

STORMWATER MANAGEMENT REPORT

Project Address: 709 Main St
Hingham, MA 02043

Date Prepared: June 15, 2026

Project Number: 26021

Prepared for: Michael Ahenr
709 Main Street
Hingham, MA 02043



PREPARED BY



**102 State Rd | SUITE F
North Dartmouth, MA 02747
Tel: (508)-730-9515**

STORMWATER MANAGEMENT REPORT

709 MAIN STREET, HINGHAM MA

PRE-DEVELOPMENT CONDITIONS

The project is located at 709 Main Street, Hingham, Massachusetts, identified by the Town of Hingham Assessors as PID 126/0/52. The existing site consists of a two-story dwelling, detached parking structure, detached shed, paved driveway, impervious hardscape features including walkways, and landscaped lawn areas.

The total lot area is approximately 32,214 square feet. Existing impervious surfaces consist of approximately 3,290 square feet of roof area and 3,034 square feet of paved driveway and other impervious hardscape areas, for a total existing impervious area of 6,324 square feet. The remaining 27,900 square feet consists of landscaped open space.

Under existing conditions, runoff from the front portion of the lot generally flows overland toward the southern corner of the property, discharging toward the intersection of Mill Lane and the existing driveway entrance on Main Street, identified as Point of Analysis 1 (POA-1) (southern corner of the property).

POST-DEVELOPMENT CONDITIONS

The project proposes partial demolition of the existing dwelling, demolition of the existing detached parking structure, removal of the majority of the existing paved parking area, construction of an addition with parking beneath/adjacent to the existing dwelling, construction of a detached pool house with an accessory dwelling unit above, installation of a new in-ground pool with associated patio area, and construction of a new pervious paver driveway.

Under proposed conditions, the site will consist of approximately 4,658 square feet of roof area, 4,585 square feet of driveway and hardscape area, and 24,971 square feet of landscaped open space. The proposed project will result in an increase in impervious area; however, the project includes stormwater management improvements designed to provide groundwater recharge, improve water quality, and reduce peak runoff rates when compared to existing conditions.

The proposed stormwater management system includes an underground infiltration/detention system, identified as System P1, consisting of ten (10) CULTEC 330XLHD chambers. System P1 has been designed to provide peak runoff attenuation for the 2-year, 10-year, 25-year, and 100-year storm events, while also providing groundwater recharge that is not currently provided under existing site conditions.

The proposed grading has been designed so that runoff from the driveway, hardscape, and roof areas will be directed toward the proposed drainage collection system. Runoff from paved driveway and hardscape areas will be collected by a trench drain and conveyed through a closed pipe system to the underground infiltration/detention system. Roof runoff will be collected by roof leaders and downspouts, conveyed through proposed 6-inch storm drain pipes, and routed directly to the infiltration/detention system.

Based on the stormwater analysis, the proposed project will decrease peak runoff rates for the 2-year, 10-year, 25-year, and 100-year storm events when compared to existing conditions. The tables below summarize the pre-development and post-development drainage areas, peak runoff rates, and design parameters used for the analysis, including soil data and rainfall information.

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The proposed underground infiltration/detention system has been designed to provide the required groundwater recharge and to fully drain within 72 hours. Refer to the post-development HydroCAD report for supporting calculations.

Table 1. – Summary of Pre and Post Dev Conditions

Areas	Ground Cover Changes		
	Pre-Dev	Post-Dev	Change
Open Space	6,266 SF	5,413 SF	-853 SF
Roof Area	998 SF	2,006 SF	+1,008 SF
Imp Area	1,213 SF	1,058 SF	-155 SF
Design Storm	POA 1: South Corner		
	Pre-Dev	Post-Dev	Change
2 Year	0.01 cfs (0.003 af)	0.00 cfs (0.002 af)	-0.01 cfs (-0.001 af)
10 Year	0.16 cfs (0.030 af)	0.11 cfs (0.023 af)	-0.05 cfs (-0.007 af)
25 Year	0.50 cfs (0.056 af)	0.36 cfs (0.044 af)	-0.06 cfs (-0.012 af)
100 Year	1.27 cfs (0.108 af)	0.99 cfs (0.086 af)	-0.28 cfs (-0.022 af)

RAINFALL DATA

Peak stormwater discharges have been determined for total rainfall estimated for the 2, 10, 25 and 100-year storm event recurrence intervals are outlined in Table 1 – Summary of Rainfall Data.

Table 2. – Summary of Rainfall Data

Reference	Rainfall Recurrence Interval	24 Hour Rainfall Depth
NOAA Atlas 14	2-Year Storm	3.39 inches
	10-Year Storm	5.19 inches
	25-Year Storm	6.31 inches
	100-Year Storm	8.04 inches

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SOILS DATA

Based upon the USDA – NRCS Soil Conservation Service (SCS) Web Soil Survey for Norfolk, soils underlying the Project (excluding surface water bodies) are classified as follows:

Table 3. – Summary of USDA Soil Classification

Soil Classification	Hydrologic Soil Group (HSG)
266 A/B Warwick Fine Sandy Loam	[HSG (A)]

Subsurface investigations comprised of two (2) test pits were conducted at site on January 23, 2025.

In all test pits the parent material of Gravely and Medium Sand was encountered. Based on this the Rawls Rate (exfiltration rate) has been established at 8.27 in/hr.

DRAWDOWN ANALYSIS

Drawdown Time: $T = V / (K \cdot A)$

where T = drawdown time (hours)

V = volume below outlet (ft³)

K = hydraulic conductivity (ft/hr)

= (8.27 in/hr) * (1 ft/12 in)

= 0.689 ft/hr

A = bottom area of infiltration system (ft²)

Infiltration System P1 $V = 1,103 \text{ ft}^3$

$K = 0.689 \text{ ft/hr}$

$A = 480 \text{ ft}^2$

$T = (1,103 \text{ ft}^3) / (0.689 \text{ ft/hr})(480 \text{ ft}^2)$

= **3.4 hours** < 72 hours



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for **Plymouth County, Massachusetts**



June 17, 2026

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



MAP LEGEND

	Area of Interest (AOI)		Spoil Area
	Area of Interest (AOI)		Stony Spot
Soils			Very Stony Spot
	Soil Map Unit Polygons		Wet Spot
	Soil Map Unit Lines		Other
	Soil Map Unit Points		Special Line Features
Special Point Features		Water Features	
	Blowout		Streams and Canals
	Borrow Pit	Transportation	
	Clay Spot		Rails
	Closed Depression		Interstate Highways
	Gravel Pit		US Routes
	Gravelly Spot		Major Roads
	Landfill		Local Roads
	Lava Flow		Aerial Photography
	Marsh or swamp		
	Mine or Quarry		
	Miscellaneous Water		
	Perennial Water		
	Rock Outcrop		
	Saline Spot		
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: Plymouth County, Massachusetts
Survey Area Data: Version 18, Sep 5, 2025

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
266A	Warwick fine sandy loam, 0 to 3 percent slopes	4.3	70.8%
266B	Warwick fine sandy loam, 3 to 8 percent slopes	1.8	29.2%
Totals for Area of Interest		6.0	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

Custom Soil Resource Report

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Plymouth County, Massachusetts

266A—Warwick fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: v8b1
Landscape: Outwash plains
Elevation: 10 to 300 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Warwick and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Warwick

Setting

Landscape: Outwash plains
Landform: Terraces, Deltas, Outwash plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits

Typical profile

Oe - 0 to 3 inches: moderately decomposed plant material
Ap - 3 to 8 inches: gravelly fine sandy loam
Bw1 - 8 to 13 inches: very gravelly fine sandy loam
Bw2 - 13 to 17 inches: extremely gravelly fine sandy loam
BC - 17 to 27 inches: extremely gravelly sandy loam
2C - 27 to 63 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash

Custom Soil Resource Report

Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 10 percent

Landscape: Outwash plains

Landform: Terraces, Kames, Outwash plains

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Tread

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

Quonset

Percent of map unit: 10 percent

Landscape: Outwash plains

Landform: Eskers, Terraces, Deltas, Kames, Outwash plains

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Tread

Down-slope shape: Convex

Across-slope shape: Convex

Hydric soil rating: No

266B—Warwick fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: v8b2

Landscape: Outwash plains

Elevation: 10 to 300 feet

Mean annual precipitation: 41 to 54 inches

Mean annual air temperature: 43 to 54 degrees F

Frost-free period: 145 to 240 days

Farmland classification: All areas are prime farmland

Map Unit Composition

Warwick and similar soils: 80 percent

Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Warwick

Setting

Landscape: Outwash plains

Landform: Terraces, Deltas, Outwash plains

Landform position (two-dimensional): Summit, shoulder

Landform position (three-dimensional): Tread

Down-slope shape: Convex

Across-slope shape: Convex

Custom Soil Resource Report

Parent material: Coarse-loamy eolian deposits over sandy and gravelly glaciofluvial deposits

Typical profile

Oe - 0 to 3 inches: moderately decomposed plant material
Ap - 3 to 8 inches: gravelly fine sandy loam
Bw1 - 8 to 13 inches: very gravelly fine sandy loam
Bw2 - 13 to 17 inches: extremely gravelly fine sandy loam
BC - 17 to 27 inches: extremely gravelly sandy loam
2C - 27 to 63 inches: extremely gravelly coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Quonset

Percent of map unit: 10 percent
Landscape: Outwash plains
Landform: Eskers, Terraces, Deltas, Kames, Outwash plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Merrimac

Percent of map unit: 10 percent
Landscape: Outwash plains
Landform: Terraces, Kames, Outwash plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No



102 Shale Rd | Unit # F
North Dartmouth, MA 02747
Tel: (508)-730-9515

MICHAEL AHERN
709 MAIN STREET
HINGHAM, MA 02043

Owner: Applicant

Condition:

FOR PERMIT

Map Type:

709 MAIN STREET
HINGHAM MA
(PARCEL ID: 126/0/52)

Date	Description	By	Rev

PROPOSED
SITE IMPROVEMENTS
FOR 709 MAIN ST

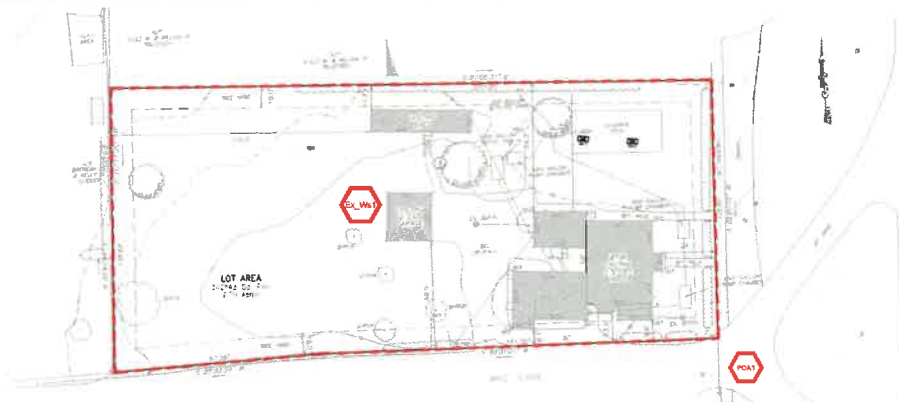
WATERSHED PLAN

Drawing Title:

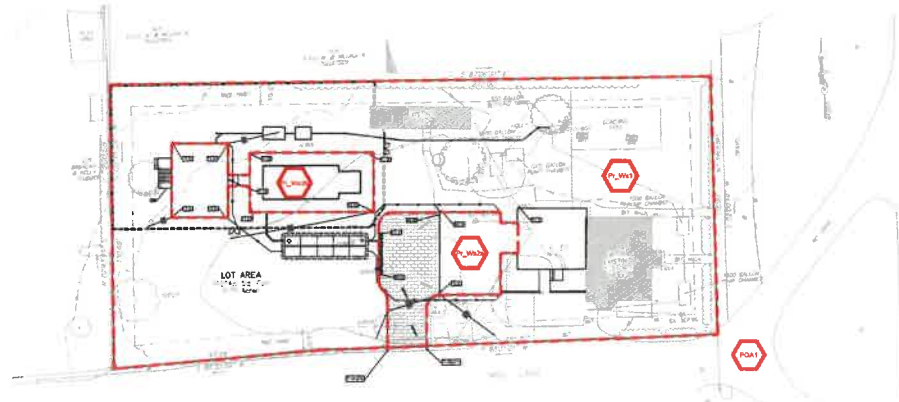
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Design by: JA	Reviewed by: JA	Scale: AS SHOWN
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Drawing No: WS	
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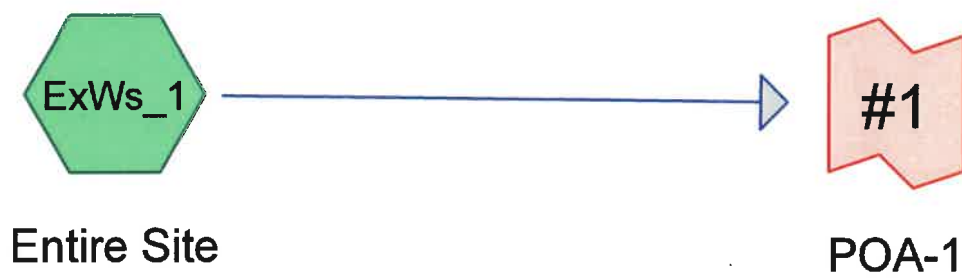


PRE-DEVELOPMENT WATERSHED			
WATERSHED			
EXISTING WATERSHED (1.00 AC)			
- PAVED DRIVEWAY WATERSHED	=	100 SF	
- ROOF WATERSHED	=	1,000 SF	
- GRASS/PAVED LOT/DRIVEWAY	=	2,900 SF	



POST-DEVELOPMENT WATERSHED			
WATERSHED			
PROPOSED WATERSHED (1.00 AC)			
- PAVED DRIVEWAY WATERSHED	=	1,000 SF	
- ROOF WATERSHED	=	2,000 SF	
- GRASS/PAVED LOT/DRIVEWAY	=	2,000 SF	
WATERSHED			
PROPOSED WATERSHED (1.00 AC)			
- PAVED DRIVEWAY WATERSHED	=	1,000 SF	
- ROOF WATERSHED	=	1,175 SF	
- GRASS/PAVED LOT/DRIVEWAY	=	175 SF	
WATERSHED			
PROPOSED WATERSHED (1.00 AC)			
- PAVED DRIVEWAY WATERSHED	=	1,175 SF	
- ROOF WATERSHED	=	800 SF	
- GRASS/PAVED LOT/DRIVEWAY	=	1,025 SF	





709_Main_Pret-dev

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	Type III 24-hr		Default	24.00	1	3.39	2
2	10-YR	Type III 24-hr		Default	24.00	1	5.19	2
3	25-YR	Type III 24-hr		Default	24.00	1	6.31	2
4	100-YR	Type III 24-hr		Default	24.00	1	8.04	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.640	39	>75% Grass cover, Good, HSG A (ExWs_1)
0.069	98	Unconnected pavement, HSG A (ExWs_1)
0.076	98	Unconnected roofs, HSG C (ExWs_1)
0.785	50	TOTAL AREA

709_Main_Pret-dev

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Type III 24-hr 2-YR Rainfall=3.39"

