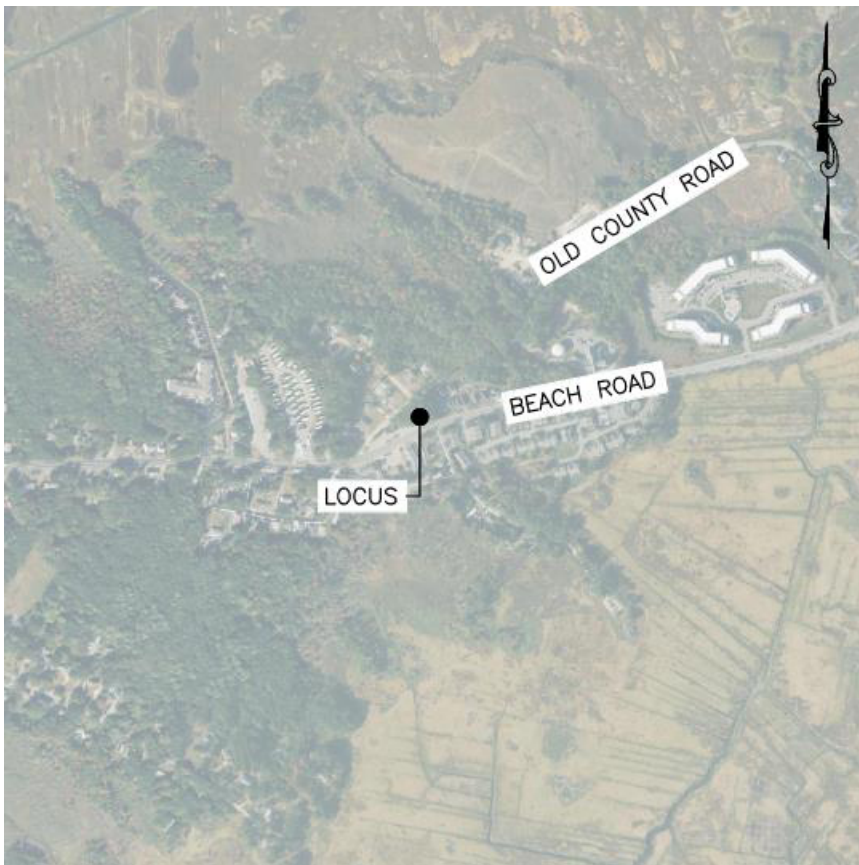


DRAINAGE REPORT

**159 Beach Road
Salisbury, Massachusetts**

CIVIL DESIGN Consultants, Inc.

Survey - Design - Permitting - Construction Administration
344 North Main Street
Andover, MA 01810-2611
Tel: (978) 416-0920



OWNER:

**Edward Foote Jr. & Joanne F. Blais
123 Central Street
Salisbury, MA 01952**

APPLICANT:

**Larkin Real Estate Group, Inc
383 Main Street
Medfield, MA 02052**

SUBMITTED TO:

**Salisbury Planning Board
5 Beach Road
Salisbury, MA 01952**

ISSUED:

**June 14, 2022
Revised: March 9, 2023**

DRAINAGE REPORT

Drainage Narrative

TAB 1

Proposed Conditions

TAB 2

2-Yr Storm Event
10-Yr Storm Event
25-Yr Storm Event
50-Yr Storm Event
100-Yr Storm Event

Supplemental Information

TAB 3

Check List for Stormwater Report
Stormwater Management Calculations
Operations and Maintenance Plan
Proposed Watershed Plan

DRAINAGE REPORT

159 Beach Road
Salisbury, Massachusetts

TAB 1

DRAINAGE REPORT

159 Beach Road
Salisbury, Massachusetts

PROJECT DESCRIPTION

The applicant proposes to re-develop 159 Beach Road in Salisbury, MA into a 24-unit residential development, with 5 triplexes, 4 duplexes, and a single-family dwelling. The parcel totals approximately 30,310-SF and contains an existing ice cream stand with paved parking and associated appurtenances. The project consists of construction of 24 units, consisting of 5 triplex dwellings, 4 duplex dwellings, and one single-family dwelling, along with associated infrastructure including driveways, landscaping, drainage facilities, and utilities. Project plans entitled *Site Development Plans for 159 Beach Road*, last revised March 9, 2023, have been prepared by this office and provided for your review. These plans illustrate the proposal in detail including zoning, easements, construction details, and provisions for utilities. Drainage will be collected and routed through best management practices sized to address the MADEP Stormwater Management Standards.

SITE DESCRIPTION

The total lot area of the project site is approximately 30,310-SF and provides frontage on Beach Road and Old County Road. The site is generally flat, with an elevation ranging between 10-FT and 14-FT across the site.

According to the Natural Resource Conservation Service Soil Survey for Middlesex County, Massachusetts soils on the site are mapped as containing Wareham Loamy Sand and Windsor Loamy Sand, both in Hydrologic Soil Group A.

SURFACE DRAINAGE

Pre-Development Condition

The pre-development condition consists of two watershed areas contributing to two design points. Design Point #1 (DP-1) receives runoff from drainage area EWA-1 and consists of overland flow to the south towards Beach Road. Design Point #2 (DP-2) receives runoff from drainage area EWA-2 and consists of overland flow to the north and east, towards the abutting properties along Old County Road and Beach Road. Contributing areas to the Design Points are detailed in the following Table 1.

TABLE 1: EXISTING WATERSHED DESIGN POINT DETAILS

DESIGN POINT	AREA NAME	AREA (SF)	T _c (min.)	CN
DP-1	EWA-1	15,898	14.4	73
DP-2	EWA-2	14,413	16.0	30

Post-Development Condition

The proposed project includes the construction of 5 triplex dwellings, 4 duplex dwellings, and one single-family dwelling. Other components include construction of a new driveways along with landscaping, drainage, utilities, and associated appurtenances. The development is less than one acre, therefore, the system has been designed to meet the requirements of the Town of Salisbury Planning Board Rules and Regulations Section III.c.5 – Drainage.

Drainage will be routed through porous pavement sections and an infiltration trench sized to capture and infiltrate runoff from roofs and driveways for up to and including the 100-year storm event. The drainage design results in all impervious area being captured and treated. This provides a net benefit compared to the existing condition, which had approximately 10,000-SF of untreated impervious area.

DRAINAGE REPORT

159 Beach Road
Salisbury, Massachusetts

The proposed construction results in six watersheds discharging to two Design Points. DP-1 receives flow from PWA-1, which consists of overland flow towards Beach Road. DP-2 receives flow from PWA-2A, PWA-2B, PWA-2C, and PWA-2D, all of which consist of overland flow. PWA-3 drains to the proposed subsurface chambers which do not overflow. Runoff directed to the chambers is treated using Contech hydrodynamic separators to treat runoff prior to infiltration. All roofs flow to subsurface infiltration trenches that are sized to capture and infiltrate all runoff for up to and including the 100-year storm event. The roof areas have been excluded from the table below. The design points are summarized in Table 2 below.

TABLE 2: PROPOSED WATERSHED DESIGN POINT DETAILS

DESIGN POINT	AREA NAME	AREA (SF)	Tc (min.)	CN
DP-1	PWA-1	4,463	6.0	39
DP-2	PWA-2A	1,799	6.0	88
	PWA-2B	1,300	6.0	39
	PWA-2C	3,123	6.0	39
	PWA-2D	2,868	6.0	39
	PWA-3	5,136	6.0	98

Peak Discharge Comparison

As illustrated in the following tables, the impact of the proposed improvements has been mitigated through the use of infiltration trenches and subsurface infiltration chambers for up to and including the 100-year, 24-hour storm event.

Design Point #1

Peak Flow:

	2-YR (3.1-IN)	10-YR (4.5-IN)	25-YR (5.3-IN)	50-YR (5.9-IN)	100-YR (6.5-IN)
	CFS	CFS	CFS	CFS	CFS
Pre-Development	0.3	0.6	0.8	1.0	1.1
Post-Development	0.0	0.0	0.0	0.0	0.0

Design Point #2

Peak Flow:

	2-YR (3.1-IN)	10-YR (4.5-IN)	25-YR (5.3-IN)	50-YR (5.9-IN)	100-YR (6.5-IN)
	CFS	CFS	CFS	CFS	CFS
Pre-Development	0.0	0.0	0.0	0.0	0.0
Post-Development	0.0	0.0	0.0	0.0	0.0

DRAINAGE REPORT

159 Beach Road
Salisbury, Massachusetts

METHODOLOGY

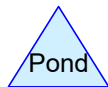
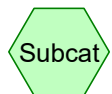
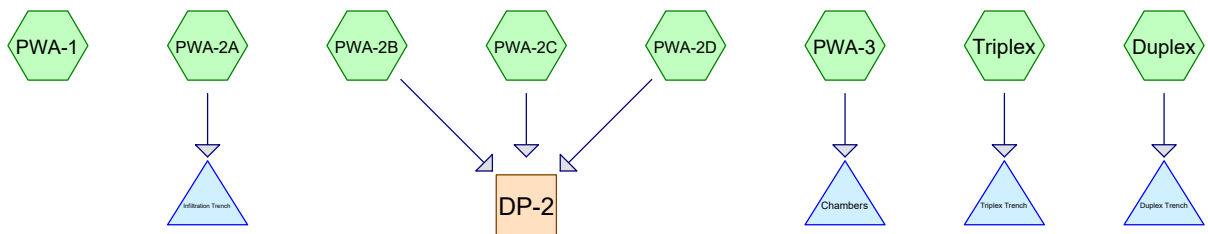
Drainage calculations were performed using the computer program HydroCAD by HydroCAD Software Solutions, LLC based upon Technical Release 20 (TR-20), developed by the NRCS, formerly the Soils Conservation Service. Drainage calculations were prepared for the 2-YR, 10-YR, 25-YR, 50-YR, and 100-YR Type III 24-hour storm events. Rainfall data corresponds with National Weather Service Technical Paper 40 (TP-40) used in Technical Release 55 (TR-55). Curve numbers were generated using the information provided in TR-55 and the SCS Soils Survey.

DRAINAGE REPORT

159 Beach Road

Salisbury, Massachusetts

TAB 2



21-10254 - Post-R4

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Type III 24-hr 2-Year Rainfall=3.10"

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Page 2

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDuplex:	Runoff Area=1,050 sf 100.00% Impervious Runoff Depth=2.87" Tc=6.0 min CN=98 Runoff=0.1 cfs 251 cf
SubcatchmentPWA-1:	Runoff Area=4,463 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=39 Runoff=0.0 cfs 0 cf
SubcatchmentPWA-2A:	Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=1.91" Tc=6.0 min CN=88 Runoff=0.1 cfs 286 cf
SubcatchmentPWA-2B:	Runoff Area=1,300 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=39 Runoff=0.0 cfs 0 cf
SubcatchmentPWA-2C:	Runoff Area=3,123 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=39 Runoff=0.0 cfs 0 cf
SubcatchmentPWA-2D:	Runoff Area=2,868 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=39 Runoff=0.0 cfs 0 cf
SubcatchmentPWA-3:	Runoff Area=5,135 sf 100.00% Impervious Runoff Depth=2.87" Tc=6.0 min CN=98 Runoff=0.3 cfs 1,227 cf
SubcatchmentTriplex:	Runoff Area=1,560 sf 100.00% Impervious Runoff Depth=2.87" Tc=6.0 min CN=98 Runoff=0.1 cfs 373 cf
Reach DP-2:	Inflow=0.0 cfs 0 cf Outflow=0.0 cfs 0 cf
Pond Chambers:	Peak Elev=7.89' Storage=209 cf Inflow=0.3 cfs 1,227 cf Outflow=0.1 cfs 1,227 cf
Pond Duplex Trench:	Peak Elev=7.58' Storage=29 cf Inflow=0.1 cfs 251 cf Outflow=0.0 cfs 251 cf
Pond Infiltration Trench:	Peak Elev=10.45' Storage=46 cf Inflow=0.1 cfs 286 cf Outflow=0.0 cfs 286 cf
Pond Triplex Trench:	Peak Elev=7.69' Storage=47 cf Inflow=0.1 cfs 373 cf Outflow=0.0 cfs 373 cf

Total Runoff Area = 21,298 sf Runoff Volume = 2,137 cf Average Runoff Depth = 1.20"
56.62% Pervious = 12,058 sf 43.38% Impervious = 9,240 sf

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Type III 24-hr 2-Year Rainfall=3.10"

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Page 3

Summary for Subcatchment Duplex:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 251 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

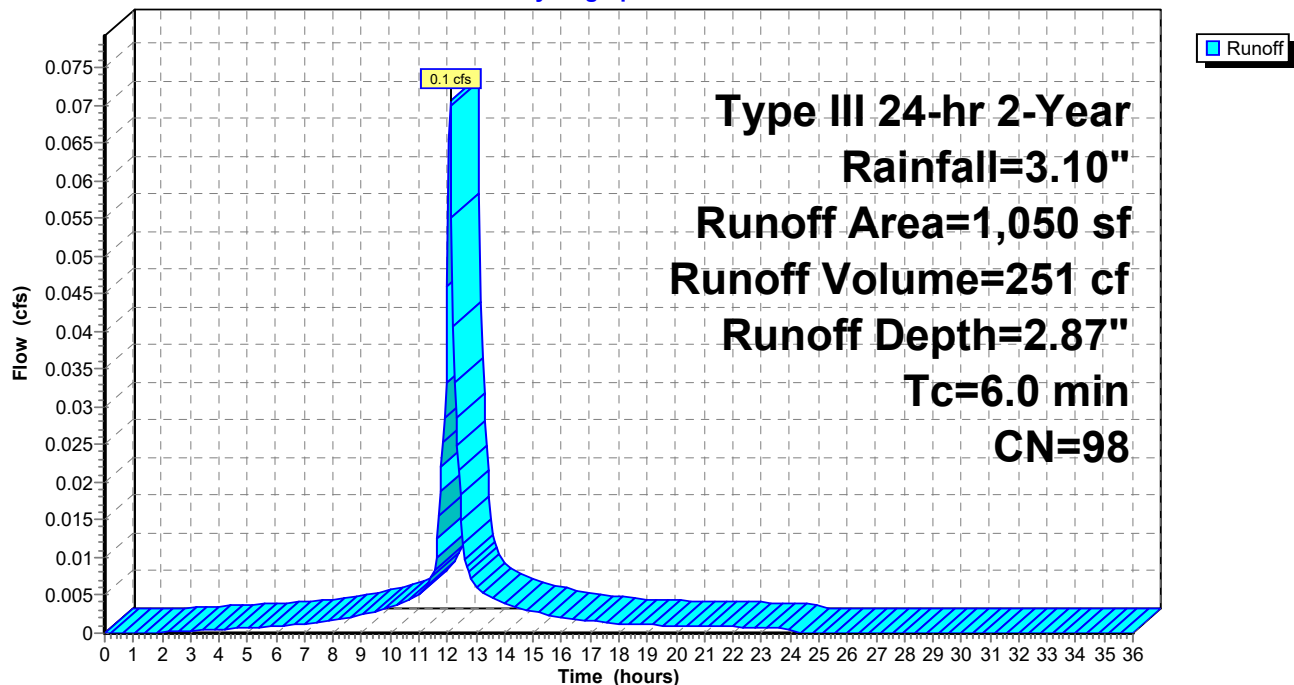
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,050	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,050	98	Weighted Average
1,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Duplex:

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment PWA-1:

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

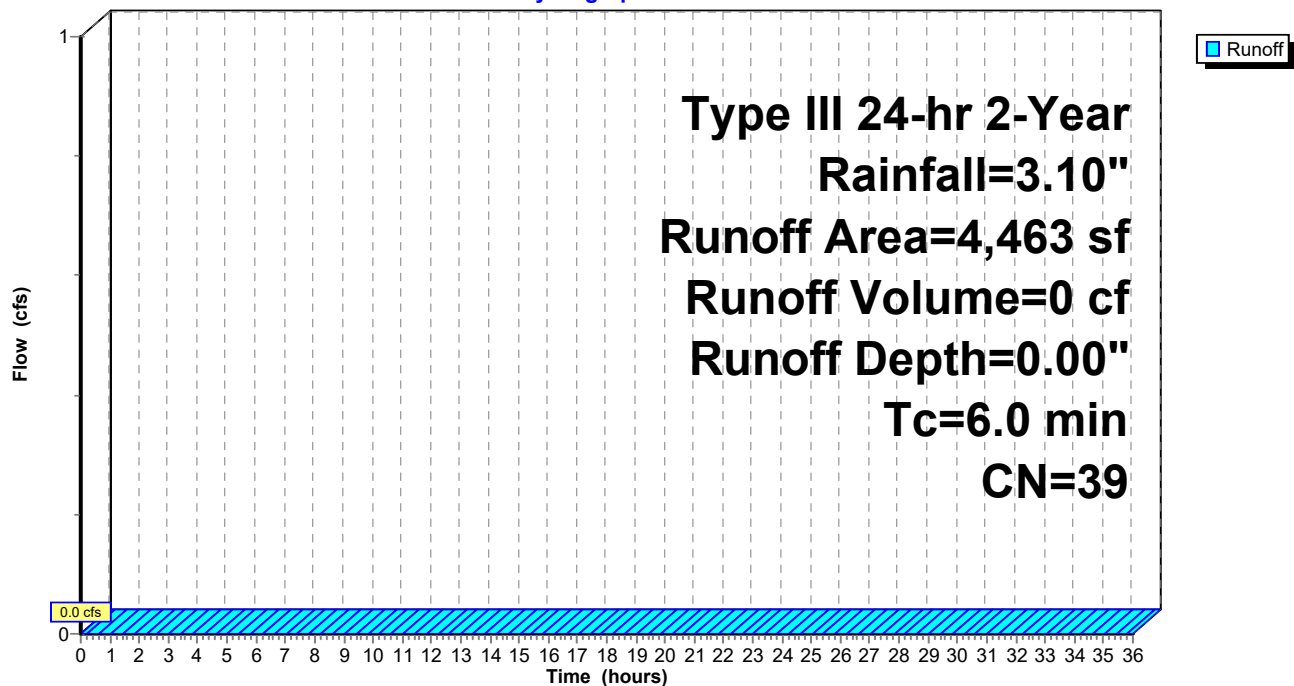
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
4,463	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,463	39	Weighted Average
4,463		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-1:

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment PWA-2A:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 286 cf, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

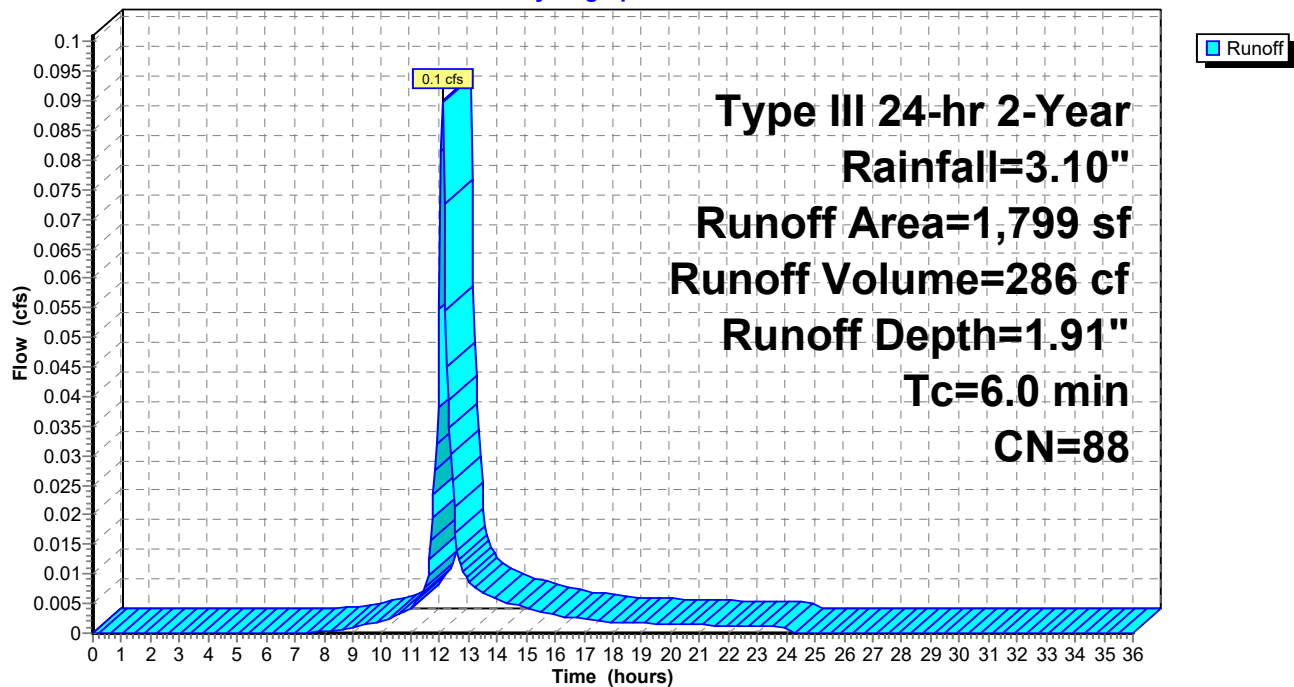
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2A:

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment PWA-2B:

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

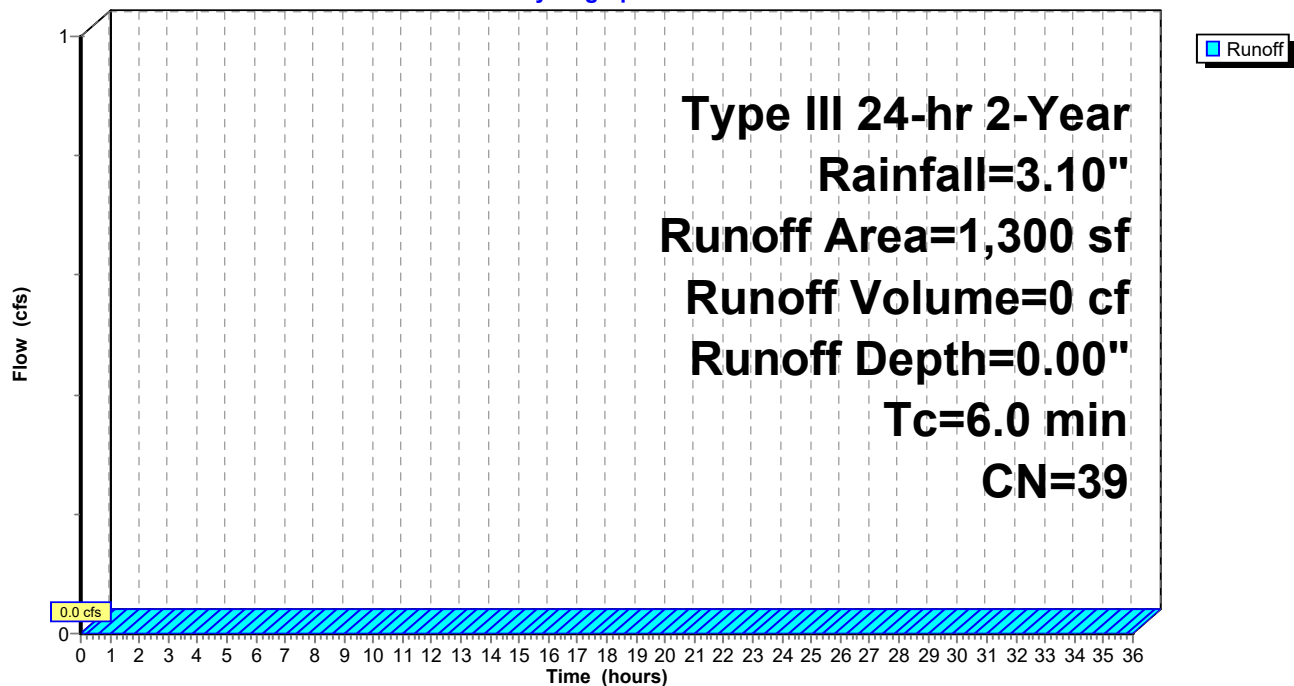
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
1,300	39	>75% Grass cover, Good, HSG A
1,300	39	Weighted Average
1,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2B:

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment PWA-2C:

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

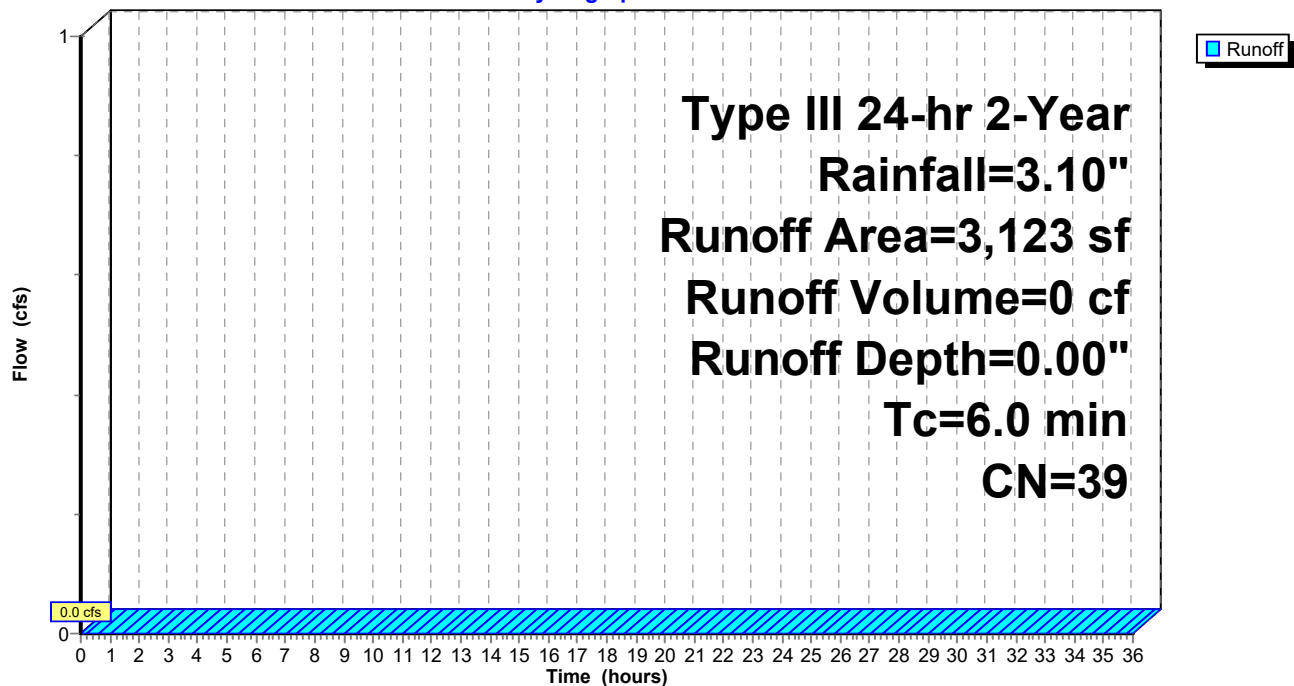
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
3,123	39	>75% Grass cover, Good, HSG A
3,123	39	Weighted Average
3,123		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2C:

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment PWA-2D:

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

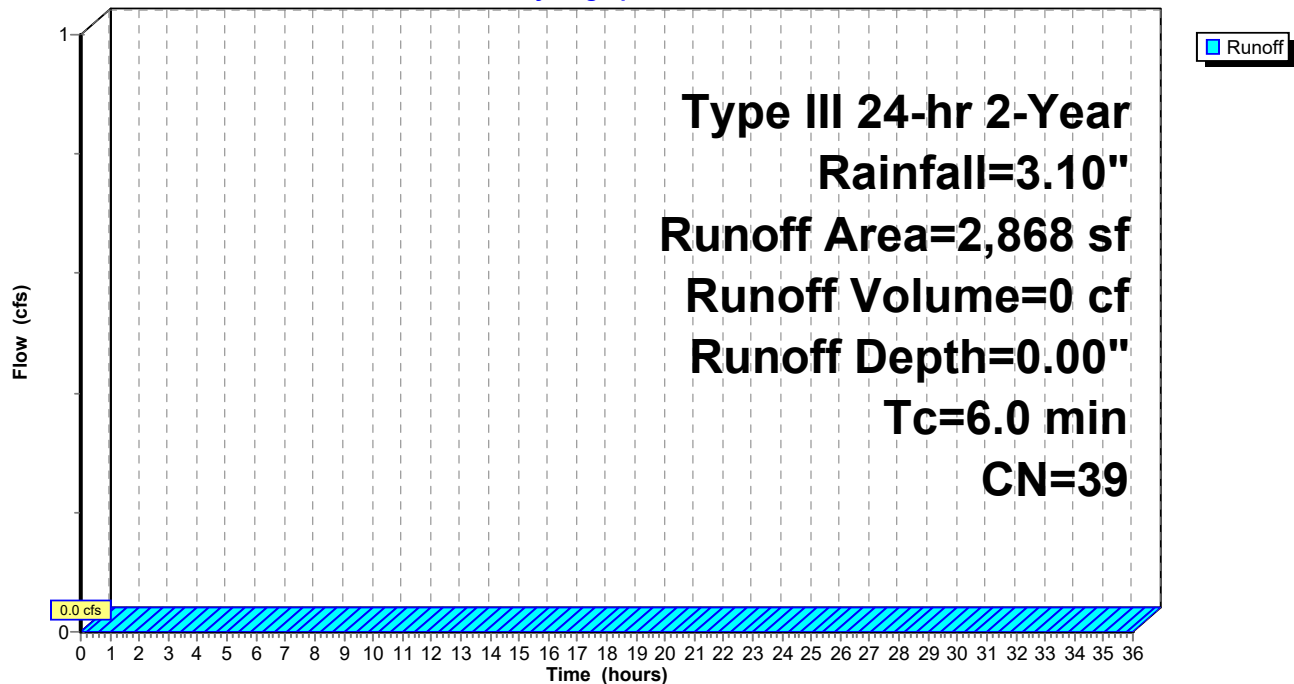
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,868	39	Weighted Average
2,868		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2D:

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment PWA-3:

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,227 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

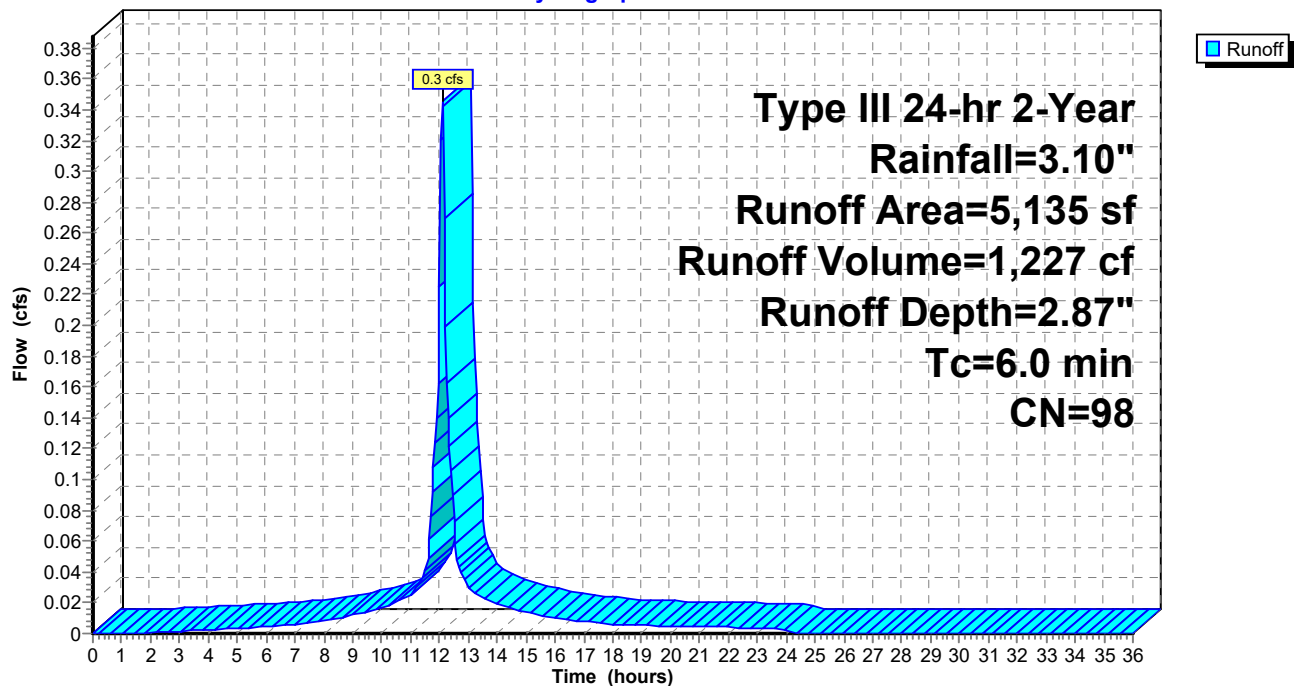
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
0	98	Roofs, HSG A
5,135	98	Paved parking, HSG A
0	39	>75% Grass cover, Good, HSG A
5,135	98	Weighted Average
5,135		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-3:

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Subcatchment Triplex:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 373 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

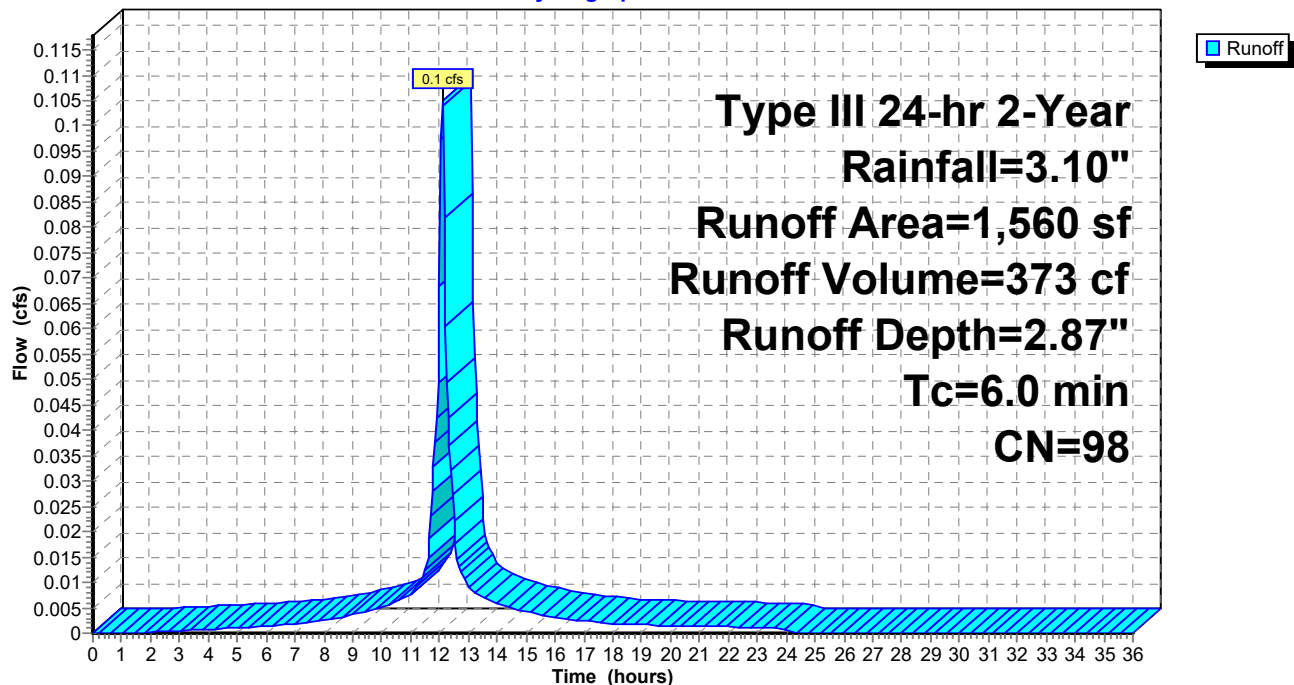
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,560	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,560	98	Weighted Average
1,560		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Triplex:

Hydrograph



Summary for Reach DP-2:

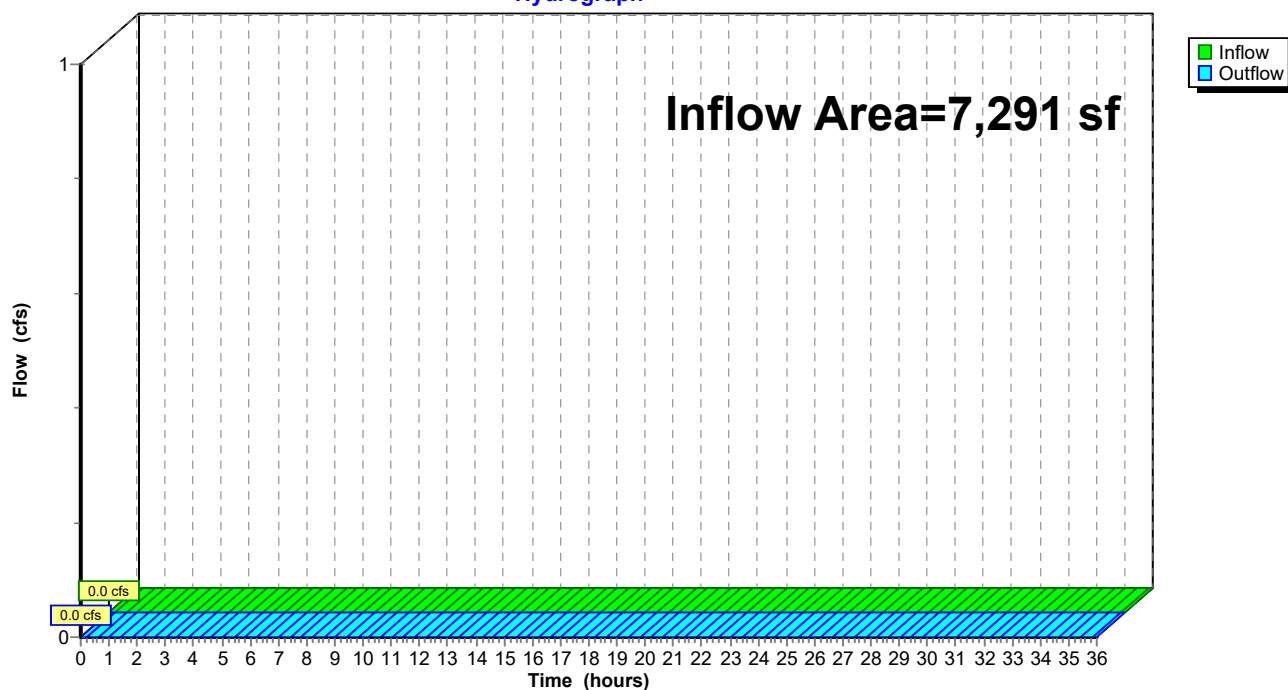
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 7,291 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Outflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-2:

Hydrograph



21-10254 - Post-R4

Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Pond Chambers:

Inflow Area = 5,135 sf, 100.00% Impervious, Inflow Depth = 2.87" for 2-Year event
 Inflow = 0.3 cfs @ 12.09 hrs, Volume= 1,227 cf
 Outflow = 0.1 cfs @ 12.37 hrs, Volume= 1,227 cf, Atten= 67%, Lag= 17.2 min
 Discarded = 0.1 cfs @ 12.37 hrs, Volume= 1,227 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 7.89' @ 12.37 hrs Surf.Area= 414 sf Storage= 209 cf

Plug-Flow detention time= 9.4 min calculated for 1,226 cf (100% of inflow)
 Center-of-Mass det. time= 9.3 min (766.4 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	395 cf	11.00'W x 37.60'L x 3.50'H Field A 1,448 cf Overall - 459 cf Embedded = 988 cf x 40.0% Voids
#2A	7.50'	459 cf	StormTech SC-740 x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		855 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.1 cfs @ 12.37 hrs HW=7.89' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

Pond Chambers: - Chamber Wizard Field A**Chamber Model = StormTech SC-740**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C

5 Chambers/Row x 7.12' Long = 35.60' + 12.0" End Stone x 2 = 37.60' Base Length

2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,447.6 cf Field - 459.4 cf Chambers = 988.2 cf Stone x 40.0% Voids = 395.3 cf Stone Storage

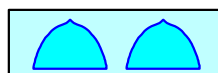
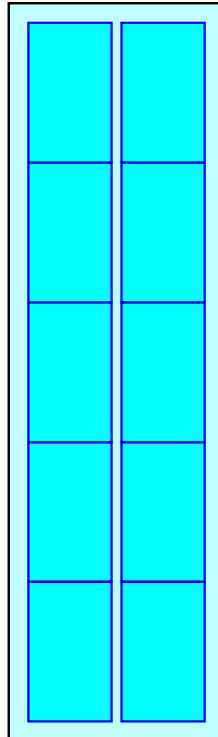
Stone + Chamber Storage = 854.7 cf = 0.020 af

10 Chambers @ \$ 0.00 /ea = \$ 0.00

53.6 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

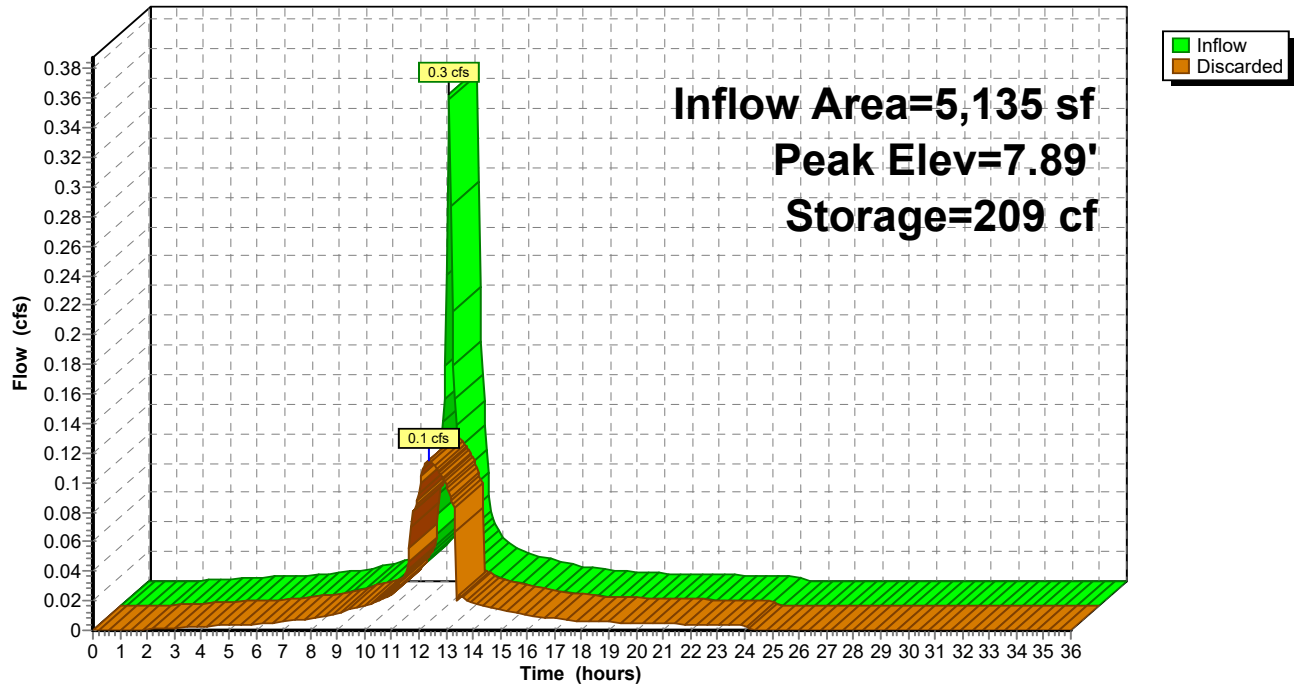
36.6 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Chambers:

Hydrograph



21-10254 - Post-R4

Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Pond Duplex Trench:

Inflow Area = 1,050 sf, 100.00% Impervious, Inflow Depth = 2.87" for 2-Year event
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 251 cf
 Outflow = 0.0 cfs @ 12.28 hrs, Volume= 251 cf, Atten= 56%, Lag= 11.3 min
 Discarded = 0.0 cfs @ 12.28 hrs, Volume= 251 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 7.58' @ 12.28 hrs Surf.Area= 125 sf Storage= 29 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 4.3 min (761.4 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	93 cf	3.04'W x 41.00'L x 2.21'H Field A 276 cf Overall - 42 cf Embedded = 234 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		126 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.0 cfs @ 12.28 hrs HW=7.58' (Free Discharge)
 ↑1=Exfiltration (Controls 0.0 cfs)

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Type III 24-hr 2-Year Rainfall=3.10"

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Pond Duplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 6.0" End Stone x 2 = 41.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

275.5 cf Field - 41.9 cf Chambers = 233.7 cf Stone x 40.0% Voids = 93.5 cf Stone Storage

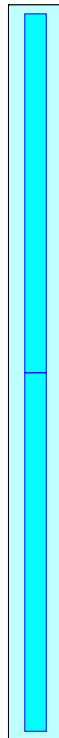
Stone + Chamber Storage = 125.9 cf = 0.003 af

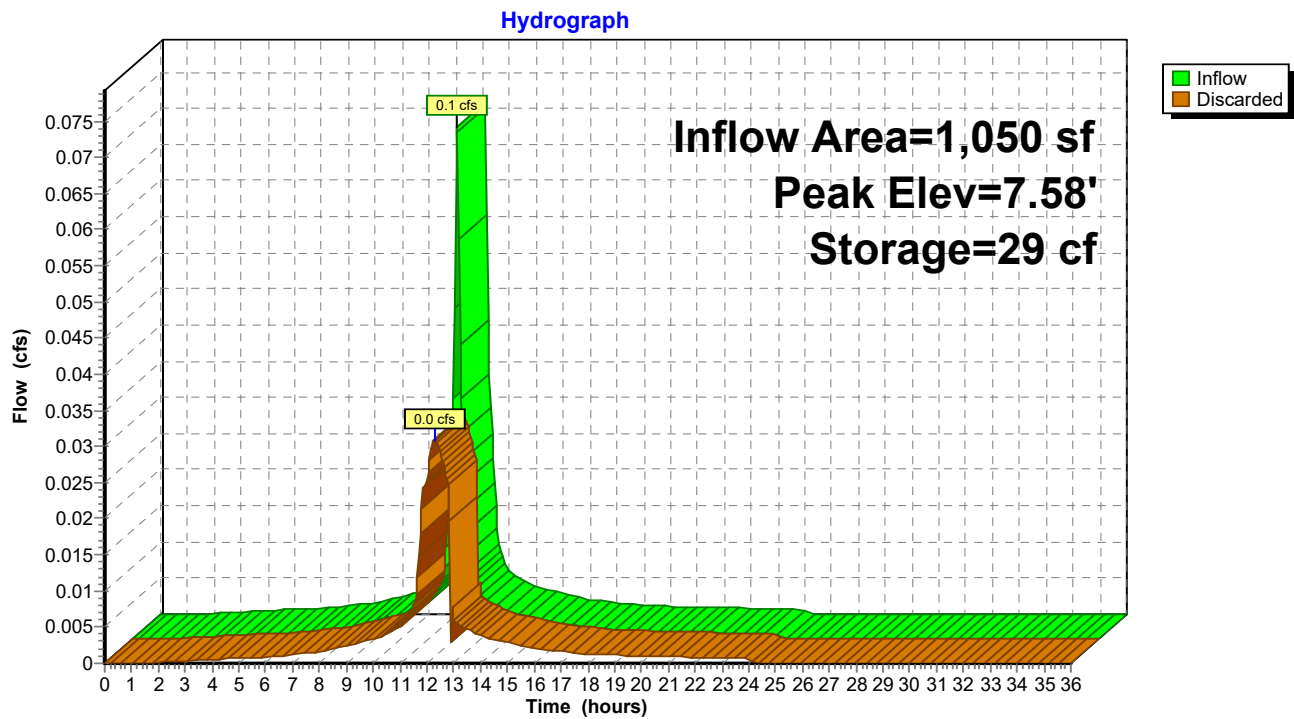
2 Chambers @ \$ 0.00 /ea = \$ 0.00

10.2 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

8.7 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Duplex Trench:

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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 1.91" for 2-Year event
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 286 cf
 Outflow = 0.0 cfs @ 12.35 hrs, Volume= 286 cf, Atten= 62%, Lag= 15.8 min
 Discarded = 0.0 cfs @ 12.35 hrs, Volume= 286 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 10.45' @ 12.35 hrs Surf.Area= 122 sf Storage= 46 cf

Plug-Flow detention time= 7.8 min calculated for 286 cf (100% of inflow)
 Center-of-Mass det. time= 7.8 min (824.2 - 816.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	3.04'W x 40.00'L x 3.88'H Field A 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
204 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.0 cfs @ 12.35 hrs HW=10.45' (Free Discharge)
 ↑1=Exfiltration (Controls 0.0 cfs)

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Type III 24-hr 2-Year Rainfall=3.10"

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Pond Infiltration Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

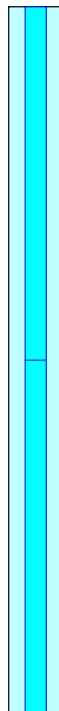
Stone + Chamber Storage = 204.3 cf = 0.005 af

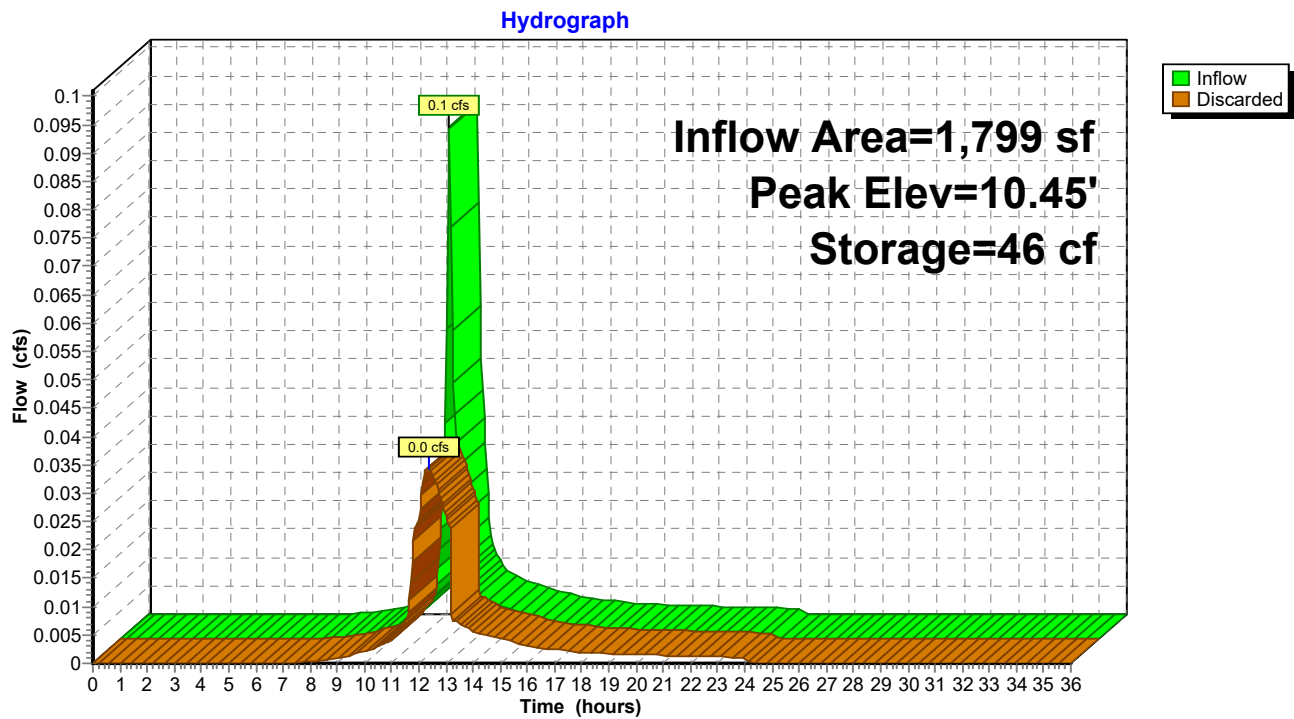
2 Chambers @ \$ 0.00 /ea = \$ 0.00

17.5 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

15.9 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Infiltration Trench:

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Type III 24-hr 2-Year Rainfall=3.10"

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Summary for Pond Triplex Trench:

Inflow Area = 1,560 sf, 100.00% Impervious, Inflow Depth = 2.87" for 2-Year event
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 373 cf
 Outflow = 0.0 cfs @ 12.29 hrs, Volume= 373 cf, Atten= 58%, Lag= 12.4 min
 Discarded = 0.0 cfs @ 12.29 hrs, Volume= 373 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 7.69' @ 12.29 hrs Surf.Area= 170 sf Storage= 47 cf

Plug-Flow detention time= 5.0 min calculated for 372 cf (100% of inflow)
 Center-of-Mass det. time= 5.0 min (762.1 - 757.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	133 cf	4.04'W x 42.00'L x 2.21'H Field A 375 cf Overall - 42 cf Embedded = 333 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.0 cfs @ 12.29 hrs HW=7.69' (Free Discharge)
 ↑1=Exfiltration (Controls 0.0 cfs)

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Type III 24-hr 2-Year Rainfall=3.10"

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Pond Triplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length

1 Rows x 14.5" Wide + 17.0" Side Stone x 2 = 4.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

375.0 cf Field - 41.9 cf Chambers = 333.2 cf Stone x 40.0% Voids = 133.3 cf Stone Storage

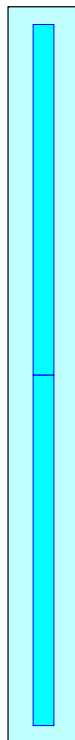
Stone + Chamber Storage = 165.7 cf = 0.004 af

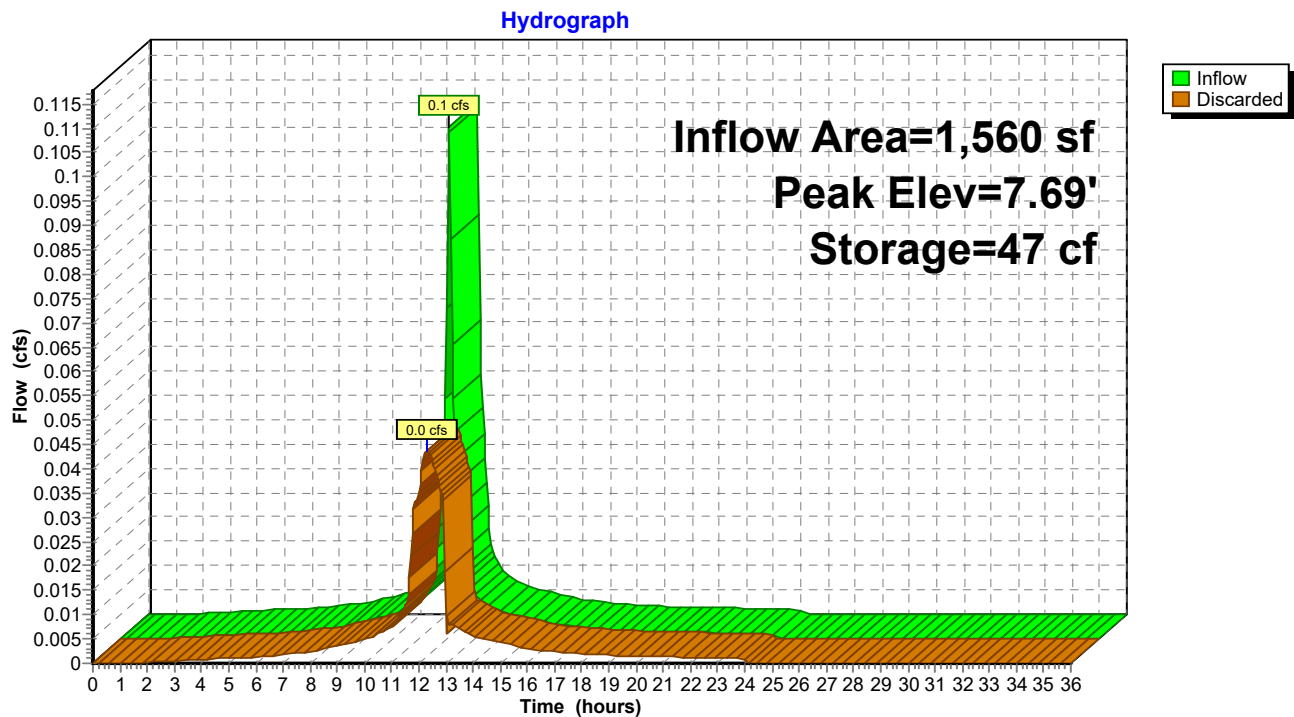
2 Chambers @ \$ 0.00 /ea = \$ 0.00

13.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

12.3 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Triplex Trench:

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Type III 24-hr 10-Year Rainfall=4.50"

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDuplex:	Runoff Area=1,050 sf 100.00% Impervious Runoff Depth=4.26" Tc=6.0 min CN=98 Runoff=0.1 cfs 373 cf
SubcatchmentPWA-1:	Runoff Area=4,463 sf 0.00% Impervious Runoff Depth=0.11" Tc=6.0 min CN=39 Runoff=0.0 cfs 41 cf
SubcatchmentPWA-2A:	Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=3.20" Tc=6.0 min CN=88 Runoff=0.1 cfs 479 cf
SubcatchmentPWA-2B:	Runoff Area=1,300 sf 0.00% Impervious Runoff Depth=0.11" Tc=6.0 min CN=39 Runoff=0.0 cfs 12 cf
SubcatchmentPWA-2C:	Runoff Area=3,123 sf 0.00% Impervious Runoff Depth=0.11" Tc=6.0 min CN=39 Runoff=0.0 cfs 29 cf
SubcatchmentPWA-2D:	Runoff Area=2,868 sf 0.00% Impervious Runoff Depth=0.11" Tc=6.0 min CN=39 Runoff=0.0 cfs 26 cf
SubcatchmentPWA-3:	Runoff Area=5,135 sf 100.00% Impervious Runoff Depth=4.26" Tc=6.0 min CN=98 Runoff=0.5 cfs 1,825 cf
SubcatchmentTriplex:	Runoff Area=1,560 sf 100.00% Impervious Runoff Depth=4.26" Tc=6.0 min CN=98 Runoff=0.2 cfs 554 cf
Reach DP-2:	Inflow=0.0 cfs 67 cf Outflow=0.0 cfs 67 cf
Pond Chambers:	Peak Elev=8.47' Storage=389 cf Inflow=0.5 cfs 1,825 cf Outflow=0.1 cfs 1,825 cf
Pond Duplex Trench:	Peak Elev=8.06' Storage=60 cf Inflow=0.1 cfs 373 cf Outflow=0.0 cfs 373 cf
Pond Infiltration Trench:	Peak Elev=11.56' Storage=103 cf Inflow=0.1 cfs 479 cf Outflow=0.0 cfs 479 cf
Pond Triplex Trench:	Peak Elev=8.23' Storage=94 cf Inflow=0.2 cfs 554 cf Outflow=0.1 cfs 554 cf

Total Runoff Area = 21,298 sf Runoff Volume = 3,340 cf Average Runoff Depth = 1.88"
56.62% Pervious = 12,058 sf 43.38% Impervious = 9,240 sf

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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment Duplex:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 373 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

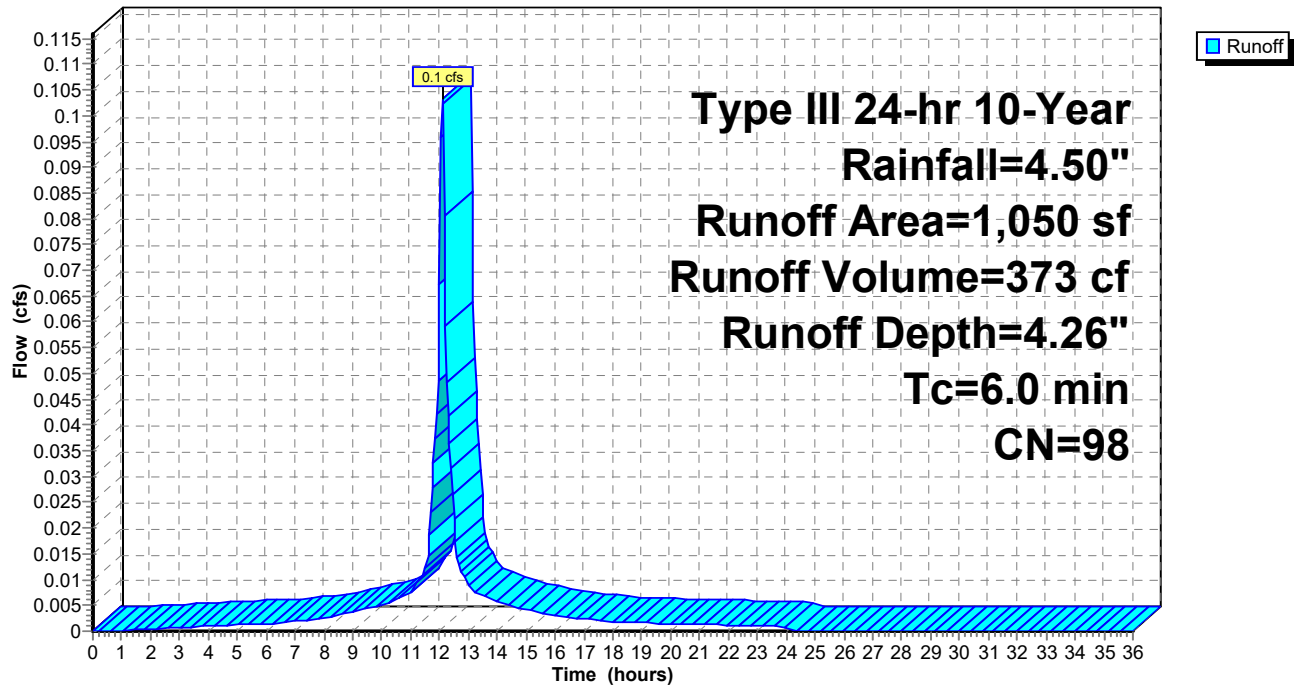
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,050	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,050	98	Weighted Average
1,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Duplex:

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment PWA-1:

Runoff = 0.0 cfs @ 14.71 hrs, Volume= 41 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

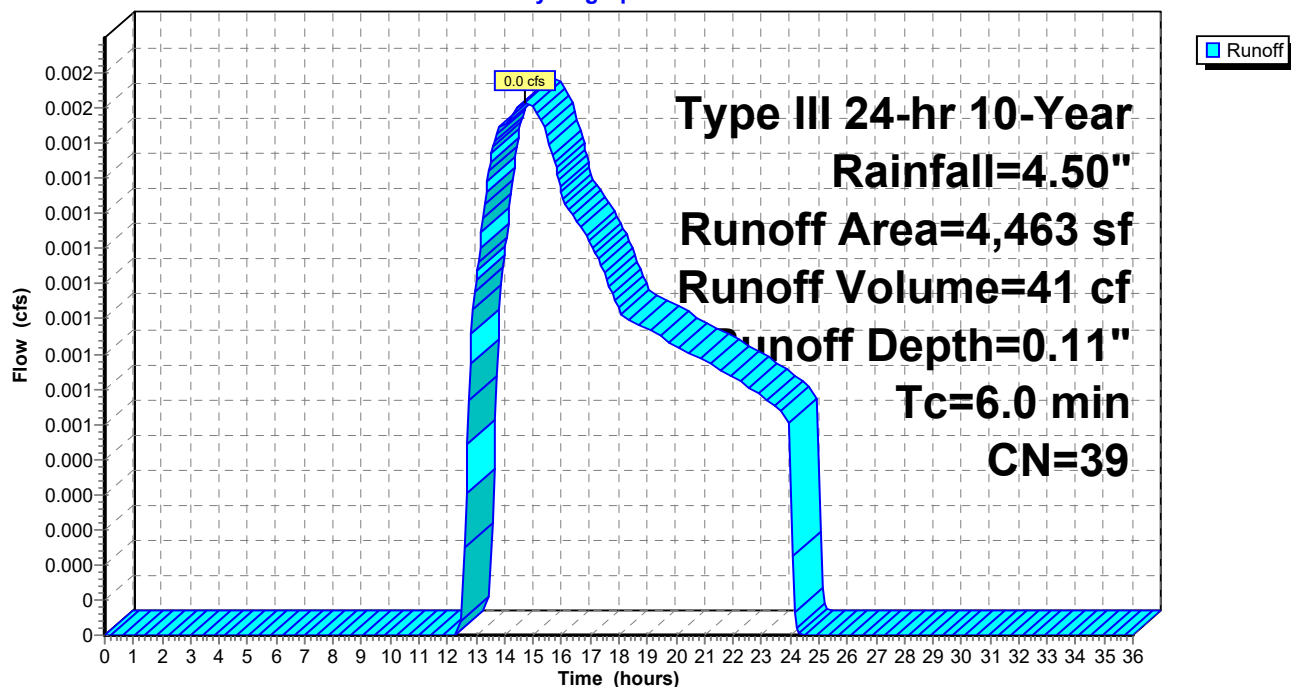
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
4,463	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,463	39	Weighted Average
4,463		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-1:

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment PWA-2A:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 479 cf, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

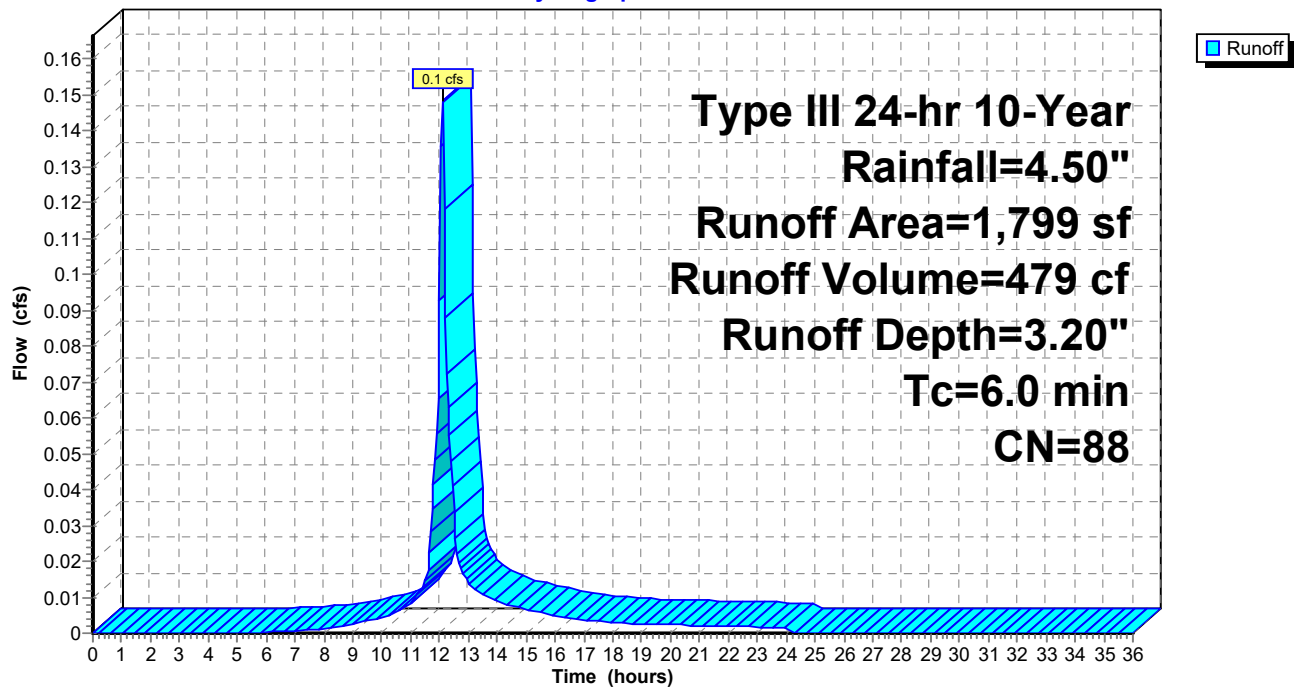
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2A:

Hydrograph



Summary for Subcatchment PWA-2B:

Runoff = 0.0 cfs @ 14.71 hrs, Volume= 12 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

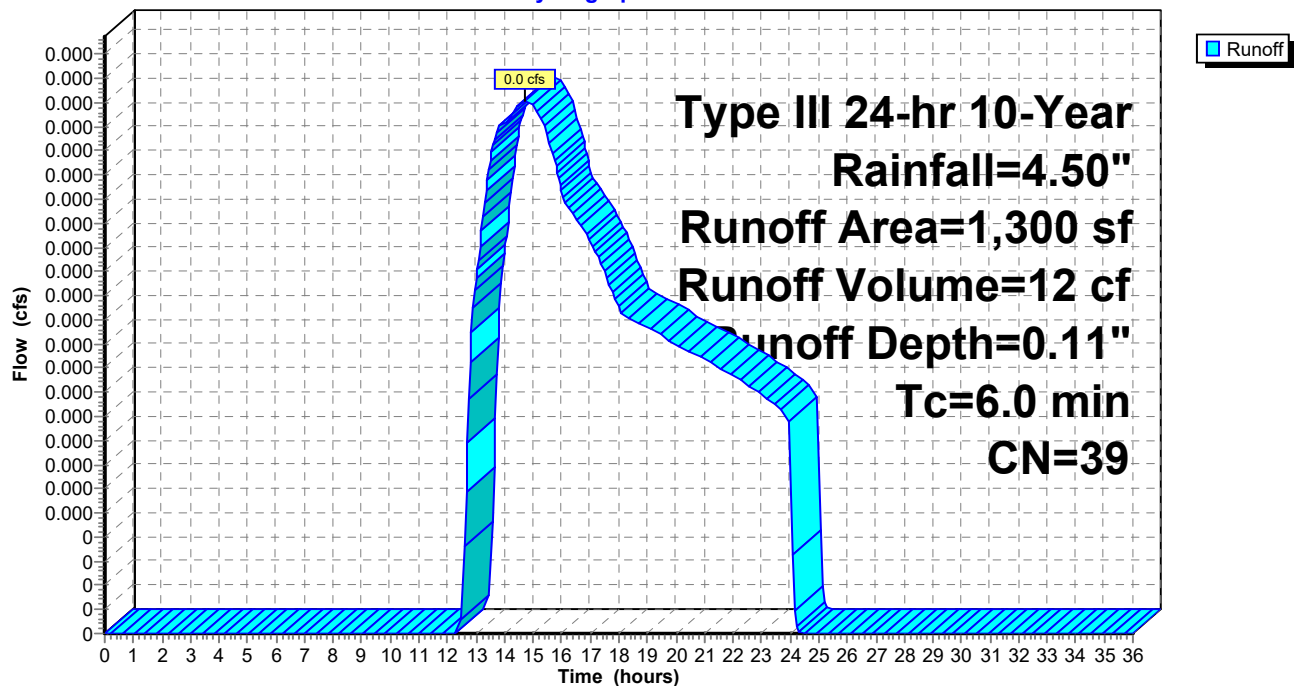
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
1,300	39	>75% Grass cover, Good, HSG A
1,300	39	Weighted Average
1,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2B:

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment PWA-2C:

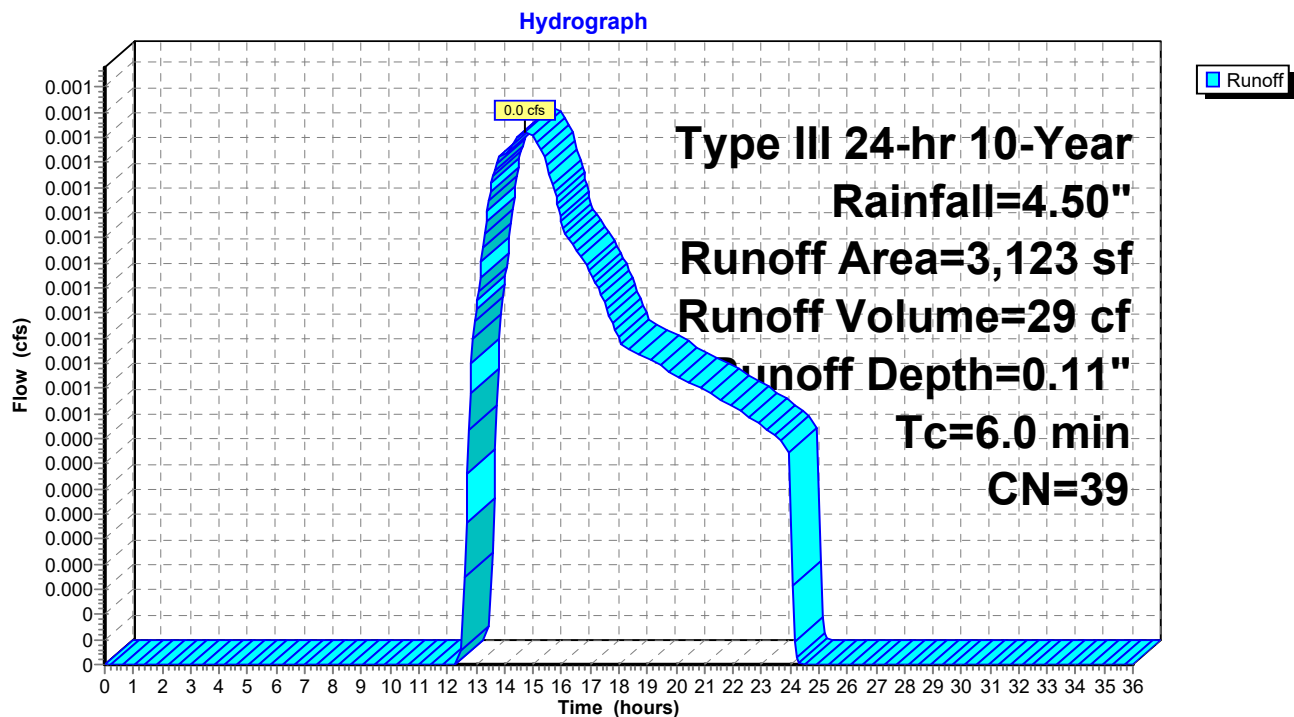
Runoff = 0.0 cfs @ 14.71 hrs, Volume= 29 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
3,123	39	>75% Grass cover, Good, HSG A
3,123	39	Weighted Average
3,123		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2C:

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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment PWA-2D:

Runoff = 0.0 cfs @ 14.71 hrs, Volume= 26 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

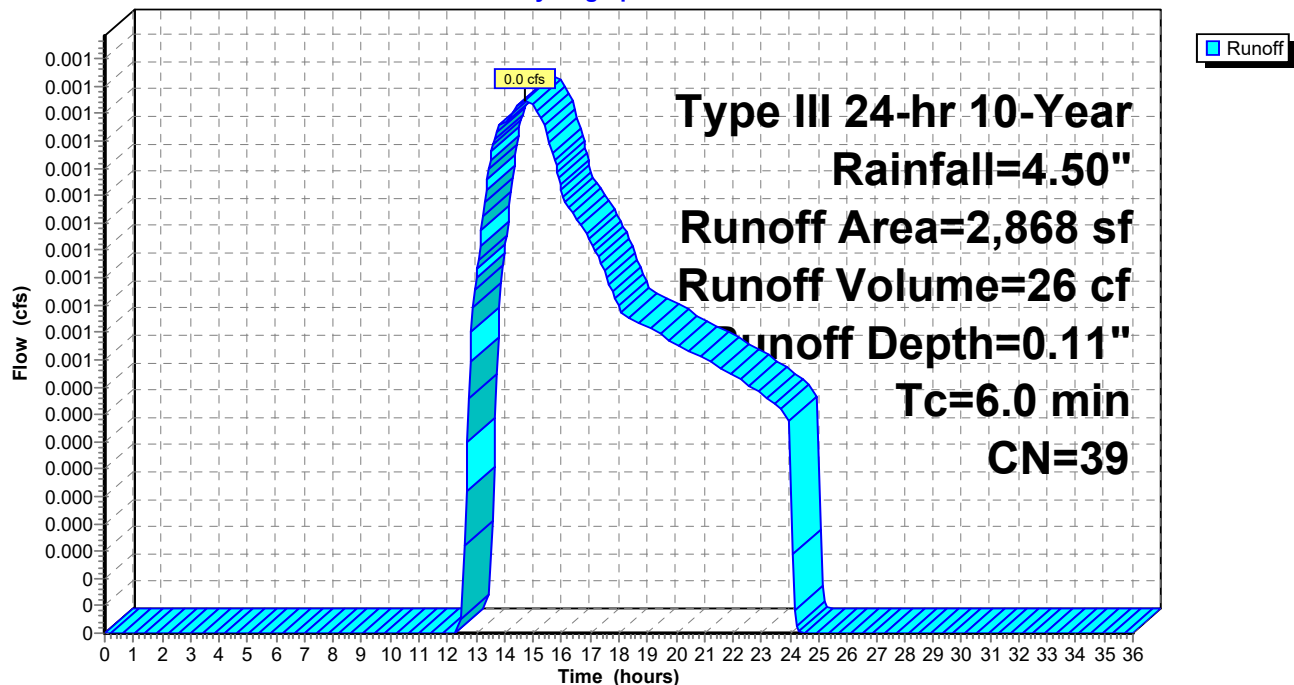
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,868	39	Weighted Average
2,868		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2D:

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment PWA-3:

Runoff = 0.5 cfs @ 12.09 hrs, Volume= 1,825 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

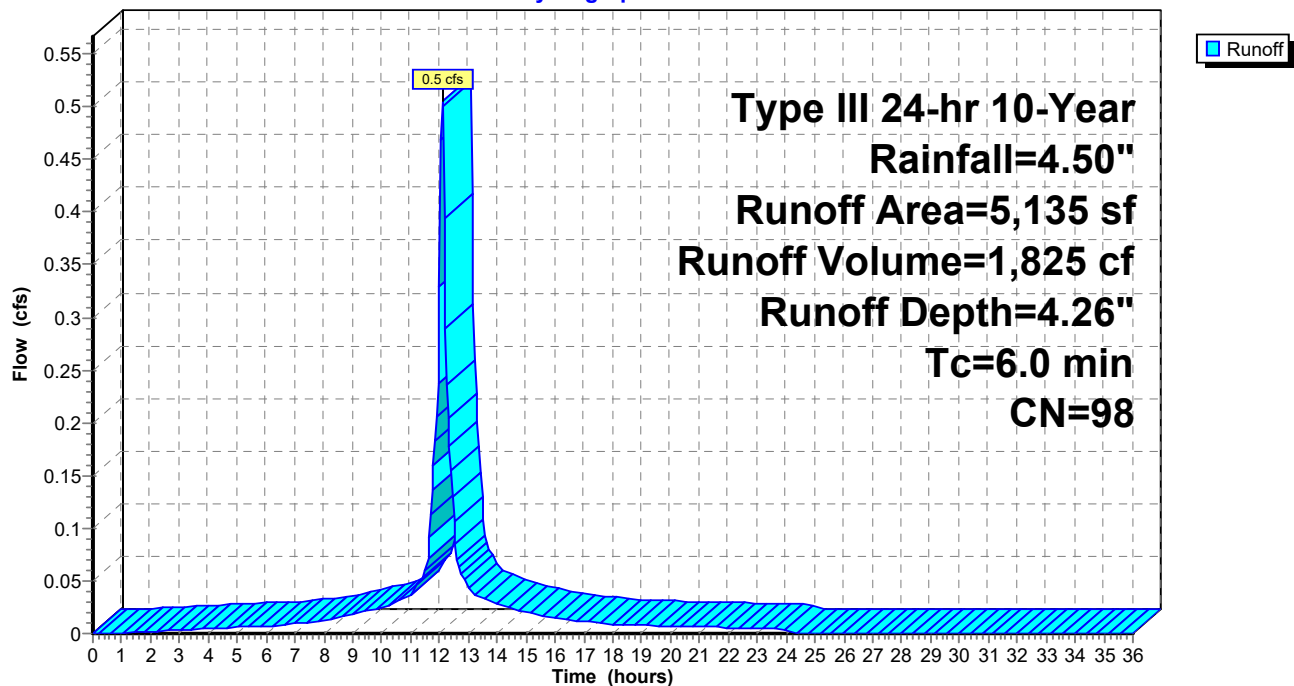
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
0	98	Roofs, HSG A
5,135	98	Paved parking, HSG A
0	39	>75% Grass cover, Good, HSG A
5,135	98	Weighted Average
5,135		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-3:

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Subcatchment Triplex:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 554 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

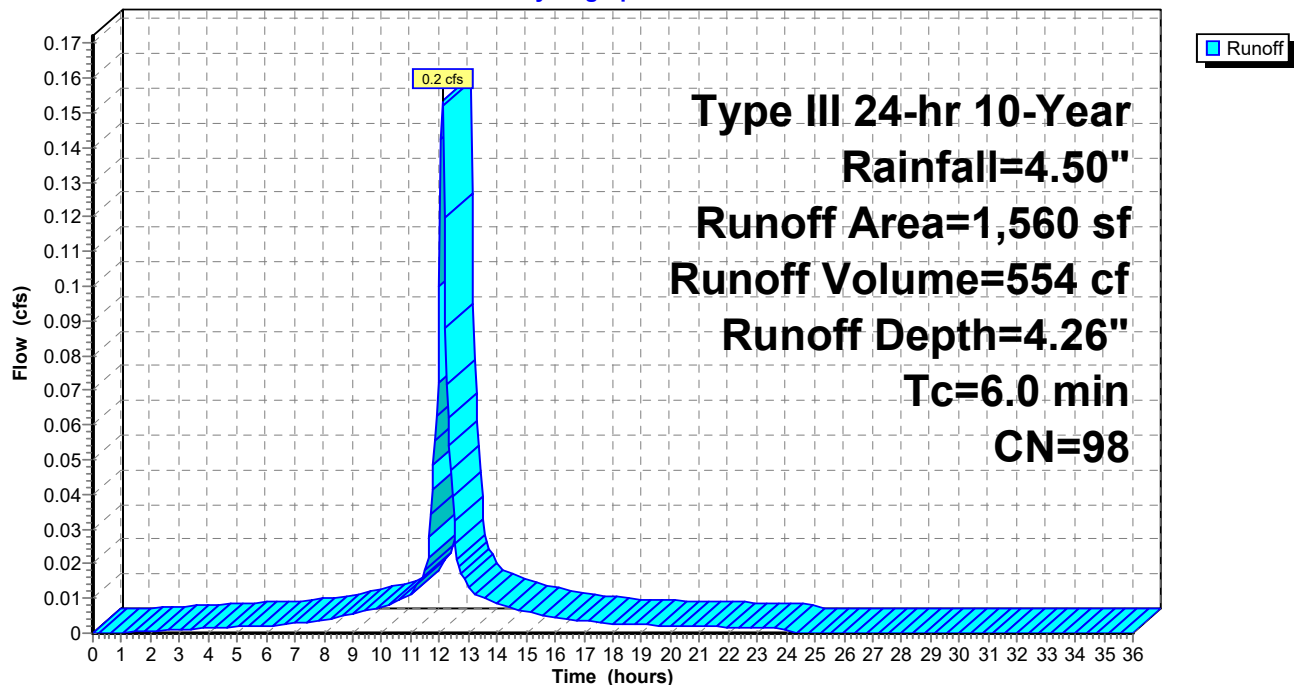
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,560	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,560	98	Weighted Average
1,560		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Triplex:

Hydrograph



Summary for Reach DP-2:

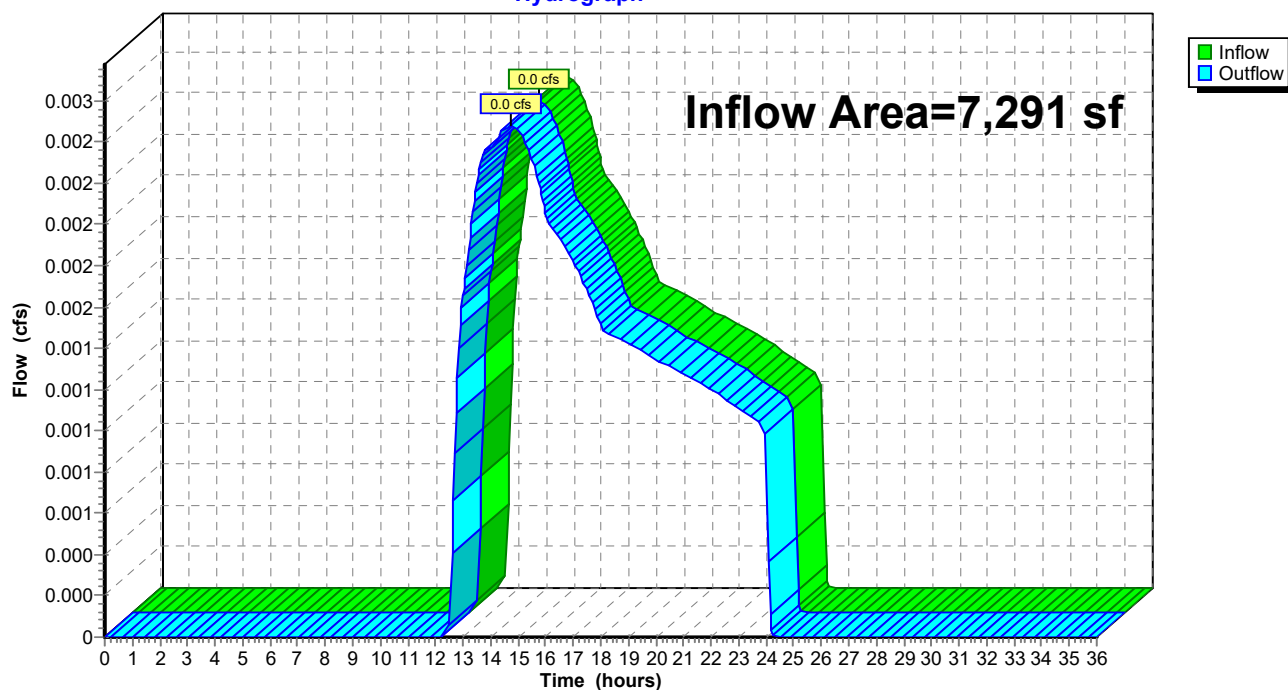
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 7,291 sf, 0.00% Impervious, Inflow Depth = 0.11" for 10-Year event
Inflow = 0.0 cfs @ 14.71 hrs, Volume= 67 cf
Outflow = 0.0 cfs @ 14.71 hrs, Volume= 67 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-2:

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Pond Chambers:

Inflow Area = 5,135 sf, 100.00% Impervious, Inflow Depth = 4.26" for 10-Year event
 Inflow = 0.5 cfs @ 12.09 hrs, Volume= 1,825 cf
 Outflow = 0.1 cfs @ 12.43 hrs, Volume= 1,825 cf, Atten= 73%, Lag= 20.9 min
 Discarded = 0.1 cfs @ 12.43 hrs, Volume= 1,825 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.47' @ 12.43 hrs Surf.Area= 414 sf Storage= 389 cf

Plug-Flow detention time= 16.0 min calculated for 1,822 cf (100% of inflow)
 Center-of-Mass det. time= 16.0 min (765.8 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	395 cf	11.00'W x 37.60'L x 3.50'H Field A 1,448 cf Overall - 459 cf Embedded = 988 cf x 40.0% Voids
#2A	7.50'	459 cf	StormTech SC-740 x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		855 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.1 cfs @ 12.43 hrs HW=8.47' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

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Type III 24-hr 10-Year Rainfall=4.50"

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Pond Chambers: - Chamber Wizard Field A**Chamber Model = StormTech SC-740**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C

5 Chambers/Row x 7.12' Long = 35.60' + 12.0" End Stone x 2 = 37.60' Base Length

2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,447.6 cf Field - 459.4 cf Chambers = 988.2 cf Stone x 40.0% Voids = 395.3 cf Stone Storage

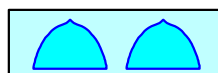
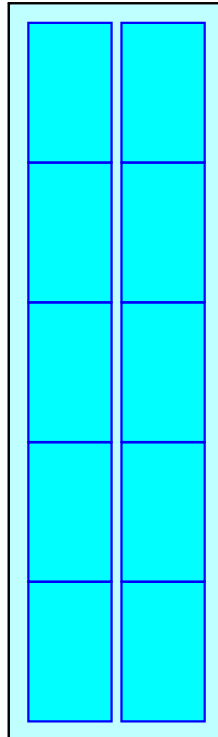
Stone + Chamber Storage = 854.7 cf = 0.020 af

10 Chambers @ \$ 0.00 /ea = \$ 0.00

53.6 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

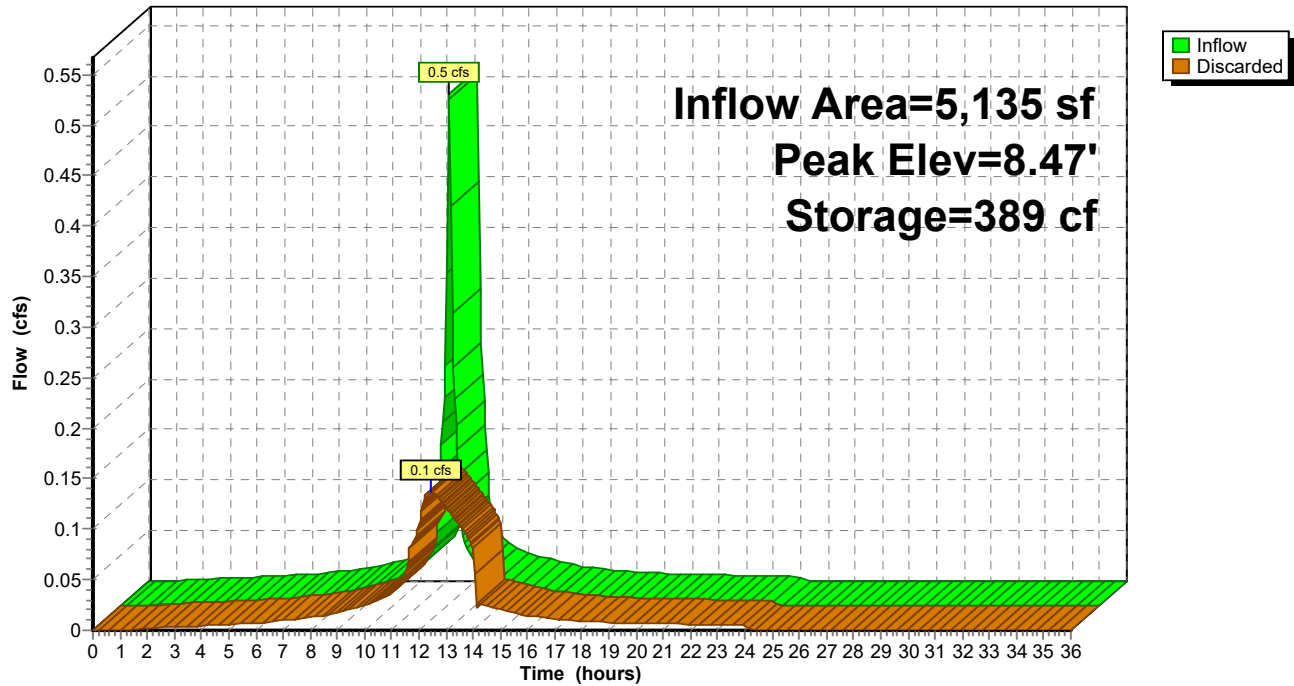
36.6 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Chambers:

Hydrograph



21-10254 - Post-R4

Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Pond Duplex Trench:

Inflow Area = 1,050 sf, 100.00% Impervious, Inflow Depth = 4.26" for 10-Year event
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 373 cf
 Outflow = 0.0 cfs @ 12.35 hrs, Volume= 373 cf, Atten= 65%, Lag= 15.8 min
 Discarded = 0.0 cfs @ 12.35 hrs, Volume= 373 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.06' @ 12.35 hrs Surf.Area= 125 sf Storage= 60 cf

Plug-Flow detention time= 8.2 min calculated for 373 cf (100% of inflow)
 Center-of-Mass det. time= 8.1 min (758.0 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	93 cf	3.04'W x 41.00'L x 2.21'H Field A 276 cf Overall - 42 cf Embedded = 234 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		126 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.0 cfs @ 12.35 hrs HW=8.06' (Free Discharge)
 ↑1=Exfiltration (Controls 0.0 cfs)

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Type III 24-hr 10-Year Rainfall=4.50"

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Pond Duplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 6.0" End Stone x 2 = 41.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

275.5 cf Field - 41.9 cf Chambers = 233.7 cf Stone x 40.0% Voids = 93.5 cf Stone Storage

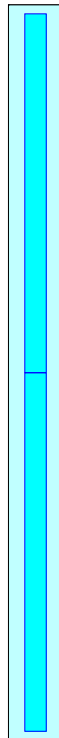
Stone + Chamber Storage = 125.9 cf = 0.003 af

2 Chambers @ \$ 0.00 /ea = \$ 0.00

10.2 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

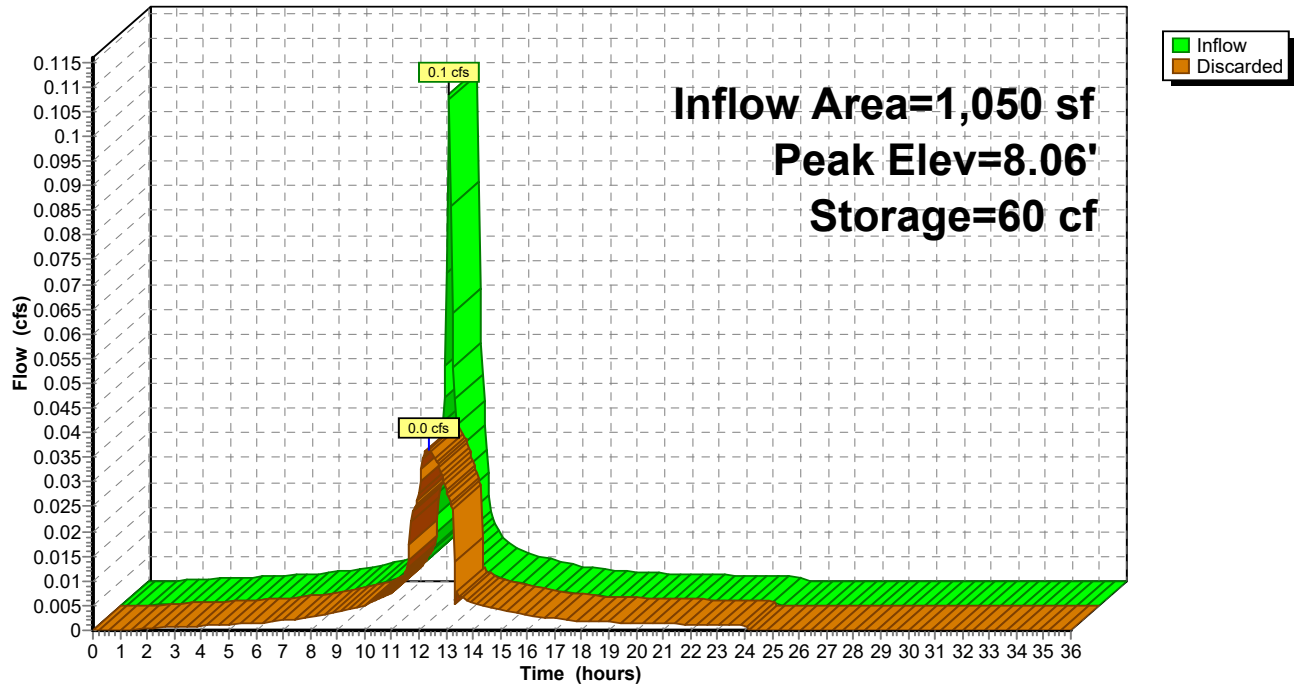
8.7 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Duplex Trench:

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 3.20" for 10-Year event
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 479 cf
 Outflow = 0.0 cfs @ 12.41 hrs, Volume= 479 cf, Atten= 68%, Lag= 19.0 min
 Discarded = 0.0 cfs @ 12.41 hrs, Volume= 479 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 11.56' @ 12.41 hrs Surf.Area= 122 sf Storage= 103 cf

Plug-Flow detention time= 14.3 min calculated for 479 cf (100% of inflow)
 Center-of-Mass det. time= 14.3 min (816.1 - 801.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	3.04'W x 40.00'L x 3.88'H Field A 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		204 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.0 cfs @ 12.41 hrs HW=11.56' (Free Discharge)
 ↑1=Exfiltration (Controls 0.0 cfs)

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Type III 24-hr 10-Year Rainfall=4.50"

