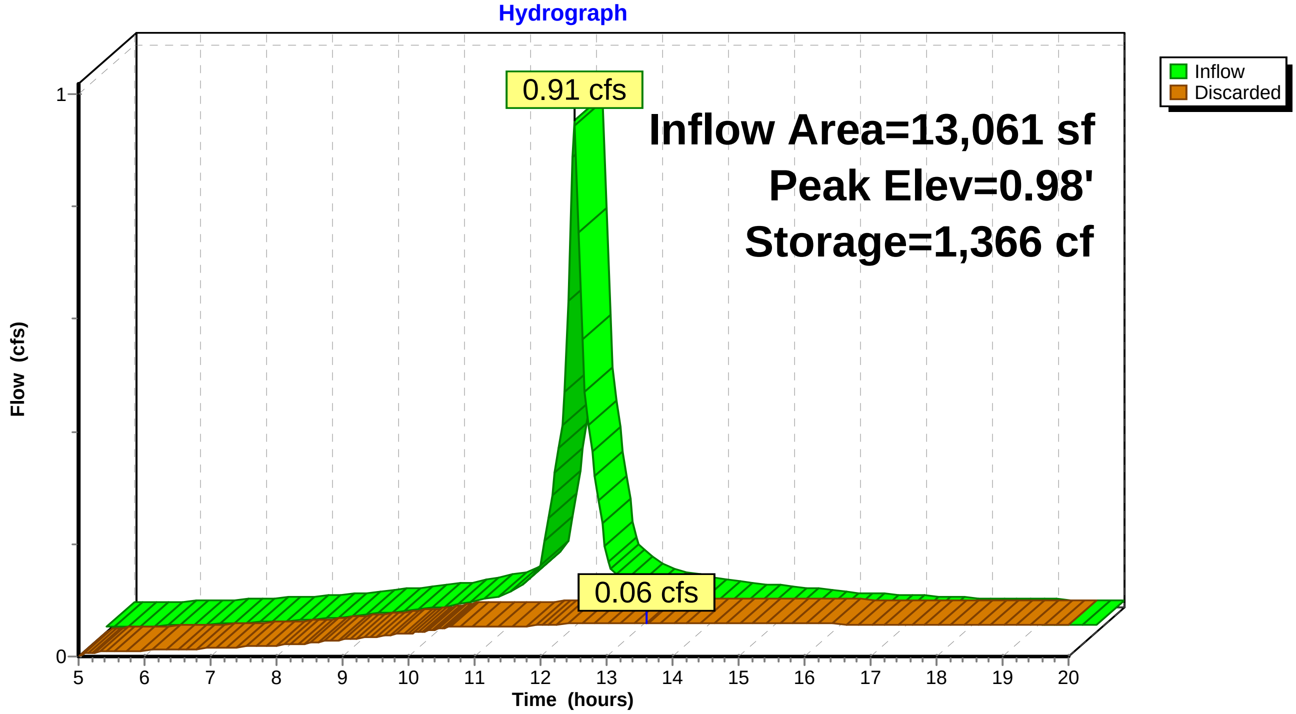
Chamber Storage + Stone Storage = 5,092.8 cf = 0.117 af
Overall Storage Efficiency = 64.0%
Overall System Size = 87.50' x 25.67' x 3.54'

60 Chambers
294.6 cy Field
176.6 cy Stone





Pond 2P: Roof Recharge



Summary for Pond 3P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 13,061 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.91 cfs @ 12.09 hrs, Volume= 3,019 cf
Outflow = 0.06 cfs @ 13.61 hrs, Volume= 2,385 cf, Atten= 94%, Lag= 91.4 min
Discarded = 0.06 cfs @ 13.61 hrs, Volume= 2,385 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.98' @ 13.61 hrs Surf.Area= 2,246 sf Storage= 1,366 cf

Plug-Flow detention time= 161.1 min calculated for 2,376 cf (79% of inflow)
Center-of-Mass det. time= 105.7 min (844.3 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,907 cf	**25.67'W x 87.50'L x 3.54'H Field A** 7,954 cf Overall - 3,185 cf Embedded = 4,769 cf x 40.0% Voids
#2A	0.50'	3,185 cf	**Cultec R-330XLHD** x 60 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		5,093 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.06 cfs @ 13.61 hrs HW=0.98' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 3P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

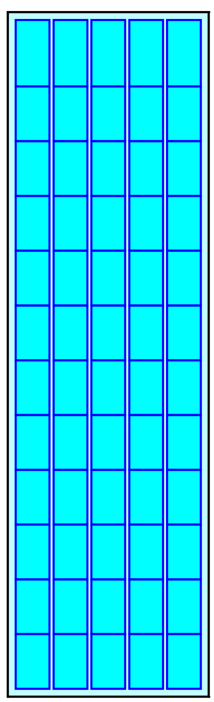
12 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 85.50' Row Length +12.0" End Stone x 2 = 87.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

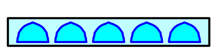
60 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 3,185.3 cf Chamber Storage

7,954.0 cf Field - 3,185.3 cf Chambers = 4,768.7 cf Stone x 40.0% Voids = 1,907.5 cf Stone Storage

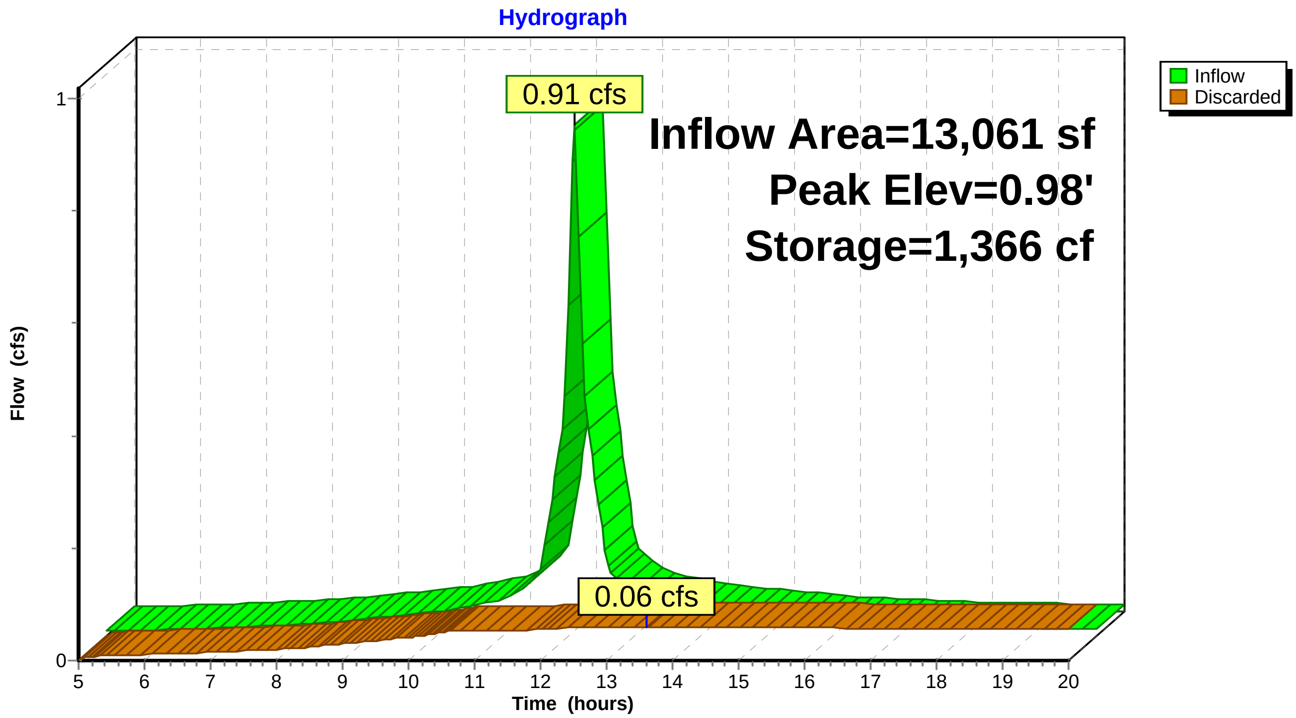
Chamber Storage + Stone Storage = 5,092.8 cf = 0.117 af
Overall Storage Efficiency = 64.0%
Overall System Size = 87.50' x 25.67' x 3.54'

60 Chambers
294.6 cy Field
176.6 cy Stone





Pond 3P: Roof Recharge



Summary for Pond 4P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 7,296 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 1,686 cf
Outflow = 0.03 cfs @ 13.57 hrs, Volume= 1,341 cf, Atten= 93%, Lag= 89.1 min
Discarded = 0.03 cfs @ 13.57 hrs, Volume= 1,341 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.00' @ 13.57 hrs Surf.Area= 1,240 sf Storage= 762 cf

Plug-Flow detention time= 161.0 min calculated for 1,336 cf (79% of inflow)
Center-of-Mass det. time= 106.4 min (845.0 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,071 cf	**20.83'W x 59.50'L x 3.54'H Field A** 4,390 cf Overall - 1,714 cf Embedded = 2,676 cf x 40.0% Voids
#2A	0.50'	1,714 cf	**Cultec R-330XLHD** x 32 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		2,784 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 13.57 hrs HW=1.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond 4P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

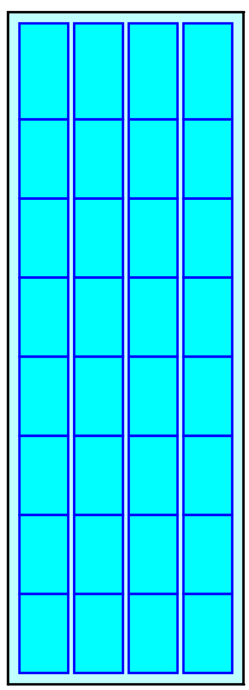
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

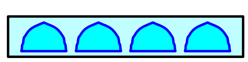
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

4,390.2 cf Field - 1,713.7 cf Chambers = 2,676.5 cf Stone x 40.0% Voids = 1,070.6 cf Stone Storage

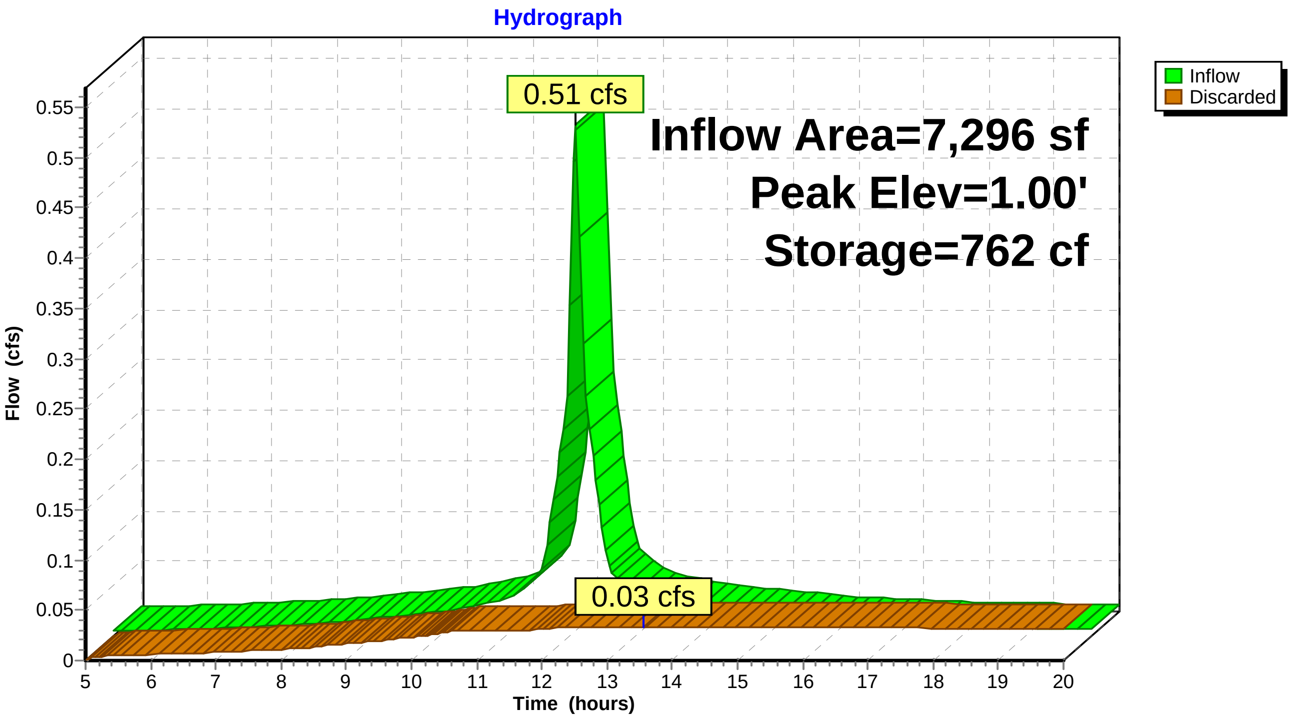
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 4P: Roof Recharge



Summary for Pond 5P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 277 cf
Outflow = 0.01 cfs @ 13.10 hrs, Volume= 244 cf, Atten= 92%, Lag= 60.6 min
Discarded = 0.01 cfs @ 13.10 hrs, Volume= 244 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.04' @ 13.10 hrs Surf.Area= 200 sf Storage= 120 cf

Plug-Flow detention time= 152.0 min calculated for 244 cf (88% of inflow)
Center-of-Mass det. time= 113.7 min (852.3 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.10 hrs HW=1.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 5P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

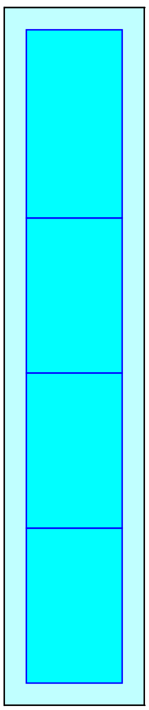
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

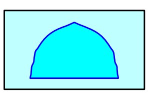
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

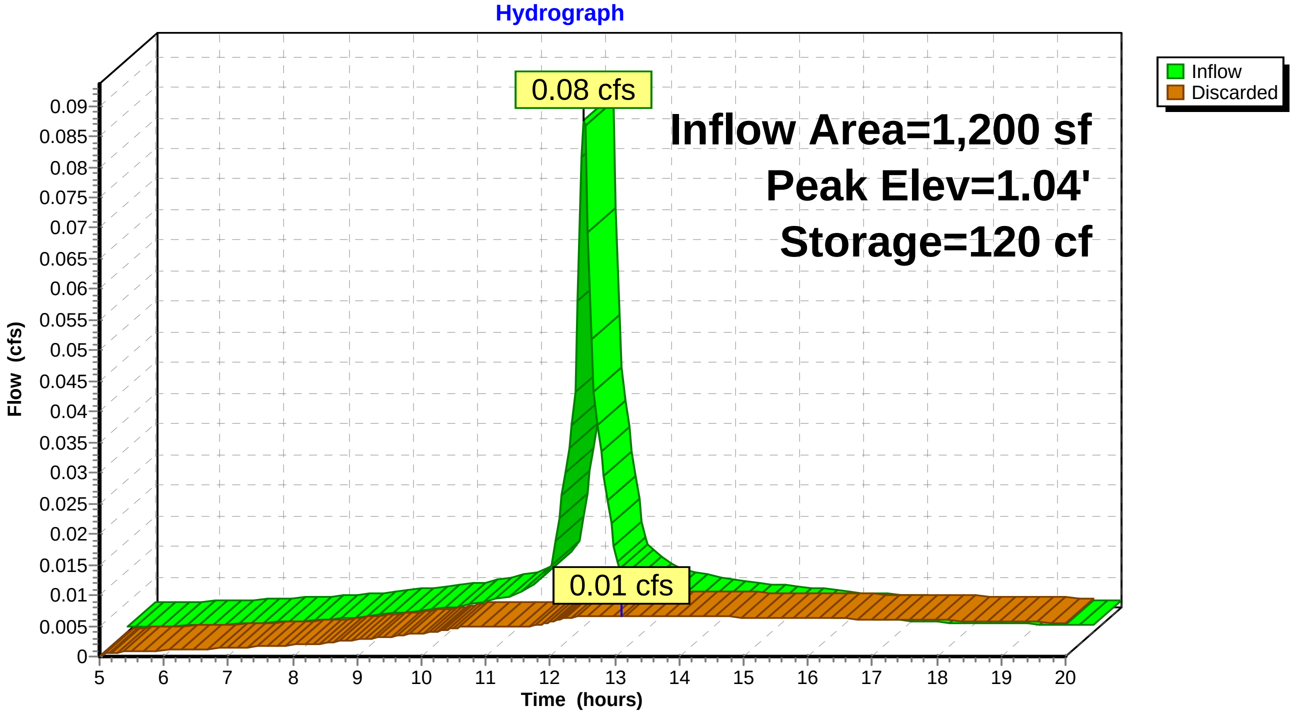
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 5P: Roof Recharge



Summary for Pond 6P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 938 cf
Outflow = 0.02 cfs @ 12.99 hrs, Volume= 924 cf, Atten= 91%, Lag= 54.4 min
Discarded = 0.02 cfs @ 12.99 hrs, Volume= 924 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.77' @ 12.99 hrs Surf.Area= 899 sf Storage= 378 cf

Plug-Flow detention time= 127.5 min calculated for 923 cf (98% of inflow)
Center-of-Mass det. time= 120.4 min (858.9 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 12.99 hrs HW=0.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Pond 6P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

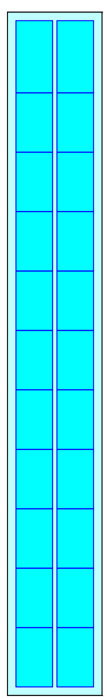
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

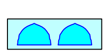
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

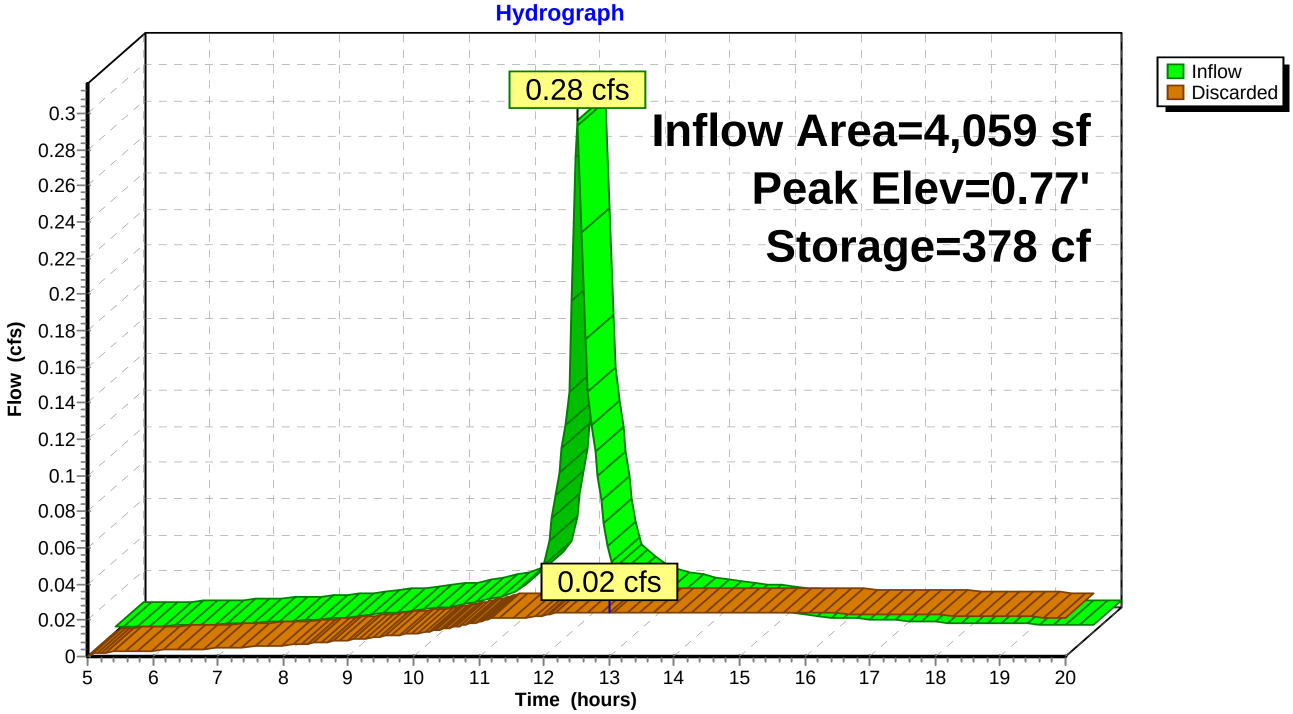
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 6P: Roof Recharge



Summary for Pond 7P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

```
Inflow Area =        4,929 sf,100.00% Impervious,  Inflow Depth >   2.77"    for  2-Year event
Inflow      =      0.34 cfs @  12.09 hrs,  Volume=        1,139 cf
Outflow     =      0.03 cfs @  13.24 hrs,  Volume=          987 cf,  Atten= 93%,  Lag= 69.0 min
Discarded   =      0.03 cfs @  13.24 hrs,  Volume=          987 cf
```

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.93' @ 13.24 hrs Surf.Area= 899 sf Storage= 493 cf

Plug-Flow detention time= 154.2 min calculated for 983 cf (86% of inflow)
Center-of-Mass det. time= 112.6 min (851.2 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 13.24 hrs HW=0.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 7P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

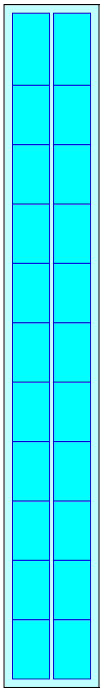
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

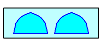
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

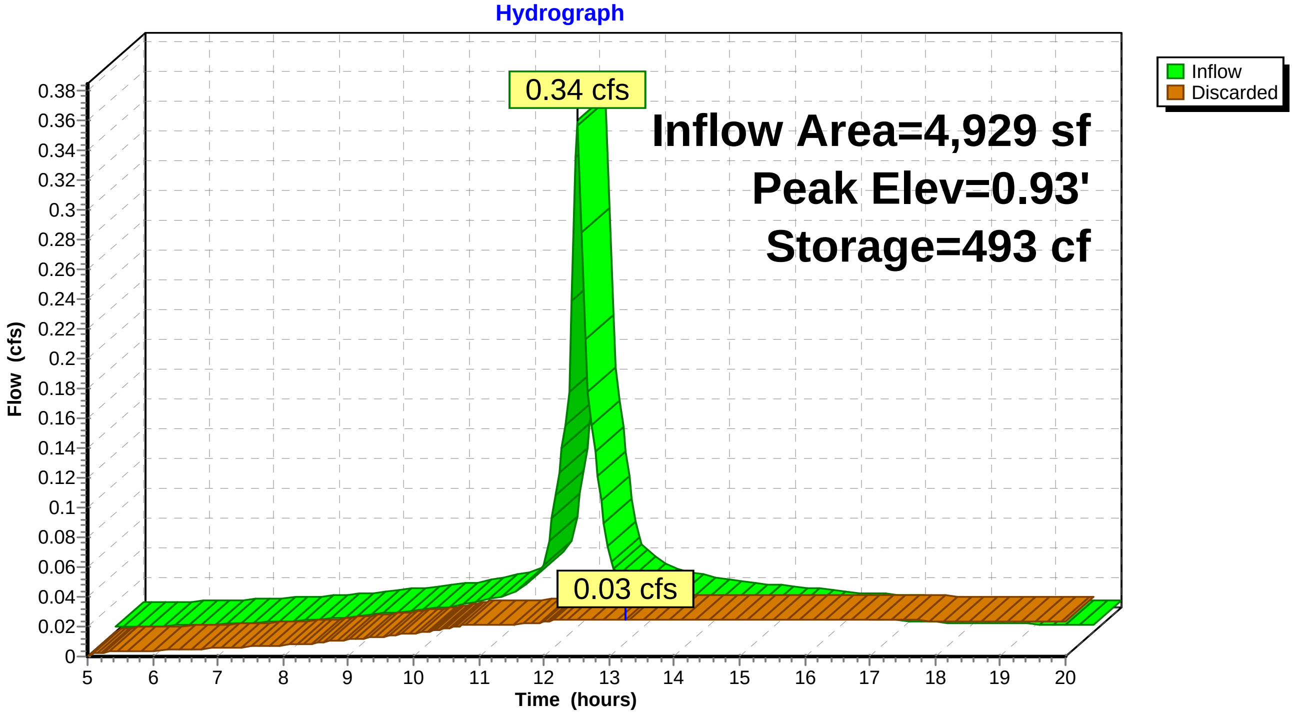
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 7P: Roof Recharge



Summary for Pond 8P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 277 cf
Outflow = 0.01 cfs @ 13.10 hrs, Volume= 244 cf, Atten= 92%, Lag= 60.6 min
Discarded = 0.01 cfs @ 13.10 hrs, Volume= 244 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.04' @ 13.10 hrs Surf.Area= 200 sf Storage= 120 cf

Plug-Flow detention time= 152.0 min calculated for 244 cf (88% of inflow)
Center-of-Mass det. time= 113.7 min (852.3 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.10 hrs HW=1.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 8P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

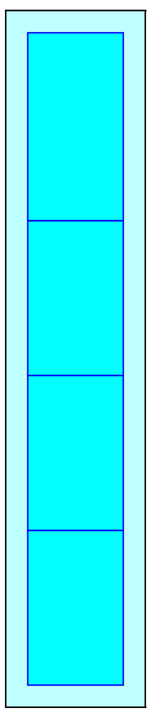
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

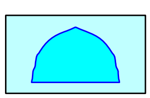
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

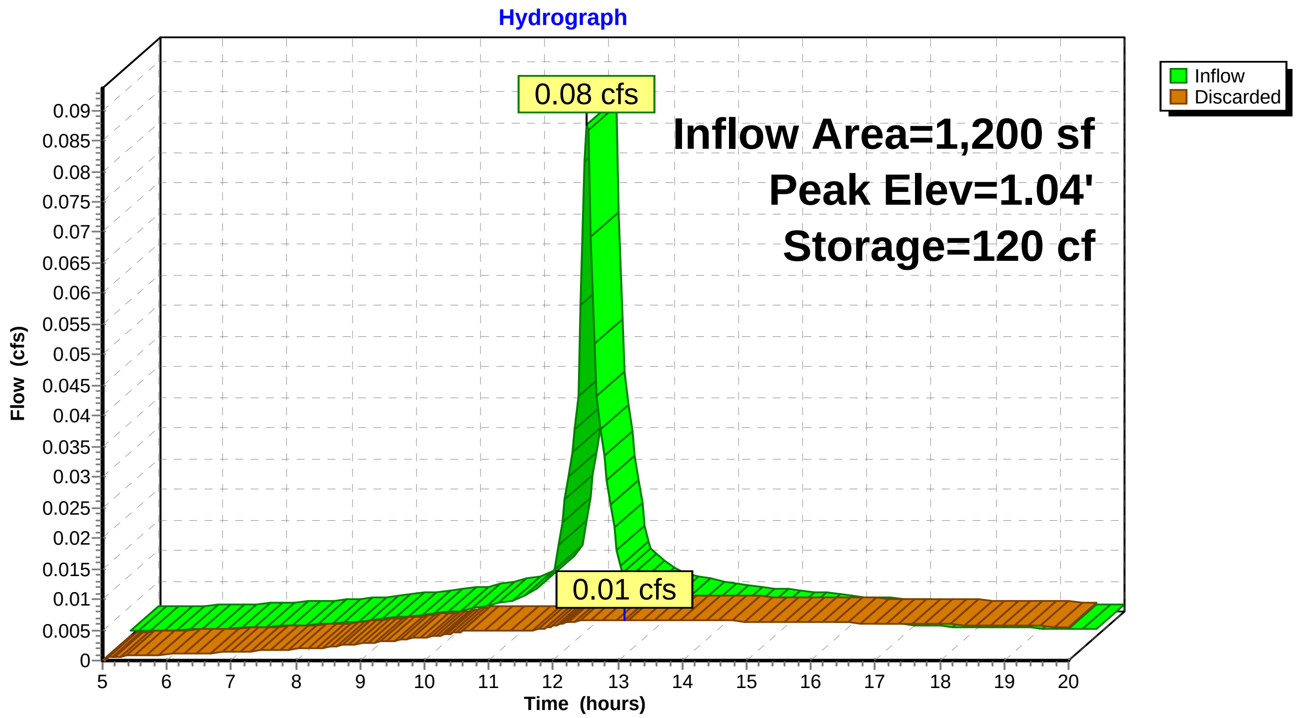
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 8P: Roof Recharge



Summary for Pond 9P: BASIN E

Inflow Area = 135,239 sf, 32.90% Impervious, Inflow Depth > 0.95" for 2-Year event
Inflow = 3.52 cfs @ 12.10 hrs, Volume= 10,664 cf
Outflow = 0.28 cfs @ 14.22 hrs, Volume= 8,057 cf, Atten= 92%, Lag= 127.1 min
Discarded = 0.28 cfs @ 14.22 hrs, Volume= 8,057 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 238.98' @ 14.22 hrs Surf.Area= 4,890 sf Storage= 5,062 cf

Plug-Flow detention time= 189.2 min calculated for 8,030 cf (75% of inflow)
Center-of-Mass det. time= 127.0 min (945.3 - 818.3)

Volume	Invert	Avail.Storage	Storage Description
#1	237.80'	24,841 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

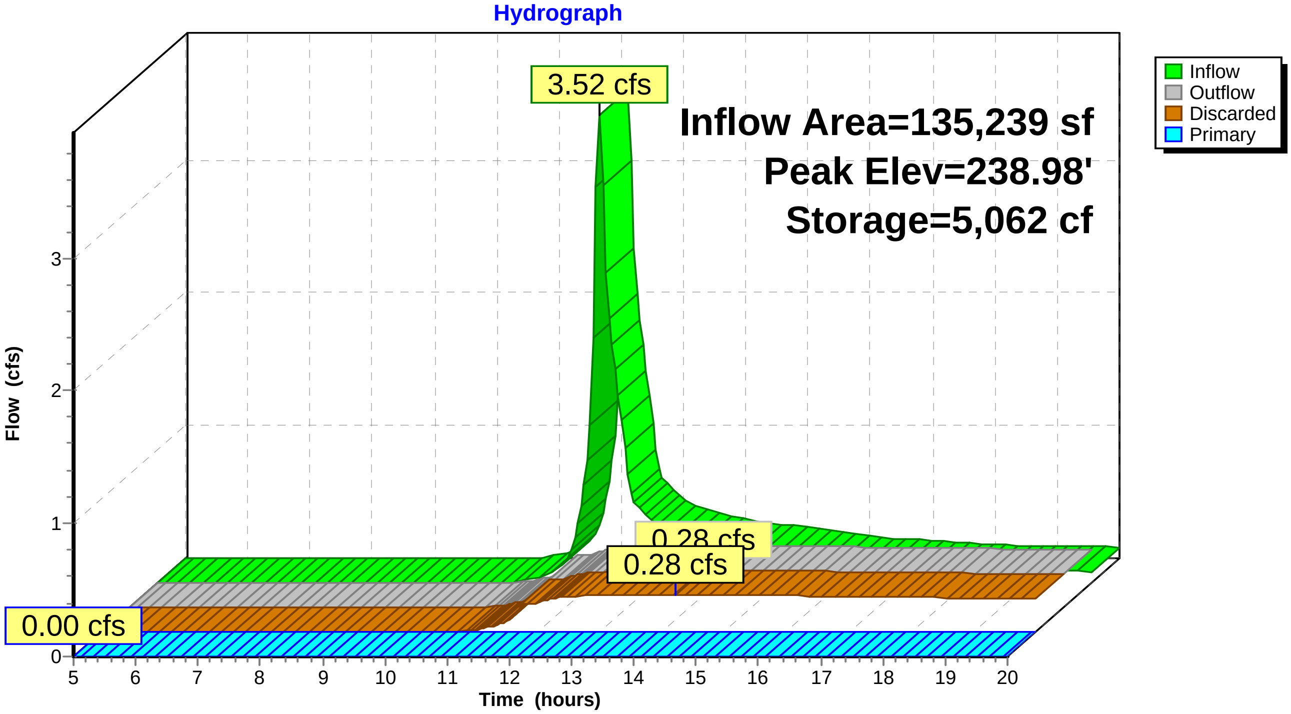
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
237.80	3,709	322.6	0	0	3,709
238.00	3,904	326.4	761	761	3,916
239.00	4,911	345.3	4,398	5,159	4,980
240.00	5,976	364.3	5,435	10,594	6,110
241.00	7,097	383.1	6,528	17,122	7,289
241.90	10,147	430.2	7,719	24,841	10,360

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.80'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.90'	**25.0' long x 18.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.28 cfs @ 14.22 hrs HW=238.98' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=237.80' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 9P: BASIN E



Summary for Pond 10P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 277 cf
Outflow = 0.01 cfs @ 13.10 hrs, Volume= 244 cf, Atten= 92%, Lag= 60.6 min
Discarded = 0.01 cfs @ 13.10 hrs, Volume= 244 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.04' @ 13.10 hrs Surf.Area= 200 sf Storage= 120 cf

Plug-Flow detention time= 152.0 min calculated for 244 cf (88% of inflow)
Center-of-Mass det. time= 113.7 min (852.3 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.10 hrs HW=1.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 10P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

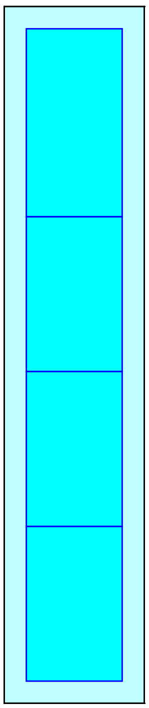
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

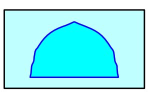
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

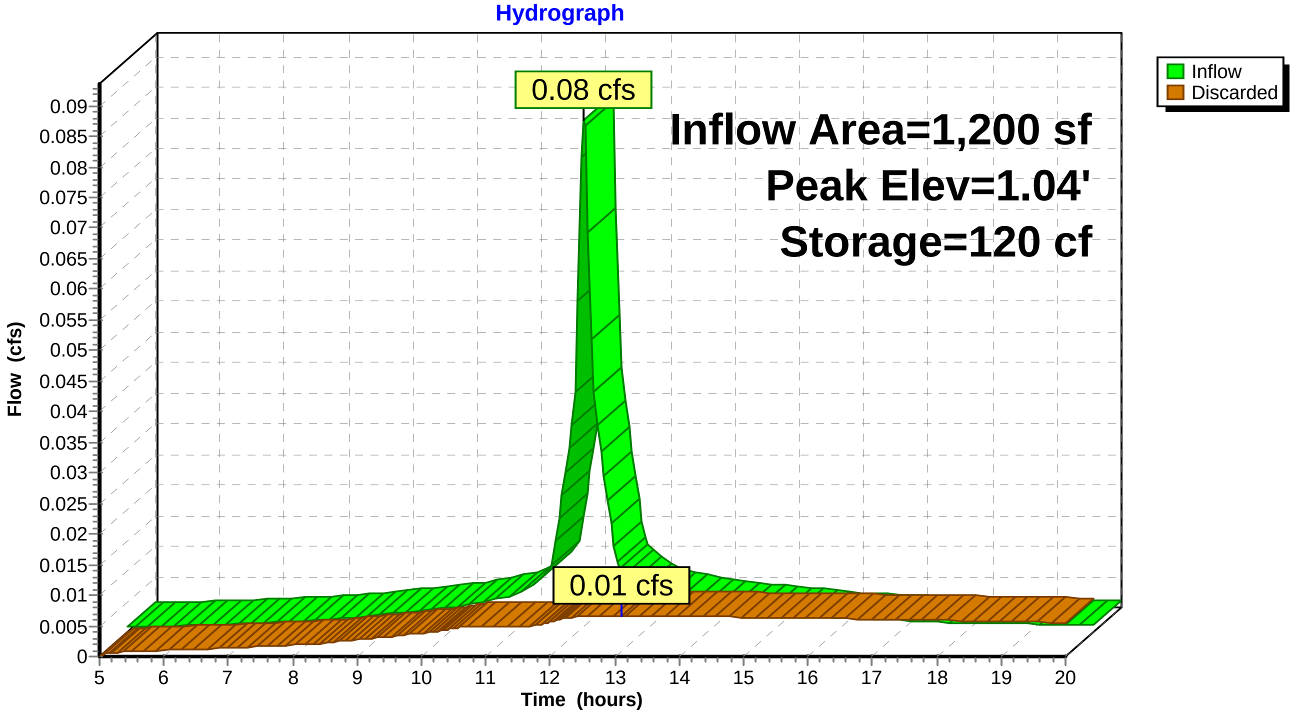
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 10P: Roof Recharge



Summary for Pond 11P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 938 cf
Outflow = 0.02 cfs @ 12.99 hrs, Volume= 924 cf, Atten= 91%, Lag= 54.4 min
Discarded = 0.02 cfs @ 12.99 hrs, Volume= 924 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.77' @ 12.99 hrs Surf.Area= 899 sf Storage= 378 cf

Plug-Flow detention time= 127.5 min calculated for 923 cf (98% of inflow)
Center-of-Mass det. time= 120.4 min (858.9 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A**
			3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 12.99 hrs HW=0.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Pond 11P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

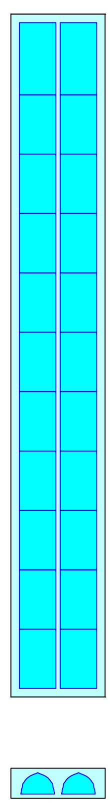
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

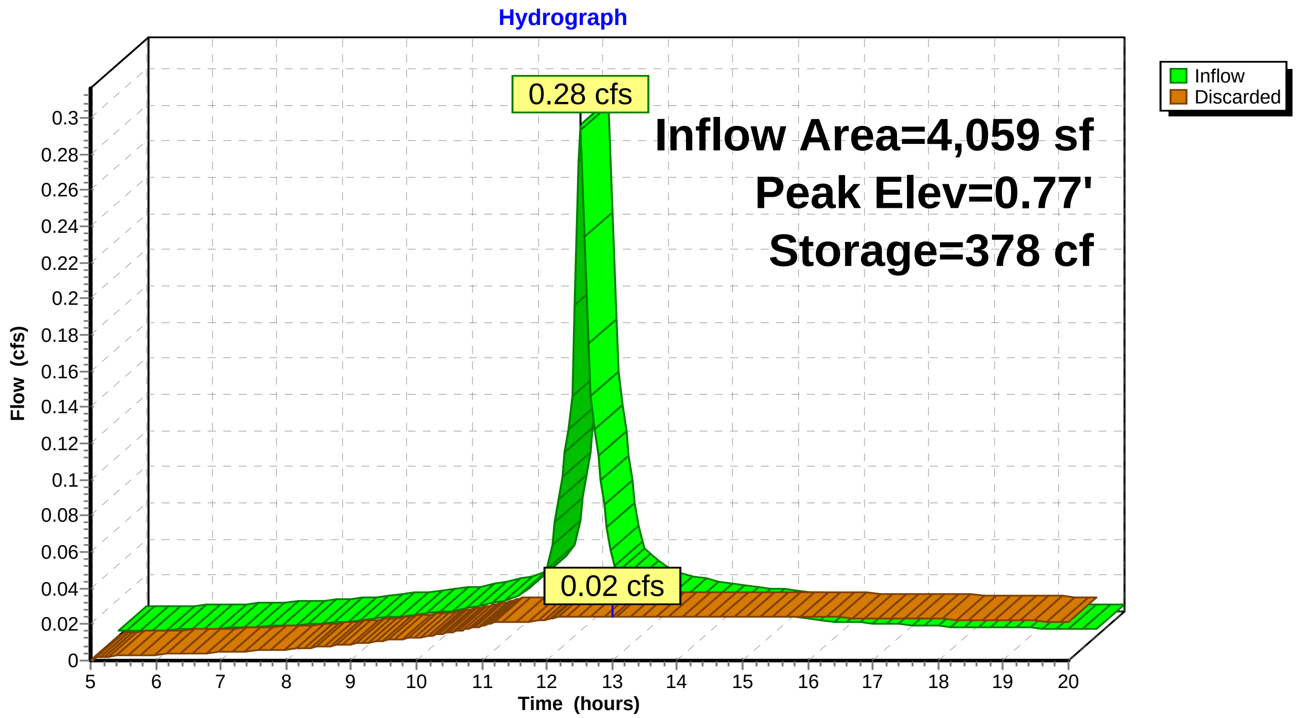
3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone



Pond 11P: Roof Recharge



Summary for Pond 13P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 277 cf
Outflow = 0.01 cfs @ 13.10 hrs, Volume= 244 cf, Atten= 92%, Lag= 60.6 min
Discarded = 0.01 cfs @ 13.10 hrs, Volume= 244 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.04' @ 13.10 hrs Surf.Area= 200 sf Storage= 120 cf

Plug-Flow detention time= 152.0 min calculated for 244 cf (88% of inflow)
Center-of-Mass det. time= 113.7 min (852.3 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.10 hrs HW=1.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 13P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

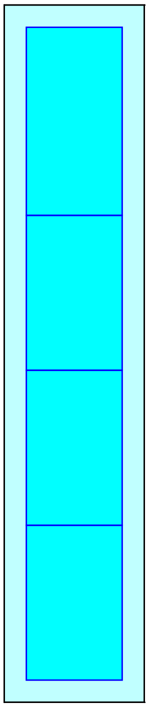
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

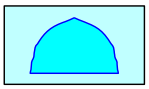
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

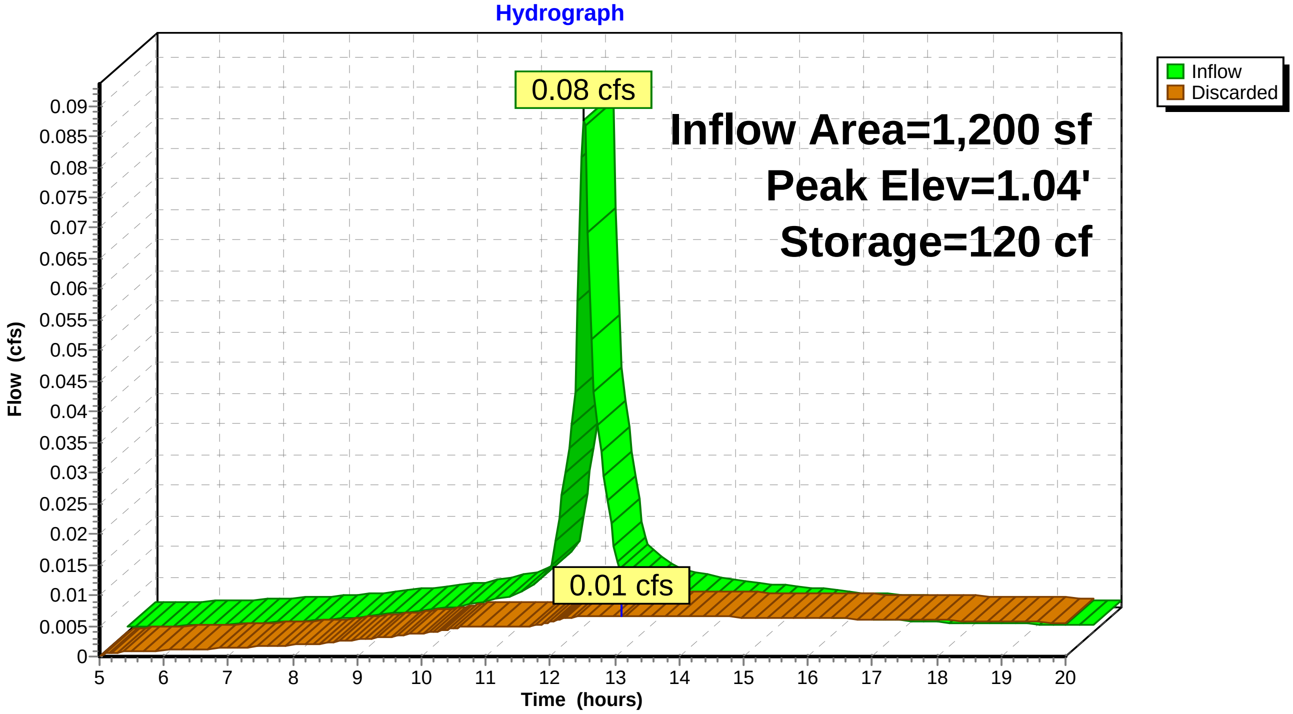
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 13P: Roof Recharge



Summary for Pond 14P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 2.77" for 2-Year event
Inflow = 0.28 cfs @ 12.09 hrs, Volume= 938 cf
Outflow = 0.02 cfs @ 13.08 hrs, Volume= 870 cf, Atten= 92%, Lag= 59.5 min
Discarded = 0.02 cfs @ 13.08 hrs, Volume= 870 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.82' @ 13.08 hrs Surf.Area= 840 sf Storage= 390 cf

Plug-Flow detention time= 143.7 min calculated for 867 cf (92% of inflow)
Center-of-Mass det. time= 117.1 min (855.6 - 738.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	738 cf	**16.00'W x 52.50'L x 3.54'H Field A** 2,975 cf Overall - 1,129 cf Embedded = 1,846 cf x 40.0% Voids
#2A	0.50'	1,129 cf	**Cultec R-330XLHD** x 21 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		1,867 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 13.08 hrs HW=0.82' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Pond 14P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

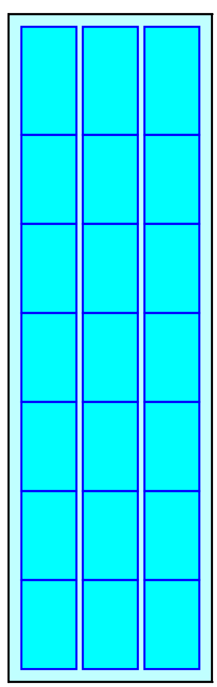
7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

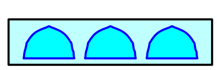
21 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 1,128.8 cf Chamber Storage

2,975.0 cf Field - 1,128.8 cf Chambers = 1,846.2 cf Stone x 40.0% Voids = 738.5 cf Stone Storage

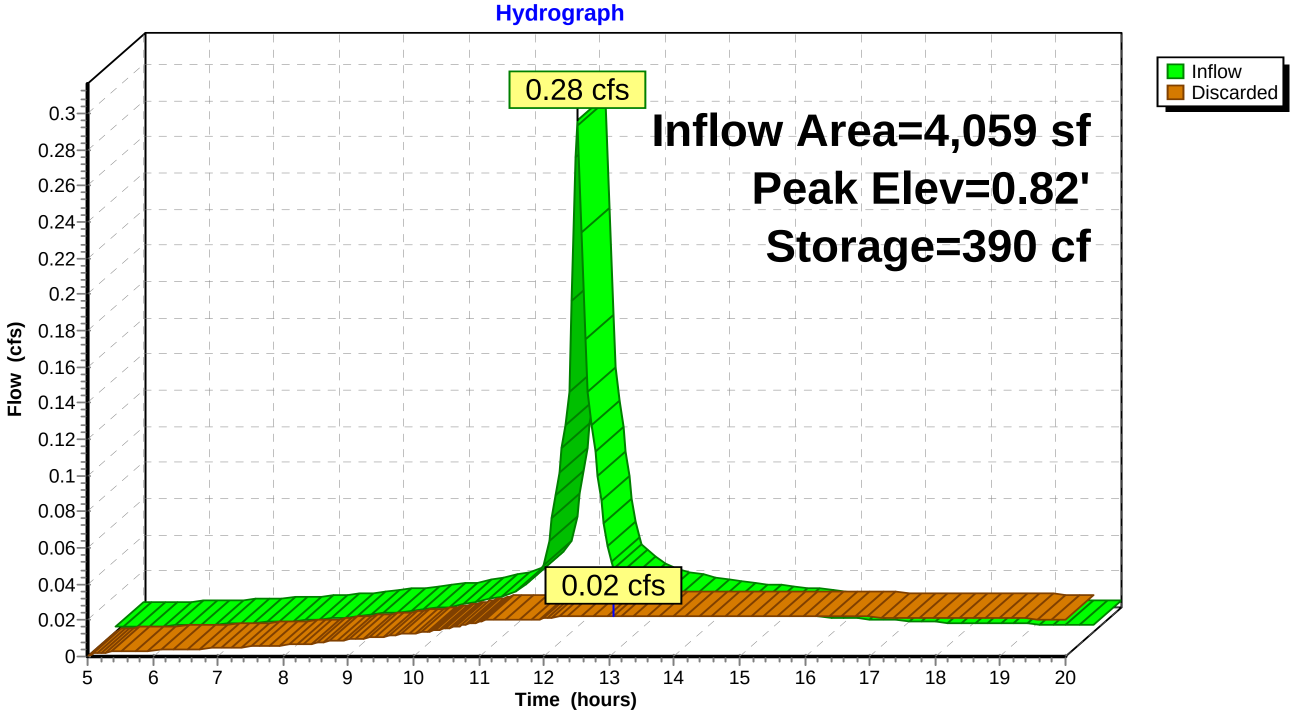
Chamber Storage + Stone Storage = 1,867.3 cf = 0.043 af
Overall Storage Efficiency = 62.8%
Overall System Size = 52.50' x 16.00' x 3.54'

21 Chambers
110.2 cy Field
68.4 cy Stone





Pond 14P: Roof Recharge



Summary for Pond 17P: Roof Recharge

Inflow Area = 13,086 sf, 37.67% Impervious, Inflow Depth > 1.79" for 2-Year event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 1,953 cf
Outflow = 0.04 cfs @ 13.88 hrs, Volume= 1,500 cf, Atten= 93%, Lag= 107.5 min
Discarded = 0.04 cfs @ 13.88 hrs, Volume= 1,500 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.93' @ 13.88 hrs Surf.Area= 1,677 sf Storage= 945 cf

Plug-Flow detention time= 183.0 min calculated for 1,500 cf (77% of inflow)
Center-of-Mass det. time= 124.8 min (909.4 - 784.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,440 cf	**20.83'W x 80.50'L x 3.54'H Field A** 5,940 cf Overall - 2,340 cf Embedded = 3,600 cf x 40.0% Voids
#2A	0.50'	2,340 cf	**Cultec R-330XLHD** x 44 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		3,780 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 13.88 hrs HW=0.93' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

Pond 17P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

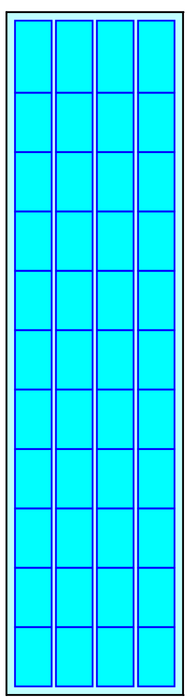
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

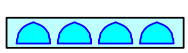
44 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 2,339.6 cf Chamber Storage

5,939.7 cf Field - 2,339.6 cf Chambers = 3,600.1 cf Stone x 40.0% Voids = 1,440.0 cf Stone Storage

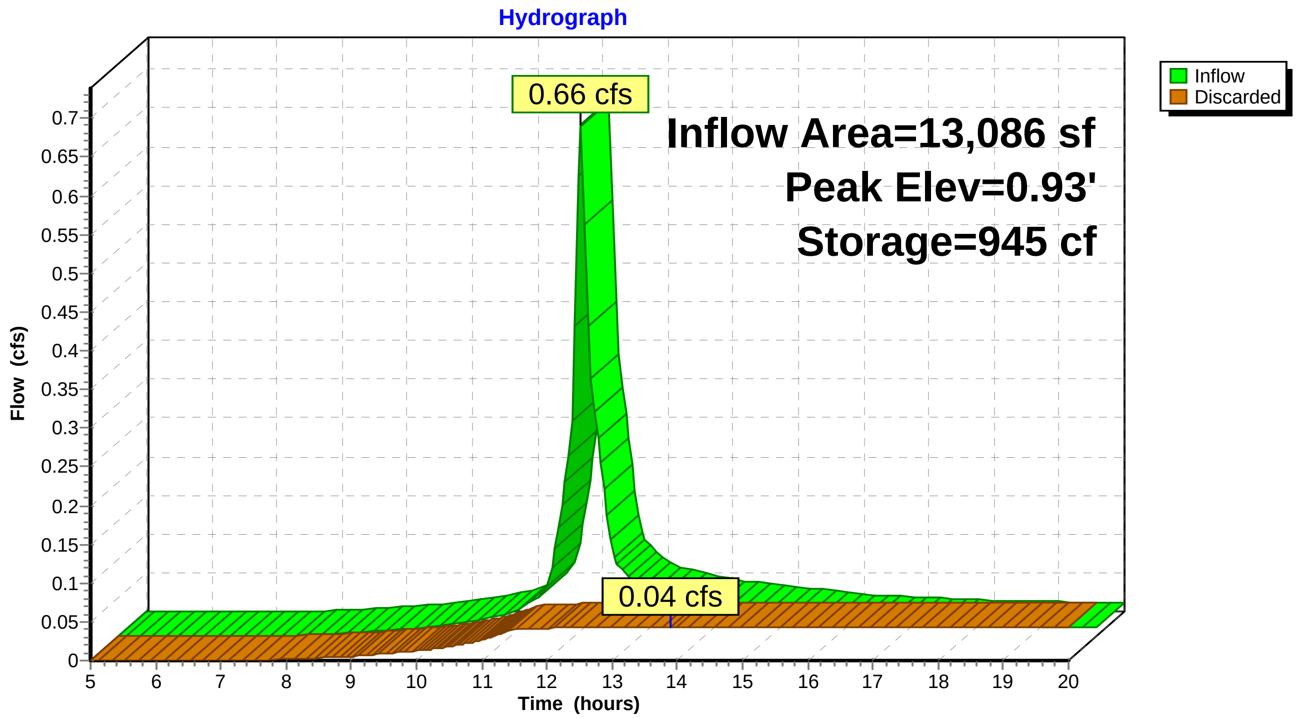
Chamber Storage + Stone Storage = 3,779.6 cf = 0.087 af
Overall Storage Efficiency = 63.6%
Overall System Size = 80.50' x 20.83' x 3.54'

44 Chambers
220.0 cy Field
133.3 cy Stone





Pond 17P: Roof Recharge



Summary for Pond 19P: Roof Recharge

Inflow Area = 11,720 sf, 42.06% Impervious, Inflow Depth > 1.87" for 2-Year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 1,828 cf
Outflow = 0.08 cfs @ 12.77 hrs, Volume= 1,825 cf, Atten= 88%, Lag= 40.5 min
Discarded = 0.08 cfs @ 12.77 hrs, Volume= 1,825 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.96' @ 12.77 hrs Surf.Area= 1,176 sf Storage= 681 cf

Plug-Flow detention time= 75.9 min calculated for 1,819 cf (100% of inflow)
Center-of-Mass det. time= 75.1 min (856.6 - 781.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,027 cf	**16.00'W x 73.50'L x 3.54'H Field A** 4,165 cf Overall - 1,598 cf Embedded = 2,567 cf x 40.0% Voids
#2A	0.50'	1,598 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		2,625 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.08 cfs @ 12.77 hrs HW=0.96' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Pond 19P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

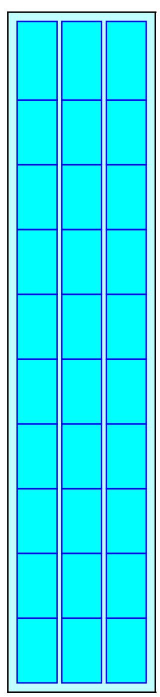
10 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 71.50' Row Length +12.0" End Stone x 2 = 73.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

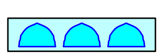
30 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 1,598.2 cf Chamber Storage

4,165.0 cf Field - 1,598.2 cf Chambers = 2,566.8 cf Stone x 40.0% Voids = 1,026.7 cf Stone Storage

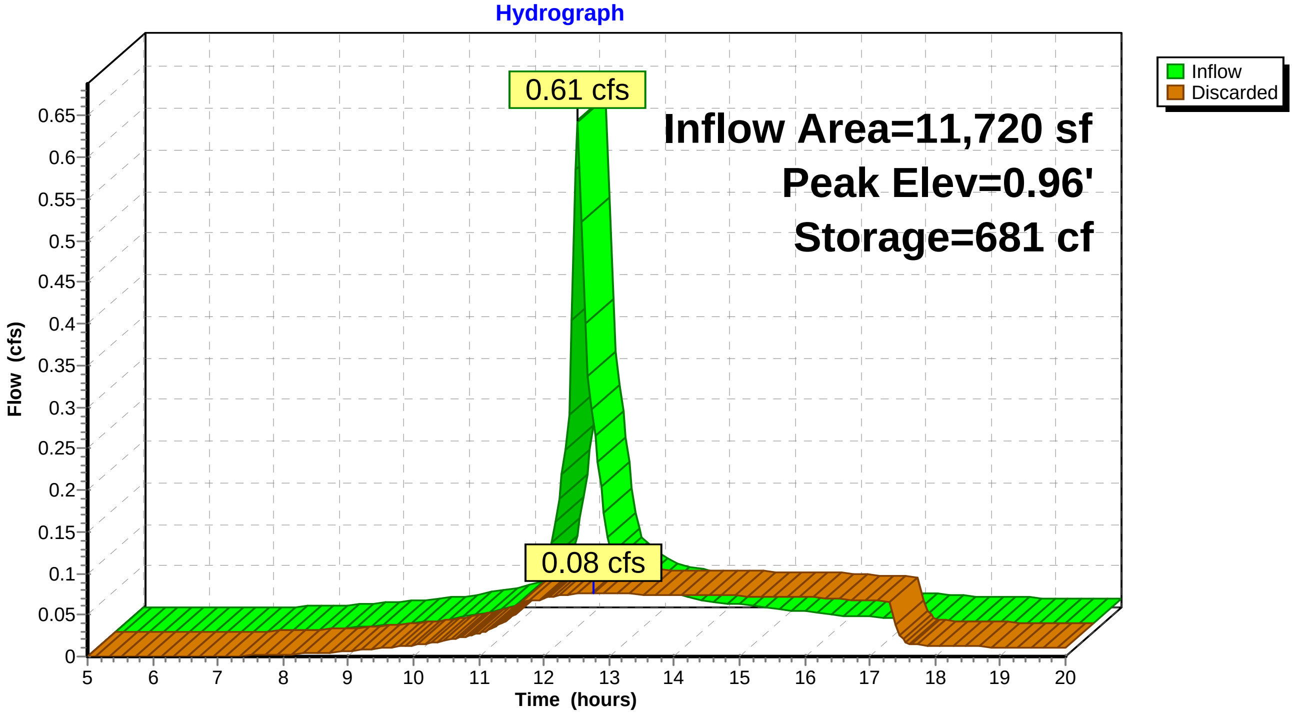
Chamber Storage + Stone Storage = 2,624.9 cf = 0.060 af
Overall Storage Efficiency = 63.0%
Overall System Size = 73.50' x 16.00' x 3.54'

30 Chambers
154.3 cy Field
95.1 cy Stone





Pond 19P: Roof Recharge



Summary for Pond 21P: BASIN B

Inflow Area = 167,695 sf, 37.24% Impervious, Inflow Depth > 0.63" for 2-Year event
Inflow = 1.99 cfs @ 12.20 hrs, Volume= 8,805 cf
Outflow = 0.31 cfs @ 13.74 hrs, Volume= 8,740 cf, Atten= 84%, Lag= 92.4 min
Discarded = 0.31 cfs @ 13.74 hrs, Volume= 8,740 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 226.10' @ 13.74 hrs Surf.Area= 5,580 sf Storage= 3,195 cf

Plug-Flow detention time= 112.7 min calculated for 8,711 cf (99% of inflow)
Center-of-Mass det. time= 109.8 min (947.9 - 838.2)

Volume	Invert	Avail.Storage	Storage Description
#1	225.50'	23,381 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

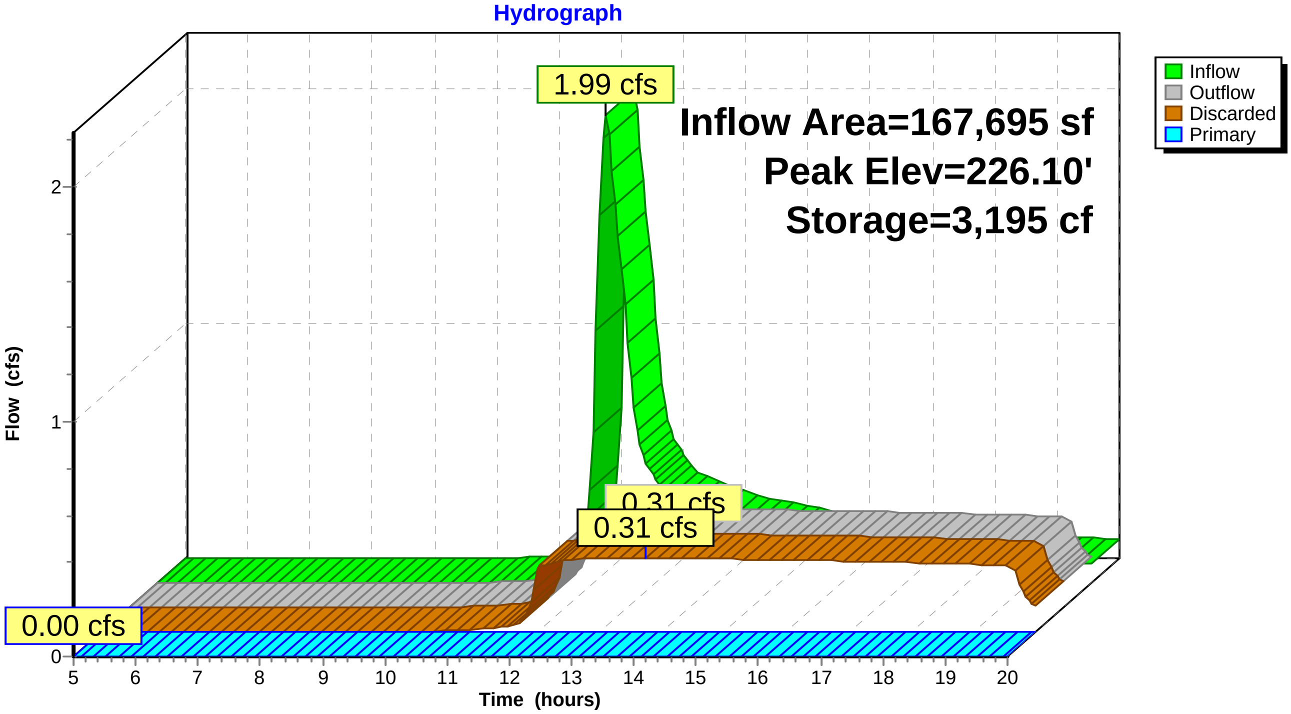
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.50	5,039	294.3	0	0	5,039
226.00	5,488	303.7	2,631	2,631	5,511
227.00	6,427	322.5	5,951	8,582	6,498
228.00	7,423	328.3	6,919	15,501	6,941
228.90	10,160	388.5	7,880	23,381	10,390

Device	Routing	Invert	Outlet Devices
#1	Discarded	225.50'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	227.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.31 cfs @ 13.74 hrs HW=226.10' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=225.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: BASIN B



Summary for Pond 22P: Roof Recharge

Inflow Area = 11,373 sf, 43.34% Impervious, Inflow Depth > 1.17" for 2-Year event
Inflow = 0.38 cfs @ 12.10 hrs, Volume= 1,110 cf
Outflow = 0.03 cfs @ 13.79 hrs, Volume= 948 cf, Atten= 92%, Lag= 101.6 min
Discarded = 0.03 cfs @ 13.79 hrs, Volume= 948 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 0.80' @ 13.79 hrs Surf.Area= 1,133 sf Storage= 504 cf

Plug-Flow detention time= 172.5 min calculated for 945 cf (85% of inflow)
Center-of-Mass det. time= 129.4 min (938.0 - 808.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,013 cf	**11.17'W x 101.50'L x 3.54'H Field A** 4,014 cf Overall - 1,483 cf Embedded = 2,531 cf x 40.0% Voids
#2A	0.50'	1,483 cf	**Cultec R-330XLHD** x 28 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		2,495 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 13.79 hrs HW=0.80' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond 22P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

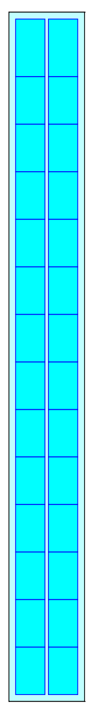
14 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 99.50' Row Length +12.0" End Stone x 2 = 101.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

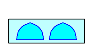
28 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,482.7 cf Chamber Storage

4,014.2 cf Field - 1,482.7 cf Chambers = 2,531.4 cf Stone x 40.0% Voids = 1,012.6 cf Stone Storage

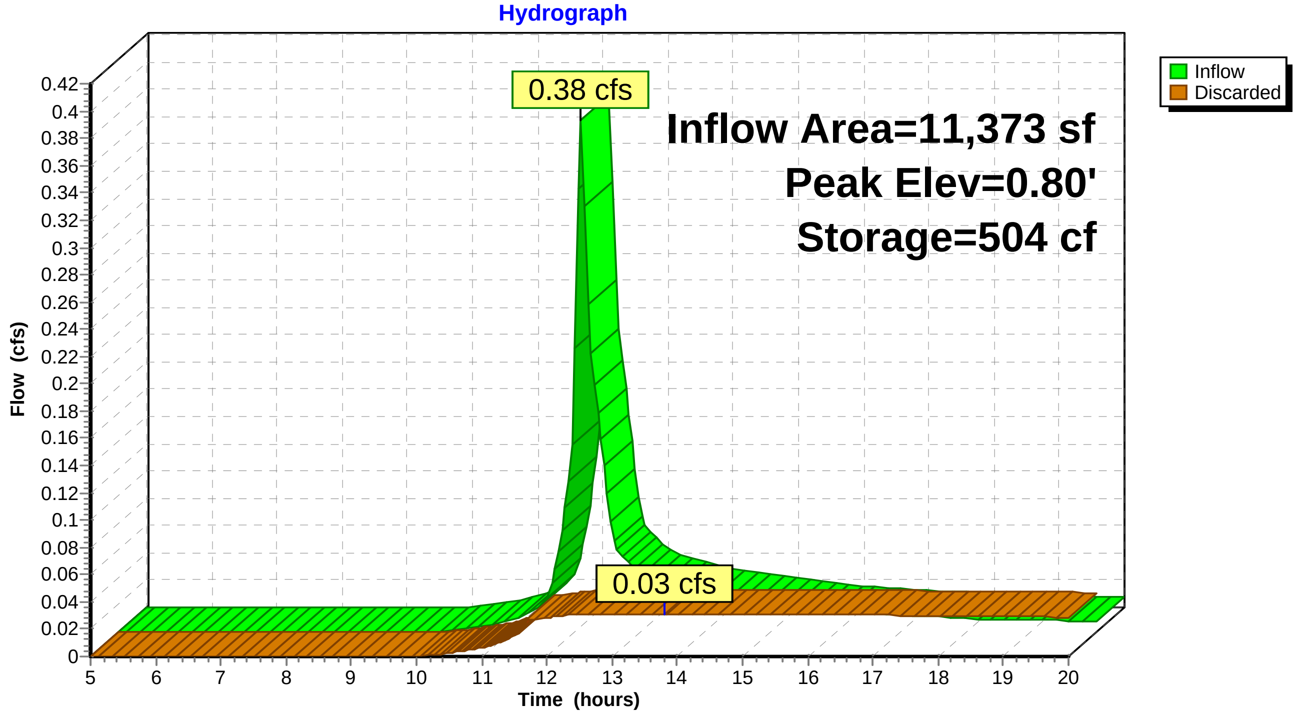
Chamber Storage + Stone Storage = 2,495.3 cf = 0.057 af
Overall Storage Efficiency = 62.2%
Overall System Size = 101.50' x 11.17' x 3.54'

28 Chambers
148.7 cy Field
93.8 cy Stone





Pond 22P: Roof Recharge



Summary for Pond 30P: BASIN A

[82] Warning: Early inflow requires earlier time span

Inflow Area = 18,459 sf, 78.24% Impervious, Inflow Depth > 2.42" for 2-Year event
Inflow = 1.36 cfs @ 12.00 hrs, Volume= 3,723 cf
Outflow = 0.17 cfs @ 12.50 hrs, Volume= 3,715 cf, Atten= 88%, Lag= 29.9 min
Discarded = 0.17 cfs @ 12.50 hrs, Volume= 3,715 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 238.99' @ 12.50 hrs Surf.Area= 2,077 sf Storage= 1,376 cf

Plug-Flow detention time= 74.1 min calculated for 3,702 cf (99% of inflow)
Center-of-Mass det. time= 72.7 min (820.5 - 747.8)

Volume	Invert	Avail.Storage	Storage Description
#1	238.20'	7,401 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

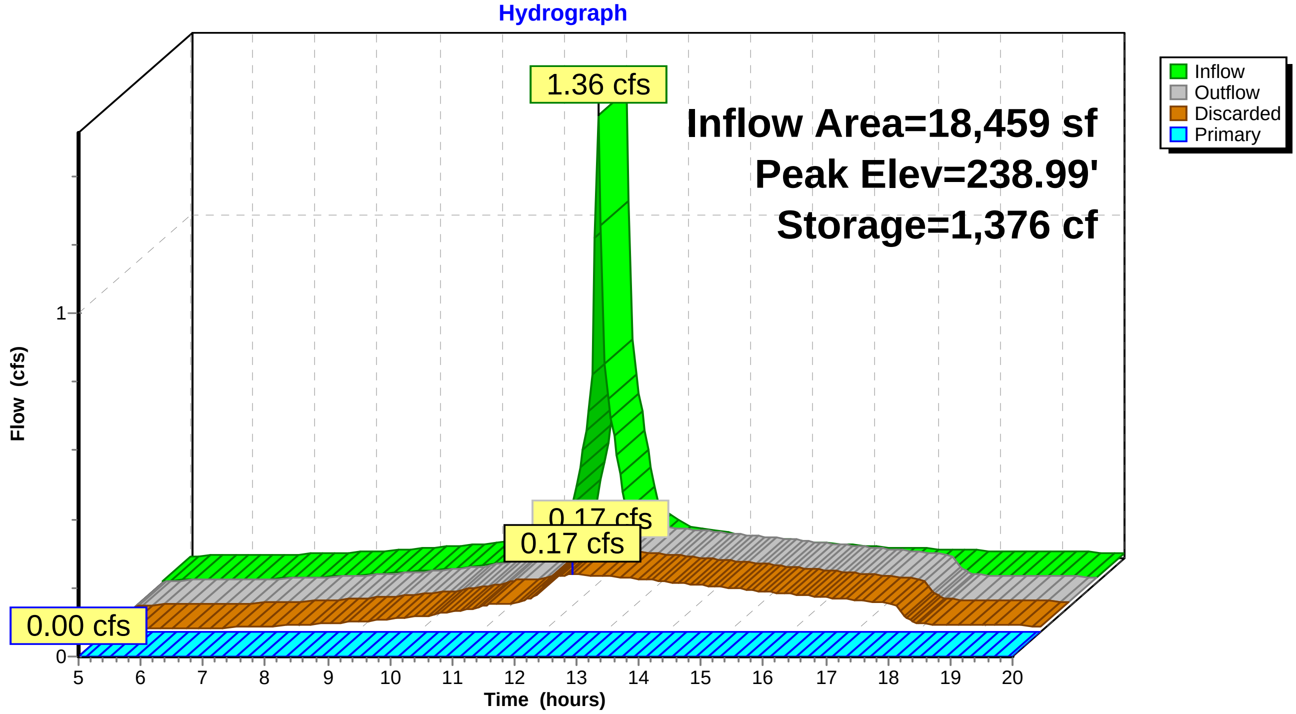
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
238.20	1,411	262.1	0	0	1,411
239.00	2,083	297.8	1,389	1,389	3,017
240.00	3,005	316.6	2,530	3,919	3,986
241.00	3,983	335.5	3,483	7,401	5,020

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.20'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.00'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.17 cfs @ 12.50 hrs HW=238.99' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=238.20' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 30P: BASIN A



Summary for Pond 31P: BASIN D

Inflow Area = 90,014 sf, 45.84% Impervious, Inflow Depth > 1.42" for 2-Year event
Inflow = 3.62 cfs @ 12.09 hrs, Volume= 10,629 cf
Outflow = 0.53 cfs @ 12.67 hrs, Volume= 10,593 cf, Atten= 85%, Lag= 34.8 min
Discarded = 0.53 cfs @ 12.67 hrs, Volume= 10,593 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 239.67' @ 12.67 hrs Surf.Area= 6,945 sf Storage= 4,022 cf

Plug-Flow detention time= 77.0 min calculated for 10,593 cf (100% of inflow)
Center-of-Mass det. time= 75.7 min (874.5 - 798.8)

Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	24,822 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

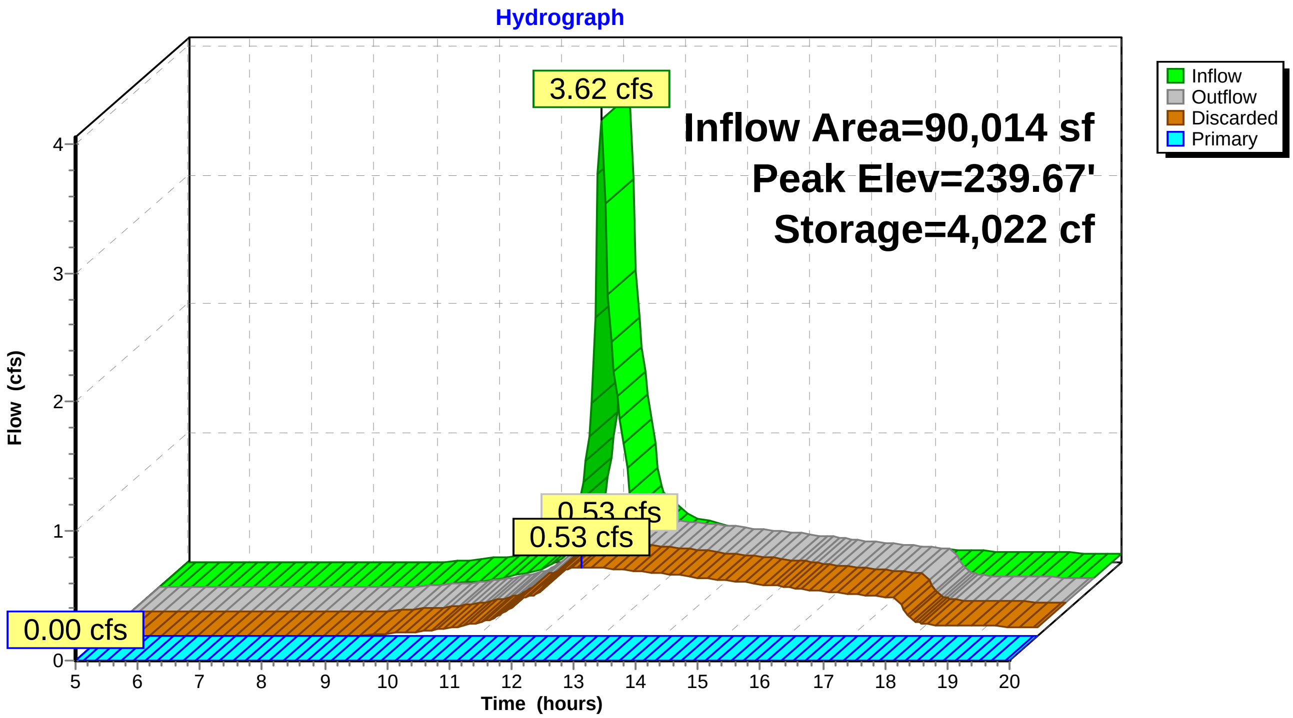
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	5,028	276.6	0	0	5,028
240.00	7,979	406.4	6,447	6,447	12,091
241.00	9,227	425.3	8,595	15,042	13,409
241.90	12,593	472.4	9,780	24,822	16,798

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.53 cfs @ 12.67 hrs HW=239.67' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.53 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=239.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 31P: BASIN D



Summary for Pond 32P: BASIN C

Inflow Area = 188,274 sf, 48.56% Impervious, Inflow Depth > 0.99" for 2-Year event
Inflow = 4.44 cfs @ 12.15 hrs, Volume= 15,572 cf
Outflow = 0.85 cfs @ 12.77 hrs, Volume= 15,510 cf, Atten= 81%, Lag= 37.3 min
Discarded = 0.85 cfs @ 12.77 hrs, Volume= 15,510 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 224.77' @ 12.77 hrs Surf.Area= 10,319 sf Storage= 5,663 cf

Plug-Flow detention time= 77.8 min calculated for 15,510 cf (100% of inflow)
Center-of-Mass det. time= 76.3 min (894.8 - 818.5)

Volume	Invert	Avail.Storage	Storage Description
#1	224.00'	38,476 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

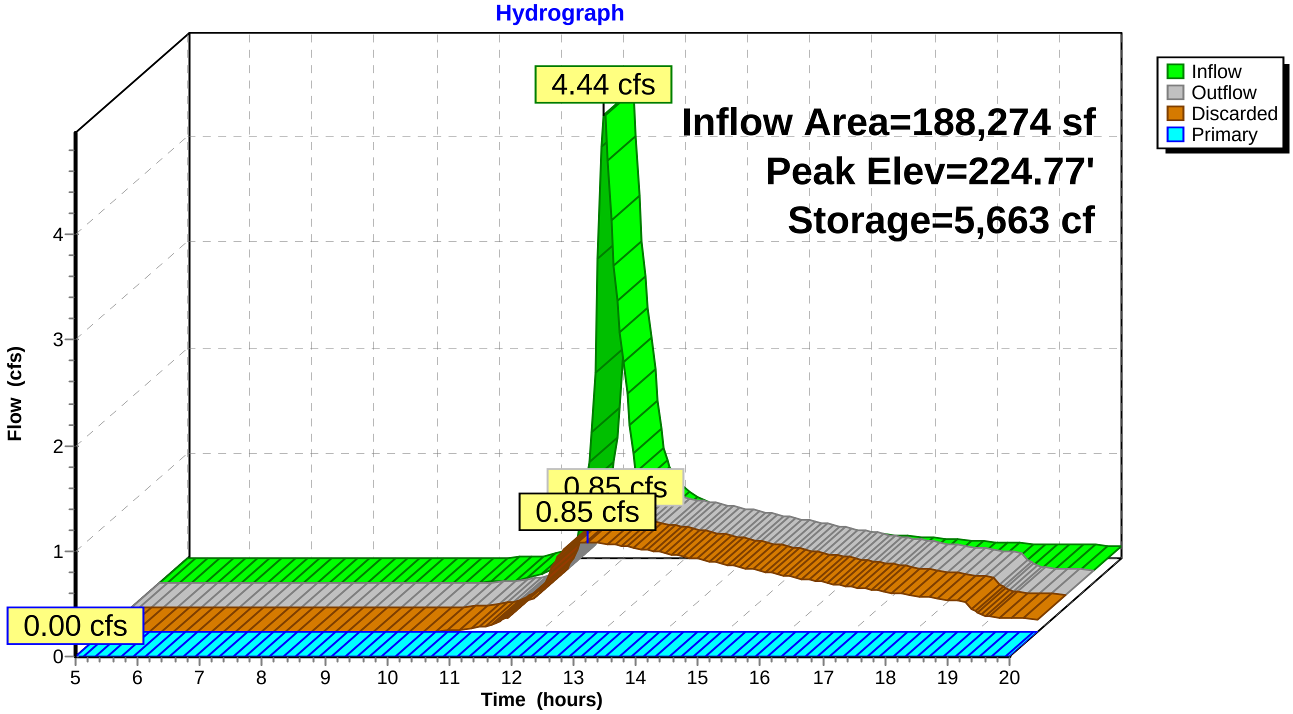
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
224.00	4,753	268.4	0	0	4,753
225.00	12,400	506.3	8,277	8,277	19,424
226.00	15,628	628.5	13,983	22,260	30,474
226.90	20,519	675.7	16,216	38,476	35,408

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	225.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.85 cfs @ 12.77 hrs HW=224.77' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.85 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=224.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 32P: BASIN C



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 34S: 10 Unit Roof Runoff Area=10,448 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=1.08 cfs 3,609 cf

Subcatchment 35S: 14 Unit Roof Runoff Area=13,061 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=1.35 cfs 4,512 cf

Subcatchment 36S: 14 Unit Roof Runoff Area=13,061 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=1.35 cfs 4,512 cf

Subcatchment 37S: 7 Unit Roof Runoff Area=7,296 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.75 cfs 2,520 cf

Subcatchment LOT 1: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.12 cfs 415 cf

Subcatchment LOT 12: DUPLEX + YARD Runoff Area=11,373 sf 43.34% Impervious Runoff Depth>2.29"
Tc=6.0 min CN=78 Runoff=0.74 cfs 2,168 cf

Subcatchment LOT 13: DUPLEX + YARD Runoff Area=11,720 sf 42.06% Impervious Runoff Depth>3.19"
Tc=6.0 min CN=88 Runoff=1.02 cfs 3,116 cf

Subcatchment LOT 14: DUPLEX + YARD Runoff Area=13,086 sf 37.67% Impervious Runoff Depth>3.09"
Tc=6.0 min CN=87 Runoff=1.12 cfs 3,373 cf

Subcatchment LOT 18: DUPLEX ROOF Runoff Area=4,929 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.51 cfs 1,703 cf

Subcatchment LOT 19: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.42 cfs 1,402 cf

Subcatchment LOT 2: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.12 cfs 415 cf

Subcatchment LOT 20: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.42 cfs 1,402 cf

Subcatchment LOT 21: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.42 cfs 1,402 cf

Subcatchment LOT 3: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.12 cfs 415 cf

Subcatchment LOT 8: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.15"
Tc=6.0 min CN=98 Runoff=0.12 cfs 415 cf

Subcatchment PRDA-1: TO BASIN D Runoff Area=51,731 sf 56.02% Impervious Runoff Depth>2.54"
Tc=6.0 min CN=81 Runoff=3.71 cfs 10,961 cf

Subcatchment PRDA-10: TO ILSF Runoff Area=14,656 sf 0.00% Impervious Runoff Depth>0.37"
Flow Length=85' Tc=15.0 min CN=47 Runoff=0.06 cfs 450 cf

Subcatchment PRDA-11: BASIN A DIRECT Runoff Area=8,000 sf 49.79% Impervious Runoff Depth>3.29"
Tc=0.0 min CN=89 Runoff=0.84 cfs 2,196 cf

Subcatchment PRDA-12: BASIN B DIRECT Runoff Area=16,454 sf 45.11% Impervious Runoff Depth>2.29"
Tc=6.0 min CN=78 Runoff=1.07 cfs 3,137 cf

Subcatchment PRDA-13: BASIN C DIRECT Runoff Area=31,453 sf 49.69% Impervious Runoff Depth>2.37"
Tc=6.0 min CN=79 Runoff=2.11 cfs 6,215 cf

Subcatchment PRDA-2: TO BASIN A Runoff Area=10,459 sf 100.00% Impervious Runoff Depth>4.15"
Tc=0.0 min CN=98 Runoff=1.26 cfs 3,614 cf

Subcatchment PRDA-3: TO BASIN B Runoff Area=151,241 sf 36.39% Impervious Runoff Depth>1.39"
Flow Length=520' Tc=13.1 min CN=66 Runoff=4.62 cfs 17,494 cf

Subcatchment PRDA-4: TO BASIN C Runoff Area=156,821 sf 48.34% Impervious Runoff Depth>1.96"
Flow Length=370' Tc=10.4 min CN=74 Runoff=7.61 cfs 25,670 cf

Subcatchment PRDA-5: BASIN D DIRECT Runoff Area=38,283 sf 32.09% Impervious Runoff Depth>2.72"
Tc=6.0 min CN=83 Runoff=2.92 cfs 8,677 cf

Subcatchment PRDA-6: TO BASIN E Runoff Area=135,239 sf 32.90% Impervious Runoff Depth>1.97"
Tc=6.0 min CN=74 Runoff=7.54 cfs 22,174 cf

Subcatchment PRDA-7: TO WETLAND Runoff Area=149,386 sf 2.80% Impervious Runoff Depth>0.59"
Tc=6.0 min CN=52 Runoff=1.73 cfs 7,346 cf

Subcatchment PRDA-8: TO WETLAND Runoff Area=46,646 sf 0.00% Impervious Runoff Depth>0.69"
Tc=6.0 min CN=54 Runoff=0.70 cfs 2,676 cf

Subcatchment PRDA-9: TO WETLAND Runoff Area=80,362 sf 11.49% Impervious Runoff Depth>2.37"
Tc=6.0 min CN=79 Runoff=5.40 cfs 15,880 cf

Reach 1R: ILSF Inflow=0.06 cfs 450 cf
Outflow=0.06 cfs 450 cf

Reach 14R: WETLAND SOUTH Inflow=5.40 cfs 15,880 cf
Outflow=5.40 cfs 15,880 cf

Reach 15R: WETLAND SOUTHEAST Inflow=0.70 cfs 2,676 cf
Outflow=0.70 cfs 2,676 cf

Reach 21R: WETLAND NORTH Inflow=1.73 cfs 7,346 cf
Outflow=1.73 cfs 7,346 cf

Pond 1P: Roof Recharge Peak Elev=1.35' Storage=1,383 cf Inflow=1.08 cfs 3,609 cf
Outflow=0.10 cfs 3,605 cf

Pond 2P: Roof Recharge Peak Elev=1.53' Storage=2,380 cf Inflow=1.35 cfs 4,512 cf
Outflow=0.06 cfs 2,693 cf

Pond 3P: Roof Recharge Peak Elev=1.53' Storage=2,380 cf Inflow=1.35 cfs 4,512 cf
Outflow=0.06 cfs 2,693 cf

Pond 4P: Roof Recharge Peak Elev=1.56' Storage=1,323 cf Inflow=0.75 cfs 2,520 cf
Outflow=0.04 cfs 1,527 cf

Pond 5P: Roof Recharge Peak Elev=1.62' Storage=204 cf Inflow=0.12 cfs 415 cf
Outflow=0.01 cfs 296 cf

Pond 6P: Roof Recharge Peak Elev=1.15' Storage=650 cf Inflow=0.42 cfs 1,402 cf
Outflow=0.03 cfs 1,067 cf

Pond 7P: Roof Recharge Peak Elev=1.43' Storage=851 cf Inflow=0.51 cfs 1,703 cf
Outflow=0.03 cfs 1,143 cf

Pond 8P: Roof Recharge Peak Elev=1.62' Storage=204 cf Inflow=0.12 cfs 415 cf
Outflow=0.01 cfs 296 cf

Pond 9P: BASIN E Peak Elev=240.40' Storage=13,055 cf Inflow=7.54 cfs 22,174 cf
Discarded=0.37 cfs 11,434 cf Primary=0.00 cfs 0 cf Outflow=0.37 cfs 11,434 cf

Pond 10P: Roof Recharge Peak Elev=1.62' Storage=204 cf Inflow=0.12 cfs 415 cf
Outflow=0.01 cfs 296 cf

Pond 11P: Roof Recharge Peak Elev=1.15' Storage=650 cf Inflow=0.42 cfs 1,402 cf
Outflow=0.03 cfs 1,067 cf

Pond 13P: Roof Recharge Peak Elev=1.62' Storage=204 cf Inflow=0.12 cfs 415 cf
Outflow=0.01 cfs 296 cf

Pond 14P: Roof Recharge Peak Elev=1.24' Storage=675 cf Inflow=0.42 cfs 1,402 cf
Outflow=0.02 cfs 996 cf

Pond 17P: Roof Recharge Peak Elev=1.66' Storage=1,935 cf Inflow=1.12 cfs 3,373 cf
Outflow=0.05 cfs 1,791 cf

Pond 19P: Roof Recharge Peak Elev=1.69' Storage=1,368 cf Inflow=1.02 cfs 3,116 cf
Outflow=0.08 cfs 2,814 cf

Pond 21P: BASIN B Peak Elev=227.44' Storage=11,502 cf Inflow=5.31 cfs 20,630 cf
Discarded=0.37 cfs 11,385 cf Primary=0.00 cfs 0 cf Outflow=0.37 cfs 11,385 cf

Pond 22P: Roof Recharge Peak Elev=1.62' Storage=1,238 cf Inflow=0.74 cfs 2,168 cf
Outflow=0.04 cfs 1,180 cf

Pond 30P: BASIN A Peak Elev=239.45' Storage=2,424 cf Inflow=2.10 cfs 5,810 cf
Discarded=0.19 cfs 5,716 cf Primary=0.00 cfs 0 cf Outflow=0.19 cfs 5,716 cf

Pond 31P: BASIN D Peak Elev=240.26' Storage=8,586 cf Inflow=6.63 cfs 19,639 cf
Discarded=0.69 cfs 18,717 cf Primary=0.00 cfs 0 cf Outflow=0.69 cfs 18,717 cf

Pond 32P: BASIN C Peak Elev=225.42' Storage=13,706 cf Inflow=9.35 cfs 31,885 cf
Discarded=1.32 cfs 30,126 cf Primary=0.00 cfs 0 cf Outflow=1.32 cfs 30,126 cf

Total Runoff Area = 992,682 sf Runoff Volume = 157,867 cf Average Runoff Depth = 1.91"
64.94% Pervious = 644,625 sf 35.06% Impervious = 348,057 sf

Summary for Subcatchment 34S: 10 Unit Roof

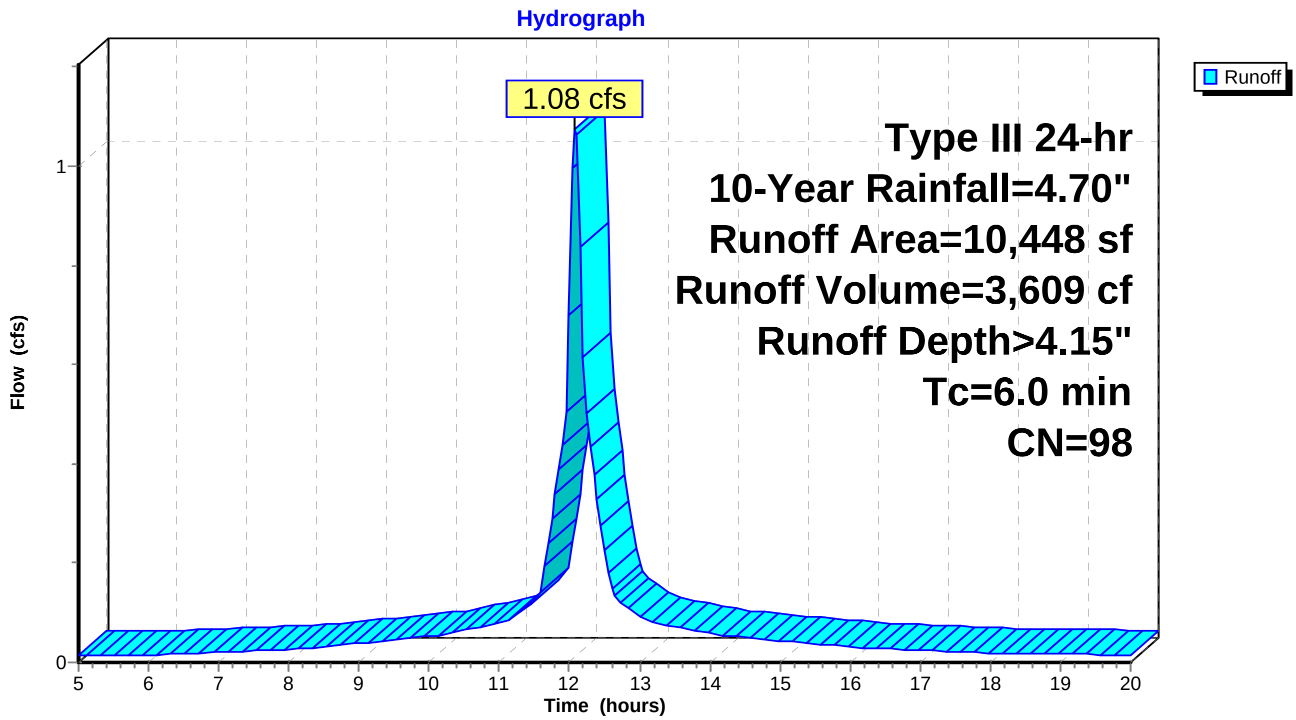
Runoff = 1.08 cfs @ 12.09 hrs, Volume= 3,609 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	10,448	98	Impervious
	10,448		100.00% Impervious Area

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

Subcatchment 34S: 10 Unit Roof



Summary for Subcatchment 35S: 14 Unit Roof

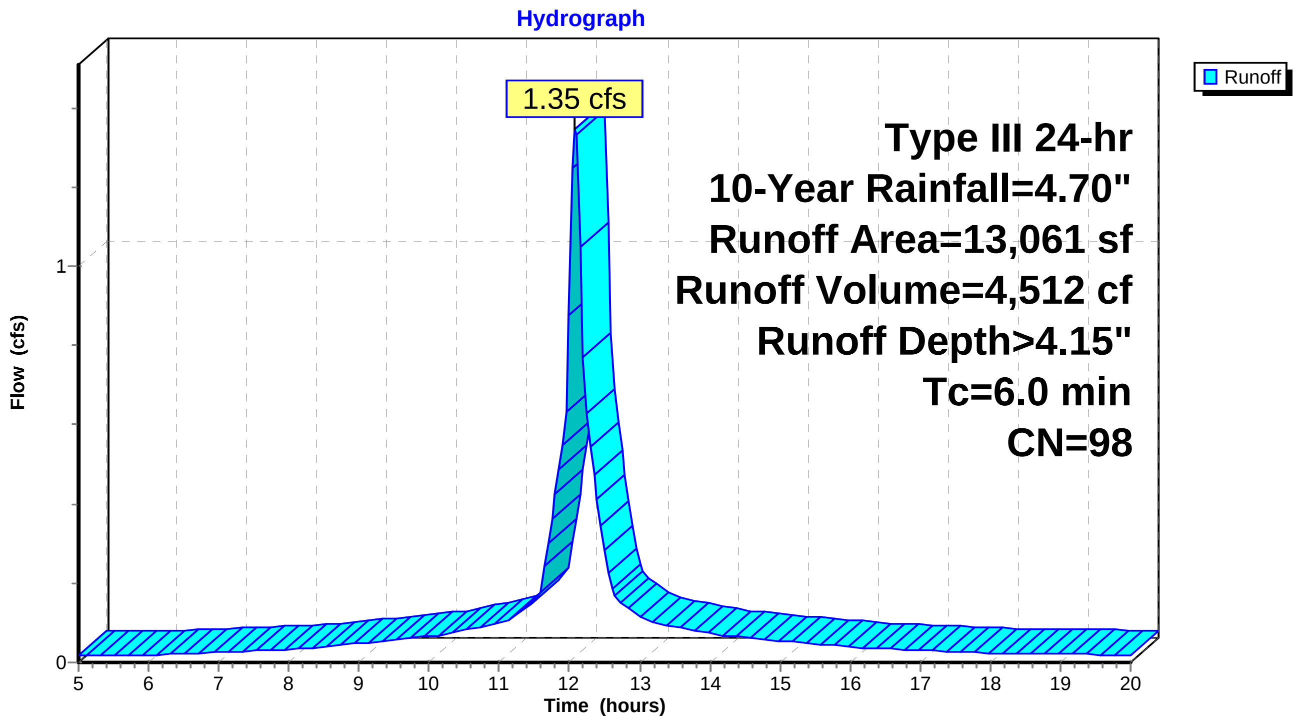
Runoff = 1.35 cfs @ 12.09 hrs, Volume= 4,512 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	13,061	98	Impervious
	13,061		100.00% Impervious Area

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

Subcatchment 35S: 14 Unit Roof



Summary for Subcatchment 36S: 14 Unit Roof

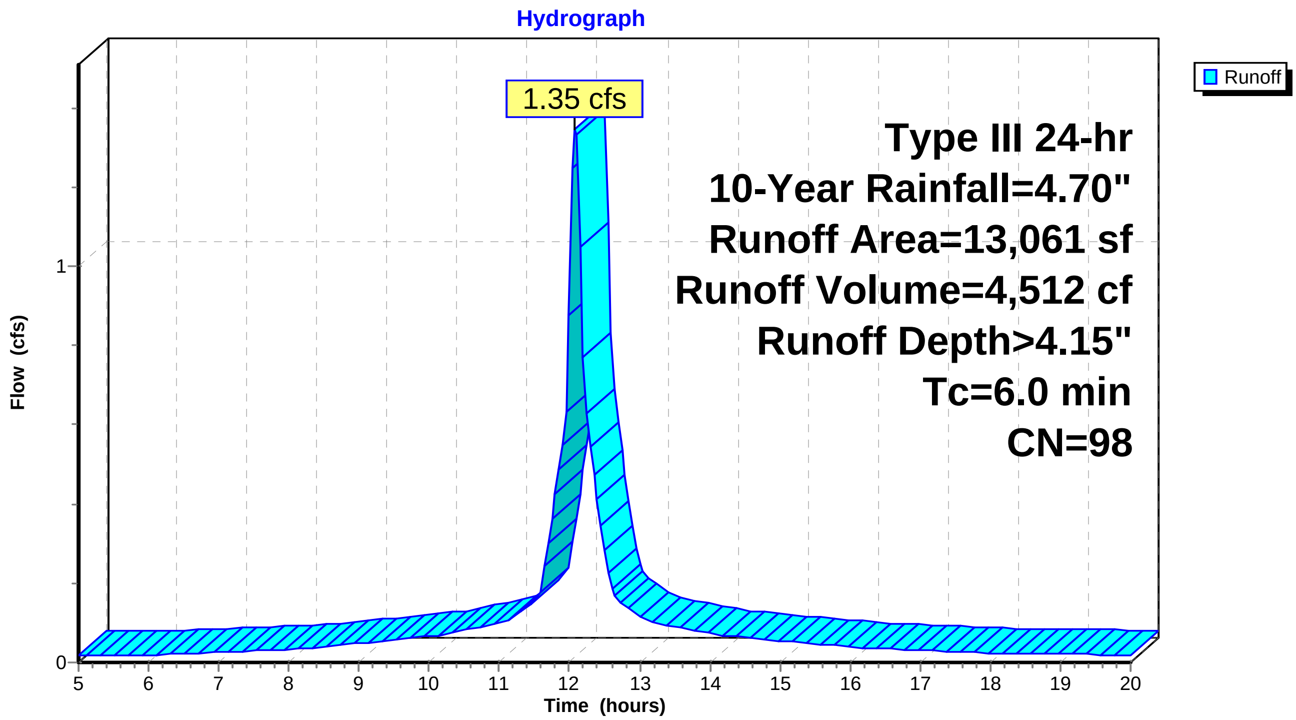
Runoff = 1.35 cfs @ 12.09 hrs, Volume= 4,512 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	13,061	98	Impervious
	13,061		100.00% Impervious Area

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

Subcatchment 36S: 14 Unit Roof



Summary for Subcatchment 37S: 7 Unit Roof

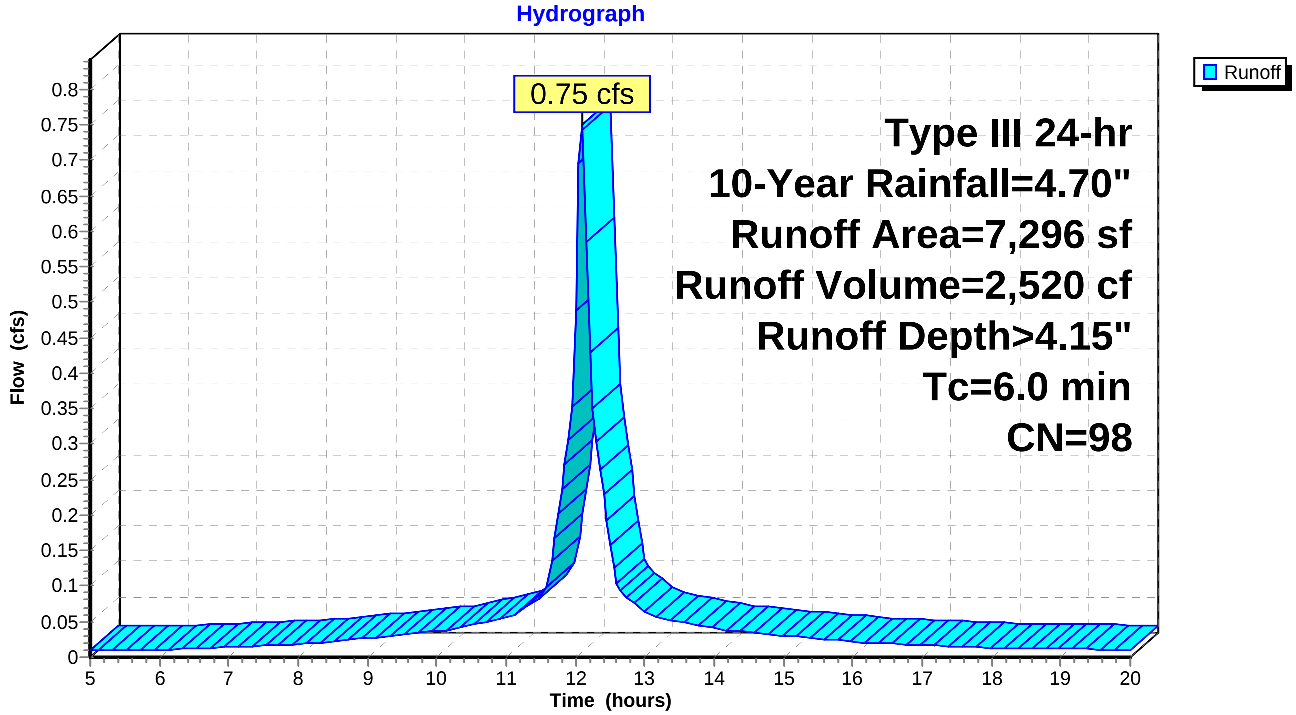
Runoff = 0.75 cfs @ 12.09 hrs, Volume= 2,520 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	7,296	98	Impervious
	7,296		100.00% Impervious Area

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

Subcatchment 37S: 7 Unit Roof



Summary for Subcatchment LOT 1: Single Family House

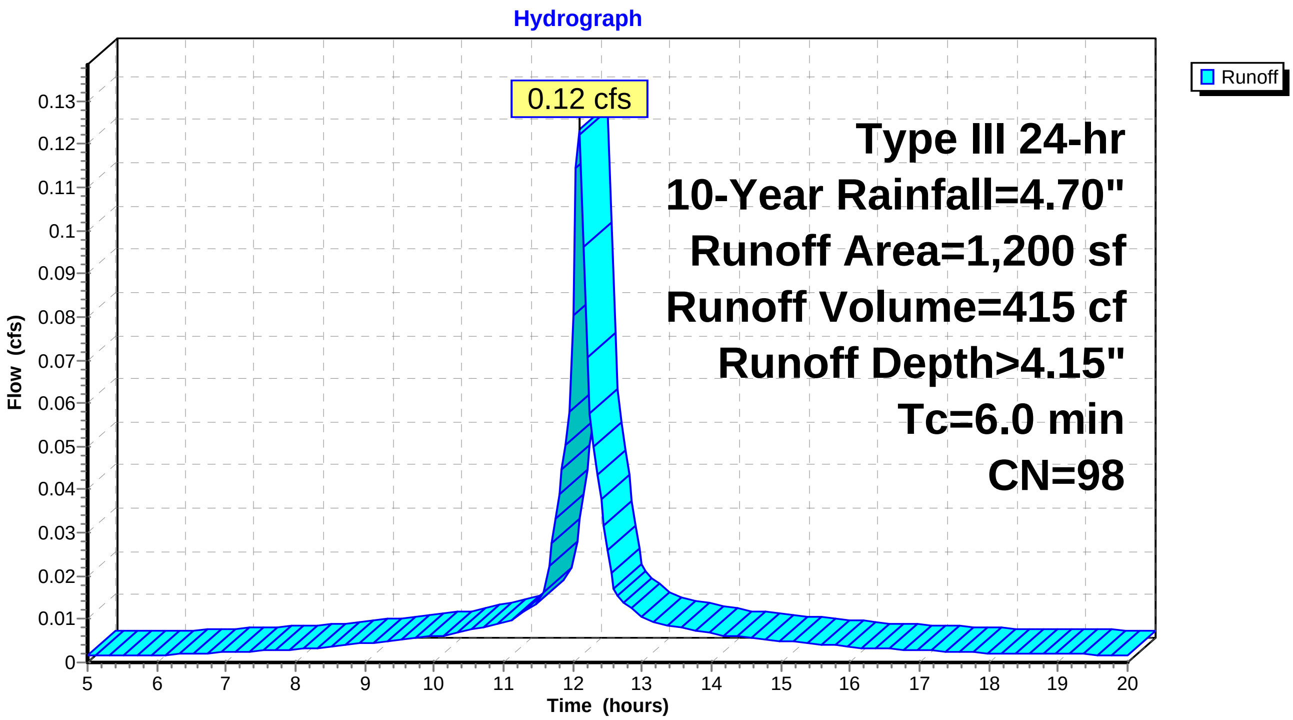
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 415 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 1: Single Family House



Summary for Subcatchment LOT 12: DUPLEX + YARD

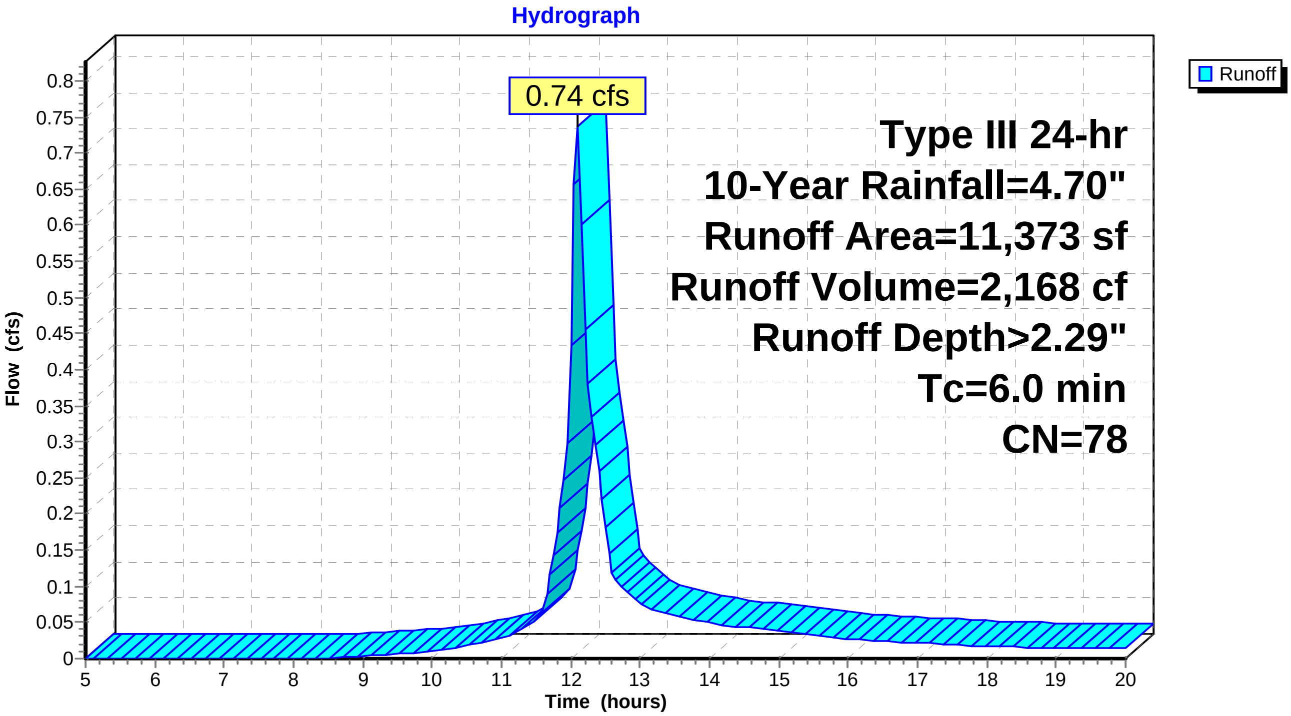
Runoff = 0.74 cfs @ 12.09 hrs, Volume= 2,168 cf, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	490	80	>75% Grass cover, Good, HSG D
	5,954	61	>75% Grass cover, Good, HSG B
	11,373	78	Weighted Average
	6,444		56.66% Pervious Area
	4,929		43.34% Impervious Area

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

Subcatchment LOT 12: DUPLEX + YARD



Summary for Subcatchment LOT 13: DUPLEX + YARD

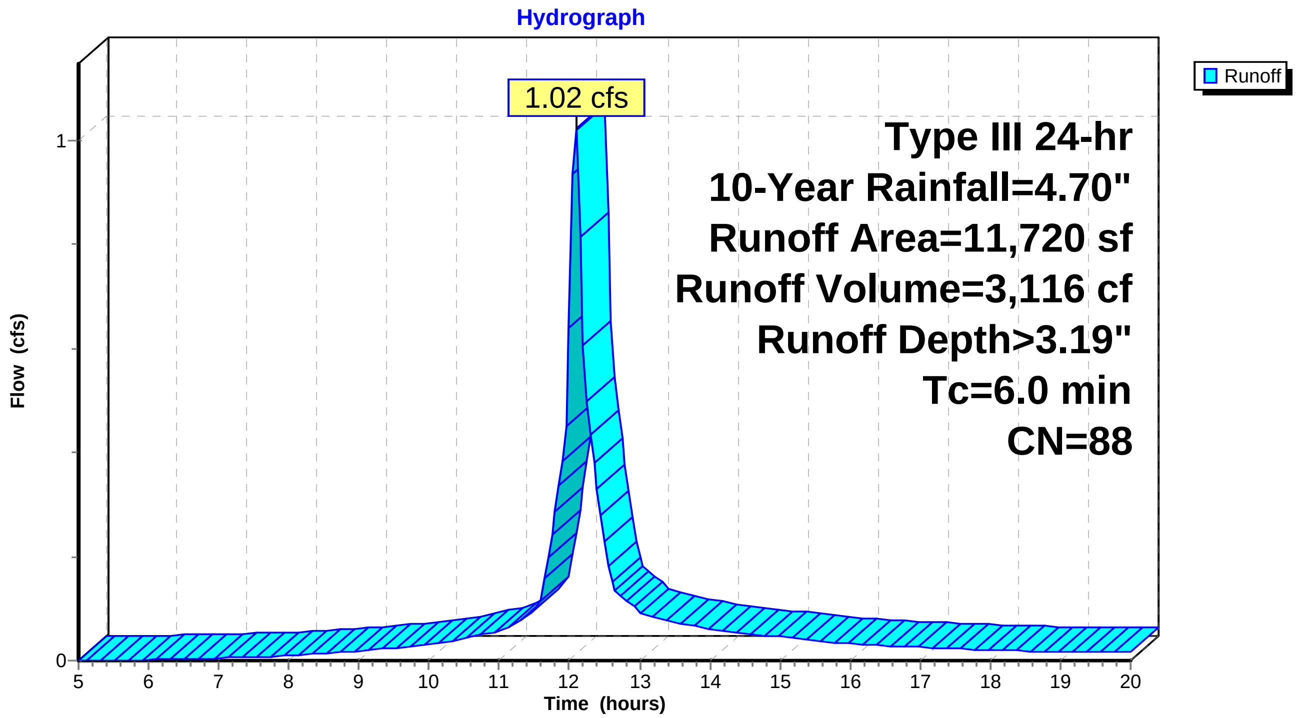
Runoff = 1.02 cfs @ 12.09 hrs, Volume= 3,116 cf, Depth> 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	6,791	80	>75% Grass cover, Good, HSG D
	11,720	88	Weighted Average
	6,791		57.94% Pervious Area
	4,929		42.06% Impervious Area

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

Subcatchment LOT 13: DUPLEX + YARD



Summary for Subcatchment LOT 14: DUPLEX + YARD

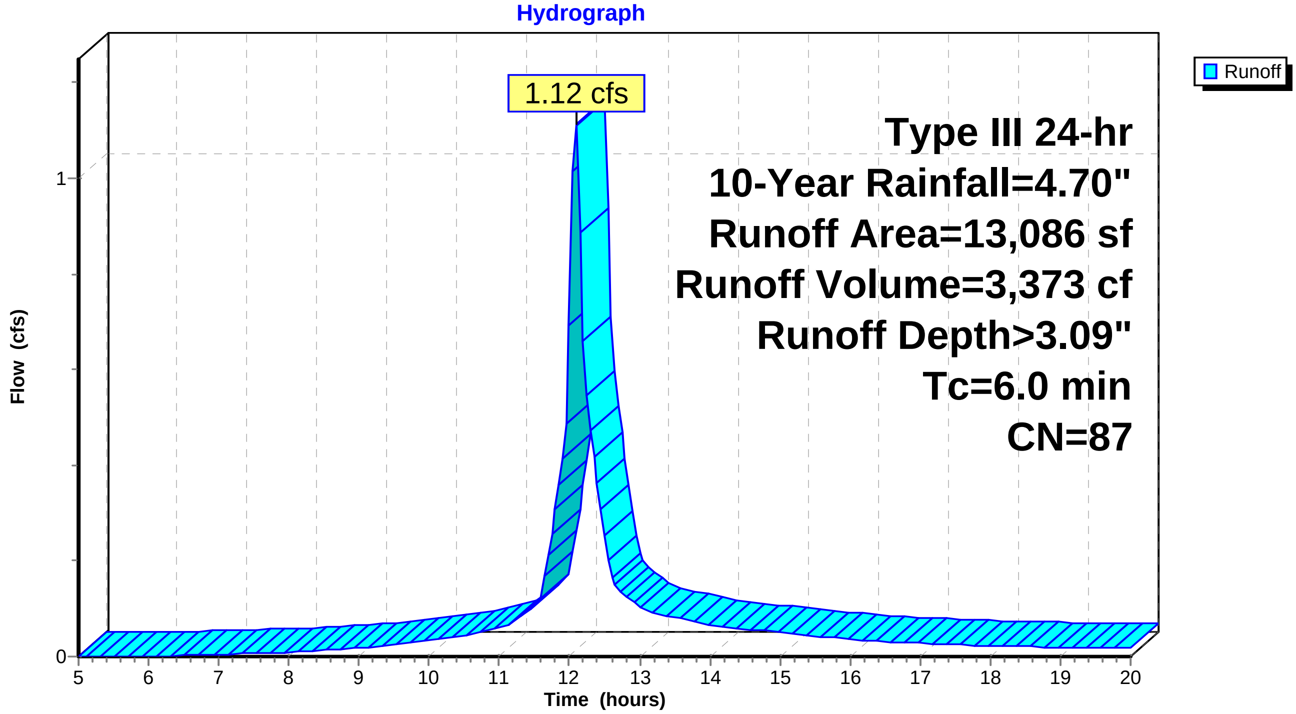
Runoff = 1.12 cfs @ 12.09 hrs, Volume= 3,373 cf, Depth> 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	8,157	80	>75% Grass cover, Good, HSG D
	13,086	87	Weighted Average
	8,157		62.33% Pervious Area
	4,929		37.67% Impervious Area

