STORMWATER REPORT

FOR

1060 MAIN STREET

MILLIS MA, 02054

PROPOSED MIXED-USE DEVELOPMENT

JULY 10, 2023

PREPARED BY:
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PREPARED FOR:
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VOLUME 1 OF 1

TABLE OF CONTENTS

INTRODUCTION

This report presents a description along with supporting calculations for the stormwater runoff treatment and mitigation systems proposed for the development as presented on a plan set entitled "1060 Main Street Millis, MA Site Plan" prepared by Legacy Engineering LLC with an original date of July 10, 2023. The development consists of the demolition of all existing buildings and the construction of a new multi-use building, along with all appurtenant parking areas, utilities, landscaped areas, and stormwater management facilities.

EXISTING SITE

The proposed development lies on the southerly side of Main Street in Millis, totaling approximately 1.01 acres. The site is fully developed with commercial buildings and parking lot.

SOILS

A series of test pits have been conducted across the site, which have generally confirmed the soils conditions described in the soils conservation service on-line soils website maps (see Attachment H). The soils conservation service maps indicate that the site is comprised of Urban Land (602), which does not have an identified soil classification. Based on the on-site testing, the calculations within this report use a Class A rating for all soils on the site.

GROUNDWATER CONDITIONS

On-site testing did not encounter any signs of groundwater in the test pits, which extended to a depth of 120" (Elev.142.9).

SOIL PERMEABILITY

For the purposes of this report and based on the soils present at the proposed stormwater infiltration facility, a Rawls rate for loamy sand (2.41 inches per hour) is used for infiltration related calculations.

FLOOD PLAIN

No portion of this site lies within a flood plain.

WETLAND PROTECTION ACT

The southern portion of the site lies within the outer riparian zone of an unnamed stream. A notice of intent will be filed with the conservation commission for the proposed redevelopment work.

PROPOSED REDEVELOPMENT

The proposed redevelopment consists of a new mixed-use building, along with associated driveways, landscape areas, utility systems, and stormwater management systems.

MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS

The stormwater management system design consists of a series of catch basins, manholes, and piping which collect runoff from the proposed development and the adjacent watersheds. These devices provide pretreatment prior to conveying stormwater into the various BMPs described herein. The stormwater management system is designed in accordance with the provisions of the DEP Stormwater Management Standards and Handbook, which are summarized below.

STANDARD 1 - New Stormwater Conveyances

No New Stormwater Conveyances (e.g. outfalls) May Discharge Untreated Stormwater Directly to or Cause Erosion in Wetlands or Waters of the Commonwealth. The proposed development complies with this standard.

The development includes three primary stormwater discharge points. Note the following:

- Design Point #1: Flow to Pleasant Street – Flow to this design point will be overland flow from a portion of the driveway in the southern portion of the site and from overflow of Infiltration Field #1. These flows will be over paved areas and will therefore not cause erosion.
- Design Point #2: Flow to 10 Pleasant Street – Flow to this design point consists of overflow from the existing infiltration field. The new field outlet will be provided with a level spreader to spread flows and reduce erosion.
- Design Point #3: Flow to 1052 Main Street – Flow to this design point consists of a small portion of landscaped area at the eastern edge of the property. Flows will be uncontrolled and greatly reduced in both rate and volume compared to the existing conditions.

STANDARD 2 – Peak Discharge Rates

Stormwater Management Systems shall be designed so that the Post-Development Peak Discharge Rates do not Exceed Pre-Development Peak Discharge Rates. The proposed development complies with this standard.

In order to model pre and post peak discharges, a program called Hydrocad was used, which employs the TR-20 modeling system. The DEP Stormwater Management regulations require that the 2- and 10-year storms should be considered for peak rates and the 100-year storm for flooding considerations. The Town of Millis also requires that the 1- and 50-year storm be analyzed. The following theoretical storm events were used to model the site before and after the proposed activities occur[1]:

Design Storm	Rainfall
1-Year	2.5 inches
2-Year	3.2 inches
10-Year	4.7 inches
50-Year	6.1 inches
100-Year	6.7 inches

DESIGN POINT #1: Flow to Pleasant Street

Description of Existing Conditions: In the existing condition, Watershed E1 represents uncontrolled overland flow from the portion of the site that fronts on Main and Pleasant Streets.

Description of Proposed Conditions: In the proposed condition, Watershed P1a represents the roof runoff from the proposed building. The runoff captured by First Defense Unit #2 is represented by Watershed P1b. These two watersheds have their runoff piped to the proposed infiltration field. Watershed P1c represents the uncontrolled runoff to Pleasant Street.

Summary of Peak Flow Rates to Design Point:

Design Storm (Year)	Peak Runoff Rate (cfs)		Volume of Runoff (ac-ft)	
	Existing	Proposed	Existing	Proposed
1	1.14	0.04	0.089	0.003
2	1.47	0.05	0.117	0.004
10	2.17	1.55	0.176	0.022
50	2.83	2.41	0.232	0.050
100	3.11	2.45	0.257	0.063

[1] Rainfall depths are as specified by MassDEP in Appendix F-1 of the Hydrology Handbook for Conservation Commissioners dated March 2002.

DESIGN POINT #2: Overland flow to 10 Pleasant Street

Description of Existing Conditions: In the existing condition, Watershed E2a represents the runoff from the rear paved portion of the site that is captured and treated by the existing infiltration field. Watershed E2b represents the uncontrolled runoff from the southern edge of the site.

Description of Proposed Conditions: In the proposed condition, Watershed P2a represents the runoff captured by First Defense Unit #1, and Watershed P1b represents runoff captured by the area drains surrounding the building. This runoff is piped to the existing infiltration field. Runoff from the southern edge of the property that flows uncontrolled to the abutter is represented by Watershed P2c.

Summary of Peak Flow Rates to Design Point:

Design Storm (Year)	Peak Runoff Rate (cfs)		Volume of Runoff (ac-ft)	
	Existing	Proposed	Existing	Proposed
1	0.00	0.00	0.000	0.000
2	0.00	0.00	0.000	0.000
10	0.35	0.34	0.010	0.033
50	2.44	0.95	0.045	0.073
100	2.84	1.21	0.061	0.091

DESIGN POINT #3: Overland flow to 1052 Main Street

Description of Existing Conditions: In the existing condition, Watershed E3 represents the uncontrolled runoff from the eastern edge of the site.

Description of Proposed Conditions: In the proposed condition, Watershed P3 represents the uncontrolled runoff from the eastern edge of the site.

Summary of Peak Flow Rates to Design Point:

Design Storm (Year)	Peak Runoff Rate (cfs)		Volume of Runoff (ac-ft)	
	Existing	Proposed	Existing	Proposed
1	0.03	0.00	0.002	0.000
2	0.04	0.00	0.003	0.000
10	0.05	0.00	0.005	0.001
50	0.07	0.01	0.008	0.002
100	0.09	0.02	0.010	0.003

STANDARD 3 - Loss of Annual Recharge

Loss of Annual Recharge to Groundwater shall be Eliminated or Minimized through the use of Environmentally Sensitive Site Design, Low Impact Development Techniques, Stormwater Best Management Practices, and Good Operation and Maintenance.

LID/ENVIRONMENTALLY SENSITIVE SITE DESIGN

The proposed stormwater system includes LID and environmentally sensitive site design. The techniques used for this site include :

- Reduced impervious area;
- No disturbance to wetland areas; and

RECHARGE CALCULATIONS AND METHODS

The DEP Stormwater Management Standards typically require that a minimum volume of runoff (Required Recharge Volume, Rv) be recharged on the site based on soils conditions in accordance with the following table:

	Class A Soils	Class B Soils	Class C Soils	Class D Soils
Runoff Depth (d) to be Recharged	d = 0.60 inches	d = 0.35 inches	d = 0.25 inches	d = 0.10 inches

The Required Recharge Volume is calculated by multiplying the runoff depth to be recharged (d) for each soils class by the amount of impervious coverage (on the site) under the proposed condition.

Infiltration Field #1

Recharge required (Rv)=(Impervious coverage)*(depth to be recharged)

	Class A Soils	Class B Soils	Class C Soils	Class D Soils
On-Site Impervious Area	15,243 s.f.	0 s.f.	0 s.f.	0 s.f.
Required Recharge Volume (Rv)	762 c.f.	0 c.f.	0 c.f.	0 c.f.
Total Rv	762 c.f.			

Standard 3 requires that infiltration facilities be provided and sized in accordance with three acceptable methods; 1) the Static Method, 2) The Simple Dynamic Method, and 3) the Dynamic Field Method. Each method is summarized below.

Static Method: The Static Method simply requires that the proposed recharge facility contain a total raw volume (adjusted for void space if stone is used within the storage volume) equal to or greater than the Required Recharge Volume.

Simple Dynamic Method: The Simple Dynamic method allows for a conservative inclusion of some of the recharge which occurs within the infiltration facility during the design storm in accordance with the following formula:

$V - kTA = V'$

Where

V is the Required Recharge Volume. If the infiltration facility also treats the Water Quality Volume, the greater of the two values is used.

k is the saturated hydraulic conductivity determined by the Rawls Rate (Table 2.3.3 of Volume 3, Chapter 1 of the Stormwater Handbook)

T is the allowable drawdown during the peak of the storm = 2 hours for this method

A is the basin bottom area

V' is the minimum required storage volume of the infiltration facility when including 2 hours of recharge

This method allows the designer to include two hours of ongoing recharge during the design storm using a permeability rate (saturated hydraulic conductivity) selected based on the classification of the soil under the infiltration facility.

Dynamic Field Method: The Dynamic Field Method uses a more aggressive inclusion of on-going recharge from an infiltration facility during the design storm. This method is calculated using rainfall routing software (Hydrocad) and a truncated hydrograph which assumes that the Required Recharge Volume is loaded to the infiltration facility during a 12 hour period. For this method the design permeability rate must be based on in-situ permeability testing with a safety factor of 50% applied to the actual rate found.

For this infiltration facility, the required storage volume is calculated using the Simple Dynamic method using the following values:

$V - kTA = V'$

V = 762 cubic feet (Rv)

K = 2.41 inches per hour = 0.20 feet per hour

T = 2 Hours

A = 1,168 square feet * 40% voids = 467 s.f.

762 cf – 0.20 ft/hr * 2 hr * 467 s.f. = 574 c.f.

Infiltration Field #1 has a storage volume of 601 c.f. below the lowest outlet, which meets this requirement.

A secondary check is required to ensure that the Rv will recharge within at least 72 hours. A K value of 2.41 is used for drawdown design purposes since soils testing found loamy sand soils at this location. Using the following formula, the drawdown time is calculated:

$Time_{drawdown}$ = [Rv/(K x Bottom Area)]

Where:

Rv = 762 c.f.

K = 2.41 inches per hour = 0.20 feet per hour

Bottom Area = 467 s.f.

It is concluded that the drawdown time for the infiltrated volume is 8.1 hours, which satisfies this requirement.

Mounding Analysis:

Based on soils testing at the field location, seasonal high groundwater under the infiltration field is below elevation 142.9. With a proposed bottom elevation of 149.50, the proposed field lies at least 6.6 feet above seasonal high groundwater. Thus, a mounding analysis is not required.

Existing Infiltration Field

Recharge required (Rv)=(Impervious coverage)*(depth to be recharged)

	Class A Soils	Class B Soils	Class C Soils	Class D Soils
On-Site Impervious Area	15,845 s.f.	0 s.f.	0 s.f.	0 s.f.
Required Recharge Volume (Rv)	792 c.f.	0 c.f.	0 c.f.	0 c.f.
Total Rv	792 c.f.			

For this infiltration facility, the required storage volume is calculated using the Simple Dynamic method using the following values:

V – kTA = V′

V = 792 cubic feet (Rv)
K = 2.41 inches per hour = 0.20 feet per hour
T = 2 Hours
A = 1,240 square feet * 40% voids = 496 s.f.

792 cf – 0.20 ft/hr * 2 hr * 496 s.f. = 593 c.f.

The existing infiltration field has a storage volume of 1,751 c.f. below the lowest outlet, which meets this requirement.

A secondary check is required to ensure that the Rv will recharge within at least 72 hours. A K value of 2.41 is used for drawdown design purposes since soils testing found loamy sand soils at this location. Using the following formula, the drawdown time is calculated:

$Time_{drawdown}$ = [Rv/(K x Bottom Area)]

Where:

Rv = 792 c.f.
K = 2.41 inches per hour = 0.20 feet per hour
Bottom Area = 496 s.f.

It is concluded that the drawdown time for the infiltrated volume is 8.0 hours, which satisfies this requirement.

Mounding Analysis:

A mounding analysis has been conducted and can be found in attachment L. The bottom of the existing infiltration field is approximately at elevation 144.2, with a seasonal high groundwater elevation below elevation 142.9 (the bottom of the test pit). The mound for the infiltration of the Rv of this field is 1.2 feet.

Capture Area Adjustment: All new impervious surfaces are routed through infiltration BMPs except for a small portion of driveway and walkways. A capture area adjustment is provided as follows:

- Total On-Site Impervious Coverage: 31,750 s.f.
- Treated Impervious Coverage: 31,088 s.f.
- Percent to Infiltration BMP: 97.9%
- Ratio: 1.02
- *Capture Area Adjusted Rv: 1,588 c.f.*

The infiltration fields recharge a total of 2,352 c.f. of stormwater, exceeding the adjusted Rv.

STANDARD 4 - TSS Removal

Stormwater Management Systems shall be Designed to Remove 80% of Average Annual Post-Construction Load of Total Suspended Solids (TSS). This standard is met when:

a) A long-term pollution prevention plan is provided and implemented as required (refer to Attachment A),
b) Structural stormwater BMP's are provided as required, and
c) Pretreatment is provided as required.

The proposed stormwater management system has been designed to provide a series of Best Management Practices in accordance with the Stormwater Management Policy to remove the pollutants found in runoff as described below for each drainage sub-system.

WATER QUALITY VOLUME (WQV)

The Water Quality Volume represents the volume of water which must receive TSS removal treatment in order to comply with Standard 4. The water quality volume is calculated based on either 0.5 inches of runoff or 1.0 inches of runoff from all impervious surfaces on the site. 0.5 inches is used except in sensitive locations as described in the Stormwater Handbook. Since this site does not discharge to a critical area, the WQV is based on 0.5 inches of runoff. The total WQV for the site is split amongst the various BMP treatment trains as described below (or may not apply if the specific BMP's utilized do not use it as a sizing criteria). Using the following formula, the WQV is calculated:

Infiltration Field #1
Required: WQV=(15,243 sq. ft.)*(0.5 in.)/(12 in/ft)=635 c.f.
Simple Dynamic Reduction: 635 cf – 0.20 ft/hr * 2 hr * 467 s.f. = 447 c.f.
Provided: 601 c.f.

Existing Infiltration Field
Required: WQV=(15,845 sq. ft.)*(0.5 in.)/(12 in/ft)=660 c.f.
Simple Dynamic Reduction: 660 cf – 0.20 ft/hr * 2 hr * 496 s.f. = 593 c.f.
Provided: 1,751 c.f.

A portion of the impervious surface on the site is not treated. As a redevelopment, stormwater is required to be treated only to the maximum extent practicable. In the proposed condition, 662 s.f. of impervious surface is not treated, which is a significant improvement over the existing conditions where 21,120 s.f. of impervious surface is not treated. It is not practicable to capture and treat all impervious runoff from the site.

PROPOSED BMP DESIGN

Deep Sump Catch Basins/Area Drains/First Defense Units:

All proposed deep sump catch basins have 4' sumps with hoods designed in accordance with the DEP Stormwater Handbook. Each structure represents one of the pretreatment BMP's in each treatment train and provides a 25% TSS removal credit. First defense units provide 80% TSS removal, information for which can be found in attachment M.

Underground Infiltration Systems:

Underground infiltration fields achieve 80% TSS removal when including a pretreatment facility. Pretreatment is not required when treating roof runoff.

TSS REMOVAL CALCULATIONS

In accordance with the DEP Stormwater Management Handbook, each of the drainage treatment trains has been analyzed for TSS removal. The required TSS removal calculation sheets are included in Attachment E and the following sections provide a narrative discussion of each.

Roof Runoff Infiltration Systems:

The existing and proposed infiltration fields are pretreated by First Defense Proprietary Treatment Units. When combined with the field itself, the total TSS removal is 80%, meeting this standard.

STANDARD 5 - Land Uses with Higher Potential Pollutant Loads

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

This development is not a Land Use with Higher Potential Pollutant Loads.

STANDARD 6 – Critical Areas

Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharge near or to any other critical area requires 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 area, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "stormwater discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone 1 or Zone A are prohibited unless essential to the operation of the public water supply.

This site does not lie within or discharge to a critical area.

STANDARD 7 - Redevelopment

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 structures 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. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The site is developed and is therefore subject to these standards to the maximum extent practicable. All standards are met except for Standard 4, an explanation for which can be found in the Standard 4 section of this report. The proposed conditions are overall a substantial improvement over existing conditions.

STANDARD 8 – Erosion Control

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 activity NPDES Stormwater Pollution Prevention Plan has been prepared and included as Attachment D.

STANDARD 9 – Long-Term Operations and Maintenance Plan

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

A Drainage System Operations and Maintenance Plan has been prepared and included as Attachment A.

STANDARD 10 – Illicit Discharge Compliance

All illicit discharges to the stormwater management system are prohibited.

See Attachment C for the Illicit Discharge Compliance Statement.

ATTACHMENT A: Operations and Maintenance Plan

Operations & Maintenance Plan

For

1060 Main Street

MILLIS MA, 02054

Proposed Mixed-Use development

July 10, 2023

PREPARED BY:
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PREPARED FOR:
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Dover, MA 02030

VOLUME 1 OF 1

TABLE OF CONTENTS

INTRODUCTION

This Operations and Maintenance Plan (hereinafter referred to "O&M Plan") is provided to ensure the long-term monitoring and maintenance of various components of the development's infrastructure. This O&M Plan includes the following provisions:

1. Stormwater System Operations and Maintenance
2. Integrated Pest Management Plan
3. Miscellaneous Provisions
4. Accidental Spill and Emergency Response Plan

The "Development" and the various components which are referenced in this O&M Plan are described on the site plan referenced below.

Project Name

1060 Main Street

Project Location

1060 Main Street
Millis, MA 02054

Operator Name and Address

1060 Main Street, LLC
10 Springdale Avenue
Dover, MA 02030

References

This O&M Plan references other documents as follows:

Site Plan - Plans entitled "1060 Main Street Millis, MA Site Plan" with an original date of July 10, 2023 (as may be amended), and prepared by Legacy Engineering LLC, hereinafter referred to as the "Site Plan".

Stormwater Report – Report entitled "Stormwater Report for 1060 Main Street" prepared by Legacy Engineering LLC with an original date of July 10, 2023 (as may be amended).

Site Description

The site consists of a proposed mixed-use building located on 1.01 acres of land on Main Street in Millis and includes all appurtenant utility systems, landscape areas, and stormwater management systems. Those land areas are collectively referred to herein as the "Development."

Site Usage and Activities

Mixed commercial and residential use building and associated appurtenances.

PART 1: STORMWATER SYSTEM OPERATIONS AND MAINTENANCE

In order to maximize the continued effectiveness of the Stormwater Management BMP's for the development, the following Operation and Maintenance requirements apply to all stormwater facilities within the extents of the Development. The stormwater facilities are depicted on the Site Plan and are hereinafter referred to as the "Stormwater Facilities."

Operations and Maintenance Responsibilities

The Operator or its designee shall be responsible for implementing all Operations and Maintenance (O&M) responsibilities.

Commencement of Operations and Maintenance Responsibilities

Operations and Maintenance tasks shall be commenced once each respective Stormwater Facility is fully constructed and is receiving runoff from the Development.

Operations and Maintenance Tasks

Deep Sump Catch Basins/Area Drains:

1. Deep sump catch basins and area drains shall be inspected daily during construction activities and all sediments and debris shall be removed four times per year unless the owner can determine through recorded observations that sediment accumulation does not warrant such frequent cleanings. If deep sump catch basin cleaning occurs less than four times per year, cleaning shall occur when two feet of sediments have accumulated in the sump and at least once per year.
2. Silt sacks shall be installed on all catch basins throughout the time of construction.
3. All sediments and hydrocarbons shall be disposed of off-site in accordance with all applicable local, state, and federal regulations.

Stormwater Treatment Units (shown on the Site Plan as "First Defense Units"): (maintenance tasks and frequency from manufacturer published data)

1. Stormwater Treatment units shall be inspected twice per year. Sediments and floating debris and petroleum products shall be removed with a vacuum truck when either the sediment depth reaches 6-inches or the floating depth of petroleum products reaches 3-inches. Sediment and floating debris removal shall occur at least once per year unless the Operator can demonstrate that sediment/floating debris accumulation does not achieve the thresholds noted above within a typical year. The Operator shall submit an analysis by a Registered Professional Engineer to the Planning Board explaining the basis for more infrequent cleaning.

2. All sediments and hydrocarbons shall be disposed of off-site in accordance with all applicable local, state, and federal regulations.

Underground Infiltration Field:

1. Perform all pretreatment BMP maintenance, structural and non-structural, as required herein.
2. Inspect the infiltration field at least twice per year, approximately 2-4 days after a rainfall event to ensure that water is not still in the field (as it should have infiltrated into underlying soils by then). Should the infiltration field fail to infiltrate water sufficiently, the field system shall be excavated and replaced in accordance with the original design.

Stormwater Pipes, Inlets and Outfalls:

1. All stormwater inlets and outfalls shall be inspected twice per year.
2. Trash, leaves, debris and sediment shall be removed from inlets and outfalls as needed to keep them free flowing.
3. If inspections indicate that stormwater pipelines have become partially obstructed with trash, leaves, debris or sediment, the pipelines shall be cleaned by water jet truck and the obstructions removed and disposed of.

The various operations and maintenance schedule requirements listed above may be reduced in frequency by approval from the Town. Should such permission be desired, the Operator shall provide documentation of actual on-site maintenance observations by a qualified source (engineer or other qualified person meeting the approval of the Town) demonstrating that the particular Stormwater BMP in question does not warrant the specified frequency of inspection or maintenance activities.

Reporting Requirements

The following documentation shall be submitted no later than December 31st of each calendar year to the Town:

1. A statement, signed by an authorized representative of the Operator indicating that the requirements of this O&M Plan were performed during the previous calendar year. Where requirements were not met, a schedule for their completion shall be provided and a follow-up statement submitted when complete.
2. A list of the maintenance activities performed along with the approximate date of the work.
3. A list of the inspections performed along with a statement by each inspector summarizing the results of the inspections performed in accordance with this O&M plan.
4. Copies of appurtenant documentation supporting the completion of the O&M responsibilities such as copies of contracts and/or receipts with parties engaged to perform maintenance and inspection services.
5. A notation regarding whether there has been any change in the name and or contact information for the Operator.

Public Safety Features

The stormwater system has been designed to safely collect surface runoff from developed areas (as described on the Site Plan and Stormwater Report) by providing collections systems at regular intervals to prevent surface flooding and to treat that runoff in accordance with the provisions of the Massachusetts Stormwater Management Standards and Handbook.

PART 2: INTEGRATED PEST MANAGEMENT PLAN

Applicability

The Development shall adhere to this IPM in perpetuity, unless the conservation Commission releases the Operator from this obligation in writing.

Lawn Preparation and Installation

The following methods shall be employed for all lawn installation and replacements.

- Topsoil installed in lawn areas shall be installed to a minimum thickness of 4-inches. Installation shall be in a manner that minimizes compaction of the topsoil. Topsoil should include a minimum organic content of 18% in the top 4-inches. In areas where existing topsoil is limited or non-existent due to bedrock or hardpan, 6-24 inches of sandy loam topsoil should be spread with a minimum 18% organic content in the top 6-inches.
- Topsoil shall be tested for pH, organic content and mineral content including calcium, magnesium, potassium and sodium at the time of installation and supplements shall be added as recommended. Lime shall be added at the rates recommended by the soil test lab to bring topsoil pH within recommended levels.
- Seeding shall include at least three of the following turf types: Fine Fescue, Kentucky Bluegrass, Perennial Rye Grass, and Tall Fescue.
- Fertilizer application at the time of seeding shall not exceed 0.5 pounds per 1,000 square feet and shall be either organic or mineral.
- During the period of turf establishment (1-2 seasons after seeding), up to two broadleaf weed control applications per year may be applied to the entire lawn area to encourage the establishment of the turf and prevent weed infestations.

Mechanical Lawn Care Standards

The following maintenance guidelines shall be generally applied to lawn care, although specific adherence to every standard is not necessary. Adherence to these mechanical lawn care standards will encourage the development of a thick, dense, and healthy turf system which will ultimately result in fewer Lawn Care Treatment requirements.

- Lawn cutting height should be adjusted according to the season using the following as guidance:
    - May – June: 2.5" Cut Height
    - July – August: 3-3.5" Cut Height
    - September: 2.5-3" Cut Height
    - October – November: 2" Cut Height

- Lawn mowing should be at sufficient frequency such that not more than 1/3 of the leaf blade height is cut off.
- Aerate the lawn generally once per year in the mid-summer to mid-fall period. A second aeration in the spring may be appropriate for compact soils conditions.
- Dethatching is generally not necessary unless the thatch layer exceed ¾".

Core Lawn Care Treatment Program

Each lawn shall adhere to the following lawn care practices and restrictions:

- A soil test shall be conducted at least once every two years to evaluate topsoil pH level and the necessary application of lime will be made to bring soil pH within recommended levels. Recommended topsoil pH levels are between 6.5 and 6.8. Soils testing shall also include organic content, mineral content, including calcium, magnesium, potassium and sodium, total cation exchange capacity, and hydrogen. Ideal base saturation percentages for these parameters are as follows:
    - Calcium: 68-70%
    - Magnesium: 15-20%
    - Potassium: 4.5-6%
    - Sodium: <3%
    - Other Bases: 4-8%
    - Hydrogen: 5-10%
- Fertilizer application shall be as-needed based on the results of the latest soils test, plant health, rooting characteristics, growth rate desired, and season. Fertilizer application shall not exceed five times per calendar year and the total quantity of fertilizer applied in any given year shall not result in the application of more than three pounds of nitrogen per 1,000 square feet with not more than one pound of nitrogen applied per 1,000 square feet in any single application. Nitrogen, in the form of fertilizer, should generally be applied in small increments to avoid nitrate leachate and runoff, undesired sprits in growth, and increase in pest population. Granular organic and/or organic/synthetic slow release fertilizers shall be used. The optimal use of fertilizers is to create an organic foundation for soil health and development which provides sufficient nutrients for controlled plant growth and avoiding subsurface and surface nutrient loss to groundwater or stormwater runoff.
- Except as noted below, only one application of crab-grass prevention product is permitted per year during March or April, and only in portions of the lawn in full sun which are prone to such infestations. The use of corn gluton (organic crab-grass control method) is permitted twice per year.
- At the time of fertilizer application, any accidental spillage onto impervious surfaces such as driveways, walkways, patios, and streets shall be swept up and either applied to the lawn or removed from the site.

Optional Maintenance Practices to be Applied as Needed

- Where topsoil testing demonstrates a deficiency, mineral or organic micro-nutrients may be added to achieve recommended levels.
- Generally, chemical pesticides should be used as a final option and the minimum amount necessary to achieve the desired result should be used. Non chemical means of pest control should be tried first. In the event of suspected pest problem, a visual inspection shall first be made by qualified personnel to confirm the presence of stressed vegetation, wildlife activity, pathogens, and other similar indicators. Should a pest problem be identified, the condition shall be monitored

periodically such that if the problem subsides, treatment methods can stop as soon as possible thereafter.

- Root bio-stimulants from organic sources (examples include Roots, Organica, or PHC type products, which are brand names and which may change depending on market conditions) may be used as needed.
- Compost topdressing (1/8" – ¼" depth) may be applied as needed.
- Spot treatment of weeds and Crabgrass may be implemented at any time as needed, but only on a spot-treatment basis and only to those areas affected.
- Spot treatment for turf disease may be implemented at any time as needed, but only one a spot-treatment basis and only to those areas affected.
- Grub control products and similar products may be applied to localized areas only where grub activity is evident. Grub control may be applied when grub populations reach an average of 8 -10 grubs per square foot or if the plant/lawns are showing signs of stress from grub activity.
- One application of Imidacloprid (Merit) or similar products per year is permitted during June and July in areas where grub activity has historically occurred.
- Pesticides which are classified for Restricted Use pursuant to 333 CMR may only be applied by properly licensed or certified personnel or by individuals under the direct on-site supervision of properly licensed or certified personnel in accordance with 333 CMR.

PART 3: MISCELLANEOUS PROVISIONS

Good Housekeeping Controls

The following good housekeeping measures will be implemented in the day-to-day operation of the Development:

1. The site will be maintained in a neat and orderly manner.
2. Fertilizers and pesticide application shall be in accordance with manufacturer recommendations.
3. All waste materials from the development will be collected in dumpsters and removed from the site by properly licensed disposal companies.

Management of Deicing Chemicals and Snow

Management of on-site snow will be as follows:

1. The site shall be plowed as needed to maintain safe driving conditions. Snow will be stored in windrows along pavement edges and shall be piled in landscape strips as needed.
2. Snow will not be plowed into piles which block or obstruct stormwater management facilities.
3. Snow will not be plowed into piles at roadway intersections such that it would obstruct visibility for entering or exiting vehicles.
4. Deicing chemicals application will be as little as possible while provide a safe environment for vehicular operation and function.
5. At such time as snow accumulations exceed the capacity of on-site storage areas, such excess snow shall be removed from the site and disposed of in accordance with state, local, and federal laws and regulations.

Operator Training

The Operator is responsible for providing training for the staff that will be responsible for the implementation of this O&M Plan. Such training shall occur at least once annually.

Illicit Discharges

The Operator shall not allow non-stormwater discharges into the development’s stormwater system. Any discovered non-stormwater discharges into the development’s stormwater system shall be immediately disconnected.

Estimated Operations and Maintenance Budget

It is estimated that the regular annual maintenance tasks described herein will cost $100 per year (2023 value).

PART 4: ACCIDENTAL SPILL AND EMERGENCY RESPONSE PLAN

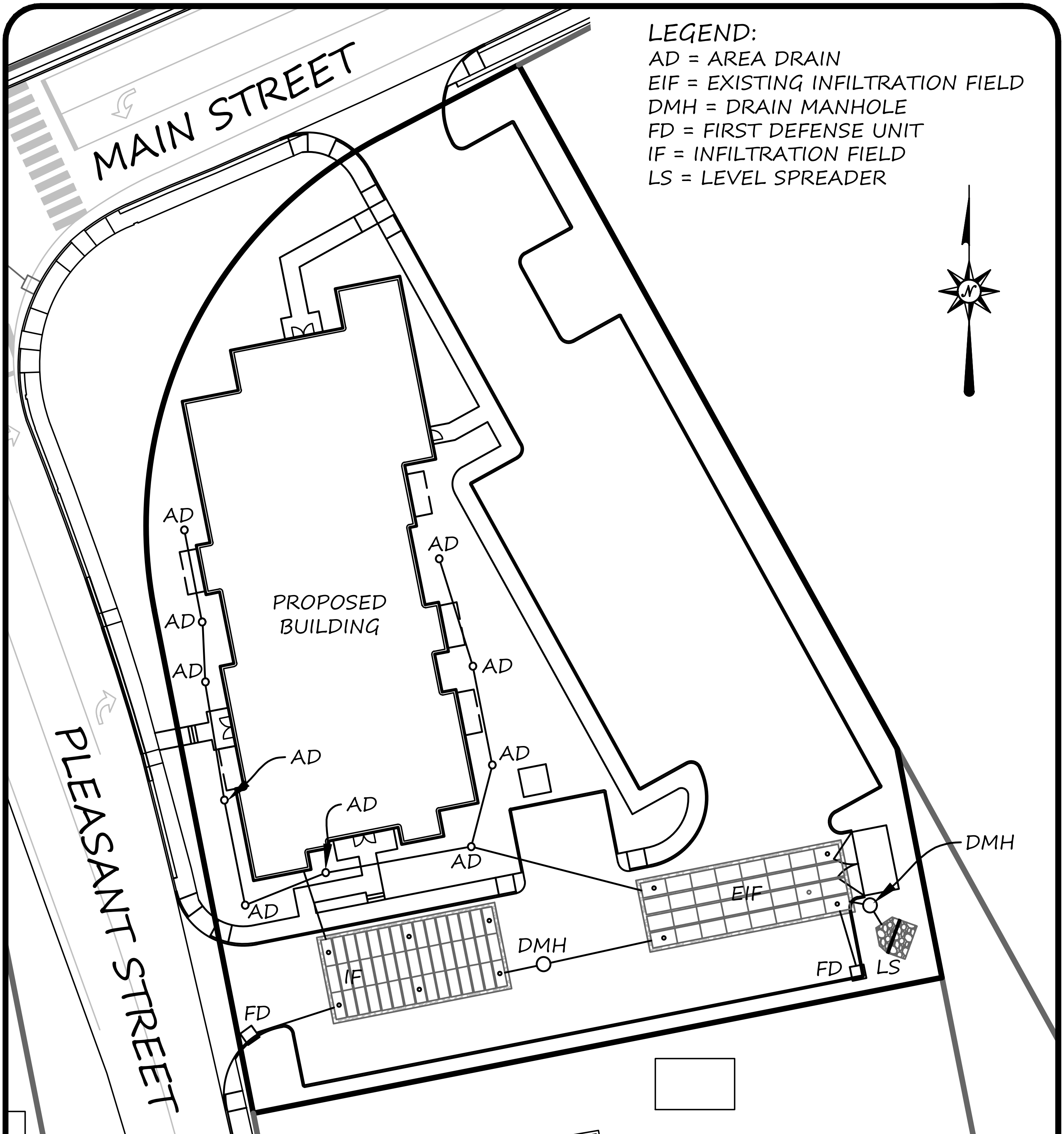
In the event of an accident within the boundaries of the Site, where significant gasoline or other petroleum products or other hazardous materials are released, the following procedure shall be followed in the order noted.

1. As quickly as possible, attempt to block the nearest stormwater catch basins if on a roadway, or if in proximity to wetlands, create a berm of soil downslope of the spill.
2. Immediately, and while the containment measures are implemented as described above, notify the following governmental entities and inform them of the type of spill that occurred:
   - Millis Fire Department at 508-376-2361,
   - Millis Board of Health at 508-376-7042,
   - Millis Conservation Commission at 508-376-7045,
   - Mass. Department of Environmental Protection (DEP) Central Region at (508) 792-7650 (address is 8 New Bond Street, Worcester, MA 01606), and
   - National Response Center (NRC) at (800) 424-8802 (for spills that require such notification pursuant to 40 CFR Part 110, 40 CFR Part 117, and 40 CR Part 302).
3. Once the various emergency response teams have arrived at the site and if the spill occurs on a lot, the owner shall follow the instructions of the various governmental entities, which may include the following:
   - A clean up firm may need to be immediately contacted.
   - If the hazardous materials have entered the stormwater system, portions of it may need to be cleaned and restored per the DEP. All such activities shall be as specified by the DEP.

Paul Mc Govern ______________________ 6/7/2023

Owner's Signature Date

EXHIBIT 1 STORMWATER FACILITIES SITE PLAN



730 MAIN STREET
SUITE 2C
MILLIS, MA 02054
508-376-8883(o)

SHEET 1 OF 1

LEGACY
ENGINEERING

1060 MAIN STREET
O&M
PLAN OF LAND
IN
MILLIS, MA

PLAN SCALE: 1"=40'

0' 40' 80'

REVISION	DATE

PLAN DATE: 2023-07-10

EXHIBIT 2 STORMWATER SYSTEM OPERATIONS AND MAINTENANCE LOG FORM

Stormwater System Operations and Maintenance Log

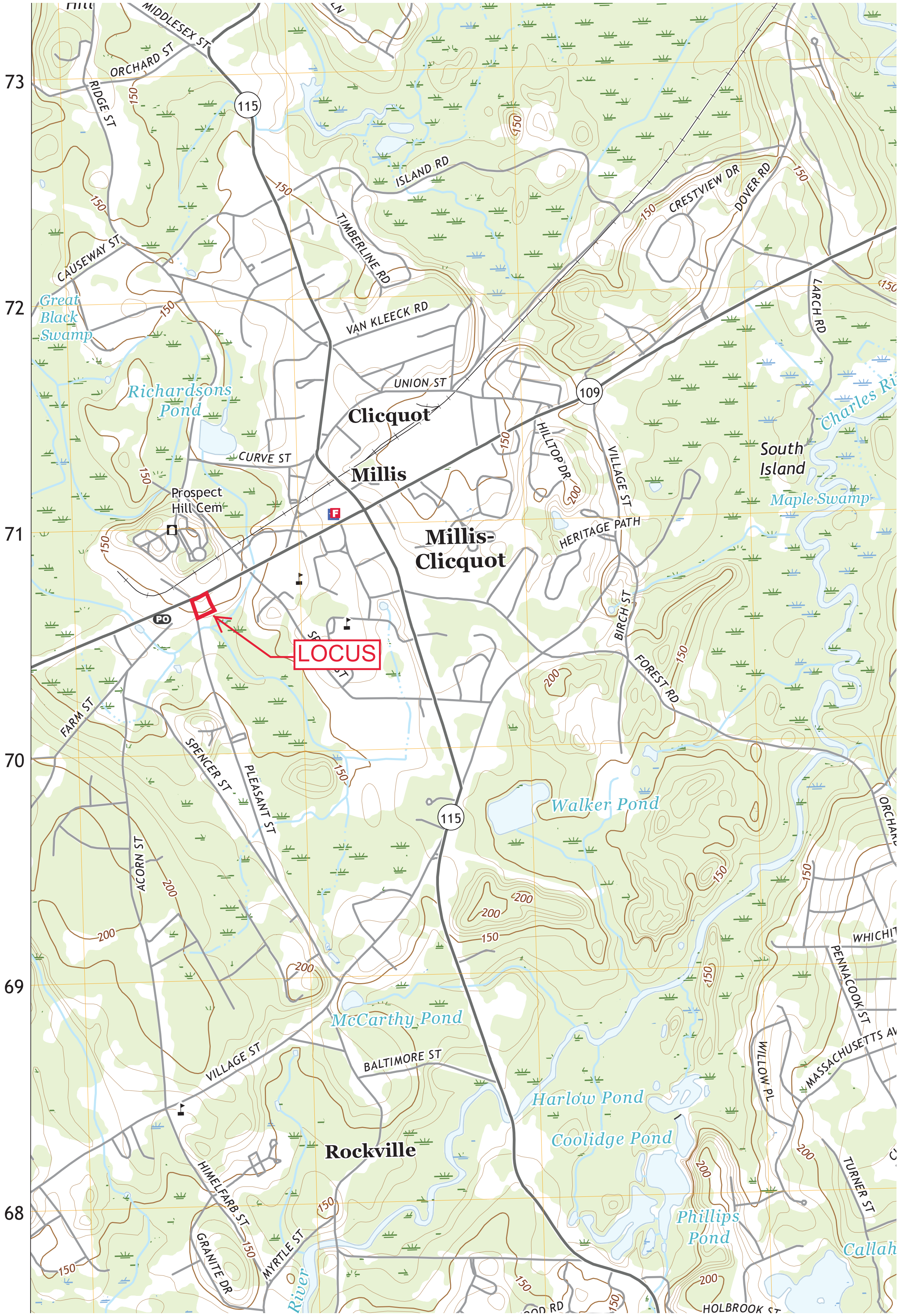
Year _______________

General Information	
Project Name	1060 Main Stret
Site Location	1060 Main Street, Millis Ma, 02054
Inspector's Name	
Inspector's Title	
Inspector's Phone	
Signature of Operator at end of Year, Certifying that Work was Completed as Noted. Date:	

O&M Task Checklist

	O&M Activity	Date Completed	Notes/Comments
Deep Sump Catch Basins/Area Drains			
	1st Quarter Cleanout		
	2nd Quarter Cleanout		
	3rd Quarter Cleanout		
	4th Quarter Cleanout		
First Defense Units			
	1st Inspection		
	2nd Inspection		
	Unit Cleaning		
Roof Runoff Infiltration System			
	1st Annual Inspection		
	2nd Annual inspection		
	System Repl. Req'd?		
Stormwater Pipes, Inlets and Outlets			
	1st Annual Inspection		
	2nd Annual inspection		

ATTACHMENT B: USGS Map



LOCUS
Clicquot
Millis
Millis-Clicquot
Rockville
South Island
Prospect Hill Cem
Great Black Swamp
Richardsons Pond
Maple Swamp
Charles Ri
Walker Pond
McCarthy Pond
Harlow Pond
Coolidge Pond
Phillips Pond
River
Callah
MIDDLESEX ST
ORCHARD ST
RIDGE ST
CAUSEWAY ST
ISLAND RD
TIMBERLINE RD
VAN KLEECK RD
UNION ST
CURVE ST
CRESTVIEW DR
DOVER RD
LARCH RD
HILLTOP DR
VILLAGE ST
HERITAGE PATH
BIRCH ST
FOREST RD
FARM ST
SPENCER ST
PLEASANT ST
ACORN ST
BALTIMORE ST
HIMELFARB ST
GRANITE DR
MYRTLE ST
WILLOW PL
PENNACOOK ST
MASSACHUSETTS AV
WHICHIT
ORCHARD
TURNER ST
HOLBROOK ST
115
109
PO
73
72
71
70
69
68
150
200

ATTACHMENT C: Illicit Discharge Compliance Statement

ILLICIT DISCHARGE COMPLIANCE STATEMENT

1060 Main Street
Millis, MA

This statement is provided in accordance with the provisions of the Massachusetts Stormwater Management Standard 10 and of the Massachusetts Stormwater Management Handbook.

Note the following:

- All stormwater management systems contain no connection to the site's wastewater sewer system or to any other non-stormwater collection system.
- Groundwater collection systems on the site are not connected to the site's wastewater sewer system or to any other non-stormwater collection system.
- The facility's Operations & Maintenance Plan is designed to prevent any discharge of non-stormwater to the drainage system.
- Any illicit discharges identified during or after construction will be immediately disconnected.

Paul Mc Govern 6/7/2023

Owner's Signature Date

ATTACHMENT D: Construction Activity NPDES Stormwater Pollution Prevention Plan

Stormwater Pollution Prevention Plan (SWPPP)

For Construction Activities At:

1060 Main Street
Millis, MA 02054
617-602-8153

SWPPP Prepared For:

1060 Main Street Realty LLC
Paul McGovern
10 Springdale Avenue
Dover, MA 02030
617-602-8153
paul@pgcminc.com

SWPPP Prepared By:

Legacy Engineering, LLC
730 Main Street, Suite 2C
Millis, MA 02054
508-376-8883
dan@legacy-ce.com

SWPPP Preparation Date:

07/10/2023

Estimated Project Dates:

Project Start Date: Insert Date

Project Completion Date: Insert Date

Contents

SECTION 1: CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 Operator(s) / Subcontractor(s)

Operator(s):

1060 Main Street Realty LLC
Paul McGovern
10 Springdale Avenue
Dover, MA 02030
617-602-8153
paul@pgcminc.com
Insert area of control (if more than one operator at site)

[Repeat as necessary.]

Subcontractor(s):

To Be Determined Prior to Construction
Insert Name
Insert Address
Insert City, State, Zip Code
Insert Telephone Number
Insert Fax/Email
Insert area of control (if more than one operator at site)

[Repeat as necessary.]

Emergency 24-Hour Contact:

To Be Determined Prior to Construction
Insert Name
Insert Telephone Number

1.2 Stormwater Team

Stormwater Team

Name and/or Position, and Contact	Responsibilities	I Have Completed Training Required by CGP Part 6.2	I Have Read the CGP and Understand the Applicable Requirements
Daniel Merrikin, P.E. President 508-376-8883 dan@legacy-ce.com	Design of stormwater controls	☒ Yes ☐ No	☒ Yes Date: 3/1/2022
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Inspections of stormwater controls	☐ Yes ☒ No	☐ Yes Date: Click here to enter a date.
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Installation, maintenance and/or repair of stormwater controls. Taking corrective actions	☐ Yes ☒ No	☐ Yes Date: Click here to enter a date.

[Insert or delete rows as necessary.]

Stormwater Team Members Who Conduct Inspections Pursuant to CGP Part 4

Name and/or Position and Contact	Training(s) Received	Date Training(s) Completed	If Training is a Non-EPA Training, Confirm that it Satisfies the Minimum Elements of CGP Part 6.3.b
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Insert Title of Training Received	Date: Click here to enter a date.	☐ Principles and practices of erosion and sediment control and pollution prevention practices at construction sites ☐ Proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites ☐ Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Insert Title of Training Received	Date: Click here to enter a date.	☐ Principles and practices of erosion and sediment control and pollution prevention practices at construction sites ☐ Proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites ☐ Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4
Insert Name of Responsible Person Insert Position Insert Telephone Number Insert Email	Insert Title of Training Received	Date: Click here to enter a date.	☐ Principles and practices of erosion and sediment control and pollution prevention practices at construction sites ☐ Proper installation and maintenance of erosion and sediment controls and pollution prevention practices used at construction sites ☐ Performance of inspections, including the proper completion of required reports and documentation, consistent with the requirements of Part 4

[Insert or delete rows as necessary.]

SECTION 2: SITE EVALUATION, ASSESSMENT, AND PLANNING

2.1 Project/Site Information

Project Name and Address

Project/Site Name: 1060 Main Street
Street/Location: 1060 Main Street
City: Millis
State: MA
ZIP Code: 02054
County or Similar Government Division: Norfolk

Project Latitude/Longitude

Latitude: 42.1636° N
(decimal degrees)

Longitude: - 71.3660 ° W
(decimal degrees)

Latitude/longitude data source: ☒ Map ☐ GPS ☐ Other (please specify):
____

Horizontal Reference Datum: ☐ NAD 27 ☒ NAD 83 ☐ WGS 84

Additional Site Information

Is your site located on Indian country lands, or on a property of religious or cultural significance to an Indian Tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian Tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian Tribe associated with the property: Not applicable

2.2 Discharge Information

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☒ Yes ☐ No

Are there any waters of the U.S. within 50 feet of your project's earth disturbances? ☐ Yes ☒ No

For each point of discharge, provide a point of discharge ID (a unique 3-digit ID, e.g., 001, 002), the name of the first receiving water that receives stormwater directly from the point of discharge and/or from the MS4 that the point of discharge discharges to, and the following receiving water information, if applicable:

Point of Discharge ID	Name of receiving water that receives stormwater discharge:	Is the receiving water impaired (on the CWA 303(d) list)?	If yes, list the pollutants that are causing the impairment:	Has a TMDL been completed for this receiving waterbody?	If yes, list TMDL Name and ID:	Pollutant(s) for which there is a TMDL:	Is this receiving water designated as a Tier 2, Tier 2.5, or Tier 3 water?	If yes, specify which Tier (2, 2.5, or 3)?
[001]	Great Black Swamp	☐ Yes ☒ No		☐ Yes ☒ No			☐ Yes ☒ No	
[002]	Richardson's Pond	☐ Yes ☒ No		☐ Yes ☒ No			☐ Yes ☒ No	
[003]	Unidentified Water	☐ Yes ☒ No		☐ Yes ☒ No			☐ Yes ☒ No	
[004]	Insert Text Here	☐ Yes ☐ No		☐ Yes ☐ No			☐ Yes ☐ No	[INSERT "Tier 2", "Tier 2.5", or "Tier 3"]
[005]	Insert Text Here	☐ Yes ☐ No		☐ Yes ☐ No			☐ Yes ☐ No	[INSERT "Tier 2", "Tier 2.5", or "Tier 3"]
[006]	Insert Text Here	☐ Yes ☐ No		☐ Yes ☐ No			☐ Yes ☐ No	[INSERT "Tier 2", "Tier 2.5", or "Tier 3"]

[Include additional rows or delete as necessary.]

2.3 Nature of the Construction Activities

General Description of Project

Provide a general description of the nature of your construction activities, including the age or dates of past renovations for structures that are undergoing demolition:

Demolition of an existing building (built in 1960) and the construction of a multi-use building along with associated driveways, parking areas, landscaped areas, utilities, and stormwater treatment facilities.

If you are conducting earth-disturbing activities in response to a public emergency, document the cause of the public emergency *(e.g., mud slides, earthquake, extreme flooding conditions, widespread disruption in essential public services)*, information substantiating its occurrence *(e.g., State disaster declaration or similar State or local declaration)*, and a description of the construction necessary to reestablish affected public services:

- The work is not related to a public emergency

Business days and hours for the project: Monday through Saturday, 7:00 am to 6:00 pm

Size of Construction Site

Size of Property	1.01 acres
Total Area Expected to be Disturbed by Construction Activities	1.0 acre
Maximum Area Expected to be Disturbed at Any One Time, Including On-site and Off-site Construction Support Areas	1.0 acre

[Repeat as necessary for individual project phases.]

Type of Construction Site *(check all that apply):*

☐ Single-Family Residential ☒ Multi-Family Residential ☒ Commercial ☐ Industrial

☐ Institutional ☐ Highway or Road ☐ Utility ☐ Other ____________________________

Will you be discharging dewatering water from your site? ☐ Yes ☒ No

If yes, will you be discharging dewatering water from a current or former Federal or State remediation site? ☐ Yes ☒ No

Pollutant-Generating Activities

List and describe all pollutant-generating activities and indicate for each activity the associated pollutants or pollutant constituents that could be discharged in stormwater from your construction site. Take into account where potential spills and leaks could occur that contribute pollutants to stormwater discharges, and any known hazardous or toxic substances, such as PCBs and asbestos, that will be disturbed during construction.

Pollutant-Generating Activity (e.g., paving operations; concrete, paint, and stucco washout and waste disposal; solid waste storage and disposal; and dewatering operations)	**Pollutants or Pollutant Constituents** (e.g., sediment, fertilizers, pesticides, paints, caulks, sealants, fluorescent light ballasts, contaminated substrates, solvents, fuels)
Paving operations	Asphalt
Concrete washout	Concrete byproducts
Solid waste storage and disposal	Solid waste, trash, construction debris, etc..

[Include additional rows or delete as necessary.]

Construction Support Activities *(only provide if applicable)*

Describe any construction support activities for the project (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas):

1. Equipment staging yards, including construction equipment (trucks, excavators, rollers, etc..)
2. Material storage areas, including site-related construction materials (pipes, manholes, fittings, etc…) and building related materials (concrete, wood, lumber, trim, siding, steel, roofing materials, etc…), and
3. Earthen materials stockpiles, including items like soil, crushed stone, sand, general fill, topsoil, etc…

Contact information for construction support activity:
To be Determined
Insert Telephone No.
Insert Email
Insert Address And/Or Latitude/Longitude

[Repeat as necessary.]

2.4 Sequence and Estimated Dates of Construction Activities

Phase I

Insert General Discription of Phase	
Estimated Start Date of Construction Activities for this Phase	Insert Estimated Date
Estimated End Date of Construction Activities for this Phase	Insert Estimated Date
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	Insert Estimated Date *[Add additional dates as necessary]*
Estimated Date(s) when Stormwater Controls will be Removed	Insert Estimated Date *[Add additional dates as necessary]*

Phase II

Insert General Discription of Phase	
Estimated Start Date of Construction Activities for this Phase	Insert Estimated Date
Estimated End Date of Construction Activities for this Phase	Insert Estimated Date
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	Insert Estimated Date *[Add additional dates as necessary]*
Estimated Date(s) when Stormwater Controls will be Removed	Insert Estimated Date *[Add additional dates as necessary]*

[Repeat as needed.]

2.5 Authorized Non-Stormwater Discharges

List of Authorized Non-Stormwater Discharges Present at the Site

Authorized Non-Stormwater Discharge	**Will or May Occur at Your Site?**
Discharges from emergency fire-fighting activities	☐ Yes ☒ No
Fire hydrant flushings	☒ Yes ☐ No
Landscape irrigation	☒ Yes ☐ No
Water used to wash vehicles and equipment	☐ Yes ☒ No
Water used to control dust	☒ Yes ☐ No
Potable water including uncontaminated water line flushings	☒ Yes ☐ No
External building washdown (soaps/solvents are not used and external surfaces do not contain hazardous substances)	☒ Yes ☐ No
Pavement wash waters	☐ Yes ☒ No
Uncontaminated air conditioning or compressor condensate	☒ Yes ☐ No
Uncontaminated, non-turbid discharges of ground water or spring water	☒ Yes ☐ No
Foundation or footing drains	☒ Yes ☐ No
Uncontaminated construction dewatering water	☒ Yes ☐ No

(Note: You are required to identify the likely locations of these authorized non-stormwater discharges on your site map. See Section 2.6, below, of this SWPPP Template.)

2.6 *Site Maps*

The project "Site Maps" are comprised of a variety of documents which cumulatively contain the information required by the SWPPP. These documents include the full detailed site or subdivision plans ("site plan") (as applicable) and the stormwater report (if applicable).

SECTION 3: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

3.1 *Endangered Species Protection*

Eligibility Criterion
Following the process outlined in Appendix D, under which criterion are you eligible for coverage under this permit?

☒ **Criterion A**: No ESA-listed species and/or designated critical habitat present in action area. Using the process outlined in Appendix D of the CGP, you certify that ESA-listed species and designated critical habitat(s) under the jurisdiction of the USFWS or NMFS are not likely to occur in your site's "action area" as defined in Appendix A of the CGP. *Please Note: NMFS' jurisdiction includes ESA-listed marine and estuarine species that spawn in inland rivers.*

☒ Check to confirm you have provided documentation in your SWPPP as required by CGP Appendix D (Note: reliance on State resources is not acceptable; see CGP Appendix D).

Documentation: See Appendix K

3.2 *Historic Property Screening Process*

Appendix E, Step 1
Do you plan on installing any stormwater controls that require subsurface earth disturbance, including, but not limited to, any of the following stormwater controls at your site? Check all that apply below, and proceed to Appendix E, Step 2.

☐ Dike

☐ Berm

☒ Catch Basin

☐ Pond

☐ Constructed Site Drainage Feature (e.g., ditch, trench, perimeter drain, swale, etc.)

☐ Culvert

☐ Channel

☒ Other type of ground-disturbing stormwater control: Infiltration Field

(Note: If you will not be installing any subsurface earth-disturbing stormwater controls, no further documentation is required for Section 3.2 of the Template.)

Appendix E, Step 2

If you answered yes in Step 1, have prior professional cultural resource surveys or other evaluations determined that historic properties do not exist, or have prior disturbances at the site have precluded the existence of historic properties? ☐ YES ☒ NO

- If yes, no further documentation is required for Section 3.2 of the Template and you may provide the prior documentation in your SWPPP.
  - Not applicable.
- If no, proceed to Appendix E, Step 3.

Appendix E, Step 3

If you answered no in Step 2, have you determined that your installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties? ☒ YES ☐ NO

- If yes, provide documentation of the basis for your determination.
  - A search on the MA Historical Commission website did not return any results for the site.
- If no, proceed to Appendix E, Step 4.

3.3 Safe Drinking Water Act Underground Injection Control Requirements

Do you plan to install any of the following controls? Check all that apply below.

☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☒ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow

☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

Construction-stage erosion controls do not include the items noted above.

SECTION 4: EROSION AND SEDIMENT CONTROLS AND DEWATERING PRACTICES

4.1 Natural Buffers or Equivalent Sediment Controls

Buffer Compliance Alternatives

Are there any receiving waters within 50 feet of your project's earth disturbances? ☐ YES ☒ NO

(Note: If no, no further documentation is required for Section 4.1 in the SWPPP Template. Continue to Section 4.2.)

4.2 Perimeter Controls

General

- Perimeter erosion and sediment control barriers will be provided, installed, and maintained downstream of all proposed construction activities in accordance with this Plan, the Site Plan, and all permits issued for the site development. Such controls must be installed before any earth-disturbing activities occur on the site in question. Erosion and sediment controls may be installed in phases so long as it precedes any earth-disturbing activities within the controls' upstream watershed.

- The proposed perimeter erosion controls will provide adequate protection. The ends of the perimeter controls shall extend upslope at a 45-degree angle to prevent stormwater from circumnavigating the edge of the perimeter control. After a storm event, erosion controls are to be extended where evidence of circumventing or undercutting of the perimeter control is found.
- Sediment shall be removed along such controls on a regular basis. In no case, shall sediment be allowed to reach a depth equal to one half of the above ground height of the erosion control device.

Specific Perimeter Controls

Compost Sock & Orange Snow Fence	
Description: Compost sock & orange snow fence	
Installation	Insert approximate date of installation
Maintenance Requirements	Remove sediment before it has accumulated to one-half of the above-ground height of any perimeter control. After a storm event, if there is evidence of stormwater circumventing or undercutting the perimeter control, extend controls and/or repair undercut areas to fix the problem.
Design Specifications	Refer to details on Site Plan

[Repeat as needed for individual perimeter controls.]

4.3 Sediment Track-Out

General

- Construction vehicles will use designated entry points for each site. Crushed stone or rip-rap entry/construction apron(s) will be installed and properly maintained during construction until the site is paved. All construction access will be via the construction entrances noted on the Site Plan. At construction entrances and in their general vicinity, existing roads will be kept clean and swept as needed to minimize the tracking of soils and dust from the site.

Specific Track-Out Controls

Construction Entrance	
Description: Crushed stone or rip-rap construction entrance	
Installation	Insert approximate date of installation
Maintenance Requirements	Where sediment has been tracked-out from your site onto paved roads, sidewalks, or other paved areas outside of your site, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. You are prohibited from hosing or sweeping tracked-out sediment into any constructed or natural site drainage feature, storm drain inlet, or receiving water.

Construction Entrance	
Design Specifications	Refer to details on Site Plan

[Repeat as needed for individual track-out controls.]

4.4 Stockpiles or Land Clearing Debris Piles Comprised of Sediment or Soil

General

- Soil stockpiles to be left in place more than 24 hours shall be surrounded with a line of compost sock to prevent the piles from eroding into the site and to discourage on-site runoff from eroding the stockpiles. Soil stockpiles to be left in place more than 14 days shall be stabilized temporarily in accordance with this temporary stabilization provisions of this plan. Dust control measures shall be implemented to prevent wind erosion of the stockpiles.

Specific Stockpile Controls

Stockpile Perimeter Controls	
Description: Compost sock around stockpile area	
Installation	As Needed
Maintenance Requirements	Secure stockpiles to prevent erosion during rainfall events that may impact wetland resource areas. You are prohibited from hosing down or sweeping soil or sediment accumulated on pavement or other impervious surfaces into any constructed or natural site drainage feature, storm drain inlet, or receiving water.
Design Specifications	Refer to details on Site Plan

[Repeat as needed for individual stockpile controls.]

4.5 Minimize Dust

General

- Dust control measures will be implemented regularly to prevent the off-site deposition of wind-eroded soils. The principal form of dust control will be water application.

Specific Dust Controls

Water Application	
Description: Use of a water truck to spray down dry areas of disturbed ground to prevent dust generation.	
Installation	As Needed
Maintenance Requirements	Apply as needed to prevent dust generation
Design Specifications	Water truck on-site

[Repeat as needed for individual dust controls.]

4.6 Minimize Steep Slope Disturbances

General

- Contractors must pay careful attention to steep slopes and must implement additional temporary erosion and sediment control measures during work on steep slopes to prevent erosion.

Specific Steep Slope Controls

Erosion Control Blankets	
Description: Installation of erosion control blankets	
Installation	As Needed
Maintenance Requirements	Replace or reinforce as needed to prevent erosion.
Design Specifications	New England Wetland Plants, Inc. ECS-2B or equal

Hydroseed	
Description: Hydroseed with tackifier	
Installation	Insert approximate date of installation
Maintenance Requirements	Ensure vegetation growth and supplement with additional hydroseed as needed.
Design Specifications	Slope control mix

[Repeat as needed for individual steep slope controls.]

4.7 Topsoil

General

- Topsoil generated from the site construction activities must either be stockpiled for reuse on site in accordance with the practices noted above, or shall be removed from the site for reuse on other sites. Topsoil may not be mixed with general fill.

Specific Topsoil Controls

Preserve Topsoil	
Description: Stockpile all topsoil from work areas and reuse on site or truck off-site for use on other sites.	
Installation	As Needed
Maintenance Requirements	None
Design Specifications	None

[Repeat as needed for individual topsoil controls.]

4.8 Soil Compaction

General

- Areas designated for final vegetative surfaces or construction-stage or final stormwater infiltration practices shall be protected from excessive compaction by restricting vehicle access and the types of equipment that may be used in such areas.

Specific Soil Compaction Controls

Access Restrictions	
Description: Prevent access by vehicles to areas that will be vegetated or used for stormwater infiltration once rough grading is complete.	
Installation	Various
Maintenance Requirements	Prevent vehicular access to affected areas
Design Specifications	None

Soil Conditioning	
Description: Prior to seeding/planting of such areas, exposed soil that has been compacted shall be loosened by tilling or other similar methods. Conditioning shall consist of deep tilling with a rotary tiller, disc harrowing, or manual loosening and re-grading with an excavator bucket. Conditioning shall extend to a depth of at least 12-inches.	
Installation	Insert approximate date of installation
Maintenance Requirements	Once conditioned, prevent re-compaction by excluding vehicular access
Design Specifications	None

[Repeat as needed for individual soil compaction controls.]

4.9 Storm Drain Inlets

General

- All storm drain system inlets inside of perimeter controls shall be protected with sediment control measures designed to remove sediment from stormwater prior to entering the inlet. Catch basins along the street frontage shall also be protected.

Specific Storm Drain Inlet Controls

Silt Sack	
Description: Install silt socks in downstream catch basin grates	
Installation	Insert approximate date of installation
Maintenance Requirements	Clean, or remove and replace, the inlet protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.
Design Specifications	Siltsack or equal

[Repeat as needed for individual storm drain inlet controls.]

4.10 Constructed Site Drainage Feature

General

- Where appropriate, temporary sediment traps will be installed at stormwater collection points. Each trap will include a rip-rap outlet apron to prevent discharge erosion.

Specific Constructed Site Drainage Features

Temporary Sediment Trap	
Description: Where shown on the site plan or where determined appropriate in the field, provide temporary sediment traps to collect and control construction-stage stormwater runoff.	
Installation	Insert approximate date of installation
Maintenance Requirements	Periodically inspect and remove accumulated sediments as needed to prevent the discharge of sediment from the traps. Remove accumulated sediment to maintain at least one-half of the design capacity and conduct all other appropriate maintenance to ensure the basin or impoundment remains in effective operating condition
Design Specifications	Refer to Site Plan

[Repeat as needed for individual constructed site drainage features.]

4.11 Sediment Basins or Similar Impoundments

General

- Where appropriate, temporary sediment traps will be installed at stormwater collection points. Each trap will include a rip-rap outlet apron to prevent discharge erosion.

Specific Sediment Basin Controls

Temporary Sediment Trap	
Description: Where shown on the site plan or where determined appropriate in the field, provide temporary sediment traps to collect and control construction-stage stormwater runoff.	
Installation	Insert approximate date of installation
Maintenance Requirements	Periodically inspect and remove accumulated sediments as needed to prevent the discharge of sediment from the traps. Remove accumulated sediment to maintain at least one-half of the design capacity and conduct all other appropriate maintenance to ensure the basin or impoundment remains in effective operating condition
Design Specifications	Refer to Site Plan

[Repeat as needed for individual sediment basin controls.]

4.12 Chemical Treatment

Soil Types

List all the soil types including soil types expected to be exposed during construction in areas of the project that will drain to chemical treatment systems and those expected to be found in fill material:

- Not applicable. No chemical treatment expected.

Treatment Chemicals

List all treatment chemicals that will be used at the site and explain why these chemicals are suited to the soil characteristics:

- Not applicable

Describe the dosage of all treatment chemicals you will use at the site or the methodology you will use to determine dosage:

- Not applicable

Provide information from any applicable Safety Data Sheets (SDS):

- Not applicable

Describe how each of the chemicals will be stored consistent with CGP Part 2.2.13c:

- Not applicable

Include references to applicable State or local requirements affecting the use of treatment chemicals, and copies of applicable manufacturer's specifications regarding the use of your specific treatment chemicals and/or chemical treatment systems:

- Not applicable

Special Controls for Cationic Treatment Chemicals (if applicable)
If the applicable EPA Regional Office authorized you to use cationic treatment chemicals, include the official EPA authorization letter or other communication, and identify the specific controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to a discharge that does not meet water quality standards:

- Not applicable

Schematic Drawings of Stormwater Controls/Chemical Treatment Systems
Provide schematic drawings of any chemically-enhanced stormwater controls or chemical treatment systems to be used for application of treatment chemicals:

- Not applicable

Training
Describe the training that personnel who handle and apply chemicals have received prior to permit coverage, or will receive prior to the use of treatment chemicals:

- Not applicable

4.13 Dewatering Practices

General

- Dewatering is not expected to be needed. However, should dewatering be required, it will be pumped into a temporary dewatering pit or designated dewatering area to prevent any discharge of dewatering water to receiving waters. Should the discharge of dewatering waters to receiving waters be required, the requirements of section 2.4 and 3.0 of the CGP shall be adhered to, including required testing and reporting.

Specific Dewatering Practices

Temporary Dewatering Pit	
Description: Construction of temporary dewatering pit of suitable size and volume to contain anticipated dewatering volume. The pit can be excavated or can be created by the installation of earthen berms to create a containment area.	
Installation	Insert approximate date of installation
Maintenance Requirements	Maintain volume of temporary area as needed to contain discharge volume. For backwash water, either haul it away for disposal or return it to the beginning of the treatment process; replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.
Design Specifications	None

[Repeat as needed for individual dewatering practices.]

4.14 Other Stormwater Controls

General

- None. Not applicable.

4.15 Site Stabilization

Total Amount of Land Disturbance Occurring at Any One Time

☒ *Five Acres or less*

☐ *More than Five Acres*

Use this template box if you are not located in an arid, semi-arid, or drought-stricken area and are not discharging to a sediment- or nutrient-impaired water or Tier 2, Tier 2.5, or Tier 3 water.

Temporary Vegetative Site Stabilization	
☒ *Vegetative* ☐ *Non-Vegetative* ☐ *Temporary* ☐ *Permanent*	
Description: ▪ Where seeded for temporary erosion control purposes, a minimum of 6 pounds per 1,000 square feet of seed will be applied along with an appropriate fertilizer (based on the time of year applied) or as necessary to obtain a 70% vegetative cover. Additional seeding will be completed if needed and periodic watering will also be employed if necessary. Where stabilization by the 14th day is precluded by snow cover, frozen ground conditions, or other similar circumstances, stabilization measures will be initiated as soon as practicable. ▪ For disturbed areas less than 5 acres, initiate within 14 days of completion of work and complete stabilization within 14 days of the initiation of stabilization measures.	
Installation	Insert approximate date of installation
Completion	Insert approximate completion date
Maintenance Requirements	Water periodically as needed to maintain vegetative cover
Design Specifications	Native grass seed mixture

Temporary Non-Vegetative Site Stabilization	
☐ *Vegetative* ☒ *Non-Vegetative* ☐ *Temporary* ☐ *Permanent*	
Description: ▪ Apply erosion control blankets, mulch, straw or stump grindings to disturbed areas. ▪ For disturbed areas less than 5 acres, initiate within 14 days of completion of work and complete stabilization within 14 days of the initiation of stabilization measures.	
Installation	Insert approximate date of installation
Completion	Insert approximate completion date

Temporary Non-Vegetative Site Stabilization	
Maintenance Requirements	Maintain to ensure effective stabilization control
Design Specifications	Wood mulch, erosion control blankets, straw, and/or stump grindings.

Final Site Stabilization	
☒ *Vegetative* ☒ *Non-Vegetative* ☐ *Temporary* ☒ *Permanent*	
Description: ▪ Final site stabilization per the site plan including lawn and landscape areas, pavement, walkways and other final site features. ▪ For disturbed areas less than 5 acres, initiate within 14 days of completion of work and complete stabilization within 14 days of the initiation of stabilization measures.	
Installation	Insert approximate date of installation
Completion	Insert approximate completion date
Maintenance Requirements	None
Design Specifications	Refer to site plan

[Repeat as needed for additional stabilization practices.]

Use this template box if unforeseen circumstances have delayed the initiation and/or completion of vegetative stabilization. Note: You will not be able to include this information in your initial SWPPP. If you are affected by circumstances such as those described in CGP Part 2.2.14.b.ii, you will need to modify your SWPPP to include this information.

Insert name of site stabilization practice	
☐ *Vegetative* ☐ *Non-Vegetative* ☐ *Temporary* ☐ *Permanent*	
Description: ▪ Insert description of stabilization practice to be installed ▪ Note how design will meet requirements of Part 2.2.14.b.ii	
Justification	Insert description of circumstances that prevent you from meeting the deadlines required in CGP CGP Parts 2.2.14.a
Installation and completion schedule	**Vegetative Measures:** Describe the schedule you will follow for initiating and completing vegetative stabilization ▪ Approximate installation date: Insert approximate date ▪ Approximate completion date: Insert the approximate date
	Non-Vegetative Measures: *(Must be completed within 14 days of the cessation of construction if disturbing 5 acres or less; within 7 days if disturbing more than 5 acres)* ▪ Approximate installation date: Insert the approximate date ▪ Approximate completion date: Insert the approximate date
Maintenance Requirements	Insert maintenance requirements for the stabilization practice

Insert name of site stabilization practice	
Design Specifications	Include copies of design specifications here

[Repeat as needed for additional stabilization practices.]

SECTION 5: POLLUTION PREVENTION CONTROLS

5.1 Potential Sources of Pollution

Construction Site Pollutants

Insert text or use table below: To be determined at the time of construction

Pollutant-Generating Activity	**Pollutants or Pollutant Constituents** (That could be discharged if exposed to stormwater)	**Location on Site** (Or reference SWPPP site map where this is shown)

[Include additional rows as necessary.]

5.2 Spill Prevention and Response

(This portion of the document is written as if giving instructions to parties working on the property and/or the owner of the property)

In the event of an accident where significant gasoline or other petroleum products are released, the following procedure shall be followed in the order noted.

- ✓ Seek to contain the spill by constructing a berm of earthen or other materials around the spill site until the appropriate emergency response personnel has arrived. Seek to seal off any downstream stormwater facilities by earthen berms or the emergency spill kit materials.
- ✓ Immediately notify the following governmental entities and inform them of the type of spill that occurred:
    - o Millis Fire Department at 508-376-2361,
    - o Millis Board of Health at 508-376-7042,
    - o Millis Conservation Commission at 508-376-7045,
    - o Mass. Department of Environmental Protection (DEP) Central Region at (508) 792-7650 (address is 8 New Bond Street, Worcester, MA 01606), and
    - o National Response Center (NRC) at (800) 424-8802 (for spills that require such notification pursuant to 40 CFR Part 110, 40 CFR Part 117, and 40 CR Part 302).
- ✓ Once the various emergency response teams have arrived at the site, the owner shall follow the instructions of the various governmental entities, which may include the following:
    - o A clean up firm may need to be immediately contacted.
    - o If the materials have remained trapped in the catch basins or proprietary stormwater treatment units, then these structures may be pumped out. All materials shall be removed by qualified personnel and disposed of in accordance with all applicable local, state, and federal regulations.

5.3 Fueling and Maintenance of Equipment or Vehicles

General

The Operator will designate a specific area of the site for fueling and overnight storage of vehicles on the site. Such area shall be located as far from wetlands areas and stormwater inlets as practicable and outside of the 100' buffer zone. Refer to the Site Plan for vehicle storage area location(s).

All equipment stored on-site will be monitored for leaks and will receive regular preventative maintenance to reduce the chance of leakage. Where vehicle leaks are identified, drip pans and absorbent pads shall be employed until the leak can be repaired, which shall be completed as soon as practicable. The Operator will maintain a bag of chemical sorbent, absorbent pads and an emergency spill kit on the site at all times within one of the designated Staging Areas. A sign shall be posted at the entrance to each Staging Area noting the location of the emergency spill kit. Spill kits shall include the following at a minimum.

- o Universal chemical sorbent capable of absorbing up to 15 gallons of liquid.
- o Gloves and safety glasses,
- o Four chemical socks,
- o Four chemical pads,
- o Four chemical pillows, and
- o Four plastic disposal bags.

5.4 Washing of Equipment and Vehicles

General

- Vehicle or equipment washing is not allowed on-site.

5.5 Storage, Handling, and Disposal of Building Products, Materials, and Wastes

5.5.1 Building Materials and Building Products

(Note: Examples include asphalt sealants, copper flashing, roofing materials, adhesives, concrete admixtures, and gravel and mulch stockpiles.)

General

- The site will be maintained in a neat and orderly manner, with debris regularly disposed of.
- All products and materials stored on-site will be stored in a neat and orderly manner in appropriate containers. Building materials that may discharge pollutants if in contact with water must be stored under cover (i.e. under a roof or under plastic sheeting) to prevent contact with rainwater.
- Manufacturer recommendations relative to the proper storage, use, and disposal of products and materials will be followed.
- An effort will be made to minimize the on-site storage of excess construction materials. In all cases, materials will be removed from the site if unused for more than three months.
- When use of products and materials have been completed, any excess products and materials will be promptly removed from the site and/or properly disposed of in accordance with all applicable state and federal regulations.
- All equipment to be stored on-site will be stored in a neat and orderly manner and such equipment will only be stored in the designated equipment Staging Areas on the site.

5.5.2 Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials

General

- Such materials may not be stored on-site and shall only be brought on-site in the quantities needed for application. Application shall be in accordance with manufacturer recommendation. Disposal of excess products shall follow local, state and federal law.

5.5.3 Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals

General

- Petroleum products may only be stored on-site in the limited quantities necessary for the ongoing work.
- All chemical containers must be watertight and closed, sealed, and secured when not in use.
- Outside storage must use a containment pallet or similar, to capture small leaks and spills.
- A spill kit must be readily available and in good working condition. Personnel must be available to respond immediately in the event of a leak or spill.
- Containers storing chemical with a storage capacity of 55 gallons or more must be stored more than 50 feet from receiving waters, drainage features, or inlets and must be provided with cover.

5.5.4 Hazardous or Toxic Waste

(Note: Examples include paints, caulks, sealants, fluorescent light ballasts, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids.)

General

- The use of hazardous products during construction will be in accordance with manufacturer recommendations and established construction practices.
- Hazardous materials must be stored in a separately designated area, under cover, and within secondary storage containers designed to hold at least 110% of the volume of the substance in question.
- Hazardous products will be kept in their original containers until they are used, and the container labels will be kept on-site within a designated Staging Area until use of the product is no longer needed.
- Unused quantities of hazardous products will be removed from the site in accordance with all applicable state and federal regulations.
- Hazardous waste materials generated by the construction (if any) will be disposed of off-site in accordance with all applicable state and federal regulations pertaining to such disposal. The Site Manager will be informed of these requirements and will ensure that this provision is adhered to.
- Any spills of hazardous materials found on the site will be cleaned up immediately using dry-cleanup procedures and reported in accordance with procedures established by local, state, and federal regulations. Washdowns of spill areas is prohibited.
- The Site Manager will be properly trained in hazardous materials spill prevention and clean-up.

5.5.5 Construction and Domestic Waste

(Note: Examples include packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, styrofoam, concrete, demolition debris, and other trash or discarded materials.)

General

- All waste materials from the site will be collected in dumpsters and disposed of off-site in accordance with all applicable state and federal regulations. The dumpster will be emptied as needed and the Operator will ensure that trash collection does not accumulate outside the dumpster. Trash and debris will be collected at least once per working day.
- Containers with lids shall be sealed at the end of each day. Containers without lids shall be covered with sheeting or a tarp. Cleanup trash and debris on the site at the end of each workday.

5.5.6 Sanitary Waste

General

- The Operator will keep a portable toilet on the site for the use of work personnel and shall dispose of the waste materials in accordance with local, state, and federal regulations. The portable toilet shall be located away from receiving waters, storm drains, and constructed or natural site drainage features. Portable toilets will be positioned so that they are secure and will not be tipped or knocked over.

5.6 Washing of Applicators and Containers used for Stucco, Paint, Concrete, Form Release Oils, Cutting Compounds, or Other Materials

General

- Any such wash water shall be directed into a leak-proof container and disposed of off-site in accordance with local, state and federal regulations.

- No liquid waste shall be allowed to enter drainage features and receiving waters or be allowed to infiltrate into the ground.
- Concrete trucks will only wash out or dump surplus concrete within areas designated by the Operator on the site in designated depressions to prevent uncontrolled migration of such materials. All such surplus concrete will be cleaned-up by crushing the concrete and either re-using it in the construction activities or by removing it from the site.
- Wash waters from concrete or stucco applications, or from paint brushes or other similar activities must be directed into a leak-proof container or pit designed to prevent overflows due to precipitation. Accumulated wastewater must be disposed of in accordance with all local, state, and federal regulations to the extent it is deemed hazardous. Washwater generating activities must be conducted as far away from wetlands areas and storm drain inlets as possible.

5.7 Application of Fertilizers

General

- Fertilizer shall be applied in accordance with the rates specified herein and in no case more than stipulated in the manufacturer's specifications.
- To the extent practicable, apply fertilizers in optimal seasons to maximize vegetation uptake and growth.
- Avoid applying fertilizers before heavy rains are expected and never apply to frozen ground or during winter conditions.
- Fertilizer may not be used in constructed or natural site drainage features.
- Fertilizers are not to be applied within buffer zones or within the Zone II for drinking water.

5.8 Other Pollution Prevention Practices

Instructions:

Describe any additional pollution prevention practices that do not fit into the above categories.

General

- Insert general description of the problem this control is designed to address

Specific Pollution Prevention Practices

Insert name of pollution prevention practice	
Description: Insert description of practice to be implemented	
Implementation	Insert approximate date of implementation
Maintenance Requirements	Insert maintenance requirements for the pollution prevention practice
Design Specifications	If applicable include copies of design specifications here

[Repeat as needed.]

SECTION 6: INSPECTION, MAINTENANCE, AND CORRECTIVE ACTION

6.1 Inspection Personnel and Procedures

Site Inspection Schedule

Select the inspection frequency(ies) that applies, based on CGP Parts 4.2, 4.3, or 4.4

(Note: you may be subject to different inspection frequencies in different areas of the site. Check all that apply and indicate which portion(s) of the site it applies to.)

Standard Frequency:
☐ Every 7 calendar days ☒ Every 14 calendar days and within 24 hours of either: ▪ A storm event that produces 0.25 inches or more of rain within a 24-hour period (including when there are multiple, smaller storms that alone produce less than 0.25 inches but together produce 0.25 inches or more in 24 hours), or ▪ A storm event that produces 0.25 inches or more of rain within a 24-hour period on the first day of a storm and continues to produce 0.25 inches or more of rain on subsequent days (you conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the last day of the storm that produces 0.25 inches or more of rain (i.e., only two inspections would be required for such a storm event)), or ▪ A discharge caused by snowmelt from a storm event that produces 3.25 inches or more of snow within a 24-hour period.
Increased Frequency (if applicable):
For areas of sites discharging to sediment or nutrient-impaired waters or to waters designated as Tier 2, Tier 2.5, or Tier 3 ☐ Every 7 days and within 24 hours of either: ▪ A storm event that produces 0.25 inches or more of rain within a 24-hour period, or ▪ A discharge caused by snowmelt from a storm event that produces 3.25 inches or more of snow within a 24-hour period.
Reduced Frequency (if applicable)
For stabilized areas ☐ Twice during first month, no more than 14 calendar days apart; then once per month after first month until permit coverage is terminated consistent with Part 9 in any area of your site where the stabilization steps in 2.2.14.a have been completed. ▪ Specify locations where stabilization steps have been completed ▪ Insert date that they were completed (Note: It is likely that you will not be able to include this in your initial SWPPP. If you qualify for this reduction (see CGP Part 4.4.1), you will need to modify your SWPPP to include this information. If construction activity resumes in this portion of the site at a later date, the inspection frequency immediately increases to that required in Parts 4.2 and 4.3, as applicable.)

For frozen conditions where construction activities are being conducted
☐ Once per month Insert beginning and ending dates of frozen conditions on your site: ▪ Beginning date of frozen conditions: Insert approximate date ▪ Ending date of frozen conditions: Insert approximate date
For frozen conditions where construction activities are suspended
☐ Inspections are temporarily suspended Insert beginning and ending dates of frozen conditions on your site: ▪ Beginning date of frozen conditions: Insert approximate date ▪ Ending date of frozen conditions: Insert approximate date

Dewatering Inspection Schedule

Select the inspection frequency that applies based on CGP Part 4.3.2

Dewatering Inspection
☐ Once per day on which the discharge of dewatering water occurs.

Rain Gauge Location (if applicable)
Specify location(s) of rain gauge to be used for determining whether a rain event of 0.25 inches or greater has occured (only applies to inspections conducted for Part 4.2.2, 4.3, or 4.4.2)

Inspection Report Forms
Insert a copy of any inspection report forms you will use here or in Appendix D of this SWPPP template

(Note: EPA has developed a sample inspection form that CGP operators can use. The form is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources)

6.2 Corrective Action

Personnel Responsible for Corrective Actions
Insert names of personnel or types of personnel responsible for corrective actions

Corrective Action Logs
See Appendix E

(Note: EPA has developed a sample corrective action log that CGP operators can use. The form is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources)

6.3 Delegation of Authority

Instructions:

- Identify the individual(s) or positions within the company who have been delegated authority to sign inspection reports.
- Attach a copy of the signed delegation of authority (see example in Appendix J of this SWPPP Template.)
- For more on this topic, see Appendix G, Subsection 11 of EPA's CGP.

Duly Authorized Representative(s) or Position(s):

Insert Company or Organization Name
Insert Name
Insert Position
Insert Address
Insert City, State, Zip Code
Insert Telephone Number
Insert Fax/Email

SECTION 7: TURBIDITY BENCHMARK MONITORING FOR DEWATERING DISCHARGES

Instructions (see CGP Part 3.3 and 7.2.8):

– If you are required to comply with the Part 3.3 turbidity benchmark monitoring requirements, describe the procedures you will follow to:
- ✓ Collect and evaluate samples,
- ✓ Report results to EPA and keep records of monitoring information, and
- ✓ Take corrective action when necessary.

– Include the specific type of turbidity meter you will use for monitoring, as well as any manuals or manufacturer instructions on how to operate and calibrate the meter.

– Describe any coordinating arrangement you may have with any other permitted operators on the same site with respect to compliance with the turbidity monitoring requirements, including which parties are tasked with specific responsibilities.

– If EPA has approved of an alternate turbidity benchmark pursuant to Part 3.3.2.b, include any data and other documentation you relied on to request use of the specific alternative benchmark.

Procedures:

Collecting and evaluating samples	Describe how you will collect and evaluate samples
Reporting results and keeping monitoring information records	Describe how you will report results to EPA and keep monitoring information records
Taking corrective action when necessary	Describe how you will take corrective action when necesary

Turbidity Meter:

Type of turbidity meter	Insert the type of turbidity meter

Turbidity meter manuals and manufacturer instructions

Insert a copy of any manuals and manufacturer instructions in Appendix N of this SWPPP Template.

Coordinating Arrangements for Turbidity Monitoring (if applicable):

Permitted operator name	Insert operator name
Permitted operator NPDES ID	Insert operator NPDES ID
Coordinating Arrangement	Describe the coordinating arrangement including which parties are tasked with specifc responsibilities

[Repeat as necessary.]

Alternate turbidity benchmark (if applicable):

Alternate turbidity benchmark (NTU)	Insert alternate turbidity benchmark
Data and documentation used to request the alternate benchmark	Insert the data and documentation that was submitted to EPA to request the alternate benchmark

SECTION 8: CERTIFICATION AND NOTIFICATION

Instructions (CGP Appendix G, Part G.11.2):

- The following certification statement must be signed and dated by a person who meets the requirements of Appendix G, Part G.11.2.
- This certification must be re-signed in the event of a SWPPP Modification.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: ______________________________ Title: ______________________________

Signature: ______________________________________ Date: __________________

[Repeat as needed for multiple construction operators at the site.]

SWPPP APPENDICES

Attach the following documentation to the SWPPP:

Appendix A – Site Maps

Appendix B – Copy of 2022 CGP

Appendix C – NOI and EPA Authorization Email

Appendix D – Site Inspection Form and Dewatering Inspection Form (if applicable)

Appendix E – Corrective Action Log

Appendix F – SWPPP Amendment Log

Appendix G – Subcontractor Certifications/Agreements

Appendix H – Grading and Stabilization Activities Log

Appendix I – Training Documentation

Appendix J – Delegation of Authority

Appendix K – Endangered Species Documentation

Appendix L – Historic Preservation Documentation

Appendix M – Rainfall Gauge Recording

Appendix N – Turbidity Meter Manual and Manufacturer's Instructions

Appendix A – Site Maps

An overview site map is included below. For detailed information, refer to the detailed project Site Plan/Subdivision Plan and any associated stormwater report.

Appendix B – Copy of 2022 CGP

INSERT COPY OF 2022 CGP

Appendix C – Copy of NOI and EPA Authorization Email

INSERT COPY OF NOI AND EPA'S AUTHORIZATION EMAIL PROVIDING COVERAGE UNDER THE CGP

Appendix D – Copy of Site and Dewatering Inspection Forms

Not expected to be applicable. Should it become necessary, utilize the EPA template available at https://www.epa.gov/npdes/construction-general-permit-resources-tools-and-templates

Appendix E – Copy of Corrective Action Log

The following corrective action log form will be used and is available at https://www.epa.gov/npdes/stormwater-discharges-construction-activities#resources

2022 CGP Corrective Action Log
Project Name:

____

NPDES ID Number:

____

Section A – Individual Completing this Log	
Name:	**Title:**
Company Name:	**Email:**
Address:	**Phone Number:**
Section B – Details of the Problem (CGP Part 5.4.1.a) Complete this section within 24 hours of discovering the condition that triggered corrective action.	
Date problem was first identified:	**Time problem was first identified**:
What site conditions triggered this corrective action? *(Check the box that applies. See instructions for a description of each triggering condition (1 thru 6).)* ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5a ☐ 5b ☐ 6	
Specific location where problem identified:	
Provide a description of the specific condition that triggered the need for corrective action and the cause (if identifiable):	
Section C – Corrective Action Completion (CGP Part 5.4.1.b) Complete this section within 24 hours after completing the corrective action.	
For site condition # 1, 2, 3, 4, or 6 (those not related to a dewatering discharge) confirm that you met the following deadlines (CGP Part 5.2.1):	
☐ Immediately took all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events. **AND**	
☐ Completed corrective action by the close of the next business day, unless a new or replacement control, or significant repair, was required. **OR**	
☐ Completed corrective action within seven (7) calendar days from the time of discovery because a new or replacement control, or significant repair, was necessary to complete the installation of the new or modified control or complete the repair. **OR**	
☐ It was infeasible to complete the installation or repair within 7 calendar days from the time of discovery. Provide the following additional information:	

Explain why 7 calendar days was infeasible to complete the installation or repair:

Provide your schedule for installing the stormwater control and making it operational as soon as feasible after the 7 calendar days:

For site condition # 5a, 5b, or 6 (those related to a dewatering discharge), confirm that you met the following deadlines:

- ☐ Immediately took all reasonable steps to minimize or prevent the discharge of pollutants until a solution could be implemented, including shutting off the dewatering discharge as soon as possible depending on the severity of the condition taking safety considerations into account.
- ☐ Determined whether the dewatering controls were operating effectively and whether they were causing the conditions.
- ☐ Made any necessary adjustments, repairs, or replacements to the dewatering controls to lower the turbidity levels below the benchmark or remove the visible plume or sheen.

Describe any modification(s) made as part of corrective action: (Insert additional rows below if applicable)	**Date of completion:**	**SWPPP update necessary?**	**If yes, date SWPPP was updated:**
1.		☐ Yes ☐ No	
2.		☐ Yes ☐ No	

Section D - Signature and Certification (CGP Part 5.4.2)

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information contained therein. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information contained is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

MANDATORY: Signature of Operator or "Duly Authorized Representative:"	
Signature:	**Date:**
Printed Name:	**Affiliation:**

OPTIONAL: Signature of Contractor or Subcontractor	
Signature:	**Date:**
Printed Name:	**Affiliation:**

General Instructions

This Corrective Action Log Template is provided to assist you creating a corrective action log that complies with the minimum reporting requirements of Part 5.4 of the EPA's Construction General Permit (CGP). For each triggering condition on your site, you will need to fill out a separate corrective action log.