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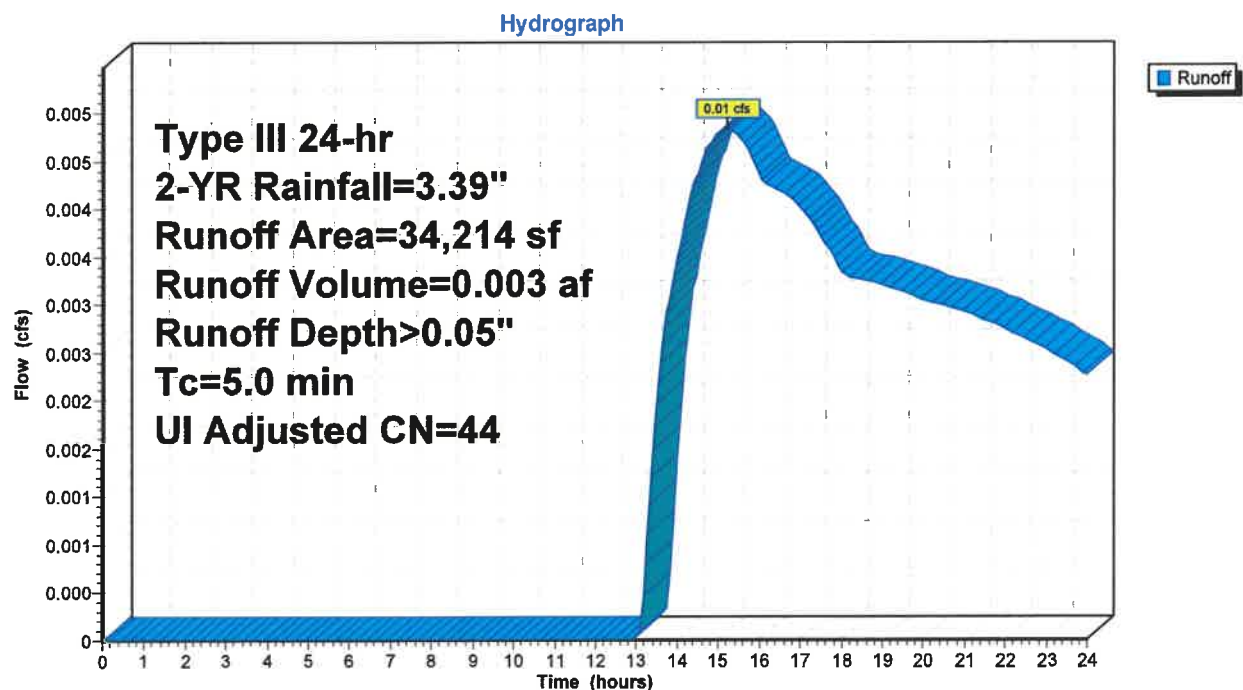
Summary for Subcatchment ExWs_1: Entire Site

Runoff = 0.01 cfs @ 15.21 hrs, Volume= 0.003 af, Depth> 0.05"
Routed to Link #1 : POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.39"

Area (sf)	CN	Adj	Description
27,900	39		>75% Grass cover, Good, HSG A
3,290	98		Unconnected roofs, HSG C
3,024	98		Unconnected pavement, HSG A
34,214	50	44	Weighted Average, UI Adjusted
27,900			81.55% Pervious Area
6,314			18.45% Impervious Area
6,314			100.00% Unconnected

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

Subcatchment ExWs_1: Entire Site

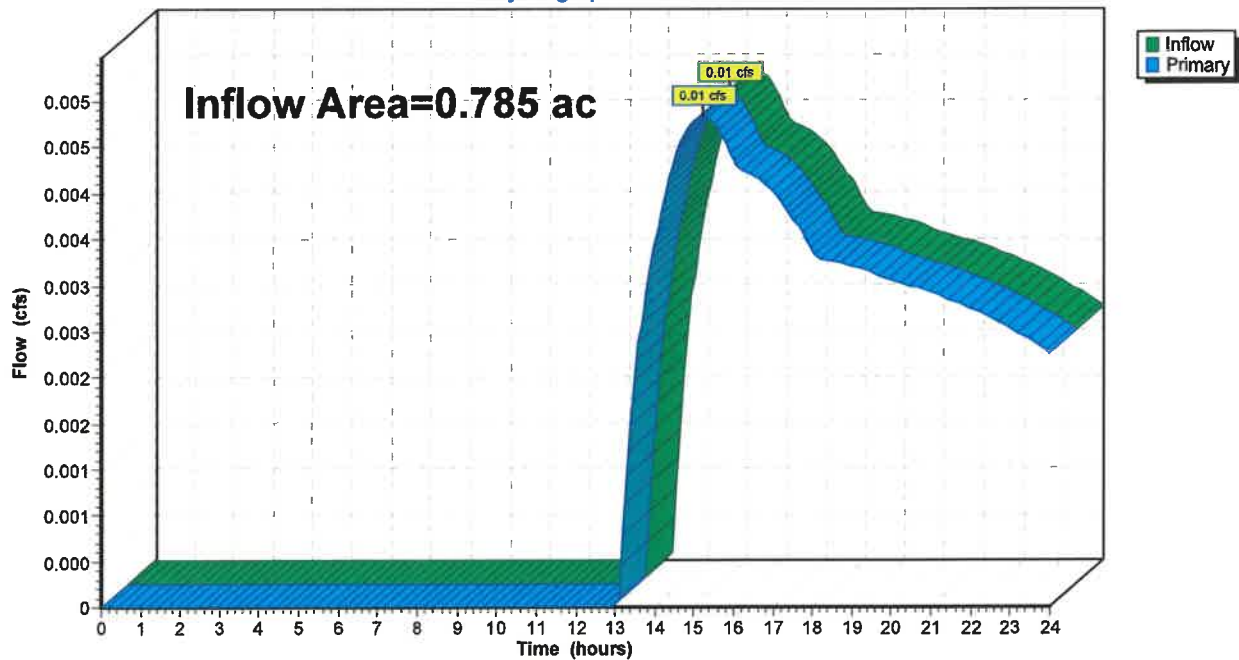
Summary for Link #1: POA-1

Inflow Area = 0.785 ac, 18.45% Impervious, Inflow Depth > 0.05" for 2-YR event
Inflow = 0.01 cfs @ 15.21 hrs, Volume= 0.003 af
Primary = 0.01 cfs @ 15.21 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link #1: POA-1

Hydrograph



709_Main_Pret-dev

Prepared by KBM Design Group

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Type III 24-hr 10-YR Rainfall=5.19"

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Summary for Subcatchment ExWs_1: Entire Site

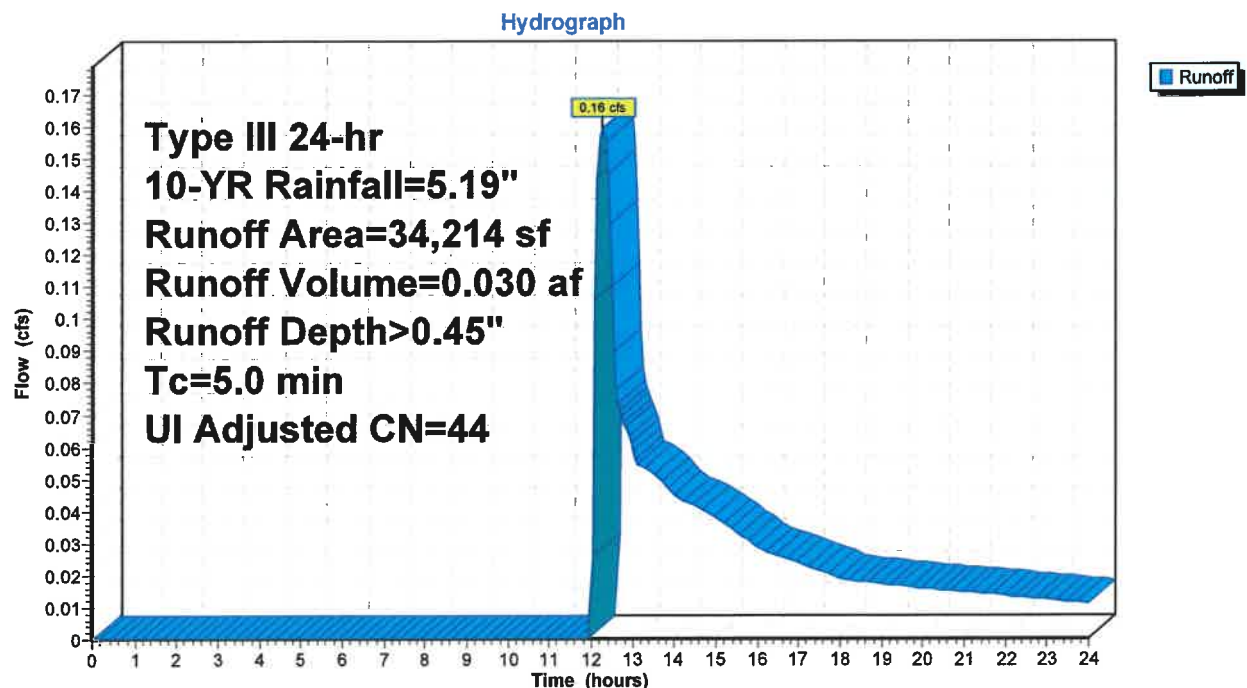
Runoff = 0.16 cfs @ 12.29 hrs, Volume= 0.030 af, Depth> 0.45"
Routed to Link #1 : POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=5.19"

Area (sf)	CN	Adj	Description
27,900	39		>75% Grass cover, Good, HSG A
3,290	98		Unconnected roofs, HSG C
3,024	98		Unconnected pavement, HSG A
34,214	50	44	Weighted Average, UI Adjusted
27,900			81.55% Pervious Area
6,314			18.45% Impervious Area
6,314			100.00% Unconnected

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

Subcatchment ExWs_1: Entire Site



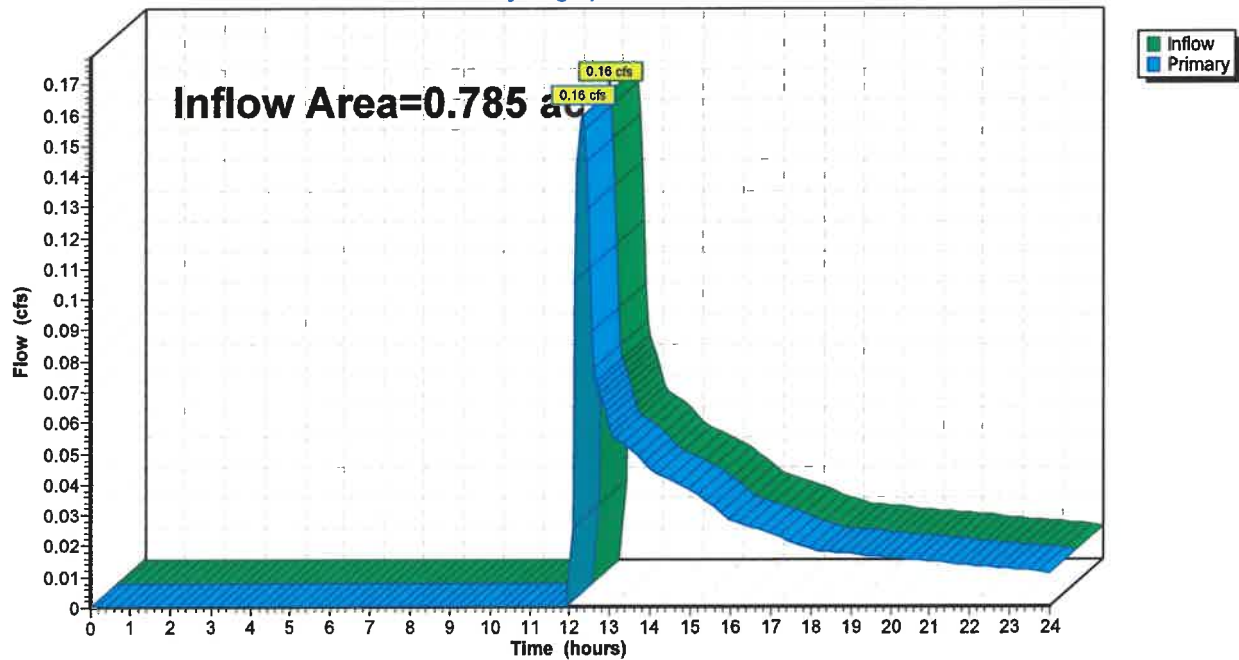
Summary for Link #1: POA-1

Inflow Area = 0.785 ac, 18.45% Impervious, Inflow Depth > 0.45" for 10-YR event
Inflow = 0.16 cfs @ 12.29 hrs, Volume= 0.030 af
Primary = 0.16 cfs @ 12.29 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link #1: POA-1

Hydrograph



709_Main_Pret-dev

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Type III 24-hr 25-YR Rainfall=6.31"

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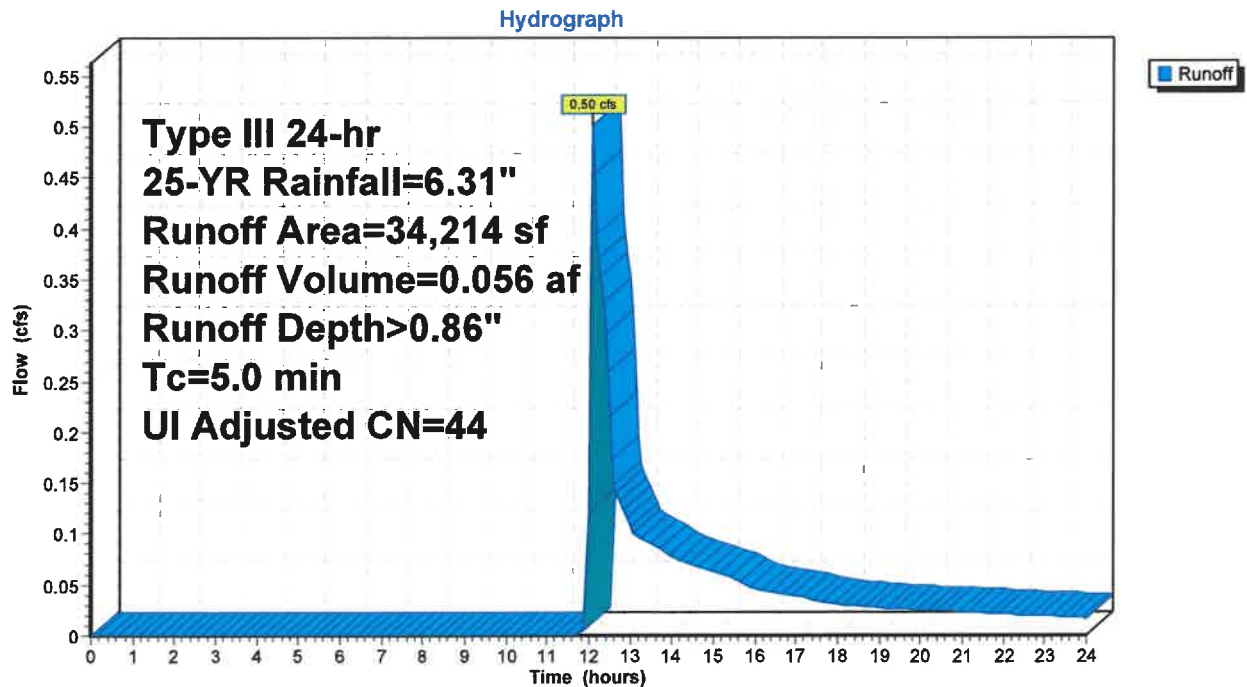
Summary for Subcatchment ExWs_1: Entire Site

Runoff = 0.50 cfs @ 12.11 hrs, Volume= 0.056 af, Depth> 0.86"
Routed to Link #1 : POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.31"

Area (sf)	CN	Adj	Description
27,900	39		>75% Grass cover, Good, HSG A
3,290	98		Unconnected roofs, HSG C
3,024	98		Unconnected pavement, HSG A
34,214	50	44	Weighted Average, UI Adjusted
27,900			81.55% Pervious Area
6,314			18.45% Impervious Area
6,314			100.00% Unconnected

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

Subcatchment ExWs_1: Entire Site

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Type III 24-hr 25-YR Rainfall=6.31"