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

Subcatchment LOT 14: DUPLEX + YARD



Summary for Subcatchment LOT 18: DUPLEX ROOF

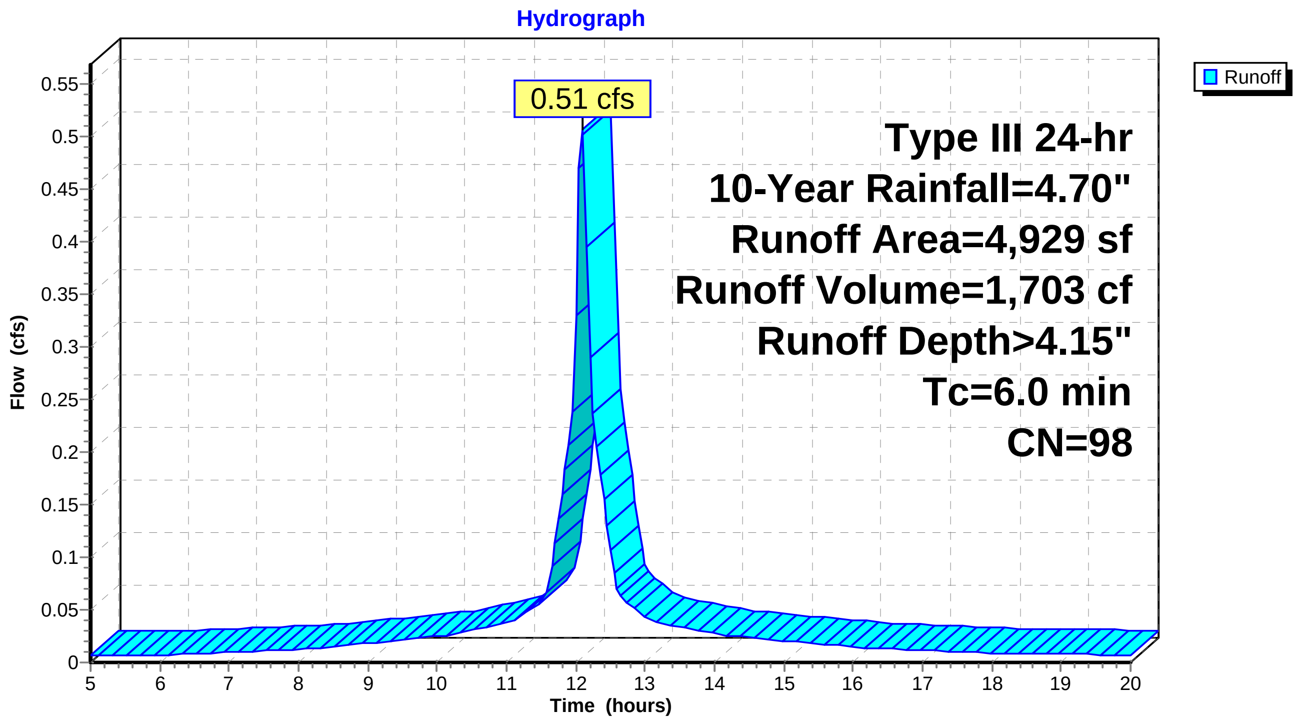
Runoff = 0.51 cfs @ 12.09 hrs, Volume= 1,703 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	4,929		100.00% Impervious Area

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

Subcatchment LOT 18: DUPLEX ROOF



Summary for Subcatchment LOT 19: DUPLEX ROOF

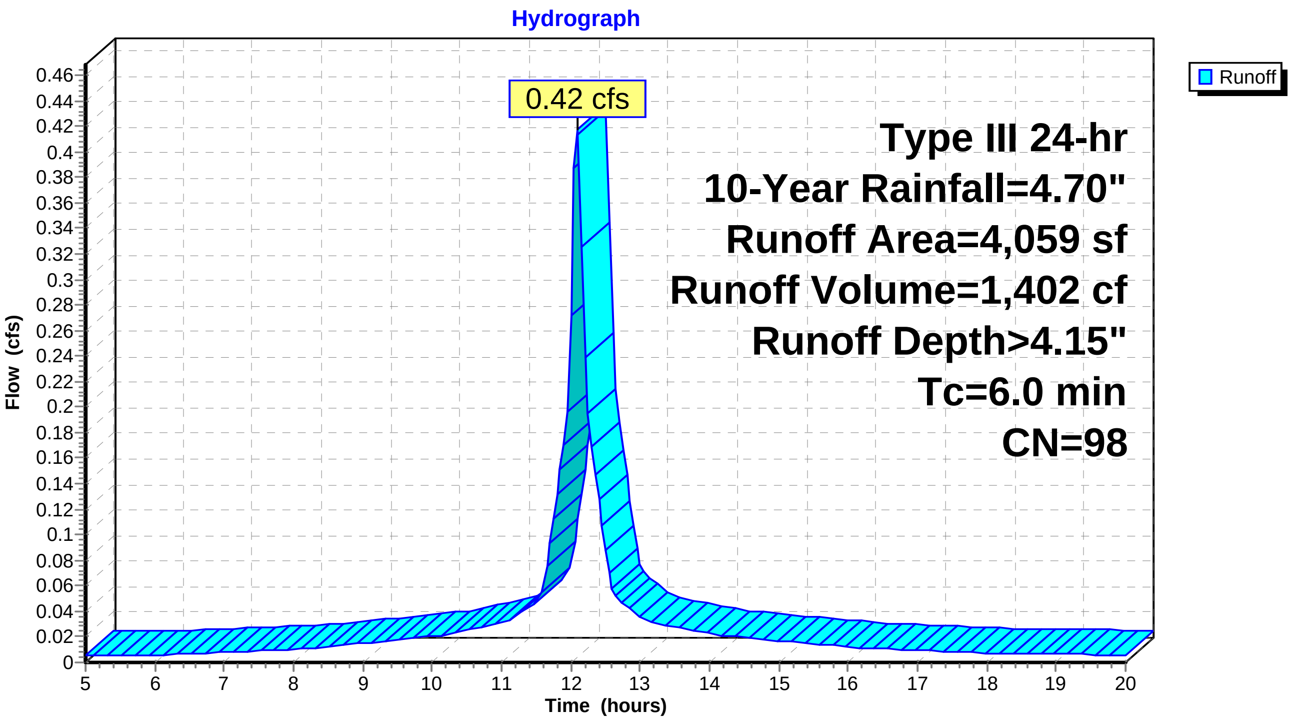
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 1,402 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 19: DUPLEX ROOF



Summary for Subcatchment LOT 2: Single Family House

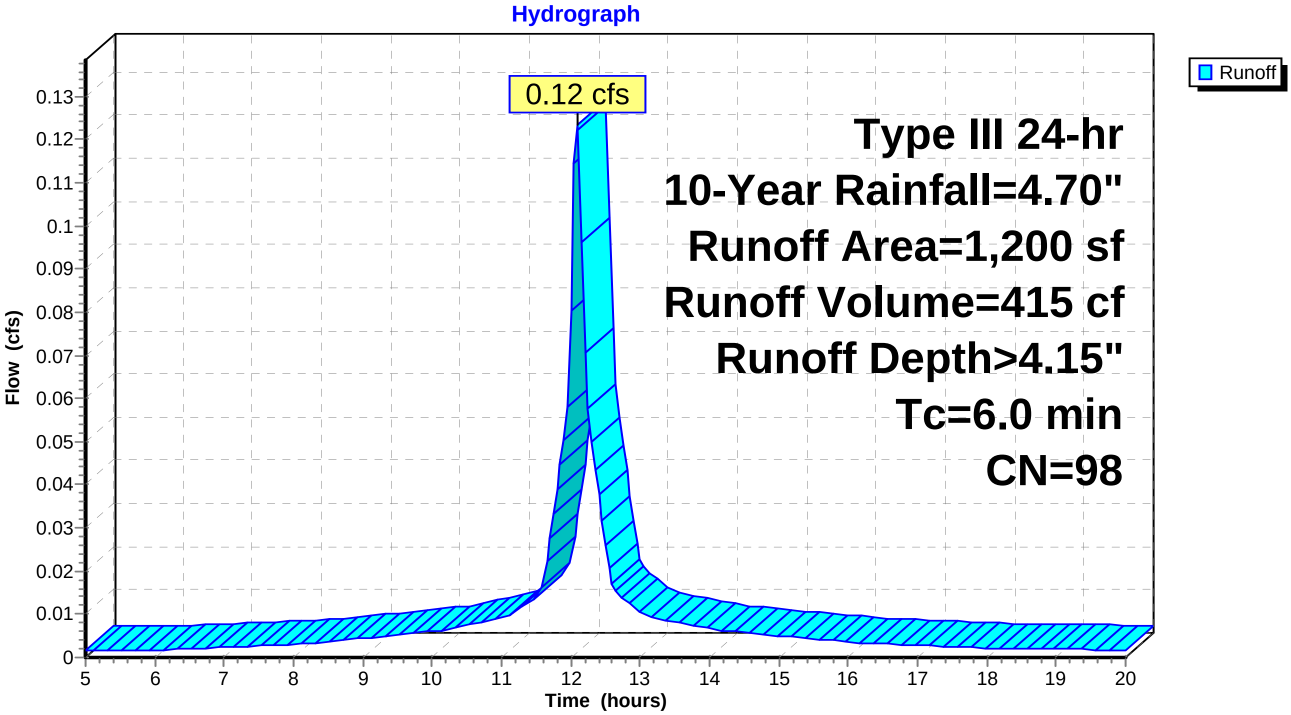
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 415 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 2: Single Family House



Summary for Subcatchment LOT 20: DUPLEX ROOF

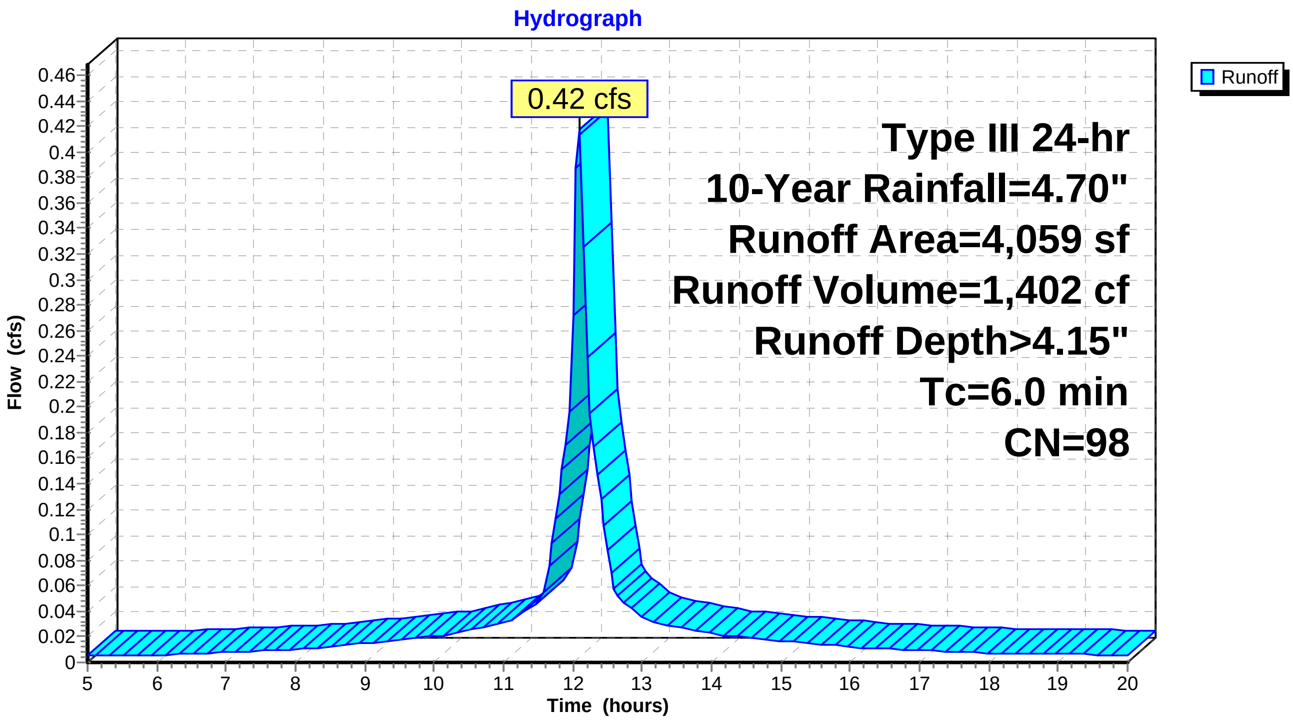
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 1,402 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 20: DUPLEX ROOF



Summary for Subcatchment LOT 21: DUPLEX ROOF

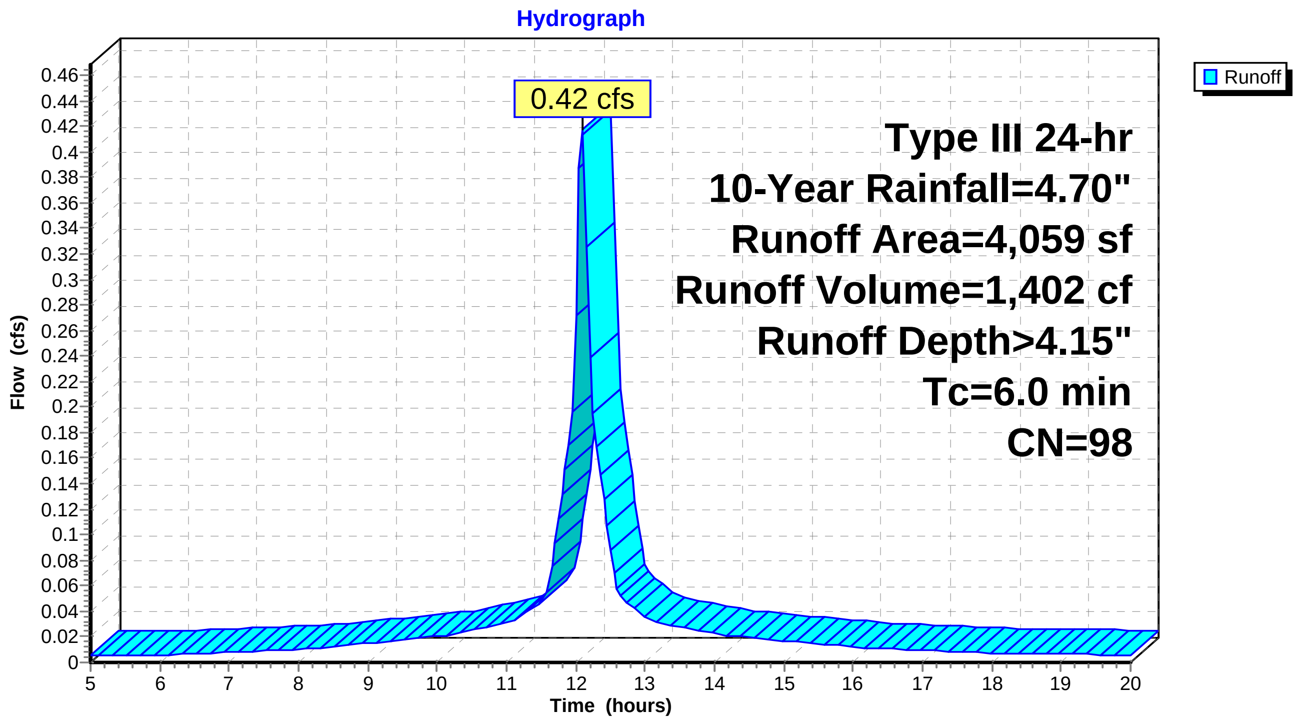
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 1,402 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 21: DUPLEX ROOF



Summary for Subcatchment LOT 3: Single Family House

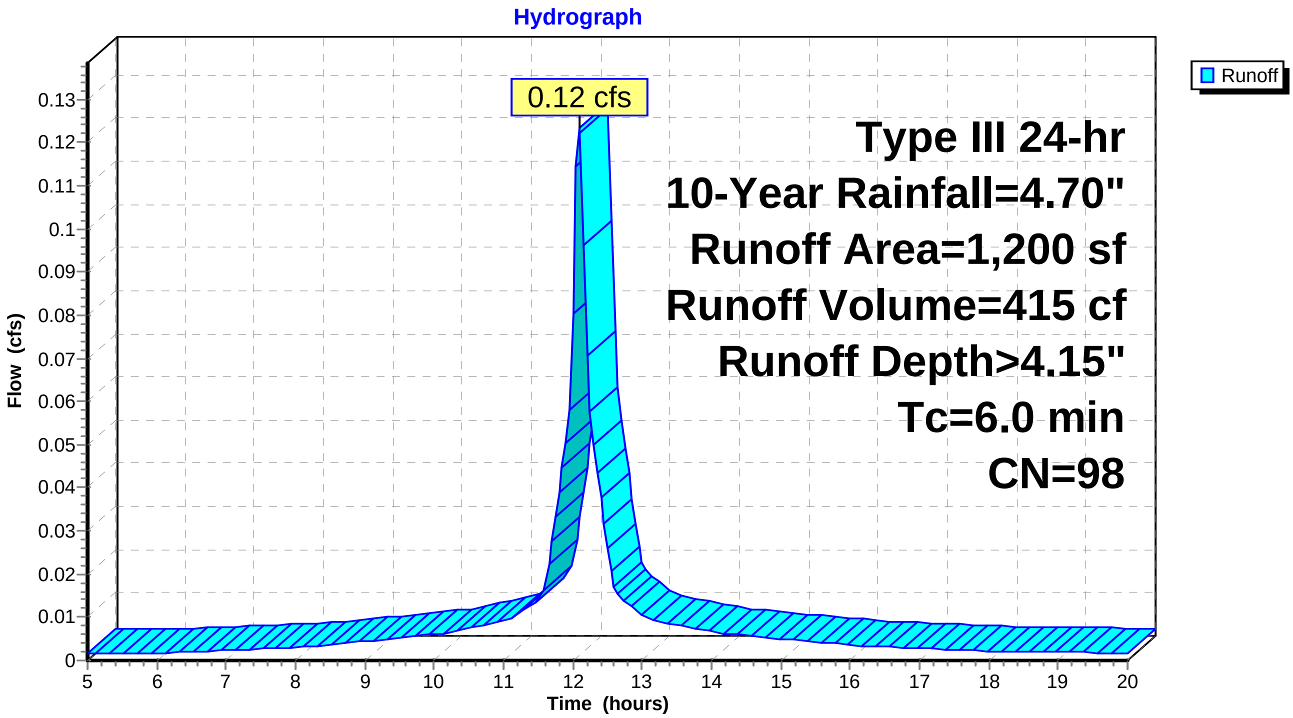
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 415 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 3: Single Family House



Summary for Subcatchment LOT 8: Single Family House

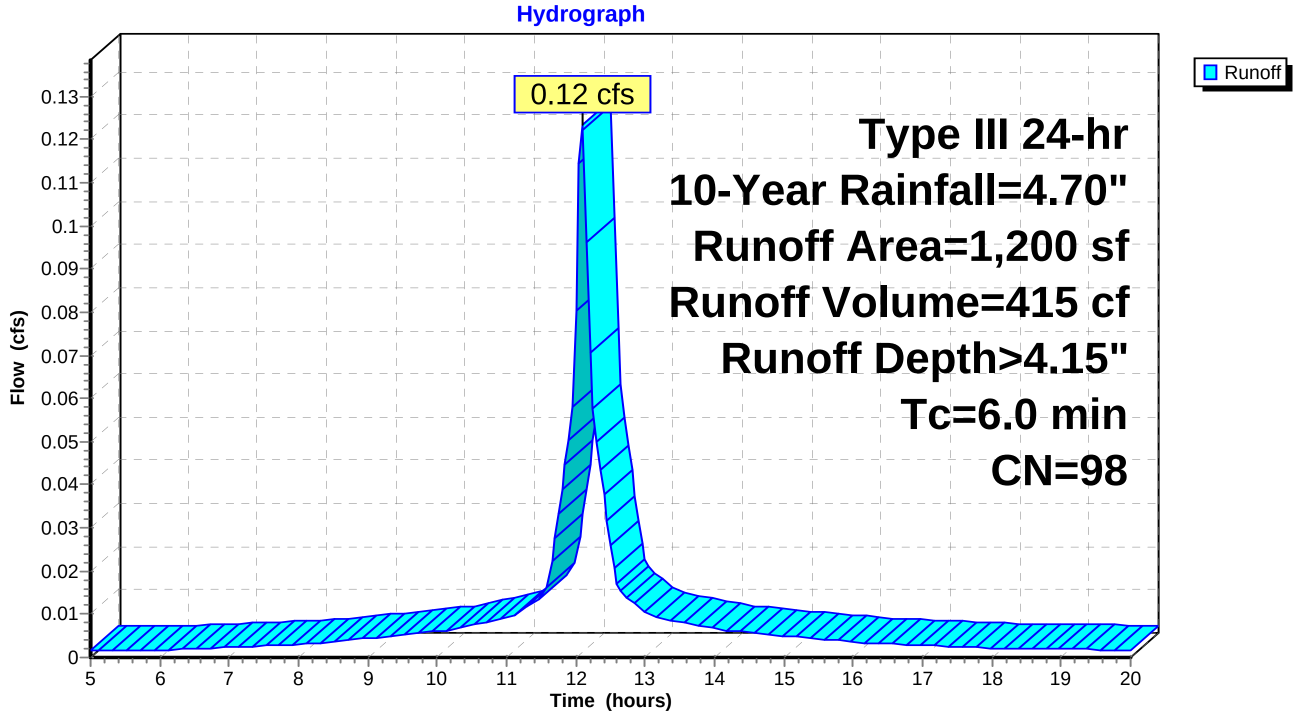
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 415 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 8: Single Family House



Summary for Subcatchment PRDA-1: TO BASIN D

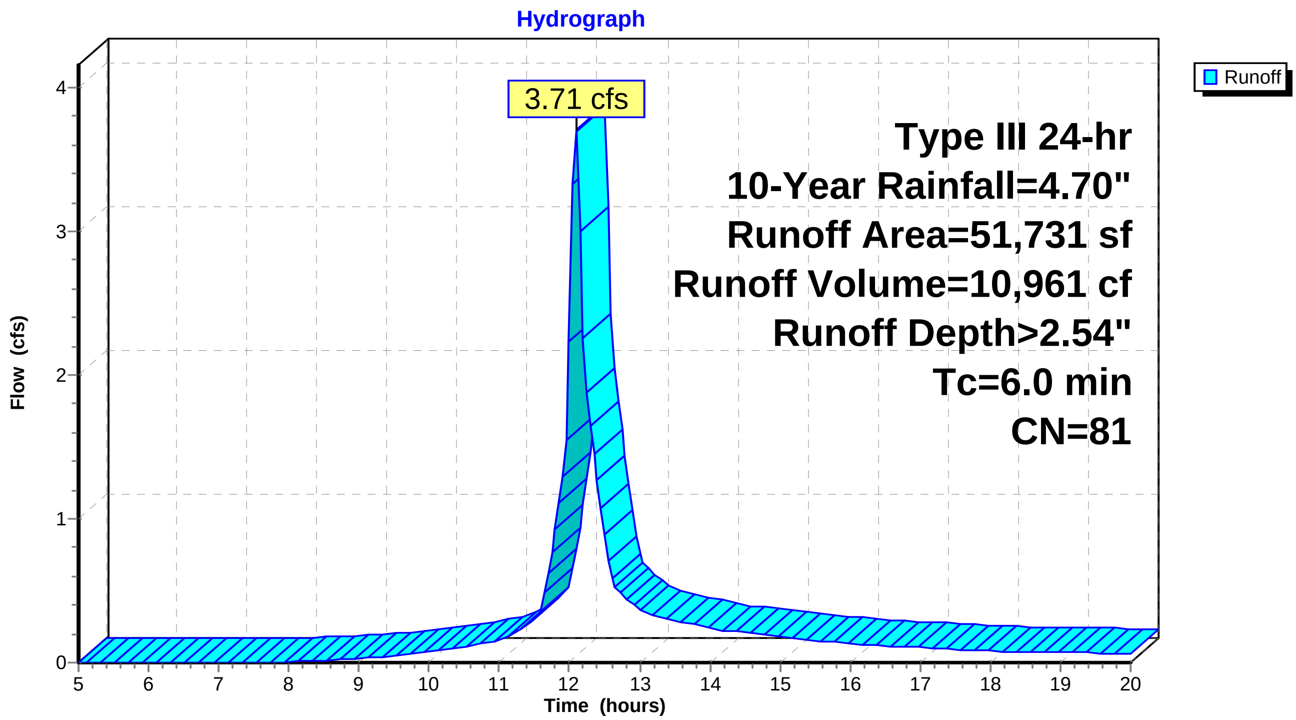
Runoff = 3.71 cfs @ 12.09 hrs, Volume= 10,961 cf, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	25,896	98	Impervious
	6,014	54	1/2 acre lots, 25% imp, HSG A
	6,314	80	1/2 acre lots, 25% imp, HSG C
	6,846	39	>75% Grass cover, Good, HSG A
	462	74	>75% Grass cover, Good, HSG C
	6,199	80	>75% Grass cover, Good, HSG D
	51,731	81	Weighted Average
	22,753		43.98% Pervious Area
	28,978		56.02% Impervious Area

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

Subcatchment PRDA-1: TO BASIN D



Summary for Subcatchment PRDA-10: TO ILSF

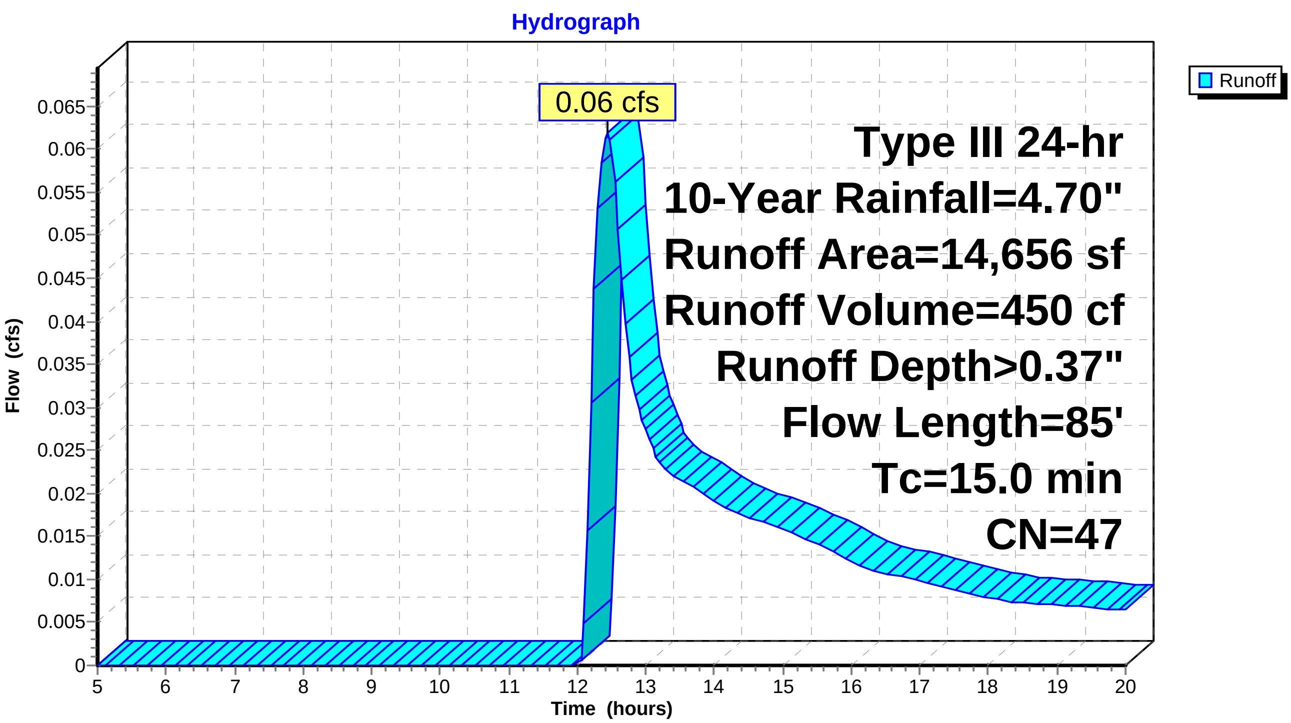
Runoff = 0.06 cfs @ 12.44 hrs, Volume= 450 cf, Depth> 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
1,166	39	>75% Grass cover, Good, HSG A
2,000	80	>75% Grass cover, Good, HSG D
8,622	30	Woods, Good, HSG A
2,868	77	Woods, Good, HSG D
14,656	47	Weighted Average
14,656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	35	0.0220	0.74		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
15.0	85	Total			

Subcatchment PRDA-10: TO ILSF



Summary for Subcatchment PRDA-11: BASIN A DIRECT

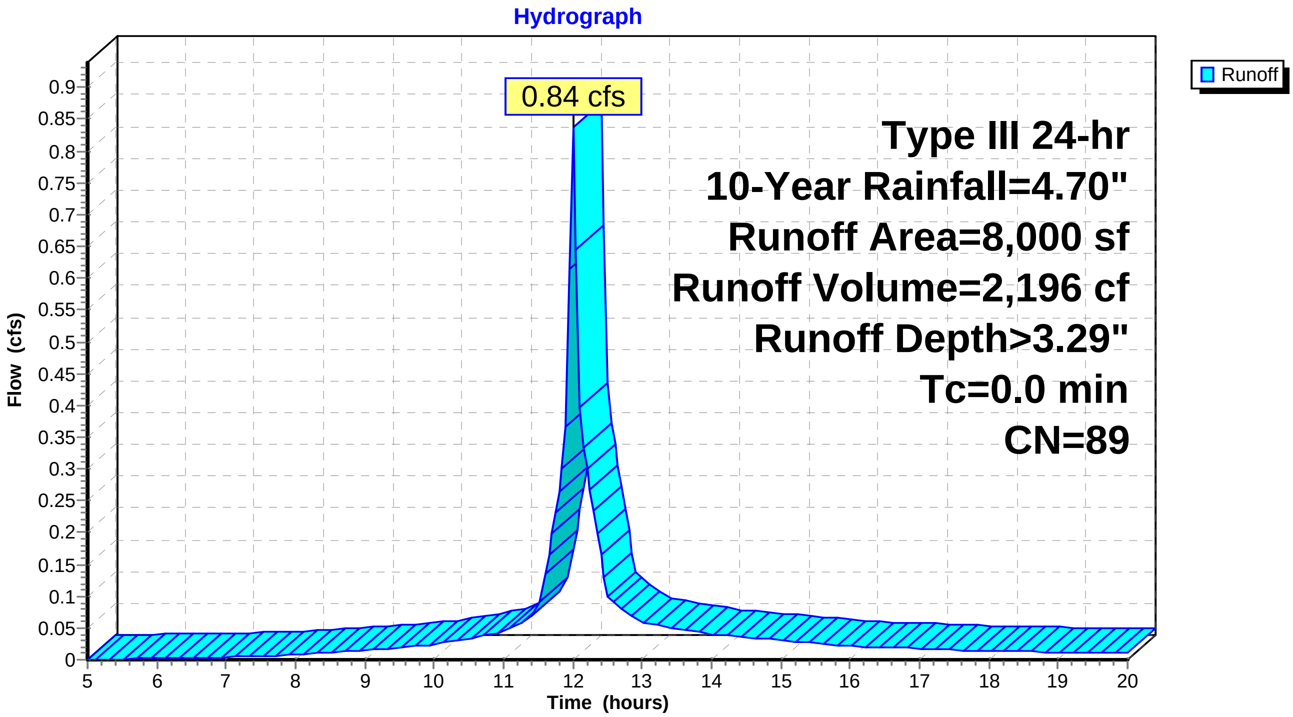
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.84 cfs @ 12.00 hrs, Volume= 2,196 cf, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
3,983	98	Water Surface, HSG B
4,017	80	>75% Grass cover, Good, HSG D
8,000	89	Weighted Average
4,017		50.21% Pervious Area
3,983		49.79% Impervious Area

Subcatchment PRDA-11: BASIN A DIRECT



Summary for Subcatchment PRDA-12: BASIN B DIRECT

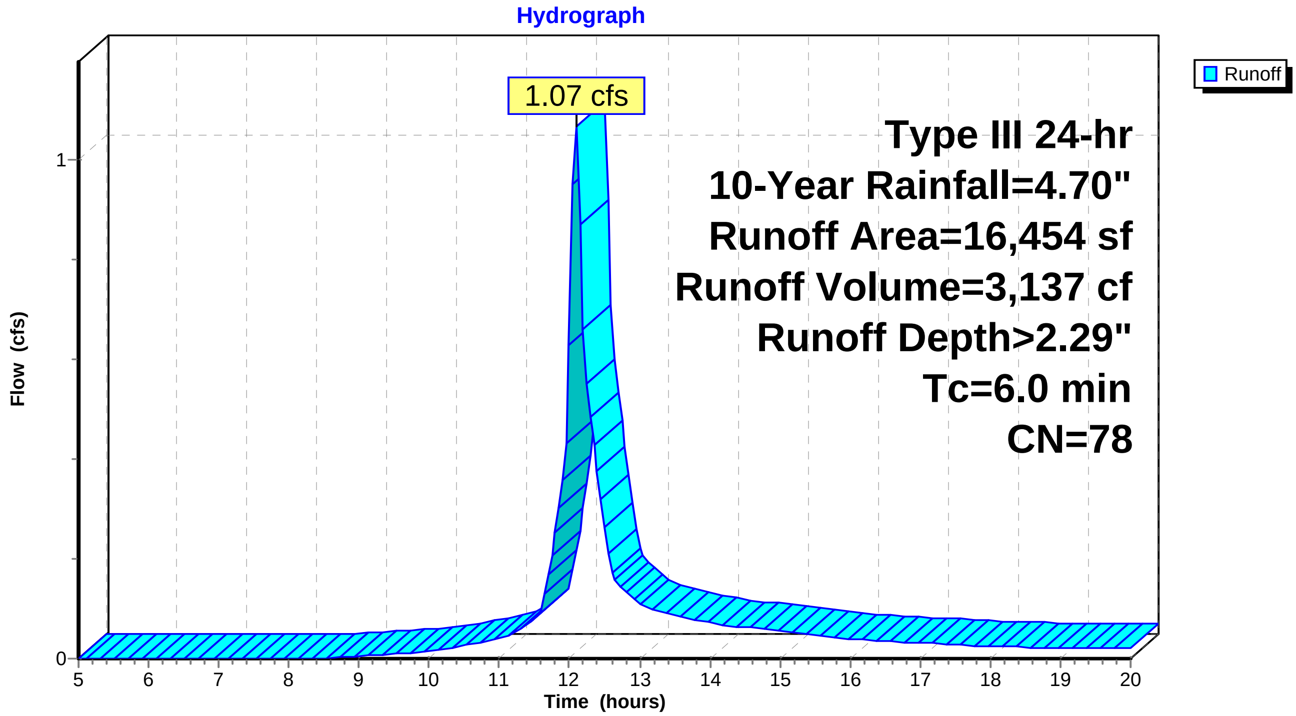
Runoff = 1.07 cfs @ 12.09 hrs, Volume= 3,137 cf, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
7,423	98	Water Surface, HSG D
5,050	80	>75% Grass cover, Good, HSG D
3,981	39	>75% Grass cover, Good, HSG A
16,454	78	Weighted Average
9,031		54.89% Pervious Area
7,423		45.11% Impervious Area

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

Subcatchment PRDA-12: BASIN B DIRECT



Summary for Subcatchment PRDA-13: BASIN C DIRECT

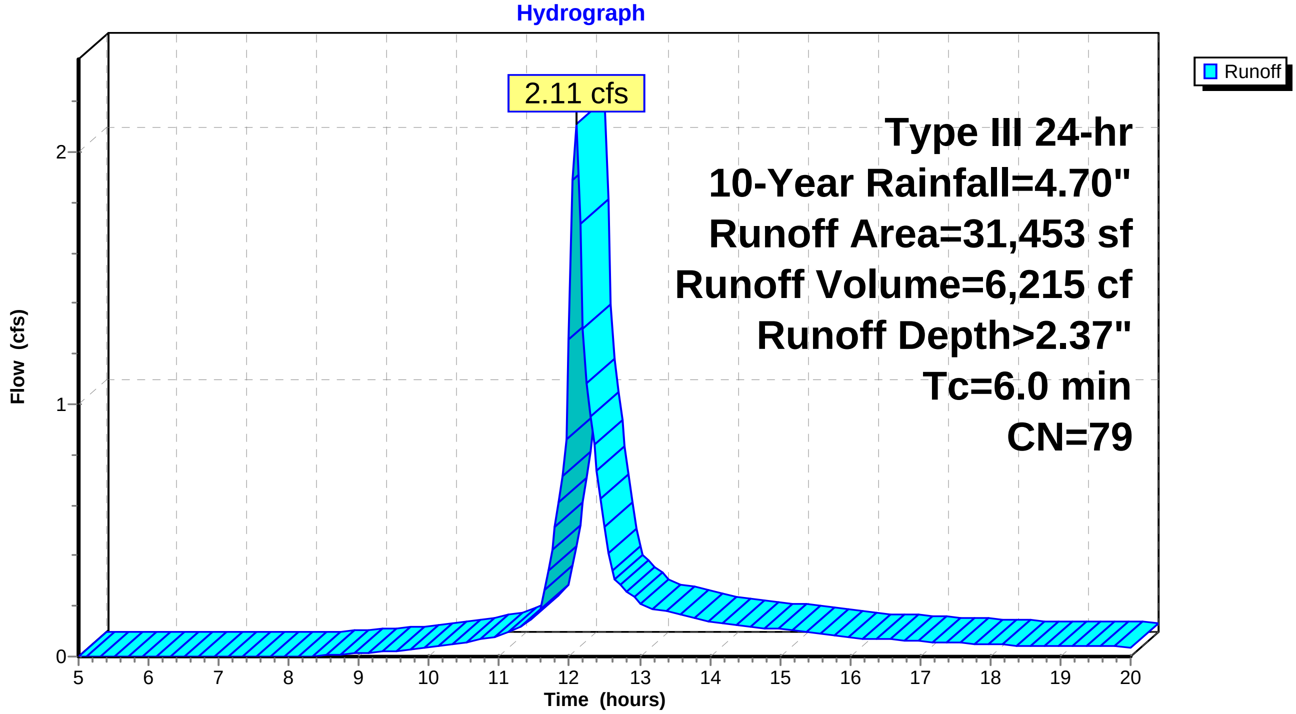
Runoff = 2.11 cfs @ 12.09 hrs, Volume= 6,215 cf, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
15,825	61	>75% Grass cover, Good, HSG B
15,628	98	Water Surface, HSG B
31,453	79	Weighted Average
15,825		50.31% Pervious Area
15,628		49.69% Impervious Area

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

Subcatchment PRDA-13: BASIN C DIRECT



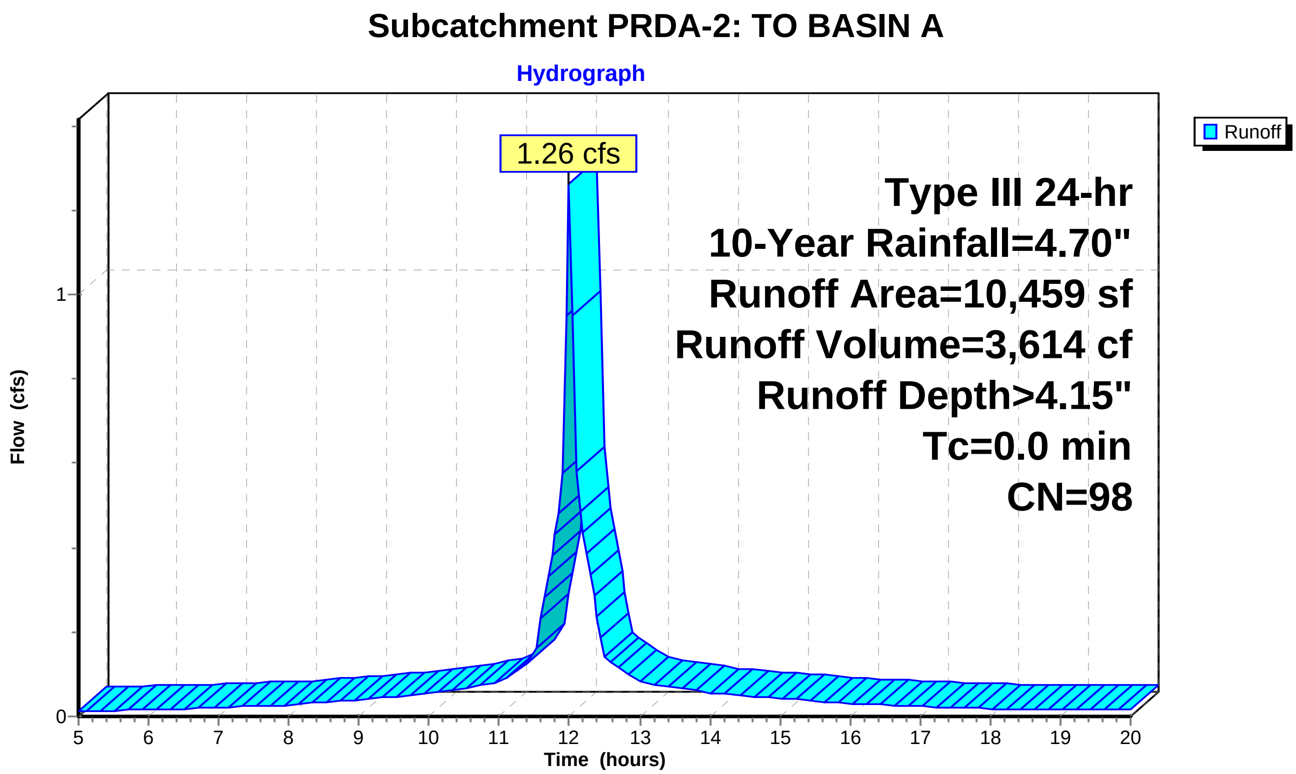
Summary for Subcatchment PRDA-2: TO BASIN A

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.26 cfs @ 12.00 hrs, Volume= 3,614 cf, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	10,459	98	IMPERVIOUS
	10,459		100.00% Impervious Area



Summary for Subcatchment PRDA-3: TO BASIN B

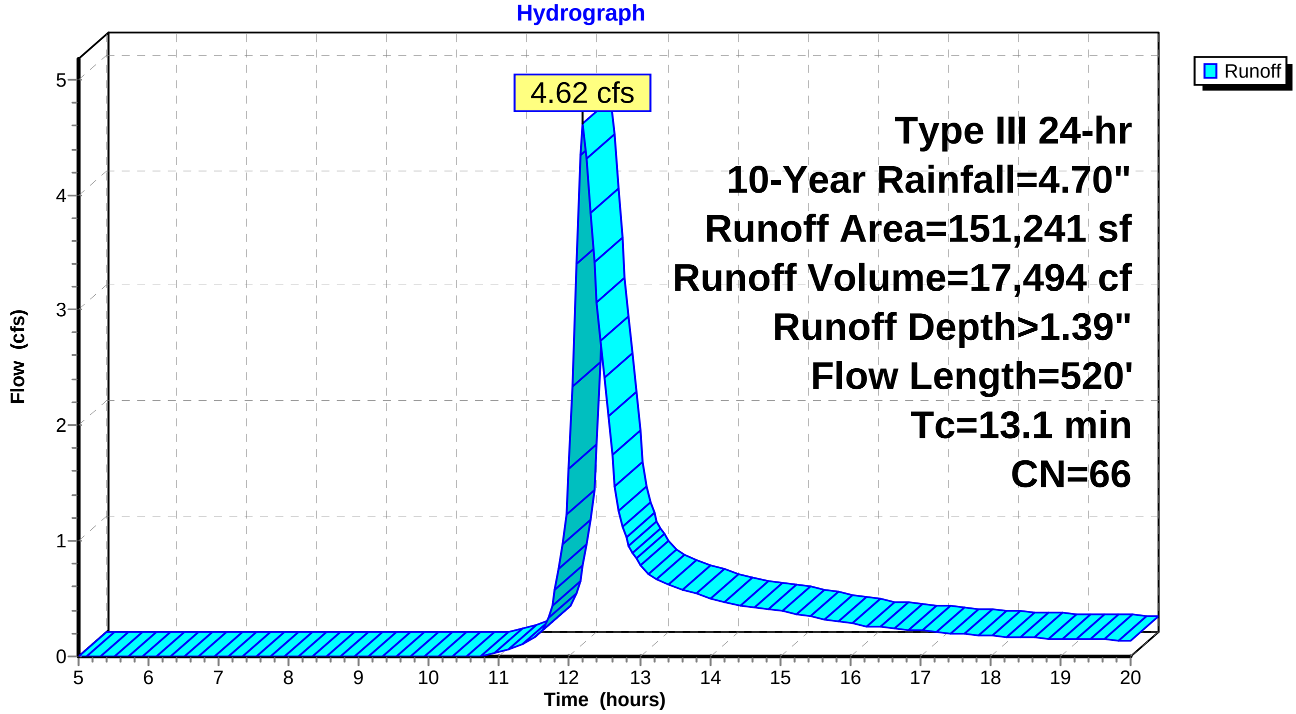
Runoff = 4.62 cfs @ 12.20 hrs, Volume= 17,494 cf, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	40,248	98	IMPERVIOUS
	14,787	98	Roofs, HSG A
	77,313	39	>75% Grass cover, Good, HSG A
	92	61	>75% Grass cover, Good, HSG B
	18,801	80	>75% Grass cover, Good, HSG D
	151,241	66	Weighted Average
	96,206		63.61% Pervious Area
	55,035		36.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0380	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
6.5	406	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	64	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.1	520	Total			

Subcatchment PRDA-3: TO BASIN B



Summary for Subcatchment PRDA-4: TO BASIN C

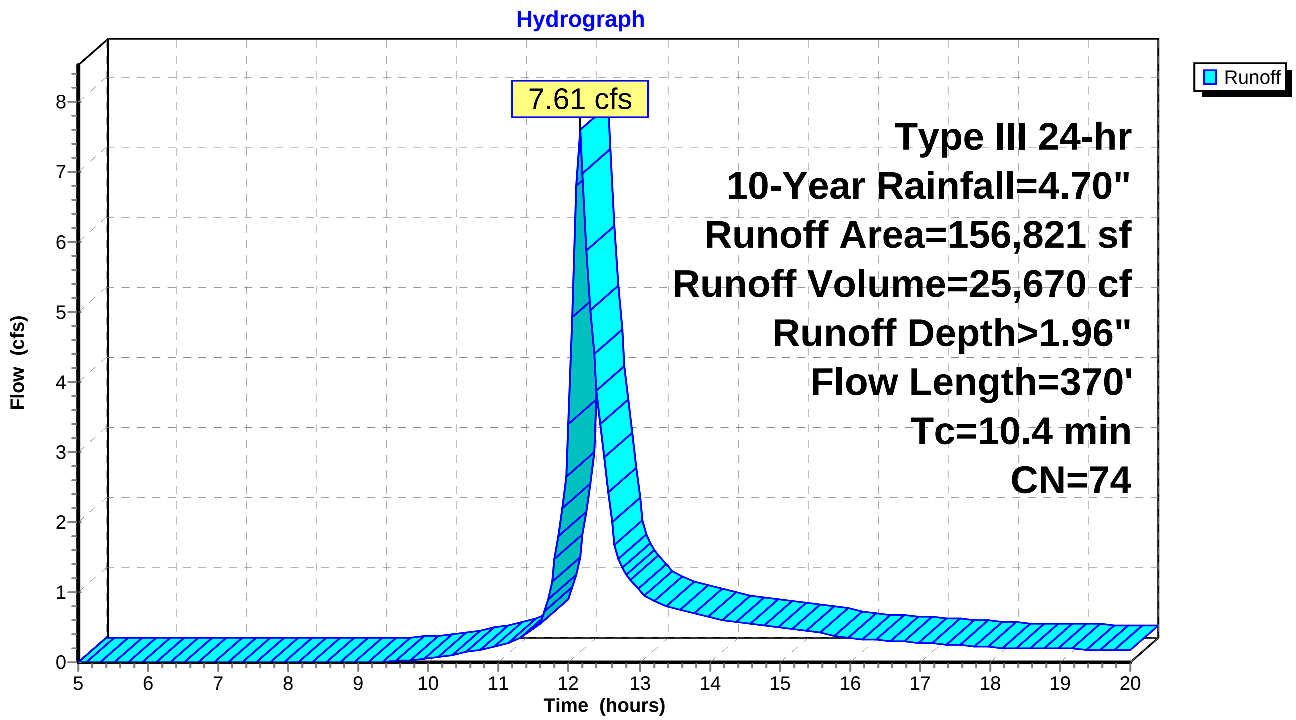
Runoff = 7.61 cfs @ 12.15 hrs, Volume= 25,670 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	70,874	98	Impervious
	4,929	98	Roofs, HSG B
	35,430	39	>75% Grass cover, Good, HSG A
	44,834	61	>75% Grass cover, Good, HSG B
	754	80	>75% Grass cover, Good, HSG D
	156,821	74	Weighted Average
	81,018		51.66% Pervious Area
	75,803		48.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0320	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
3.1	217	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	103	0.0270	3.34		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.4	370	Total			

Subcatchment PRDA-4: TO BASIN C



Summary for Subcatchment PRDA-5: BASIN D DIRECT

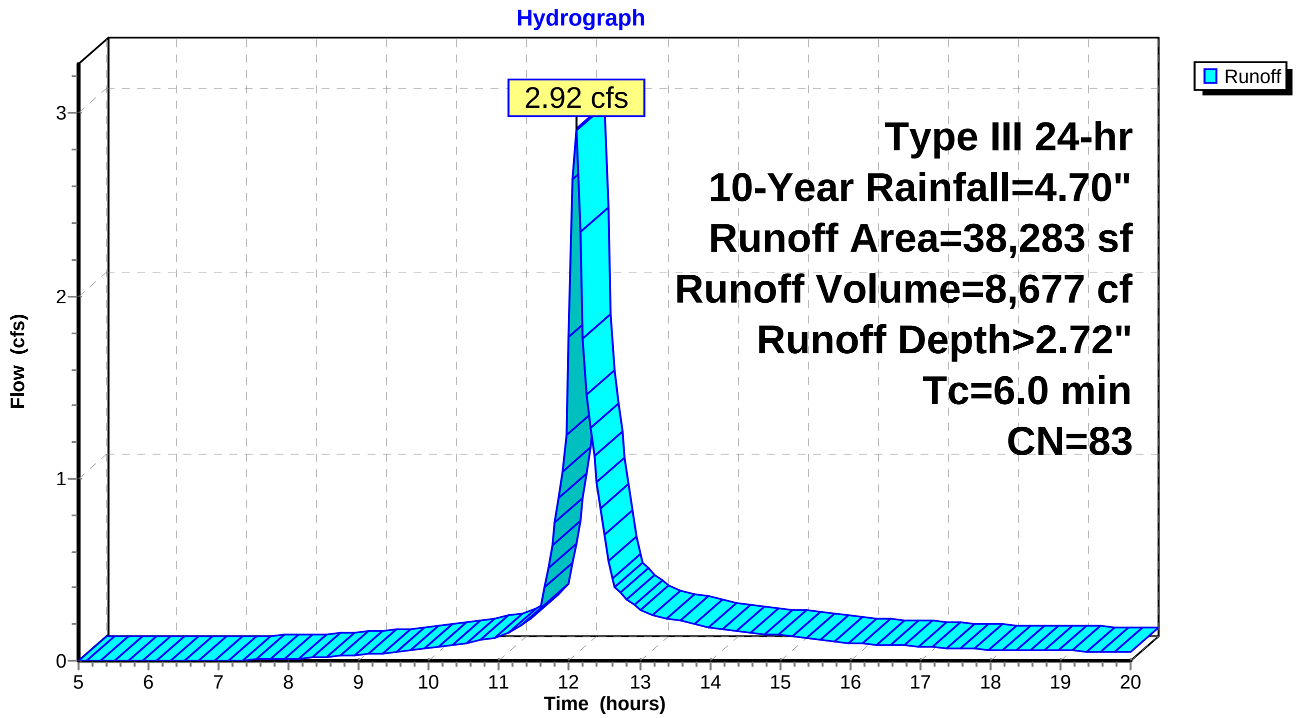
Runoff = 2.92 cfs @ 12.09 hrs, Volume= 8,677 cf, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	1,132	98	Impervious
	7,697	80	1/2 acre lots, 25% imp, HSG C
	374	39	>75% Grass cover, Good, HSG A
	7,237	74	>75% Grass cover, Good, HSG C
	6,781	80	>75% Grass cover, Good, HSG D
	9,227	98	Water Surface, HSG A
	4,080	77	Woods, Good, HSG D
	1,323	70	Woods, Good, HSG C
	432	96	Gravel surface, HSG C
	38,283	83	Weighted Average
	26,000		67.91% Pervious Area
	12,283		32.09% Impervious Area

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

Subcatchment PRDA-5: BASIN D DIRECT



Summary for Subcatchment PRDA-6: TO BASIN E

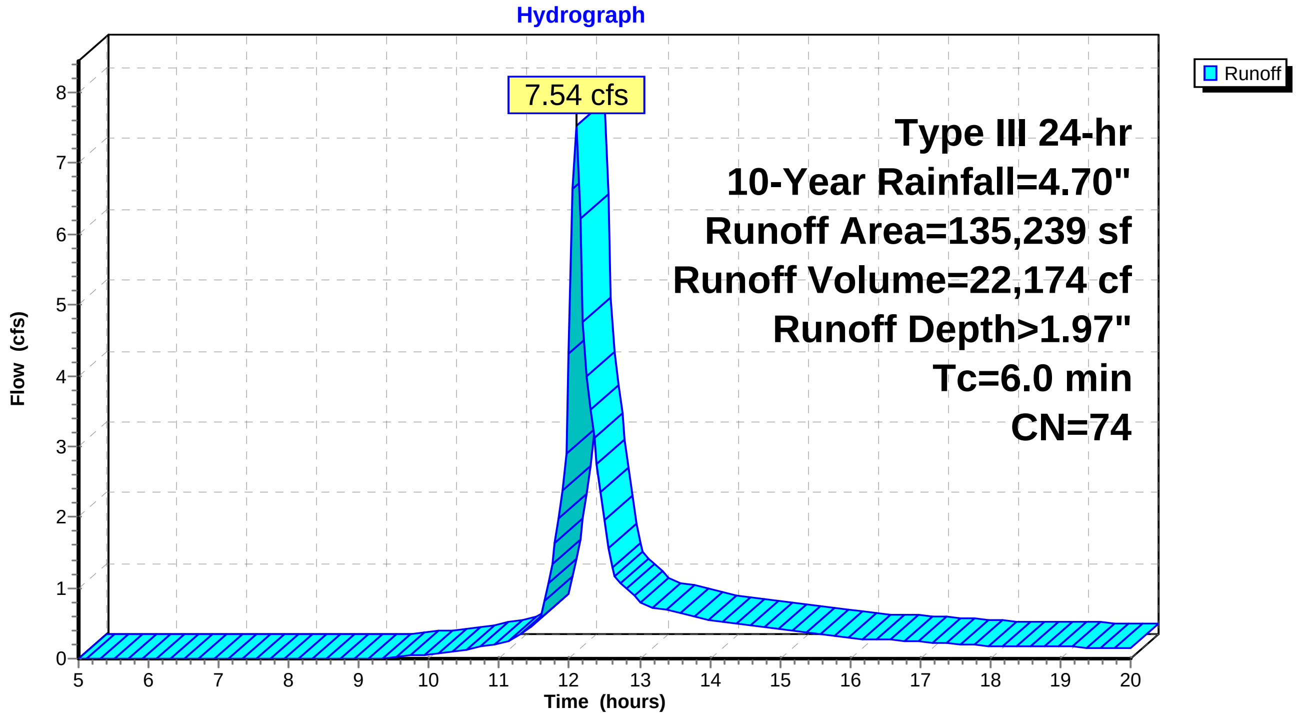
Runoff = 7.54 cfs @ 12.10 hrs, Volume= 22,174 cf, Depth> 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
*	19,869	98	IMPERVIOUS
	57,855	80	1/2 acre lots, 25% imp, HSG C
	2,327	54	1/2 acre lots, 25% imp, HSG A
	3,600	98	Roofs, HSG A
	27,519	39	>75% Grass cover, Good, HSG A
	16,283	74	>75% Grass cover, Good, HSG C
	1,810	80	>75% Grass cover, Good, HSG D
	5,976	98	Water Surface, HSG D
	135,239	74	Weighted Average
	90,749		67.10% Pervious Area
	44,491		32.90% Impervious Area

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

Subcatchment PRDA-6: TO BASIN E



Summary for Subcatchment PRDA-7: TO WETLAND NORTH

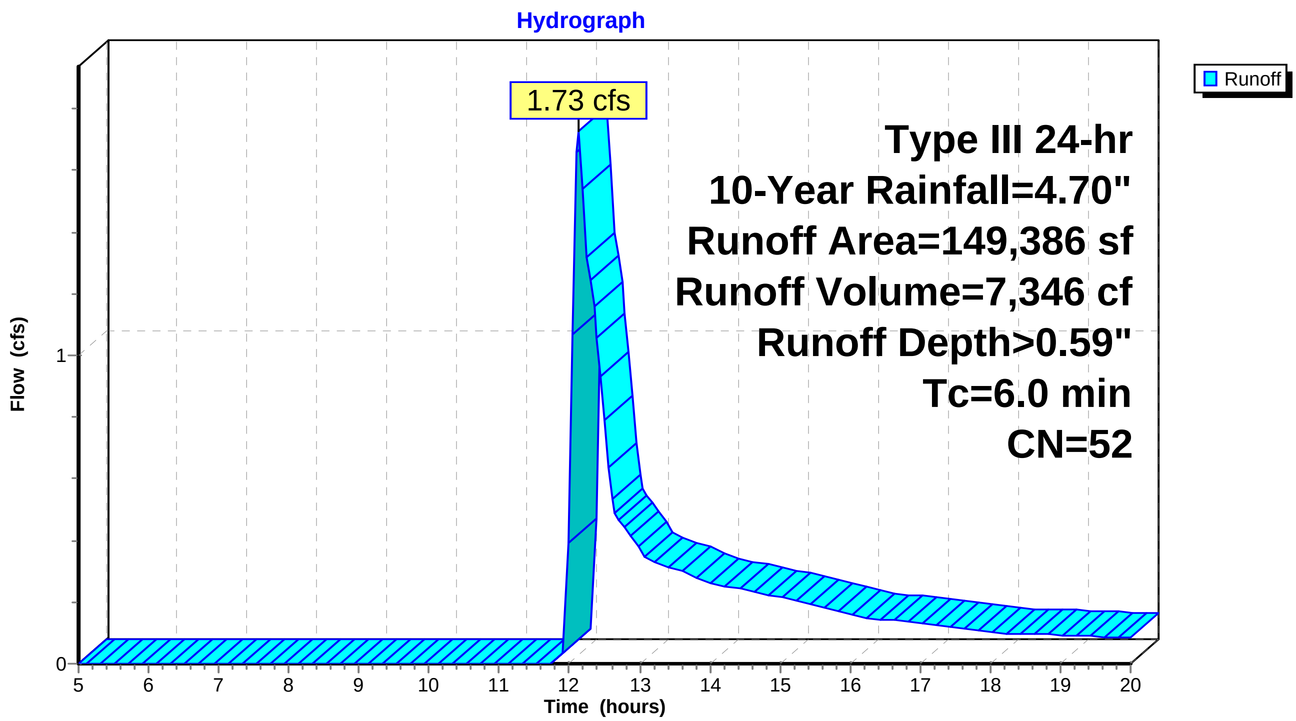
Runoff = 1.73 cfs @ 12.12 hrs, Volume= 7,346 cf, Depth> 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	2,951	80	1/2 acre lots, 25% imp, HSG C
	8,254	54	1/2 acre lots, 25% imp, HSG A
	52,416	39	>75% Grass cover, Good, HSG A
	27,465	61	>75% Grass cover, Good, HSG B
	538	74	>75% Grass cover, Good, HSG C
	9,934	80	>75% Grass cover, Good, HSG D
	22,059	30	Woods, Good, HSG A
	14,418	70	Woods, Good, HSG C
	9,973	77	Woods, Good, HSG D
*	1,378	98	impervious
	149,386	52	Weighted Average
	145,207		97.20% Pervious Area
	4,179		2.80% Impervious Area

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

Subcatchment PRDA-7: TO WETLAND NORTH



Summary for Subcatchment PRDA-8: TO WETLAND SOUTHEAST

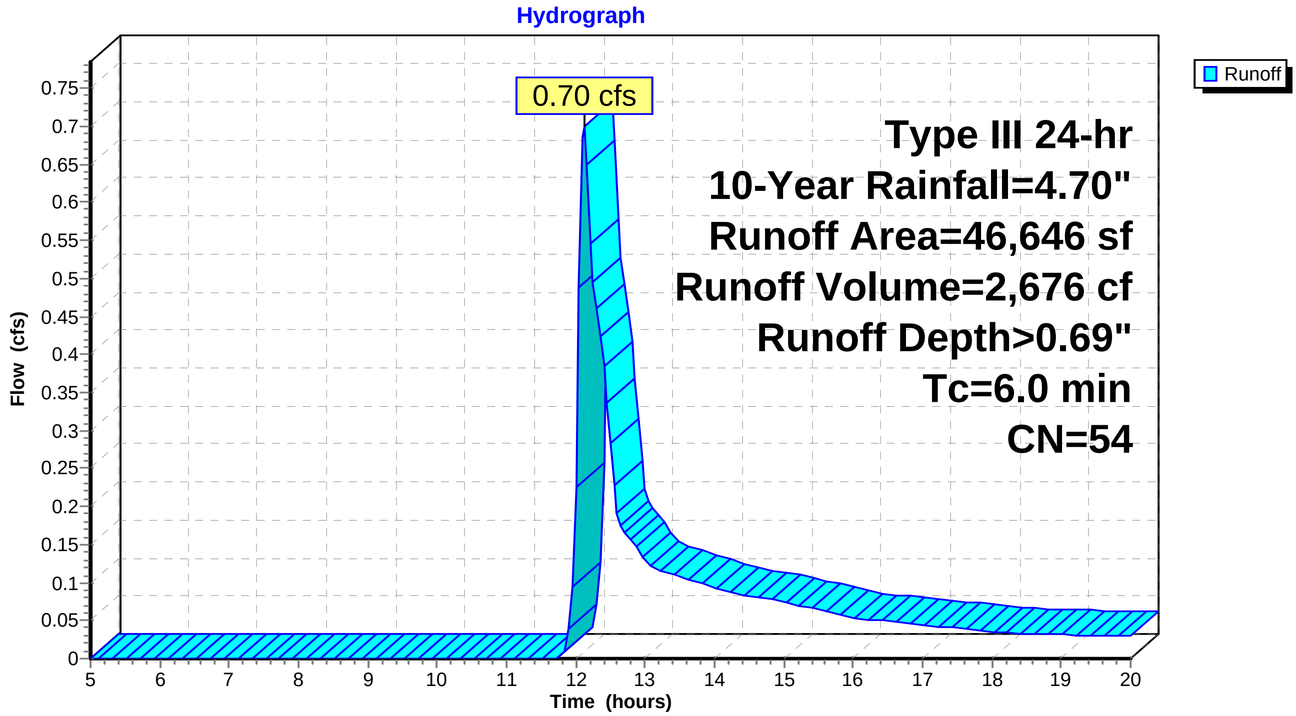
Runoff = 0.70 cfs @ 12.12 hrs, Volume= 2,676 cf, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

Area (sf)	CN	Description
21,559	39	>75% Grass cover, Good, HSG A
7,434	80	>75% Grass cover, Good, HSG D
12,118	77	Woods, Good, HSG D
5,535	30	Woods, Good, HSG A
46,646	54	Weighted Average
46,646		100.00% Pervious Area

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

Subcatchment PRDA-8: TO WETLAND SOUTHEAST



Summary for Subcatchment PRDA-9: TO WETLAND SOUTH

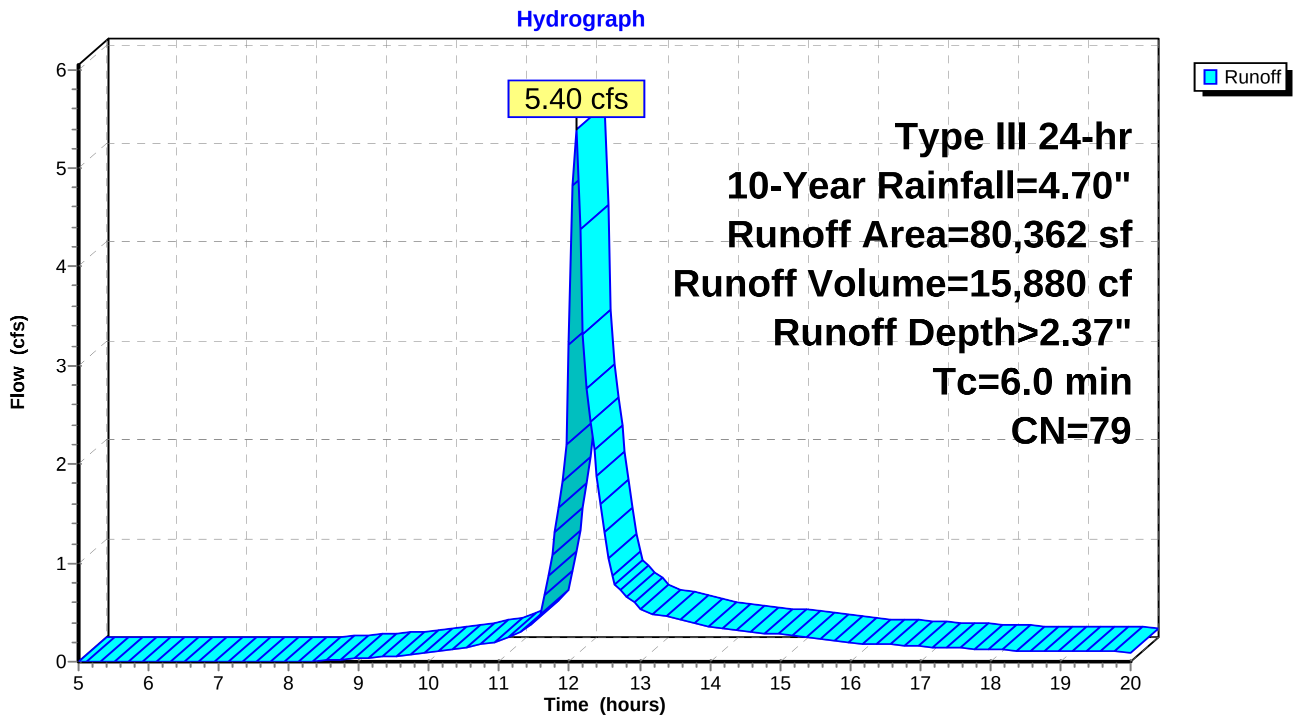
Runoff = 5.40 cfs @ 12.09 hrs, Volume= 15,880 cf, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.70"

	Area (sf)	CN	Description
	274	39	>75% Grass cover, Good, HSG A
	20,073	80	>75% Grass cover, Good, HSG D
	7,904	70	Woods, Good, HSG C
	34,217	77	Woods, Good, HSG D
	11,544	80	1/2 acre lots, 25% imp, HSG C
*	6,350	98	IMPERVIOUS
	80,362	79	Weighted Average
	71,126		88.51% Pervious Area
	9,236		11.49% Impervious Area

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

Subcatchment PRDA-9: TO WETLAND SOUTH

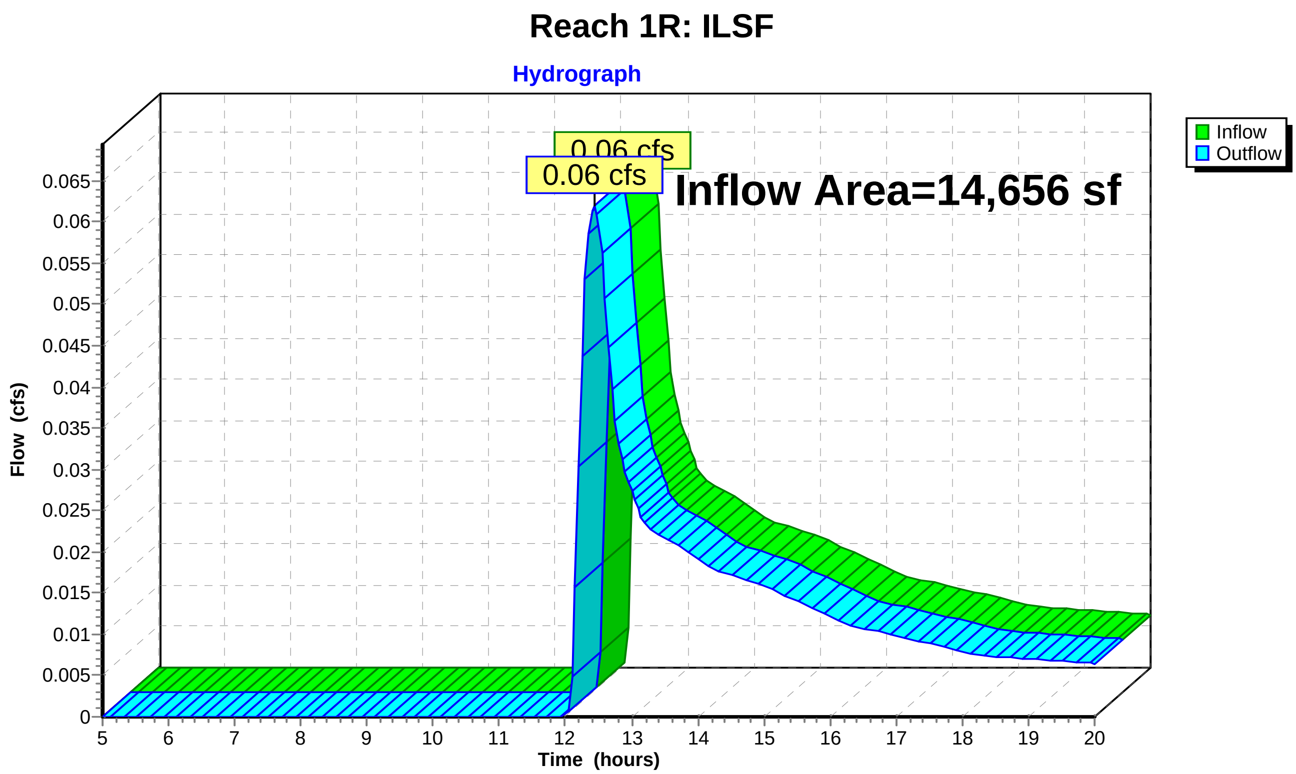


Summary for Reach 1R: ILSF

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

Inflow Area = 14,656 sf, 0.00% Impervious, Inflow Depth > 0.37" for 10-Year event
Inflow = 0.06 cfs @ 12.44 hrs, Volume= 450 cf
Outflow = 0.06 cfs @ 12.44 hrs, Volume= 450 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



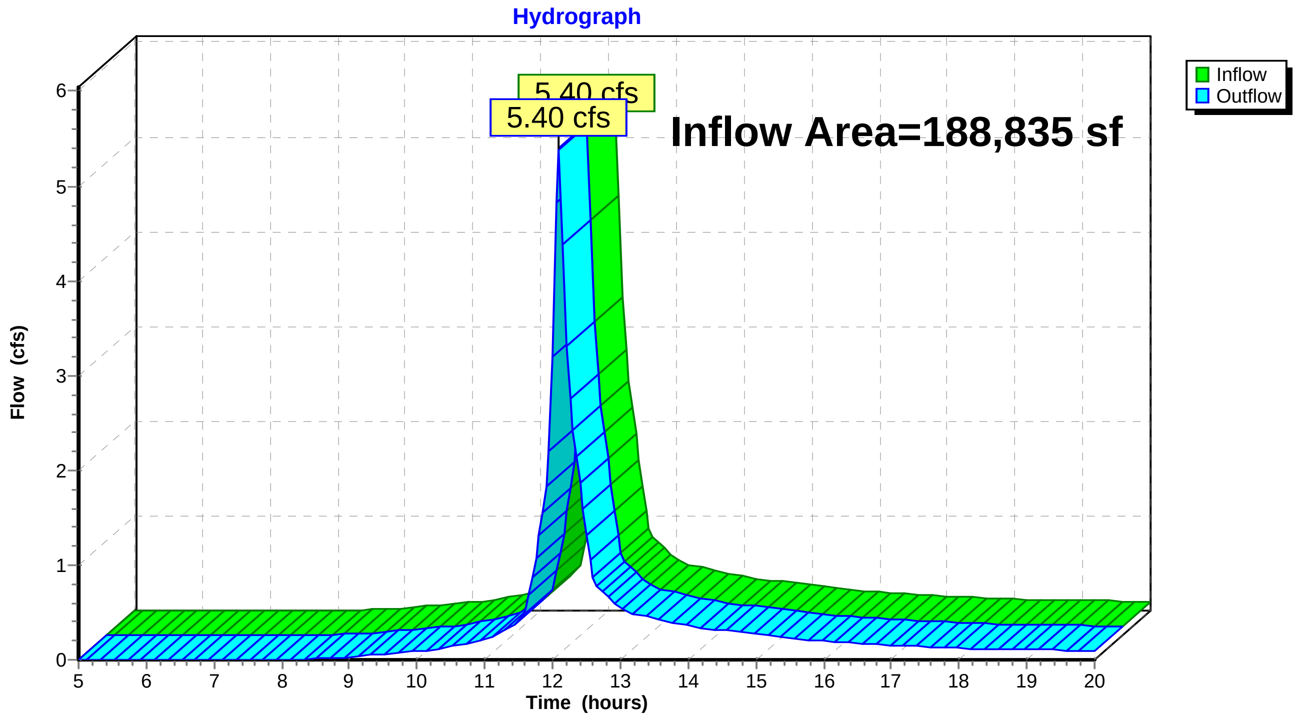
Summary for Reach 14R: WETLAND SOUTH

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

Inflow Area = 188,835 sf, 34.39% Impervious, Inflow Depth > 1.01" for 10-Year event
Inflow = 5.40 cfs @ 12.09 hrs, Volume= 15,880 cf
Outflow = 5.40 cfs @ 12.09 hrs, Volume= 15,880 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: WETLAND SOUTH



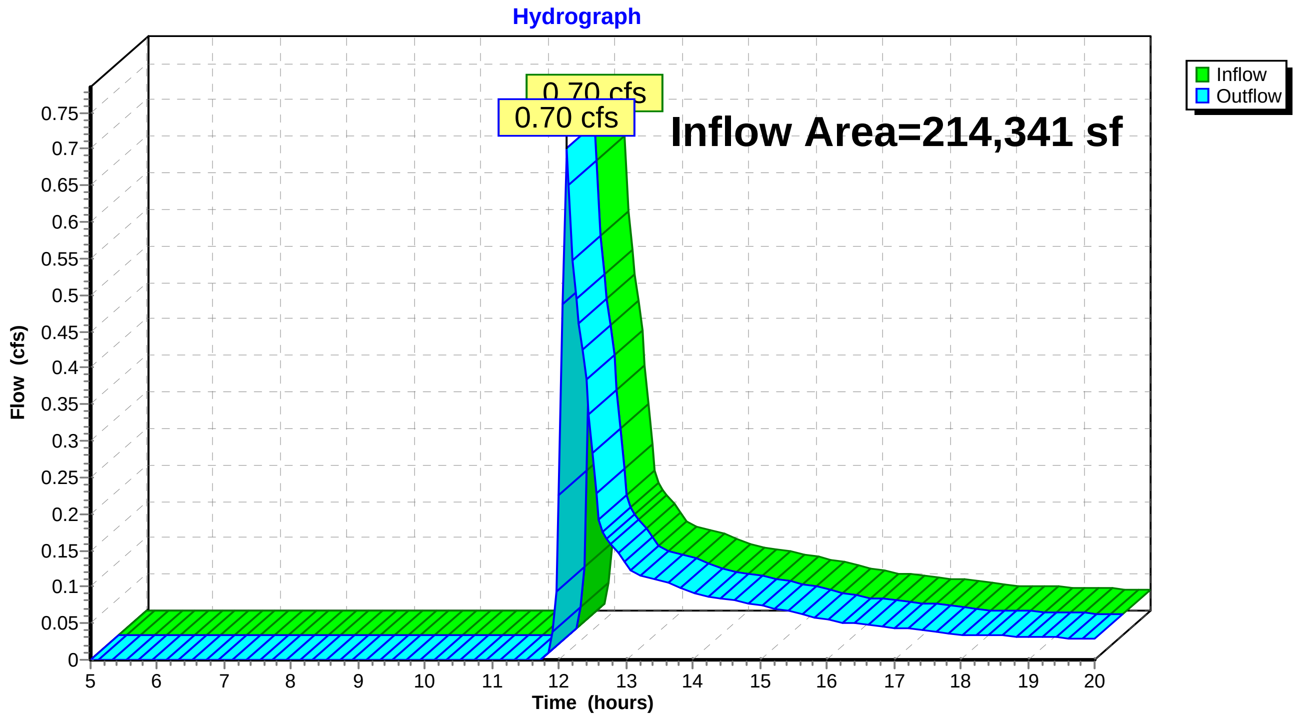
Summary for Reach 15R: WETLAND SOUTHEAST

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

Inflow Area = 214,341 sf, 29.14% Impervious, Inflow Depth > 0.15" for 10-Year event
Inflow = 0.70 cfs @ 12.12 hrs, Volume= 2,676 cf
Outflow = 0.70 cfs @ 12.12 hrs, Volume= 2,676 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 15R: WETLAND SOUTHEAST

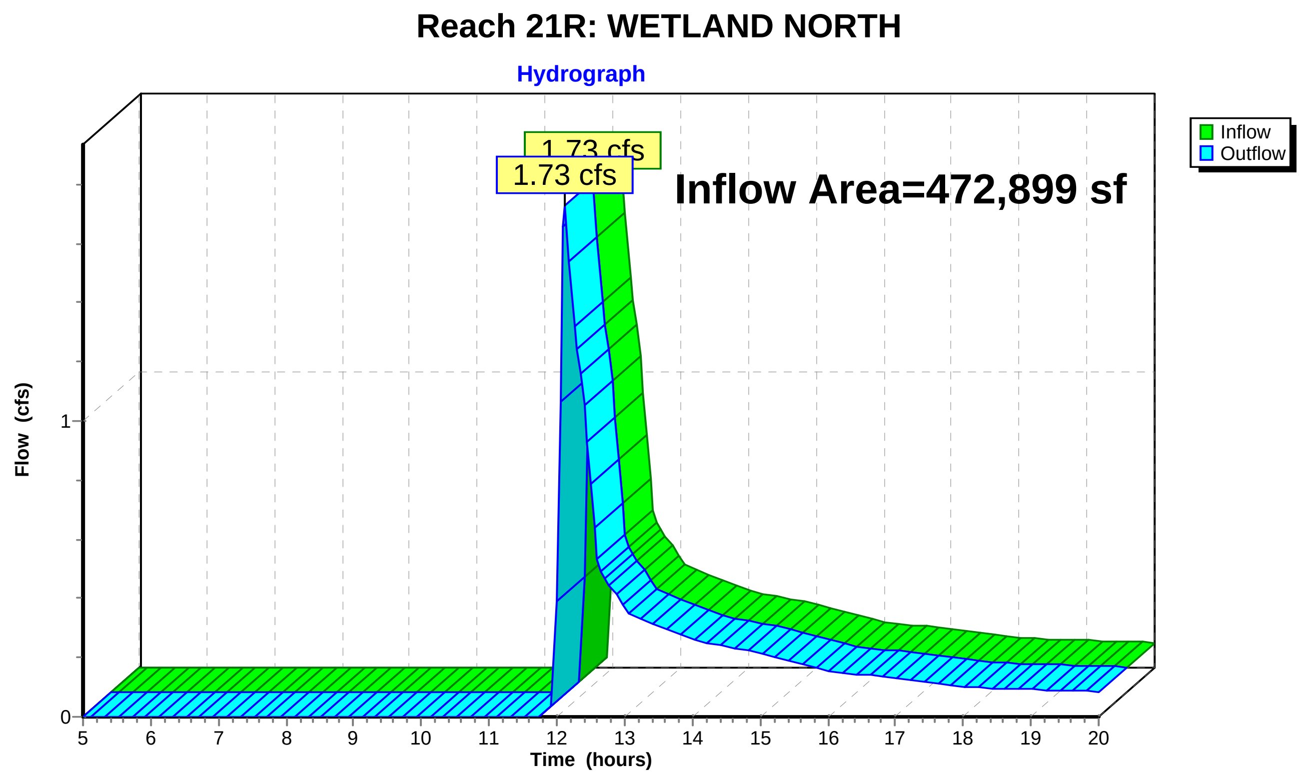


Summary for Reach 21R: WETLAND NORTH

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

Inflow Area = 472,899 sf, 29.63% Impervious, Inflow Depth > 0.19" for 10-Year event
Inflow = 1.73 cfs @ 12.12 hrs, Volume= 7,346 cf
Outflow = 1.73 cfs @ 12.12 hrs, Volume= 7,346 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Pond 1P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 10,448 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 1.08 cfs @ 12.09 hrs, Volume= 3,609 cf
Outflow = 0.10 cfs @ 12.93 hrs, Volume= 3,605 cf, Atten= 91%, Lag= 50.7 min
Discarded = 0.10 cfs @ 12.93 hrs, Volume= 3,605 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.35' @ 12.93 hrs Surf.Area= 1,531 sf Storage= 1,383 cf

Plug-Flow detention time= 108.7 min calculated for 3,604 cf (100% of inflow)
Center-of-Mass det. time= 108.0 min (843.5 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,317 cf	**20.83'W x 73.50'L x 3.54'H Field A** 5,423 cf Overall - 2,131 cf Embedded = 3,292 cf x 40.0% Voids
#2A	0.50'	2,131 cf	**Cultec R-330XLHD** x 40 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		3,448 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.10 cfs @ 12.93 hrs HW=1.35' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Pond 1P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

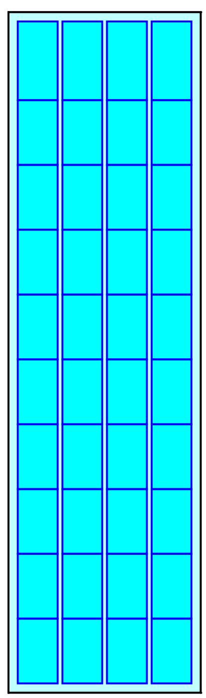
10 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 71.50' Row Length +12.0" End Stone x 2 = 73.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

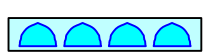
40 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 2,131.0 cf Chamber Storage

5,423.2 cf Field - 2,131.0 cf Chambers = 3,292.2 cf Stone x 40.0% Voids = 1,316.9 cf Stone Storage

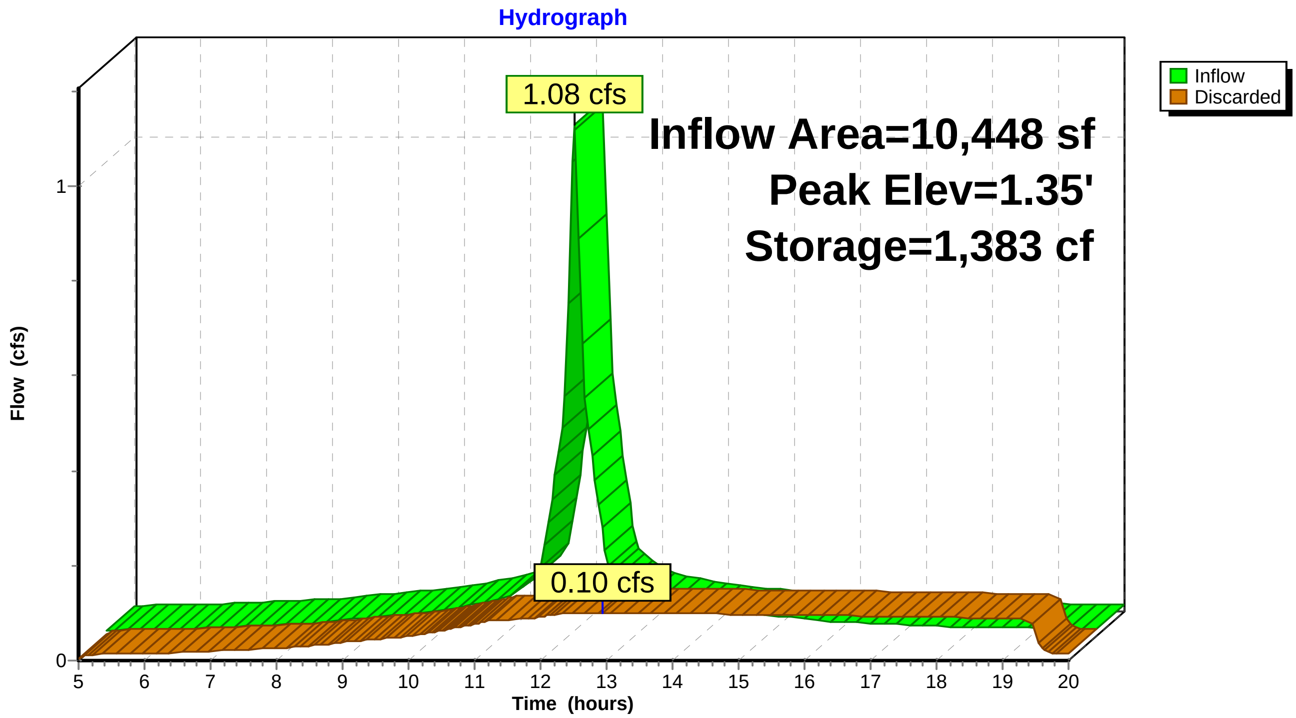
Chamber Storage + Stone Storage = 3,447.9 cf = 0.079 af
Overall Storage Efficiency = 63.6%
Overall System Size = 73.50' x 20.83' x 3.54'

40 Chambers
200.9 cy Field
121.9 cy Stone





Pond 1P: Roof Recharge



Summary for Pond 2P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 13,061 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 1.35 cfs @ 12.09 hrs, Volume= 4,512 cf
Outflow = 0.06 cfs @ 14.60 hrs, Volume= 2,693 cf, Atten= 95%, Lag= 150.7 min
Discarded = 0.06 cfs @ 14.60 hrs, Volume= 2,693 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.53' @ 14.60 hrs Surf.Area= 2,246 sf Storage= 2,380 cf

Plug-Flow detention time= 165.9 min calculated for 2,692 cf (60% of inflow)
Center-of-Mass det. time= 84.4 min (819.9 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,907 cf	**25.67'W x 87.50'L x 3.54'H Field A**
			7,954 cf Overall - 3,185 cf Embedded = 4,769 cf x 40.0% Voids
#2A	0.50'	3,185 cf	**Cultec R-330XLHD** x 60 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		5,093 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.06 cfs @ 14.60 hrs HW=1.53' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 2P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

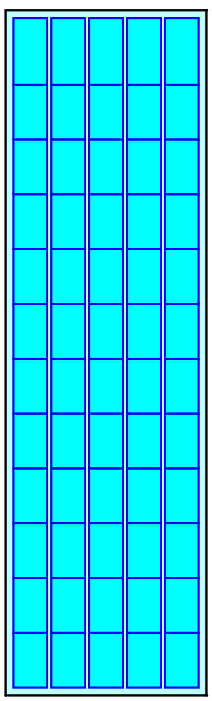
12 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 85.50' Row Length +12.0" End Stone x 2 = 87.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

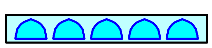
60 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 3,185.3 cf Chamber Storage

7,954.0 cf Field - 3,185.3 cf Chambers = 4,768.7 cf Stone x 40.0% Voids = 1,907.5 cf Stone Storage

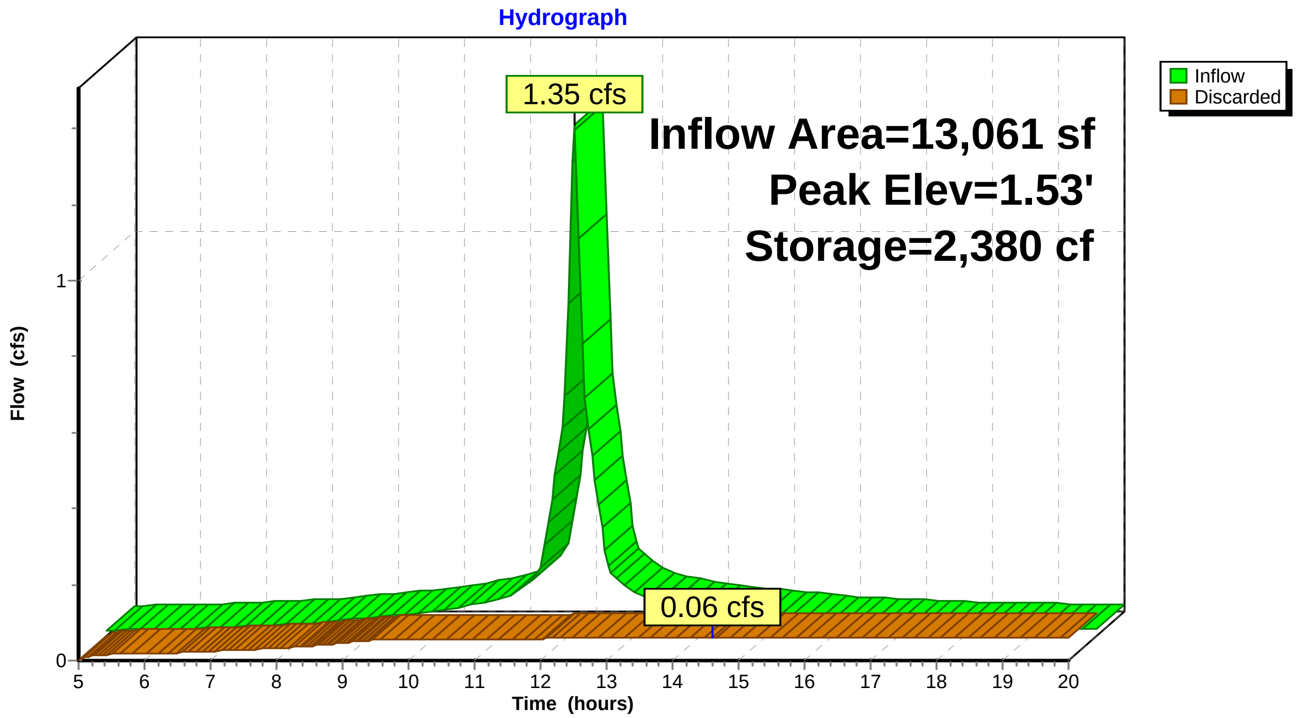
Chamber Storage + Stone Storage = 5,092.8 cf = 0.117 af
Overall Storage Efficiency = 64.0%
Overall System Size = 87.50' x 25.67' x 3.54'

60 Chambers
294.6 cy Field
176.6 cy Stone





Pond 2P: Roof Recharge



Summary for Pond 3P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 13,061 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 1.35 cfs @ 12.09 hrs, Volume= 4,512 cf
Outflow = 0.06 cfs @ 14.60 hrs, Volume= 2,693 cf, Atten= 95%, Lag= 150.7 min
Discarded = 0.06 cfs @ 14.60 hrs, Volume= 2,693 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.53' @ 14.60 hrs Surf.Area= 2,246 sf Storage= 2,380 cf

Plug-Flow detention time= 165.9 min calculated for 2,692 cf (60% of inflow)
Center-of-Mass det. time= 84.4 min (819.9 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,907 cf	**25.67'W x 87.50'L x 3.54'H Field A** 7,954 cf Overall - 3,185 cf Embedded = 4,769 cf x 40.0% Voids
#2A	0.50'	3,185 cf	**Cultec R-330XLHD** x 60 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		5,093 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.06 cfs @ 14.60 hrs HW=1.53' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 3P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

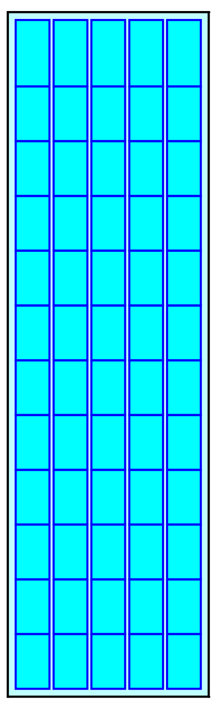
12 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 85.50' Row Length +12.0" End Stone x 2 = 87.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

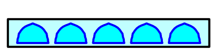
60 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 3,185.3 cf Chamber Storage

7,954.0 cf Field - 3,185.3 cf Chambers = 4,768.7 cf Stone x 40.0% Voids = 1,907.5 cf Stone Storage

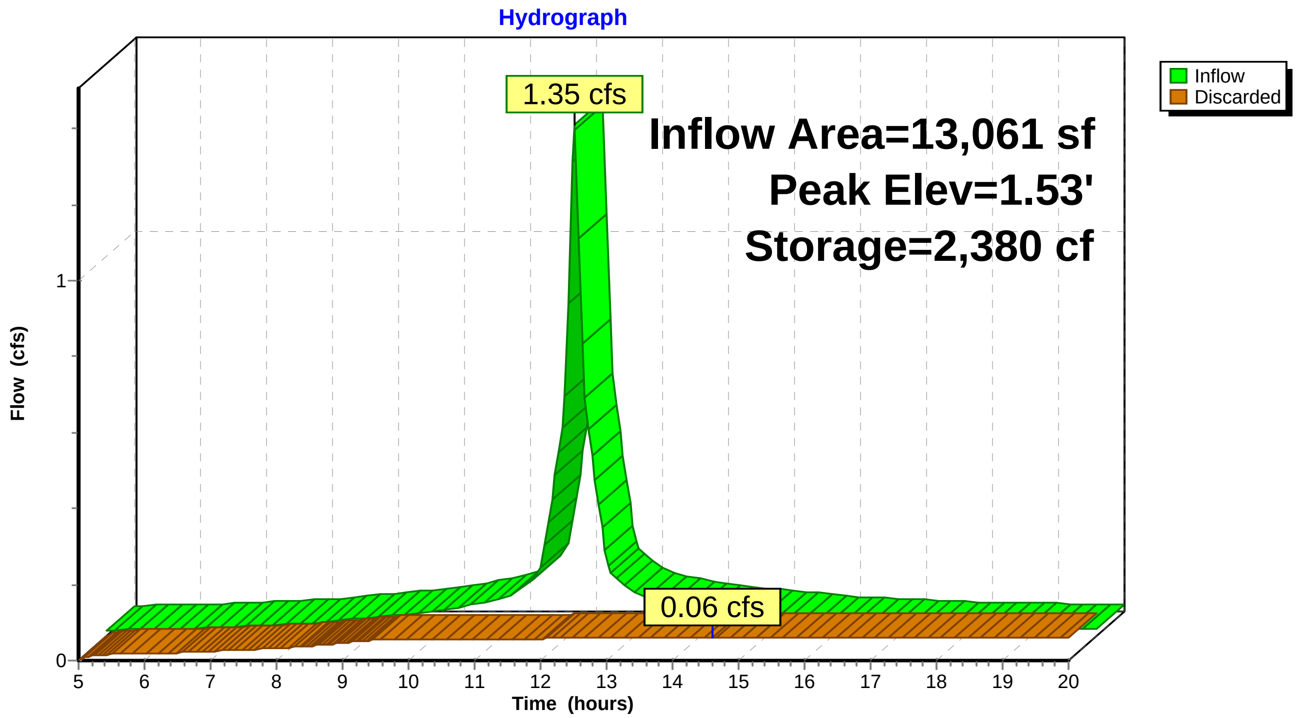
Chamber Storage + Stone Storage = 5,092.8 cf = 0.117 af
Overall Storage Efficiency = 64.0%
Overall System Size = 87.50' x 25.67' x 3.54'

60 Chambers
294.6 cy Field
176.6 cy Stone





Pond 3P: Roof Recharge



Summary for Pond 4P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area =	7,296 sf,100.00% Impervious,	Inflow Depth > 4.15"	for 10-Year event	
Inflow =	0.75 cfs @	12.09 hrs, Volume=	2,520 cf	
Outflow =	0.04 cfs @	14.49 hrs, Volume=	1,527 cf,	Atten= 95%, Lag= 144.3 min
Discarded =	0.04 cfs @	14.49 hrs, Volume=	1,527 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.56' @ 14.49 hrs Surf.Area= 1,240 sf Storage= 1,323 cf

Plug-Flow detention time= 167.0 min calculated for 1,526 cf (61% of inflow)
Center-of-Mass det. time= 86.8 min (822.3 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,071 cf	**20.83'W x 59.50'L x 3.54'H Field A** 4,390 cf Overall - 1,714 cf Embedded = 2,676 cf x 40.0% Voids
#2A	0.50'	1,714 cf	**Cultec R-330XLHD** x 32 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		2,784 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 14.49 hrs HW=1.56' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Pond 4P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

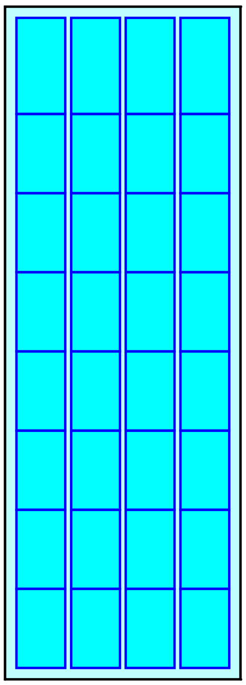
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

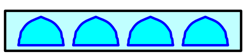
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

4,390.2 cf Field - 1,713.7 cf Chambers = 2,676.5 cf Stone x 40.0% Voids = 1,070.6 cf Stone Storage

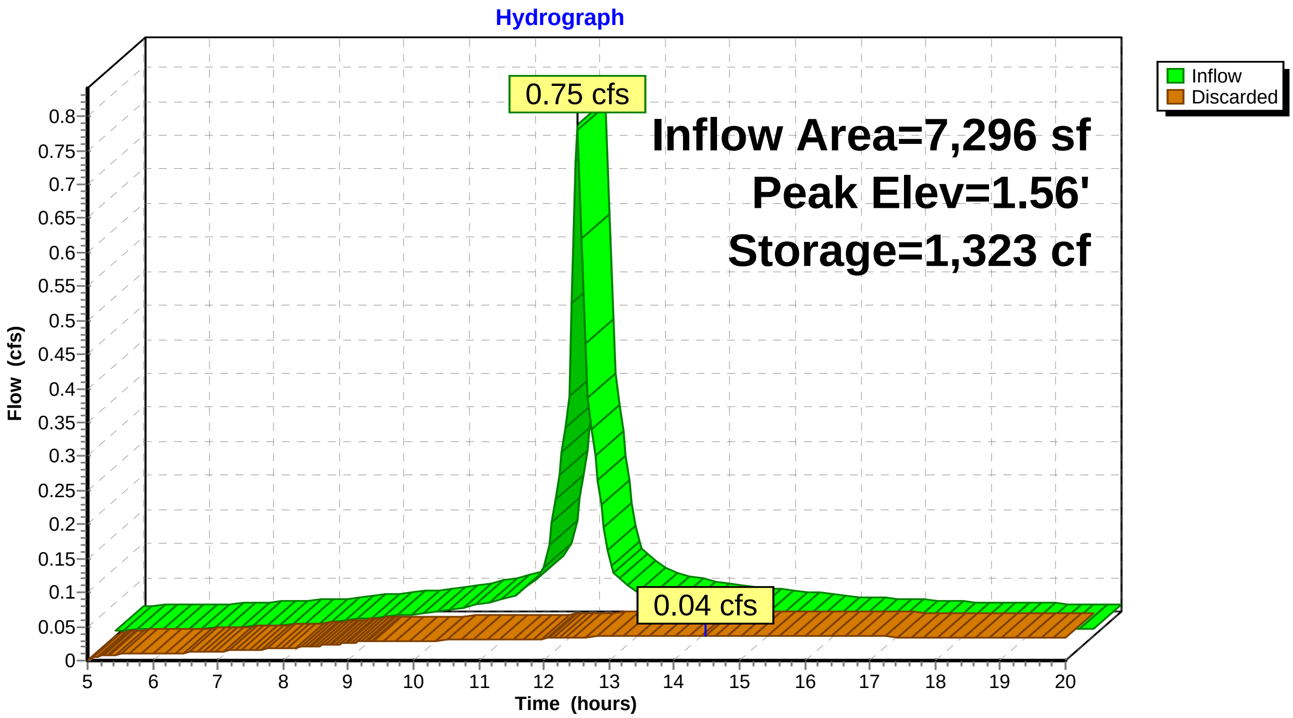
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 4P: Roof Recharge



Summary for Pond 5P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.12 cfs @ 12.09 hrs, Volume= 415 cf
Outflow = 0.01 cfs @ 13.70 hrs, Volume= 296 cf, Atten= 94%, Lag= 96.9 min
Discarded = 0.01 cfs @ 13.70 hrs, Volume= 296 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.62' @ 13.70 hrs Surf.Area= 200 sf Storage= 204 cf

Plug-Flow detention time= 169.7 min calculated for 295 cf (71% of inflow)
Center-of-Mass det. time= 103.7 min (839.2 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.70 hrs HW=1.62' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 5P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

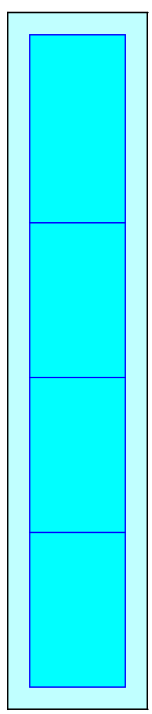
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

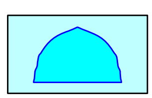
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

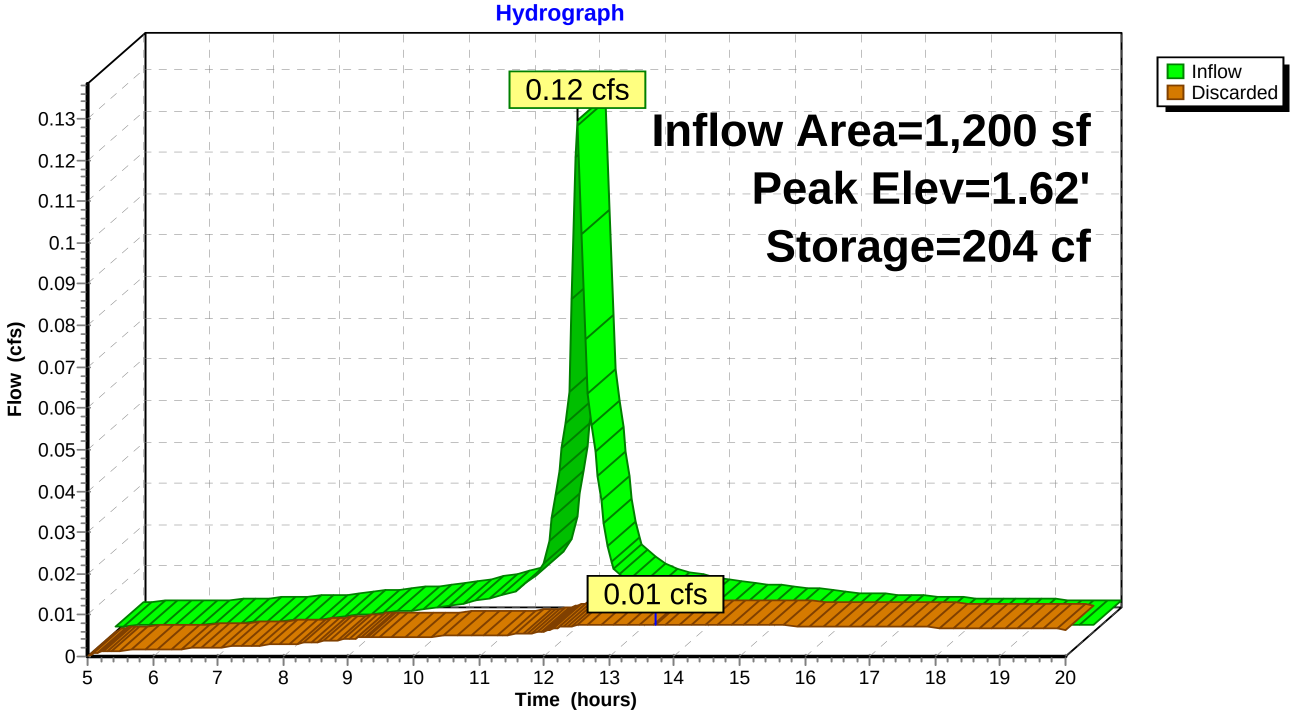
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 5P: Roof Recharge



Summary for Pond 6P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,402 cf
Outflow = 0.03 cfs @ 13.66 hrs, Volume= 1,067 cf, Atten= 94%, Lag= 94.2 min
Discarded = 0.03 cfs @ 13.66 hrs, Volume= 1,067 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.15' @ 13.66 hrs Surf.Area= 899 sf Storage= 650 cf

Plug-Flow detention time= 162.6 min calculated for 1,063 cf (76% of inflow)
Center-of-Mass det. time= 102.7 min (838.2 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 13.66 hrs HW=1.15' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Pond 6P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

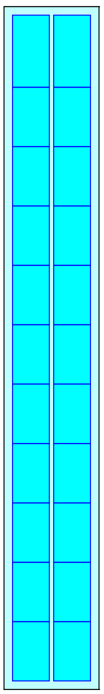
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

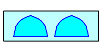
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

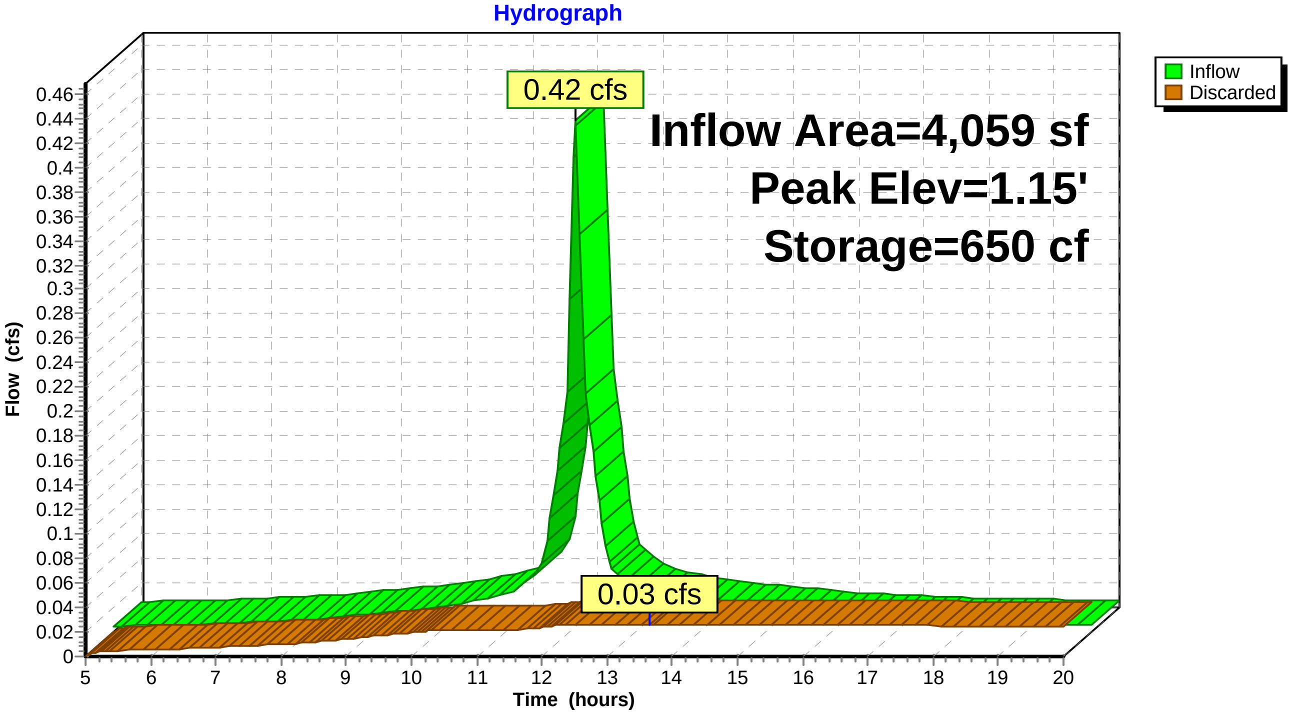
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 6P: Roof Recharge



Summary for Pond 7P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area =	4,929 sf,100.00% Impervious,	Inflow Depth > 4.15"	for 10-Year event
Inflow =	0.51 cfs @ 12.09 hrs,	Volume= 1,703 cf	
Outflow =	0.03 cfs @ 14.00 hrs,	Volume= 1,143 cf,	Atten= 95%, Lag= 114.7 min
Discarded =	0.03 cfs @ 14.00 hrs,	Volume= 1,143 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.43' @ 14.00 hrs Surf.Area= 899 sf Storage= 851 cf

Plug-Flow detention time= 166.5 min calculated for 1,139 cf (67% of inflow)
Center-of-Mass det. time= 95.4 min (830.9 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 14.00 hrs HW=1.43' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 7P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

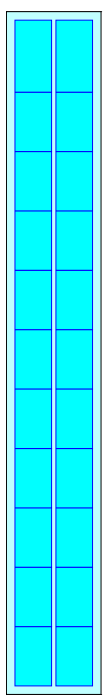
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

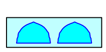
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

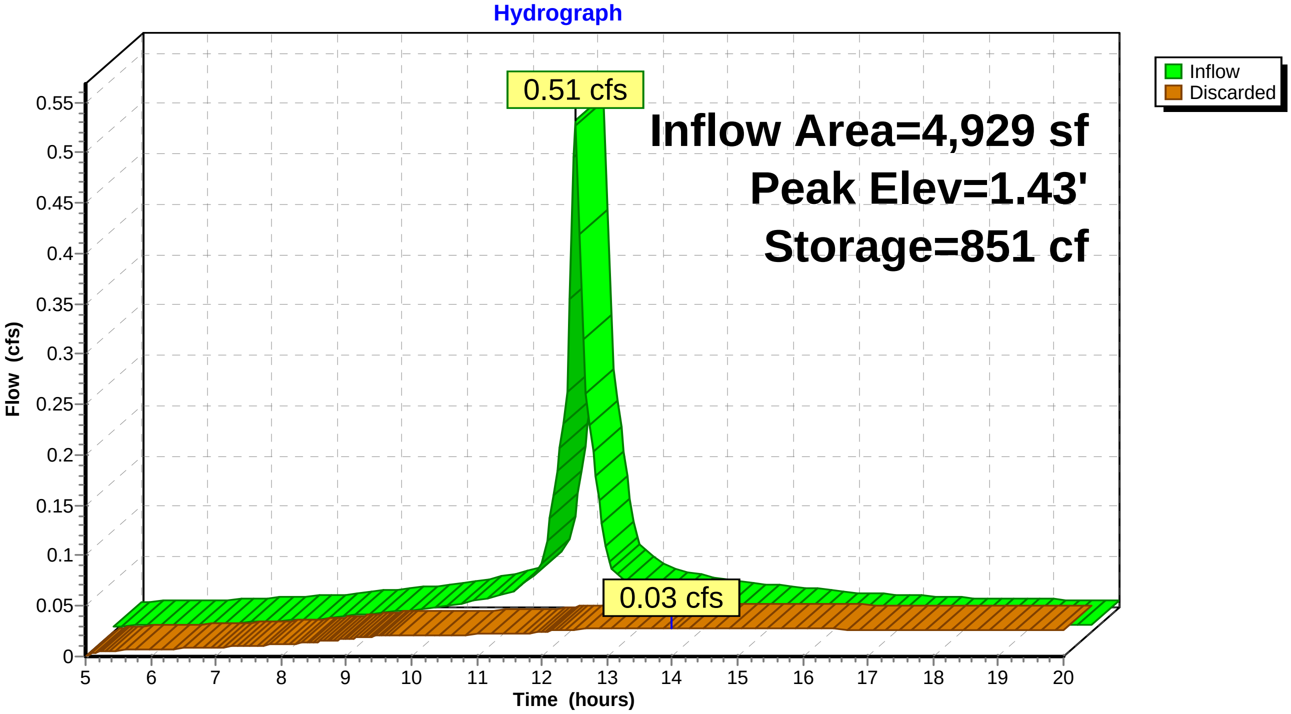
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 7P: Roof Recharge



Summary for Pond 8P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area =	1,200 sf,100.00% Impervious,	Inflow Depth > 4.15"	for 10-Year event	
Inflow =	0.12 cfs @	12.09 hrs, Volume=	415 cf	
Outflow =	0.01 cfs @	13.70 hrs, Volume=	296 cf,	Atten= 94%, Lag= 96.9 min
Discarded =	0.01 cfs @	13.70 hrs, Volume=	296 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.62' @ 13.70 hrs Surf.Area= 200 sf Storage= 204 cf

Plug-Flow detention time= 169.7 min calculated for 295 cf (71% of inflow)
Center-of-Mass det. time= 103.7 min (839.2 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.70 hrs HW=1.62' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 8P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

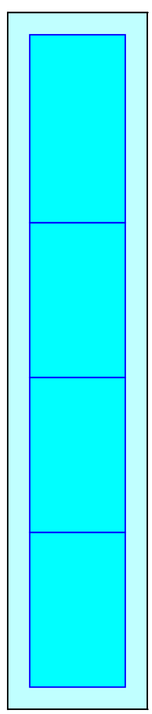
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

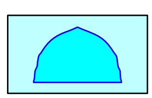
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

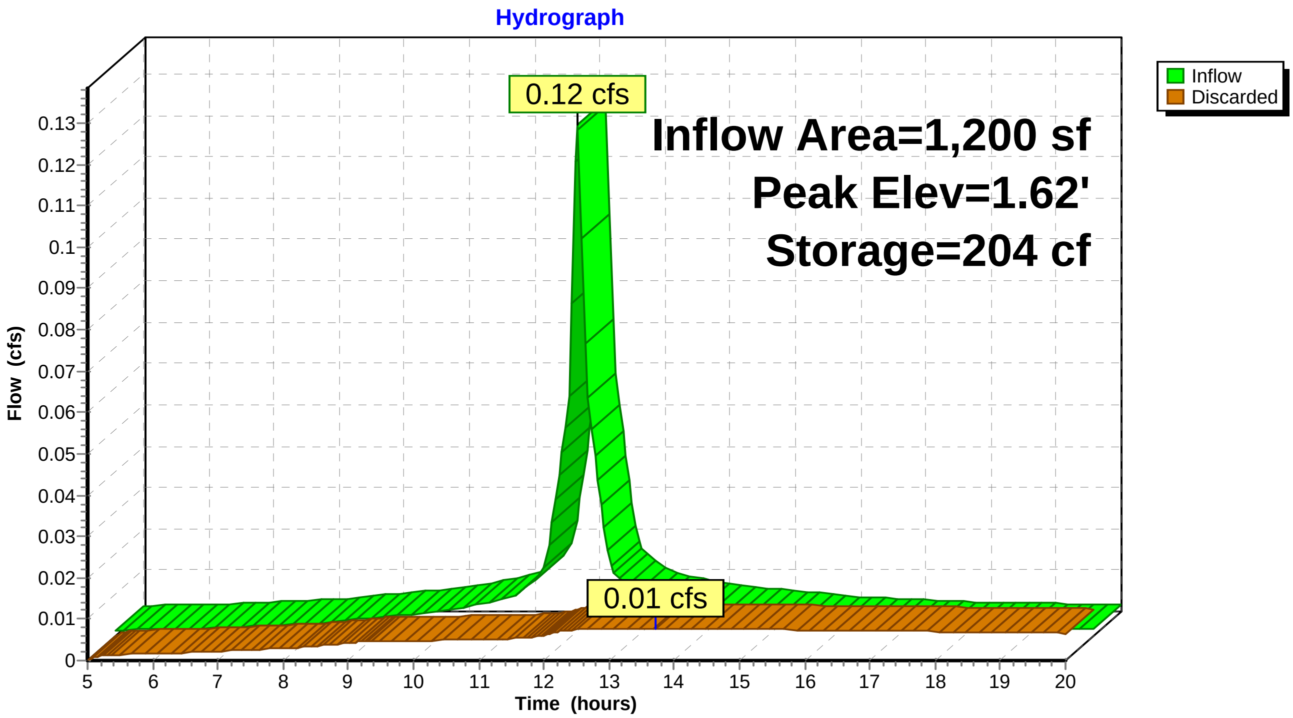
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 8P: Roof Recharge



Summary for Pond 9P: BASIN E

Inflow Area = 135,239 sf, 32.90% Impervious, Inflow Depth > 1.97" for 10-Year event
Inflow = 7.54 cfs @ 12.10 hrs, Volume= 22,174 cf
Outflow = 0.37 cfs @ 15.42 hrs, Volume= 11,434 cf, Atten= 95%, Lag= 199.6 min
Discarded = 0.37 cfs @ 15.42 hrs, Volume= 11,434 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 240.40' @ 15.42 hrs Surf.Area= 6,410 sf Storage= 13,055 cf

Plug-Flow detention time= 213.4 min calculated for 11,434 cf (52% of inflow)
Center-of-Mass det. time= 129.6 min (931.6 - 801.9)

Volume	Invert	Avail.Storage	Storage Description
#1	237.80'	24,841 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

