**Stormwater Addendum 1**
**for**
**Fearing Hill Road Solar Project**
**Wareham, Massachusetts**

**Prepared for:**
**WAREHAM MA 3, LLC**
**100 Summit Lake Drive, Suite 210**
**Valhalla, NY 10595**

Prepared by:
Atlantic Design Engineers, Inc.
P.O. Box 1051
Sandwich, Massachusetts 02563

June 14, 2022
Atlantic Project No. 3055.02

## TABLE OF CONTENTS

I. INTRODUCTION
II. SUMMARY OF REVISIONS

**APPENDICES**

A. Pre- and Post-Development HydroCAD Stormwater Analysis- 1ST Revision
- Revised Pre-Development Analysis
- Revised Post-Development Analysis

B. Diversion Trench Capacity Calculation
C. Pre-Development & Post-Development Watershed Plans – 1st Revision

**UNDER SEPARATE COVER**

Copy of plans entitled "Site Development Plans for Fearing Hill Road Solar Project, Wareham Massachusetts" (Sheets 1 - 7) prepared by Atlantic Design Engineers, Inc., Revised date June 14, 2022

## I. INTRODUCTION

This addendum to the 5/17/2021 Stormwater Drainage Analysis for the Proposed Fearing Hill Road Solar Project in Wareham, MA has been prepared to address a revised site layout/site design and comments received from the Town's consulting engineer Charles Rowley, as well as to address issues and recommendations from the May 2022 Hydrogeologic and Hydrology Study by Horsley Witten Group.

## II. SUMMARY OF REVISIONS

The following is a summary of the revisions made since the last submittal. They are as follows:

- Revised watershed boundaries and areas to reflect the latest site layout/design.
- Incorporation of the railroad grade/ditch west of the site into the Hydrocad modelling.
- Incorporation of a diversion swale/trench to divert stormwater from the south western side of the project to the eastern side.
- Include analysis of pre- versus post-development runoff volumes in addition to peak rates.

Revised Pre- and Post-Development stormwater calculations were performed for the 2, 10, 25 and 100-year, Type III storm events. A comparison of the Pre- vs. Post-Development peak runoff rates and volumes for each storm event at the east and west design points is summarized in the following tables:

**Table 11: Pre- and post-development flows for HW Models**

| **DP1** | **Northeast Wetland** | | | | | |
|---|---|---|---|---|---|---|
| Event | ***Pre-development (HW)*** | | ***Post-development (SW)*** | | **Change** | |
| | Flow, *cfs* | Volume, *a-f* | Flow, *cfs* | Volume, *a-f* | Flow | Volume |
| 2-yr | 14.02 | 1.8 | 13.38 | 2.4 | -5% | 33% |
| 10-yr | 30.64 | 3.8 | 26.00 | 4.8 | -15% | 26% |
| 25-yr | 43.84 | 5.4 | 34.98 | 6.6 | -20% | 22% |
| 100-yr | 66.37 | 8.2 | 48.58 | 9.8 | -27% | 19% |

| **DP2** | **Southwest Wetland/Railroad Ditch** | | | | | |
|---|---|---|---|---|---|---|
| Event | ***Pre-development (HW)*** | | ***Post-development (SW)*** | | **Change** | |
| | Flow, *cfs* | Volume, *a-f* | Flow, *cfs* | Volume, *a-f* | Flow | Volume |
| 2-yr | 8.77 | 1.32* | 7.26 | 1.39* | -17% | 3.8%* |
| 10-yr | 23.31 | 3.1 | 17.22 | 3.1 | -26% | 0% |
| 25-yr | 35.55 | 4.6 | 25.45 | 4.5 | -28% | -2% |
| 100-yr | 57.28 | 7.3 | 39.93 | 6.9 | -30% | -5% |

| ***ALL*** | ***ALL COMBINED*** | | | | | |
|---|---|---|---|---|---|---|
| Event | ***Pre-development (HW)*** | | ***Post-development (SW)*** | | **Change** | |
| | Flow, *cfs* | Volume, *a-f* | Flow, *cfs* | Volume, *a-f* | Flow | Volume |
| 2-yr | 22.79 | 3.1 | 20.64 | 3.79 | -9% | 22% |
| 10-yr | 53.95 | 6.9 | 43.22 | 7.9 | -20% | 14% |
| 25-yr | 79.39 | 10.0 | 60.43 | 11.1 | -23% | 11% |
| 100-yr | 123.65 | 15.5 | 88.51 | 16.7 | -28% | 8% |

*In CF, Pre-Volume = 57,339 CF. Post Volume = 59,665 CF. A negligible increase of 2,326 CF.

As shown in the tables, the peak rates of stormwater runoff generated under Post-Development conditions will be less than the peak rates generated under Pre-Development conditions for all of the storm events at both the east and west design points.

Runoff volumes to the southwest have been reduced under Post-Development conditions for all storm events with the exception of a negligible increase in the 2-yr storm. Post-Development runoff volumes to the northeast are calculated to be increased over Pre-Development runoff volumes, primarily due to diversion of ±2.5 acres of the southwest watershed into the northeast watershed. However, this increase will have no affect on the expansive wetland system northeast of the site.

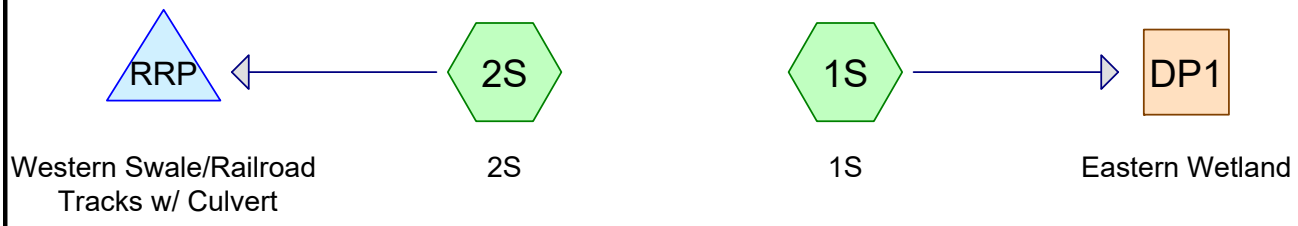
# APPENDIX A

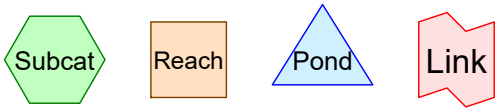
**Pre- and Post-Development HydroCAD Stormwater Analysis – 1st Revision**

*Revised Pre-Development Analysis*

*Revised Post-Development Analysis*

## PRE-DEVELOPMENT




**Routing Diagram for 3055.01- FEARING HILL RD - PRE-REV2**
Prepared by Atlantic Design Engineers, Inc., Printed 6/15/2022
HydroCAD® 10.00-25 s/n 00480 © 2019 HydroCAD Software Solutions LLC

Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1S: 1S** Runoff Area=809,848 sf 0.00% Impervious Runoff Depth=1.18"
Flow Length=463' Tc=28.4 min CN=71 Runoff=14.02 cfs 1.8 af

**Subcatchment 2S: 2S** Runoff Area=862,401 sf 0.00% Impervious Runoff Depth=0.80"
Flow Length=850' Tc=30.4 min CN=64 Runoff=8.77 cfs 1.3 af

**Reach DP1: Eastern Wetland** Inflow=14.02 cfs 1.8 af
Outflow=14.02 cfs 1.8 af

**Pond RRP: Western Swale/Railroad Tracks w/** Peak Elev=58.77' Storage=6,134 cf Inflow=8.77 cfs 1.3 af
Outflow=8.39 cfs 1.3 af

**Total Runoff Area = 38.390 ac Runoff Volume = 3.1 af Average Runoff Depth = 0.98"**
**100.00% Pervious = 38.390 ac 0.00% Impervious = 0.000 ac**

## Summary for Subcatchment 1S: 1S

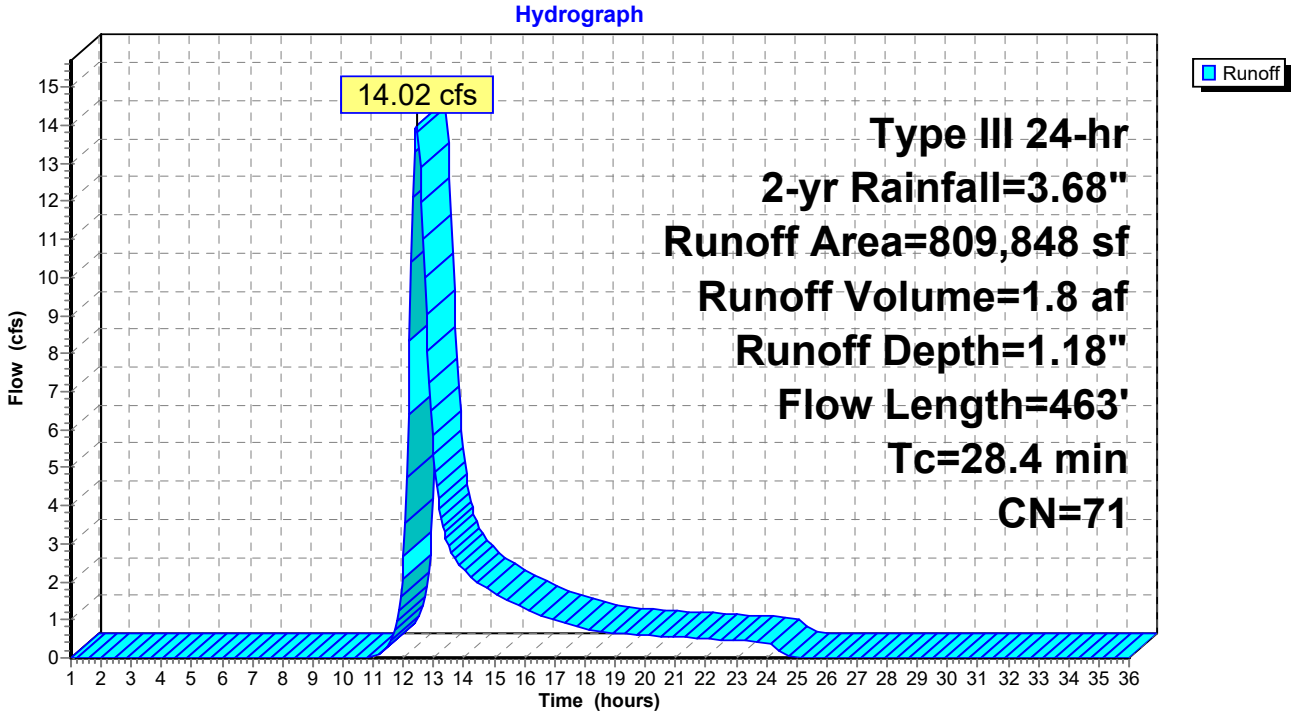
Runoff = 14.02 cfs @ 12.43 hrs, Volume= 1.8 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.68"

| Area (sf) | CN | Description |
|---|---|---|
| 41,299 | 55 | Woods, Good, HSG B |
| 598,726 | 70 | Woods, Good, HSG C |
| 169,823 | 77 | Woods, Good, HSG D |
| 809,848 | 71 | Weighted Average |
| 809,848 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 1.7 | 413 | 0.0670 | 4.17 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 28.4 | 463 | Total | | | |

## Subcatchment 1S: 1S



## Summary for Subcatchment 2S: 2S

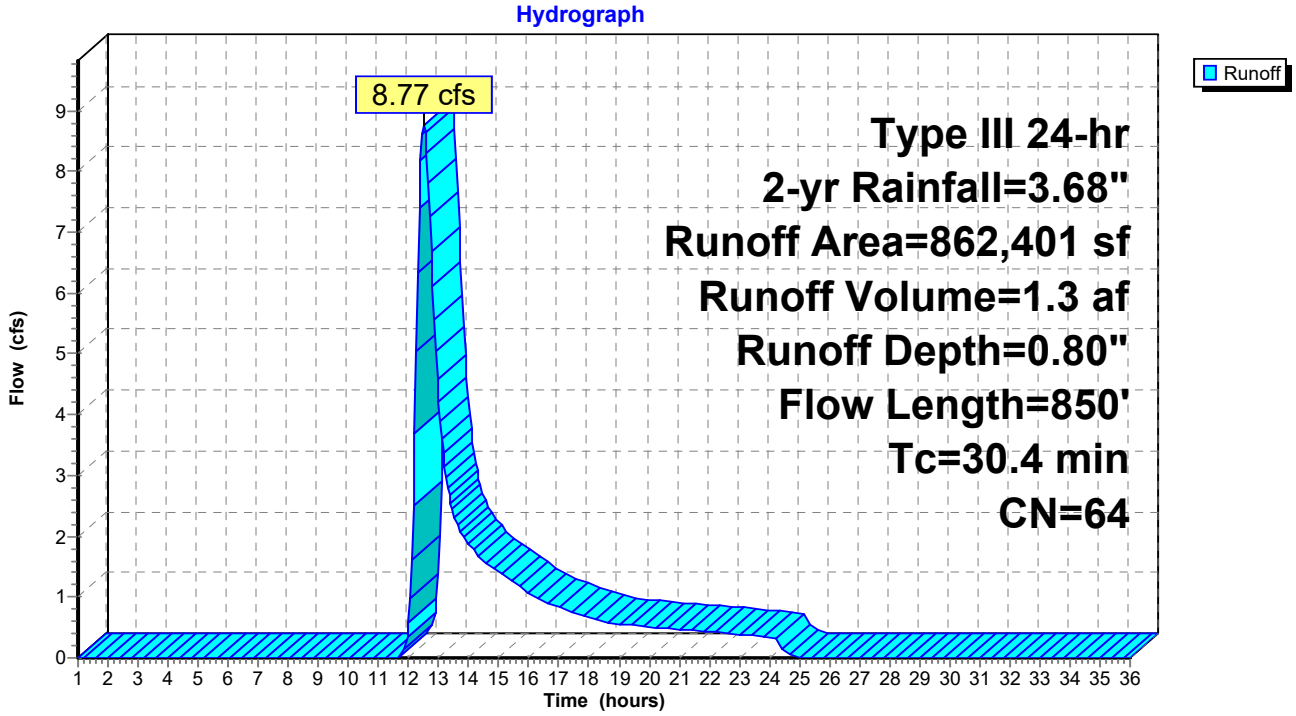
Runoff = 8.77 cfs @ 12.50 hrs, Volume= 1.3 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.68"

| Area (sf) | CN | Description |
|---|---|---|
| 344,400 | 55 | Woods, Good, HSG B |
| 512,627 | 70 | Woods, Good, HSG C |
| 5,374 | 74 | >75% Grass cover, Good, HSG C |
| 862,401 | 64 | Weighted Average |
| 862,401 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 3.7 | 800 | 0.0500 | 3.60 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 30.4 | 850 | Total | | | |

## Subcatchment 2S: 2S

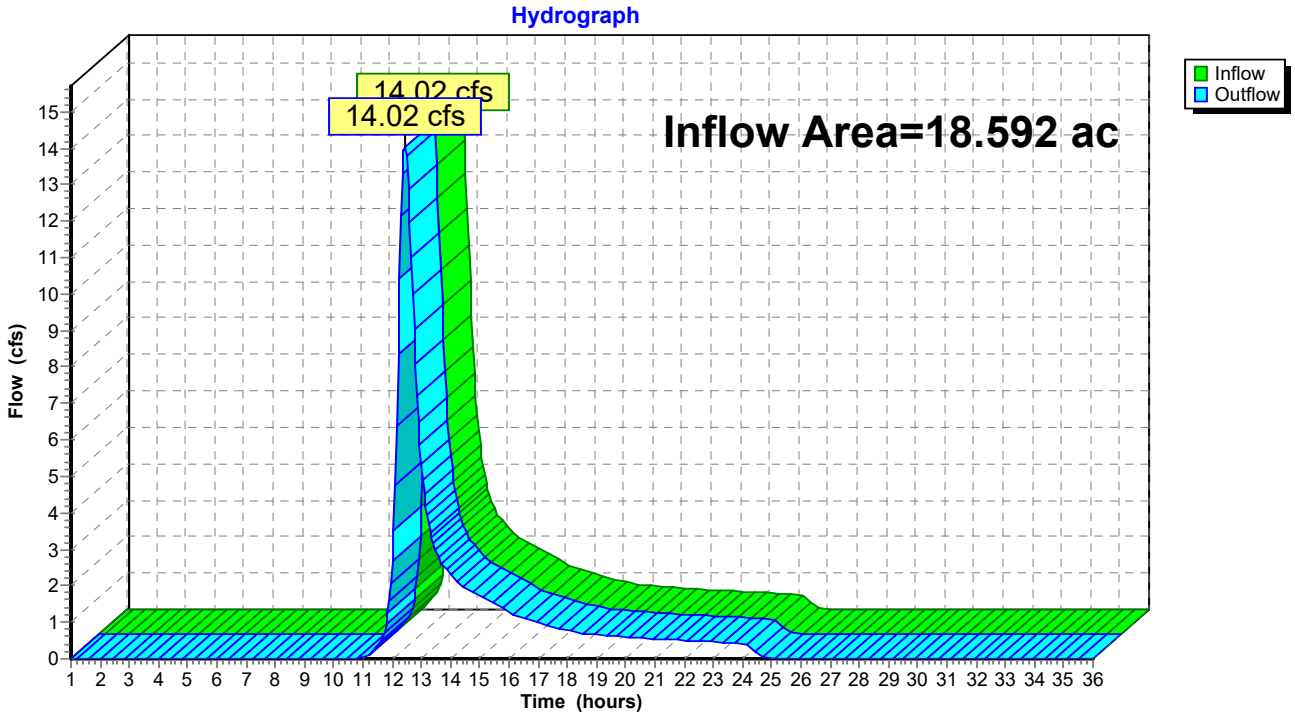


## Summary for Reach DP1: Eastern Wetland

Inflow Area = 18.592 ac, 0.00% Impervious, Inflow Depth = 1.18" for 2-yr event
Inflow = 14.02 cfs @ 12.43 hrs, Volume= 1.8 af
Outflow = 14.02 cfs @ 12.43 hrs, Volume= 1.8 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

## Reach DP1: Eastern Wetland



## Summary for Pond RRP: Western Swale/Railroad Tracks w/ Culvert

Inflow Area = 19.798 ac, 0.00% Impervious, Inflow Depth = 0.80" for 2-yr event
Inflow = 8.77 cfs @ 12.50 hrs, Volume= 1.3 af
Outflow = 8.39 cfs @ 12.61 hrs, Volume= 1.3 af, Atten= 4%, Lag= 6.5 min
Primary = 8.39 cfs @ 12.61 hrs, Volume= 1.3 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 58.77' @ 12.61 hrs Surf.Area= 8,330 sf Storage= 6,134 cf

Plug-Flow detention time= 14.2 min calculated for 1.3 af (100% of inflow)
Center-of-Mass det. time= 14.1 min ( 923.1 - 909.1 )

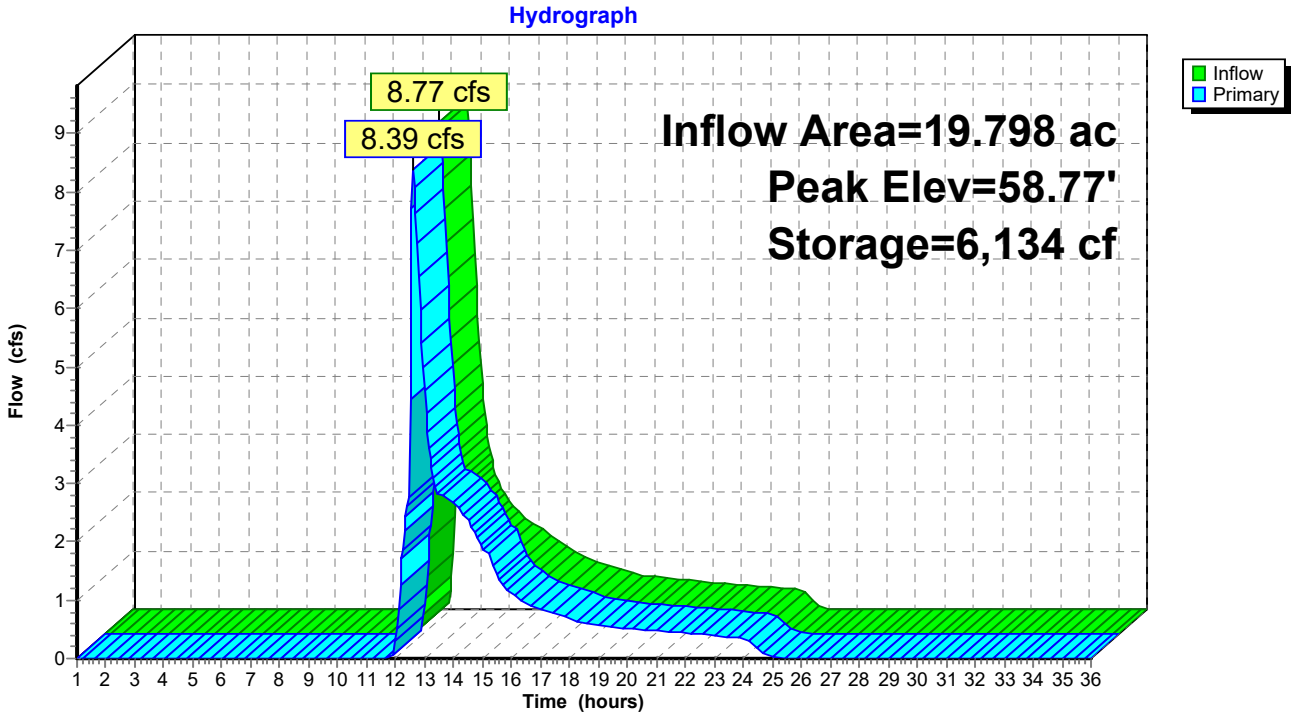
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 56.00' | 22,735 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 56.00 | 13 | 26.5 | 0 | 0 | 13 |
| 57.00 | 864 | 47.2 | 328 | 328 | 140 |
| 58.00 | 2,779 | 348.1 | 1,731 | 2,059 | 9,607 |
| 59.00 | 10,591 | 884.0 | 6,265 | 8,324 | 62,155 |
| 60.00 | 18,605 | 1,253.7 | 14,411 | 22,735 | 125,054 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 56.26' | **12.0" Round CMP_Round 12"**<br>L= 60.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 56.26' / 55.86' S= 0.0067 '/' Cc= 0.900<br>n= 0.025 Corrugated metal, Flow Area= 0.79 sf |
| #2 | Primary | 58.65' | **50.0' long x 35.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

**Primary OutFlow** Max=8.29 cfs @ 12.61 hrs HW=58.77' (Free Discharge)
└─**1=CMP_Round 12"** (Barrel Controls 2.92 cfs @ 3.72 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 5.36 cfs @ 0.92 fps)

## Pond RRP: Western Swale/Railroad Tracks w/ Culvert



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1S: 1S** Runoff Area=809,848 sf 0.00% Impervious Runoff Depth=2.45"
Flow Length=463' Tc=28.4 min CN=71 Runoff=30.64 cfs 3.8 af

**Subcatchment 2S: 2S** Runoff Area=862,401 sf 0.00% Impervious Runoff Depth=1.87"
Flow Length=850' Tc=30.4 min CN=64 Runoff=23.31 cfs 3.1 af

**Reach DP1: Eastern Wetland** Inflow=30.64 cfs 3.8 af
Outflow=30.64 cfs 3.8 af

**Pond RRP: Western Swale/Railroad Tracks w/** Peak Elev=58.93' Storage=7,627 cf Inflow=23.31 cfs 3.1 af
Outflow=23.20 cfs 3.1 af

**Total Runoff Area = 38.390 ac Runoff Volume = 6.9 af Average Runoff Depth = 2.15"**
**100.00% Pervious = 38.390 ac 0.00% Impervious = 0.000 ac**

## Summary for Subcatchment 1S: 1S

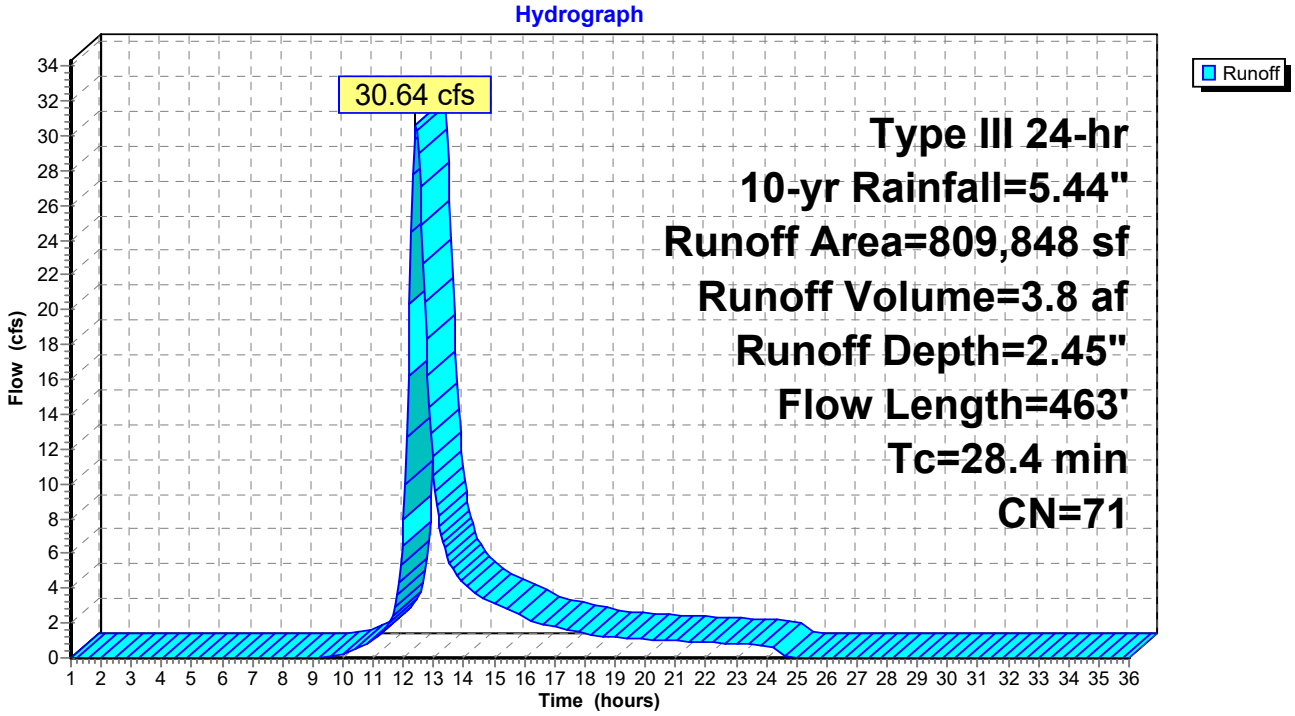
Runoff = 30.64 cfs @ 12.41 hrs, Volume= 3.8 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.44"

| Area (sf) | CN | Description |
|---|---|---|
| 41,299 | 55 | Woods, Good, HSG B |
| 598,726 | 70 | Woods, Good, HSG C |
| 169,823 | 77 | Woods, Good, HSG D |
| 809,848 | 71 | Weighted Average |
| 809,848 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 1.7 | 413 | 0.0670 | 4.17 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 28.4 | 463 | Total | | | |

## Subcatchment 1S: 1S



## Summary for Subcatchment 2S: 2S

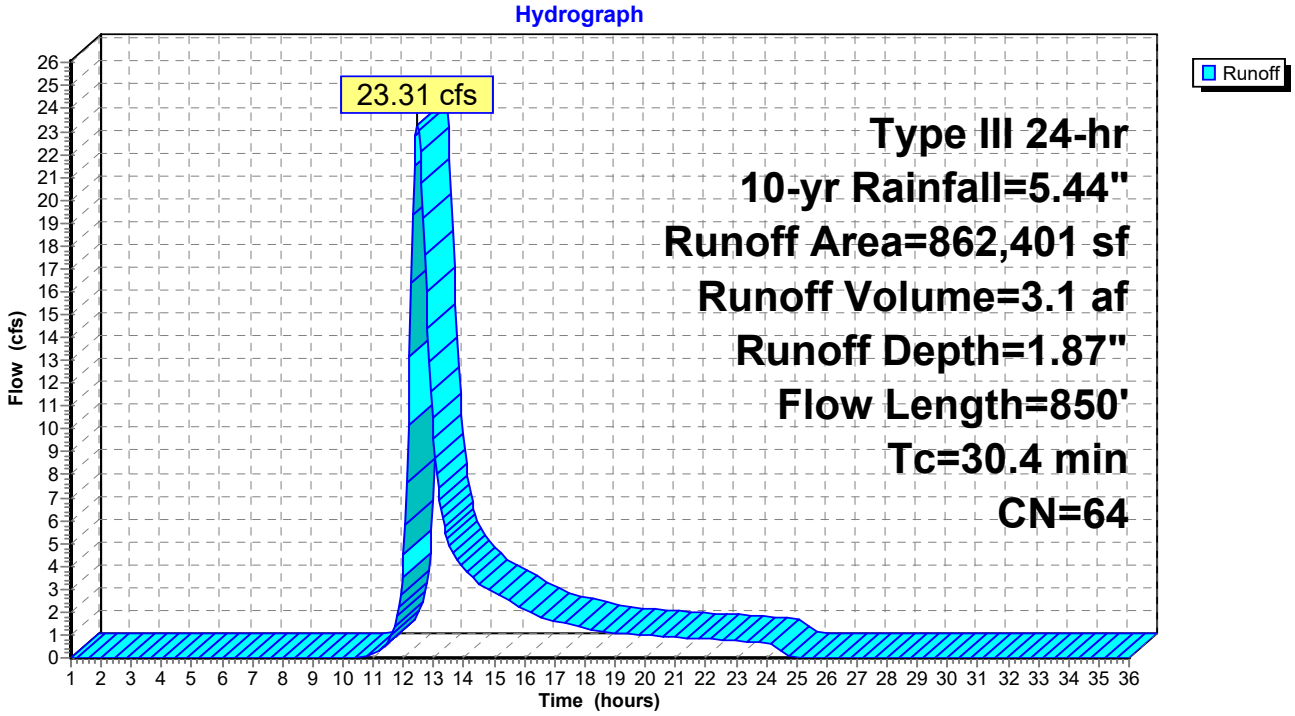
Runoff = 23.31 cfs @ 12.46 hrs, Volume= 3.1 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.44"

| Area (sf) | CN | Description |
|---|---|---|
| 344,400 | 55 | Woods, Good, HSG B |
| 512,627 | 70 | Woods, Good, HSG C |
| 5,374 | 74 | >75% Grass cover, Good, HSG C |
| 862,401 | 64 | Weighted Average |
| 862,401 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 3.7 | 800 | 0.0500 | 3.60 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 30.4 | 850 | Total | | | |

## Subcatchment 2S: 2S

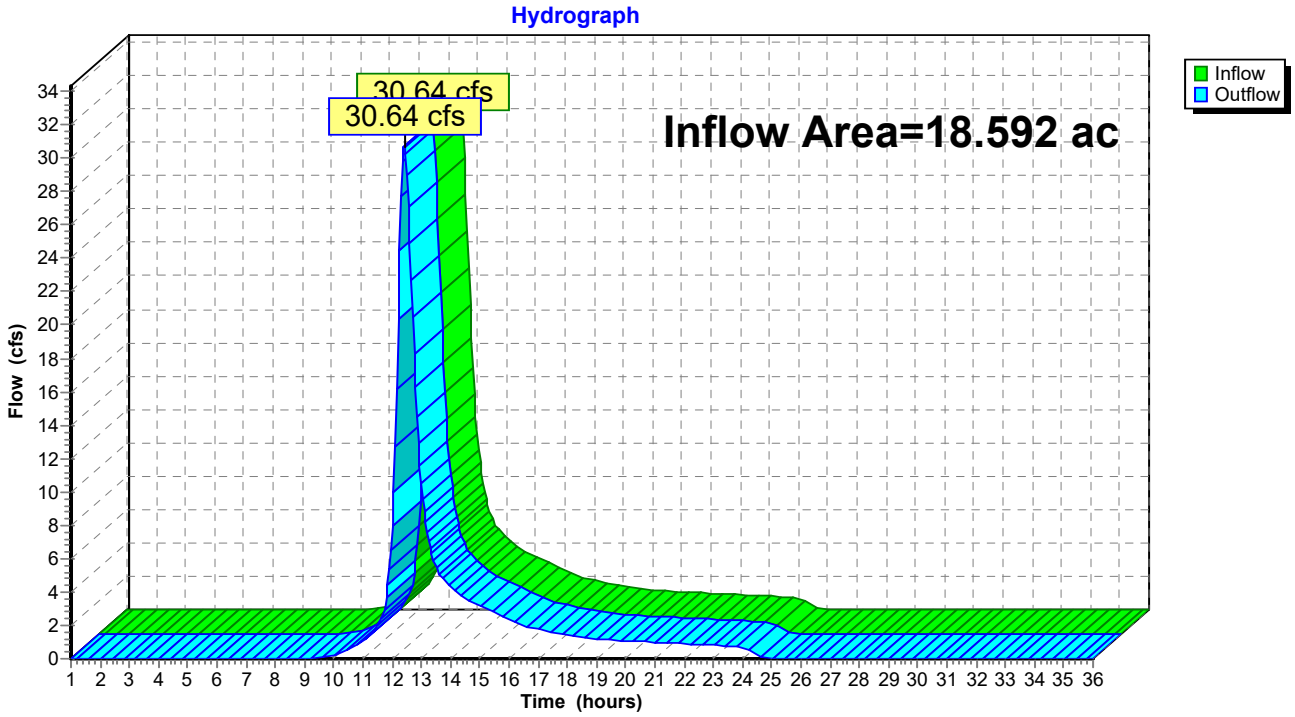


## Summary for Reach DP1: Eastern Wetland

Inflow Area = 18.592 ac, 0.00% Impervious, Inflow Depth = 2.45" for 10-yr event
Inflow = 30.64 cfs @ 12.41 hrs, Volume= 3.8 af
Outflow = 30.64 cfs @ 12.41 hrs, Volume= 3.8 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

## Reach DP1: Eastern Wetland



## Summary for Pond RRP: Western Swale/Railroad Tracks w/ Culvert

Inflow Area = 19.798 ac, 0.00% Impervious, Inflow Depth = 1.87" for 10-yr event
Inflow = 23.31 cfs @ 12.46 hrs, Volume= 3.1 af
Outflow = 23.20 cfs @ 12.48 hrs, Volume= 3.1 af, Atten= 0%, Lag= 1.5 min
Primary = 23.20 cfs @ 12.48 hrs, Volume= 3.1 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 58.93' @ 12.48 hrs Surf.Area= 9,900 sf Storage= 7,627 cf

Plug-Flow detention time= 12.8 min calculated for 3.1 af (100% of inflow)
Center-of-Mass det. time= 12.8 min ( 893.8 - 881.0 )