The entire form must be completed to be compliant with the requirements of the permit. (Note: In Section C, if you do not need the number of rows provided in the corrective action log, you may delete these or cross them off. Alternatively, if you need more space to describe any modifications, you may insert additional rows in the electronic version of this form or use the bottom of the page in the field version of this form.)

If you are covered under a State CGP, this template may be helpful in developing a log that can be used for that permit; however, you will likely need to modify this form to meet the specific requirements of any State-issued permit. If your permitting authority requires you to use a specific corrective action log, you should not use this template.

Instructions for Section A

Individual completing this form Enter the name of the person completing this log. Include the person's contact information (title, affiliated company name, address, email, and phone number).

Instructions for Section B

You must complete Section B within 24 hours of discovering the condition that triggered corrective action. (CGP Part 5.4)

When was the problem first discovered?
Specify the date and time when the triggering condition was first discovered.

What site conditions triggered this corrective action? (CGP Parts 5.1 and 5.3)
Check the box corresponding to the numbered triggering condition below that applies to your site.

1. A stormwater control needs a significant repair or a new or replacement control is needed, or, in accordance with Part Error! Reference source not found., you find it necessary to repeatedly (i.e., 3 or more times) conduct the same routine maintenance fix to the same control at the same location (unless you document in your inspection report under Part Error! Reference source not found. that the specific reoccurrence of this same problem should still be addressed as a routine maintenance fix under Part Error! Reference source not found.);
2. A stormwater control necessary to comply with the requirements of this permit was never installed, or was installed incorrectly;
3. Your discharges are not meeting applicable water quality standards;
4. A prohibited discharge has occurred (see Part 1.3);
5. During discharge from site dewatering activities:
    a. The weekly average of your turbidity monitoring results exceeds the 50 NTU benchmark (or alternate benchmark if approved by EPA pursuant to Part **Error! Reference source not found.**); or
    b. You observe or you are informed by EPA, State, or local authorities of the presence of any of the following at the point of discharge to a receiving water flowing through or immediately adjacent to your site and/or to constructed or natural site drainage features or storm drain inlets:
        - sediment plume
        - suspended solids
        - unusual color
        - presence of odor
        - decreased clarity
        - presence of foam
        - visible sheen on the water surface or visible oily deposits on the bottom or shoreline of the receiving water

6. EPA requires corrective action as a result of permit violations found during an inspection carried out under Part 4.8.

Provide a description of the problem (CGP Part 5.4.1.a)
Provide a summary description of the condition you found that triggered corrective action, the cause of the problem (if identifiable), and the specific location where it was found. Be as specific as possible about the location; it is recommended that you refer to a precise point on your site map.

Instructions for Section C

You must complete Section C within 24 hours after completing the correction action. (CGP Part 5.4)

Deadlines for completing corrective action for condition # 1, 2, 3, 4, or 6 (if not relating to a dewatering discharge) (CGP Part 5.2.1)
Check the box to confirm that you met the deadlines that apply to each triggering condition. You are always required to check the first box (i.e., Immediately took all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events.). Only one of the next three boxes should be checked depending on the situation that applies to this corrective action.

Check the second box if the corrective action for this particular triggering condition does not require a new or replacement control, or a significant repair. These actions must be completed by the close of the next business day from the time of discovery of the condition.

Check the third box if the corrective action for this particular triggering condition requires a new or replacement control, or a significant repair. These actions must be completed by no later than seven calendar days from the time of discover of the condition.

Check the fourth box if the corrective action for this particular triggering condition requires a new or replacement control, or a significant repair, and if it is infeasible to complete the work within seven calendar days. Additionally, you will need to fill out the table below the checkbox that requires:

1. An explanation as to why it was infeasible to complete the installation or repair within seven calendar days of discovering the condition.
2. Provide the schedule you will adhere to for installing the stormwater control and making it operational as soon as feasible after the seventh day following discovery.

Note: Per Part 5.2.1.c, where these actions result in changes to any of the stormwater controls or procedures documented in your SWPPP, you must modify your SWPPP accordingly within seven calendar days of completing this work.

Deadlines for completing corrective action for condition # 5a, 5b, or 6 related to a dewatering discharge (CGP Part 5.2.2)
These deadlines apply to conditions relating to construction dewatering activities. Check the box to confirm that you met the deadlines that apply to each triggering condition. You are required to check all of the boxes in this section to indicate your compliance with the corrective action deadlines.

List of modification(s) to correct problem
Provide a list of modifications you completed to correct the problem.

Date of completion
Enter the date you completed the modification. The work must be completed by the deadline you indicated above.

SWPPP update necessary?
Check "Yes" or "No" to indicate if a SWPPP update is necessary consistent with Part 7.4.1.a in order to reflect changes implemented at your site. If "Yes," then enter the date you updated your SWPPP. The

SWPPP updates must be made within seven calendar days of completing a corrective action. (CGP Part 5.2.1.c)

Instructions for Section D

Each corrective action log entry must be signed and certified following completion of Section D to be considered complete. (CGP Part 5.4.2)

Operator or "Duly Authorized Representative" – MANDATORY (CGP Appendix G Part G.11.2 and CGP Appendix H Section X)

At a minimum, the corrective action log must be signed by either (1) the person who signed the NOI, or (2) a duly authorized representative of that person. The following requirements apply:

If the signatory will be the person who signed the NOI for permit coverage, as a reminder, that person must be one of the following types of individuals:

- *For a corporation*: By a responsible corporate officer. For the purpose of this subsection, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
- *For a partnership or sole proprietorship*: By a general partner or the proprietor, respectively.
- *For a municipality, State, Federal, or other public agency*: By either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a Federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

If the signatory will be a duly authorized representative, the following requirements must be met:

- The authorization is made in writing by the person who signed the NOI (see above);
- The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
- The signed and dated written authorization is included in the SWPPP. A copy must be submitted to EPA, if requested.

Sign, date and print your name and affiliation.

Contractor or Subcontractor - OPTIONAL

Where you rely on a contractor or subcontractor to complete this log and the associated corrective action, you should consider requiring the individual(s) to sign and certify each log entry. Note that this does not relieve you, the permitted operator, of the requirement to sign and certify the log as well. If applicable, sign, date, and print your name and affiliation.

Recordkeeping

Logs must be retained for at least 3 years from the date your permit coverage expires or is terminated. (CGP Part 5.4.4)

Keep copies of your signed corrective action log entries at the site or at an easily accessible location so that it can be made immediately available at the time of an on-site inspection or upon request by EPA. (CGP Part 5.4.3) Include a copy of the corrective action log in your SWPPP. (CGP Part 7.2.7.e)

Note

While EPA has made every effort to ensure the accuracy of all instructions contained in this template, it is the permit, not this template, that determines the actual obligations of regulated construction stormwater discharges. In the event of a conflict between this template and any corresponding provision of the CGP, you must abide by the requirements in the permit. EPA welcomes comments on this Corrective Action Log Template at any time and will consider those comments in any future revision. You may contact EPA for CGP-related inquiries at cgp@epa.gov

Appendix F – SWPPP Amendment Log

Instructions (see CGP Part 7.4):

- Create a log here of changes and updates to the SWPPP. You may use the table below to track these modifications.
- SWPPP modifications are required pursuant to CGP Part 7.4.1 in the following circumstances:
  - ✓ Whenever new operators become active in construction activities on your site, or you make changes to your construction plans, stormwater controls, or other activities at your site that are no longer accurately reflected in your SWPPP (this includes changes made in response to corrective actions triggered under CGP Part 5);
  - ✓ To reflect areas on your site map where operational control has been transferred (and the date of transfer) since initiating permit coverage;
  - ✓ If inspections or investigations determine that SWPPP modifications are necessary for compliance with this permit;
  - ✓ Where EPA determines it is necessary to install and/or implement additional controls at your site in order to meet requirements of the permit;
  - ✓ To reflect any revisions to applicable Federal, State, Tribal, or local requirements that affect the stormwater control measures implemented at the site; and
  - ✓ If applicable, if a change in chemical treatment systems or chemically-enhanced stormwater control is made, including use of a different treatment chemical, different dosage rate, or different area of application.

No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]
		INSERT DATE	
		INSERT DATE	
		INSERT DATE	
		INSERT DATE	
		INSERT DATE	
		INSERT DATE	
		INSERT DATE	
		INSERT DATE	

Appendix G – *Sample* Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: ____

Project Title: ____

Operator(s): ____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: ____

Address: ____

Telephone Number: ____________________

Type of construction service to be provided: ______________________________

____

____

Signature: ____________________

Title: ____________________

Date: ____________________

Appendix H – Grading and Stabilization Activities Log

Date Grading Activity Initiated	**Description of Grading Activity**	**Description of Stabilization Measure and Location**	**Date Grading Activity Ceased** (Indicate Temporary or Permanent)	**Date When Stabilization Measures Initiated**
INSERT DATE			INSERT DATE ☐ Temporary ☐ Permanent	INSERT DATE
INSERT DATE			INSERT DATE ☐ Temporary ☐ Permanent	INSERT DATE
INSERT DATE			INSERT DATE ☐ Temporary ☐ Permanent	INSERT DATE
INSERT DATE			INSERT DATE ☐ Temporary ☐ Permanent	INSERT DATE
INSERT DATE			INSERT DATE ☐ Temporary ☐ Permanent	INSERT DATE
INSERT DATE			INSERT DATE ☐ Temporary ☐ Permanent	INSERT DATE
INSERT DATE			INSERT DATE ☐ Temporary ☐ Permanent	INSERT DATE
INSERT DATE			INSERT DATE ☐ Temporary ☐ Permanent	INSERT DATE

Appendix I –Training Documentation

INSERT DOCUMENTATION CONSISTENT WITH SWPPP TEMPLATE SECTION 1.2 AND CGP PART 7.2.2

Appendix J – *Sample* Delegation of Authority Form

Delegation of Authority

I, _______________________ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the EPA's Construction General Permit (CGP), at the ____________________________________ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

____ (name of person or position)
____ (company)
____ (address)
____ (city, State, zip)
____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix G of EPA's CGP, and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix G.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: ____

Company: ____

Title: ____

Signature: ____

Date: ____

Appendix K – Endangered Species Documentation

INSERT DOCUMENTATION CONSISTENT WITH SWPPP TEMPLATE SECTION 3.1 AND CGP APPENDIX D

Appendix L – Historic Properties Documentation

The attached image is from the MACRIS website map. There are no locations of historical significance in or around the site.

Appendix M – Rainfall Gauge Recording

Not expected to be needed as it is expected that the Operator will rely on a weather station that is representative of the site location, but if this option is elected by the Operator, use the table below to record on-site rainfall gauge readings at the beginning and end of each work day.

Month/Year			Month/Year			Month/Year		
Day	Start time	End time	Day	Start time	End time	Day	Start time	End time
1			1			1		
2			2			2		
3			3			3		
4			4			4		
5			5			5		
6			6			6		
7			7			7		
8			8			8		
9			9			9		
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21			21			21		
22			22			22		
23			23			23		
24			24			24		
25			25			25		
26			26			26		
27			27			27		
28			28			28		
29			29			29		
30			30			30		
31			31			31		

Example Rainfall Gauge Recording

April 2022			May 2022			June 2022		
Day	7:00 am	4:400 pm	Day	7:00 am	4:00 pm	Day	7:00 am	4:00 pm
1	--	--	1	0.2	0	1	0	0.4
2	--	--	2	0	0	2	0	0
3	0	0	3	0.1	0.3	3	--	--
4	0	0.3	4	0	0	4	--	--
5	0	0	5	0	0	5	0	0

In this example (for only partial months), 0.25-inch rainfall inspections would have been conducted on April 4 and June 1.

Appendix N – Turbidity Monitoring Sampling Documentation

INSERT DOCUMENTATION CONSISTENT WITH SWPPP TEMPLATE SECTION 7.2.8 AND CGP PART 3.3.4

ATTACHMENT E: TSS Removal Calculation Sheets

INSTRUCTIONS: *Non-automated: Mar. 4, 2008*

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

Location: Infiltration Field Pretreatment

TSS Removal Calculation Worksheet

A BMP 1	B TSS Removal Rate 1	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
First Defense Unit	80%	1.00	80%	20%

Total TSS Removal = 80%

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

Project: 1060 Main Street

Prepared By: Legacy Engineering LLC

Date: July 10, 2023

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From Mass DEP Stormwater Handboook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS: *Non-automated: Mar. 4, 2008*

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

Location: Infiltration Fields

TSS Removal Calculation Worksheet

A BMP1	B TSS Removal Rate1	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Infiltration Field w/ First Defense Unit	80%	1.00	80%	20%

Total TSS Removal = 80%

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

Project: 1060 Main Street

Prepared By: Legacy Engineering LLC

Date: July 10, 2023

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

ATTACHMENT F: Stormwater Management Handbook Checklist

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
DANIEL J.
MERRIKIN
CIVIL
No. 43309
REGISTERED
PROFESSIONAL ENGINEER

Daniel Merrikin

Digitally signed by Daniel J. Merrikin, P.E.
Date: 2023.07.10 13:59:35 -04'00'

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 for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

☐ is within the Zone II or Interim Wellhead Protection Area

☐ is near or to other critical areas

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

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

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

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

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

ATTACHMENT G: FEMA Firmette

National Flood Hazard Layer FIRMette

FEMA

71°22'16"W 42°10'2"N

71°21'38"W 42°9'36"N

Feet
0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

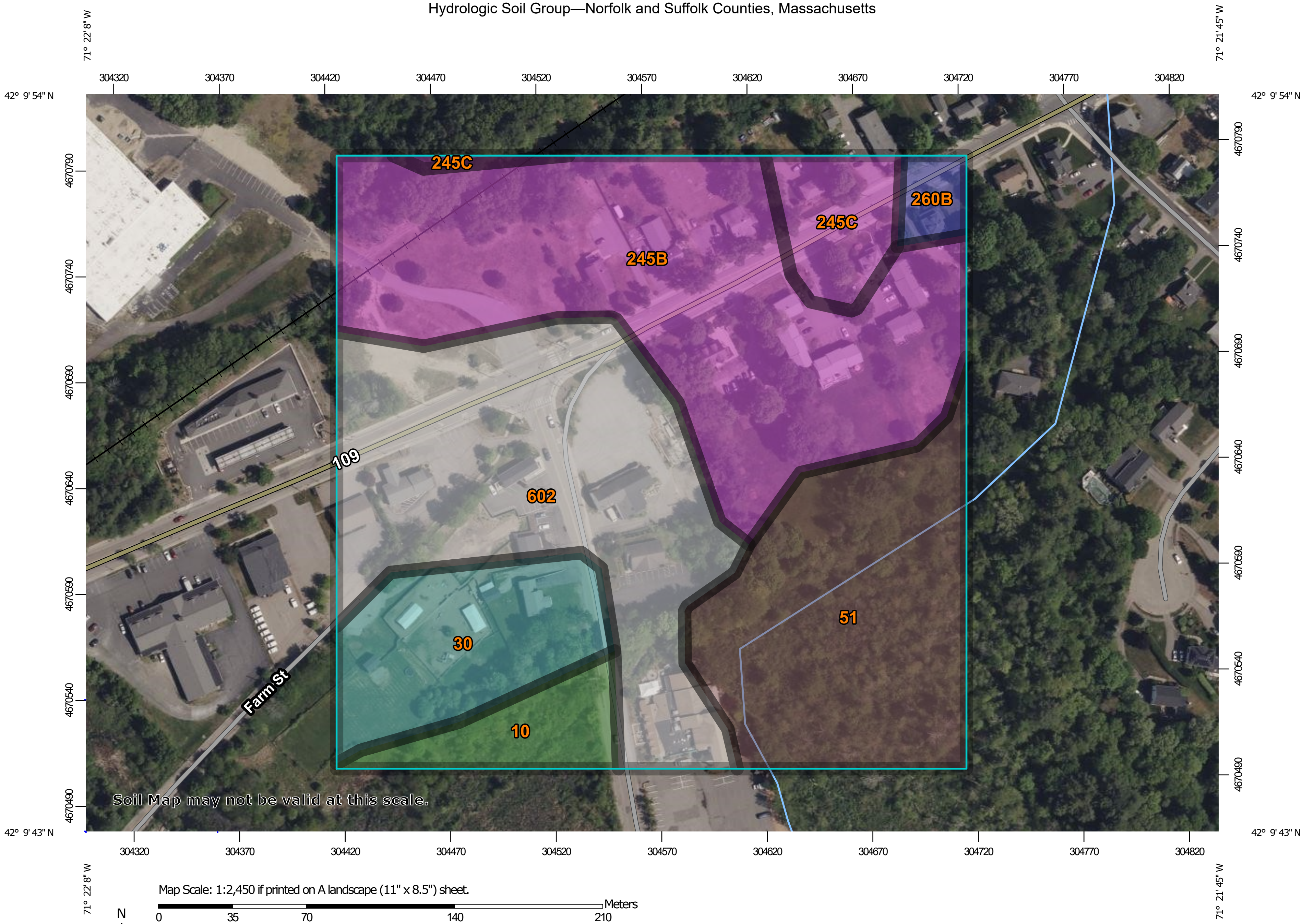
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/14/2022 at 2:37 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

ATTACHMENT H: Soils Data



Map Scale: 1:2,450 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 18, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	A/D	0.9	4.3%
30	Raynham silt loam, 0 to 3 percent slopes	C	2.1	10.0%
51	Swansea muck, 0 to 1 percent slopes	B/D	4.2	19.6%
245B	Hinckley loamy sand, 3 to 8 percent slopes	A	7.1	33.3%
245C	Hinckley loamy sand, 8 to 15 percent slopes	A	1.0	4.5%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	B	0.3	1.5%
602	Urban land, 0 to 15 percent slopes		5.8	26.9%
Totals for Area of Interest			**21.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

DEEP OBSERVATION TEST HOLE SOIL LOG
1060 Main Street Millis, MA 02054

Deep Observation Hole: OTH 23-1 **Date of Test Hole: April 6, 2023** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
22”	Fill										
74”	C1	2.5Y6/3				Sandy Loam	<1%	<1%	Massive	V. Friable	
120”	C2	2.5Y6/3				Loamy Sand	<1%	<1%	Massive	V. Friable	

Additional Notes: Ground Elev.=152.9

Groundwater Indicators Observed at Time of Testing:

☐ Depth observed standing water in observation hole: None

☐ Depth to soil redoximorphic features (mottles): None

☐ Depth weeping from side of observation hole: None

DEEP OBSERVATION TEST HOLE SOIL LOG
1060 Main Street Millis, MA 02054

Deep Observation Hole: OTH 23-2 **Date of Test Hole: April 6, 2023** **Soil Evaluation By: Daniel J. Merrikin, P.E.**
(Mass. Approved Soil Evaluator)

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
65”	Fill										
84”	C1	10YR6/8				Loamy Sand	<1%	<1%	Massive	V. Friable	
120”	C2	2.5Y6/3				Loamy Sand	<1%	<1%	Massive	V. Friable	

Additional Notes: Ground Elev.=152.9

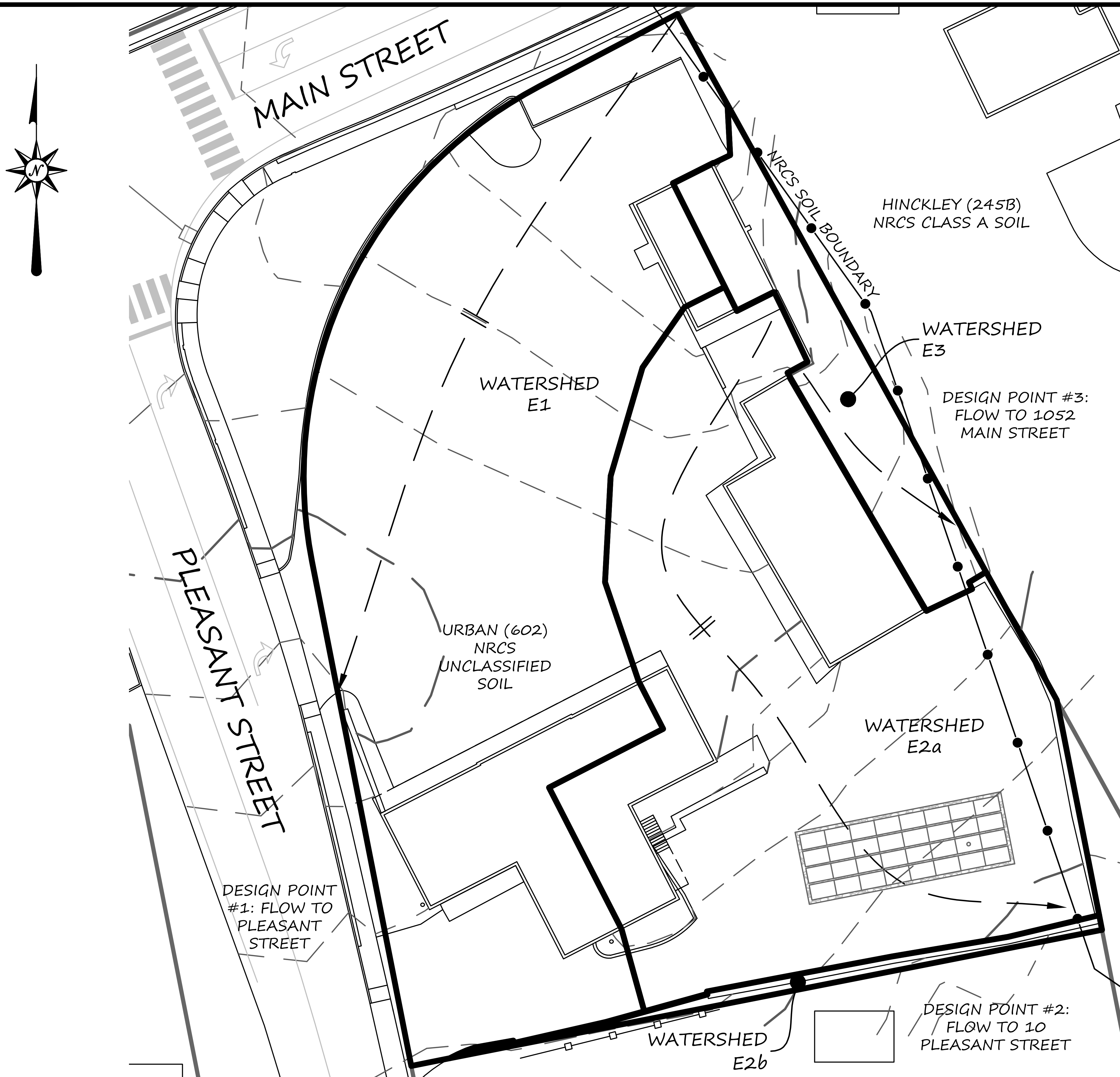
<u>Groundwater Indicators Observed at Time of Testing:</u>

☐ Depth observed standing water in observation hole: None

☐ Depth to soil redoximorphic features (mottles): None

☐ Depth weeping from side of observation hole: None

ATTACHMENT I: Existing Watershed Plan



PLAN SCALE: 1"=30'

0' 30' 60'

PLAN DATE: JULY 10, 2023

REVISION	DATE	BY

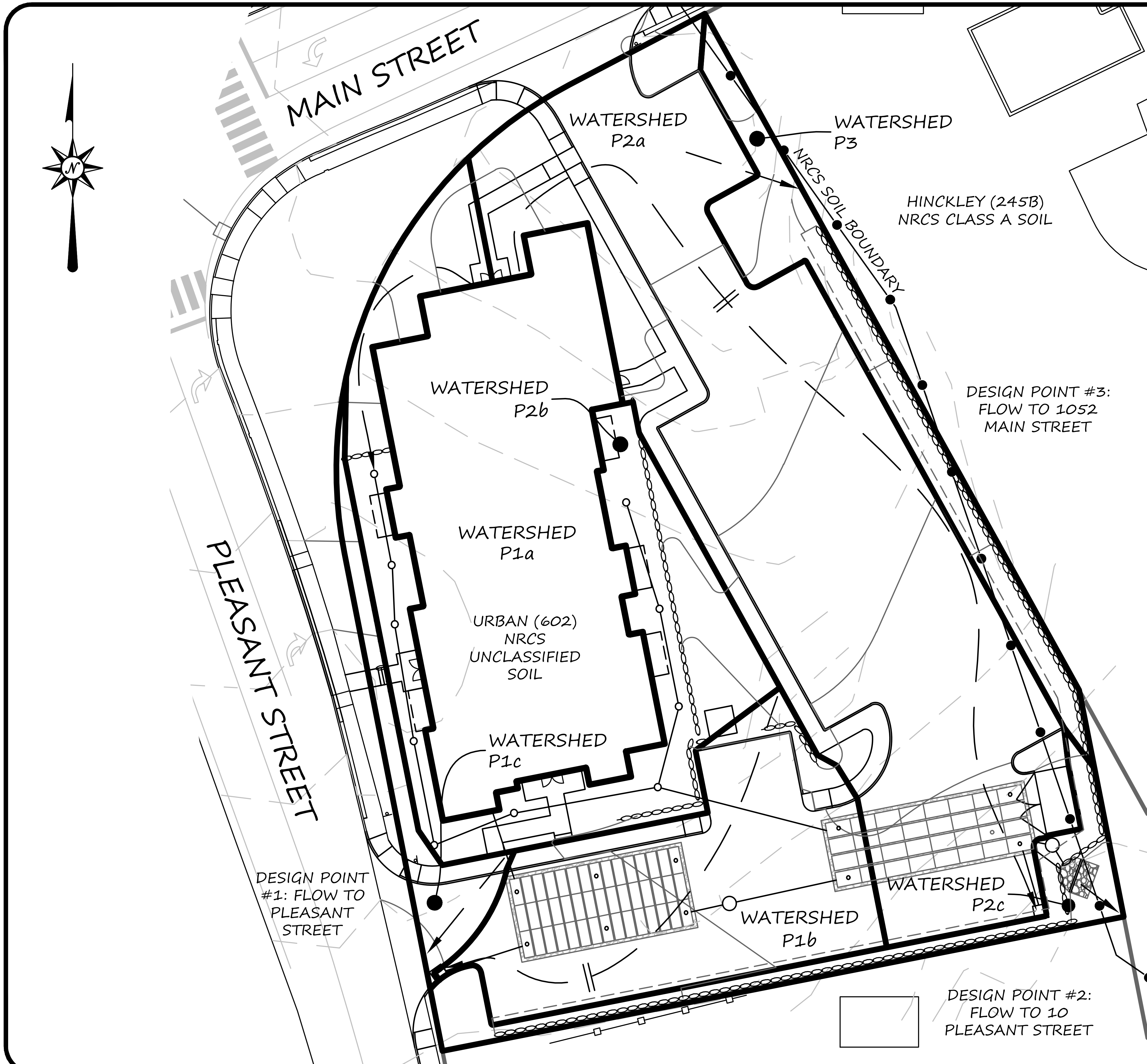
1060 MAIN STREET
EXISTING WATERSHED
PLAN OF LAND
IN
MILLIS, MA

730 MAIN STREET
SUITE 2C
MILLIS, MA 02054
508-376-8883(o)

SHEET 1 OF 1

LEGACY ENGINEERING

ATTACHMENT J: Proposed Watershed Plan



PLAN SCALE: 1"=30'

0' 30' 60'

PLAN DATE: JULY 10, 2023

REVISION	DATE	BY

1060 MAIN STREET EXISTING WATERSHED PLAN OF LAND IN MILLIS, MA

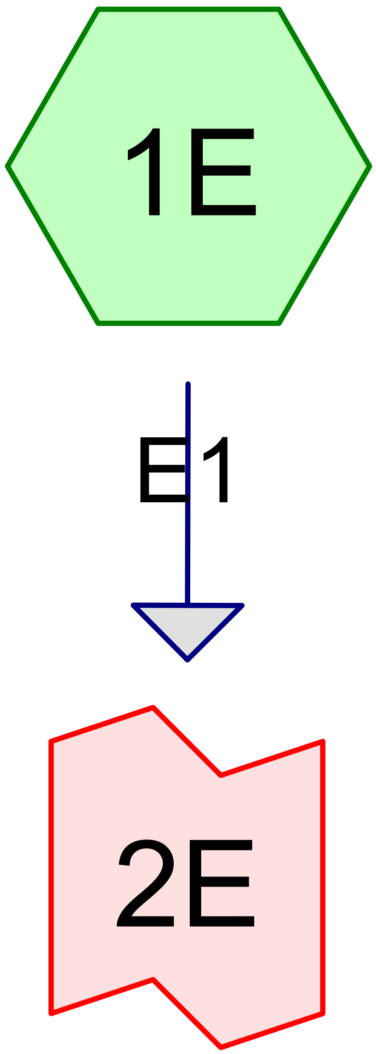
730 MAIN STREET
SUITE 2C
MILLIS, MA 02054
508-376-8883(o)

SHEET 1 OF 1

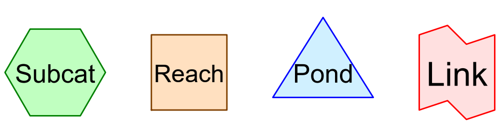
LEGACY ENGINEERING

ATTACHMENT K: Hydrocad Hydrology Calculations

DESIGN POINT #1: FLOW TO PLEASANT STREET EXISTING CONDITIONS



Design Point #1: Flow to Pleasant Street



Routing Diagram for HydroCAD
Prepared by Legacy Engineering LLC, Printed 6/5/2023
HydroCAD® 10.20-3c s/n 02346

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type III 24-hr		Default	24.00	1	2.50	2
2	2-YR	Type III 24-hr		Default	24.00	1	3.20	2
3	10-YR	Type III 24-hr		Default	24.00	1	4.70	2
4	50-YR	Type III 24-hr		Default	24.00	1	6.10	2
5	100-YR	Type III 24-hr		Default	24.00	1	6.70	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.035	39	>75% Grass cover, Good HSG A (1E)
0.405	98	Paved parking HSG A (1E)
0.068	98	Roofs HSG A (1E)
0.507	**94**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1E: E1 Runoff Area=22,104 sf 93.20% Impervious Runoff Depth=2.12"
Flow Length=212' Tc=6.0 min CN=WQ Runoff=1.14 cfs 0.089 af

Link 2E: Design Point #1: Flow to Pleasant Street Inflow=1.14 cfs 0.089 af
Primary=1.14 cfs 0.089 af

Total Runoff Area = 0.507 ac Runoff Volume = 0.089 af Average Runoff Depth = 2.12"
6.80% Pervious = 0.035 ac 93.20% Impervious = 0.473 ac

Summary for Subcatchment 1E: E1

CarlsonPlanXYPos|0.0000|0.0000|

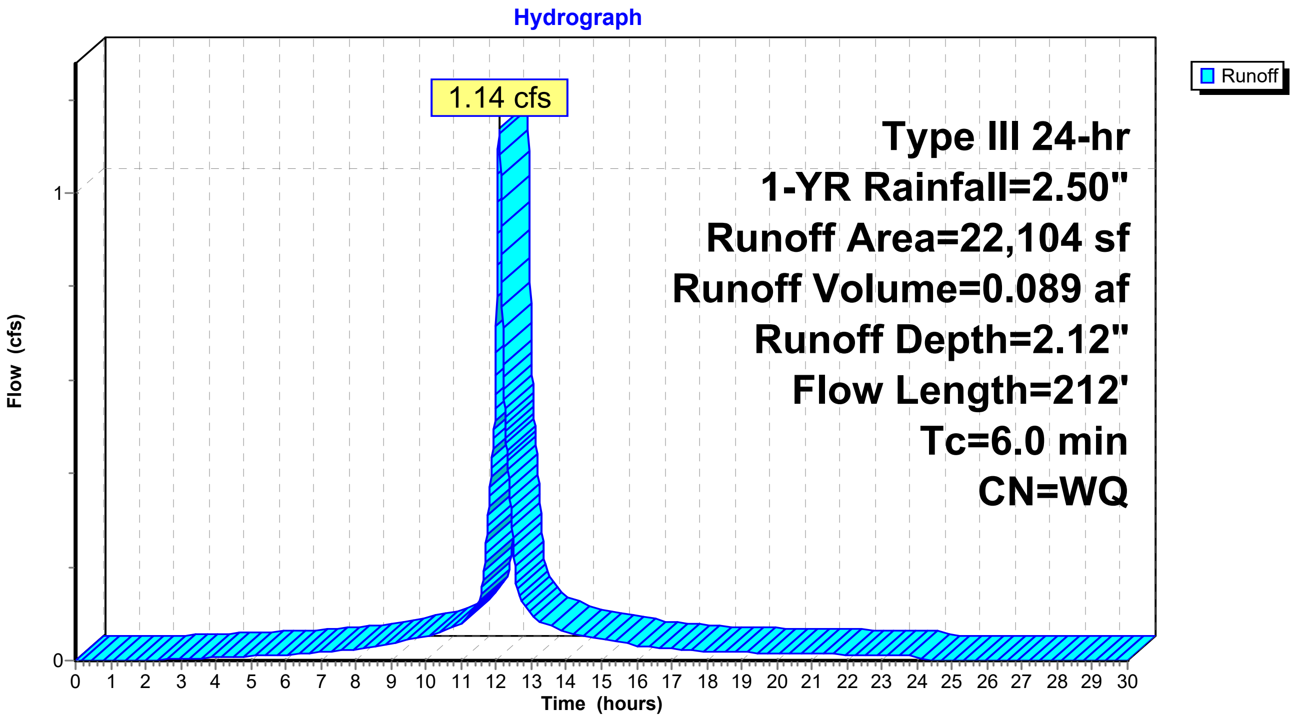
Runoff = 1.14 cfs @ 12.08 hrs, Volume= 0.089 af, Depth= 2.12"
Routed to Link 2E : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
2,957	98	Roofs HSG A
17,643	98	Paved parking HSG A
1,504	39	>75% Grass cover, Good HSG A
22,104		Weighted Average
1,504		6.80% Pervious Area
20,600		93.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	21	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.8	79	0.0400	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	112	0.0550	4.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.7	212	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1E: E1

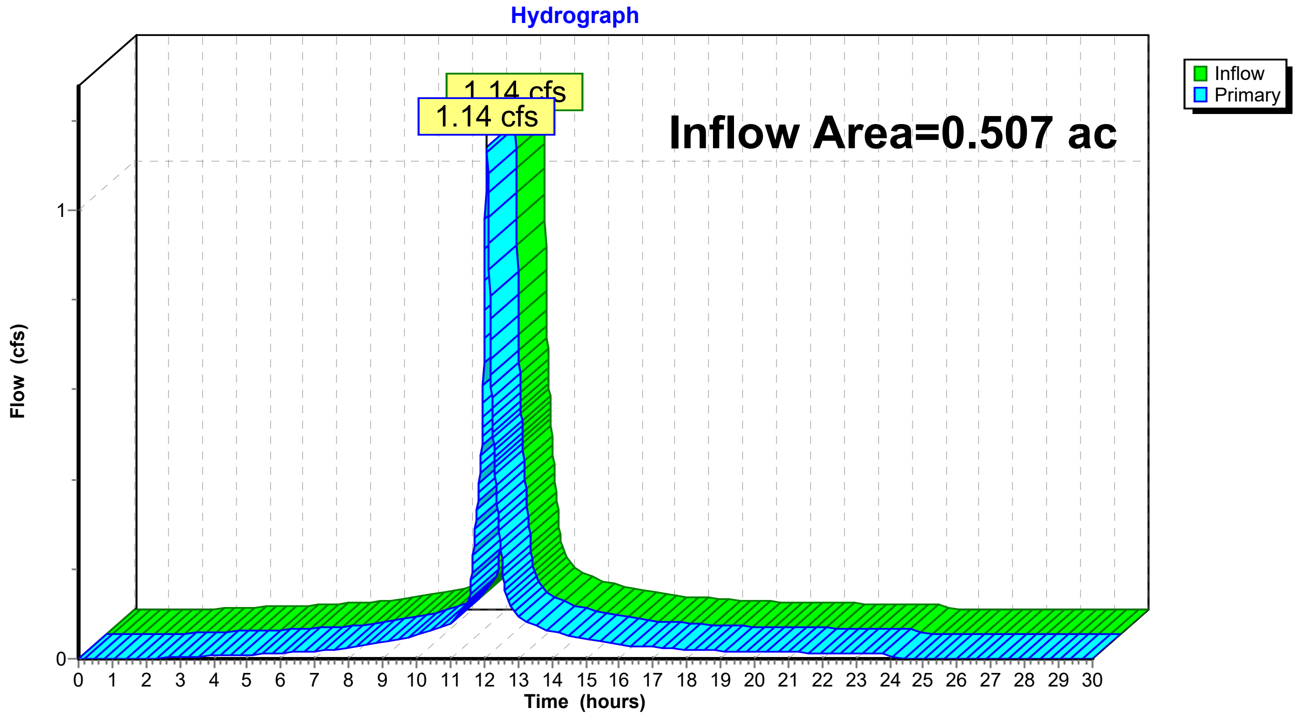


Summary for Link 2E: Design Point #1: Flow to Pleasant Street

Inflow Area = 0.507 ac, 93.20% Impervious, Inflow Depth = 2.12" for 1-YR event
Inflow = 1.14 cfs @ 12.08 hrs, Volume= 0.089 af
Primary = 1.14 cfs @ 12.08 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2E: Design Point #1: Flow to Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1E: E1 Runoff Area=22,104 sf 93.20% Impervious Runoff Depth=2.77"
Flow Length=212' Tc=6.0 min CN=WQ Runoff=1.47 cfs 0.117 af

Link 2E: Design Point #1: Flow to Pleasant Street Inflow=1.47 cfs 0.117 af
Primary=1.47 cfs 0.117 af

Total Runoff Area = 0.507 ac Runoff Volume = 0.117 af Average Runoff Depth = 2.77"
6.80% Pervious = 0.035 ac 93.20% Impervious = 0.473 ac

Summary for Subcatchment 1E: E1

CarlsonPlanXYPos|0.0000|0.0000|

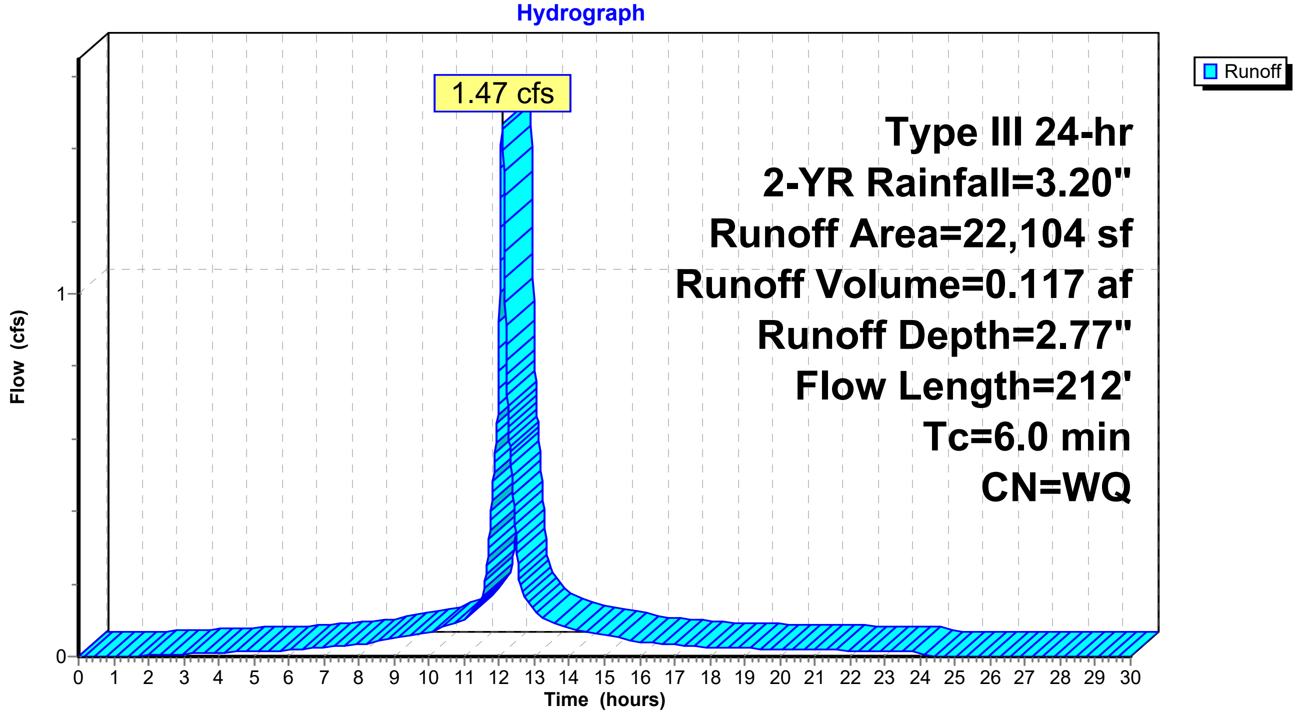
Runoff = 1.47 cfs @ 12.08 hrs, Volume= 0.117 af, Depth= 2.77"
Routed to Link 2E : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,957	98	Roofs HSG A
17,643	98	Paved parking HSG A
1,504	39	>75% Grass cover, Good HSG A
22,104		Weighted Average
1,504		6.80% Pervious Area
20,600		93.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	21	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.8	79	0.0400	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	112	0.0550	4.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.7	212	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1E: E1

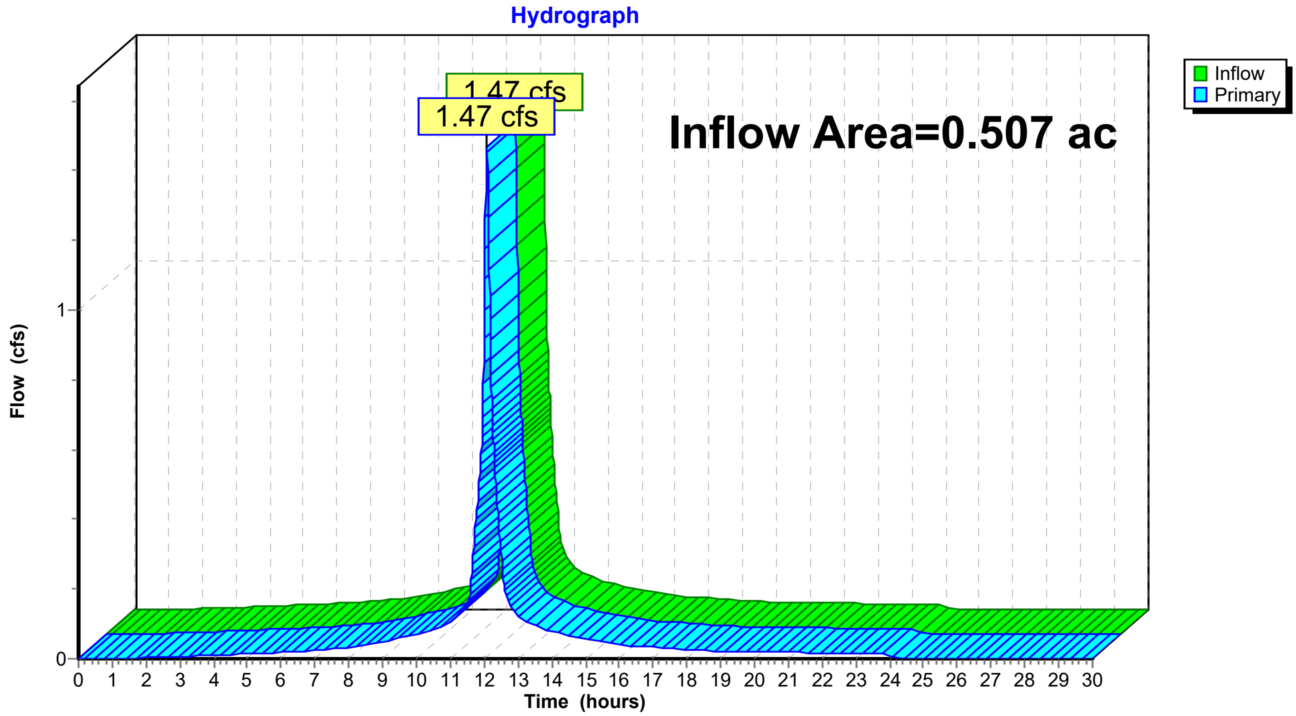


Summary for Link 2E: Design Point #1: Flow to Pleasant Street

Inflow Area = 0.507 ac, 93.20% Impervious, Inflow Depth = 2.77" for 2-YR event
Inflow = 1.47 cfs @ 12.08 hrs, Volume= 0.117 af
Primary = 1.47 cfs @ 12.08 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2E: Design Point #1: Flow to Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1E: E1 Runoff Area=22,104 sf 93.20% Impervious Runoff Depth=4.17"
Flow Length=212' Tc=6.0 min CN=WQ Runoff=2.17 cfs 0.176 af

Link 2E: Design Point #1: Flow to Pleasant Street Inflow=2.17 cfs 0.176 af
Primary=2.17 cfs 0.176 af

Total Runoff Area = 0.507 ac Runoff Volume = 0.176 af Average Runoff Depth = 4.17"
6.80% Pervious = 0.035 ac 93.20% Impervious = 0.473 ac

Summary for Subcatchment 1E: E1

CarlsonPlanXYPos|0.0000|0.0000|

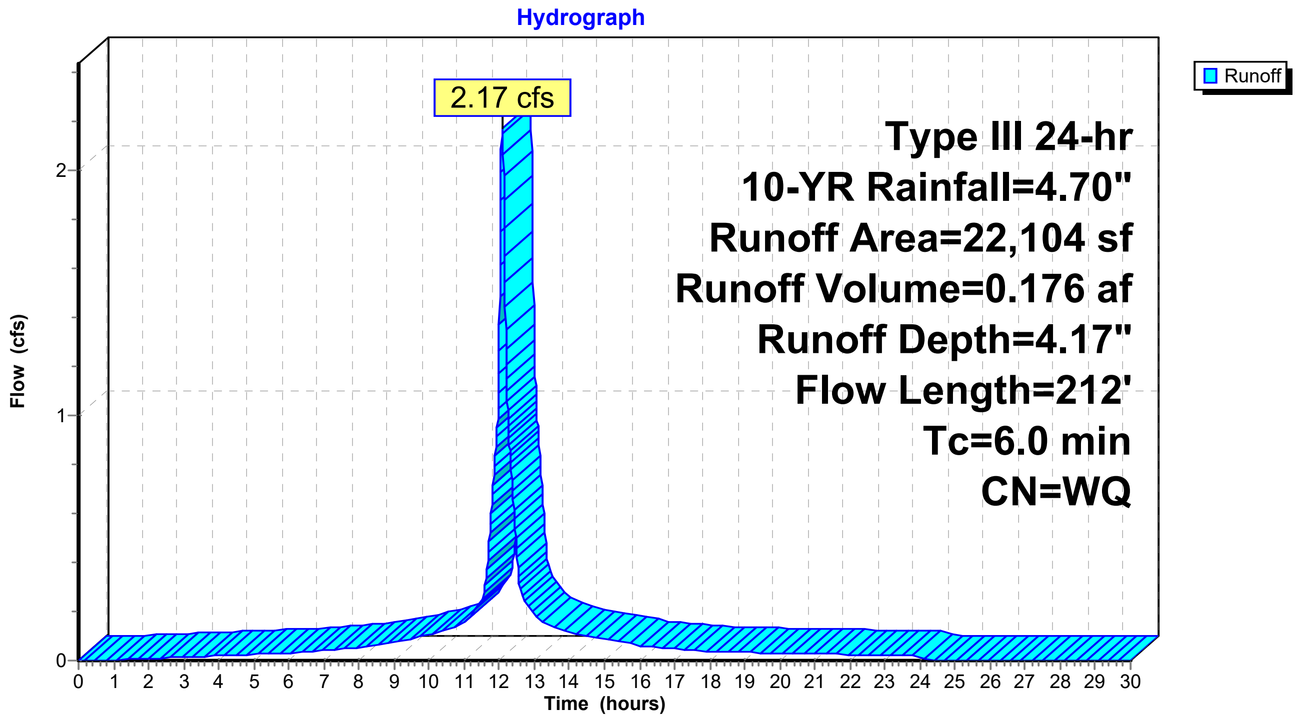
Runoff = 2.17 cfs @ 12.08 hrs, Volume= 0.176 af, Depth= 4.17"
Routed to Link 2E : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
2,957	98	Roofs HSG A
17,643	98	Paved parking HSG A
1,504	39	>75% Grass cover, Good HSG A
22,104		Weighted Average
1,504		6.80% Pervious Area
20,600		93.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	21	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.8	79	0.0400	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	112	0.0550	4.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.7	212	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1E: E1

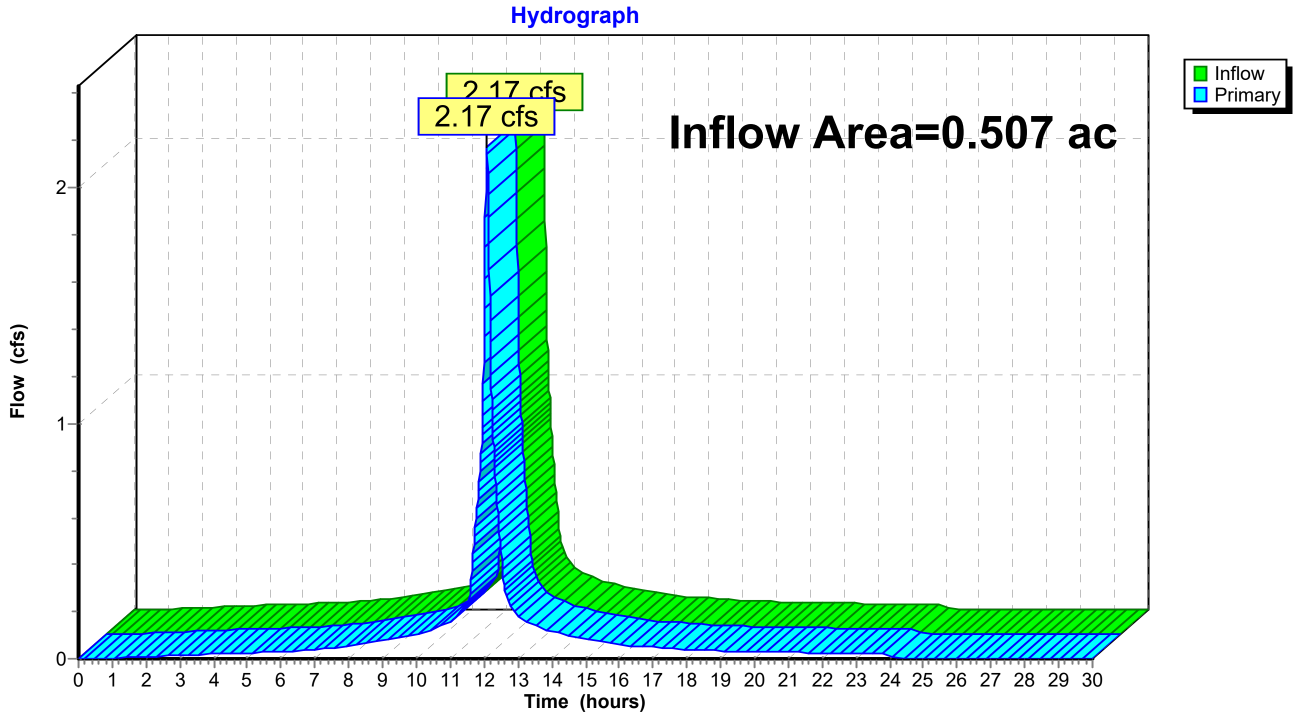


Summary for Link 2E: Design Point #1: Flow to Pleasant Street

Inflow Area = 0.507 ac, 93.20% Impervious, Inflow Depth = 4.17" for 10-YR event
Inflow = 2.17 cfs @ 12.08 hrs, Volume= 0.176 af
Primary = 2.17 cfs @ 12.08 hrs, Volume= 0.176 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2E: Design Point #1: Flow to Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1E: E1 Runoff Area=22,104 sf 93.20% Impervious Runoff Depth=5.50"
Flow Length=212' Tc=6.0 min CN=WQ Runoff=2.83 cfs 0.232 af

Link 2E: Design Point #1: Flow to Pleasant Street Inflow=2.83 cfs 0.232 af
Primary=2.83 cfs 0.232 af

Total Runoff Area = 0.507 ac Runoff Volume = 0.232 af Average Runoff Depth = 5.50"
6.80% Pervious = 0.035 ac 93.20% Impervious = 0.473 ac

Summary for Subcatchment 1E: E1

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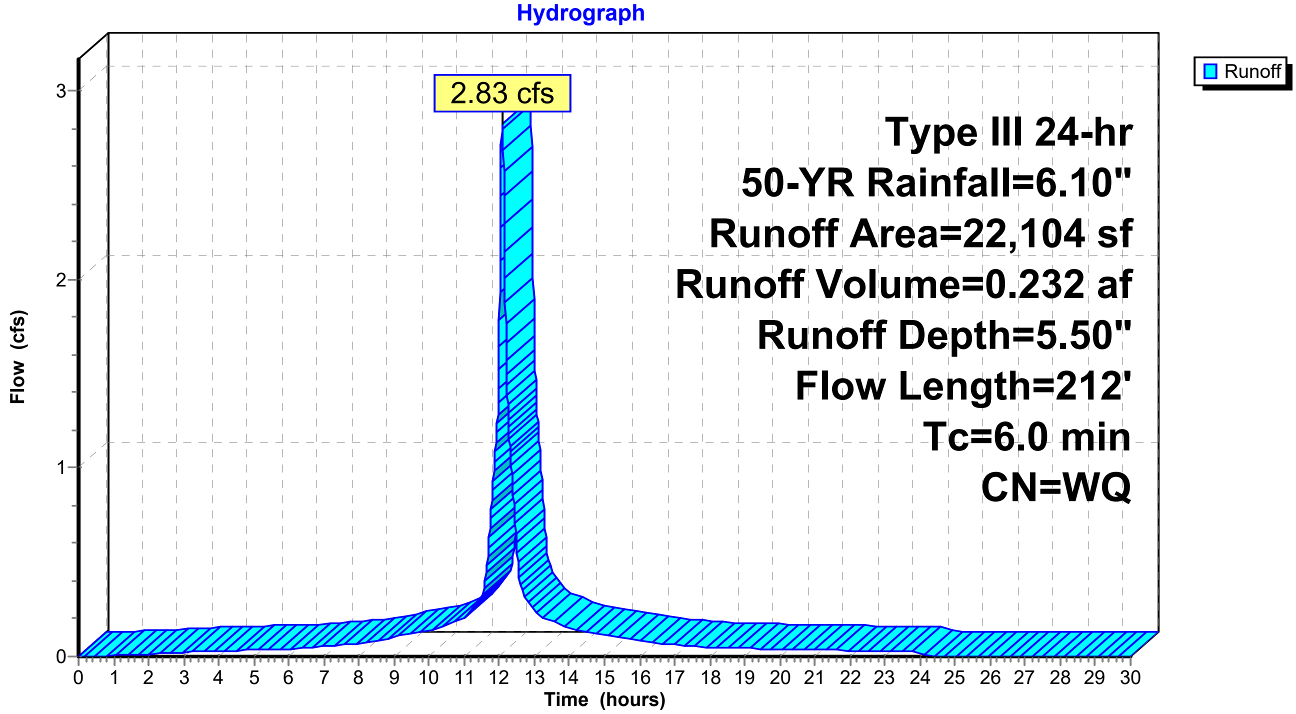
Runoff = 2.83 cfs @ 12.08 hrs, Volume= 0.232 af, Depth= 5.50"
Routed to Link 2E : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
2,957	98	Roofs HSG A
17,643	98	Paved parking HSG A
1,504	39	>75% Grass cover, Good HSG A
22,104		Weighted Average
1,504		6.80% Pervious Area
20,600		93.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	21	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.8	79	0.0400	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	112	0.0550	4.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.7	212	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1E: E1

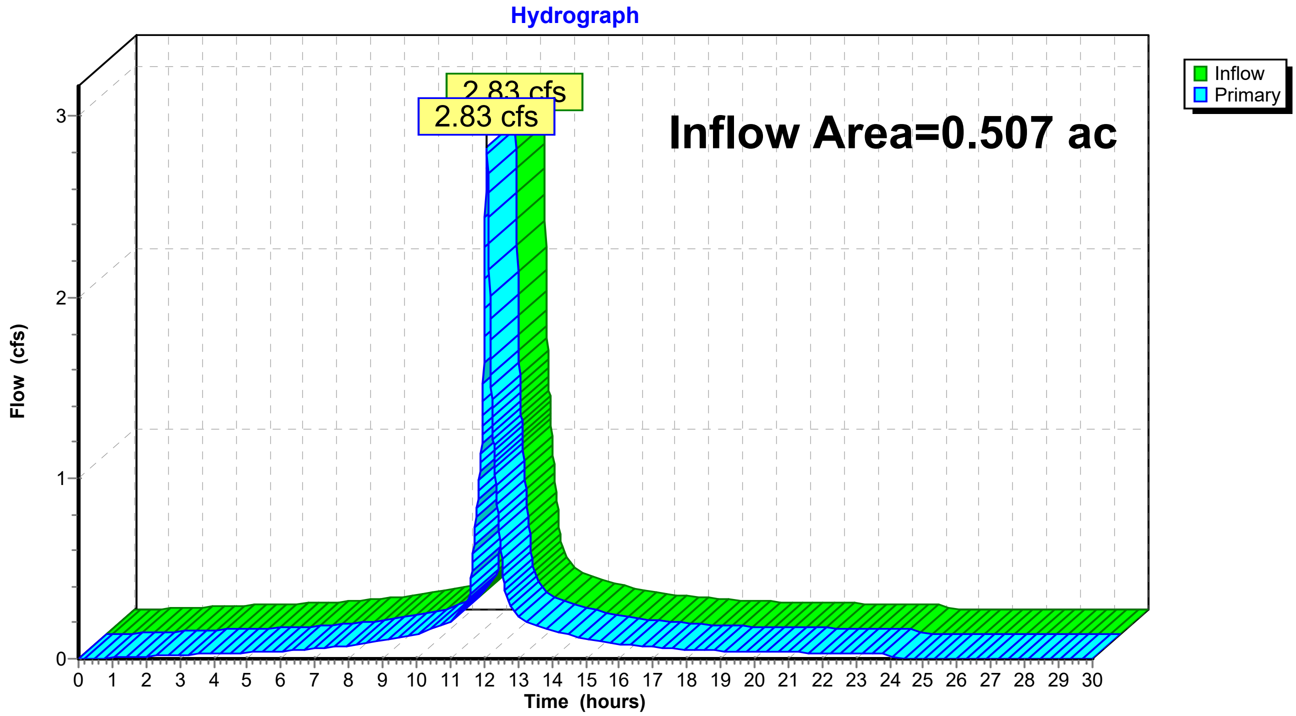


Summary for Link 2E: Design Point #1: Flow to Pleasant Street

Inflow Area =	0.507 ac,	93.20% Impervious,	Inflow Depth = 5.50"	for 50-YR event
Inflow =	2.83 cfs @	12.08 hrs, Volume=	0.232 af	
Primary =	2.83 cfs @	12.08 hrs, Volume=	0.232 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2E: Design Point #1: Flow to Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1E: E1 Runoff Area=22,104 sf 93.20% Impervious Runoff Depth=6.07"
Flow Length=212' Tc=6.0 min CN=WQ Runoff=3.11 cfs 0.257 af

Link 2E: Design Point #1: Flow to Pleasant Street Inflow=3.11 cfs 0.257 af
Primary=3.11 cfs 0.257 af

Total Runoff Area = 0.507 ac Runoff Volume = 0.257 af Average Runoff Depth = 6.07"
6.80% Pervious = 0.035 ac 93.20% Impervious = 0.473 ac

Summary for Subcatchment 1E: E1

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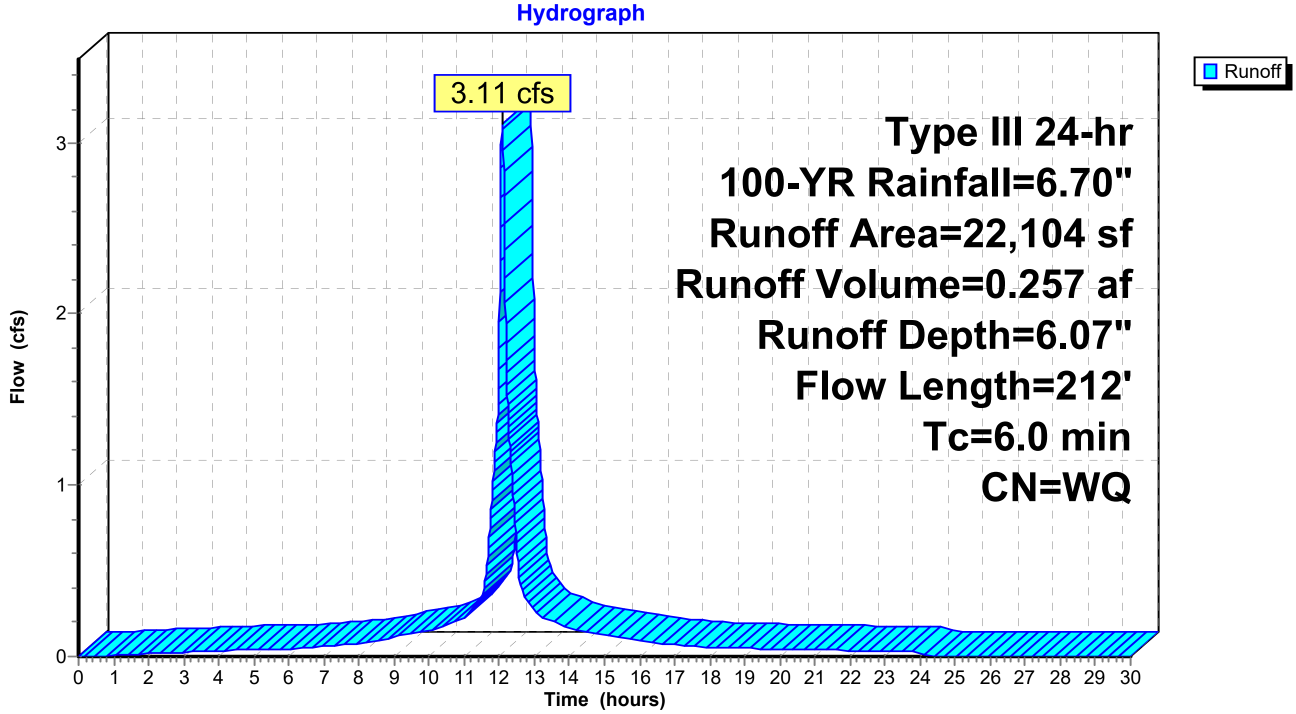
Runoff = 3.11 cfs @ 12.08 hrs, Volume= 0.257 af, Depth= 6.07"
Routed to Link 2E : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
2,957	98	Roofs HSG A
17,643	98	Paved parking HSG A
1,504	39	>75% Grass cover, Good HSG A
22,104		Weighted Average
1,504		6.80% Pervious Area
20,600		93.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	21	0.0300	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.8	79	0.0400	1.73		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	112	0.0550	4.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.7	212	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1E: E1

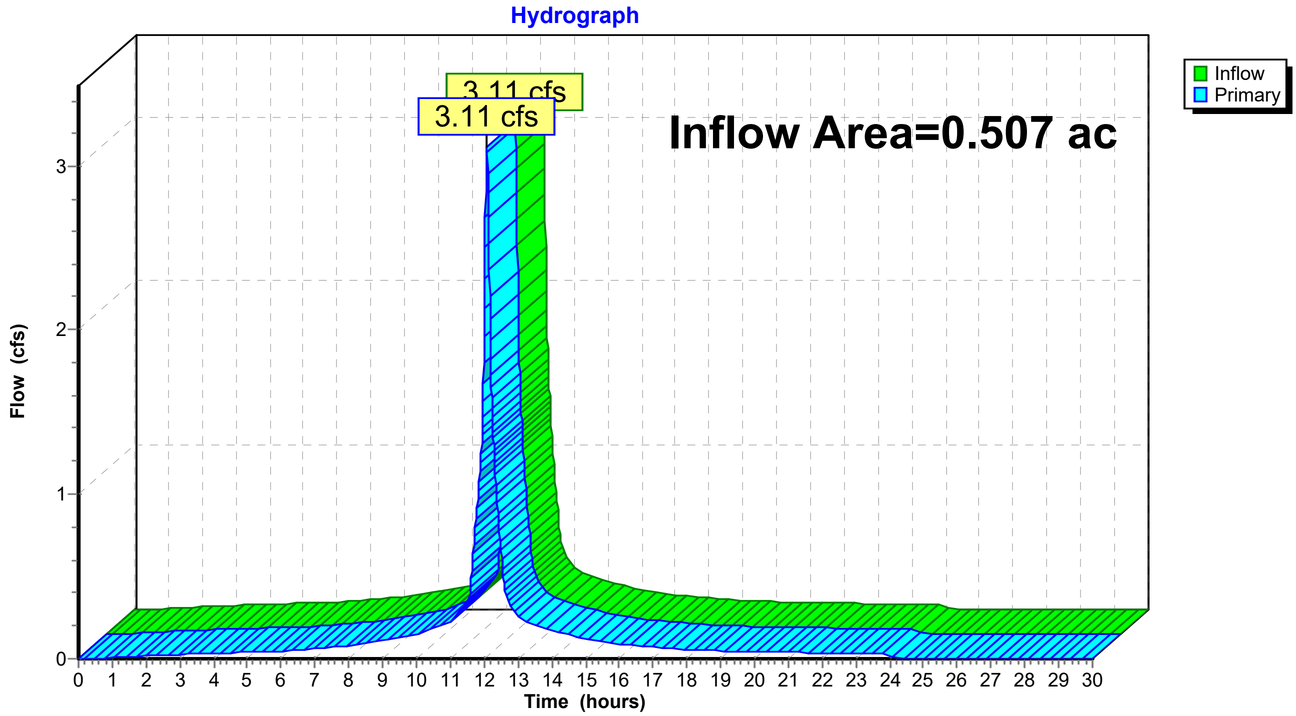


Summary for Link 2E: Design Point #1: Flow to Pleasant Street

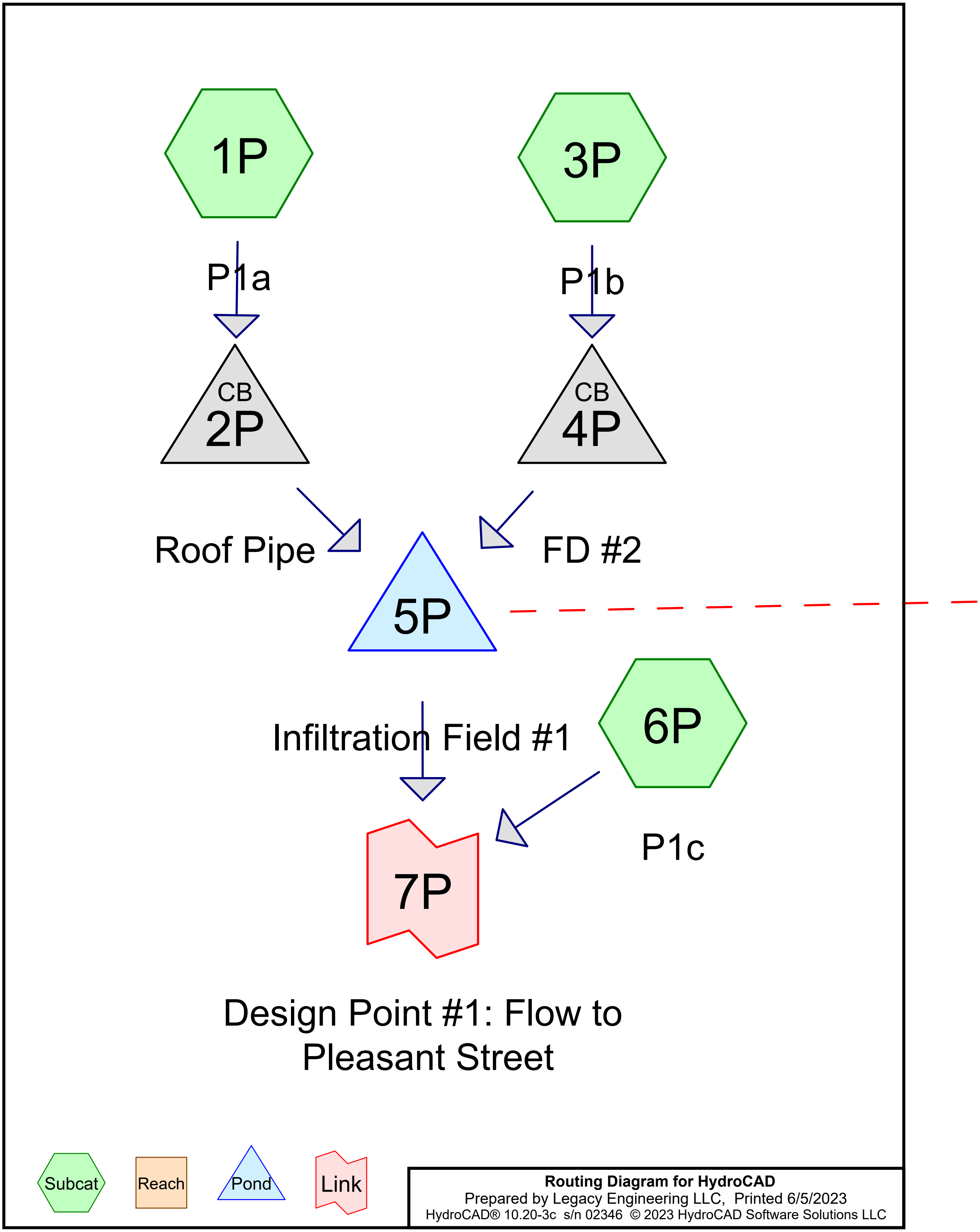
Inflow Area = 0.507 ac, 93.20% Impervious, Inflow Depth = 6.07" for 100-YR event
Inflow = 3.11 cfs @ 12.08 hrs, Volume= 0.257 af
Primary = 3.11 cfs @ 12.08 hrs, Volume= 0.257 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 2E: Design Point #1: Flow to Pleasant Street



DESIGN POINT #1: FLOW TO PLEASANT STREET PROPOSED CONDITIONS



Routing Diagram for HydroCAD
Prepared by Legacy Engineering LLC, Printed 6/5/2023
HydroCAD® 10.20-3c s/n 02346 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type III 24-hr		Default	24.00	1	2.50	2
2	2-YR	Type III 24-hr		Default	24.00	1	3.20	2
3	10-YR	Type III 24-hr		Default	24.00	1	4.70	2
4	50-YR	Type III 24-hr		Default	24.00	1	6.10	2
5	100-YR	Type III 24-hr		Default	24.00	1	6.70	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.023	39	>75% Grass cover, Good HSG A (3P, 6P)
0.152	98	Paved parking HSG A (3P, 6P)
0.213	98	Roofs HSG A (1P)
0.388	**95**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1P: P1a Runoff Area=9,288 sf 100.00% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=98 Runoff=0.51 cfs 0.040 af

Pond 2P: Roof Pipe Peak Elev=151.36' Inflow=0.51 cfs 0.040 af
12.0" Round Culvert n=0.011 L=20.0' S=0.0500 '/' Outflow=0.51 cfs 0.040 af

Subcatchment 3P: P1b Runoff Area=6,292 sf 94.64% Impervious Runoff Depth=2.15"
Flow Length=147' Tc=6.0 min CN=WQ Runoff=0.33 cfs 0.026 af

Pond 4P: FD #2 Peak Elev=150.89' Inflow=0.33 cfs 0.026 af
18.0" Round Culvert n=0.011 L=23.0' S=0.0087 '/' Outflow=0.33 cfs 0.026 af

Pond 5P: Infiltration Field #1 Peak Elev=150.89' Storage=1,031 cf Inflow=0.84 cfs 0.066 af
Discarded=0.07 cfs 0.062 af Primary=0.00 cfs 0.000 af Secondary=0.02 cfs 0.004 af Outflow=0.08 cfs 0.066 af

Subcatchment 6P: P1c Runoff Area=1,309 sf 50.57% Impervious Runoff Depth=1.15"
Flow Length=36' Slope=0.0350 '/' Tc=6.0 min CN=WQ Runoff=0.04 cfs 0.003 af

Link 7P: Design Point #1: Flow to Pleasant Street Inflow=0.04 cfs 0.003 af
Primary=0.04 cfs 0.003 af

Total Runoff Area = 0.388 ac Runoff Volume = 0.069 af Average Runoff Depth = 2.14"
5.83% Pervious = 0.023 ac 94.17% Impervious = 0.365 ac

Summary for Subcatchment 1P: P1a

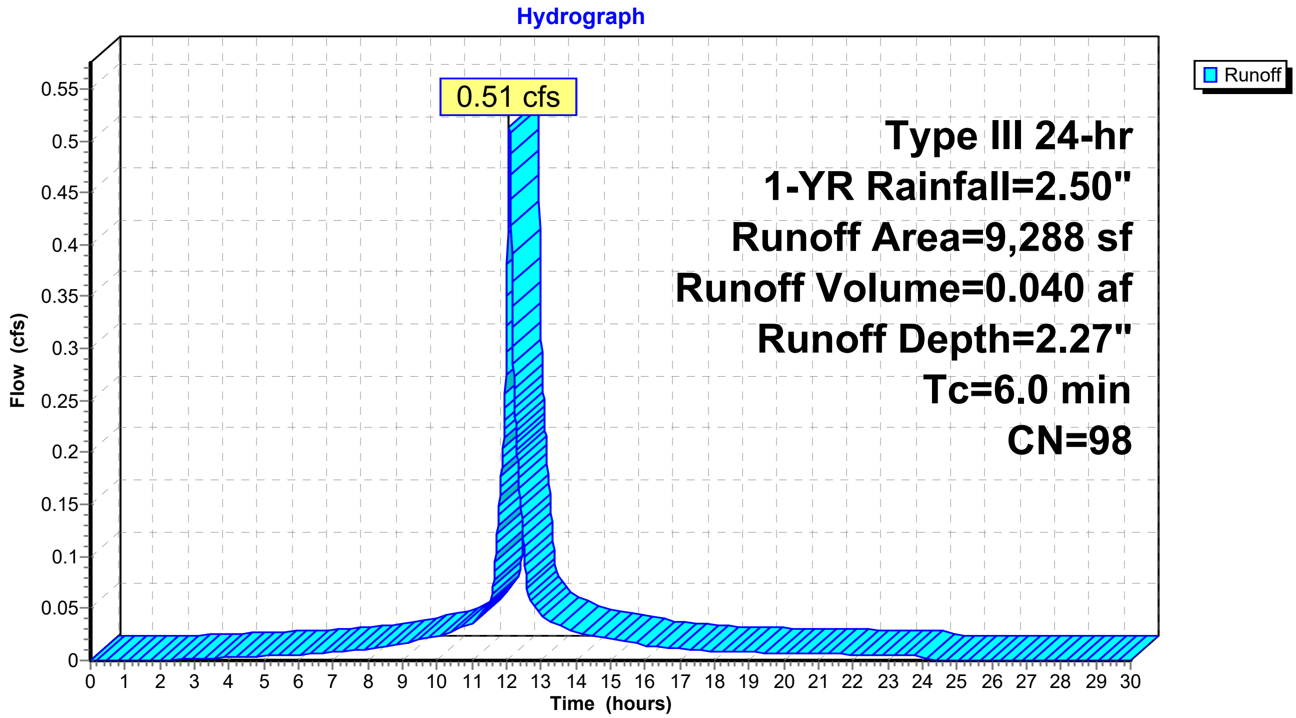
Runoff = 0.51 cfs @ 12.08 hrs, Volume= 0.040 af, Depth= 2.27"
Routed to Pond 2P : Roof Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
9,288	98	Roofs HSG A
9,288		100.00% Impervious Area

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

Subcatchment 1P: P1a



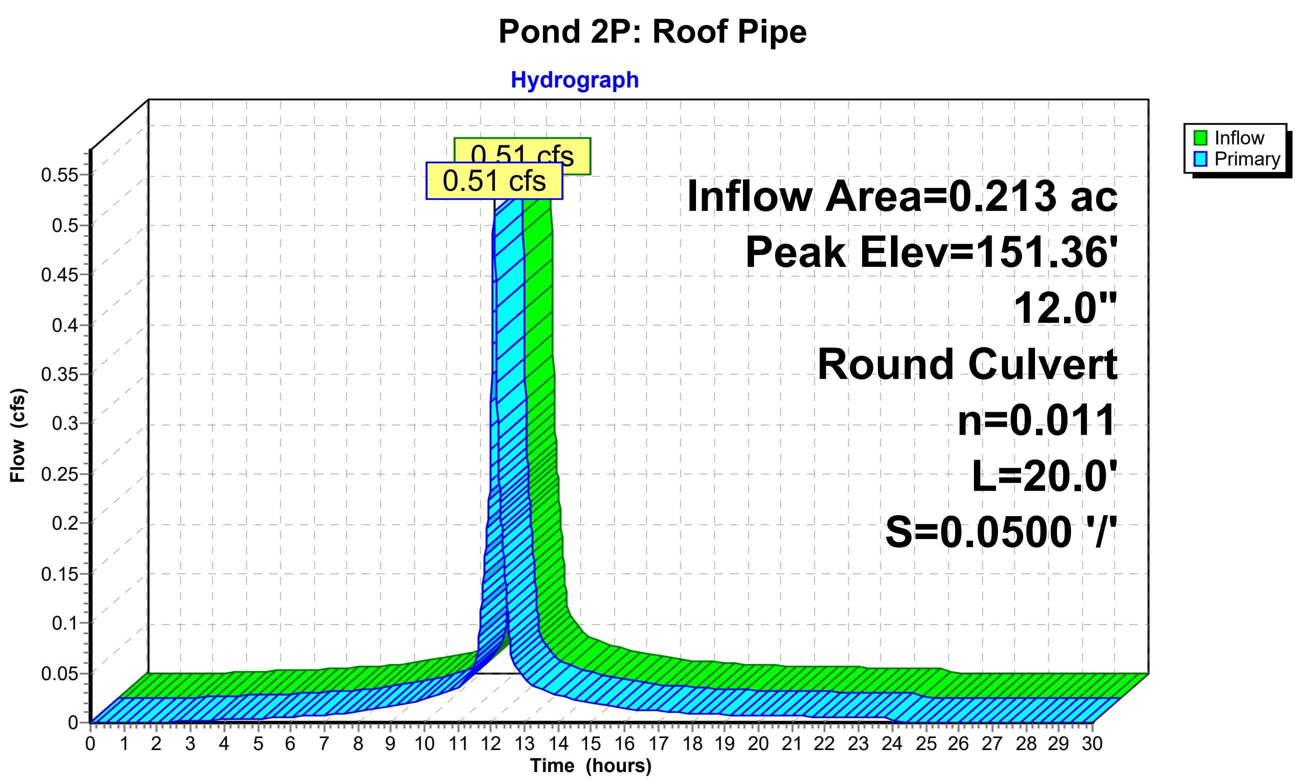
Summary for Pond 2P: Roof Pipe

Inflow Area = 0.213 ac,100.00% Impervious, Inflow Depth = 2.27" for 1-YR event
Inflow = 0.51 cfs @ 12.08 hrs, Volume= 0.040 af
Outflow = 0.51 cfs @ 12.08 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 0.51 cfs @ 12.08 hrs, Volume= 0.040 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 151.36' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.00' / 150.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.51 cfs @ 12.08 hrs HW=151.36' TW=150.30' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.51 cfs @ 2.03 fps)



Summary for Subcatchment 3P: P1b

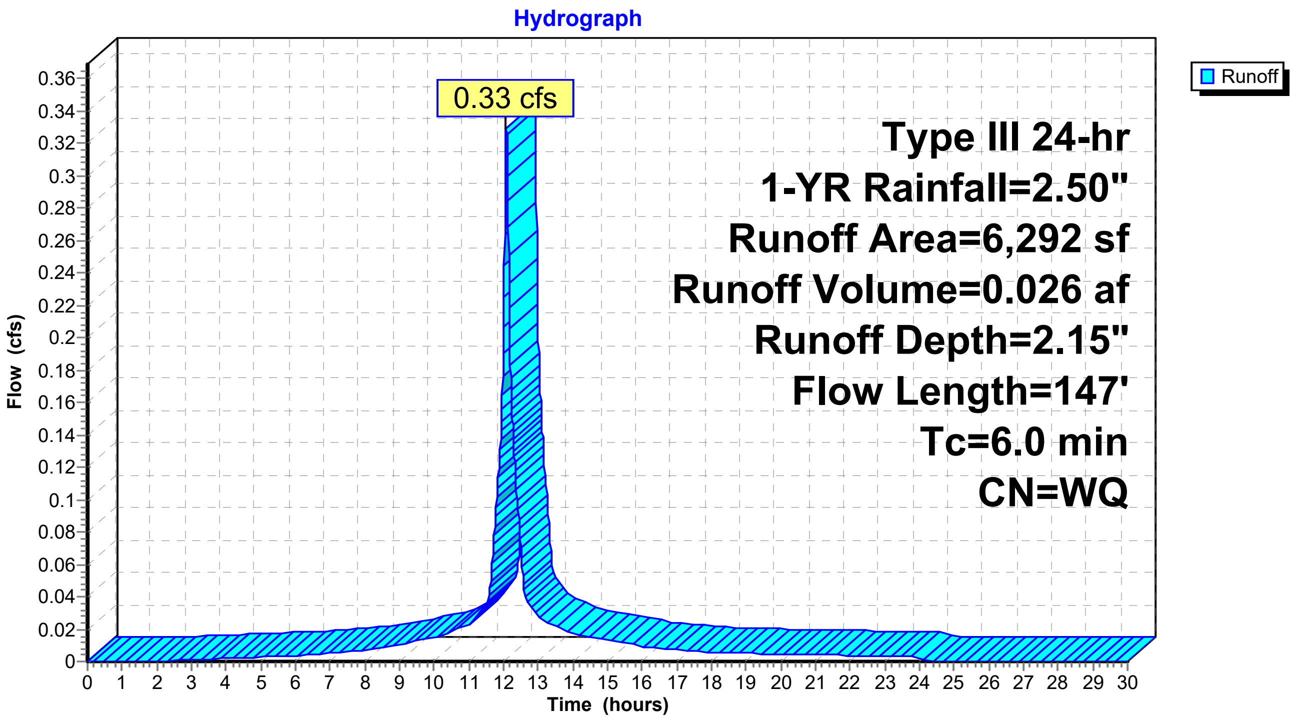
Runoff = 0.33 cfs @ 12.08 hrs, Volume= 0.026 af, Depth= 2.15"
Routed to Pond 4P : FD #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
5,955	98	Paved parking HSG A
337	39	>75% Grass cover, Good HSG A
6,292		Weighted Average
337		5.36% Pervious Area
5,955		94.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	13	0.2000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.4	87	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	147	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3P: P1b



Summary for Pond 4P: FD #2

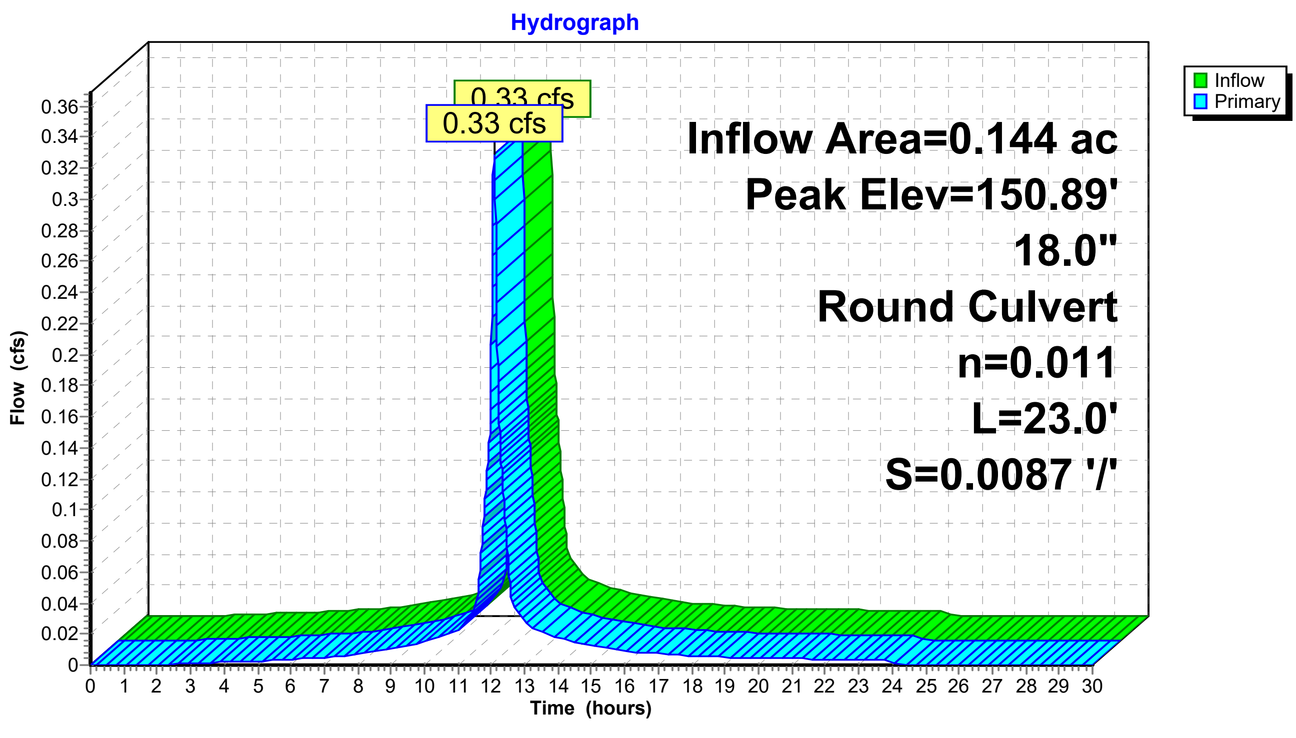
Inflow Area = 0.144 ac, 94.64% Impervious, Inflow Depth = 2.15" for 1-YR event
Inflow = 0.33 cfs @ 12.08 hrs, Volume= 0.026 af
Outflow = 0.33 cfs @ 12.08 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.08 hrs, Volume= 0.026 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.89' @ 12.86 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.20'	**18.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.20' / 150.00' S= 0.0087 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=0.30 cfs @ 12.08 hrs HW=150.48' TW=150.30' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.30 cfs @ 2.04 fps)

Pond 4P: FD #2



Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 2.22" for 1-YR event
Inflow = 0.84 cfs @ 12.08 hrs, Volume= 0.066 af
Outflow = 0.08 cfs @ 12.85 hrs, Volume= 0.066 af, Atten= 90%, Lag= 46.3 min
Discarded = 0.07 cfs @ 11.55 hrs, Volume= 0.062 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.02 cfs @ 12.85 hrs, Volume= 0.004 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.89' @ 12.85 hrs Surf.Area= 1,168 sf Storage= 1,031 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 97.9 min (859.8 - 761.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.55 hrs HW=149.55' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=149.50' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.02 cfs @ 12.85 hrs HW=150.89' TW=145.54' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.02 cfs of 0.70 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.02 cfs @ 3.24 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

