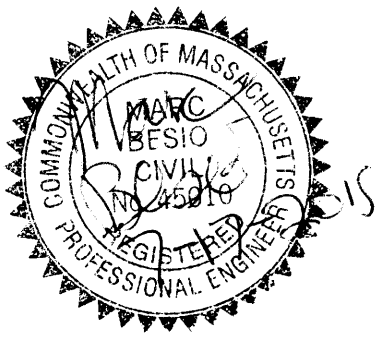
STORMWATER REPORT
28 SUMNER STREET
NEWTON, MASSACHUSETTS



July 15, 2015

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INTRODUCTION

VTP Associates has performed a stormwater management analysis to evaluate the post-development impacts created by the proposed residential at #28 Sumner Street in Newton, Massachusetts. The project shall consist of a residential with 3 units, surface driveways, landscaped areas, and an associated stormwater management system.

VTP Associates analyzed the hydrology for the drainage areas impacted by the proposed work utilizing the Soil Conservation Service's (SCS) Runoff Curve Number (CN) methodology. VTP Associates used the HydroCAD computer modeling system in conjunction with the SCS's methods to determine the peak rate of runoff for the 2, 10, and 100-year storm events.

VTP Associates proposes the use of best management practices (BMPs) as defined by the Massachusetts Department of Environmental Protection (MA DEP) for stormwater management onsite to protect downstream receiving waters from adverse water quality impacts due to stormwater runoff. Mitigating the rate and quality of stormwater runoff from the project site will also help to lessen the environmental impact of the proposed development.

METHODOLOGY

Hydrology and Hydraulics

VTP Associates analyzed the survey base plan and conducted a site visit to determine the existing drainage flow patterns onsite. The existing conditions survey, in conjunction with aerial photography, and site visits were used to determine existing surface coverage areas for the site. VTP Associates determined that a majority of the pre-developed surface cover for the study area is pervious cover. Initial soil research was determined using the Natural Resources Conservation Service (NRCS) soil survey maps for Middlesex County, Massachusetts via Web Soil Survey 1.1. According to the soil survey, the soil on the site consists of the following:

634B: Haven - Urban land

Soil borings were conducted and determined that the site consists of high draining medium to coarse sand. Based upon these findings, VTP Associates used a Hydrologic soil group 'A' for its drainage calculations. The soil boring information has been included within this report. As per the Mass DEP Stormwater Hydrology Handbook for Conservation Commissions, VTP used a design infiltration rate of 6.0in/hr for 'A' soils.

For each subcatchment area, VTP Associates determined drainage flow path lengths, surface cover type and slopes for sheet and shallow concentrated flow. The information was used to calculate the time of concentration (Tc) for each subcatchment areas. Where applicable, a minimum Tc of 5 minutes was used; the minimum value for highly developed, small catchment areas. SCS Runoff Curve Numbers were selected by using the cover type and hydrologic soil group of each area. The peak runoff rates for the 2, 10 and 100-year storm events were then determined by inputting the weighted CN, Tc, drainage areas, and drainage system information into the HydroCAD storm water modeling system computer program. The storm events were based on the 24-hour duration storm with a SCS Type III storm distribution curve.

Storm Event

VTP Associates used Massachusetts rainfall data maps from Technical Paper 40, Rainfall Frequency Atlas of the United States and the City of Newton's Requirements for On-Site Drainage to estimate the rainfall depth for the 2, 10 and 100-year storms. The rainfall depths for the 24-hour storm events used are as follows:

Storm Event	24-Hour Rainfall Depth (inches)
2-year	3.1
10-year	4.5
100-year	7.0

HYDROLOGICAL ANALYSIS

Pre-Development Conditions

The existing site consists of a two story wood house, a driveway, and landscaped areas. Approximately 5,816 square feet (27.4%) of the site is impervious cover. The site is bound by residential building to the south, east and north, and Sumner Street to the west.

VTP Associates compiled the existing drainage areas from an existing conditions survey prepared by VTP Associates. Additionally, VTP Associates conducted site visits to evaluate the existing onsite drainage patterns and watershed divides from the existing conditions survey. At present, stormwater runoffs from the existing study area drain to the south (E2) abutter, and to Sumner Street to the east (E1). The pre-development drainage areas are shown on "Figure 1: Pre-Development Drainage Areas."

Post Development Conditions

The proposed project includes the construction of a new multi-family residential, consisting in 3 units, surface driveways, landscaped areas, and associated drainage improvements. As a result, the proposed site will have approximately 9,488 square feet (44.7%) of impervious cover, which is an increase of 3,672 square feet. The same overall area was analyzed for the proposed conditions as the pre-development conditions and is shown on "Figure 2: Post-Development Drainage Areas."

The new building will have approximately 5,546 square feet of impervious, or roof, and the driveways will be approximately 3,355 square feet. The roof runoff area (PR1) will be collected by roof leaders and discharge into the onsite infiltration system #3 (INF-3). The roof runoff area (PR2) will be collected by roof leaders and discharge into the onsite infiltration system #2 (INF-2). The driveway runoff (PD1) and (PD2) will be collected by two catch basin and discharge into onsite infiltration system #1 (INF-1). The driveway runoff (PD3) will be collected by a catch basin and discharge into onsite infiltration system #3 (INF-3) The intent of the proposed stormwater management systems are to infiltrate stormwater runoff of the proposed building and driveway. The infiltration systems were designed to infiltrate the 100-year storm and help mitigate proposed peak rates of runoff to less than existing conditions. The drainage areas can be seen on "Figure 2: Post-Development Drainage Areas."

VTP Associates analyzed the pre- and post-development site conditions to determine the peak rates of runoff at the design points. By incorporating the stormwater management features discussed above, the peak rates of runoff in the post-development condition is to be better than pre-development levels. Pre-development peak runoff rates vs. post-development peak runoff rates for the 2, 10, and 100-year storm events are presented in Table 1 below.

Table 1, Pre-development vs. Post-Development Peak Rate of Runoff

Design Point #1 –Sumner Street

STORM EVENT (DESIGN POINT)	*PRE-DEVELOPMENT PEAK RATE OF RUNOFF (CFS)*	*POST-DEVELOPMENT PEAK RATE OF RUNOFF (CFS)*
2-YEAR	0.08	0.00
10-YEAR	0.38	0.01
100-YEAR	1.15	0.17

Design Point #2 –South Abutter

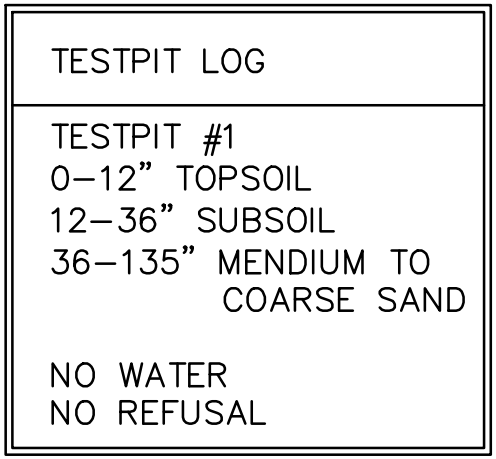
STORM EVENT (DESIGN POINT)	*PRE-DEVELOPMENT PEAK RATE OF RUNOFF (CFS)*	*POST-DEVELOPMENT PEAK RATE OF RUNOFF (CFS)*
2-YEAR	0.00	0.00
10-YEAR	0.01	0.00
100-YEAR	0.08	0.03

CONCLUSION

The post-development peak rate of runoff is expected to be less than or equal to pre-development levels for the 2, 10, and 100-year storm events. Although there is increased impervious coverage on the site as a result of the proposed redevelopment, the addition of the underground infiltration systems controls the post-development runoff to pre-development levels or better.

ENCLOSURES

Soil Boring
NRCS Soil Map
Pre-Development Drainage Areas (Figure 1)
Post-Development Drainage Areas (Figure 2)
Pre & Post Development HydroCAD Calculations


TESTPIT LOG
TESTPIT #1
0–12" TOPSOIL
12–36" SUBSOIL
36–135" MENDIUM TO
COARSE SAND
NO WATER
NO REFUSAL

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- 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
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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: http://websoilsurvey.nrcs.usda.gov
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: Middlesex County, Massachusetts
Survey Area Data: Version 14, Sep 19, 2014

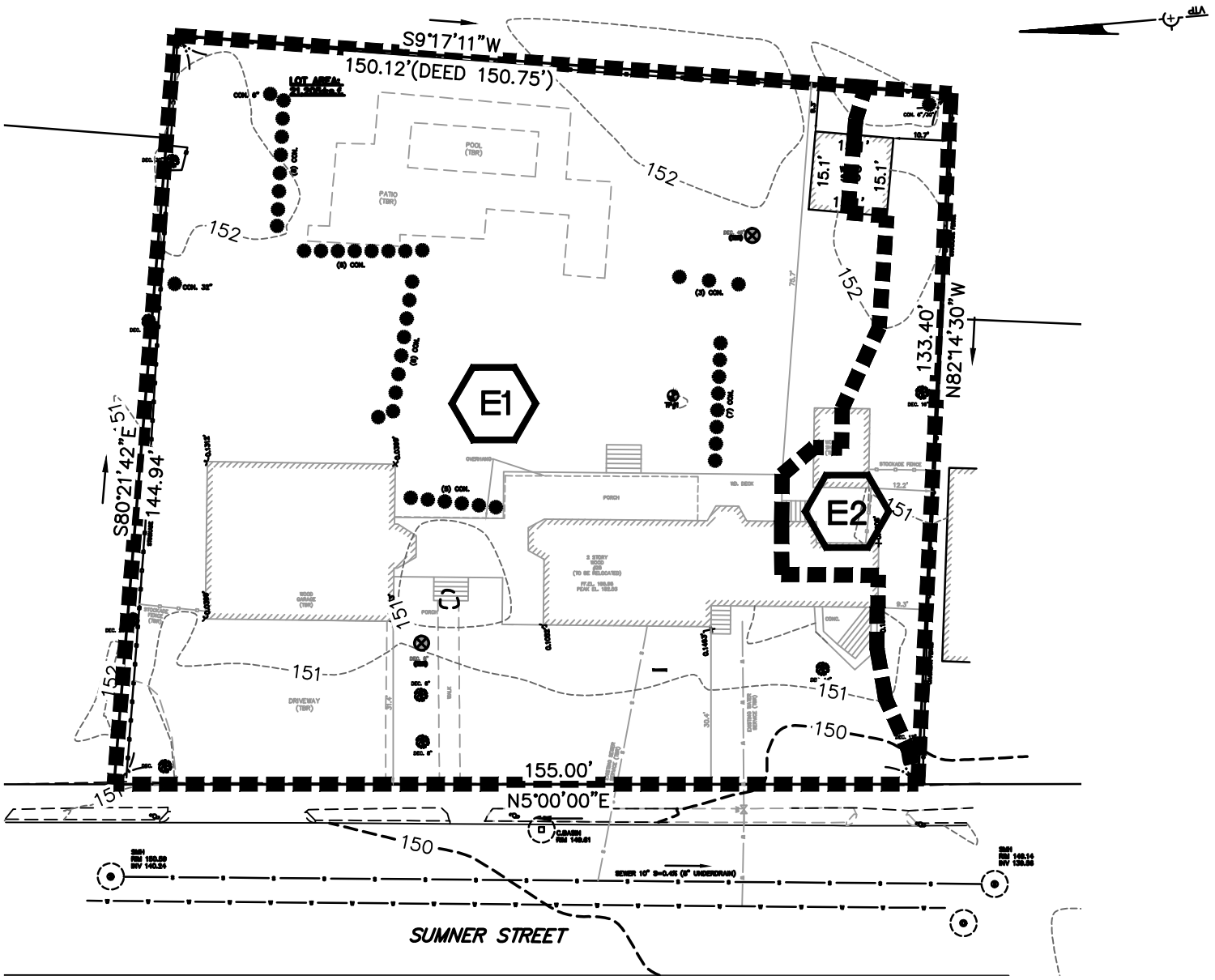
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014

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.

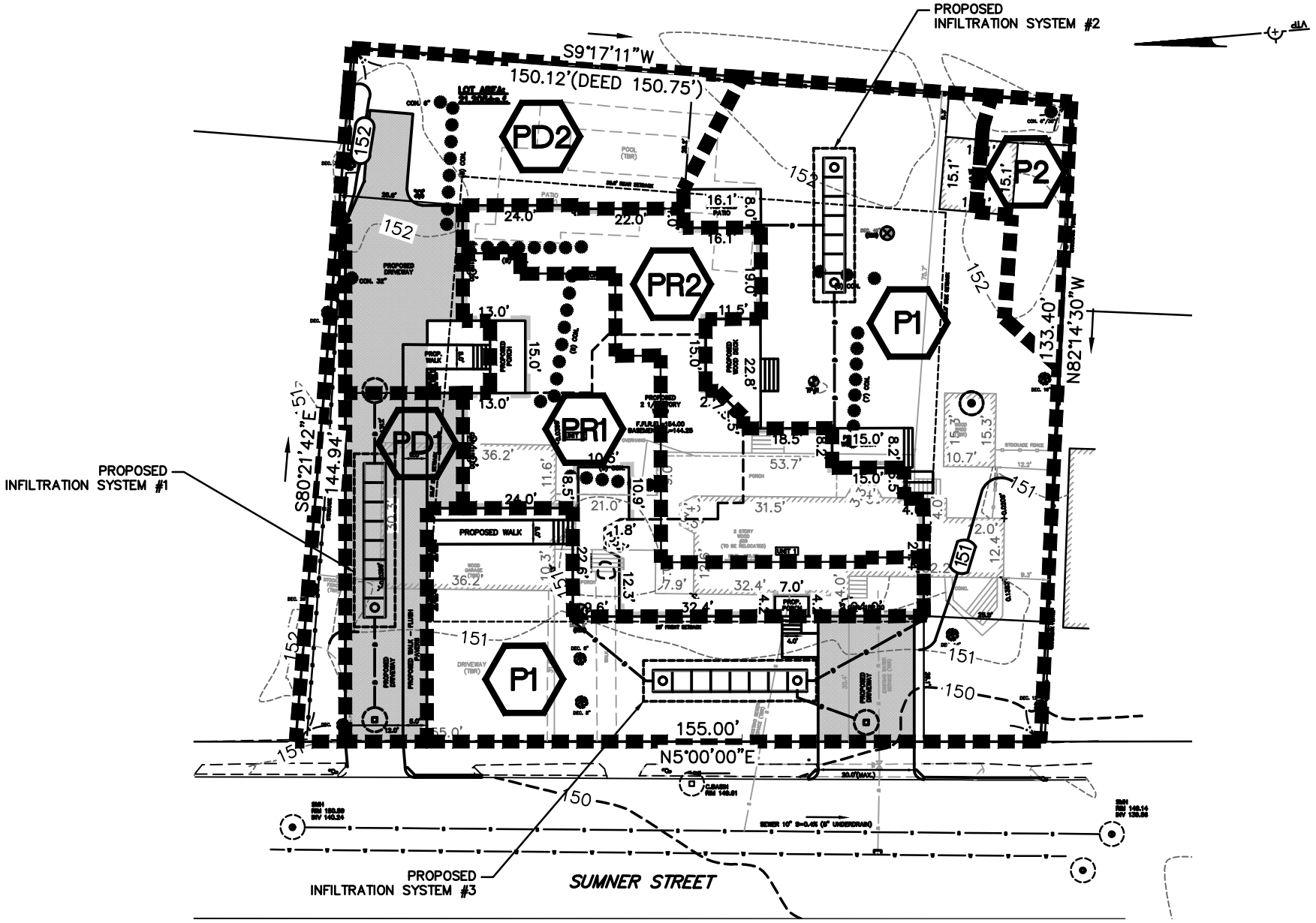
Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
624B	Haven-Urban land complex, 0 to 8 percent slopes	0.5	100.0%
Totals for Area of Interest		**0.5**	**100.0%**



SCALE: 1in.=30ft.
DATE: JULY 15, 2015

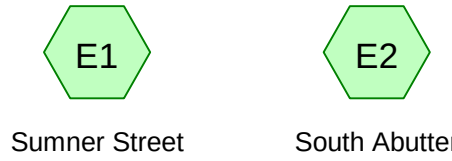
FIGURE 1:
PRE-DEVELOPMENT DRAINAGE AREAS
#28 SUMNER STREET



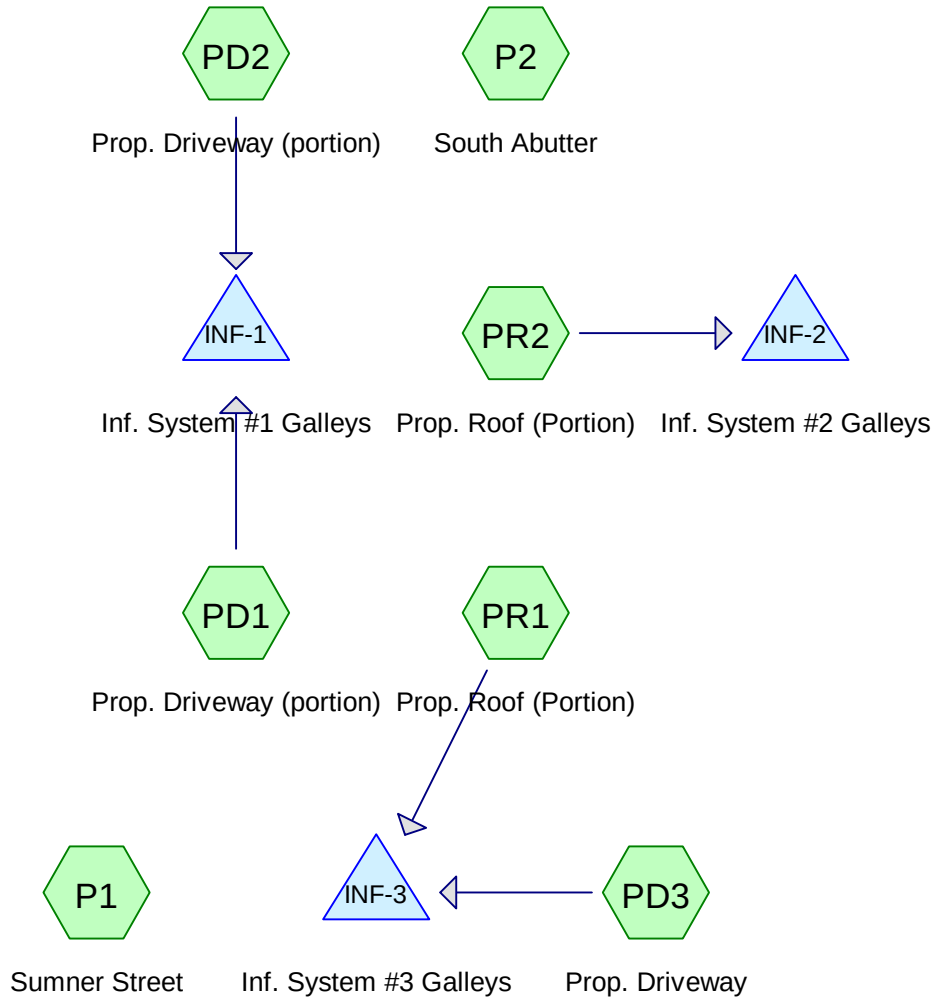
SCALE: 1in.=30ft.
DATE: JULY 15, 2015

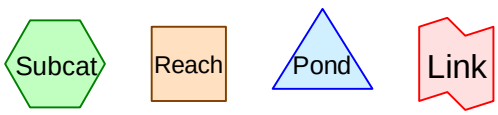
FIGURE 2:
POST-DEVELOPMENT DRAINAGE AREAS
#28 SUMNER STREET

PRE-DEVELOPMENT CONDITIONS



POST-DEVELOPMENT CONDITIONS





Routing Diagram for 214212 #28 Sumner Street Newton, MA
Prepared by VTP associates, inc., Printed 7/15/2015
HydroCAD® 10.00-15 s/n 08174 © 2015 HydroCAD Software Solutions LLC

