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***CIVIL ENGINEERS***

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***SURFACE WATER MANAGEMENT PLAN  
FOR BLOCK 3803, LOT 20, AND BLOCK 4201, LOT 1 & 2  
#30 HILLVIEW ROAD  
TOWNSHIP OF PEQUANNOCK  
MORRIS COUNTY, NEW JERSEY***

Prepared for:

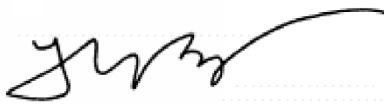
Hillview Med  
30 Hillview Road  
Pequannock, NJ 07440

Date:

September 8, 2022

Prepared by:

Thomas A. Boorady, PE

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Thomas A. Boorady, PE  
NJPE #43110

# 1. Project Description

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The Applicant is proposing to redevelop the proposed site from a commercial garden center into a cannabis cultivation facility. The Applicant proposes to demolish the existing greenhouse structure, other minor structures, and remove all existing gravel driveways and pavement. The Applicant proposes to then construct a new Cannabis Cultivation space, office space, warehouse space, exterior equipment, utility building, and switch yard. In addition, a combination of asphalt, permeable paver and gravel driveways and parking areas are proposed throughout the site to give access to the various facilities. The single-family residence will remain as-is.

The total site area is approximately 22.894 acres (997,259 SF) for all lots combine. The area of disturbance is approximately 532,956 SF (12.23 acres). The redevelopment of the site will reduce impervious coverage on site from 403,186 SF to 320,077 SF. Please note that the existing gravel driveway is considered as impervious surface, however, the proposed gravel driveways are considered pervious.

The purpose of this report is to assess the stormwater management impacts of the proposed development and demonstrate compliance with the regulations in Pequannock Township Code Chapter 308, NJAC 7:8, and the NJ Soil Erosion Standards.

# 1. Stormwater Rules

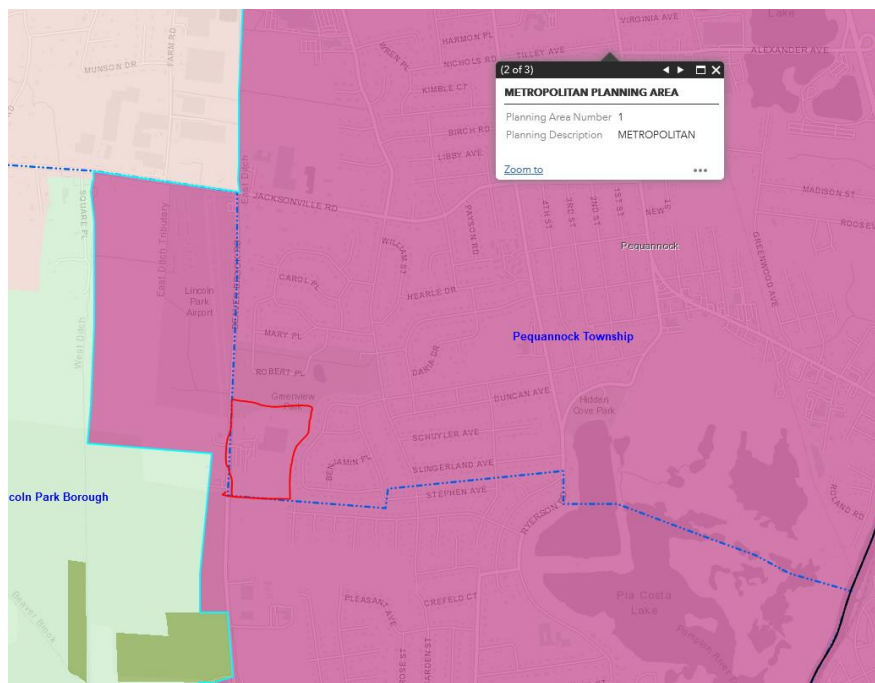
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## Major Development

Per NJAC 7:8 and §308, a major development is an individual development as well as multiple developments that individually or collectively result in the disturbance of one or more acres of land since February 2, 2004, as well as other criteria. The proposed area of disturbance is 12.23 acres and so the project is classified as Major Development and must meet all applicable requirements.

## Groundwater Recharge Standards

Per NJAC 7:8-5.4, the groundwater recharge requirement does not apply to projects within the “urban redevelopment area”. Urban redevelopment areas are defined as previously developed portions of areas delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1). Per said map, the entire township of Pequannock is located within the PA1 area



Per §306, the groundwater recharge requirements shall apply to all projects within the Township of Pequannock. Given the reduction in impervious area and that all soil types (per the New Jersey Groundwater Recharge Spreadsheet) within the subject property site yield zero groundwater recharge, our project satisfies the requirements of §306 without further study.

### **Stormwater Runoff Quality Standards**

Per §306 and NJAC 7:8, the runoff quality standards are applicable when the major development results in an increase of 1/4 acre or more of regulated motor vehicle surface. We propose to reduce the regulated motor vehicles surfaces on site from 255,179 SF to 130,814 SF, a reduction of 124,365 SF. See Appendix D for a graphical summary of regulated motor vehicle surfaces on site.

### **Stormwater Runoff Quantity Standards**

Per §306 and NJAC 7:8, the design engineer must demonstrate one of the following:

1. Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two-, ten-, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.

2. Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two-, ten- and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area.
3. Design stormwater management measures so that the post-construction peak runoff rates for the two-, ten- and 100-year storm events are 50%, 75% and 80%, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed

For this project, given that at certain points the pre- and post-development hydrographs intersect and that the peak runoff post-development during the 2-yr storm event is not 50% of the predevelopment peak runoff, we will demonstrate through Method 2 that stormwater quantity standards have been met.

### **Green Infrastructure Standards**

Per §306 and NJAC 7:8, to satisfy the stormwater runoff quantity standards the design engineer shall utilize BMPs from Table 1. As part of our redevelopment, we propose to construct a pervious paving system. The footprint of the pervious paving system is 41,292 SF where the total inflow area to the basin is 104,215 SF. The area of additional inflow is thus 62,923 SF. The ratio of additional inflow to the area occupied by the BMP is thus 1.52 where a maximum of three is permitted.

## 2. On-Site Soils

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According to the Morris County Soil Survey as issued by the Natural Resource Conservation Services, the soils in the area on the project site are the following:

| Map Unit Symbol | Map Unit Name                                                                      | Hydrologic Soil Group | Acres in AOI | Percent of AOI |
|-----------------|------------------------------------------------------------------------------------|-----------------------|--------------|----------------|
| PafAt           | Natchaug muck, 0 to 2 percent slopes, frequently flooded                           | B/D                   | 13.4         | 58.6%          |
| PrkAt           | Preakness sandy loam, 0 to 3 percent slopes, frequently flooded                    | D                     | 7.3          | 31.9%          |
| PrsdAt          | Preakness dark surface variant sandy loam, 0 to 3 percent slopes, frequently flood | D                     | 1.8          | 8.0%           |
| USPREB          | Urban land-Preakness complex, 0 to 8 percent slopes                                | D                     | 0.3          | 1.5%           |
| Site Total      |                                                                                    |                       | 22.9         | 100.0%         |

Given the reduction in impervious area for the proposed development, we conservatively assumed Hydrologic Soil Group D for the entire site.

### 3. Pre-Development Drainage Conditions

#### Summary

The project site consists of a single-family residences including accessory structures (6,030 SF), a greenhouse garden center (119,936 SF), and a shared asphalt/gravel driveway and parking area. The site is bound by residential uses to the east, a farm to the south, East Ditch to the west, and a disturbed and Greenview Park to the north. East Ditch, an FW2 regulated water, runs parallel to the westerly property line. The subject property is bisected by a stormwater ditch running east to west. As it approaches the East Ditch it is routed underground through three (3) 24" diameter culverts. Runoff from the site is collected into three (3) existing irrigation and detention ponds constructed in the 1990's and then released into the central ditch. For analysis, the existing ponds are assumed to be functioning.

The following is a breakdown of the existing drainage areas with the corresponding times of concentration:

| <b>Existing Drainage Area Summary</b> |                         |              |                 |                                 |
|---------------------------------------|-------------------------|--------------|-----------------|---------------------------------|
| Drainage Area                         | Subcat Label (HydroCAD) | Area Extents | Impervious Area | Time of Concentration (minutes) |
| EDA-1                                 | 1S                      | 206,959 SF   | 75,545 SF       | 18.7                            |
| EDA-2                                 | 2S                      | 21,184 SF    | 401 SF          | 18.6                            |
| EDA-3                                 | 3S                      | 23,775 SF    | 10,240 SF       | 13.3                            |
| EDA-4                                 | 4S                      | 56,602 SF    | 51,568 SF       | 11.7                            |
| EDA-5                                 | 5S                      | 29,986 SF    | 23,372 SF       | 8.4                             |
| EDA-6                                 | 6S                      | 56,161 SF    | 33,840 SF       | 12.0                            |
| EDA-7                                 | 7S                      | 57,648 SF    | 43,945 SF       | 27.4                            |
| EDA-8                                 | 8S                      | 10,366 SF    | 372 SF          | 20.3                            |
| EDA-9                                 | 9S                      | 16,311 SF    | 0 SF            | 0.0                             |
| EDA-10                                | 18S                     | 8,922 SF     | 0 SF            | 0.0                             |
| EDA-11                                | 16S                     | 192,008 SF   | 146,667 SF      | 8.1                             |

#### Curve Number

Standard curve numbers published in NRCS TR-55 Urban Hydrology for Small Watersheds (June 1986) were used in the routing of the existing runoff from the site. Note that a CN of 96 was used for the existing gravel driveway and parking area as the standard CN of 91 is weighted against "open space" in poor condition. Since we are calculating the CN number for areas outside of the gravel area separately the more accurate CN is 96. The gravel parking area is compacted. An infiltration test was attempted but it was too difficult to get a seal between the gravel and the cylinder. The test was abandoned. In one location, we were able to get a marginal seal. The water

was not able to infiltrate into the gravel confirming our assumption that the gravel is largely impervious.

### **Ponds**

There are three existing irrigation and detention ponds on site. All three (3) discharge to the Central Ditch. The footprint of the basins is based on the boundaries given by the Surveyor. The surveyors were unable to survey the shape of the inside of the basin due to the standing water in the basins. Pond #1A and #1B are connected in series. The following are the properties used in our analysis:

| <b>Existing Pond Summary</b> |                                        |           |           |                                                                                                                                                            |
|------------------------------|----------------------------------------|-----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pond                         | Location                               | Area (SF) | Invert    | Outlet                                                                                                                                                     |
| Pond #1A                     | Southernmost                           | 10,074 SF | 172.58 ft | 173.08 ft – 12” Ø Culvert                                                                                                                                  |
| Pond #1B                     | Adjacent to South of the Central Ditch | 8,922 SF  | 172.58 ft | 173.08 ft – 3” Ø Orifice<br>173.58 ft – 10” Ø Orifice<br>175.83 ft – 4’-0” Wide Sharp-Crested Wier<br><br>All Discharging to:<br>173.08 ft – 12” Ø Culvert |
| Pond #2                      | North of the Central Ditch             | 13,951 SF | 174.86 ft | 175.09 ft – 12” Ø Culvert<br>180.00 ft – 540 LF Broad Crested Wier                                                                                         |

All elevations are in the NAVD 88 Datum

## 4. Post-Development Drainage Conditions

### Summary

Post-Development drainage patterns closely follow existing drainage patterns. The following is a breakdown of all the drainage areas:

| Post-Development Drainage Areas |                         |              |                 |                                 |
|---------------------------------|-------------------------|--------------|-----------------|---------------------------------|
| Drainage Area                   | Subcat Label (HydroCAD) | Area Extents | Impervious Area | Time of Concentration (minutes) |
| 1                               | 11S                     | 102,868 SF   | 63,521 SF       | 9.3                             |
| 2                               | 12S                     | 125,236 SF   | 84,550 SF       | 8.4                             |
| 3                               | 13S                     | 56,989 SF    | 41,160 SF       | 6.1                             |
| 4                               | 14S                     | 47,496 SF    | 47,496 SF       | 18.0                            |
| 5                               | 15S                     | 79,842 SF    | 49,709 SF       | 4.9                             |
| 6                               | 17S                     | 16,800 SF    | 11,836 SF       | 1.8                             |
| 7                               | 18S                     | 37,893 SF    | 26,579 SF       | 4.3                             |
| 8                               | 19S                     | 212,044 SF   | 21,656 SF       | 18.5                            |
| 9                               | 20S                     | 9,311 SF     | 9,311 SF        | 20.4                            |

Runoff from part of the proposed building, truck loading area, and area immediately surrounding it will be collected and stored in porous pavement BMP. The porous pavement basin utilizes an underdrain system as there is inadequate separation between the Seasonal High-Water Table and the bottom of the basin. A groundwater mounding analysis has thus not been performed since infiltration is assumed not to take place.

| Basin Properties |                                        |                           |                           |                                |                                 |                                      |
|------------------|----------------------------------------|---------------------------|---------------------------|--------------------------------|---------------------------------|--------------------------------------|
| Basin Label      | BO Basin                               | Inflow Area (Acres/SF)    | Basin Area (Acres/SF)     | Ratio (Inflow Area/Basin Area) | Permeable Paver Area (Acres/SF) | Connected Impervious Area (Acres/SF) |
| B-1              | 176.0 ft<br>175.17 ft @<br>Underdrains | 2.36 acres/<br>102,868 SF | 0.95 acres /<br>41,292 SF | $2.49 < 3$ thus<br>OK          | 0.24 acres /<br>10,550 SF       | 1.02 acres /<br>44,502 SF            |

### Curve Numbers

Standard curve numbers published in NRCS TR-55 Urban Hydrology for Small Watersheds (June 1986) were used in the routing of the proposed runoff from the site. Note that a CN of 68 was used for the proposed gravel areas. This is based on a 12" thick gravel base with a 40% void ratio. Details of the proposed gravel area provided in the drawing set.

$$S = \frac{1000}{CN} - 10 \text{ thus } CN = \frac{1000}{S + 10}$$

$$S = T \times 0.40 = 12 \times 0.40 = 4.8$$

$$CN = \frac{1000}{S + 10} = \frac{1000}{4.8 + 10} = 67.6 \approx 68$$

Where:

S is the available voids in the gravel

T is the total thickness of gravel

CN is the curve number

## 5. Stormwater Management Analysis

### Stormwater Runoff Quantity (Global):

The following is a summary of the pre- and post-development peak runoff rates:

| <b><u>Peak Runoff Rates</u></b> |                        |                         |                    |
|---------------------------------|------------------------|-------------------------|--------------------|
| <b>Storm Event</b>              | <b>Pre-Development</b> | <b>Post Development</b> | <b>% Reduction</b> |
| 2-yr                            | 14.95 CFS              | 9.19 CSF                | 38.5%              |
| 10-yr                           | 23.02 CFS              | 14.40 CFS               | 37.4%              |
| 25-yr                           | 28.47 CFS              | 18.11 CFS               | 22.3%              |
| 100-yr                          | 38.72 CFS              | 25.62 CFS               | 33.8%              |

The following is a summary of total runoff from the site:

| <b><u>Total Runoff from Site</u></b> |                        |                         |                    |
|--------------------------------------|------------------------|-------------------------|--------------------|
| <b>Storm Event</b>                   | <b>Pre-Development</b> | <b>Post Development</b> | <b>% Reduction</b> |
| 2-yr                                 | 3.234 acre-ft          | 2.855 acre-ft           | 11.7%              |
| 10-yr                                | 5.334 acre-ft          | 4.892 acre-ft           | 8.3%               |
| 25-yr                                | 6.755 acre-ft          | 6.290 acre-ft           | 6.9%               |
| 100-yr                               | 9.721 acre-ft          | 8.785 acre-ft           | 9.6%               |

A total reduction in runoff is anticipated considering the reduction in impervious surfaces.

| Storm Event | Hour  | Pre-Development Rate averaged over one hour (CFS) | Average Post Development Increase Over Hour (CFS) | % Increase |
|-------------|-------|---------------------------------------------------|---------------------------------------------------|------------|
| 2-yr        | 19-20 | 1.25 CFS                                          | 0.13 CFS                                          | 10.4%      |
| 10-yr       | 16-17 | 4.21 CFS                                          | 0.23 CFS                                          | 5.5%       |
| 100-yr      | 13-14 | 10.71 CFS                                         | 1.50 CFS                                          | 14.0%      |

The following chart depicts the runoff from the 2,10, and 100-year storm event. Graphically comparing two lines shows a slight increase in between 6 and 12 hours into the duration of the storm. By inspection, considering the reduction in total runoff volume and that the general timing of the runoff has not changed, the increase in the tail leg of the hydrograph will not create additional flooding downstream from the site. The East Ditch has full flow capacity of approximately 665.26 CFS. The additional 1.50 CFS between hours 13 and 14 during the 100-yr storm event constitutes 0.2% of the capacity of the stream.

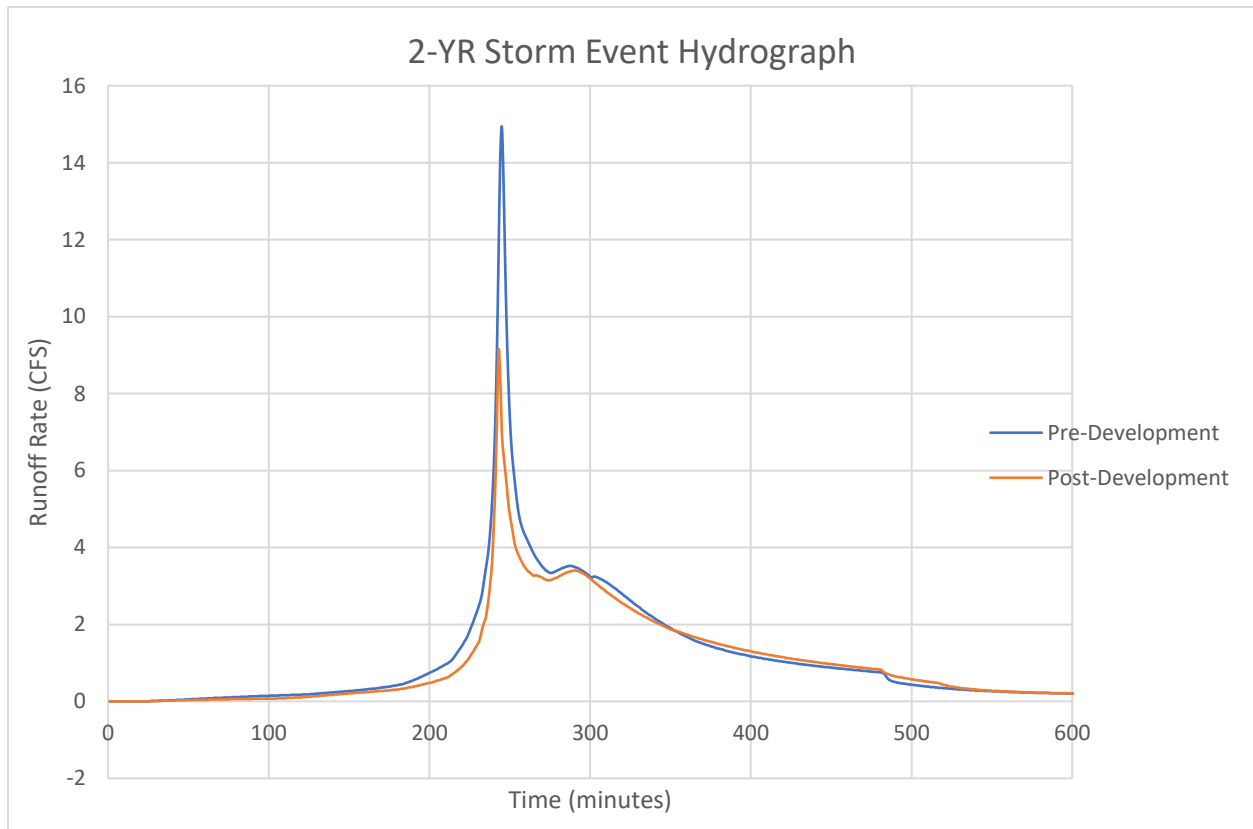


Figure 1: 2-yr Storm Event Hydrograph

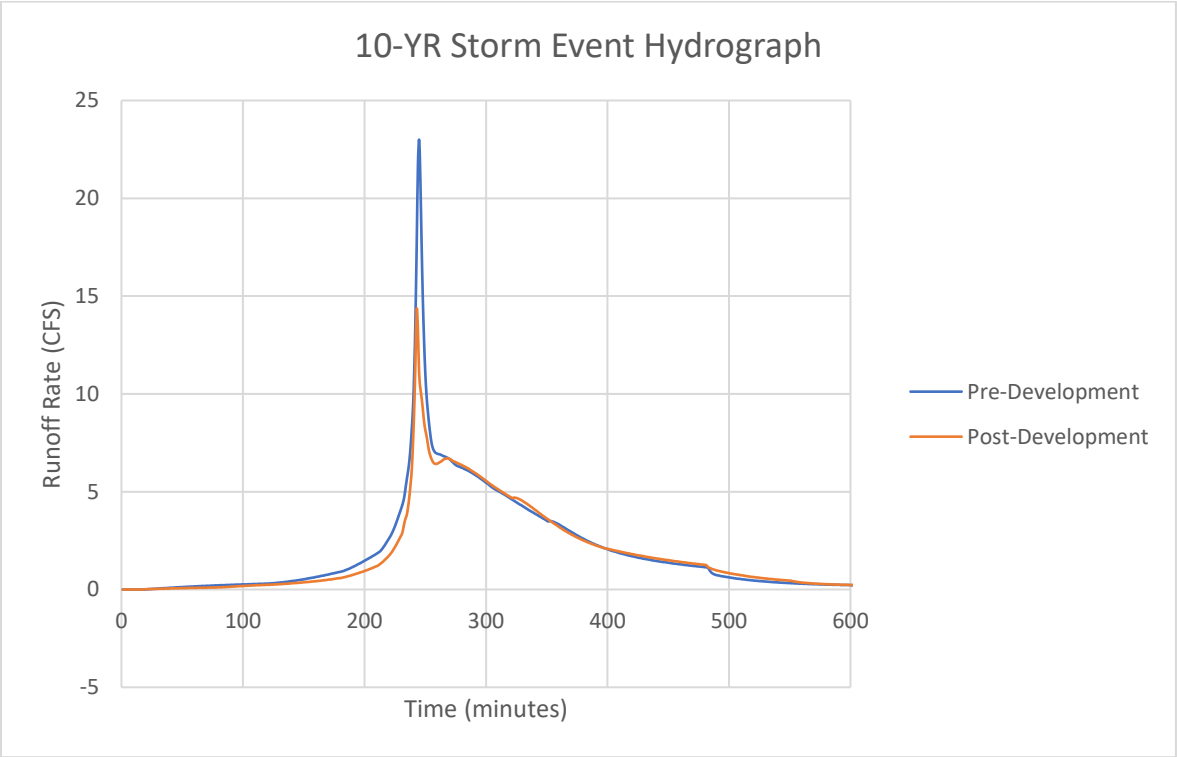


Figure 2: 10-YR Storm Hydrograph

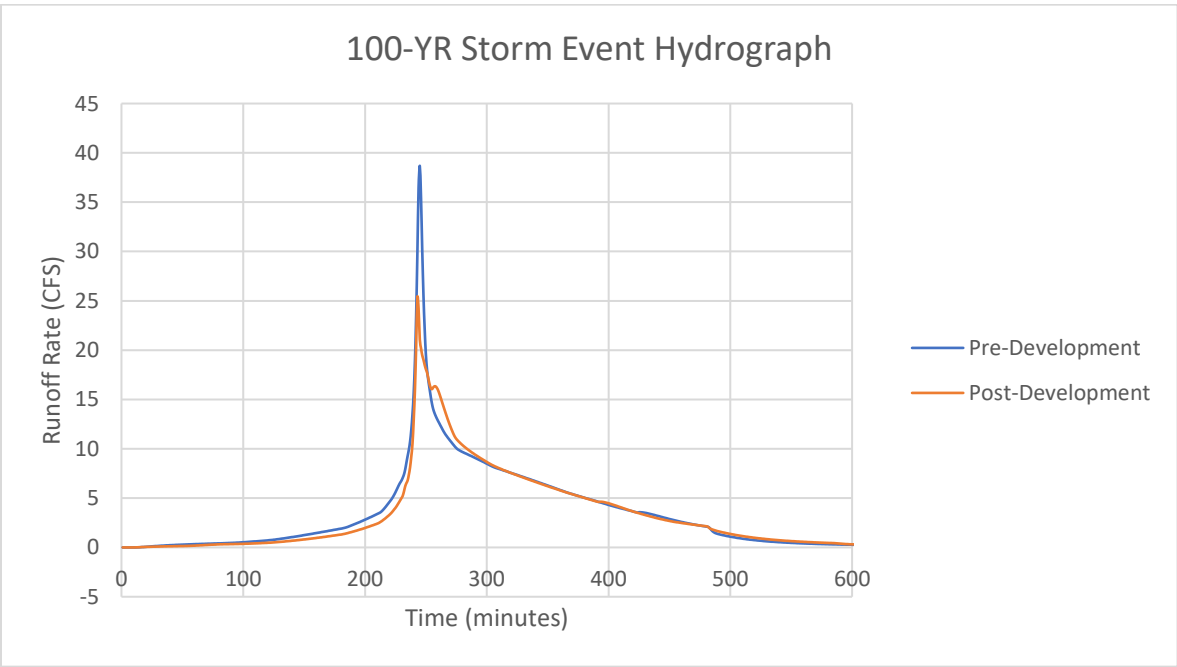


Figure 3: 100-YR Storm Hydrograph

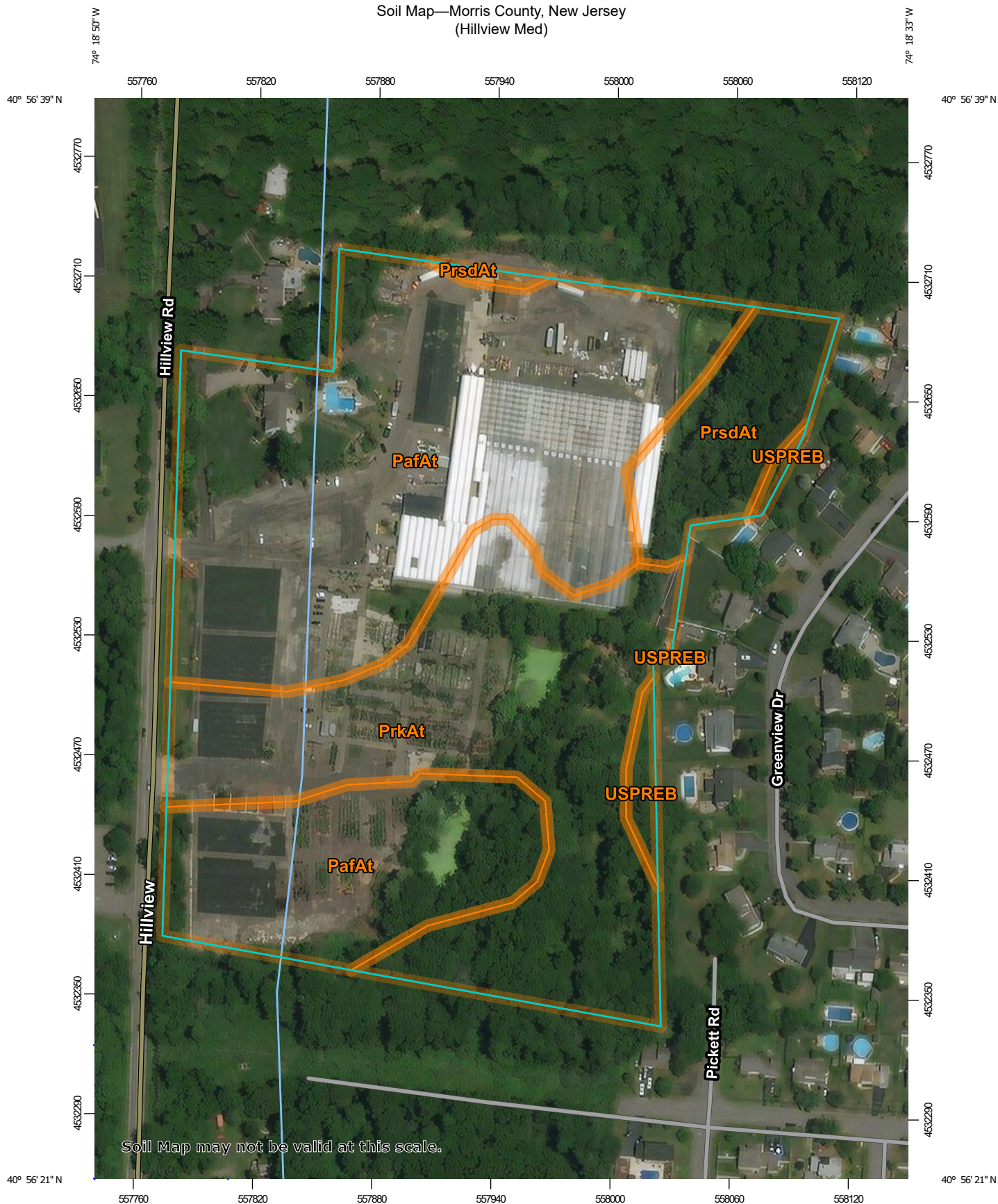
DARMOFALSKI ENGINEERING ASSOCIATES, INC.

Stormwater Drainage Report  
#30 Hillview Road, Pequannock, Morris County

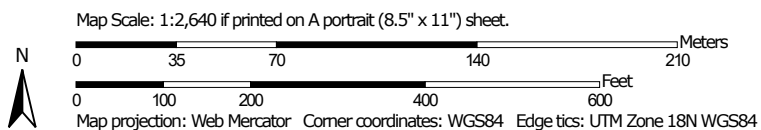
September 8, 2022

**Appendix A**  
NRCS Soil Survey

# Soil Map—Morris County, New Jersey (Hillview Med)



Soil Map may not be valid at this scale.



**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

8/26/2022  
Page 1 of 3

Soil Map—Morris County, New Jersey  
(Hillview Med)

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Morris County, New Jersey

Survey Area Data: Version 16, Aug 31, 2021

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

Date(s) aerial images were photographed: Dec 31, 2009—Feb 26, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

| Map Unit Symbol                    | Map Unit Name                                                                        | Acres in AOI | Percent of AOI |
|------------------------------------|--------------------------------------------------------------------------------------|--------------|----------------|
| PafAt                              | Natchaug muck, 0 to 2 percent slopes, frequently flooded                             | 13.4         | 58.6%          |
| PrkAt                              | Preakness sandy loam, 0 to 3 percent slopes, frequently flooded                      | 7.3          | 31.9%          |
| PrsdAt                             | Preakness dark surface variant sandy loam, 0 to 3 percent slopes, frequently flooded | 1.8          | 8.0%           |
| USPREB                             | Urban land-Preakness complex, 0 to 8 percent slopes                                  | 0.3          | 1.5%           |
| <b>Totals for Area of Interest</b> |                                                                                      | <b>22.9</b>  | <b>100.0%</b>  |

## Morris County, New Jersey

### PrsdAt—Preakness dark surface variant sandy loam, 0 to 3 percent slopes, frequently flooded

#### Map Unit Setting

*National map unit symbol:* 1kgmp

*Elevation:* 160 to 1,050 feet

*Mean annual precipitation:* 30 to 64 inches

*Mean annual air temperature:* 46 to 79 degrees F

*Frost-free period:* 131 to 178 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Preakness, very poorly drained, frequently flooded, and similar soils:* 90 percent

*Minor components:* 10 percent

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

#### Description of Preakness, Very Poorly Drained, Frequently Flooded

##### Setting

*Landform:* Outwash plains, outwash terraces

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Coarse-loamy outwash derived from granite and some basalt

##### Typical profile

*Oa1 - 0 to 6 inches:* muck

*Oa2 - 6 to 13 inches:* muck

*A - 13 to 15 inches:* sandy loam

*Bg1 - 15 to 24 inches:* sandy loam

*Bg2 - 24 to 32 inches:* sandy loam

*BCg1 - 32 to 39 inches:* loamy sand

*BCg2 - 39 to 43 inches:* loamy sand

*Cg - 43 to 70 inches:* sand

*C - 70 to 72 inches:* sand

##### Properties and qualities

*Slope:* 0 to 3 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Very poorly drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water*

*(Ksat):* Moderately high to high (0.57 to 1.98 in/hr)

*Depth to water table:* About 0 to 6 inches

*Frequency of flooding:* FrequentNone

*Frequency of ponding:* Rare

*Available water supply, 0 to 60 inches:* High (about 10.8 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4w

*Hydrologic Soil Group:* D

*Hydric soil rating:* Yes

**Minor Components**

**Preakness**

*Percent of map unit:* 10 percent

*Landform:* Outwash plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* Yes

**Data Source Information**

Soil Survey Area: Morris County, New Jersey

Survey Area Data: Version 16, Aug 31, 2021

## Morris County, New Jersey

### USPREB—Urban land-Preakness complex, 0 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 13q0c

*Elevation:* 160 to 1,500 feet

*Mean annual precipitation:* 30 to 64 inches

*Mean annual air temperature:* 46 to 79 degrees F

*Frost-free period:* 131 to 178 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Urban land, rarely flooded:* 45 percent

*Preakness, frequently flooded, and similar soils:* 40 percent

*Minor components:* 15 percent

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

#### Description of Urban Land, Rarely Flooded

##### Setting

*Landform:* Outwash terraces

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

##### Typical profile

*C - 0 to 60 inches:* variable

##### Properties and qualities

*Slope:* 0 to 3 percent

*Runoff class:* Very high

*Depth to water table:* About 6 to 18 inches

*Available water supply, 0 to 60 inches:* Very low (about 0.0 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 8s

*Hydric soil rating:* Unranked

#### Description of Preakness, Frequently Flooded

##### Setting

*Landform:* Outwash terraces

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Coarse-loamy outwash derived from gneiss, sandstone, conglomerate and basalt

**Typical profile**

*Ap - 0 to 8 inches:* sandy loam  
*AB - 8 to 12 inches:* sandy loam  
*Bg - 12 to 30 inches:* sandy loam  
*2C - 30 to 60 inches:* stratified gravelly loamy sand to gravelly sandy loam

**Properties and qualities**

*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Drainage class:* Poorly drained  
*Runoff class:* Negligible  
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)  
*Depth to water table:* About 0 inches  
*Frequency of flooding:* NoneFrequent  
*Frequency of ponding:* Occasional  
*Available water supply, 0 to 60 inches:* Moderate (about 7.0 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4w  
*Hydrologic Soil Group:* D  
*Ecological site:* F144AY031MA - Very Wet Outwash  
*Hydric soil rating:* Yes

**Minor Components****Pompton**

*Percent of map unit:* 10 percent  
*Landform:* Outwash plains  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

**Riverhead**

*Percent of map unit:* 5 percent  
*Landform:* Outwash fans  
*Landform position (three-dimensional):* Base slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Hydric soil rating:* No

**Data Source Information**

Soil Survey Area: Morris County, New Jersey  
Survey Area Data: Version 16, Aug 31, 2021

## Morris County, New Jersey

### PafAt—Natchaug muck, 0 to 2 percent slopes, frequently flooded

#### Map Unit Setting

*National map unit symbol:* 2w699

*Elevation:* 170 to 1,090 feet

*Mean annual precipitation:* 36 to 71 inches

*Mean annual air temperature:* 39 to 55 degrees F

*Frost-free period:* 145 to 240 days

*Farmland classification:* Farmland of unique importance

#### Map Unit Composition

*Natchaug, clayey substratum, frequently flooded, and similar soils:* 85 percent

*Minor components:* 15 percent

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

### Description of Natchaug, Clayey Substratum, Frequently Flooded

#### Setting

*Landform:* Backswamps, backswamps, backswamps

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Parent material:* Highly decomposed organic material over clayey glaciolacustrine deposits and/or clayey backswamp deposits

#### Typical profile

*Oa1 - 0 to 12 inches:* muck

*Oa2 - 12 to 31 inches:* muck

*2Cg - 31 to 79 inches:* clay

#### Properties and qualities

*Slope:* 0 to 2 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Very poorly drained

*Runoff class:* Negligible

*Capacity of the most limiting layer to transmit water*

*(Ksat):* Moderately low to high (0.01 to 14.17 in/hr)

*Depth to water table:* About 0 inches

*Frequency of flooding:* NoneFrequent

*Frequency of ponding:* Frequent

*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)

*Available water supply, 0 to 60 inches:* Very high (about 17.3 inches)

#### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 5w

*Hydrologic Soil Group:* B/D

*Hydric soil rating:* Yes

### Minor Components

#### **Catden, frequently flooded**

*Percent of map unit:* 5 percent

*Landform:* Backswamps, backswamps, backswamps

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

#### **Timakwa, frequently flooded**

*Percent of map unit:* 5 percent

*Landform:* Backswamps, backswamps, backswamps

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Hydric soil rating:* Yes

#### **Parsippany, frequently flooded**

*Percent of map unit:* 3 percent

*Landform:* Basin floors

*Landform position (three-dimensional):* Tread

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* Yes

#### **Preakness, frequently flooded, poorly drained**

*Percent of map unit:* 2 percent

*Landform:* Outwash plains, outwash terraces

*Landform position (three-dimensional):* Tread

*Microfeatures of landform position:* Open depressions

*Down-slope shape:* Linear, concave

*Across-slope shape:* Linear, concave

*Hydric soil rating:* Yes

## Data Source Information

Soil Survey Area: Morris County, New Jersey

Survey Area Data: Version 16, Aug 31, 2021

## Morris County, New Jersey

### PrkAt—Preakness sandy loam, 0 to 3 percent slopes, frequently flooded

#### Map Unit Setting

*National map unit symbol:* 1kgxh

*Elevation:* 160 to 1,050 feet

*Mean annual precipitation:* 30 to 64 inches

*Mean annual air temperature:* 46 to 79 degrees F

*Frost-free period:* 131 to 178 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Preakness, poorly drained, and similar soils:* 90 percent

*Minor components:* 10 percent

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

#### Description of Preakness, Poorly Drained

##### Setting

*Landform:* Outwash plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Parent material:* Coarse-loamy outwash derived from granite and some basalt

##### Typical profile

*Oi - 0 to 1 inches:* slightly decomposed plant material

*A - 1 to 9 inches:* sandy loam

*Bg1 - 9 to 11 inches:* sandy loam

*Bg2 - 11 to 24 inches:* sandy loam

*BCg1 - 24 to 28 inches:* loamy sand

*BCg2 - 28 to 33 inches:* loamy sand

*Cg - 33 to 55 inches:* sand

*C - 55 to 60 inches:* sand

##### Properties and qualities

*Slope:* 0 to 3 percent

*Depth to restrictive feature:* More than 80 inches

*Drainage class:* Poorly drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* High  
(2.00 to 6.00 in/hr)

*Depth to water table:* About 0 to 6 inches

*Frequency of flooding:* FrequentNone

*Frequency of ponding:* Frequent

*Available water supply, 0 to 60 inches:* Moderate (about 7.4 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 4w

*Hydrologic Soil Group:* D

*Hydric soil rating:* Yes

**Minor Components**

**Pompton**

*Percent of map unit:* 10 percent

*Landform:* Outwash plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Hydric soil rating:* No

**Data Source Information**

Soil Survey Area: Morris County, New Jersey

Survey Area Data: Version 16, Aug 31, 2021

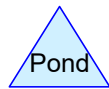
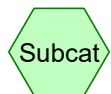
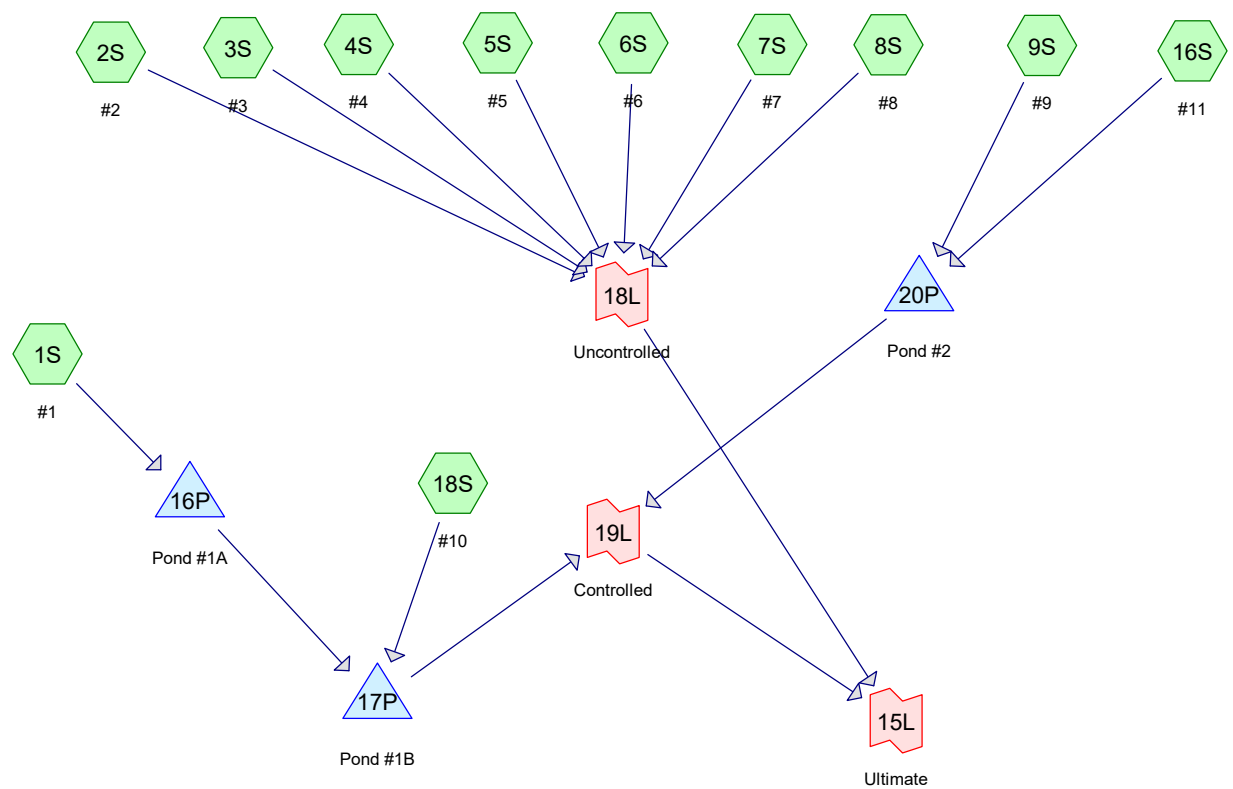
DARMOFALSKI ENGINEERING ASSOCIATES, INC.

Stormwater Drainage Report  
#30 Hillview Road, Pequannock, Morris County

September 8, 2022

## **Appendix B**

Existing Drainage Areas HydroCAD Outputs



# **Routing Diagram for Existing\_Global Model**

Prepared by HP Inc., Printed 9/8/2022

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## Existing\_Global Model

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### Rainfall Events Listing

| Event# | Event Name | Storm Type | Curve | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|------------|-------|---------|------------------|-----|----------------|-----|
| 1      | 2-yr       | NOAA 24-hr | D     | Default | 24.00            | 1   | 3.54           | 2   |
| 2      | 10-yr      | NOAA 24-hr | D     | Default | 24.00            | 1   | 5.24           | 2   |
| 3      | 25-yr      | NOAA 24-hr | D     | Default | 24.00            | 1   | 6.37           | 2   |
| 4      | 100-yr     | NOAA 24-hr | D     | Default | 24.00            | 1   | 8.35           | 2   |

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### Area Listing (all nodes)

| Area<br>(acres) | CN        | Description<br>(subcatchment-numbers)                              |
|-----------------|-----------|--------------------------------------------------------------------|
| 4.689           | 80        | >75% Grass cover, Good, HSG D (1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S) |
| 4.281           | 96        | Gravel surface, HSG D (1S, 3S, 4S, 6S, 7S, 8S, 16S)                |
| 2.898           | 98        | Paved parking, HSG D (1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 16S)         |
| 2.733           | 98        | Roofs, HSG D (3S, 4S, 5S, 6S, 7S, 16S)                             |
| 0.252           | 98        | Water Surface, 0% imp, HSG D (2S, 3S, 5S, 7S, 8S)                  |
| 0.756           | 98        | Water Surface, HSG D (1S, 9S, 18S)                                 |
| <b>15.609</b>   | <b>92</b> | <b>TOTAL AREA</b>                                                  |

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### Soil Listing (all nodes)

| Area<br>(acres) | Soil<br>Group | Subcatchment<br>Numbers                      |
|-----------------|---------------|----------------------------------------------|
| 0.000           | HSG A         |                                              |
| 0.000           | HSG B         |                                              |
| 0.000           | HSG C         |                                              |
| 15.609          | HSG D         | 1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 16S, 18S |
| 0.000           | Other         |                                              |
| <b>15.609</b>   |               | <b>TOTAL AREA</b>                            |

## Existing\_Global Model

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### Ground Covers (all nodes)

| HSG-A<br>(acres) | HSG-B<br>(acres) | HSG-C<br>(acres) | HSG-D<br>(acres) | Other<br>(acres) | Total<br>(acres) | Ground<br>Cover        | Subcatchment<br>Numbers                         |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------------|-------------------------------------------------|
| 0.000            | 0.000            | 0.000            | 4.689            | 0.000            | 4.689            | >75% Grass cover, Good | 1S, 2S,<br>3S, 4S,<br>5S, 6S,<br>7S, 8S,<br>9S  |
| 0.000            | 0.000            | 0.000            | 4.281            | 0.000            | 4.281            | Gravel surface         | 1S, 3S,<br>4S, 6S,<br>7S, 8S,<br>16S            |
| 0.000            | 0.000            | 0.000            | 2.898            | 0.000            | 2.898            | Paved parking          | 1S, 2S,<br>3S, 4S,<br>5S, 6S,<br>7S, 8S,<br>16S |
| 0.000            | 0.000            | 0.000            | 2.733            | 0.000            | 2.733            | Roofs                  | 3S, 4S,<br>5S, 6S,<br>7S, 16S                   |
| 0.000            | 0.000            | 0.000            | 0.756            | 0.000            | 0.756            | Water Surface          | 1S, 9S,<br>18S                                  |
| 0.000            | 0.000            | 0.000            | 0.252            | 0.000            | 0.252            | Water Surface, 0% imp  | 2S, 3S,<br>5S, 7S,<br>8S                        |
| <b>0.000</b>     | <b>0.000</b>     | <b>0.000</b>     | <b>15.609</b>    | <b>0.000</b>     | <b>15.609</b>    | <b>TOTAL AREA</b>      |                                                 |

## Existing\_Global Model

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### Pipe Listing (all nodes)

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Width<br>(inches) | Diam/Height<br>(inches) | Inside-Fill<br>(inches) |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|-------------------|-------------------------|-------------------------|
| 1     | 1S             | 0.00                | 0.00                 | 235.0            | 0.0050           | 0.013 | 0.0               | 12.0                    | 0.0                     |
| 2     | 2S             | 0.00                | 0.00                 | 310.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 3     | 3S             | 0.00                | 0.00                 | 310.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 4     | 4S             | 0.00                | 0.00                 | 240.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 5     | 5S             | 0.00                | 0.00                 | 310.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 6     | 6S             | 0.00                | 0.00                 | 186.0            | 0.0001           | 0.013 | 0.0               | 12.0                    | 0.0                     |
| 7     | 6S             | 0.00                | 0.00                 | 240.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 8     | 7S             | 0.00                | 0.00                 | 310.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 9     | 8S             | 0.00                | 0.00                 | 310.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 10    | 16S            | 0.00                | 0.00                 | 481.0            | 0.0050           | 0.013 | 0.0               | 8.0                     | 0.0                     |
| 11    | 16P            | 173.08              | 173.08               | 142.0            | 0.0000           | 0.012 | 0.0               | 12.0                    | 0.0                     |
| 12    | 17P            | 173.08              | 173.08               | 25.0             | 0.0000           | 0.012 | 0.0               | 12.0                    | 0.0                     |
| 13    | 20P            | 175.09              | 174.58               | 352.0            | 0.0014           | 0.013 | 0.0               | 12.0                    | 0.0                     |

**Existing\_Global Model**

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NOAA 24-hr D 2-yr Rainfall=3.54"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                               |                                                                                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment 1S: #1</b>    | Runoff Area=206,959 sf 12.79% Impervious Runoff Depth=2.28"<br>Flow Length=665' Tc=18.7 min CN=WQ Runoff=8.00 cfs 0.904 af                |
| <b>Subcatchment 2S: #2</b>    | Runoff Area=21,184 sf 1.89% Impervious Runoff Depth=1.91"<br>Flow Length=723' Tc=18.6 min CN=WQ Runoff=0.70 cfs 0.077 af                  |
| <b>Subcatchment 3S: #3</b>    | Runoff Area=23,775 sf 37.60% Impervious Runoff Depth=2.54"<br>Flow Length=543' Tc=13.3 min CN=WQ Runoff=1.14 cfs 0.115 af                 |
| <b>Subcatchment 4S: #4</b>    | Runoff Area=56,602 sf 19.11% Impervious Runoff Depth=3.00"<br>Flow Length=483' Tc=11.7 min CN=WQ Runoff=3.34 cfs 0.325 af                 |
| <b>Subcatchment 5S: #5</b>    | Runoff Area=29,986 sf 77.94% Impervious Runoff Depth=3.08"<br>Flow Length=688' Tc=8.4 min CN=WQ Runoff=1.97 cfs 0.177 af                  |
| <b>Subcatchment 6S: #6</b>    | Runoff Area=56,161 sf 25.15% Impervious Runoff Depth=2.58"<br>Flow Length=649' Tc=12.0 min CN=WQ Runoff=2.87 cfs 0.277 af                 |
| <b>Subcatchment 7S: #7</b>    | Runoff Area=57,648 sf 68.78% Impervious Runoff Depth=2.99"<br>Flow Length=940' Tc=12.8 min CN=WQ Runoff=3.22 cfs 0.329 af                 |
| <b>Subcatchment 8S: #8</b>    | Runoff Area=10,366 sf 1.71% Impervious Runoff Depth=1.80"<br>Flow Length=958' Tc=20.3 min CN=WQ Runoff=0.31 cfs 0.036 af                  |
| <b>Subcatchment 9S: #9</b>    | Runoff Area=16,311 sf 85.53% Impervious Runoff Depth=3.07"<br>Tc=0.0 min CN=WQ Runoff=1.30 cfs 0.096 af                                   |
| <b>Subcatchment 16S: #11</b>  | Runoff Area=192,008 sf 68.43% Impervious Runoff Depth=3.24"<br>Flow Length=841' Tc=8.1 min CN=WQ Runoff=13.43 cfs 1.189 af                |
| <b>Subcatchment 18S: #10</b>  | Runoff Area=8,922 sf 100.00% Impervious Runoff Depth=3.31"<br>Tc=0.0 min CN=98 Runoff=0.76 cfs 0.056 af                                   |
| <b>Pond 16P: Pond #1A</b>     | Peak Elev=174.52' Storage=19,570 cf Inflow=8.00 cfs 0.904 af<br>12.0" Round Culvert n=0.012 L=142.0' S=0.0000 ' Outflow=1.82 cfs 0.765 af |
| <b>Pond 17P: Pond #1B</b>     | Peak Elev=174.04' Storage=13,024 cf Inflow=1.89 cfs 0.821 af<br>Outflow=0.93 cfs 0.701 af                                                 |
| <b>Pond 20P: Pond #2</b>      | Peak Elev=176.93' Storage=28,842 cf Inflow=13.91 cfs 1.285 af<br>Outflow=2.06 cfs 1.196 af                                                |
| <b>Link 15L: Ultimate</b>     | Inflow=14.95 cfs 3.234 af<br>Primary=14.95 cfs 3.234 af                                                                                   |
| <b>Link 18L: Uncontrolled</b> | Inflow=13.18 cfs 1.337 af<br>Primary=13.18 cfs 1.337 af                                                                                   |

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### Link 19L: Controlled

Inflow=2.67 cfs 1.898 af

Primary=2.67 cfs 1.898 af

**Total Runoff Area = 15.609 ac   Runoff Volume = 3.582 af   Average Runoff Depth = 2.75"**  
**59.08% Pervious = 9.222 ac   40.92% Impervious = 6.387 ac**

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**Summary for Subcatchment 1S: #1**

[47] Hint: Peak is 317% of capacity of segment #3

Runoff = 8.00 cfs @ 12.27 hrs, Volume= 0.904 af, Depth= 2.28"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 121,340   | 80 | >75% Grass cover, Good, HSG D |
| 16,397    | 98 | Paved parking, HSG D          |
| 59,148    | 96 | Gravel surface, HSG D         |
| 10,074    | 98 | Water Surface, HSG D          |
| 206,959   |    | Weighted Average              |
| 180,488   | 85 | 87.21% Pervious Area          |
| 26,471    | 98 | 12.79% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                          |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow, Sheet Flow</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length                                  |
| 8.6      | 398           | 0.0023        | 0.77              |                | <b>Shallow Concentrated Flow, Shallow Concentrated Flow</b><br>Unpaved Kv= 16.1 fps                                                  |
| 1.2      | 235           | 0.0050        | 3.21              | 2.52           | <b>Pipe Channel, 12" Perforated Pipe</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 18.7     | 665           | Total         |                   |                |                                                                                                                                      |

## Existing\_Global Model

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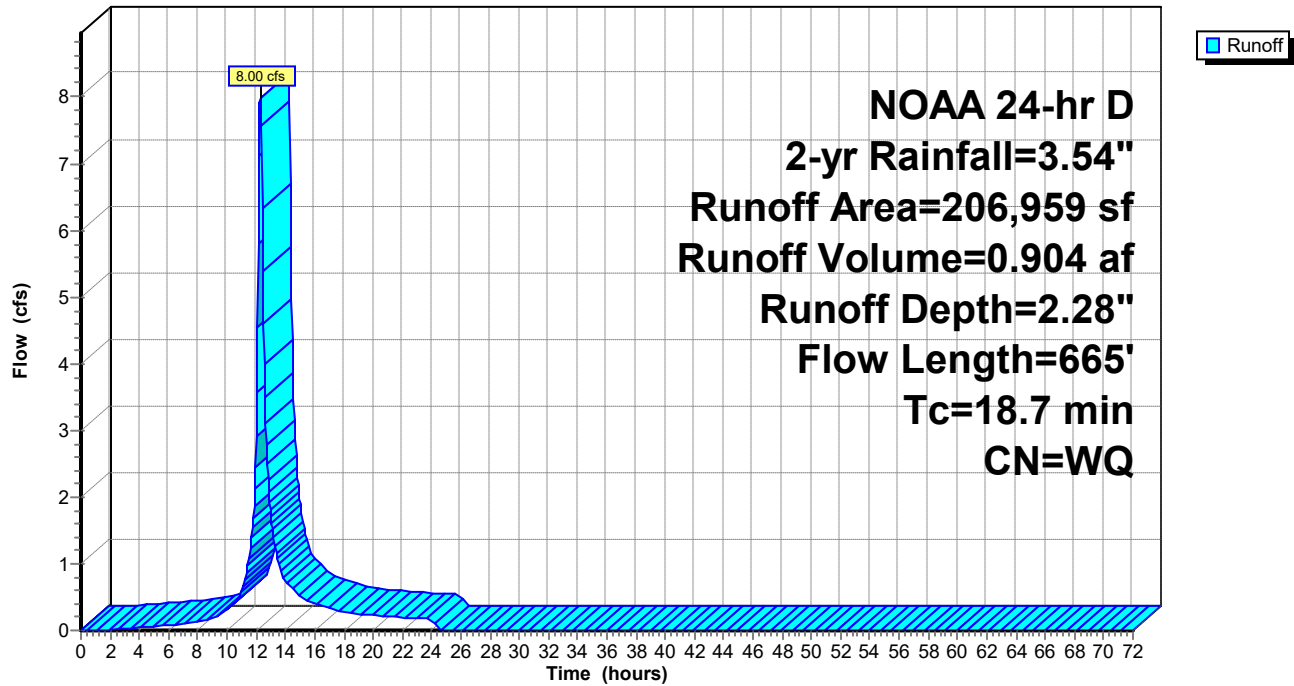
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 1S: #1

Hydrograph



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**Summary for Subcatchment 2S: #2**

Runoff = 0.70 cfs @ 12.28 hrs, Volume= 0.077 af, Depth= 1.91"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 401       | 98 | Paved parking, HSG D          |
| 18,044    | 80 | >75% Grass cover, Good, HSG D |
| 2,739     | 98 | Water Surface, 0% imp, HSG D  |
| 21,184    |    | Weighted Average              |
| 20,783    | 82 | 98.11% Pervious Area          |
| 401       | 98 | 1.89% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------|
| 9.0      | 33            | 0.0024        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length   |
| 2.7      | 129           | 0.0024        | 0.79              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                  |
| 5.9      | 251           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.035 Earth, dense weeds |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011          |
| 18.6     | 723           | Total         |                   |                |                                                                                            |

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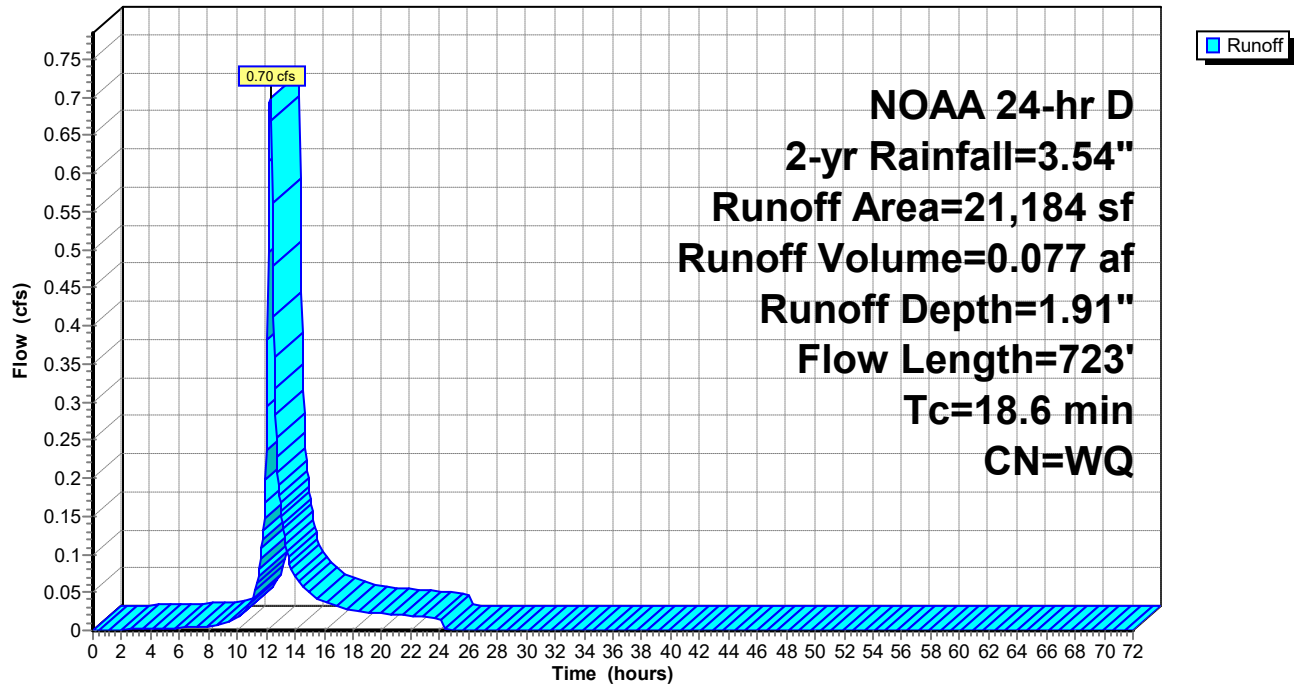
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 2S: #2

Hydrograph



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**Summary for Subcatchment 3S: #3**

Runoff = 1.14 cfs @ 12.21 hrs, Volume= 0.115 af, Depth= 2.54"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,884     | 98 | Paved parking, HSG D          |
| 2,219     | 98 | Water Surface, 0% imp, HSG D  |
| 10,956    | 80 | >75% Grass cover, Good, HSG D |
| 1,661     | 96 | Gravel surface, HSG D         |
| 55        | 98 | Roofs, HSG D                  |
| 23,775    |    | Weighted Average              |
| 14,836    | 84 | 62.40% Pervious Area          |
| 8,939     | 98 | 37.60% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------|
| 8.9      | 60            | 0.0080        | 0.11              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length   |
| 0.6      | 55            | 0.0080        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                  |
| 2.8      | 118           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.035 Earth, dense weeds |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011          |
| 13.3     | 543           | Total         |                   |                |                                                                                            |

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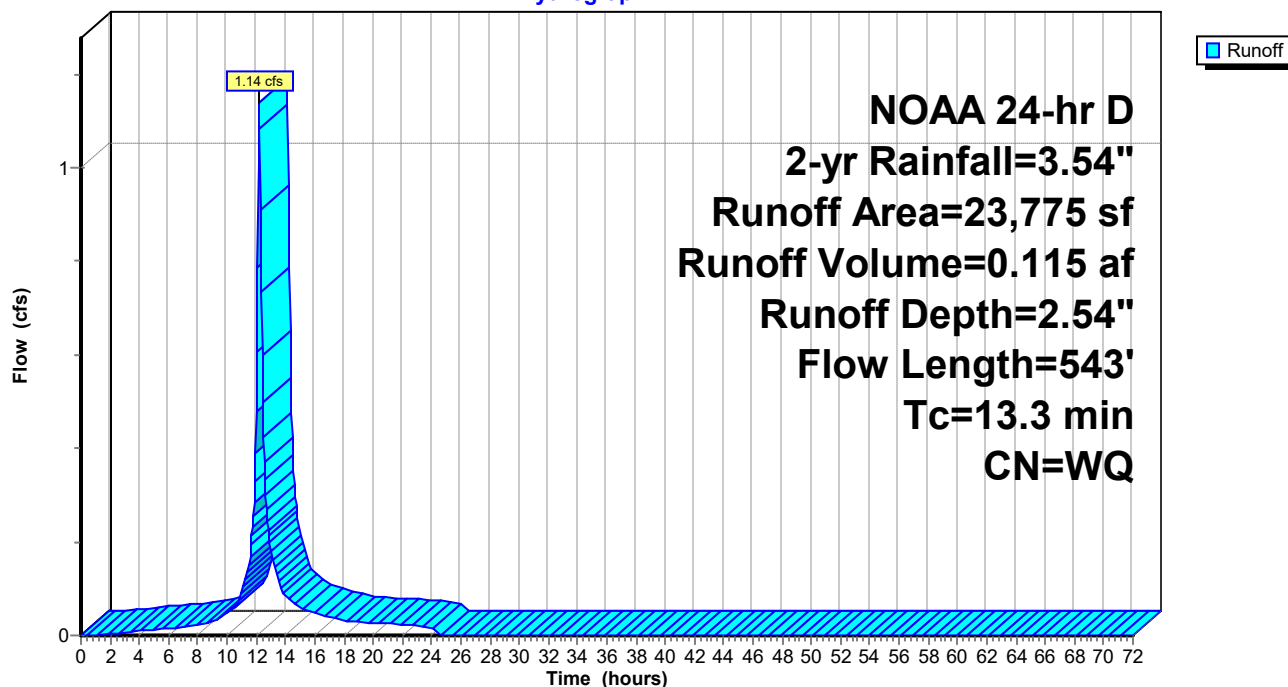
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 3S: #3

Hydrograph



**Existing\_Global Model**

NOAA 24-hr D 2-yr Rainfall=3.54"

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**Summary for Subcatchment 4S: #4**

Runoff = 3.34 cfs @ 12.19 hrs, Volume= 0.325 af, Depth= 3.00"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 10,547    | 98 | Paved parking, HSG D          |
| 40,844    | 96 | Gravel surface, HSG D         |
| 267       | 98 | Roofs, HSG D                  |
| 4,944     | 80 | >75% Grass cover, Good, HSG D |
| 56,602    |    | Weighted Average              |
| 45,788    | 94 | 80.89% Pervious Area          |
| 10,814    | 98 | 19.11% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 60            | 0.0080        | 0.11              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 2.1      | 183           | 0.0080        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                |
| 0.7      | 240           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 11.7     | 483           | Total         |                   |                |                                                                                          |

## Existing\_Global Model

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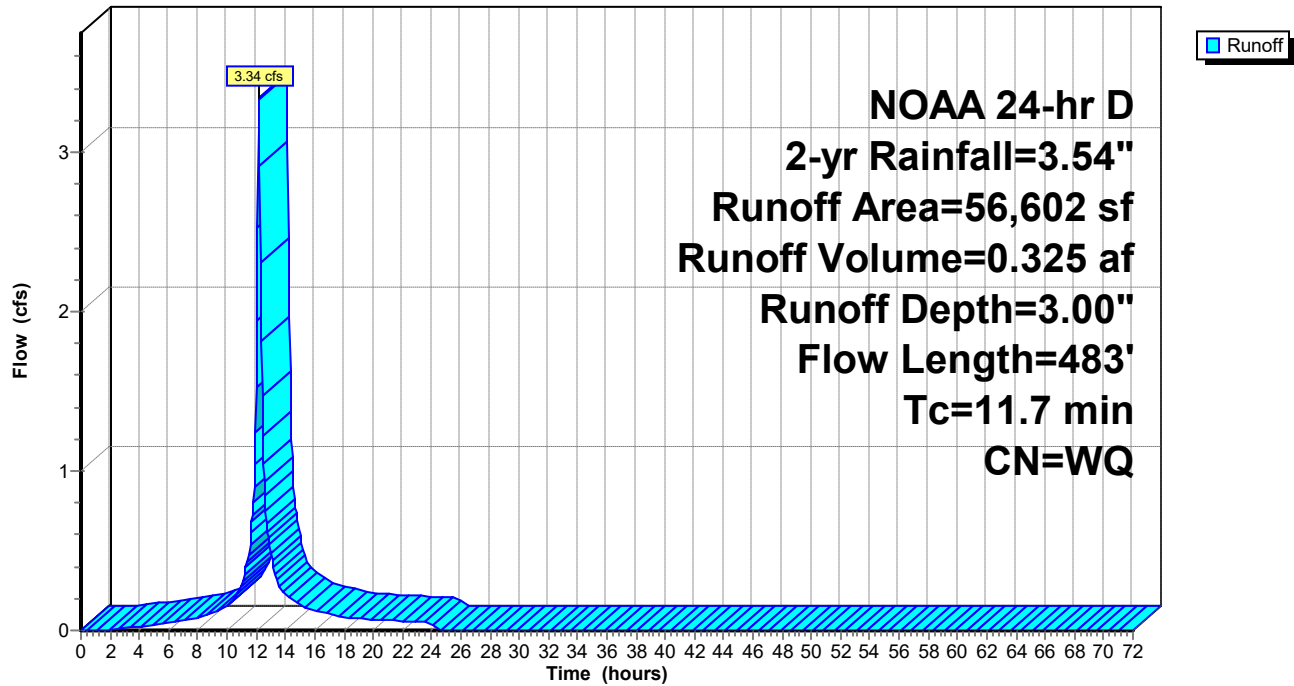
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 4S: #4

Hydrograph



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**Summary for Subcatchment 5S: #5**

Runoff = 1.97 cfs @ 12.15 hrs, Volume= 0.177 af, Depth= 3.08"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

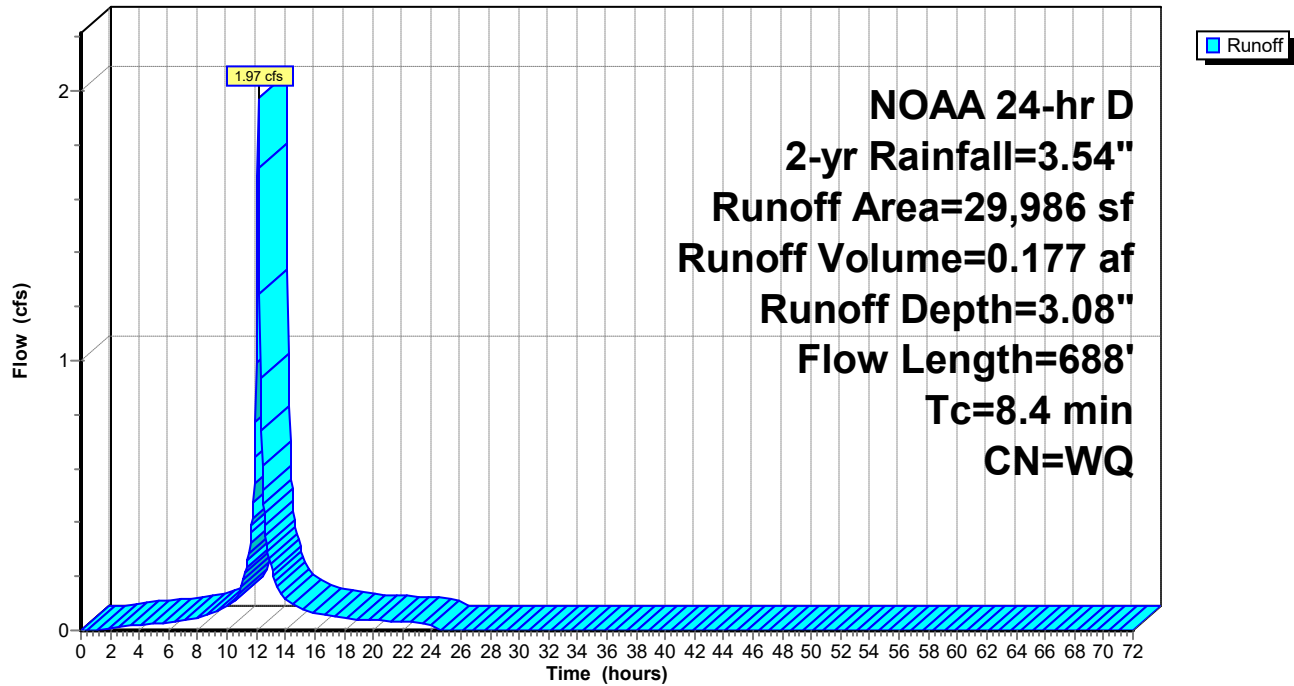
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 23,144    | 98 | Roofs, HSG D                  |
| 228       | 98 | Paved parking, HSG D          |
| 4,093     | 80 | >75% Grass cover, Good, HSG D |
| 2,521     | 98 | Water Surface, 0% imp, HSG D  |
| 29,986    |    | Weighted Average              |
| 6,614     | 87 | 22.06% Pervious Area          |
| 23,372    | 98 | 77.94% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 3.1      | 171           | 0.0020        | 0.91              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 0.1      | 29            | 0.0500        | 3.60              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                         |
| 4.2      | 178           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.035              |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011 |
| 8.4      | 688           | Total         |                   |                |                                                                                   |

Subcatchment 5S: #5

Hydrograph



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**Summary for Subcatchment 6S: #6**

[47] Hint: Peak is 806% of capacity of segment #3

Runoff = 2.87 cfs @ 12.20 hrs, Volume= 0.277 af, Depth= 2.58"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 5,706     | 98 | Roofs, HSG D                  |
| 22,321    | 80 | >75% Grass cover, Good, HSG D |
| 19,713    | 96 | Gravel surface, HSG D         |
| 8,421     | 98 | Paved parking, HSG D          |
| 56,161    |    | Weighted Average              |
| 42,034    | 88 | 74.85% Pervious Area          |
| 14,127    | 98 | 25.15% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                      |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------------------------------|
| 2.3      | 100           | 0.0035        | 0.72              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                         |
| 2.2      | 123           | 0.0035        | 0.95              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                                        |
| 6.8      | 186           | 0.0001        | 0.45              | 0.36           | <b>Pipe Channel,</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 0.7      | 240           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011                                |
| 12.0     | 649           | Total         |                   |                |                                                                                                                  |

