# DRAINAGE ANALYSIS REPORT

## #474 Main Street & 31 Ashumet Road
## Mashpee, MA
## Parcels 27-001-000A & 27-001-000B

PREPARED FOR

**Joao L. Junqueira**
**53 Mercantile Way, Unit 6**
**Mashpee, MA 02649**

PREPARED BY

**Bracken Engineering, Inc.**
**49 Herring Pond Road**
**Buzzards Bay, MA 02532**


**Zachary L. Basinski, P.E.**
**February 19, 2024**

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## Appendix

## Introduction:

The purpose of this report is to analyze the hydrologic impacts associated with the development of a proposed 6,000 sf warehouse & retail building and associated parking lot and loading areas. The stormwater system is designed to meet the Town of Mashpee Zoning Regulations and the Massachusetts Stormwater Management Act.

## Existing Conditions:

The locus is shown as parcels 27-001-000A & 27-001-000B on the Town of Mashpee Assessors Maps. The total area of the site is 98,740± s.f., or approximately 2.267 acres and the total anticipated area of disturbance is 44,625± SF.

The site is abutted by developed commercial lots to the north and south on Main Street, and a multi-unit residential property to the north west (off Ashumet Rd). To the east lies Main Street (State Rt 132) and to the southwest lies Ashumet Road.

The site is a vacant lot. Soil on the site consists of a Enfield Silt Loam, Carver Coarse Sand, and disturbed Urban Land. Exploratory test pits performed on site indicated sandy soils consistent with Carver Coarse Sand. These soils have high infiltration and a very low runoff rate. The topography consists of higher elevations along the North and west property lines with a lower valley in the middle of the site, sloping up again to the south and east property lines. The site was subject to an unknown history of soil dumping, leaving a hummocky, disturbed surface. Existing runoff on the site predominately drains towards the low points in the middle of the lot where it infiltrates naturally. A portion of the western side of the lot slopes towards Ashumet Road.

## Proposed Conditions:

The proposed project consists of constructing a 6,000 s.f. warehouse/retail building with associated parking area and loading zone areas. All proposed parking, loading areas and entrance driveways will be paved. An additional outdoor material storage area will be surfaced with gravel. New stormwater runoff associated with the proposed building and proposed loading dock area will be directed towards three (3) proposed stormwater management areas. The stormwater management areas are located along the north, east, and southern property lines. Runoff from the parking area and driveway shall be routed towards a sediment forebay and rain garden before being infiltrated in subsurface basins. Runoff from the proposed roof shall be piped directly to a subsurface infiltration area.

The stormwater management area has been sized to treat the required water quality volume and completely mitigate the required recharge volume onsite up to a 100-year storm event. See the enclosed calculations for further details.

## Stormwater Recharge:

Infiltration BMP's have been designed using the "static" method to infiltrate the Required Recharge Volume for each subcatchment area. Carver Coarse Sand soils have a hydrologic soil classification of "A" and accordingly a 0.60-inch Target Depth Factor. Soil conditions have been confirmed to verify the substratum to be sand with an 8.27 inch/hour Rawls Rate. The drawdown analysis for the Required Recharge Volume has been provided. See attached calculations for each BMP. Since the infiltration BMP's have been sized to attenuate the 100-year storm event and the separation distance to seasonal high groundwater is greater than four feet, groundwater mounding calculations have not been provided.

## Method of Calculation:

The stormwater management areas were analyzed utilizing standard engineering practices and the Soil Conservation Service (SCS) Technical Release 20 (TR20). The systems were sized using the rainfall data for a two (2), ten (10), twenty-five (25), and one hundred (100) year, twenty-four (24) hour duration storm frequencies. Based on the U.S. Department of Agriculture's Technical Release Paper 40 (TP40) rainfall maps, the precipitation is 3.5", 4.8", 5.7", and 7.1" respectively.

To assist in the analysis, the computer software program "HydroCAD" was used to develop hydrographs and infiltration area inflow/outflow calculations.

The drainage area boundaries were developed from on-site survey topography, the anticipated development footprint and proposed site grades.

The proposed subsurface infiltration system has been designed to treat and recharge runoff up to a 7.1" (100-yr) storm event.

## Critical Areas:

The site is located within a Zone II wellhead protection zone and the Mashpee Groundwater Protection District.

## Erosion and Sediment Controls:

Erosion control measures including silt socks, tracking pads, silt sacks and construction notes are shown on site development plans.

## Operations and Maintenance Plan:

An operation and maintenance plan is included, see appendix.

## Conclusion:

The drainage system has been designed in accordance with the Town of Mashpee Zoning By-law utilizing the Massachusetts Stormwater Management Standards. A stormwater management system incorporating low impact development techniques has been designed to treat, mitigate and recharge the increase in stormwater runoff onsite. The following chart identifies the pre- and post-development stormwater characteristics at the identified design points.

**TABLE 1:**

| STORM EVENT (Year) | 2 | | 10 | | 25 | | 100 | |
|---|---|---|---|---|---|---|---|---|
| Design Point | PRE (cfs) | POST (cfs) | PRE (cfs) | POST (cfs) | PRE (cfs) | POST (cfs) | PRE (cfs) | POST (cfs) |
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.04 | 0.02 |
| 2 | 0.00 | -- | 0.00 | -- | 0.00 | -- | 0.03 | -- |
| 2P | -- | 0.47 | -- | 0.65 | -- | 0.77 | -- | 0.95 |
| 3 | 0.00 | 0.00 | 0.03 | 0.01 | 0.07 | 0.03 | 0.16 | 0.10 |
| 4 | 0.00 | -- | 0.00 | -- | 0.00 | -- | 0.02 | -- |
| 4P | -- | 0.33 | -- | 0.96 | -- | 1.5 | -- | 2.37 |
| 5 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 |

## LEGEND

1 = DESIGN POINT

1S = SUBCATCHMENT AREA

= SUBCATCHMENT BOUNDARY

= FLOW PATH

N

W E

S

MA. COORD. SYSTEM MAINLAND ZONE

#476 MAIN STREET
PARCEL ID: 27–135
(COMMERCIAL)

#10 OAKWOOD ROAD
PARCEL ID: 27–136
(COMMERCIAL)

#16 OAKWOOD ROAD
PARCEL ID: 27–137
(COMMERCIAL)

#35 ASHUMET ROAD
PARCEL ID: 27–22
(RESIDENTIAL)

#470 MAIN STREET
PARCEL ID: 27–021

MAIN STREET

ROUTE 130

ASHUMET ROAD

EXISTING EDGE OF PAVEMENT

EXISTING PAVED PARKING LOT

PAVED SIDEWALK

PAVED DRIVE

NAIL FND

IR FND

CBDH FND (HELD)

ZONE LINE DIGITIZED FROM PB 629 PG 44 (C-3 ZONE)

N 65°30'30" E 116.11'

N 49°39'10" E 90.75'

N 49°39'10" E 94.25'

N 53°03'10" E 13.68'

N 53°03'10" E 116.50'

N 51°31'10" E 89.75'

N 74°22'00" W 118.76'

L=259.67'
R=910.54'

S 28°21'55" E 200.46'

S 65°30'30" W 101.88'

S 61°47'43" W 104.14'

S 61°47'43" W 72.19'

S 28°21'55" E 114.31'

PARCEL ID
27–21–000A
40,442± s.f.

PARCEL ID
27–21–000B
58,298± s.f.

SUBCATCHMENT AREA 1S:
1,697 S.F. – MULCH/BRUSH
10,119 S.F. – WOODS
CN = 35
Tc = 19.5 MIN.

SUBCATCHMENT AREA 2S:
462 S.F. – MULCH/BRUSH
41,106 S.F. – WOODS
CN = 30
Tc = 19.9 MIN.

SUBCATCHMENT AREA 3S:
1,701 S.F. – MULCH/BRUSH
3,655 S.F. – WOODS
388 S.F. – PAVEMENT
CN = 46
Tc = 5 MIN.

SUBCATCHMENT AREA 4S:
32,149 S.F. – WOODS
CN = 30
Tc = 34.5 MIN.

SUBCATCHMENT AREA 5S:
7,841 S.F. – WOODS
CN = 30
Tc = 27.4 MIN.

PLAN SCALE

0 10 20 30 40 50 75 100 150

1 inch = 50 feet


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# PRE–DEVELOPMENT WATERSHED PLAN

IN MASHPEE, MASSACHUSETTS

Prepared for:

JOAO JUNQUEIRA

#474 MAIN STREET & 31 ASHUMET ROAD
PARCELS 27–001–000A & 27–001–000B

| Date: | Drawn: | Checked: |
|---|---|---|
| FEBRUARY 19, 2024 | RED/BEI | ZLB |

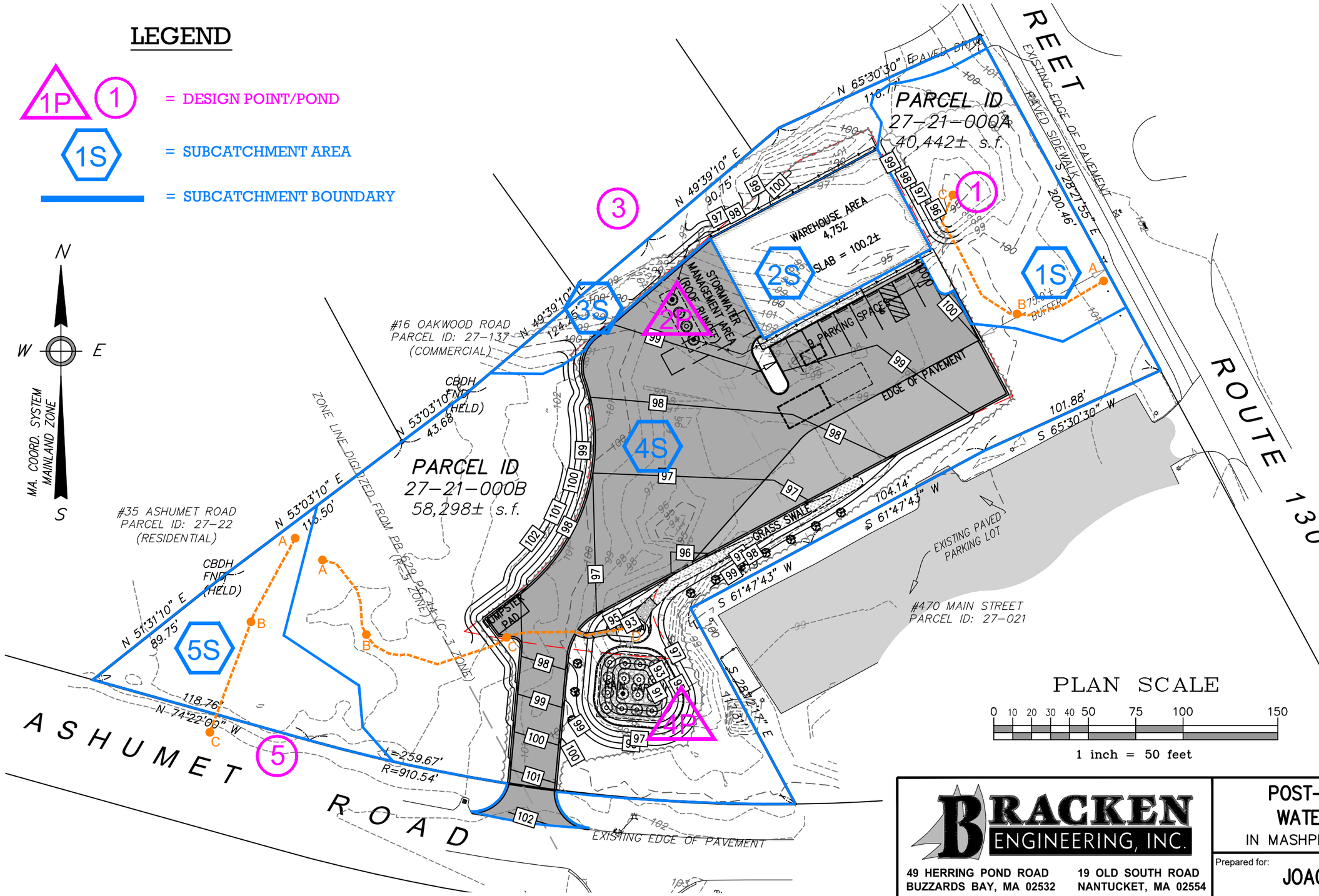
S:\Autocad Drawings\Mashpee\Main Street\474 Main Street & 31 Ashumet Rd\05_Design Calculations\Hydrology\474 Main st – Pre–Developement.dwg

## LEGEND

1P 1 = DESIGN POINT/POND

1S = SUBCATCHMENT AREA

= SUBCATCHMENT BOUNDARY




SUBCATCHMENT AREA 1S:
827 S.F. – GRASS
10,598 S.F. – WOODS
CN = 33
Tc = 19.5 MIN.

SUBCATCHMENT AREA 2S:
6,000 S.F. – ROOF
CN = 98
Tc = 5.0 MIN.

SUBCATCHMENT AREA 3S:
1,203 S.F. – GRASS
4,731 S.F. – WOODS
388 S.F. – PAVEMENT
CN = 41
Tc = 5 MIN.

SUBCATCHMENT AREA 4S:
30,382 S.F. – WOODS
23,939 S.F. – PAVEMENT
6,630 S.F. – GRASS
4,832 S.F. – GRAVEL
2,063 S.F. – RAIN GARDEN
CN = 59
Tc = 33.3 MIN.

SUBCATCHMENT AREA 5S:
7,841 S.F. – WOODS
CN = 30
Tc = 27.4 MIN.

PLAN SCALE

0 10 20 30 40 50 75 100 150

1 inch = 50 feet

| Date: | Drawn: | Checked: |
|---|---|---|
| FEBRUARY 19, 2024 | RED/BEI | ZLB |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# POST-DEVELOPMENT WATERSHED PLAN

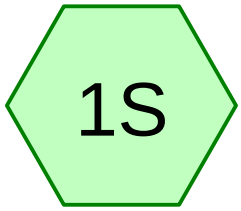
IN MASHPEE, MASSACHUSETTS

Prepared for:

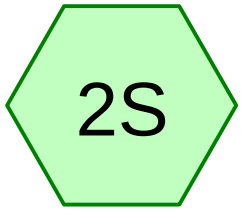
JOAO JUNQUEIRA

#474 MAIN STREET & 31 ASHUMET ROAD
PARCELS 27-001-000A & 27-001-000B

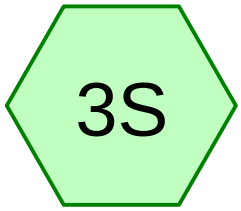
S:\Autocad Drawings\Mashpee\Main Street\474 Main Street & 31 Ashumet Rd\05_Design Calculations\Hydrology\474 Main st – Post-Developement.dwg



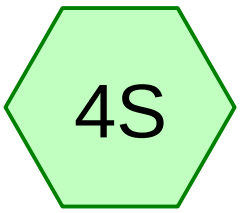

Catchment Area 1



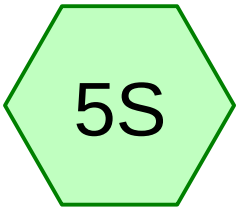

Catchment Area 2



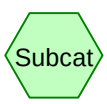

Catchment Area 3



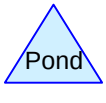

Catchment Area 4




Catchment Area 5









**Routing Diagram for 474 Main Street - Pre-Developement**
Prepared by {enter your company name here}, Printed 2/2/2024
HydroCAD® 10.10-4a s/n 03102 © 2020 HydroCAD Software Solutions LLC

## Rainfall Events Listing

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|---|---|---|---|---|---|---|---|---|
| 1 | A - 2 YR | Type III 24-hr | | Default | 24.00 | 1 | 3.50 | 2 |
| 2 | B - 10 YR | Type III 24-hr | | Default | 24.00 | 1 | 4.80 | 2 |
| 3 | C - 25 YR | Type III 24-hr | | Default | 24.00 | 1 | 5.70 | 2 |
| 4 | D - 100YR | Type III 24-hr | | Default | 24.00 | 1 | 7.00 | 2 |

## Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 3,860 | 68 | <50% Grass cover, Poor, HSG A (1S, 2S, 3S) |
| 388 | 98 | Paved parking, HSG A (3S) |
| 94,870 | 30 | Woods, Good, HSG A (1S, 2S, 3S, 4S, 5S) |
| **99,118** | **32** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 99,118 | HSG A | 1S, 2S, 3S, 4S, 5S |
| 0 | HSG B | |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| **99,118** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover | Subc Numb |
|---|---|---|---|---|---|---|---|
| 3,860 | 0 | 0 | 0 | 0 | 3,860 | <50% Grass cover, Poor | |
| 388 | 0 | 0 | 0 | 0 | 388 | Paved parking | |
| 94,870 | 0 | 0 | 0 | 0 | 94,870 | Woods, Good | |
| **99,118** | **0** | **0** | **0** | **0** | **99,118** | **TOTAL AREA** | |

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

**Subcatchment 1S: Catchment Area 1** Runoff Area=11,816 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=131' Tc=19.5 min CN=35 Runoff=0.00 cfs 0 cf

**Subcatchment 2S: Catchment Area 2** Runoff Area=41,568 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=170' Tc=19.9 min CN=30 Runoff=0.00 cfs 0 cf

**Subcatchment 3S: Catchment Area 3** Runoff Area=5,744 sf 6.75% Impervious Runoff Depth>0.08"
Tc=5.0 min CN=46 Runoff=0.00 cfs 38 cf

**Subcatchment 4S: Catchment Area 4** Runoff Area=32,149 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=231' Tc=34.5 min CN=30 Runoff=0.00 cfs 0 cf

**Subcatchment 5S: Catchment Area 5** Runoff Area=7,841 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=112' Tc=27.4 min CN=30 Runoff=0.00 cfs 0 cf

**Total Runoff Area = 99,118 sf Runoff Volume = 38 cf Average Runoff Depth = 0.00"**
**99.61% Pervious = 98,730 sf 0.39% Impervious = 388 sf**

## Summary for Subcatchment 1S: Catchment Area 1

[45] Hint: Runoff=Zero

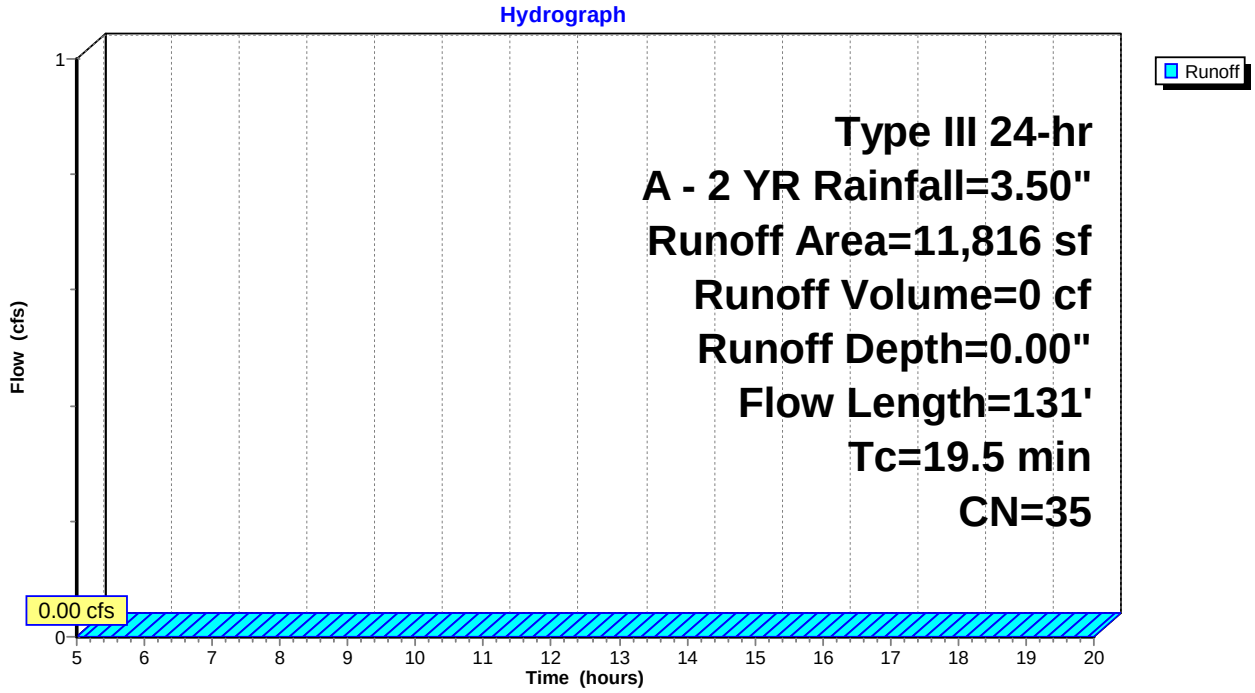
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 1,697 | 68 | <50% Grass cover, Poor, HSG A |
| 10,119 | 30 | Woods, Good, HSG A |
| 11,816 | 35 | Weighted Average |
| 11,816 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.5 | 50 | 0.0260 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 1.0 | 81 | 0.0691 | 1.31 | | **Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps |
| 19.5 | 131 | Total | | | |

## Subcatchment 1S: Catchment Area 1



## Summary for Subcatchment 2S: Catchment Area 2

[45] Hint: Runoff=Zero

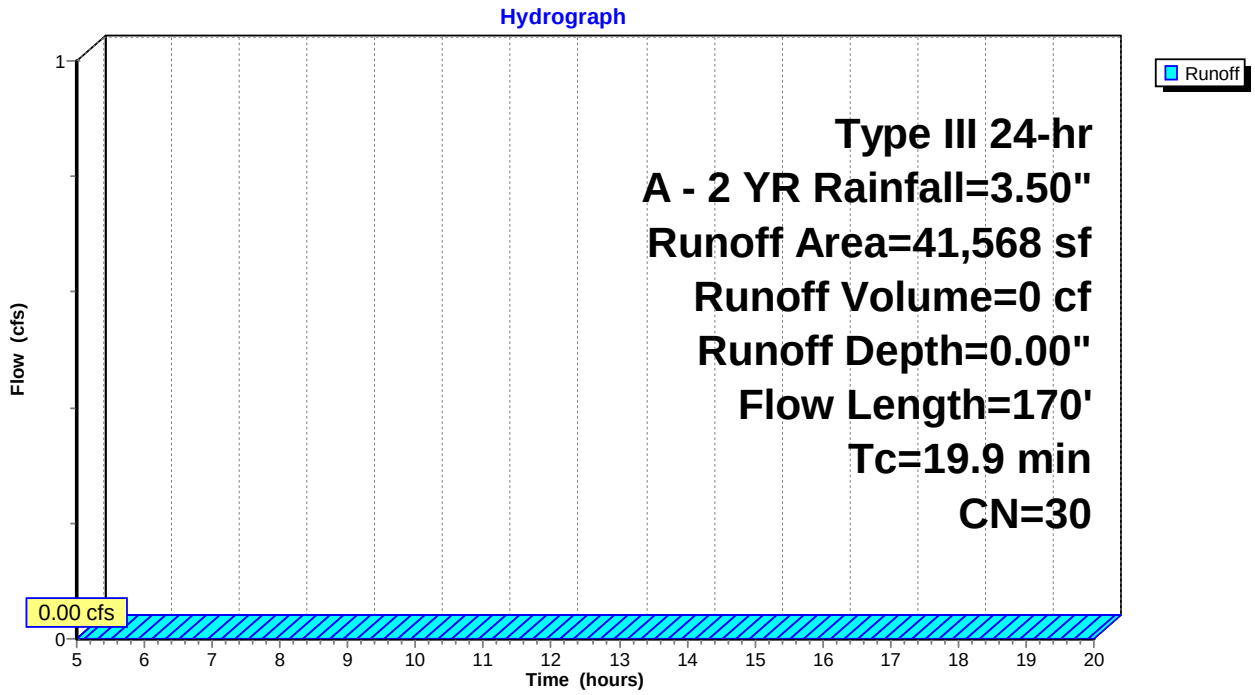
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 462 | 68 | <50% Grass cover, Poor, HSG A |
| 41,106 | 30 | Woods, Good, HSG A |
| 41,568 | 30 | Weighted Average |
| 41,568 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.0 | 50 | 0.0320 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.9 | 120 | 0.0750 | 0.68 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 19.9 | 170 | Total | | | |

## Subcatchment 2S: Catchment Area 2



## Summary for Subcatchment 3S: Catchment Area 3

[49] Hint: Tc<2dt may require smaller dt

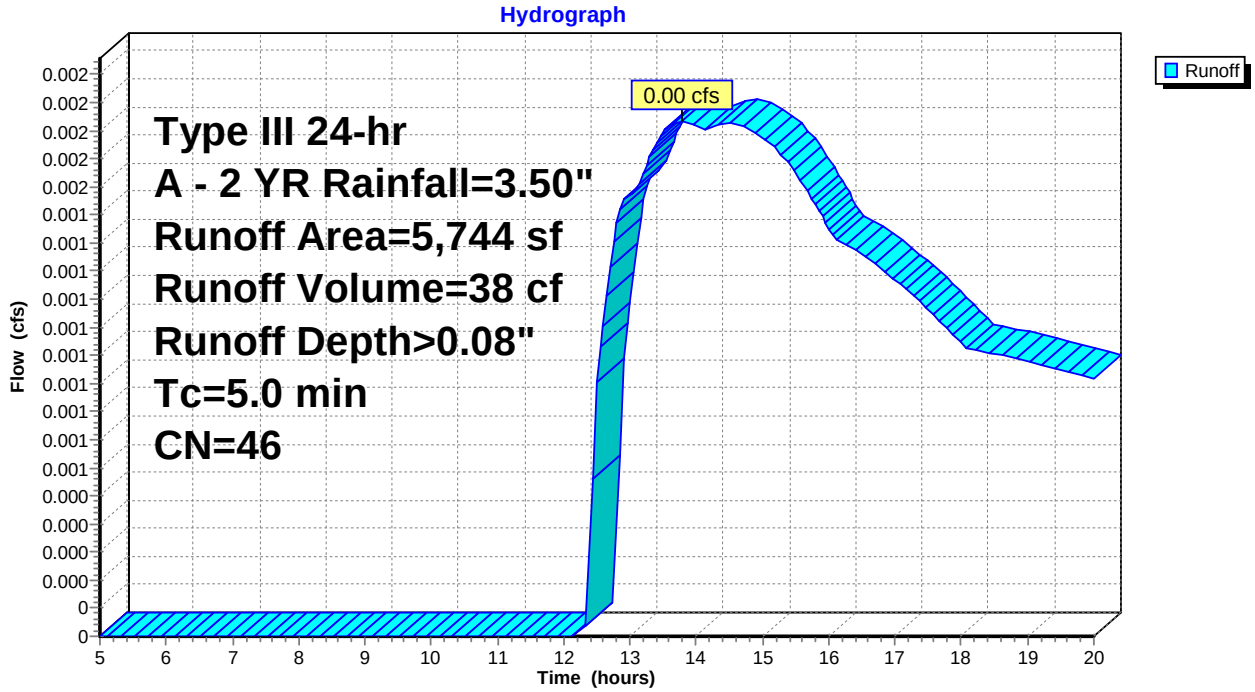
Runoff = 0.00 cfs @ 13.78 hrs, Volume= 38 cf, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 1,701 | 68 | <50% Grass cover, Poor, HSG A |
| 3,655 | 30 | Woods, Good, HSG A |
| 388 | 98 | Paved parking, HSG A |
| 5,744 | 46 | Weighted Average |
| 5,356 | | 93.25% Pervious Area |
| 388 | | 6.75% Impervious Area |

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

## Subcatchment 3S: Catchment Area 3



## Summary for Subcatchment 4S: Catchment Area 4

[45] Hint: Runoff=Zero

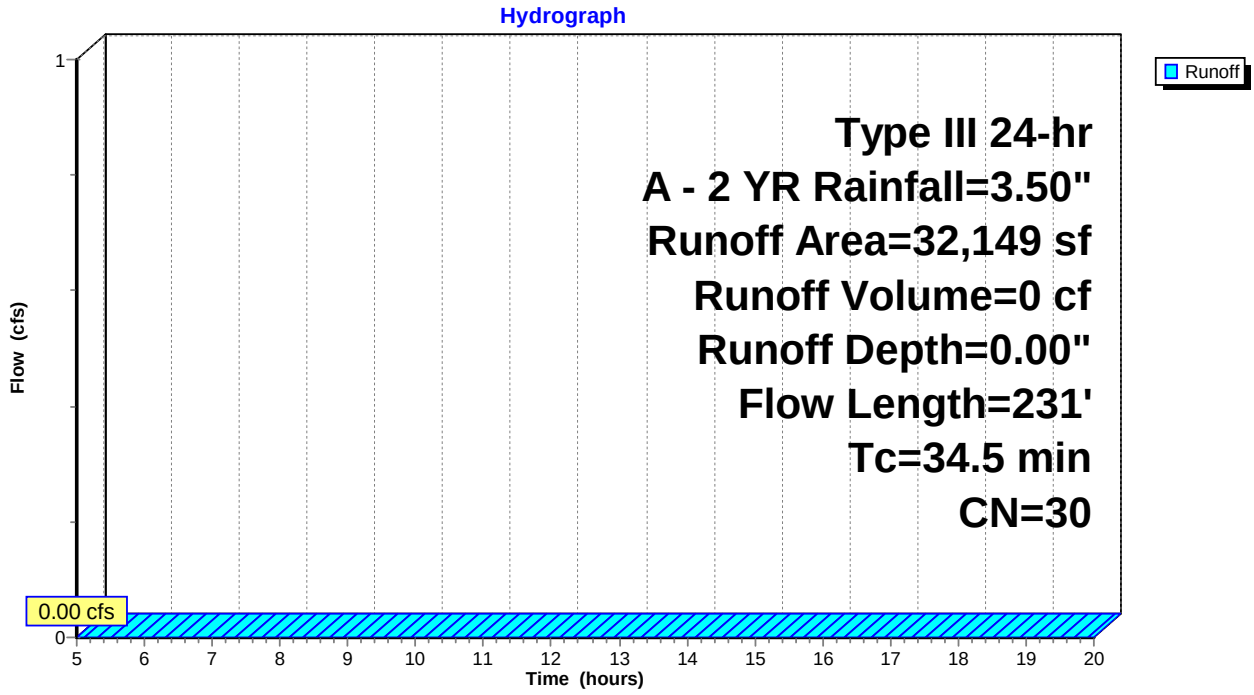
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 32,149 | 30 | Woods, Good, HSG A |
| 32,149 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.6 | 50 | 0.0080 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 4.9 | 181 | 0.0608 | 0.62 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 34.5 | 231 | Total | | | |

## Subcatchment 4S: Catchment Area 4



## Summary for Subcatchment 5S: Catchment Area 5

[45] Hint: Runoff=Zero

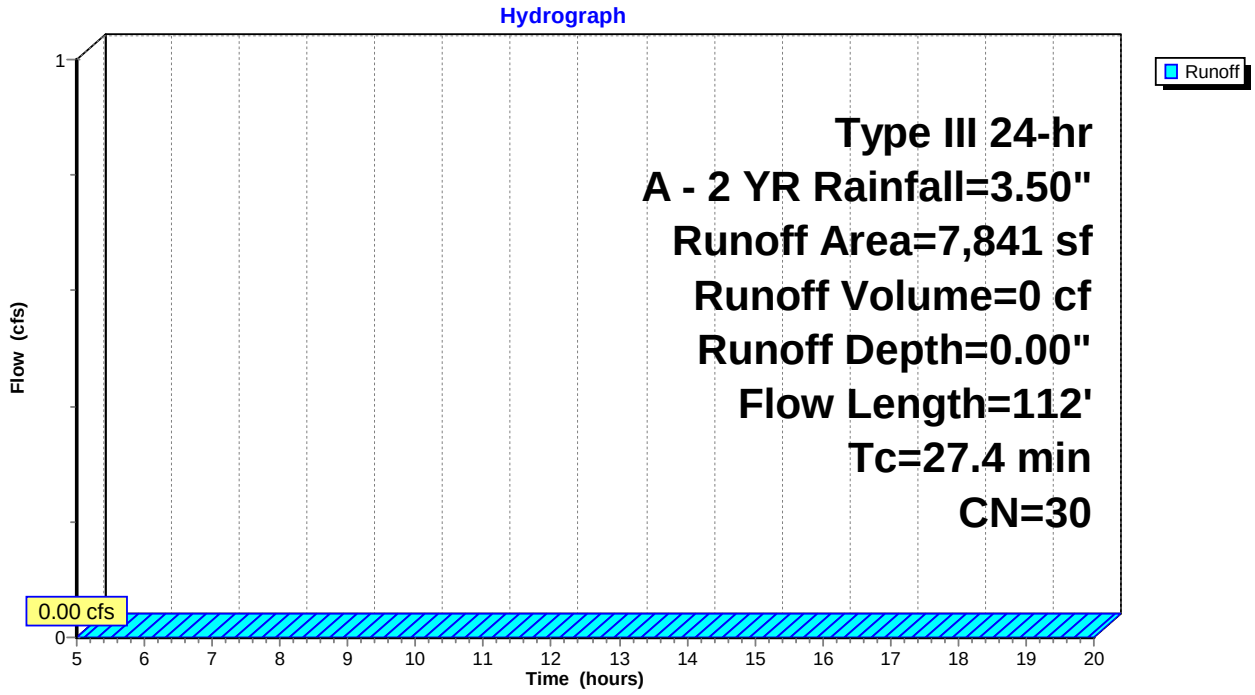
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 7,841 | 30 | Woods, Good, HSG A |
| 7,841 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.2 | 50 | 0.0120 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.2 | 62 | 0.0339 | 0.46 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 27.4 | 112 | Total | | | |

## Subcatchment 5S: Catchment Area 5



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

**Subcatchment 1S: Catchment Area 1** Runoff Area=11,816 sf 0.00% Impervious Runoff Depth>0.04"
Flow Length=131' Tc=19.5 min CN=35 Runoff=0.00 cfs 38 cf