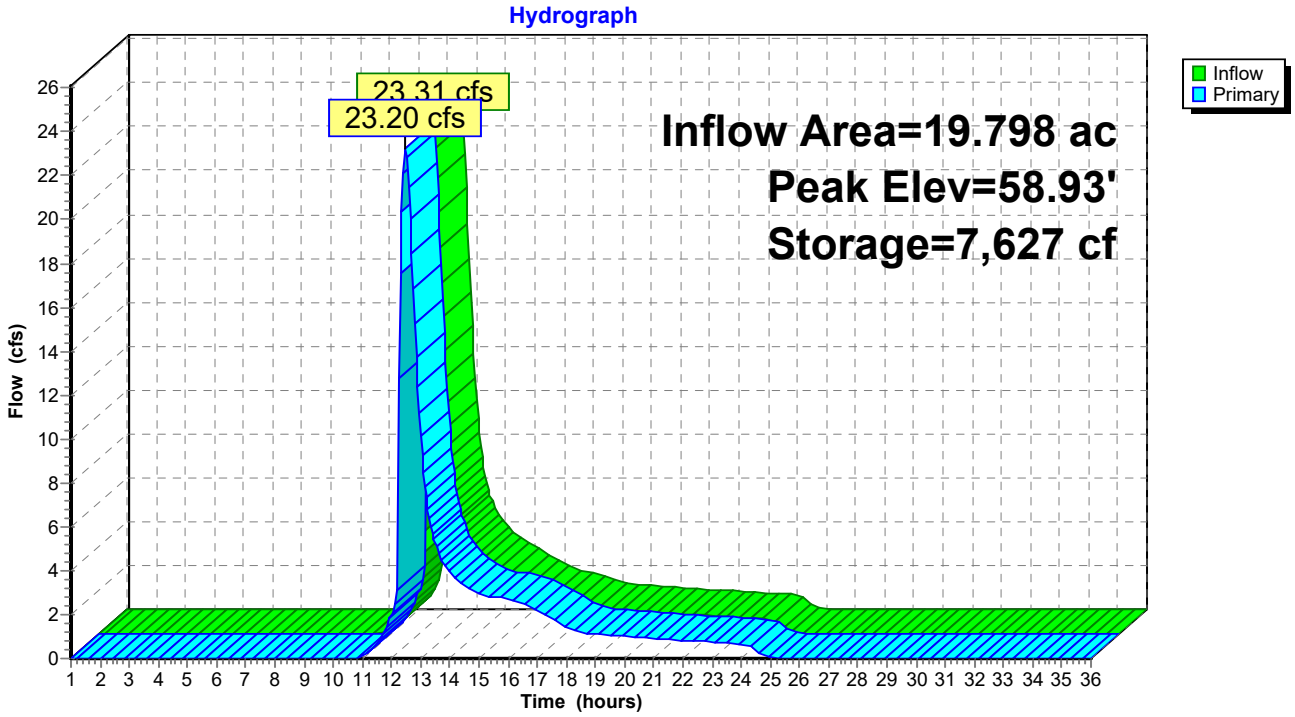
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 56.00' | 22,735 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 56.00 | 13 | 26.5 | 0 | 0 | 13 |
| 57.00 | 864 | 47.2 | 328 | 328 | 140 |
| 58.00 | 2,779 | 348.1 | 1,731 | 2,059 | 9,607 |
| 59.00 | 10,591 | 884.0 | 6,265 | 8,324 | 62,155 |
| 60.00 | 18,605 | 1,253.7 | 14,411 | 22,735 | 125,054 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 56.26' | **12.0" Round CMP_Round 12"**<br>L= 60.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 56.26' / 55.86' S= 0.0067 '/' Cc= 0.900<br>n= 0.025 Corrugated metal, Flow Area= 0.79 sf |
| #2 | Primary | 58.65' | **50.0' long x 35.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

**Primary OutFlow** Max=23.09 cfs @ 12.48 hrs HW=58.93' (Free Discharge)
└─**1=CMP_Round 12"** (Barrel Controls 3.05 cfs @ 3.88 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 20.05 cfs @ 1.43 fps)

## Pond RRP: Western Swale/Railroad Tracks w/ Culvert



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1S: 1S** Runoff Area=809,848 sf 0.00% Impervious Runoff Depth=3.48"
Flow Length=463' Tc=28.4 min CN=71 Runoff=43.84 cfs 5.4 af

**Subcatchment 2S: 2S** Runoff Area=862,401 sf 0.00% Impervious Runoff Depth=2.78"
Flow Length=850' Tc=30.4 min CN=64 Runoff=35.55 cfs 4.6 af

**Reach DP1: Eastern Wetland** Inflow=43.84 cfs 5.4 af
Outflow=43.84 cfs 5.4 af

**Pond RRP: Western Swale/Railroad Tracks w/** Peak Elev=59.04' Storage=8,704 cf Inflow=35.55 cfs 4.6 af
Outflow=35.44 cfs 4.6 af

**Total Runoff Area = 38.390 ac Runoff Volume = 10.0 af Average Runoff Depth = 3.12"**
**100.00% Pervious = 38.390 ac 0.00% Impervious = 0.000 ac**

## Summary for Subcatchment 1S: 1S

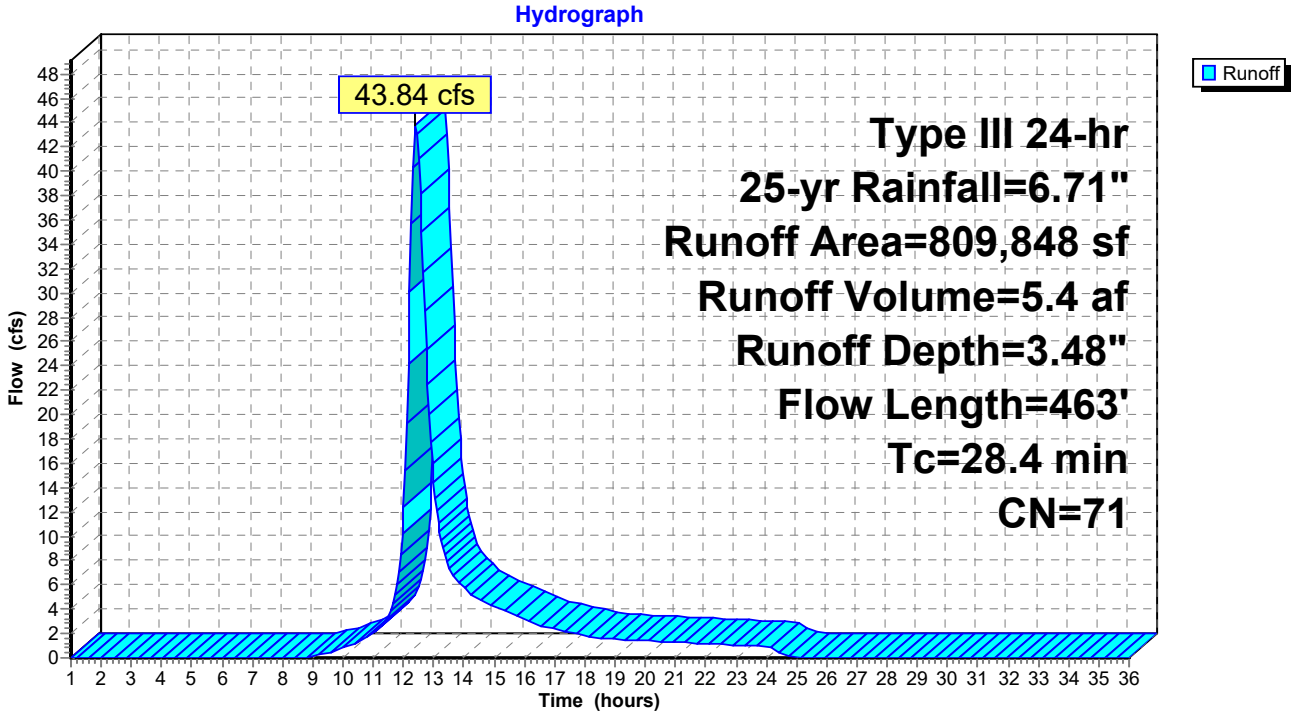
Runoff = 43.84 cfs @ 12.40 hrs, Volume= 5.4 af, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.71"

| Area (sf) | CN | Description |
|---|---|---|
| 41,299 | 55 | Woods, Good, HSG B |
| 598,726 | 70 | Woods, Good, HSG C |
| 169,823 | 77 | Woods, Good, HSG D |
| 809,848 | 71 | Weighted Average |
| 809,848 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 1.7 | 413 | 0.0670 | 4.17 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 28.4 | 463 | Total | | | |

## Subcatchment 1S: 1S



## Summary for Subcatchment 2S: 2S

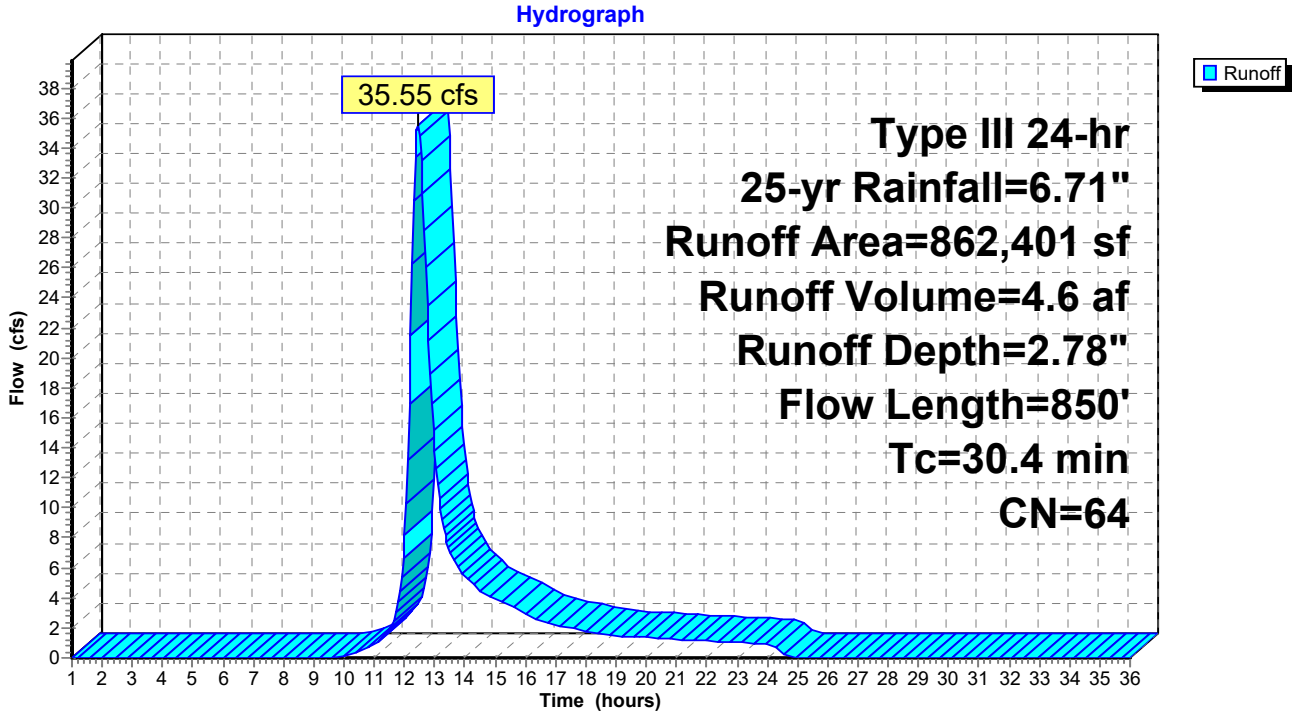
Runoff = 35.55 cfs @ 12.44 hrs, Volume= 4.6 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.71"

| Area (sf) | CN | Description |
|---|---|---|
| 344,400 | 55 | Woods, Good, HSG B |
| 512,627 | 70 | Woods, Good, HSG C |
| 5,374 | 74 | >75% Grass cover, Good, HSG C |
| 862,401 | 64 | Weighted Average |
| 862,401 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 3.7 | 800 | 0.0500 | 3.60 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 30.4 | 850 | Total | | | |

## Subcatchment 2S: 2S

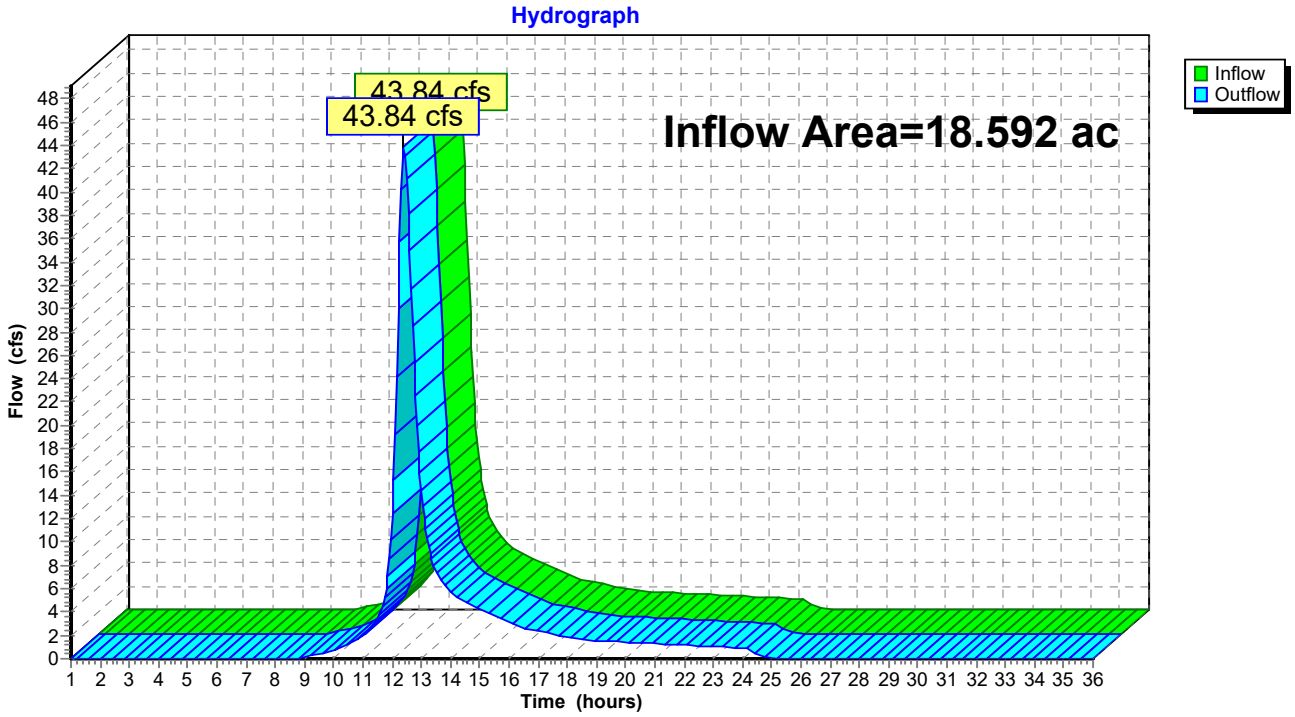


## Summary for Reach DP1: Eastern Wetland

Inflow Area = 18.592 ac, 0.00% Impervious, Inflow Depth = 3.48" for 25-yr event
Inflow = 43.84 cfs @ 12.40 hrs, Volume= 5.4 af
Outflow = 43.84 cfs @ 12.40 hrs, Volume= 5.4 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

### Reach DP1: Eastern Wetland



## Summary for Pond RRP: Western Swale/Railroad Tracks w/ Culvert

Inflow Area = 19.798 ac, 0.00% Impervious, Inflow Depth = 2.78" for 25-yr event
Inflow = 35.55 cfs @ 12.44 hrs, Volume= 4.6 af
Outflow = 35.44 cfs @ 12.47 hrs, Volume= 4.6 af, Atten= 0%, Lag= 1.5 min
Primary = 35.44 cfs @ 12.47 hrs, Volume= 4.6 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 59.04' @ 12.47 hrs Surf.Area= 10,837 sf Storage= 8,704 cf

Plug-Flow detention time= 11.4 min calculated for 4.6 af (100% of inflow)
Center-of-Mass det. time= 11.3 min ( 880.4 - 869.1 )

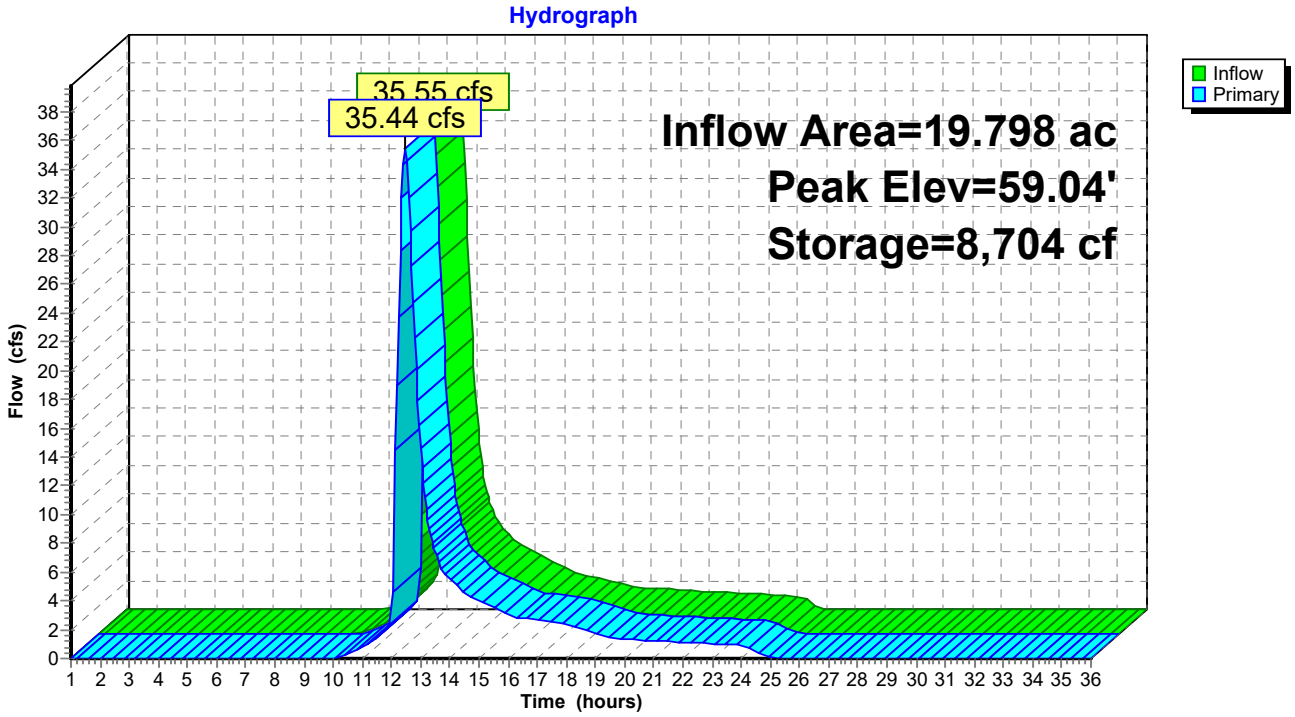
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 56.00' | 22,735 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 56.00 | 13 | 26.5 | 0 | 0 | 13 |
| 57.00 | 864 | 47.2 | 328 | 328 | 140 |
| 58.00 | 2,779 | 348.1 | 1,731 | 2,059 | 9,607 |
| 59.00 | 10,591 | 884.0 | 6,265 | 8,324 | 62,155 |
| 60.00 | 18,605 | 1,253.7 | 14,411 | 22,735 | 125,054 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 56.26' | **12.0" Round CMP_Round 12"**<br>L= 60.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 56.26' / 55.86' S= 0.0067 '/' Cc= 0.900<br>n= 0.025 Corrugated metal, Flow Area= 0.79 sf |
| #2 | Primary | 58.65' | **50.0' long x 35.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

**Primary OutFlow** Max=35.29 cfs @ 12.47 hrs HW=59.03' (Free Discharge)
└─**1=CMP_Round 12"** (Barrel Controls 3.12 cfs @ 3.97 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 32.16 cfs @ 1.67 fps)

## Pond RRP: Western Swale/Railroad Tracks w/ Culvert



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1S: 1S** Runoff Area=809,848 sf 0.00% Impervious Runoff Depth=5.26"
Flow Length=463' Tc=28.4 min CN=71 Runoff=66.37 cfs 8.2 af

**Subcatchment 2S: 2S** Runoff Area=862,401 sf 0.00% Impervious Runoff Depth=4.41"
Flow Length=850' Tc=30.4 min CN=64 Runoff=57.28 cfs 7.3 af

**Reach DP1: Eastern Wetland** Inflow=66.37 cfs 8.2 af
Outflow=66.37 cfs 8.2 af

**Pond RRP: Western Swale/Railroad Tracks w/** Peak Elev=59.19' Storage=10,487 cf Inflow=57.28 cfs 7.3 af
Outflow=57.12 cfs 7.3 af

**Total Runoff Area = 38.390 ac Runoff Volume = 15.4 af Average Runoff Depth = 4.82"**
**100.00% Pervious = 38.390 ac 0.00% Impervious = 0.000 ac**

## Summary for Subcatchment 1S: 1S

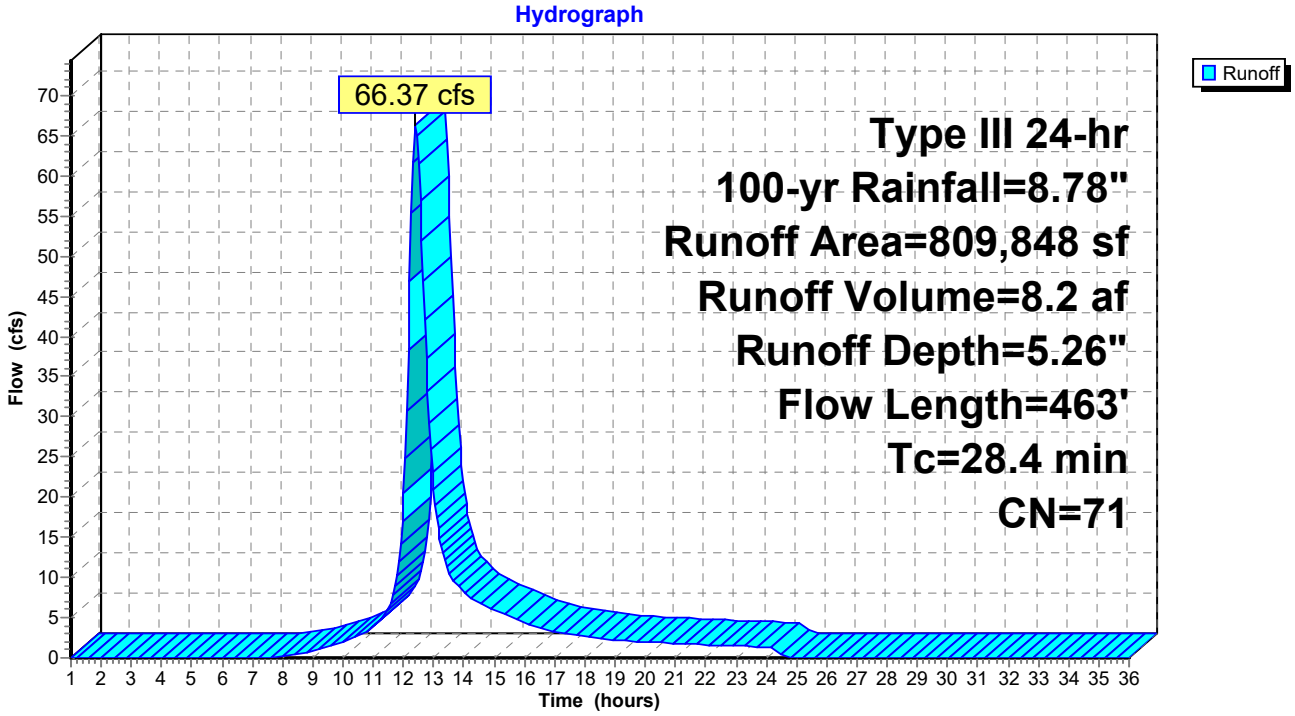
Runoff = 66.37 cfs @ 12.39 hrs, Volume= 8.2 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.78"

| Area (sf) | CN | Description |
|---|---|---|
| 41,299 | 55 | Woods, Good, HSG B |
| 598,726 | 70 | Woods, Good, HSG C |
| 169,823 | 77 | Woods, Good, HSG D |
| 809,848 | 71 | Weighted Average |
| 809,848 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 1.7 | 413 | 0.0670 | 4.17 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 28.4 | 463 | Total | | | |

### Subcatchment 1S: 1S



## Summary for Subcatchment 2S: 2S

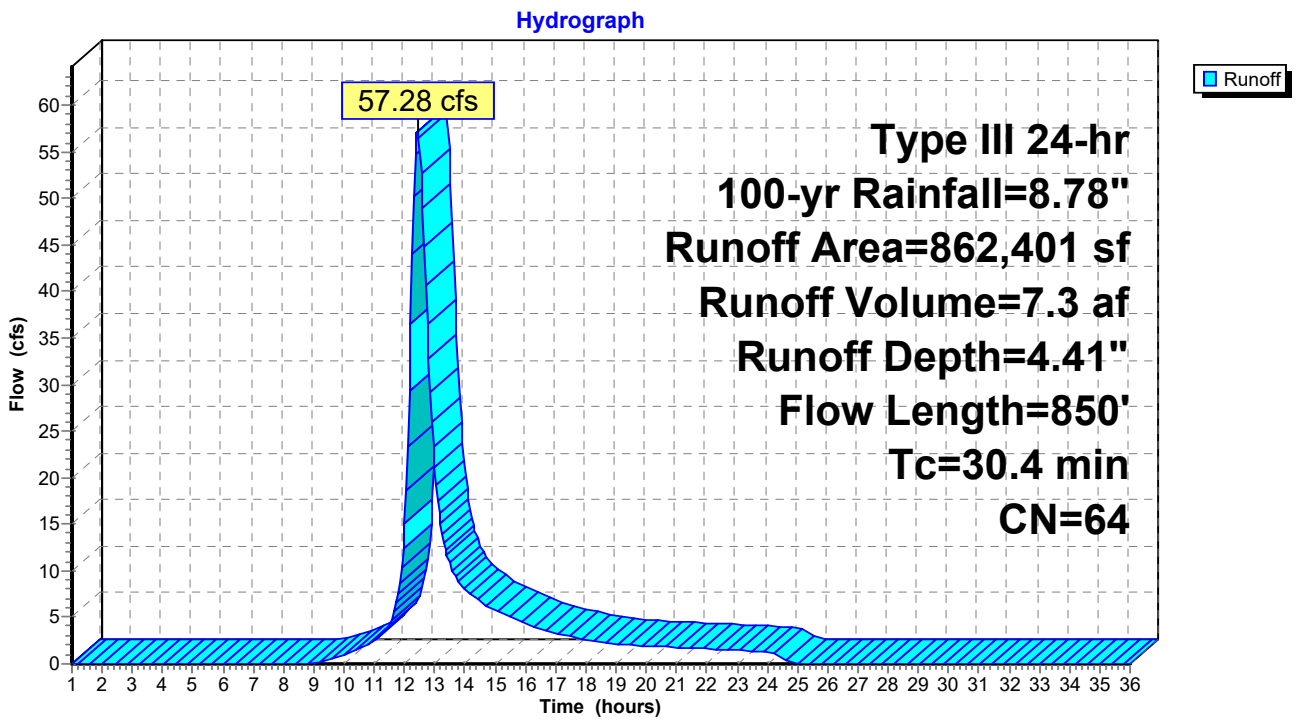
Runoff = 57.28 cfs @ 12.43 hrs, Volume= 7.3 af, Depth= 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.78"

| Area (sf) | CN | Description |
|---|---|---|
| 344,400 | 55 | Woods, Good, HSG B |
| 512,627 | 70 | Woods, Good, HSG C |
| 5,374 | 74 | >75% Grass cover, Good, HSG C |
| 862,401 | 64 | Weighted Average |
| 862,401 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 3.7 | 800 | 0.0500 | 3.60 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 30.4 | 850 | Total | | | |

## Subcatchment 2S: 2S

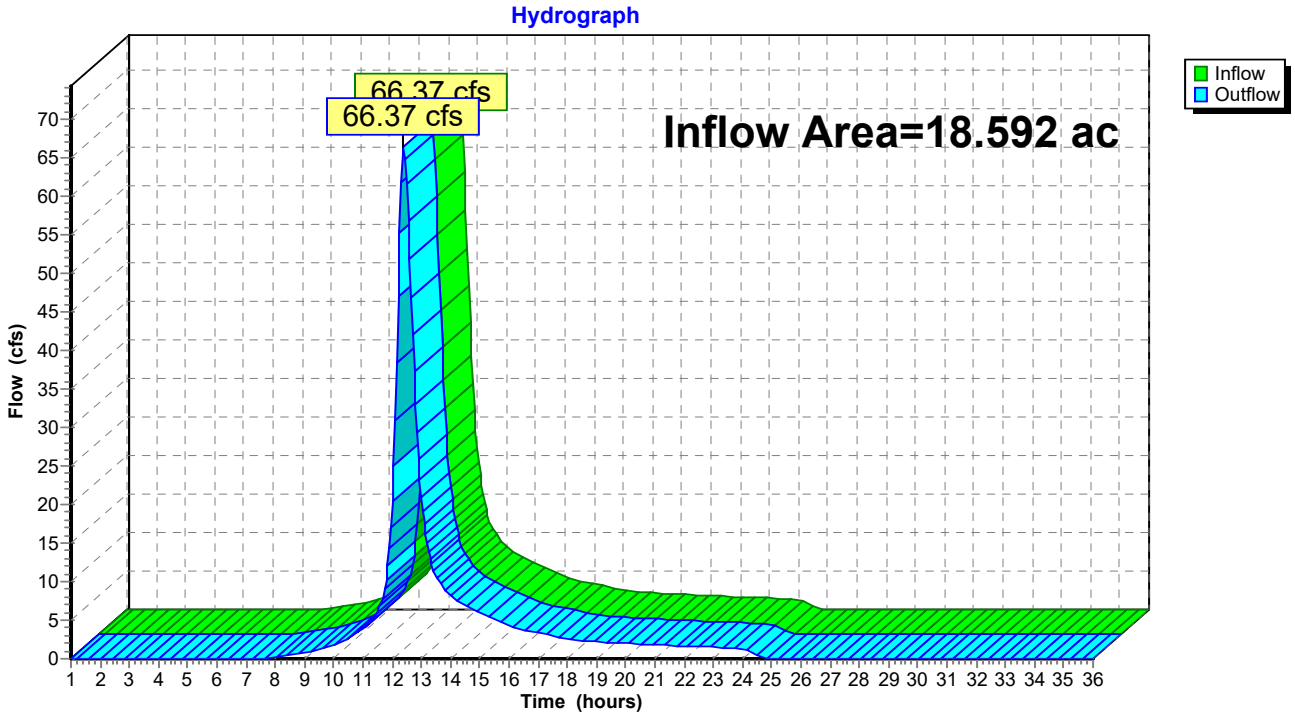


## Summary for Reach DP1: Eastern Wetland

Inflow Area = 18.592 ac, 0.00% Impervious, Inflow Depth = 5.26" for 100-yr event
Inflow = 66.37 cfs @ 12.39 hrs, Volume= 8.2 af
Outflow = 66.37 cfs @ 12.39 hrs, Volume= 8.2 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

### Reach DP1: Eastern Wetland



## Summary for Pond RRP: Western Swale/Railroad Tracks w/ Culvert

Inflow Area = 19.798 ac, 0.00% Impervious, Inflow Depth = 4.41" for 100-yr event
Inflow = 57.28 cfs @ 12.43 hrs, Volume= 7.3 af
Outflow = 57.12 cfs @ 12.45 hrs, Volume= 7.3 af, Atten= 0%, Lag= 1.4 min
Primary = 57.12 cfs @ 12.45 hrs, Volume= 7.3 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 59.19' @ 12.45 hrs Surf.Area= 11,956 sf Storage= 10,487 cf

Plug-Flow detention time= 10.5 min calculated for 7.3 af (100% of inflow)
Center-of-Mass det. time= 10.1 min ( 865.7 - 855.6 )

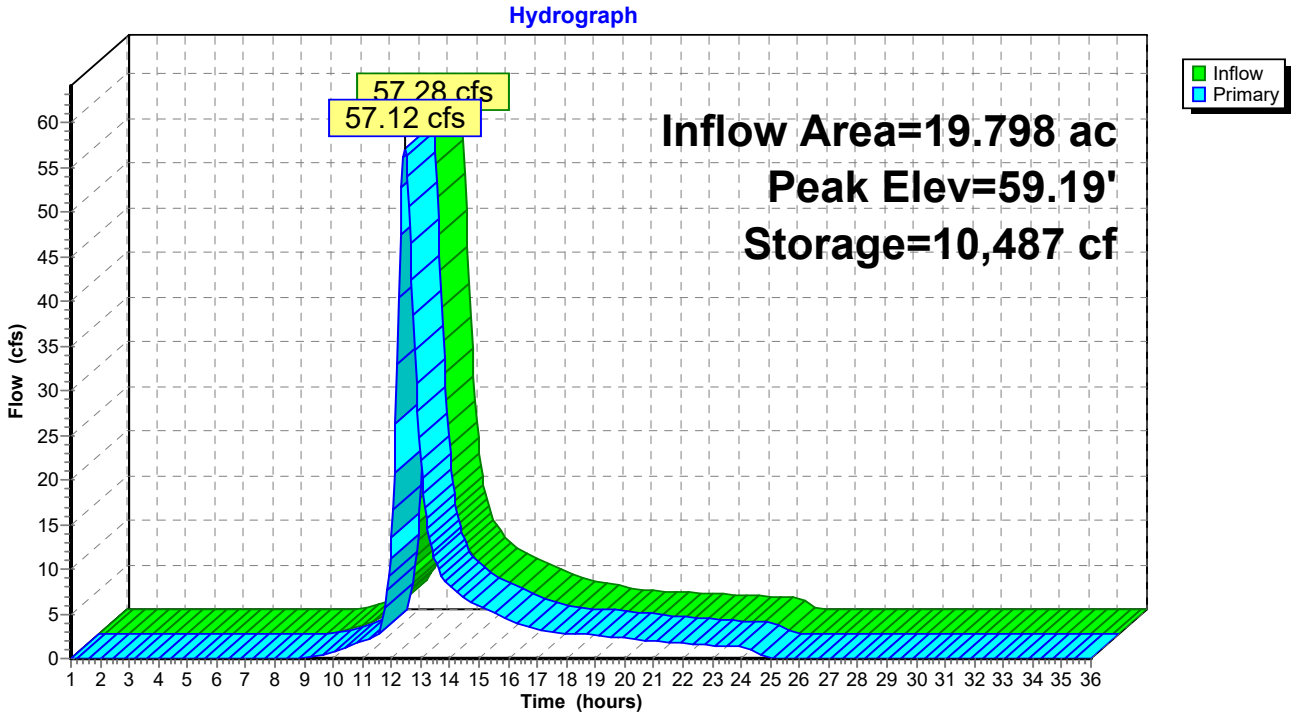
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 56.00' | 22,735 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 56.00 | 13 | 26.5 | 0 | 0 | 13 |
| 57.00 | 864 | 47.2 | 328 | 328 | 140 |
| 58.00 | 2,779 | 348.1 | 1,731 | 2,059 | 9,607 |
| 59.00 | 10,591 | 884.0 | 6,265 | 8,324 | 62,155 |
| 60.00 | 18,605 | 1,253.7 | 14,411 | 22,735 | 125,054 |