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Pond Infiltration Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

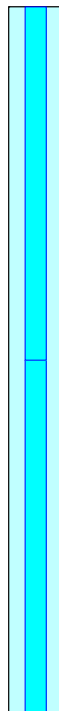
Stone + Chamber Storage = 204.3 cf = 0.005 af

2 Chambers @ \$ 0.00 /ea = \$ 0.00

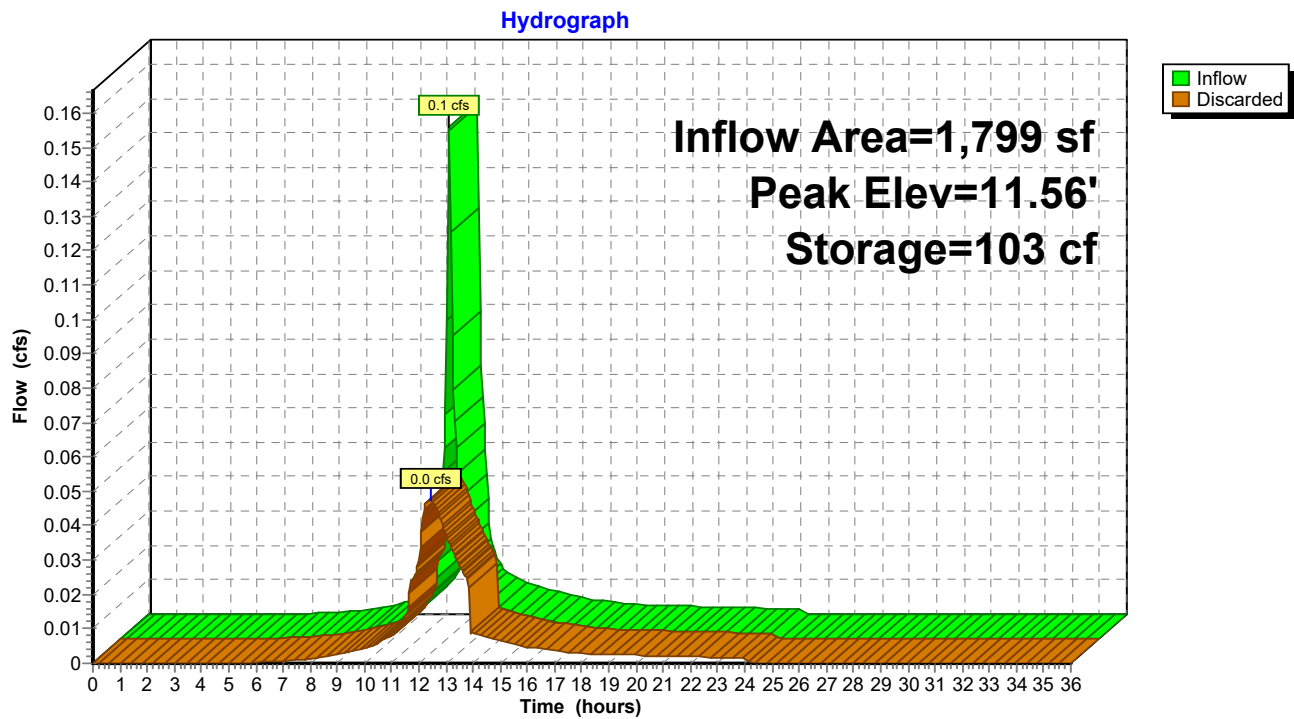
17.5 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

15.9 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Infiltration Trench:



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Type III 24-hr 10-Year Rainfall=4.50"

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Summary for Pond Triplex Trench:

Inflow Area = 1,560 sf, 100.00% Impervious, Inflow Depth = 4.26" for 10-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 554 cf
 Outflow = 0.1 cfs @ 12.36 hrs, Volume= 554 cf, Atten= 66%, Lag= 16.5 min
 Discarded = 0.1 cfs @ 12.36 hrs, Volume= 554 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.23' @ 12.36 hrs Surf.Area= 170 sf Storage= 94 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 9.2 min (759.0 - 749.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	133 cf	4.04'W x 42.00'L x 2.21'H Field A 375 cf Overall - 42 cf Embedded = 333 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.1 cfs @ 12.36 hrs HW=8.23' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

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Type III 24-hr 10-Year Rainfall=4.50"

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Pond Triplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length

1 Rows x 14.5" Wide + 17.0" Side Stone x 2 = 4.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

375.0 cf Field - 41.9 cf Chambers = 333.2 cf Stone x 40.0% Voids = 133.3 cf Stone Storage

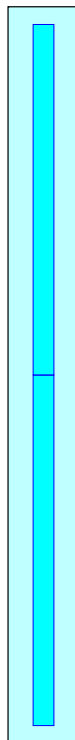
Stone + Chamber Storage = 165.7 cf = 0.004 af

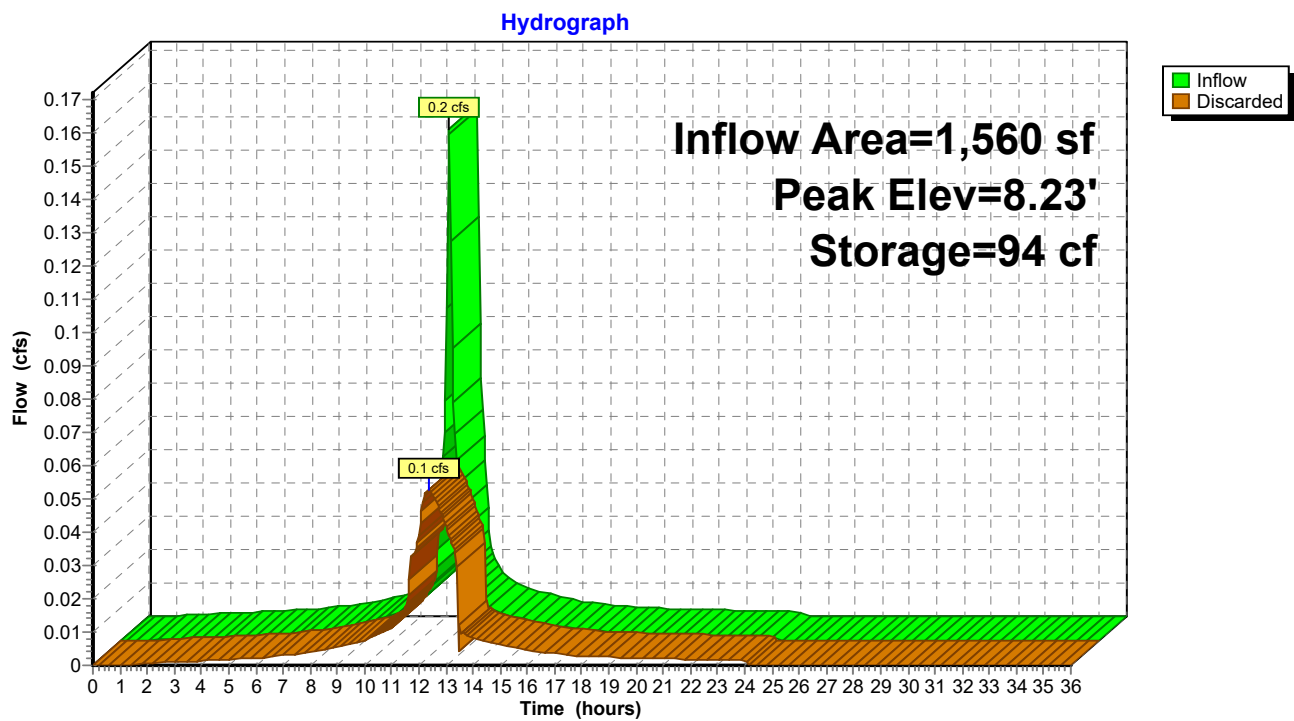
2 Chambers @ \$ 0.00 /ea = \$ 0.00

13.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

12.3 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Triplex Trench:

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Type III 24-hr 25-Year Rainfall=5.30"

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDuplex:	Runoff Area=1,050 sf 100.00% Impervious Runoff Depth=5.06" Tc=6.0 min CN=98 Runoff=0.1 cfs 443 cf
SubcatchmentPWA-1:	Runoff Area=4,463 sf 0.00% Impervious Runoff Depth=0.26" Tc=6.0 min CN=39 Runoff=0.0 cfs 98 cf
SubcatchmentPWA-2A:	Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=3.95" Tc=6.0 min CN=88 Runoff=0.2 cfs 593 cf
SubcatchmentPWA-2B:	Runoff Area=1,300 sf 0.00% Impervious Runoff Depth=0.26" Tc=6.0 min CN=39 Runoff=0.0 cfs 29 cf
SubcatchmentPWA-2C:	Runoff Area=3,123 sf 0.00% Impervious Runoff Depth=0.26" Tc=6.0 min CN=39 Runoff=0.0 cfs 69 cf
SubcatchmentPWA-2D:	Runoff Area=2,868 sf 0.00% Impervious Runoff Depth=0.26" Tc=6.0 min CN=39 Runoff=0.0 cfs 63 cf
SubcatchmentPWA-3:	Runoff Area=5,135 sf 100.00% Impervious Runoff Depth=5.06" Tc=6.0 min CN=98 Runoff=0.6 cfs 2,166 cf
SubcatchmentTriplex:	Runoff Area=1,560 sf 100.00% Impervious Runoff Depth=5.06" Tc=6.0 min CN=98 Runoff=0.2 cfs 658 cf
Reach DP-2:	Inflow=0.0 cfs 161 cf Outflow=0.0 cfs 161 cf
Pond Chambers:	Peak Elev=8.84' Storage=496 cf Inflow=0.6 cfs 2,166 cf Outflow=0.2 cfs 2,166 cf
Pond Duplex Trench:	Peak Elev=8.33' Storage=79 cf Inflow=0.1 cfs 443 cf Outflow=0.0 cfs 443 cf
Pond Infiltration Trench:	Peak Elev=12.07' Storage=140 cf Inflow=0.2 cfs 593 cf Outflow=0.1 cfs 593 cf
Pond Triplex Trench:	Peak Elev=8.57' Storage=123 cf Inflow=0.2 cfs 658 cf Outflow=0.1 cfs 658 cf

Total Runoff Area = 21,298 sf Runoff Volume = 4,120 cf Average Runoff Depth = 2.32"
56.62% Pervious = 12,058 sf 43.38% Impervious = 9,240 sf

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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment Duplex:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 443 cf, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

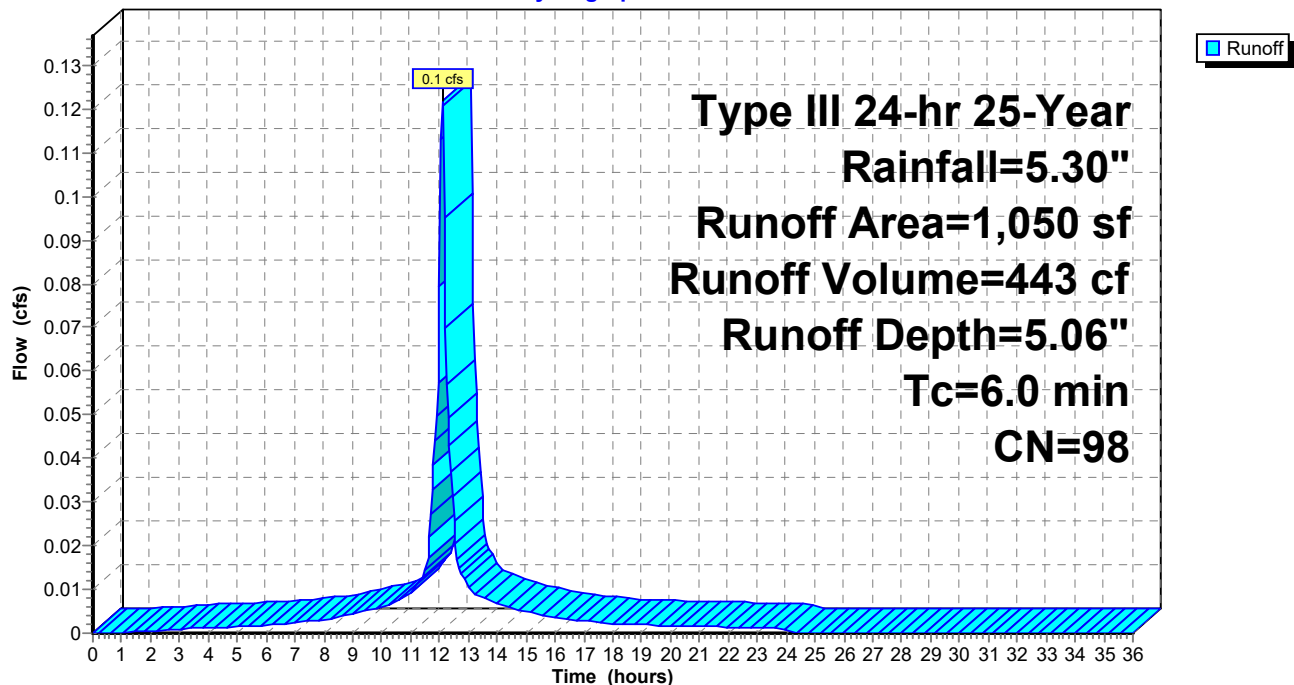
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,050	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,050	98	Weighted Average
1,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Duplex:

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment PWA-1:

Runoff = 0.0 cfs @ 12.43 hrs, Volume= 98 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

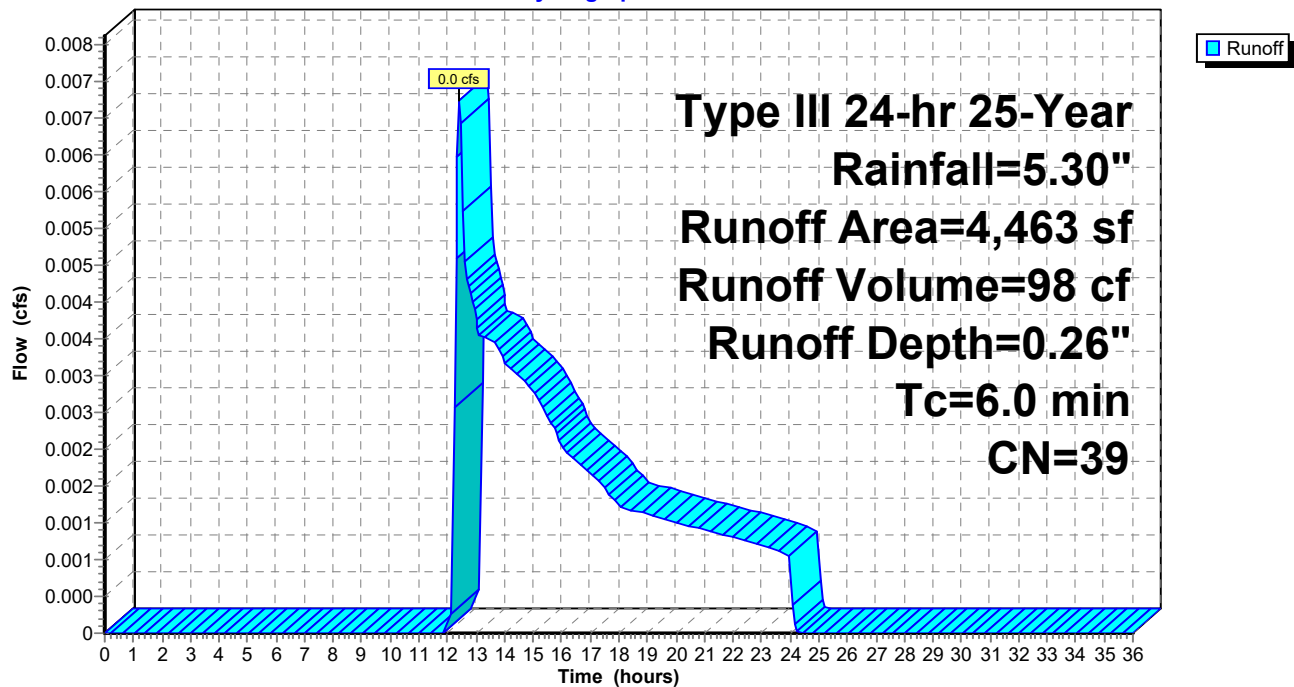
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
4,463	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,463	39	Weighted Average
4,463		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-1:

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment PWA-2A:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 593 cf, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

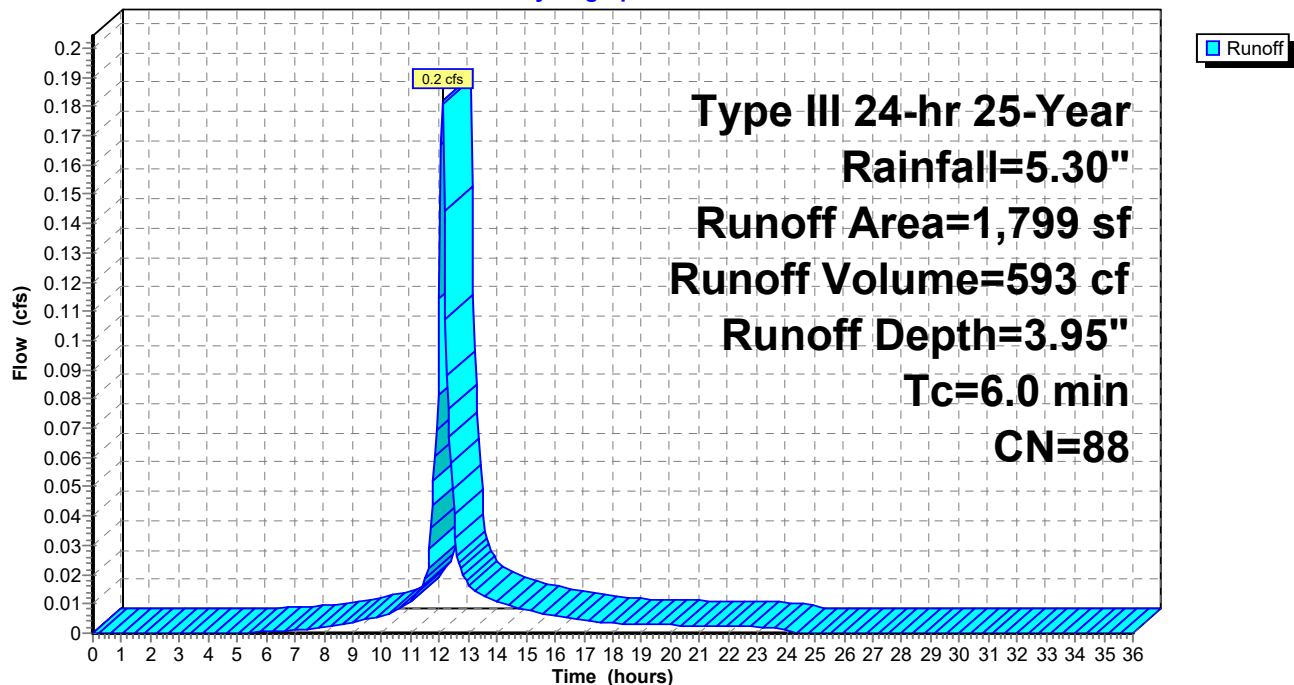
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2A:

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment PWA-2B:

Runoff = 0.0 cfs @ 12.43 hrs, Volume= 29 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

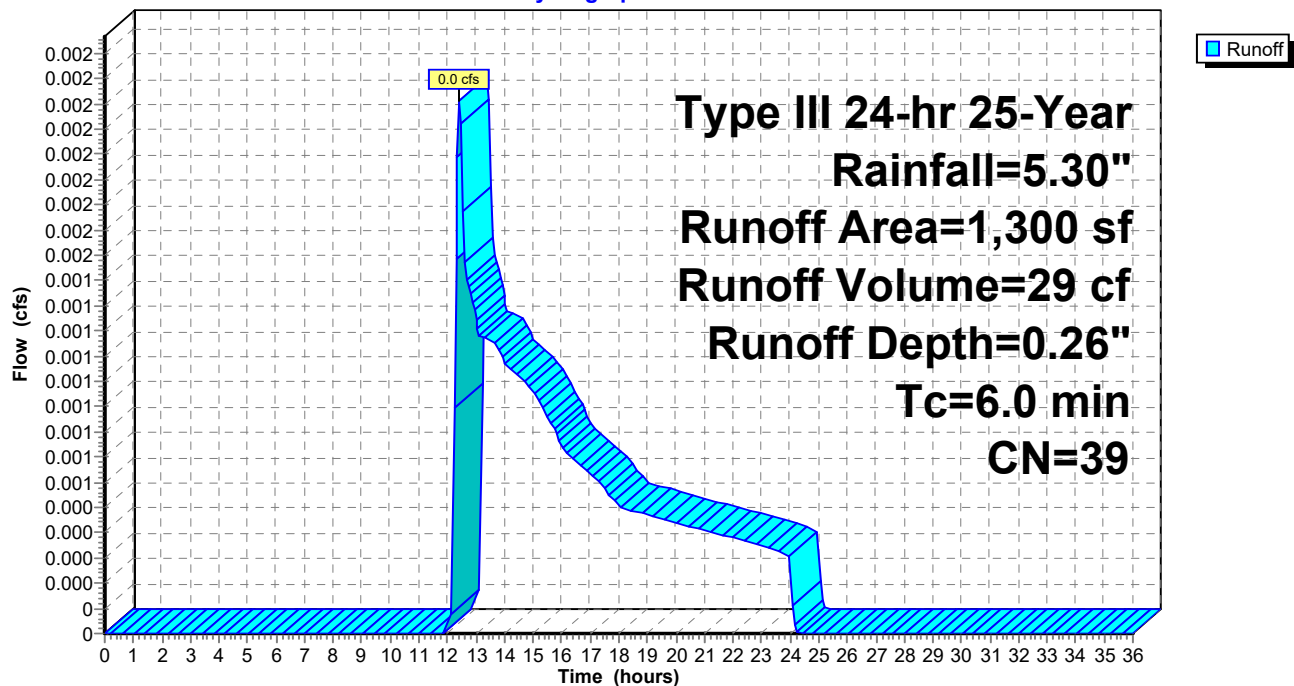
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
1,300	39	>75% Grass cover, Good, HSG A
1,300	39	Weighted Average
1,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2B:

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment PWA-2C:

Runoff = 0.0 cfs @ 12.43 hrs, Volume= 69 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

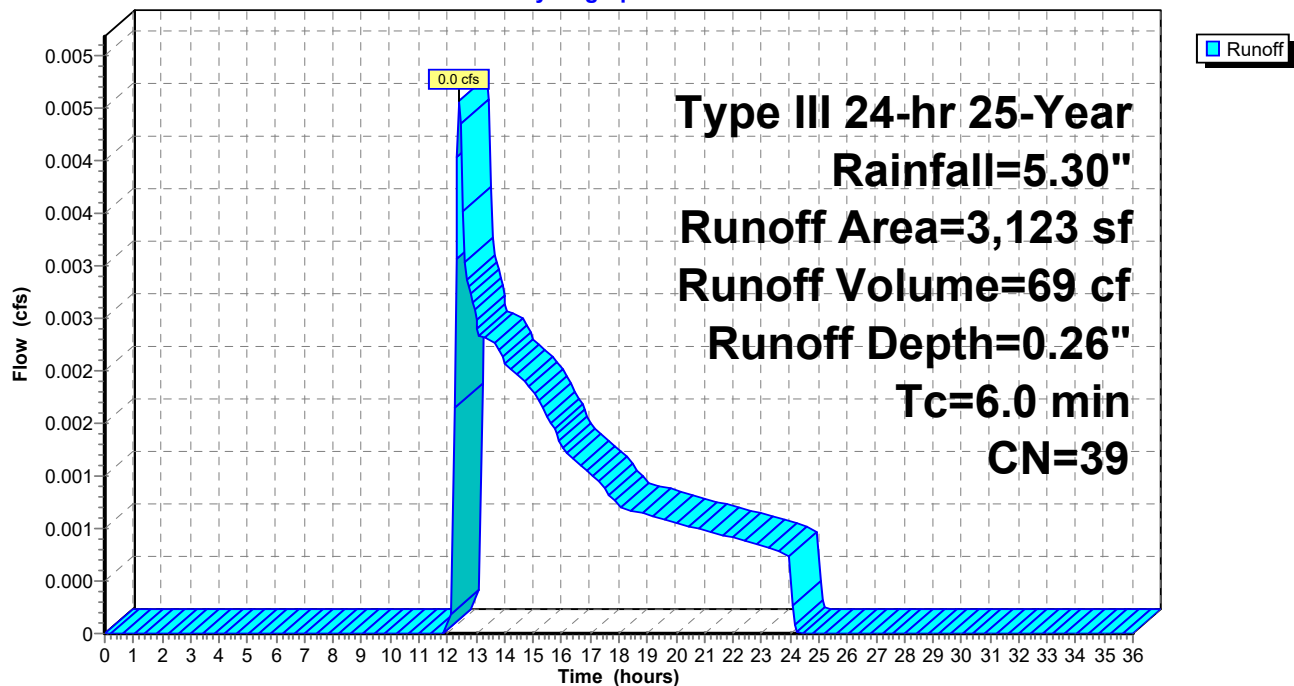
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
3,123	39	>75% Grass cover, Good, HSG A
3,123	39	Weighted Average
3,123		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2C:

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment PWA-2D:

Runoff = 0.0 cfs @ 12.43 hrs, Volume= 63 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

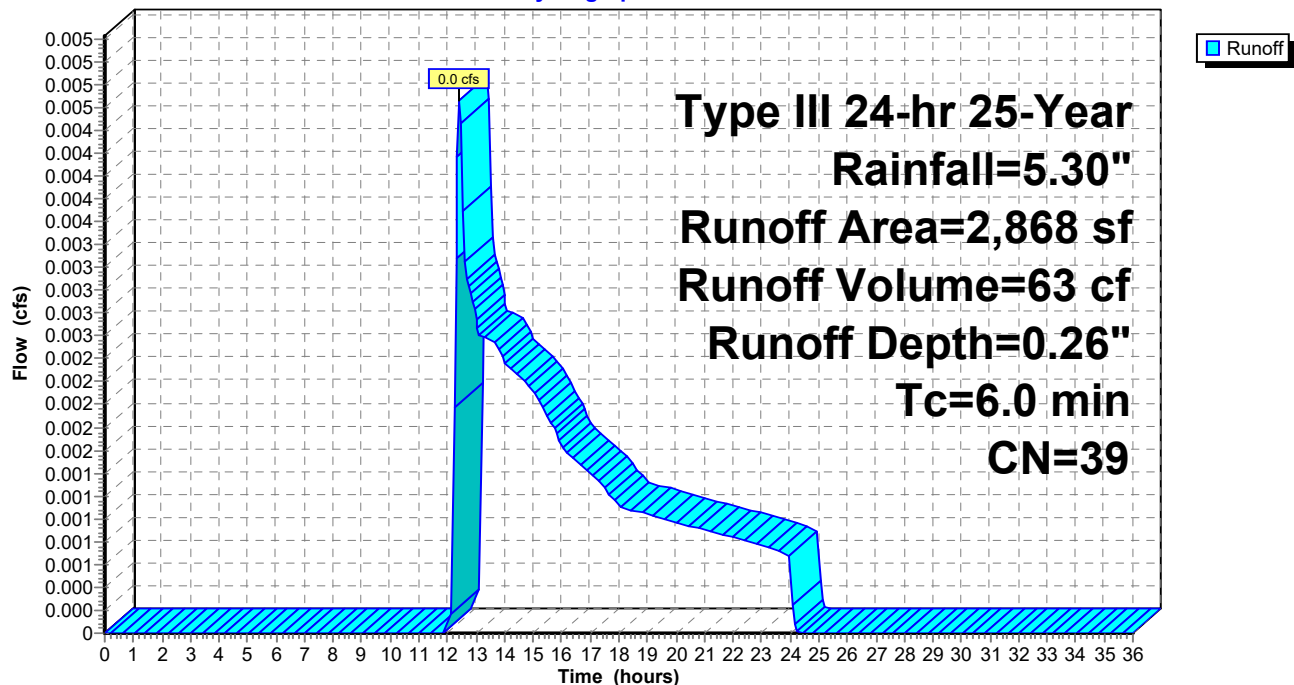
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,868	39	Weighted Average
2,868		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2D:

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment PWA-3:

Runoff = 0.6 cfs @ 12.09 hrs, Volume= 2,166 cf, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

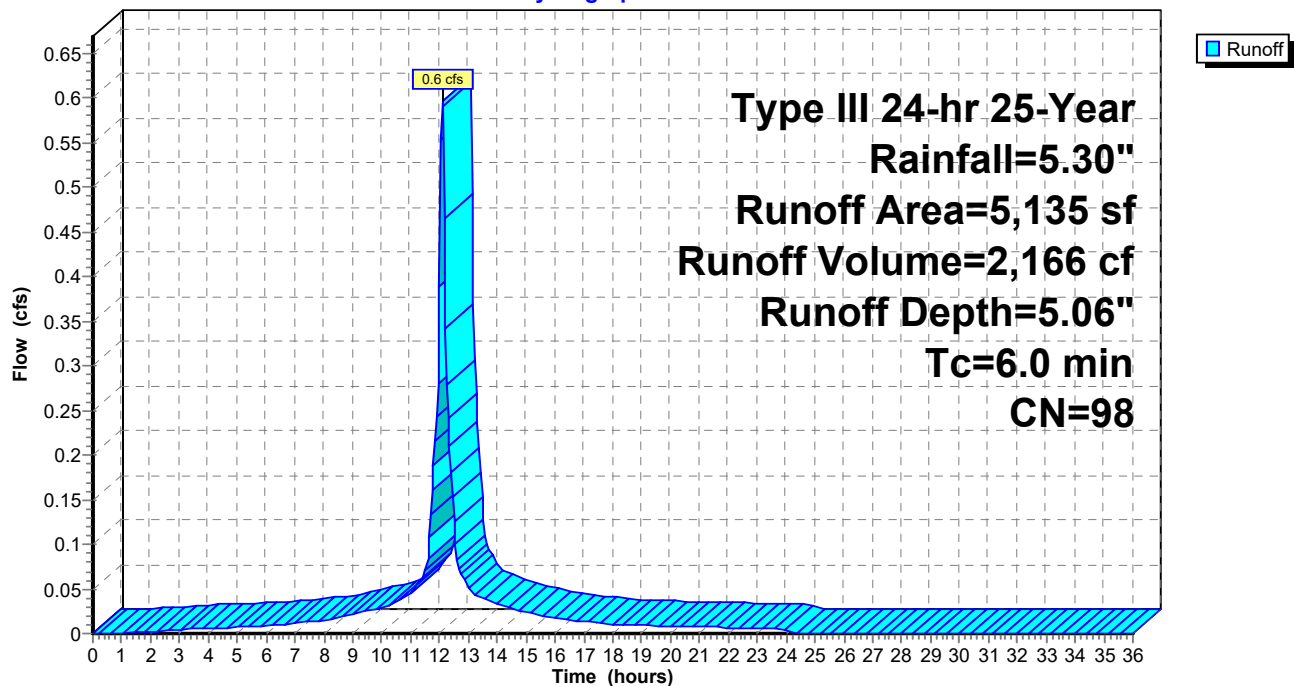
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
0	98	Roofs, HSG A
5,135	98	Paved parking, HSG A
0	39	>75% Grass cover, Good, HSG A
5,135	98	Weighted Average
5,135		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-3:

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Subcatchment Triplex:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 658 cf, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