**Subcatchment 2S: Catchment Area 2** Runoff Area=41,568 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=170' Tc=19.9 min CN=30 Runoff=0.00 cfs 0 cf

**Subcatchment 3S: Catchment Area 3** Runoff Area=5,744 sf 6.75% Impervious Runoff Depth>0.36"
Tc=5.0 min CN=46 Runoff=0.03 cfs 172 cf

**Subcatchment 4S: Catchment Area 4** Runoff Area=32,149 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=231' Tc=34.5 min CN=30 Runoff=0.00 cfs 0 cf

**Subcatchment 5S: Catchment Area 5** Runoff Area=7,841 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=112' Tc=27.4 min CN=30 Runoff=0.00 cfs 0 cf

**Total Runoff Area = 99,118 sf Runoff Volume = 210 cf Average Runoff Depth = 0.03"**
**99.61% Pervious = 98,730 sf 0.39% Impervious = 388 sf**

## Summary for Subcatchment 1S: Catchment Area 1

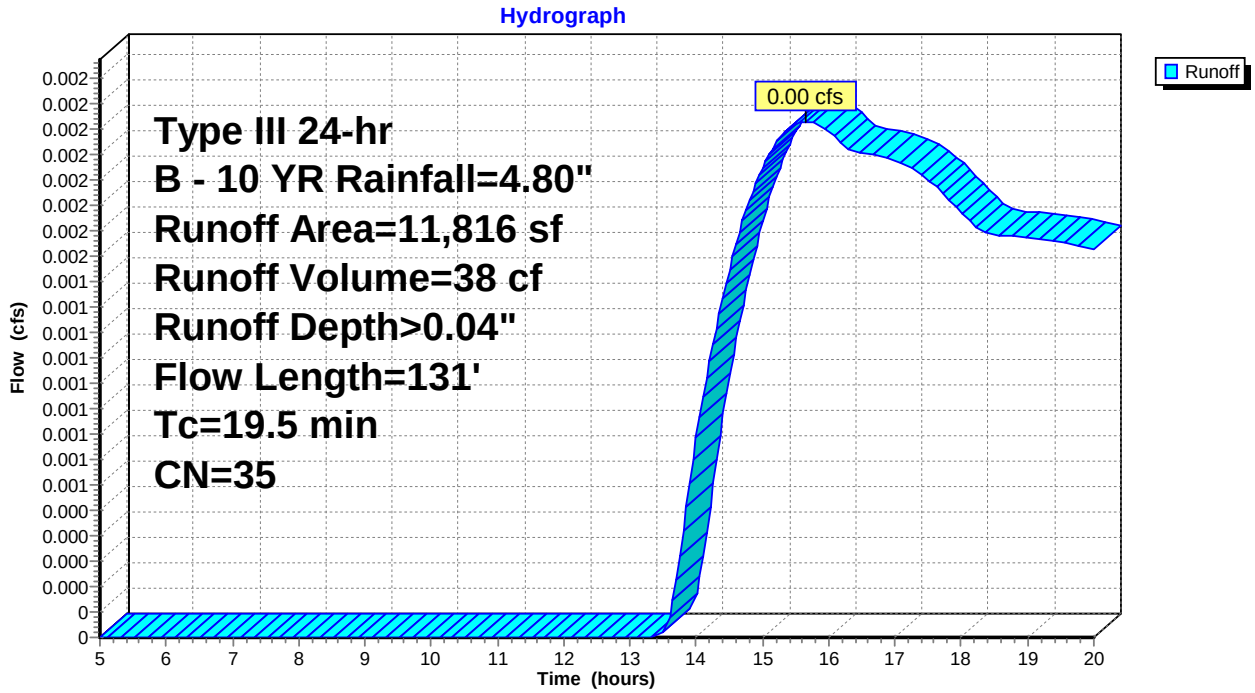
Runoff = 0.00 cfs @ 15.66 hrs, Volume= 38 cf, Depth> 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 1,697 | 68 | <50% Grass cover, Poor, HSG A |
| 10,119 | 30 | Woods, Good, HSG A |
| 11,816 | 35 | Weighted Average |
| 11,816 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.5 | 50 | 0.0260 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 1.0 | 81 | 0.0691 | 1.31 | | **Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps |
| 19.5 | 131 | Total | | | |

## Subcatchment 1S: Catchment Area 1



## Summary for Subcatchment 2S: Catchment Area 2

[45] Hint: Runoff=Zero

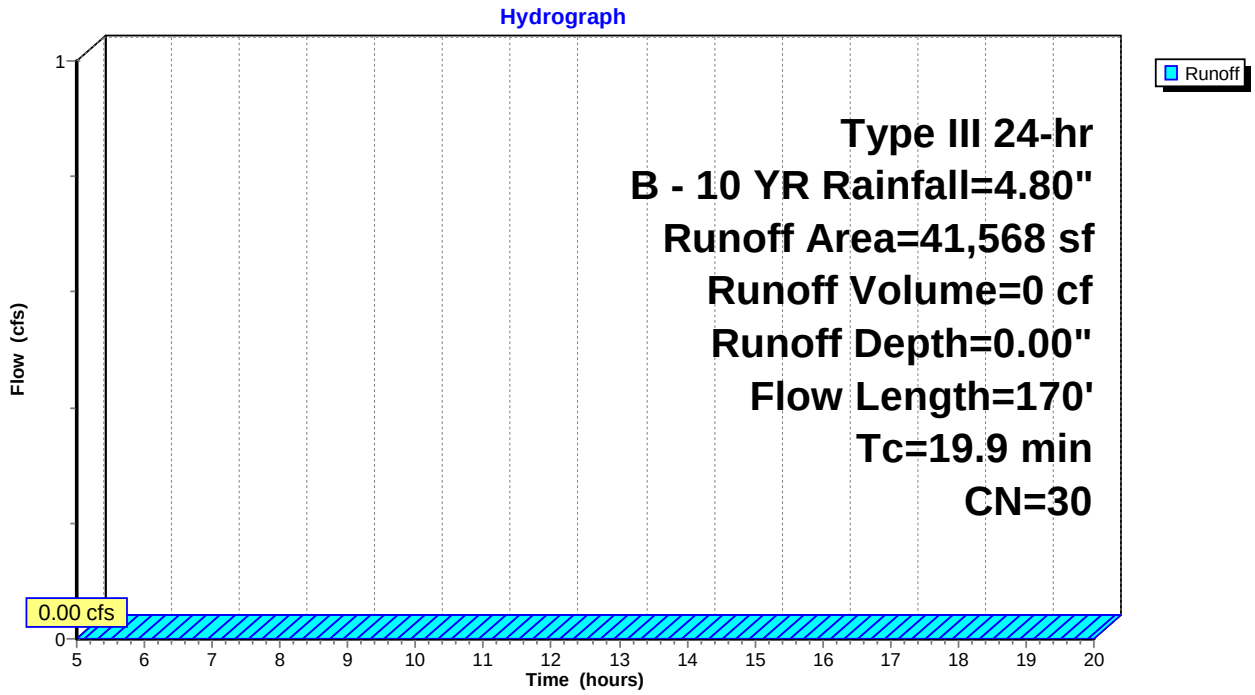
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 462 | 68 | <50% Grass cover, Poor, HSG A |
| 41,106 | 30 | Woods, Good, HSG A |
| 41,568 | 30 | Weighted Average |
| 41,568 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.0 | 50 | 0.0320 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.9 | 120 | 0.0750 | 0.68 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 19.9 | 170 | Total | | | |

## Subcatchment 2S: Catchment Area 2



## Summary for Subcatchment 3S: Catchment Area 3

[49] Hint: Tc<2dt may require smaller dt

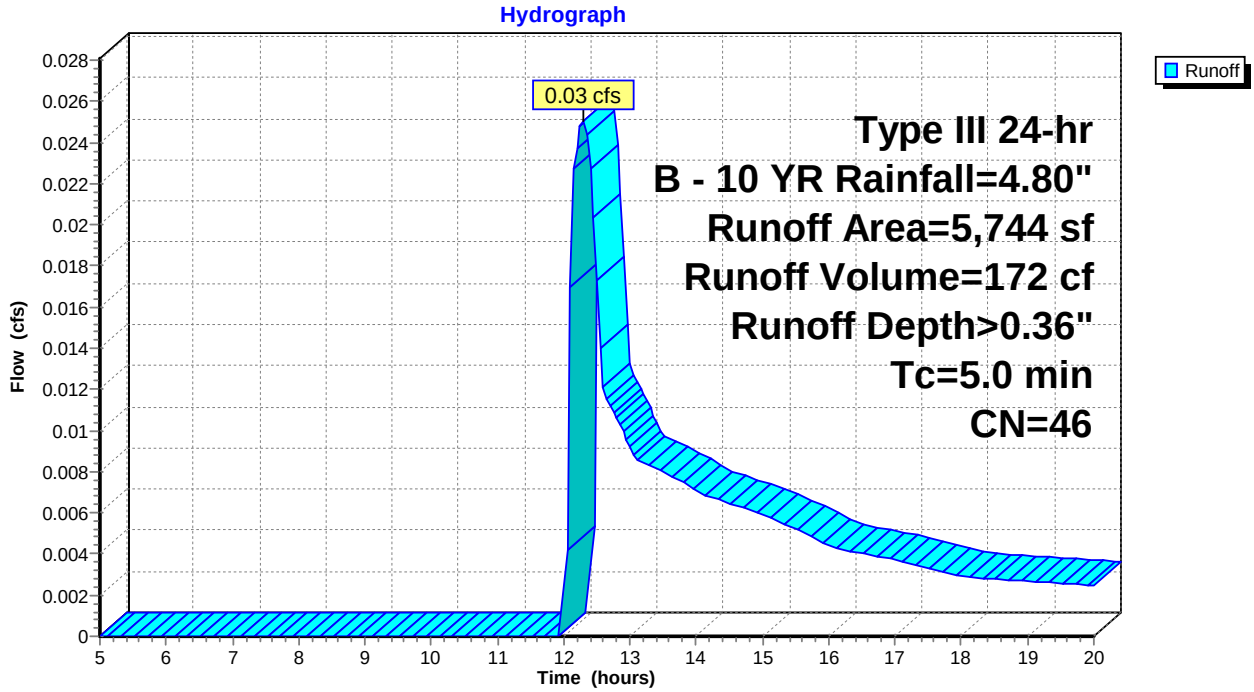
Runoff = 0.03 cfs @ 12.29 hrs, Volume= 172 cf, Depth> 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 1,701 | 68 | <50% Grass cover, Poor, HSG A |
| 3,655 | 30 | Woods, Good, HSG A |
| 388 | 98 | Paved parking, HSG A |
| 5,744 | 46 | Weighted Average |
| 5,356 | | 93.25% Pervious Area |
| 388 | | 6.75% Impervious Area |

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

## Subcatchment 3S: Catchment Area 3



## Summary for Subcatchment 4S: Catchment Area 4

[45] Hint: Runoff=Zero

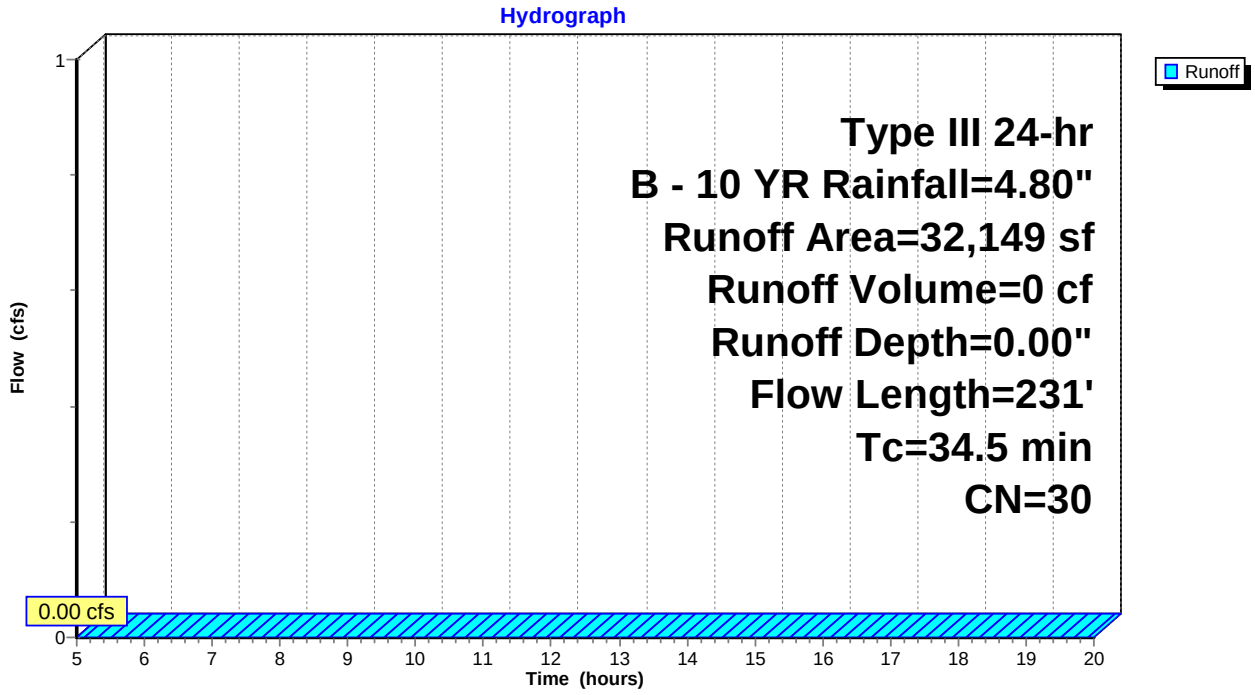
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 32,149 | 30 | Woods, Good, HSG A |
| 32,149 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.6 | 50 | 0.0080 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 4.9 | 181 | 0.0608 | 0.62 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 34.5 | 231 | Total | | | |

## Subcatchment 4S: Catchment Area 4



## Summary for Subcatchment 5S: Catchment Area 5

[45] Hint: Runoff=Zero

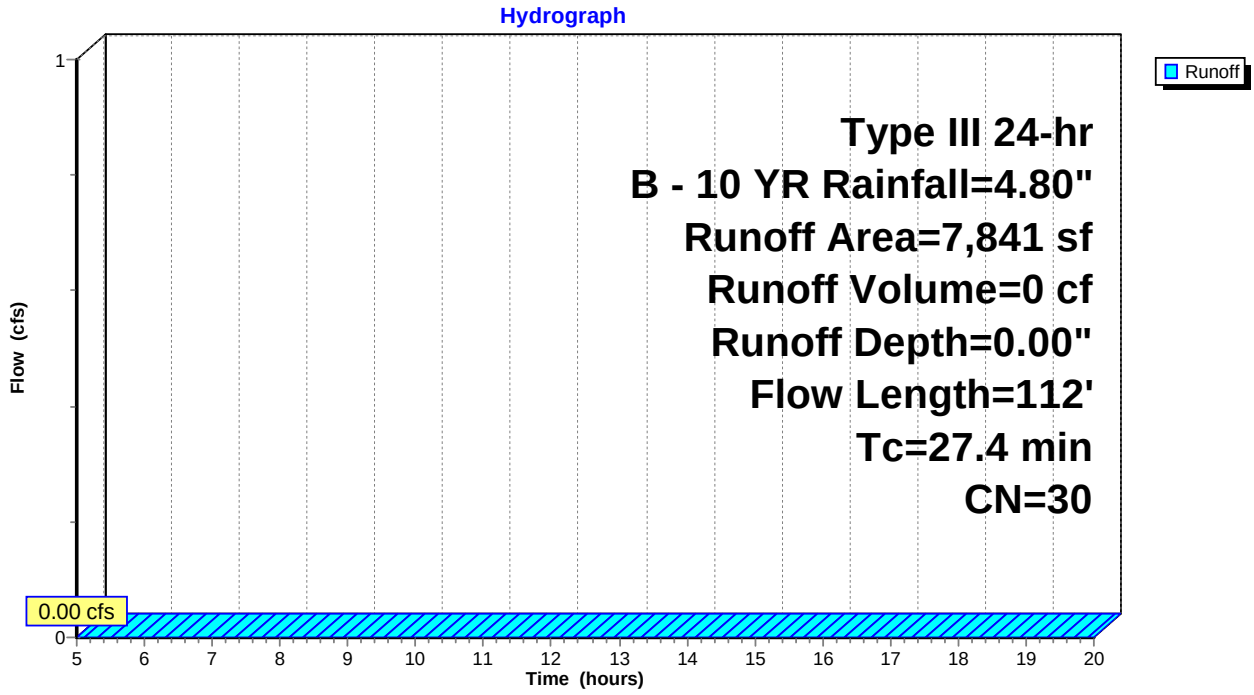
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 7,841 | 30 | Woods, Good, HSG A |
| 7,841 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.2 | 50 | 0.0120 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.2 | 62 | 0.0339 | 0.46 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 27.4 | 112 | Total | | | |

## Subcatchment 5S: Catchment Area 5



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

**Subcatchment 1S: Catchment Area 1** Runoff Area=11,816 sf 0.00% Impervious Runoff Depth>0.15"
Flow Length=131' Tc=19.5 min CN=35 Runoff=0.01 cfs 144 cf

**Subcatchment 2S: Catchment Area 2** Runoff Area=41,568 sf 0.00% Impervious Runoff Depth>0.02"
Flow Length=170' Tc=19.9 min CN=30 Runoff=0.00 cfs 85 cf

**Subcatchment 3S: Catchment Area 3** Runoff Area=5,744 sf 6.75% Impervious Runoff Depth>0.65"
Tc=5.0 min CN=46 Runoff=0.07 cfs 311 cf

**Subcatchment 4S: Catchment Area 4** Runoff Area=32,149 sf 0.00% Impervious Runoff Depth>0.02"
Flow Length=231' Tc=34.5 min CN=30 Runoff=0.00 cfs 62 cf

**Subcatchment 5S: Catchment Area 5** Runoff Area=7,841 sf 0.00% Impervious Runoff Depth>0.02"
Flow Length=112' Tc=27.4 min CN=30 Runoff=0.00 cfs 16 cf

**Total Runoff Area = 99,118 sf Runoff Volume = 617 cf Average Runoff Depth = 0.07"**
**99.61% Pervious = 98,730 sf 0.39% Impervious = 388 sf**

## Summary for Subcatchment 1S: Catchment Area 1

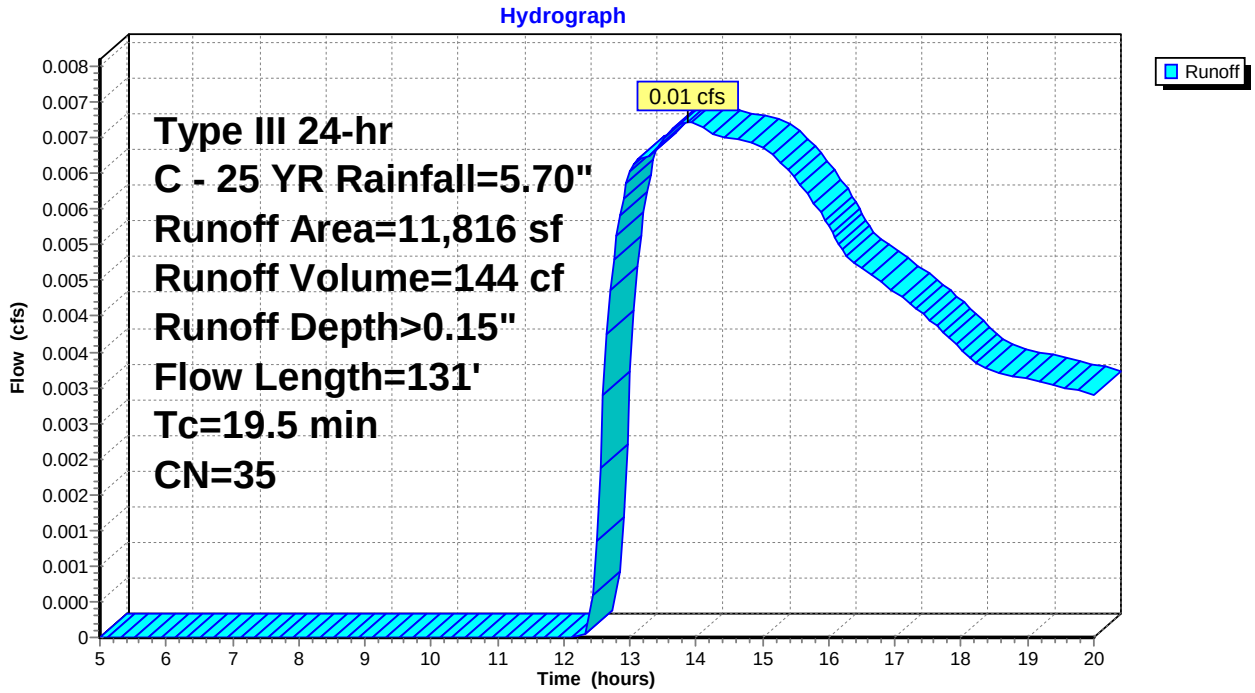
Runoff = 0.01 cfs @ 13.88 hrs, Volume= 144 cf, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 1,697 | 68 | <50% Grass cover, Poor, HSG A |
| 10,119 | 30 | Woods, Good, HSG A |
| 11,816 | 35 | Weighted Average |
| 11,816 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.5 | 50 | 0.0260 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 1.0 | 81 | 0.0691 | 1.31 | | **Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps |
| 19.5 | 131 | Total | | | |

## Subcatchment 1S: Catchment Area 1



## Summary for Subcatchment 2S: Catchment Area 2

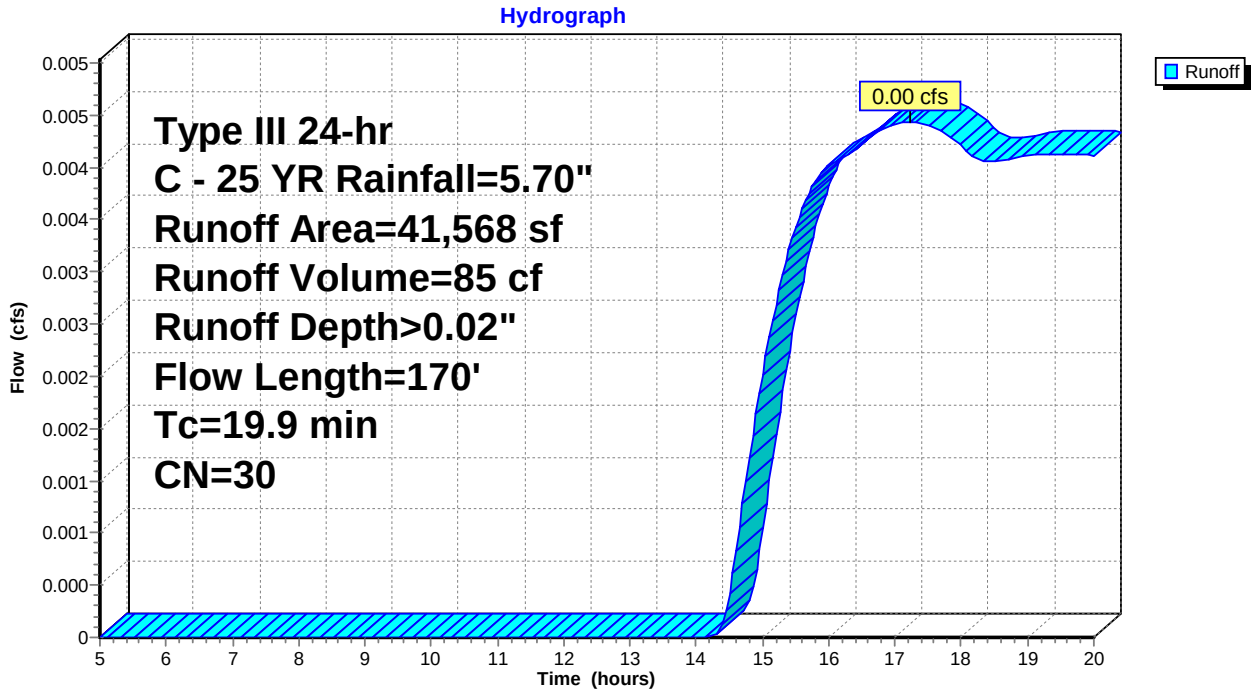
Runoff = 0.00 cfs @ 17.22 hrs, Volume= 85 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 462 | 68 | <50% Grass cover, Poor, HSG A |
| 41,106 | 30 | Woods, Good, HSG A |
| 41,568 | 30 | Weighted Average |
| 41,568 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.0 | 50 | 0.0320 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.9 | 120 | 0.0750 | 0.68 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 19.9 | 170 | Total | | | |

## Subcatchment 2S: Catchment Area 2



## Summary for Subcatchment 3S: Catchment Area 3

[49] Hint: Tc<2dt may require smaller dt

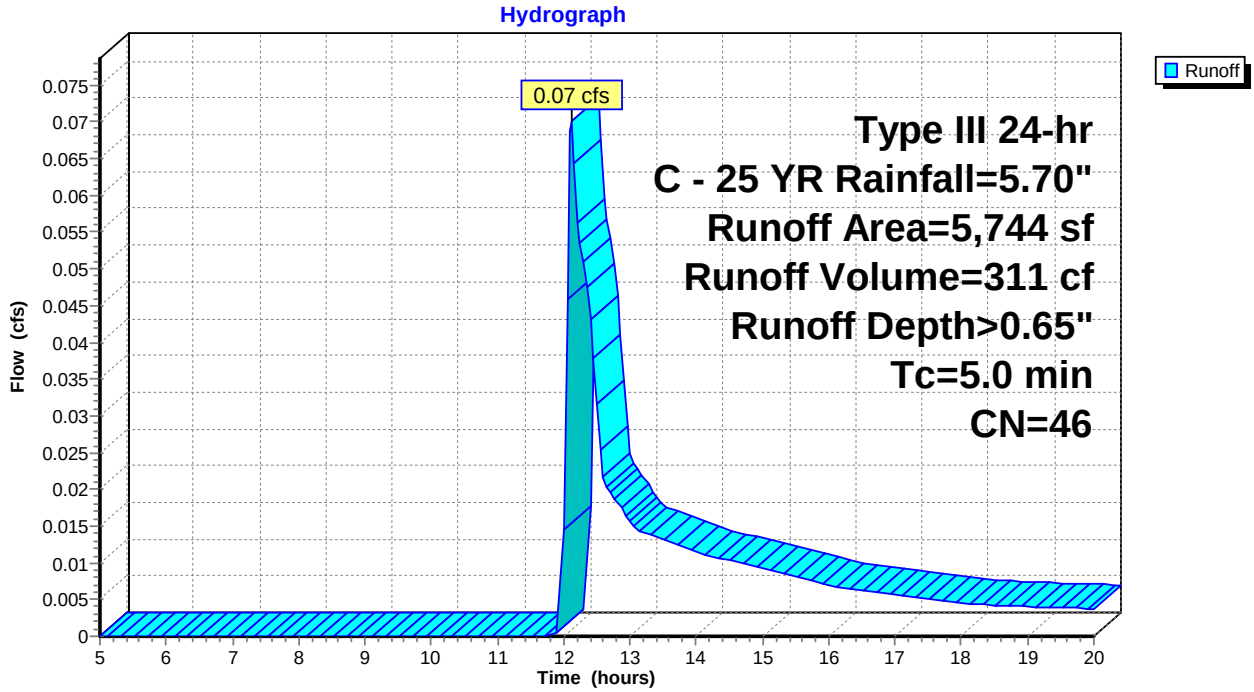
Runoff = 0.07 cfs @ 12.12 hrs, Volume= 311 cf, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 1,701 | 68 | <50% Grass cover, Poor, HSG A |
| 3,655 | 30 | Woods, Good, HSG A |
| 388 | 98 | Paved parking, HSG A |
| 5,744 | 46 | Weighted Average |
| 5,356 | | 93.25% Pervious Area |
| 388 | | 6.75% Impervious Area |

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

## Subcatchment 3S: Catchment Area 3



## Summary for Subcatchment 4S: Catchment Area 4

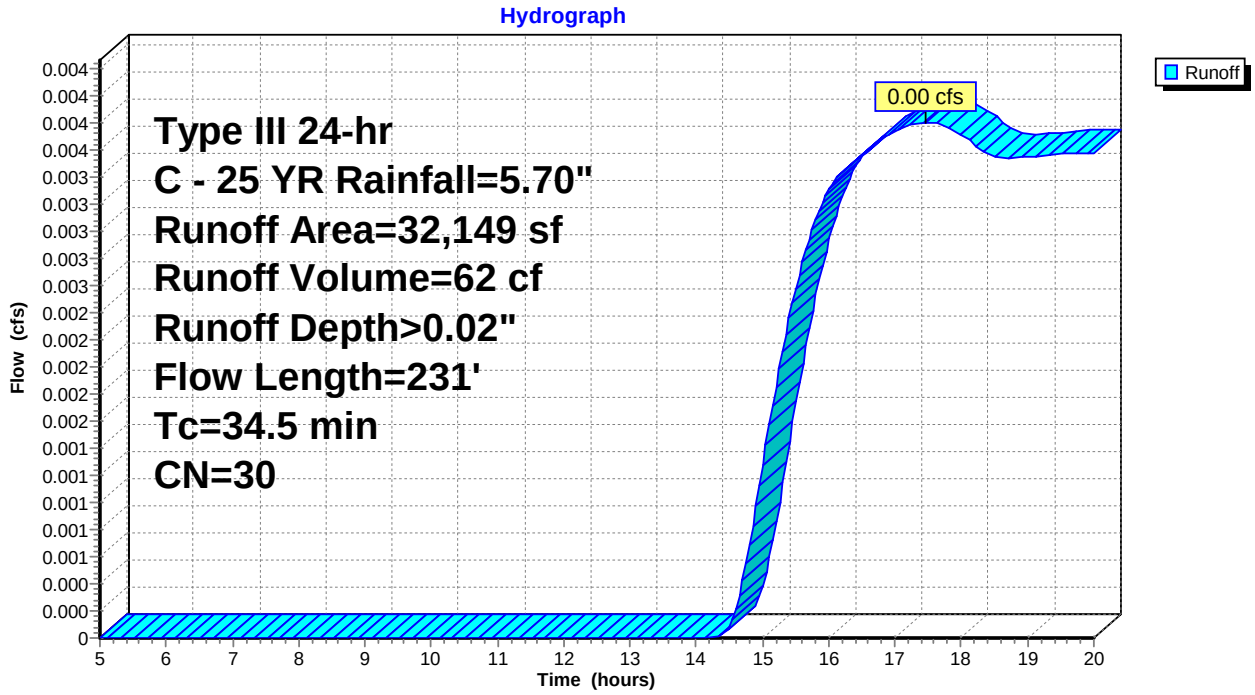
Runoff = 0.00 cfs @ 17.46 hrs, Volume= 62 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 32,149 | 30 | Woods, Good, HSG A |
| 32,149 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.6 | 50 | 0.0080 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 4.9 | 181 | 0.0608 | 0.62 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 34.5 | 231 | Total | | | |

## Subcatchment 4S: Catchment Area 4



## Summary for Subcatchment 5S: Catchment Area 5

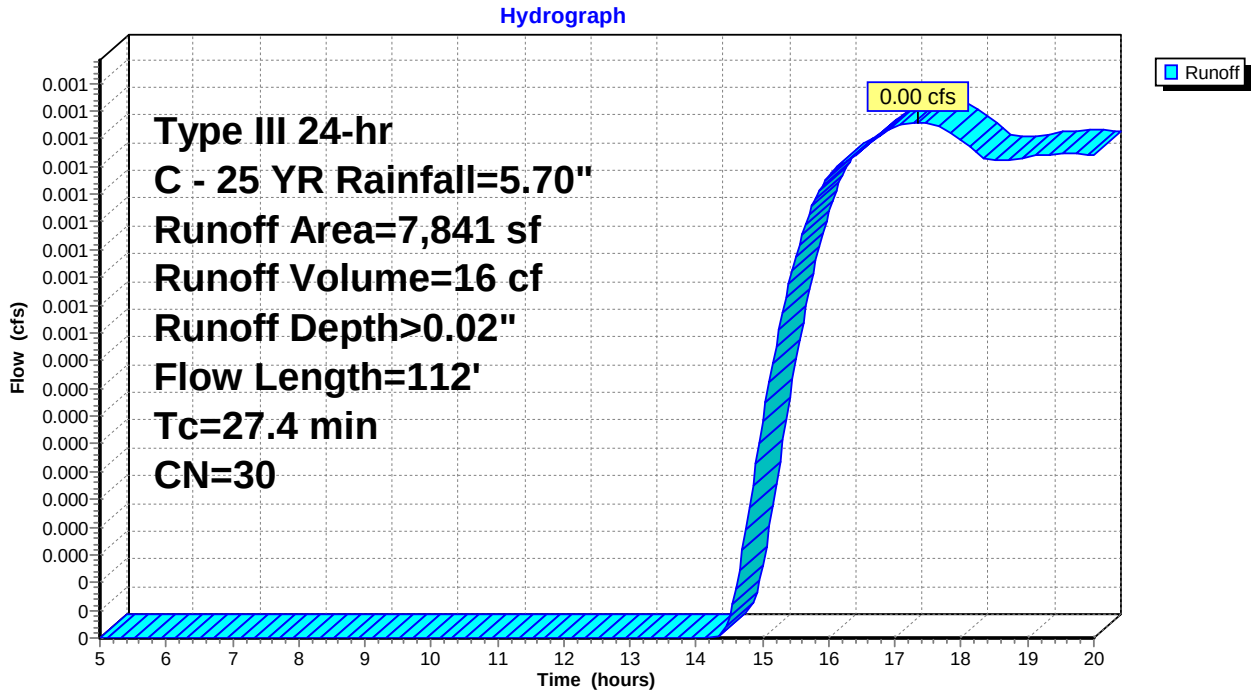
Runoff = 0.00 cfs @ 17.34 hrs, Volume= 16 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 7,841 | 30 | Woods, Good, HSG A |
| 7,841 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.2 | 50 | 0.0120 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.2 | 62 | 0.0339 | 0.46 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 27.4 | 112 | Total | | | |