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Summary for Subcatchment E1: Sumner Street

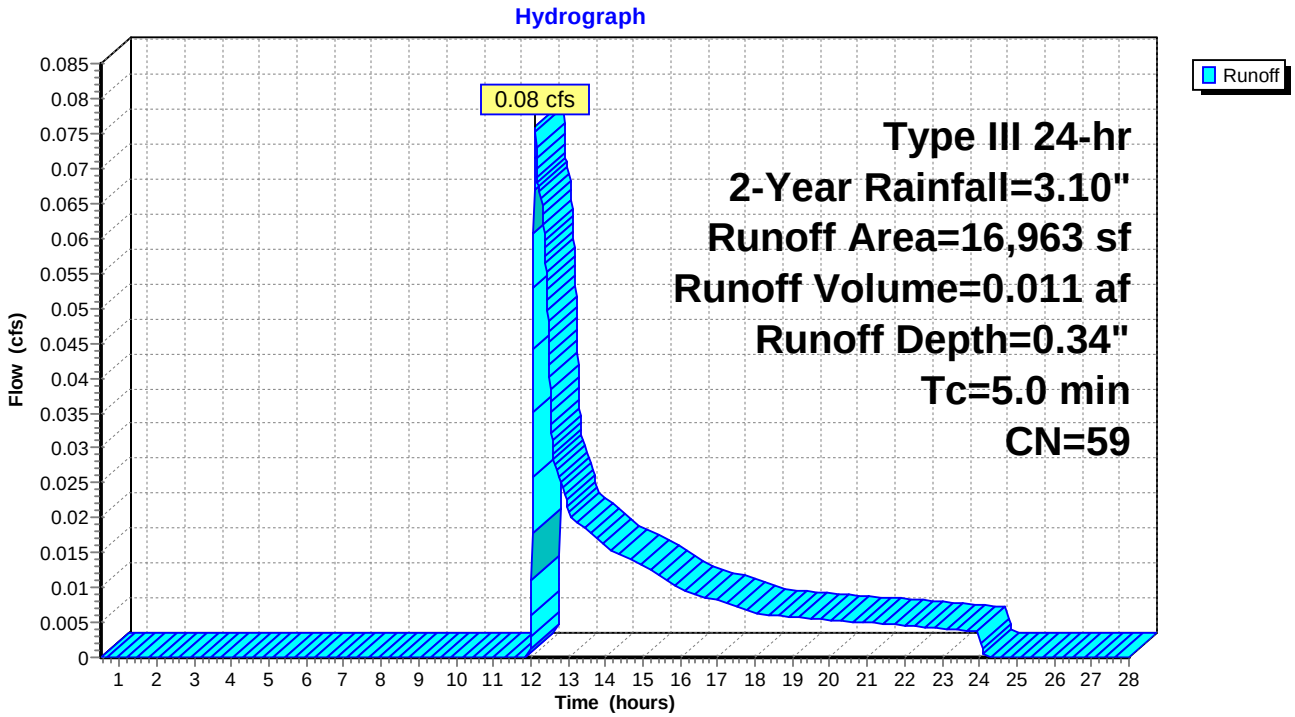
Runoff = 0.08 cfs @ 12.12 hrs, Volume= 0.011 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	2,983	98	Roof (portion)
*	1,438	98	Driveway
*	126	98	Walks
*	37	98	Ret. Wall
*	1,018	98	Patio
*	214	98	Pool
	11,147	39	>75% Grass cover, Good, HSG A
	16,963	59	Weighted Average
	11,147		65.71% Pervious Area
	5,816		34.29% Impervious Area

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

Subcatchment E1: Sumner Street



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Summary for Subcatchment E2: South Abutter

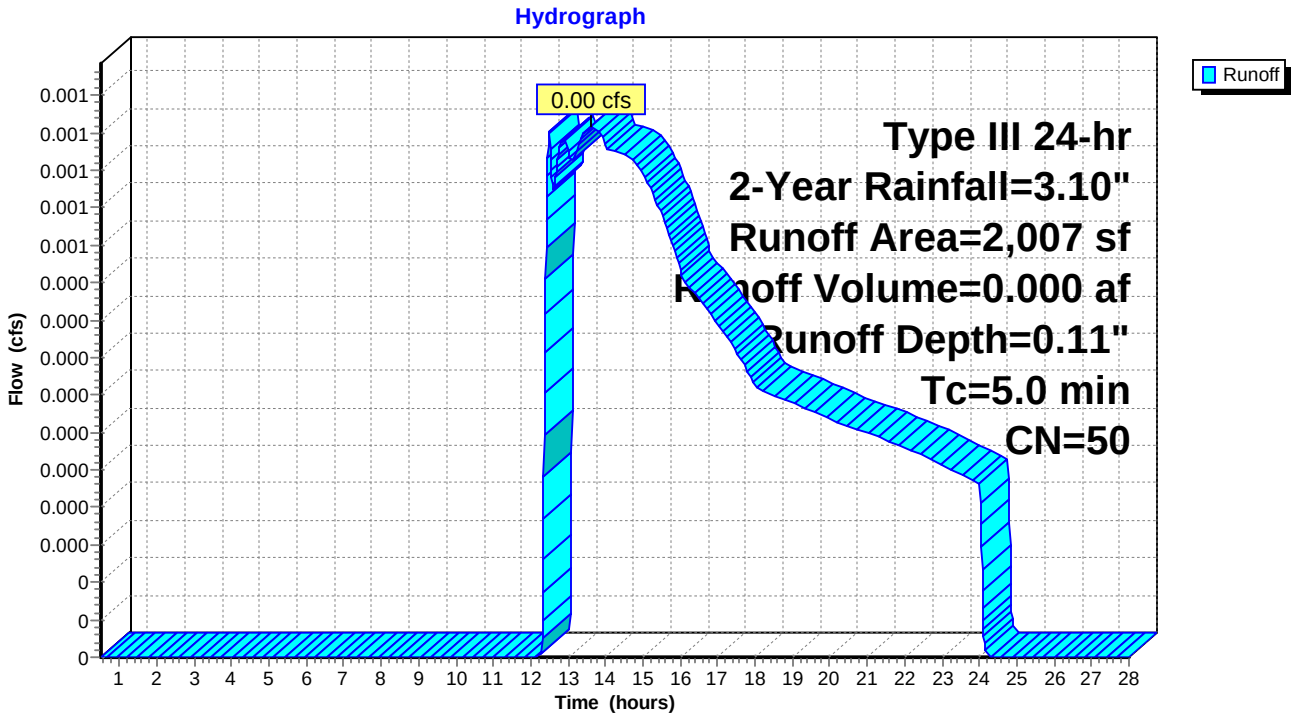
Runoff = 0.00 cfs @ 13.63 hrs, Volume= 0.000 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	379	98	Roof (portion)
	1,628	39	>75% Grass cover, Good, HSG A
	2,007	50	Weighted Average
	1,628		81.12% Pervious Area
	379		18.88% Impervious Area

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

Subcatchment E2: South Abutter



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Summary for Subcatchment P1: Sumner Street

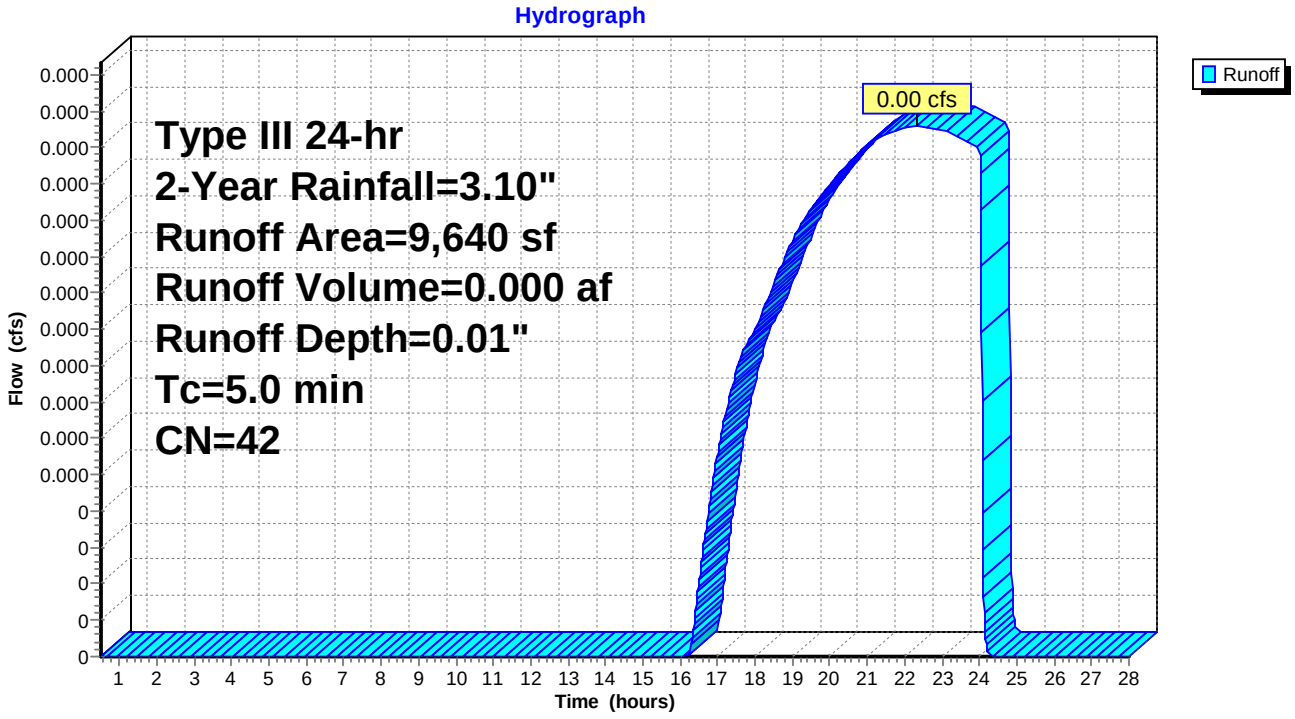
Runoff = 0.00 cfs @ 22.35 hrs, Volume= 0.000 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	114	98	Roof (portion)
*	203	98	Walks
*	27	98	Bulkhead
*	129	98	Patio
	9,167	39	>75% Grass cover, Good, HSG A
	9,640	42	Weighted Average
	9,167		95.09% Pervious Area
	473		4.91% Impervious Area

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

Subcatchment P1: Sumner Street



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Summary for Subcatchment P2: South Abutter

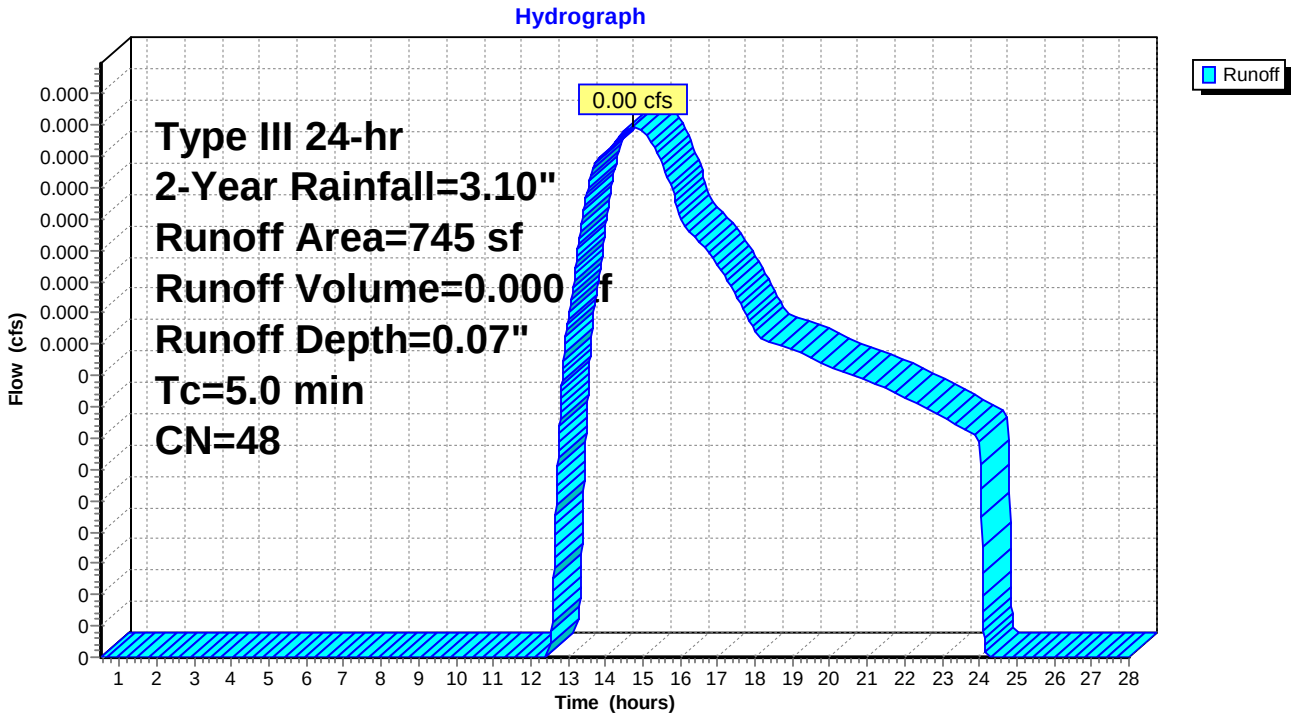
Runoff = 0.00 cfs @ 14.74 hrs, Volume= 0.000 af, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	114	98	Shed (portion)
	631	39	>75% Grass cover, Good, HSG A
	745	48	Weighted Average
	631		84.70% Pervious Area
	114		15.30% Impervious Area

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

Subcatchment P2: South Abutter



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Summary for Subcatchment PD1: Prop. Driveway (portion)

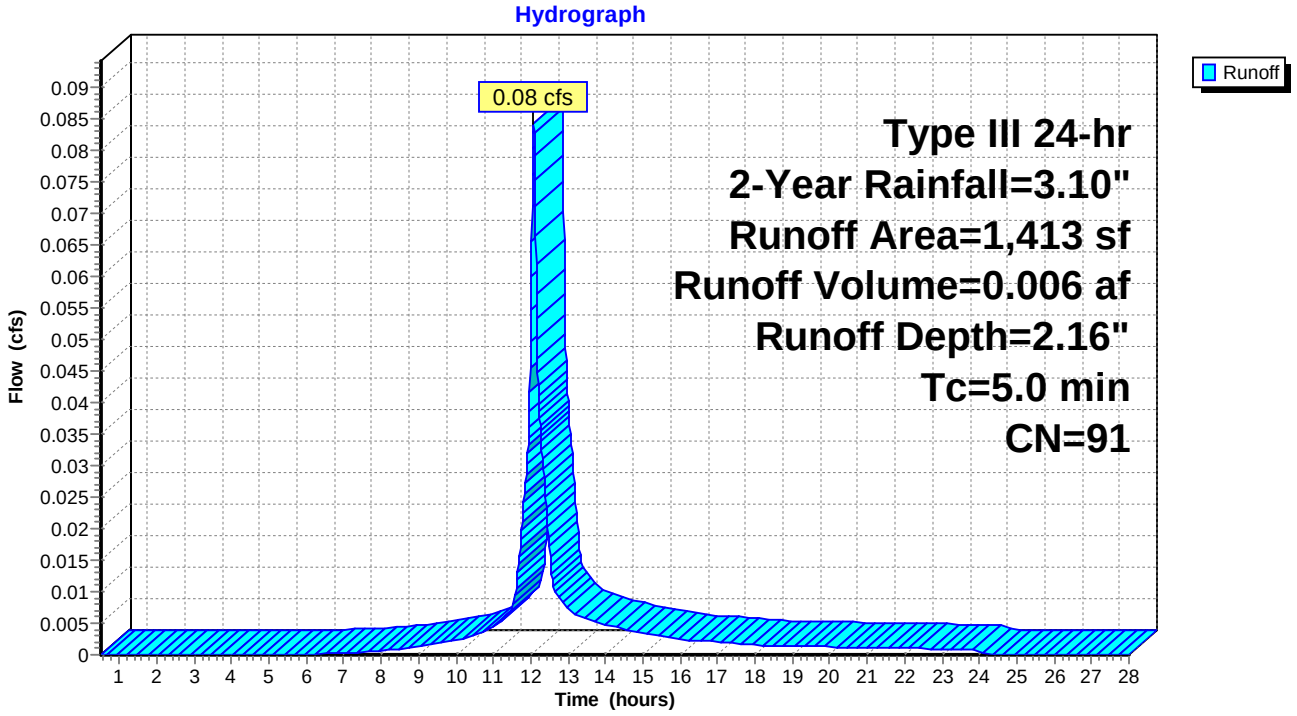
Runoff = 0.08 cfs @ 12.07 hrs, Volume= 0.006 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	879	98	Paved Driveway
*	362	98	Pavers Walk/ Driveway
	172	39	>75% Grass cover, Good, HSG A
	1,413	91	Weighted Average
	172		12.17% Pervious Area
	1,241		87.83% Impervious Area

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

Subcatchment PD1: Prop. Driveway (portion)



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Summary for Subcatchment PD2: Prop. Driveway (portion)

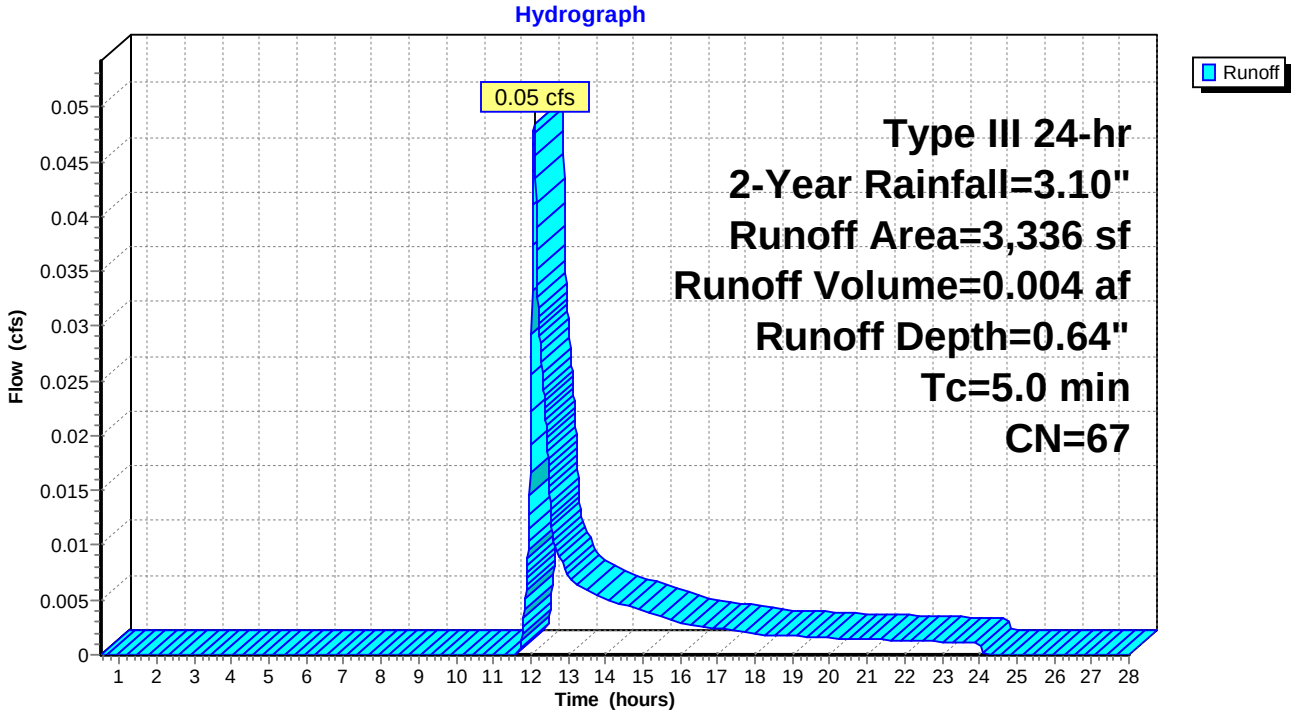
Runoff = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	972	98	Paved Driveway
*	619	98	Pavers Walk/Driveway
	1,745	39	>75% Grass cover, Good, HSG A
	3,336	67	Weighted Average
	1,745		52.31% Pervious Area
	1,591		47.69% Impervious Area