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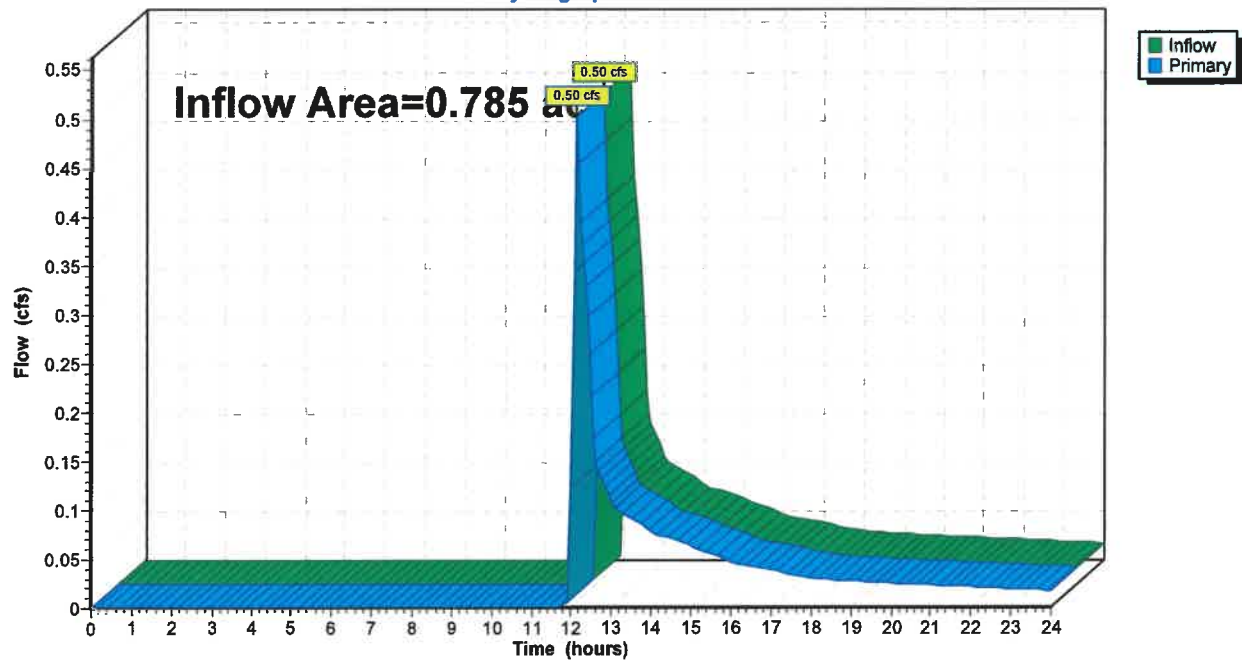
Summary for Link #1: POA-1

Inflow Area = 0.785 ac, 18.45% Impervious, Inflow Depth > 0.86" for 25-YR event
Inflow = 0.50 cfs @ 12.11 hrs, Volume= 0.056 af
Primary = 0.50 cfs @ 12.11 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link #1: POA-1

Hydrograph



709_Main_Pret-dev

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Type III 24-hr 100-YR Rainfall=8.04"

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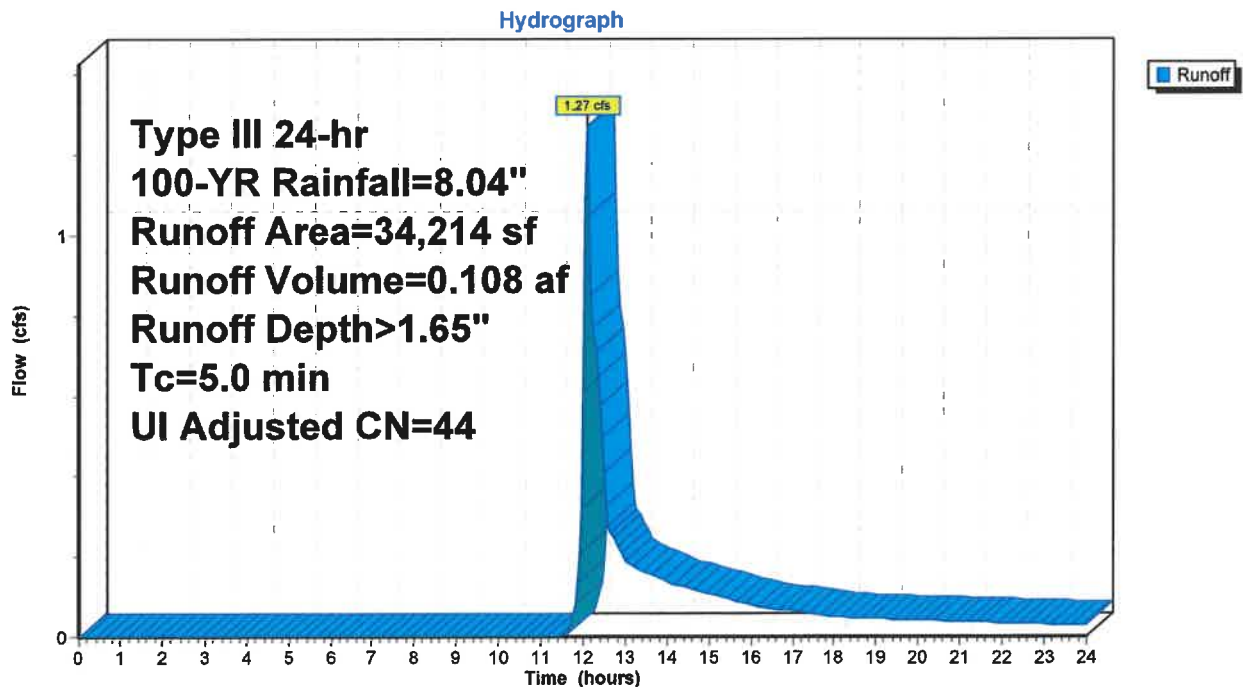
Summary for Subcatchment ExWs_1: Entire Site

Runoff = 1.27 cfs @ 12.10 hrs, Volume= 0.108 af, Depth> 1.65"
Routed to Link #1 : POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=8.04"

Area (sf)	CN	Adj	Description
27,900	39		>75% Grass cover, Good, HSG A
3,290	98		Unconnected roofs, HSG C
3,024	98		Unconnected pavement, HSG A
34,214	50	44	Weighted Average, UI Adjusted
27,900			81.55% Pervious Area
6,314			18.45% Impervious Area
6,314			100.00% Unconnected

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

Subcatchment ExWs_1: Entire Site

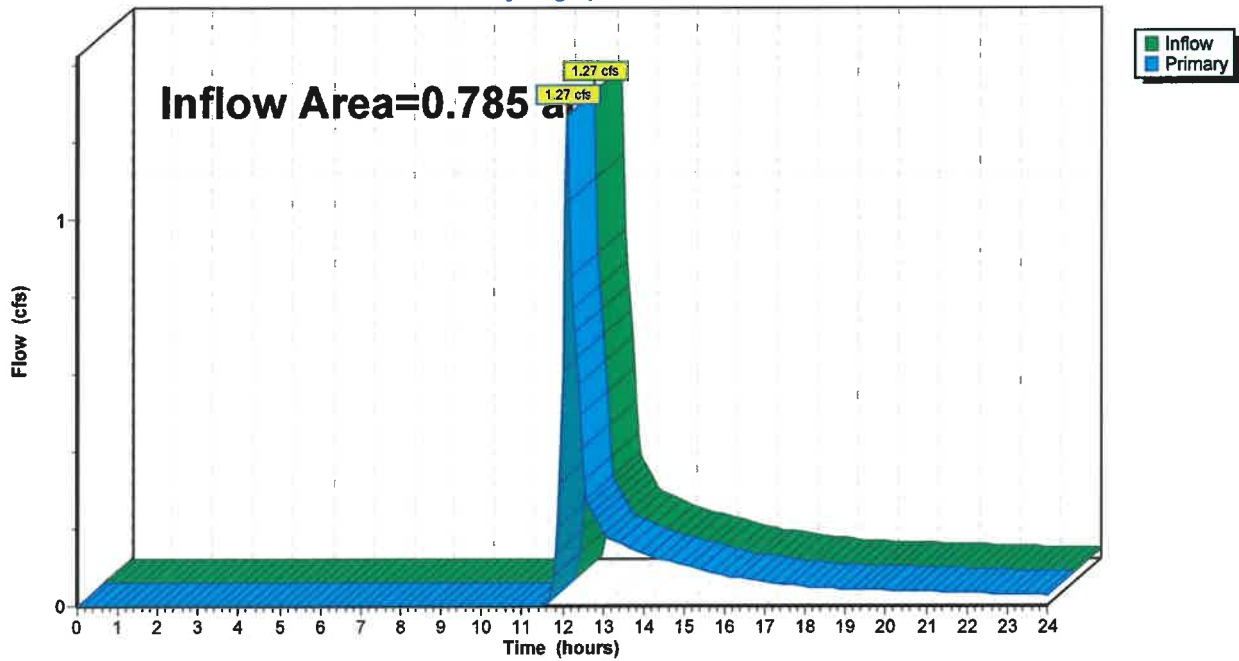
Summary for Link #1: POA-1

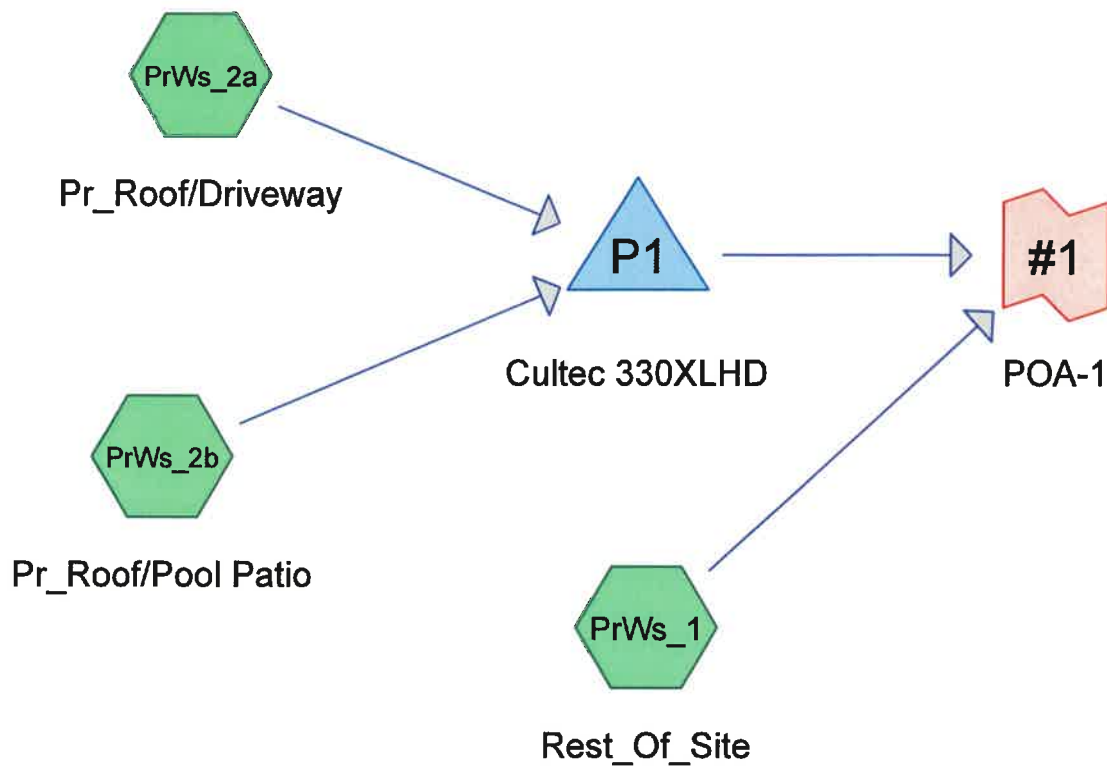
Inflow Area = 0.785 ac, 18.45% Impervious, Inflow Depth > 1.65" for 100-YR event
Inflow = 1.27 cfs @ 12.10 hrs, Volume= 0.108 af
Primary = 1.27 cfs @ 12.10 hrs, Volume= 0.108 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link #1: POA-1

Hydrograph





Subcat



Reach



Pond



Link

Routing Diagram for 709_Main_Post-dev
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709_Main_Post-dev

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	Type III 24-hr		Default	24.00	1	3.39	2
2	10-YR	Type III 24-hr		Default	24.00	1	5.19	2
3	25-YR	Type III 24-hr		Default	24.00	1	6.31	2
4	100-YR	Type III 24-hr		Default	24.00	1	8.04	2

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.573	39	>75% Grass cover, Good, HSG A (PrWs_1)
0.034	90	Pervious Driveway (PrWs_2a)
0.071	98	Unconnected pavement, HSG A (PrWs_1, PrWs_2b)
0.047	98	Unconnected roofs, HSG A (PrWs_2a, PrWs_2b)
0.060	98	Unconnected roofs, HSG C (PrWs_1)
0.785	55	TOTAL AREA

709_Main_Post-dev

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Type III 24-hr 2-YR Rainfall=3.39"

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Summary for Subcatchment PrWs_1: Rest_Of_Site

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

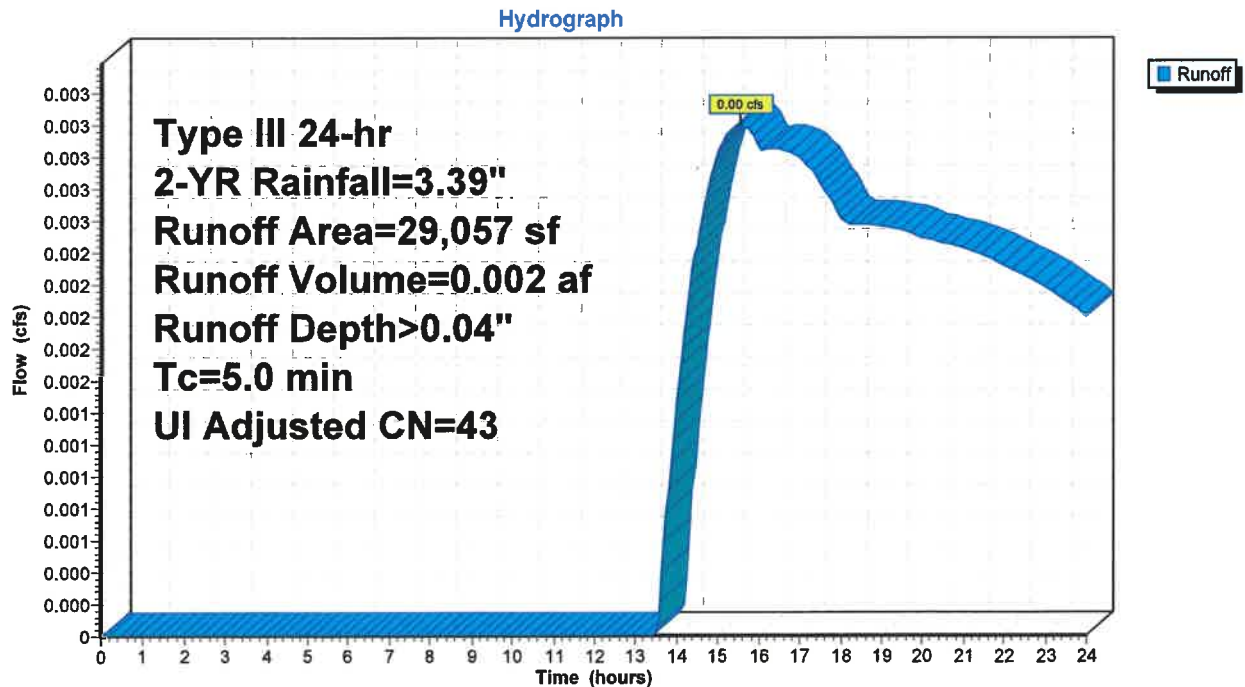
Runoff = 0.00 cfs @ 15.53 hrs, Volume= 0.002 af, Depth> 0.04"
Routed to Link #1 : POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt= 0.05$ hrs
Type III 24-hr 2-YR Rainfall=3.39"