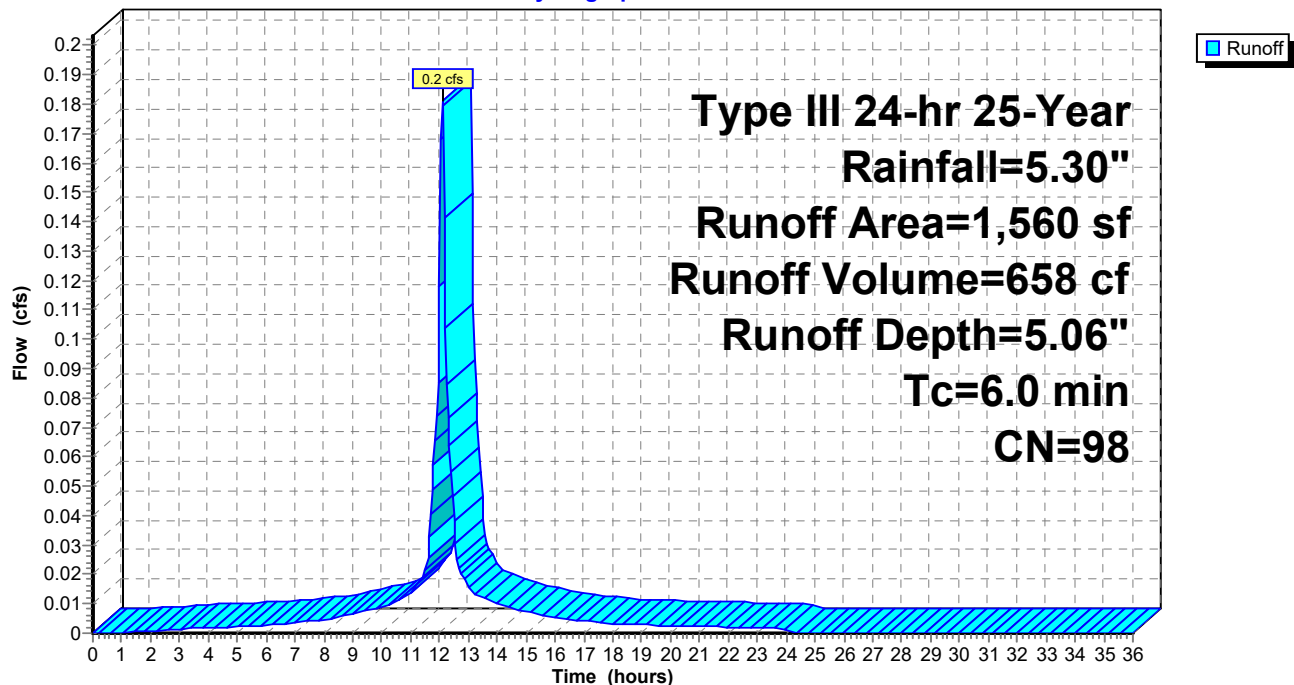
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,560	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,560	98	Weighted Average
1,560		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Triplex:

Hydrograph

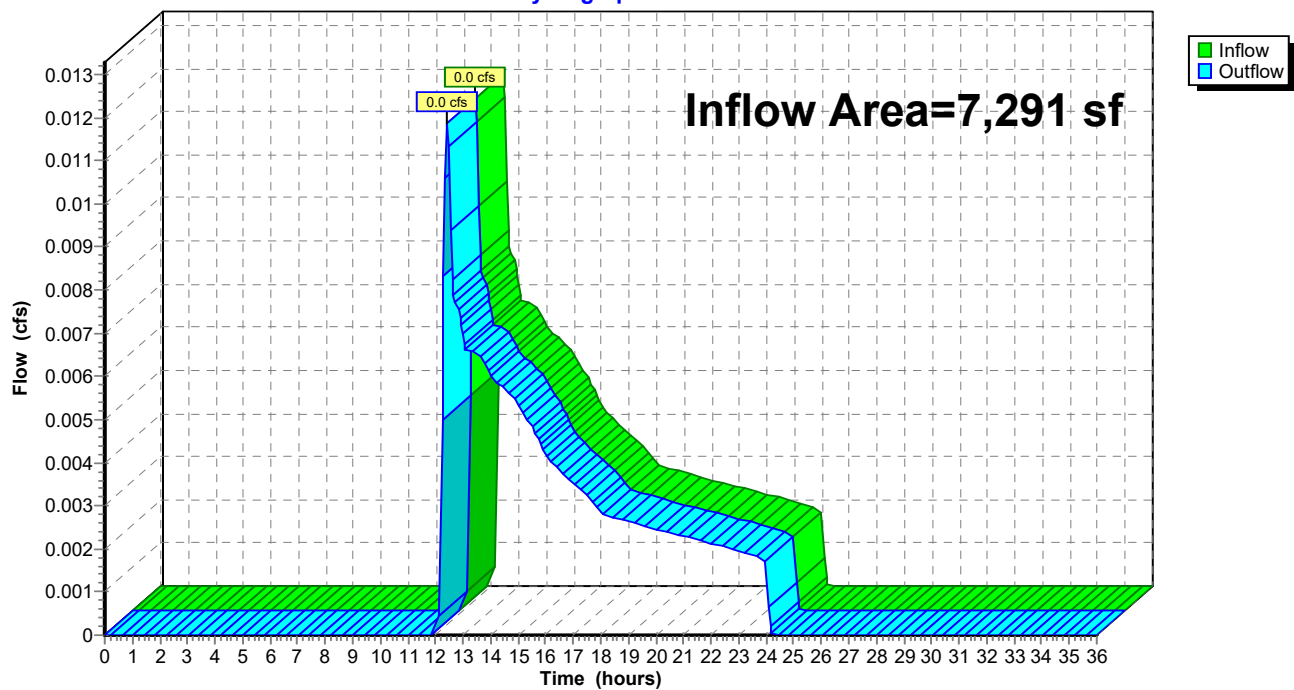


Summary for Reach DP-2:

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

Inflow Area = 7,291 sf, 0.00% Impervious, Inflow Depth = 0.26" for 25-Year event
Inflow = 0.0 cfs @ 12.43 hrs, Volume= 161 cf
Outflow = 0.0 cfs @ 12.43 hrs, Volume= 161 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-2:**Hydrograph**

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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Pond Chambers:

Inflow Area = 5,135 sf, 100.00% Impervious, Inflow Depth = 5.06" for 25-Year event
 Inflow = 0.6 cfs @ 12.09 hrs, Volume= 2,166 cf
 Outflow = 0.2 cfs @ 12.45 hrs, Volume= 2,166 cf, Atten= 75%, Lag= 22.0 min
 Discarded = 0.2 cfs @ 12.45 hrs, Volume= 2,166 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.84' @ 12.45 hrs Surf.Area= 414 sf Storage= 496 cf

Plug-Flow detention time= 19.4 min calculated for 2,163 cf (100% of inflow)
 Center-of-Mass det. time= 19.4 min (766.5 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	395 cf	11.00'W x 37.60'L x 3.50'H Field A 1,448 cf Overall - 459 cf Embedded = 988 cf x 40.0% Voids
#2A	7.50'	459 cf	StormTech SC-740 x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		855 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.2 cfs @ 12.45 hrs HW=8.84' (Free Discharge)
 ↑1=Exfiltration (Controls 0.2 cfs)

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Type III 24-hr 25-Year Rainfall=5.30"

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Pond Chambers: - Chamber Wizard Field A**Chamber Model = StormTech SC-740**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C

5 Chambers/Row x 7.12' Long = 35.60' + 12.0" End Stone x 2 = 37.60' Base Length

2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,447.6 cf Field - 459.4 cf Chambers = 988.2 cf Stone x 40.0% Voids = 395.3 cf Stone Storage

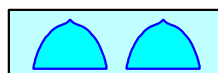
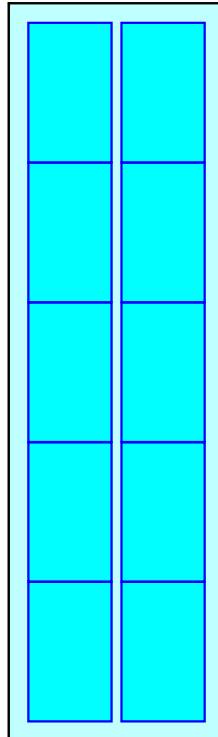
Stone + Chamber Storage = 854.7 cf = 0.020 af

10 Chambers @ \$ 0.00 /ea = \$ 0.00

53.6 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

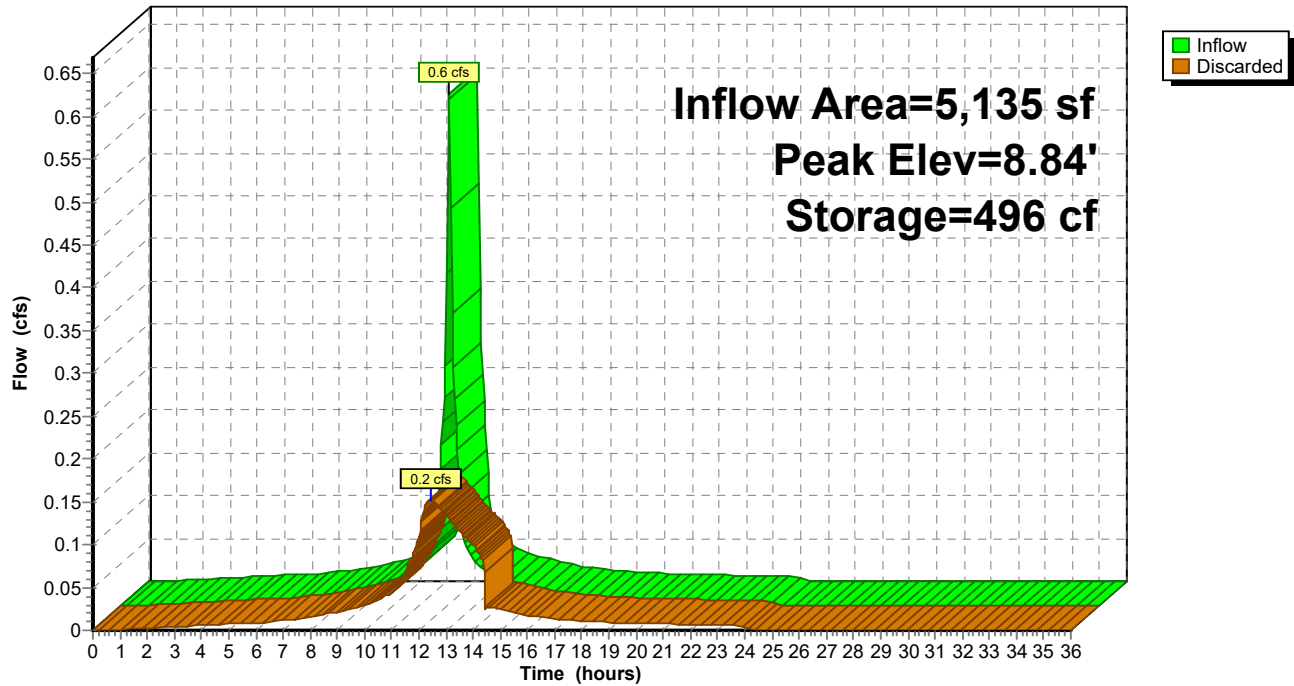
36.6 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Chambers:

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Pond Duplex Trench:

Inflow Area = 1,050 sf, 100.00% Impervious, Inflow Depth = 5.06" for 25-Year event
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 443 cf
 Outflow = 0.0 cfs @ 12.38 hrs, Volume= 443 cf, Atten= 67%, Lag= 17.5 min
 Discarded = 0.0 cfs @ 12.38 hrs, Volume= 443 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.33' @ 12.38 hrs Surf.Area= 125 sf Storage= 79 cf

Plug-Flow detention time= 10.4 min calculated for 442 cf (100% of inflow)
 Center-of-Mass det. time= 10.4 min (757.4 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	93 cf	3.04'W x 41.00'L x 2.21'H Field A 276 cf Overall - 42 cf Embedded = 234 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		126 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.0 cfs @ 12.38 hrs HW=8.33' (Free Discharge)
 ↑ **1=Exfiltration** (Controls 0.0 cfs)

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Type III 24-hr 25-Year Rainfall=5.30"

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Pond Duplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 6.0" End Stone x 2 = 41.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

275.5 cf Field - 41.9 cf Chambers = 233.7 cf Stone x 40.0% Voids = 93.5 cf Stone Storage

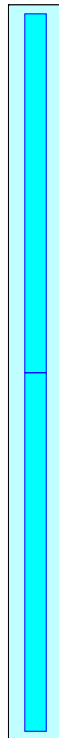
Stone + Chamber Storage = 125.9 cf = 0.003 af

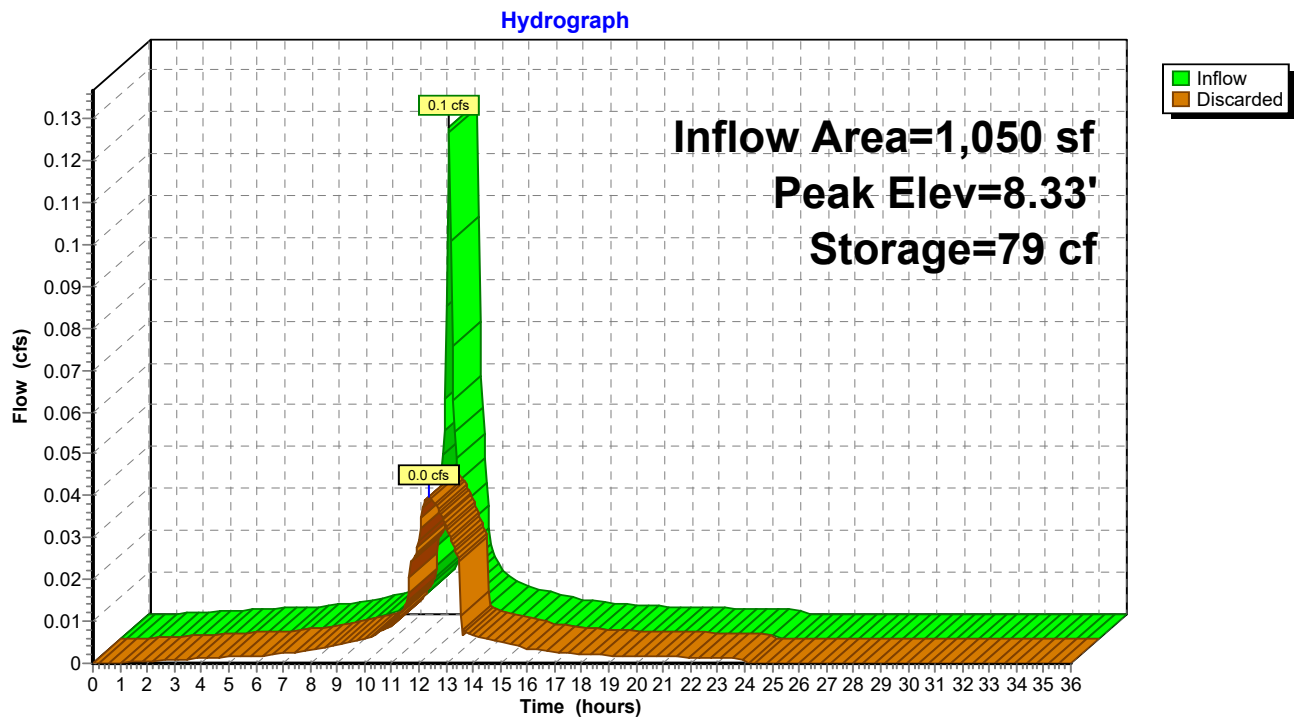
2 Chambers @ \$ 0.00 /ea = \$ 0.00

10.2 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

8.7 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Duplex Trench:

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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 3.95" for 25-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 593 cf
 Outflow = 0.1 cfs @ 12.43 hrs, Volume= 593 cf, Atten= 71%, Lag= 20.3 min
 Discarded = 0.1 cfs @ 12.43 hrs, Volume= 593 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 12.07' @ 12.43 hrs Surf.Area= 122 sf Storage= 140 cf

Plug-Flow detention time= 17.7 min calculated for 592 cf (100% of inflow)
 Center-of-Mass det. time= 17.7 min (813.5 - 795.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	3.04'W x 40.00'L x 3.88'H Field A 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
204 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.1 cfs @ 12.43 hrs HW=12.07' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

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Type III 24-hr 25-Year Rainfall=5.30"

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Pond Infiltration Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

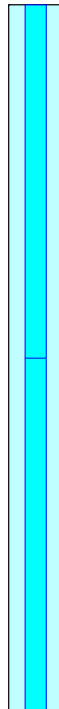
Stone + Chamber Storage = 204.3 cf = 0.005 af

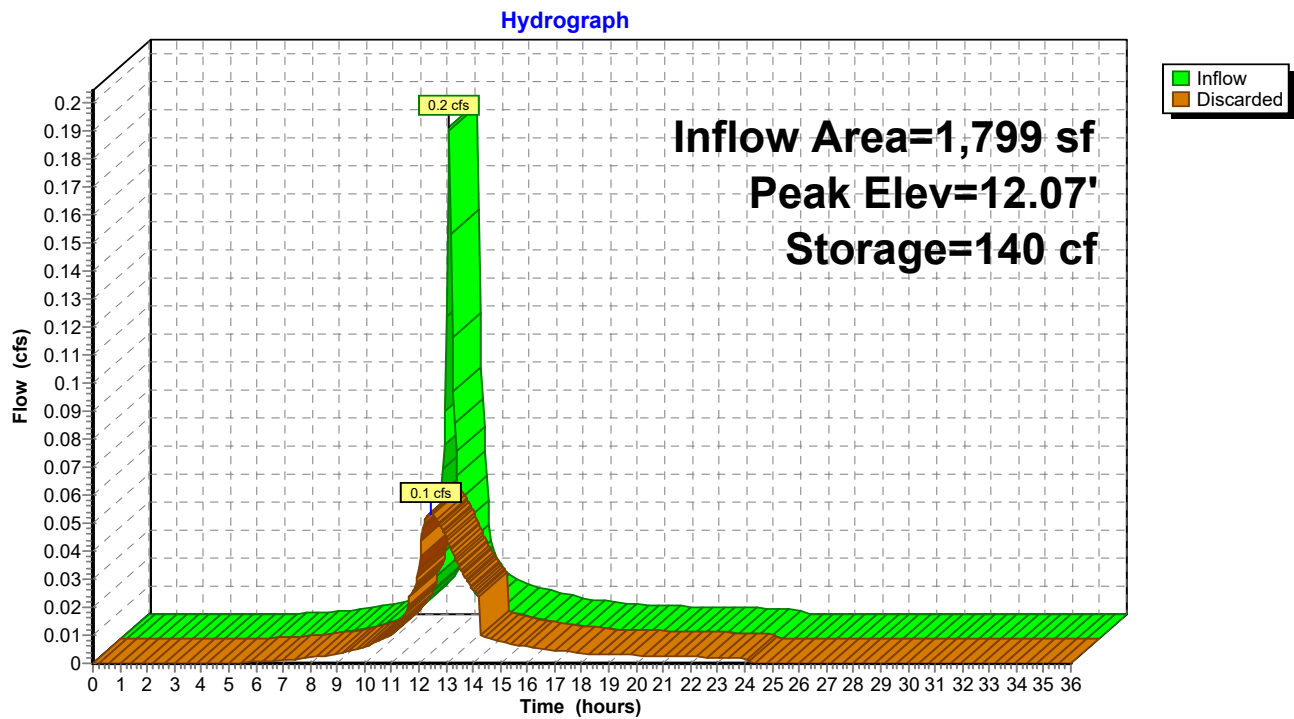
2 Chambers @ \$ 0.00 /ea = \$ 0.00

17.5 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

15.9 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Infiltration Trench:

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Type III 24-hr 25-Year Rainfall=5.30"

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Summary for Pond Triplex Trench:

Inflow Area = 1,560 sf, 100.00% Impervious, Inflow Depth = 5.06" for 25-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 658 cf
 Outflow = 0.1 cfs @ 12.38 hrs, Volume= 658 cf, Atten= 68%, Lag= 17.8 min
 Discarded = 0.1 cfs @ 12.38 hrs, Volume= 658 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.57' @ 12.38 hrs Surf.Area= 170 sf Storage= 123 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 11.5 min (758.5 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	133 cf	4.04'W x 42.00'L x 2.21'H Field A 375 cf Overall - 42 cf Embedded = 333 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.1 cfs @ 12.38 hrs HW=8.57' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

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Type III 24-hr 25-Year Rainfall=5.30"

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Pond Triplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length

1 Rows x 14.5" Wide + 17.0" Side Stone x 2 = 4.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

375.0 cf Field - 41.9 cf Chambers = 333.2 cf Stone x 40.0% Voids = 133.3 cf Stone Storage

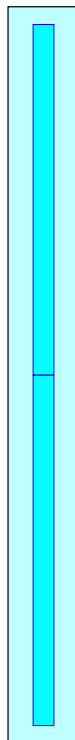
Stone + Chamber Storage = 165.7 cf = 0.004 af

2 Chambers @ \$ 0.00 /ea = \$ 0.00

13.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

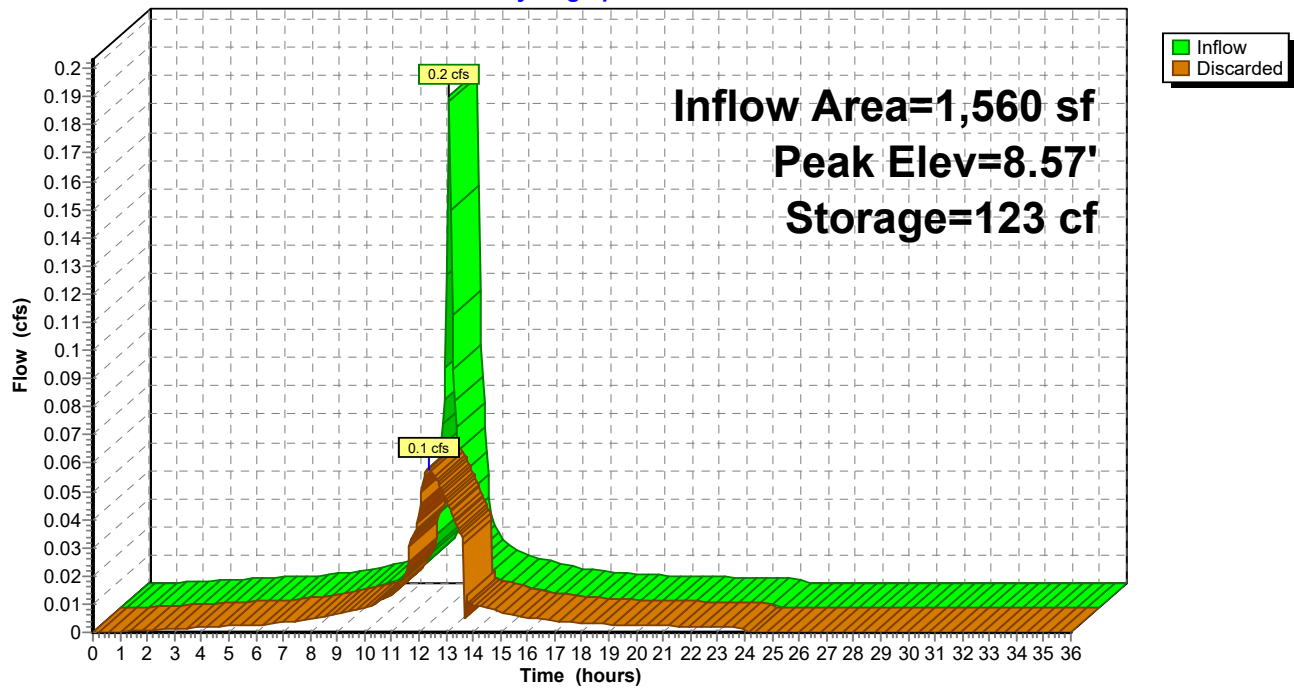
12.3 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Triplex Trench:

Hydrograph



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Type III 24-hr 50-Year Rainfall=5.90"

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDuplex:	Runoff Area=1,050 sf 100.00% Impervious Runoff Depth=5.66" Tc=6.0 min CN=98 Runoff=0.1 cfs 495 cf
SubcatchmentPWA-1:	Runoff Area=4,463 sf 0.00% Impervious Runoff Depth=0.42" Tc=6.0 min CN=39 Runoff=0.0 cfs 155 cf
SubcatchmentPWA-2A:	Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=4.53" Tc=6.0 min CN=88 Runoff=0.2 cfs 679 cf
SubcatchmentPWA-2B:	Runoff Area=1,300 sf 0.00% Impervious Runoff Depth=0.42" Tc=6.0 min CN=39 Runoff=0.0 cfs 45 cf
SubcatchmentPWA-2C:	Runoff Area=3,123 sf 0.00% Impervious Runoff Depth=0.42" Tc=6.0 min CN=39 Runoff=0.0 cfs 109 cf
SubcatchmentPWA-2D:	Runoff Area=2,868 sf 0.00% Impervious Runoff Depth=0.42" Tc=6.0 min CN=39 Runoff=0.0 cfs 100 cf
SubcatchmentPWA-3:	Runoff Area=5,135 sf 100.00% Impervious Runoff Depth=5.66" Tc=6.0 min CN=98 Runoff=0.7 cfs 2,423 cf
SubcatchmentTriplex:	Runoff Area=1,560 sf 100.00% Impervious Runoff Depth=5.66" Tc=6.0 min CN=98 Runoff=0.2 cfs 736 cf
Reach DP-2:	Inflow=0.0 cfs 254 cf Outflow=0.0 cfs 254 cf
Pond Chambers:	Peak Elev=9.13' Storage=577 cf Inflow=0.7 cfs 2,423 cf Outflow=0.2 cfs 2,423 cf
Pond Duplex Trench:	Peak Elev=8.56' Storage=94 cf Inflow=0.1 cfs 495 cf Outflow=0.0 cfs 495 cf
Pond Infiltration Trench:	Peak Elev=12.60' Storage=166 cf Inflow=0.2 cfs 679 cf Outflow=0.1 cfs 679 cf
Pond Triplex Trench:	Peak Elev=8.89' Storage=144 cf Inflow=0.2 cfs 736 cf Outflow=0.1 cfs 736 cf

Total Runoff Area = 21,298 sf Runoff Volume = 4,742 cf Average Runoff Depth = 2.67"
56.62% Pervious = 12,058 sf 43.38% Impervious = 9,240 sf

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Type III 24-hr 50-Year Rainfall=5.90"

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Summary for Subcatchment Duplex:

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 495 cf, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

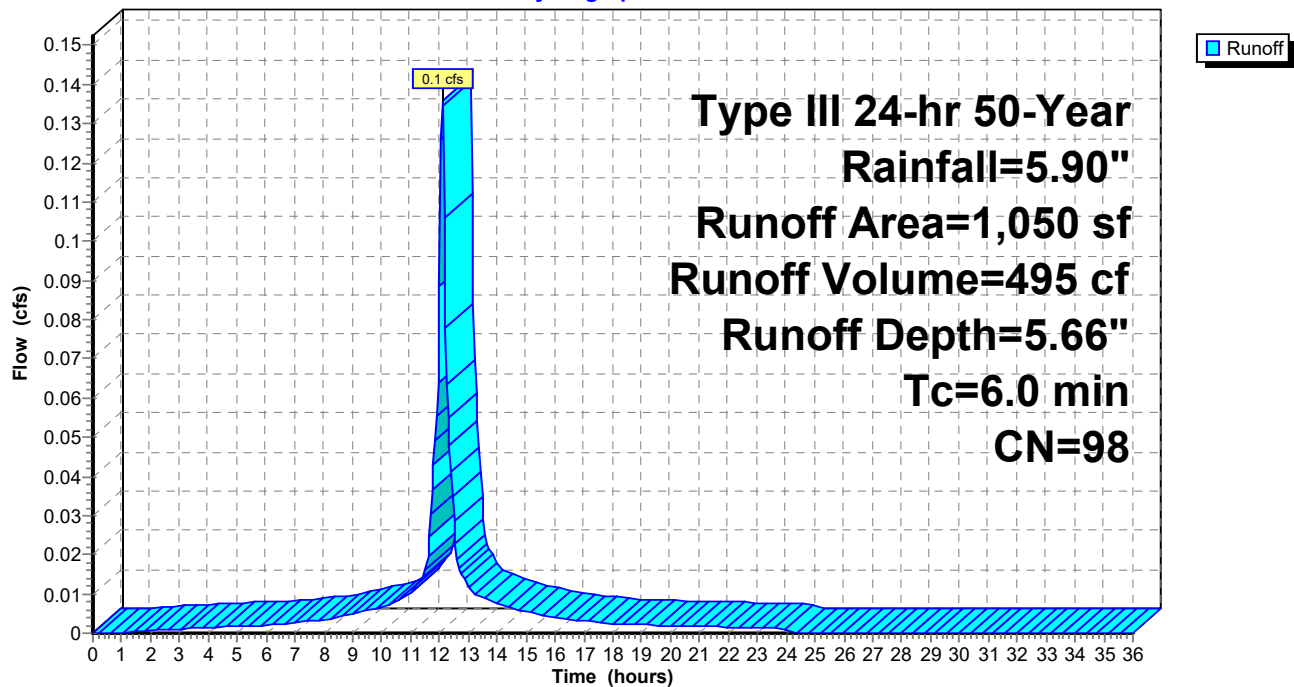
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,050	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,050	98	Weighted Average
1,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Duplex:

Hydrograph



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Type III 24-hr 50-Year Rainfall=5.90"

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Summary for Subcatchment PWA-1:

Runoff = 0.0 cfs @ 12.36 hrs, Volume= 155 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

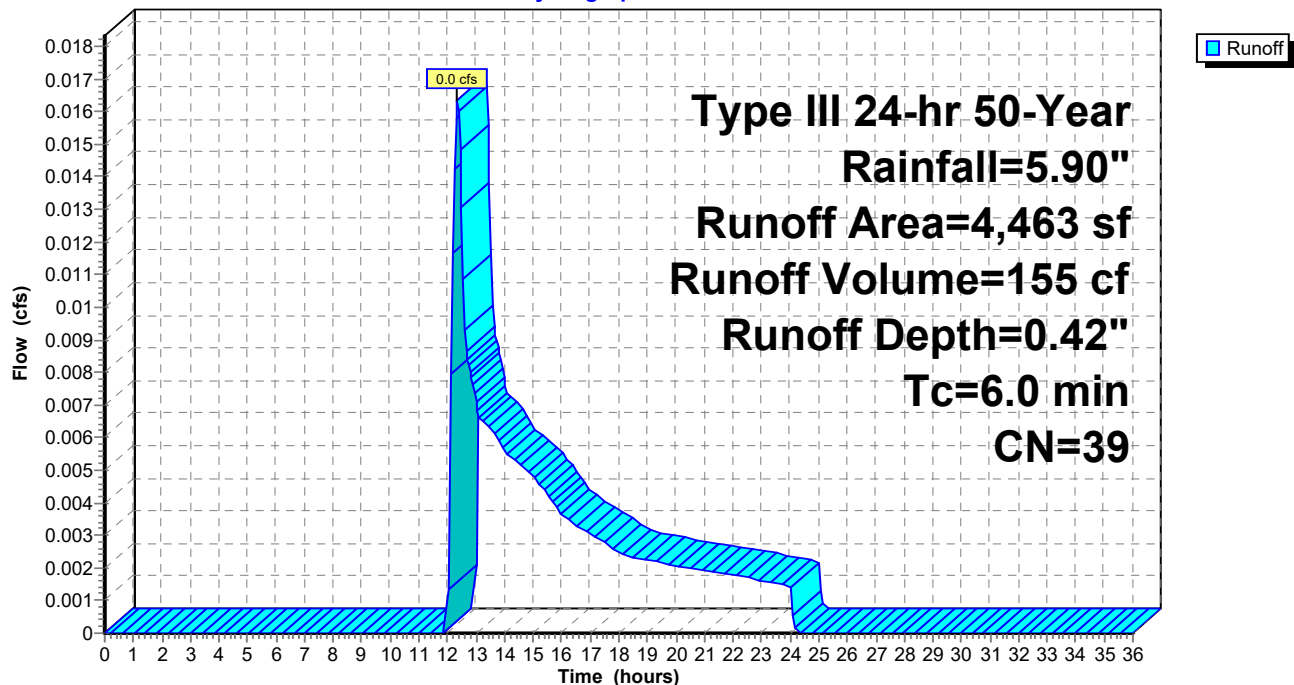
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
4,463	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,463	39	Weighted Average
4,463		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-1:

Hydrograph



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Summary for Subcatchment PWA-2A:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 679 cf, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