## Subcatchment 5S: Catchment Area 5



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

**Subcatchment 1S: Catchment Area 1** Runoff Area=11,816 sf 0.00% Impervious Runoff Depth>0.41"
Flow Length=131' Tc=19.5 min CN=35 Runoff=0.04 cfs 400 cf

**Subcatchment 2S: Catchment Area 2** Runoff Area=41,568 sf 0.00% Impervious Runoff Depth>0.16"
Flow Length=170' Tc=19.9 min CN=30 Runoff=0.03 cfs 550 cf

**Subcatchment 3S: Catchment Area 3** Runoff Area=5,744 sf 6.75% Impervious Runoff Depth>1.17"
Tc=5.0 min CN=46 Runoff=0.16 cfs 562 cf

**Subcatchment 4S: Catchment Area 4** Runoff Area=32,149 sf 0.00% Impervious Runoff Depth>0.16"
Flow Length=231' Tc=34.5 min CN=30 Runoff=0.02 cfs 417 cf

**Subcatchment 5S: Catchment Area 5** Runoff Area=7,841 sf 0.00% Impervious Runoff Depth>0.16"
Flow Length=112' Tc=27.4 min CN=30 Runoff=0.01 cfs 103 cf

**Total Runoff Area = 99,118 sf Runoff Volume = 2,032 cf Average Runoff Depth = 0.25"**
**99.61% Pervious = 98,730 sf 0.39% Impervious = 388 sf**

## Summary for Subcatchment 1S: Catchment Area 1

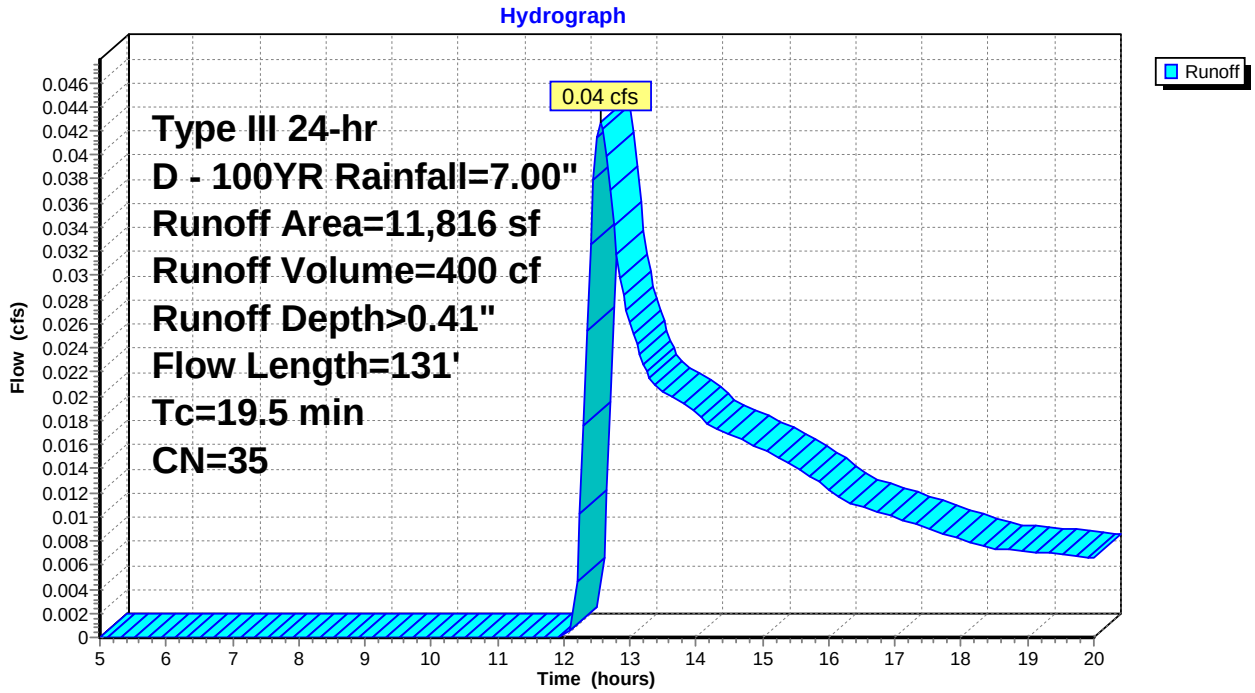
Runoff = 0.04 cfs @ 12.56 hrs, Volume= 400 cf, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 1,697 | 68 | <50% Grass cover, Poor, HSG A |
| 10,119 | 30 | Woods, Good, HSG A |
| 11,816 | 35 | Weighted Average |
| 11,816 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.5 | 50 | 0.0260 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 1.0 | 81 | 0.0691 | 1.31 | | **Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps |
| 19.5 | 131 | Total | | | |

## Subcatchment 1S: Catchment Area 1



## Summary for Subcatchment 2S: Catchment Area 2

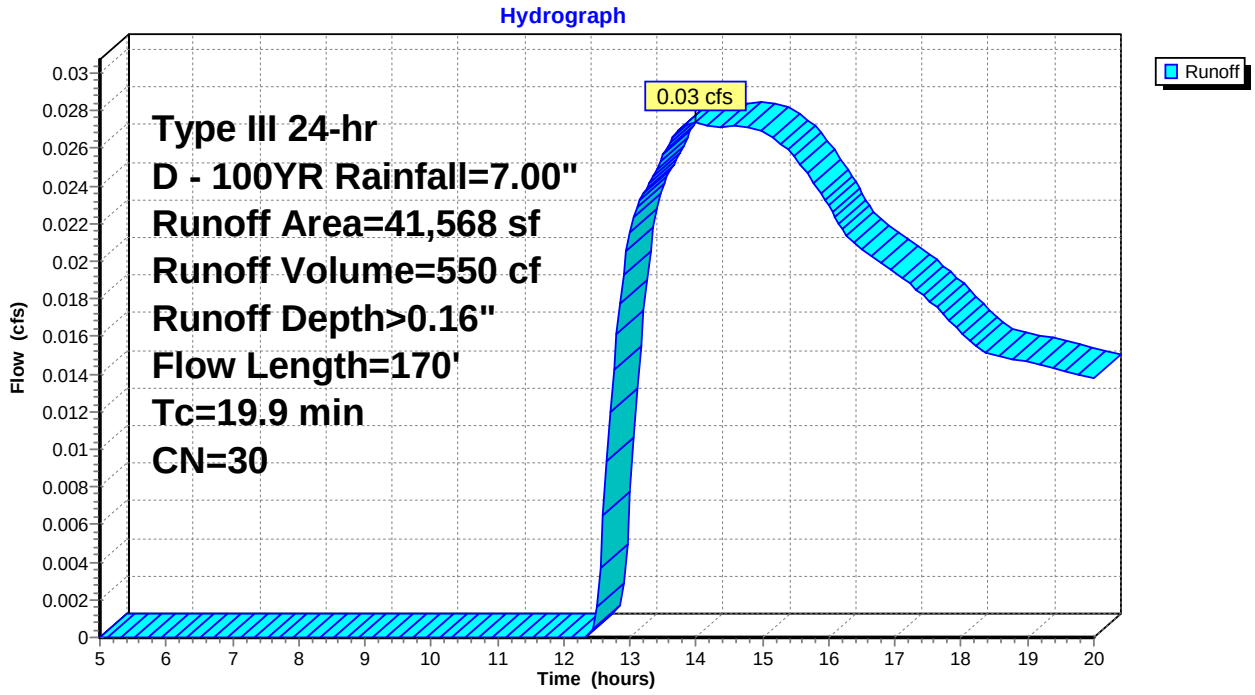
Runoff = 0.03 cfs @ 13.99 hrs, Volume= 550 cf, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 462 | 68 | <50% Grass cover, Poor, HSG A |
| 41,106 | 30 | Woods, Good, HSG A |
| 41,568 | 30 | Weighted Average |
| 41,568 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.0 | 50 | 0.0320 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.9 | 120 | 0.0750 | 0.68 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 19.9 | 170 | Total | | | |

## Subcatchment 2S: Catchment Area 2



## Summary for Subcatchment 3S: Catchment Area 3

[49] Hint: Tc<2dt may require smaller dt

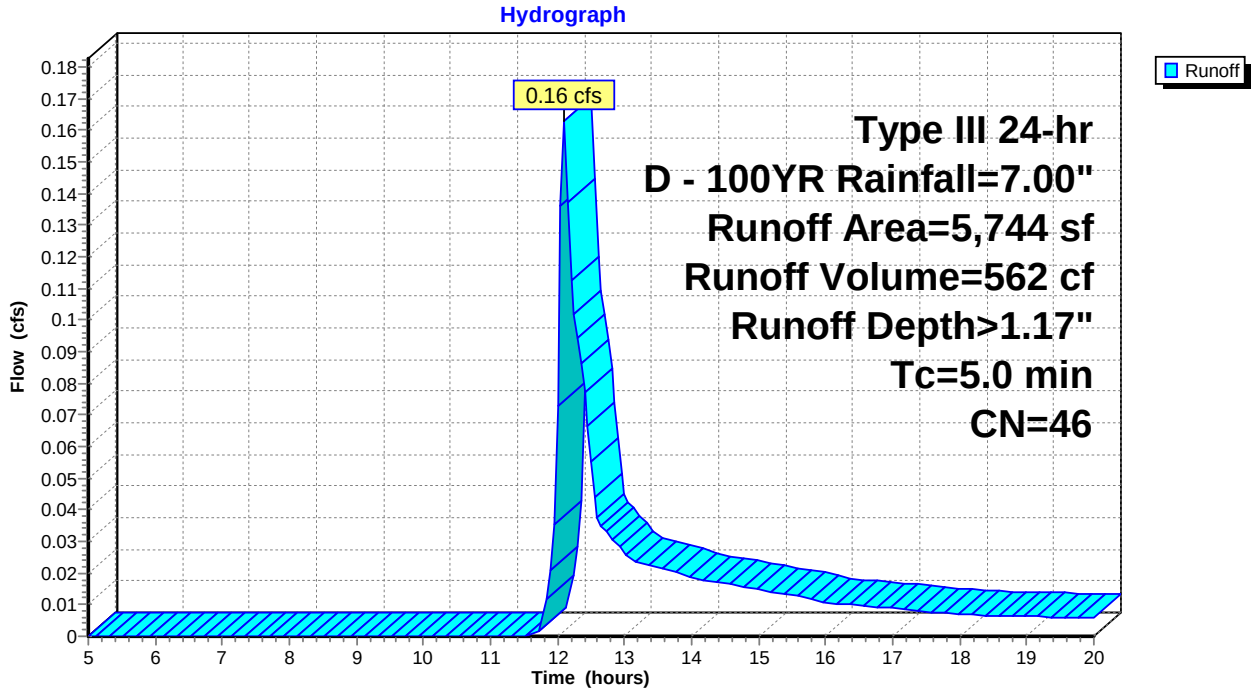
Runoff = 0.16 cfs @ 12.10 hrs, Volume= 562 cf, Depth> 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 1,701 | 68 | <50% Grass cover, Poor, HSG A |
| 3,655 | 30 | Woods, Good, HSG A |
| 388 | 98 | Paved parking, HSG A |
| 5,744 | 46 | Weighted Average |
| 5,356 | | 93.25% Pervious Area |
| 388 | | 6.75% Impervious Area |

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

### Subcatchment 3S: Catchment Area 3



## Summary for Subcatchment 4S: Catchment Area 4

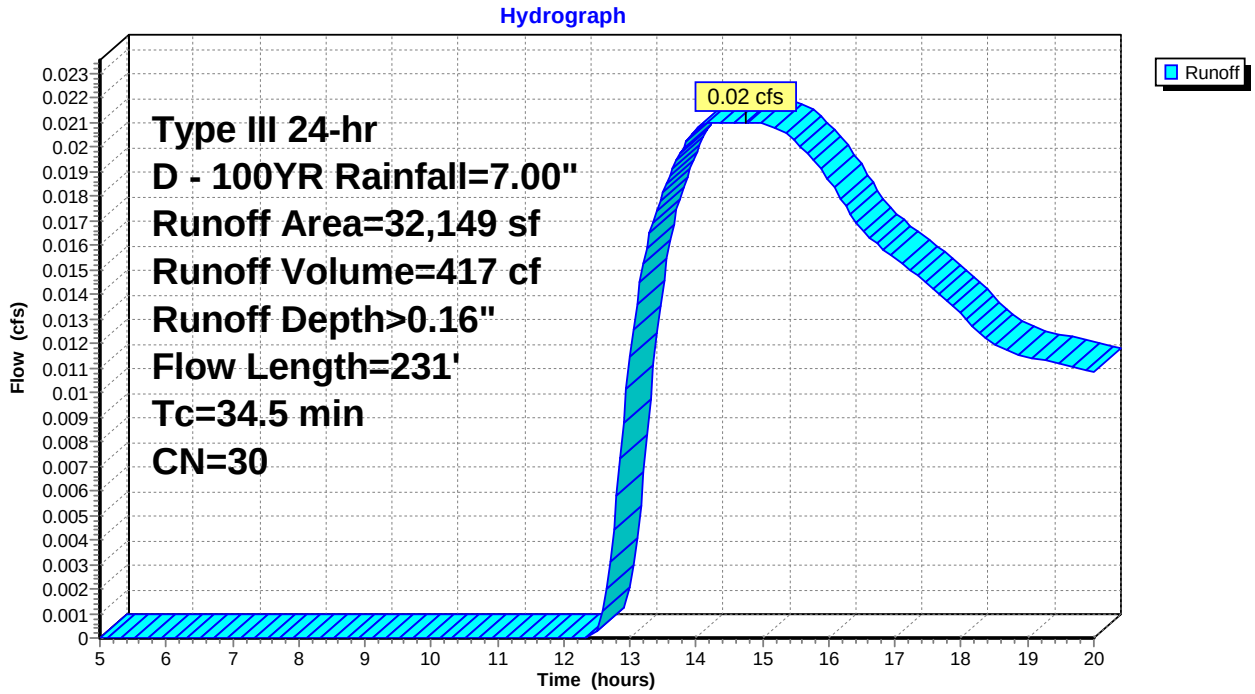
Runoff = 0.02 cfs @ 14.75 hrs, Volume= 417 cf, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 32,149 | 30 | Woods, Good, HSG A |
| 32,149 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.6 | 50 | 0.0080 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 4.9 | 181 | 0.0608 | 0.62 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 34.5 | 231 | Total | | | |

## Subcatchment 4S: Catchment Area 4



## Summary for Subcatchment 5S: Catchment Area 5

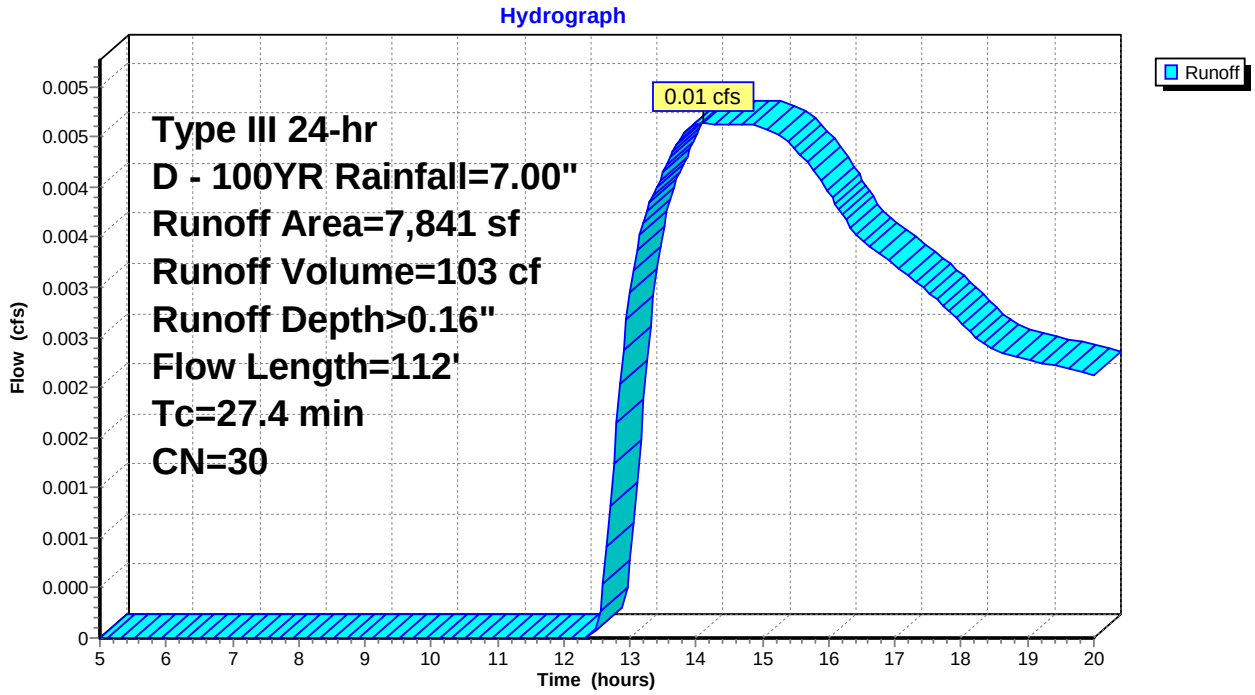
Runoff = 0.01 cfs @ 14.11 hrs, Volume= 103 cf, Depth> 0.16"

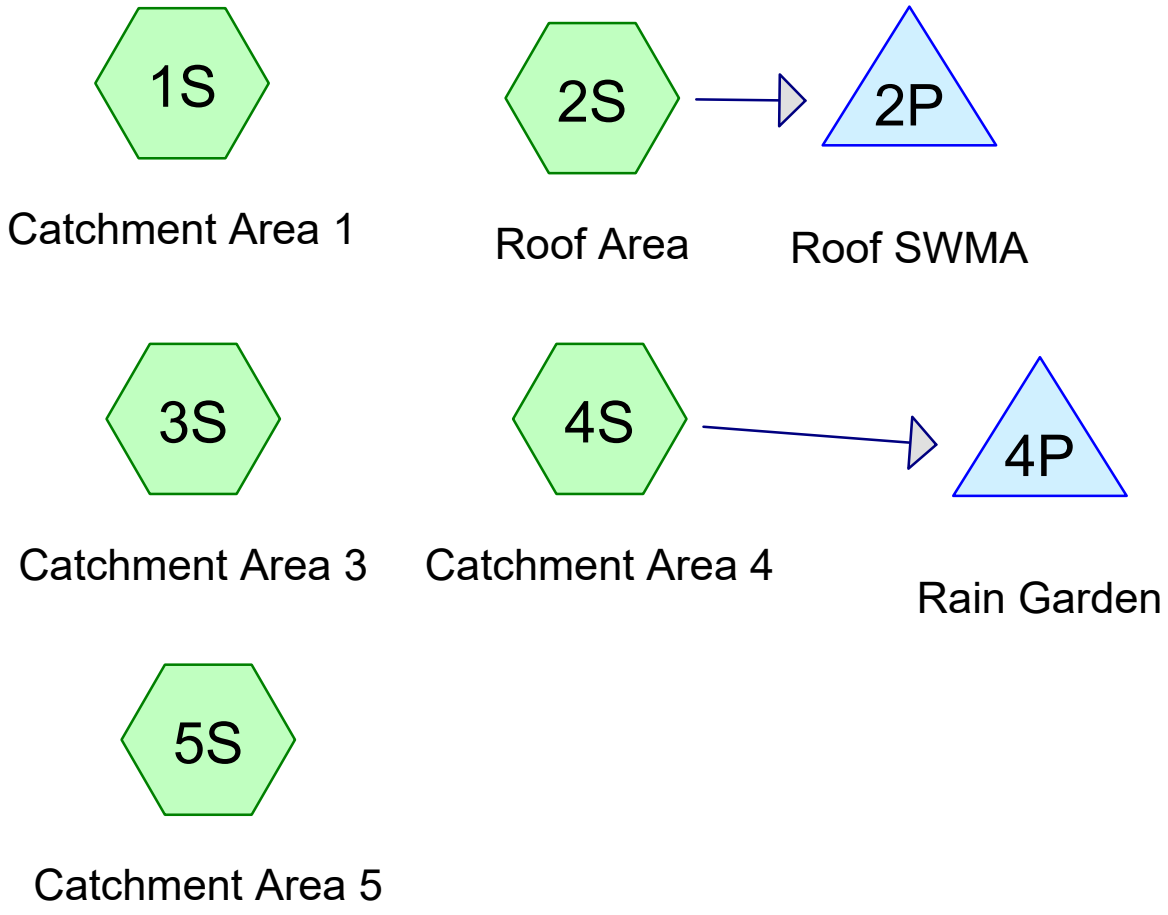
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 7,841 | 30 | Woods, Good, HSG A |
| 7,841 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.2 | 50 | 0.0120 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.2 | 62 | 0.0339 | 0.46 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 27.4 | 112 | Total | | | |

## Subcatchment 5S: Catchment Area 5






Subcat Reach Pond Link

**Routing Diagram for 474 Main Street - Post-Development**
Prepared by {enter your company name here}, Printed 2/5/2024

## Area Listing (selected nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 4,093 | 68 | <50% Grass cover, Poor, HSG A (1S, 3S, 4S) |
| 6,630 | 39 | >75% Grass cover, Good, HSG A (4S) |
| 4,832 | 76 | Gravel roads, HSG A (4S) |
| 24,327 | 98 | Paved parking, HSG A (3S, 4S) |
| 6,000 | 98 | Roofs, HSG A (2S) |
| 53,552 | 30 | Woods, Good, HSG A (1S, 3S, 4S, 5S) |
| **99,434** | **55** | **TOTAL AREA** |

## Soil Listing (selected nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 99,434 | HSG A | 1S, 2S, 3S, 4S, 5S |
| 0 | HSG B | |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| **99,434** | | **TOTAL AREA** |

## Ground Covers (selected nodes)

| HSG-A (sq-ft) | HSG-B (sq-ft) | HSG-C (sq-ft) | HSG-D (sq-ft) | Other (sq-ft) | Total (sq-ft) | Ground Cover | Sub Num |
|---|---|---|---|---|---|---|---|
| 4,093 | 0 | 0 | 0 | 0 | 4,093 | <50% Grass cover, Poor | |
| 6,630 | 0 | 0 | 0 | 0 | 6,630 | >75% Grass cover, Good | |
| 4,832 | 0 | 0 | 0 | 0 | 4,832 | Gravel roads | |
| 24,327 | 0 | 0 | 0 | 0 | 24,327 | Paved parking | |
| 6,000 | 0 | 0 | 0 | 0 | 6,000 | Roofs | |
| 53,552 | 0 | 0 | 0 | 0 | 53,552 | Woods, Good | |
| **99,434** | **0** | **0** | **0** | **0** | **99,434** | **TOTAL AREA** | |

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

**Subcatchment 1S: Catchment Area 1** Runoff Area=11,425 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=131' Tc=19.5 min CN=33 Runoff=0.00 cfs 0 cf

**Subcatchment 2S: Roof Area** Runoff Area=6,000 sf 100.00% Impervious Runoff Depth>3.05"
Tc=5.0 min CN=98 Runoff=0.47 cfs 1,524 cf

**Subcatchment 3S: Catchment Area 3** Runoff Area=6,322 sf 6.14% Impervious Runoff Depth>0.01"
Tc=5.0 min CN=41 Runoff=0.00 cfs 8 cf

**Subcatchment 4S: Catchment Area 4** Runoff Area=67,846 sf 35.28% Impervious Runoff Depth>0.42"
Flow Length=199' Tc=33.3 min CN=59 Runoff=0.33 cfs 2,386 cf

**Subcatchment 5S: Catchment Area 5** Runoff Area=7,841 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=112' Tc=27.4 min CN=30 Runoff=0.00 cfs 0 cf

**Pond 2P: Roof SWMA** Peak Elev=86.62' Storage=394 cf Inflow=0.47 cfs 1,524 cf
Outflow=0.11 cfs 1,523 cf

**Pond 4P: Rain Garden** Peak Elev=80.92' Storage=1,167 cf Inflow=0.33 cfs 2,386 cf
Outflow=0.06 cfs 1,453 cf

**Total Runoff Area = 99,434 sf Runoff Volume = 3,919 cf Average Runoff Depth = 0.47"**
**69.50% Pervious = 69,107 sf 30.50% Impervious = 30,327 sf**

## Summary for Subcatchment 1S: Catchment Area 1

[45] Hint: Runoff=Zero

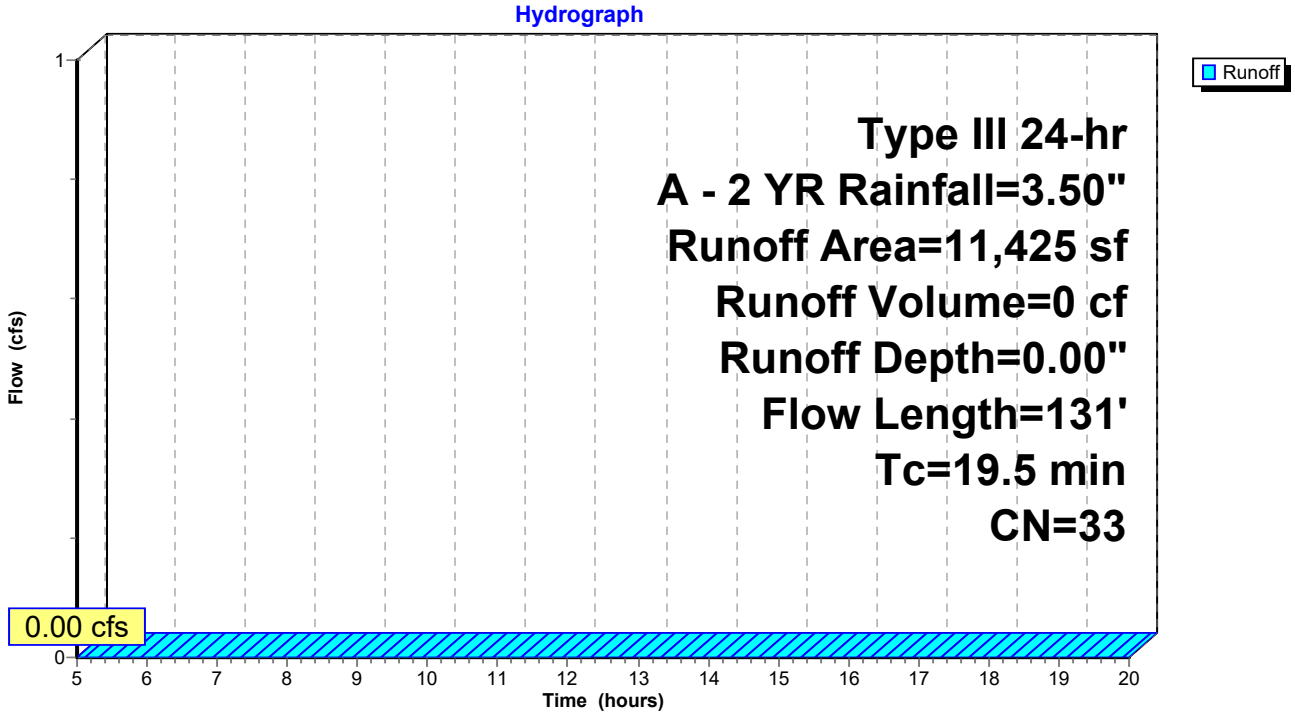
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 827 | 68 | <50% Grass cover, Poor, HSG A |
| 10,598 | 30 | Woods, Good, HSG A |
| 11,425 | 33 | Weighted Average |
| 11,425 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.5 | 50 | 0.0260 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 1.0 | 81 | 0.0691 | 1.31 | | **Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps |
| 19.5 | 131 | Total | | | |

### Subcatchment 1S: Catchment Area 1



## Summary for Subcatchment 2S: Roof Area

[49] Hint: Tc<2dt may require smaller dt

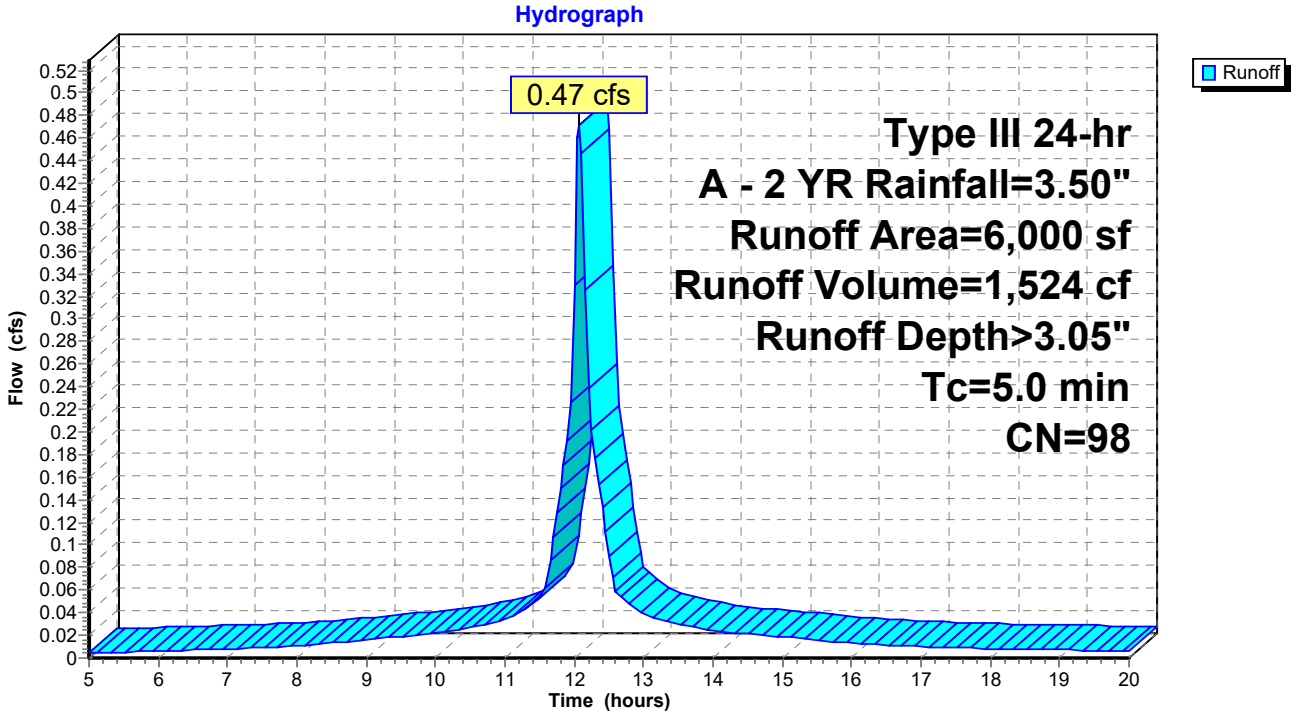
Runoff = 0.47 cfs @ 12.07 hrs, Volume= 1,524 cf, Depth> 3.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 6,000 | 98 | Roofs, HSG A |
| 6,000 | | 100.00% Impervious Area |

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

### Subcatchment 2S: Roof Area



## Summary for Subcatchment 3S: Catchment Area 3

[49] Hint: Tc<2dt may require smaller dt

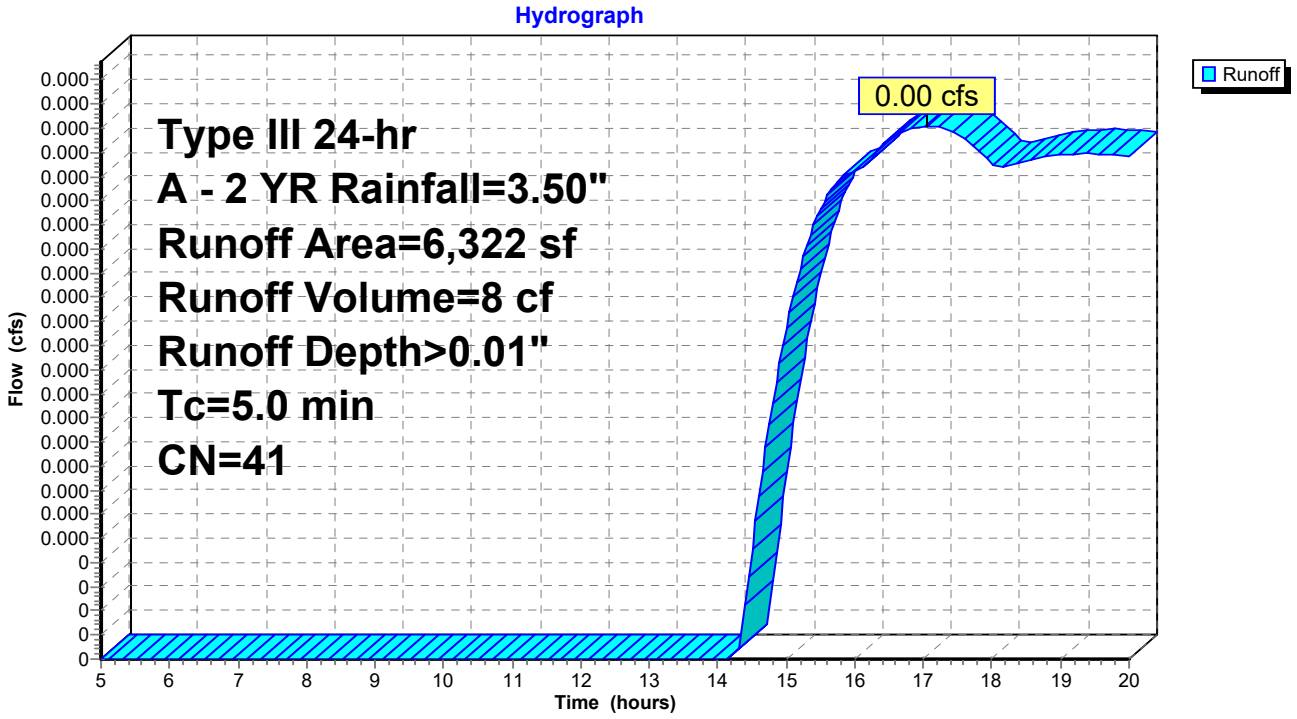
Runoff = 0.00 cfs @ 17.05 hrs, Volume= 8 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 1,203 | 68 | <50% Grass cover, Poor, HSG A |
| 4,731 | 30 | Woods, Good, HSG A |
| 388 | 98 | Paved parking, HSG A |
| 6,322 | 41 | Weighted Average |
| 5,934 | | 93.86% Pervious Area |
| 388 | | 6.14% Impervious Area |