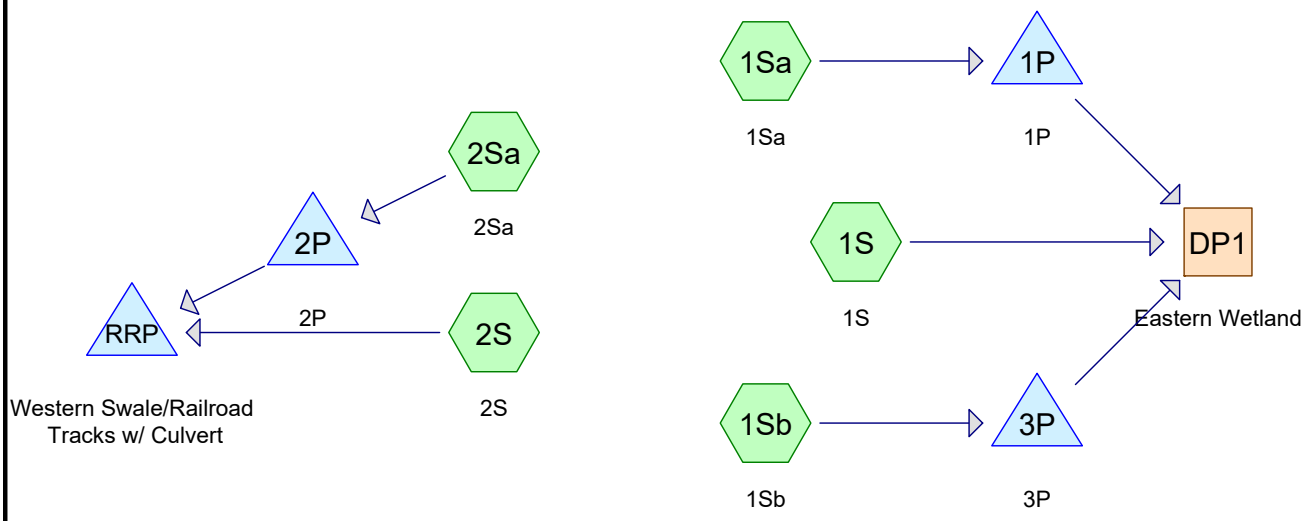
| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 56.26' | **12.0" Round CMP_Round 12"**<br>L= 60.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 56.26' / 55.86' S= 0.0067 '/' Cc= 0.900<br>n= 0.025 Corrugated metal, Flow Area= 0.79 sf |
| #2 | Primary | 58.65' | **50.0' long x 35.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

**Primary OutFlow** Max=57.03 cfs @ 12.45 hrs HW=59.19' (Free Discharge)
└─**1=CMP_Round 12"** (Barrel Controls 3.23 cfs @ 4.12 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 53.80 cfs @ 1.99 fps)

## Pond RRP: Western Swale/Railroad Tracks w/ Culvert



## POST-DEVELOPMENT




Subcat Reach Pond Link

**Routing Diagram for 3055.01- FEARING HILL RD - POST-REV2**
Prepared by Atlantic Design Engineers, Inc., Printed 6/17/2022
HydroCAD® 10.00-25 s/n 00480 © 2019 HydroCAD Software Solutions LLC

Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1S: 1S** Runoff Area=386,365 sf 0.00% Impervious Runoff Depth=1.30"
Flow Length=468' Tc=32.0 min CN=73 Runoff=7.12 cfs 1.0 af

**Subcatchment 1Sa: 1Sa** Runoff Area=332,772 sf 1.93% Impervious Runoff Depth=1.50"
Flow Length=251' Tc=7.8 min CN=76 Runoff=12.20 cfs 1.0 af

**Subcatchment 1Sb: 1Sb** Runoff Area=178,528 sf 0.00% Impervious Runoff Depth=1.43"
Flow Length=221' Tc=18.4 min CN=75 Runoff=4.65 cfs 0.5 af

**Subcatchment 2S: 2S** Runoff Area=601,941 sf 0.00% Impervious Runoff Depth=0.80"
Flow Length=898' Tc=34.8 min CN=64 Runoff=5.76 cfs 0.9 af

**Subcatchment 2Sa: 2Sa** Runoff Area=172,643 sf 0.00% Impervious Runoff Depth=1.37"
Flow Length=283' Tc=8.9 min CN=74 Runoff=5.46 cfs 0.5 af

**Reach DP1: Eastern Wetland** Inflow=13.38 cfs 2.4 af
Outflow=13.38 cfs 2.4 af

**Pond 1P: 1P** Peak Elev=74.45' Storage=14,671 cf Inflow=12.20 cfs 1.0 af
Outflow=2.35 cfs 1.0 af

**Pond 2P: 2P** Peak Elev=70.45' Storage=5,576 cf Inflow=5.46 cfs 0.5 af
Outflow=1.50 cfs 0.5 af

**Pond 3P: 3P** Peak Elev=73.61' Storage=1,131 cf Inflow=4.65 cfs 0.5 af
Outflow=4.38 cfs 0.5 af

**Pond RRP: Western Swale/Railroad Tracks w/** Peak Elev=58.74' Storage=5,941 cf Inflow=7.26 cfs 1.4 af
Outflow=6.86 cfs 1.4 af

**Total Runoff Area = 38.390 ac Runoff Volume = 3.8 af Average Runoff Depth = 1.18"**
**99.62% Pervious = 38.242 ac 0.38% Impervious = 0.147 ac**

## Summary for Subcatchment 1S: 1S

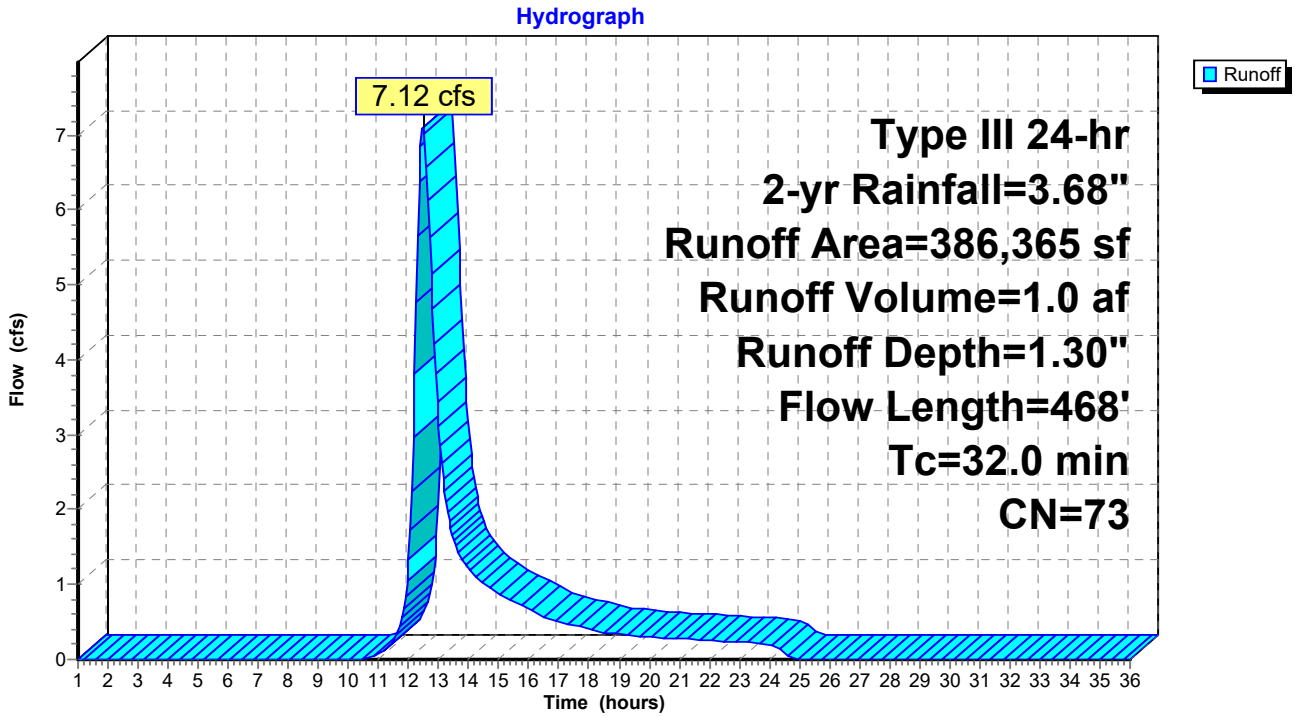
Runoff = 7.12 cfs @ 12.48 hrs, Volume= 1.0 af, Depth= 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.68"

| Area (sf) | CN | Description |
|---|---|---|
| 41,299 | 55 | Woods, Good, HSG B |
| 121,227 | 70 | Woods, Good, HSG C |
| 96,253 | 77 | Woods, Good, HSG D |
| 42,050 | 79 | 50-75% Grass cover, Fair, HSG C |
| 44,337 | 74 | >75% Grass cover, Good, HSG C |
| 41,199 | 84 | 50-75% Grass cover, Fair, HSG D |
| 386,365 | 73 | Weighted Average |
| 386,365 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 5.3 | 418 | 0.0681 | 1.30 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 32.0 | 468 | Total | | | |

## Subcatchment 1S: 1S



## Summary for Subcatchment 1Sa: 1Sa

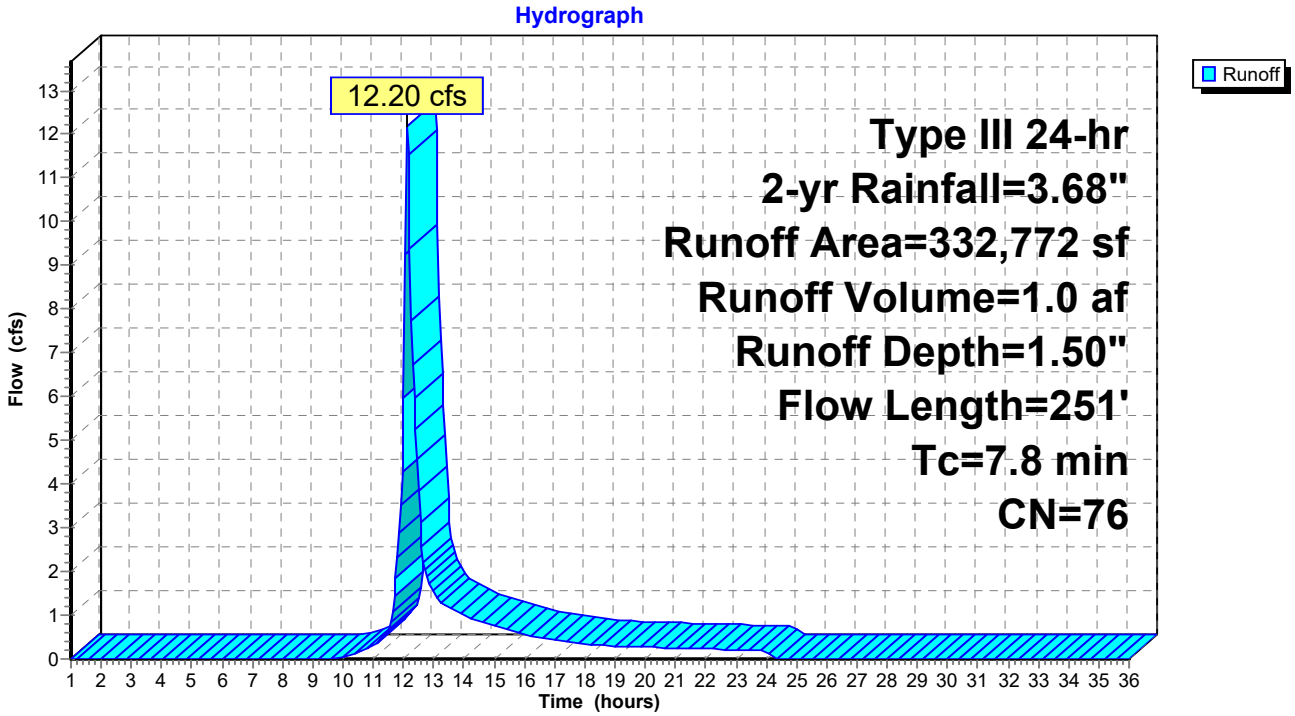
Runoff = 12.20 cfs @ 12.12 hrs, Volume= 1.0 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.68"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 6,408 | 98 | Unconnected pavement, HSG C - EQ PADS |
| | 5,146 | 96 | Gravel surface, HSG C |
| | 252,473 | 74 | >75% Grass cover, Good, HSG C |
| | 59,360 | 79 | 50-75% Grass cover, Fair, HSG C |
| | 9,385 | 84 | 50-75% Grass cover, Fair, HSG D |
| | 332,772 | 76 | Weighted Average |
| | 326,364 | | 98.07% Pervious Area |
| | 6,408 | | 1.93% Impervious Area |
| | 6,408 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.0 | 50 | 0.0100 | 0.12 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.8 | 201 | 0.0640 | 4.07 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 7.8 | 251 | Total | | | |

### Subcatchment 1Sa: 1Sa



## Summary for Subcatchment 1Sb: 1Sb

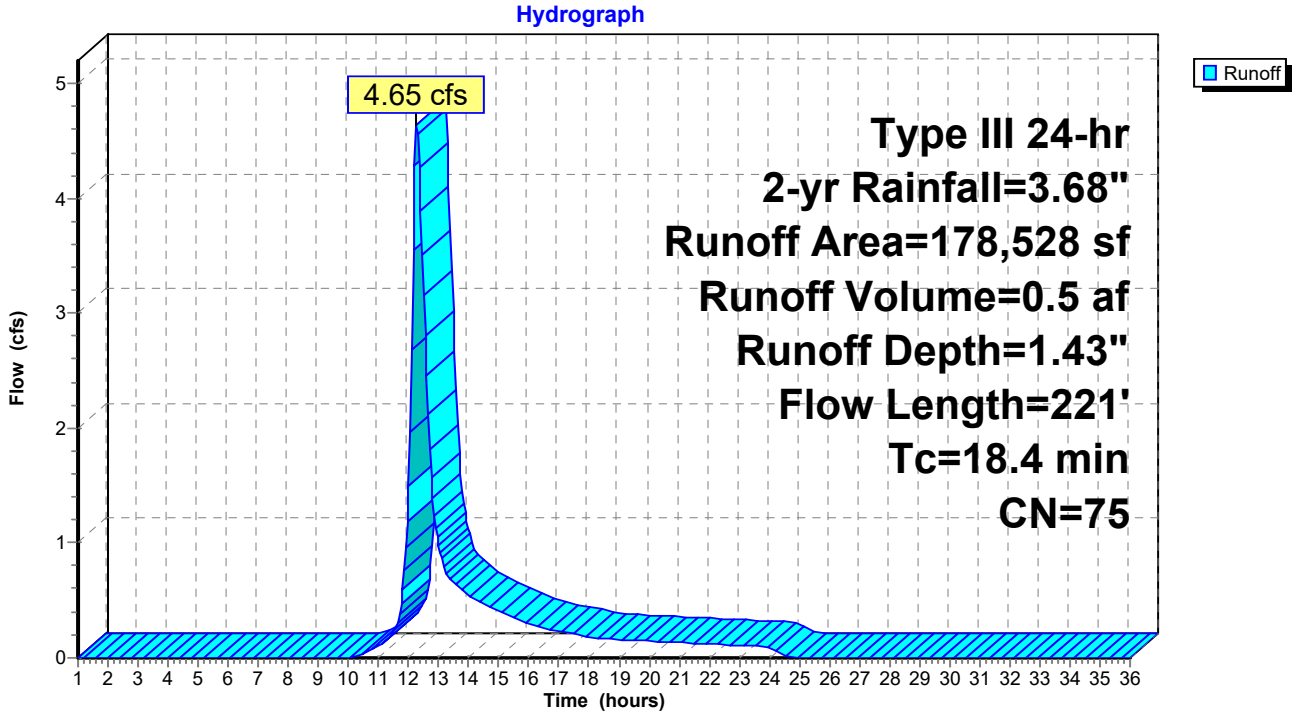
Runoff = 4.65 cfs @ 12.27 hrs, Volume= 0.5 af, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.68"

| Area (sf) | CN | Description |
|---|---|---|
| 4,422 | 96 | Gravel surface, HSG C |
| 157,889 | 74 | >75% Grass cover, Good, HSG C |
| 16,217 | 79 | 50-75% Grass cover, Fair, HSG C |
| 178,528 | 75 | Weighted Average |
| 178,528 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.6 | 50 | 0.0010 | 0.05 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.8 | 171 | 0.0450 | 3.42 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 18.4 | 221 | Total | | | |

## Subcatchment 1Sb: 1Sb



## Summary for Subcatchment 2S: 2S

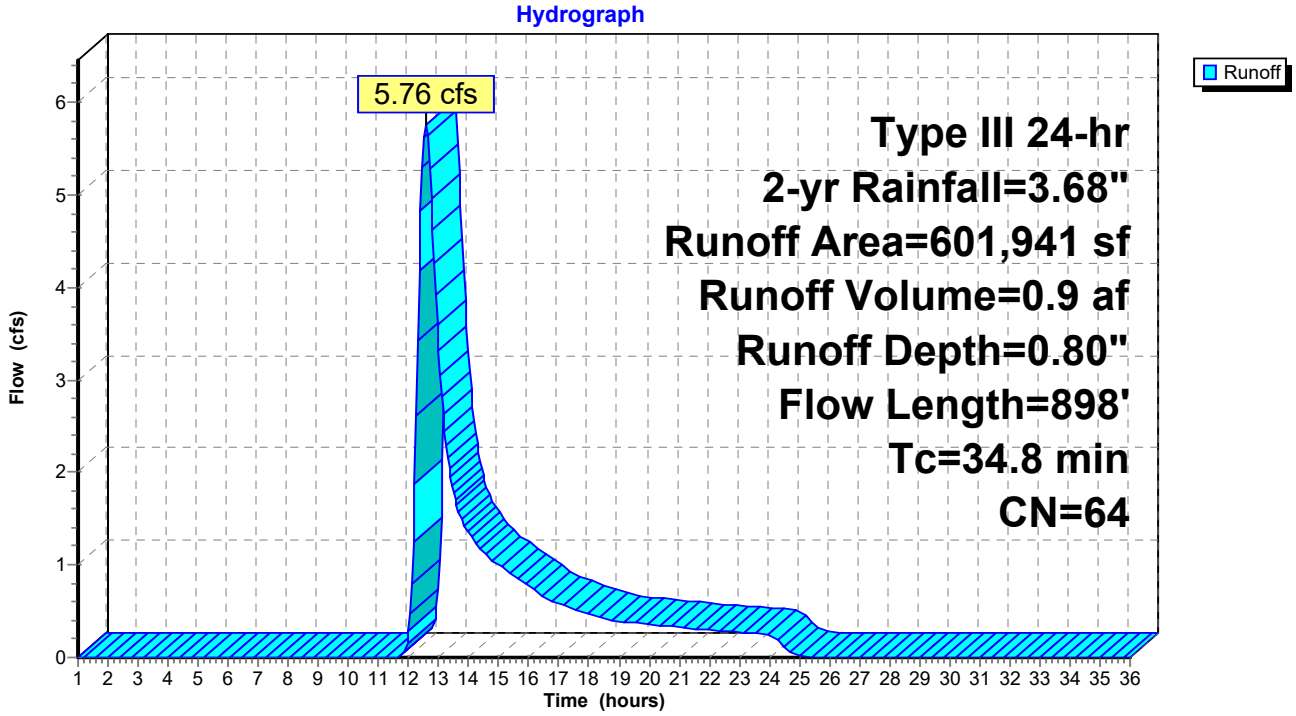
Runoff = 5.76 cfs @ 12.57 hrs, Volume= 0.9 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.68"

| Area (sf) | CN | Description |
|---|---|---|
| 12,903 | 96 | Gravel surface, HSG C |
| 22,963 | 74 | >75% Grass cover, Good, HSG C |
| 285,668 | 55 | Woods, Good, HSG B |
| 225,635 | 70 | Woods, Good, HSG C |
| 15,496 | 69 | 50-75% Grass cover, Fair, HSG B |
| 39,276 | 79 | 50-75% Grass cover, Fair, HSG C |
| 601,941 | 64 | Weighted Average |
| 601,941 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.2 | 50 | 0.0080 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 5.6 | 848 | 0.0250 | 2.55 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 34.8 | 898 | Total | | | |

## Subcatchment 2S: 2S



## Summary for Subcatchment 2Sa: 2Sa

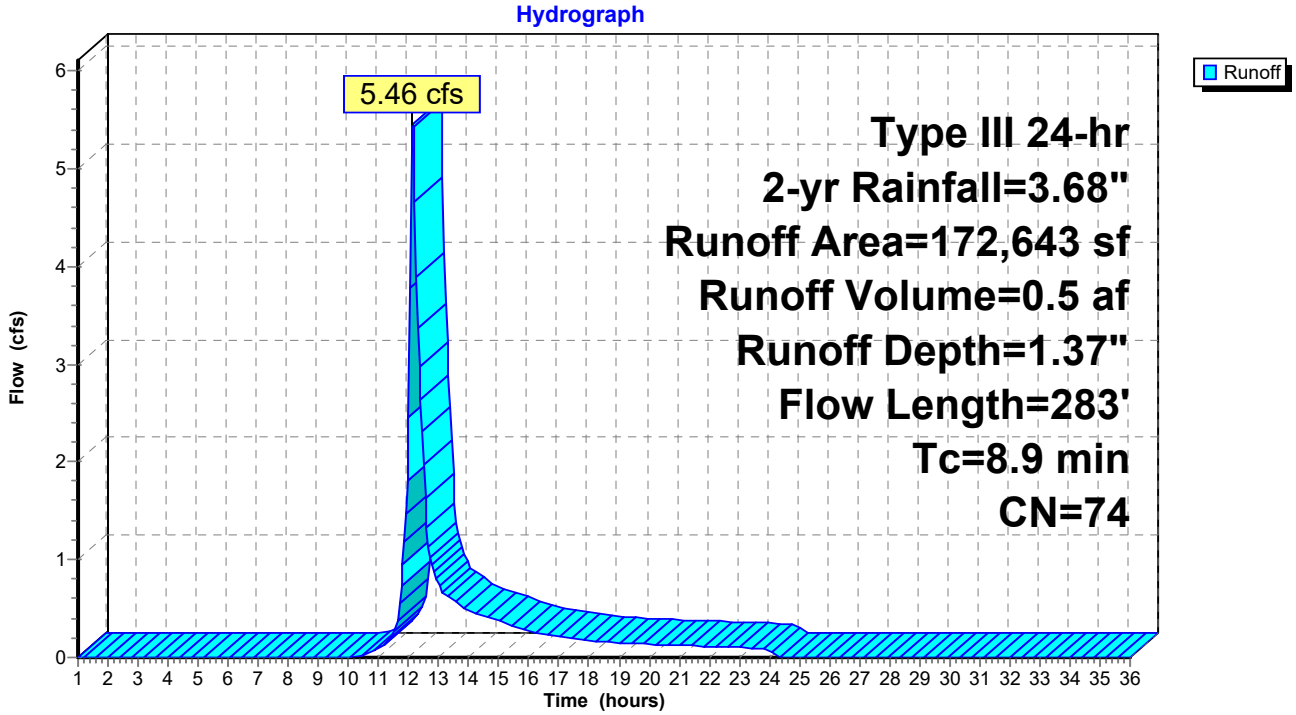
Runoff = 5.46 cfs @ 12.14 hrs, Volume= 0.5 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.68"

| Area (sf) | CN | Description |
|---|---|---|
| 1,962 | 96 | Gravel surface, HSG C |
| 42,320 | 69 | 50-75% Grass cover, Fair, HSG B |
| 98,678 | 74 | >75% Grass cover, Good, HSG C |
| 29,683 | 79 | 50-75% Grass cover, Fair, HSG C |
| 172,643 | 74 | Weighted Average |
| 172,643 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.0 | 50 | 0.0072 | 0.10 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.7 | 184 | 0.0850 | 4.69 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 49 | 0.0612 | 3.71 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 8.9 | 283 | Total | | | |

## Subcatchment 2Sa: 2Sa

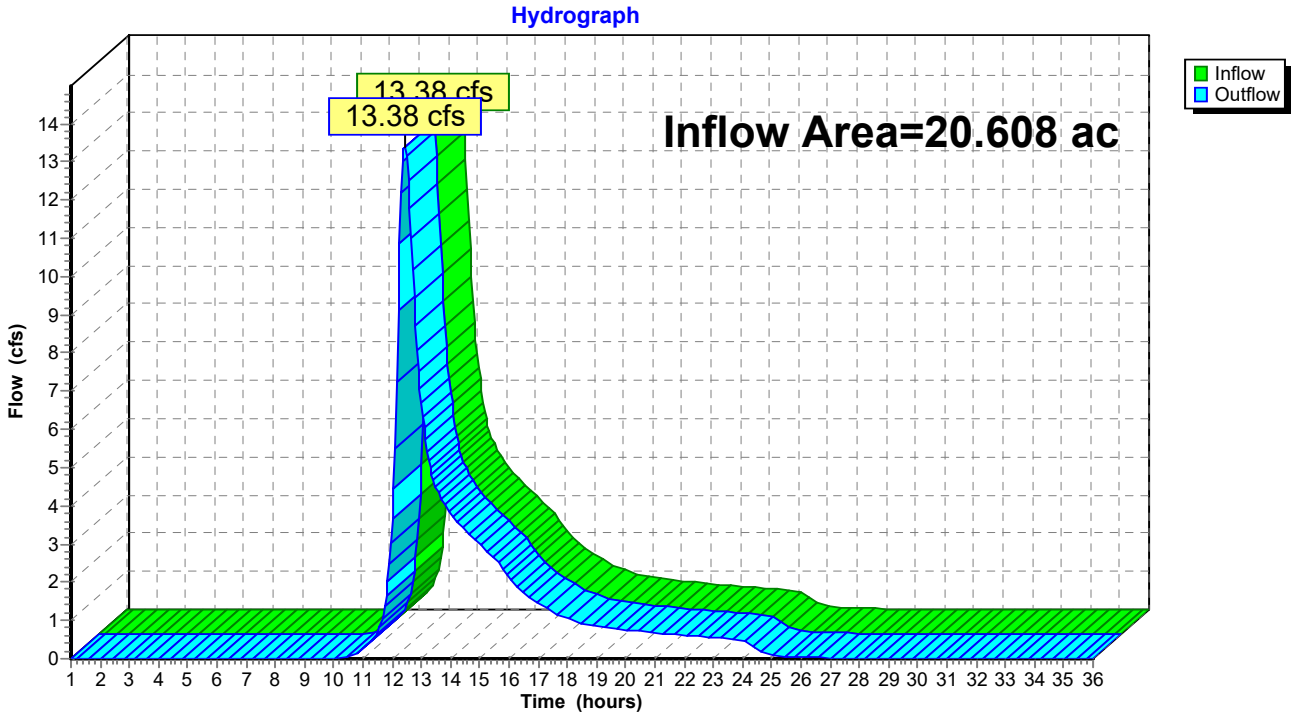


## Summary for Reach DP1: Eastern Wetland

Inflow Area = 20.608 ac, 0.71% Impervious, Inflow Depth > 1.40" for 2-yr event
Inflow = 13.38 cfs @ 12.42 hrs, Volume= 2.4 af
Outflow = 13.38 cfs @ 12.42 hrs, Volume= 2.4 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

### Reach DP1: Eastern Wetland



## Summary for Pond 1P: 1P

Inflow Area = 7.639 ac, 1.93% Impervious, Inflow Depth = 1.50" for 2-yr event
Inflow = 12.20 cfs @ 12.12 hrs, Volume= 1.0 af
Outflow = 2.35 cfs @ 12.63 hrs, Volume= 1.0 af, Atten= 81%, Lag= 30.8 min
Primary = 2.35 cfs @ 12.63 hrs, Volume= 1.0 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 74.45' @ 12.63 hrs Surf.Area= 18,732 sf Storage= 14,671 cf

Plug-Flow detention time= 77.5 min calculated for 1.0 af (100% of inflow)
Center-of-Mass det. time= 77.6 min ( 927.0 - 849.4 )

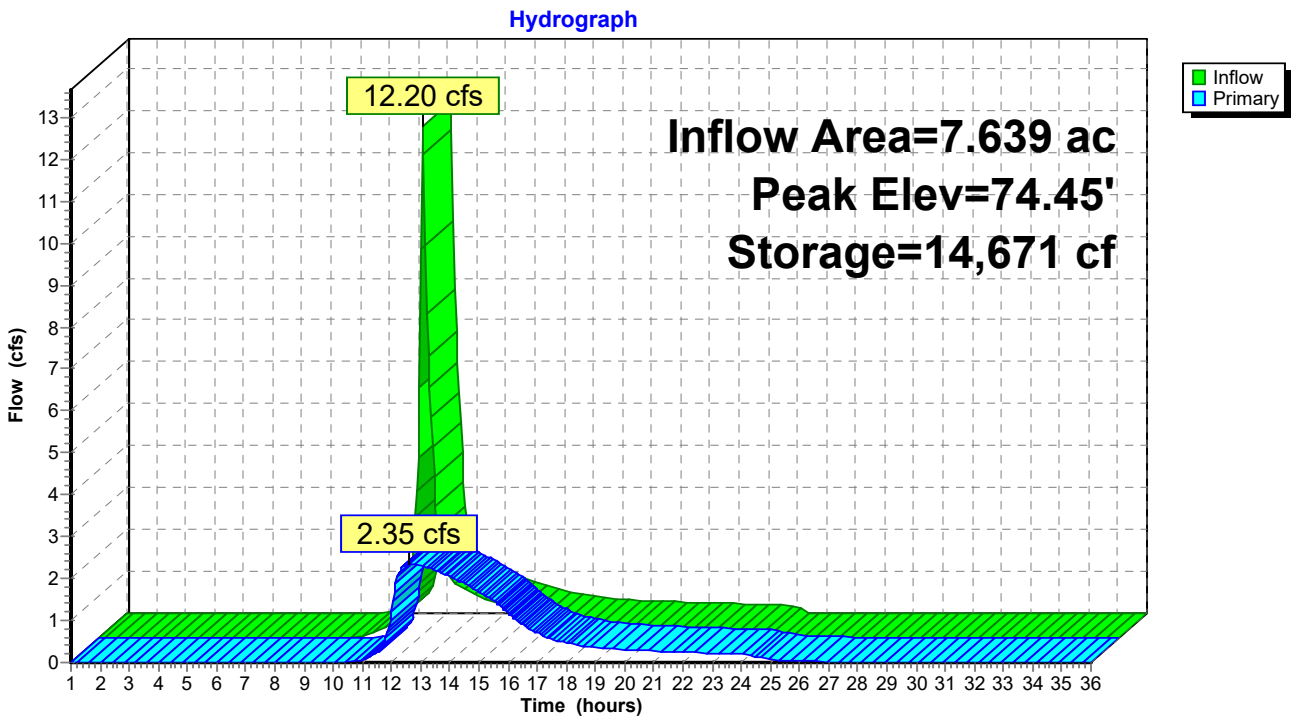
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 73.00' | 140,073 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 73.00 | 2,895 | 876.8 | 0 | 0 | 2,895 |
| 74.00 | 13,416 | 1,517.5 | 7,514 | 7,514 | 124,975 |
| 75.00 | 26,522 | 1,740.9 | 19,600 | 27,115 | 182,924 |
| 76.00 | 41,778 | 1,899.3 | 33,862 | 60,977 | 228,845 |
| 77.00 | 58,419 | 2,081.5 | 49,867 | 110,844 | 286,597 |
| 77.50 | 58,500 | 2,100.0 | 29,230 | 140,073 | 292,842 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.00' | **20.0' long x 20.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Primary | 73.00' | **10.0" Round Culvert**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 73.00' / 72.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf |

**Primary OutFlow** Max=2.35 cfs @ 12.63 hrs HW=74.45' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
└─**2=Culvert** (Inlet Controls 2.35 cfs @ 4.31 fps)

## Pond 1P: 1P


Hydrograph
12.20 cfs
2.35 cfs
Inflow Area=7.639 ac
Peak Elev=74.45'
Storage=14,671 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond 2P: 2P

Inflow Area = 3.963 ac, 0.00% Impervious, Inflow Depth = 1.37" for 2-yr event
Inflow = 5.46 cfs @ 12.14 hrs, Volume= 0.5 af
Outflow = 1.50 cfs @ 12.57 hrs, Volume= 0.5 af, Atten= 73%, Lag= 26.1 min
Primary = 1.50 cfs @ 12.57 hrs, Volume= 0.5 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 70.45' @ 12.57 hrs Surf.Area= 8,044 sf Storage= 5,576 cf

Plug-Flow detention time= 41.3 min calculated for 0.5 af (100% of inflow)
Center-of-Mass det. time= 41.1 min ( 897.4 - 856.4 )

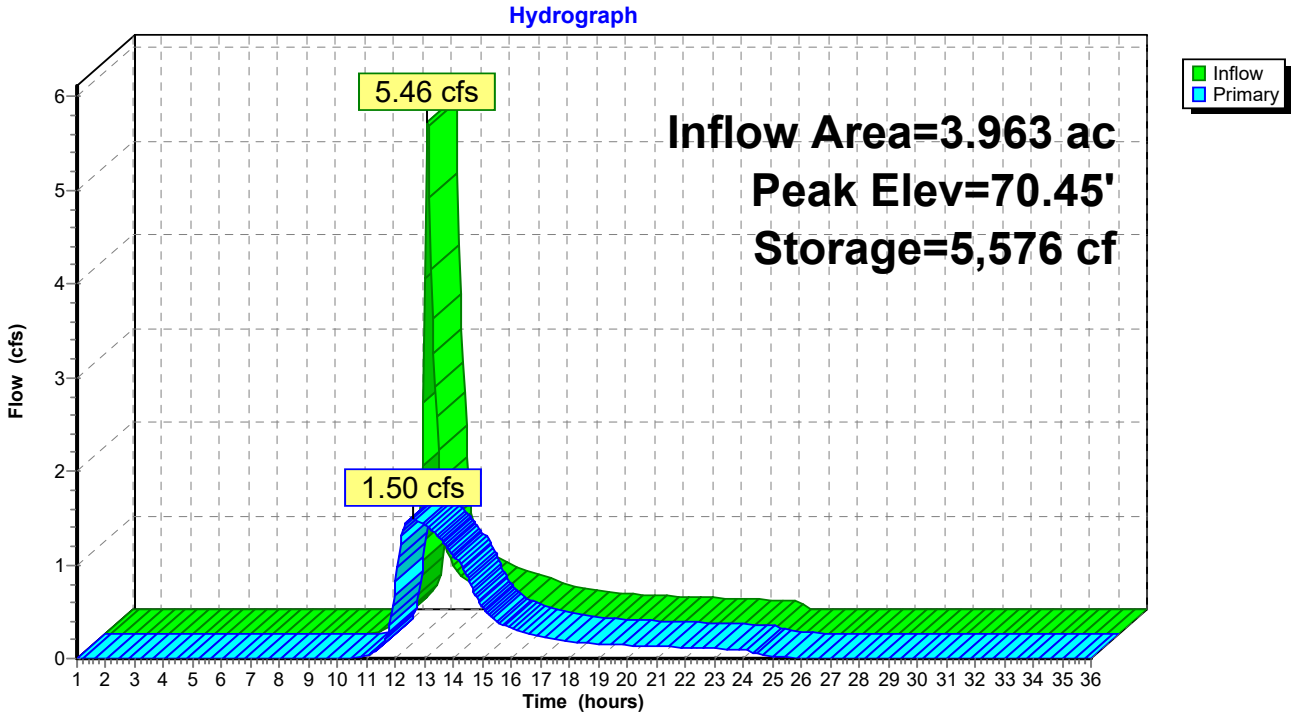
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 69.00' | 58,912 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 69.00 | 1,009 | 191.5 | 0 | 0 | 1,009 |
| 70.00 | 4,826 | 397.8 | 2,681 | 2,681 | 10,688 |
| 71.00 | 12,978 | 663.6 | 8,573 | 11,253 | 33,145 |
| 72.00 | 23,823 | 909.9 | 18,128 | 29,381 | 63,995 |
| 73.00 | 35,633 | 1,063.0 | 29,531 | 58,912 | 88,052 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 72.50' | **20.0' long x 8.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2 | Primary | 69.00' | **8.0" Round Culvert**<br>L= 41.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 69.00' / 68.67' S= 0.0080 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf |

**Primary OutFlow** Max=1.50 cfs @ 12.57 hrs HW=70.45' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
└─**2=Culvert** (Barrel Controls 1.50 cfs @ 4.29 fps)

## Pond 2P: 2P


Hydrograph
5.46 cfs
1.50 cfs
Inflow Area=3.963 ac
Peak Elev=70.45'
Storage=5,576 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond 3P: 3P