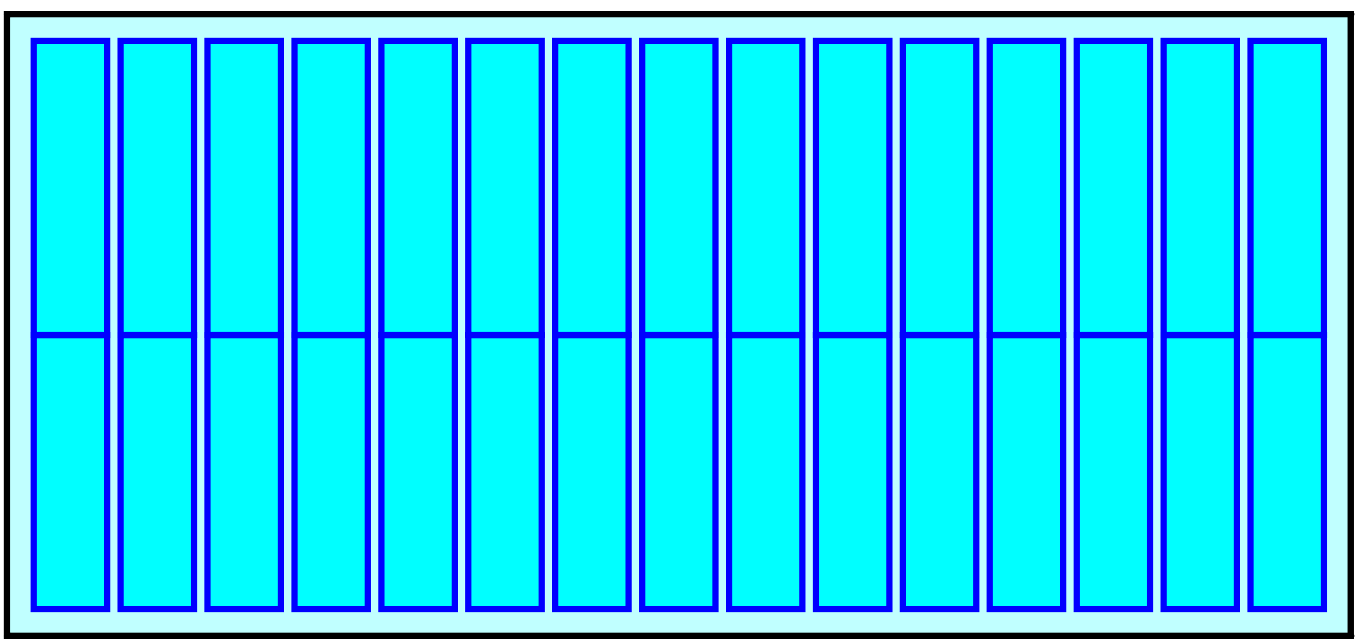
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

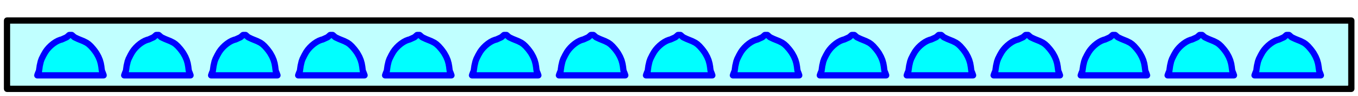
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

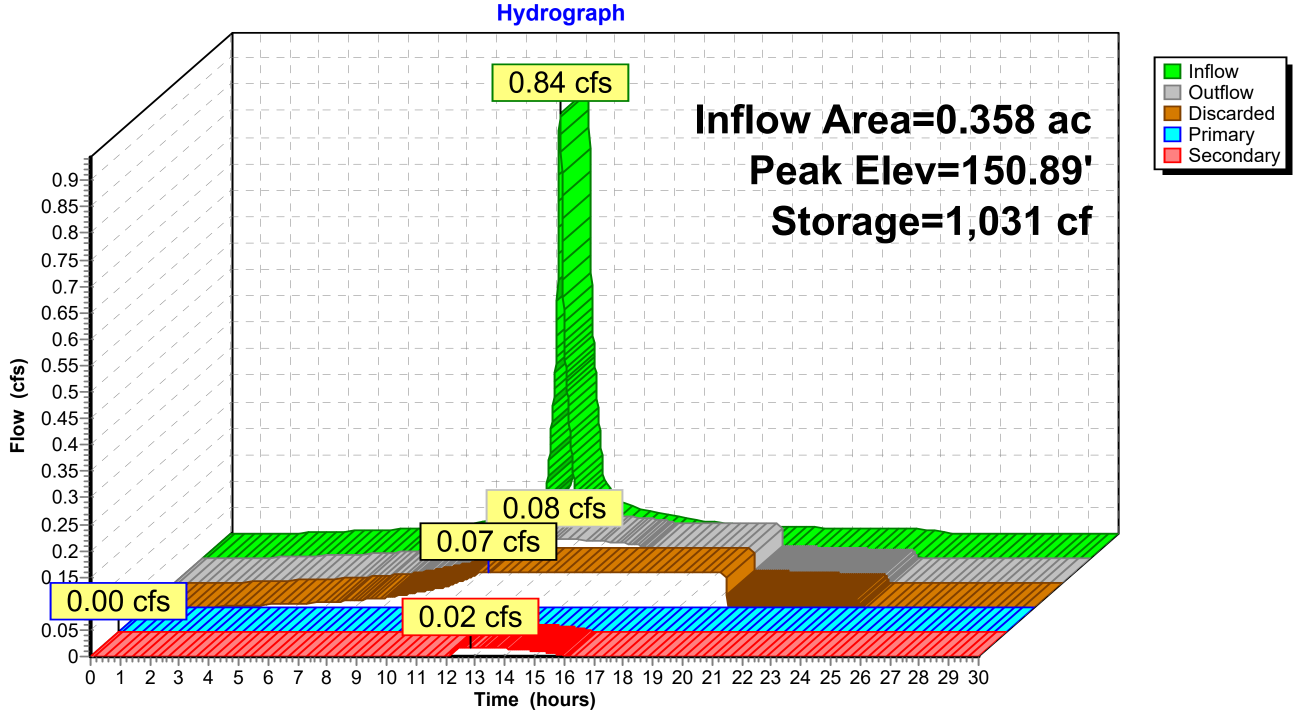
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 6P: P1c

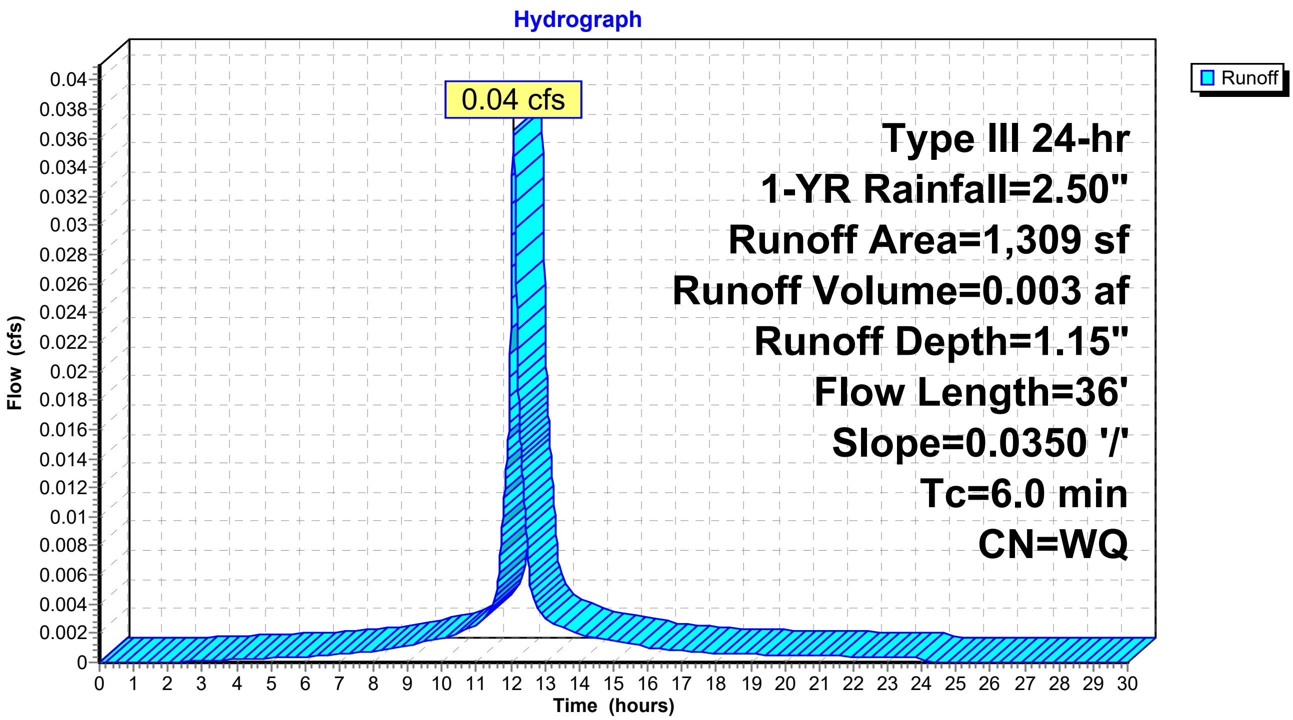
Runoff = 0.04 cfs @ 12.08 hrs, Volume= 0.003 af, Depth= 1.15"
Routed to Link 7P : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
662	98	Paved parking HSG A
647	39	>75% Grass cover, Good HSG A
1,309		Weighted Average
647		49.43% Pervious Area
662		50.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	36	0.0350	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6P: P1c

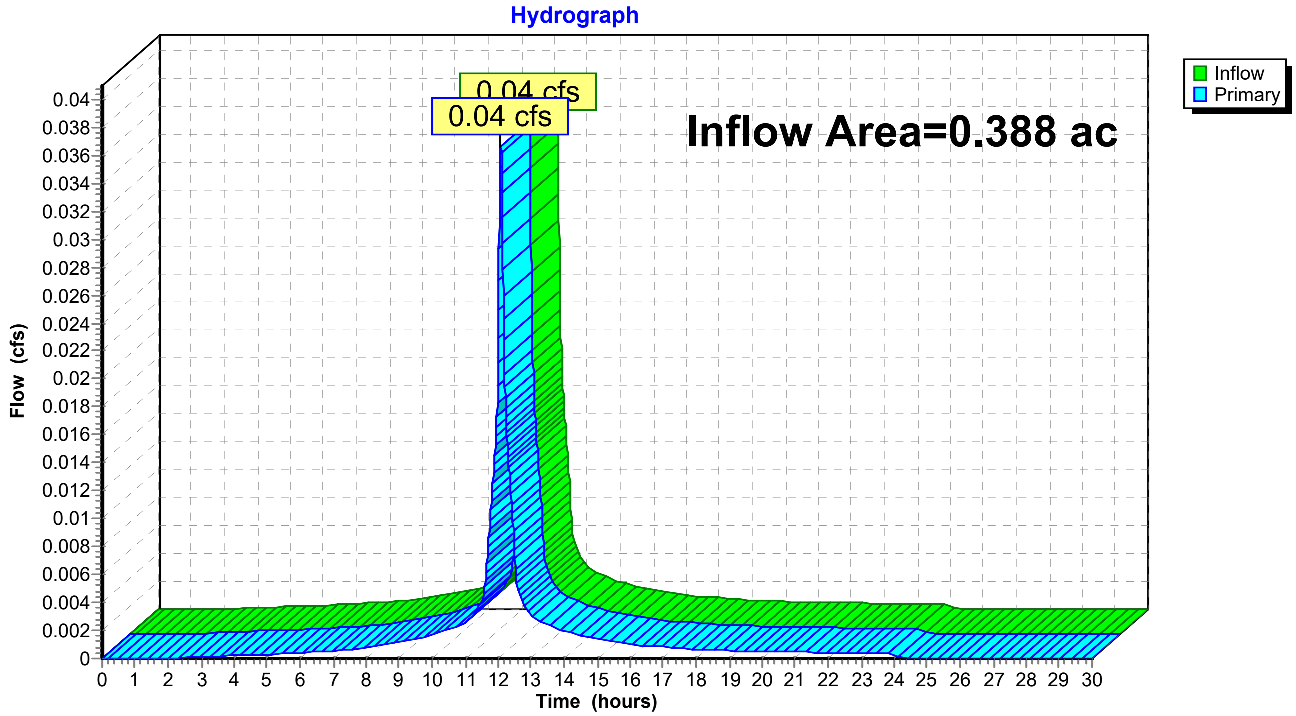


Summary for Link 7P: Design Point #1: Flow to Pleasant Street

Inflow Area = 0.388 ac, 94.17% Impervious, Inflow Depth = 0.09" for 1-YR event
Inflow = 0.04 cfs @ 12.08 hrs, Volume= 0.003 af
Primary = 0.04 cfs @ 12.08 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 7P: Design Point #1: Flow to Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1P: P1a Runoff Area=9,288 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=0.66 cfs 0.053 af

Pond 2P: Roof Pipe Peak Elev=151.51' Inflow=0.66 cfs 0.053 af
12.0" Round Culvert n=0.011 L=20.0' S=0.0500 '/' Outflow=0.66 cfs 0.053 af

Subcatchment 3P: P1b Runoff Area=6,292 sf 94.64% Impervious Runoff Depth=2.81"
Flow Length=147' Tc=6.0 min CN=WQ Runoff=0.42 cfs 0.034 af

Pond 4P: FD #2 Peak Elev=151.51' Inflow=0.42 cfs 0.034 af
18.0" Round Culvert n=0.011 L=23.0' S=0.0087 '/' Outflow=0.42 cfs 0.034 af

Pond 5P: Infiltration Field #1 Peak Elev=151.51' Storage=1,452 cf Inflow=1.09 cfs 0.087 af
Discarded=0.07 cfs 0.077 af Primary=0.00 cfs 0.000 af Secondary=0.03 cfs 0.010 af Outflow=0.09 cfs 0.087 af

Subcatchment 6P: P1c Runoff Area=1,309 sf 50.57% Impervious Runoff Depth=1.50"
Flow Length=36' Slope=0.0350 '/' Tc=6.0 min CN=WQ Runoff=0.05 cfs 0.004 af

Link 7P: Design Point #1: Flow to Pleasant Street Inflow=0.05 cfs 0.004 af
Primary=0.05 cfs 0.004 af

Total Runoff Area = 0.388 ac Runoff Volume = 0.090 af Average Runoff Depth = 2.79"
5.83% Pervious = 0.023 ac 94.17% Impervious = 0.365 ac

Summary for Subcatchment 1P: P1a

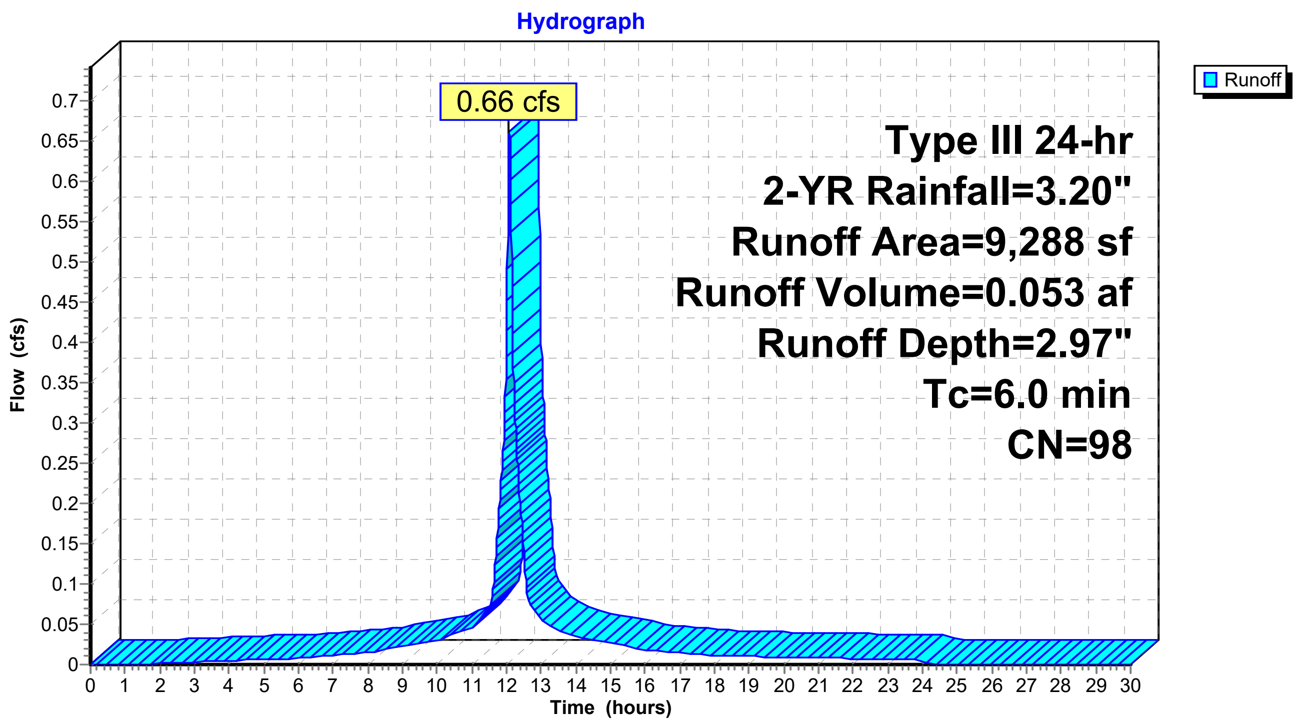
Runoff = 0.66 cfs @ 12.08 hrs, Volume= 0.053 af, Depth= 2.97"
Routed to Pond 2P : Roof Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
9,288	98	Roofs HSG A
9,288		100.00% Impervious Area

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

Subcatchment 1P: P1a



Summary for Pond 2P: Roof Pipe

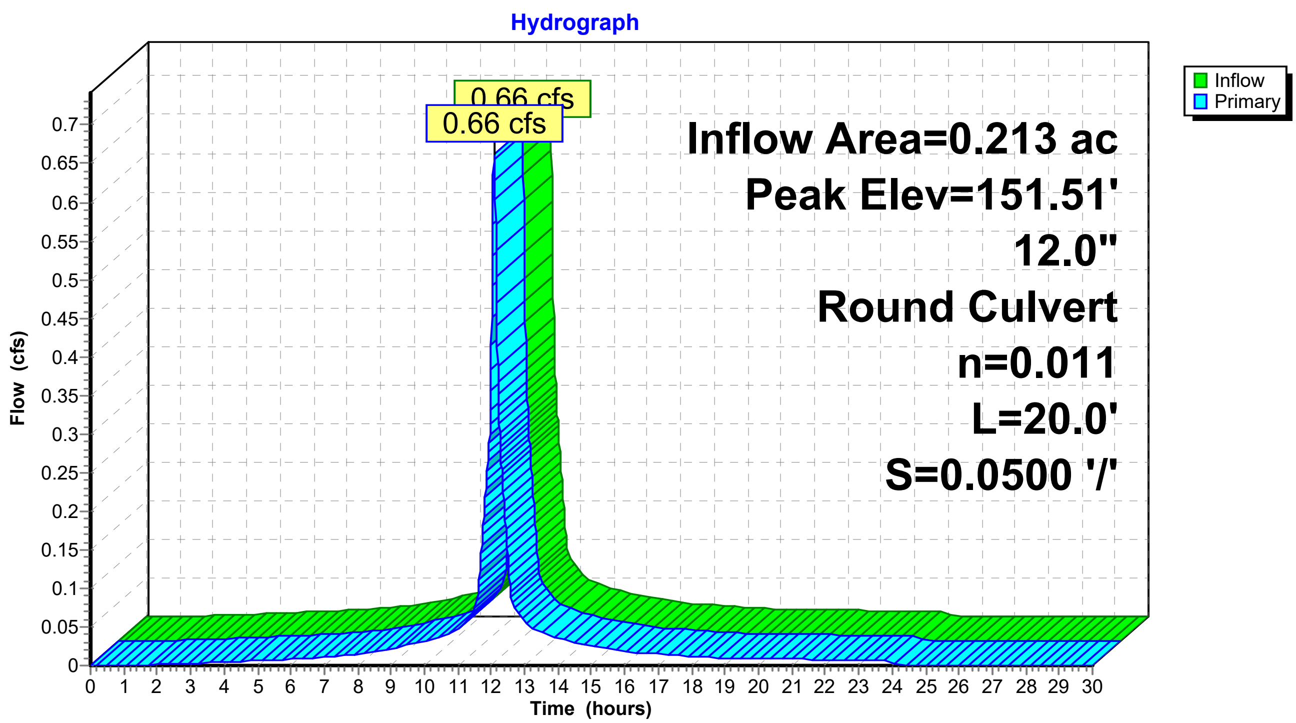
Inflow Area = 0.213 ac,100.00% Impervious, Inflow Depth = 2.97" for 2-YR event
Inflow = 0.66 cfs @ 12.08 hrs, Volume= 0.053 af
Outflow = 0.66 cfs @ 12.08 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Primary = 0.66 cfs @ 12.08 hrs, Volume= 0.053 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 151.51' @ 12.99 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.00' / 150.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.66 cfs @ 12.08 hrs HW=151.41' TW=150.56' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.66 cfs @ 2.18 fps)

Pond 2P: Roof Pipe



Summary for Subcatchment 3P: P1b

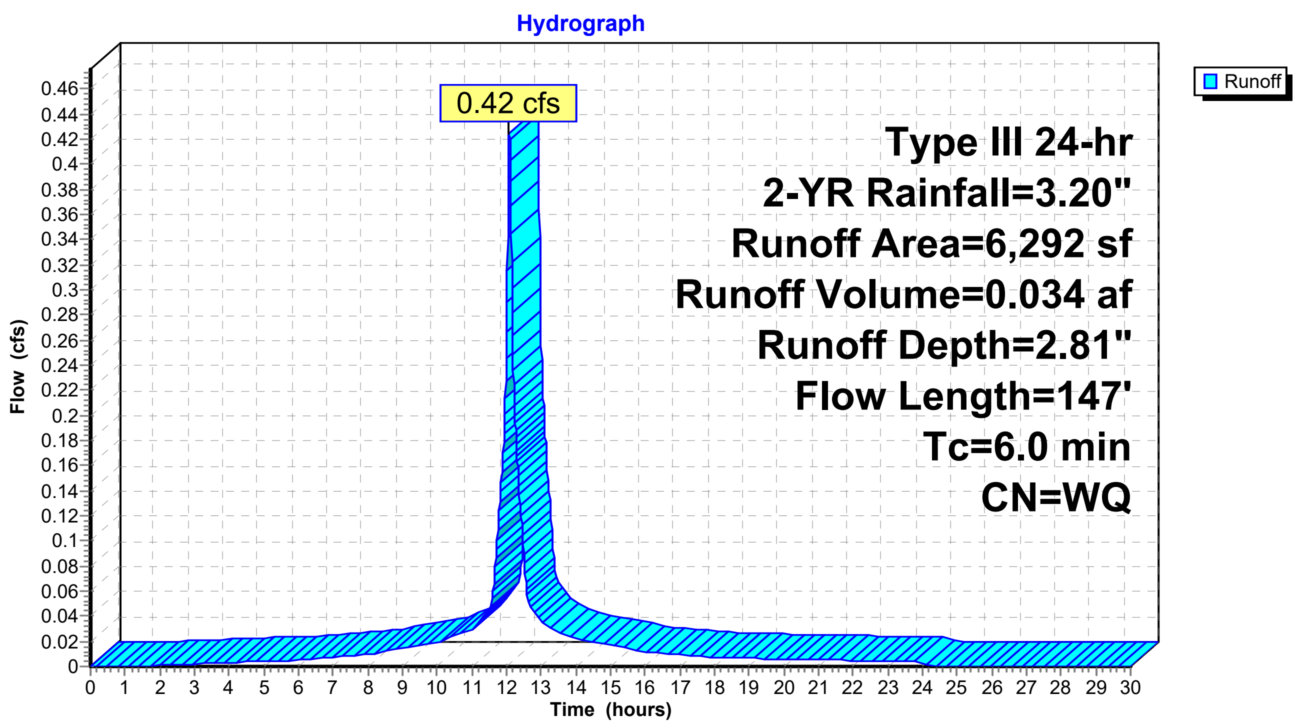
Runoff = 0.42 cfs @ 12.08 hrs, Volume= 0.034 af, Depth= 2.81"
Routed to Pond 4P : FD #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
5,955	98	Paved parking HSG A
337	39	>75% Grass cover, Good HSG A
6,292		Weighted Average
337		5.36% Pervious Area
5,955		94.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	13	0.2000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.4	87	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	147	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3P: P1b



Summary for Pond 4P: FD #2

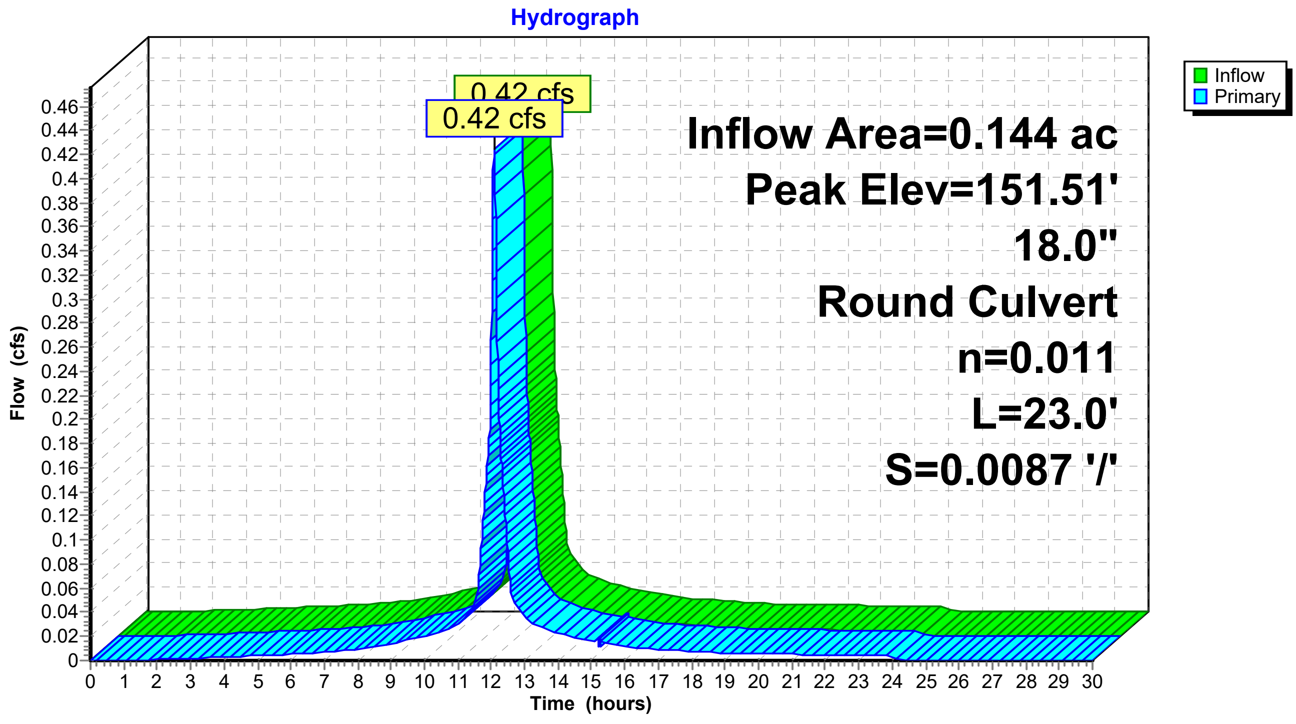
Inflow Area = 0.144 ac, 94.64% Impervious, Inflow Depth = 2.81" for 2-YR event
Inflow = 0.42 cfs @ 12.08 hrs, Volume= 0.034 af
Outflow = 0.42 cfs @ 12.08 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.08 hrs, Volume= 0.034 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 151.51' @ 13.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.20'	**18.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.20' / 150.00' S= 0.0087 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=0.32 cfs @ 12.08 hrs HW=150.61' TW=150.56' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.32 cfs @ 1.22 fps)

Pond 4P: FD #2



Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 2.90" for 2-YR event
Inflow = 1.09 cfs @ 12.08 hrs, Volume= 0.087 af
Outflow = 0.09 cfs @ 12.99 hrs, Volume= 0.087 af, Atten= 91%, Lag= 54.1 min
Discarded = 0.07 cfs @ 12.23 hrs, Volume= 0.077 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.03 cfs @ 12.99 hrs, Volume= 0.010 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 151.51' @ 12.99 hrs Surf.Area= 1,181 sf Storage= 1,452 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 131.1 min (887.5 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.23 hrs HW=151.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=149.50' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.03 cfs @ 12.99 hrs HW=151.51' TW=146.05' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.03 cfs of 1.02 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.97 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

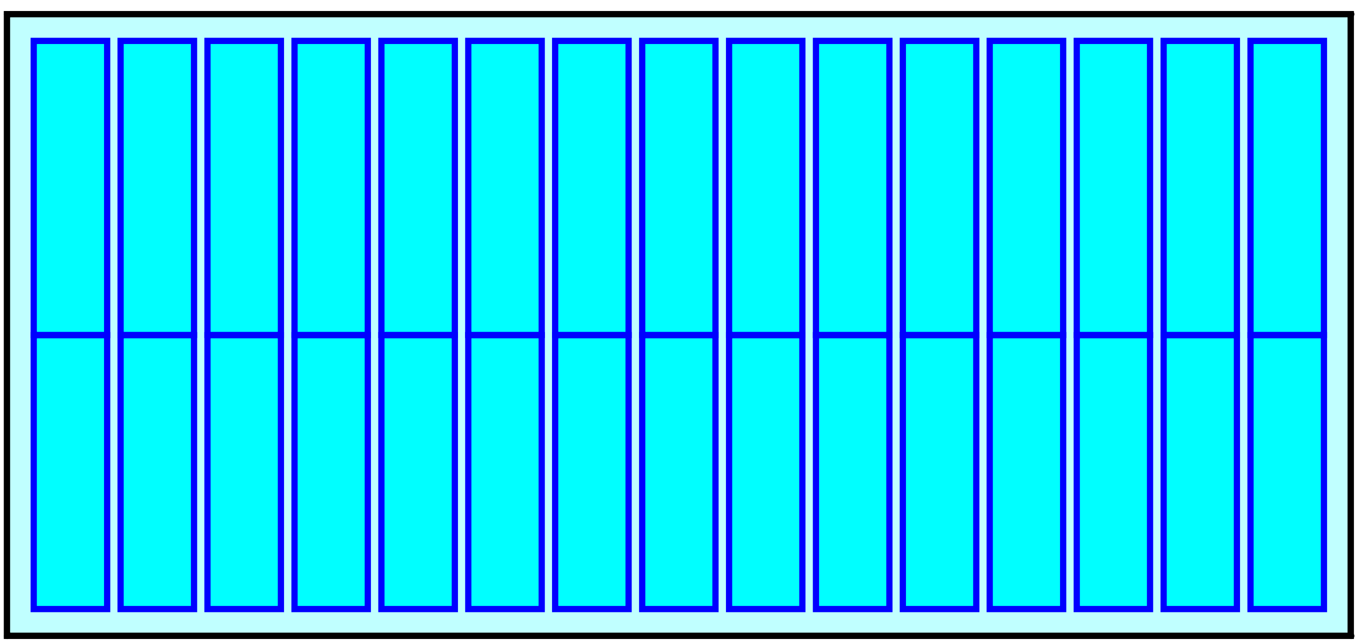
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

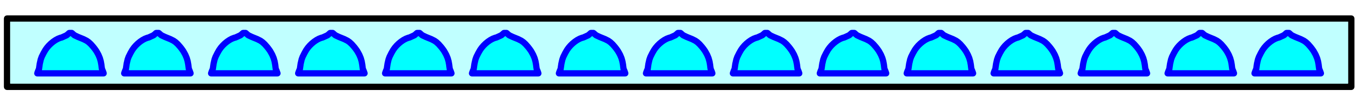
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

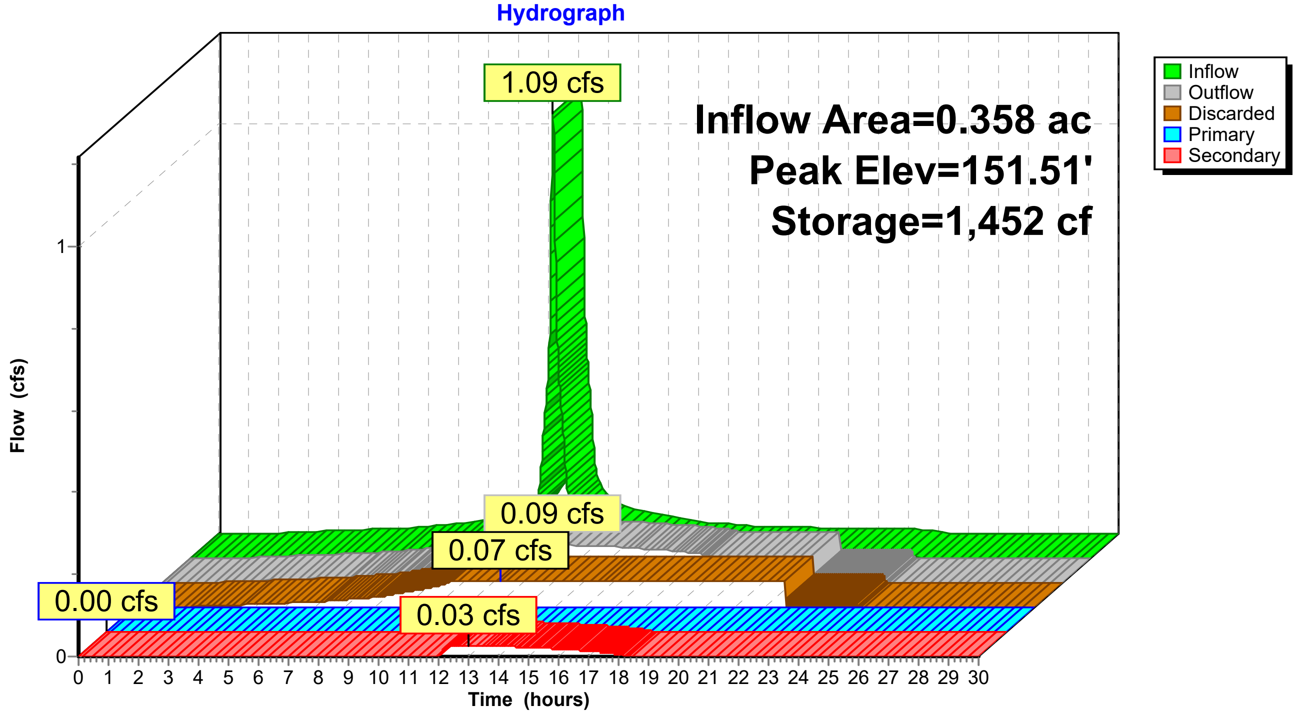
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 6P: P1c

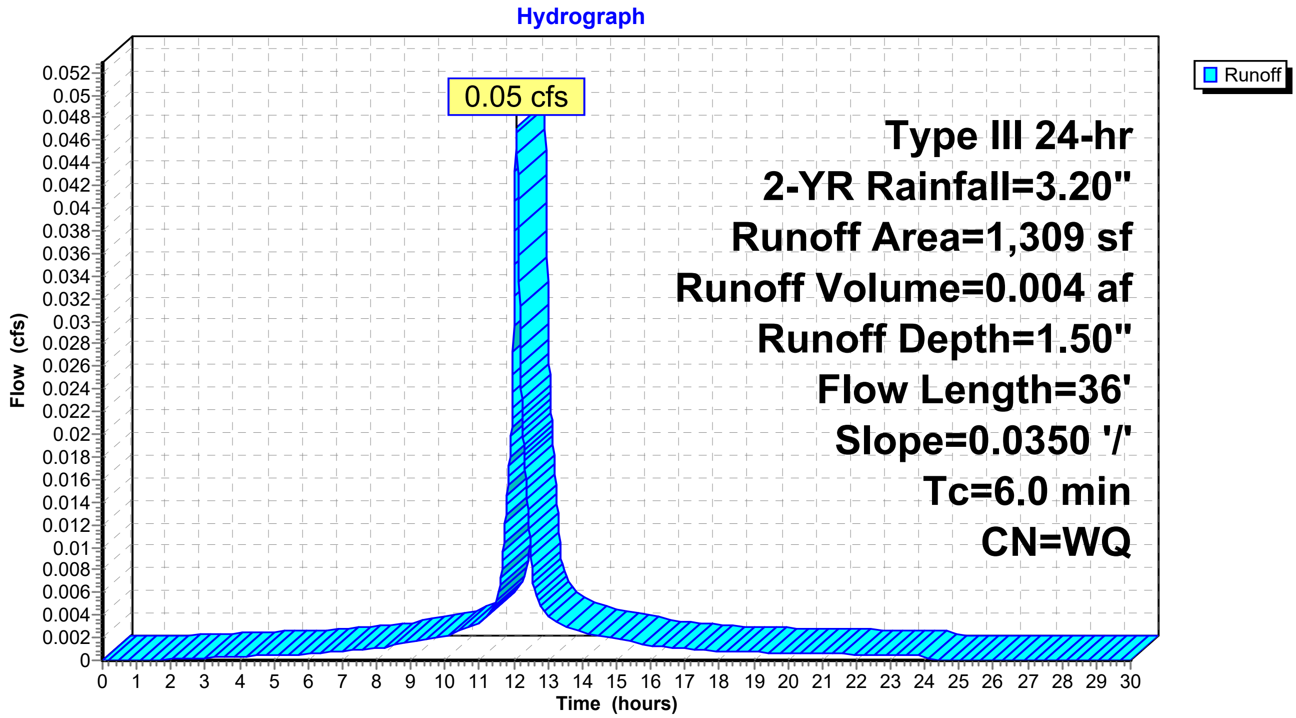
Runoff = 0.05 cfs @ 12.08 hrs, Volume= 0.004 af, Depth= 1.50"
Routed to Link 7P : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
662	98	Paved parking HSG A
647	39	>75% Grass cover, Good HSG A
1,309		Weighted Average
647		49.43% Pervious Area
662		50.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	36	0.0350	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6P: P1c

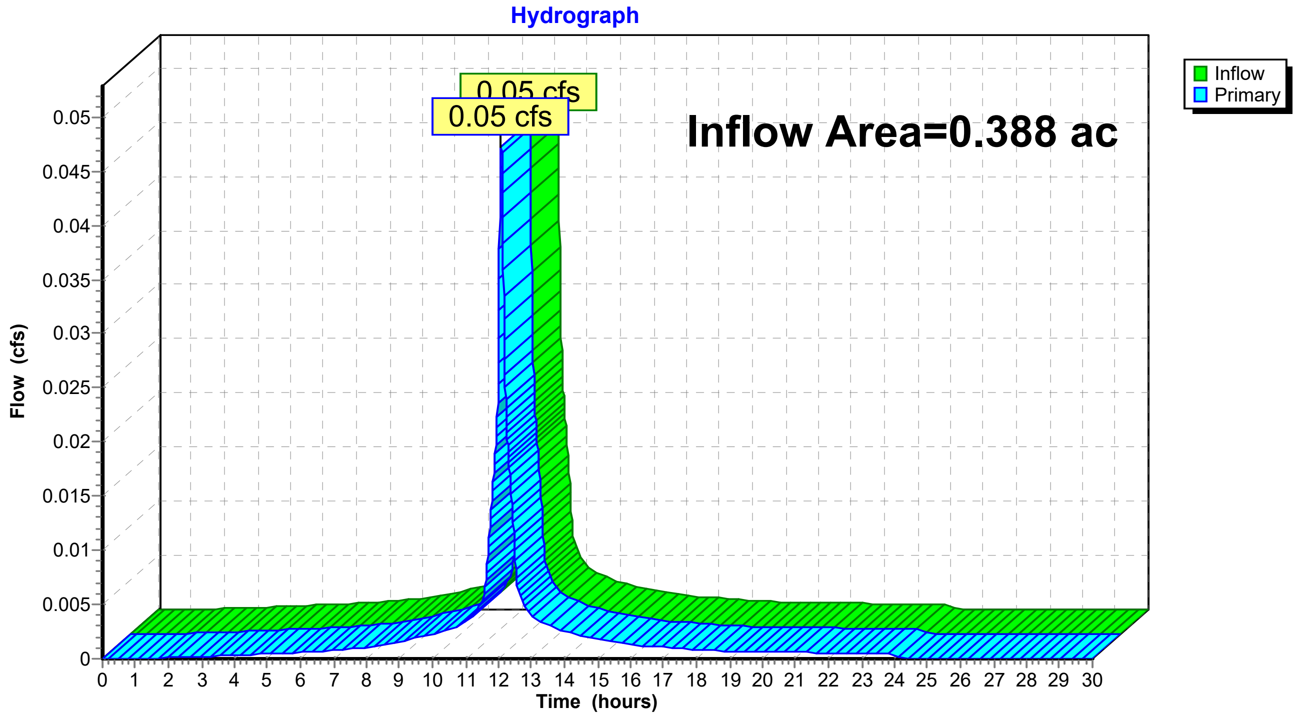


Summary for Link 7P: Design Point #1: Flow to Pleasant Street

Inflow Area = 0.388 ac, 94.17% Impervious, Inflow Depth = 0.12" for 2-YR event
Inflow = 0.05 cfs @ 12.08 hrs, Volume= 0.004 af
Primary = 0.05 cfs @ 12.08 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 7P: Design Point #1: Flow to Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1P: P1a Runoff Area=9,288 sf 100.00% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=98 Runoff=0.98 cfs 0.079 af

Pond 2P: Roof Pipe Peak Elev=154.07' Inflow=0.98 cfs 0.079 af
12.0" Round Culvert n=0.011 L=20.0' S=0.0500 '/' Outflow=0.98 cfs 0.079 af

Subcatchment 3P: P1b Runoff Area=6,292 sf 94.64% Impervious Runoff Depth=4.23"
Flow Length=147' Tc=6.0 min CN=WQ Runoff=0.63 cfs 0.051 af

Pond 4P: FD #2 Peak Elev=154.05' Inflow=0.63 cfs 0.051 af
18.0" Round Culvert n=0.011 L=23.0' S=0.0087 '/' Outflow=0.63 cfs 0.051 af

Pond 5P: Infiltration Field #1 Peak Elev=154.05' Storage=1,732 cf Inflow=1.61 cfs 0.130 af
Discarded=0.07 cfs 0.095 af Primary=1.51 cfs 0.016 af Secondary=0.05 cfs 0.019 af Outflow=1.62 cfs 0.130 af

Subcatchment 6P: P1c Runoff Area=1,309 sf 50.57% Impervious Runoff Depth=2.33"
Flow Length=36' Slope=0.0350 '/' Tc=6.0 min CN=WQ Runoff=0.07 cfs 0.006 af

Link 7P: Design Point #1: Flow to Pleasant Street Inflow=1.55 cfs 0.022 af
Primary=1.55 cfs 0.022 af

Total Runoff Area = 0.388 ac Runoff Volume = 0.136 af Average Runoff Depth = 4.21"
5.83% Pervious = 0.023 ac 94.17% Impervious = 0.365 ac

Summary for Subcatchment 1P: P1a

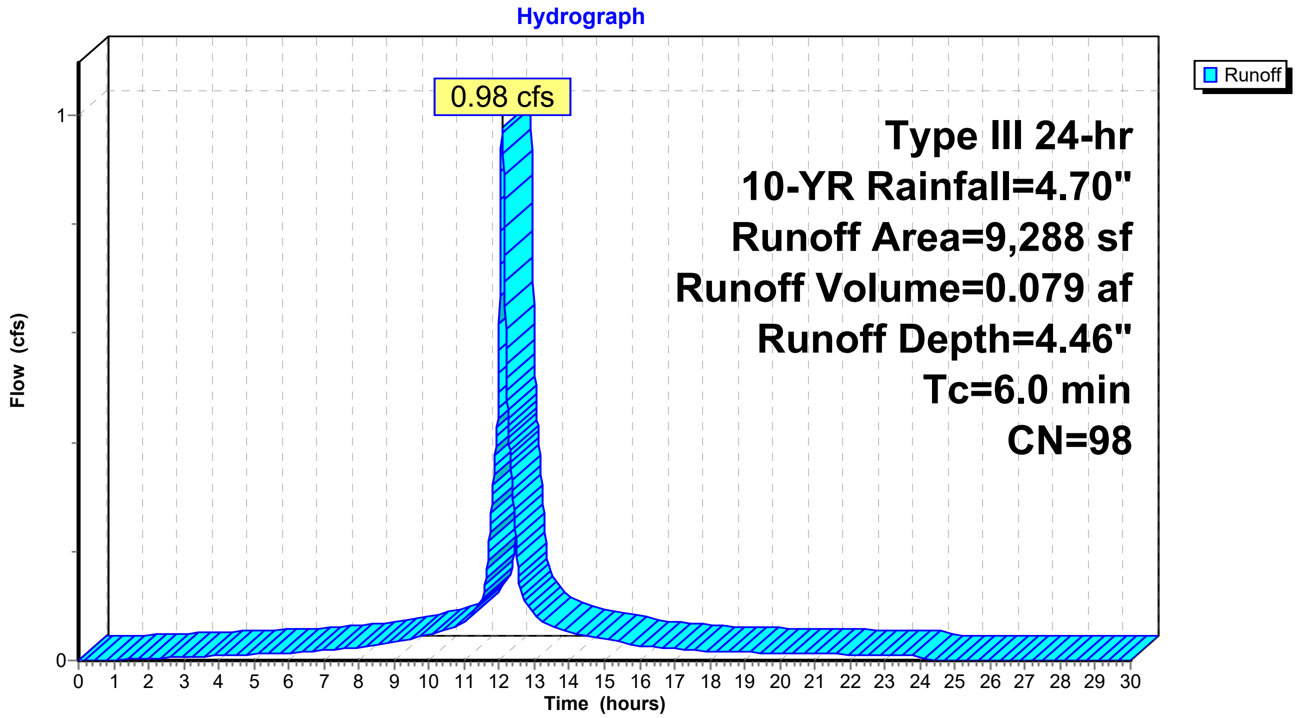
Runoff = 0.98 cfs @ 12.08 hrs, Volume= 0.079 af, Depth= 4.46"
Routed to Pond 2P : Roof Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
9,288	98	Roofs HSG A
9,288		100.00% Impervious Area

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

Subcatchment 1P: P1a



Summary for Pond 2P: Roof Pipe

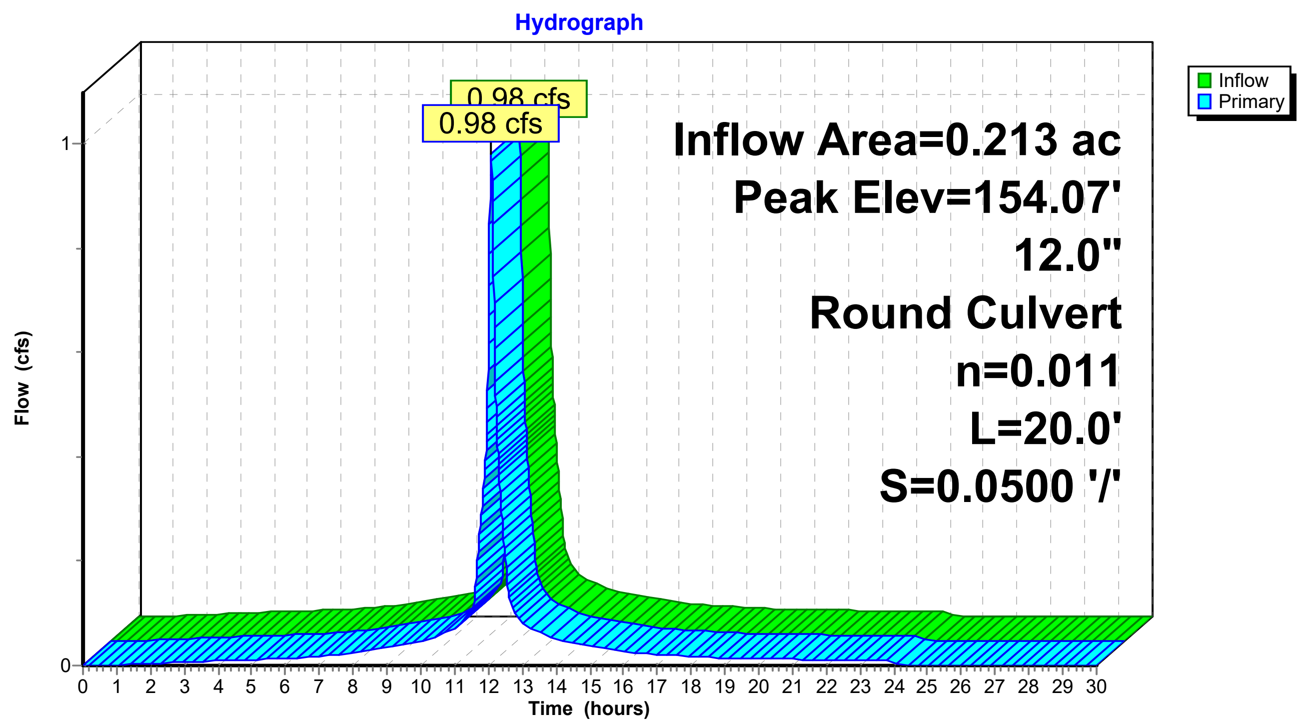
Inflow Area = 0.213 ac,100.00% Impervious, Inflow Depth = 4.46" for 10-YR event
Inflow = 0.98 cfs @ 12.08 hrs, Volume= 0.079 af
Outflow = 0.98 cfs @ 12.08 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min
Primary = 0.98 cfs @ 12.08 hrs, Volume= 0.079 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.07' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.00' / 150.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.86 cfs @ 12.08 hrs HW=151.54' TW=151.28' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.86 cfs @ 2.86 fps)

Pond 2P: Roof Pipe



Summary for Subcatchment 3P: P1b

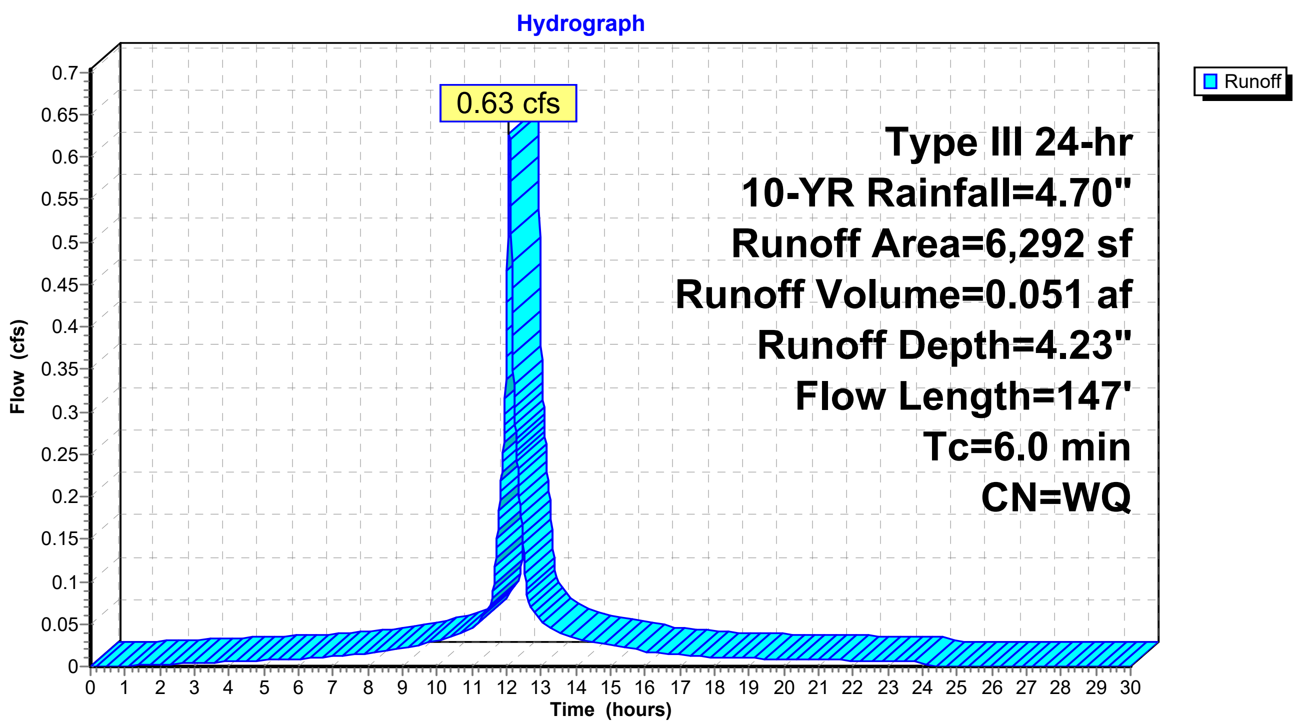
Runoff = 0.63 cfs @ 12.08 hrs, Volume= 0.051 af, Depth= 4.23"
Routed to Pond 4P : FD #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
5,955	98	Paved parking HSG A
337	39	>75% Grass cover, Good HSG A
6,292		Weighted Average
337		5.36% Pervious Area
5,955		94.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	13	0.2000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.4	87	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	147	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3P: P1b



Summary for Pond 4P: FD #2

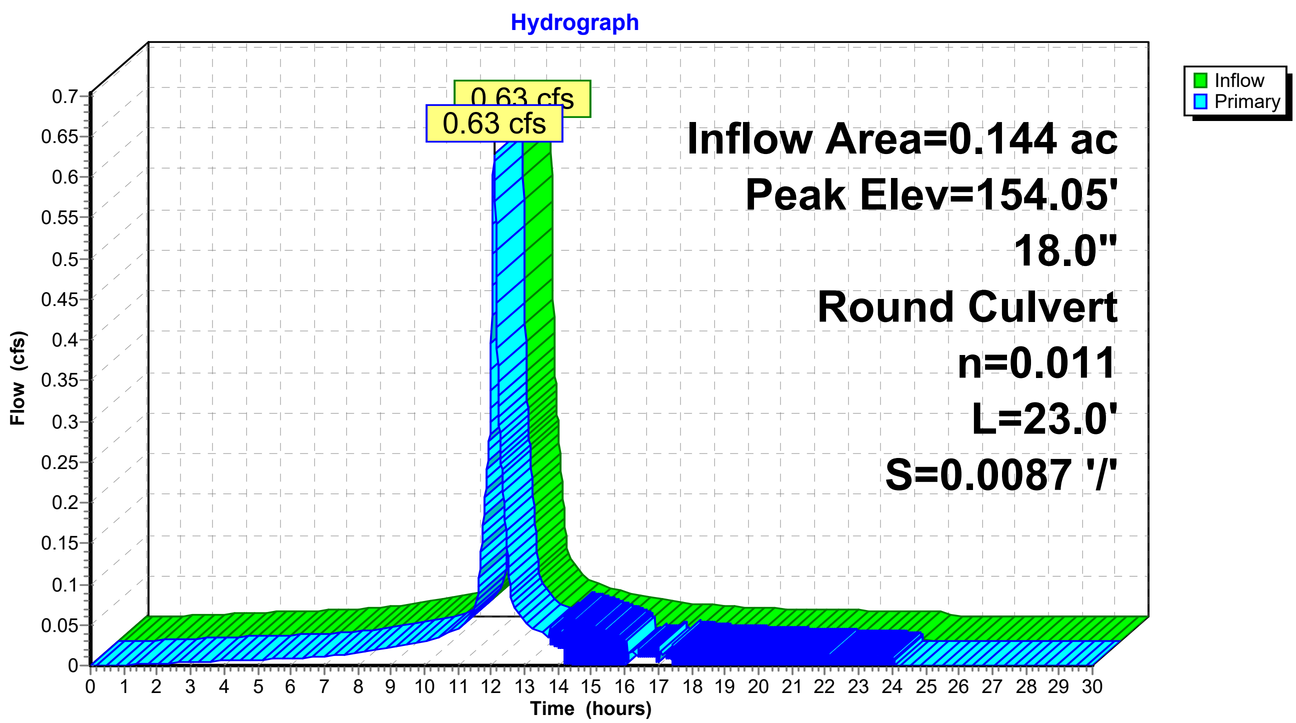
Inflow Area = 0.144 ac, 94.64% Impervious, Inflow Depth = 4.23" for 10-YR event
Inflow = 0.63 cfs @ 12.08 hrs, Volume= 0.051 af
Outflow = 0.63 cfs @ 12.08 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.08 hrs, Volume= 0.051 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.05' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.20'	**18.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.20' / 150.00' S= 0.0087 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=151.22' TW=151.28' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)

Pond 4P: FD #2



Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 4.37" for 10-YR event
Inflow = 1.61 cfs @ 12.08 hrs, Volume= 0.130 af
Outflow = 1.62 cfs @ 12.18 hrs, Volume= 0.130 af, Atten= 0%, Lag= 5.8 min
Discarded = 0.07 cfs @ 12.05 hrs, Volume= 0.095 af
Primary = 1.51 cfs @ 12.18 hrs, Volume= 0.016 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.05 cfs @ 12.18 hrs, Volume= 0.019 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.05' @ 12.18 hrs Surf.Area= 1,181 sf Storage= 1,732 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 135.0 min (884.2 - 749.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.05 hrs HW=151.04' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=1.44 cfs @ 12.18 hrs HW=154.04' TW=0.00' (Dynamic Tailwater)
└—**2=Orifice/Grate** (Weir Controls 1.44 cfs @ 1.24 fps)

Secondary OutFlow Max=0.05 cfs @ 12.18 hrs HW=154.05' TW=146.26' (Dynamic Tailwater)
└—**3=Culvert** (Passes 0.05 cfs of 1.82 cfs potential flow)
  └—**4=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.15 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

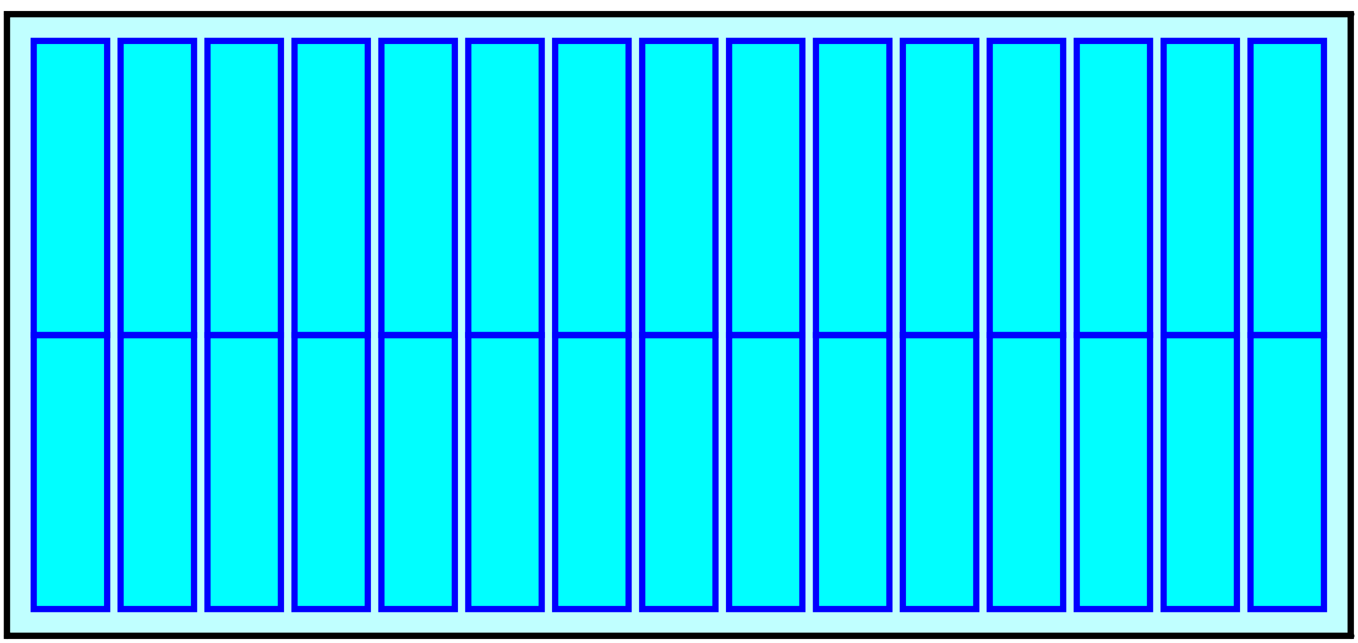
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

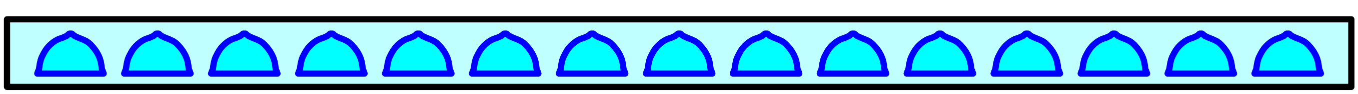
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

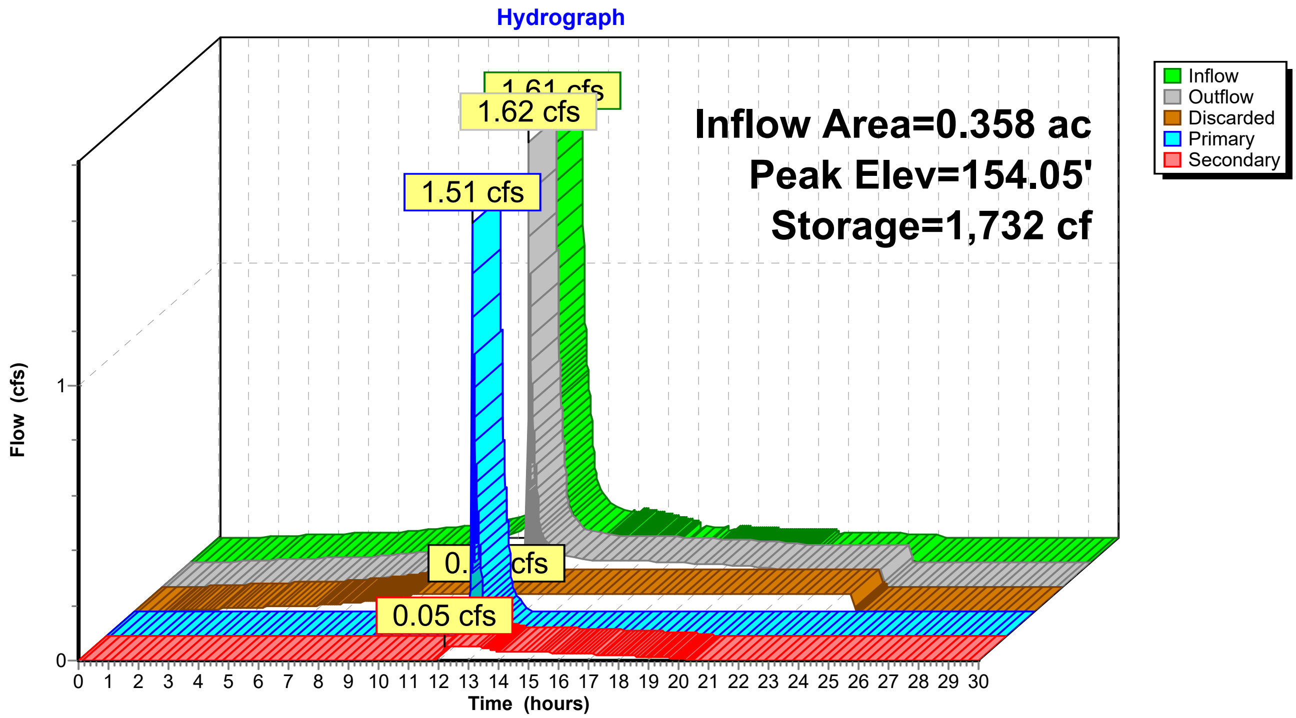
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 6P: P1c

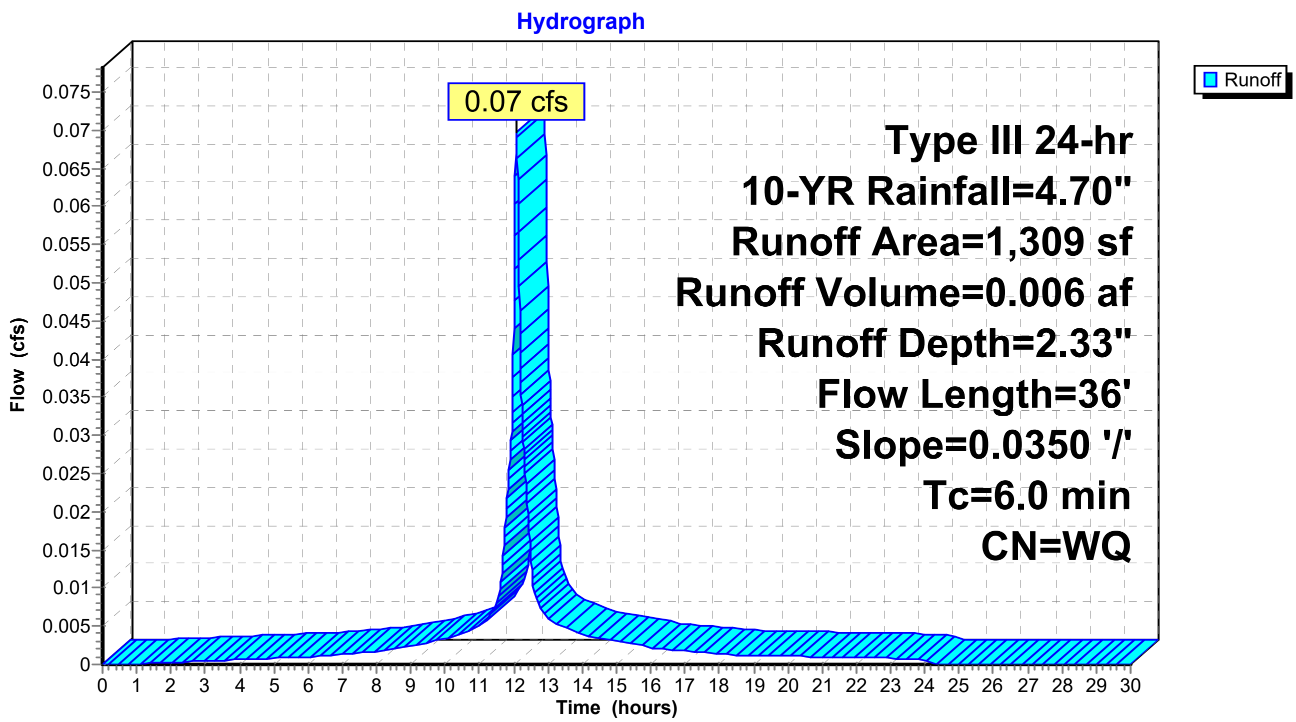
Runoff = 0.07 cfs @ 12.08 hrs, Volume= 0.006 af, Depth= 2.33"
Routed to Link 7P : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
662	98	Paved parking HSG A
647	39	>75% Grass cover, Good HSG A
1,309		Weighted Average
647		49.43% Pervious Area
662		50.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	36	0.0350	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6P: P1c

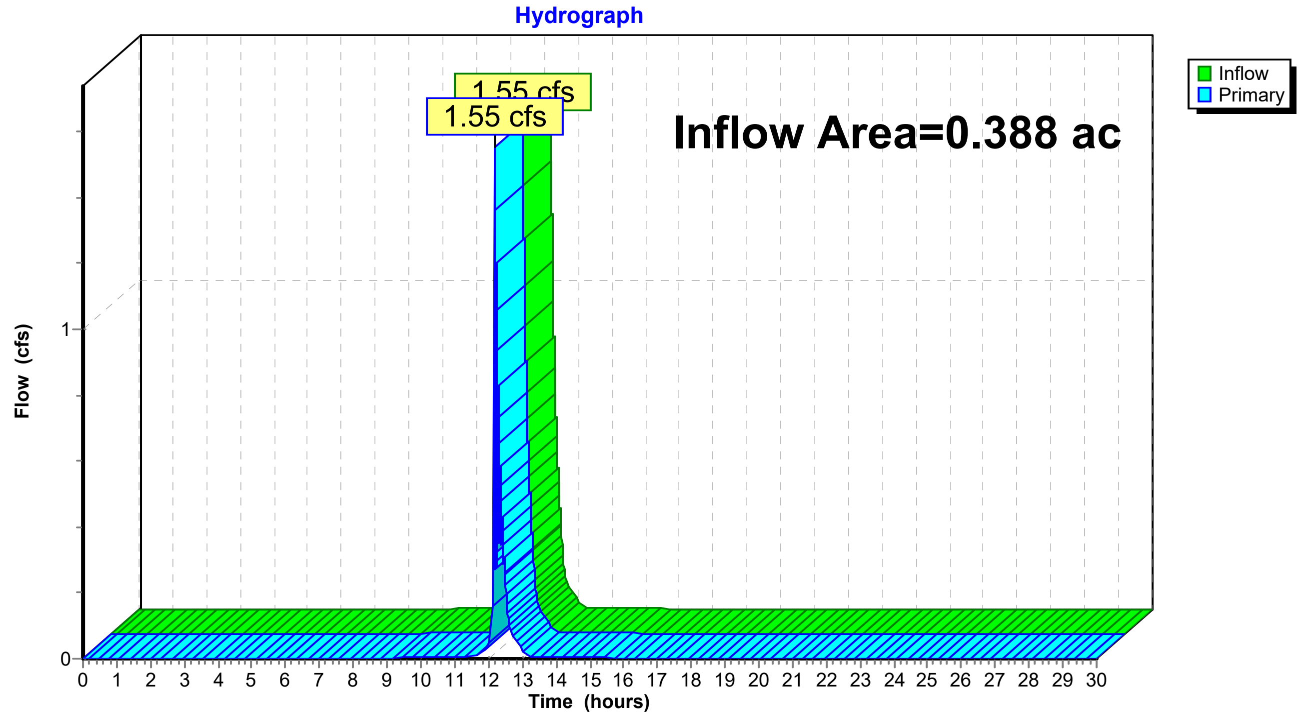


Summary for Link 7P: Design Point #1: Flow to Pleasant Street

Inflow Area = 0.388 ac, 94.17% Impervious, Inflow Depth = 0.69" for 10-YR event
Inflow = 1.55 cfs @ 12.18 hrs, Volume= 0.022 af
Primary = 1.55 cfs @ 12.18 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 7P: Design Point #1: Flow to Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1P: P1a Runoff Area=9,288 sf 100.00% Impervious Runoff Depth=5.86"
Tc=6.0 min CN=98 Runoff=1.27 cfs 0.104 af

Pond 2P: Roof Pipe Peak Elev=154.21' Inflow=1.27 cfs 0.104 af
12.0" Round Culvert n=0.011 L=20.0' S=0.0500 '/' Outflow=1.27 cfs 0.104 af

Subcatchment 3P: P1b Runoff Area=6,292 sf 94.64% Impervious Runoff Depth=5.57"
Flow Length=147' Tc=6.0 min CN=WQ Runoff=0.82 cfs 0.067 af

Pond 4P: FD #2 Peak Elev=154.11' Inflow=0.82 cfs 0.067 af
18.0" Round Culvert n=0.011 L=23.0' S=0.0087 '/' Outflow=0.82 cfs 0.067 af

Pond 5P: Infiltration Field #1 Peak Elev=154.10' Storage=1,732 cf Inflow=2.09 cfs 0.171 af
Discarded=0.07 cfs 0.106 af Primary=2.32 cfs 0.042 af Secondary=0.05 cfs 0.023 af Outflow=2.43 cfs 0.171 af

Subcatchment 6P: P1c Runoff Area=1,309 sf 50.57% Impervious Runoff Depth=3.20"
Flow Length=36' Slope=0.0350 '/' Tc=6.0 min CN=WQ Runoff=0.09 cfs 0.008 af

Link 7P: Design Point #1: Flow to Pleasant Street Inflow=2.41 cfs 0.050 af
Primary=2.41 cfs 0.050 af

Total Runoff Area = 0.388 ac Runoff Volume = 0.179 af Average Runoff Depth = 5.55"
5.83% Pervious = 0.023 ac 94.17% Impervious = 0.365 ac

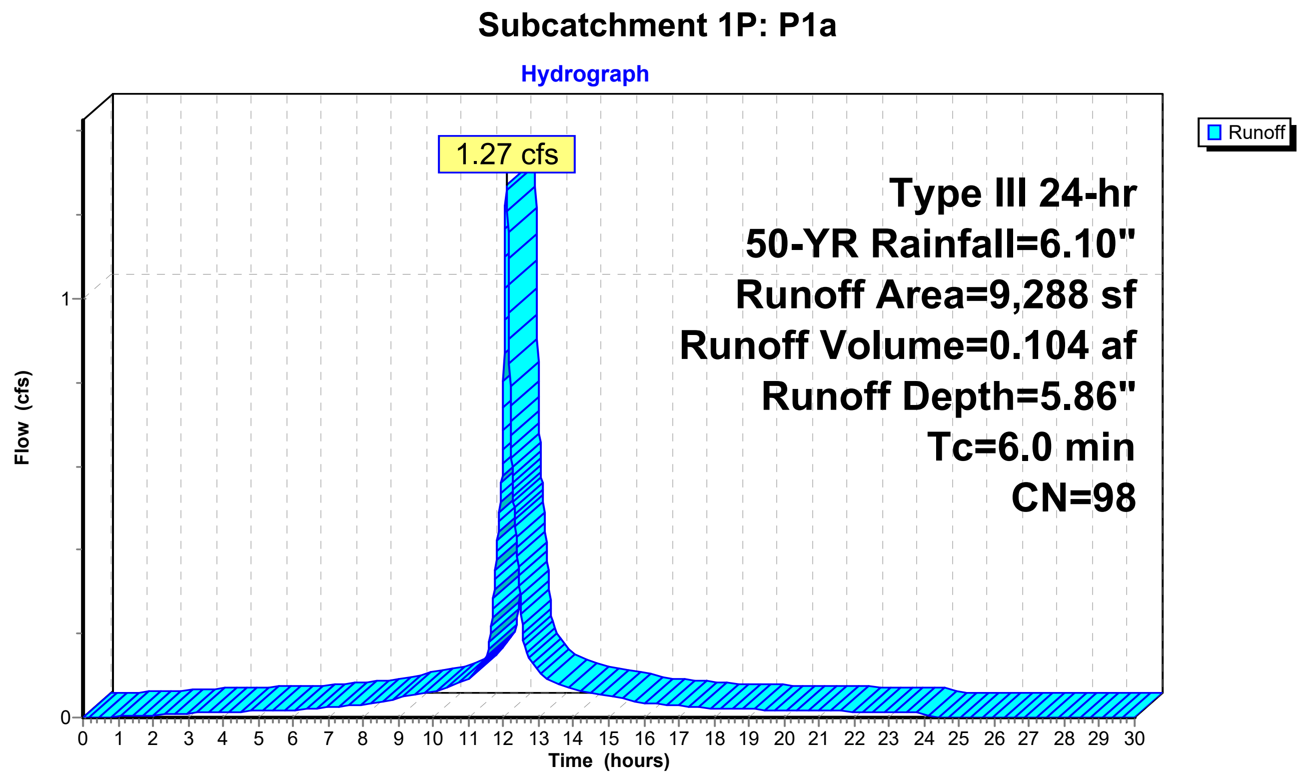
Summary for Subcatchment 1P: P1a

Runoff = 1.27 cfs @ 12.08 hrs, Volume= 0.104 af, Depth= 5.86"
Routed to Pond 2P : Roof Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
9,288	98	Roofs HSG A
9,288		100.00% Impervious Area

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



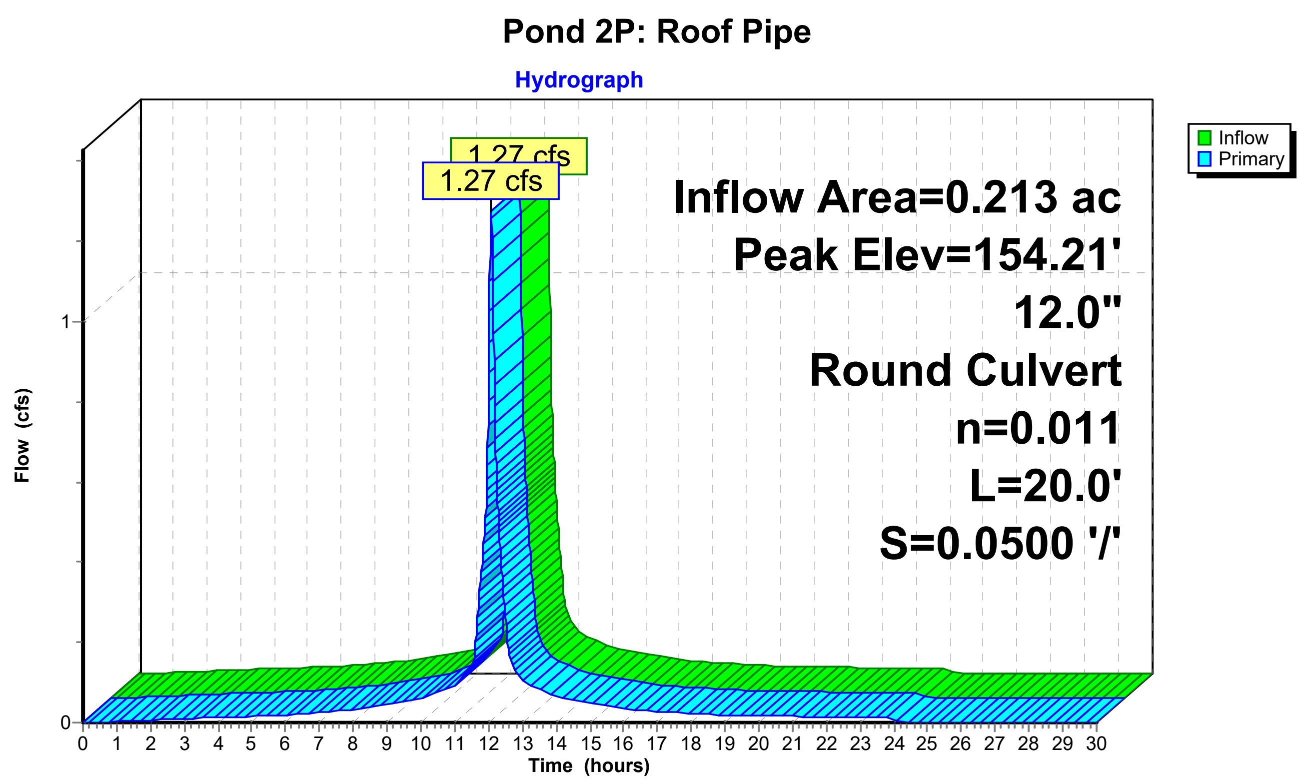
Summary for Pond 2P: Roof Pipe

Inflow Area = 0.213 ac,100.00% Impervious, Inflow Depth = 5.86" for 50-YR event
Inflow = 1.27 cfs @ 12.08 hrs, Volume= 0.104 af
Outflow = 1.27 cfs @ 12.08 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min
Primary = 1.27 cfs @ 12.08 hrs, Volume= 0.104 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.21' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.00' / 150.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.18 cfs @ 12.08 hrs HW=154.18' TW=154.09' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.18 cfs @ 1.51 fps)



Summary for Subcatchment 3P: P1b

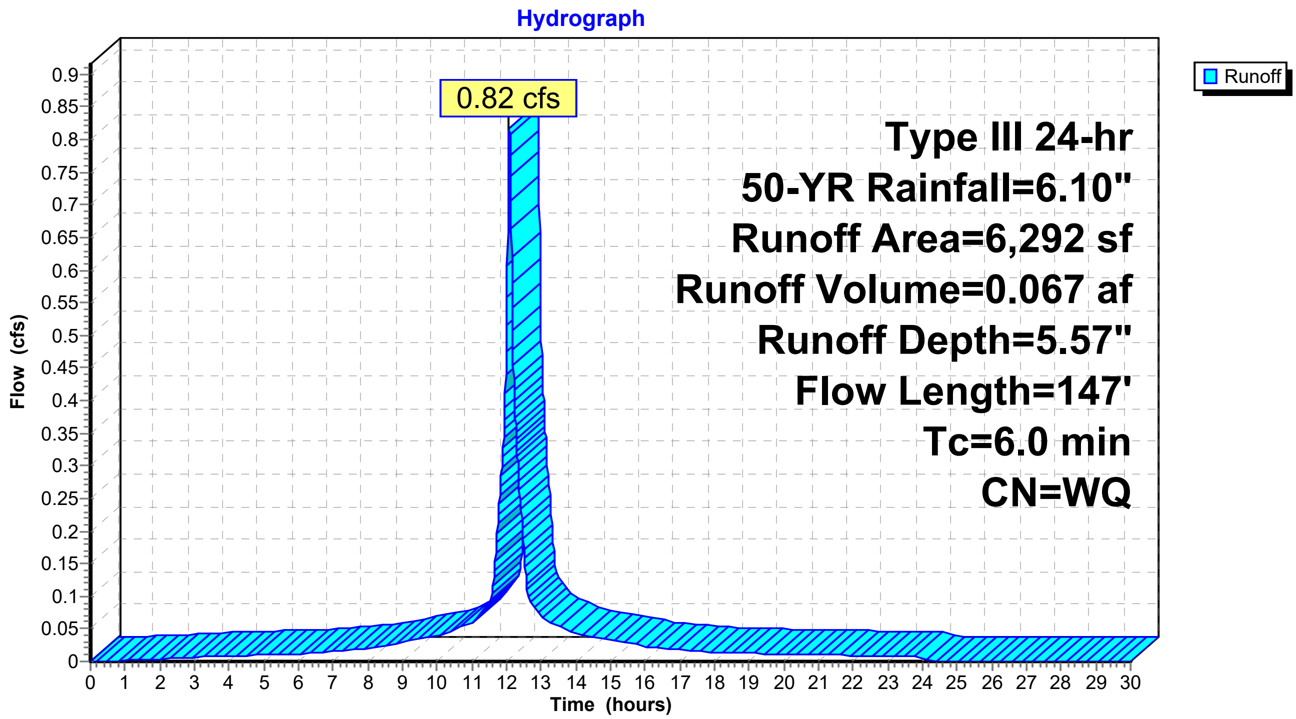
Runoff = 0.82 cfs @ 12.08 hrs, Volume= 0.067 af, Depth= 5.57"
Routed to Pond 4P : FD #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
5,955	98	Paved parking HSG A
337	39	>75% Grass cover, Good HSG A
6,292		Weighted Average
337		5.36% Pervious Area
5,955		94.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	13	0.2000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.4	87	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	147	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3P: P1b



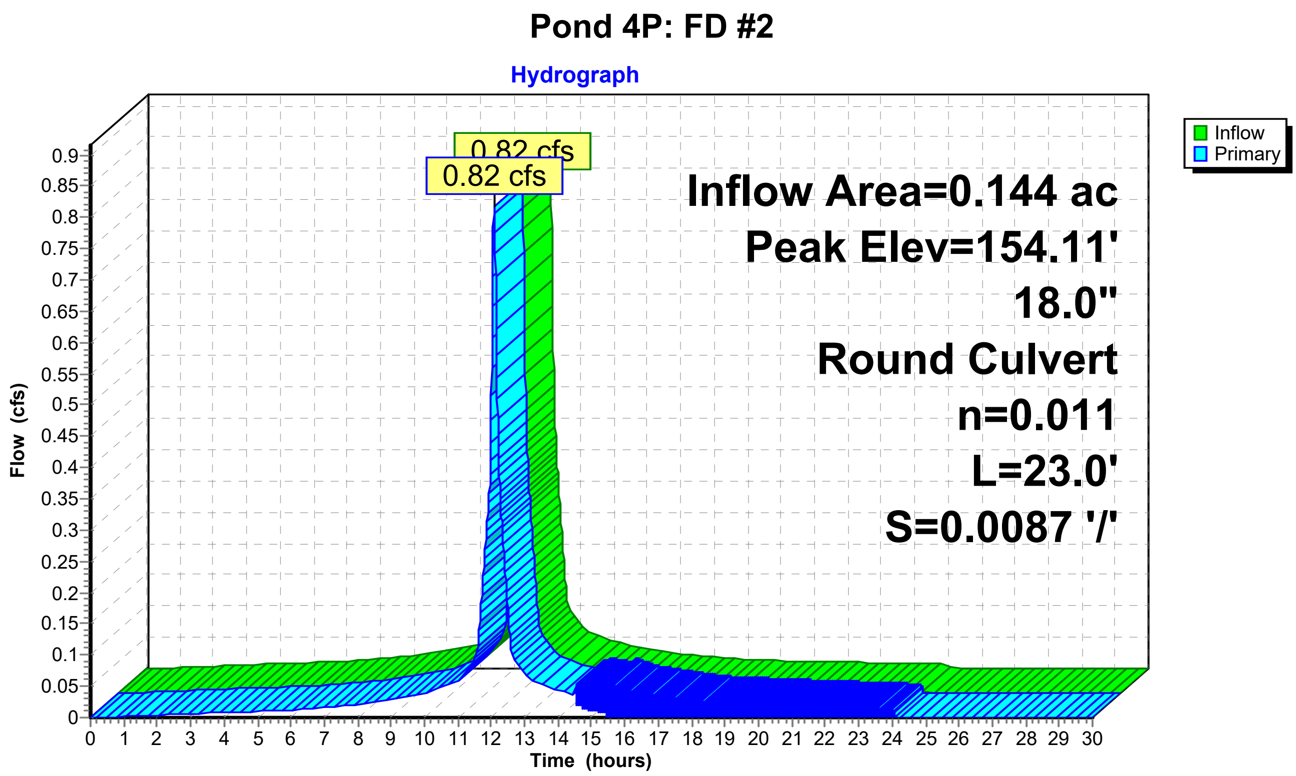
Summary for Pond 4P: FD #2

Inflow Area = 0.144 ac, 94.64% Impervious, Inflow Depth = 5.57" for 50-YR event
Inflow = 0.82 cfs @ 12.08 hrs, Volume= 0.067 af
Outflow = 0.82 cfs @ 12.08 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Primary = 0.82 cfs @ 12.08 hrs, Volume= 0.067 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.11' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.20'	**18.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.20' / 150.00' S= 0.0087 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=154.08' TW=154.08' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)



Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 5.75" for 50-YR event
Inflow = 2.09 cfs @ 12.08 hrs, Volume= 0.171 af
Outflow = 2.43 cfs @ 12.08 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.91 hrs, Volume= 0.106 af
Primary = 2.32 cfs @ 12.08 hrs, Volume= 0.042 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.05 cfs @ 12.08 hrs, Volume= 0.023 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.10' @ 12.08 hrs Surf.Area= 1,181 sf Storage= 1,732 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 121.1 min (866.4 - 745.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.91 hrs HW=151.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.31 cfs @ 12.08 hrs HW=154.10' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 2.31 cfs @ 1.46 fps)

Secondary OutFlow Max=0.05 cfs @ 12.08 hrs HW=154.10' TW=146.44' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.05 cfs of 1.83 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.21 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

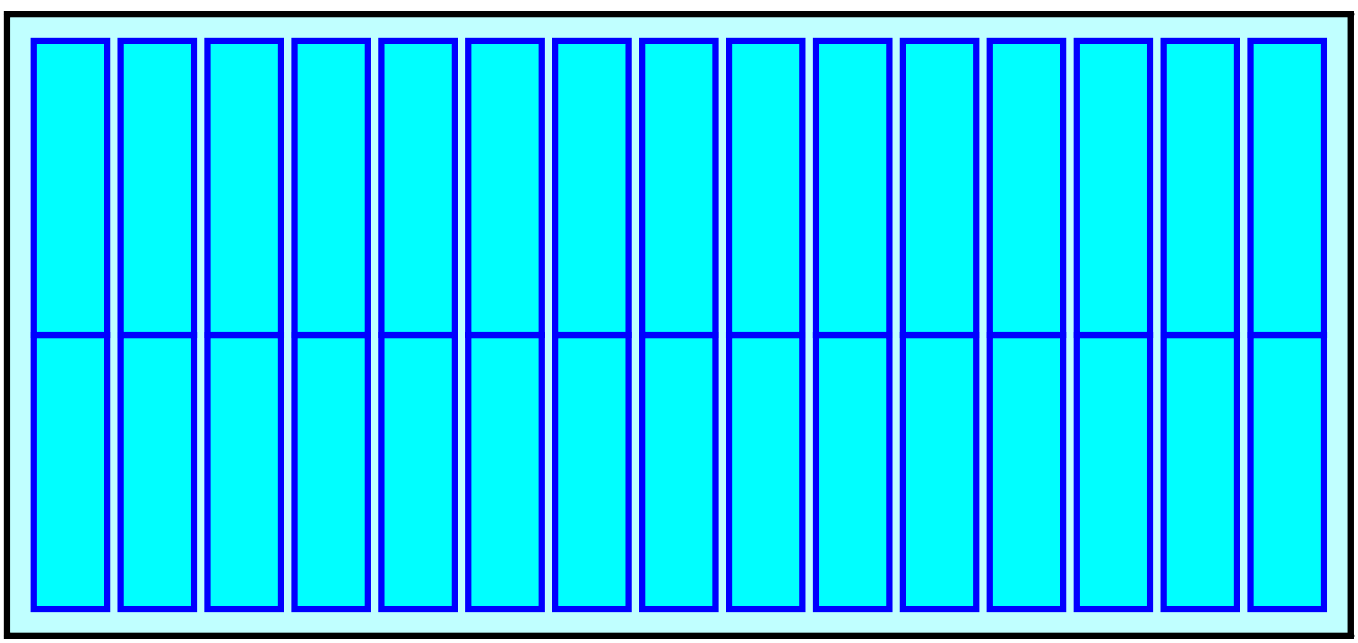
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