## Existing\_Global Model

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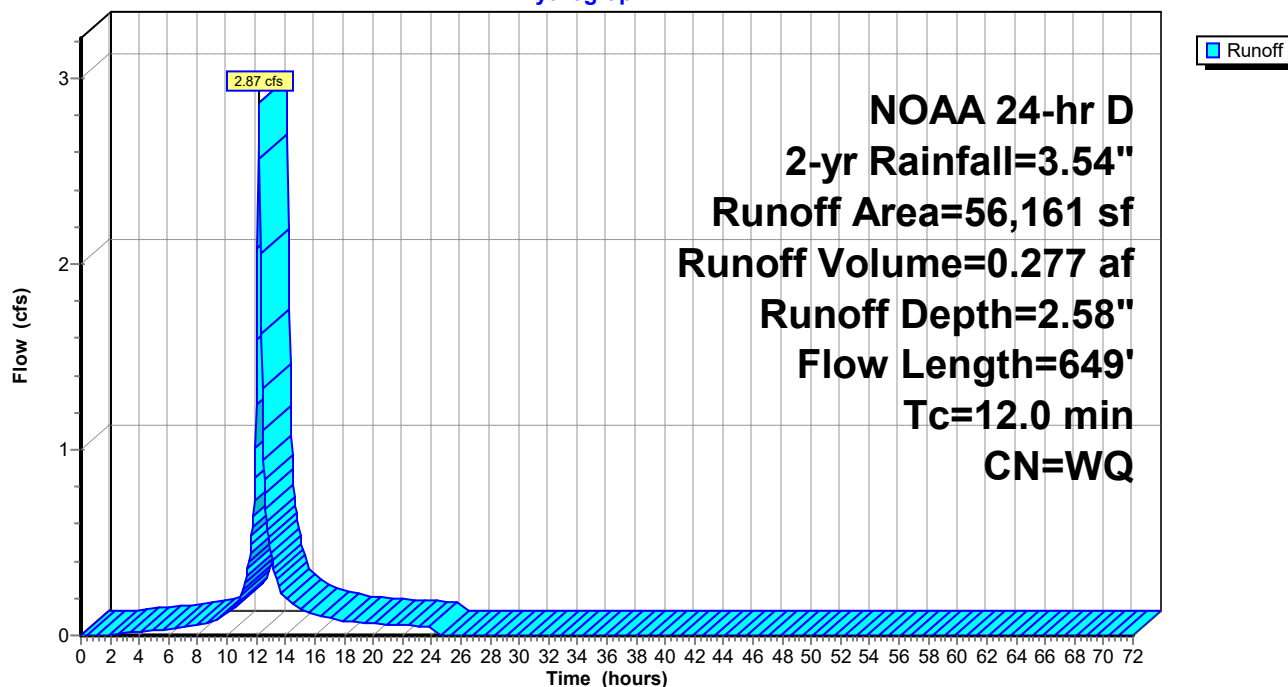
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 6S: #6

Hydrograph



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**Summary for Subcatchment 7S: #7**

Runoff = 3.22 cfs @ 12.20 hrs, Volume= 0.329 af, Depth= 2.99"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 39,428    | 98 | Roofs, HSG D                  |
| 4,293     | 96 | Gravel surface, HSG D         |
| 224       | 98 | Paved parking, HSG D          |
| 10,665    | 80 | >75% Grass cover, Good, HSG D |
| 3,038     | 98 | Water Surface, 0% imp, HSG D  |
| 57,648    |    | Weighted Average              |
| 17,996    | 87 | 31.22% Pervious Area          |
| 39,652    | 98 | 68.78% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 1.2      | 65            | 0.0020        | 0.91              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 2.0      | 140           | 0.0050        | 1.14              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                         |
| 8.6      | 425           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030              |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011 |
| 12.8     | 940           | Total         |                   |                |                                                                                   |

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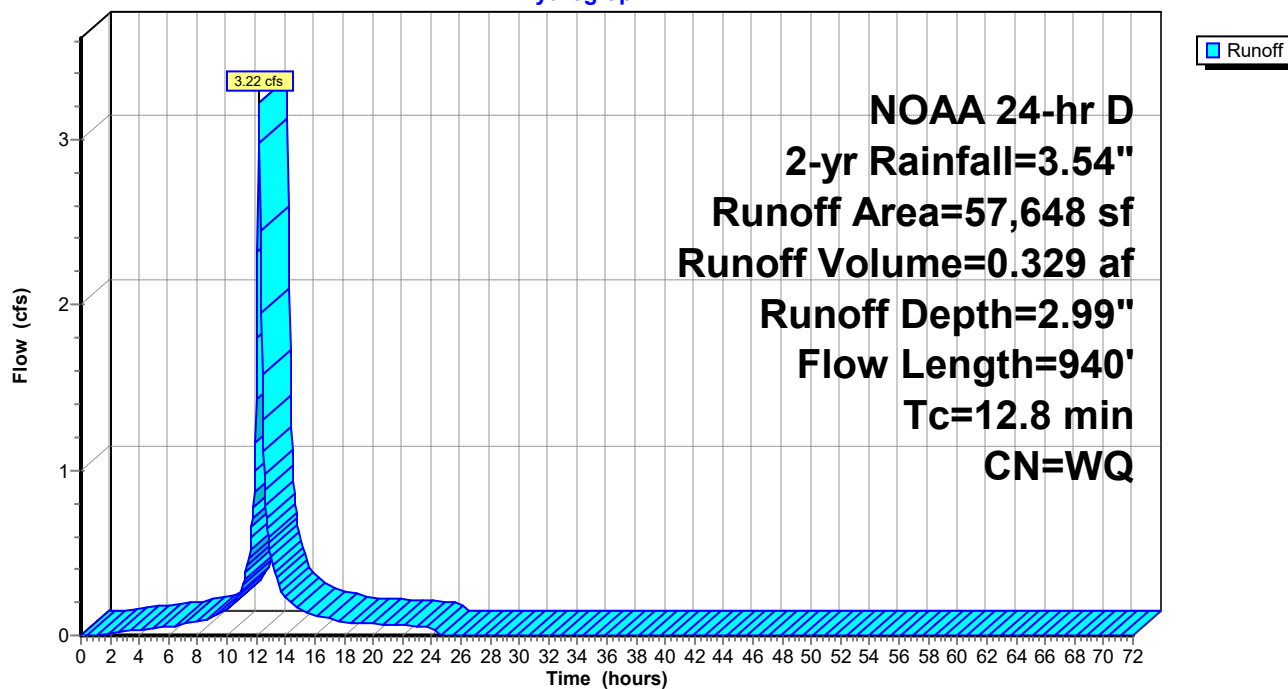
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 7S: #7

Hydrograph



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**Summary for Subcatchment 8S: #8**

Runoff = 0.31 cfs @ 12.30 hrs, Volume= 0.036 af, Depth= 1.80"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 195       | 96 | Gravel surface, HSG D         |
| 9,524     | 80 | >75% Grass cover, Good, HSG D |
| 177       | 98 | Paved parking, HSG D          |
| 470       | 98 | Water Surface, 0% imp, HSG D  |
| 10,366    |    | Weighted Average              |
| 10,189    | 81 | 98.29% Pervious Area          |
| 177       | 98 | 1.71% Impervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                              |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------------------------|
| 8.9         | 76               | 0.0130           | 0.14                 |                   | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 0.9         | 98               | 0.0130           | 1.84                 |                   | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                |
| 9.5         | 474              | 0.0001           | 0.83                 | 53.01             | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030                     |
| 1.0         | 310              | 0.0040           | 5.38                 | 16.91             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 20.3        | 958              | Total            |                      |                   |                                                                                          |

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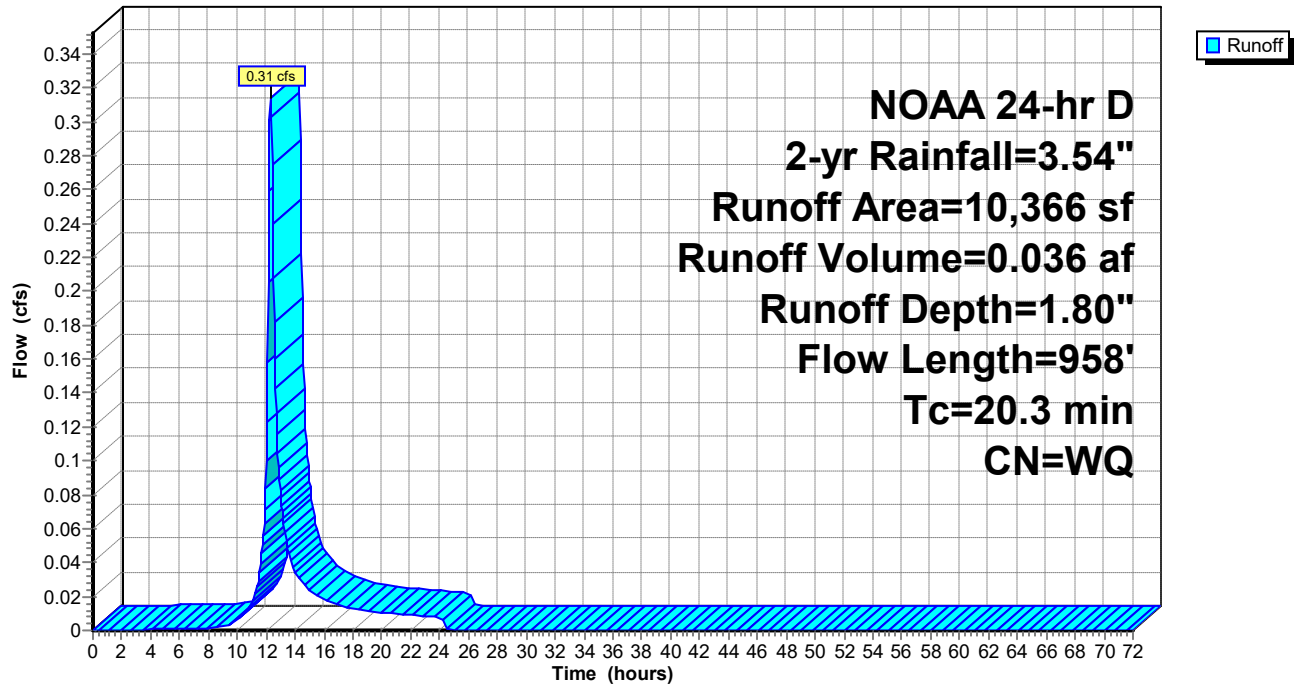
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### Subcatchment 8S: #8

#### Hydrograph



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### Summary for Subcatchment 9S: #9

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.30 cfs @ 12.04 hrs, Volume= 0.096 af, Depth= 3.07"  
Routed to Pond 20P : Pond #2

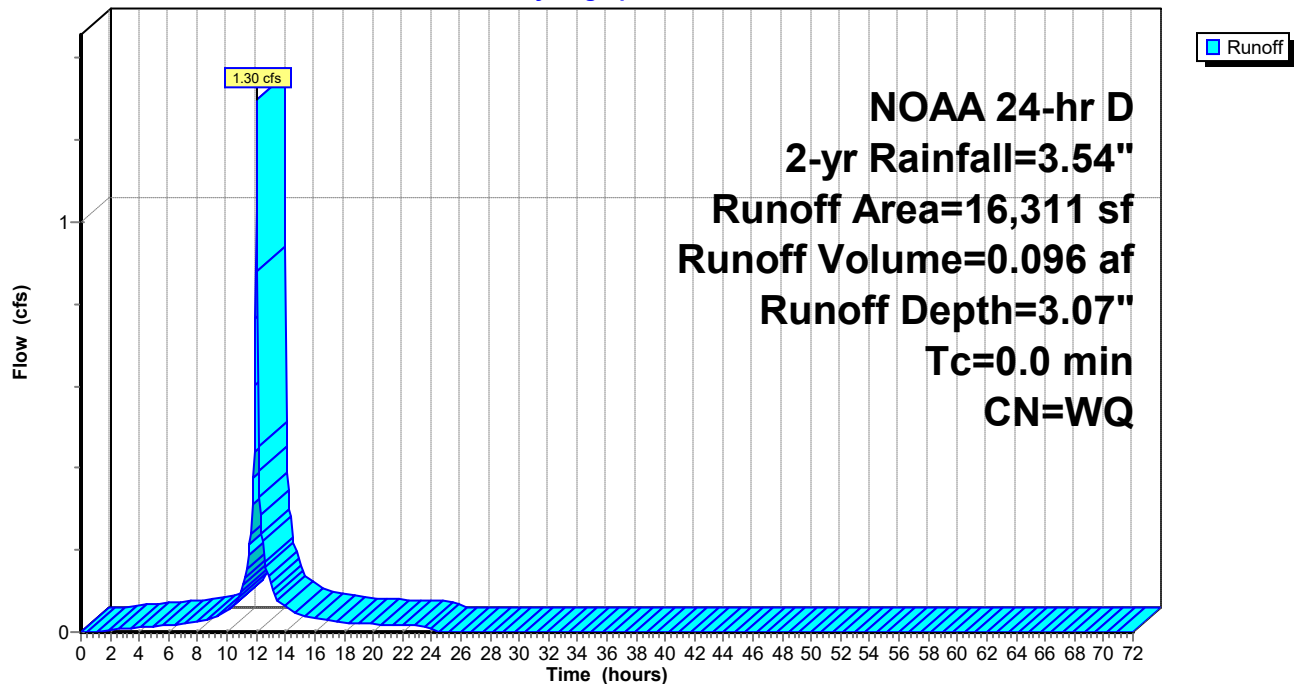
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 13,951    | 98 | Water Surface, HSG D          |
| 2,360     | 80 | >75% Grass cover, Good, HSG D |
| 16,311    |    | Weighted Average              |
| 2,360     | 80 | 14.47% Pervious Area          |
| 13,951    | 98 | 85.53% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description   |
|-------------|------------------|------------------|----------------------|-------------------|---------------|
| 0.0         |                  |                  |                      |                   | Direct Entry, |

### Subcatchment 9S: #9

Hydrograph



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**Summary for Subcatchment 16S: #11**

[47] Hint: Peak is 1572% of capacity of segment #3

Runoff = 13.43 cfs @ 12.15 hrs, Volume= 1.189 af, Depth= 3.24"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description            |
|-----------|----|------------------------|
| 8,641     | 98 | Paved parking, HSG D   |
| 14,953    | 98 | Paved parking, HSG D   |
| 60,610    | 96 | Gravel surface, HSG D  |
| 5,108     | 98 | Roofs, HSG D           |
| 45,331    | 98 | Roofs, HSG D           |
| 57,365    | 98 | Paved parking, HSG D   |
| 192,008   |    | Weighted Average       |
| 60,610    | 96 | 31.57% Pervious Area   |
| 131,398   | 98 | 68.43% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                    |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1.9      | 100           | 0.0056        | 0.87              |                | <b>Sheet Flow, Gravel</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                                |
| 2.9      | 260           | 0.0056        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                                                        |
| 3.3      | 481           | 0.0050        | 2.45              | 0.85           | <b>Pipe Channel, Pipe to Pond 2</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.013 Corrugated PE, smooth interior |
| 8.1      | 841           | Total         |                   |                |                                                                                                                                |

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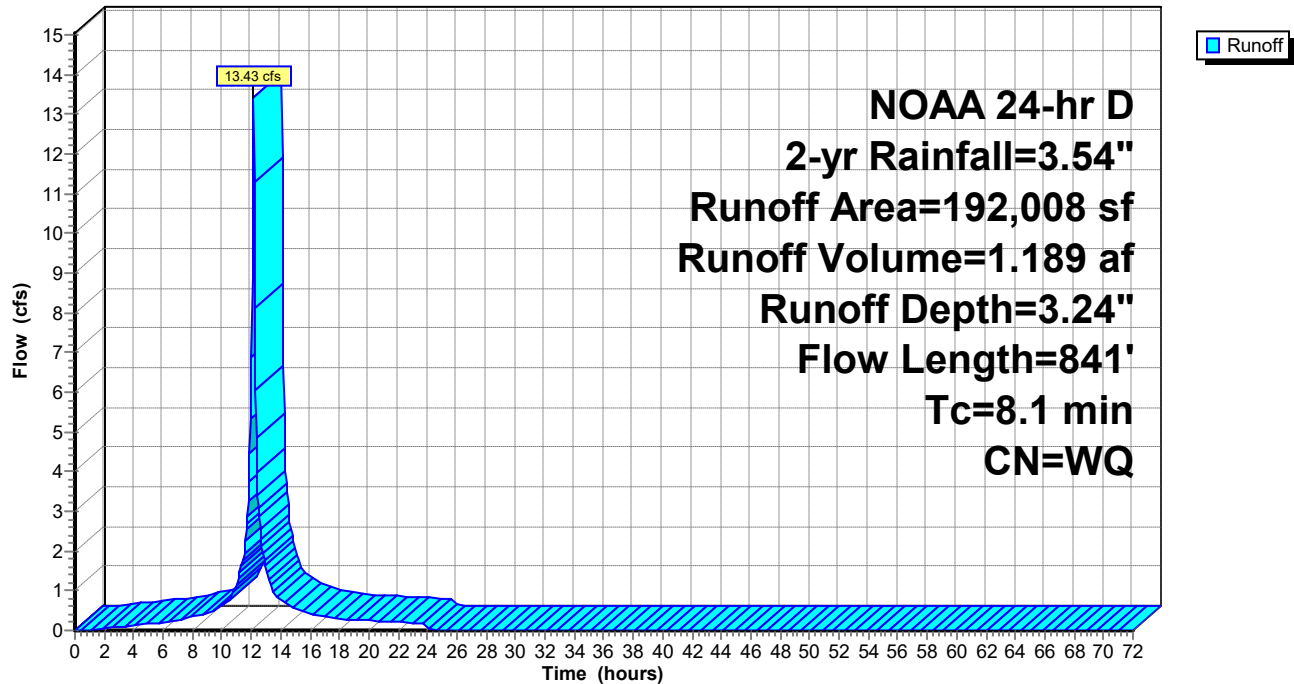
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 16S: #11

Hydrograph



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### Summary for Subcatchment 18S: #10

[46] Hint:  $T_c=0$  (Instant runoff peak depends on dt)

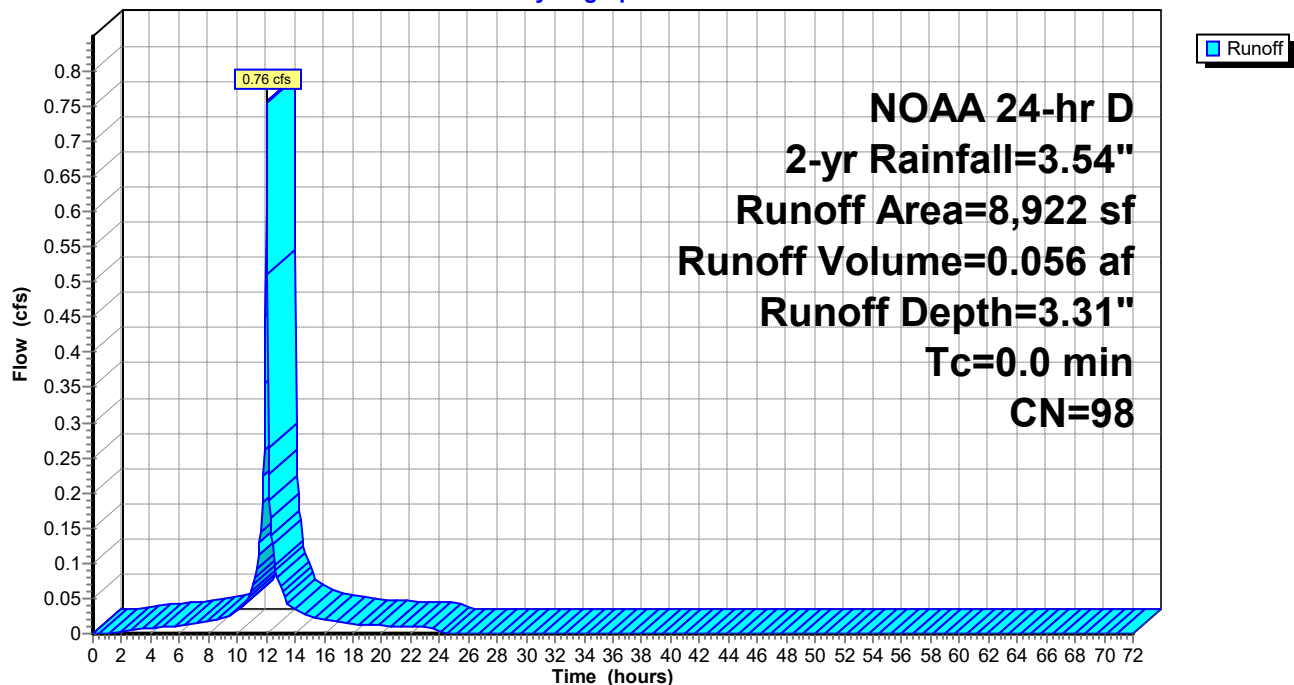
Runoff = 0.76 cfs @ 12.04 hrs, Volume= 0.056 af, Depth= 3.31"  
Routed to Pond 17P : Pond #1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 8,922     | 98 | Water Surface, HSG D    |
| 8,922     | 98 | 100.00% Impervious Area |

### Subcatchment 18S: #10

Hydrograph



**Existing\_Global Model**

NOAA 24-hr D 2-yr Rainfall=3.54"

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**Summary for Pond 16P: Pond #1A**

Inflow Area = 4.751 ac, 12.79% Impervious, Inflow Depth = 2.28" for 2-yr event  
 Inflow = 8.00 cfs @ 12.27 hrs, Volume= 0.904 af  
 Outflow = 1.82 cfs @ 12.95 hrs, Volume= 0.765 af, Atten= 77%, Lag= 40.3 min  
 Primary = 1.82 cfs @ 12.95 hrs, Volume= 0.765 af  
 Routed to Pond 17P : Pond #1B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 174.52' @ 12.95 hrs Surf.Area= 10,074 sf Storage= 19,570 cf  
 Flood Elev= 177.08' Surf.Area= 10,074 sf Storage= 45,333 cf

Plug-Flow detention time= 424.4 min calculated for 0.765 af (85% of inflow)  
 Center-of-Mass det. time= 352.6 min ( 1,167.2 - 814.6 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 45,333 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

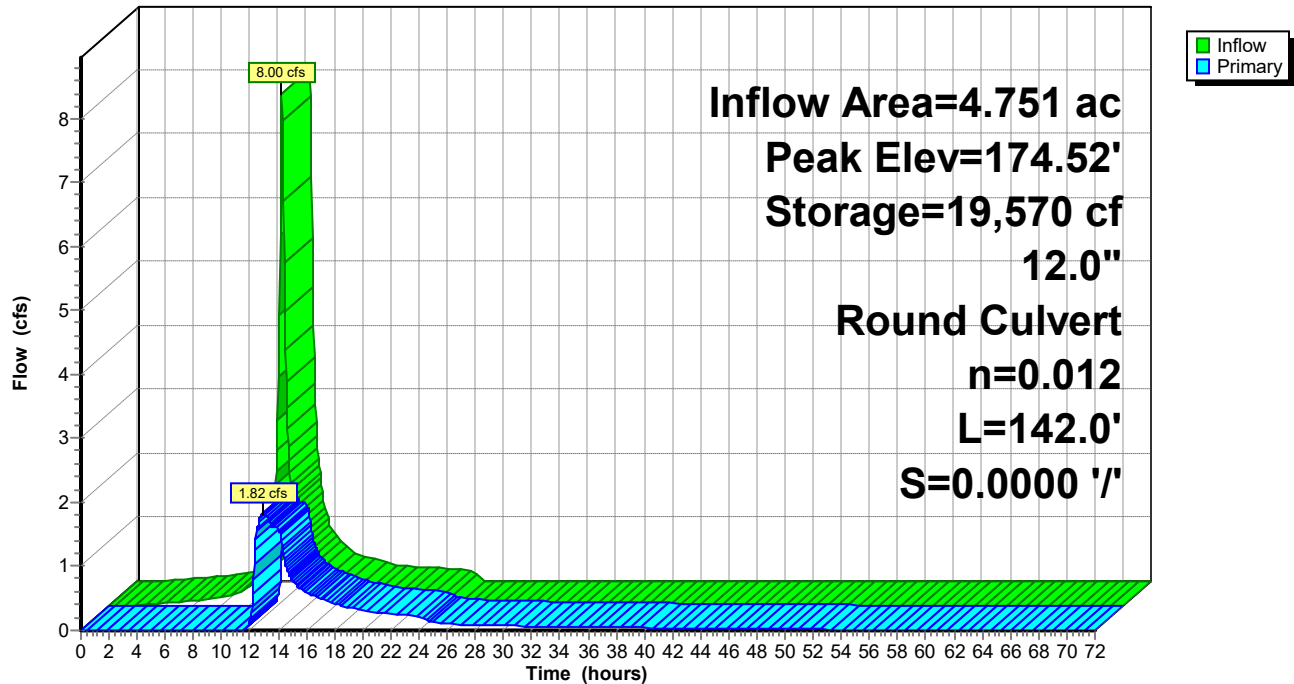
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 10,074               | 0                         | 0                         |
| 177.08              | 10,074               | 45,333                    | 45,333                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                      |
| #1     | Primary | 173.08' | <b>12.0" Round Culvert</b><br>L= 142.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' / Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=1.82 cfs @ 12.95 hrs HW=174.52' TW=173.26' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Barrel Controls 1.82 cfs @ 2.32 fps)

**Pond 16P: Pond #1A**

**Hydrograph**



## Existing\_Global Model

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### Summary for Pond 17P: Pond #1B

Inflow Area = 4.956 ac, 16.39% Impervious, Inflow Depth > 1.99" for 2-yr event  
Inflow = 1.89 cfs @ 12.91 hrs, Volume= 0.821 af  
Outflow = 0.93 cfs @ 14.72 hrs, Volume= 0.701 af, Atten= 51%, Lag= 108.9 min  
Primary = 0.93 cfs @ 14.72 hrs, Volume= 0.701 af  
Routed to Link 19L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 174.04' @ 14.72 hrs Surf.Area= 8,922 sf Storage= 13,024 cf

Plug-Flow detention time= 519.4 min calculated for 0.701 af (85% of inflow)  
Center-of-Mass det. time= 326.6 min ( 1,465.1 - 1,138.5 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 40,149 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 8,922                | 0                         | 0                         |
| 177.08              | 8,922                | 40,149                    | 40,149                    |

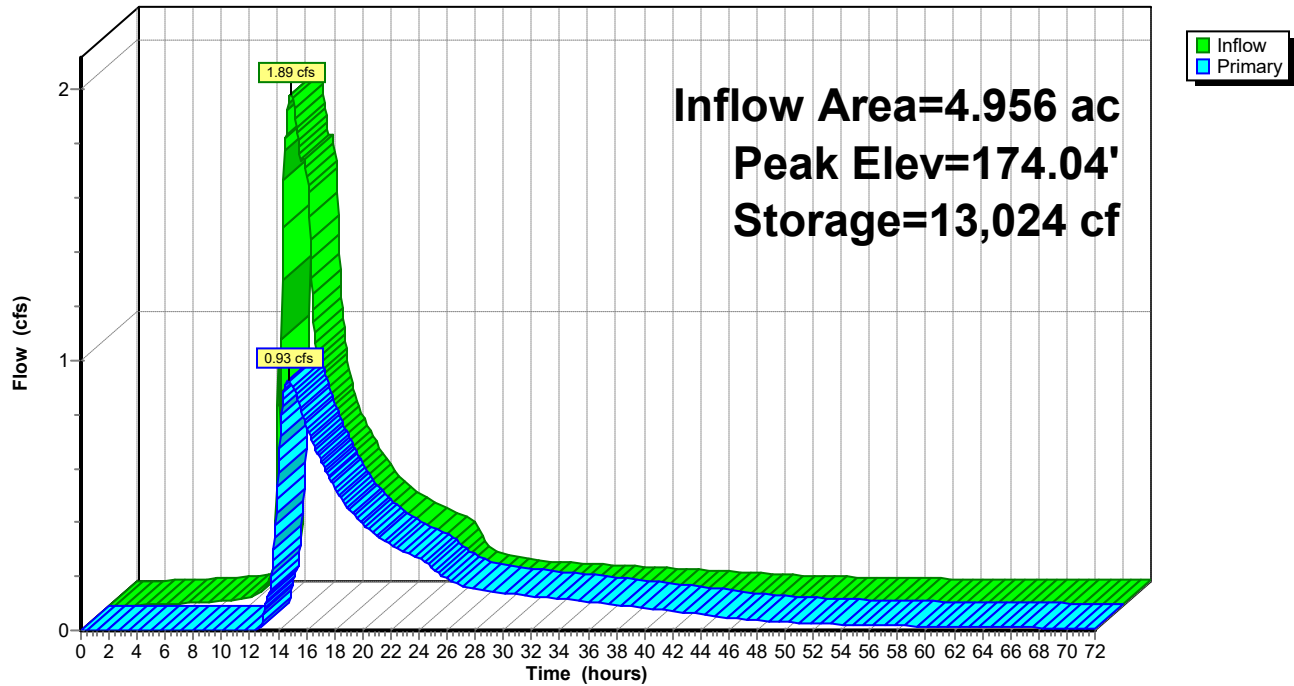
| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                                           |
|--------|----------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Device 4 | 173.08' | <b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                               |
| #2     | Device 4 | 173.58' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                              |
| #3     | Device 4 | 175.83' | <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                                     |
| #4     | Primary  | 173.08' | <b>12.0" Round Culvert</b><br>L= 25.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.93 cfs @ 14.72 hrs HW=174.04' TW=0.00' (Dynamic Tailwater)

4=Culvert (Passes 0.93 cfs of 1.67 cfs potential flow)  
1=Orifice/Grate (Orifice Controls 0.22 cfs @ 4.40 fps)  
2=Orifice/Grate (Orifice Controls 0.71 cfs @ 2.31 fps)  
3=Sharp-Crested Rectangular Weir ( Controls 0.00 cfs)

Pond 17P: Pond #1B

Hydrograph



**Existing\_Global Model**

NOAA 24-hr D 2-yr Rainfall=3.54"

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**Summary for Pond 20P: Pond #2**

Inflow Area = 4.782 ac, 69.77% Impervious, Inflow Depth = 3.22" for 2-yr event  
 Inflow = 13.91 cfs @ 12.14 hrs, Volume= 1.285 af  
 Outflow = 2.06 cfs @ 12.79 hrs, Volume= 1.196 af, Atten= 85%, Lag= 38.7 min  
 Primary = 2.06 cfs @ 12.79 hrs, Volume= 1.196 af  
 Routed to Link 19L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 176.93' @ 12.79 hrs Surf.Area= 13,951 sf Storage= 28,842 cf

Plug-Flow detention time= 301.2 min calculated for 1.196 af (93% of inflow)  
 Center-of-Mass det. time= 261.8 min ( 1,025.0 - 763.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 174.86' | 78,684 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 174.86              | 13,951               | 0                         | 0                         |
| 180.50              | 13,951               | 78,684                    | 78,684                    |

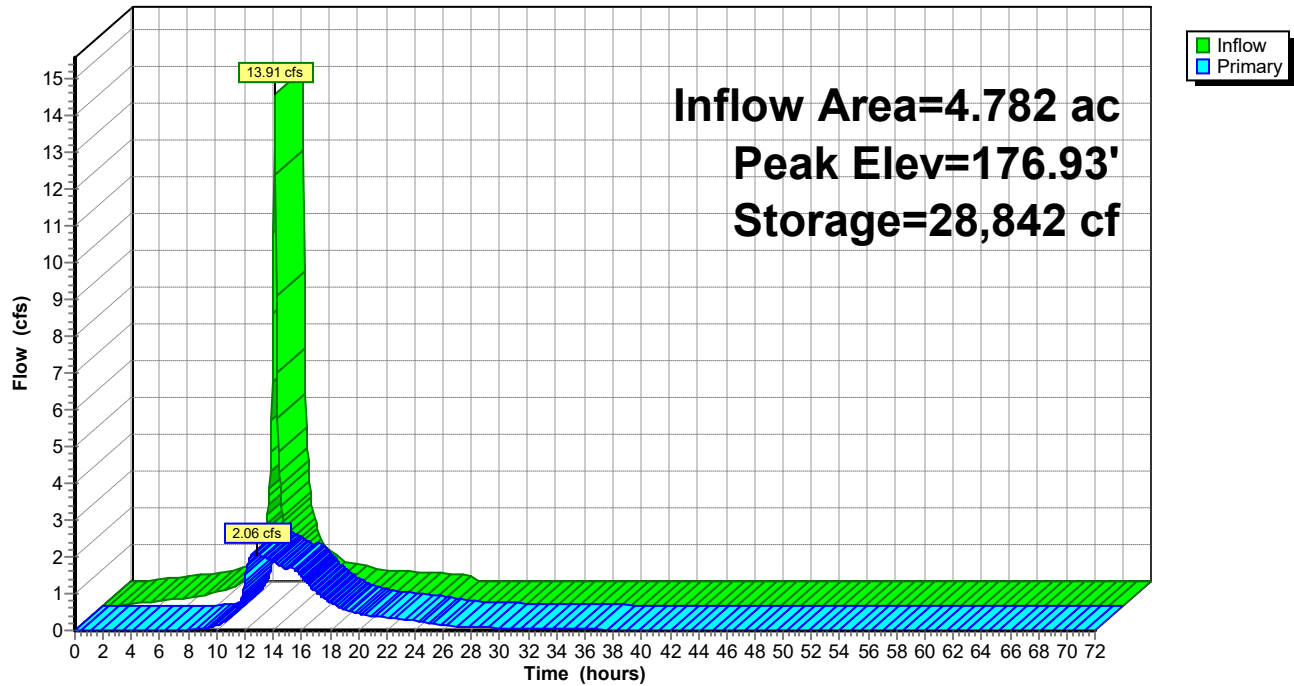
| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 175.09' | <b>12.0" Round Culvert</b><br>L= 352.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 175.09' / 174.58' S= 0.0014 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Primary | 180.00' | <b>540.0' long (Profile 2) Broad-Crested Rectangular Weir</b><br>Head (feet) 0.49 0.98 1.48<br>Coef. (English) 2.90 3.26 3.44                                                                                    |

**Primary OutFlow** Max=2.06 cfs @ 12.79 hrs HW=176.93' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 2.06 cfs @ 2.63 fps)  
 2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

Pond 20P: Pond #2

Hydrograph



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NOAA 24-hr D 2-yr Rainfall=3.54"

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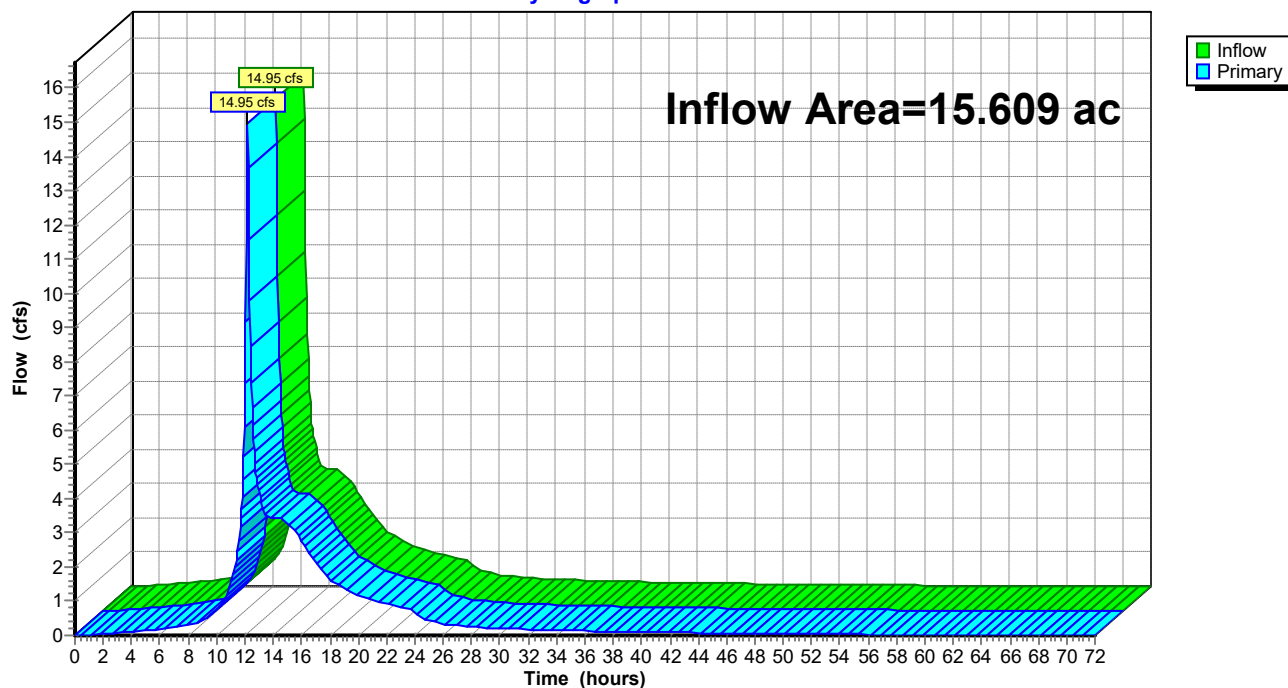
### Summary for Link 15L: Ultimate

Inflow Area = 15.609 ac, 40.92% Impervious, Inflow Depth > 2.49" for 2-yr event  
Inflow = 14.95 cfs @ 12.20 hrs, Volume= 3.234 af  
Primary = 14.95 cfs @ 12.20 hrs, Volume= 3.234 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 15L: Ultimate

Hydrograph



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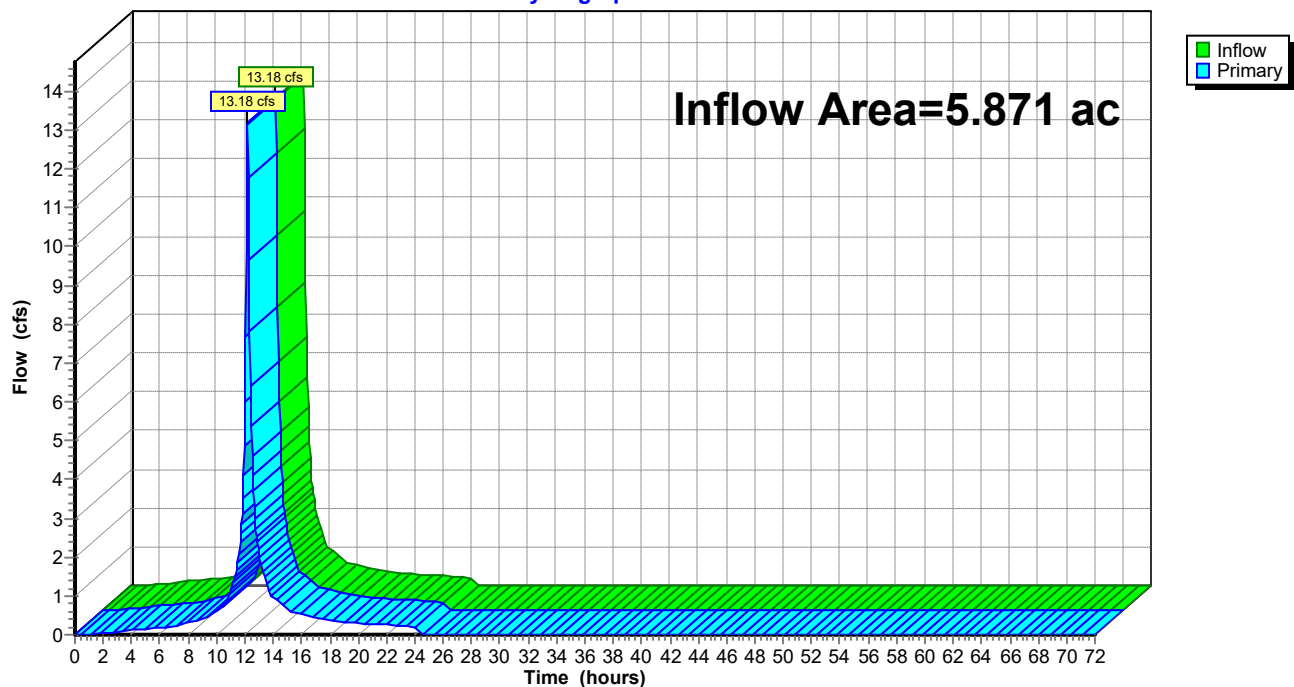
### Summary for Link 18L: Uncontrolled

Inflow Area = 5.871 ac, 38.12% Impervious, Inflow Depth = 2.73" for 2-yr event  
Inflow = 13.18 cfs @ 12.19 hrs, Volume= 1.337 af  
Primary = 13.18 cfs @ 12.19 hrs, Volume= 1.337 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 15L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 18L: Uncontrolled

Hydrograph



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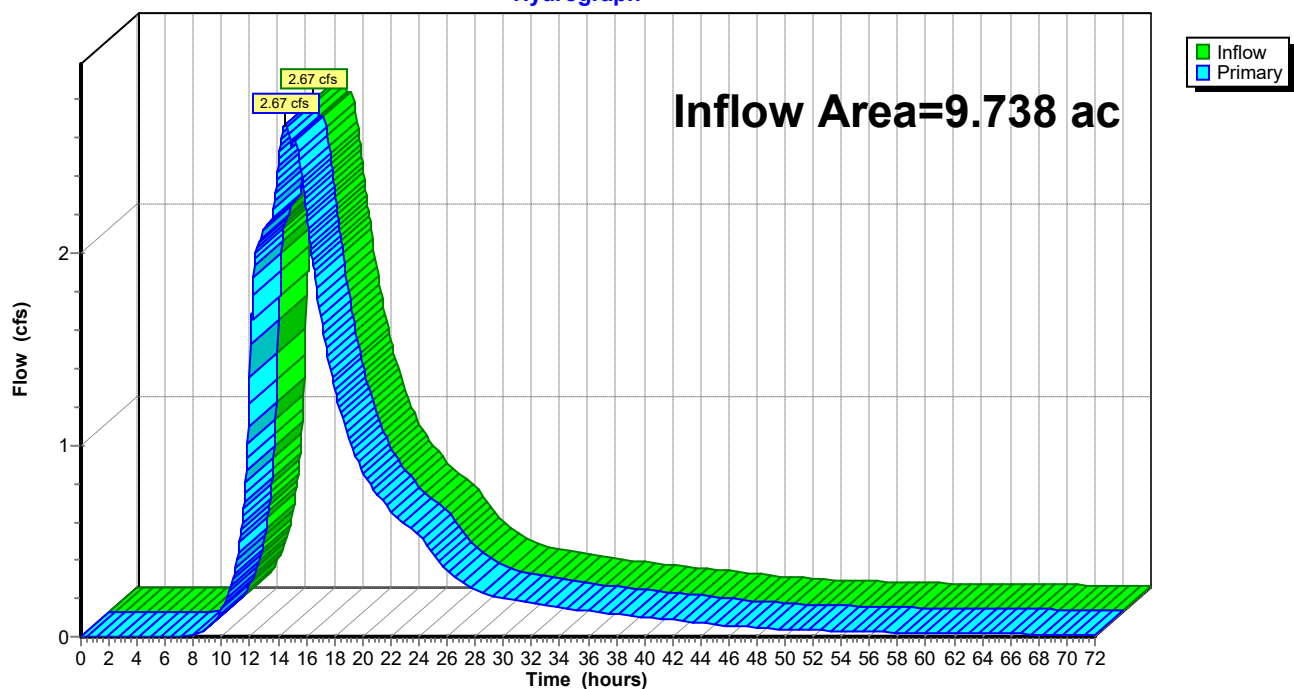
### Summary for Link 19L: Controlled

Inflow Area = 9.738 ac, 42.61% Impervious, Inflow Depth > 2.34" for 2-yr event  
Inflow = 2.67 cfs @ 14.48 hrs, Volume= 1.898 af  
Primary = 2.67 cfs @ 14.48 hrs, Volume= 1.898 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 15L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 19L: Controlled

Hydrograph



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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                               |                                                                                                                                            |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment 1S: #1</b>    | Runoff Area=206,959 sf 12.79% Impervious Runoff Depth=3.82"<br>Flow Length=665' Tc=18.7 min CN=WQ Runoff=13.34 cfs 1.514 af                |
| <b>Subcatchment 2S: #2</b>    | Runoff Area=21,184 sf 1.89% Impervious Runoff Depth=3.38"<br>Flow Length=723' Tc=18.6 min CN=WQ Runoff=1.25 cfs 0.137 af                   |
| <b>Subcatchment 3S: #3</b>    | Runoff Area=23,775 sf 37.60% Impervious Runoff Depth=4.11"<br>Flow Length=543' Tc=13.3 min CN=WQ Runoff=1.84 cfs 0.187 af                  |
| <b>Subcatchment 4S: #4</b>    | Runoff Area=56,602 sf 19.11% Impervious Runoff Depth=4.67"<br>Flow Length=483' Tc=11.7 min CN=WQ Runoff=5.10 cfs 0.506 af                  |
| <b>Subcatchment 5S: #5</b>    | Runoff Area=29,986 sf 77.94% Impervious Runoff Depth=4.74"<br>Flow Length=688' Tc=8.4 min CN=WQ Runoff=3.00 cfs 0.272 af                   |
| <b>Subcatchment 6S: #6</b>    | Runoff Area=56,161 sf 25.15% Impervious Runoff Depth=4.17"<br>Flow Length=649' Tc=12.0 min CN=WQ Runoff=4.60 cfs 0.448 af                  |
| <b>Subcatchment 7S: #7</b>    | Runoff Area=57,648 sf 68.78% Impervious Runoff Depth=4.63"<br>Flow Length=940' Tc=12.8 min CN=WQ Runoff=4.94 cfs 0.511 af                  |
| <b>Subcatchment 8S: #8</b>    | Runoff Area=10,366 sf 1.71% Impervious Runoff Depth=3.25"<br>Flow Length=958' Tc=20.3 min CN=WQ Runoff=0.57 cfs 0.065 af                   |
| <b>Subcatchment 9S: #9</b>    | Runoff Area=16,311 sf 85.53% Impervious Runoff Depth=4.73"<br>Tc=0.0 min CN=WQ Runoff=1.98 cfs 0.148 af                                    |
| <b>Subcatchment 16S: #11</b>  | Runoff Area=192,008 sf 68.43% Impervious Runoff Depth=4.93"<br>Flow Length=841' Tc=8.1 min CN=WQ Runoff=20.08 cfs 1.811 af                 |
| <b>Subcatchment 18S: #10</b>  | Runoff Area=8,922 sf 100.00% Impervious Runoff Depth=5.00"<br>Tc=0.0 min CN=98 Runoff=1.13 cfs 0.085 af                                    |
| <b>Pond 16P: Pond #1A</b>     | Peak Elev=175.63' Storage=30,694 cf Inflow=13.34 cfs 1.514 af<br>12.0" Round Culvert n=0.012 L=142.0' S=0.0000 ' Outflow=3.41 cfs 1.374 af |
| <b>Pond 17P: Pond #1B</b>     | Peak Elev=174.52' Storage=17,319 cf Inflow=3.52 cfs 1.459 af<br>Outflow=2.17 cfs 1.339 af                                                  |
| <b>Pond 20P: Pond #2</b>      | Peak Elev=177.90' Storage=42,478 cf Inflow=20.80 cfs 1.958 af<br>Outflow=2.71 cfs 1.870 af                                                 |
| <b>Link 15L: Ultimate</b>     | Inflow=23.02 cfs 5.334 af<br>Primary=23.02 cfs 5.334 af                                                                                    |
| <b>Link 18L: Uncontrolled</b> | Inflow=20.68 cfs 2.125 af<br>Primary=20.68 cfs 2.125 af                                                                                    |

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### Link 19L: Controlled

Inflow=4.72 cfs 3.209 af

Primary=4.72 cfs 3.209 af

**Total Runoff Area = 15.609 ac   Runoff Volume = 5.682 af   Average Runoff Depth = 4.37"**  
**59.08% Pervious = 9.222 ac   40.92% Impervious = 6.387 ac**

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**Summary for Subcatchment 1S: #1**

[47] Hint: Peak is 530% of capacity of segment #3

Runoff = 13.34 cfs @ 12.27 hrs, Volume= 1.514 af, Depth= 3.82"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 121,340   | 80 | >75% Grass cover, Good, HSG D |
| 16,397    | 98 | Paved parking, HSG D          |
| 59,148    | 96 | Gravel surface, HSG D         |
| 10,074    | 98 | Water Surface, HSG D          |
| 206,959   |    | Weighted Average              |
| 180,488   | 85 | 87.21% Pervious Area          |
| 26,471    | 98 | 12.79% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                          |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow, Sheet Flow</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length                                  |
| 8.6      | 398           | 0.0023        | 0.77              |                | <b>Shallow Concentrated Flow, Shallow Concentrated Flow</b><br>Unpaved Kv= 16.1 fps                                                  |
| 1.2      | 235           | 0.0050        | 3.21              | 2.52           | <b>Pipe Channel, 12" Perforated Pipe</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 18.7     | 665           | Total         |                   |                |                                                                                                                                      |

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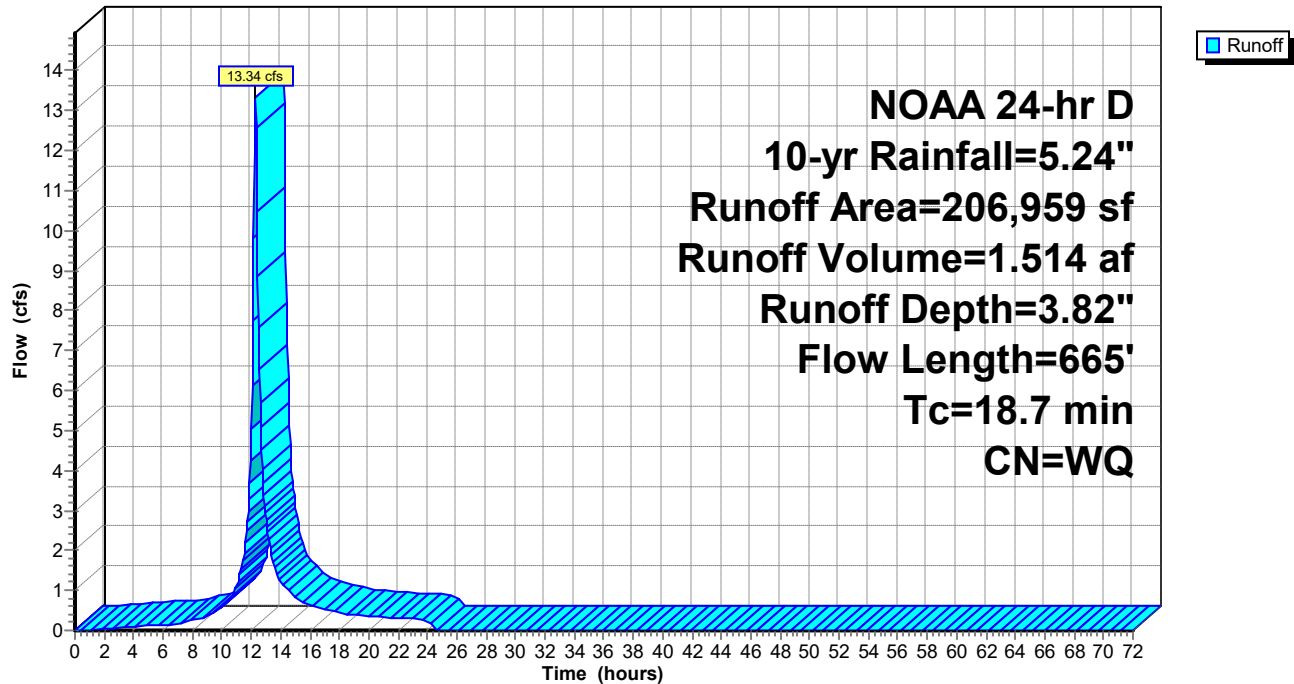
NOAA 24-hr D 10-yr Rainfall=5.24"

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### Subcatchment 1S: #1

Hydrograph



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**Summary for Subcatchment 2S: #2**

Runoff = 1.25 cfs @ 12.27 hrs, Volume= 0.137 af, Depth= 3.38"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

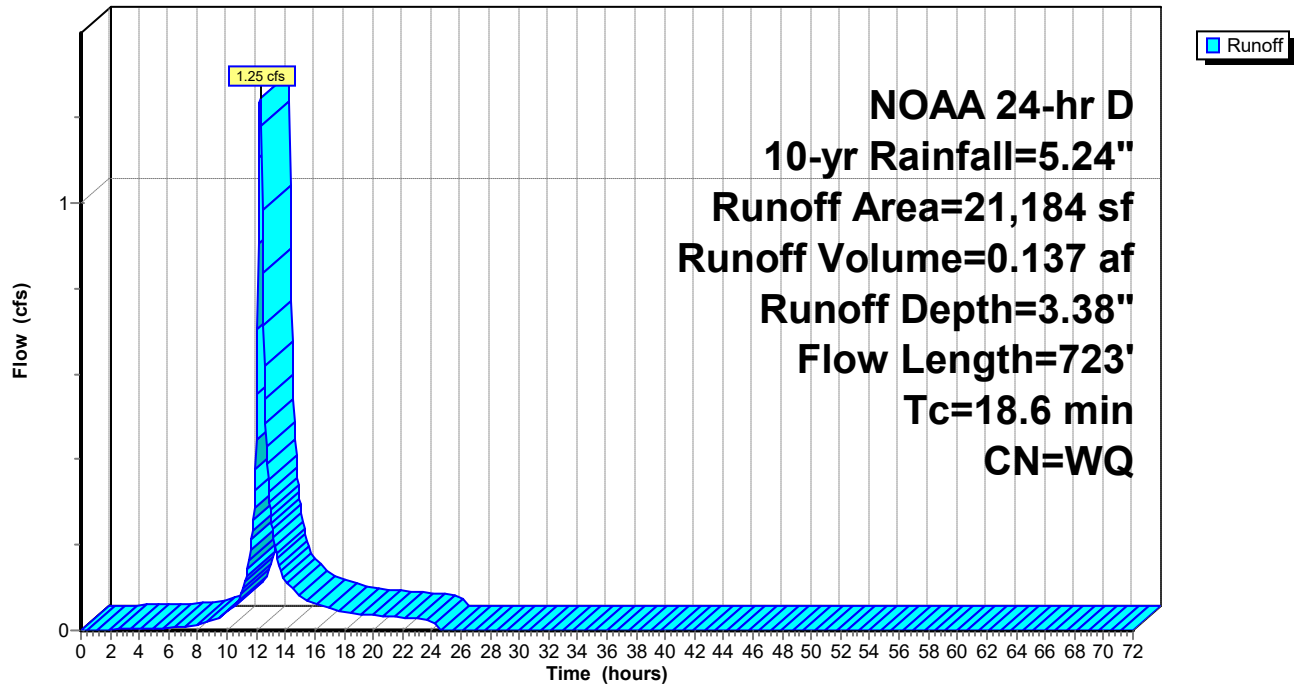
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 401       | 98 | Paved parking, HSG D          |
| 18,044    | 80 | >75% Grass cover, Good, HSG D |
| 2,739     | 98 | Water Surface, 0% imp, HSG D  |
| 21,184    |    | Weighted Average              |
| 20,783    | 82 | 98.11% Pervious Area          |
| 401       | 98 | 1.89% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------|
| 9.0      | 33            | 0.0024        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length   |
| 2.7      | 129           | 0.0024        | 0.79              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                  |
| 5.9      | 251           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.035 Earth, dense weeds |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011          |
| 18.6     | 723           | Total         |                   |                |                                                                                            |

Subcatchment 2S: #2

Hydrograph



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**Summary for Subcatchment 3S: #3**

Runoff = 1.84 cfs @ 12.21 hrs, Volume= 0.187 af, Depth= 4.11"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

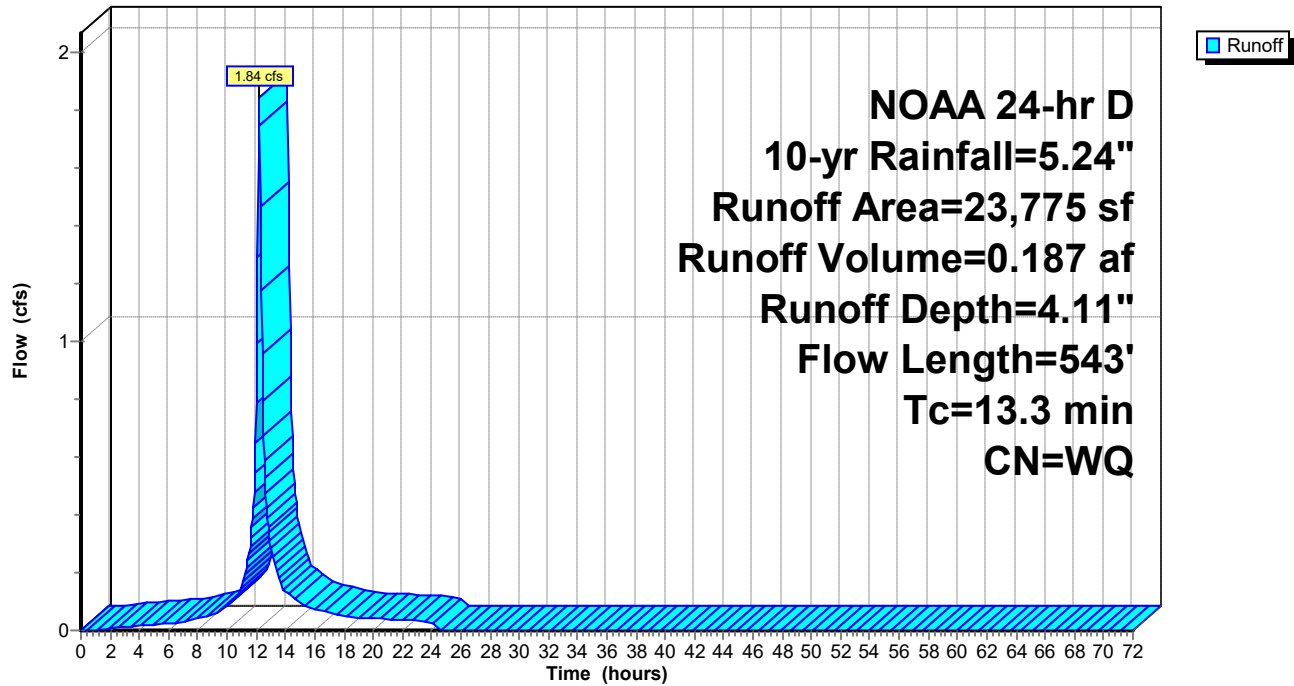
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,884     | 98 | Paved parking, HSG D          |
| 2,219     | 98 | Water Surface, 0% imp, HSG D  |
| 10,956    | 80 | >75% Grass cover, Good, HSG D |
| 1,661     | 96 | Gravel surface, HSG D         |
| 55        | 98 | Roofs, HSG D                  |
| 23,775    |    | Weighted Average              |
| 14,836    | 84 | 62.40% Pervious Area          |
| 8,939     | 98 | 37.60% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------|
| 8.9      | 60            | 0.0080        | 0.11              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length   |
| 0.6      | 55            | 0.0080        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                  |
| 2.8      | 118           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.035 Earth, dense weeds |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011          |
| 13.3     | 543           | Total         |                   |                |                                                                                            |

Subcatchment 3S: #3

Hydrograph



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**Summary for Subcatchment 4S: #4**

Runoff = 5.10 cfs @ 12.19 hrs, Volume= 0.506 af, Depth= 4.67"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 10,547    | 98 | Paved parking, HSG D          |
| 40,844    | 96 | Gravel surface, HSG D         |
| 267       | 98 | Roofs, HSG D                  |
| 4,944     | 80 | >75% Grass cover, Good, HSG D |
| 56,602    |    | Weighted Average              |
| 45,788    | 94 | 80.89% Pervious Area          |
| 10,814    | 98 | 19.11% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 60            | 0.0080        | 0.11              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 2.1      | 183           | 0.0080        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                |
| 0.7      | 240           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 11.7     | 483           | Total         |                   |                |                                                                                          |

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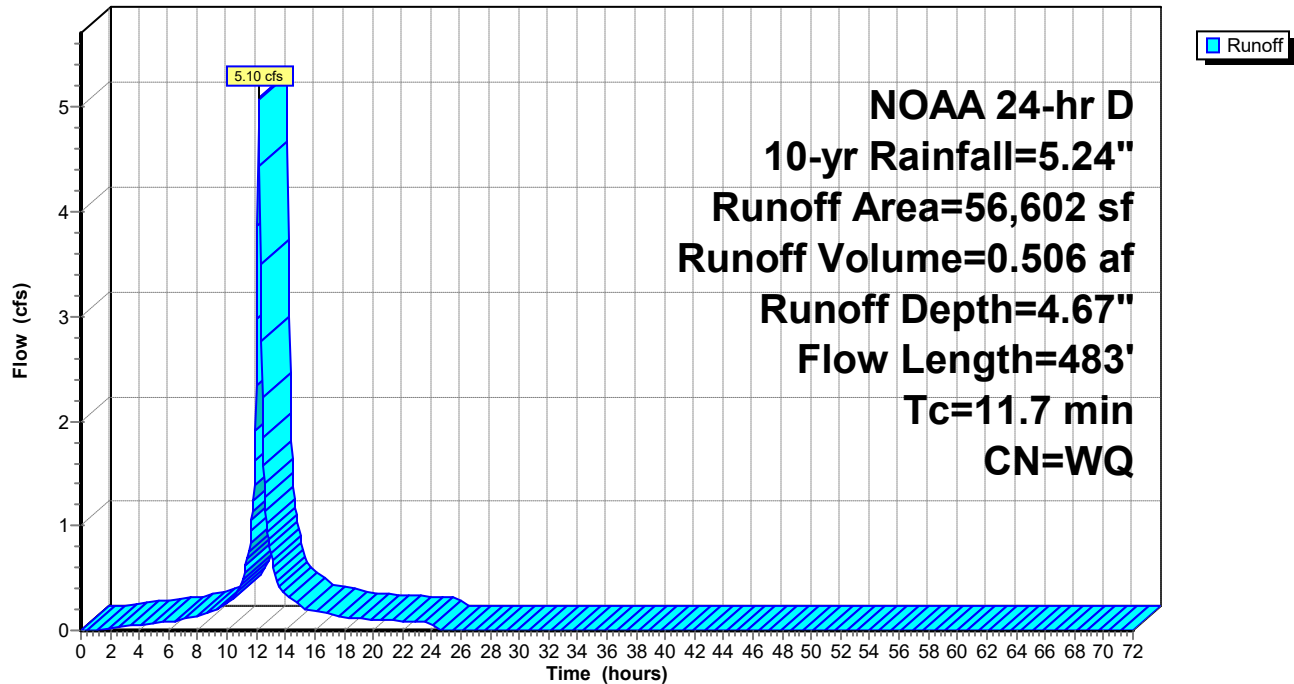
NOAA 24-hr D 10-yr Rainfall=5.24"

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### Subcatchment 4S: #4

Hydrograph



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**Summary for Subcatchment 5S: #5**

Runoff = 3.00 cfs @ 12.15 hrs, Volume= 0.272 af, Depth= 4.74"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

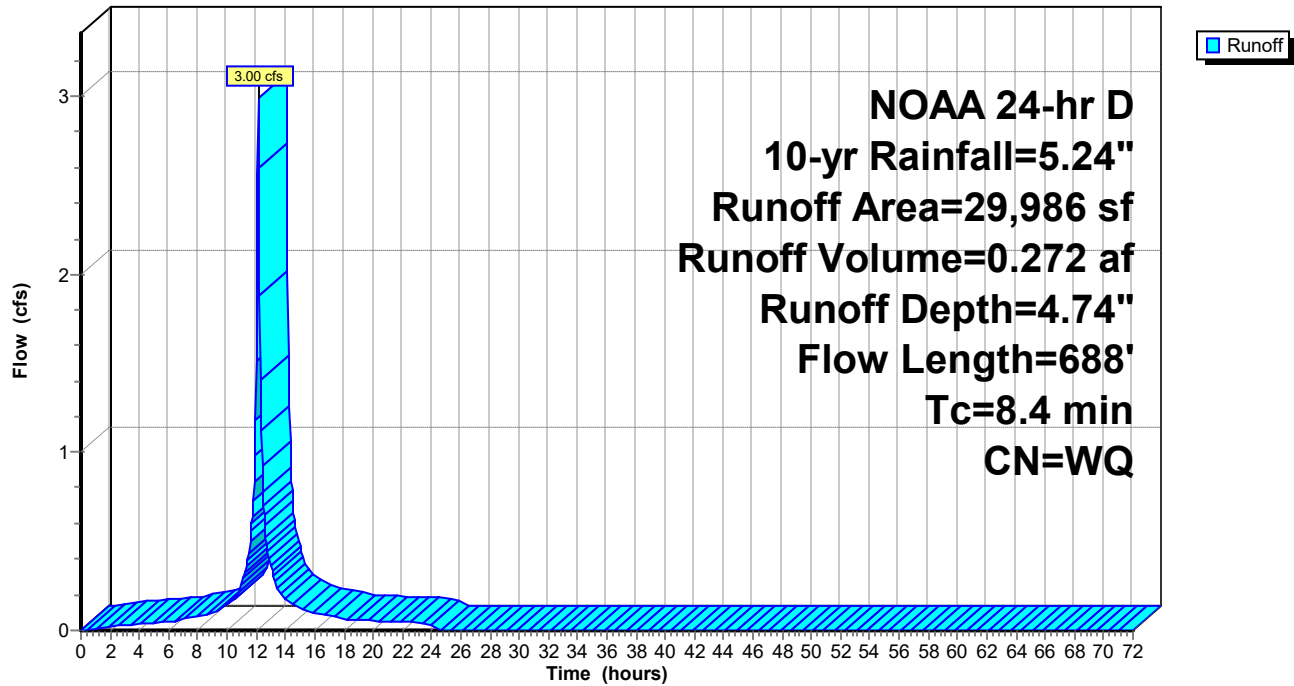
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 23,144    | 98 | Roofs, HSG D                  |
| 228       | 98 | Paved parking, HSG D          |
| 4,093     | 80 | >75% Grass cover, Good, HSG D |
| 2,521     | 98 | Water Surface, 0% imp, HSG D  |
| 29,986    |    | Weighted Average              |
| 6,614     | 87 | 22.06% Pervious Area          |
| 23,372    | 98 | 77.94% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 3.1      | 171           | 0.0020        | 0.91              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 0.1      | 29            | 0.0500        | 3.60              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                         |
| 4.2      | 178           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.035              |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011 |
| 8.4      | 688           | Total         |                   |                |                                                                                   |

Subcatchment 5S: #5

Hydrograph



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NOAA 24-hr D 10-yr Rainfall=5.24"

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**Summary for Subcatchment 6S: #6**

[47] Hint: Peak is 1290% of capacity of segment #3

Runoff = 4.60 cfs @ 12.19 hrs, Volume= 0.448 af, Depth= 4.17"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

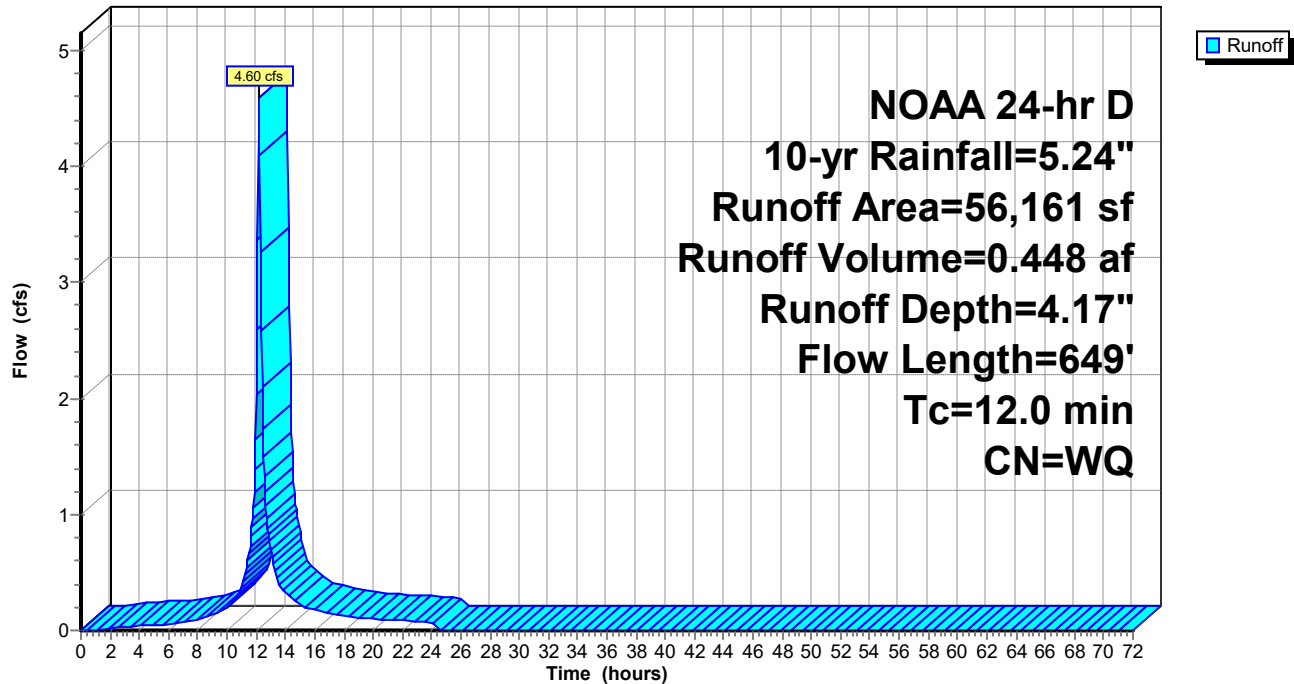
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 5,706     | 98 | Roofs, HSG D                  |
| 22,321    | 80 | >75% Grass cover, Good, HSG D |
| 19,713    | 96 | Gravel surface, HSG D         |
| 8,421     | 98 | Paved parking, HSG D          |
| 56,161    |    | Weighted Average              |
| 42,034    | 88 | 74.85% Pervious Area          |
| 14,127    | 98 | 25.15% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                      |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------------------------------|
| 2.3      | 100           | 0.0035        | 0.72              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                         |
| 2.2      | 123           | 0.0035        | 0.95              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                                        |
| 6.8      | 186           | 0.0001        | 0.45              | 0.36           | <b>Pipe Channel,</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 0.7      | 240           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011                                |
| 12.0     | 649           | Total         |                   |                |                                                                                                                  |

Subcatchment 6S: #6

Hydrograph



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NOAA 24-hr D 10-yr Rainfall=5.24"

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**Summary for Subcatchment 7S: #7**

Runoff = 4.94 cfs @ 12.20 hrs, Volume= 0.511 af, Depth= 4.63"  
 Routed to Link 18L : Uncontrolled

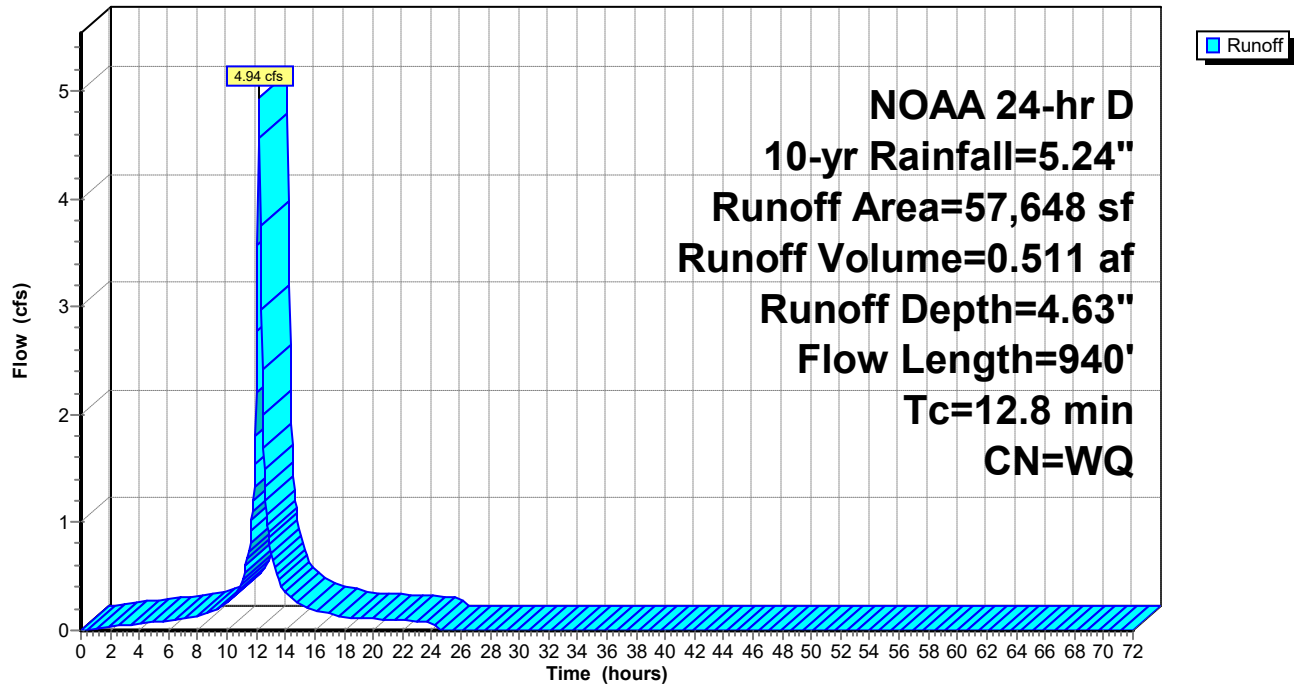
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 39,428    | 98 | Roofs, HSG D                  |
| 4,293     | 96 | Gravel surface, HSG D         |
| 224       | 98 | Paved parking, HSG D          |
| 10,665    | 80 | >75% Grass cover, Good, HSG D |
| 3,038     | 98 | Water Surface, 0% imp, HSG D  |
| 57,648    |    | Weighted Average              |
| 17,996    | 87 | 31.22% Pervious Area          |
| 39,652    | 98 | 68.78% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 1.2      | 65            | 0.0020        | 0.91              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 2.0      | 140           | 0.0050        | 1.14              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                         |
| 8.6      | 425           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030              |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011 |
| 12.8     | 940           | Total         |                   |                |                                                                                   |