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

Subcatchment PD2: Prop. Driveway (portion)



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Summary for Subcatchment PD3: Prop. Driveway

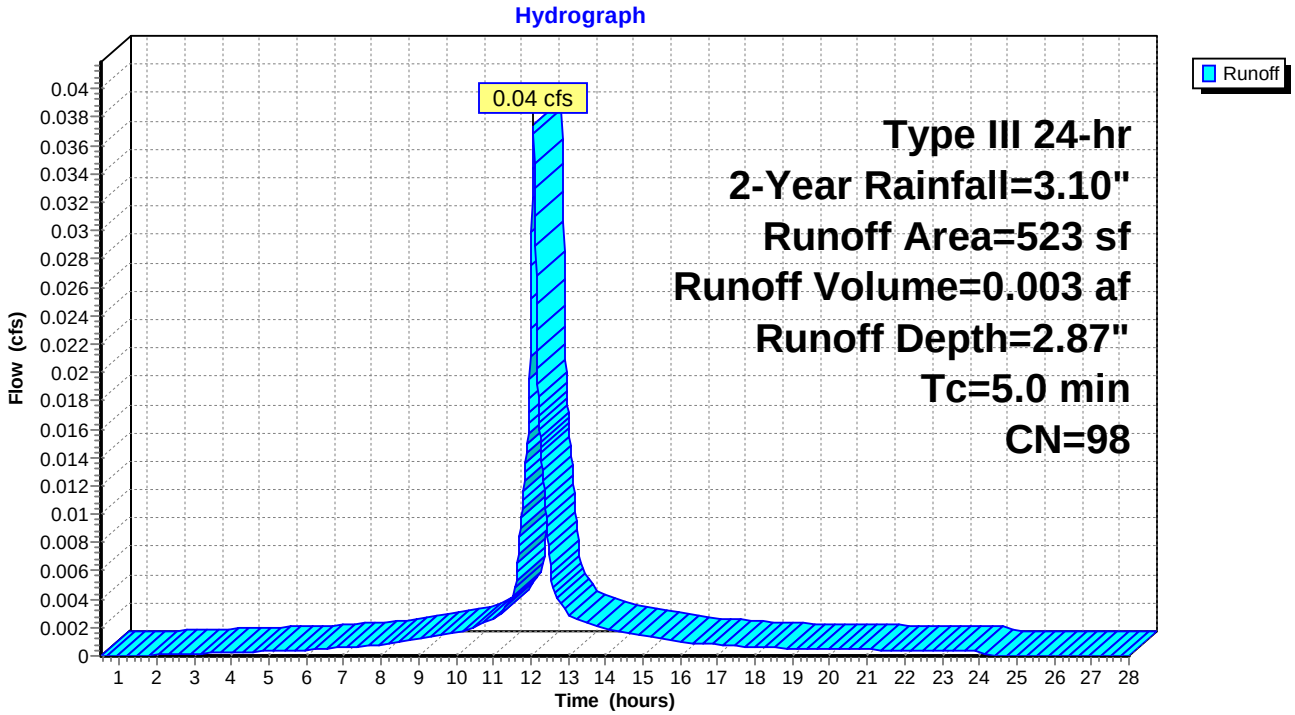
Runoff = 0.04 cfs @ 12.07 hrs, Volume= 0.003 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	523	98	Paved Driveway
	523		100.00% Impervious Area

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

Subcatchment PD3: Prop. Driveway



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Summary for Subcatchment PR1: Prop. Roof (Portion)

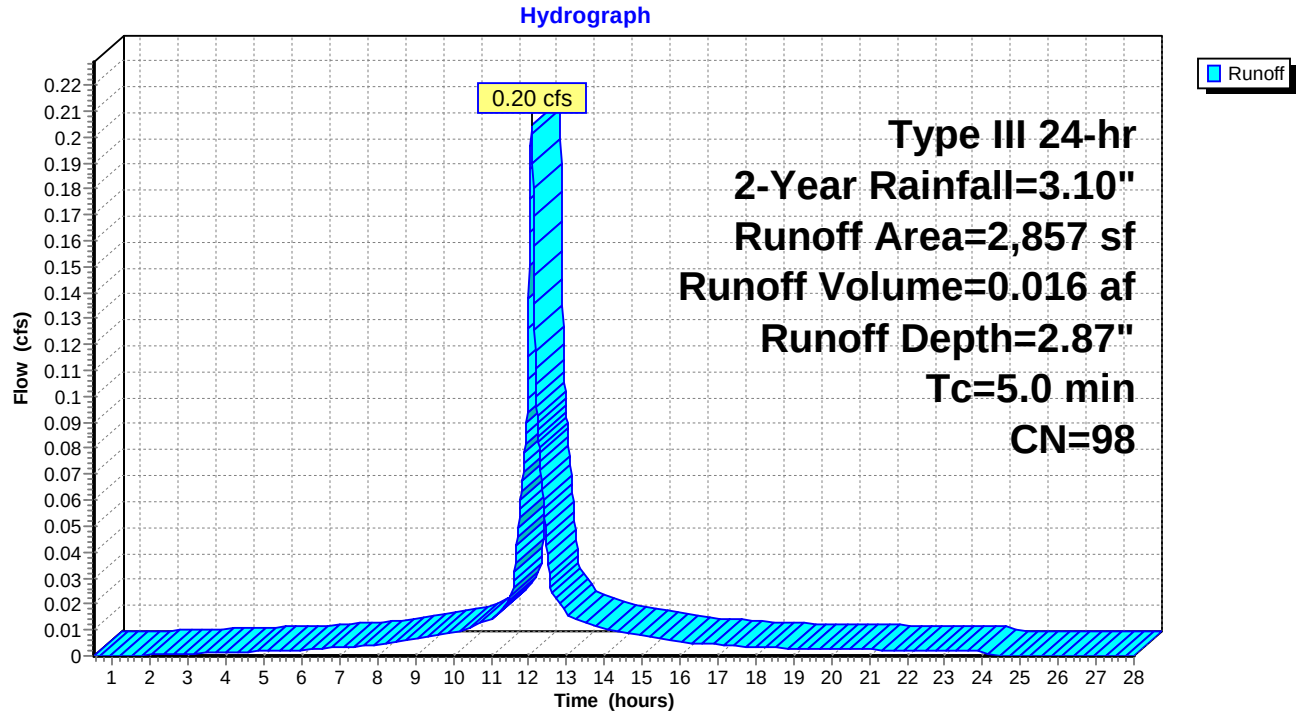
Runoff = 0.20 cfs @ 12.07 hrs, Volume= 0.016 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	2,857	98	Roof (Unit 1&2))
	2,857		100.00% Impervious Area

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

Subcatchment PR1: Prop. Roof (Portion)



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Summary for Subcatchment PR2: Prop. Roof (Portion)

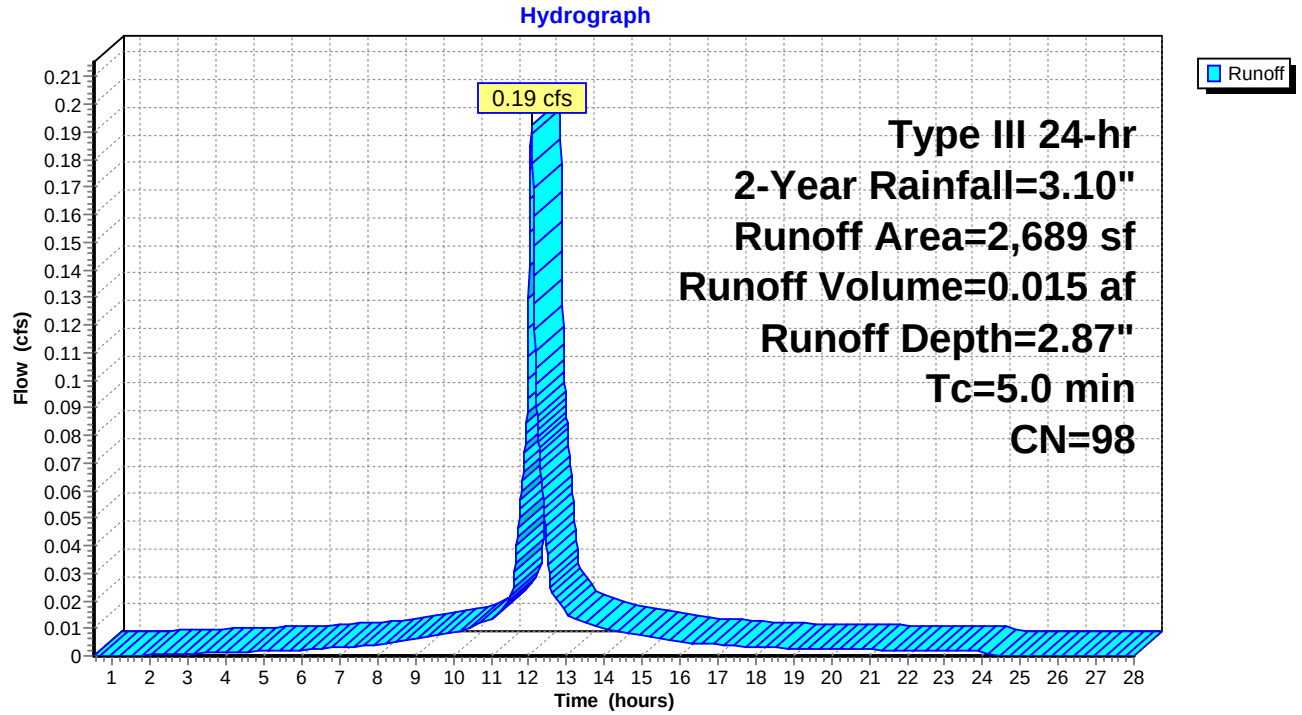
Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.10"

	Area (sf)	CN	Description
*	2,689	98	Roof (Unit 2&3)
	2,689		100.00% Impervious Area

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

Subcatchment PR2: Prop. Roof (Portion)



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Summary for Pond INF-1: Inf. System #1 Galleys

Inflow Area = 0.109 ac, 59.63% Impervious, Inflow Depth = 1.09" for 2-Year event
Inflow = 0.13 cfs @ 12.08 hrs, Volume= 0.010 af
Outflow = 0.04 cfs @ 12.01 hrs, Volume= 0.010 af, Atten= 68%, Lag= 0.0 min
Discarded = 0.04 cfs @ 12.01 hrs, Volume= 0.010 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 144.43' @ 12.43 hrs Surf.Area= 0.007 ac Storage= 0.001 af

Plug-Flow detention time= 6.6 min calculated for 0.010 af (100% of inflow)
Center-of-Mass det. time= 6.6 min (844.7 - 838.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.75'	0.008 af	**8.50'W x 36.00'L x 5.25'H Field A** 0.037 af Overall - 0.011 af Embedded = 0.025 af x 30.0% Voids
#2A	144.75'	0.009 af	**Galley 4x4x4.25** x 8 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.75'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 12.01 hrs HW=143.81' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

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Pond INF-1: Inf. System #1 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

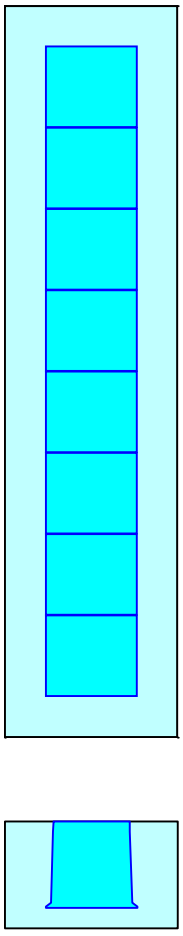
8 Chambers/Row x 4.00' Long = 32.00' Row Length +24.0" End Stone x 2 = 36.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

8 Chambers x 46.4 cf = 371.0 cf Chamber Storage
8 Chambers x 62.3 cf = 498.7 cf Displacement

1,606.5 cf Field - 498.7 cf Chambers = 1,107.8 cf Stone x 30.0% Voids = 332.4 cf Stone Storage

Chamber Storage + Stone Storage = 703.4 cf = 0.016 af
Overall Storage Efficiency = 43.8%

8 Chambers
59.5 cy Field
41.0 cy Stone



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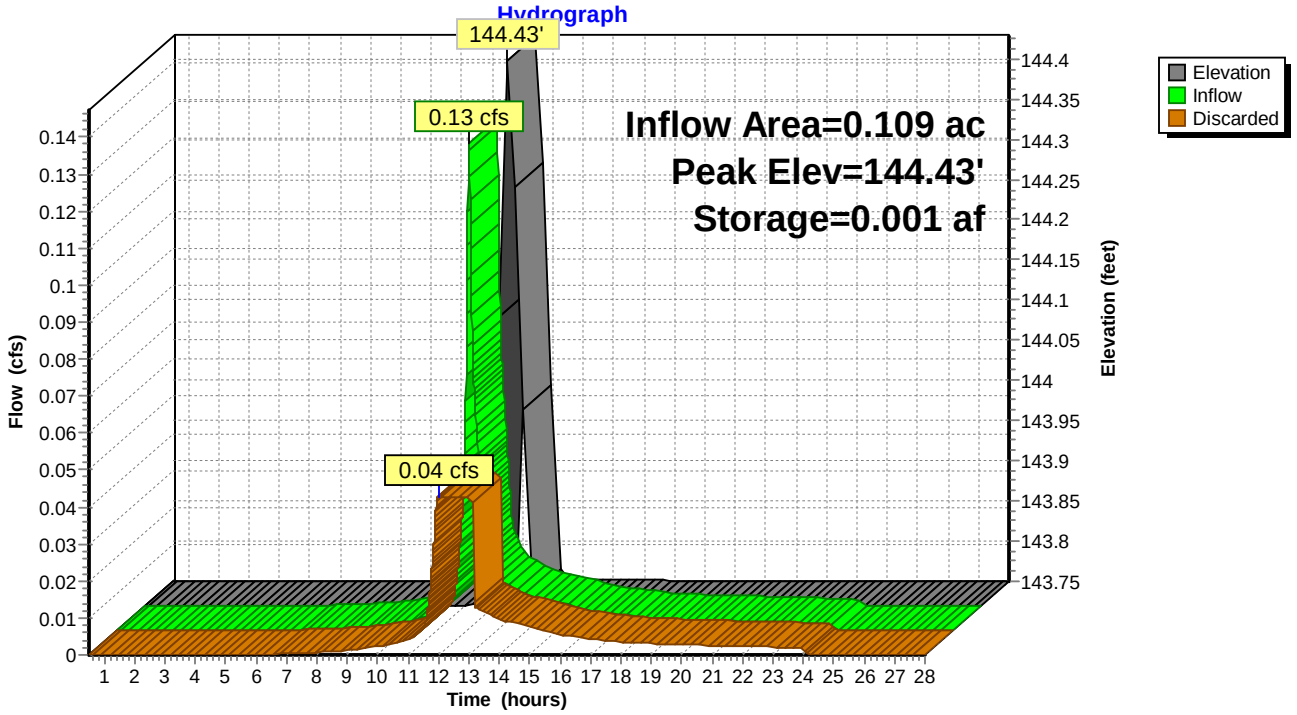
Pond INF-1: Inf. System #1 Galleys



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Summary for Pond INF-2: Inf. System #2 Galleys

Inflow Area = 0.062 ac,100.00% Impervious, Inflow Depth = 2.87" for 2-Year event
Inflow = 0.19 cfs @ 12.07 hrs, Volume= 0.015 af
Outflow = 0.04 cfs @ 11.78 hrs, Volume= 0.015 af, Atten= 80%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.78 hrs, Volume= 0.015 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 145.41' @ 12.49 hrs Surf.Area= 0.006 ac Storage= 0.003 af

Plug-Flow detention time= 18.8 min calculated for 0.015 af (100% of inflow)
Center-of-Mass det. time= 18.8 min (774.9 - 756.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.95'	0.007 af	**8.50'W x 32.00'L x 5.25'H Field A** 0.033 af Overall - 0.010 af Embedded = 0.023 af x 30.0% Voids
#2A	144.95'	0.007 af	**Galley 4x4x4.25** x 7 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.014 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.95'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 11.78 hrs HW=144.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

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Pond INF-2: Inf. System #2 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

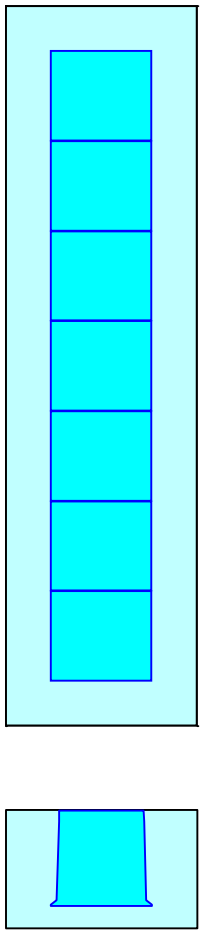
7 Chambers/Row x 4.00' Long = 28.00' Row Length +24.0" End Stone x 2 = 32.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

7 Chambers x 46.4 cf = 324.7 cf Chamber Storage
7 Chambers x 62.3 cf = 436.3 cf Displacement

1,428.0 cf Field - 436.3 cf Chambers = 991.7 cf Stone x 30.0% Voids = 297.5 cf Stone Storage

Chamber Storage + Stone Storage = 622.2 cf = 0.014 af
Overall Storage Efficiency = 43.6%

7 Chambers
52.9 cy Field
36.7 cy Stone



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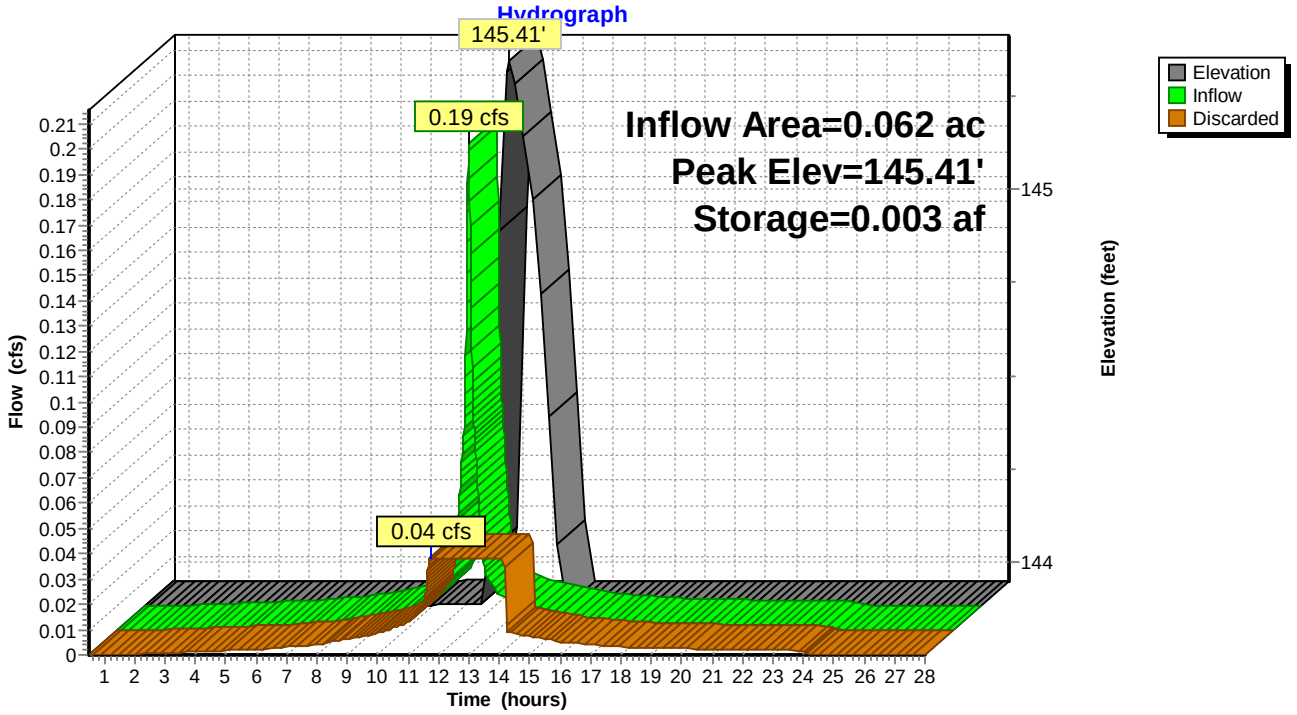
Pond INF-2: Inf. System #2 Galleys