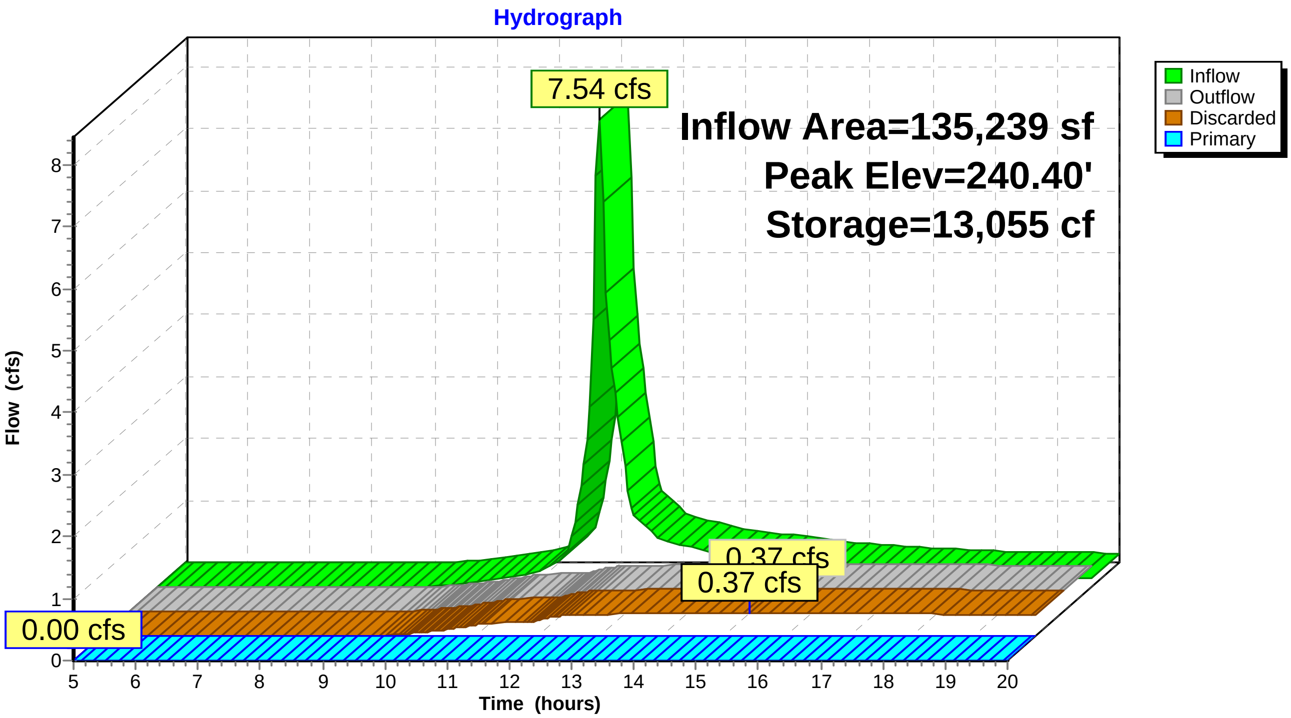
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
237.80	3,709	322.6	0	0	3,709
238.00	3,904	326.4	761	761	3,916
239.00	4,911	345.3	4,398	5,159	4,980
240.00	5,976	364.3	5,435	10,594	6,110
241.00	7,097	383.1	6,528	17,122	7,289
241.90	10,147	430.2	7,719	24,841	10,360

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.80'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.90'	**25.0' long x 18.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.37 cfs @ 15.42 hrs HW=240.40' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=237.80' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 9P: BASIN E



Summary for Pond 10P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.12 cfs @ 12.09 hrs, Volume= 415 cf
Outflow = 0.01 cfs @ 13.70 hrs, Volume= 296 cf, Atten= 94%, Lag= 96.9 min
Discarded = 0.01 cfs @ 13.70 hrs, Volume= 296 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.62' @ 13.70 hrs Surf.Area= 200 sf Storage= 204 cf

Plug-Flow detention time= 169.7 min calculated for 295 cf (71% of inflow)
Center-of-Mass det. time= 103.7 min (839.2 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.70 hrs HW=1.62' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 10P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

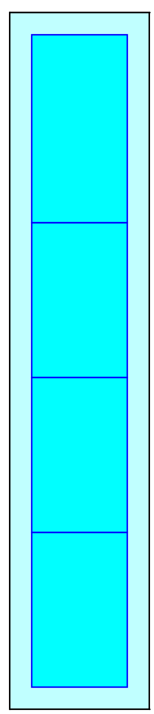
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

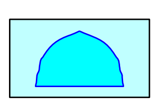
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

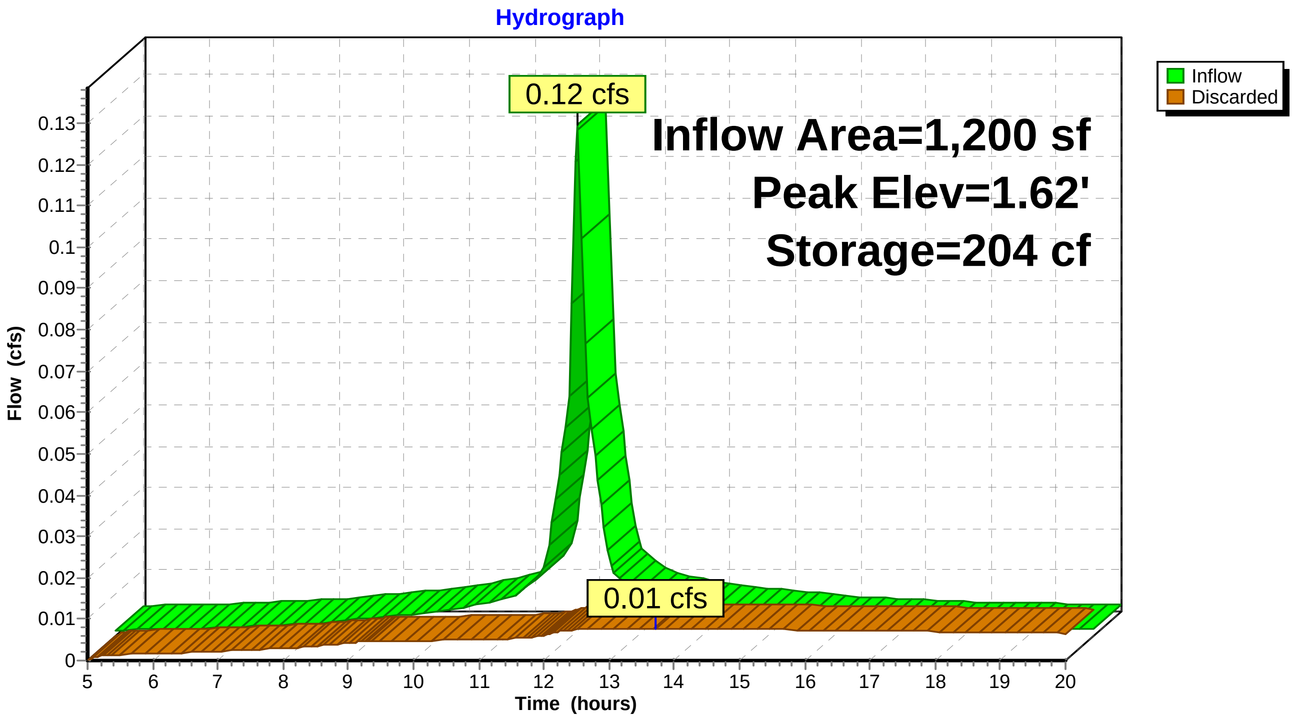
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 10P: Roof Recharge



Summary for Pond 11P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,402 cf
Outflow = 0.03 cfs @ 13.66 hrs, Volume= 1,067 cf, Atten= 94%, Lag= 94.2 min
Discarded = 0.03 cfs @ 13.66 hrs, Volume= 1,067 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.15' @ 13.66 hrs Surf.Area= 899 sf Storage= 650 cf

Plug-Flow detention time= 162.6 min calculated for 1,063 cf (76% of inflow)
Center-of-Mass det. time= 102.7 min (838.2 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 13.66 hrs HW=1.15' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 11P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

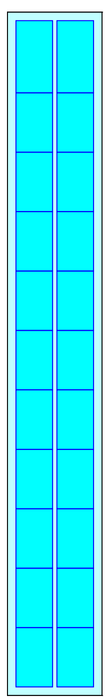
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

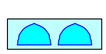
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

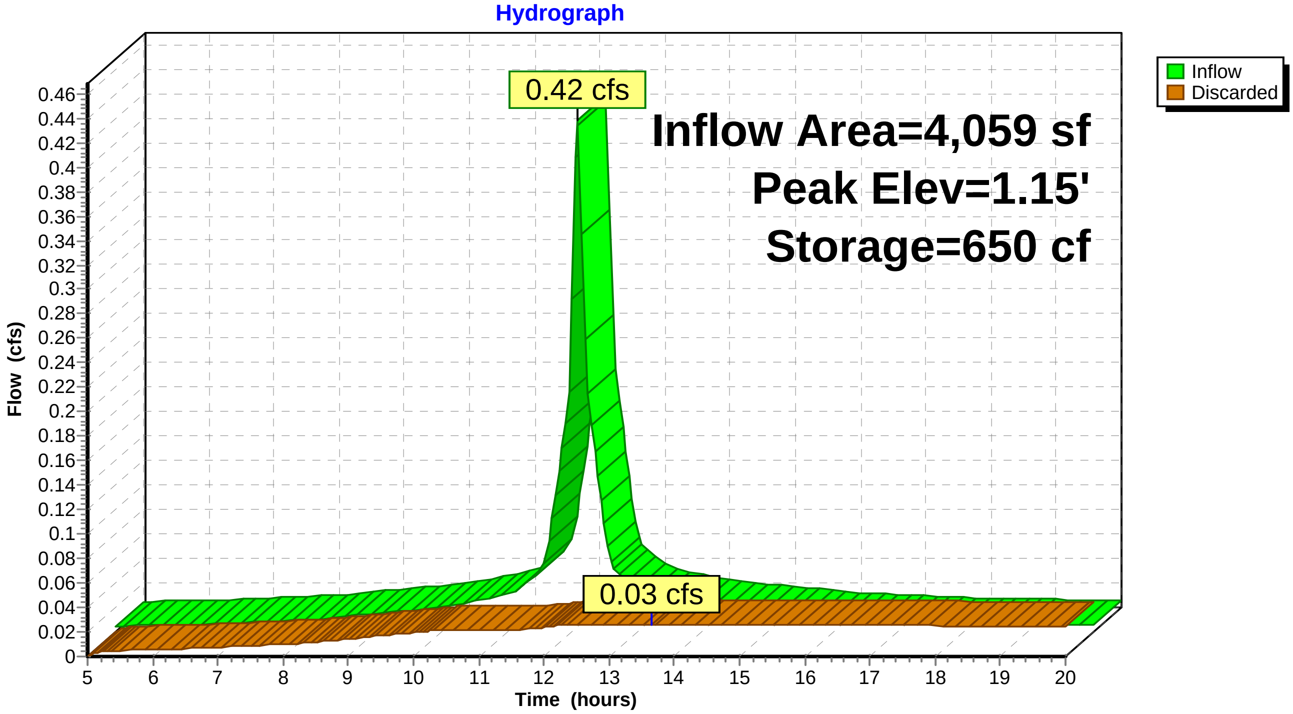
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 11P: Roof Recharge



Summary for Pond 13P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.12 cfs @ 12.09 hrs, Volume= 415 cf
Outflow = 0.01 cfs @ 13.70 hrs, Volume= 296 cf, Atten= 94%, Lag= 96.9 min
Discarded = 0.01 cfs @ 13.70 hrs, Volume= 296 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.62' @ 13.70 hrs Surf.Area= 200 sf Storage= 204 cf

Plug-Flow detention time= 169.7 min calculated for 295 cf (71% of inflow)
Center-of-Mass det. time= 103.7 min (839.2 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.70 hrs HW=1.62' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 13P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

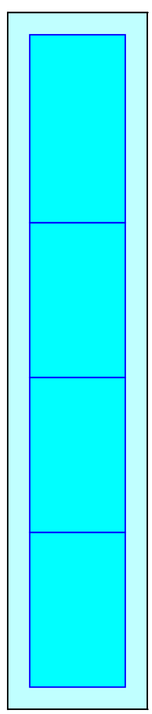
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

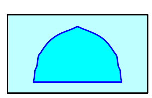
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

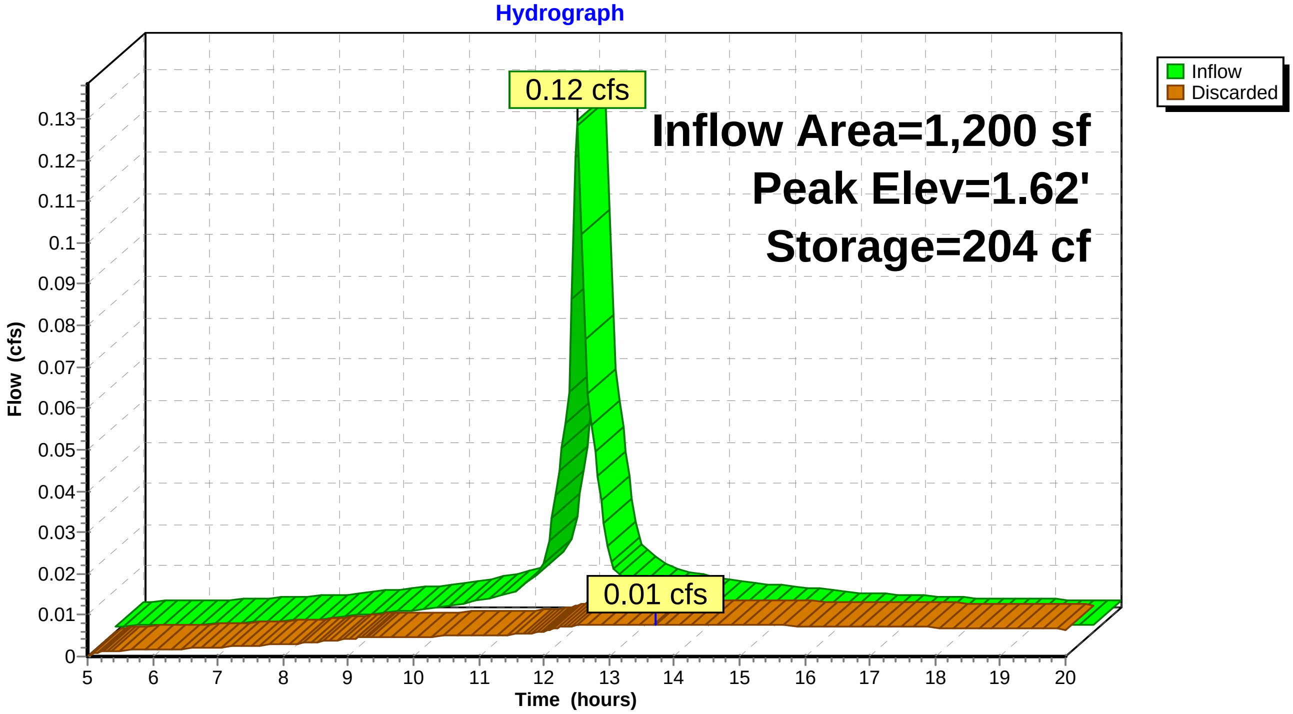
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 13P: Roof Recharge



Summary for Pond 14P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 4.15" for 10-Year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,402 cf
Outflow = 0.02 cfs @ 13.88 hrs, Volume= 996 cf, Atten= 94%, Lag= 107.6 min
Discarded = 0.02 cfs @ 13.88 hrs, Volume= 996 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.24' @ 13.88 hrs Surf.Area= 840 sf Storage= 675 cf

Plug-Flow detention time= 163.9 min calculated for 992 cf (71% of inflow)
Center-of-Mass det. time= 97.5 min (833.0 - 735.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	738 cf	**16.00'W x 52.50'L x 3.54'H Field A**
			2,975 cf Overall - 1,129 cf Embedded = 1,846 cf x 40.0% Voids
#2A	0.50'	1,129 cf	**Cultec R-330XLHD** x 21 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		1,867 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 13.88 hrs HW=1.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Pond 14P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

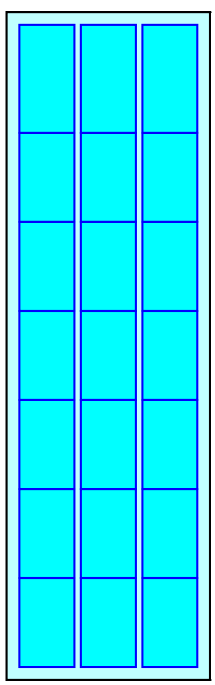
7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

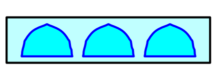
21 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 1,128.8 cf Chamber Storage

2,975.0 cf Field - 1,128.8 cf Chambers = 1,846.2 cf Stone x 40.0% Voids = 738.5 cf Stone Storage

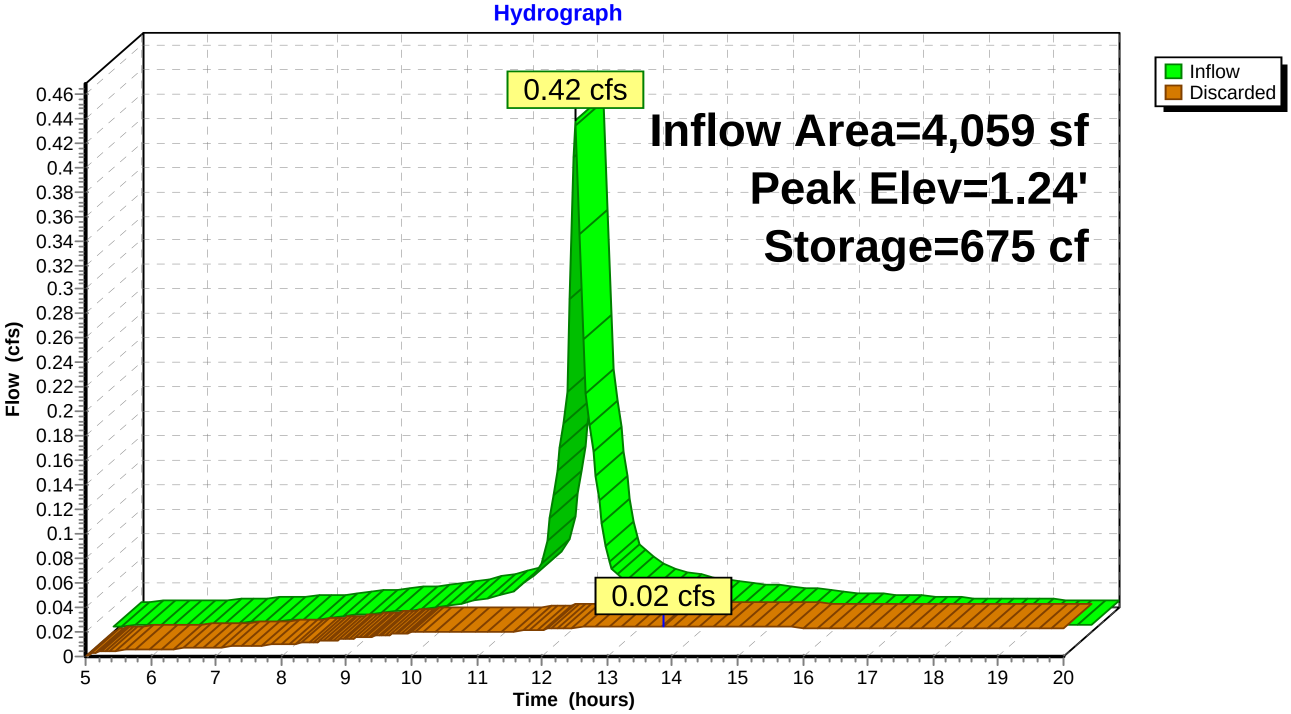
Chamber Storage + Stone Storage = 1,867.3 cf = 0.043 af
Overall Storage Efficiency = 62.8%
Overall System Size = 52.50' x 16.00' x 3.54'

21 Chambers
110.2 cy Field
68.4 cy Stone





Pond 14P: Roof Recharge



Summary for Pond 17P: Roof Recharge

Inflow Area = 13,086 sf, 37.67% Impervious, Inflow Depth > 3.09" for 10-Year event
Inflow = 1.12 cfs @ 12.09 hrs, Volume= 3,373 cf
Outflow = 0.05 cfs @ 15.19 hrs, Volume= 1,791 cf, Atten= 96%, Lag= 186.1 min
Discarded = 0.05 cfs @ 15.19 hrs, Volume= 1,791 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.66' @ 15.19 hrs Surf.Area= 1,677 sf Storage= 1,935 cf

Plug-Flow detention time= 186.6 min calculated for 1,791 cf (53% of inflow)
Center-of-Mass det. time= 105.8 min (877.5 - 771.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,440 cf	**20.83'W x 80.50'L x 3.54'H Field A** 5,940 cf Overall - 2,340 cf Embedded = 3,600 cf x 40.0% Voids
#2A	0.50'	2,340 cf	**Cultec R-330XLHD** x 44 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		3,780 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.05 cfs @ 15.19 hrs HW=1.66' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 17P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

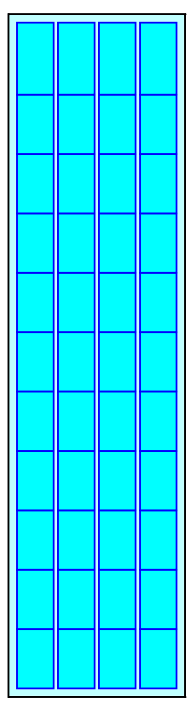
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

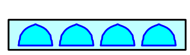
44 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 2,339.6 cf Chamber Storage

5,939.7 cf Field - 2,339.6 cf Chambers = 3,600.1 cf Stone x 40.0% Voids = 1,440.0 cf Stone Storage

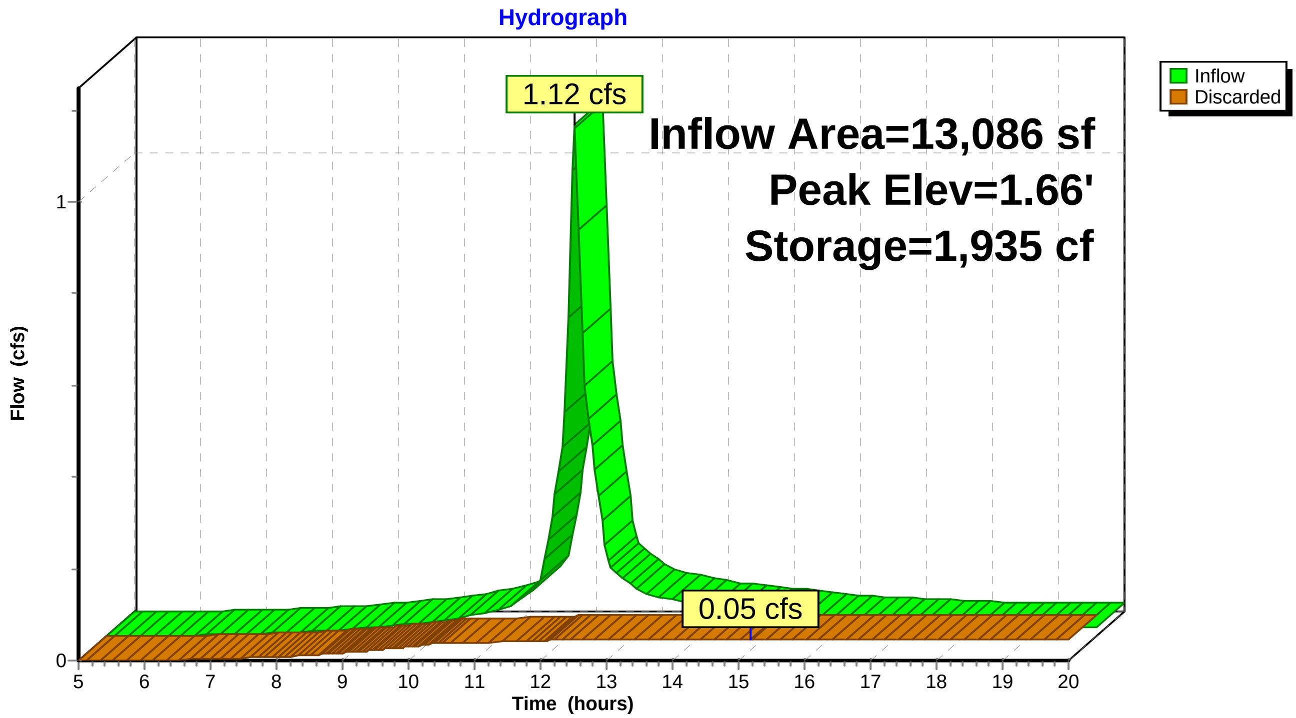
Chamber Storage + Stone Storage = 3,779.6 cf = 0.087 af
Overall Storage Efficiency = 63.6%
Overall System Size = 80.50' x 20.83' x 3.54'

44 Chambers
220.0 cy Field
133.3 cy Stone





Pond 17P: Roof Recharge



Summary for Pond 19P: Roof Recharge

Inflow Area = 11,720 sf, 42.06% Impervious, Inflow Depth > 3.19" for 10-Year event
Inflow = 1.02 cfs @ 12.09 hrs, Volume= 3,116 cf
Outflow = 0.08 cfs @ 13.19 hrs, Volume= 2,814 cf, Atten= 92%, Lag= 66.2 min
Discarded = 0.08 cfs @ 13.19 hrs, Volume= 2,814 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.69' @ 13.19 hrs Surf.Area= 1,176 sf Storage= 1,368 cf

Plug-Flow detention time= 153.5 min calculated for 2,805 cf (90% of inflow)
Center-of-Mass det. time= 121.6 min (890.3 - 768.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,027 cf	**16.00'W x 73.50'L x 3.54'H Field A** 4,165 cf Overall - 1,598 cf Embedded = 2,567 cf x 40.0% Voids
#2A	0.50'	1,598 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		2,625 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.08 cfs @ 13.19 hrs HW=1.69' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.08 cfs)

Pond 19P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

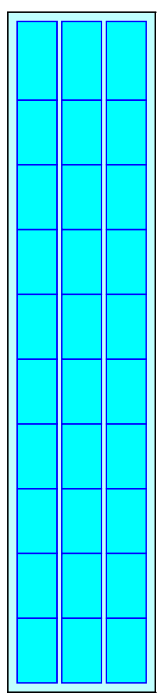
10 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 71.50' Row Length +12.0" End Stone x 2 = 73.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

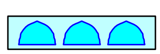
30 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 1,598.2 cf Chamber Storage

4,165.0 cf Field - 1,598.2 cf Chambers = 2,566.8 cf Stone x 40.0% Voids = 1,026.7 cf Stone Storage

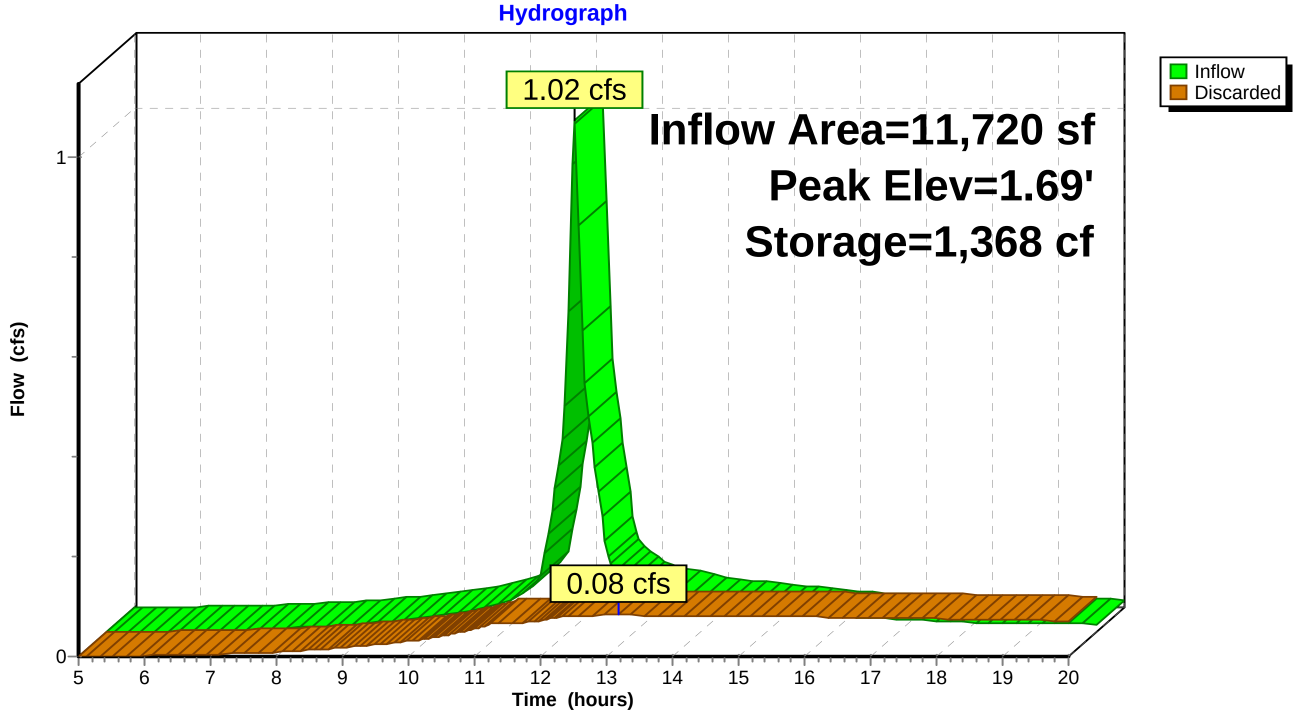
Chamber Storage + Stone Storage = 2,624.9 cf = 0.060 af
Overall Storage Efficiency = 63.0%
Overall System Size = 73.50' x 16.00' x 3.54'

30 Chambers
154.3 cy Field
95.1 cy Stone





Pond 19P: Roof Recharge



Summary for Pond 21P: BASIN B

Inflow Area = 167,695 sf, 37.24% Impervious, Inflow Depth > 1.48" for 10-Year event
Inflow = 5.31 cfs @ 12.18 hrs, Volume= 20,630 cf
Outflow = 0.37 cfs @ 15.60 hrs, Volume= 11,385 cf, Atten= 93%, Lag= 205.2 min
Discarded = 0.37 cfs @ 15.60 hrs, Volume= 11,385 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 227.44' @ 15.60 hrs Surf.Area= 6,856 sf Storage= 11,502 cf

Plug-Flow detention time= 209.3 min calculated for 11,347 cf (55% of inflow)
Center-of-Mass det. time= 124.6 min (943.6 - 819.1)

Volume	Invert	Avail.Storage	Storage Description
#1	225.50'	23,381 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

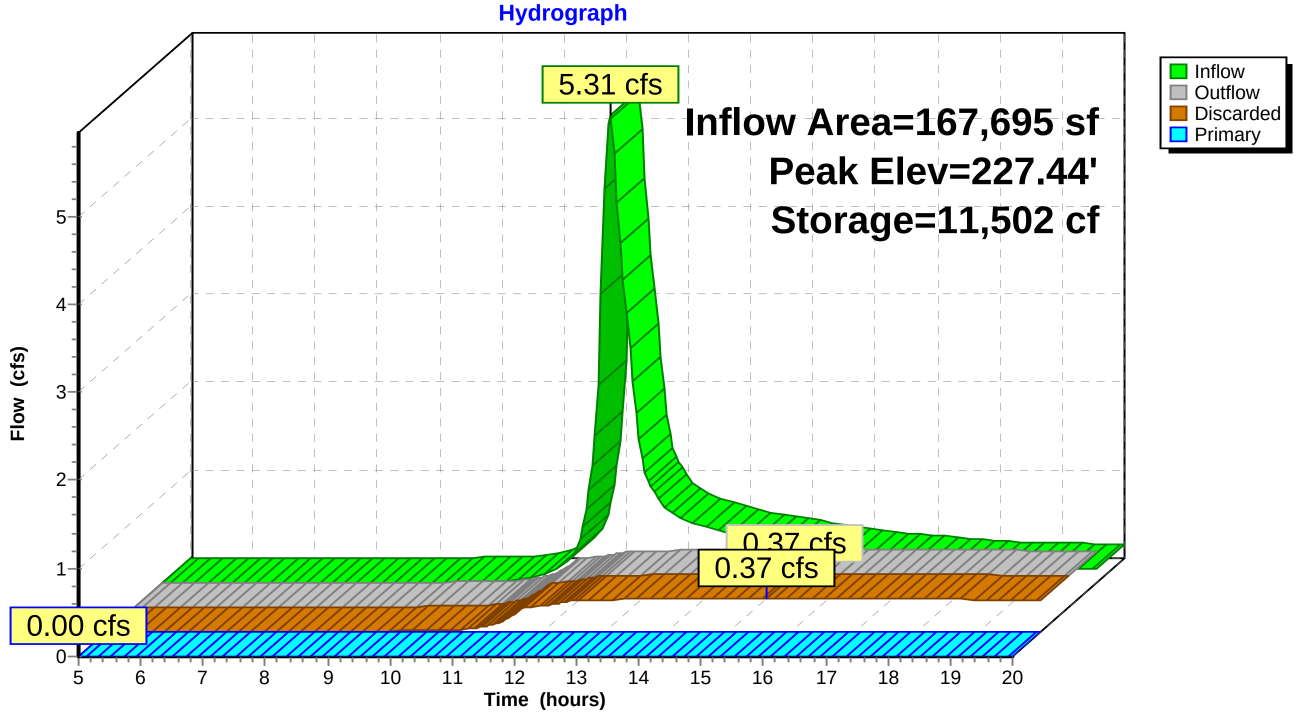
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.50	5,039	294.3	0	0	5,039
226.00	5,488	303.7	2,631	2,631	5,511
227.00	6,427	322.5	5,951	8,582	6,498
228.00	7,423	328.3	6,919	15,501	6,941
228.90	10,160	388.5	7,880	23,381	10,390

Device	Routing	Invert	Outlet Devices
#1	Discarded	225.50'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	227.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.37 cfs @ 15.60 hrs HW=227.44' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.37 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=225.50' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 21P: BASIN B



Summary for Pond 22P: Roof Recharge

Inflow Area = 11,373 sf, 43.34% Impervious, Inflow Depth > 2.29" for 10-Year event
Inflow = 0.74 cfs @ 12.09 hrs, Volume= 2,168 cf
Outflow = 0.04 cfs @ 15.24 hrs, Volume= 1,180 cf, Atten= 95%, Lag= 189.0 min
Discarded = 0.04 cfs @ 15.24 hrs, Volume= 1,180 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.62' @ 15.24 hrs Surf.Area= 1,133 sf Storage= 1,238 cf

Plug-Flow detention time= 201.3 min calculated for 1,176 cf (54% of inflow)
Center-of-Mass det. time= 121.7 min (915.3 - 793.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,013 cf	**11.17'W x 101.50'L x 3.54'H Field A**
			4,014 cf Overall - 1,483 cf Embedded = 2,531 cf x 40.0% Voids
#2A	0.50'	1,483 cf	**Cultec R-330XLHD** x 28 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		2,495 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 15.24 hrs HW=1.62' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

Pond 22P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

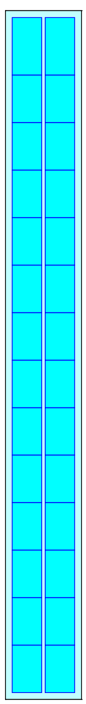
14 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 99.50' Row Length +12.0" End Stone x 2 = 101.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

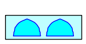
28 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,482.7 cf Chamber Storage

4,014.2 cf Field - 1,482.7 cf Chambers = 2,531.4 cf Stone x 40.0% Voids = 1,012.6 cf Stone Storage

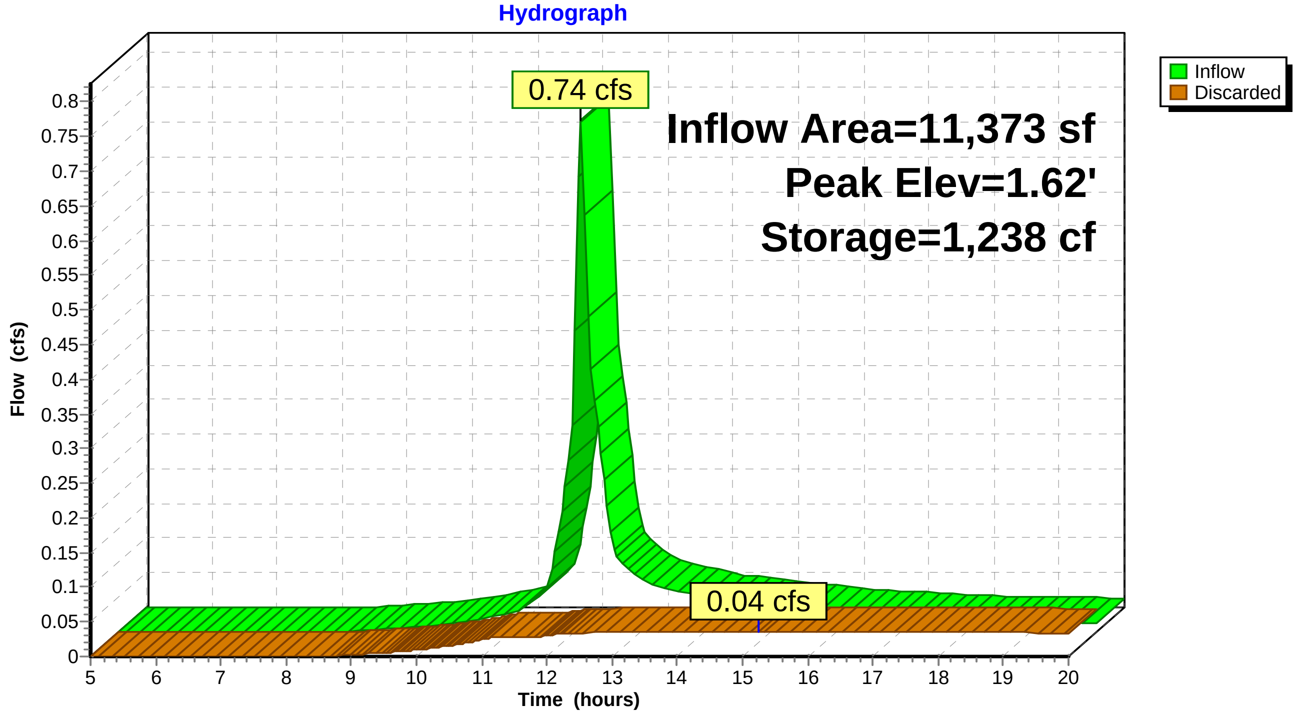
Chamber Storage + Stone Storage = 2,495.3 cf = 0.057 af
Overall Storage Efficiency = 62.2%
Overall System Size = 101.50' x 11.17' x 3.54'

28 Chambers
148.7 cy Field
93.8 cy Stone





Pond 22P: Roof Recharge



Summary for Pond 30P: BASIN A

[82] Warning: Early inflow requires earlier time span

Inflow Area =	18,459 sf,	78.24% Impervious,	Inflow Depth > 3.78"	for 10-Year event	
Inflow =	2.10 cfs @	12.00 hrs,	Volume=	5,810 cf	
Outflow =	0.19 cfs @	12.71 hrs,	Volume=	5,716 cf,	Atten= 91%, Lag= 42.7 min
Discarded =	0.19 cfs @	12.71 hrs,	Volume=	5,716 cf	
Primary =	0.00 cfs @	5.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 239.45' @ 12.71 hrs Surf.Area= 2,481 sf Storage= 2,424 cf

Plug-Flow detention time= 118.6 min calculated for 5,715 cf (98% of inflow)
Center-of-Mass det. time= 111.3 min (853.7 - 742.3)

Volume	Invert	Avail.Storage	Storage Description
#1	238.20'	7,401 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

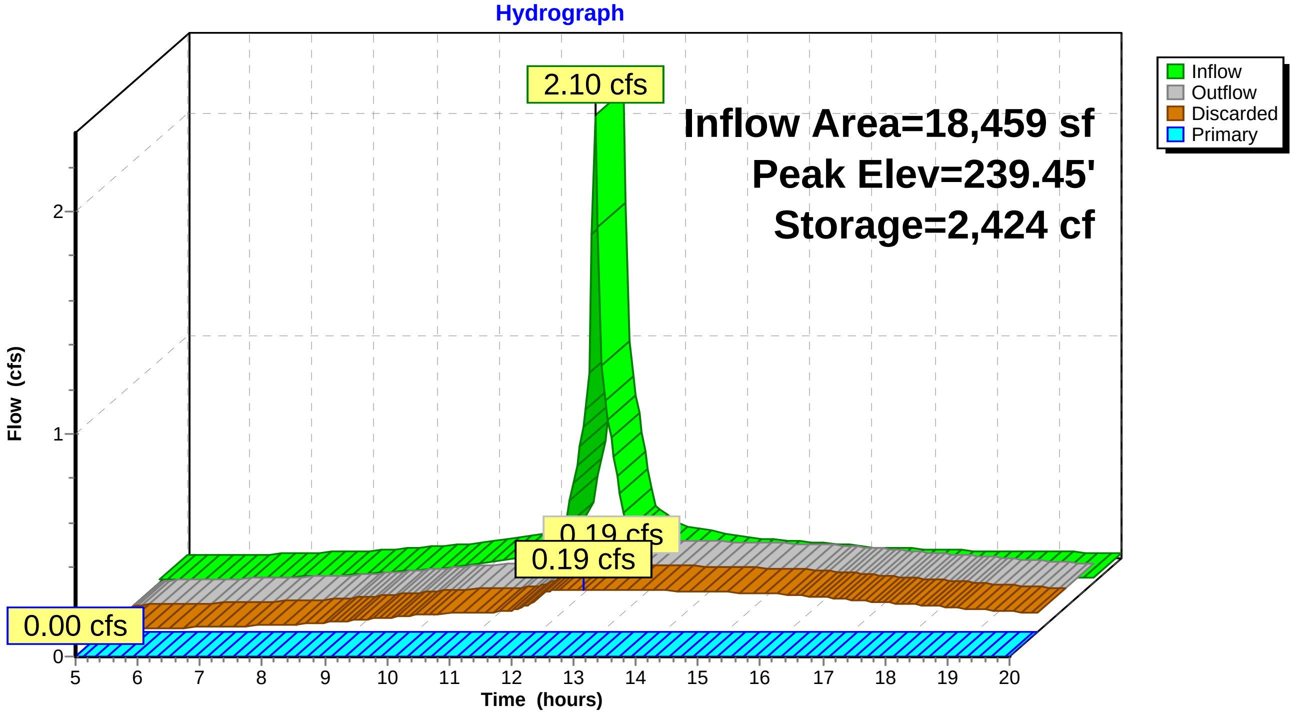
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
238.20	1,411	262.1	0	0	1,411
239.00	2,083	297.8	1,389	1,389	3,017
240.00	3,005	316.6	2,530	3,919	3,986
241.00	3,983	335.5	3,483	7,401	5,020

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.20'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.00'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.19 cfs @ 12.71 hrs HW=239.45' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=238.20' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 30P: BASIN A



Summary for Pond 31P: BASIN D

Inflow Area = 90,014 sf, 45.84% Impervious, Inflow Depth > 2.62" for 10-Year event
Inflow = 6.63 cfs @ 12.09 hrs, Volume= 19,639 cf
Outflow = 0.69 cfs @ 12.95 hrs, Volume= 18,717 cf, Atten= 90%, Lag= 51.4 min
Discarded = 0.69 cfs @ 12.95 hrs, Volume= 18,717 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 240.26' @ 12.95 hrs Surf.Area= 8,298 sf Storage= 8,586 cf

Plug-Flow detention time= 131.6 min calculated for 18,655 cf (95% of inflow)
Center-of-Mass det. time= 114.2 min (899.1 - 784.9)

Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	24,822 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

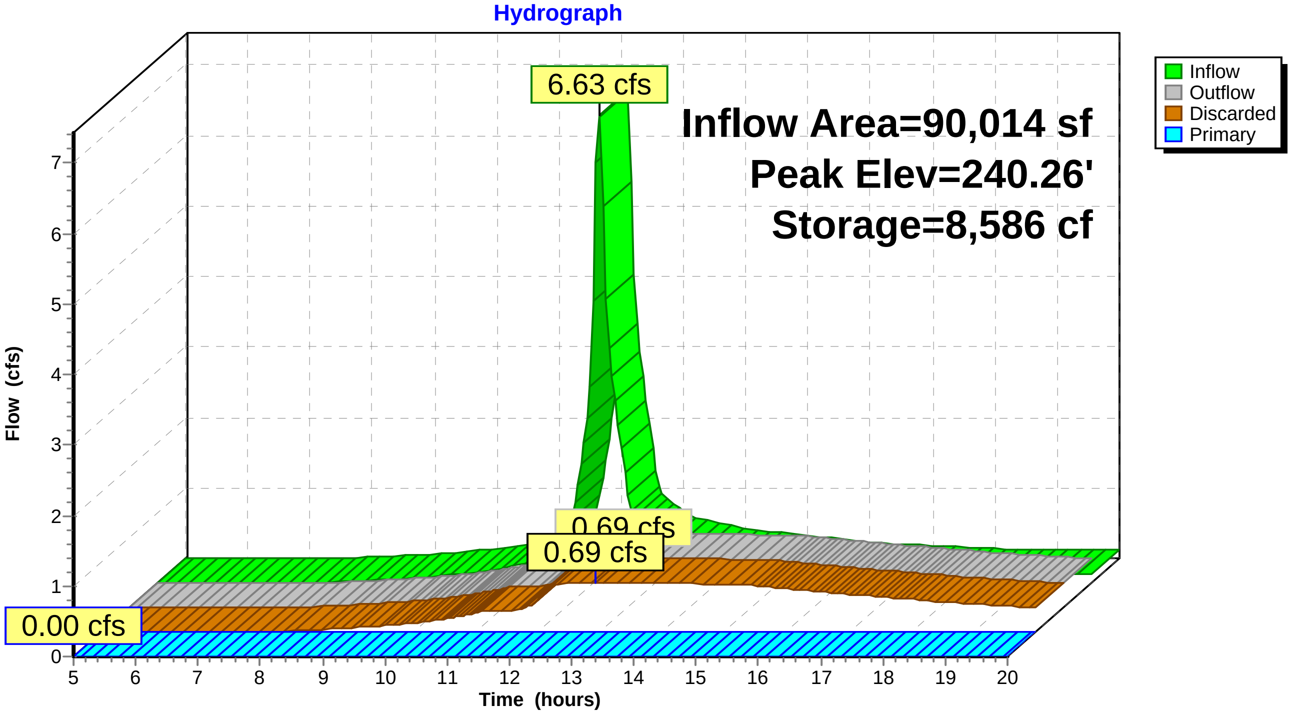
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	5,028	276.6	0	0	5,028
240.00	7,979	406.4	6,447	6,447	12,091
241.00	9,227	425.3	8,595	15,042	13,409
241.90	12,593	472.4	9,780	24,822	16,798

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.69 cfs @ 12.95 hrs HW=240.26' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.69 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=239.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 31P: BASIN D



Summary for Pond 32P: BASIN C

Inflow Area = 188,274 sf, 48.56% Impervious, Inflow Depth > 2.03" for 10-Year event
Inflow = 9.35 cfs @ 12.14 hrs, Volume= 31,885 cf
Outflow = 1.32 cfs @ 12.94 hrs, Volume= 30,126 cf, Atten= 86%, Lag= 48.0 min
Discarded = 1.32 cfs @ 12.94 hrs, Volume= 30,126 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 225.42' @ 12.94 hrs Surf.Area= 13,698 sf Storage= 13,706 cf

Plug-Flow detention time= 124.2 min calculated for 30,026 cf (94% of inflow)
Center-of-Mass det. time= 104.7 min (907.3 - 802.6)

Volume	Invert	Avail.Storage	Storage Description
#1	224.00'	38,476 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

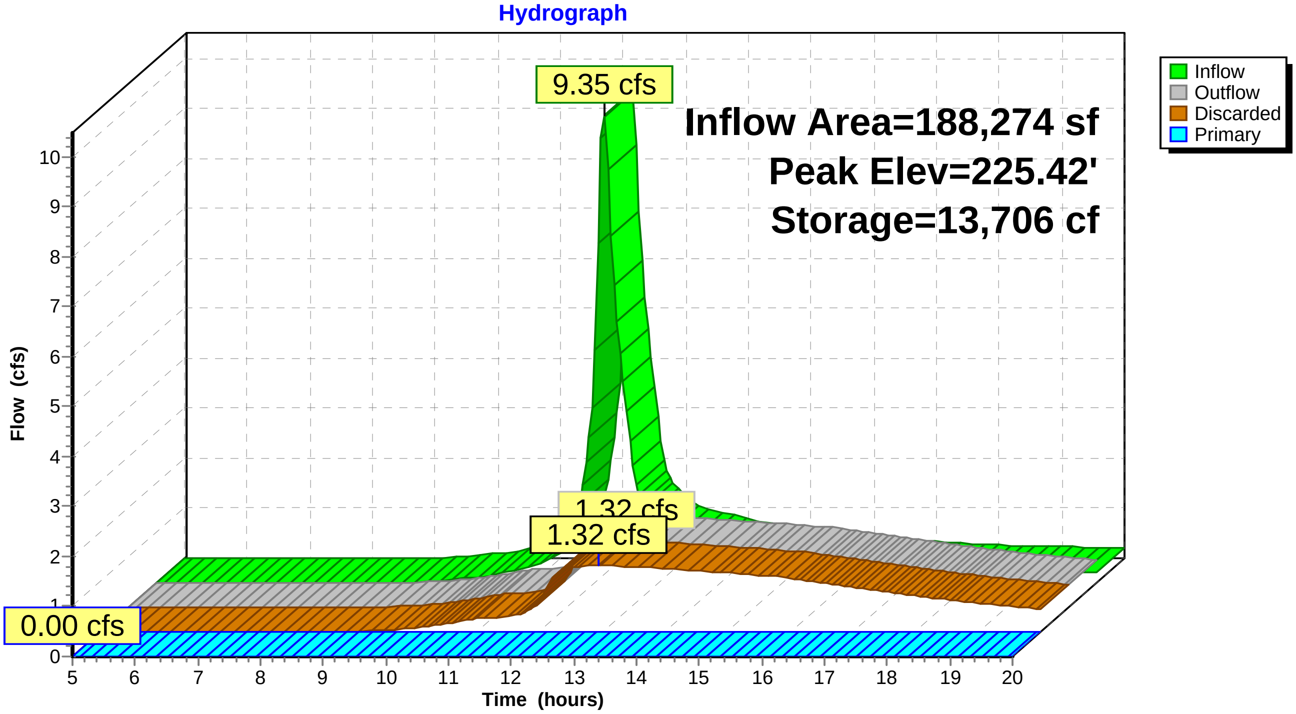
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
224.00	4,753	268.4	0	0	4,753
225.00	12,400	506.3	8,277	8,277	19,424
226.00	15,628	628.5	13,983	22,260	30,474
226.90	20,519	675.7	16,216	38,476	35,408

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	225.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.32 cfs @ 12.94 hrs HW=225.42' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 1.32 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=224.00' (Free Discharge)
└—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 32P: BASIN C



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 34S: 10 Unit Roof Runoff Area=10,448 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=1.26 cfs 4,244 cf

Subcatchment 35S: 14 Unit Roof Runoff Area=13,061 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=1.58 cfs 5,305 cf

Subcatchment 36S: 14 Unit Roof Runoff Area=13,061 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=1.58 cfs 5,305 cf

Subcatchment 37S: 7 Unit Roof Runoff Area=7,296 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.88 cfs 2,963 cf

Subcatchment LOT 1: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.14 cfs 487 cf

Subcatchment LOT 12: DUPLEX + YARD Runoff Area=11,373 sf 43.34% Impervious Runoff Depth>2.93"
Tc=6.0 min CN=78 Runoff=0.94 cfs 2,779 cf

Subcatchment LOT 13: DUPLEX + YARD Runoff Area=11,720 sf 42.06% Impervious Runoff Depth>3.91"
Tc=6.0 min CN=88 Runoff=1.24 cfs 3,823 cf

Subcatchment LOT 14: DUPLEX + YARD Runoff Area=13,086 sf 37.67% Impervious Runoff Depth>3.81"
Tc=6.0 min CN=87 Runoff=1.36 cfs 4,156 cf

Subcatchment LOT 18: DUPLEX ROOF Runoff Area=4,929 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.60 cfs 2,002 cf

Subcatchment LOT 19: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.49 cfs 1,649 cf

Subcatchment LOT 2: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.14 cfs 487 cf

Subcatchment LOT 20: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.49 cfs 1,649 cf

Subcatchment LOT 21: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.49 cfs 1,649 cf

Subcatchment LOT 3: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.14 cfs 487 cf

Subcatchment LOT 8: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=0.14 cfs 487 cf

Subcatchment PRDA-1: TO BASIN D Runoff Area=51,731 sf 56.02% Impervious Runoff Depth>3.21"
Tc=6.0 min CN=81 Runoff=4.66 cfs 13,859 cf

Subcatchment PRDA-10: TO ILSF Runoff Area=14,656 sf 0.00% Impervious Runoff Depth>0.63"
Flow Length=85' Tc=15.0 min CN=47 Runoff=0.13 cfs 767 cf

Subcatchment PRDA-11: BASIN A DIRECT Runoff Area=8,000 sf 49.79% Impervious Runoff Depth>4.02"
Tc=0.0 min CN=89 Runoff=1.01 cfs 2,682 cf

Subcatchment PRDA-12: BASIN B DIRECT Runoff Area=16,454 sf 45.11% Impervious Runoff Depth>2.93"
Tc=6.0 min CN=78 Runoff=1.36 cfs 4,021 cf

Subcatchment PRDA-13: BASIN C DIRECT Runoff Area=31,453 sf 49.69% Impervious Runoff Depth>3.03"
Tc=6.0 min CN=79 Runoff=2.68 cfs 7,930 cf

Subcatchment PRDA-2: TO BASIN A Runoff Area=10,459 sf 100.00% Impervious Runoff Depth>4.87"
Tc=0.0 min CN=98 Runoff=1.48 cfs 4,249 cf

Subcatchment PRDA-3: TO BASIN B Runoff Area=151,241 sf 36.39% Impervious Runoff Depth>1.90"
Flow Length=520' Tc=13.1 min CN=66 Runoff=6.46 cfs 23,953 cf

Subcatchment PRDA-4: TO BASIN C Runoff Area=156,821 sf 48.34% Impervious Runoff Depth>2.57"
Flow Length=370' Tc=10.4 min CN=74 Runoff=9.97 cfs 33,563 cf

Subcatchment PRDA-5: BASIN D DIRECT Runoff Area=38,283 sf 32.09% Impervious Runoff Depth>3.41"
Tc=6.0 min CN=83 Runoff=3.63 cfs 10,876 cf

Subcatchment PRDA-6: TO BASIN E Runoff Area=135,239 sf 32.90% Impervious Runoff Depth>2.57"
Tc=6.0 min CN=74 Runoff=9.87 cfs 28,989 cf

Subcatchment PRDA-7: TO WETLAND Runoff Area=149,386 sf 2.80% Impervious Runoff Depth>0.92"
Tc=6.0 min CN=52 Runoff=3.23 cfs 11,466 cf

Subcatchment PRDA-8: TO WETLAND Runoff Area=46,646 sf 0.00% Impervious Runoff Depth>1.05"
Tc=6.0 min CN=54 Runoff=1.21 cfs 4,069 cf

Subcatchment PRDA-9: TO WETLAND Runoff Area=80,362 sf 11.49% Impervious Runoff Depth>3.03"
Tc=6.0 min CN=79 Runoff=6.85 cfs 20,262 cf

Reach 1R: ILSF Inflow=0.13 cfs 767 cf
Outflow=0.13 cfs 767 cf

Reach 14R: WETLAND SOUTH Inflow=6.85 cfs 20,262 cf
Outflow=6.85 cfs 20,262 cf

Reach 15R: WETLAND SOUTHEAST Inflow=1.21 cfs 6,608 cf
Outflow=1.21 cfs 6,608 cf

Reach 21R: WETLAND NORTH Inflow=3.23 cfs 13,169 cf
Outflow=3.23 cfs 13,169 cf

Pond 1P: Roof Recharge Peak Elev=1.62' Storage=1,723 cf Inflow=1.26 cfs 4,244 cf
Outflow=0.10 cfs 3,967 cf

Pond 2P: Roof Recharge Peak Elev=1.86' Storage=2,977 cf Inflow=1.58 cfs 5,305 cf
Outflow=0.06 cfs 2,828 cf

Pond 3P: Roof Recharge Peak Elev=1.86' Storage=2,977 cf Inflow=1.58 cfs 5,305 cf
Outflow=0.06 cfs 2,828 cf

Pond 4P: Roof Recharge Peak Elev=1.89' Storage=1,652 cf Inflow=0.88 cfs 2,963 cf
Outflow=0.04 cfs 1,611 cf

Pond 5P: Roof Recharge Peak Elev=1.96' Storage=252 cf Inflow=0.14 cfs 487 cf
Outflow=0.01 cfs 322 cf

Pond 6P: Roof Recharge Peak Elev=1.38' Storage=811 cf Inflow=0.49 cfs 1,649 cf
Outflow=0.03 cfs 1,133 cf

Pond 7P: Roof Recharge Peak Elev=1.73' Storage=1,059 cf Inflow=0.60 cfs 2,002 cf
Outflow=0.03 cfs 1,216 cf

Pond 8P: Roof Recharge Peak Elev=1.96' Storage=252 cf Inflow=0.14 cfs 487 cf
Outflow=0.01 cfs 322 cf

Pond 9P: BASIN E Peak Elev=240.93' Storage=16,617 cf Inflow=9.87 cfs 28,989 cf
Discarded=0.40 cfs 12,939 cf Primary=0.37 cfs 1,703 cf Outflow=0.77 cfs 14,643 cf

Pond 10P: Roof Recharge Peak Elev=1.96' Storage=252 cf Inflow=0.14 cfs 487 cf
Outflow=0.01 cfs 322 cf

Pond 11P: Roof Recharge Peak Elev=1.38' Storage=811 cf Inflow=0.49 cfs 1,649 cf
Outflow=0.03 cfs 1,133 cf

Pond 13P: Roof Recharge Peak Elev=1.96' Storage=252 cf Inflow=0.14 cfs 487 cf
Outflow=0.01 cfs 322 cf

Pond 14P: Roof Recharge Peak Elev=1.49' Storage=843 cf Inflow=0.49 cfs 1,649 cf
Outflow=0.02 cfs 1,053 cf

Pond 17P: Roof Recharge Peak Elev=2.12' Storage=2,525 cf Inflow=1.36 cfs 4,156 cf
Outflow=0.05 cfs 1,939 cf

Pond 19P: Roof Recharge Peak Elev=2.15' Storage=1,777 cf Inflow=1.24 cfs 3,823 cf
Outflow=0.09 cfs 3,076 cf

Pond 21P: BASIN B Peak Elev=227.93' Storage=15,017 cf Inflow=7.35 cfs 27,974 cf
Discarded=0.39 cfs 12,228 cf Primary=0.47 cfs 2,539 cf Outflow=0.85 cfs 14,768 cf

Pond 22P: Roof Recharge Peak Elev=2.16' Storage=1,692 cf Inflow=0.94 cfs 2,779 cf
Outflow=0.04 cfs 1,314 cf

Pond 30P: BASIN A Peak Elev=239.69' Storage=3,039 cf Inflow=2.49 cfs 6,931 cf
Discarded=0.21 cfs 6,497 cf Primary=0.00 cfs 0 cf Outflow=0.21 cfs 6,497 cf

Pond 31P: BASIN D Peak Elev=240.61' Storage=11,557 cf Inflow=8.29 cfs 24,735 cf
Discarded=0.72 cfs 21,915 cf Primary=0.00 cfs 0 cf Outflow=0.72 cfs 21,915 cf

Pond 32P: BASIN C Peak Elev=225.78' Storage=18,870 cf Inflow=12.19 cfs 41,493 cf
Discarded=1.55 cfs 37,848 cf Primary=0.00 cfs 0 cf Outflow=1.55 cfs 37,848 cf

Total Runoff Area = 992,682 sf Runoff Volume = 204,159 cf Average Runoff Depth = 2.47"
64.94% Pervious = 644,625 sf 35.06% Impervious = 348,057 sf

Summary for Subcatchment 34S: 10 Unit Roof

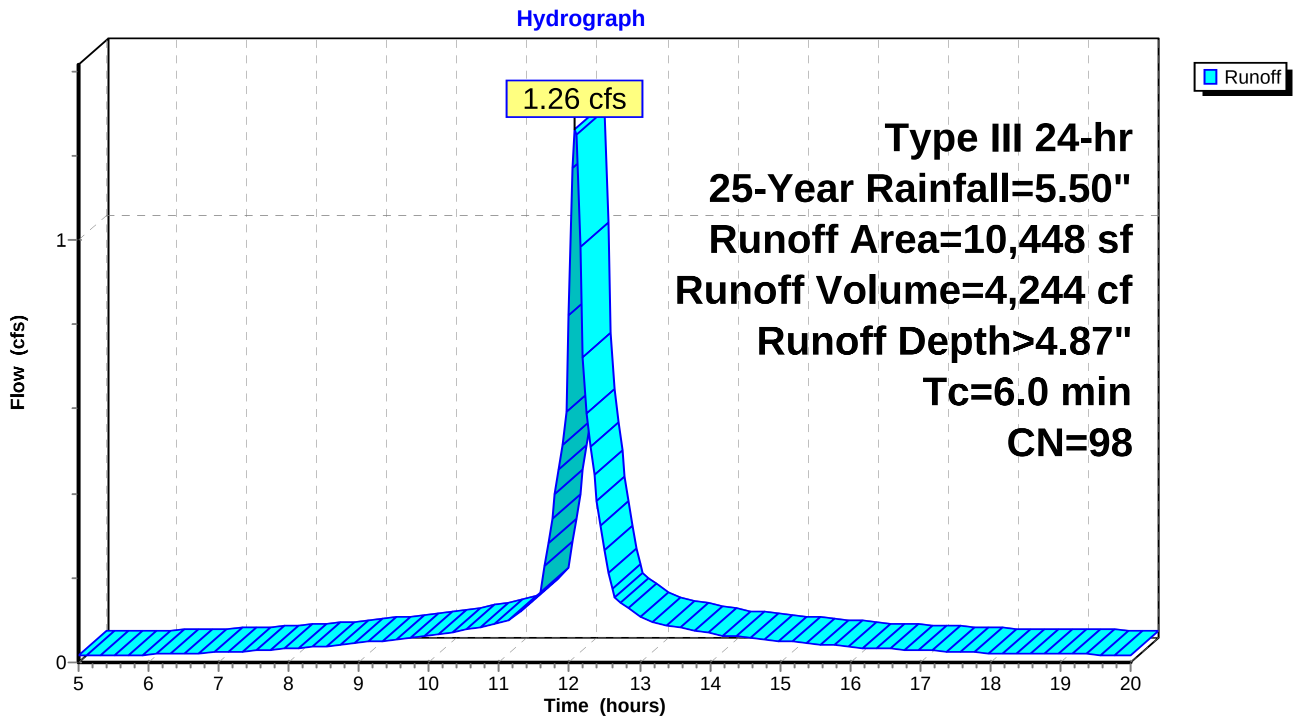
Runoff = 1.26 cfs @ 12.09 hrs, Volume= 4,244 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	10,448	98	Impervious
	10,448		100.00% Impervious Area

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

Subcatchment 34S: 10 Unit Roof



Summary for Subcatchment 35S: 14 Unit Roof

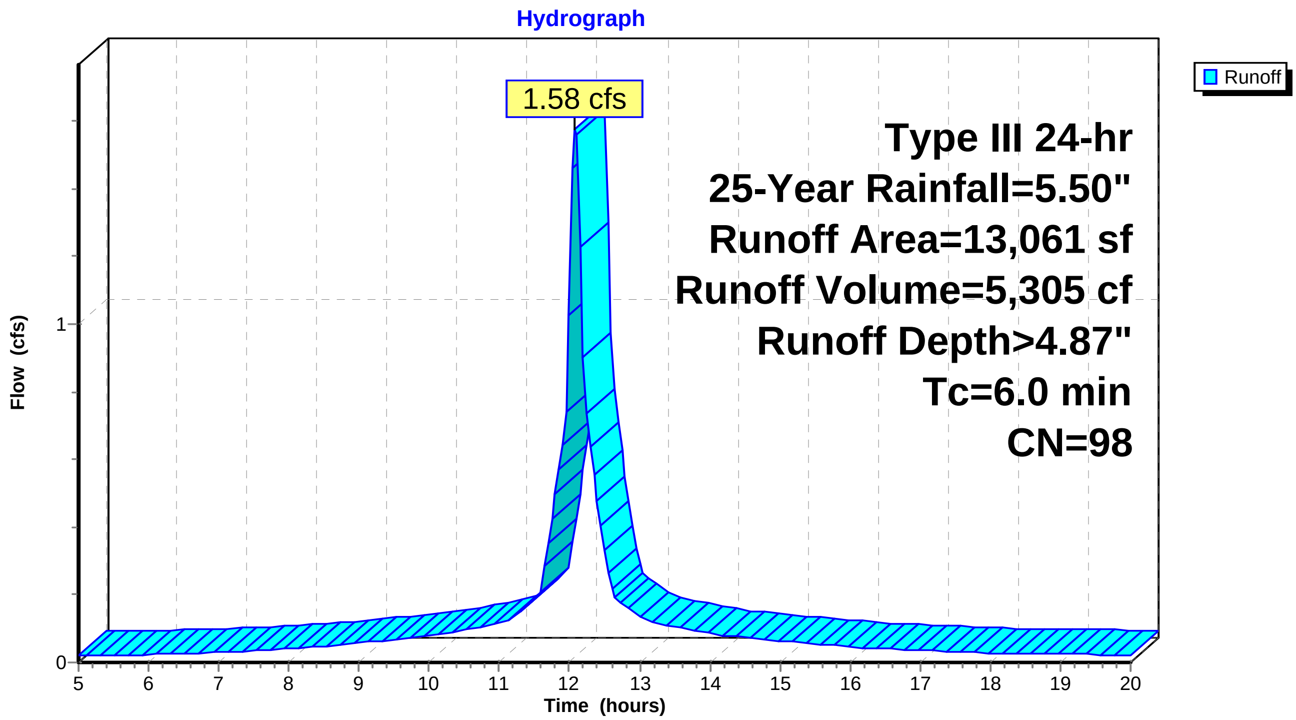
Runoff = 1.58 cfs @ 12.09 hrs, Volume= 5,305 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	13,061	98	Impervious
	13,061		100.00% Impervious Area

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

Subcatchment 35S: 14 Unit Roof



Summary for Subcatchment 36S: 14 Unit Roof

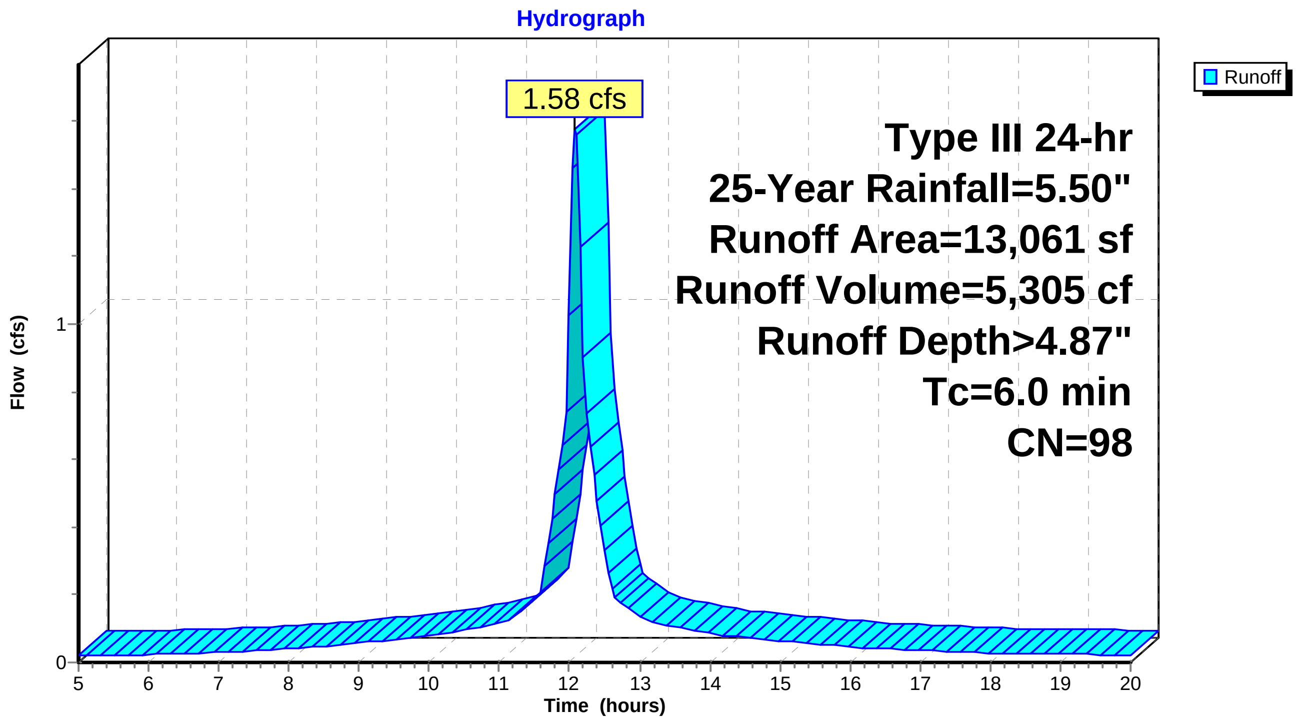
Runoff = 1.58 cfs @ 12.09 hrs, Volume= 5,305 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	13,061	98	Impervious
	13,061		100.00% Impervious Area

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

Subcatchment 36S: 14 Unit Roof



Summary for Subcatchment 37S: 7 Unit Roof

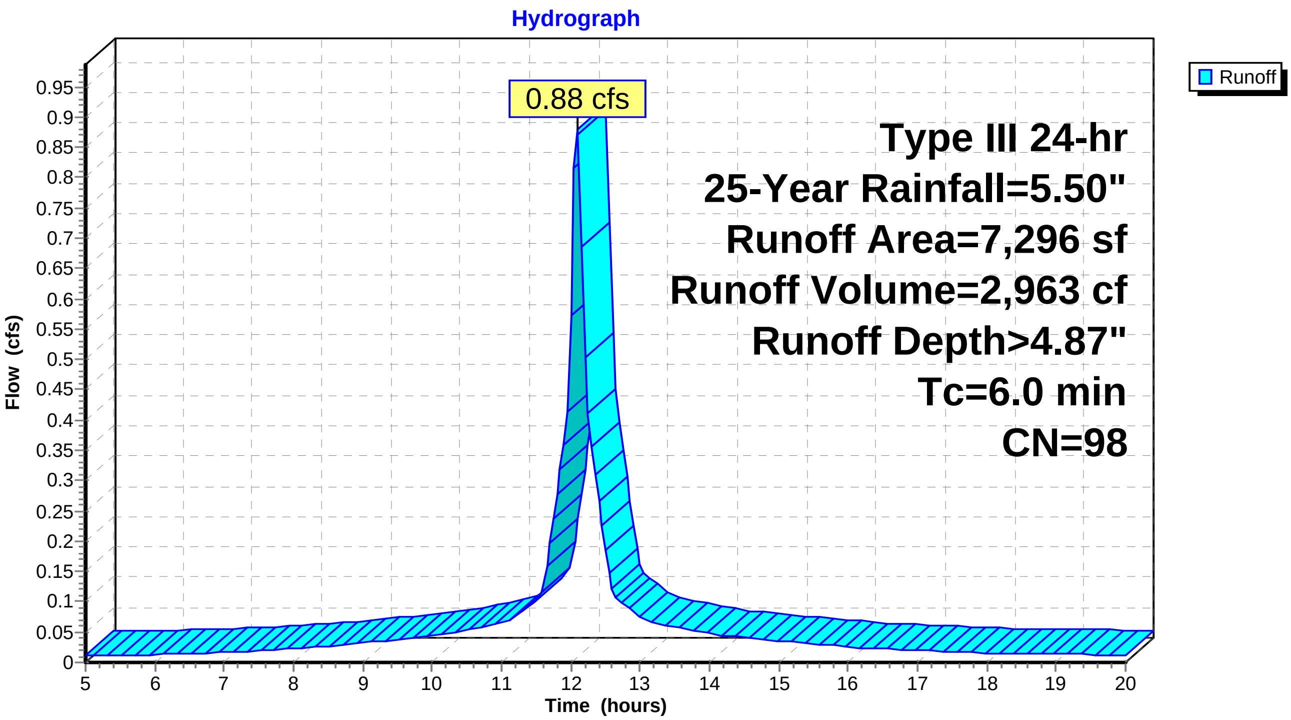
Runoff = 0.88 cfs @ 12.09 hrs, Volume= 2,963 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	7,296	98	Impervious
	7,296		100.00% Impervious Area

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

Subcatchment 37S: 7 Unit Roof



Summary for Subcatchment LOT 1: Single Family House

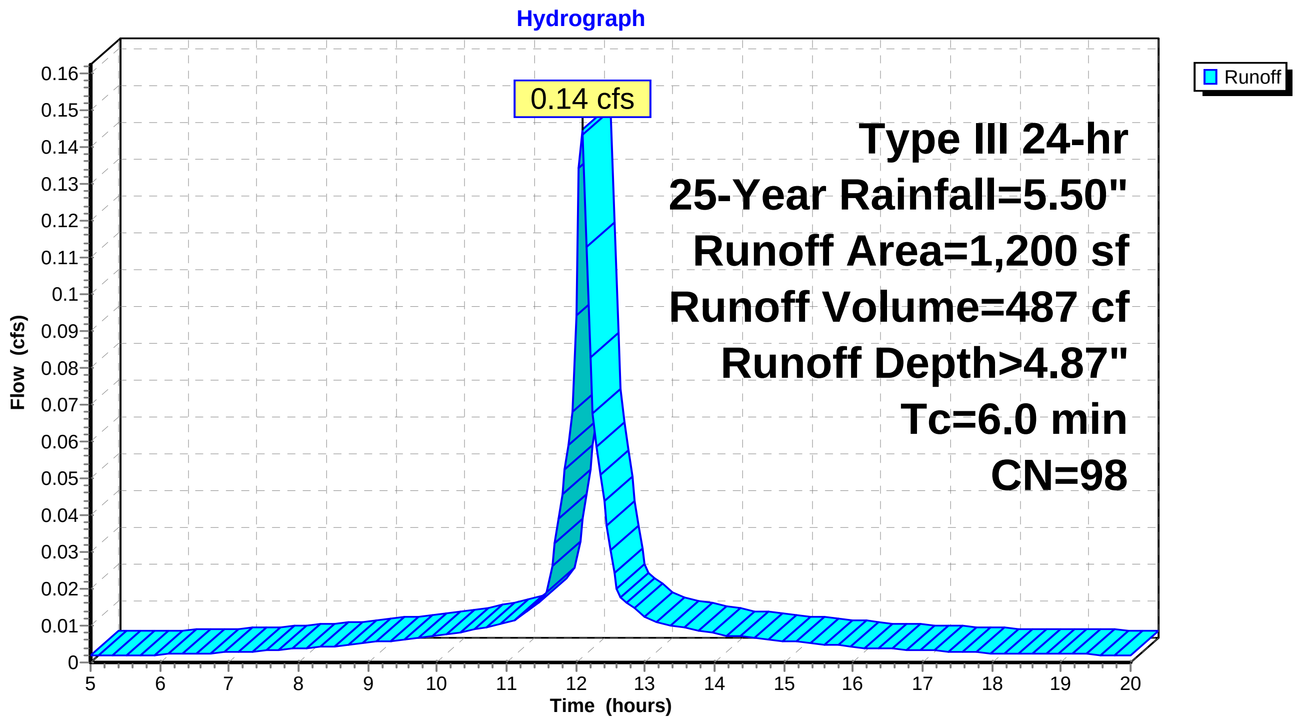
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 487 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 1: Single Family House



Summary for Subcatchment LOT 12: DUPLEX + YARD

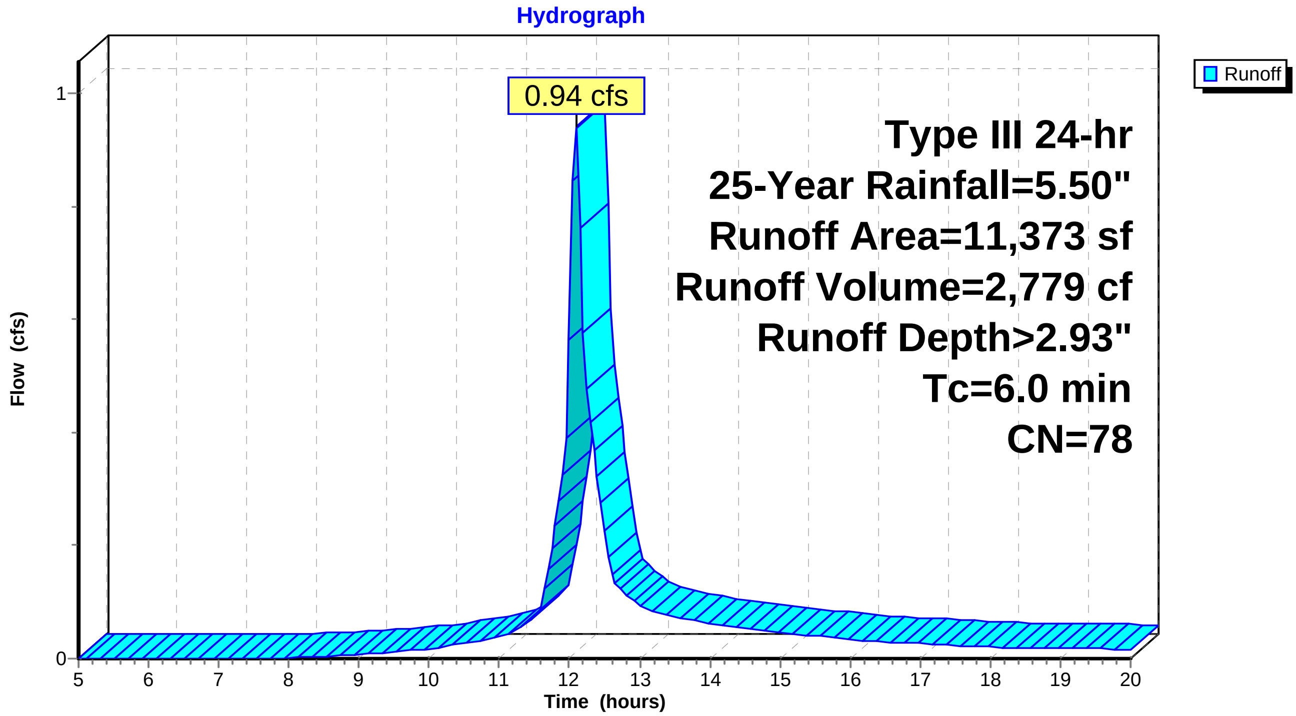
Runoff = 0.94 cfs @ 12.09 hrs, Volume= 2,779 cf, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	490	80	>75% Grass cover, Good, HSG D
	5,954	61	>75% Grass cover, Good, HSG B
	11,373	78	Weighted Average
	6,444		56.66% Pervious Area
	4,929		43.34% Impervious Area

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

Subcatchment LOT 12: DUPLEX + YARD



Summary for Subcatchment LOT 13: DUPLEX + YARD

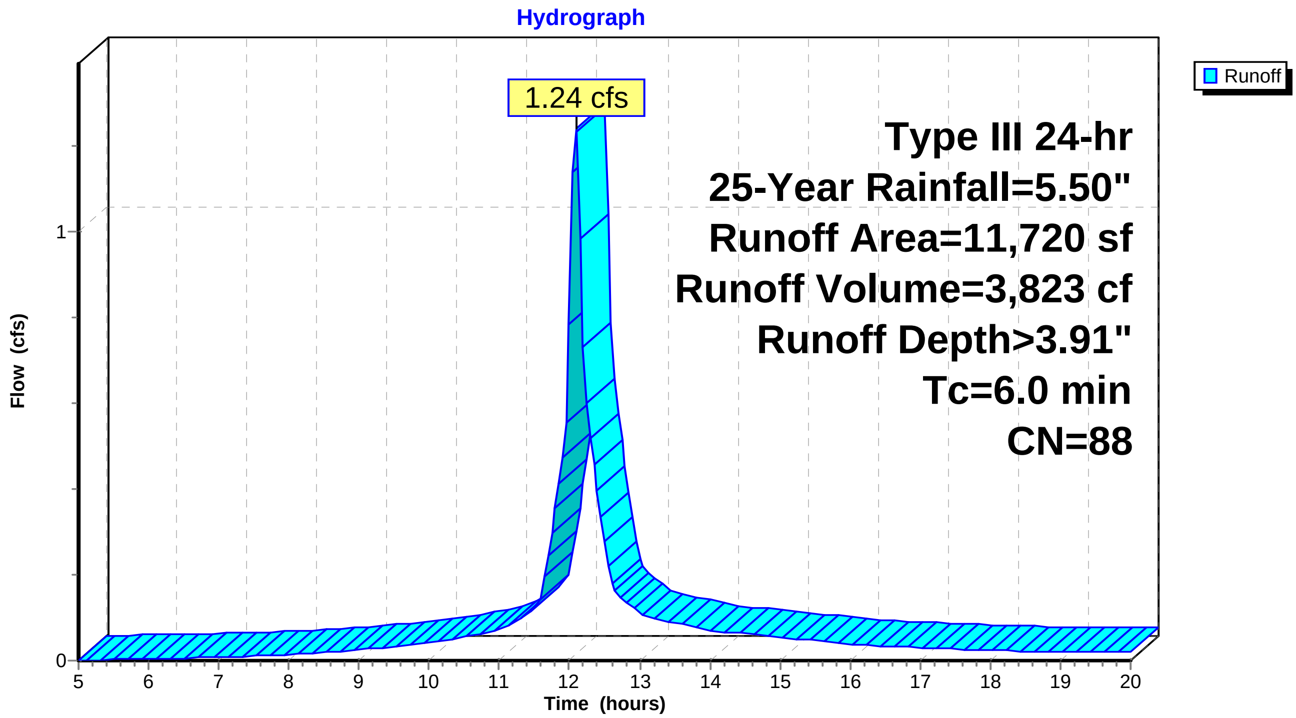
Runoff = 1.24 cfs @ 12.09 hrs, Volume= 3,823 cf, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	6,791	80	>75% Grass cover, Good, HSG D
	11,720	88	Weighted Average
	6,791		57.94% Pervious Area
	4,929		42.06% Impervious Area

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

Subcatchment LOT 13: DUPLEX + YARD



Summary for Subcatchment LOT 14: DUPLEX + YARD

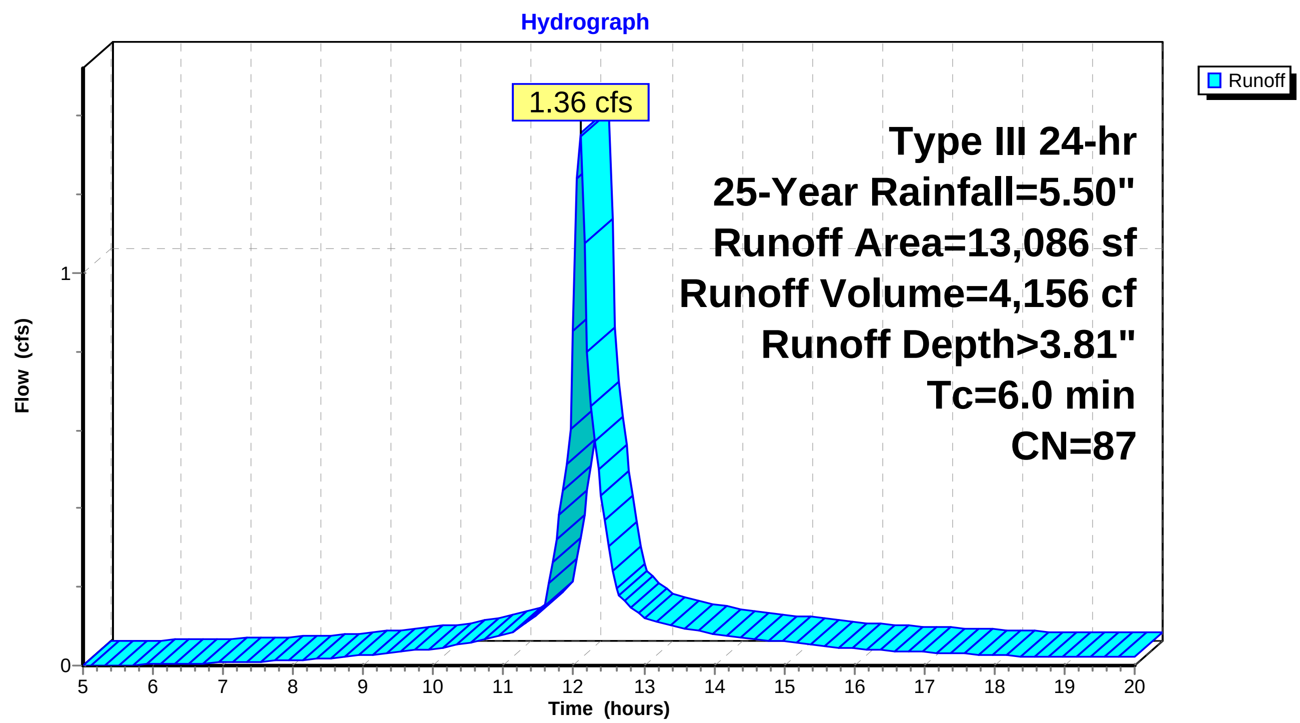
Runoff = 1.36 cfs @ 12.09 hrs, Volume= 4,156 cf, Depth> 3.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	8,157	80	>75% Grass cover, Good, HSG D
	13,086	87	Weighted Average
	8,157		62.33% Pervious Area
	4,929		37.67% Impervious Area

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

Subcatchment LOT 14: DUPLEX + YARD



Summary for Subcatchment LOT 18: DUPLEX ROOF

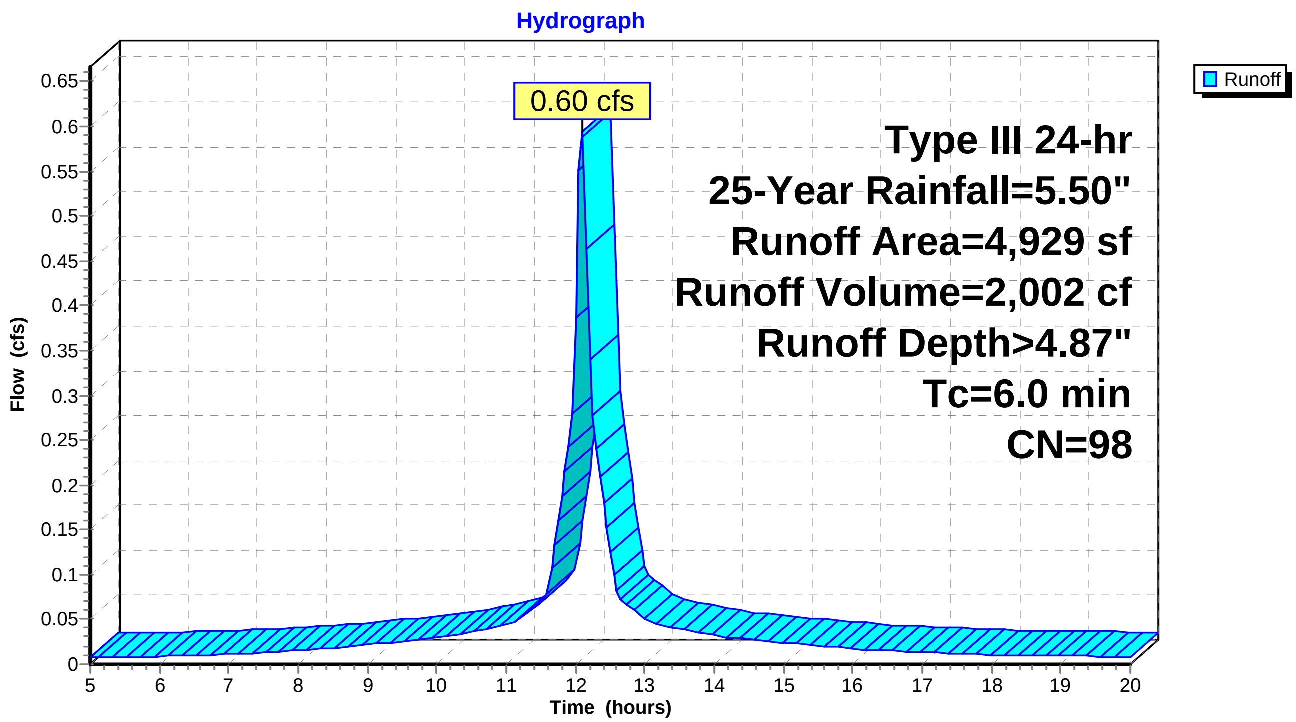
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 2,002 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	4,929		100.00% Impervious Area

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

Subcatchment LOT 18: DUPLEX ROOF



Summary for Subcatchment LOT 19: DUPLEX ROOF

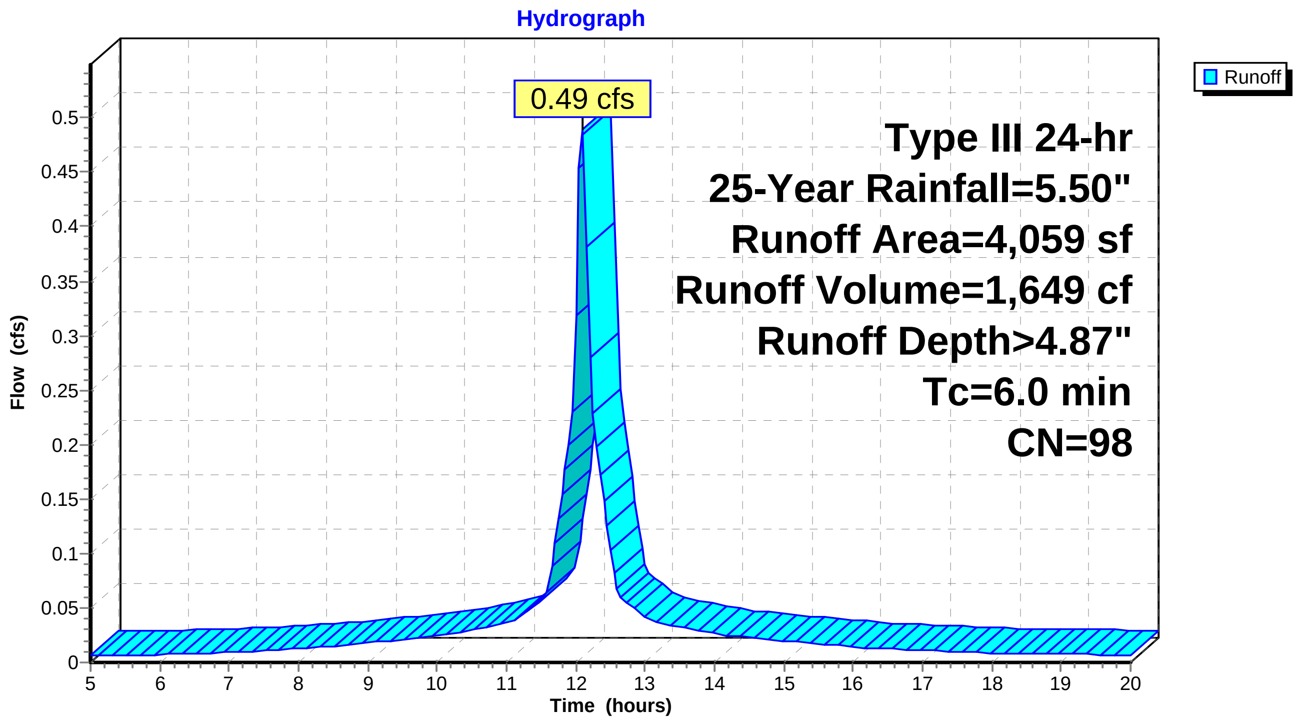
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,649 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 19: DUPLEX ROOF



Summary for Subcatchment LOT 2: Single Family House

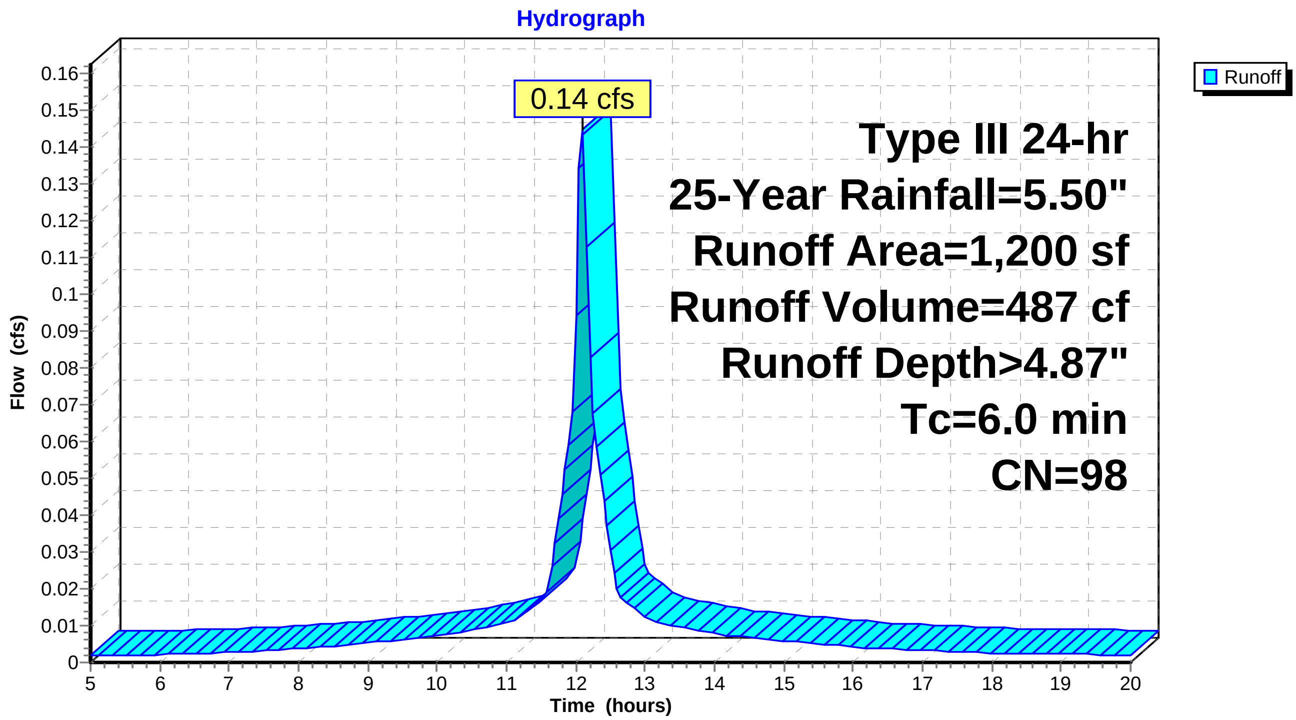
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 487 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 2: Single Family House



Summary for Subcatchment LOT 20: DUPLEX ROOF

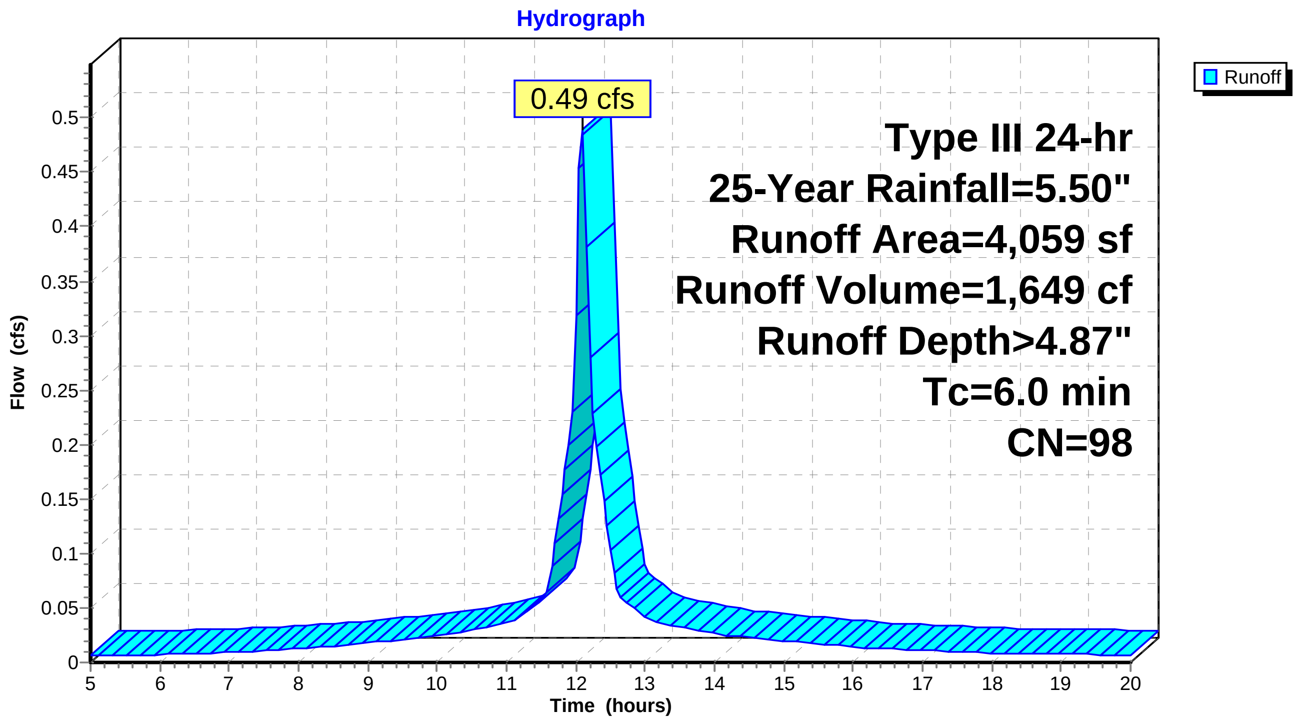
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,649 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 20: DUPLEX ROOF



Summary for Subcatchment LOT 21: DUPLEX ROOF

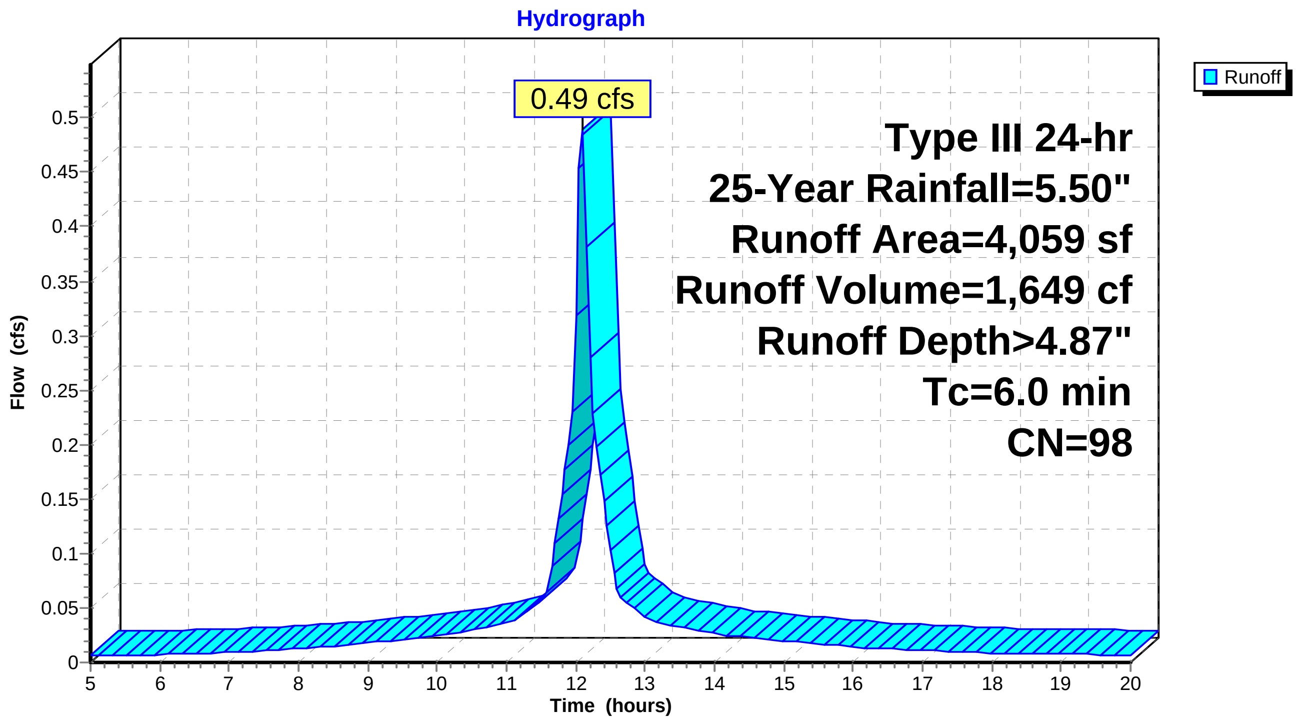
Runoff = 0.49 cfs @ 12.09 hrs, Volume= 1,649 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 21: DUPLEX ROOF



Summary for Subcatchment LOT 3: Single Family House

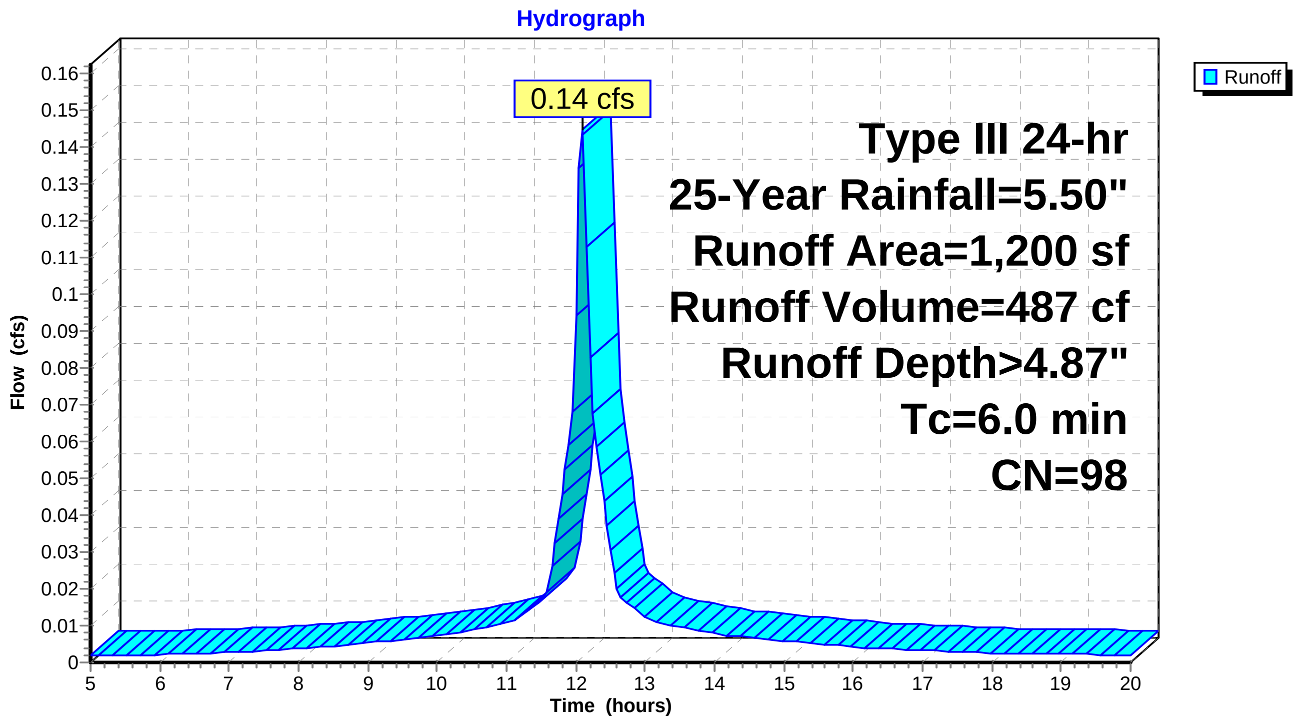
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 487 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 3: Single Family House



Summary for Subcatchment LOT 8: Single Family House

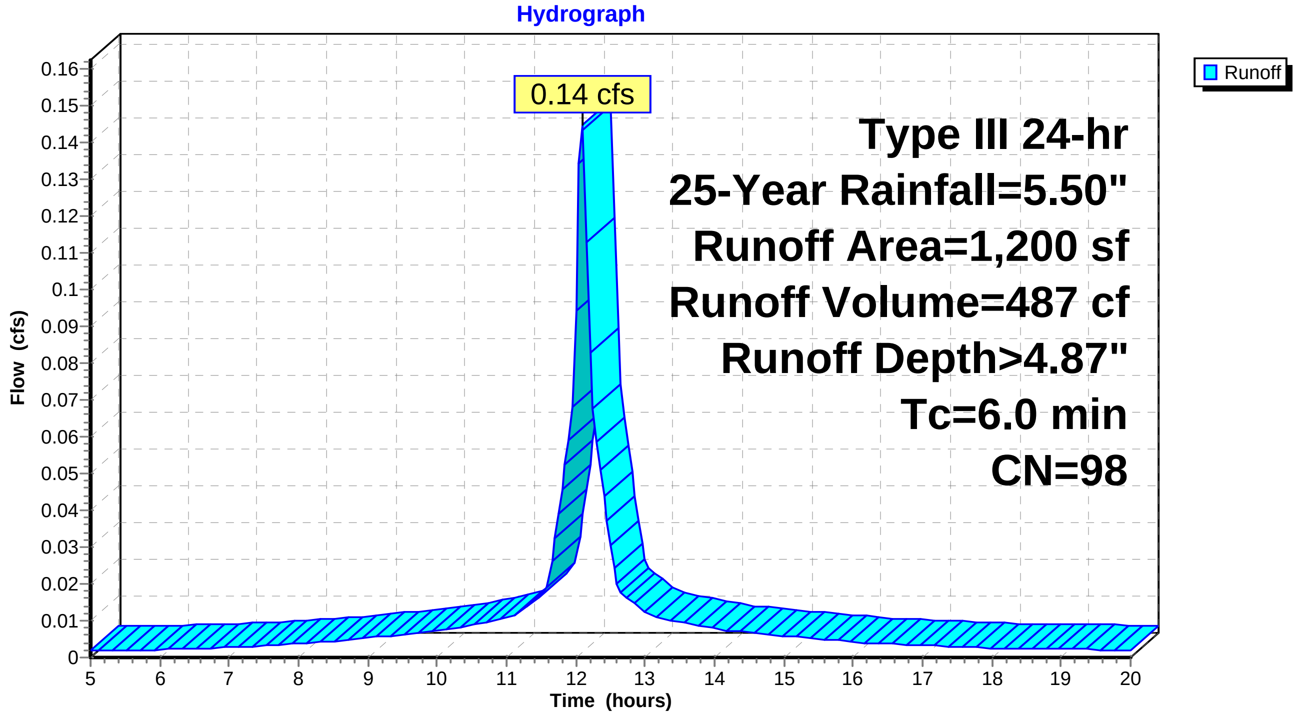
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 487 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 8: Single Family House



Summary for Subcatchment PRDA-1: TO BASIN D

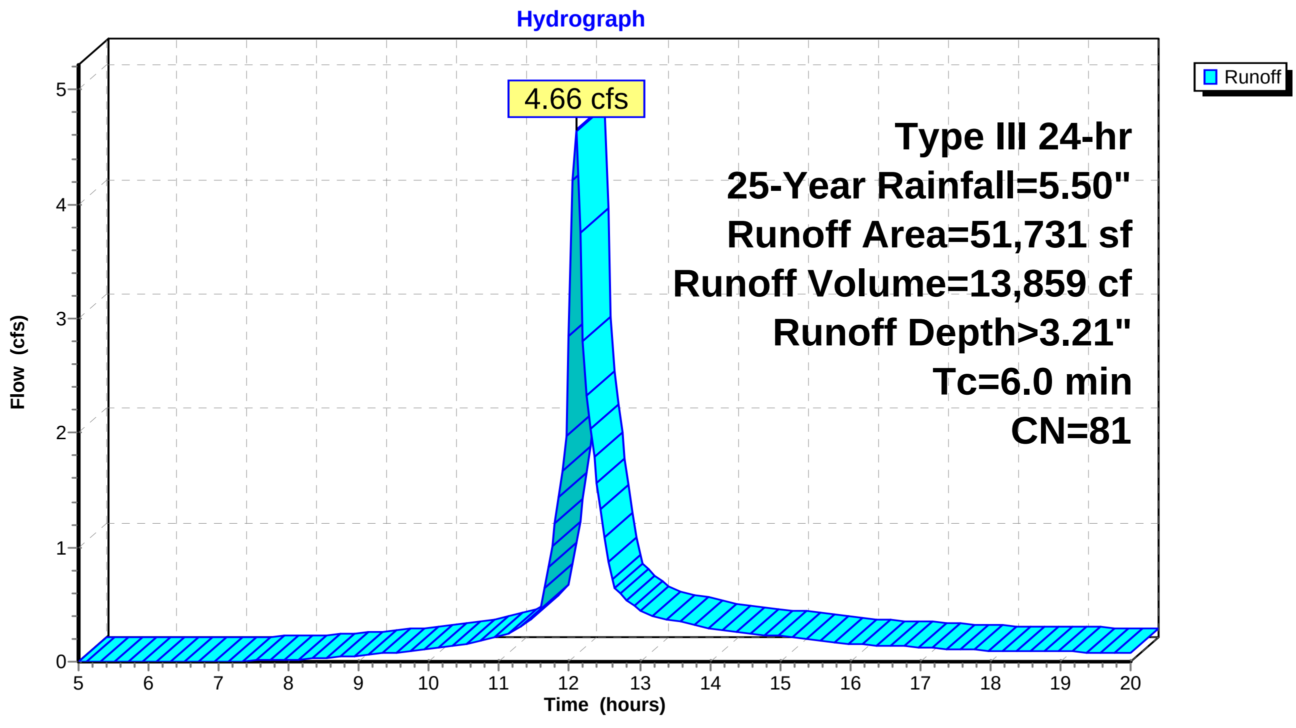
Runoff = 4.66 cfs @ 12.09 hrs, Volume= 13,859 cf, Depth> 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	25,896	98	Impervious
	6,014	54	1/2 acre lots, 25% imp, HSG A
	6,314	80	1/2 acre lots, 25% imp, HSG C
	6,846	39	>75% Grass cover, Good, HSG A
	462	74	>75% Grass cover, Good, HSG C
	6,199	80	>75% Grass cover, Good, HSG D
	51,731	81	Weighted Average
	22,753		43.98% Pervious Area
	28,978		56.02% Impervious Area

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

Subcatchment PRDA-1: TO BASIN D



Summary for Subcatchment PRDA-10: TO ILSF

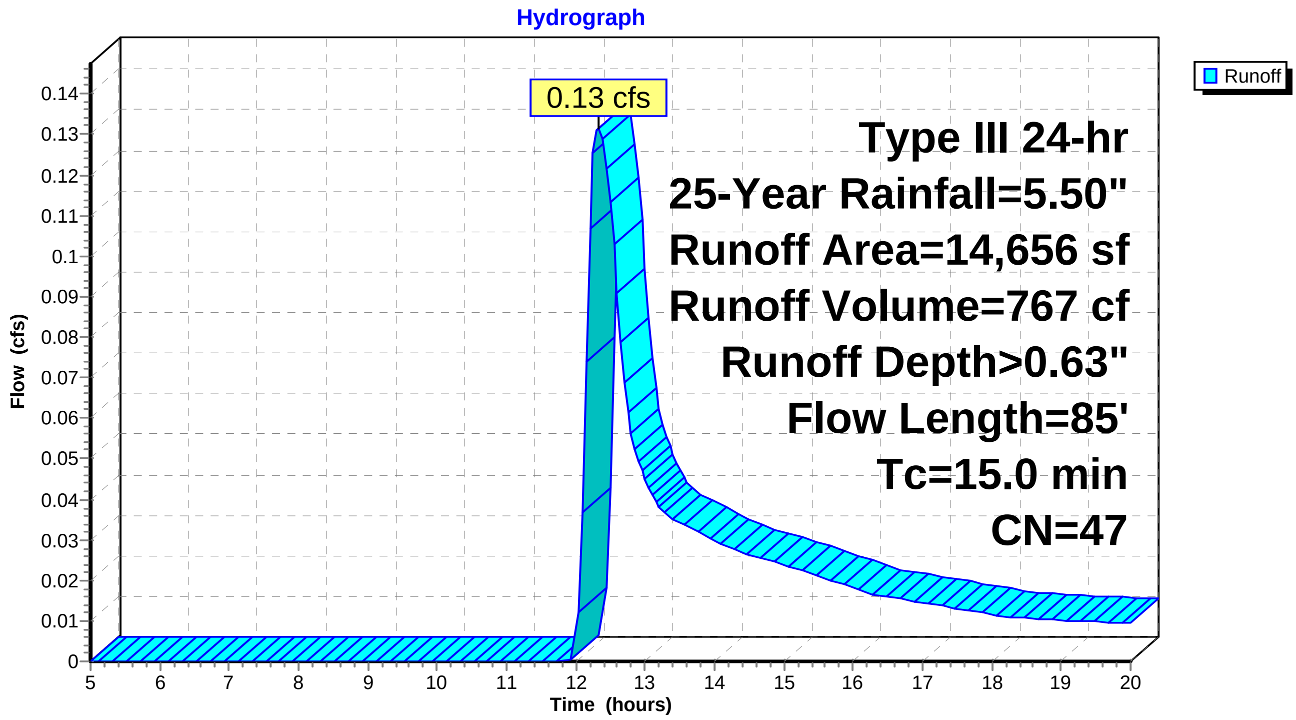
Runoff = 0.13 cfs @ 12.32 hrs, Volume= 767 cf, Depth> 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
1,166	39	>75% Grass cover, Good, HSG A
2,000	80	>75% Grass cover, Good, HSG D
8,622	30	Woods, Good, HSG A
2,868	77	Woods, Good, HSG D
14,656	47	Weighted Average
14,656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	35	0.0220	0.74		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
15.0	85	Total			

Subcatchment PRDA-10: TO ILSF



Summary for Subcatchment PRDA-11: BASIN A DIRECT

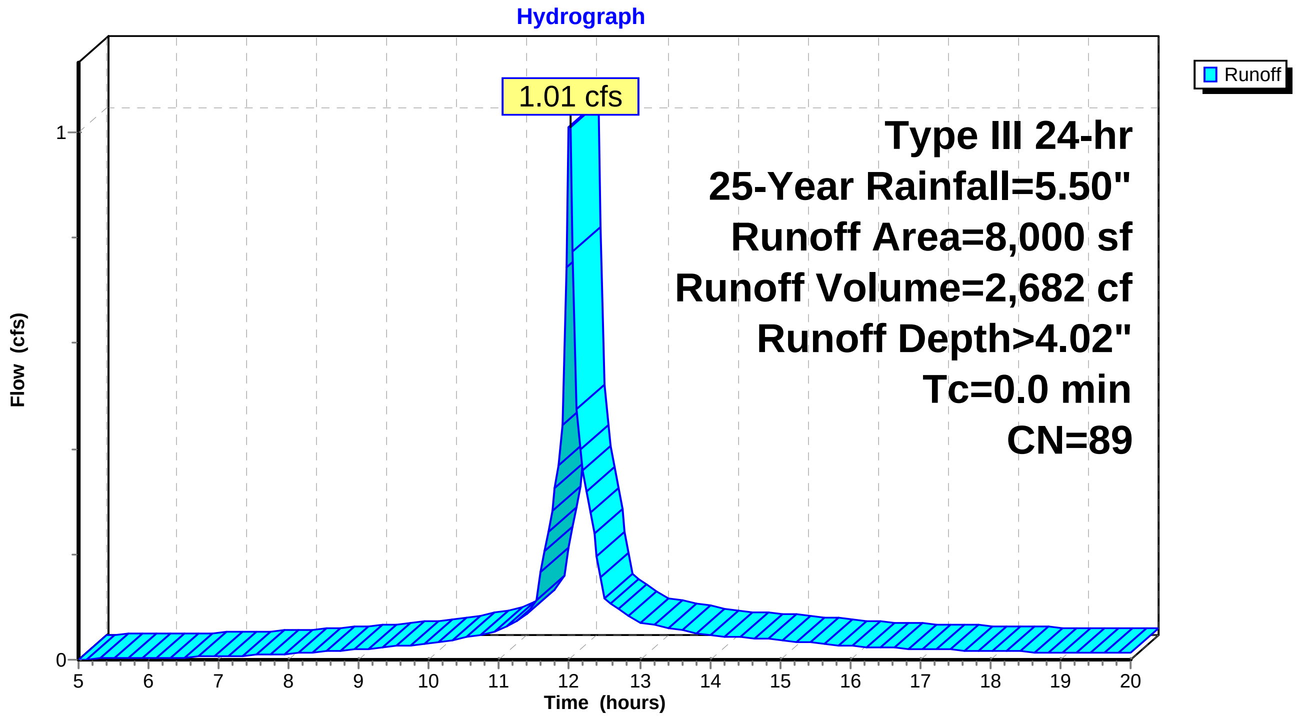
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.01 cfs @ 12.00 hrs, Volume= 2,682 cf, Depth> 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
3,983	98	Water Surface, HSG B
4,017	80	>75% Grass cover, Good, HSG D
8,000	89	Weighted Average
4,017		50.21% Pervious Area
3,983		49.79% Impervious Area