Subcatchment 7S: #7

Hydrograph



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NOAA 24-hr D 10-yr Rainfall=5.24"

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**Summary for Subcatchment 8S: #8**

Runoff = 0.57 cfs @ 12.30 hrs, Volume= 0.065 af, Depth= 3.25"  
 Routed to Link 18L : Uncontrolled

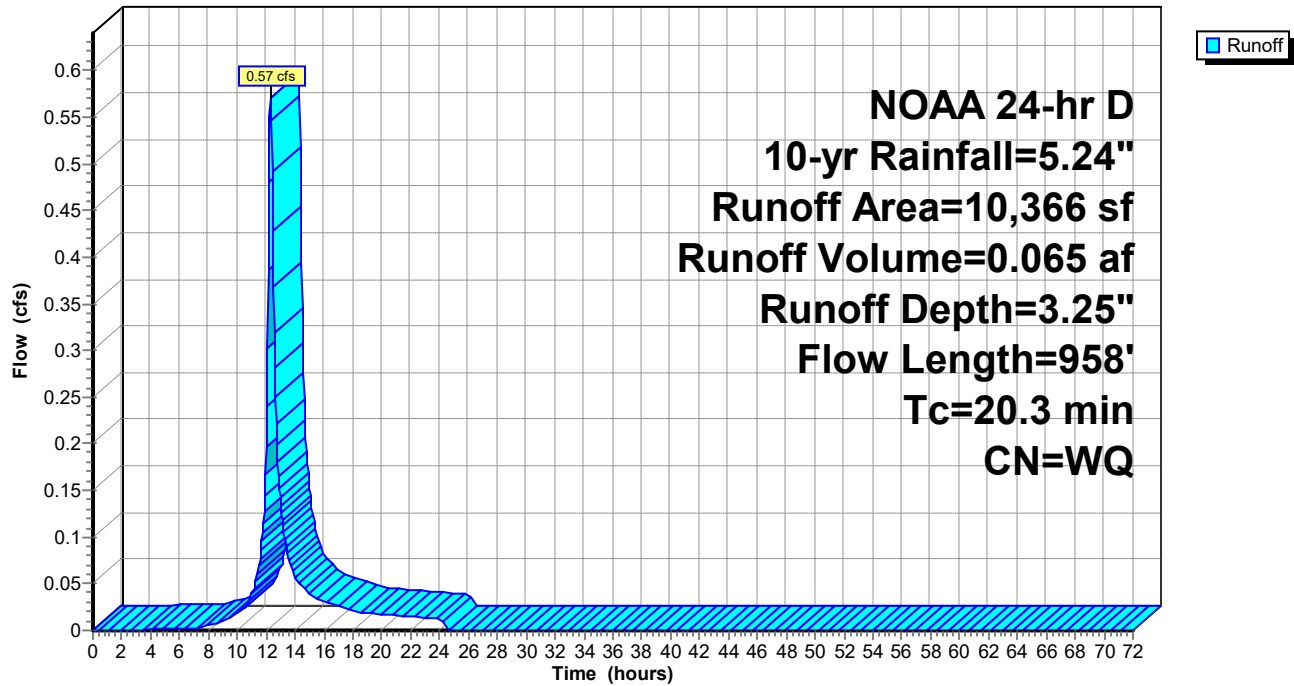
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 195       | 96 | Gravel surface, HSG D         |
| 9,524     | 80 | >75% Grass cover, Good, HSG D |
| 177       | 98 | Paved parking, HSG D          |
| 470       | 98 | Water Surface, 0% imp, HSG D  |
| 10,366    |    | Weighted Average              |
| 10,189    | 81 | 98.29% Pervious Area          |
| 177       | 98 | 1.71% Impervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                              |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------------------------|
| 8.9         | 76               | 0.0130           | 0.14                 |                   | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 0.9         | 98               | 0.0130           | 1.84                 |                   | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                |
| 9.5         | 474              | 0.0001           | 0.83                 | 53.01             | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030                     |
| 1.0         | 310              | 0.0040           | 5.38                 | 16.91             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 20.3        | 958              | Total            |                      |                   |                                                                                          |

Subcatchment 8S: #8

Hydrograph



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### Summary for Subcatchment 9S: #9

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.98 cfs @ 12.04 hrs, Volume= 0.148 af, Depth= 4.73"  
Routed to Pond 20P : Pond #2

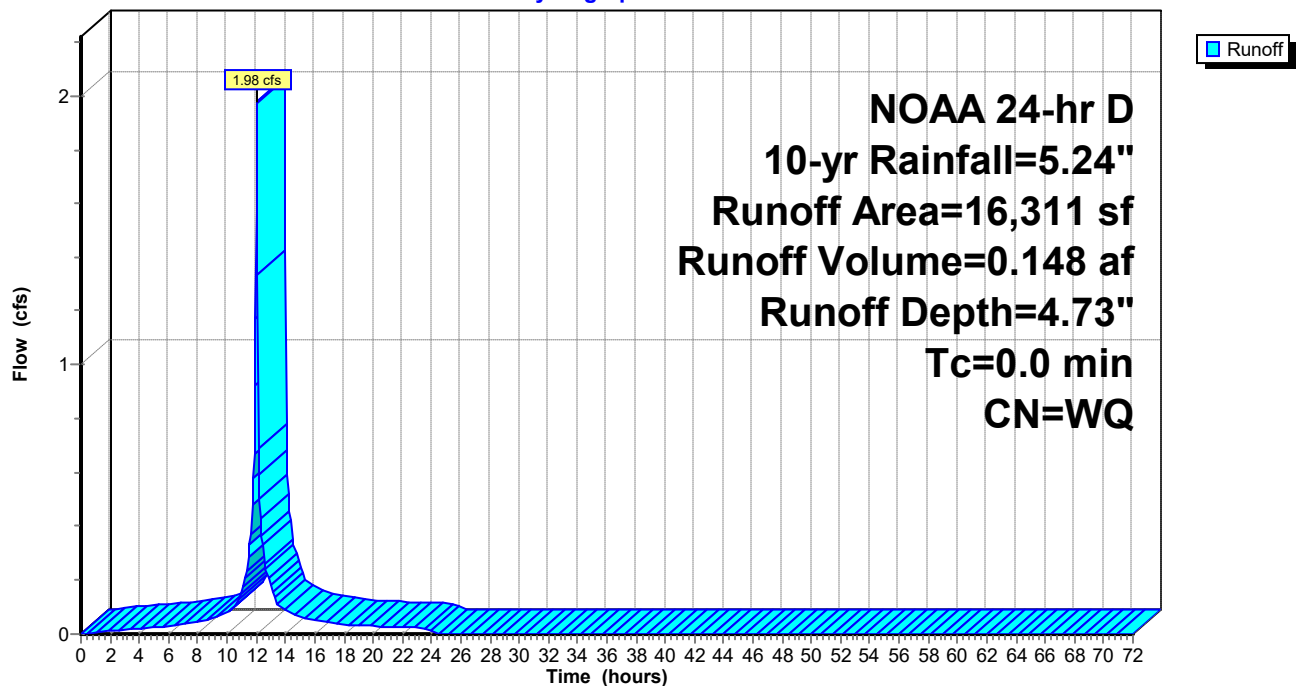
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 13,951    | 98 | Water Surface, HSG D          |
| 2,360     | 80 | >75% Grass cover, Good, HSG D |
| 16,311    |    | Weighted Average              |
| 2,360     | 80 | 14.47% Pervious Area          |
| 13,951    | 98 | 85.53% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 0.0      |               |               |                   |                | Direct Entry, |

### Subcatchment 9S: #9

Hydrograph



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**Summary for Subcatchment 16S: #11**

[47] Hint: Peak is 2350% of capacity of segment #3

Runoff = 20.08 cfs @ 12.15 hrs, Volume= 1.811 af, Depth= 4.93"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

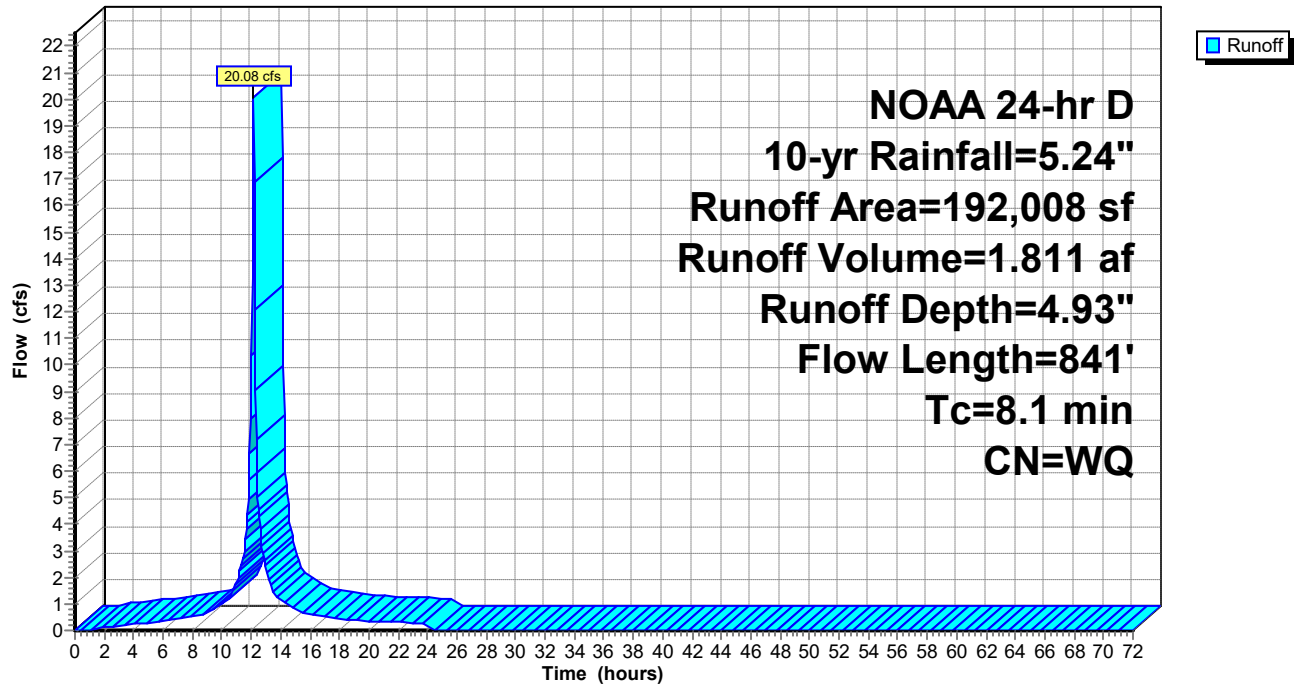
| Area (sf) | CN | Description            |
|-----------|----|------------------------|
| 8,641     | 98 | Paved parking, HSG D   |
| 14,953    | 98 | Paved parking, HSG D   |
| 60,610    | 96 | Gravel surface, HSG D  |
| 5,108     | 98 | Roofs, HSG D           |
| 45,331    | 98 | Roofs, HSG D           |
| 57,365    | 98 | Paved parking, HSG D   |
| 192,008   |    | Weighted Average       |
| 60,610    | 96 | 31.57% Pervious Area   |
| 131,398   | 98 | 68.43% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                    |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1.9      | 100           | 0.0056        | 0.87              |                | <b>Sheet Flow, Gravel</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                                |
| 2.9      | 260           | 0.0056        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                                                        |
| 3.3      | 481           | 0.0050        | 2.45              | 0.85           | <b>Pipe Channel, Pipe to Pond 2</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.013 Corrugated PE, smooth interior |
| 8.1      | 841           | Total         |                   |                |                                                                                                                                |

Subcatchment 16S: #11

Hydrograph



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### Summary for Subcatchment 18S: #10

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

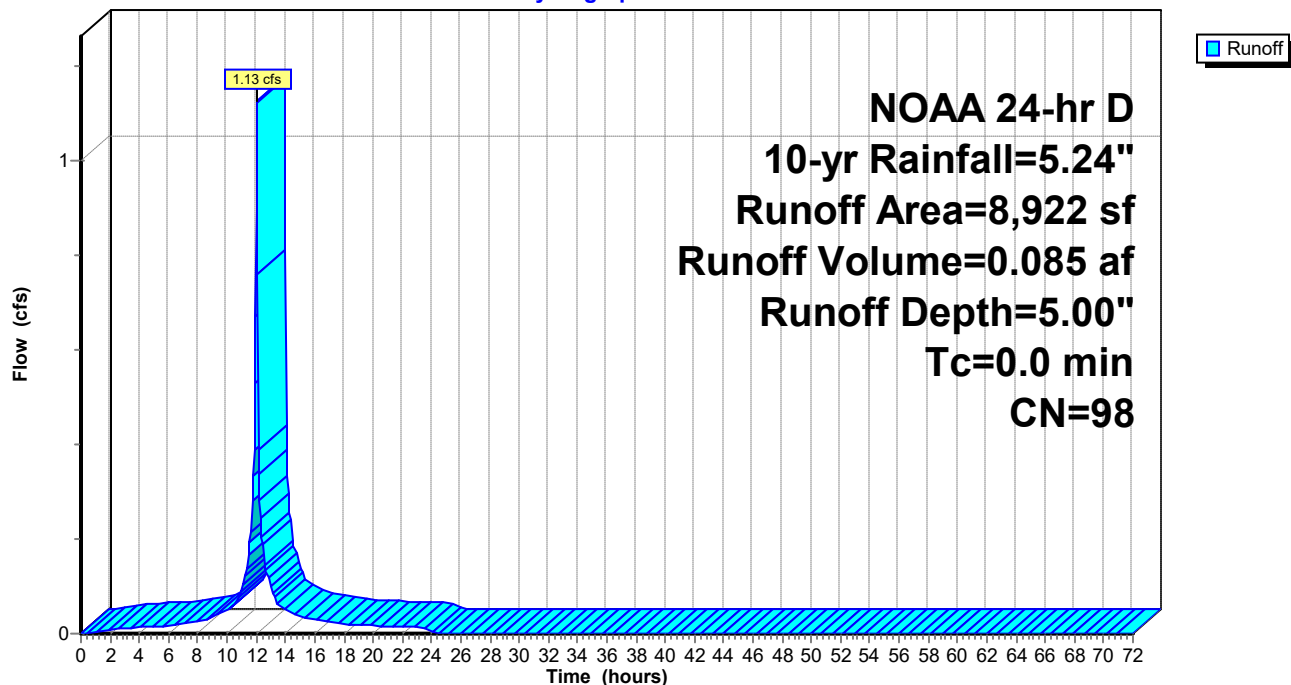
Runoff = 1.13 cfs @ 12.04 hrs, Volume= 0.085 af, Depth= 5.00"  
Routed to Pond 17P : Pond #1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 8,922     | 98 | Water Surface, HSG D    |
| 8,922     | 98 | 100.00% Impervious Area |

### Subcatchment 18S: #10

Hydrograph



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**Summary for Pond 16P: Pond #1A**

Inflow Area = 4.751 ac, 12.79% Impervious, Inflow Depth = 3.82" for 10-yr event  
 Inflow = 13.34 cfs @ 12.27 hrs, Volume= 1.514 af  
 Outflow = 3.41 cfs @ 12.84 hrs, Volume= 1.374 af, Atten= 74%, Lag= 34.4 min  
 Primary = 3.41 cfs @ 12.84 hrs, Volume= 1.374 af  
 Routed to Pond 17P : Pond #1B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 175.63' @ 12.84 hrs Surf.Area= 10,074 sf Storage= 30,694 cf  
 Flood Elev= 177.08' Surf.Area= 10,074 sf Storage= 45,333 cf

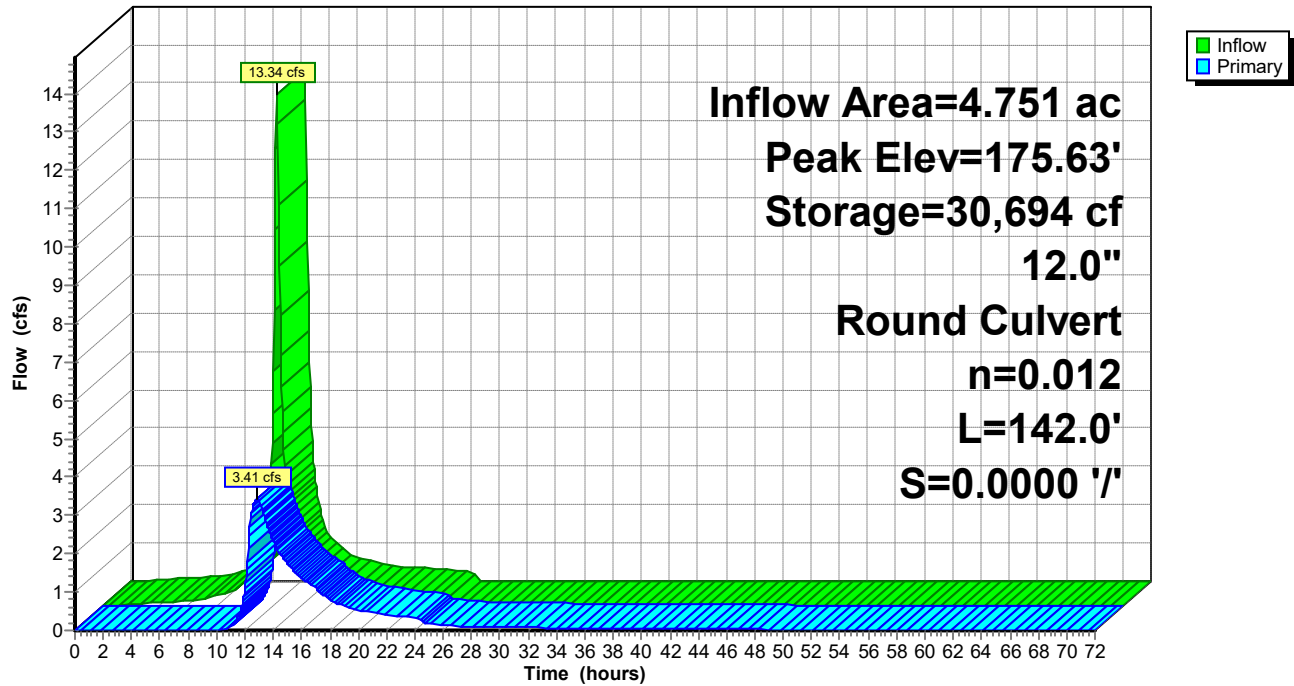
Plug-Flow detention time= 315.6 min calculated for 1.373 af (91% of inflow)  
 Center-of-Mass det. time= 268.5 min ( 1,072.3 - 803.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 45,333 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 10,074               | 0                         | 0                         |
| 177.08              | 10,074               | 45,333                    | 45,333                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                      |
| #1     | Primary | 173.08' | <b>12.0" Round Culvert</b><br>L= 142.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' / Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.41 cfs @ 12.84 hrs HW=175.63' TW=173.91' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Barrel Controls 3.41 cfs @ 4.34 fps)

**Pond 16P: Pond #1A****Hydrograph**

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### Summary for Pond 17P: Pond #1B

Inflow Area = 4.956 ac, 16.39% Impervious, Inflow Depth > 3.53" for 10-yr event  
Inflow = 3.52 cfs @ 12.80 hrs, Volume= 1.459 af  
Outflow = 2.17 cfs @ 14.26 hrs, Volume= 1.339 af, Atten= 38%, Lag= 87.6 min  
Primary = 2.17 cfs @ 14.26 hrs, Volume= 1.339 af  
Routed to Link 19L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 174.52' @ 14.26 hrs Surf.Area= 8,922 sf Storage= 17,319 cf

Plug-Flow detention time= 319.0 min calculated for 1.339 af (92% of inflow)  
Center-of-Mass det. time= 203.9 min ( 1,256.9 - 1,053.0 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 40,149 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 8,922                | 0                         | 0                         |
| 177.08              | 8,922                | 40,149                    | 40,149                    |

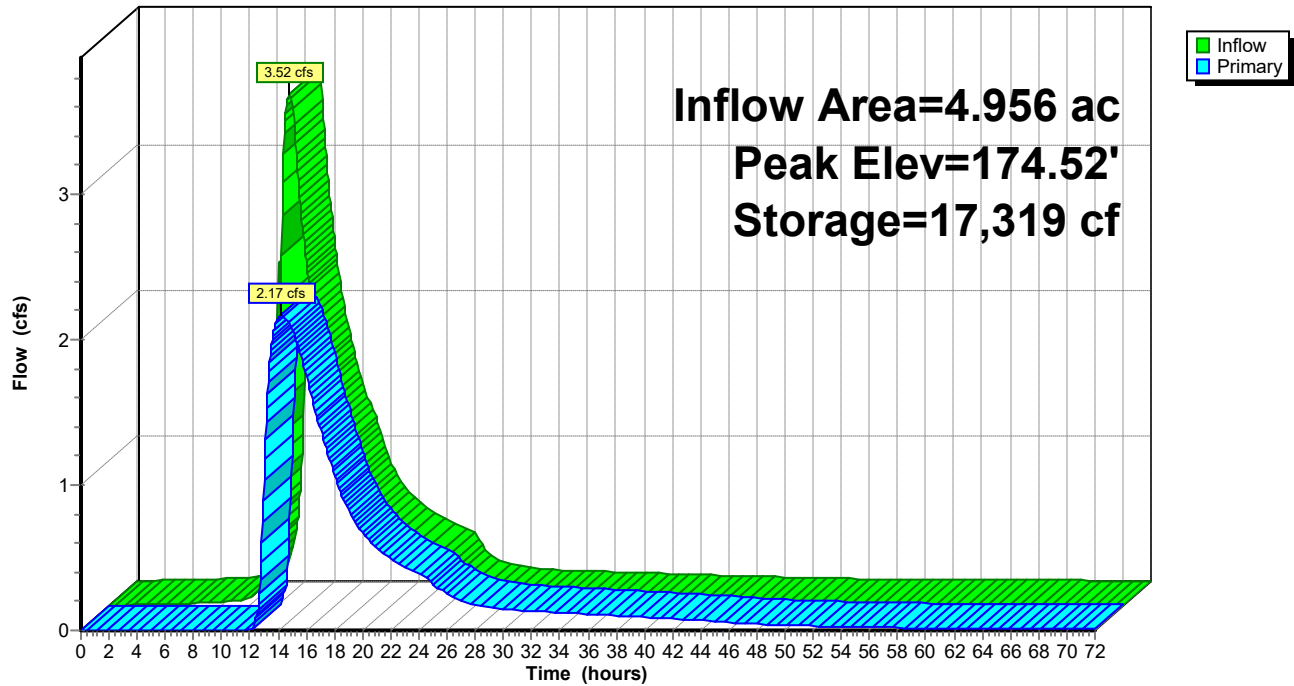
| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                                 |
|--------|----------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Device 4 | 173.08' | <b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                     |
| #2     | Device 4 | 173.58' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                    |
| #3     | Device 4 | 175.83' | <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                           |
| #4     | Primary  | 173.08' | <b>12.0" Round Culvert</b><br>L= 25.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' / Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.17 cfs @ 14.26 hrs HW=174.52' TW=0.00' (Dynamic Tailwater)

↑ **4=Culvert** (Passes 2.17 cfs of 2.84 cfs potential flow)  
↑ **1=Orifice/Grate** (Orifice Controls 0.27 cfs @ 5.52 fps)  
↑ **2=Orifice/Grate** (Orifice Controls 1.90 cfs @ 3.49 fps)  
↑ **3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 17P: Pond #1B

## Hydrograph



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**Summary for Pond 20P: Pond #2**

Inflow Area = 4.782 ac, 69.77% Impervious, Inflow Depth = 4.91" for 10-yr event  
 Inflow = 20.80 cfs @ 12.14 hrs, Volume= 1.958 af  
 Outflow = 2.71 cfs @ 12.92 hrs, Volume= 1.870 af, Atten= 87%, Lag= 46.8 min  
 Primary = 2.71 cfs @ 12.92 hrs, Volume= 1.870 af  
 Routed to Link 19L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 177.90' @ 12.92 hrs Surf.Area= 13,951 sf Storage= 42,478 cf

Plug-Flow detention time= 277.1 min calculated for 1.868 af (95% of inflow)  
 Center-of-Mass det. time= 251.2 min ( 1,005.9 - 754.7 )

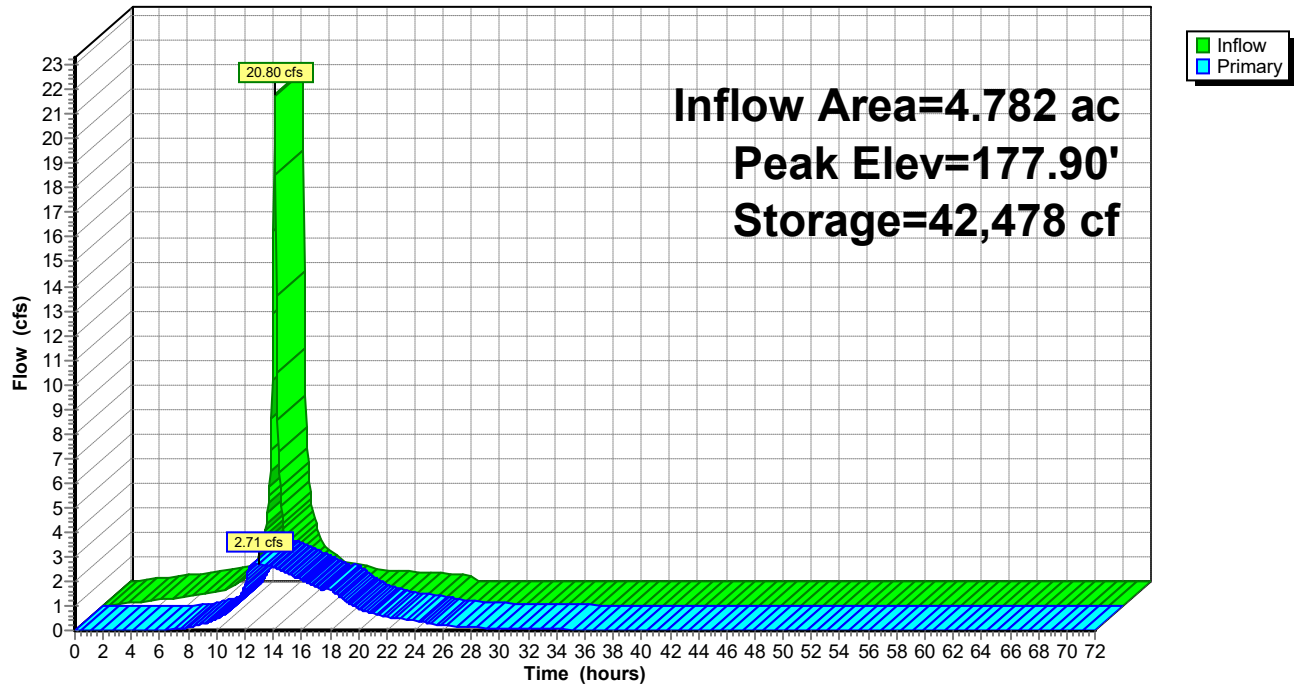
| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 174.86' | 78,684 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 174.86              | 13,951               | 0                         | 0                         |
| 180.50              | 13,951               | 78,684                    | 78,684                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                  |
|--------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 175.09' | <b>12.0" Round Culvert</b><br>L= 352.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 175.09' / 174.58' S= 0.0014 '/ Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Primary | 180.00' | <b>540.0' long (Profile 2) Broad-Crested Rectangular Weir</b><br>Head (feet) 0.49 0.98 1.48<br>Coef. (English) 2.90 3.26 3.44                                                                                   |

**Primary OutFlow** Max=2.71 cfs @ 12.92 hrs HW=177.90' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 2.71 cfs @ 3.45 fps)  
 2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Pond 20P: Pond #2****Hydrograph**

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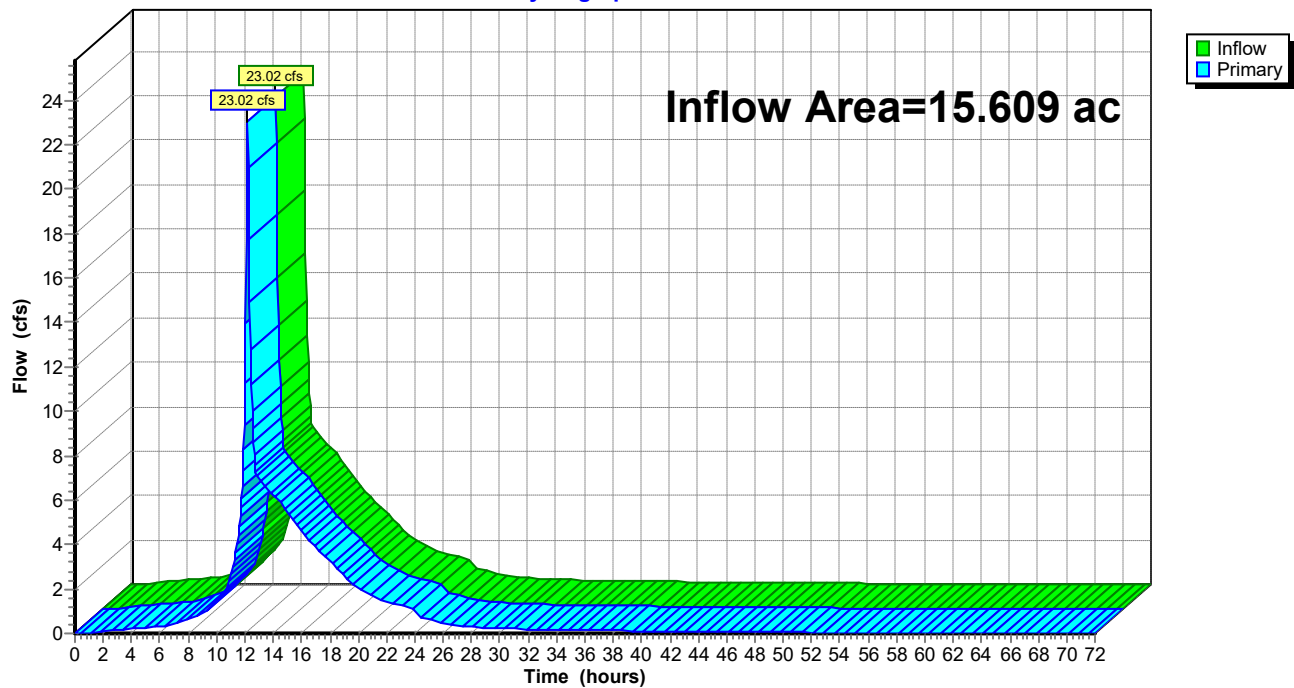
### Summary for Link 15L: Ultimate

Inflow Area = 15.609 ac, 40.92% Impervious, Inflow Depth > 4.10" for 10-yr event  
Inflow = 23.02 cfs @ 12.19 hrs, Volume= 5.334 af  
Primary = 23.02 cfs @ 12.19 hrs, Volume= 5.334 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 15L: Ultimate

Hydrograph



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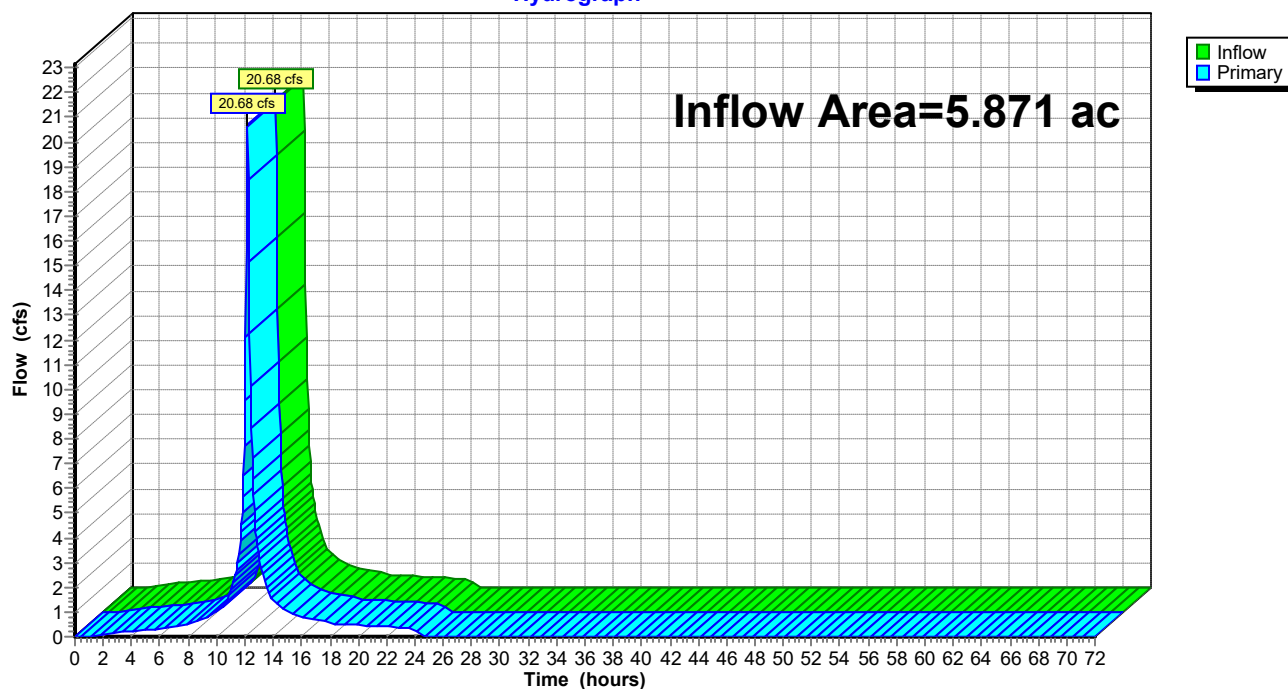
### Summary for Link 18L: Uncontrolled

Inflow Area = 5.871 ac, 38.12% Impervious, Inflow Depth = 4.34" for 10-yr event  
Inflow = 20.68 cfs @ 12.19 hrs, Volume= 2.125 af  
Primary = 20.68 cfs @ 12.19 hrs, Volume= 2.125 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 15L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 18L: Uncontrolled

Hydrograph



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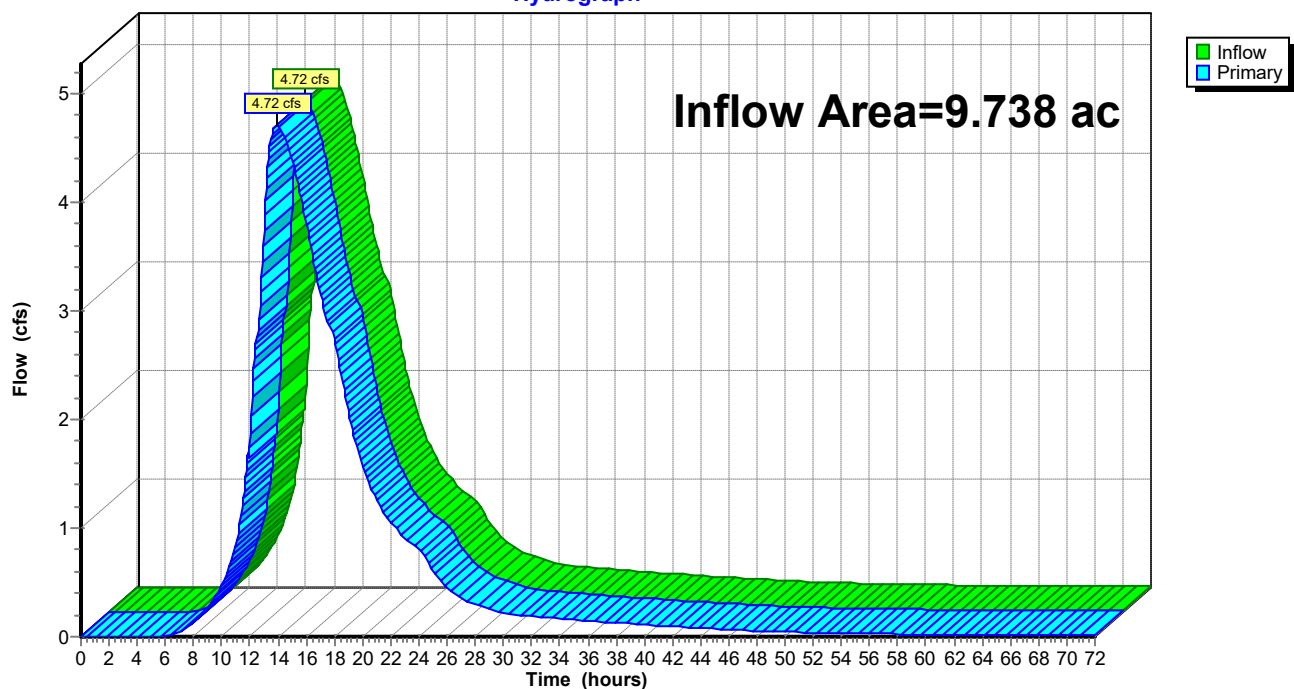
### Summary for Link 19L: Controlled

Inflow Area = 9.738 ac, 42.61% Impervious, Inflow Depth > 3.95" for 10-yr event  
Inflow = 4.72 cfs @ 13.96 hrs, Volume= 3.209 af  
Primary = 4.72 cfs @ 13.96 hrs, Volume= 3.209 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 15L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 19L: Controlled

Hydrograph



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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                               |                                                                                                                                            |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment 1S: #1</b>    | Runoff Area=206,959 sf 12.79% Impervious Runoff Depth=4.88"<br>Flow Length=665' Tc=18.7 min CN=WQ Runoff=16.96 cfs 1.933 af                |
| <b>Subcatchment 2S: #2</b>    | Runoff Area=21,184 sf 1.89% Impervious Runoff Depth=4.42"<br>Flow Length=723' Tc=18.6 min CN=WQ Runoff=1.62 cfs 0.179 af                   |
| <b>Subcatchment 3S: #3</b>    | Runoff Area=23,775 sf 37.60% Impervious Runoff Depth=5.19"<br>Flow Length=543' Tc=13.3 min CN=WQ Runoff=2.32 cfs 0.236 af                  |
| <b>Subcatchment 4S: #4</b>    | Runoff Area=56,602 sf 19.11% Impervious Runoff Depth=5.79"<br>Flow Length=483' Tc=11.7 min CN=WQ Runoff=6.26 cfs 0.626 af                  |
| <b>Subcatchment 5S: #5</b>    | Runoff Area=29,986 sf 77.94% Impervious Runoff Depth=5.86"<br>Flow Length=688' Tc=8.4 min CN=WQ Runoff=3.68 cfs 0.336 af                   |
| <b>Subcatchment 6S: #6</b>    | Runoff Area=56,161 sf 25.15% Impervious Runoff Depth=5.25"<br>Flow Length=649' Tc=12.0 min CN=WQ Runoff=5.76 cfs 0.564 af                  |
| <b>Subcatchment 7S: #7</b>    | Runoff Area=57,648 sf 68.78% Impervious Runoff Depth=5.74"<br>Flow Length=940' Tc=12.8 min CN=WQ Runoff=6.09 cfs 0.633 af                  |
| <b>Subcatchment 8S: #8</b>    | Runoff Area=10,366 sf 1.71% Impervious Runoff Depth=4.28"<br>Flow Length=958' Tc=20.3 min CN=WQ Runoff=0.75 cfs 0.085 af                   |
| <b>Subcatchment 9S: #9</b>    | Runoff Area=16,311 sf 85.53% Impervious Runoff Depth=5.84"<br>Tc=0.0 min CN=WQ Runoff=2.43 cfs 0.182 af                                    |
| <b>Subcatchment 16S: #11</b>  | Runoff Area=192,008 sf 68.43% Impervious Runoff Depth=6.06"<br>Flow Length=841' Tc=8.1 min CN=WQ Runoff=24.48 cfs 2.225 af                 |
| <b>Subcatchment 18S: #10</b>  | Runoff Area=8,922 sf 100.00% Impervious Runoff Depth=6.13"<br>Tc=0.0 min CN=98 Runoff=1.37 cfs 0.105 af                                    |
| <b>Pond 16P: Pond #1A</b>     | Peak Elev=176.39' Storage=38,422 cf Inflow=16.96 cfs 1.933 af<br>12.0" Round Culvert n=0.012 L=142.0' S=0.0000 ' Outflow=4.12 cfs 1.794 af |
| <b>Pond 17P: Pond #1B</b>     | Peak Elev=174.85' Storage=20,285 cf Inflow=4.28 cfs 1.898 af<br>Outflow=2.73 cfs 1.778 af                                                  |
| <b>Pond 20P: Pond #2</b>      | Peak Elev=178.57' Storage=51,742 cf Inflow=25.37 cfs 2.407 af<br>Outflow=3.08 cfs 2.318 af                                                 |
| <b>Link 15L: Ultimate</b>     | Inflow=28.47 cfs 6.755 af<br>Primary=28.47 cfs 6.755 af                                                                                    |
| <b>Link 18L: Uncontrolled</b> | Inflow=25.70 cfs 2.659 af<br>Primary=25.70 cfs 2.659 af                                                                                    |

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NOAA 24-hr D 25-yr Rainfall=6.37"

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### Link 19L: Controlled

Inflow=5.66 cfs 4.096 af

Primary=5.66 cfs 4.096 af

**Total Runoff Area = 15.609 ac   Runoff Volume = 7.104 af   Average Runoff Depth = 5.46"**  
**59.08% Pervious = 9.222 ac   40.92% Impervious = 6.387 ac**

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**Summary for Subcatchment 1S: #1**

[47] Hint: Peak is 673% of capacity of segment #3

Runoff = 16.96 cfs @ 12.27 hrs, Volume= 1.933 af, Depth= 4.88"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 121,340   | 80 | >75% Grass cover, Good, HSG D |
| 16,397    | 98 | Paved parking, HSG D          |
| 59,148    | 96 | Gravel surface, HSG D         |
| 10,074    | 98 | Water Surface, HSG D          |
| 206,959   |    | Weighted Average              |
| 180,488   | 85 | 87.21% Pervious Area          |
| 26,471    | 98 | 12.79% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                          |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow, Sheet Flow</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length                                  |
| 8.6      | 398           | 0.0023        | 0.77              |                | <b>Shallow Concentrated Flow, Shallow Concentrated Flow</b><br>Unpaved Kv= 16.1 fps                                                  |
| 1.2      | 235           | 0.0050        | 3.21              | 2.52           | <b>Pipe Channel, 12" Perforated Pipe</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 18.7     | 665           | Total         |                   |                |                                                                                                                                      |

## Existing\_Global Model

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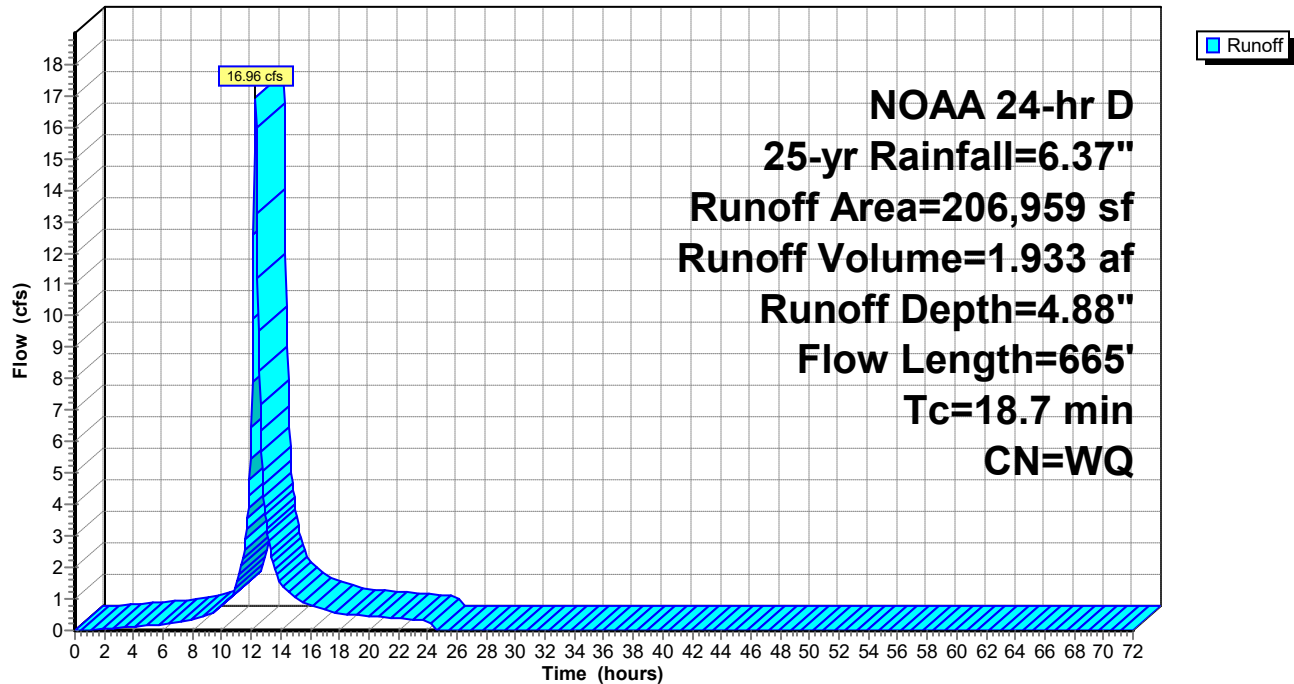
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 1S: #1

#### Hydrograph



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**Summary for Subcatchment 2S: #2**

Runoff = 1.62 cfs @ 12.27 hrs, Volume= 0.179 af, Depth= 4.42"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 401       | 98 | Paved parking, HSG D          |
| 18,044    | 80 | >75% Grass cover, Good, HSG D |
| 2,739     | 98 | Water Surface, 0% imp, HSG D  |
| 21,184    |    | Weighted Average              |
| 20,783    | 82 | 98.11% Pervious Area          |
| 401       | 98 | 1.89% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------|
| 9.0      | 33            | 0.0024        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length   |
| 2.7      | 129           | 0.0024        | 0.79              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                  |
| 5.9      | 251           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.035 Earth, dense weeds |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011          |
| 18.6     | 723           | Total         |                   |                |                                                                                            |

## Existing\_Global Model

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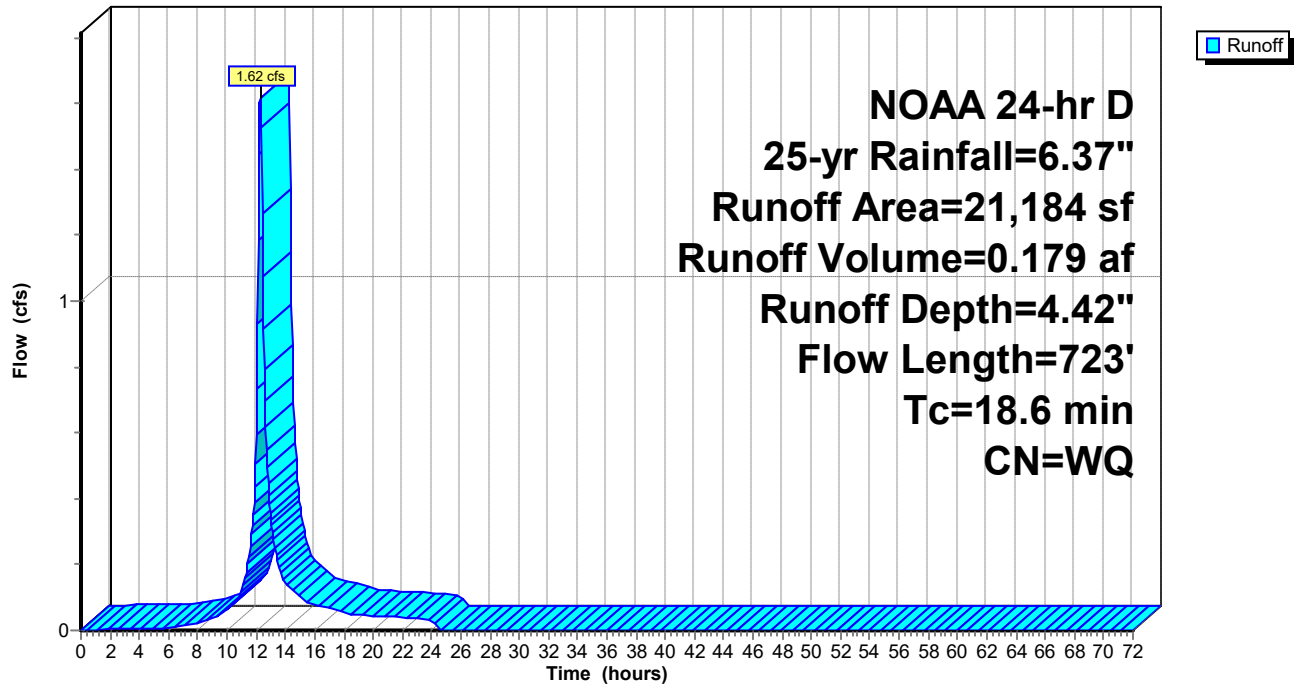
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 2S: #2

Hydrograph



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**Summary for Subcatchment 3S: #3**

Runoff = 2.32 cfs @ 12.21 hrs, Volume= 0.236 af, Depth= 5.19"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

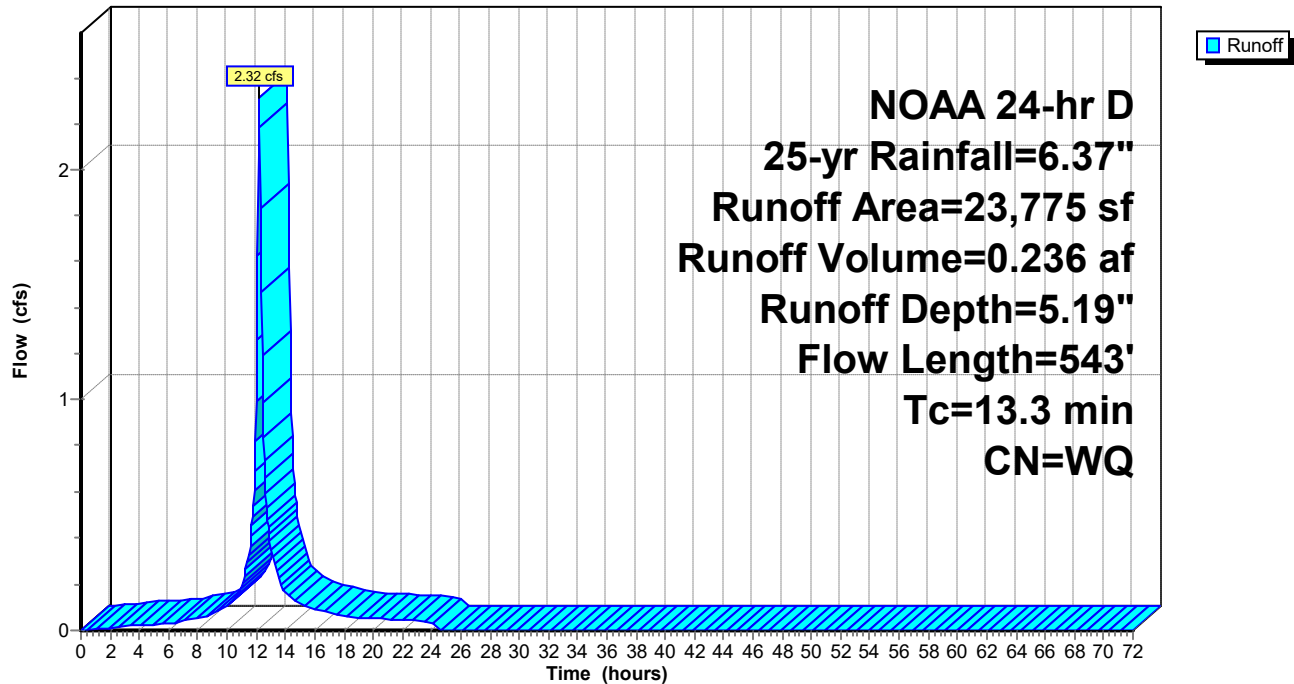
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,884     | 98 | Paved parking, HSG D          |
| 2,219     | 98 | Water Surface, 0% imp, HSG D  |
| 10,956    | 80 | >75% Grass cover, Good, HSG D |
| 1,661     | 96 | Gravel surface, HSG D         |
| 55        | 98 | Roofs, HSG D                  |
| 23,775    |    | Weighted Average              |
| 14,836    | 84 | 62.40% Pervious Area          |
| 8,939     | 98 | 37.60% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------|
| 8.9      | 60            | 0.0080        | 0.11              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length   |
| 0.6      | 55            | 0.0080        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                  |
| 2.8      | 118           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.035 Earth, dense weeds |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011          |
| 13.3     | 543           | Total         |                   |                |                                                                                            |

Subcatchment 3S: #3

Hydrograph



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**Summary for Subcatchment 4S: #4**

Runoff = 6.26 cfs @ 12.19 hrs, Volume= 0.626 af, Depth= 5.79"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 10,547    | 98 | Paved parking, HSG D          |
| 40,844    | 96 | Gravel surface, HSG D         |
| 267       | 98 | Roofs, HSG D                  |
| 4,944     | 80 | >75% Grass cover, Good, HSG D |
| 56,602    |    | Weighted Average              |
| 45,788    | 94 | 80.89% Pervious Area          |
| 10,814    | 98 | 19.11% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 60            | 0.0080        | 0.11              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 2.1      | 183           | 0.0080        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                |
| 0.7      | 240           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 11.7     | 483           | Total         |                   |                |                                                                                          |

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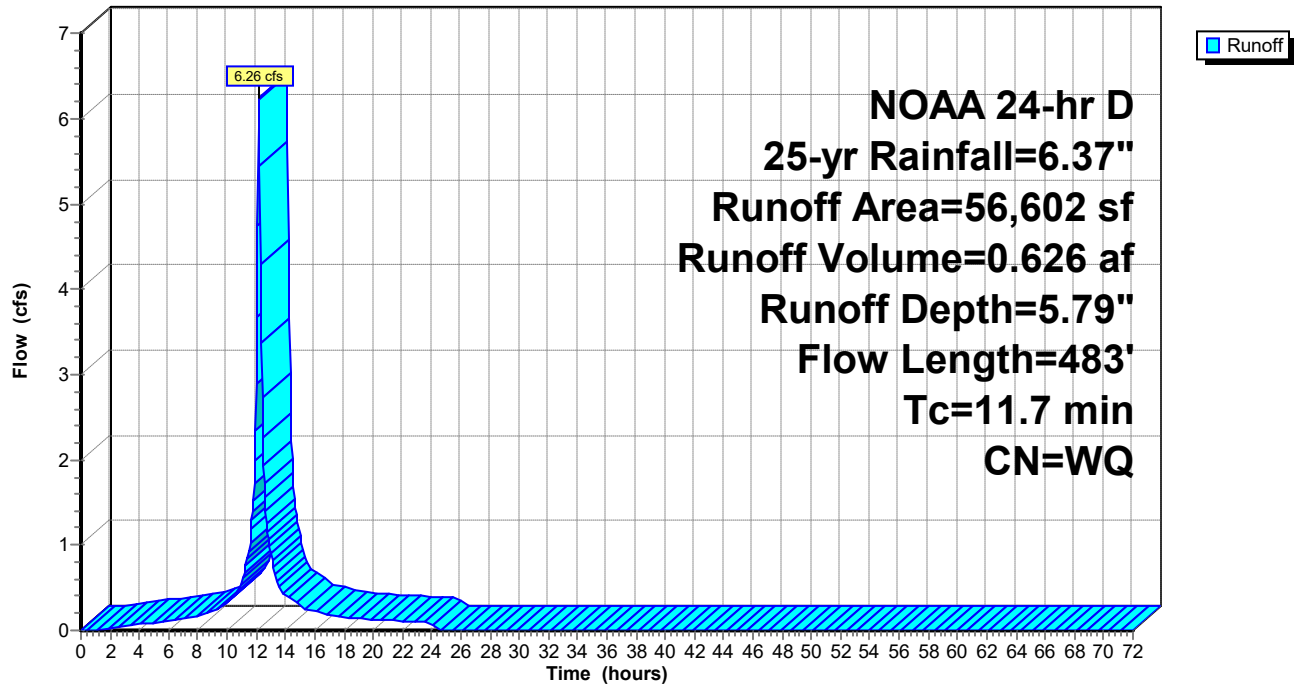
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 4S: #4

Hydrograph



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**Summary for Subcatchment 5S: #5**

Runoff = 3.68 cfs @ 12.15 hrs, Volume= 0.336 af, Depth= 5.86"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

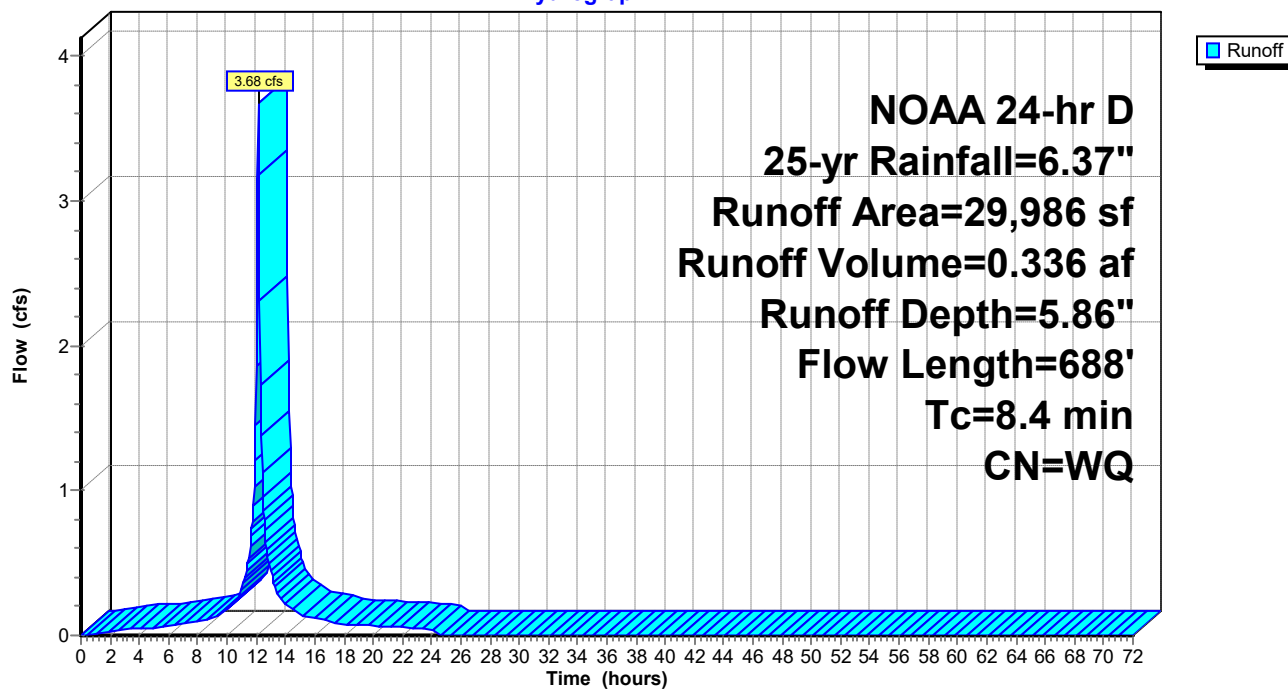
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 23,144    | 98 | Roofs, HSG D                  |
| 228       | 98 | Paved parking, HSG D          |
| 4,093     | 80 | >75% Grass cover, Good, HSG D |
| 2,521     | 98 | Water Surface, 0% imp, HSG D  |
| 29,986    |    | Weighted Average              |
| 6,614     | 87 | 22.06% Pervious Area          |
| 23,372    | 98 | 77.94% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 3.1      | 171           | 0.0020        | 0.91              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 0.1      | 29            | 0.0500        | 3.60              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                         |
| 4.2      | 178           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.035              |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011 |
| 8.4      | 688           | Total         |                   |                |                                                                                   |

Subcatchment 5S: #5

Hydrograph



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**Summary for Subcatchment 6S: #6**

[47] Hint: Peak is 1615% of capacity of segment #3

Runoff = 5.76 cfs @ 12.19 hrs, Volume= 0.564 af, Depth= 5.25"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

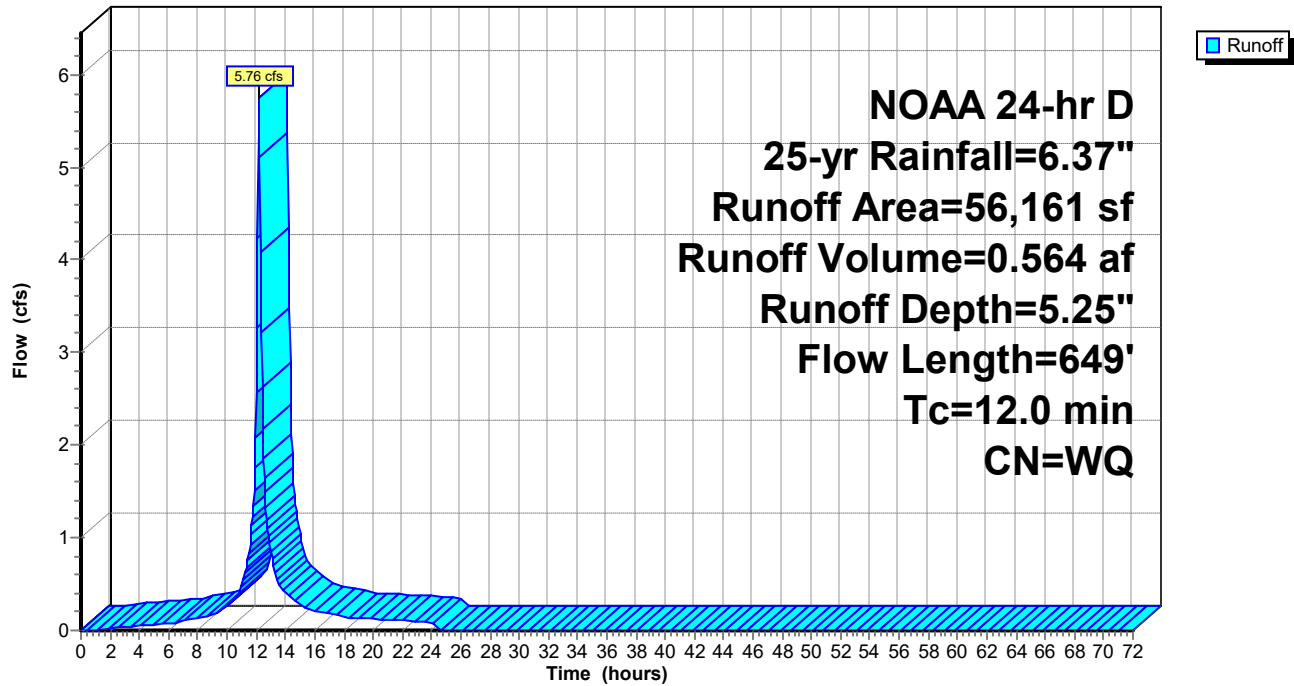
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 5,706     | 98 | Roofs, HSG D                  |
| 22,321    | 80 | >75% Grass cover, Good, HSG D |
| 19,713    | 96 | Gravel surface, HSG D         |
| 8,421     | 98 | Paved parking, HSG D          |
| 56,161    |    | Weighted Average              |
| 42,034    | 88 | 74.85% Pervious Area          |
| 14,127    | 98 | 25.15% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                      |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------------------------------|
| 2.3      | 100           | 0.0035        | 0.72              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                         |
| 2.2      | 123           | 0.0035        | 0.95              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                                        |
| 6.8      | 186           | 0.0001        | 0.45              | 0.36           | <b>Pipe Channel,</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 0.7      | 240           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011                                |
| 12.0     | 649           | Total         |                   |                |                                                                                                                  |

Subcatchment 6S: #6

Hydrograph



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**Summary for Subcatchment 7S: #7**

Runoff = 6.09 cfs @ 12.20 hrs, Volume= 0.633 af, Depth= 5.74"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

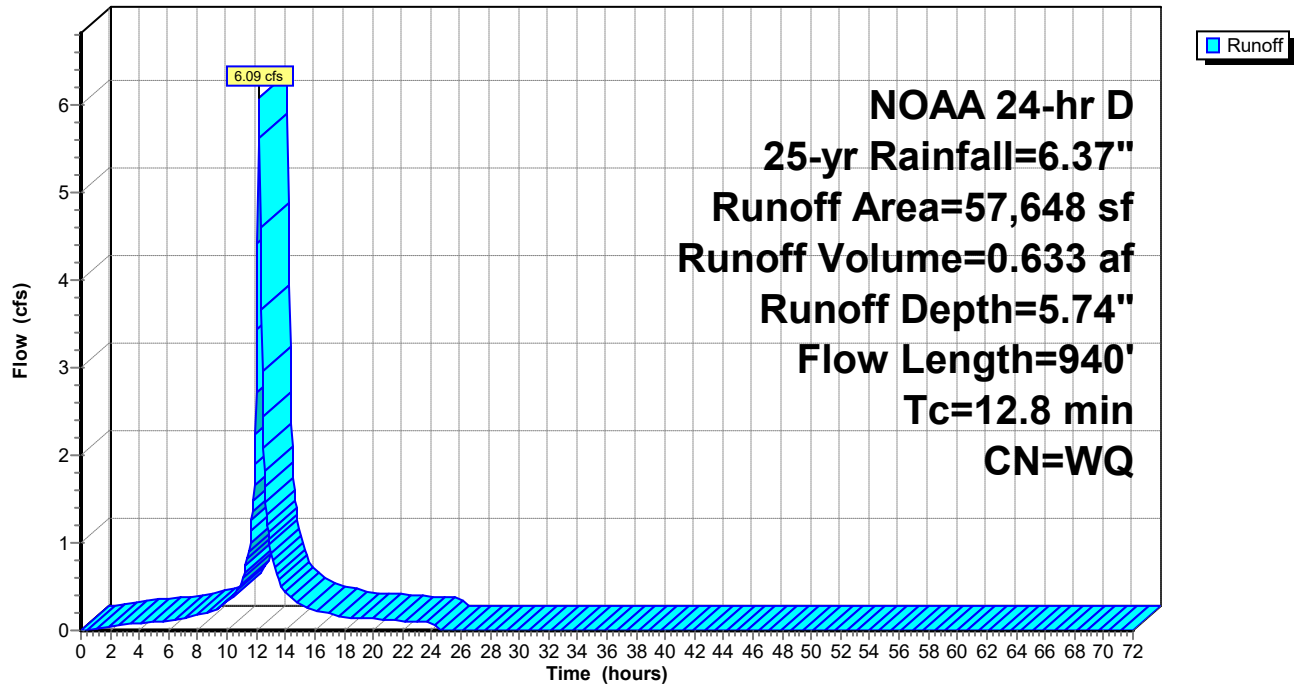
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 39,428    | 98 | Roofs, HSG D                  |
| 4,293     | 96 | Gravel surface, HSG D         |
| 224       | 98 | Paved parking, HSG D          |
| 10,665    | 80 | >75% Grass cover, Good, HSG D |
| 3,038     | 98 | Water Surface, 0% imp, HSG D  |
| 57,648    |    | Weighted Average              |
| 17,996    | 87 | 31.22% Pervious Area          |
| 39,652    | 98 | 68.78% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 1.2      | 65            | 0.0020        | 0.91              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 2.0      | 140           | 0.0050        | 1.14              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                         |
| 8.6      | 425           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030              |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011 |
| 12.8     | 940           | Total         |                   |                |                                                                                   |

Subcatchment 7S: #7

Hydrograph



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**Summary for Subcatchment 8S: #8**

Runoff = 0.75 cfs @ 12.30 hrs, Volume= 0.085 af, Depth= 4.28"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 195       | 96 | Gravel surface, HSG D         |
| 9,524     | 80 | >75% Grass cover, Good, HSG D |
| 177       | 98 | Paved parking, HSG D          |
| 470       | 98 | Water Surface, 0% imp, HSG D  |
| 10,366    |    | Weighted Average              |
| 10,189    | 81 | 98.29% Pervious Area          |
| 177       | 98 | 1.71% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 76            | 0.0130        | 0.14              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 0.9      | 98            | 0.0130        | 1.84              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                |
| 9.5      | 474           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030                     |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 20.3     | 958           | Total         |                   |                |                                                                                          |

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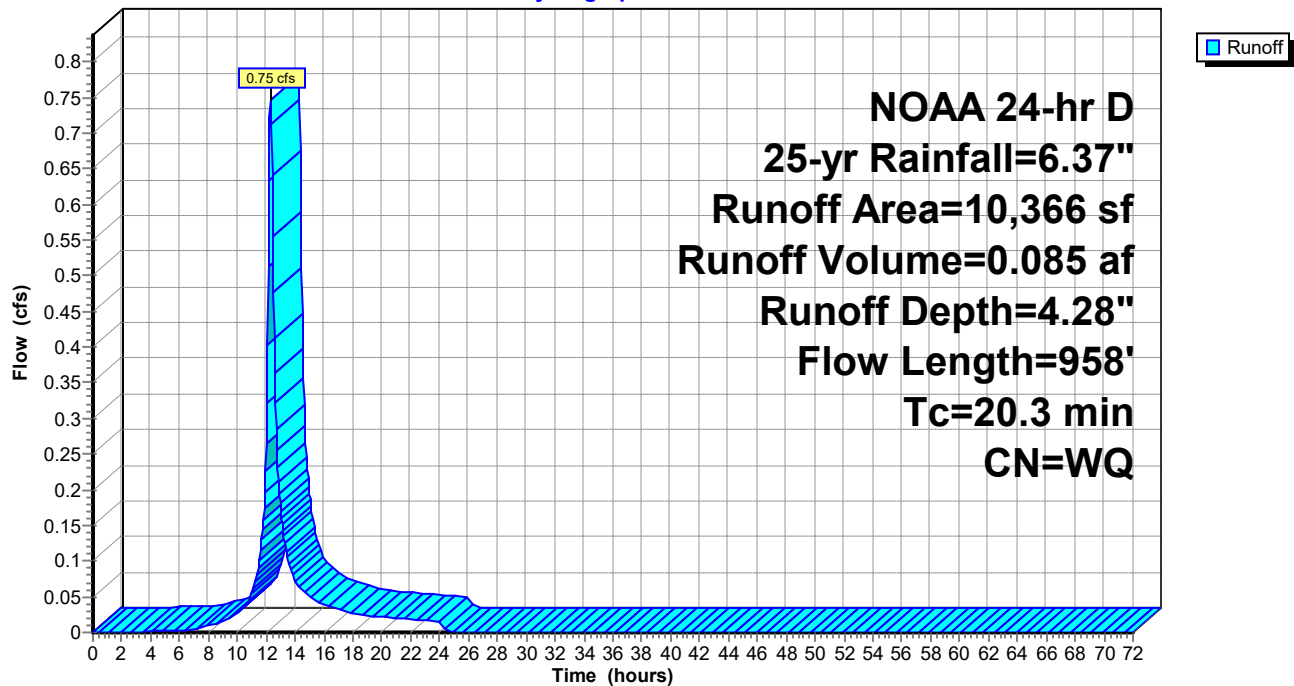
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 8S: #8

#### Hydrograph



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### Summary for Subcatchment 9S: #9

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.43 cfs @ 12.04 hrs, Volume= 0.182 af, Depth= 5.84"  
Routed to Pond 20P : Pond #2