Area (sf)	CN	Adj	Description
24,971	39		>75% Grass cover, Good, HSG A
2,596	98		Unconnected roofs, HSG C
1,490	98		Unconnected pavement, HSG A
29,057	47	43	Weighted Average, UI Adjusted
24,971			85.94% Pervious Area
4,086			14.06% Impervious Area
4,086			100.00% Unconnected

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

Subcatchment PrWs_1: Rest_Of_Site



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Type III 24-hr 2-YR Rainfall=3.39"

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Summary for Subcatchment PrWs_2a: Pr_Roof/Driveway

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

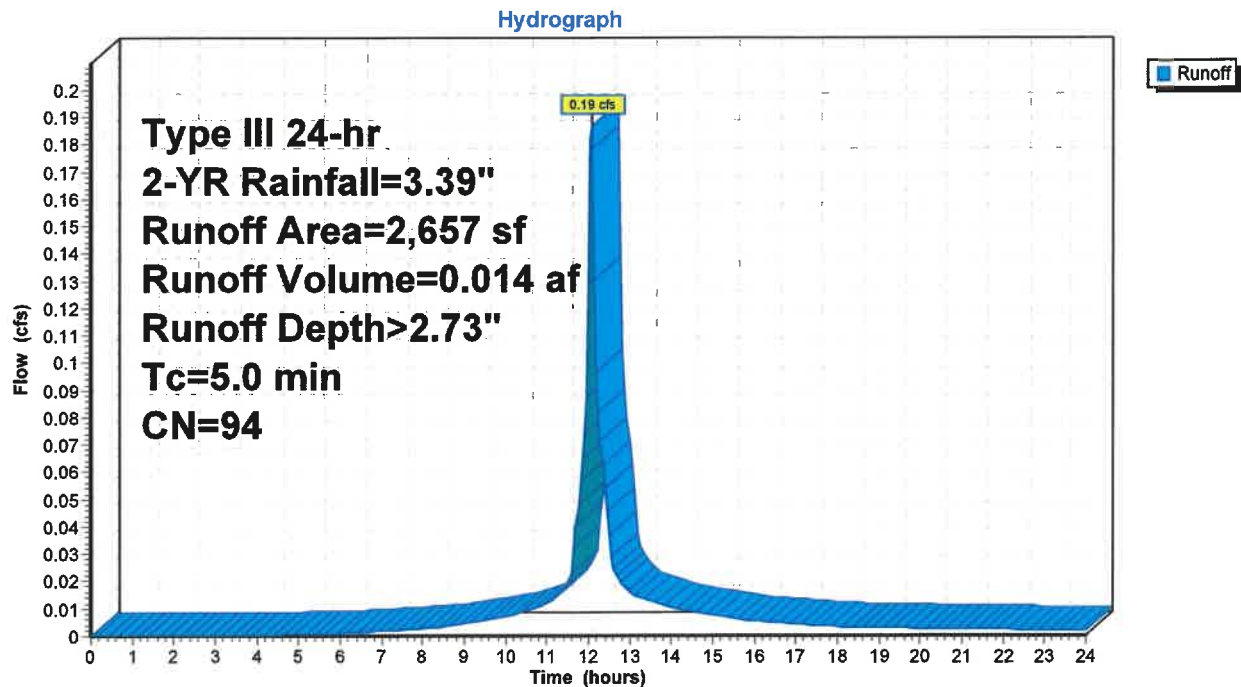
Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.014 af, Depth> 2.73"
Routed to Pond P1 : Cultec 330XLHD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt= 0.05$ hrs
Type III 24-hr 2-YR Rainfall=3.39"

Area (sf)	CN	Description
1,176	98	Unconnected roofs, HSG A
* 1,481	90	Pervious Driveway
2,657	94	Weighted Average
1,481		55.74% Pervious Area
1,176		44.26% Impervious Area
1,176		100.00% Unconnected

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

Subcatchment PrWs_2a: Pr_Roof/Driveway



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Type III 24-hr 2-YR Rainfall=3.39"

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Summary for Subcatchment PrWs_2b: Pr_Roof/Pool Patio

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

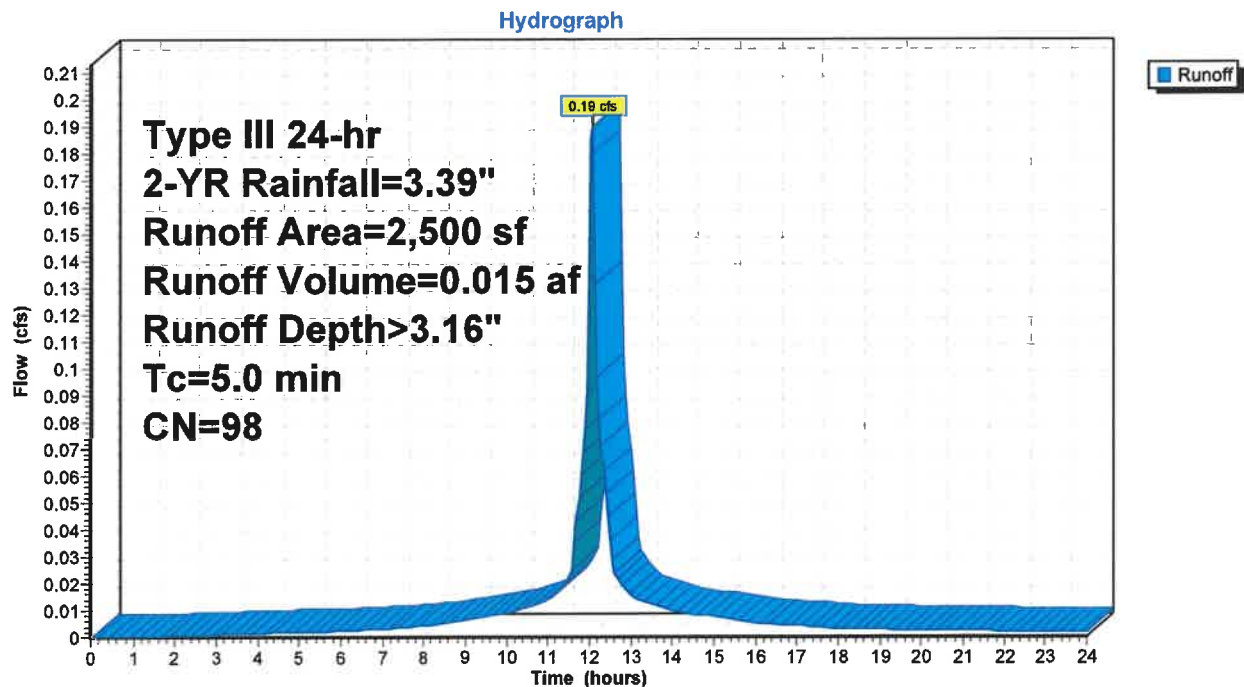
Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af, Depth> 3.16"
Routed to Pond P1 : Cultec 330XLHD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.05$ hrs
Type III 24-hr 2-YR Rainfall=3.39"

Area (sf)	CN	Description
1,614	98	Unconnected pavement, HSG A
886	98	Unconnected roofs, HSG A
2,500	98	Weighted Average
2,500		100.00% Impervious Area
2,500		100.00% Unconnected

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

Subcatchment PrWs_2b: Pr_Roof/Pool Patio



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Type III 24-hr 2-YR Rainfall=3.39"

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Summary for Pond P1: Cultec 330XLHD

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.118 ac, 71.28% Impervious, Inflow Depth > 2.93" for 2-YR event
 Inflow = 0.38 cfs @ 12.07 hrs, Volume= 0.029 af
 Outflow = 0.09 cfs @ 11.80 hrs, Volume= 0.029 af, Atten= 76%, Lag= 0.0 min
 Discarded = 0.09 cfs @ 11.80 hrs, Volume= 0.029 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routed to Link #1 : POA-1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 65.18' @ 12.45 hrs Surf.Area= 481 sf Storage= 257 cf

Plug-Flow detention time= 14.2 min calculated for 0.029 af (100% of inflow)

Center-of-Mass det. time= 14.0 min (782.3 - 768.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.00'	559 cf	12.17'W x 39.50'L x 4.04'H Field A 1,942 cf Overall - 544 cf Embedded = 1,398 cf x 40.0% Voids
#2A	65.00'	544 cf	Cultec R-330XLHD x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,103 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	69.50'	6.0" x 240.0" Horiz. Area Drain C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 11.80 hrs HW=64.07' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.09 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=64.00' (Free Discharge)↑**2=Area Drain** (Controls 0.00 cfs)

709_Main_Post-dev

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Type III 24-hr 2-YR Rainfall=3.39"

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Pond P1: Cultec 330XLHD - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (For residential use only)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

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

5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +18.0" End Stone x 2 = 39.50' Base Length

2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 18.0" Side Stone x 2 = 12.17' Base Width

12.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 4.04' Field Height

10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 543.9 cf Chamber Storage

1,942.4 cf Field - 543.9 cf Chambers = 1,398.4 cf Stone x 40.0% Voids = 559.4 cf Stone Storage

Chamber Storage + Stone Storage = 1,103.3 cf = 0.025 af

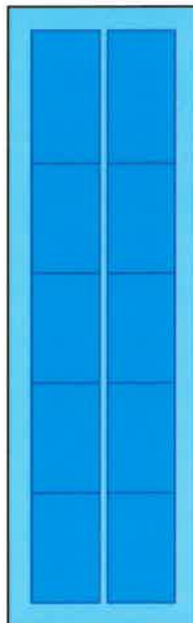
Overall Storage Efficiency = 56.8%

Overall System Size = 39.50' x 12.17' x 4.04'

10 Chambers

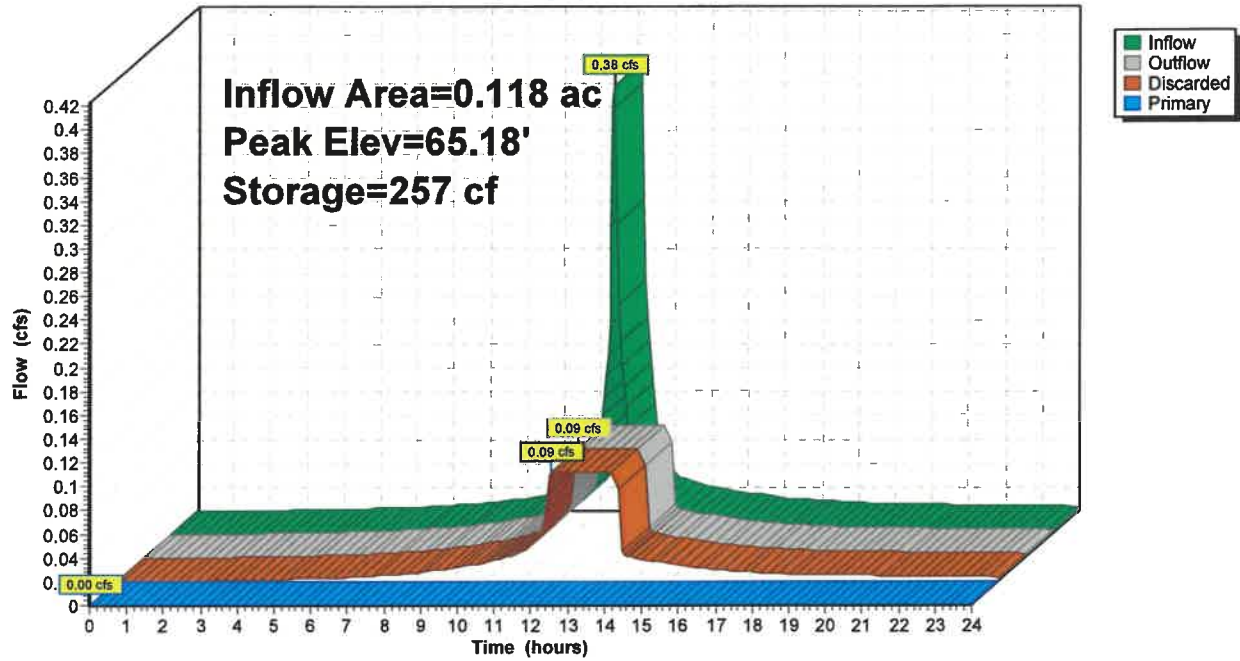
71.9 cy Field

51.8 cy Stone



Pond P1: Cultec 330XLHD

Hydrograph



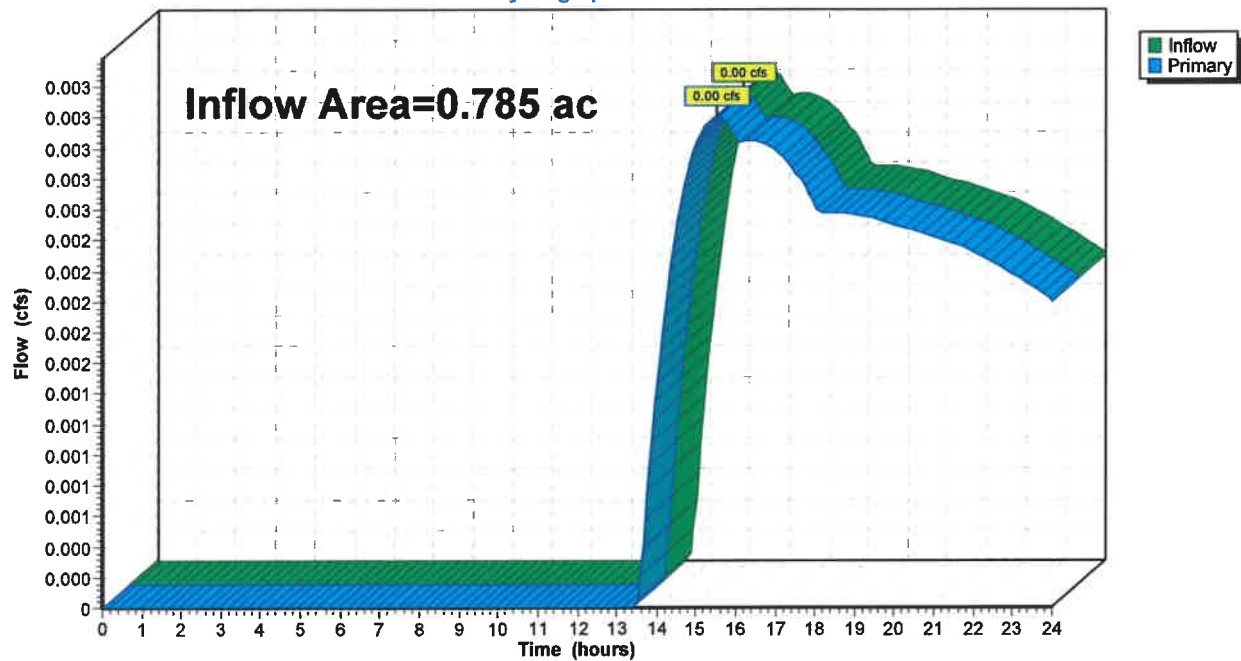
Summary for Link #1: POA-1

Inflow Area = 0.785 ac, 22.69% Impervious, Inflow Depth > 0.03" for 2-YR event
Inflow = 0.00 cfs @ 15.53 hrs, Volume= 0.002 af
Primary = 0.00 cfs @ 15.53 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link #1: POA-1

Hydrograph



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Type III 24-hr 10-YR Rainfall=5.19"