Subcatchment PRDA-11: BASIN A DIRECT



Summary for Subcatchment PRDA-12: BASIN B DIRECT

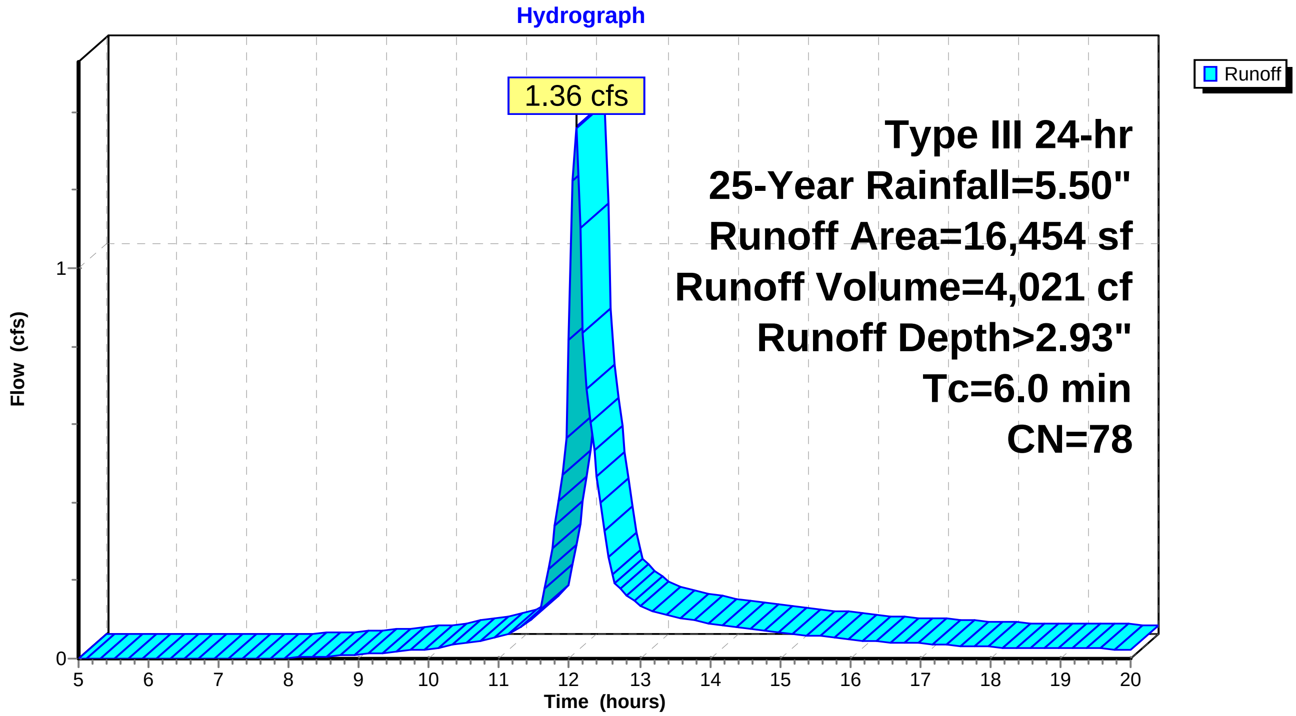
Runoff = 1.36 cfs @ 12.09 hrs, Volume= 4,021 cf, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
7,423	98	Water Surface, HSG D
5,050	80	>75% Grass cover, Good, HSG D
3,981	39	>75% Grass cover, Good, HSG A
16,454	78	Weighted Average
9,031		54.89% Pervious Area
7,423		45.11% Impervious Area

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

Subcatchment PRDA-12: BASIN B DIRECT



Summary for Subcatchment PRDA-13: BASIN C DIRECT

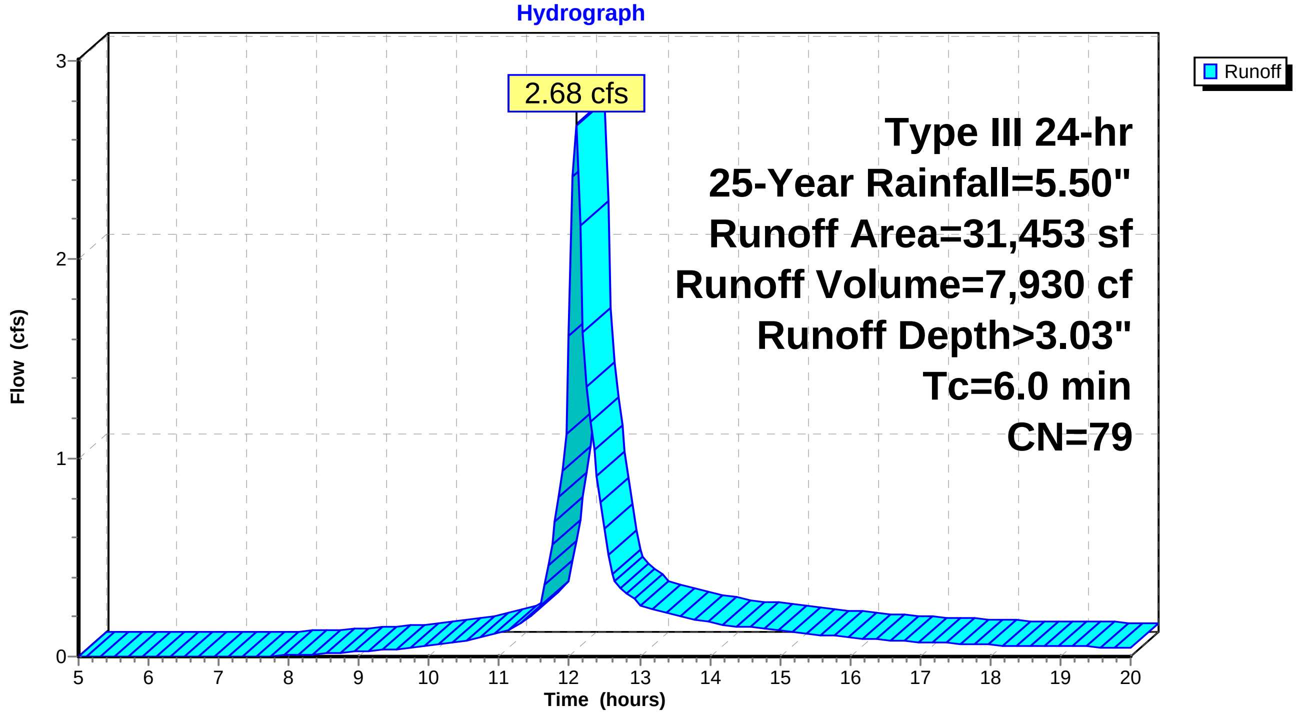
Runoff = 2.68 cfs @ 12.09 hrs, Volume= 7,930 cf, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
15,825	61	>75% Grass cover, Good, HSG B
15,628	98	Water Surface, HSG B
31,453	79	Weighted Average
15,825		50.31% Pervious Area
15,628		49.69% Impervious Area

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

Subcatchment PRDA-13: BASIN C DIRECT



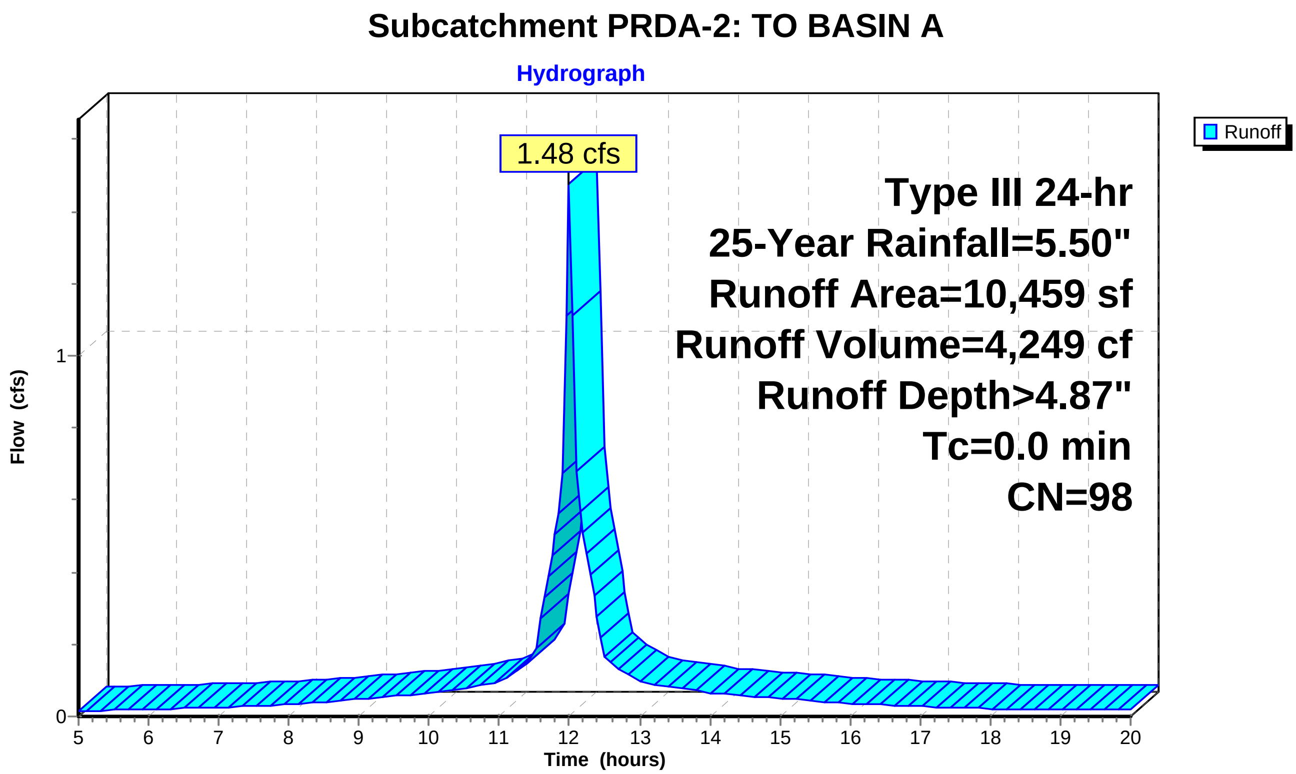
Summary for Subcatchment PRDA-2: TO BASIN A

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.48 cfs @ 12.00 hrs, Volume= 4,249 cf, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	10,459	98	IMPERVIOUS
	10,459		100.00% Impervious Area



Summary for Subcatchment PRDA-3: TO BASIN B

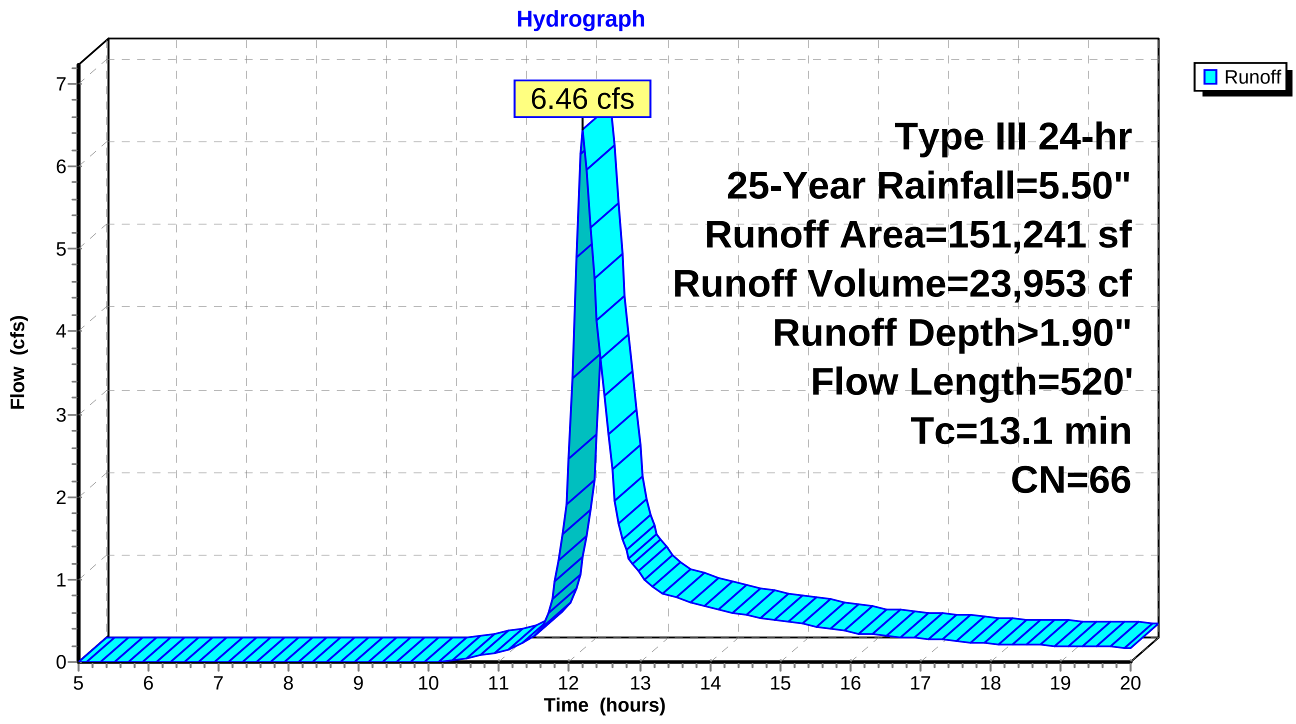
Runoff = 6.46 cfs @ 12.19 hrs, Volume= 23,953 cf, Depth> 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	40,248	98	IMPERVIOUS
	14,787	98	Roofs, HSG A
	77,313	39	>75% Grass cover, Good, HSG A
	92	61	>75% Grass cover, Good, HSG B
	18,801	80	>75% Grass cover, Good, HSG D
	151,241	66	Weighted Average
	96,206		63.61% Pervious Area
	55,035		36.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0380	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
6.5	406	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	64	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.1	520	Total			

Subcatchment PRDA-3: TO BASIN B



Summary for Subcatchment PRDA-4: TO BASIN C

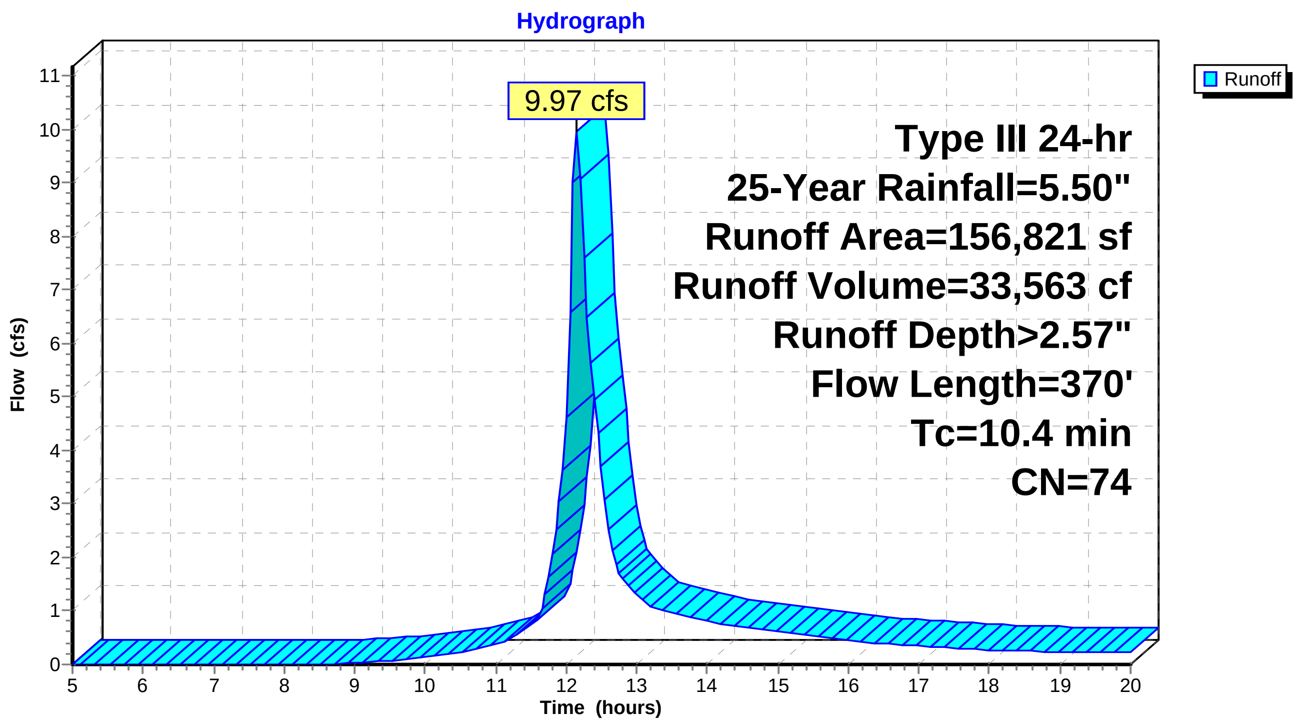
Runoff = 9.97 cfs @ 12.15 hrs, Volume= 33,563 cf, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	70,874	98	Impervious
	4,929	98	Roofs, HSG B
	35,430	39	>75% Grass cover, Good, HSG A
	44,834	61	>75% Grass cover, Good, HSG B
	754	80	>75% Grass cover, Good, HSG D
	156,821	74	Weighted Average
	81,018		51.66% Pervious Area
	75,803		48.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0320	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
3.1	217	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	103	0.0270	3.34		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.4	370	Total			

Subcatchment PRDA-4: TO BASIN C



Summary for Subcatchment PRDA-5: BASIN D DIRECT

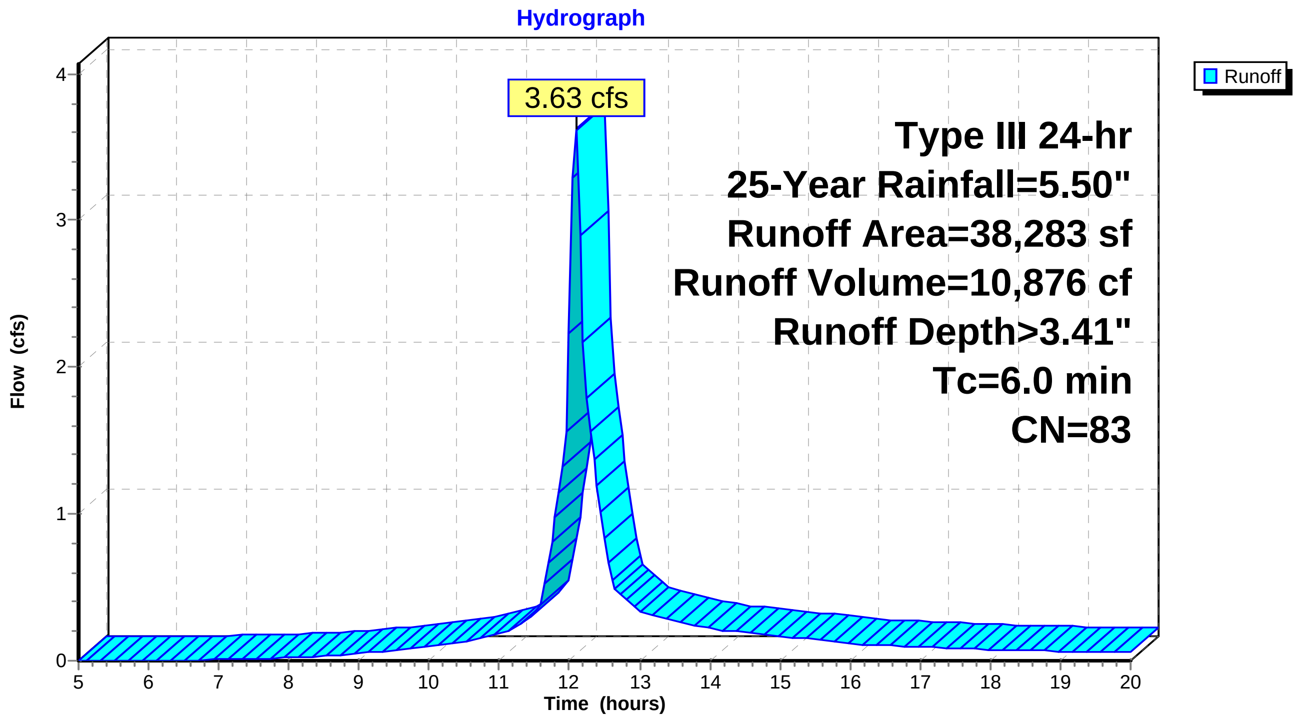
Runoff = 3.63 cfs @ 12.09 hrs, Volume= 10,876 cf, Depth> 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	1,132	98	Impervious
	7,697	80	1/2 acre lots, 25% imp, HSG C
	374	39	>75% Grass cover, Good, HSG A
	7,237	74	>75% Grass cover, Good, HSG C
	6,781	80	>75% Grass cover, Good, HSG D
	9,227	98	Water Surface, HSG A
	4,080	77	Woods, Good, HSG D
	1,323	70	Woods, Good, HSG C
	432	96	Gravel surface, HSG C
	38,283	83	Weighted Average
	26,000		67.91% Pervious Area
	12,283		32.09% Impervious Area

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

Subcatchment PRDA-5: BASIN D DIRECT



Summary for Subcatchment PRDA-6: TO BASIN E

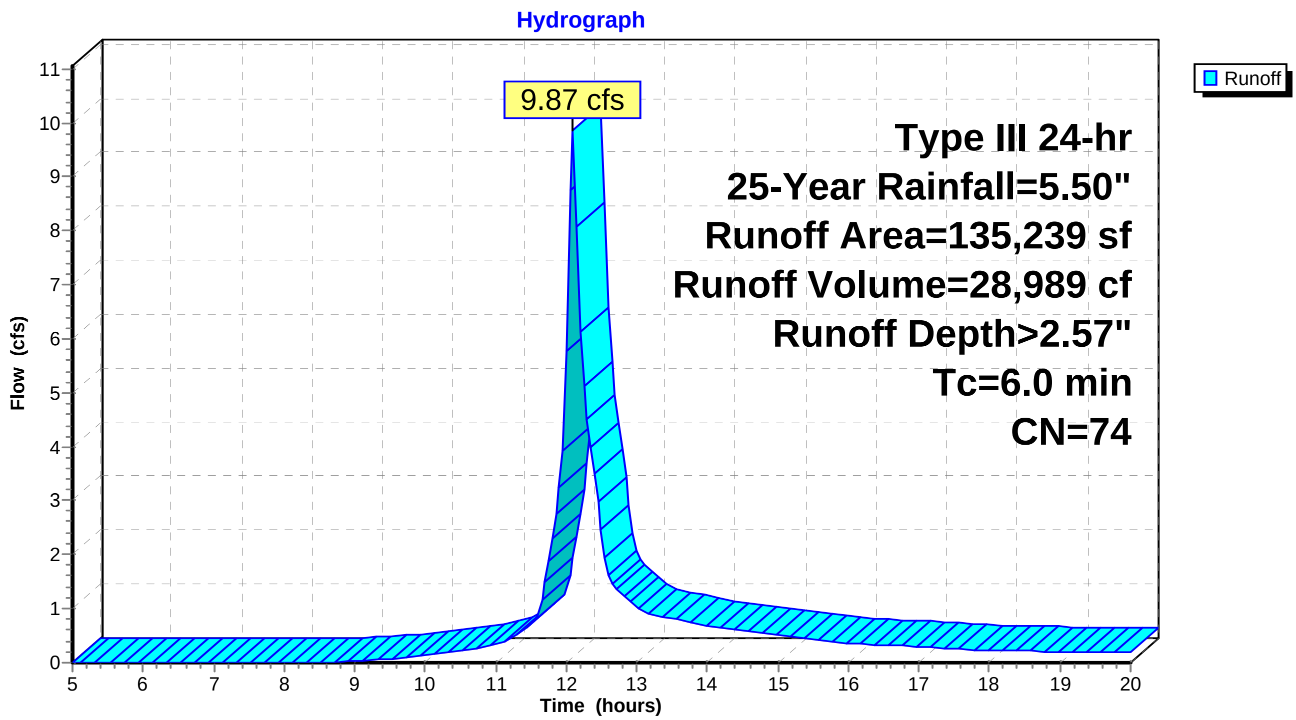
Runoff = 9.87 cfs @ 12.09 hrs, Volume= 28,989 cf, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
*	19,869	98	IMPERVIOUS
	57,855	80	1/2 acre lots, 25% imp, HSG C
	2,327	54	1/2 acre lots, 25% imp, HSG A
	3,600	98	Roofs, HSG A
	27,519	39	>75% Grass cover, Good, HSG A
	16,283	74	>75% Grass cover, Good, HSG C
	1,810	80	>75% Grass cover, Good, HSG D
	5,976	98	Water Surface, HSG D
	135,239	74	Weighted Average
	90,749		67.10% Pervious Area
	44,491		32.90% Impervious Area

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

Subcatchment PRDA-6: TO BASIN E



Summary for Subcatchment PRDA-7: TO WETLAND NORTH

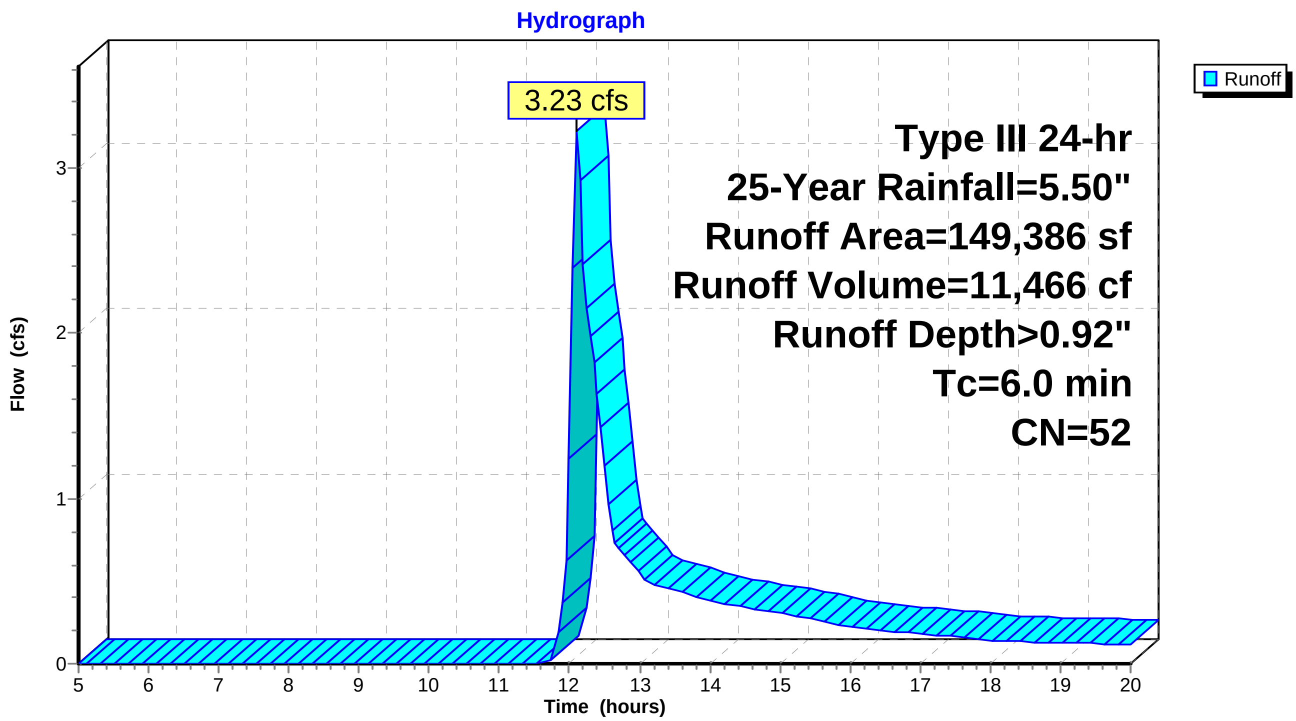
Runoff = 3.23 cfs @ 12.11 hrs, Volume= 11,466 cf, Depth> 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
	2,951	80	1/2 acre lots, 25% imp, HSG C
	8,254	54	1/2 acre lots, 25% imp, HSG A
	52,416	39	>75% Grass cover, Good, HSG A
	27,465	61	>75% Grass cover, Good, HSG B
	538	74	>75% Grass cover, Good, HSG C
	9,934	80	>75% Grass cover, Good, HSG D
	22,059	30	Woods, Good, HSG A
	14,418	70	Woods, Good, HSG C
	9,973	77	Woods, Good, HSG D
*	1,378	98	impervious
	149,386	52	Weighted Average
	145,207		97.20% Pervious Area
	4,179		2.80% Impervious Area

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

Subcatchment PRDA-7: TO WETLAND NORTH



Summary for Subcatchment PRDA-8: TO WETLAND SOUTHEAST

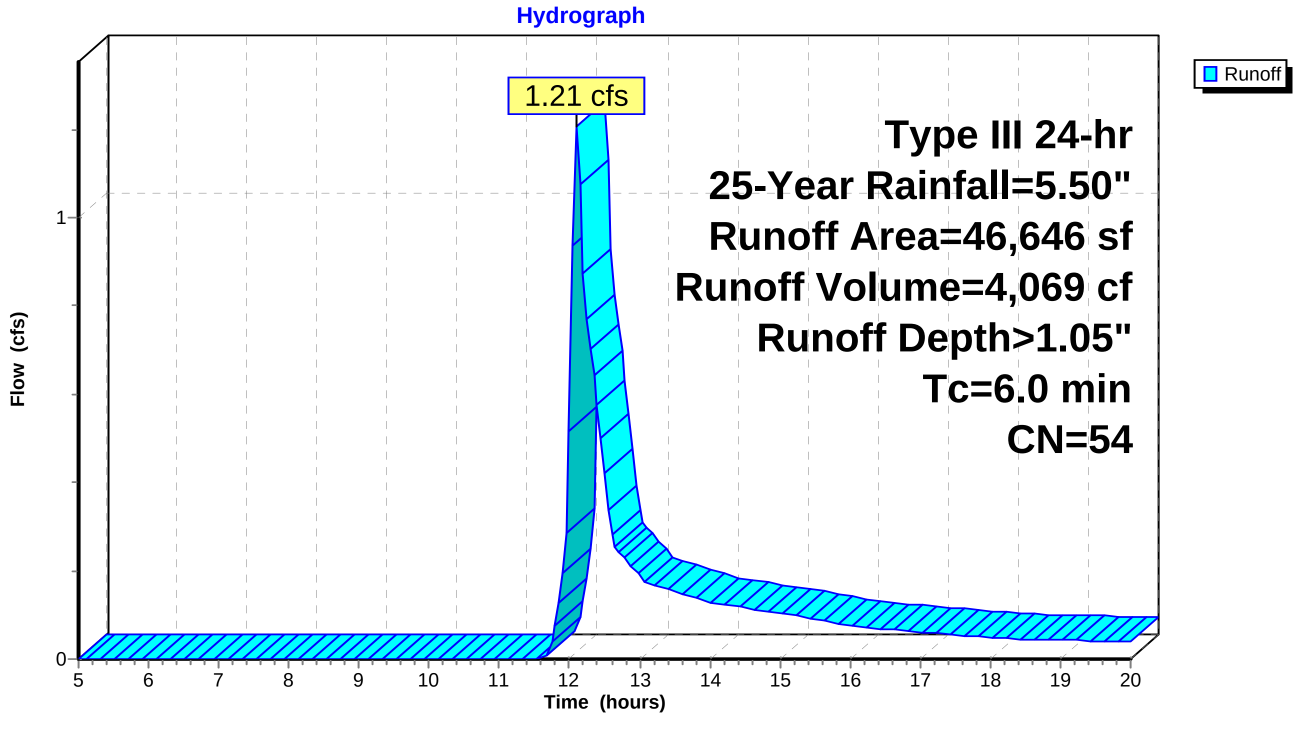
Runoff = 1.21 cfs @ 12.11 hrs, Volume= 4,069 cf, Depth> 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

Area (sf)	CN	Description
21,559	39	>75% Grass cover, Good, HSG A
7,434	80	>75% Grass cover, Good, HSG D
12,118	77	Woods, Good, HSG D
5,535	30	Woods, Good, HSG A
46,646	54	Weighted Average
46,646		100.00% Pervious Area

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

Subcatchment PRDA-8: TO WETLAND SOUTHEAST



Summary for Subcatchment PRDA-9: TO WETLAND SOUTH

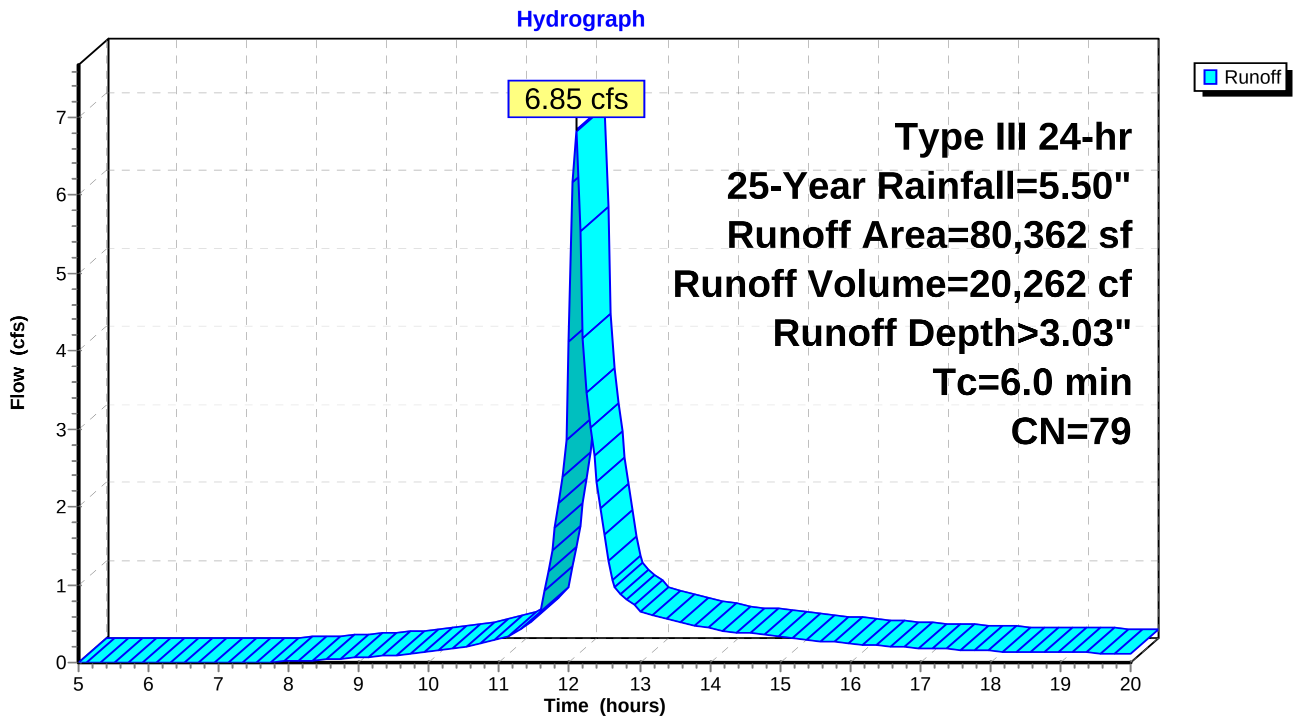
Runoff = 6.85 cfs @ 12.09 hrs, Volume= 20,262 cf, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.50"

	Area (sf)	CN	Description
	274	39	>75% Grass cover, Good, HSG A
	20,073	80	>75% Grass cover, Good, HSG D
	7,904	70	Woods, Good, HSG C
	34,217	77	Woods, Good, HSG D
	11,544	80	1/2 acre lots, 25% imp, HSG C
*	6,350	98	IMPERVIOUS
	80,362	79	Weighted Average
	71,126		88.51% Pervious Area
	9,236		11.49% Impervious Area

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

Subcatchment PRDA-9: TO WETLAND SOUTH

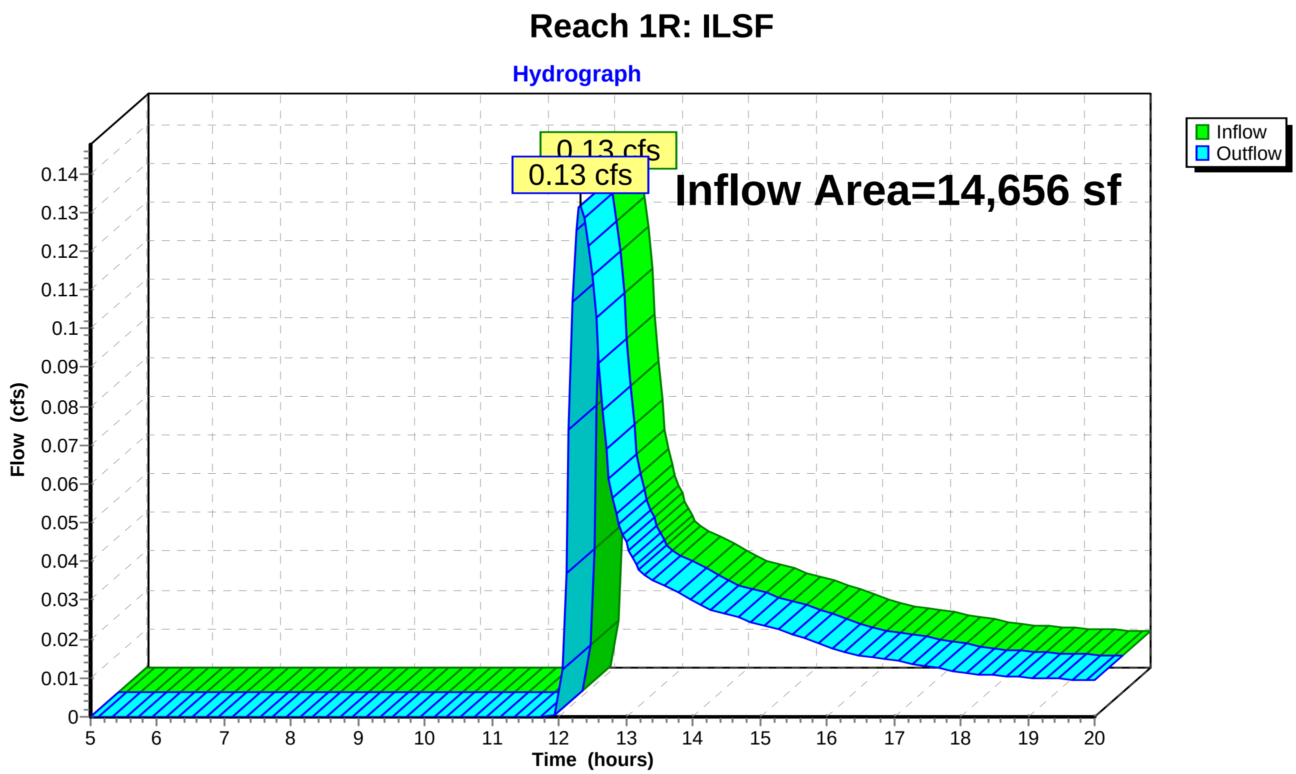


Summary for Reach 1R: ILSF

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

Inflow Area =	14,656 sf,	0.00% Impervious,	Inflow Depth > 0.63"	for 25-Year event	
Inflow =	0.13 cfs @	12.32 hrs,	Volume=	767 cf	
Outflow =	0.13 cfs @	12.32 hrs,	Volume=	767 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



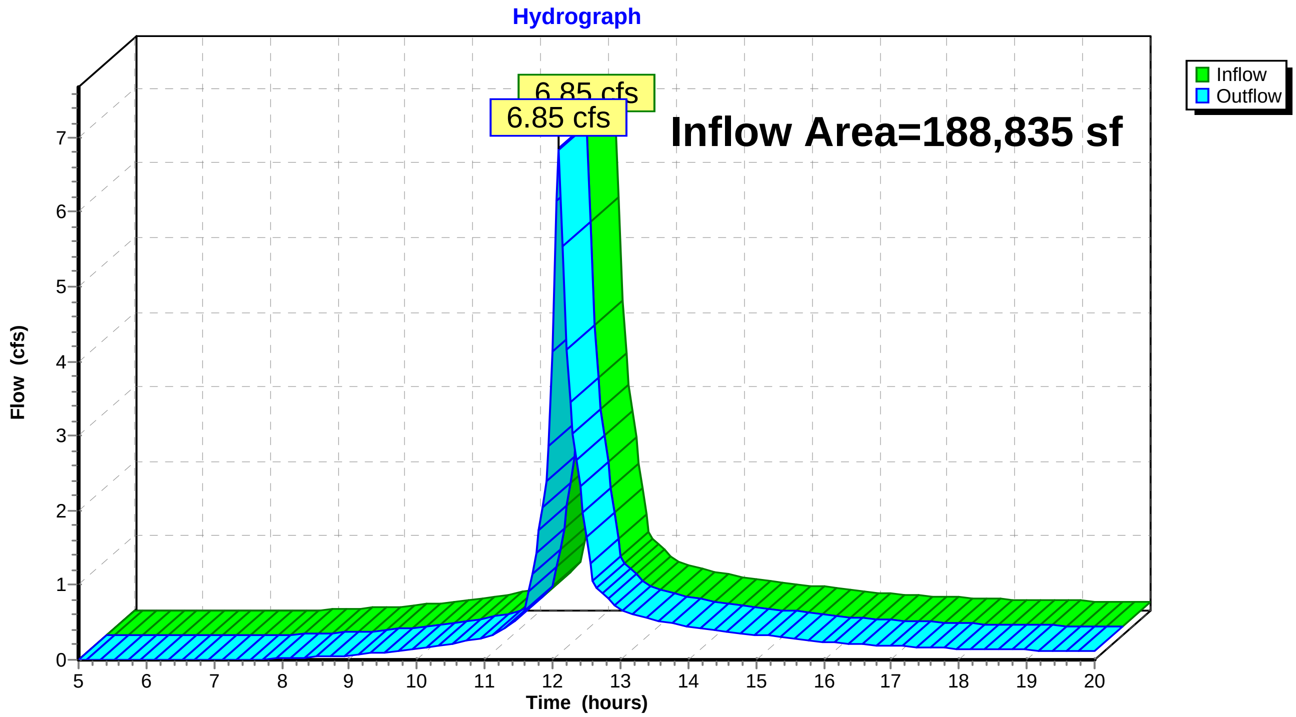
Summary for Reach 14R: WETLAND SOUTH

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

Inflow Area =	188,835 sf,	34.39% Impervious,	Inflow Depth > 1.29"	for 25-Year event
Inflow =	6.85 cfs @	12.09 hrs, Volume=	20,262 cf	
Outflow =	6.85 cfs @	12.09 hrs, Volume=	20,262 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: WETLAND SOUTH

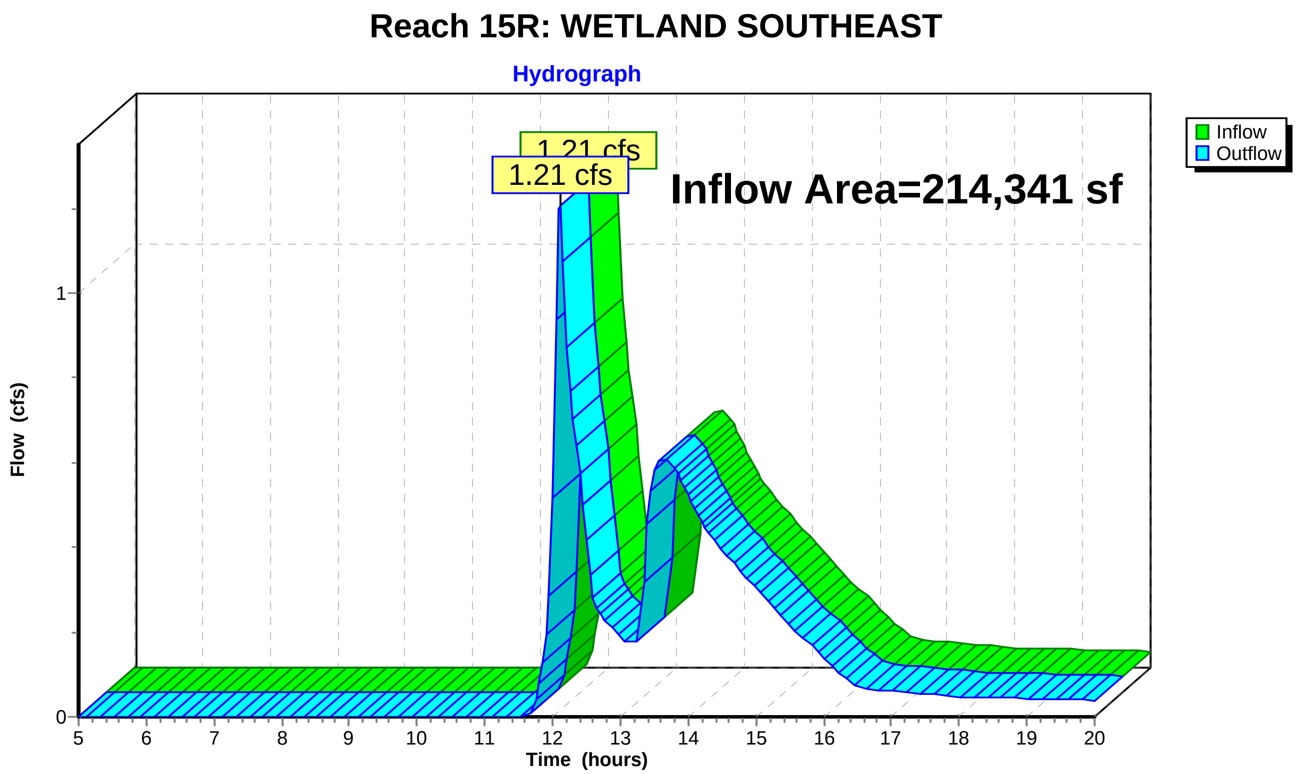


Summary for Reach 15R: WETLAND SOUTHEAST

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

Inflow Area = 214,341 sf, 29.14% Impervious, Inflow Depth > 0.37" for 25-Year event
Inflow = 1.21 cfs @ 12.11 hrs, Volume= 6,608 cf
Outflow = 1.21 cfs @ 12.11 hrs, Volume= 6,608 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



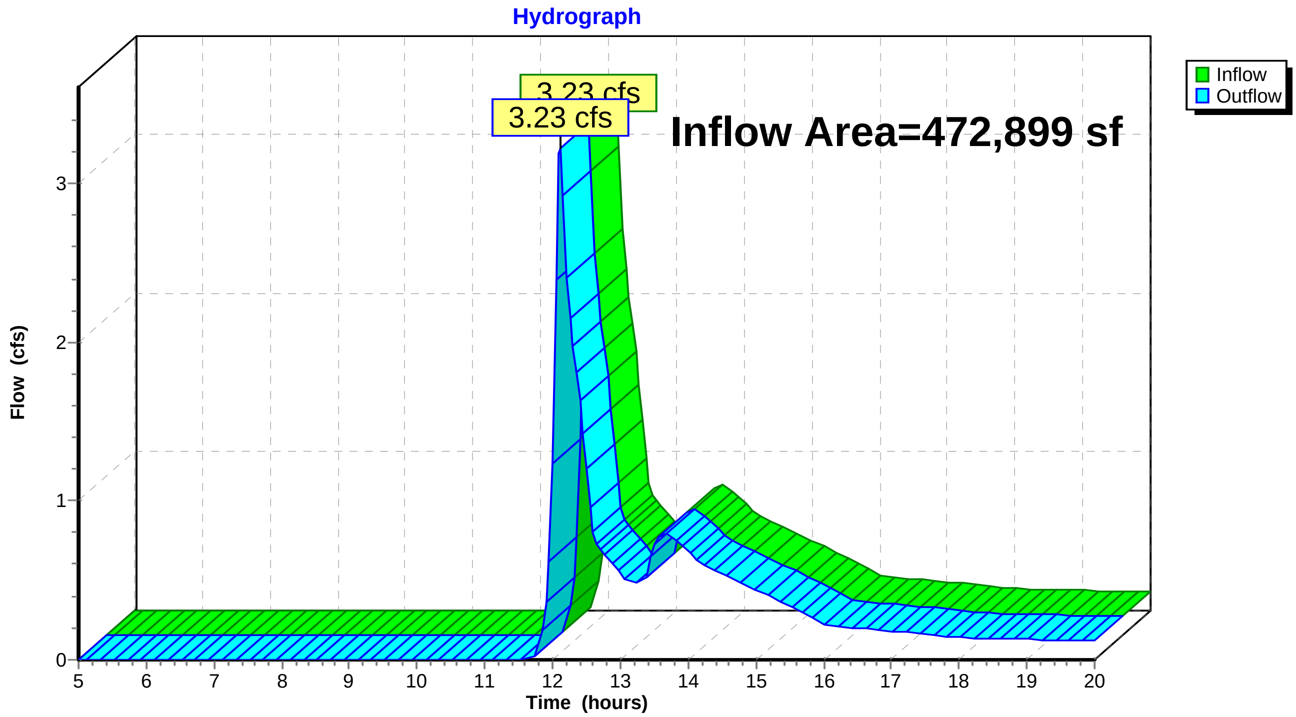
Summary for Reach 21R: WETLAND NORTH

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

Inflow Area = 472,899 sf, 29.63% Impervious, Inflow Depth > 0.33" for 25-Year event
Inflow = 3.23 cfs @ 12.11 hrs, Volume= 13,169 cf
Outflow = 3.23 cfs @ 12.11 hrs, Volume= 13,169 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 21R: WETLAND NORTH



Summary for Pond 1P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 10,448 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 1.26 cfs @ 12.09 hrs, Volume= 4,244 cf
Outflow = 0.10 cfs @ 13.05 hrs, Volume= 3,967 cf, Atten= 92%, Lag= 57.9 min
Discarded = 0.10 cfs @ 13.05 hrs, Volume= 3,967 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.62' @ 13.05 hrs Surf.Area= 1,531 sf Storage= 1,723 cf

Plug-Flow detention time= 137.2 min calculated for 3,953 cf (93% of inflow)
Center-of-Mass det. time= 112.5 min (847.1 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,317 cf	**20.83'W x 73.50'L x 3.54'H Field A** 5,423 cf Overall - 2,131 cf Embedded = 3,292 cf x 40.0% Voids
#2A	0.50'	2,131 cf	**Cultec R-330XLHD** x 40 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		3,448 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.10 cfs @ 13.05 hrs HW=1.62' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Pond 1P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

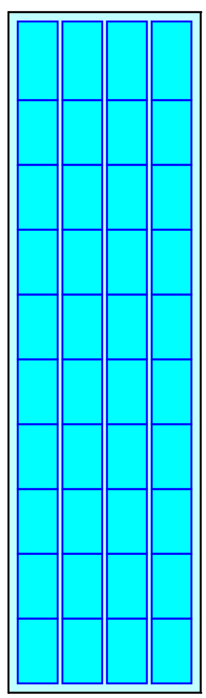
10 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 71.50' Row Length +12.0" End Stone x 2 = 73.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

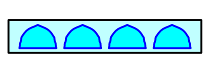
40 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 2,131.0 cf Chamber Storage

5,423.2 cf Field - 2,131.0 cf Chambers = 3,292.2 cf Stone x 40.0% Voids = 1,316.9 cf Stone Storage

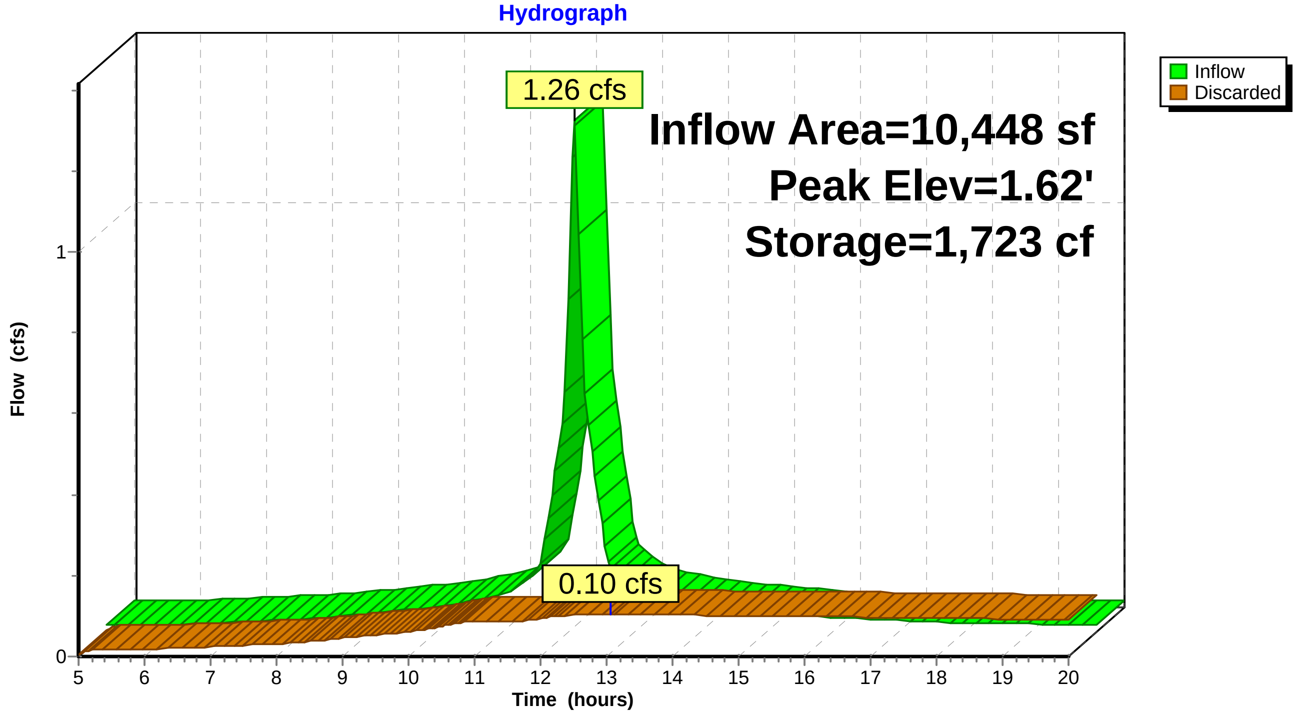
Chamber Storage + Stone Storage = 3,447.9 cf = 0.079 af
Overall Storage Efficiency = 63.6%
Overall System Size = 73.50' x 20.83' x 3.54'

40 Chambers
200.9 cy Field
121.9 cy Stone





Pond 1P: Roof Recharge



Summary for Pond 2P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 13,061 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 1.58 cfs @ 12.09 hrs, Volume= 5,305 cf
Outflow = 0.06 cfs @ 15.05 hrs, Volume= 2,828 cf, Atten= 96%, Lag= 178.0 min
Discarded = 0.06 cfs @ 15.05 hrs, Volume= 2,828 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.86' @ 15.05 hrs Surf.Area= 2,246 sf Storage= 2,977 cf

Plug-Flow detention time= 168.4 min calculated for 2,826 cf (53% of inflow)
Center-of-Mass det. time= 77.4 min (812.0 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,907 cf	**25.67'W x 87.50'L x 3.54'H Field A** 7,954 cf Overall - 3,185 cf Embedded = 4,769 cf x 40.0% Voids
#2A	0.50'	3,185 cf	**Cultec R-330XLHD** x 60 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		5,093 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.06 cfs @ 15.05 hrs HW=1.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 2P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

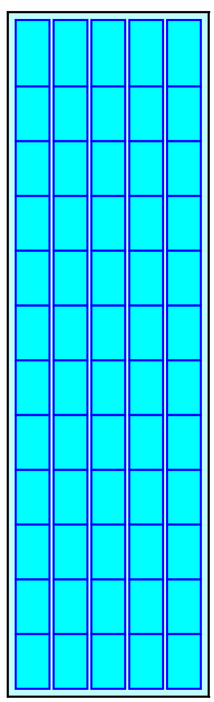
12 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 85.50' Row Length +12.0" End Stone x 2 = 87.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

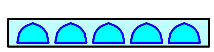
60 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 3,185.3 cf Chamber Storage

7,954.0 cf Field - 3,185.3 cf Chambers = 4,768.7 cf Stone x 40.0% Voids = 1,907.5 cf Stone Storage

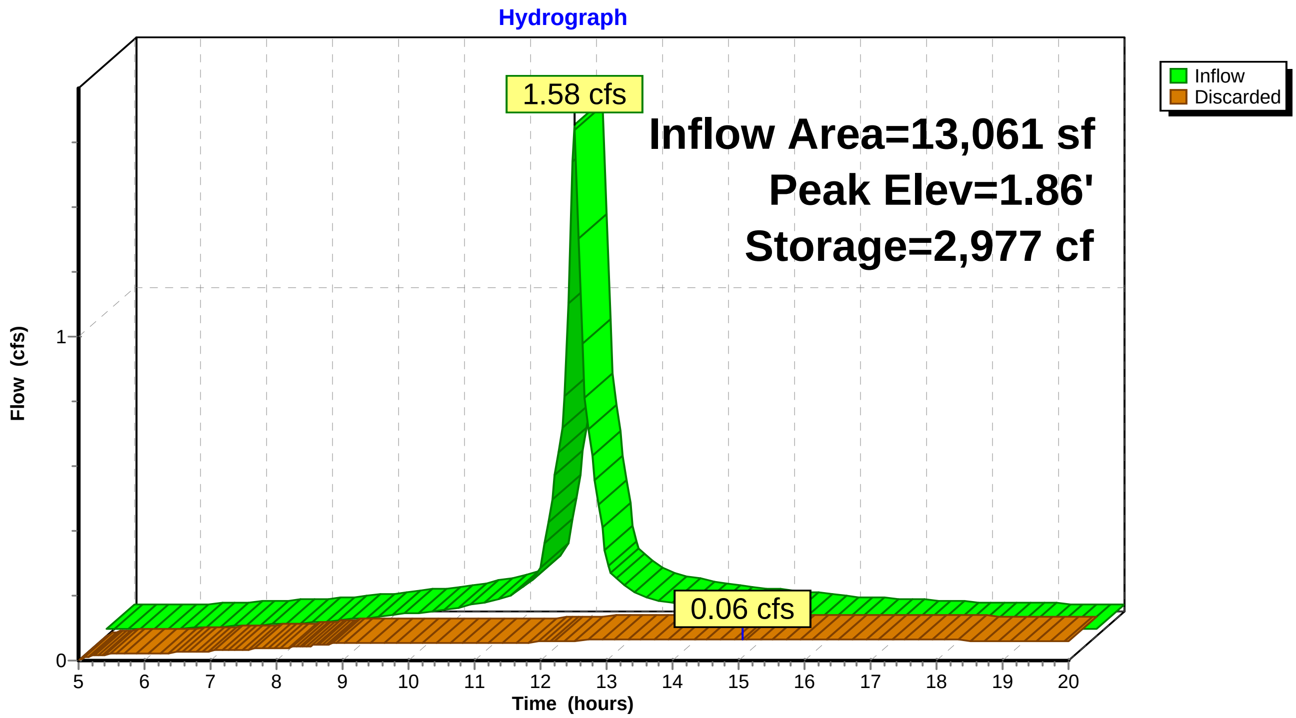
Chamber Storage + Stone Storage = 5,092.8 cf = 0.117 af
Overall Storage Efficiency = 64.0%
Overall System Size = 87.50' x 25.67' x 3.54'

60 Chambers
294.6 cy Field
176.6 cy Stone





Pond 2P: Roof Recharge



Summary for Pond 3P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 13,061 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 1.58 cfs @ 12.09 hrs, Volume= 5,305 cf
Outflow = 0.06 cfs @ 15.05 hrs, Volume= 2,828 cf, Atten= 96%, Lag= 178.0 min
Discarded = 0.06 cfs @ 15.05 hrs, Volume= 2,828 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.86' @ 15.05 hrs Surf.Area= 2,246 sf Storage= 2,977 cf

Plug-Flow detention time= 168.4 min calculated for 2,826 cf (53% of inflow)
Center-of-Mass det. time= 77.4 min (812.0 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,907 cf	**25.67'W x 87.50'L x 3.54'H Field A** 7,954 cf Overall - 3,185 cf Embedded = 4,769 cf x 40.0% Voids
#2A	0.50'	3,185 cf	**Cultec R-330XLHD** x 60 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		5,093 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.06 cfs @ 15.05 hrs HW=1.86' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Pond 3P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

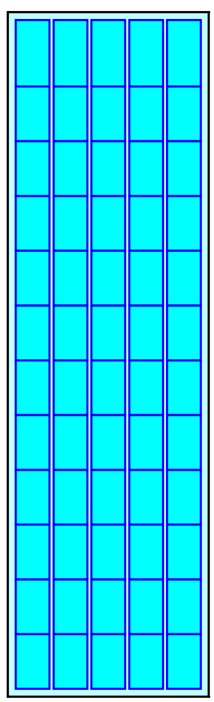
12 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 85.50' Row Length +12.0" End Stone x 2 = 87.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

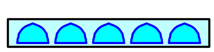
60 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 3,185.3 cf Chamber Storage

7,954.0 cf Field - 3,185.3 cf Chambers = 4,768.7 cf Stone x 40.0% Voids = 1,907.5 cf Stone Storage

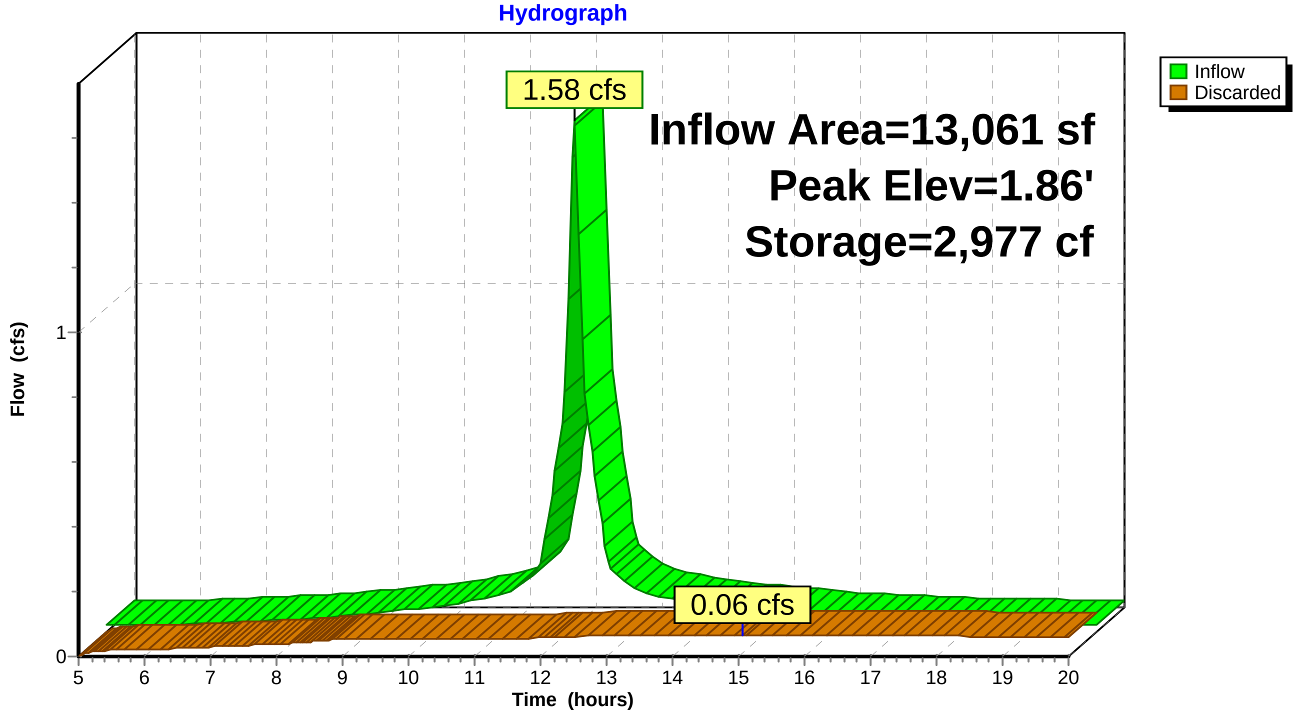
Chamber Storage + Stone Storage = 5,092.8 cf = 0.117 af
Overall Storage Efficiency = 64.0%
Overall System Size = 87.50' x 25.67' x 3.54'

60 Chambers
294.6 cy Field
176.6 cy Stone





Pond 3P: Roof Recharge



Summary for Pond 4P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 7,296 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 2,963 cf
Outflow = 0.04 cfs @ 14.94 hrs, Volume= 1,611 cf, Atten= 96%, Lag= 170.9 min
Discarded = 0.04 cfs @ 14.94 hrs, Volume= 1,611 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.89' @ 14.94 hrs Surf.Area= 1,240 sf Storage= 1,652 cf

Plug-Flow detention time= 169.0 min calculated for 1,605 cf (54% of inflow)
Center-of-Mass det. time= 80.6 min (815.1 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,071 cf	**20.83'W x 59.50'L x 3.54'H Field A** 4,390 cf Overall - 1,714 cf Embedded = 2,676 cf x 40.0% Voids
#2A	0.50'	1,714 cf	**Cultec R-330XLHD** x 32 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		2,784 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 14.94 hrs HW=1.89' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Pond 4P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

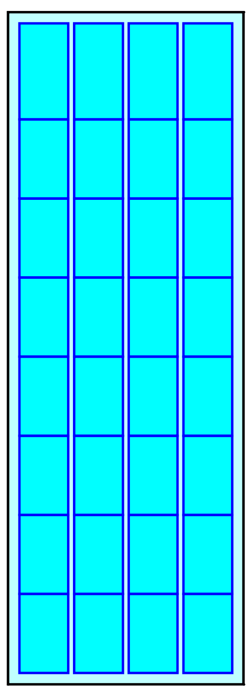
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

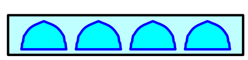
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

4,390.2 cf Field - 1,713.7 cf Chambers = 2,676.5 cf Stone x 40.0% Voids = 1,070.6 cf Stone Storage

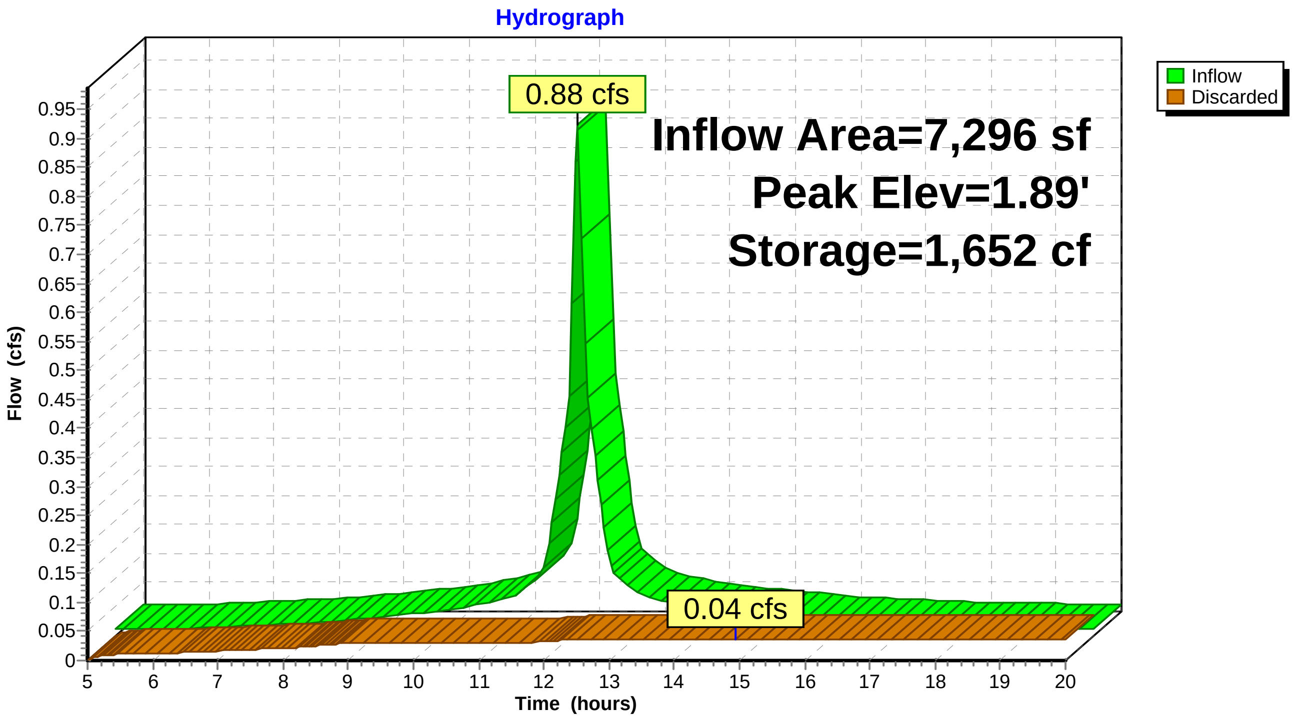
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 4P: Roof Recharge



Summary for Pond 5P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 487 cf
Outflow = 0.01 cfs @ 13.89 hrs, Volume= 322 cf, Atten= 94%, Lag= 108.1 min
Discarded = 0.01 cfs @ 13.89 hrs, Volume= 322 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.96' @ 13.89 hrs Surf.Area= 200 sf Storage= 252 cf

Plug-Flow detention time= 174.6 min calculated for 320 cf (66% of inflow)
Center-of-Mass det. time= 101.9 min (836.5 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.89 hrs HW=1.96' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 5P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

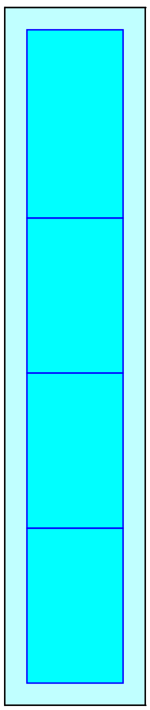
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

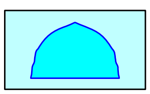
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

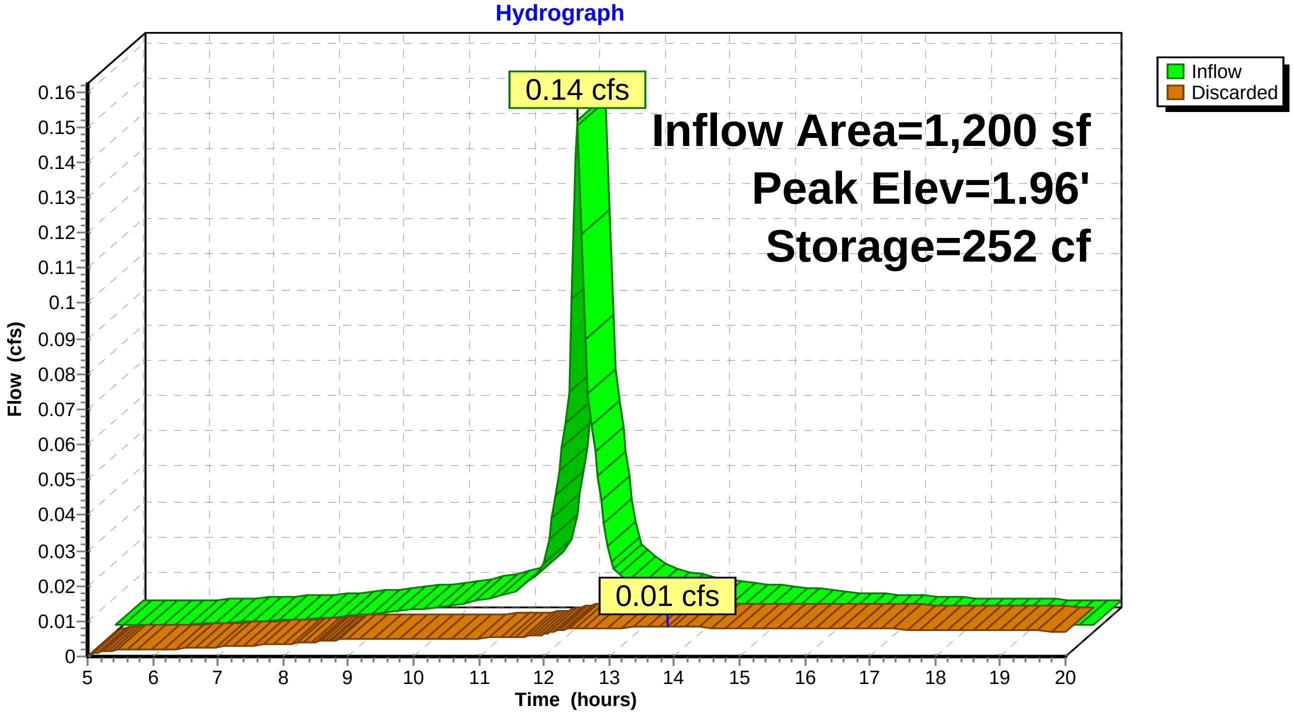
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 5P: Roof Recharge



Summary for Pond 6P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,649 cf
Outflow = 0.03 cfs @ 13.94 hrs, Volume= 1,133 cf, Atten= 94%, Lag= 111.1 min
Discarded = 0.03 cfs @ 13.94 hrs, Volume= 1,133 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.38' @ 13.94 hrs Surf.Area= 899 sf Storage= 811 cf

Plug-Flow detention time= 166.3 min calculated for 1,133 cf (69% of inflow)
Center-of-Mass det. time= 96.1 min (830.6 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 13.94 hrs HW=1.38' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 6P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

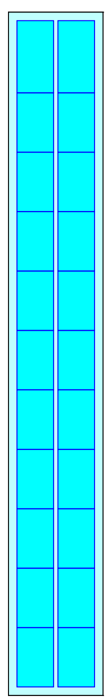
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

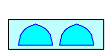
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

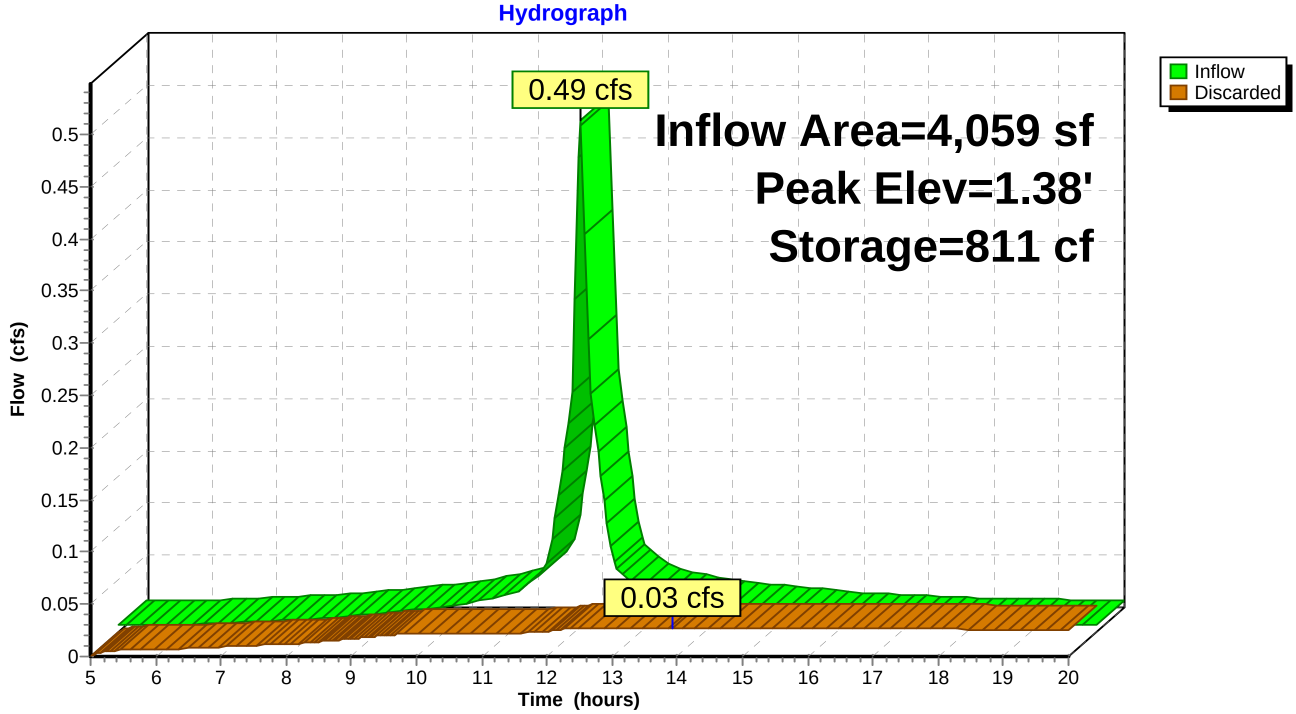
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 6P: Roof Recharge



Summary for Pond 7P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,929 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 2,002 cf
Outflow = 0.03 cfs @ 14.37 hrs, Volume= 1,216 cf, Atten= 95%, Lag= 136.7 min
Discarded = 0.03 cfs @ 14.37 hrs, Volume= 1,216 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.73' @ 14.37 hrs Surf.Area= 899 sf Storage= 1,059 cf

Plug-Flow detention time= 169.6 min calculated for 1,212 cf (61% of inflow)
Center-of-Mass det. time= 90.3 min (824.8 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 14.37 hrs HW=1.73' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 7P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

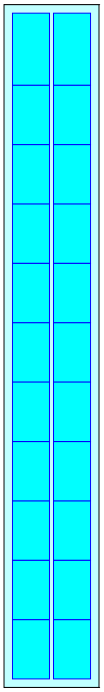
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

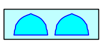
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

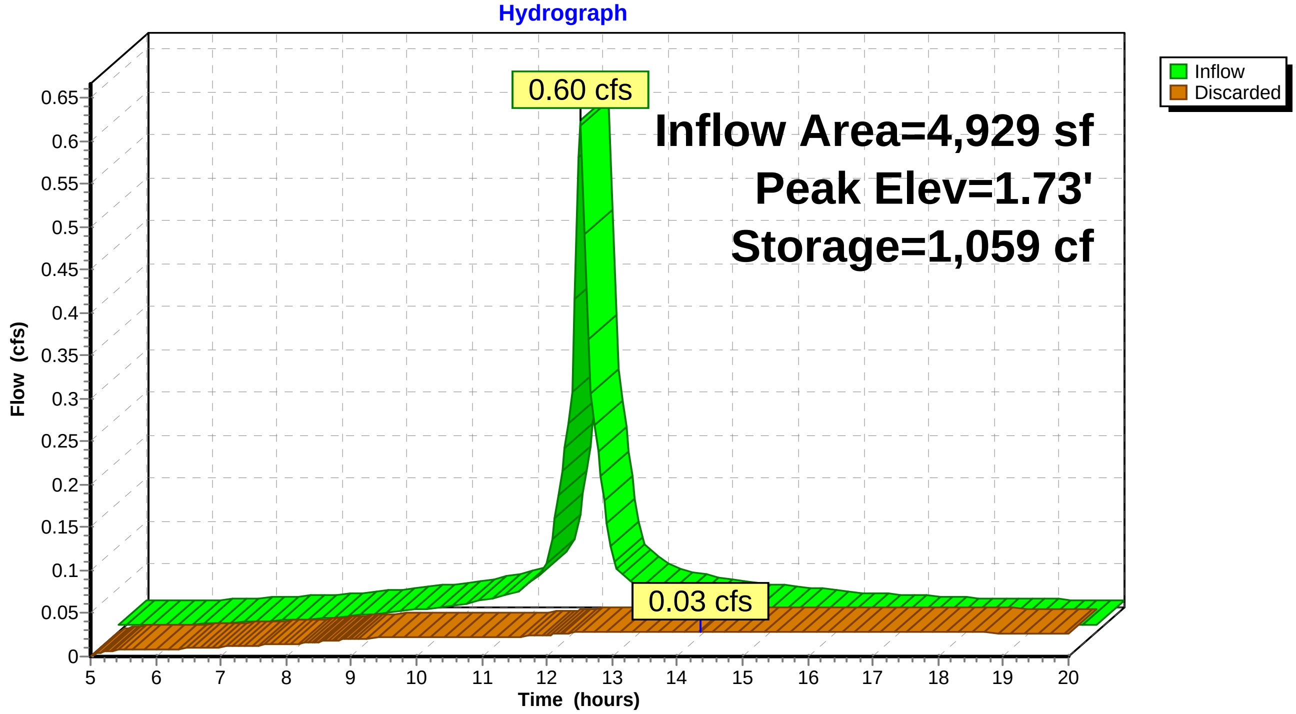
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 7P: Roof Recharge



Summary for Pond 8P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 487 cf
Outflow = 0.01 cfs @ 13.89 hrs, Volume= 322 cf, Atten= 94%, Lag= 108.1 min
Discarded = 0.01 cfs @ 13.89 hrs, Volume= 322 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.96' @ 13.89 hrs Surf.Area= 200 sf Storage= 252 cf

Plug-Flow detention time= 174.6 min calculated for 320 cf (66% of inflow)
Center-of-Mass det. time= 101.9 min (836.5 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.89 hrs HW=1.96' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 8P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

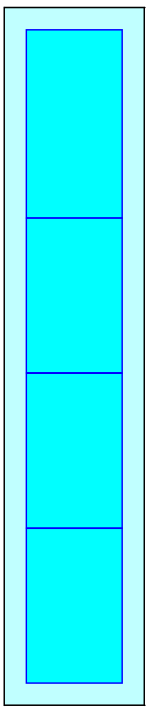
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

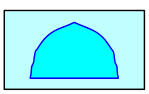
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

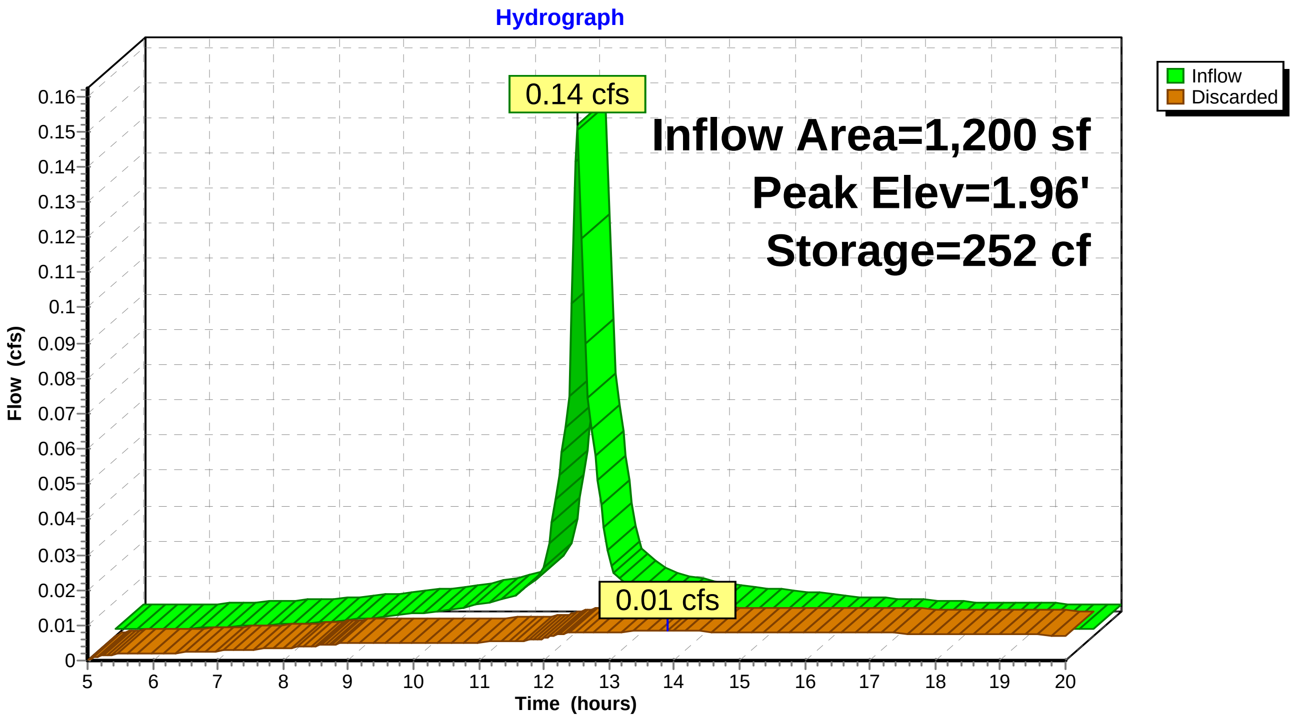
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 8P: Roof Recharge



Summary for Pond 9P: BASIN E

Inflow Area = 135,239 sf, 32.90% Impervious, Inflow Depth > 2.57" for 25-Year event
Inflow = 9.87 cfs @ 12.09 hrs, Volume= 28,989 cf
Outflow = 0.77 cfs @ 13.68 hrs, Volume= 14,643 cf, Atten= 92%, Lag= 95.0 min
Discarded = 0.40 cfs @ 13.68 hrs, Volume= 12,939 cf
Primary = 0.37 cfs @ 13.68 hrs, Volume= 1,703 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 240.93' @ 13.68 hrs Surf.Area= 7,013 sf Storage= 16,617 cf

Plug-Flow detention time= 202.3 min calculated for 14,643 cf (51% of inflow)
Center-of-Mass det. time= 119.2 min (915.1 - 795.9)

Volume	Invert	Avail.Storage	Storage Description
#1	237.80'	24,841 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

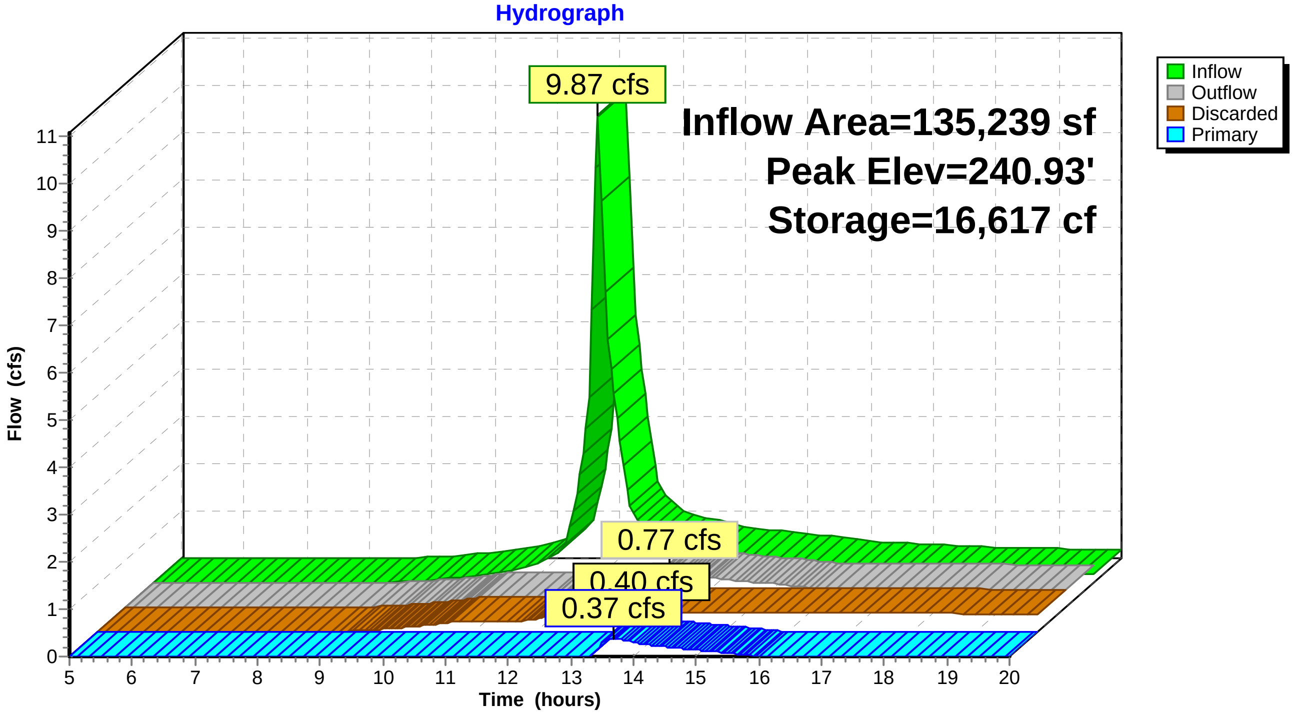
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
237.80	3,709	322.6	0	0	3,709
238.00	3,904	326.4	761	761	3,916
239.00	4,911	345.3	4,398	5,159	4,980
240.00	5,976	364.3	5,435	10,594	6,110
241.00	7,097	383.1	6,528	17,122	7,289
241.90	10,147	430.2	7,719	24,841	10,360

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.80'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.90'	**25.0' long x 18.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.40 cfs @ 13.68 hrs HW=240.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=0.32 cfs @ 13.68 hrs HW=240.93' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.32 cfs @ 0.45 fps)

Pond 9P: BASIN E



Summary for Pond 10P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 487 cf
Outflow = 0.01 cfs @ 13.89 hrs, Volume= 322 cf, Atten= 94%, Lag= 108.1 min
Discarded = 0.01 cfs @ 13.89 hrs, Volume= 322 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.96' @ 13.89 hrs Surf.Area= 200 sf Storage= 252 cf

Plug-Flow detention time= 174.6 min calculated for 320 cf (66% of inflow)
Center-of-Mass det. time= 101.9 min (836.5 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.89 hrs HW=1.96' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 10P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

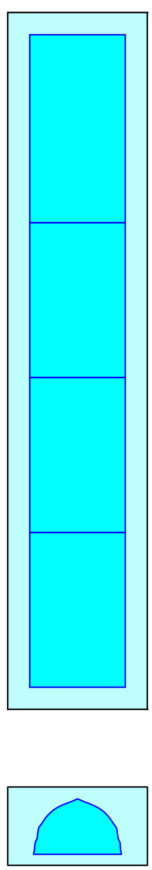
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

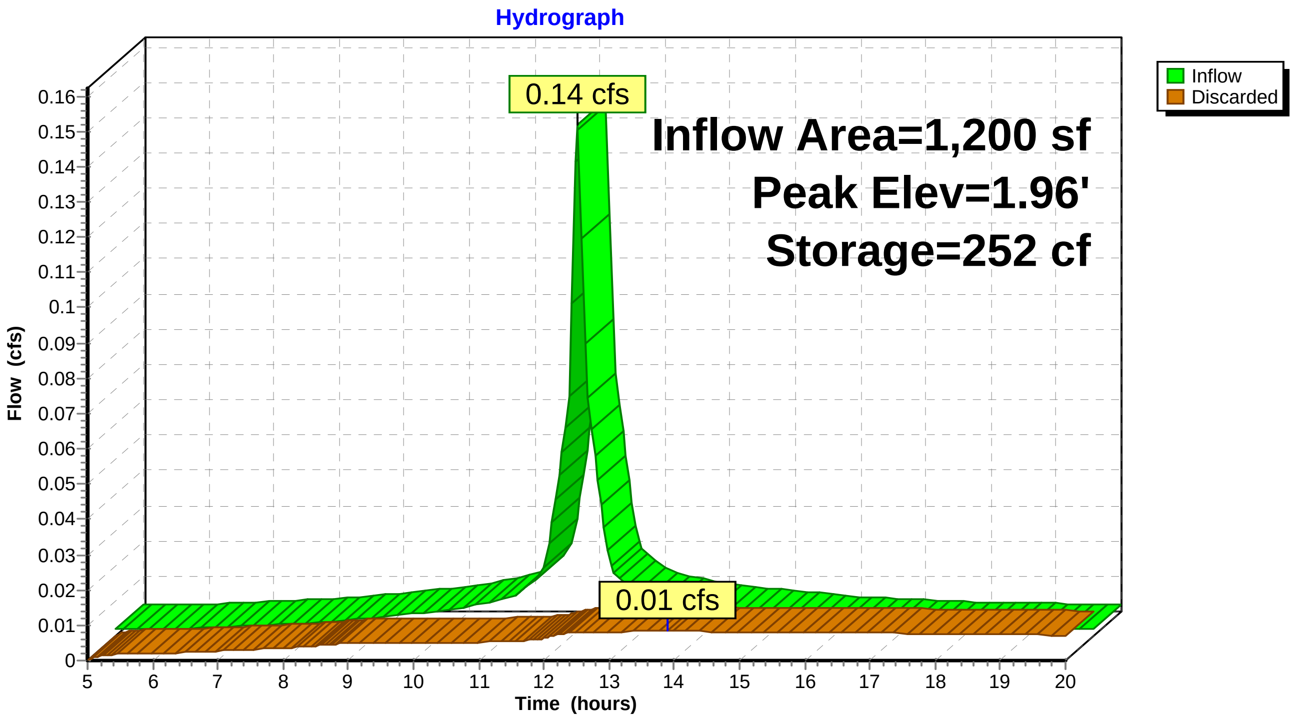
706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone



Pond 10P: Roof Recharge



Summary for Pond 11P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,649 cf
Outflow = 0.03 cfs @ 13.94 hrs, Volume= 1,133 cf, Atten= 94%, Lag= 111.1 min
Discarded = 0.03 cfs @ 13.94 hrs, Volume= 1,133 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.38' @ 13.94 hrs Surf.Area= 899 sf Storage= 811 cf

Plug-Flow detention time= 166.3 min calculated for 1,133 cf (69% of inflow)
Center-of-Mass det. time= 96.1 min (830.6 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 13.94 hrs HW=1.38' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 11P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

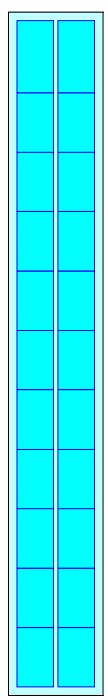
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

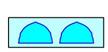
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

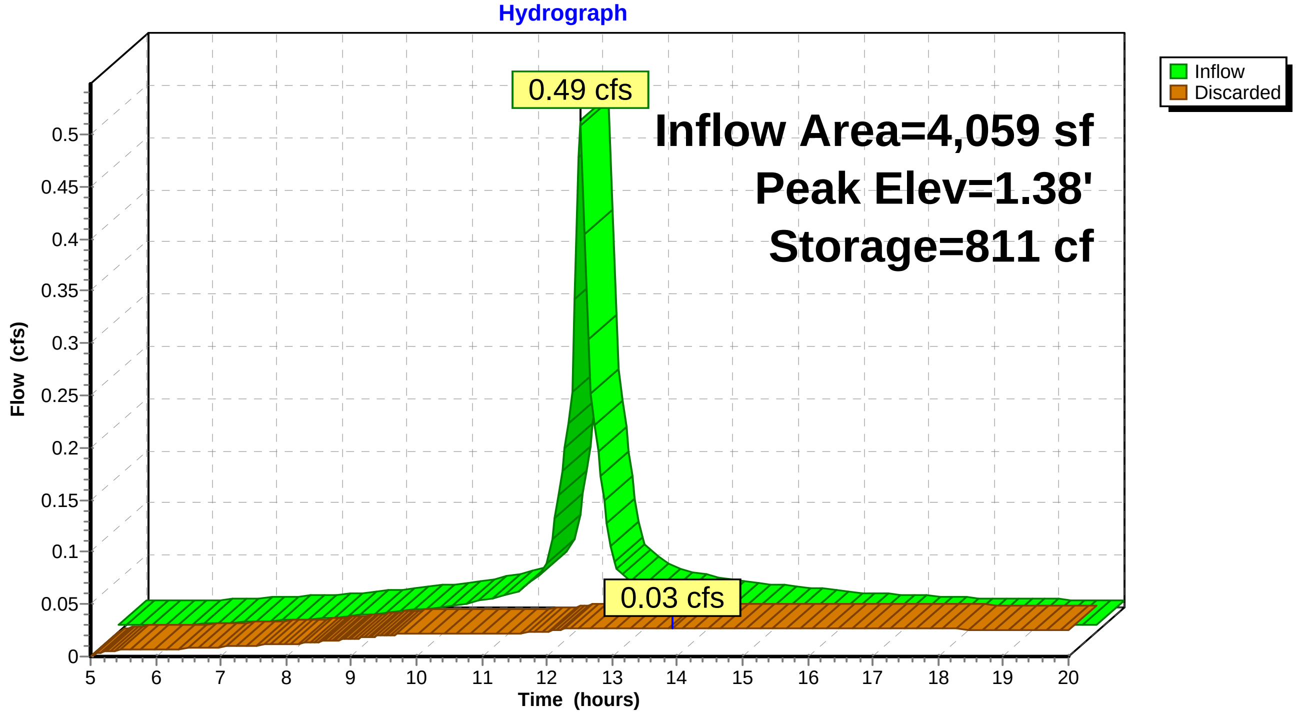
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 11P: Roof Recharge



Summary for Pond 13P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 487 cf
Outflow = 0.01 cfs @ 13.89 hrs, Volume= 322 cf, Atten= 94%, Lag= 108.1 min
Discarded = 0.01 cfs @ 13.89 hrs, Volume= 322 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.96' @ 13.89 hrs Surf.Area= 200 sf Storage= 252 cf

Plug-Flow detention time= 174.6 min calculated for 320 cf (66% of inflow)
Center-of-Mass det. time= 101.9 min (836.5 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A**
			707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 13.89 hrs HW=1.96' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 13P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

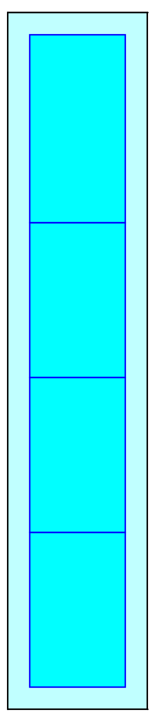
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

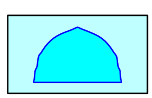
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

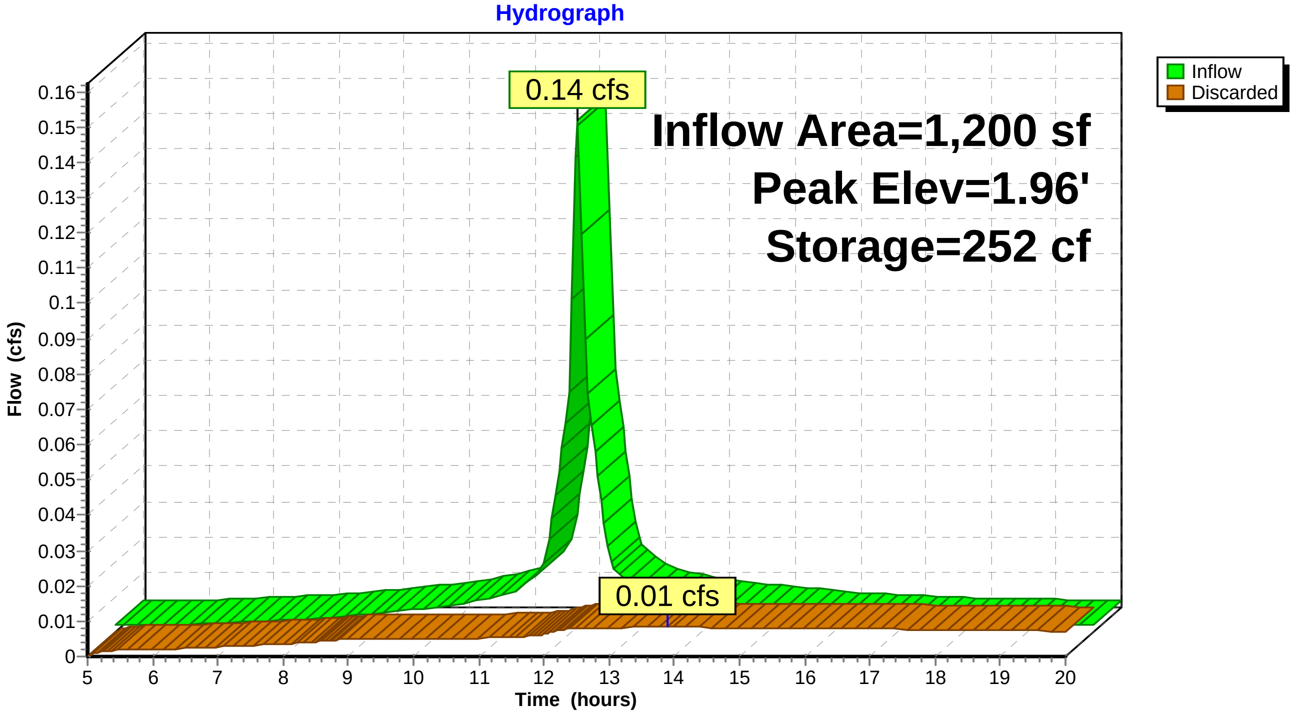
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 13P: Roof Recharge



Summary for Pond 14P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 4.87" for 25-Year event
Inflow = 0.49 cfs @ 12.09 hrs, Volume= 1,649 cf
Outflow = 0.02 cfs @ 14.20 hrs, Volume= 1,053 cf, Atten= 95%, Lag= 126.8 min
Discarded = 0.02 cfs @ 14.20 hrs, Volume= 1,053 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.49' @ 14.20 hrs Surf.Area= 840 sf Storage= 843 cf

Plug-Flow detention time= 166.8 min calculated for 1,053 cf (64% of inflow)
Center-of-Mass det. time= 90.6 min (825.2 - 734.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	738 cf	**16.00'W x 52.50'L x 3.54'H Field A** 2,975 cf Overall - 1,129 cf Embedded = 1,846 cf x 40.0% Voids
#2A	0.50'	1,129 cf	**Cultec R-330XLHD** x 21 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		1,867 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 14.20 hrs HW=1.49' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Pond 14P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

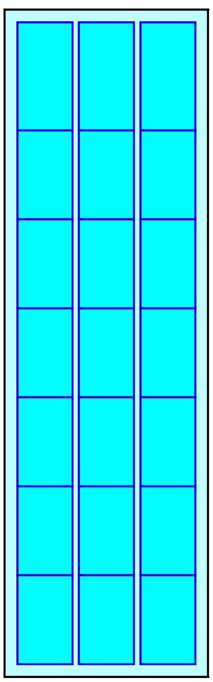
7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

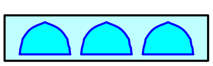
21 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 1,128.8 cf Chamber Storage

2,975.0 cf Field - 1,128.8 cf Chambers = 1,846.2 cf Stone x 40.0% Voids = 738.5 cf Stone Storage

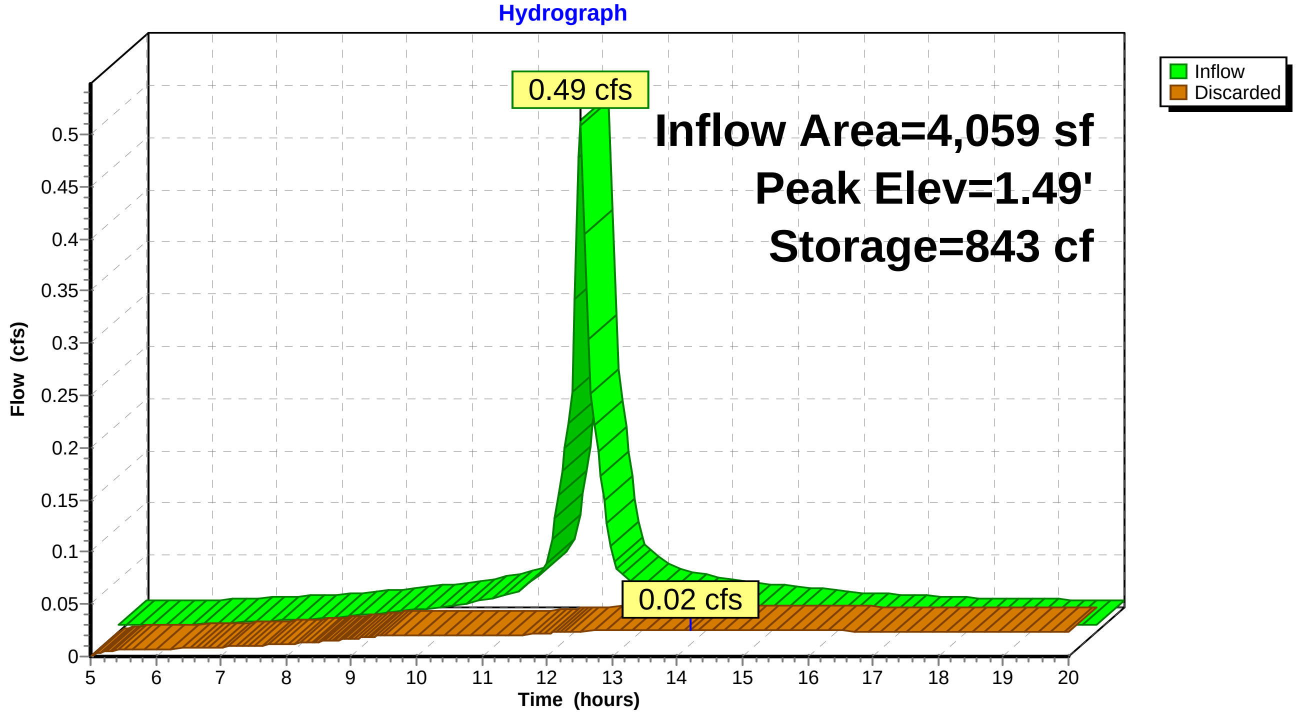
Chamber Storage + Stone Storage = 1,867.3 cf = 0.043 af
Overall Storage Efficiency = 62.8%
Overall System Size = 52.50' x 16.00' x 3.54'

21 Chambers
110.2 cy Field
68.4 cy Stone





Pond 14P: Roof Recharge



Summary for Pond 17P: Roof Recharge

Inflow Area = 13,086 sf, 37.67% Impervious, Inflow Depth > 3.81" for 25-Year event
Inflow = 1.36 cfs @ 12.09 hrs, Volume= 4,156 cf
Outflow = 0.05 cfs @ 15.59 hrs, Volume= 1,939 cf, Atten= 96%, Lag= 209.8 min
Discarded = 0.05 cfs @ 15.59 hrs, Volume= 1,939 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.12' @ 15.59 hrs Surf.Area= 1,677 sf Storage= 2,525 cf

Plug-Flow detention time= 185.8 min calculated for 1,939 cf (47% of inflow)
Center-of-Mass det. time= 97.7 min (864.4 - 766.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,440 cf	**20.83'W x 80.50'L x 3.54'H Field A** 5,940 cf Overall - 2,340 cf Embedded = 3,600 cf x 40.0% Voids
#2A	0.50'	2,340 cf	**Cultec R-330XLHD** x 44 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		3,780 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.05 cfs @ 15.59 hrs HW=2.12' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 17P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

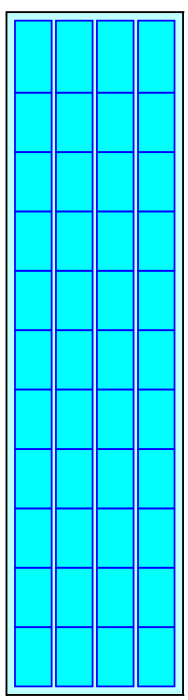
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

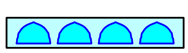
44 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 2,339.6 cf Chamber Storage

5,939.7 cf Field - 2,339.6 cf Chambers = 3,600.1 cf Stone x 40.0% Voids = 1,440.0 cf Stone Storage

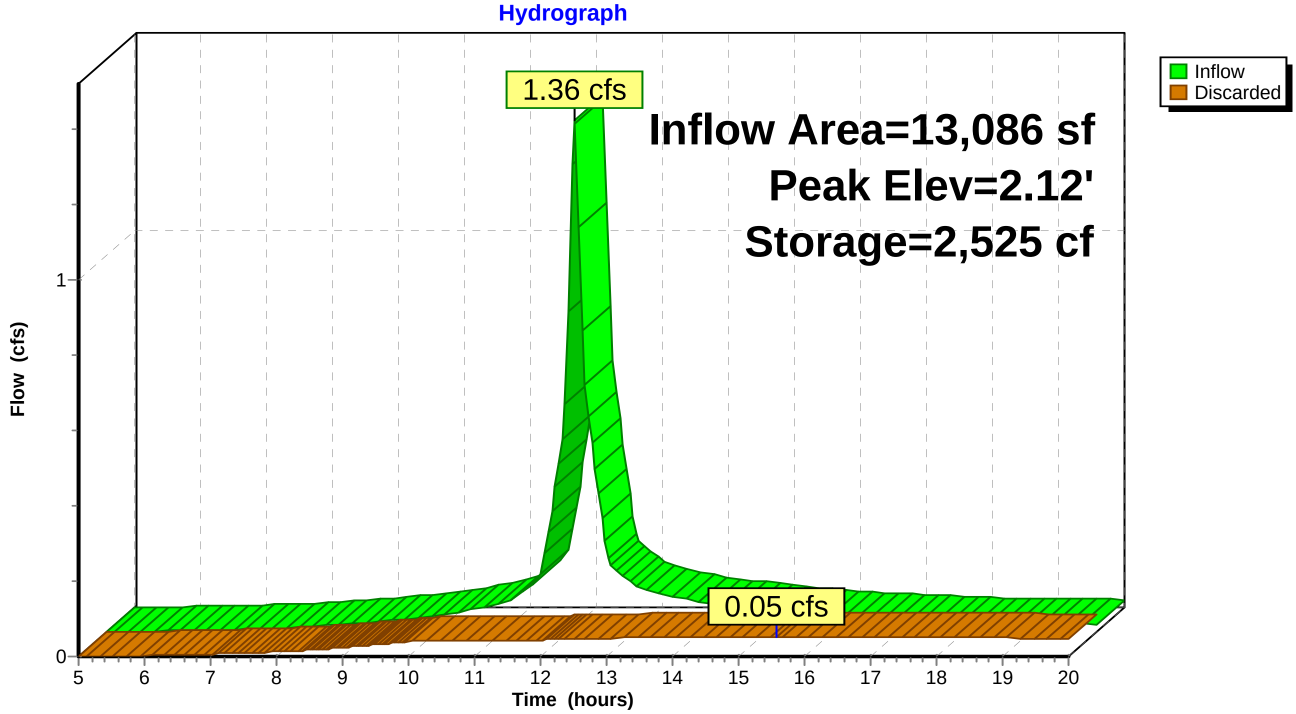
Chamber Storage + Stone Storage = 3,779.6 cf = 0.087 af
Overall Storage Efficiency = 63.6%
Overall System Size = 80.50' x 20.83' x 3.54'

44 Chambers
220.0 cy Field
133.3 cy Stone





Pond 17P: Roof Recharge



Summary for Pond 19P: Roof Recharge

Inflow Area =	11,720 sf,	42.06% Impervious,	Inflow Depth > 3.91"	for 25-Year event
Inflow =	1.24 cfs @	12.09 hrs, Volume=	3,823 cf	
Outflow =	0.09 cfs @	13.54 hrs, Volume=	3,076 cf,	Atten= 93%, Lag= 86.8 min
Discarded =	0.09 cfs @	13.54 hrs, Volume=	3,076 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.15' @ 13.54 hrs Surf.Area= 1,176 sf Storage= 1,777 cf

Plug-Flow detention time= 168.4 min calculated for 3,076 cf (80% of inflow)
Center-of-Mass det. time= 115.9 min (879.8 - 763.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,027 cf	**16.00'W x 73.50'L x 3.54'H Field A** 4,165 cf Overall - 1,598 cf Embedded = 2,567 cf x 40.0% Voids
#2A	0.50'	1,598 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		2,625 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.09 cfs @ 13.54 hrs HW=2.15' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Pond 19P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

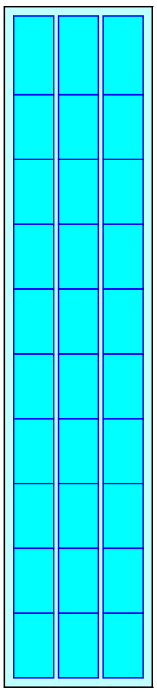
10 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 71.50' Row Length +12.0" End Stone x 2 = 73.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

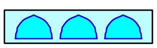
30 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 1,598.2 cf Chamber Storage

4,165.0 cf Field - 1,598.2 cf Chambers = 2,566.8 cf Stone x 40.0% Voids = 1,026.7 cf Stone Storage

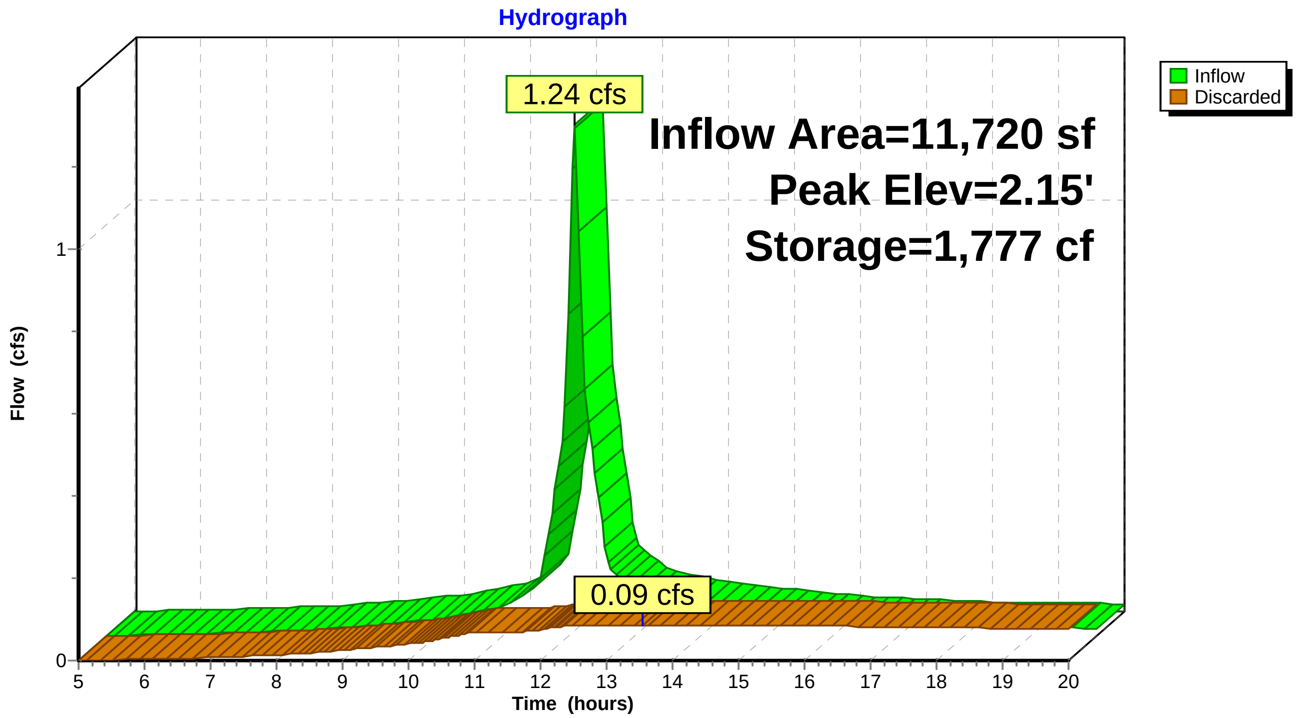
Chamber Storage + Stone Storage = 2,624.9 cf = 0.060 af
Overall Storage Efficiency = 63.0%
Overall System Size = 73.50' x 16.00' x 3.54'