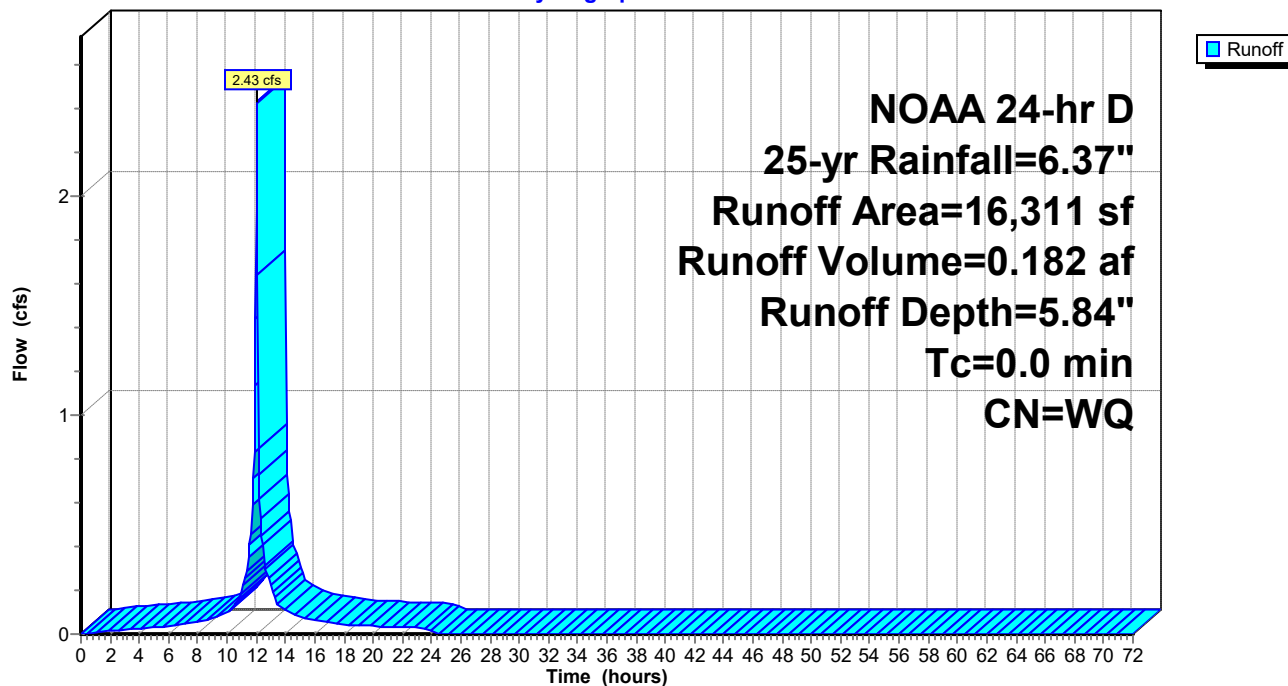
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 13,951    | 98 | Water Surface, HSG D          |
| 2,360     | 80 | >75% Grass cover, Good, HSG D |
| 16,311    |    | Weighted Average              |
| 2,360     | 80 | 14.47% Pervious Area          |
| 13,951    | 98 | 85.53% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description   |
|----------|---------------|---------------|-------------------|----------------|---------------|
| 0.0      |               |               |                   |                | Direct Entry, |

### Subcatchment 9S: #9

Hydrograph



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**Summary for Subcatchment 16S: #11**

[47] Hint: Peak is 2865% of capacity of segment #3

Runoff = 24.48 cfs @ 12.15 hrs, Volume= 2.225 af, Depth= 6.06"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description            |
|-----------|----|------------------------|
| 8,641     | 98 | Paved parking, HSG D   |
| 14,953    | 98 | Paved parking, HSG D   |
| 60,610    | 96 | Gravel surface, HSG D  |
| 5,108     | 98 | Roofs, HSG D           |
| 45,331    | 98 | Roofs, HSG D           |
| 57,365    | 98 | Paved parking, HSG D   |
| 192,008   |    | Weighted Average       |
| 60,610    | 96 | 31.57% Pervious Area   |
| 131,398   | 98 | 68.43% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                    |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1.9      | 100           | 0.0056        | 0.87              |                | <b>Sheet Flow, Gravel</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                                |
| 2.9      | 260           | 0.0056        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                                                        |
| 3.3      | 481           | 0.0050        | 2.45              | 0.85           | <b>Pipe Channel, Pipe to Pond 2</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.013 Corrugated PE, smooth interior |
| 8.1      | 841           | Total         |                   |                |                                                                                                                                |

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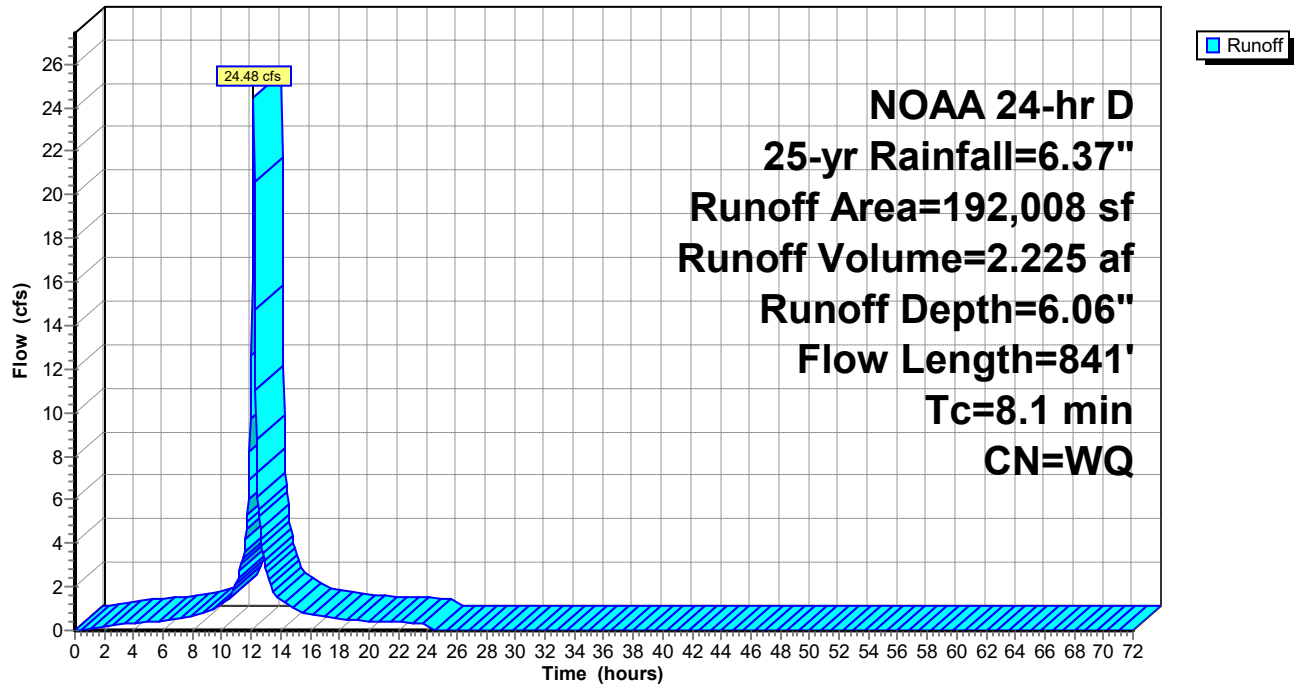
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 16S: #11

Hydrograph



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### Summary for Subcatchment 18S: #10

[46] Hint:  $T_c=0$  (Instant runoff peak depends on dt)

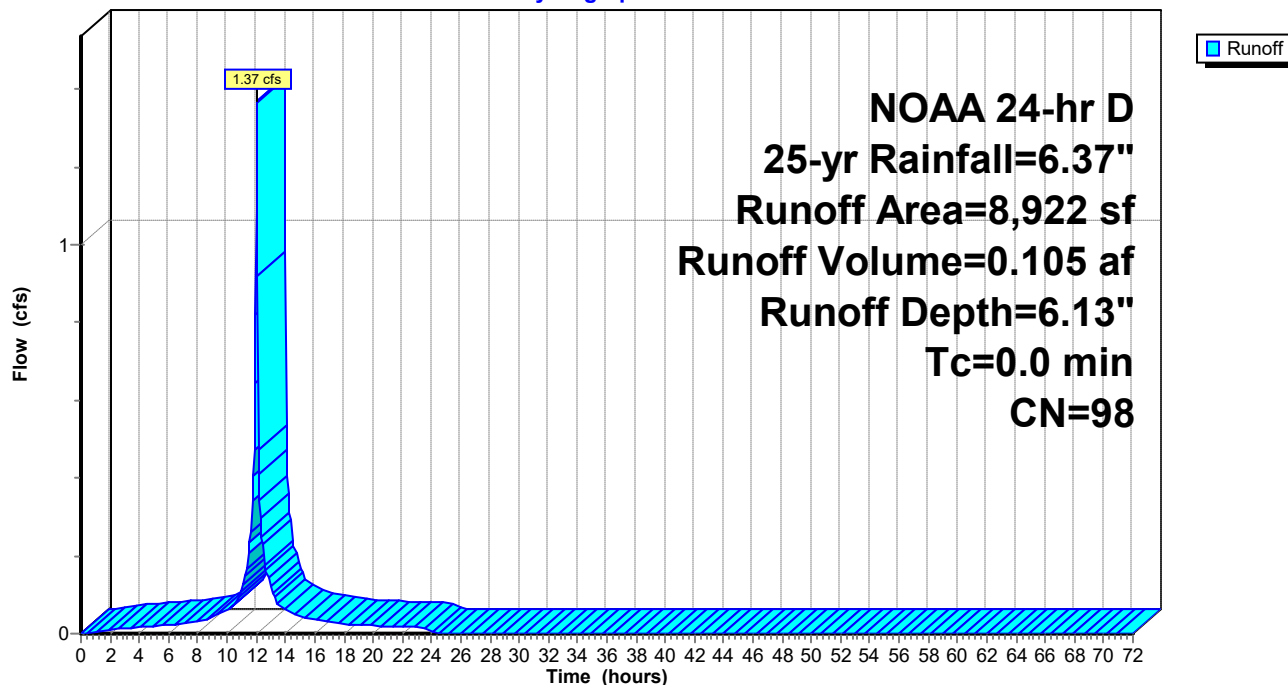
Runoff = 1.37 cfs @ 12.04 hrs, Volume= 0.105 af, Depth= 6.13"  
Routed to Pond 17P : Pond #1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 8,922     | 98 | Water Surface, HSG D    |
| 8,922     | 98 | 100.00% Impervious Area |

### Subcatchment 18S: #10

Hydrograph



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**Summary for Pond 16P: Pond #1A**

Inflow Area = 4.751 ac, 12.79% Impervious, Inflow Depth = 4.88" for 25-yr event  
 Inflow = 16.96 cfs @ 12.27 hrs, Volume= 1.933 af  
 Outflow = 4.12 cfs @ 12.70 hrs, Volume= 1.794 af, Atten= 76%, Lag= 25.5 min  
 Primary = 4.12 cfs @ 12.70 hrs, Volume= 1.794 af  
 Routed to Pond 17P : Pond #1B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 176.39' @ 12.89 hrs Surf.Area= 10,074 sf Storage= 38,422 cf  
 Flood Elev= 177.08' Surf.Area= 10,074 sf Storage= 45,333 cf

Plug-Flow detention time= 288.9 min calculated for 1.794 af (93% of inflow)  
 Center-of-Mass det. time= 248.6 min ( 1,047.1 - 798.5 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 45,333 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

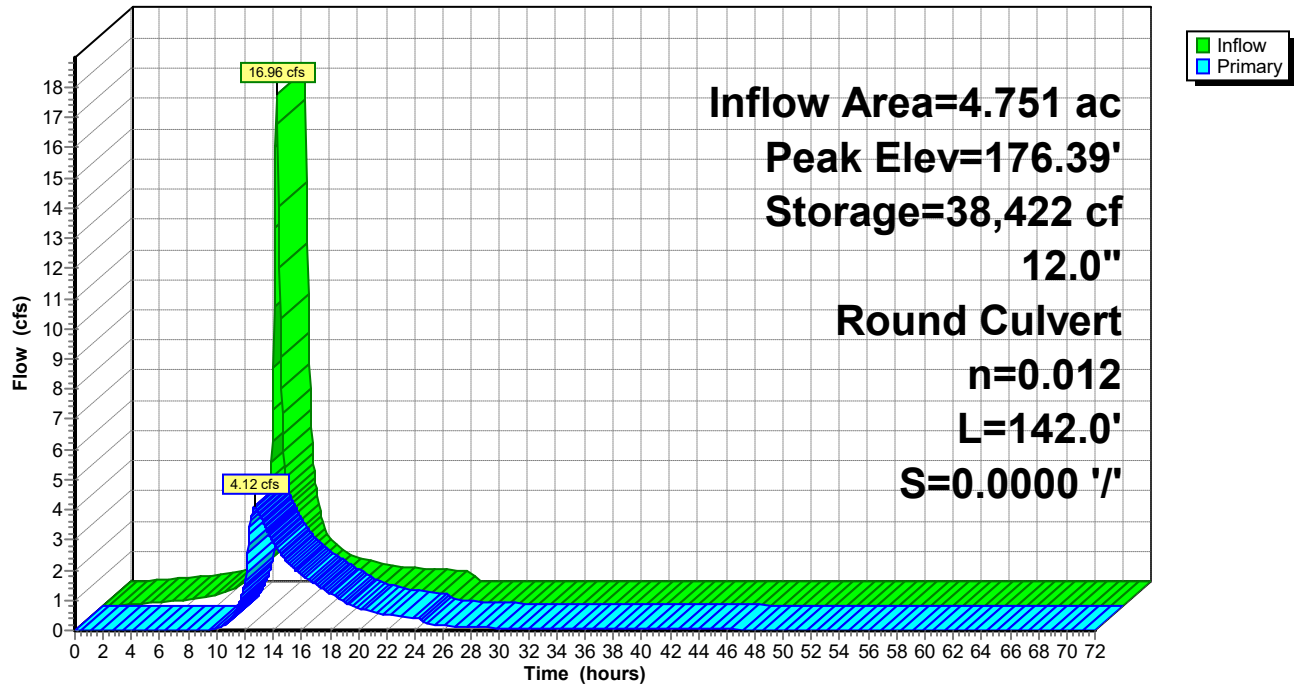
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 10,074               | 0                         | 0                         |
| 177.08              | 10,074               | 45,333                    | 45,333                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                      |
| #1     | Primary | 173.08' | <b>12.0" Round Culvert</b><br>L= 142.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' / Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=4.06 cfs @ 12.70 hrs HW=176.35' TW=174.14' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Outlet Controls 4.06 cfs @ 5.18 fps)

## Pond 16P: Pond #1A

## Hydrograph



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### Summary for Pond 17P: Pond #1B

Inflow Area = 4.956 ac, 16.39% Impervious, Inflow Depth > 4.60" for 25-yr event  
Inflow = 4.28 cfs @ 12.69 hrs, Volume= 1.898 af  
Outflow = 2.73 cfs @ 14.31 hrs, Volume= 1.778 af, Atten= 36%, Lag= 97.4 min  
Primary = 2.73 cfs @ 14.31 hrs, Volume= 1.778 af  
Routed to Link 19L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 174.85' @ 14.31 hrs Surf.Area= 8,922 sf Storage= 20,285 cf

Plug-Flow detention time= 262.1 min calculated for 1.777 af (94% of inflow)  
Center-of-Mass det. time= 173.3 min ( 1,203.5 - 1,030.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 40,149 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 8,922                | 0                         | 0                         |
| 177.08              | 8,922                | 40,149                    | 40,149                    |

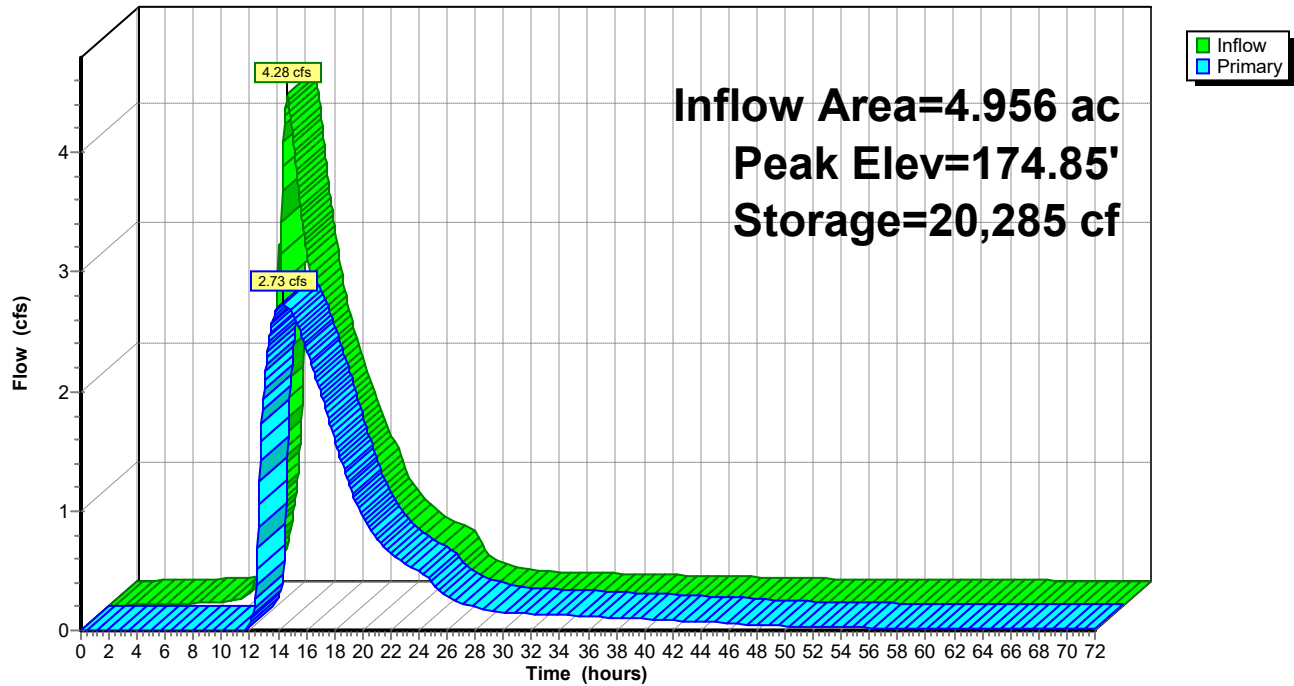
| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                                           |
|--------|----------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Device 4 | 173.08' | <b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                               |
| #2     | Device 4 | 173.58' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                              |
| #3     | Device 4 | 175.83' | <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                                     |
| #4     | Primary  | 173.08' | <b>12.0" Round Culvert</b><br>L= 25.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.73 cfs @ 14.31 hrs HW=174.85' TW=0.00' (Dynamic Tailwater)

4=Culvert (Passes 2.73 cfs of 3.76 cfs potential flow)  
1=Orifice/Grate (Orifice Controls 0.30 cfs @ 6.18 fps)  
2=Orifice/Grate (Orifice Controls 2.43 cfs @ 4.46 fps)  
3=Sharp-Crested Rectangular Weir ( Controls 0.00 cfs)

## Pond 17P: Pond #1B

## Hydrograph



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**Summary for Pond 20P: Pond #2**

Inflow Area = 4.782 ac, 69.77% Impervious, Inflow Depth = 6.04" for 25-yr event  
 Inflow = 25.37 cfs @ 12.14 hrs, Volume= 2.407 af  
 Outflow = 3.08 cfs @ 13.00 hrs, Volume= 2.318 af, Atten= 88%, Lag= 51.2 min  
 Primary = 3.08 cfs @ 13.00 hrs, Volume= 2.318 af  
 Routed to Link 19L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 178.57' @ 13.00 hrs Surf.Area= 13,951 sf Storage= 51,742 cf

Plug-Flow detention time= 275.4 min calculated for 2.318 af (96% of inflow)  
 Center-of-Mass det. time= 252.2 min ( 1,003.3 - 751.1 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 174.86' | 78,684 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 174.86              | 13,951               | 0                         | 0                         |
| 180.50              | 13,951               | 78,684                    | 78,684                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                  |
|--------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 175.09' | <b>12.0" Round Culvert</b><br>L= 352.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 175.09' / 174.58' S= 0.0014 '/ Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Primary | 180.00' | <b>540.0' long (Profile 2) Broad-Crested Rectangular Weir</b><br>Head (feet) 0.49 0.98 1.48<br>Coef. (English) 2.90 3.26 3.44                                                                                   |

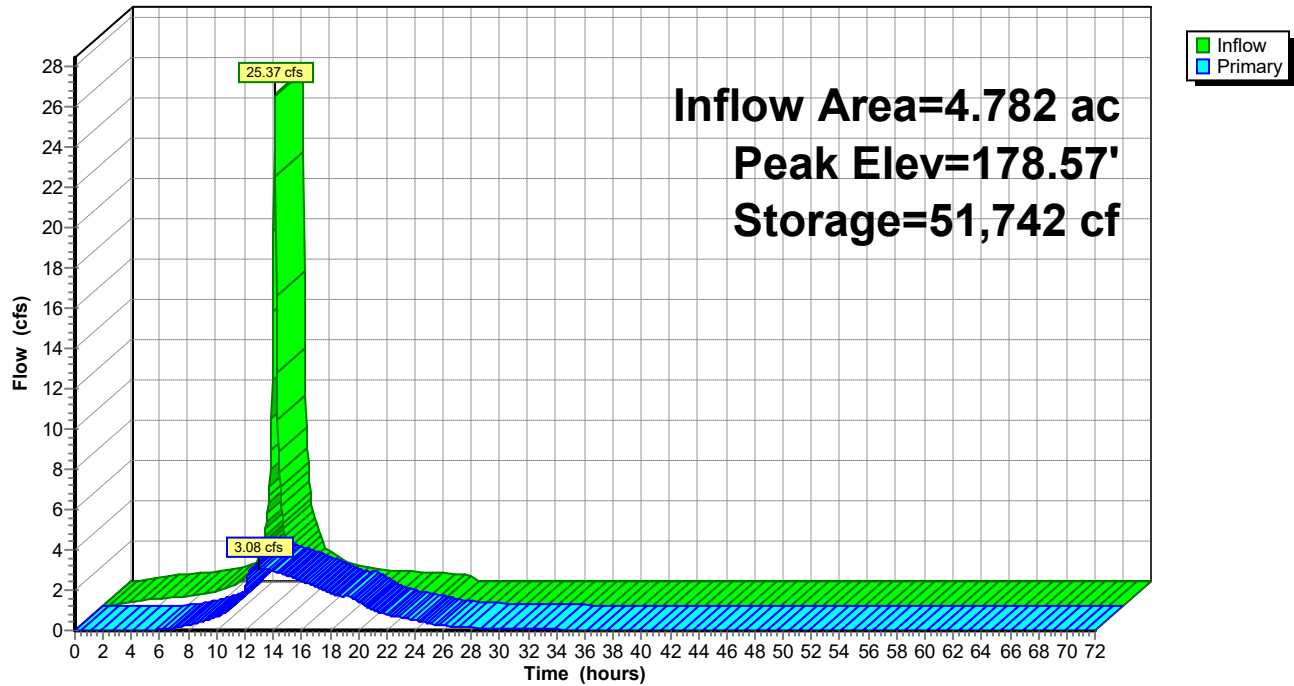
**Primary OutFlow** Max=3.08 cfs @ 13.00 hrs HW=178.57' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 3.08 cfs @ 3.92 fps)

2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

## Pond 20P: Pond #2

## Hydrograph



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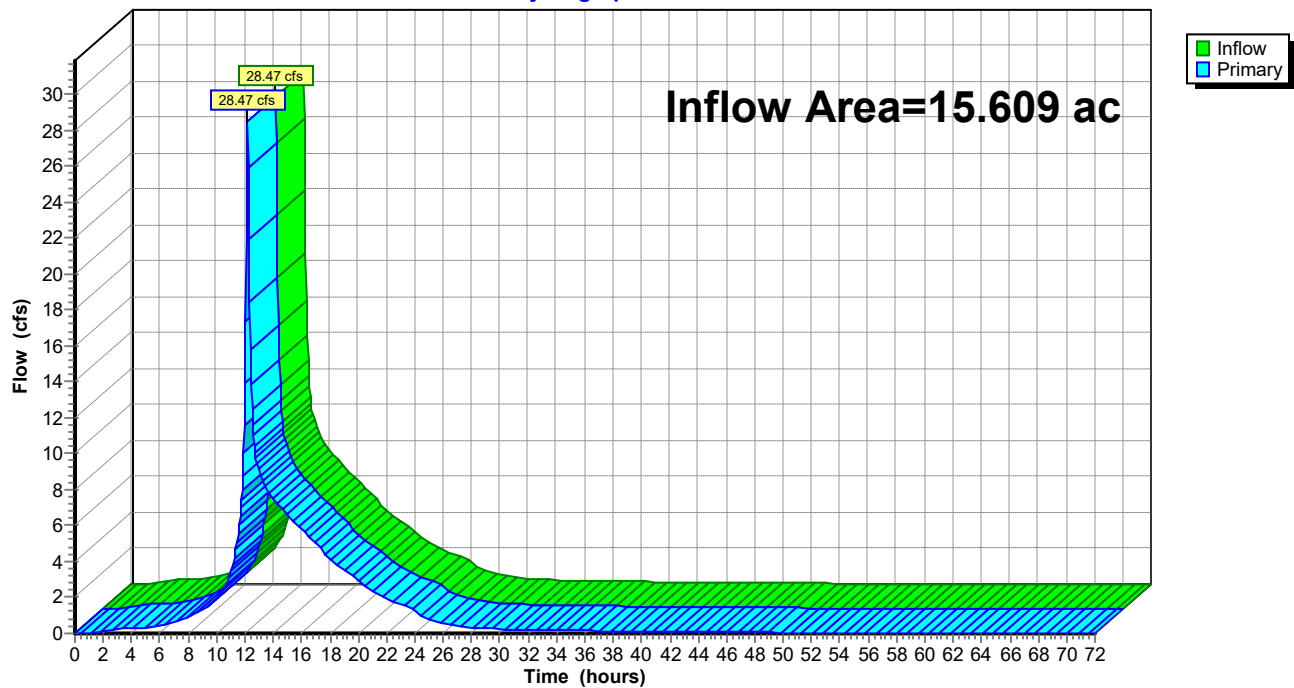
### Summary for Link 15L: Ultimate

Inflow Area = 15.609 ac, 40.92% Impervious, Inflow Depth > 5.19" for 25-yr event  
Inflow = 28.47 cfs @ 12.19 hrs, Volume= 6.755 af  
Primary = 28.47 cfs @ 12.19 hrs, Volume= 6.755 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 15L: Ultimate

Hydrograph



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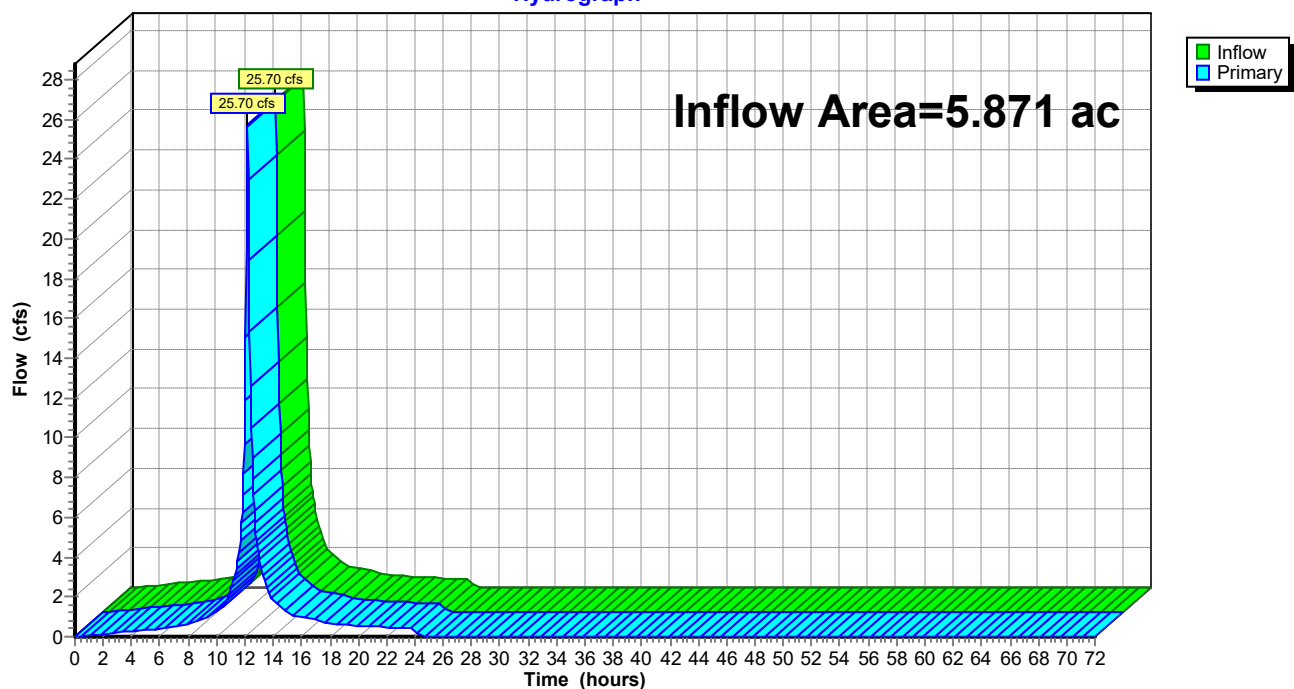
### Summary for Link 18L: Uncontrolled

Inflow Area = 5.871 ac, 38.12% Impervious, Inflow Depth = 5.44" for 25-yr event  
Inflow = 25.70 cfs @ 12.19 hrs, Volume= 2.659 af  
Primary = 25.70 cfs @ 12.19 hrs, Volume= 2.659 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 15L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 18L: Uncontrolled

Hydrograph



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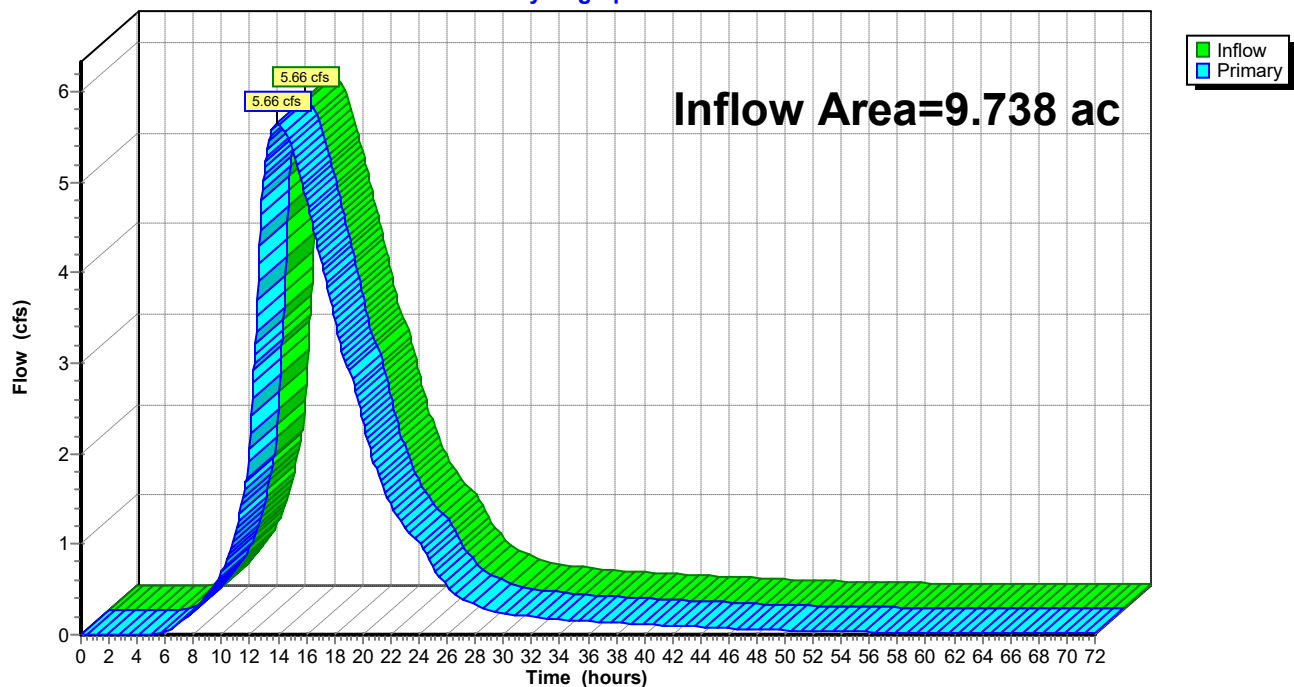
### Summary for Link 19L: Controlled

Inflow Area = 9.738 ac, 42.61% Impervious, Inflow Depth > 5.05" for 25-yr event  
Inflow = 5.66 cfs @ 13.95 hrs, Volume= 4.096 af  
Primary = 5.66 cfs @ 13.95 hrs, Volume= 4.096 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 15L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 19L: Controlled

Hydrograph



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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                               |                                                                                                                                             |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment 1S: #1</b>    | Runoff Area=206,959 sf 12.79% Impervious Runoff Depth=6.78"<br>Flow Length=665' Tc=18.7 min CN=WQ Runoff=23.32 cfs 2.683 af                 |
| <b>Subcatchment 2S: #2</b>    | Runoff Area=21,184 sf 1.89% Impervious Runoff Depth=6.27"<br>Flow Length=723' Tc=18.6 min CN=WQ Runoff=2.28 cfs 0.254 af                    |
| <b>Subcatchment 3S: #3</b>    | Runoff Area=23,775 sf 37.60% Impervious Runoff Depth=7.10"<br>Flow Length=543' Tc=13.3 min CN=WQ Runoff=3.15 cfs 0.323 af                   |
| <b>Subcatchment 4S: #4</b>    | Runoff Area=56,602 sf 19.11% Impervious Runoff Depth=7.75"<br>Flow Length=483' Tc=11.7 min CN=WQ Runoff=8.29 cfs 0.839 af                   |
| <b>Subcatchment 5S: #5</b>    | Runoff Area=29,986 sf 77.94% Impervious Runoff Depth=7.82"<br>Flow Length=688' Tc=8.4 min CN=WQ Runoff=4.88 cfs 0.448 af                    |
| <b>Subcatchment 6S: #6</b>    | Runoff Area=56,161 sf 25.15% Impervious Runoff Depth=7.17"<br>Flow Length=649' Tc=12.0 min CN=WQ Runoff=7.79 cfs 0.770 af                   |
| <b>Subcatchment 7S: #7</b>    | Runoff Area=57,648 sf 68.78% Impervious Runoff Depth=7.69"<br>Flow Length=940' Tc=12.8 min CN=WQ Runoff=8.10 cfs 0.848 af                   |
| <b>Subcatchment 8S: #8</b>    | Runoff Area=10,366 sf 1.71% Impervious Runoff Depth=6.12"<br>Flow Length=958' Tc=20.3 min CN=WQ Runoff=1.06 cfs 0.121 af                    |
| <b>Subcatchment 9S: #9</b>    | Runoff Area=16,311 sf 85.53% Impervious Runoff Depth=7.80"<br>Tc=0.0 min CN=WQ Runoff=3.22 cfs 0.243 af                                     |
| <b>Subcatchment 16S: #11</b>  | Runoff Area=192,008 sf 68.43% Impervious Runoff Depth=8.03"<br>Flow Length=841' Tc=8.1 min CN=WQ Runoff=32.18 cfs 2.951 af                  |
| <b>Subcatchment 18S: #10</b>  | Runoff Area=8,922 sf 100.00% Impervious Runoff Depth=8.11"<br>Tc=0.0 min CN=98 Runoff=1.80 cfs 0.138 af                                     |
| <b>Pond 16P: Pond #1A</b>     | Peak Elev=177.08' Storage=45,333 cf Inflow=23.32 cfs 2.683 af<br>12.0" Round Culvert n=0.012 L=142.0' S=0.0000 ' Outflow=14.27 cfs 2.543 af |
| <b>Pond 17P: Pond #1B</b>     | Peak Elev=175.67' Storage=27,582 cf Inflow=14.54 cfs 2.682 af<br>Outflow=3.77 cfs 2.561 af                                                  |
| <b>Pond 20P: Pond #2</b>      | Peak Elev=179.77' Storage=68,502 cf Inflow=33.35 cfs 3.195 af<br>Outflow=3.64 cfs 3.105 af                                                  |
| <b>Link 15L: Ultimate</b>     | Inflow=38.72 cfs 9.271 af<br>Primary=38.72 cfs 9.271 af                                                                                     |
| <b>Link 18L: Uncontrolled</b> | Inflow=34.51 cfs 3.605 af<br>Primary=34.51 cfs 3.605 af                                                                                     |

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### Link 19L: Controlled

Inflow=7.41 cfs 5.666 af

Primary=7.41 cfs 5.666 af

**Total Runoff Area = 15.609 ac   Runoff Volume = 9.621 af   Average Runoff Depth = 7.40"**  
**59.08% Pervious = 9.222 ac   40.92% Impervious = 6.387 ac**

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**Summary for Subcatchment 1S: #1**

[47] Hint: Peak is 926% of capacity of segment #3

Runoff = 23.32 cfs @ 12.27 hrs, Volume= 2.683 af, Depth= 6.78"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

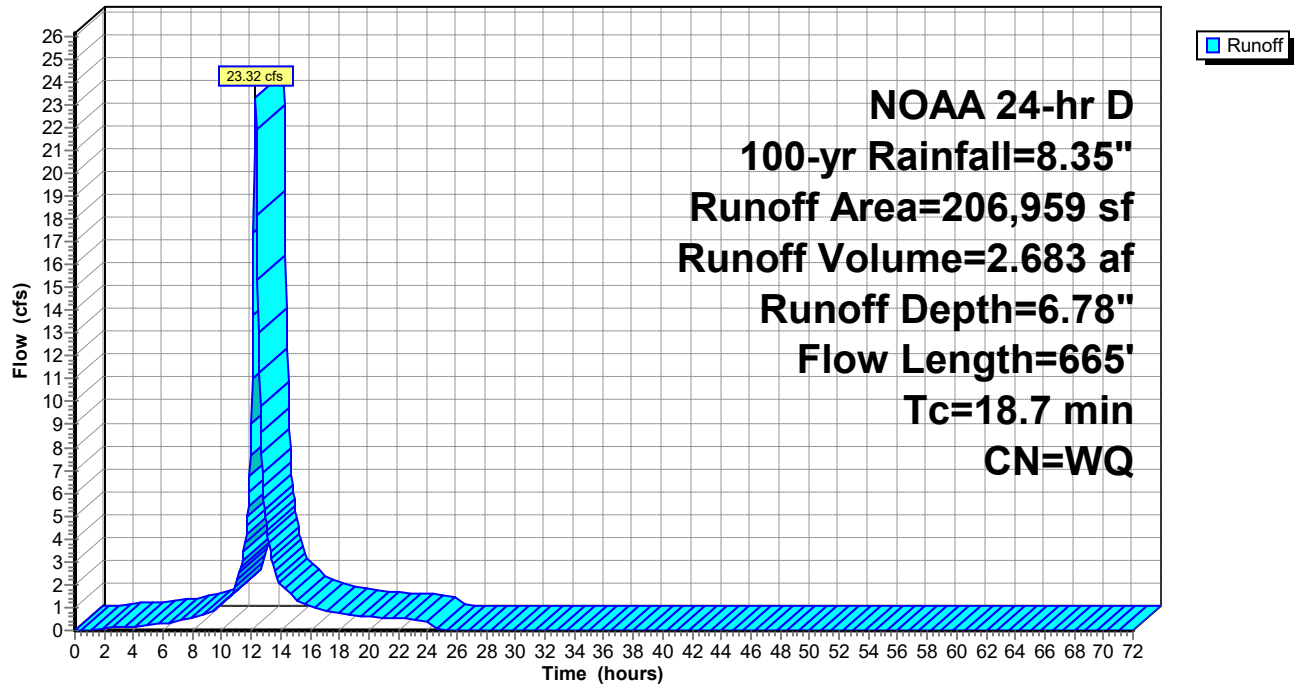
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 121,340   | 80 | >75% Grass cover, Good, HSG D |
| 16,397    | 98 | Paved parking, HSG D          |
| 59,148    | 96 | Gravel surface, HSG D         |
| 10,074    | 98 | Water Surface, HSG D          |
| 206,959   |    | Weighted Average              |
| 180,488   | 85 | 87.21% Pervious Area          |
| 26,471    | 98 | 12.79% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                          |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow, Sheet Flow</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length                                  |
| 8.6      | 398           | 0.0023        | 0.77              |                | <b>Shallow Concentrated Flow, Shallow Concentrated Flow</b><br>Unpaved Kv= 16.1 fps                                                  |
| 1.2      | 235           | 0.0050        | 3.21              | 2.52           | <b>Pipe Channel, 12" Perforated Pipe</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 18.7     | 665           | Total         |                   |                |                                                                                                                                      |

Subcatchment 1S: #1

Hydrograph



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**Summary for Subcatchment 2S: #2**

Runoff = 2.28 cfs @ 12.27 hrs, Volume= 0.254 af, Depth= 6.27"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

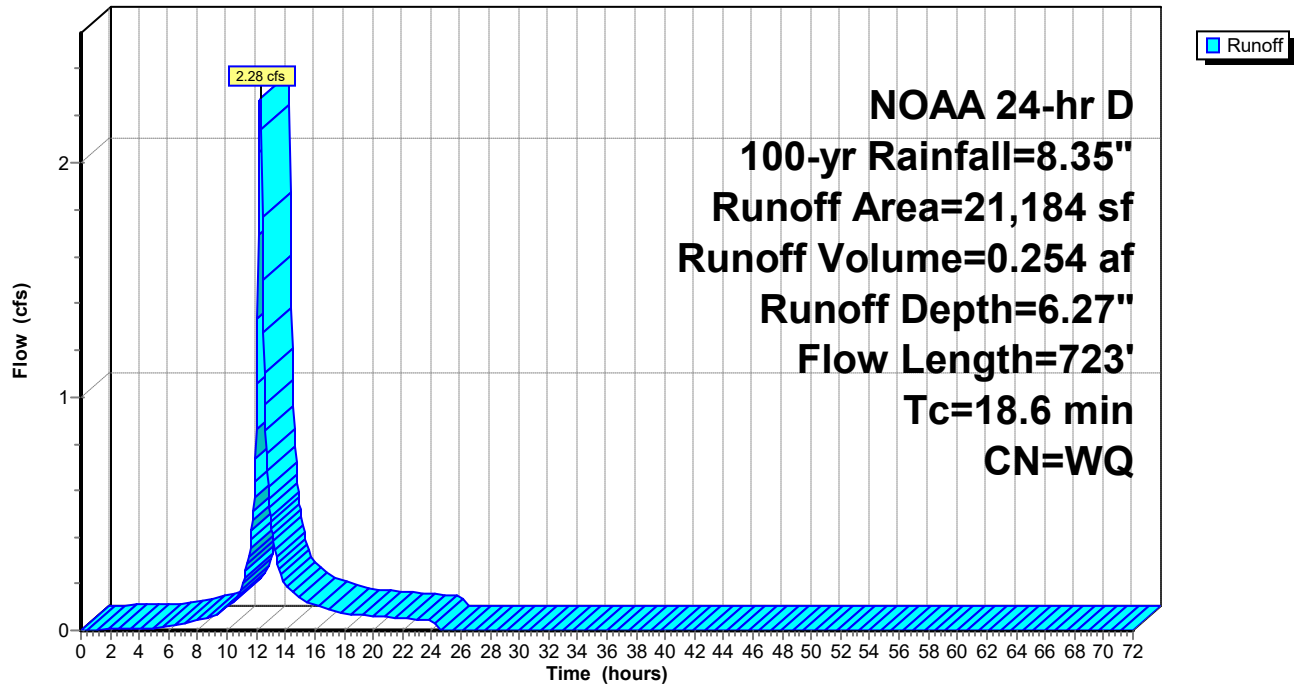
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 401       | 98 | Paved parking, HSG D          |
| 18,044    | 80 | >75% Grass cover, Good, HSG D |
| 2,739     | 98 | Water Surface, 0% imp, HSG D  |
| 21,184    |    | Weighted Average              |
| 20,783    | 82 | 98.11% Pervious Area          |
| 401       | 98 | 1.89% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------|
| 9.0      | 33            | 0.0024        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length   |
| 2.7      | 129           | 0.0024        | 0.79              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                  |
| 5.9      | 251           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.035 Earth, dense weeds |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011          |
| 18.6     | 723           | Total         |                   |                |                                                                                            |

Subcatchment 2S: #2

Hydrograph



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**Summary for Subcatchment 3S: #3**

Runoff = 3.15 cfs @ 12.21 hrs, Volume= 0.323 af, Depth= 7.10"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

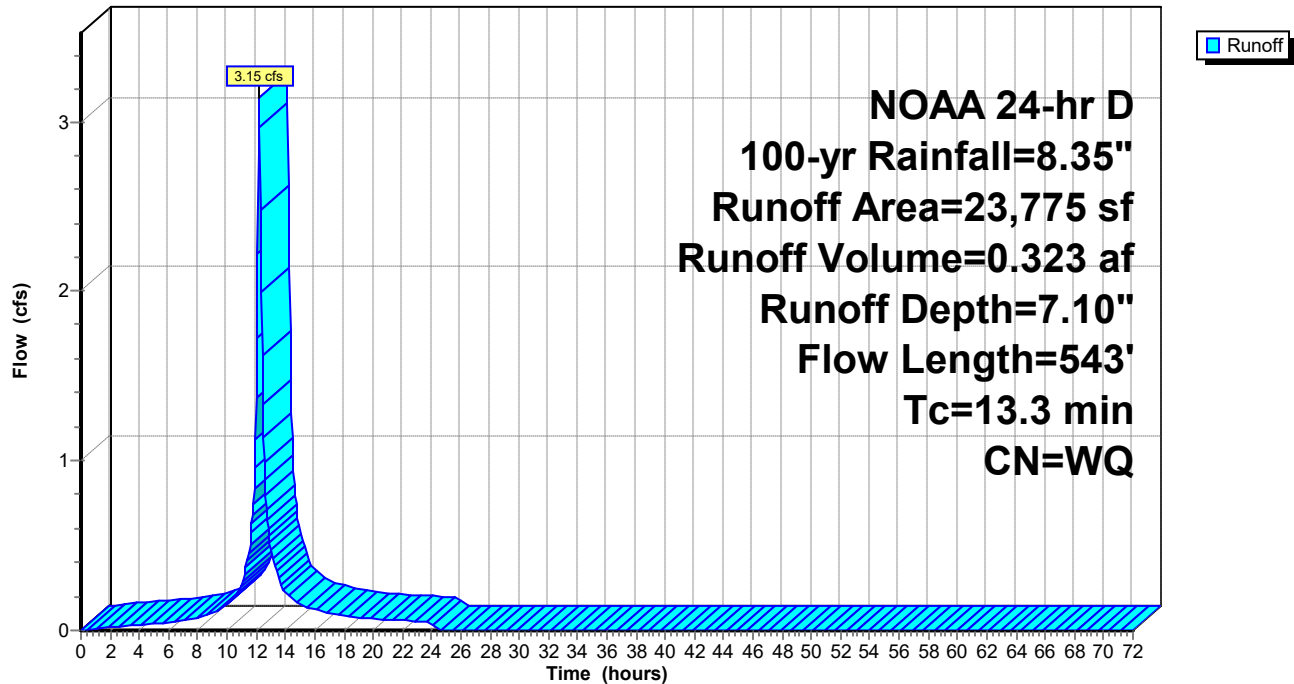
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,884     | 98 | Paved parking, HSG D          |
| 2,219     | 98 | Water Surface, 0% imp, HSG D  |
| 10,956    | 80 | >75% Grass cover, Good, HSG D |
| 1,661     | 96 | Gravel surface, HSG D         |
| 55        | 98 | Roofs, HSG D                  |
| 23,775    |    | Weighted Average              |
| 14,836    | 84 | 62.40% Pervious Area          |
| 8,939     | 98 | 37.60% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------|
| 8.9      | 60            | 0.0080        | 0.11              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length   |
| 0.6      | 55            | 0.0080        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                  |
| 2.8      | 118           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.035 Earth, dense weeds |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011          |
| 13.3     | 543           | Total         |                   |                |                                                                                            |

Subcatchment 3S: #3

Hydrograph



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**Summary for Subcatchment 4S: #4**

Runoff = 8.29 cfs @ 12.19 hrs, Volume= 0.839 af, Depth= 7.75"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 10,547    | 98 | Paved parking, HSG D          |
| 40,844    | 96 | Gravel surface, HSG D         |
| 267       | 98 | Roofs, HSG D                  |
| 4,944     | 80 | >75% Grass cover, Good, HSG D |
| 56,602    |    | Weighted Average              |
| 45,788    | 94 | 80.89% Pervious Area          |
| 10,814    | 98 | 19.11% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 60            | 0.0080        | 0.11              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 2.1      | 183           | 0.0080        | 1.44              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                |
| 0.7      | 240           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 11.7     | 483           | Total         |                   |                |                                                                                          |

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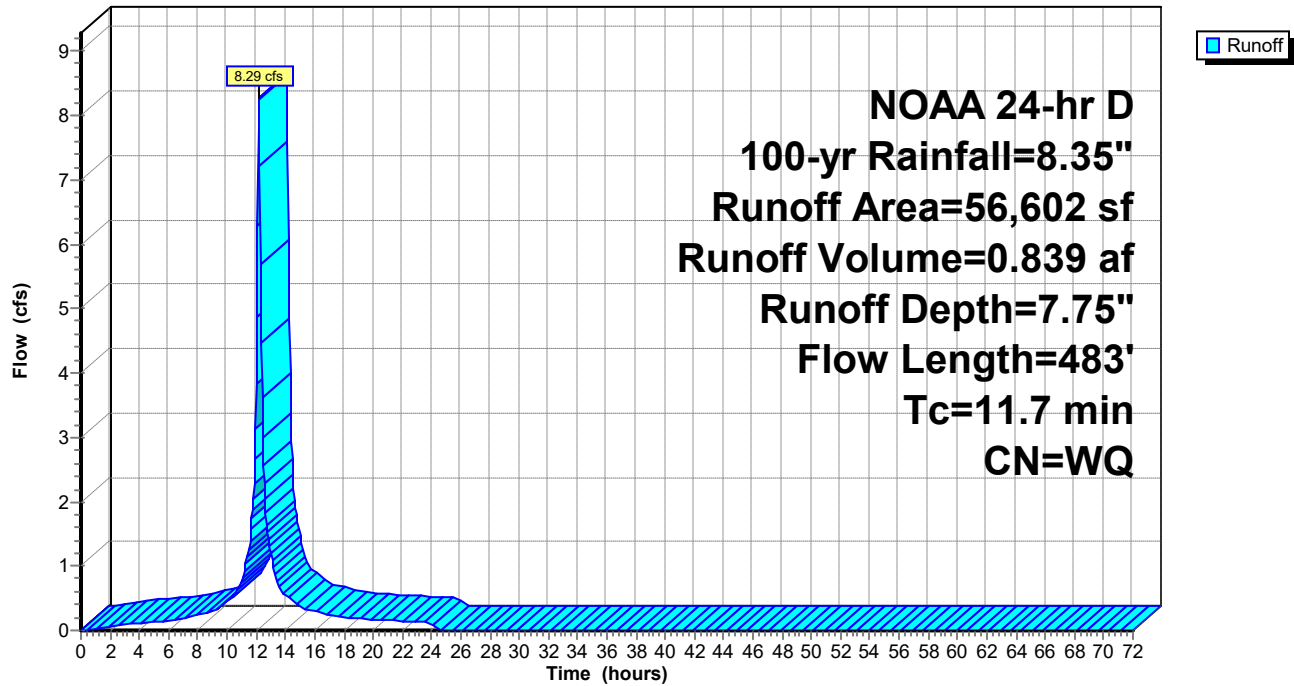
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 4S: #4

#### Hydrograph



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NOAA 24-hr D 100-yr Rainfall=8.35"

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**Summary for Subcatchment 5S: #5**

Runoff = 4.88 cfs @ 12.15 hrs, Volume= 0.448 af, Depth= 7.82"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

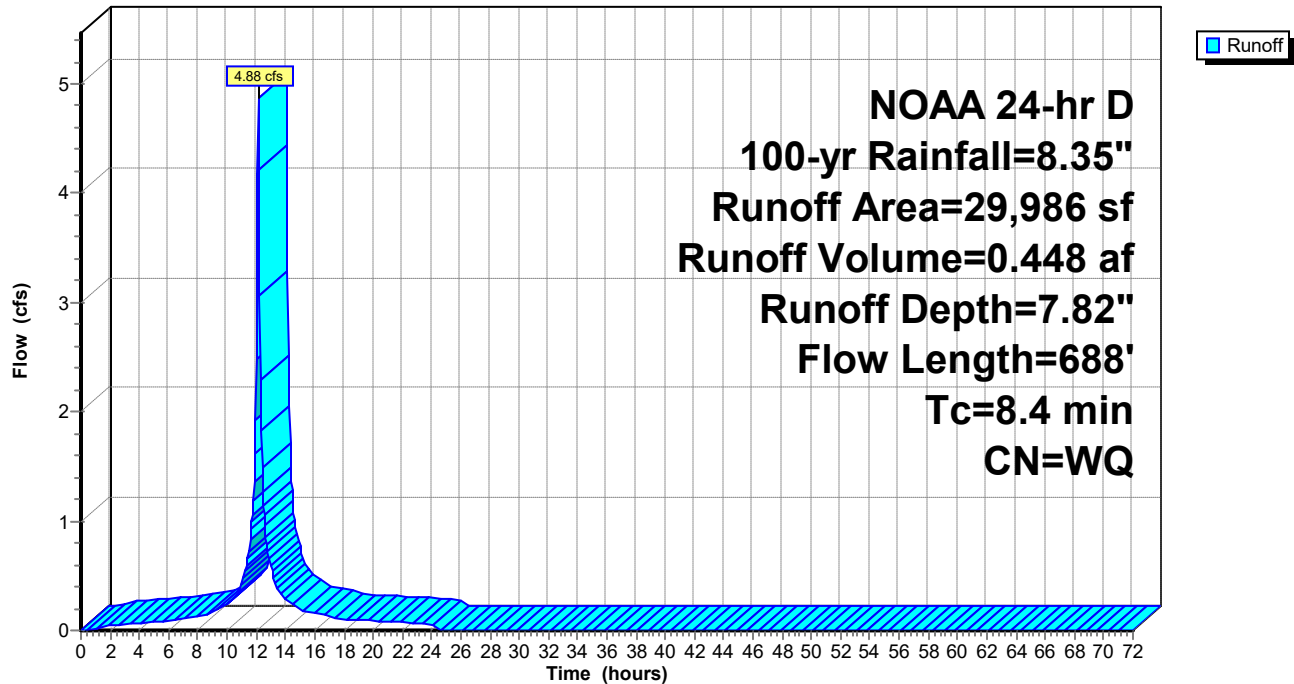
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 23,144    | 98 | Roofs, HSG D                  |
| 228       | 98 | Paved parking, HSG D          |
| 4,093     | 80 | >75% Grass cover, Good, HSG D |
| 2,521     | 98 | Water Surface, 0% imp, HSG D  |
| 29,986    |    | Weighted Average              |
| 6,614     | 87 | 22.06% Pervious Area          |
| 23,372    | 98 | 77.94% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 3.1      | 171           | 0.0020        | 0.91              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 0.1      | 29            | 0.0500        | 3.60              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                         |
| 4.2      | 178           | 0.0001        | 0.71              | 45.43          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.035              |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011 |
| 8.4      | 688           | Total         |                   |                |                                                                                   |

Subcatchment 5S: #5

Hydrograph



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**Summary for Subcatchment 6S: #6**

[47] Hint: Peak is 2186% of capacity of segment #3

Runoff = 7.79 cfs @ 12.19 hrs, Volume= 0.770 af, Depth= 7.17"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 5,706     | 98 | Roofs, HSG D                  |
| 22,321    | 80 | >75% Grass cover, Good, HSG D |
| 19,713    | 96 | Gravel surface, HSG D         |
| 8,421     | 98 | Paved parking, HSG D          |
| 56,161    |    | Weighted Average              |
| 42,034    | 88 | 74.85% Pervious Area          |
| 14,127    | 98 | 25.15% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                      |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------------------------------|
| 2.3      | 100           | 0.0035        | 0.72              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                         |
| 2.2      | 123           | 0.0035        | 0.95              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                                        |
| 6.8      | 186           | 0.0001        | 0.45              | 0.36           | <b>Pipe Channel,</b><br>12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'<br>n= 0.013 Corrugated PE, smooth interior |
| 0.7      | 240           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011                                |
| 12.0     | 649           | Total         |                   |                |                                                                                                                  |

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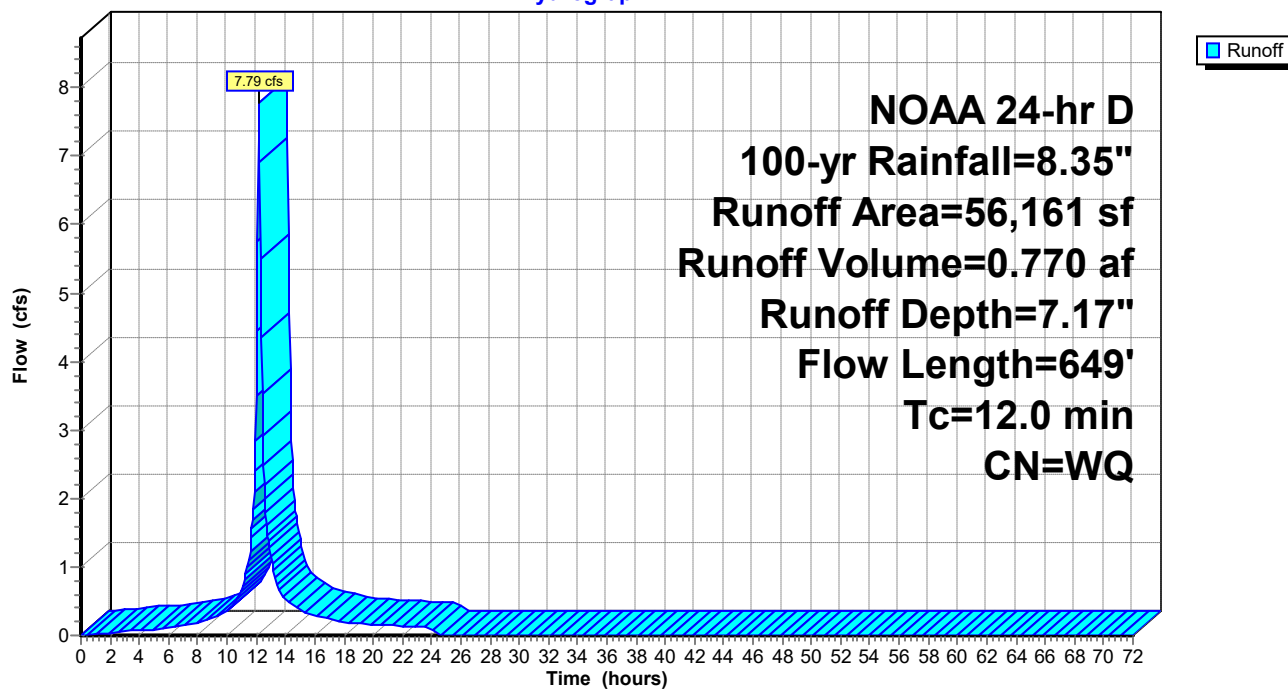
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 6S: #6

Hydrograph



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**Summary for Subcatchment 7S: #7**

Runoff = 8.10 cfs @ 12.20 hrs, Volume= 0.848 af, Depth= 7.69"  
 Routed to Link 18L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 39,428    | 98 | Roofs, HSG D                  |
| 4,293     | 96 | Gravel surface, HSG D         |
| 224       | 98 | Paved parking, HSG D          |
| 10,665    | 80 | >75% Grass cover, Good, HSG D |
| 3,038     | 98 | Water Surface, 0% imp, HSG D  |
| 57,648    |    | Weighted Average              |
| 17,996    | 87 | 31.22% Pervious Area          |
| 39,652    | 98 | 68.78% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                       |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------|
| 1.2      | 65            | 0.0020        | 0.91              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                           |
| 2.0      | 140           | 0.0050        | 1.14              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                         |
| 8.6      | 425           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030              |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011 |
| 12.8     | 940           | Total         |                   |                |                                                                                   |

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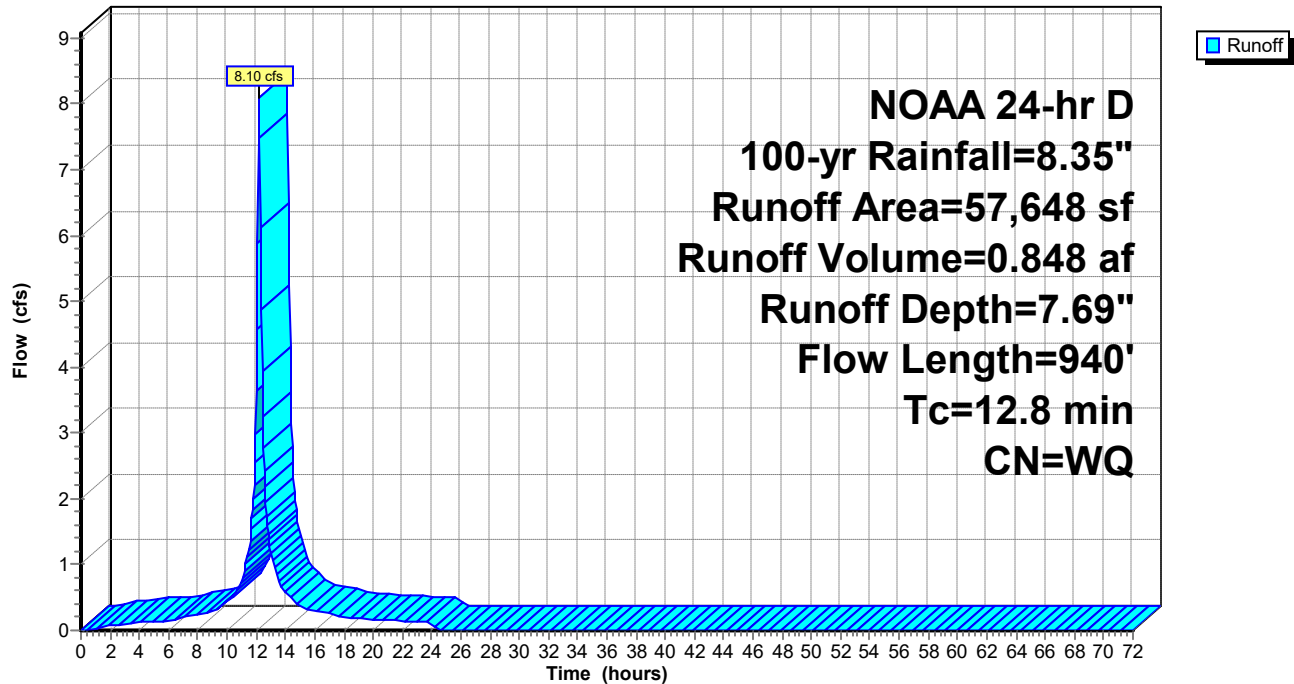
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 7S: #7

#### Hydrograph



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**Summary for Subcatchment 8S: #8**

Runoff = 1.06 cfs @ 12.29 hrs, Volume= 0.121 af, Depth= 6.12"  
 Routed to Link 18L : Uncontrolled

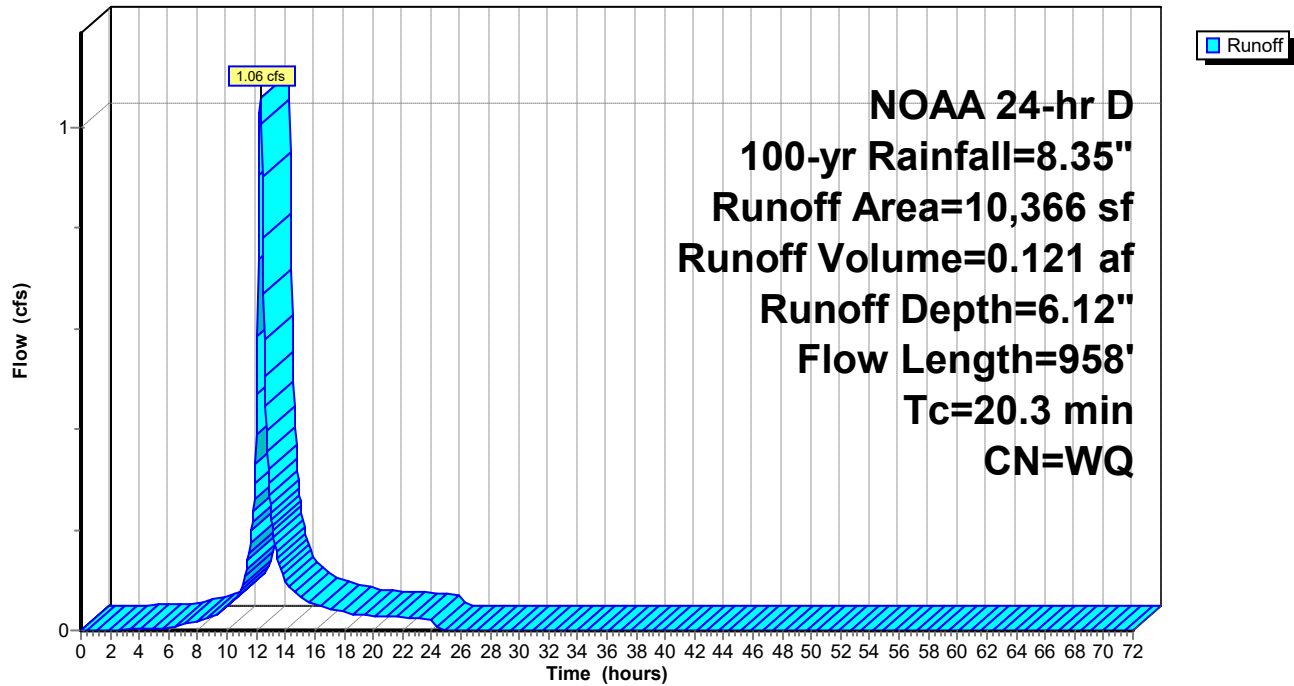
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 195       | 96 | Gravel surface, HSG D         |
| 9,524     | 80 | >75% Grass cover, Good, HSG D |
| 177       | 98 | Paved parking, HSG D          |
| 470       | 98 | Water Surface, 0% imp, HSG D  |
| 10,366    |    | Weighted Average              |
| 10,189    | 81 | 98.29% Pervious Area          |
| 177       | 98 | 1.71% Impervious Area         |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                              |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------------------------|
| 8.9         | 76               | 0.0130           | 0.14                 |                   | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 0.9         | 98               | 0.0130           | 1.84                 |                   | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                |
| 9.5         | 474              | 0.0001           | 0.83                 | 53.01             | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030                     |
| 1.0         | 310              | 0.0040           | 5.38                 | 16.91             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 20.3        | 958              | Total            |                      |                   |                                                                                          |

Subcatchment 8S: #8

Hydrograph



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### Summary for Subcatchment 9S: #9

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 3.22 cfs @ 12.04 hrs, Volume= 0.243 af, Depth= 7.80"  
Routed to Pond 20P : Pond #2

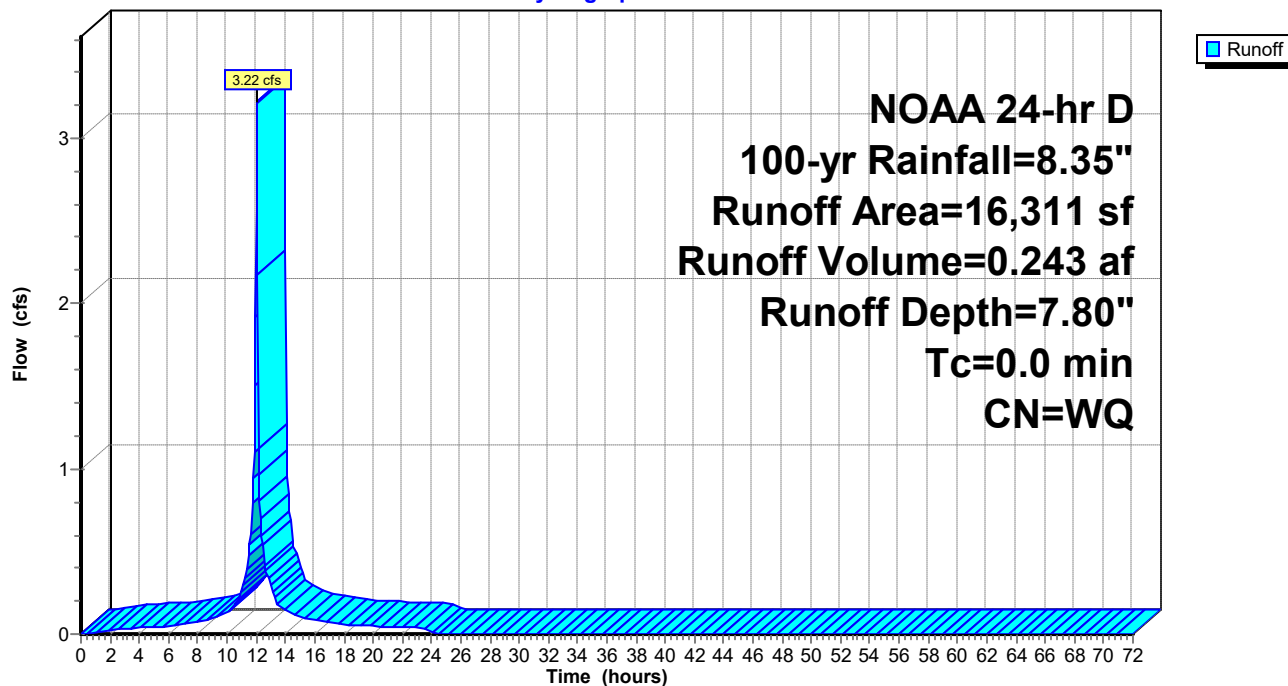
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 13,951    | 98 | Water Surface, HSG D          |
| 2,360     | 80 | >75% Grass cover, Good, HSG D |
| 16,311    |    | Weighted Average              |
| 2,360     | 80 | 14.47% Pervious Area          |
| 13,951    | 98 | 85.53% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description   |
|-------------|------------------|------------------|----------------------|-------------------|---------------|
| 0.0         |                  |                  |                      |                   | Direct Entry, |

### Subcatchment 9S: #9

Hydrograph



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**Summary for Subcatchment 16S: #11**

[47] Hint: Peak is 3766% of capacity of segment #3

Runoff = 32.18 cfs @ 12.15 hrs, Volume= 2.951 af, Depth= 8.03"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description            |
|-----------|----|------------------------|
| 8,641     | 98 | Paved parking, HSG D   |
| 14,953    | 98 | Paved parking, HSG D   |
| 60,610    | 96 | Gravel surface, HSG D  |
| 5,108     | 98 | Roofs, HSG D           |
| 45,331    | 98 | Roofs, HSG D           |
| 57,365    | 98 | Paved parking, HSG D   |
| 192,008   |    | Weighted Average       |
| 60,610    | 96 | 31.57% Pervious Area   |
| 131,398   | 98 | 68.43% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                    |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1.9      | 100           | 0.0056        | 0.87              |                | <b>Sheet Flow, Gravel</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                                |
| 2.9      | 260           | 0.0056        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps                                                                        |
| 3.3      | 481           | 0.0050        | 2.45              | 0.85           | <b>Pipe Channel, Pipe to Pond 2</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.013 Corrugated PE, smooth interior |
| 8.1      | 841           | Total         |                   |                |                                                                                                                                |