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Summary for Pond INF-3: Inf. System #3 Galleys

Inflow Area = 0.078 ac,100.00% Impervious, Inflow Depth = 2.87" for 2-Year event
Inflow = 0.24 cfs @ 12.07 hrs, Volume= 0.019 af
Outflow = 0.04 cfs @ 11.75 hrs, Volume= 0.019 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.75 hrs, Volume= 0.019 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 144.62' @ 12.51 hrs Surf.Area= 0.007 ac Storage= 0.005 af

Plug-Flow detention time= 23.8 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 23.8 min (780.0 - 756.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	142.95'	0.008 af	**8.50'W x 36.00'L x 5.25'H Field A** 0.037 af Overall - 0.011 af Embedded = 0.025 af x 30.0% Voids
#2A	143.95'	0.009 af	**Galley 4x4x4.25** x 8 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	142.95'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 11.75 hrs HW=143.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

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Pond INF-3: Inf. System #3 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

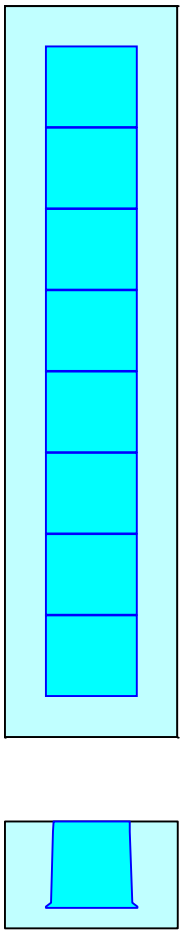
8 Chambers/Row x 4.00' Long = 32.00' Row Length +24.0" End Stone x 2 = 36.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

8 Chambers x 46.4 cf = 371.0 cf Chamber Storage
8 Chambers x 62.3 cf = 498.7 cf Displacement

1,606.5 cf Field - 498.7 cf Chambers = 1,107.8 cf Stone x 30.0% Voids = 332.4 cf Stone Storage

Chamber Storage + Stone Storage = 703.4 cf = 0.016 af
Overall Storage Efficiency = 43.8%

8 Chambers
59.5 cy Field
41.0 cy Stone



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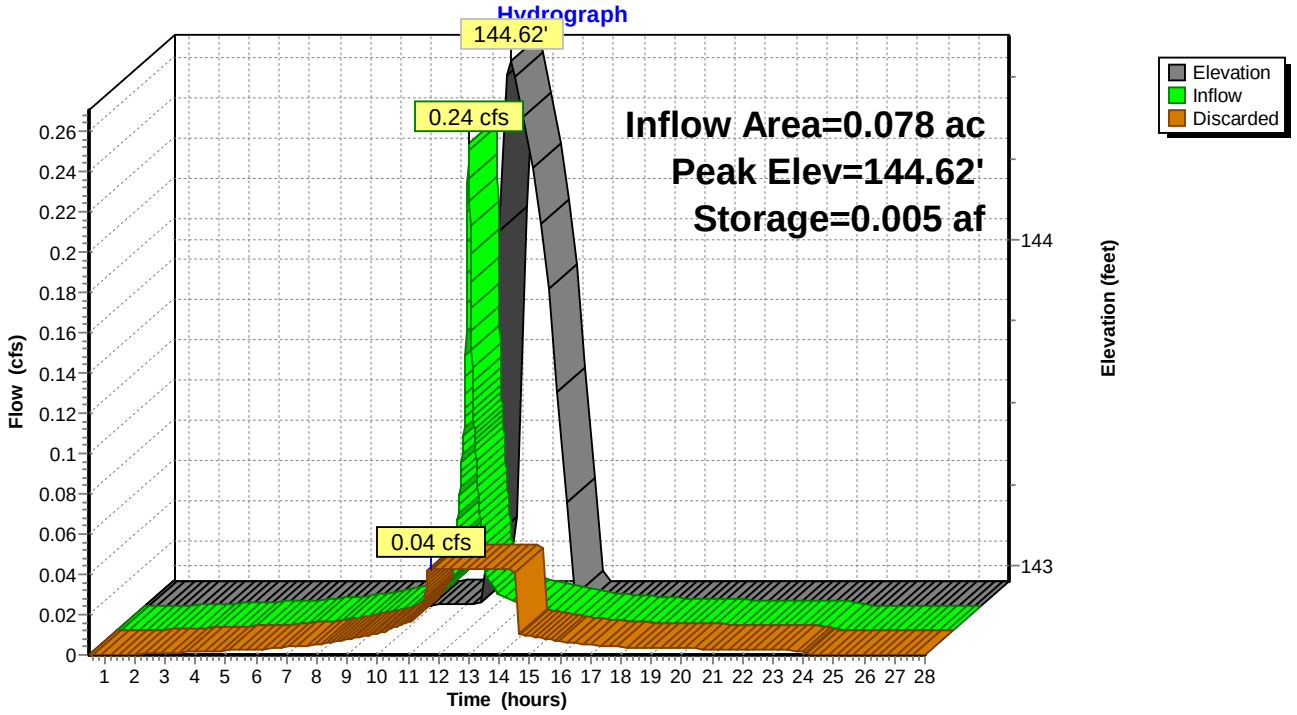
Pond INF-3: Inf. System #3 Galleys



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Summary for Subcatchment E1: Sumner Street

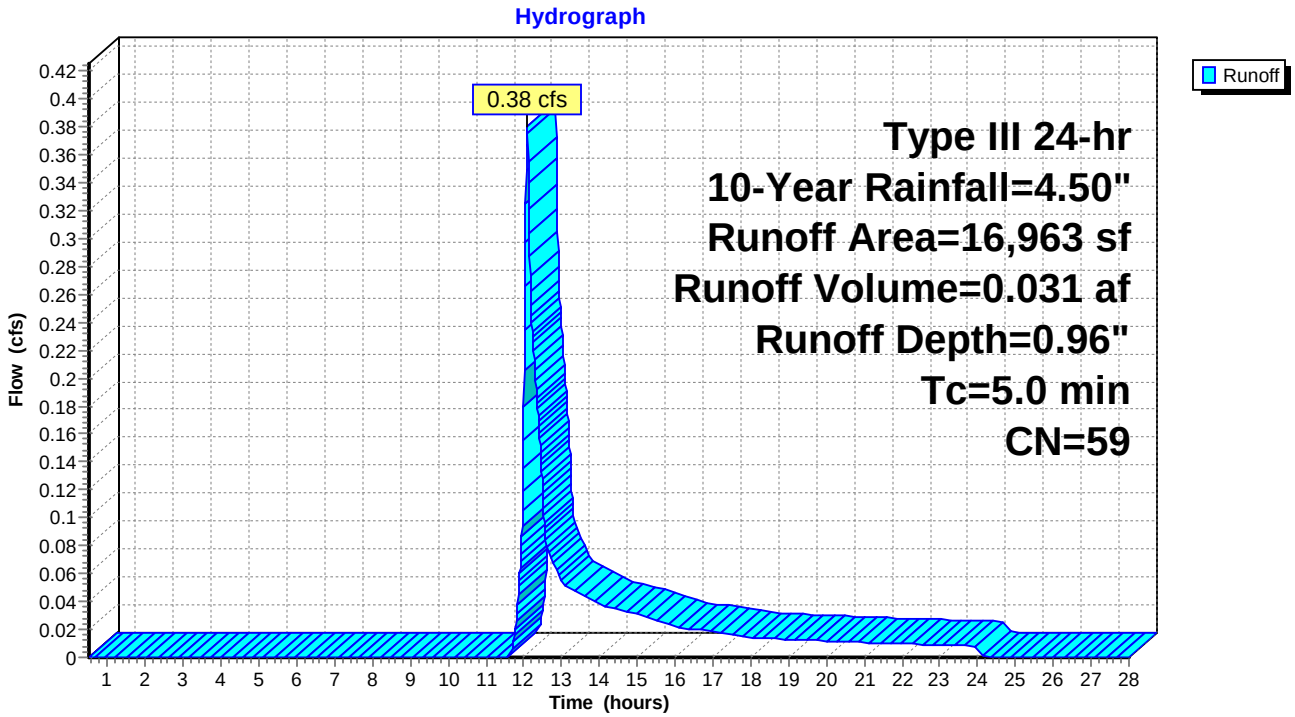
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.031 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	2,983	98	Roof (portion)
*	1,438	98	Driveway
*	126	98	Walks
*	37	98	Ret. Wall
*	1,018	98	Patio
*	214	98	Pool
	11,147	39	>75% Grass cover, Good, HSG A
	16,963	59	Weighted Average
	11,147		65.71% Pervious Area
	5,816		34.29% Impervious Area

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

Subcatchment E1: Sumner Street



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Summary for Subcatchment E2: South Abutter

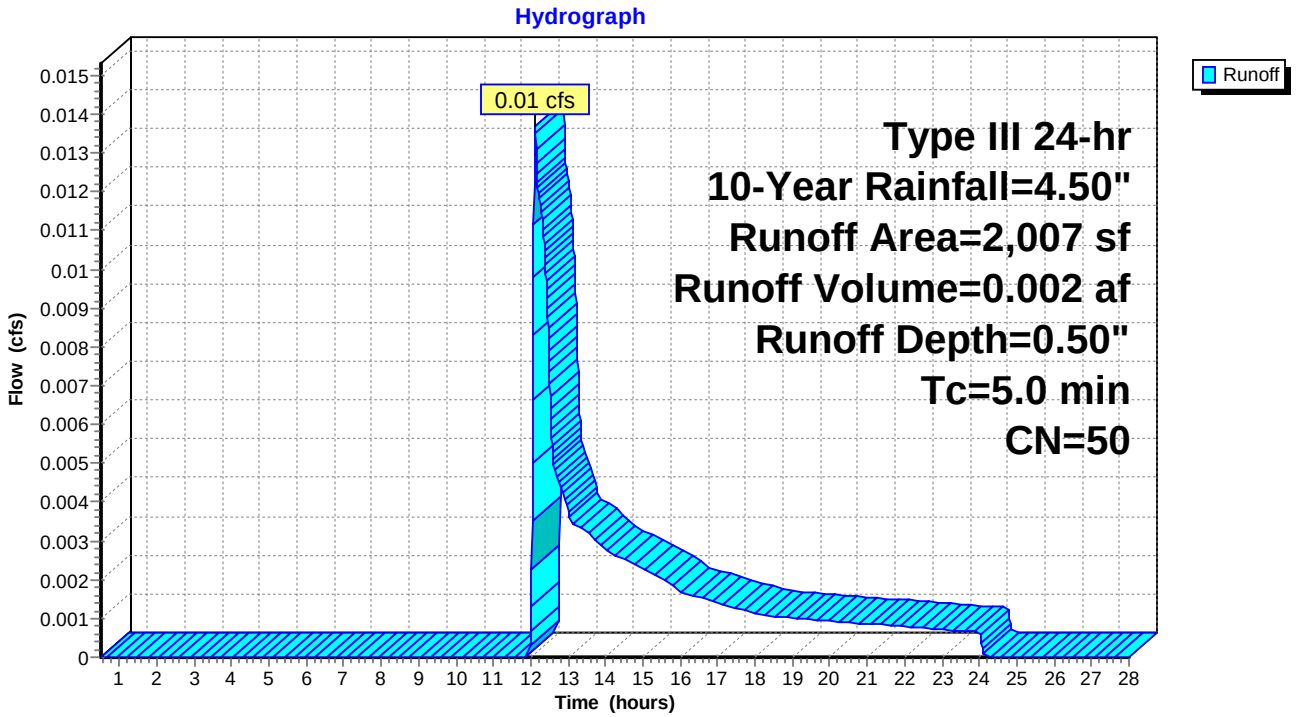
Runoff = 0.01 cfs @ 12.12 hrs, Volume= 0.002 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	379	98	Roof (portion)
	1,628	39	>75% Grass cover, Good, HSG A
	2,007	50	Weighted Average
	1,628		81.12% Pervious Area
	379		18.88% Impervious Area

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

Subcatchment E2: South Abutter



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Summary for Subcatchment P1: Sumner Street

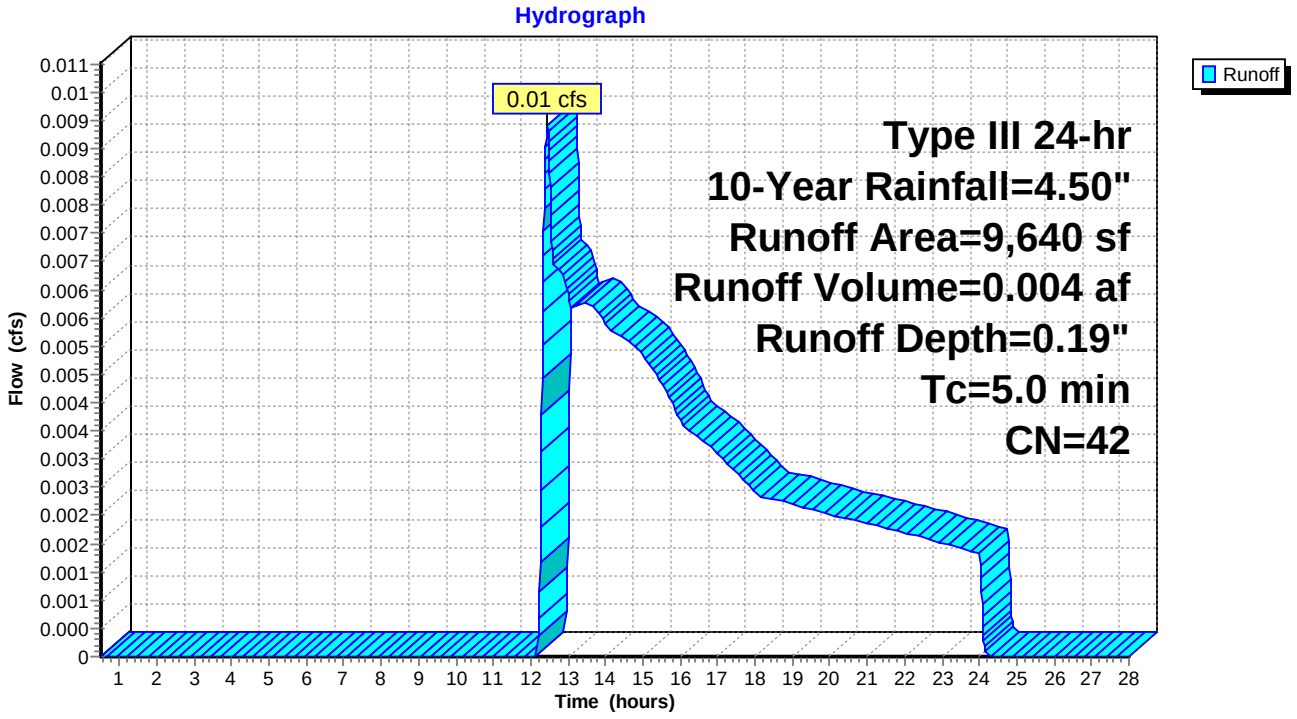
Runoff = 0.01 cfs @ 12.44 hrs, Volume= 0.004 af, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	114	98	Roof (portion)
*	203	98	Walks
*	27	98	Bulkhead
*	129	98	Patio
	9,167	39	>75% Grass cover, Good, HSG A
	9,640	42	Weighted Average
	9,167		95.09% Pervious Area
	473		4.91% Impervious Area

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

Subcatchment P1: Sumner Street



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Summary for Subcatchment P2: South Abutter

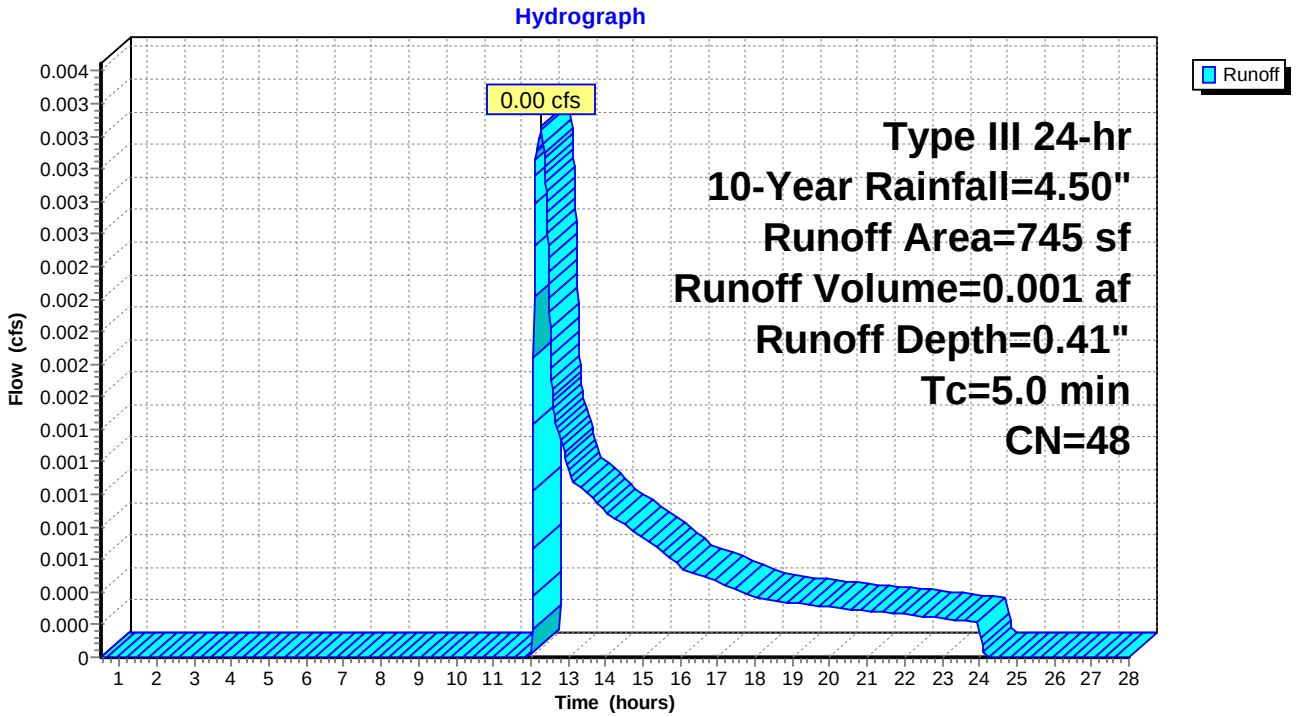
Runoff = 0.00 cfs @ 12.28 hrs, Volume= 0.001 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	114	98	Shed (portion)
	631	39	>75% Grass cover, Good, HSG A
	745	48	Weighted Average
	631		84.70% Pervious Area
	114		15.30% Impervious Area