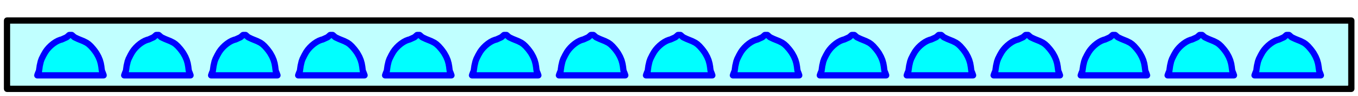
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

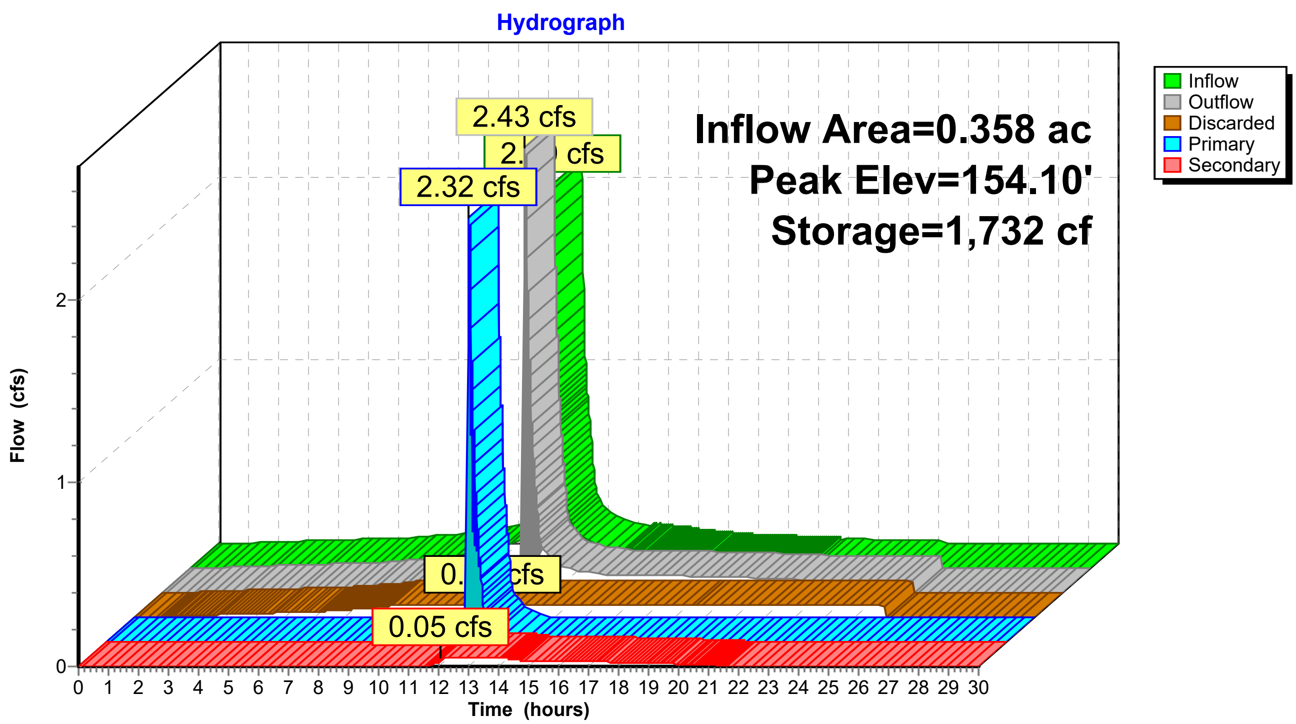
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 6P: P1c

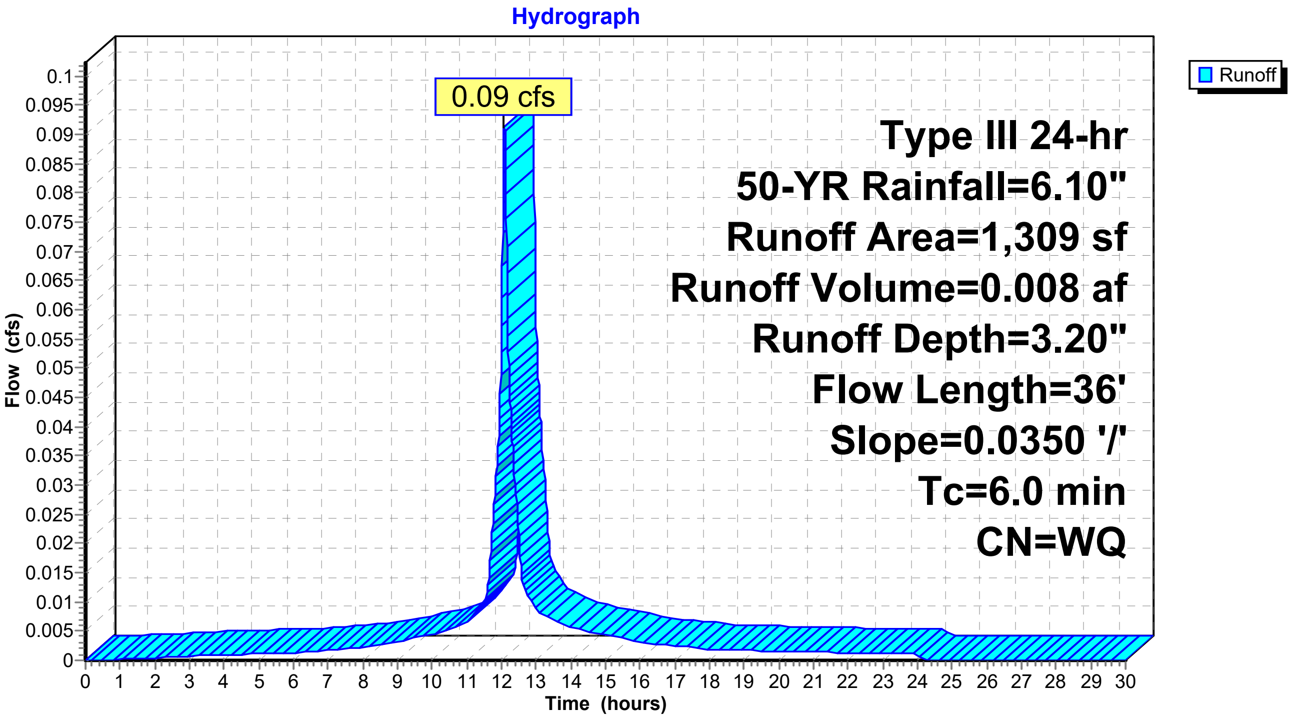
Runoff = 0.09 cfs @ 12.08 hrs, Volume= 0.008 af, Depth= 3.20"
Routed to Link 7P : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
662	98	Paved parking HSG A
647	39	>75% Grass cover, Good HSG A
1,309		Weighted Average
647		49.43% Pervious Area
662		50.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	36	0.0350	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6P: P1c

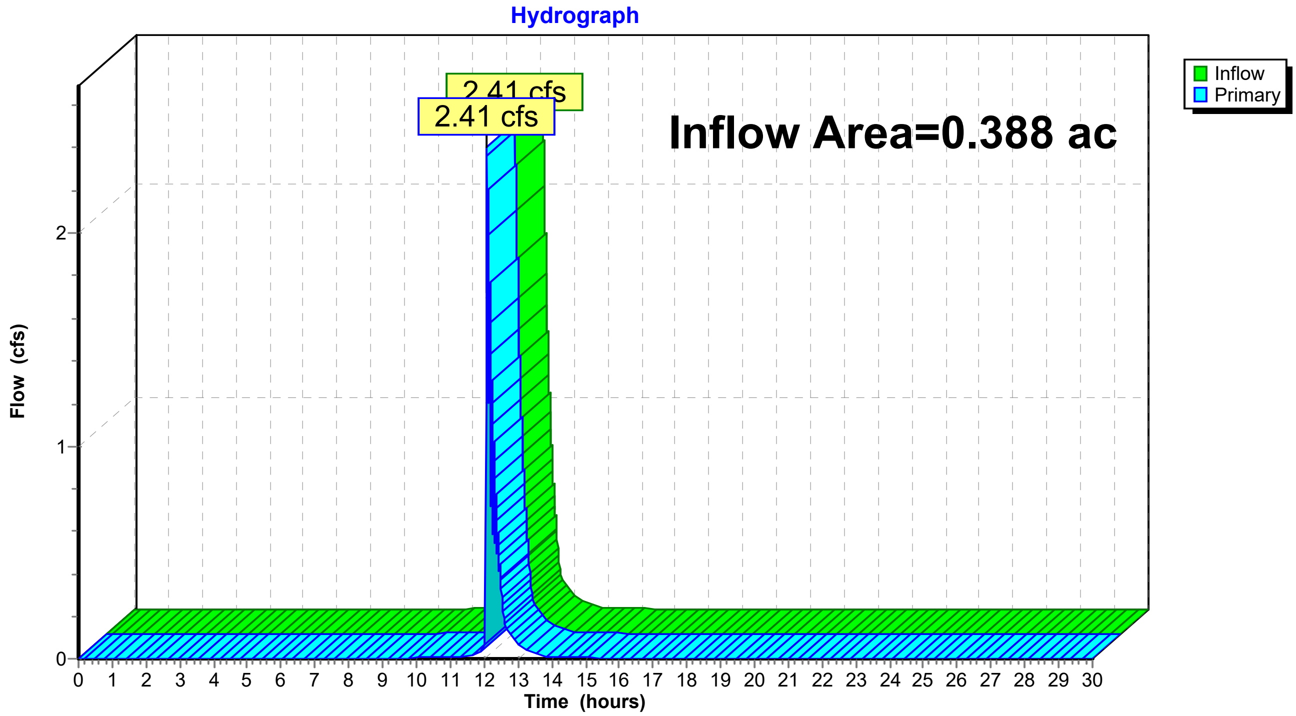


Summary for Link 7P: Design Point #1: Flow to Pleasant Street

Inflow Area =	0.388 ac,	94.17% Impervious,	Inflow Depth = 1.56"	for 50-YR event
Inflow =	2.41 cfs @	12.08 hrs, Volume=	0.050 af	
Primary =	2.41 cfs @	12.08 hrs, Volume=	0.050 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 7P: Design Point #1: Flow to Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1P: P1a Runoff Area=9,288 sf 100.00% Impervious Runoff Depth=6.46"
Tc=6.0 min CN=98 Runoff=1.40 cfs 0.115 af

Pond 2P: Roof Pipe Peak Elev=154.24' Inflow=1.40 cfs 0.115 af
12.0" Round Culvert n=0.011 L=20.0' S=0.0500 '/' Outflow=1.40 cfs 0.115 af

Subcatchment 3P: P1b Runoff Area=6,292 sf 94.64% Impervious Runoff Depth=6.15"
Flow Length=147' Tc=6.0 min CN=WQ Runoff=0.90 cfs 0.074 af

Pond 4P: FD #2 Peak Elev=154.11' Inflow=0.90 cfs 0.074 af
18.0" Round Culvert n=0.011 L=23.0' S=0.0087 '/' Outflow=0.90 cfs 0.074 af

Pond 5P: Infiltration Field #1 Peak Elev=154.10' Storage=1,732 cf Inflow=2.30 cfs 0.189 af
Discarded=0.07 cfs 0.110 af Primary=2.34 cfs 0.054 af Secondary=0.05 cfs 0.025 af Outflow=2.46 cfs 0.189 af

Subcatchment 6P: P1c Runoff Area=1,309 sf 50.57% Impervious Runoff Depth=3.60"
Flow Length=36' Slope=0.0350 '/' Tc=6.0 min CN=WQ Runoff=0.10 cfs 0.009 af

Link 7P: Design Point #1: Flow to Pleasant Street Inflow=2.45 cfs 0.063 af
Primary=2.45 cfs 0.063 af

Total Runoff Area = 0.388 ac Runoff Volume = 0.198 af Average Runoff Depth = 6.12"
5.83% Pervious = 0.023 ac 94.17% Impervious = 0.365 ac

Summary for Subcatchment 1P: P1a

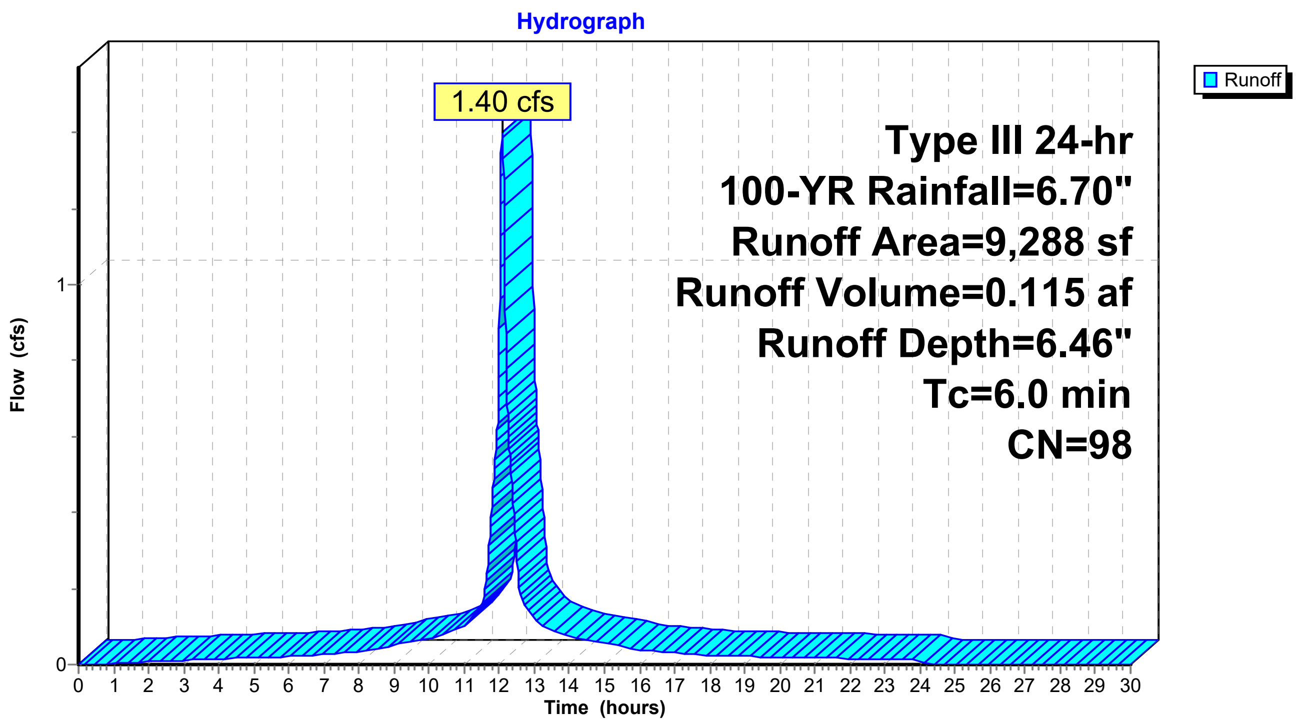
Runoff = 1.40 cfs @ 12.08 hrs, Volume= 0.115 af, Depth= 6.46"
Routed to Pond 2P : Roof Pipe

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
9,288	98	Roofs HSG A
9,288		100.00% Impervious Area

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

Subcatchment 1P: P1a



Summary for Pond 2P: Roof Pipe

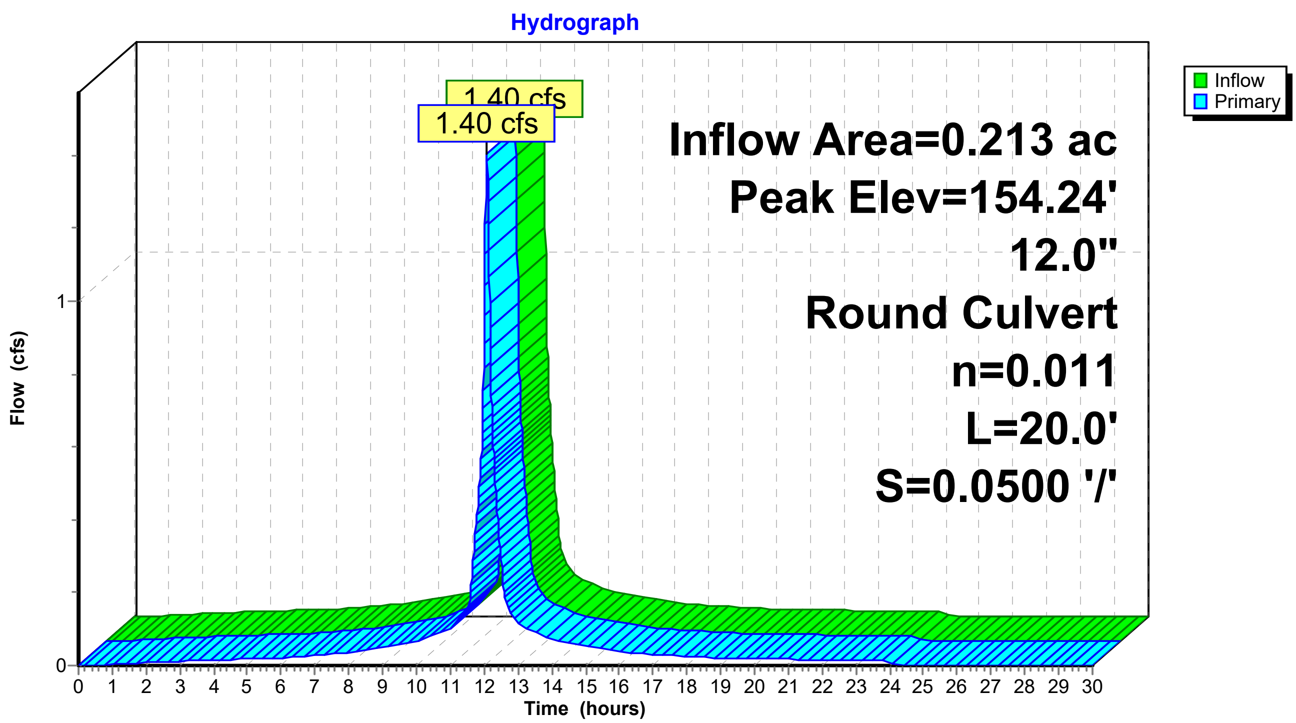
Inflow Area = 0.213 ac,100.00% Impervious, Inflow Depth = 6.46" for 100-YR event
Inflow = 1.40 cfs @ 12.08 hrs, Volume= 0.115 af
Outflow = 1.40 cfs @ 12.08 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min
Primary = 1.40 cfs @ 12.08 hrs, Volume= 0.115 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.24' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	151.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 151.00' / 150.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.43 cfs @ 12.08 hrs HW=154.23' TW=154.09' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.43 cfs @ 1.82 fps)

Pond 2P: Roof Pipe



Summary for Subcatchment 3P: P1b

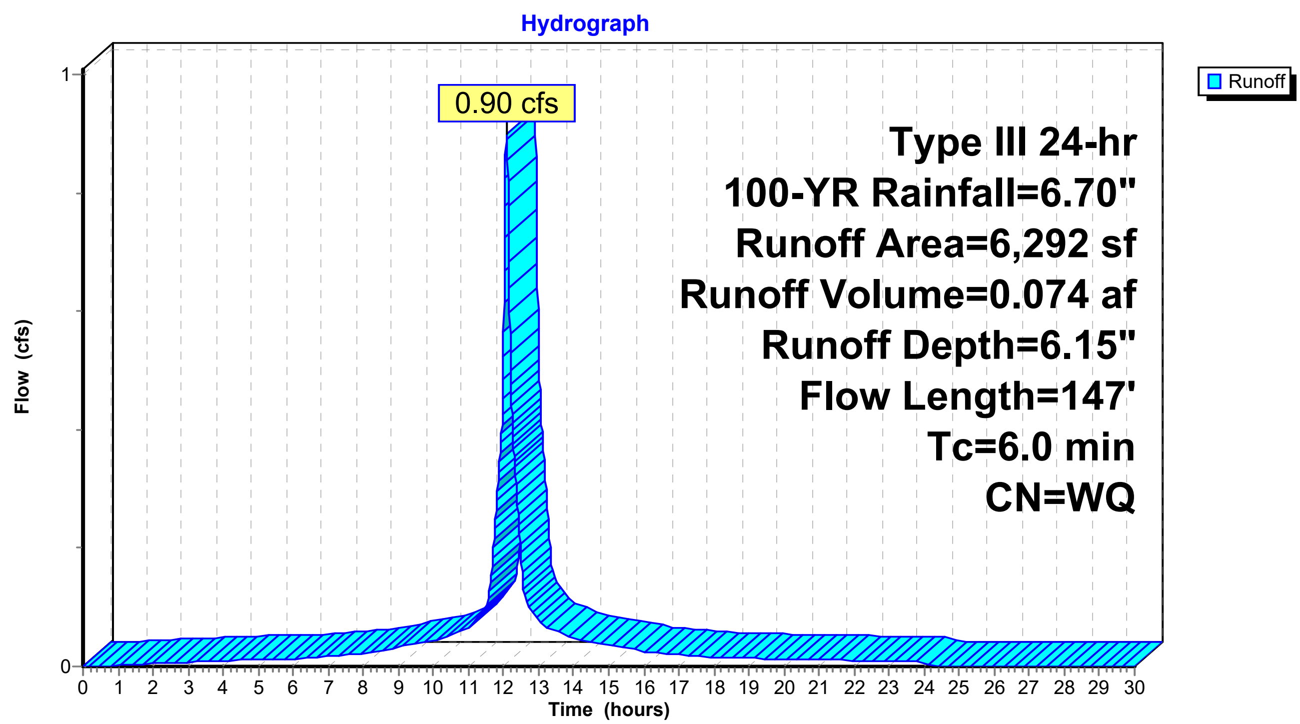
Runoff = 0.90 cfs @ 12.08 hrs, Volume= 0.074 af, Depth= 6.15"
Routed to Pond 4P : FD #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
5,955	98	Paved parking HSG A
337	39	>75% Grass cover, Good HSG A
6,292		Weighted Average
337		5.36% Pervious Area
5,955		94.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.1	13	0.2000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.4	87	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	47	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	147	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3P: P1b



Summary for Pond 4P: FD #2

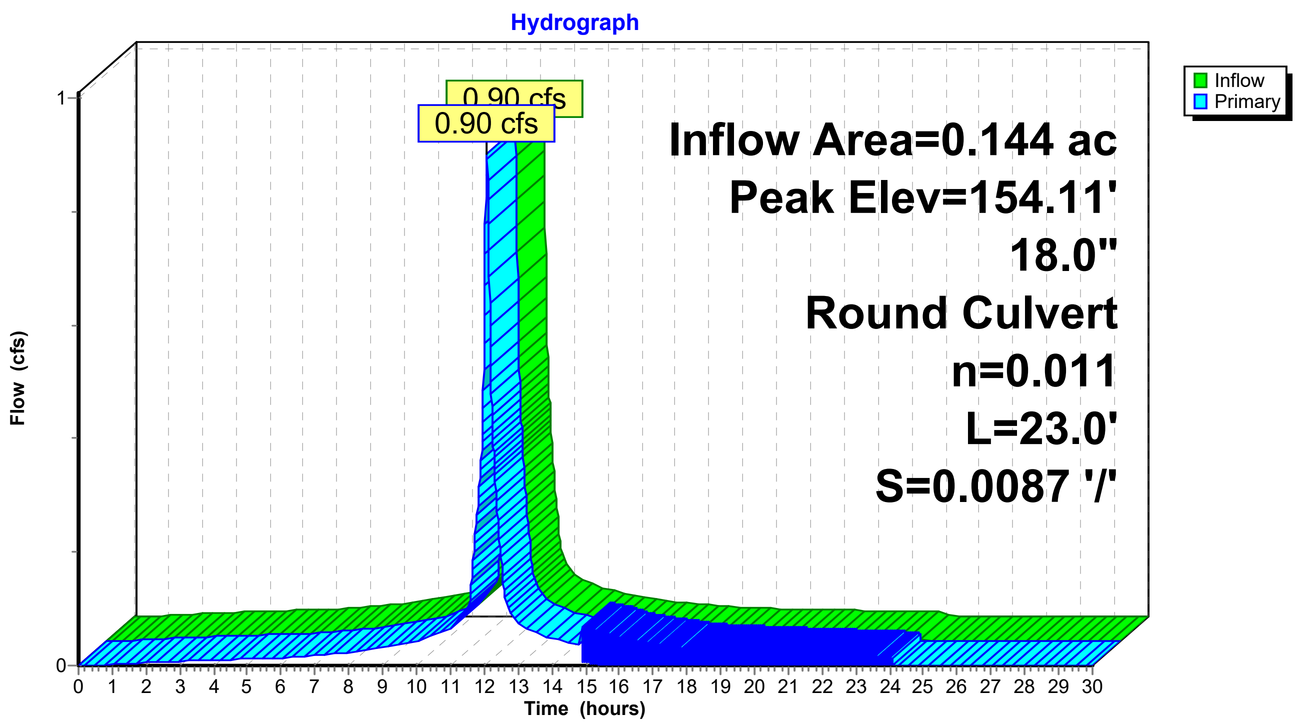
Inflow Area = 0.144 ac, 94.64% Impervious, Inflow Depth = 6.15" for 100-YR event
Inflow = 0.90 cfs @ 12.08 hrs, Volume= 0.074 af
Outflow = 0.90 cfs @ 12.08 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min
Primary = 0.90 cfs @ 12.08 hrs, Volume= 0.074 af
Routed to Pond 5P : Infiltration Field #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.11' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	150.20'	**18.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.20' / 150.00' S= 0.0087 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf

Primary OutFlow Max=1.08 cfs @ 12.08 hrs HW=154.10' TW=154.09' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.08 cfs @ 0.61 fps)

Pond 4P: FD #2



Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 6.34" for 100-YR event
Inflow = 2.30 cfs @ 12.08 hrs, Volume= 0.189 af
Outflow = 2.46 cfs @ 12.09 hrs, Volume= 0.189 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.07 cfs @ 11.84 hrs, Volume= 0.110 af
Primary = 2.34 cfs @ 12.09 hrs, Volume= 0.054 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.05 cfs @ 12.09 hrs, Volume= 0.025 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.10' @ 12.09 hrs Surf.Area= 1,181 sf Storage= 1,732 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 116.5 min (860.5 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.84 hrs HW=151.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.33 cfs @ 12.09 hrs HW=154.10' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 2.33 cfs @ 1.46 fps)

Secondary OutFlow Max=0.05 cfs @ 12.09 hrs HW=154.10' TW=146.87' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.05 cfs of 1.83 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.21 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

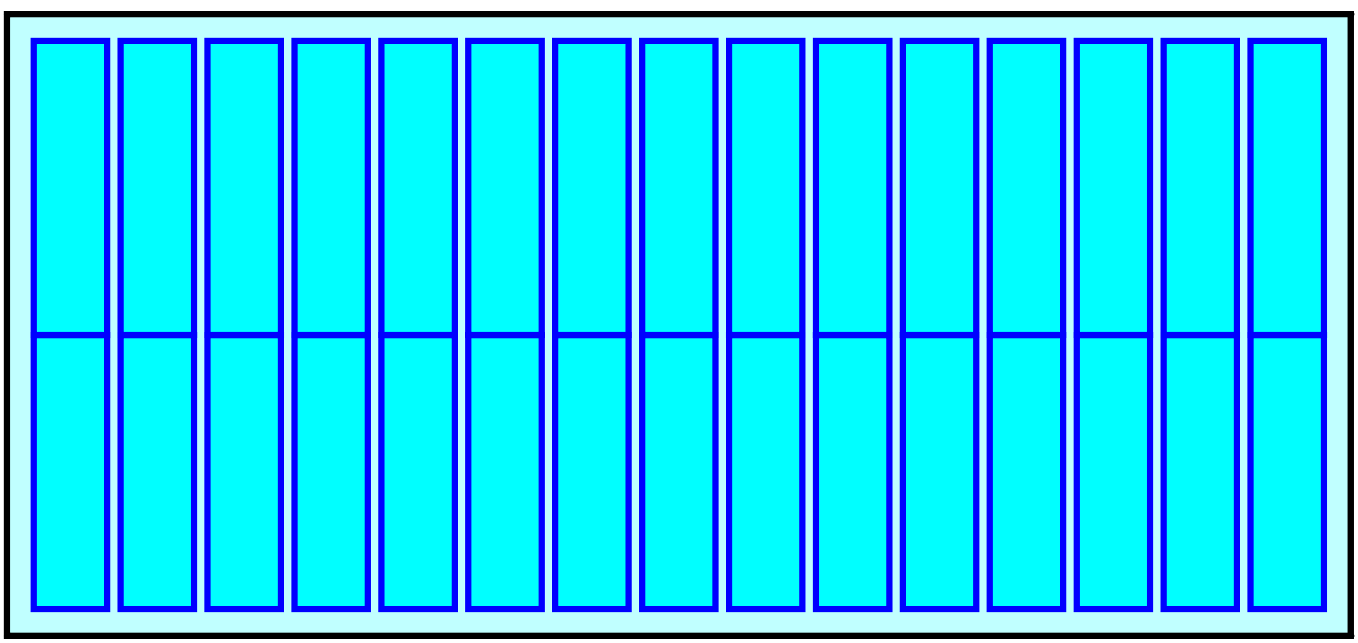
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

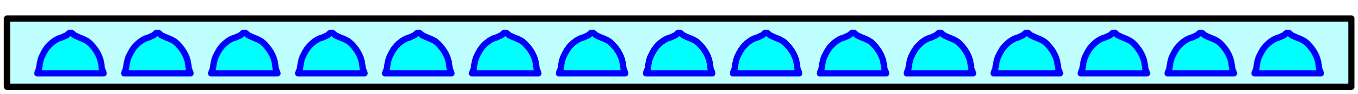
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

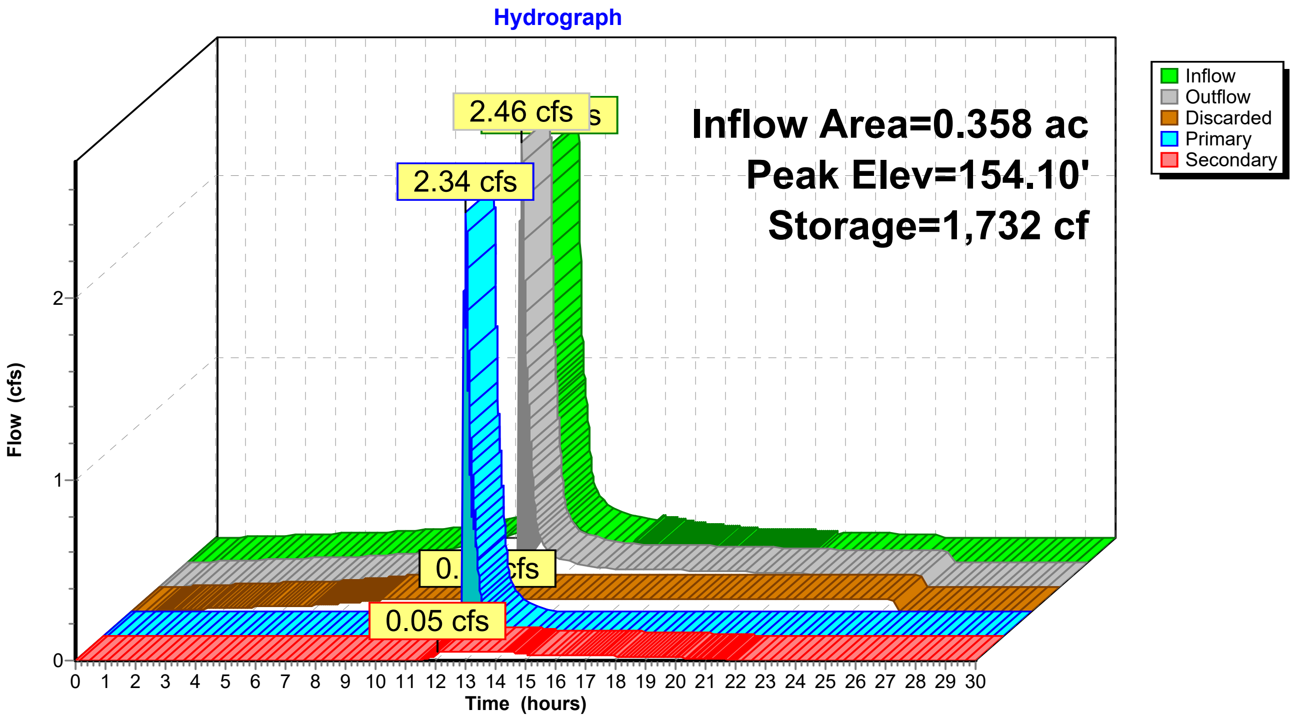
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 6P: P1c

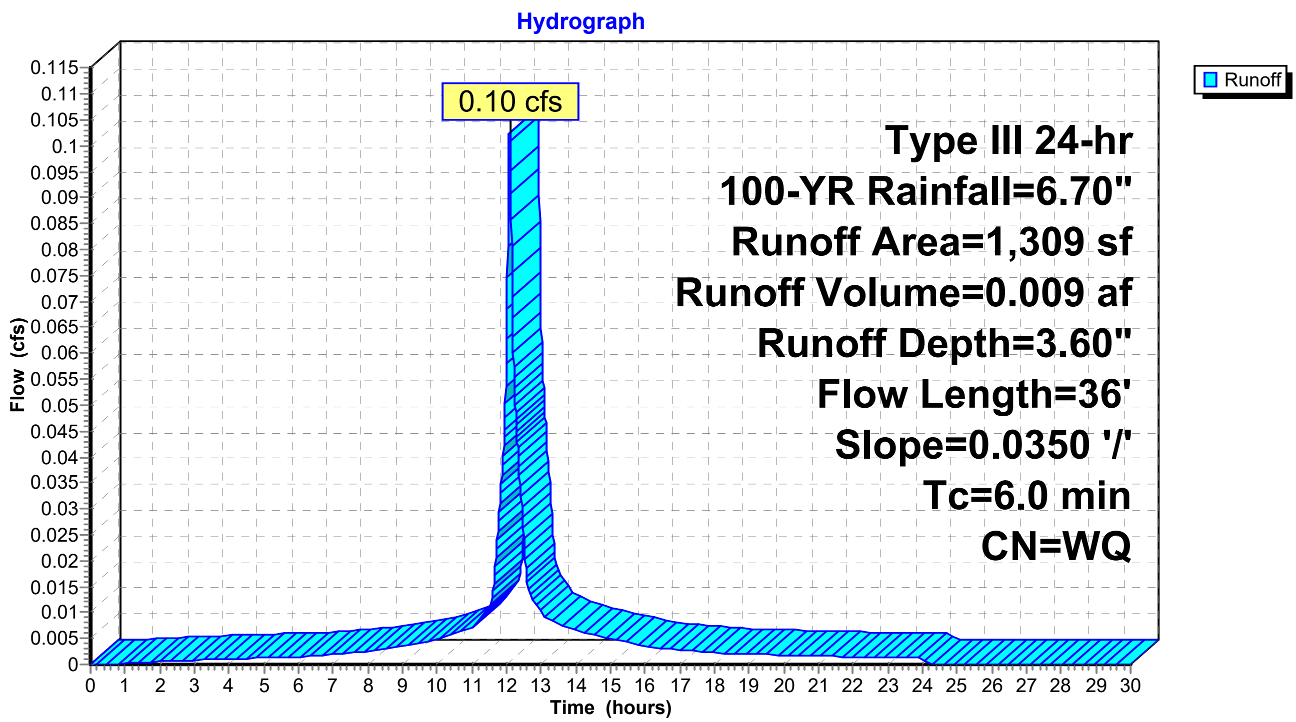
Runoff = 0.10 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 3.60"
Routed to Link 7P : Design Point #1: Flow to Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
662	98	Paved parking HSG A
647	39	>75% Grass cover, Good HSG A
1,309		Weighted Average
647		49.43% Pervious Area
662		50.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	36	0.0350	1.40		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	36	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 6P: P1c

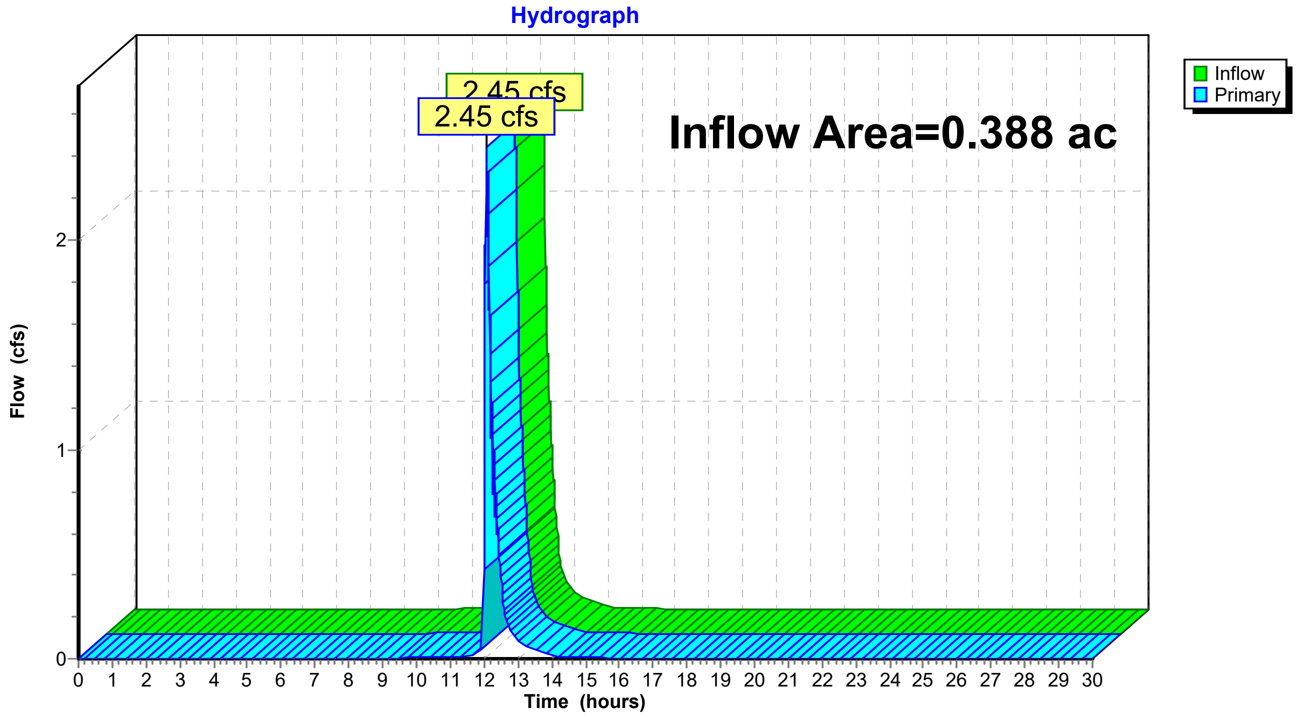


Summary for Link 7P: Design Point #1: Flow to Pleasant Street

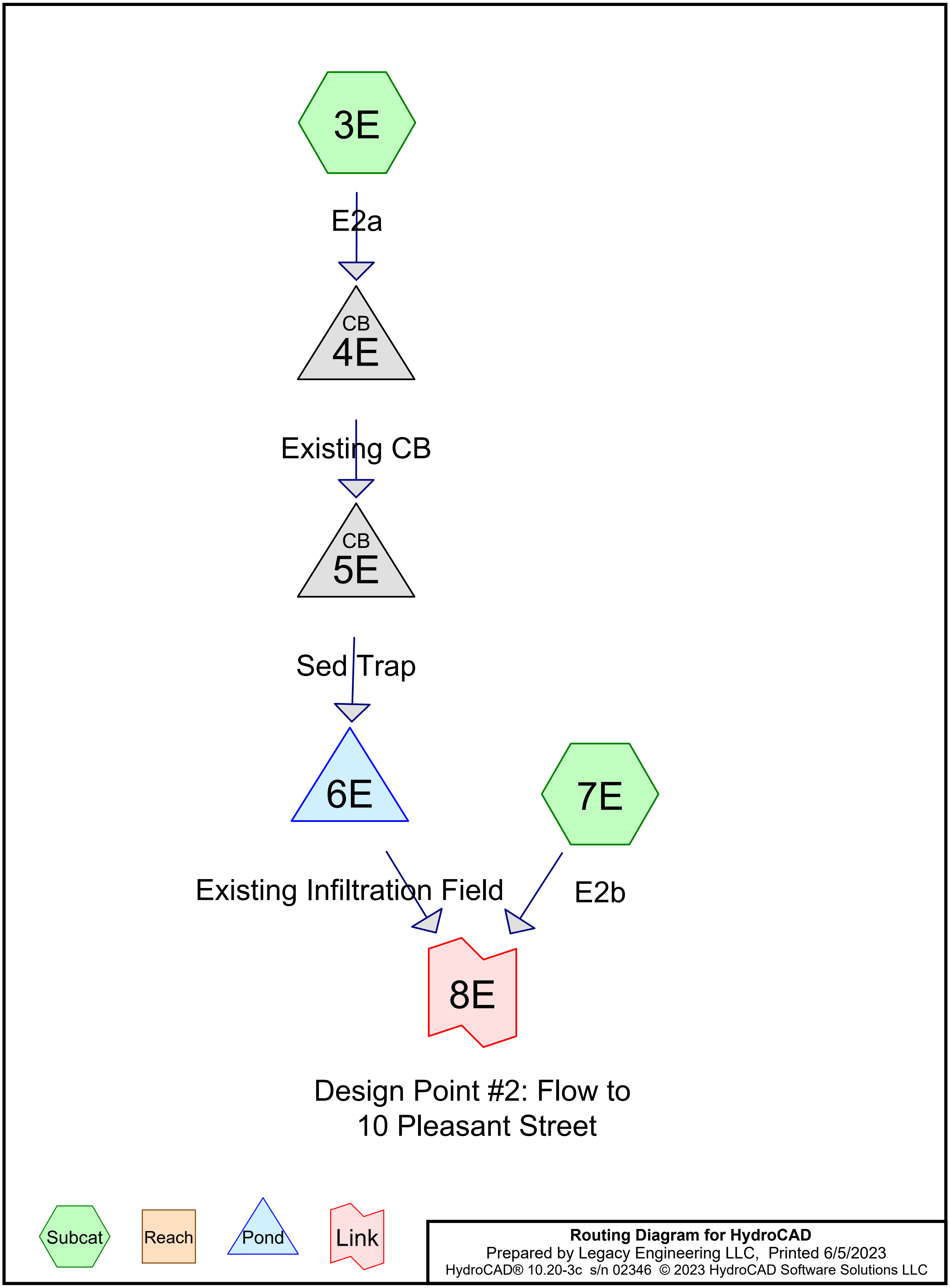
Inflow Area =	0.388 ac,	94.17% Impervious,	Inflow Depth = 1.95"	for 100-YR event
Inflow =	2.45 cfs @	12.09 hrs,	Volume=	0.063 af
Primary =	2.45 cfs @	12.09 hrs,	Volume=	0.063 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 7P: Design Point #1: Flow to Pleasant Street



DESIGN POINT #2: FLOW TO 10 PLEASANT STREET EXISTING CONDITIONS


3E
E2a
CB
4E
Existing CB
CB
5E
Sed Trap
6E
7E
Existing Infiltration Field
E2b
8E
Design Point #2: Flow to
10 Pleasant Street
Subcat
Reach
Pond
Link
Routing Diagram for HydroCAD
Prepared by Legacy Engineering LLC, Printed 6/5/2023
HydroCAD® 10.20-3c s/n 02346 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type III 24-hr		Default	24.00	1	2.50	2
2	2-YR	Type III 24-hr		Default	24.00	1	3.20	2
3	10-YR	Type III 24-hr		Default	24.00	1	4.70	2
4	50-YR	Type III 24-hr		Default	24.00	1	6.10	2
5	100-YR	Type III 24-hr		Default	24.00	1	6.70	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.029	39	>75% Grass cover, Good HSG A (3E)
0.013	39	>75% Grass cover, Good, HSG A (7E)
0.362	98	Paved parking HSG A (3E)
0.034	98	Roofs HSG A (3E)
0.439	**92**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3E: E2a Runoff Area=18,529 sf 93.23% Impervious Runoff Depth=2.12"
Flow Length=240' Tc=6.0 min CN=WQ Runoff=0.96 cfs 0.075 af

Pond 4E: Existing CB Peak Elev=147.00' Inflow=0.96 cfs 0.075 af
10.0" Round Culvert n=0.011 L=2.0' S=0.0500 '/' Outflow=0.96 cfs 0.075 af

Pond 5E: Sed Trap Peak Elev=146.55' Inflow=0.96 cfs 0.075 af
10.0" Round Culvert n=0.011 L=20.0' S=0.0250 '/' Outflow=0.96 cfs 0.075 af

Pond 6E: Existing Infiltration Field Peak Elev=145.69' Storage=1,256 cf Inflow=0.96 cfs 0.075 af
Discarded=0.07 cfs 0.075 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.075 af

Subcatchment 7E: E2b Runoff Area=575 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=5' Slope=0.0500 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 8E: Design Point #2: Flow to 10 Pleasant Street Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 0.439 ac Runoff Volume = 0.075 af Average Runoff Depth = 2.05"
9.57% Pervious = 0.042 ac 90.43% Impervious = 0.397 ac

Summary for Subcatchment 3E: E2a

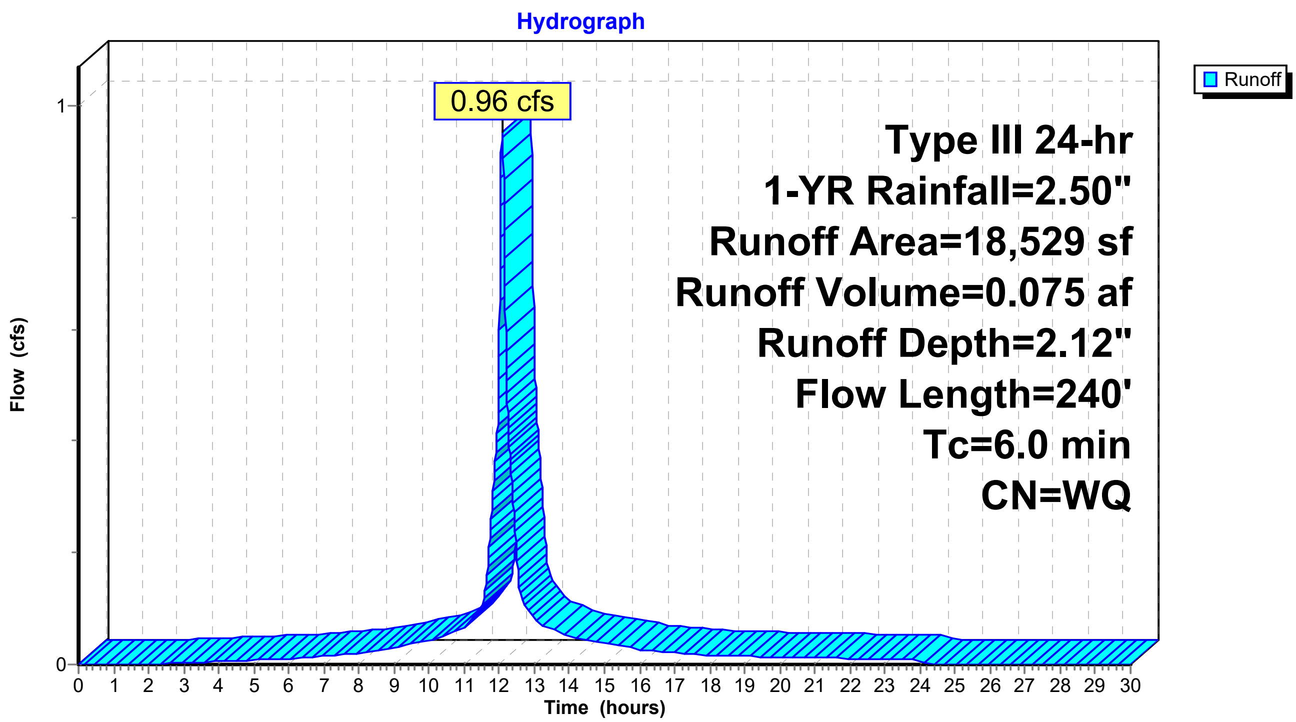
Runoff = 0.96 cfs @ 12.08 hrs, Volume= 0.075 af, Depth= 2.12"
Routed to Pond 4E : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
1,501	98	Roofs HSG A
15,774	98	Paved parking HSG A
1,254	39	>75% Grass cover, Good HSG A
18,529		Weighted Average
1,254		6.77% Pervious Area
17,275		93.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	25	0.0200	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.20"
0.7	75	0.0500	1.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	140	0.0800	5.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	240	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3E: E2a



Summary for Pond 4E: Existing CB

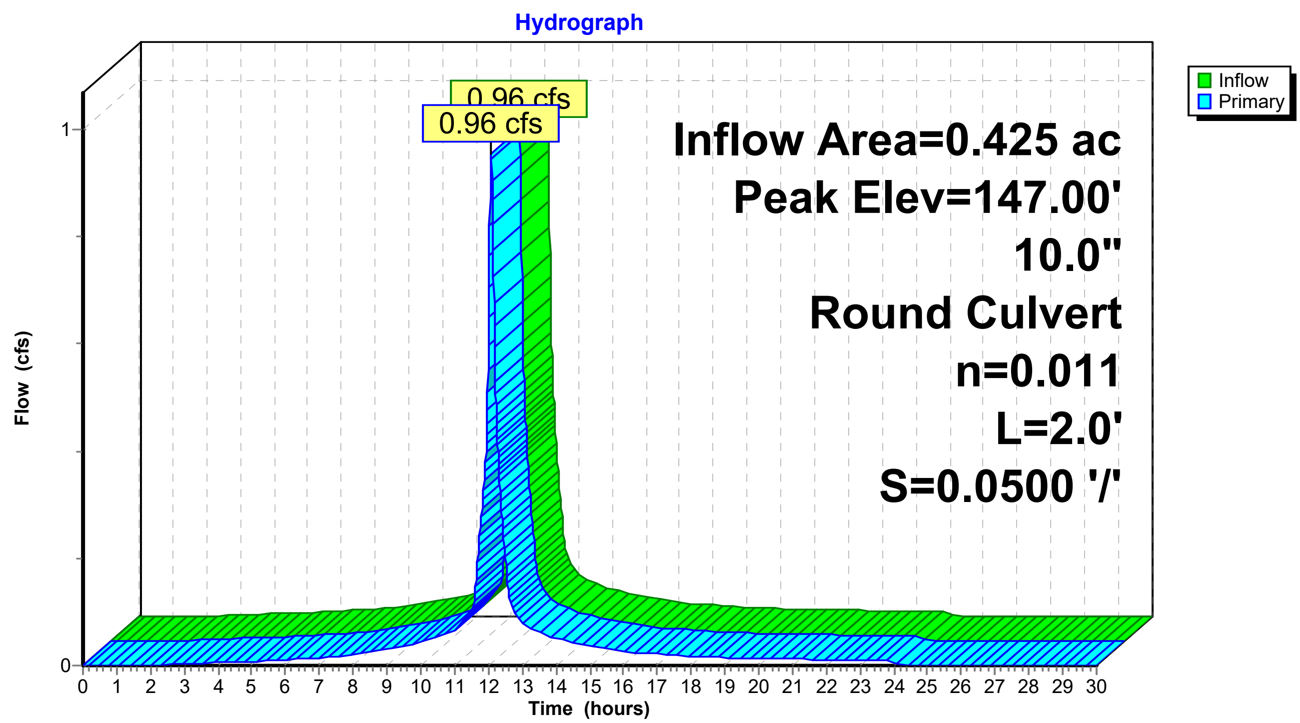
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 2.12" for 1-YR event
Inflow = 0.96 cfs @ 12.08 hrs, Volume= 0.075 af
Outflow = 0.96 cfs @ 12.08 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Primary = 0.96 cfs @ 12.08 hrs, Volume= 0.075 af
Routed to Pond 5E : Sed Trap

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 147.00' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.40'	**10.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.40' / 146.30' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=0.95 cfs @ 12.08 hrs HW=146.99' TW=146.55' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.95 cfs @ 3.21 fps)

Pond 4E: Existing CB



Summary for Pond 5E: Sed Trap

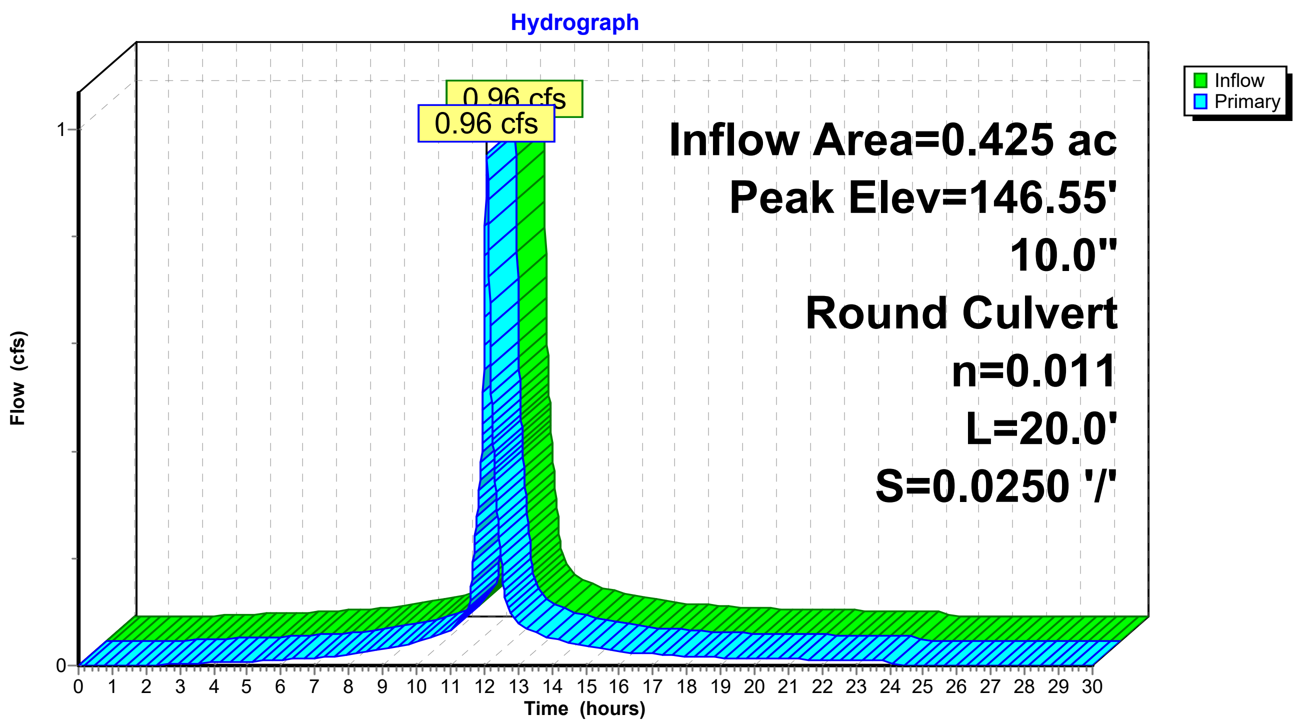
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 2.12" for 1-YR event
Inflow = 0.96 cfs @ 12.08 hrs, Volume= 0.075 af
Outflow = 0.96 cfs @ 12.08 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Primary = 0.96 cfs @ 12.08 hrs, Volume= 0.075 af
Routed to Pond 6E : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 146.55' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.00'	**10.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.00' / 145.50' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=0.95 cfs @ 12.08 hrs HW=146.55' TW=145.03' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.95 cfs @ 2.52 fps)

Pond 5E: Sed Trap



Summary for Pond 6E: Existing Infiltration Field

Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 2.12" for 1-YR event
Inflow = 0.96 cfs @ 12.08 hrs, Volume= 0.075 af
Outflow = 0.07 cfs @ 11.51 hrs, Volume= 0.075 af, Atten= 93%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.51 hrs, Volume= 0.075 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 145.69' @ 13.23 hrs Surf.Area= 1,240 sf Storage= 1,256 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 136.7 min (898.6 - 761.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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
#3	147.50'	25 cf	**4.00'D x 2.00'H Vertical Cone/Cylinder**
		2,809 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	149.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.51 hrs HW=144.25' (Free Discharge)
└—**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.20' TW=0.00' (Dynamic Tailwater)
└—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 6E: Existing Infiltration Field - 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

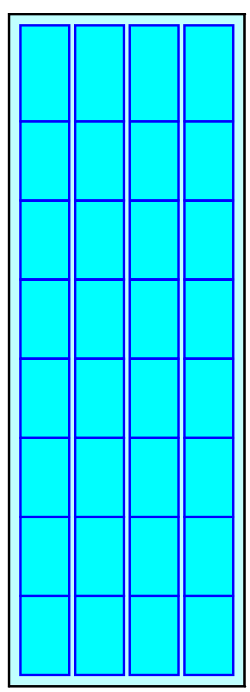
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

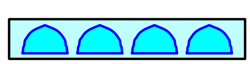
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

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

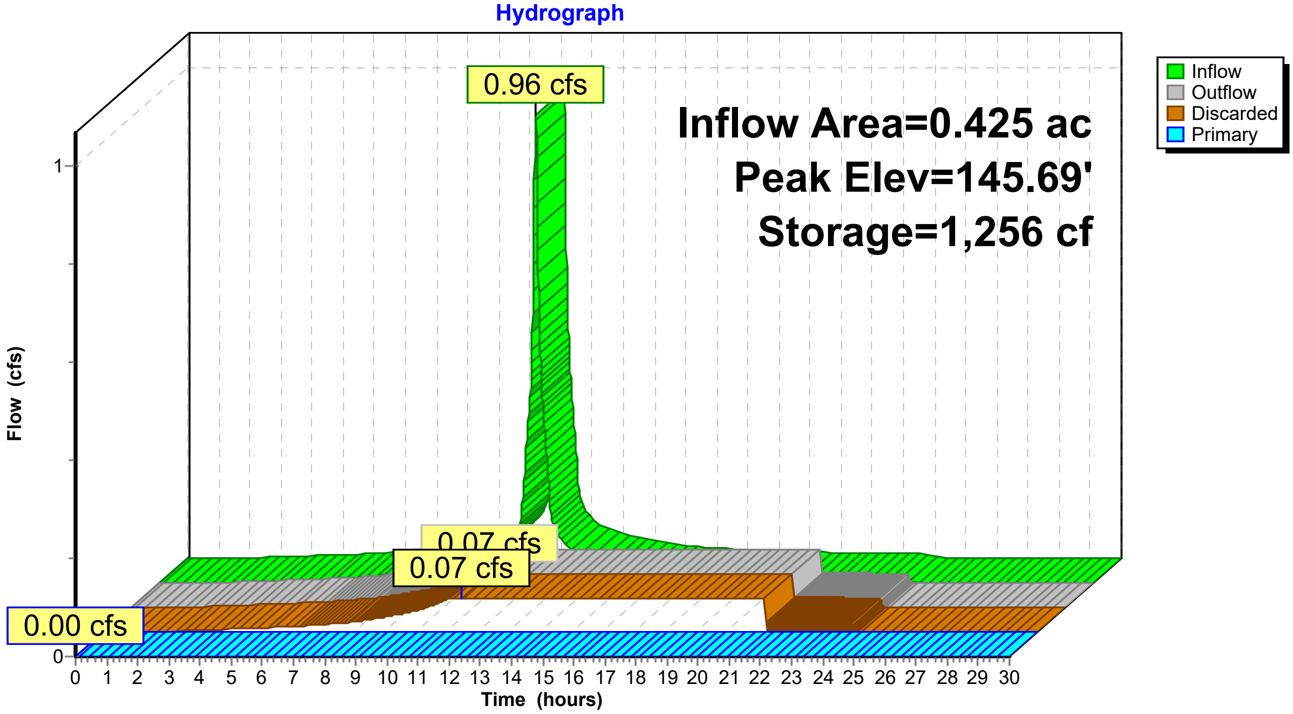
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 6E: Existing Infiltration Field



Summary for Subcatchment 7E: E2b

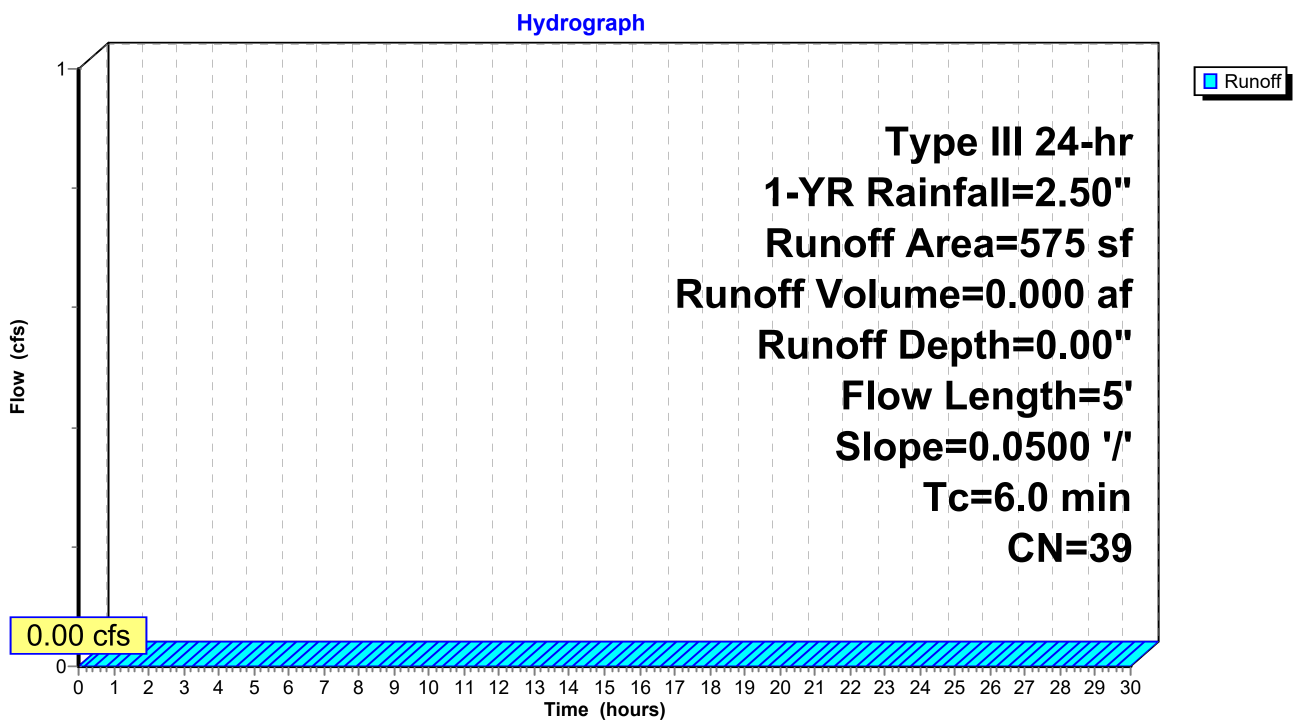
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
575	39	>75% Grass cover, Good, HSG A
575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	5	0.0500	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.9	5	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7E: E2b

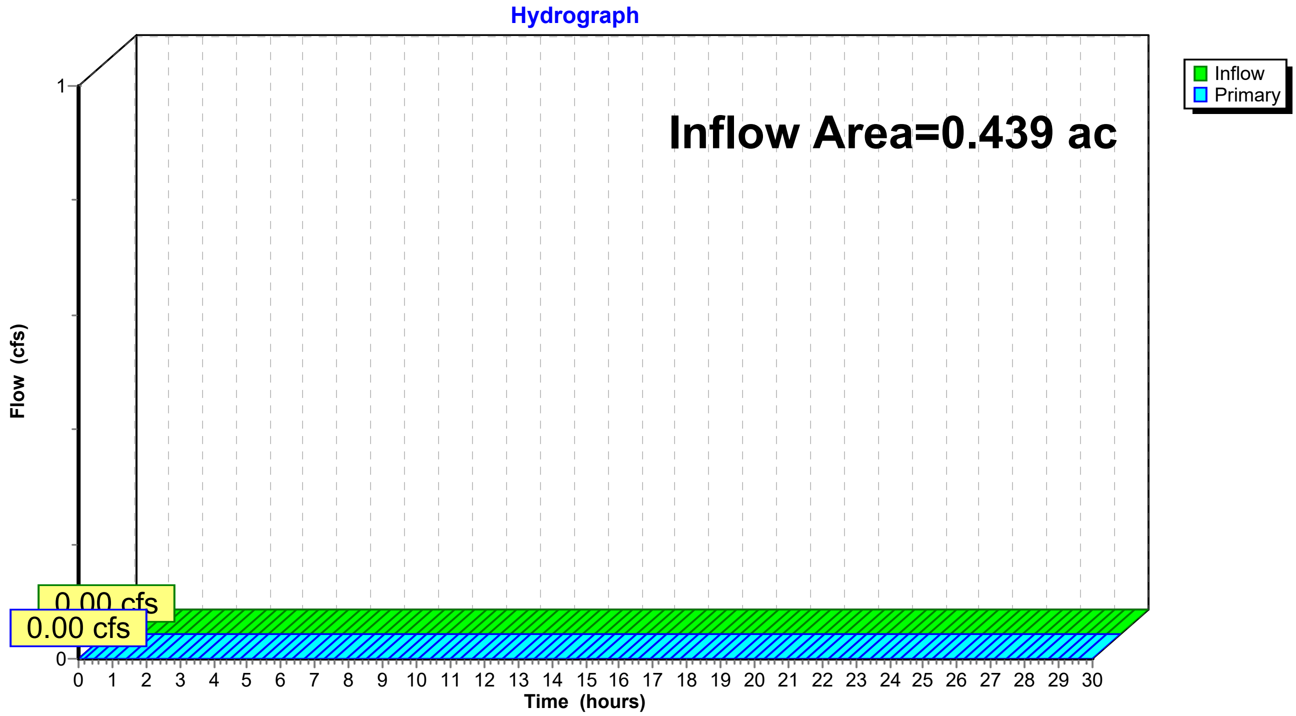


Summary for Link 8E: Design Point #2: Flow to 10 Pleasant Street

Inflow Area = 0.439 ac, 90.43% Impervious, Inflow Depth = 0.00" for 1-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 8E: Design Point #2: Flow to 10 Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3E: E2a Runoff Area=18,529 sf 93.23% Impervious Runoff Depth=2.77"
Flow Length=240' Tc=6.0 min CN=WQ Runoff=1.23 cfs 0.098 af

Pond 4E: Existing CB Peak Elev=147.10' Inflow=1.23 cfs 0.098 af
10.0" Round Culvert n=0.011 L=2.0' S=0.0500 '/' Outflow=1.23 cfs 0.098 af

Pond 5E: Sed Trap Peak Elev=146.64' Inflow=1.23 cfs 0.098 af
10.0" Round Culvert n=0.011 L=20.0' S=0.0250 '/' Outflow=1.23 cfs 0.098 af

Pond 6E: Existing Infiltration Field Peak Elev=146.28' Storage=1,823 cf Inflow=1.23 cfs 0.098 af
Discarded=0.07 cfs 0.098 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.098 af

Subcatchment 7E: E2b Runoff Area=575 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=5' Slope=0.0500 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 8E: Design Point #2: Flow to 10 Pleasant Street Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 0.439 ac Runoff Volume = 0.098 af Average Runoff Depth = 2.68"
9.57% Pervious = 0.042 ac 90.43% Impervious = 0.397 ac

Summary for Subcatchment 3E: E2a

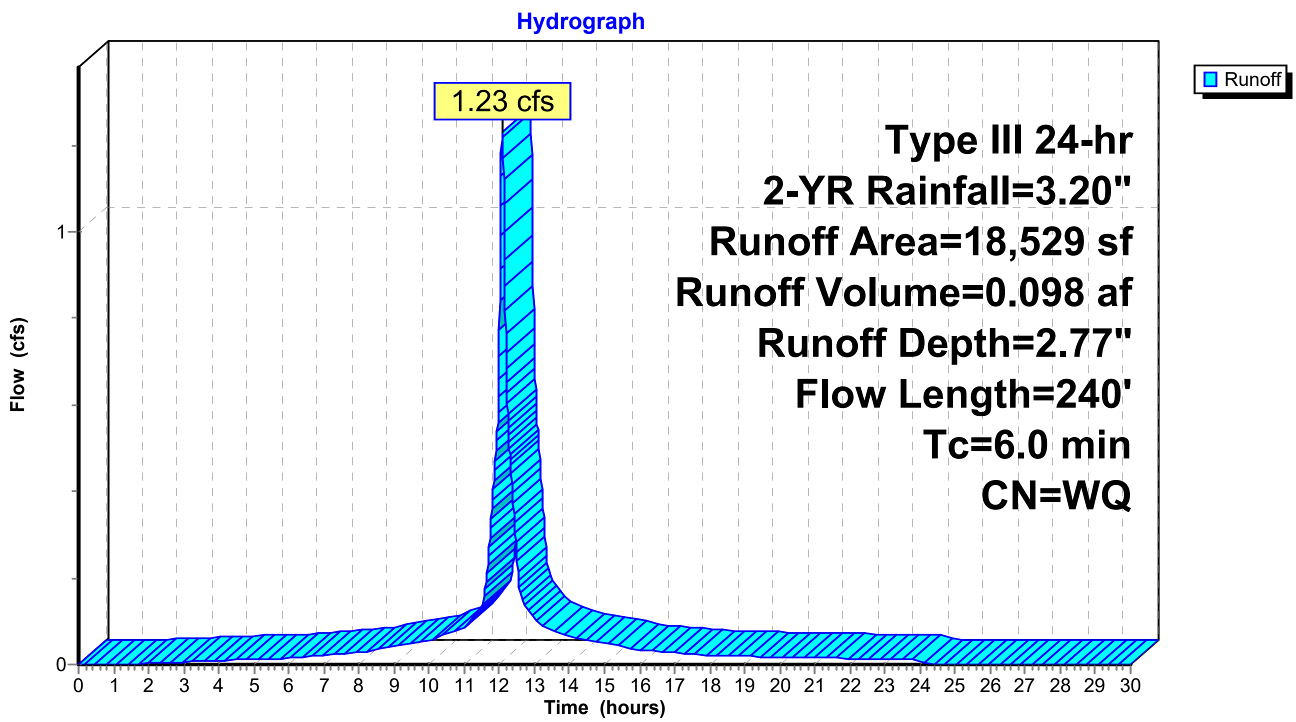
Runoff = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af, Depth= 2.77"
Routed to Pond 4E : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,501	98	Roofs HSG A
15,774	98	Paved parking HSG A
1,254	39	>75% Grass cover, Good HSG A
18,529		Weighted Average
1,254		6.77% Pervious Area
17,275		93.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	25	0.0200	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.20"
0.7	75	0.0500	1.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	140	0.0800	5.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	240	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3E: E2a



Summary for Pond 4E: Existing CB

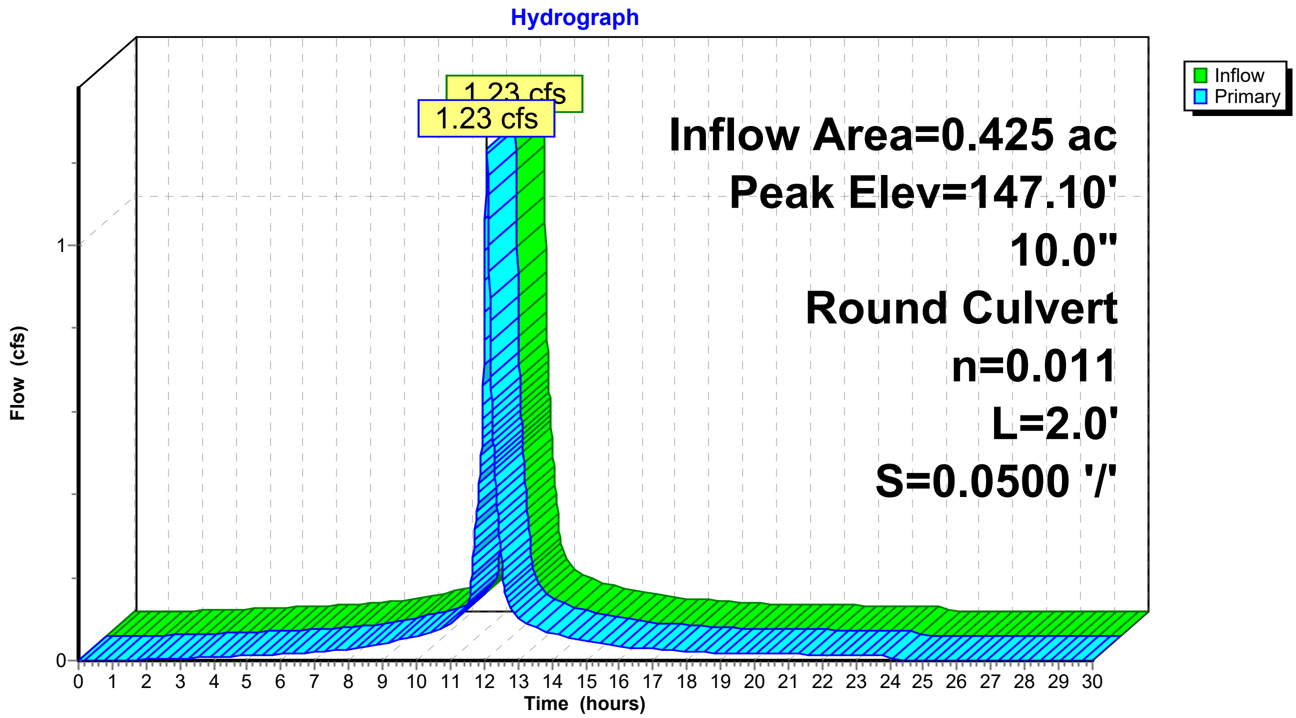
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 2.77" for 2-YR event
Inflow = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af
Outflow = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
Primary = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af
Routed to Pond 5E : Sed Trap

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 147.10' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.40'	**10.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.40' / 146.30' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=1.23 cfs @ 12.08 hrs HW=147.10' TW=146.64' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 1.23 cfs @ 3.39 fps)

Pond 4E: Existing CB



Summary for Pond 5E: Sed Trap

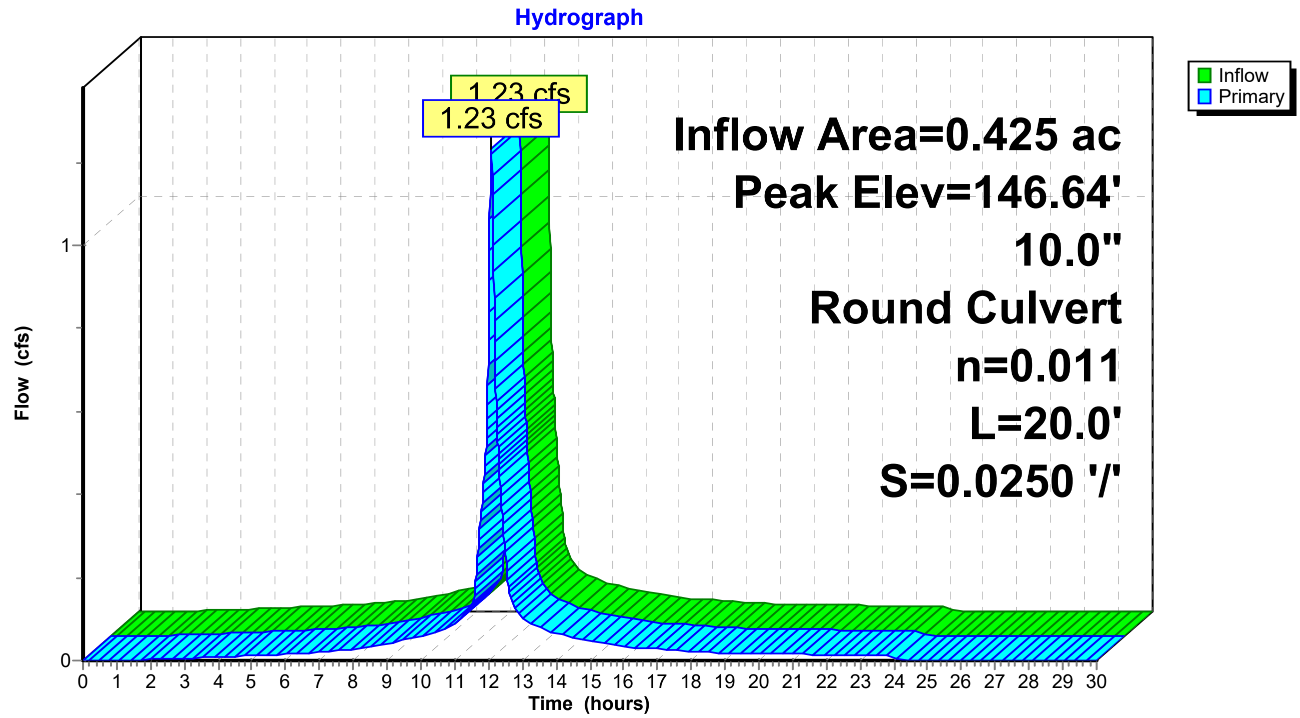
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 2.77" for 2-YR event
Inflow = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af
Outflow = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
Primary = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af
Routed to Pond 6E : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 146.64' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.00'	**10.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.00' / 145.50' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=1.23 cfs @ 12.08 hrs HW=146.64' TW=145.30' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.23 cfs @ 2.73 fps)

Pond 5E: Sed Trap



Summary for Pond 6E: Existing Infiltration Field

Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 2.77" for 2-YR event
Inflow = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af
Outflow = 0.07 cfs @ 11.13 hrs, Volume= 0.098 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.13 hrs, Volume= 0.098 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 146.28' @ 13.87 hrs Surf.Area= 1,240 sf Storage= 1,823 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 211.3 min (967.7 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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
#3	147.50'	25 cf	**4.00'D x 2.00'H Vertical Cone/Cylinder**
		2,809 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	149.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.13 hrs HW=144.25' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.20' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 6E: Existing Infiltration Field - 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

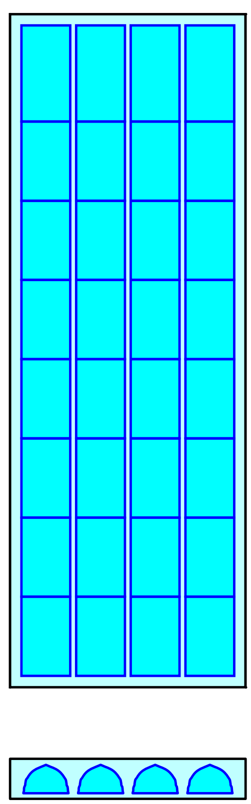
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

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

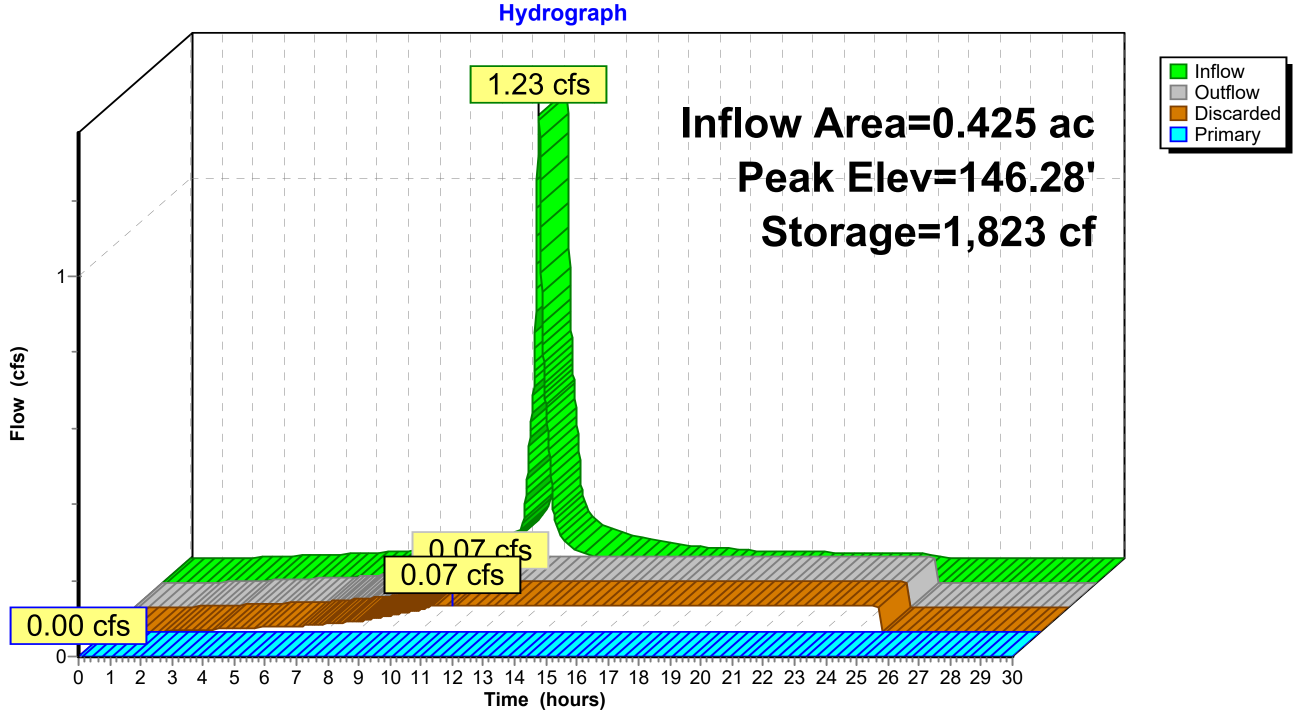
4,390.2 cf Field - 1,713.7 cf Chambers = 2,676.5 cf Stone x 40.0% Voids = 1,070.6 cf Stone Storage

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 6E: Existing Infiltration Field



Summary for Subcatchment 7E: E2b

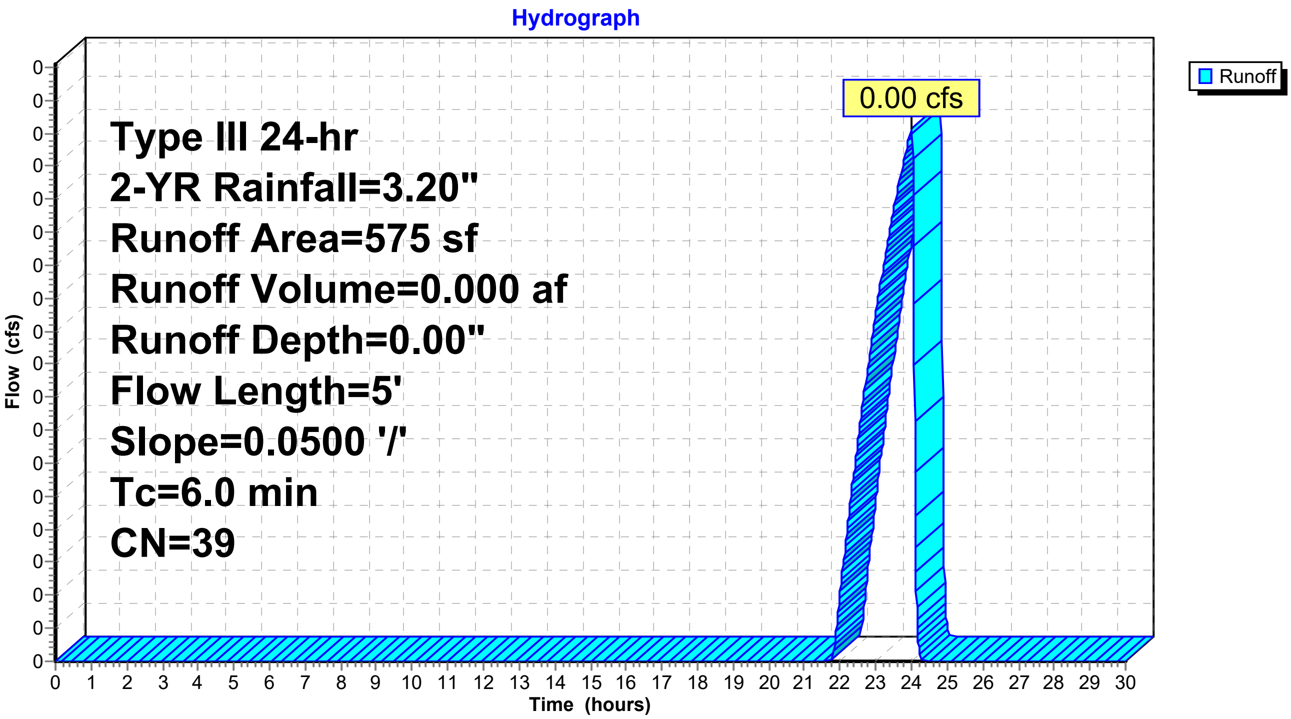
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
575	39	>75% Grass cover, Good, HSG A
575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	5	0.0500	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.9	5	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7E: E2b

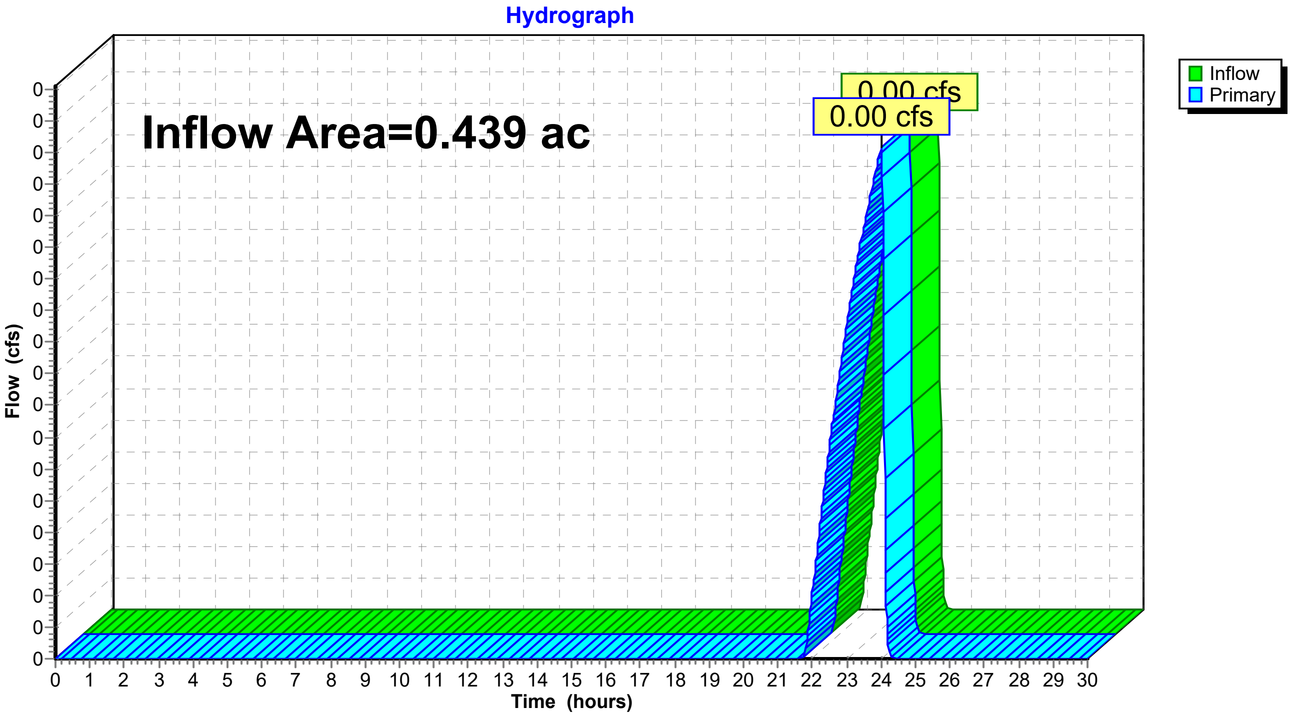


Summary for Link 8E: Design Point #2: Flow to 10 Pleasant Street

Inflow Area = 0.439 ac, 90.43% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 8E: Design Point #2: Flow to 10 Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3E: E2a Runoff Area=18,529 sf 93.23% Impervious Runoff Depth=4.17"
Flow Length=240' Tc=6.0 min CN=WQ Runoff=1.82 cfs 0.148 af