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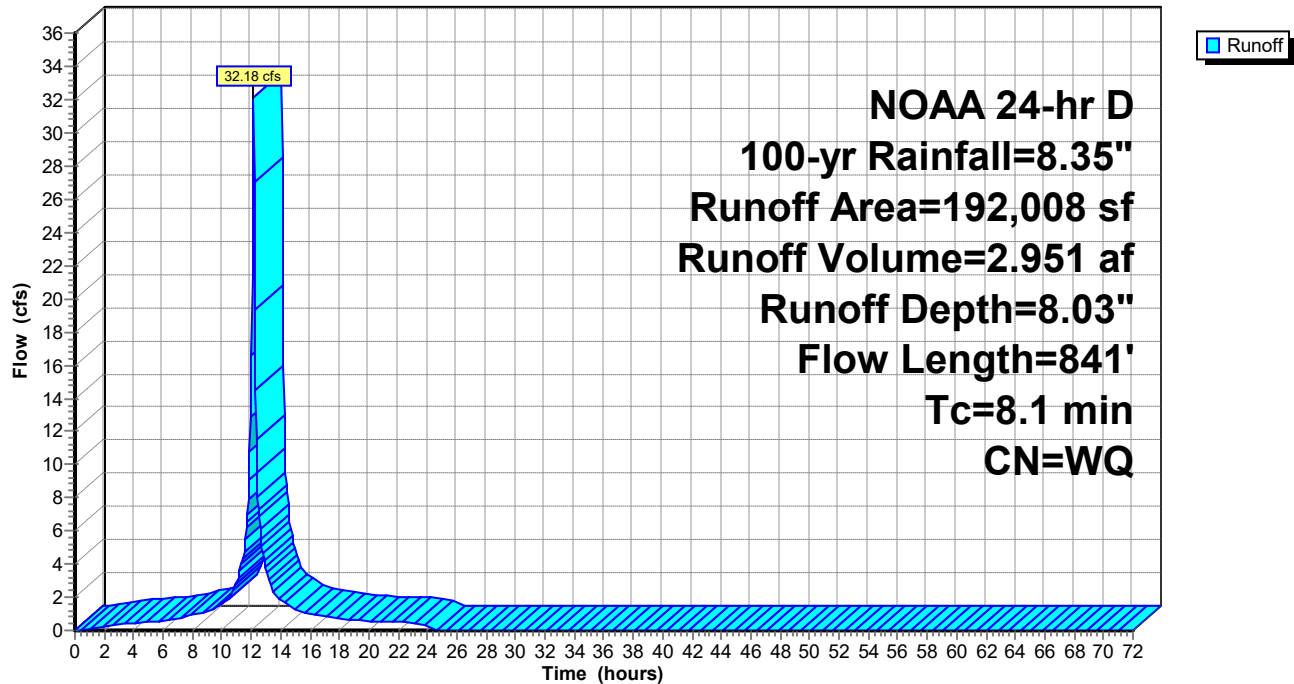
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 16S: #11

Hydrograph



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### Summary for Subcatchment 18S: #10

[46] Hint: Tc=0 (Instant runoff peak depends on dt)

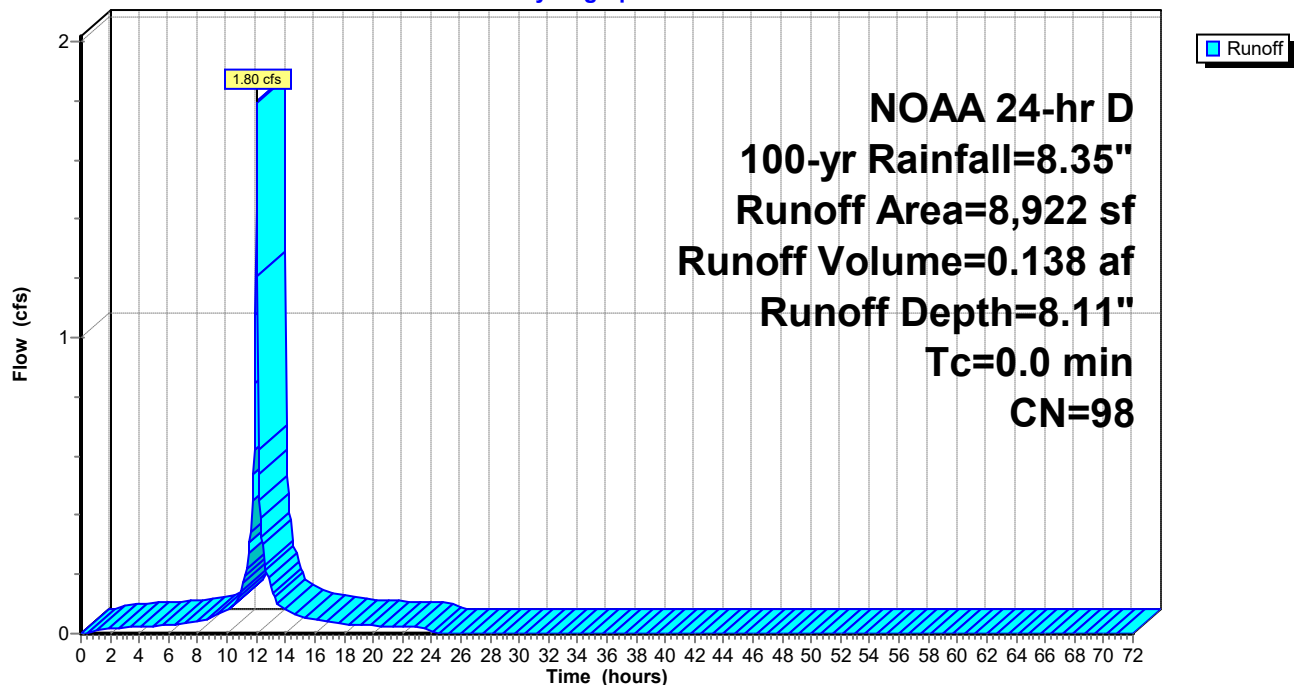
Runoff = 1.80 cfs @ 12.04 hrs, Volume= 0.138 af, Depth= 8.11"  
Routed to Pond 17P : Pond #1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description             |
|-----------|----|-------------------------|
| 8,922     | 98 | Water Surface, HSG D    |
| 8,922     | 98 | 100.00% Impervious Area |

### Subcatchment 18S: #10

Hydrograph



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### Summary for Pond 16P: Pond #1A

Inflow Area = 4.751 ac, 12.79% Impervious, Inflow Depth = 6.78" for 100-yr event  
Inflow = 23.32 cfs @ 12.27 hrs, Volume= 2.683 af  
Outflow = 14.27 cfs @ 12.51 hrs, Volume= 2.543 af, Atten= 39%, Lag= 14.4 min  
Primary = 14.27 cfs @ 12.51 hrs, Volume= 2.543 af  
Routed to Pond 17P : Pond #1B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 177.08' @ 12.45 hrs Surf.Area= 10,074 sf Storage= 45,333 cf  
Flood Elev= 177.08' Surf.Area= 10,074 sf Storage= 45,333 cf

Plug-Flow detention time= 254.3 min calculated for 2.543 af (95% of inflow)  
Center-of-Mass det. time= 223.7 min ( 1,015.0 - 791.4 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 45,333 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

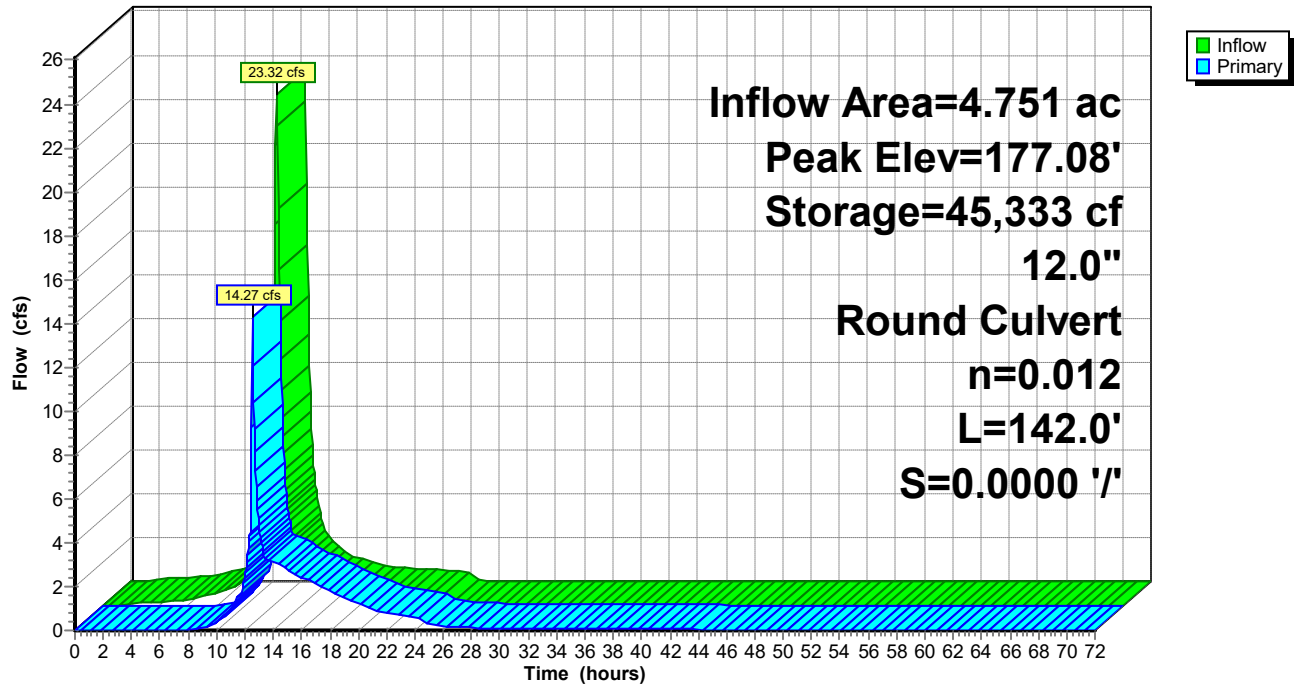
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 10,074               | 0                         | 0                         |
| 177.08              | 10,074               | 45,333                    | 45,333                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                     |
|--------|---------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                        |
| #1     | Primary | 173.08' | <b>12.0" Round Culvert</b><br>L= 142.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' / ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=4.24 cfs @ 12.51 hrs HW=177.08' TW=174.69' (Dynamic Tailwater)  
↑**1=Culvert** (Outlet Controls 4.24 cfs @ 5.39 fps)

## Pond 16P: Pond #1A

## Hydrograph



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### Summary for Pond 17P: Pond #1B

Inflow Area = 4.956 ac, 16.39% Impervious, Inflow Depth > 6.49" for 100-yr event  
Inflow = 14.54 cfs @ 12.51 hrs, Volume= 2.682 af  
Outflow = 3.77 cfs @ 13.24 hrs, Volume= 2.561 af, Atten= 74%, Lag= 44.1 min  
Primary = 3.77 cfs @ 13.24 hrs, Volume= 2.561 af  
Routed to Link 19L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 175.67' @ 13.24 hrs Surf.Area= 8,922 sf Storage= 27,582 cf

Plug-Flow detention time= 213.9 min calculated for 2.559 af (95% of inflow)  
Center-of-Mass det. time= 149.4 min ( 1,150.1 - 1,000.6 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 40,149 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 8,922                | 0                         | 0                         |
| 177.08              | 8,922                | 40,149                    | 40,149                    |

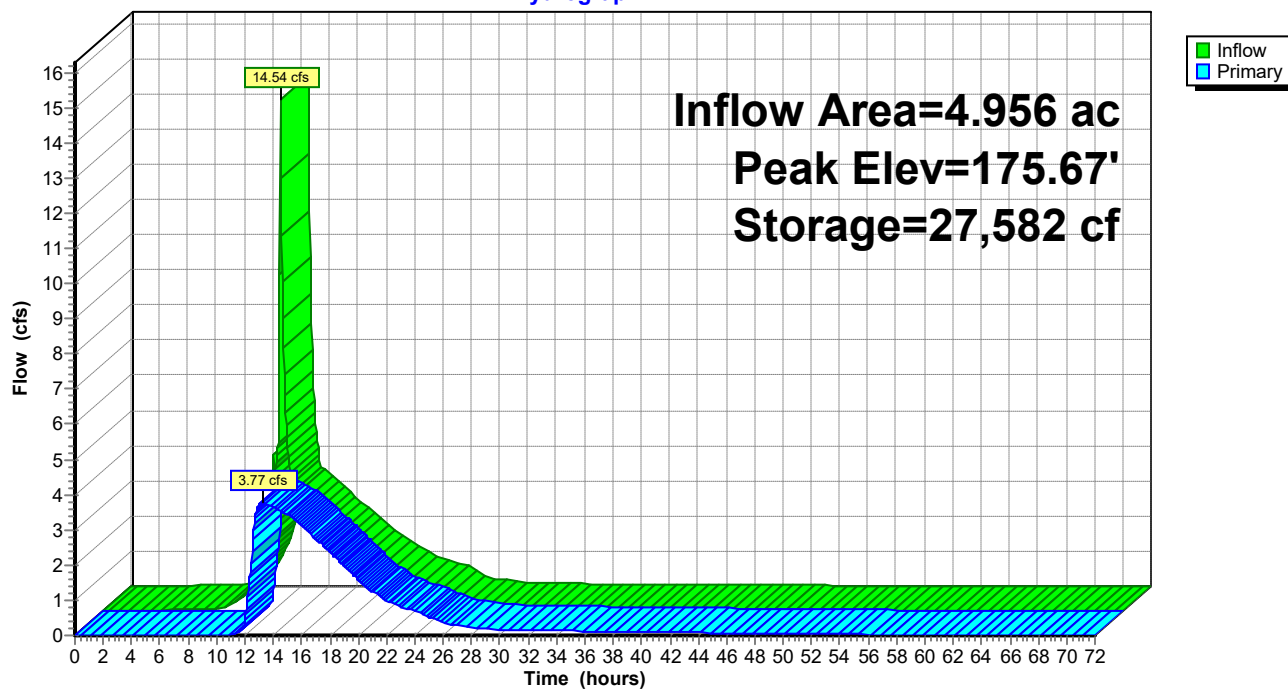
| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                                           |
|--------|----------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Device 4 | 173.08' | <b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                               |
| #2     | Device 4 | 173.58' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                              |
| #3     | Device 4 | 175.83' | <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                                     |
| #4     | Primary  | 173.08' | <b>12.0" Round Culvert</b><br>L= 25.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.77 cfs @ 13.24 hrs HW=175.67' TW=0.00' (Dynamic Tailwater)

4=Culvert (Passes 3.77 cfs of 5.40 cfs potential flow)  
1=Orifice/Grate (Orifice Controls 0.37 cfs @ 7.56 fps)  
2=Orifice/Grate (Orifice Controls 3.40 cfs @ 6.23 fps)  
3=Sharp-Crested Rectangular Weir ( Controls 0.00 cfs)

## Pond 17P: Pond #1B

## Hydrograph



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### Summary for Pond 20P: Pond #2

Inflow Area = 4.782 ac, 69.77% Impervious, Inflow Depth = 8.02" for 100-yr event  
Inflow = 33.35 cfs @ 12.14 hrs, Volume= 3.195 af  
Outflow = 3.64 cfs @ 13.10 hrs, Volume= 3.105 af, Atten= 89%, Lag= 57.2 min  
Primary = 3.64 cfs @ 13.10 hrs, Volume= 3.105 af  
Routed to Link 19L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 179.77' @ 13.10 hrs Surf.Area= 13,951 sf Storage= 68,502 cf

Plug-Flow detention time= 277.4 min calculated for 3.103 af (97% of inflow)  
Center-of-Mass det. time= 261.1 min ( 1,007.8 - 746.7 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 174.86' | 78,684 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 174.86              | 13,951               | 0                         | 0                         |
| 180.50              | 13,951               | 78,684                    | 78,684                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                  |
|--------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 175.09' | <b>12.0" Round Culvert</b><br>L= 352.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 175.09' / 174.58' S= 0.0014 '/ Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Primary | 180.00' | <b>540.0' long (Profile 2) Broad-Crested Rectangular Weir</b><br>Head (feet) 0.49 0.98 1.48<br>Coef. (English) 2.90 3.26 3.44                                                                                   |

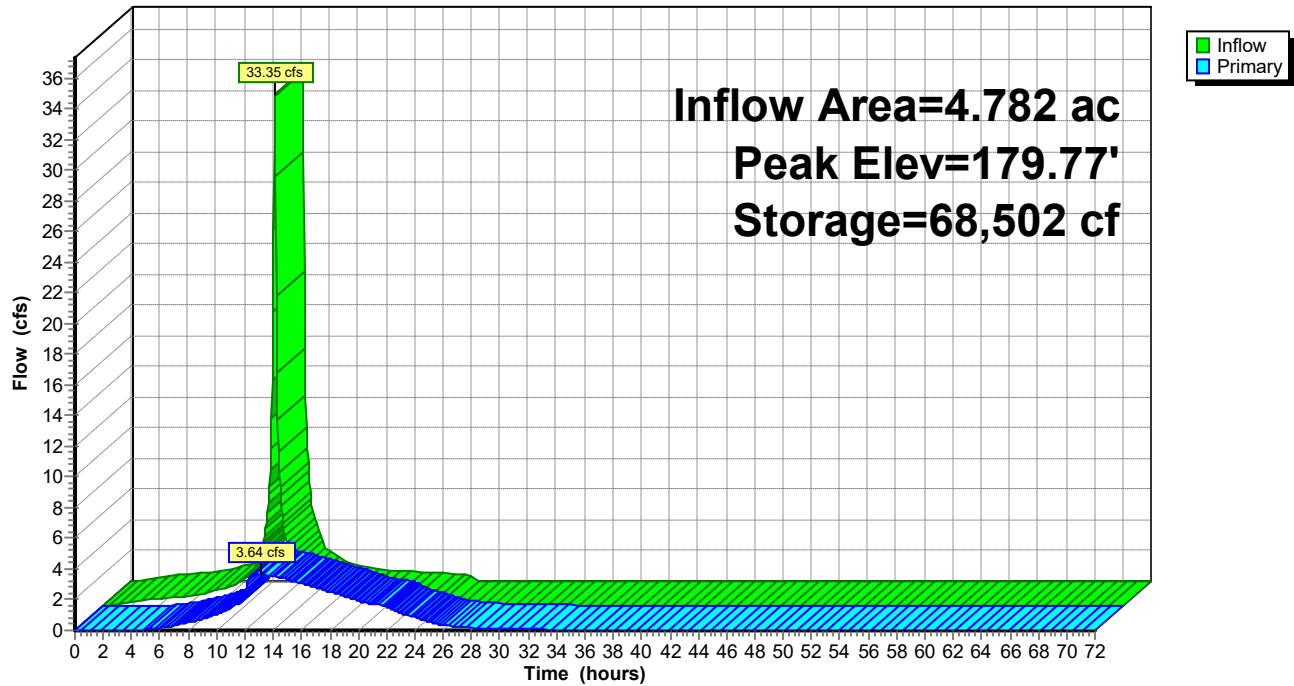
**Primary OutFlow** Max=3.64 cfs @ 13.10 hrs HW=179.77' TW=0.00' (Dynamic Tailwater)

1=Culvert (Barrel Controls 3.64 cfs @ 4.64 fps)

2=Broad-Crested Rectangular Weir ( Controls 0.00 cfs)

**Pond 20P: Pond #2**

**Hydrograph**



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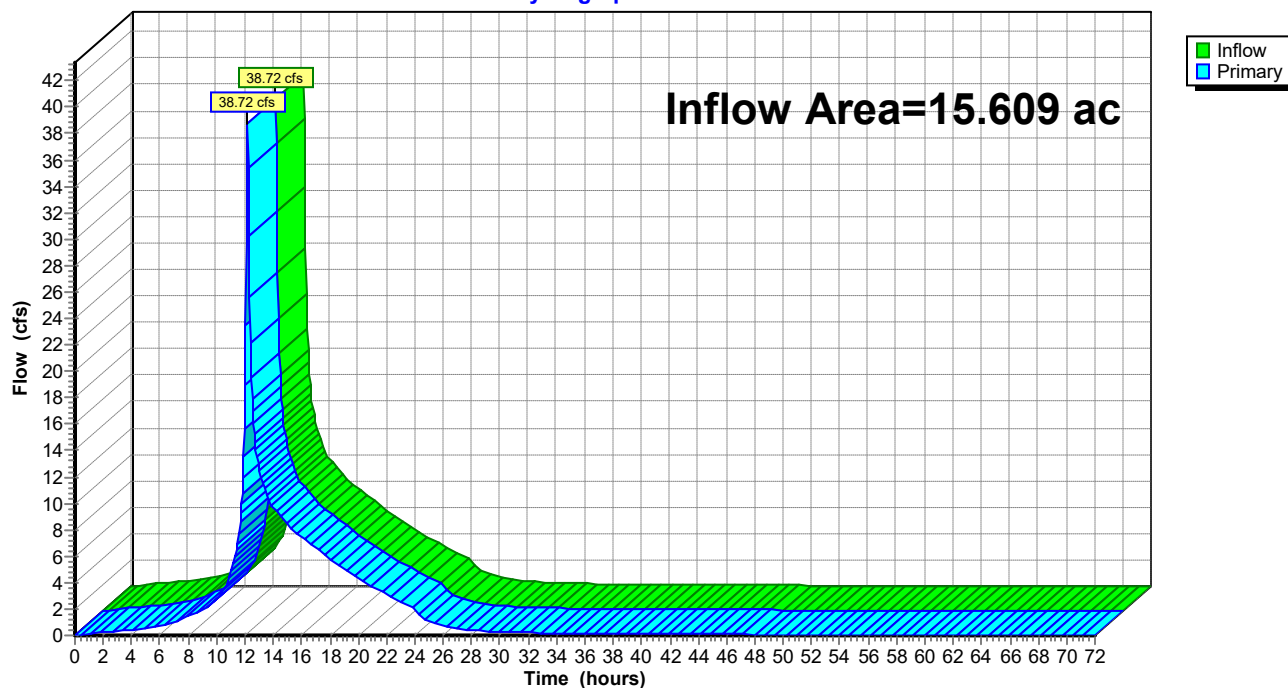
### Summary for Link 15L: Ultimate

Inflow Area = 15.609 ac, 40.92% Impervious, Inflow Depth > 7.13" for 100-yr event  
Inflow = 38.72 cfs @ 12.20 hrs, Volume= 9.271 af  
Primary = 38.72 cfs @ 12.20 hrs, Volume= 9.271 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 15L: Ultimate

Hydrograph



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NOAA 24-hr D 100-yr Rainfall=8.35"

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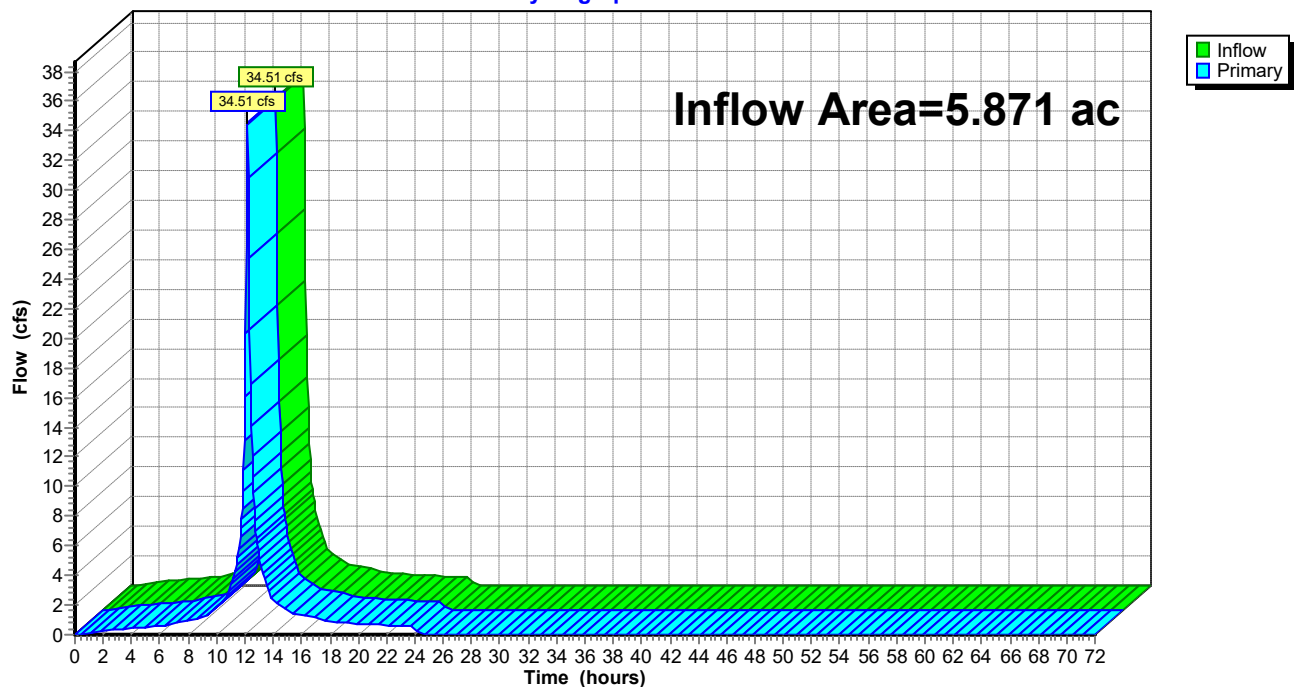
### Summary for Link 18L: Uncontrolled

Inflow Area = 5.871 ac, 38.12% Impervious, Inflow Depth = 7.37" for 100-yr event  
Inflow = 34.51 cfs @ 12.19 hrs, Volume= 3.605 af  
Primary = 34.51 cfs @ 12.19 hrs, Volume= 3.605 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 15L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 18L: Uncontrolled

Hydrograph



## Existing\_Global Model

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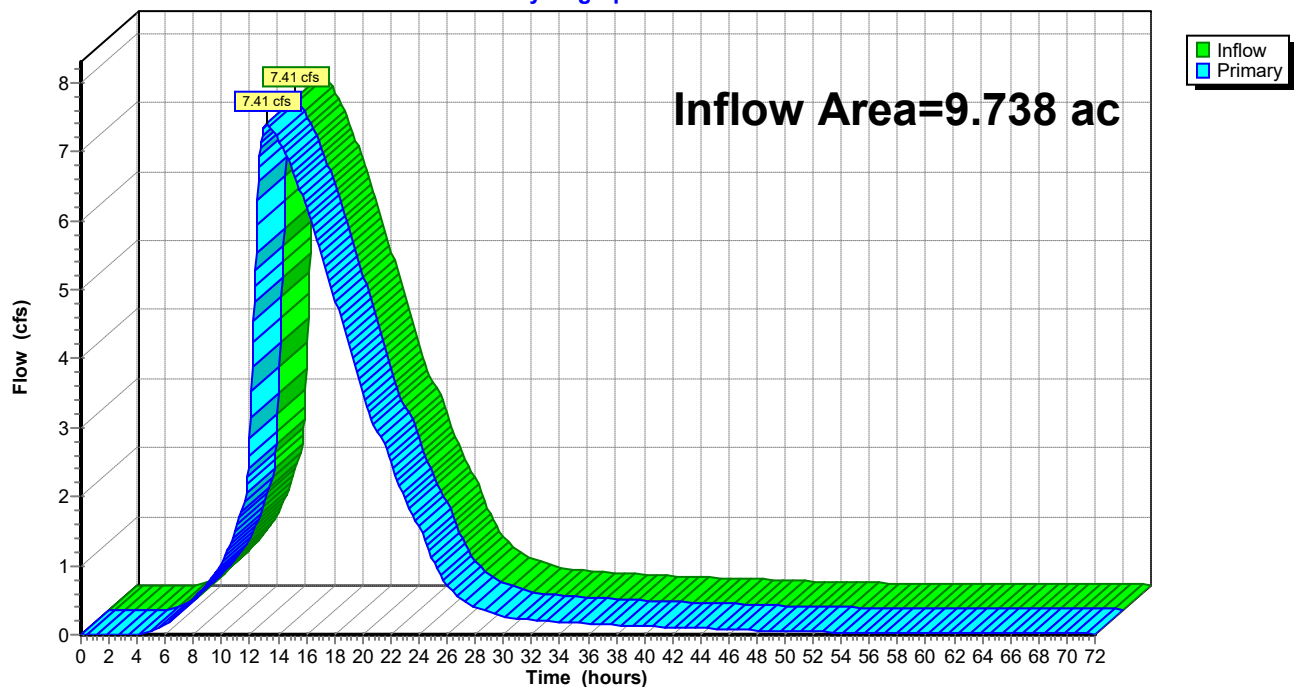
### Summary for Link 19L: Controlled

Inflow Area = 9.738 ac, 42.61% Impervious, Inflow Depth > 6.98" for 100-yr event  
Inflow = 7.41 cfs @ 13.22 hrs, Volume= 5.666 af  
Primary = 7.41 cfs @ 13.22 hrs, Volume= 5.666 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 15L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 19L: Controlled

Hydrograph



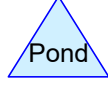
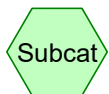
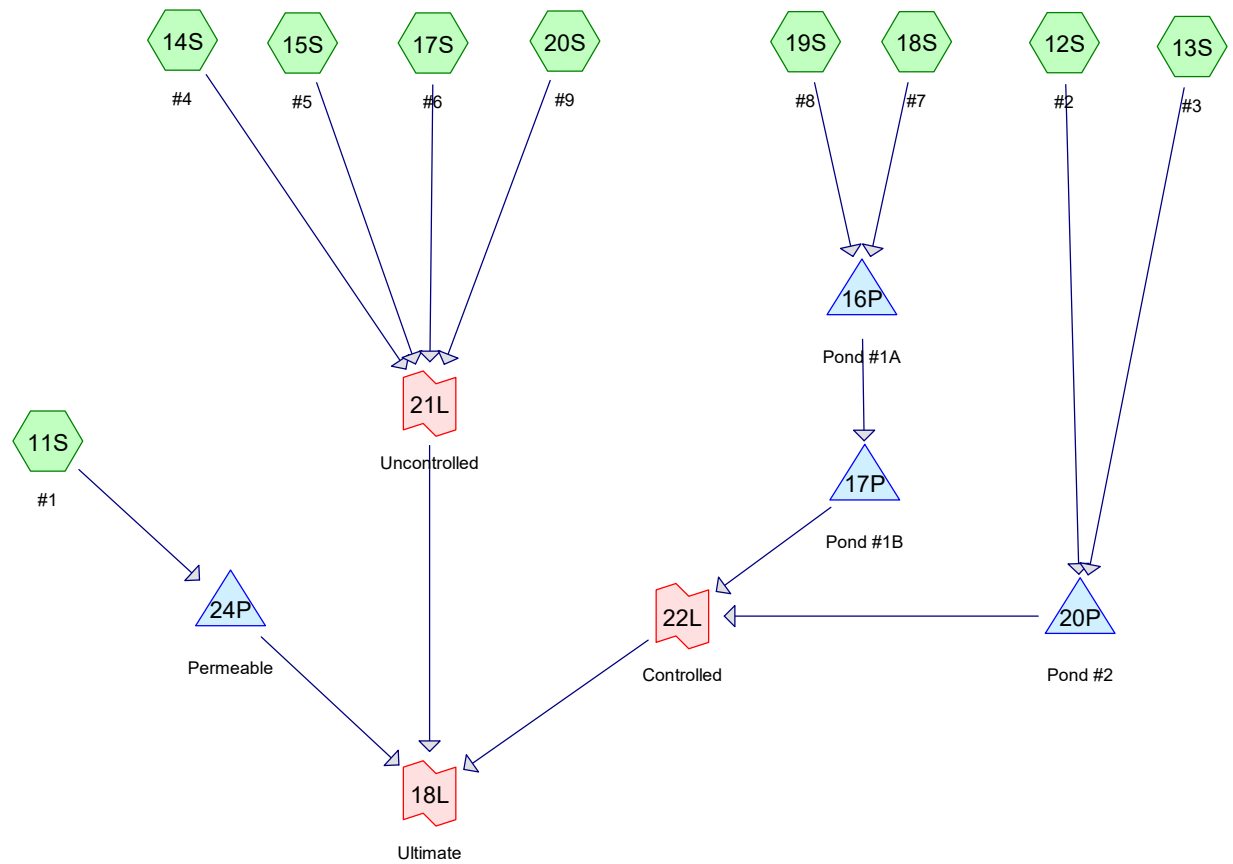
DARMOFALSKI ENGINEERING ASSOCIATES, INC.

Stormwater Drainage Report  
#30 Hillview Road, Pequannock, Morris County

September 8, 2022

### Appendix C

Proposed Drainage Areas HydroCAD Outputs



### Routing Diagram for Proposed\_Global Model

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### Rainfall Events Listing (selected events)

| Event# | Event Name | Storm Type | Curve | Mode    | Duration (hours) | B/B | Depth (inches) | AMC |
|--------|------------|------------|-------|---------|------------------|-----|----------------|-----|
| 1      | 2-yr       | NOAA 24-hr | D     | Default | 24.00            | 1   | 3.54           | 2   |
| 2      | 10-yr      | NOAA 24-hr | D     | Default | 24.00            | 1   | 5.24           | 2   |
| 3      | 25-yr      | NOAA 24-hr | D     | Default | 24.00            | 1   | 6.37           | 2   |
| 4      | 100-yr     | NOAA 24-hr | D     | Default | 24.00            | 1   | 8.35           | 2   |

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### Area Listing (all nodes)

| Area<br>(acres) | CN        | Description<br>(subcatchment-numbers)                                       |
|-----------------|-----------|-----------------------------------------------------------------------------|
| 0.069           | 80        | 1/2 Switchyard (19S)                                                        |
| 0.069           | 98        | 1/2 Switchyard (19S)                                                        |
| 6.752           | 80        | >75% Grass cover, Good, HSG D (11S, 12S, 13S, 14S, 15S, 17S, 18S, 19S, 20S) |
| 0.005           | 98        | Bridge (14S, 15S)                                                           |
| 0.169           | 98        | Equipment (12S, 14S, 19S)                                                   |
| 0.173           | 80        | Grass Paver (15S)                                                           |
| 0.928           | 68        | Gravel (11S, 12S, 19S)                                                      |
| 3.102           | 98        | Greenhouse (12S, 13S, 15S)                                                  |
| 0.614           | 98        | Headhouse (15S)                                                             |
| 0.256           | 98        | Headhouse - North (11S)                                                     |
| 0.180           | 98        | House Imp (11S)                                                             |
| 2.269           | 98        | Paved parking, HSG D (11S, 17S, 18S, 19S)                                   |
| 0.172           | 98        | Powerhouse (12S)                                                            |
| 0.033           | 98        | Sidewalk (12S, 15S)                                                         |
| 0.256           | 98        | Water Surface, 0% imp, HSG D (14S, 15S, 20S)                                |
| 0.756           | 98        | Water Surface, HSG D (13S, 19S)                                             |
| <b>15.805</b>   | <b>88</b> | <b>TOTAL AREA</b>                                                           |

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### Soil Listing (all nodes)

| Area<br>(acres) | Soil<br>Group | Subcatchment<br>Numbers                     |
|-----------------|---------------|---------------------------------------------|
| 0.000           | HSG A         |                                             |
| 0.000           | HSG B         |                                             |
| 0.000           | HSG C         |                                             |
| 10.033          | HSG D         | 11S, 12S, 13S, 14S, 15S, 17S, 18S, 19S, 20S |
| 5.772           | Other         | 11S, 12S, 13S, 14S, 15S, 19S                |
| <b>15.805</b>   |               | <b>TOTAL AREA</b>                           |

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**Ground Covers (all nodes)**

| HSG-A<br>(acres) | HSG-B<br>(acres) | HSG-C<br>(acres) | HSG-D<br>(acres) | Other<br>(acres) | Total<br>(acres) | Ground<br>Cover        | Subcatchment<br>Numbers                                             |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------------|---------------------------------------------------------------------|
| 0.000            | 0.000            | 0.000            | 0.000            | 0.138            | 0.138            | 1/2 Switchyard         | 19S                                                                 |
| 0.000            | 0.000            | 0.000            | 6.752            | 0.000            | 6.752            | >75% Grass cover, Good | 11S,<br>12S,<br>13S,<br>14S,<br>15S,<br>17S,<br>18S,<br>19S,<br>20S |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.005            | 0.005            | Bridge                 | 14S,<br>15S                                                         |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.169            | 0.169            | Equipment              | 12S,<br>14S,<br>19S                                                 |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.173            | 0.173            | Grass Paver            | 15S                                                                 |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.928            | 0.928            | Gravel                 | 11S,<br>12S,<br>19S                                                 |
| 0.000            | 0.000            | 0.000            | 0.000            | 3.102            | 3.102            | Greenhouse             | 12S,<br>13S,<br>15S                                                 |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.614            | 0.614            | Headhouse              | 15S                                                                 |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.256            | 0.256            | Headhouse - North      | 11S                                                                 |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.180            | 0.180            | House Imp              | 11S                                                                 |
| 0.000            | 0.000            | 0.000            | 2.269            | 0.000            | 2.269            | Paved parking          | 11S,<br>17S,<br>18S,<br>19S                                         |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.172            | 0.172            | Powerhouse             | 12S                                                                 |
| 0.000            | 0.000            | 0.000            | 0.000            | 0.033            | 0.033            | Sidewalk               | 12S,<br>15S                                                         |
| 0.000            | 0.000            | 0.000            | 0.756            | 0.000            | 0.756            | Water Surface          | 13S,<br>19S                                                         |
| 0.000            | 0.000            | 0.000            | 0.256            | 0.000            | 0.256            | Water Surface, 0% imp  | 14S,<br>15S,<br>20S                                                 |
| <b>0.000</b>     | <b>0.000</b>     | <b>0.000</b>     | <b>10.033</b>    | <b>5.772</b>     | <b>15.805</b>    | <b>TOTAL AREA</b>      |                                                                     |

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### Pipe Listing (all nodes)

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Width<br>(inches) | Diam/Height<br>(inches) | Inside-Fill<br>(inches) |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|-------------------|-------------------------|-------------------------|
| 1     | 12S            | 0.00                | 0.00                 | 275.0            | 0.0020           | 0.012 | 0.0               | 8.0                     | 0.0                     |
| 2     | 12S            | 0.00                | 0.00                 | 345.0            | 0.0020           | 0.013 | 0.0               | 18.0                    | 0.0                     |
| 3     | 12S            | 0.00                | 0.00                 | 142.0            | 0.0033           | 0.013 | 0.0               | 24.0                    | 0.0                     |
| 4     | 13S            | 0.00                | 0.00                 | 264.0            | 0.0020           | 0.012 | 0.0               | 8.0                     | 0.0                     |
| 5     | 13S            | 0.00                | 0.00                 | 149.0            | 0.0033           | 0.013 | 0.0               | 24.0                    | 0.0                     |
| 6     | 14S            | 0.00                | 0.00                 | 310.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 7     | 15S            | 0.00                | 0.00                 | 229.0            | 0.0075           | 0.013 | 0.0               | 18.0                    | 0.0                     |
| 8     | 15S            | 0.00                | 0.00                 | 310.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 9     | 17S            | 0.00                | 0.00                 | 79.0             | 0.0025           | 0.013 | 0.0               | 15.0                    | 0.0                     |
| 10    | 17S            | 0.00                | 0.00                 | 132.0            | 0.0025           | 0.011 | 30.0              | 19.0                    | 0.0                     |
| 11    | 18S            | 0.00                | 0.00                 | 182.0            | 0.0025           | 0.013 | 0.0               | 15.0                    | 0.0                     |
| 12    | 18S            | 0.00                | 0.00                 | 45.0             | 0.0025           | 0.013 | 30.0              | 19.0                    | 0.0                     |
| 13    | 18S            | 0.00                | 0.00                 | 173.0            | 0.0025           | 0.013 | 38.0              | 24.0                    | 0.0                     |
| 14    | 18S            | 0.00                | 0.00                 | 235.0            | 0.0025           | 0.013 | 38.0              | 24.0                    | 0.0                     |
| 15    | 19S            | 0.00                | 0.00                 | 235.0            | 0.0025           | 0.013 | 38.0              | 24.0                    | 0.0                     |
| 16    | 20S            | 0.00                | 0.00                 | 310.0            | 0.0040           | 0.011 | 0.0               | 24.0                    | 0.0                     |
| 17    | 16P            | 173.08              | 173.08               | 142.0            | 0.0000           | 0.012 | 0.0               | 12.0                    | 0.0                     |
| 18    | 17P            | 173.08              | 173.08               | 25.0             | 0.0000           | 0.012 | 0.0               | 12.0                    | 0.0                     |
| 19    | 20P            | 175.09              | 174.58               | 352.0            | 0.0014           | 0.013 | 0.0               | 12.0                    | 0.0                     |
| 20    | 24P            | 175.42              | 175.42               | 440.0            | 0.0000           | 0.010 | 0.0               | 6.0                     | 0.0                     |
| 21    | 24P            | 175.25              | 174.94               | 66.0             | 0.0047           | 0.013 | 0.0               | 18.0                    | 0.0                     |

**Proposed\_Global Model**

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NOAA 24-hr D 2-yr Rainfall=3.54"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                               |                                                                                                                                                  |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment 11S: #1</b>   | Runoff Area=102,868 sf 61.75% Impervious Runoff Depth=2.67"<br>Flow Length=81' Tc=9.3 min CN=WQ Runoff=5.79 cfs 0.526 af                         |
| <b>Subcatchment 12S: #2</b>   | Runoff Area=125,236 sf 67.51% Impervious Runoff Depth=2.62"<br>Flow Length=862' Tc=8.4 min CN=WQ Runoff=7.05 cfs 0.629 af                        |
| <b>Subcatchment 13S: #3</b>   | Runoff Area=56,989 sf 96.70% Impervious Runoff Depth=3.25"<br>Flow Length=513' Tc=6.1 min CN=WQ Runoff=4.19 cfs 0.355 af                         |
| <b>Subcatchment 14S: #4</b>   | Runoff Area=47,496 sf 0.55% Impervious Runoff Depth=1.85"<br>Flow Length=723' Tc=18.0 min CN=WQ Runoff=1.55 cfs 0.168 af                         |
| <b>Subcatchment 15S: #5</b>   | Runoff Area=79,843 sf 62.26% Impervious Runoff Depth=2.80"<br>Flow Length=768' Tc=4.9 min CN=WQ Runoff=5.37 cfs 0.428 af                         |
| <b>Subcatchment 17S: #6</b>   | Runoff Area=16,800 sf 70.45% Impervious Runoff Depth=2.82"<br>Flow Length=270' Tc=1.8 min CN=WQ Runoff=1.27 cfs 0.091 af                         |
| <b>Subcatchment 18S: #7</b>   | Runoff Area=37,893 sf 70.14% Impervious Runoff Depth=2.82"<br>Flow Length=720' Tc=4.3 min CN=WQ Runoff=2.63 cfs 0.204 af                         |
| <b>Subcatchment 19S: #8</b>   | Runoff Area=212,044 sf 19.17% Impervious Runoff Depth=1.93"<br>Flow Length=664' Tc=18.5 min CN=WQ Runoff=7.01 cfs 0.784 af                       |
| <b>Subcatchment 20S: #9</b>   | Runoff Area=9,311 sf 0.00% Impervious Runoff Depth=1.77"<br>Flow Length=957' Tc=20.4 min CN=WQ Runoff=0.28 cfs 0.032 af                          |
| <b>Pond 16P: Pond #1A</b>     | Peak Elev=174.63' Storage=20,623 cf Inflow=7.90 cfs 0.988 af<br>12.0" Round Culvert n=0.012 L=142.0' S=0.0000 ' Outflow=2.03 cfs 0.849 af        |
| <b>Pond 17P: Pond #1B</b>     | Peak Elev=174.06' Storage=13,190 cf Inflow=2.03 cfs 0.849 af<br>Outflow=0.98 cfs 0.729 af                                                        |
| <b>Pond 20P: Pond #2</b>      | Peak Elev=176.46' Storage=22,272 cf Inflow=11.14 cfs 0.983 af<br>Discarded=0.00 cfs 0.000 af Primary=1.72 cfs 0.895 af Outflow=1.72 cfs 0.895 af |
| <b>Pond 24P: Permeable</b>    | Peak Elev=176.33' Storage=10,642 cf Inflow=5.79 cfs 0.526 af<br>Discarded=0.00 cfs 0.000 af Primary=0.64 cfs 0.513 af Outflow=0.64 cfs 0.513 af  |
| <b>Link 18L: Ultimate</b>     | Inflow=9.19 cfs 2.855 af<br>Primary=9.19 cfs 2.855 af                                                                                            |
| <b>Link 21L: Uncontrolled</b> | Inflow=7.55 cfs 0.718 af<br>Primary=7.55 cfs 0.718 af                                                                                            |
| <b>Link 22L: Controlled</b>   | Inflow=2.36 cfs 1.624 af<br>Primary=2.36 cfs 1.624 af                                                                                            |

## **Proposed\_Global Model**

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**Total Runoff Area = 15.805 ac   Runoff Volume = 3.216 af   Average Runoff Depth = 2.44"**  
**51.75% Pervious = 8.179 ac   48.25% Impervious = 7.627 ac**

## Proposed\_Global Model

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NOAA 24-hr D 2-yr Rainfall=3.54"

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### Summary for Subcatchment 11S: #1

Runoff = 5.79 cfs @ 12.16 hrs, Volume= 0.526 af, Depth= 2.67"  
Routed to Pond 24P : Permeable

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 2-yr Rainfall=3.54"

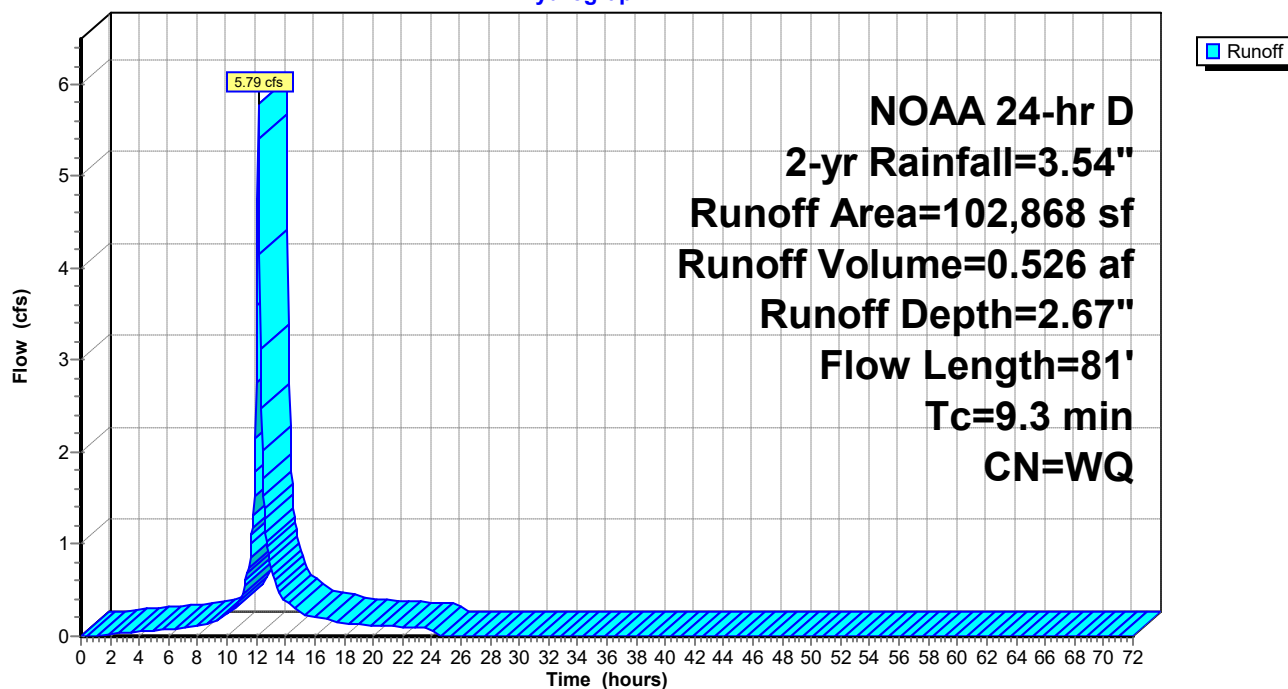
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| * 38,450  | 80 | >75% Grass cover, Good, HSG D |
| 44,502    | 98 | Paved parking, HSG D          |
| * 897     | 68 | Gravel                        |
| * 7,857   | 98 | House Imp                     |
| * 11,162  | 98 | Headhouse - North             |
| 102,868   |    | Weighted Average              |
| 39,347    | 80 | 38.25% Pervious Area          |
| 63,521    | 98 | 61.75% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 9.0      | 37            | 0.0030        | 0.07              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 0.3      | 44            | 0.0300        | 2.60              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                       |
| 9.3      | 81            | Total         |                   |                |                                                                                          |

### Subcatchment 11S: #1

Hydrograph



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**Summary for Subcatchment 12S: #2**

[47] Hint: Peak is 1204% of capacity of segment #2

[47] Hint: Peak is 150% of capacity of segment #3

Runoff = 7.05 cfs @ 12.15 hrs, Volume= 0.629 af, Depth= 2.62"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 15,527    | 80 | >75% Grass cover, Good, HSG D |
| * 1,149   | 98 | Sidewalk                      |
| * 25,159  | 68 | Gravel                        |
| * 4,507   | 98 | Equipment                     |
| * 71,399  | 98 | Greenhouse                    |
| * 7,495   | 98 | Powerhouse                    |
| 125,236   |    | Weighted Average              |
| 40,686    | 73 | 32.49% Pervious Area          |
| 84,550    | 98 | 67.51% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------------|
| 2.9      | 100           | 0.0020        | 0.58              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                             |
| 2.7      | 275           | 0.0020        | 1.68              | 0.59           | <b>Pipe Channel,</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.012                                     |
| 2.2      | 345           | 0.0020        | 2.66              | 4.70           | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'<br>n= 0.013 Concrete pipe, bends & connections |
| 0.6      | 142           | 0.0033        | 4.14              | 13.00          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 Corrugated PE, smooth interior     |
| 8.4      | 862           | Total         |                   |                |                                                                                                                      |

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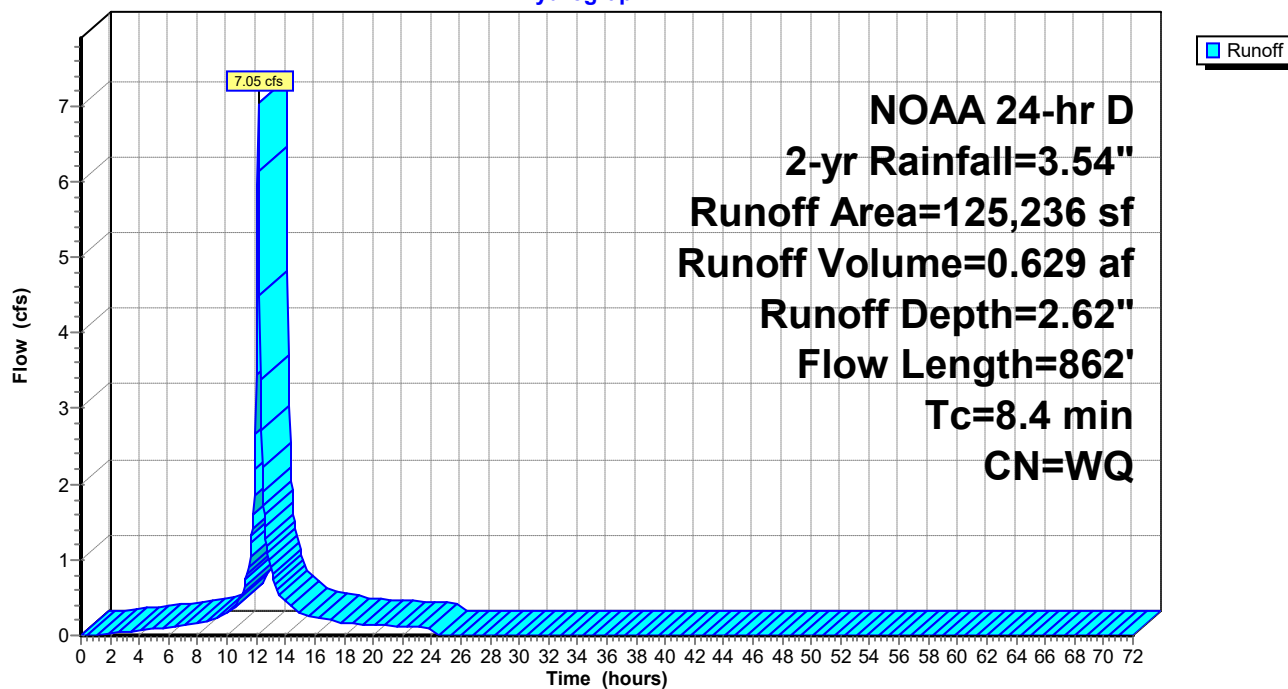
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 12S: #2

Hydrograph



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**Summary for Subcatchment 13S: #3**

[47] Hint: Peak is 715% of capacity of segment #2

Runoff = 4.19 cfs @ 12.13 hrs, Volume= 0.355 af, Depth= 3.25"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 41,160    | 98 | Greenhouse                    |
|   | 13,951    | 98 | Water Surface, HSG D          |
|   | 1,878     | 80 | >75% Grass cover, Good, HSG D |
|   | 56,989    |    | Weighted Average              |
|   | 1,878     | 80 | 3.30% Pervious Area           |
|   | 55,111    | 98 | 96.70% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                                      |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------------------------------------------------|
| 2.9         | 100              | 0.0020           | 0.58                 |                   | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                         |
| 2.6         | 264              | 0.0020           | 1.68                 | 0.59              | <b>Pipe Channel,</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.012 Steel, smooth                   |
| 0.6         | 149              | 0.0033           | 4.14                 | 13.00             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 Corrugated PE, smooth interior |
| 6.1         | 513              | Total            |                      |                   |                                                                                                                  |

## Proposed\_Global Model

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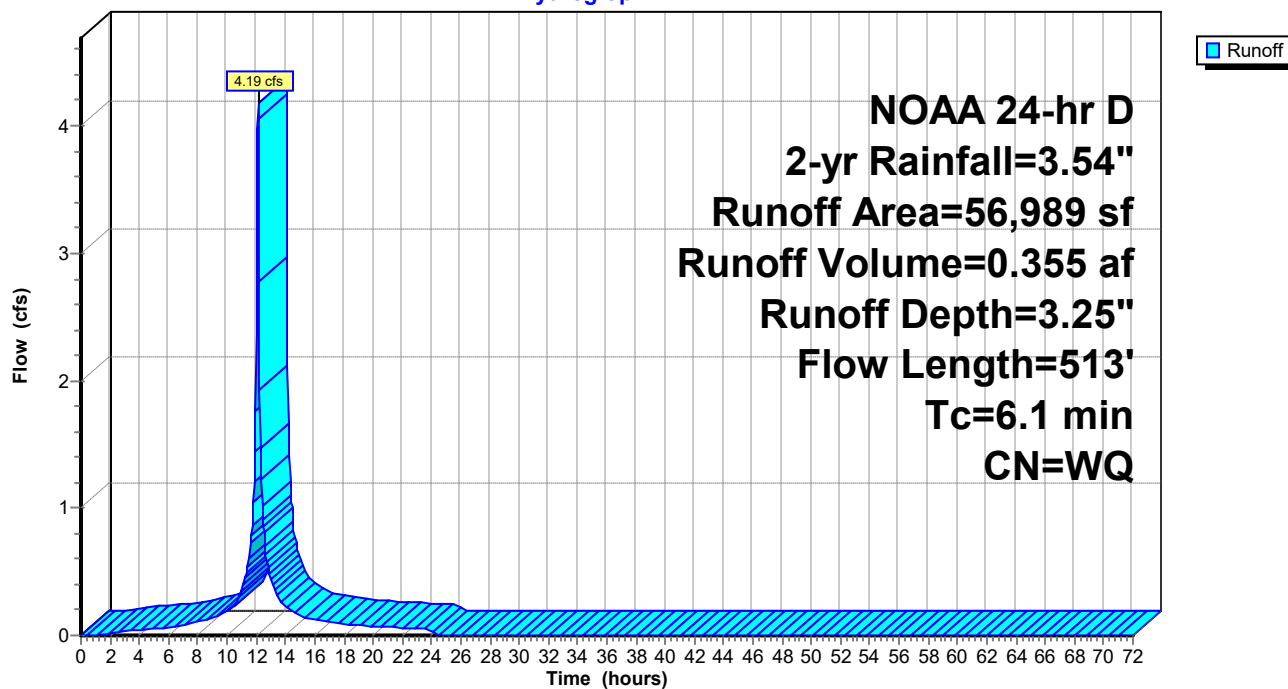
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Subcatchment 13S: #3

Hydrograph



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**Summary for Subcatchment 14S: #4**

Runoff = 1.55 cfs @ 12.27 hrs, Volume= 0.168 af, Depth= 1.85"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 4,953     | 98 | Water Surface, 0% imp, HSG D  |
| * 118     | 98 | Bridge                        |
| * 144     | 98 | Equipment                     |
| 42,281    | 80 | >75% Grass cover, Good, HSG D |
| 47,496    |    | Weighted Average              |
| 47,234    | 82 | 99.45% Pervious Area          |
| 262       | 98 | 0.55% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 3.0      | 129           | 0.0023        | 0.72              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                       |
| 5.1      | 252           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030                     |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 18.0     | 723           | Total         |                   |                |                                                                                          |

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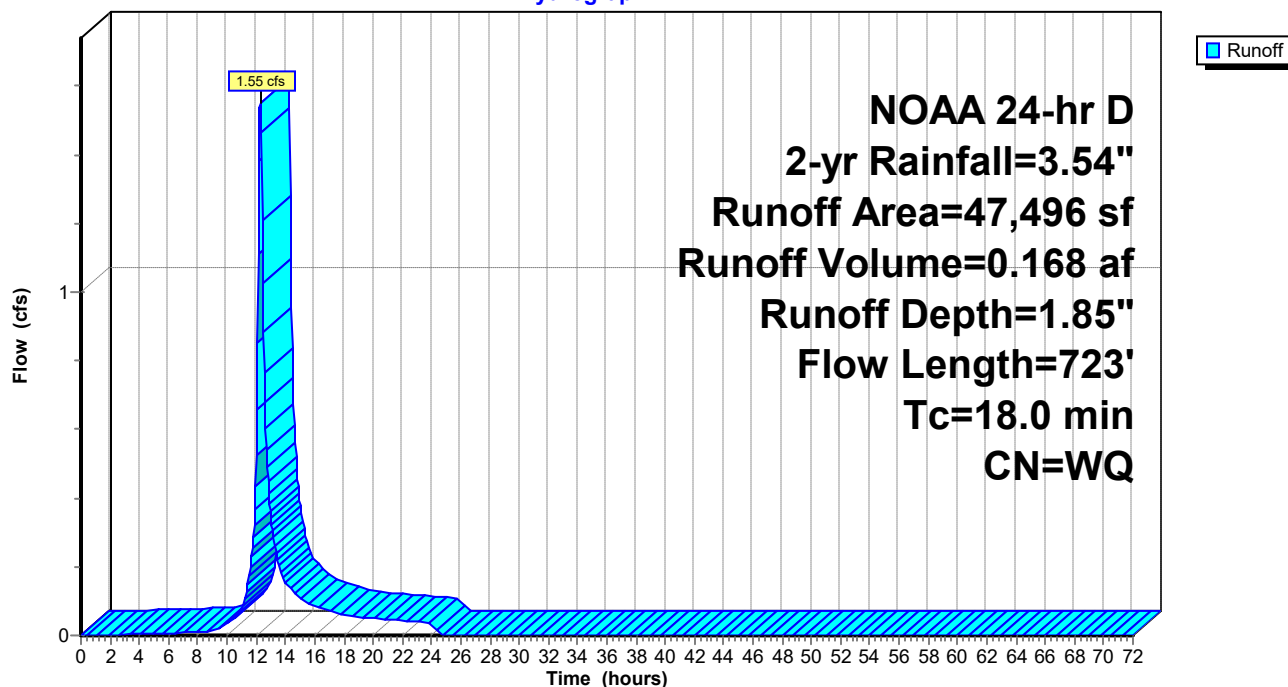
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### Subcatchment 14S: #4

Hydrograph



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**Summary for Subcatchment 15S: #5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 5.37 cfs @ 12.11 hrs, Volume= 0.428 af, Depth= 2.80"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs,  $dt= 0.05$  hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 7,544     | 80 | Grass Paver                   |
| * | 298       | 98 | Sidewalk                      |
| * | 113       | 98 | Bridge                        |
|   | 5,608     | 98 | Water Surface, 0% imp, HSG D  |
| * | 22,568    | 98 | Greenhouse                    |
| * | 16,982    | 80 | >75% Grass cover, Good, HSG D |
| * | 26,730    | 98 | Headhouse                     |
|   | 79,843    |    | Weighted Average              |
|   | 30,134    | 83 | 37.74% Pervious Area          |
|   | 49,709    | 98 | 62.26% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------------|
| 1.2      | 100           | 0.0200        | 1.45              |                | <b>Sheet Flow, 1</b><br>Smooth surfaces $n= 0.011$ $P2= 3.54"$                                                       |
| 0.3      | 47            | 0.0200        | 2.87              |                | <b>Shallow Concentrated Flow,</b><br>Paved $K_v= 20.3$ fps                                                           |
| 0.7      | 229           | 0.0075        | 5.15              | 9.10           | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' $r= 0.38'$<br>$n= 0.013$ Corrugated PE, smooth interior |
| 1.7      | 82            | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' $r= 2.16'$ $n= 0.030$                                             |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' $r= 0.50'$<br>$n= 0.011$                                |
| 4.9      | 768           | Total         |                   |                |                                                                                                                      |

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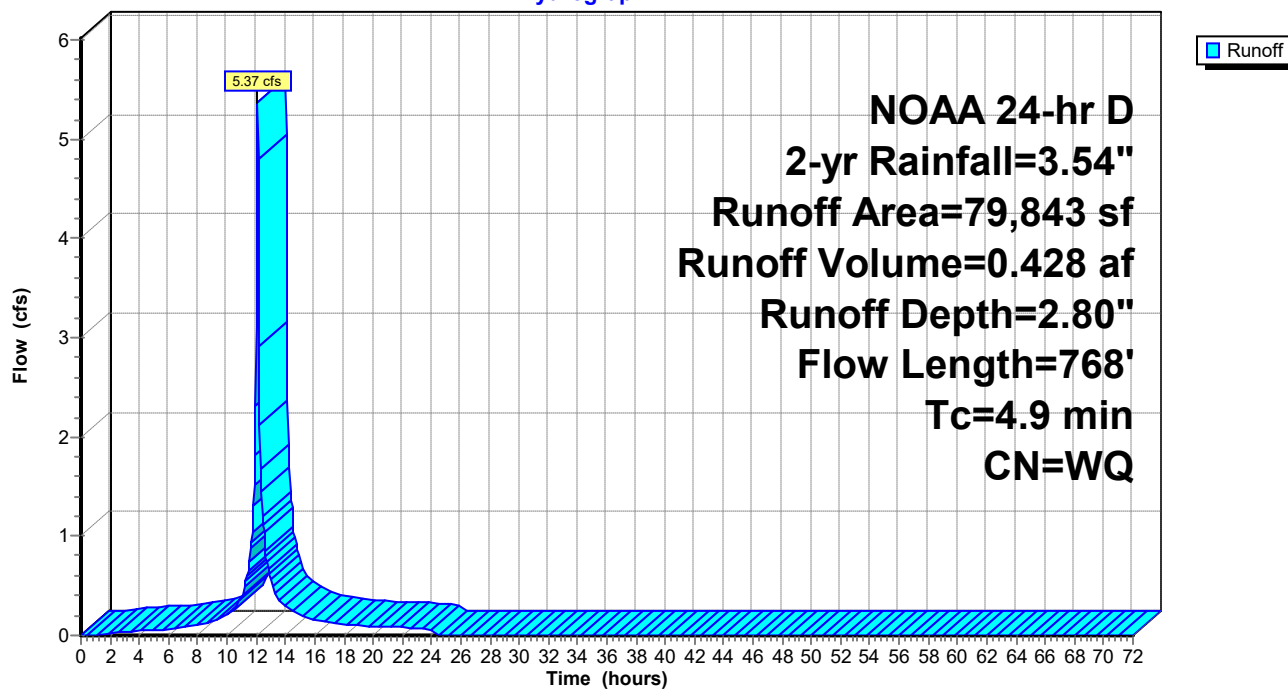
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### Subcatchment 15S: #5

Hydrograph



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**Summary for Subcatchment 17S: #6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.27 cfs @ 12.08 hrs, Volume= 0.091 af, Depth= 2.82"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs,  $dt= 0.05$  hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,836    | 98 | Paved parking, HSG D          |
| 4,964     | 80 | >75% Grass cover, Good, HSG D |
| 16,800    |    | Weighted Average              |
| 4,964     | 80 | 29.55% Pervious Area          |
| 11,836    | 98 | 70.45% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.8      | 59            | 0.0170        | 1.22              |                | <b>Sheet Flow,</b><br>Smooth surfaces $n= 0.011$ $P2= 3.54"$                                                                                                       |
| 0.5      | 79            | 0.0025        | 2.63              | 3.23           | <b>Pipe Channel,</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' $r= 0.31'$<br>$n= 0.013$ Corrugated PE, smooth interior                                               |
| 0.5      | 132           | 0.0025        | 4.21              | 13.80          | <b>Pipe Channel, RCP_Elliptical 30x19</b><br>30.0" x 19.0", $R=33.5"$ Elliptical Area= 3.3 sf Perim= 6.7' $r= 0.49'$<br>$n= 0.011$ Concrete pipe, straight & clean |
| 1.8      | 270           | Total         |                   |                |                                                                                                                                                                    |

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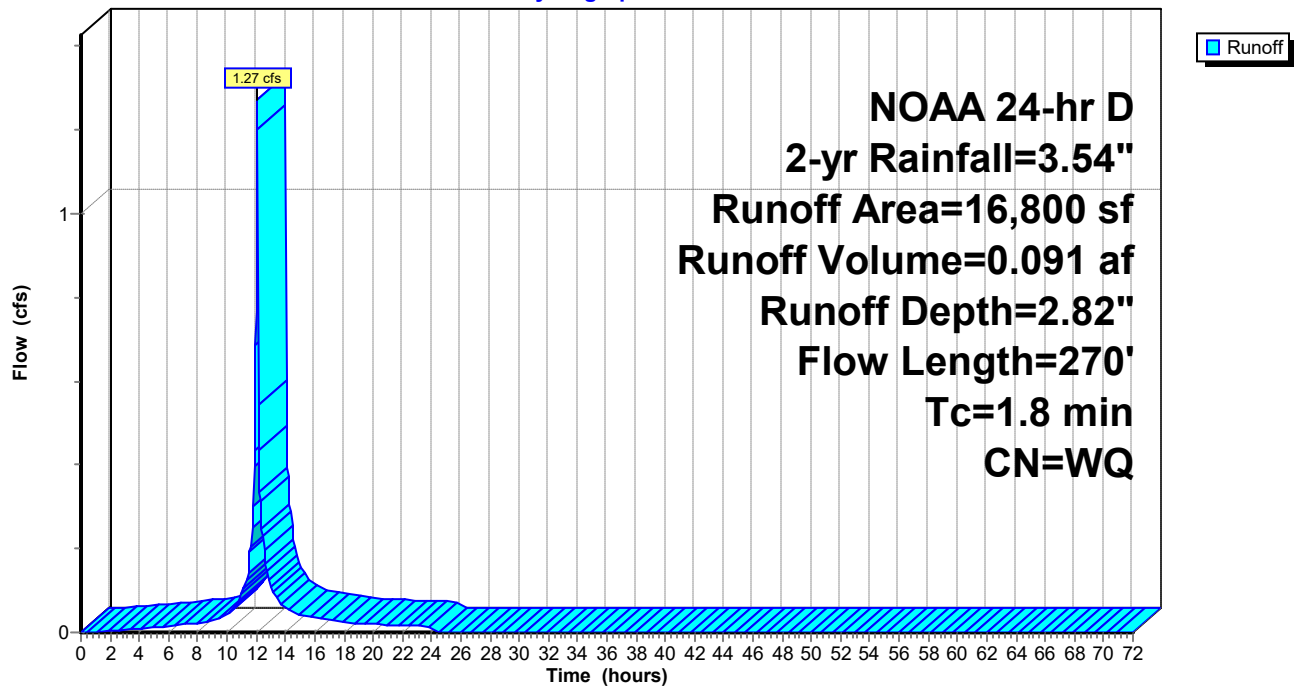
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### Subcatchment 17S: #6

Hydrograph



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**Summary for Subcatchment 18S: #7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 2.63 cfs @ 12.10 hrs, Volume= 0.204 af, Depth= 2.82"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs,  $dt= 0.05$  hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 26,579    | 98 | Paved parking, HSG D          |
| 11,314    | 80 | >75% Grass cover, Good, HSG D |
| 37,893    |    | Weighted Average              |
| 11,314    | 80 | 29.86% Pervious Area          |
| 26,579    | 98 | 70.14% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                           |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.2      | 85            | 0.0126        | 1.16              |                | <b>Sheet Flow,</b><br>Smooth surfaces $n= 0.011$ $P2= 3.54"$                                                                                                          |
| 1.2      | 182           | 0.0025        | 2.63              | 3.23           | <b>Pipe Channel,</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' $r= 0.31'$<br>$n= 0.013$ Corrugated PE, smooth interior                                                  |
| 0.2      | 45            | 0.0025        | 3.56              | 11.68          | <b>Pipe Channel, RCP_Elliptical 30x19</b><br>30.0" x 19.0", $R=33.5"$ Elliptical Area= 3.3 sf Perim= 6.7' $r= 0.49'$<br>$n= 0.013$ Concrete pipe, bends & connections |
| 0.7      | 173           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", $R=31.2"$ Elliptical Area= 5.1 sf Perim= 8.3' $r= 0.61'$<br>$n= 0.013$ Concrete pipe, bends & connections |
| 1.0      | 235           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", $R=31.2"$ Elliptical Area= 5.1 sf Perim= 8.3' $r= 0.61'$<br>$n= 0.013$ Concrete pipe, bends & connections |
| 4.3      | 720           | Total         |                   |                |                                                                                                                                                                       |

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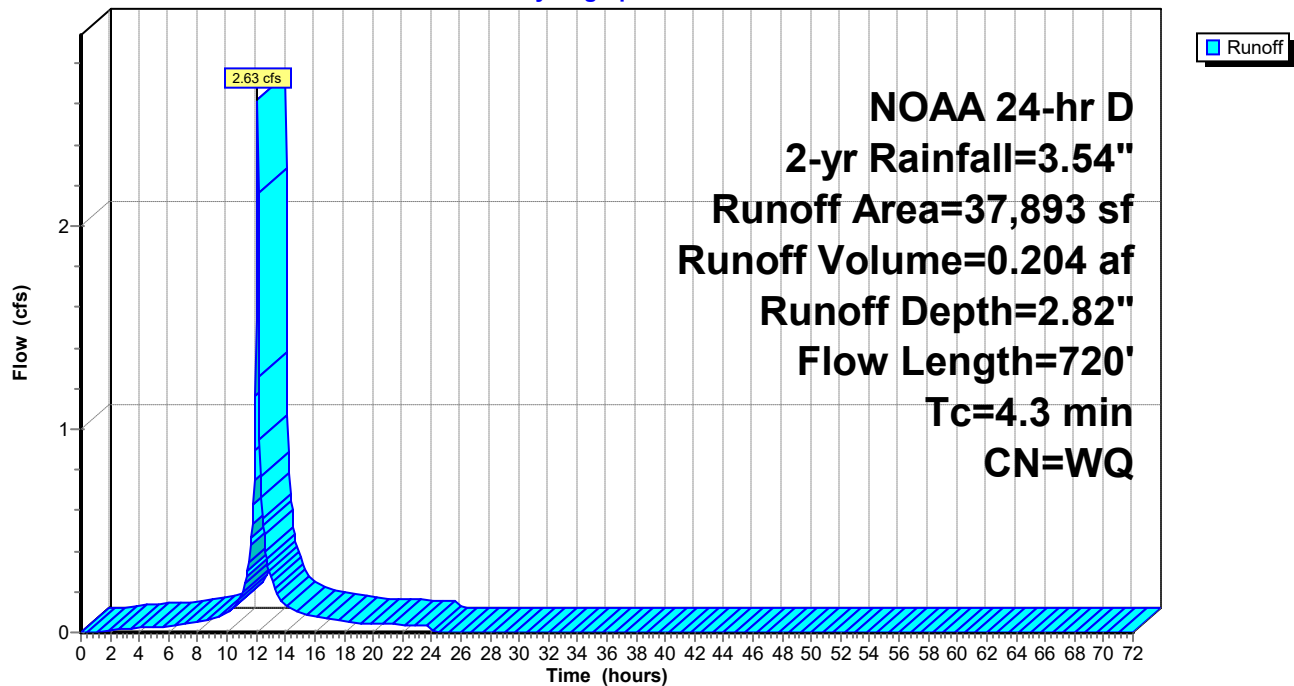
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### Subcatchment 18S: #7

Hydrograph



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**Summary for Subcatchment 19S: #8**

Runoff = 7.01 cfs @ 12.28 hrs, Volume= 0.784 af, Depth= 1.93"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 18,996    | 98 | Water Surface, HSG D          |
| 153,994   | 80 | >75% Grass cover, Good, HSG D |
| 15,929    | 98 | Paved parking, HSG D          |
| * 14,385  | 68 | Gravel                        |
| * 2,714   | 98 | Equipment                     |
| * 3,013   | 80 | 1/2 Switchyard                |
| * 3,013   | 98 | 1/2 Switchyard                |
| 212,044   |    | Weighted Average              |
| 171,392   | 79 | 80.83% Pervious Area          |
| 40,652    | 98 | 19.17% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                                                                                     |
|-------------|------------------|------------------|----------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.9         | 32               | 0.0023           | 0.06                 |                   | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length                                                                        |
| 8.6         | 397              | 0.0023           | 0.77                 |                   | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                                                                                       |
| 1.0         | 235              | 0.0025           | 4.12                 | 21.00             | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 18.5        | 664              | Total            |                      |                   |                                                                                                                                                                 |