Inflow Area = 4.098 ac, 0.00% Impervious, Inflow Depth = 1.43" for 2-yr event
Inflow = 4.65 cfs @ 12.27 hrs, Volume= 0.5 af
Outflow = 4.38 cfs @ 12.34 hrs, Volume= 0.5 af, Atten= 6%, Lag= 4.1 min
Primary = 4.38 cfs @ 12.34 hrs, Volume= 0.5 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 73.61' @ 12.34 hrs Surf.Area= 1,880 sf Storage= 1,131 cf

Plug-Flow detention time= 4.0 min calculated for 0.5 af (100% of inflow)
Center-of-Mass det. time= 3.8 min ( 866.0 - 862.2 )

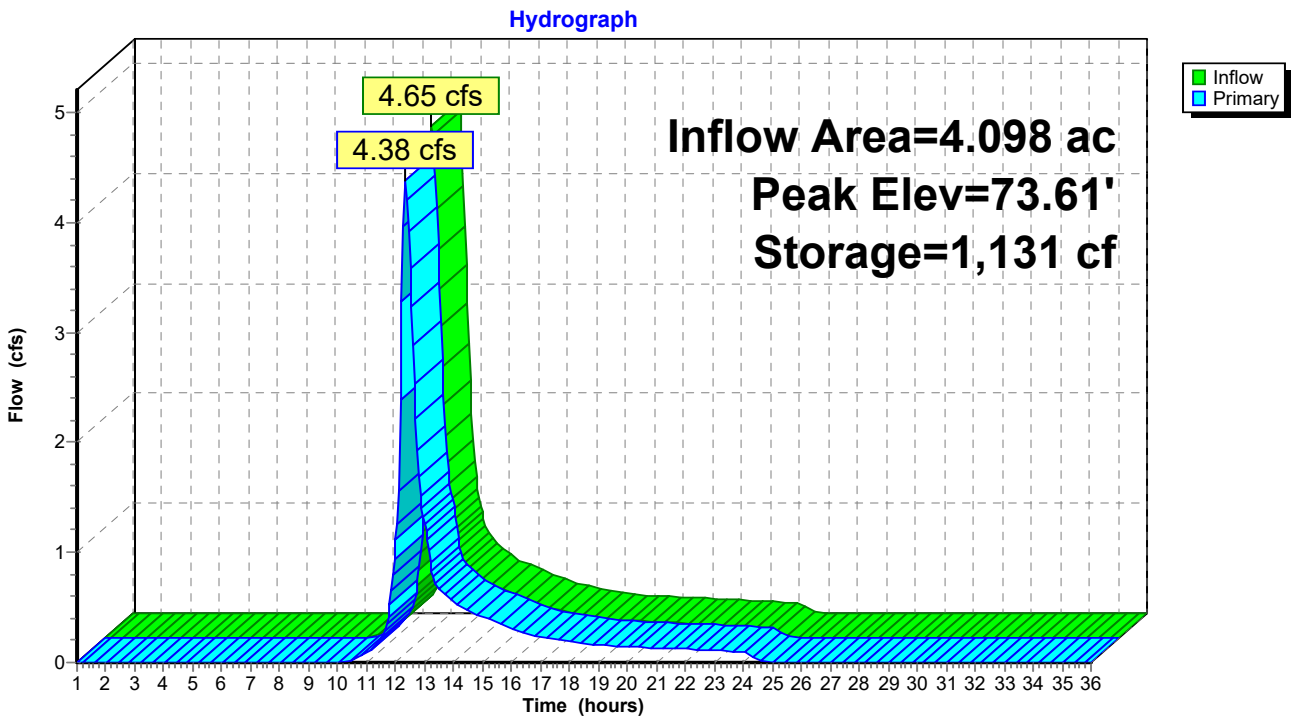
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 72.00' | 17,415 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 72.00 | 167 | 153.1 | 0 | 0 | 167 |
| 73.00 | 660 | 176.0 | 386 | 386 | 789 |
| 74.00 | 2,979 | 333.6 | 1,680 | 2,067 | 7,185 |
| 75.00 | 9,151 | 469.4 | 5,784 | 7,850 | 15,872 |
| 76.00 | 9,984 | 563.0 | 9,564 | 17,415 | 23,579 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 75.50' | **20.0' long x 20.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Primary | 72.00' | **6.0" Round Culvert X 2.00**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 72.00' / 71.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf |
| #3 | Primary | 73.00' | **14.0" Round Culvert X 2.00**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 73.00' / 72.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.07 sf |

**Primary OutFlow** Max=4.36 cfs @ 12.34 hrs HW=73.61' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
- **2=Culvert** (Barrel Controls 1.72 cfs @ 4.37 fps)
- **3=Culvert** (Inlet Controls 2.65 cfs @ 2.34 fps)

## Pond 3P: 3P


Hydrograph
4.65 cfs
4.38 cfs
Inflow Area=4.098 ac
Peak Elev=73.61'
Storage=1,131 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond RRP: Western Swale/Railroad Tracks w/ Culvert

Inflow Area = 17.782 ac, 0.00% Impervious, Inflow Depth = 0.92" for 2-yr event
Inflow = 7.26 cfs @ 12.57 hrs, Volume= 1.4 af
Outflow = 6.86 cfs @ 12.70 hrs, Volume= 1.4 af, Atten= 6%, Lag= 8.1 min
Primary = 6.86 cfs @ 12.70 hrs, Volume= 1.4 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 58.74' @ 12.70 hrs Surf.Area= 8,116 sf Storage= 5,941 cf

Plug-Flow detention time= 16.3 min calculated for 1.4 af (100% of inflow)
Center-of-Mass det. time= 15.9 min ( 923.9 - 908.0 )

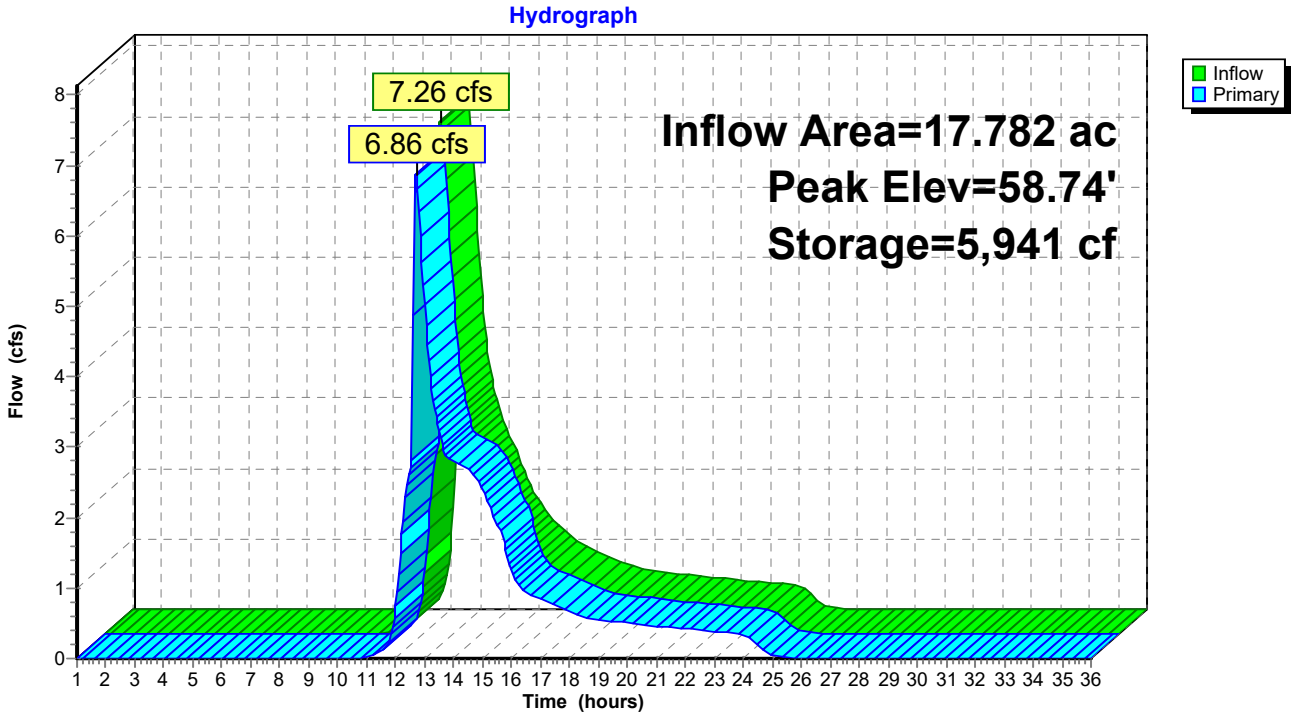
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 56.00' | 22,735 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 56.00 | 13 | 26.5 | 0 | 0 | 13 |
| 57.00 | 864 | 47.2 | 328 | 328 | 140 |
| 58.00 | 2,779 | 348.1 | 1,731 | 2,059 | 9,607 |
| 59.00 | 10,591 | 884.0 | 6,265 | 8,324 | 62,155 |
| 60.00 | 18,605 | 1,253.7 | 14,411 | 22,735 | 125,054 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 56.26' | **12.0" Round CMP_Round 12"**<br>L= 60.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 56.26' / 55.86' S= 0.0067 '/' Cc= 0.900<br>n= 0.025 Corrugated metal, Flow Area= 0.79 sf |
| #2 | Primary | 58.65' | **50.0' long x 35.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

**Primary OutFlow** Max=6.79 cfs @ 12.70 hrs HW=58.74' (Free Discharge)
└─**1=CMP_Round 12"** (Barrel Controls 2.91 cfs @ 3.70 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 3.88 cfs @ 0.82 fps)

## Pond RRP: Western Swale/Railroad Tracks w/ Culvert



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1S: 1S** Runoff Area=386,365 sf 0.00% Impervious Runoff Depth=2.63"
Flow Length=468' Tc=32.0 min CN=73 Runoff=14.90 cfs 1.9 af

**Subcatchment 1Sa: 1Sa** Runoff Area=332,772 sf 1.93% Impervious Runoff Depth=2.90"
Flow Length=251' Tc=7.8 min CN=76 Runoff=24.12 cfs 1.8 af

**Subcatchment 1Sb: 1Sb** Runoff Area=178,528 sf 0.00% Impervious Runoff Depth=2.81"
Flow Length=221' Tc=18.4 min CN=75 Runoff=9.38 cfs 1.0 af

**Subcatchment 2S: 2S** Runoff Area=601,941 sf 0.00% Impervious Runoff Depth=1.87"
Flow Length=898' Tc=34.8 min CN=64 Runoff=15.30 cfs 2.2 af

**Subcatchment 2Sa: 2Sa** Runoff Area=172,643 sf 0.00% Impervious Runoff Depth=2.72"
Flow Length=283' Tc=8.9 min CN=74 Runoff=11.19 cfs 0.9 af

**Reach DP1: Eastern Wetland** Inflow=26.00 cfs 4.8 af
Outflow=26.00 cfs 4.8 af

**Pond 1P: 1P** Peak Elev=75.22' Storage=33,239 cf Inflow=24.12 cfs 1.8 af
Outflow=3.11 cfs 1.8 af

**Pond 2P: 2P** Peak Elev=71.19' Storage=13,957 cf Inflow=11.19 cfs 0.9 af
Outflow=1.93 cfs 0.9 af

**Pond 3P: 3P** Peak Elev=74.09' Storage=2,357 cf Inflow=9.38 cfs 1.0 af
Outflow=8.49 cfs 1.0 af

**Pond RRP: Western Swale/Railroad Tracks w/** Peak Elev=58.87' Storage=7,060 cf Inflow=17.22 cfs 3.1 af
Outflow=17.15 cfs 3.1 af

**Total Runoff Area = 38.390 ac Runoff Volume = 7.8 af Average Runoff Depth = 2.44"**
**99.62% Pervious = 38.242 ac 0.38% Impervious = 0.147 ac**

## Summary for Subcatchment 1S: 1S

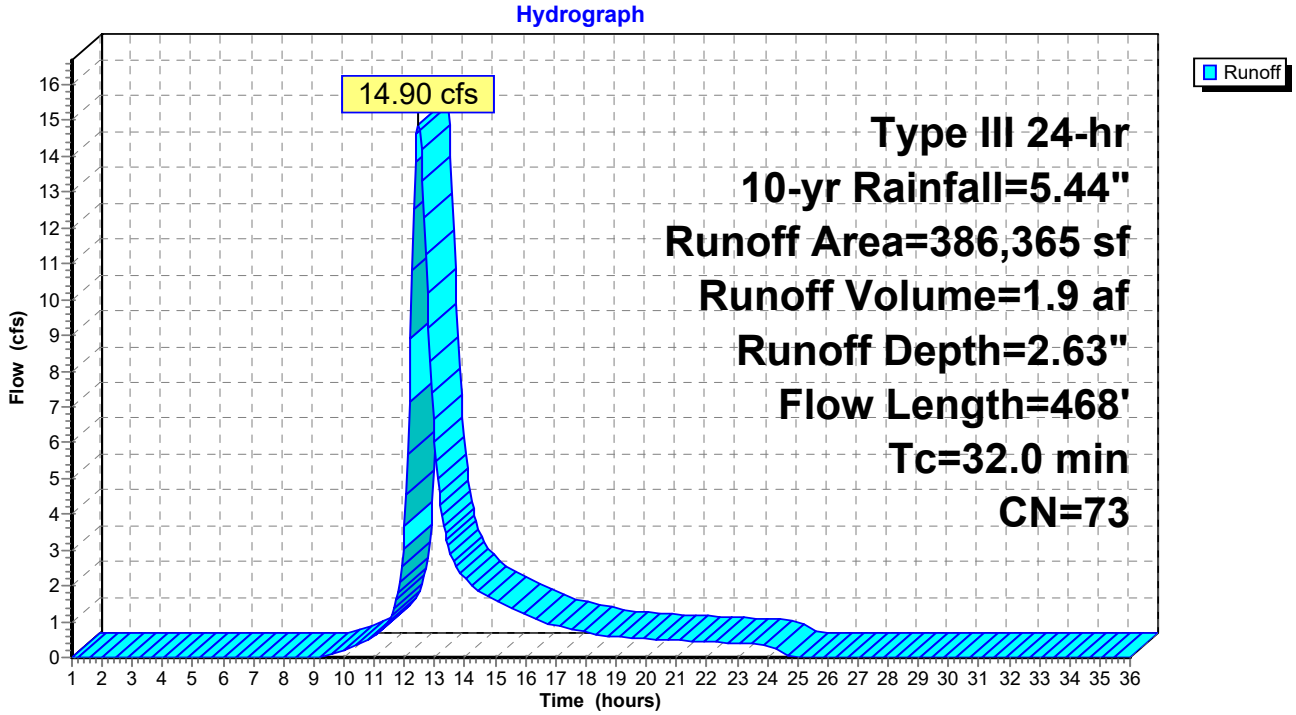
Runoff = 14.90 cfs @ 12.46 hrs, Volume= 1.9 af, Depth= 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.44"

| Area (sf) | CN | Description |
|---|---|---|
| 41,299 | 55 | Woods, Good, HSG B |
| 121,227 | 70 | Woods, Good, HSG C |
| 96,253 | 77 | Woods, Good, HSG D |
| 42,050 | 79 | 50-75% Grass cover, Fair, HSG C |
| 44,337 | 74 | >75% Grass cover, Good, HSG C |
| 41,199 | 84 | 50-75% Grass cover, Fair, HSG D |
| 386,365 | 73 | Weighted Average |
| 386,365 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 5.3 | 418 | 0.0681 | 1.30 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 32.0 | 468 | Total | | | |

## Subcatchment 1S: 1S



## Summary for Subcatchment 1Sa: 1Sa

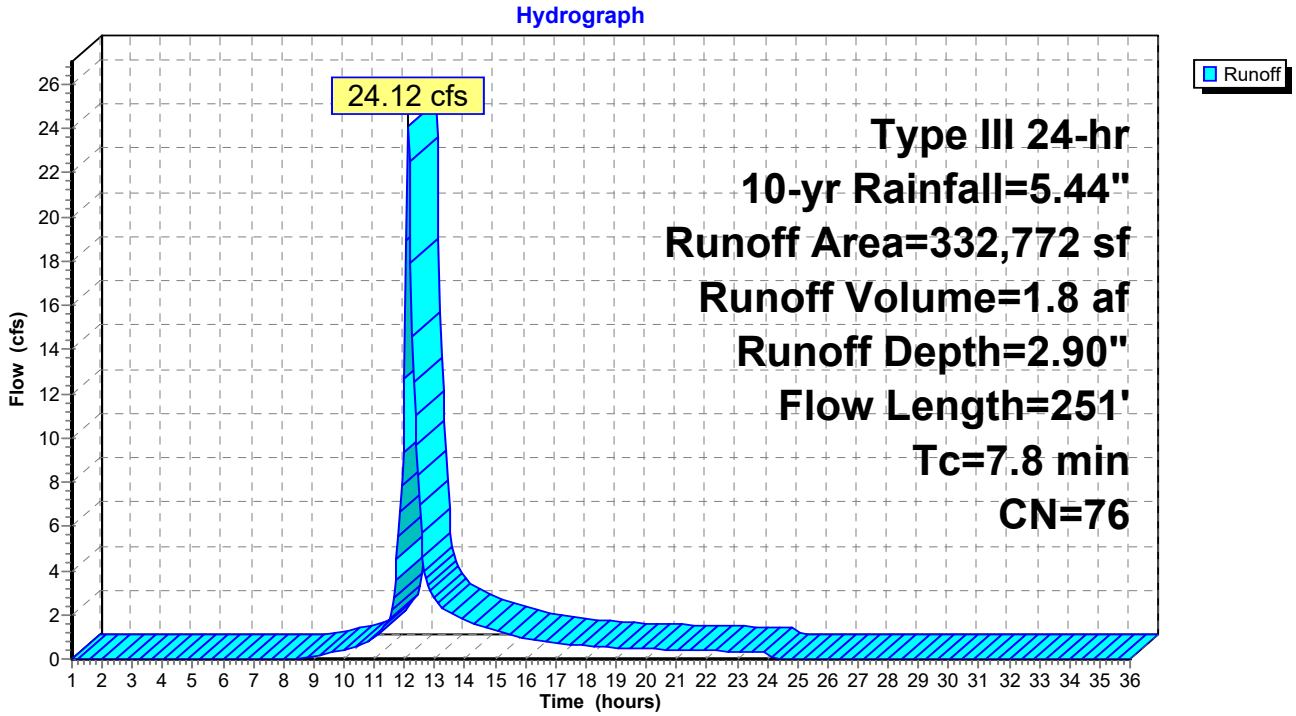
Runoff = 24.12 cfs @ 12.11 hrs, Volume= 1.8 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.44"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 6,408 | 98 | Unconnected pavement, HSG C - EQ PADS |
| | 5,146 | 96 | Gravel surface, HSG C |
| | 252,473 | 74 | >75% Grass cover, Good, HSG C |
| | 59,360 | 79 | 50-75% Grass cover, Fair, HSG C |
| | 9,385 | 84 | 50-75% Grass cover, Fair, HSG D |
| | 332,772 | 76 | Weighted Average |
| | 326,364 | | 98.07% Pervious Area |
| | 6,408 | | 1.93% Impervious Area |
| | 6,408 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.0 | 50 | 0.0100 | 0.12 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.8 | 201 | 0.0640 | 4.07 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 7.8 | 251 | Total | | | |

## Subcatchment 1Sa: 1Sa



## Summary for Subcatchment 1Sb: 1Sb

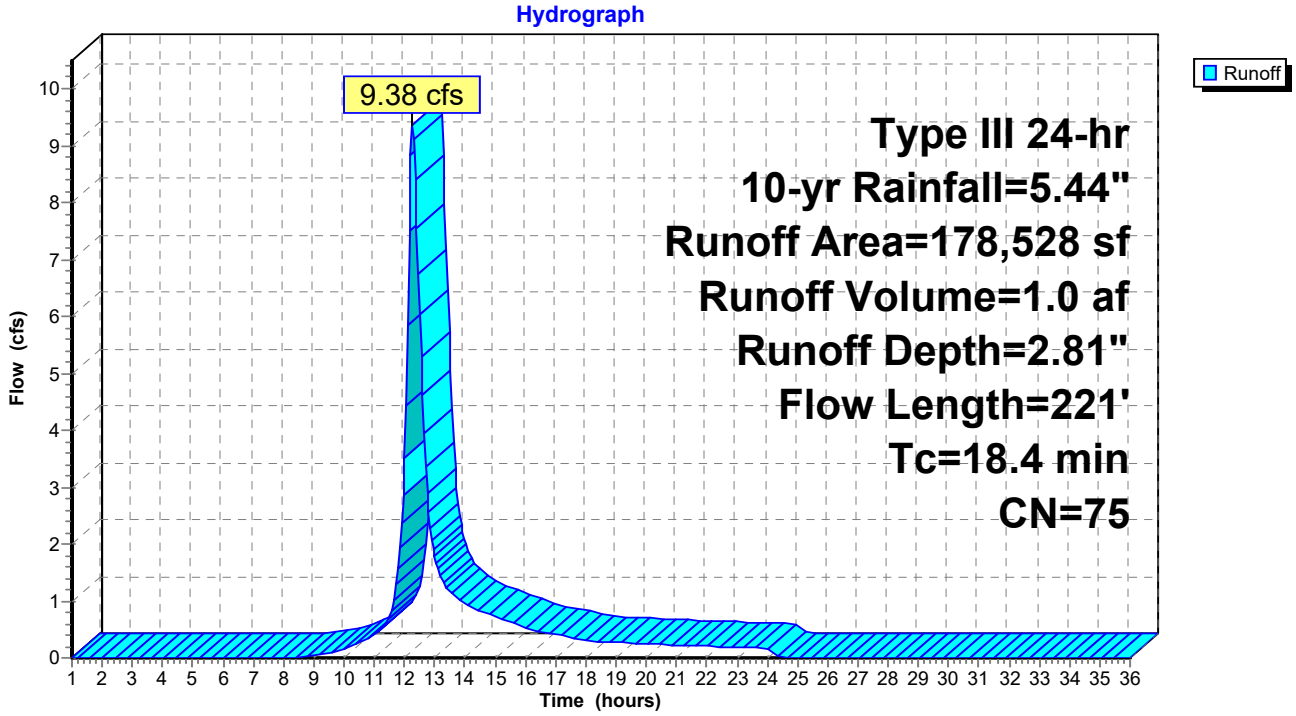
Runoff = 9.38 cfs @ 12.26 hrs, Volume= 1.0 af, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.44"

| Area (sf) | CN | Description |
|---|---|---|
| 4,422 | 96 | Gravel surface, HSG C |
| 157,889 | 74 | >75% Grass cover, Good, HSG C |
| 16,217 | 79 | 50-75% Grass cover, Fair, HSG C |
| 178,528 | 75 | Weighted Average |
| 178,528 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.6 | 50 | 0.0010 | 0.05 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.8 | 171 | 0.0450 | 3.42 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 18.4 | 221 | Total | | | |

## Subcatchment 1Sb: 1Sb



## Summary for Subcatchment 2S: 2S

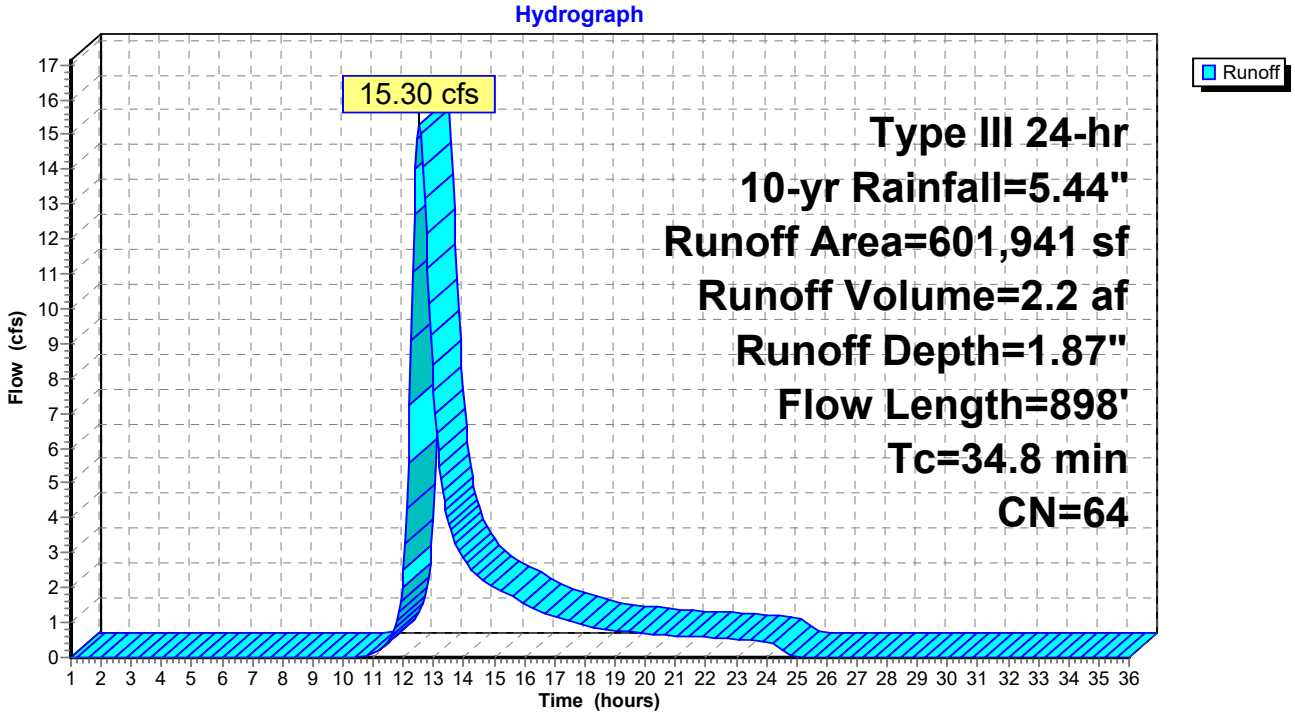
Runoff = 15.30 cfs @ 12.52 hrs, Volume= 2.2 af, Depth= 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.44"

| Area (sf) | CN | Description |
|---|---|---|
| 12,903 | 96 | Gravel surface, HSG C |
| 22,963 | 74 | >75% Grass cover, Good, HSG C |
| 285,668 | 55 | Woods, Good, HSG B |
| 225,635 | 70 | Woods, Good, HSG C |
| 15,496 | 69 | 50-75% Grass cover, Fair, HSG B |
| 39,276 | 79 | 50-75% Grass cover, Fair, HSG C |
| 601,941 | 64 | Weighted Average |
| 601,941 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.2 | 50 | 0.0080 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 5.6 | 848 | 0.0250 | 2.55 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 34.8 | 898 | Total | | | |

## Subcatchment 2S: 2S



## Summary for Subcatchment 2Sa: 2Sa

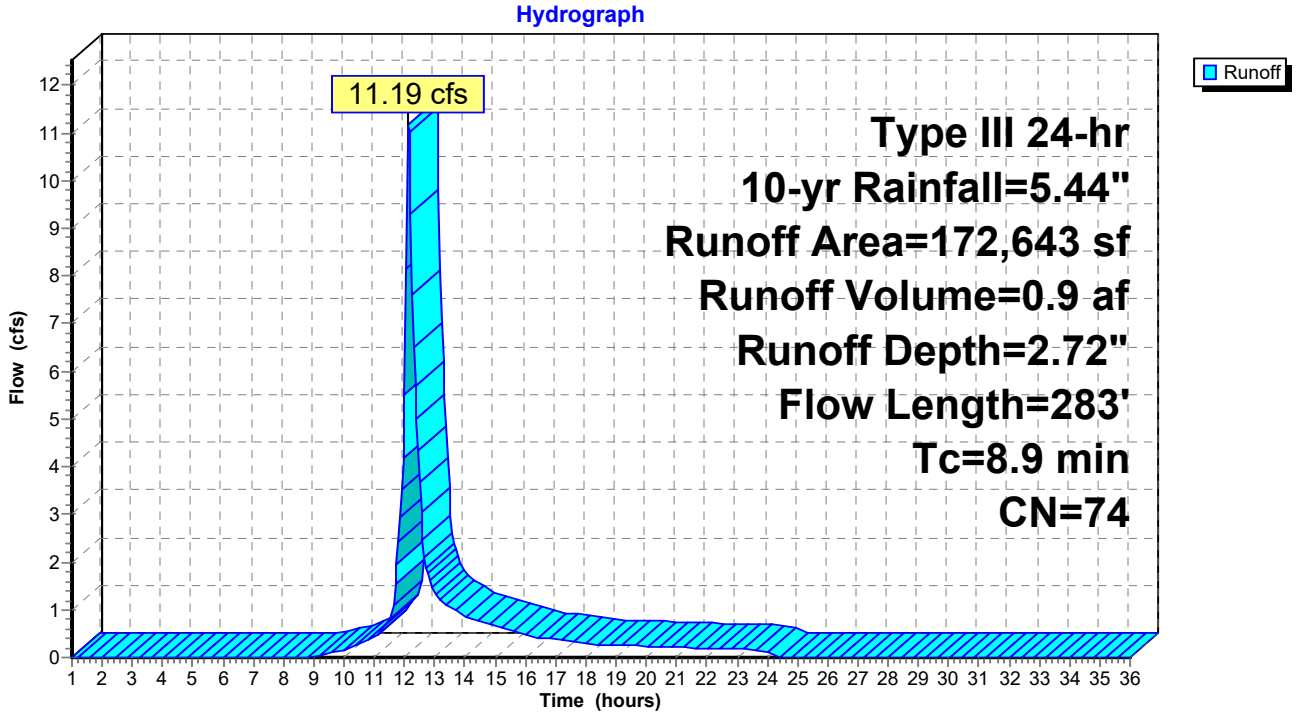
Runoff = 11.19 cfs @ 12.13 hrs, Volume= 0.9 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.44"

| Area (sf) | CN | Description |
|---|---|---|
| 1,962 | 96 | Gravel surface, HSG C |
| 42,320 | 69 | 50-75% Grass cover, Fair, HSG B |
| 98,678 | 74 | >75% Grass cover, Good, HSG C |
| 29,683 | 79 | 50-75% Grass cover, Fair, HSG C |
| 172,643 | 74 | Weighted Average |
| 172,643 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.0 | 50 | 0.0072 | 0.10 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.7 | 184 | 0.0850 | 4.69 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 49 | 0.0612 | 3.71 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 8.9 | 283 | Total | | | |

## Subcatchment 2Sa: 2Sa

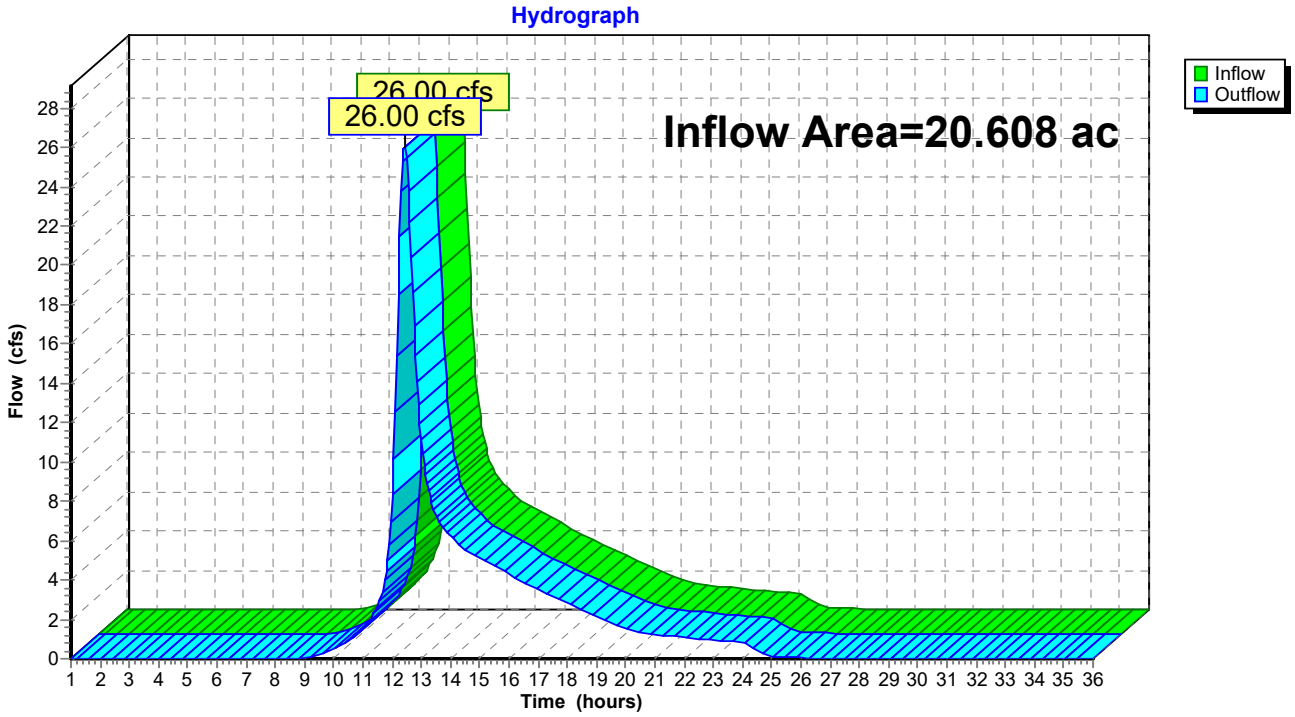


## Summary for Reach DP1: Eastern Wetland

Inflow Area = 20.608 ac, 0.71% Impervious, Inflow Depth = 2.77" for 10-yr event
Inflow = 26.00 cfs @ 12.42 hrs, Volume= 4.8 af
Outflow = 26.00 cfs @ 12.42 hrs, Volume= 4.8 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

### Reach DP1: Eastern Wetland



## Summary for Pond 1P: 1P

Inflow Area = 7.639 ac, 1.93% Impervious, Inflow Depth = 2.90" for 10-yr event
Inflow = 24.12 cfs @ 12.11 hrs, Volume= 1.8 af
Outflow = 3.11 cfs @ 12.86 hrs, Volume= 1.8 af, Atten= 87%, Lag= 44.6 min
Primary = 3.11 cfs @ 12.86 hrs, Volume= 1.8 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 75.22' @ 12.86 hrs Surf.Area= 29,561 sf Storage= 33,239 cf

Plug-Flow detention time= 118.3 min calculated for 1.8 af (100% of inflow)
Center-of-Mass det. time= 118.5 min ( 948.6 - 830.1 )