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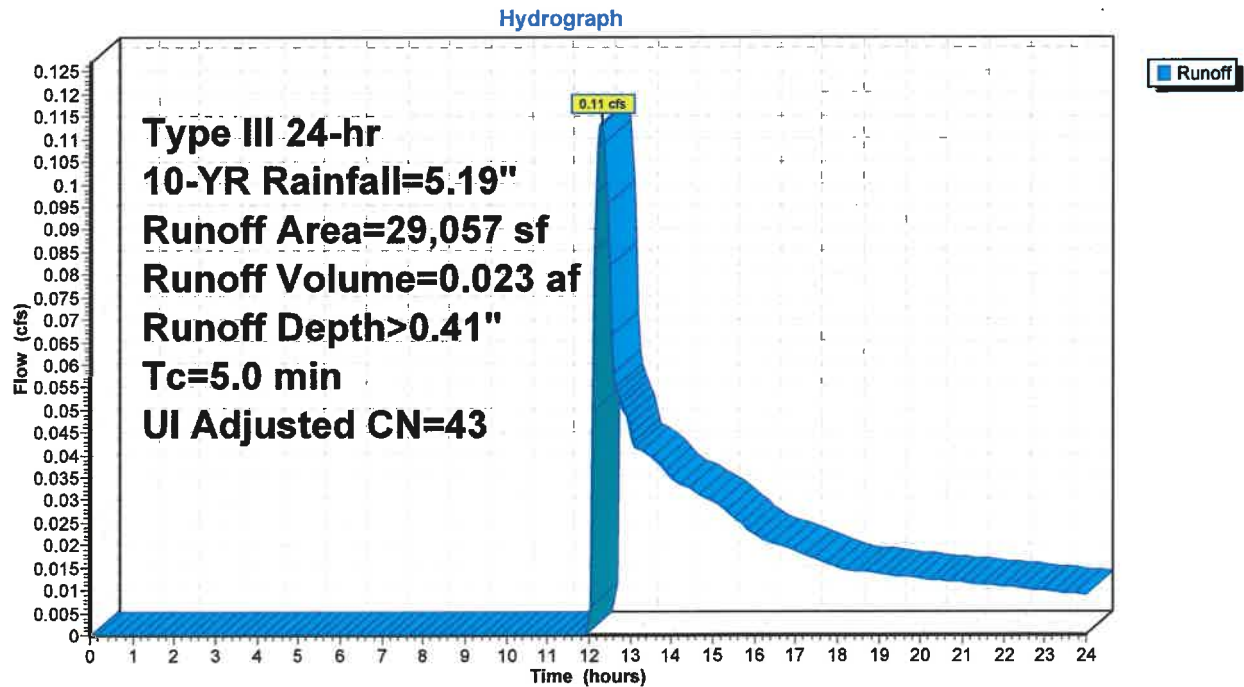
Summary for Subcatchment PrWs_1: Rest_Of_Site[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.11 cfs @ 12.32 hrs, Volume= 0.023 af, Depth> 0.41"
Routed to Link #1 : POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt= 0.05$ hrs
Type III 24-hr 10-YR Rainfall=5.19"

Area (sf)	CN	Adj	Description
24,971	39		>75% Grass cover, Good, HSG A
2,596	98		Unconnected roofs, HSG C
1,490	98		Unconnected pavement, HSG A
29,057	47	43	Weighted Average, UI Adjusted
24,971			85.94% Pervious Area
4,086			14.06% Impervious Area
4,086			100.00% Unconnected

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

Subcatchment PrWs_1: Rest_Of_Site

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Type III 24-hr 10-YR Rainfall=5.19"

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Summary for Subcatchment PrWs_2a: Pr_Roof/Driveway

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

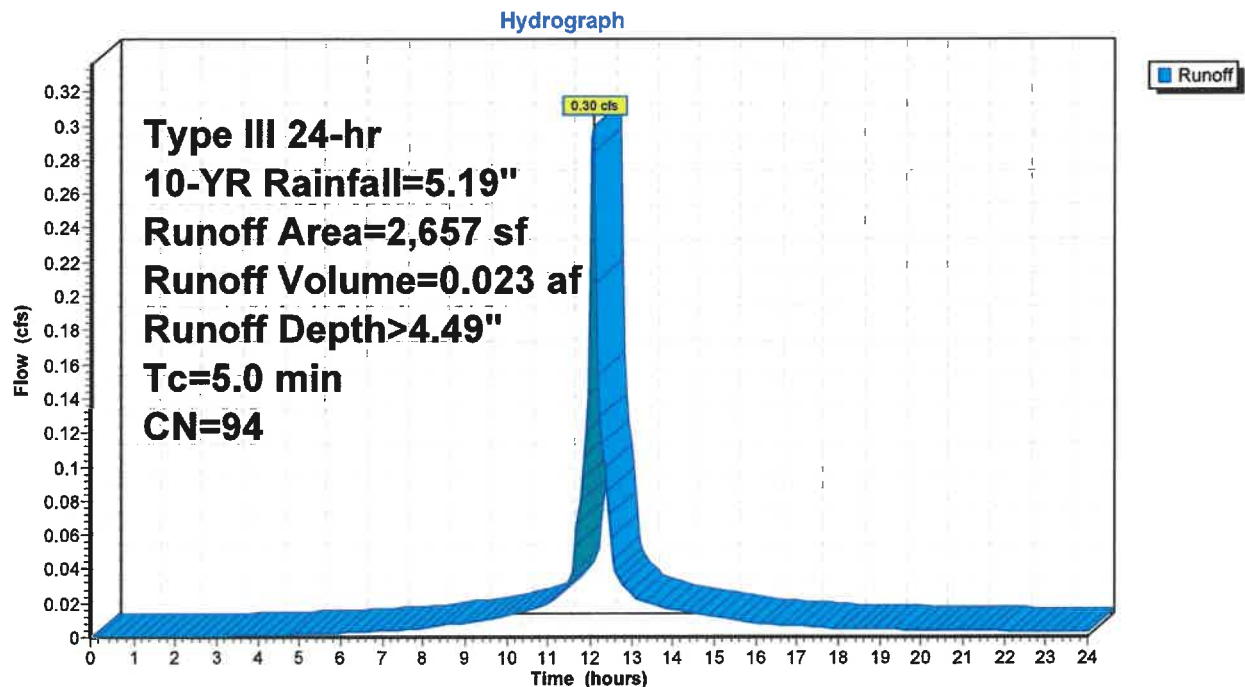
Runoff = 0.30 cfs @ 12.07 hrs, Volume= 0.023 af, Depth> 4.49"
Routed to Pond P1 : Cultec 330XLHD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt= 0.05$ hrs
Type III 24-hr 10-YR Rainfall=5.19"

Area (sf)	CN	Description
1,176	98	Unconnected roofs, HSG A
* 1,481	90	Pervious Driveway
2,657	94	Weighted Average
1,481		55.74% Pervious Area
1,176		44.26% Impervious Area
1,176		100.00% Unconnected

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

Subcatchment PrWs_2a: Pr_Roof/Driveway



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Type III 24-hr 10-YR Rainfall=5.19"

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Summary for Subcatchment PrWs_2b: Pr_Roof/Pool Patio

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

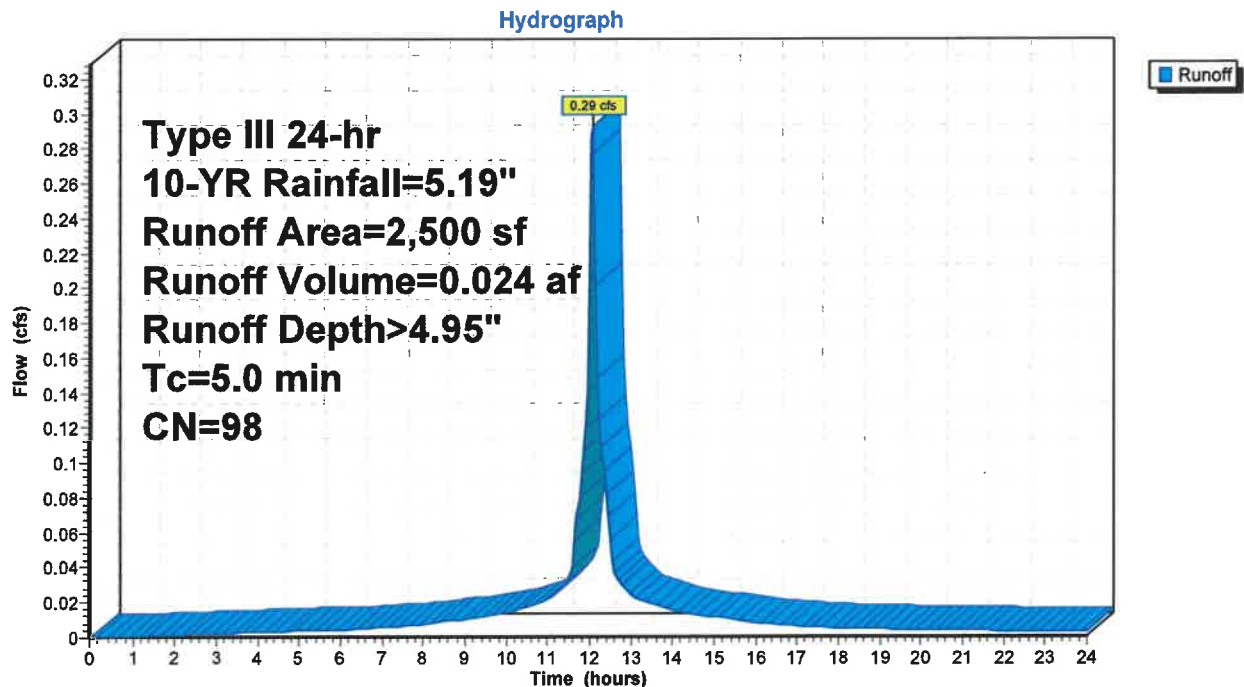
Runoff = 0.29 cfs @ 12.07 hrs, Volume= 0.024 af, Depth> 4.95"
Routed to Pond P1 : Cultec 330XLHD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.05$ hrs
Type III 24-hr 10-YR Rainfall=5.19"

Area (sf)	CN	Description
1,614	98	Unconnected pavement, HSG A
886	98	Unconnected roofs, HSG A
2,500	98	Weighted Average
2,500		100.00% Impervious Area
2,500		100.00% Unconnected

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

Subcatchment PrWs_2b: Pr_Roof/Pool Patio



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Type III 24-hr 10-YR Rainfall=5.19"

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Summary for Pond P1: Cultec 330XLHD

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.118 ac, 71.28% Impervious, Inflow Depth > 4.71" for 10-YR event
 Inflow = 0.59 cfs @ 12.07 hrs, Volume= 0.047 af
 Outflow = 0.09 cfs @ 11.65 hrs, Volume= 0.047 af, Atten= 84%, Lag= 0.0 min
 Discarded = 0.09 cfs @ 11.65 hrs, Volume= 0.047 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routed to Link #1 : POA-1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 66.01' @ 12.55 hrs Surf.Area= 481 sf Storage= 555 cf

Plug-Flow detention time= 34.5 min calculated for 0.046 af (100% of inflow)

Center-of-Mass det. time= 34.2 min (792.7 - 758.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.00'	559 cf	12.17'W x 39.50'L x 4.04'H Field A 1,942 cf Overall - 544 cf Embedded = 1,398 cf x 40.0% Voids
#2A	65.00'	544 cf	Cultec R-330XLHD x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,103 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	69.50'	6.0" x 240.0" Horiz. Area Drain C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 11.65 hrs HW=64.06' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.09 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=64.00' (Free Discharge)↑**2=Area Drain** (Controls 0.00 cfs)

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Type III 24-hr 10-YR Rainfall=5.19"

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Pond P1: Cultec 330XLHD - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (For residential use only)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

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

5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +18.0" End Stone x 2 = 39.50' Base Length

2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 18.0" Side Stone x 2 = 12.17' Base Width

12.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 4.04' Field Height

10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 543.9 cf Chamber Storage

1,942.4 cf Field - 543.9 cf Chambers = 1,398.4 cf Stone x 40.0% Voids = 559.4 cf Stone Storage

Chamber Storage + Stone Storage = 1,103.3 cf = 0.025 af

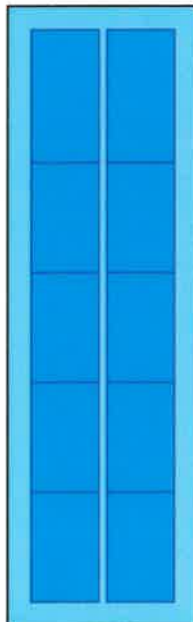
Overall Storage Efficiency = 56.8%

Overall System Size = 39.50' x 12.17' x 4.04'

10 Chambers

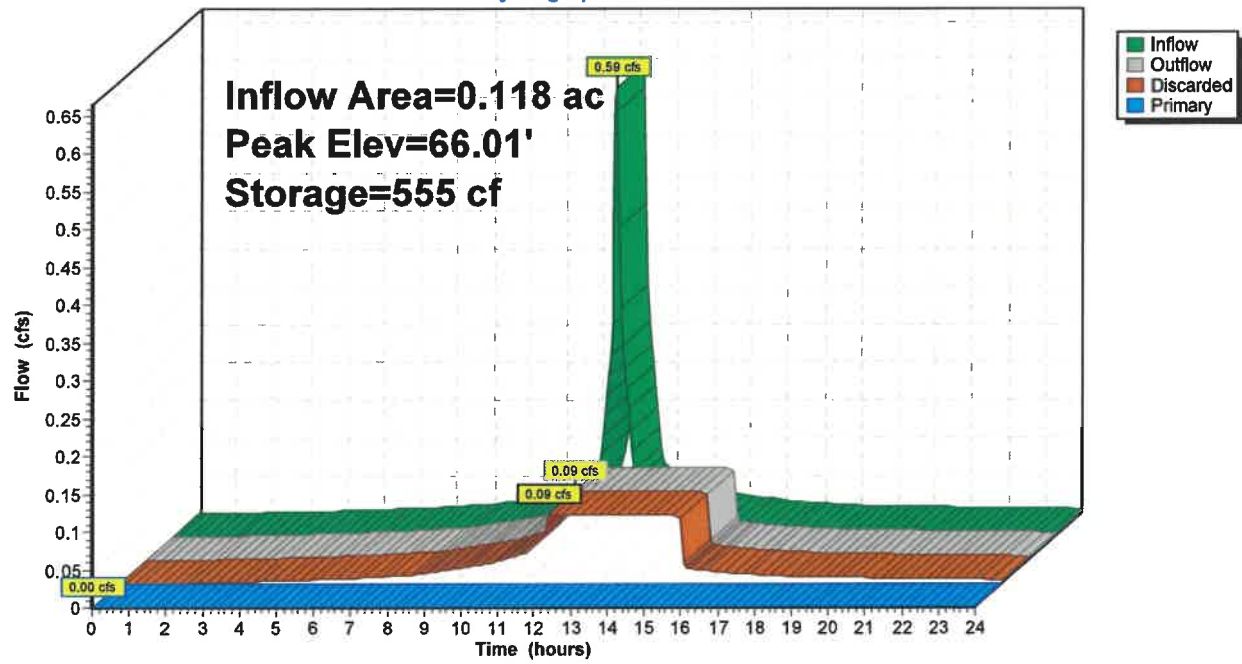
71.9 cy Field

51.8 cy Stone



Pond P1: Cultec 330XLHD

Hydrograph



709_Main_Post-dev

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Type III 24-hr 10-YR Rainfall=5.19"