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

Subcatchment P2: South Abutter



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Summary for Subcatchment PD1: Prop. Driveway (portion)

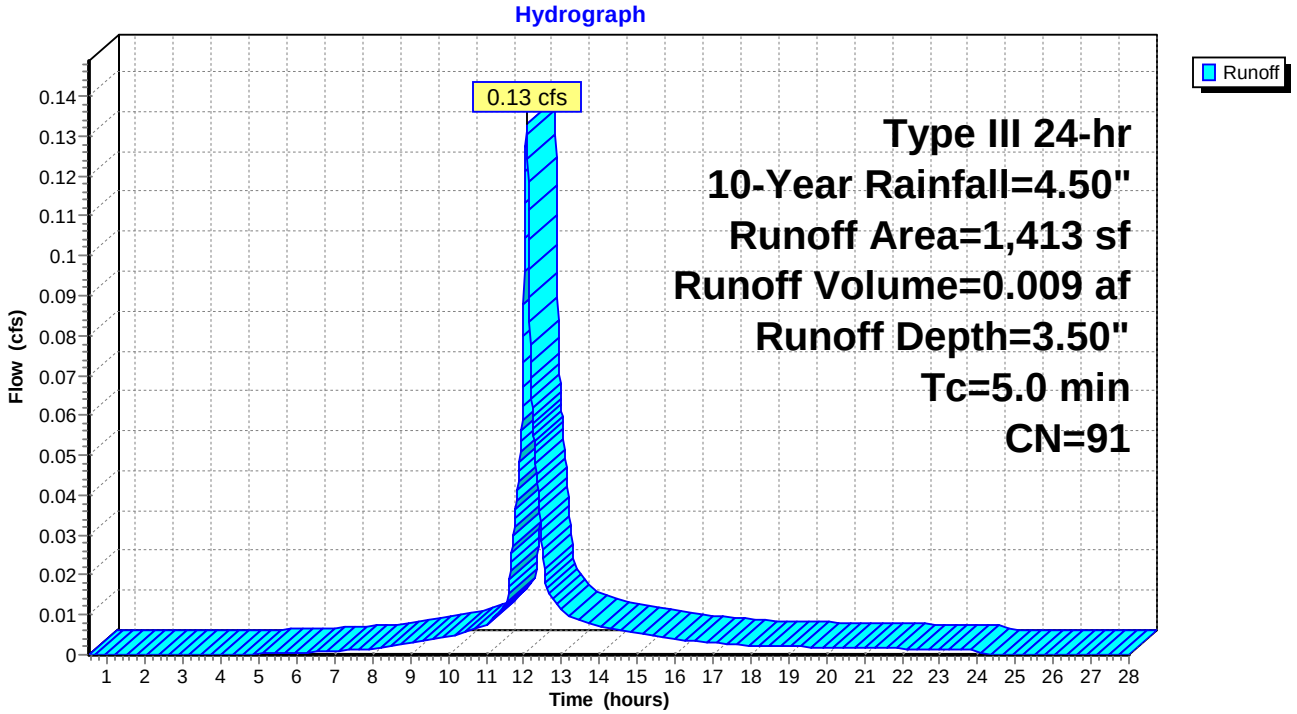
Runoff = 0.13 cfs @ 12.07 hrs, Volume= 0.009 af, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	879	98	Paved Driveway
*	362	98	Pavers Walk/ Driveway
	172	39	>75% Grass cover, Good, HSG A
	1,413	91	Weighted Average
	172		12.17% Pervious Area
	1,241		87.83% Impervious Area

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

Subcatchment PD1: Prop. Driveway (portion)



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Summary for Subcatchment PD2: Prop. Driveway (portion)

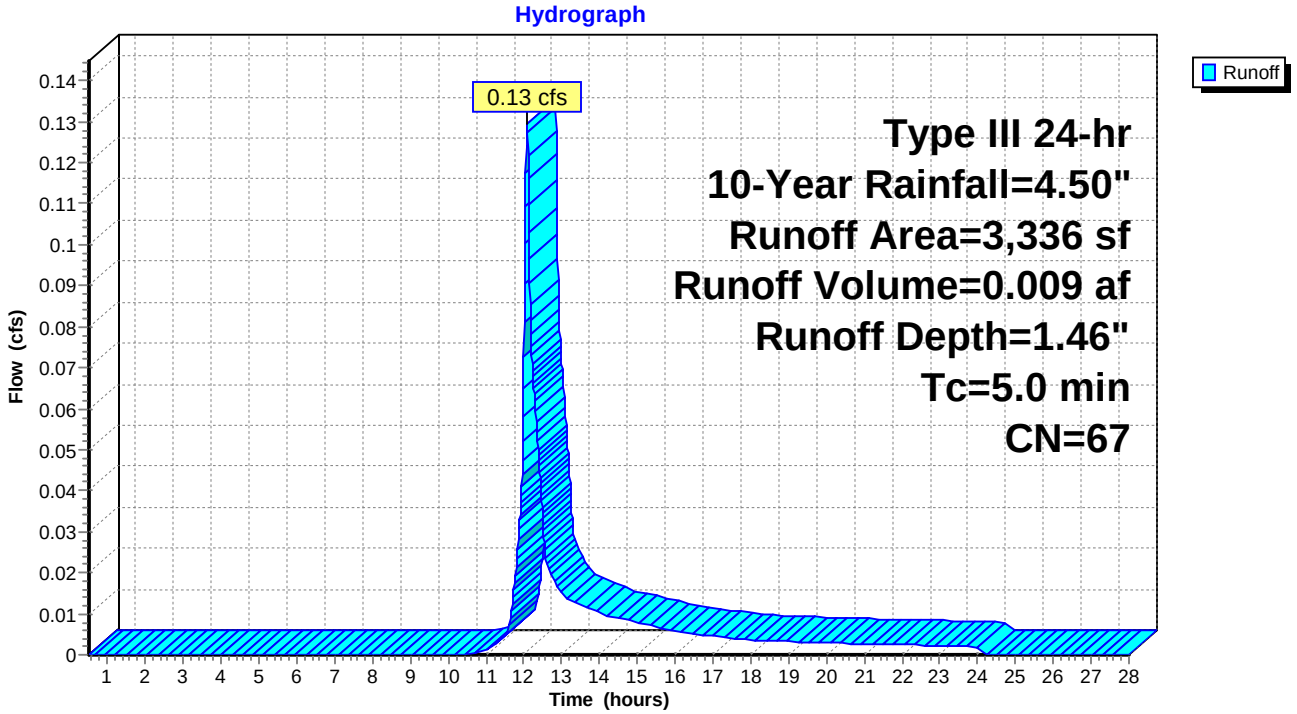
Runoff = 0.13 cfs @ 12.08 hrs, Volume= 0.009 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	972	98	Paved Driveway
*	619	98	Pavers Walk/Driveway
	1,745	39	>75% Grass cover, Good, HSG A
	3,336	67	Weighted Average
	1,745		52.31% Pervious Area
	1,591		47.69% Impervious Area

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

Subcatchment PD2: Prop. Driveway (portion)



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Summary for Subcatchment PD3: Prop. Driveway

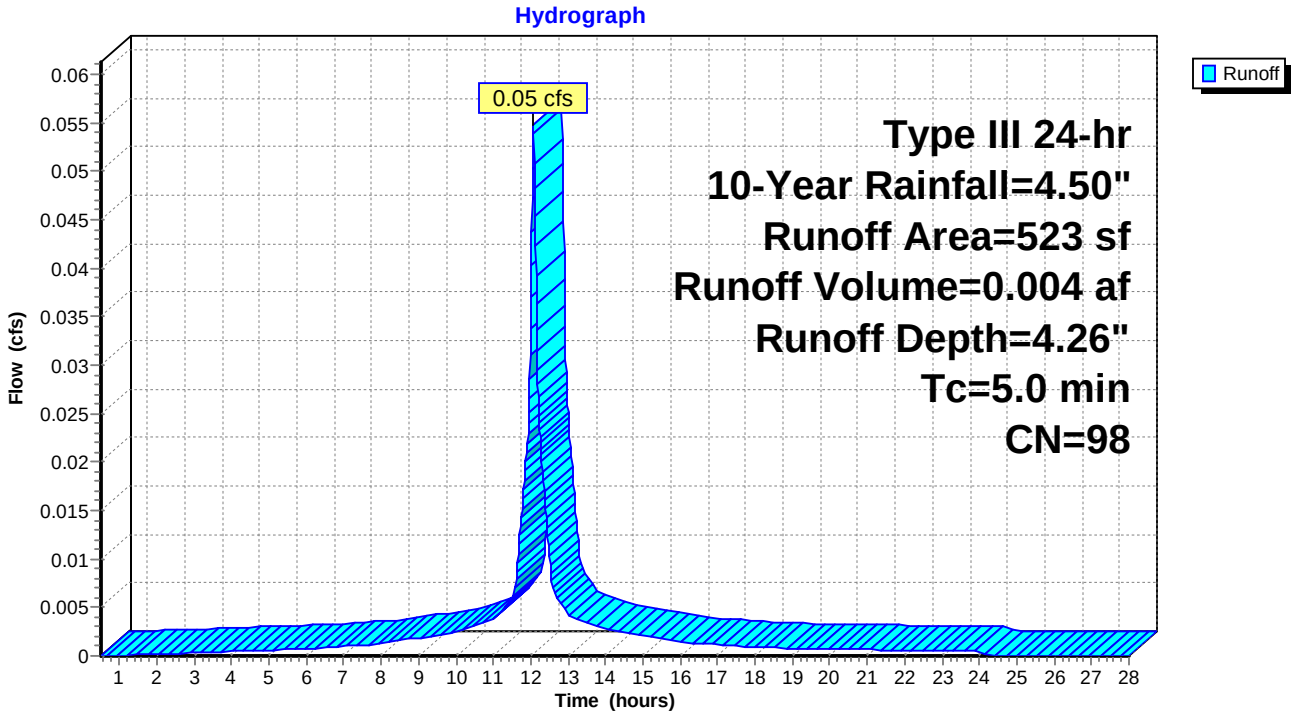
Runoff = 0.05 cfs @ 12.07 hrs, Volume= 0.004 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	523	98	Paved Driveway
	523		100.00% Impervious Area

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

Subcatchment PD3: Prop. Driveway



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Summary for Subcatchment PR1: Prop. Roof (Portion)

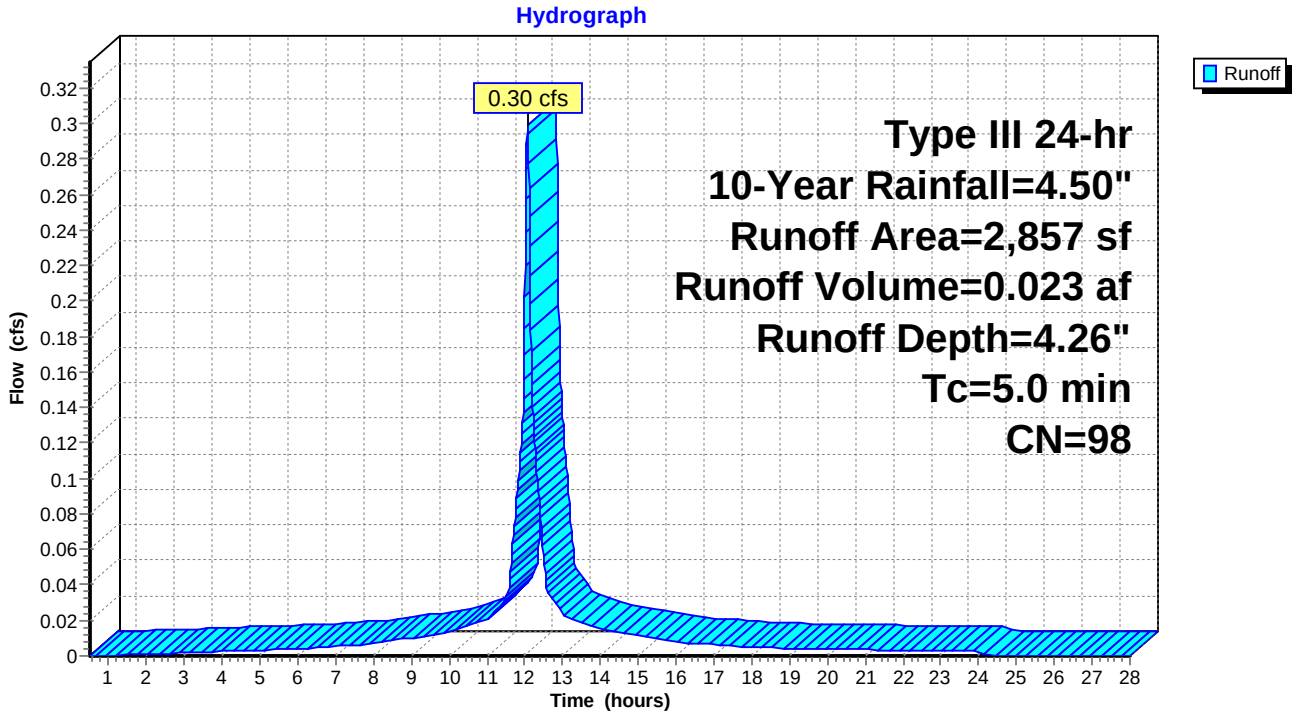
Runoff = 0.30 cfs @ 12.07 hrs, Volume= 0.023 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	2,857	98	Roof (Unit 1&2))
	2,857		100.00% Impervious Area

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

Subcatchment PR1: Prop. Roof (Portion)



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Summary for Subcatchment PR2: Prop. Roof (Portion)

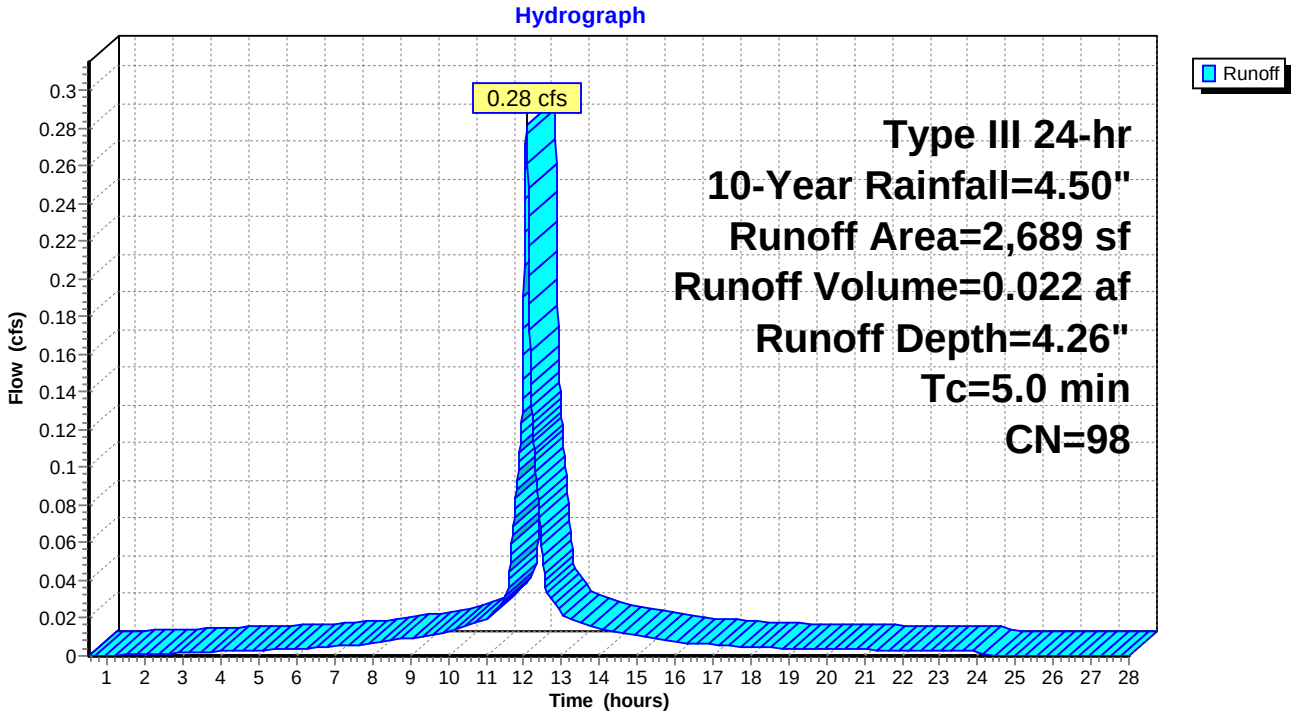
Runoff = 0.28 cfs @ 12.07 hrs, Volume= 0.022 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.50"

	Area (sf)	CN	Description
*	2,689	98	Roof (Unit 2&3)
	2,689		100.00% Impervious Area

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

Subcatchment PR2: Prop. Roof (Portion)



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Summary for Pond INF-1: Inf. System #1 Galleys

Inflow Area = 0.109 ac, 59.63% Impervious, Inflow Depth = 2.07" for 10-Year event
Inflow = 0.26 cfs @ 12.08 hrs, Volume= 0.019 af
Outflow = 0.04 cfs @ 11.82 hrs, Volume= 0.019 af, Atten= 84%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.82 hrs, Volume= 0.019 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 145.57' @ 12.57 hrs Surf.Area= 0.007 ac Storage= 0.005 af

Plug-Flow detention time= 32.7 min calculated for 0.019 af (100% of inflow)
Center-of-Mass det. time= 32.6 min (857.6 - 825.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.75'	0.008 af	**8.50'W x 36.00'L x 5.25'H Field A** 0.037 af Overall - 0.011 af Embedded = 0.025 af x 30.0% Voids
#2A	144.75'	0.009 af	**Galley 4x4x4.25** x 8 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.75'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 11.82 hrs HW=143.80' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

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Pond INF-1: Inf. System #1 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

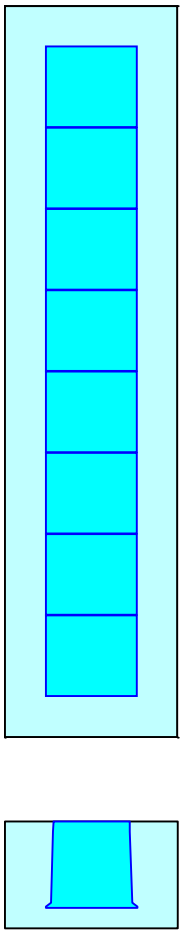
8 Chambers/Row x 4.00' Long = 32.00' Row Length +24.0" End Stone x 2 = 36.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

8 Chambers x 46.4 cf = 371.0 cf Chamber Storage
8 Chambers x 62.3 cf = 498.7 cf Displacement

1,606.5 cf Field - 498.7 cf Chambers = 1,107.8 cf Stone x 30.0% Voids = 332.4 cf Stone Storage

Chamber Storage + Stone Storage = 703.4 cf = 0.016 af
Overall Storage Efficiency = 43.8%