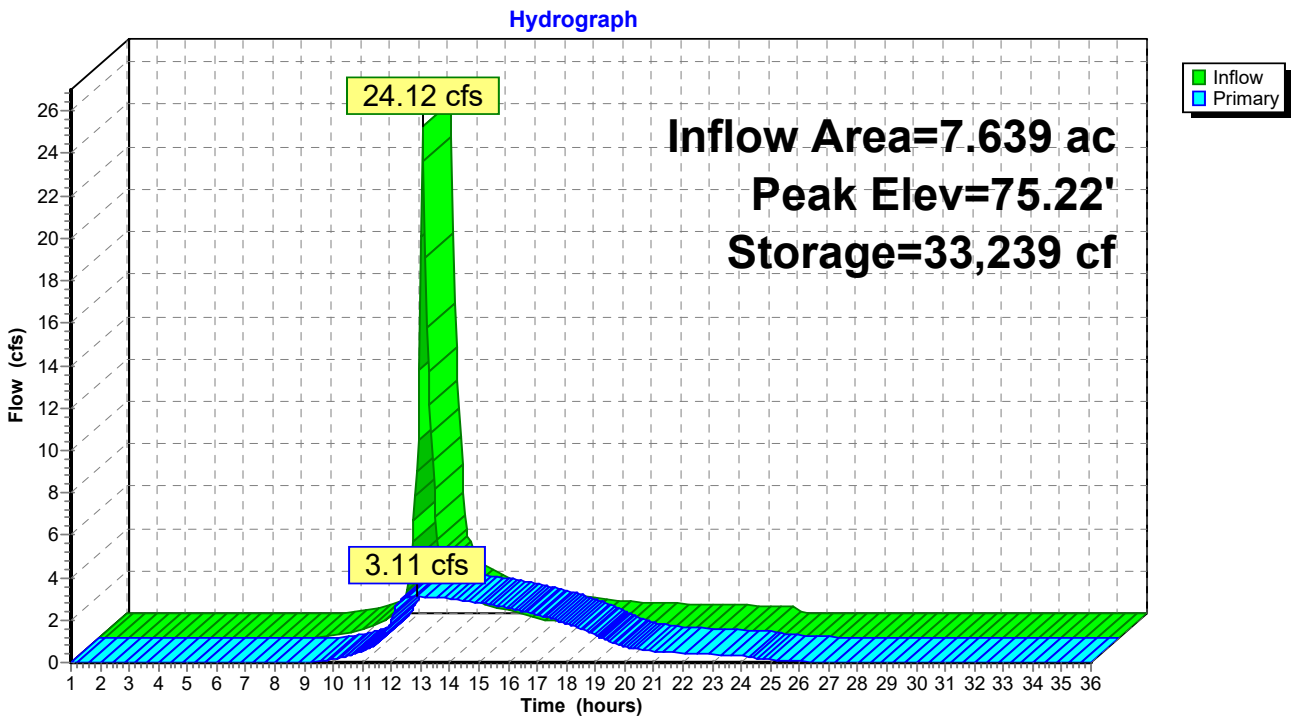
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 73.00' | 140,073 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 73.00 | 2,895 | 876.8 | 0 | 0 | 2,895 |
| 74.00 | 13,416 | 1,517.5 | 7,514 | 7,514 | 124,975 |
| 75.00 | 26,522 | 1,740.9 | 19,600 | 27,115 | 182,924 |
| 76.00 | 41,778 | 1,899.3 | 33,862 | 60,977 | 228,845 |
| 77.00 | 58,419 | 2,081.5 | 49,867 | 110,844 | 286,597 |
| 77.50 | 58,500 | 2,100.0 | 29,230 | 140,073 | 292,842 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.00' | **20.0' long x 20.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Primary | 73.00' | **10.0" Round Culvert**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 73.00' / 72.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf |

**Primary OutFlow** Max=3.11 cfs @ 12.86 hrs HW=75.22' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
└─**2=Culvert** (Inlet Controls 3.11 cfs @ 5.70 fps)

## Pond 1P: 1P


Hydrograph
24.12 cfs
3.11 cfs
Inflow Area=7.639 ac
Peak Elev=75.22'
Storage=33,239 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond 2P: 2P

Inflow Area = 3.963 ac, 0.00% Impervious, Inflow Depth = 2.72" for 10-yr event
Inflow = 11.19 cfs @ 12.13 hrs, Volume= 0.9 af
Outflow = 1.93 cfs @ 12.69 hrs, Volume= 0.9 af, Atten= 83%, Lag= 33.7 min
Primary = 1.93 cfs @ 12.69 hrs, Volume= 0.9 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 71.19' @ 12.69 hrs Surf.Area= 14,832 sf Storage= 13,957 cf

Plug-Flow detention time= 70.5 min calculated for 0.9 af (100% of inflow)
Center-of-Mass det. time= 70.8 min ( 906.8 - 836.1 )

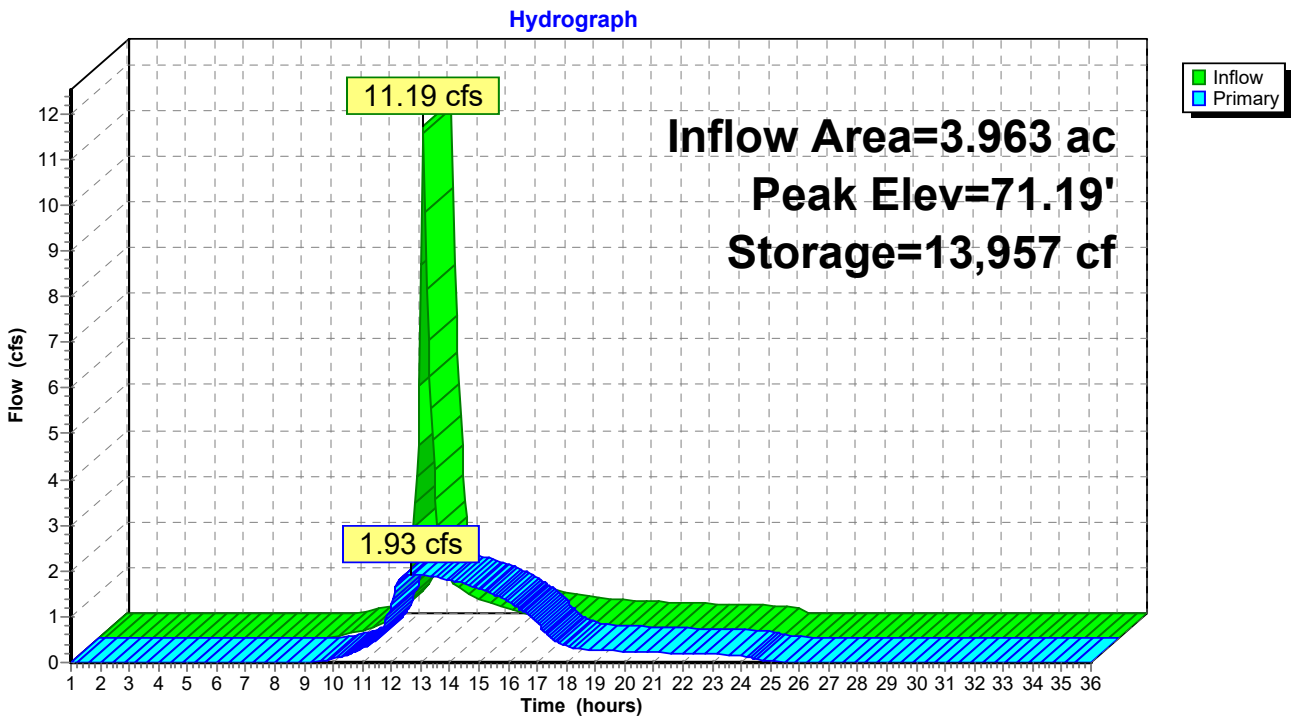
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 69.00' | 58,912 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 69.00 | 1,009 | 191.5 | 0 | 0 | 1,009 |
| 70.00 | 4,826 | 397.8 | 2,681 | 2,681 | 10,688 |
| 71.00 | 12,978 | 663.6 | 8,573 | 11,253 | 33,145 |
| 72.00 | 23,823 | 909.9 | 18,128 | 29,381 | 63,995 |
| 73.00 | 35,633 | 1,063.0 | 29,531 | 58,912 | 88,052 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 72.50' | **20.0' long x 8.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2 | Primary | 69.00' | **8.0" Round Culvert**<br>L= 41.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 69.00' / 68.67' S= 0.0080 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf |

**Primary OutFlow** Max=1.93 cfs @ 12.69 hrs HW=71.19' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
└─**2=Culvert** (Barrel Controls 1.93 cfs @ 5.53 fps)

## Pond 2P: 2P


Hydrograph
11.19 cfs
1.93 cfs
Inflow Area=3.963 ac
Peak Elev=71.19'
Storage=13,957 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond 3P: 3P

Inflow Area = 4.098 ac, 0.00% Impervious, Inflow Depth = 2.81" for 10-yr event
Inflow = 9.38 cfs @ 12.26 hrs, Volume= 1.0 af
Outflow = 8.49 cfs @ 12.35 hrs, Volume= 1.0 af, Atten= 10%, Lag= 5.3 min
Primary = 8.49 cfs @ 12.35 hrs, Volume= 1.0 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 74.09' @ 12.35 hrs Surf.Area= 3,402 sf Storage= 2,357 cf

Plug-Flow detention time= 3.8 min calculated for 1.0 af (100% of inflow)
Center-of-Mass det. time= 3.8 min ( 846.2 - 842.4 )

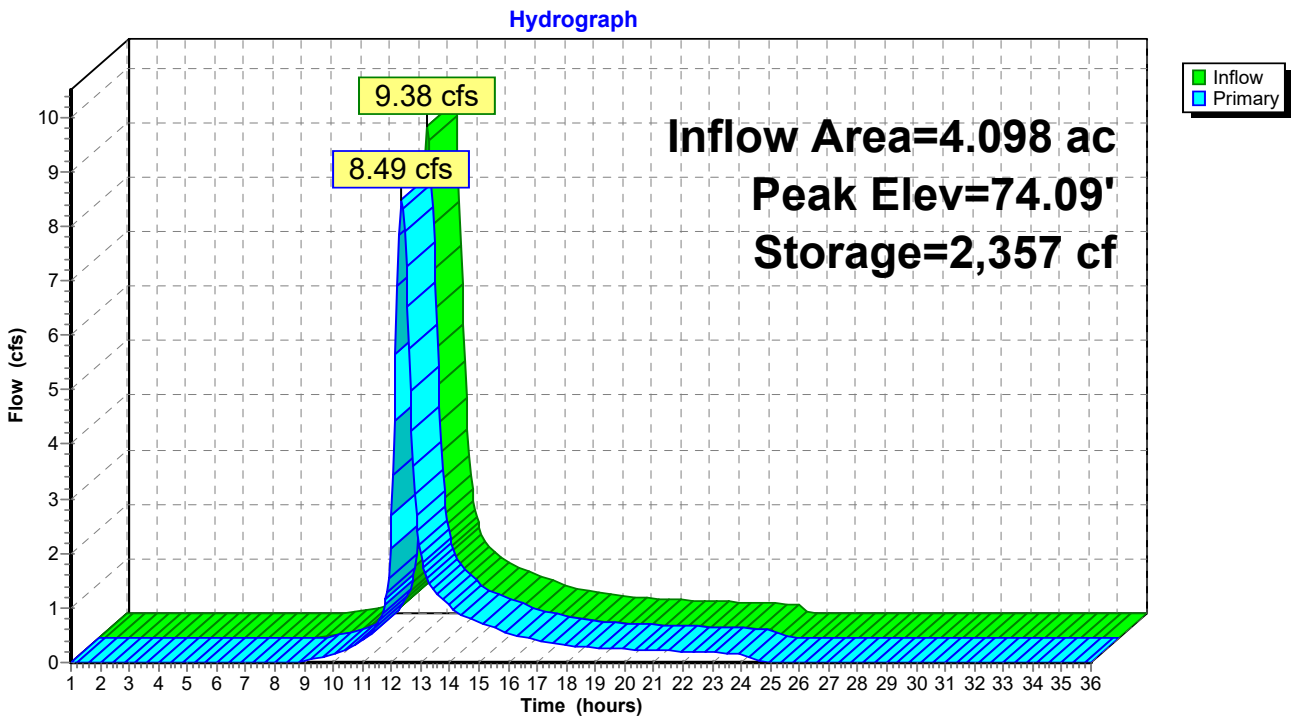
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 72.00' | 17,415 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 72.00 | 167 | 153.1 | 0 | 0 | 167 |
| 73.00 | 660 | 176.0 | 386 | 386 | 789 |
| 74.00 | 2,979 | 333.6 | 1,680 | 2,067 | 7,185 |
| 75.00 | 9,151 | 469.4 | 5,784 | 7,850 | 15,872 |
| 76.00 | 9,984 | 563.0 | 9,564 | 17,415 | 23,579 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 75.50' | **20.0' long x 20.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Primary | 72.00' | **6.0" Round Culvert X 2.00**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 72.00' / 71.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf |
| #3 | Primary | 73.00' | **14.0" Round Culvert X 2.00**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 73.00' / 72.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.07 sf |

**Primary OutFlow** Max=8.48 cfs @ 12.35 hrs HW=74.09' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
- **2=Culvert** (Barrel Controls 1.96 cfs @ 5.00 fps)
- **3=Culvert** (Inlet Controls 6.52 cfs @ 3.14 fps)

## Pond 3P: 3P


Hydrograph
9.38 cfs
8.49 cfs
Inflow Area=4.098 ac
Peak Elev=74.09'
Storage=2,357 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond RRP: Western Swale/Railroad Tracks w/ Culvert

Inflow Area = 17.782 ac, 0.00% Impervious, Inflow Depth = 2.06" for 10-yr event
Inflow = 17.22 cfs @ 12.52 hrs, Volume= 3.1 af
Outflow = 17.15 cfs @ 12.55 hrs, Volume= 3.1 af, Atten= 0%, Lag= 1.8 min
Primary = 17.15 cfs @ 12.55 hrs, Volume= 3.1 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 58.87' @ 12.55 hrs Surf.Area= 9,319 sf Storage= 7,060 cf

Plug-Flow detention time= 14.6 min calculated for 3.1 af (100% of inflow)
Center-of-Mass det. time= 14.6 min ( 906.1 - 891.5 )

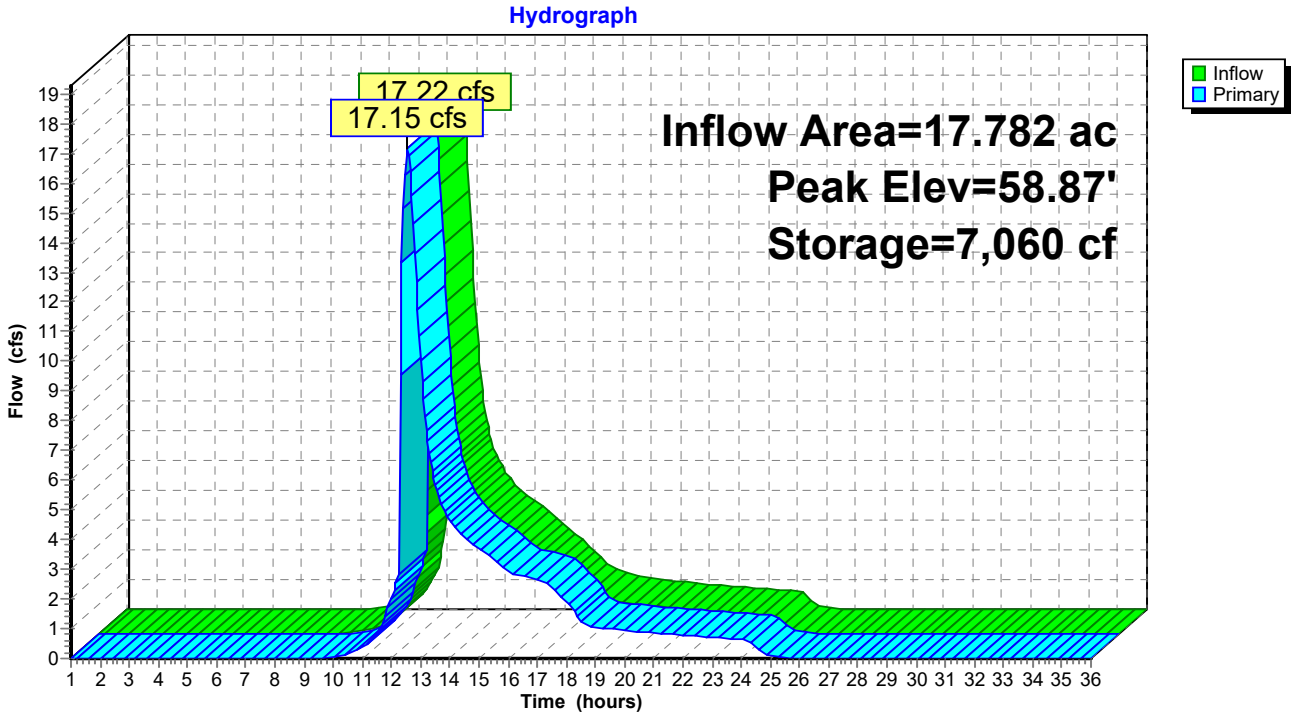
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 56.00' | 22,735 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 56.00 | 13 | 26.5 | 0 | 0 | 13 |
| 57.00 | 864 | 47.2 | 328 | 328 | 140 |
| 58.00 | 2,779 | 348.1 | 1,731 | 2,059 | 9,607 |
| 59.00 | 10,591 | 884.0 | 6,265 | 8,324 | 62,155 |
| 60.00 | 18,605 | 1,253.7 | 14,411 | 22,735 | 125,054 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 56.26' | **12.0" Round CMP_Round 12"**<br>L= 60.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 56.26' / 55.86' S= 0.0067 '/' Cc= 0.900<br>n= 0.025 Corrugated metal, Flow Area= 0.79 sf |
| #2 | Primary | 58.65' | **50.0' long x 35.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

**Primary OutFlow** Max=17.12 cfs @ 12.55 hrs HW=58.87' (Free Discharge)
└─**1=CMP_Round 12"** (Barrel Controls 3.00 cfs @ 3.82 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 14.12 cfs @ 1.27 fps)

## Pond RRP: Western Swale/Railroad Tracks w/ Culvert



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1S: 1S** Runoff Area=386,365 sf 0.00% Impervious Runoff Depth=3.69"
Flow Length=468' Tc=32.0 min CN=73 Runoff=20.99 cfs 2.7 af

**Subcatchment 1Sa: 1Sa** Runoff Area=332,772 sf 1.93% Impervious Runoff Depth=4.00"
Flow Length=251' Tc=7.8 min CN=76 Runoff=33.22 cfs 2.5 af

**Subcatchment 1Sb: 1Sb** Runoff Area=178,528 sf 0.00% Impervious Runoff Depth=3.89"
Flow Length=221' Tc=18.4 min CN=75 Runoff=13.02 cfs 1.3 af

**Subcatchment 2S: 2S** Runoff Area=601,941 sf 0.00% Impervious Runoff Depth=2.78"
Flow Length=898' Tc=34.8 min CN=64 Runoff=23.33 cfs 3.2 af

**Subcatchment 2Sa: 2Sa** Runoff Area=172,643 sf 0.00% Impervious Runoff Depth=3.79"
Flow Length=283' Tc=8.9 min CN=74 Runoff=15.62 cfs 1.3 af

**Reach DP1: Eastern Wetland** Inflow=34.98 cfs 6.6 af
Outflow=34.98 cfs 6.6 af

**Pond 1P: 1P** Peak Elev=75.70' Storage=49,072 cf Inflow=33.22 cfs 2.5 af
Outflow=3.50 cfs 2.5 af

**Pond 2P: 2P** Peak Elev=71.62' Storage=21,286 cf Inflow=15.62 cfs 1.3 af
Outflow=2.14 cfs 1.3 af

**Pond 3P: 3P** Peak Elev=74.47' Storage=4,040 cf Inflow=13.02 cfs 1.3 af
Outflow=10.71 cfs 1.3 af

**Pond RRP: Western Swale/Railroad Tracks w/** Peak Elev=58.95' Storage=7,822 cf Inflow=25.45 cfs 4.5 af
Outflow=25.36 cfs 4.5 af

**Total Runoff Area = 38.390 ac Runoff Volume = 11.1 af Average Runoff Depth = 3.46"**
**99.62% Pervious = 38.242 ac 0.38% Impervious = 0.147 ac**

## Summary for Subcatchment 1S: 1S

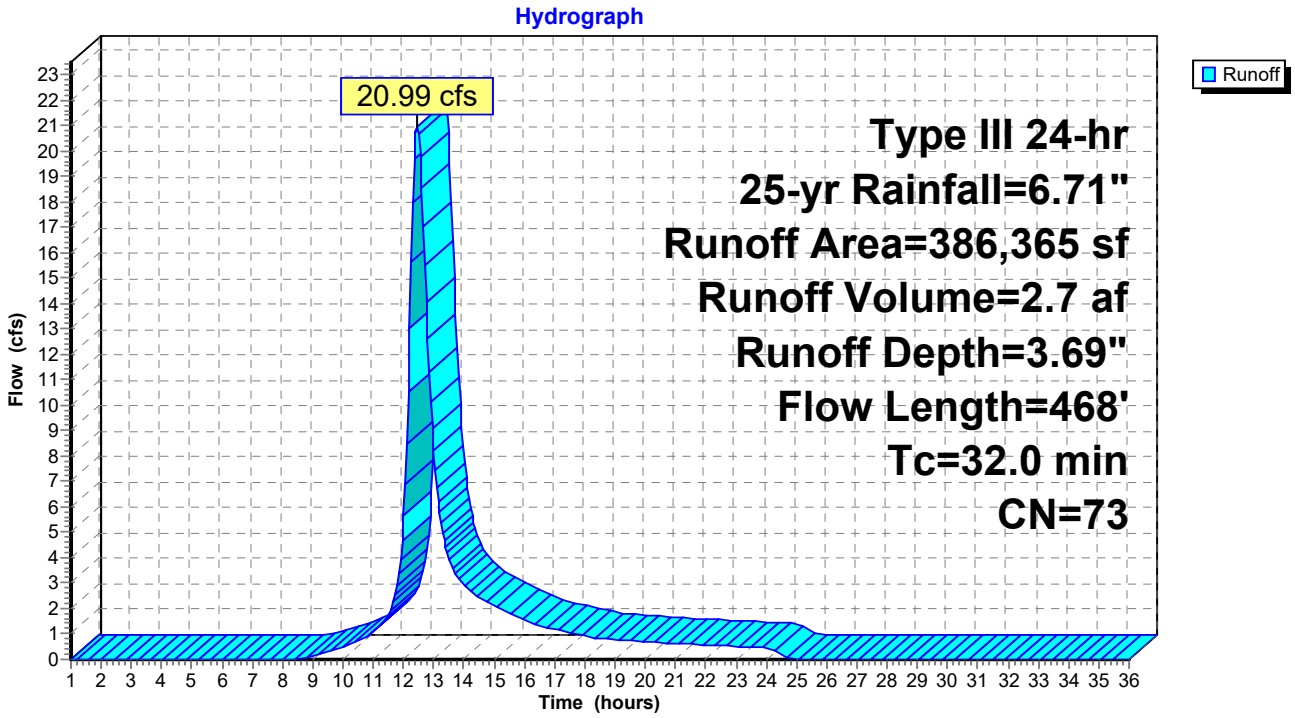
Runoff = 20.99 cfs @ 12.45 hrs, Volume= 2.7 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.71"

| Area (sf) | CN | Description |
|---|---|---|
| 41,299 | 55 | Woods, Good, HSG B |
| 121,227 | 70 | Woods, Good, HSG C |
| 96,253 | 77 | Woods, Good, HSG D |
| 42,050 | 79 | 50-75% Grass cover, Fair, HSG C |
| 44,337 | 74 | >75% Grass cover, Good, HSG C |
| 41,199 | 84 | 50-75% Grass cover, Fair, HSG D |
| 386,365 | 73 | Weighted Average |
| 386,365 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 5.3 | 418 | 0.0681 | 1.30 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 32.0 | 468 | Total | | | |

## Subcatchment 1S: 1S



## Summary for Subcatchment 1Sa: 1Sa

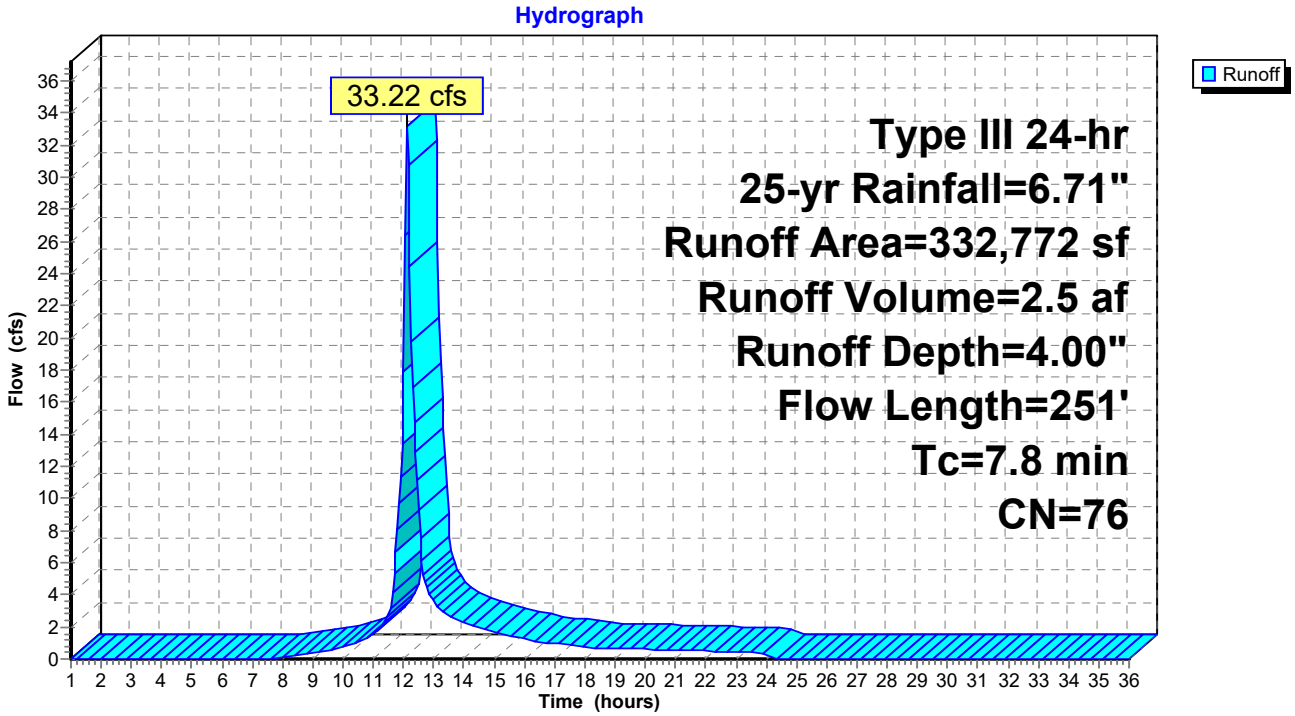
Runoff = 33.22 cfs @ 12.11 hrs, Volume= 2.5 af, Depth= 4.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.71"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 6,408 | 98 | Unconnected pavement, HSG C - EQ PADS |
| | 5,146 | 96 | Gravel surface, HSG C |
| | 252,473 | 74 | >75% Grass cover, Good, HSG C |
| | 59,360 | 79 | 50-75% Grass cover, Fair, HSG C |
| | 9,385 | 84 | 50-75% Grass cover, Fair, HSG D |
| | 332,772 | 76 | Weighted Average |
| | 326,364 | | 98.07% Pervious Area |
| | 6,408 | | 1.93% Impervious Area |
| | 6,408 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.0 | 50 | 0.0100 | 0.12 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.8 | 201 | 0.0640 | 4.07 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 7.8 | 251 | Total | | | |

## Subcatchment 1Sa: 1Sa



## Summary for Subcatchment 1Sb: 1Sb

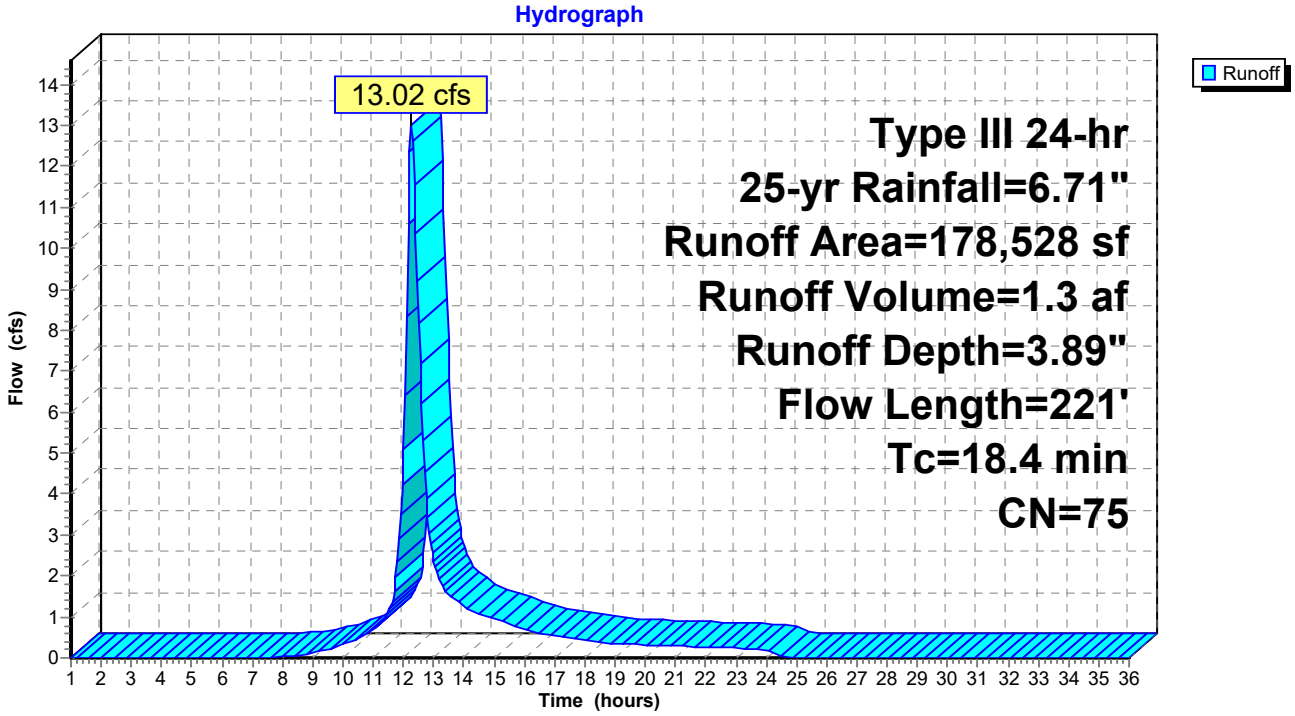
Runoff = 13.02 cfs @ 12.26 hrs, Volume= 1.3 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.71"

| Area (sf) | CN | Description |
|---|---|---|
| 4,422 | 96 | Gravel surface, HSG C |
| 157,889 | 74 | >75% Grass cover, Good, HSG C |
| 16,217 | 79 | 50-75% Grass cover, Fair, HSG C |
| 178,528 | 75 | Weighted Average |
| 178,528 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.6 | 50 | 0.0010 | 0.05 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.8 | 171 | 0.0450 | 3.42 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 18.4 | 221 | Total | | | |

## Subcatchment 1Sb: 1Sb



## Summary for Subcatchment 2S: 2S

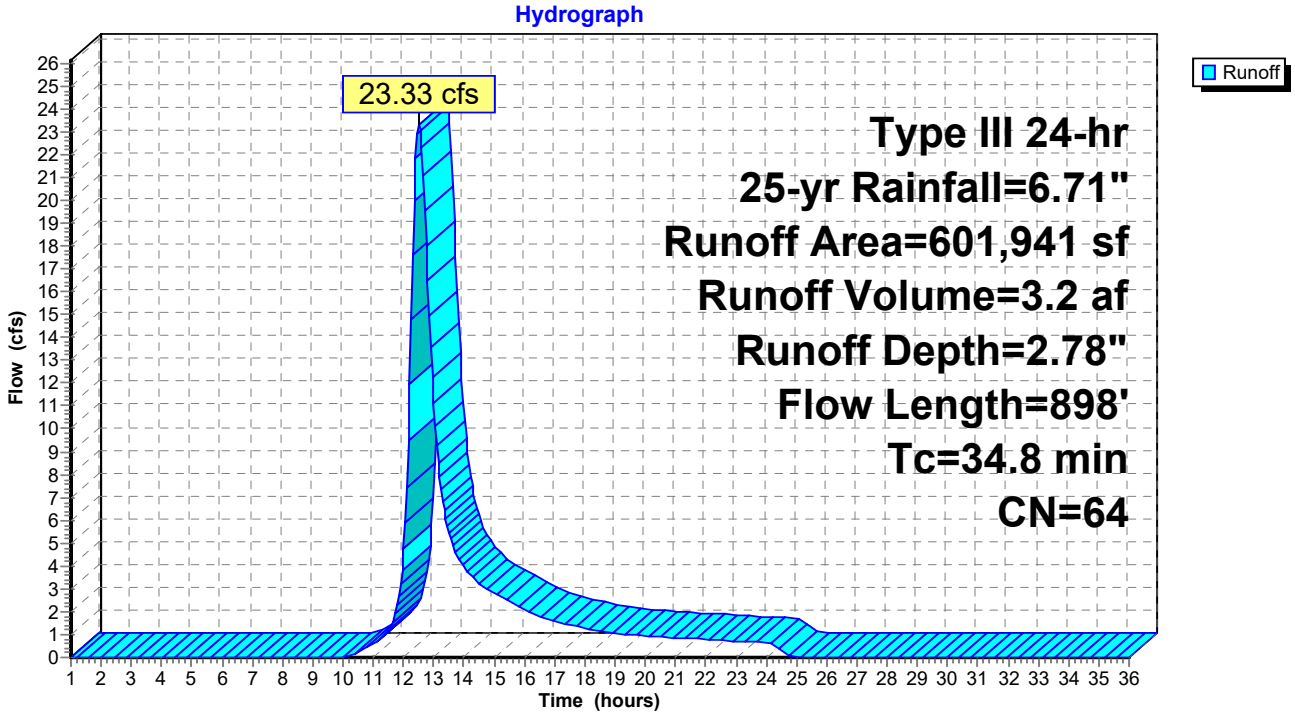
Runoff = 23.33 cfs @ 12.51 hrs, Volume= 3.2 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.71"

| Area (sf) | CN | Description |
|---|---|---|
| 12,903 | 96 | Gravel surface, HSG C |
| 22,963 | 74 | >75% Grass cover, Good, HSG C |
| 285,668 | 55 | Woods, Good, HSG B |
| 225,635 | 70 | Woods, Good, HSG C |
| 15,496 | 69 | 50-75% Grass cover, Fair, HSG B |
| 39,276 | 79 | 50-75% Grass cover, Fair, HSG C |
| 601,941 | 64 | Weighted Average |
| 601,941 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.2 | 50 | 0.0080 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 5.6 | 848 | 0.0250 | 2.55 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 34.8 | 898 | Total | | | |