30 Chambers
154.3 cy Field
95.1 cy Stone





Pond 19P: Roof Recharge



Summary for Pond 21P: BASIN B

Inflow Area = 167,695 sf, 37.24% Impervious, Inflow Depth > 2.00" for 25-Year event
Inflow = 7.35 cfs @ 12.18 hrs, Volume= 27,974 cf
Outflow = 0.85 cfs @ 13.65 hrs, Volume= 14,768 cf, Atten= 88%, Lag= 88.1 min
Discarded = 0.39 cfs @ 13.65 hrs, Volume= 12,228 cf
Primary = 0.47 cfs @ 13.65 hrs, Volume= 2,539 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 227.93' @ 13.65 hrs Surf.Area= 7,356 sf Storage= 15,017 cf

Plug-Flow detention time= 192.5 min calculated for 14,719 cf (53% of inflow)
Center-of-Mass det. time= 108.5 min (921.1 - 812.5)

Volume	Invert	Avail.Storage	Storage Description
#1	225.50'	23,381 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

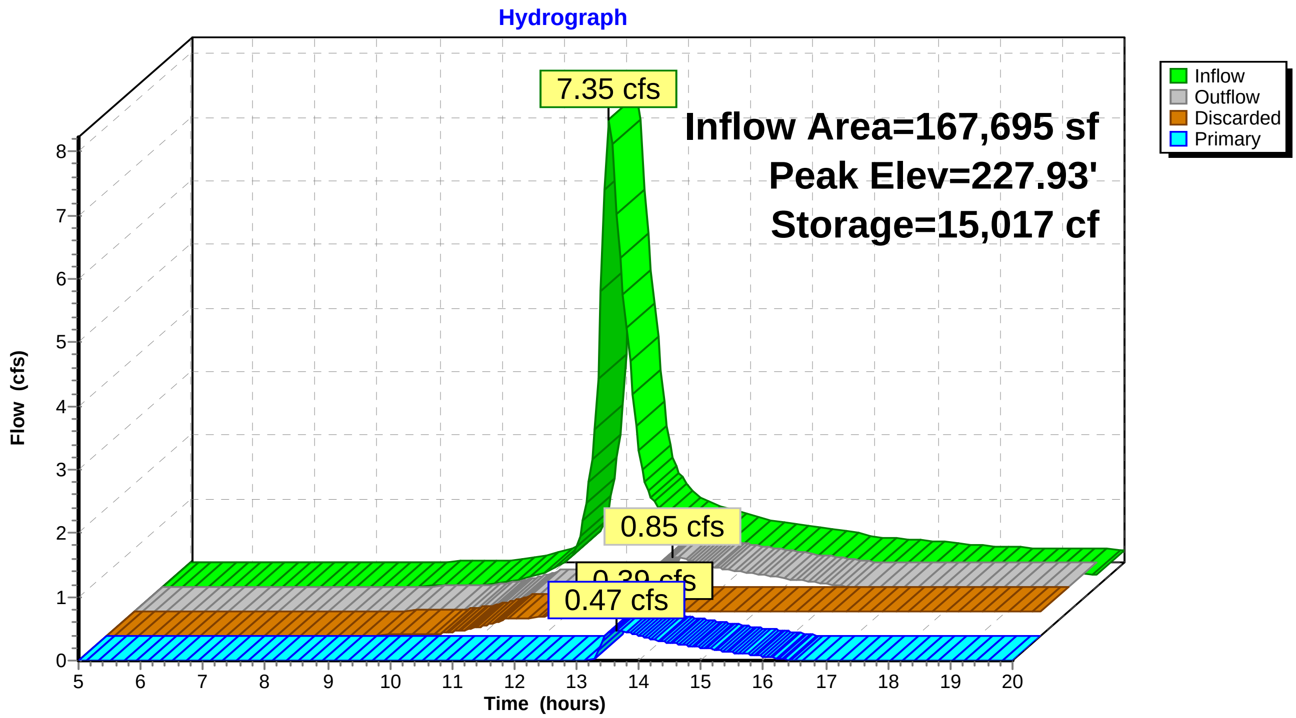
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.50	5,039	294.3	0	0	5,039
226.00	5,488	303.7	2,631	2,631	5,511
227.00	6,427	322.5	5,951	8,582	6,498
228.00	7,423	328.3	6,919	15,501	6,941
228.90	10,160	388.5	7,880	23,381	10,390

Device	Routing	Invert	Outlet Devices
#1	Discarded	225.50'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	227.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.39 cfs @ 13.65 hrs HW=227.93' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.39 cfs)

Primary OutFlow Max=0.43 cfs @ 13.65 hrs HW=227.93' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.43 cfs @ 0.50 fps)

Pond 21P: BASIN B



Summary for Pond 22P: Roof Recharge

Inflow Area = 11,373 sf, 43.34% Impervious, Inflow Depth > 2.93" for 25-Year event
Inflow = 0.94 cfs @ 12.09 hrs, Volume= 2,779 cf
Outflow = 0.04 cfs @ 15.62 hrs, Volume= 1,314 cf, Atten= 96%, Lag= 211.7 min
Discarded = 0.04 cfs @ 15.62 hrs, Volume= 1,314 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.16' @ 15.62 hrs Surf.Area= 1,133 sf Storage= 1,692 cf

Plug-Flow detention time= 200.9 min calculated for 1,309 cf (47% of inflow)
Center-of-Mass det. time= 117.5 min (905.4 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,013 cf	**11.17'W x 101.50'L x 3.54'H Field A**
			4,014 cf Overall - 1,483 cf Embedded = 2,531 cf x 40.0% Voids
#2A	0.50'	1,483 cf	**Cultec R-330XLHD** x 28 Inside #1
			Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
			Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
			Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		2,495 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 15.62 hrs HW=2.16' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Pond 22P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

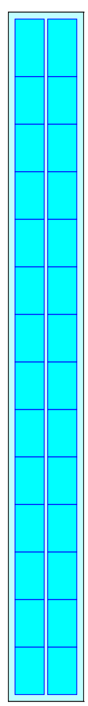
14 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 99.50' Row Length +12.0" End Stone x 2 = 101.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

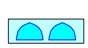
28 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,482.7 cf Chamber Storage

4,014.2 cf Field - 1,482.7 cf Chambers = 2,531.4 cf Stone x 40.0% Voids = 1,012.6 cf Stone Storage

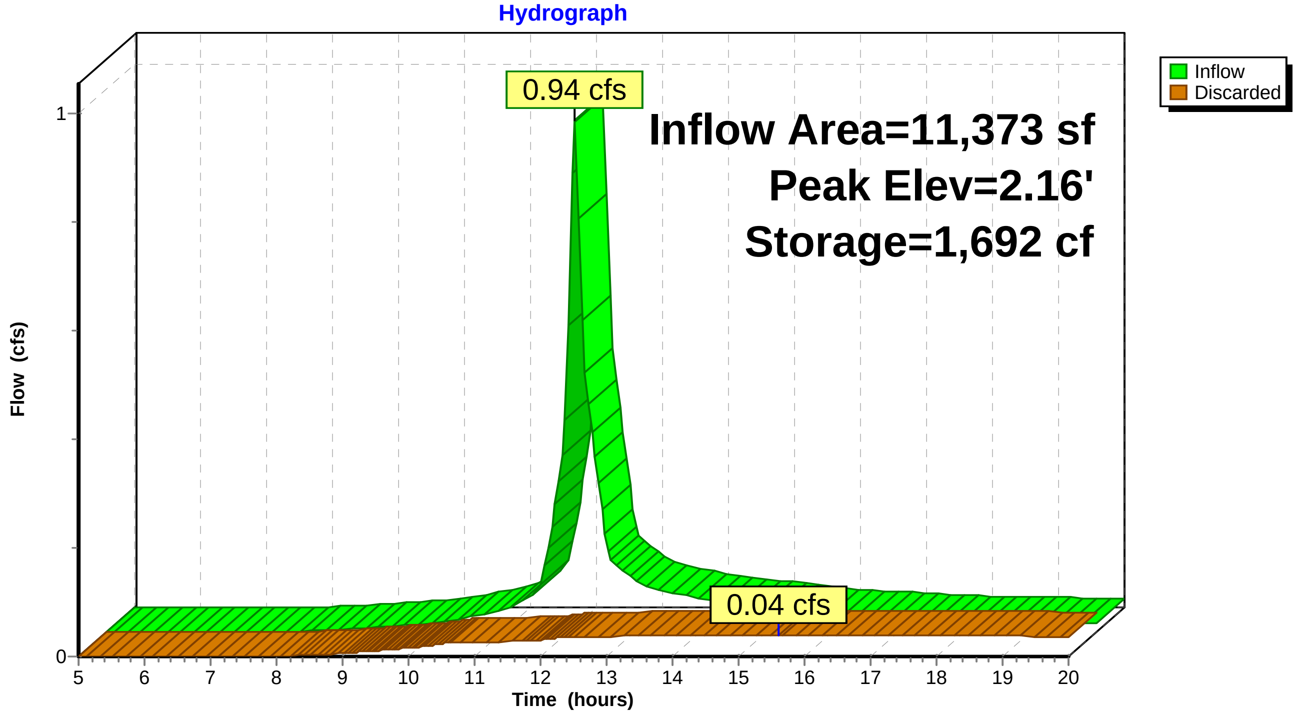
Chamber Storage + Stone Storage = 2,495.3 cf = 0.057 af
Overall Storage Efficiency = 62.2%
Overall System Size = 101.50' x 11.17' x 3.54'

28 Chambers
148.7 cy Field
93.8 cy Stone





Pond 22P: Roof Recharge



Summary for Pond 30P: BASIN A

[82] Warning: Early inflow requires earlier time span

Inflow Area = 18,459 sf, 78.24% Impervious, Inflow Depth > 4.51" for 25-Year event
Inflow = 2.49 cfs @ 12.00 hrs, Volume= 6,931 cf
Outflow = 0.21 cfs @ 12.82 hrs, Volume= 6,497 cf, Atten= 92%, Lag= 49.0 min
Discarded = 0.21 cfs @ 12.82 hrs, Volume= 6,497 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 239.69' @ 12.82 hrs Surf.Area= 2,703 sf Storage= 3,039 cf

Plug-Flow detention time= 141.6 min calculated for 6,496 cf (94% of inflow)
Center-of-Mass det. time= 117.6 min (857.9 - 740.3)

Volume	Invert	Avail.Storage	Storage Description
#1	238.20'	7,401 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

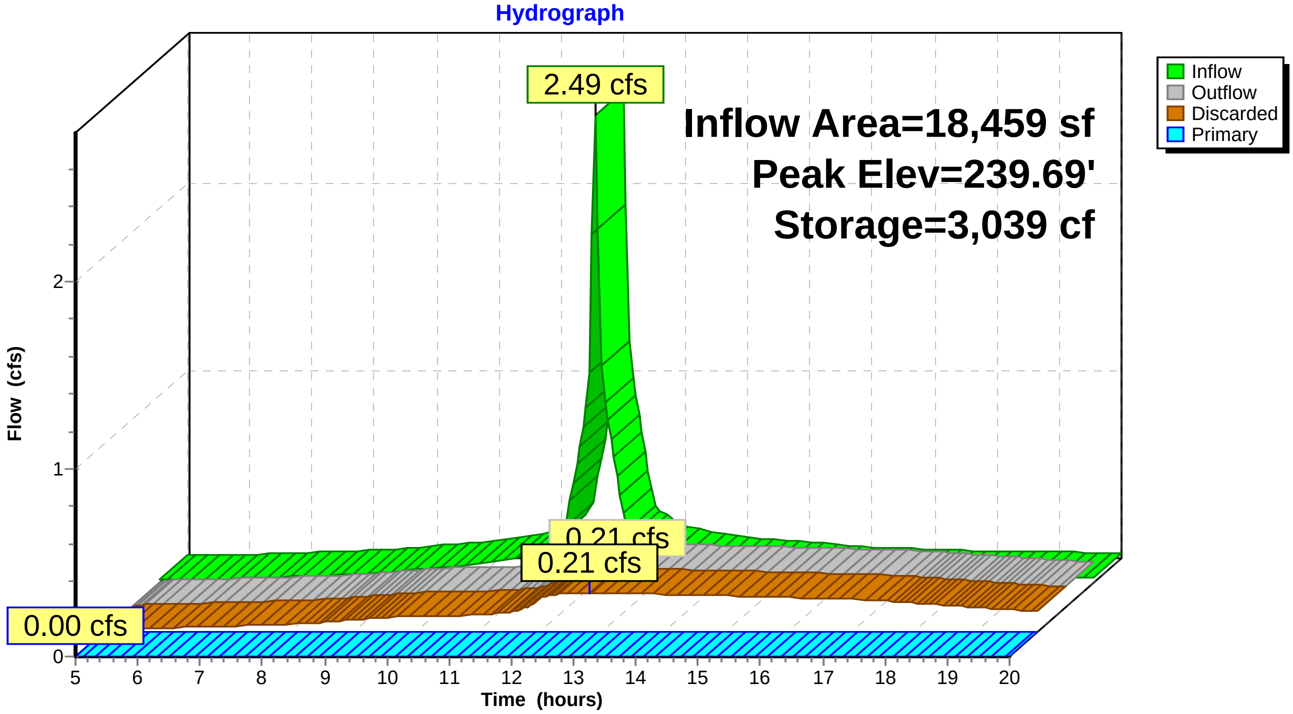
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
238.20	1,411	262.1	0	0	1,411
239.00	2,083	297.8	1,389	1,389	3,017
240.00	3,005	316.6	2,530	3,919	3,986
241.00	3,983	335.5	3,483	7,401	5,020

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.20'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.00'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.21 cfs @ 12.82 hrs HW=239.69' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=238.20' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 30P: BASIN A



Summary for Pond 31P: BASIN D

Inflow Area = 90,014 sf, 45.84% Impervious, Inflow Depth > 3.30" for 25-Year event
Inflow = 8.29 cfs @ 12.09 hrs, Volume= 24,735 cf
Outflow = 0.72 cfs @ 13.12 hrs, Volume= 21,915 cf, Atten= 91%, Lag= 61.8 min
Discarded = 0.72 cfs @ 13.12 hrs, Volume= 21,915 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 240.61' @ 13.12 hrs Surf.Area= 8,732 sf Storage= 11,557 cf

Plug-Flow detention time= 162.3 min calculated for 21,915 cf (89% of inflow)
Center-of-Mass det. time= 126.1 min (905.6 - 779.5)

Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	24,822 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

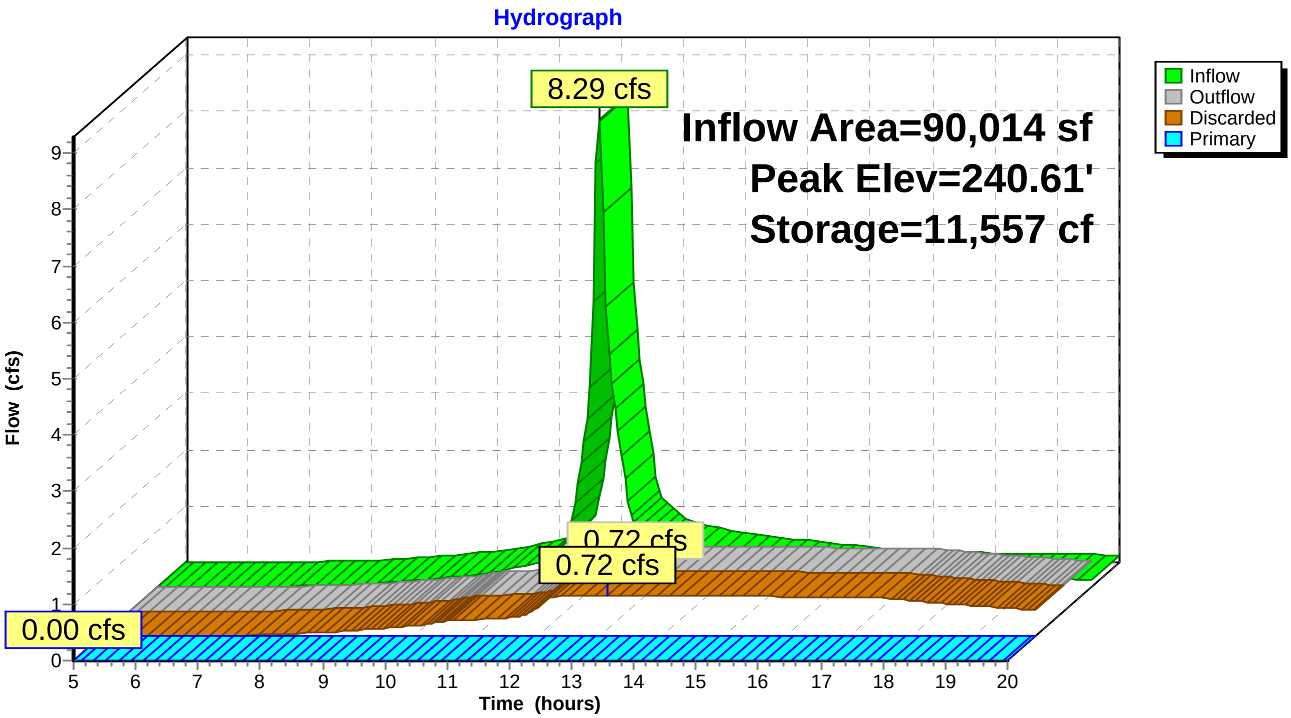
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	5,028	276.6	0	0	5,028
240.00	7,979	406.4	6,447	6,447	12,091
241.00	9,227	425.3	8,595	15,042	13,409
241.90	12,593	472.4	9,780	24,822	16,798

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.72 cfs @ 13.12 hrs HW=240.61' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.72 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=239.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 31P: BASIN D



Summary for Pond 32P: BASIN C

Inflow Area = 188,274 sf, 48.56% Impervious, Inflow Depth > 2.64" for 25-Year event
Inflow = 12.19 cfs @ 12.14 hrs, Volume= 41,493 cf
Outflow = 1.55 cfs @ 13.01 hrs, Volume= 37,848 cf, Atten= 87%, Lag= 52.1 min
Discarded = 1.55 cfs @ 13.01 hrs, Volume= 37,848 cf
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 225.78' @ 13.01 hrs Surf.Area= 14,878 sf Storage= 18,870 cf

Plug-Flow detention time= 144.8 min calculated for 37,848 cf (91% of inflow)
Center-of-Mass det. time= 115.7 min (912.5 - 796.8)

Volume	Invert	Avail.Storage	Storage Description
#1	224.00'	38,476 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

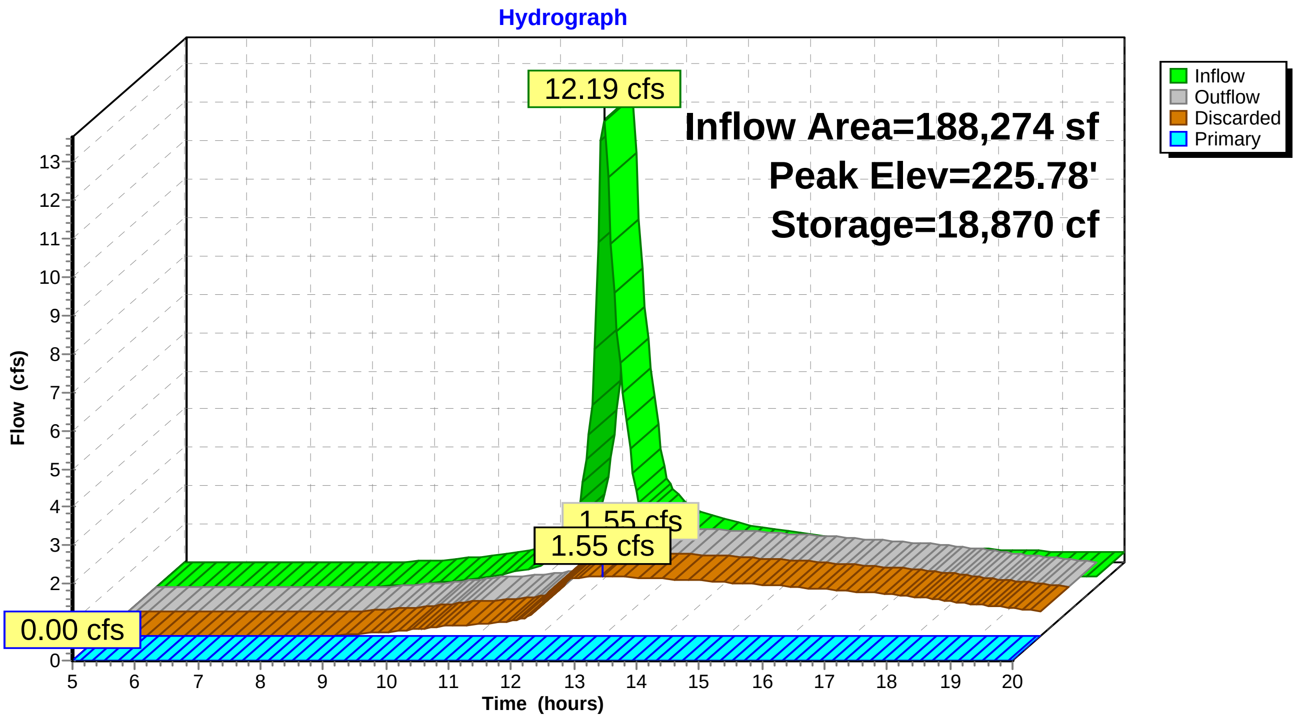
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
224.00	4,753	268.4	0	0	4,753
225.00	12,400	506.3	8,277	8,277	19,424
226.00	15,628	628.5	13,983	22,260	30,474
226.90	20,519	675.7	16,216	38,476	35,408

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	225.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.55 cfs @ 13.01 hrs HW=225.78' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.55 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=224.00' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 32P: BASIN C



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 34S: 10 Unit Roof Runoff Area=10,448 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=1.54 cfs 5,194 cf

Subcatchment 35S: 14 Unit Roof Runoff Area=13,061 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=1.92 cfs 6,493 cf

Subcatchment 36S: 14 Unit Roof Runoff Area=13,061 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=1.92 cfs 6,493 cf

Subcatchment 37S: 7 Unit Roof Runoff Area=7,296 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=1.07 cfs 3,627 cf

Subcatchment LOT 1: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=0.18 cfs 597 cf

Subcatchment LOT 12: DUPLEX + YARD Runoff Area=11,373 sf 43.34% Impervious Runoff Depth>3.94"
Tc=6.0 min CN=78 Runoff=1.26 cfs 3,734 cf

Subcatchment LOT 13: DUPLEX + YARD Runoff Area=11,720 sf 42.06% Impervious Runoff Depth>5.01"
Tc=6.0 min CN=88 Runoff=1.57 cfs 4,894 cf

Subcatchment LOT 14: DUPLEX + YARD Runoff Area=13,086 sf 37.67% Impervious Runoff Depth>4.90"
Tc=6.0 min CN=87 Runoff=1.72 cfs 5,347 cf

Subcatchment LOT 18: DUPLEX ROOF Runoff Area=4,929 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=0.73 cfs 2,450 cf

Subcatchment LOT 19: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=0.60 cfs 2,018 cf

Subcatchment LOT 2: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=0.18 cfs 597 cf

Subcatchment LOT 20: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=0.60 cfs 2,018 cf

Subcatchment LOT 21: DUPLEX ROOF Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=0.60 cfs 2,018 cf

Subcatchment LOT 3: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=0.18 cfs 597 cf

Subcatchment LOT 8: Single Family House Runoff Area=1,200 sf 100.00% Impervious Runoff Depth>5.97"
Tc=6.0 min CN=98 Runoff=0.18 cfs 597 cf

Subcatchment PRDA-1: TO BASIN D Runoff Area=51,731 sf 56.02% Impervious Runoff Depth>4.26"
Tc=6.0 min CN=81 Runoff=6.10 cfs 18,345 cf

Subcatchment PRDA-10: TO ILSF Runoff Area=14,656 sf 0.00% Impervious Runoff Depth>1.11"
Flow Length=85' Tc=15.0 min CN=47 Runoff=0.29 cfs 1,357 cf

Subcatchment PRDA-11: BASIN A DIRECT Runoff Area=8,000 sf 49.79% Impervious Runoff Depth>5.12"
Tc=0.0 min CN=89 Runoff=1.27 cfs 3,417 cf

Subcatchment PRDA-12: BASIN B DIRECT Runoff Area=16,454 sf 45.11% Impervious Runoff Depth>3.94"
Tc=6.0 min CN=78 Runoff=1.82 cfs 5,402 cf

Subcatchment PRDA-13: BASIN C DIRECT Runoff Area=31,453 sf 49.69% Impervious Runoff Depth>4.04"
Tc=6.0 min CN=79 Runoff=3.55 cfs 10,600 cf

Subcatchment PRDA-2: TO BASIN A Runoff Area=10,459 sf 100.00% Impervious Runoff Depth>5.97"
Tc=0.0 min CN=98 Runoff=1.81 cfs 5,200 cf

Subcatchment PRDA-3: TO BASIN B Runoff Area=151,241 sf 36.39% Impervious Runoff Depth>2.74"
Flow Length=520' Tc=13.1 min CN=66 Runoff=9.42 cfs 34,504 cf

Subcatchment PRDA-4: TO BASIN C Runoff Area=156,821 sf 48.34% Impervious Runoff Depth>3.52"
Flow Length=370' Tc=10.4 min CN=74 Runoff=13.64 cfs 46,053 cf

Subcatchment PRDA-5: BASIN D DIRECT Runoff Area=38,283 sf 32.09% Impervious Runoff Depth>4.47"
Tc=6.0 min CN=83 Runoff=4.70 cfs 14,259 cf

Subcatchment PRDA-6: TO BASIN E Runoff Area=135,239 sf 32.90% Impervious Runoff Depth>3.53"
Tc=6.0 min CN=74 Runoff=13.49 cfs 39,773 cf

Subcatchment PRDA-7: TO WETLAND Runoff Area=149,386 sf 2.80% Impervious Runoff Depth>1.51"
Tc=6.0 min CN=52 Runoff=5.87 cfs 18,769 cf

Subcatchment PRDA-8: TO WETLAND Runoff Area=46,646 sf 0.00% Impervious Runoff Depth>1.67"
Tc=6.0 min CN=54 Runoff=2.08 cfs 6,501 cf

Subcatchment PRDA-9: TO WETLAND Runoff Area=80,362 sf 11.49% Impervious Runoff Depth>4.04"
Tc=6.0 min CN=79 Runoff=9.08 cfs 27,084 cf

Reach 1R: ILSF Inflow=0.29 cfs 1,357 cf
Outflow=0.29 cfs 1,357 cf

Reach 14R: WETLAND SOUTH Inflow=9.08 cfs 29,537 cf
Outflow=9.08 cfs 29,537 cf

Reach 15R: WETLAND SOUTHEAST Inflow=5.20 cfs 19,298 cf
Outflow=5.20 cfs 19,298 cf

Reach 21R: WETLAND NORTH Inflow=10.29 cfs 36,353 cf
Outflow=10.29 cfs 36,353 cf

Pond 1P: Roof Recharge Peak Elev=2.09' Storage=2,271 cf Inflow=1.54 cfs 5,194 cf
Outflow=0.11 cfs 4,290 cf

Pond 2P: Roof Recharge Peak Elev=2.43' Storage=3,907 cf Inflow=1.92 cfs 6,493 cf
Outflow=0.07 cfs 3,014 cf

Pond 3P: Roof Recharge Peak Elev=2.43' Storage=3,907 cf Inflow=1.92 cfs 6,493 cf
Outflow=0.07 cfs 3,014 cf

Pond 4P: Roof Recharge Peak Elev=2.47' Storage=2,164 cf Inflow=1.07 cfs 3,627 cf
Outflow=0.04 cfs 1,729 cf

Pond 5P: Roof Recharge Peak Elev=2.54' Storage=326 cf Inflow=0.18 cfs 597 cf
Outflow=0.01 cfs 360 cf

Pond 6P: Roof Recharge Peak Elev=1.75' Storage=1,068 cf Inflow=0.60 cfs 2,018 cf
Outflow=0.03 cfs 1,223 cf

Pond 7P: Roof Recharge Peak Elev=2.23' Storage=1,386 cf Inflow=0.73 cfs 2,450 cf
Outflow=0.03 cfs 1,321 cf

Pond 8P: Roof Recharge Peak Elev=2.54' Storage=326 cf Inflow=0.18 cfs 597 cf
Outflow=0.01 cfs 360 cf

Pond 9P: BASIN E Peak Elev=241.06' Storage=17,545 cf Inflow=13.49 cfs 39,773 cf
Discarded=0.42 cfs 13,774 cf Primary=4.27 cfs 10,769 cf Outflow=4.68 cfs 24,543 cf

Pond 10P: Roof Recharge Peak Elev=2.54' Storage=326 cf Inflow=0.18 cfs 597 cf
Outflow=0.01 cfs 360 cf

Pond 11P: Roof Recharge Peak Elev=1.75' Storage=1,068 cf Inflow=0.60 cfs 2,018 cf
Outflow=0.03 cfs 1,223 cf

Pond 13P: Roof Recharge Peak Elev=2.54' Storage=326 cf Inflow=0.18 cfs 597 cf
Outflow=0.01 cfs 360 cf

Pond 14P: Roof Recharge Peak Elev=1.90' Storage=1,110 cf Inflow=0.60 cfs 2,018 cf
Outflow=0.03 cfs 1,131 cf

Pond 17P: Roof Recharge Peak Elev=3.05' Storage=3,450 cf Inflow=1.72 cfs 5,347 cf
Outflow=0.05 cfs 2,164 cf

Pond 19P: Roof Recharge Peak Elev=3.13' Storage=2,430 cf Inflow=1.57 cfs 4,894 cf
Outflow=0.10 cfs 3,483 cf

Pond 21P: BASIN B Peak Elev=228.07' Storage=16,003 cf Inflow=10.67 cfs 39,906 cf
Discarded=0.40 cfs 13,015 cf Primary=4.58 cfs 12,797 cf Outflow=4.98 cfs 25,812 cf

Pond 22P: Roof Recharge Peak Elev=3.35' Storage=2,407 cf Inflow=1.26 cfs 3,734 cf
Outflow=0.04 cfs 1,549 cf

Pond 30P: BASIN A Peak Elev=240.01' Storage=3,942 cf Inflow=3.08 cfs 8,616 cf
Discarded=0.22 cfs 7,462 cf Primary=0.07 cfs 87 cf Outflow=0.30 cfs 7,549 cf

Pond 31P: BASIN D Peak Elev=240.98' Storage=14,812 cf Inflow=10.80 cfs 32,604 cf
Discarded=0.75 cfs 24,595 cf Primary=1.38 cfs 2,366 cf Outflow=2.13 cfs 26,961 cf

Pond 32P: BASIN C Peak Elev=226.06' Storage=23,166 cf Inflow=16.60 cfs 56,653 cf
Discarded=1.72 cfs 44,037 cf Primary=4.19 cfs 6,815 cf Outflow=5.91 cfs 50,852 cf

Total Runoff Area = 992,682 sf Runoff Volume = 277,934 cf Average Runoff Depth = 3.36"
64.94% Pervious = 644,625 sf 35.06% Impervious = 348,057 sf

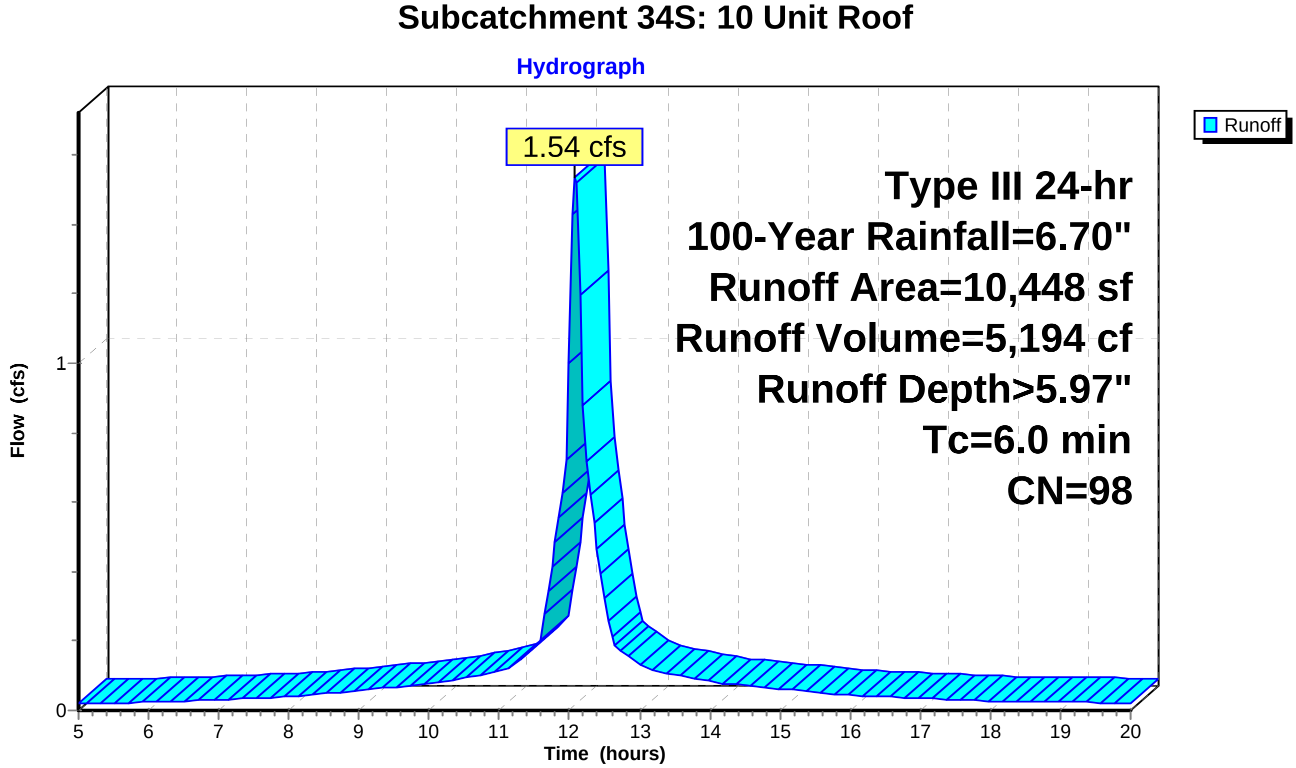
Summary for Subcatchment 34S: 10 Unit Roof

Runoff = 1.54 cfs @ 12.09 hrs, Volume= 5,194 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	10,448	98	Impervious
	10,448		100.00% Impervious Area

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



Summary for Subcatchment 35S: 14 Unit Roof

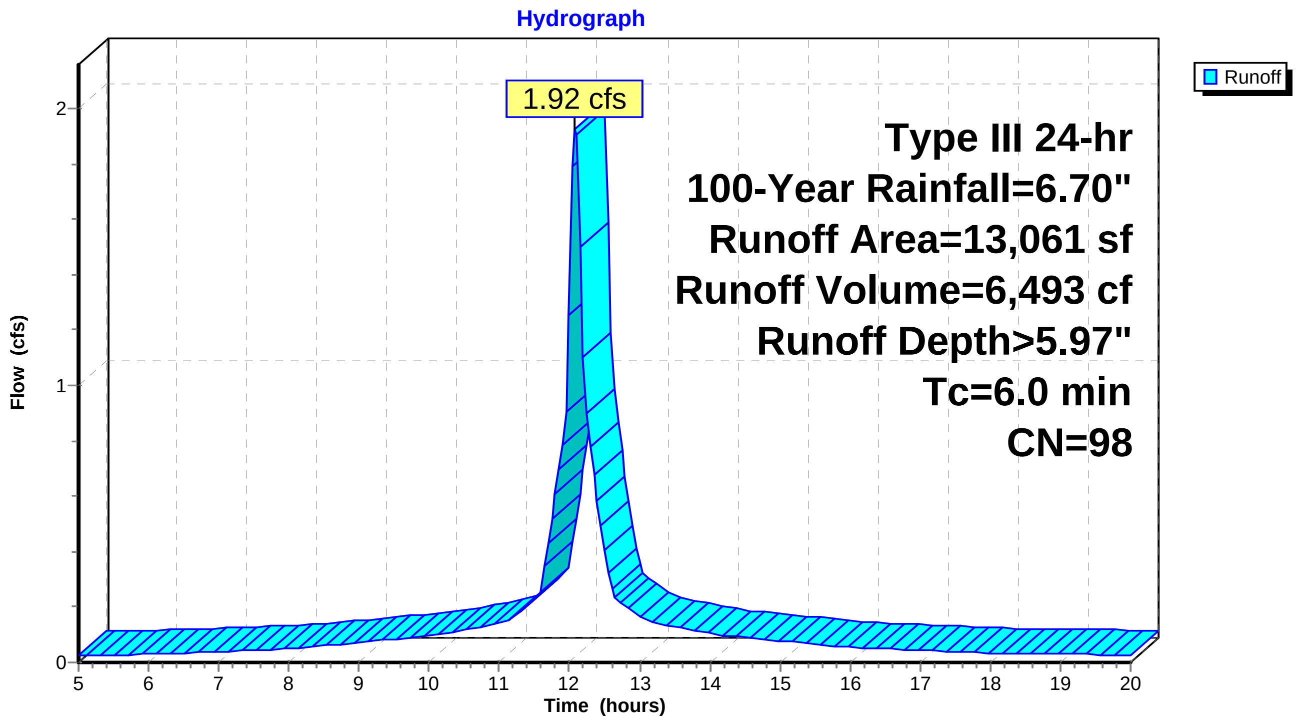
Runoff = 1.92 cfs @ 12.09 hrs, Volume= 6,493 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	13,061	98	Impervious
	13,061		100.00% Impervious Area

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

Subcatchment 35S: 14 Unit Roof



Summary for Subcatchment 36S: 14 Unit Roof

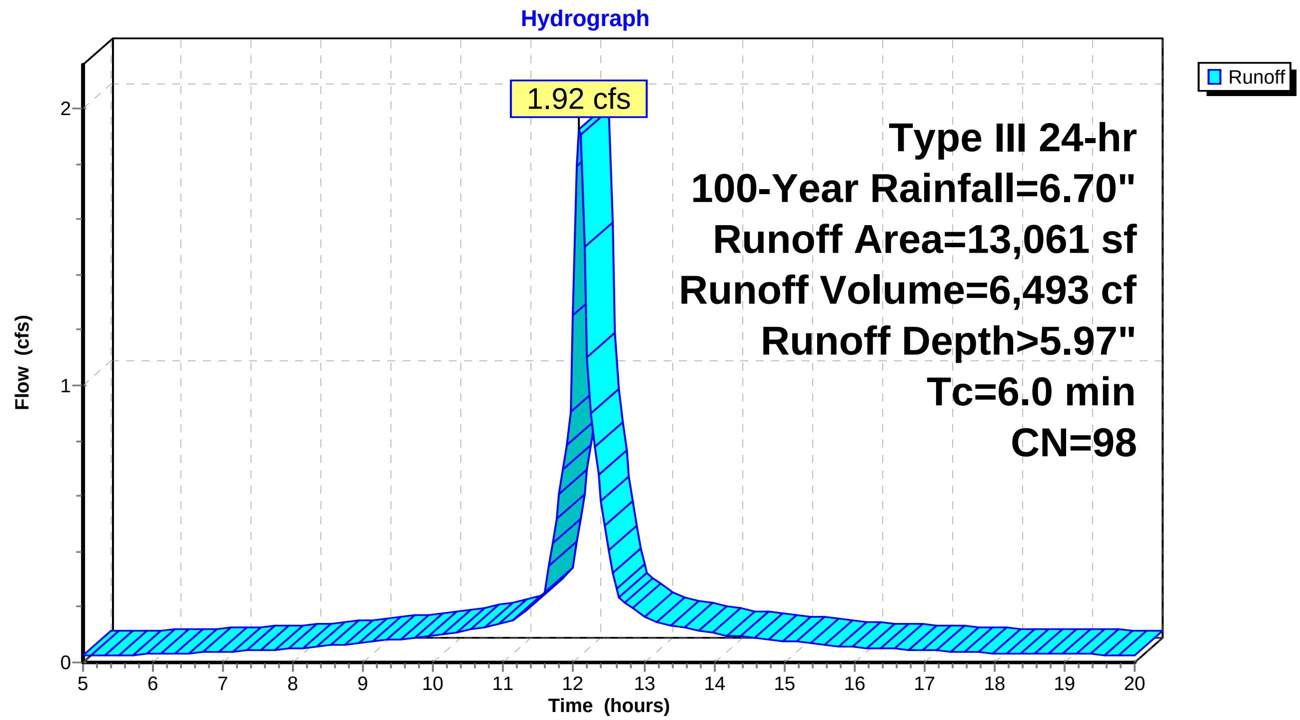
Runoff = 1.92 cfs @ 12.09 hrs, Volume= 6,493 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	13,061	98	Impervious
	13,061		100.00% Impervious Area

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

Subcatchment 36S: 14 Unit Roof



Summary for Subcatchment 37S: 7 Unit Roof

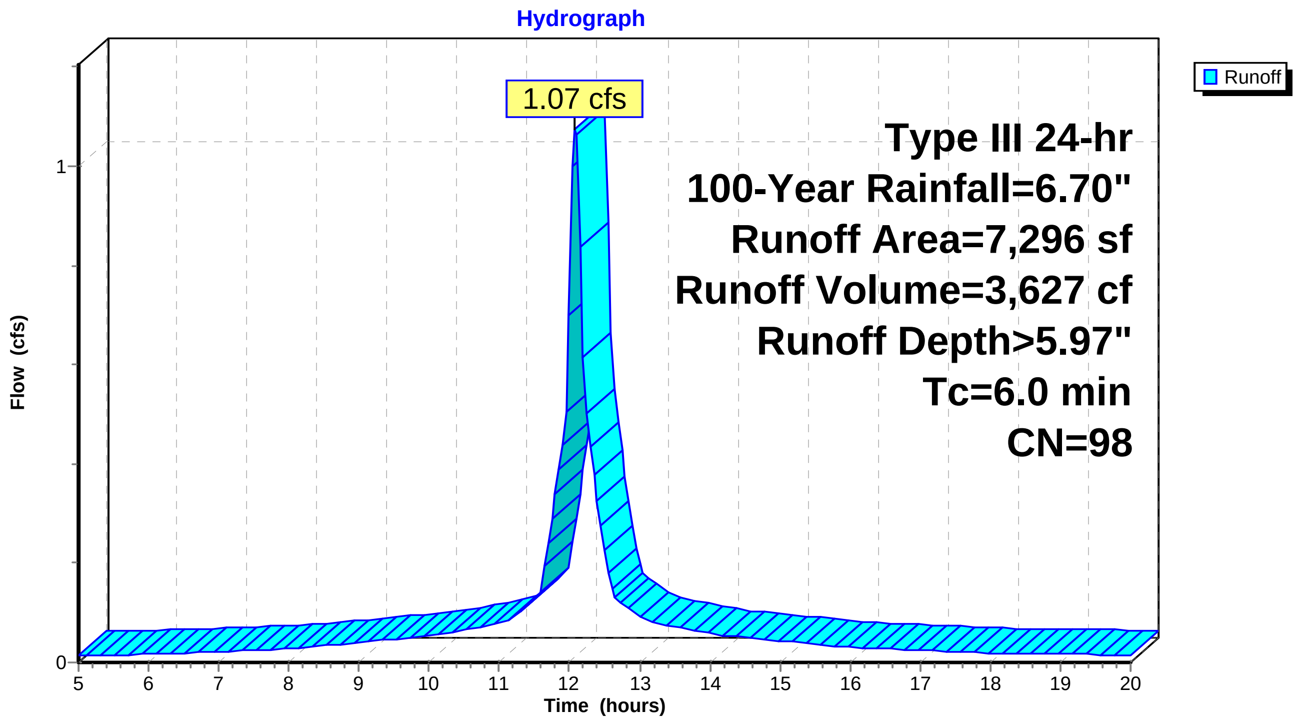
Runoff = 1.07 cfs @ 12.09 hrs, Volume= 3,627 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	7,296	98	Impervious
	7,296		100.00% Impervious Area

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

Subcatchment 37S: 7 Unit Roof



Summary for Subcatchment LOT 1: Single Family House

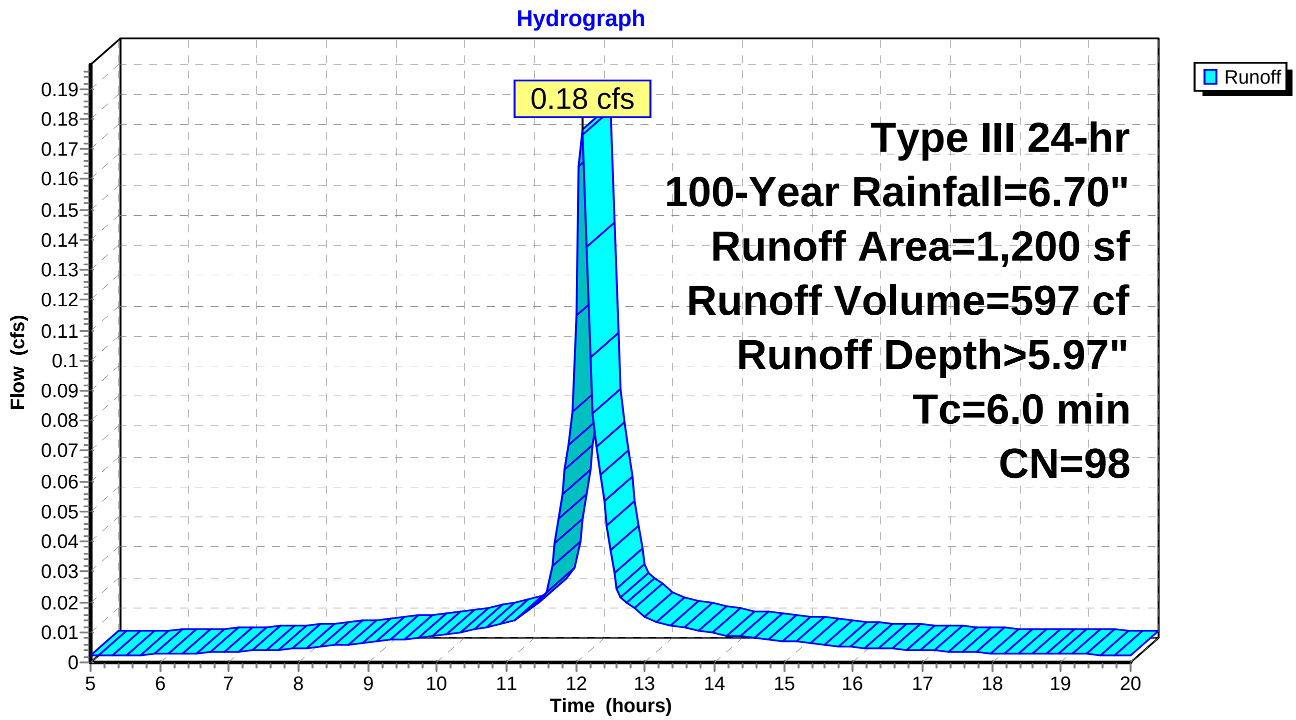
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 597 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 1: Single Family House



Summary for Subcatchment LOT 12: DUPLEX + YARD

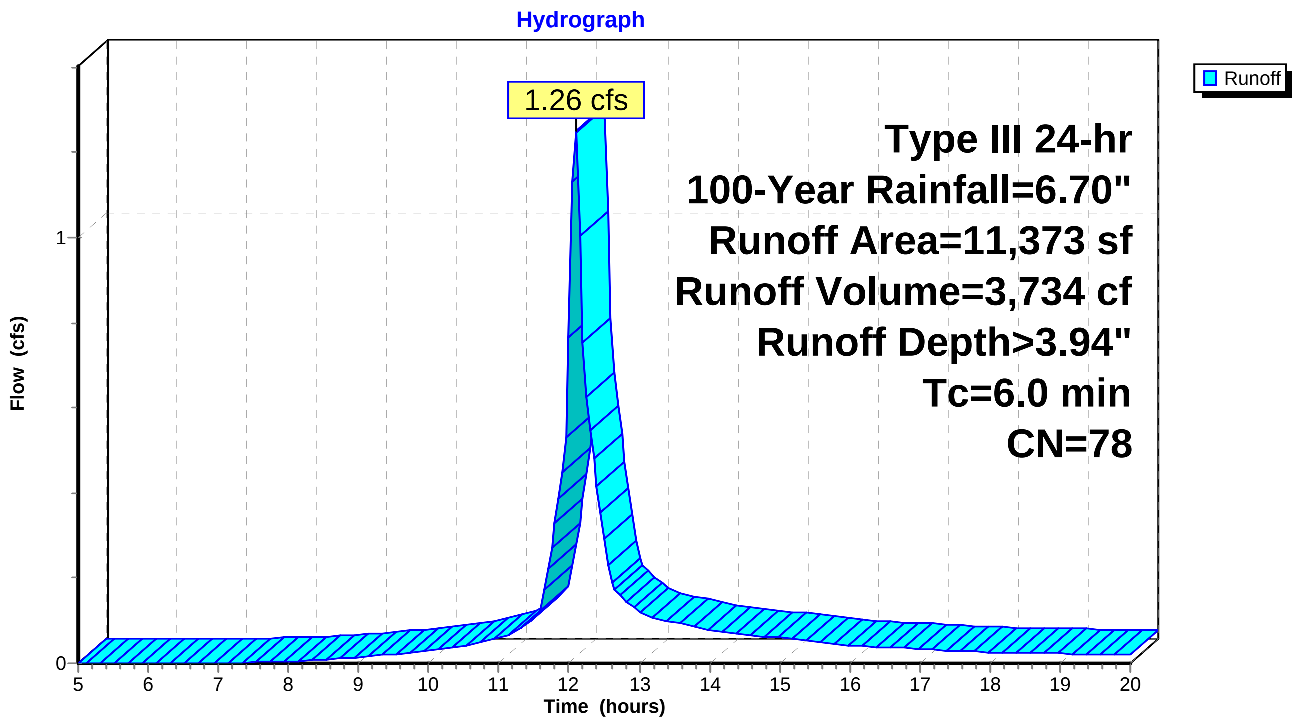
Runoff = 1.26 cfs @ 12.09 hrs, Volume= 3,734 cf, Depth> 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	490	80	>75% Grass cover, Good, HSG D
	5,954	61	>75% Grass cover, Good, HSG B
	11,373	78	Weighted Average
	6,444		56.66% Pervious Area
	4,929		43.34% Impervious Area

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

Subcatchment LOT 12: DUPLEX + YARD



Summary for Subcatchment LOT 13: DUPLEX + YARD

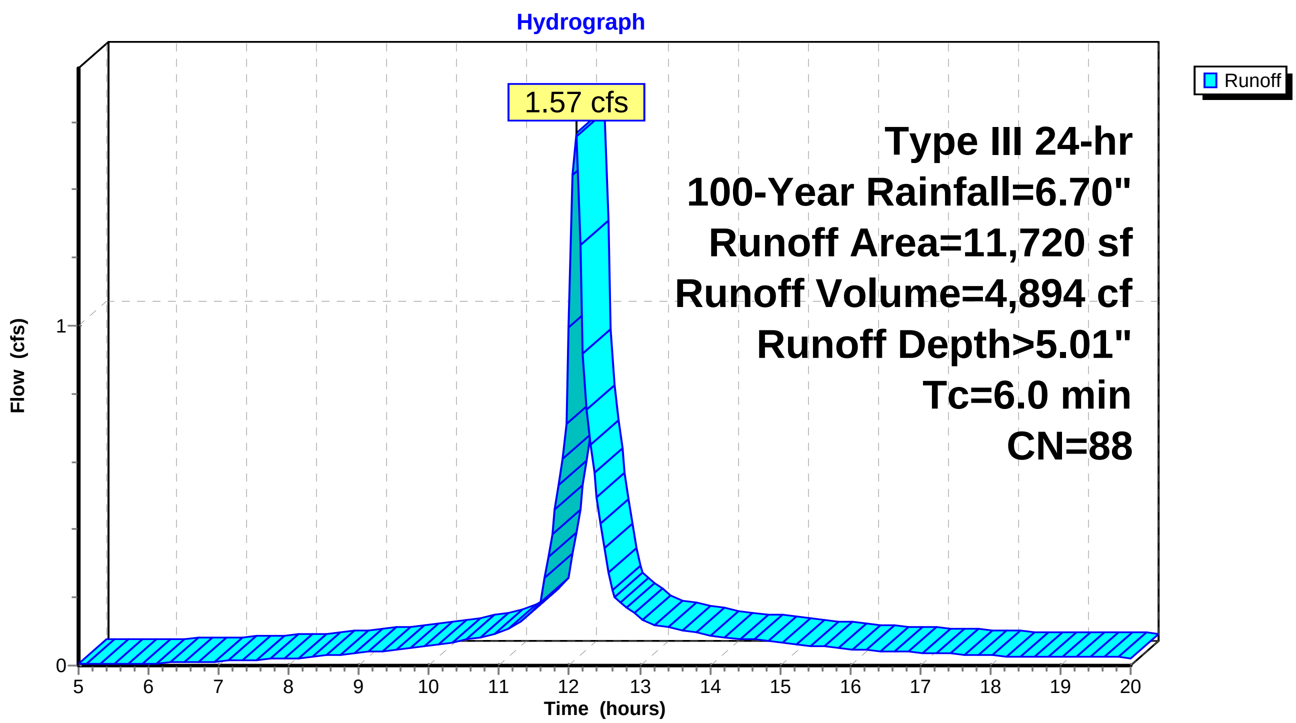
Runoff = 1.57 cfs @ 12.09 hrs, Volume= 4,894 cf, Depth> 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	6,791	80	>75% Grass cover, Good, HSG D
	11,720	88	Weighted Average
	6,791		57.94% Pervious Area
	4,929		42.06% Impervious Area

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

Subcatchment LOT 13: DUPLEX + YARD



Summary for Subcatchment LOT 14: DUPLEX + YARD

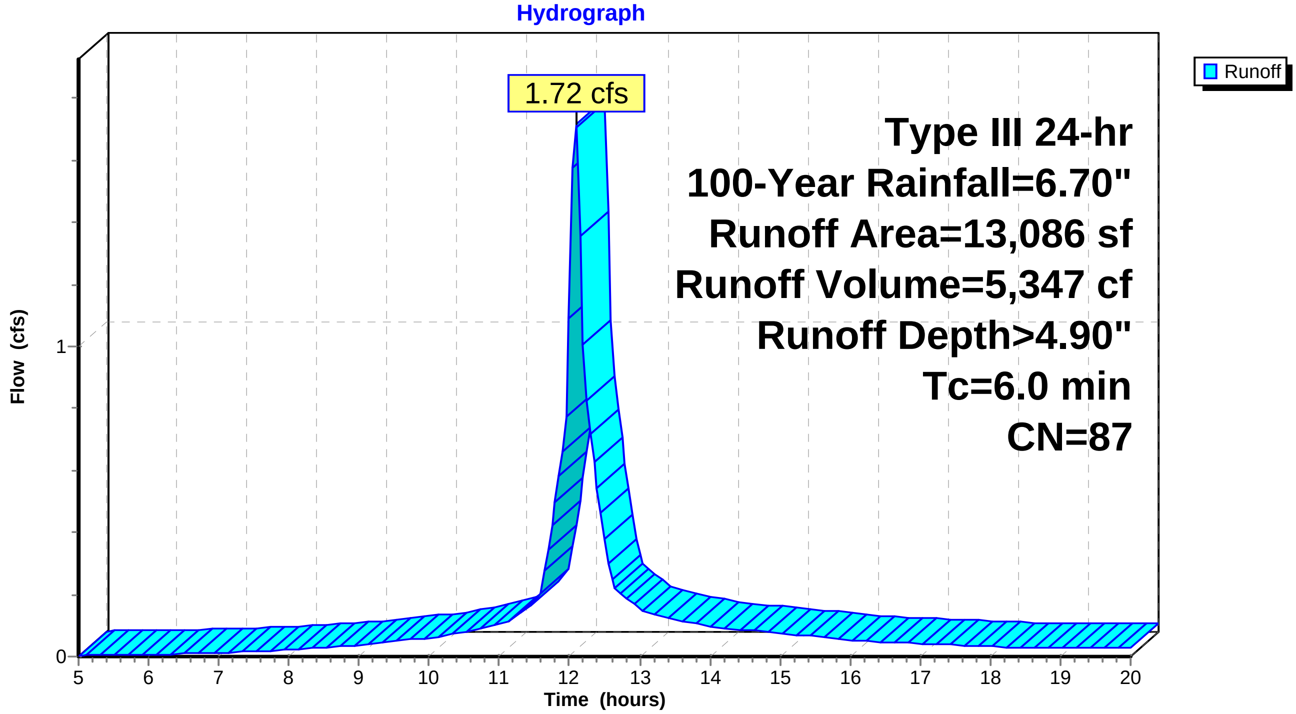
Runoff = 1.72 cfs @ 12.09 hrs, Volume= 5,347 cf, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	8,157	80	>75% Grass cover, Good, HSG D
	13,086	87	Weighted Average
	8,157		62.33% Pervious Area
	4,929		37.67% Impervious Area

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

Subcatchment LOT 14: DUPLEX + YARD



Summary for Subcatchment LOT 18: DUPLEX ROOF

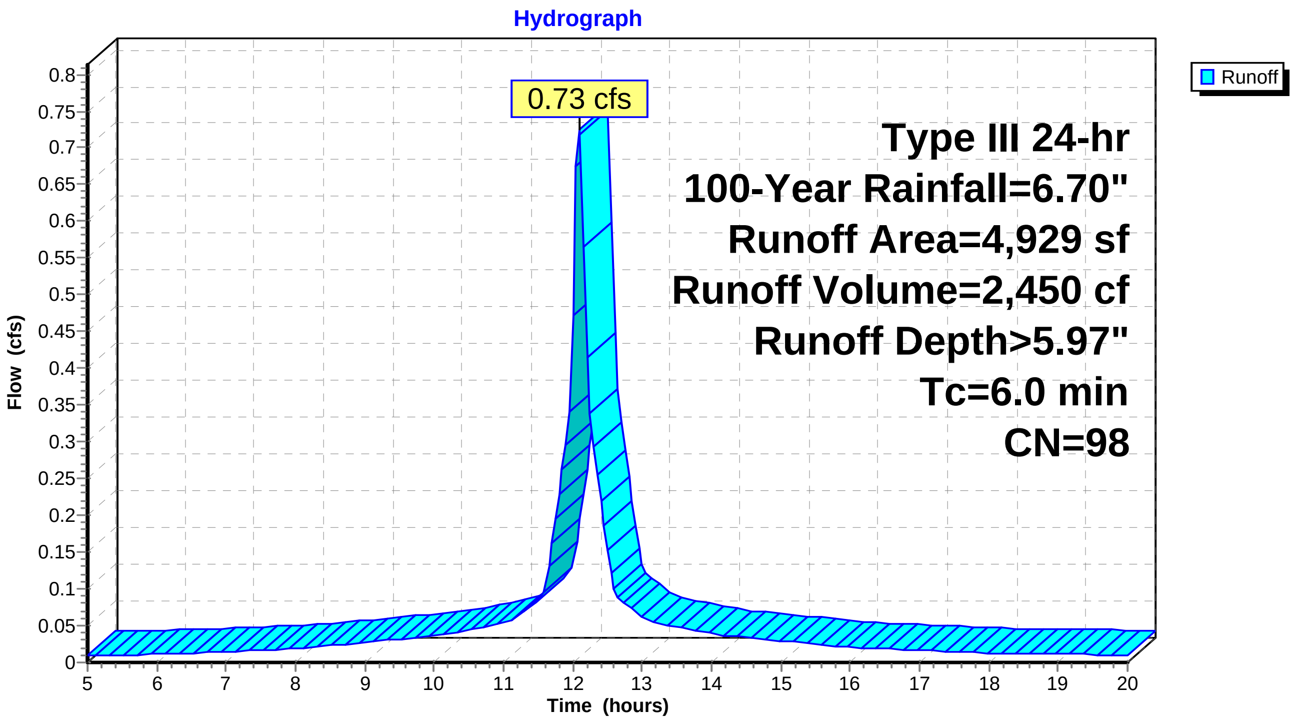
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 2,450 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	4,929	98	Impervious
	4,929		100.00% Impervious Area

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

Subcatchment LOT 18: DUPLEX ROOF



Summary for Subcatchment LOT 19: DUPLEX ROOF

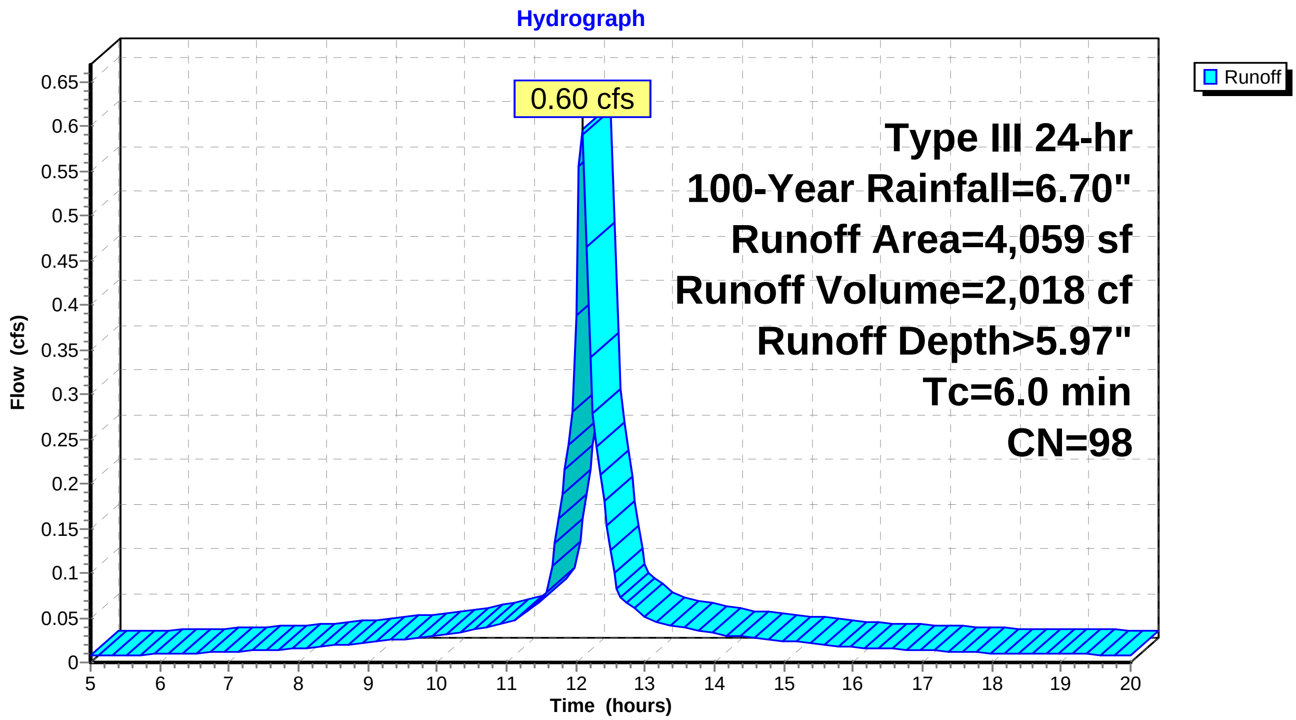
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 2,018 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 19: DUPLEX ROOF



Summary for Subcatchment LOT 2: Single Family House

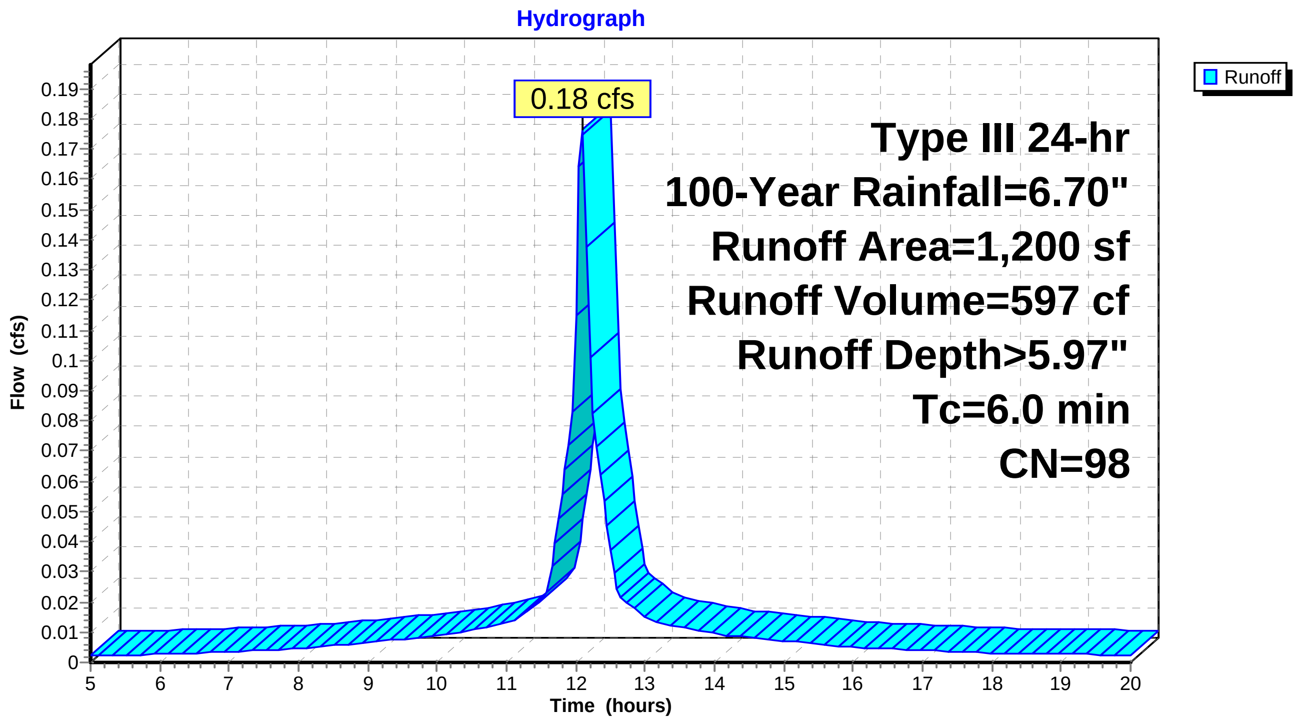
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 597 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 2: Single Family House



Summary for Subcatchment LOT 20: DUPLEX ROOF

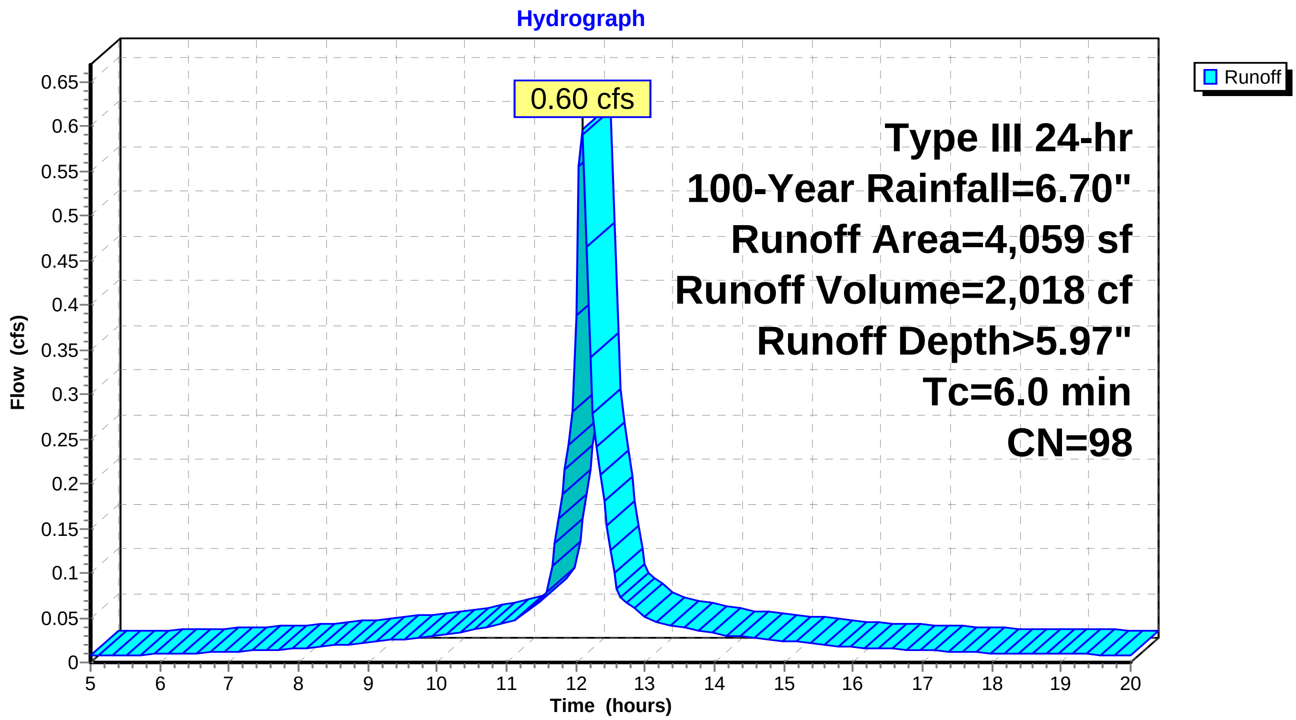
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 2,018 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 20: DUPLEX ROOF



Summary for Subcatchment LOT 21: DUPLEX ROOF

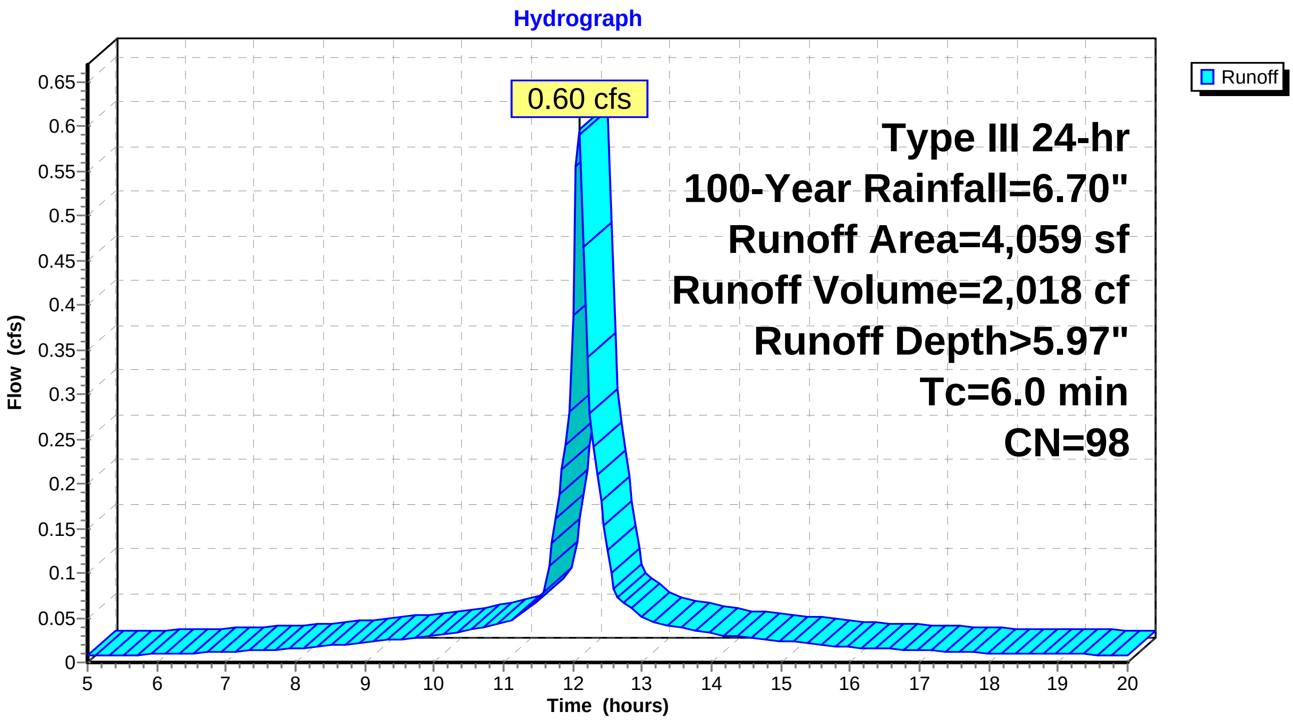
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 2,018 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	4,059	98	Impervious
	4,059		100.00% Impervious Area

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

Subcatchment LOT 21: DUPLEX ROOF



Summary for Subcatchment LOT 3: Single Family House

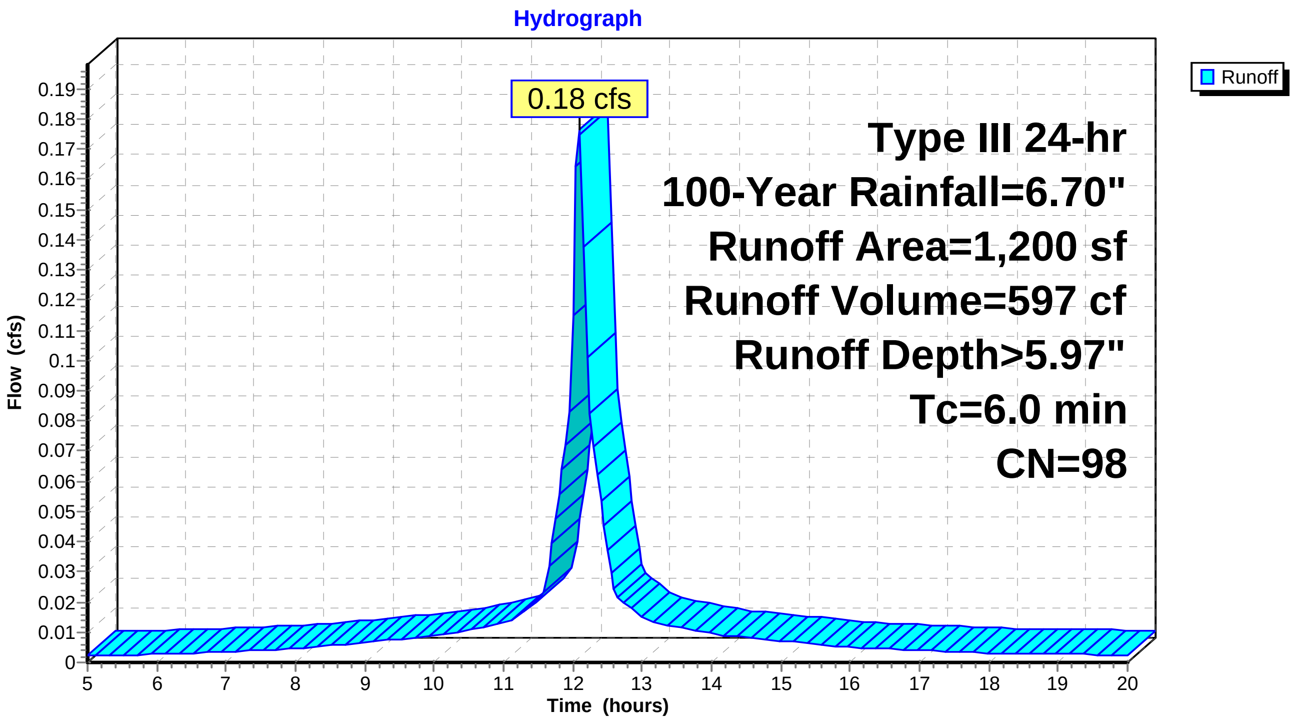
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 597 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 3: Single Family House



Summary for Subcatchment LOT 8: Single Family House

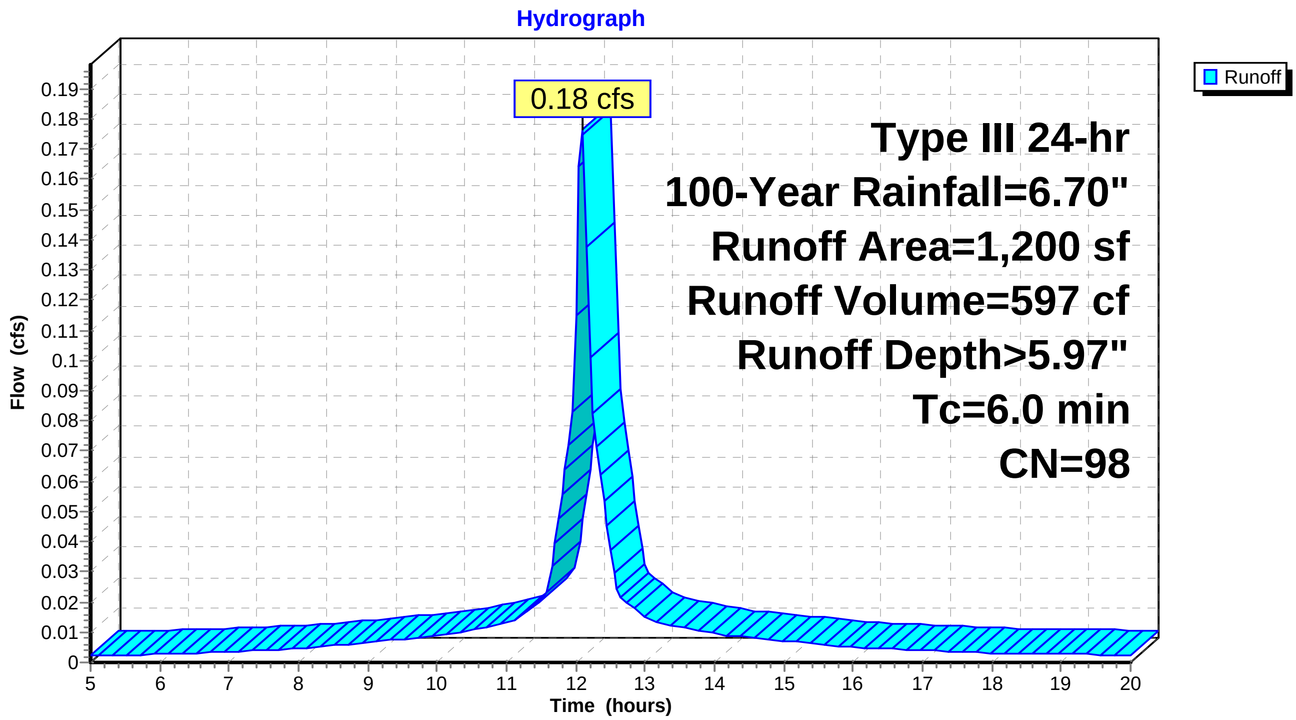
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 597 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	1,200	98	Impervious
	1,200		100.00% Impervious Area

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

Subcatchment LOT 8: Single Family House



Summary for Subcatchment PRDA-1: TO BASIN D

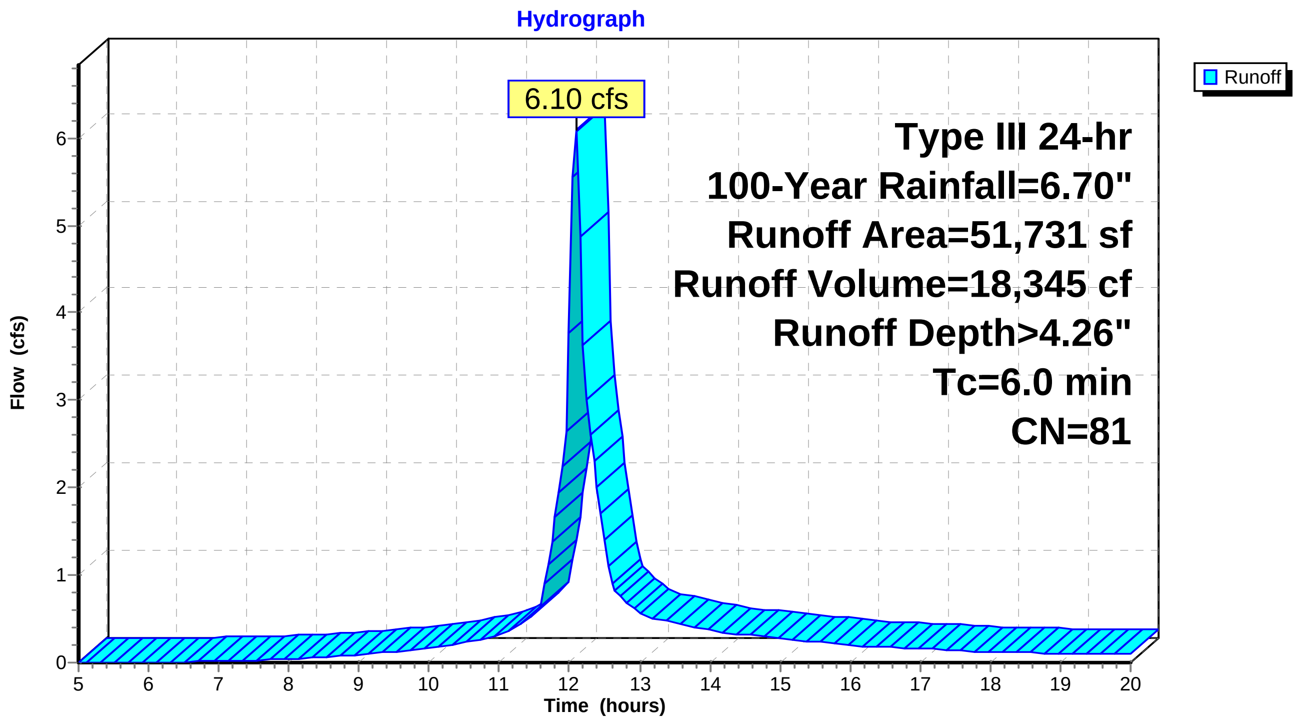
Runoff = 6.10 cfs @ 12.09 hrs, Volume= 18,345 cf, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	25,896	98	Impervious
	6,014	54	1/2 acre lots, 25% imp, HSG A
	6,314	80	1/2 acre lots, 25% imp, HSG C
	6,846	39	>75% Grass cover, Good, HSG A
	462	74	>75% Grass cover, Good, HSG C
	6,199	80	>75% Grass cover, Good, HSG D
	51,731	81	Weighted Average
	22,753		43.98% Pervious Area
	28,978		56.02% Impervious Area

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

Subcatchment PRDA-1: TO BASIN D



Summary for Subcatchment PRDA-10: TO ILSF

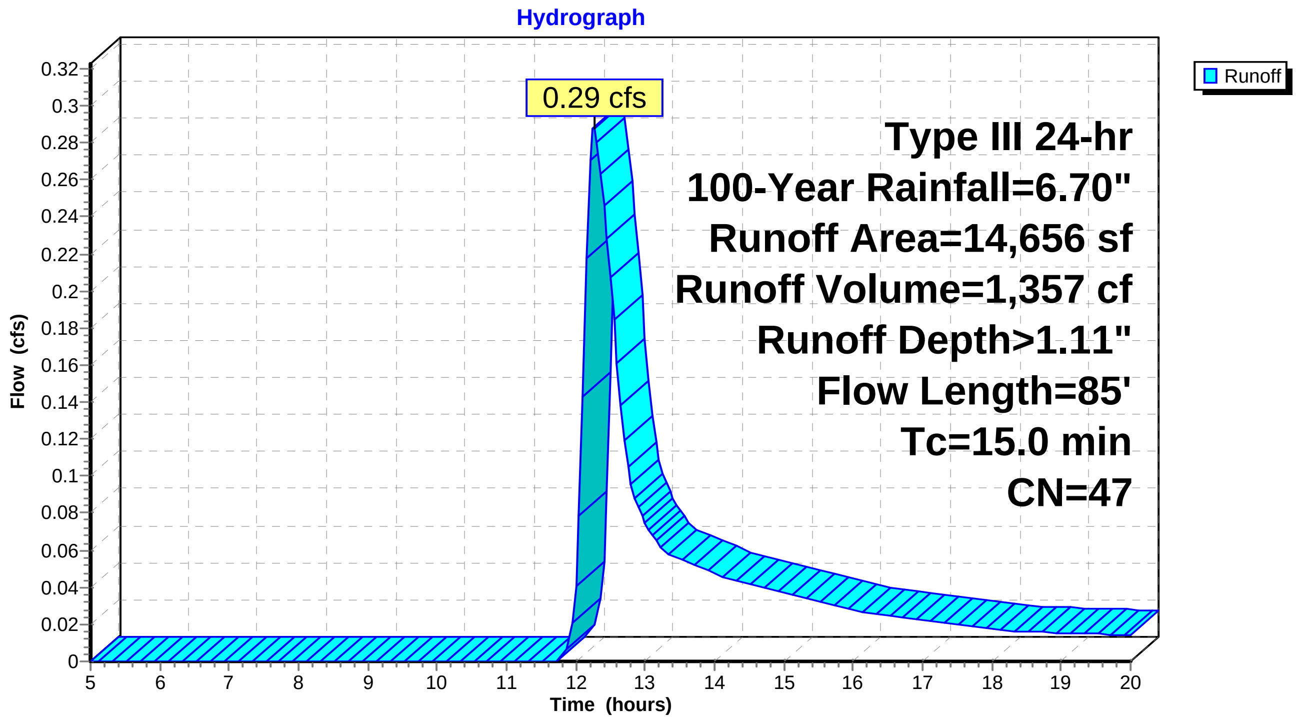
Runoff = 0.29 cfs @ 12.26 hrs, Volume= 1,357 cf, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
1,166	39	>75% Grass cover, Good, HSG A
2,000	80	>75% Grass cover, Good, HSG D
8,622	30	Woods, Good, HSG A
2,868	77	Woods, Good, HSG D
14,656	47	Weighted Average
14,656		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	50	0.0140	0.06		**Sheet Flow, AB** Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	35	0.0220	0.74		**Shallow Concentrated Flow, BC** Woodland Kv= 5.0 fps
15.0	85	Total			

Subcatchment PRDA-10: TO ILSF



Summary for Subcatchment PRDA-11: BASIN A DIRECT

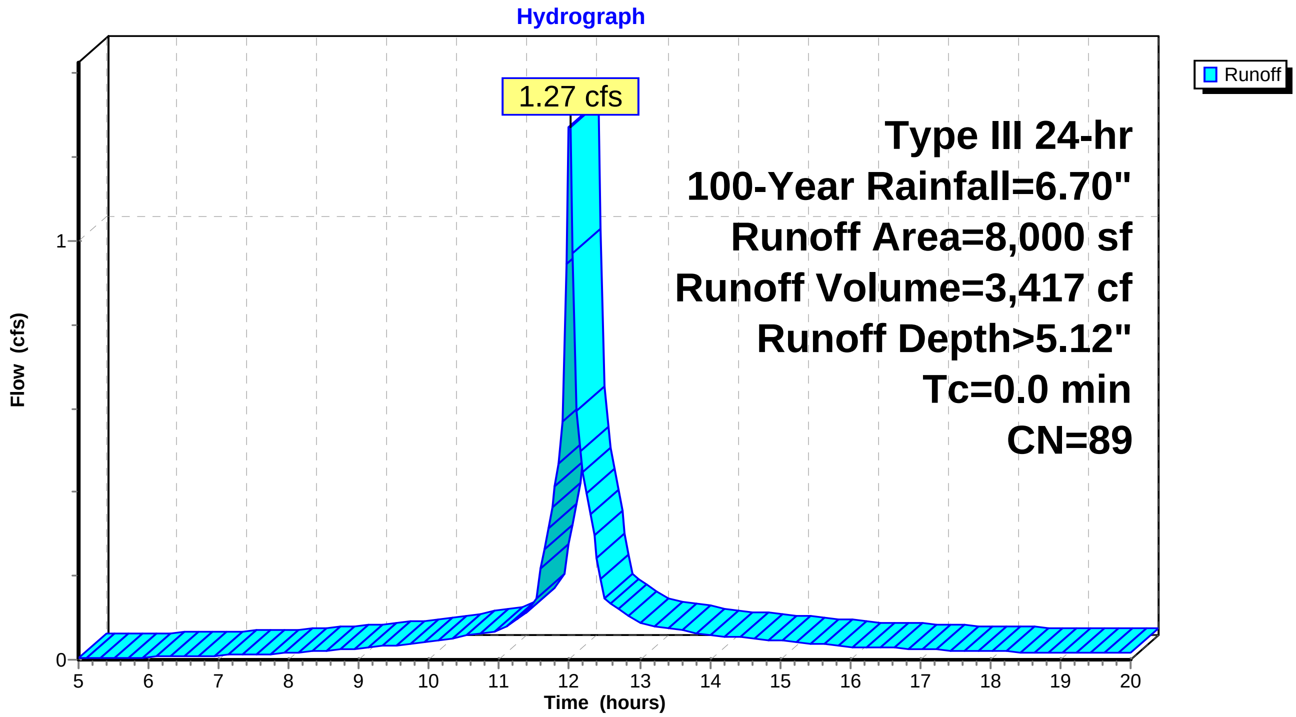
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.27 cfs @ 12.00 hrs, Volume= 3,417 cf, Depth> 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
3,983	98	Water Surface, HSG B
4,017	80	>75% Grass cover, Good, HSG D
8,000	89	Weighted Average
4,017		50.21% Pervious Area
3,983		49.79% Impervious Area

Subcatchment PRDA-11: BASIN A DIRECT



Summary for Subcatchment PRDA-12: BASIN B DIRECT

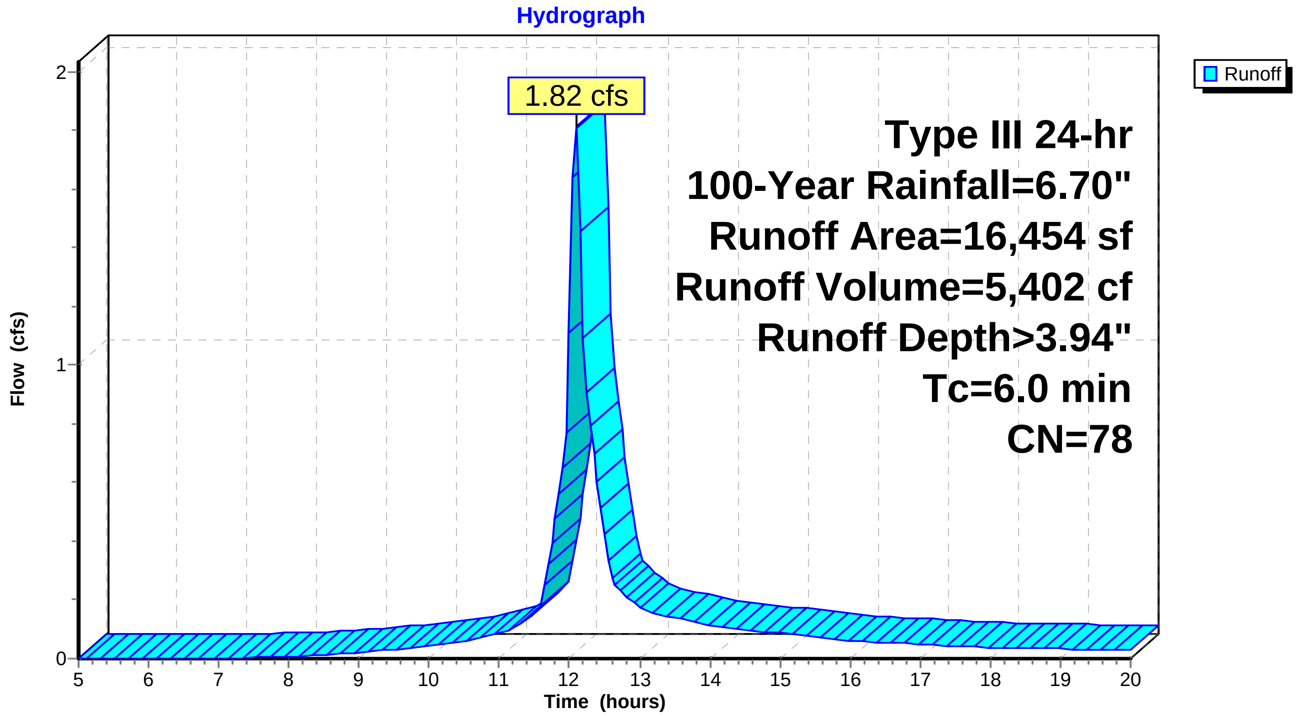
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 5,402 cf, Depth> 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
7,423	98	Water Surface, HSG D
5,050	80	>75% Grass cover, Good, HSG D
3,981	39	>75% Grass cover, Good, HSG A
16,454	78	Weighted Average
9,031		54.89% Pervious Area
7,423		45.11% Impervious Area

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

Subcatchment PRDA-12: BASIN B DIRECT



Summary for Subcatchment PRDA-13: BASIN C DIRECT

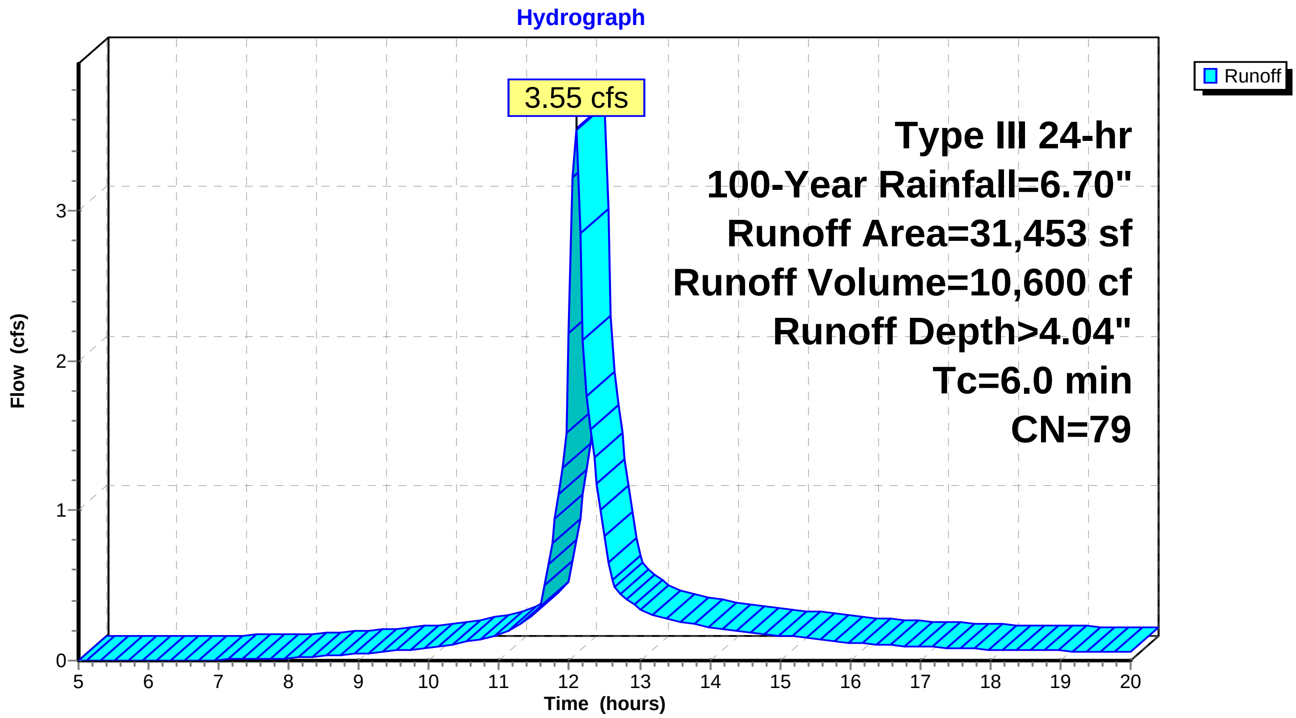
Runoff = 3.55 cfs @ 12.09 hrs, Volume= 10,600 cf, Depth> 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
15,825	61	>75% Grass cover, Good, HSG B
15,628	98	Water Surface, HSG B
31,453	79	Weighted Average
15,825		50.31% Pervious Area
15,628		49.69% Impervious Area

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

Subcatchment PRDA-13: BASIN C DIRECT



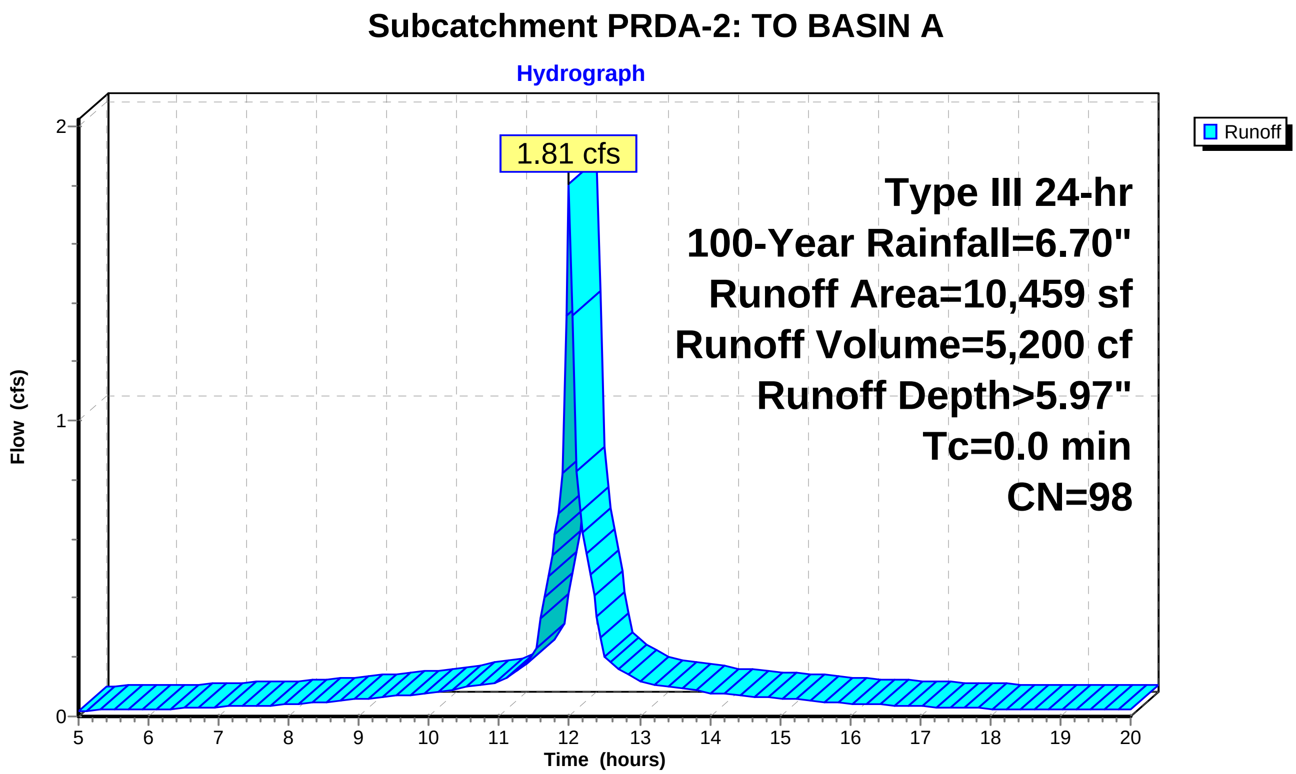
Summary for Subcatchment PRDA-2: TO BASIN A

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.81 cfs @ 12.00 hrs, Volume= 5,200 cf, Depth> 5.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	10,459	98	IMPERVIOUS
	10,459		100.00% Impervious Area



Summary for Subcatchment PRDA-3: TO BASIN B

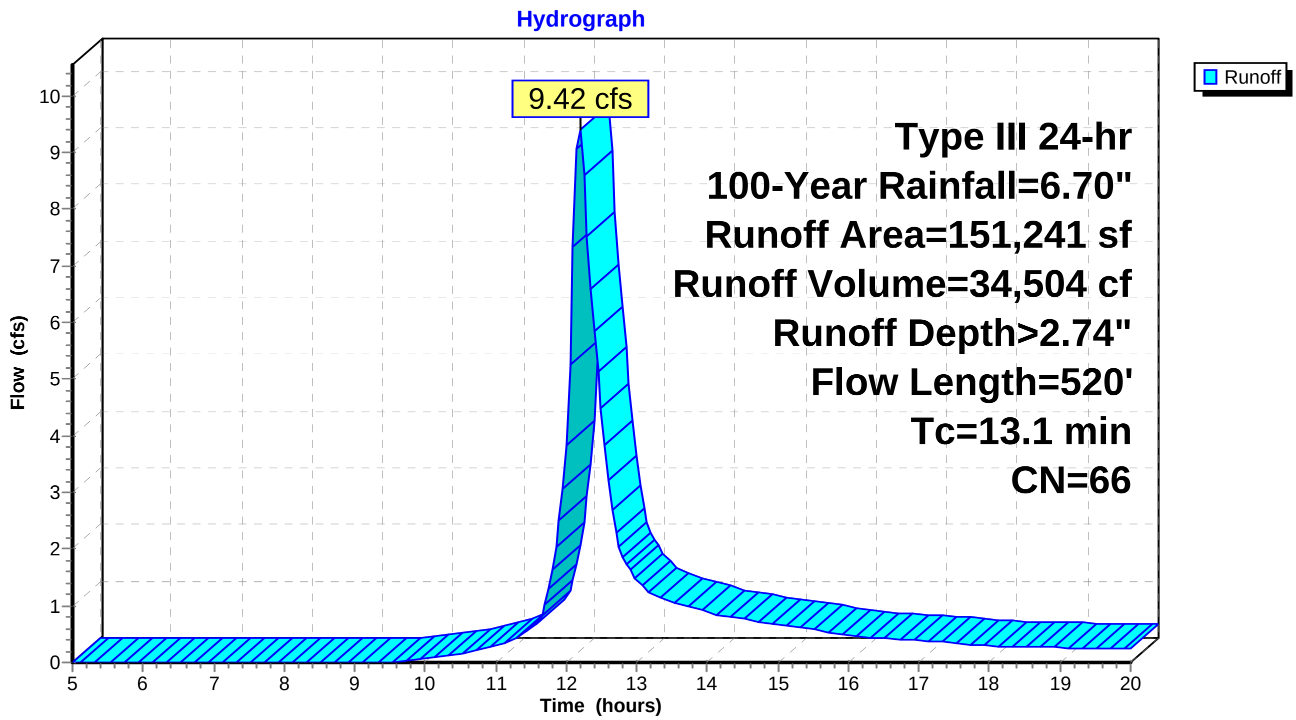
Runoff = 9.42 cfs @ 12.19 hrs, Volume= 34,504 cf, Depth> 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	40,248	98	IMPERVIOUS
	14,787	98	Roofs, HSG A
	77,313	39	>75% Grass cover, Good, HSG A
	92	61	>75% Grass cover, Good, HSG B
	18,801	80	>75% Grass cover, Good, HSG D
	151,241	66	Weighted Average
	96,206		63.61% Pervious Area
	55,035		36.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0380	0.13		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
6.5	406	0.0220	1.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	64	0.0360	3.85		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
13.1	520	Total			

Subcatchment PRDA-3: TO BASIN B



Summary for Subcatchment PRDA-4: TO BASIN C

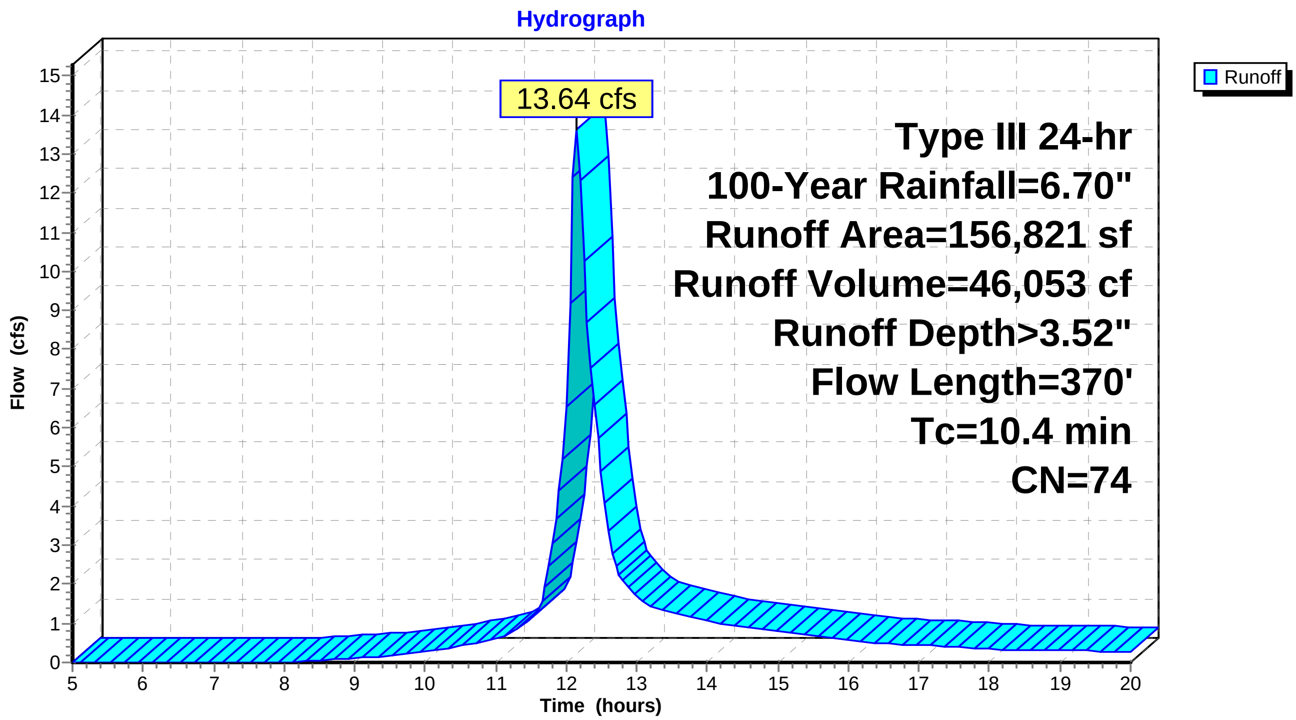
Runoff = 13.64 cfs @ 12.15 hrs, Volume= 46,053 cf, Depth> 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	70,874	98	Impervious
	4,929	98	Roofs, HSG B
	35,430	39	>75% Grass cover, Good, HSG A
	44,834	61	>75% Grass cover, Good, HSG B
	754	80	>75% Grass cover, Good, HSG D
	156,821	74	Weighted Average
	81,018		51.66% Pervious Area
	75,803		48.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0320	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
3.1	217	0.0280	1.17		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	103	0.0270	3.34		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.4	370	Total			

Subcatchment PRDA-4: TO BASIN C



Summary for Subcatchment PRDA-5: BASIN D DIRECT

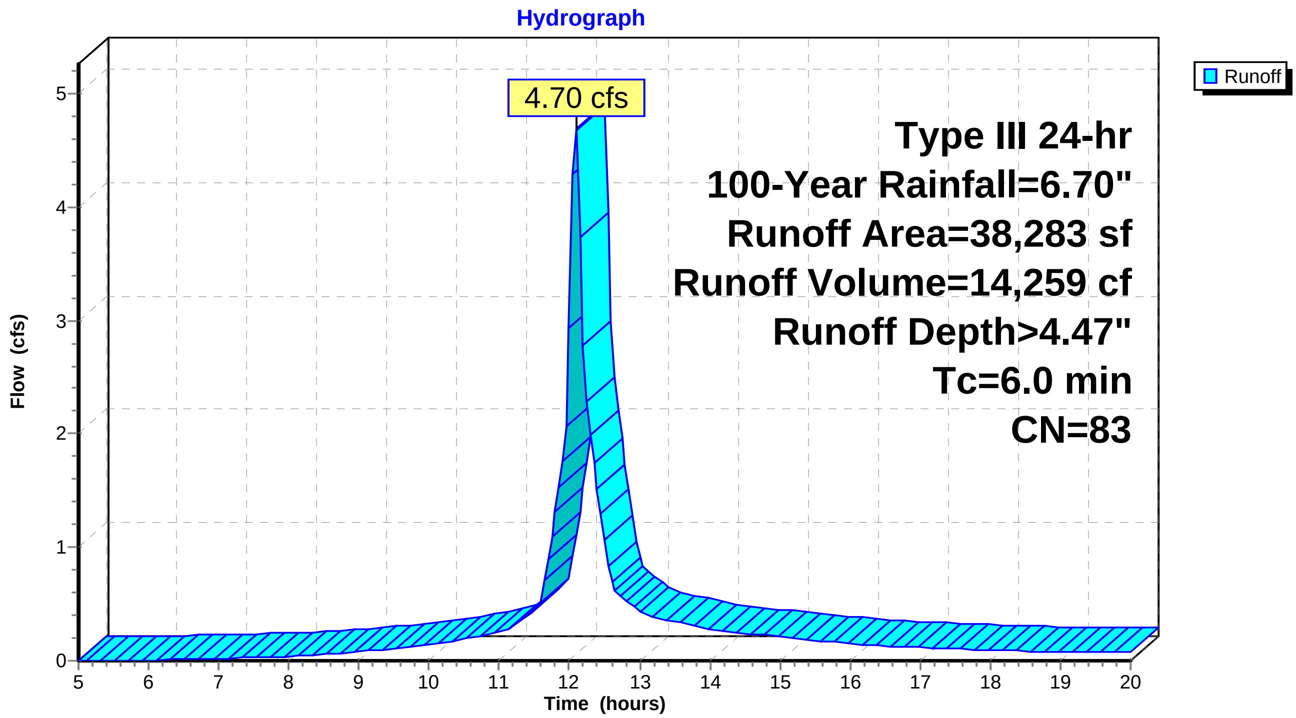
Runoff = 4.70 cfs @ 12.09 hrs, Volume= 14,259 cf, Depth> 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	1,132	98	Impervious
	7,697	80	1/2 acre lots, 25% imp, HSG C
	374	39	>75% Grass cover, Good, HSG A
	7,237	74	>75% Grass cover, Good, HSG C
	6,781	80	>75% Grass cover, Good, HSG D
	9,227	98	Water Surface, HSG A
	4,080	77	Woods, Good, HSG D
	1,323	70	Woods, Good, HSG C
	432	96	Gravel surface, HSG C
	38,283	83	Weighted Average
	26,000		67.91% Pervious Area
	12,283		32.09% Impervious Area

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

Subcatchment PRDA-5: BASIN D DIRECT



Summary for Subcatchment PRDA-6: TO BASIN E

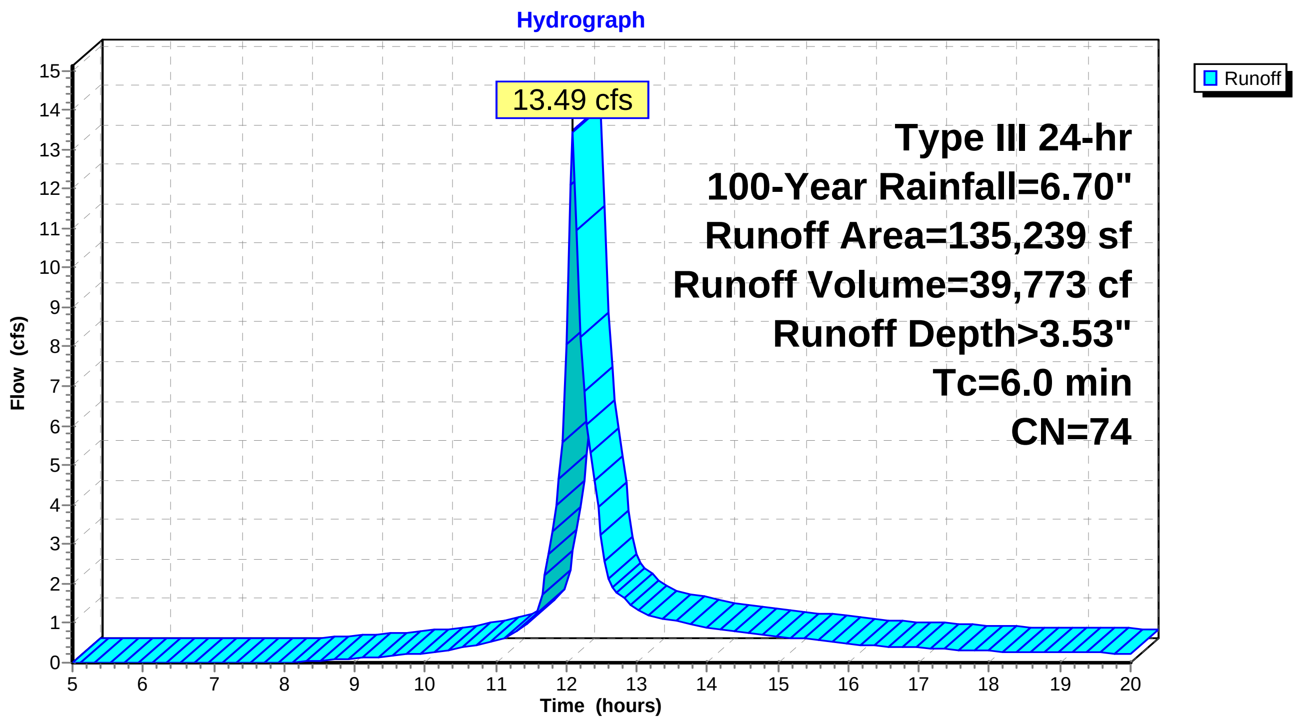
Runoff = 13.49 cfs @ 12.09 hrs, Volume= 39,773 cf, Depth> 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
*	19,869	98	IMPERVIOUS
	57,855	80	1/2 acre lots, 25% imp, HSG C
	2,327	54	1/2 acre lots, 25% imp, HSG A
	3,600	98	Roofs, HSG A
	27,519	39	>75% Grass cover, Good, HSG A
	16,283	74	>75% Grass cover, Good, HSG C
	1,810	80	>75% Grass cover, Good, HSG D
	5,976	98	Water Surface, HSG D
	135,239	74	Weighted Average
	90,749		67.10% Pervious Area
	44,491		32.90% Impervious Area

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

Subcatchment PRDA-6: TO BASIN E



Summary for Subcatchment PRDA-7: TO WETLAND NORTH

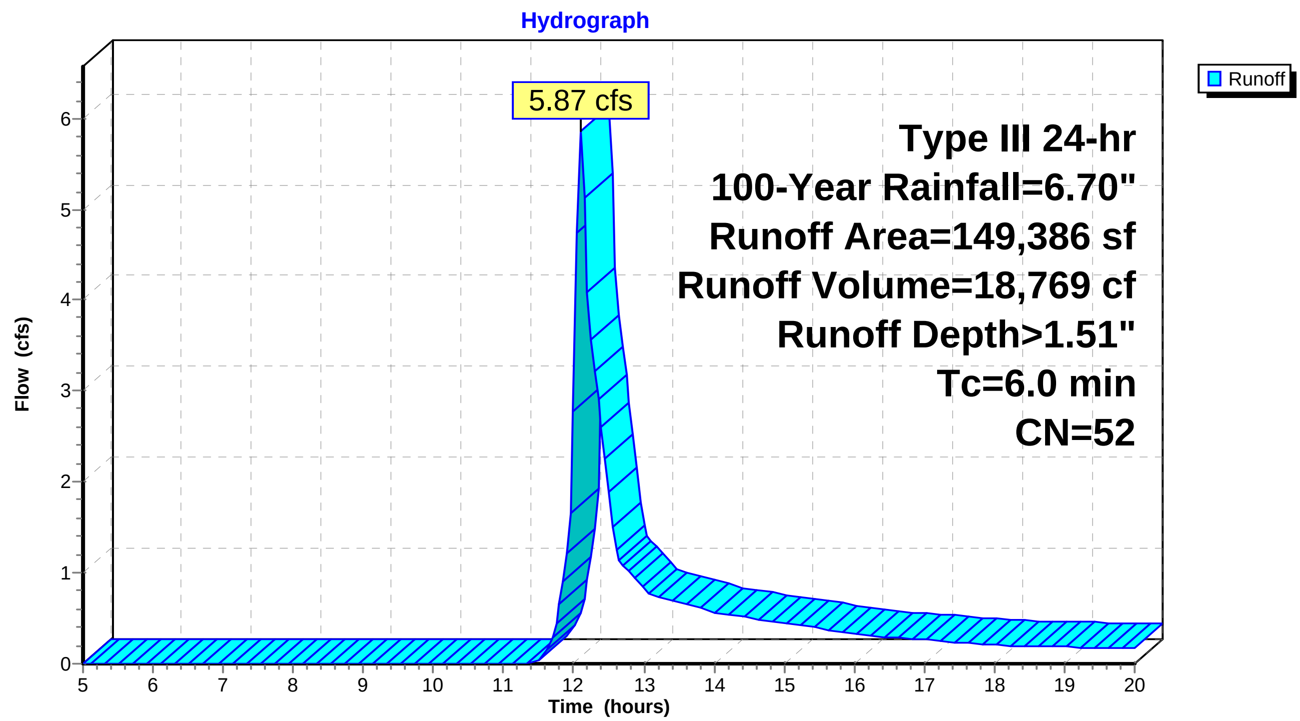
Runoff = 5.87 cfs @ 12.11 hrs, Volume= 18,769 cf, Depth> 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	2,951	80	1/2 acre lots, 25% imp, HSG C
	8,254	54	1/2 acre lots, 25% imp, HSG A
	52,416	39	>75% Grass cover, Good, HSG A
	27,465	61	>75% Grass cover, Good, HSG B
	538	74	>75% Grass cover, Good, HSG C
	9,934	80	>75% Grass cover, Good, HSG D
	22,059	30	Woods, Good, HSG A
	14,418	70	Woods, Good, HSG C
	9,973	77	Woods, Good, HSG D
*	1,378	98	impervious
	149,386	52	Weighted Average
	145,207		97.20% Pervious Area
	4,179		2.80% Impervious Area