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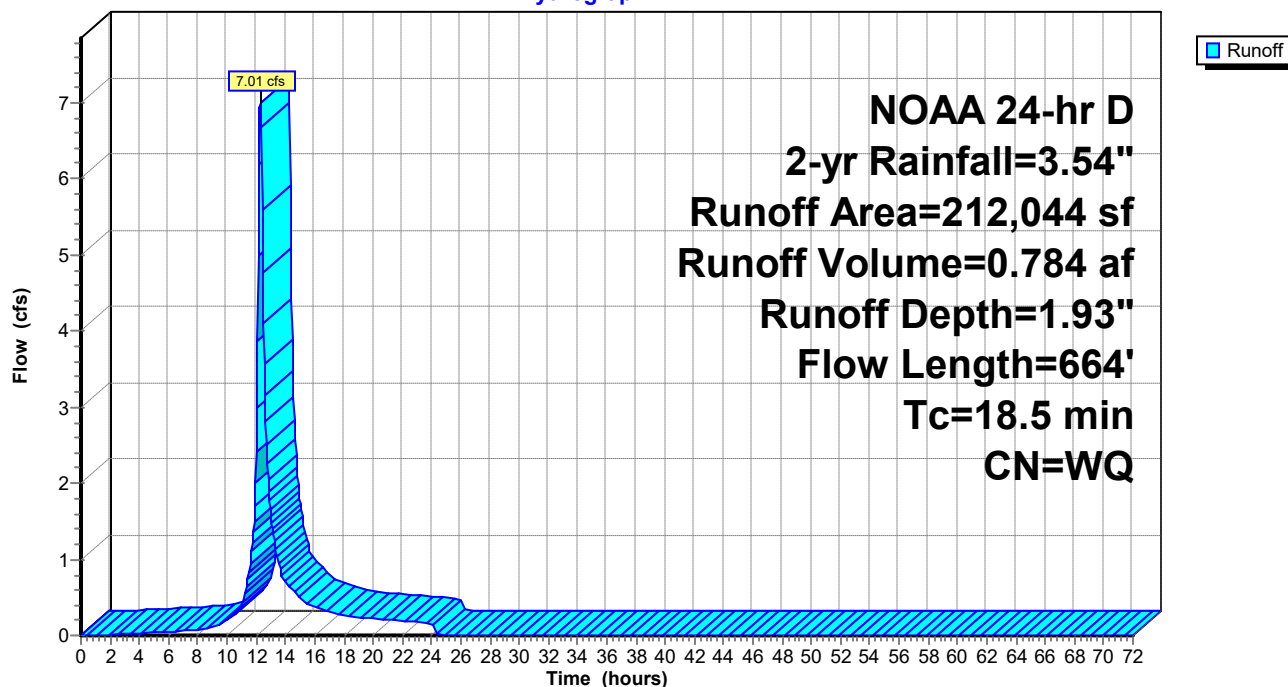
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### Subcatchment 19S: #8

Hydrograph



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**Summary for Subcatchment 20S: #9**

Runoff = 0.28 cfs @ 12.30 hrs, Volume= 0.032 af, Depth= 1.77"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 2-yr Rainfall=3.54"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,738     | 80 | >75% Grass cover, Good, HSG D |
| 573       | 98 | Water Surface, 0% imp, HSG D  |
| 9,311     |    | Weighted Average              |
| 9,311     | 81 | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                      |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------|
| 8.9      | 76            | 0.0130        | 0.14              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length         |
| 1.0      | 98            | 0.0130        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                               |
| 9.5      | 473           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.030 Stream, clean & straight |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011                |
| 20.4     | 957           | Total         |                   |                |                                                                                                  |

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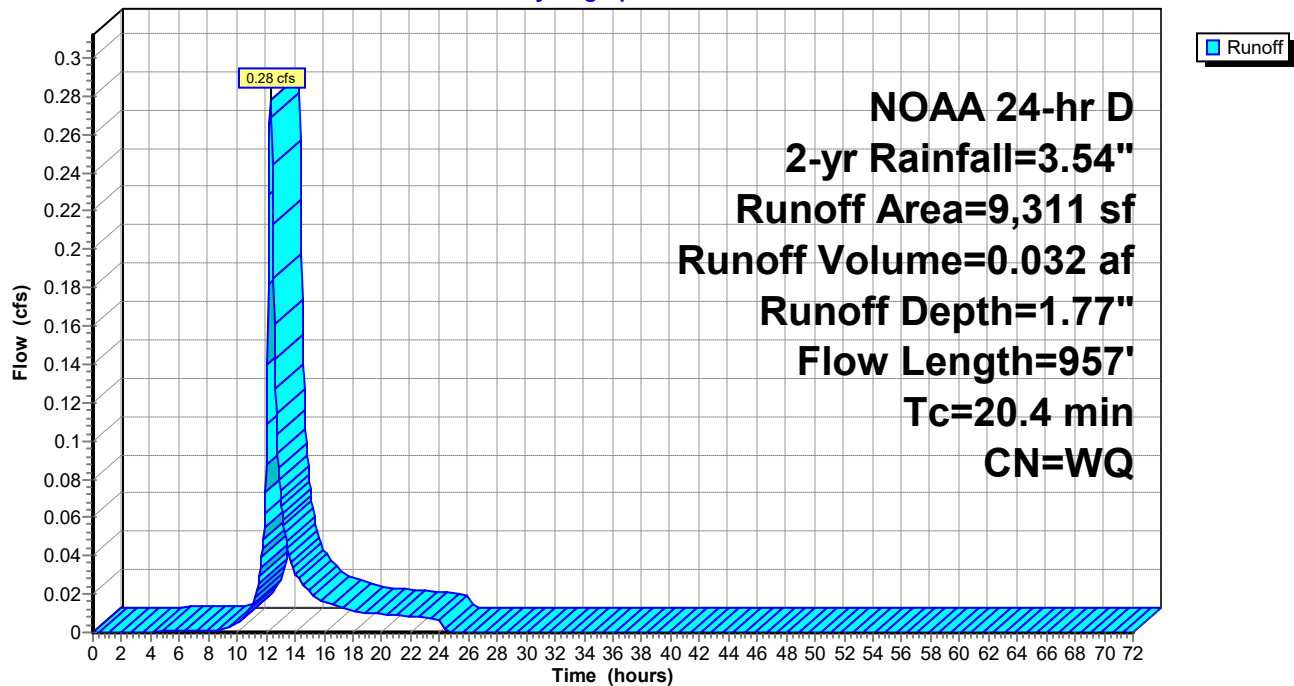
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### Subcatchment 20S: #9

Hydrograph



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### Summary for Pond 16P: Pond #1A

Inflow Area = 5.738 ac, 26.90% Impervious, Inflow Depth = 2.07" for 2-yr event  
Inflow = 7.90 cfs @ 12.26 hrs, Volume= 0.988 af  
Outflow = 2.03 cfs @ 12.92 hrs, Volume= 0.849 af, Atten= 74%, Lag= 39.3 min  
Primary = 2.03 cfs @ 12.92 hrs, Volume= 0.849 af  
Routed to Pond 17P : Pond #1B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 174.63' @ 12.92 hrs Surf.Area= 10,074 sf Storage= 20,623 cf  
Flood Elev= 177.08' Surf.Area= 10,074 sf Storage= 45,333 cf

Plug-Flow detention time= 396.8 min calculated for 0.848 af (86% of inflow)  
Center-of-Mass det. time= 330.6 min ( 1,149.2 - 818.6 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 45,333 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 10,074               | 0                         | 0                         |
| 177.08              | 10,074               | 45,333                    | 45,333                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                      |
| #1     | Primary | 173.08' | <b>12.0" Round Culvert</b><br>L= 142.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' / Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.02 cfs @ 12.92 hrs HW=174.63' TW=173.12' (Dynamic Tailwater)  
↑**1=Culvert** (Barrel Controls 2.02 cfs @ 2.58 fps)

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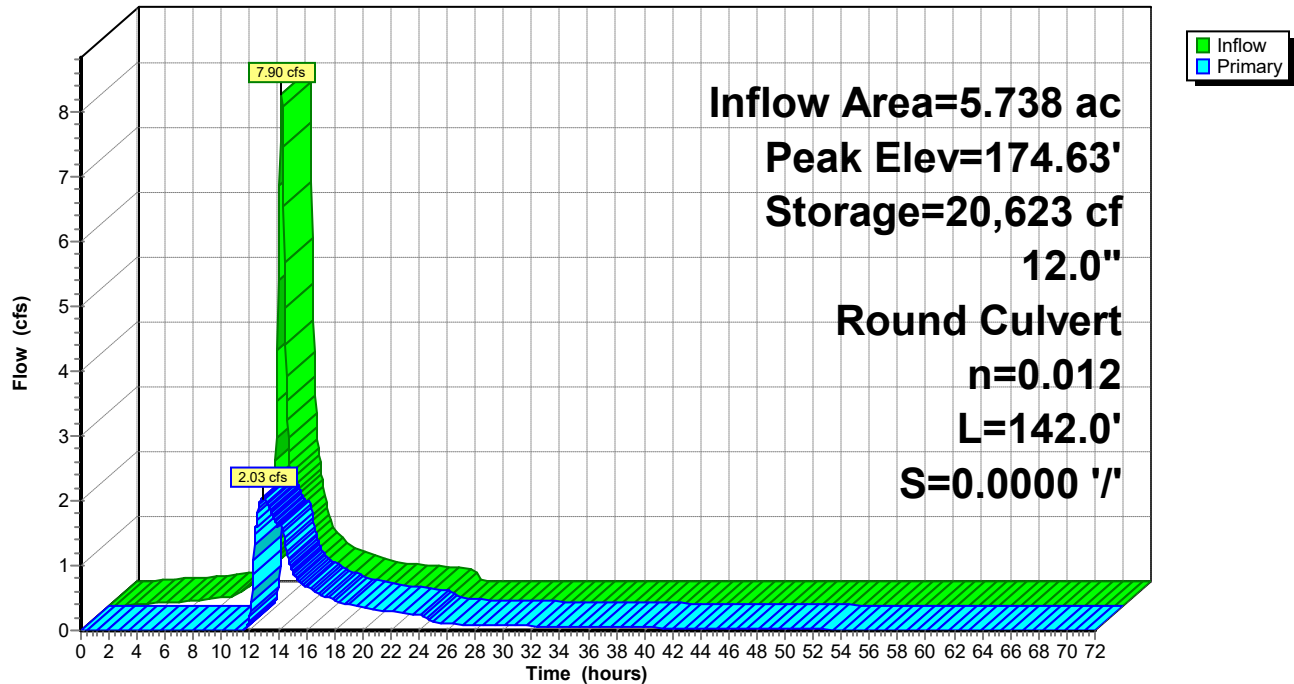
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### Pond 16P: Pond #1A

#### Hydrograph



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### Summary for Pond 17P: Pond #1B

Inflow Area = 5.738 ac, 26.90% Impervious, Inflow Depth > 1.78" for 2-yr event  
Inflow = 2.03 cfs @ 12.92 hrs, Volume= 0.849 af  
Outflow = 0.98 cfs @ 14.88 hrs, Volume= 0.729 af, Atten= 52%, Lag= 117.7 min  
Primary = 0.98 cfs @ 14.88 hrs, Volume= 0.729 af  
Routed to Link 22L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 174.06' @ 14.88 hrs Surf.Area= 8,922 sf Storage= 13,190 cf  
Flood Elev= 177.08' Surf.Area= 8,922 sf Storage= 40,149 cf

Plug-Flow detention time= 499.6 min calculated for 0.729 af (86% of inflow)  
Center-of-Mass det. time= 313.2 min ( 1,462.4 - 1,149.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 40,149 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 8,922                | 0                         | 0                         |
| 177.08              | 8,922                | 40,149                    | 40,149                    |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                                           |
|--------|----------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary  | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                              |
| #1     | Device 4 | 173.08' | <b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                               |
| #2     | Device 4 | 173.58' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                              |
| #3     | Device 4 | 175.83' | <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                                     |
| #4     | Primary  | 173.08' | <b>12.0" Round Culvert</b><br>L= 25.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=0.98 cfs @ 14.88 hrs HW=174.06' TW=0.00' (Dynamic Tailwater)

↑ **4=Culvert** (Passes 0.98 cfs of 1.72 cfs potential flow)  
↑ **1=Orifice/Grate** (Orifice Controls 0.22 cfs @ 4.45 fps)  
↑ **2=Orifice/Grate** (Orifice Controls 0.76 cfs @ 2.35 fps)  
↑ **3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)

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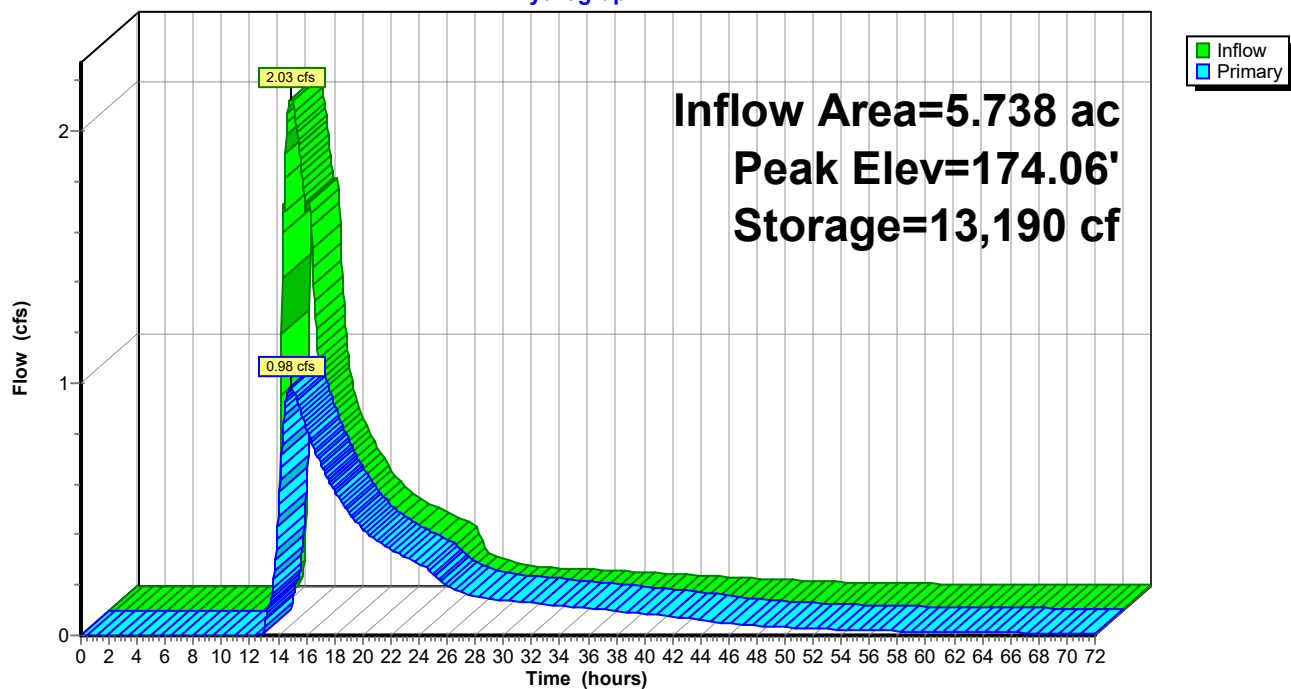
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### Pond 17P: Pond #1B

Hydrograph



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### Summary for Pond 20P: Pond #2

Inflow Area = 4.183 ac, 76.64% Impervious, Inflow Depth = 2.82" for 2-yr event  
Inflow = 11.14 cfs @ 12.14 hrs, Volume= 0.983 af  
Outflow = 1.72 cfs @ 13.51 hrs, Volume= 0.895 af, Atten= 85%, Lag= 82.3 min  
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
Primary = 1.72 cfs @ 13.51 hrs, Volume= 0.895 af  
Routed to Link 22L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 176.46' @ 12.77 hrs Surf.Area= 13,951 sf Storage= 22,272 cf

Plug-Flow detention time= 329.0 min calculated for 0.895 af (91% of inflow)  
Center-of-Mass det. time= 279.9 min ( 1,048.7 - 768.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 174.86' | 78,684 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 174.86              | 13,951               | 0                         | 0                         |
| 180.50              | 13,951               | 78,684                    | 78,684                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 175.09' | <b>12.0" Round Culvert</b><br>L= 352.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 175.09' / 174.58' S= 0.0014 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Discarded | 180.00' | <b>540.0' long (Profile 2) Broad-Crested Rectangular Weir</b><br>Head (feet) 0.49 0.98 1.48<br>Coef. (English) 2.90 3.26 3.44                                                                                    |

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=174.86' (Free Discharge)

↑ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Primary OutFlow** Max=1.72 cfs @ 13.51 hrs HW=176.36' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Barrel Controls 1.72 cfs @ 2.22 fps)

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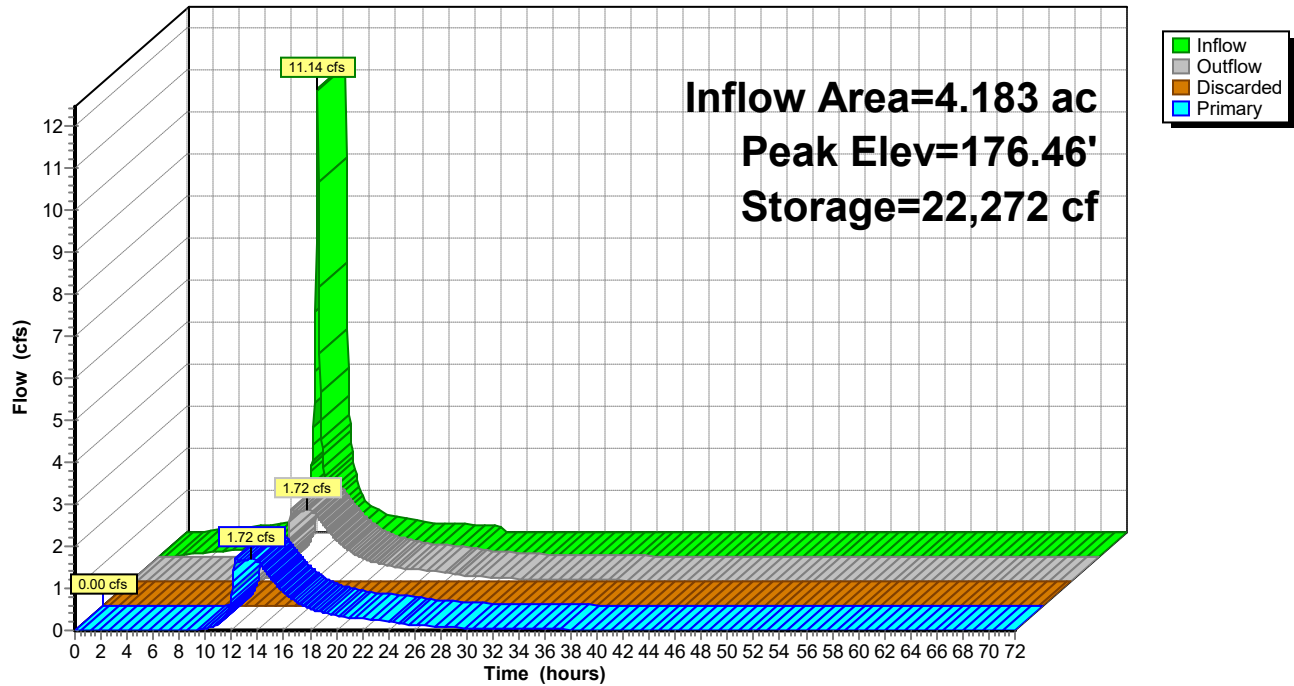
NOAA 24-hr D 2-yr Rainfall=3.54"

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### Pond 20P: Pond #2

#### Hydrograph



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**Summary for Pond 24P: Permeable**

Inflow Area = 2.362 ac, 61.75% Impervious, Inflow Depth = 2.67" for 2-yr event  
 Inflow = 5.79 cfs @ 12.16 hrs, Volume= 0.526 af  
 Outflow = 0.64 cfs @ 13.19 hrs, Volume= 0.513 af, Atten= 89%, Lag= 61.4 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 0.64 cfs @ 13.19 hrs, Volume= 0.513 af  
 Routed to Link 18L : Ultimate

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 176.33' @ 13.19 hrs Surf.Area= 41,292 sf Storage= 10,642 cf  
 Flood Elev= 178.50' Surf.Area= 41,292 sf Storage= 46,516 cf

Plug-Flow detention time= 229.6 min calculated for 0.513 af (97% of inflow)  
 Center-of-Mass det. time= 213.3 min ( 994.4 - 781.1 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                            |
|--------|---------|---------------|------------------------------------------------------------------------------------------------|
| #1     | 175.17' | 54,774 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>136,936 cf Overall x 40.0% Voids |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 175.17              | 4,401                | 0                         | 0                         |
| 175.74              | 4,401                | 2,509                     | 2,509                     |
| 175.75              | 41,292               | 228                       | 2,737                     |
| 179.00              | 41,292               | 134,199                   | 136,936                   |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                  |
|--------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Discarded | 179.00' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                     |
| #1     | Device 6  | 175.42' | <b>6.0" Round Culvert X 3.00</b> L= 440.0' Ke= 1.000<br>Inlet / Outlet Invert= 175.42' / 175.42' S= 0.0000 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf   |
| #2     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #3     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #4     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #5     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #6     | Primary   | 175.25' | <b>18.0" Round Culvert</b><br>L= 66.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 175.25' / 174.94' S= 0.0047 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.77 sf |
| #7     | Device 6  | 176.33' | <b>48.0" W x 8.0" H Vert. Orifice/Grate X 0.40</b> C= 0.600<br>Limited to weir flow at low heads                                                                                |

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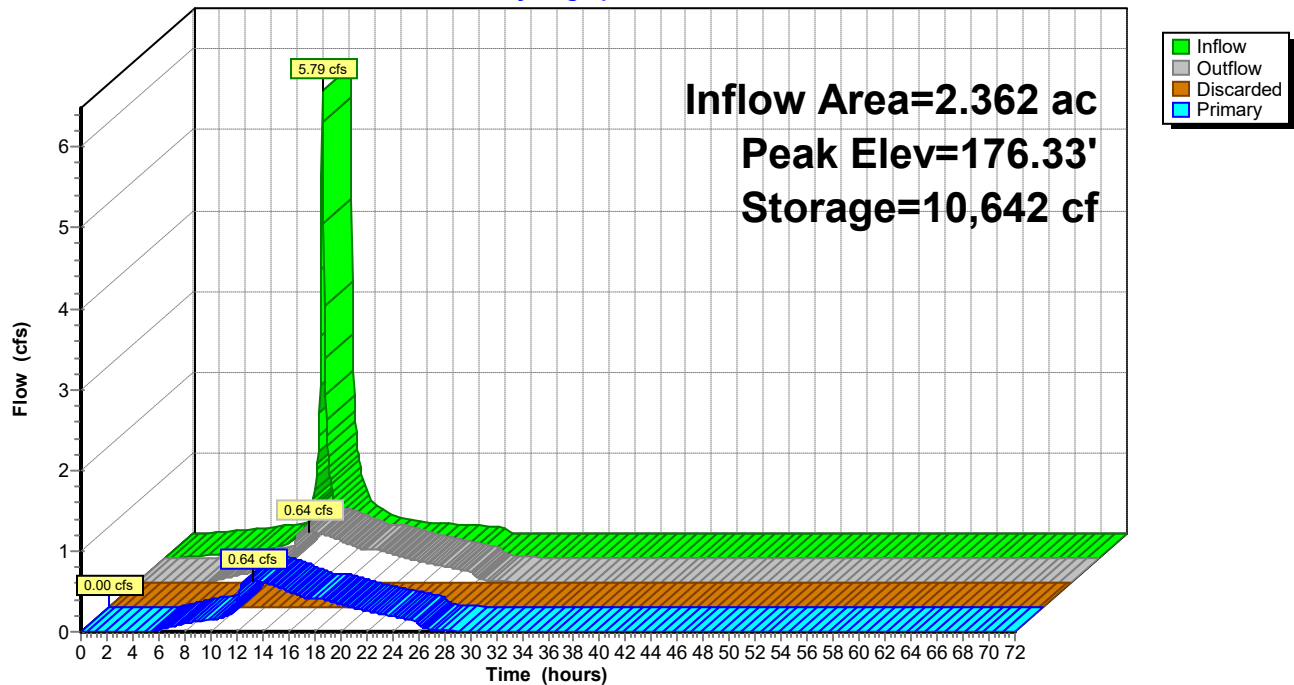
**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=175.17' (Free Discharge)

**Primary OutFlow** Max=0.64 cfs @ 13.19 hrs HW=176.33' TW=0.00' (Dynamic Tailwater)

- 6=Culvert (Passes 0.64 cfs of 3.66 cfs potential flow)
- 1=Culvert (Barrel Controls 0.64 cfs @ 1.08 fps)
- 2=Orifice/Grate (Passes < 4.81 cfs potential flow)
- 3=Orifice/Grate (Passes < 4.81 cfs potential flow)
- 4=Orifice/Grate (Passes < 4.81 cfs potential flow)
- 5=Orifice/Grate (Passes < 4.81 cfs potential flow)
- 7=Orifice/Grate ( Controls 0.00 cfs)

### Pond 24P: Permeable

#### Hydrograph



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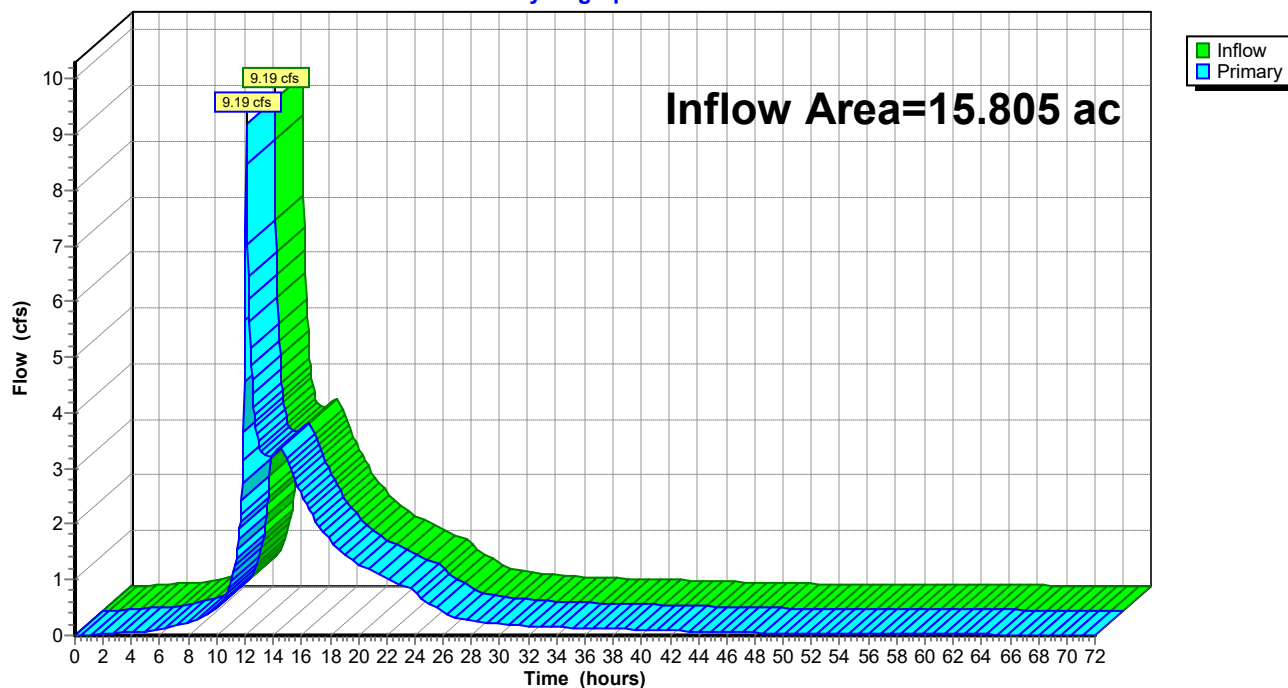
### Summary for Link 18L: Ultimate

Inflow Area = 15.805 ac, 48.25% Impervious, Inflow Depth > 2.17" for 2-yr event  
Inflow = 9.19 cfs @ 12.11 hrs, Volume= 2.855 af  
Primary = 9.19 cfs @ 12.11 hrs, Volume= 2.855 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 18L: Ultimate

Hydrograph



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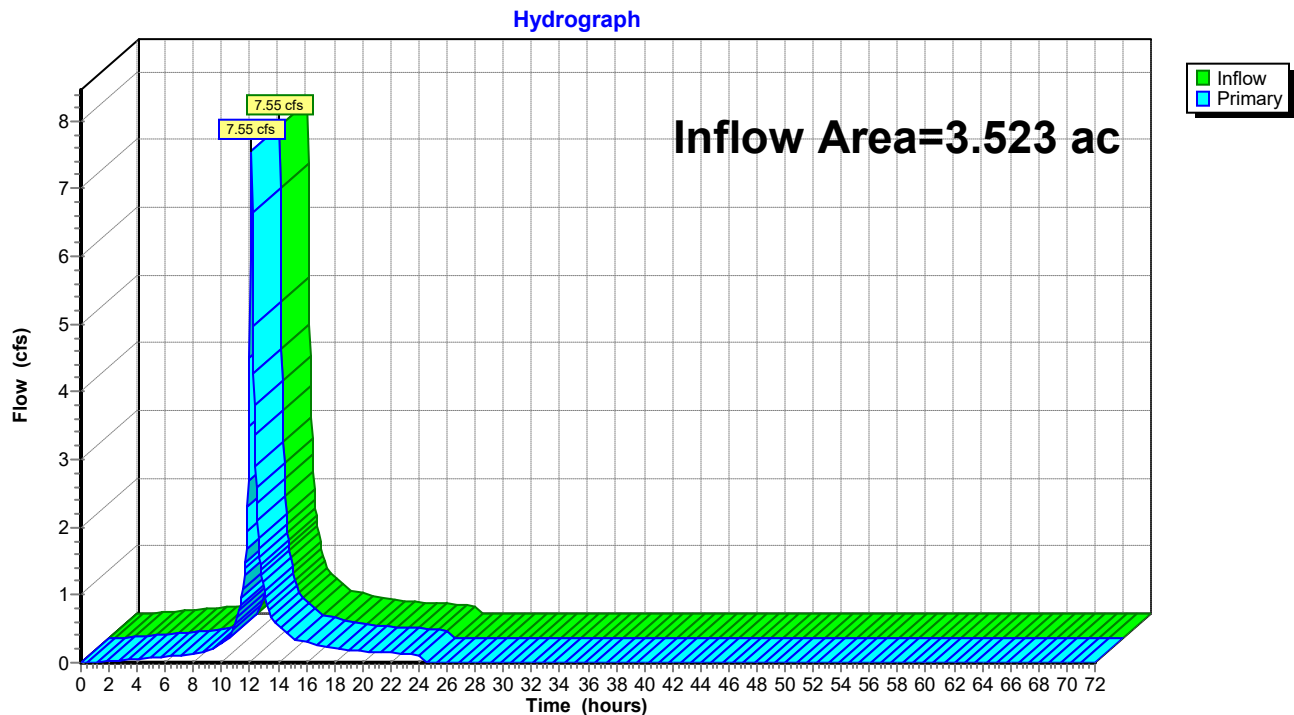
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### Summary for Link 21L: Uncontrolled

Inflow Area = 3.523 ac, 40.28% Impervious, Inflow Depth = 2.45" for 2-yr event  
Inflow = 7.55 cfs @ 12.11 hrs, Volume= 0.718 af  
Primary = 7.55 cfs @ 12.11 hrs, Volume= 0.718 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 18L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 21L: Uncontrolled



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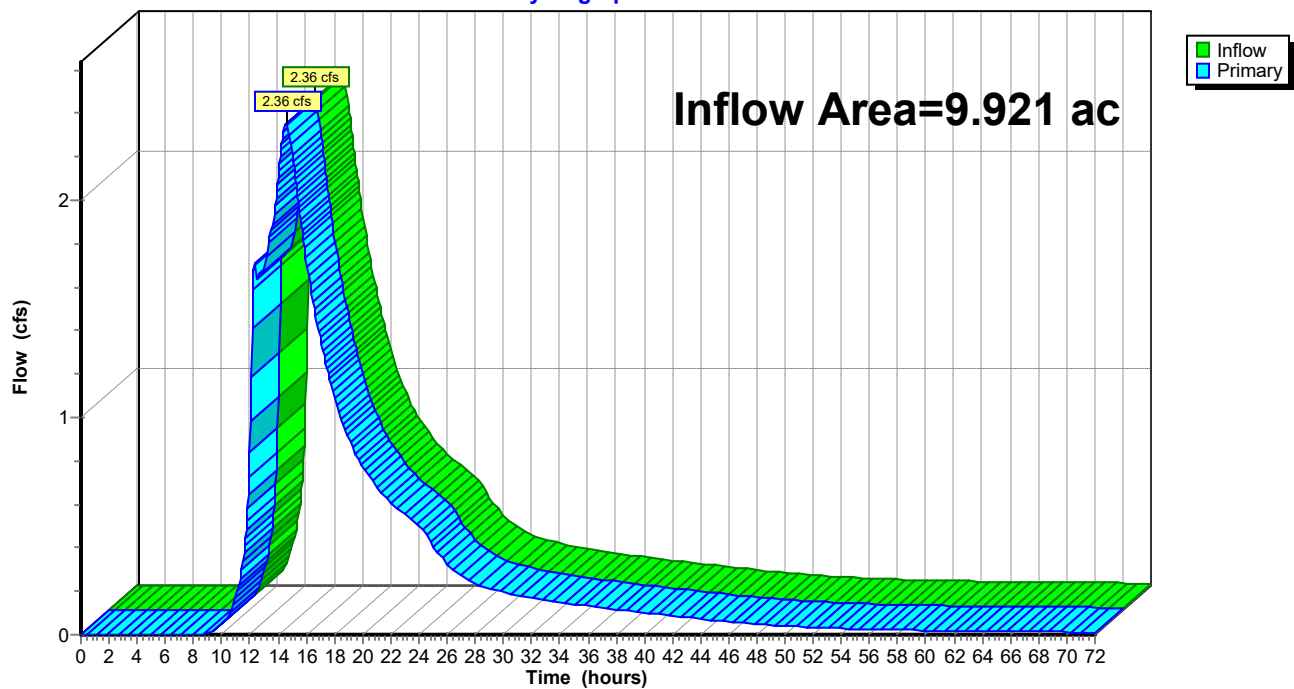
### Summary for Link 22L: Controlled

Inflow Area = 9.921 ac, 47.87% Impervious, Inflow Depth > 1.96" for 2-yr event  
Inflow = 2.36 cfs @ 14.56 hrs, Volume= 1.624 af  
Primary = 2.36 cfs @ 14.56 hrs, Volume= 1.624 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 18L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 22L: Controlled

Hydrograph



**Proposed\_Global Model**

NOAA 24-hr D 10-yr Rainfall=5.24"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                               |                                                                                                                                                  |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment 11S: #1</b>   | Runoff Area=102,868 sf 61.75% Impervious Runoff Depth=4.27"<br>Flow Length=81' Tc=9.3 min CN=WQ Runoff=9.19 cfs 0.840 af                         |
| <b>Subcatchment 12S: #2</b>   | Runoff Area=125,236 sf 67.51% Impervious Runoff Depth=4.17"<br>Flow Length=862' Tc=8.4 min CN=WQ Runoff=11.19 cfs 1.000 af                       |
| <b>Subcatchment 13S: #3</b>   | Runoff Area=56,989 sf 96.70% Impervious Runoff Depth=4.94"<br>Flow Length=513' Tc=6.1 min CN=WQ Runoff=6.26 cfs 0.539 af                         |
| <b>Subcatchment 14S: #4</b>   | Runoff Area=47,496 sf 0.55% Impervious Runoff Depth=3.31"<br>Flow Length=723' Tc=18.0 min CN=WQ Runoff=2.80 cfs 0.301 af                         |
| <b>Subcatchment 15S: #5</b>   | Runoff Area=79,843 sf 62.26% Impervious Runoff Depth=4.42"<br>Flow Length=768' Tc=4.9 min CN=WQ Runoff=8.40 cfs 0.675 af                         |
| <b>Subcatchment 17S: #6</b>   | Runoff Area=16,800 sf 70.45% Impervious Runoff Depth=4.44"<br>Flow Length=270' Tc=1.8 min CN=WQ Runoff=1.98 cfs 0.143 af                         |
| <b>Subcatchment 18S: #7</b>   | Runoff Area=37,893 sf 70.14% Impervious Runoff Depth=4.44"<br>Flow Length=720' Tc=4.3 min CN=WQ Runoff=4.10 cfs 0.322 af                         |
| <b>Subcatchment 19S: #8</b>   | Runoff Area=212,044 sf 19.17% Impervious Runoff Depth=3.40"<br>Flow Length=664' Tc=18.5 min CN=WQ Runoff=12.44 cfs 1.378 af                      |
| <b>Subcatchment 20S: #9</b>   | Runoff Area=9,311 sf 0.00% Impervious Runoff Depth=3.22"<br>Flow Length=957' Tc=20.4 min CN=WQ Runoff=0.51 cfs 0.057 af                          |
| <b>Pond 16P: Pond #1A</b>     | Peak Elev=175.92' Storage=33,639 cf Inflow=13.79 cfs 1.699 af<br>12.0" Round Culvert n=0.012 L=142.0' S=0.0000 ' Outflow=3.71 cfs 1.560 af       |
| <b>Pond 17P: Pond #1B</b>     | Peak Elev=174.58' Storage=17,880 cf Inflow=3.71 cfs 1.560 af<br>Outflow=2.29 cfs 1.439 af                                                        |
| <b>Pond 20P: Pond #2</b>      | Peak Elev=177.27' Storage=33,608 cf Inflow=17.30 cfs 1.539 af<br>Discarded=0.00 cfs 0.000 af Primary=2.31 cfs 1.450 af Outflow=2.31 cfs 1.450 af |
| <b>Pond 24P: Permeable</b>    | Peak Elev=176.64' Storage=15,793 cf Inflow=9.19 cfs 0.840 af<br>Discarded=0.00 cfs 0.000 af Primary=1.73 cfs 0.826 af Outflow=1.73 cfs 0.826 af  |
| <b>Link 18L: Ultimate</b>     | Inflow=14.40 cfs 4.892 af<br>Primary=14.40 cfs 4.892 af                                                                                          |
| <b>Link 21L: Uncontrolled</b> | Inflow=12.11 cfs 1.176 af<br>Primary=12.11 cfs 1.176 af                                                                                          |
| <b>Link 22L: Controlled</b>   | Inflow=4.39 cfs 2.889 af<br>Primary=4.39 cfs 2.889 af                                                                                            |

## Proposed\_Global Model

NOAA 24-hr D 10-yr Rainfall=5.24"

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**Total Runoff Area = 15.805 ac   Runoff Volume = 5.254 af   Average Runoff Depth = 3.99"**  
**51.75% Pervious = 8.179 ac   48.25% Impervious = 7.627 ac**

## Proposed\_Global Model

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NOAA 24-hr D 10-yr Rainfall=5.24"

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### Summary for Subcatchment 11S: #1

Runoff = 9.19 cfs @ 12.16 hrs, Volume= 0.840 af, Depth= 4.27"  
Routed to Pond 24P : Permeable

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 10-yr Rainfall=5.24"

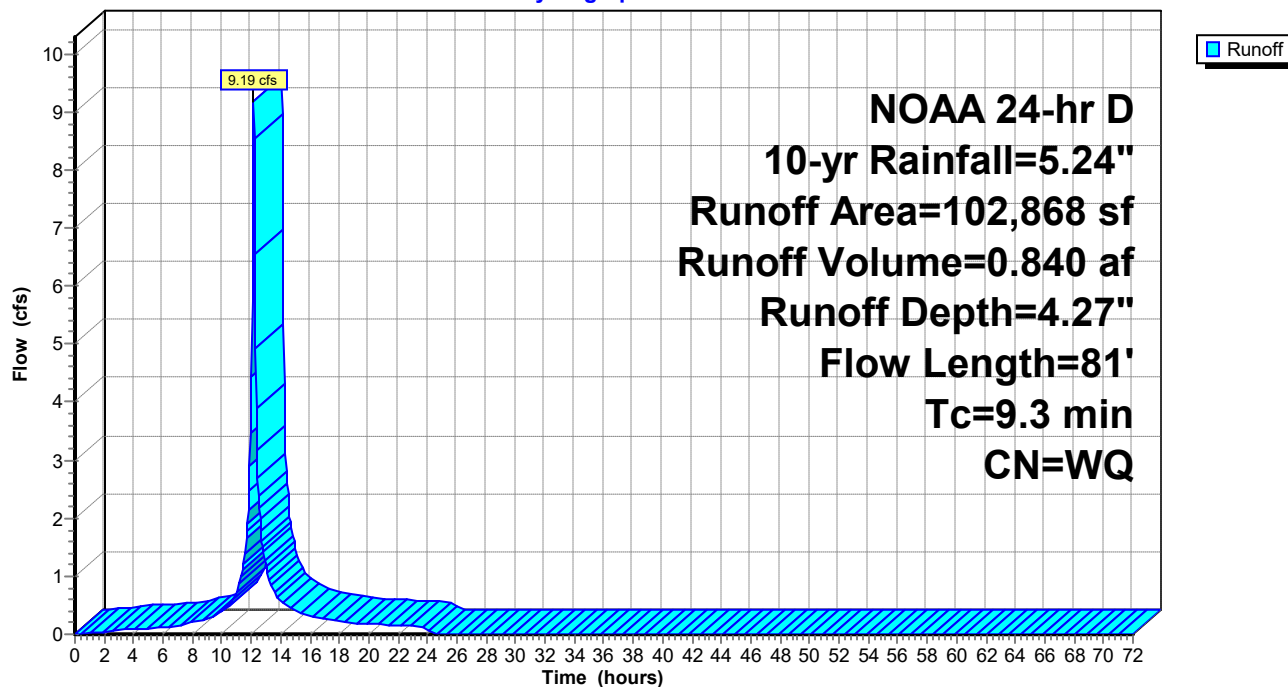
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| * 38,450  | 80 | >75% Grass cover, Good, HSG D |
| 44,502    | 98 | Paved parking, HSG D          |
| * 897     | 68 | Gravel                        |
| * 7,857   | 98 | House Imp                     |
| * 11,162  | 98 | Headhouse - North             |
| 102,868   |    | Weighted Average              |
| 39,347    | 80 | 38.25% Pervious Area          |
| 63,521    | 98 | 61.75% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 9.0      | 37            | 0.0030        | 0.07              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 0.3      | 44            | 0.0300        | 2.60              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                       |
| 9.3      | 81            | Total         |                   |                |                                                                                          |

### Subcatchment 11S: #1

Hydrograph



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**Summary for Subcatchment 12S: #2**

[47] Hint: Peak is 1911% of capacity of segment #2

[47] Hint: Peak is 238% of capacity of segment #3

Runoff = 11.19 cfs @ 12.15 hrs, Volume= 1.000 af, Depth= 4.17"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 15,527    | 80 | >75% Grass cover, Good, HSG D |
| * 1,149   | 98 | Sidewalk                      |
| * 25,159  | 68 | Gravel                        |
| * 4,507   | 98 | Equipment                     |
| * 71,399  | 98 | Greenhouse                    |
| * 7,495   | 98 | Powerhouse                    |
| 125,236   |    | Weighted Average              |
| 40,686    | 73 | 32.49% Pervious Area          |
| 84,550    | 98 | 67.51% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------------|
| 2.9      | 100           | 0.0020        | 0.58              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                             |
| 2.7      | 275           | 0.0020        | 1.68              | 0.59           | <b>Pipe Channel,</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.012                                     |
| 2.2      | 345           | 0.0020        | 2.66              | 4.70           | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'<br>n= 0.013 Concrete pipe, bends & connections |
| 0.6      | 142           | 0.0033        | 4.14              | 13.00          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 Corrugated PE, smooth interior     |
| 8.4      | 862           | Total         |                   |                |                                                                                                                      |

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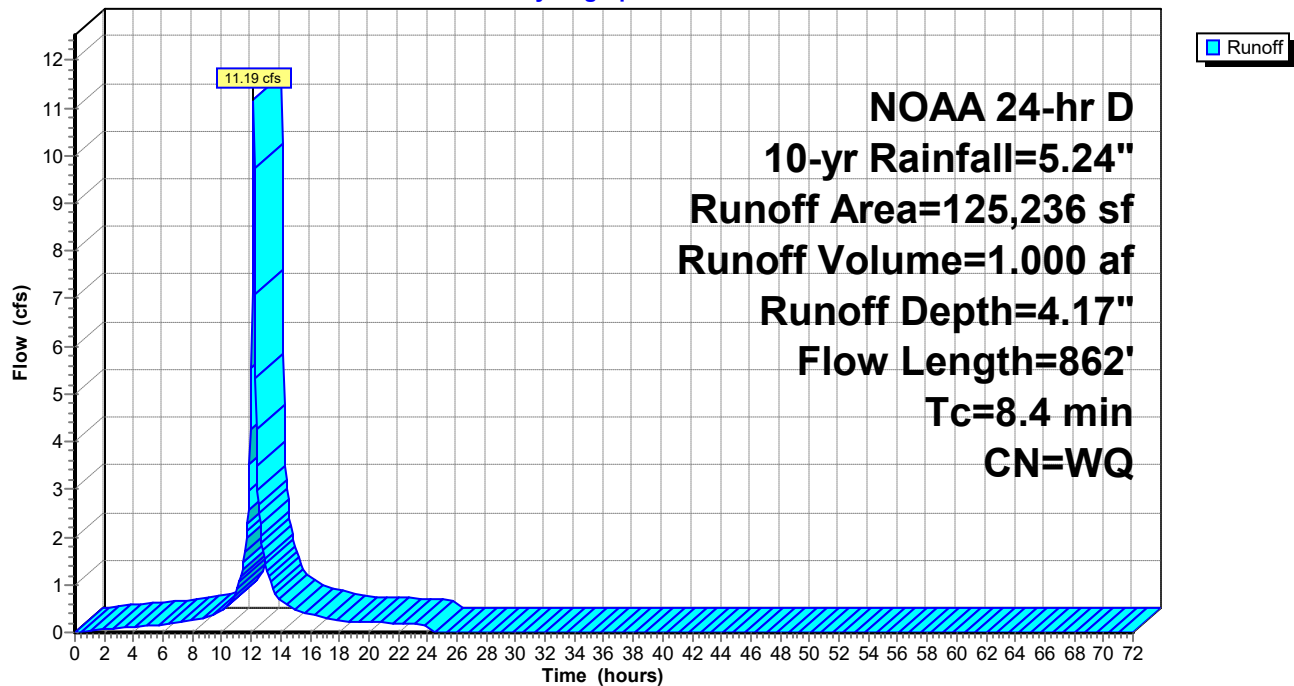
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### Subcatchment 12S: #2

Hydrograph



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**Summary for Subcatchment 13S: #3**

[47] Hint: Peak is 1069% of capacity of segment #2

Runoff = 6.26 cfs @ 12.13 hrs, Volume= 0.539 af, Depth= 4.94"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 41,160    | 98 | Greenhouse                    |
|   | 13,951    | 98 | Water Surface, HSG D          |
|   | 1,878     | 80 | >75% Grass cover, Good, HSG D |
|   | 56,989    |    | Weighted Average              |
|   | 1,878     | 80 | 3.30% Pervious Area           |
|   | 55,111    | 98 | 96.70% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                                      |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------------------------------------------------|
| 2.9         | 100              | 0.0020           | 0.58                 |                   | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                         |
| 2.6         | 264              | 0.0020           | 1.68                 | 0.59              | <b>Pipe Channel,</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.012 Steel, smooth                   |
| 0.6         | 149              | 0.0033           | 4.14                 | 13.00             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 Corrugated PE, smooth interior |
| 6.1         | 513              | Total            |                      |                   |                                                                                                                  |

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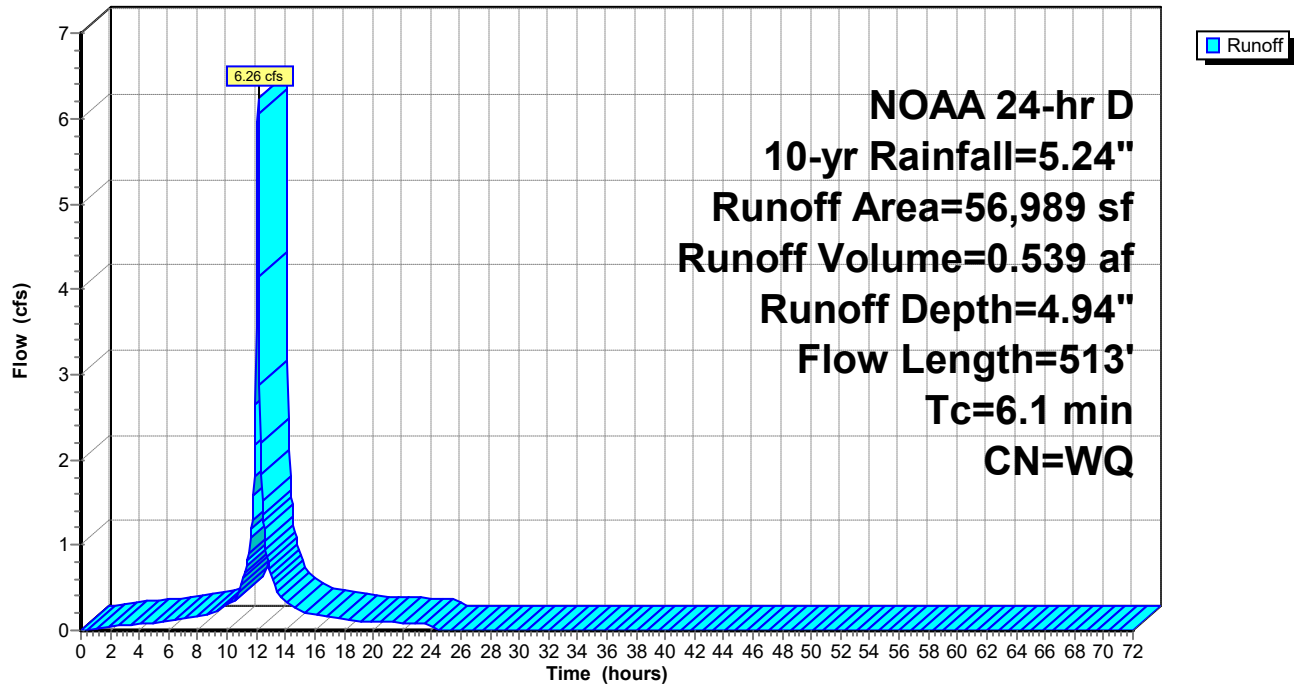
NOAA 24-hr D 10-yr Rainfall=5.24"

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### Subcatchment 13S: #3

Hydrograph



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**Summary for Subcatchment 14S: #4**

Runoff = 2.80 cfs @ 12.27 hrs, Volume= 0.301 af, Depth= 3.31"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 4,953     | 98 | Water Surface, 0% imp, HSG D  |
| * 118     | 98 | Bridge                        |
| * 144     | 98 | Equipment                     |
| 42,281    | 80 | >75% Grass cover, Good, HSG D |
| 47,496    |    | Weighted Average              |
| 47,234    | 82 | 99.45% Pervious Area          |
| 262       | 98 | 0.55% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 3.0      | 129           | 0.0023        | 0.72              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                       |
| 5.1      | 252           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030                     |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 18.0     | 723           | Total         |                   |                |                                                                                          |

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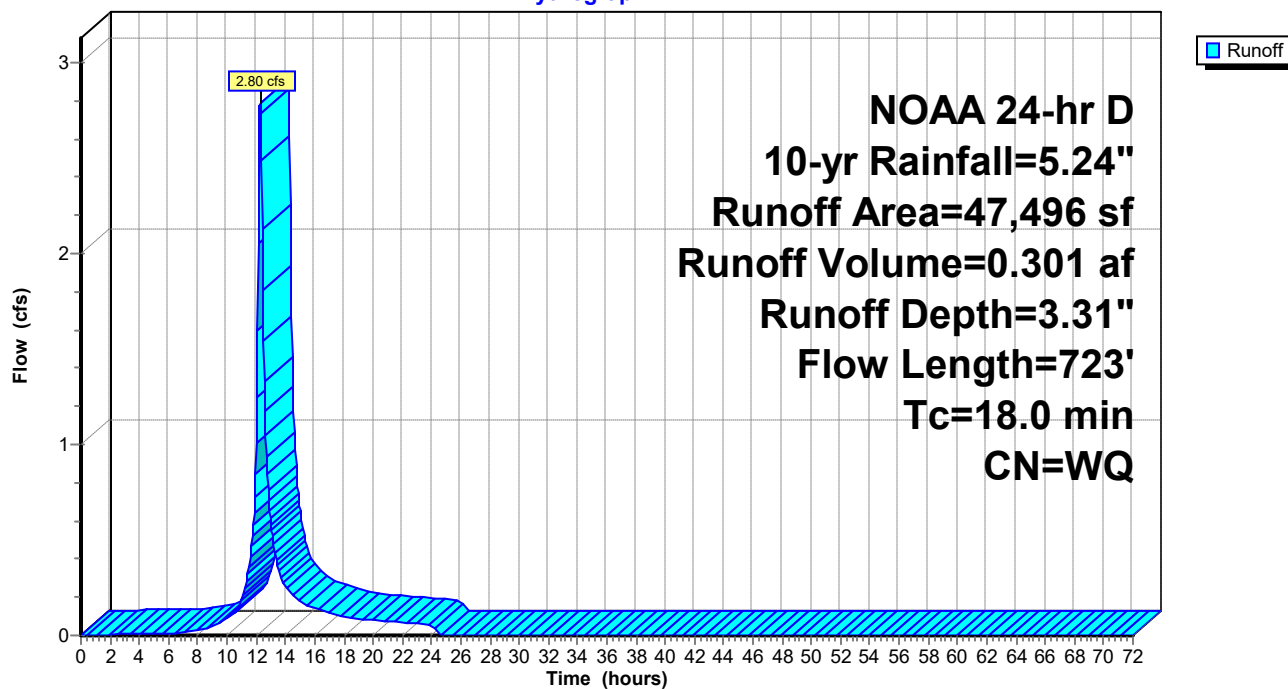
NOAA 24-hr D 10-yr Rainfall=5.24"

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### Subcatchment 14S: #4

Hydrograph



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**Summary for Subcatchment 15S: #5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 8.40 cfs @ 12.11 hrs, Volume= 0.675 af, Depth= 4.42"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs,  $dt= 0.05$  hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 7,544     | 80 | Grass Paver                   |
| * | 298       | 98 | Sidewalk                      |
| * | 113       | 98 | Bridge                        |
|   | 5,608     | 98 | Water Surface, 0% imp, HSG D  |
| * | 22,568    | 98 | Greenhouse                    |
| * | 16,982    | 80 | >75% Grass cover, Good, HSG D |
| * | 26,730    | 98 | Headhouse                     |
|   | 79,843    |    | Weighted Average              |
|   | 30,134    | 83 | 37.74% Pervious Area          |
|   | 49,709    | 98 | 62.26% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------------------------------------------------|
| 1.2      | 100           | 0.0200        | 1.45              |                | <b>Sheet Flow, 1</b><br>Smooth surfaces $n= 0.011$ $P2= 3.54"$                                                       |
| 0.3      | 47            | 0.0200        | 2.87              |                | <b>Shallow Concentrated Flow,</b><br>Paved $K_v= 20.3$ fps                                                           |
| 0.7      | 229           | 0.0075        | 5.15              | 9.10           | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' $r= 0.38'$<br>$n= 0.013$ Corrugated PE, smooth interior |
| 1.7      | 82            | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' $r= 2.16'$ $n= 0.030$                                             |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' $r= 0.50'$<br>$n= 0.011$                                |
| 4.9      | 768           | Total         |                   |                |                                                                                                                      |

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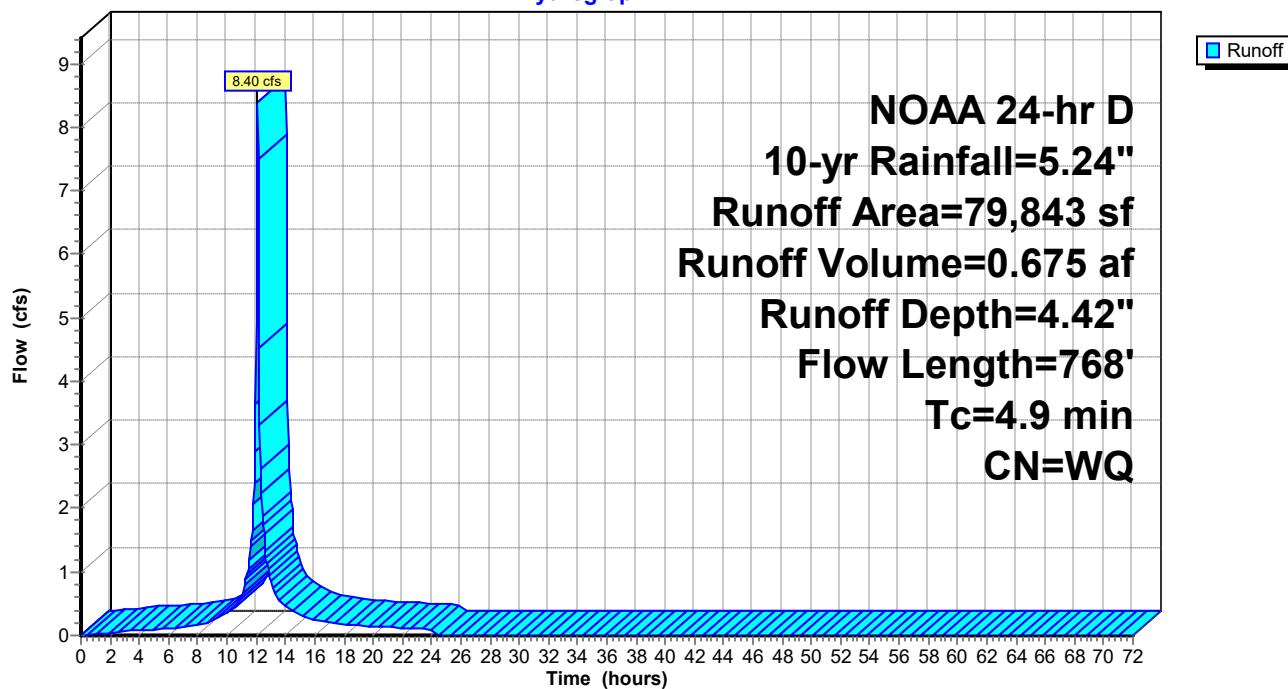
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### Subcatchment 15S: #5

Hydrograph



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**Summary for Subcatchment 17S: #6**

[49] Hint: Tc&lt;2dt may require smaller dt

Runoff = 1.98 cfs @ 12.08 hrs, Volume= 0.143 af, Depth= 4.44"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,836    | 98 | Paved parking, HSG D          |
| 4,964     | 80 | >75% Grass cover, Good, HSG D |
| 16,800    |    | Weighted Average              |
| 4,964     | 80 | 29.55% Pervious Area          |
| 11,836    | 98 | 70.45% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                  |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.8      | 59            | 0.0170        | 1.22              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                                                                     |
| 0.5      | 79            | 0.0025        | 2.63              | 3.23           | <b>Pipe Channel,</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.013 Corrugated PE, smooth interior                                             |
| 0.5      | 132           | 0.0025        | 4.21              | 13.80          | <b>Pipe Channel, RCP_Elliptical 30x19</b><br>30.0" x 19.0", R=33.5" Elliptical Area= 3.3 sf Perim= 6.7' r= 0.49'<br>n= 0.011 Concrete pipe, straight & clean |
| 1.8      | 270           | Total         |                   |                |                                                                                                                                                              |

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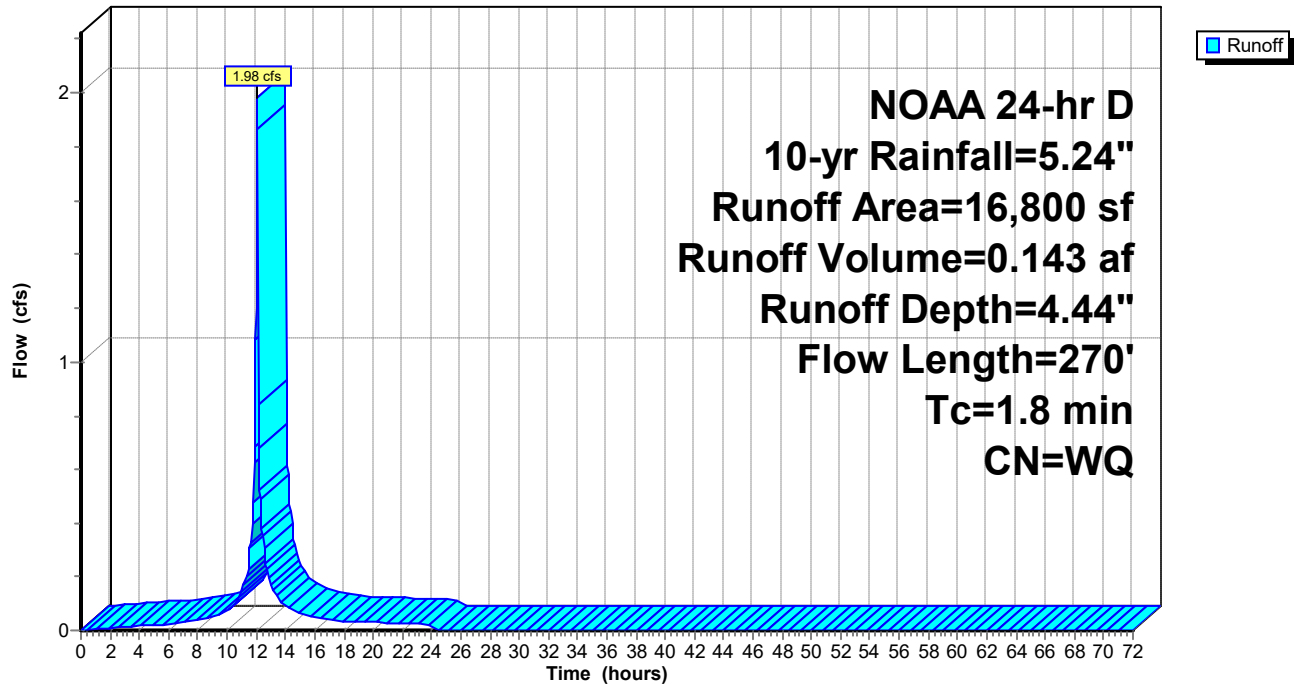
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### Subcatchment 17S: #6

Hydrograph



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**Summary for Subcatchment 18S: #7**

[49] Hint: Tc&lt;2dt may require smaller dt

[47] Hint: Peak is 127% of capacity of segment #2

Runoff = 4.10 cfs @ 12.10 hrs, Volume= 0.322 af, Depth= 4.44"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 26,579    | 98 | Paved parking, HSG D          |
| 11,314    | 80 | >75% Grass cover, Good, HSG D |
| 37,893    |    | Weighted Average              |
| 11,314    | 80 | 29.86% Pervious Area          |
| 26,579    | 98 | 70.14% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.2      | 85            | 0.0126        | 1.16              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                                                                        |
| 1.2      | 182           | 0.0025        | 2.63              | 3.23           | <b>Pipe Channel,</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.013 Corrugated PE, smooth interior                                                |
| 0.2      | 45            | 0.0025        | 3.56              | 11.68          | <b>Pipe Channel, RCP_Elliptical 30x19</b><br>30.0" x 19.0", R=33.5" Elliptical Area= 3.3 sf Perim= 6.7' r= 0.49'<br>n= 0.013 Concrete pipe, bends & connections |
| 0.7      | 173           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 1.0      | 235           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 4.3      | 720           | Total         |                   |                |                                                                                                                                                                 |

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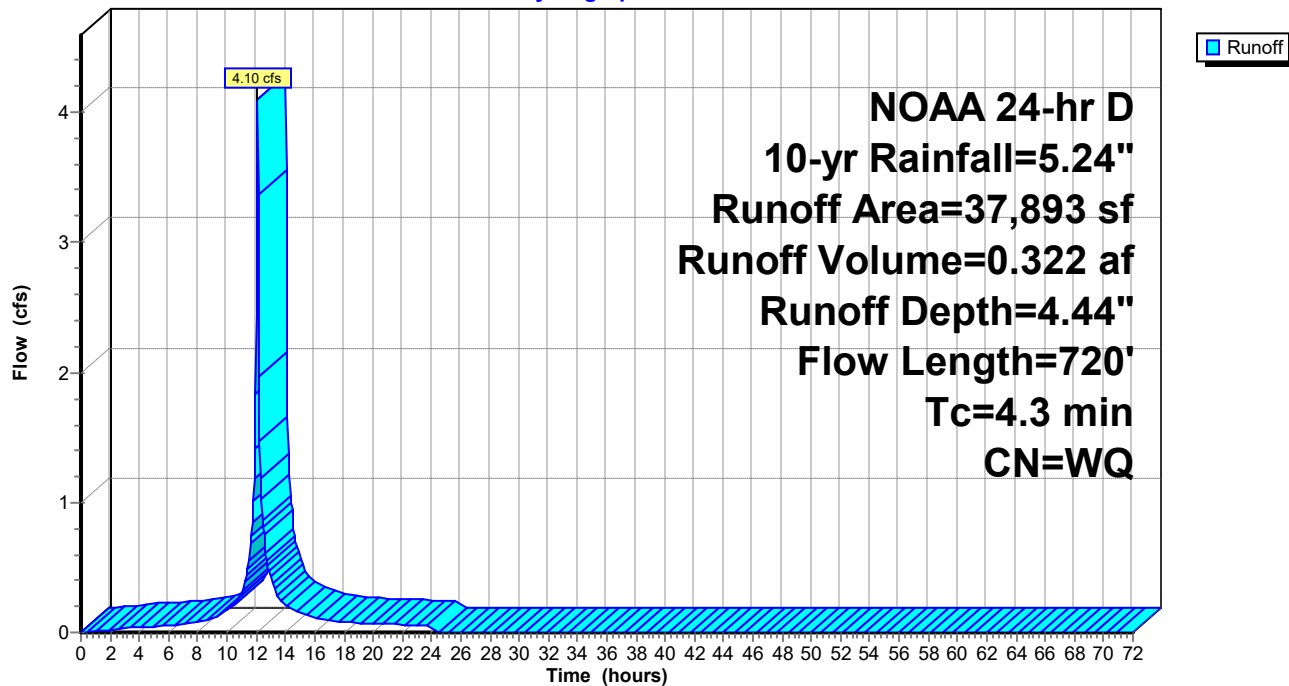
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### Subcatchment 18S: #7

Hydrograph



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**Summary for Subcatchment 19S: #8**

Runoff = 12.44 cfs @ 12.27 hrs, Volume= 1.378 af, Depth= 3.40"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 18,996    | 98 | Water Surface, HSG D          |
| 153,994   | 80 | >75% Grass cover, Good, HSG D |
| 15,929    | 98 | Paved parking, HSG D          |
| * 14,385  | 68 | Gravel                        |
| * 2,714   | 98 | Equipment                     |
| * 3,013   | 80 | 1/2 Switchyard                |
| * 3,013   | 98 | 1/2 Switchyard                |
| 212,044   |    | Weighted Average              |
| 171,392   | 79 | 80.83% Pervious Area          |
| 40,652    | 98 | 19.17% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length                                                                        |
| 8.6      | 397           | 0.0023        | 0.77              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                                                                                       |
| 1.0      | 235           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 18.5     | 664           | Total         |                   |                |                                                                                                                                                                 |

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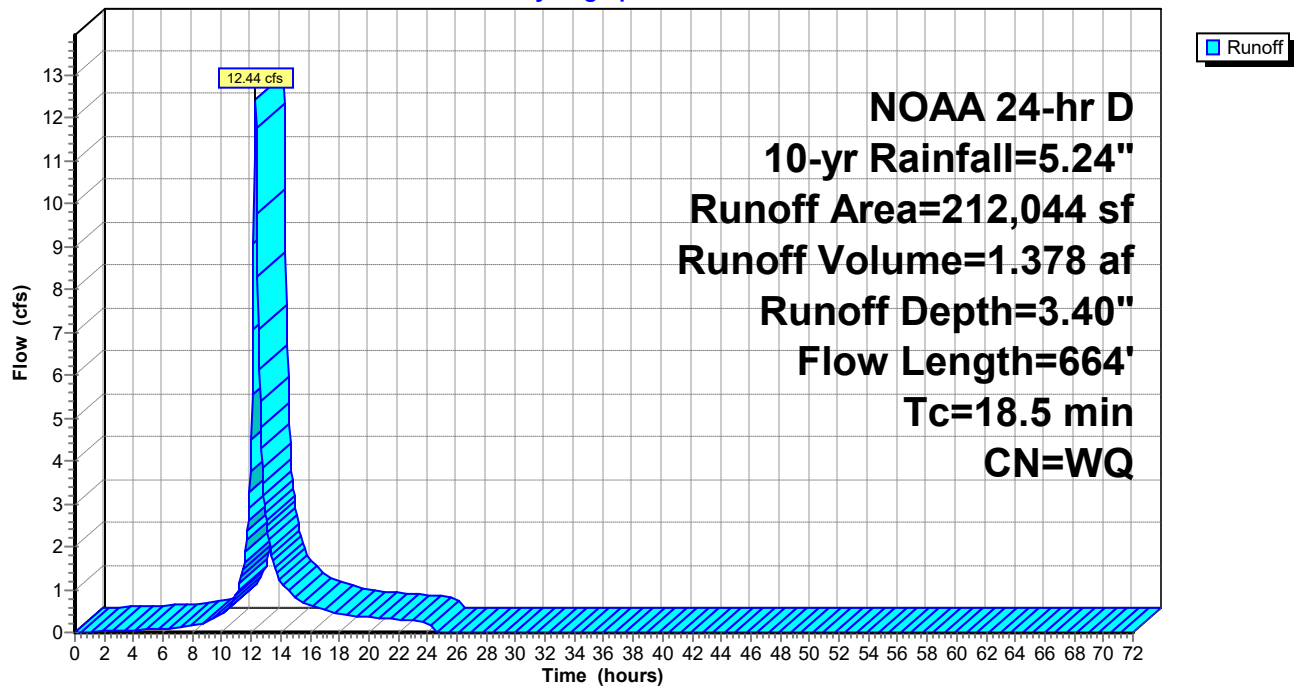
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### Subcatchment 19S: #8

Hydrograph



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**Summary for Subcatchment 20S: #9**

Runoff = 0.51 cfs @ 12.30 hrs, Volume= 0.057 af, Depth= 3.22"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 10-yr Rainfall=5.24"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,738     | 80 | >75% Grass cover, Good, HSG D |
| 573       | 98 | Water Surface, 0% imp, HSG D  |
| 9,311     |    | Weighted Average              |
| 9,311     | 81 | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                      |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------|
| 8.9      | 76            | 0.0130        | 0.14              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length         |
| 1.0      | 98            | 0.0130        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                               |
| 9.5      | 473           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.030 Stream, clean & straight |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011                |
| 20.4     | 957           | Total         |                   |                |                                                                                                  |