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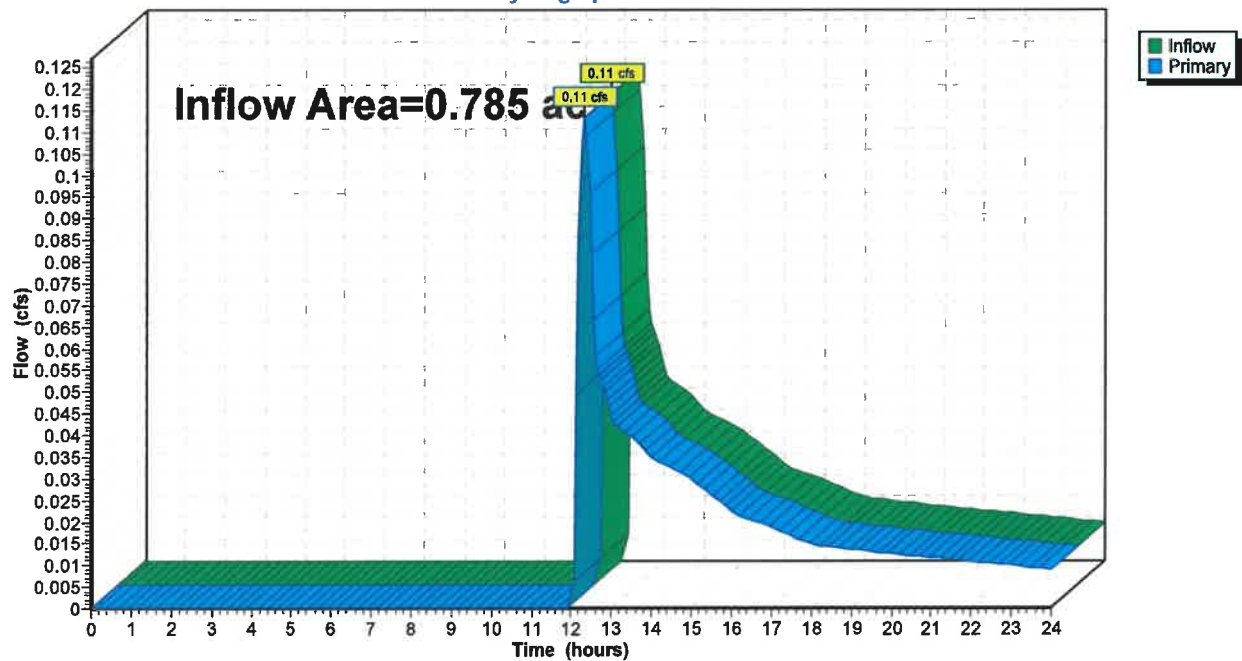
Summary for Link #1: POA-1

Inflow Area = 0.785 ac, 22.69% Impervious, Inflow Depth > 0.35" for 10-YR event
Inflow = 0.11 cfs @ 12.32 hrs, Volume= 0.023 af
Primary = 0.11 cfs @ 12.32 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link #1: POA-1

Hydrograph



709_Main_Post-dev

Prepared by KBM Design Group

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Type III 24-hr 25-YR Rainfall=6.31"

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Summary for Subcatchment PrWs_1: Rest_Of_Site[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.36 cfs @ 12.12 hrs, Volume= 0.044 af, Depth> 0.79"
Routed to Link #1 : POA-1

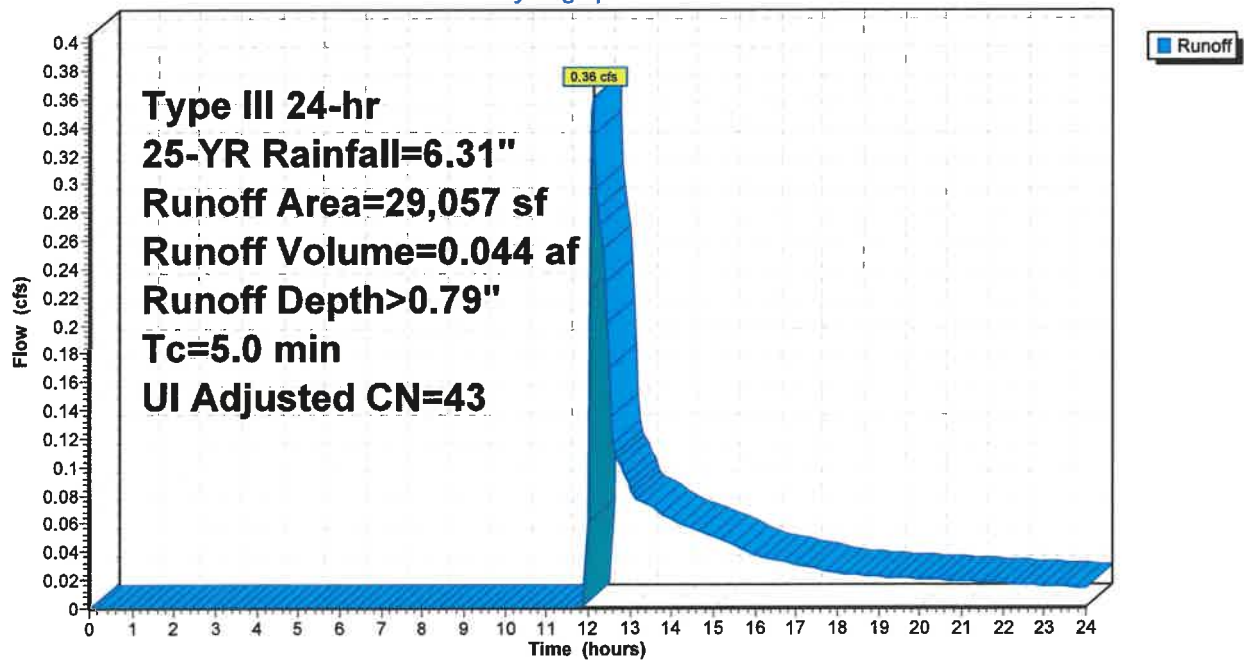
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt= 0.05$ hrs
Type III 24-hr 25-YR Rainfall=6.31"

Area (sf)	CN	Adj	Description
24,971	39		>75% Grass cover, Good, HSG A
2,596	98		Unconnected roofs, HSG C
1,490	98		Unconnected pavement, HSG A
29,057	47	43	Weighted Average, UI Adjusted
24,971			85.94% Pervious Area
4,086			14.06% Impervious Area
4,086			100.00% Unconnected

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

Subcatchment PrWs_1: Rest_Of_Site

Hydrograph



709_Main_Post-dev

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Type III 24-hr 25-YR Rainfall=6.31"

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Summary for Subcatchment PrWs_2a: Pr_Roof/Driveway

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

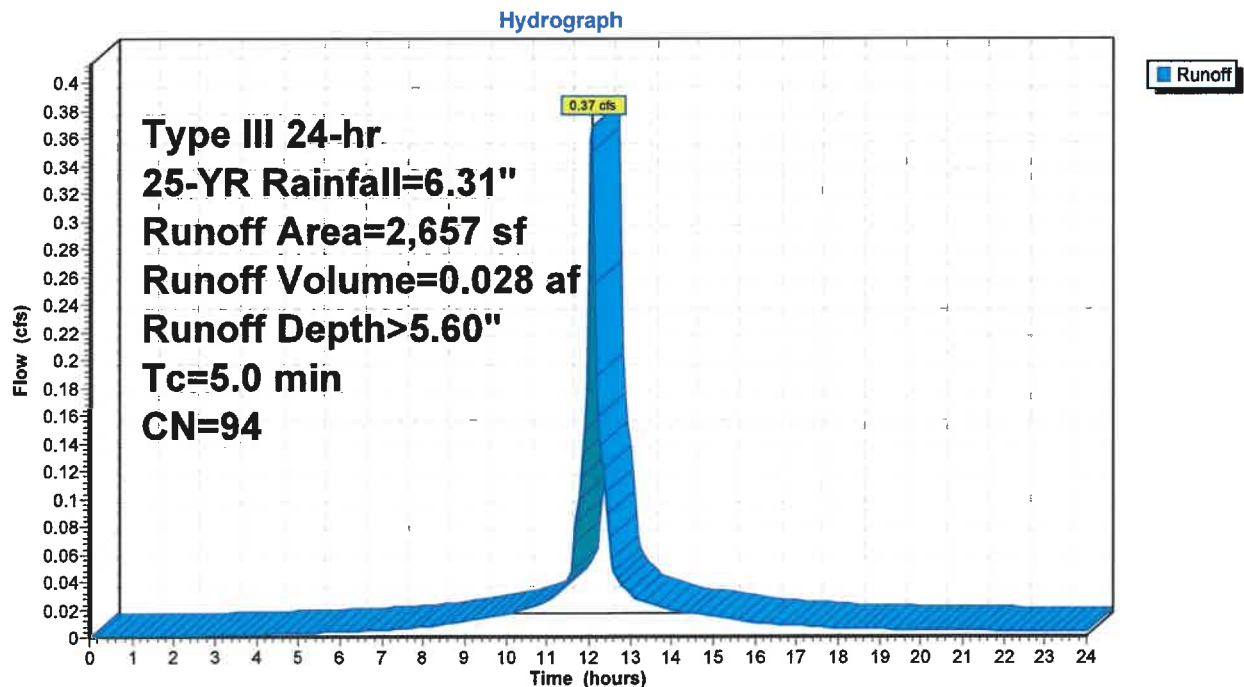
Runoff = 0.37 cfs @ 12.07 hrs, Volume= 0.028 af, Depth> 5.60"
Routed to Pond P1 : Cultec 330XLHD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.05$ hrs
Type III 24-hr 25-YR Rainfall=6.31"

	Area (sf)	CN	Description
	1,176	98	Unconnected roofs, HSG A
*	1,481	90	Pervious Driveway
	2,657	94	Weighted Average
	1,481		55.74% Pervious Area
	1,176		44.26% Impervious Area
	1,176		100.00% Unconnected

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

Subcatchment PrWs_2a: Pr_Roof/Driveway



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Type III 24-hr 25-YR Rainfall=6.31"

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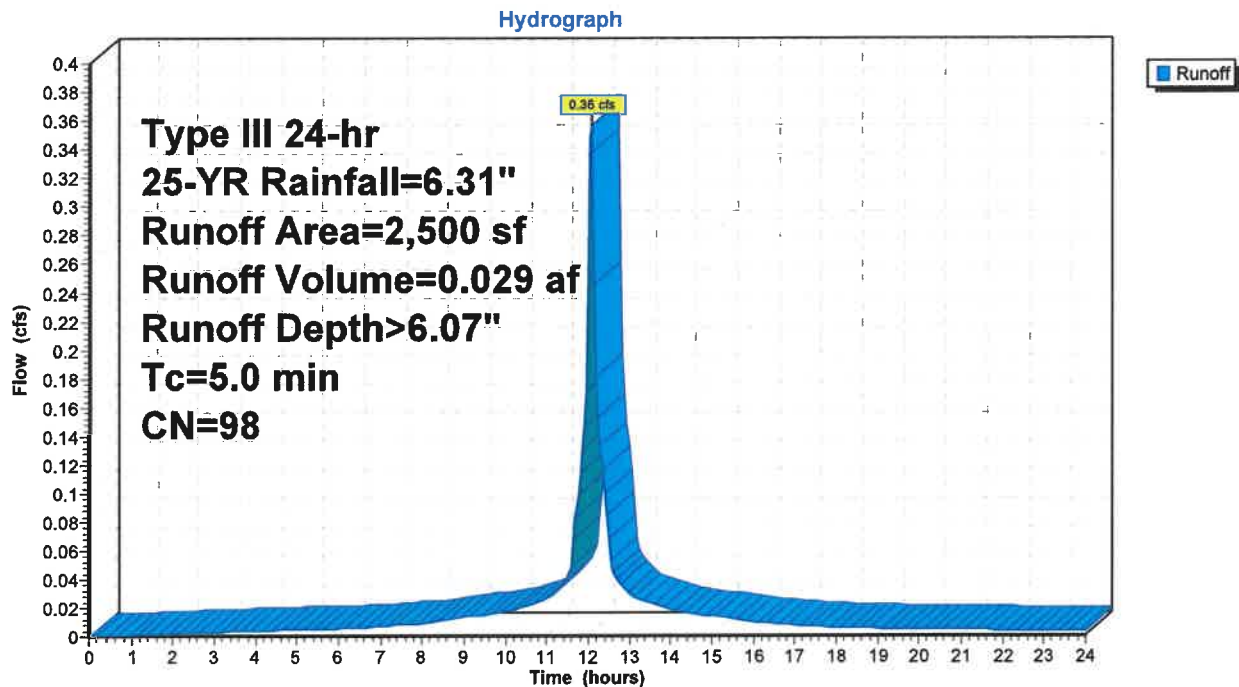
Summary for Subcatchment PrWs_2b: Pr_Roof/Pool Patio[49] Hint: $T_c < 2dt$ may require smaller dt

Runoff = 0.36 cfs @ 12.07 hrs, Volume= 0.029 af, Depth> 6.07"
Routed to Pond P1 : Cultec 330XLHD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt= 0.05$ hrs
Type III 24-hr 25-YR Rainfall=6.31"

Area (sf)	CN	Description
1,614	98	Unconnected pavement, HSG A
886	98	Unconnected roofs, HSG A
2,500	98	Weighted Average
2,500		100.00% Impervious Area
2,500		100.00% Unconnected

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

Subcatchment PrWs_2b: Pr_Roof/Pool Patio

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Type III 24-hr 25-YR Rainfall=6.31"

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Summary for Pond P1: Cultec 330XLHD

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.118 ac, 71.28% Impervious, Inflow Depth > 5.83" for 25-YR event
 Inflow = 0.73 cfs @ 12.07 hrs, Volume= 0.057 af
 Outflow = 0.09 cfs @ 11.60 hrs, Volume= 0.057 af, Atten= 87%, Lag= 0.0 min
 Discarded = 0.09 cfs @ 11.60 hrs, Volume= 0.057 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routed to Link #1 : POA-1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 66.59' @ 12.61 hrs Surf.Area= 481 sf Storage= 751 cf

Plug-Flow detention time= 50.0 min calculated for 0.057 af (100% of inflow)

Center-of-Mass det. time= 49.7 min (804.2 - 754.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.00'	559 cf	12.17'W x 39.50'L x 4.04'H Field A 1,942 cf Overall - 544 cf Embedded = 1,398 cf x 40.0% Voids
#2A	65.00'	544 cf	Cultec R-330XLHD x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,103 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	69.50'	6.0" x 240.0" Horiz. Area Drain C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 11.60 hrs HW=64.06' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.09 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=64.00' (Free Discharge)↑**2=Area Drain** (Controls 0.00 cfs)

709_Main_Post-dev

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Type III 24-hr 25-YR Rainfall=6.31"

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Pond P1: Cultec 330XLHD - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (For residential use only)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

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

5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +18.0" End Stone x 2 = 39.50' Base Length

2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 18.0" Side Stone x 2 = 12.17' Base Width

12.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 4.04' Field Height

10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 543.9 cf Chamber Storage

1,942.4 cf Field - 543.9 cf Chambers = 1,398.4 cf Stone x 40.0% Voids = 559.4 cf Stone Storage

Chamber Storage + Stone Storage = 1,103.3 cf = 0.025 af

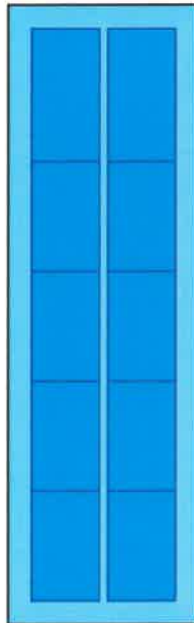
Overall Storage Efficiency = 56.8%

Overall System Size = 39.50' x 12.17' x 4.04'