8 Chambers
59.5 cy Field
41.0 cy Stone



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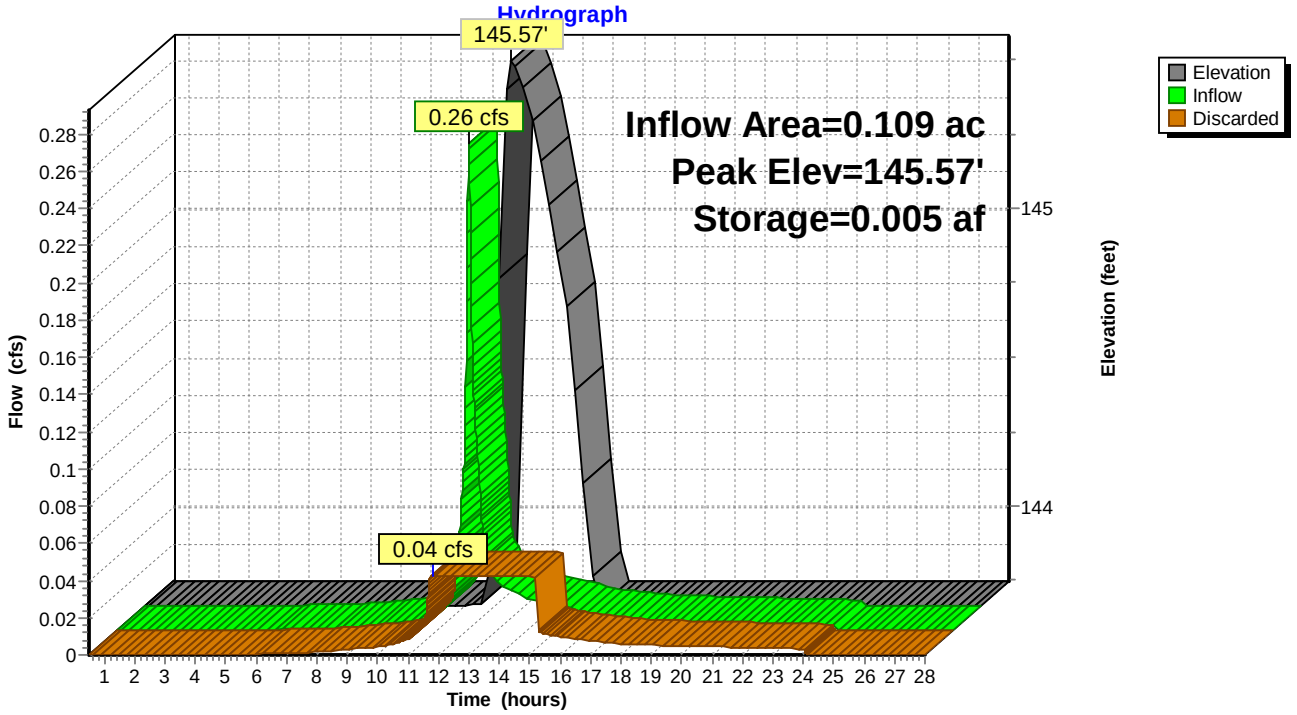
Pond INF-1: Inf. System #1 Galleys



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Summary for Pond INF-2: Inf. System #2 Galleys

Inflow Area = 0.062 ac,100.00% Impervious, Inflow Depth = 4.26" for 10-Year event
Inflow = 0.28 cfs @ 12.07 hrs, Volume= 0.022 af
Outflow = 0.04 cfs @ 11.69 hrs, Volume= 0.022 af, Atten= 87%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.69 hrs, Volume= 0.022 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 146.30' @ 12.57 hrs Surf.Area= 0.006 ac Storage= 0.006 af

Plug-Flow detention time= 40.3 min calculated for 0.022 af (100% of inflow)
Center-of-Mass det. time= 40.3 min (789.2 - 748.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.95'	0.007 af	**8.50'W x 32.00'L x 5.25'H Field A** 0.033 af Overall - 0.010 af Embedded = 0.023 af x 30.0% Voids
#2A	144.95'	0.007 af	**Galley 4x4x4.25** x 7 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.014 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.95'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 11.69 hrs HW=144.01' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

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Pond INF-2: Inf. System #2 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

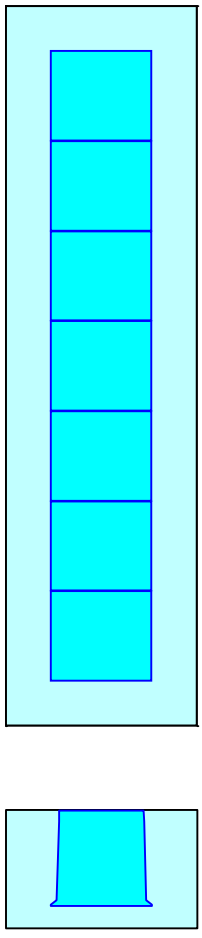
7 Chambers/Row x 4.00' Long = 28.00' Row Length +24.0" End Stone x 2 = 32.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

7 Chambers x 46.4 cf = 324.7 cf Chamber Storage
7 Chambers x 62.3 cf = 436.3 cf Displacement

1,428.0 cf Field - 436.3 cf Chambers = 991.7 cf Stone x 30.0% Voids = 297.5 cf Stone Storage

Chamber Storage + Stone Storage = 622.2 cf = 0.014 af
Overall Storage Efficiency = 43.6%

7 Chambers
52.9 cy Field
36.7 cy Stone



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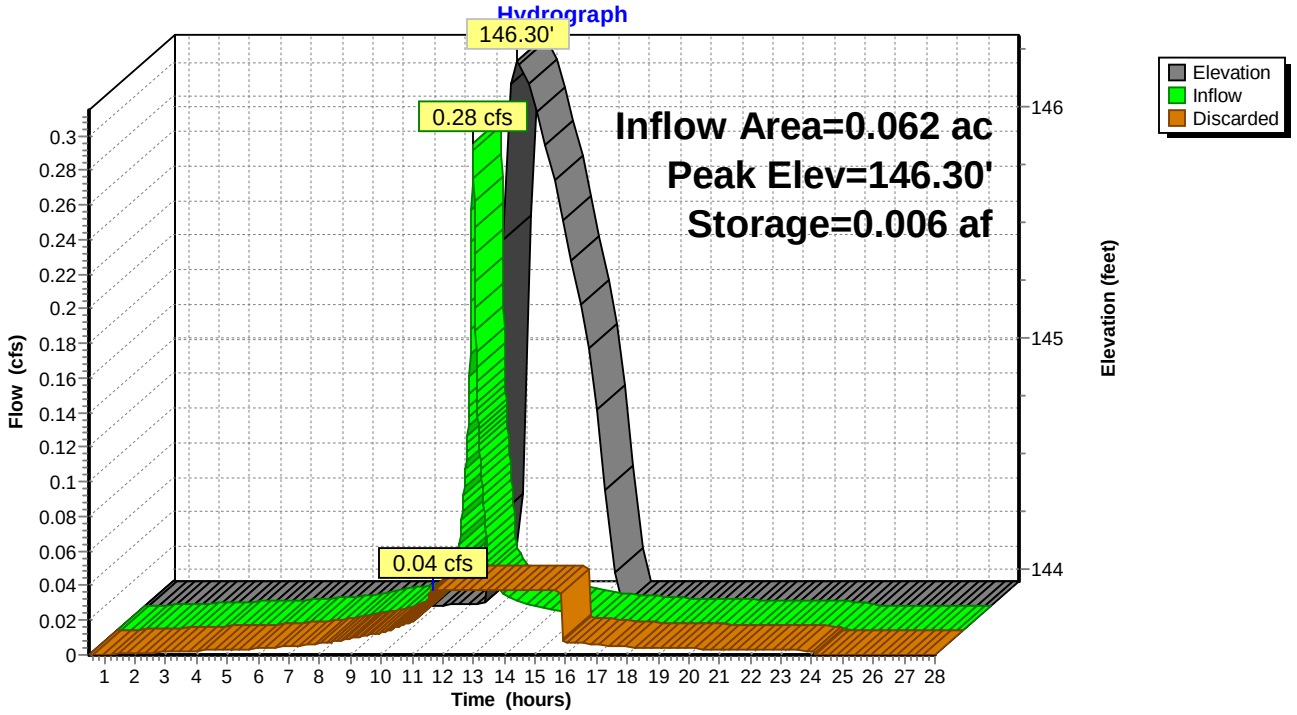
Pond INF-2: Inf. System #2 Galleys



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Summary for Pond INF-3: Inf. System #3 Galleys

Inflow Area = 0.078 ac,100.00% Impervious, Inflow Depth = 4.26" for 10-Year event
Inflow = 0.35 cfs @ 12.07 hrs, Volume= 0.028 af
Outflow = 0.04 cfs @ 11.67 hrs, Volume= 0.028 af, Atten= 88%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.67 hrs, Volume= 0.028 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 145.63' @ 12.61 hrs Surf.Area= 0.007 ac Storage= 0.008 af

Plug-Flow detention time= 49.8 min calculated for 0.028 af (100% of inflow)
Center-of-Mass det. time= 49.8 min (798.7 - 748.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	142.95'	0.008 af	**8.50'W x 36.00'L x 5.25'H Field A** 0.037 af Overall - 0.011 af Embedded = 0.025 af x 30.0% Voids
#2A	143.95'	0.009 af	**Galley 4x4x4.25** x 8 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	142.95'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 11.67 hrs HW=143.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

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Pond INF-3: Inf. System #3 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

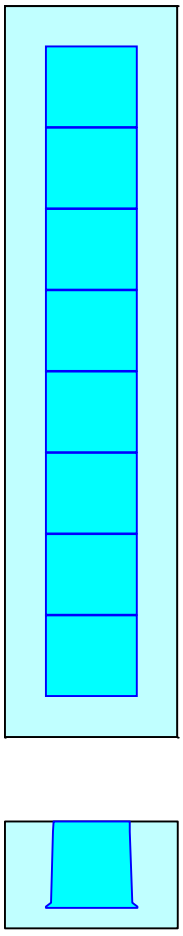
8 Chambers/Row x 4.00' Long = 32.00' Row Length +24.0" End Stone x 2 = 36.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

8 Chambers x 46.4 cf = 371.0 cf Chamber Storage
8 Chambers x 62.3 cf = 498.7 cf Displacement

1,606.5 cf Field - 498.7 cf Chambers = 1,107.8 cf Stone x 30.0% Voids = 332.4 cf Stone Storage

Chamber Storage + Stone Storage = 703.4 cf = 0.016 af
Overall Storage Efficiency = 43.8%

8 Chambers
59.5 cy Field
41.0 cy Stone



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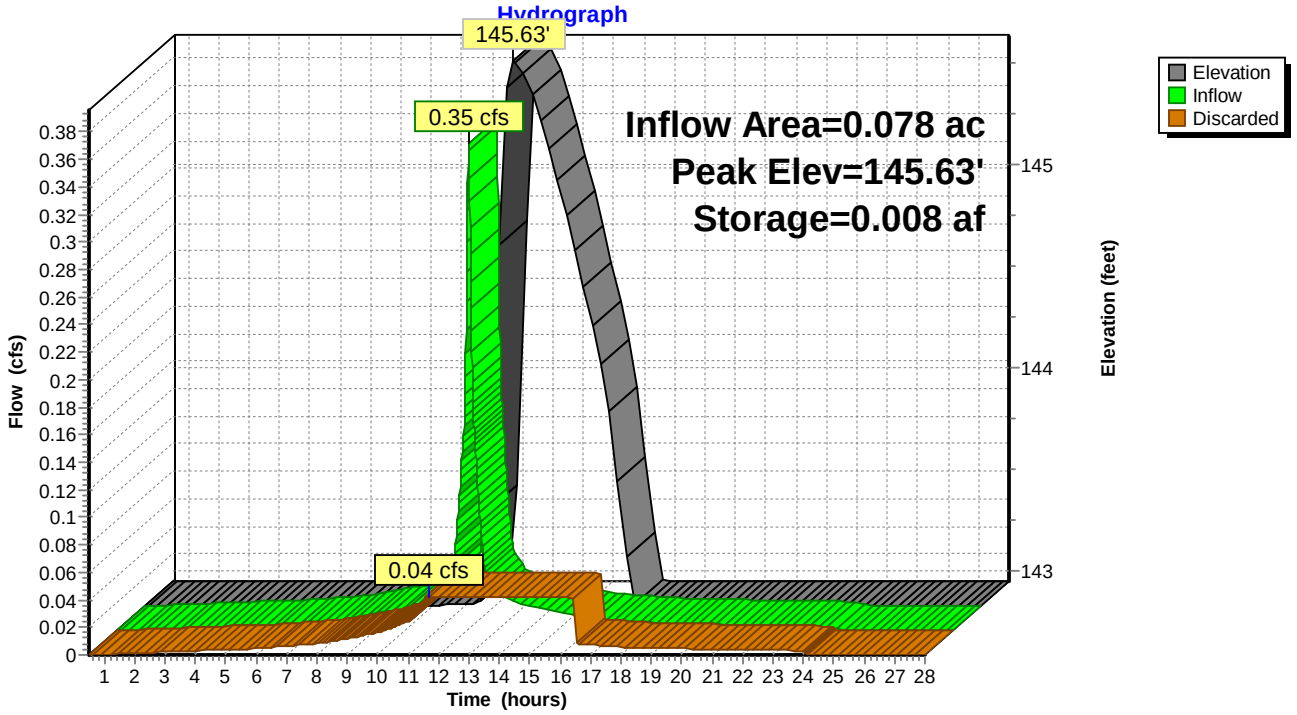
Pond INF-3: Inf. System #3 Galleys



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Summary for Subcatchment E1: Sumner Street

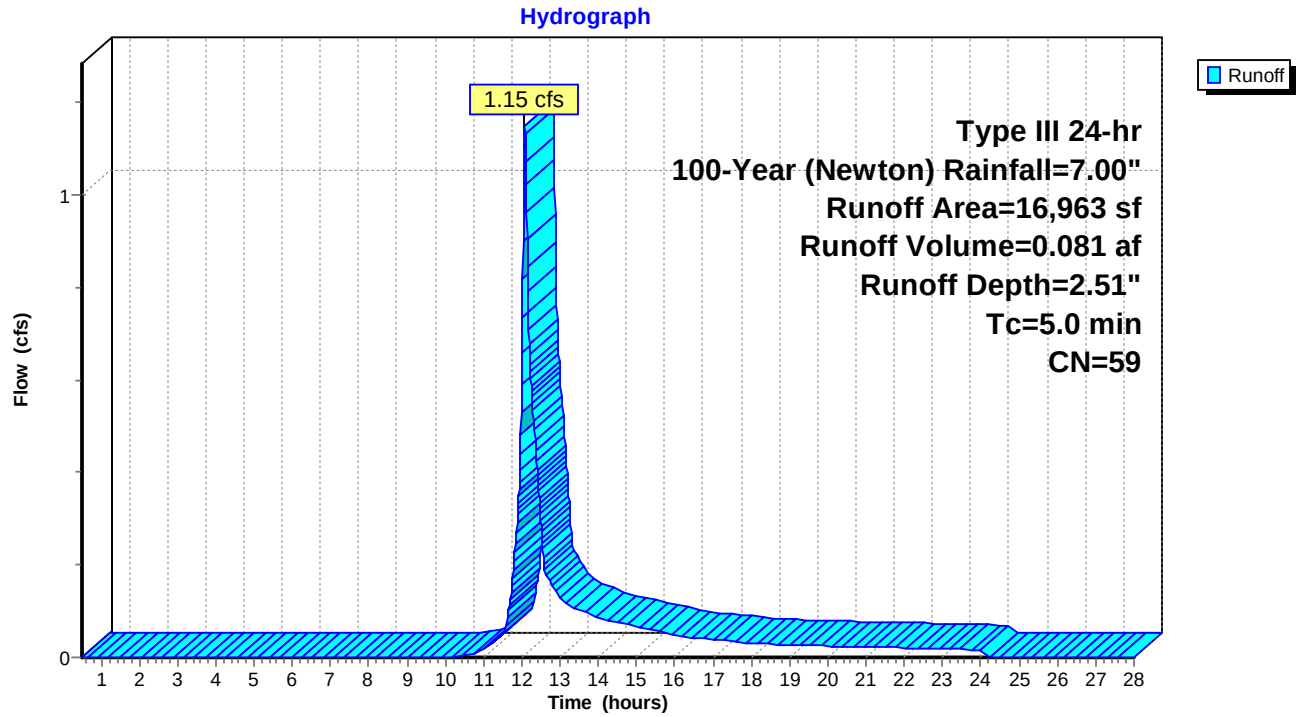
Runoff = 1.15 cfs @ 12.08 hrs, Volume= 0.081 af, Depth= 2.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	2,983	98	Roof (portion)
*	1,438	98	Driveway
*	126	98	Walks
*	37	98	Ret. Wall
*	1,018	98	Patio
*	214	98	Pool
	11,147	39	>75% Grass cover, Good, HSG A
	16,963	59	Weighted Average
	11,147		65.71% Pervious Area
	5,816		34.29% Impervious Area

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

Subcatchment E1: Sumner Street



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Summary for Subcatchment E2: South Abutter

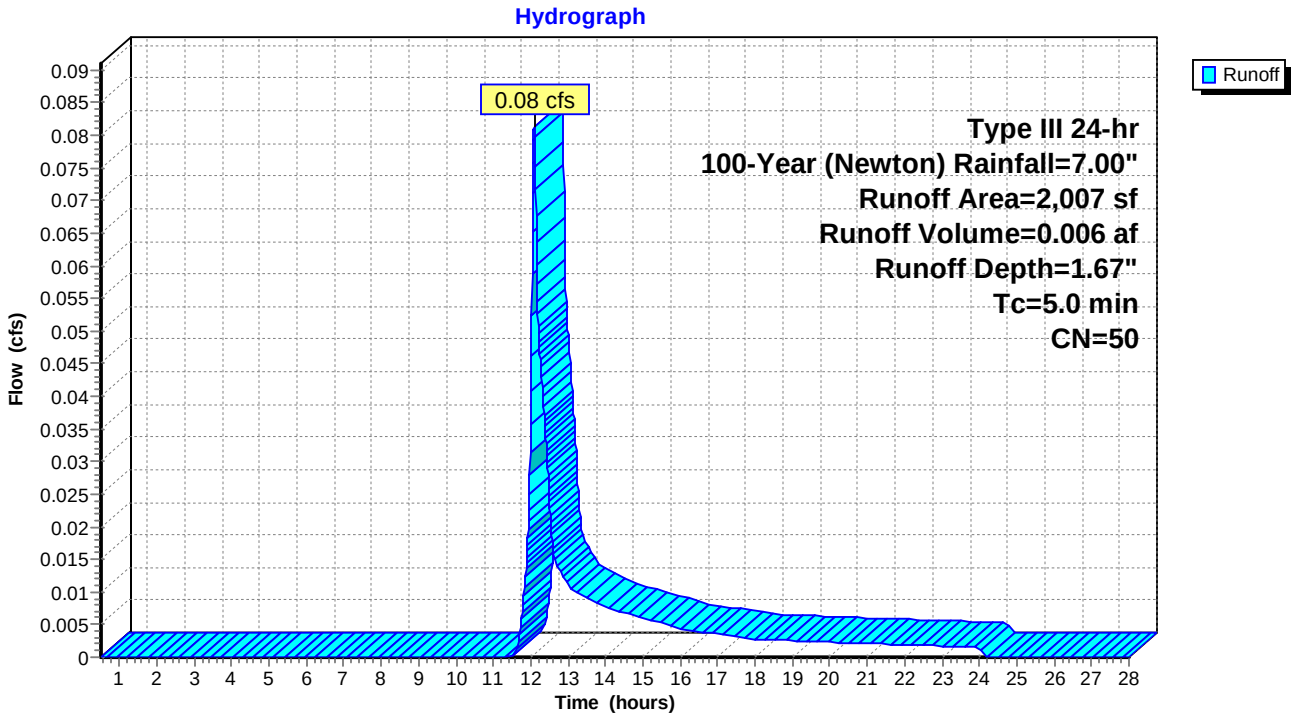
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	379	98	Roof (portion)
	1,628	39	>75% Grass cover, Good, HSG A
	2,007	50	Weighted Average
	1,628		81.12% Pervious Area
	379		18.88% Impervious Area

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

Subcatchment E2: South Abutter



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Summary for Subcatchment P1: Sumner Street