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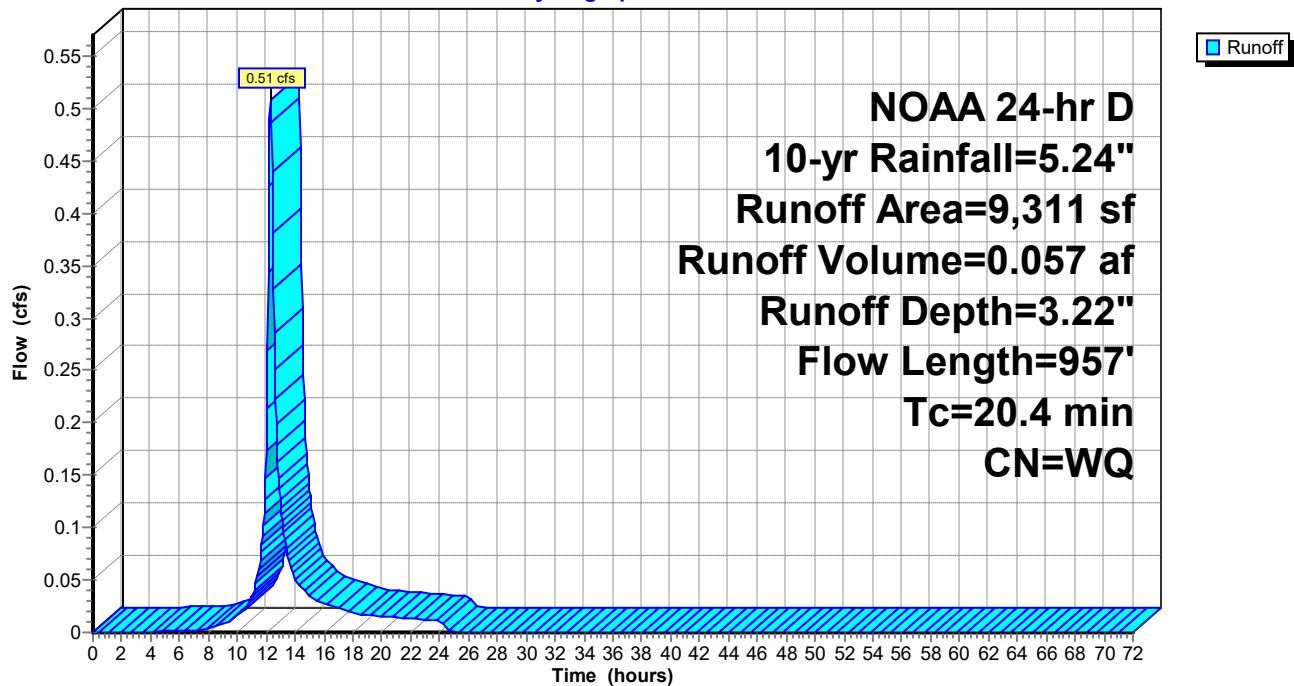
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### Subcatchment 20S: #9

Hydrograph



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**Summary for Pond 16P: Pond #1A**

Inflow Area = 5.738 ac, 26.90% Impervious, Inflow Depth = 3.55" for 10-yr event  
 Inflow = 13.79 cfs @ 12.26 hrs, Volume= 1.699 af  
 Outflow = 3.71 cfs @ 12.85 hrs, Volume= 1.560 af, Atten= 73%, Lag= 35.2 min  
 Primary = 3.71 cfs @ 12.85 hrs, Volume= 1.560 af  
 Routed to Pond 17P : Pond #1B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 175.92' @ 12.85 hrs Surf.Area= 10,074 sf Storage= 33,639 cf  
 Flood Elev= 177.08' Surf.Area= 10,074 sf Storage= 45,333 cf

Plug-Flow detention time= 295.8 min calculated for 1.558 af (92% of inflow)  
 Center-of-Mass det. time= 253.1 min ( 1,061.6 - 808.5 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 45,333 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 10,074               | 0                         | 0                         |
| 177.08              | 10,074               | 45,333                    | 45,333                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                      |
| #1     | Primary | 173.08' | <b>12.0" Round Culvert</b><br>L= 142.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' / Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=3.71 cfs @ 12.85 hrs HW=175.92' TW=173.79' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Barrel Controls 3.71 cfs @ 4.73 fps)

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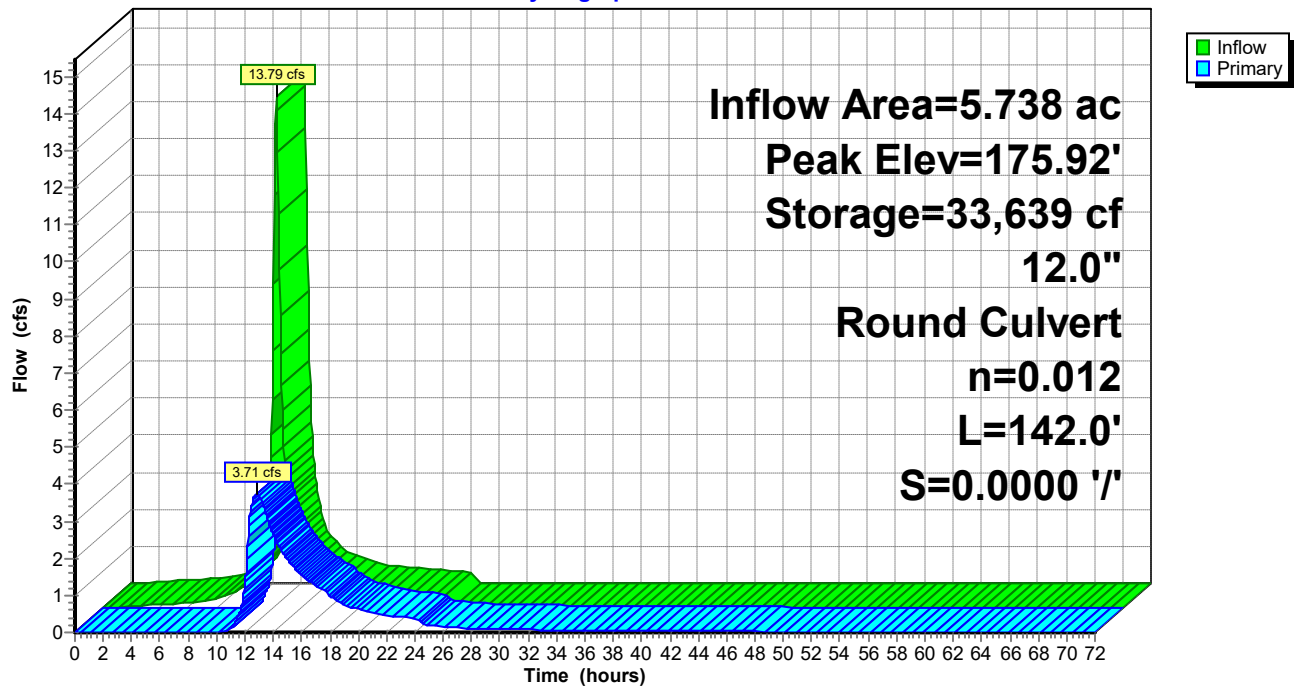
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### Pond 16P: Pond #1A

#### Hydrograph



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### Summary for Pond 17P: Pond #1B

Inflow Area = 5.738 ac, 26.90% Impervious, Inflow Depth > 3.26" for 10-yr event  
Inflow = 3.71 cfs @ 12.85 hrs, Volume= 1.560 af  
Outflow = 2.29 cfs @ 14.44 hrs, Volume= 1.439 af, Atten= 38%, Lag= 95.6 min  
Primary = 2.29 cfs @ 14.44 hrs, Volume= 1.439 af  
Routed to Link 22L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 174.58' @ 14.44 hrs Surf.Area= 8,922 sf Storage= 17,880 cf  
Flood Elev= 177.08' Surf.Area= 8,922 sf Storage= 40,149 cf

Plug-Flow detention time= 299.3 min calculated for 1.439 af (92% of inflow)  
Center-of-Mass det. time= 191.3 min ( 1,252.9 - 1,061.6 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 172.58'              | 40,149 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 172.58              | 8,922                | 0                         | 0                                                          |
| 177.08              | 8,922                | 40,149                    | 40,149                                                     |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                                           |
|--------|----------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary  | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                              |
| #1     | Device 4 | 173.08' | <b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                               |
| #2     | Device 4 | 173.58' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                              |
| #3     | Device 4 | 175.83' | <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                                     |
| #4     | Primary  | 173.08' | <b>12.0" Round Culvert</b><br>L= 25.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.29 cfs @ 14.44 hrs HW=174.58' TW=0.00' (Dynamic Tailwater)

↑ **4=Culvert** (Passes 2.29 cfs of 3.04 cfs potential flow)  
↑ **1=Orifice/Grate** (Orifice Controls 0.28 cfs @ 5.65 fps)  
↑ **2=Orifice/Grate** (Orifice Controls 2.01 cfs @ 3.69 fps)  
↑ **3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)

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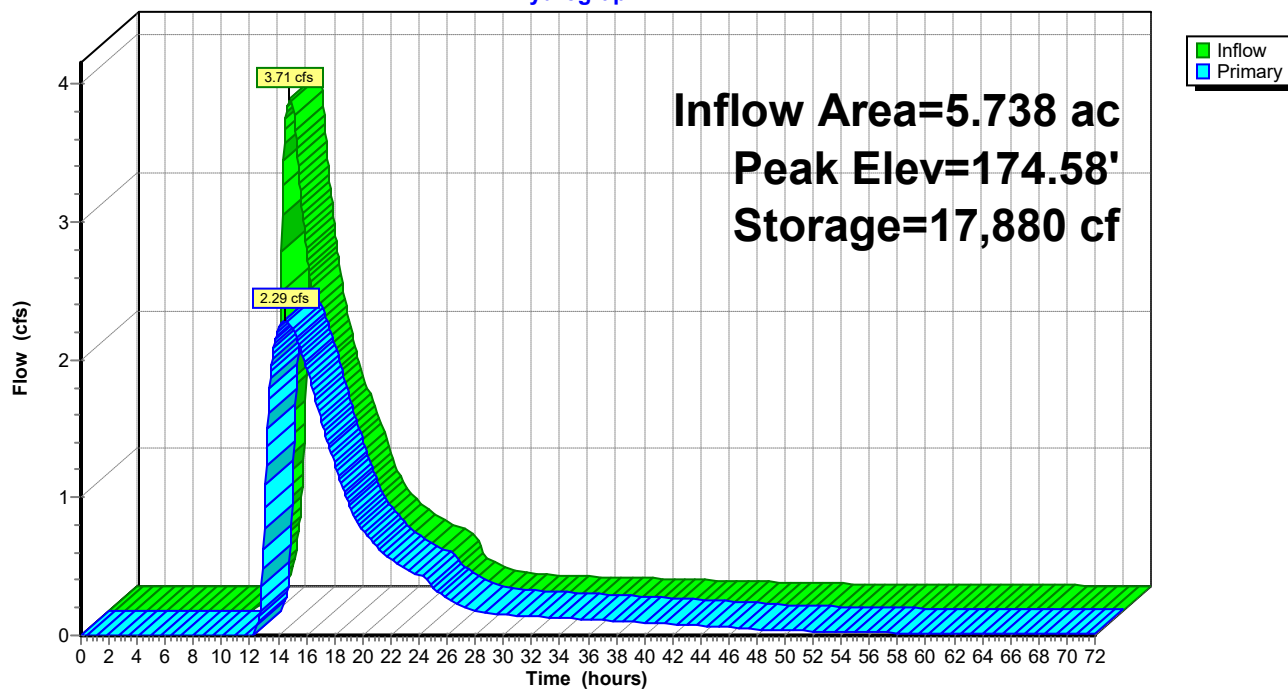
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### Pond 17P: Pond #1B

Hydrograph



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### Summary for Pond 20P: Pond #2

Inflow Area = 4.183 ac, 76.64% Impervious, Inflow Depth = 4.41" for 10-yr event  
Inflow = 17.30 cfs @ 12.14 hrs, Volume= 1.539 af  
Outflow = 2.31 cfs @ 12.88 hrs, Volume= 1.450 af, Atten= 87%, Lag= 44.2 min  
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
Primary = 2.31 cfs @ 12.88 hrs, Volume= 1.450 af  
Routed to Link 22L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 177.27' @ 12.88 hrs Surf.Area= 13,951 sf Storage= 33,608 cf

Plug-Flow detention time= 290.7 min calculated for 1.450 af (94% of inflow)  
Center-of-Mass det. time= 256.5 min ( 1,019.2 - 762.6 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 174.86' | 78,684 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 174.86              | 13,951               | 0                         | 0                         |
| 180.50              | 13,951               | 78,684                    | 78,684                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 175.09' | <b>12.0" Round Culvert</b><br>L= 352.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 175.09' / 174.58' S= 0.0014 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Discarded | 180.00' | <b>540.0' long (Profile 2) Broad-Crested Rectangular Weir</b><br>Head (feet) 0.49 0.98 1.48<br>Coef. (English) 2.90 3.26 3.44                                                                                    |

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=174.86' (Free Discharge)

↑ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Primary OutFlow** Max=2.31 cfs @ 12.88 hrs HW=177.27' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Barrel Controls 2.31 cfs @ 2.94 fps)

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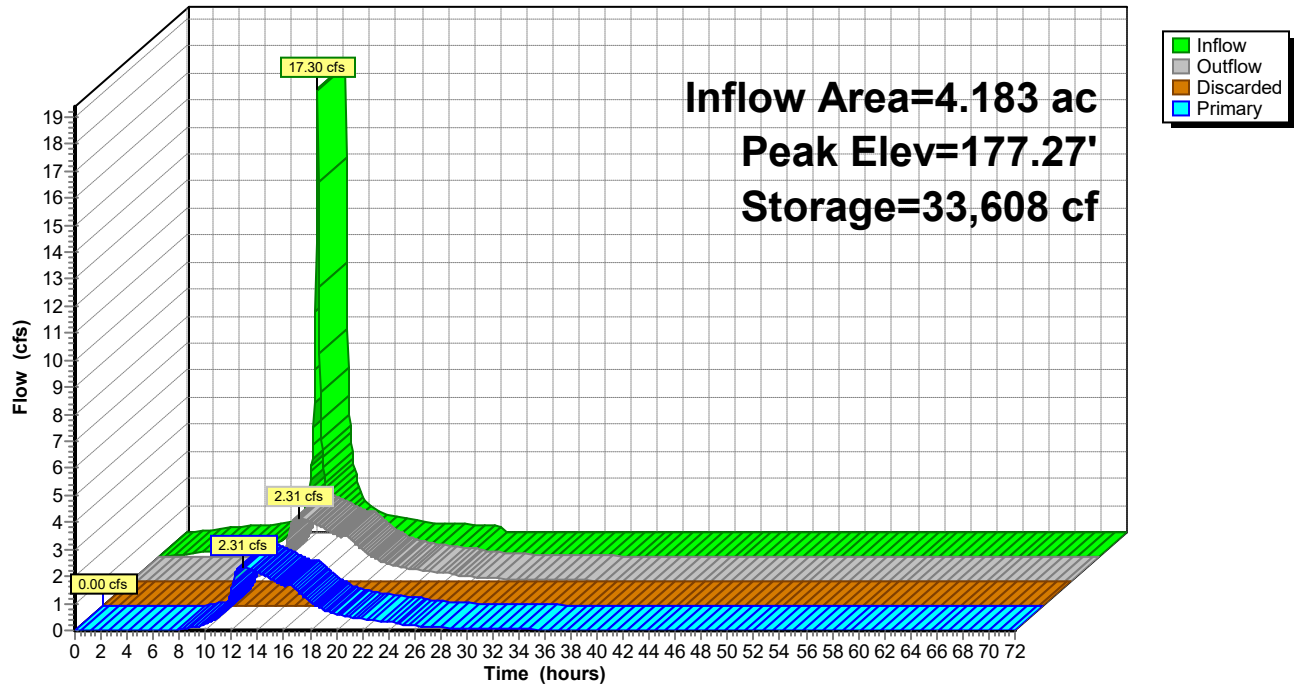
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### Pond 20P: Pond #2

#### Hydrograph



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**Summary for Pond 24P: Permeable**

Inflow Area = 2.362 ac, 61.75% Impervious, Inflow Depth = 4.27" for 10-yr event  
 Inflow = 9.19 cfs @ 12.16 hrs, Volume= 0.840 af  
 Outflow = 1.73 cfs @ 12.66 hrs, Volume= 0.826 af, Atten= 81%, Lag= 30.2 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 1.73 cfs @ 12.66 hrs, Volume= 0.826 af  
 Routed to Link 18L : Ultimate

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 176.64' @ 12.66 hrs Surf.Area= 41,292 sf Storage= 15,793 cf  
 Flood Elev= 178.50' Surf.Area= 41,292 sf Storage= 46,516 cf

Plug-Flow detention time= 209.7 min calculated for 0.826 af (98% of inflow)  
 Center-of-Mass det. time= 199.0 min ( 972.8 - 773.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                            |
|--------|---------|---------------|------------------------------------------------------------------------------------------------|
| #1     | 175.17' | 54,774 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>136,936 cf Overall x 40.0% Voids |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 175.17              | 4,401                | 0                         | 0                         |
| 175.74              | 4,401                | 2,509                     | 2,509                     |
| 175.75              | 41,292               | 228                       | 2,737                     |
| 179.00              | 41,292               | 134,199                   | 136,936                   |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                  |
|--------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Discarded | 179.00' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                     |
| #1     | Device 6  | 175.42' | <b>6.0" Round Culvert X 3.00</b> L= 440.0' Ke= 1.000<br>Inlet / Outlet Invert= 175.42' / 175.42' S= 0.0000 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf   |
| #2     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #3     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #4     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #5     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #6     | Primary   | 175.25' | <b>18.0" Round Culvert</b><br>L= 66.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 175.25' / 174.94' S= 0.0047 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.77 sf |
| #7     | Device 6  | 176.33' | <b>48.0" W x 8.0" H Vert. Orifice/Grate X 0.40</b> C= 0.600<br>Limited to weir flow at low heads                                                                                |

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NOAA 24-hr D 10-yr Rainfall=5.24"

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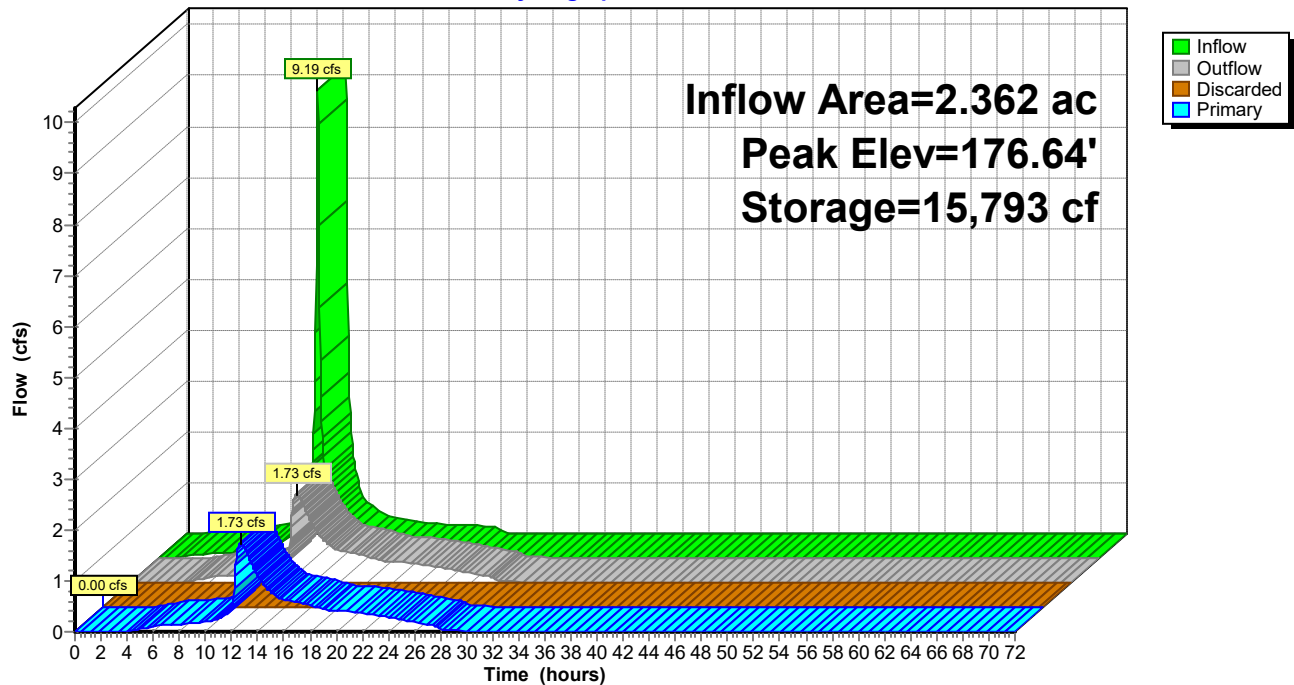
**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=175.17' (Free Discharge)

**Primary OutFlow** Max=1.73 cfs @ 12.66 hrs HW=176.64' TW=0.00' (Dynamic Tailwater)

- 6=Culvert (Passes 1.73 cfs of 5.43 cfs potential flow)
  - 1=Culvert (Barrel Controls 0.84 cfs @ 1.43 fps)
  - 2=Orifice/Grate (Passes < 5.66 cfs potential flow)
  - 3=Orifice/Grate (Passes < 5.66 cfs potential flow)
  - 4=Orifice/Grate (Passes < 5.66 cfs potential flow)
  - 5=Orifice/Grate (Passes < 5.66 cfs potential flow)
  - 7=Orifice/Grate (Orifice Controls 0.88 cfs @ 0.71 fps)

### Pond 24P: Permeable

#### Hydrograph



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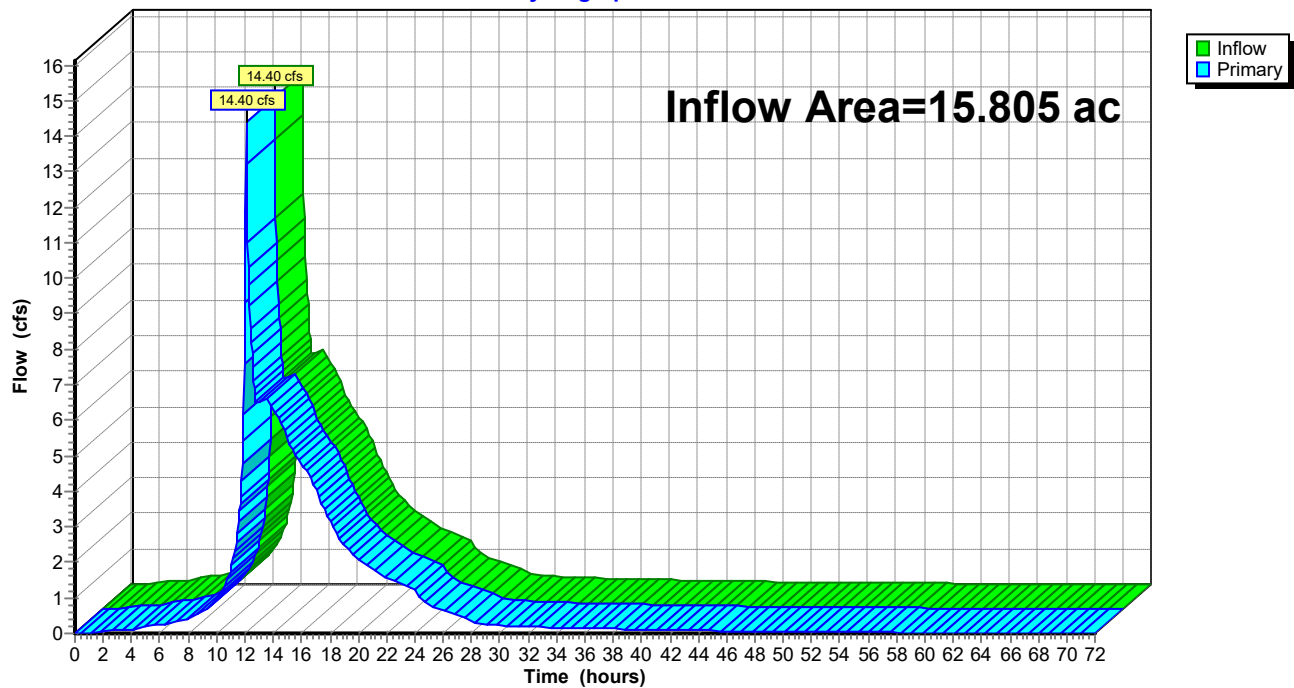
### Summary for Link 18L: Ultimate

Inflow Area = 15.805 ac, 48.25% Impervious, Inflow Depth > 3.71" for 10-yr event  
Inflow = 14.40 cfs @ 12.11 hrs, Volume= 4.892 af  
Primary = 14.40 cfs @ 12.11 hrs, Volume= 4.892 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 18L: Ultimate

Hydrograph



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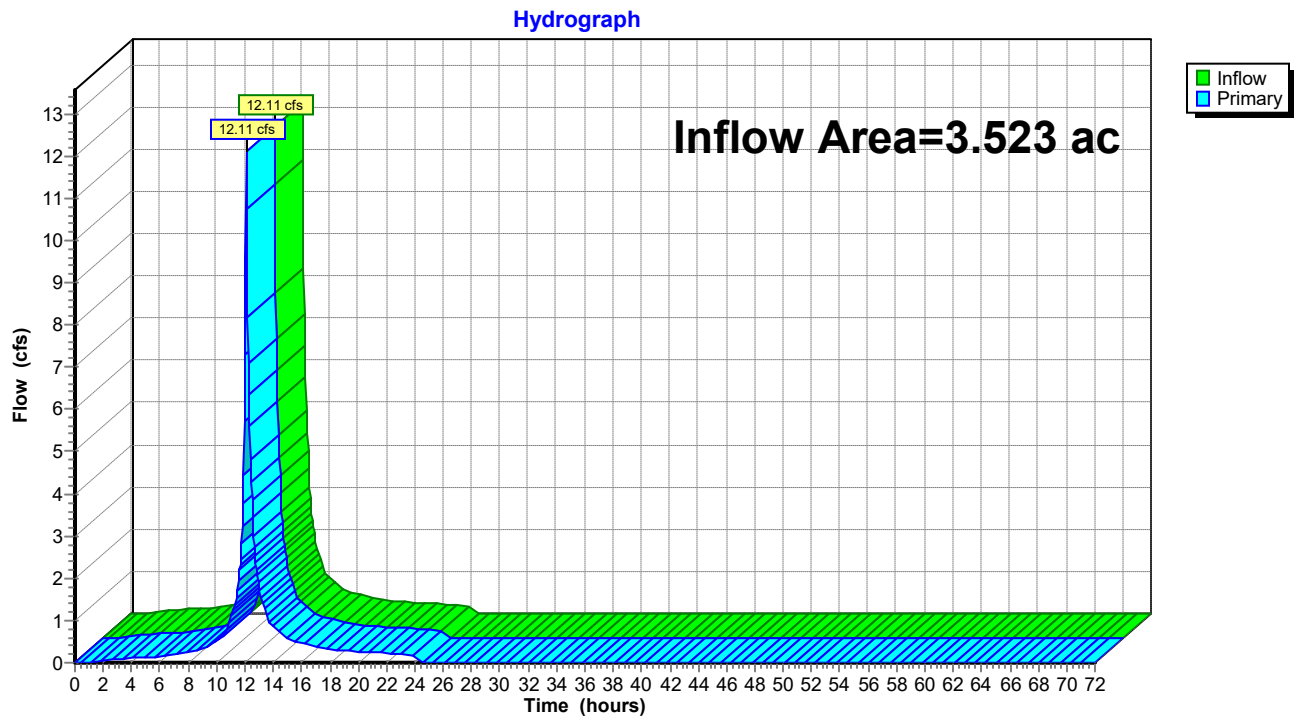
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### Summary for Link 21L: Uncontrolled

Inflow Area = 3.523 ac, 40.28% Impervious, Inflow Depth = 4.01" for 10-yr event  
Inflow = 12.11 cfs @ 12.11 hrs, Volume= 1.176 af  
Primary = 12.11 cfs @ 12.11 hrs, Volume= 1.176 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 18L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 21L: Uncontrolled



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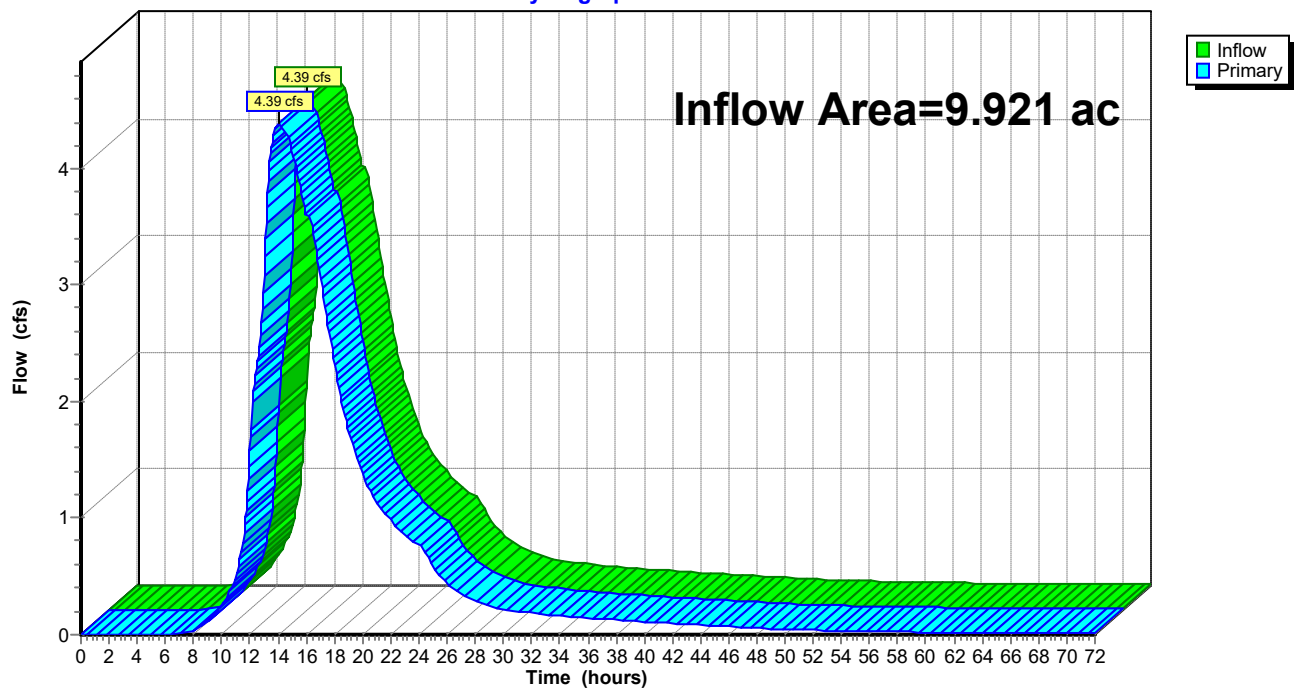
### Summary for Link 22L: Controlled

Inflow Area = 9.921 ac, 47.87% Impervious, Inflow Depth > 3.49" for 10-yr event  
Inflow = 4.39 cfs @ 14.10 hrs, Volume= 2.889 af  
Primary = 4.39 cfs @ 14.10 hrs, Volume= 2.889 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 18L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 22L: Controlled

Hydrograph



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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                               |                                                                                                                                                  |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment 11S: #1</b>   | Runoff Area=102,868 sf 61.75% Impervious Runoff Depth=5.35"<br>Flow Length=81' Tc=9.3 min CN=WQ Runoff=11.47 cfs 1.053 af                        |
| <b>Subcatchment 12S: #2</b>   | Runoff Area=125,236 sf 67.51% Impervious Runoff Depth=5.23"<br>Flow Length=862' Tc=8.4 min CN=WQ Runoff=14.00 cfs 1.254 af                       |
| <b>Subcatchment 13S: #3</b>   | Runoff Area=56,989 sf 96.70% Impervious Runoff Depth=6.07"<br>Flow Length=513' Tc=6.1 min CN=WQ Runoff=7.64 cfs 0.661 af                         |
| <b>Subcatchment 14S: #4</b>   | Runoff Area=47,496 sf 0.55% Impervious Runoff Depth=4.34"<br>Flow Length=723' Tc=18.0 min CN=WQ Runoff=3.65 cfs 0.394 af                         |
| <b>Subcatchment 15S: #5</b>   | Runoff Area=79,843 sf 62.26% Impervious Runoff Depth=5.51"<br>Flow Length=768' Tc=4.9 min CN=WQ Runoff=10.42 cfs 0.842 af                        |
| <b>Subcatchment 17S: #6</b>   | Runoff Area=16,800 sf 70.45% Impervious Runoff Depth=5.54"<br>Flow Length=270' Tc=1.8 min CN=WQ Runoff=2.46 cfs 0.178 af                         |
| <b>Subcatchment 18S: #7</b>   | Runoff Area=37,893 sf 70.14% Impervious Runoff Depth=5.53"<br>Flow Length=720' Tc=4.3 min CN=WQ Runoff=5.09 cfs 0.401 af                         |
| <b>Subcatchment 19S: #8</b>   | Runoff Area=212,044 sf 19.17% Impervious Runoff Depth=4.42"<br>Flow Length=664' Tc=18.5 min CN=WQ Runoff=16.15 cfs 1.793 af                      |
| <b>Subcatchment 20S: #9</b>   | Runoff Area=9,311 sf 0.00% Impervious Runoff Depth=4.24"<br>Flow Length=957' Tc=20.4 min CN=WQ Runoff=0.67 cfs 0.076 af                          |
| <b>Pond 16P: Pond #1A</b>     | Peak Elev=176.84' Storage=42,875 cf Inflow=17.84 cfs 2.194 af<br>12.0" Round Culvert n=0.012 L=142.0' S=0.0000 ' Outflow=4.53 cfs 2.054 af       |
| <b>Pond 17P: Pond #1B</b>     | Peak Elev=174.96' Storage=21,235 cf Inflow=4.53 cfs 2.054 af<br>Outflow=2.89 cfs 1.934 af                                                        |
| <b>Pond 20P: Pond #2</b>      | Peak Elev=177.82' Storage=41,303 cf Inflow=21.46 cfs 1.915 af<br>Discarded=0.00 cfs 0.000 af Primary=2.66 cfs 1.826 af Outflow=2.66 cfs 1.826 af |
| <b>Pond 24P: Permeable</b>    | Peak Elev=176.83' Storage=18,945 cf Inflow=11.47 cfs 1.053 af<br>Discarded=0.00 cfs 0.000 af Primary=2.77 cfs 1.040 af Outflow=2.77 cfs 1.040 af |
| <b>Link 18L: Ultimate</b>     | Inflow=18.11 cfs 6.290 af<br>Primary=18.11 cfs 6.290 af                                                                                          |
| <b>Link 21L: Uncontrolled</b> | Inflow=15.20 cfs 1.490 af<br>Primary=15.20 cfs 1.490 af                                                                                          |
| <b>Link 22L: Controlled</b>   | Inflow=5.35 cfs 3.760 af<br>Primary=5.35 cfs 3.760 af                                                                                            |

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**Total Runoff Area = 15.805 ac   Runoff Volume = 6.652 af   Average Runoff Depth = 5.05"**  
**51.75% Pervious = 8.179 ac   48.25% Impervious = 7.627 ac**

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### Summary for Subcatchment 11S: #1

Runoff = 11.47 cfs @ 12.16 hrs, Volume= 1.053 af, Depth= 5.35"  
Routed to Pond 24P : Permeable

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 25-yr Rainfall=6.37"

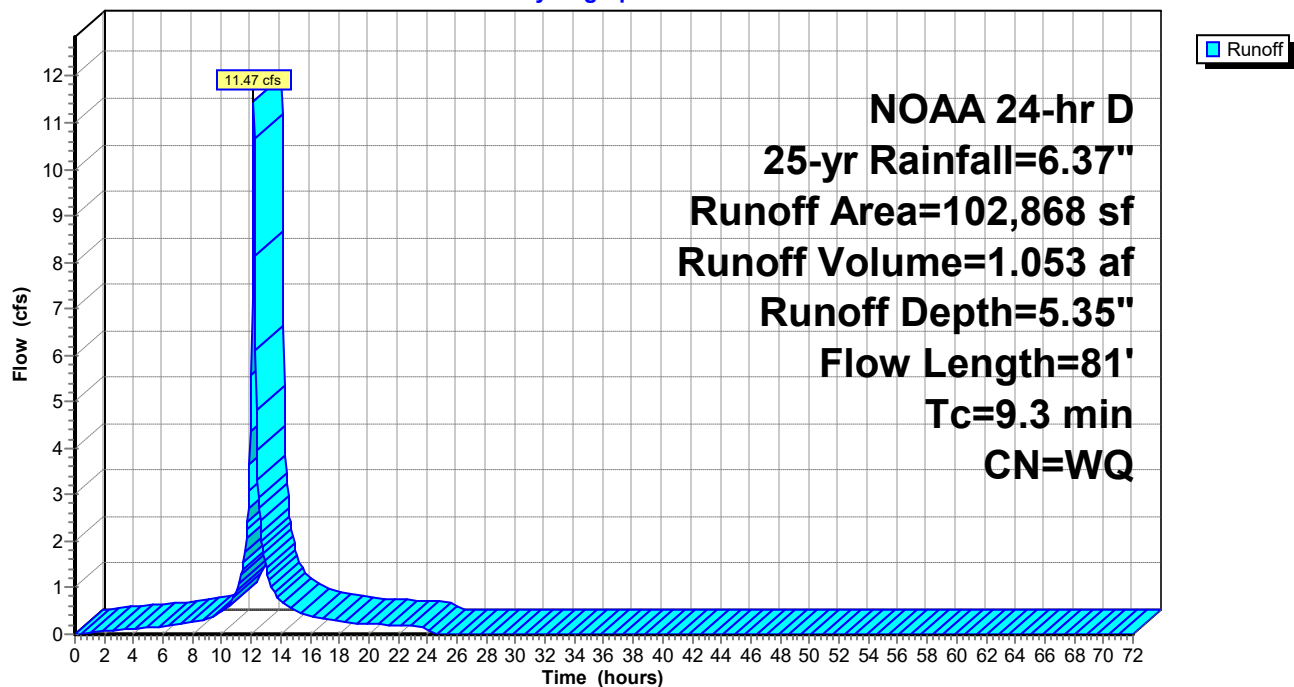
| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| * 38,450  | 80 | >75% Grass cover, Good, HSG D |
| 44,502    | 98 | Paved parking, HSG D          |
| * 897     | 68 | Gravel                        |
| * 7,857   | 98 | House Imp                     |
| * 11,162  | 98 | Headhouse - North             |
| 102,868   |    | Weighted Average              |
| 39,347    | 80 | 38.25% Pervious Area          |
| 63,521    | 98 | 61.75% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 9.0      | 37            | 0.0030        | 0.07              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 0.3      | 44            | 0.0300        | 2.60              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                       |
| 9.3      | 81            | Total         |                   |                |                                                                                          |

### Subcatchment 11S: #1

Hydrograph



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**Summary for Subcatchment 12S: #2**

[47] Hint: Peak is 2392% of capacity of segment #2

[47] Hint: Peak is 298% of capacity of segment #3

[47] Hint: Peak is 108% of capacity of segment #4

Runoff = 14.00 cfs @ 12.15 hrs, Volume= 1.254 af, Depth= 5.23"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
|   | 15,527    | 80 | >75% Grass cover, Good, HSG D |
| * | 1,149     | 98 | Sidewalk                      |
| * | 25,159    | 68 | Gravel                        |
| * | 4,507     | 98 | Equipment                     |
| * | 71,399    | 98 | Greenhouse                    |
| * | 7,495     | 98 | Powerhouse                    |
|   | 125,236   |    | Weighted Average              |
|   | 40,686    | 73 | 32.49% Pervious Area          |
|   | 84,550    | 98 | 67.51% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                                          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------------------------------------------------------------------------------------------------------|
| 2.9         | 100              | 0.0020           | 0.58                 |                   | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                             |
| 2.7         | 275              | 0.0020           | 1.68                 | 0.59              | <b>Pipe Channel,</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.012                                     |
| 2.2         | 345              | 0.0020           | 2.66                 | 4.70              | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'<br>n= 0.013 Concrete pipe, bends & connections |
| 0.6         | 142              | 0.0033           | 4.14                 | 13.00             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 Corrugated PE, smooth interior     |
| 8.4         | 862              | Total            |                      |                   |                                                                                                                      |

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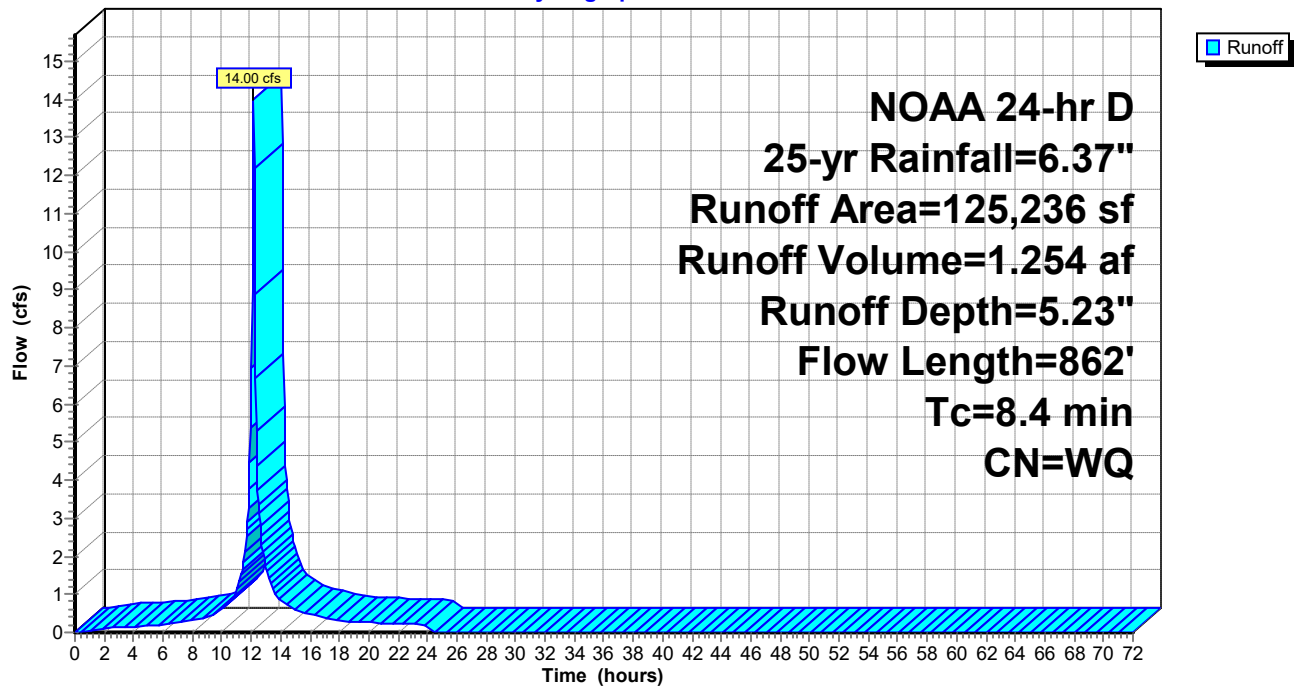
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 12S: #2

Hydrograph



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**Summary for Subcatchment 13S: #3**

[47] Hint: Peak is 1304% of capacity of segment #2

Runoff = 7.64 cfs @ 12.13 hrs, Volume= 0.661 af, Depth= 6.07"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 41,160    | 98 | Greenhouse                    |
|   | 13,951    | 98 | Water Surface, HSG D          |
|   | 1,878     | 80 | >75% Grass cover, Good, HSG D |
|   | 56,989    |    | Weighted Average              |
|   | 1,878     | 80 | 3.30% Pervious Area           |
|   | 55,111    | 98 | 96.70% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                      |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------------------------------|
| 2.9      | 100           | 0.0020        | 0.58              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                         |
| 2.6      | 264           | 0.0020        | 1.68              | 0.59           | <b>Pipe Channel,</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.012 Steel, smooth                   |
| 0.6      | 149           | 0.0033        | 4.14              | 13.00          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 Corrugated PE, smooth interior |
| 6.1      | 513           | Total         |                   |                |                                                                                                                  |

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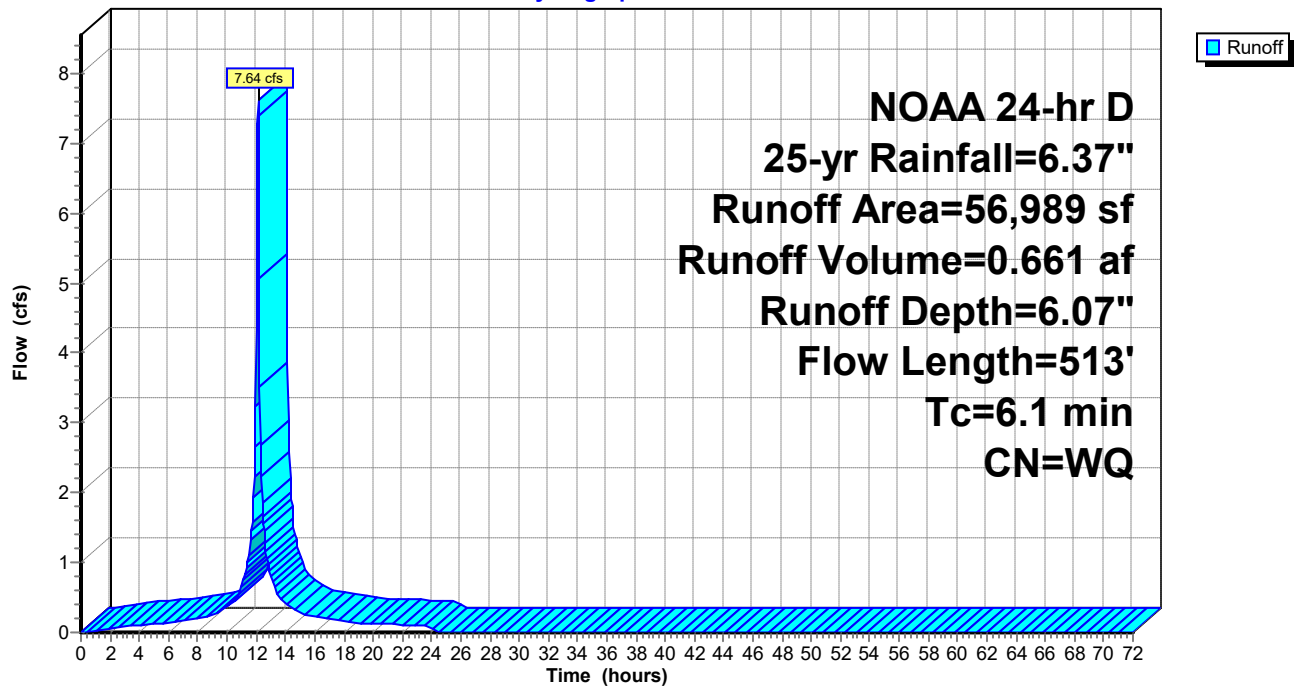
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 13S: #3

Hydrograph



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NOAA 24-hr D 25-yr Rainfall=6.37"

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**Summary for Subcatchment 14S: #4**

Runoff = 3.65 cfs @ 12.27 hrs, Volume= 0.394 af, Depth= 4.34"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 4,953     | 98 | Water Surface, 0% imp, HSG D  |
| * 118     | 98 | Bridge                        |
| * 144     | 98 | Equipment                     |
| 42,281    | 80 | >75% Grass cover, Good, HSG D |
| 47,496    |    | Weighted Average              |
| 47,234    | 82 | 99.45% Pervious Area          |
| 262       | 98 | 0.55% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 3.0      | 129           | 0.0023        | 0.72              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                       |
| 5.1      | 252           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030                     |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 18.0     | 723           | Total         |                   |                |                                                                                          |

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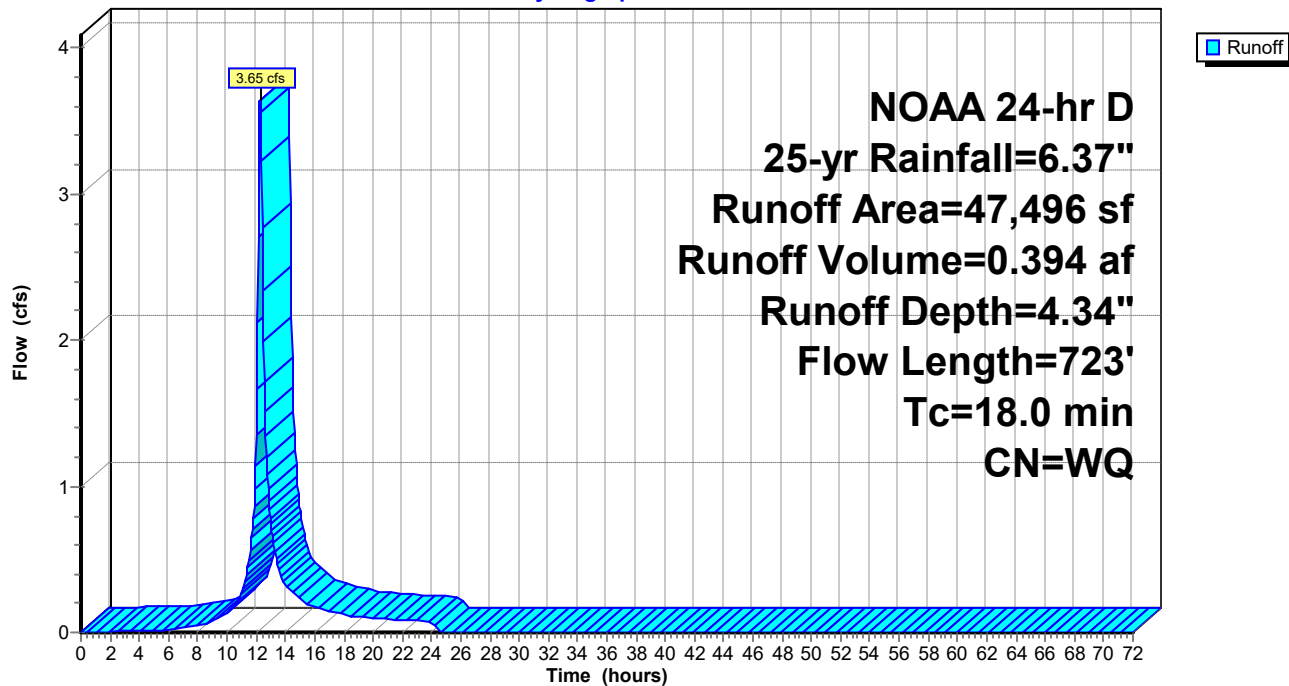
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 14S: #4

Hydrograph



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**Summary for Subcatchment 15S: #5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

[47] Hint: Peak is 115% of capacity of segment #3

Runoff = 10.42 cfs @ 12.11 hrs, Volume= 0.842 af, Depth= 5.51"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs,  $dt=0.05$  hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 7,544     | 80 | Grass Paver                   |
| * | 298       | 98 | Sidewalk                      |
| * | 113       | 98 | Bridge                        |
|   | 5,608     | 98 | Water Surface, 0% imp, HSG D  |
| * | 22,568    | 98 | Greenhouse                    |
| * | 16,982    | 80 | >75% Grass cover, Good, HSG D |
| * | 26,730    | 98 | Headhouse                     |
|   | 79,843    |    | Weighted Average              |
|   | 30,134    | 83 | 37.74% Pervious Area          |
|   | 49,709    | 98 | 62.26% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------|
| 1.2      | 100           | 0.0200        | 1.45              |                | <b>Sheet Flow, 1</b><br>Smooth surfaces $n=0.011$ $P2=3.54"$                                                       |
| 0.3      | 47            | 0.0200        | 2.87              |                | <b>Shallow Concentrated Flow,</b><br>Paved $K_v=20.3$ fps                                                          |
| 0.7      | 229           | 0.0075        | 5.15              | 9.10           | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' $r=0.38'$<br>$n=0.013$ Corrugated PE, smooth interior |
| 1.7      | 82            | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' $r=2.16'$ $n=0.030$                                             |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' $r=0.50'$<br>$n=0.011$                                |
| 4.9      | 768           | Total         |                   |                |                                                                                                                    |

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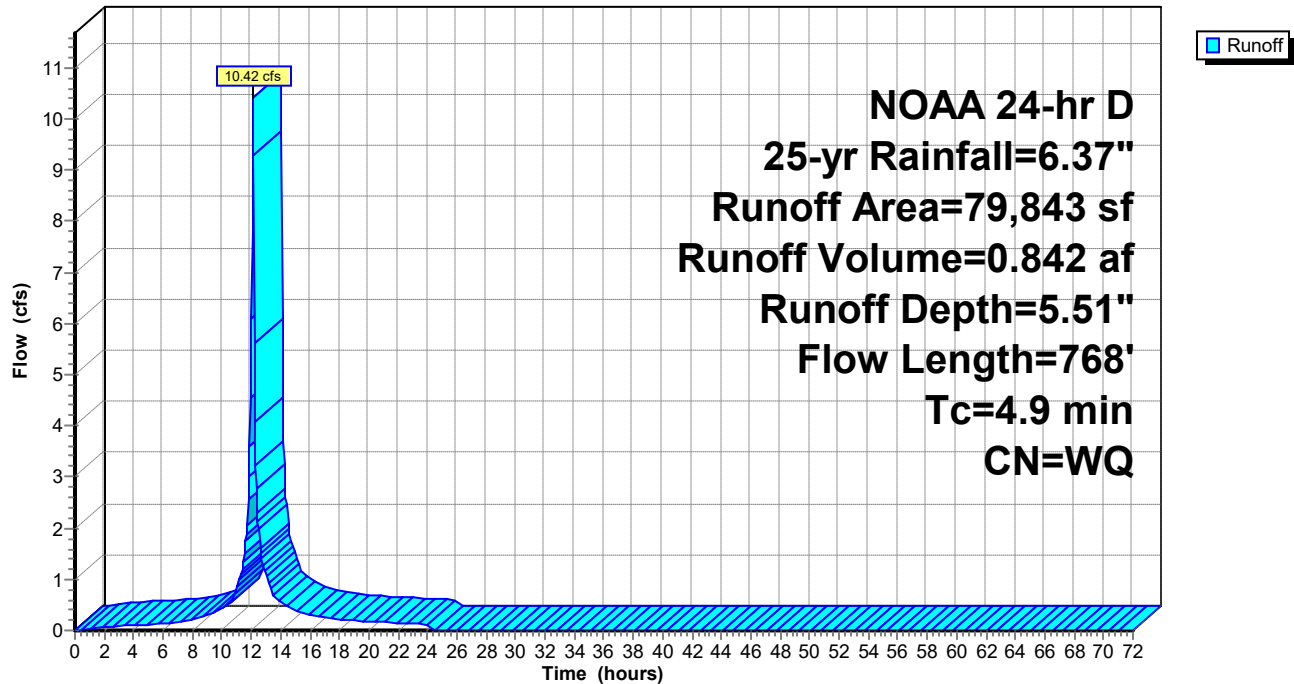
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 15S: #5

Hydrograph



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**Summary for Subcatchment 17S: #6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 2.46 cfs @ 12.08 hrs, Volume= 0.178 af, Depth= 5.54"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs,  $dt= 0.05$  hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,836    | 98 | Paved parking, HSG D          |
| 4,964     | 80 | >75% Grass cover, Good, HSG D |
| 16,800    |    | Weighted Average              |
| 4,964     | 80 | 29.55% Pervious Area          |
| 11,836    | 98 | 70.45% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                        |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.8      | 59            | 0.0170        | 1.22              |                | <b>Sheet Flow,</b><br>Smooth surfaces $n= 0.011$ $P2= 3.54"$                                                                                                       |
| 0.5      | 79            | 0.0025        | 2.63              | 3.23           | <b>Pipe Channel,</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' $r= 0.31'$<br>$n= 0.013$ Corrugated PE, smooth interior                                               |
| 0.5      | 132           | 0.0025        | 4.21              | 13.80          | <b>Pipe Channel, RCP_Elliptical 30x19</b><br>30.0" x 19.0", $R=33.5"$ Elliptical Area= 3.3 sf Perim= 6.7' $r= 0.49'$<br>$n= 0.011$ Concrete pipe, straight & clean |
| 1.8      | 270           | Total         |                   |                |                                                                                                                                                                    |

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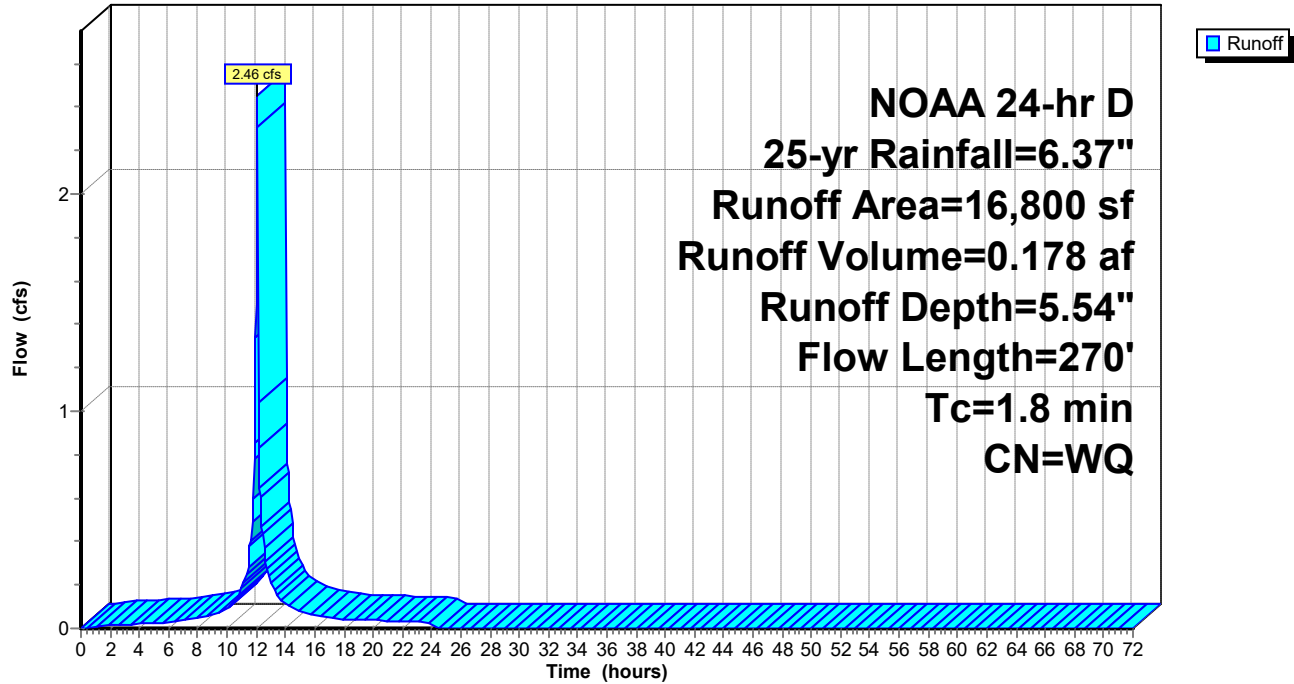
NOAA 24-hr D 25-yr Rainfall=6.37"

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### Subcatchment 17S: #6

Hydrograph



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**Summary for Subcatchment 18S: #7**

[49] Hint: Tc&lt;2dt may require smaller dt

[47] Hint: Peak is 158% of capacity of segment #2

Runoff = 5.09 cfs @ 12.10 hrs, Volume= 0.401 af, Depth= 5.53"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 26,579    | 98 | Paved parking, HSG D          |
| 11,314    | 80 | >75% Grass cover, Good, HSG D |
| 37,893    |    | Weighted Average              |
| 11,314    | 80 | 29.86% Pervious Area          |
| 26,579    | 98 | 70.14% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.2      | 85            | 0.0126        | 1.16              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                                                                        |
| 1.2      | 182           | 0.0025        | 2.63              | 3.23           | <b>Pipe Channel,</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.013 Corrugated PE, smooth interior                                                |
| 0.2      | 45            | 0.0025        | 3.56              | 11.68          | <b>Pipe Channel, RCP_Elliptical 30x19</b><br>30.0" x 19.0", R=33.5" Elliptical Area= 3.3 sf Perim= 6.7' r= 0.49'<br>n= 0.013 Concrete pipe, bends & connections |
| 0.7      | 173           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 1.0      | 235           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 4.3      | 720           | Total         |                   |                |                                                                                                                                                                 |

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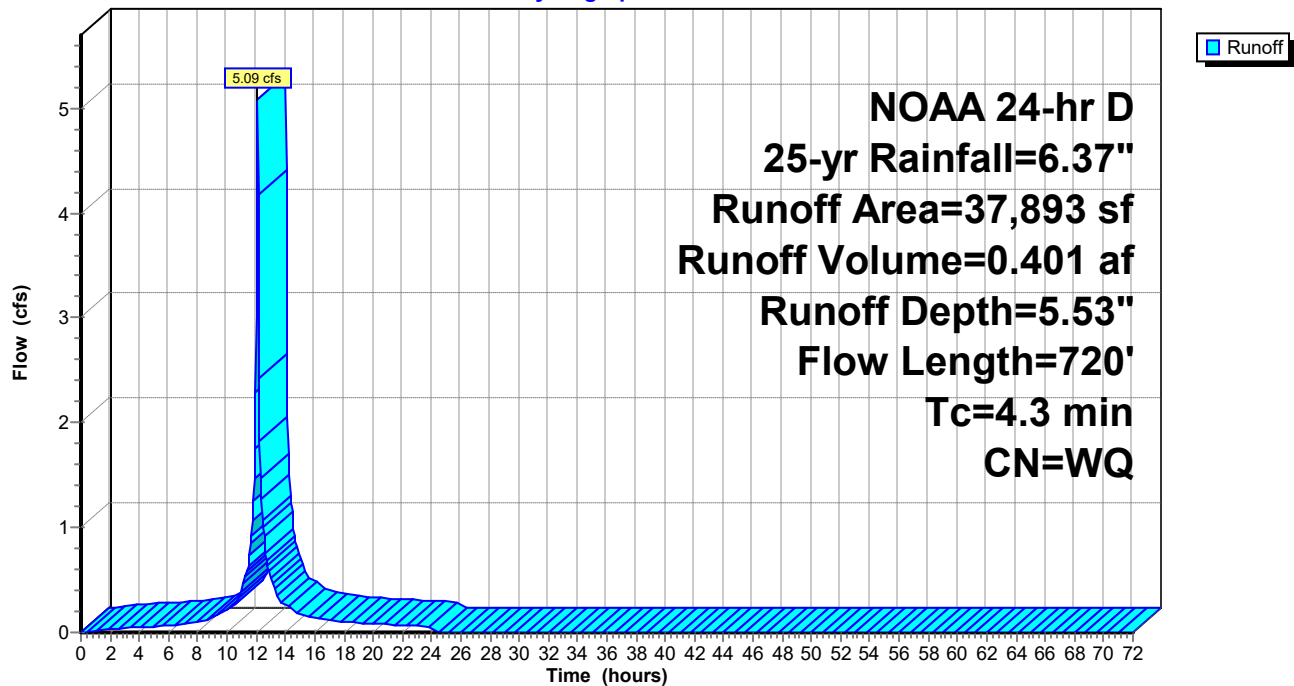
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### Subcatchment 18S: #7

Hydrograph



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**Summary for Subcatchment 19S: #8**

Runoff = 16.15 cfs @ 12.27 hrs, Volume= 1.793 af, Depth= 4.42"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 18,996    | 98 | Water Surface, HSG D          |
| 153,994   | 80 | >75% Grass cover, Good, HSG D |
| 15,929    | 98 | Paved parking, HSG D          |
| * 14,385  | 68 | Gravel                        |
| * 2,714   | 98 | Equipment                     |
| * 3,013   | 80 | 1/2 Switchyard                |
| * 3,013   | 98 | 1/2 Switchyard                |
| 212,044   |    | Weighted Average              |
| 171,392   | 79 | 80.83% Pervious Area          |
| 40,652    | 98 | 19.17% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length                                                                        |
| 8.6      | 397           | 0.0023        | 0.77              |                | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                                                                                       |
| 1.0      | 235           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 18.5     | 664           | Total         |                   |                |                                                                                                                                                                 |

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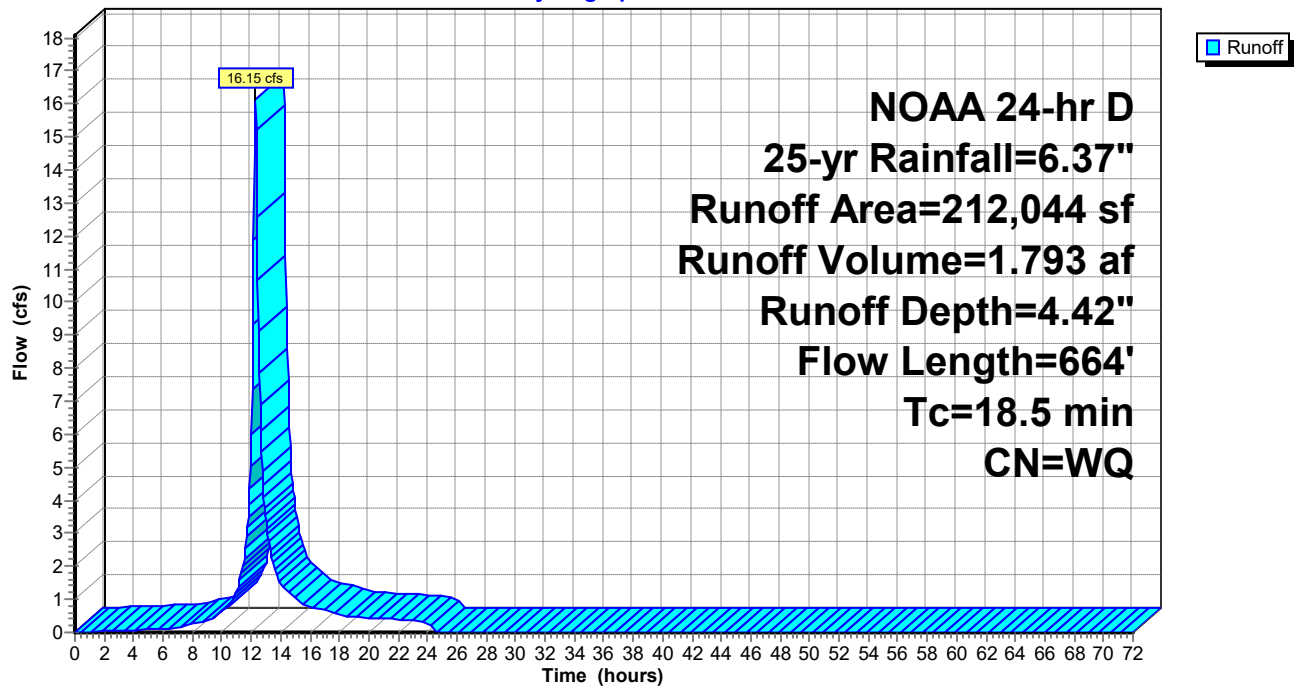
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### Subcatchment 19S: #8

Hydrograph



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**Summary for Subcatchment 20S: #9**

Runoff = 0.67 cfs @ 12.30 hrs, Volume= 0.076 af, Depth= 4.24"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 25-yr Rainfall=6.37"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,738     | 80 | >75% Grass cover, Good, HSG D |
| 573       | 98 | Water Surface, 0% imp, HSG D  |
| 9,311     |    | Weighted Average              |
| 9,311     | 81 | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                      |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------|
| 8.9      | 76            | 0.0130        | 0.14              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length         |
| 1.0      | 98            | 0.0130        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                               |
| 9.5      | 473           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.030 Stream, clean & straight |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011                |
| 20.4     | 957           | Total         |                   |                |                                                                                                  |

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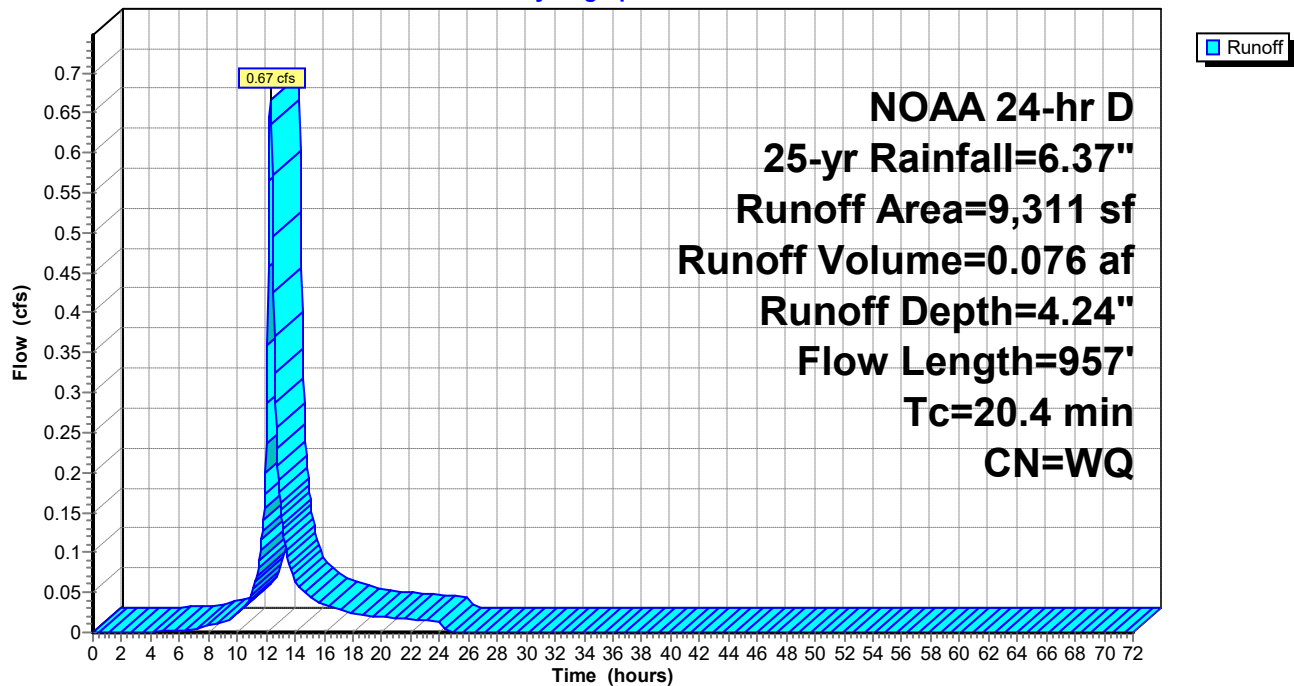
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### Subcatchment 20S: #9

Hydrograph



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**Summary for Pond 16P: Pond #1A**

Inflow Area = 5.738 ac, 26.90% Impervious, Inflow Depth = 4.59" for 25-yr event  
 Inflow = 17.84 cfs @ 12.26 hrs, Volume= 2.194 af  
 Outflow = 4.53 cfs @ 12.77 hrs, Volume= 2.054 af, Atten= 75%, Lag= 30.5 min  
 Primary = 4.53 cfs @ 12.77 hrs, Volume= 2.054 af  
 Routed to Pond 17P : Pond #1B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 176.84' @ 12.89 hrs Surf.Area= 10,074 sf Storage= 42,875 cf  
 Flood Elev= 177.08' Surf.Area= 10,074 sf Storage= 45,333 cf

Plug-Flow detention time= 271.1 min calculated for 2.053 af (94% of inflow)  
 Center-of-Mass det. time= 237.0 min ( 1,040.3 - 803.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 45,333 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 10,074               | 0                         | 0                         |
| 177.08              | 10,074               | 45,333                    | 45,333                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                             |
|--------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                                |
| #1     | Primary | 173.08' | <b>12.0" Round Culvert</b><br>L= 142.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=4.50 cfs @ 12.77 hrs HW=176.82' TW=174.12' (Dynamic Tailwater)  
 ↑ **1=Culvert** (Outlet Controls 4.50 cfs @ 5.73 fps)

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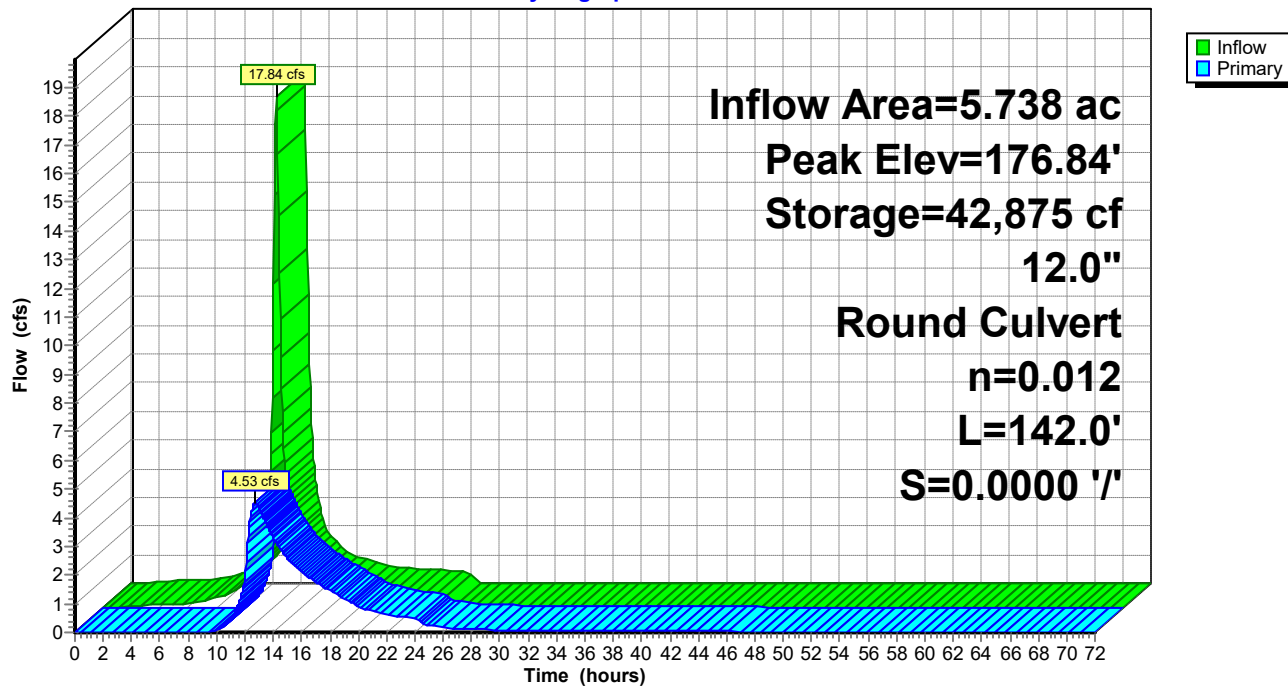
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### Pond 16P: Pond #1A