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

## Subcatchment 3S: Catchment Area 3



## Summary for Subcatchment 4S: Catchment Area 4

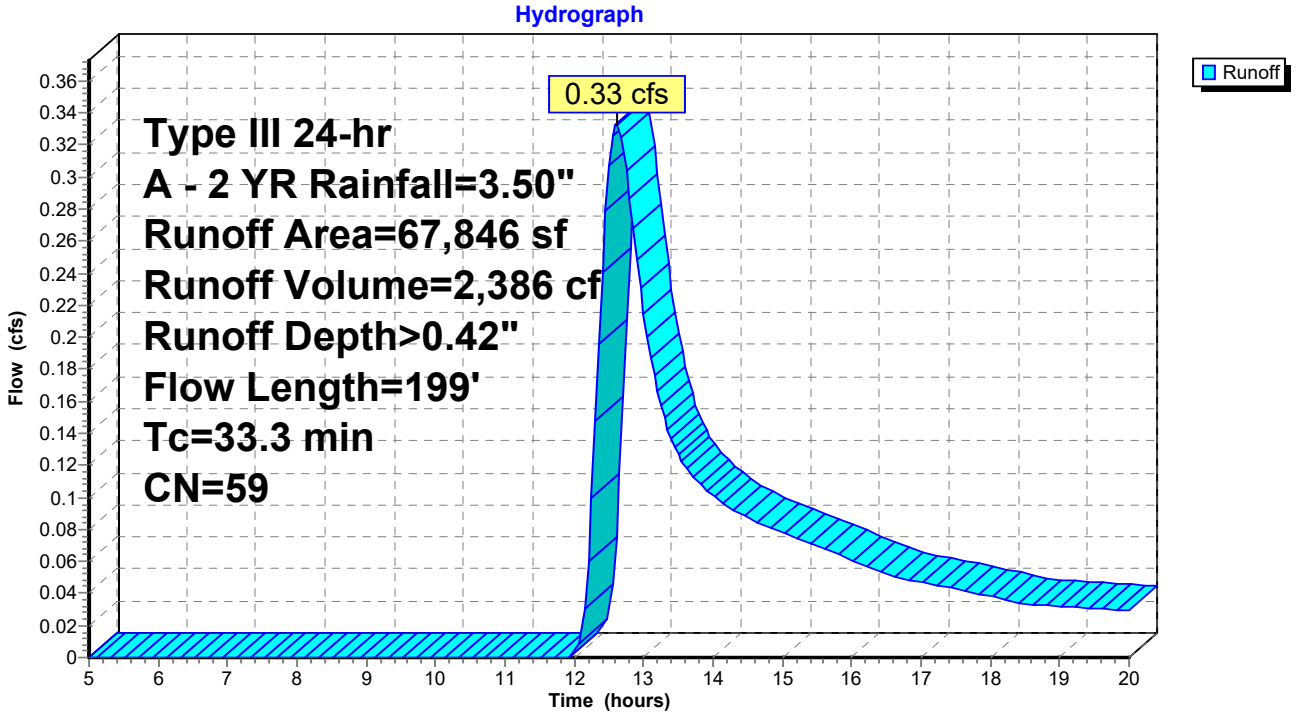
Runoff = 0.33 cfs @ 12.61 hrs, Volume= 2,386 cf, Depth> 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 30,382 | 30 | Woods, Good, HSG A |
| 23,939 | 98 | Paved parking, HSG A |
| 6,630 | 39 | >75% Grass cover, Good, HSG A |
| 4,832 | 76 | Gravel roads, HSG A |
| 2,063 | 68 | <50% Grass cover, Poor, HSG A |
| 67,846 | 59 | Weighted Average |
| 43,907 | | 64.72% Pervious Area |
| 23,939 | | 35.28% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.6 | 50 | 0.0080 | 0.03 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 3.5 | 82 | 0.0250 | 0.40 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 0.2 | 67 | 0.1300 | 7.32 | | **Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps |
| 33.3 | 199 | Total | | | |

## Subcatchment 4S: Catchment Area 4



## Summary for Subcatchment 5S: Catchment Area 5

[45] Hint: Runoff=Zero

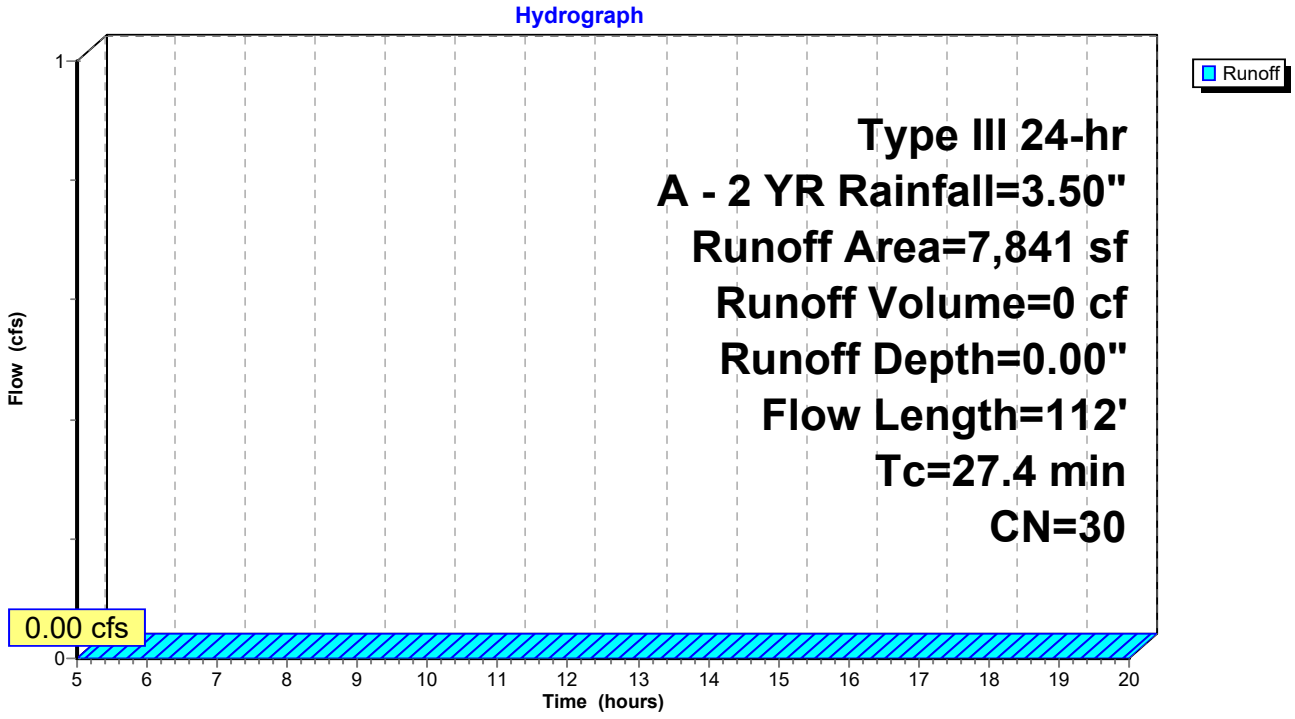
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr A - 2 YR Rainfall=3.50"

| Area (sf) | CN | Description |
|---|---|---|
| 7,841 | 30 | Woods, Good, HSG A |
| 7,841 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.2 | 50 | 0.0120 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.2 | 62 | 0.0339 | 0.46 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 27.4 | 112 | Total | | | |

### Subcatchment 5S: Catchment Area 5



## Summary for Pond 2P: Roof SWMA

[82] Warning: Early inflow requires earlier time span

Inflow Area = 6,000 sf,100.00% Impervious, Inflow Depth > 3.05" for A - 2 YR event
Inflow = 0.47 cfs @ 12.07 hrs, Volume= 1,524 cf
Outflow = 0.11 cfs @ 12.46 hrs, Volume= 1,523 cf, Atten= 77%, Lag= 23.1 min
Discarded = 0.11 cfs @ 12.46 hrs, Volume= 1,523 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 86.62' @ 12.46 hrs Surf.Area= 340 sf Storage= 394 cf

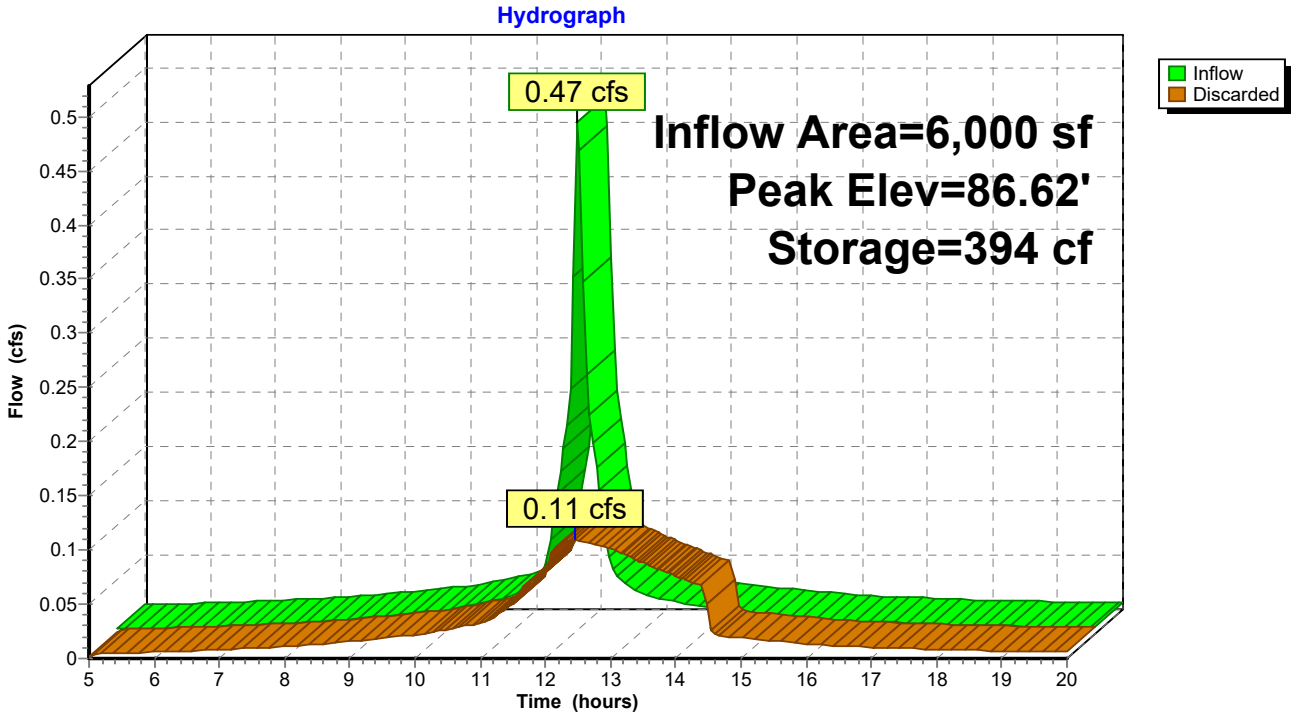
Plug-Flow detention time= 23.7 min calculated for 1,518 cf (100% of inflow)
Center-of-Mass det. time= 23.2 min ( 760.2 - 737.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 84.00' | 769 cf | **10.00'W x 34.00'L x 8.00'H Prismatoid**<br>2,720 cf Overall - 796 cf Embedded = 1,924 cf x 40.0% Voids |
| #2 | 86.00' | 679 cf | **6.00'D x 6.00'H Vertical Cone/Cylinder** x 4 Inside #1<br>796 cf Overall - 3.0" Wall Thickness = 679 cf |
| | | 1,448 cf | Total Available Storage |

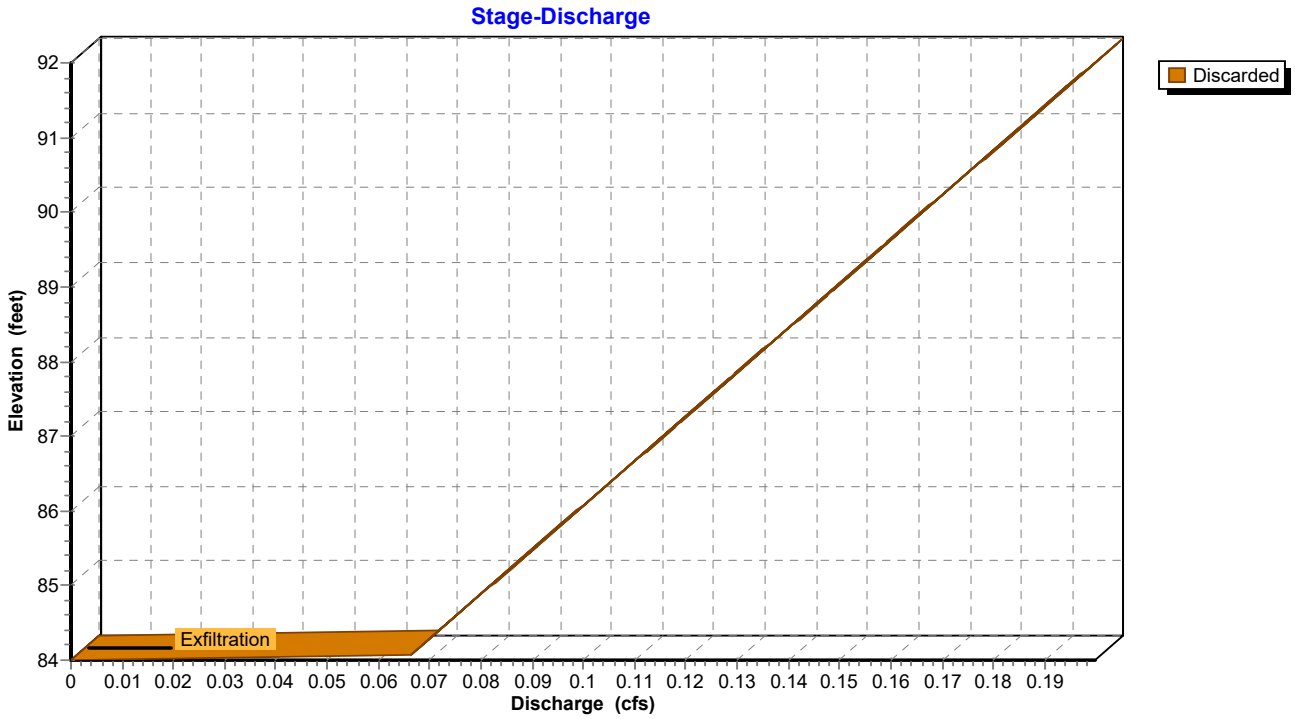
| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 84.00' | **8.270 in/hr Exfiltration over Wetted area** |

**Discarded OutFlow** Max=0.11 cfs @ 12.46 hrs HW=86.62' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

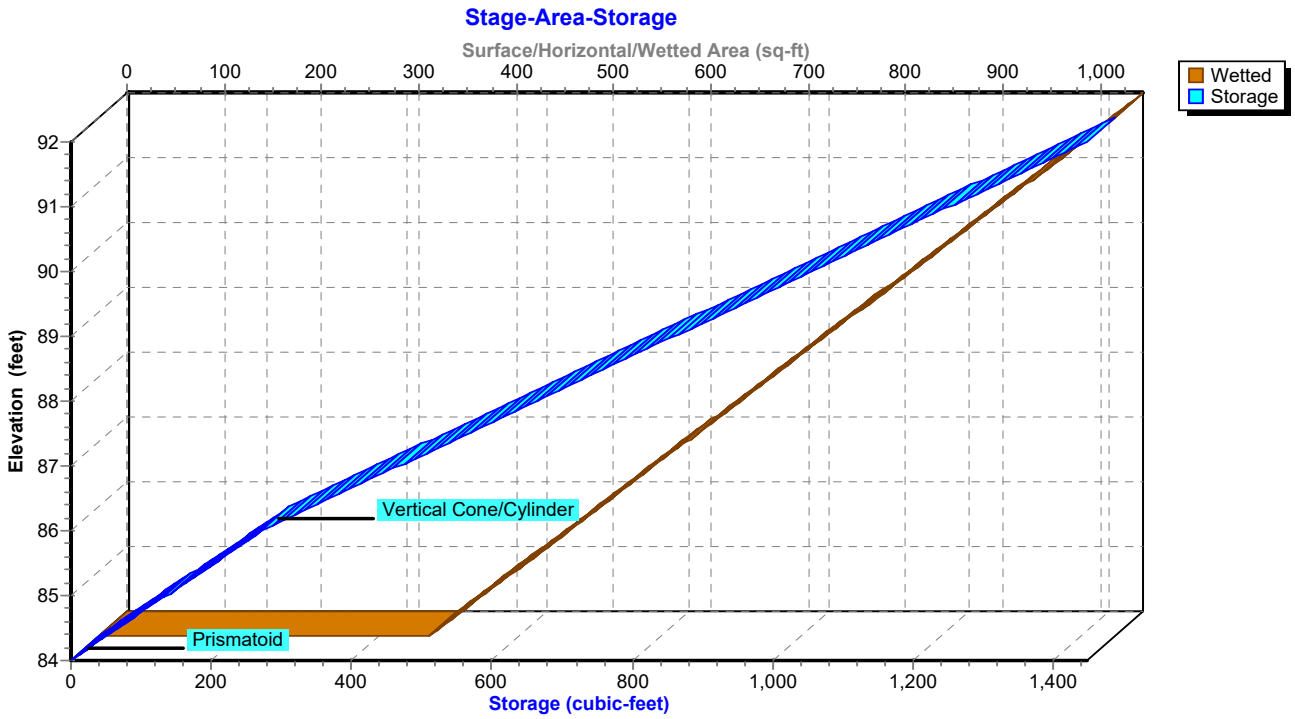
## Pond 2P: Roof SWMA




## Pond 2P: Roof SWMA



## Pond 2P: Roof SWMA



## Summary for Pond 4P: Rain Garden

Inflow Area = 67,846 sf, 35.28% Impervious, Inflow Depth > 0.42" for A - 2 YR event
Inflow = 0.33 cfs @ 12.61 hrs, Volume= 2,386 cf
Outflow = 0.06 cfs @ 16.06 hrs, Volume= 1,453 cf, Atten= 82%, Lag= 207.0 min
Discarded = 0.06 cfs @ 16.06 hrs, Volume= 1,453 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 80.92' @ 16.06 hrs Surf.Area= 1,296 sf Storage= 1,167 cf

Plug-Flow detention time= 194.7 min calculated for 1,448 cf (61% of inflow)
Center-of-Mass det. time= 108.9 min ( 984.3 - 875.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 87.66' | 3,876 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) -Impervious |
| #2 | 78.75' | 2,873 cf | **36.00'W x 36.00'L x 8.00'H Prismatoid**<br>10,368 cf Overall - 3,186 cf Embedded = 7,182 cf x 40.0% Voids |
| #3 | 80.75' | 2,714 cf | **6.00'D x 6.00'H Vertical Cone/Cylinder** x 16 Inside #2<br>3,186 cf Overall - 3.0" Wall Thickness = 2,714 cf |
| | | 9,463 cf | Total Available Storage |

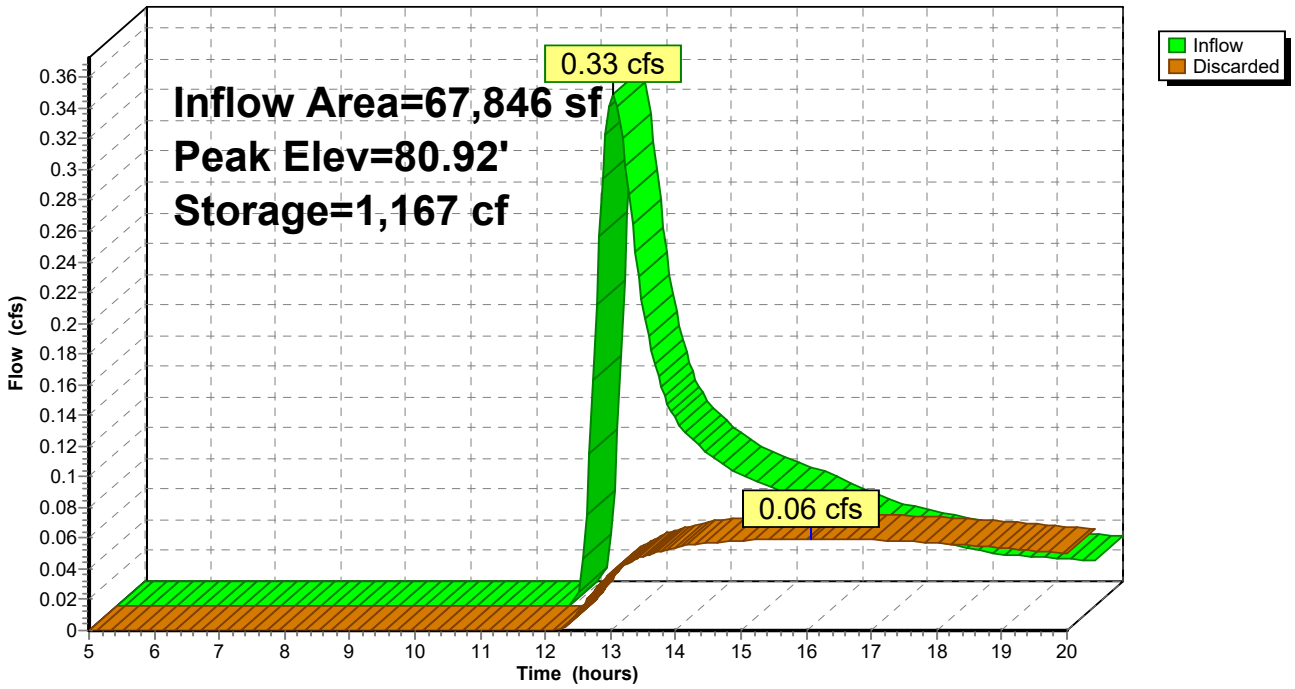
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Voids (%) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|---|
| 87.66 | 359 | 73.0 | 0.0 | 0 | 0 | 359 |
| 87.67 | 359 | 73.0 | 40.0 | 1 | 1 | 360 |
| 88.99 | 359 | 73.0 | 40.0 | 190 | 191 | 456 |
| 89.00 | 359 | 73.0 | 30.0 | 1 | 192 | 457 |
| 90.74 | 359 | 73.0 | 30.0 | 187 | 379 | 584 |
| 90.75 | 359 | 73.0 | 30.0 | 1 | 381 | 585 |
| 90.99 | 359 | 73.0 | 30.0 | 26 | 406 | 602 |
| 91.00 | 359 | 73.0 | 100.0 | 4 | 410 | 603 |
| 92.00 | 606 | 91.9 | 100.0 | 477 | 887 | 864 |
| 93.00 | 910 | 110.7 | 100.0 | 753 | 1,640 | 1,184 |
| 94.00 | 1,270 | 129.6 | 100.0 | 1,085 | 2,725 | 1,565 |
| 94.80 | 1,614 | 145.3 | 100.0 | 1,151 | 3,876 | 1,925 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 78.75' | **8.270 in/hr Exfiltration over Wetted area from 78.75' - 90.00'**<br>Excluded Wetted area = 1,296 sf |

**Discarded OutFlow** Max=0.06 cfs @ 16.06 hrs HW=80.92' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

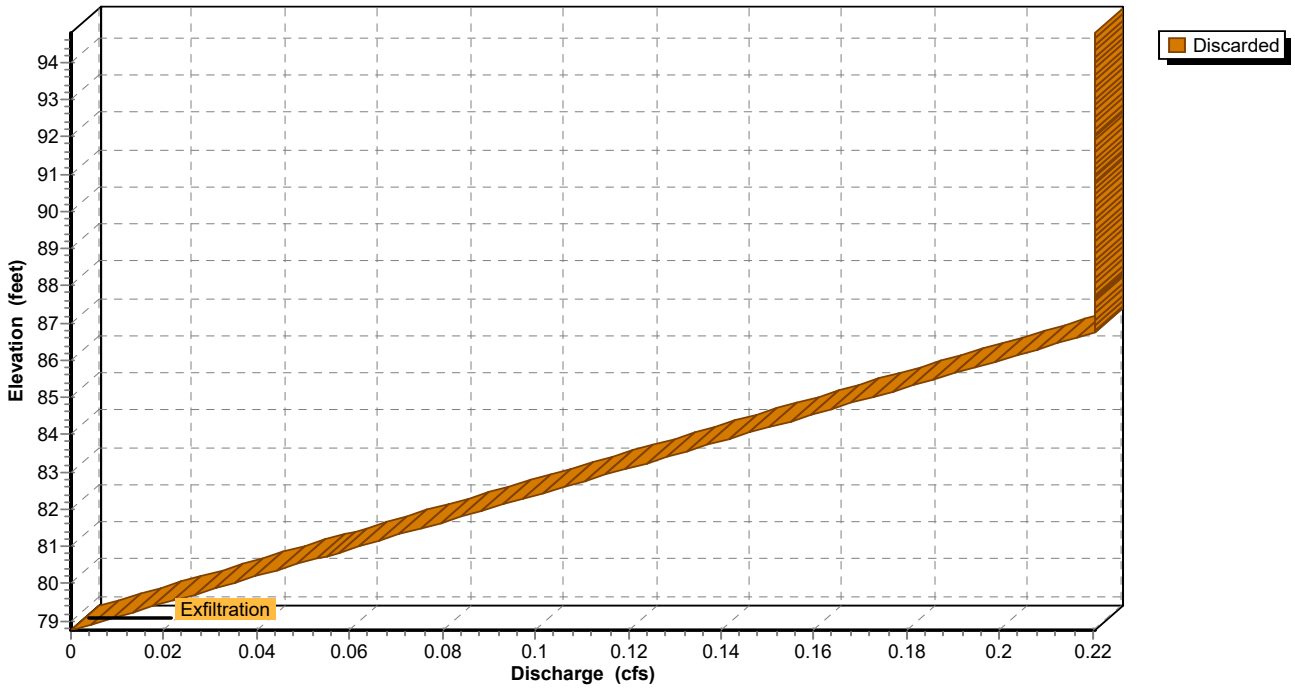
## Pond 4P: Rain Garden

Hydrograph

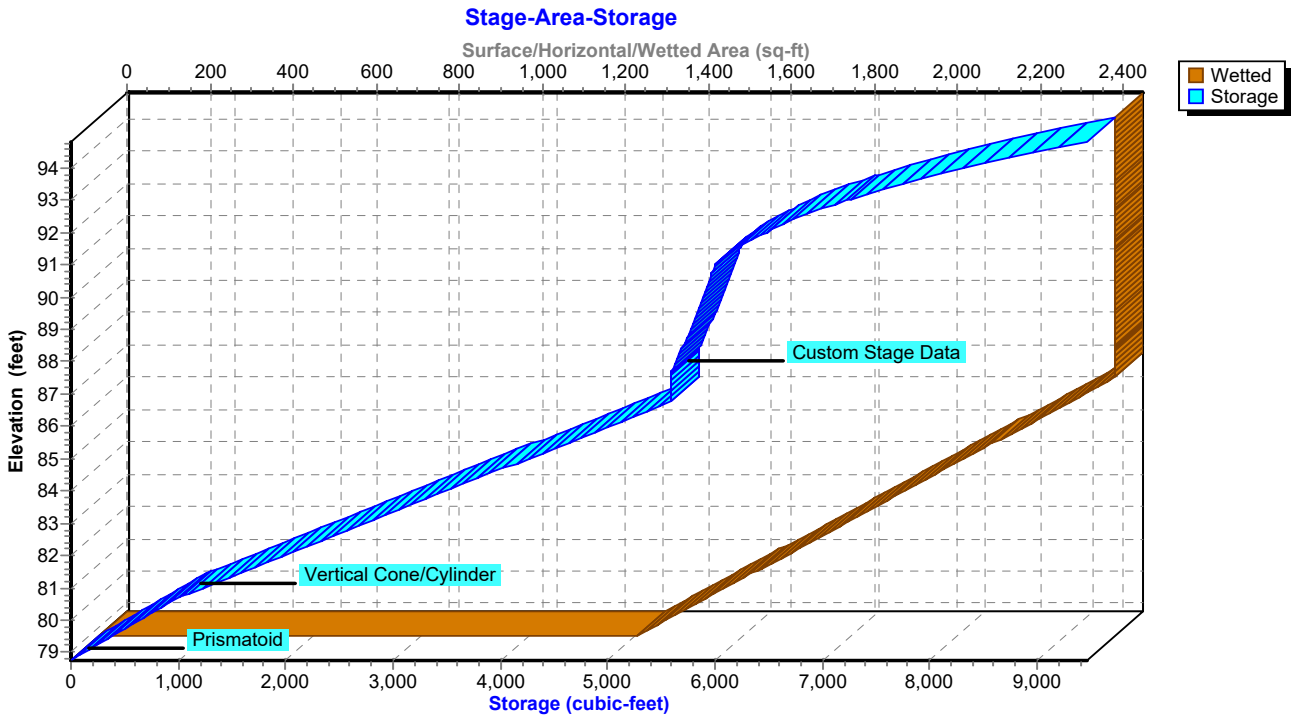



## Pond 4P: Rain Garden

Stage-Discharge



## Pond 4P: Rain Garden



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

**Subcatchment 1S: Catchment Area 1** Runoff Area=11,425 sf 0.00% Impervious Runoff Depth>0.01"
Flow Length=131' Tc=19.5 min CN=33 Runoff=0.00 cfs 12 cf

**Subcatchment 2S: Roof Area** Runoff Area=6,000 sf 100.00% Impervious Runoff Depth>4.24"
Tc=5.0 min CN=98 Runoff=0.65 cfs 2,118 cf

**Subcatchment 3S: Catchment Area 3** Runoff Area=6,322 sf 6.14% Impervious Runoff Depth>0.18"
Tc=5.0 min CN=41 Runoff=0.01 cfs 96 cf

**Subcatchment 4S: Catchment Area 4** Runoff Area=67,846 sf 35.28% Impervious Runoff Depth>0.99"
Flow Length=199' Tc=33.3 min CN=59 Runoff=0.96 cfs 5,621 cf

**Subcatchment 5S: Catchment Area 5** Runoff Area=7,841 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=112' Tc=27.4 min CN=30 Runoff=0.00 cfs 0 cf

**Pond 2P: Roof SWMA** Peak Elev=87.76' Storage=618 cf Inflow=0.65 cfs 2,118 cf
Outflow=0.13 cfs 2,117 cf

**Pond 4P: Rain Garden** Peak Elev=83.40' Storage=3,049 cf Inflow=0.96 cfs 5,621 cf
Outflow=0.13 cfs 3,192 cf

**Total Runoff Area = 99,434 sf Runoff Volume = 7,847 cf Average Runoff Depth = 0.95"**
**69.50% Pervious = 69,107 sf 30.50% Impervious = 30,327 sf**

## Summary for Subcatchment 1S: Catchment Area 1

[73] Warning: Peak may fall outside time span

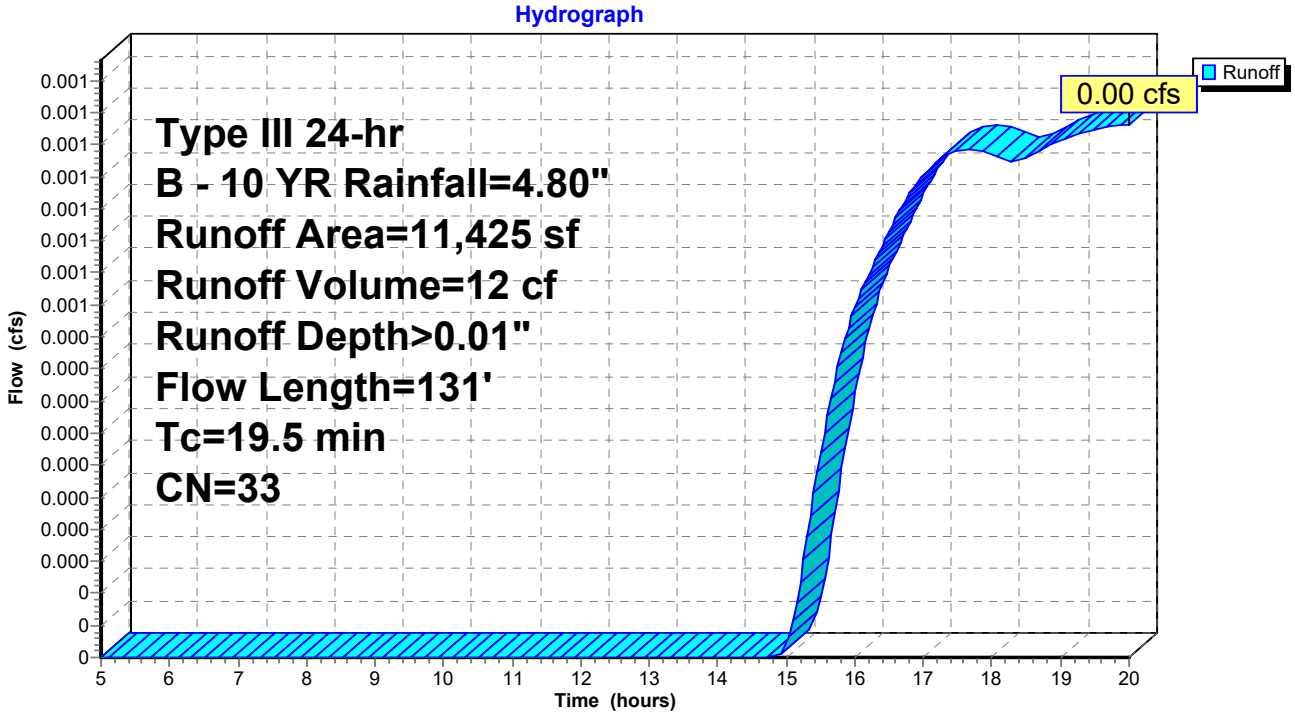
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 12 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 827 | 68 | <50% Grass cover, Poor, HSG A |
| 10,598 | 30 | Woods, Good, HSG A |
| 11,425 | 33 | Weighted Average |
| 11,425 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.5 | 50 | 0.0260 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 1.0 | 81 | 0.0691 | 1.31 | | **Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps |
| 19.5 | 131 | Total | | | |