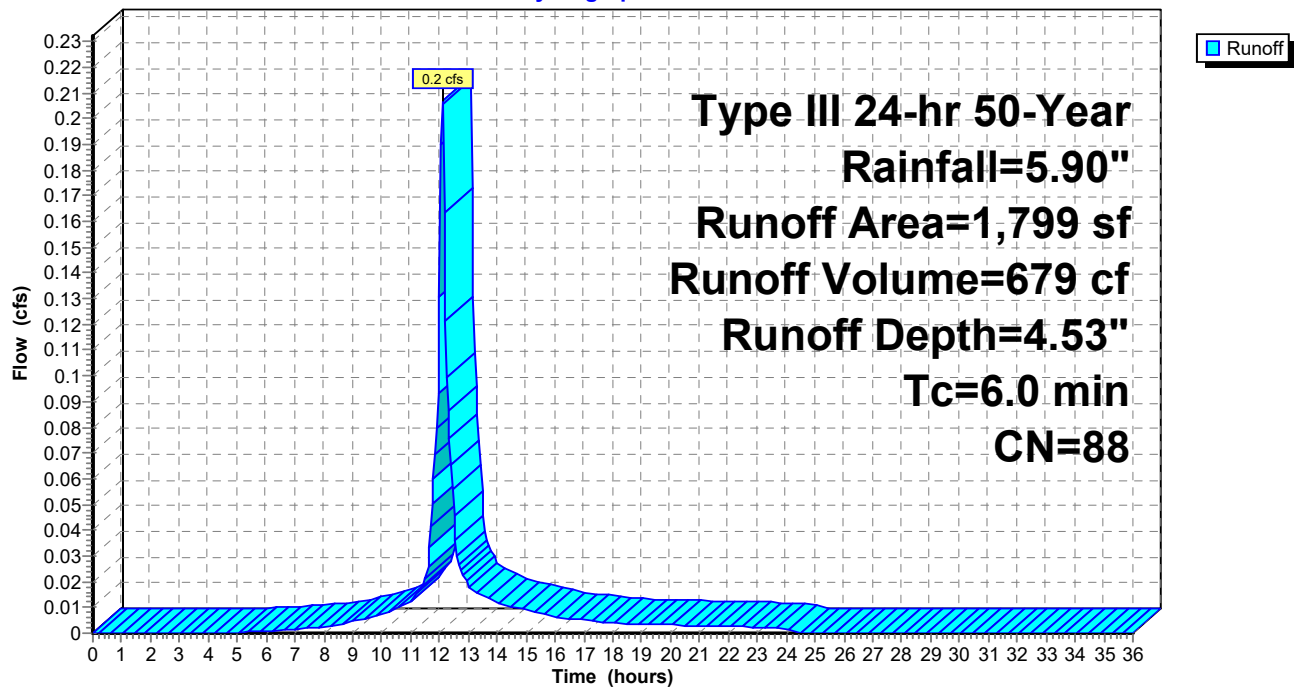
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2A:

Hydrograph



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Summary for Subcatchment PWA-2B:

Runoff = 0.0 cfs @ 12.36 hrs, Volume= 45 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

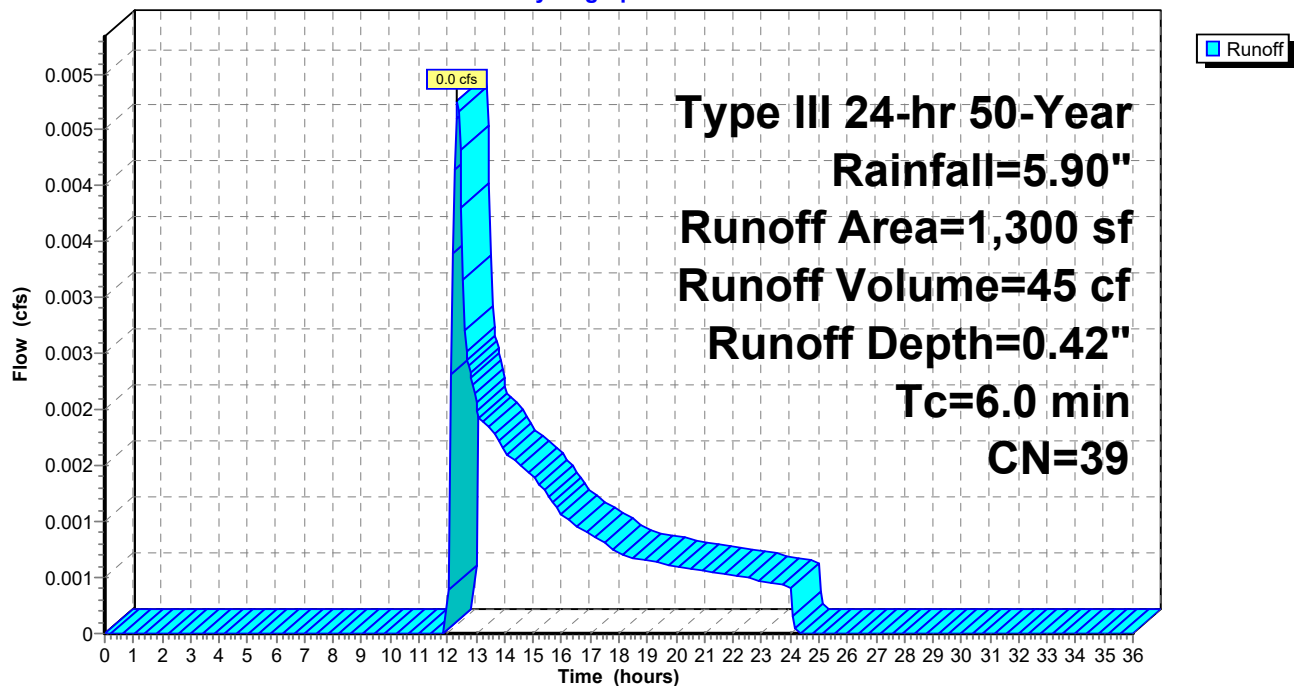
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
1,300	39	>75% Grass cover, Good, HSG A
1,300	39	Weighted Average
1,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2B:

Hydrograph



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Summary for Subcatchment PWA-2C:

Runoff = 0.0 cfs @ 12.36 hrs, Volume= 109 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

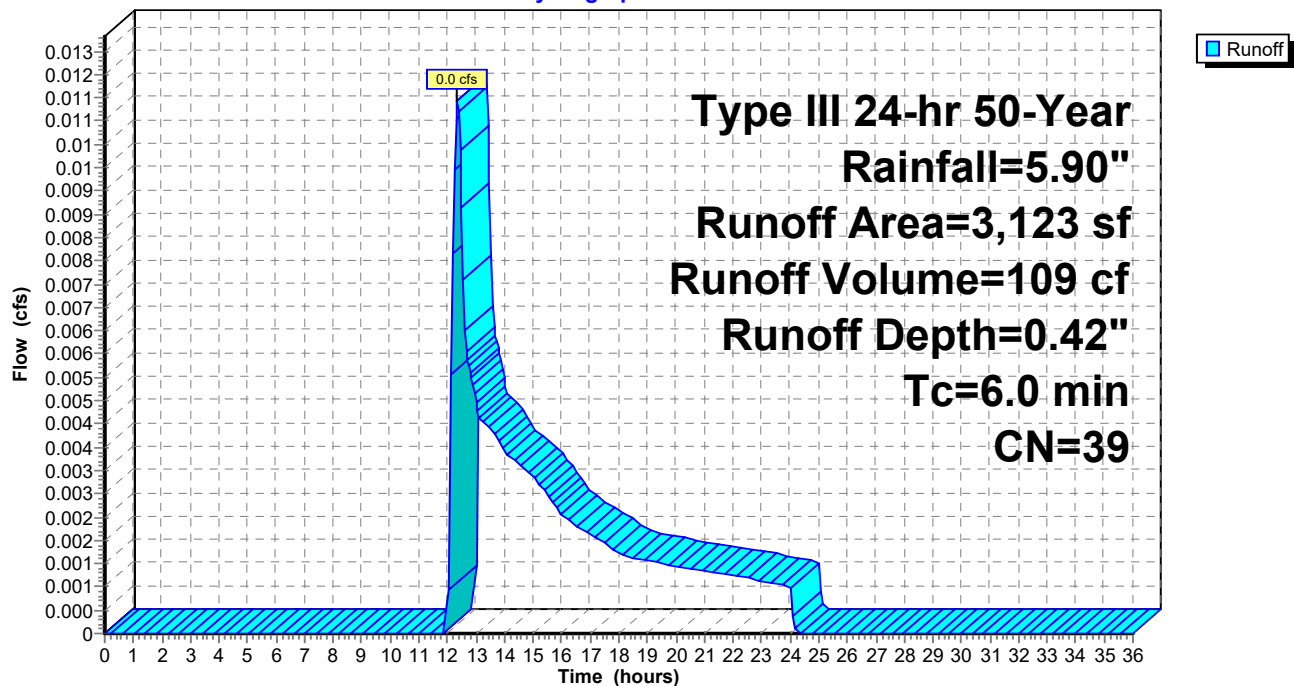
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
3,123	39	>75% Grass cover, Good, HSG A
3,123	39	Weighted Average
3,123		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2C:

Hydrograph



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Summary for Subcatchment PWA-2D:

Runoff = 0.0 cfs @ 12.36 hrs, Volume= 100 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

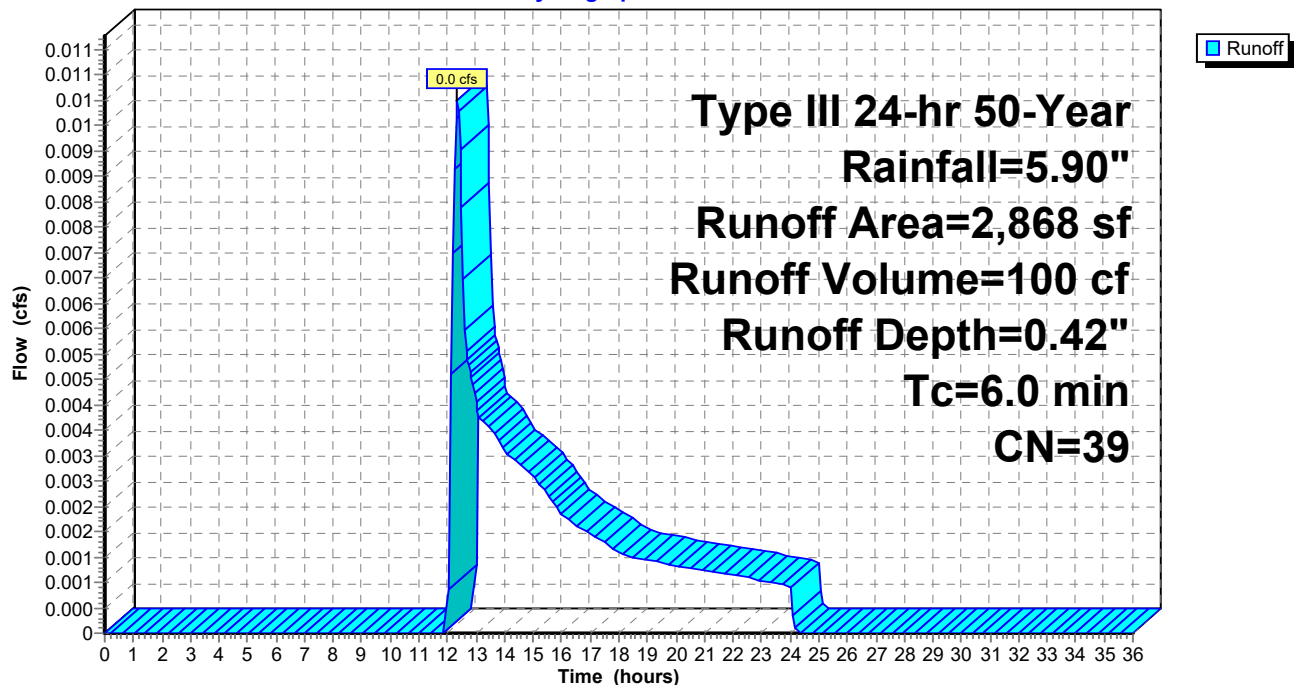
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,868	39	Weighted Average
2,868		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2D:

Hydrograph



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Summary for Subcatchment PWA-3:

Runoff = 0.7 cfs @ 12.09 hrs, Volume= 2,423 cf, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

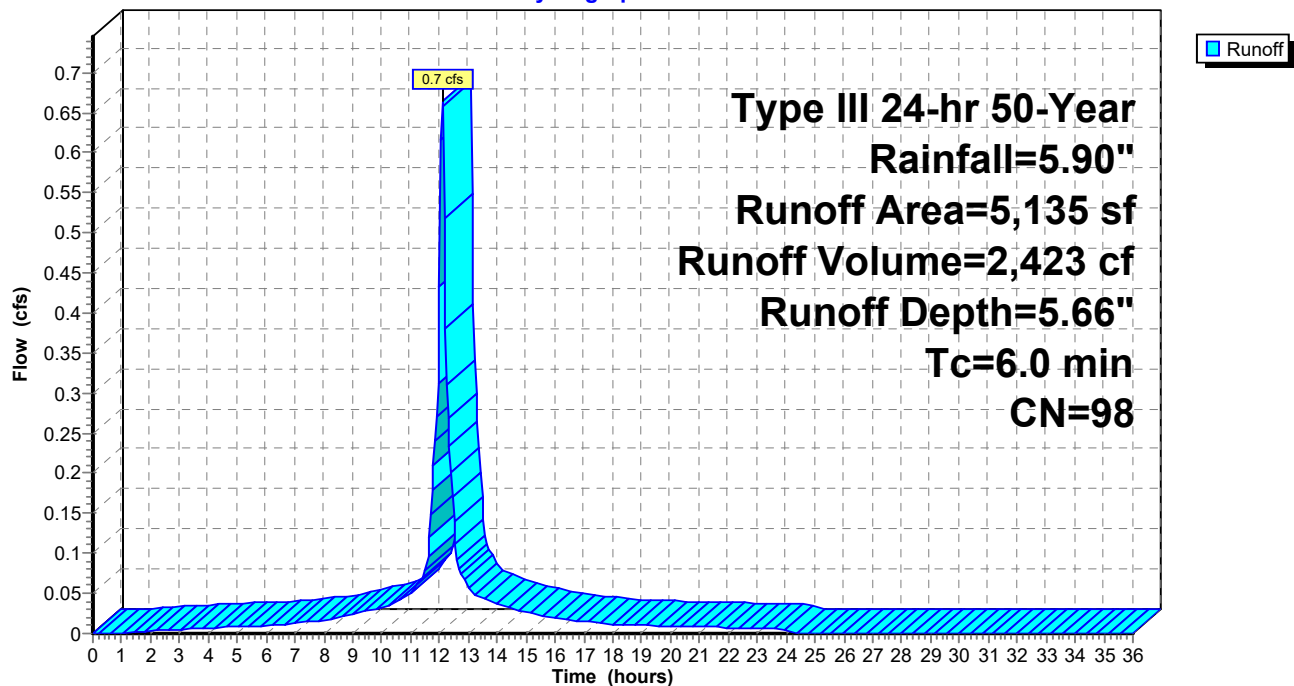
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
0	98	Roofs, HSG A
5,135	98	Paved parking, HSG A
0	39	>75% Grass cover, Good, HSG A
5,135	98	Weighted Average
5,135		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-3:

Hydrograph



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Type III 24-hr 50-Year Rainfall=5.90"

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Summary for Subcatchment Triplex:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 736 cf, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

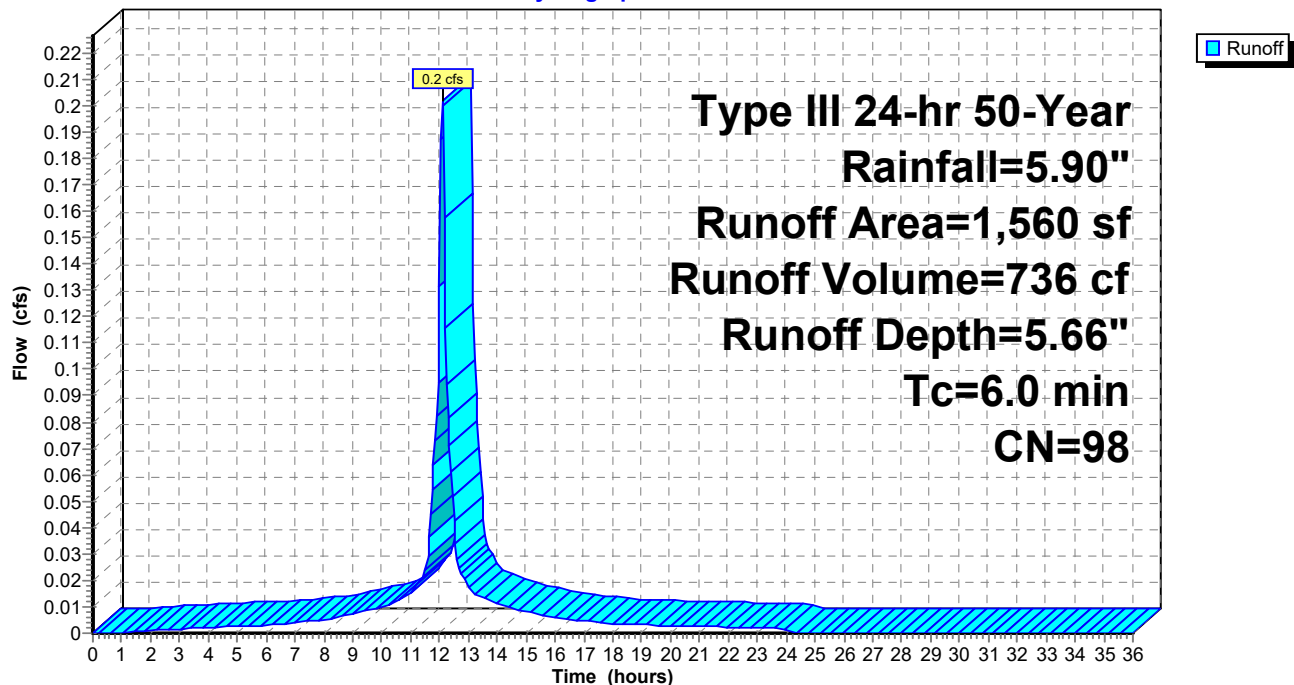
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,560	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,560	98	Weighted Average
1,560		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Triplex:

Hydrograph

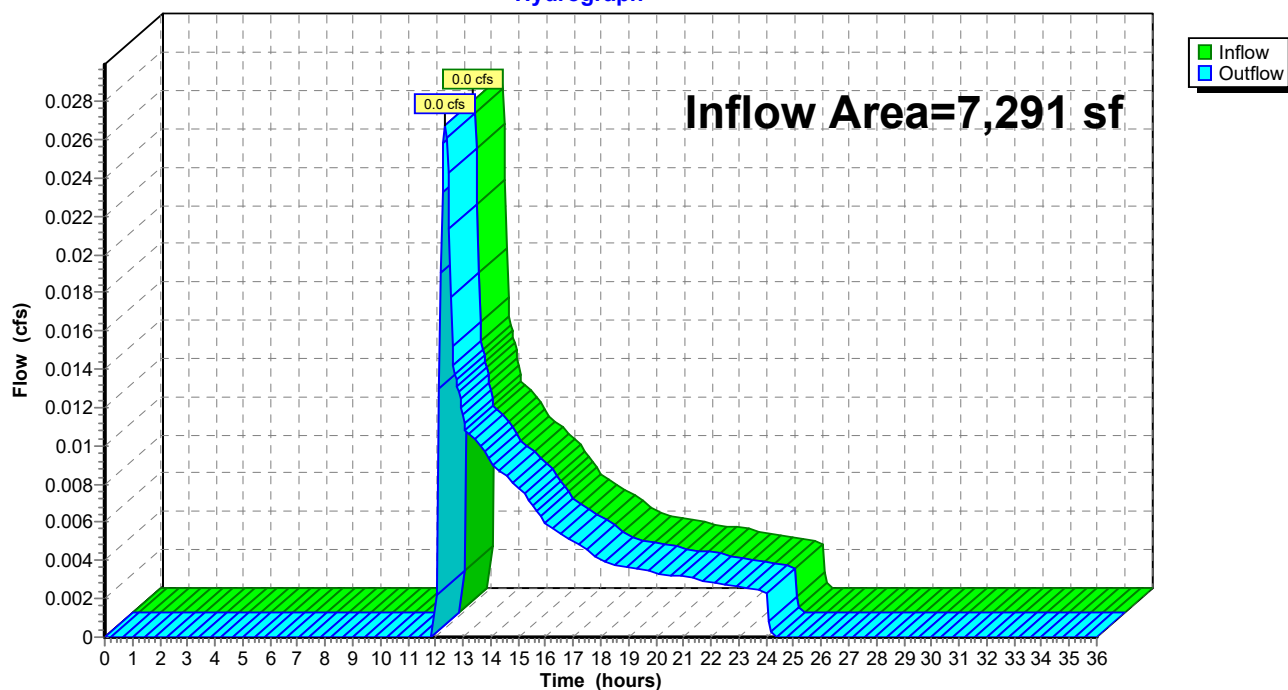


Summary for Reach DP-2:

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

Inflow Area = 7,291 sf, 0.00% Impervious, Inflow Depth = 0.42" for 50-Year event
Inflow = 0.0 cfs @ 12.36 hrs, Volume= 254 cf
Outflow = 0.0 cfs @ 12.36 hrs, Volume= 254 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-2:**Hydrograph**

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Type III 24-hr 50-Year Rainfall=5.90"

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Summary for Pond Chambers:

Inflow Area = 5,135 sf, 100.00% Impervious, Inflow Depth = 5.66" for 50-Year event
 Inflow = 0.7 cfs @ 12.09 hrs, Volume= 2,423 cf
 Outflow = 0.2 cfs @ 12.46 hrs, Volume= 2,423 cf, Atten= 75%, Lag= 22.6 min
 Discarded = 0.2 cfs @ 12.46 hrs, Volume= 2,423 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 9.13' @ 12.46 hrs Surf.Area= 414 sf Storage= 577 cf

Plug-Flow detention time= 21.8 min calculated for 2,419 cf (100% of inflow)
 Center-of-Mass det. time= 21.8 min (767.2 - 745.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	395 cf	11.00'W x 37.60'L x 3.50'H Field A 1,448 cf Overall - 459 cf Embedded = 988 cf x 40.0% Voids
#2A	7.50'	459 cf	StormTech SC-740 x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		855 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.2 cfs @ 12.46 hrs HW=9.13' (Free Discharge)
 ↑1=Exfiltration (Controls 0.2 cfs)

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Type III 24-hr 50-Year Rainfall=5.90"

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Pond Chambers: - Chamber Wizard Field A**Chamber Model = StormTech SC-740**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C

5 Chambers/Row x 7.12' Long = 35.60' + 12.0" End Stone x 2 = 37.60' Base Length

2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,447.6 cf Field - 459.4 cf Chambers = 988.2 cf Stone x 40.0% Voids = 395.3 cf Stone Storage

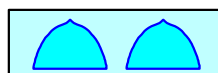
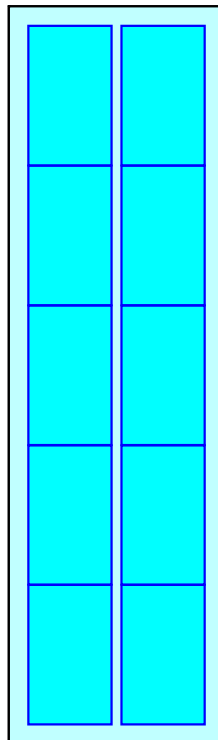
Stone + Chamber Storage = 854.7 cf = 0.020 af

10 Chambers @ \$ 0.00 /ea = \$ 0.00

53.6 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

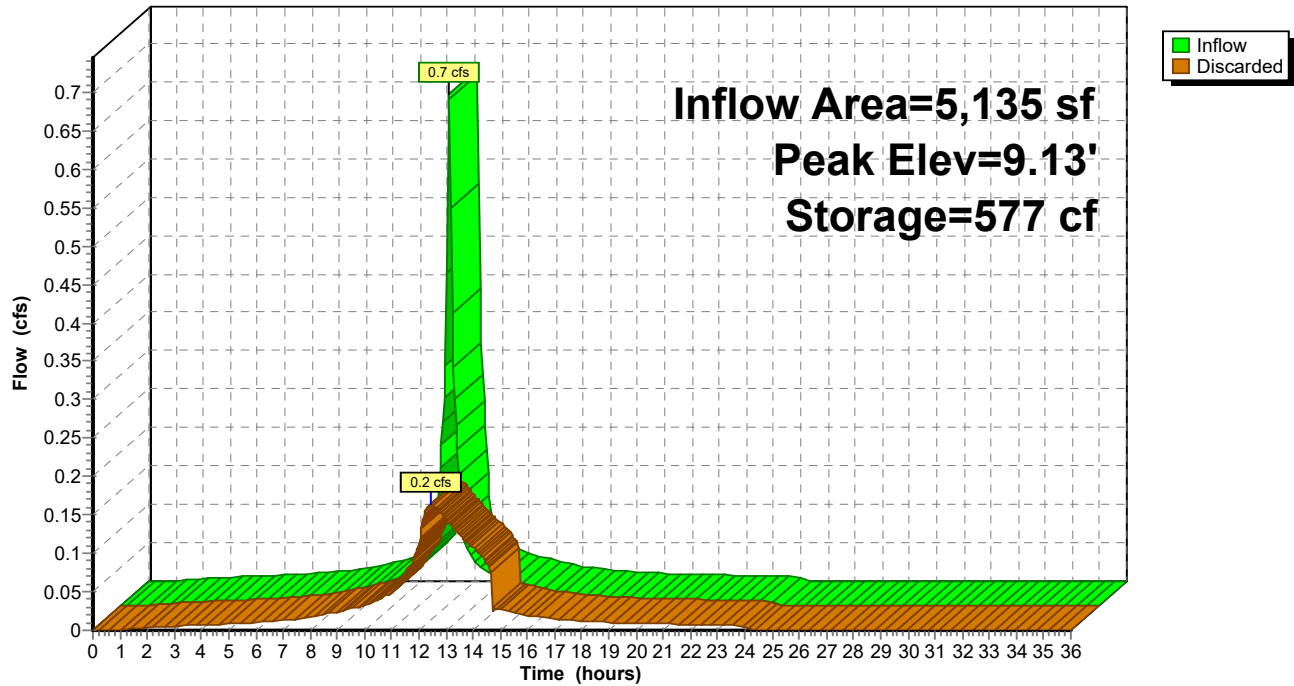
36.6 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Chambers:

Hydrograph



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Type III 24-hr 50-Year Rainfall=5.90"

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Summary for Pond Duplex Trench:

Inflow Area = 1,050 sf, 100.00% Impervious, Inflow Depth = 5.66" for 50-Year event
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 495 cf
 Outflow = 0.0 cfs @ 12.39 hrs, Volume= 495 cf, Atten= 69%, Lag= 18.3 min
 Discarded = 0.0 cfs @ 12.39 hrs, Volume= 495 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.56' @ 12.39 hrs Surf.Area= 125 sf Storage= 94 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 11.9 min (757.3 - 745.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	93 cf	3.04'W x 41.00'L x 2.21'H Field A 276 cf Overall - 42 cf Embedded = 234 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
126 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.0 cfs @ 12.39 hrs HW=8.56' (Free Discharge)
 ↑1=Exfiltration (Controls 0.0 cfs)

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Type III 24-hr 50-Year Rainfall=5.90"

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Pond Duplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 6.0" End Stone x 2 = 41.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

275.5 cf Field - 41.9 cf Chambers = 233.7 cf Stone x 40.0% Voids = 93.5 cf Stone Storage

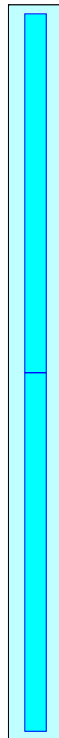
Stone + Chamber Storage = 125.9 cf = 0.003 af

2 Chambers @ \$ 0.00 /ea = \$ 0.00

10.2 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

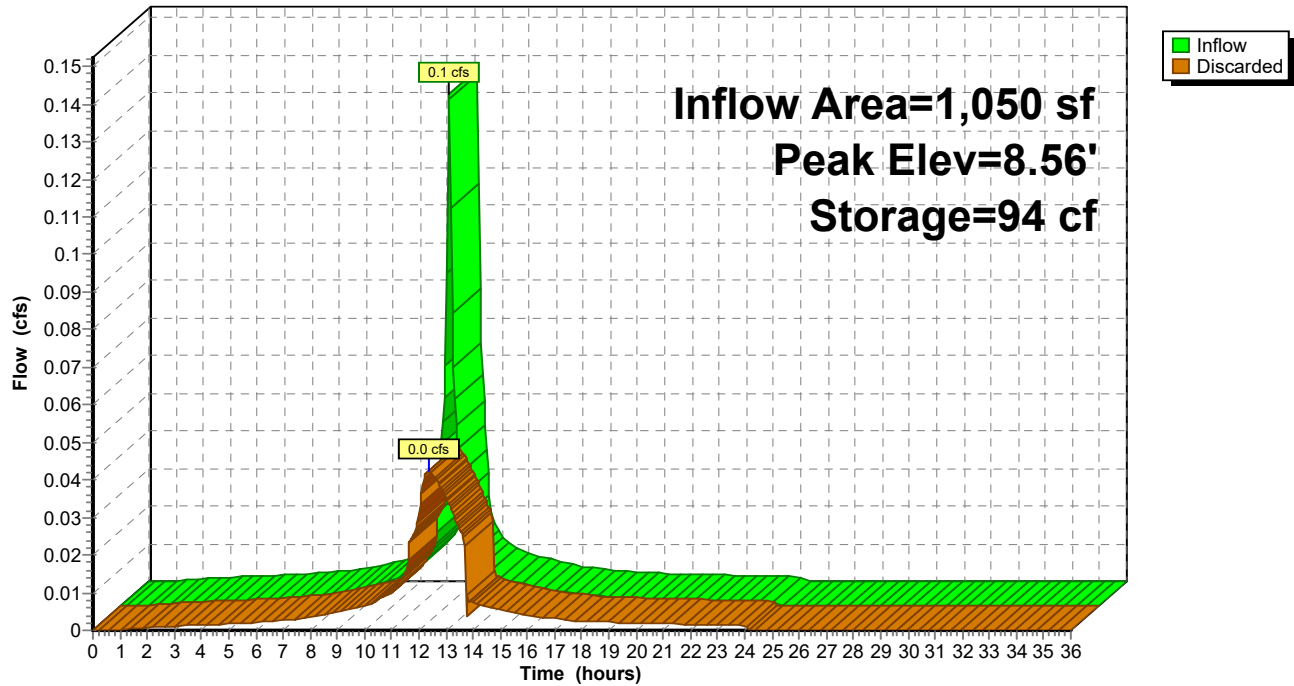
8.7 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Duplex Trench:

Hydrograph



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Type III 24-hr 50-Year Rainfall=5.90"

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Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 4.53" for 50-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 679 cf
 Outflow = 0.1 cfs @ 12.43 hrs, Volume= 679 cf, Atten= 71%, Lag= 20.6 min
 Discarded = 0.1 cfs @ 12.43 hrs, Volume= 679 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 12.60' @ 12.43 hrs Surf.Area= 122 sf Storage= 166 cf

Plug-Flow detention time= 19.9 min calculated for 678 cf (100% of inflow)
 Center-of-Mass det. time= 19.9 min (811.9 - 792.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	3.04'W x 40.00'L x 3.88'H Field A 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		204 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.1 cfs @ 12.43 hrs HW=12.59' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

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Type III 24-hr 50-Year Rainfall=5.90"

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Pond Infiltration Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

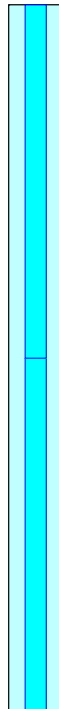
Stone + Chamber Storage = 204.3 cf = 0.005 af