Pond 4E: Existing CB Peak Elev=149.08' Inflow=1.82 cfs 0.148 af
10.0" Round Culvert n=0.011 L=2.0' S=0.0500 '/' Outflow=1.82 cfs 0.148 af

Pond 5E: Sed Trap Peak Elev=149.07' Inflow=1.82 cfs 0.148 af
10.0" Round Culvert n=0.011 L=20.0' S=0.0250 '/' Outflow=1.82 cfs 0.148 af

Pond 6E: Existing Infiltration Field Peak Elev=149.06' Storage=2,804 cf Inflow=1.82 cfs 0.148 af
Discarded=0.07 cfs 0.136 af Primary=0.35 cfs 0.010 af Outflow=0.42 cfs 0.146 af

Subcatchment 7E: E2b Runoff Area=575 sf 0.00% Impervious Runoff Depth=0.14"
Flow Length=5' Slope=0.0500 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 8E: Design Point #2: Flow to 10 Pleasant Street Inflow=0.35 cfs 0.010 af
Primary=0.35 cfs 0.010 af

Total Runoff Area = 0.439 ac Runoff Volume = 0.148 af Average Runoff Depth = 4.05"
9.57% Pervious = 0.042 ac 90.43% Impervious = 0.397 ac

Summary for Subcatchment 3E: E2a

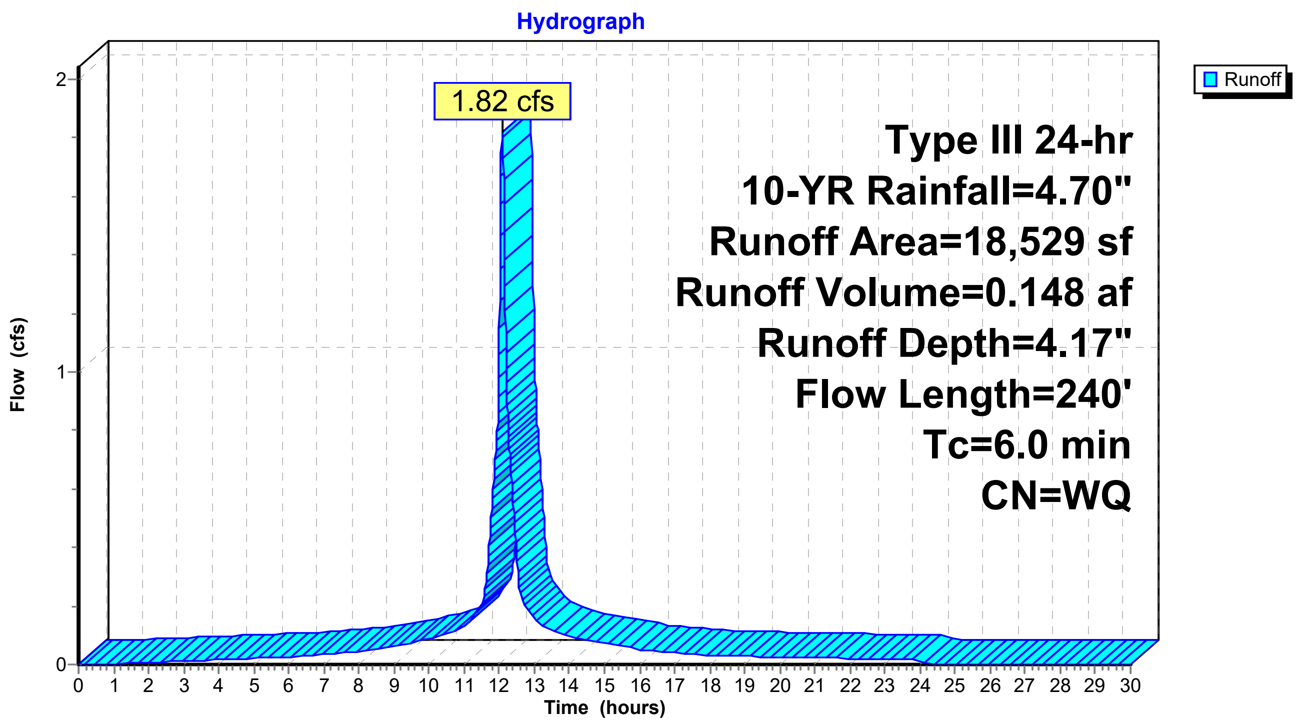
Runoff = 1.82 cfs @ 12.08 hrs, Volume= 0.148 af, Depth= 4.17"
Routed to Pond 4E : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
1,501	98	Roofs HSG A
15,774	98	Paved parking HSG A
1,254	39	>75% Grass cover, Good HSG A
18,529		Weighted Average
1,254		6.77% Pervious Area
17,275		93.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	25	0.0200	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.20"
0.7	75	0.0500	1.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	140	0.0800	5.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	240	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3E: E2a



Summary for Pond 4E: Existing CB

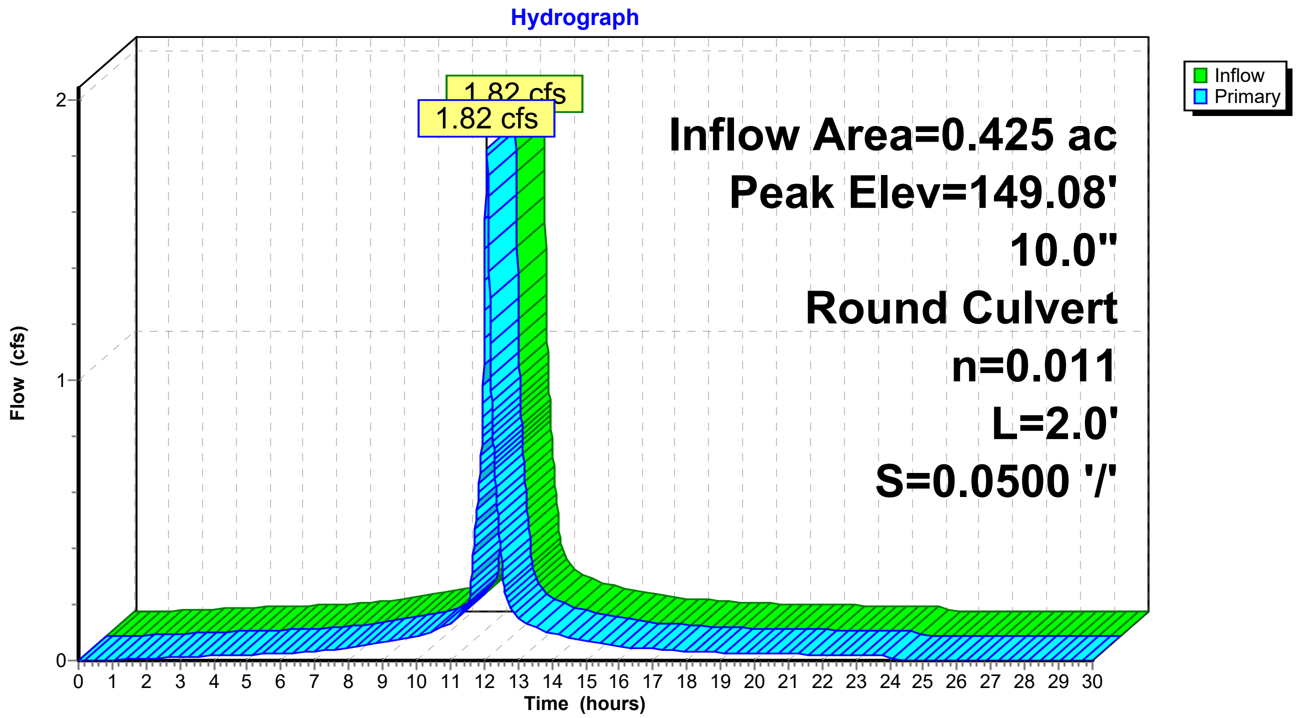
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 4.17" for 10-YR event
Inflow = 1.82 cfs @ 12.08 hrs, Volume= 0.148 af
Outflow = 1.82 cfs @ 12.08 hrs, Volume= 0.148 af, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.08 hrs, Volume= 0.148 af
Routed to Pond 5E : Sed Trap

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 149.08' @ 12.58 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.40'	**10.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.40' / 146.30' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=1.81 cfs @ 12.08 hrs HW=147.37' TW=146.90' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.81 cfs @ 3.31 fps)

Pond 4E: Existing CB



Summary for Pond 5E: Sed Trap

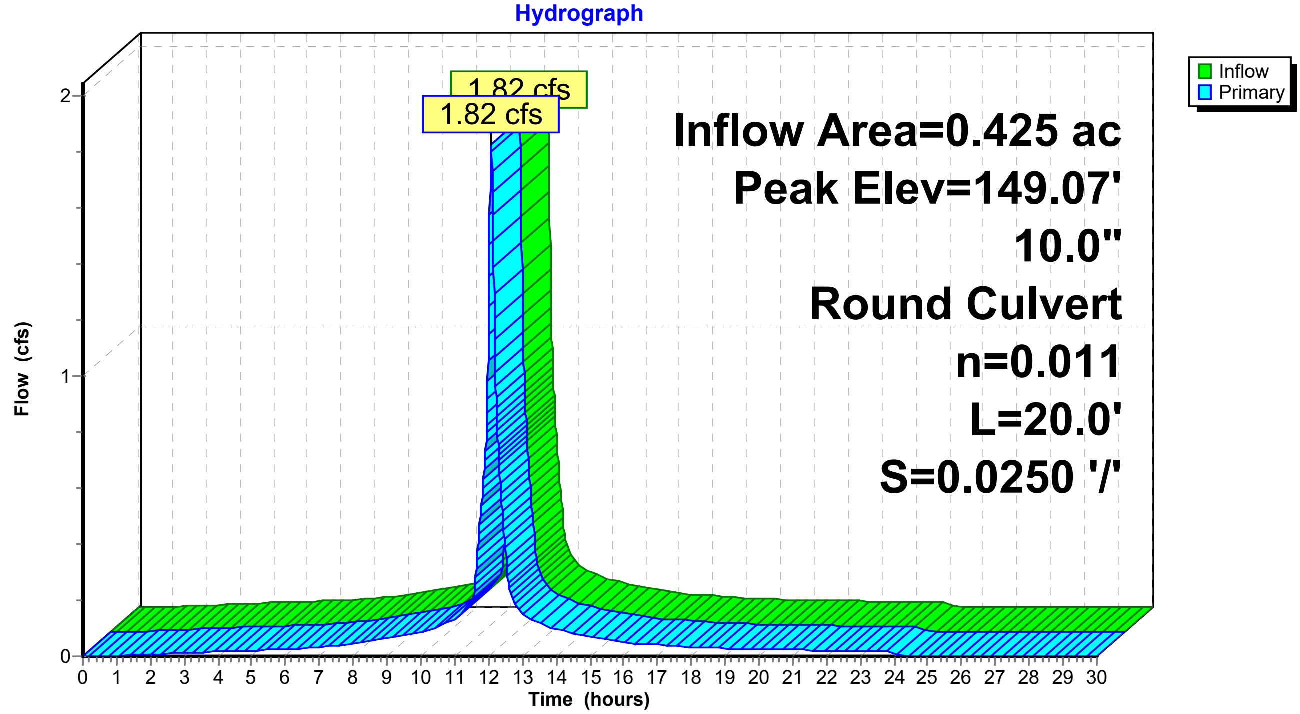
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 4.17" for 10-YR event
Inflow = 1.82 cfs @ 12.08 hrs, Volume= 0.148 af
Outflow = 1.82 cfs @ 12.08 hrs, Volume= 0.148 af, Atten= 0%, Lag= 0.0 min
Primary = 1.82 cfs @ 12.08 hrs, Volume= 0.148 af
Routed to Pond 6E : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 149.07' @ 12.57 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.00'	**10.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.00' / 145.50' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=1.82 cfs @ 12.08 hrs HW=146.90' TW=146.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.82 cfs @ 3.34 fps)

Pond 5E: Sed Trap



Summary for Pond 6E: Existing Infiltration Field

Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 4.17" for 10-YR event
Inflow = 1.82 cfs @ 12.08 hrs, Volume= 0.148 af
Outflow = 0.42 cfs @ 12.56 hrs, Volume= 0.146 af, Atten= 77%, Lag= 28.6 min
Discarded = 0.07 cfs @ 12.43 hrs, Volume= 0.136 af
Primary = 0.35 cfs @ 12.56 hrs, Volume= 0.010 af
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 149.06' @ 12.56 hrs Surf.Area= 1,252 sf Storage= 2,804 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 310.1 min (1,059.8 - 749.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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
#3	147.50'	25 cf	**4.00'D x 2.00'H Vertical Cone/Cylinder**
		2,809 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	149.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600
			Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.43 hrs HW=147.50' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.34 cfs @ 12.56 hrs HW=149.06' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 0.34 cfs @ 0.77 fps)

Pond 6E: Existing Infiltration Field - 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

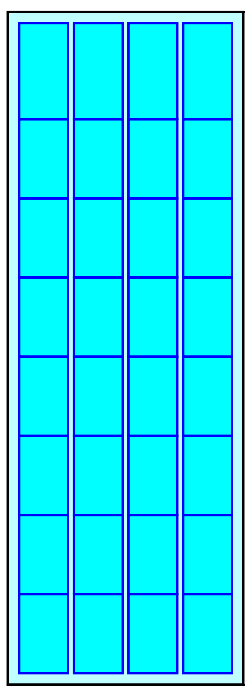
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

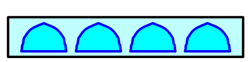
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

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

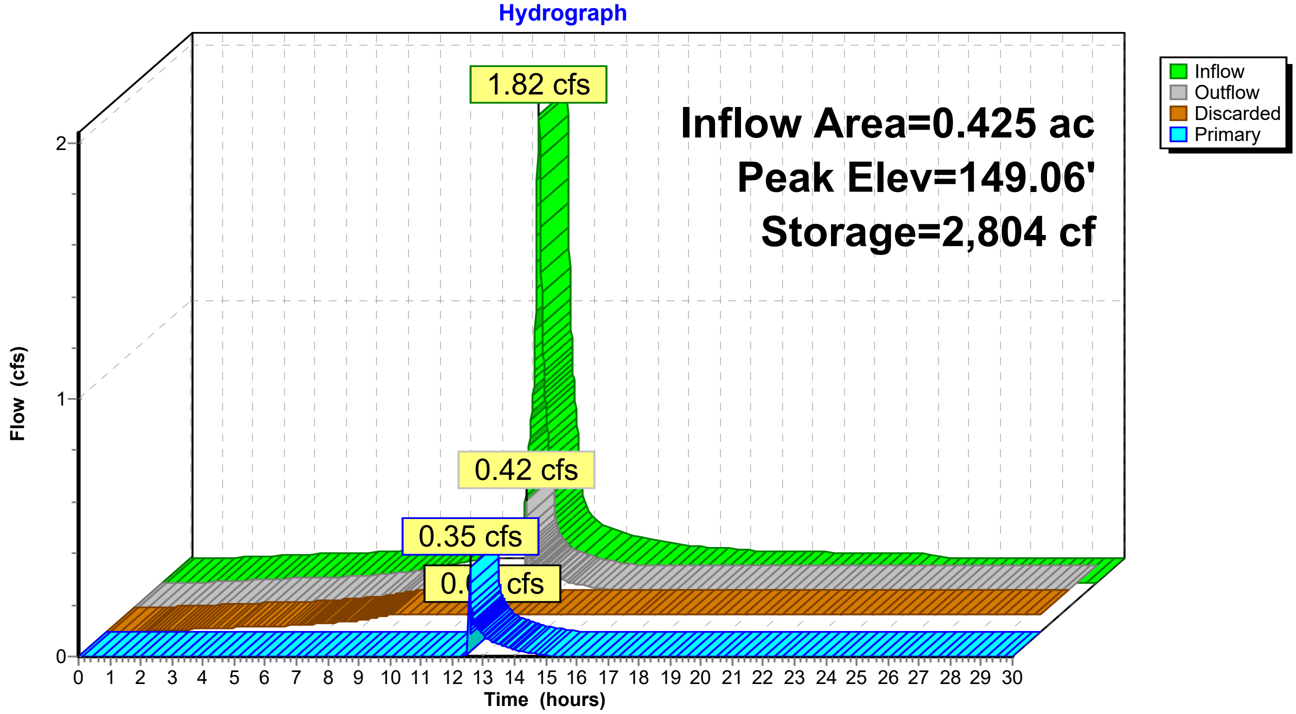
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 6E: Existing Infiltration Field



Summary for Subcatchment 7E: E2b

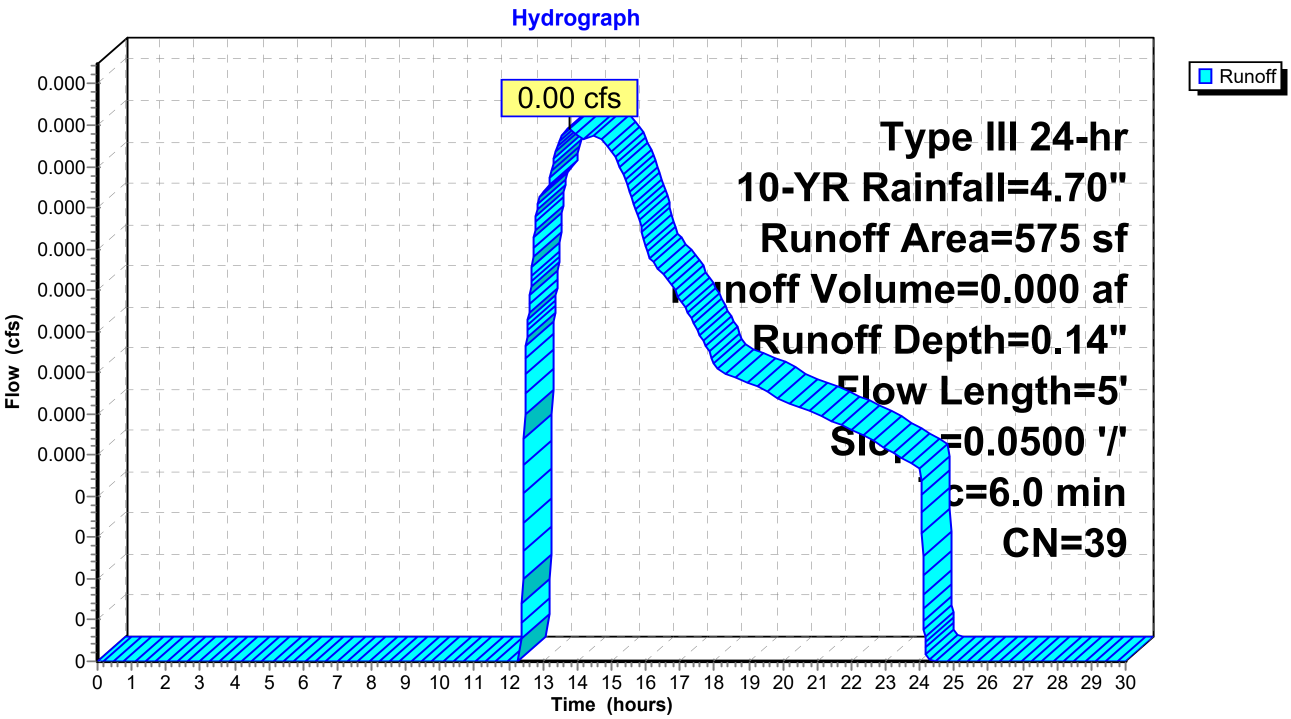
Runoff = 0.00 cfs @ 13.78 hrs, Volume= 0.000 af, Depth= 0.14"
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
575	39	>75% Grass cover, Good, HSG A
575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	5	0.0500	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.9	5	Total,	Increased to minimum Tc = 6.0 min		

Subcatchment 7E: E2b

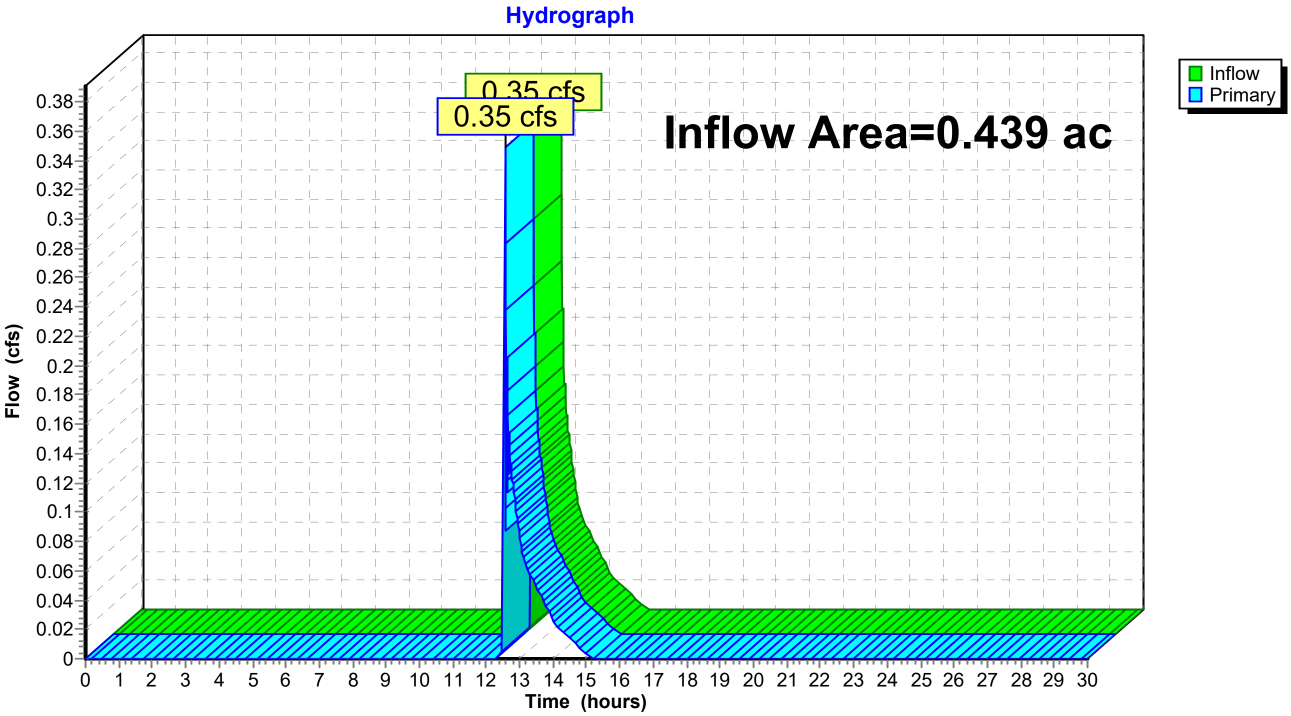


Summary for Link 8E: Design Point #2: Flow to 10 Pleasant Street

Inflow Area = 0.439 ac, 90.43% Impervious, Inflow Depth = 0.28" for 10-YR event
Inflow = 0.35 cfs @ 12.56 hrs, Volume= 0.010 af
Primary = 0.35 cfs @ 12.56 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 8E: Design Point #2: Flow to 10 Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3E: E2a Runoff Area=18,529 sf 93.23% Impervious Runoff Depth=5.50"
Flow Length=240' Tc=6.0 min CN=WQ Runoff=2.37 cfs 0.195 af

Pond 4E: Existing CB Peak Elev=149.98' Inflow=2.37 cfs 0.195 af
10.0" Round Culvert n=0.011 L=2.0' S=0.0500 '/' Outflow=2.37 cfs 0.195 af

Pond 5E: Sed Trap Peak Elev=149.67' Inflow=2.37 cfs 0.195 af
10.0" Round Culvert n=0.011 L=20.0' S=0.0250 '/' Outflow=2.37 cfs 0.195 af

Pond 6E: Existing Infiltration Field Peak Elev=149.20' Storage=2,806 cf Inflow=2.37 cfs 0.195 af
Discarded=0.07 cfs 0.142 af Primary=2.44 cfs 0.045 af Outflow=2.51 cfs 0.187 af

Subcatchment 7E: E2b Runoff Area=575 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=5' Slope=0.0500 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Link 8E: Design Point #2: Flow to 10 Pleasant Street Inflow=2.44 cfs 0.045 af
Primary=2.44 cfs 0.045 af

Total Runoff Area = 0.439 ac Runoff Volume = 0.195 af Average Runoff Depth = 5.35"
9.57% Pervious = 0.042 ac 90.43% Impervious = 0.397 ac

Summary for Subcatchment 3E: E2a

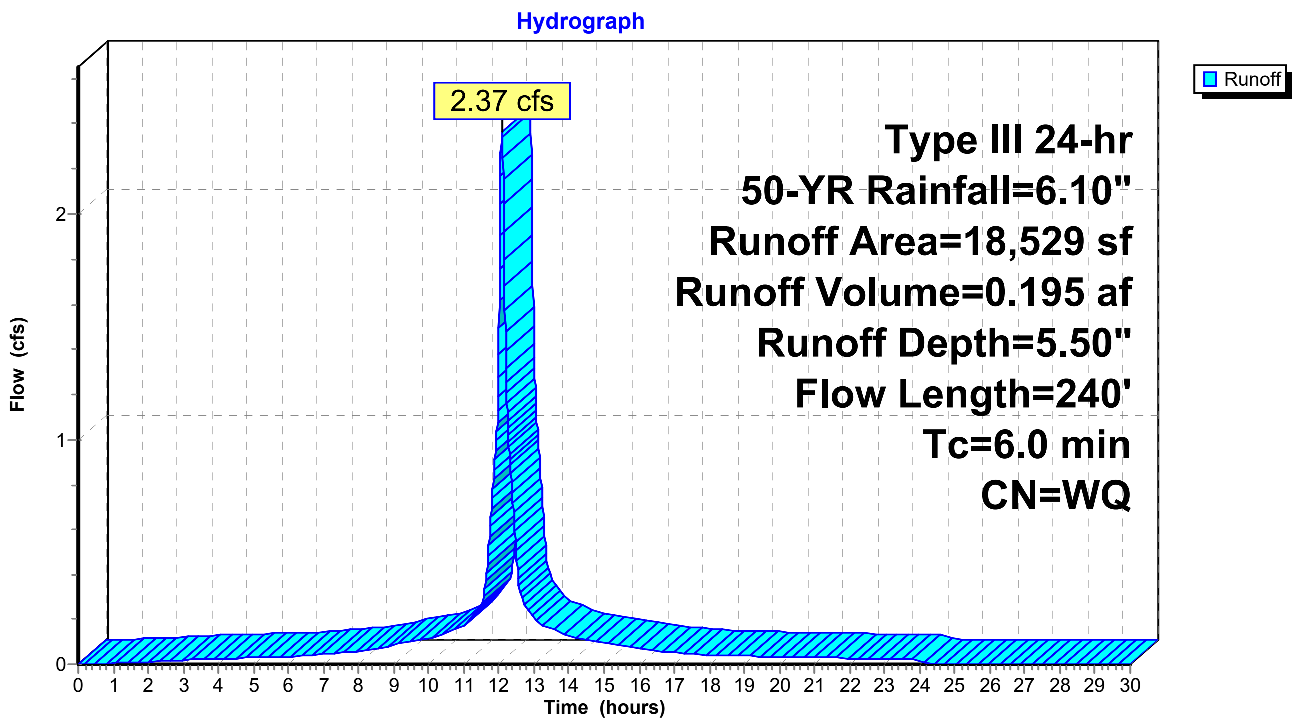
Runoff = 2.37 cfs @ 12.08 hrs, Volume= 0.195 af, Depth= 5.50"
Routed to Pond 4E : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
1,501	98	Roofs HSG A
15,774	98	Paved parking HSG A
1,254	39	>75% Grass cover, Good HSG A
18,529		Weighted Average
1,254		6.77% Pervious Area
17,275		93.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	25	0.0200	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.20"
0.7	75	0.0500	1.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	140	0.0800	5.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	240	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3E: E2a



Summary for Pond 4E: Existing CB

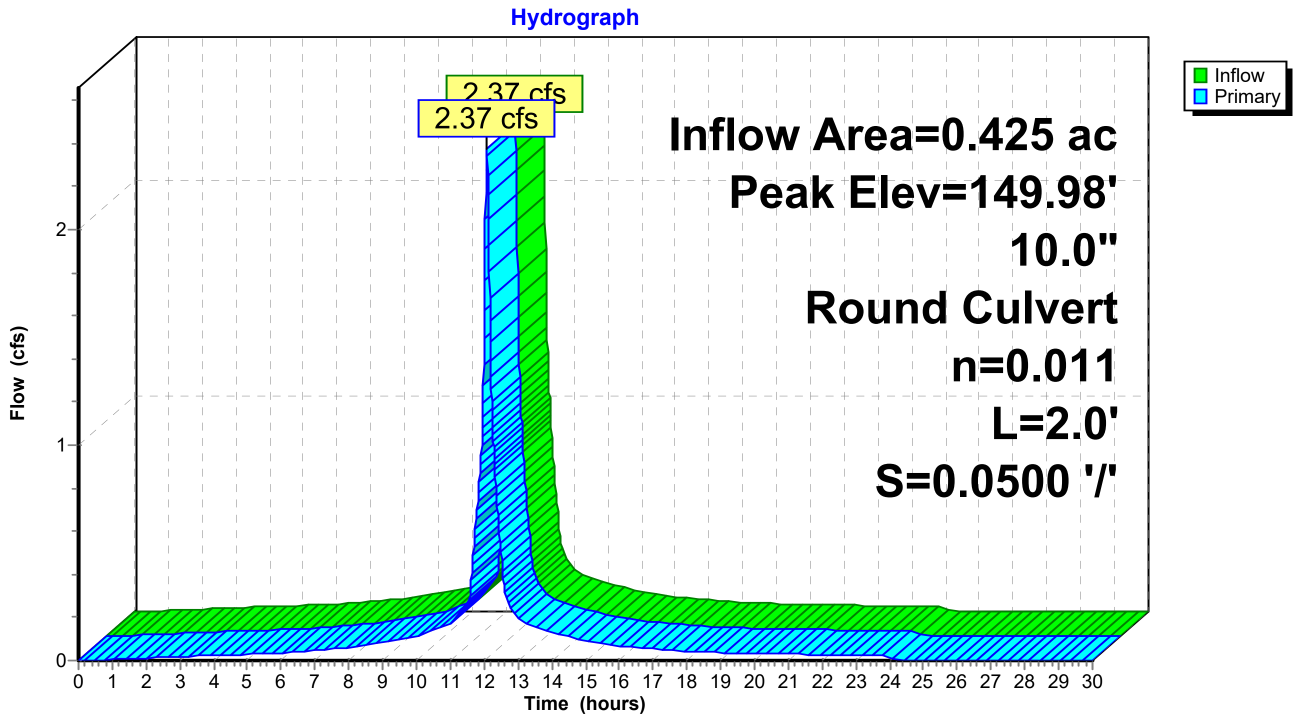
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 5.50" for 50-YR event
Inflow = 2.37 cfs @ 12.08 hrs, Volume= 0.195 af
Outflow = 2.37 cfs @ 12.08 hrs, Volume= 0.195 af, Atten= 0%, Lag= 0.0 min
Primary = 2.37 cfs @ 12.08 hrs, Volume= 0.195 af
Routed to Pond 5E : Sed Trap

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 149.98' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.40'	**10.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.40' / 146.30' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=2.20 cfs @ 12.08 hrs HW=148.24' TW=147.54' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.20 cfs @ 4.03 fps)

Pond 4E: Existing CB



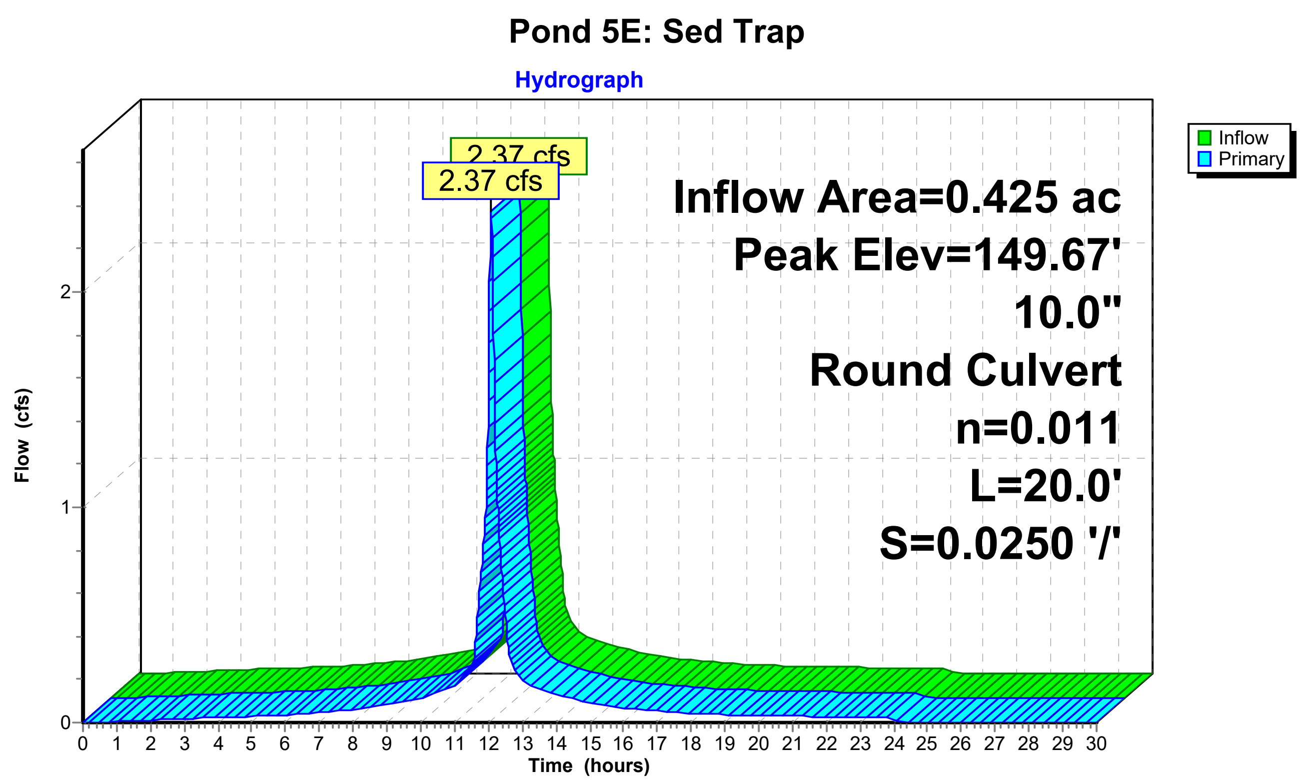
Summary for Pond 5E: Sed Trap

Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 5.50" for 50-YR event
Inflow = 2.37 cfs @ 12.08 hrs, Volume= 0.195 af
Outflow = 2.37 cfs @ 12.08 hrs, Volume= 0.195 af, Atten= 0%, Lag= 0.0 min
Primary = 2.37 cfs @ 12.08 hrs, Volume= 0.195 af
Routed to Pond 6E : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 149.67' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.00'	**10.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.00' / 145.50' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=2.20 cfs @ 12.08 hrs HW=147.54' TW=146.84' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.20 cfs @ 4.04 fps)



Summary for Pond 6E: Existing Infiltration Field

Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 5.50" for 50-YR event
Inflow = 2.37 cfs @ 12.08 hrs, Volume= 0.195 af
Outflow = 2.51 cfs @ 12.16 hrs, Volume= 0.187 af, Atten= 0%, Lag= 4.7 min
Discarded = 0.07 cfs @ 12.14 hrs, Volume= 0.142 af
Primary = 2.44 cfs @ 12.16 hrs, Volume= 0.045 af
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 149.20' @ 12.16 hrs Surf.Area= 1,252 sf Storage= 2,806 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 235.2 min (981.3 - 746.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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
#3	147.50'	25 cf	**4.00'D x 2.00'H Vertical Cone/Cylinder**
		2,809 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	149.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.14 hrs HW=147.62' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.24 cfs @ 12.16 hrs HW=149.19' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 2.24 cfs @ 1.44 fps)

Pond 6E: Existing Infiltration Field - 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

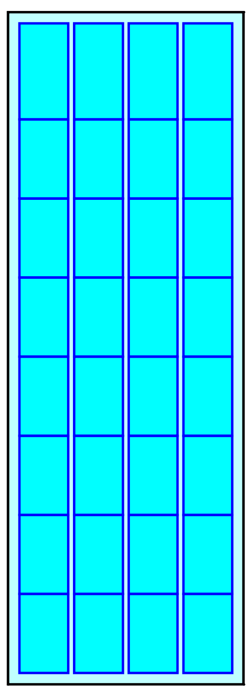
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

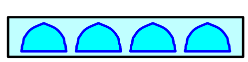
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

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

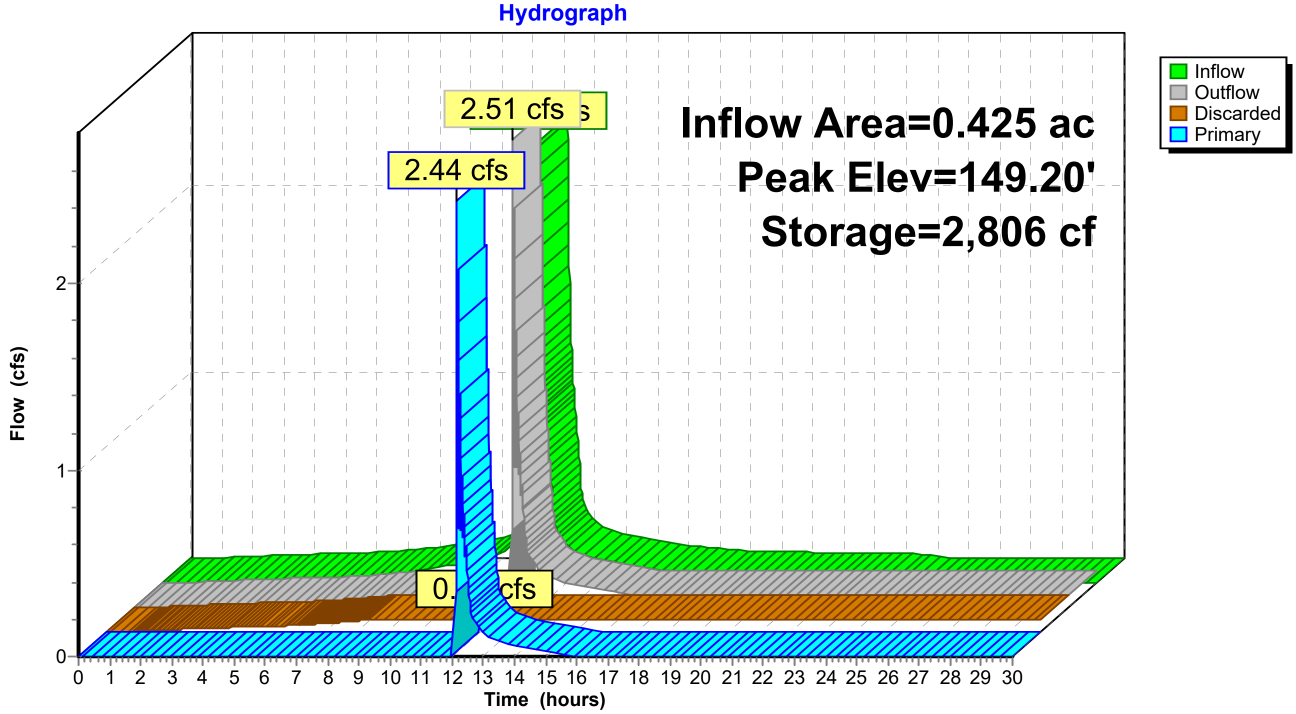
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 6E: Existing Infiltration Field



Summary for Subcatchment 7E: E2b

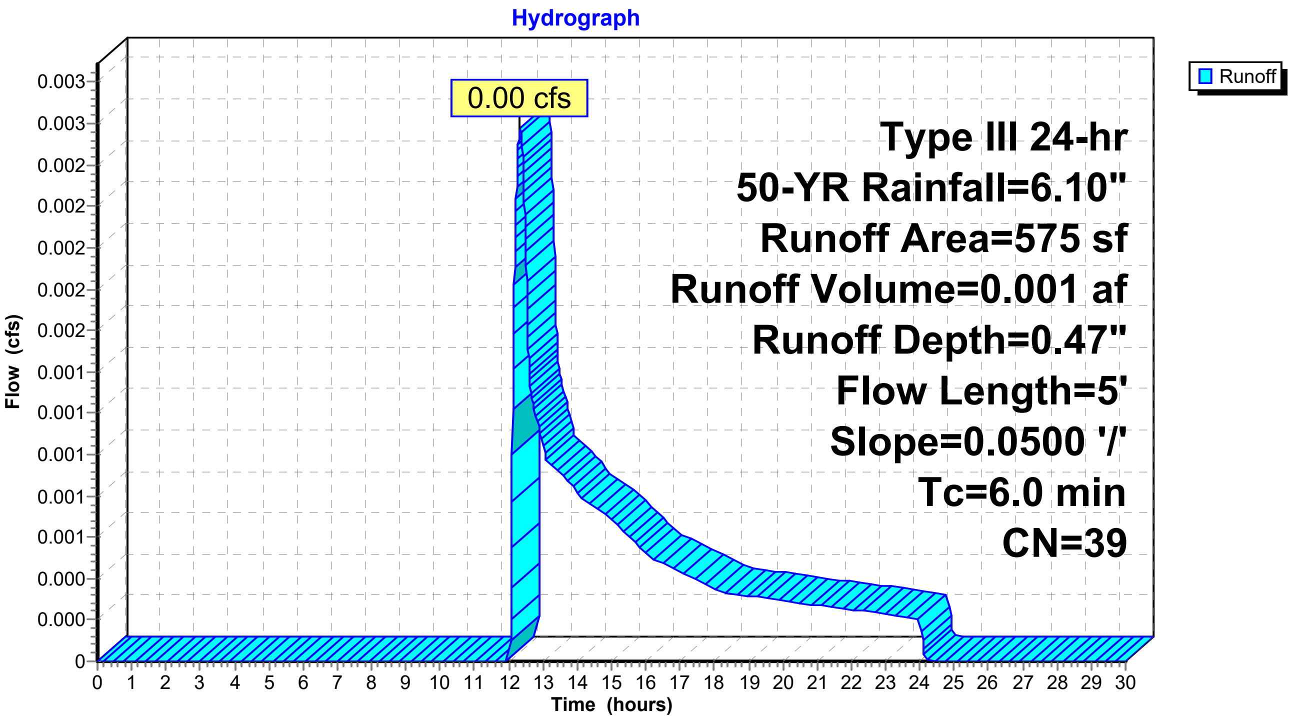
Runoff = 0.00 cfs @ 12.33 hrs, Volume= 0.001 af, Depth= 0.47"
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
575	39	>75% Grass cover, Good, HSG A
575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	5	0.0500	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.9	5	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 7E: E2b

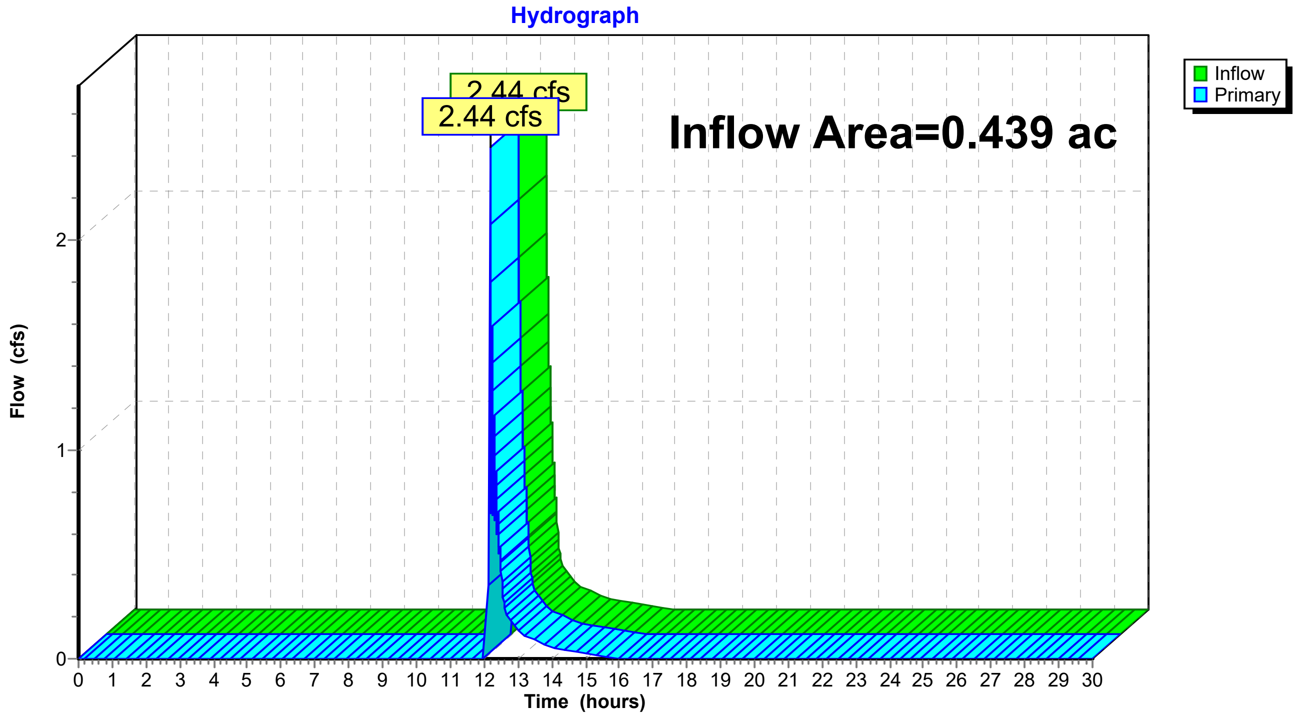


Summary for Link 8E: Design Point #2: Flow to 10 Pleasant Street

Inflow Area = 0.439 ac, 90.43% Impervious, Inflow Depth = 1.24" for 50-YR event
Inflow = 2.44 cfs @ 12.16 hrs, Volume= 0.045 af
Primary = 2.44 cfs @ 12.16 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 8E: Design Point #2: Flow to 10 Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3E: E2a Runoff Area=18,529 sf 93.23% Impervious Runoff Depth=6.07"
Flow Length=240' Tc=6.0 min CN=WQ Runoff=2.61 cfs 0.215 af

Pond 4E: Existing CB Peak Elev=150.88' Inflow=2.61 cfs 0.215 af
10.0" Round Culvert n=0.011 L=2.0' S=0.0500 '/' Outflow=2.61 cfs 0.215 af

Pond 5E: Sed Trap Peak Elev=150.18' Inflow=2.61 cfs 0.215 af
10.0" Round Culvert n=0.011 L=20.0' S=0.0250 '/' Outflow=2.61 cfs 0.215 af

Pond 6E: Existing Infiltration Field Peak Elev=149.22' Storage=2,806 cf Inflow=2.61 cfs 0.215 af
Discarded=0.07 cfs 0.144 af Primary=2.84 cfs 0.060 af Outflow=2.91 cfs 0.205 af

Subcatchment 7E: E2b Runoff Area=575 sf 0.00% Impervious Runoff Depth=0.66"
Flow Length=5' Slope=0.0500 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Link 8E: Design Point #2: Flow to 10 Pleasant Street Inflow=2.84 cfs 0.061 af
Primary=2.84 cfs 0.061 af

Total Runoff Area = 0.439 ac Runoff Volume = 0.216 af Average Runoff Depth = 5.91"
9.57% Pervious = 0.042 ac 90.43% Impervious = 0.397 ac

Summary for Subcatchment 3E: E2a

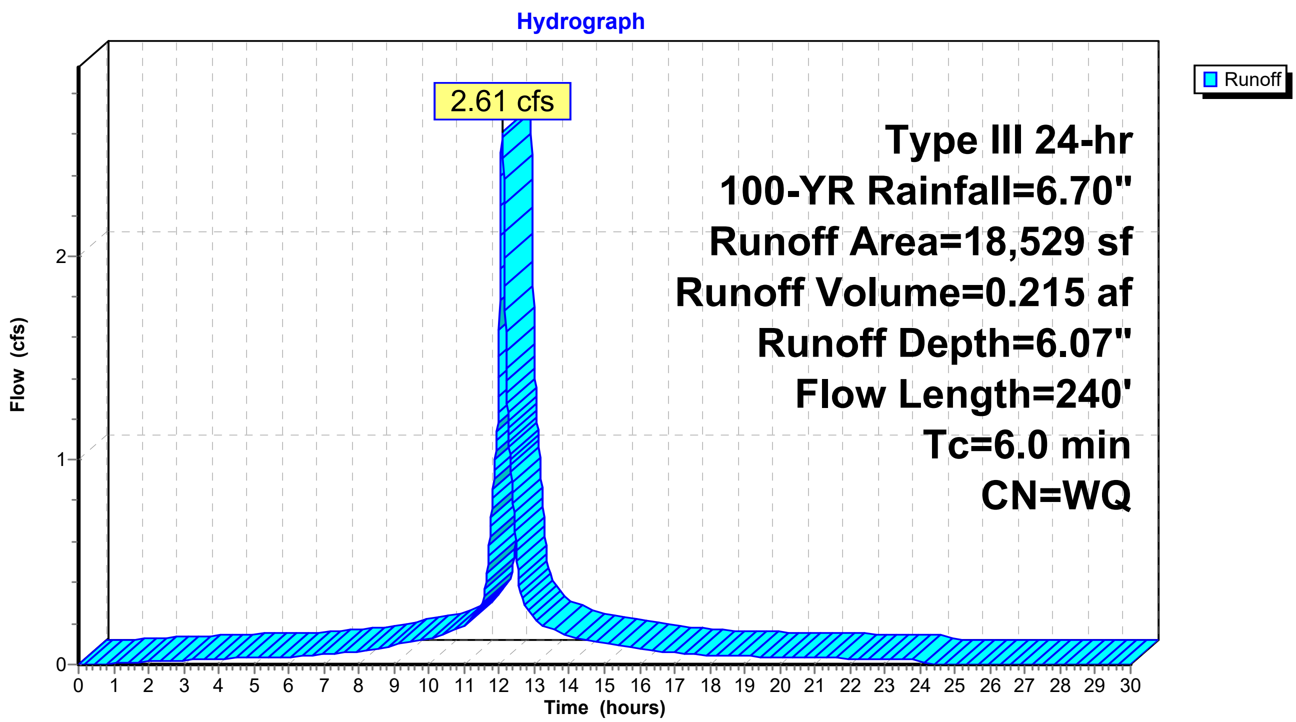
Runoff = 2.61 cfs @ 12.08 hrs, Volume= 0.215 af, Depth= 6.07"
Routed to Pond 4E : Existing CB

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
1,501	98	Roofs HSG A
15,774	98	Paved parking HSG A
1,254	39	>75% Grass cover, Good HSG A
18,529		Weighted Average
1,254		6.77% Pervious Area
17,275		93.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	25	0.0200	0.31		**Sheet Flow,** Fallow n= 0.050 P2= 3.20"
0.7	75	0.0500	1.87		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.4	140	0.0800	5.74		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.4	240	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3E: E2a



Summary for Pond 4E: Existing CB

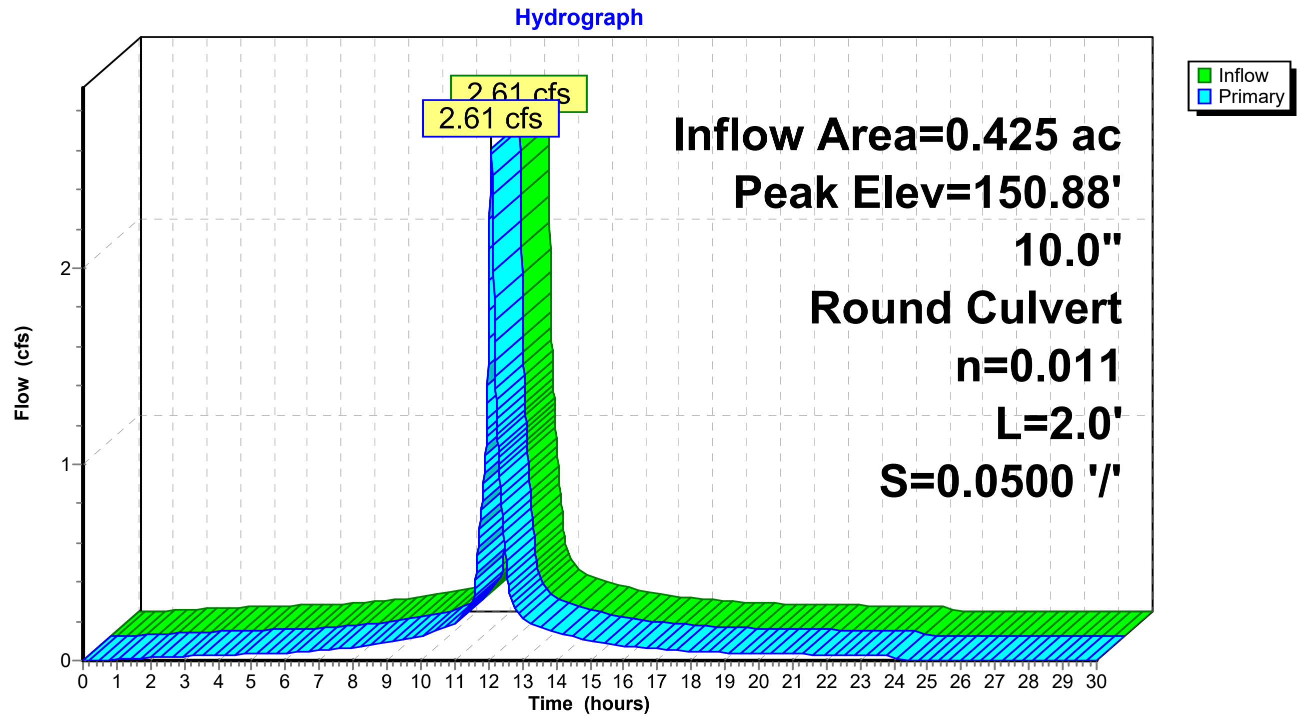
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 6.07" for 100-YR event
Inflow = 2.61 cfs @ 12.08 hrs, Volume= 0.215 af
Outflow = 2.61 cfs @ 12.08 hrs, Volume= 0.215 af, Atten= 0%, Lag= 0.0 min
Primary = 2.61 cfs @ 12.08 hrs, Volume= 0.215 af
Routed to Pond 5E : Sed Trap

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.88' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.40'	**10.0" Round Culvert** L= 2.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.40' / 146.30' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=2.36 cfs @ 12.08 hrs HW=149.01' TW=148.21' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.36 cfs @ 4.33 fps)

Pond 4E: Existing CB



Summary for Pond 5E: Sed Trap

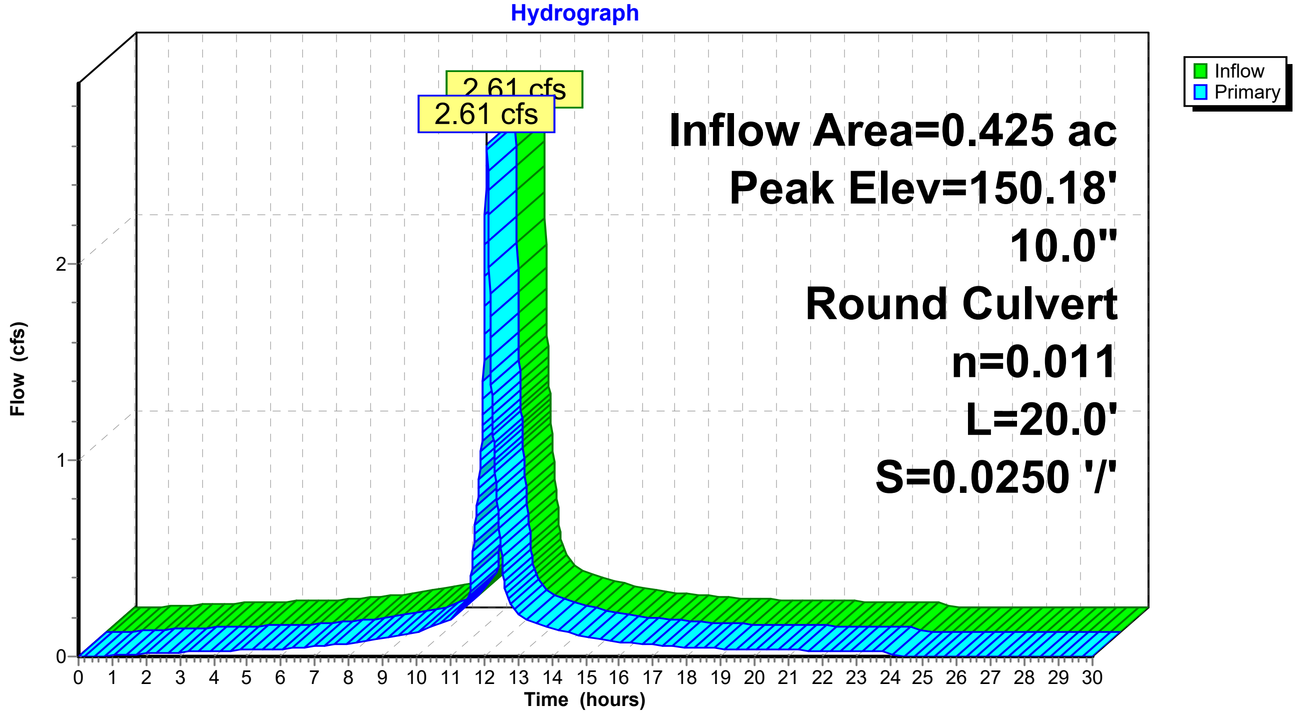
Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 6.07" for 100-YR event
Inflow = 2.61 cfs @ 12.08 hrs, Volume= 0.215 af
Outflow = 2.61 cfs @ 12.08 hrs, Volume= 0.215 af, Atten= 0%, Lag= 0.0 min
Primary = 2.61 cfs @ 12.08 hrs, Volume= 0.215 af
Routed to Pond 6E : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.18' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	146.00'	**10.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.00' / 145.50' S= 0.0250 '/' Cc= 0.900 n= 0.011, Flow Area= 0.55 sf

Primary OutFlow Max=2.35 cfs @ 12.08 hrs HW=148.21' TW=147.40' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.35 cfs @ 4.32 fps)

Pond 5E: Sed Trap



Summary for Pond 6E: Existing Infiltration Field

Inflow Area = 0.425 ac, 93.23% Impervious, Inflow Depth = 6.07" for 100-YR event
Inflow = 2.61 cfs @ 12.08 hrs, Volume= 0.215 af
Outflow = 2.91 cfs @ 12.11 hrs, Volume= 0.205 af, Atten= 0%, Lag= 1.8 min
Discarded = 0.07 cfs @ 12.09 hrs, Volume= 0.144 af
Primary = 2.84 cfs @ 12.11 hrs, Volume= 0.060 af
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 149.22' @ 12.11 hrs Surf.Area= 1,252 sf Storage= 2,806 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 211.9 min (956.9 - 745.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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
#3	147.50'	25 cf	**4.00'D x 2.00'H Vertical Cone/Cylinder**
		2,809 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	149.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.09 hrs HW=147.52' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.48 cfs @ 12.11 hrs HW=149.21' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 2.48 cfs @ 1.49 fps)

Pond 6E: Existing Infiltration Field - 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

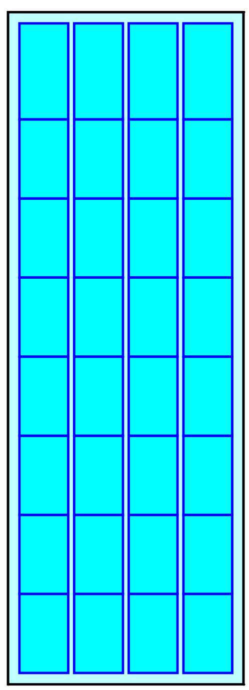
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

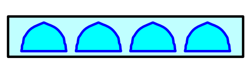
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

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

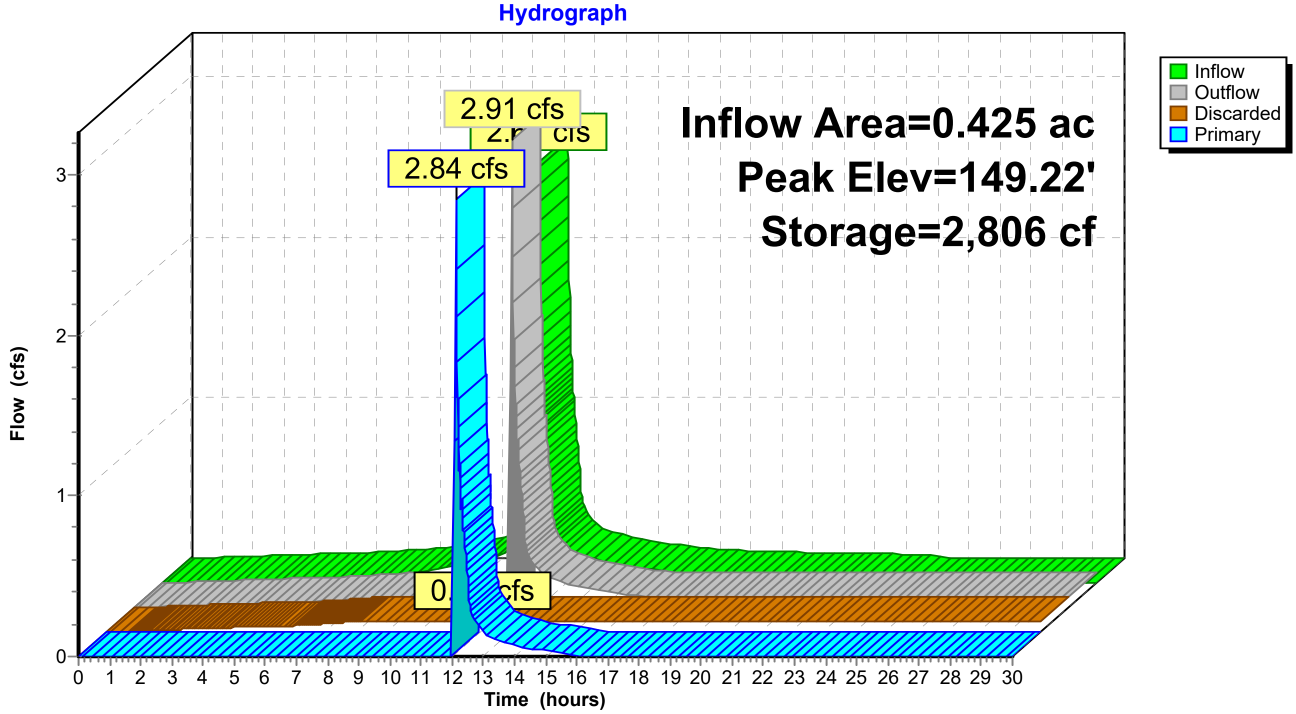
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 6E: Existing Infiltration Field



Summary for Subcatchment 7E: E2b

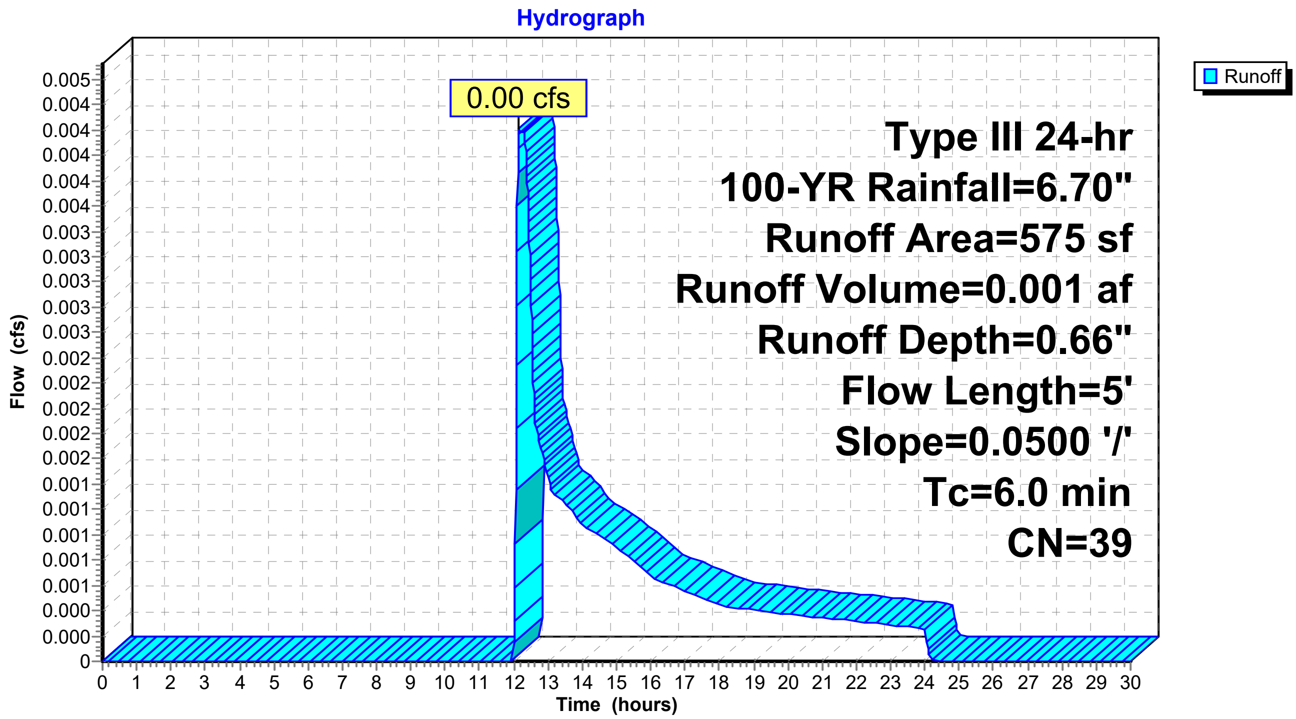
Runoff = 0.00 cfs @ 12.16 hrs, Volume= 0.001 af, Depth= 0.66"
Routed to Link 8E : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
575	39	>75% Grass cover, Good, HSG A
575		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	5	0.0500	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.9	5	Total,	Increased to minimum Tc = 6.0 min		

Subcatchment 7E: E2b

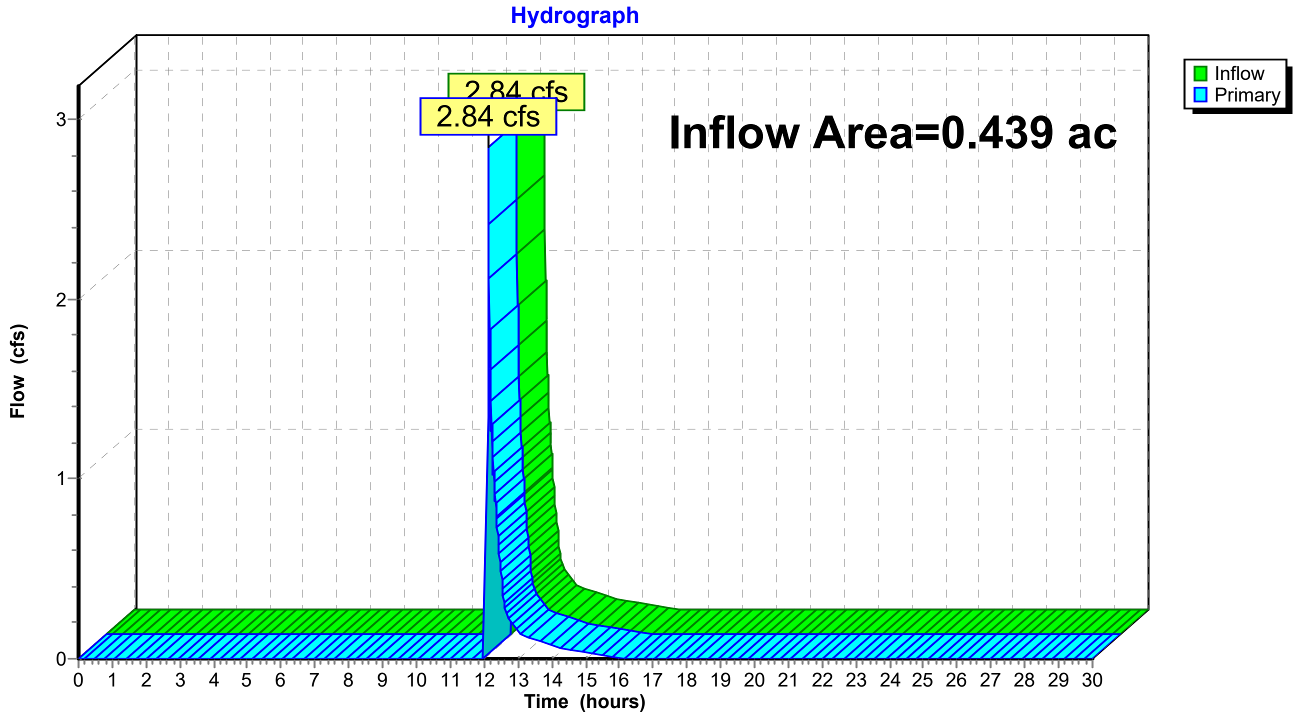


Summary for Link 8E: Design Point #2: Flow to 10 Pleasant Street

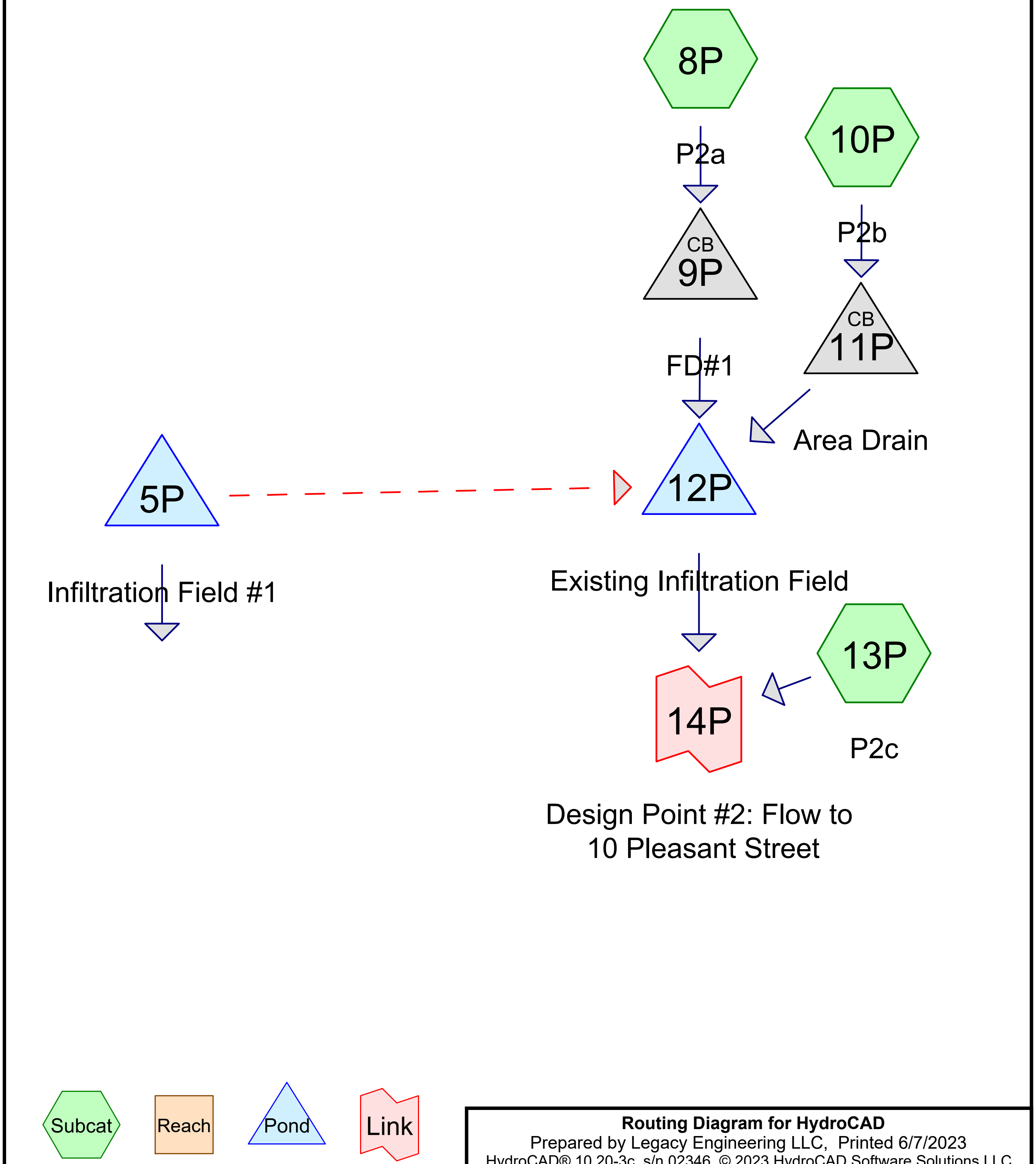
Inflow Area =	0.439 ac, 90.43% Impervious, Inflow Depth = 1.67" for 100-YR event		
Inflow =	2.84 cfs @ 12.11 hrs, Volume=	0.061 af	
Primary =	2.84 cfs @ 12.11 hrs, Volume=	0.061 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 8E: Design Point #2: Flow to 10 Pleasant Street



DESIGN POINT #2: FLOW TO 10 PLEASANT STREET PROPOSED CONDITIONS



Routing Diagram for HydroCAD
Prepared by Legacy Engineering LLC, Printed 6/7/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type III 24-hr		Default	24.00	1	2.50	2
2	2-YR	Type III 24-hr		Default	24.00	1	3.20	2
3	10-YR	Type III 24-hr		Default	24.00	1	4.70	2
4	50-YR	Type III 24-hr		Default	24.00	1	6.10	2
5	100-YR	Type III 24-hr		Default	24.00	1	6.70	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.206	39	>75% Grass cover, Good HSG A (8P, 10P, 13P)
0.356	98	Paved parking HSG A (8P, 10P)
0.562	**76**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond 5P: Infiltration Field #1 Peak Elev=150.89' Storage=1,031 cf Inflow=0.84 cfs 0.066 af
Discarded=0.07 cfs 0.062 af Primary=0.00 cfs 0.000 af Secondary=0.02 cfs 0.004 af Outflow=0.08 cfs 0.066 af

Subcatchment 8P: P2a Runoff Area=16,520 sf 89.05% Impervious Runoff Depth=2.02"
Flow Length=305' Tc=6.0 min CN=WQ Runoff=0.81 cfs 0.064 af

Pond 9P: FD#1 Peak Elev=150.16' Inflow=0.81 cfs 0.064 af
12.0" Round Culvert n=0.011 L=17.0' S=0.2941 '/' Outflow=0.81 cfs 0.064 af

Subcatchment 10P: P2b Runoff Area=6,144 sf 13.18% Impervious Runoff Depth=0.30"
Flow Length=84' Slope=0.0700 '/' Tc=7.5 min CN=WQ Runoff=0.04 cfs 0.004 af

Pond 11P: Area Drain Peak Elev=152.71' Inflow=0.04 cfs 0.004 af
8.0" Round Culvert n=0.011 L=137.0' S=0.0190 '/' Outflow=0.04 cfs 0.004 af

Pond 12P: Existing Infiltration Field Peak Elev=145.58' Storage=1,146 cf Inflow=0.85 cfs 0.072 af
Discarded=0.07 cfs 0.072 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.072 af

Subcatchment 13P: P2c Runoff Area=1,811 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=29' Slope=0.0400 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 14P: Design Point #2: Flow to 10 Pleasant Street Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 0.562 ac Runoff Volume = 0.067 af Average Runoff Depth = 1.44"
36.58% Pervious = 0.206 ac 63.42% Impervious = 0.356 ac

Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 2.22" for 1-YR event
Inflow = 0.84 cfs @ 12.08 hrs, Volume= 0.066 af
Outflow = 0.08 cfs @ 12.85 hrs, Volume= 0.066 af, Atten= 90%, Lag= 46.3 min
Discarded = 0.07 cfs @ 11.55 hrs, Volume= 0.062 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.02 cfs @ 12.85 hrs, Volume= 0.004 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.89' @ 12.85 hrs Surf.Area= 1,168 sf Storage= 1,031 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 97.9 min (859.8 - 761.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.55 hrs HW=149.55' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=149.50' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.02 cfs @ 12.85 hrs HW=150.89' TW=145.54' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.02 cfs of 0.70 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.02 cfs @ 3.24 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

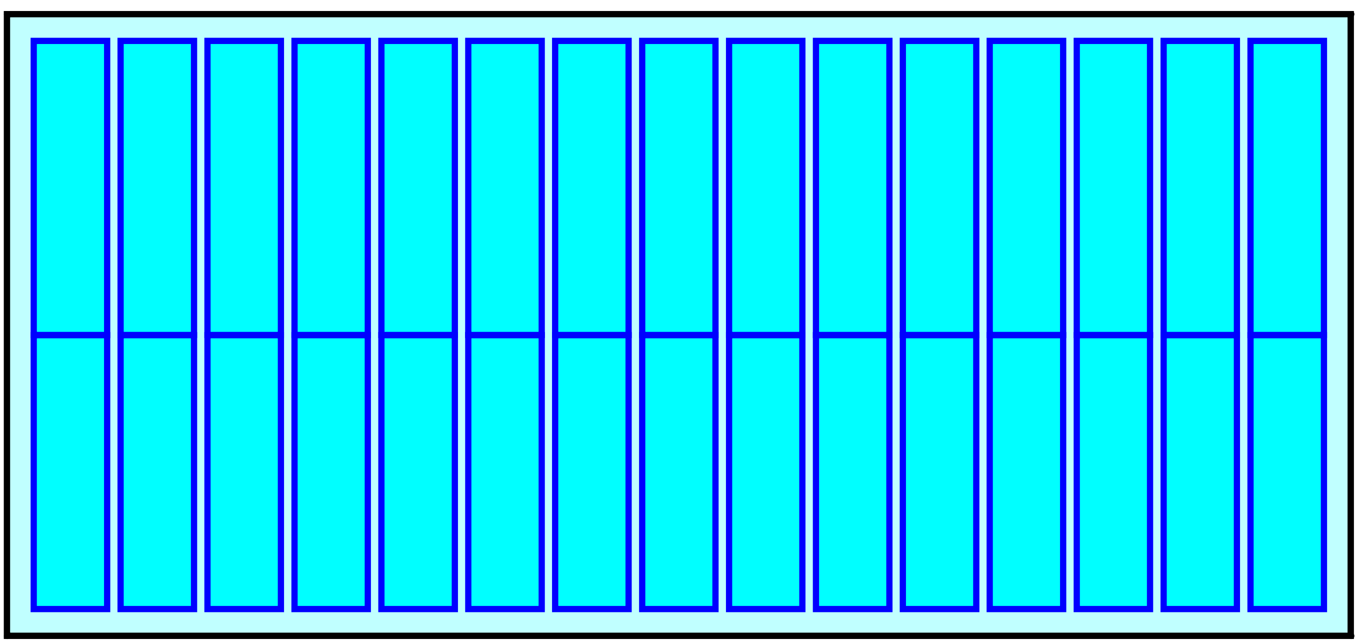
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

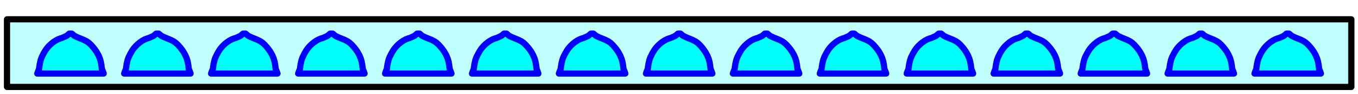
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

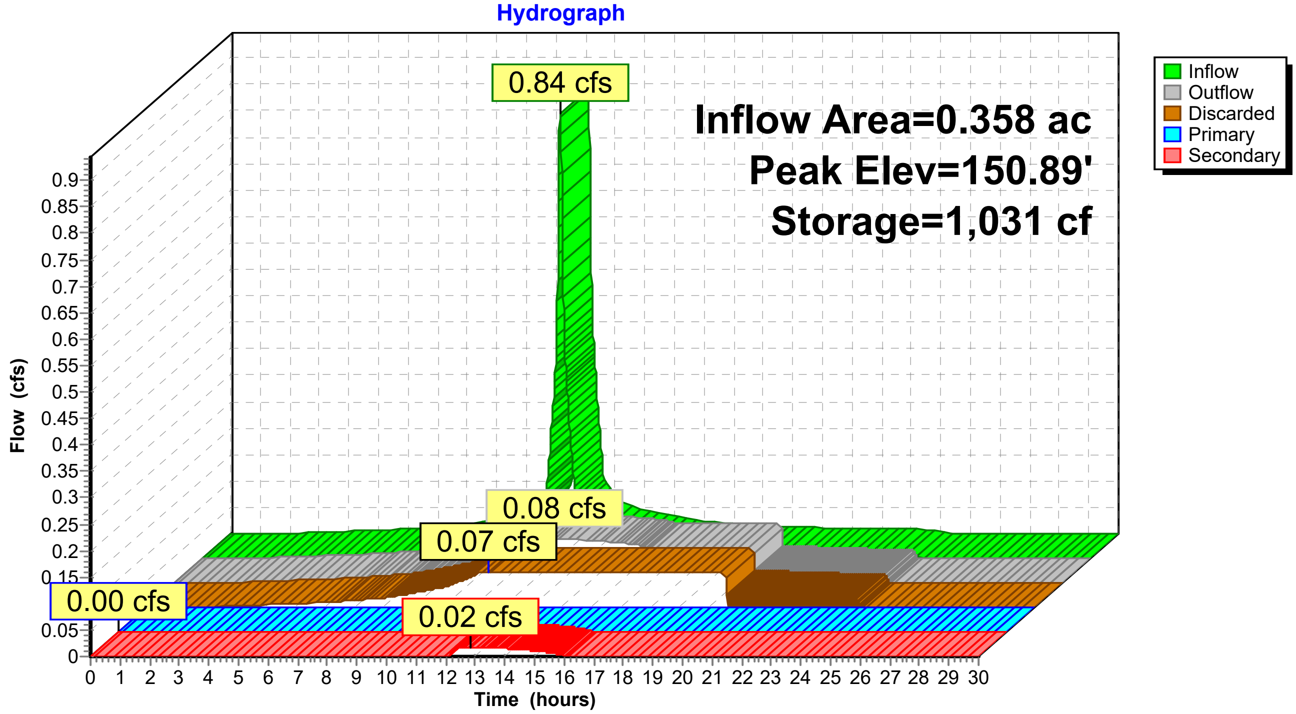
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 8P: P2a

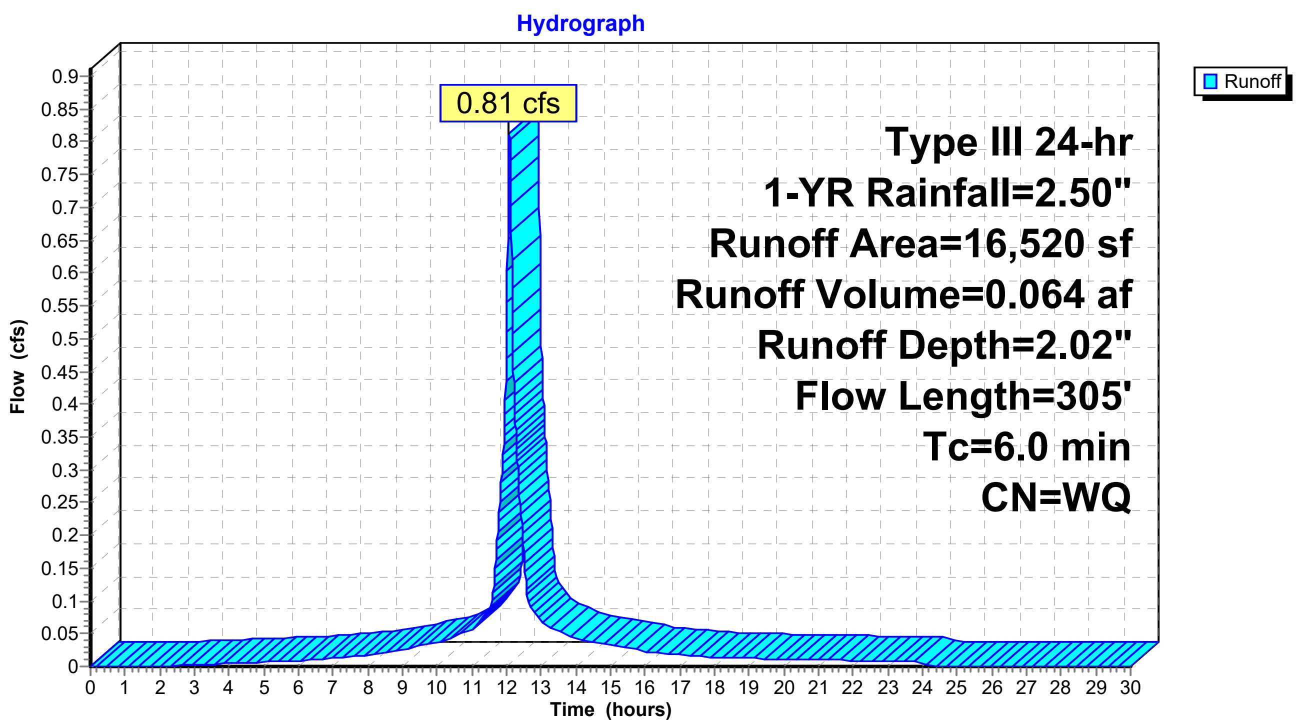
Runoff = 0.81 cfs @ 12.08 hrs, Volume= 0.064 af, Depth= 2.02"
Routed to Pond 9P : FD#1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
14,711	98	Paved parking HSG A
1,809	39	>75% Grass cover, Good HSG A
16,520		Weighted Average
1,809		10.95% Pervious Area
14,711		89.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	36	0.0500	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.6	64	0.0400	1.66		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	205	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.8	305	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8P: P2a