## Subcatchment 2S: 2S



## Summary for Subcatchment 2Sa: 2Sa

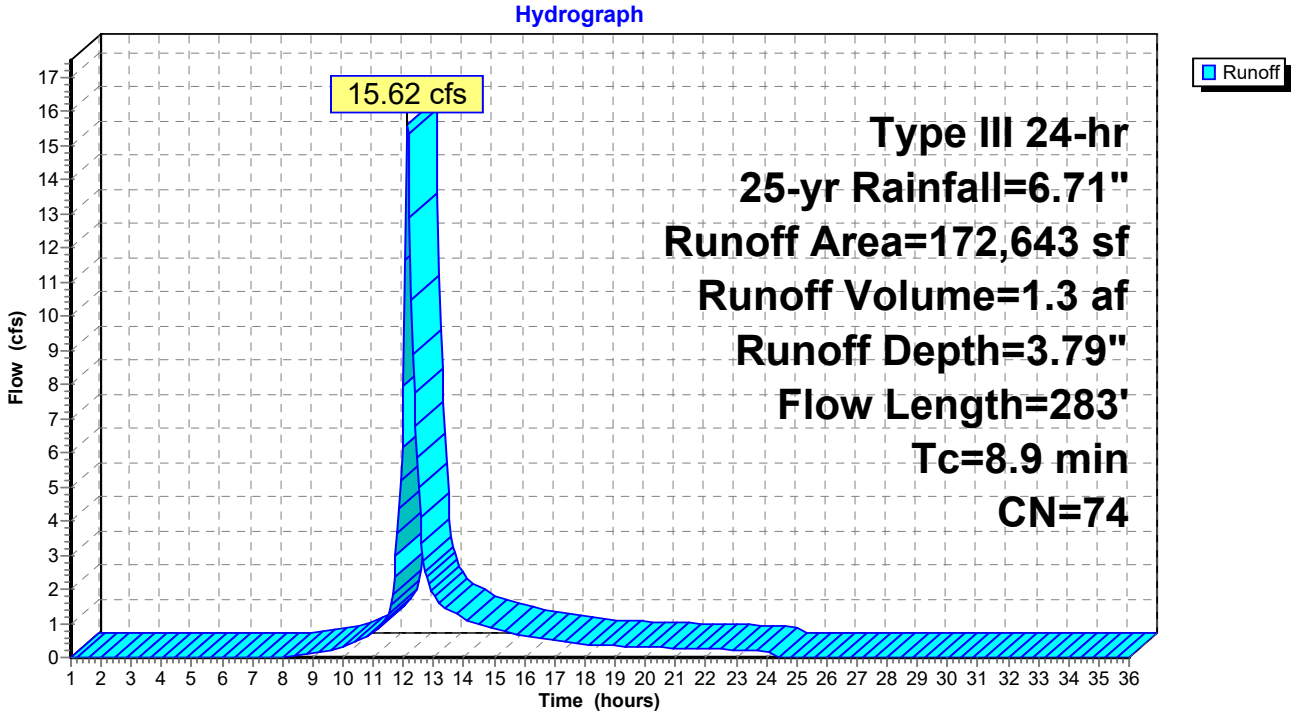
Runoff = 15.62 cfs @ 12.13 hrs, Volume= 1.3 af, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.71"

| Area (sf) | CN | Description |
|---|---|---|
| 1,962 | 96 | Gravel surface, HSG C |
| 42,320 | 69 | 50-75% Grass cover, Fair, HSG B |
| 98,678 | 74 | >75% Grass cover, Good, HSG C |
| 29,683 | 79 | 50-75% Grass cover, Fair, HSG C |
| 172,643 | 74 | Weighted Average |
| 172,643 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.0 | 50 | 0.0072 | 0.10 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.7 | 184 | 0.0850 | 4.69 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 49 | 0.0612 | 3.71 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 8.9 | 283 | Total | | | |

## Subcatchment 2Sa: 2Sa

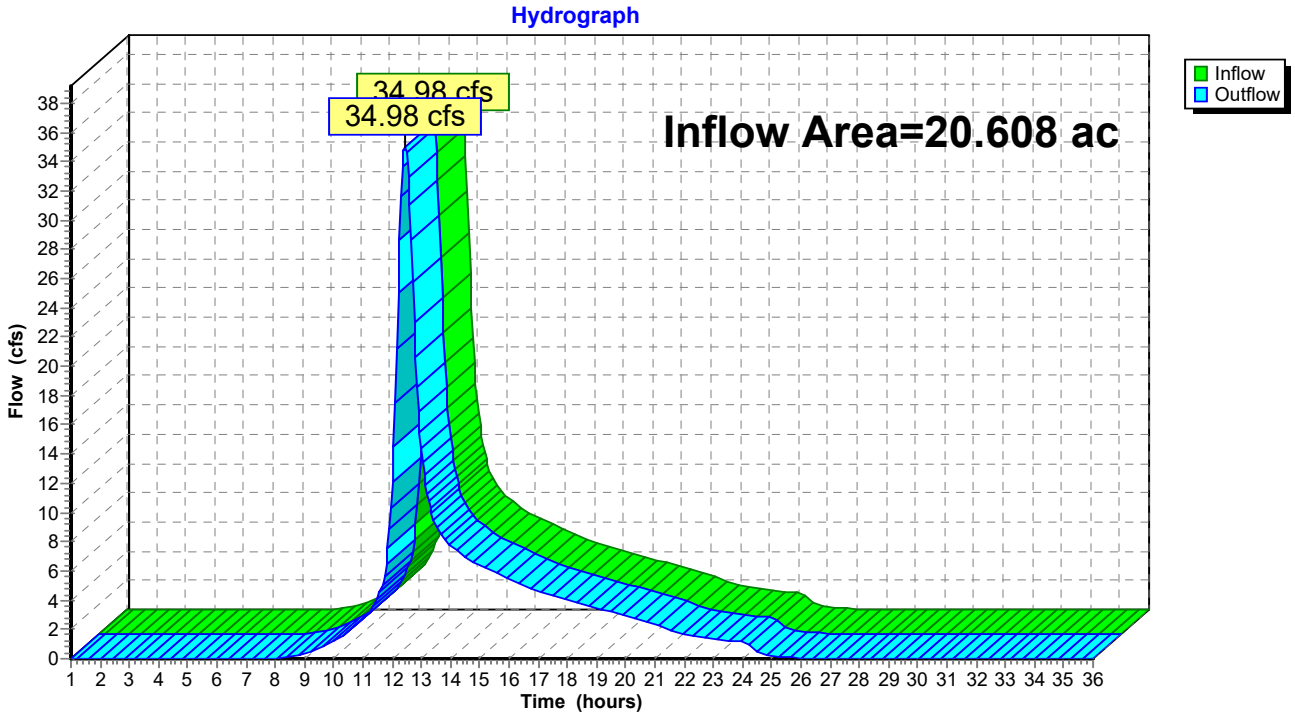


## Summary for Reach DP1: Eastern Wetland

Inflow Area = 20.608 ac, 0.71% Impervious, Inflow Depth = 3.84" for 25-yr event
Inflow = 34.98 cfs @ 12.43 hrs, Volume= 6.6 af
Outflow = 34.98 cfs @ 12.43 hrs, Volume= 6.6 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

### Reach DP1: Eastern Wetland



## Summary for Pond 1P: 1P

Inflow Area = 7.639 ac, 1.93% Impervious, Inflow Depth = 4.00" for 25-yr event
Inflow = 33.22 cfs @ 12.11 hrs, Volume= 2.5 af
Outflow = 3.50 cfs @ 13.02 hrs, Volume= 2.5 af, Atten= 89%, Lag= 54.5 min
Primary = 3.50 cfs @ 13.02 hrs, Volume= 2.5 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 75.70' @ 13.02 hrs Surf.Area= 36,787 sf Storage= 49,072 cf

Plug-Flow detention time= 153.4 min calculated for 2.5 af (100% of inflow)
Center-of-Mass det. time= 153.0 min ( 973.9 - 820.9 )

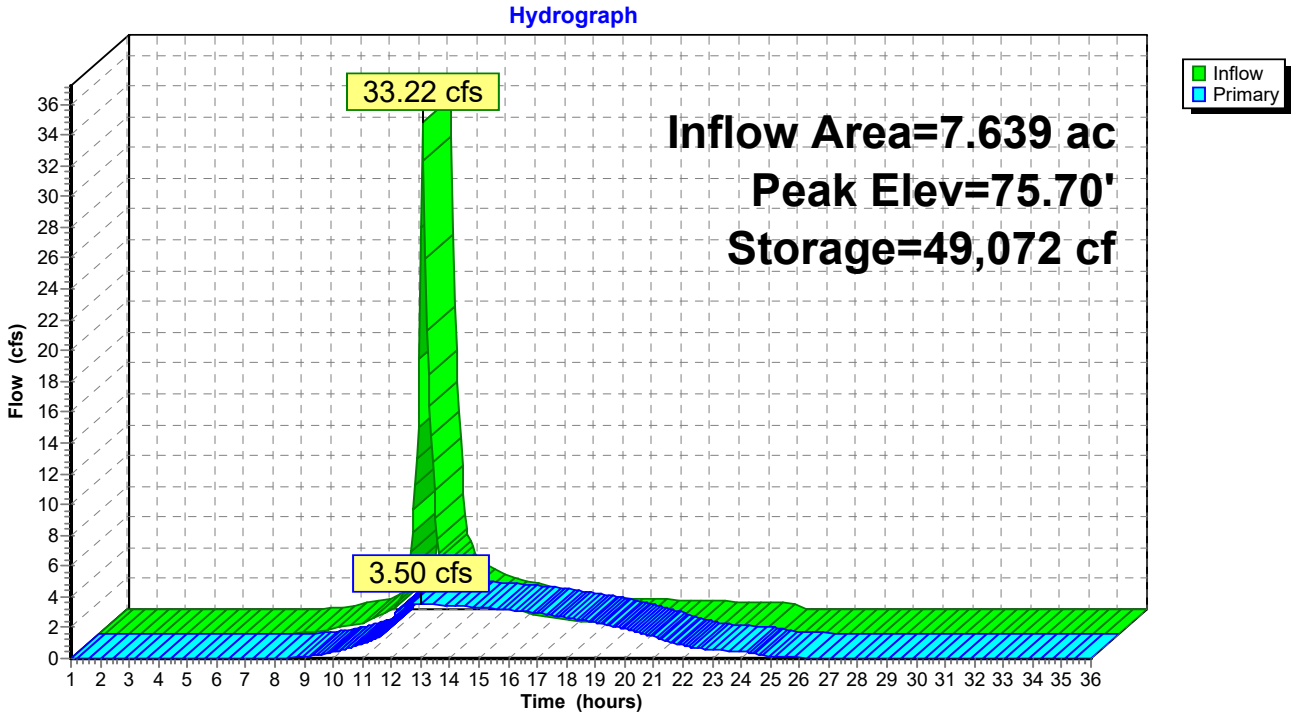
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 73.00' | 140,073 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 73.00 | 2,895 | 876.8 | 0 | 0 | 2,895 |
| 74.00 | 13,416 | 1,517.5 | 7,514 | 7,514 | 124,975 |
| 75.00 | 26,522 | 1,740.9 | 19,600 | 27,115 | 182,924 |
| 76.00 | 41,778 | 1,899.3 | 33,862 | 60,977 | 228,845 |
| 77.00 | 58,419 | 2,081.5 | 49,867 | 110,844 | 286,597 |
| 77.50 | 58,500 | 2,100.0 | 29,230 | 140,073 | 292,842 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.00' | **20.0' long x 20.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Primary | 73.00' | **10.0" Round Culvert**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 73.00' / 72.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf |

**Primary OutFlow** Max=3.50 cfs @ 13.02 hrs HW=75.70' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
└─**2=Culvert** (Inlet Controls 3.50 cfs @ 6.42 fps)

## Pond 1P: 1P


Hydrograph
33.22 cfs
3.50 cfs
Inflow Area=7.639 ac
Peak Elev=75.70'
Storage=49,072 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond 2P: 2P

Inflow Area = 3.963 ac, 0.00% Impervious, Inflow Depth = 3.79" for 25-yr event
Inflow = 15.62 cfs @ 12.13 hrs, Volume= 1.3 af
Outflow = 2.14 cfs @ 12.84 hrs, Volume= 1.3 af, Atten= 86%, Lag= 42.6 min
Primary = 2.14 cfs @ 12.84 hrs, Volume= 1.3 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 71.62' @ 12.84 hrs Surf.Area= 19,367 sf Storage= 21,286 cf

Plug-Flow detention time= 97.7 min calculated for 1.3 af (100% of inflow)
Center-of-Mass det. time= 97.4 min ( 923.9 - 826.5 )

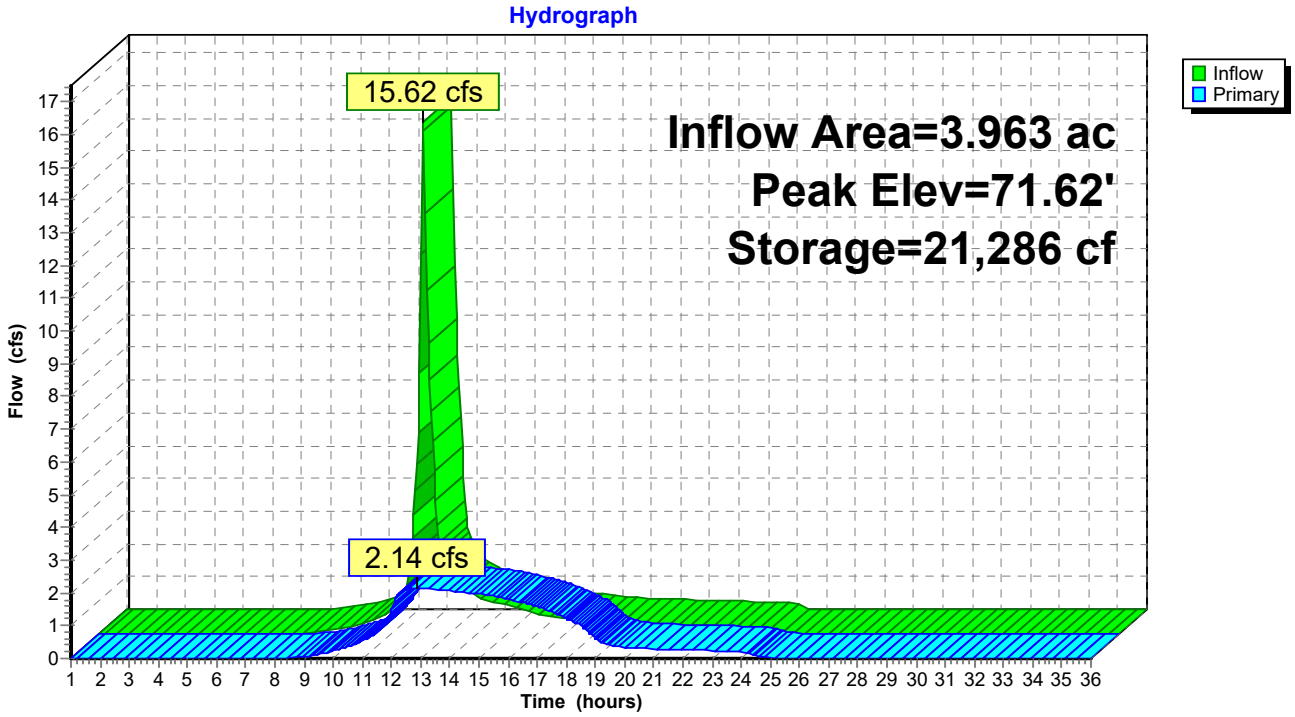
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 69.00' | 58,912 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 69.00 | 1,009 | 191.5 | 0 | 0 | 1,009 |
| 70.00 | 4,826 | 397.8 | 2,681 | 2,681 | 10,688 |
| 71.00 | 12,978 | 663.6 | 8,573 | 11,253 | 33,145 |
| 72.00 | 23,823 | 909.9 | 18,128 | 29,381 | 63,995 |
| 73.00 | 35,633 | 1,063.0 | 29,531 | 58,912 | 88,052 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 72.50' | **20.0' long x 8.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2 | Primary | 69.00' | **8.0" Round Culvert**<br>L= 41.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 69.00' / 68.67' S= 0.0080 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf |

**Primary OutFlow** Max=2.14 cfs @ 12.84 hrs HW=71.62' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
└─**2=Culvert** (Barrel Controls 2.14 cfs @ 6.14 fps)

## Pond 2P: 2P


Hydrograph
15.62 cfs
2.14 cfs
Inflow Area=3.963 ac
Peak Elev=71.62'
Storage=21,286 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond 3P: 3P

Inflow Area = 4.098 ac, 0.00% Impervious, Inflow Depth = 3.89" for 25-yr event
Inflow = 13.02 cfs @ 12.26 hrs, Volume= 1.3 af
Outflow = 10.71 cfs @ 12.39 hrs, Volume= 1.3 af, Atten= 18%, Lag= 7.9 min
Primary = 10.71 cfs @ 12.39 hrs, Volume= 1.3 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 74.47' @ 12.39 hrs Surf.Area= 5,481 sf Storage= 4,040 cf

Plug-Flow detention time= 4.5 min calculated for 1.3 af (100% of inflow)
Center-of-Mass det. time= 4.3 min ( 837.3 - 833.0 )

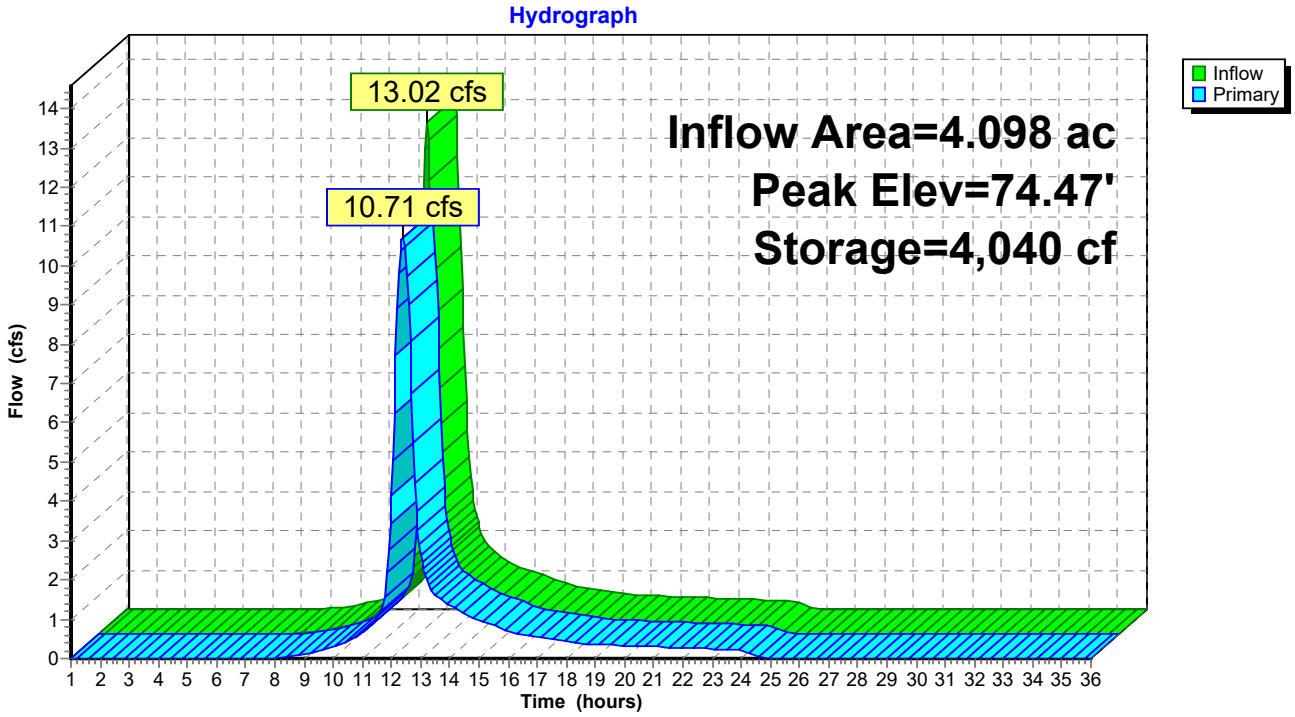
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 72.00' | 17,415 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 72.00 | 167 | 153.1 | 0 | 0 | 167 |
| 73.00 | 660 | 176.0 | 386 | 386 | 789 |
| 74.00 | 2,979 | 333.6 | 1,680 | 2,067 | 7,185 |
| 75.00 | 9,151 | 469.4 | 5,784 | 7,850 | 15,872 |
| 76.00 | 9,984 | 563.0 | 9,564 | 17,415 | 23,579 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 75.50' | **20.0' long x 20.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Primary | 72.00' | **6.0" Round Culvert X 2.00**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 72.00' / 71.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf |
| #3 | Primary | 73.00' | **14.0" Round Culvert X 2.00**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 73.00' / 72.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.07 sf |

**Primary OutFlow** Max=10.69 cfs @ 12.39 hrs HW=74.47' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
- **2=Culvert** (Barrel Controls 2.14 cfs @ 5.44 fps)
- **3=Culvert** (Inlet Controls 8.55 cfs @ 4.00 fps)

## Pond 3P: 3P


Hydrograph
13.02 cfs
10.71 cfs
Inflow Area=4.098 ac
Peak Elev=74.47'
Storage=4,040 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond RRP: Western Swale/Railroad Tracks w/ Culvert

Inflow Area = 17.782 ac, 0.00% Impervious, Inflow Depth = 3.01" for 25-yr event
Inflow = 25.45 cfs @ 12.51 hrs, Volume= 4.5 af
Outflow = 25.36 cfs @ 12.53 hrs, Volume= 4.5 af, Atten= 0%, Lag= 1.6 min
Primary = 25.36 cfs @ 12.53 hrs, Volume= 4.5 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 58.95' @ 12.53 hrs Surf.Area= 10,096 sf Storage= 7,822 cf

Plug-Flow detention time= 13.7 min calculated for 4.5 af (100% of inflow)
Center-of-Mass det. time= 13.4 min ( 900.9 - 887.4 )

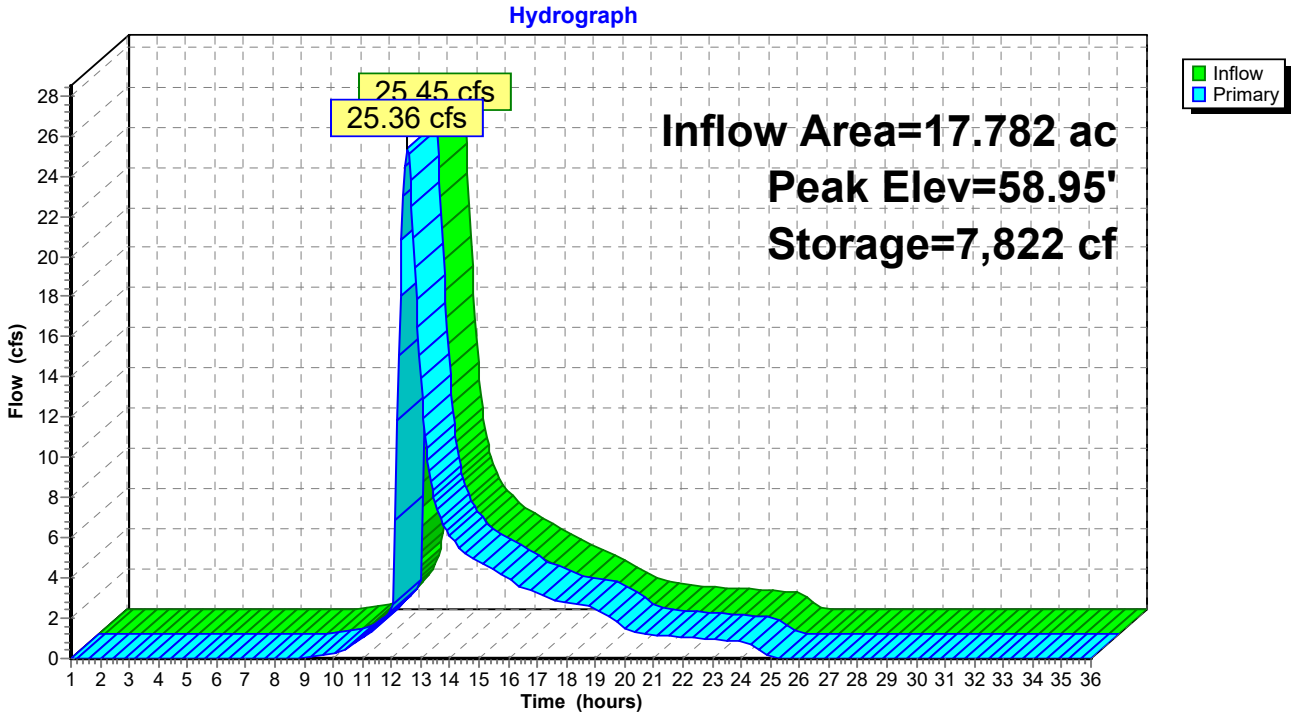
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 56.00' | 22,735 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 56.00 | 13 | 26.5 | 0 | 0 | 13 |
| 57.00 | 864 | 47.2 | 328 | 328 | 140 |
| 58.00 | 2,779 | 348.1 | 1,731 | 2,059 | 9,607 |
| 59.00 | 10,591 | 884.0 | 6,265 | 8,324 | 62,155 |
| 60.00 | 18,605 | 1,253.7 | 14,411 | 22,735 | 125,054 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 56.26' | **12.0" Round CMP_Round 12"**<br>L= 60.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 56.26' / 55.86' S= 0.0067 '/' Cc= 0.900<br>n= 0.025 Corrugated metal, Flow Area= 0.79 sf |
| #2 | Primary | 58.65' | **50.0' long x 35.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

**Primary OutFlow** Max=25.26 cfs @ 12.53 hrs HW=58.95' (Free Discharge)
└─**1=CMP_Round 12"** (Barrel Controls 3.06 cfs @ 3.90 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 22.20 cfs @ 1.48 fps)

## Pond RRP: Western Swale/Railroad Tracks w/ Culvert



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1S: 1S** Runoff Area=386,365 sf 0.00% Impervious Runoff Depth=5.51"
Flow Length=468' Tc=32.0 min CN=73 Runoff=31.30 cfs 4.1 af

**Subcatchment 1Sa: 1Sa** Runoff Area=332,772 sf 1.93% Impervious Runoff Depth=5.87"
Flow Length=251' Tc=7.8 min CN=76 Runoff=48.39 cfs 3.7 af

**Subcatchment 1Sb: 1Sb** Runoff Area=178,528 sf 0.00% Impervious Runoff Depth=5.75"
Flow Length=221' Tc=18.4 min CN=75 Runoff=19.13 cfs 2.0 af

**Subcatchment 2S: 2S** Runoff Area=601,941 sf 0.00% Impervious Runoff Depth=4.41"
Flow Length=898' Tc=34.8 min CN=64 Runoff=37.57 cfs 5.1 af

**Subcatchment 2Sa: 2Sa** Runoff Area=172,643 sf 0.00% Impervious Runoff Depth=5.63"
Flow Length=283' Tc=8.9 min CN=74 Runoff=23.08 cfs 1.9 af

**Reach DP1: Eastern Wetland** Inflow=48.58 cfs 9.8 af
Outflow=48.58 cfs 9.8 af

**Pond 1P: 1P** Peak Elev=76.38' Storage=77,965 cf Inflow=48.39 cfs 3.7 af
Outflow=3.99 cfs 3.7 af

**Pond 2P: 2P** Peak Elev=72.22' Storage=34,960 cf Inflow=23.08 cfs 1.9 af
Outflow=2.41 cfs 1.9 af

**Pond 3P: 3P** Peak Elev=75.06' Storage=8,405 cf Inflow=19.13 cfs 2.0 af
Outflow=13.42 cfs 2.0 af

**Pond RRP: Western Swale/Railroad Tracks w/** Peak Elev=59.07' Storage=9,074 cf Inflow=39.93 cfs 6.9 af
Outflow=39.81 cfs 6.9 af

**Total Runoff Area = 38.390 ac Runoff Volume = 16.7 af Average Runoff Depth = 5.22"**
**99.62% Pervious = 38.242 ac 0.38% Impervious = 0.147 ac**

## Summary for Subcatchment 1S: 1S

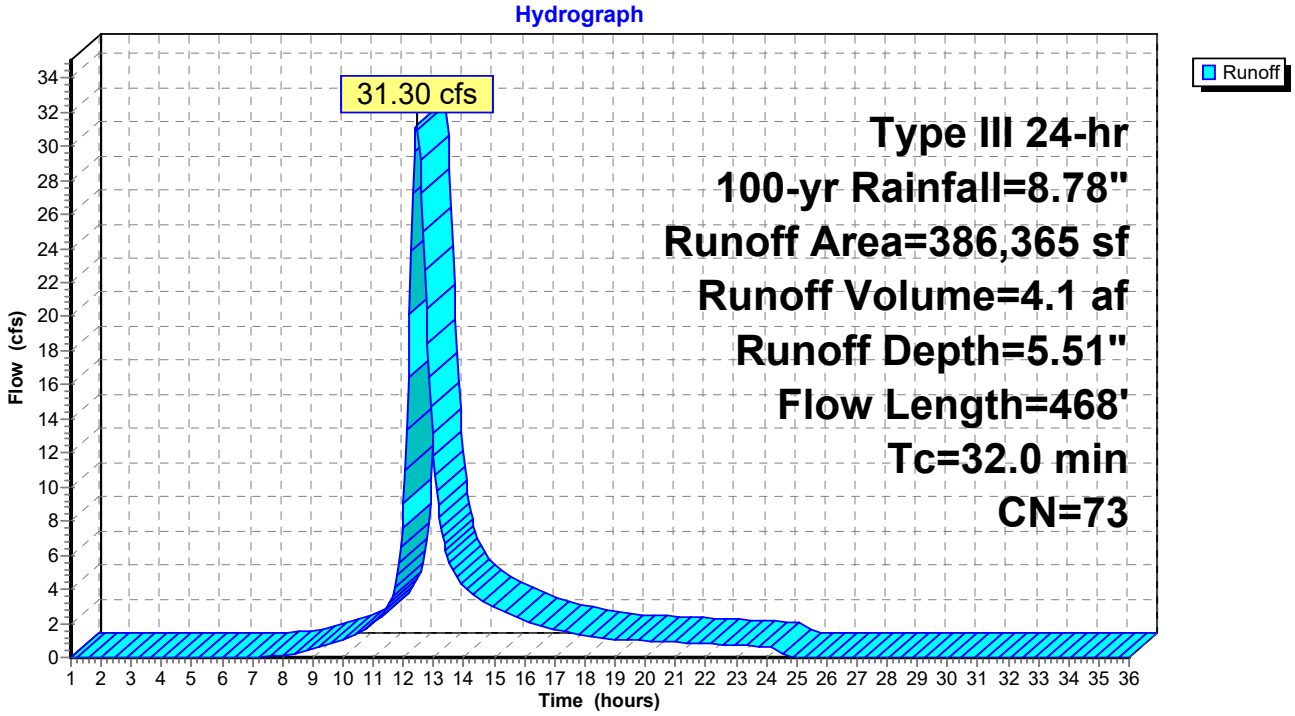
Runoff = 31.30 cfs @ 12.44 hrs, Volume= 4.1 af, Depth= 5.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.78"

| Area (sf) | CN | Description |
|---|---|---|
| 41,299 | 55 | Woods, Good, HSG B |
| 121,227 | 70 | Woods, Good, HSG C |
| 96,253 | 77 | Woods, Good, HSG D |
| 42,050 | 79 | 50-75% Grass cover, Fair, HSG C |
| 44,337 | 74 | >75% Grass cover, Good, HSG C |
| 41,199 | 84 | 50-75% Grass cover, Fair, HSG D |
| 386,365 | 73 | Weighted Average |
| 386,365 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 26.7 | 50 | 0.0100 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 5.3 | 418 | 0.0681 | 1.30 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 32.0 | 468 | Total | | | |

## Subcatchment 1S: 1S



## Summary for Subcatchment 1Sa: 1Sa

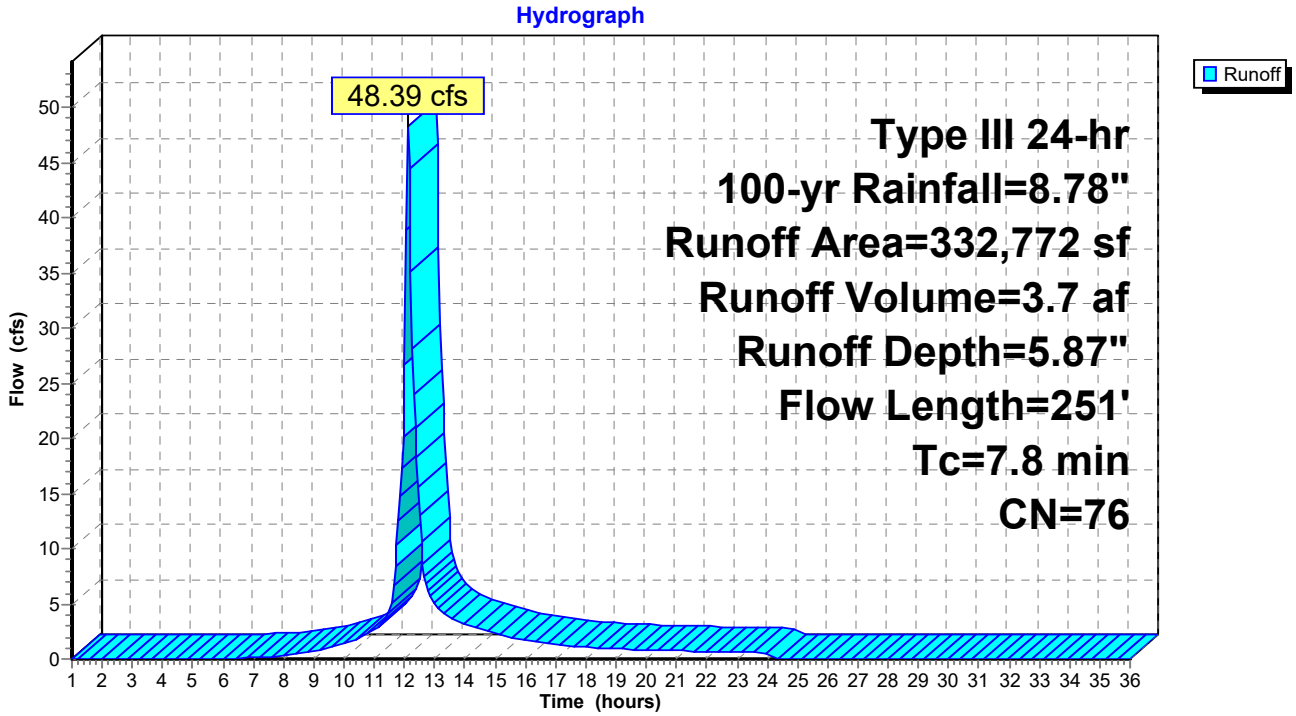
Runoff = 48.39 cfs @ 12.11 hrs, Volume= 3.7 af, Depth= 5.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.78"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 6,408 | 98 | Unconnected pavement, HSG C - EQ PADS |
| | 5,146 | 96 | Gravel surface, HSG C |
| | 252,473 | 74 | >75% Grass cover, Good, HSG C |
| | 59,360 | 79 | 50-75% Grass cover, Fair, HSG C |
| | 9,385 | 84 | 50-75% Grass cover, Fair, HSG D |
| | 332,772 | 76 | Weighted Average |
| | 326,364 | | 98.07% Pervious Area |
| | 6,408 | | 1.93% Impervious Area |
| | 6,408 | | 100.00% Unconnected |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.0 | 50 | 0.0100 | 0.12 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.8 | 201 | 0.0640 | 4.07 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 7.8 | 251 | Total | | | |