10 Chambers

71.9 cy Field

51.8 cy Stone



709_Main_Post-dev

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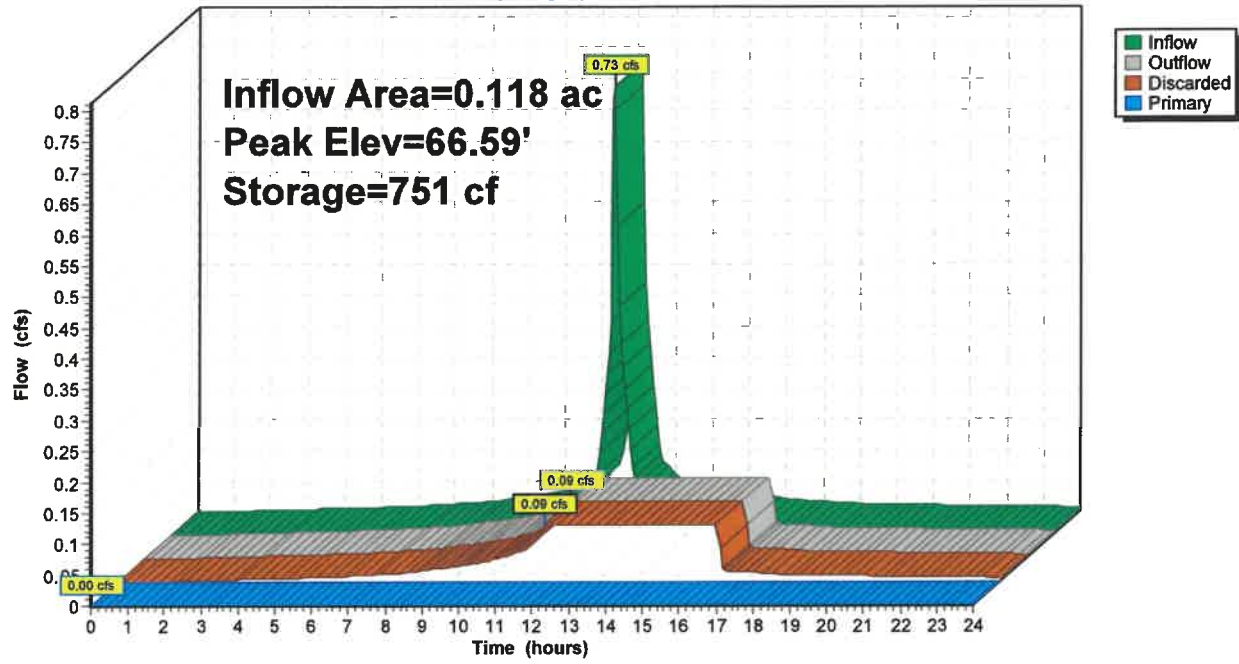
Type III 24-hr 25-YR Rainfall=6.31"

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Pond P1: Cultec 330XLHD

Hydrograph



709_Main_Post-dev

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Type III 24-hr 25-YR Rainfall=6.31"

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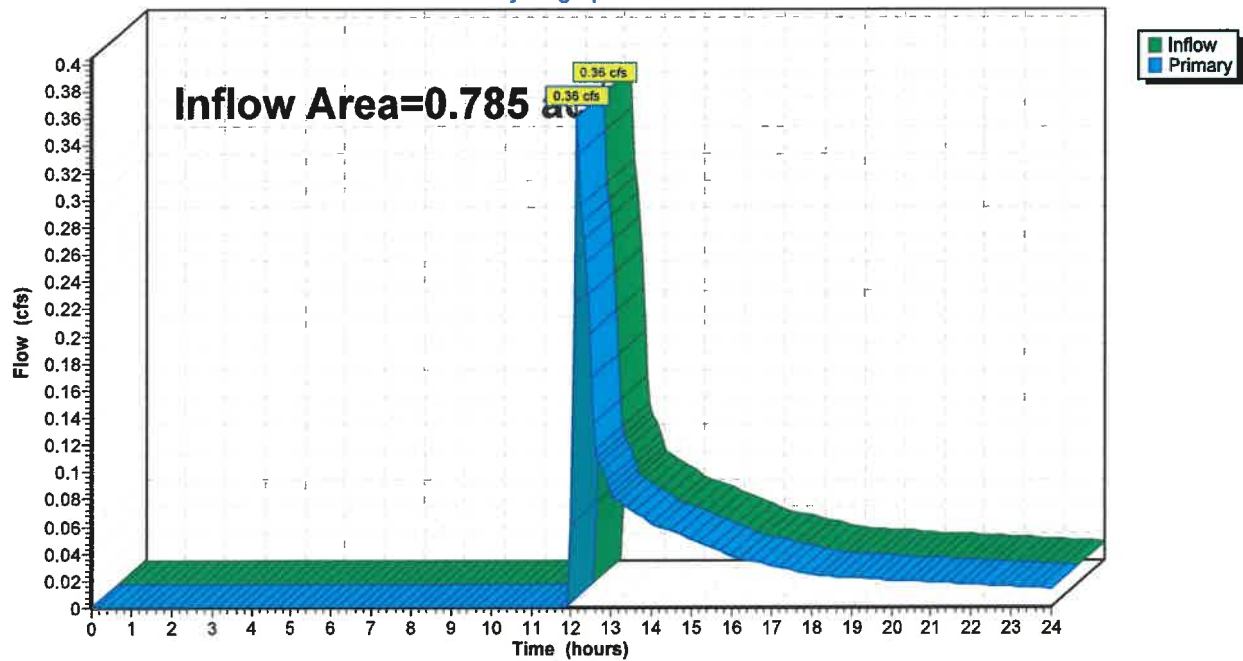
Summary for Link #1: POA-1

Inflow Area = 0.785 ac, 22.69% Impervious, Inflow Depth > 0.67" for 25-YR event
Inflow = 0.36 cfs @ 12.12 hrs, Volume= 0.044 af
Primary = 0.36 cfs @ 12.12 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link #1: POA-1

Hydrograph



709_Main_Post-dev

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Type III 24-hr 100-YR Rainfall=8.04"

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Summary for Subcatchment PrWs_1: Rest_Of_Site

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

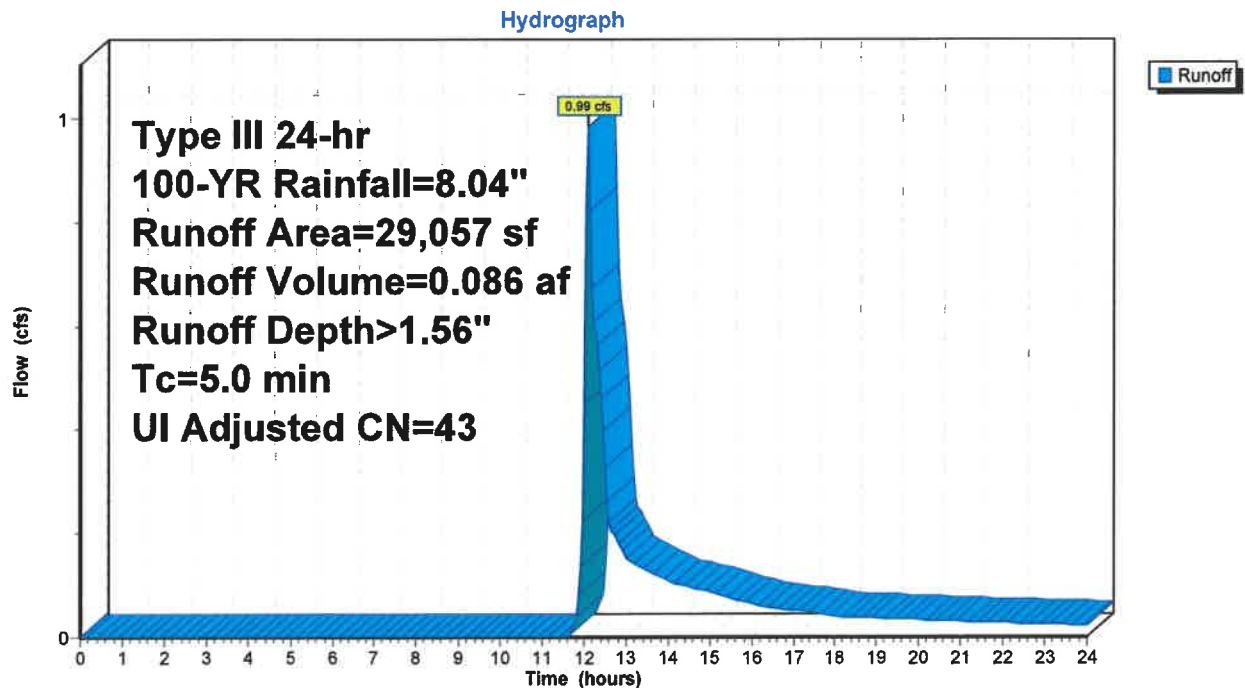
Runoff = 0.99 cfs @ 12.10 hrs, Volume= 0.086 af, Depth> 1.56"
Routed to Link #1 : POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-YR Rainfall=8.04"

Area (sf)	CN	Adj	Description
24,971	39		>75% Grass cover, Good, HSG A
2,596	98		Unconnected roofs, HSG C
1,490	98		Unconnected pavement, HSG A
29,057	47	43	Weighted Average, UI Adjusted
24,971			85.94% Pervious Area
4,086			14.06% Impervious Area
4,086			100.00% Unconnected

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

Subcatchment PrWs_1: Rest_Of_Site



709_Main_Post-dev

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Type III 24-hr 100-YR Rainfall=8.04"

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Summary for Subcatchment PrWs_2a: Pr_Roof/Driveway

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

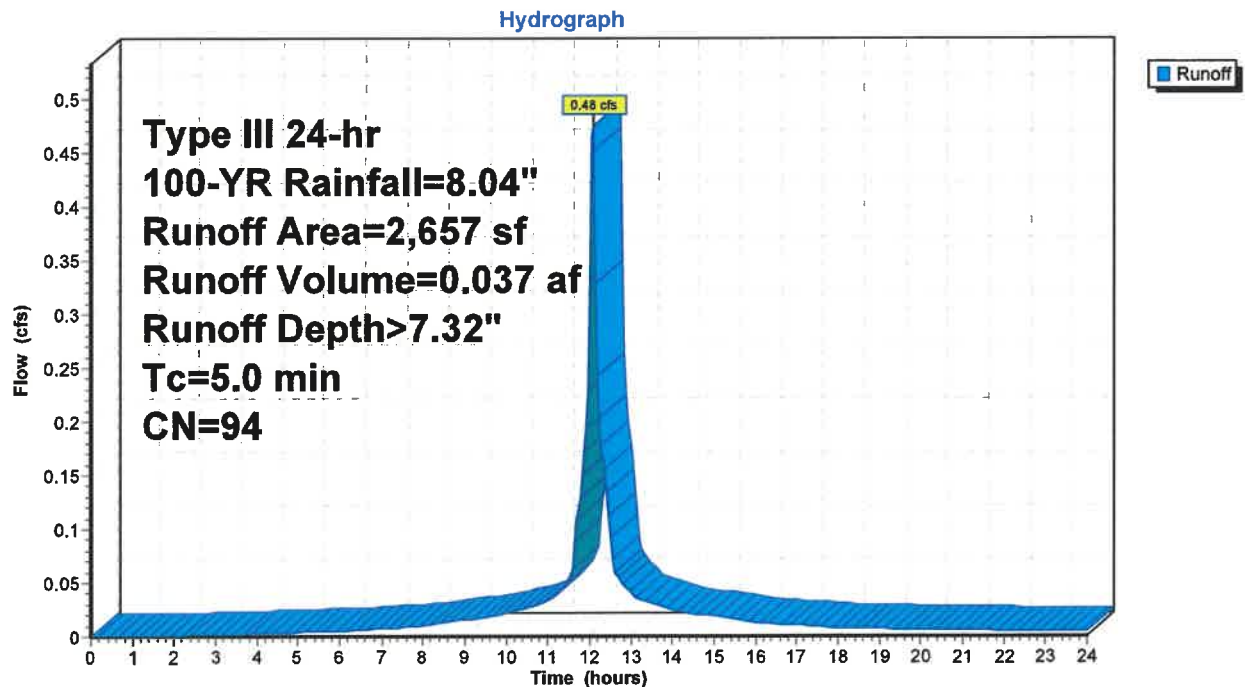
Runoff = 0.48 cfs @ 12.07 hrs, Volume= 0.037 af, Depth> 7.32"
Routed to Pond P1 : Cultec 330XLHD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-YR Rainfall=8.04"

Area (sf)	CN	Description
1,176	98	Unconnected roofs, HSG A
* 1,481	90	Pervious Driveway
2,657	94	Weighted Average
1,481		55.74% Pervious Area
1,176		44.26% Impervious Area
1,176		100.00% Unconnected

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

Subcatchment PrWs_2a: Pr_Roof/Driveway



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Type III 24-hr 100-YR Rainfall=8.04"

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Summary for Subcatchment PrWs_2b: Pr_Roof/Pool Patio

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

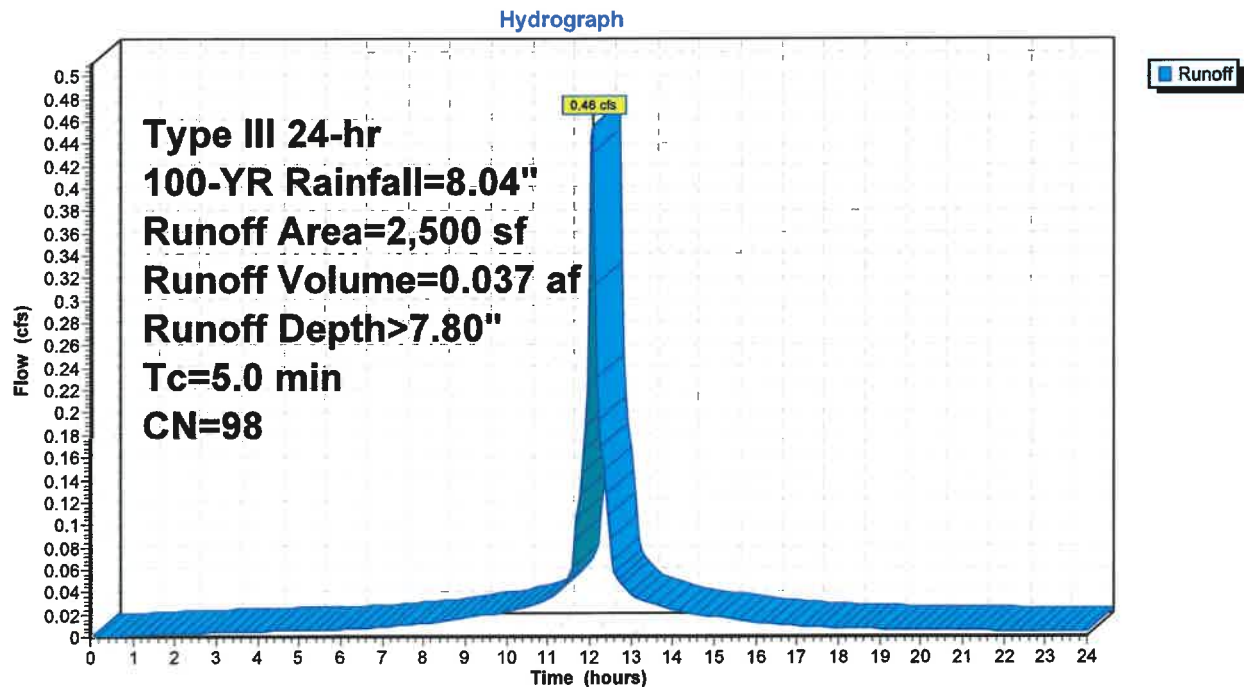
Runoff = 0.46 cfs @ 12.07 hrs, Volume= 0.037 af, Depth> 7.80"
Routed to Pond P1 : Cultec 330XLHD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, $dt=0.05$ hrs
Type III 24-hr 100-YR Rainfall=8.04"

Area (sf)	CN	Description
1,614	98	Unconnected pavement, HSG A
886	98	Unconnected roofs, HSG A
2,500	98	Weighted Average
2,500		100.00% Impervious Area
2,500		100.00% Unconnected

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

Subcatchment PrWs_2b: Pr_Roof/Pool Patio



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Type III 24-hr 100-YR Rainfall=8.04"

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Summary for Pond P1: Cultec 330XLHD

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.118 ac, 71.28% Impervious, Inflow Depth > 7.55" for 100-YR event
 Inflow = 0.93 cfs @ 12.07 hrs, Volume= 0.074 af
 Outflow = 0.09 cfs @ 11.40 hrs, Volume= 0.074 af, Atten= 90%, Lag= 0.0 min
 Discarded = 0.09 cfs @ 11.40 hrs, Volume= 0.074 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
 Routed to Link #1 : POA-1

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 67.89' @ 12.82 hrs Surf.Area= 481 sf Storage= 1,073 cf