### Subcatchment 1S: Catchment Area 1



## Summary for Subcatchment 2S: Roof Area

[49] Hint: Tc<2dt may require smaller dt

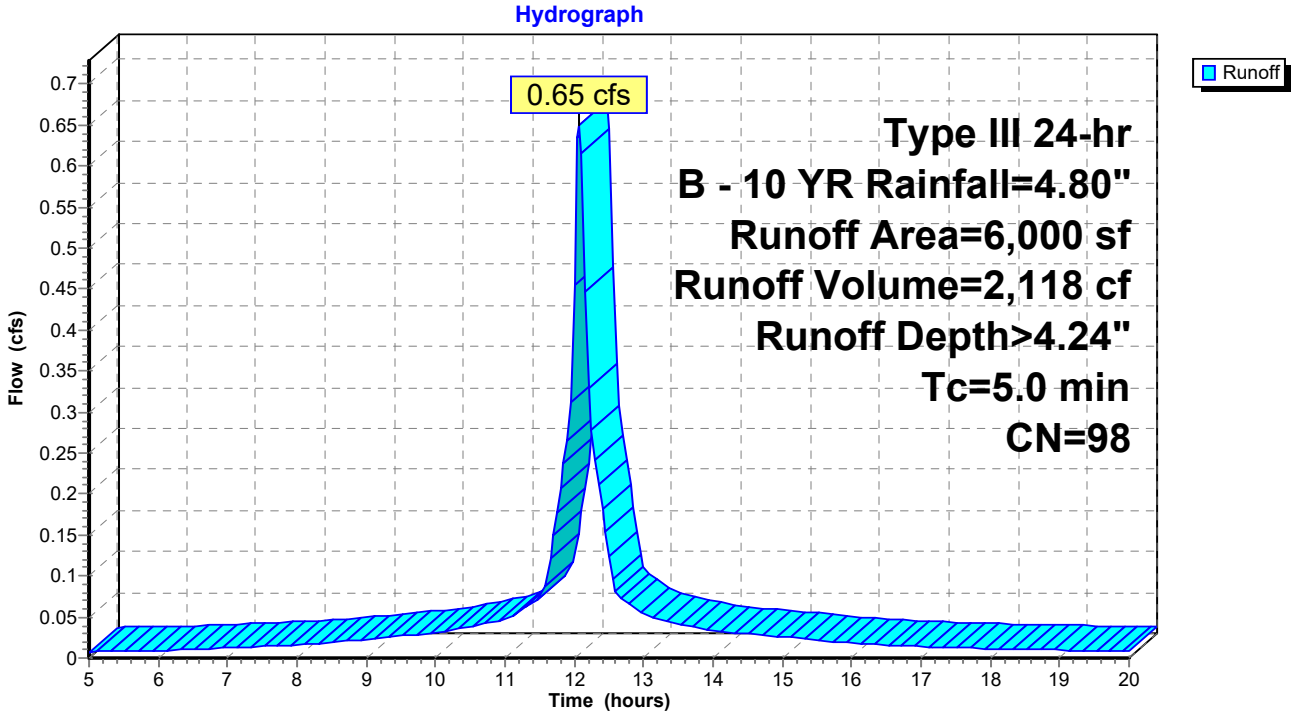
Runoff = 0.65 cfs @ 12.07 hrs, Volume= 2,118 cf, Depth> 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 6,000 | 98 | Roofs, HSG A |
| 6,000 | | 100.00% Impervious Area |

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

### Subcatchment 2S: Roof Area



## Summary for Subcatchment 3S: Catchment Area 3

[49] Hint: Tc<2dt may require smaller dt

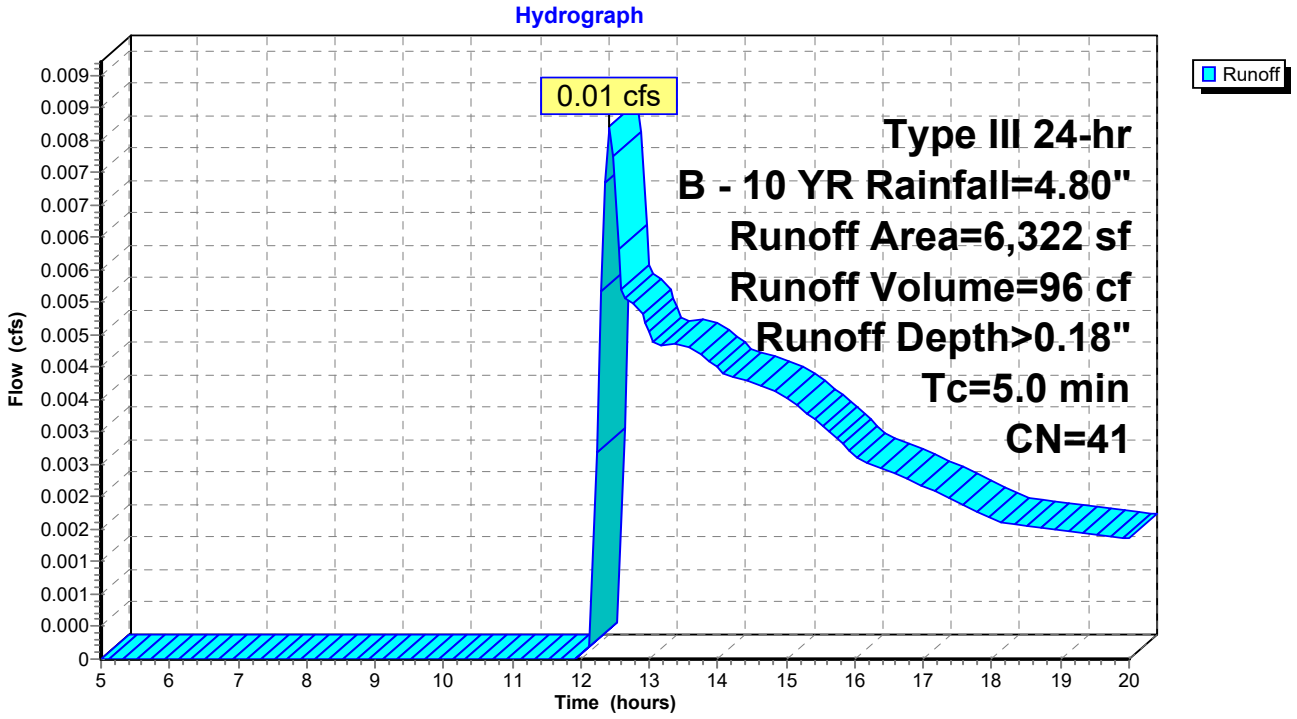
Runoff = 0.01 cfs @ 12.42 hrs, Volume= 96 cf, Depth> 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 1,203 | 68 | <50% Grass cover, Poor, HSG A |
| 4,731 | 30 | Woods, Good, HSG A |
| 388 | 98 | Paved parking, HSG A |
| 6,322 | 41 | Weighted Average |
| 5,934 | | 93.86% Pervious Area |
| 388 | | 6.14% Impervious Area |

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

## Subcatchment 3S: Catchment Area 3



## Summary for Subcatchment 4S: Catchment Area 4

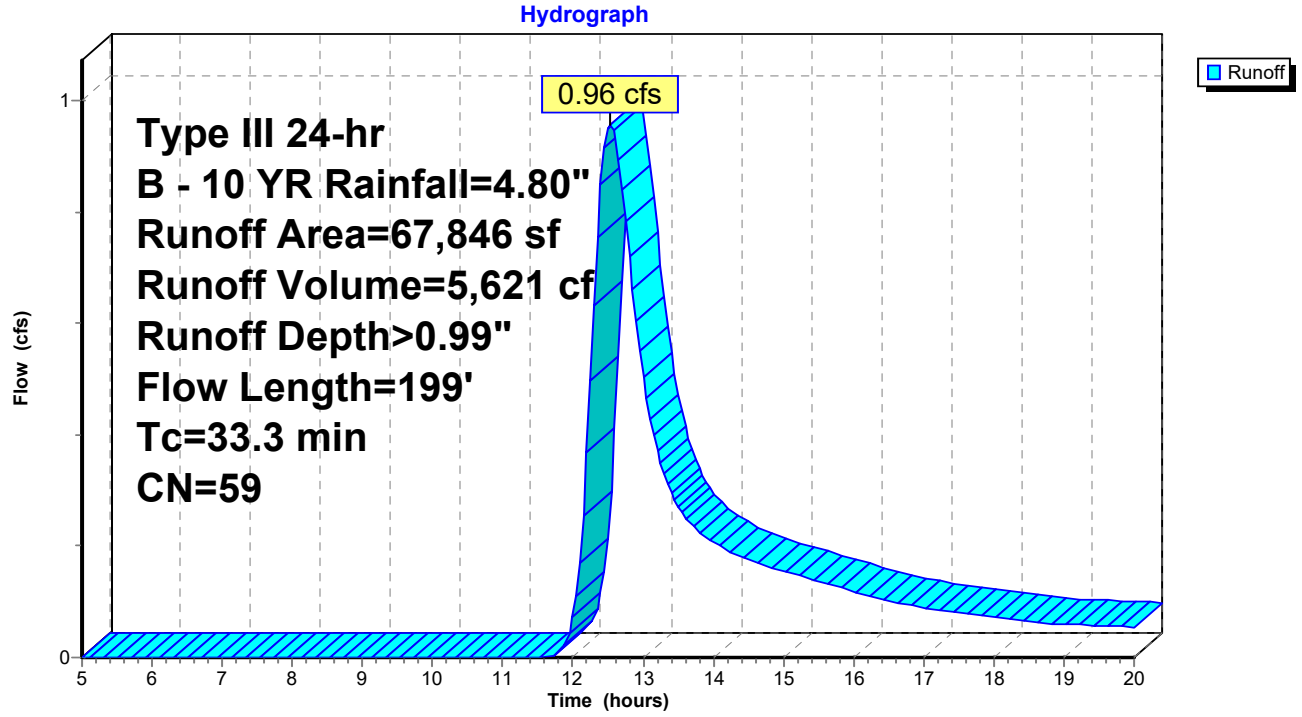
Runoff = 0.96 cfs @ 12.54 hrs, Volume= 5,621 cf, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 30,382 | 30 | Woods, Good, HSG A |
| 23,939 | 98 | Paved parking, HSG A |
| 6,630 | 39 | >75% Grass cover, Good, HSG A |
| 4,832 | 76 | Gravel roads, HSG A |
| 2,063 | 68 | <50% Grass cover, Poor, HSG A |
| 67,846 | 59 | Weighted Average |
| 43,907 | | 64.72% Pervious Area |
| 23,939 | | 35.28% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.6 | 50 | 0.0080 | 0.03 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 3.5 | 82 | 0.0250 | 0.40 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 0.2 | 67 | 0.1300 | 7.32 | | **Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps |
| 33.3 | 199 | Total | | | |

## Subcatchment 4S: Catchment Area 4



## Summary for Subcatchment 5S: Catchment Area 5

[45] Hint: Runoff=Zero

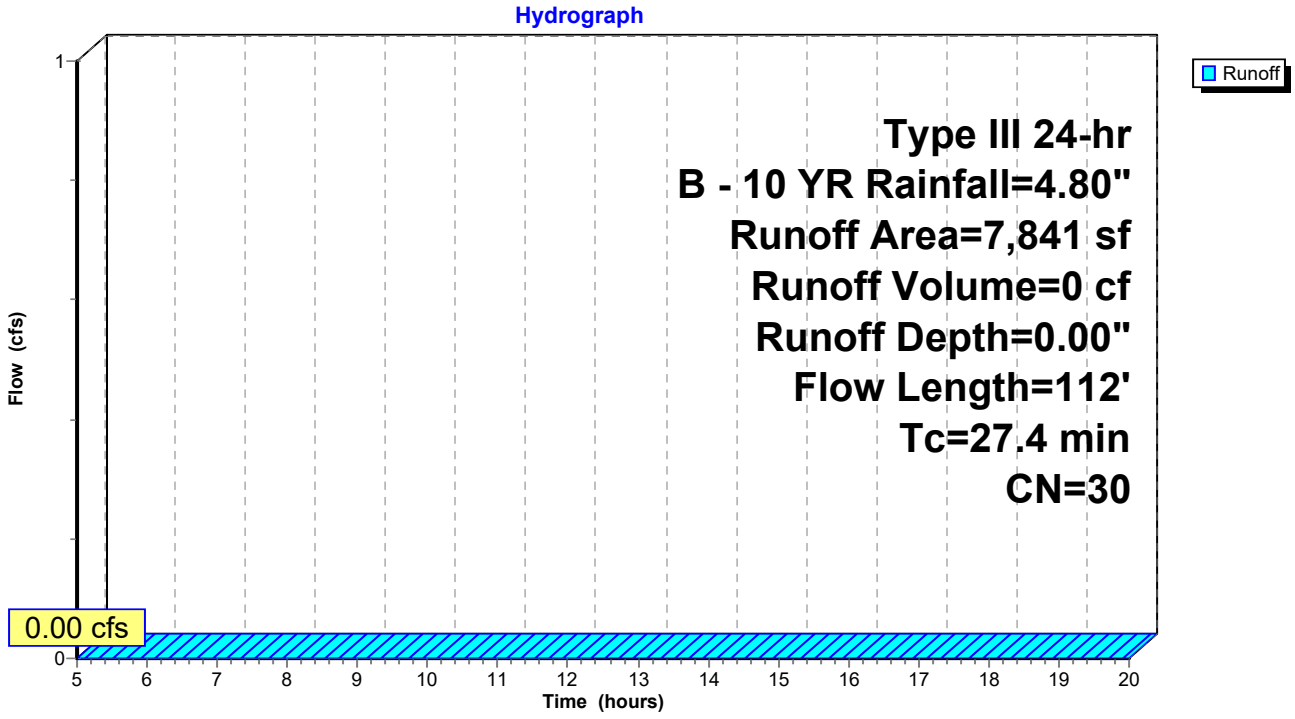
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr B - 10 YR Rainfall=4.80"

| Area (sf) | CN | Description |
|---|---|---|
| 7,841 | 30 | Woods, Good, HSG A |
| 7,841 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.2 | 50 | 0.0120 | 0.03 | | **Sheet Flow, A-B**<br>Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.2 | 62 | 0.0339 | 0.46 | | **Shallow Concentrated Flow, B-C**<br>Forest w/Heavy Litter Kv= 2.5 fps |
| 27.4 | 112 | Total | | | |

## Subcatchment 5S: Catchment Area 5



## Summary for Pond 2P: Roof SWMA

[82] Warning: Early inflow requires earlier time span

Inflow Area = 6,000 sf,100.00% Impervious, Inflow Depth > 4.24" for B - 10 YR event
Inflow = 0.65 cfs @ 12.07 hrs, Volume= 2,118 cf
Outflow = 0.13 cfs @ 12.49 hrs, Volume= 2,117 cf, Atten= 80%, Lag= 25.4 min
Discarded = 0.13 cfs @ 12.49 hrs, Volume= 2,117 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 87.76' @ 12.49 hrs Surf.Area= 340 sf Storage= 618 cf

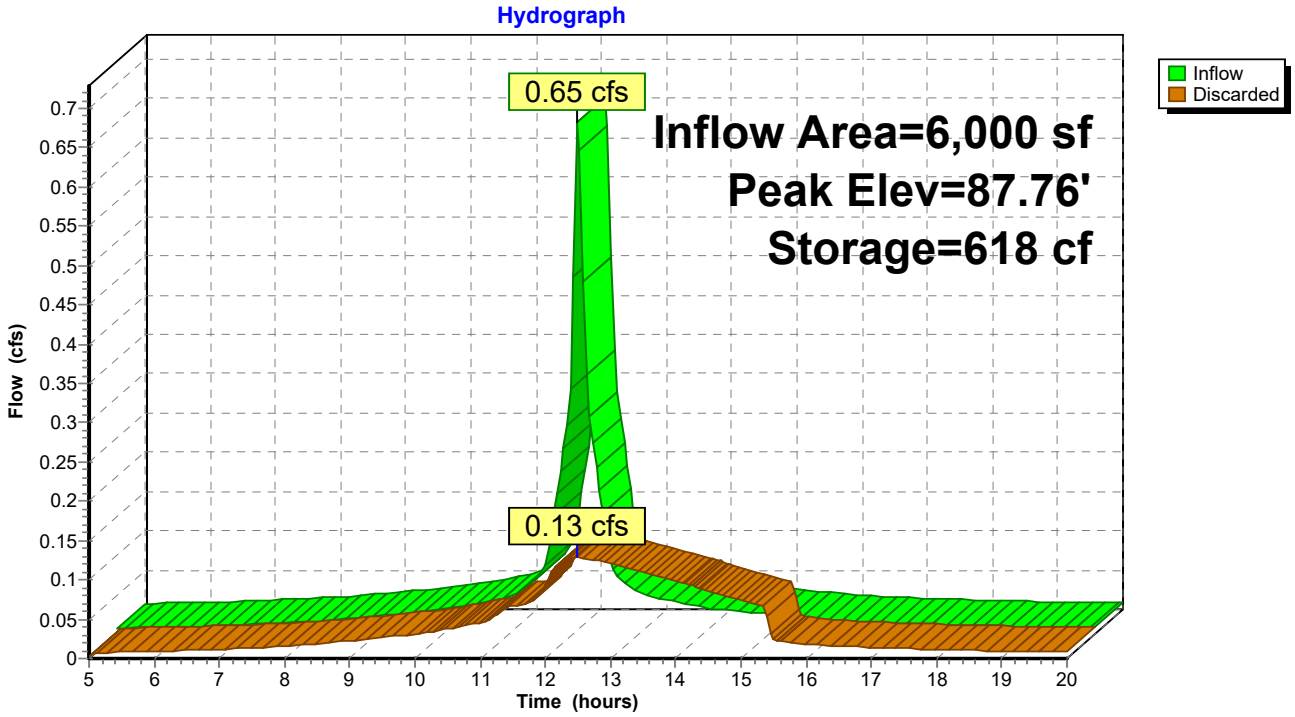
Plug-Flow detention time= 34.2 min calculated for 2,116 cf (100% of inflow)
Center-of-Mass det. time= 33.7 min ( 768.3 - 734.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 84.00' | 769 cf | **10.00'W x 34.00'L x 8.00'H Prismatoid**<br>2,720 cf Overall - 796 cf Embedded = 1,924 cf x 40.0% Voids |
| #2 | 86.00' | 679 cf | **6.00'D x 6.00'H Vertical Cone/Cylinder** x 4 Inside #1<br>796 cf Overall - 3.0" Wall Thickness = 679 cf |
| | | 1,448 cf | Total Available Storage |

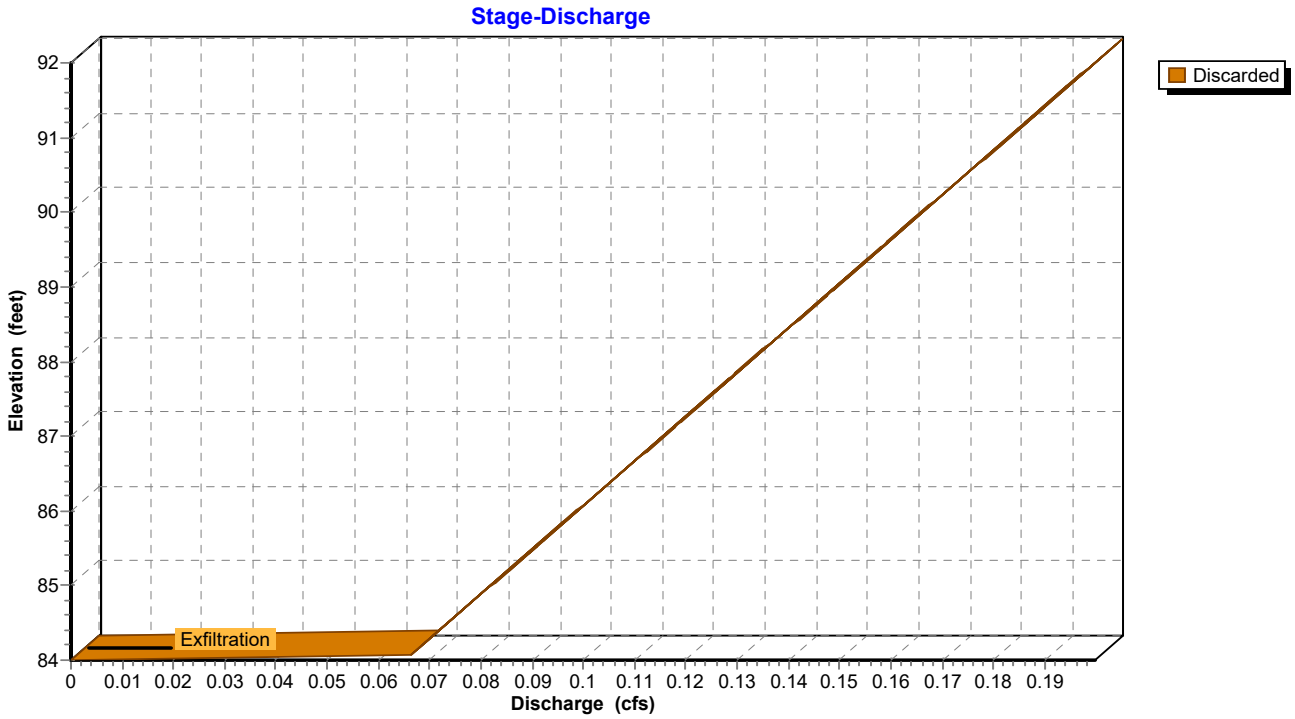
| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 84.00' | **8.270 in/hr Exfiltration over Wetted area** |

**Discarded OutFlow** Max=0.13 cfs @ 12.49 hrs HW=87.76' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

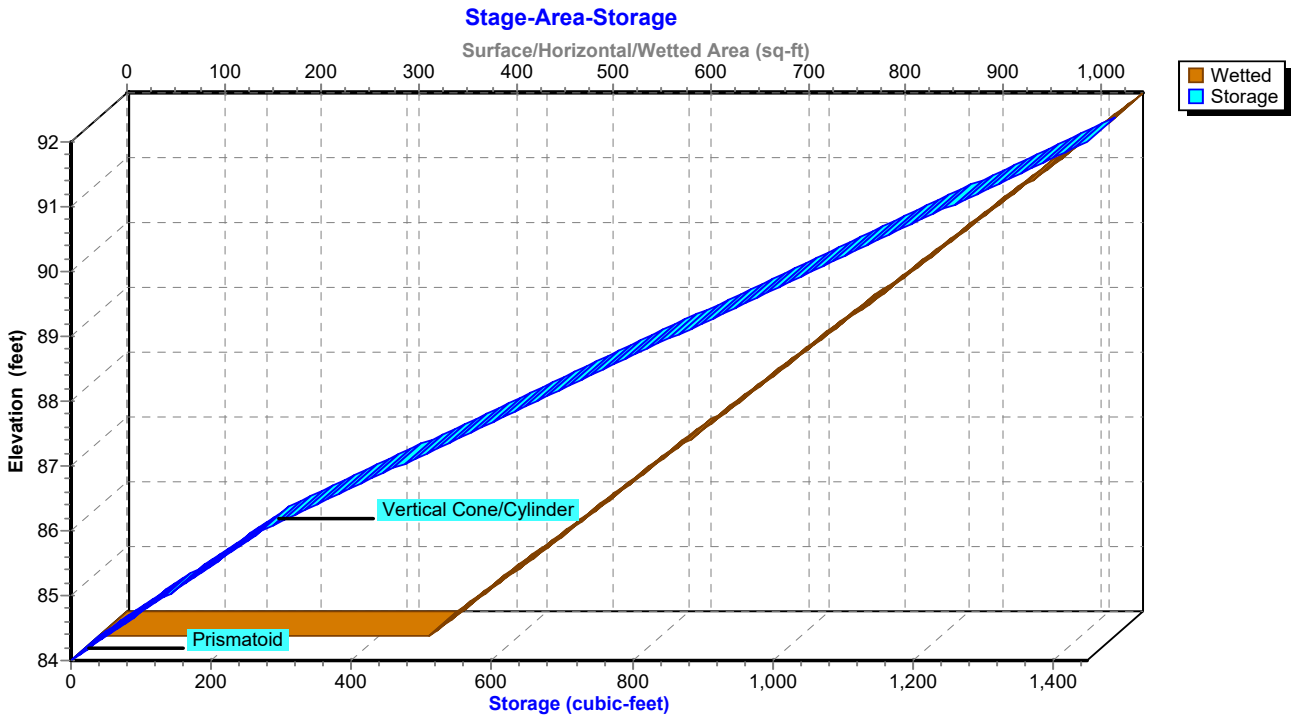
## Pond 2P: Roof SWMA




## Pond 2P: Roof SWMA



## Pond 2P: Roof SWMA



## Summary for Pond 4P: Rain Garden

Inflow Area = 67,846 sf, 35.28% Impervious, Inflow Depth > 0.99" for B - 10 YR event
Inflow = 0.96 cfs @ 12.54 hrs, Volume= 5,621 cf
Outflow = 0.13 cfs @ 15.73 hrs, Volume= 3,192 cf, Atten= 87%, Lag= 191.5 min
Discarded = 0.13 cfs @ 15.73 hrs, Volume= 3,192 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 83.40' @ 15.73 hrs Surf.Area= 1,296 sf Storage= 3,049 cf

Plug-Flow detention time= 210.6 min calculated for 3,192 cf (57% of inflow)
Center-of-Mass det. time= 124.0 min ( 976.9 - 852.9 )

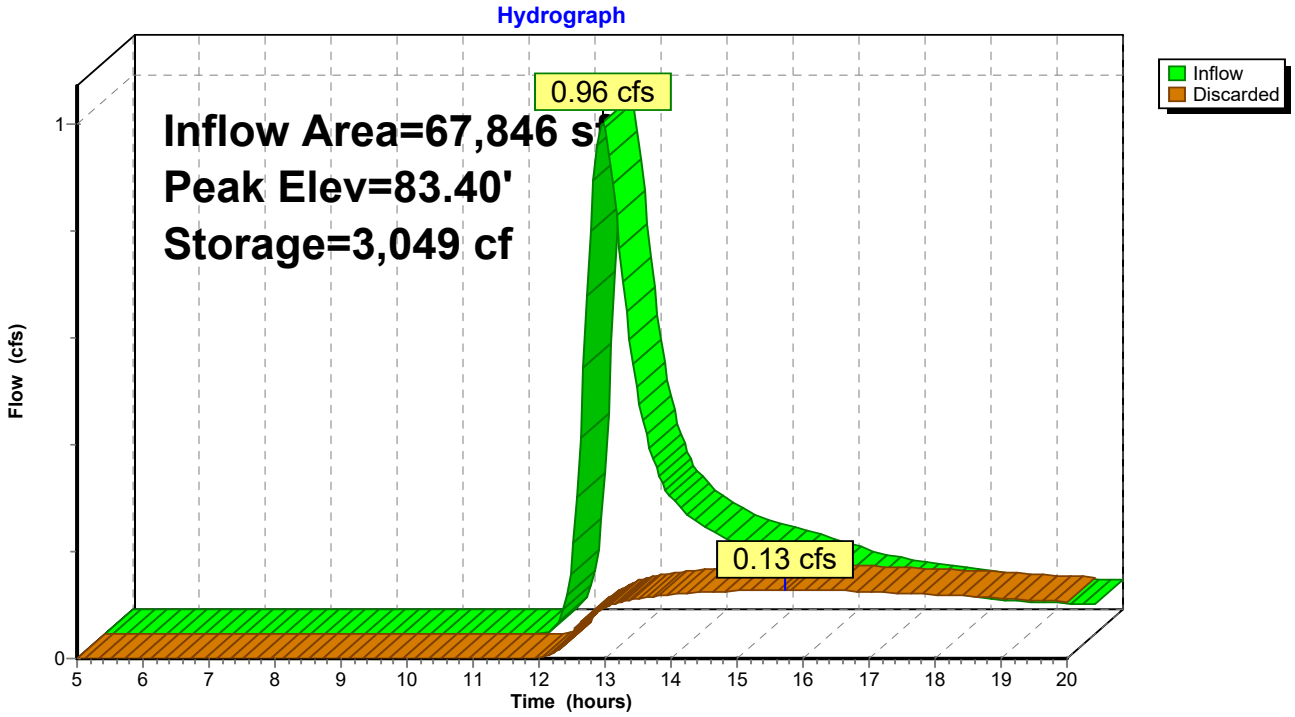
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 87.66' | 3,876 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) -Impervious |
| #2 | 78.75' | 2,873 cf | **36.00'W x 36.00'L x 8.00'H Prismatoid**<br>10,368 cf Overall - 3,186 cf Embedded = 7,182 cf x 40.0% Voids |
| #3 | 80.75' | 2,714 cf | **6.00'D x 6.00'H Vertical Cone/Cylinder** x 16 Inside #2<br>3,186 cf Overall - 3.0" Wall Thickness = 2,714 cf |
| | | 9,463 cf | Total Available Storage |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Voids (%) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|---|
| 87.66 | 359 | 73.0 | 0.0 | 0 | 0 | 359 |
| 87.67 | 359 | 73.0 | 40.0 | 1 | 1 | 360 |
| 88.99 | 359 | 73.0 | 40.0 | 190 | 191 | 456 |
| 89.00 | 359 | 73.0 | 30.0 | 1 | 192 | 457 |
| 90.74 | 359 | 73.0 | 30.0 | 187 | 379 | 584 |
| 90.75 | 359 | 73.0 | 30.0 | 1 | 381 | 585 |
| 90.99 | 359 | 73.0 | 30.0 | 26 | 406 | 602 |
| 91.00 | 359 | 73.0 | 100.0 | 4 | 410 | 603 |
| 92.00 | 606 | 91.9 | 100.0 | 477 | 887 | 864 |
| 93.00 | 910 | 110.7 | 100.0 | 753 | 1,640 | 1,184 |
| 94.00 | 1,270 | 129.6 | 100.0 | 1,085 | 2,725 | 1,565 |
| 94.80 | 1,614 | 145.3 | 100.0 | 1,151 | 3,876 | 1,925 |

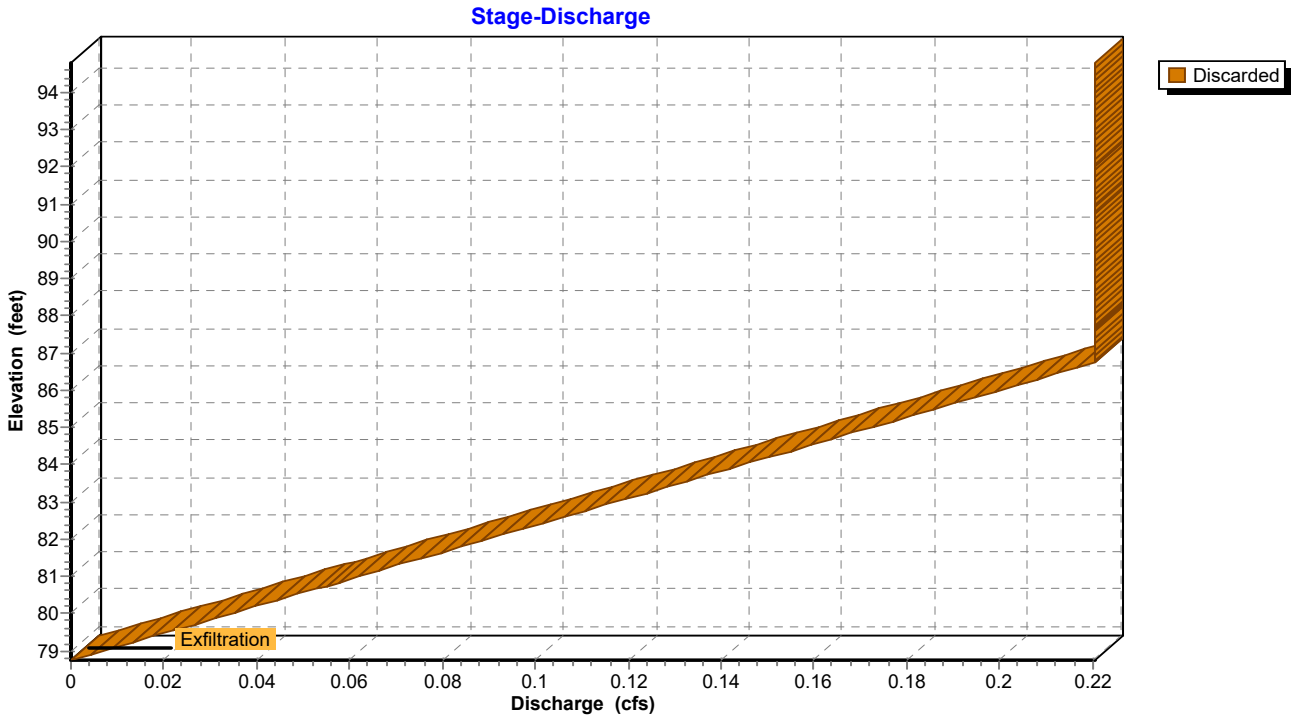
| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 78.75' | **8.270 in/hr Exfiltration over Wetted area from 78.75' - 90.00'**<br>Excluded Wetted area = 1,296 sf |