## Subcatchment 1Sa: 1Sa



## Summary for Subcatchment 1Sb: 1Sb

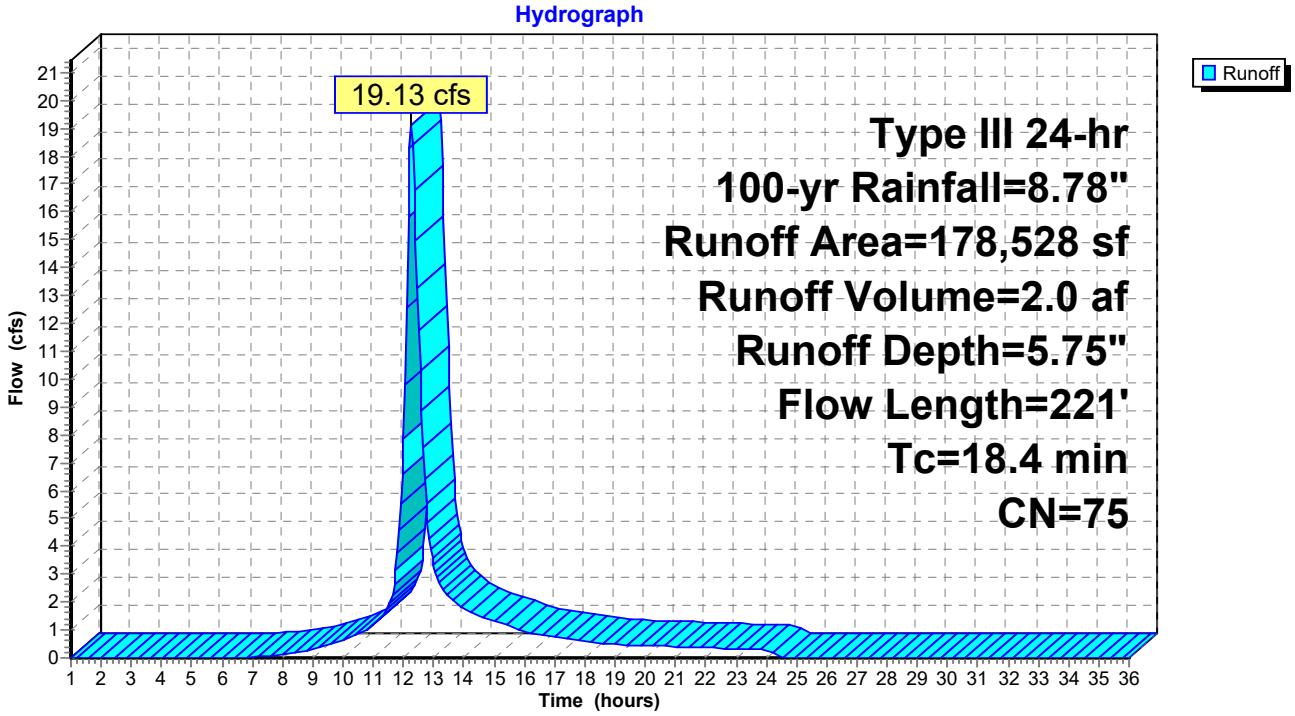
Runoff = 19.13 cfs @ 12.25 hrs, Volume= 2.0 af, Depth= 5.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.78"

| Area (sf) | CN | Description |
|---|---|---|
| 4,422 | 96 | Gravel surface, HSG C |
| 157,889 | 74 | >75% Grass cover, Good, HSG C |
| 16,217 | 79 | 50-75% Grass cover, Fair, HSG C |
| 178,528 | 75 | Weighted Average |
| 178,528 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.6 | 50 | 0.0010 | 0.05 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.8 | 171 | 0.0450 | 3.42 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 18.4 | 221 | Total | | | |

## Subcatchment 1Sb: 1Sb



## Summary for Subcatchment 2S: 2S

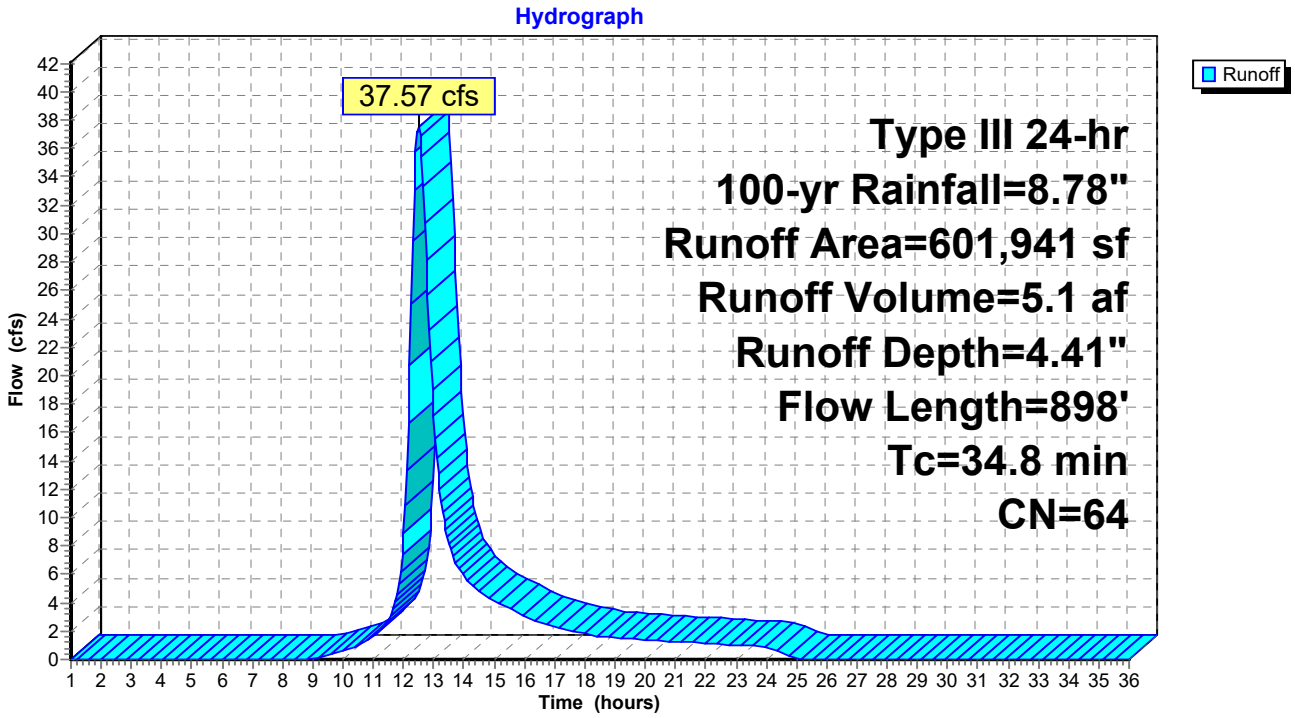
Runoff = 37.57 cfs @ 12.49 hrs, Volume= 5.1 af, Depth= 4.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.78"

| Area (sf) | CN | Description |
|---|---|---|
| 12,903 | 96 | Gravel surface, HSG C |
| 22,963 | 74 | >75% Grass cover, Good, HSG C |
| 285,668 | 55 | Woods, Good, HSG B |
| 225,635 | 70 | Woods, Good, HSG C |
| 15,496 | 69 | 50-75% Grass cover, Fair, HSG B |
| 39,276 | 79 | 50-75% Grass cover, Fair, HSG C |
| 601,941 | 64 | Weighted Average |
| 601,941 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 29.2 | 50 | 0.0080 | 0.03 | | **Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.60" |
| 5.6 | 848 | 0.0250 | 2.55 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 34.8 | 898 | Total | | | |

## Subcatchment 2S: 2S



## Summary for Subcatchment 2Sa: 2Sa

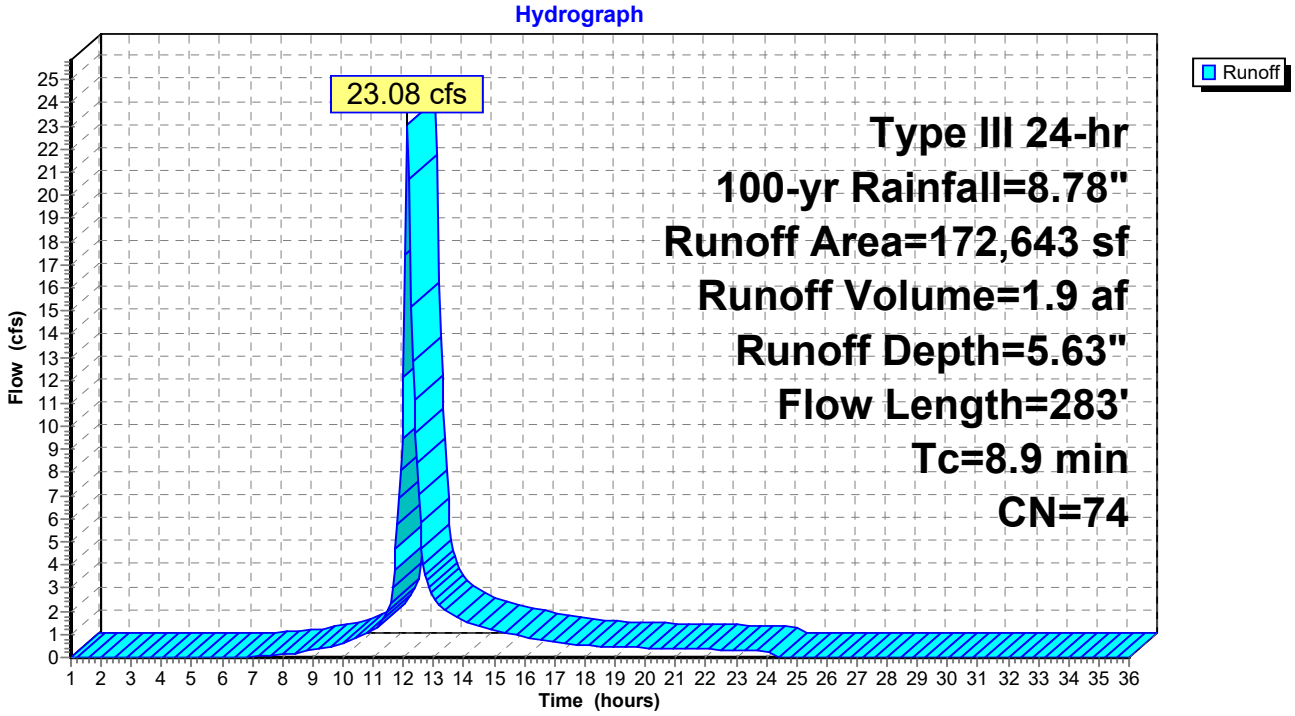
Runoff = 23.08 cfs @ 12.13 hrs, Volume= 1.9 af, Depth= 5.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.78"

| Area (sf) | CN | Description |
|---|---|---|
| 1,962 | 96 | Gravel surface, HSG C |
| 42,320 | 69 | 50-75% Grass cover, Fair, HSG B |
| 98,678 | 74 | >75% Grass cover, Good, HSG C |
| 29,683 | 79 | 50-75% Grass cover, Fair, HSG C |
| 172,643 | 74 | Weighted Average |
| 172,643 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 8.0 | 50 | 0.0072 | 0.10 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.7 | 184 | 0.0850 | 4.69 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 0.2 | 49 | 0.0612 | 3.71 | | **Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps |
| 8.9 | 283 | Total | | | |

## Subcatchment 2Sa: 2Sa

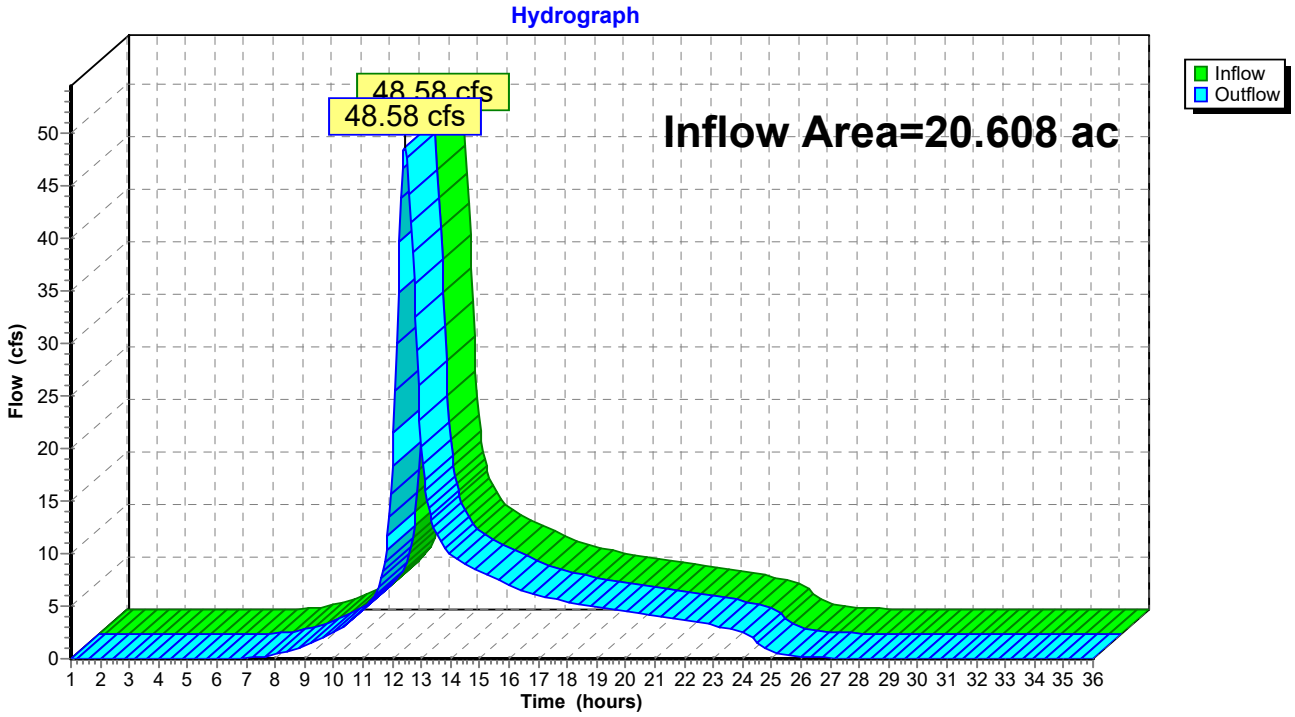


## Summary for Reach DP1: Eastern Wetland

Inflow Area = 20.608 ac, 0.71% Impervious, Inflow Depth = 5.69" for 100-yr event
Inflow = 48.58 cfs @ 12.44 hrs, Volume= 9.8 af
Outflow = 48.58 cfs @ 12.44 hrs, Volume= 9.8 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs

## Reach DP1: Eastern Wetland



## Summary for Pond 1P: 1P

Inflow Area = 7.639 ac, 1.93% Impervious, Inflow Depth = 5.87" for 100-yr event
Inflow = 48.39 cfs @ 12.11 hrs, Volume= 3.7 af
Outflow = 3.99 cfs @ 13.38 hrs, Volume= 3.7 af, Atten= 92%, Lag= 76.3 min
Primary = 3.99 cfs @ 13.38 hrs, Volume= 3.7 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 76.38' @ 13.38 hrs Surf.Area= 47,769 sf Storage= 77,965 cf

Plug-Flow detention time= 213.8 min calculated for 3.7 af (100% of inflow)
Center-of-Mass det. time= 213.4 min ( 1,023.4 - 809.9 )

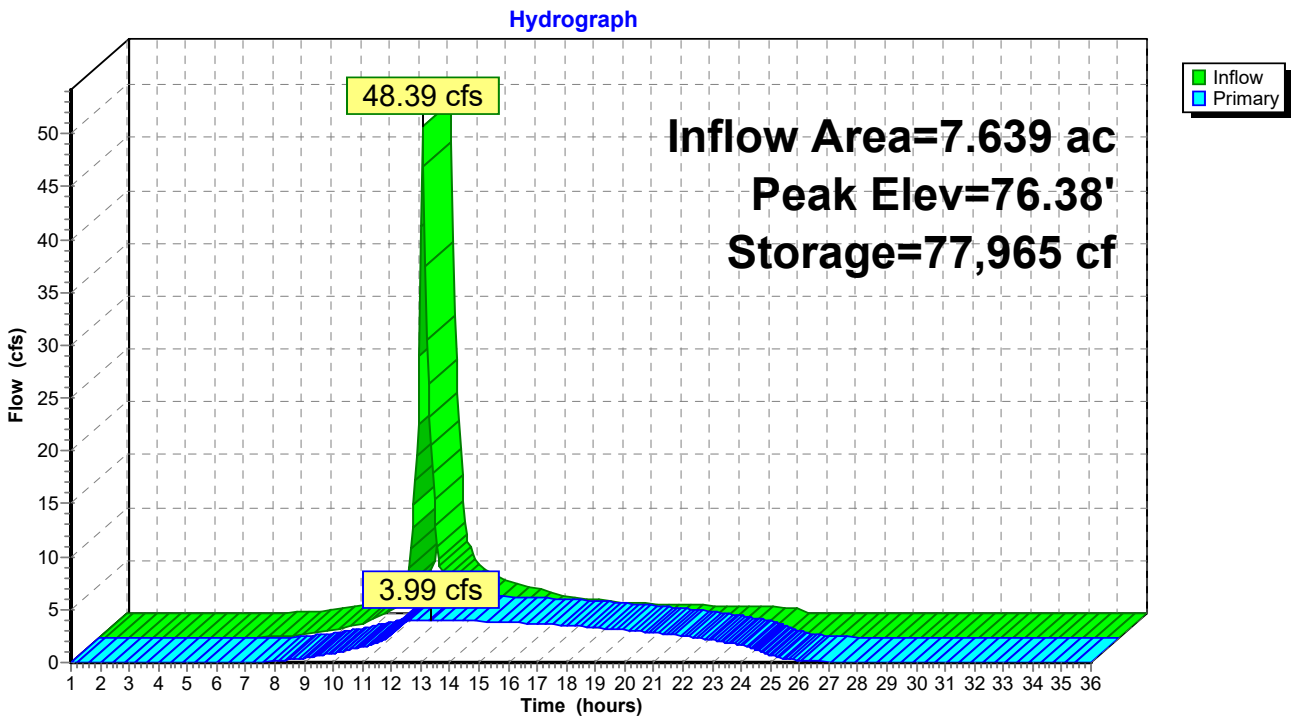
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 73.00' | 140,073 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 73.00 | 2,895 | 876.8 | 0 | 0 | 2,895 |
| 74.00 | 13,416 | 1,517.5 | 7,514 | 7,514 | 124,975 |
| 75.00 | 26,522 | 1,740.9 | 19,600 | 27,115 | 182,924 |
| 76.00 | 41,778 | 1,899.3 | 33,862 | 60,977 | 228,845 |
| 77.00 | 58,419 | 2,081.5 | 49,867 | 110,844 | 286,597 |
| 77.50 | 58,500 | 2,100.0 | 29,230 | 140,073 | 292,842 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 77.00' | **20.0' long x 20.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Primary | 73.00' | **10.0" Round Culvert**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 73.00' / 72.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf |

**Primary OutFlow** Max=3.99 cfs @ 13.38 hrs HW=76.38' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
└─**2=Culvert** (Inlet Controls 3.99 cfs @ 7.31 fps)

## Pond 1P: 1P


Hydrograph
48.39 cfs
3.99 cfs
Inflow Area=7.639 ac
Peak Elev=76.38'
Storage=77,965 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond 2P: 2P

Inflow Area = 3.963 ac, 0.00% Impervious, Inflow Depth = 5.63" for 100-yr event
Inflow = 23.08 cfs @ 12.13 hrs, Volume= 1.9 af
Outflow = 2.41 cfs @ 13.07 hrs, Volume= 1.9 af, Atten= 90%, Lag= 56.4 min
Primary = 2.41 cfs @ 13.07 hrs, Volume= 1.9 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 72.22' @ 13.07 hrs Surf.Area= 26,250 sf Storage= 34,960 cf

Plug-Flow detention time= 145.7 min calculated for 1.9 af (100% of inflow)
Center-of-Mass det. time= 145.4 min ( 960.6 - 815.2 )

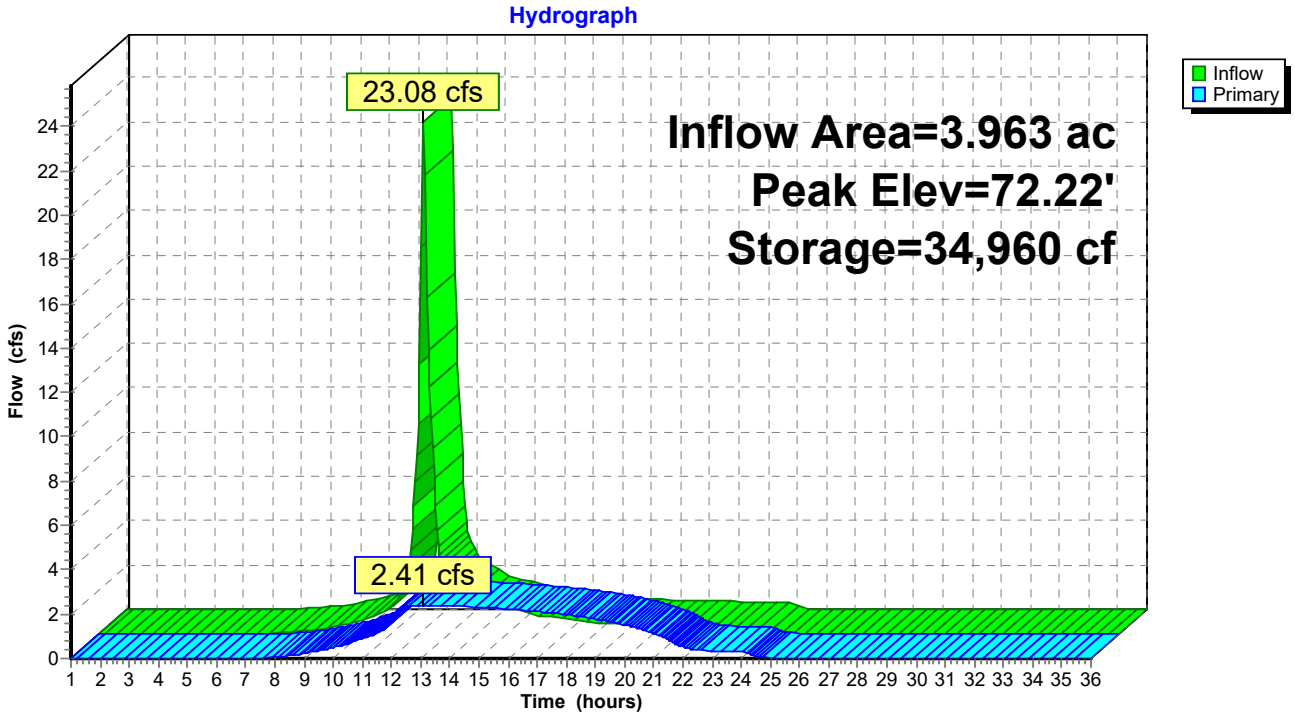
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 69.00' | 58,912 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 69.00 | 1,009 | 191.5 | 0 | 0 | 1,009 |
| 70.00 | 4,826 | 397.8 | 2,681 | 2,681 | 10,688 |
| 71.00 | 12,978 | 663.6 | 8,573 | 11,253 | 33,145 |
| 72.00 | 23,823 | 909.9 | 18,128 | 29,381 | 63,995 |
| 73.00 | 35,633 | 1,063.0 | 29,531 | 58,912 | 88,052 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 72.50' | **20.0' long x 8.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74 |
| #2 | Primary | 69.00' | **8.0" Round Culvert**<br>L= 41.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 69.00' / 68.67' S= 0.0080 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf |

**Primary OutFlow** Max=2.41 cfs @ 13.07 hrs HW=72.22' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
└─**2=Culvert** (Barrel Controls 2.41 cfs @ 6.89 fps)

## Pond 2P: 2P


Hydrograph
23.08 cfs
2.41 cfs
Inflow Area=3.963 ac
Peak Elev=72.22'
Storage=34,960 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond 3P: 3P

Inflow Area = 4.098 ac, 0.00% Impervious, Inflow Depth = 5.75" for 100-yr event
Inflow = 19.13 cfs @ 12.25 hrs, Volume= 2.0 af
Outflow = 13.42 cfs @ 12.45 hrs, Volume= 2.0 af, Atten= 30%, Lag= 11.7 min
Primary = 13.42 cfs @ 12.45 hrs, Volume= 2.0 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 75.06' @ 12.45 hrs Surf.Area= 9,200 sf Storage= 8,405 cf

Plug-Flow detention time= 5.6 min calculated for 2.0 af (100% of inflow)
Center-of-Mass det. time= 5.6 min ( 827.5 - 821.9 )

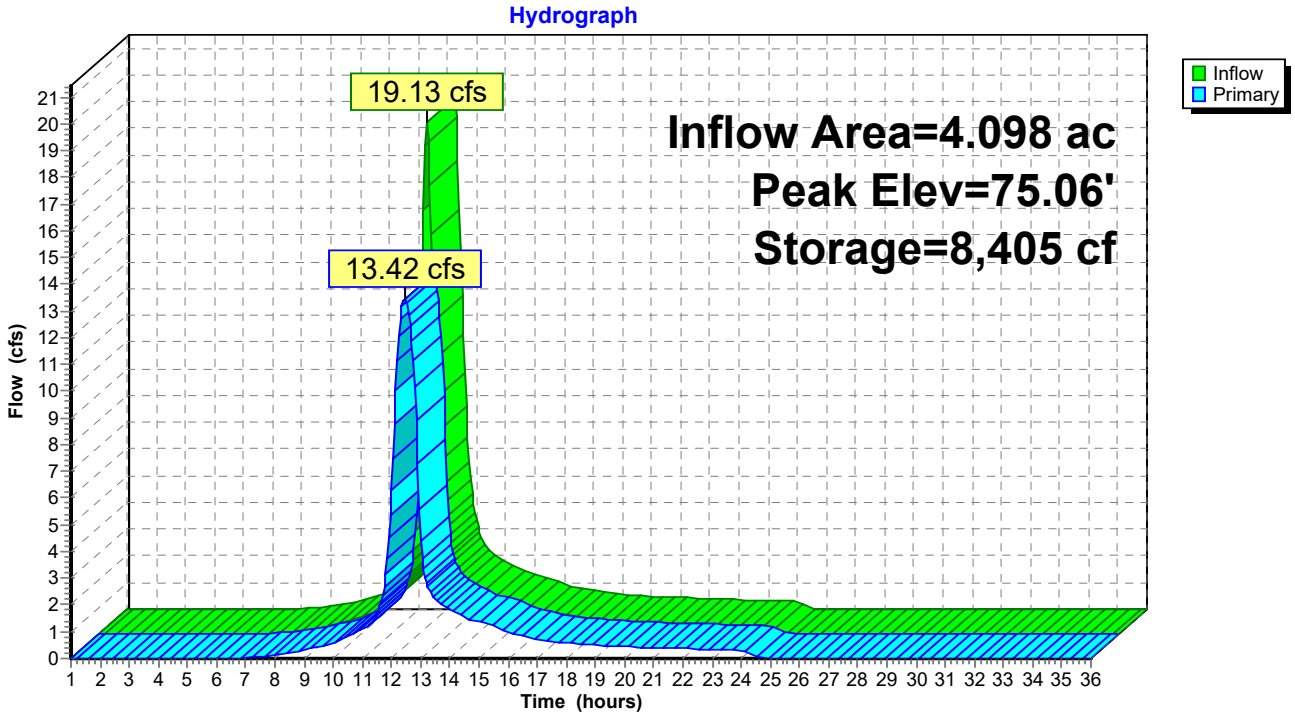
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 72.00' | 17,415 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 72.00 | 167 | 153.1 | 0 | 0 | 167 |
| 73.00 | 660 | 176.0 | 386 | 386 | 789 |
| 74.00 | 2,979 | 333.6 | 1,680 | 2,067 | 7,185 |
| 75.00 | 9,151 | 469.4 | 5,784 | 7,850 | 15,872 |
| 76.00 | 9,984 | 563.0 | 9,564 | 17,415 | 23,579 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 75.50' | **20.0' long x 20.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |
| #2 | Primary | 72.00' | **6.0" Round Culvert X 2.00**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 72.00' / 71.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf |
| #3 | Primary | 73.00' | **14.0" Round Culvert X 2.00**<br>L= 45.0' CPP, mitered to conform to fill, Ke= 0.700<br>Inlet / Outlet Invert= 73.00' / 72.55' S= 0.0100 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.07 sf |

**Primary OutFlow** Max=13.42 cfs @ 12.45 hrs HW=75.06' (Free Discharge)
- **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)
- **2=Culvert** (Barrel Controls 2.38 cfs @ 6.07 fps)
- **3=Culvert** (Inlet Controls 11.04 cfs @ 5.16 fps)

## Pond 3P: 3P


Hydrograph
19.13 cfs
13.42 cfs
Inflow Area=4.098 ac
Peak Elev=75.06'
Storage=8,405 cf
Inflow
Primary
Flow (cfs)
Time (hours)

## Summary for Pond RRP: Western Swale/Railroad Tracks w/ Culvert

Inflow Area = 17.782 ac, 0.00% Impervious, Inflow Depth = 4.68" for 100-yr event
Inflow = 39.93 cfs @ 12.50 hrs, Volume= 6.9 af
Outflow = 39.81 cfs @ 12.52 hrs, Volume= 6.9 af, Atten= 0%, Lag= 1.4 min
Primary = 39.81 cfs @ 12.52 hrs, Volume= 6.9 af

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 59.07' @ 12.52 hrs Surf.Area= 11,074 sf Storage= 9,074 cf

Plug-Flow detention time= 12.6 min calculated for 6.9 af (100% of inflow)
Center-of-Mass det. time= 12.5 min ( 899.3 - 886.7 )

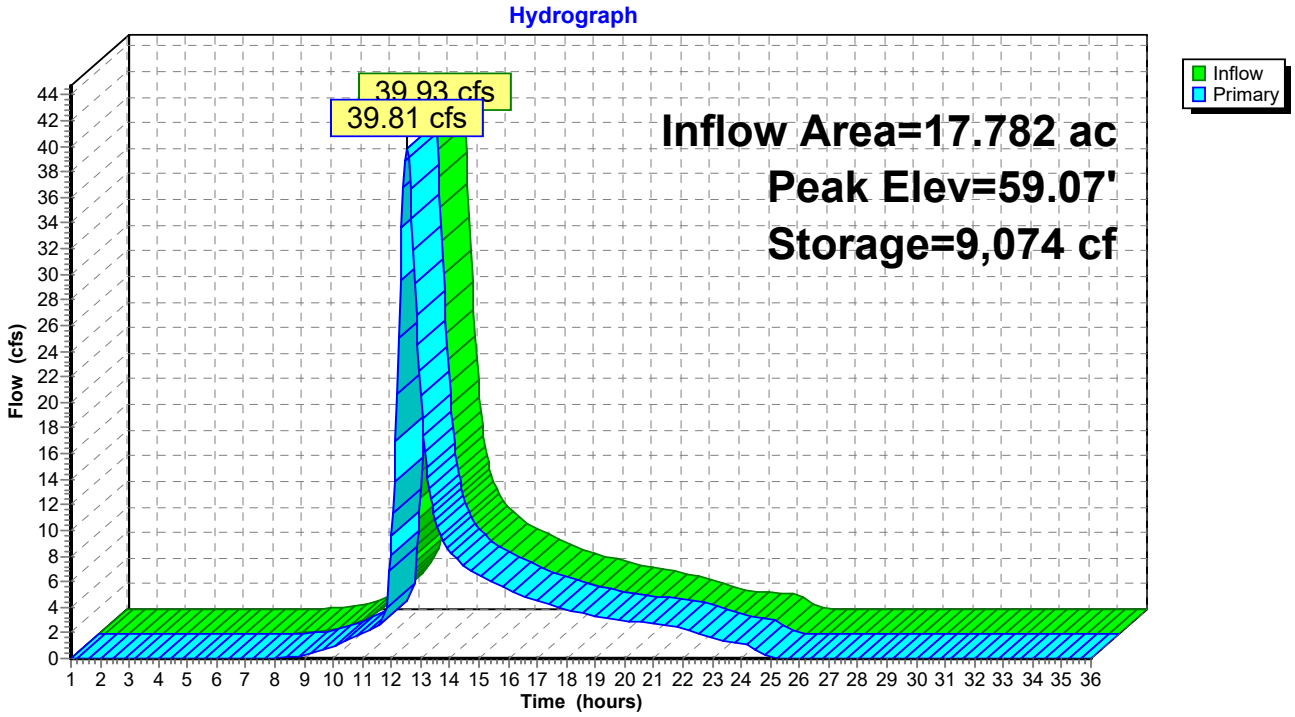
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 56.00' | 22,735 cf | **Custom Stage Data (Irregular)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Perim. (feet) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) | Wet.Area (sq-ft) |
|---|---|---|---|---|---|
| 56.00 | 13 | 26.5 | 0 | 0 | 13 |
| 57.00 | 864 | 47.2 | 328 | 328 | 140 |
| 58.00 | 2,779 | 348.1 | 1,731 | 2,059 | 9,607 |
| 59.00 | 10,591 | 884.0 | 6,265 | 8,324 | 62,155 |
| 60.00 | 18,605 | 1,253.7 | 14,411 | 22,735 | 125,054 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 56.26' | **12.0" Round CMP_Round 12"**<br>L= 60.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 56.26' / 55.86' S= 0.0067 '/' Cc= 0.900<br>n= 0.025 Corrugated metal, Flow Area= 0.79 sf |
| #2 | Primary | 58.65' | **50.0' long x 35.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 |

**Primary OutFlow** Max=39.67 cfs @ 12.52 hrs HW=59.07' (Free Discharge)
└─**1=CMP_Round 12"** (Barrel Controls 3.15 cfs @ 4.00 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 36.53 cfs @ 1.75 fps)

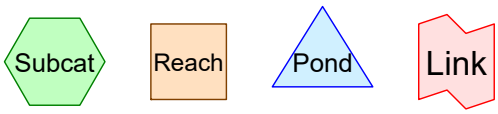
## Pond RRP: Western Swale/Railroad Tracks w/ Culvert



# APPENDIX B

## Diversion Trench Capacity Calculation

# DIVERSION SWALE




**Routing Diagram for 3055.01- FEARING HILL RD - POST-TRENCH SIZING - NJC**
Prepared by Atlantic Design Engineers, Inc., Printed 6/15/2022
HydroCAD® 10.00-25 s/n 00480 © 2019 HydroCAD Software Solutions LLC

Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1Sc: 1Sc** Runoff Area=104,701 sf 0.00% Impervious Runoff Depth=1.43"
Flow Length=155' Tc=18.2 min CN=75 Runoff=2.74 cfs 12,483 cf

**Reach SWALE: SWALE** Avg. Flow Depth=0.40' Max Vel=1.23 fps Inflow=2.74 cfs 12,483 cf
n=0.040 L=1,025.0' S=0.0068 '/' Capacity=16.69 cfs Outflow=2.13 cfs 12,483 cf

**Total Runoff Area = 104,701 sf Runoff Volume = 12,483 cf Average Runoff Depth = 1.43"**
**100.00% Pervious = 104,701 sf 0.00% Impervious = 0 sf**

## Summary for Subcatchment 1Sc: 1Sc

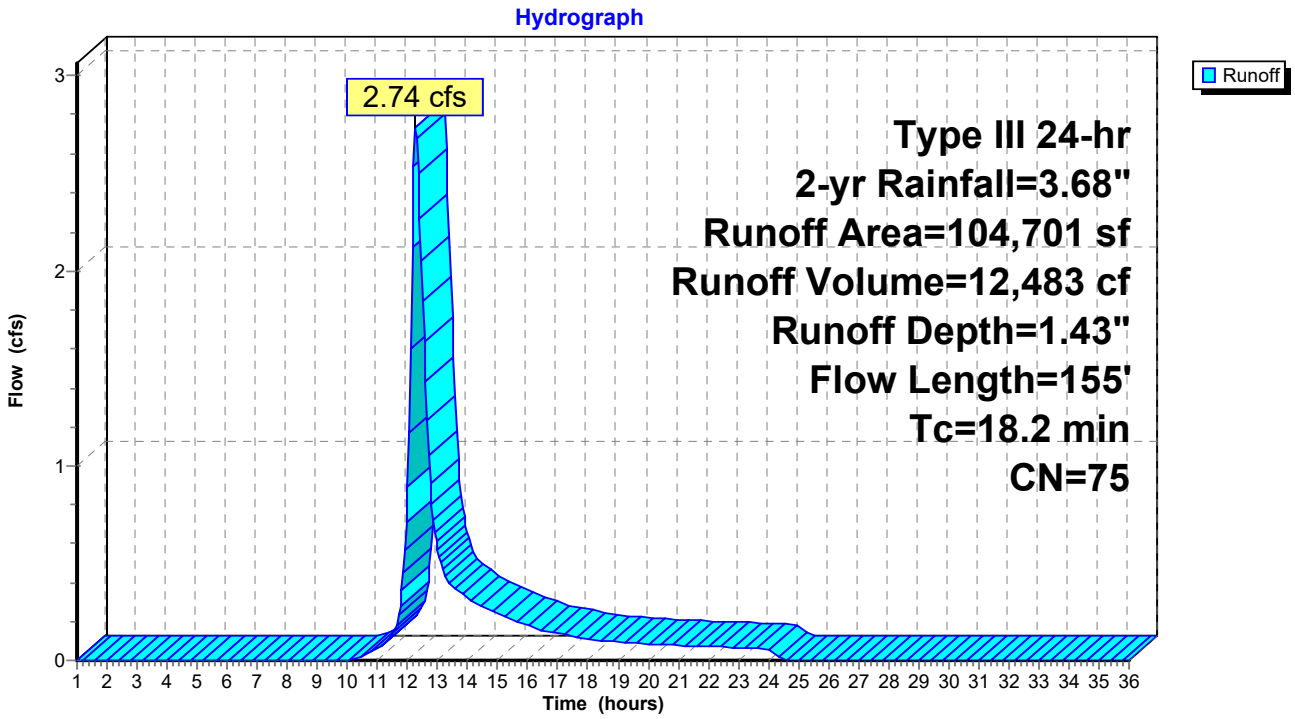
Runoff = 2.74 cfs @ 12.27 hrs, Volume= 12,483 cf, Depth= 1.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.68"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 96 | Gravel surface, HSG C |
| 100,300 | 74 | >75% Grass cover, Good, HSG C |
| 104,701 | 75 | Weighted Average |
| 104,701 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.6 | 50 | 0.0010 | 0.05 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.6 | 105 | 0.0330 | 2.92 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 18.2 | 155 | Total | | | |