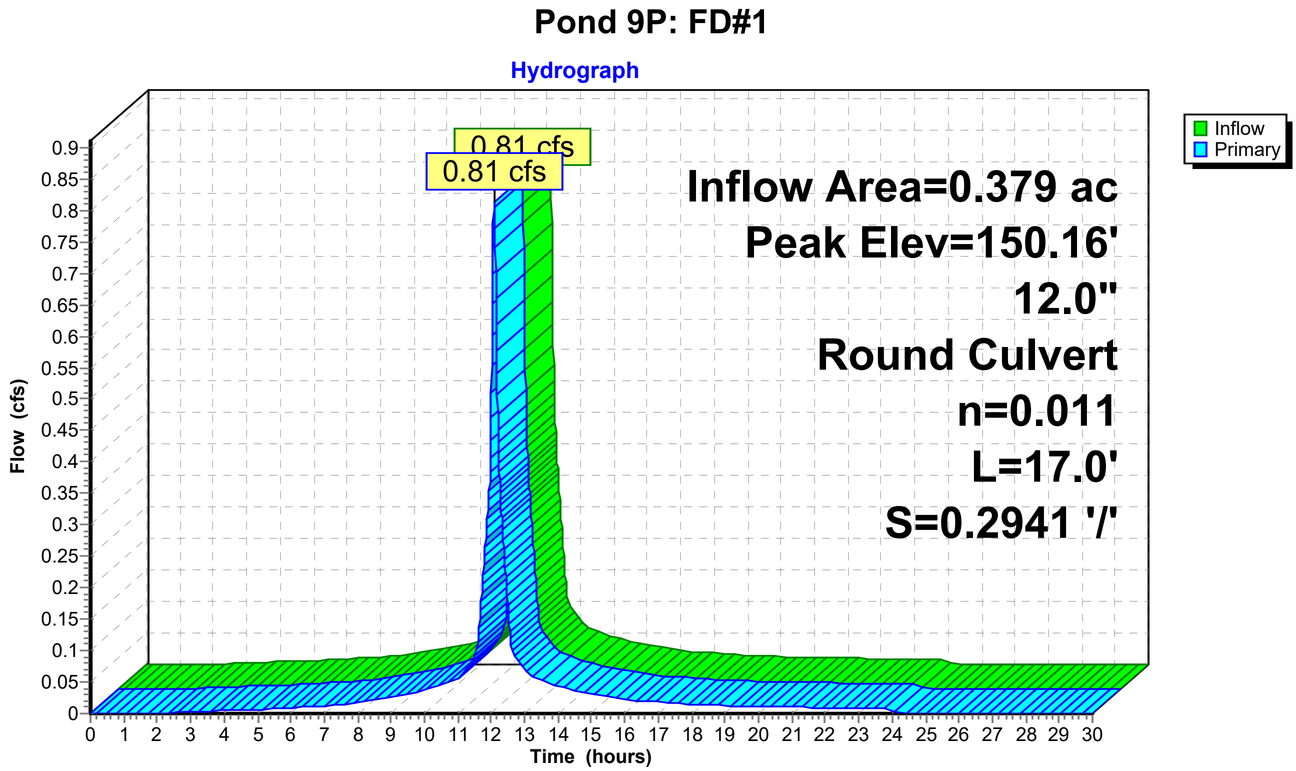
Summary for Pond 9P: FD#1

Inflow Area = 0.379 ac, 89.05% Impervious, Inflow Depth = 2.02" for 1-YR event
Inflow = 0.81 cfs @ 12.08 hrs, Volume= 0.064 af
Outflow = 0.81 cfs @ 12.08 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min
Primary = 0.81 cfs @ 12.08 hrs, Volume= 0.064 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.16' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	**12.0" Round Culvert** L= 17.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 149.70' / 144.70' S= 0.2941 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=0.81 cfs @ 12.08 hrs HW=150.16' TW=144.95' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.81 cfs @ 2.31 fps)



Summary for Subcatchment 10P: P2b

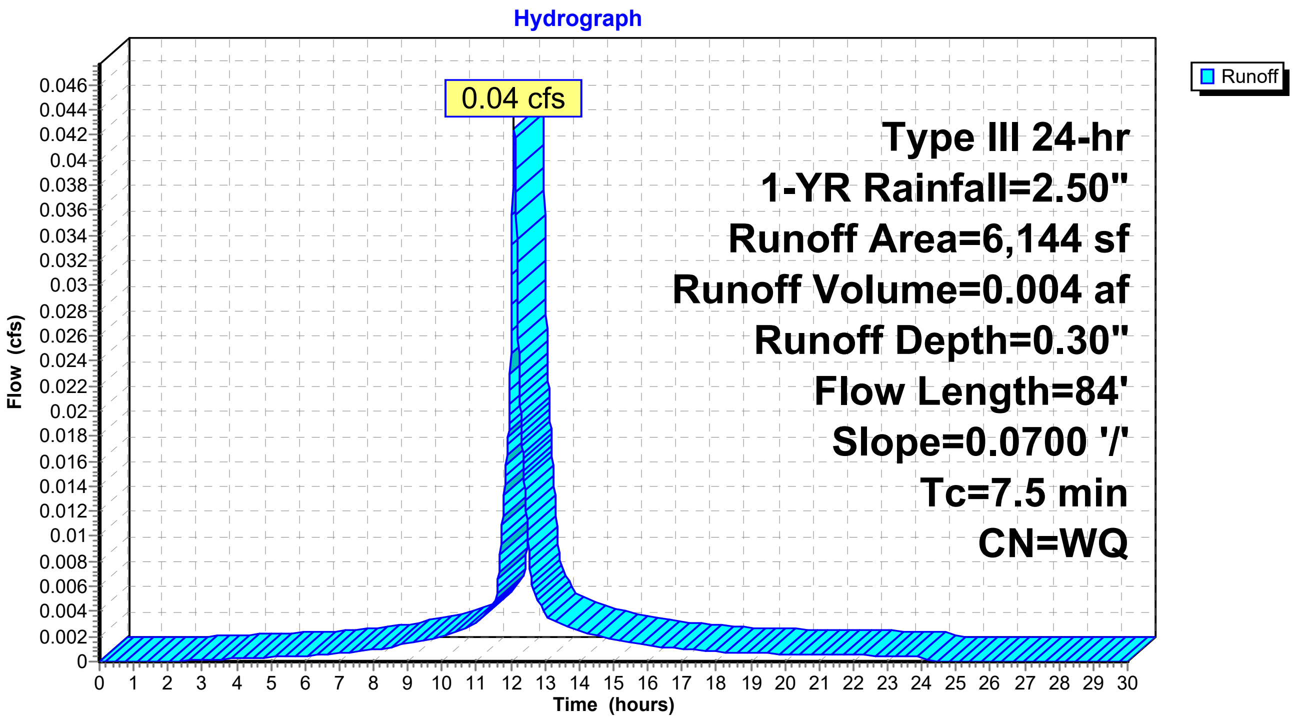
Runoff = 0.04 cfs @ 12.10 hrs, Volume= 0.004 af, Depth= 0.30"
Routed to Pond 11P : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
810	98	Paved parking HSG A
5,334	39	>75% Grass cover, Good HSG A
6,144		Weighted Average
5,334		86.82% Pervious Area
810		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	84	0.0700	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 10P: P2b



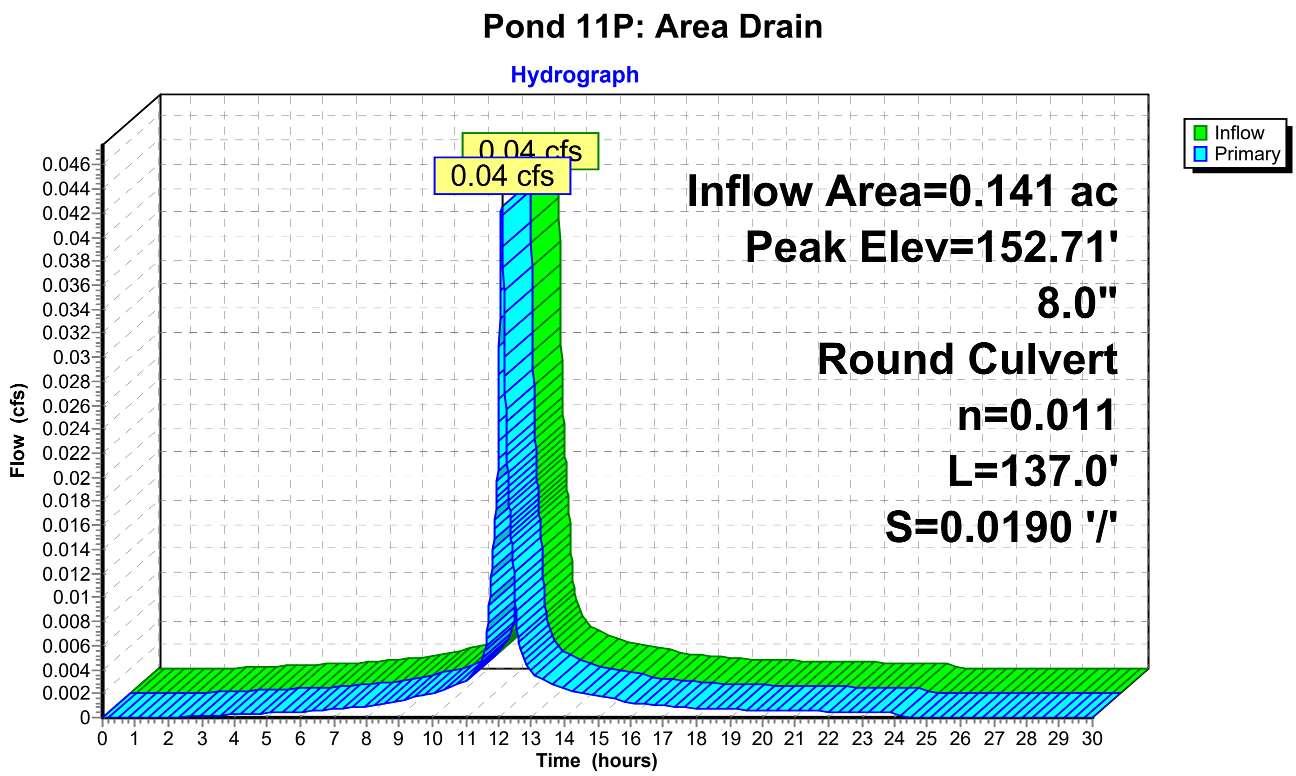
Summary for Pond 11P: Area Drain

Inflow Area = 0.141 ac, 13.18% Impervious, Inflow Depth = 0.30" for 1-YR event
Inflow = 0.04 cfs @ 12.10 hrs, Volume= 0.004 af
Outflow = 0.04 cfs @ 12.10 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.10 hrs, Volume= 0.004 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 152.71' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.60'	**8.0" Round Culvert** L= 137.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.60' / 150.00' S= 0.0190 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.04 cfs @ 12.10 hrs HW=152.71' TW=145.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.04 cfs @ 1.13 fps)



Summary for Pond 12P: Existing Infiltration Field

Inflow Area = 0.520 ac, 68.48% Impervious, Inflow Depth = 1.65" for 1-YR event
Inflow = 0.85 cfs @ 12.08 hrs, Volume= 0.072 af
Outflow = 0.07 cfs @ 11.55 hrs, Volume= 0.072 af, Atten= 92%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.55 hrs, Volume= 0.072 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 145.58' @ 13.66 hrs Surf.Area= 1,240 sf Storage= 1,146 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 130.1 min (895.9 - 765.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	146.20'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.20' / 146.10' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Device 2	146.20'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	146.50'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.55 hrs HW=144.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.20' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 12P: Existing Infiltration Field - 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

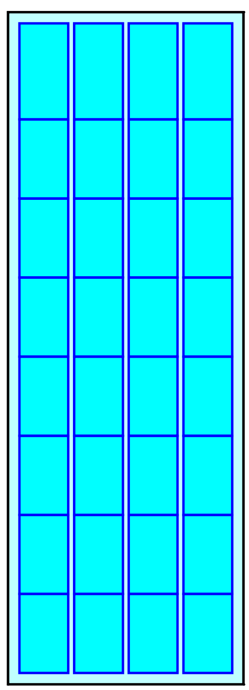
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

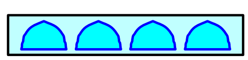
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

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

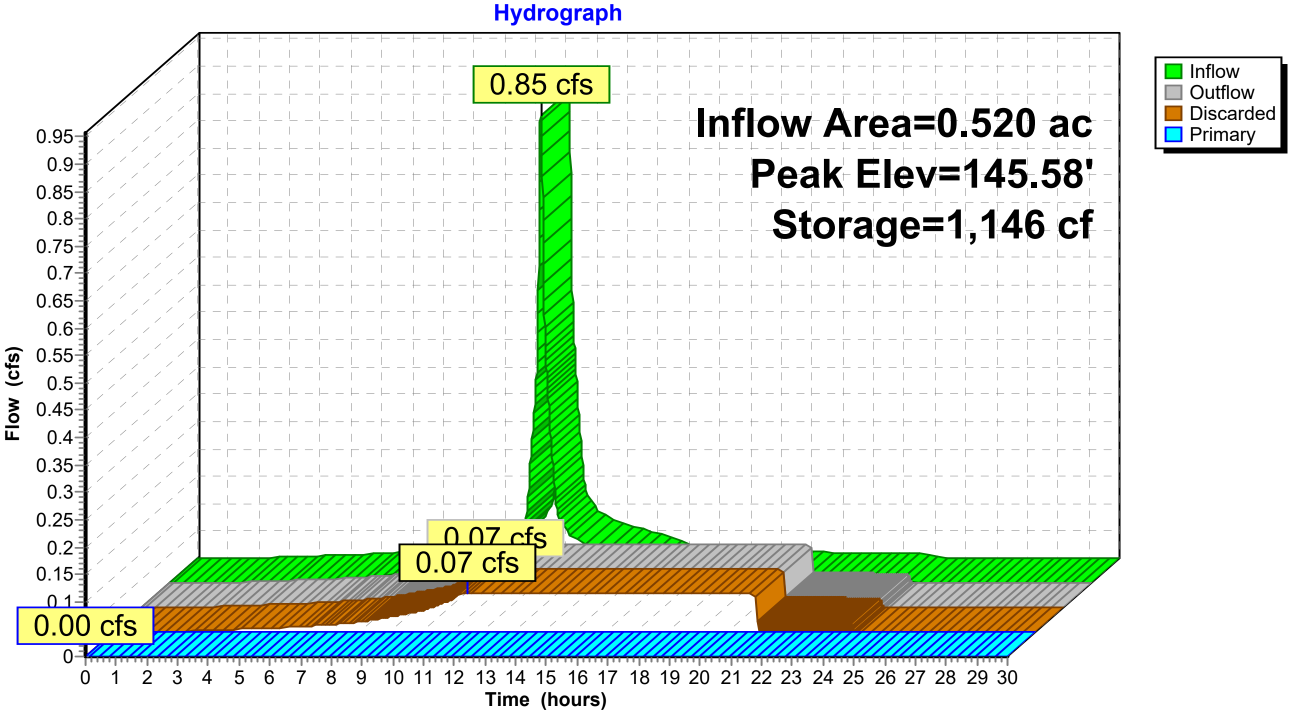
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 12P: Existing Infiltration Field



Summary for Subcatchment 13P: P2c

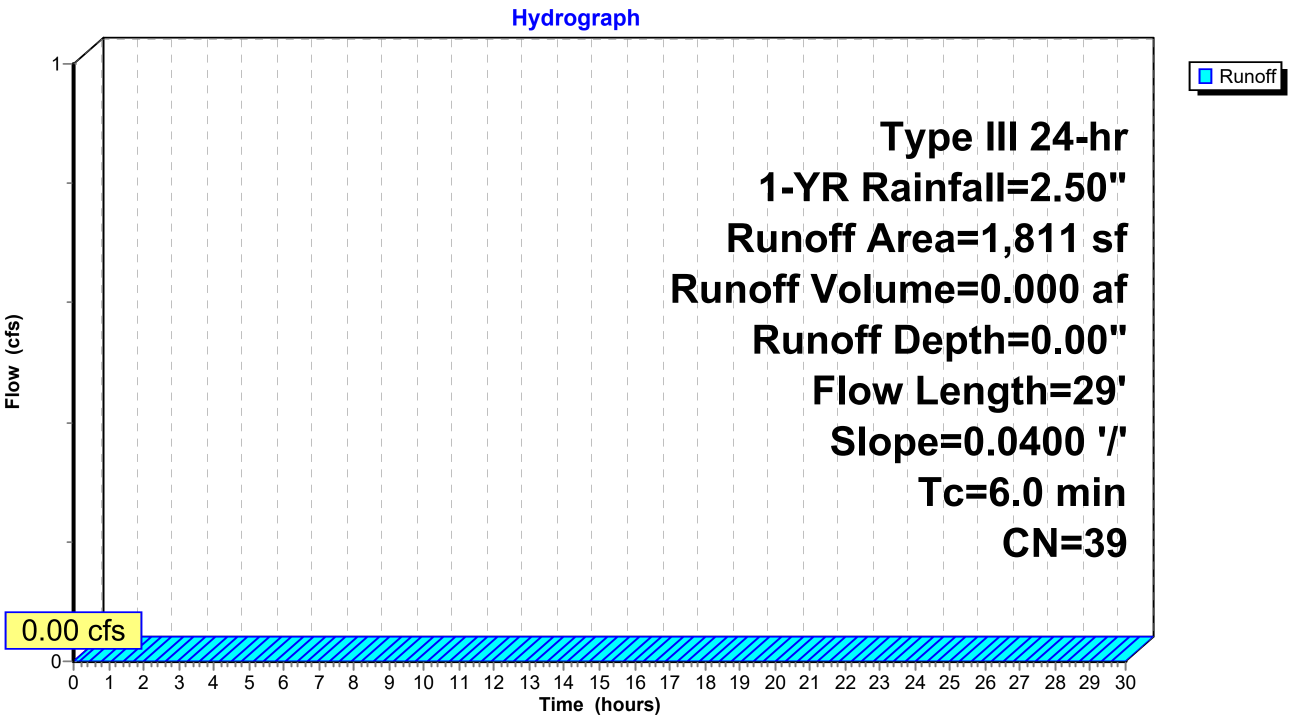
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
1,811	39	>75% Grass cover, Good HSG A
1,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	29	0.0400	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
4.0	29	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13P: P2c

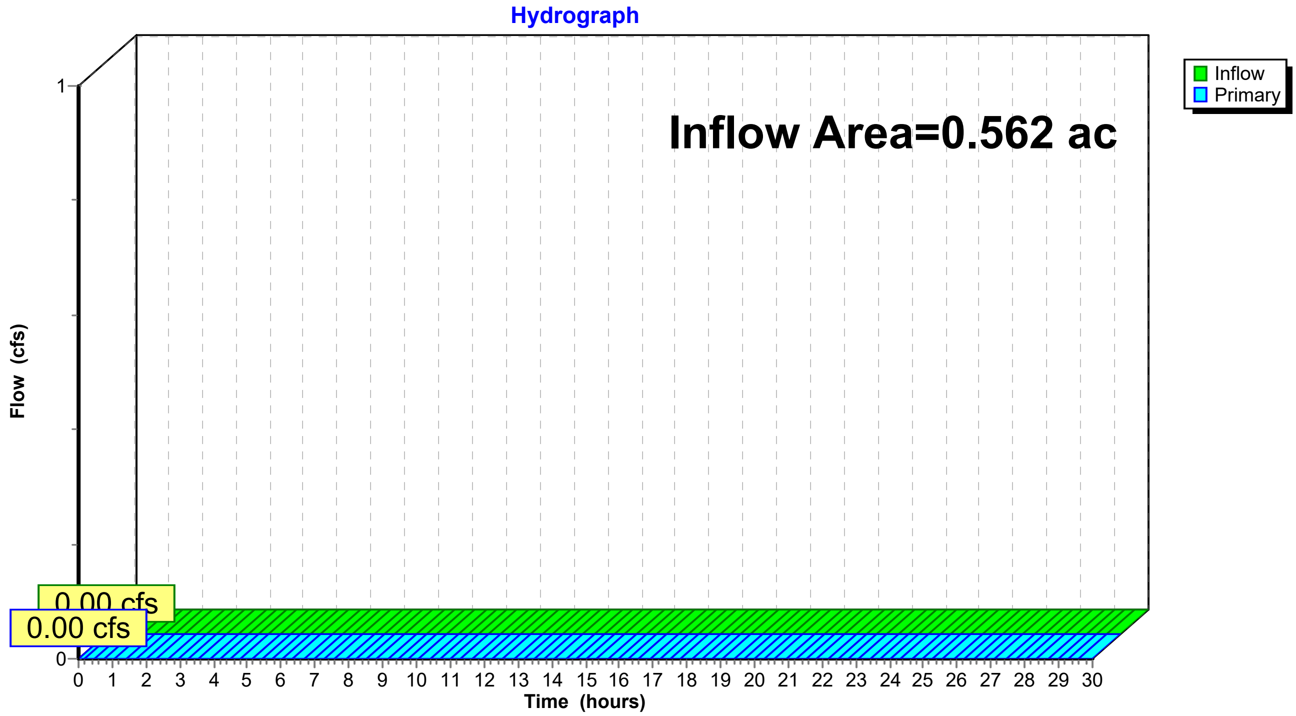


Summary for Link 14P: Design Point #2: Flow to 10 Pleasant Street

Inflow Area = 0.562 ac, 63.42% Impervious, Inflow Depth = 0.00" for 1-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 14P: Design Point #2: Flow to 10 Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond 5P: Infiltration Field #1 Peak Elev=151.51' Storage=1,452 cf Inflow=1.09 cfs 0.087 af
Discarded=0.07 cfs 0.077 af Primary=0.00 cfs 0.000 af Secondary=0.03 cfs 0.010 af Outflow=0.09 cfs 0.087 af

Subcatchment 8P: P2a Runoff Area=16,520 sf 89.05% Impervious Runoff Depth=2.64"
Flow Length=305' Tc=6.0 min CN=WQ Runoff=1.05 cfs 0.084 af

Pond 9P: FD#1 Peak Elev=150.23' Inflow=1.05 cfs 0.084 af
12.0" Round Culvert n=0.011 L=17.0' S=0.2941 '/' Outflow=1.05 cfs 0.084 af

Subcatchment 10P: P2b Runoff Area=6,144 sf 13.18% Impervious Runoff Depth=0.39"
Flow Length=84' Slope=0.0700 '/' Tc=7.5 min CN=WQ Runoff=0.05 cfs 0.005 af

Pond 11P: Area Drain Peak Elev=152.73' Inflow=0.05 cfs 0.005 af
8.0" Round Culvert n=0.011 L=137.0' S=0.0190 '/' Outflow=0.05 cfs 0.005 af

Pond 12P: Existing Infiltration Field Peak Elev=146.19' Storage=1,745 cf Inflow=1.11 cfs 0.098 af
Discarded=0.07 cfs 0.098 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.098 af

Subcatchment 13P: P2c Runoff Area=1,811 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=29' Slope=0.0400 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 14P: Design Point #2: Flow to 10 Pleasant Street Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 0.562 ac Runoff Volume = 0.088 af Average Runoff Depth = 1.88"
36.58% Pervious = 0.206 ac 63.42% Impervious = 0.356 ac

Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 2.90" for 2-YR event
Inflow = 1.09 cfs @ 12.08 hrs, Volume= 0.087 af
Outflow = 0.09 cfs @ 12.99 hrs, Volume= 0.087 af, Atten= 91%, Lag= 54.1 min
Discarded = 0.07 cfs @ 12.23 hrs, Volume= 0.077 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.03 cfs @ 12.99 hrs, Volume= 0.010 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 151.51' @ 12.99 hrs Surf.Area= 1,181 sf Storage= 1,452 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 131.1 min (887.5 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.23 hrs HW=151.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=149.50' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.03 cfs @ 12.99 hrs HW=151.51' TW=146.05' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.03 cfs of 1.02 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.97 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

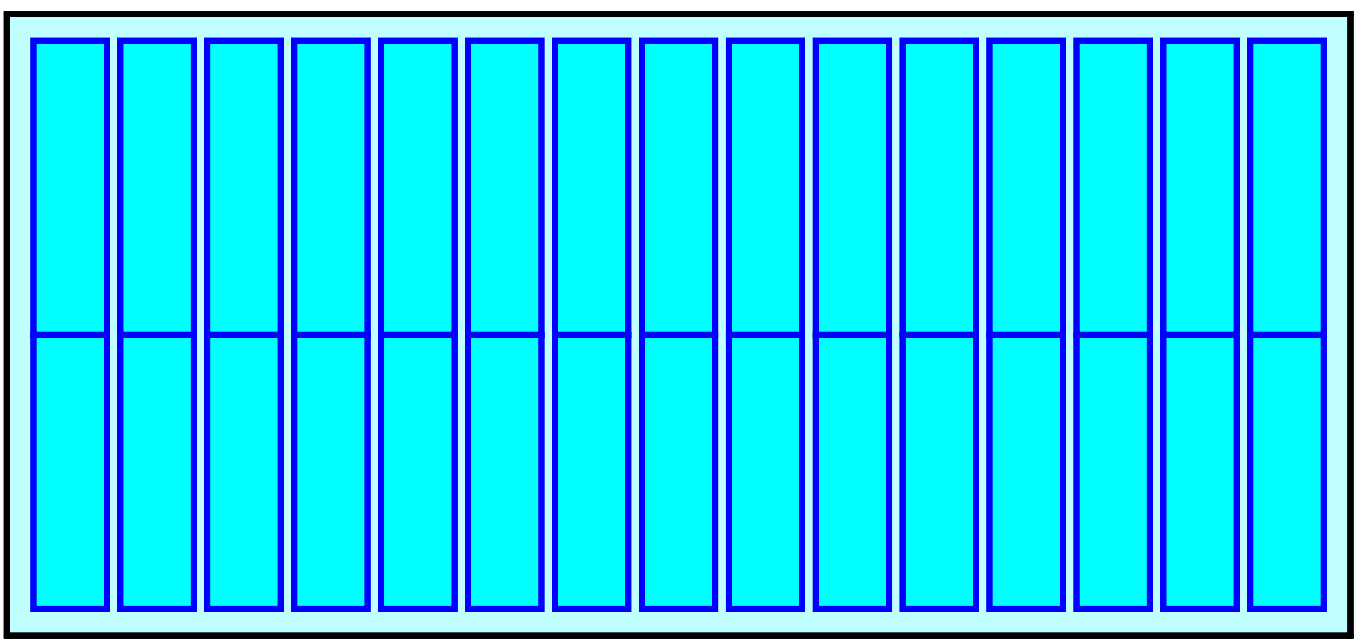
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

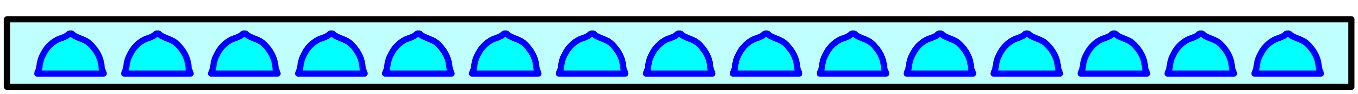
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

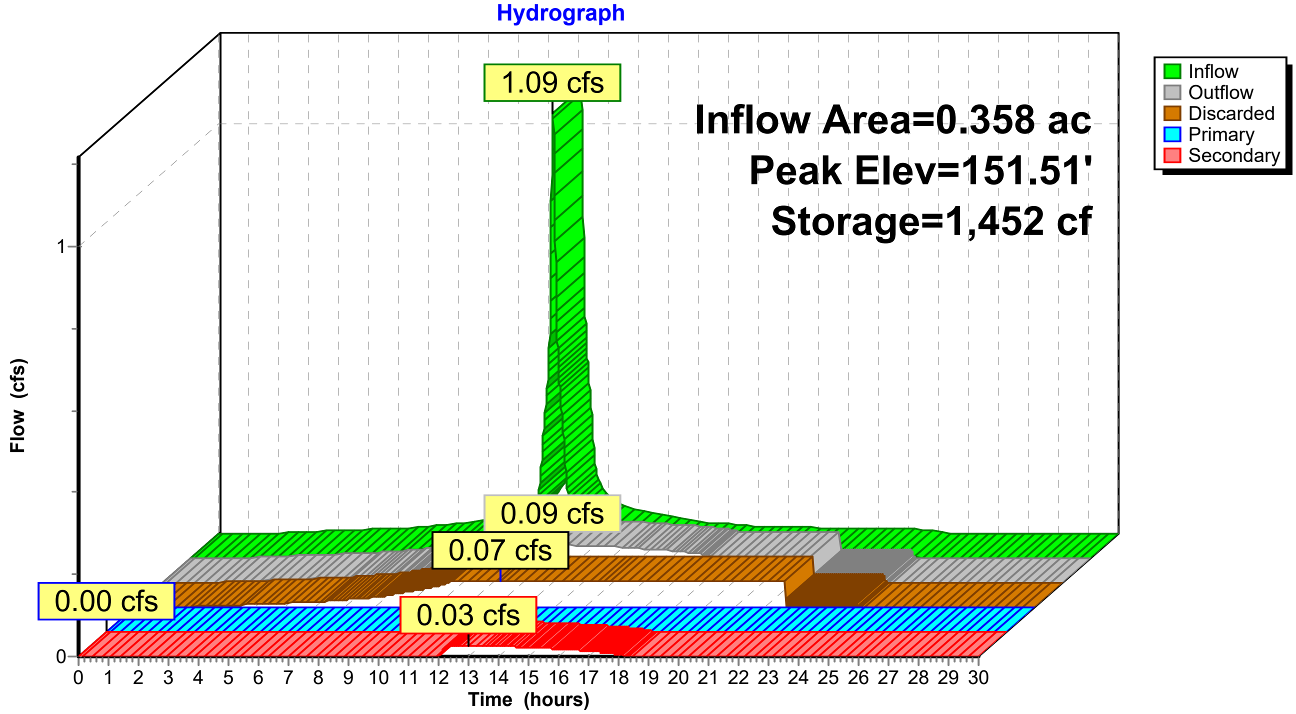
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 8P: P2a

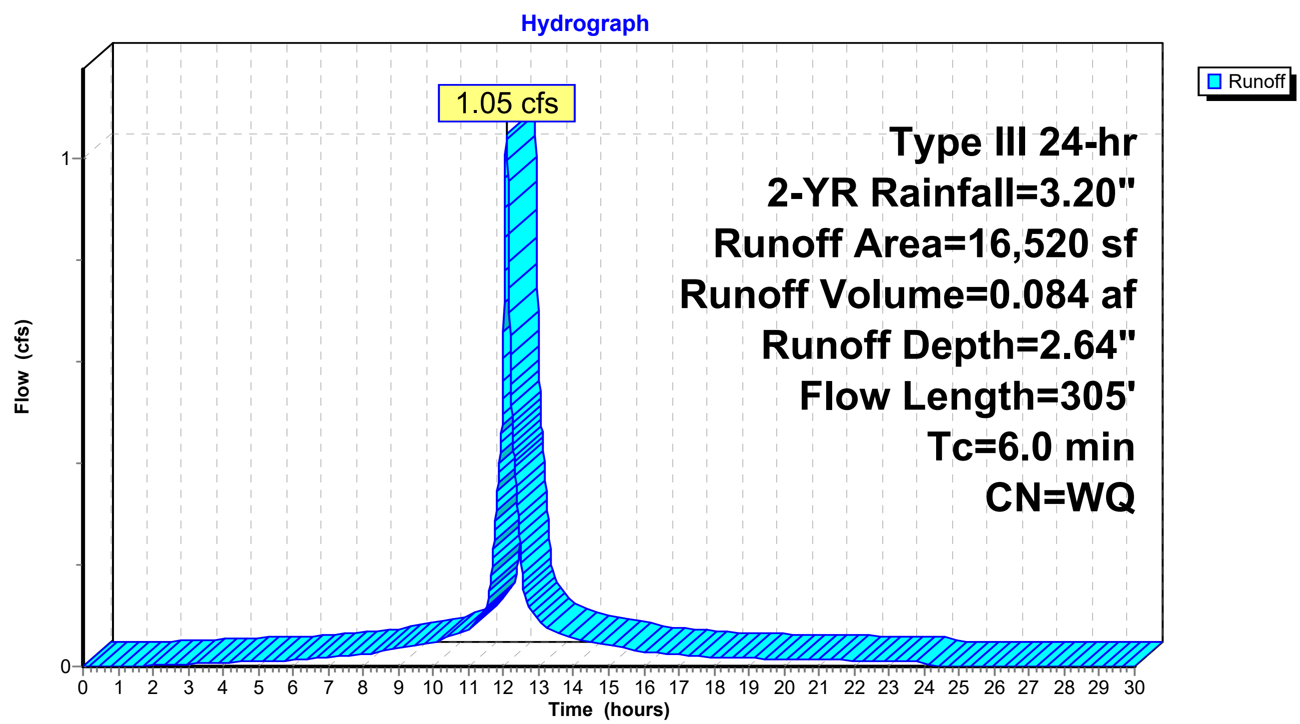
Runoff = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af, Depth= 2.64"
Routed to Pond 9P : FD#1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
14,711	98	Paved parking HSG A
1,809	39	>75% Grass cover, Good HSG A
16,520		Weighted Average
1,809		10.95% Pervious Area
14,711		89.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	36	0.0500	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.6	64	0.0400	1.66		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	205	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.8	305	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8P: P2a



Summary for Pond 9P: FD#1

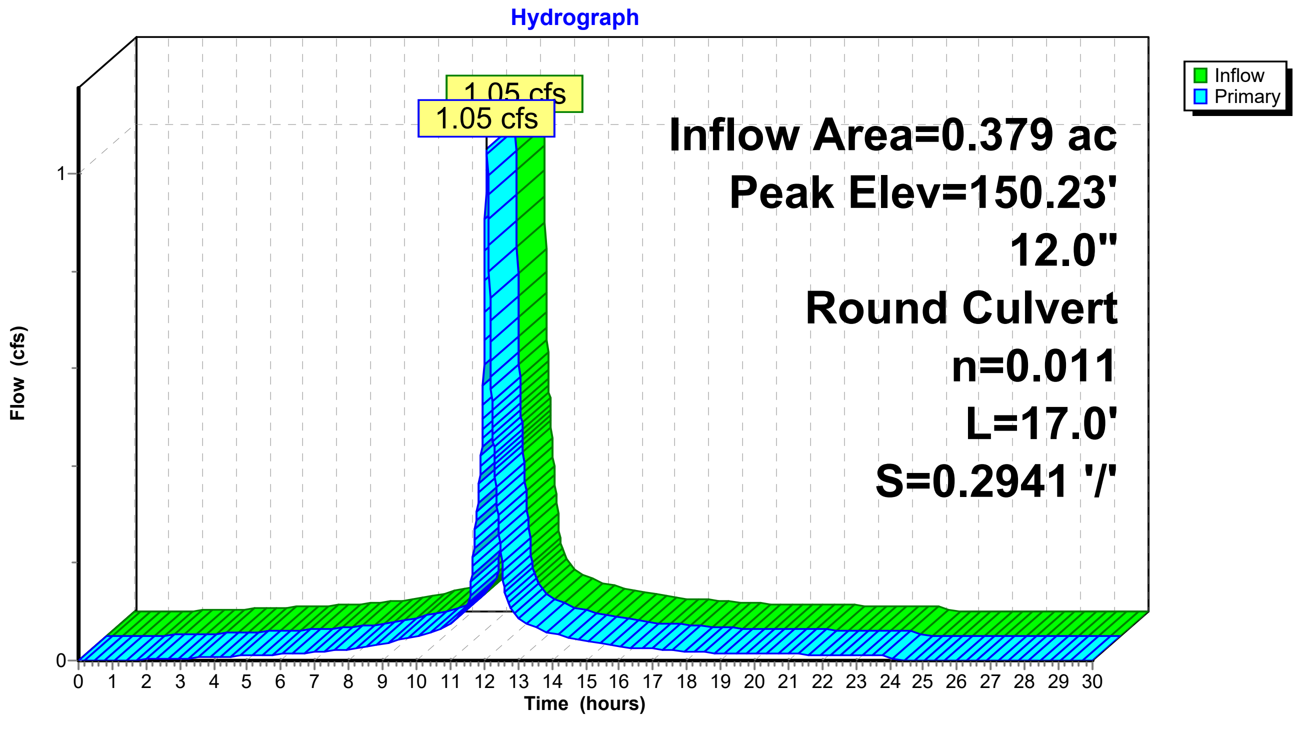
Inflow Area = 0.379 ac, 89.05% Impervious, Inflow Depth = 2.64" for 2-YR event
Inflow = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af
Outflow = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min
Primary = 1.05 cfs @ 12.08 hrs, Volume= 0.084 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.23' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	**12.0" Round Culvert** L= 17.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 149.70' / 144.70' S= 0.2941 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.05 cfs @ 12.08 hrs HW=150.23' TW=145.17' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 1.05 cfs @ 2.48 fps)

Pond 9P: FD#1



Summary for Subcatchment 10P: P2b

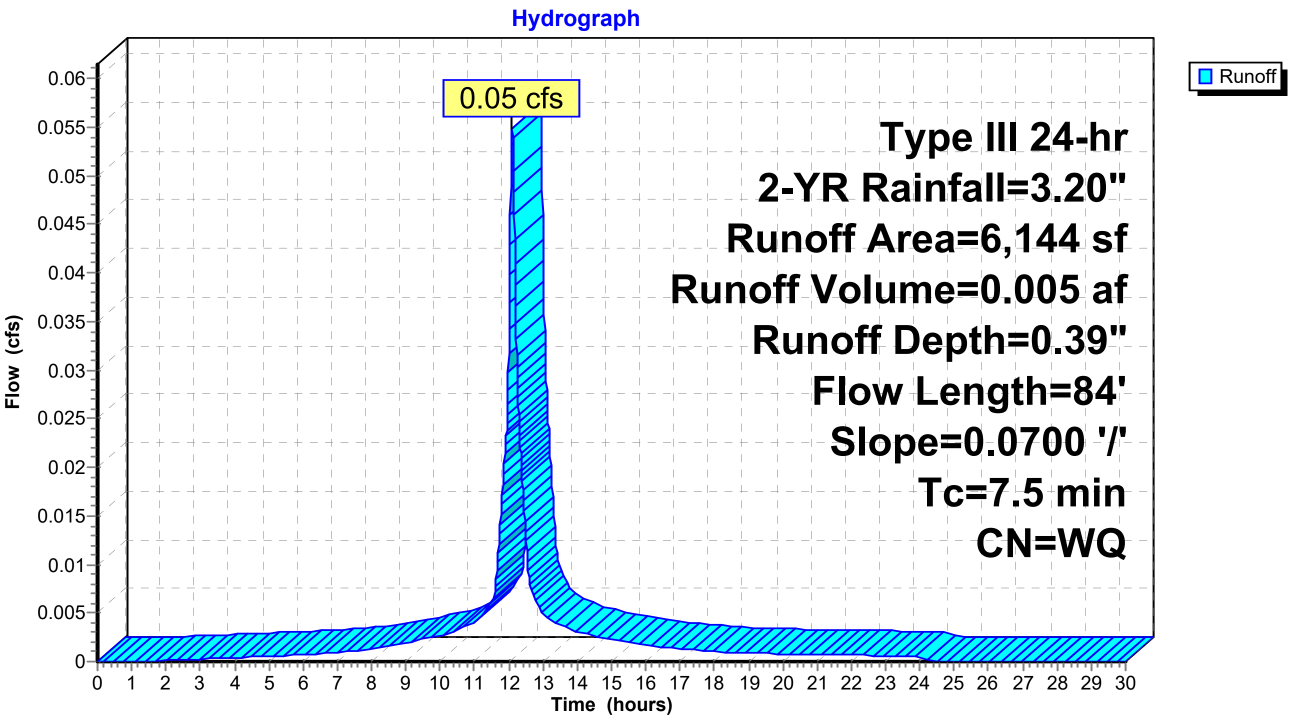
Runoff = 0.05 cfs @ 12.10 hrs, Volume= 0.005 af, Depth= 0.39"
Routed to Pond 11P : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
810	98	Paved parking HSG A
5,334	39	>75% Grass cover, Good HSG A
6,144		Weighted Average
5,334		86.82% Pervious Area
810		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	84	0.0700	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 10P: P2b



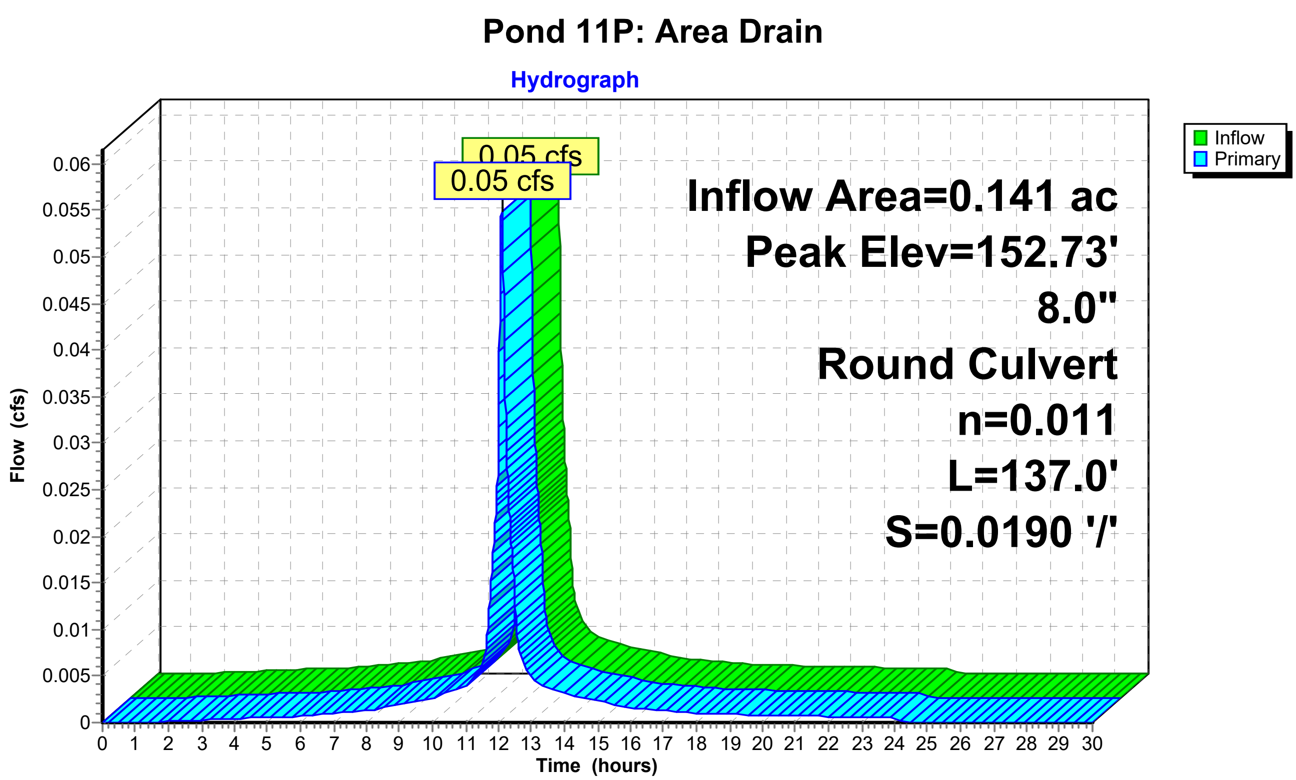
Summary for Pond 11P: Area Drain

Inflow Area = 0.141 ac, 13.18% Impervious, Inflow Depth = 0.39" for 2-YR event
Inflow = 0.05 cfs @ 12.10 hrs, Volume= 0.005 af
Outflow = 0.05 cfs @ 12.10 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 12.10 hrs, Volume= 0.005 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 152.73' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.60'	**8.0" Round Culvert** L= 137.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.60' / 150.00' S= 0.0190 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.05 cfs @ 12.10 hrs HW=152.73' TW=145.24' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.05 cfs @ 1.21 fps)



Summary for Pond 12P: Existing Infiltration Field

```
Inflow Area =       0.520 ac, 68.48% Impervious, Inflow Depth =  2.26"   for 2-YR event
Inflow      =      1.11 cfs @  12.09 hrs, Volume=         0.098 af
Outflow     =      0.07 cfs @  11.24 hrs, Volume=         0.098 af, Atten= 94%, Lag= 0.0 min
Discarded   =      0.07 cfs @  11.24 hrs, Volume=         0.098 af
Primary     =      0.00 cfs @   0.00 hrs, Volume=         0.000 af
    Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 146.19' @ 14.83 hrs Surf.Area= 1,240 sf Storage= 1,745 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 215.7 min (984.2 - 768.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	146.20'	**12.0" Round Culvert**
			L= 3.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 146.20' / 146.10' S= 0.0333 '/' Cc= 0.900
			n= 0.011, Flow Area= 0.79 sf
#3	Device 2	146.20'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	146.50'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.24 hrs HW=144.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=144.20' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Controls 0.00 cfs)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 12P: Existing Infiltration Field - 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

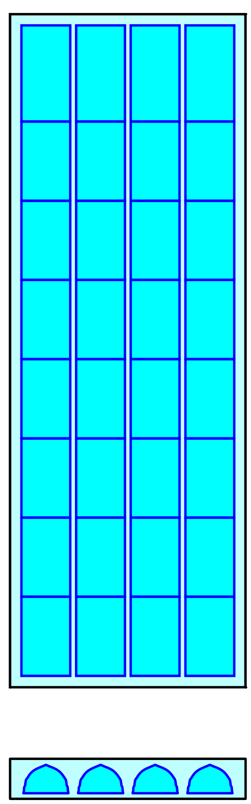
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

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

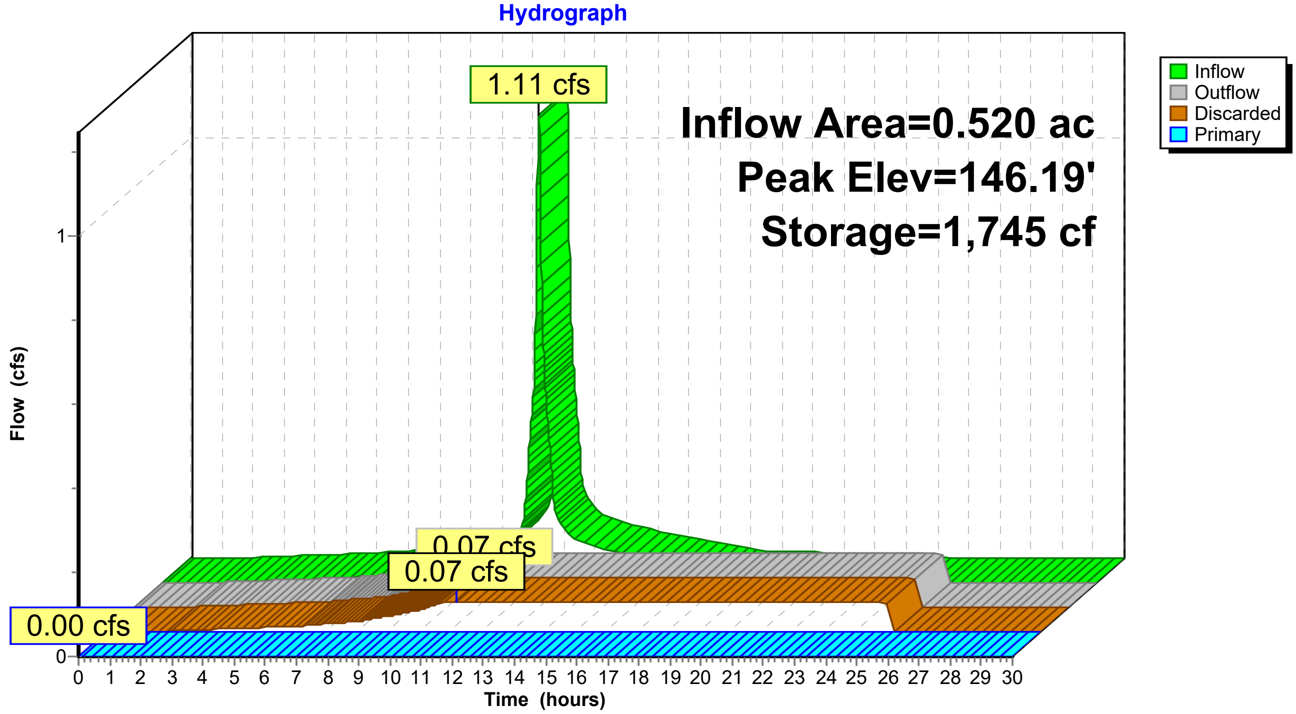
4,390.2 cf Field - 1,713.7 cf Chambers = 2,676.5 cf Stone x 40.0% Voids = 1,070.6 cf Stone Storage

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 12P: Existing Infiltration Field



Summary for Subcatchment 13P: P2c

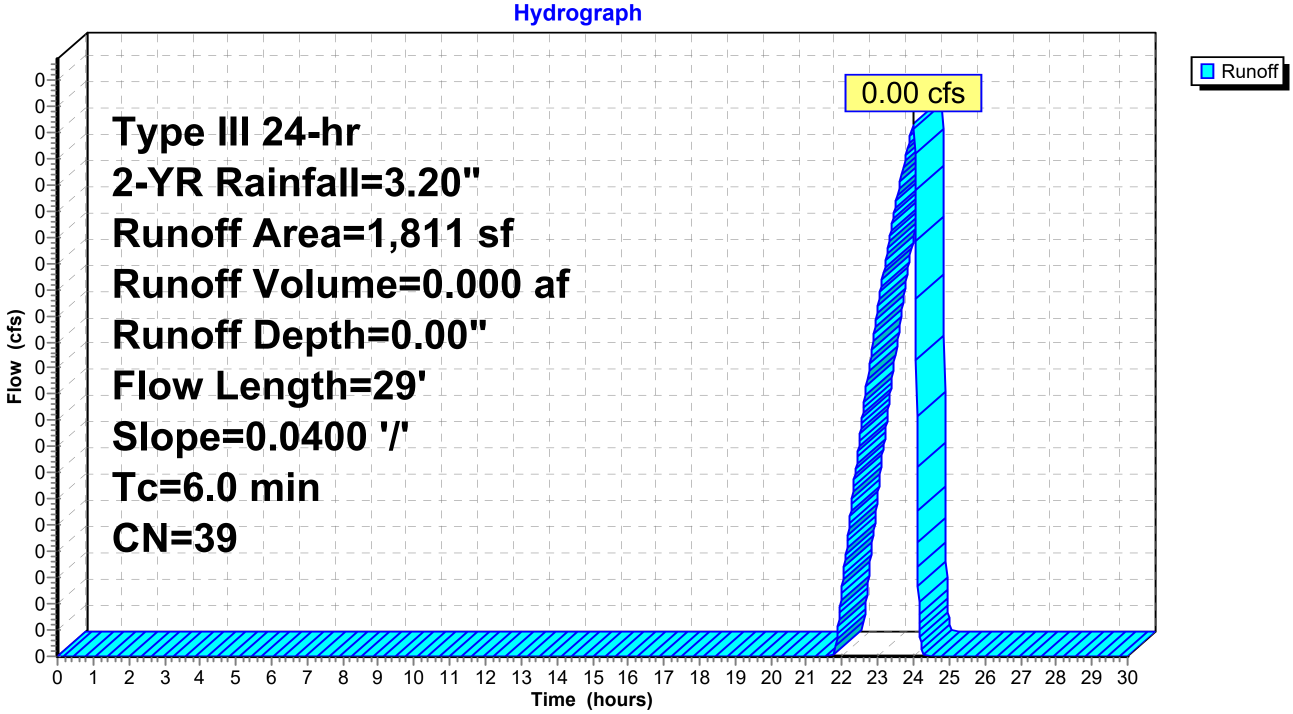
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
1,811	39	>75% Grass cover, Good HSG A
1,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	29	0.0400	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
4.0	29	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13P: P2c

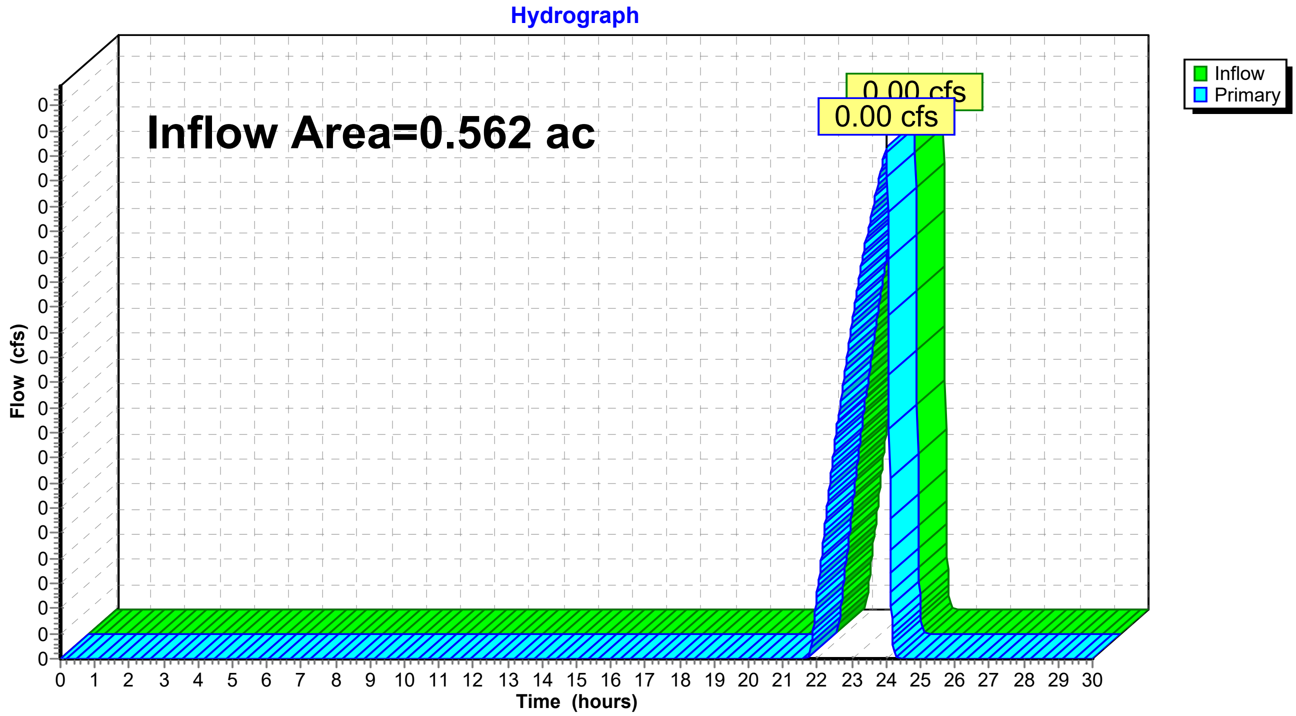


Summary for Link 14P: Design Point #2: Flow to 10 Pleasant Street

Inflow Area =	0.562 ac,	63.42% Impervious,	Inflow Depth = 0.00"	for 2-YR event
Inflow =	0.00 cfs @	24.01 hrs,	Volume=	0.000 af
Primary =	0.00 cfs @	24.01 hrs,	Volume=	0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 14P: Design Point #2: Flow to 10 Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond 5P: Infiltration Field #1 Peak Elev=154.05' Storage=1,732 cf Inflow=1.61 cfs 0.130 af
Discarded=0.07 cfs 0.095 af Primary=1.51 cfs 0.016 af Secondary=0.05 cfs 0.019 af Outflow=1.62 cfs 0.130 af

Subcatchment 8P: P2a Runoff Area=16,520 sf 89.05% Impervious Runoff Depth=3.99"
Flow Length=305' Tc=6.0 min CN=WQ Runoff=1.55 cfs 0.126 af

Pond 9P: FD#1 Peak Elev=150.37' Inflow=1.55 cfs 0.126 af
12.0" Round Culvert n=0.011 L=17.0' S=0.2941 '/' Outflow=1.55 cfs 0.126 af

Subcatchment 10P: P2b Runoff Area=6,144 sf 13.18% Impervious Runoff Depth=0.71"
Flow Length=84' Slope=0.0700 '/' Tc=7.5 min CN=WQ Runoff=0.08 cfs 0.008 af

Pond 11P: Area Drain Peak Elev=152.75' Inflow=0.08 cfs 0.008 af
8.0" Round Culvert n=0.011 L=137.0' S=0.0190 '/' Outflow=0.08 cfs 0.008 af

Pond 12P: Existing Infiltration Field Peak Elev=146.82' Storage=2,281 cf Inflow=1.66 cfs 0.153 af
Discarded=0.07 cfs 0.122 af Primary=0.34 cfs 0.032 af Outflow=0.41 cfs 0.153 af

Subcatchment 13P: P2c Runoff Area=1,811 sf 0.00% Impervious Runoff Depth=0.14"
Flow Length=29' Slope=0.0400 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 14P: Design Point #2: Flow to 10 Pleasant Street Inflow=0.35 cfs 0.032 af
Primary=0.35 cfs 0.032 af

Total Runoff Area = 0.562 ac Runoff Volume = 0.135 af Average Runoff Depth = 2.88"
36.58% Pervious = 0.206 ac 63.42% Impervious = 0.356 ac

Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 4.37" for 10-YR event
Inflow = 1.61 cfs @ 12.08 hrs, Volume= 0.130 af
Outflow = 1.62 cfs @ 12.18 hrs, Volume= 0.130 af, Atten= 0%, Lag= 5.8 min
Discarded = 0.07 cfs @ 12.05 hrs, Volume= 0.095 af
Primary = 1.51 cfs @ 12.18 hrs, Volume= 0.016 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.05 cfs @ 12.18 hrs, Volume= 0.019 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.05' @ 12.18 hrs Surf.Area= 1,181 sf Storage= 1,732 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 135.0 min (884.2 - 749.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 12.05 hrs HW=151.04' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=1.44 cfs @ 12.18 hrs HW=154.04' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 1.44 cfs @ 1.24 fps)

Secondary OutFlow Max=0.05 cfs @ 12.18 hrs HW=154.05' TW=146.26' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.05 cfs of 1.82 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.15 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

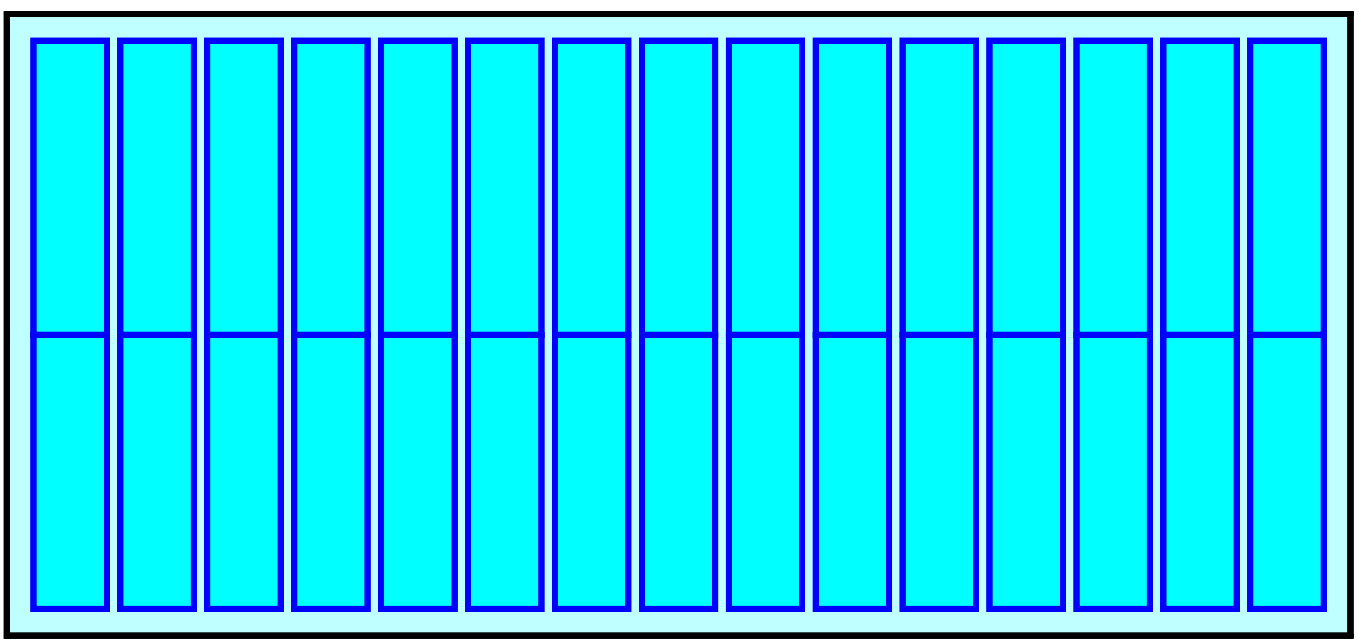
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

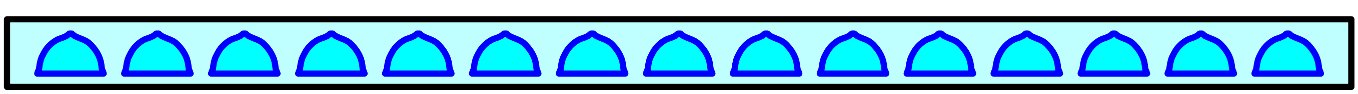
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

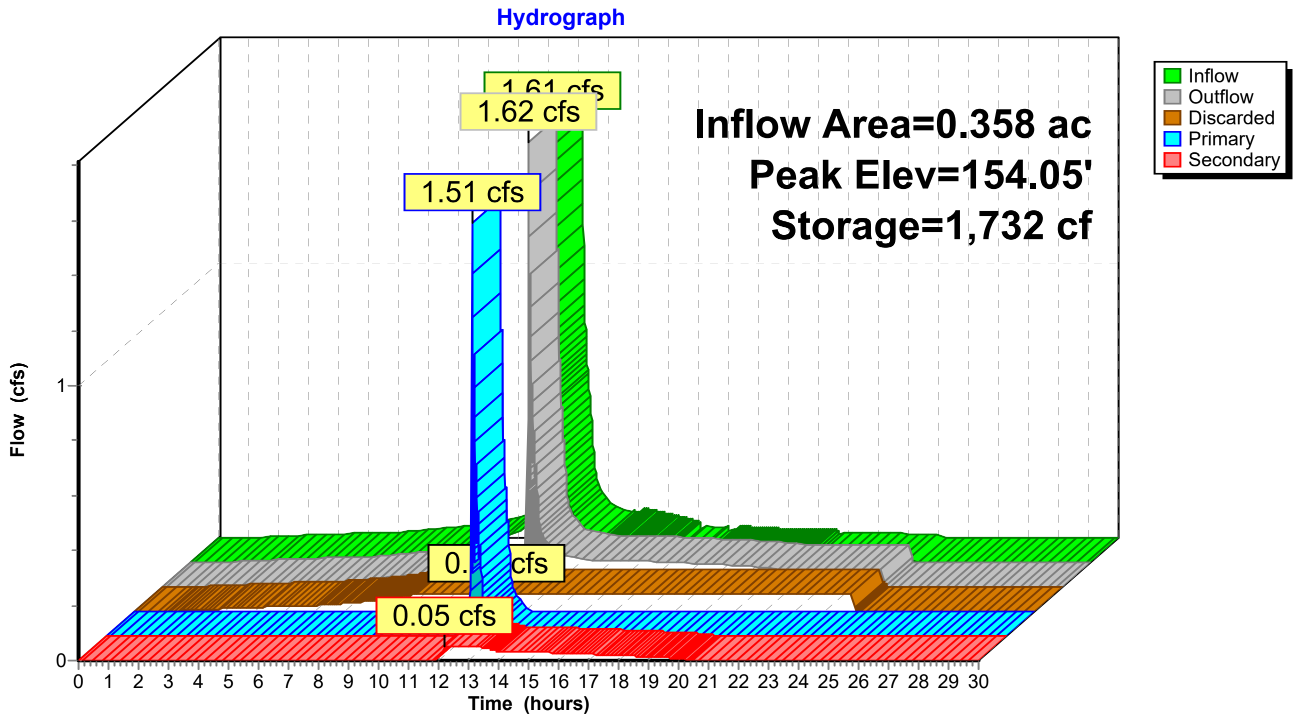
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 8P: P2a

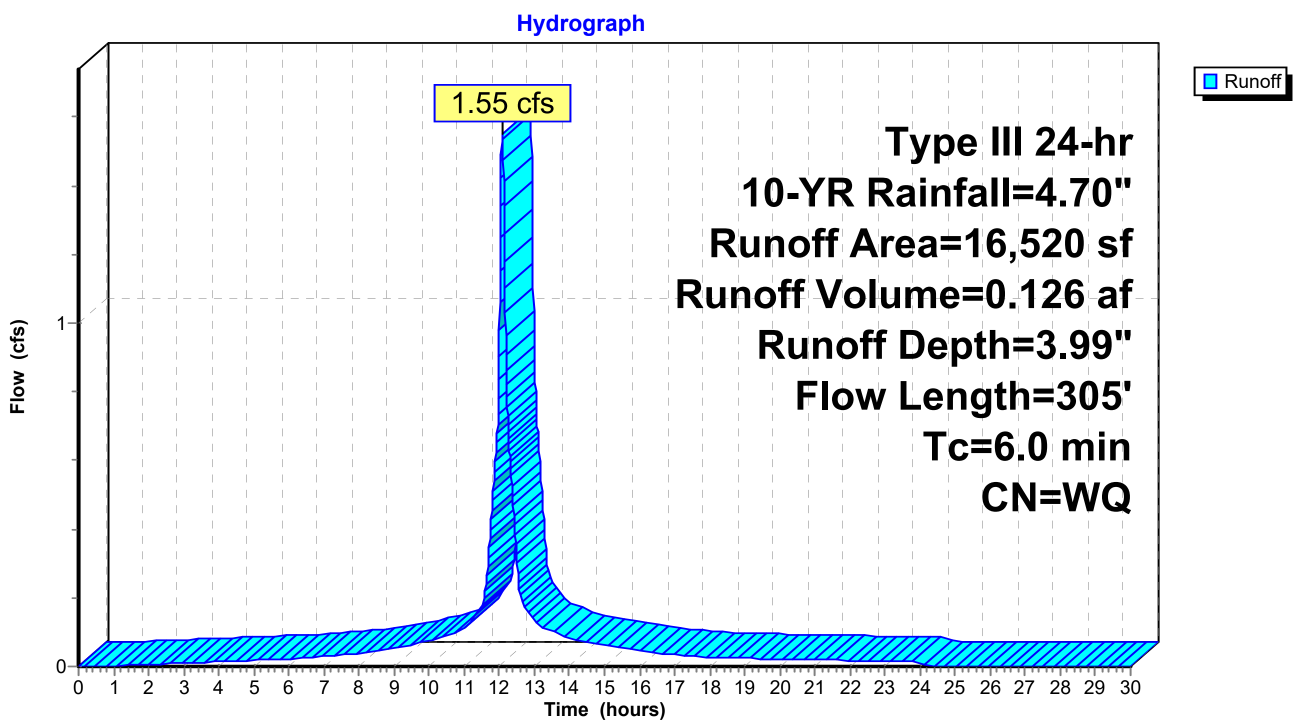
Runoff = 1.55 cfs @ 12.08 hrs, Volume= 0.126 af, Depth= 3.99"
Routed to Pond 9P : FD#1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
14,711	98	Paved parking HSG A
1,809	39	>75% Grass cover, Good HSG A
16,520		Weighted Average
1,809		10.95% Pervious Area
14,711		89.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	36	0.0500	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.6	64	0.0400	1.66		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	205	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.8	305	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8P: P2a



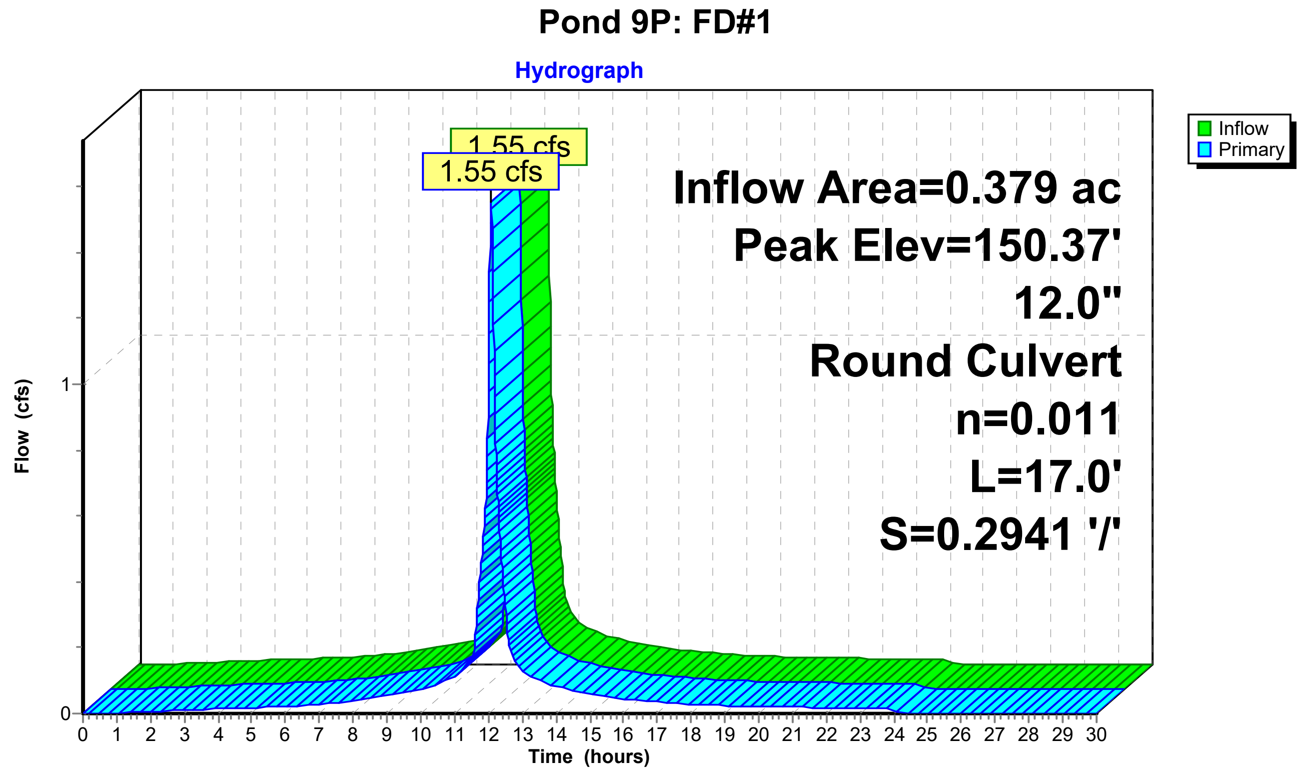
Summary for Pond 9P: FD#1

Inflow Area = 0.379 ac, 89.05% Impervious, Inflow Depth = 3.99" for 10-YR event
Inflow = 1.55 cfs @ 12.08 hrs, Volume= 0.126 af
Outflow = 1.55 cfs @ 12.08 hrs, Volume= 0.126 af, Atten= 0%, Lag= 0.0 min
Primary = 1.55 cfs @ 12.08 hrs, Volume= 0.126 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.37' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	**12.0" Round Culvert** L= 17.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 149.70' / 144.70' S= 0.2941 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=1.55 cfs @ 12.08 hrs HW=150.37' TW=145.77' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.55 cfs @ 2.78 fps)



Summary for Subcatchment 10P: P2b

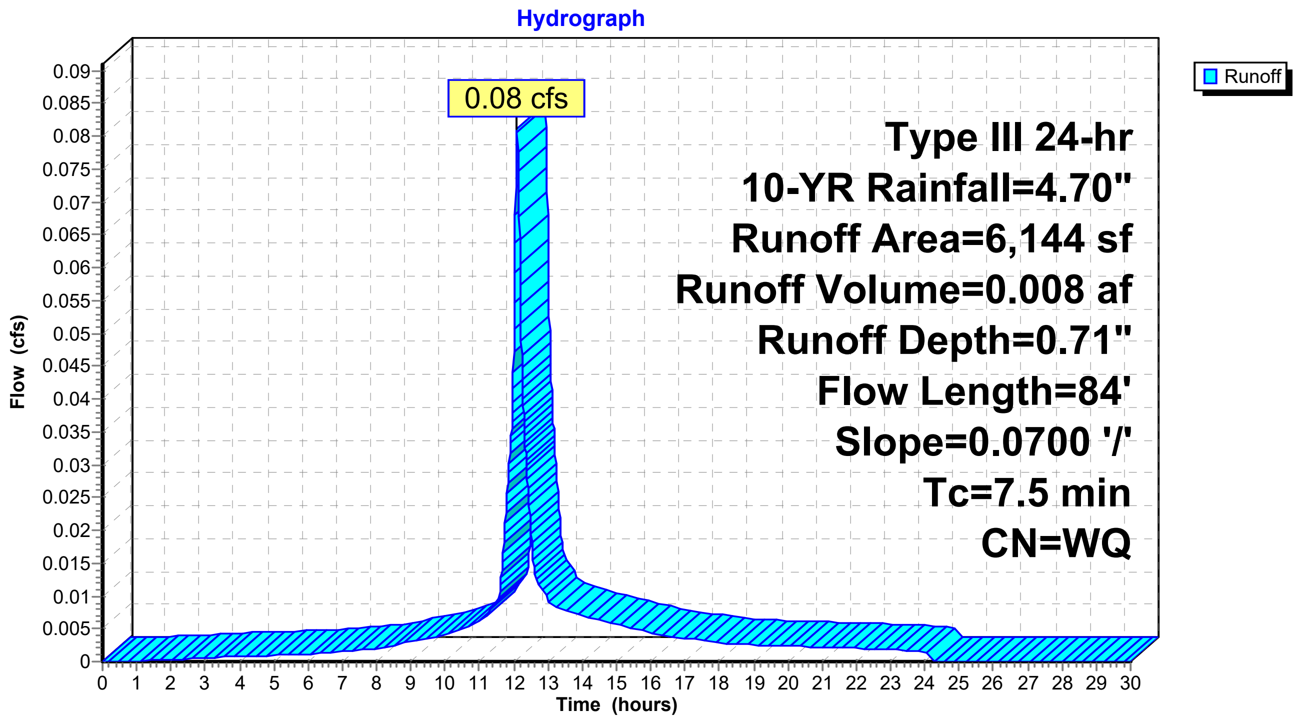
Runoff = 0.08 cfs @ 12.10 hrs, Volume= 0.008 af, Depth= 0.71"
Routed to Pond 11P : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
810	98	Paved parking HSG A
5,334	39	>75% Grass cover, Good HSG A
6,144		Weighted Average
5,334		86.82% Pervious Area
810		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	84	0.0700	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 10P: P2b



Summary for Pond 11P: Area Drain

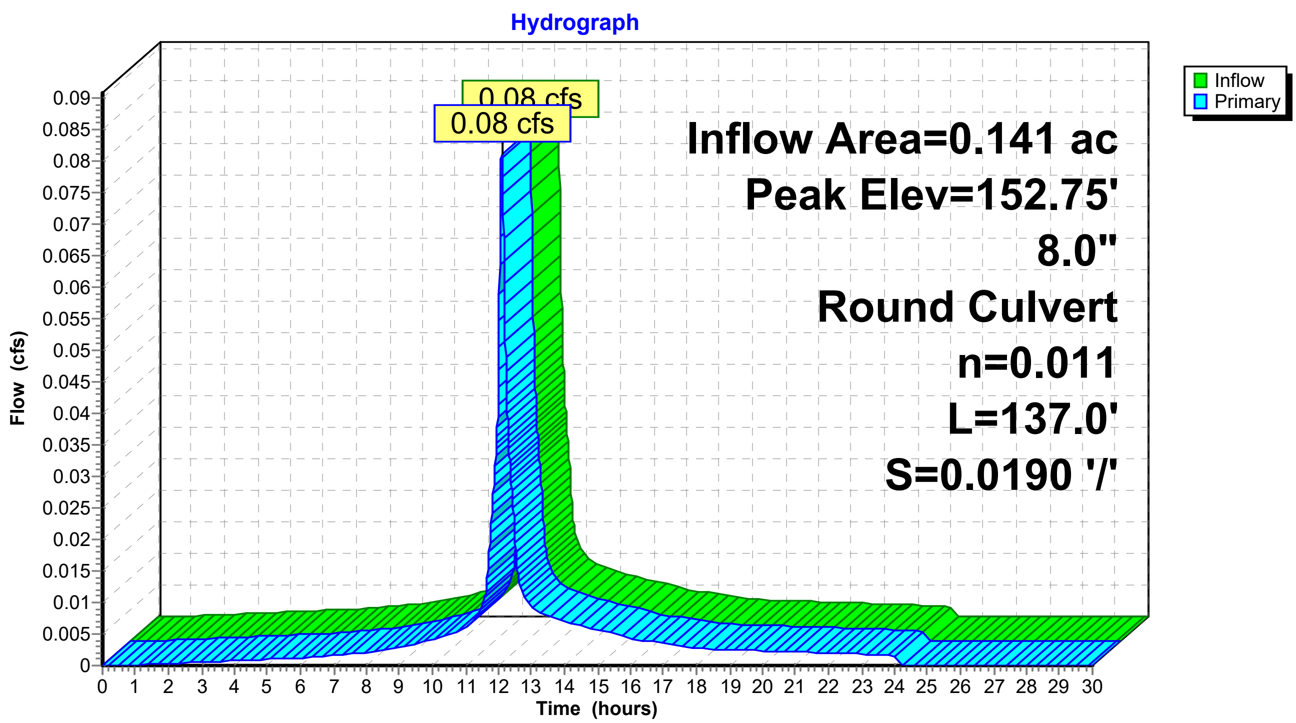
Inflow Area = 0.141 ac, 13.18% Impervious, Inflow Depth = 0.71" for 10-YR event
Inflow = 0.08 cfs @ 12.10 hrs, Volume= 0.008 af
Outflow = 0.08 cfs @ 12.10 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.10 hrs, Volume= 0.008 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 152.75' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.60'	**8.0" Round Culvert** L= 137.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.60' / 150.00' S= 0.0190 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.08 cfs @ 12.10 hrs HW=152.75' TW=145.88' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.08 cfs @ 1.33 fps)

Pond 11P: Area Drain



Summary for Pond 12P: Existing Infiltration Field

Inflow Area = 0.520 ac, 68.48% Impervious, Inflow Depth = 3.54" for 10-YR event
Inflow = 1.66 cfs @ 12.08 hrs, Volume= 0.153 af
Outflow = 0.41 cfs @ 12.48 hrs, Volume= 0.153 af, Atten= 75%, Lag= 23.9 min
Discarded = 0.07 cfs @ 10.25 hrs, Volume= 0.122 af
Primary = 0.34 cfs @ 12.48 hrs, Volume= 0.032 af
Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 146.82' @ 12.48 hrs Surf.Area= 1,240 sf Storage= 2,281 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 211.1 min (983.0 - 771.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	146.20'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.20' / 146.10' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Device 2	146.20'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	146.50'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 10.25 hrs HW=144.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.34 cfs @ 12.48 hrs HW=146.82' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 0.34 cfs of 1.17 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.02 cfs @ 3.67 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.32 cfs @ 1.94 fps)

Pond 12P: Existing Infiltration Field - 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

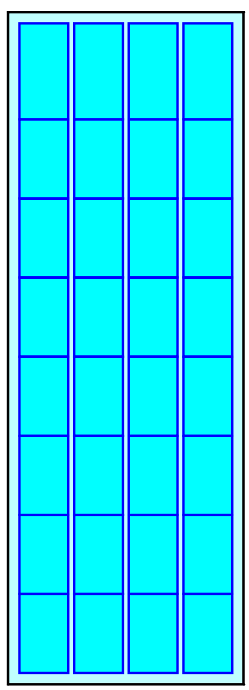
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

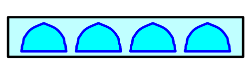
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

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

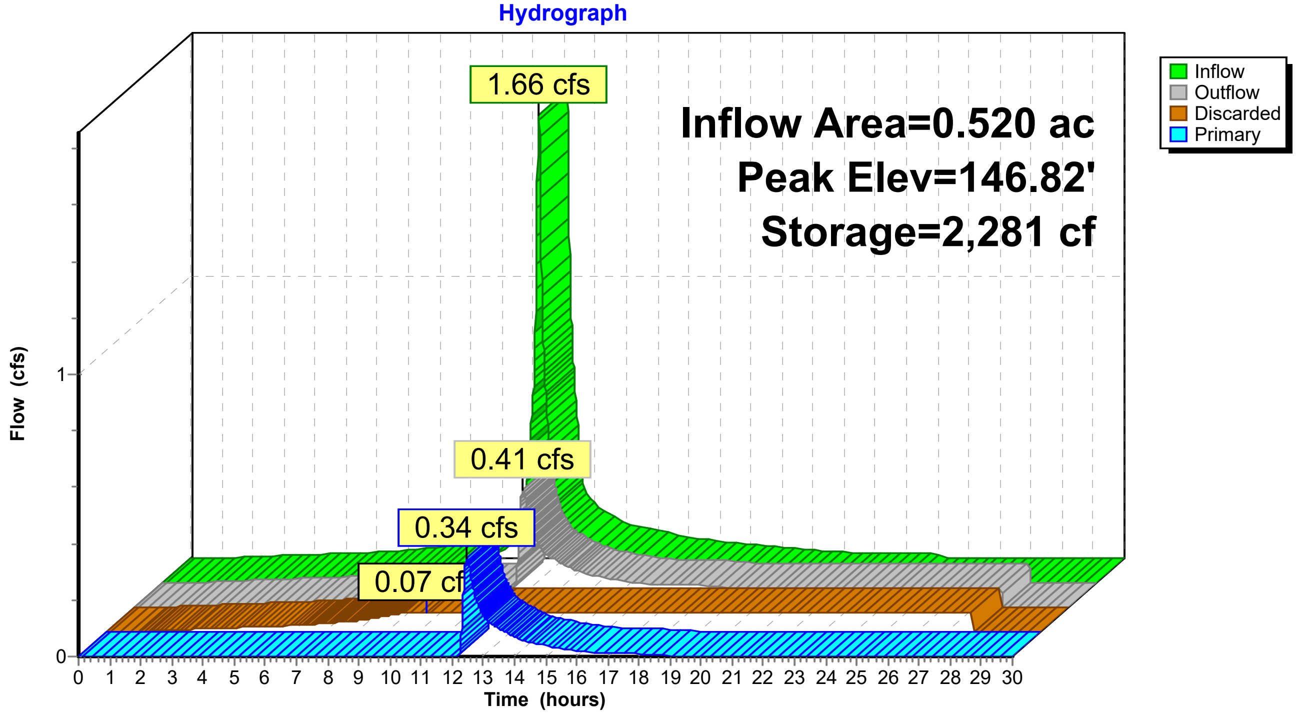
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 12P: Existing Infiltration Field



Summary for Subcatchment 13P: P2c

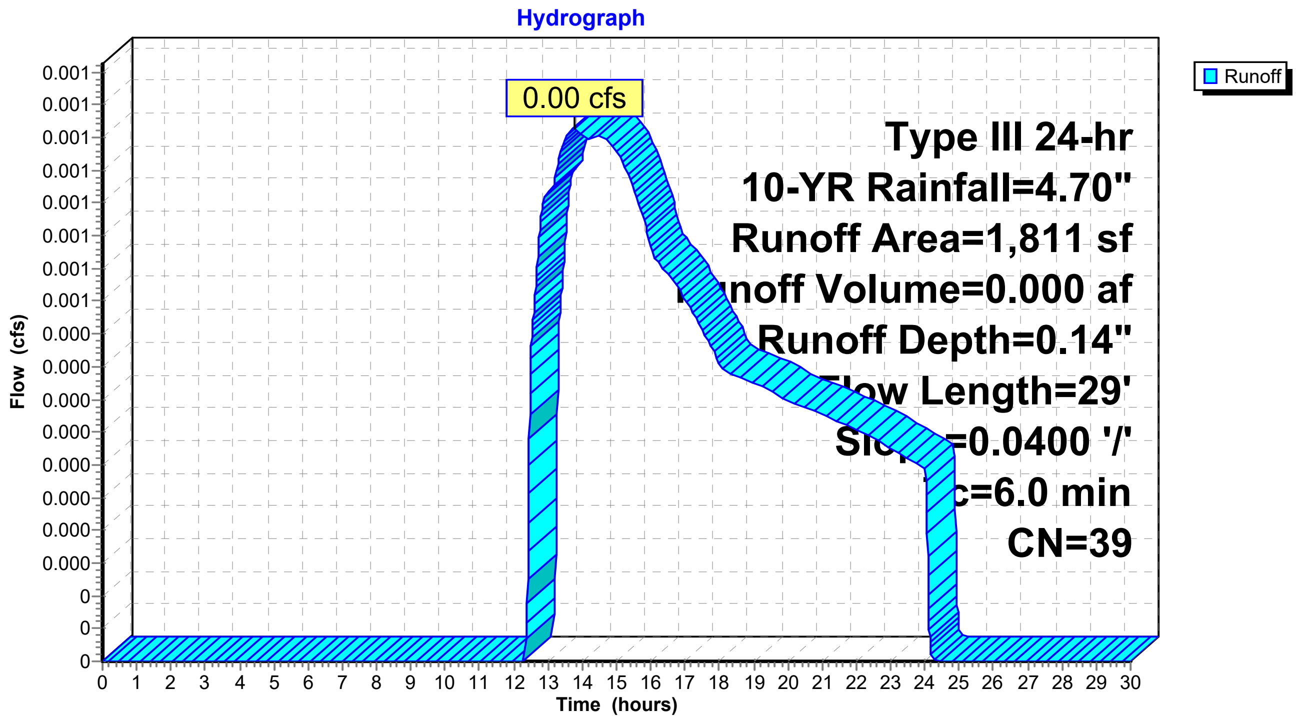
Runoff = 0.00 cfs @ 13.78 hrs, Volume= 0.000 af, Depth= 0.14"
Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
1,811	39	>75% Grass cover, Good HSG A
1,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	29	0.0400	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
4.0	29	Total,	Increased to minimum Tc = 6.0 min		

Subcatchment 13P: P2c

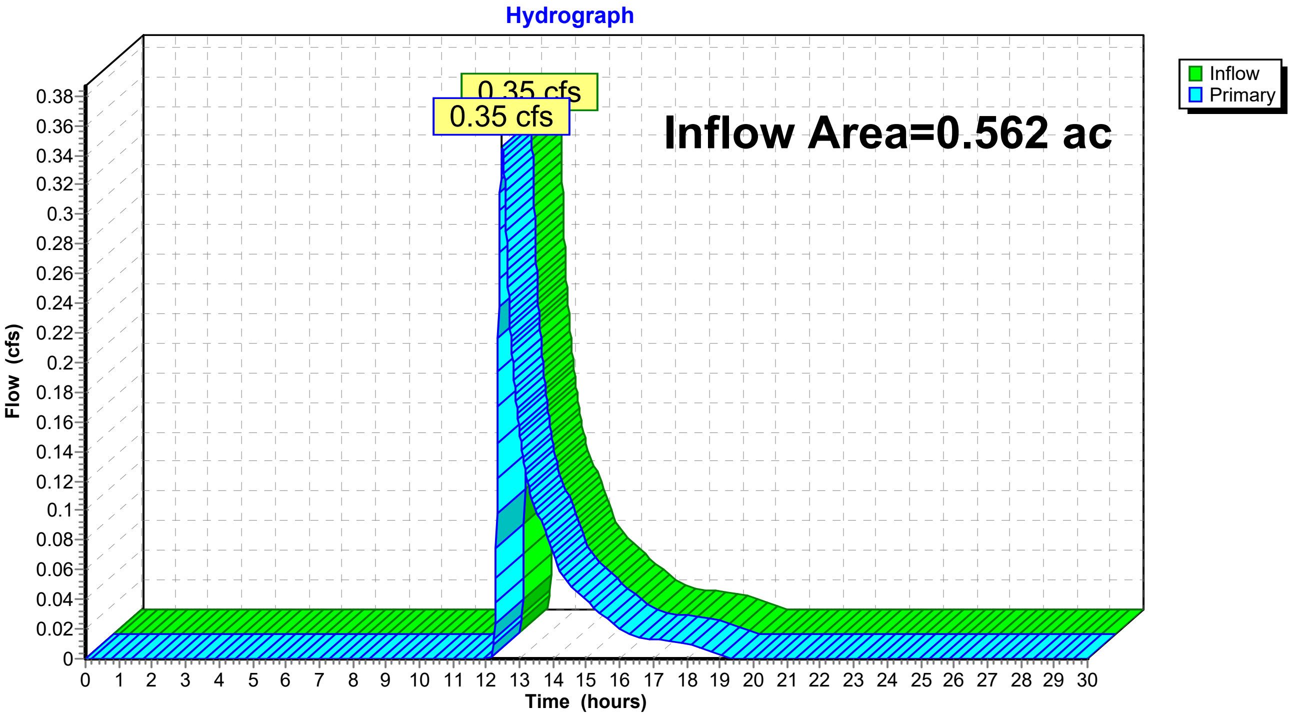


Summary for Link 14P: Design Point #2: Flow to 10 Pleasant Street

Inflow Area =	0.562 ac, 63.42% Impervious, Inflow Depth = 0.68" for 10-YR event		
Inflow =	0.35 cfs @ 12.48 hrs, Volume=	0.032 af	
Primary =	0.35 cfs @ 12.48 hrs, Volume=	0.032 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 14P: Design Point #2: Flow to 10 Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond 5P: Infiltration Field #1 Peak Elev=154.10' Storage=1,732 cf Inflow=2.09 cfs 0.171 af
Discarded=0.07 cfs 0.106 af Primary=2.32 cfs 0.042 af Secondary=0.05 cfs 0.023 af Outflow=2.43 cfs 0.171 af

Subcatchment 8P: P2a Runoff Area=16,520 sf 89.05% Impervious Runoff Depth=5.27"
Flow Length=305' Tc=6.0 min CN=WQ Runoff=2.02 cfs 0.167 af

Pond 9P: FD#1 Peak Elev=150.49' Inflow=2.02 cfs 0.167 af
12.0" Round Culvert n=0.011 L=17.0' S=0.2941 '/' Outflow=2.02 cfs 0.167 af

Subcatchment 10P: P2b Runoff Area=6,144 sf 13.18% Impervious Runoff Depth=1.18"
Flow Length=84' Slope=0.0700 '/' Tc=7.5 min CN=WQ Runoff=0.11 cfs 0.014 af

Pond 11P: Area Drain Peak Elev=152.78' Inflow=0.11 cfs 0.014 af
8.0" Round Culvert n=0.011 L=137.0' S=0.0190 '/' Outflow=0.11 cfs 0.014 af

Pond 12P: Existing Infiltration Field Peak Elev=147.17' Storage=2,501 cf Inflow=2.18 cfs 0.204 af
Discarded=0.07 cfs 0.135 af Primary=1.00 cfs 0.069 af Outflow=1.07 cfs 0.204 af

Subcatchment 13P: P2c Runoff Area=1,811 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=29' Slope=0.0400 '/' Tc=6.0 min CN=39 Runoff=0.01 cfs 0.002 af

Link 14P: Design Point #2: Flow to 10 Pleasant Street Inflow=1.01 cfs 0.071 af
Primary=1.01 cfs 0.071 af

Total Runoff Area = 0.562 ac Runoff Volume = 0.182 af Average Runoff Depth = 3.89"
36.58% Pervious = 0.206 ac 63.42% Impervious = 0.356 ac

Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 5.75" for 50-YR event
Inflow = 2.09 cfs @ 12.08 hrs, Volume= 0.171 af
Outflow = 2.43 cfs @ 12.08 hrs, Volume= 0.171 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.07 cfs @ 11.91 hrs, Volume= 0.106 af
Primary = 2.32 cfs @ 12.08 hrs, Volume= 0.042 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.05 cfs @ 12.08 hrs, Volume= 0.023 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.10' @ 12.08 hrs Surf.Area= 1,181 sf Storage= 1,732 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 121.1 min (866.4 - 745.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.91 hrs HW=151.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.31 cfs @ 12.08 hrs HW=154.10' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 2.31 cfs @ 1.46 fps)

Secondary OutFlow Max=0.05 cfs @ 12.08 hrs HW=154.10' TW=146.44' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.05 cfs of 1.83 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.21 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

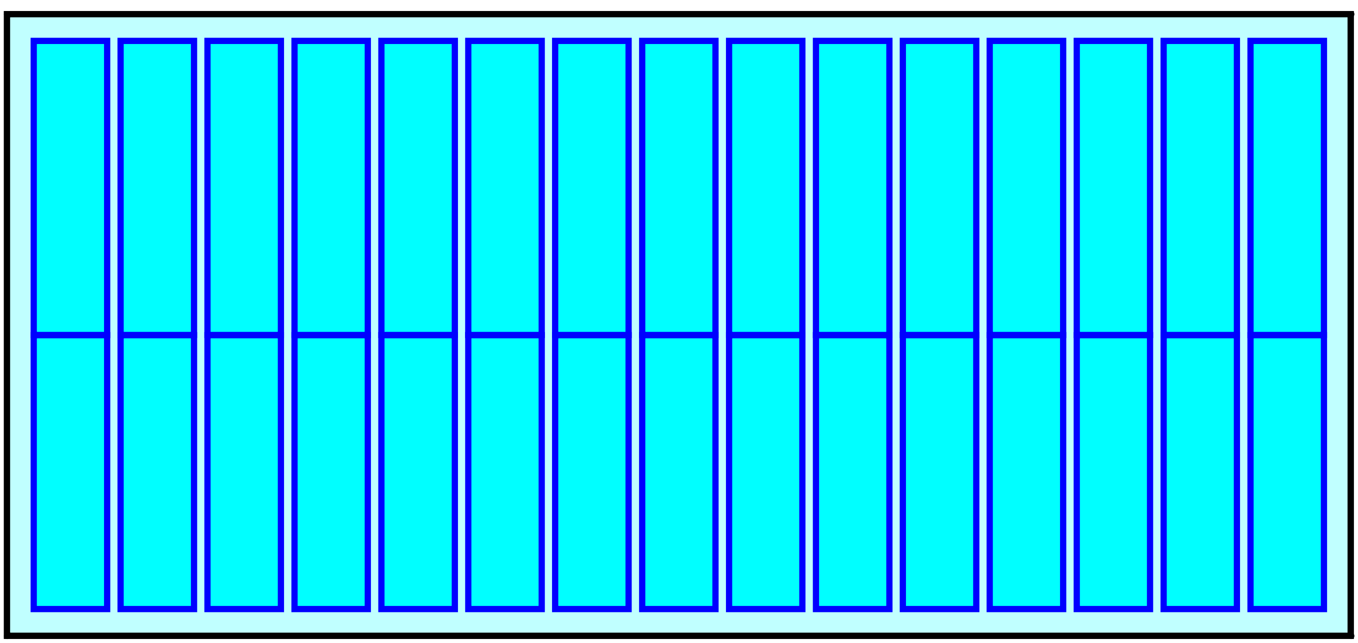
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

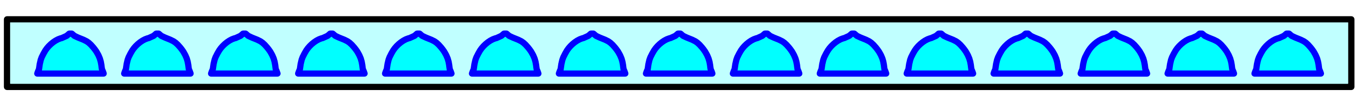
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

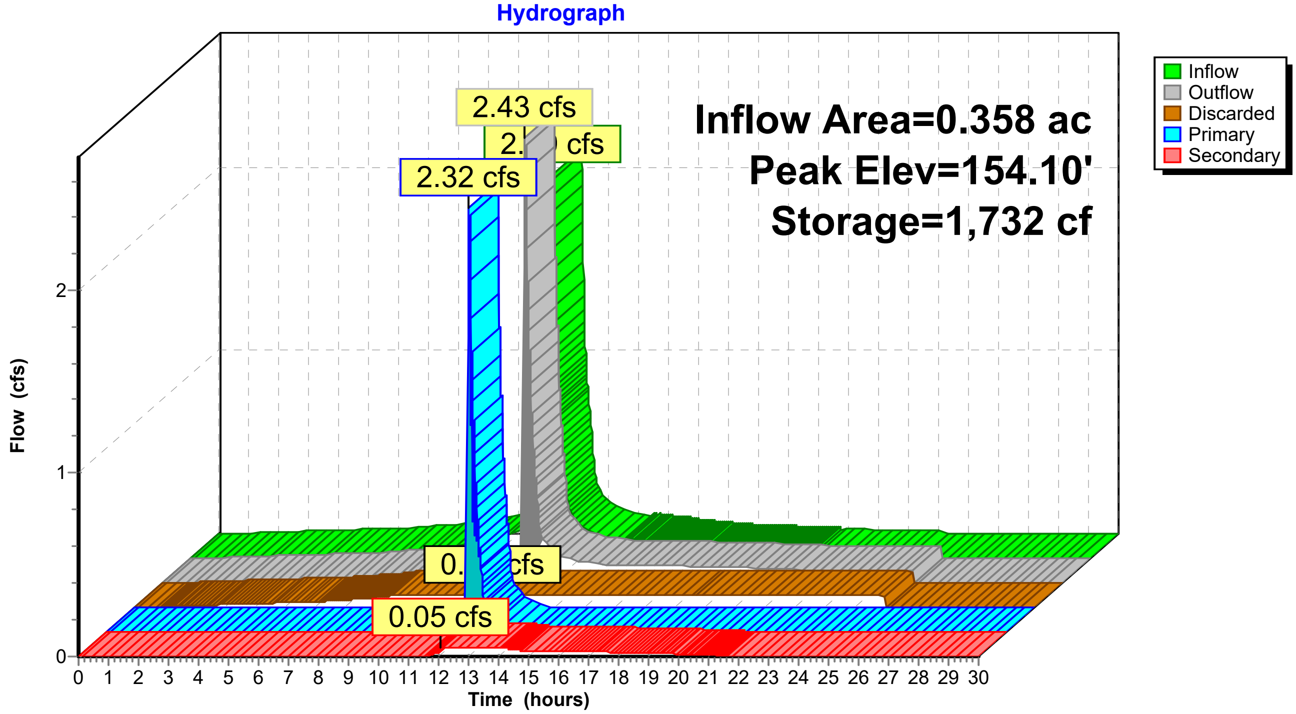
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 8P: P2a

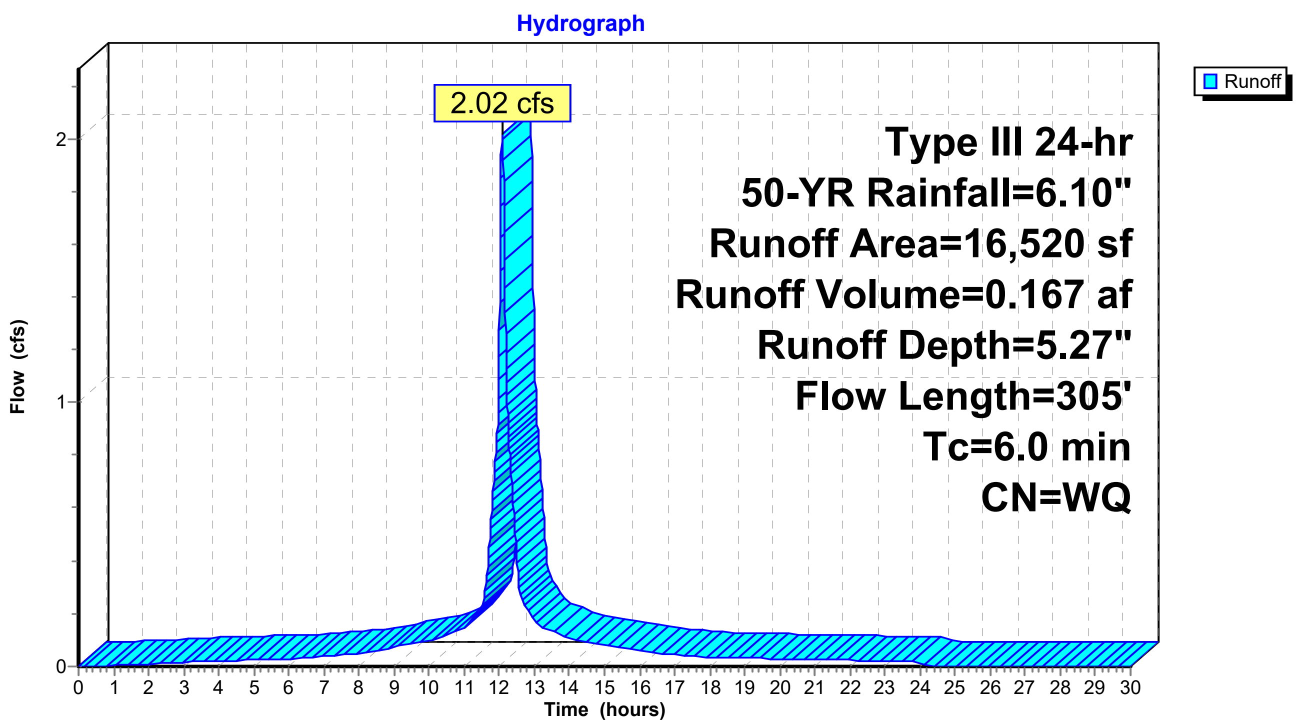
Runoff = 2.02 cfs @ 12.08 hrs, Volume= 0.167 af, Depth= 5.27"
Routed to Pond 9P : FD#1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
14,711	98	Paved parking HSG A
1,809	39	>75% Grass cover, Good HSG A
16,520		Weighted Average
1,809		10.95% Pervious Area
14,711		89.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	36	0.0500	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.6	64	0.0400	1.66		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	205	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.8	305	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8P: P2a



Summary for Pond 9P: FD#1

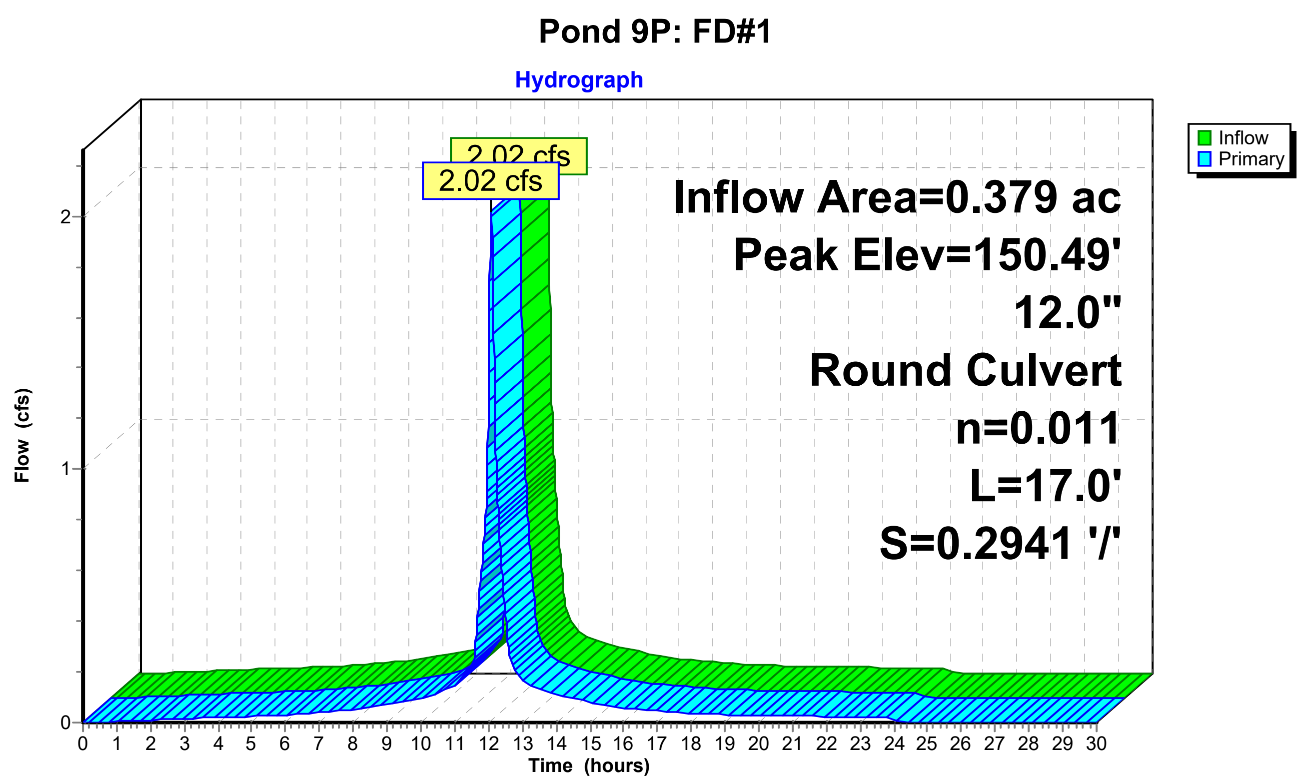
Inflow Area =	0.379 ac,	89.05% Impervious,	Inflow Depth =	5.27"	for 50-YR event
Inflow =	2.02 cfs @	12.08 hrs,	Volume=	0.167 af	
Outflow =	2.02 cfs @	12.08 hrs,	Volume=	0.167 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.02 cfs @	12.08 hrs,	Volume=	0.167 af	

Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.49' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	**12.0" Round Culvert** L= 17.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 149.70' / 144.70' S= 0.2941 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.02 cfs @ 12.08 hrs HW=150.49' TW=146.47' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.02 cfs @ 3.03 fps)



Summary for Subcatchment 10P: P2b

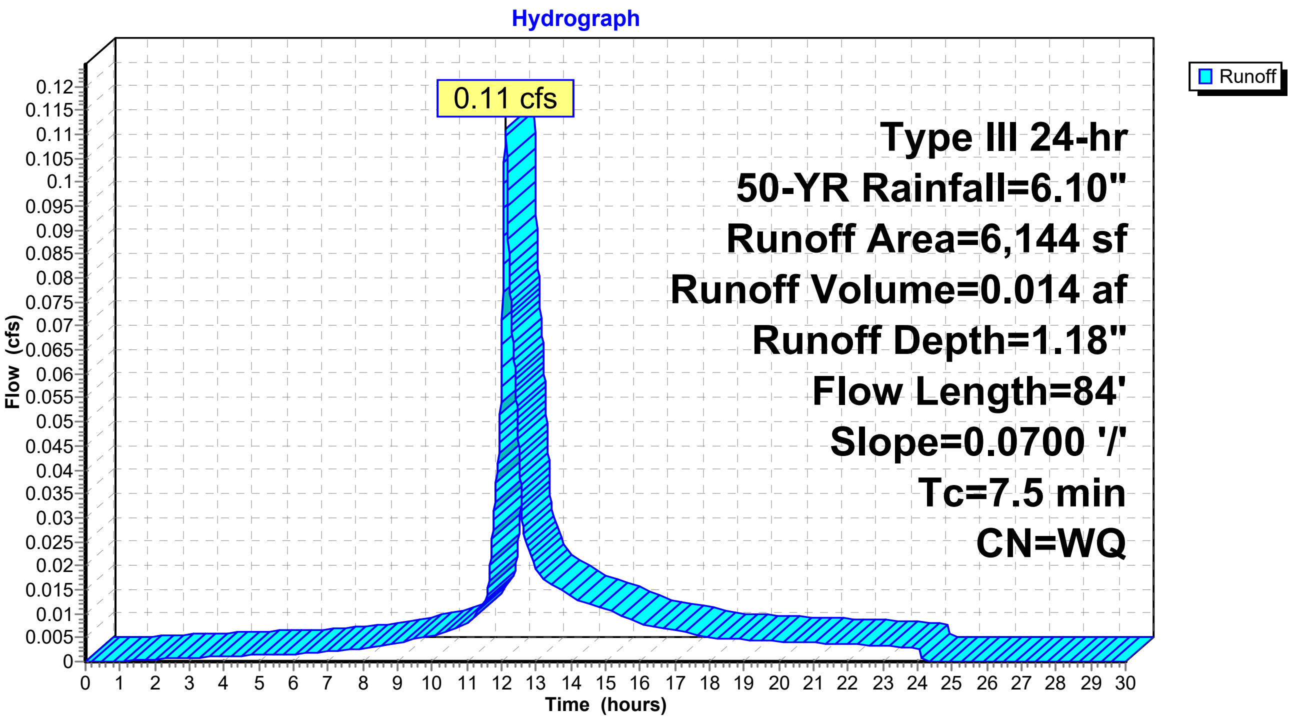
Runoff = 0.11 cfs @ 12.12 hrs, Volume= 0.014 af, Depth= 1.18"
Routed to Pond 11P : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
810	98	Paved parking HSG A
5,334	39	>75% Grass cover, Good HSG A
6,144		Weighted Average
5,334		86.82% Pervious Area
810		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	84	0.0700	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 10P: P2b



Summary for Pond 11P: Area Drain

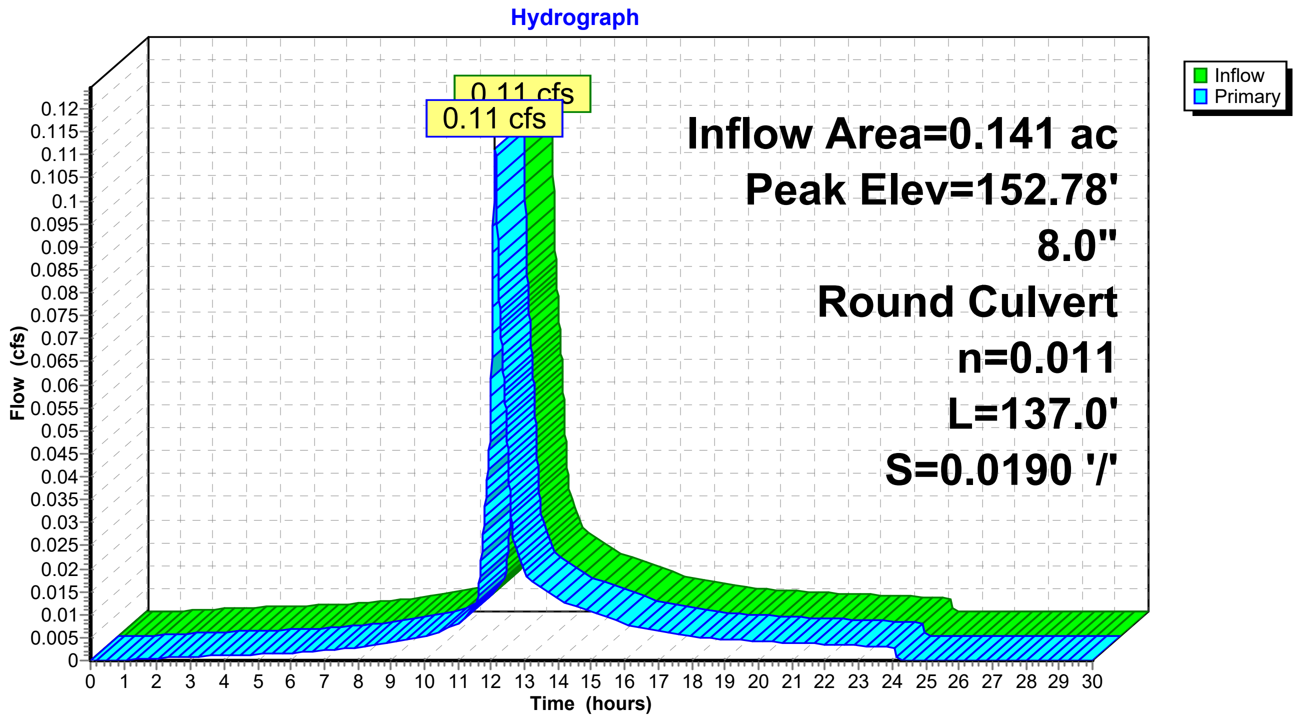
Inflow Area = 0.141 ac, 13.18% Impervious, Inflow Depth = 1.18" for 50-YR event
Inflow = 0.11 cfs @ 12.12 hrs, Volume= 0.014 af
Outflow = 0.11 cfs @ 12.12 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Primary = 0.11 cfs @ 12.12 hrs, Volume= 0.014 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 152.78' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.60'	**8.0" Round Culvert** L= 137.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.60' / 150.00' S= 0.0190 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.11 cfs @ 12.12 hrs HW=152.78' TW=146.74' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.11 cfs @ 1.45 fps)

Pond 11P: Area Drain



Summary for Pond 12P: Existing Infiltration Field