**Discarded OutFlow** Max=0.13 cfs @ 15.73 hrs HW=83.40' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

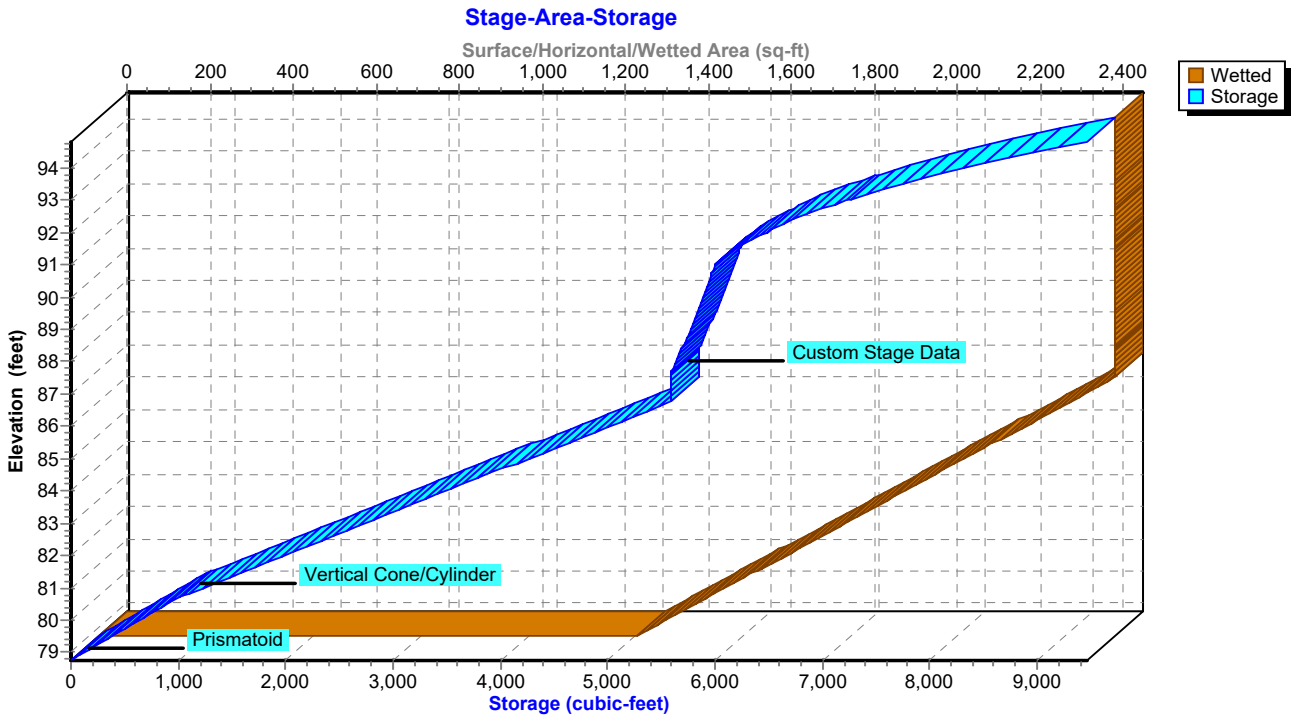
## Pond 4P: Rain Garden




## Pond 4P: Rain Garden



## Pond 4P: Rain Garden



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

**Subcatchment 1S: Catchment Area 1** Runoff Area=11,425 sf 0.00% Impervious Runoff Depth>0.09"
Flow Length=131' Tc=19.5 min CN=33 Runoff=0.00 cfs 83 cf

**Subcatchment 2S: Roof Area** Runoff Area=6,000 sf 100.00% Impervious Runoff Depth>5.06"
Tc=5.0 min CN=98 Runoff=0.77 cfs 2,528 cf

**Subcatchment 3S: Catchment Area 3** Runoff Area=6,322 sf 6.14% Impervious Runoff Depth>0.39"
Tc=5.0 min CN=41 Runoff=0.03 cfs 206 cf

**Subcatchment 4S: Catchment Area 4** Runoff Area=67,846 sf 35.28% Impervious Runoff Depth>1.48"
Flow Length=199' Tc=33.3 min CN=59 Runoff=1.50 cfs 8,355 cf

**Subcatchment 5S: Catchment Area 5** Runoff Area=7,841 sf 0.00% Impervious Runoff Depth>0.02"
Flow Length=112' Tc=27.4 min CN=30 Runoff=0.00 cfs 16 cf

**Pond 2P: Roof SWMA** Peak Elev=88.59' Storage=780 cf Inflow=0.77 cfs 2,528 cf
Outflow=0.14 cfs 2,526 cf

**Pond 4P: Rain Garden** Peak Elev=85.55' Storage=4,677 cf Inflow=1.50 cfs 8,355 cf
Outflow=0.19 cfs 4,682 cf

**Total Runoff Area = 99,434 sf Runoff Volume = 11,187 cf Average Runoff Depth = 1.35"**
**69.50% Pervious = 69,107 sf 30.50% Impervious = 30,327 sf**

## Summary for Subcatchment 1S: Catchment Area 1

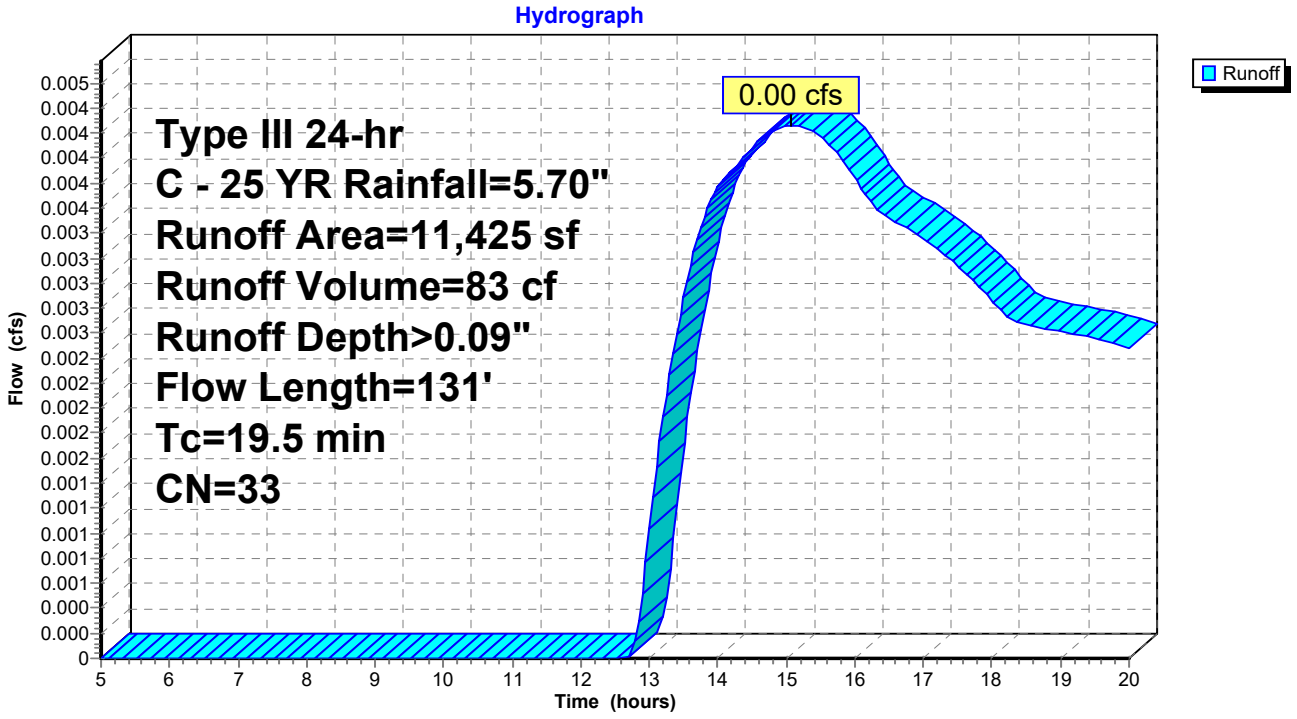
Runoff = 0.00 cfs @ 15.07 hrs, Volume= 83 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 827 | 68 | <50% Grass cover, Poor, HSG A |
| 10,598 | 30 | Woods, Good, HSG A |
| 11,425 | 33 | Weighted Average |
| 11,425 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.5 | 50 | 0.0260 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 1.0 | 81 | 0.0691 | 1.31 | | **Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps |
| 19.5 | 131 | Total | | | |

## Subcatchment 1S: Catchment Area 1



## Summary for Subcatchment 2S: Roof Area

[49] Hint: Tc<2dt may require smaller dt

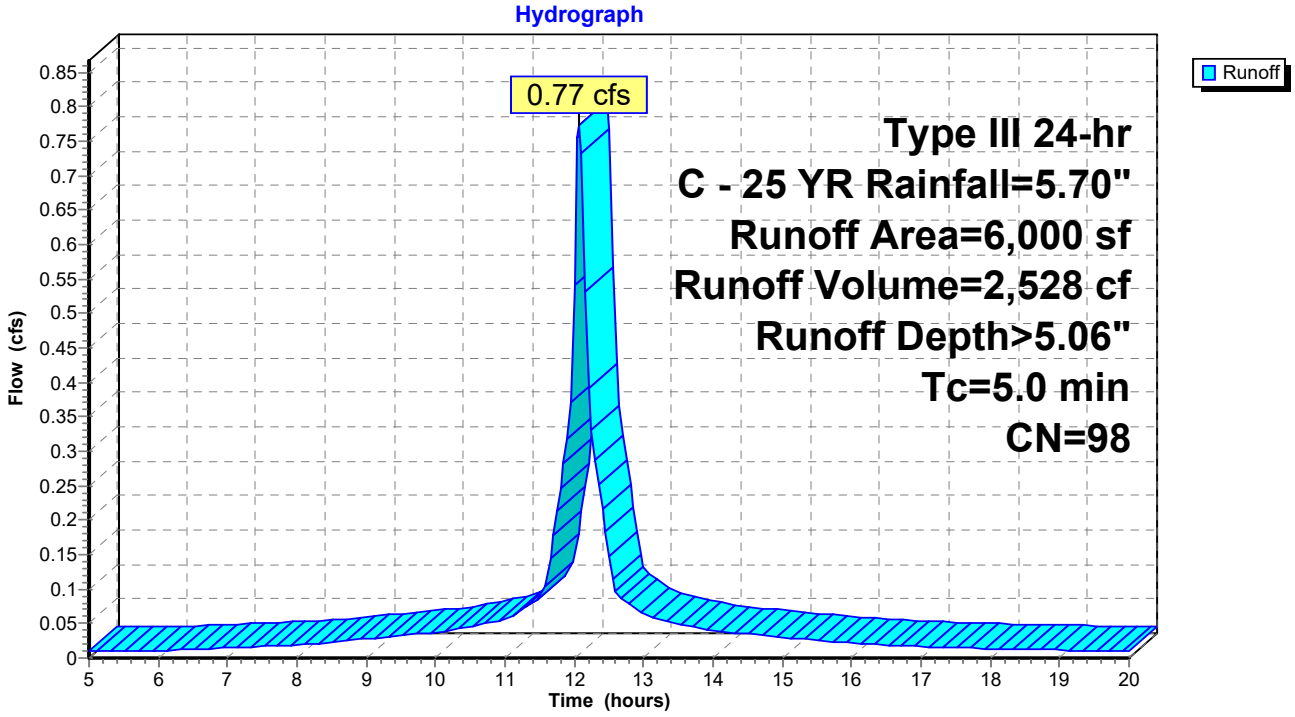
Runoff = 0.77 cfs @ 12.07 hrs, Volume= 2,528 cf, Depth> 5.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 6,000 | 98 | Roofs, HSG A |
| 6,000 | | 100.00% Impervious Area |

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

### Subcatchment 2S: Roof Area



## Summary for Subcatchment 3S: Catchment Area 3

[49] Hint: Tc<2dt may require smaller dt

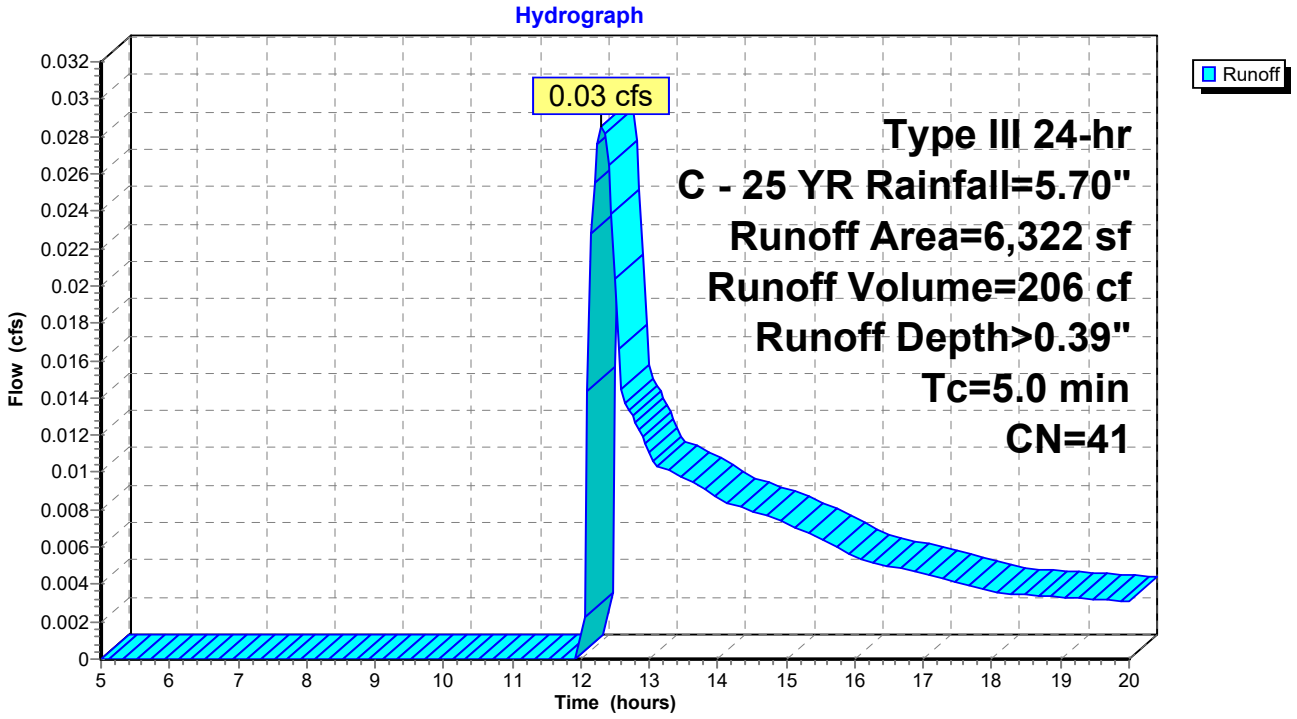
Runoff = 0.03 cfs @ 12.31 hrs, Volume= 206 cf, Depth> 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 1,203 | 68 | <50% Grass cover, Poor, HSG A |
| 4,731 | 30 | Woods, Good, HSG A |
| 388 | 98 | Paved parking, HSG A |
| 6,322 | 41 | Weighted Average |
| 5,934 | | 93.86% Pervious Area |
| 388 | | 6.14% Impervious Area |

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

### Subcatchment 3S: Catchment Area 3



## Summary for Subcatchment 4S: Catchment Area 4

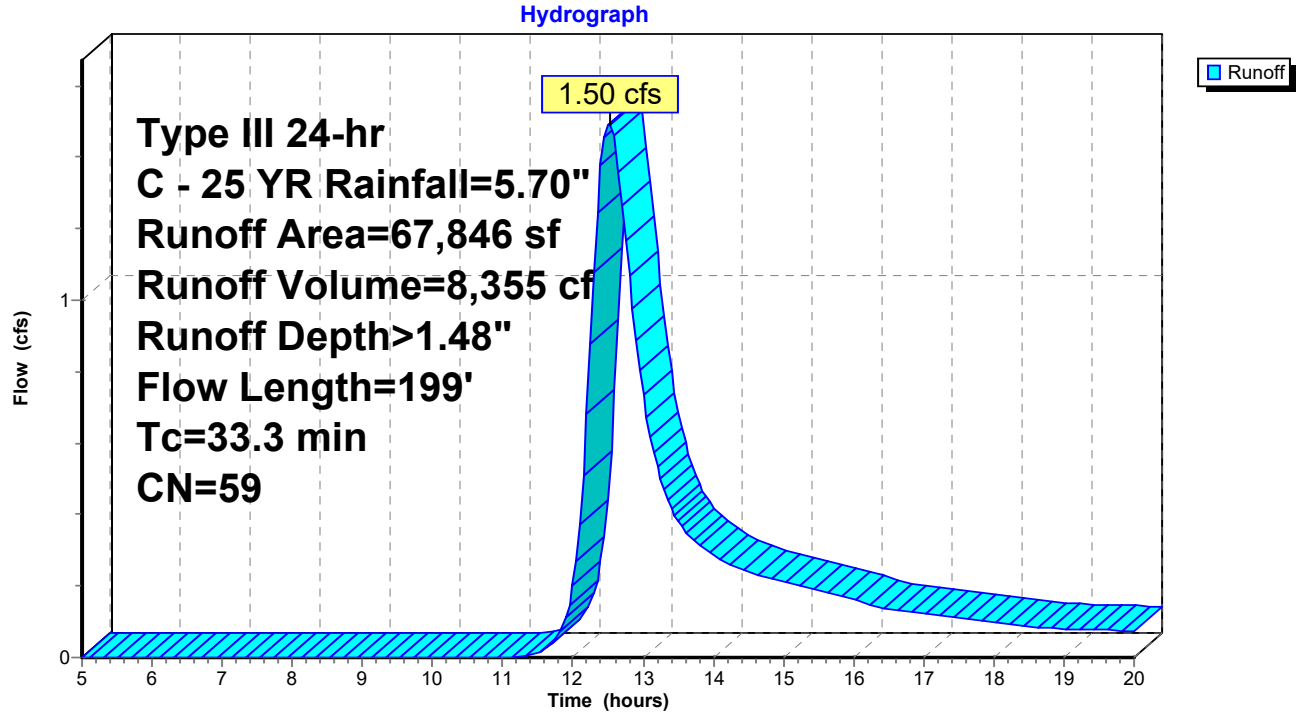
Runoff = 1.50 cfs @ 12.51 hrs, Volume= 8,355 cf, Depth> 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 30,382 | 30 | Woods, Good, HSG A |
| 23,939 | 98 | Paved parking, HSG A |
| 6,630 | 39 | >75% Grass cover, Good, HSG A |
| 4,832 | 76 | Gravel roads, HSG A |
| 2,063 | 68 | <50% Grass cover, Poor, HSG A |
| 67,846 | 59 | Weighted Average |
| 43,907 | | 64.72% Pervious Area |
| 23,939 | | 35.28% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.6 | 50 | 0.0080 | 0.03 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 3.5 | 82 | 0.0250 | 0.40 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 0.2 | 67 | 0.1300 | 7.32 | | **Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps |
| 33.3 | 199 | Total | | | |

## Subcatchment 4S: Catchment Area 4



## Summary for Subcatchment 5S: Catchment Area 5

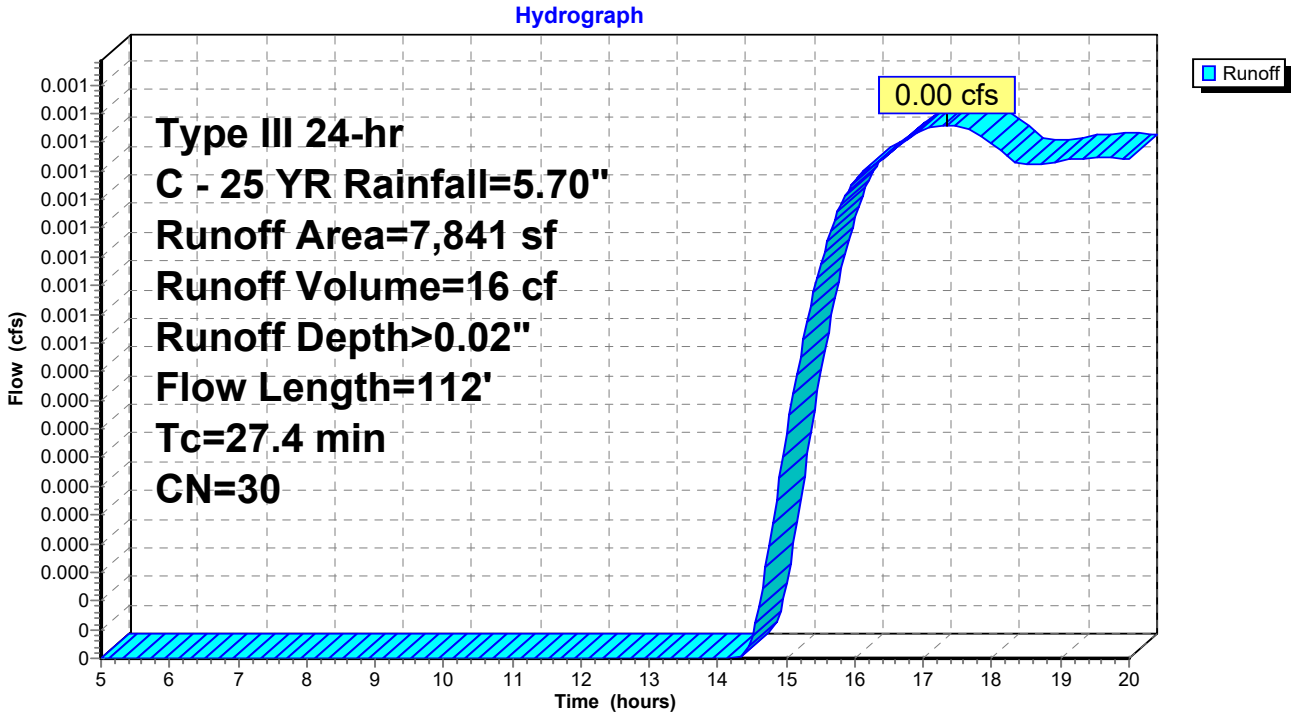
Runoff = 0.00 cfs @ 17.34 hrs, Volume= 16 cf, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr C - 25 YR Rainfall=5.70"

| Area (sf) | CN | Description |
|---|---|---|
| 7,841 | 30 | Woods, Good, HSG A |
| 7,841 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.2 | 50 | 0.0120 | 0.03 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.2 | 62 | 0.0339 | 0.46 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 27.4 | 112 | Total | | | |

## Subcatchment 5S: Catchment Area 5



## Summary for Pond 2P: Roof SWMA

[82] Warning: Early inflow requires earlier time span

Inflow Area = 6,000 sf,100.00% Impervious, Inflow Depth > 5.06" for C - 25 YR event
Inflow = 0.77 cfs @ 12.07 hrs, Volume= 2,528 cf
Outflow = 0.14 cfs @ 12.51 hrs, Volume= 2,526 cf, Atten= 82%, Lag= 26.3 min
Discarded = 0.14 cfs @ 12.51 hrs, Volume= 2,526 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 88.59' @ 12.51 hrs Surf.Area= 340 sf Storage= 780 cf

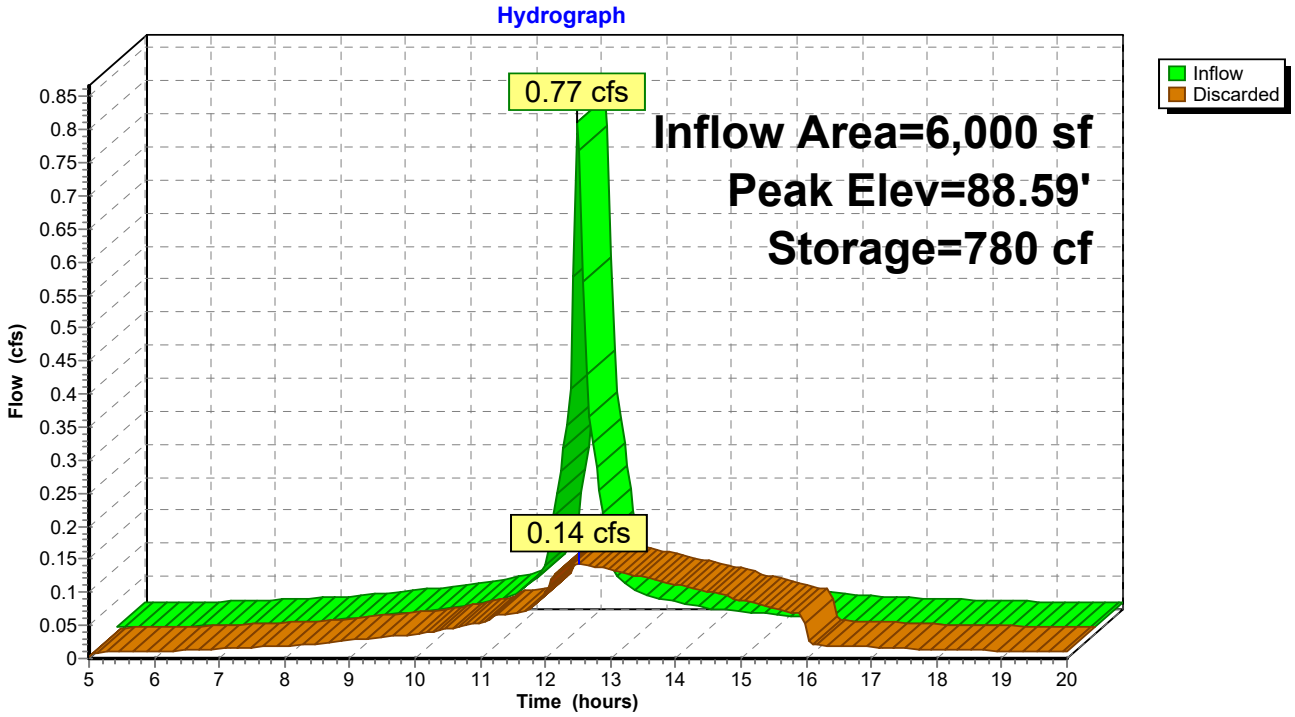
Plug-Flow detention time= 41.2 min calculated for 2,526 cf (100% of inflow)
Center-of-Mass det. time= 40.6 min ( 774.3 - 733.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 84.00' | 769 cf | **10.00'W x 34.00'L x 8.00'H Prismatoid**<br>2,720 cf Overall - 796 cf Embedded = 1,924 cf x 40.0% Voids |
| #2 | 86.00' | 679 cf | **6.00'D x 6.00'H Vertical Cone/Cylinder** x 4 Inside #1<br>796 cf Overall - 3.0" Wall Thickness = 679 cf |
| | | 1,448 cf | Total Available Storage |

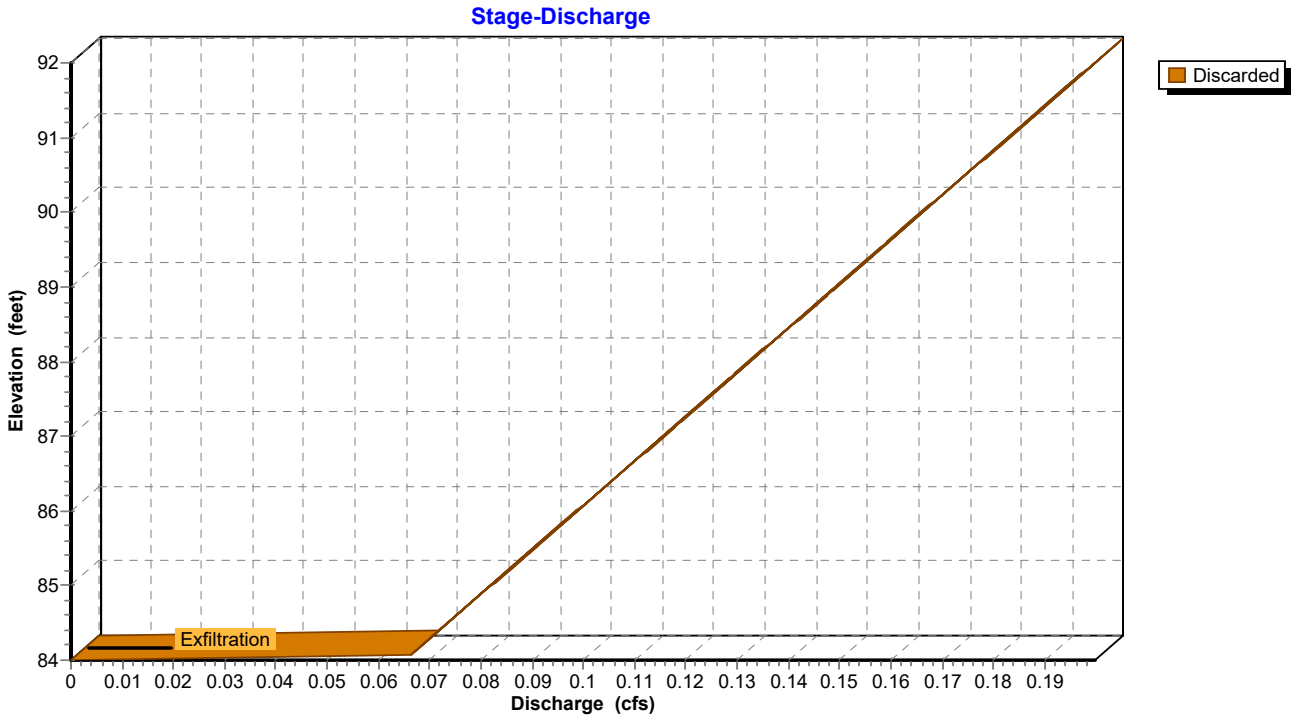
| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 84.00' | **8.270 in/hr Exfiltration over Wetted area** |

**Discarded OutFlow** Max=0.14 cfs @ 12.51 hrs HW=88.59' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

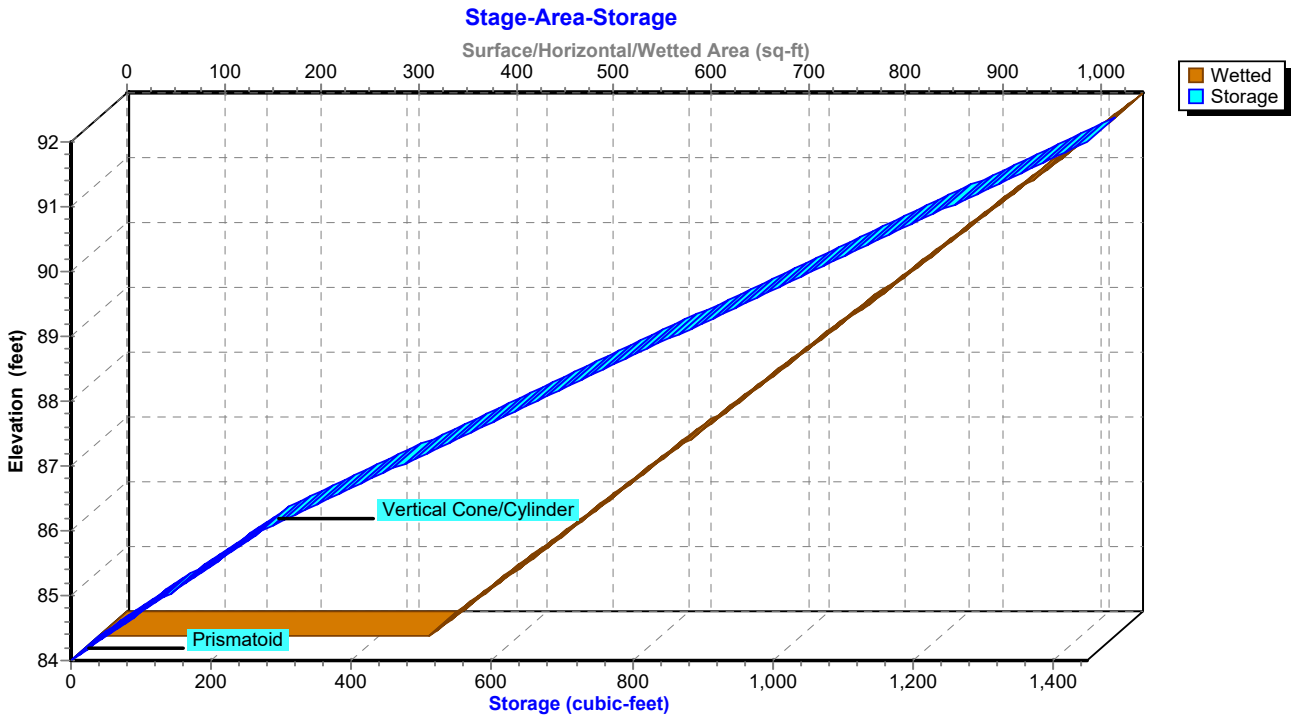
## Pond 2P: Roof SWMA




## Pond 2P: Roof SWMA



## Pond 2P: Roof SWMA



## Summary for Pond 4P: Rain Garden

Inflow Area = 67,846 sf, 35.28% Impervious, Inflow Depth > 1.48" for C - 25 YR event
Inflow = 1.50 cfs @ 12.51 hrs, Volume= 8,355 cf
Outflow = 0.19 cfs @ 15.50 hrs, Volume= 4,682 cf, Atten= 87%, Lag= 178.9 min
Discarded = 0.19 cfs @ 15.50 hrs, Volume= 4,682 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 85.55' @ 15.50 hrs Surf.Area= 1,296 sf Storage= 4,677 cf

Plug-Flow detention time= 214.3 min calculated for 4,682 cf (56% of inflow)
Center-of-Mass det. time= 129.8 min ( 973.7 - 843.9 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 87.66' | 3,876 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) -Impervious |
| #2 | 78.75' | 2,873 cf | **36.00'W x 36.00'L x 8.00'H Prismatoid**<br>10,368 cf Overall - 3,186 cf Embedded = 7,182 cf x 40.0% Voids |
| #3 | 80.75' | 2,714 cf | **6.00'D x 6.00'H Vertical Cone/Cylinder** x 16 Inside #2<br>3,186 cf Overall - 3.0" Wall Thickness = 2,714 cf |
| | | 9,463 cf | Total Available Storage |