## Subcatchment 1Sc: 1Sc



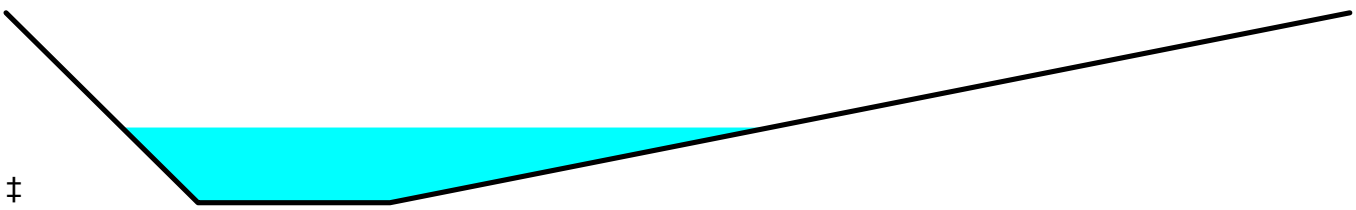
## Summary for Reach SWALE: SWALE

Inflow Area = 104,701 sf, 0.00% Impervious, Inflow Depth = 1.43" for 2-yr event
Inflow = 2.74 cfs @ 12.27 hrs, Volume= 12,483 cf
Outflow = 2.13 cfs @ 12.44 hrs, Volume= 12,483 cf, Atten= 22%, Lag= 10.2 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.23 fps, Min. Travel Time= 13.9 min
Avg. Velocity = 0.38 fps, Avg. Travel Time= 44.9 min

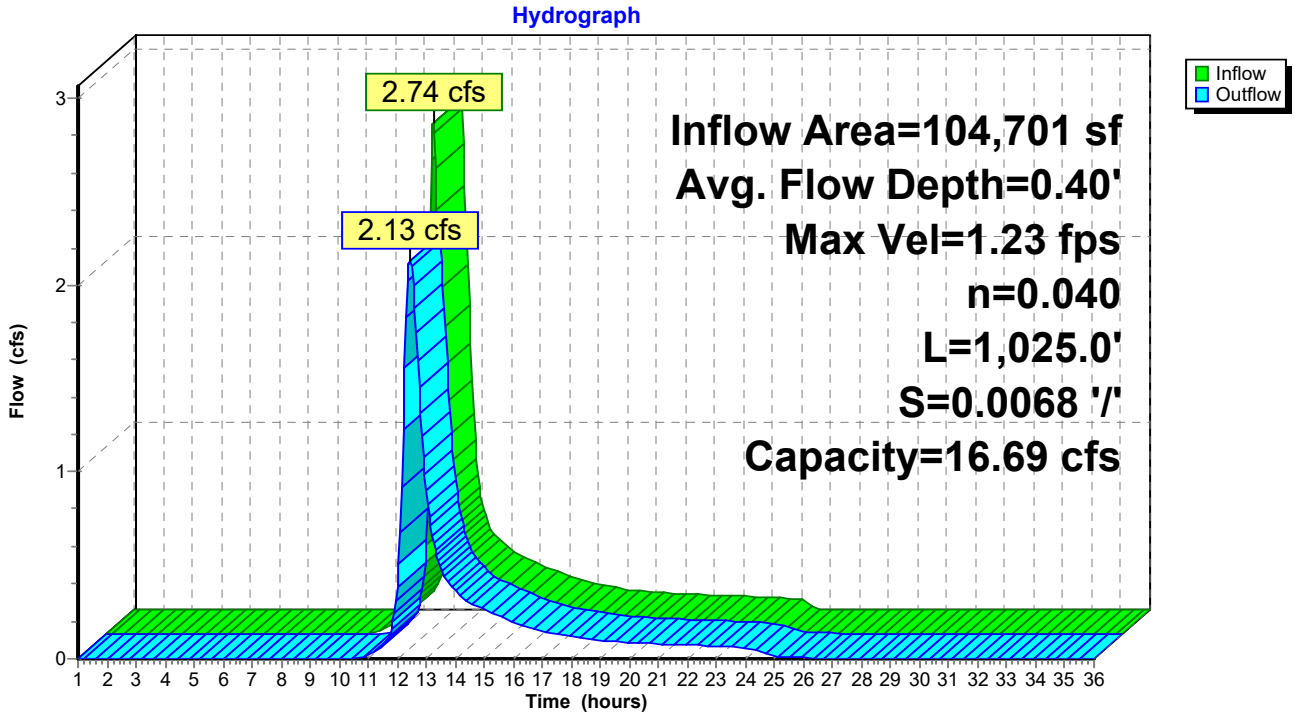
Peak Storage= 1,778 cf @ 12.44 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 16.69 cfs

2.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 10.0 '/' Top Width= 14.00'
Length= 1,025.0' Slope= 0.0068 '/'
Inlet Invert= 91.00', Outlet Invert= 84.00'



‡

### Reach SWALE: SWALE



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1Sc: 1Sc** Runoff Area=104,701 sf 0.00% Impervious Runoff Depth=2.81"
Flow Length=155' Tc=18.2 min CN=75 Runoff=5.52 cfs 24,523 cf

**Reach SWALE: SWALE** Avg. Flow Depth=0.56' Max Vel=1.49 fps Inflow=5.52 cfs 24,523 cf
n=0.040 L=1,025.0' S=0.0068 '/' Capacity=16.69 cfs Outflow=4.53 cfs 24,523 cf

**Total Runoff Area = 104,701 sf Runoff Volume = 24,523 cf Average Runoff Depth = 2.81"**
**100.00% Pervious = 104,701 sf 0.00% Impervious = 0 sf**

## Summary for Subcatchment 1Sc: 1Sc

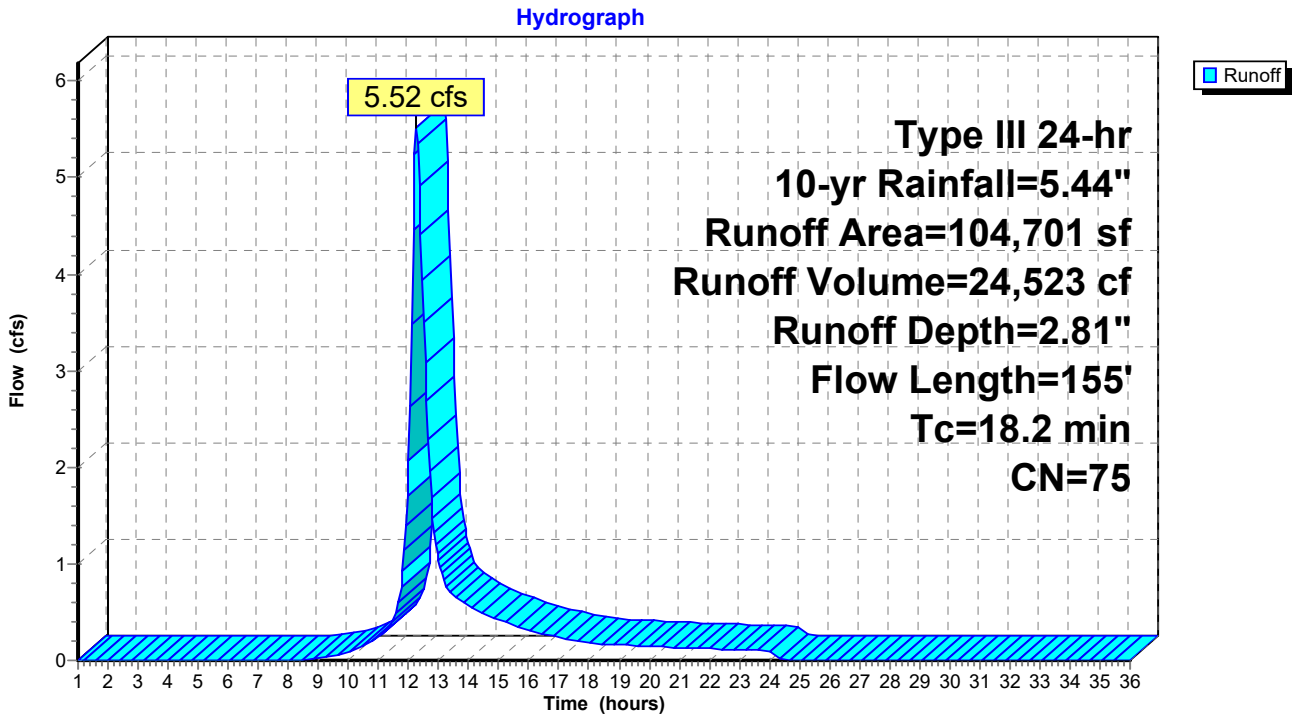
Runoff = 5.52 cfs @ 12.26 hrs, Volume= 24,523 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.44"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 96 | Gravel surface, HSG C |
| 100,300 | 74 | >75% Grass cover, Good, HSG C |
| 104,701 | 75 | Weighted Average |
| 104,701 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.6 | 50 | 0.0010 | 0.05 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.6 | 105 | 0.0330 | 2.92 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 18.2 | 155 | Total | | | |

## Subcatchment 1Sc: 1Sc



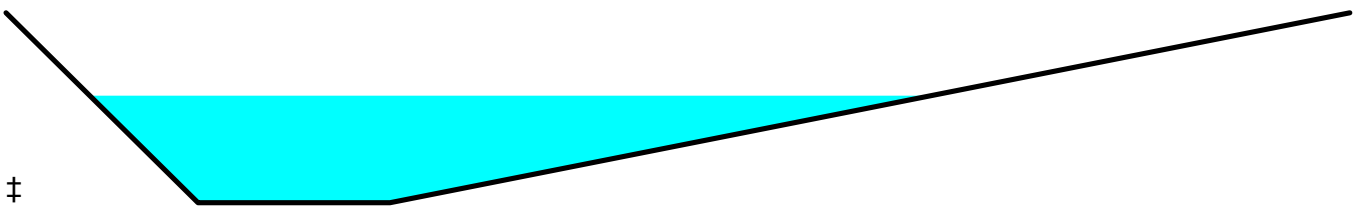
## Summary for Reach SWALE: SWALE

Inflow Area = 104,701 sf, 0.00% Impervious, Inflow Depth = 2.81" for 10-yr event
Inflow = 5.52 cfs @ 12.26 hrs, Volume= 24,523 cf
Outflow = 4.53 cfs @ 12.39 hrs, Volume= 24,523 cf, Atten= 18%, Lag= 8.1 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.49 fps, Min. Travel Time= 11.4 min
Avg. Velocity = 0.45 fps, Avg. Travel Time= 38.2 min

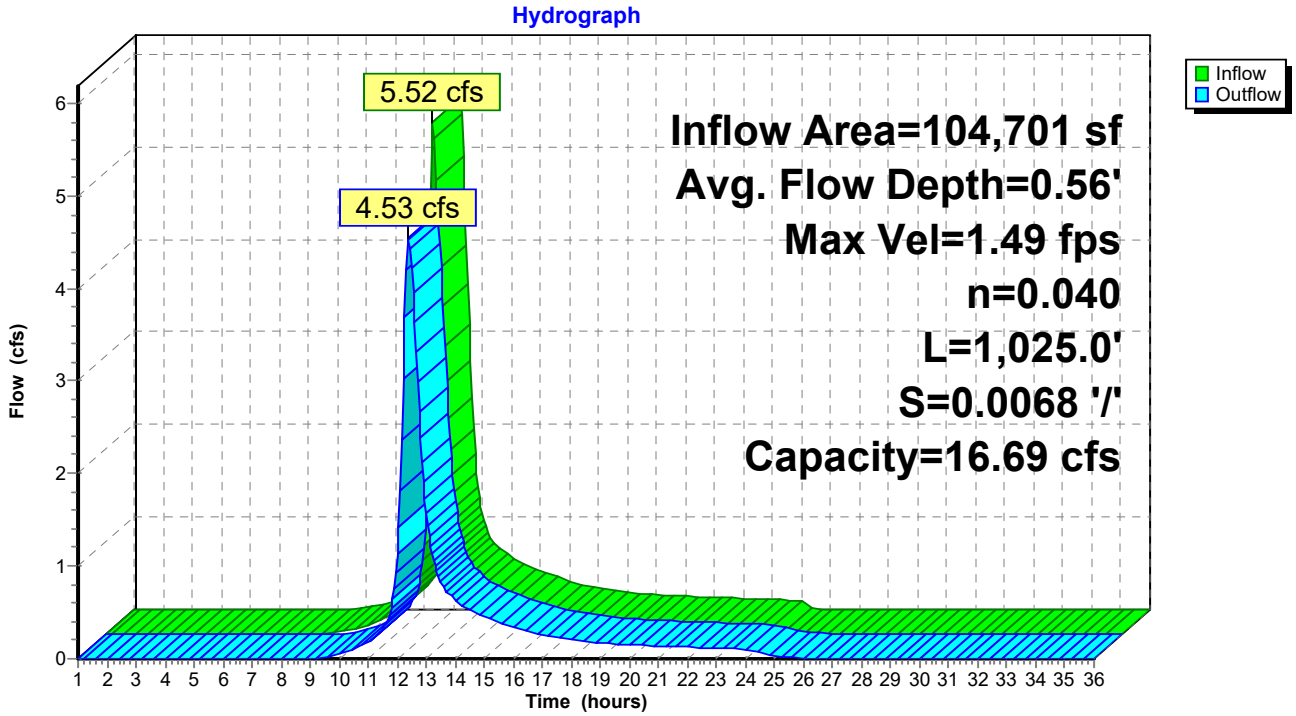
Peak Storage= 3,108 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 16.69 cfs

2.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 10.0 '/' Top Width= 14.00'
Length= 1,025.0' Slope= 0.0068 '/'
Inlet Invert= 91.00', Outlet Invert= 84.00'



‡

### Reach SWALE: SWALE



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1Sc: 1Sc** Runoff Area=104,701 sf 0.00% Impervious Runoff Depth=3.89"
Flow Length=155' Tc=18.2 min CN=75 Runoff=7.67 cfs 33,984 cf

**Reach SWALE: SWALE** Avg. Flow Depth=0.66' Max Vel=1.63 fps Inflow=7.67 cfs 33,984 cf
n=0.040 L=1,025.0' S=0.0068 '/' Capacity=16.69 cfs Outflow=6.44 cfs 33,984 cf

**Total Runoff Area = 104,701 sf Runoff Volume = 33,984 cf Average Runoff Depth = 3.89"**
**100.00% Pervious = 104,701 sf 0.00% Impervious = 0 sf**

## Summary for Subcatchment 1Sc: 1Sc

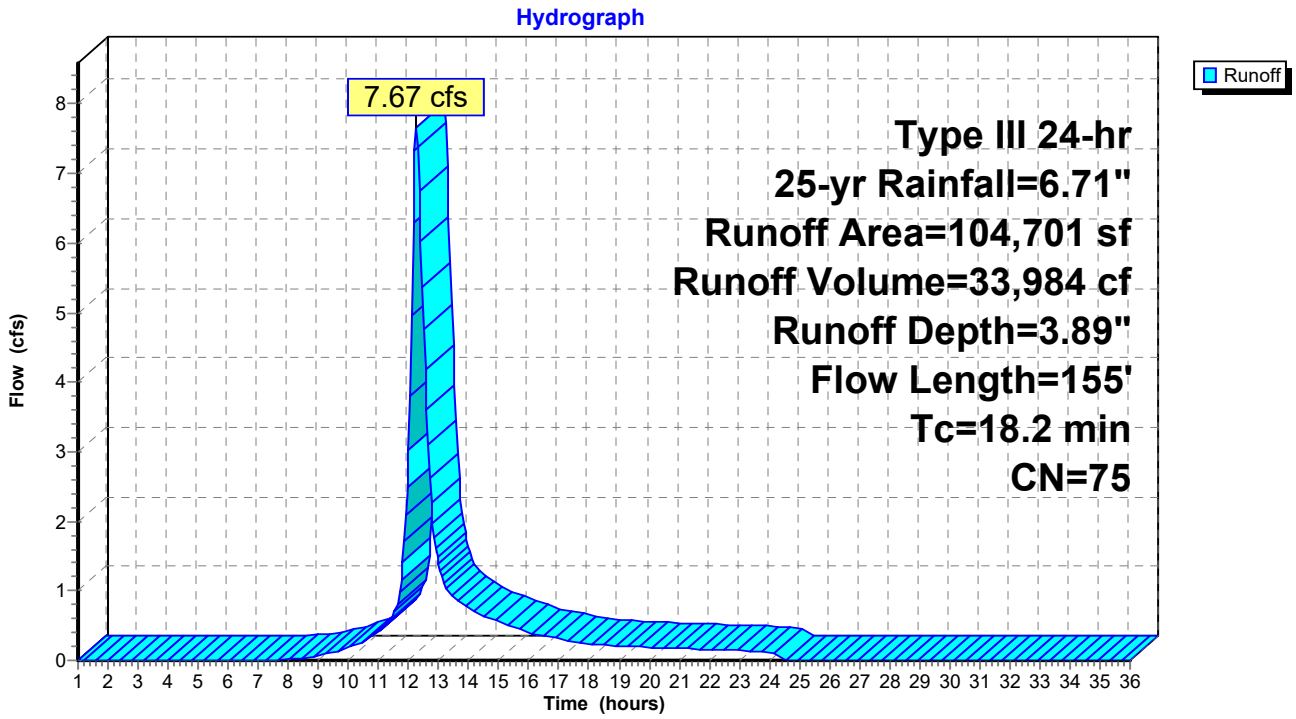
Runoff = 7.67 cfs @ 12.25 hrs, Volume= 33,984 cf, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.71"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 96 | Gravel surface, HSG C |
| 100,300 | 74 | >75% Grass cover, Good, HSG C |
| 104,701 | 75 | Weighted Average |
| 104,701 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.6 | 50 | 0.0010 | 0.05 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.6 | 105 | 0.0330 | 2.92 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 18.2 | 155 | Total | | | |

## Subcatchment 1Sc: 1Sc



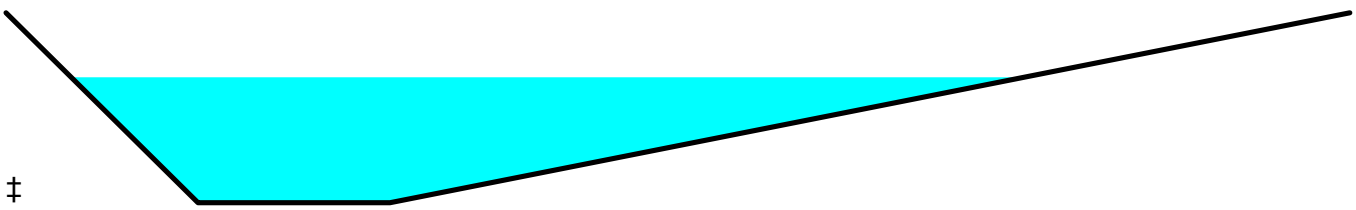
## Summary for Reach SWALE: SWALE

Inflow Area = 104,701 sf, 0.00% Impervious, Inflow Depth = 3.89" for 25-yr event
Inflow = 7.67 cfs @ 12.25 hrs, Volume= 33,984 cf
Outflow = 6.44 cfs @ 12.37 hrs, Volume= 33,984 cf, Atten= 16%, Lag= 7.3 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.63 fps, Min. Travel Time= 10.5 min
Avg. Velocity = 0.48 fps, Avg. Travel Time= 35.4 min

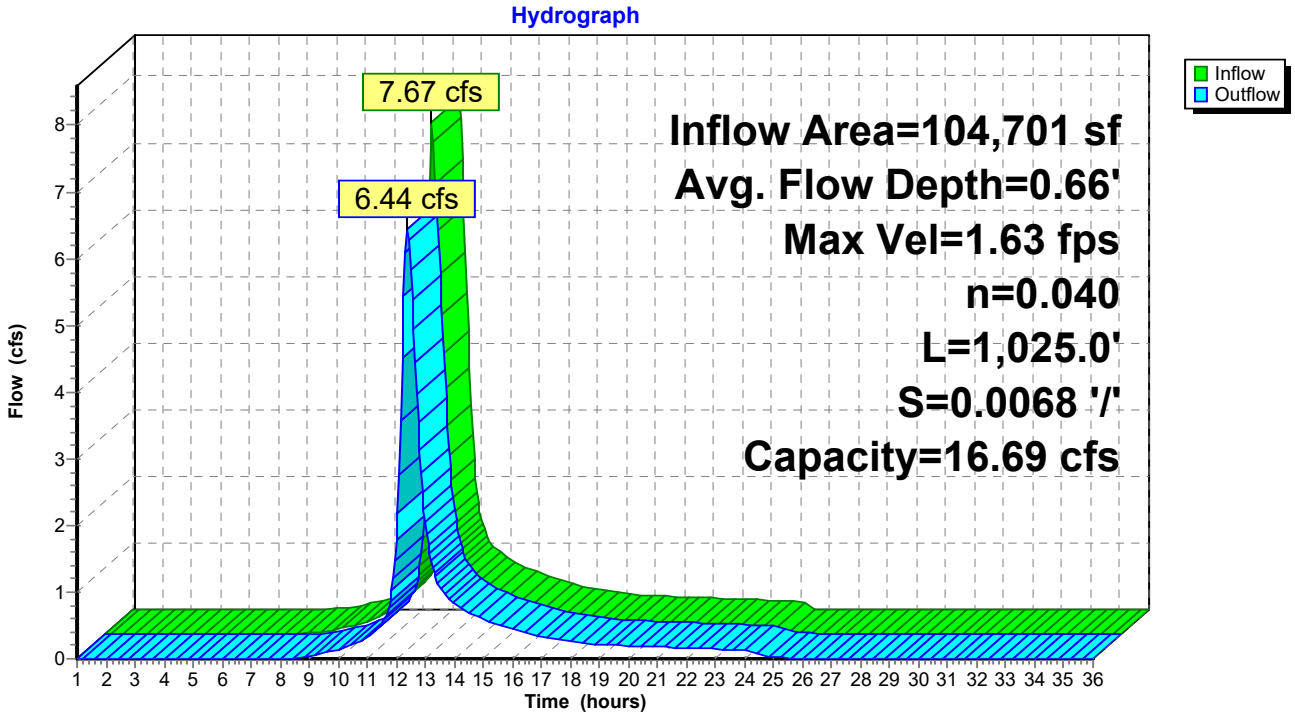
Peak Storage= 4,035 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 16.69 cfs

2.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 10.0 '/' Top Width= 14.00'
Length= 1,025.0' Slope= 0.0068 '/'
Inlet Invert= 91.00', Outlet Invert= 84.00'



‡

### Reach SWALE: SWALE



Time span=1.00-36.00 hrs, dt=0.05 hrs, 701 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**Subcatchment 1Sc: 1Sc** Runoff Area=104,701 sf 0.00% Impervious Runoff Depth=5.75"
Flow Length=155' Tc=18.2 min CN=75 Runoff=11.27 cfs 50,175 cf

**Reach SWALE: SWALE** Avg. Flow Depth=0.79' Max Vel=1.82 fps Inflow=11.27 cfs 50,175 cf
n=0.040 L=1,025.0' S=0.0068 '/' Capacity=16.69 cfs Outflow=9.68 cfs 50,175 cf

**Total Runoff Area = 104,701 sf Runoff Volume = 50,175 cf Average Runoff Depth = 5.75"**
**100.00% Pervious = 104,701 sf 0.00% Impervious = 0 sf**

## Summary for Subcatchment 1Sc: 1Sc

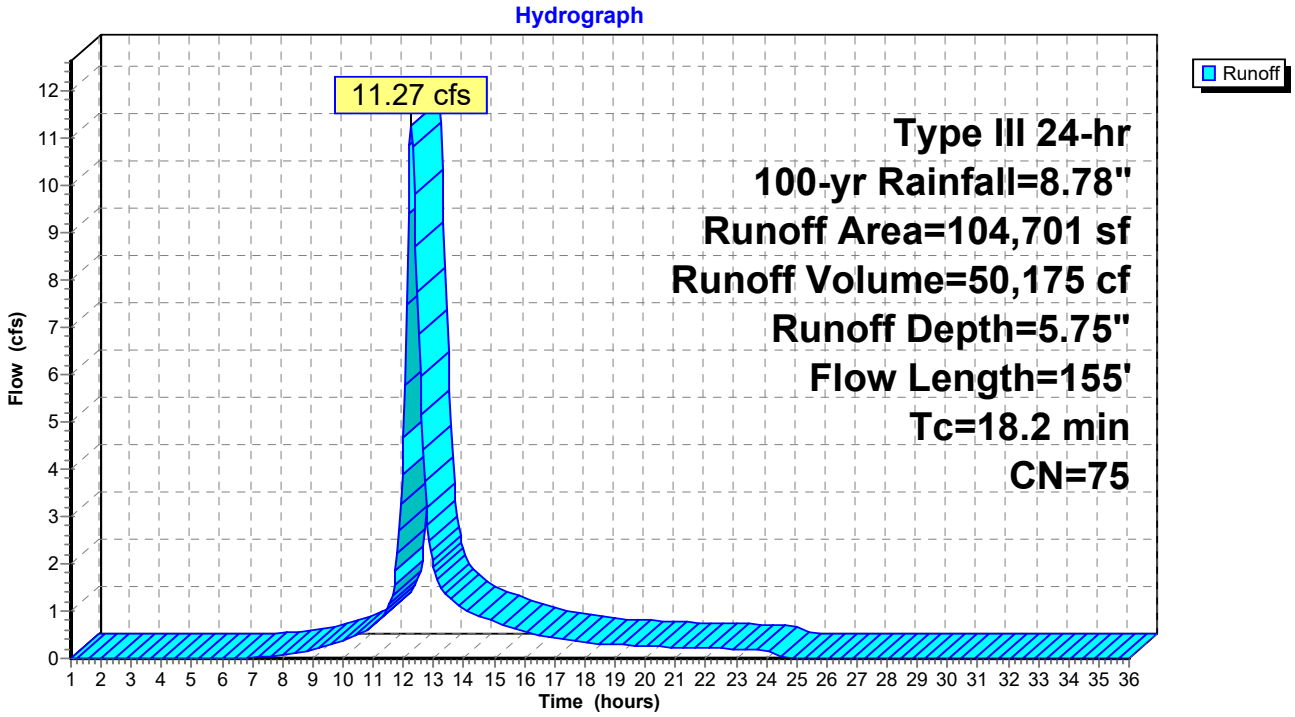
Runoff = 11.27 cfs @ 12.25 hrs, Volume= 50,175 cf, Depth= 5.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.78"

| Area (sf) | CN | Description |
|---|---|---|
| 4,401 | 96 | Gravel surface, HSG C |
| 100,300 | 74 | >75% Grass cover, Good, HSG C |
| 104,701 | 75 | Weighted Average |
| 104,701 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 17.6 | 50 | 0.0010 | 0.05 | | **Sheet Flow,** Grass: Short n= 0.150 P2= 3.60" |
| 0.6 | 105 | 0.0330 | 2.92 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 18.2 | 155 | Total | | | |

## Subcatchment 1Sc: 1Sc



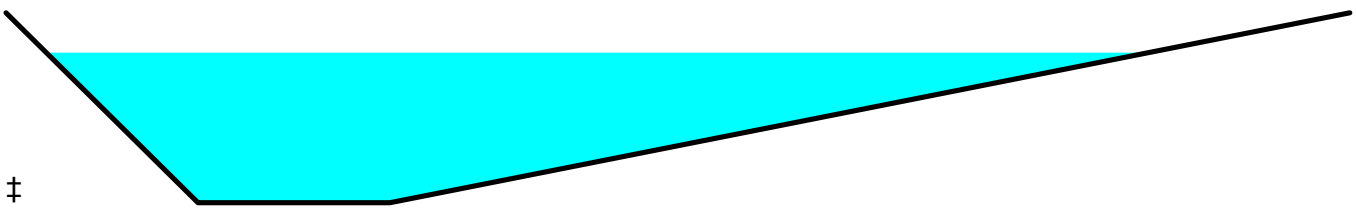
## Summary for Reach SWALE: SWALE

Inflow Area = 104,701 sf, 0.00% Impervious, Inflow Depth = 5.75" for 100-yr event
Inflow = 11.27 cfs @ 12.25 hrs, Volume= 50,175 cf
Outflow = 9.68 cfs @ 12.36 hrs, Volume= 50,175 cf, Atten= 14%, Lag= 6.7 min

Routing by Stor-Ind method, Time Span= 1.00-36.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.82 fps, Min. Travel Time= 9.4 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 32.2 min

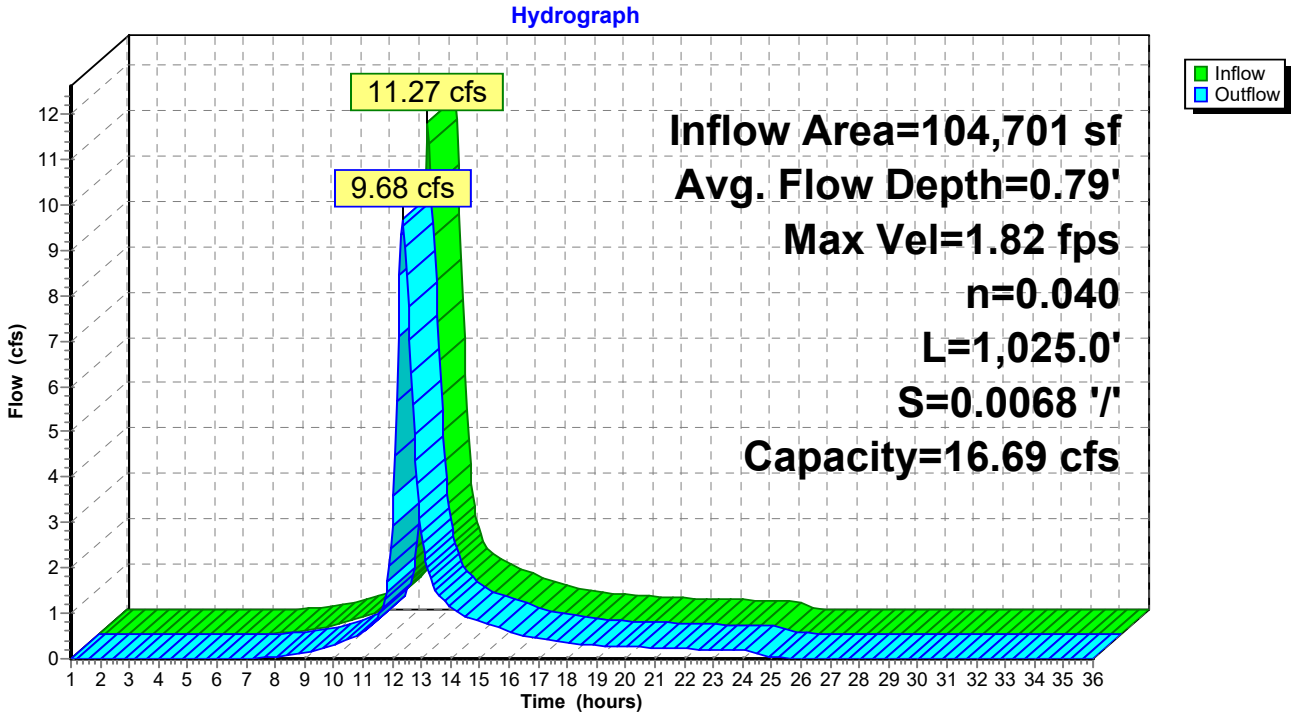
Peak Storage= 5,465 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 1.00' Flow Area= 8.0 sf, Capacity= 16.69 cfs

2.00' x 1.00' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 10.0 '/' Top Width= 14.00'
Length= 1,025.0' Slope= 0.0068 '/'
Inlet Invert= 91.00', Outlet Invert= 84.00'



‡

### Reach SWALE: SWALE



# APPENDIX C

## Pre-Development & Post-Development Watershed Plans – 1st Revision

## LEGEND

| | |
|---|---|
| 1P | STORMWATER BASIN |
| 1S | SUBCATCHMENT AREA |
| DP1 | DESIGN POINT |
| | Tc PATH |
| | SUBCATCHMENT AND UNDISTURBED AREA BOUNDARY |
| 32A "D" | HYDROLOGIC SOIL GROUP AND BOUNDARY |

FILE: 3055.02-WSHD

**Atlantic®** DESIGN ENGINEERS, INC.
P.O. Box 1051, Sandwich, MA 02563 (508) 888 – 9282

Designed by :
Drawn by :
Checked by :
Survey chk. by :
Approved by :

SCALE
SCALE 1" = 120'
0 60 120 240

| NO. | BY | DATE | REVISION |
|---|---|---|---|
| 1 | NJC | 6/14/22 | PER TOWN COMMENTS & HYDROGIOLOGICAL REPORT |

DATE

APPLICANT:
WAREHAM MA 3, LLC
100 SUMMIT LAKE DRIVE, SUITE 210
VALHALLA, NY 10595

PRE DEVELOPMENT WATERSHED PLAN
FOR
FEARING HILL ROAD SOLAR PROJECT
WAREHAM, MA 02576
MAY 17, 2021

Sheet 1 of 1
JOB NUMBER 3055.02

## LEGEND

| | |
|---|---|
| 1P | STORMWATER BASIN |
| 1S | SUBCATCHMENT AREA |
| DP1 | DESIGN POINT |
| | Tc PATH |
| | SUBCATCHMENT AND UNDISTURBED AREA BOUNDARY |
| 32A "D" | HYDROLOGIC SOIL GROUP AND BOUNDARY |

FILE: 3055.02-WSHD

**Atlantic®** DESIGN ENGINEERS, INC.
P.O. Box 1051, Sandwich, MA 02563 (508) 888 – 9282

Designed by :
Drawn by :
Checked by :
Survey chk. by :
Approved by :

SCALE
SCALE 1" = 120'
0 60 120 240

| NO. | BY | DATE | REVISION |
|---|---|---|---|
| 1 | NJC | 6/14/22 | PER TOWN COMMENTS & HYDROGIOLOGICAL REPORT |

DATE

APPLICANT:
WAREHAM MA 3, LLC
100 SUMMIT LAKE DRIVE, SUITE 210
VALHALLA, NY 10595

POST DEVELOPMENT WATERSHED PLAN
FOR
FEARING HILL ROAD SOLAR PROJECT
WAREHAM, MA 02576
MAY 17, 2021

Sheet 1 of 1
JOB NUMBER 3055.02