```
Inflow Area =        0.520 ac, 68.48% Impervious, Inflow Depth =  4.69"   for 50-YR event
Inflow      =        2.18 cfs @  12.08 hrs, Volume=         0.204 af
Outflow     =        1.07 cfs @  12.24 hrs, Volume=         0.204 af, Atten= 51%, Lag= 9.6 min
Discarded   =        0.07 cfs @   9.33 hrs, Volume=         0.135 af
Primary     =        1.00 cfs @  12.24 hrs, Volume=         0.069 af
    Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 147.17' @ 12.24 hrs Surf.Area= 1,240 sf Storage= 2,501 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 182.8 min (954.7 - 771.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	146.20'	**12.0" Round Culvert** L= 3.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 146.20' / 146.10' S= 0.0333 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#3	Device 2	146.20'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	146.50'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 9.33 hrs HW=144.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=1.00 cfs @ 12.24 hrs HW=147.17' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 1.00 cfs of 2.31 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.64 fps)
  └─**4=Orifice/Grate** (Orifice Controls 0.98 cfs @ 2.80 fps)

Pond 12P: Existing Infiltration Field - 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

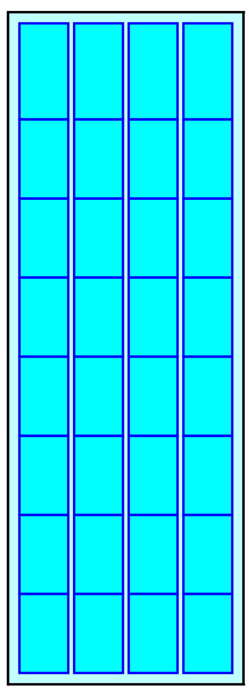
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

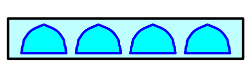
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

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

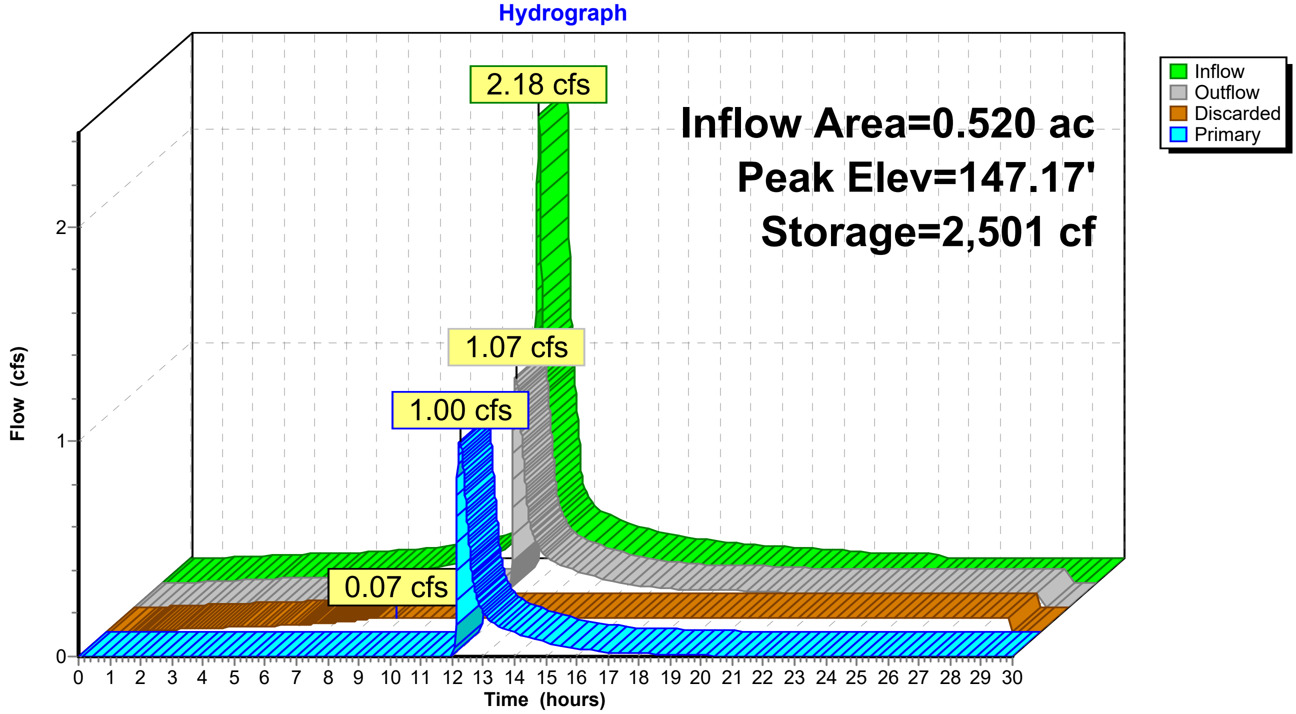
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 12P: Existing Infiltration Field



Summary for Subcatchment 13P: P2c

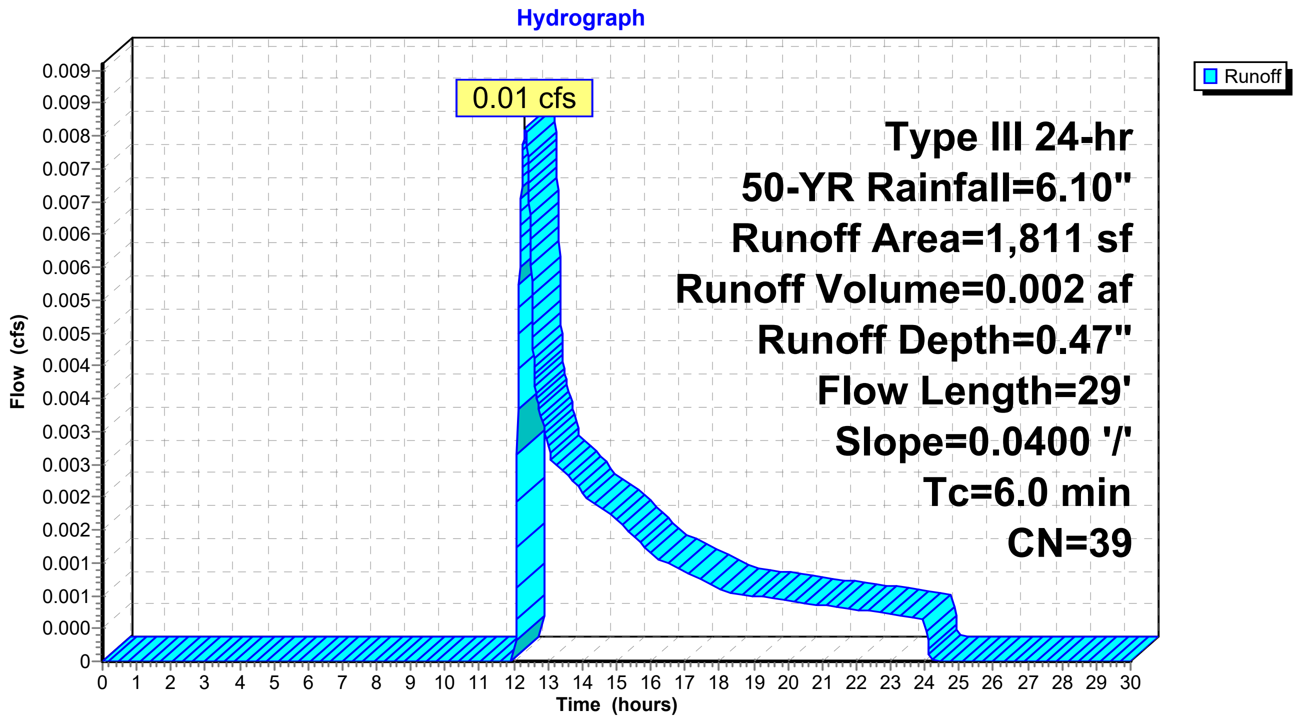
Runoff = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af, Depth= 0.47"
Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
1,811	39	>75% Grass cover, Good HSG A
1,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	29	0.0400	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
4.0	29	Total,	Increased to minimum Tc = 6.0 min		

Subcatchment 13P: P2c

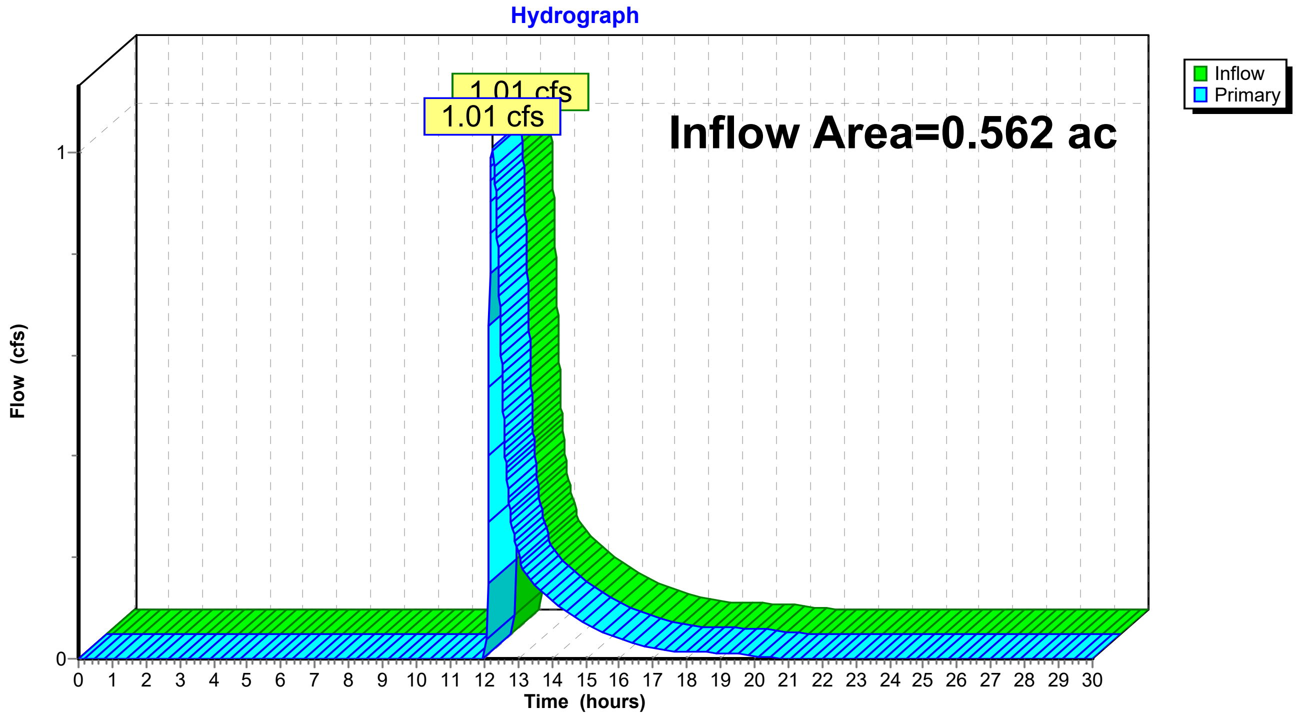


Summary for Link 14P: Design Point #2: Flow to 10 Pleasant Street

Inflow Area =	0.562 ac,	63.42% Impervious,	Inflow Depth = 1.51"	for 50-YR event
Inflow =	1.01 cfs @	12.24 hrs,	Volume=	0.071 af
Primary =	1.01 cfs @	12.24 hrs,	Volume=	0.071 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 14P: Design Point #2: Flow to 10 Pleasant Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond 5P: Infiltration Field #1 Peak Elev=154.10' Storage=1,732 cf Inflow=2.30 cfs 0.189 af
Discarded=0.07 cfs 0.110 af Primary=2.34 cfs 0.054 af Secondary=0.05 cfs 0.025 af Outflow=2.46 cfs 0.189 af

Subcatchment 8P: P2a Runoff Area=16,520 sf 89.05% Impervious Runoff Depth=5.83"
Flow Length=305' Tc=6.0 min CN=WQ Runoff=2.23 cfs 0.184 af

Pond 9P: FD#1 Peak Elev=150.55' Inflow=2.23 cfs 0.184 af
12.0" Round Culvert n=0.011 L=17.0' S=0.2941 '/' Outflow=2.23 cfs 0.184 af

Subcatchment 10P: P2b Runoff Area=6,144 sf 13.18% Impervious Runoff Depth=1.43"
Flow Length=84' Slope=0.0700 '/' Tc=7.5 min CN=WQ Runoff=0.14 cfs 0.017 af

Pond 11P: Area Drain Peak Elev=152.81' Inflow=0.14 cfs 0.017 af
8.0" Round Culvert n=0.011 L=137.0' S=0.0190 '/' Outflow=0.14 cfs 0.017 af

Pond 12P: Existing Infiltration Field Peak Elev=147.43' Storage=2,629 cf Inflow=2.41 cfs 0.226 af
Discarded=0.07 cfs 0.139 af Primary=1.33 cfs 0.087 af Outflow=1.40 cfs 0.226 af

Subcatchment 13P: P2c Runoff Area=1,811 sf 0.00% Impervious Runoff Depth=0.66"
Flow Length=29' Slope=0.0400 '/' Tc=6.0 min CN=39 Runoff=0.01 cfs 0.002 af

Link 14P: Design Point #2: Flow to 10 Pleasant Street Inflow=1.34 cfs 0.089 af
Primary=1.34 cfs 0.089 af

Total Runoff Area = 0.562 ac Runoff Volume = 0.203 af Average Runoff Depth = 4.34"
36.58% Pervious = 0.206 ac 63.42% Impervious = 0.356 ac

Summary for Pond 5P: Infiltration Field #1

Inflow Area = 0.358 ac, 97.84% Impervious, Inflow Depth = 6.34" for 100-YR event
Inflow = 2.30 cfs @ 12.08 hrs, Volume= 0.189 af
Outflow = 2.46 cfs @ 12.09 hrs, Volume= 0.189 af, Atten= 0%, Lag= 0.4 min
Discarded = 0.07 cfs @ 11.84 hrs, Volume= 0.110 af
Primary = 2.34 cfs @ 12.09 hrs, Volume= 0.054 af
Routed to Link 7P : Design Point #1: Flow to Pleasant Street
Secondary = 0.05 cfs @ 12.09 hrs, Volume= 0.025 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 154.10' @ 12.09 hrs Surf.Area= 1,181 sf Storage= 1,732 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 116.5 min (860.5 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	149.50'	850 cf	**50.25'W x 23.25'L x 2.54'H Field A** 2,969 cf Overall - 844 cf Embedded = 2,125 cf x 40.0% Voids
#2A	150.00'	844 cf	**Cultec R-150XLHD** x 30 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 15 rows
#3	151.00'	38 cf	**4.00'D x 3.00'H Vertical Cone/Cylinder**
		1,732 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	149.50'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	153.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	150.10'	**6.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 150.10' / 144.70' S= 0.1800 '/' Cc= 0.900 n= 0.011, Flow Area= 0.20 sf
#4	Device 3	150.40'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 11.84 hrs HW=151.01' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=2.33 cfs @ 12.09 hrs HW=154.10' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Weir Controls 2.33 cfs @ 1.46 fps)

Secondary OutFlow Max=0.05 cfs @ 12.09 hrs HW=154.10' TW=146.87' (Dynamic Tailwater)
└─**3=Culvert** (Passes 0.05 cfs of 1.83 cfs potential flow)
  └─**4=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.21 fps)

Pond 5P: Infiltration Field #1 - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)
Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf
Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap
Row Length Adjustment= +0.75' x 2.65 sf x 15 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

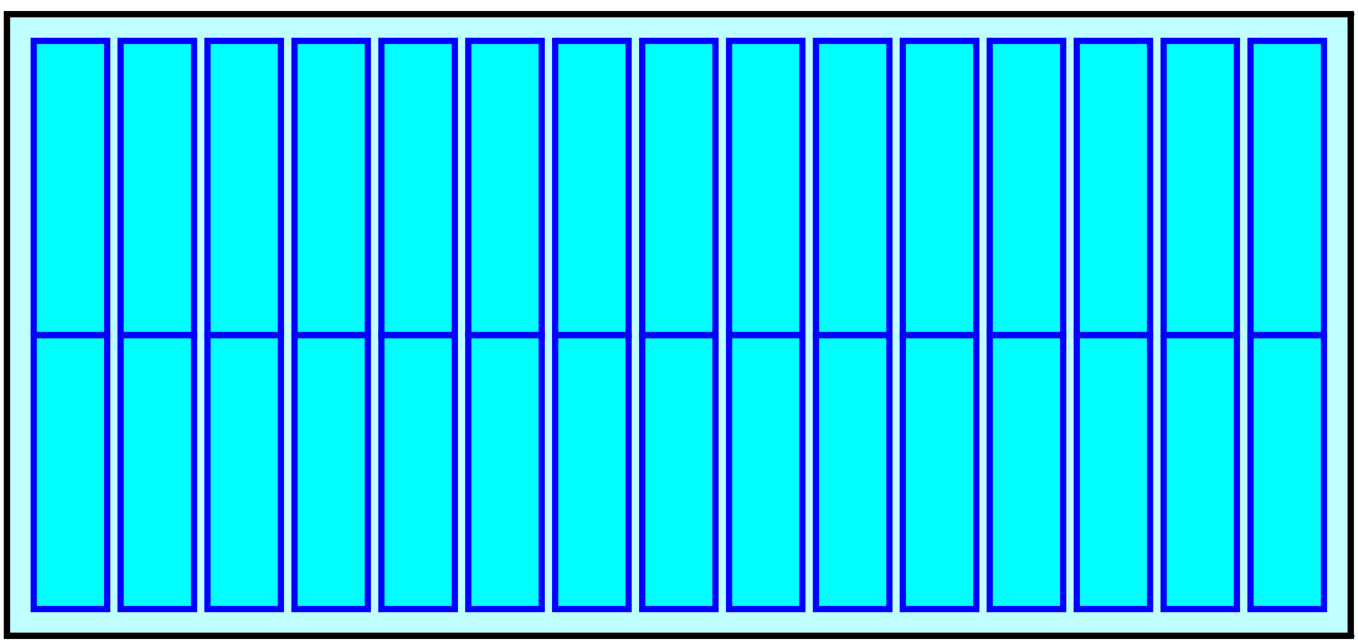
2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length
15 Rows x 33.0" Wide + 6.0" Spacing x 14 + 12.0" Side Stone x 2 = 50.25' Base Width
6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

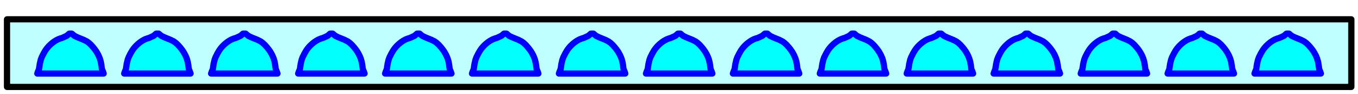
30 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 15 Rows = 844.4 cf Chamber Storage

2,969.5 cf Field - 844.4 cf Chambers = 2,125.1 cf Stone x 40.0% Voids = 850.0 cf Stone Storage

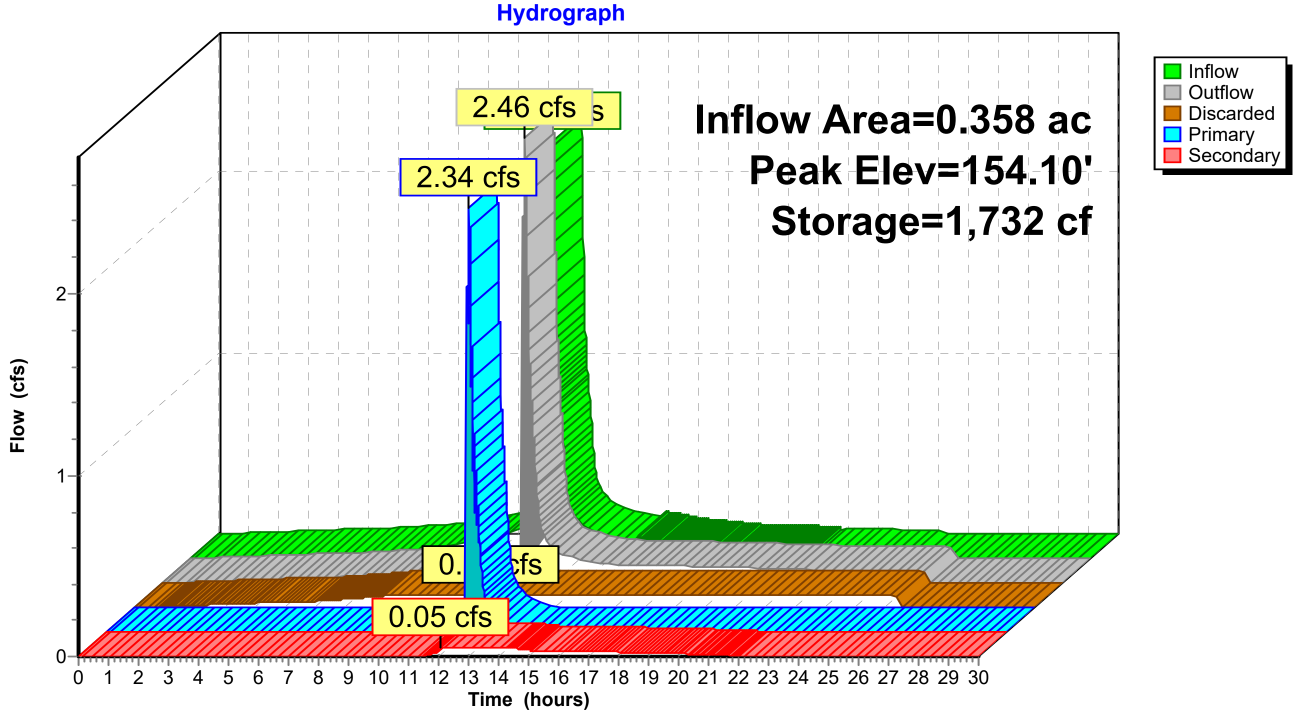
Chamber Storage + Stone Storage = 1,694.4 cf = 0.039 af
Overall Storage Efficiency = 57.1%
Overall System Size = 23.25' x 50.25' x 2.54'

30 Chambers
110.0 cy Field
78.7 cy Stone





Pond 5P: Infiltration Field #1



Summary for Subcatchment 8P: P2a

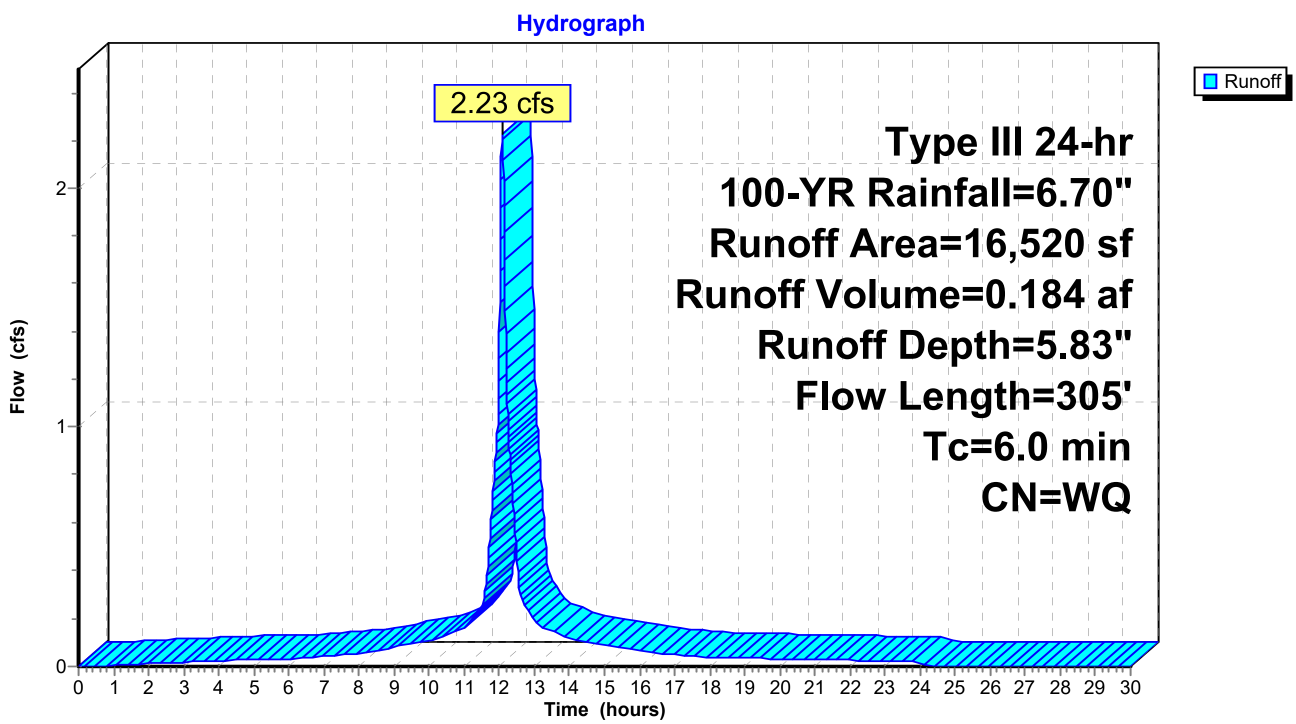
Runoff = 2.23 cfs @ 12.08 hrs, Volume= 0.184 af, Depth= 5.83"
Routed to Pond 9P : FD#1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
14,711	98	Paved parking HSG A
1,809	39	>75% Grass cover, Good HSG A
16,520		Weighted Average
1,809		10.95% Pervious Area
14,711		89.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	36	0.0500	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
0.6	64	0.0400	1.66		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.8	205	0.0400	4.06		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.8	305	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 8P: P2a



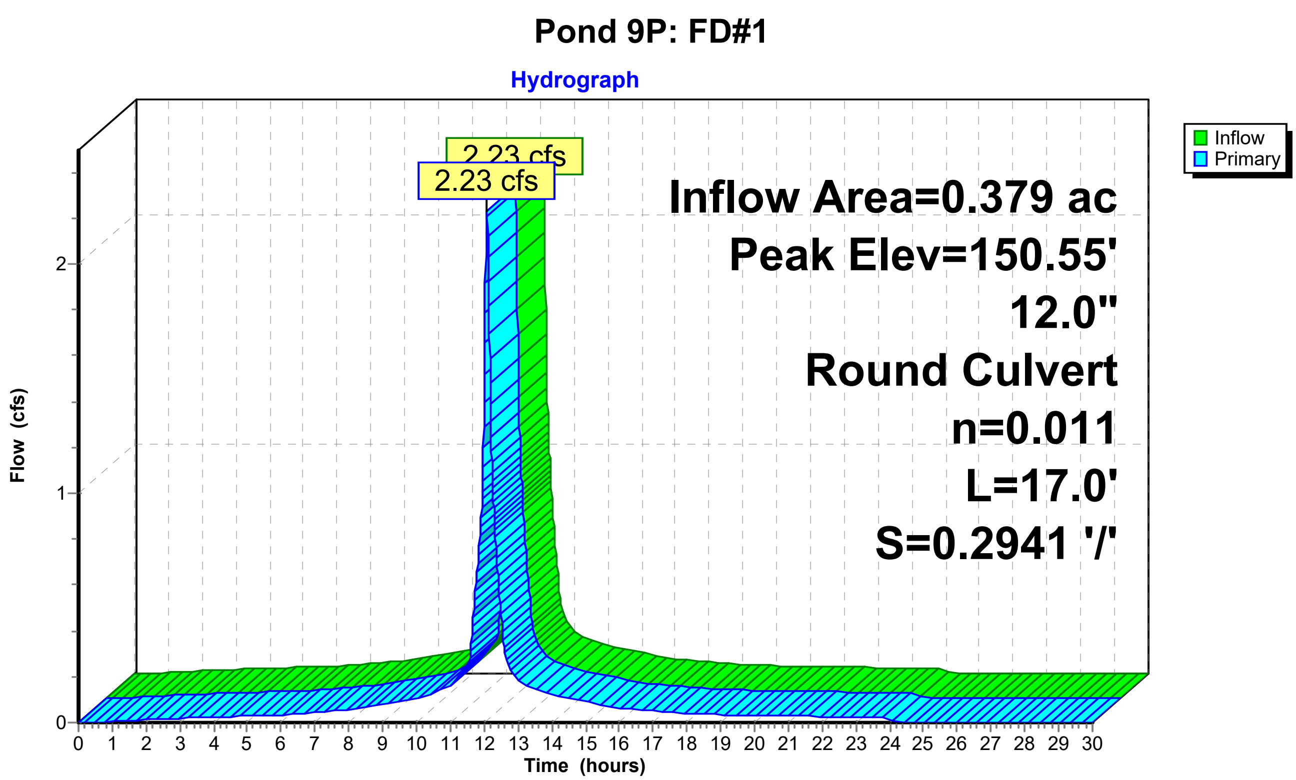
Summary for Pond 9P: FD#1

Inflow Area = 0.379 ac, 89.05% Impervious, Inflow Depth = 5.83" for 100-YR event
Inflow = 2.23 cfs @ 12.08 hrs, Volume= 0.184 af
Outflow = 2.23 cfs @ 12.08 hrs, Volume= 0.184 af, Atten= 0%, Lag= 0.0 min
Primary = 2.23 cfs @ 12.08 hrs, Volume= 0.184 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 150.55' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	**12.0" Round Culvert** L= 17.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 149.70' / 144.70' S= 0.2941 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Primary OutFlow Max=2.22 cfs @ 12.08 hrs HW=150.55' TW=146.82' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.22 cfs @ 3.13 fps)



Summary for Subcatchment 10P: P2b

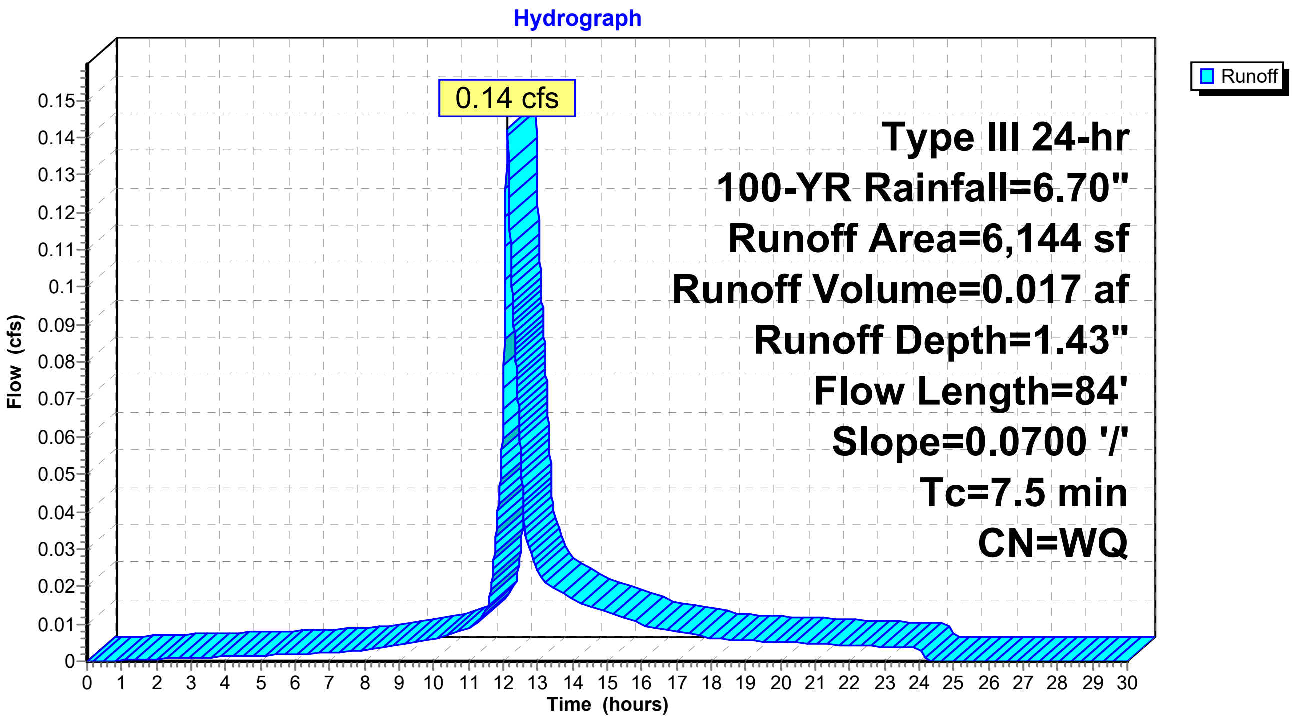
Runoff = 0.14 cfs @ 12.12 hrs, Volume= 0.017 af, Depth= 1.43"
Routed to Pond 11P : Area Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
810	98	Paved parking HSG A
5,334	39	>75% Grass cover, Good HSG A
6,144		Weighted Average
5,334		86.82% Pervious Area
810		13.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	84	0.0700	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 10P: P2b



Summary for Pond 11P: Area Drain

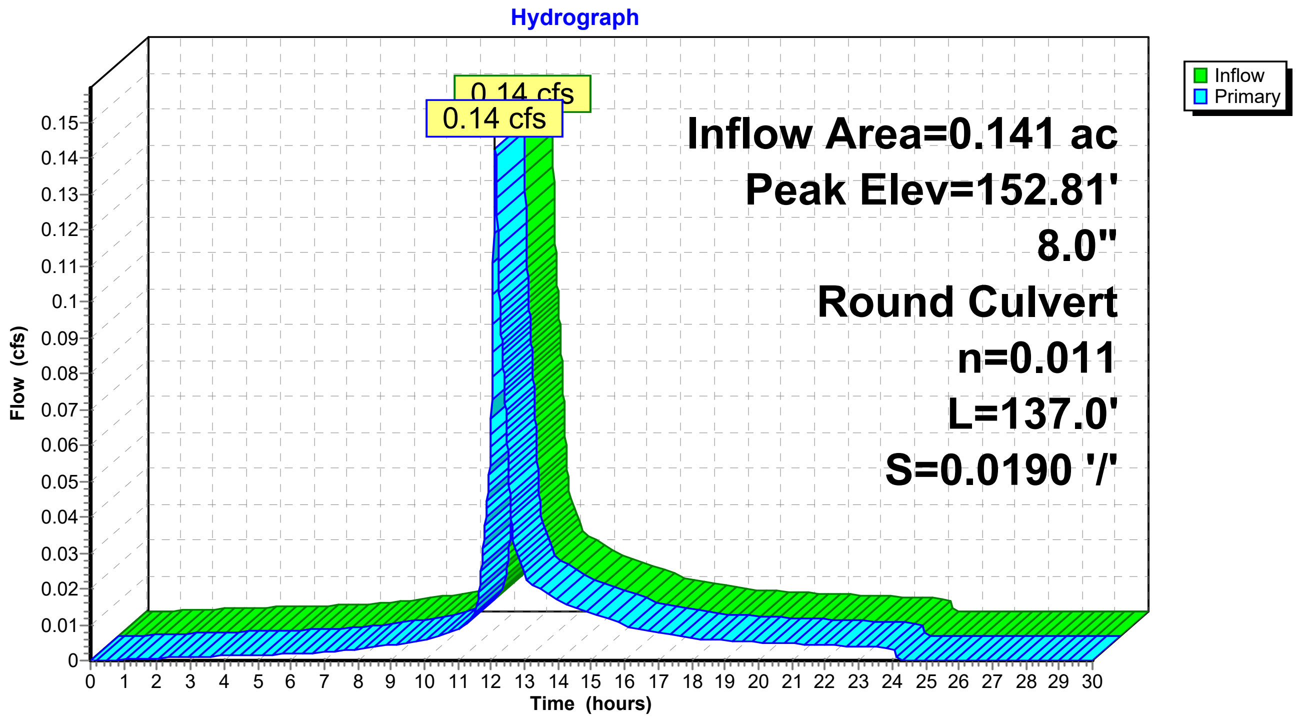
Inflow Area = 0.141 ac, 13.18% Impervious, Inflow Depth = 1.43" for 100-YR event
Inflow = 0.14 cfs @ 12.12 hrs, Volume= 0.017 af
Outflow = 0.14 cfs @ 12.12 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min
Primary = 0.14 cfs @ 12.12 hrs, Volume= 0.017 af
Routed to Pond 12P : Existing Infiltration Field

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 152.81' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	152.60'	**8.0" Round Culvert** L= 137.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 152.60' / 150.00' S= 0.0190 '/' Cc= 0.900 n= 0.011, Flow Area= 0.35 sf

Primary OutFlow Max=0.14 cfs @ 12.12 hrs HW=152.81' TW=147.17' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.14 cfs @ 1.55 fps)

Pond 11P: Area Drain



Summary for Pond 12P: Existing Infiltration Field

Inflow Area = 0.520 ac, 68.48% Impervious, Inflow Depth = 5.21" for 100-YR event
Inflow = 2.41 cfs @ 12.09 hrs, Volume= 0.226 af
Outflow = 1.40 cfs @ 12.20 hrs, Volume= 0.226 af, Atten= 42%, Lag= 7.0 min
Discarded = 0.07 cfs @ 9.04 hrs, Volume= 0.139 af
Primary = 1.33 cfs @ 12.20 hrs, Volume= 0.087 af
Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 147.43' @ 12.20 hrs Surf.Area= 1,240 sf Storage= 2,629 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 173.2 min (945.2 - 772.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	144.20'	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	144.70'	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	144.20'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	146.20'	**12.0" Round Culvert**
			L= 3.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 146.20' / 146.10' S= 0.0333 '/' Cc= 0.900
			n= 0.011, Flow Area= 0.79 sf
#3	Device 2	146.20'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	146.50'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.07 cfs @ 9.04 hrs HW=144.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=1.33 cfs @ 12.20 hrs HW=147.43' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Passes 1.33 cfs of 3.11 cfs potential flow)
  ├─**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.25 fps)
  └─**4=Orifice/Grate** (Orifice Controls 1.30 cfs @ 3.72 fps)

Pond 12P: Existing Infiltration Field - 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

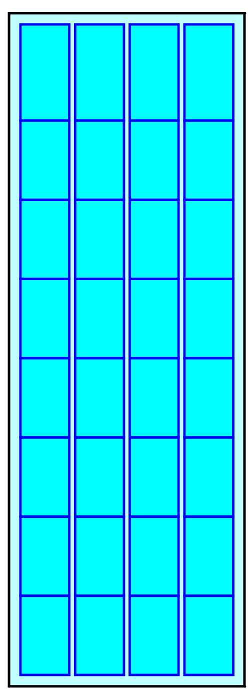
8 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 57.50' Row Length +12.0" End Stone x 2 = 59.50' Base Length
4 Rows x 52.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.83' Base Width
6.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 3.54' Field Height

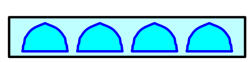
32 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 4 Rows = 1,713.7 cf Chamber Storage

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

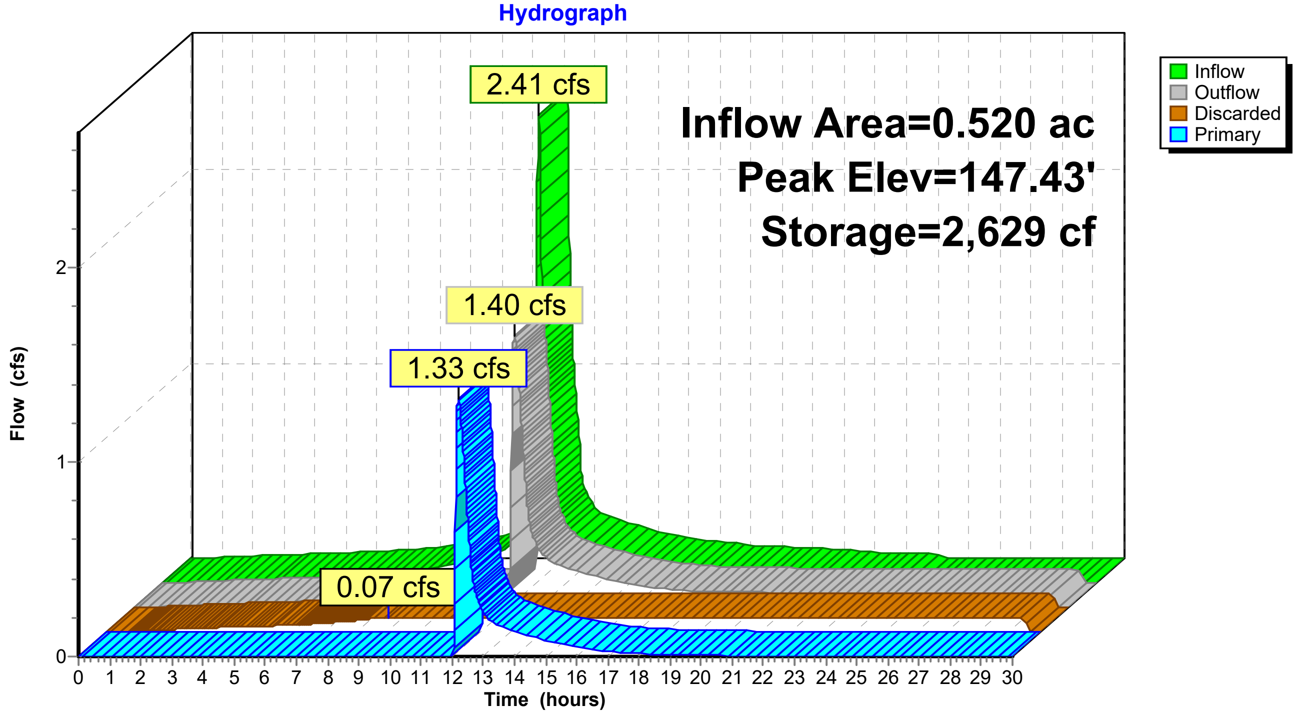
Chamber Storage + Stone Storage = 2,784.3 cf = 0.064 af
Overall Storage Efficiency = 63.4%
Overall System Size = 59.50' x 20.83' x 3.54'

32 Chambers
162.6 cy Field
99.1 cy Stone





Pond 12P: Existing Infiltration Field



Summary for Subcatchment 13P: P2c

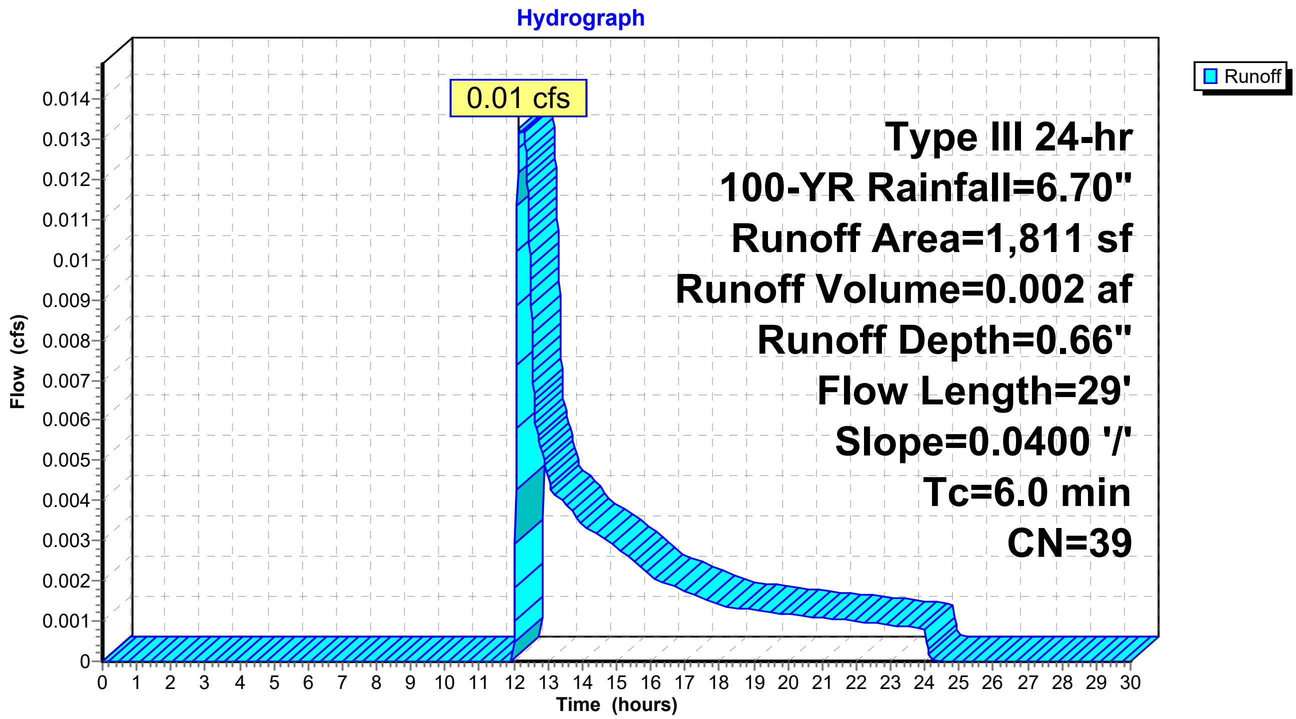
Runoff = 0.01 cfs @ 12.16 hrs, Volume= 0.002 af, Depth= 0.66"
Routed to Link 14P : Design Point #2: Flow to 10 Pleasant Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
1,811	39	>75% Grass cover, Good HSG A
1,811		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	29	0.0400	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
4.0	29	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 13P: P2c

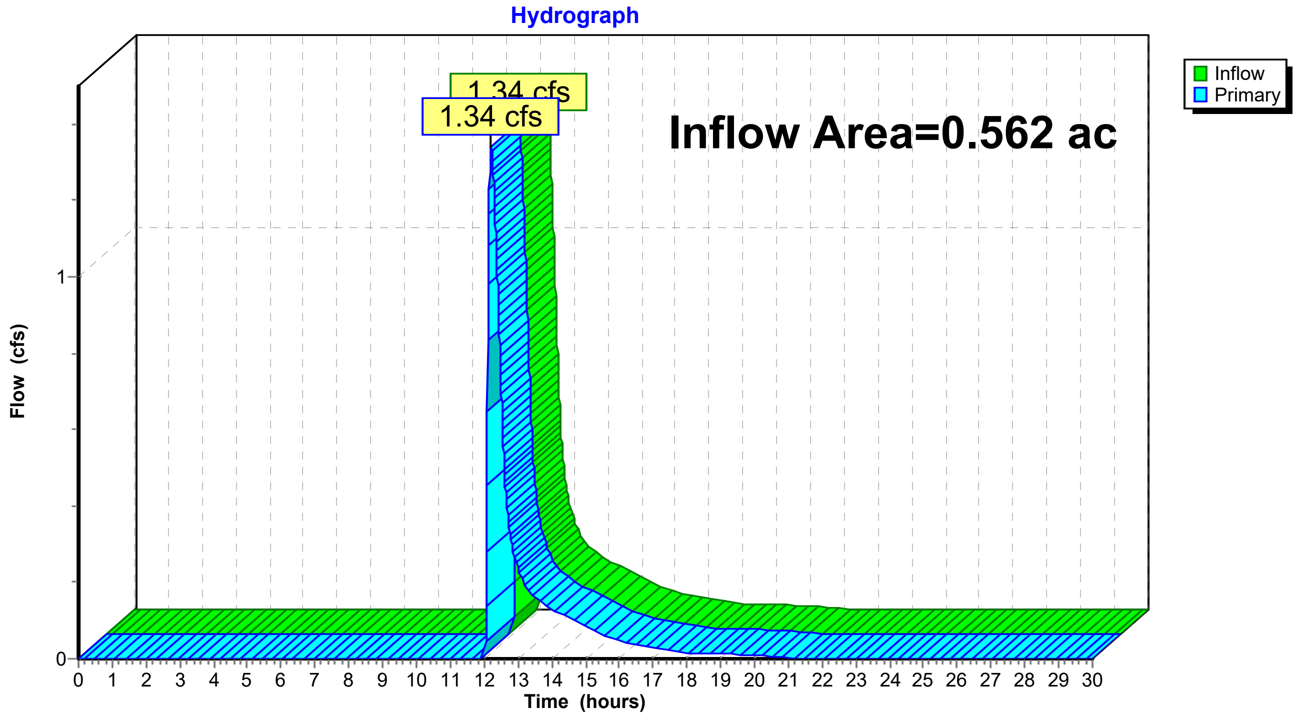


Summary for Link 14P: Design Point #2: Flow to 10 Pleasant Street

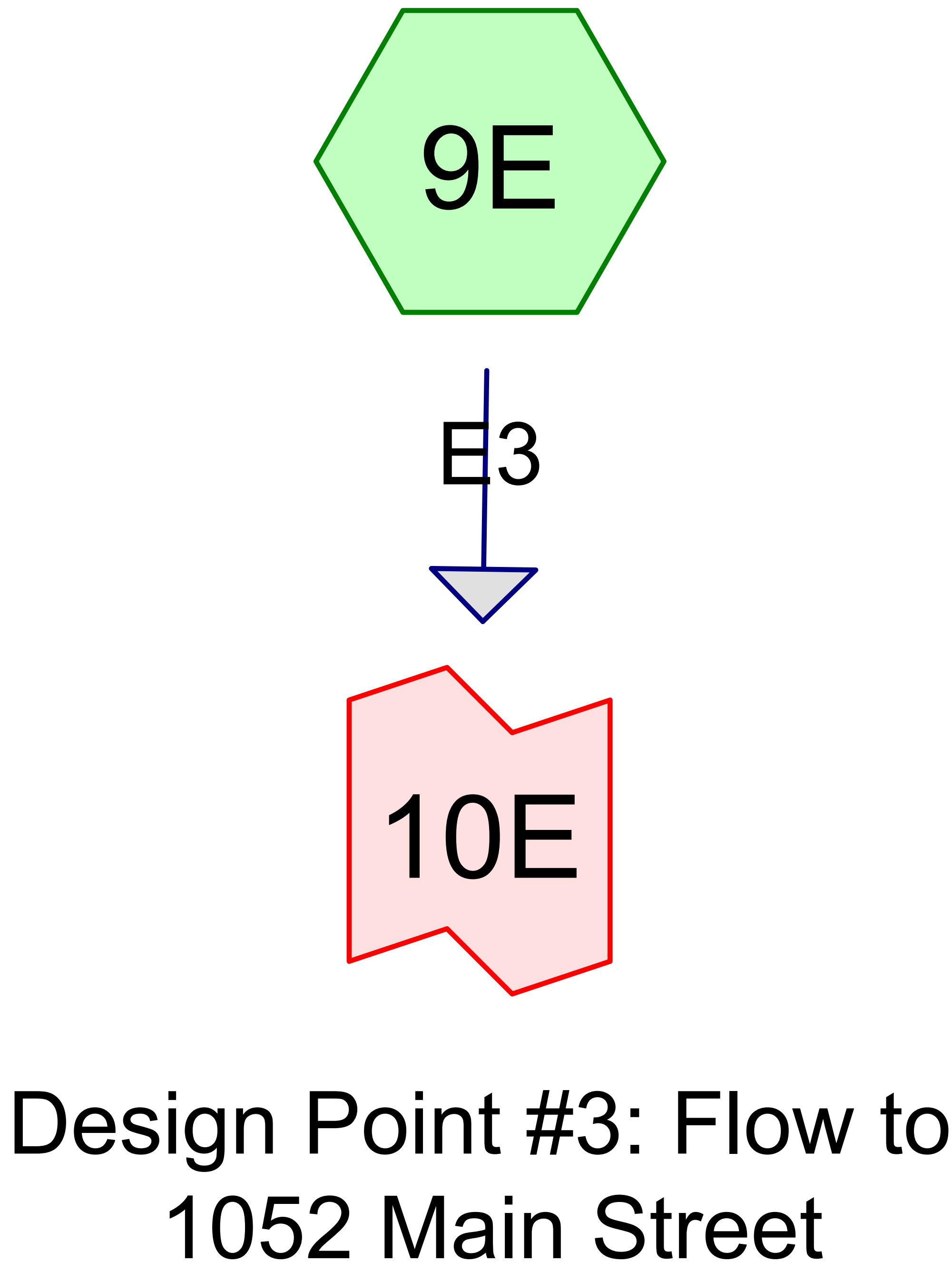
Inflow Area = 0.562 ac, 63.42% Impervious, Inflow Depth = 1.90" for 100-YR event
Inflow = 1.34 cfs @ 12.20 hrs, Volume= 0.089 af
Primary = 1.34 cfs @ 12.20 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min

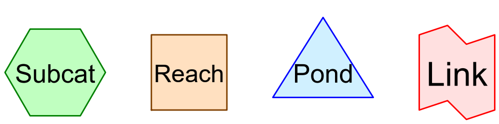
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 14P: Design Point #2: Flow to 10 Pleasant Street



DESIGN POINT #3: FLOW TO 1052 MAIN STREET EXISTING CONDITIONS





Routing Diagram for HydroCAD
Prepared by Legacy Engineering LLC, Printed 6/5/2023
HydroCAD® 10.20-3c s/n 02346 © 2023 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type III 24-hr		Default	24.00	1	2.50	2
2	2-YR	Type III 24-hr		Default	24.00	1	3.20	2
3	10-YR	Type III 24-hr		Default	24.00	1	4.70	2
4	50-YR	Type III 24-hr		Default	24.00	1	6.10	2
5	100-YR	Type III 24-hr		Default	24.00	1	6.70	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.058	39	>75% Grass cover, Good HSG A (9E)
0.012	98	Roofs HSG A (9E)
0.069	**49**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 9E: E3 Runoff Area=3,027 sf 17.18% Impervious Runoff Depth=0.39"
Flow Length=60' Slope=0.0550 '/' Tc=6.3 min CN=WQ Runoff=0.03 cfs 0.002 af

Link 10E: Design Point #3: Flow to 1052 Main Street Inflow=0.03 cfs 0.002 af
Primary=0.03 cfs 0.002 af

Total Runoff Area = 0.069 ac Runoff Volume = 0.002 af Average Runoff Depth = 0.39"
82.82% Pervious = 0.058 ac 17.18% Impervious = 0.012 ac

Summary for Subcatchment 9E: E3

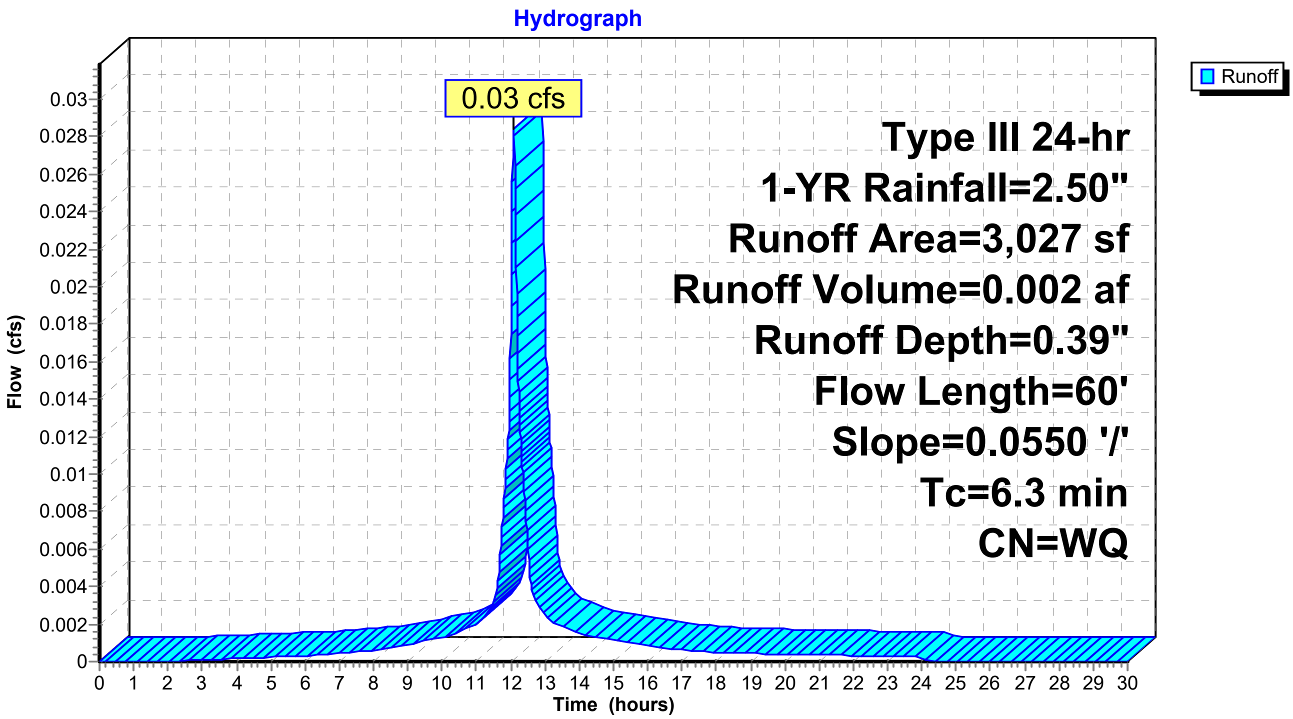
Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 0.39"
Routed to Link 10E : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
520	98	Roofs HSG A
2,507	39	>75% Grass cover, Good HSG A
3,027		Weighted Average
2,507		82.82% Pervious Area
520		17.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	60	0.0550	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 9E: E3

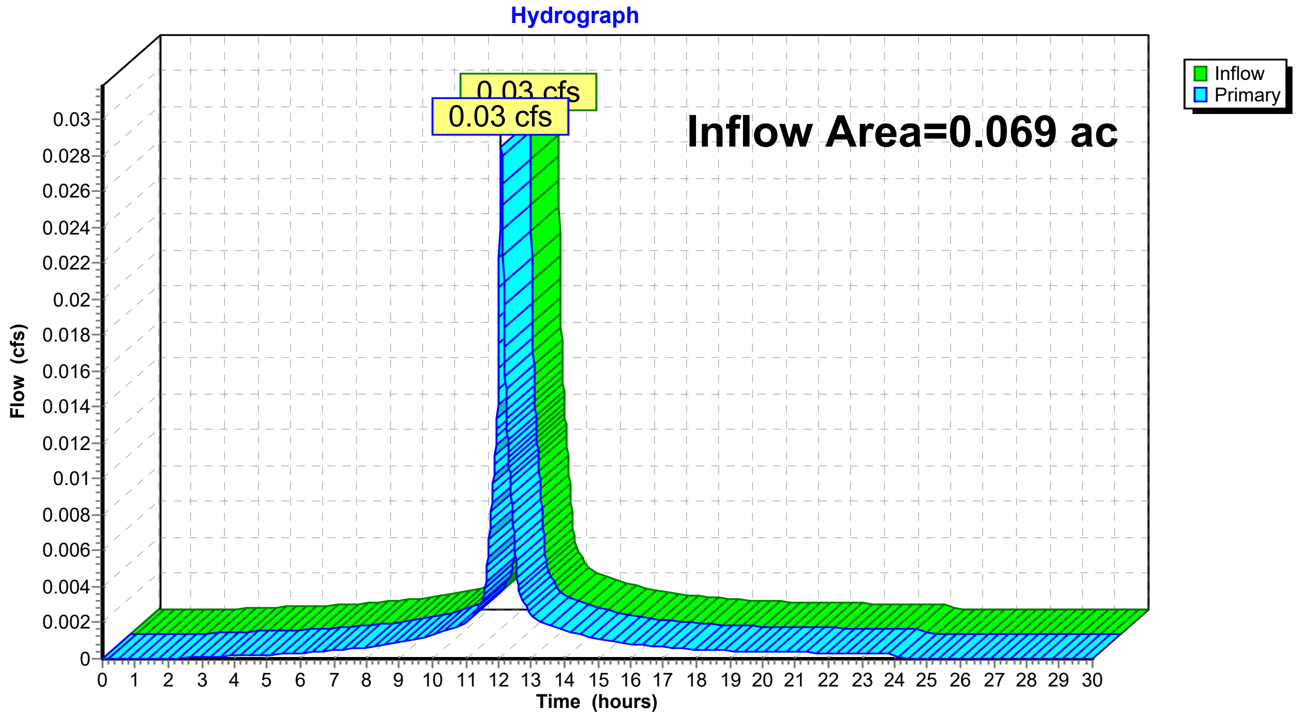


Summary for Link 10E: Design Point #3: Flow to 1052 Main Street

Inflow Area = 0.069 ac, 17.18% Impervious, Inflow Depth = 0.39" for 1-YR event
Inflow = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af
Primary = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 10E: Design Point #3: Flow to 1052 Main Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 9E: E3 Runoff Area=3,027 sf 17.18% Impervious Runoff Depth=0.51"
Flow Length=60' Slope=0.0550 '/' Tc=6.3 min CN=WQ Runoff=0.04 cfs 0.003 af

Link 10E: Design Point #3: Flow to 1052 Main Street Inflow=0.04 cfs 0.003 af
Primary=0.04 cfs 0.003 af

Total Runoff Area = 0.069 ac Runoff Volume = 0.003 af Average Runoff Depth = 0.51"
82.82% Pervious = 0.058 ac 17.18% Impervious = 0.012 ac

Summary for Subcatchment 9E: E3

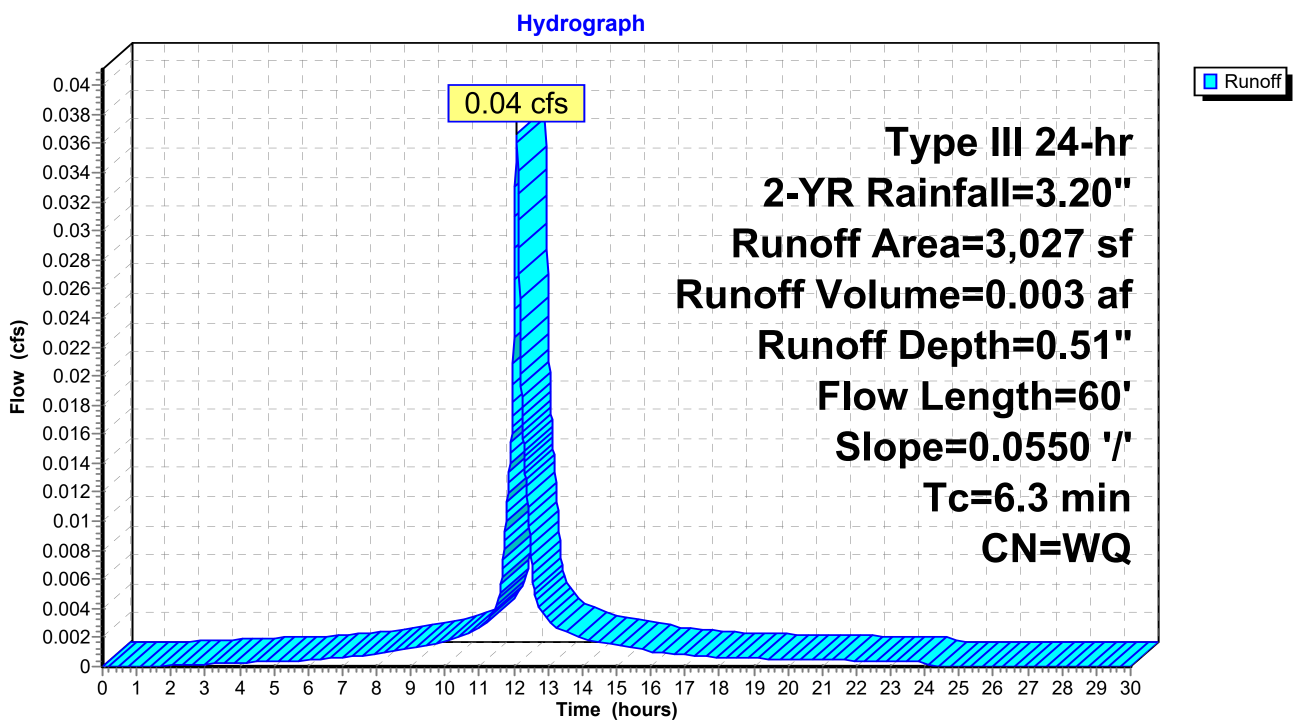
Runoff = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Depth= 0.51"
Routed to Link 10E : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
520	98	Roofs HSG A
2,507	39	>75% Grass cover, Good HSG A
3,027		Weighted Average
2,507		82.82% Pervious Area
520		17.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	60	0.0550	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 9E: E3