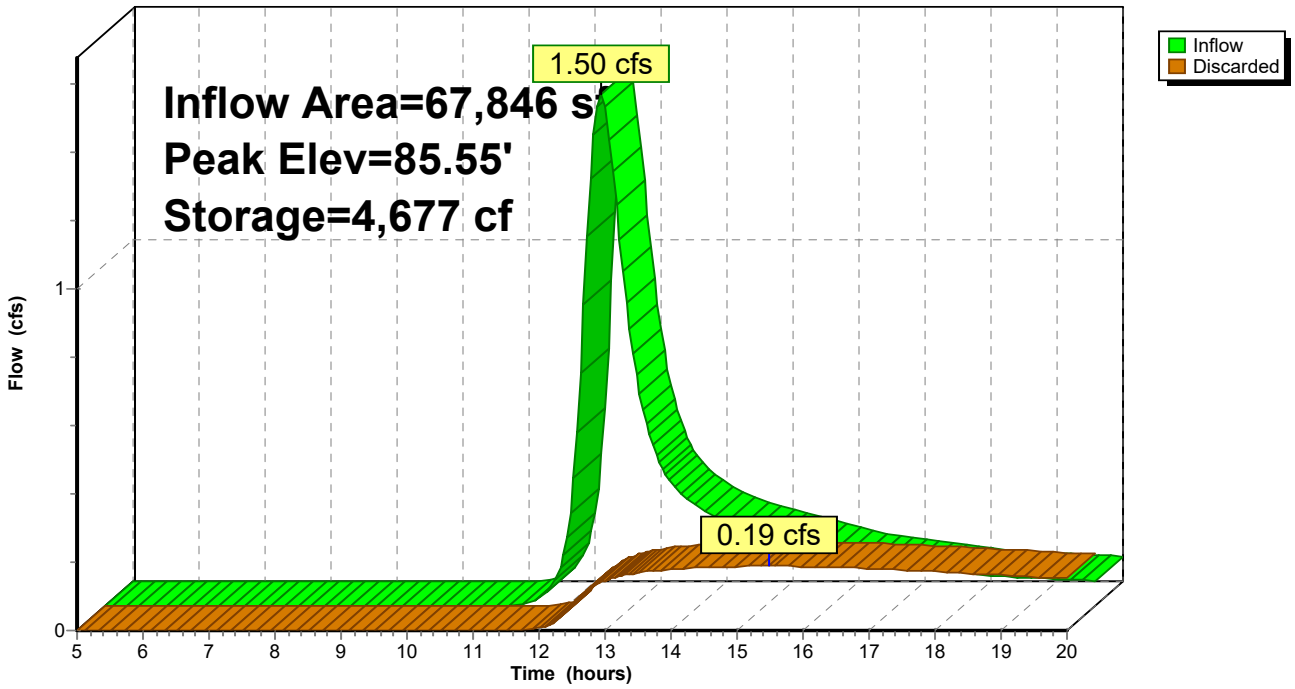
| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Voids (%) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|---|
| 87.66 | 359 | 73.0 | 0.0 | 0 | 0 | 359 |
| 87.67 | 359 | 73.0 | 40.0 | 1 | 1 | 360 |
| 88.99 | 359 | 73.0 | 40.0 | 190 | 191 | 456 |
| 89.00 | 359 | 73.0 | 30.0 | 1 | 192 | 457 |
| 90.74 | 359 | 73.0 | 30.0 | 187 | 379 | 584 |
| 90.75 | 359 | 73.0 | 30.0 | 1 | 381 | 585 |
| 90.99 | 359 | 73.0 | 30.0 | 26 | 406 | 602 |
| 91.00 | 359 | 73.0 | 100.0 | 4 | 410 | 603 |
| 92.00 | 606 | 91.9 | 100.0 | 477 | 887 | 864 |
| 93.00 | 910 | 110.7 | 100.0 | 753 | 1,640 | 1,184 |
| 94.00 | 1,270 | 129.6 | 100.0 | 1,085 | 2,725 | 1,565 |
| 94.80 | 1,614 | 145.3 | 100.0 | 1,151 | 3,876 | 1,925 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 78.75' | **8.270 in/hr Exfiltration over Wetted area from 78.75' - 90.00'**<br>Excluded Wetted area = 1,296 sf |

**Discarded OutFlow** Max=0.19 cfs @ 15.50 hrs HW=85.55' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

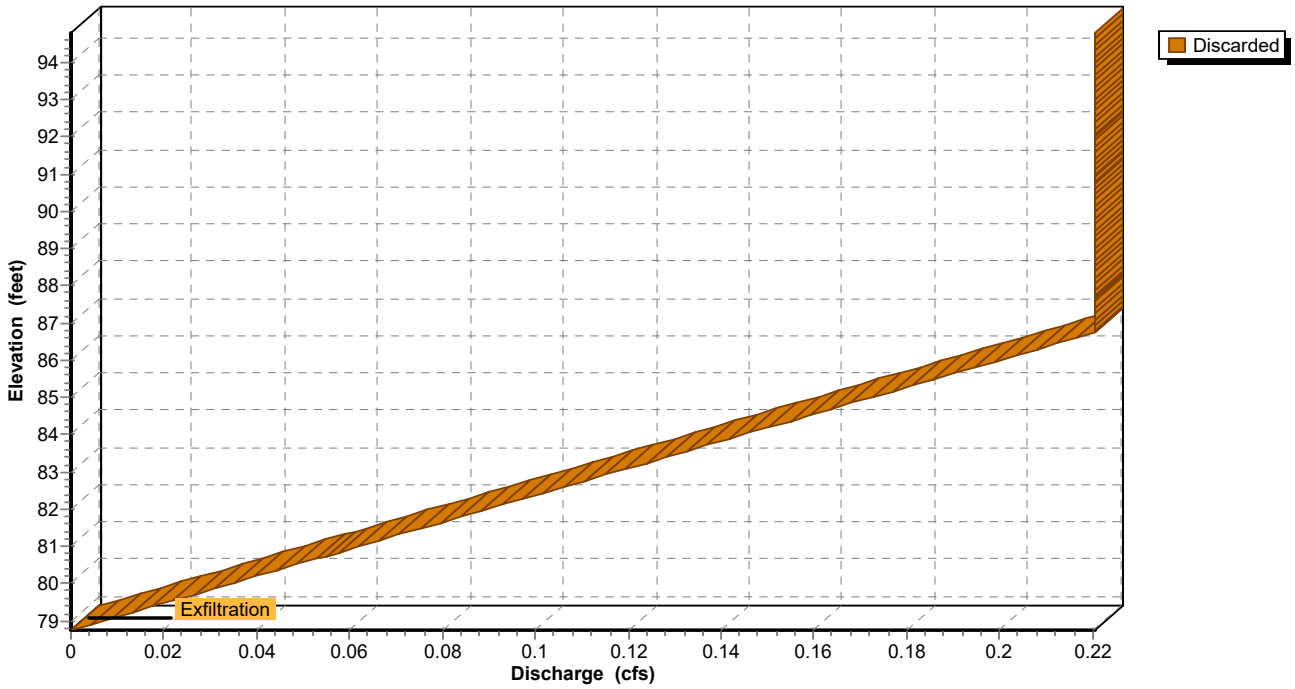
## Pond 4P: Rain Garden

Hydrograph

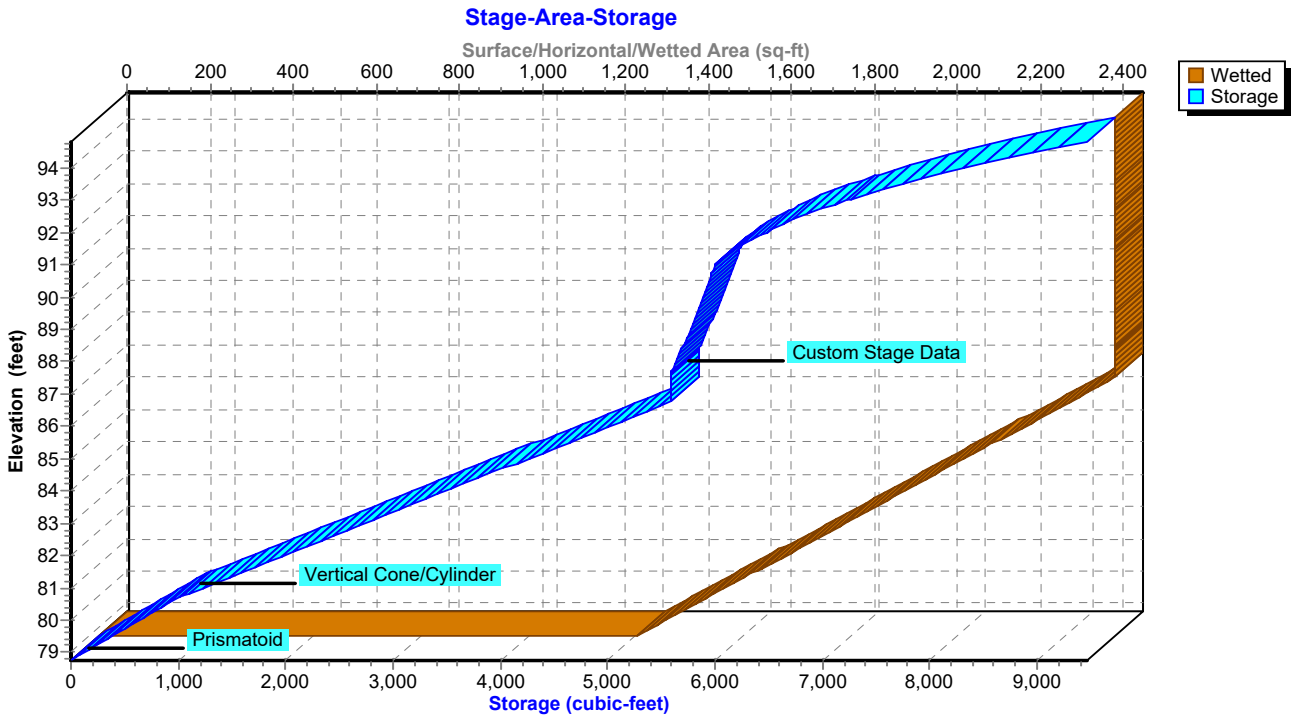



## Pond 4P: Rain Garden

Stage-Discharge



## Pond 4P: Rain Garden



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

**Subcatchment 1S: Catchment Area 1** Runoff Area=11,425 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=131' Tc=19.5 min CN=33 Runoff=0.02 cfs 284 cf

**Subcatchment 2S: Roof Area** Runoff Area=6,000 sf 100.00% Impervious Runoff Depth>6.24"
Tc=5.0 min CN=98 Runoff=0.95 cfs 3,119 cf

**Subcatchment 3S: Catchment Area 3** Runoff Area=6,322 sf 6.14% Impervious Runoff Depth>0.80"
Tc=5.0 min CN=41 Runoff=0.10 cfs 421 cf

**Subcatchment 4S: Catchment Area 4** Runoff Area=67,846 sf 35.28% Impervious Runoff Depth>2.27"
Flow Length=199' Tc=33.3 min CN=59 Runoff=2.37 cfs 12,824 cf

**Subcatchment 5S: Catchment Area 5** Runoff Area=7,841 sf 0.00% Impervious Runoff Depth>0.16"
Flow Length=112' Tc=27.4 min CN=30 Runoff=0.01 cfs 103 cf

**Pond 2P: Roof SWMA** Peak Elev=89.83' Storage=1,023 cf Inflow=0.95 cfs 3,119 cf
Outflow=0.16 cfs 3,117 cf

**Pond 4P: Rain Garden** Peak Elev=93.64' Storage=7,882 cf Inflow=2.37 cfs 12,824 cf
Outflow=0.22 cfs 6,054 cf

**Total Runoff Area = 99,434 sf Runoff Volume = 16,751 cf Average Runoff Depth = 2.02"**
**69.50% Pervious = 69,107 sf 30.50% Impervious = 30,327 sf**

## Summary for Subcatchment 1S: Catchment Area 1

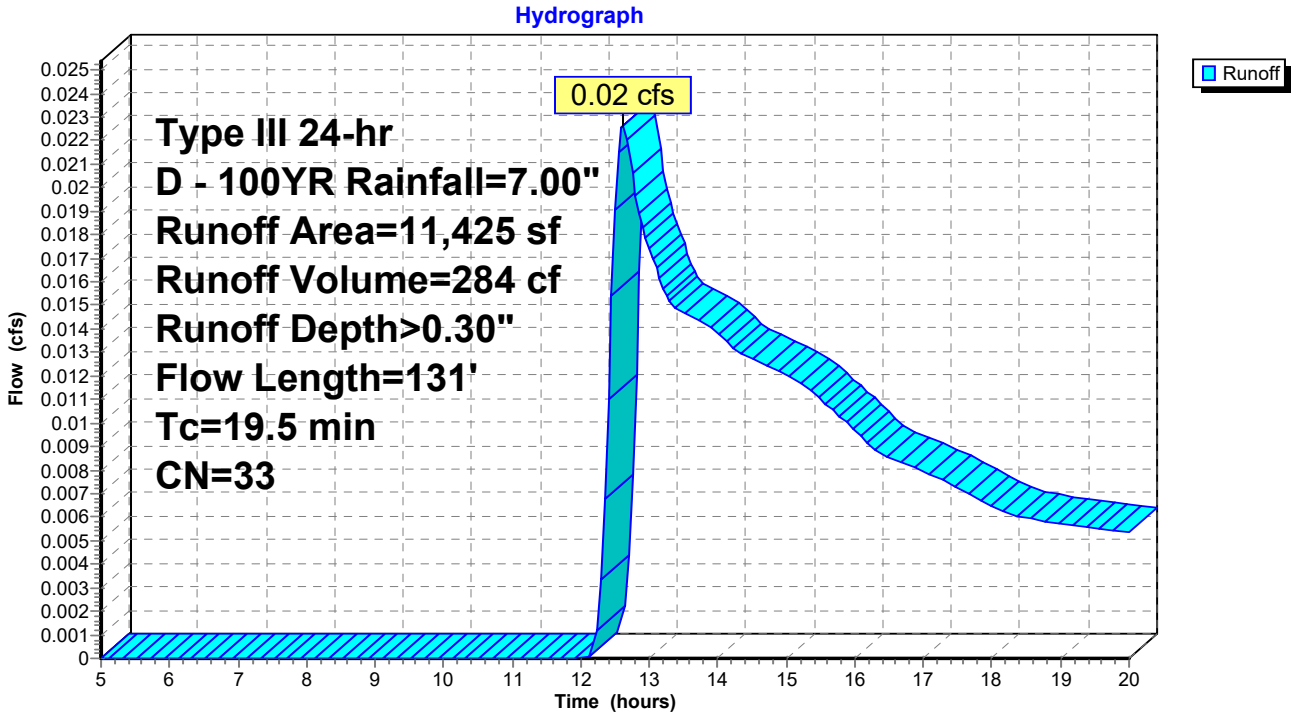
Runoff = 0.02 cfs @ 12.62 hrs, Volume= 284 cf, Depth> 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 827 | 68 | <50% Grass cover, Poor, HSG A |
| 10,598 | 30 | Woods, Good, HSG A |
| 11,425 | 33 | Weighted Average |
| 11,425 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 18.5 | 50 | 0.0260 | 0.05 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 1.0 | 81 | 0.0691 | 1.31 | | **Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps |
| 19.5 | 131 | Total | | | |

## Subcatchment 1S: Catchment Area 1



## Summary for Subcatchment 2S: Roof Area

[49] Hint: Tc<2dt may require smaller dt

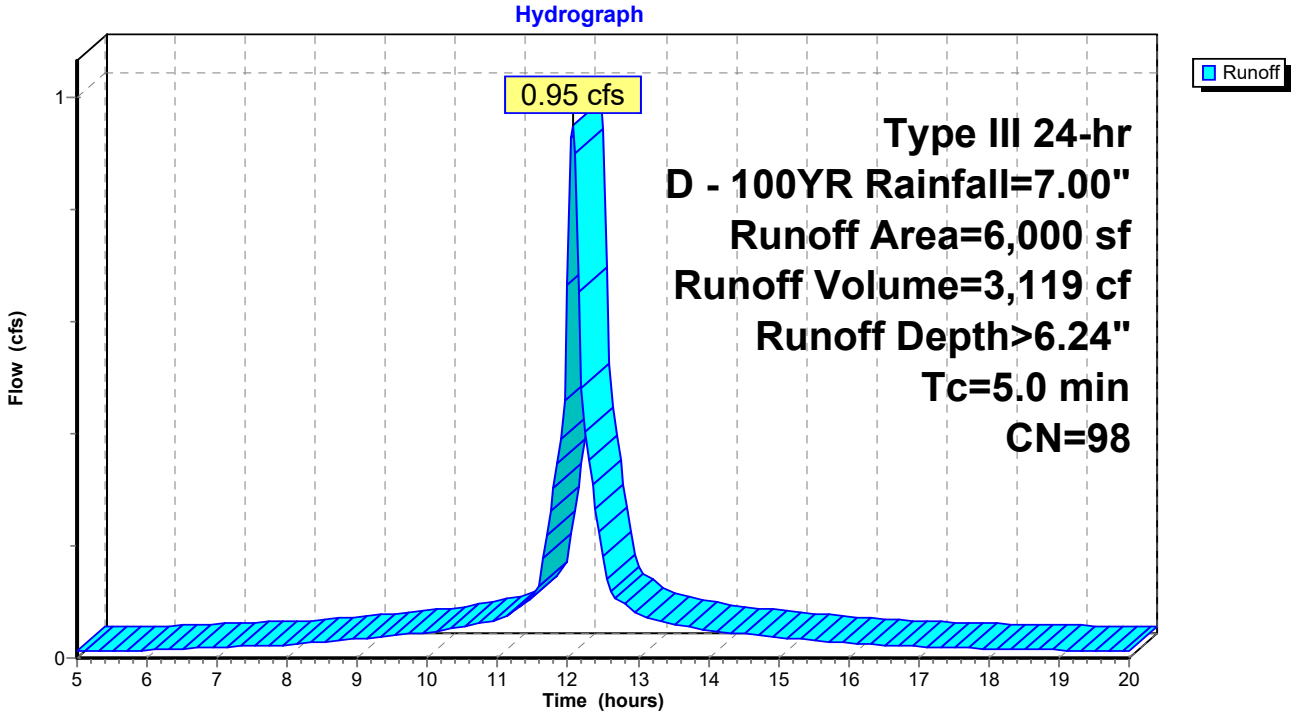
Runoff = 0.95 cfs @ 12.07 hrs, Volume= 3,119 cf, Depth> 6.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 6,000 | 98 | Roofs, HSG A |
| 6,000 | | 100.00% Impervious Area |

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

### Subcatchment 2S: Roof Area



## Summary for Subcatchment 3S: Catchment Area 3

[49] Hint: Tc<2dt may require smaller dt

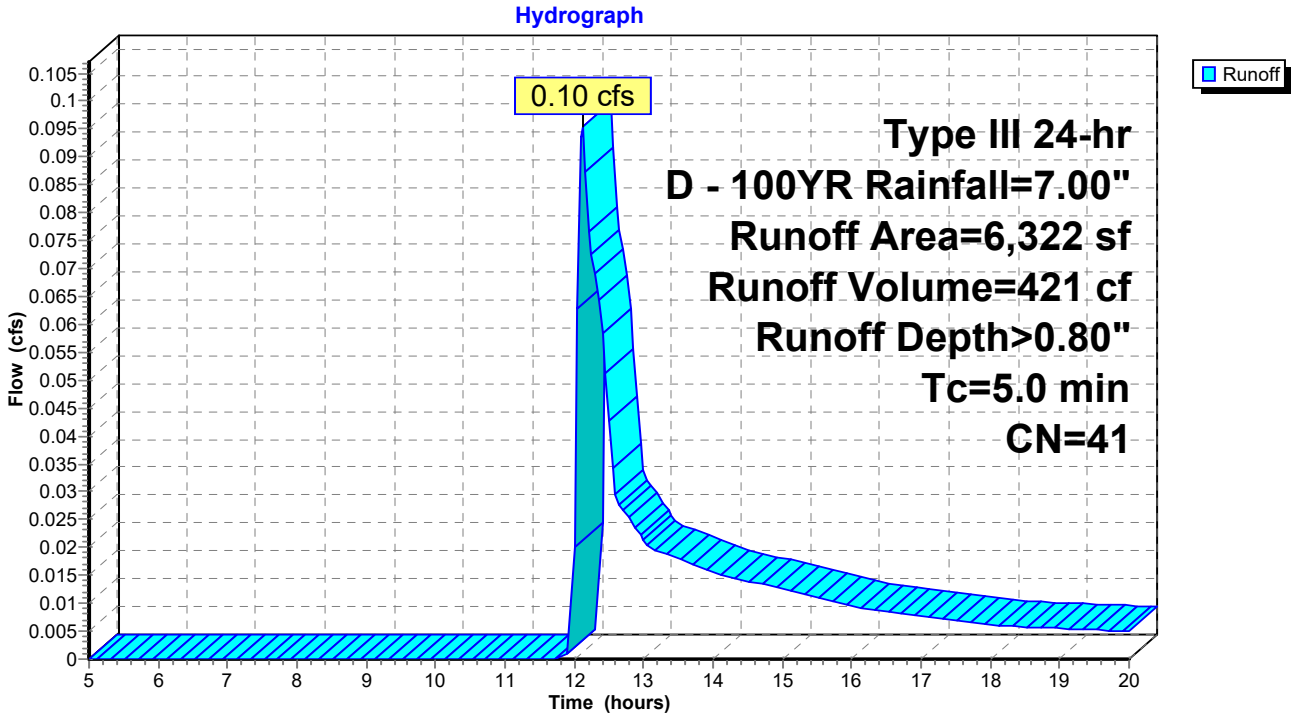
Runoff = 0.10 cfs @ 12.12 hrs, Volume= 421 cf, Depth> 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 1,203 | 68 | <50% Grass cover, Poor, HSG A |
| 4,731 | 30 | Woods, Good, HSG A |
| 388 | 98 | Paved parking, HSG A |
| 6,322 | 41 | Weighted Average |
| 5,934 | | 93.86% Pervious Area |
| 388 | | 6.14% Impervious Area |

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

### Subcatchment 3S: Catchment Area 3



## Summary for Subcatchment 4S: Catchment Area 4

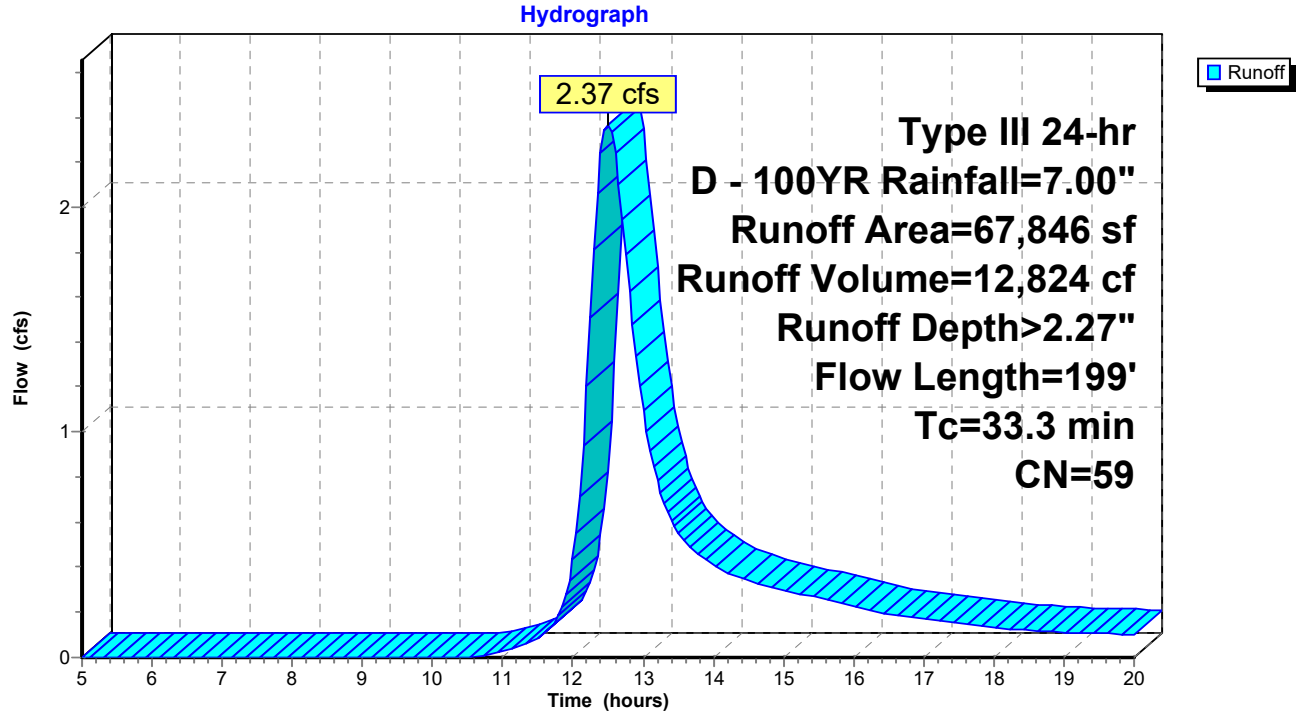
Runoff = 2.37 cfs @ 12.50 hrs, Volume= 12,824 cf, Depth> 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 30,382 | 30 | Woods, Good, HSG A |
| 23,939 | 98 | Paved parking, HSG A |
| 6,630 | 39 | >75% Grass cover, Good, HSG A |
| 4,832 | 76 | Gravel roads, HSG A |
| 2,063 | 68 | <50% Grass cover, Poor, HSG A |
| 67,846 | 59 | Weighted Average |
| 43,907 | | 64.72% Pervious Area |
| 23,939 | | 35.28% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.6 | 50 | 0.0080 | 0.03 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 3.5 | 82 | 0.0250 | 0.40 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 0.2 | 67 | 0.1300 | 7.32 | | **Shallow Concentrated Flow, C-D** Paved Kv= 20.3 fps |
| 33.3 | 199 | Total | | | |

## Subcatchment 4S: Catchment Area 4



## Summary for Subcatchment 5S: Catchment Area 5

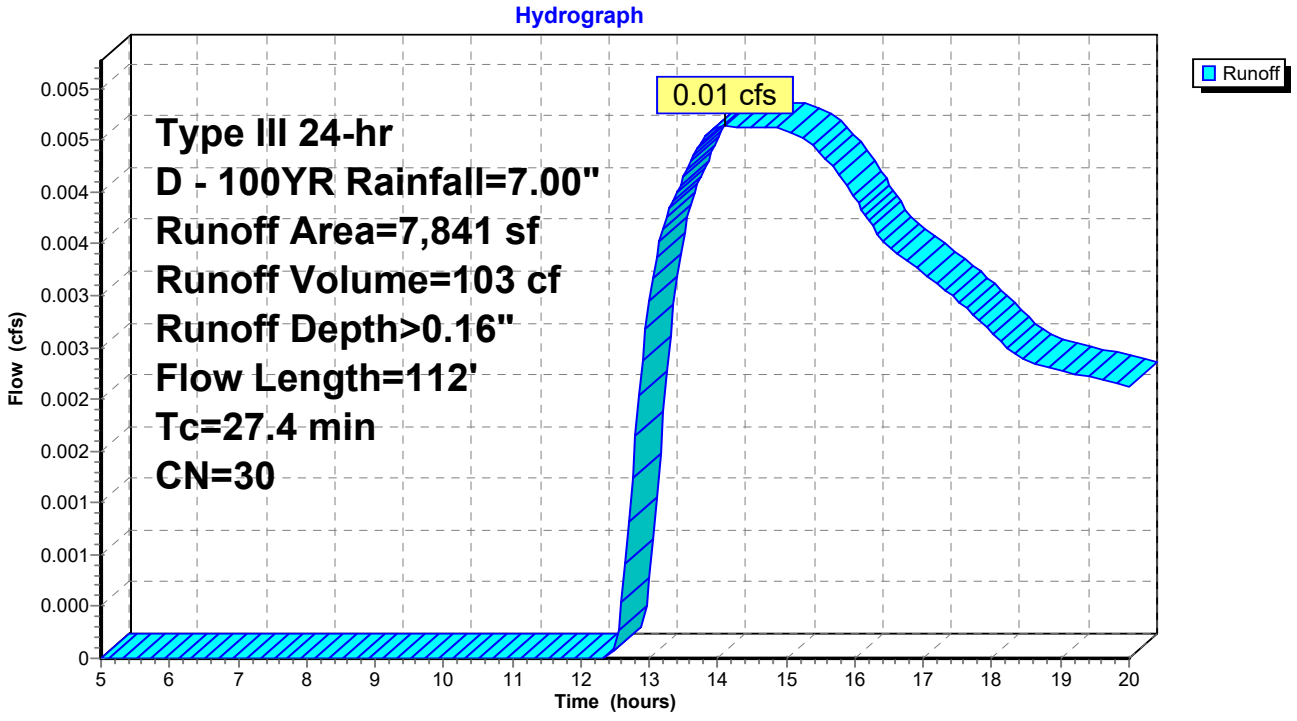
Runoff = 0.01 cfs @ 14.11 hrs, Volume= 103 cf, Depth> 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr D - 100YR Rainfall=7.00"

| Area (sf) | CN | Description |
|---|---|---|
| 7,841 | 30 | Woods, Good, HSG A |
| 7,841 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 25.2 | 50 | 0.0120 | 0.03 | | **Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.50" |
| 2.2 | 62 | 0.0339 | 0.46 | | **Shallow Concentrated Flow, B-C** Forest w/Heavy Litter Kv= 2.5 fps |
| 27.4 | 112 | Total | | | |

## Subcatchment 5S: Catchment Area 5



## Summary for Pond 2P: Roof SWMA

[82] Warning: Early inflow requires earlier time span

Inflow Area = 6,000 sf,100.00% Impervious, Inflow Depth > 6.24" for D - 100YR event
Inflow = 0.95 cfs @ 12.07 hrs, Volume= 3,119 cf
Outflow = 0.16 cfs @ 12.52 hrs, Volume= 3,117 cf, Atten= 83%, Lag= 27.2 min
Discarded = 0.16 cfs @ 12.52 hrs, Volume= 3,117 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 89.83' @ 12.52 hrs Surf.Area= 340 sf Storage= 1,023 cf

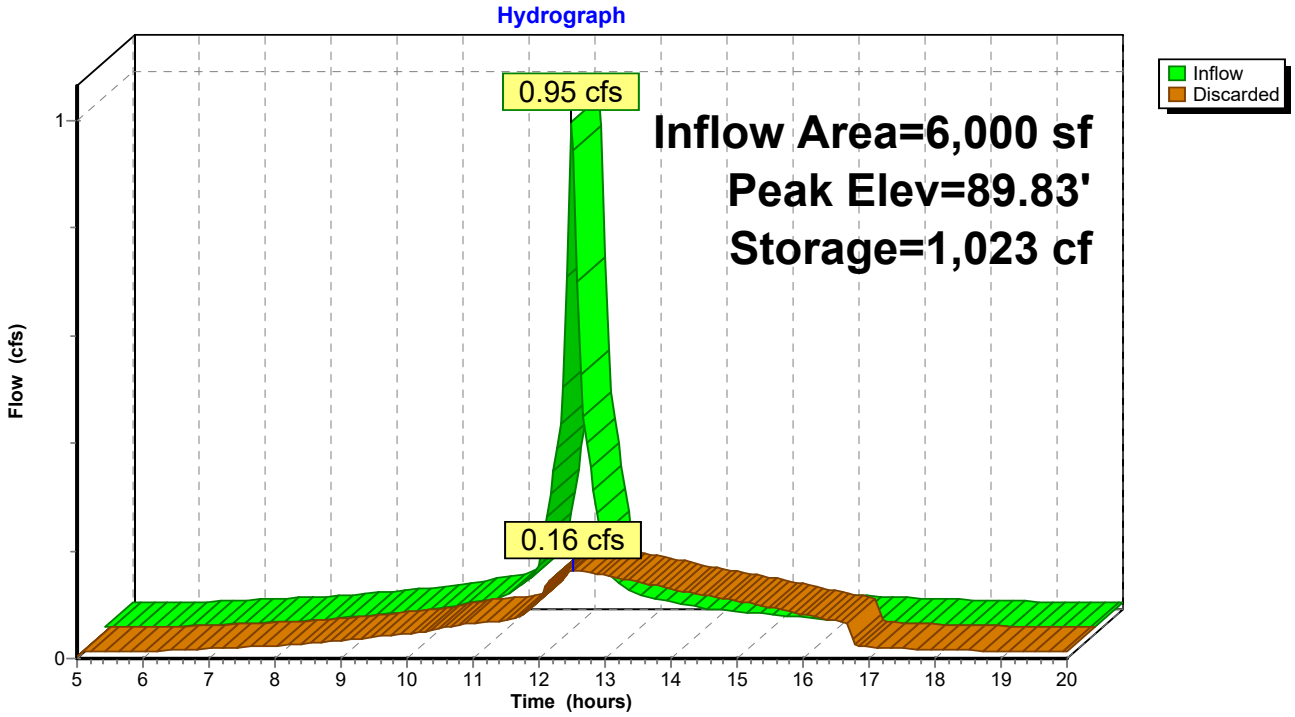
Plug-Flow detention time= 50.4 min calculated for 3,116 cf (100% of inflow)
Center-of-Mass det. time= 49.9 min ( 782.7 - 732.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 84.00' | 769 cf | **10.00'W x 34.00'L x 8.00'H Prismatoid**<br>2,720 cf Overall - 796 cf Embedded = 1,924 cf x 40.0% Voids |
| #2 | 86.00' | 679 cf | **6.00'D x 6.00'H Vertical Cone/Cylinder** x 4 Inside #1<br>796 cf Overall - 3.0" Wall Thickness = 679 cf |
| | | 1,448 cf | Total Available Storage |