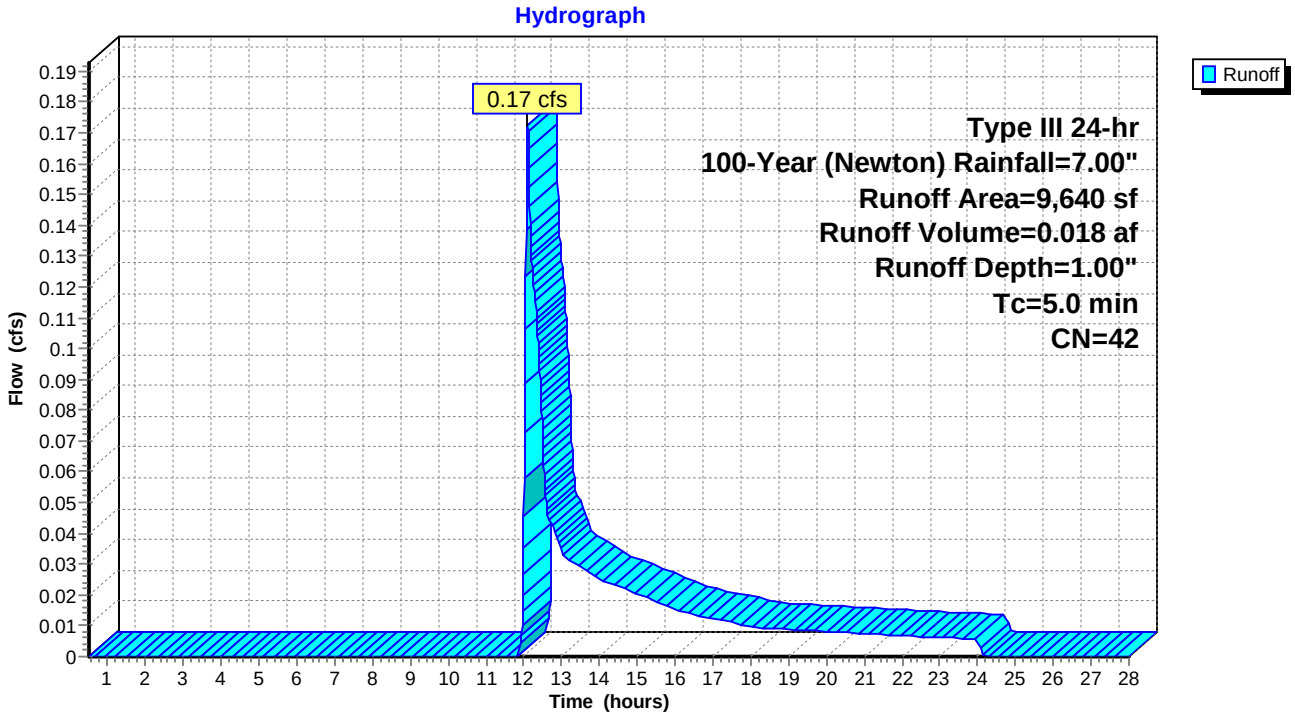
Runoff = 0.17 cfs @ 12.11 hrs, Volume= 0.018 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	114	98	Roof (portion)
*	203	98	Walks
*	27	98	Bulkhead
*	129	98	Patio
	9,167	39	>75% Grass cover, Good, HSG A
	9,640	42	Weighted Average
	9,167		95.09% Pervious Area
	473		4.91% Impervious Area

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

Subcatchment P1: Sumner Street



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Summary for Subcatchment P2: South Abutter

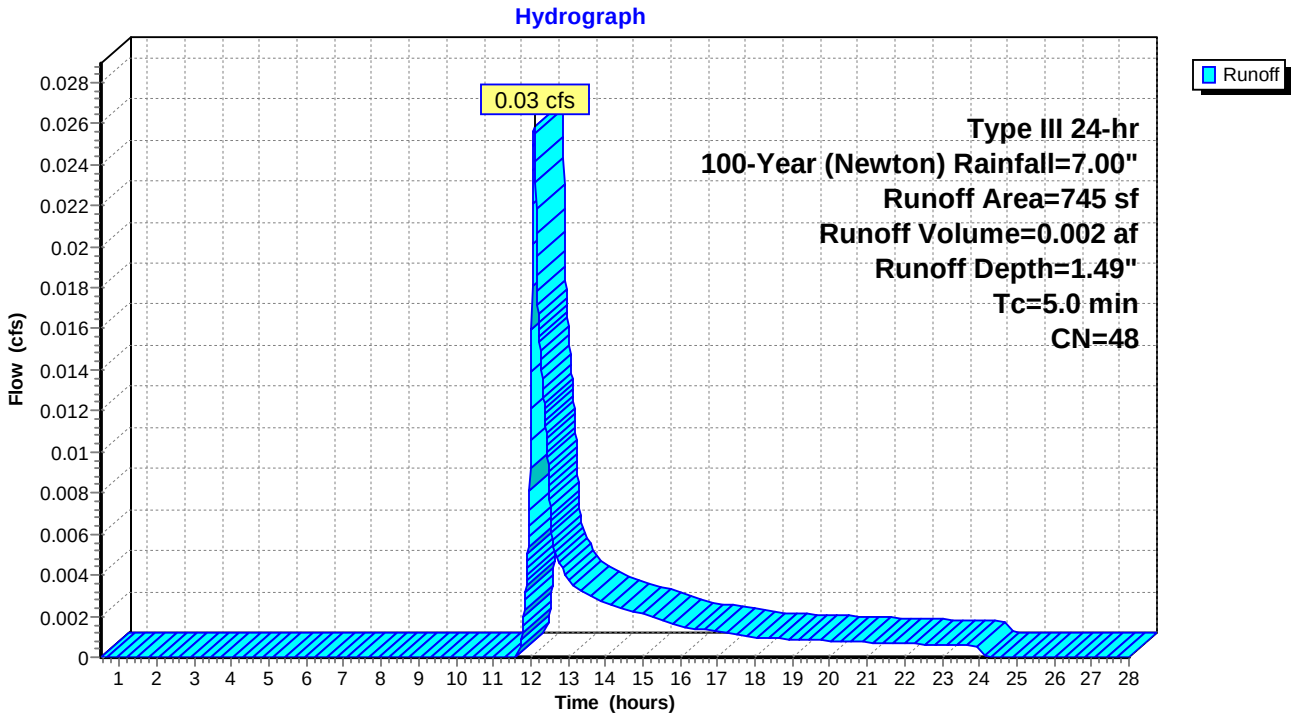
Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	114	98	Shed (portion)
	631	39	>75% Grass cover, Good, HSG A
	745	48	Weighted Average
	631		84.70% Pervious Area
	114		15.30% Impervious Area

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

Subcatchment P2: South Abutter



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Summary for Subcatchment PD1: Prop. Driveway (portion)

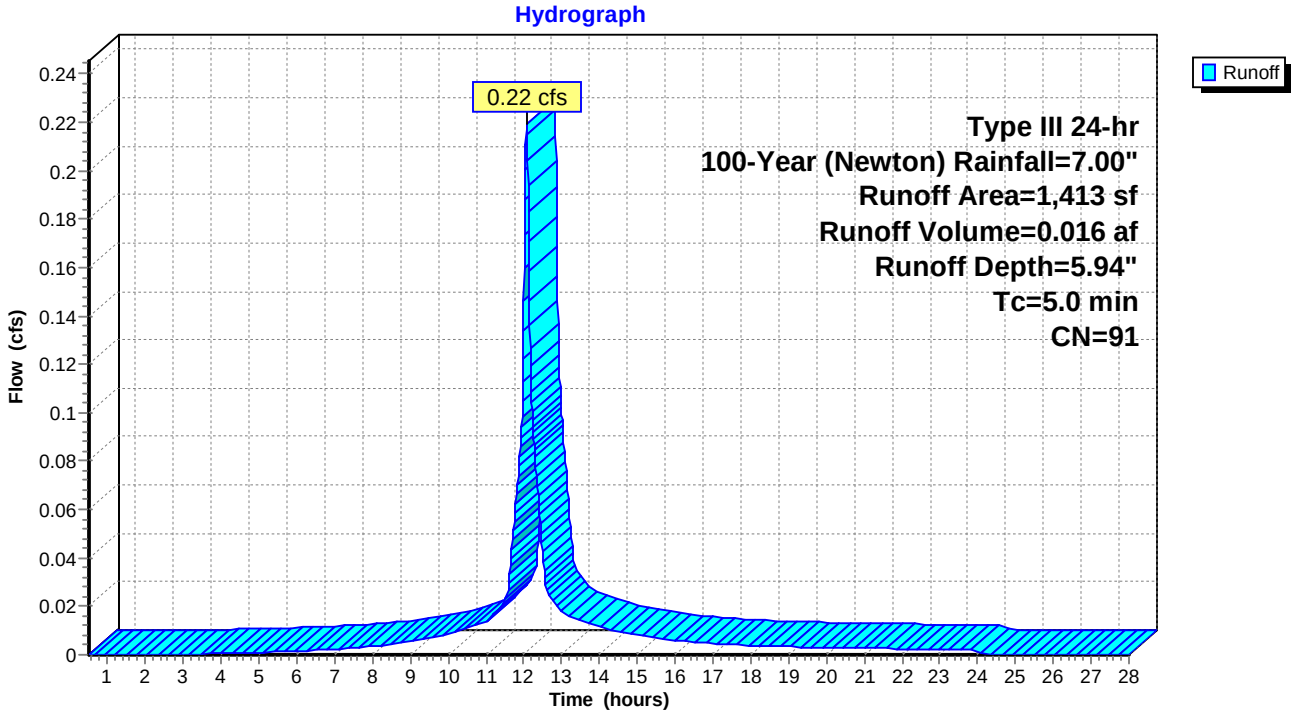
Runoff = 0.22 cfs @ 12.07 hrs, Volume= 0.016 af, Depth= 5.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	879	98	Paved Driveway
*	362	98	Pavers Walk/ Driveway
	172	39	>75% Grass cover, Good, HSG A
	1,413	91	Weighted Average
	172		12.17% Pervious Area
	1,241		87.83% Impervious Area

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

Subcatchment PD1: Prop. Driveway (portion)



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Summary for Subcatchment PD2: Prop. Driveway (portion)

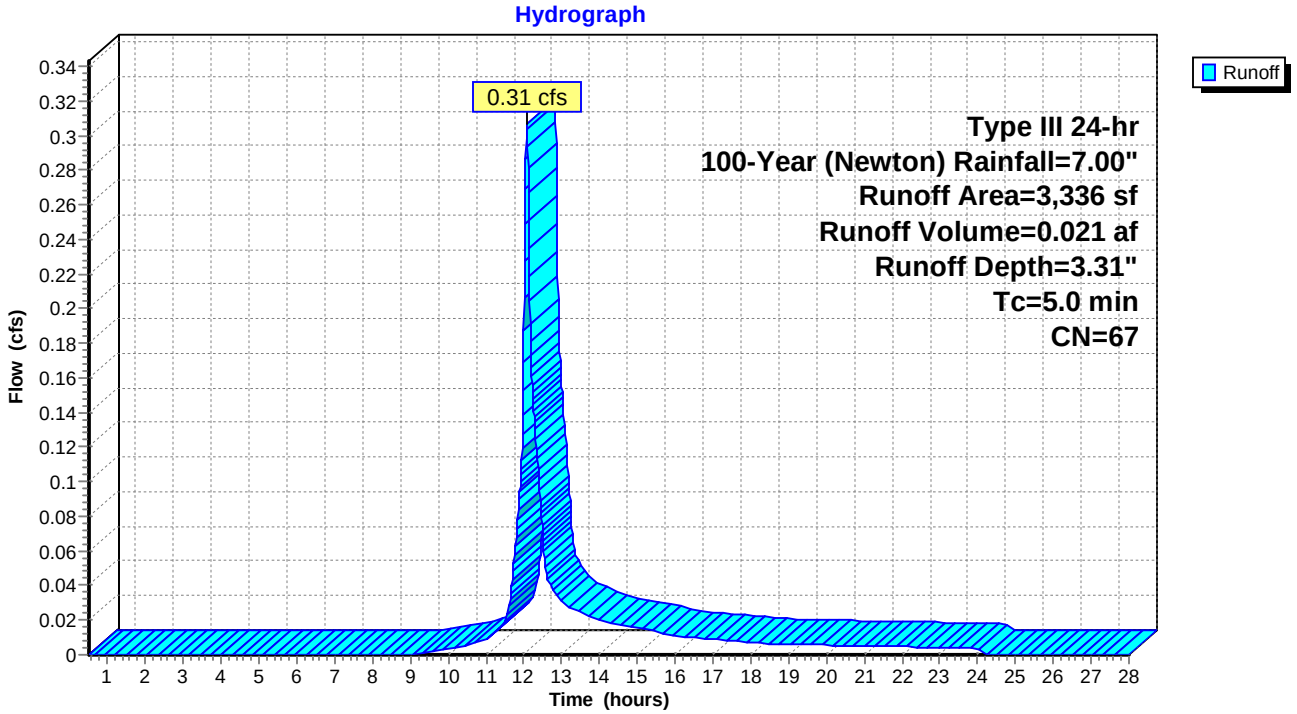
Runoff = 0.31 cfs @ 12.08 hrs, Volume= 0.021 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	972	98	Paved Driveway
*	619	98	Pavers Walk/Driveway
	1,745	39	>75% Grass cover, Good, HSG A
	3,336	67	Weighted Average
	1,745		52.31% Pervious Area
	1,591		47.69% Impervious Area

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

Subcatchment PD2: Prop. Driveway (portion)



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Summary for Subcatchment PD3: Prop. Driveway

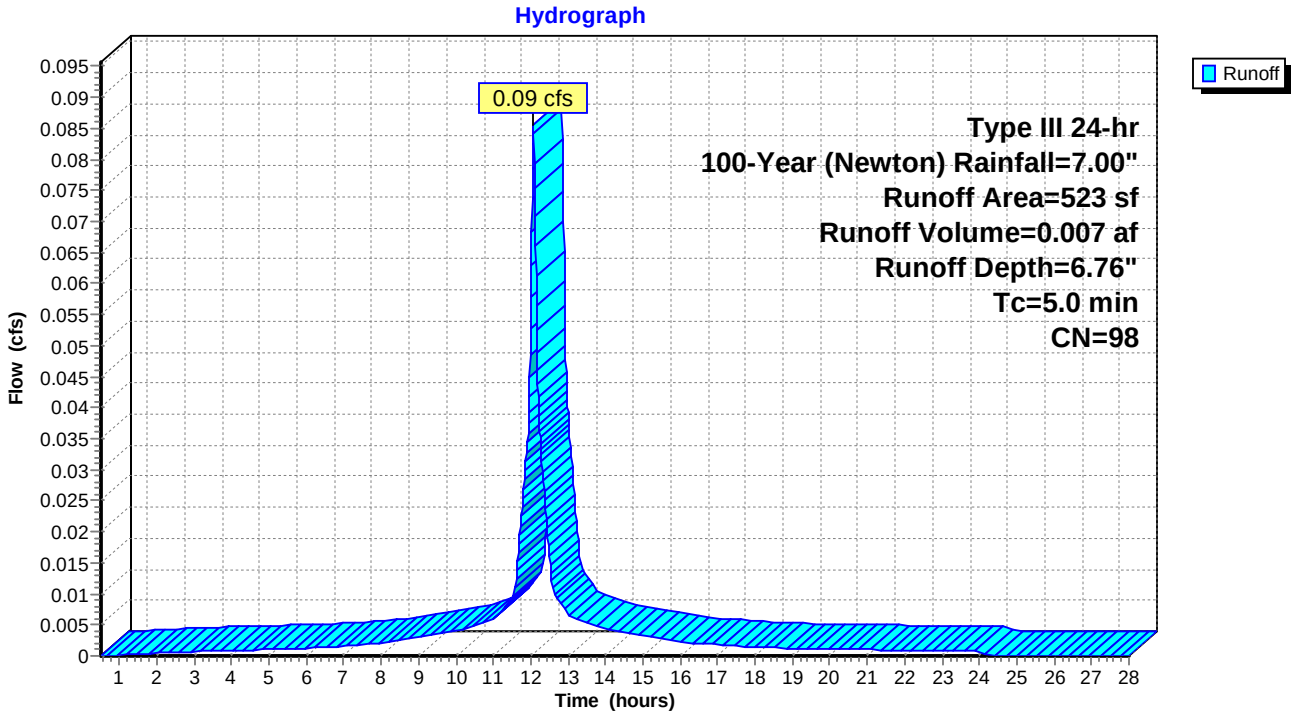
Runoff = 0.09 cfs @ 12.07 hrs, Volume= 0.007 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	523	98	Paved Driveway
	523		100.00% Impervious Area

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

Subcatchment PD3: Prop. Driveway



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Summary for Subcatchment PR1: Prop. Roof (Portion)

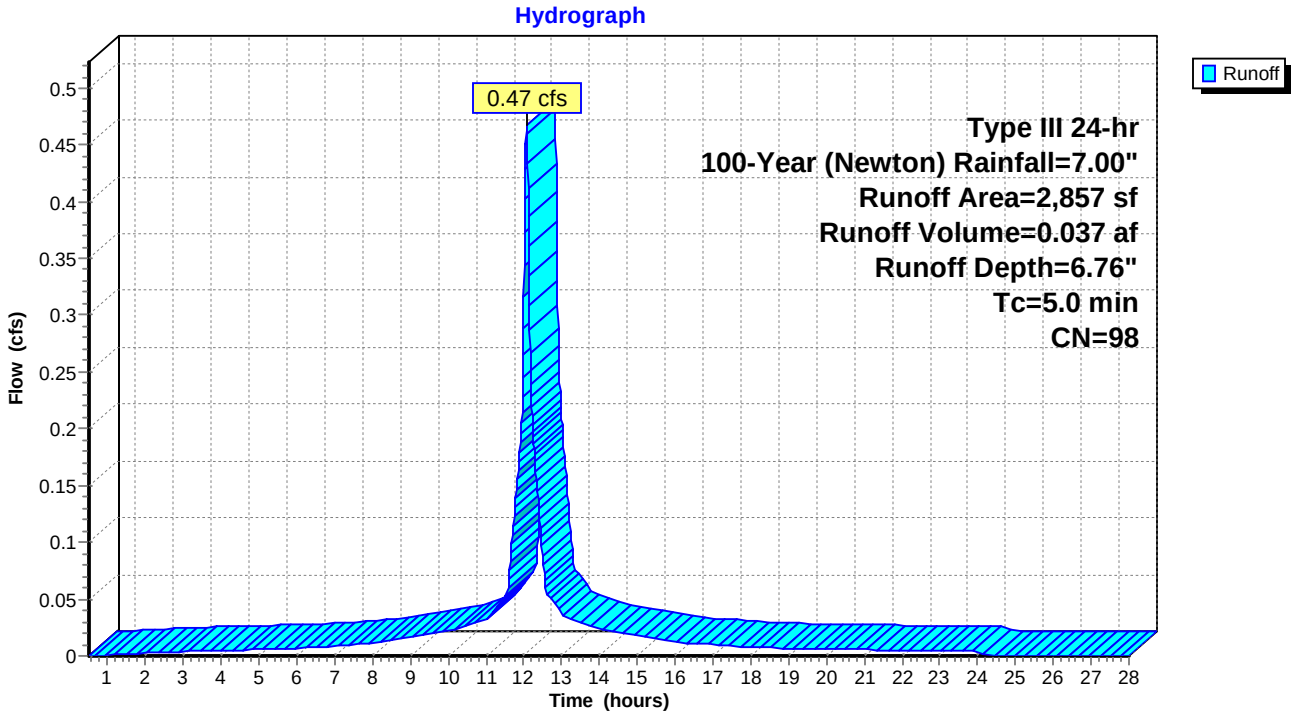
Runoff = 0.47 cfs @ 12.07 hrs, Volume= 0.037 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	2,857	98	Roof (Unit 1&2))
	2,857		100.00% Impervious Area

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

Subcatchment PR1: Prop. Roof (Portion)