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

Subcatchment PRDA-7: TO WETLAND NORTH



Summary for Subcatchment PRDA-8: TO WETLAND SOUTHEAST

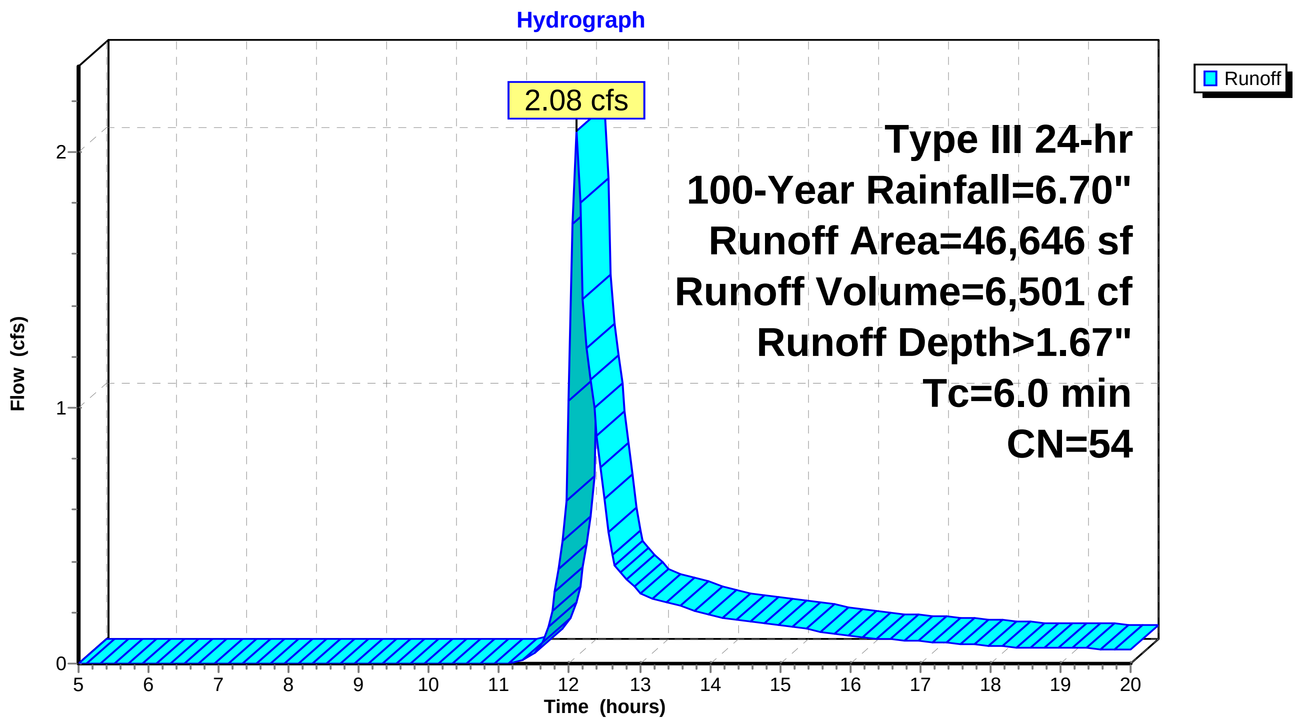
Runoff = 2.08 cfs @ 12.10 hrs, Volume= 6,501 cf, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

Area (sf)	CN	Description
21,559	39	>75% Grass cover, Good, HSG A
7,434	80	>75% Grass cover, Good, HSG D
12,118	77	Woods, Good, HSG D
5,535	30	Woods, Good, HSG A
46,646	54	Weighted Average
46,646		100.00% Pervious Area

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

Subcatchment PRDA-8: TO WETLAND SOUTHEAST



Summary for Subcatchment PRDA-9: TO WETLAND SOUTH

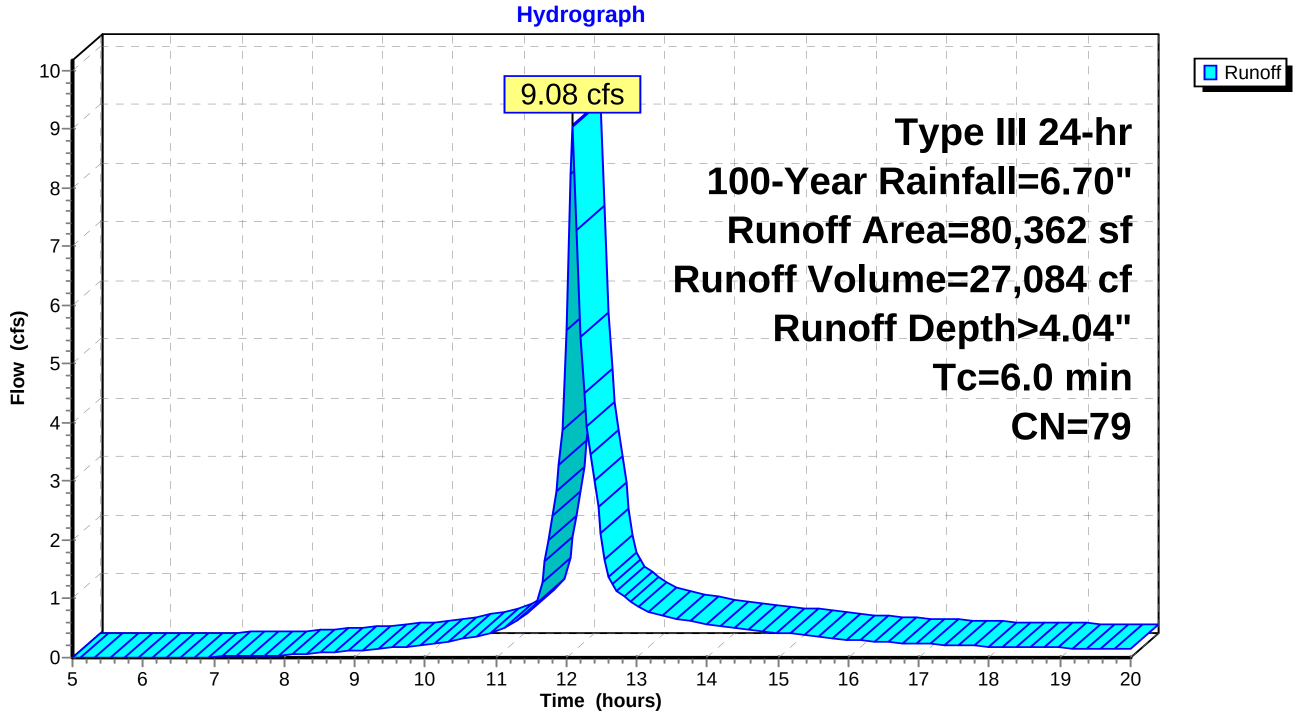
Runoff = 9.08 cfs @ 12.09 hrs, Volume= 27,084 cf, Depth> 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.70"

	Area (sf)	CN	Description
	274	39	>75% Grass cover, Good, HSG A
	20,073	80	>75% Grass cover, Good, HSG D
	7,904	70	Woods, Good, HSG C
	34,217	77	Woods, Good, HSG D
	11,544	80	1/2 acre lots, 25% imp, HSG C
*	6,350	98	IMPERVIOUS
	80,362	79	Weighted Average
	71,126		88.51% Pervious Area
	9,236		11.49% Impervious Area

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

Subcatchment PRDA-9: TO WETLAND SOUTH

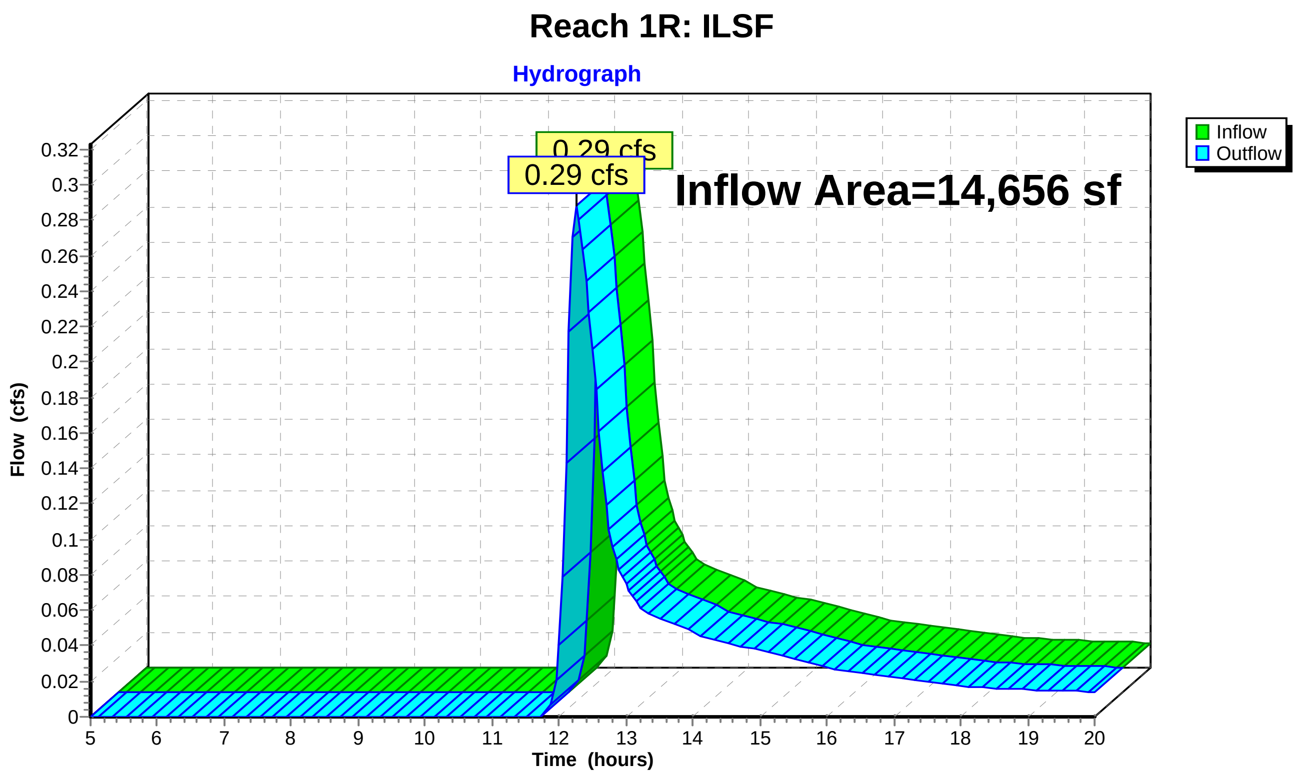


Summary for Reach 1R: ILSF

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

Inflow Area =	14,656 sf,	0.00% Impervious,	Inflow Depth > 1.11"	for 100-Year event	
Inflow =	0.29 cfs @	12.26 hrs,	Volume=	1,357 cf	
Outflow =	0.29 cfs @	12.26 hrs,	Volume=	1,357 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



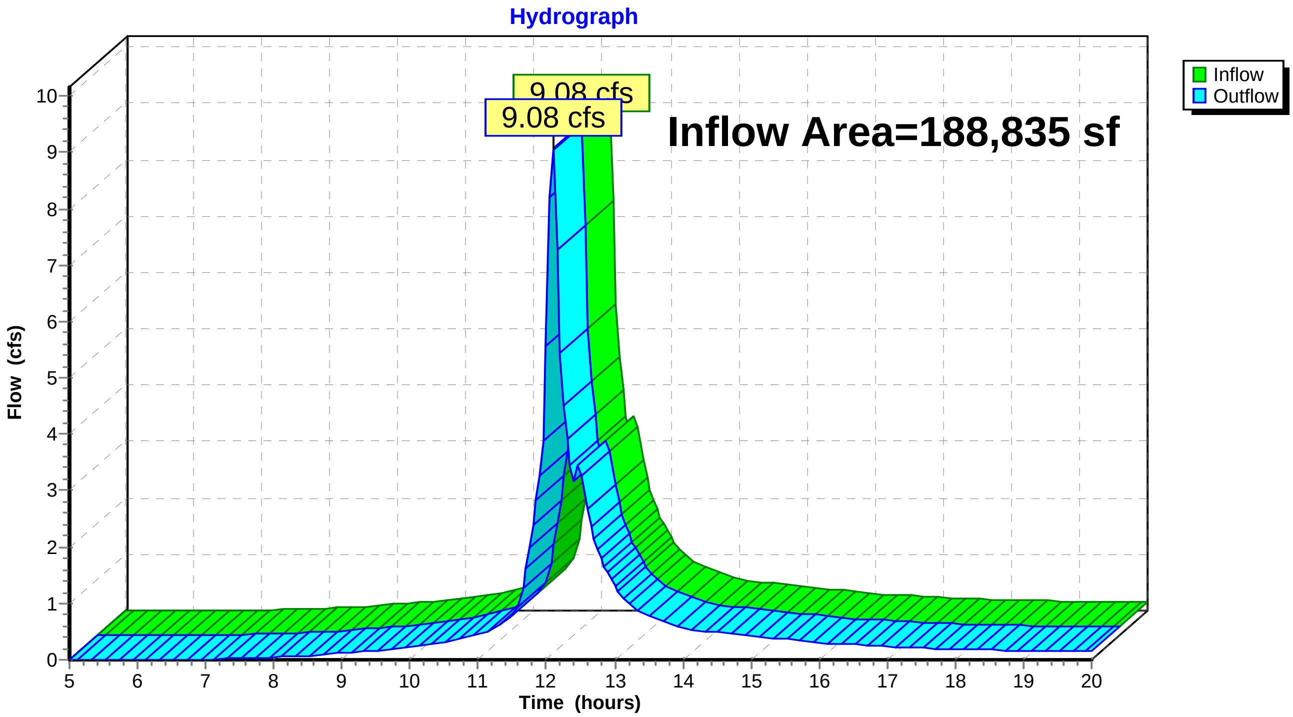
Summary for Reach 14R: WETLAND SOUTH

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

Inflow Area = 188,835 sf, 34.39% Impervious, Inflow Depth > 1.88" for 100-Year event
Inflow = 9.08 cfs @ 12.09 hrs, Volume= 29,537 cf
Outflow = 9.08 cfs @ 12.09 hrs, Volume= 29,537 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 14R: WETLAND SOUTH

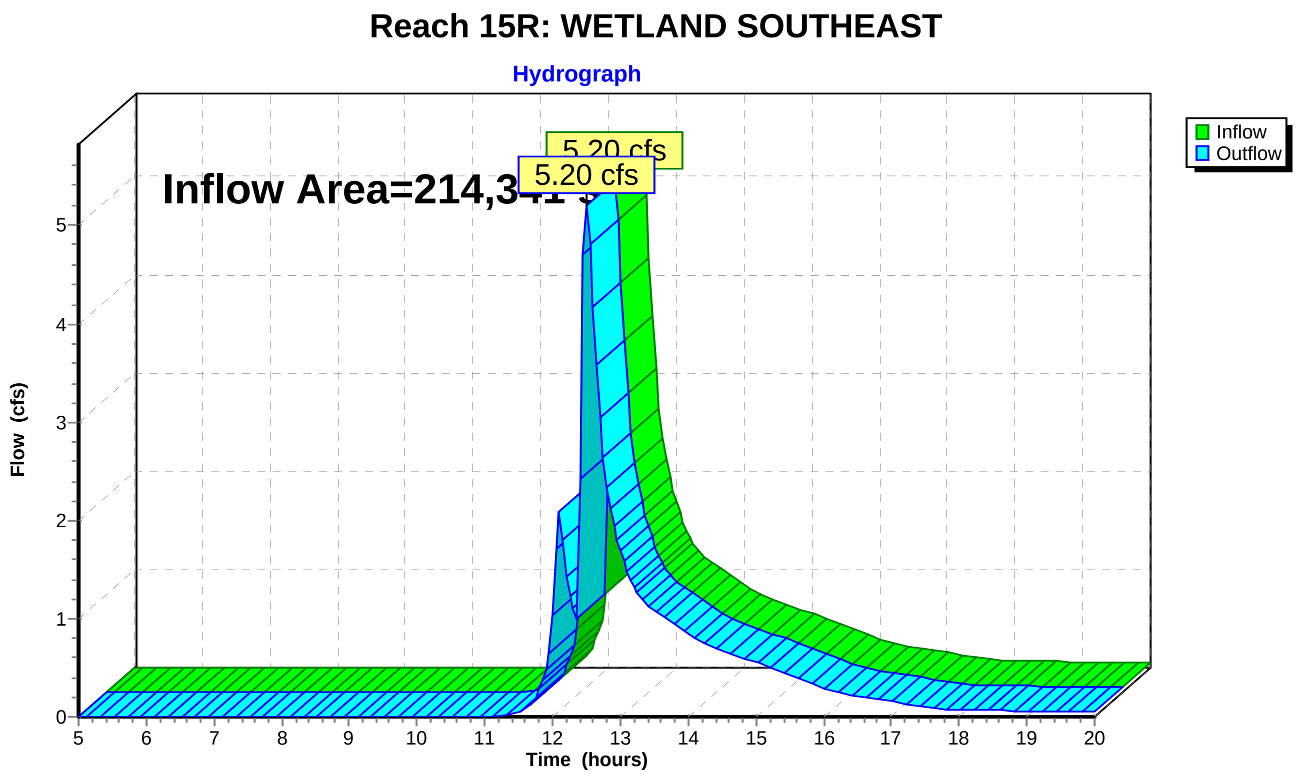


Summary for Reach 15R: WETLAND SOUTHEAST

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

Inflow Area = 214,341 sf, 29.14% Impervious, Inflow Depth > 1.08" for 100-Year event
Inflow = 5.20 cfs @ 12.50 hrs, Volume= 19,298 cf
Outflow = 5.20 cfs @ 12.50 hrs, Volume= 19,298 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

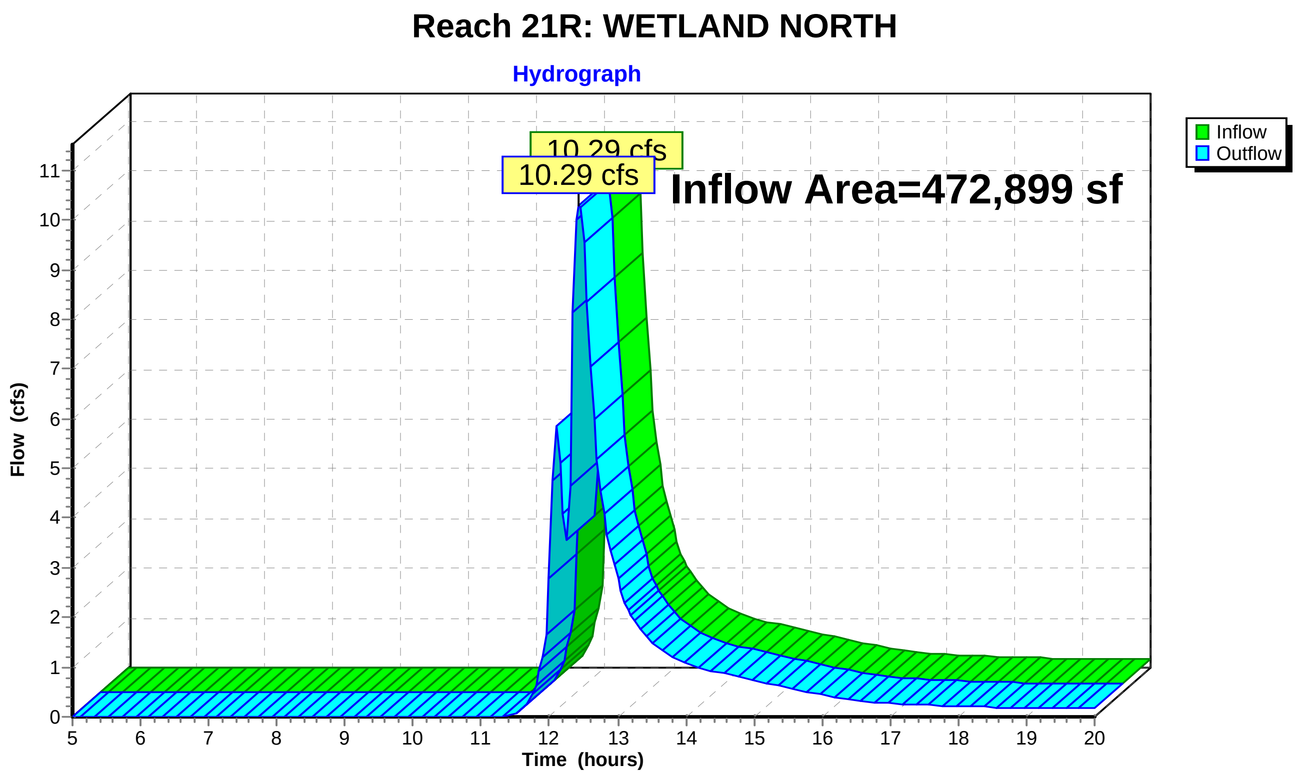


Summary for Reach 21R: WETLAND NORTH

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

Inflow Area =	472,899 sf, 29.63% Impervious,	Inflow Depth > 0.92"	for 100-Year event
Inflow =	10.29 cfs @ 12.44 hrs, Volume=	36,353 cf	
Outflow =	10.29 cfs @ 12.44 hrs, Volume=	36,353 cf,	Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs



Summary for Pond 1P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 10,448 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 1.54 cfs @ 12.09 hrs, Volume= 5,194 cf
Outflow = 0.11 cfs @ 13.37 hrs, Volume= 4,290 cf, Atten= 93%, Lag= 76.9 min
Discarded = 0.11 cfs @ 13.37 hrs, Volume= 4,290 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.09' @ 13.37 hrs Surf.Area= 1,531 sf Storage= 2,271 cf

Plug-Flow detention time= 153.8 min calculated for 4,274 cf (82% of inflow)
Center-of-Mass det. time= 104.0 min (837.7 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,317 cf	**20.83'W x 73.50'L x 3.54'H Field A** 5,423 cf Overall - 2,131 cf Embedded = 3,292 cf x 40.0% Voids
#2A	0.50'	2,131 cf	**Cultec R-330XLHD** x 40 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		3,448 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.11 cfs @ 13.37 hrs HW=2.09' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Pond 1P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

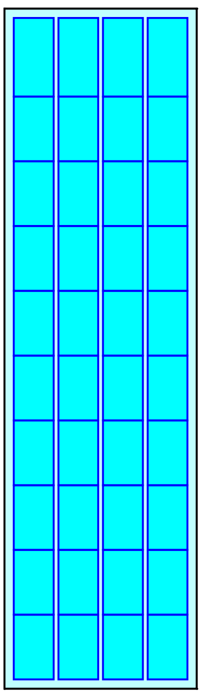
10 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 71.50' Row Length +12.0" End Stone x 2 = 73.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

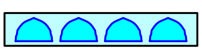
40 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 2,131.0 cf Chamber Storage

5,423.2 cf Field - 2,131.0 cf Chambers = 3,292.2 cf Stone x 40.0% Voids = 1,316.9 cf Stone Storage

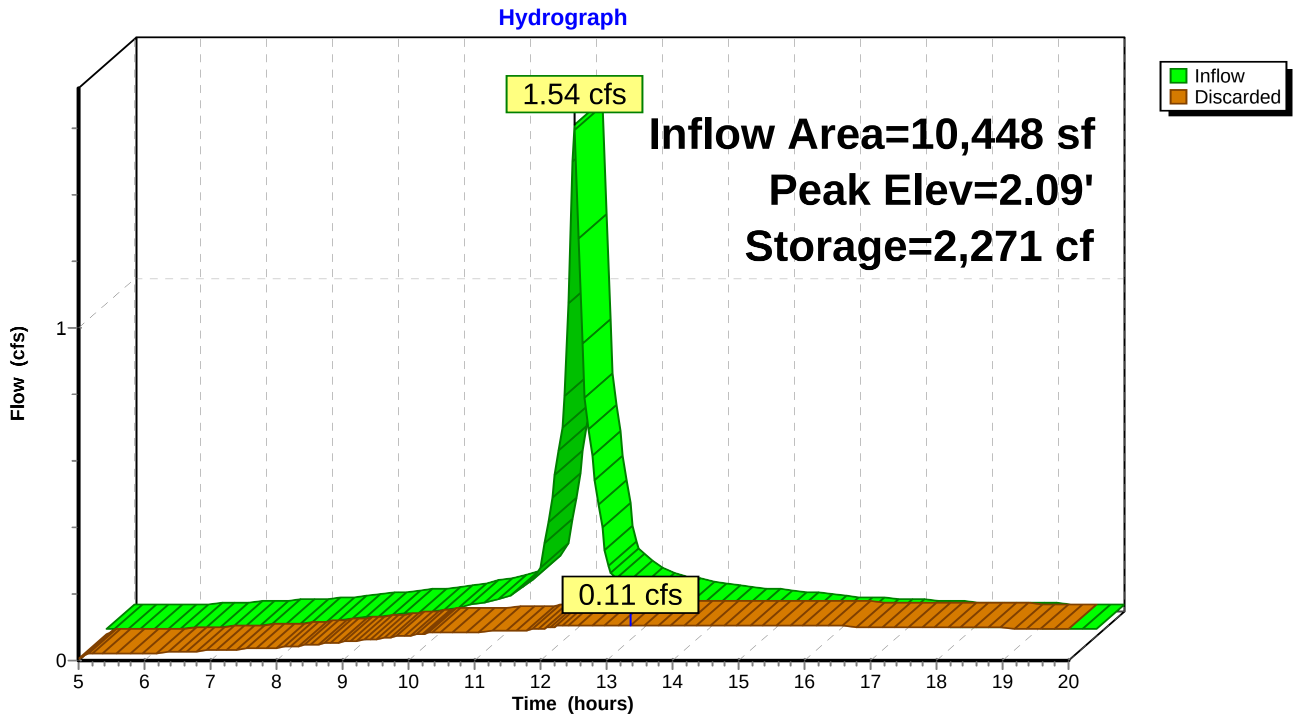
Chamber Storage + Stone Storage = 3,447.9 cf = 0.079 af
Overall Storage Efficiency = 63.6%
Overall System Size = 73.50' x 20.83' x 3.54'

40 Chambers
200.9 cy Field
121.9 cy Stone





Pond 1P: Roof Recharge



Summary for Pond 2P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 13,061 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 1.92 cfs @ 12.09 hrs, Volume= 6,493 cf
Outflow = 0.07 cfs @ 15.52 hrs, Volume= 3,014 cf, Atten= 97%, Lag= 205.7 min
Discarded = 0.07 cfs @ 15.52 hrs, Volume= 3,014 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.43' @ 15.52 hrs Surf.Area= 2,246 sf Storage= 3,907 cf

Plug-Flow detention time= 173.1 min calculated for 3,002 cf (46% of inflow)
Center-of-Mass det. time= 70.2 min (803.9 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,907 cf	**25.67'W x 87.50'L x 3.54'H Field A** 7,954 cf Overall - 3,185 cf Embedded = 4,769 cf x 40.0% Voids
#2A	0.50'	3,185 cf	**Cultec R-330XLHD** x 60 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		5,093 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.07 cfs @ 15.52 hrs HW=2.43' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Pond 2P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

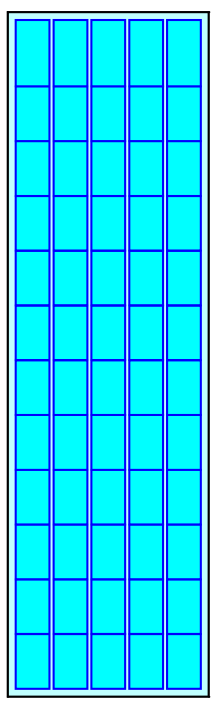
12 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 85.50' Row Length +12.0" End Stone x 2 = 87.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

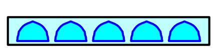
60 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 3,185.3 cf Chamber Storage

7,954.0 cf Field - 3,185.3 cf Chambers = 4,768.7 cf Stone x 40.0% Voids = 1,907.5 cf Stone Storage

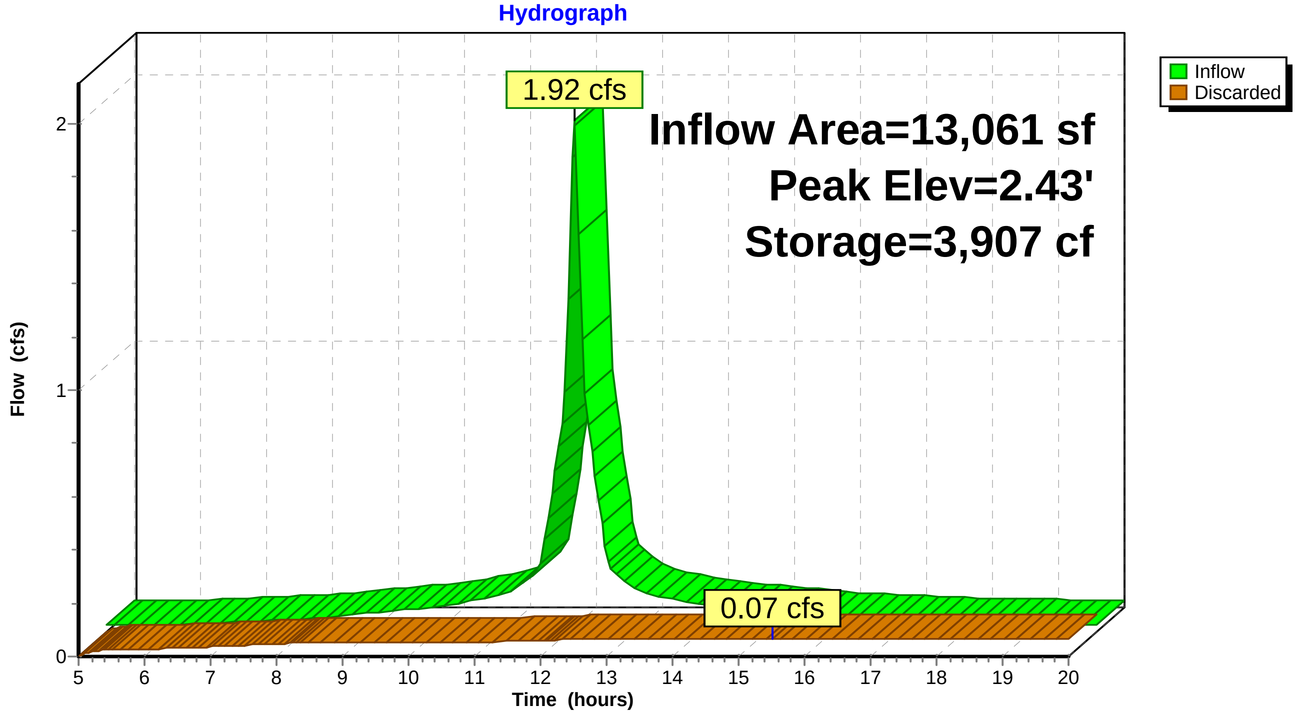
Chamber Storage + Stone Storage = 5,092.8 cf = 0.117 af
Overall Storage Efficiency = 64.0%
Overall System Size = 87.50' x 25.67' x 3.54'

60 Chambers
294.6 cy Field
176.6 cy Stone





Pond 2P: Roof Recharge



Summary for Pond 3P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 13,061 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 1.92 cfs @ 12.09 hrs, Volume= 6,493 cf
Outflow = 0.07 cfs @ 15.52 hrs, Volume= 3,014 cf, Atten= 97%, Lag= 205.7 min
Discarded = 0.07 cfs @ 15.52 hrs, Volume= 3,014 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.43' @ 15.52 hrs Surf.Area= 2,246 sf Storage= 3,907 cf

Plug-Flow detention time= 173.1 min calculated for 3,002 cf (46% of inflow)
Center-of-Mass det. time= 70.2 min (803.9 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,907 cf	**25.67'W x 87.50'L x 3.54'H Field A** 7,954 cf Overall - 3,185 cf Embedded = 4,769 cf x 40.0% Voids
#2A	0.50'	3,185 cf	**Cultec R-330XLHD** x 60 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 5 rows
		5,093 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.07 cfs @ 15.52 hrs HW=2.43' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Pond 3P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 5 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

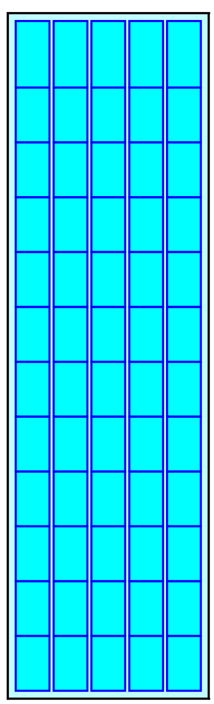
12 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 85.50' Row Length +12.0" End Stone x 2 = 87.50' Base Length
5 Rows x 52.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.67' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

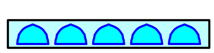
60 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 5 Rows = 3,185.3 cf Chamber Storage

7,954.0 cf Field - 3,185.3 cf Chambers = 4,768.7 cf Stone x 40.0% Voids = 1,907.5 cf Stone Storage

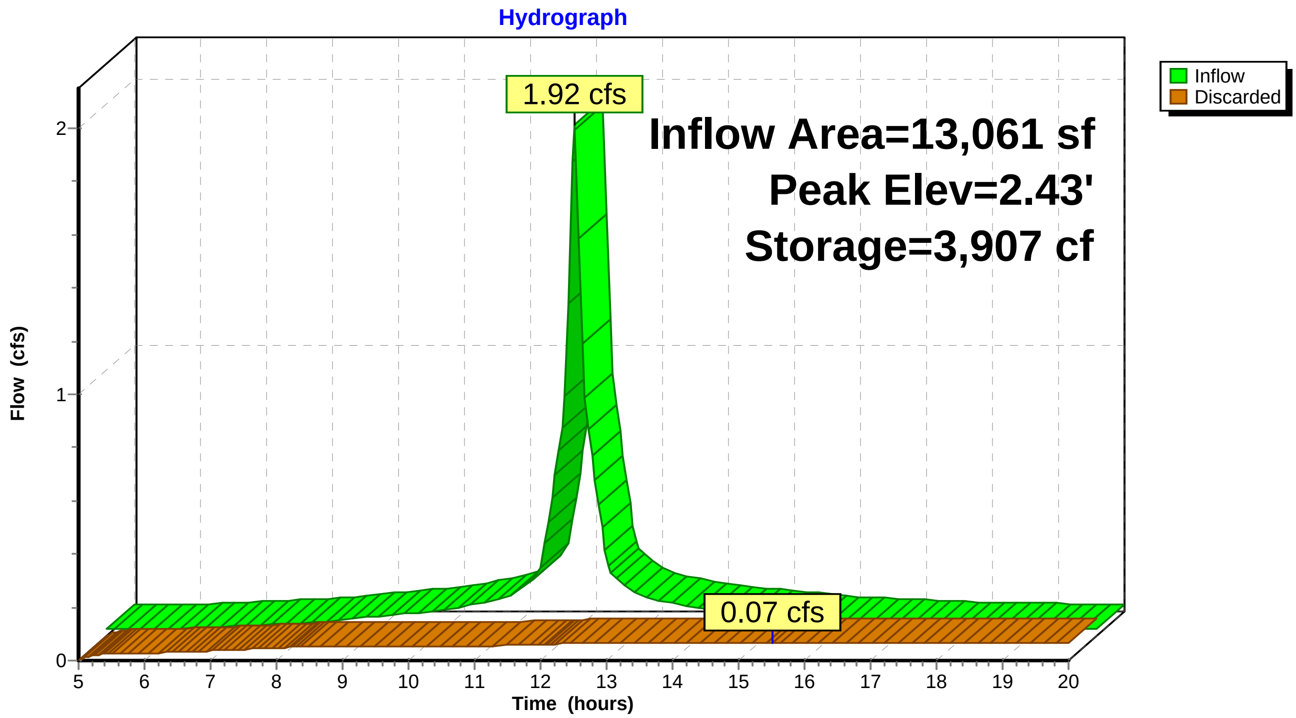
Chamber Storage + Stone Storage = 5,092.8 cf = 0.117 af
Overall Storage Efficiency = 64.0%
Overall System Size = 87.50' x 25.67' x 3.54'

60 Chambers
294.6 cy Field
176.6 cy Stone





Pond 3P: Roof Recharge



Summary for Pond 4P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 7,296 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 1.07 cfs @ 12.09 hrs, Volume= 3,627 cf
Outflow = 0.04 cfs @ 15.38 hrs, Volume= 1,729 cf, Atten= 96%, Lag= 197.6 min
Discarded = 0.04 cfs @ 15.38 hrs, Volume= 1,729 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.47' @ 15.38 hrs Surf.Area= 1,240 sf Storage= 2,164 cf

Plug-Flow detention time= 175.1 min calculated for 1,722 cf (47% of inflow)
Center-of-Mass det. time= 74.6 min (808.3 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,071 cf	**20.83'W x 59.50'L x 3.54'H Field A** 4,390 cf Overall - 1,714 cf Embedded = 2,676 cf x 40.0% Voids
#2A	0.50'	1,714 cf	**Cultec R-330XLHD** x 32 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		2,784 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 15.38 hrs HW=2.47' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Pond 4P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

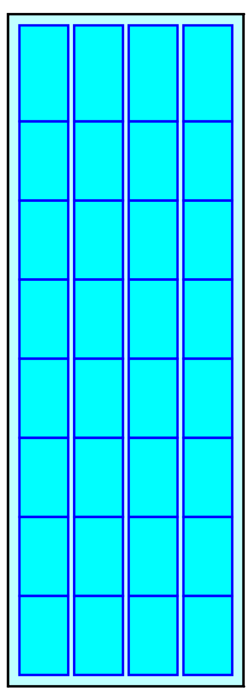
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

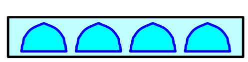
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

4,390.2 cf Field - 1,713.7 cf Chambers = 2,676.5 cf Stone x 40.0% Voids = 1,070.6 cf Stone Storage

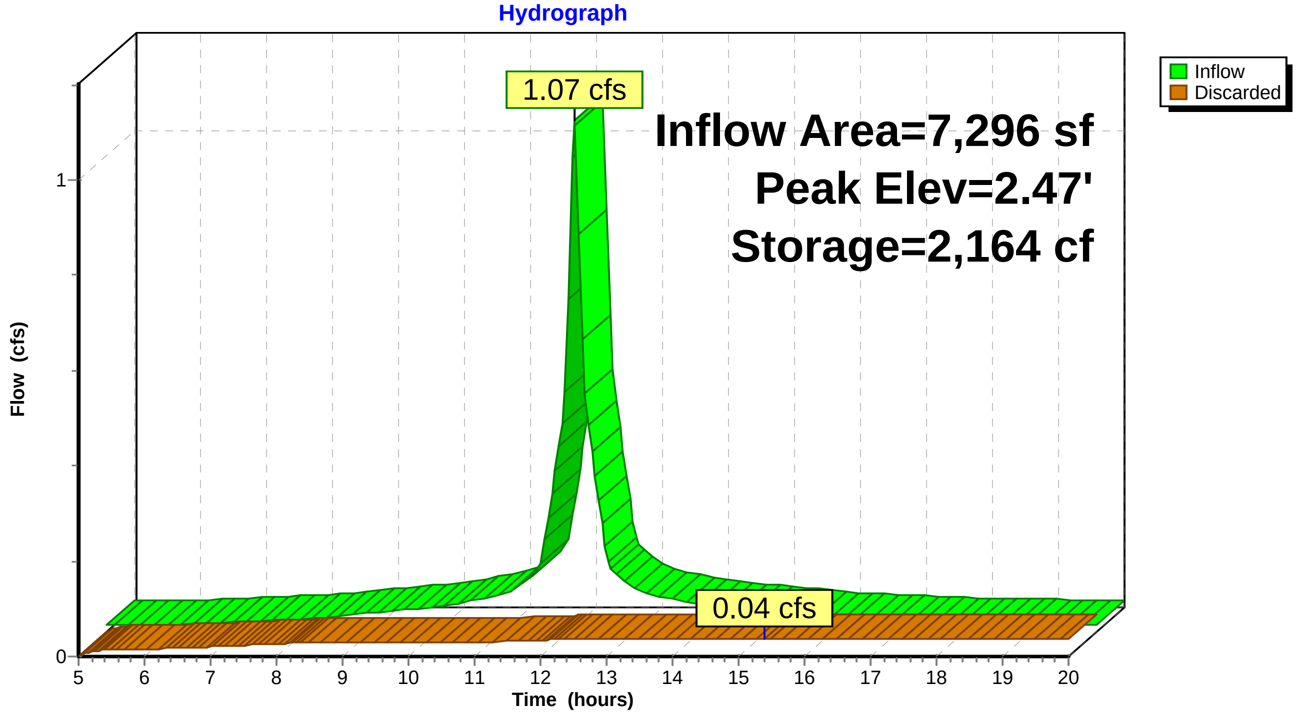
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 4P: Roof Recharge



Summary for Pond 5P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 597 cf
Outflow = 0.01 cfs @ 14.07 hrs, Volume= 360 cf, Atten= 95%, Lag= 118.8 min
Discarded = 0.01 cfs @ 14.07 hrs, Volume= 360 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.54' @ 14.07 hrs Surf.Area= 200 sf Storage= 326 cf

Plug-Flow detention time= 182.5 min calculated for 360 cf (60% of inflow)
Center-of-Mass det. time= 101.4 min (835.1 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 14.07 hrs HW=2.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 5P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

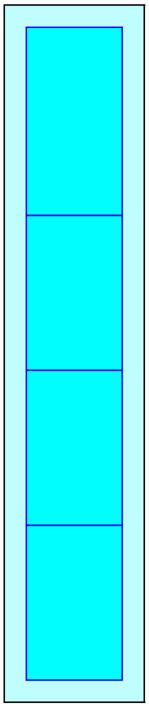
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

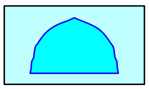
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

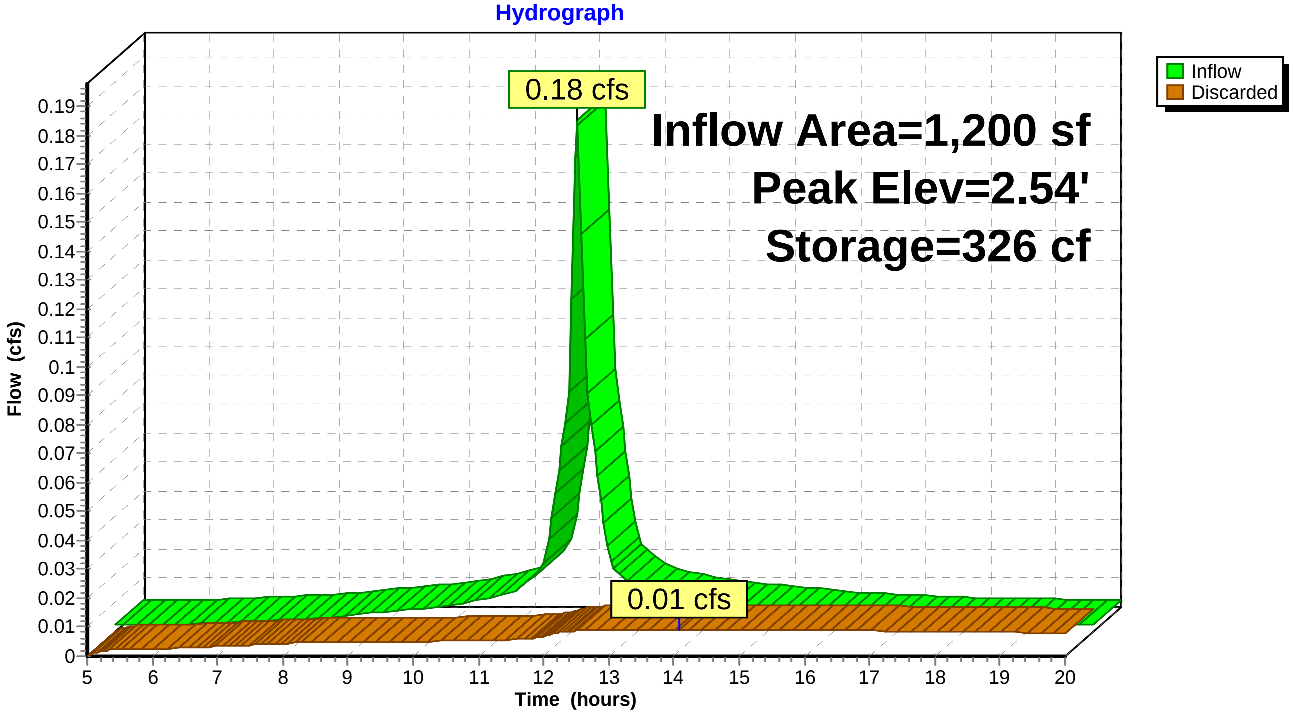
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 5P: Roof Recharge



Summary for Pond 6P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 2,018 cf
Outflow = 0.03 cfs @ 14.37 hrs, Volume= 1,223 cf, Atten= 95%, Lag= 137.2 min
Discarded = 0.03 cfs @ 14.37 hrs, Volume= 1,223 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.75' @ 14.37 hrs Surf.Area= 899 sf Storage= 1,068 cf

Plug-Flow detention time= 169.3 min calculated for 1,219 cf (60% of inflow)
Center-of-Mass det. time= 89.6 min (823.3 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 14.37 hrs HW=1.75' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 6P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

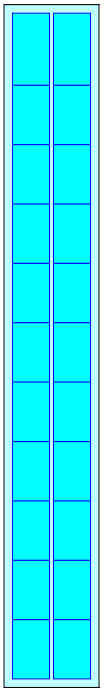
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

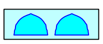
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

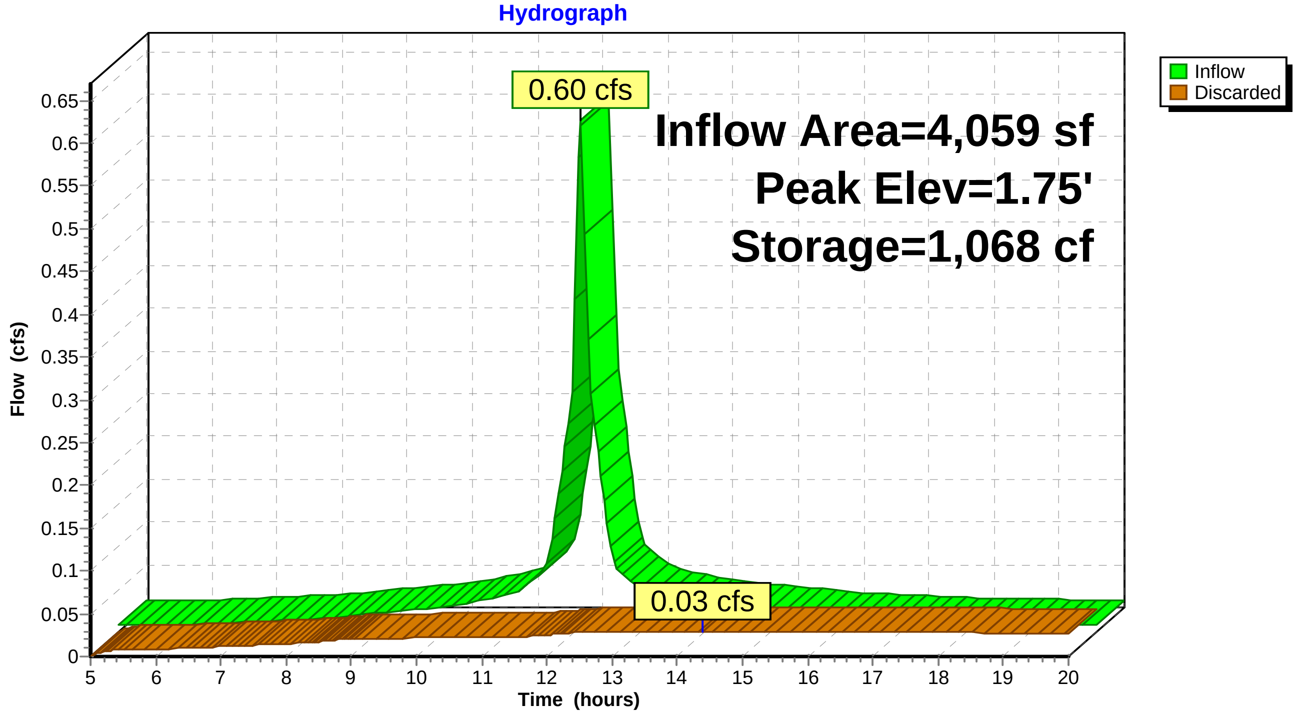
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 6P: Roof Recharge



Summary for Pond 7P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,929 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 2,450 cf
Outflow = 0.03 cfs @ 14.84 hrs, Volume= 1,321 cf, Atten= 96%, Lag= 164.9 min
Discarded = 0.03 cfs @ 14.84 hrs, Volume= 1,321 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.23' @ 14.84 hrs Surf.Area= 899 sf Storage= 1,386 cf

Plug-Flow detention time= 175.3 min calculated for 1,316 cf (54% of inflow)
Center-of-Mass det. time= 85.7 min (819.4 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 14.84 hrs HW=2.23' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 7P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

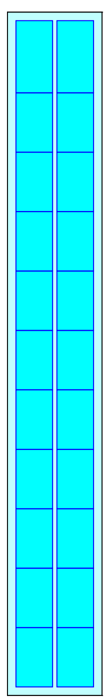
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

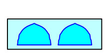
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

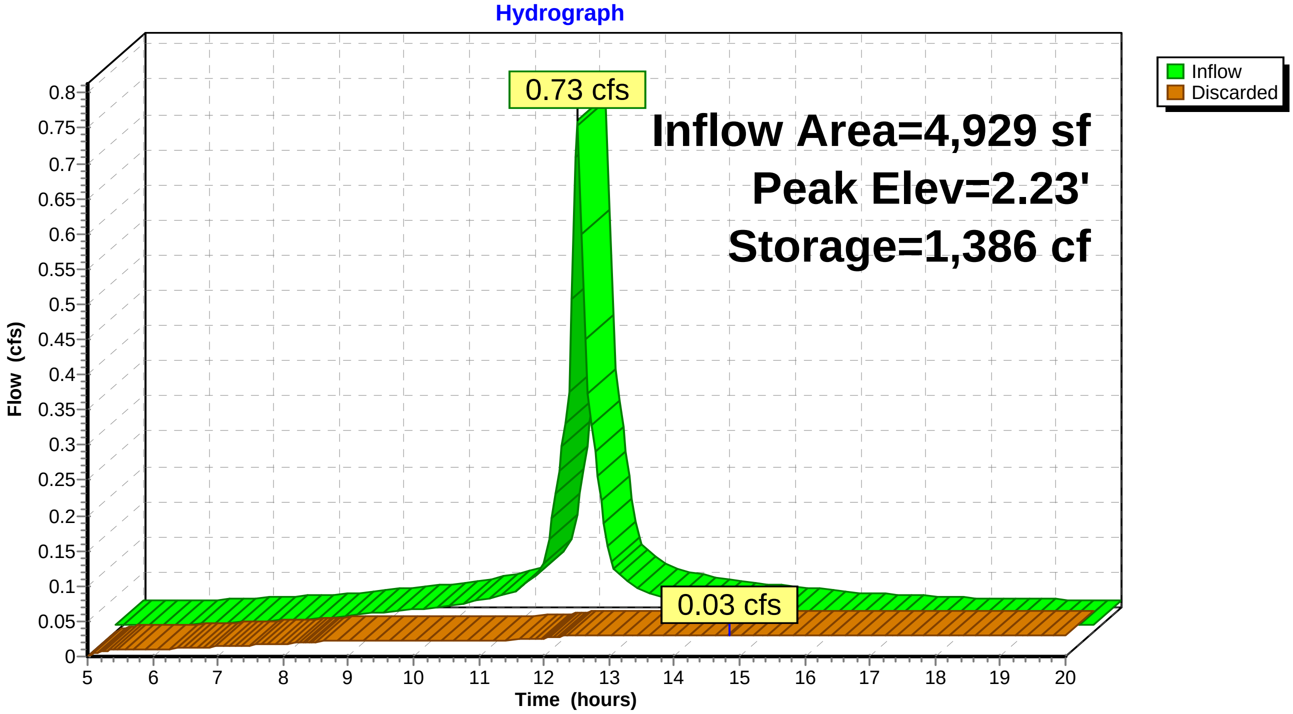
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 7P: Roof Recharge



Summary for Pond 8P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 597 cf
Outflow = 0.01 cfs @ 14.07 hrs, Volume= 360 cf, Atten= 95%, Lag= 118.8 min
Discarded = 0.01 cfs @ 14.07 hrs, Volume= 360 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.54' @ 14.07 hrs Surf.Area= 200 sf Storage= 326 cf

Plug-Flow detention time= 182.5 min calculated for 360 cf (60% of inflow)
Center-of-Mass det. time= 101.4 min (835.1 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 14.07 hrs HW=2.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 8P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

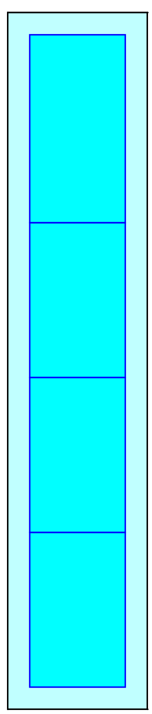
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

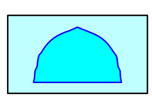
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

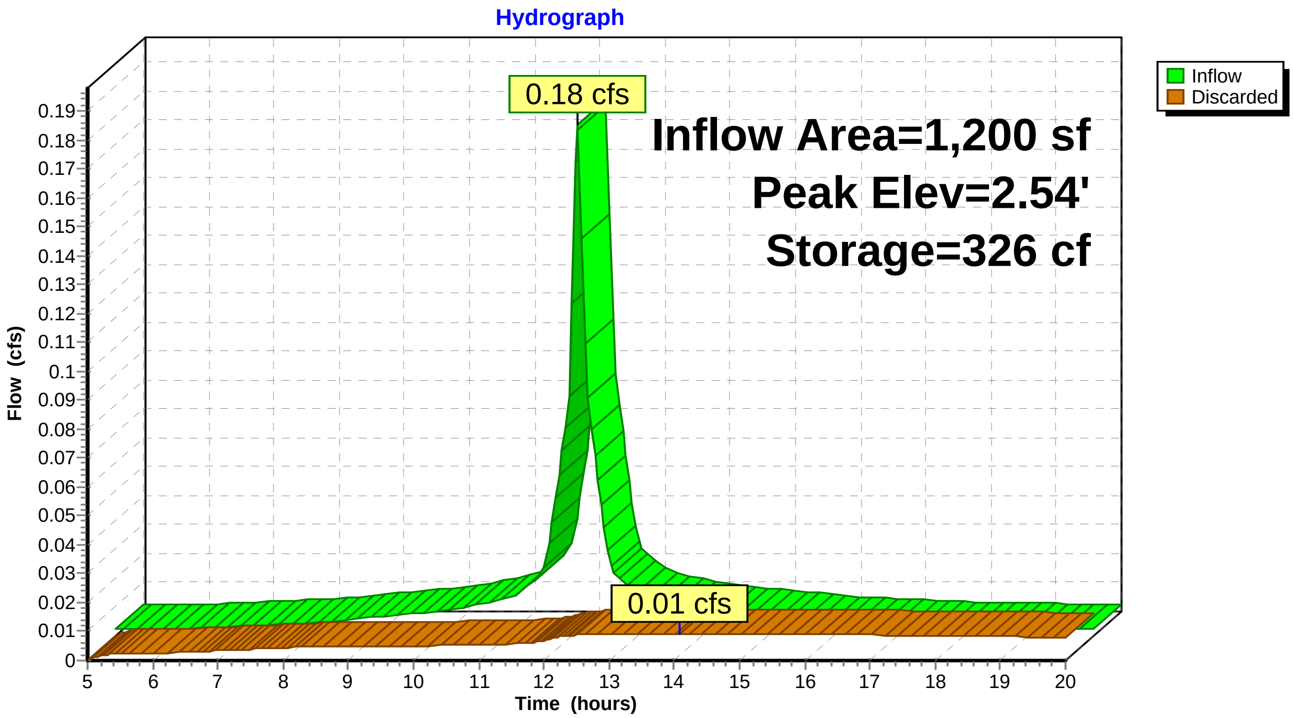
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 8P: Roof Recharge



Summary for Pond 9P: BASIN E

Inflow Area = 135,239 sf, 32.90% Impervious, Inflow Depth > 3.53" for 100-Year event
Inflow = 13.49 cfs @ 12.09 hrs, Volume= 39,773 cf
Outflow = 4.68 cfs @ 12.41 hrs, Volume= 24,543 cf, Atten= 65%, Lag= 19.0 min
Discarded = 0.42 cfs @ 12.41 hrs, Volume= 13,774 cf
Primary = 4.27 cfs @ 12.41 hrs, Volume= 10,769 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 241.06' @ 12.41 hrs Surf.Area= 7,280 sf Storage= 17,545 cf

Plug-Flow detention time= 143.2 min calculated for 24,461 cf (62% of inflow)
Center-of-Mass det. time= 69.4 min (858.1 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	237.80'	24,841 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

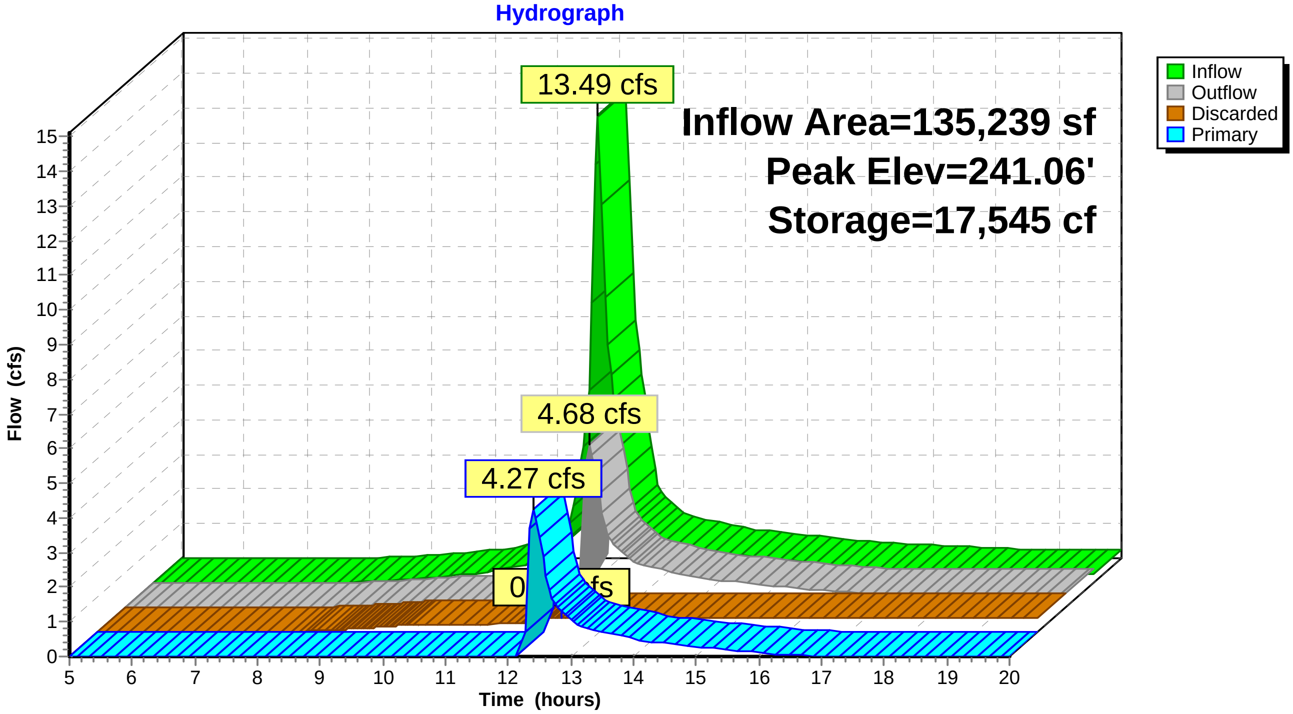
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
237.80	3,709	322.6	0	0	3,709
238.00	3,904	326.4	761	761	3,916
239.00	4,911	345.3	4,398	5,159	4,980
240.00	5,976	364.3	5,435	10,594	6,110
241.00	7,097	383.1	6,528	17,122	7,289
241.90	10,147	430.2	7,719	24,841	10,360

Device	Routing	Invert	Outlet Devices
#1	Discarded	237.80'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.90'	**25.0' long x 18.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.42 cfs @ 12.41 hrs HW=241.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=4.17 cfs @ 12.41 hrs HW=241.06' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.17 cfs @ 1.06 fps)

Pond 9P: BASIN E



Summary for Pond 10P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 597 cf
Outflow = 0.01 cfs @ 14.07 hrs, Volume= 360 cf, Atten= 95%, Lag= 118.8 min
Discarded = 0.01 cfs @ 14.07 hrs, Volume= 360 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.54' @ 14.07 hrs Surf.Area= 200 sf Storage= 326 cf

Plug-Flow detention time= 182.5 min calculated for 360 cf (60% of inflow)
Center-of-Mass det. time= 101.4 min (835.1 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 14.07 hrs HW=2.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 10P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

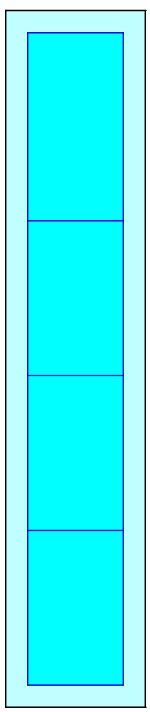
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

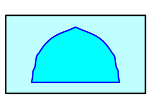
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

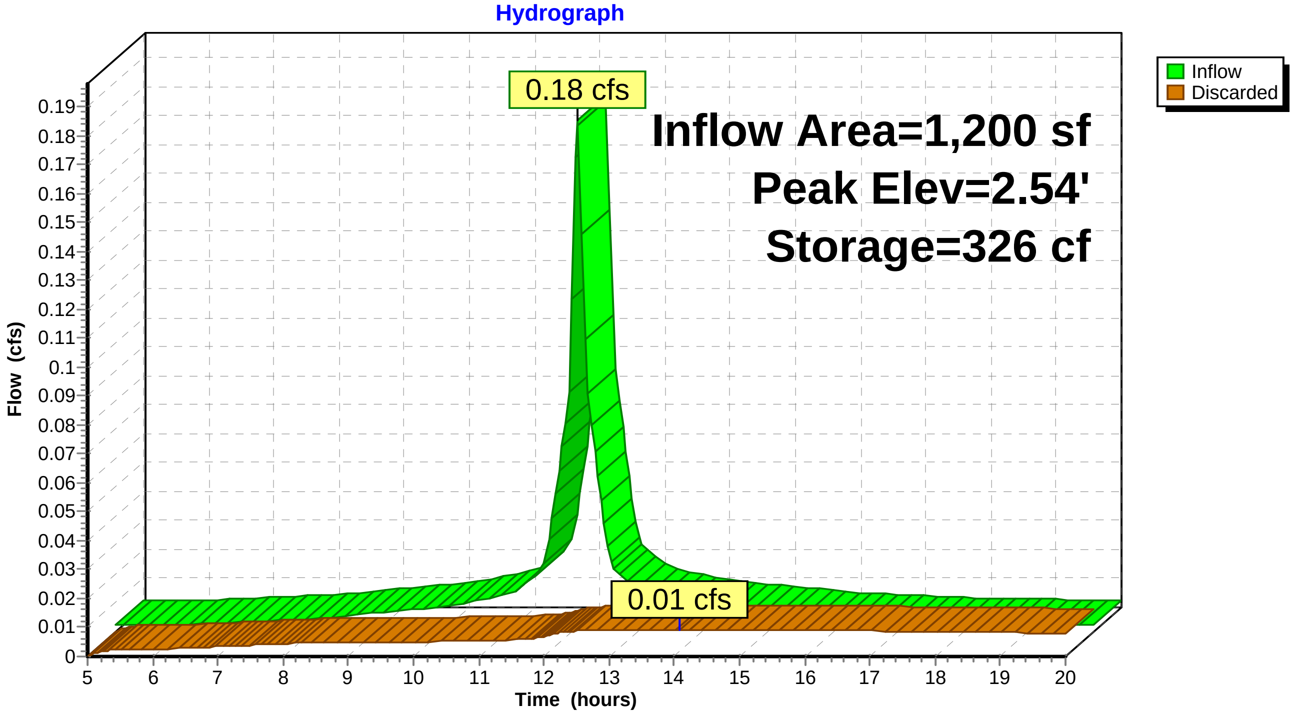
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 10P: Roof Recharge



Summary for Pond 11P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 2,018 cf
Outflow = 0.03 cfs @ 14.37 hrs, Volume= 1,223 cf, Atten= 95%, Lag= 137.2 min
Discarded = 0.03 cfs @ 14.37 hrs, Volume= 1,223 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.75' @ 14.37 hrs Surf.Area= 899 sf Storage= 1,068 cf

Plug-Flow detention time= 169.3 min calculated for 1,219 cf (60% of inflow)
Center-of-Mass det. time= 89.6 min (823.3 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	806 cf	**11.17'W x 80.50'L x 3.54'H Field A** 3,184 cf Overall - 1,170 cf Embedded = 2,014 cf x 40.0% Voids
#2A	0.50'	1,170 cf	**Cultec R-330XLHD** x 22 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,975 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 14.37 hrs HW=1.75' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 11P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

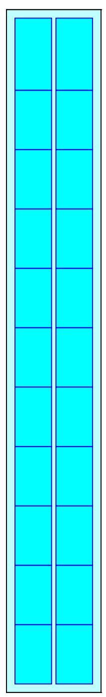
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

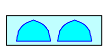
22 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,169.8 cf Chamber Storage

3,183.7 cf Field - 1,169.8 cf Chambers = 2,013.9 cf Stone x 40.0% Voids = 805.5 cf Stone Storage

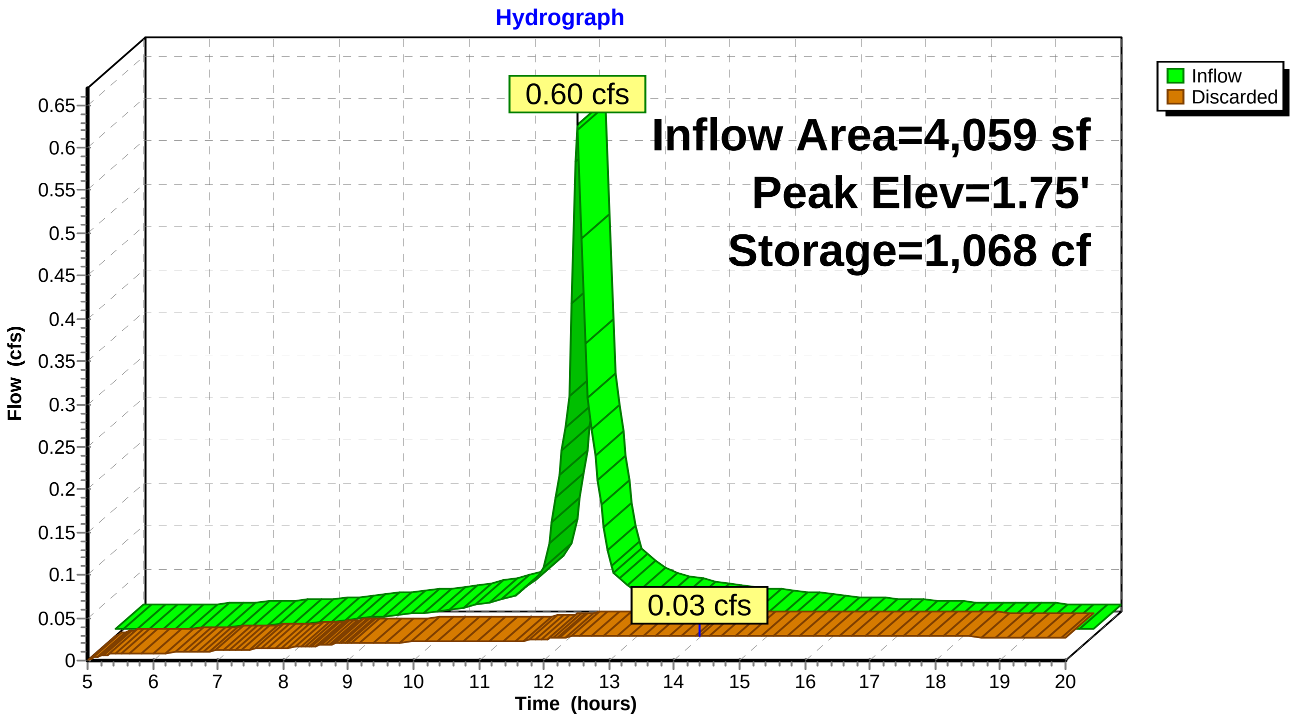
Chamber Storage + Stone Storage = 1,975.3 cf = 0.045 af
Overall Storage Efficiency = 62.0%
Overall System Size = 80.50' x 11.17' x 3.54'

22 Chambers
117.9 cy Field
74.6 cy Stone





Pond 11P: Roof Recharge



Summary for Pond 13P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1,200 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 597 cf
Outflow = 0.01 cfs @ 14.07 hrs, Volume= 360 cf, Atten= 95%, Lag= 118.8 min
Discarded = 0.01 cfs @ 14.07 hrs, Volume= 360 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 2.54' @ 14.07 hrs Surf.Area= 200 sf Storage= 326 cf

Plug-Flow detention time= 182.5 min calculated for 360 cf (60% of inflow)
Center-of-Mass det. time= 101.4 min (835.1 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	195 cf	**6.33'W x 31.50'L x 3.54'H Field A** 707 cf Overall - 220 cf Embedded = 487 cf x 40.0% Voids
#2A	0.50'	220 cf	**Cultec R-330XLHD** x 4 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 1 rows
		415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.01 cfs @ 14.07 hrs HW=2.54' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Pond 13P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 1 rows

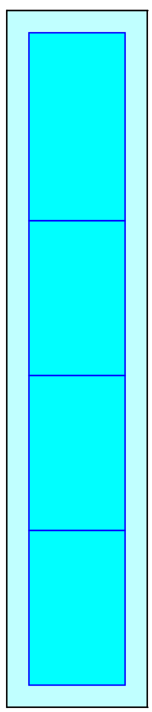
4 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 29.50' Row Length +12.0" End Stone x 2 = 31.50' Base Length
1 Rows x 52.0" Wide + 12.0" Side Stone x 2 = 6.33' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

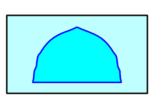
4 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 1 Rows = 219.8 cf Chamber Storage

706.6 cf Field - 219.8 cf Chambers = 486.8 cf Stone x 40.0% Voids = 194.7 cf Stone Storage

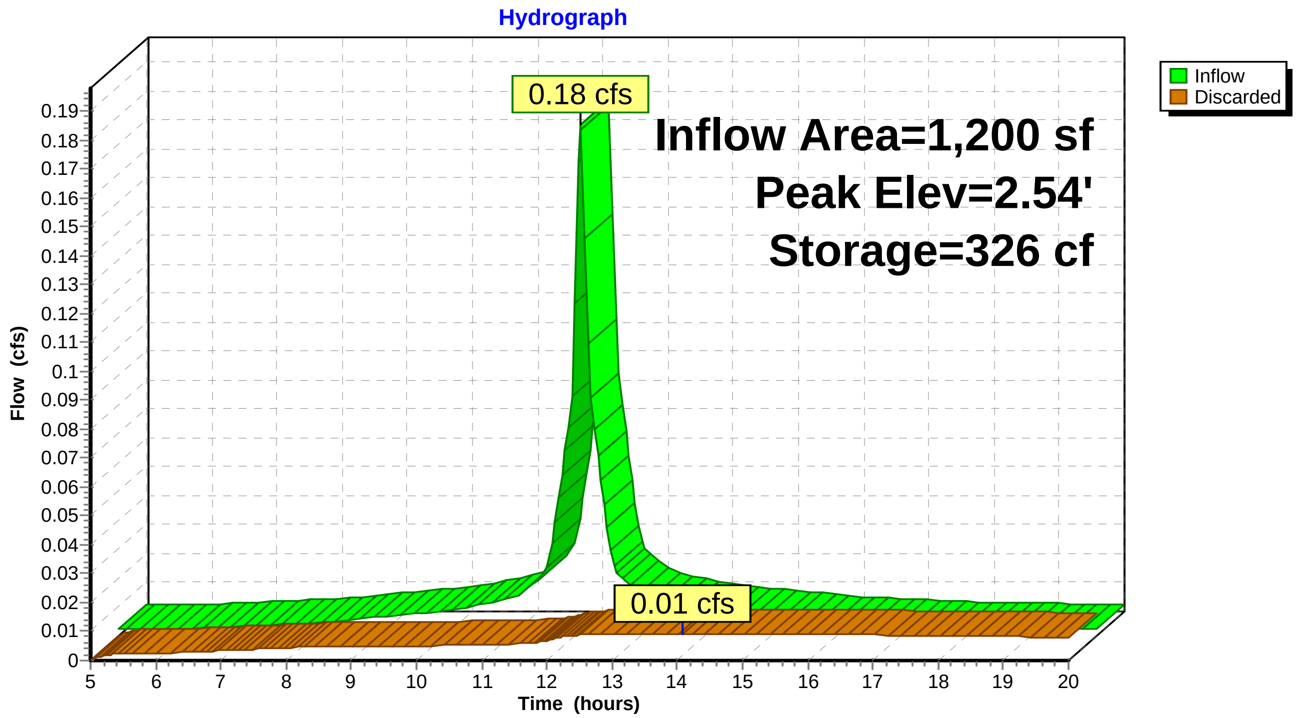
Chamber Storage + Stone Storage = 414.5 cf = 0.010 af
Overall Storage Efficiency = 58.7%
Overall System Size = 31.50' x 6.33' x 3.54'

4 Chambers
26.2 cy Field
18.0 cy Stone





Pond 13P: Roof Recharge



Summary for Pond 14P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 4,059 sf,100.00% Impervious, Inflow Depth > 5.97" for 100-Year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 2,018 cf
Outflow = 0.03 cfs @ 14.76 hrs, Volume= 1,131 cf, Atten= 96%, Lag= 160.5 min
Discarded = 0.03 cfs @ 14.76 hrs, Volume= 1,131 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1.90' @ 14.76 hrs Surf.Area= 840 sf Storage= 1,110 cf

Plug-Flow detention time= 170.9 min calculated for 1,131 cf (56% of inflow)
Center-of-Mass det. time= 83.7 min (817.4 - 733.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	738 cf	**16.00'W x 52.50'L x 3.54'H Field A** 2,975 cf Overall - 1,129 cf Embedded = 1,846 cf x 40.0% Voids
#2A	0.50'	1,129 cf	**Cultec R-330XLHD** x 21 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		1,867 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 14.76 hrs HW=1.90' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 14P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

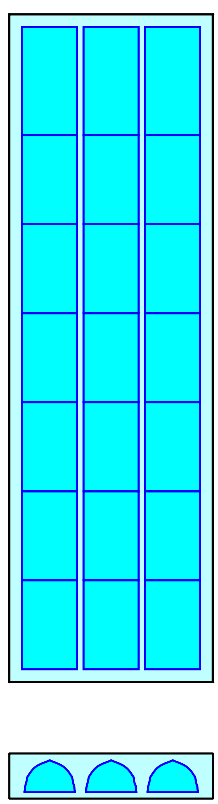
7 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 50.50' Row Length +12.0" End Stone x 2 = 52.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

21 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 1,128.8 cf Chamber Storage

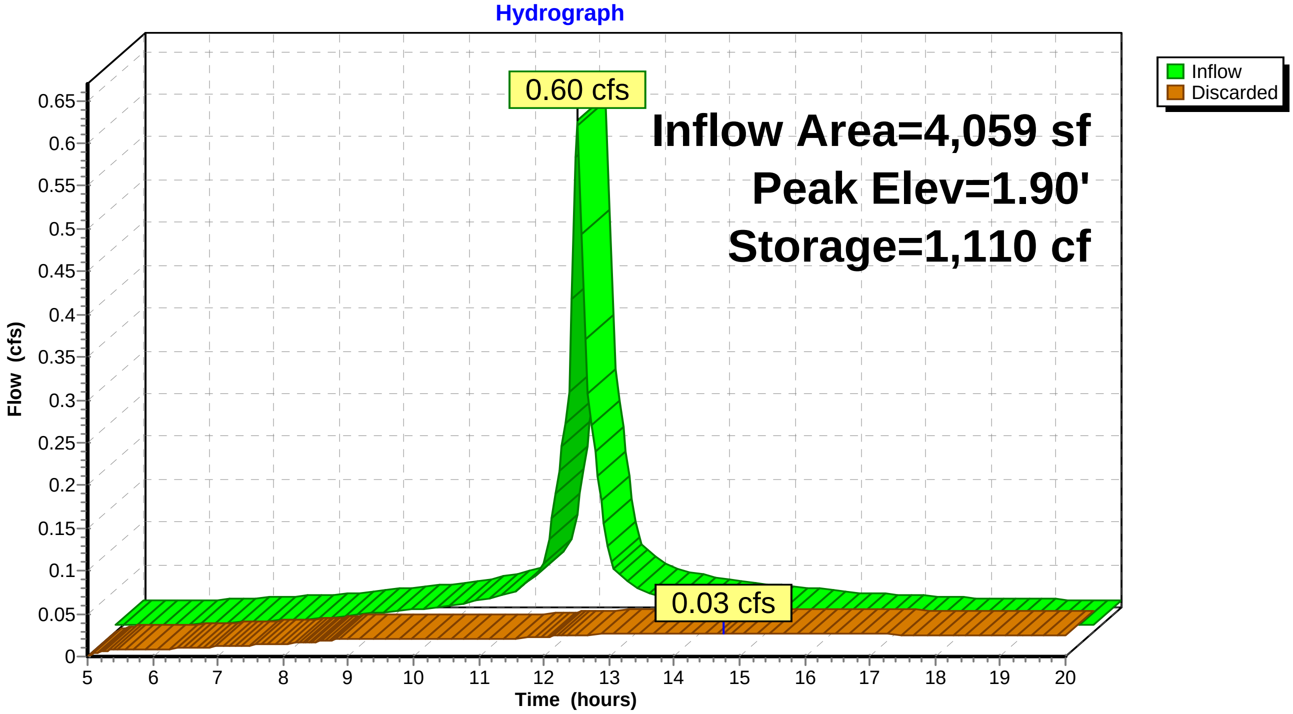
2,975.0 cf Field - 1,128.8 cf Chambers = 1,846.2 cf Stone x 40.0% Voids = 738.5 cf Stone Storage

Chamber Storage + Stone Storage = 1,867.3 cf = 0.043 af
Overall Storage Efficiency = 62.8%
Overall System Size = 52.50' x 16.00' x 3.54'

21 Chambers
110.2 cy Field
68.4 cy Stone



Pond 14P: Roof Recharge



Summary for Pond 17P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area =	13,086 sf, 37.67% Impervious,	Inflow Depth > 4.90"	for 100-Year event
Inflow =	1.72 cfs @ 12.09 hrs, Volume=	5,347 cf	
Outflow =	0.05 cfs @ 15.92 hrs, Volume=	2,164 cf, Atten= 97%, Lag= 230.1 min	
Discarded =	0.05 cfs @ 15.92 hrs, Volume=	2,164 cf	

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.05' @ 15.92 hrs Surf.Area= 1,677 sf Storage= 3,450 cf

Plug-Flow detention time= 187.7 min calculated for 2,157 cf (40% of inflow)
Center-of-Mass det. time= 90.2 min (851.1 - 760.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,440 cf	**20.83'W x 80.50'L x 3.54'H Field A** 5,940 cf Overall - 2,340 cf Embedded = 3,600 cf x 40.0% Voids
#2A	0.50'	2,340 cf	**Cultec R-330XLHD** x 44 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows
		3,780 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.05 cfs @ 15.92 hrs HW=3.05' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Pond 17P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 4 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

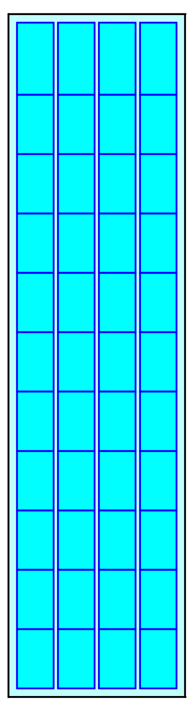
11 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 78.50' Row Length +12.0" End Stone x 2 = 80.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

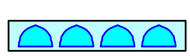
44 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 2,339.6 cf Chamber Storage

5,939.7 cf Field - 2,339.6 cf Chambers = 3,600.1 cf Stone x 40.0% Voids = 1,440.0 cf Stone Storage

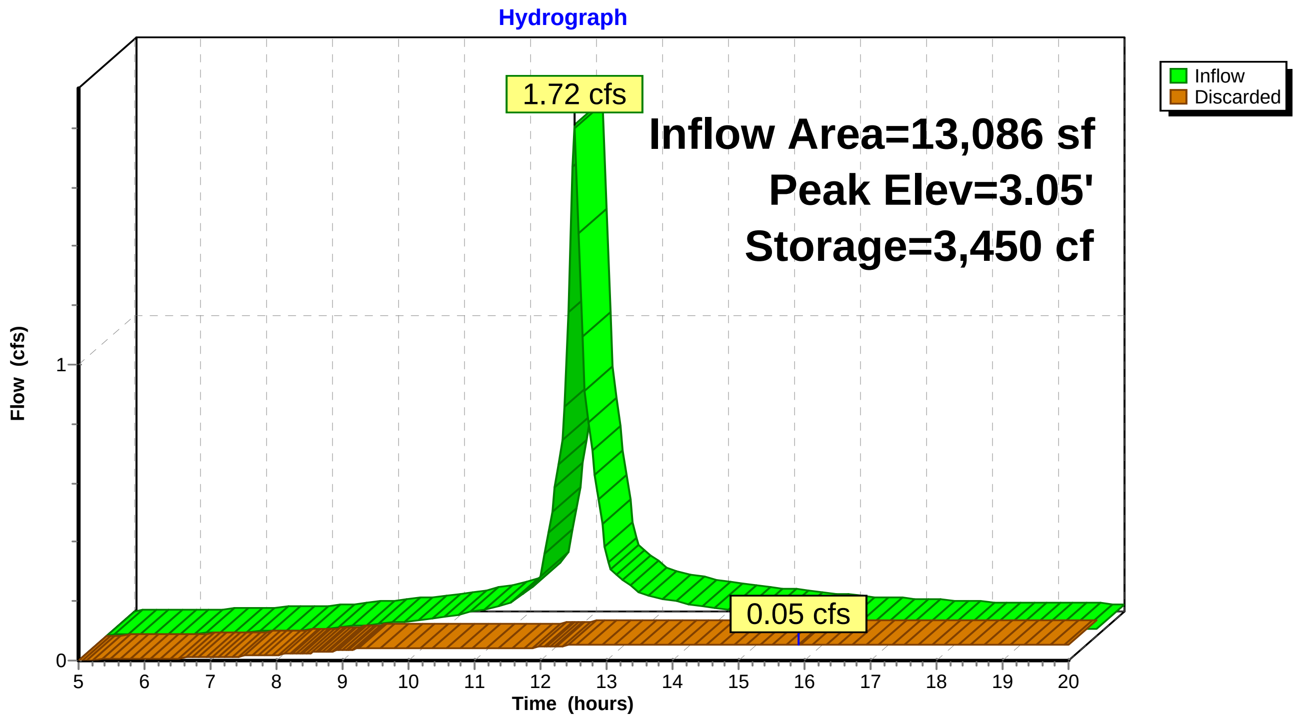
Chamber Storage + Stone Storage = 3,779.6 cf = 0.087 af
Overall Storage Efficiency = 63.6%
Overall System Size = 80.50' x 20.83' x 3.54'

44 Chambers
220.0 cy Field
133.3 cy Stone





Pond 17P: Roof Recharge



Summary for Pond 19P: Roof Recharge

[82] Warning: Early inflow requires earlier time span

Inflow Area = 11,720 sf, 42.06% Impervious, Inflow Depth > 5.01" for 100-Year event
Inflow = 1.57 cfs @ 12.09 hrs, Volume= 4,894 cf
Outflow = 0.10 cfs @ 13.81 hrs, Volume= 3,483 cf, Atten= 94%, Lag= 103.3 min
Discarded = 0.10 cfs @ 13.81 hrs, Volume= 3,483 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.13' @ 13.81 hrs Surf.Area= 1,176 sf Storage= 2,430 cf

Plug-Flow detention time= 174.0 min calculated for 3,471 cf (71% of inflow)
Center-of-Mass det. time= 109.5 min (868.0 - 758.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,027 cf	**16.00'W x 73.50'L x 3.54'H Field A** 4,165 cf Overall - 1,598 cf Embedded = 2,567 cf x 40.0% Voids
#2A	0.50'	1,598 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		2,625 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**2.410 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.10 cfs @ 13.81 hrs HW=3.13' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.10 cfs)

Pond 19P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 3 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

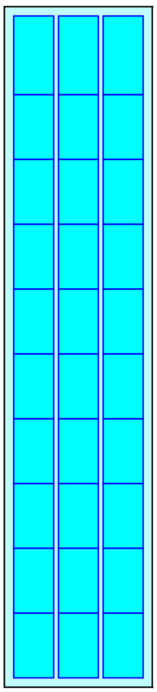
10 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 71.50' Row Length +12.0" End Stone x 2 = 73.50' Base Length
3 Rows x 52.0" Wide + 6.0" Spacing x 2 + 12.0" Side Stone x 2 = 16.00' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

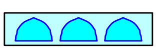
30 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 3 Rows = 1,598.2 cf Chamber Storage

4,165.0 cf Field - 1,598.2 cf Chambers = 2,566.8 cf Stone x 40.0% Voids = 1,026.7 cf Stone Storage

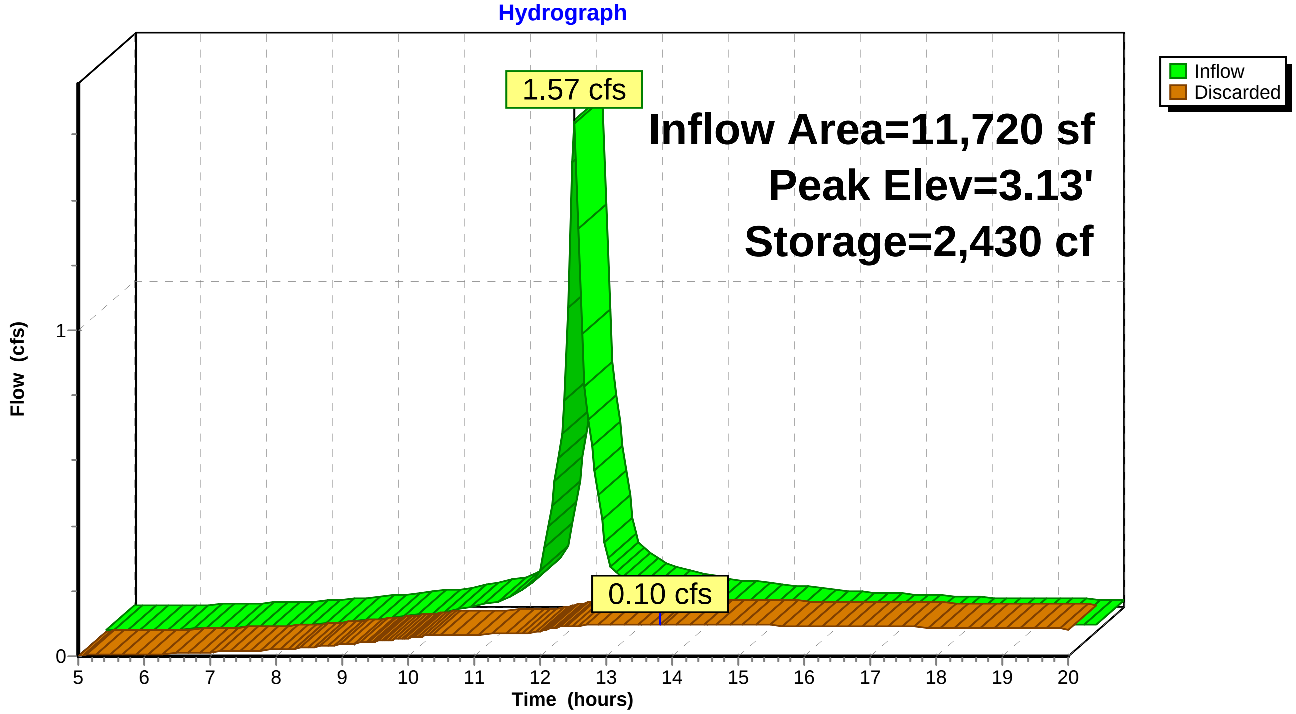
Chamber Storage + Stone Storage = 2,624.9 cf = 0.060 af
Overall Storage Efficiency = 63.0%
Overall System Size = 73.50' x 16.00' x 3.54'

30 Chambers
154.3 cy Field
95.1 cy Stone





Pond 19P: Roof Recharge



Summary for Pond 21P: BASIN B

Inflow Area = 167,695 sf, 37.24% Impervious, Inflow Depth > 2.86" for 100-Year event
Inflow = 10.67 cfs @ 12.17 hrs, Volume= 39,906 cf
Outflow = 4.98 cfs @ 12.51 hrs, Volume= 25,812 cf, Atten= 53%, Lag= 20.1 min
Discarded = 0.40 cfs @ 12.51 hrs, Volume= 13,015 cf
Primary = 4.58 cfs @ 12.51 hrs, Volume= 12,797 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 228.07' @ 12.51 hrs Surf.Area= 7,611 sf Storage= 16,003 cf

Plug-Flow detention time= 132.5 min calculated for 25,812 cf (65% of inflow)
Center-of-Mass det. time= 58.8 min (863.6 - 804.8)

Volume	Invert	Avail.Storage	Storage Description
#1	225.50'	23,381 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

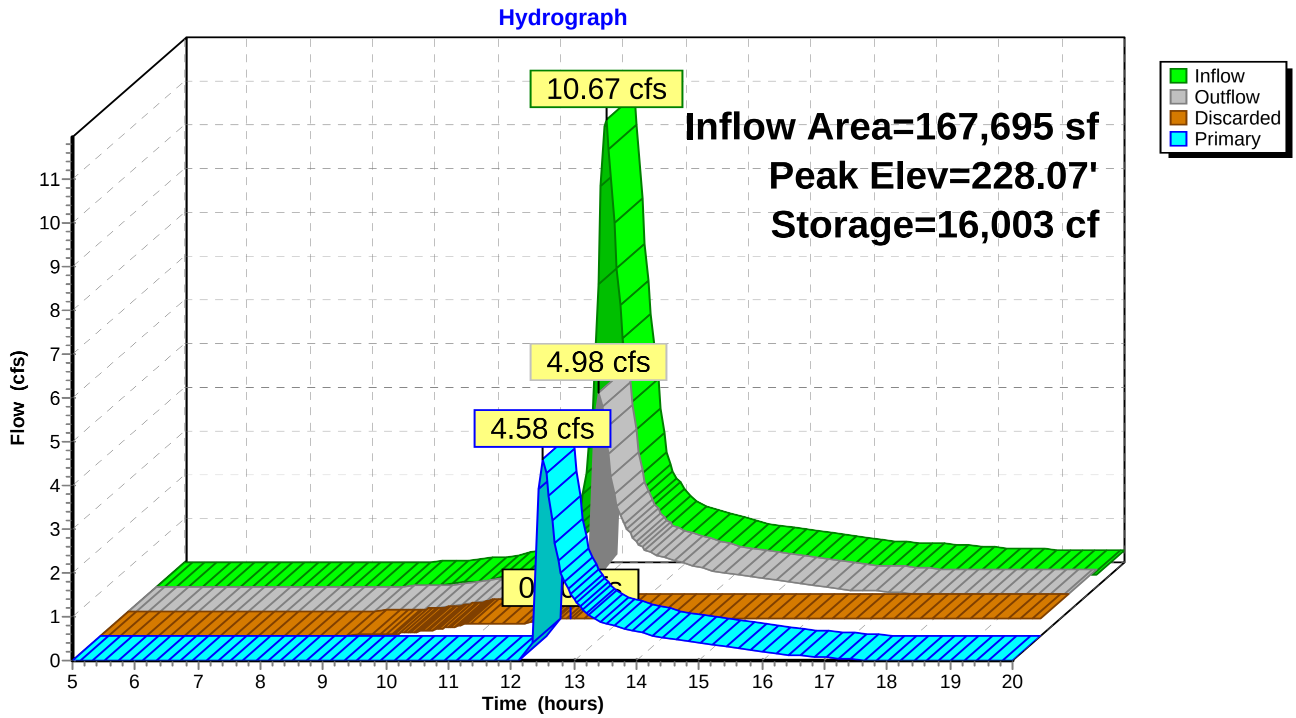
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.50	5,039	294.3	0	0	5,039
226.00	5,488	303.7	2,631	2,631	5,511
227.00	6,427	322.5	5,951	8,582	6,498
228.00	7,423	328.3	6,919	15,501	6,941
228.90	10,160	388.5	7,880	23,381	10,390

Device	Routing	Invert	Outlet Devices
#1	Discarded	225.50'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	227.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.40 cfs @ 12.51 hrs HW=228.07' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=4.49 cfs @ 12.51 hrs HW=228.07' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.49 cfs @ 1.09 fps)

Pond 21P: BASIN B



Summary for Pond 22P: Roof Recharge

Inflow Area = 11,373 sf, 43.34% Impervious, Inflow Depth > 3.94" for 100-Year event
Inflow = 1.26 cfs @ 12.09 hrs, Volume= 3,734 cf
Outflow = 0.04 cfs @ 15.86 hrs, Volume= 1,549 cf, Atten= 96%, Lag= 226.0 min
Discarded = 0.04 cfs @ 15.86 hrs, Volume= 1,549 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 3.35' @ 15.86 hrs Surf.Area= 1,133 sf Storage= 2,407 cf

Plug-Flow detention time= 203.9 min calculated for 1,549 cf (41% of inflow)
Center-of-Mass det. time= 114.6 min (895.6 - 781.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	0.00'	1,013 cf	**11.17'W x 101.50'L x 3.54'H Field A** 4,014 cf Overall - 1,483 cf Embedded = 2,531 cf x 40.0% Voids
#2A	0.50'	1,483 cf	**Cultec R-330XLHD** x 28 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		2,495 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.020 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 15.86 hrs HW=3.35' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

Pond 22P: Roof Recharge - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (Cultec Recharger® 330XLHD)
Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf
Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap
Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

52.0" Wide + 6.0" Spacing = 58.0" C-C Row Spacing

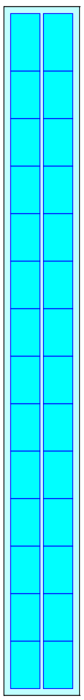
14 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 99.50' Row Length +12.0" End Stone x 2 = 101.50' Base Length
2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.17' Base Width
6.0" Base + 30.5" Chamber Height + 6.0" Cover = 3.54' Field Height

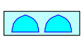
28 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 1,482.7 cf Chamber Storage

4,014.2 cf Field - 1,482.7 cf Chambers = 2,531.4 cf Stone x 40.0% Voids = 1,012.6 cf Stone Storage

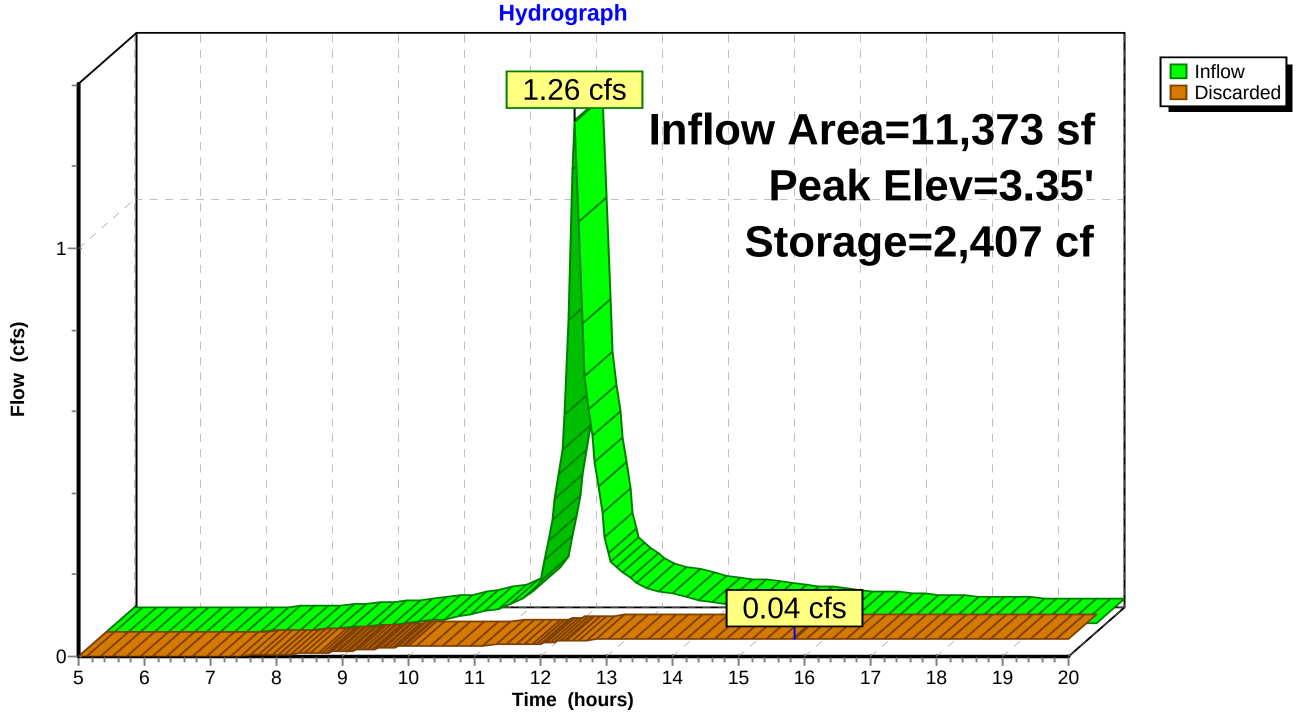
Chamber Storage + Stone Storage = 2,495.3 cf = 0.057 af
Overall Storage Efficiency = 62.2%
Overall System Size = 101.50' x 11.17' x 3.54'

28 Chambers
148.7 cy Field
93.8 cy Stone





Pond 22P: Roof Recharge



Summary for Pond 30P: BASIN A

[82] Warning: Early inflow requires earlier time span

Inflow Area = 18,459 sf, 78.24% Impervious, Inflow Depth > 5.60" for 100-Year event
Inflow = 3.08 cfs @ 12.00 hrs, Volume= 8,616 cf
Outflow = 0.30 cfs @ 12.65 hrs, Volume= 7,549 cf, Atten= 90%, Lag= 39.1 min
Discarded = 0.22 cfs @ 12.65 hrs, Volume= 7,462 cf
Primary = 0.07 cfs @ 12.65 hrs, Volume= 87 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 240.01' @ 12.65 hrs Surf.Area= 3,012 sf Storage= 3,942 cf

Plug-Flow detention time= 161.1 min calculated for 7,522 cf (87% of inflow)
Center-of-Mass det. time= 121.4 min (859.4 - 738.0)

Volume	Invert	Avail.Storage	Storage Description
#1	238.20'	7,401 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

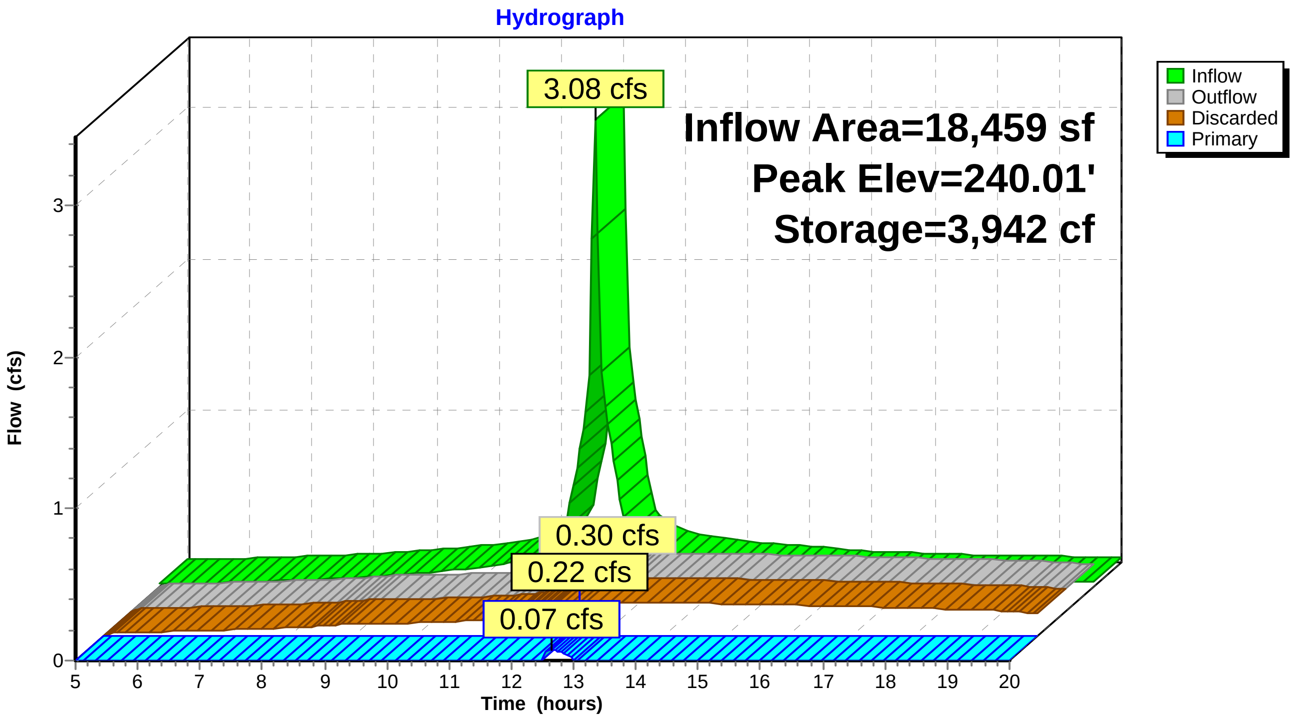
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
238.20	1,411	262.1	0	0	1,411
239.00	2,083	297.8	1,389	1,389	3,017
240.00	3,005	316.6	2,530	3,919	3,986
241.00	3,983	335.5	3,483	7,401	5,020

Device	Routing	Invert	Outlet Devices
#1	Discarded	238.20'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.00'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.22 cfs @ 12.65 hrs HW=240.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=0.05 cfs @ 12.65 hrs HW=240.01' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.24 fps)

Pond 30P: BASIN A



Summary for Pond 31P: BASIN D

Inflow Area = 90,014 sf, 45.84% Impervious, Inflow Depth > 4.35" for 100-Year event
Inflow = 10.80 cfs @ 12.09 hrs, Volume= 32,604 cf
Outflow = 2.13 cfs @ 12.54 hrs, Volume= 26,961 cf, Atten= 80%, Lag= 27.0 min
Discarded = 0.75 cfs @ 12.54 hrs, Volume= 24,595 cf
Primary = 1.38 cfs @ 12.54 hrs, Volume= 2,366 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 240.98' @ 12.54 hrs Surf.Area= 9,195 sf Storage= 14,812 cf

Plug-Flow detention time= 165.6 min calculated for 26,871 cf (82% of inflow)
Center-of-Mass det. time= 117.6 min (890.6 - 772.9)

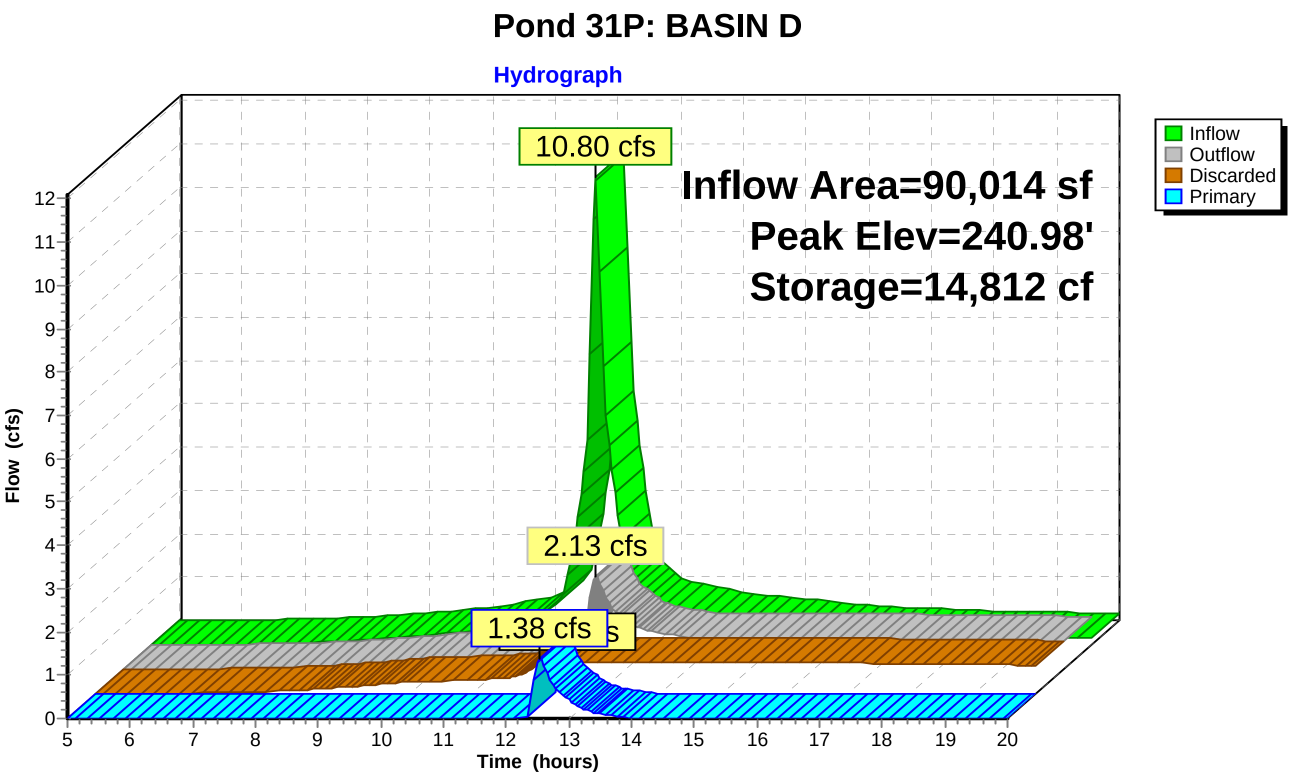
Volume	Invert	Avail.Storage	Storage Description
#1	239.00'	24,822 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
239.00	5,028	276.6	0	0	5,028
240.00	7,979	406.4	6,447	6,447	12,091
241.00	9,227	425.3	8,595	15,042	13,409
241.90	12,593	472.4	9,780	24,822	16,798

Device	Routing	Invert	Outlet Devices
#1	Discarded	239.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	240.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.75 cfs @ 12.54 hrs HW=240.97' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.75 cfs)

Primary OutFlow Max=1.36 cfs @ 12.54 hrs HW=240.97' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.36 cfs @ 0.73 fps)


Pond 31P: BASIN D
Hydrograph
10.80 cfs
2.13 cfs
1.38 cfs
Inflow Area=90,014 sf
Peak Elev=240.98'
Storage=14,812 cf
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Summary for Pond 32P: BASIN C

Inflow Area = 188,274 sf, 48.56% Impervious, Inflow Depth > 3.61" for 100-Year event
Inflow = 16.60 cfs @ 12.14 hrs, Volume= 56,653 cf
Outflow = 5.91 cfs @ 12.50 hrs, Volume= 50,852 cf, Atten= 64%, Lag= 21.7 min
Discarded = 1.72 cfs @ 12.50 hrs, Volume= 44,037 cf
Primary = 4.19 cfs @ 12.50 hrs, Volume= 6,815 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 226.06' @ 12.50 hrs Surf.Area= 15,920 sf Storage= 23,166 cf

Plug-Flow detention time= 133.0 min calculated for 50,683 cf (89% of inflow)
Center-of-Mass det. time= 100.3 min (890.0 - 789.7)

Volume	Invert	Avail.Storage	Storage Description
#1	224.00'	38,476 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

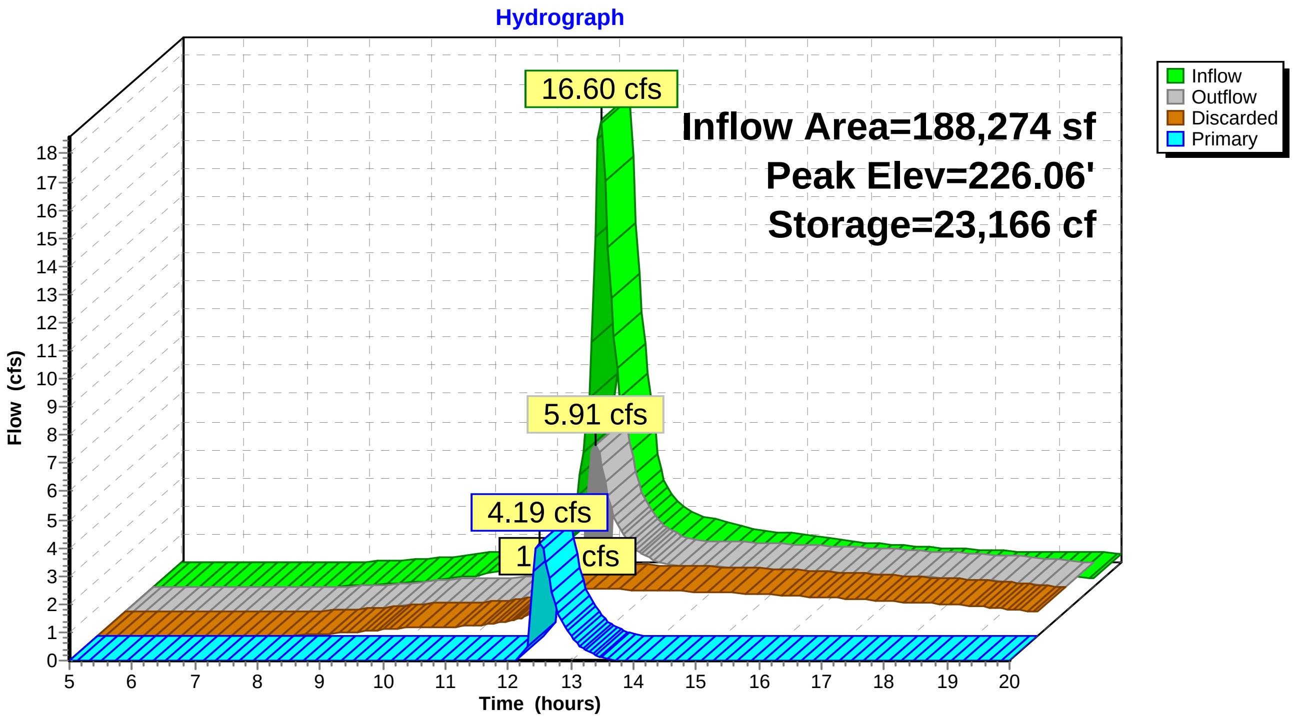
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
224.00	4,753	268.4	0	0	4,753
225.00	12,400	506.3	8,277	8,277	19,424
226.00	15,628	628.5	13,983	22,260	30,474
226.90	20,519	675.7	16,216	38,476	35,408

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.00'	**2.410 in/hr Exfiltration over Wetted area**
#2	Primary	225.90'	**25.0' long x 21.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=1.72 cfs @ 12.50 hrs HW=226.06' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.72 cfs)

Primary OutFlow Max=4.17 cfs @ 12.50 hrs HW=226.06' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 4.17 cfs @ 1.06 fps)

Pond 32P: BASIN C



APPENDIX B: HYDRAULIC ANALYSIS

PIPE SIZING CALCULATIONS

MBL Land Development & Permitting, Corp.
Land Development, Transportation & Environmental Solutions

Project No.: 2016-002
Location: Joanna Hills Estates, Avon, MA
Calculated By: Justin Williams
Calculated On: 10/27/2020

DESIGN STORM	K	b
2	70	13
10	111	16
25	170	27
50	187	24
100	220	28

Steel Formula: I=K/(tc+b)
Region 4
Design Storm 25
K= 170
b= 27

COVER	C
WOODED	0.20
LANDSCAPED	0.40
IMPERVIOUS	0.85

Joanna Hills Estates - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	Tc L/V (MIN)
WS CB-1	LANDSCAPED	0.296		0.400								From: CB-1	Out:	ADS												
	IMPERVIOUS	0.338		0.850										N-12	12	23	0.79	0.250	0.005	0.012	**2.73**	**3.47**	0.77	0.97	3.37	0.11
			0.634	0.640	0.406		6.00	NONE	6.00	5.15	**2.09**	To: DMH-1	In:													
WS CB-2	LANDSCAPED	0.297		0.400								From: CB-2	Out:	ADS												
	IMPERVIOUS	0.256		0.850										N-12	12	15	0.79	0.250	0.005	0.012	**2.73**	**3.47**	0.64	0.92	3.19	0.08
			0.554	0.608	0.337		6.00	NONE	6.00	5.15	**1.73**	To: DMH-1	In:													
												From: DMH-1	Out:	ADS												
DMH-1	**TO WQU-1**					0.743	6.00	0.11	6.11	5.13	**3.81**			N-12	15	19	1.23	0.313	0.005	0.012	**4.95**	**4.03**	0.77	0.97	3.91	0.08
												To: WQU-1	In:													
												From: WQU-1	Out:	ADS												
WQU-1	**TO FLARED END-1**					0.743	6.11	0.08	6.19	5.12	**3.80**			N-12	15	162	1.23	0.3125	0.005	0.012	**4.95**	**4.03**	**0.77**	**0.97**	**3.91**	**0.69**
												To: FLARED END-1	In:													
WS CB-3	LANDSCAPED	0.000		0.400								From: CB-3	Out:													
	IMPERVIOUS	0.138		0.850										HDPE	12	25	0.79	0.250	0.005	0.013	**2.52**	**3.21**	0.24	0.69	2.22	0.19
			0.138	0.850	0.117		6.00	NONE	6.00	5.15	**0.60**	To: DMH-2	In:													
WS CB-4	LANDSCAPED	0.000		0.400								From: CB-4	Out:													
	IMPERVIOUS	0.061		0.850										HDPE	12	18	0.79	0.250	0.005	0.013	**2.52**	**3.21**	0.11	0.55	1.75	0.17
			0.061	0.850	0.052		6.00	NONE	6.00	5.15	**0.27**	To: DMH-2	In:													
WS CB-5	LANDSCAPED	0.000		0.400								From: CB-5	Out:													
	IMPERVIOUS	0.041		0.850										HDPE	12	26	0.79	0.250	0.005	0.013	**2.52**	**3.21**	0.07	0.49	1.56	0.28
			0.041	0.850	0.035		6.00	NONE	6.00	5.15	**0.18**	To: DMH-2	In:													
												From: DMH-2	Out:													
DMH-2	**TO WQU-2**					0.204	6.00	0.28	6.28	5.11	**1.04**			HDPE	12	28	0.79	0.250	0.008	0.013	**3.19**	**4.06**	0.33	0.76	3.07	0.15
												To: WQU-2	In:													
												From: WQU-2	Out:													
WQU-2	**TO FLARED END-2**					0.204	6.28	0.15	6.43	5.09	**1.04**			HDPE	12	36	0.79	0.250	0.005	0.013	**2.52**	**3.21**	**0.41**	**0.81**	**2.60**	**0.23**
												To: FLARED END-2	In:													