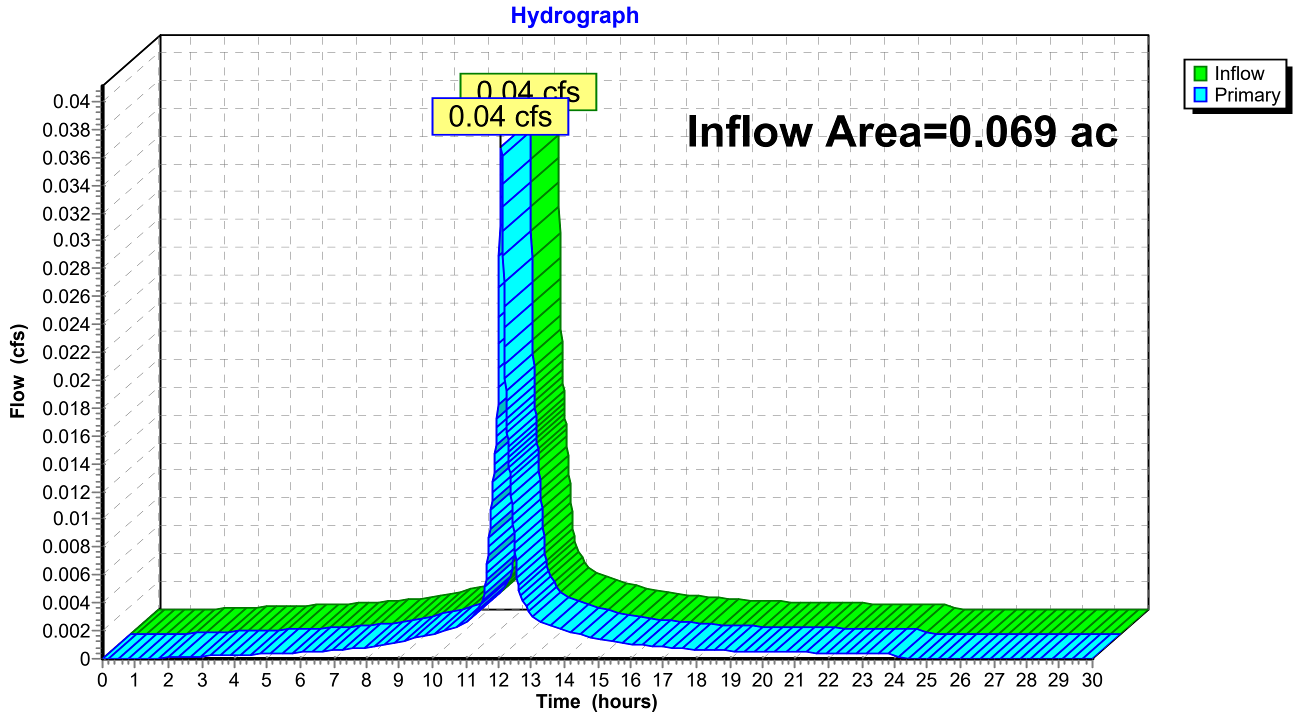


Summary for Link 10E: Design Point #3: Flow to 1052 Main Street

Inflow Area = 0.069 ac, 17.18% Impervious, Inflow Depth = 0.51" for 2-YR event
Inflow = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af
Primary = 0.04 cfs @ 12.09 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 10E: Design Point #3: Flow to 1052 Main Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 9E: E3 Runoff Area=3,027 sf 17.18% Impervious Runoff Depth=0.89"
Flow Length=60' Slope=0.0550 '/' Tc=6.3 min CN=WQ Runoff=0.05 cfs 0.005 af

Link 10E: Design Point #3: Flow to 1052 Main Street Inflow=0.05 cfs 0.005 af
Primary=0.05 cfs 0.005 af

Total Runoff Area = 0.069 ac Runoff Volume = 0.005 af Average Runoff Depth = 0.89"
82.82% Pervious = 0.058 ac 17.18% Impervious = 0.012 ac

Summary for Subcatchment 9E: E3

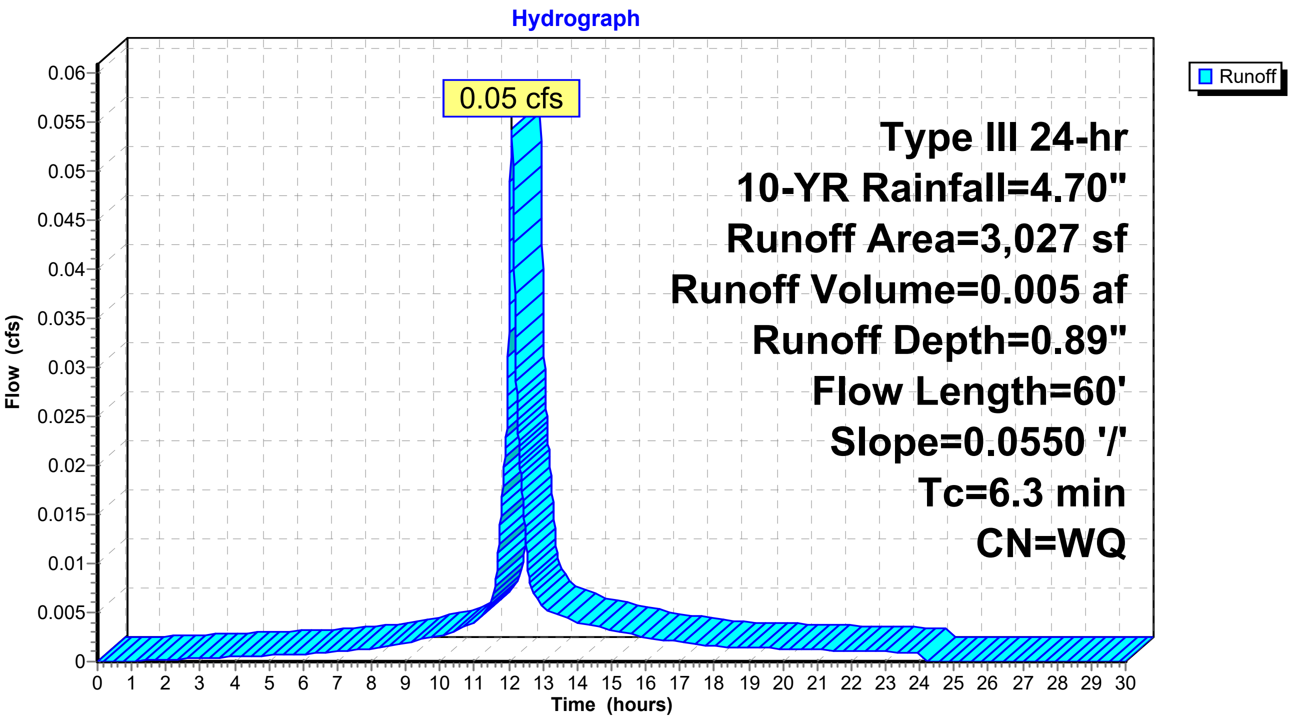
Runoff = 0.05 cfs @ 12.09 hrs, Volume= 0.005 af, Depth= 0.89"
Routed to Link 10E : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
520	98	Roofs HSG A
2,507	39	>75% Grass cover, Good HSG A
3,027		Weighted Average
2,507		82.82% Pervious Area
520		17.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	60	0.0550	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 9E: E3

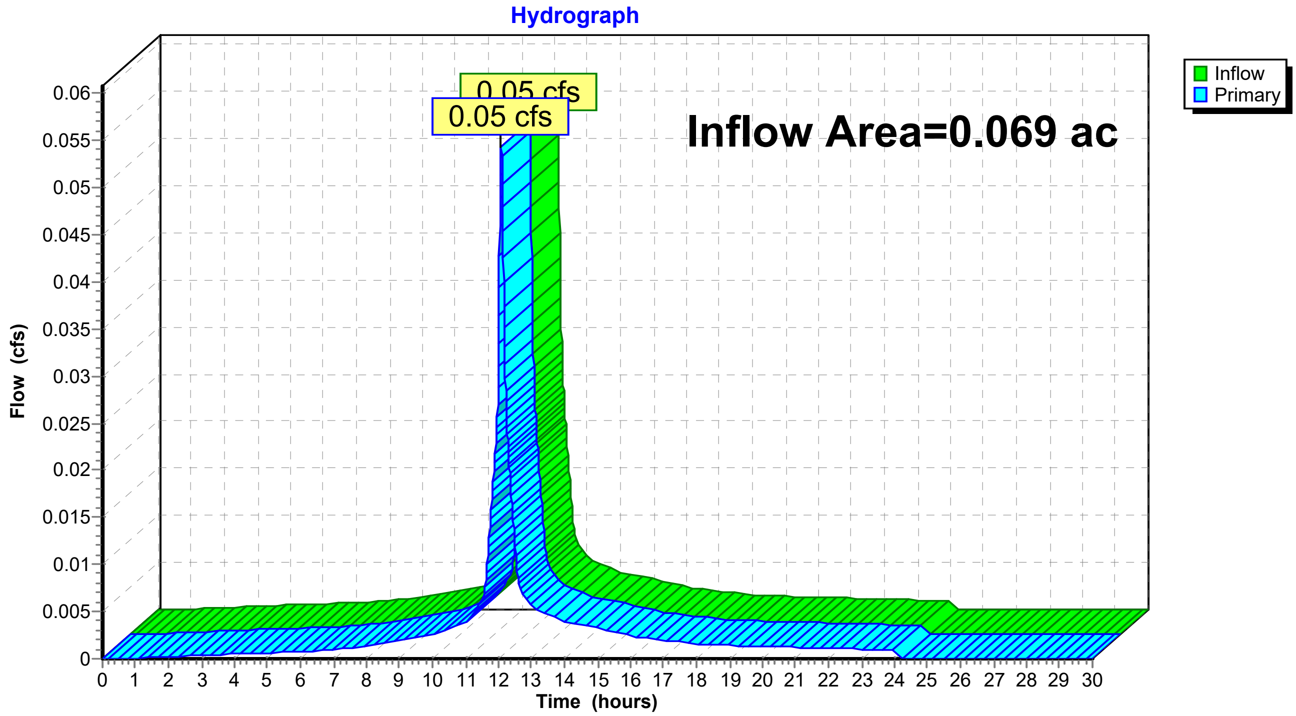


Summary for Link 10E: Design Point #3: Flow to 1052 Main Street

Inflow Area = 0.069 ac, 17.18% Impervious, Inflow Depth = 0.89" for 10-YR event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 0.005 af
Primary = 0.05 cfs @ 12.09 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 10E: Design Point #3: Flow to 1052 Main Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 9E: E3 Runoff Area=3,027 sf 17.18% Impervious Runoff Depth=1.40"
Flow Length=60' Slope=0.0550 '/' Tc=6.3 min CN=WQ Runoff=0.07 cfs 0.008 af

Link 10E: Design Point #3: Flow to 1052 Main Street Inflow=0.07 cfs 0.008 af
Primary=0.07 cfs 0.008 af

Total Runoff Area = 0.069 ac Runoff Volume = 0.008 af Average Runoff Depth = 1.40"
82.82% Pervious = 0.058 ac 17.18% Impervious = 0.012 ac

Summary for Subcatchment 9E: E3

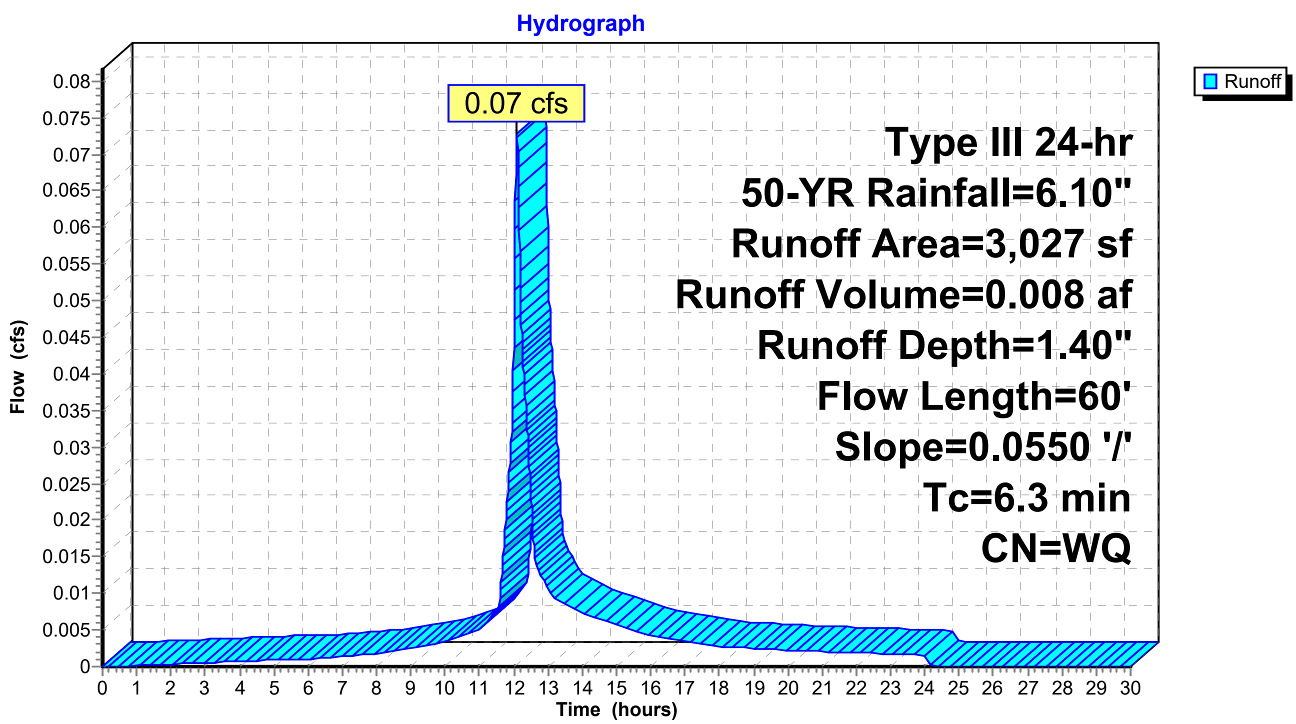
Runoff = 0.07 cfs @ 12.10 hrs, Volume= 0.008 af, Depth= 1.40"
Routed to Link 10E : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
520	98	Roofs HSG A
2,507	39	>75% Grass cover, Good HSG A
3,027		Weighted Average
2,507		82.82% Pervious Area
520		17.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	60	0.0550	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 9E: E3

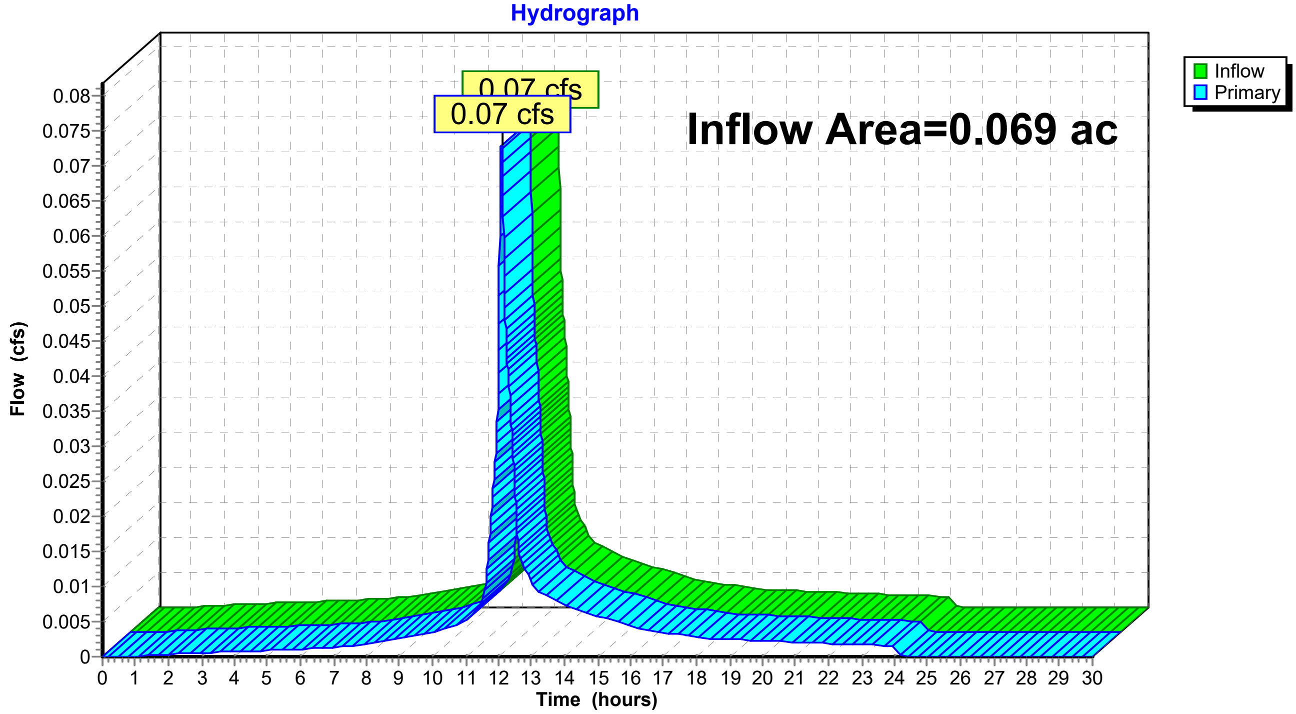


Summary for Link 10E: Design Point #3: Flow to 1052 Main Street

Inflow Area =	0.069 ac, 17.18% Impervious, Inflow Depth = 1.40" for 50-YR event		
Inflow =	0.07 cfs @ 12.10 hrs, Volume=	0.008 af	
Primary =	0.07 cfs @ 12.10 hrs, Volume=	0.008 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 10E: Design Point #3: Flow to 1052 Main Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 9E: E3 Runoff Area=3,027 sf 17.18% Impervious Runoff Depth=1.66"
Flow Length=60' Slope=0.0550 '/' Tc=6.3 min CN=WQ Runoff=0.09 cfs 0.010 af

Link 10E: Design Point #3: Flow to 1052 Main Street Inflow=0.09 cfs 0.010 af
Primary=0.09 cfs 0.010 af

Total Runoff Area = 0.069 ac Runoff Volume = 0.010 af Average Runoff Depth = 1.66"
82.82% Pervious = 0.058 ac 17.18% Impervious = 0.012 ac

Summary for Subcatchment 9E: E3

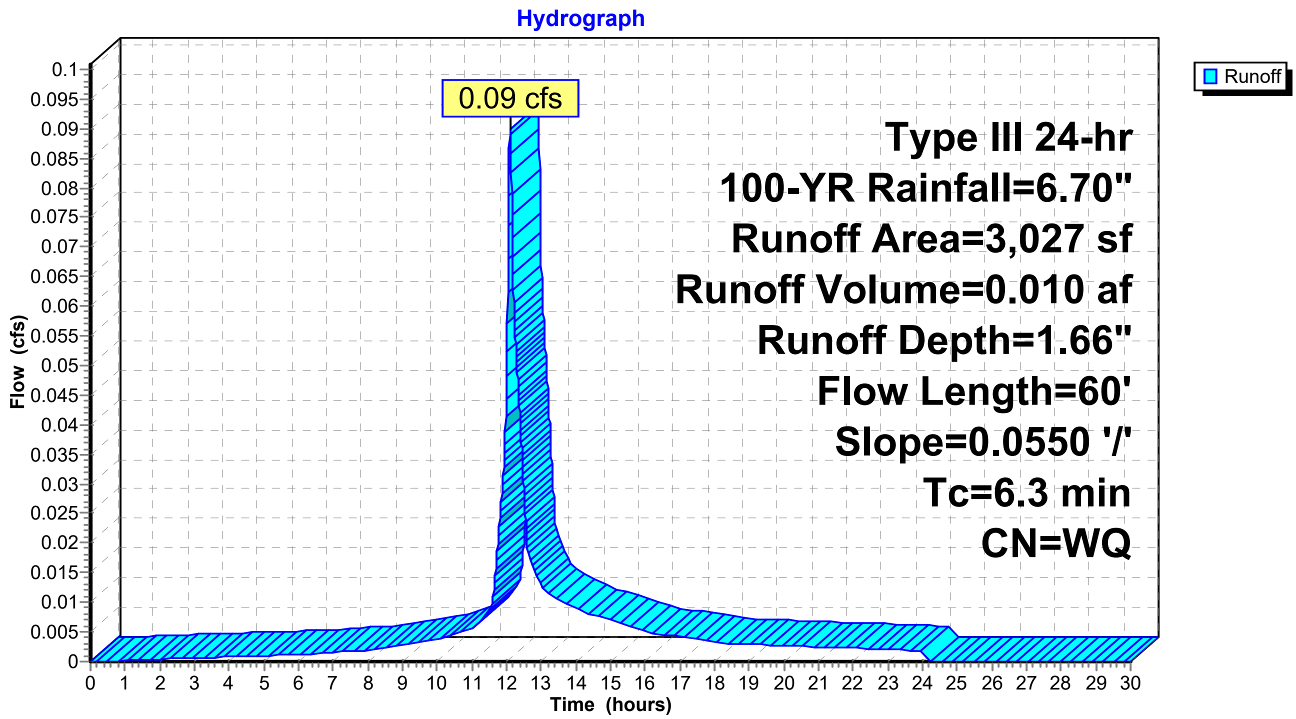
Runoff = 0.09 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 1.66"
Routed to Link 10E : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
520	98	Roofs HSG A
2,507	39	>75% Grass cover, Good HSG A
3,027		Weighted Average
2,507		82.82% Pervious Area
520		17.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	60	0.0550	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"

Subcatchment 9E: E3

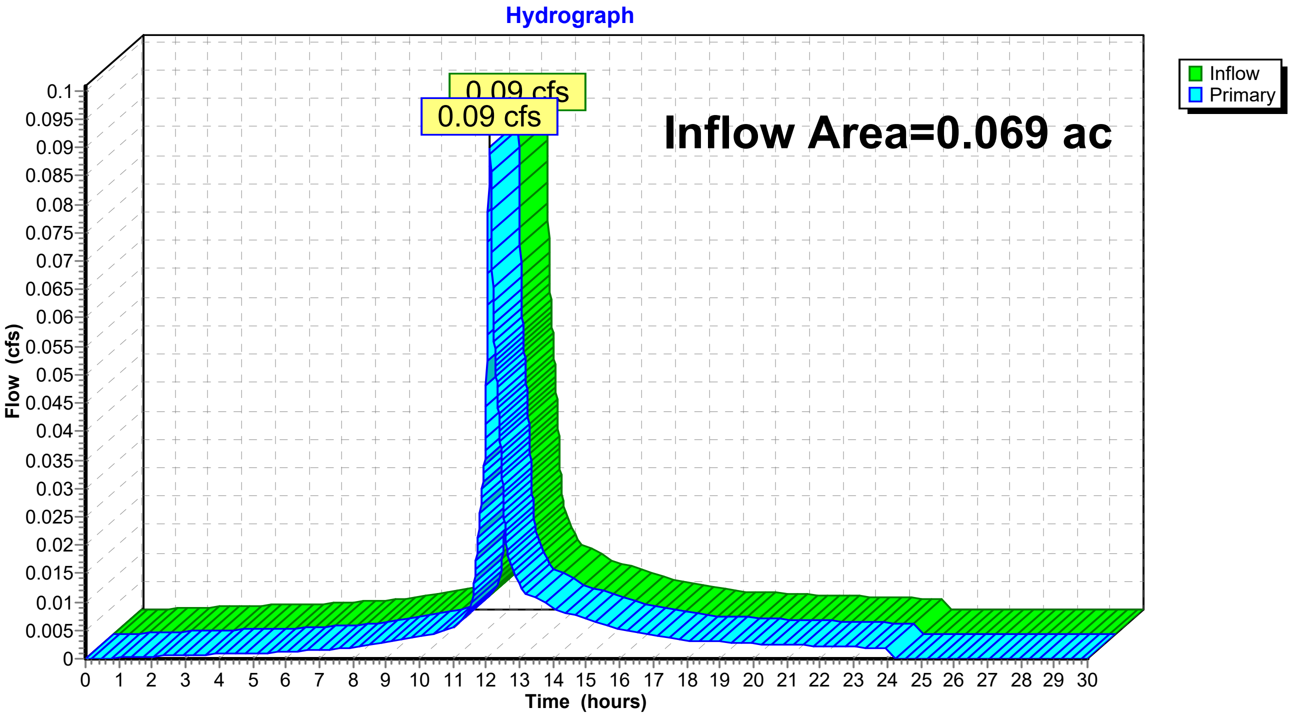


Summary for Link 10E: Design Point #3: Flow to 1052 Main Street

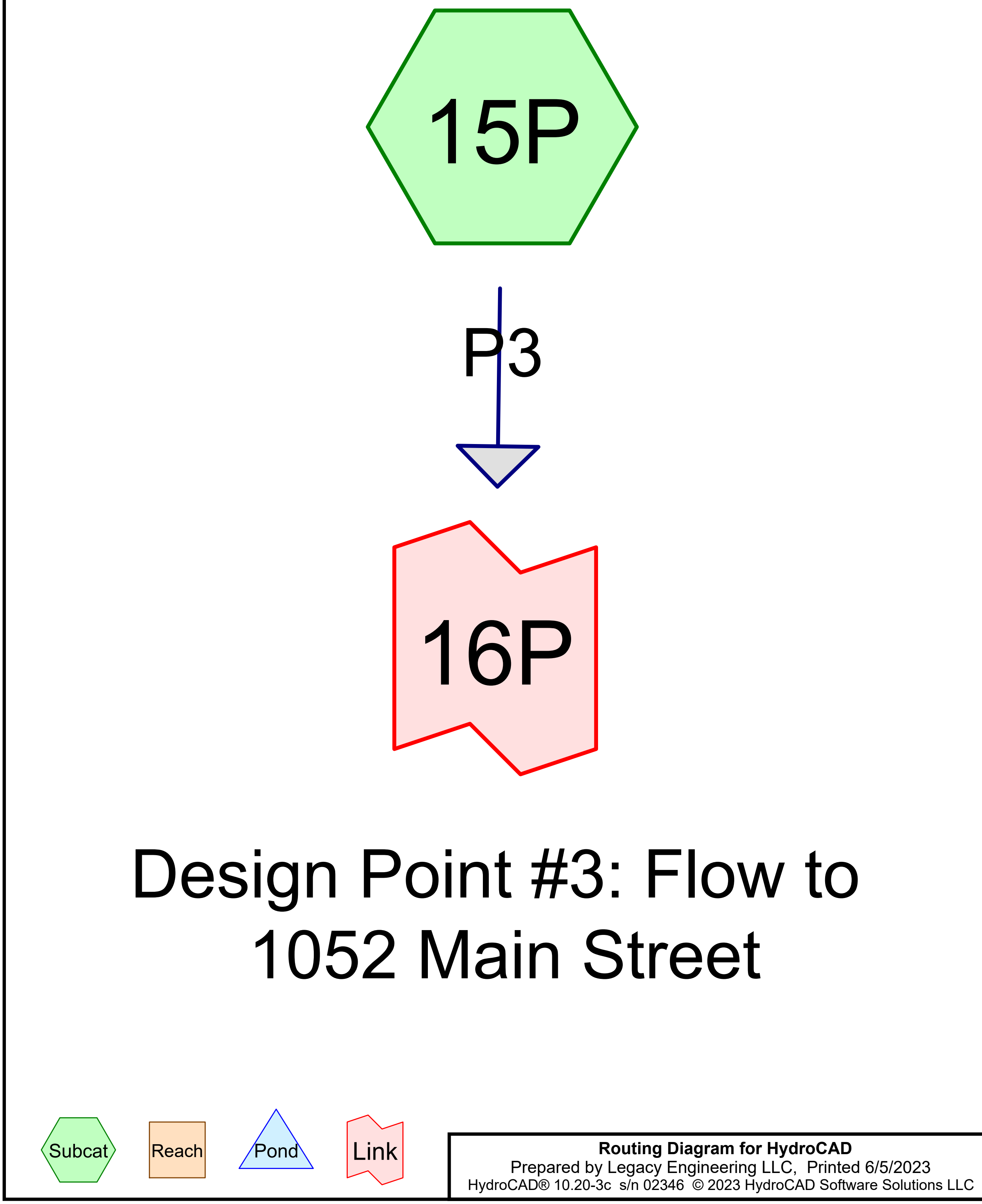
Inflow Area = 0.069 ac, 17.18% Impervious, Inflow Depth = 1.66" for 100-YR event
Inflow = 0.09 cfs @ 12.10 hrs, Volume= 0.010 af
Primary = 0.09 cfs @ 12.10 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 10E: Design Point #3: Flow to 1052 Main Street



DESIGN POINT #3: FLOW TO 1052 MAIN STREET PROPOSED CONDITIONS



Routing Diagram for HydroCAD
Prepared by Legacy Engineering LLC, Printed 6/5/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type III 24-hr		Default	24.00	1	2.50	2
2	2-YR	Type III 24-hr		Default	24.00	1	3.20	2
3	10-YR	Type III 24-hr		Default	24.00	1	4.70	2
4	50-YR	Type III 24-hr		Default	24.00	1	6.10	2
5	100-YR	Type III 24-hr		Default	24.00	1	6.70	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.066	39	>75% Grass cover, Good HSG A (15P)
0.066	**39**	**TOTAL AREA**

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15P: P3 Runoff Area=2,873 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=32' Slope=0.1900 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 16P: Design Point #3: Flow to 1052 Main Street Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 0.066 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 0.066 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 15P: P3

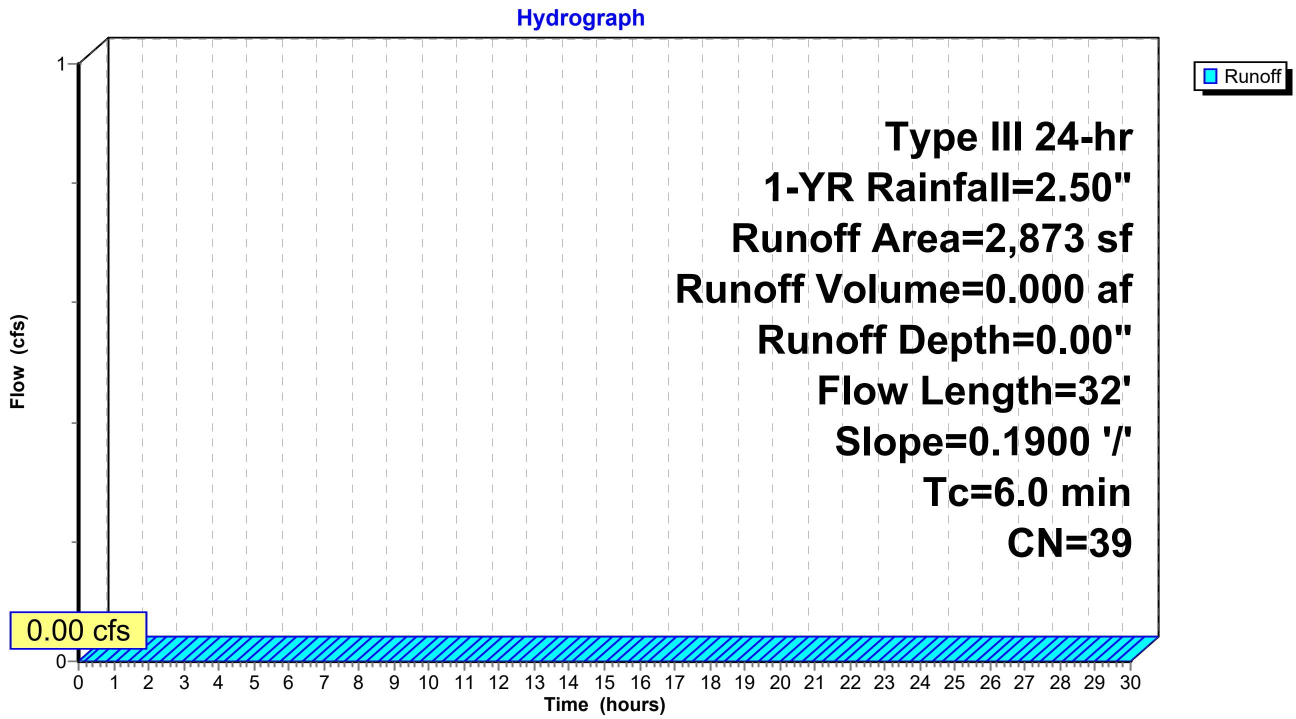
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 16P : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YR Rainfall=2.50"

Area (sf)	CN	Description
2,873	39	>75% Grass cover, Good HSG A
2,873		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	32	0.1900	0.23		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
2.3	32	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15P: P3

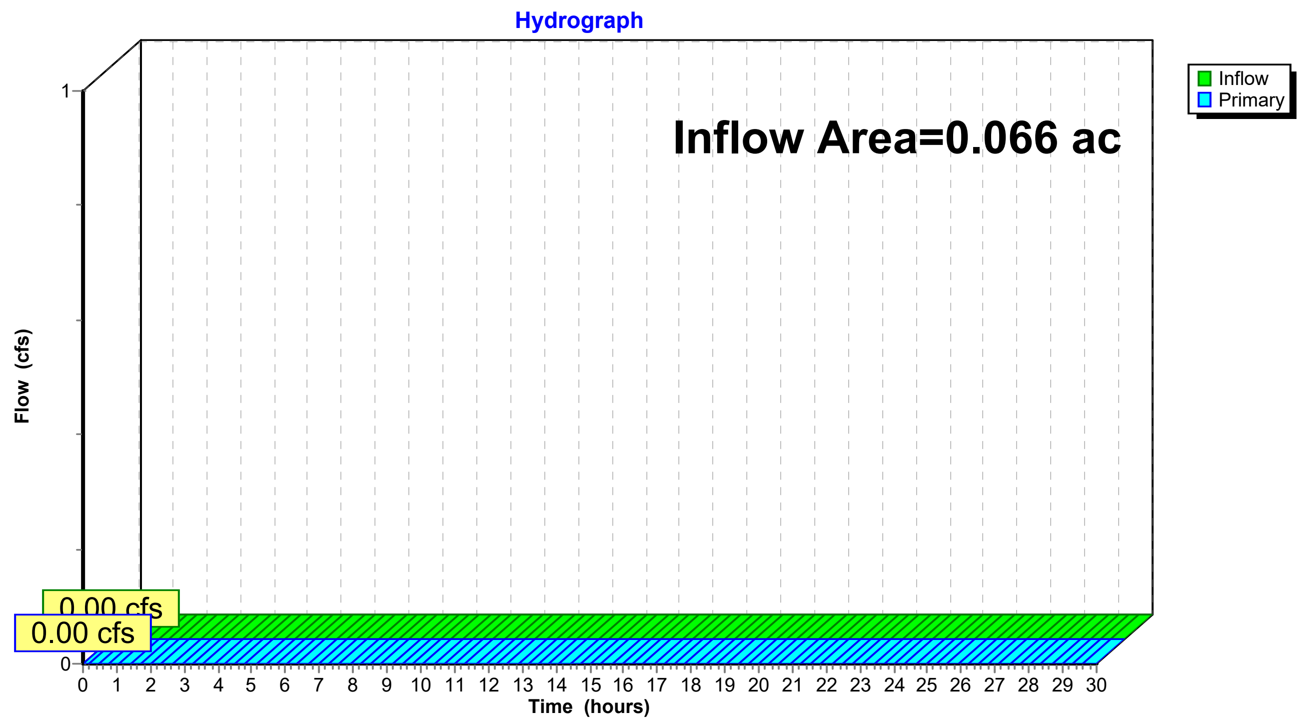


Summary for Link 16P: Design Point #3: Flow to 1052 Main Street

Inflow Area = 0.066 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 16P: Design Point #3: Flow to 1052 Main Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15P: P3 Runoff Area=2,873 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=32' Slope=0.1900 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Link 16P: Design Point #3: Flow to 1052 Main Street Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 0.066 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 0.066 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 15P: P3

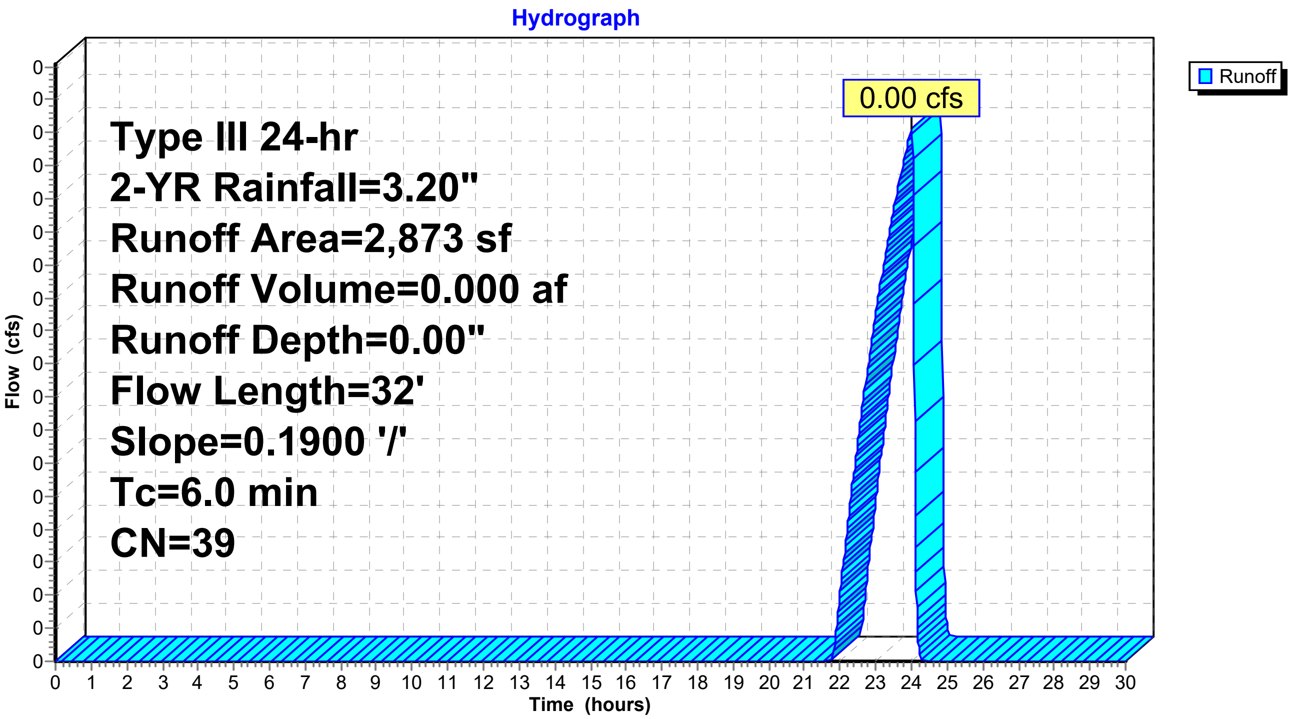
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link 16P : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.20"

Area (sf)	CN	Description
2,873	39	>75% Grass cover, Good HSG A
2,873		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	32	0.1900	0.23		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
2.3	32	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15P: P3

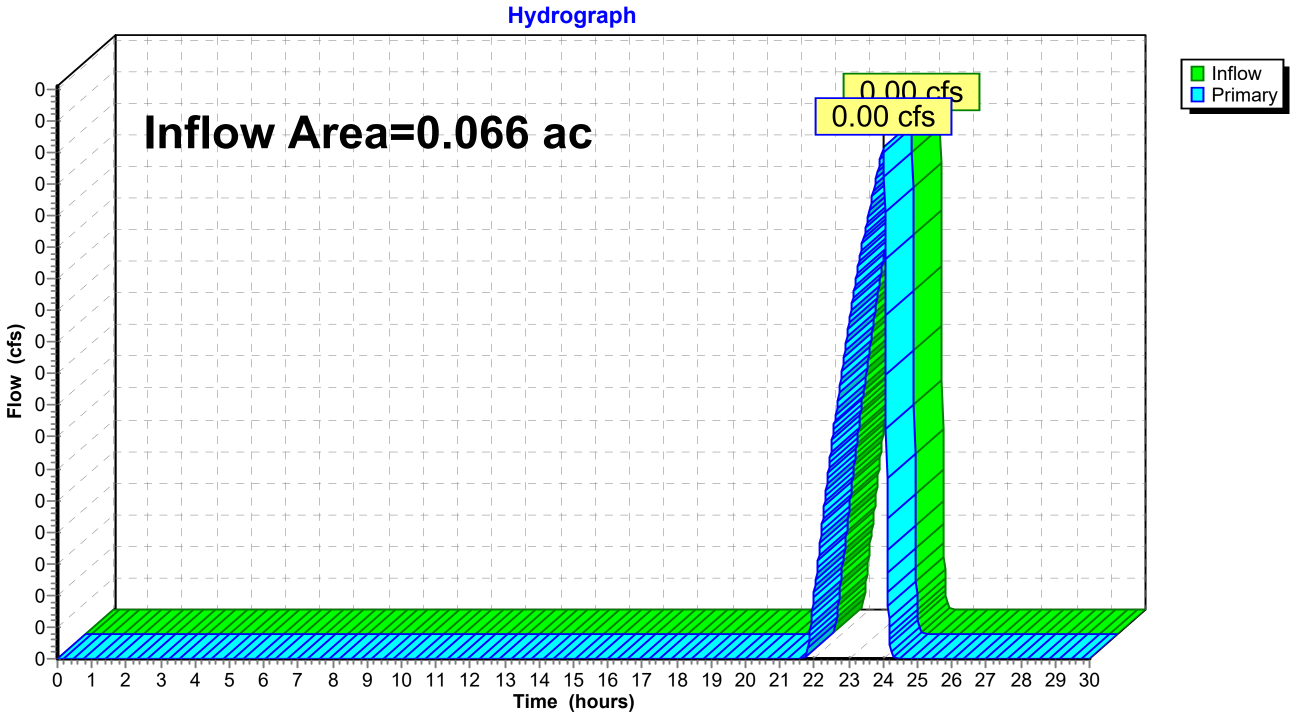


Summary for Link 16P: Design Point #3: Flow to 1052 Main Street

Inflow Area = 0.066 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 16P: Design Point #3: Flow to 1052 Main Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15P: P3 Runoff Area=2,873 sf 0.00% Impervious Runoff Depth=0.14"
Flow Length=32' Slope=0.1900 '/' Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

Link 16P: Design Point #3: Flow to 1052 Main Street Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Total Runoff Area = 0.066 ac Runoff Volume = 0.001 af Average Runoff Depth = 0.14"
100.00% Pervious = 0.066 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 15P: P3

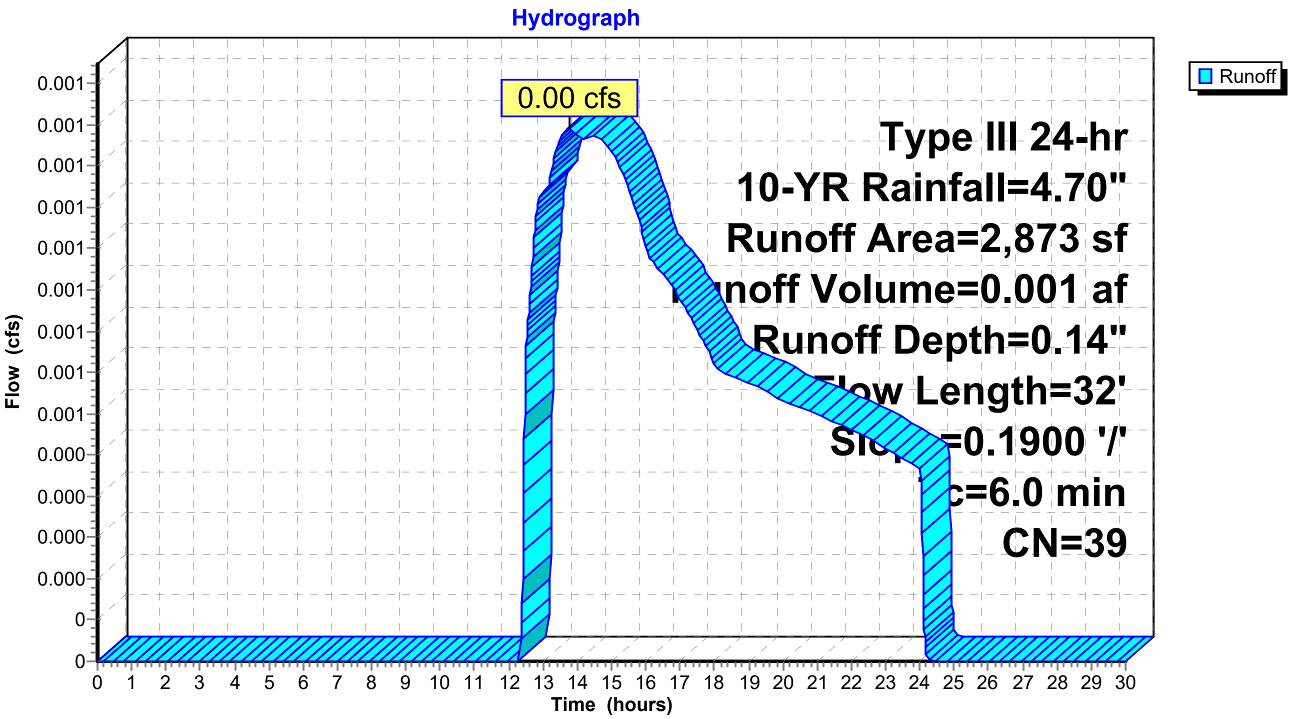
Runoff = 0.00 cfs @ 13.78 hrs, Volume= 0.001 af, Depth= 0.14"
Routed to Link 16P : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=4.70"

Area (sf)	CN	Description
2,873	39	>75% Grass cover, Good HSG A
2,873		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	32	0.1900	0.23		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
2.3	32	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15P: P3

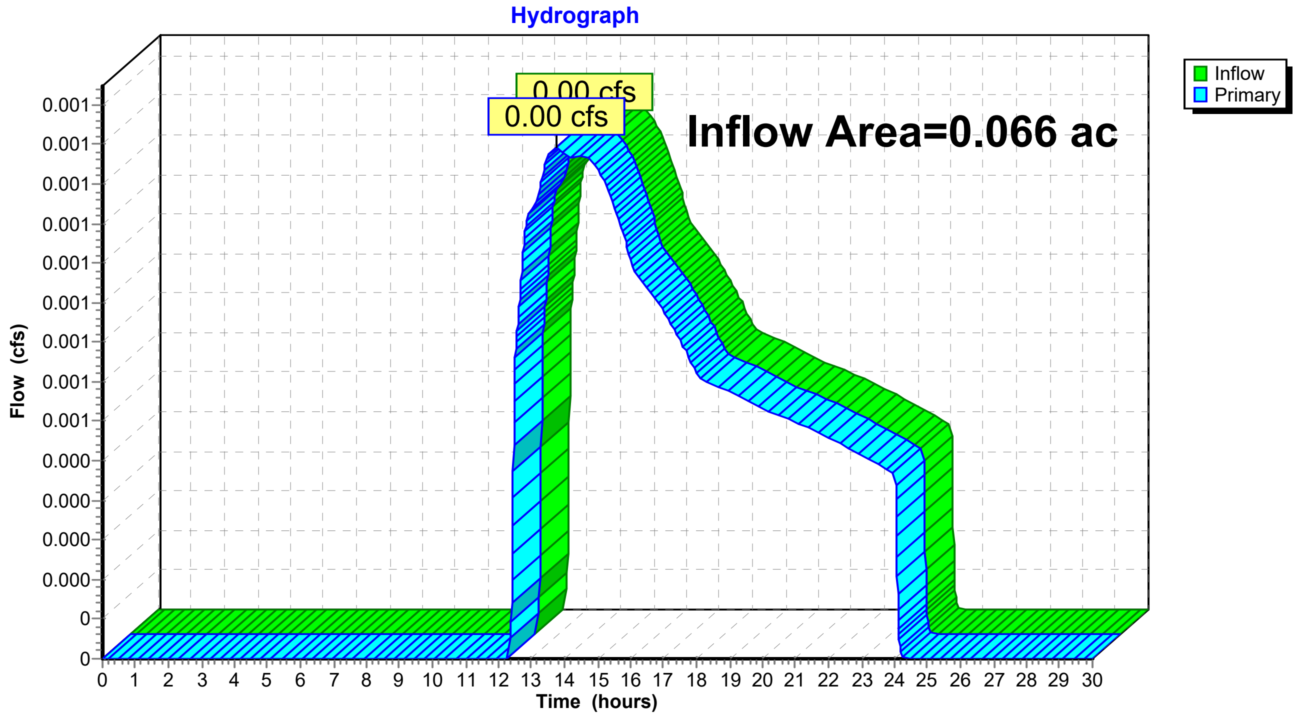


Summary for Link 16P: Design Point #3: Flow to 1052 Main Street

Inflow Area = 0.066 ac, 0.00% Impervious, Inflow Depth = 0.14" for 10-YR event
Inflow = 0.00 cfs @ 13.78 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 13.78 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 16P: Design Point #3: Flow to 1052 Main Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15P: P3 Runoff Area=2,873 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=32' Slope=0.1900 '/' Tc=6.0 min CN=39 Runoff=0.01 cfs 0.003 af

Link 16P: Design Point #3: Flow to 1052 Main Street Inflow=0.01 cfs 0.003 af
Primary=0.01 cfs 0.003 af

Total Runoff Area = 0.066 ac Runoff Volume = 0.003 af Average Runoff Depth = 0.47"
100.00% Pervious = 0.066 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 15P: P3

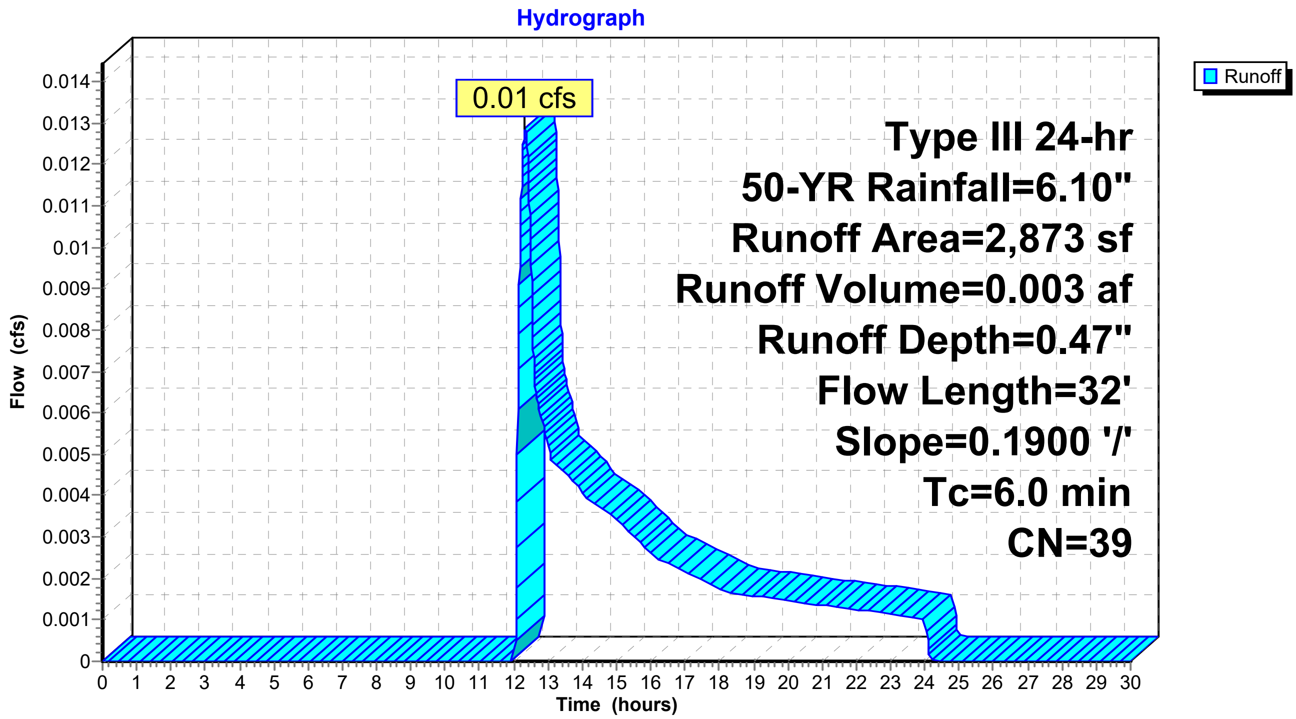
Runoff = 0.01 cfs @ 12.33 hrs, Volume= 0.003 af, Depth= 0.47"
Routed to Link 16P : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-YR Rainfall=6.10"

Area (sf)	CN	Description
2,873	39	>75% Grass cover, Good HSG A
2,873		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	32	0.1900	0.23		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
2.3	32	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15P: P3

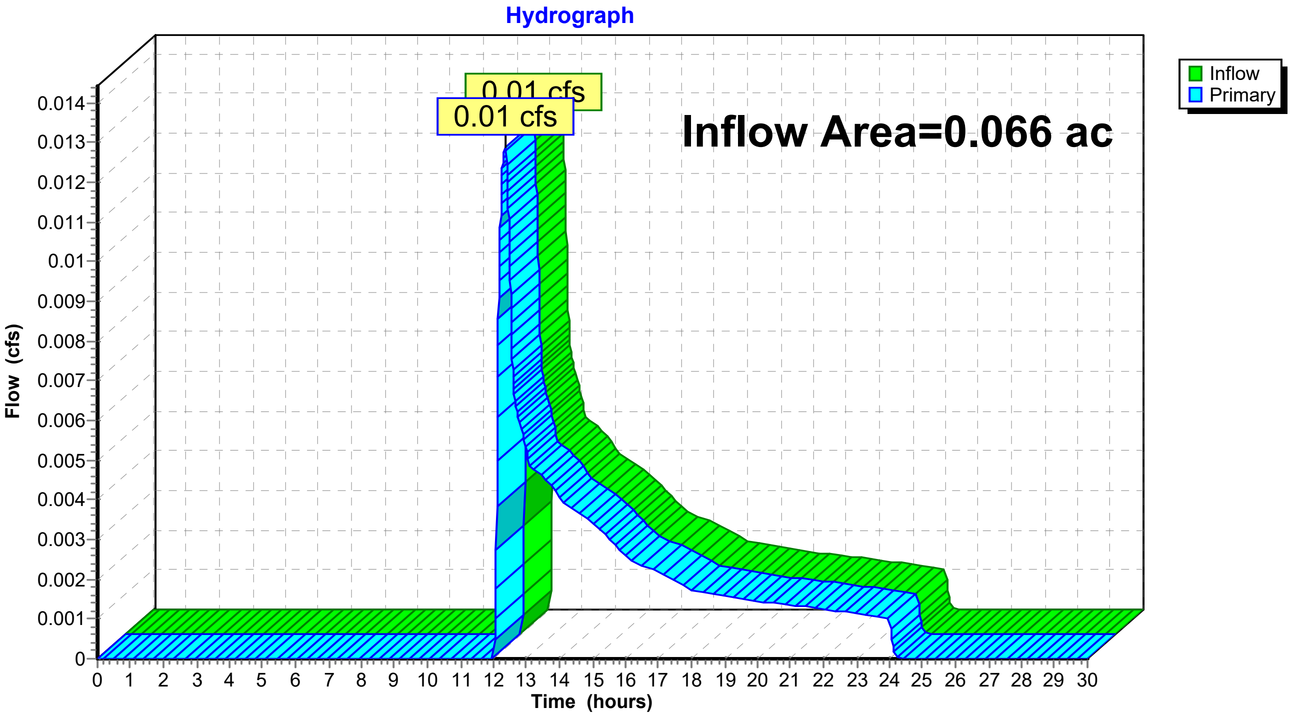


Summary for Link 16P: Design Point #3: Flow to 1052 Main Street

Inflow Area =	0.066 ac,	0.00% Impervious,	Inflow Depth =	0.47"	for 50-YR event	
Inflow =	0.01 cfs @	12.33 hrs,	Volume=	0.003 af		
Primary =	0.01 cfs @	12.33 hrs,	Volume=	0.003 af,	Atten= 0%,	Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 16P: Design Point #3: Flow to 1052 Main Street



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 15P: P3 Runoff Area=2,873 sf 0.00% Impervious Runoff Depth=0.66"
Flow Length=32' Slope=0.1900 '/' Tc=6.0 min CN=39 Runoff=0.02 cfs 0.004 af

Link 16P: Design Point #3: Flow to 1052 Main Street Inflow=0.02 cfs 0.004 af
Primary=0.02 cfs 0.004 af

Total Runoff Area = 0.066 ac Runoff Volume = 0.004 af Average Runoff Depth = 0.66"
100.00% Pervious = 0.066 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 15P: P3

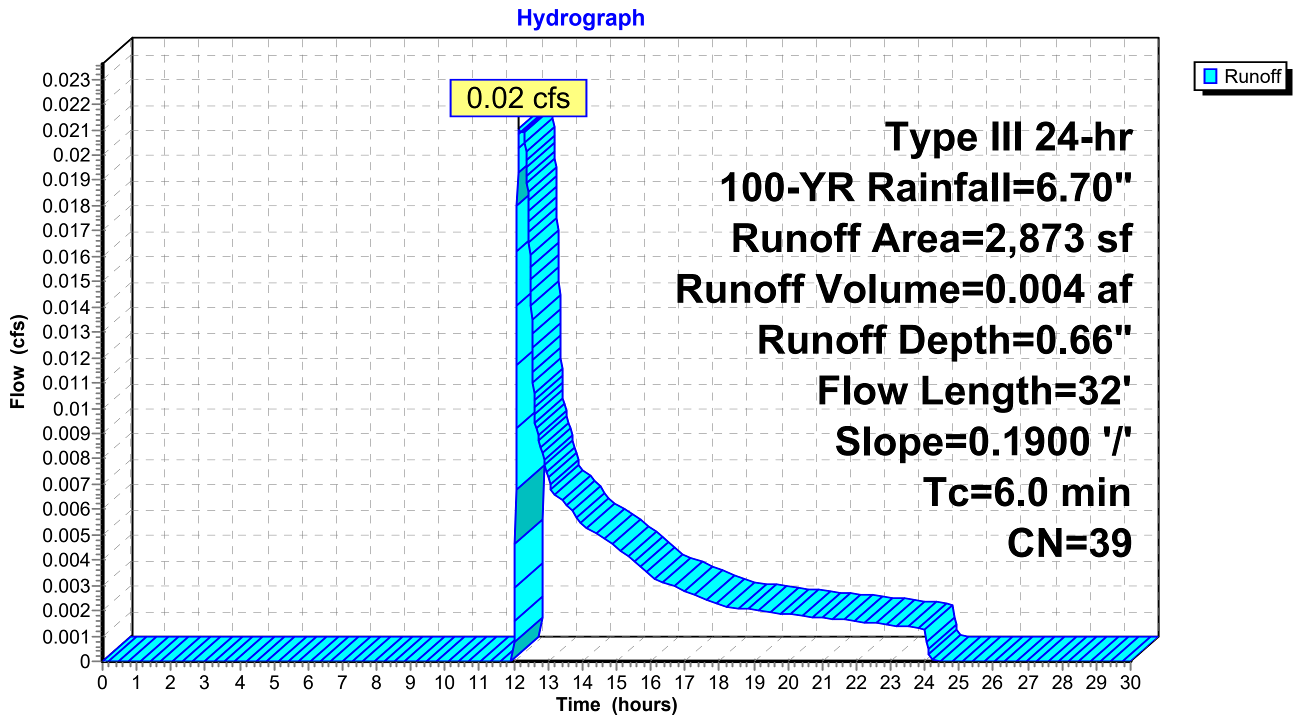
Runoff = 0.02 cfs @ 12.16 hrs, Volume= 0.004 af, Depth= 0.66"
Routed to Link 16P : Design Point #3: Flow to 1052 Main Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=6.70"

Area (sf)	CN	Description
2,873	39	>75% Grass cover, Good HSG A
2,873		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	32	0.1900	0.23		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
2.3	32	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15P: P3

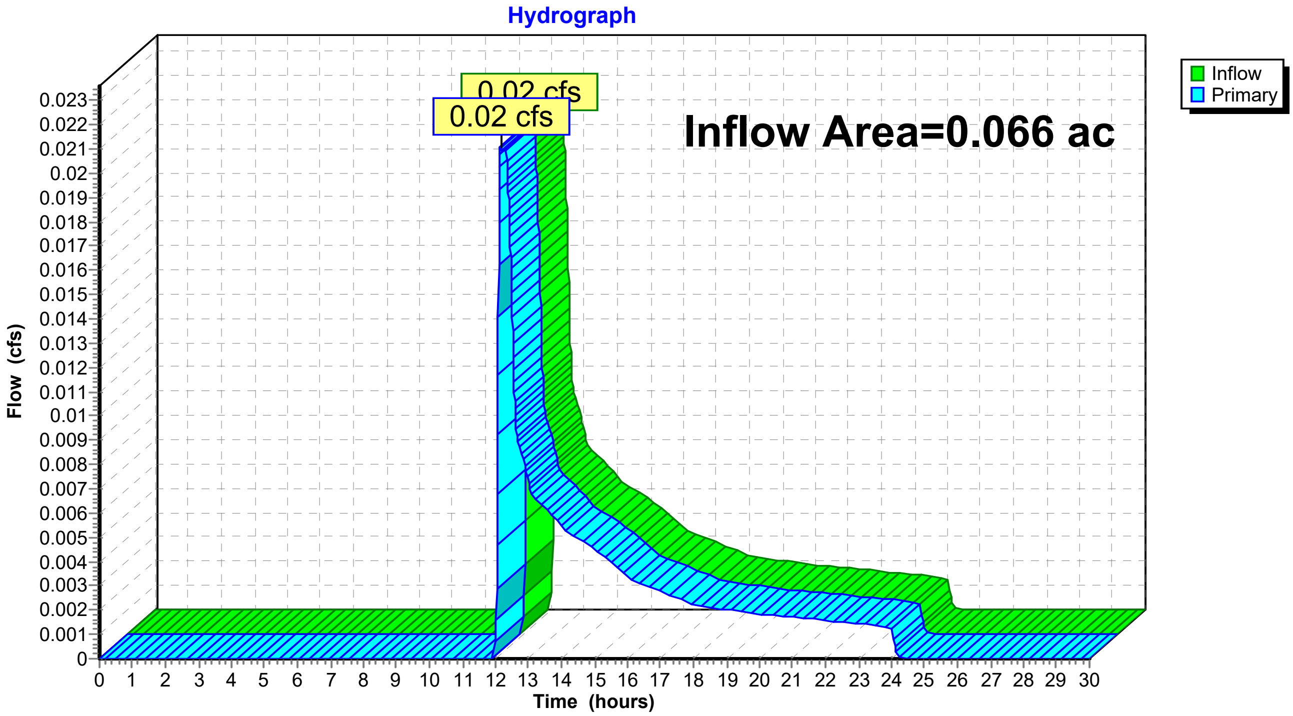


Summary for Link 16P: Design Point #3: Flow to 1052 Main Street

Inflow Area = 0.066 ac, 0.00% Impervious, Inflow Depth = 0.66" for 100-YR event
Inflow = 0.02 cfs @ 12.16 hrs, Volume= 0.004 af
Primary = 0.02 cfs @ 12.16 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

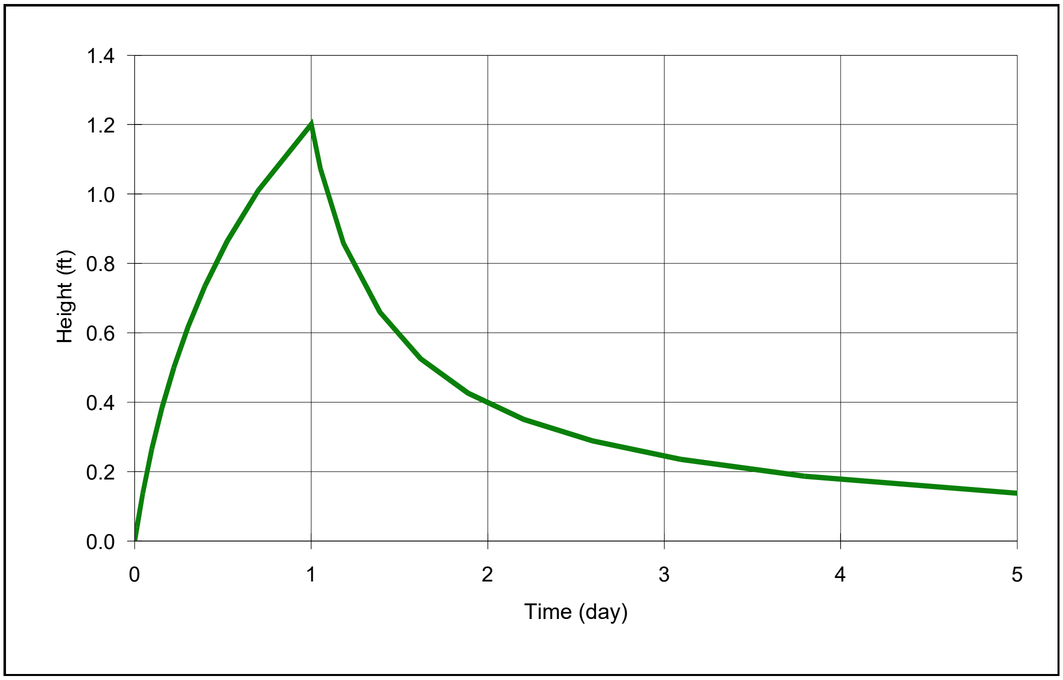
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Link 16P: Design Point #3: Flow to 1052 Main Street



ATTACHMENT L: Mounding Calculations

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Legacy Engineering

PROJECT: Existing Infiltration Field

ANALYST: Daniel J. Merrikin, P.E.

DATE: 5/11/2023 TIME: 1:04:33 PM

INPUT PARAMETERS

Application rate: 0.63 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 5 day
Fillable porosity: 0.2
Hydraulic conductivity: 4.8 ft/day
Initial saturated thickness: 20 ft
Length of application area: 59.5 ft
Width of application area: 20.8 ft
Constant head boundary used at: 200 ft
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 779.688 cft

MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
0	0.04
0	0.14
0.1	0.27
0.2	0.38
0.2	0.5
0.3	0.62
0.4	0.74
0.5	0.86
0.7	1.01
1	1.2
1.1	1.07
1.2	0.86
1.4	0.66
1.6	0.53
1.9	0.43
2.2	0.35
2.6	0.29
3.1	0.24
3.8	0.19
5	0.14

ATTACHMENT M: First Defense Proprietary Treatment Unit

Hydro International®

First Defense® High Capacity

A Simple Solution for your Trickiest Sites

Product Profile

The First Defense® High Capacity is an enhanced vortex separator that combines an effective stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® High Capacity is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (**Table 1**, next page).

Applications

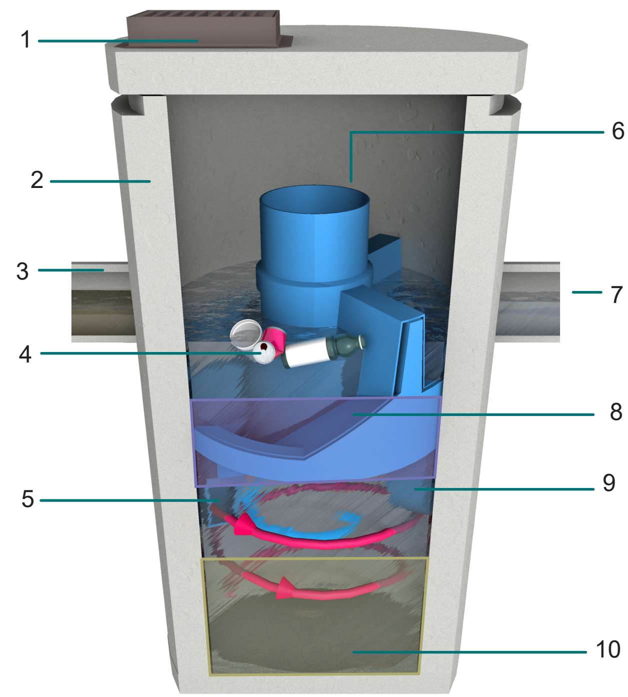
- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 450% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

Verified by NJCAT and NJDEP

Fig.1 The First Defense® High Capacity has internal components designed to efficiently capture pollutants and prevent washout at peak flows.



Components

1. Inlet Grate (optional)
2. Precast chamber
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Inlet Chute
6. Internal Bypass
7. Outlet pipe
8. Oil and Floatables Storage
9. Outlet chute
10. Sediment Storage Sump

How it Works

The First Defense® High Capacity has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons (**Fig.1**).

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

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Stormwater Solutions
hydro-int.com/firstdefensehc

First Defense® High Capacity

Sizing & Design

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.

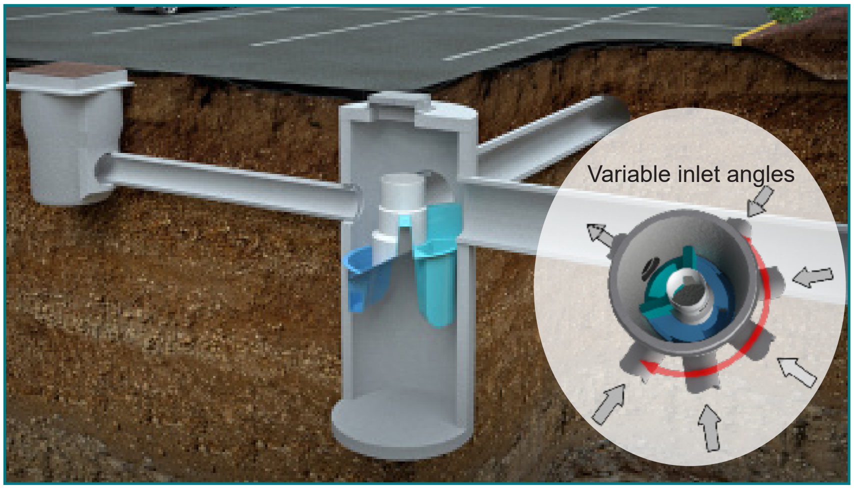

Fig 2. Works with multiple inlet pipes and grates

Inspection and Maintenance

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

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

Sizing Calculator for Engineers

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

Go to hydro-int.com/sizing to access the tool.

Fig 3. Maintenance is done with a vactor truck

Table 1. First Defense® High Capacity Design Criteria.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	110µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd^3 / m^3)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.06 / 45.3	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 50.9	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.34 / 66.2	2.94 / 82.1	20 / 566	24 / 600	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.23 / 133.9	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

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Technical Abstract
First Defense®

Hydro International®

Performance Verification of TSS Removal with OK-110 Silica Sand

The First Defense® is a cost competitive device used to capture oil, debris and sediment from stormwater runoff. Commonly used as a pre-treatment device, the First Defense® effectively captures the bulk of the pollutant load when used upstream of more sensitive treatment devices such as infiltration systems.

The First Defense® is equally well suited as a stand alone treatment device for use on space constrained sites. Whereas pretreatment devices are used to capture gross solids, stand alone treatment devices must remove gross solids and finer particles. Stand alone treatment units must also prevent pollutant washout during intense storm events, as there is no additional treatment system downstream to capture pollutants scoured from the upstream system before runoff is discharged to the environment.

The First Defense® uses the principles of rotational flow to provide greater capture efficiency of fine suspended solids as compared to that of conventional gravity separation chambers. Furthermore, its unique internal bypass prevents washout of captured pollutants during intense storm flows. Flows exceeding the design treatment flow rate are diverted away from the pollutant storage sump through an enclosed bypass chute. This arrangement protects captured pollutants from high scour velocities during high-intensity rainfall without requiring the use of an additional bypass junction manhole (Fig.1).

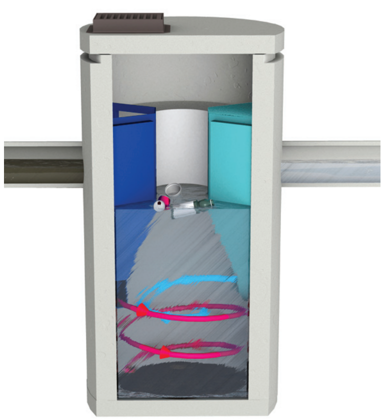


Fig.1 The First Defense® captures fine sediments as well as gross pollutants, making it an effective stand-alone treatment device for space constrained sites.

Performance Test Objectives and Protocols

To evaluate the treatment performance of the First Defense®, a 4-ft diameter unit was tested at Hydro International's hydraulics laboratory in Portland, ME. The primary objectives were to: 1) independently verify the removal efficiency of Total Suspended Solids (TSS) with a fine particle size gradation, and 2) verify that the First Defense® protects previously captured pollutants from washout during high-flow bypass mode.

TSS removal tests were conducted according to the Maine Department of Environmental Protection (MEDEP) Test Protocols, which specify OK-110 sediment as the test pollutant (Fig.2).

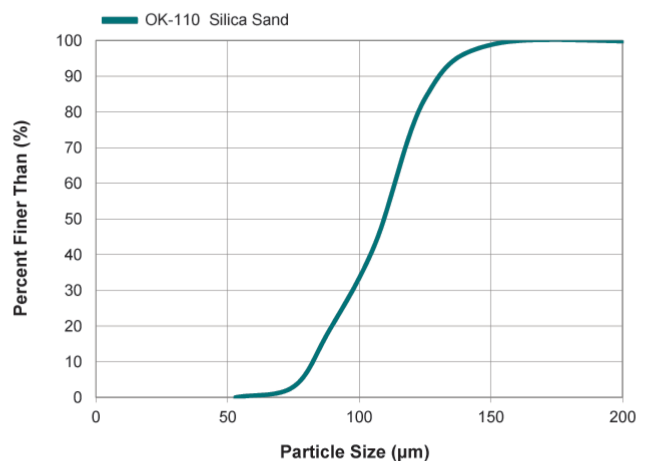


Fig.2 Particle size distribution of the OK-110 silica blend, which contains a large fraction of fine particle sizes that are targeted by stand-alone stormwater treatment devices.

Washout tests were conducted in conformance with the 2009 New Jersey DEP protocols for Hydrodynamic Separators, which require pre-loading the sump of the test unit to 50% capacity with OK-110 (Fig.3).

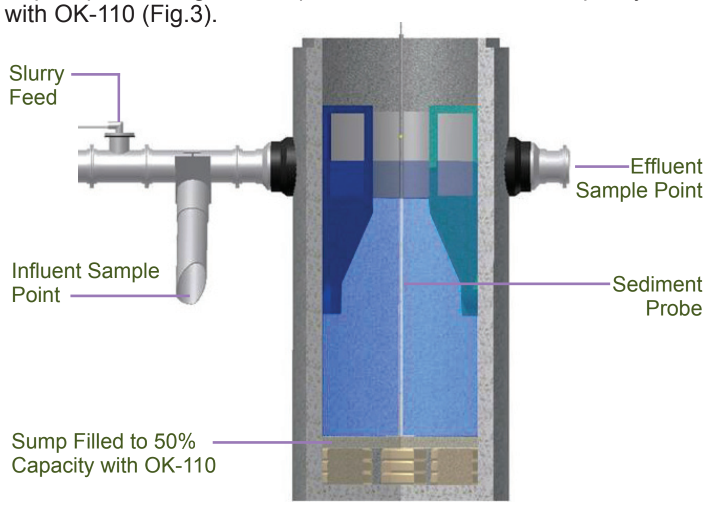


Fig.3 The 4-ft First Defense® was tested with its sump pre-loaded to 50% capacity with OK-110 sediment.

First Defense®

Washout Test Procedures

Washout tests were conducted at multiple flow rates ranging from 0.88 to 3.8 cfs. At each tested flow rate, clean water from a 23,000 gallon reservoir was pumped to the First Defense® for 15 minutes (Fig.4).

At the conclusion of the test run, the sediment depth was measured and compared to the initial depth. Results showed no measureable decrease in the depth of sediment pre-loaded in the sump.

The first round of retention results were confirmed by retesting at the same flow rates while measuring changes in effluent concentrations. While pumping clean water from the reservoir through the pre-loaded sump for 25 minutes at each flow rate, influent and effluent samples were collected at 5-minute intervals. The samples were analyzed for TSS by an independent, state-certified laboratory utilizing APHA SM2540D.

The analytical results for all test runs showed non-detectable levels of TSS.

A representative from the University of New Hampshire Stormwater Center observed all of the washout tests as an independent witness. This witness reviewed data analysis and quality control procedures of the external laboratory used for sample analysis, and provided a written report to independently verify the observations.

TSS Removal Efficiency Test Procedures

TSS removal efficiency tests were run at 0.7 cfs, the targeted Design Treatment Flow Rate of the 4-ft First Defense®. A slurry mixture of F-60 was pumped into the clean water pipeline conveying water from a 23,000 gal reservoir to the First Defense® (Fig.4).

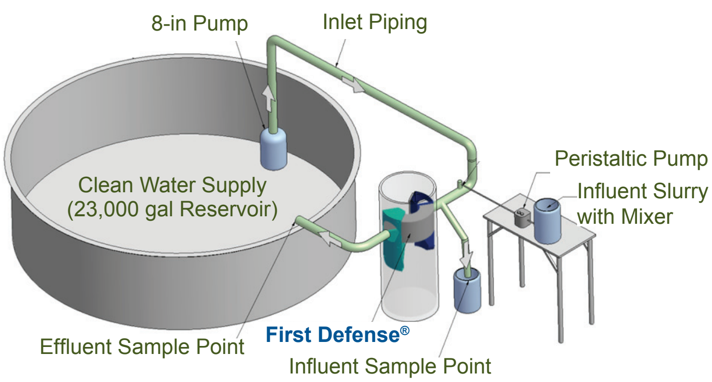


Fig.4 The First Defense® was tested at Hydro International's Portland, Maine test facility.

Influent and effluent samples were taken at pre-determined intervals spaced by residence time. All samples had a minimum volume of 500 mL. Background influent and effluent samples were collected and analyzed to ensure clean water supplied from the reservoir did not exceed non-detectable concentrations of 4 mg/L TSS.

Samples were independently analyzed for TSS using APHA SM2540D by an accredited third party laboratory.

Test Results

Overall, the First Defense® met and exceeded the scour test requirements of the NJDEP protocol, showing no measurable effluent TSS concentration and no measurable decrease in depth of the pre-loaded sediment at flows up to 500% of the model's Design Treatment Flow Rate.

Overall, the test results show that the First Defense® exceeds 94% removal for the mean flow rate of 0.65 cfs (293 gpm), and would be expected to exceed 90% removal at the target flow rate of 0.71 cfs (Table 1). These tests were independently witnessed and reported by Jeff Dennis of the Maine DEP. As stated in his written assessment:

"All paired sample removal efficiencies exceeded 80%, as did their mean whether or not they were adjusted for background concentrations, so it is very clear that at 290 gpm, a 4-ft diameter First Defense® unit can remove at least 80% of OK-110 grade silica sand, and seems to be able to remove more than 90% at this flow."

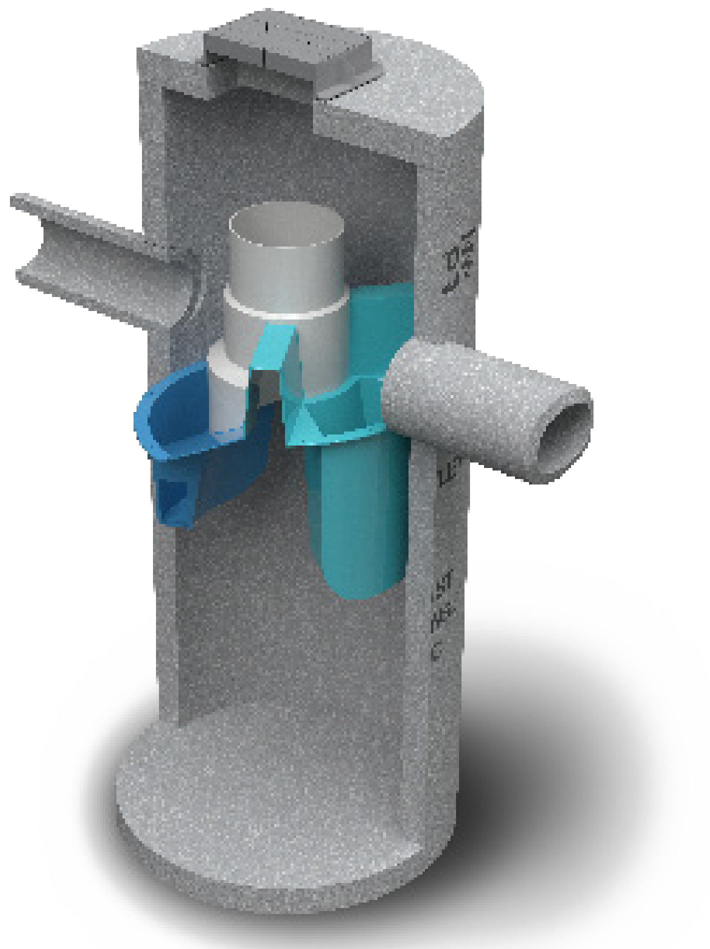
Table 1. OK-110 Sediment Removal Efficiency.

Test Run	Flow Rate	Influent TSS Concentration	Effluent TSS Concentration	Removal Efficiency
	(cfs)	(mg/L)	(mg/L)	(%)
1	0.61	299.8	13.7	95.4
2	0.73	268.6	16.8	93.7
3	0.67	189.1	12.6	93.3
4	0.66	279.1	15.8	94.3
5	0.58	291.1	17.3	94.1
6	0.63	267.2	15.8	94.1
Mean	0.65	265.5	15.2	94.2

Conclusions

The results confirm that the First Defense® effectively captures fine sediment at its treatment flow rate, and that fine sediments captured in the pollutant storage sump are protected from washout during intense storm events. This confirms that the First Defense® is a suitable stand-alone stormwater treatment device for sites where larger treatment systems are not practical solutions.

Hydro International



Operation and Maintenance Manual

First Defense® High Capacity and First Defense® Optimum

Vortex Separator for Stormwater Treatment

Table of Contents

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I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints.

The two product models described in this guide are the First Defense® High Capacity and the First Defense® Optimum; they are inspected and maintained identically.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for “offline” arrangements using separate junction manholes
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

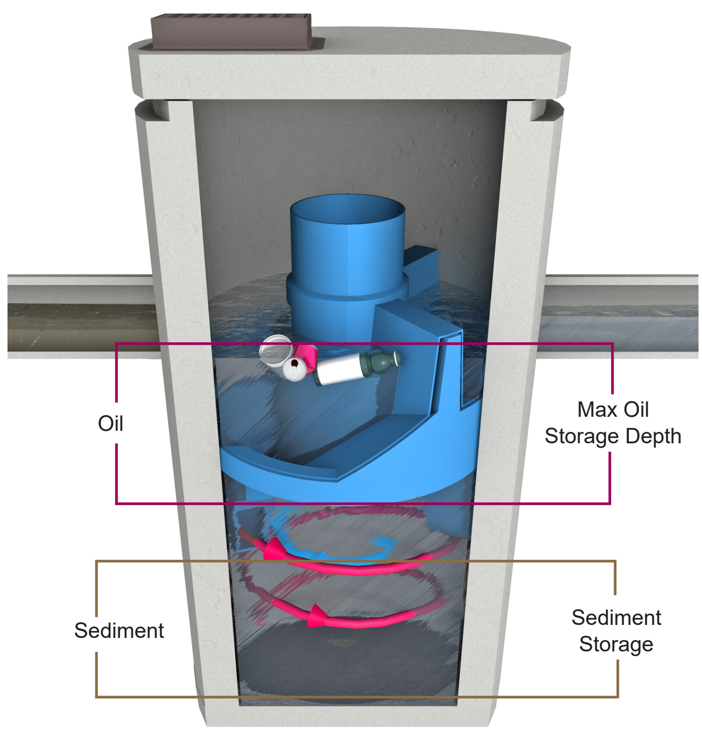

Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components have modified geometries allowing greater design flexibility to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2). First Defense® model sizes (diameter) are shown in Table 1.

III. Maintenance

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

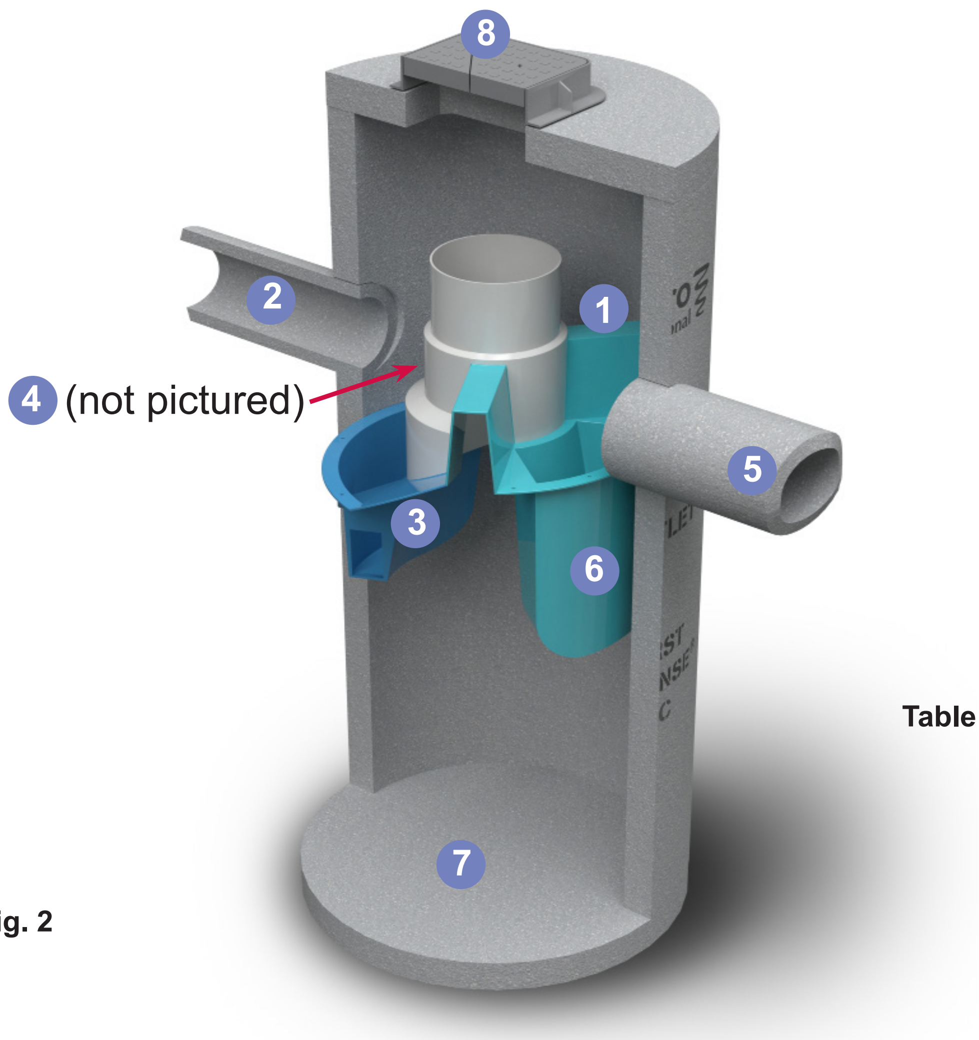

Fig. 2

Table 1

First Defense® Model Sizes
(ft / m) diameter
3 / 0.9
4 / 1.2
5 / 1.5
6 / 1.8
7 / 2.1
8 / 2.4
10 / 3.0

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense® have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.

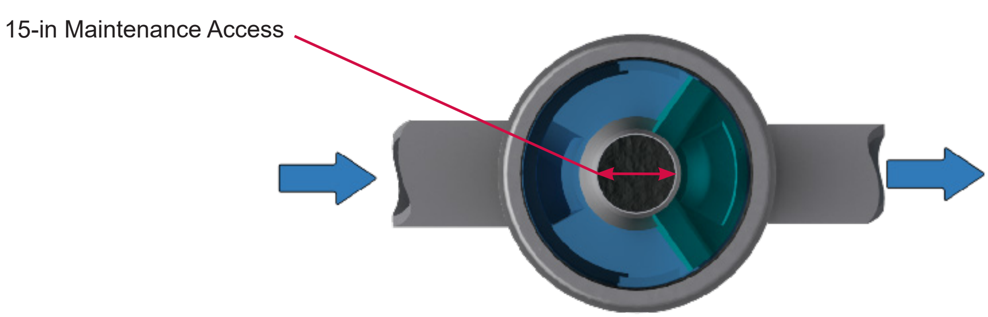

Fig.3 The central opening to the sump of the First Defense®is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Fig.4 Floatables are removed with a vactor hose

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.4).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose to be lowered to the base of the sump.

Scheduling

- Floatables and sump clean out are typically conducted once a year during any season.

- Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Recommended Equipment

- Safety Equipment (traffic cones, etc)

- Crow bar or other tool to remove grate or lid

- Pole with skimmer or net (if only floatables are being removed)

- Sediment probe (such as a Sludge Judge®)

- Vactor truck (flexible hose recommended)

- First Defense® Maintenance Log

Floatables and Sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose or with the skimmer or net

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Maintenance at a Glance

Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	