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Summary for Subcatchment PR2: Prop. Roof (Portion)

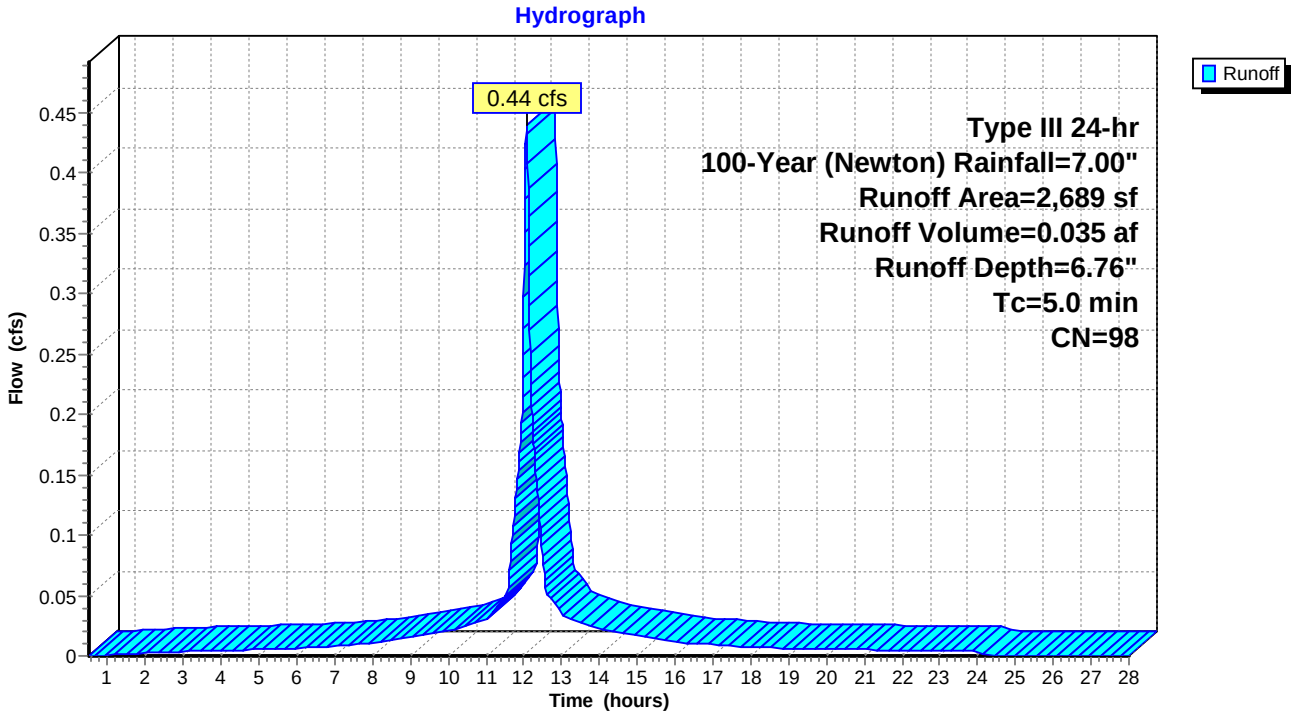
Runoff = 0.44 cfs @ 12.07 hrs, Volume= 0.035 af, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year (Newton) Rainfall=7.00"

	Area (sf)	CN	Description
*	2,689	98	Roof (Unit 2&3)
	2,689		100.00% Impervious Area

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

Subcatchment PR2: Prop. Roof (Portion)



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Summary for Pond INF-1: Inf. System #1 Galleys

Inflow Area = 0.109 ac, 59.63% Impervious, Inflow Depth = 4.09" for 100-Year (Newton) event
Inflow = 0.53 cfs @ 12.07 hrs, Volume= 0.037 af
Outflow = 0.04 cfs @ 11.64 hrs, Volume= 0.037 af, Atten= 92%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.64 hrs, Volume= 0.037 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 148.13' @ 13.22 hrs Surf.Area= 0.007 ac Storage= 0.014 af

Plug-Flow detention time= 121.5 min calculated for 0.037 af (100% of inflow)
Center-of-Mass det. time= 121.4 min (931.6 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.75'	0.008 af	**8.50'W x 36.00'L x 5.25'H Field A** 0.037 af Overall - 0.011 af Embedded = 0.025 af x 30.0% Voids
#2A	144.75'	0.009 af	**Galley 4x4x4.25** x 8 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.75'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 11.64 hrs HW=143.81' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

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Pond INF-1: Inf. System #1 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

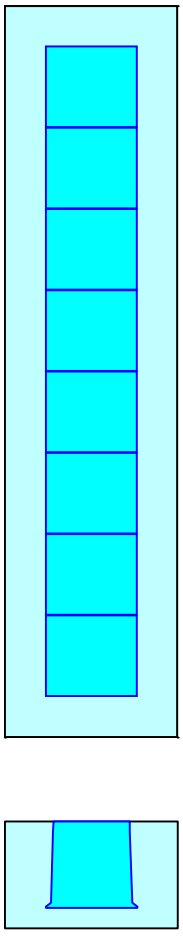
8 Chambers/Row x 4.00' Long = 32.00' Row Length +24.0" End Stone x 2 = 36.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

8 Chambers x 46.4 cf = 371.0 cf Chamber Storage
8 Chambers x 62.3 cf = 498.7 cf Displacement

1,606.5 cf Field - 498.7 cf Chambers = 1,107.8 cf Stone x 30.0% Voids = 332.4 cf Stone Storage

Chamber Storage + Stone Storage = 703.4 cf = 0.016 af
Overall Storage Efficiency = 43.8%

8 Chambers
59.5 cy Field
41.0 cy Stone



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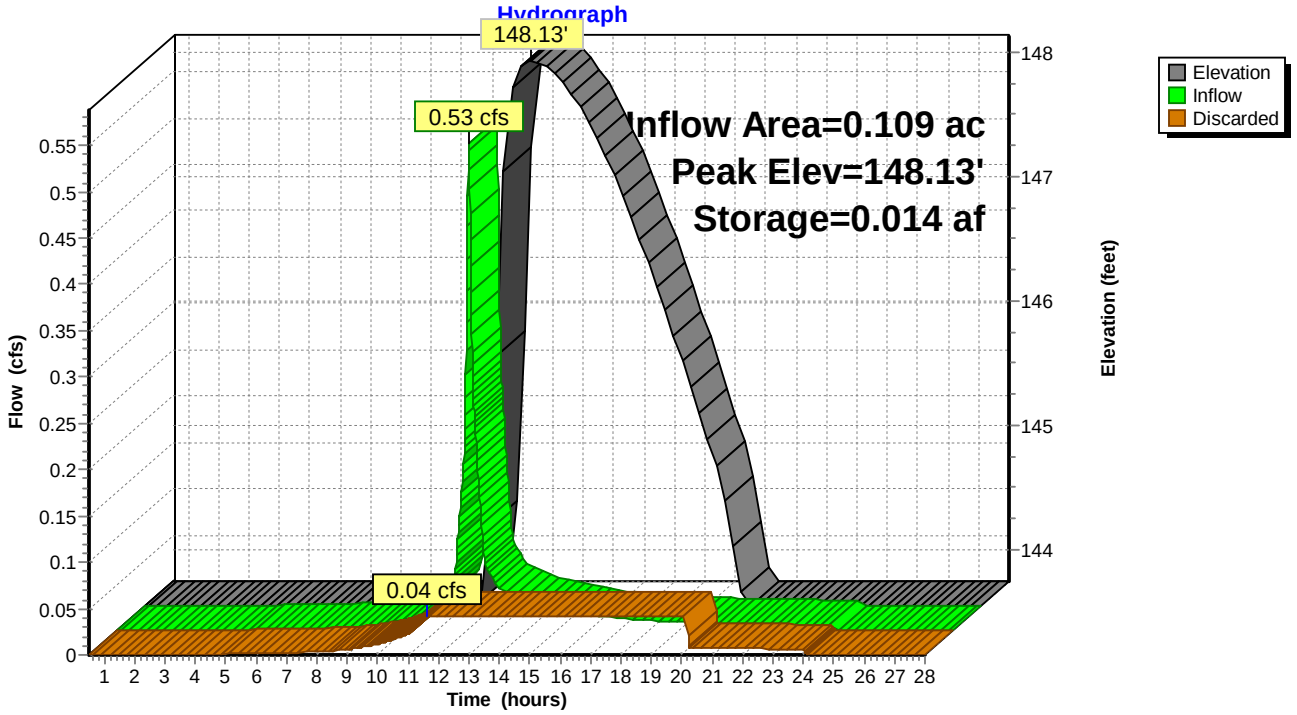
Pond INF-1: Inf. System #1 Galleys



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Summary for Pond INF-2: Inf. System #2 Galleys

Inflow Area = 0.062 ac,100.00% Impervious, Inflow Depth = 6.76" for 100-Year (Newton) event
Inflow = 0.44 cfs @ 12.07 hrs, Volume= 0.035 af
Outflow = 0.04 cfs @ 11.46 hrs, Volume= 0.035 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.46 hrs, Volume= 0.035 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 148.09' @ 12.93 hrs Surf.Area= 0.006 ac Storage= 0.012 af

Plug-Flow detention time= 91.0 min calculated for 0.035 af (100% of inflow)
Center-of-Mass det. time= 91.0 min (833.0 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.95'	0.007 af	**8.50'W x 32.00'L x 5.25'H Field A** 0.033 af Overall - 0.010 af Embedded = 0.023 af x 30.0% Voids
#2A	144.95'	0.007 af	**Galley 4x4x4.25** x 7 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.014 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.95'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 11.46 hrs HW=144.00' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

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Pond INF-2: Inf. System #2 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

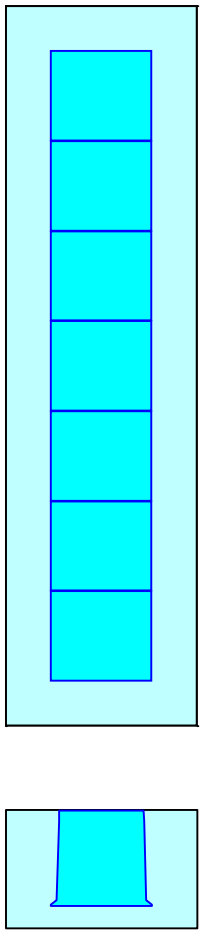
7 Chambers/Row x 4.00' Long = 28.00' Row Length +24.0" End Stone x 2 = 32.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

7 Chambers x 46.4 cf = 324.7 cf Chamber Storage
7 Chambers x 62.3 cf = 436.3 cf Displacement

1,428.0 cf Field - 436.3 cf Chambers = 991.7 cf Stone x 30.0% Voids = 297.5 cf Stone Storage

Chamber Storage + Stone Storage = 622.2 cf = 0.014 af
Overall Storage Efficiency = 43.6%

7 Chambers
52.9 cy Field
36.7 cy Stone



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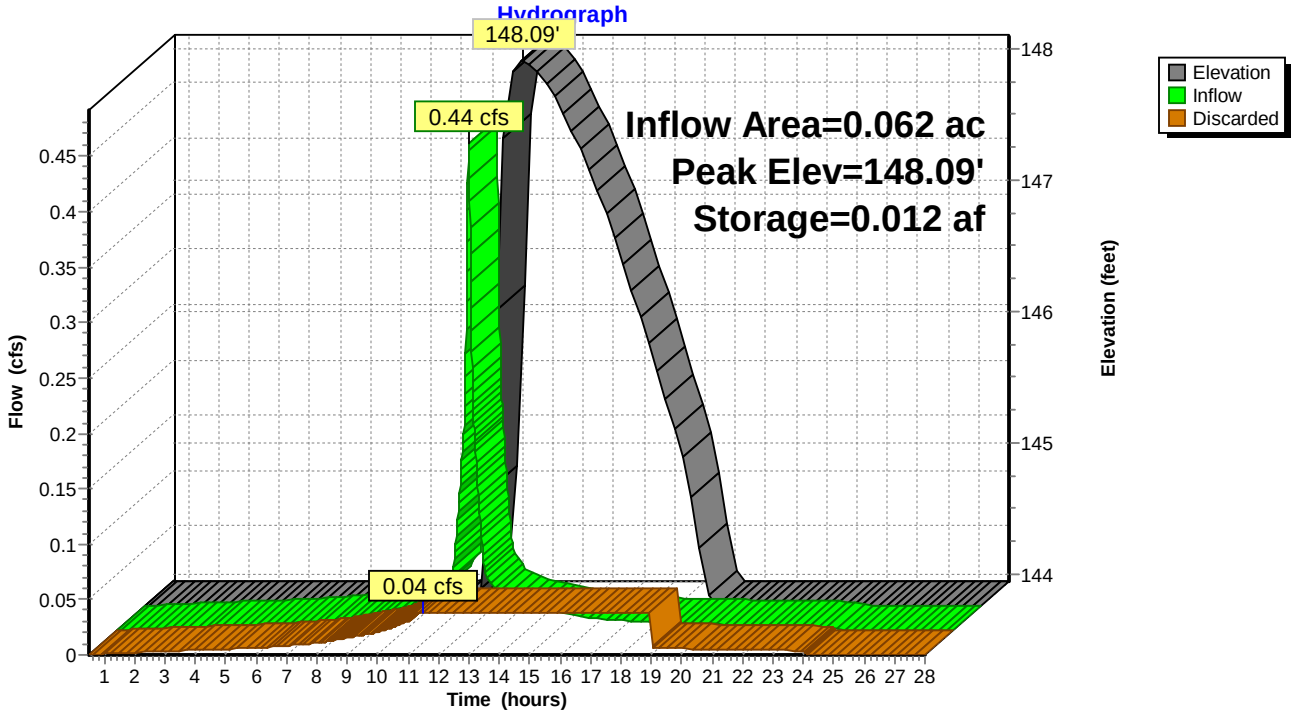
Pond INF-2: Inf. System #2 Galleys



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Summary for Pond INF-3: Inf. System #3 Galleys

Inflow Area = 0.078 ac,100.00% Impervious, Inflow Depth = 6.76" for 100-Year (Newton) event
Inflow = 0.55 cfs @ 12.07 hrs, Volume= 0.044 af
Outflow = 0.04 cfs @ 11.35 hrs, Volume= 0.044 af, Atten= 92%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.35 hrs, Volume= 0.044 af

Routing by Dyn-Stor-Ind method, Time Span= 0.50-28.00 hrs, dt= 0.01 hrs
Peak Elev= 147.75' @ 13.03 hrs Surf.Area= 0.007 ac Storage= 0.016 af

Plug-Flow detention time= 111.0 min calculated for 0.044 af (100% of inflow)
Center-of-Mass det. time= 111.0 min (853.0 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	142.95'	0.008 af	**8.50'W x 36.00'L x 5.25'H Field A** 0.037 af Overall - 0.011 af Embedded = 0.025 af x 30.0% Voids
#2A	143.95'	0.009 af	**Galley 4x4x4.25** x 8 Inside #1 Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf
		0.016 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	142.95'	**6.000 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.04 cfs @ 11.35 hrs HW=143.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.04 cfs)

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Pond INF-3: Inf. System #3 Galleys - Chamber Wizard Field A

Chamber Model = Galley 4x4x4.25 (Concrete Galley, Shea LE-EGH, LE-CGH or equivalent)
Inside= 42.2"W x 45.0"H => 13.25 sf x 3.50'L = 46.4 cf
Outside= 54.0"W x 51.0"H => 15.58 sf x 4.00'L = 62.3 cf

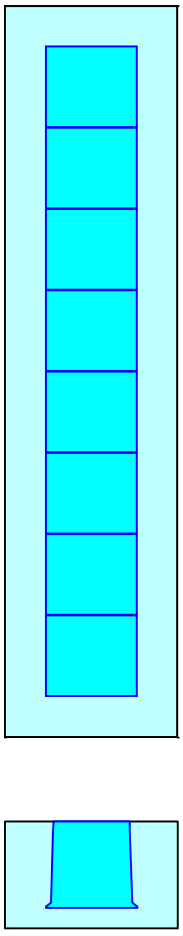
8 Chambers/Row x 4.00' Long = 32.00' Row Length +24.0" End Stone x 2 = 36.00' Base Length
1 Rows x 54.0" Wide + 24.0" Side Stone x 2 = 8.50' Base Width
12.0" Base + 51.0" Chamber Height = 5.25' Field Height

8 Chambers x 46.4 cf = 371.0 cf Chamber Storage
8 Chambers x 62.3 cf = 498.7 cf Displacement

1,606.5 cf Field - 498.7 cf Chambers = 1,107.8 cf Stone x 30.0% Voids = 332.4 cf Stone Storage

Chamber Storage + Stone Storage = 703.4 cf = 0.016 af
Overall Storage Efficiency = 43.8%

8 Chambers
59.5 cy Field
41.0 cy Stone



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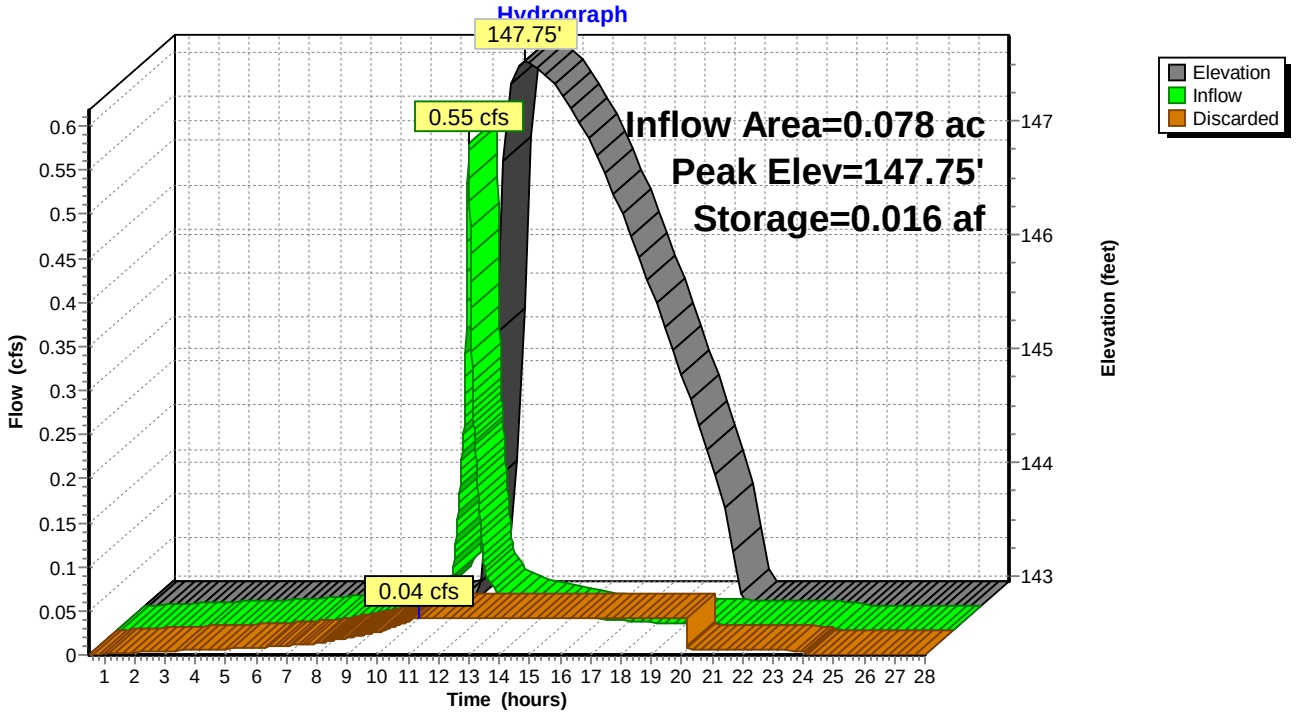
Pond INF-3: Inf. System #3 Galleys



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