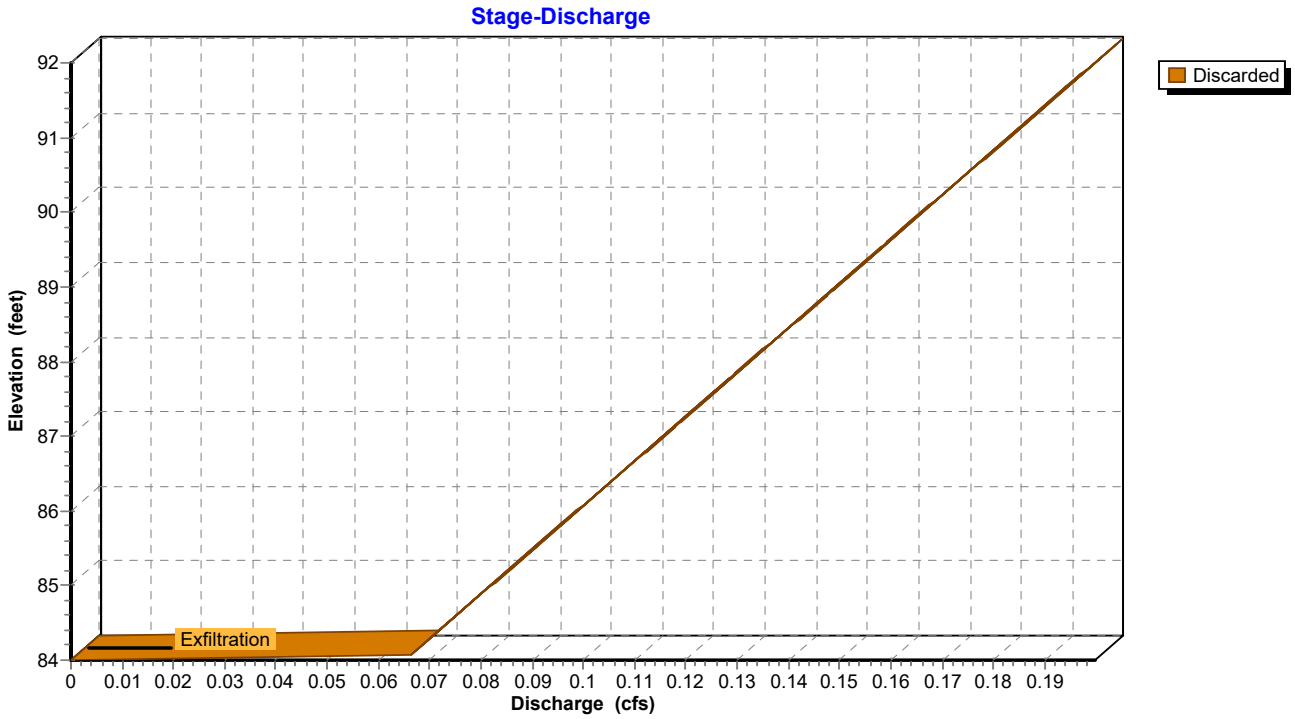
| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 84.00' | **8.270 in/hr Exfiltration over Wetted area** |

**Discarded OutFlow** Max=0.16 cfs @ 12.52 hrs HW=89.83' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

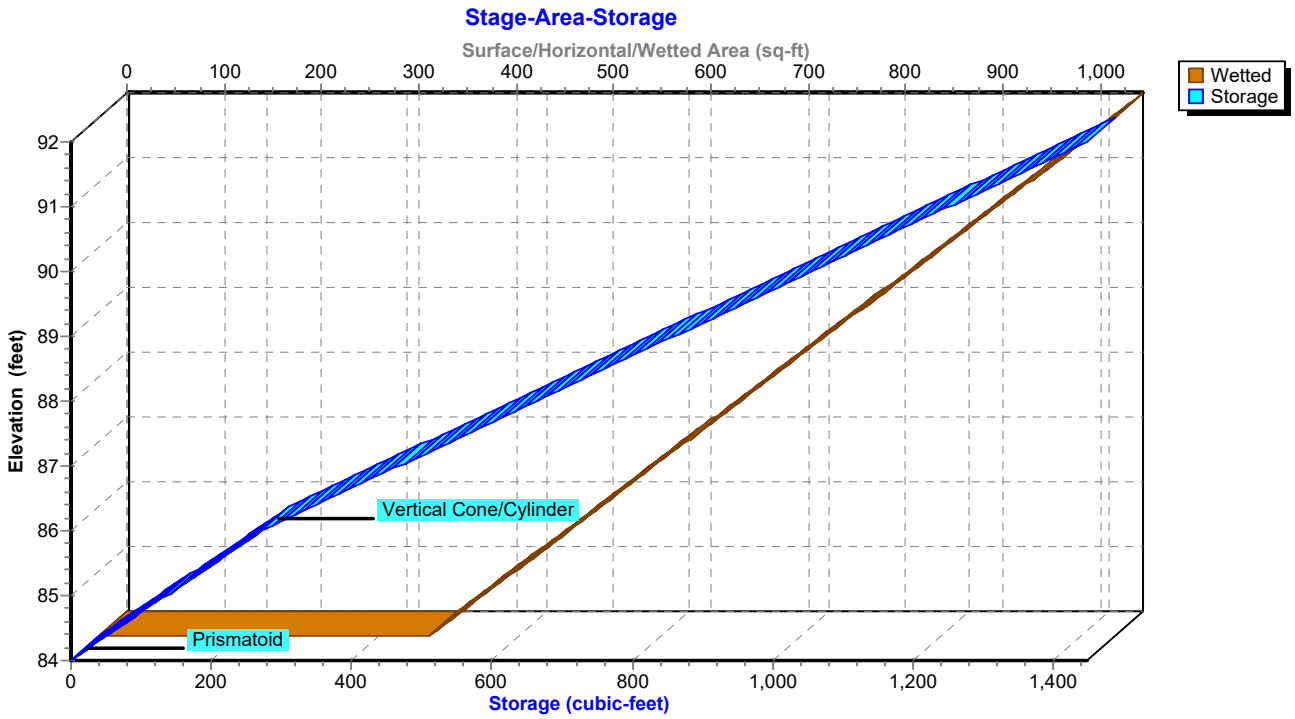
## Pond 2P: Roof SWMA




## Pond 2P: Roof SWMA



## Pond 2P: Roof SWMA



## Summary for Pond 4P: Rain Garden

Inflow Area = 67,846 sf, 35.28% Impervious, Inflow Depth > 2.27" for D - 100YR event
Inflow = 2.37 cfs @ 12.50 hrs, Volume= 12,824 cf
Outflow = 0.22 cfs @ 12.95 hrs, Volume= 6,054 cf, Atten= 91%, Lag= 27.2 min
Discarded = 0.22 cfs @ 12.95 hrs, Volume= 6,054 cf

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 93.64' @ 16.07 hrs Surf.Area= 1,296 sf Storage= 7,882 cf

Plug-Flow detention time= 224.5 min calculated for 6,034 cf (47% of inflow)
Center-of-Mass det. time= 137.7 min ( 972.3 - 834.5 )

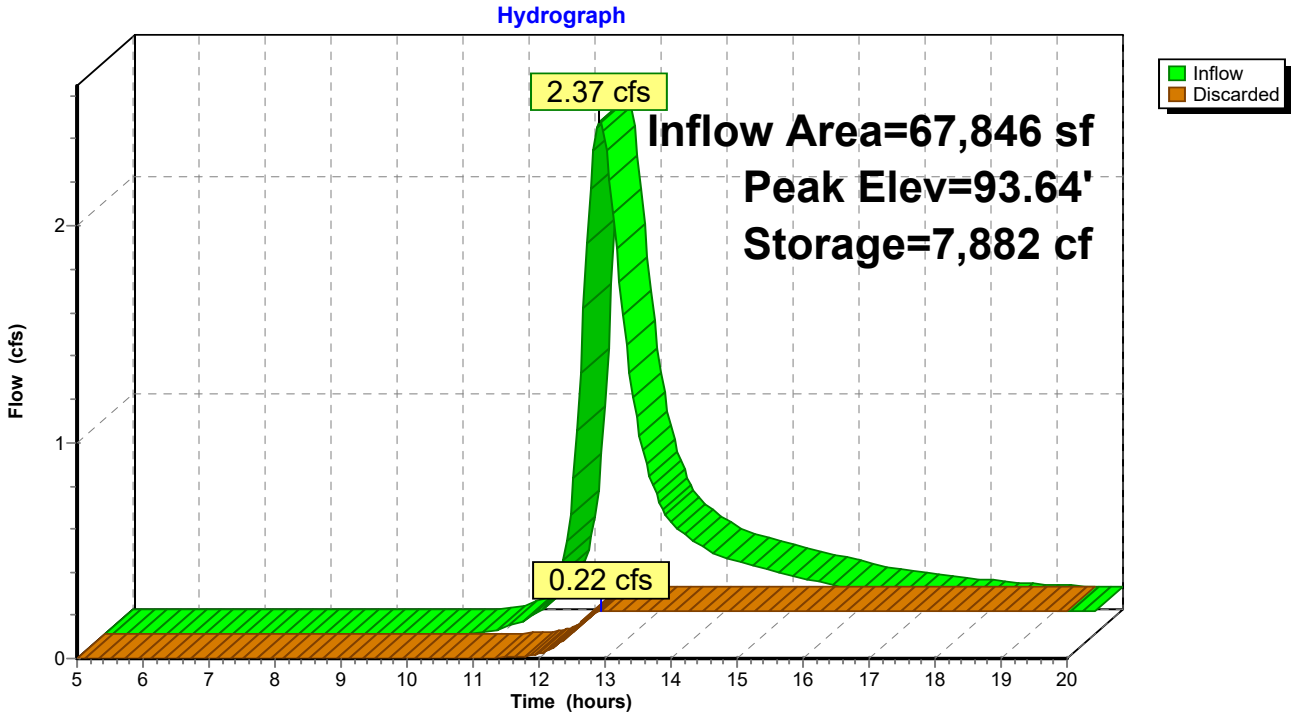
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 87.66' | 3,876 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) -Impervious |
| #2 | 78.75' | 2,873 cf | **36.00'W x 36.00'L x 8.00'H Prismatoid**<br>10,368 cf Overall - 3,186 cf Embedded = 7,182 cf x 40.0% Voids |
| #3 | 80.75' | 2,714 cf | **6.00'D x 6.00'H Vertical Cone/Cylinder** x 16 Inside #2<br>3,186 cf Overall - 3.0" Wall Thickness = 2,714 cf |
| | | 9,463 cf | Total Available Storage |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Voids (%) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|---|
| 87.66 | 359 | 73.0 | 0.0 | 0 | 0 | 359 |
| 87.67 | 359 | 73.0 | 40.0 | 1 | 1 | 360 |
| 88.99 | 359 | 73.0 | 40.0 | 190 | 191 | 456 |
| 89.00 | 359 | 73.0 | 30.0 | 1 | 192 | 457 |
| 90.74 | 359 | 73.0 | 30.0 | 187 | 379 | 584 |
| 90.75 | 359 | 73.0 | 30.0 | 1 | 381 | 585 |
| 90.99 | 359 | 73.0 | 30.0 | 26 | 406 | 602 |
| 91.00 | 359 | 73.0 | 100.0 | 4 | 410 | 603 |
| 92.00 | 606 | 91.9 | 100.0 | 477 | 887 | 864 |
| 93.00 | 910 | 110.7 | 100.0 | 753 | 1,640 | 1,184 |
| 94.00 | 1,270 | 129.6 | 100.0 | 1,085 | 2,725 | 1,565 |
| 94.80 | 1,614 | 145.3 | 100.0 | 1,151 | 3,876 | 1,925 |

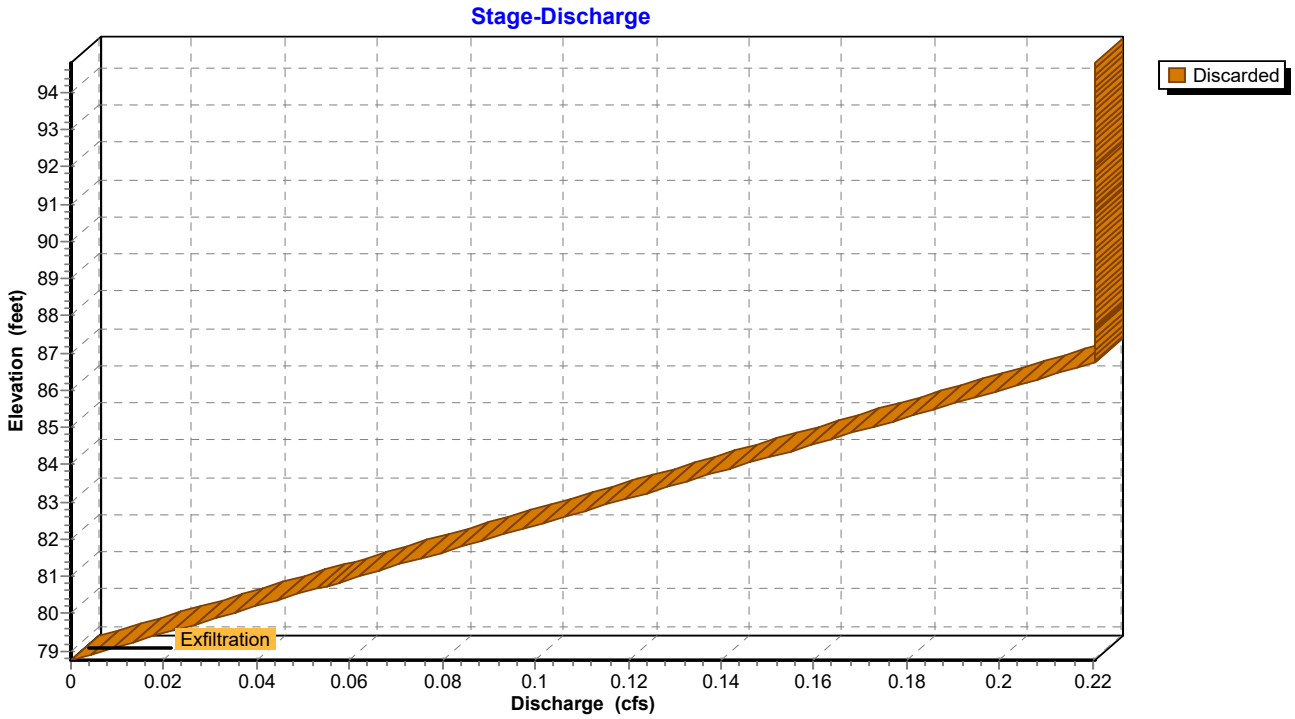
| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 78.75' | **8.270 in/hr Exfiltration over Wetted area from 78.75' - 90.00'**<br>Excluded Wetted area = 1,296 sf |

**Discarded OutFlow** Max=0.22 cfs @ 12.95 hrs HW=88.27' (Free Discharge)
**1=Exfiltration** (Exfiltration Controls 0.22 cfs)

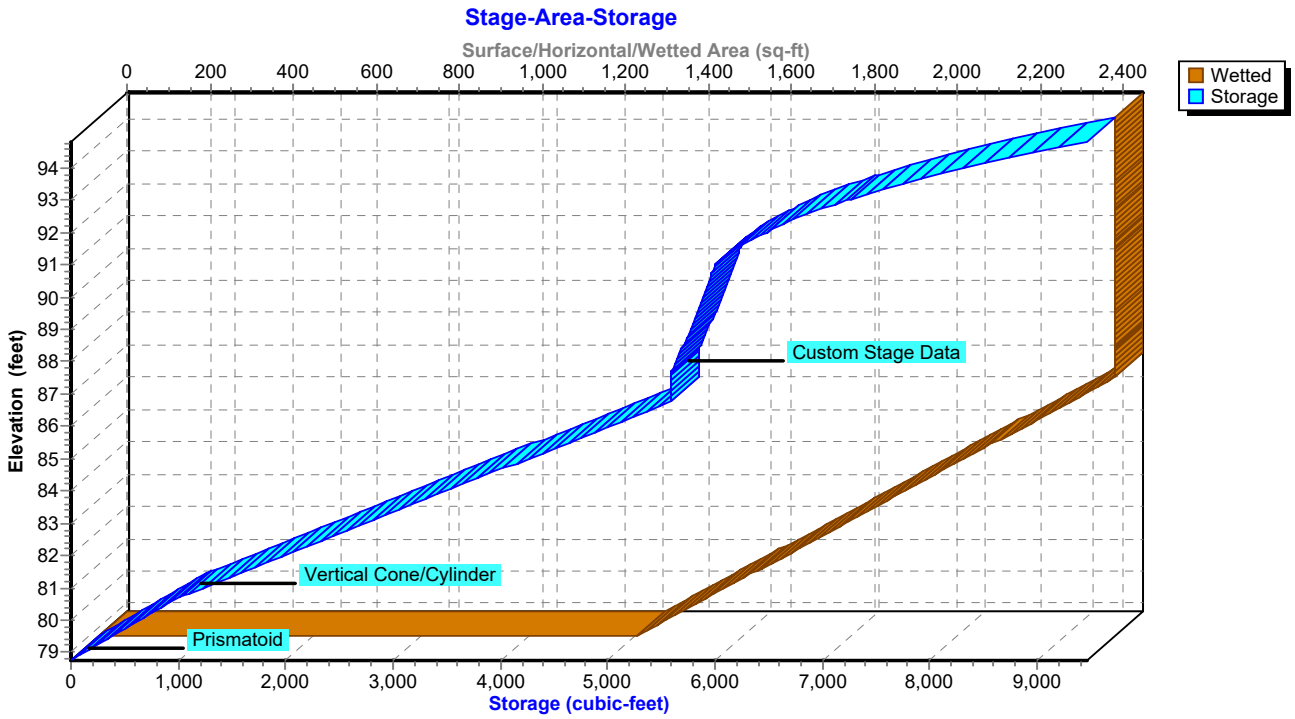
## Pond 4P: Rain Garden




## Pond 4P: Rain Garden



## Pond 4P: Rain Garden



Soil Map—Barnstable County, Massachusetts
(474 Main Street & 31 Ashumet Road)


Map Scale: 1:1,150 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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

# Barnstable County, Massachusetts

## 252D—Carver coarse sand, 15 to 35 percent slopes

### Map Unit Setting

*National map unit symbol:* 2y07y
*Elevation:* 0 to 220 feet
*Mean annual precipitation:* 36 to 71 inches
*Mean annual air temperature:* 39 to 55 degrees F
*Frost-free period:* 140 to 250 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

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

### Description of Carver, Coarse Sand

#### Setting

*Landform:* Moraines, outwash plains
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Head slope, nose slope, side slope, riser
*Down-slope shape:* Convex, linear
*Across-slope shape:* Linear
*Parent material:* Sandy glaciofluvial deposits

#### Typical profile

*Oi - 0 to 2 inches:* slightly decomposed plant material
*Oe - 2 to 3 inches:* moderately decomposed plant material
*A - 3 to 7 inches:* coarse sand
*E - 7 to 10 inches:* coarse sand
*Bw1 - 10 to 15 inches:* coarse sand
*Bw2 - 15 to 28 inches:* coarse sand
*BC - 28 to 32 inches:* coarse sand
*C - 32 to 67 inches:* coarse sand

#### Properties and qualities

*Slope:* 15 to 35 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Excessively drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to very high (1.42 to 14.17 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)
*Available water supply, 0 to 60 inches:* Low (about 4.3 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 6e
*Hydrologic Soil Group:* A
*Ecological site:* F149BY005MA - Dry Outwash
*Hydric soil rating:* No

**Minor Components**

**Deerfield**

*Percent of map unit:* 10 percent
*Landform:* Outwash terraces, outwash plains, kame terraces, outwash deltas
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Concave
*Hydric soil rating:* No

**Hinckley**

*Percent of map unit:* 5 percent
*Landform:* Moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces
*Landform position (two-dimensional):* Summit, shoulder, backslope, footslope, toeslope
*Landform position (three-dimensional):* Head slope, nose slope, side slope, crest, riser, tread
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Hydric soil rating:* No

**Merrimac**

*Percent of map unit:* 3 percent
*Landform:* Kame terraces, outwash deltas, outwash terraces
*Landform position (three-dimensional):* Riser, tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Hydric soil rating:* No

**Freetown, coastal lowland**

*Percent of map unit:* 2 percent
*Landform:* Bogs, marshes, swamps
*Landform position (three-dimensional):* Dip
*Down-slope shape:* Concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

# Data Source Information

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 20, Sep 12, 2023

# Barnstable County, Massachusetts

## 265A—Enfield silt loam, 0 to 3 percent slopes

### Map Unit Setting

*National map unit symbol:* 98qs
*Elevation:* 0 to 1,000 feet
*Mean annual precipitation:* 40 to 50 inches
*Mean annual air temperature:* 45 to 55 degrees F
*Frost-free period:* 140 to 240 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

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

### Description of Enfield

#### Setting

*Landform:* Outwash plains
*Landform position (two-dimensional):* Summit
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Parent material:* Silty, friable loamy eolian deposits over loose sandy glaciofluvial deposits

#### Typical profile

*H1 - 0 to 12 inches:* silt loam
*H2 - 12 to 31 inches:* silt loam
*H3 - 31 to 64 inches:* gravelly coarse sand

#### Properties and qualities

*Slope:* 0 to 3 percent
*Depth to restrictive feature:* 16 to 40 inches to strongly contrasting textural stratification
*Drainage class:* Well drained
*Runoff class:* Low
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high (0.60 to 2.00 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* Moderate (about 7.4 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 1
*Hydrologic Soil Group:* B

*Ecological site:* F144AY024NY - Well Drained Eolian Outwash
*Hydric soil rating:* No

**Minor Components**

**Merrimac**
*Percent of map unit:* 10 percent
*Hydric soil rating:* No

**Carver**
*Percent of map unit:* 5 percent
*Hydric soil rating:* No

**Hinckley**
*Percent of map unit:* 5 percent
*Hydric soil rating:* No

# Data Source Information

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 20, Sep 12, 2023

# Barnstable County, Massachusetts

## 602—Urban land

### Map Unit Setting

*National map unit symbol:* 98s7
*Frost-free period:* 120 to 220 days
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Urban land:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Urban Land

#### Setting

*Parent material:* Excavated and filled land

### Minor Components

#### Udipsamments

*Percent of map unit:* 15 percent
*Hydric soil rating:* Unranked

# Data Source Information

Soil Survey Area: Barnstable County, Massachusetts
Survey Area Data: Version 20, Sep 12, 2023

## Appendix - F
## Drawdown Calculations for Stormwater Management Systems

**Exfiltration Rate:** 8.27 in/hr = 0.689 ft/hr Carver Coarse Sand

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subsurface Sys. 2P:** | 100-YR Recharge Volume: | 3,117.00 | c.f. | | | | |
| | Bottom Area: | 500 | s.f. | | | | |
| | Bottom Exfiltration rate = | 340 | s.f. | x | 0.689 ft/hr | = | 234.3 c.f./hour |
| | Drawdown Time = | 3,117.00 | c.f. | / | 234.3 c.f./hr | = | 13.31 hours |
| | | 13.31 hours < 72 hours, therefore, system complies with drawdown time. | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Subsurface Sys. 4P:** | 100-YR Recharge Volume: | 6,054.00 | c.f. | | | | |
| | Bottom Area: | 1156 | s.f. | | | | |
| | Bottom Exfiltration rate = | 1156 | s.f. | x | 0.689 ft/hr | = | 796.5 c.f./hour |
| | Drawdown Time = | 6,054.00 | c.f. | / | 796.5 c.f./hr | = | 7.601 hours |
| | | 7.6 hours < 72 hours, therefore, system complies with drawdown time. | | | | | |

**Appendix G**
Project: 474 Main Street / 31 Ashumet Road – Mashpee, MA Rain Garden
Prepared By: ZLB
Date: 02/19/2024

TSS Removal Calculation Worksheet

| A<br>BMP | B<br>TSS Removal Rate | C<br>Starting TSS Load | D<br>Amount Removed (BxC) | E<br>Remaining Load (C-D) |
|---|---|---|---|---|
| Street Sweeping | 10% | 1.00 | 0.10 | 0.90 |
| Sediment Forebay | 25% | 0.90 | 0.22 | 0.68 |
| Rain Garden | 90% | 0.68 | 0.61 | 0.07 |
| | | | | |
| | | | | |
| | | Total TSS Removal = | 93% | |

Note: Greater than 44% TSS removed prior to infiltration

49 Herring Pond Road
Bourne, MA 02532
ph: 508-833-0070
fx: 505-833-2282

# Appendix H

## Required Water Quality

This site falls within an area with a rapid recharge rate (>2.4 inches per hour). Therefore, 1" water quality volume is to be used.

**Rain Garden #1**
Required WQV = (1.0 inch) * (1 ft/12 inches) * $A_{imp}$, where $A_{imp}$ is the impervious area onsite.

WQV = (1.0 inch) * (1 ft/12 inches) * 28,056 s.f. = **2,338 c.f.**

Water Quality Volume below overflow grate elevation **93.8** = **2,484 c.f.**

**Water Quality Volume Provided = 2,484 c.f. > 2,338 c.f. Required**

## Required Sediment Forebay Sizing

**Rain Garden Forebay #1**
Required Sediment Forebay Volume = (0.1 inch) * (1 ft/12 inches) * $A_{imp}$ = **233.8 c.f.**

Sediment Control Volume below check dam elevation **94.8** = **271 c.f.**

**Sediment Control Volume Provided = 271 c.f. > 233.8 c.f. Required**

# Appendix I

## CONSTRUCTION PERIOD POLLUTION PREVENTION & EROSION AND SEDIMENTATION CONTROL PLAN

The construction of the proposed development is to be done sequentially according to elevation and siting needs.

Siltation control is to be established as needed to protect the abutting property and roadway from eroding soil and siltation during construction Silts sacks are to be installed in all existing abutting catch basins.

No washing and/or cleaning of vehicles and/or equipment is to take place on site. In order to prevent mud and debris from being transported offsite. If debris is transported onto abutting properties it is to be removed immediately to maintain public safety. Any mud or siltation that has been tracked offsite is to be cleaned up before crews leave for the day.

Care should be taken to avoid excessive compaction of the area being used for onsite recharge. Filter fabric and/or silt sacks are to be placed under the grate of all catch basins. All basins and drains are to be checked monthly or before and after large rain storms, 0.5 inches or greater. This barrier is to be replaced when silt has built up or any damage has been found during inspection. The silt sacks are to be emptied and washed when they are 1/3 full. Site will then be brought to proposed subgrade for the patio and lawn areas. Once subgrade is obtained and all abutting landscape areas have been stabilized, the final patio areas shall be installed.

Care should be taken throughout the construction process to protect the infiltration areas from siltation and heavy vehicle traffic. It is recommended to stake or flag these areas as a visual reminder to onsite contractors.

A construction dumpster shall be kept onsite where it is out of the way of construction. All trash, scraps, offcuts, and the like are to be deposited in the dumpster as soon as possible. The dumpster is to be covered at the end of the work day to prevent wind-born debris from littering the neighboring properties. All contractors are responsible for cleaning up their waste and scraps. If it is necessary to store materials onsite, they must be kept neat and orderly.

# OPERATIONS AND MAINTENANCE PLAN

**Facility Location:** 474 Main Street / 31 Ashumet Road – Mashpee, MA
Parcel IDs: 27-001-000A & 27-001-000B

**Proposed Facility Owner:** Joao L. Junqueira
53 Mercantile Way, Unit 6
Mashpee, MA 02649

**Facility Description:**

The drainage system Best Management Practice (BMP) is designed for a commercial development consisting of one building, and associated loading, parking, storage areas. Drainage system components consist of the following:

- Two (2) subsurface infiltration systems
- One (1) rain garden with subsurface infiltration
- One (1) sediment forebay
- One (1) grassed conveyance swale

**Maintenance During Site Preparation:**

1. Tree clearing and removal of topsoil shall be kept at a minimum in conformance with the Design Plan.
2. Stockpile areas for top and subsoil shall be located in an area away from the low points to avoid entering the drainage system. The perimeter of stockpile areas is to be staked with silt fence and/or haybales, if required.
3. All erosion control measures shall be inspected and repaired or replaced following every rainfall event.
4. Shoulders and side slopes shall be protected with mulch, hay, sod or approved equal until all slopes are permanently stabilized.

**Maintenance During Building Construction:**

1. The driveway entrance shall be designated prior to work. The entrance shall be prepared by removing top and subsoil and placing crushed stone in accordance with Plan Details. This entrance shall be the sole entrance during construction of the buildings, driveway, and site preparation. This apron shall be pitched away from the roadway to prevent runoff from the apron entering the roadway.
2. Areas that drain to the main driveway, such as lawn and landscaped areas shall be permanently stabilized prior to final pavement.
3. The owner of the facilities (Joao L. Junqueira), or its agent, shall inspect all of the erosion control measures on a weekly basis and repair/replace as required. The owner/agent shall also inspect all erosion control measures after each significant rainstorm.
4. The rain gardens and drywells shall be protected with crushed stone and rip-rap until stabilized with vegetation.

**Routine Maintenance:**

The routine maintenance program shall begin only after the following:

- Construction and slope stabilization are complete;
- All disturbed areas are adequately vegetated and stabilized;
- All leaching systems have been pumped and completely cleaned;
- The system has been completely inspected by the design engineer and the Planning Board's engineer and found to be functioning as designed in that no clogging of the leaching system has occurred during construction.

**Routine maintenance shall consist of the following:**

1. The leaching systems shall be inspected annually.
2. The rain gardens are to be cleared of debris and sediment on a bi-annual basis, including the stone diaphragm.
3. Forebay is to be inspected annually. Excessive sediment buildup is to be removed as required.
4. The Grass Conveyance Swale is to be inspected annually. Excessive sediment buildup is to be removed as required.

# EMERGENCY SPILL CLEANUP PLAN

**Facility Location:** 474 Main Street / 31 Ashumet Road – Mashpee, MA
Parcel IDs: 27-001-000A & 27-001-000B

The owner of the facility shall have a designated person with overall responsibility for spill response cleanup.

1) Key personnel shall be trained in the use of this plan and spill containment and cleanup methods. All employees should have basic knowledge of spill control procedures.

2) A summary of this plan shall be posted in a prominent location in the building. The Summary shall identify the spill cleanup coordinators, location of cleanup kit, and phone numbers of regulatory agencies and individuals to be contacted in the event of a spill.

3) In the event of a spill, the following shall be notified:

| | |
|---|---|
| a. Mashpee Fire Department | 508-539-1454 |
| b. Department of Environmental Protection | 508-946-2700 |
| c. Mashpee Water District | 508-477-6767 |
| d. Bourne Board of Health | 508-539-1426 |

4) The cleanup of spills shall begin immediately.

5) An emergency spill containment and cleanup kit shall be stored and maintained on site. The kit shall be stored in a manner that allows rapid access and use by employees. A Spill Safety Supply-Oilup Sorbent® 31 Gallon Spill Response Kit or equal and Two Spillmagnet™ 24" x 24" drain covers shall be stored with the emergency spill response and containment kit. Kits and refills are available from Lab Safety Supply (800-356-0783).

6) The emergency spill cleanup plan shall be updated regularly.

## OWNER CERTIFICATION

**Facility Location:** 474 Main Street / 31 Ashumet Road – Mashpee, MA
Parcel IDs: 27-001-000A & 27-001-000B

I, Joao L. Junqueira, hereby acknowledge that I have read and understand the Operation and Maintenance Plan and Emergency Spill Cleanup Plan, which shall be adhered to during and after construction. A copy of the Emergency Spill Cleanup Plan shall be given to each tenant with the Hazardous Waste Acknowledgement Form.

Joao L. Junqueira Date

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

# 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.

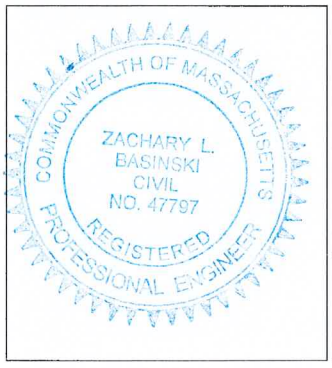
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that 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




Signature and Date 2/19/24

## 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:

- [x] No disturbance to any Wetland Resource Areas
- [x] Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- [ ] Reduced Impervious Area (Redevelopment Only)
- [x] 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
- [x] Bioretention Cells (includes Rain Gardens)
- [ ] Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- [ ] Treebox Filter
- [ ] Water Quality Swale
- [x] Grass Channel
- [ ] Green Roof
- [ ] Other (describe): _____

**Standard 1: No New Untreated Discharges**

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

# Checklist for Stormwater Report

## Checklist (continued)

### Standard 2: Peak Rate Attenuation

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

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

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

### Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

# Checklist 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 propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

**Standard 6: Critical Areas**

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

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

# Checklist 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.

# Appendix K

## ILLICIT DISCHARGE POLLUTION PREVENTION STATEMENT
## 474 Main Street / 31 Ashumet Road – Mashpee, Ma.

There is to be no dumping of toxins, pollutants, or illicit materials into the storm drainage systems on-site as it is strictly prohibited by law.

Toxins, pollutants, or illicit materials consist of, but are not limited to: paint, bleach, antifreeze, motor oil, raw sewage, hydrocarbons, kitchen grease, lubricating grease, etc.

The on-site storm drainage system is to be inspected periodically in accordance with the Operations and Maintenance plan. At the time of inspection, an inspection for illicit discharges shall be conducted. If illicit discharges are found during inspection, then immediate action should be taken to remediate and clean up the illicit discharge.

The remediation and/or clean-up is to be performed by a qualified company, such as Clean Harbors, 42 Longwater Dr., Norwell, MA 02061, Phone 1-800-645-8265 or equivalent.