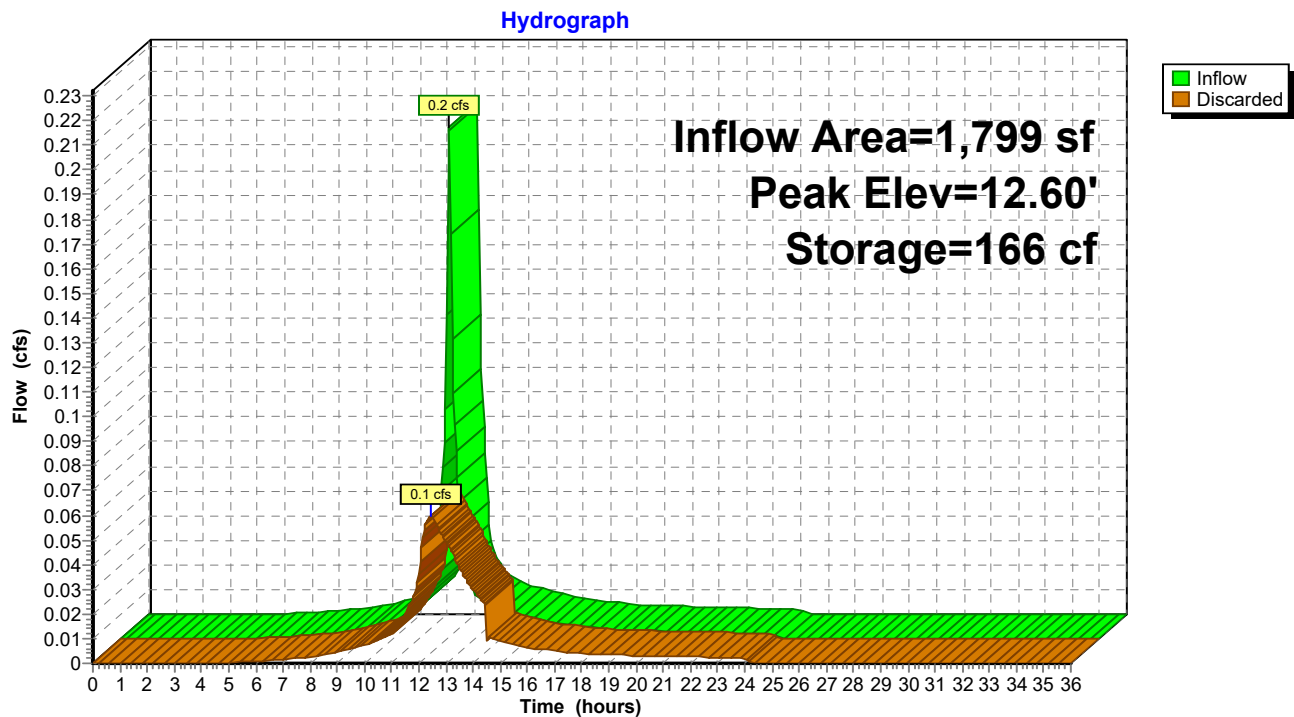
2 Chambers @ \$ 0.00 /ea = \$ 0.00

17.5 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

15.9 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Infiltration Trench:

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Type III 24-hr 50-Year Rainfall=5.90"

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Summary for Pond Triplex Trench:

Inflow Area = 1,560 sf, 100.00% Impervious, Inflow Depth = 5.66" for 50-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 736 cf
 Outflow = 0.1 cfs @ 12.39 hrs, Volume= 736 cf, Atten= 69%, Lag= 18.3 min
 Discarded = 0.1 cfs @ 12.39 hrs, Volume= 736 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.89' @ 12.39 hrs Surf.Area= 170 sf Storage= 144 cf

Plug-Flow detention time= 12.9 min calculated for 735 cf (100% of inflow)
 Center-of-Mass det. time= 12.9 min (758.3 - 745.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	133 cf	4.04'W x 42.00'L x 2.21'H Field A 375 cf Overall - 42 cf Embedded = 333 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.1 cfs @ 12.39 hrs HW=8.89' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

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Type III 24-hr 50-Year Rainfall=5.90"

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Pond Triplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length

1 Rows x 14.5" Wide + 17.0" Side Stone x 2 = 4.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

375.0 cf Field - 41.9 cf Chambers = 333.2 cf Stone x 40.0% Voids = 133.3 cf Stone Storage

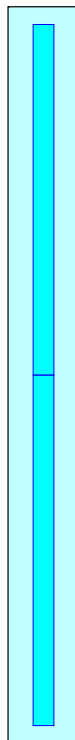
Stone + Chamber Storage = 165.7 cf = 0.004 af

2 Chambers @ \$ 0.00 /ea = \$ 0.00

13.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

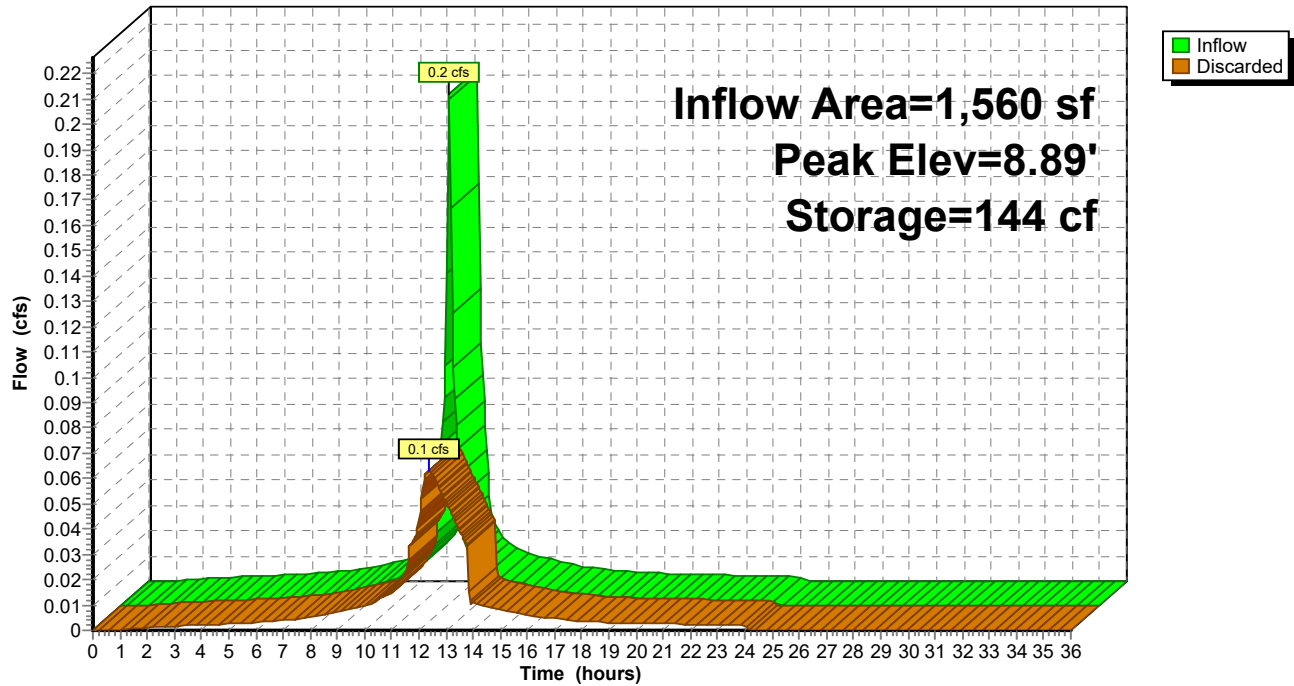
12.3 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Triplex Trench:

Hydrograph



21-10254 - Post-R4*Type III 24-hr 100-Year Rainfall=6.50"*

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Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentDuplex:	Runoff Area=1,050 sf 100.00% Impervious Runoff Depth=6.26" Tc=6.0 min CN=98 Runoff=0.2 cfs 548 cf
SubcatchmentPWA-1:	Runoff Area=4,463 sf 0.00% Impervious Runoff Depth=0.60" Tc=6.0 min CN=39 Runoff=0.0 cfs 222 cf
SubcatchmentPWA-2A:	Runoff Area=1,799 sf 83.10% Impervious Runoff Depth=5.11" Tc=6.0 min CN=88 Runoff=0.2 cfs 766 cf
SubcatchmentPWA-2B:	Runoff Area=1,300 sf 0.00% Impervious Runoff Depth=0.60" Tc=6.0 min CN=39 Runoff=0.0 cfs 65 cf
SubcatchmentPWA-2C:	Runoff Area=3,123 sf 0.00% Impervious Runoff Depth=0.60" Tc=6.0 min CN=39 Runoff=0.0 cfs 156 cf
SubcatchmentPWA-2D:	Runoff Area=2,868 sf 0.00% Impervious Runoff Depth=0.60" Tc=6.0 min CN=39 Runoff=0.0 cfs 143 cf
SubcatchmentPWA-3:	Runoff Area=5,135 sf 100.00% Impervious Runoff Depth=6.26" Tc=6.0 min CN=98 Runoff=0.7 cfs 2,679 cf
SubcatchmentTriplex:	Runoff Area=1,560 sf 100.00% Impervious Runoff Depth=6.26" Tc=6.0 min CN=98 Runoff=0.2 cfs 814 cf
Reach DP-2:	Inflow=0.0 cfs 363 cf Outflow=0.0 cfs 363 cf
Pond Chambers:	Peak Elev=9.45' Storage=659 cf Inflow=0.7 cfs 2,679 cf Outflow=0.2 cfs 2,679 cf
Pond Duplex Trench:	Peak Elev=8.86' Storage=108 cf Inflow=0.2 cfs 548 cf Outflow=0.0 cfs 548 cf
Pond Infiltration Trench:	Peak Elev=13.14' Storage=193 cf Inflow=0.2 cfs 766 cf Outflow=0.1 cfs 766 cf
Pond Triplex Trench:	Peak Elev=9.21' Storage=166 cf Inflow=0.2 cfs 814 cf Outflow=0.1 cfs 814 cf

Total Runoff Area = 21,298 sf Runoff Volume = 5,393 cf Average Runoff Depth = 3.04"
56.62% Pervious = 12,058 sf 43.38% Impervious = 9,240 sf

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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment Duplex:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 548 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

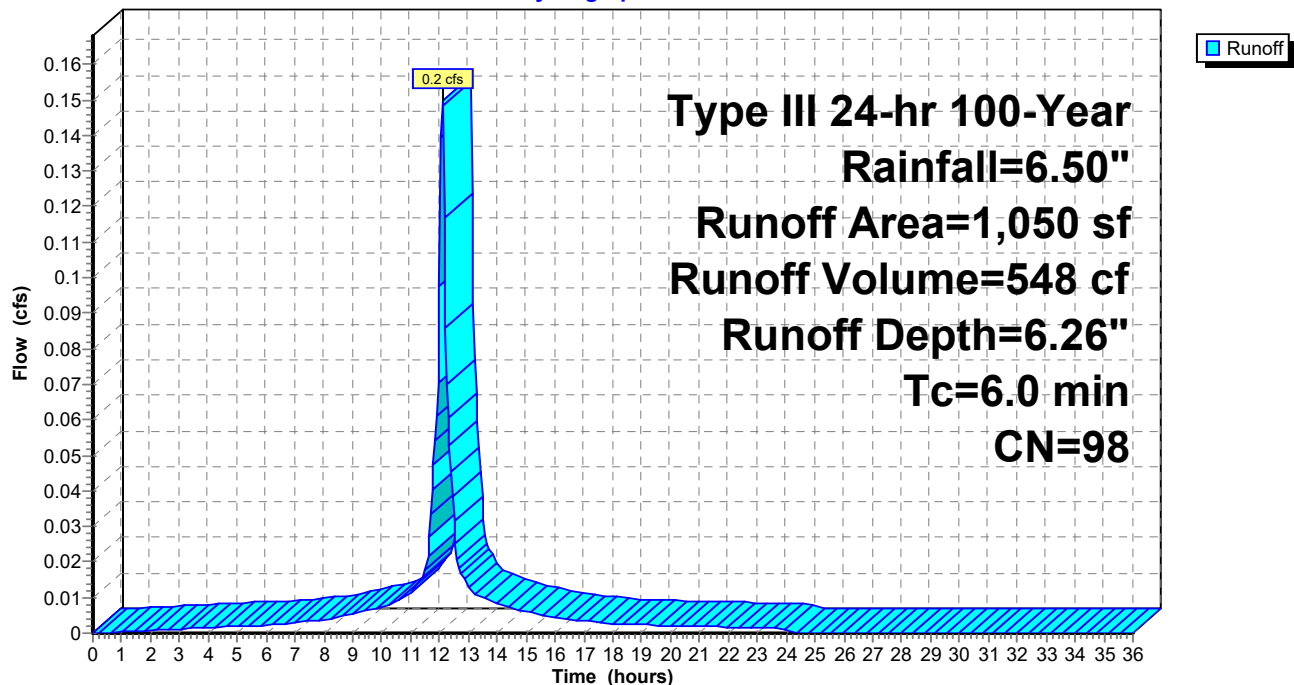
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,050	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,050	98	Weighted Average
1,050		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Duplex:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-1:

Runoff = 0.0 cfs @ 12.29 hrs, Volume= 222 cf, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

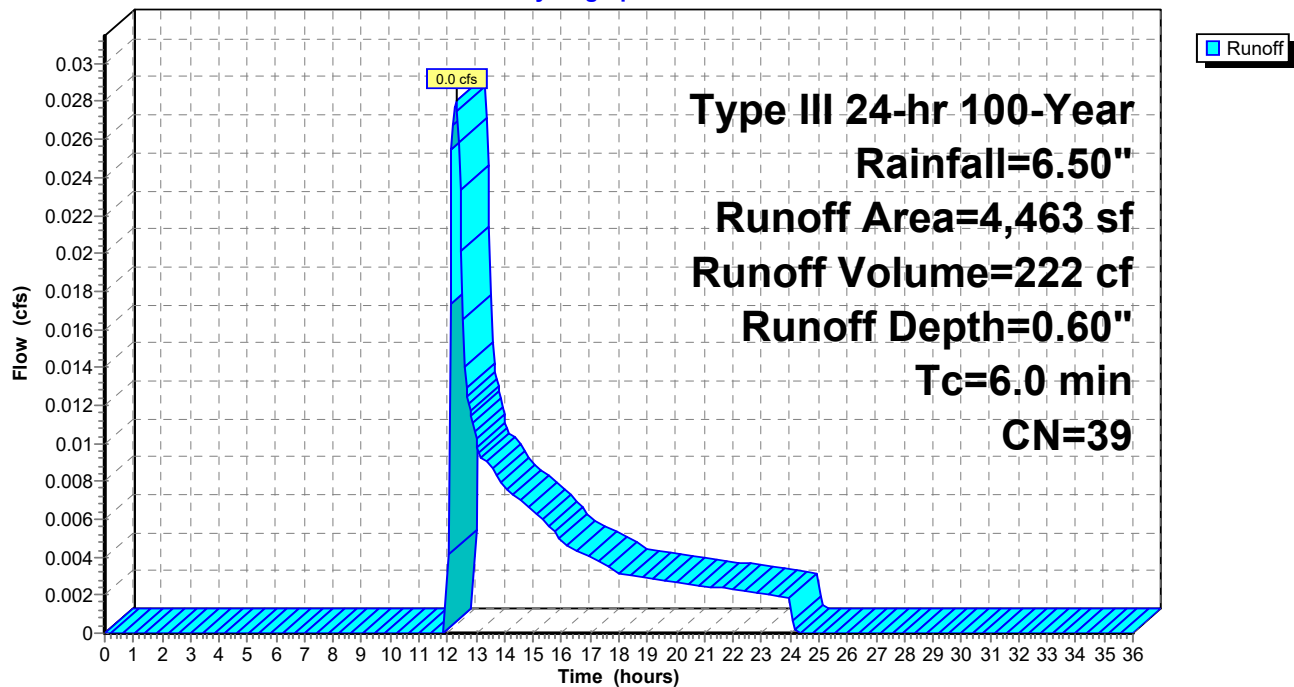
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
4,463	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
4,463	39	Weighted Average
4,463		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-1:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-2A:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 766 cf, Depth= 5.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

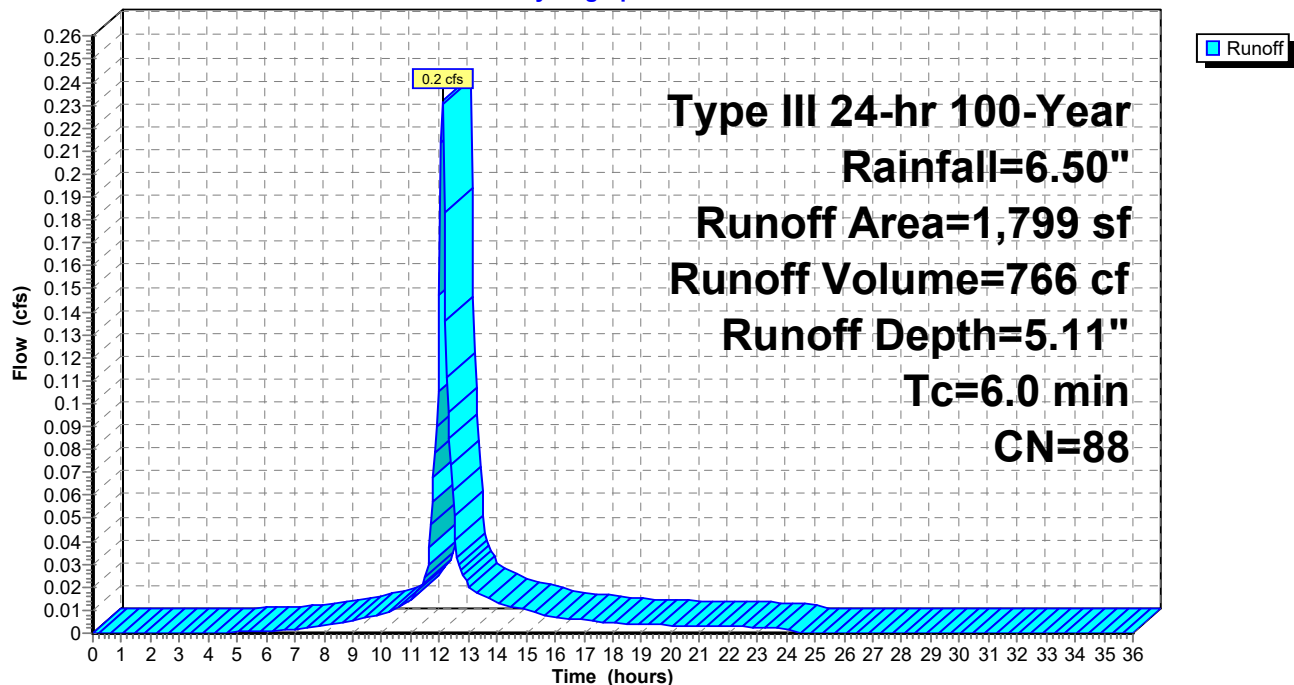
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
828	98	Roofs, HSG A
667	98	Paved parking, HSG A
304	39	>75% Grass cover, Good, HSG A
1,799	88	Weighted Average
304		16.90% Pervious Area
1,495		83.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2A:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-2B:

Runoff = 0.0 cfs @ 12.29 hrs, Volume= 65 cf, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

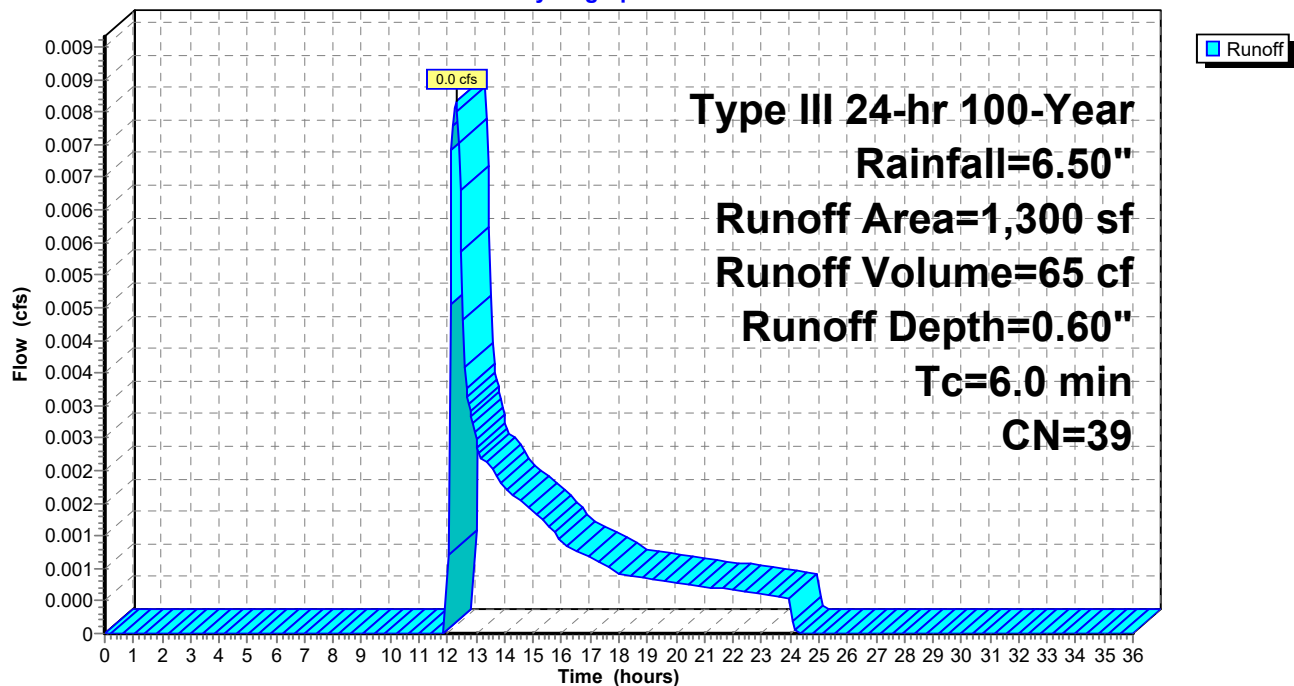
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
1,300	39	>75% Grass cover, Good, HSG A
1,300	39	Weighted Average
1,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2B:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-2C:

Runoff = 0.0 cfs @ 12.29 hrs, Volume= 156 cf, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

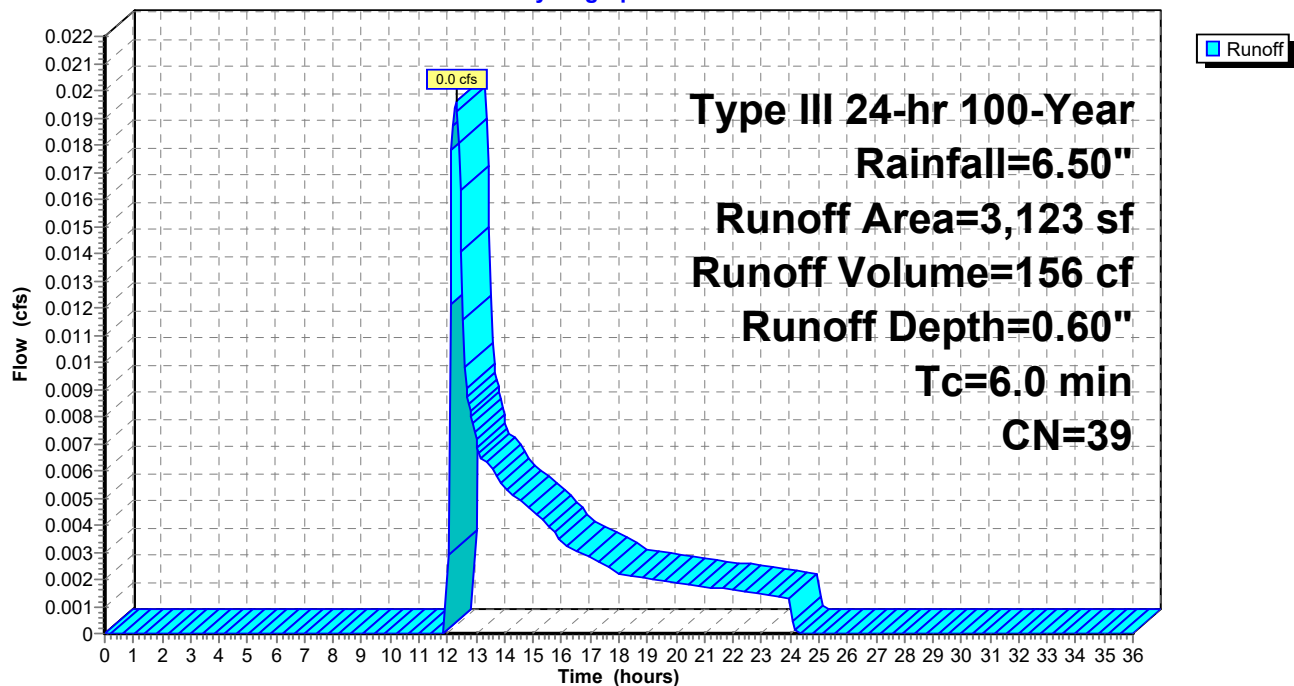
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
3,123	39	>75% Grass cover, Good, HSG A
3,123	39	Weighted Average
3,123		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2C:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-2D:

Runoff = 0.0 cfs @ 12.29 hrs, Volume= 143 cf, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

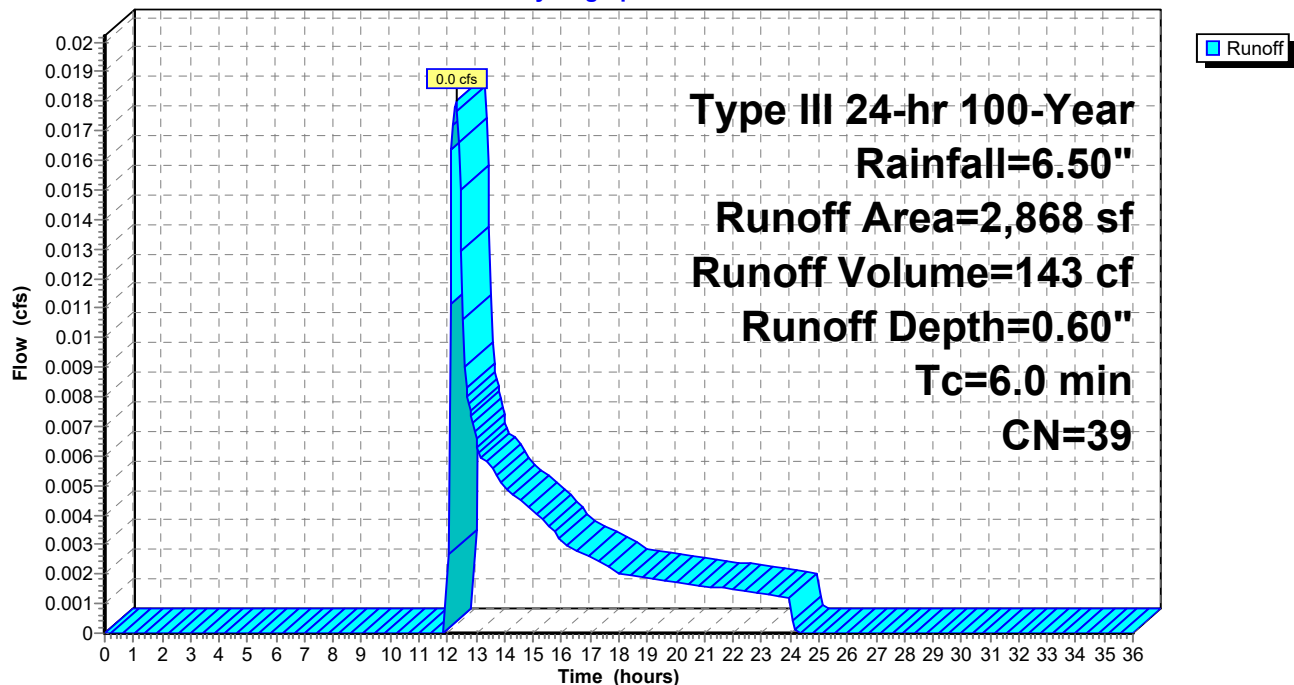
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
2,868	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,868	39	Weighted Average
2,868		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-2D:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment PWA-3:

Runoff = 0.7 cfs @ 12.09 hrs, Volume= 2,679 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

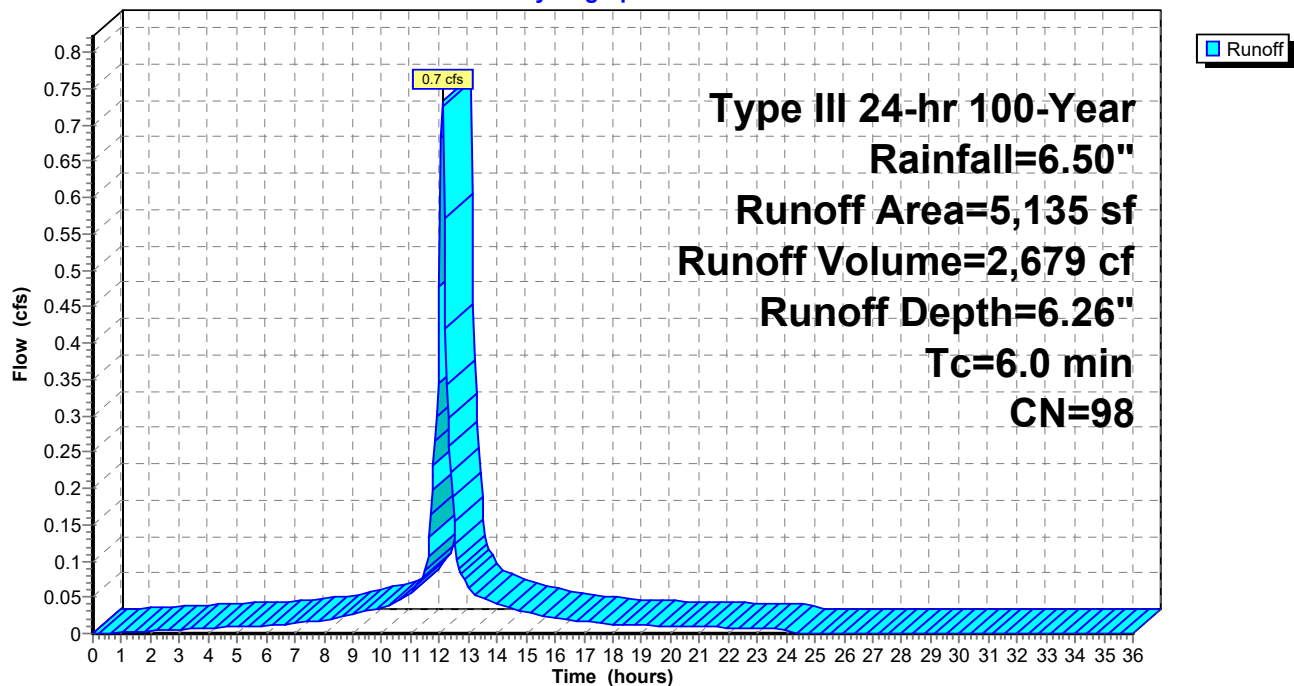
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
0	98	Roofs, HSG A
5,135	98	Paved parking, HSG A
0	39	>75% Grass cover, Good, HSG A
5,135	98	Weighted Average
5,135		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment PWA-3:

Hydrograph



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Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Subcatchment Triplex:

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 814 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

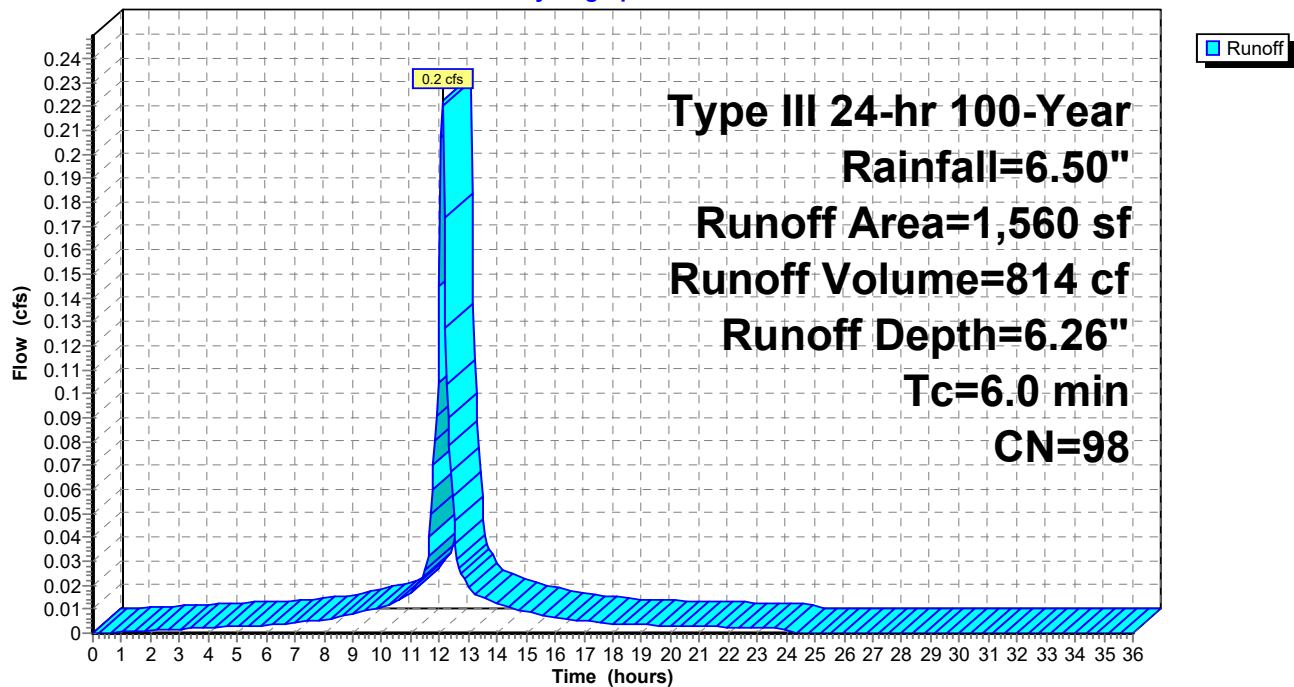
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
1,560	98	Roofs, HSG A
0	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
1,560	98	Weighted Average
1,560		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