Plug-Flow detention time= 77.6 min calculated for 0.074 af (100% of inflow)
 Center-of-Mass det. time= 77.4 min (827.3 - 749.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	64.00'	559 cf	12.17'W x 39.50'L x 4.04'H Field A 1,942 cf Overall - 544 cf Embedded = 1,398 cf x 40.0% Voids
#2A	65.00'	544 cf	Cultec R-330XLHD x 10 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,103 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	64.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	69.50'	6.0" x 240.0" Horiz. Area Drain C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.09 cfs @ 11.40 hrs HW=64.06' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=64.00' (Free Discharge)
 ↳ **2=Area Drain** (Controls 0.00 cfs)

709_Main_Post-dev

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Type III 24-hr 100-YR Rainfall=8.04"

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Pond P1: Cultec 330XLHD - Chamber Wizard Field A

Chamber Model = Cultec R-330XLHD (For residential use only)

Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf

Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap

Row Length Adjustment= +1.50' x 7.45 sf x 2 rows

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

5 Chambers/Row x 7.00' Long +1.50' Row Adjustment = 36.50' Row Length +18.0" End Stone x 2 = 39.50' Base Length

2 Rows x 52.0" Wide + 6.0" Spacing x 1 + 18.0" Side Stone x 2 = 12.17' Base Width

12.0" Stone Base + 30.5" Chamber Height + 6.0" Stone Cover = 4.04' Field Height

10 Chambers x 52.2 cf +1.50' Row Adjustment x 7.45 sf x 2 Rows = 543.9 cf Chamber Storage

1,942.4 cf Field - 543.9 cf Chambers = 1,398.4 cf Stone x 40.0% Voids = 559.4 cf Stone Storage

Chamber Storage + Stone Storage = 1,103.3 cf = 0.025 af

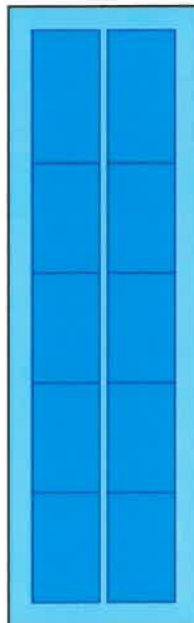
Overall Storage Efficiency = 56.8%

Overall System Size = 39.50' x 12.17' x 4.04'

10 Chambers

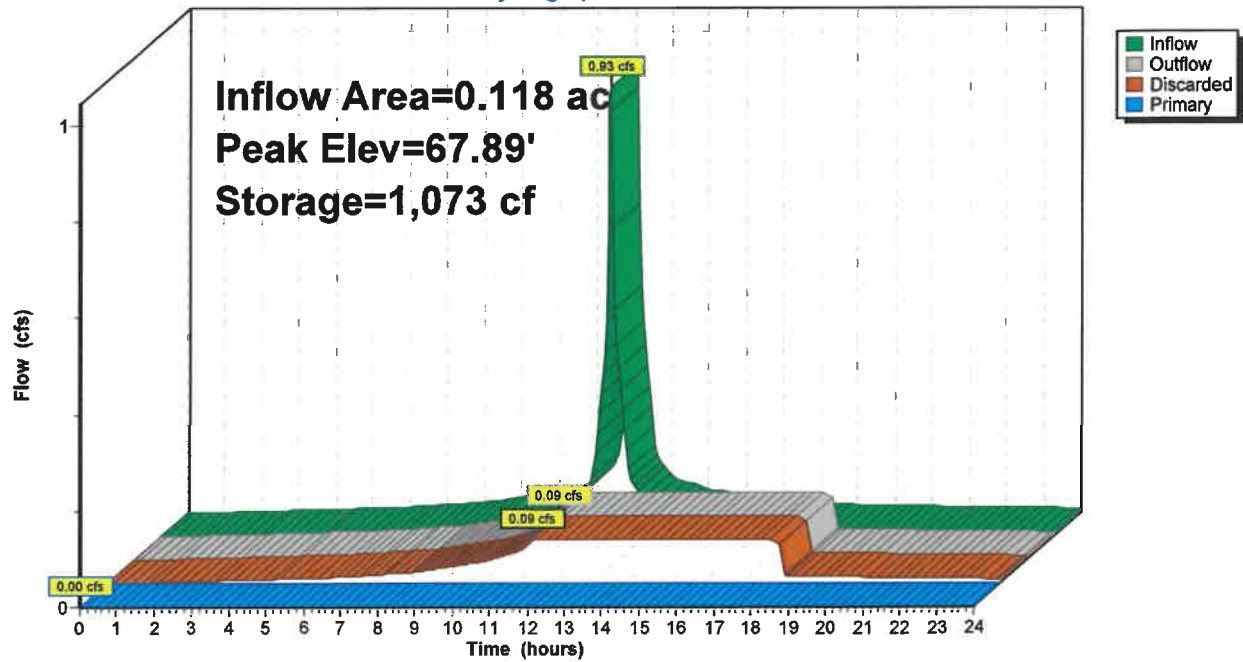
71.9 cy Field

51.8 cy Stone



Pond P1: Cultec 330XLHD

Hydrograph



709_Main_Post-dev

Prepared by KBM Design Group

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Type III 24-hr 100-YR Rainfall=8.04"

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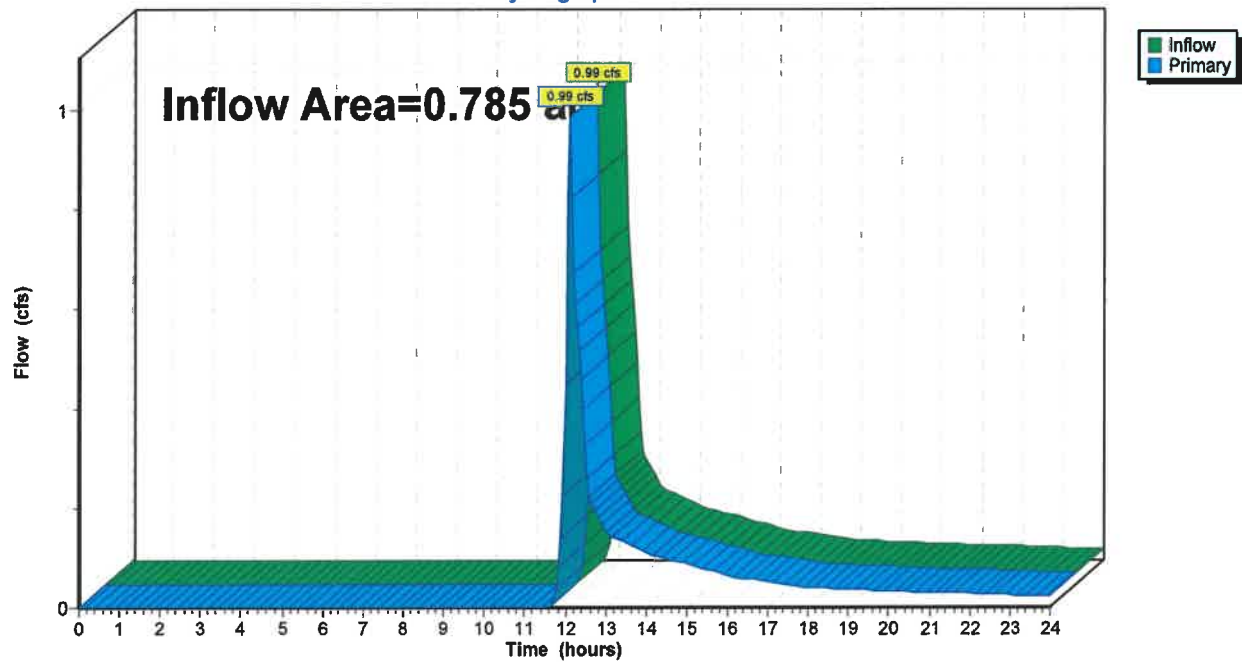
Summary for Link #1: POA-1

Inflow Area = 0.785 ac, 22.69% Impervious, Inflow Depth > 1.32" for 100-YR event
Inflow = 0.99 cfs @ 12.10 hrs, Volume= 0.086 af
Primary = 0.99 cfs @ 12.10 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link #1: POA-1

Hydrograph



INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: 709 Main St Hingham MA

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Porous Pavement	0.80	1.00	0.80	0.20
	Infiltration Basin	0.80	0.20	0.16	0.04
		0.00	0.04	0.00	0.04
		0.00	0.04	0.00	0.04
		0.00	0.04	0.00	0.04

Total TSS Removal = 96%

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

Project: 709 Main St Hingham
Prepared By: AK
Date: 6/15/2026

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

Non-automated TSS Calculation Sheet
must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

LONG TERM OPERATIONS & MAINTENANCE PLAN

709 MAIN ST, HINGHAM MA

Date: June 15, 2026

PROJECT OVERVIEW

Prevention of offsite flooding and implementation of stormwater runoff, water quality, and groundwater recharge improvements where none currently exist on-site are the main priorities of the project with respect to drainage design. The project will improve existing stormwater management within the property with respect to the existing site condition, which currently includes no such improvements, by installing a stormwater management system comprising various Best Management Practices (BMPs). Long-term water quality BMPs to mitigate the runoff generated by the site improvements include a water quality unit, and an underground infiltration/detention system and periodic mechanical sweeping to remove sand and sediment from paved surfaces.

The permanent BMPs used in this design were chosen for their effectiveness and ease of maintenance. Providing for maintenance requirements that are practical is essential to achieve the desired result of improved stormwater quality, and peak attenuation. This plan will be provided to the property owner, property manager, and general contractor to educate them on the recommendations of this plan and the DEP Stormwater Management Guidelines.

POST-CONSTRUCTION BEST MANAGEMENT PRACTICES

a) NON-STRUCTURAL BEST MANAGEMENT PRACTICES

Implementing source controls can aid in reducing the types and concentrations of contaminants in stormwater runoff. This principle for pollution prevention and non-structural controls, or BMPs, is to minimize the volume of runoff and to minimize contact of stormwater with potential pollutants. Measures such as street sweeping, managing snow removal, and educating the owner/operator of good maintenance practices are examples of non-structural BMPs.

i. PUBLIC AWARENESS

The building owner shall issue periodic reminders to all residents or tenants to avoid dumping or releasing pollutants into the storm drains and onto the ground.

LONG TERM OPERATIONS & MAINTENANCE PLAN

709 MAIN ST, HINGHAM MA

ii. SWEEPING

Driveway sweeping is an integral part of the stormwater management plan as a fundamental component of source reduction efforts. Sweeping activities shall begin on or around April 1. However, sweeping may be done after winter thaw and the onset of early spring. It is critical to remove the accumulated sediment in the driveway areas from the winter months as soon as possible before spring precipitation.

iii. SNOW AND SNOWMELT MANAGEMENT

The removal contractor shall avoid stockpiling snow directly on top of catch basin grates and also avoid stockpiling snow in the water quality unit and area drain.

It is suggested that during snowfall events, the snow be stockpiled in at the edge of the driveway only.

It is suggested that no de-icing compounds such as calcium chloride (CaCl_2), calcium magnesium acetate (CMA) or the like be used on the site. The snow removal contractor shall store all sand off-site.

b) STRUCTURAL BEST MANAGEMENT PRACTICES:

Structural BMPs are those physical facilities that are designed to manage both stormwater quantity and quality. Proper maintenance of the proposed structural BMPs will ensure design performance and promote longevity of the structure and may decrease operator maintenance costs.

i. UNDERGROUND INFILTRATION/DETENTION SYSTEMS

Underground detention systems comprising of concrete galleys are proposed throughout the site. The systems are designed to drain completely within 72 hours.

The systems shall be inspected twice per year, at the beginning of July and late October/early November, to determine if any loss of capacity has occurred. The system shall also be inspected 24 hours after a rainstorm of over 2.5 inches in a 24-hour period to ensure that the system is free of extraneous debris and fines and is draining adequately. If inspections indicate accumulation of sediment within the system or the cleaning shall be conducted via vacuum truck through the at-grade inspection ports.

LONG TERM OPERATIONS & MAINTENANCE PLAN

709 MAIN ST, HINGHAM MA

ii. ROOF DOWNSPOUTS, (LEAF FILTERS AND CLEANOUTS)

Runoff from the roof gutters flows towards the downspouts to the underground 6" ADS N12 pipe to either the underground infiltration/detention system or towards to area drains at the rear. At each downspout location there is a cleanout with a leaf filter. The function of the cleanout and leaf filter is to remove any debris that might come from the downspouts such as leaves and provide maintenance access to the underground pipes. It is very important that the leaf filter at each downspout is inspected every three months and cleaned as needed. If the filter is observed to be damaged, it shall be replaced immediately.

iii. PERVIOUS PAVERS

Pervious pavers in the driveway and parking areas are proposed to promote recharge, stormwater storage and reduce peak runoff volume. These pavers work as designed when frequent cleaning is performed throughout the year.

Post-construction, the pavers shall be inspected three (3) times per year and cleaned at least twice per year. Once at the beginning of spring (March) and once at the end of foliage season (November). Cleaning shall be performed by sweeping or using regenerative air equipment to remove debris that might be stuck between the gaps.

During the winter season avoid using sand for traction or any salt products that contain sand. Refer to manufacturer's specifications for more information.

MAINTENANCE AGREEMENT

The legal property owner of 709 Main Street, Hingham MA 02043 shall inspect and maintain the drainage system and its accessories as outlined in this Long-Term Operations and Maintenance Report. The inspection logs provided with this maintenance plan shall be kept as records by the homeowner(s).

LONG TERM MAINTENANCE & OPERATIONS PLAN

709 MAIN STREET HINGHAM MA

BMP MAINTENANCE LOG

[illegible]

LONG TERM OPERATIONS & MAINTENANCE PLAN

709 MAIN STREET HINGHAM MA

INSPECTION FORM: PERVIOUS PAVER AREA

All Pervious Paver Area: (Refer to Site Grading and Drainage Plan)

Inspector Name:

Date/Time:

Weather:

TYPE OF INSPECTION (CHECK ONE)	
☐	Routine (Once annually)
☐	Post-Storm (Depth = _____ inches; Storm Duration = _____ hrs; Storm End Date = _____)
☐	Post-Spill (Time/Date of Spill: _____)

INSPECTION CHECKLIST (CHECK ALL THAT APPLY)	
☐	Power wash pavement surface to dislodge trapped particles and vacuum sweep area
☐	Check pavement surface for differential settlement, spalling, cracking
☐	Conduct permeability test (per ASTM C 1701/C 1701M) (two tests per porous pavement area)
☐	Test 1: Water application rate = _____ Time elapsed = _____ Rate = _____
☐	Test 2: Water application rate = _____ Time elapsed = _____ Rate = _____

CORRECTIVE ACTION REQUIRED

ADDITIONAL NOTES/OBSERVATIONS

LONG TERM OPERATIONS & MAINTENANCE PLAN

709 MAIN STREET HINGHAM MA

INSPECTION FORM: UNDERGROUND INFILTRATION/DETENTION SYSTEM (P1)

Unit Number: P1 (Refer to Site Grading and Drainage Plan)

Inspector Name:

Date/Time:

Weather:

TYPE OF INSPECTION (CHECK ONE)	
☐	Routine (Every Six Months)
☐	Annual
☐	Post-Storm (Depth = _____ inches; Storm Duration = _____ hrs; Storm End Date = _____)
☐	Post-Spill (Time/Date of Spill: _____)

INSPECTION CHECKLIST (CHECK ALL THAT APPLY)	
☐	Check for settlement/ cracking of pavement
☐	Check for ground settlement at inspection port locations
☐	Check for sediment accumulation at inlets/outlet via inspection ports
☐	Confirm dry condition within system

CORRECTIVE ACTION REQUIRED	

ADDITIONAL NOTES/OBSERVATIONS	

LONG TERM MAINTENANCE & OPERATIONS PLAN

709 MAIN STREET HINGHAM MA

DATE	NAME OF MAINTENANCE PERSONNEL/COMPANY	TYPE OF MAINTENANCE PERFORMED	ISSUES/NEED FOR FOLLOW-UP	WORK ORDER PROVIDED?

Reproduce log sheets as necessary over the life of this Operation and Maintenance Plan.