MBL Land Development & Permitting, Corp.
Land Development, Transportation & Environmental Solutions

Project No.: 2016-002
Location: Joanna Hills Estates, Avon, MA
Calculated By: Justin Williams
Calculated On: 10/27/2020

Joanna Hills Estates - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-6	LANDSCAPED	0.383		0.400								From: CB-6	Out:													
	IMPERVIOUS	0.314		0.850										HDPE	12	12	0.79	0.250	0.005	0.013	2.52	3.21	0.86	1.00	3.21	0.06
			0.697	0.603	0.420		6.00	NONE	6.00	5.15	2.16	To: DMH-3	In:													
WS CB-7	LANDSCAPED	0.099		0.400								From: CB-7	Out:													
	IMPERVIOUS	0.183		0.850										HDPE	12	12	0.79	0.250	0.005	0.013	2.52	3.21	0.40	0.80	2.57	0.08
			0.282	0.692	0.195		6.00	NONE	6.00	5.15	1.00	To: DMH-3	In:													
												From: DMH-3	Out:													
DMH-3 TO	DMH-4					0.615	6.00	0.08	6.08	5.14	3.16			HDPE	12	210	0.79	0.250	0.020	0.013	5.04	6.42	0.63	0.91	5.87	0.60
												To: DMH-4	In:													
												From: DMH-4	Out:													
DMH-4 TO	WQU-3					0.615	6.08	0.60	6.67	5.05	3.10			HDPE	12	58	0.79	0.250	0.016	0.013	4.51	5.74	0.69	0.94	5.39	0.18
												To: WQU-3	In:													
WS CB-8	LANDSCAPED	0.456		0.400								From: CB-8	Out:	ADS												
	IMPERVIOUS	0.443		0.850										N-12	15	13	1.23	0.313	0.005	0.012	4.95	4.03	0.58	0.90	3.61	0.06
			0.899	0.622	0.559		6.00	NONE	6.00	5.15	2.88	To: DMH-5	In:													
WS CB-9	LANDSCAPED	0.450		0.400								From: CB-9	Out:	ADS												
	IMPERVIOUS	0.323		0.850										N-12	12	13	0.79	0.250	0.005	0.012	2.73	3.47	0.86	1.00	3.48	0.06
			0.773	0.588	0.455		6.00	NONE	6.00	5.15	2.34	To: DMH-5	In:													
												From: DMH-5	Out:	ADS												
DMH-5 TO	WQU-3					1.014	6.00	0.06	6.06	5.14	5.21			N-12	18	26	1.77	0.375	0.005	0.012	8.05	4.55	0.65	0.92	4.20	0.10
												To: WQU-3	In:													
												From: WQU-3	Out:													
WQU-3 TO	FLARED END-3					1.629	6.67	0.18	6.85	5.02	8.18			RCP	21	46	2.41	0.4375	0.005	0.011	13.24	5.51	0.62	0.91	5.01	0.15
												To: FLARED END-3	In:													
WS CB-10	LANDSCAPED	0.044		0.400								From: CB-10	Out:													
	IMPERVIOUS	0.238		0.850										HDPE	12	11	0.79	0.250	0.025	0.013	5.63	7.17	0.20	0.66	4.72	0.04
			0.282	0.780	0.220		6.00	NONE	6.00	5.15	1.13	To: DMH-6	In:													
WS CB-11	LANDSCAPED	0.025		0.400								From: CB-11	Out:													
	IMPERVIOUS	0.047		0.850										HDPE	12	14	0.79	0.250	0.025	0.013	5.63	7.17	0.05	0.43	3.07	0.08
			0.072	0.694	0.050		6.00	NONE	6.00	5.15	0.26	To: DMH-6	In:													
												From: DMH-6	Out:													
DMH-6 TO	DMH-7					0.270	6.00	0.08	6.08	5.14	1.39			HDPE	12	282	0.79	0.250	0.025	0.013	5.63	7.17	0.25	0.70	5.00	0.94
												To: DMH-7	In:													
WS CB-12	LANDSCAPED	0.060		0.400								From: CB-12	Out:													
	IMPERVIOUS	0.158		0.850										HDPE	12	20	0.79	0.250	0.005	0.013	2.52	3.21	0.32	0.76	2.42	0.14
			0.218	0.727	0.158		6.00	NONE	6.00	5.15	0.82	To: DMH-7	In:													
												From: DMH-7	Out:													
DMH-7 TO	DMH-8					0.428	6.08	0.94	7.02	5.00	2.14			HDPE	12	34	0.79	0.250	0.020	0.013	5.04	6.42	0.42	0.82	5.24	0.11
												To: DMH-8	In:													

MBL Land Development & Permitting, Corp.
Land Development, Transportation & Environmental Solutions

Project No.: 2016-002
Location: Joanna Hills Estates, Avon, MA
Calculated By: Justin Williams
Calculated On: 10/27/2020

Joanna Hills Estates - 25 YEAR STORM

WATERSHED CHARACTERISTICS												PIPE CHARACTERISTICS											FLOW CHARACTERISTICS			
LOCATION				LAND USE			FLOW TIME			FLOW		R = hydraulic radius = area/wetted perimeter														Tc
Description	Cover	Increm. (ACRE)	Total_A (ACRE)	C	CA	Total CA	To Inlet (MIN)	In Pipe (MIN)	Tc (MIN)	I (IPH)	Q (CFS)	Structure	Invert	Pipe	Size (IN)	Length (FT)	Area (SF)	R (FT)	Slope	n	Qf (CFS)	Vf (FT/S)	Q/Qf	V/Vf	V (FT/S)	L/V (MIN)
WS CB-13	LANDSCAPED	0.137		0.400								From: CB-13	Out:													
	IMPERVIOUS	0.362		0.850										HDPE	12	4	0.79	0.250	0.020	0.013	**5.04**	**6.42**	0.37	0.79	5.04	0.01
			0.499	0.727	0.363		6.00	NONE	6.00	5.15	**1.87**	To: DMH-8	In:													
WS CB-14	LANDSCAPED	0.087		0.400								From: CB-14	Out:													
	IMPERVIOUS	0.163		0.850										HDPE	12	15	0.79	0.250	0.010	0.013	**3.56**	**4.54**	0.25	0.70	3.18	0.08
			0.250	0.693	0.173		6.00	NONE	6.00	5.15	**0.89**	To: DMH-8	In:													
												From: DMH-8	Out:													
DMH-8 TO DMH-9						0.964	7.02	0.11	7.12	4.98	**4.80**			HDPE	12	56	0.79	0.250	0.025	0.013	**5.63**	**7.17**	**0.85**	**1.00**	**7.17**	**0.13**
												To: DMH-9	In:													
												From: DMH-9	Out:													
DMH-9 TO DMH-10						0.964	7.12	0.13	7.25	4.96	**4.79**			HDPE	15	127	1.23	0.3125	0.015	0.013	**7.91**	**6.45**	**0.60**	**0.90**	**5.83**	**0.36**
												To: DMH-10	In:													
WS CB-15	LANDSCAPED	0.245		0.400								From: CB-15	Out:													
	IMPERVIOUS	0.067		0.850										RCP	12	25	0.79	0.250	0.005	0.011	**2.98**	**3.79**	0.24	0.69	2.61	0.16
			0.312	0.497	0.155		10.40	NONE	10.40	4.55	**0.70**	To: DMH-10	In:													
												From: DMH-10	Out:													
DMH-10 TO DMH-11						1.119	10.40	0.36	10.76	4.50	5.04			RCP	15	62	1.23	0.3125	0.012	0.011	**8.36**	**6.81**	**0.60**	**0.90**	**6.16**	**0.17**
												To: DMH-11	In:													
WS CB-16	LANDSCAPED	0.694		0.400								From: CB-16	Out:													
	IMPERVIOUS	0.206		0.850										RCP	12	91	0.79	0.250	0.005	0.011	**2.98**	**3.79**	0.78	0.98	3.70	0.41
			0.901	0.503	0.453		6.00	NONE	6.00	5.15	**2.33**	To: DMH-11	In:													
WS CB-17	LANDSCAPED	0.582		0.400								From: CB-17	Out:													
	IMPERVIOUS	0.498		0.850										RCP	15	22	1.23	0.313	0.005	0.011	**5.40**	**4.40**	0.55	0.88	3.88	0.09
			1.081	0.607	0.656		10.40	NONE	10.40	4.55	**2.98**	To: DMH-11	In:													
												From: DMH-11	Out:													
DMH-11 TO WQU-4						2.229	10.76	0.41	11.17	4.45	**9.93**			RCP	21	18	2.41	0.438	0.005	0.011	**13.24**	**5.51**	**0.75**	**0.96**	**5.30**	**0.06**
												To: WQU-4	In:													
												From: WQU-4	Out:													
WQU-4 TO FLARED END-4						2.229	11.17	0.06	11.23	4.45	**9.91**			RCP	21	31	2.41	0.438	0.005	0.011	**13.24**	**5.51**	**0.75**	**0.96**	**5.30**	**0.10**
												To: FLARED END-4	In:													
WS CB-18	LANDSCAPED	0.852		0.400								From: CB-18	Out:	ADS												
	IMPERVIOUS	0.497		0.850										N-12	15	10	1.23	0.313	0.005	0.012	**4.95**	**4.03**	0.79	0.98	3.95	0.04
			1.349	0.566	0.764		6.00	NONE	6.00	5.15	**3.93**	To: WQU-5	In:													
												From: WQU-5	Out:	ADS												
WQU-5 TO FLARED END-5						0.764	6.00	0.04	6.04	5.14	**3.93**			N-12	15	126	1.23	0.313	0.005	0.012	**4.95**	**4.03**	**0.79**	**0.98**	**3.95**	**0.53**
												To: FLARED END-5	In:													

APPENDIX C: GROUNDWATER RECHARGE CALCULATIONS & 72-HR DRAWDOWN CALCULATIONS

Groundwater Recharge Calculations - Basin A

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Calculate the Required Recharge Volume

NRCS Hydrologic Soil Group	Volume to Recharge (inches)	Impervious Area (square feet)	Required Recharge Volume (cubic feet)
A	0.60	7566	378
B	0.35		0
C	0.25		0
D	0.10	2893	24
		Total Required Recharge Volume	402

Capture Area Adjustment

A minimum of 65% of the total site impervious area must be directed to a recharge BMP:

Impervious Area Directed to Recharge BMP (square feet)	Total Impervious Area (square feet)	% of Total Directed to Recharge BMP
10459	10459	100%

Calculate the Adjustment Factor:

Impervious Area Directed to Recharge BMP (square feet)	Total Impervious Area (square feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP
10459	10459	1.00

Calculate the Adjusted Required Recharge Volume:

Required Recharge Volume (cubic feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP	Adjusted Required Recharge Volume (cubic feet)
402	1.00	402
	Total Required Recharge Volume	402
	Total Provided Recharge Volume (EL. 238.47 in Basin)	403

Groundwater Recharge Calculations - Basin B

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Calculate the Required Recharge Volume

NRCS Hydrologic Soil Group	Volume to Recharge (inches)	Impervious Area (square feet)	Required Recharge Volume (cubic feet)
A	0.60	45015	2251
B	0.35		0
C	0.25		0
D	0.10	10020	84
		Total Required Recharge Volume	2334

Capture Area Adjustment

A minimum of 65% of the total site impervious area must be directed to a recharge BMP:

Impervious Area Directed to Recharge BMP (square feet)	Total Impervious Area (square feet)	% of Total Directed to Recharge BMP
55035	55035	100%

Calculate the Adjustment Factor:

Impervious Area Directed to Recharge BMP (square feet)	Total Impervious Area (square feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP
55035	55035	1.00

Calculate the Adjusted Required Recharge Volume:

Required Recharge Volume (cubic feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP	Adjusted Required Recharge Volume (cubic feet)
2334	1.00	2334
	Total Required Recharge Volume	2334
	Total Provided Recharge Volume (EL. 225.95 in Basin)	2340

Groundwater Recharge Calculations - Basin C

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Calculate the Required Recharge Volume

NRCS Hydrologic Soil Group	Volume to Recharge (inches)	Impervious Area (square feet)	Required Recharge Volume (cubic feet)
A	0.60	38690	1935
B	0.35	34912	1018
C	0.25		0
D	0.10	2200	18
		Total Required Recharge Volume	2971

Capture Area Adjustment

A minimum of 65% of the total site impervious area must be directed to a recharge BMP:

Impervious Area Directed to Recharge BMP (square feet)	Total Impervious Area (square feet)	% of Total Directed to Recharge BMP
74130	75803	98%

Calculate the Adjustment Factor:

Impervious Area Directed to Recharge BMP (square feet)	Total Impervious Area (square feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP
74130	75803	1.02

Calculate the Adjusted Required Recharge Volume:

Required Recharge Volume (cubic feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP	Adjusted Required Recharge Volume (cubic feet)
2971	1.02	3038
	Total Required Recharge Volume	3038
	Total Provided Recharge Volume (EL.224.49 in Basin)	3065

Groundwater Recharge Calculations - Basin D

Project No.	2016-002
Project:	Joanna Hills Estates
Location:	Joanna Road, Avon, MA
Date:	March 6, 2020

Calculate the Required Recharge Volume

NRCS Hydrologic Soil Group	Volume to Recharge (inches)	Impervious Area (square feet)	Required Recharge Volume (cubic feet)
A	0.60	7532	377
B	0.35		0
C	0.25	6345	132
D	0.10	13151	110
		Total Required Recharge Volume	618

Capture Area Adjustment

A minimum of 65% of the total site impervious area must be directed to a recharge BMP:

Impervious Area Directed to Recharge BMP (square feet)	Total Impervious Area (square feet)	% of Total Directed to Recharge BMP
27028	27028	100%

Calculate the Adjustment Factor:

Impervious Area Directed to Recharge BMP (square feet)	Total Impervious Area (square feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP
27028	27028	1.00

Calculate the Adjusted Required Recharge Volume:

Required Recharge Volume (cubic feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP	Adjusted Required Recharge Volume (cubic feet)
618	1.00	618
	Total Required Recharge Volume	618
	Total Provided Recharge Volume (EL. 239.12 in Basin)	626

Groundwater Recharge Calculations - Basin E

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Calculate the Required Recharge Volume

NRCS Hydrologic Soil Group	Volume to Recharge (inches)	Impervious Area (square feet)	Required Recharge Volume (cubic feet)
A	0.60	22353	1118
B	0.35		0
C	0.25	1116	23
D	0.10		0
		Total Required Recharge Volume	1141

Capture Area Adjustment

A minimum of 65% of the total site impervious area must be directed to a recharge BMP:

Impervious Area Directed to Recharge BMP (square feet)	Total Site Impervious Area (square feet)	% of Total Site Directed to Recharge BMP
23469	23469	100%

Calculate the Adjustment Factor:

Impervious Area Directed to Recharge BMP (square feet)	Total Site Impervious Area (square feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP
23469	23469	1.00

Calculate the Adjusted Required Recharge Volume:

Required Recharge Volume (cubic feet)	Ratio of Total Impervious Area to Impervious Area Directed to BMP	Adjusted Required Recharge Volume (cubic feet)
1141	1.00	1141
	Total Required Recharge Volume	1141
	Total Provided Recharge Volume (EL. 238.10)	1141

72 Hour Drawdown Calculations

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

According to the Massachusetts Stormwater Management Handbook, recharge BMP's must be designed to drain within 72 hours. Below is the drawdown calculation used:

$\text{Time}_{\text{(Drawdown)}} = R_v / (K*A)$

Where:

R_v: Required Recharge Volume (ft^3)

K: Recharge Rate (Rawl's Rate) used to size the infiltration BMP (in/hour)

A: Bottom Area of the Infiltration Facility (ft^2)

Location	R_v	K (in/hour)	K (ft/hr)	A	Drawdown Time (hrs)	Drawdown Time Less than 72 Hours?
Basin A	402	2.41	0.20	1411	1.42	YES
Basin B	2334	2.41	0.20	5039	2.31	YES
Basin C	3038	2.41	0.20	4753	3.18	YES
Basin D	618	2.41	0.20	5028	0.61	YES
Basin E	1141	2.41	0.20	3709	1.53	YES

Drawdown Conforms to the Stormwater Management Standards

APPENDIX D: REQUIRED WATER QUALITY VOLUME & TSS REMOVAL CALCULATIONS

Water Quality Calculations

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Calculate the Required Water Quality Volume

Basin A

Depth of Runoff (inches)	Discharge To:	Total Impervious Area (square feet)	Required Water Quality Volume (cubic feet)
0.5	Not Discharging to a Critical Area		0
1	Discharging to a Critical Area		0
1	Soils with Rapid Infiltration Rate >2.41 "/hr	10459	872
		Required Water Quality Volume	872
		Provided Water Quality Volume (EL: 238.74)	875

Basin B

Depth of Runoff (inches)	Discharge To:	Total Impervious Area (square feet)	Required Water Quality Volume (cubic feet)
0.5	Not Discharging to a Critical Area		0
1	Discharging to a Critical Area		0
1	Soils with Rapid Infiltration Rate >2.41 "/hr	55035	4586
		Required Water Quality Volume	4586
		Provided Water Quality Volume (EL: 226.35)	4633

Basin C

Depth of Runoff (inches)	Discharge To:	Total Impervious Area (square feet)	Required Water Quality Volume (cubic feet)
0.5	Not Discharging to a Critical Area		0
1	Discharging to a Critical Area		0
1	Soils with Rapid Infiltration Rate >2.41 "/hr	75803	6317
		Required Water Quality Volume	6317
		Provided Water Quality Volume (EL: 224.83)	6345

Water Quality Calculations

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Calculate the Required Water Quality Volume

Basin D

Depth of Runoff (inches)	Discharge To:	Total Impervious Area (square feet)	Required Water Quality Volume (cubic feet)
0.5	Not Discharging to a Critical Area		0
1	Discharging to a Critical Area		0
1	Soils with Rapid Infiltration Rate >2.41 "/hr	27028	2252
		Required Water Quality Volume	2252
		Provided Water Quality Volume (EL: 239.41)	2262

Basin E

Depth of Runoff (inches)	Discharge To:	Total Impervious Area (square feet)	Required Water Quality Volume (cubic feet)
0.5	Not Discharging to a Critical Area		0
1	Discharging to a Critical Area		0
1	Soils with Rapid Infiltration Rate >2.41 "/hr	23469	1956
		Required Water Quality Volume	1956
		Provided Water Quality Volume (EL: 238.30)	1966

TSS Removal Spreadsheet

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Treatment Train: **To Basin A**

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load	TSS Removed
Deep Sump Hooded Catch Basins	25%	100%	75%	75%	25%
Water Quality Unit - WQU-2	95%	75%	71%	4%	96%
Infiltration Basin A	80%	4%	3%	1%	99%

Since the project is within soils with a rapid infiltration rate (greater than 2.4 inches per hour), 44% TSS removal pretreatment is required prior to infiltration.

96% > 44% so the pretreatment requirement is met

Treatment Train: **To Basin B**

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load	TSS Removed
Deep Sump Hooded Catch Basins	25%	100%	75%	75%	25%
Water Quality Unit - WQU-3	87%	75%	65%	10%	90%
Infiltration Basin B	80%	10%	8%	2%	98%

Since the project is within soils with a rapid infiltration rate (greater than 2.4 inches per hour), 44% TSS removal pretreatment is required prior to infiltration.

90% > 44% so the pretreatment requirement is met

TSS Removal Spreadsheet

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Treatment Train: **To Basin C**

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load	TSS Removed
Deep Sump Hooded Catch Basins	25%	100%	75%	75%	25%
Water Quality Unit - WQU-4	84%	75%	63%	12%	88%
Infiltration Basin C	80%	12%	10%	2%	98%

Since the project is within soils with a rapid infiltration rate (greater than 2.4 inches per hour), 44% TSS removal pretreatment is required prior to infiltration.

88% > 44% so the pretreatment requirement is met

Treatment Train: **To Basin D**

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load	TSS Removed
Deep Sump Hooded Catch Basins	25%	100%	75%	75%	25%
Water Quality Unit - WQU-1	91%	75%	68%	7%	93%
Infiltration Basin D	80%	7%	5%	1%	99%

Since the project is within soils with a rapid infiltration rate (greater than 2.4 inches per hour), 44% TSS removal pretreatment is required prior to infiltration.

93% > 44% so the pretreatment requirement is met

TSS Removal Spreadsheet

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Treatment Train: **To Basin E**

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load	TSS Removed
Deep Sump Hooded Catch Basins	25%	100%	75%	75%	25%
Water Quality Unit - WQU-5	88%	75%	66%	9%	91%
Infiltration Basin E	80%	9%	7%	2%	98%

Since the project is within soils with a rapid infiltration rate (greater than 2.4 inches per hour), 44% TSS removal pretreatment is required prior to infiltration.

91% > 44% so the pretreatment requirement is met

Brief Stormceptor Sizing Report - WQU-1

Project Information & Location			
Project Name	Joanna Hills Estates	**Project Number**	2016-002
City	Avon	**State/ Province**	Massachusetts
Country	United States of America	**Date**	8/8/2019
Designer Information		**EOR Information (optional)**	
Name	JUSTIN WILLIAMS	**Name**	
Company	MBL LAND DEVELOPMENT & PERMITTING	**Company**	
Phone #	781-706-7433	**Phone #**	
Email	Justin@MBLLandDevelopment.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	WQU-1
Target TSS Removal (%)	90
TSS Removal (%) Provided	91
Recommended Stormceptor Model	STC 2400

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	82
STC 900	88
STC 1200	88
STC 1800	88
STC 2400	91
STC 3600	91
STC 4800	93
STC 6000	93
STC 7200	95
STC 11000	96
STC 13000	96
STC 16000	97

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Sizing Details

Drainage Area

Drainage Area	
Total Area (acres)	1.18
Imperviousness %	56.0

Rainfall

Rainfall	
Station Name	BLUE HILL
State/Province	Massachusetts
Station ID #	0736
Years of Records	58
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective

Water Quality Objective	
TSS Removal (%)	90.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	6.10
Water Quality Flow Rate (CFS)	1.21

Up Stream Storage

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

Up Stream Flow Diversion

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

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

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

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.

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

Brief Stormceptor Sizing Report - WQU-2

Project Information & Location			
Project Name	Joanna Hills Estates	**Project Number**	2016-002
City	Avon	**State/ Province**	Massachusetts
Country	United States of America	**Date**	8/8/2019
Designer Information		**EOR Information (optional)**	
Name	JUSTIN WILLIAMS	**Name**	
Company	MBL LAND DEVELOPMENT & PERMITTING	**Company**	
Phone #	781-706-7433	**Phone #**	
Email	Justin@MBLLandDevelopment.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	WQU-2
Target TSS Removal (%)	95
TSS Removal (%) Provided	95
Recommended Stormceptor Model	STC 2400

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	89
STC 900	94
STC 1200	94
STC 1800	94
STC 2400	95
STC 3600	96
STC 4800	97
STC 6000	97
STC 7200	98
STC 11000	98
STC 13000	98
STC 16000	99

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Sizing Details

Drainage Area

Drainage Area	
Total Area (acres)	0.24
Imperviousness %	100.0

Rainfall

Rainfall	
Station Name	BLUE HILL
State/Province	Massachusetts
Station ID #	0736
Years of Records	58
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective

Water Quality Objective	
TSS Removal (%)	95.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	1.81
Water Quality Flow Rate (CFS)	0.94

Up Stream Storage

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

Up Stream Flow Diversion

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

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

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

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.

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

Brief Stormceptor Sizing Report - WQU-3

Project Information & Location			
Project Name	Joanna Hills Estates	**Project Number**	2016-002
City	Avon	**State/ Province**	Massachusetts
Country	United States of America	**Date**	8/8/2019
Designer Information		**EOR Information (optional)**	
Name	JUSTIN WILLIAMS	**Name**	
Company	MBL LAND DEVELOPMENT & PERMITTING	**Company**	
Phone #	781-706-7433	**Phone #**	
Email	Justin@MBLLandDevelopment.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	WQU-3
Target TSS Removal (%)	85
TSS Removal (%) Provided	87
Recommended Stormceptor Model	STC 2400

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	75
STC 900	83
STC 1200	83
STC 1800	83
STC 2400	87
STC 3600	87
STC 4800	90
STC 6000	90
STC 7200	92
STC 11000	94
STC 13000	94
STC 16000	95

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Sizing Details

Drainage Area	
Total Area (acres)	3.47
Imperviousness %	36.3

Rainfall	
Station Name	BLUE HILL
State/Province	Massachusetts
Station ID #	0736
Years of Records	58
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective	
TSS Removal (%)	85.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	9.42
Water Quality Flow Rate (CFS)	2.22

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

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

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
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

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.

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

Brief Stormceptor Sizing Report - WQU-4

Project Information & Location			
Project Name	Joanna Hills Estates	**Project Number**	2016-002
City	Avon	**State/ Province**	Massachusetts
Country	United States of America	**Date**	8/8/2019
Designer Information		**EOR Information (optional)**	
Name	JUSTIN WILLIAMS	**Name**	
Company	MBL LAND DEVELOPMENT & PERMITTING	**Company**	
Phone #	781-706-7433	**Phone #**	
Email	Justin@MBLLandDevelopment.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	WQU-4
Target TSS Removal (%)	84
TSS Removal (%) Provided	84
Recommended Stormceptor Model	STC 2400

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	71
STC 900	80
STC 1200	80
STC 1800	80
STC 2400	84
STC 3600	84
STC 4800	87
STC 6000	88
STC 7200	90
STC 11000	92
STC 13000	93
STC 16000	94

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Sizing Details

Drainage Area	
Total Area (acres)	3.60
Imperviousness %	48.3

Rainfall	
Station Name	BLUE HILL
State/Province	Massachusetts
Station ID #	0736
Years of Records	58
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective	
TSS Removal (%)	84.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	13.64
Water Quality Flow Rate (CFS)	3.91

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

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

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
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

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.

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

Brief Stormceptor Sizing Report - WQU-5

Project Information & Location			
Project Name	Joanna Hills Estates	**Project Number**	2016-002
City	Avon	**State/ Province**	Massachusetts
Country	United States of America	**Date**	8/8/2019
Designer Information		**EOR Information (optional)**	
Name	JUSTIN WILLIAMS	**Name**	
Company	MBL LAND DEVELOPMENT & PERMITTING	**Company**	
Phone #	781-706-7433	**Phone #**	
Email	Justin@MBLLandDevelopment.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	WQU-5
Target TSS Removal (%)	88
TSS Removal (%) Provided	88
Recommended Stormceptor Model	STC 2400

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	76
STC 900	84
STC 1200	84
STC 1800	84
STC 2400	88
STC 3600	88
STC 4800	91
STC 6000	91
STC 7200	93
STC 11000	95
STC 13000	95
STC 16000	96

Stormceptor®

CONTECH ENGINEERED SOLUTIONS

Sizing Details

Drainage Area	
Total Area (acres)	3.10
Imperviousness %	32.9

Rainfall	
Station Name	BLUE HILL
State/Province	Massachusetts
Station ID #	0736
Years of Records	58
Latitude	42°12'44"N
Longitude	71°6'53"W

Water Quality Objective	
TSS Removal (%)	88.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	13.49
Water Quality Flow Rate (CFS)	1.73

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

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

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
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

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.

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

APPENDIX E: CONSTRUCTION PERIOD POLLUTION PREVENTION PLAN

This construction period pollution prevention plan has been prepared in accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP), for the proposed site development at:

Joanna Hills Estates, Joanna Road, Avon, MA

SECTION I: POTENTIAL SOURCES OF POLLUTION

The following potential sources of pollution should be monitored during construction.

WASTE MATERIALS

All waste materials will be collected and stored in a securely lidded dumpster located more than 100 feet from any resource area as is reasonably practical. The dumpster will meet all local and State solid waste management regulations. All trash and construction debris from the site will be deposited in the dumpster at the end of each work day. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer, and the individual who manages day-to-day site operations will be responsible for seeing that these practices are followed.

HAZARDOUS WASTE

All hazardous waste materials will be disposed of in the manner specified by local or State regulation or by the manufacturer. Site personnel will be instructed in these practices and the individual, whom manages day-to-day site operations, will be responsible for seeing that these practices are followed.

SANITARY WASTE

All sanitary waste will be collected from the portable units a minimum of once per week by a licensed sanitary waste management contractor, as required by the local or State regulation.

NON-STORM WATER DISCHARGES

During construction activities at the site, some water from the site will be suitable for discharge. Uncontaminated groundwater from de-watering activities will be directed to recharge groundwater on-site. The construction de-watering and all non-stormwater discharges will be directed through a silt bag, dewatering or sedimentation basin prior to discharge to the wetlands. The general contractor will comply with the EPA.'s Final General Permit for Construction De-watering Discharges and the Stormwater Pollution Prevention Plan.

CONCRETE TRUCK WASHOUT AREAS

Concrete trucks will be directed to a washout area located outside of the 100-foot Wetland Buffer. Washout areas shall consist of a layer of polyurethane sheeting draped over a rectangular area built out of straw bales.

PROPER EQUIPMENT/ VEHICLE FUELING AND MAINTENANCE PRACTICES

Petroleum products related to the operation of said equipment will be stored and tightly sealed containers, which will be clearly labeled. Spray guns will be cleaned on a disposable tarp. Vehicles will not be allowed to refuel on-site.

SPILL PREVENTION AND CONTROL PLAN

Materials and equipment necessary for spill cleanup will be kept on-site. Equipment will include but not be limited to brooms, dustpans, 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 stormwater management system shall be reported to the Massachusetts DEP or National Response Center at 1-800-424-8802.

SECTION II: BEST MANAGEMENT PRACTICES

An Erosion Control and Sedimentation Control program will be implemented to prevent indirect impact to the existing wetland, existing roadways, and surrounding sites during the construction. The program incorporates Best Management Practices (BMP's) as specified in the guidelines developed by DEP and the Environmental Protection Agency and complies with the requirements of the NPDES General Permit for Storm Water Discharges for Construction Activities. These measures include the installation of temporary erosion and sedimentation controls and construction sequencing. Areas of exposed soil will be kept to a minimum and/or phased during construction and a permanent vegetative cover or other forms of stabilization will be established as soon as practicable.

Proper implementation of the erosion and sedimentation control program will:

- Minimize exposed soils through temporary mulching or seeding or by sequencing so that the amount of exposed soil is kept to a minimum.
- Place erosion controls structures to manage erosion and site runoff.
- Managing the control structures through the life of the construction activities and repairing all damaged structures as well as removing trapped silt as soon as recommended.
- Establish a permanent vegetative cover or other forms of stabilization as soon as practicable.

The following erosion and sedimentation control BMP's are presented in the sequence to which they will be implemented at the site. The measures will be inspected on a weekly basis or immediately before and or after storm event greater than 0.5". The controls will be routinely maintained throughout the duration of the project. Any damaged controls will be repaired and or replaced immediately. The locations of the specified sedimentation and erosion control measures are depicted on the proposed design drawings.

EROSION CONTROL BARRIERS

Erosion control barriers will be installed and inspected by the appropriate authority at the down gradient limit of work prior to any construction. The barriers will consist of filter mitts and will be entrenched into the ground to prevent under flow. When necessary, additional erosion controls will be installed immediately down gradient of the erosion prone areas, such as the base of steep exposed slopes, around material stockpile areas, throughout the construction phase of the project. Erosion control barriers shall be inspected continuously and maintained and adjusted throughout construction. A sufficient supply of material shall be kept on site to facilitate the repair or replacement of the proposed barriers.

STABILIZED CONSTRUCTION ENTRANCE

The stabilized construction entrance shall be installed after site clearing but before any earth moving activities. The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic topdressing with additional stone. Remove mud and sediment tracked or washed onto public road immediately. Reshape pad as needed for drainage and runoff control. Repair any broken road pavement immediately. All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment shall be removed or stabilized on site. Inspect the pad and sediment disposal area weekly and after heavy rains or heavy use.

DUST CONTROL

Dust shall be controlled during construction by applying water to exposed surfaces during dry conditions.

STREET SWEEPING

The surfaces of Joanna Road, Lothrop Road, and the section of Page Street nearest Joanna Road to be swept by street sweeper a minimum of once per week and whenever sediment accumulates on the pavement surfaces.

TEMPORARY SURFACE AND SLOPE STABILIZATION

Any area of exposed soil that will remain unstabilized for a period of more than twenty days will be covered with a layer of straw or mulch until the time of final loam and seeding.

TEMPORARY SEEDING

A temporary vegetative cover of fast growing indigenous grasses will be established on areas of exposed soils that remain unstable for a period of twenty-one days. Depending on the slope, the seeded surfaces will be covered with a layer of mulch.

PERMANENT SEEDING

Upon completion of the final grading, any area not covered by pavement, other forms of stabilization, or other landscaped methods will be loamed and seeded with New England Erosion Control/Restoration Mix (for dry sites) produced by New England Wetland Plants, Inc. (or approved equivalent). This mix includes grasses and broad leaf herbaceous plants that are indigenous to the northeastern Massachusetts. Depending on slope the seeded area will be covered with mulch or erosion control blanket. The seed mix will be applied at a rate of 25lbs/acre.

INFILTRATION PROTECTION

The following practices should be implemented by the contractor to protect the in-situ soils in the location of the infiltration basin

- Never allow heavy construction equipment to drive across areas;
- Limit smearing and compacting of soils in infiltration areas;
- Rotary till or disc harrow to a depth of 12” to restore infiltration rates after final grading.

SECTION III: INSPECTIONS

Construction Inspections: Construction inspections shall be performed by personnel from the site contractor and/or the Engineer of Record, as appointed by the owner. Inspection forms shall be executed for each corresponding inspection.

- Perimeter Sediment Controls: FilterMitt will be laid in advance of construction along the perimeter of the project site in locations shown on the Erosion & Sedimentation Control Plan. Such barriers shall be inspected within 12 hours of a storm event in excess of 0.5" and weekly. Sediment deposits must be removed when the level of deposition reaches approximately one-half the height of the barrier.

- Construction Entrance: The temporary construction entrance should be maintained in a condition that will prevent tracking or flowing of sediment into the street. This may require periodic topdressing with additional stone.

  The entrance should be inspected weekly and within 12 hours of a storm event in excess of 0.5". Mud and soil particles will eventually clog the voids in the gravel and the effectiveness of the gravel pad. When this occurs, the pad should be top dressed with new stone. Complete replacement of the pad may be necessary when the pad becomes completely clogged.

- Catch Basin Inlet Protection: Silt sacks are to be installed in all proposed catch basins to prevent sediment from entering the municipal drainage system prior to permanent stabilization. Silt sacks should be inspected after rainstorm in excess of 0.5" and weekly. In addition to the silt sacks a perimeter of hay bales shall be installed as an additional filter around all catch basins. Sediment should be disposed of in a suitable area and protected from erosion by either structural or vegetative means. Catch basin inlet protection should be removed and the area repaired as soon as the contributing drainage area to the inlet has been completely stabilized.

APPENDIX F: LONG TERM POLLUTION PREVENTION PLAN

To keep the stormwater management system functioning properly, a Long Term Pollution Prevention Plan is required. Adherence to this Long Term Pollution Prevention Plan will be the responsibility of the following:

Joanna Hills, LLC

LONG TERM POLLUTION PREVENTION PLAN TRAINING

Annual stormwater pollution prevention plan training shall be conducted. Training records shall be kept on file.

GOOD HOUSEKEEPING PRACTICES
All areas exposed to the weather shall be kept clean.

SOLID WASTE MANAGEMENT
Solid waste shall be kept in the covered dumpster and collected at a minimum of once per week and disposed of in a legal manner, at a state licensed recycling center or landfill.

REQUIREMENTS FOR STORAGE AND USE OF FERTILIZERS, HERBICIDES AND PESTICIDES
Fertilizers shall not be used within 100 feet of the wetland resource areas. Excess fertilizers shall be swept up from all impervious surfaces and not be allowed to run into the stormwater management system.
All fertilizers, herbicides and pesticides and any other hazardous substances shall be stored at least 100 feet from the wetlands resource areas and be kept in a wrapped or sealed container and under cover.

SNOW DISPOSAL AND PLOWING PLANS
Snow shall not be stored within 100 feet of wetland resource areas. If not possible to store the snow on-site, it shall be trucked away and disposed of in the same manner described above.

WINTER ROAD SALT/ SAND USE AND STORAGE RESTRICTIONS
Road salt shall not be used on the site.

STREET SWEEPING SCHEDULE
Street sweeping shall be performed on paved surfaces no less than four times per year.

APPENDIX G: OPERATION & MAINTENANCE PLAN

To keep the stormwater management system functioning properly and to ensure that the Total Suspended Solids (TSS) are reduced, periodic inspections and maintenance of the system is required. The operation and maintenance of all components of the proposed stormwater management system will be the responsibility of the following:

Joanna Hills, LLC

The following is a guideline of the specific maintenance schedules and tasks on a component by component basis that is required to keep the stormwater management system functioning properly. A log of the maintenance performed is to be perpetually maintained and a copy submitted to the Avon Conservation Commission annually.

DEEP SUMP CATCH BASINS

Unscheduled Maintenance: At the end of foliage and snow-removal seasons, inspect or clean the basin. Remove any branches, trash or other large debris that could interfere with the proper operation of the stormwater management system. Whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin, remove any accumulated sediment with clamshell buckets or vacuum trucks.

Quarterly Maintenance: Inspect or clean the basin. Remove any branches, trash or other large debris that could interfere with the proper operation of the stormwater management system. Remove any accumulated sediment with clamshell buckets or vacuum trucks.

WATER QUALITY UNITS

See attached on the following pages, the operation and maintenance requirements and owner's manual for the Stormceptor Water Quality Units.

PAVED AREAS

Quarterly Maintenance: Sweep, vacuum, or clean paved areas to reduce the amount of sediment entering the stormwater management system.

INFILTRATION BASINS WITH RIPRAP OVERFLOW SPILLWAYS

Unscheduled Maintenance: After rain events in excess of two inches, or after any snow or rain event accompanied by high winds, inspect the basin for debris. Remove any branches, trash, or other large debris that could interfere with the proper operation of the stormwater management system.

General Maintenance: Maintain the grassed side slopes of the basin through regular mowing. Keep the grass between three to six inches in length. Remove grass clippings to prevent them from impeding the flow of stormwater. During the spring and fall, remove any accumulated leaves from the basin including the rip rap overflow spillway. Reset any displaced rip rap.

Quarterly Maintenance: Inspect the basin for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the stormwater management system. Remove any accumulated sediment by the use of hand tools (rakes, shovels, wheelbarrows, etc.) when it exceeds three inches.

Annual Maintenance: Inspect the basin for debris. Remove any branches, trash or other large debris that could interfere with the proper operation of the stormwater management system. Remove any accumulated sediment by the use of hand tools (rakes, shovels, wheelbarrows, etc.) annually. Reset any displaced rip rap from the overflow spillway.

CULTEC 330XLHD INFILTRATION CHAMBERS (ROOF RECHARGE)

See attached on the following pages, the operation and maintenance requirements

Semi Annual Maintenance (Spring And Fall): Check inlets and outlets for clogging and remove any debris that could interfere with the proper operation of the system.

STORMWATER OPERATION + MAINTENANCE (O+M) PLAN

PAVED AREAS:

QUARTERLY MAINTENANCE: SWEEP, VACUUM, OR CLEAN PAVED AREAS TO REDUCE THE AMOUNT OF SEDIMENT ENTERING THE STORMWATER MANAGEMENT SYSTEM.

DEEP SUMP CATCH BASINS:

UNSCHEDULED MAINTENANCE: AT THE END OF FOLIAGE AND SNOW–REMOVAL SEASONS, INSPECT OR CLEAN THE BASIN. REMOVE ANY BRANCHES, TRASH OR OTHER LARGE DEBRIS THAT COULD INTERFERE WITH THE PROPER OPERATION OF THE STORMWATER MANAGEMENT SYSTEM. WHENEVER THE DEPTH OF DEPOSITS IS GREATER THAN OR EQUAL TO ONE HALF THE DEPTH FROM THE BOTTOM OF THE INVERT OF THE LOWEST PIPE IN THE BASIN, REMOVE ANY ACCUMULATED SEDIMENT WITH CLAMSHELL BUCKETS OR VACUUM TRUCKS.

QUARTERLY MAINTENANCE: INSPECT OR CLEAN THE BASIN. REMOVE ANY BRANCHES, TRASH OR OTHER LARGE DEBRIS THAT COULD INTERFERE WITH THE PROPER OPERATION OF THE STORMWATER MANAGEMENT SYSTEM. REMOVE ANY ACCUMULATED SEDIMENT WITH CLAMSHELL BUCKETS OR VACUUM TRUCKS.

INFILTRATION BASIN WITH OVERFLOW SPILLWAY:

UNSCHEDULED MAINTENANCE: AFTER RAIN EVENTS IN EXCESS OF TWO INCHES, OR AFTER ANY SNOW OR RAIN EVENT ACCOMPANIED BY HIGH WINDS, INSPECT THE BASIN FOR DEBRIS. REMOVE ANY BRANCHES, TRASH, OR OTHER LARGE DEBRIS THAT COULD INTERFERE WITH THE PROPER OPERATION OF THE STORMWATER MANAGEMENT SYSTEM.

GENERAL MAINTENANCE: MAINTAIN THE GRASSED SIDE SLOPES OF THE BASIN THROUGH REGULAR MOWING. KEEP THE GRASS BETWEEN THREE TO SIX INCHES IN LENGTH. REMOVE GRASS CLIPPINGS TO PREVENT THEM FROM IMPEDING THE FLOW OF STORMWATER. DURING THE SPRING AND FALL, REMOVE ANY ACCUMULATED LEAVES FROM THE BASIN INCLUDING THE RIP RAP OVERFLOW SPILLWAY. RESET ANY DISPLACED RIP RAP.

QUARTERLY MAINTENANCE: INSPECT THE BASIN FOR DEBRIS. REMOVE ANY BRANCHES, TRASH OR OTHER LARGE DEBRIS THAT COULD INTERFERE WITH THE PROPER OPERATION OF THE STORMWATER MANAGEMENT SYSTEM. REMOVE ANY ACCUMULATED SEDIMENT BY THE USE OF HAND TOOLS (RAKES, SHOVELS, WHEELBARROWS, ETC.) WHEN IT EXCEEDS THREE INCHES.

ANNUAL MAINTENANCE: INSPECT THE BASIN FOR DEBRIS. REMOVE ANY BRANCHES, TRASH OR OTHER LARGE DEBRIS THAT COULD INTERFERE WITH THE PROPER OPERATION OF THE STORMWATER MANAGEMENT SYSTEM. REMOVE ANY ACCUMULATED SEDIMENT BY THE USE OF HAND TOOLS (RAKES, SHOVELS, WHEELBARROWS, ETC.) ANNUALLY. RESET ANY DISPLACED RIP RAP FROM THE OVERFLOW SPILLWAY.

ANNUAL MAINTENANCE: INSPECT THE CULVERTS AND FLARED END SECTIONS FOR DEBRIS. RESET ANY DISPLACED RIP RAP FROM THE AROUND THE FLARED END SECTIONS. REMOVE ANY BRANCHES, TRASH OR OTHER LARGE DEBRIS THAT COULD PLUG THE CULVERTS. REMOVE ANY ACCUMULATED SEDIMENT BY THE USE OF HAND TOOLS OR VAC TRUCK, IF NECESSARY.

CULTEC (330XLHD) INFILTRATION CHAMBERS (ROOF RECHARGE):

SEE FULL O&M REQUIREMENTS ATTACHED IN DRAINAGE REPORT.

SEMI ANNUAL MAINTENANCE (SPRING AND FALL): CHECK INLETS AND OUTLETS FOR CLOGGING AND REMOVE ANY DEBRIS THAT COULD INTERFERE WITH THE PROPER OPERATION OF THE SYSTEM.

STORMCEPTOR (STC 2400) WATER QUALITY UNITS:

SEE FULL O&M REQUIREMENTS ATTACHED IN DRAINAGE REPORT.

SEMI ANNUAL MAINTENANCE (SPRING AND FALL): CHECK INLETS, SEPARATION SCREENS AND OUTLETS FOR CLOGGING AND REMOVE ANY DEBRIS THAT COULD INTERFERE WITH THE PROPER OPERATION OF THE SYSTEM. REMOVE ANY ACCUMULATED SEDIMENT WITH VACUUM TRUCKS WHEN IT REACHES 50% OF THE CAPACITY IN THE SUMP.

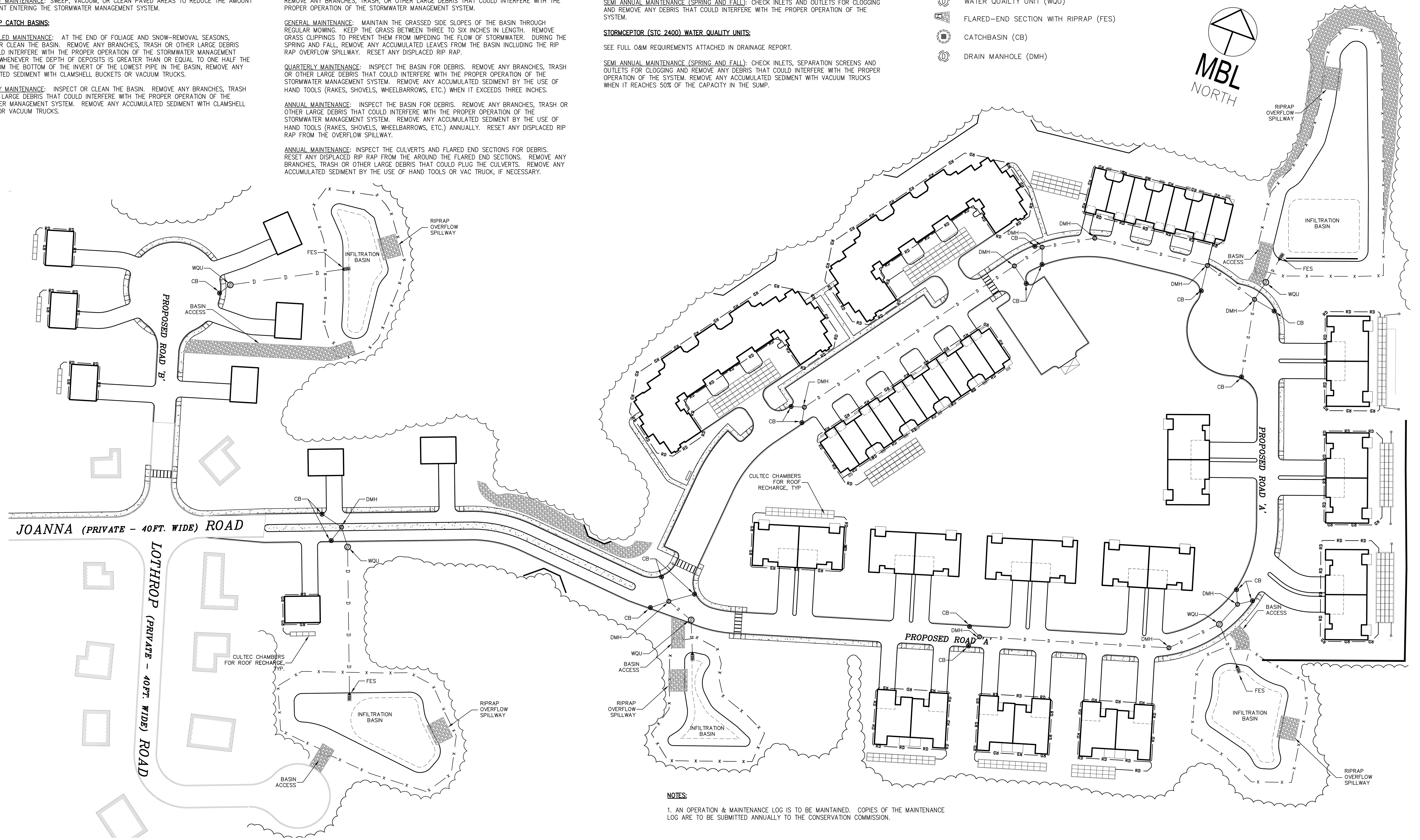
LEGEND

WATER QUAILTY UNIT (WQU)

FLARED–END SECTION WITH RIPRAP (FES)

CATCHBASIN (CB)

DRAIN MANHOLE (DMH)



NOTES:

1. AN OPERATION & MAINTENANCE LOG IS TO BE MAINTAINED. COPIES OF THE MAINTENANCE LOG ARE TO BE SUBMITTED ANNUALLY TO THE CONSERVATION COMMISSION.

No.	DATE	DESCRIPTION	BY
1	3/6/2020	REVISIONS PER TOWN & CONSULTANT COMMENTS	TLD

REVISIONS

PROJ. MANAGER: MBL
CHIEF DESIGNER: MBL
REVIEWED BY: DATE

SEAL

SEAL

PREPARED FOR

JOANNA HILLS LLC
32 NORFOLK AVENUE
SOUTH EASTON MASSACHUSETTS

SCALE:
HORZ.: 1"=50'
VERT.:
DATUM:
HORZ.:
VERT.:
50 25 0 50
GRAPHIC SCALE

MBL
LAND DEVELOPMENT & PERMITTING, CORP.
LAND DEVELOPMENT, TRANSPORTATION AND ENVIRONMENTAL SOLUTIONS
770 BROADWAY SUITE 6
RAYNHAM, MA. 02767
P.508.297.2746 F.508.297.2756
EMAIL:info@MBLLandDevelopment.com
WEB: www.MBLLandDevelopment.com

SITE PLANS

OPERATION & MAINTENANCE BMP MAP
CHAPTER 40B - JOANNA HILLS ESTATES
ASSESSORS MAP C7, BLOCK 3 & PLOT 15
AVON MASSACHUSETTS

PROJ. No.: 2016-002
DATE: MARCH 6, 2020

O&M

MAINTENANCE

Inspection and Maintenance. Easy. Convenient.

When it rains, oils, sediment and other contaminants are captured and contained by over 40,000 Stormceptor units operating worldwide. While Stormceptor's patented scour prevention technology ensures captured pollutants remain in the unit during all rainfall events, the accumulated pollutants must eventually be removed as part of a regular maintenance program.

If neglected, oil and sediment gradually build up and diminish any BMP's efficiency, harming the environment and leaving owners and operators vulnerable to fines, surcharges and bad publicity.

Maintenance is a must

Ease, frequency and cost of maintenance are often overlooked by specifiers when considering the merits of a stormwater treatment system. In reality, maintenance is fundamental to the long-term performance of any stormwater quality treatment device.

While regular maintenance is crucial, it shouldn't be complicated. An ongoing maintenance program with Stormceptor is convenient and practically effortless. With virtually no disruptions, you can concentrate on your core business.

Quick inspections

Inspections are easily carried out above ground from any standard surface access cover through a visual inspection of the orifice and drop tee components. A sludge judge and oil dip-stick are all that are needed for sediment and oil depth measurements.

Easy unit access

Maintenance is typically conducted from the same surface access cover, eliminating the need for confined space entry into the unit. Your site remains undisturbed, saving you time and money.

No muss, no fuss and fast

Maintenance is performed quickly and inexpensively with a standard vacuum truck. Servicing usually takes less than two hours, with no disruption to your site.

A complete stormwater management plan for Stormceptor extends beyond installation and performance to regular maintenance. It's the smart, cost-effective way to ensure your unit continues to remove more pollutants than any other separator for decades to come.

Stormceptor maintenance recommendations

- Units should be inspected post-construction, prior to being put into service.
- Inspect every six months for the first year of operation to determine the oil and sediment accumulation rate.
- In subsequent years, inspections can be based on first-year observations or local requirements.
- Cleaning is recommended once the sediment depth reaches 15% of storage capacity, (generally taking one year or longer). Local regulations for maintenance frequency may vary.
- Inspect the unit immediately after an oil, fuel or chemical spill.
- A licensed waste management company should remove captured petroleum waste products from any oil, chemical or fuel spills and dispose responsibly.

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

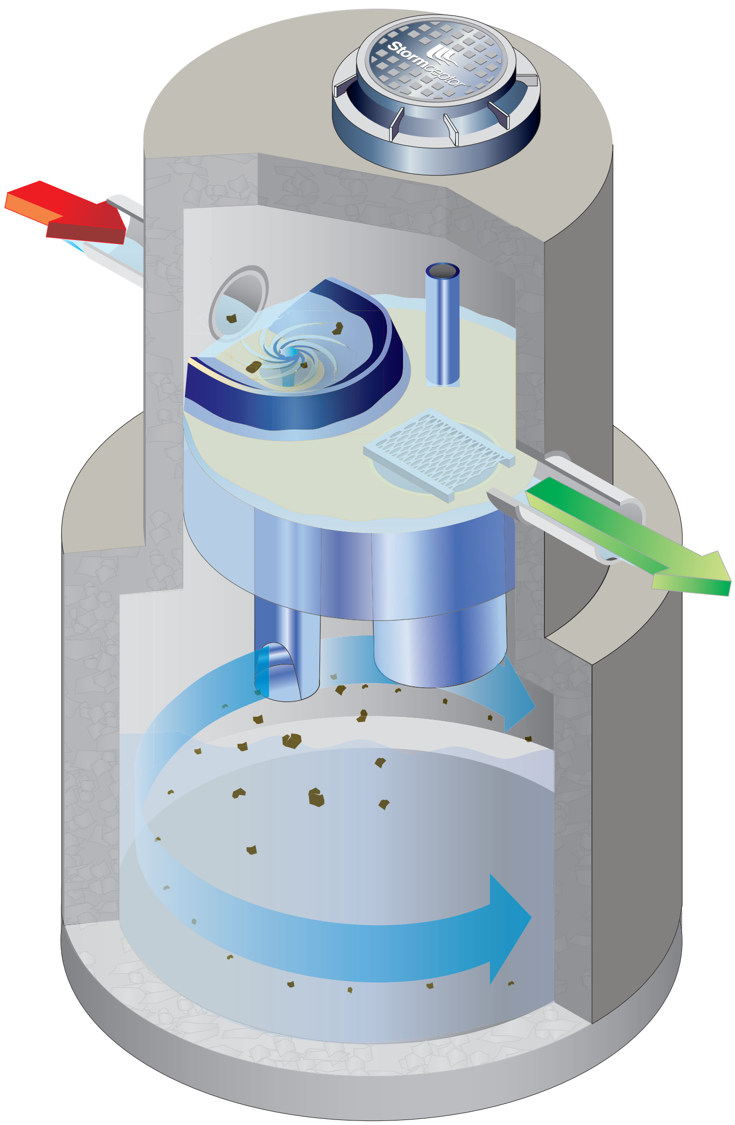
imbrium

www.imbriumsystems.com

USA: (888) 279 8826
CANADA: (800) 565 4801

Stormceptor®

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,175,277
Canadian Patent No. 2,180,305
Canadian Patent No. 2,180,338
Canadian Patent No. 2,206,338
Canadian Patent No. 2,327,768
U.S. Patent No. 5,753,115
U.S. Patent No. 5,849,181
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 707,133
Australia Patent No. 729,096
Australia Patent No. 779,401
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Indonesia Patent No. 0007058
Japan Patent No. 3581233
Japan Patent No. 9-11476
Korean Patent No. 0519212
Malaysia Patent No. 118987
New Zealand Patent No. 314,646
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Other Patents Pending

Table of Contents

Congratulations!

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a “Hydrodynamic Separator (HDS)” or an “Oil Grit Separator (OGS)”, engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- “STORMCEPTOR” is *clearly* marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- STF (Fiberglass)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site’s tailwater conditions)
- Series Unit (combines treatment in two systems)

Please Maintain Your Stormceptor

To ensure long-term environmental protection through continued performance as originally designed for your site, **Stormceptor must be maintained**, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call your local Stormceptor Licensee or Imbrium® Systems.

2 – Stormceptor Operation & Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology.

Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

Figure 1.

Inline Stormceptor

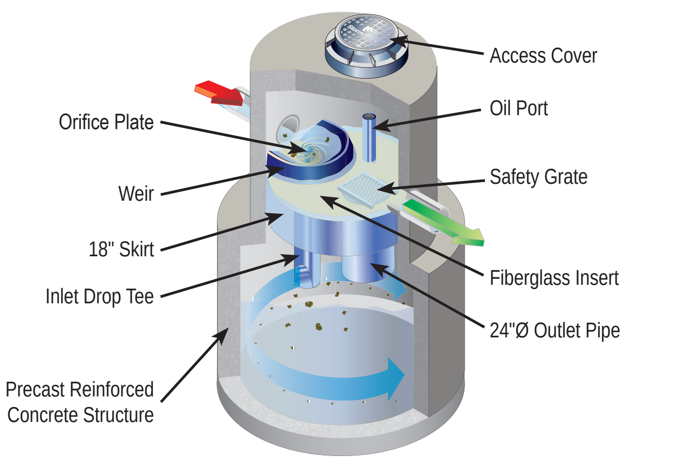
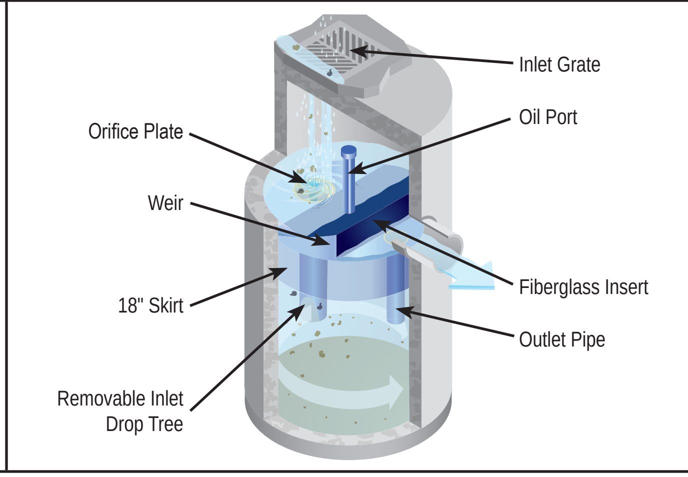


Figure 2.

Inlet Stormceptor



- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS, MAX and STF) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/ approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using **Table 1**.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Stormceptor Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS & OSR Stormceptor models in both USA and Canada/International (excluding South East Asia and Australia) are provided in **Tables 1 and 2**. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1A. (US) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (in.)
450	60
900	55
1200	71
1800	105
2400	94
3600	134
4800	128
6000	150
7200	134
11000*	128
13000*	150
16000*	134

EOS Model	Insert to Base (in.)
4-175	60
9-365	55
12-590	71
18-1000	105
24-1400	94
36-1700	134
48-2000	128
60-2500	150
72-3400	134
110-5000*	128
130-6000*	150
160-7800*	134

OSR Model	Insert to Base (in.)
65	60
140	55
250	94
390	128
560	134
780*	128
1125*	134

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

   **Consist of two chamber structures in series.*

Table 1B. (CA & Int'l) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
1500	2.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
11000*	4.0
14000*	3.7

EOS Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
10000*	4.0
14000*	3.7

OSR Model	Insert to Base (m)
300	1.7
750	1.6
2000	2.6
4000	3.6
6000	3.7
9000*	3.6
14000*	3.7

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

   **Consist of two chamber structures in series.*

Table 2A. (US) Storage Capacities

STC Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft^3	EOS Model	Hydrocarbon Storage Capacity gal	OSR Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft^3
450	86	46	**4-175**	175	**065**	115	46
900	251	89	**9-365**	365	**140**	233	58
1200	251	127	**12-590**	591			
1800	251	207	**18-1000**	1198			
2400	840	205	**24-1400**	1457	**250**	792	156
3600	840	373	**36-1700**	1773			
4800	909	543	**48-2000**	2005	**390**	1233	465
6000	909	687	**60-2500**	2514			
7200	1059	839	**72-3400**	3418	**560**	1384	690
11000*	2797	1089	**110-5000***	5023	**780***	2430	930
13000*	2797	1374	**130-6000***	6041			
16000*	3055	1677	**160-7800***	7850	**1125***	2689	1378

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

   **Consist of two chamber structures in series.*

Table 2B. (CA & Int'l) Storage Capacities

STC Model	Hydrocarbon Storage Capacity L	Sediment Capacity L	EOS Model	Hydrocarbon Storage Capacity L	OSR Model	Hydrocarbon Storage Capacity L	Sediment Capacity L
300	300	1450	**300**	662	**300**	300	1500
750	915	3000	**750**	1380	**750**	900	3000
1000	915	3800	**1000**	2235			
1500	915	6205					
2000	2890	7700	**2000**	5515	**2000**	2790	7700
3000	2890	11965	**3000**	6710			
4000	3360	16490	**4000**	7585	**4000**	4700	22200
5000	3360	20940	**5000**	9515			
6000	3930	26945	**6000**	12940	**6000**	5200	26900
9000*	10555	32980	**9000***	19010	**9000***	9300	33000
11000*	10555	37415	**10000***	22865			
14000*	11700	53890	**14000***	29715	**14000***	10500	53900

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

**Consist of two chamber structures in series.*

4 – Stormceptor Inspection & Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see **Table 2**). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.

- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in **Table 2**, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor. Information provided within this Manual (provided to the site owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

What equipment is typically required for inspection?

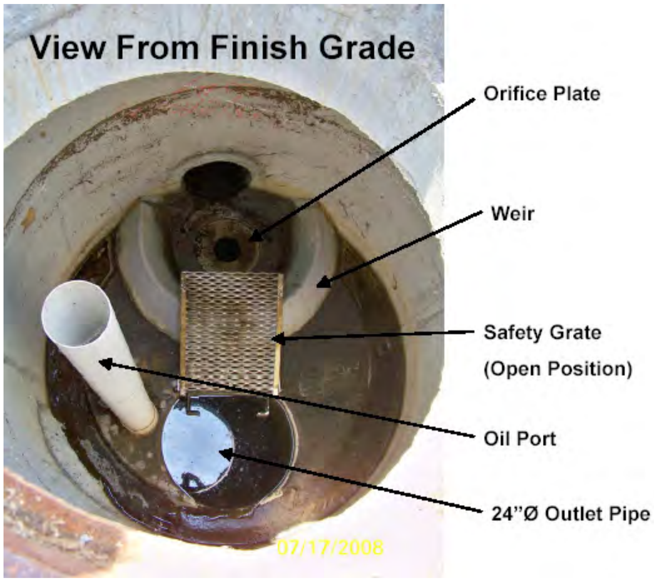
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Recommended Stormceptor Inspection Procedure:

- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch (100 mm) or 6-inch (150 mm) diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch (610 mm) diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

Figure 3.

Figure 4.



What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck.

No entry into the unit is required for maintenance. ***DO NOT ENTER THE STORMCEPTOR CHAMBER*** unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146 or Canada Occupational Safety and Health Regulations – SOR/86-304). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local, provincial, and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
    - For 6-ft (1800 mm) diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch (610 mm) outlet riser pipe.
    - For 4-ft (1200 mm) diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch (305 mm) drop tee hole.

Figure 5.

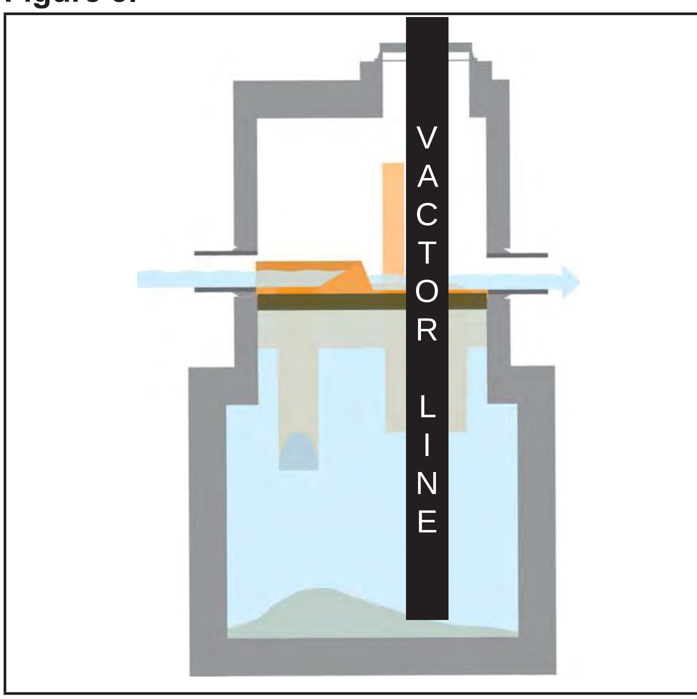
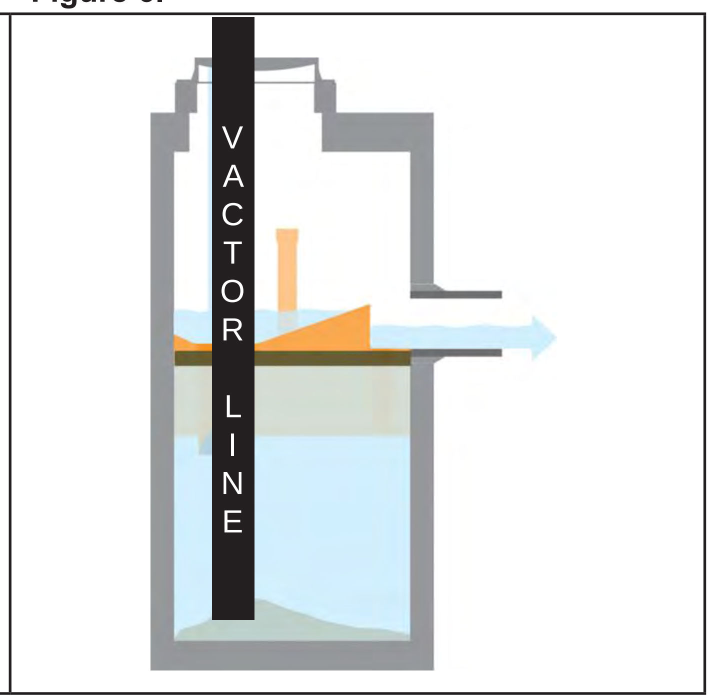


Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

Figure 7.

Figure 8.

A maintenance worker stationed at the above ground surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

What is required for proper disposal?
The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?
Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?
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 hydrocarbon rainbow or sheen can be seen at

very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean that 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 or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?
The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?
Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in **Table 3** based on the unit size.

Table 3A. (US) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (in)	EOS Model	Maintenance Sediment depth (in)	Oil Storage Depth (in)	OSR Model	Maintenance Sediment depth (in)
450	8	**4-175**	9	24	**065**	8
900	8	**9-365**	9	24	**140**	8
1200	10	**12-590**	11	39		
1800	15					
2400	12	**24-1400**	14	68	**250**	12
3600	17	**36-1700**	19	79		
4800	15	**48-2000**	16	68	**390**	17
6000	18	**60-2500**	20	79		
7200	15	**72-3400**	17	79	**560**	17
11000*	17	**110-5000***	16	68	**780***	17
13000*	20	**130-6000***	20	79		
16000*	17	**160-7800***	17	79	**1125***	17

Note:

1. *The values above are for typical standard units.*

**Per structure.*

Table 3B. (CA & Int'l) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (mm)	EOS Model	Maintenance Sediment depth (mm)	Oil Storage Depth (mm)	OSR Model	Maintenance Sediment depth (mm)
300	225	**300**	225	610	**300**	200
750	230	**750**	230	610	**750**	200
1000	275	**1000**	275	990		
1500	400					
2000	350	**2000**	350	1727	**2000**	300
3000	475	**3000**	475	2006		
4000	400	**4000**	400	1727	**4000**	375
5000	500	**5000**	500	2006		
6000	425	**6000**	425	2006	**6000**	375
9000*	400	**9000***	400	1727	**9000***	425
11000*	500	**10000***	500	2006		
14000*	425	**14000***	425	2006	**14000***	425

Note:

1. *The values above are for typical standard units.*

   **Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Stormceptor Representative, or Imbrium Systems.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: ______________________

Allowable Sediment Depth: ______________________

Serial Number: ______________________

Installation Date: ______________________

Location Description of Unit: ______________________

Other Comments: ______________________

Contact Information

Questions regarding the Stormceptor can be addressed by contacting your area Stormceptor Licensee, Imbrium Systems, or visit our website at www.stormceptor.com.

Stormceptor Licensees:

CANADA

Lafarge Canada Inc.
www.lafargepipe.com

403-292-9502 / 1-888-422-4022	Calgary, AB
780-468-5910	Edmonton, AB
204-958-6348	Winnipeg, MB, NW. ON, SK

Langley Concrete Group
www.langleyconcretegroup.com

604-502-5236	BC

Hanson Pipe & Precast Inc.
www.hansonpipeandprecast.com

519-622-7574 / 1-888-888-3222	ON

Lécuyer et Fils Ltée.
www.lecuyerbeton.com

450-454-3928 / 1-800-561-0970	QC

Strescon Limited
www.strescon.com

902-494-7400	NS, NF
506-633-8877	NB, PE

UNITED STATES

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Email	info@imbriumsystems.com

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May 2017

These instructions are for single-layer traffic applications only. For multi-layer applications, contact CULTEC.
All illustrations and photos shown herein are examples of typical situations. Be sure to follow the engineer's drawings.
Actual designs may vary.

This manual contains guidelines recommended by CULTEC, Inc. and may be used in conjunction with, but not to supersede, local regulations or regulatory authorities. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Introduction

The CULTEC Subsurface Stormwater Management System is a high-density polyethylene (HDPE) chamber system arranged in parallel rows surrounded by washed stone. The CULTEC chambers create arch-shaped voids within the washed stone to provide stormwater detention, retention, infiltration, and reclamation. Filter fabric is placed between the native soil and stone interface to prevent the intrusion of fines into the system. In order to minimize the amount of sediment which may enter the CULTEC system, a sediment collection device (stormwater pretreatment device) is recommended upstream from the CULTEC chamber system. Examples of pretreatment devices include, but are not limited to, an appropriately sized catch basin with sump, pretreatment catchment device, oil grit separator, or baffled distribution box. Manufactured pretreatment devices may also be used in accordance with CULTEC chambers. Installation, operation, and maintenance of these devices shall be in accordance with manufacturer's recommendations. Almost all of the sediment entering the stormwater management system will be collected within the pretreatment device.

Best Management Practices allow for the maintenance of the preliminary collection systems prior to feeding the CULTEC chambers. The pretreatment structures shall be inspected for any debris that will restrict inlet flow rates. Outfall structures, if any, such as outlet control must also be inspected for any obstructions that would restrict outlet flow rates. OSHA Guidelines must be followed when inspecting or cleaning any structure.

Operation and Maintenance Requirements

I. Operation

CULTEC stormwater management systems shall be operated to receive only stormwater run-off in accordance with applicable local regulations. CULTEC subsurface stormwater management chambers operate at peak performance when installed in series with pretreatment. Pretreatment of suspended solids is superior to treatment of solids once they have been introduced into the system. The use of pretreatment is adequate as long as the structure is maintained and the site remains stable with finished impervious surfaces such as parking lots, walkways, and pervious areas are properly maintained. If there is to be an unstable condition, such as improvements to buildings or parking areas, all proper silt control measures shall be implemented according to local regulations.

II. Inspection and Maintenance Options

A. The CULTEC system may be equipped with an inspection port located on the inlet row. The inspection port is a circular cast box placed in a rectangular concrete collar. When the lid is removed, a 6-inch (150 mm) pipe with a screw-in plug will be exposed. Remove the plug. This will provide access to the CULTEC Chamber row below. From the surface, through this access, the sediment may be measured at this location. A stadia rod may be used to measure the depth of sediment if any in this row. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream manhole or through the CULTEC StormFilter Unit (or other pre-treatment device). CCTV inspection of this row can be deployed through this access port to deter mine if any sediment has accumulated in the inlet row.

B. If the CULTEC bed is not equipped with an inspection port, then access to the inlet row will be through an upstream manhole or the CULTEC StormFilter.

1. Manhole Access
This inspection should only be carried out by persons trained in confined space entry and sewer inspection services. After the manhole cover has been removed a gas detector must be lowered into the manhole to ensure that there are not high concentrations of toxic gases present. The inspector should be lowered into the manhole with the proper safety equipment as per OSHA requirements. The inspector may be able to observe sediment from this location. If this is not possible, the inspector will need to deploy a CCTV robot to permit viewing of the sediment.

2. **StormFilter Access**
Remove the manhole cover to allow access to the unit. Typically a 30-inch (750 mm) pipe is used as a riser from the StormFilter to the surface. As in the case with manhole access, this access point requires a technician trained in confined space entry with proper gas detection equipment. This individual must be equipped with the proper safety equipment for entry into the StormFilter. The technician will be lowered onto the StormFilter unit. The hatch on the unit must be removed. Inside the unit are two filters which may be removed according to StormFilter maintenance guidelines. Once these filters are removed the inspector can enter the StormFilter unit to launch the CCTV camera robot.

C. The inlet row of the CULTEC system is placed on a polyethylene liner to prevent scouring of the washed stone beneath this row. This also facilitates the flushing of this row with high pressure water through a culvert cleaning nozzle. The nozzle is deployed through a manhole or the StormFilter and extended to the end of the row. The water is turned on and the inlet row is back-flushed into the manhole or StormFilter. This water is to be removed from the manhole or StormFilter using a vacuum truck.

III. Maintenance Guidelines

The following guidelines shall be adhered to for the operation and maintenance of the CULTEC stormwater management system:

A. The owner shall keep a maintenance log which shall include details of any events which would have an effect on the system's operational capacity.

B. The operation and maintenance procedure shall be reviewed periodically and changed to meet site conditions.

C. Maintenance of the stormwater management system shall be performed by qualified workers and shall follow applicable occupational health and safety requirements.

D. Debris removed from the stormwater management system shall be disposed of in accordance with applicable laws and regulations.

IV. Suggested Maintenance Schedules

A. Minor Maintenance
The following suggested schedule shall be followed for routine maintenance during the regular operation of the stormwater system:

Frequency	Action
Monthly in first year	Check inlets and outlets for clogging and remove any debris, as required.
Spring and Fall	Check inlets and outlets for clogging and remove any debris, as required.
One year after commissioning and every third year following	Check inlets and outlets for clogging and remove any debris, as required.

B. Major Maintenance
The following suggested maintenance schedule shall be followed to maintain the performance of the CULTEC stormwater management chambers. Additional work may be necessary due to insufficient performance and other issues that might be found during the inspection of the stormwater management chambers. (See table on next page)

	Frequency	Action
Inlets and Outlets	Every 3 years	• Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
	Spring and Fall	• Check inlet and outlets for clogging and remove any debris as required.
CULTEC Stormwater Chambers	2 years after commissioning	• Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
	9 years after commissioning every 9 years following	• Clean stormwater management chambers and feed connectors of any debris. • Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique. • Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.
	45 years after commissioning	• Clean stormwater management chambers and feed connectors of any debris. • Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required. • Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique. • Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection. • Attain the appropriate approvals as required. • Establish a new operation and maintenance schedule.
Surrounding Site	Monthly in 1st year	• Check for depressions in areas over and surrounding the stormwater management system.
	Spring and Fall	• Check for depressions in areas over and surrounding the stormwater management system.
	Yearly	• Confirm that no unauthorized modifications have been performed to the site.

For additional information concerning the maintenance of CULTEC Subsurface Stormwater Management Chambers, please contact CULTEC, Inc. at 1-800-428-5832.

WQMP
Operation & Maintenance (O&M) Plan

Project Name:____

Prepared for:

Project Name: ____

Address:____

City, State Zip:____

Prepared on:

Date:____

This O&M Plan describes the designated responsible party for implementation of this WQMP, including: operation and maintenance of all the structural BMP(s), conducting the training/educational program and duties, and any other necessary activities. The O&M Plan includes detailed inspection and maintenance requirements for all structural BMPs, including copies of any maintenance contract agreements, manufacturer's maintenance requirements, permits, etc.

8.1.1 Project Information

Project name	
Address	
City, State Zip	
Site size	
List of structural BMPs, number of each	
Other notes	

8.1.2 Responsible Party

The responsible party for implementation of this WQMP is:

Name of Person or HOA Property Manager	
Address	
City, State Zip	
Phone number	
24-Hour Emergency Contact number	
Email	

8.1.3 Record Keeping

Parties responsible for the O&M plan shall retain records for at least 5 years.

All training and educational activities and BMP operation and maintenance shall be documented to verify compliance with this O&M Plan. A sample Training Log and Inspection and Maintenance Log are included in this document.

8.1.4 Electronic Data Submittal

This document along with the Site Plan and Attachments shall be provided in PDF format. AutoCAD files and/or GIS coordinates of BMPs shall also be submitted to the City.

Appendix ___

BMP SITE PLAN

Site plan is preferred on minimum 11” by 17” colored sheets, as long as legible.

BMP OPERATION & MAINTENANCE LOG

Project Name: ____

Today's Date:____

Name of Person Performing Activity (Printed):____

Signature: ____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

Minor Maintenance

Frequency		Action
Monthly in first year		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Month 1	Date:	
□ Month 2	Date:	
□ Month 3	Date:	
□ Month 4	Date	
□ Month 5	Date:	
□ Month 6	Date:	
□ Month 7	Date:	
□ Month 8	Date:	
□ Month 9	Date:	
□ Month 10	Date:	
□ Month 11	Date:	
□ Month 12	Date:	
Spring and Fall		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
□ Spring	Date:	
□ Fall	Date:	
One year after commissioning and every third year following		Check inlets and outlets for clogging and remove any debris, as required.
		Notes
□ Year 1	Date:	
□ Year 4	Date:	
□ Year 7	Date:	
□ Year 10	Date:	
□ Year 13	Date:	
□ Year 16	Date:	
□ Year 19	Date:	
□ Year 22	Date:	

Major Maintenance

	Frequency		Action
Inlets and Outlets	**Every 3 years**		Obtain documentation that the inlets, outlets and vents have been cleaned and will function as intended.
			Notes
	□ Year 1	Date:	
	□ Year 4	Date:	
	□ Year 7	Date:	
	□ Year 10	Date:	
	□ Year 13	Date:	
	□ Year 16	Date:	
	□ Year 19	Date:	
	□ Year 22	Date:	
	Spring and Fall		Check inlet and outlets for clogging and remove any debris, as required.
			Notes
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
	□ Spring	Date:	
	□ Fall	Date:	
CULTEC Stormwater Chambers	**2 years after commissioning**		□ Inspect the interior of the stormwater management chambers through inspection port for deficiencies using CCTV or comparable technique. □ Obtain documentation that the stormwater management chambers and feed connectors will function as anticipated.
			Notes
	□ Year 2	Date:	

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

 Operations and Maintenance Guidelines CULG008 05-17

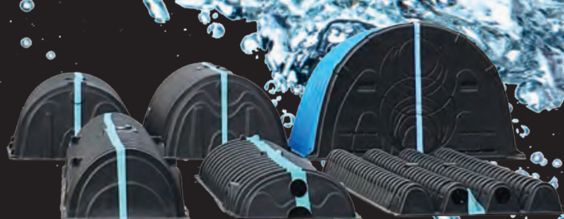
Major Maintenance

<table>
<tr><th></th><th colspan="2">Frequency</th><th>Action</th></tr>
<tr><td rowspan="9">CULTEC Stormwater Chambers</td><td colspan="2" rowspan="2">9 years after commissioning every 9 years following</td><td>□ Clean stormwater management chambers and feed connectors of any debris.
□ Inspect the interior of the stormwater management structures for deficiencies using CCTV or comparable technique.
□ Obtain documentation that the stormwater management chambers and feed connectors have been cleaned and will function as intended.</td></tr>
<tr><td>Notes</td></tr>
<tr><td>□ Year 9</td><td>Date:</td><td></td></tr>
<tr><td>□ Year 18</td><td>Date:</td><td></td></tr>
<tr><td>□ Year 27</td><td>Date:</td><td></td></tr>
<tr><td>□ Year 36</td><td>Date:</td><td></td></tr>
<tr><td colspan="2" rowspan="2">45 years after commissioning</td><td>□ Clean stormwater management chambers and feed connectors of any debris.
□ Determine the remaining life expectancy of the stormwater management chambers and recommended schedule and actions to rehabilitate the stormwater management chambers as required.
□ Inspect the interior of the stormwater management chambers for deficiencies using CCTV or comparable technique.
□ Replace or restore the stormwater management chambers in accordance with the schedule determined at the 45-year inspection.
□ Attain the appropriate approvals as required.
□ Establish a new operation and maintenance schedule.</td></tr>
<tr><td>Notes</td></tr>
<tr><td>□ Year 45</td><td>Date:</td><td></td></tr>
</table>

For more information, contact CULTEC at (203) 775-4416 or visit www.cultec.com.

Major Maintenance

	Frequency		Action
Surrounding Site	**Monthly in 1st year**		☐ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	☐ Month 1	Date:	
	☐ Month 2	Date:	
	☐ Month 3	Date:	
	☐ Month 4	Date:	
	☐ Month 5	Date:	
	☐ Month 6	Date:	
	☐ Month 7	Date:	
	☐ Month 8	Date:	
	☐ Month 9	Date:	
	☐ Month 10	Date:	
	☐ Month 11	Date:	
	☐ Month 12	Date:	
	Spring and Fall		☐ Check for depressions in areas over and surrounding the stormwater management system.
			Notes
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	☐ Spring	Date:	
	☐ Fall	Date:	
	Yearly		☐ Confirm that no unauthorized modifications have been performed to the site.
			Notes
	☐ Year 1	Date:	
	☐ Year 2	Date:	
	☐ Year 3	Date:	
	☐ Year 4	Date:	
	☐ Year 5	Date:	
	☐ Year 6	Date:	
	☐ Year 7	Date:	



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The Founder of Plastic Chamber Technology
www.cultec.com | 1(800) 4-CULTEC |
878 Federal Road | P.O. Box 280 | Brookfield , CT 06804 USA

CULG008 05-17

Stormwater Management System Annual Cost of Operation & Maintenance

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Annual O&M Budget

Facility	Activity	Frequency	Units	Quantity	Unit Price	Cost	Cost/ Year
All	Routine Inspections	Quarterly	Hrs	16	$25	$400	$1,600
All	Landscaping (basin mowing)	As needed	LS	1	$500	$500	$2,000
Recharge Chambers	Recharge Chamber CCTV Inspection	2 Years	Each	15	$300	$4,500	$2,250
	Recharge Chamber Cleaning	3 Years	Each	15	$50	$750	$250
Deep Sump Hooded Catch Basins	Catch Basin Cleaning	Quarterly	Each	17	$50	$850	$3,400
Water Quality Units	Cleaning	Semi-Annually	Each	5	$50	$250	$500
Culverts & Flared End Sections	Debris Removal	Quarterly	Each	5	$25	$125	$500
Infiltration Basins	Sediment Removal - Excavation	5 Years	Hrs	16	$125	$2,000	$400
	Sediment Removal - Disposal	5 Years	CY	25	$50	$1,250	$250
	Refurbishment - Till & Seed	5 Years	SF	53646	0.25	$13,412	$2,682
Overflow Spillways	Debris Removal/ Replace Rip Rap	Annual	Each	5	$100	$500	$500
						Total	**$14,332**

APPENDIX H: ILLICIT DISCHARGE COMPLIANCE STATEMENT

To the best of my knowledge, no detectable illicit discharges exist on-site. The site plans included with this report detail the stormwater management system that manages stormwater on the site and demonstrate that the system does not include the entry of an illicit discharge. As the owner, I will ultimately be responsible for implementing the Long Term Pollution Prevention Plan which includes measures to prevent illicit discharges.

Signature: ______________________________

Owner

APPENDIX I: GROUNDWATER MOUNDING ANALYSIS

Mounding Analysis Calculations

Project No. 2016-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Infiltration Facility Name	Recharge Rate (feet/day)	1/2 Length (ft)	1/2 Width (ft)	Duration	Specific Yield	Hydraulic Conductivity (ft/day)	Saturated Thickness (ft)	Mound Height (ft)	Separation to Groundwater (ft)
Basin A	4.82	50	8	1 Day	0.20	60	28	1.37	2 (Min.)
Basin B	4.82	32.5	35	1 Day	0.20	60	28	3.50	3.76
Basin C	4.82	38	29	1 Day	0.20	60	28	3.45	3.48
Basin D	4.82	33	20	1 Day	0.20	60	28	2.33	2.34
Basin E	4.82	45	13	1 Day	0.20	60	28	1.99	2 (Min.)

Per MA DEP Stormwater Management Regulations, groundwater mounding calculations beneath infiltration systems, within areas subject to jursidiction under the Wetlands Protection Act, are required when the bottom of an infiltration facility is within 4 feet of season high groundwater. The table above summarizes the calculated mound heights using the Hantoush Equation as provided separation to groundwater before mounding.

Length of Application: The length of the bottom of the proposed infiltration facility.

Width of Application: The width of the bottom of the proposed infiltration facility.

Recharge Rate: Based on soil texture from test pits and Soils Mapping - Loamy Sand (2.41 in/hr = 4.82 ft/day), Sandy Loam (1.02 in/hr=2.41 ft/day)

Duration of Application: The duration is 1 day to match the 100-year, 24-hour storm event

Specific Yeild: This is a value based on the soil classification of the soils found at the location of the infiltration facility (Clays=0.02, Sandy Clay=0.07. Silt=0.18, Fine Sand=0.21, Medium Sand=0.26, Coarse Sand=0.27, Gravelly Sand=0.25, Fine Gravel=0.25, Medium, Gravel=0.23, Coarse Gravel=0.22) Source: Johnson, 1967

Hydraulic Conductivity: This is a value that represents the ease with which water can move through the soil (Sandy Loams=10 ft/day, Loamy Sands=60 ft/day & Course Sands/ Gravels=200 ft/day)

Initial Saturated Thickness: This value represents the depth to the highest natural restrictive layer (clay or bedrock). When bedrock is not encountered during on-site test pits, this value was estimated from a Well Completion Report from the MassDEP Search Well Database. For this project the well was located at 352 Page St and the initial saturated thickness is the depth to bedrock in the well report (28 ft).

BASIN A

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

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

Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet & days)

Input Values		use consistent units (e.g. feet & days **or** inches & hours)
4.8200	*R*	**Recharge (infiltration) rate (feet/day)**
0.200	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
60.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
50.000	x	**1/2 length of basin (x direction, in feet)**
8.000	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
28.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

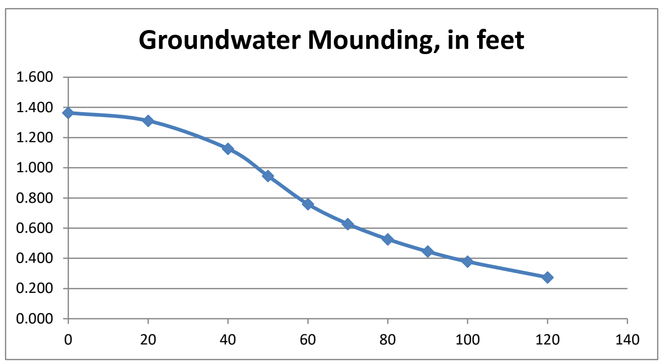
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

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

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

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
1.365	0
1.311	20
1.126	40
0.946	50
0.759	60
0.628	70
0.527	80
0.445	90
0.378	100
0.274	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

BASIN B

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

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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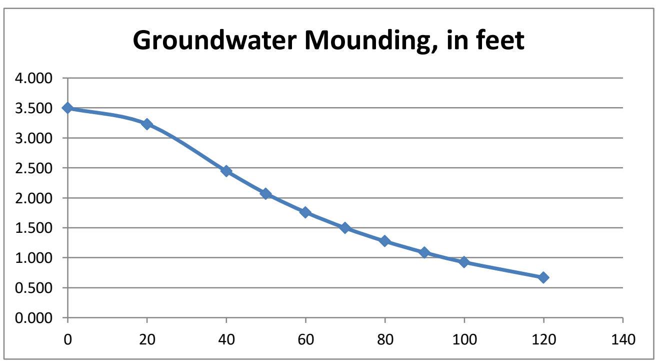
Input Values		use consistent units (e.g. feet & days **or** inches & hours)	**Conversion Table**	
			inch/hour	**feet/day**
4.8200	*R*	**Recharge (infiltration) rate (feet/day)**	0.67	1.33
0.210	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**		
60.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***	2.00	4.00
32.500	x	**1/2 length of basin (x direction, in feet)**		
35.000	y	**1/2 width of basin (y direction, in feet)**	**hours**	**days**
1.000	t	**duration of infiltration period (days)**	36	1.50
28.000	hi(0)	**initial thickness of saturated zone (feet)**		

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

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

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
3.497	**0**
3.231	**20**
2.445	**40**
2.070	**50**
1.758	**60**
1.496	**70**
1.275	**80**
1.086	**90**
0.925	**100**
0.668	**120**

Re-Calculate Now



Disclaimer

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BASIN C

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

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

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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
4.8200	*R*	**Recharge (infiltration) rate (feet/day)**
0.200	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
60.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
38.000	x	**1/2 length of basin (x direction, in feet)**
29.000	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
28.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

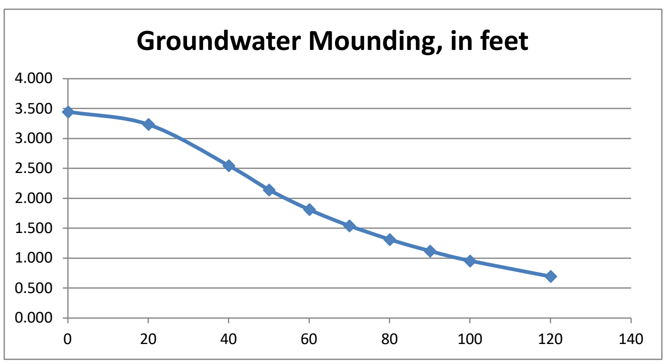
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

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

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

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
3.447	0
3.237	20
2.548	40
2.144	50
1.814	60
1.542	70
1.314	80
1.121	90
0.957	100
0.696	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

BASIN D

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

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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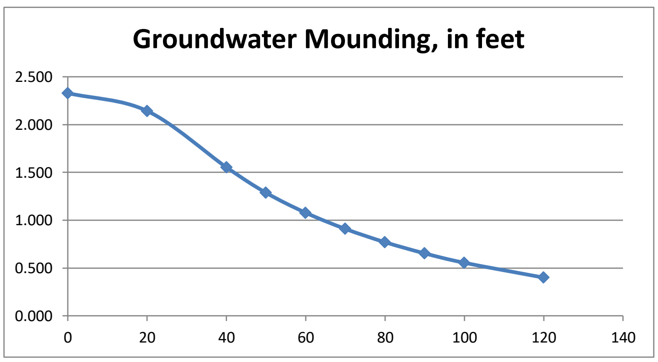
Input Values		use consistent units (e.g. feet & days **or** inches & hours)	**Conversion Table**	
			inch/hour	**feet/day**
4.8200	***R***	**Recharge (infiltration) rate (feet/day)**	0.67	1.33
0.210	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**		
60.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***	2.00	4.00
33.000	**x**	**1/2 length of basin (x direction, in feet)**		
20.000	**y**	**1/2 width of basin (y direction, in feet)**	**hours**	**days**
1.000	**t**	**duration of infiltration period (days)**	36	1.50
28.000	**hi(0)**	**initial thickness of saturated zone (feet)**		

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

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

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
2.329	**0**
2.143	**20**
1.554	**40**
1.287	**50**
1.078	**60**
0.909	**70**
0.769	**80**
0.653	**90**
0.554	**100**
0.399	**120**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

BASIN E

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

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

Input Values		use consistent units (e.g. feet & days **or** inches & hours)
4.8200	*R*	**Recharge (infiltration) rate (feet/day)**
0.200	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
60.00	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
45.000	x	**1/2 length of basin (x direction, in feet)**
13.000	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
28.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

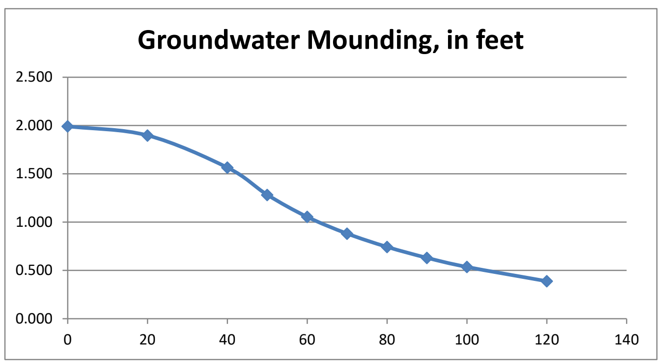
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

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

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

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
1.992	0
1.898	20
1.565	40
1.283	50
1.054	60
0.881	70
0.743	80
0.630	90
0.536	100
0.388	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

MassDEP

Well Completion Report

WELL LOCATION

GPS North:

GPS West:

Assessors Map:

Address: 352 Page Street

Assessors Lot:

Sub Division:

Permit Number:

City/Town: AVON

Date Issued:

Board Of Health Permit Obtained: NR

Work Performed	Well Type	Drilling Method Overburden	Drilling Method Bedrock
New Well	Irrigation		

ADDITIONAL WELL INFORMATION

Developed: No

Disinfected: No

Total Well Depth: 400.00

Fracture Enhancement: No

Well Seal Type:

Depth to Bedrock: 28.00

PERMANENT PUMP (IF AVAILABLE)

Pump Description:

Type:

Nominal Pump Capacity:

Intake Depth:

Horsepower:

Comments:

CASING

From(ft)	To(ft)	Type	Thickness	Diameter
0.00				
2.00 (Above Ground)	40.00	Steel		6

SCREEN

From(ft)	To(ft)	Type	slotsize	Diameter

WELL SEAL / FILTER PACK / ABANDONMENT MATERIAL

From(ft)	To(ft)	Material Description	Purpose

STATIC WATER LEVEL(ALL WELLS)

Date Measured	Depth Below Ground Surface
07/17/2003	17.00

WELL TEST DATA (ALL SECTIONS MANDATORY FOR PRODUCTION WELLS)

Date	Method	Yield(GPM)	Time Pumped (hrs & min)	Pumping Level (Ft. BGS)	Time To Recoover (Hrs & min)	Recovery
07/17/2003	Air Lift	4.00	04:00:00	400	00:30:00	17

OVER BURDEN

From(ft)	To(ft)	Lithology	Color	Comment	Water Zone	Loss / Add of Fluid	Drill Stem Drop	Drill Rate

BEDROCK

From(ft)	To(ft)	Lithology	Comment	Water Zone	Drill Stem Drop	Extra Large	Drill Rate	Rust Stain	Loss / Add Of Fluid	# of Fract Per Ft

APPENDIX J: SOIL LOGS & SIEVE ANALYSIS RESULTS

OBSERVATION HOLE DATA

(hatched) INDICATES PERC TEST

TEST PIT # 1 GRD. EL. 239.61 TEST BY: BRIAN M. DUNN
GW. EL. 232.61 WITNESSED BY:
DATE: 4/13/2016 MOTTLING. EL. 236.61 CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
238.61	0"-12"	A	ORGANIC			
231.61	12"-108"	FILL	FILL MATERIAL		MOTTLES=84"	

WATER WEEPING OBSERVED @ 84" PERC RATE N/A MIN/INCH
PERC DEPTH N/A INCHES

TEST PIT # 2 GRD. EL. 238.80 TEST BY: BRIAN M. DUNN
GW. EL. N/A WITNESSED BY:
DATE: 4/13/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
238.55	0"-3"	FILL	FILL MATERIAL			
235.30	3"-42"	A/B	ORGANIC			
233.30	42"-66"	C1	CLAY			
231.80	66"-84"	C2	BTM/NATURAL			

WATER WEEPING OBSERVED @ N/A PERC RATE N/A MIN/INCH
PERC DEPTH N/A INCHES

TEST PIT # 3 GRD. EL. 239.54 TEST BY: BRIAN M. DUNN
GW. EL. 233.04 WITNESSED BY:
DATE: 4/13/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
239.04	0"-6"	A	ORGANIC			
233.04	6"-78"	B	LOAMY SAND			

WATER WEEPING OBSERVED @ 78" PERC RATE N/A MIN/INCH
PERC DEPTH N/A INCHES

TEST PIT # 4 GRD. EL. 240.29 TEST BY: BRIAN M. DUNN
GW. EL. 232.99 WITNESSED BY:
DATE: 4/13/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
239.79	0"-6"	A	ORGANIC			
233.79	6"-90"	B	LOAMY SAND			

WATER WEEPING OBSERVED @ 90" PERC RATE N/A MIN/INCH
PERC DEPTH N/A INCHES

TEST PIT # 5 GRD. EL. 236.17 TEST BY: BRIAN M. DUNN
GW. EL. 228.84 WITNESSED BY:
DATE: 4/13/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
235.67	0"-6"	A	ORGANIC			
229.67	6"-88"	B	LOAMY SAND			

WATER WEEPING OBSERVED @ 88" PERC RATE N/A MIN/INCH
PERC DEPTH N/A INCHES

TEST PIT # 6 GRD. EL. 234.26 TEST BY: BRIAN M. DUNN
GW. EL. 225.26 WITNESSED BY:
DATE: 4/13/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
233.76	0"-6"	A	ORGANIC			
231.76	6"-30"	B	SANDY LOAM			
227.26	30"-84"	C1	LOAMY SAND			
225.26	84"-108"	C2	LOAMY SAND			

WATER STANDING OBSERVED @ 108" PERC RATE 8 MIN/INCH
PERC DEPTH 35" INCHES

TEST PIT # 7 GRD. EL. 229.31 TEST BY: BRIAN M. DUNN
GW. EL. 224.31 WITNESSED BY:
DATE: 4/13/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
228.81	0"-6"	A	LOAM			
226.81	6"-30"	FILL	FILL MATERIAL			
217.81	24"-138"	C1	SANDY LOAM			REFUSAL @ 138"

WATER WEEPING OBSERVED @ 60" PERC RATE N/A MIN/INCH
PERC DEPTH N/A INCHES

TEST PIT # 8 GRD. EL. 230.13 TEST BY: BRIAN M. DUNN
GW. EL. 222.13 WITNESSED BY:
DATE: 4/13/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
229.63	0"-6"	Ao	ORGANIC			
227.63	6"-30"	B	SANDY LOAM			
223.13	30"-84"	C1	LOAMY SAND			
218.13	84"-144"	C2	LOAMY SAND		WEEP=118" STANDING=96"	

WATER STANDING OBSERVED @ 96" PERC RATE 11 MIN/INCH
PERC DEPTH 56" INCHES

TEST PIT # 9 GRD. EL. 232.03 TEST BY: BRIAN M. DUNN
GW. EL. 226.61 WITNESSED BY:
DATE: 04/13/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
231.03	0"-12"	A	LOAM			
230.03	12"-24"	B	LOAMY SAND			
224.03	24"-96"	C1	SANDY LOAM		WEEP=65" STANDING=96"	SAND GRAVEL STONES

WATER WEEPING OBSERVED @ 65" PERC RATE 17 MIN/INCH
PERC DEPTH 48" INCHES

TEST PIT # 10 GRD. EL. 225.06 TEST BY: BRIAN M. DUNN
GW. EL. 219.06 WITNESSED BY:
DATE: 04/13/2016 MOTTLING. EL. 219.06 CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
254.56	0"-6"	A/Oi	ORGANIC			
252.56	6"-30"	B	SANDY LOAM			
248.06	30"-84"	C1	LOAMY SAND		MOTTLES=72"	
243.06	84"-144"	C2	LOAMY SAND		WEEP=118" STANDING=134"	

WATER WEEPING OBSERVED @ 118" PERC RATE <2 MIN/INCH
PERC DEPTH 60" INCHES

TEST PIT # 11 GRD. EL. 226.99 TEST BY: BRIAN M. DUNN
GW. EL. 217.23 WITNESSED BY:
DATE: 04/14/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
226.49	0"-6"	A	LOAM			
223.99	6"-36"	B	LOAMY SAND			15-30% GRAVEL
221.32	36"-68"	C1	LOAMY SAND			LARGE BOULDER
216.15	68"-130"	C2	LOAMY SAND		WEEP=116" STANDING=120"	BOULDERS

WATER WEEPING OBSERVED @ 116" PERC RATE N/A MIN/INCH
PERC DEPTH 36" INCHES

TEST PIT # 12 GRD. EL. 229.69 TEST BY: BRIAN M. DUNN
GW. EL. 220.67 WITNESSED BY:
DATE: 04/14/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
229.19	0"-6"	A/Oi	ORGANIC			
227.52	6"-26"	B	SANDY LOAM			
223.69	26"-72"	C1	LOAMY SAND			15-20% DENSE GRAVEL
218.85	72"-130"	C2	LOAMY SAND		WEEP=108" STANDING=126"	COBBLES

WATER WEEPING OBSERVED @ 108" PERC RATE 4 MIN/INCH
PERC DEPTH 48" INCHES

TEST PIT # 13 GRD. EL. 229.56 TEST BY: BRIAN M. DUNN
GW. EL. 227.56 WITNESSED BY:
DATE: 04/14/2016 MOTTLING. EL. CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
228.56	0"-12"	A	LOAM			
227.56	12"-24"	B	LOAMY SAND			
					STANDING=24"	

WATER WEEPING OBSERVED @ 24" PERC RATE N/A MIN/INCH
PERC DEPTH N/A INCHES

TEST PIT #14 GRD. EL. 231.70 TEST BY: BRIAN M. DUNN
GW. EL. 225.03 WITNESSED BY:
DATE: 4/14/2016 MOTTLING. EL. 225.03 CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
231.03	0"-8"	Ao	ORGANIC			
229.20	8"-30"	B	SANDY LOAM			
220.78	30"-131"	C	LOAMY SAND		MOTTLES=80" WEEP=80"	COBBLES

WATER WEEPING OBSERVED @ 80" PERC RATE N/A MIN/INCH
PERC DEPTH N/A INCHES

TEST PIT # 15 GRD. EL. 226.38 TEST BY: BRIAN M. DUNN
GW. EL. 218.13 WITNESSED BY:
DATE: 4/14/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
225.88	0"-6"	A	LOAM			
224.88	6"-18"	B	LOAMY SAND			
216.38	18"-120"	C	SANDY LOAM		WEEP=99" STANDING=120"	SAND GRAVEL STONES

WATER WEEPING OBSERVED @ 99" PERC RATE 9 MIN/INCH
PERC DEPTH 48" INCHES

TEST # 16 GRD. EL. 223.50 TEST BY: BRIAN M. DUNN
GW. EL. N/A WITNESSED BY:
DATE: 4/14/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
225.88	0"-6"	Ao	ORGANIC			
224.88	8"-24"	B	SANDY LOAM			
216.38	28"-96"	C	SANDY LOAM			FRACTURED LEDGE COBBLE REFUSAL AT 96"

WATER WEEPING OBSERVED @ N/A PERC RATE 3.6 MIN/INCH
PERC DEPTH 56" INCHES

TEST PIT # 17 GRD. EL. 224.24 TEST BY: BRIAN M. DUNN
GW. EL. N/A WITNESSED BY:
DATE: 4/14/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
223.57	0"-8"	A	LOAM			
222.24	8"-24"	B	LOAMY SAND			BOULDERS
217.24	24"-84"	C	SANDY LOAM			FRACTURED LEDGE, COURSE GRAVEL, REFUSAL AT 84"

WATER WEEPING OBSERVED @ N/A PERC RATE 9 MIN/INCH
PERC DEPTH 36" INCHES

TEST PIT # 18 GRD. EL. 223.52 TEST BY: BRIAN M. DUNN
GW. EL. 220.52 WITNESSED BY:
DATE: 4/14/2016 MOTTLING. EL. 220.52 CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
223.02	0"-8"	Ao	ORGANIC			
221.02	8"-24"	B	SANDY LOAM			
214.52	24"-108"	C	LOAMY SAND		MOTTLES=36"	
					WEEP=68" STANDING=96"	

WATER WEEPING OBSERVED @ 68" PERC RATE 10 MIN/INCH
PERC DEPTH 56" INCHES

TEST PIT # 19 GRD. EL. 219.42 TEST BY: BRIAN M. DUNN
GW. EL. 214.75 WITNESSED BY:
DATE: 4/14/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
219.00	0"-5"	A/OI	LOAM			
211.42	5"-96"	B	LOAMY SAND		WEEP=56" STANDING=96"	SAND GRAVEL STONES

WATER WEEPING OBSERVED @ 54" PERC RATE 11 MIN/INCH
PERC DEPTH 48" INCHES

TEST PIT # 20 GRD. EL. 222.83 TEST BY: BRIAN M. DUNN
GW. EL. 218.33 WITNESSED BY:
DATE: 4/14/2016 MOTTLING. EL. N/A CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
222.33	0"-6"	A/oi	ORGANIC			
221.16	6"-20"	B	SANDY LOAM			
214.83	20"-96"	C	LOAMY SAND		WEEP=54" STANDING=91"	COBBLES, COARSE FINE SAND

WATER WEEPING OBSERVED @ 54" PERC RATE 10 MIN/INCH
PERC DEPTH 48" INCHES

No.	DATE	DESCRIPTION	BY
1	3/6/2020	REVISIONS PER TOWN & CONSULTANT COMMENTS	TLD

REVISIONS

PROJ. MANAGER: MBL
CHIEF DESIGNER: MBL
REVIEWED BY: DATE

SEAL SEAL

PREPARED FOR
JOANNA HILLS LLC
32 NORFOLK AVENUE
SOUTH EASTON MASSACHUSETTS

SCALE: HORZ.: VERT.:
DATUM: HORZ.: VERT.:
0
GRAPHIC SCALE

MBL
LAND DEVELOPMENT & PERMITTING, CORP.
LAND DEVELOPMENT, TRANSPORTATION AND ENVIRONMENTAL SOLUTIONS
770 BROADWAY SUITE 6
RAYNHAM, MA. 02767
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EMAIL:info@MBLLandDevelopment.com
WEB: www.MBLLandDevelopment.com

SITE PLANS
TEST PIT LOGS
CHAPTER 40B - JOANNA HILLS ESTATES
ASSESSORS MAP C7, BLOCK 3 & PLOT 15
AVON MASSACHUSETTS

PROJ. No.: 2016-002
DATE: AUGUST 8, 2019

C-7.0

UCS: X:\2016\002\CIVIL\PLOT\2016-002 Site Plans.dwg 3/9/2020 8:32:23 AM EDT
MS VIEW: LMAN: CTB:

OBSERVATION HOLE DATA

INDICATES PERC TEST — INDICATES OBSERVED GROUNDWATER

TEST PIT # 21

GRD. EL. 247.78 — TEST BY: TRACY L. DUARTE, PE
GW. EL. N/A — WITNESSED BY:
DATE: 10/25/2018 — MOTTLING. EL. N/A — CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
247.61	2"–0"	O	ORGANIC			
246.78	0"–10"	A	SANDY LOAM	10YR 3/2		ROOTS
245.61	10"–24"	B	SANDY LOAM	10YR 4/6		5% STONES, 10% C+G
239.78	24"–94"	C	M-C. LOAMY SAND	2.5YR 4/4		5% STONES, 10% C+G
REFUS.						BONY, TIGHT

WATER WEEPING OBSERVED @ N/A — PERC RATE 8 MIN/INCH
PERC DEPTH 24"–42" INCHES

TEST PIT # 22

GRD. EL. 236.21 — TEST BY: TRACY L. DUARTE, PE
GW. EL. N/A — WITNESSED BY:
DATE: 10/25/2018 — MOTTLING. EL. N/A — CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
236.04	2"–0"	O	ORGANIC			
235.21	0"–10"	A	SANDY LOAM	10YR 3/2		ROOTS
234.21	10"–22"	B	SANDY LOAM	10YR 4/6		5% STONES, 10 % C+G
229.04	22"–84"	C	M-C. LOAMY SAND	2.5YR 4/4		5% STONES, 10 % C+G
REFUS.						BONY, TIGHT

WATER WEEPING OBSERVED @ N/A — PERC RATE 9 MIN/INCH
PERC DEPTH 30"–48" INCHES

TEST PIT # 23

GRD. EL. 225.37 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 221.54 — WITNESSED BY:
DATE: 10/25/2018 — MOTTLING. EL. 221.54 — CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
224.37	0"–12"	A	SANDY LOAM	10YR 4/2		ROOTS
222.87	12"–30"	B	SANDY LOAM	10YR 4/6		5% STONES, 10% C+G
217.87	30"–90"	C	MED. SANDY LOAM	2.5YR 4/4	MOTTLING @ 46"	5% STONES, 10% C+G
REFUS.						BONY, TIGHT, MOD. STRUCTURE

WATER WEEPING OBSERVED @ 80" — PERC RATE 14 MIN/INCH
PERC DEPTH 36"–54" INCHES

TEST PIT # 24

GRD. EL. 226.88 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 223.88 — WITNESSED BY:
DATE: 10/25/2018 — MOTTLING. EL. 223.88 — CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
225.88	0"–12"	A	SANDY LOAM	10YR 3/2		
224.54	12"–28"	B	MED. LOAMY SAND	10YR 4/4		10% C+G
215.88	28"–132"	C	M-C. LOAMY SAND	2.5YR 6/4	MOTTLING @ 36" 7.5YR 4/6	5% STONES, 10% C+G

WATER WEEPING OBSERVED @ 94" — PERC RATE 6 MIN/INCH
PERC DEPTH 34"–52" INCHES

TEST PIT # 25

GRD. EL. 229.1 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 223.1 — WITNESSED BY:
DATE: 10/25/2018 — MOTTLING. EL. 223.1 — CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
228.93	2"–0"	O	ORGANIC			
228.10	0"–10"	AB	SANDY LOAM	10YR 3/6		ROOTS
226.10	10"–34"	B	SANDY LOAM	10YR 4/6		10% STONES, 15% C+G
219.93	34"–108"	C	M-C. LOAMY SAND	2.5YR 4/4	MOTTLING @ 72"	10% STONES, 15% C+G, MOD. STRUCTURE
						LEDGE AT 72" ON SOUTH SIDE OF HOLE

WATER WEEPING OBSERVED @ 96" — PERC RATE 3 MIN/INCH
PERC DEPTH 36"–54" INCHES

TEST PIT # 26

GRD. EL. 237.85 — TEST BY: TRACY L. DUARTE, PE
GW. EL. N/A — WITNESSED BY:
DATE: 10/25/2018 — MOTTLING. EL. N/A — CERTIFIED BY:

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
237.51	4"–0"	O	ORGANIC			
237.00	0"–6"	AB	SANDY LOAM	10YR 3/6		ROOTS
235.00	6"–32"	B	SANDY LOAM	10YR 4/6		15% STONES, 15% C+G
228.17	32"–114"	C	M-C. LOAMY SAND	2.5YR 4/4		15% STONES, 15% C+G

WATER WEEPING OBSERVED @ N/A — PERC RATE 4 MIN/INCH
PERC DEPTH 34"–52" INCHES

TEST PIT # 27

GRD. EL. 238.44 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 232.77 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 232.77 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
237.77	0"–8"	A	SANDY LOAM	10YR 2/2		ROOTS, ORGANICS
235.94	8"–30"	B	FINE LOAMY SAND	10YR 4/4		5–10% G+C
232.77	30"–68"	C1	FINE LOAMY SAND	10YR 4/6		5–10% G+C
228.44	68"–120"	C2	MEDIUM LOAMY SAND	2.5Y 4/2	MOTTLING @ 68"	5% G+C

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 28

GRD. EL. 238.13 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 235.80 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 235.80 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
237.30	0"–10"	A	LOAM	10YR 2/2		ROOTS, ORGANICS
235.88	10"–27"	B	LOAMY SAND	10YR 5/4		STONEY
233.30	27"–58"	C1	FINE SANDY LOAM	2.5Y 4/3	MOTTLING @ 28" 7.5Y 4/4	TIGHT, COMPACT, MOTTLES THROUGHOUT
230.13	58"–96"	C2	LOAMY SAND	2.5Y 4/2		GRAVELLY, LOOSE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 29

GRD. EL. 237.83 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 235.50 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 235.50 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
236.66	0"–14"	A	LOAM	10YR 2/2		ROOTS, ORGANICS
235.00	14"–34"	B	SANDY LOAM	10YR 5/4		ROOTS, STONEY
231.33	34"–78"	C1	FINE SANDY LOAM	2.5Y 4/3	MOTTLING @ 28" 7.5Y 4/4	TIGHT, COMPACT, MOTTLES THROUGHOUT
228.83	78"–108"	C2	LOAMY SAND	2.5Y 4/2		GRAVELLY, LOOSE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 30

GRD. EL. 239.99 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 236.66 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 236.66 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
239.07	0"–11"	A	SANDY LOAM	10YR 3/3		ROOTS, ORGANICS
237.82	11"–26"	B	SANDY LOAM	10YR 4/4		ROOTS, STONEY
232.82	26"–86"	C	SAND	2.5Y 4/4	MOTTLING @ 40" 7.5Y 4/6	GRAVELLY, MANY STONES

WATER WEEPING OBSERVED @ 66" — PERC RATE MIN/INCH
STANDING OBSERVED @ 84" — PERC DEPTH INCHES

TEST PIT # 31

GRD. EL. 238.82 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 235.82 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 235.82 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
238.07	0"–9"	A	SANDY LOAM	10YR 3/3		ROOTS, ORGANICS
236.65	9"–26"	B	LOAMY SAND	10YR 5/6		
232.15	26"–80"	C	SAND	2.5Y 5/3	MOTTLING @ 36" 7.5Y 4/6	GRAVELLY, MANY STONES

WATER WEEPING OBSERVED @ 71" — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 32

GRD. EL. 238.88 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 235.55 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 235.55 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
238.05	0"–10"	A	SANDY LOAM	10YR 3/3		ROOTS, ORGANICS
237.38	10"–18"	B	LOAMY SAND	10YR 5/6		ROOTS, STONEY
235.55	18"–40"	C1	FINE SAND	2.5Y 5/3		
230.21	40"–104"	C2	SAND	2.5Y 5/3	MOTTLING @ 40" 7.5Y 4/6	STONEY

WATER WEEPING OBSERVED @ 101" — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 33

GRD. EL. 239.43 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 236.18 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 236.18 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
238.43	0"–12"	A	LOAM	10YR 3/2		ROOTS, ORGANICS
237.10	12"–28"	B	SANDY LOAM	10YR 5/6		STONEY
230.93	28"–102"	C	LOAMY SAND	2.5Y 5/3	MOTTLING @ 39"	GRAVELLY, LOOSE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 34

GRD. EL. 238.44 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 235.77 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 235.77 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
237.61	0"–10"	A	LOAM	10YR 3/2		ROOTS, ORGANICS
236.11	10"–28"	B	SANDY LOAM	10YR 5/6		
234.61	28"–46"	C1	SANDY LOAM	2.5Y 5/4	MOTTLING @ 32"	
230.11	46"–100"	C2	LOAMY SAND	2.5Y 5/2		GRAVELLY, LOOSE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 35

GRD. EL. 238.44 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 235.94 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 235.94 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
237.69	0"–9"	A	LOAM	10YR 3/2		ROOTS, ORGANICS
236.36	9"–25"	B	SANDY LOAM	10YR 5/6		
234.86	25"–43"	C1	SANDY LOAM	2.5Y 5/4	MOTTLING @ 30"	
230.44	43"–96"	C2	LOAMY SAND	2.5Y 5/2		GRAVELLY, LOOSE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 36

GRD. EL. 223..69 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 220.52 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 220.52 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
222.86	0"–10"	A	SANDY LOAM	10YR 3/2		ROOTS
221.36	10"–28"	B	LOAMY SAND	10YR 5/6		STONEY
215.69	28"–96"	C	LOAMY SAND	2.5Y 5/3	MOTTLING @ 38" 10YR 5/4	GRAVELLY, LOOSE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 37

GRD. EL. 220.40 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 215.32 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 215.32 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
219.40	0"–12"	A	SANDY LOAM	10YR 3/2		ROOTS
218.90	12"–18"	B	LOAMY SAND	10YR 5/6		STONEY
212.98	18"–89"	C	LOAMY SAND	2.5Y 5/3	MOTTLING @ 61"	GRAVELLY, LOOSE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 38

GRD. EL. 218.40 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 215.07 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/4/2019 — MOTTLING. EL. 215.07 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
217.57	0"–10"	A	SANDY LOAM	10YR 3/2		ROOTS
216.23	10"–26"	B	SANDY LOAM	10YR 5/6		
211.57	26"–82"	C	LOAMY SAND	2.5Y 5/3	MOTTLING @ 40"	GRAVELLY, LOOSE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 39