Subcatchment Triplex:

Hydrograph



Summary for Reach DP-2:

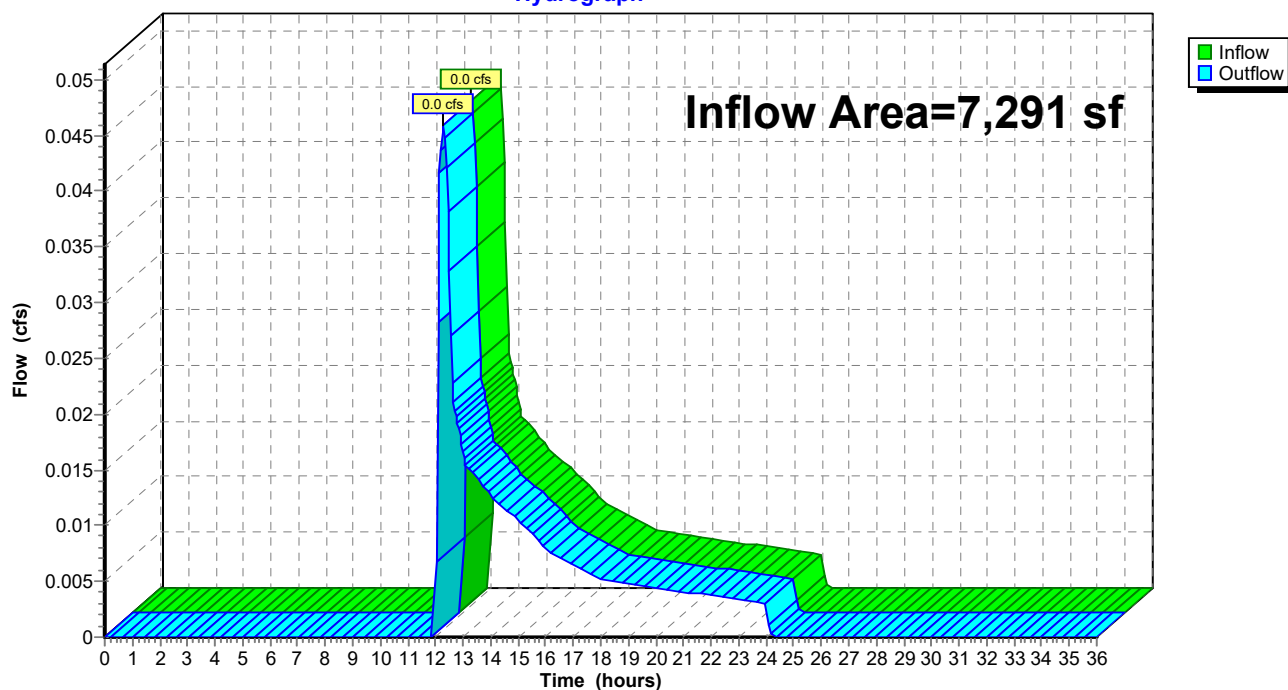
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 7,291 sf, 0.00% Impervious, Inflow Depth = 0.60" for 100-Year event
Inflow = 0.0 cfs @ 12.29 hrs, Volume= 363 cf
Outflow = 0.0 cfs @ 12.29 hrs, Volume= 363 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach DP-2:

Hydrograph



21-10254 - Post-R4

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond Chambers:

Inflow Area = 5,135 sf, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event
 Inflow = 0.7 cfs @ 12.09 hrs, Volume= 2,679 cf
 Outflow = 0.2 cfs @ 12.47 hrs, Volume= 2,679 cf, Atten= 76%, Lag= 23.0 min
 Discarded = 0.2 cfs @ 12.47 hrs, Volume= 2,679 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 9.45' @ 12.47 hrs Surf.Area= 414 sf Storage= 659 cf

Plug-Flow detention time= 24.0 min calculated for 2,676 cf (100% of inflow)
 Center-of-Mass det. time= 24.0 min (767.9 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	395 cf	11.00'W x 37.60'L x 3.50'H Field A 1,448 cf Overall - 459 cf Embedded = 988 cf x 40.0% Voids
#2A	7.50'	459 cf	StormTech SC-740 x 10 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
		855 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.2 cfs @ 12.47 hrs HW=9.44' (Free Discharge)
 ↑1=Exfiltration (Controls 0.2 cfs)

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Type III 24-hr 100-Year Rainfall=6.50"

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Pond Chambers: - Chamber Wizard Field A**Chamber Model = StormTech SC-740**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C

5 Chambers/Row x 7.12' Long = 35.60' + 12.0" End Stone x 2 = 37.60' Base Length

2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

10 Chambers x 45.9 cf = 459.4 cf Chamber Storage

1,447.6 cf Field - 459.4 cf Chambers = 988.2 cf Stone x 40.0% Voids = 395.3 cf Stone Storage

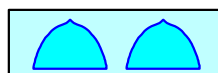
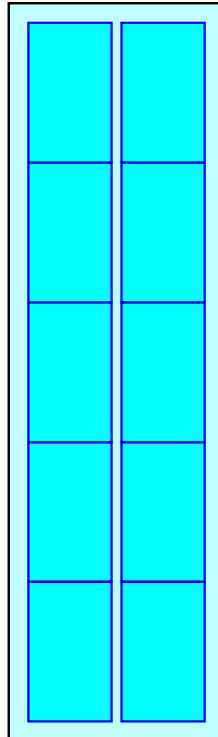
Stone + Chamber Storage = 854.7 cf = 0.020 af

10 Chambers @ \$ 0.00 /ea = \$ 0.00

53.6 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

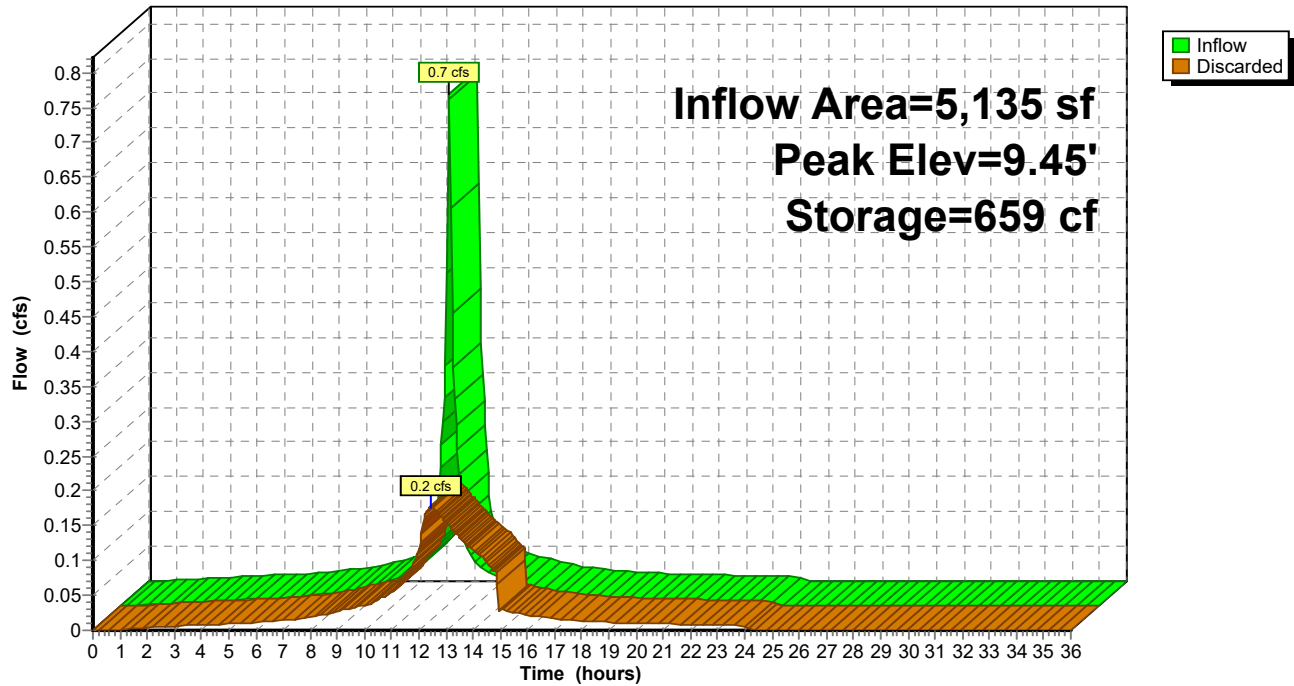
36.6 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Chambers:

Hydrograph



21-10254 - Post-R4

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond Duplex Trench:

Inflow Area = 1,050 sf, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 548 cf
 Outflow = 0.0 cfs @ 12.40 hrs, Volume= 548 cf, Atten= 69%, Lag= 18.6 min
 Discarded = 0.0 cfs @ 12.40 hrs, Volume= 548 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.86' @ 12.40 hrs Surf.Area= 125 sf Storage= 108 cf

Plug-Flow detention time= 13.3 min calculated for 547 cf (100% of inflow)
 Center-of-Mass det. time= 13.3 min (757.3 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	93 cf	3.04'W x 41.00'L x 2.21'H Field A 276 cf Overall - 42 cf Embedded = 234 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
126 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.0 cfs @ 12.40 hrs HW=8.86' (Free Discharge)
 ↑1=Exfiltration (Controls 0.0 cfs)

21-10254 - Post-R4

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Type III 24-hr 100-Year Rainfall=6.50"

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Pond Duplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 6.0" End Stone x 2 = 41.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

275.5 cf Field - 41.9 cf Chambers = 233.7 cf Stone x 40.0% Voids = 93.5 cf Stone Storage

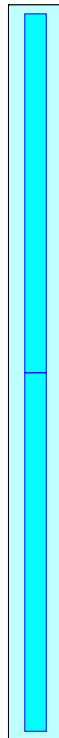
Stone + Chamber Storage = 125.9 cf = 0.003 af

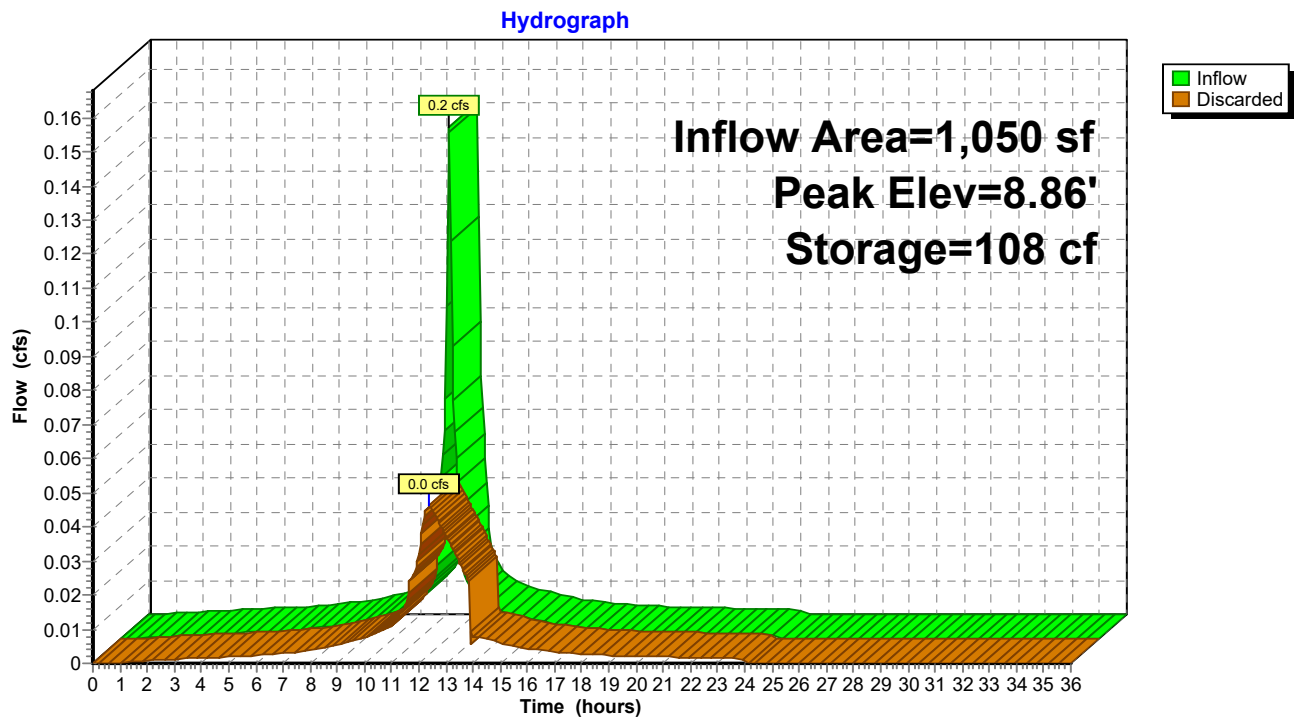
2 Chambers @ \$ 0.00 /ea = \$ 0.00

10.2 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

8.7 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Duplex Trench:

21-10254 - Post-R4

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond Infiltration Trench:

Inflow Area = 1,799 sf, 83.10% Impervious, Inflow Depth = 5.11" for 100-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 766 cf
 Outflow = 0.1 cfs @ 12.43 hrs, Volume= 766 cf, Atten= 72%, Lag= 20.7 min
 Discarded = 0.1 cfs @ 12.43 hrs, Volume= 766 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 13.14' @ 12.43 hrs Surf.Area= 122 sf Storage= 193 cf

Plug-Flow detention time= 21.7 min calculated for 765 cf (100% of inflow)
 Center-of-Mass det. time= 21.6 min (810.4 - 788.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.50'	172 cf	3.04'W x 40.00'L x 3.88'H Field A 472 cf Overall - 42 cf Embedded = 430 cf x 40.0% Voids
#2A	11.17'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
204 cf			Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 7.50'

Discarded OutFlow Max=0.1 cfs @ 12.43 hrs HW=13.14' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

21-10254 - Post-R4*Type III 24-hr 100-Year Rainfall=6.50"*

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Pond Infiltration Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 0.0" Spacing = 14.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' Base Length

1 Rows x 14.5" Wide + 11.0" Side Stone x 2 = 3.04' Base Width

20.0" Base + 14.5" Chamber Height + 12.0" Cover = 3.88' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

471.6 cf Field - 41.9 cf Chambers = 429.8 cf Stone x 40.0% Voids = 171.9 cf Stone Storage

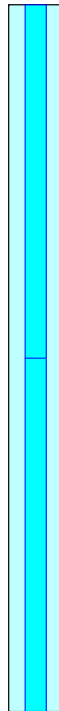
Stone + Chamber Storage = 204.3 cf = 0.005 af

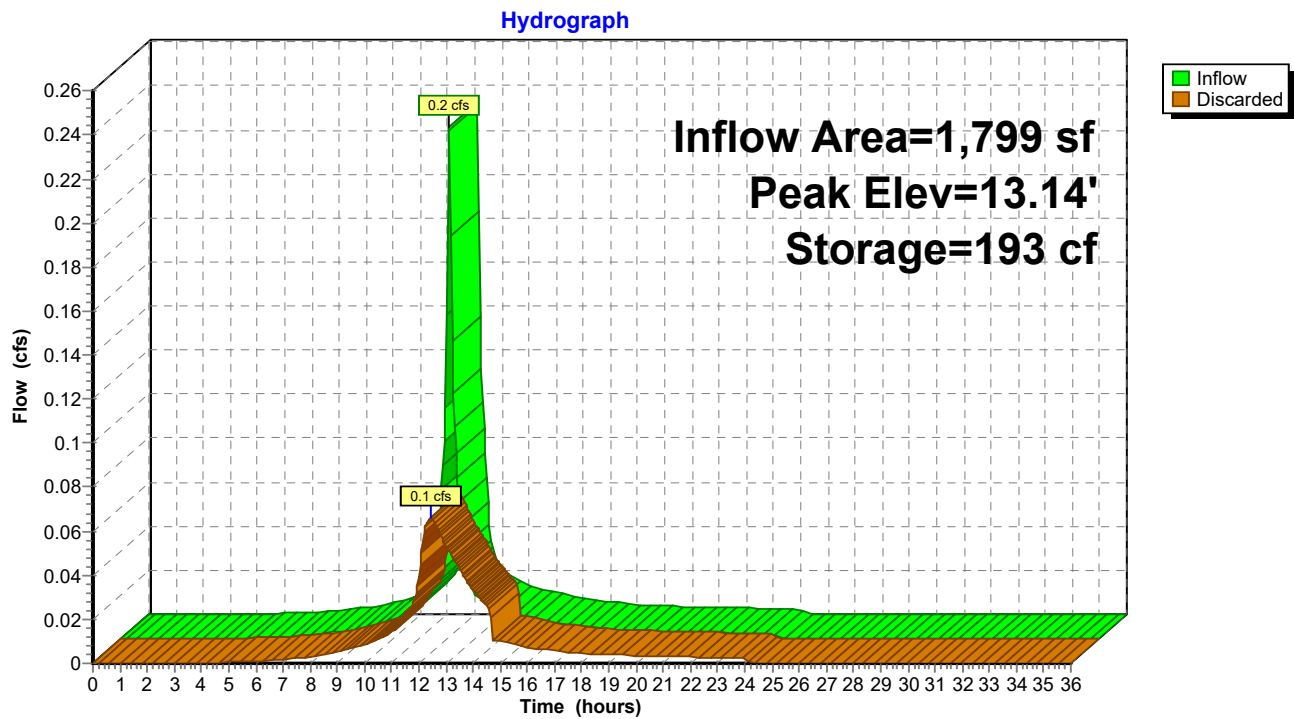
2 Chambers @ \$ 0.00 /ea = \$ 0.00

17.5 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

15.9 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Infiltration Trench:

21-10254 - Post-R4

Type III 24-hr 100-Year Rainfall=6.50"

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Summary for Pond Triplex Trench:

Inflow Area = 1,560 sf, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 814 cf
 Outflow = 0.1 cfs @ 12.40 hrs, Volume= 814 cf, Atten= 69%, Lag= 18.7 min
 Discarded = 0.1 cfs @ 12.40 hrs, Volume= 814 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
 Peak Elev= 9.21' @ 12.40 hrs Surf.Area= 170 sf Storage= 166 cf

Plug-Flow detention time= 14.3 min calculated for 813 cf (100% of inflow)
 Center-of-Mass det. time= 14.2 min (758.2 - 744.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	7.00'	133 cf	4.04'W x 42.00'L x 2.21'H Field A 375 cf Overall - 42 cf Embedded = 333 cf x 40.0% Voids
#2A	7.50'	32 cf	ADS N-12 12 x 2 Inside #1 Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf
		166 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	7.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 5.00'

Discarded OutFlow Max=0.1 cfs @ 12.40 hrs HW=9.21' (Free Discharge)
 ↑1=Exfiltration (Controls 0.1 cfs)

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Type III 24-hr 100-Year Rainfall=6.50"

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Pond Triplex Trench: - Chamber Wizard Field A**Chamber Model = ADS N-12 12**

Inside= 12.2"W x 12.2"H => 0.81 sf x 20.00'L = 16.2 cf

Outside= 14.5"W x 14.5"H => 1.05 sf x 20.00'L = 20.9 cf

14.5" Wide + 6.0" Spacing = 20.5" C-C

2 Chambers/Row x 20.00' Long = 40.00' + 12.0" End Stone x 2 = 42.00' Base Length

1 Rows x 14.5" Wide + 17.0" Side Stone x 2 = 4.04' Base Width

6.0" Base + 14.5" Chamber Height + 6.0" Cover = 2.21' Field Height

2 Chambers x 16.2 cf = 32.4 cf Chamber Storage

2 Chambers x 20.9 cf = 41.9 cf Displacement

375.0 cf Field - 41.9 cf Chambers = 333.2 cf Stone x 40.0% Voids = 133.3 cf Stone Storage

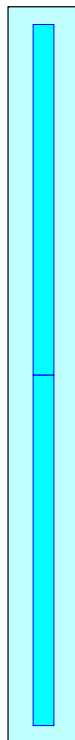
Stone + Chamber Storage = 165.7 cf = 0.004 af

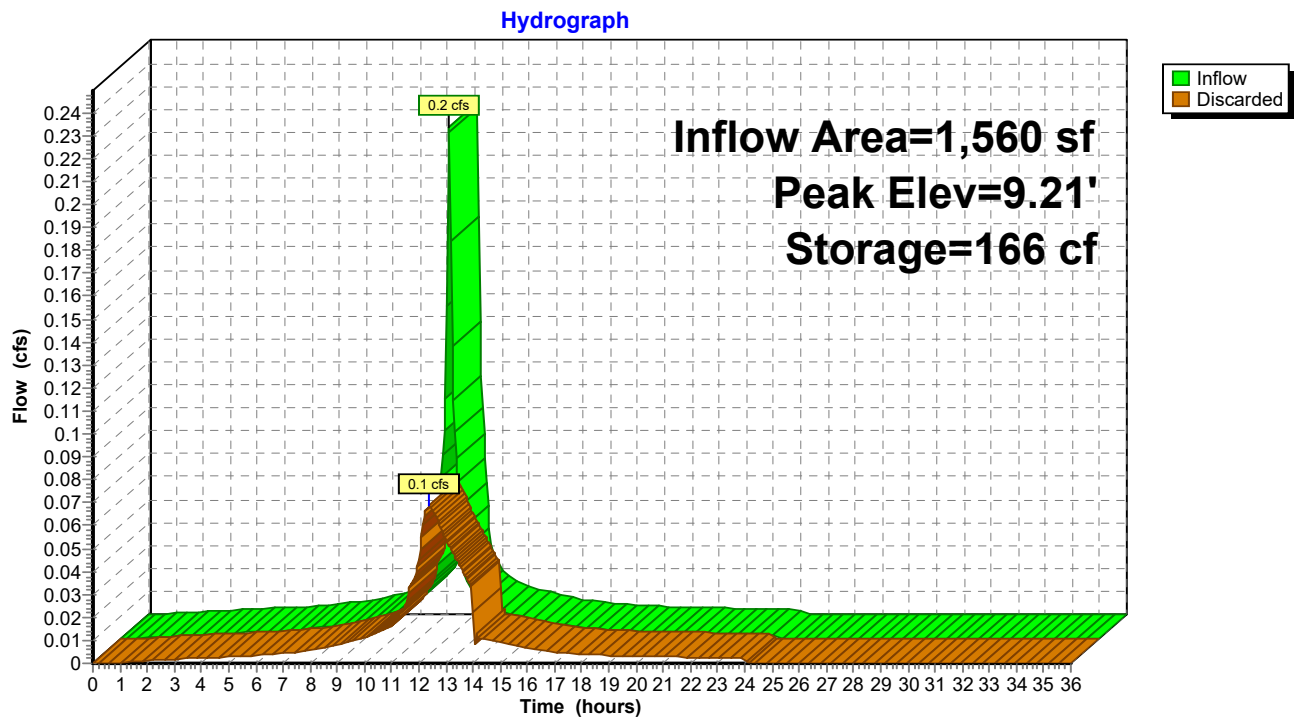
2 Chambers @ \$ 0.00 /ea = \$ 0.00

13.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

12.3 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



Pond Triplex Trench:

DRAINAGE REPORT

159 Beach Road
Salisbury, Massachusetts

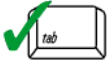
TAB 3



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

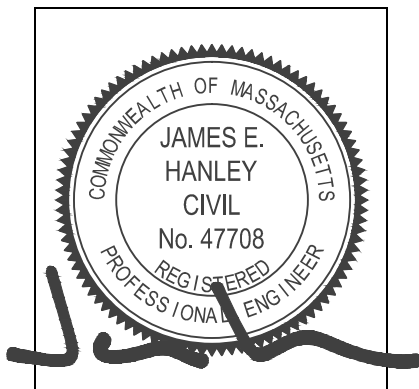
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



3/10/2023

Signature and Date

Checklist

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

- ☒ New development
- ☐ Redevelopment
- ☐ Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☒ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☐ Redevelopment Project
 - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☒ Name of the stormwater management system owners;
 - ☒ Party responsible for operation and maintenance;
 - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☒ Description and delineation of public safety features;
 - ☒ Estimated operation and maintenance budget; and
 - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☐ An Illicit Discharge Compliance Statement is attached;
- ☒ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Project: 159 Beach Road
Location: Salisbury, MA
Client: Larkin Real Estate Group, Inc.

Project Number: 21-10254
Prepared By: William Hall, P.E.
Date: March 9, 2023

STORMWATER MANAGEMENT STANDARDS CALCULATIONS

Standard 1: Velocity & Rip-Rap Apron Sizing and Gradation Calculations

- Not Applicable, no outlets proposed.

Conclusion: No stormwater discharges are proposed, the Stormwater Management System conforms to Standard 1.

Standard 2: Peak Discharge Summary (CFS)

	2-Year (3.1-IN)	10-Year (4.5-IN)	25-Year (5.3-IN)	50-Year (5.9-IN)	100-Year (6.5-IN)
Design Point 1					
Pre-Development Conditions:	0.3	0.6	0.8	1.0	1.1
Post Development Conditions:	0.0	0.0	0.0	0.0	0.0

	2-Year (3.1-IN)	10-Year (4.5-IN)	25-Year (5.3-IN)	50-Year (5.9-IN)	100-Year (6.5-IN)
Design Point 2					
Pre-Development Conditions:	0.0	0.0	0.0	0.0	0.0
Post Development Conditions:	0.0	0.0	0.0	0.0	0.0

Conclusion: The Stormwater Management System conforms to Standard 2.

Standard 3: Recharge Calculations (Static Method)

Subsurface Chambers

Hydrologic Soils Group:	A	B	C	D	
Total Proposed Impervious Area:	0.12	0.00	0.00	0.00	0.12
Target Factor:	0.60	0.35	0.25	0.10	
Required Recharge Volume:	257	0	0	0	257 CF

Volume Provided: 855 CF

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27 IN/HR
Bottom Area of Infiltration Basin:	414 SF
Drawdown Time:	3.0 HRS

Roof Trench

Hydrologic Soils Group:	A	B	C	D	
Total Proposed Impervious Area:	0.04	0.00	0.00	0.00	0.04
Target Factor:	0.60	0.35	0.25	0.10	
Required Recharge Volume:	78	0	0	0	78 CF

Volume Provided: 165 CF

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27 IN/HR
Bottom Area of Infiltration Basin:	170 SF
Drawdown Time:	1.4 HRS

Infiltration Trench

Hydrologic Soils Group:	A	B	C	D	
Total Proposed Impervious Area:	0.03	0.00	0.00	0.00	0.03
Target Factor:	0.60	0.35	0.25	0.10	
Required Recharge Volume:	75	0	0	0	75 CF

Volume Provided: 201 CF

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27 IN/HR
Bottom Area of Infiltration Basin:	122 SF
Drawdown Time:	2.4 HRS

Conclusion: The volume provided exceeds the minimum recharge volume required. In addition, the BMPs drain within 72-HRS to comply with DEP regulations. The Stormwater Management System conforms to Standard 3.

Standard 4: Water Quality Volume Calculations

Subsurface Chambers

Water Quality Depth:	1.0 IN
Total Proposed Impervious Area:	0.12 Acres
Required Water Quality Volume:	428 CF
Provided Water Quality Volume:	855 CF

Roof Trench

Water Quality Depth:	1.0 IN
Total Proposed Impervious Area:	0.04 Acres
Required Water Quality Volume:	165 CF
Provided Water Quality Volume:	1,208 CF

Infiltration Trench

Water Quality Depth:	1.0 IN
Total Proposed Impervious Area:	0.03 Acres
Required Water Quality Volume:	125 CF
Provided Water Quality Volume:	201 CF

TSS Removal Rate Calculations

Treatment Provided From Pervious Pavement Systems 1 & 2

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Hydrodynamic Separator	90%	1.00	0.90	0.10
Subsurface Chambers	80%	0.10	0.08	0.02
TSS Removed through Pervious Pavement:				98.0%

Treatment Provided From Infiltration Trench

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Infiltration Trench with Filter Strip:	80%	1.00	0.80	0.20
TSS Removed through Infiltration Trench:				80.0%

Conclusion: The volume provided by the infiltration structures exceeds the Water Quality Volume, therefore the TSS Removal Rate meets 80%. The Stormwater Management System conforms to Standard 4.

Standard 5: Land Uses With Higher Potential Pollutant Loads

Conclusion: The proposed use is not considered a Land Use with Higher Potential Pollutant Loads. This Standard is NOT Applicable.

Standard 6: Critical Areas

Conclusion: The proposal is not located within a Critical Area. This Standard is NOT Applicable.

Standard 7: Redevelopment


Conclusion: The development does not meet the criteria for Redevelopment.

Standard 8: Construction Period Controls

Conclusion: The project is not covered by a NPDES Construction General Permit. An erosion and sedimentation control plan has been submitted to address construction period pollution prevention measures and to reduce the potential for erosion and sedimentation. The Stormwater Management System Conforms to Standard 8.

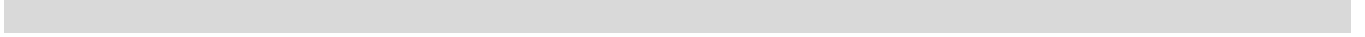
Standard 9: Operations and Maintenance Plan

Conclusion: An Operations and Maintenance Plan has been prepared and provided with this summary. The Stormwater Management System Conforms to Standard 9.



Standard 10: Illicit Discharges to Drainage System

Conclusion: All off-site discharges are comprised entirely of stormwater. The Stormwater Management System Conforms to Standard 10.



OPERATIONS AND MAINTENANCE PLAN

March 9, 2023

This Operations and Maintenance (O&M) Plan has been prepared in accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP) for 159 Beach Road in Salisbury, MA.

Upon a period beginning twelve months after the completion of the project, the porous pavers shall be inspected annually. Maintenance and inspection shall be performed as indicated below:

Visual Inspection

The surface must be inspected annually for signs of degradation and clogging of the infiltration trenches. Regularly monitor the surface after storm events to make sure that the surface drains properly. Puddling could be an indication of clogging of the drainage system. Trenches shall be weeded and mowed as required to control vegetation.

Infiltration Trenches and Subsurface Chambers

Infiltration systems are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Installing the required pretreatment BMPs will significantly reduce maintenance requirements. Inspections and preventive maintenance must be performed at least twice a year. Drainage pipes shall be inspected and cleaned of sediment at least every five (5) years, or in accordance to manufacture's specifications, or as required to maintain adequate functionality of the stormwater conveyance system. All sediments shall be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

Snow Storage / Removal

Snow plowed from the proposed driveway will be placed or disposed of in accordance with the policy developed by DEP. Under no circumstances shall snow plowed or removed from the road be stockpiled within the Town right-of-way. If conditions arise where snow storage areas are at capacity the Operator is required to remove and dispose of snow off site in conformance with all local, state and federal regulations.

Property Applicant / Responsible Party:

Larkin Real Estate Group, Inc.
383 Main Street
Medfield, MA 02052

Construction Period Pollution Prevention Plan:

See Sheet C-5 for construction period erosion and sedimentation control measure.

System Map:

See Sheet C-3 for the location of all stormwater management facilities.

Estimated Operations and Maintenance Budget

All maintenance will be performed as required. An annual budget of \$2,500 a year should be specified for operations and maintenance of the obligations.