GRD. EL. 226.04 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 221.04 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/9/2019 — MOTTLING. EL. 221.04 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
225.04	0"–12"	A	SANDY LOAM	10YR 3/2		ROOTS
223.87	12"–26"	B	LOAMY SAND	10YR 5/6		5% STONES, 10% C+G
223.37	26"–32"	BC	COARSE LOAMY SAND	2.5Y 5/6	MOTTLING @ 60"	5% STONES, 10% C+G
216.21	32"–118"	C	COARSE LOAMY SAND	2.5Y 6/3		5% STONES, 10% C+G

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

TEST PIT # 40

GRD. EL. 224.90 — TEST BY: TRACY L. DUARTE, PE
GW. EL. 222.40 — WITNESSED BY: KATHLEEN WALDRON
DATE: 10/9/2019 — MOTTLING. EL. 222.40 — WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
224.40	0"–6"	A	SANDY LOAM	10YR 3/2		ROOTS
223.4	6"–18"	B	SANDY LOAM	10YR 5/6		5% STONES, 10% C+G
216.73	18"–98"	C	SANDY LOAM	2.5Y 6/4	MOTTLING @ 30"	GRAVELLY, FIRM IN PLACE

WATER WEEPING OBSERVED @ N/A — PERC RATE MIN/INCH
STANDING OBSERVED @ N/A — PERC DEPTH INCHES

No.	DATE	DESCRIPTION	BY
1	3/6/2020	REVISIONS PER TOWN & CONSULTANT COMMENTS	TLD

REVISIONS

PROJ. MANAGER: MBL
CHIEF DESIGNER: MBL
REVIEWED BY: — DATE

SEAL — SEAL

PREPARED FOR
JOANNA HILLS LLC
32 NORFOLK AVENUE
SOUTH EASTON — MASSACHUSETTS

SCALE: HORZ.: VERT.:
DATUM: HORZ.: VERT.:
0
GRAPHIC SCALE

MBL
LAND DEVELOPMENT & PERMITTING, CORP.
LAND DEVELOPMENT, TRANSPORTATION AND ENVIRONMENTAL SOLUTIONS
770 BROADWAY SUITE 6
RAYNHAM, MA. 02767
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EMAIL:info@MBLLandDevelopment.com
WEB: www.MBLLandDevelopment.com

SITE PLANS
TEST PIT LOGS
CHAPTER 40B - JOANNA HILLS ESTATES
ASSESSORS MAP C7, BLOCK 3 & PLOT 15
AVON — MASSACHUSETTS

PROJ. No.: 2016-002
DATE: AUGUST 8, 2019

C-7.1

UCS: X:\2016\002\CIVIL\PLOT\2016-002 Site Plans.dwg 3/9/2020 8:32:23 AM EDT
MS VIEW: LMAN: CTB:

OBSERVATION HOLE DATA

INDICATES PERC TEST

INDICATES OBSERVED GROUNDWATER

TEST PIT # 41 GRD. EL. 222.41 TEST BY: TRACY L. DUARTE, PE
GW. EL. 219.91 WITNESSED BY: KATHLEEN WALDRON
DATE: 10/9/2019 MOTTLING. EL. 219.91 WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
221.58	0"–10"	A	SANDY LOAM	10YR 3/2		ROOTS, ORGANICS
220.74	10"–20"	B	LOAMY SAND	10YR 5/6		
219.41	20"–36"	BC	COARSE LOAMY SAND	2.5Y 6/6	MOTTLING @ 30"	
213.74	36"–104"	C	COARSE LOAMY SAND	2.5Y 5/2		GRAVELLY, FIRM IN PLACE

WATER
WEEPING OBSERVED @ N/A PERC RATE ______ MIN/INCH
STANDING OBSERVED @ N/A PERC DEPTH______ INCHES

TEST PIT # 42 GRD. EL. 224.41 TEST BY: TRACY L. DUARTE, PE
GW. EL. 221.74 WITNESSED BY: KATHLEEN WALDRON
DATE: 10/9/2019 MOTTLING. EL. 221.74 WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
223.74	0"–8"	A	SANDY LOAM	10YR 3/2		
222.58	8"–22"	B	LOAMY SAND	10YR 5/6		
217.16	22"–87"	C	COARSE LOAMY SAND	2.5Y 6/2	MOTTLING @ 32"	GRAVELLY, FIRM IN PLACE

WATER
WEEPING OBSERVED @ N/A PERC RATE ______ MIN/INCH
STANDING OBSERVED @ N/A PERC DEPTH______ INCHES

TEST PIT # 43 GRD. EL. 221.93 TEST BY: TRACY L. DUARTE, PE
GW. EL. 219.26 WITNESSED BY: KATHLEEN WALDRON
DATE: 10/9/2019 MOTTLING. EL. 219.26 WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
221.10	0"–10"	A	SANDY LOAM	10YR 3/2		ROOTS, ORGANICS
220.26	10"–20"	B	LOAMY SAND	10YR 5/6		
219.26	20"–32"	BC	LOAMY SAND	2.5Y 5/8		
214.68	32"–87"	C	COARSE LOAMY SAND	2.5Y 6/2	MOTTLING @ 32" 5YR 5/8	GRAVELLY, FIRM IN PLACE

WATER
WEEPING OBSERVED @ N/A PERC RATE ______ MIN/INCH
STANDING OBSERVED @ N/A PERC DEPTH______ INCHES

TEST PIT # 44 GRD. EL. 222.41 TEST BY: TRACY L. DUARTE, PE
GW. EL. 220.33 WITNESSED BY: KATHLEEN WALDRON
DATE: 10/9/2019 MOTTLING. EL. 220.33 WADE SAUCIER

ELEV.	SURFACE DEPTH	SOIL HORZ.	SOIL TEXTURE	SOIL COLOR	SOIL MOTTLING	OTHER
221.66	0"–9"	A	SANDY LOAM	10YR 3/2		
220.41	9"–24"	B	LOAMY SAND	10YR 5/6		
214.58	24"–94"	C	COARSE LOAMY SAND	2.5Y 6/2	MOTTLING @ 25"	GRAVELLY, FIRM IN PLACE

WATER
WEEPING OBSERVED @ N/A PERC RATE ______ MIN/INCH
STANDING OBSERVED @ N/A PERC DEPTH______ INCHES

No.	DATE	DESCRIPTION	BY
1	3/6/2020	REVISIONS PER TOWN & CONSULTANT COMMENTS	TLD

REVISIONS

PROJ. MANAGER: MBL
CHIEF DESIGNER: MBL
REVIEWED BY: DATE

SEAL

SEAL

PREPARED FOR

JOANNA HILLS LLC
32 NORFOLK AVENUE

SOUTH EASTON MASSACHUSETTS

SCALE:
HORZ.:
VERT.:
DATUM:
HORZ.:
VERT.:
0
GRAPHIC SCALE

MBL
LAND DEVELOPMENT & PERMITTING, CORP.
LAND DEVELOPMENT, TRANSPORTATION AND ENVIRONMENTAL SOLUTIONS
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SITE PLANS

TEST PIT LOGS
CHAPTER 40B - JOANNA HILLS ESTATES
ASSESSORS MAP C7, BLOCK 3 & PLOT 15

AVON MASSACHUSETTS

PROJ. No.: 2016-002
DATE: AUGUST 8, 2019

C-7.2

Outback Engineering Incorporated

165 East Grove Street
Middleborough, MA 02346

Tel: 508-946-9231 **Fax: 508-947-8873**

www.outback-eng.com

JOB #:	OEL-1048-H-Pit 27	**DATE:**	10/17/2019
LOCATION:	Pit 27 - Joanna Rd. Avon, MA	**TEST BY:**	M.S.
CLIENT:	Stonebridge Homes	**CHECK BY:**	J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	67.28%
# 4	4.75	55.65%
# 10	2	45.29%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	78.19%	SAND
# 50	0.3	48.69%	SAND
# 100	0.15	31.74%	SAND
# 140	0.106	23.70%	SAND
# 270	0.053	14.63%	SAND

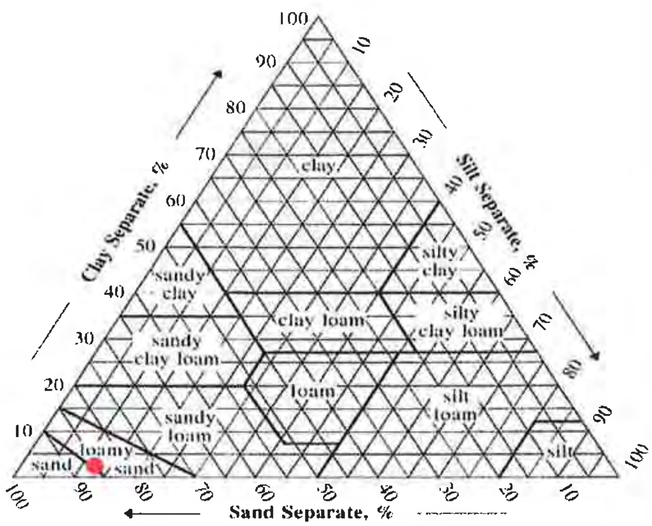
Hydrometer Analysis of Material Passing #270 Sieve

	0.05735	13.86%	SILT
	0.04146	13.09%	SILT
	0.03066	11.42%	SILT
	0.02286	9.24%	SILT
	0.01669	7.83%	SILT
	0.01219	6.29%	SILT
	0.00918	4.75%	SILT
	0.00772	4.36%	SILT
	0.00408	2.57%	SILT
	0.00330	2.18%	CLAY
	0.00142	2.05%	CLAY

Triangle Classification of Material Passing the #10 Sieve

% Sand	**85.37%**
% Silt	**12.45%**
% Clay	**2.18%**

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

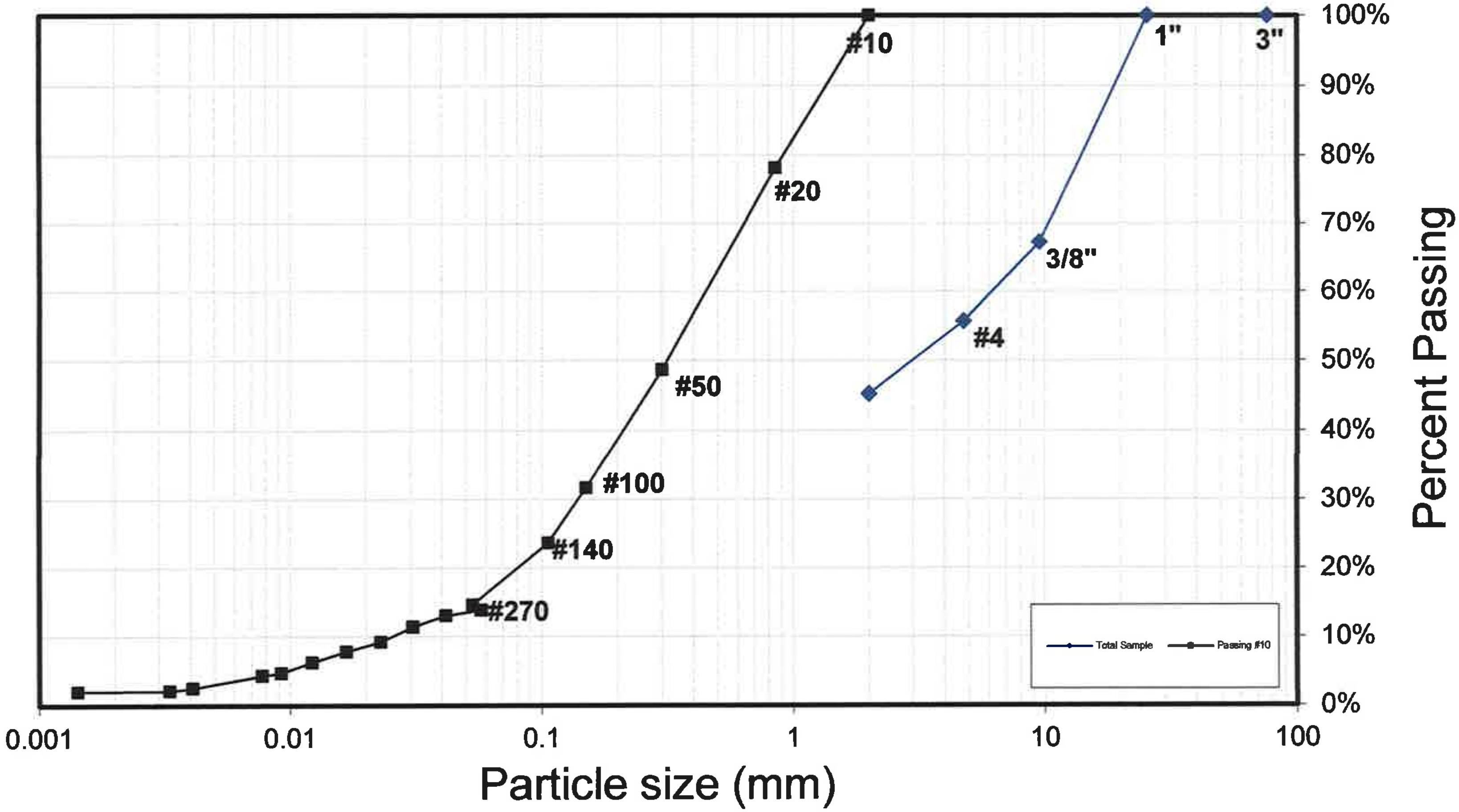
Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

Outback Engineering Incorporated
165 East Grove Street Middleboro, MA 02346
Tel: 508-946-9231 Fax: 508-947-8873

JOB #: OEL-1048-H-Pit 27
LOCATION: Pit 27 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/17/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



165 East Grove Street
Middleborough, MA 02346

Tel: 508-946-9231 Fax: 508-947-8873

www.outback-eng.com

JOB #: OEL-1048-H-Pit 28
LOCATION: Pit 28 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/21/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	90.58%
# 4	4.75	83.28%
# 10	2	72.72%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	83.44%	
# 50	0.3	57.25%	
# 100	0.15	47.09%	
# 140	0.106	40.42%	
# 270	0.053	34.65%	

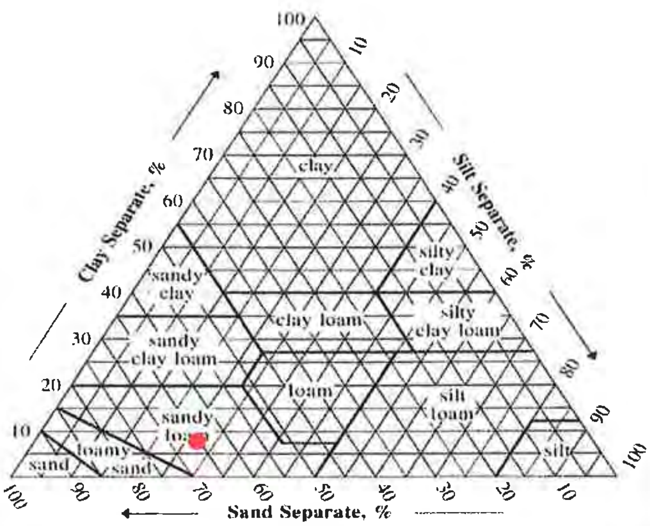
Hydrometer Analysis of Material Passing #270 Sieve

	0.04293	35.03%	SILT
	0.03096	32.74%	
	0.02273	28.17%	
	0.01655	24.36%	
	0.01236	21.32%	
	0.00892	18.27%	
	0.00650	13.70%	
	0.00467	11.42%	
	0.00346	8.75%	
	0.00273	7.61%	CLAY
	0.00081	5.33%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	65.35%
% Silt	27.04%
% Clay	7.61%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

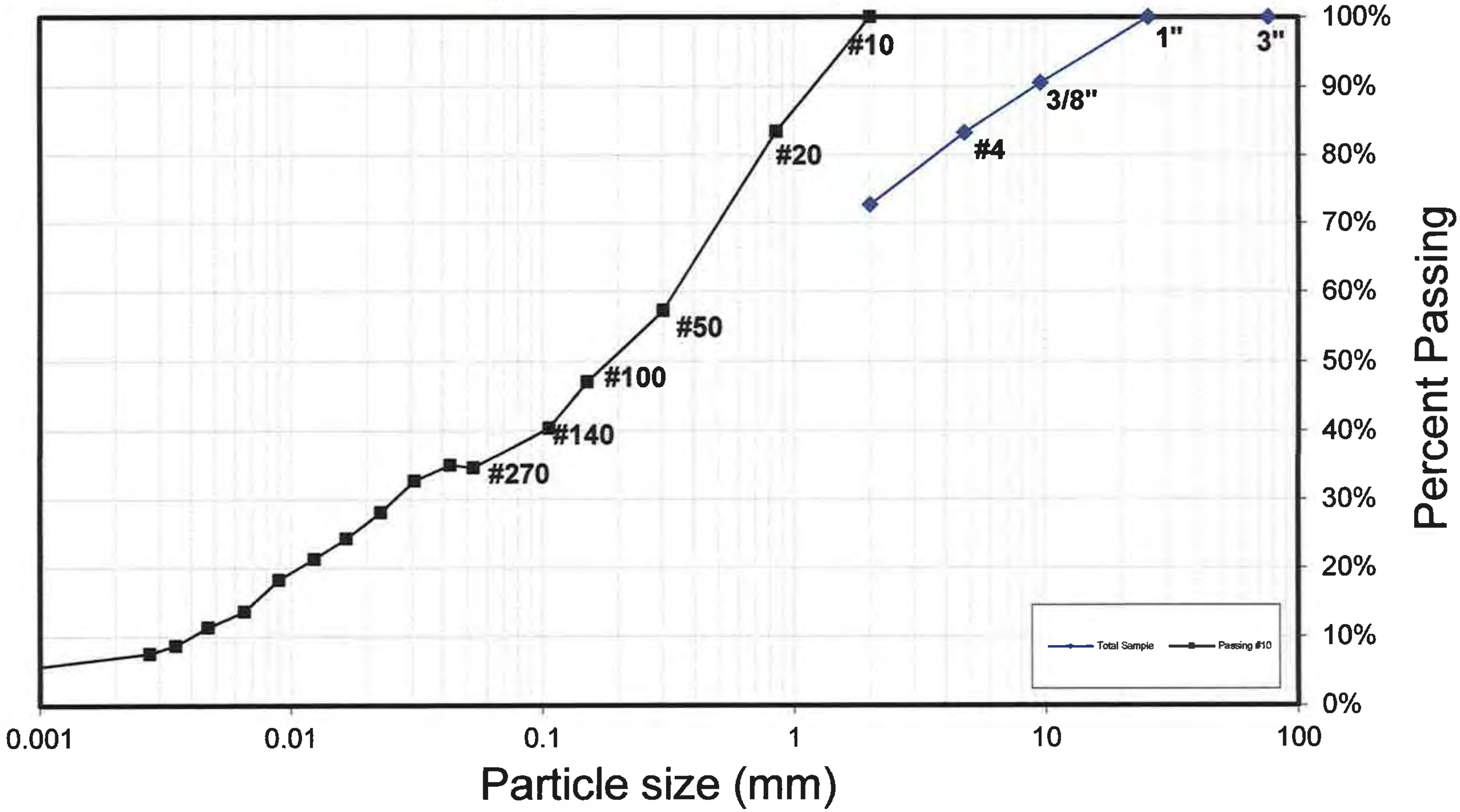
Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

Outback Engineering Incorporated
165 East Grove Street Middleboro, MA 02346
Tel: 508-946-9231 Fax: 508-947-8873

JOB #: OEL-1048-H-Pit 28
LOCATION: Pit 28 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/21/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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JOB #: OEL-1048-H-Pit 29
LOCATION: Pit 29 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/11/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	92.35%
# 4	4.75	85.81%
# 10	2	72.30%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	79.76%	
# 50	0.3	53.85%	
# 100	0.15	40.51%	
# 140	0.106	34.15%	
# 270	0.053	28.95%	

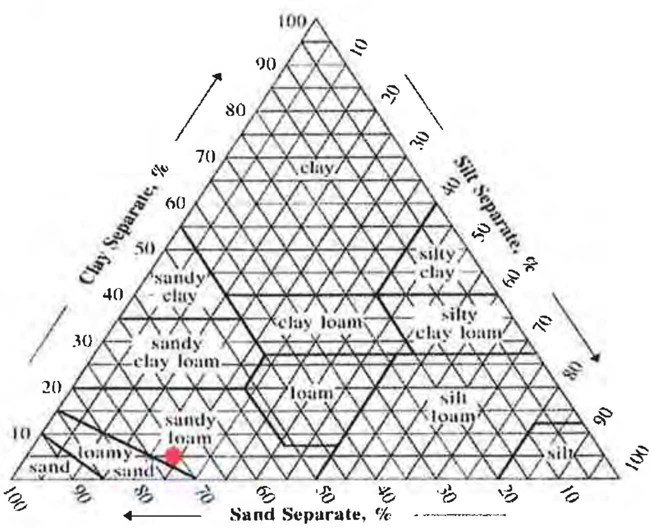
Hydrometer Analysis of Material Passing #270 Sieve

	0.04264	28.54%	SILT
	0.03126	25.20%	
	0.02313	20.65%	
	0.01683	17.61%	
	0.01255	15.18%	
	0.00915	11.54%	
	0.00657	9.71%	
	0.00473	7.28%	
	0.00271	5.77%	
	0.00143	4.85%	CLAY
	0.00141	2.56%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	71.05%
% Silt	24.10%
% Clay	4.85%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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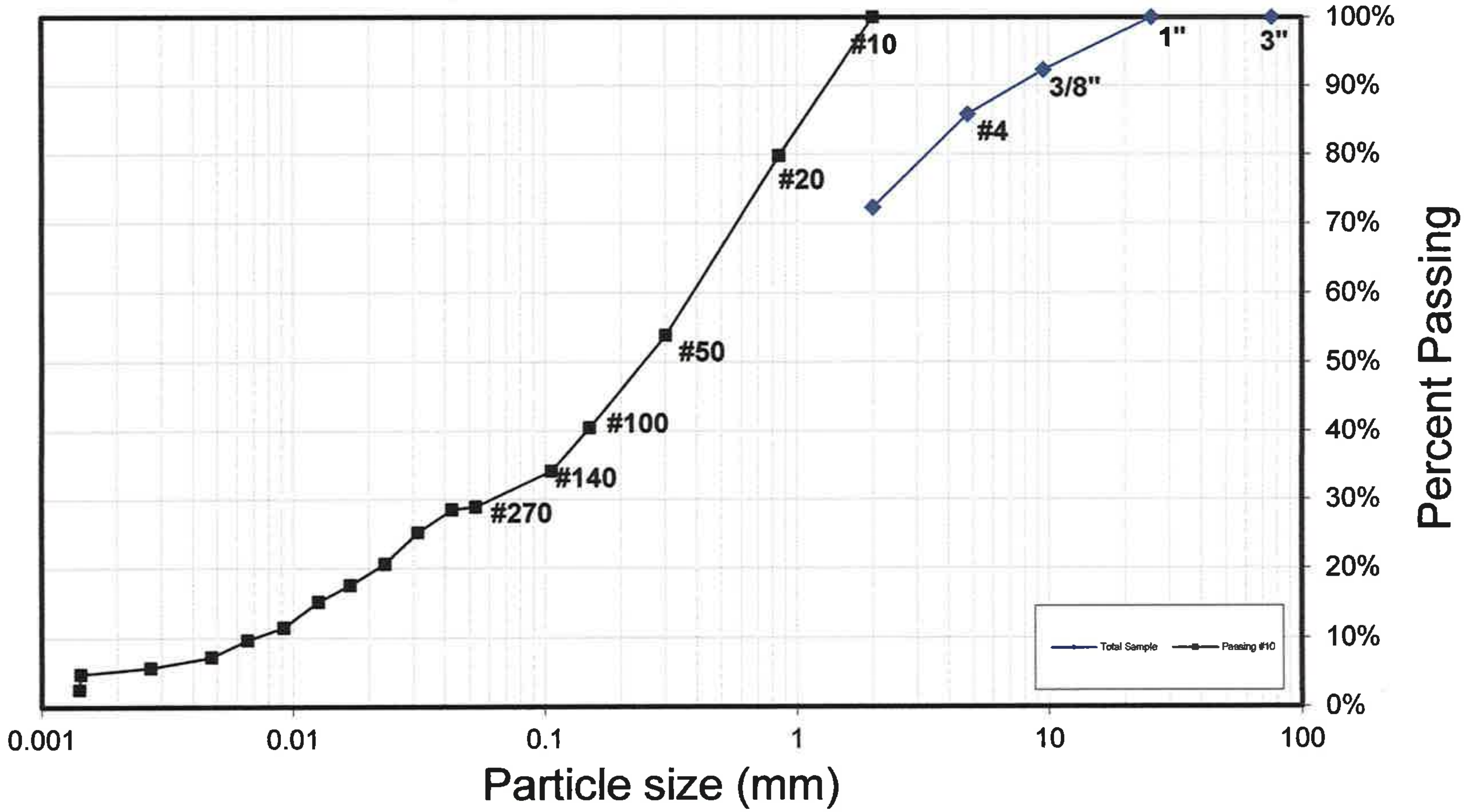
JOB #: OEL-1048-H-Pit 29
LOCATION: Pit 29 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/11/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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JOB #: OEL-1048-H-Pit 30
LOCATION: Pit 30 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/14/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	74.27%
# 4	4.75	60.87%
# 10	2	43.58%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	62.08%	
# 50	0.3	31.64%	
# 100	0.15	21.49%	
# 140	0.106	17.68%	
# 270	0.053	12.23%	

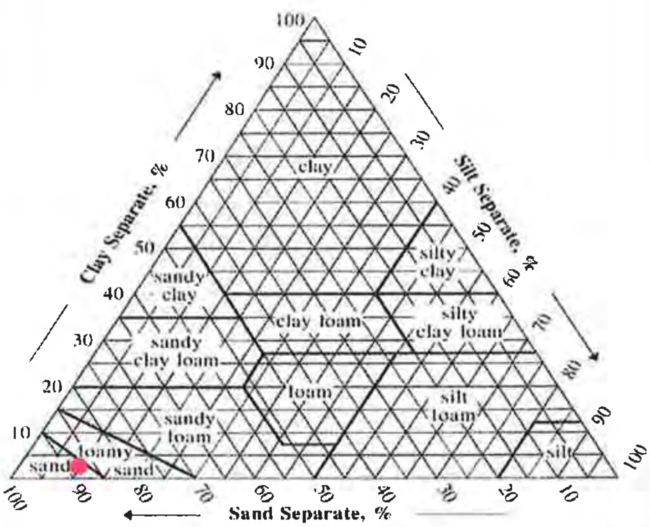
Hydrometer Analysis of Material Passing #270 Sieve

	0.04264	12.54%	SILT
	0.03156	10.67%	
	0.02300	9.34%	
	0.01683	7.74%	
	0.01255	6.67%	
	0.00906	5.60%	
	0.00657	4.27%	
	0.00506	3.73%	
	0.00301	2.53%	
	0.00253	2.40%	CLAY
	0.00080	2.00%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	87.77%
% Silt	9.83%
% Clay	2.40%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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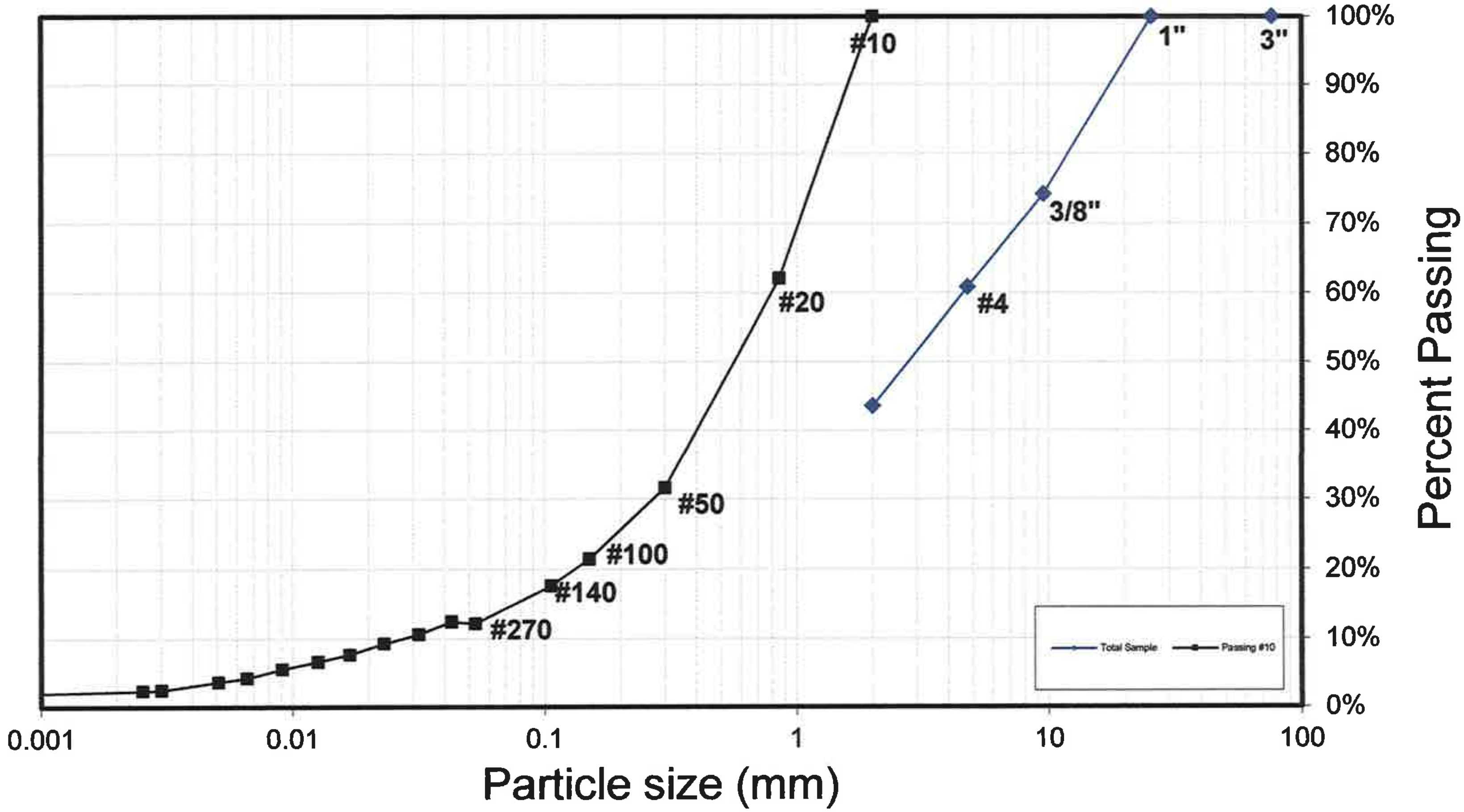
JOB #: OEL-1048-H-Pit 30
LOCATION: Pit 30 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/14/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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JOB #: OEL-1048-H-Pit 31
LOCATION: Pit 31 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/24/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	71.36%
# 4	4.75	57.26%
# 10	2	44.23%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	66.83%	SAND
# 50	0.3	34.06%	SAND
# 100	0.15	25.23%	SAND
# 140	0.106	21.47%	SAND
# 270	0.053	11.94%	SAND

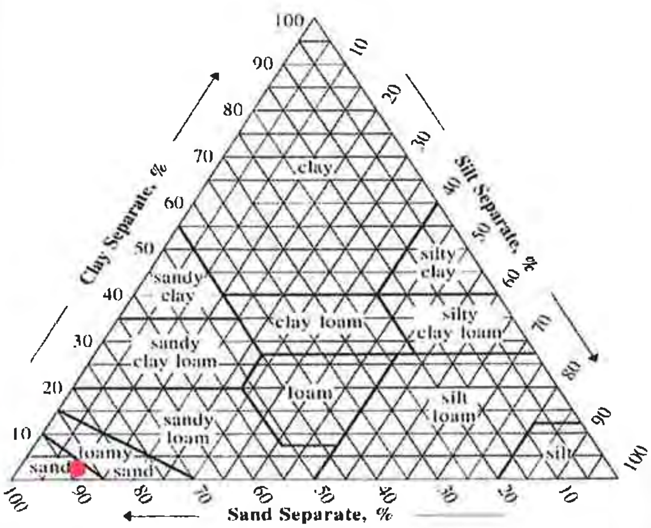
Hydrometer Analysis of Material Passing #270 Sieve

	0.06091	12.15%	SILT
	0.04407	11.22%	SILT
	0.03262	9.21%	SILT
	0.02399	7.34%	SILT
	0.01781	4.81%	SILT
	0.01313	4.27%	SILT
	0.00938	3.74%	SILT
	0.00672	2.94%	SILT
	0.00511	2.67%	SILT
	0.00276	2.27%	CLAY
	0.00139	2.13%	CLAY

Triangle Classification of Material Passing the #10 Sieve

% Sand	88.06%
% Silt	9.67%
% Clay	2.27%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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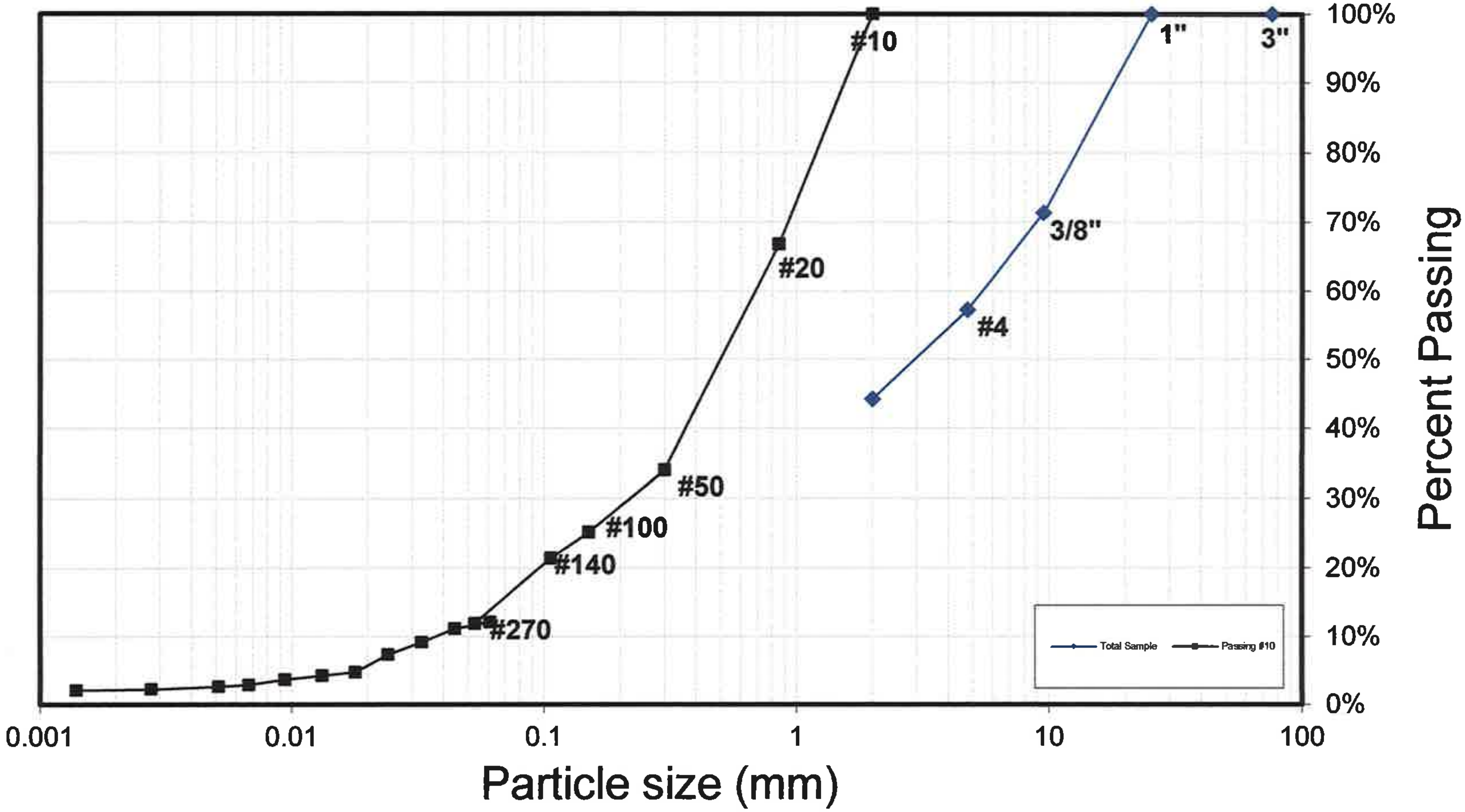
JOB #: OEL-1048-H-Pit 31
LOCATION: Pit 31 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/24/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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JOB #: OEL-1048-H-Pit 32
LOCATION: Pit 32 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/14/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	81.29%
# 4	4.75	71.19%
# 10	2	61.17%

Triangle Classification of Material Passing the #10 Sieve

% Sand	82.22%
% Silt	15.47%
% Clay	2.31%

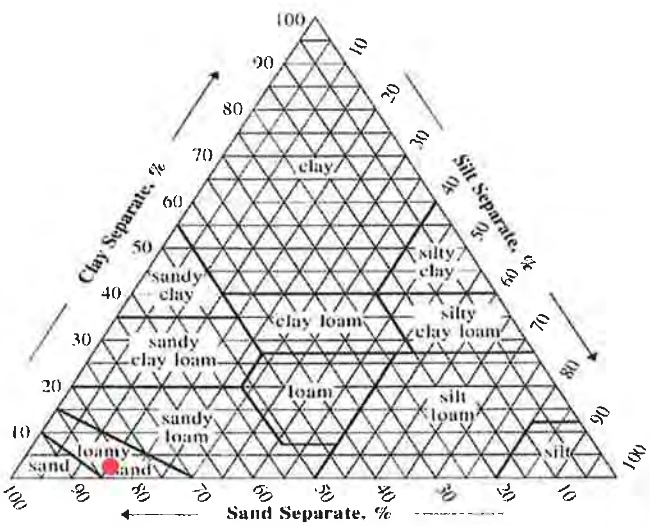
Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	84.25%	
# 50	0.3	59.76%	
# 100	0.15	40.58%	
# 140	0.106	31.88%	
# 270	0.053	17.78%	

Hydrometer Analysis of Material Passing #270 Sieve

	0.03993	16.18%	SILT
	0.02994	13.87%	
	0.02231	11.56%	
	0.01659	9.10%	
	0.01252	7.37%	
	0.00913	5.63%	
	0.00663	4.04%	
	0.00475	3.18%	
	0.00294	2.45%	
	0.00252	2.31%	CLAY
	0.00080	1.73%	

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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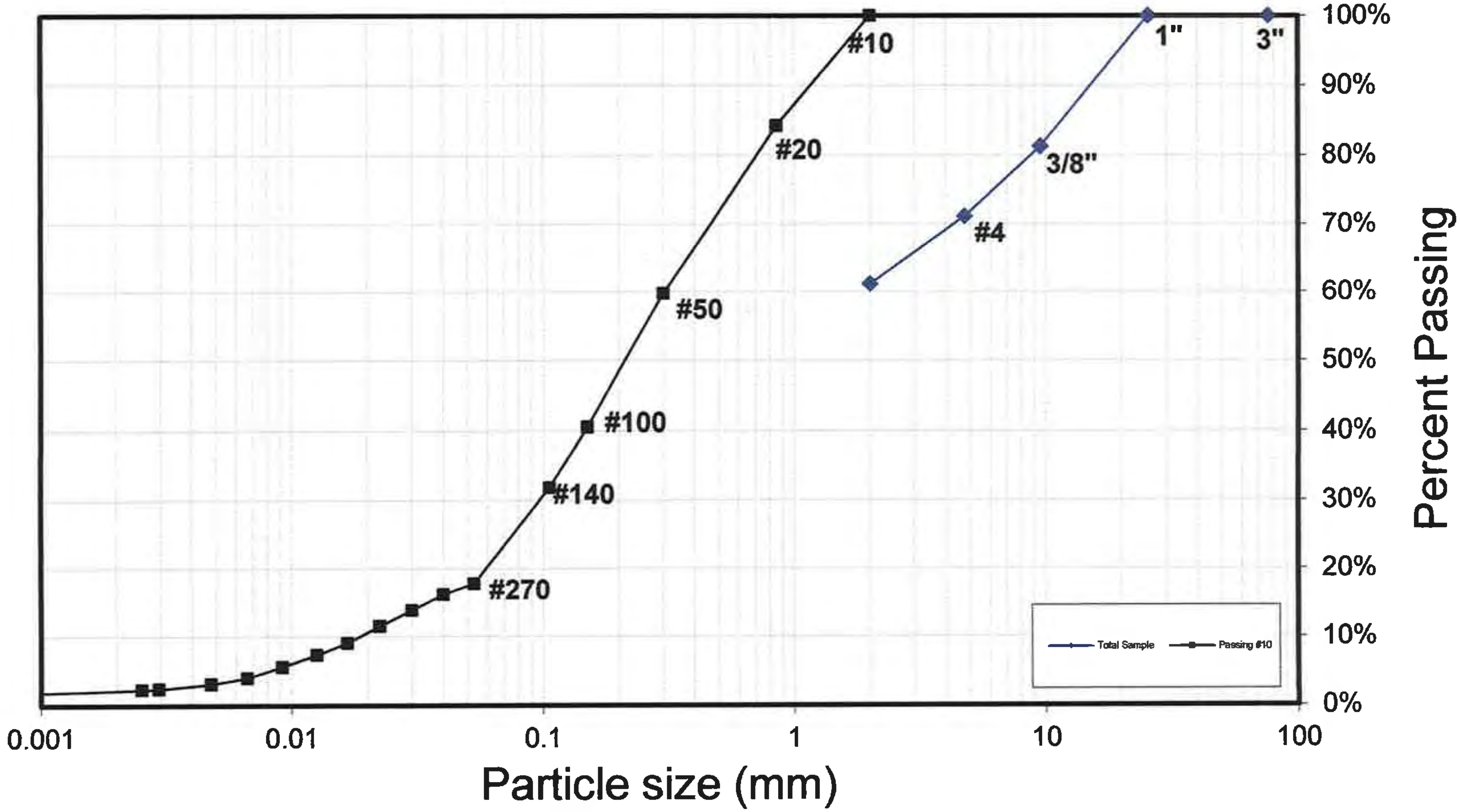
JOB #: OEL-1048-H-Pit 32
LOCATION: Pit 32 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/14/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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JOB #: OEL-1048-H-Pit 33
LOCATION: Pit 33 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/22/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	75.10%
# 4	4.75	66.25%
# 10	2	56.52%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	83.15%	
# 50	0.3	60.50%	
# 100	0.15	43.38%	
# 140	0.106	32.74%	
# 270	0.053	19.88%	

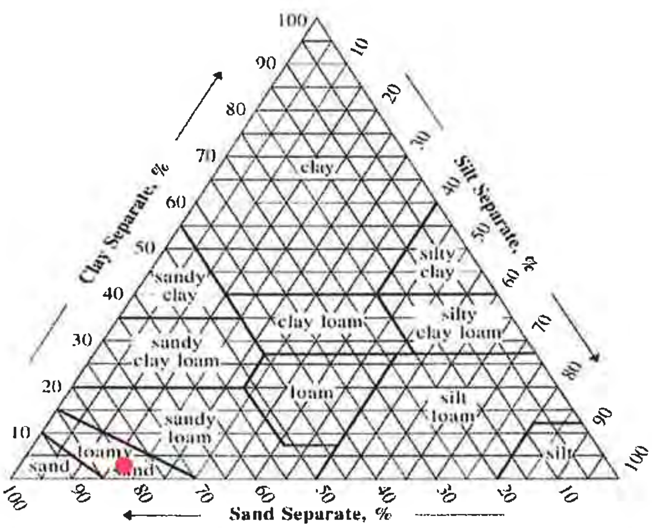
Hydrometer Analysis of Material Passing #270 Sieve

	0.05377	19.90%	SILT
	0.03946	18.46%	
	0.02994	15.41%	
	0.02225	13.00%	
	0.01669	9.79%	
	0.01242	8.67%	
	0.00908	6.58%	
	0.00654	4.81%	
	0.00460	3.85%	
	0.00278	2.73%	CLAY
	0.00140	2.25%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	80.12%
% Silt	17.15%
% Clay	2.73%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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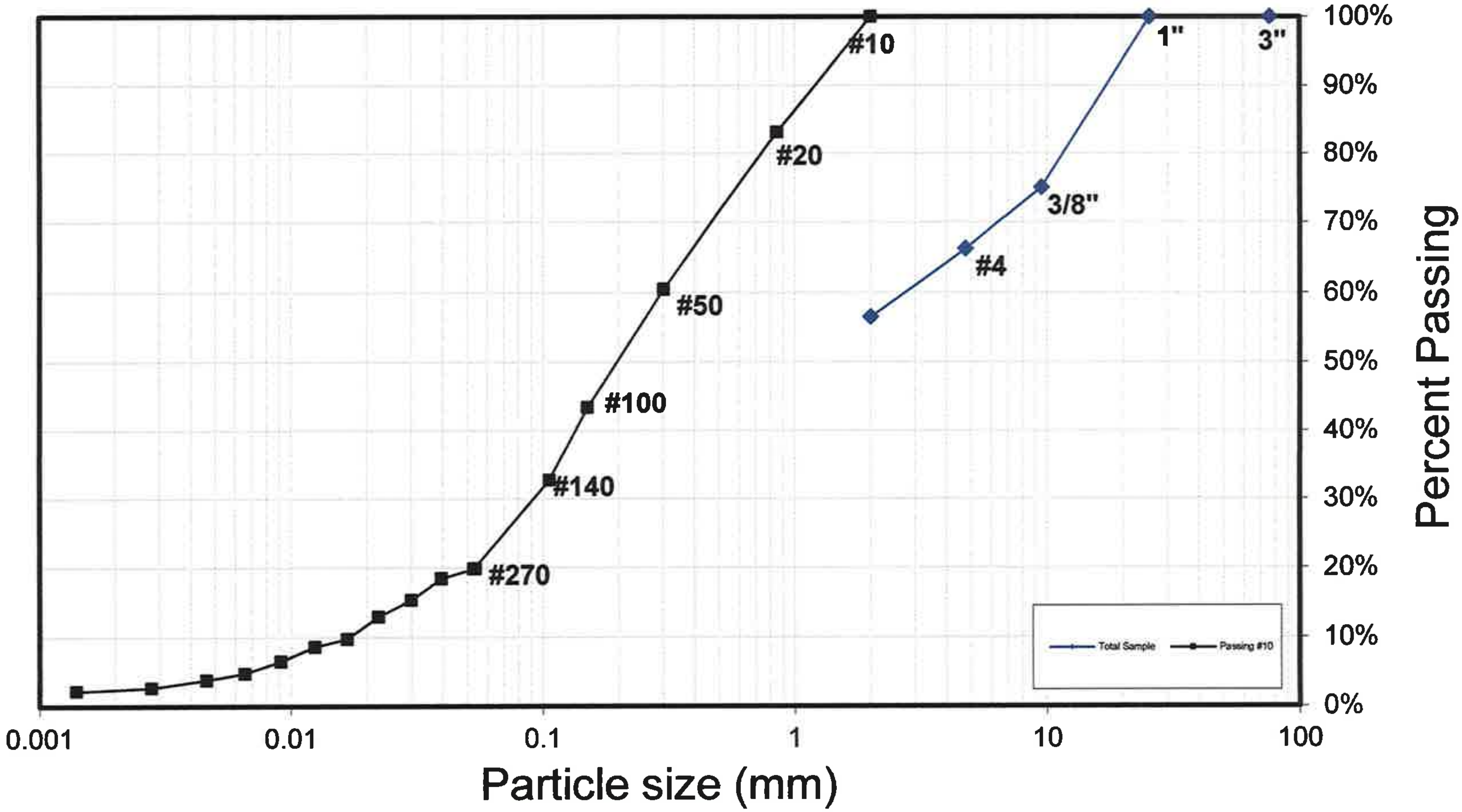
JOB #: OEL-1048-H-Pit 33
LOCATION: Pit 33 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/22/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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www.outback-eng.com

JOB #: OEL-1048-H-Pit 34
LOCATION: Pit 34 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/10/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	91.43%
3/8"	9.5	63.51%
# 4	4.75	52.89%
# 10	2	43.11%

Sieve Analysis of Material Passing #10 Sieve

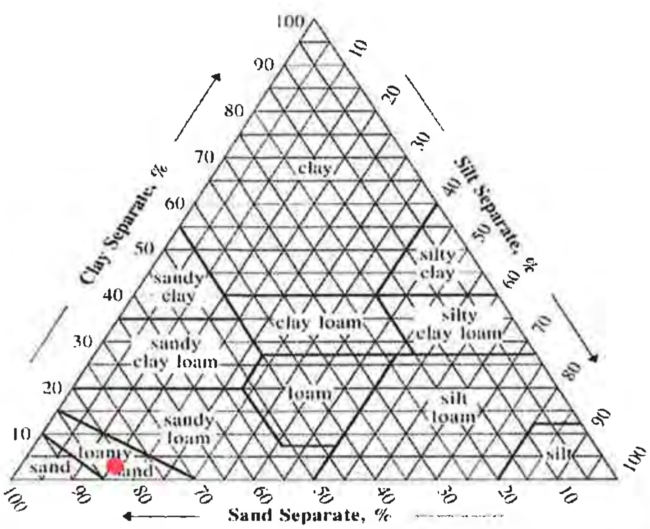
Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	81.71%	
# 50	0.3	55.32%	
# 100	0.15	35.95%	
# 140	0.106	27.95%	
# 270	0.053	18.52%	

Hydrometer Analysis of Material Passing #270 Sieve

	0.04293	18.12%	SILT
	0.03195	14.97%	
	0.02373	11.62%	
	0.01746	8.66%	
	0.01294	7.48%	
	0.00933	5.91%	
	0.00669	4.72%	
	0.00479	3.74%	
	0.00304	3.35%	
	0.00265	2.75%	CLAY
	0.00141	2.56%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	81.48%
% Silt	15.77%
% Clay	2.75%



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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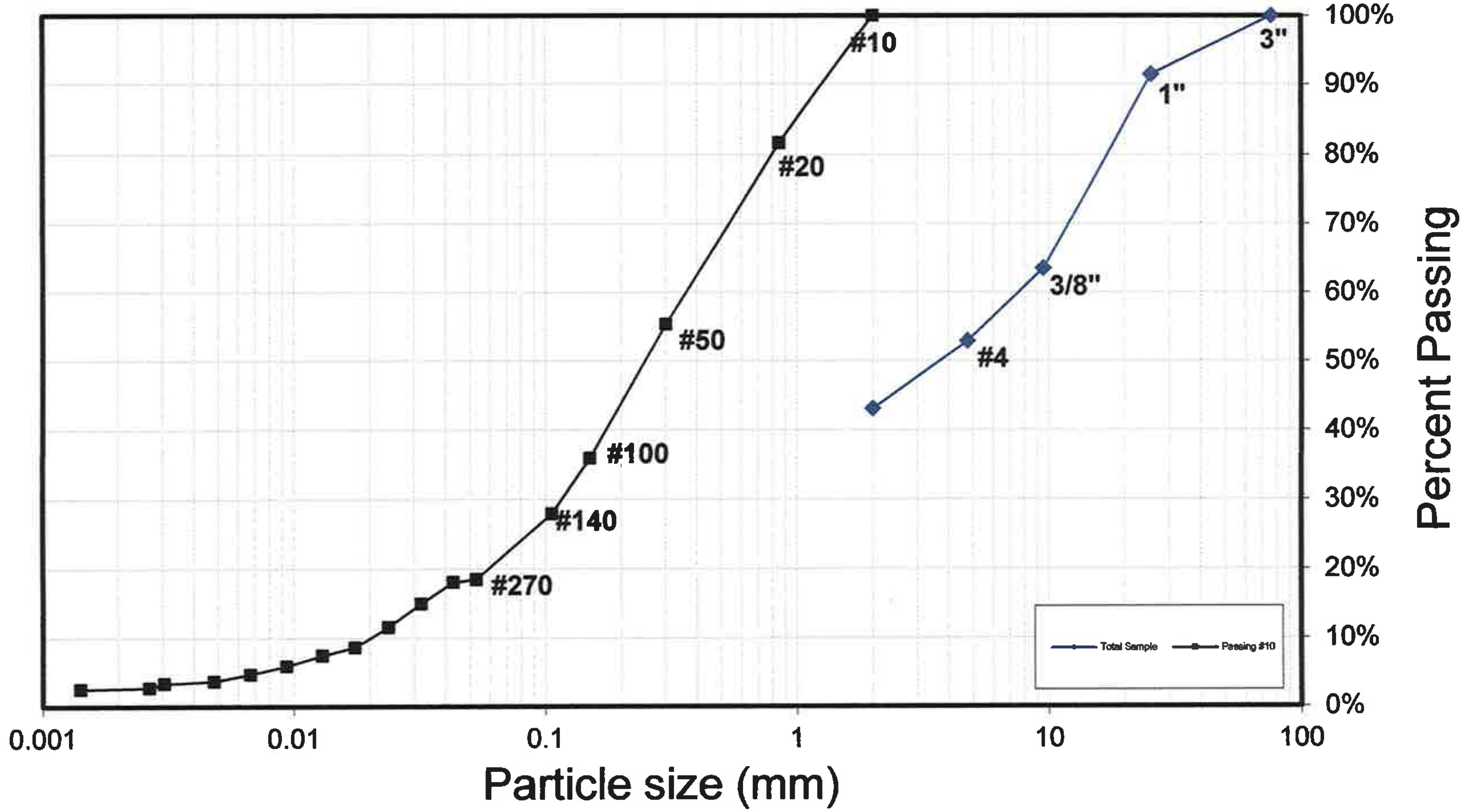
JOB #: OEL-1048-H-Pit 34
LOCATION: Pit 34 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/10/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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Middleborough, MA 02346

Tel: 508-946-9231 **Fax: 508-947-8873**

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JOB #: OEL-1048-H-Pit 35
LOCATION: Pit 35 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/23/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	81.70%
# 4	4.75	69.80%
# 10	2	58.48%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	82.25%	
# 50	0.3	60.41%	
# 100	0.15	44.65%	
# 140	0.106	36.18%	
# 270	0.053	23.33%	

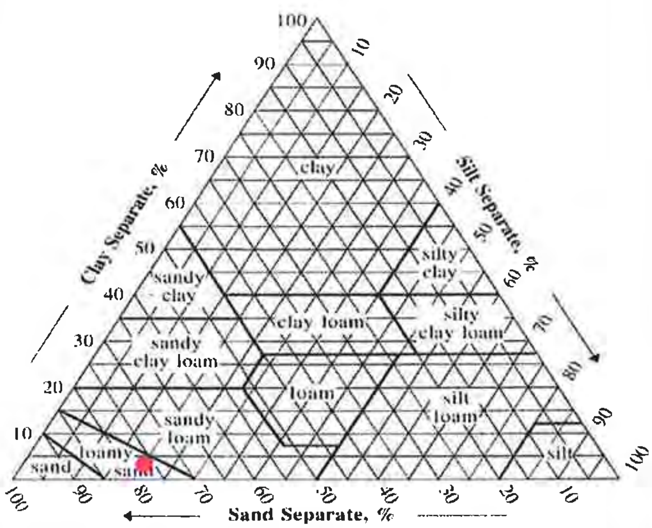
Hydrometer Analysis of Material Passing #270 Sieve

	0.05469	22.30%	SILT
	0.03993	20.81%	
	0.03015	17.47%	
	0.02259	14.12%	
	0.01678	10.96%	
	0.01265	8.73%	
	0.00872	5.94%	
	0.00668	4.64%	
	0.00425	3.34%	
	0.00373	2.97%	CLAY
	0.00281	2.23%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	**76.67%**
% Silt	**20.36%**
% Clay	**2.97%**

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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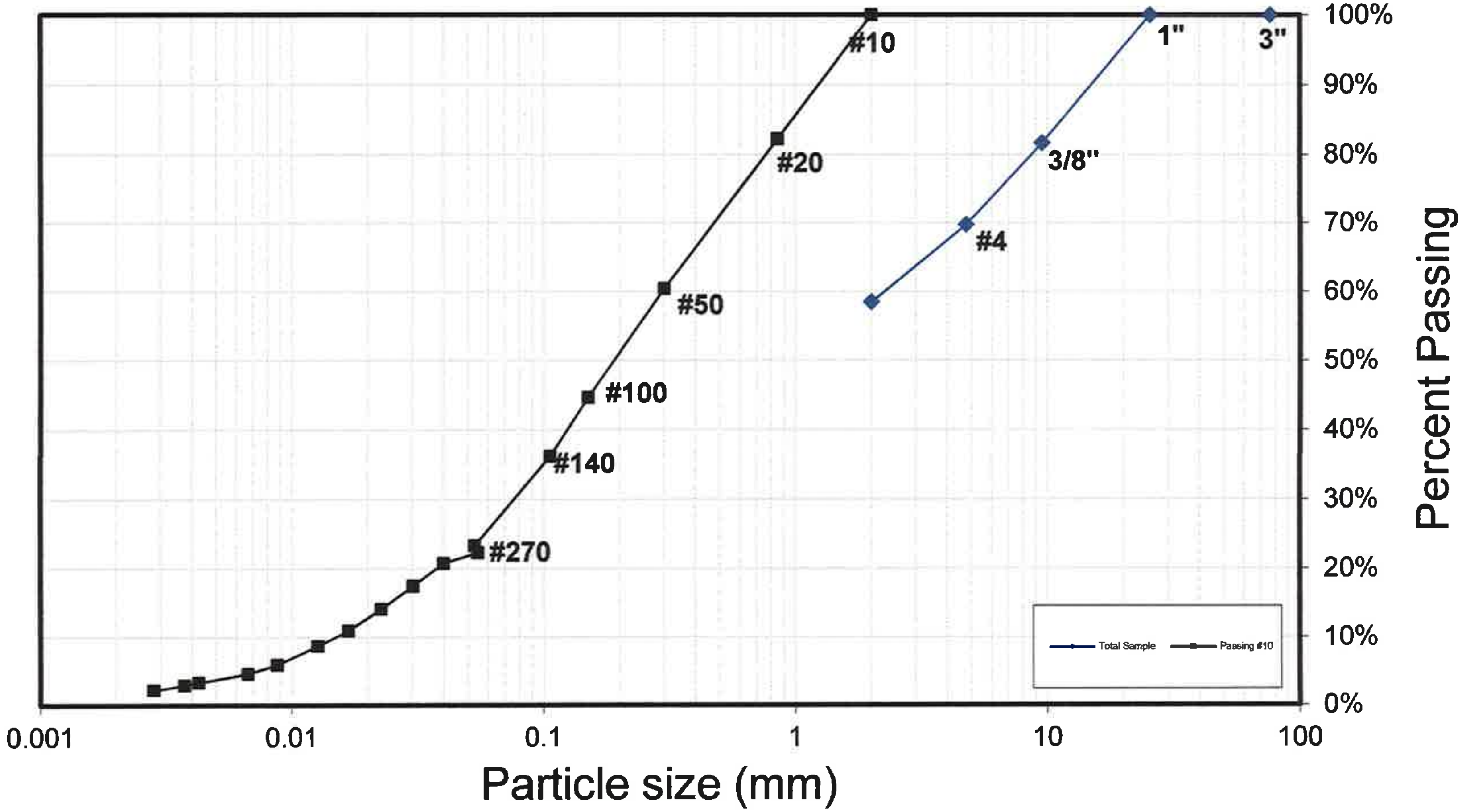
JOB #: OEL-1048-H-Pit 35
LOCATION: Pit 35 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/23/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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www.outback-eng.com

JOB #: OEL-1048-H-Pit 36
LOCATION: Pit 36 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/11/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	77.43%
# 4	4.75	65.62%
# 10	2	54.52%

Sieve Analysis of Material Passing #10 Sieve

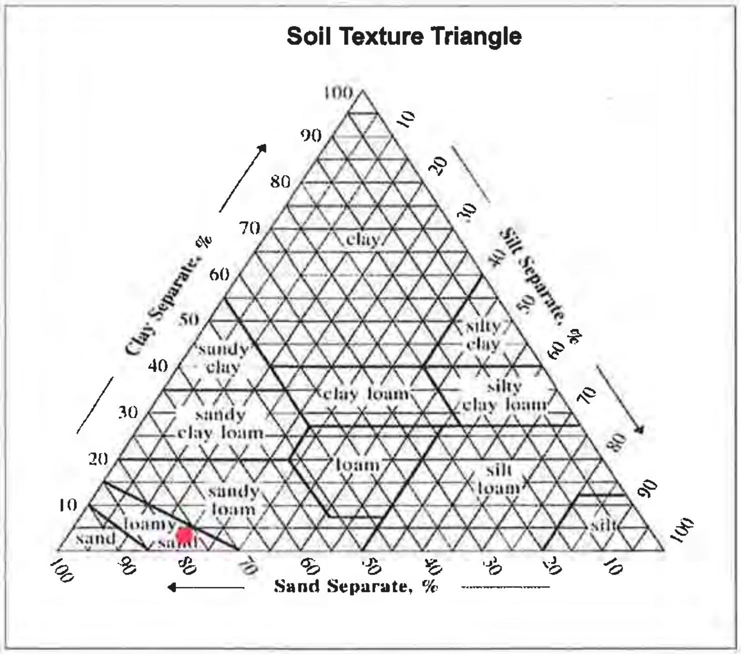
Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	81.75%	
# 50	0.3	56.98%	
# 100	0.15	41.34%	
# 140	0.106	34.08%	
# 270	0.053	22.71%	

Hydrometer Analysis of Material Passing #270 Sieve

	0.05469	21.98%	SILT
	0.04024	20.15%	
	0.02994	17.59%	
	0.02245	14.29%	
	0.01678	10.81%	
	0.01262	8.79%	
	0.00915	6.96%	
	0.00660	5.49%	
	0.00495	4.21%	
	0.00276	3.11%	CLAY
	0.00144	2.38%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	77.29%
% Silt	19.60%
% Clay	3.11%



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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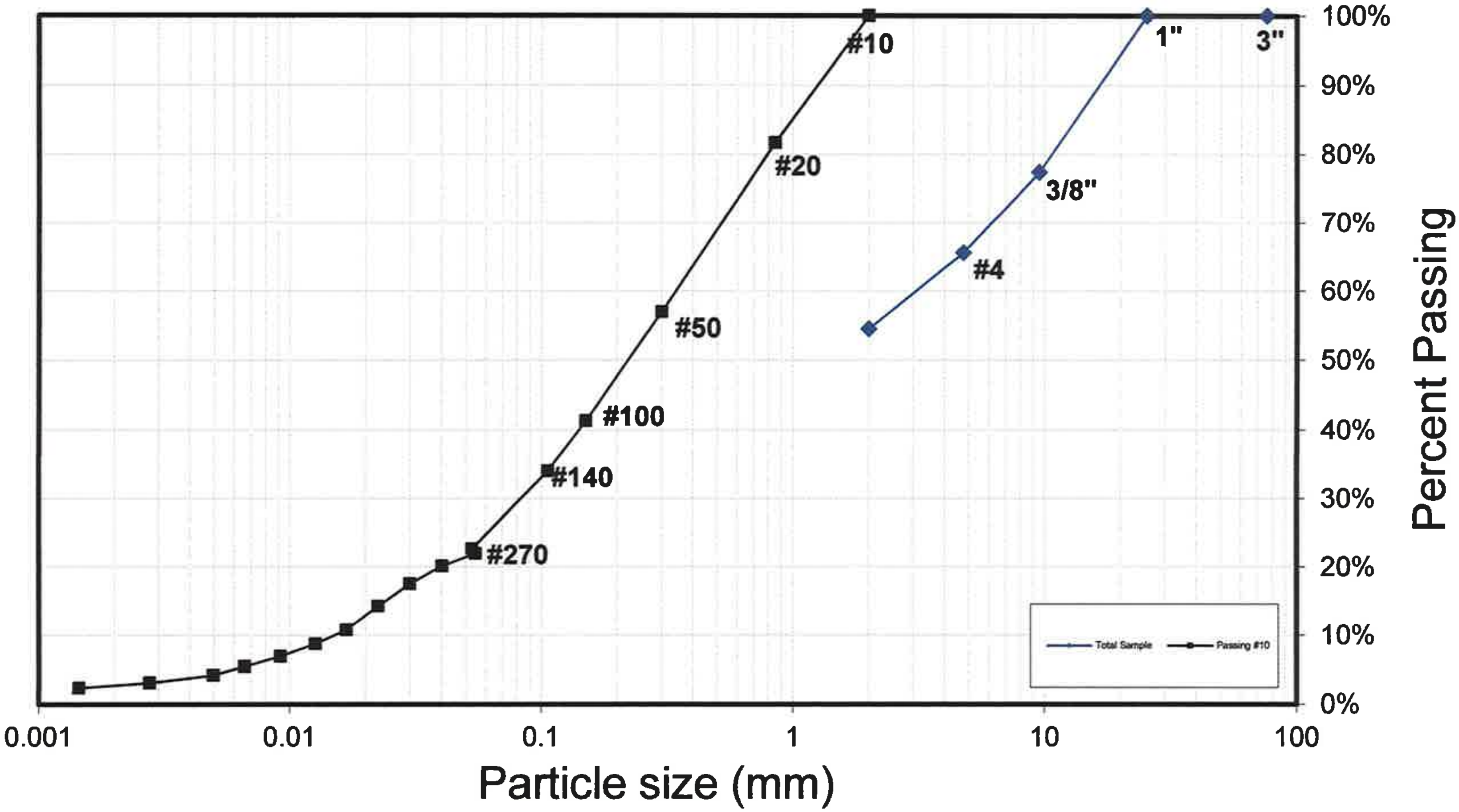
JOB #: OEL-1048-H-Pit 36
LOCATION: Pit 36 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/11/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



Outback Engineering Incorporated

166 East Grove Street
Middleborough, MA 02346

Tel: 508-946-9231 Fax: 508-947-8873

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JOB #: OEL-1048-H-Pit 37
LOCATION: Pit 37 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/24/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	84.12%
# 4	4.75	71.83%
# 10	2	60.00%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	79.98%	
# 50	0.3	54.39%	
# 100	0.15	38.73%	
# 140	0.106	30.26%	
# 270	0.053	19.19%	

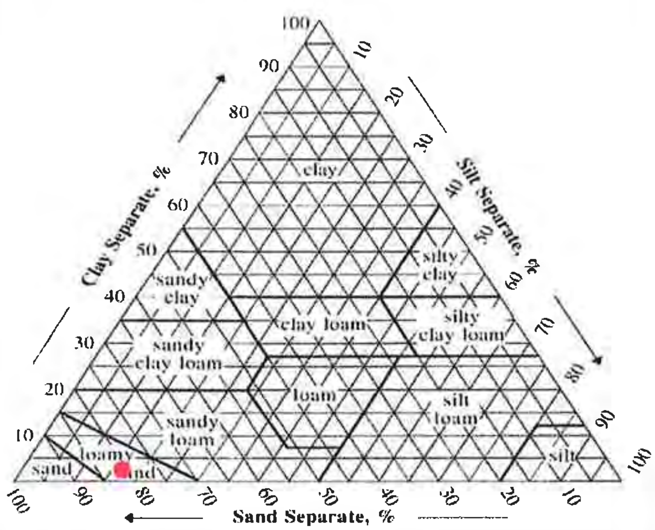
Hydrometer Analysis of Material Passing #270 Sieve

	0.0396	17.68%	SILT
	0.0299	14.88%	
	0.0226	11.78%	
	0.0159	8.84%	
	0.0127	7.13%	
	0.0092	5.27%	
	0.0067	4.03%	
	0.0045	2.79%	
	0.0034	2.48%	
	0.0028	2.32%	CLAY
	0.0014	1.86%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	80.81%
% Silt	16.87%
% Clay	2.32%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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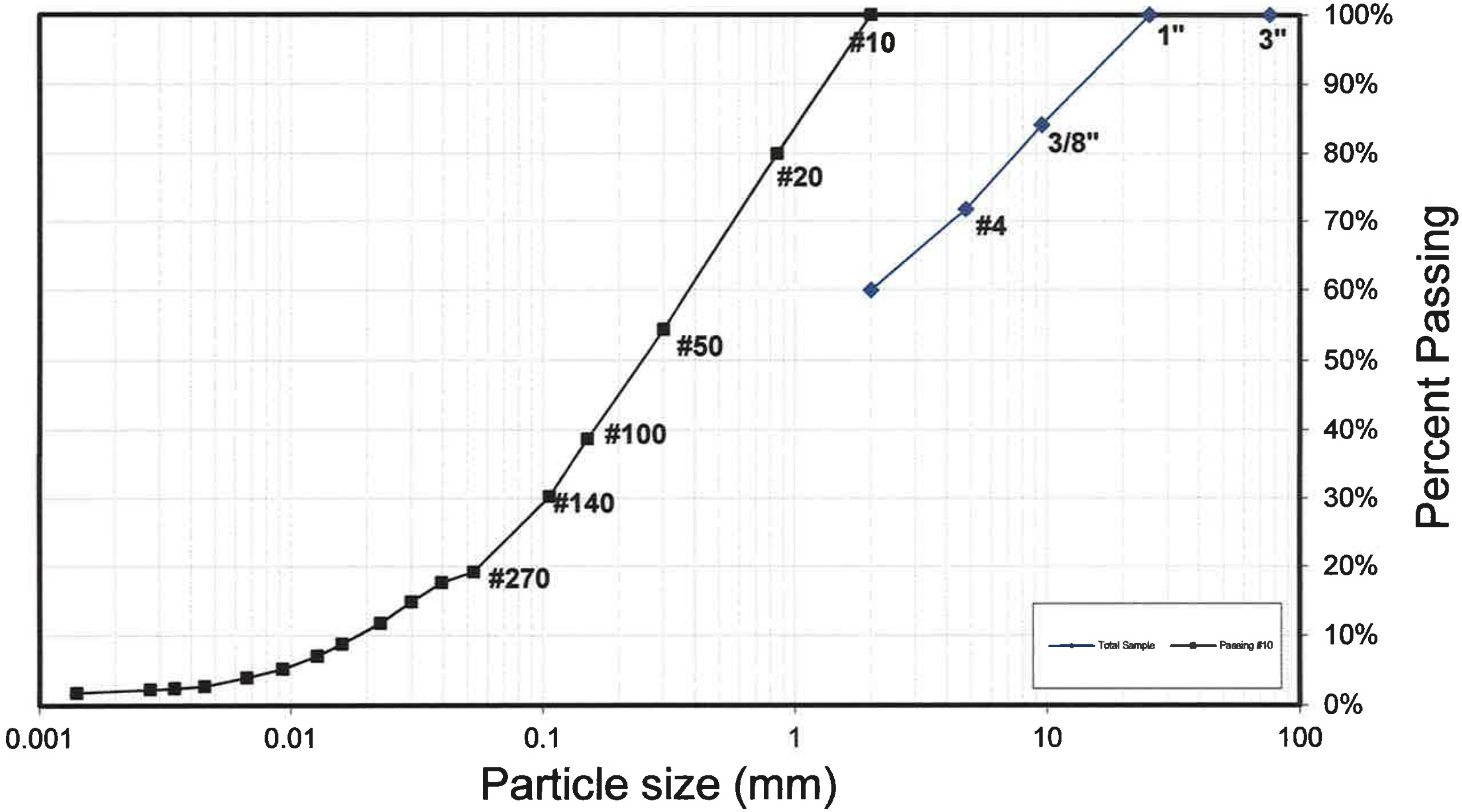
JOB #: OEL-1048-H-Pit 37
LOCATION: Pit 37 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/24/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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JOB #: OEL-1048-H-Pit 38
LOCATION: Pit 38 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/10/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	96.54%
3/8"	9.5	79.29%
# 4	4.75	69.92%
# 10	2	58.81%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	78.73%	
# 50	0.3	50.97%	
# 100	0.15	36.36%	
# 140	0.106	29.32%	
# 270	0.053	20.91%	

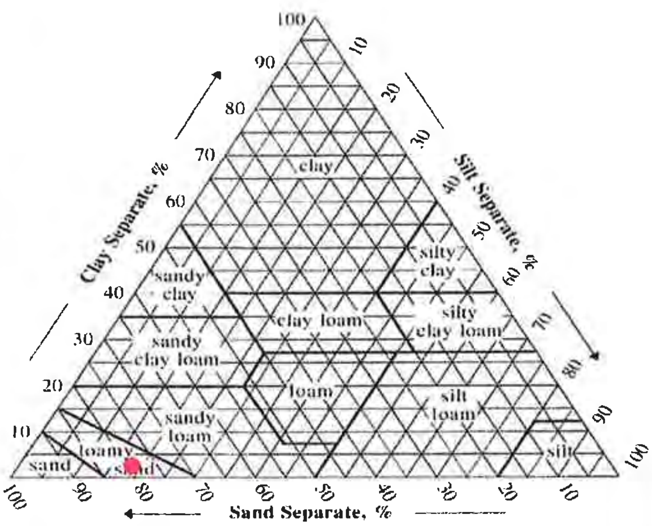
Hydrometer Analysis of Material Passing #270 Sieve

	0.03931	19.45%	SILT
	0.02994	16.10%	
	0.02203	14.08%	
	0.01659	10.56%	
	0.01249	8.72%	
	0.00915	6.37%	
	0.00658	5.20%	
	0.00494	4.02%	
	0.00295	3.02%	
	0.00268	2.35%	CLAY
	0.00142	2.01%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	79.09%
% Silt	18.56%
% Clay	2.35%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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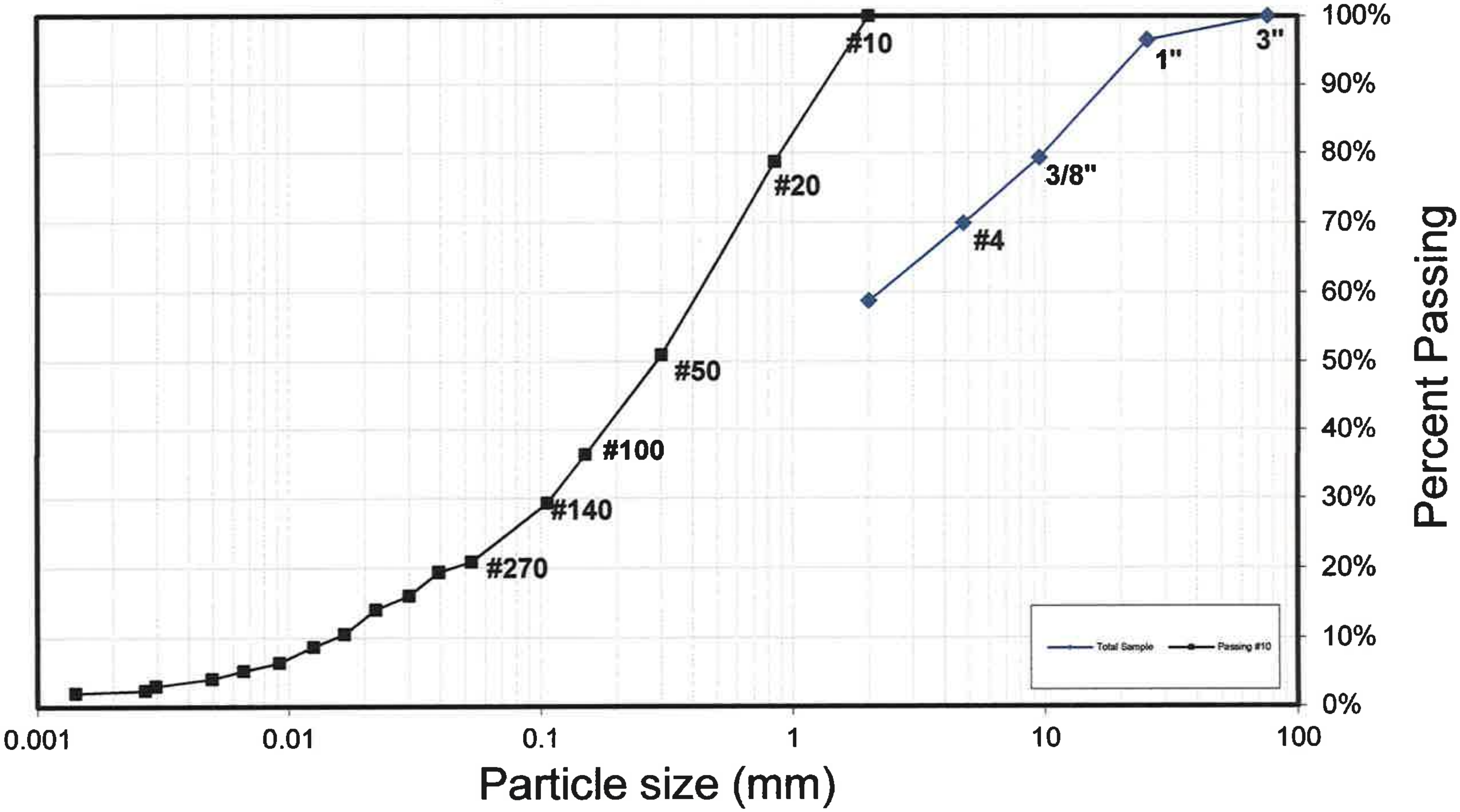
JOB #: OEL-1048-H-Pit 38
LOCATION: Pit 38 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/10/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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JOB #: OEL-1048-H-Pit 39
LOCATION: Pit 39 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/21/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	85.43%
# 4	4.75	80.32%
# 10	2	73.20%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	88.72%	
# 50	0.3	66.92%	
# 100	0.15	45.79%	
# 140	0.106	34.63%	
# 270	0.053	20.84%	

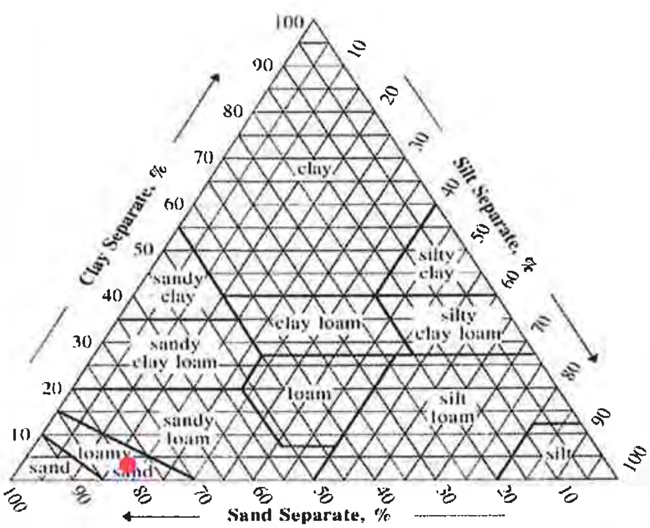
Hydrometer Analysis of Material Passing #270 Sieve

	0.03931	18.89%	SILT
	0.02942	16.45%	
	0.02211	13.52%	
	0.01650	10.58%	
	0.01246	8.63%	
	0.00908	6.67%	
	0.00657	5.21%	
	0.00485	4.23%	
	0.00354	3.74%	
	0.00276	3.09%	CLAY
	0.00139	2.60%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	**79.16%**
% Silt	**17.75%**
% Clay	**3.09%**

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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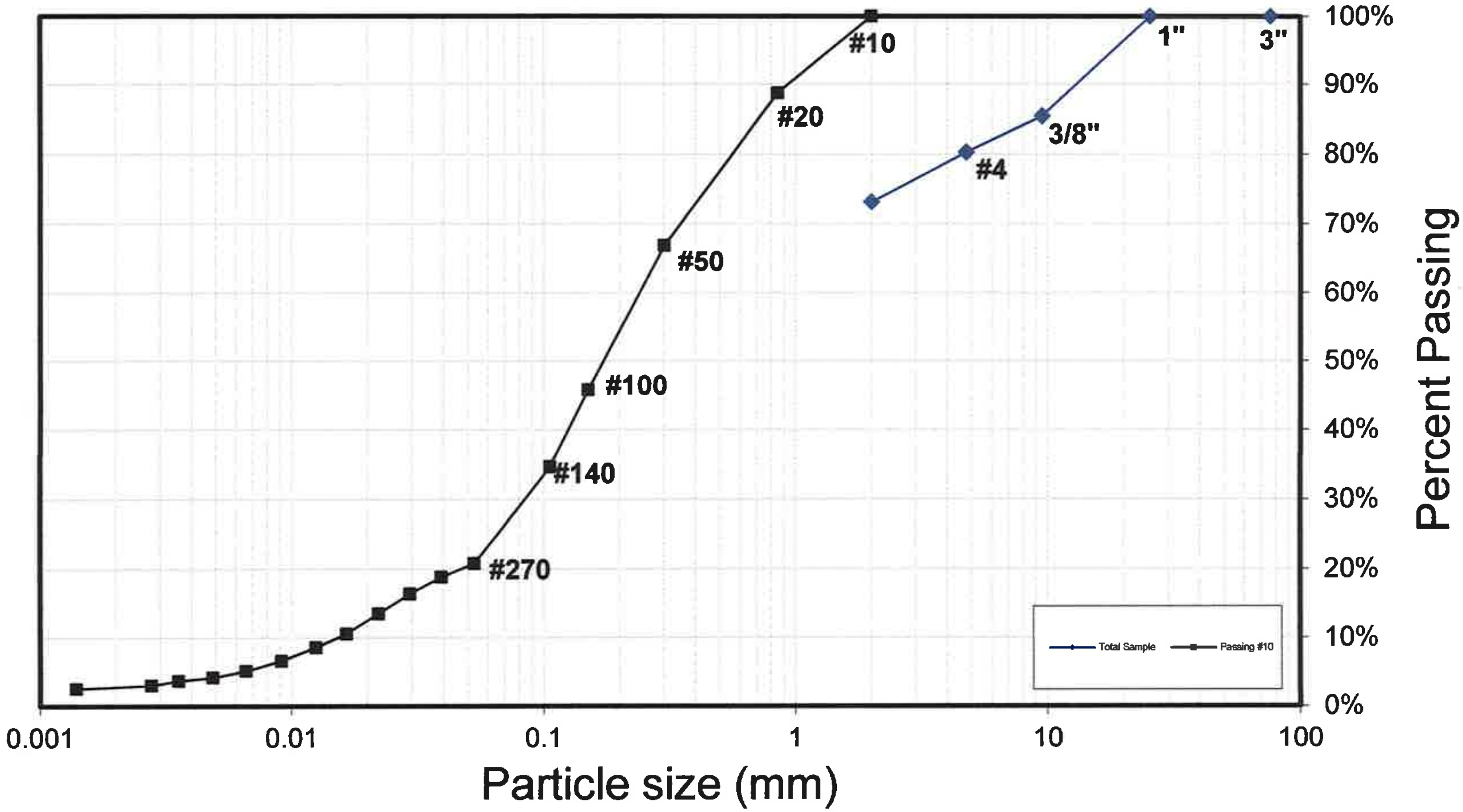
JOB #: OEL-1048-H-Pit 39
LOCATION: Pit 39 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/21/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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JOB #: OEL-1048-H-Pit 40
LOCATION: Pit 40 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/17/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	79.80%
# 4	4.75	68.76%
# 10	2	55.99%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	77.79%	
# 50	0.3	54.79%	
# 100	0.15	41.04%	
# 140	0.106	34.63%	
# 270	0.053	25.08%	

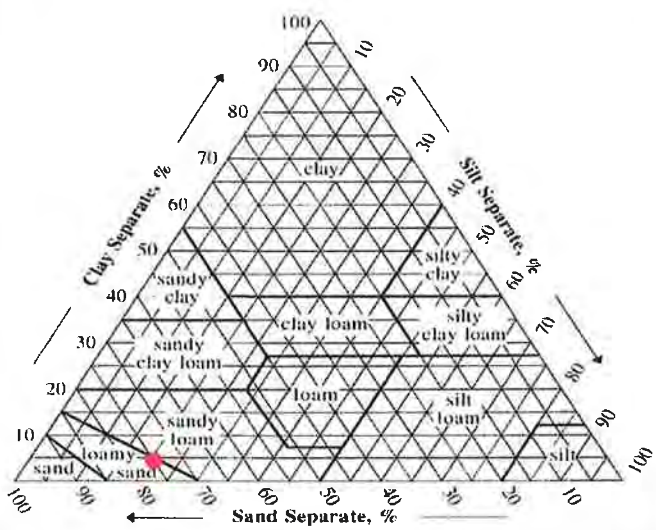
Hydrometer Analysis of Material Passing #270 Sieve

	0.05284	25.78%	SILT
	0.03867	24.17%	
	0.02910	20.94%	
	0.02196	17.12%	
	0.01631	13.89%	
	0.01222	12.08%	
	0.00892	9.66%	
	0.00699	7.25%	
	0.00393	4.83%	
	0.00321	4.23%	CLAY
	0.00142	3.22%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	74.92%
% Silt	20.85%
% Clay	4.23%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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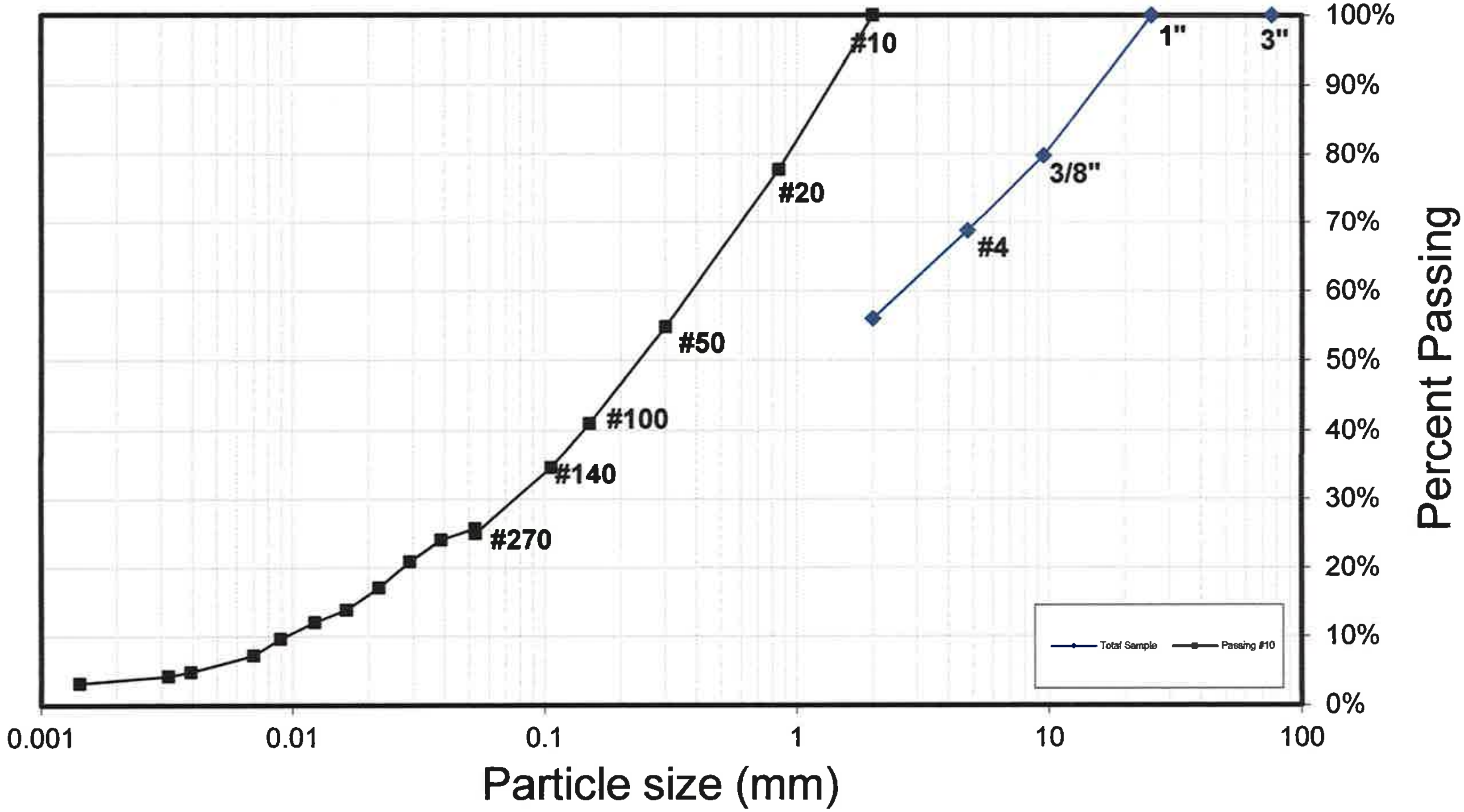
JOB #: OEL-1048-H-Pit 40
LOCATION: Pit 40 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/17/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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Tel: 508-946-9231 Fax: 508-947-8873

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JOB #: OEL-1048-H-Pit 41
LOCATION: Pit 41 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/18/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	81.54%
# 4	4.75	75.37%
# 10	2	68.04%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	85.91%	SAND
# 50	0.3	64.11%	SAND
# 100	0.15	48.61%	SAND
# 140	0.106	39.70%	SAND
# 270	0.053	27.98%	SAND

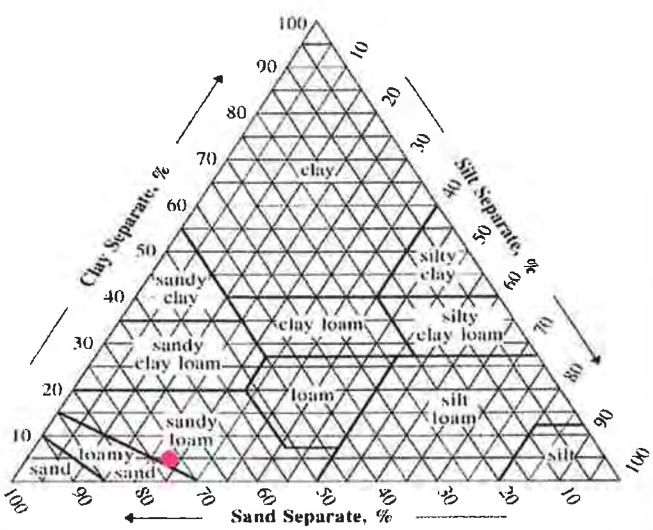
Hydrometer Analysis of Material Passing #270 Sieve

	0.04	26.56%	SILT
	0.03	23.46%	SILT
	0.02	20.14%	SILT
	0.02	16.60%	SILT
	0.00	54.44%	SILT
	0.01	10.84%	SILT
	0.01	8.41%	SILT
	0.00	7.30%	SILT
	0.00	5.31%	SILT
	0.00	4.64%	CLAY
	0.00	3.76%	CLAY

Triangle Classification of Material Passing the #10 Sieve

% Sand	72.02%
% Silt	23.34%
% Clay	4.64%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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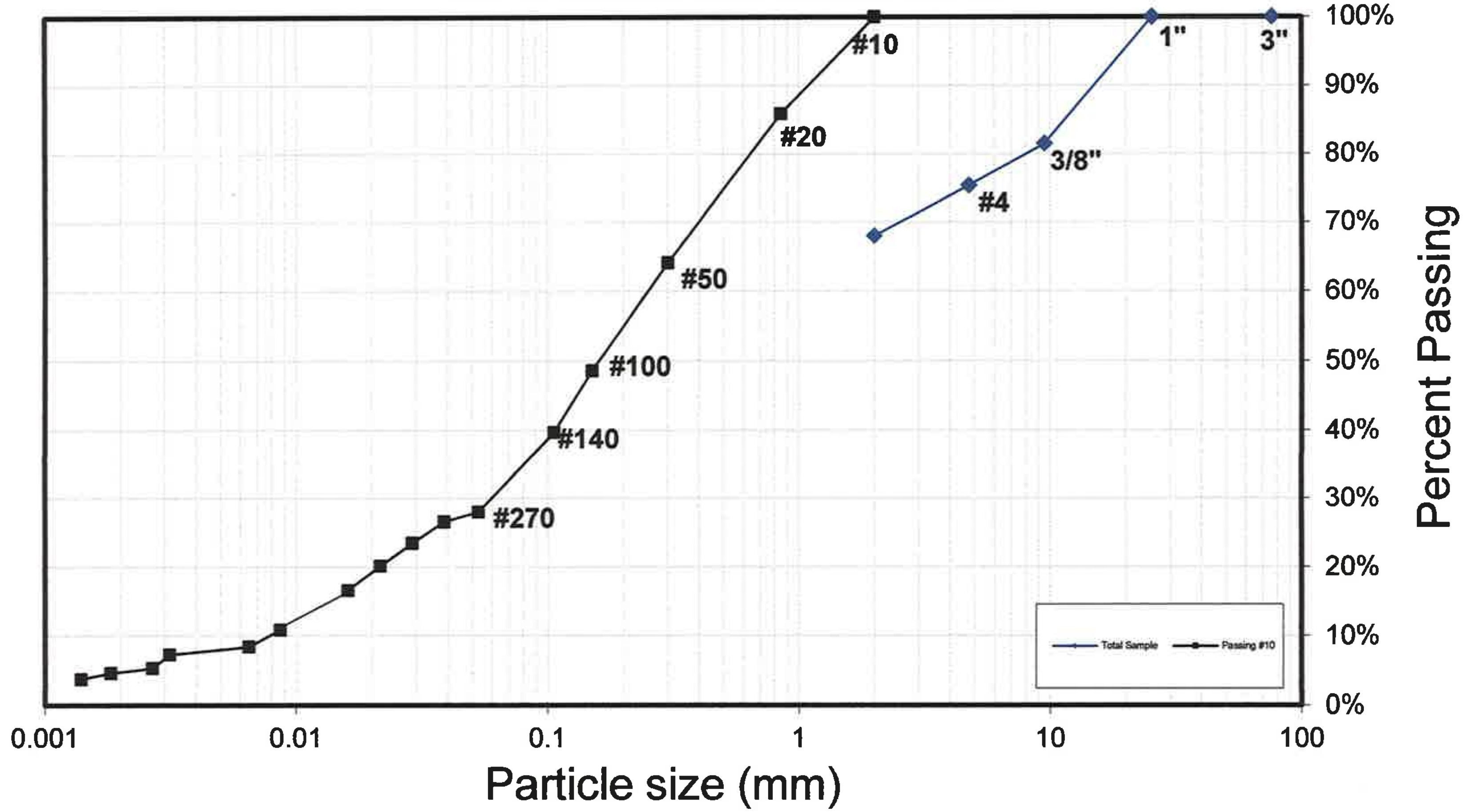
JOB #: OEL-1048-H-Pit 41
LOCATION: Pit 41 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/18/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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Tel: 508-946-9231 **Fax: 508-947-8873**

www.outback-eng.com

JOB #: OEL-1048-H-Pit 42
LOCATION: Pit 42 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/23/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	86.89%
# 4	4.75	80.25%
# 10	2	72.77%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	86.76%	
# 50	0.3	66.55%	
# 100	0.15	52.21%	
# 140	0.106	44.10%	
# 270	0.053	34.60%	

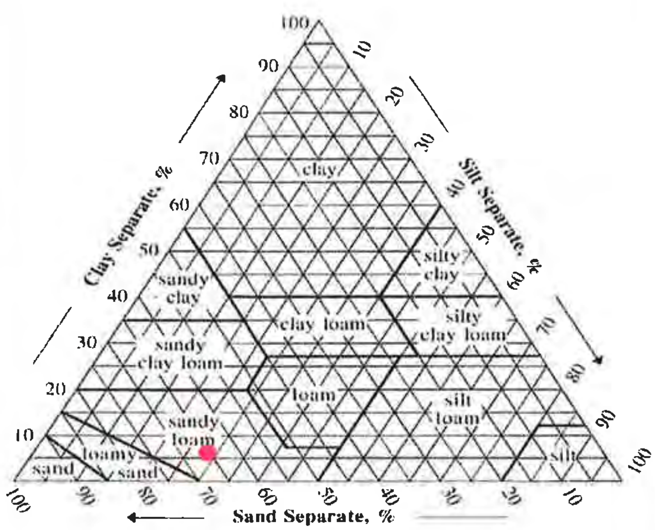
Hydrometer Analysis of Material Passing #270 Sieve

	0.0383	30.37%	SILT
	0.0287	26.88%	
	0.0215	22.90%	
	0.0159	19.42%	
	0.0119	16.93%	
	0.0088	13.19%	
	0.0063	8.96%	
	0.0040	7.71%	
	0.0035	6.97%	
	0.0027	5.97%	CLAY
	0.0003	4.23%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	**65.40%**
% Silt	**28.63%**
% Clay	**5.97%**

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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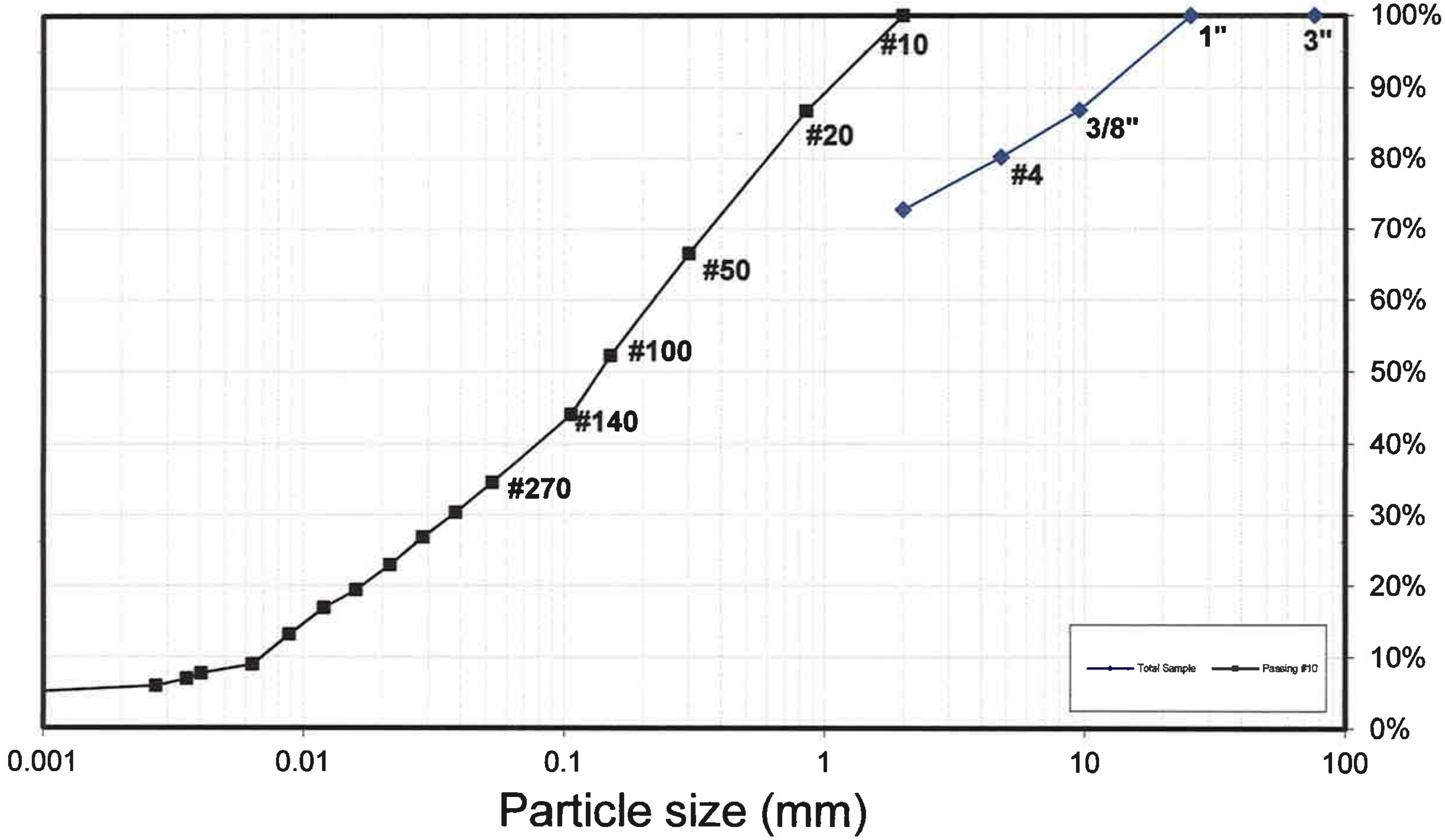
JOB #: OEL-1048-H-Pit 42
LOCATION: Pit 42 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/23/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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www.outback-eng.com

JOB #: OEL-1048-H-Pit 43
LOCATION: Pit 43 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/18/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	87.59%
# 4	4.75	81.28%
# 10	2	74.55%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	90.39%	
# 50	0.3	71.16%	
# 100	0.15	53.14%	
# 140	0.106	44.01%	
# 270	0.053	32.70%	

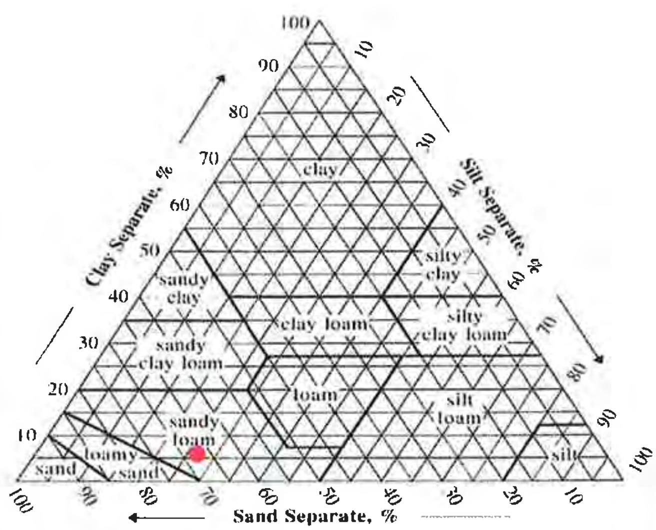
Hydrometer Analysis of Material Passing #270 Sieve

	0.0377	31.65%	SILT
	0.0281	28.39%	
	0.0210	24.62%	
	0.0157	20.60%	
	0.0118	17.84%	
	0.0087	14.82%	
	0.0066	12.06%	
	0.0050	9.29%	
	0.0031	6.53%	
	0.0027	5.77%	CLAY
	0.0014	4.02%	

Triangle Classification of Material Passing the #10 Sieve

% Sand	67.30%
% Silt	26.93%
% Clay	5.77%

Soil Texture Triangle



USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1. Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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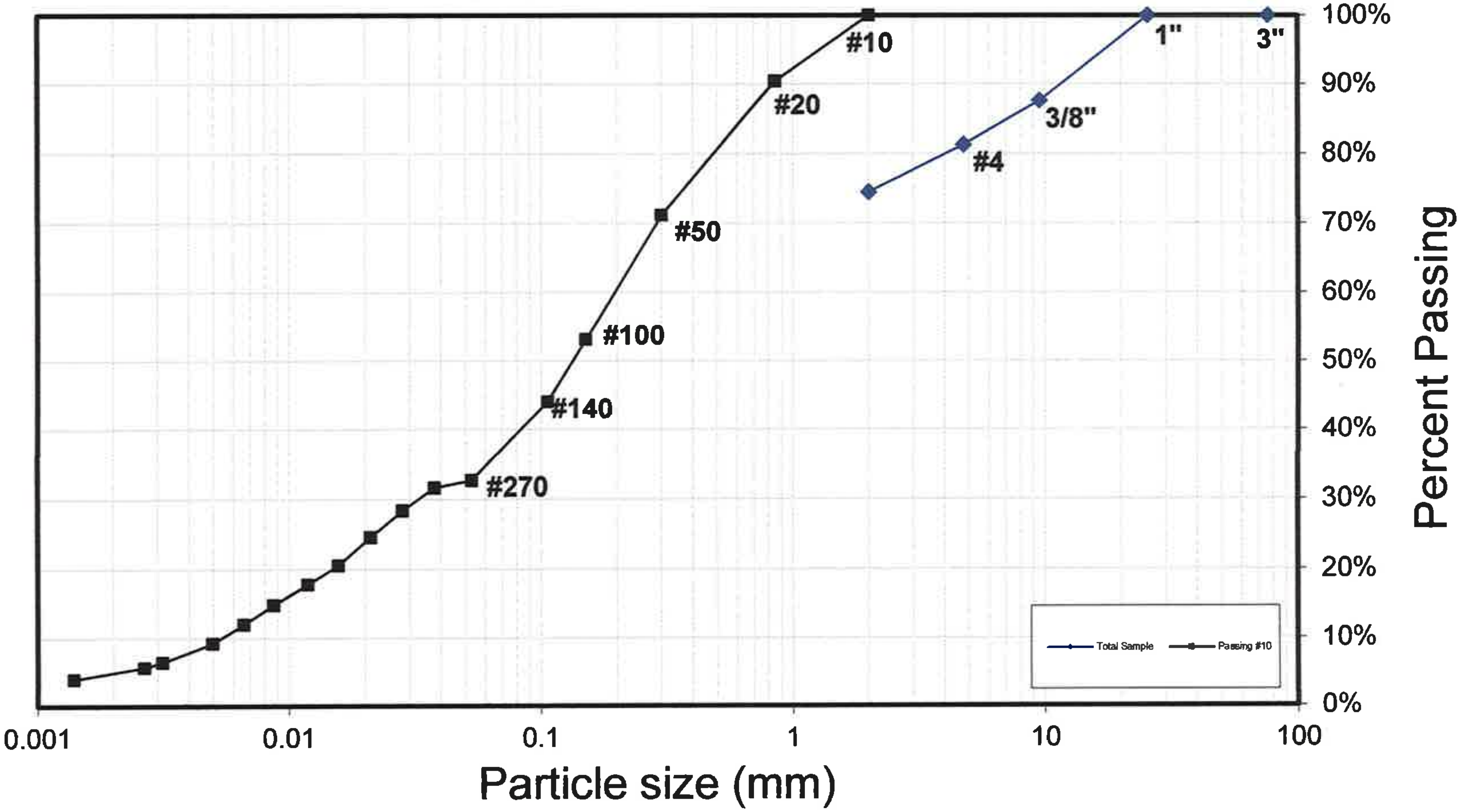
JOB #: OEL-1048-H-Pit 43
LOCATION: Pit 43 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/18/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



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www.outback-eng.com

JOB #: OEL-1048-H-Pit 44
LOCATION: Pit 44 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/22/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Title V Particle Size Analysis (Combined Sieve & Hydrometer) Report

Sieve Analysis of Total Sample

Sieve_No	Particle Diameter (mm):	Percent Passing (%):
3"	76.2	100.00%
1"	25.4	100.00%
3/8"	9.5	91.30%
# 4	4.75	85.02%
# 10	2	77.21%

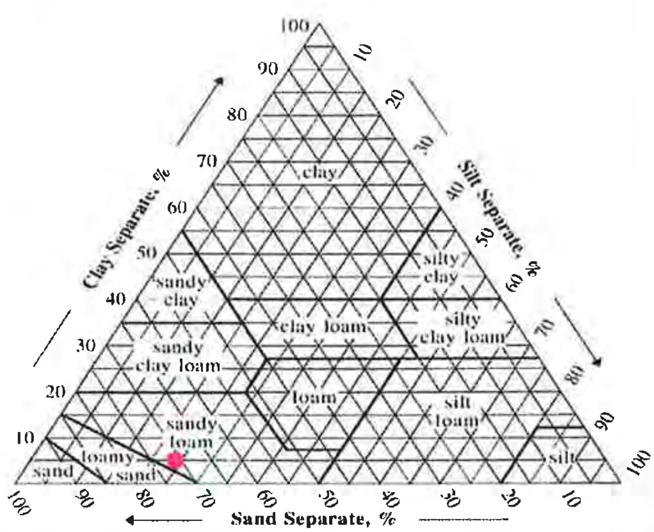
Triangle Classification of Material Passing the #10 Sieve

% Sand	70.89%
% Silt	24.18%
% Clay	4.93%

Sieve Analysis of Material Passing #10 Sieve

Sieve_No	Particle Diameter (mm):	Percent Passing (%):	
# 10	2	100.00%	SAND
# 20	0.85	86.19%	
# 50	0.3	65.90%	
# 100	0.15	49.42%	
# 140	0.106	41.47%	
# 270	0.053	29.11%	

Soil Texture Triangle



Hydrometer Analysis of Material Passing #270 Sieve

	0.05331	29.60%	SILT
	0.03865	28.22%	
	0.02867	25.37%	
	0.02146	21.61%	
	0.01607	17.38%	
	0.01222	14.09%	
	0.00892	11.27%	
	0.00647	8.92%	
	0.00475	7.05%	
	0.00275	4.93%	CLAY
	0.00139	3.99%	

USDA Soil Textural Triangle

Jason Youngquist, P.E.
Laboratory Supervisor

Particle Size Analysis Methodology taken from Gee and Bauder (1986) **Methods of Soil Analysis, Part 1, Physical and Mineralogical Methods, 2nd Edition** as specified in Appendix 2 of Mass DEP Policy #:BRP/DWM/PeP-P00-4; **Title 5 Alternative to Percolation Testing Policy for System Upgrades**

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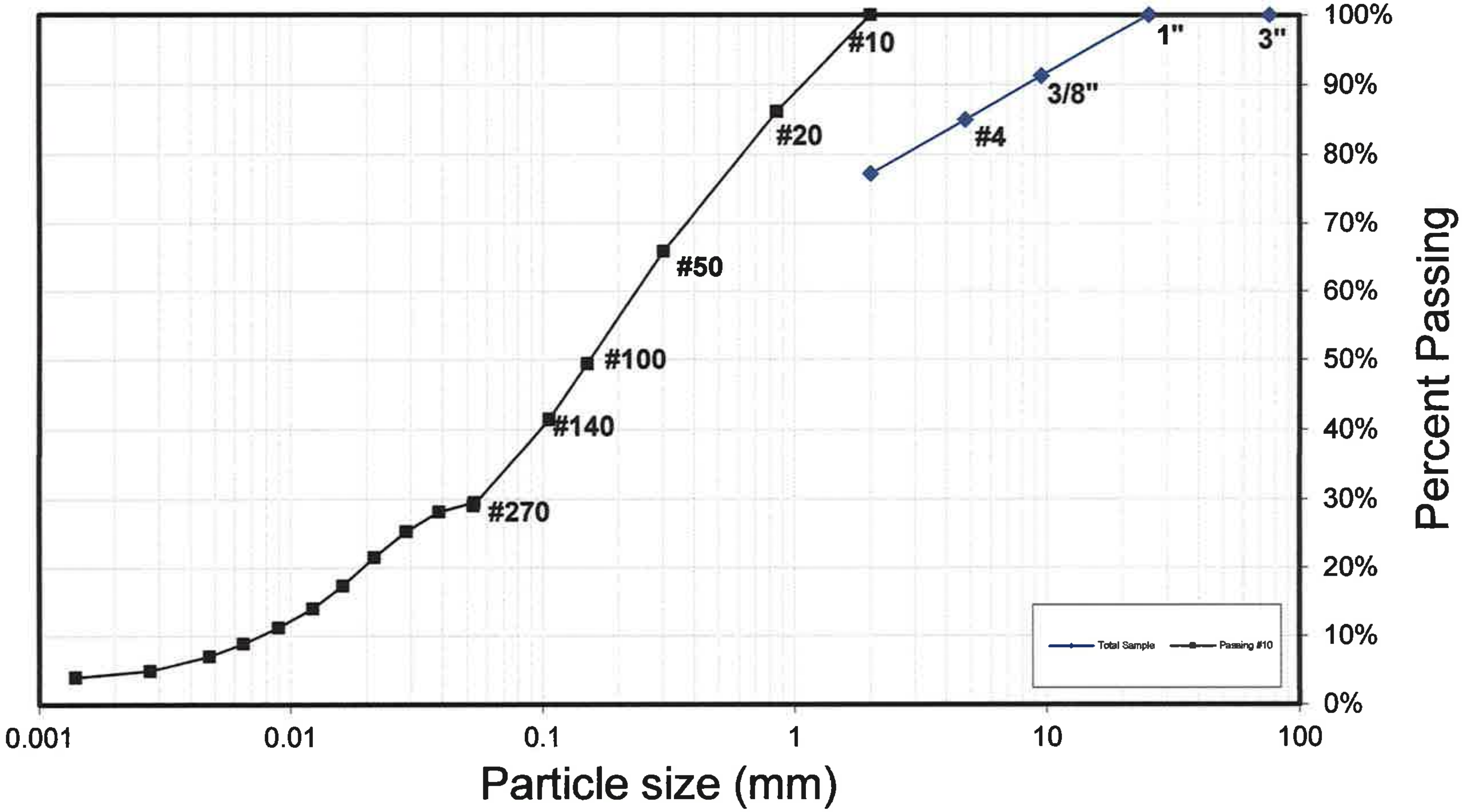
JOB #: OEL-1048-H-Pit 44
LOCATION: Pit 44 - Joanna Rd. Avon, MA
CLIENT: Stonebridge Homes

DATE: 10/22/2019
TEST BY: M.S.
CHECK BY: J.A.Y.

Soil Grainsize Distribution Curve



APPENDIX K: RIPRAP SIZING CALCULATIONS

Riprap Sizing Spreadsheet

Project No. 2019-002
Project: Joanna Hills Estates
Location: Joanna Road, Avon, MA
Date: March 6, 2020

Riprap is used for erosion control, to prevent scour, and to minimize sediment transport into wetland resource areas. A stable riprap rock size is desired. The Isbash equation computes the smallest diameter stone, D, having a specific gravity, S, that if dropped in water flowing at velocity, V, will settle and remain stationary.

$$D = V^2 / (2gC^2(S-1))$$

Where:

D: Median diameter of spherical stone or rock. Also known as D_{50}. (Meters)

C: Isbash Constant. C=0.86 for highly turbulent conditions or 1.2 for low turbulence conditions.

g: Acceleration due to gravity, 9.8066 m/s^2

S: Specific gravity of the riprap. Typically varies from 2.56 to 2.92 depending on the rock material. A commonly used value is 2.65.

V: Water velocity approaching the riprap (m/s). This is calculated using the 100-yr peak flow rate for the basin and dividing it by the area of the spillway at the peak elevation of the 100-yr storm.

Location	C	g (m/s^2)	S	Q_{100} (cfs)	A_{100} (ft^2)	V (ft/s)	V (m/s)	D (m)	D (Inches)
Outlet Basin A	0.86	9.81	2.65	0.07	0.25	0.28	0.09	0.00	0.01
Outlet Basin B	0.86	9.81	2.65	4.58	4.25	1.08	0.33	0.00	0.18
Outlet Basin C	0.86	9.81	2.65	4.19	4	1.05	0.32	0.00	0.17
Outlet Basin D	0.86	9.81	2.65	1.38	2	0.69	0.21	0.00	0.07
Outlet Basin E	0.86	9.81	2.65	4.27	4	1.07	0.33	0.00	0.17

Riprap Design Values		
D (Inches)	Weight (Kg)	Weight (lbs)
6	5	10
9	16	35
12	39	85
18	125	275
24	227	500

MassDOT specification M2.02.0 for Riprap requires a minimum weight of 50lb (25 kg)

APPENDIX L: TURF MANAGEMENT PLAN

TURF MANAGEMENT PLAN – LOT 10

The following is a guideline detailing proper turf management techniques, maintenance schedules, and tasks to be completed to reduce the amount of pollutants entering the stormwater system from turfed areas.

FERTILIZER

First Application: To establish final turf at the end of construction activities, phosphate-free organic nitrogen slow-release fertilizer should be used. Fertilizers should not be used within 100 feet of wetlands.

Semi-Annual Maintenance (Spring and Fall): Inspect turf for any bare soil or thin grass areas. Slow-release fertilizer should be applied where bare spots or thin areas are present to assist with the reestablishment of the turf. All fertilizer shall be kept in a wrapped or sealed container and stored at least 100 feet from the wetland at all times.

SEEDING

First Application: To establish final turf at the end of construction activities, a seed mix of 65% fine Fescue, 20% perennial ryegrass, and 15% Kentucky Bluegrass should be applied at a rate of 4-6 LBS/1000FT^2. Seeding should take place in late summer.

Semi-Annual Maintenance (Spring and Fall): Inspect turf for any bare soil or thin grass areas. Where bare spots or thin areas are present, over-seed the area(s) with the grass seed mix to allow for turf reestablishment.

MOWING

General Maintenance: Turf should be mowed as needed and shall be cut to a minimum of 3 inches in height. If at the time of mowing the grass clippings are less than 1 inch in height, grass clippings can be left on the turf to serve as a natural fertilizer. If grass clippings are collected, they shall be removed from the property and disposed of properly.

WATERING

Unscheduled Maintenance: An irrigation system shall be installed to ensure proper watering of the turf on site. The system should be equipped with a rain gauge to prevent the system from running after a recent rain storm.

PEST CONTROL

See the attached Integrated Pest Management Guide for guidelines on lawn care pest control.