#### Hydrograph



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### Summary for Pond 17P: Pond #1B

Inflow Area = 5.738 ac, 26.90% Impervious, Inflow Depth > 4.30" for 25-yr event  
Inflow = 4.53 cfs @ 12.77 hrs, Volume= 2.054 af  
Outflow = 2.89 cfs @ 14.53 hrs, Volume= 1.934 af, Atten= 36%, Lag= 105.6 min  
Primary = 2.89 cfs @ 14.53 hrs, Volume= 1.934 af  
Routed to Link 22L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 174.96' @ 14.53 hrs Surf.Area= 8,922 sf Storage= 21,235 cf  
Flood Elev= 177.08' Surf.Area= 8,922 sf Storage= 40,149 cf

Plug-Flow detention time= 246.5 min calculated for 1.934 af (94% of inflow)  
Center-of-Mass det. time= 162.8 min ( 1,203.0 - 1,040.3 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 40,149 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 8,922                | 0                         | 0                         |
| 177.08              | 8,922                | 40,149                    | 40,149                    |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                                           |
|--------|----------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary  | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                              |
| #1     | Device 4 | 173.08' | <b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                               |
| #2     | Device 4 | 173.58' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                              |
| #3     | Device 4 | 175.83' | <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                                     |
| #4     | Primary  | 173.08' | <b>12.0" Round Culvert</b><br>L= 25.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=2.89 cfs @ 14.53 hrs HW=174.96' TW=0.00' (Dynamic Tailwater)

↑ **4=Culvert** (Passes 2.89 cfs of 4.01 cfs potential flow)  
↑ **1=Orifice/Grate** (Orifice Controls 0.31 cfs @ 6.38 fps)  
↑ **2=Orifice/Grate** (Orifice Controls 2.58 cfs @ 4.73 fps)  
↑ **3=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)

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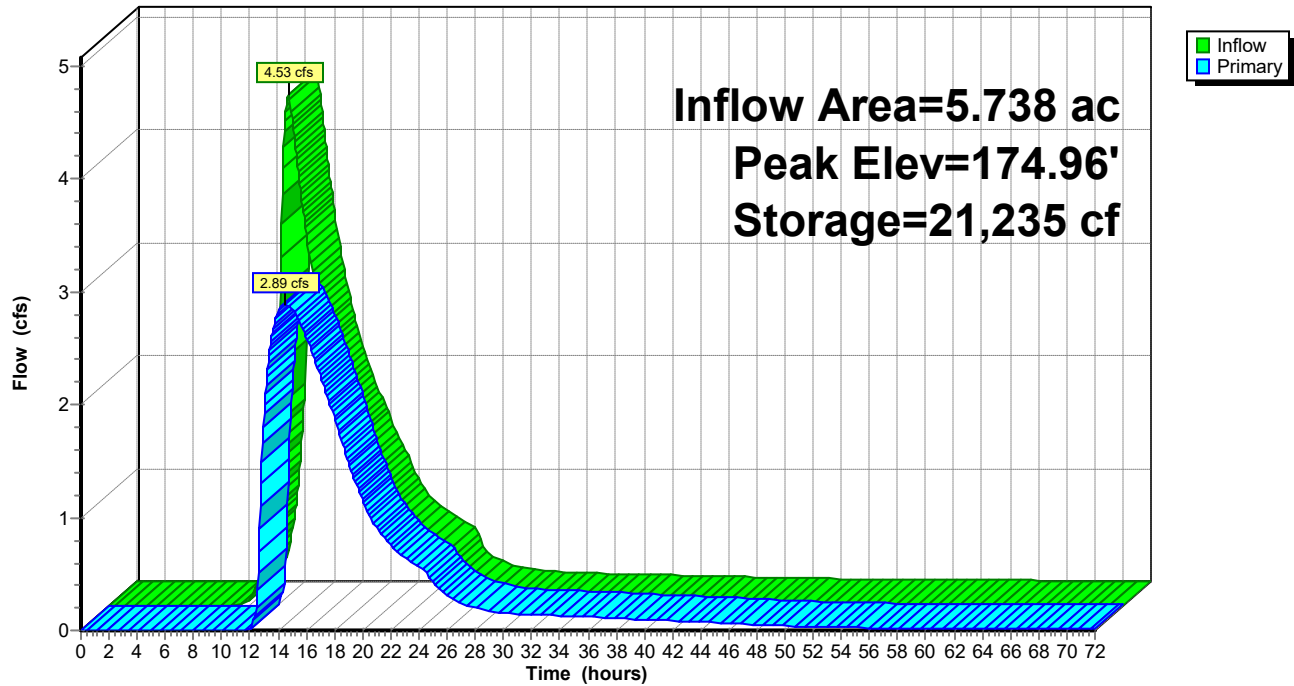
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### Pond 17P: Pond #1B

Hydrograph



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### Summary for Pond 20P: Pond #2

Inflow Area = 4.183 ac, 76.64% Impervious, Inflow Depth = 5.49" for 25-yr event  
Inflow = 21.46 cfs @ 12.14 hrs, Volume= 1.915 af  
Outflow = 2.66 cfs @ 12.95 hrs, Volume= 1.826 af, Atten= 88%, Lag= 48.7 min  
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
Primary = 2.66 cfs @ 12.95 hrs, Volume= 1.826 af  
Routed to Link 22L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 177.82' @ 12.95 hrs Surf.Area= 13,951 sf Storage= 41,303 cf

Plug-Flow detention time= 278.8 min calculated for 1.825 af (95% of inflow)  
Center-of-Mass det. time= 252.4 min ( 1,012.2 - 759.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 174.86' | 78,684 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 174.86              | 13,951               | 0                         | 0                         |
| 180.50              | 13,951               | 78,684                    | 78,684                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 175.09' | <b>12.0" Round Culvert</b><br>L= 352.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 175.09' / 174.58' S= 0.0014 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Discarded | 180.00' | <b>540.0' long (Profile 2) Broad-Crested Rectangular Weir</b><br>Head (feet) 0.49 0.98 1.48<br>Coef. (English) 2.90 3.26 3.44                                                                                    |

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=174.86' (Free Discharge)

↑ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Primary OutFlow** Max=2.66 cfs @ 12.95 hrs HW=177.82' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Barrel Controls 2.66 cfs @ 3.39 fps)

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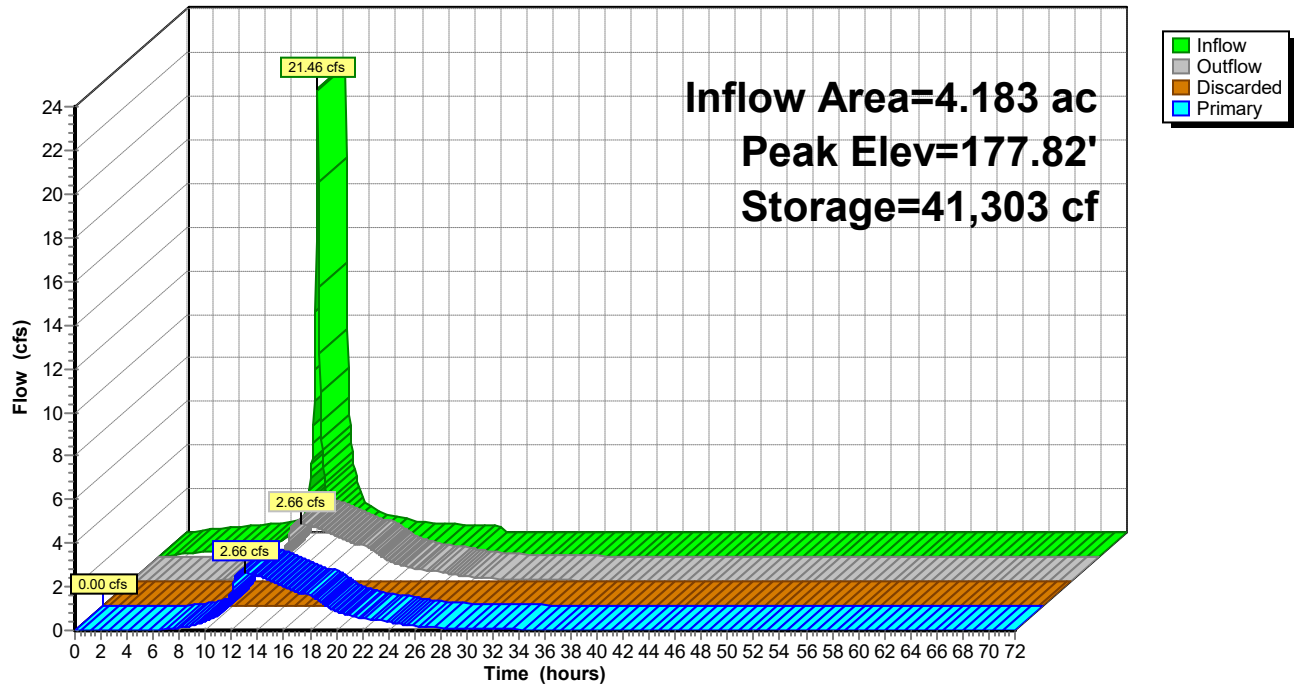
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### Pond 20P: Pond #2

#### Hydrograph



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**Summary for Pond 24P: Permeable**

Inflow Area = 2.362 ac, 61.75% Impervious, Inflow Depth = 5.35" for 25-yr event  
 Inflow = 11.47 cfs @ 12.16 hrs, Volume= 1.053 af  
 Outflow = 2.77 cfs @ 12.54 hrs, Volume= 1.040 af, Atten= 76%, Lag= 22.6 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 2.77 cfs @ 12.54 hrs, Volume= 1.040 af  
 Routed to Link 18L : Ultimate

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 176.83' @ 12.54 hrs Surf.Area= 41,292 sf Storage= 18,945 cf  
 Flood Elev= 178.50' Surf.Area= 41,292 sf Storage= 46,516 cf

Plug-Flow detention time= 192.8 min calculated for 1.039 af (99% of inflow)  
 Center-of-Mass det. time= 184.8 min ( 955.0 - 770.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                            |
|--------|---------|---------------|------------------------------------------------------------------------------------------------|
| #1     | 175.17' | 54,774 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>136,936 cf Overall x 40.0% Voids |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 175.17              | 4,401                | 0                         | 0                         |
| 175.74              | 4,401                | 2,509                     | 2,509                     |
| 175.75              | 41,292               | 228                       | 2,737                     |
| 179.00              | 41,292               | 134,199                   | 136,936                   |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                  |
|--------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Discarded | 179.00' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                     |
| #1     | Device 6  | 175.42' | <b>6.0" Round Culvert X 3.00</b> L= 440.0' Ke= 1.000<br>Inlet / Outlet Invert= 175.42' / 175.42' S= 0.0000 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf   |
| #2     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #3     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #4     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #5     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #6     | Primary   | 175.25' | <b>18.0" Round Culvert</b><br>L= 66.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 175.25' / 174.94' S= 0.0047 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.77 sf |
| #7     | Device 6  | 176.33' | <b>48.0" W x 8.0" H Vert. Orifice/Grate X 0.40</b> C= 0.600<br>Limited to weir flow at low heads                                                                                |

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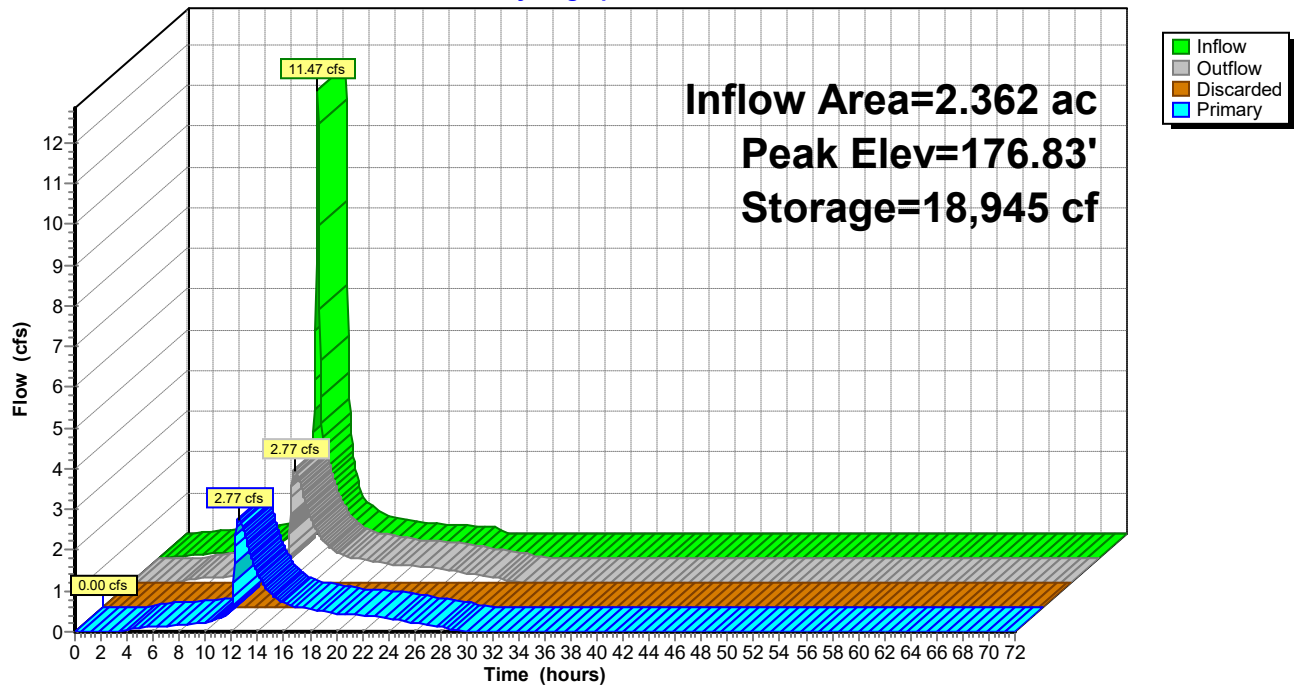
**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=175.17' (Free Discharge)

**Primary OutFlow** Max=2.77 cfs @ 12.54 hrs HW=176.83' TW=0.00' (Dynamic Tailwater)

- 6=Culvert (Passes 2.77 cfs of 6.47 cfs potential flow)
  - 1=Culvert (Barrel Controls 0.95 cfs @ 1.61 fps)
  - 2=Orifice/Grate (Passes < 6.13 cfs potential flow)
  - 3=Orifice/Grate (Passes < 6.13 cfs potential flow)
  - 4=Orifice/Grate (Passes < 6.13 cfs potential flow)
  - 5=Orifice/Grate (Passes < 6.13 cfs potential flow)
  - 7=Orifice/Grate (Orifice Controls 1.82 cfs @ 0.91 fps)

### Pond 24P: Permeable

#### Hydrograph



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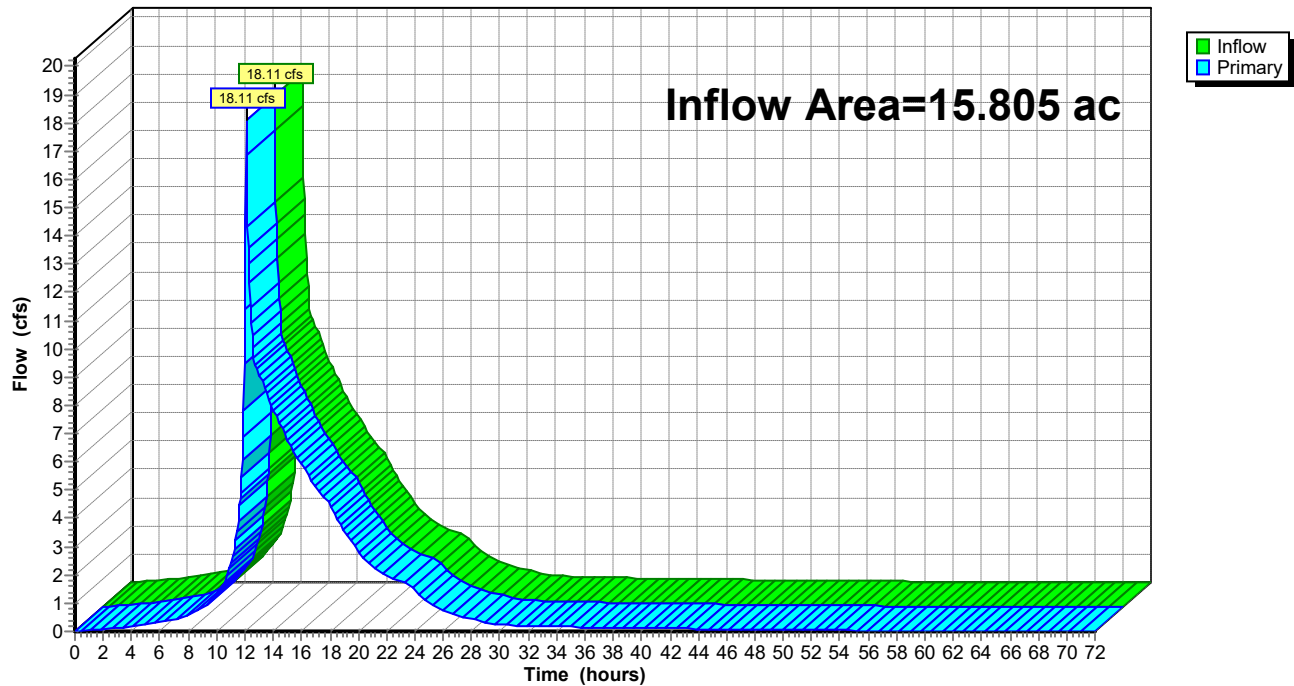
### Summary for Link 18L: Ultimate

Inflow Area = 15.805 ac, 48.25% Impervious, Inflow Depth > 4.78" for 25-yr event  
Inflow = 18.11 cfs @ 12.11 hrs, Volume= 6.290 af  
Primary = 18.11 cfs @ 12.11 hrs, Volume= 6.290 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 18L: Ultimate

Hydrograph



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NOAA 24-hr D 25-yr Rainfall=6.37"

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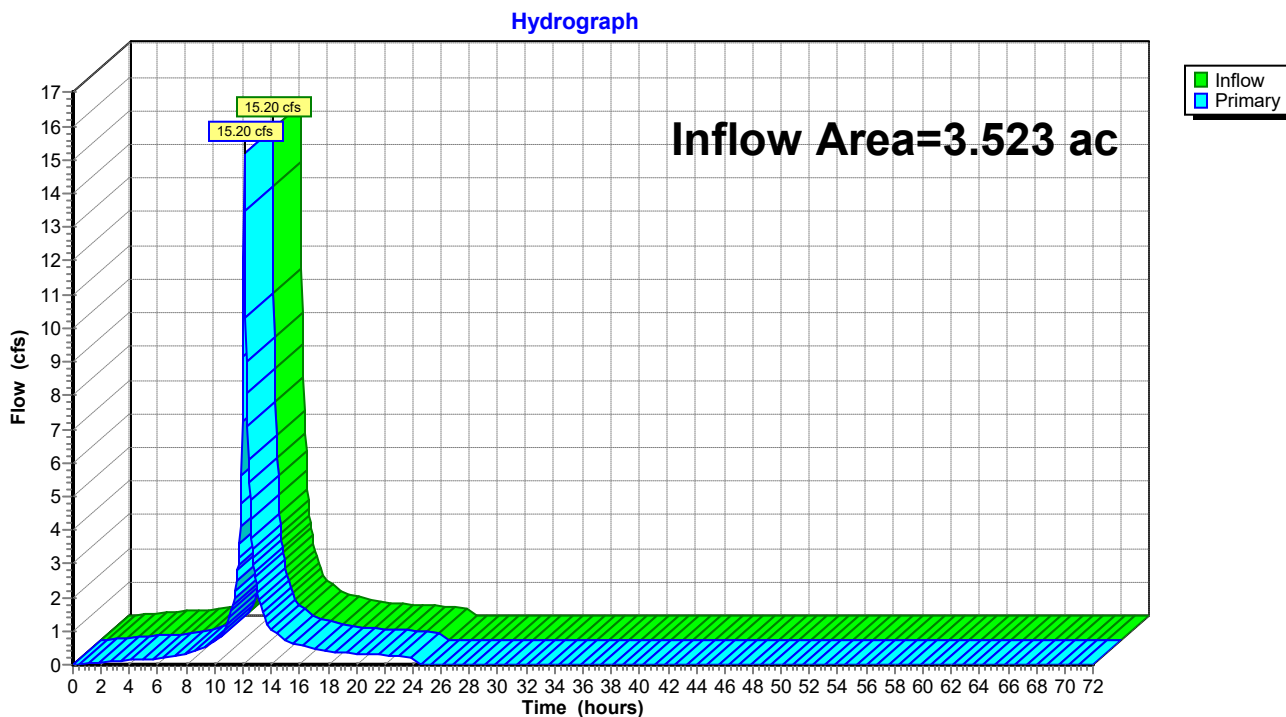
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### Summary for Link 21L: Uncontrolled

Inflow Area = 3.523 ac, 40.28% Impervious, Inflow Depth = 5.07" for 25-yr event  
Inflow = 15.20 cfs @ 12.11 hrs, Volume= 1.490 af  
Primary = 15.20 cfs @ 12.11 hrs, Volume= 1.490 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 18L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 21L: Uncontrolled



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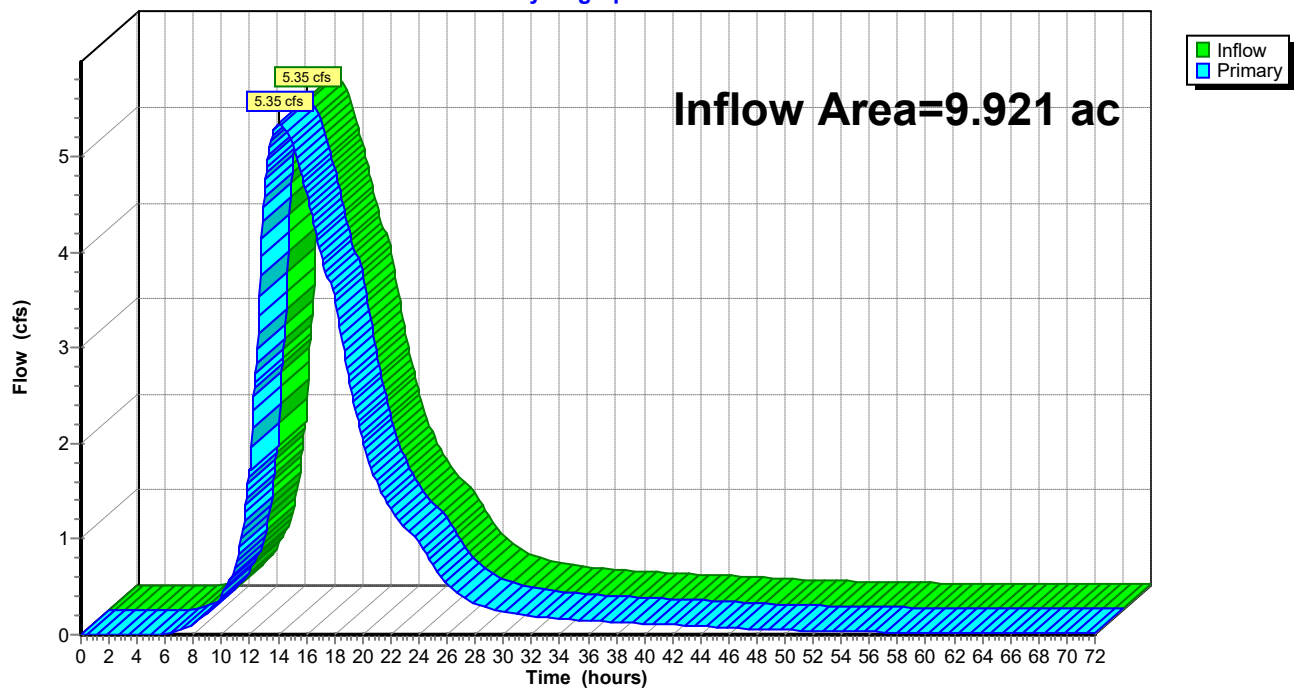
### Summary for Link 22L: Controlled

Inflow Area = 9.921 ac, 47.87% Impervious, Inflow Depth > 4.55" for 25-yr event  
Inflow = 5.35 cfs @ 14.11 hrs, Volume= 3.760 af  
Primary = 5.35 cfs @ 14.11 hrs, Volume= 3.760 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 18L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 22L: Controlled

Hydrograph



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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

|                               |                                                                                                                                                  |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment 11S: #1</b>   | Runoff Area=102,868 sf 61.75% Impervious Runoff Depth=7.27"<br>Flow Length=81' Tc=9.3 min CN=WQ Runoff=15.48 cfs 1.431 af                        |
| <b>Subcatchment 12S: #2</b>   | Runoff Area=125,236 sf 67.51% Impervious Runoff Depth=7.12"<br>Flow Length=862' Tc=8.4 min CN=WQ Runoff=18.99 cfs 1.707 af                       |
| <b>Subcatchment 13S: #3</b>   | Runoff Area=56,989 sf 96.70% Impervious Runoff Depth=8.04"<br>Flow Length=513' Tc=6.1 min CN=WQ Runoff=10.04 cfs 0.876 af                        |
| <b>Subcatchment 14S: #4</b>   | Runoff Area=47,496 sf 0.55% Impervious Runoff Depth=6.19"<br>Flow Length=723' Tc=18.0 min CN=WQ Runoff=5.15 cfs 0.562 af                         |
| <b>Subcatchment 15S: #5</b>   | Runoff Area=79,843 sf 62.26% Impervious Runoff Depth=7.45"<br>Flow Length=768' Tc=4.9 min CN=WQ Runoff=13.98 cfs 1.138 af                        |
| <b>Subcatchment 17S: #6</b>   | Runoff Area=16,800 sf 70.45% Impervious Runoff Depth=7.47"<br>Flow Length=270' Tc=1.8 min CN=WQ Runoff=3.29 cfs 0.240 af                         |
| <b>Subcatchment 18S: #7</b>   | Runoff Area=37,893 sf 70.14% Impervious Runoff Depth=7.47"<br>Flow Length=720' Tc=4.3 min CN=WQ Runoff=6.82 cfs 0.541 af                         |
| <b>Subcatchment 19S: #8</b>   | Runoff Area=212,044 sf 19.17% Impervious Runoff Depth=6.27"<br>Flow Length=664' Tc=18.5 min CN=WQ Runoff=22.72 cfs 2.544 af                      |
| <b>Subcatchment 20S: #9</b>   | Runoff Area=9,311 sf 0.00% Impervious Runoff Depth=6.09"<br>Flow Length=957' Tc=20.4 min CN=WQ Runoff=0.95 cfs 0.108 af                          |
| <b>Pond 16P: Pond #1A</b>     | Peak Elev=177.08' Storage=45,333 cf Inflow=24.99 cfs 3.085 af<br>12.0" Round Culvert n=0.012 L=142.0' S=0.0000 ' Outflow=22.67 cfs 2.945 af      |
| <b>Pond 17P: Pond #1B</b>     | Peak Elev=176.07' Storage=31,167 cf Inflow=22.67 cfs 2.945 af<br>Outflow=5.73 cfs 2.824 af                                                       |
| <b>Pond 20P: Pond #2</b>      | Peak Elev=178.83' Storage=55,324 cf Inflow=28.80 cfs 2.583 af<br>Discarded=0.00 cfs 0.000 af Primary=3.20 cfs 2.494 af Outflow=3.20 cfs 2.494 af |
| <b>Pond 24P: Permeable</b>    | Peak Elev=177.16' Storage=24,399 cf Inflow=15.48 cfs 1.431 af<br>Discarded=0.00 cfs 0.000 af Primary=4.66 cfs 1.418 af Outflow=4.66 cfs 1.418 af |
| <b>Link 18L: Ultimate</b>     | Inflow=25.62 cfs 8.785 af<br>Primary=25.62 cfs 8.785 af                                                                                          |
| <b>Link 21L: Uncontrolled</b> | Inflow=20.62 cfs 2.049 af<br>Primary=20.62 cfs 2.049 af                                                                                          |
| <b>Link 22L: Controlled</b>   | Inflow=8.94 cfs 5.318 af<br>Primary=8.94 cfs 5.318 af                                                                                            |

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**Total Runoff Area = 15.805 ac   Runoff Volume = 9.148 af   Average Runoff Depth = 6.95"**  
**51.75% Pervious = 8.179 ac   48.25% Impervious = 7.627 ac**

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NOAA 24-hr D 100-yr Rainfall=8.35"

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### Summary for Subcatchment 11S: #1

Runoff = 15.48 cfs @ 12.16 hrs, Volume= 1.431 af, Depth= 7.27"  
Routed to Pond 24P : Permeable

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
NOAA 24-hr D 100-yr Rainfall=8.35"

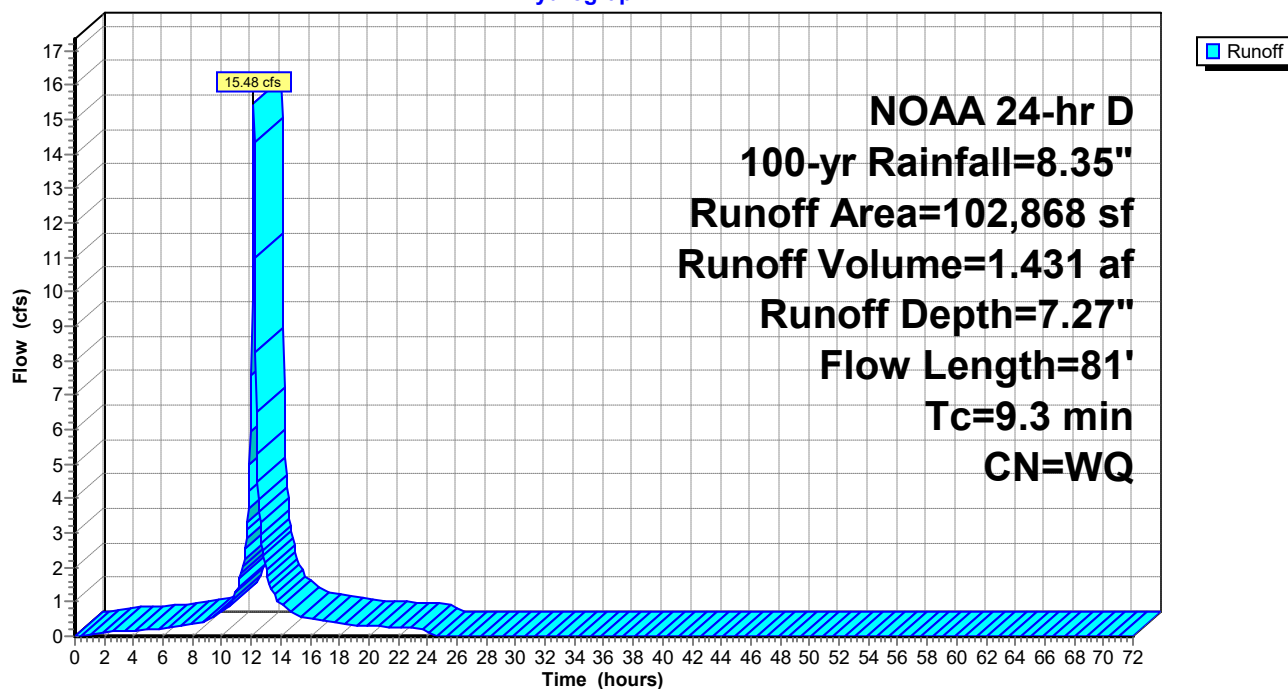
|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 38,450    | 80 | >75% Grass cover, Good, HSG D |
|   | 44,502    | 98 | Paved parking, HSG D          |
| * | 897       | 68 | Gravel                        |
| * | 7,857     | 98 | House Imp                     |
| * | 11,162    | 98 | Headhouse - North             |
|   | 102,868   |    | Weighted Average              |
|   | 39,347    | 80 | 38.25% Pervious Area          |
|   | 63,521    | 98 | 61.75% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 9.0      | 37            | 0.0030        | 0.07              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 0.3      | 44            | 0.0300        | 2.60              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                       |
| 9.3      | 81            | Total         |                   |                |                                                                                          |

### Subcatchment 11S: #1

Hydrograph



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**Summary for Subcatchment 12S: #2**

[47] Hint: Peak is 3244% of capacity of segment #2

[47] Hint: Peak is 404% of capacity of segment #3

[47] Hint: Peak is 146% of capacity of segment #4

Runoff = 18.99 cfs @ 12.15 hrs, Volume= 1.707 af, Depth= 7.12"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
|   | 15,527    | 80 | >75% Grass cover, Good, HSG D |
| * | 1,149     | 98 | Sidewalk                      |
| * | 25,159    | 68 | Gravel                        |
| * | 4,507     | 98 | Equipment                     |
| * | 71,399    | 98 | Greenhouse                    |
| * | 7,495     | 98 | Powerhouse                    |
|   | 125,236   |    | Weighted Average              |
|   | 40,686    | 73 | 32.49% Pervious Area          |
|   | 84,550    | 98 | 67.51% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                                          |
|-------------|------------------|------------------|----------------------|-------------------|----------------------------------------------------------------------------------------------------------------------|
| 2.9         | 100              | 0.0020           | 0.58                 |                   | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                             |
| 2.7         | 275              | 0.0020           | 1.68                 | 0.59              | <b>Pipe Channel,</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.012                                     |
| 2.2         | 345              | 0.0020           | 2.66                 | 4.70              | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38'<br>n= 0.013 Concrete pipe, bends & connections |
| 0.6         | 142              | 0.0033           | 4.14                 | 13.00             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 Corrugated PE, smooth interior     |
| 8.4         | 862              | Total            |                      |                   |                                                                                                                      |

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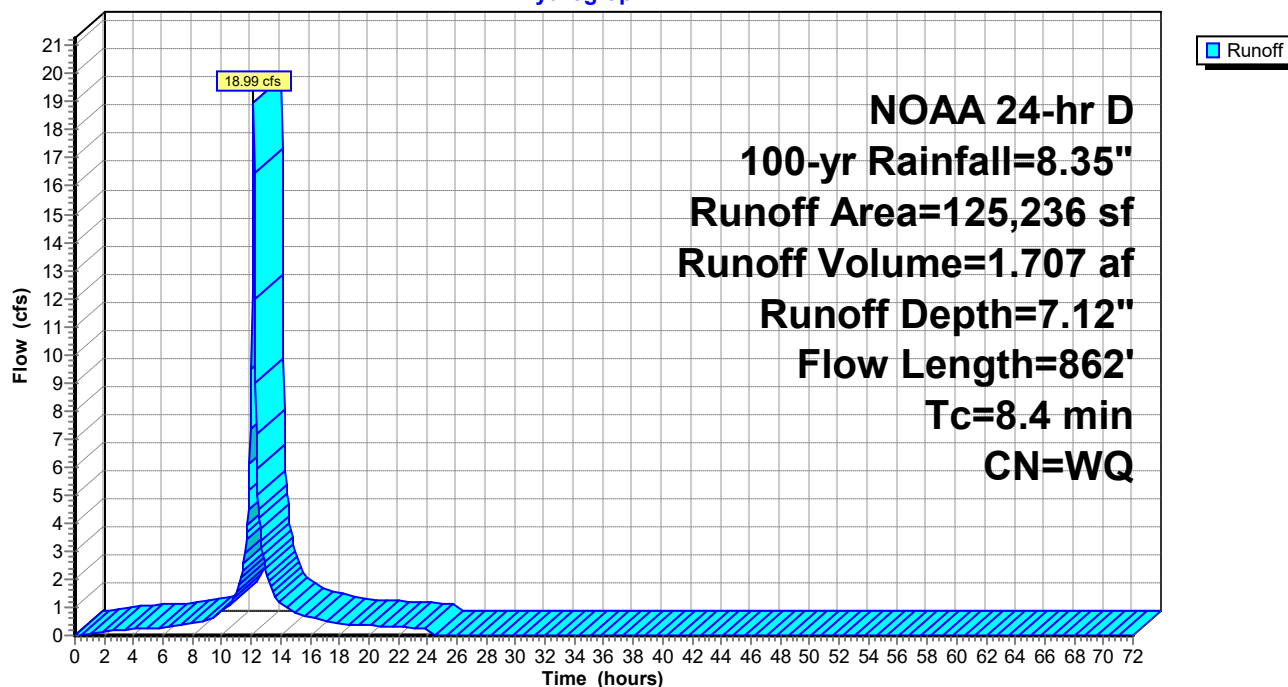
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 12S: #2

Hydrograph



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**Summary for Subcatchment 13S: #3**

[47] Hint: Peak is 1716% of capacity of segment #2

Runoff = 10.04 cfs @ 12.13 hrs, Volume= 0.876 af, Depth= 8.04"  
 Routed to Pond 20P : Pond #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 41,160    | 98 | Greenhouse                    |
|   | 13,951    | 98 | Water Surface, HSG D          |
|   | 1,878     | 80 | >75% Grass cover, Good, HSG D |
|   | 56,989    |    | Weighted Average              |
|   | 1,878     | 80 | 3.30% Pervious Area           |
|   | 55,111    | 98 | 96.70% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                                      |
|-------------|------------------|------------------|----------------------|-------------------|------------------------------------------------------------------------------------------------------------------|
| 2.9         | 100              | 0.0020           | 0.58                 |                   | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                         |
| 2.6         | 264              | 0.0020           | 1.68                 | 0.59              | <b>Pipe Channel,</b><br>8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17'<br>n= 0.012 Steel, smooth                   |
| 0.6         | 149              | 0.0033           | 4.14                 | 13.00             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.013 Corrugated PE, smooth interior |
| 6.1         | 513              | Total            |                      |                   |                                                                                                                  |

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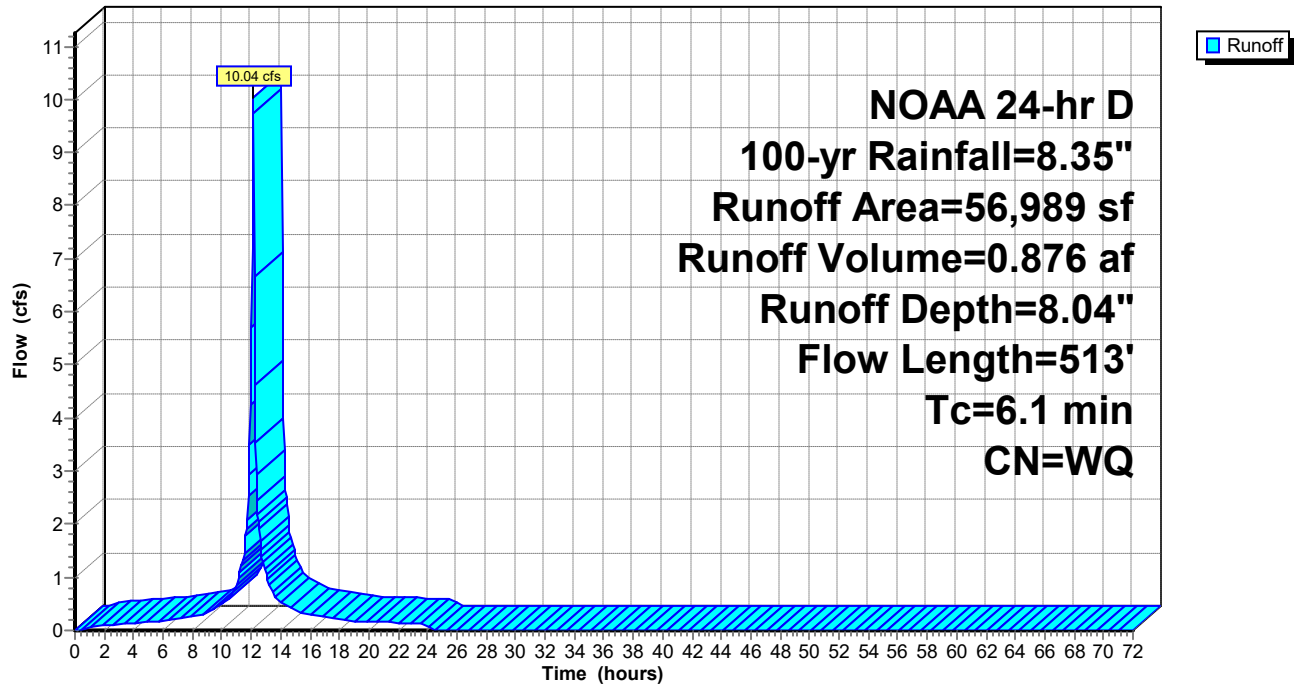
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 13S: #3

Hydrograph



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NOAA 24-hr D 100-yr Rainfall=8.35"

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**Summary for Subcatchment 14S: #4**

Runoff = 5.15 cfs @ 12.27 hrs, Volume= 0.562 af, Depth= 6.19"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 4,953     | 98 | Water Surface, 0% imp, HSG D  |
| * 118     | 98 | Bridge                        |
| * 144     | 98 | Equipment                     |
| 42,281    | 80 | >75% Grass cover, Good, HSG D |
| 47,496    |    | Weighted Average              |
| 47,234    | 82 | 99.45% Pervious Area          |
| 262       | 98 | 0.55% Impervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                              |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------|
| 8.9      | 32            | 0.0023        | 0.06              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length |
| 3.0      | 129           | 0.0023        | 0.72              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                       |
| 5.1      | 252           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16' n= 0.030                     |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011        |
| 18.0     | 723           | Total         |                   |                |                                                                                          |

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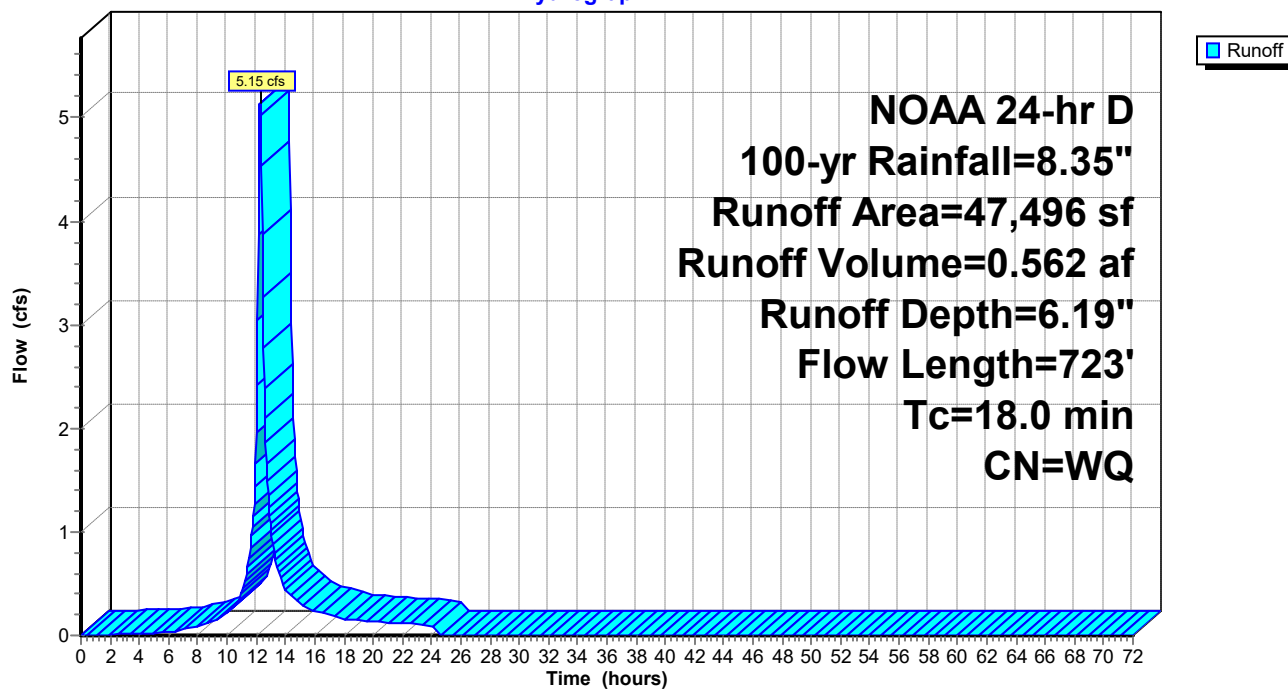
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 14S: #4

Hydrograph



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NOAA 24-hr D 100-yr Rainfall=8.35"

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**Summary for Subcatchment 15S: #5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

[47] Hint: Peak is 154% of capacity of segment #3

Runoff = 13.98 cfs @ 12.11 hrs, Volume= 1.138 af, Depth= 7.45"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs,  $dt=0.05$  hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

|   | Area (sf) | CN | Description                   |
|---|-----------|----|-------------------------------|
| * | 7,544     | 80 | Grass Paver                   |
| * | 298       | 98 | Sidewalk                      |
| * | 113       | 98 | Bridge                        |
|   | 5,608     | 98 | Water Surface, 0% imp, HSG D  |
| * | 22,568    | 98 | Greenhouse                    |
| * | 16,982    | 80 | >75% Grass cover, Good, HSG D |
| * | 26,730    | 98 | Headhouse                     |
|   | 79,843    |    | Weighted Average              |
|   | 30,134    | 83 | 37.74% Pervious Area          |
|   | 49,709    | 98 | 62.26% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                                        |
|-------------|------------------|------------------|----------------------|-------------------|--------------------------------------------------------------------------------------------------------------------|
| 1.2         | 100              | 0.0200           | 1.45                 |                   | <b>Sheet Flow, 1</b><br>Smooth surfaces $n=0.011$ $P2=3.54"$                                                       |
| 0.3         | 47               | 0.0200           | 2.87                 |                   | <b>Shallow Concentrated Flow,</b><br>Paved $K_v=20.3$ fps                                                          |
| 0.7         | 229              | 0.0075           | 5.15                 | 9.10              | <b>Pipe Channel,</b><br>18.0" Round Area= 1.8 sf Perim= 4.7' $r=0.38'$<br>$n=0.013$ Corrugated PE, smooth interior |
| 1.7         | 82               | 0.0001           | 0.83                 | 53.01             | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' $r=2.16'$ $n=0.030$                                             |
| 1.0         | 310              | 0.0040           | 5.38                 | 16.91             | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' $r=0.50'$<br>$n=0.011$                                |
| 4.9         | 768              | Total            |                      |                   |                                                                                                                    |

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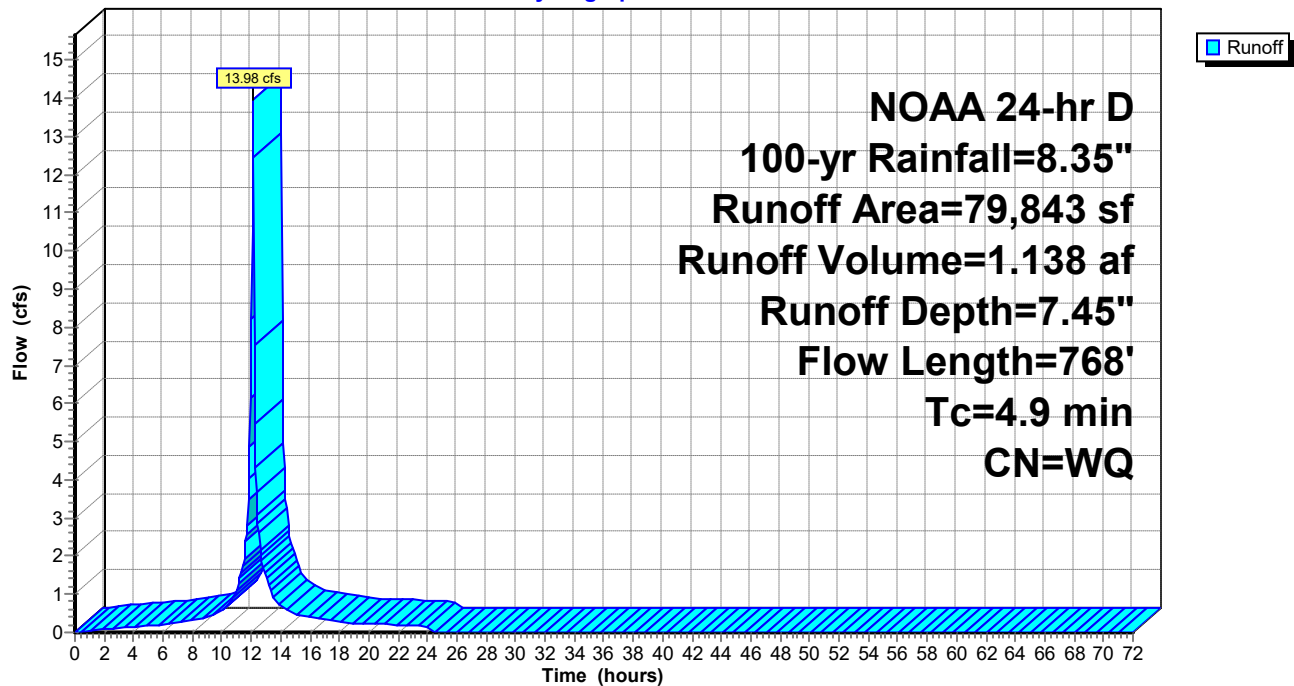
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### Subcatchment 15S: #5

Hydrograph



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**Summary for Subcatchment 17S: #6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

[47] Hint: Peak is 102% of capacity of segment #2

Runoff = 3.29 cfs @ 12.08 hrs, Volume= 0.240 af, Depth= 7.47"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs,  $dt=0.05$  hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 11,836    | 98 | Paved parking, HSG D          |
| 4,964     | 80 | >75% Grass cover, Good, HSG D |
| 16,800    |    | Weighted Average              |
| 4,964     | 80 | 29.55% Pervious Area          |
| 11,836    | 98 | 70.45% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                      |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.8      | 59            | 0.0170        | 1.22              |                | <b>Sheet Flow,</b><br>Smooth surfaces $n=0.011$ $P2=3.54"$                                                                                                       |
| 0.5      | 79            | 0.0025        | 2.63              | 3.23           | <b>Pipe Channel,</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' $r=0.31'$<br>$n=0.013$ Corrugated PE, smooth interior                                               |
| 0.5      | 132           | 0.0025        | 4.21              | 13.80          | <b>Pipe Channel, RCP_Elliptical 30x19</b><br>30.0" x 19.0", $R=33.5"$ Elliptical Area= 3.3 sf Perim= 6.7' $r=0.49'$<br>$n=0.011$ Concrete pipe, straight & clean |
| 1.8      | 270           | Total         |                   |                |                                                                                                                                                                  |

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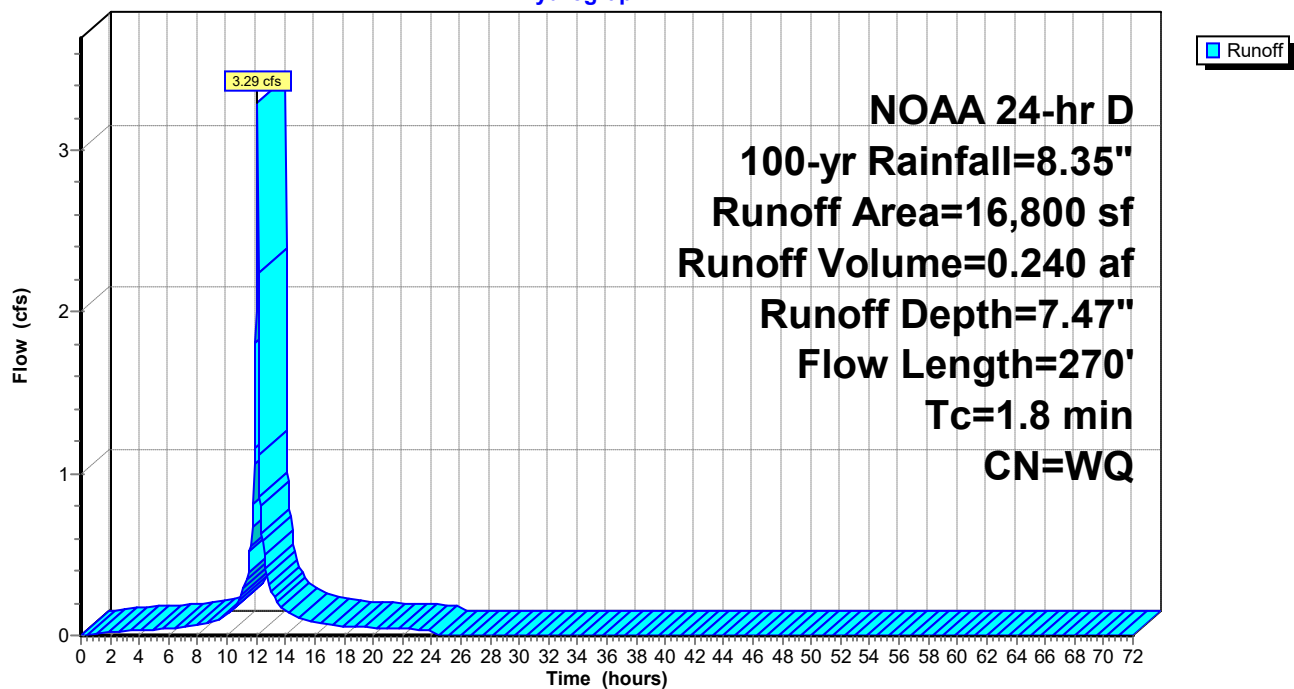
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 17S: #6

Hydrograph



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NOAA 24-hr D 100-yr Rainfall=8.35"

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**Summary for Subcatchment 18S: #7**

[49] Hint: Tc&lt;2dt may require smaller dt

[47] Hint: Peak is 211% of capacity of segment #2

Runoff = 6.82 cfs @ 12.10 hrs, Volume= 0.541 af, Depth= 7.47"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 26,579    | 98 | Paved parking, HSG D          |
| 11,314    | 80 | >75% Grass cover, Good, HSG D |
| 37,893    |    | Weighted Average              |
| 11,314    | 80 | 29.86% Pervious Area          |
| 26,579    | 98 | 70.14% Impervious Area        |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                                                                                     |
|----------|---------------|---------------|-------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.2      | 85            | 0.0126        | 1.16              |                | <b>Sheet Flow,</b><br>Smooth surfaces n= 0.011 P2= 3.54"                                                                                                        |
| 1.2      | 182           | 0.0025        | 2.63              | 3.23           | <b>Pipe Channel,</b><br>15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31'<br>n= 0.013 Corrugated PE, smooth interior                                                |
| 0.2      | 45            | 0.0025        | 3.56              | 11.68          | <b>Pipe Channel, RCP_Elliptical 30x19</b><br>30.0" x 19.0", R=33.5" Elliptical Area= 3.3 sf Perim= 6.7' r= 0.49'<br>n= 0.013 Concrete pipe, bends & connections |
| 0.7      | 173           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 1.0      | 235           | 0.0025        | 4.12              | 21.00          | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 4.3      | 720           | Total         |                   |                |                                                                                                                                                                 |

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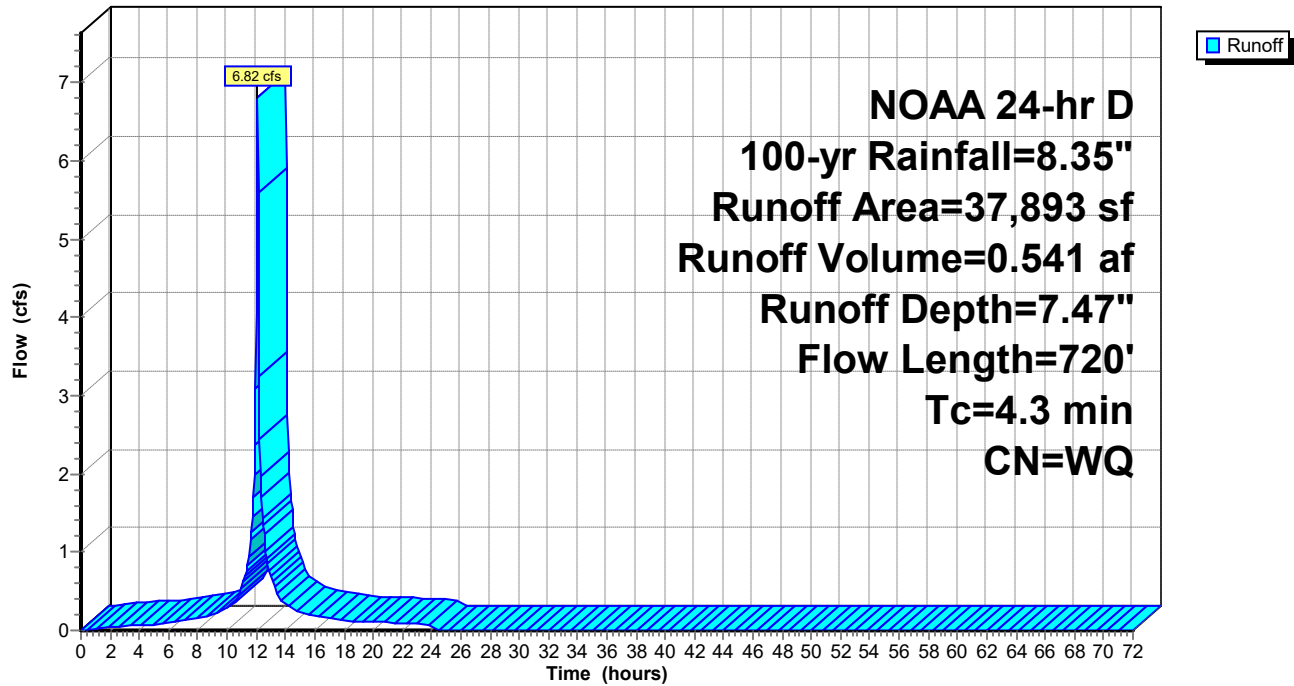
NOAA 24-hr D 100-yr Rainfall=8.35"

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### Subcatchment 18S: #7

Hydrograph



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**Summary for Subcatchment 19S: #8**

[47] Hint: Peak is 108% of capacity of segment #3

Runoff = 22.72 cfs @ 12.27 hrs, Volume= 2.544 af, Depth= 6.27"  
 Routed to Pond 16P : Pond #1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 18,996    | 98 | Water Surface, HSG D          |
| 153,994   | 80 | >75% Grass cover, Good, HSG D |
| 15,929    | 98 | Paved parking, HSG D          |
| * 14,385  | 68 | Gravel                        |
| * 2,714   | 98 | Equipment                     |
| * 3,013   | 80 | 1/2 Switchyard                |
| * 3,013   | 98 | 1/2 Switchyard                |
| 212,044   |    | Weighted Average              |
| 171,392   | 79 | 80.83% Pervious Area          |
| 40,652    | 98 | 19.17% Impervious Area        |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description                                                                                                                                                     |
|-------------|------------------|------------------|----------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8.9         | 32               | 0.0023           | 0.06                 |                   | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length                                                                        |
| 8.6         | 397              | 0.0023           | 0.77                 |                   | <b>Shallow Concentrated Flow,</b><br>Unpaved Kv= 16.1 fps                                                                                                       |
| 1.0         | 235              | 0.0025           | 4.12                 | 21.00             | <b>Pipe Channel, RCP_Elliptical 38x24</b><br>38.0" x 24.0", R=31.2" Elliptical Area= 5.1 sf Perim= 8.3' r= 0.61'<br>n= 0.013 Concrete pipe, bends & connections |
| 18.5        | 664              | Total            |                      |                   |                                                                                                                                                                 |

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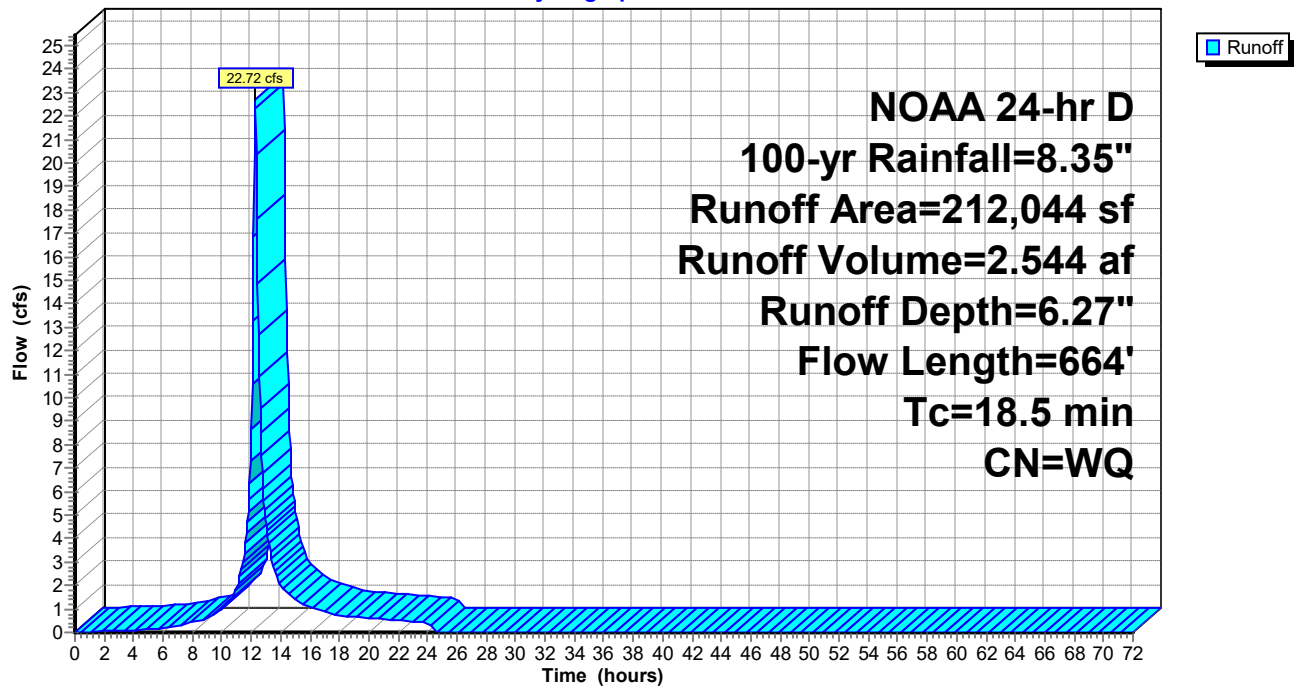
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### Subcatchment 19S: #8

Hydrograph



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**Summary for Subcatchment 20S: #9**

Runoff = 0.95 cfs @ 12.29 hrs, Volume= 0.108 af, Depth= 6.09"  
 Routed to Link 21L : Uncontrolled

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr D 100-yr Rainfall=8.35"

| Area (sf) | CN | Description                   |
|-----------|----|-------------------------------|
| 8,738     | 80 | >75% Grass cover, Good, HSG D |
| 573       | 98 | Water Surface, 0% imp, HSG D  |
| 9,311     |    | Weighted Average              |
| 9,311     | 81 | 100.00% Pervious Area         |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                                      |
|----------|---------------|---------------|-------------------|----------------|--------------------------------------------------------------------------------------------------|
| 8.9      | 76            | 0.0130        | 0.14              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.54"<br>Using McCuen-Spiess flow length         |
| 1.0      | 98            | 0.0130        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Grassed Waterway Kv= 15.0 fps                               |
| 9.5      | 473           | 0.0001        | 0.83              | 53.01          | <b>Channel Flow,</b><br>Area= 64.0 sf Perim= 29.6' r= 2.16'<br>n= 0.030 Stream, clean & straight |
| 1.0      | 310           | 0.0040        | 5.38              | 16.91          | <b>Pipe Channel,</b><br>24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50'<br>n= 0.011                |
| 20.4     | 957           | Total         |                   |                |                                                                                                  |

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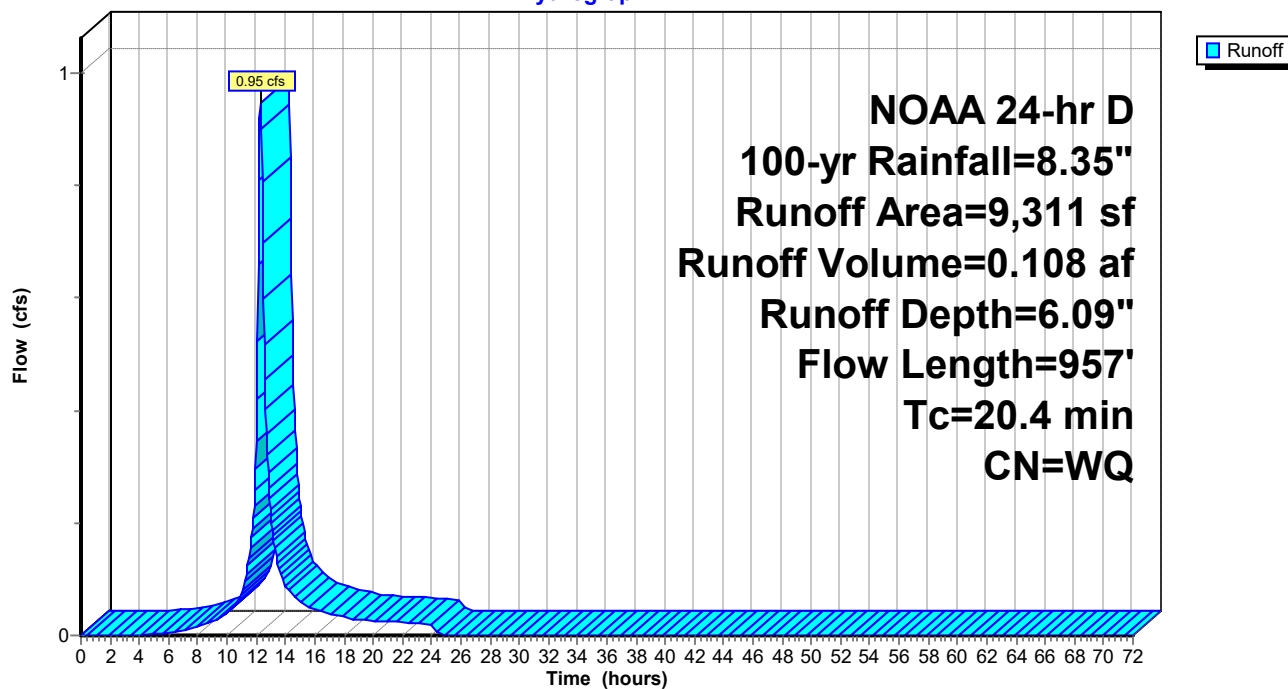
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### Subcatchment 20S: #9

Hydrograph



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### Summary for Pond 16P: Pond #1A

Inflow Area = 5.738 ac, 26.90% Impervious, Inflow Depth = 6.45" for 100-yr event  
Inflow = 24.99 cfs @ 12.26 hrs, Volume= 3.085 af  
Outflow = 22.67 cfs @ 12.37 hrs, Volume= 2.945 af, Atten= 9%, Lag= 7.0 min  
Primary = 22.67 cfs @ 12.37 hrs, Volume= 2.945 af  
Routed to Pond 17P : Pond #1B

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 177.08' @ 12.35 hrs Surf.Area= 10,074 sf Storage= 45,333 cf  
Flood Elev= 177.08' Surf.Area= 10,074 sf Storage= 45,333 cf

Plug-Flow detention time= 229.1 min calculated for 2.943 af (95% of inflow)  
Center-of-Mass det. time= 204.1 min ( 1,000.0 - 796.0 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 172.58' | 45,333 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 172.58              | 10,074               | 0                         | 0                         |
| 177.08              | 10,074               | 45,333                    | 45,333                    |

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                                             |
|--------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                                |
| #1     | Primary | 173.08' | <b>12.0" Round Culvert</b><br>L= 142.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=4.42 cfs @ 12.37 hrs HW=177.08' TW=174.47' (Dynamic Tailwater)  
↑ **1=Culvert** (Outlet Controls 4.42 cfs @ 5.63 fps)

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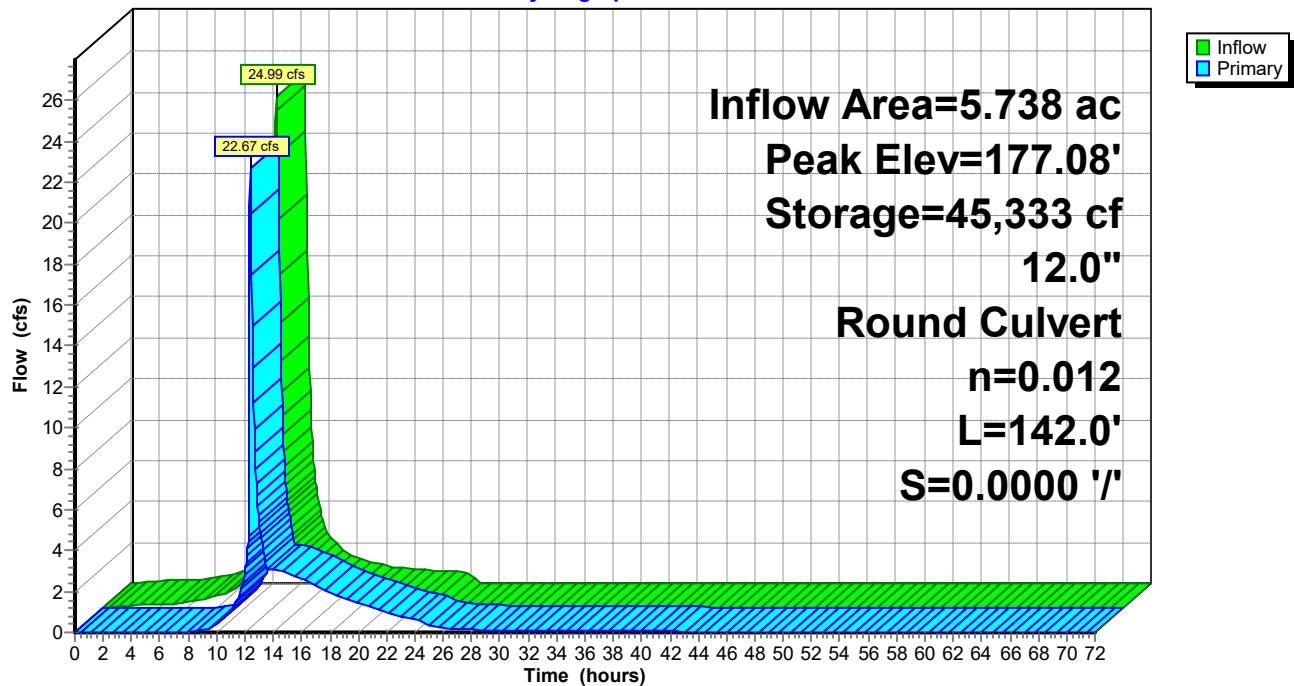
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### Pond 16P: Pond #1A

#### Hydrograph



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### Summary for Pond 17P: Pond #1B

Inflow Area = 5.738 ac, 26.90% Impervious, Inflow Depth > 6.16" for 100-yr event  
Inflow = 22.67 cfs @ 12.37 hrs, Volume= 2.945 af  
Outflow = 5.73 cfs @ 12.96 hrs, Volume= 2.824 af, Atten= 75%, Lag= 35.0 min  
Primary = 5.73 cfs @ 12.96 hrs, Volume= 2.824 af  
Routed to Link 22L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 176.07' @ 12.96 hrs Surf.Area= 8,922 sf Storage= 31,167 cf  
Flood Elev= 177.08' Surf.Area= 8,922 sf Storage= 40,149 cf

Plug-Flow detention time= 198.9 min calculated for 2.822 af (96% of inflow)  
Center-of-Mass det. time= 139.8 min ( 1,139.8 - 1,000.0 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 172.58'              | 40,149 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 172.58              | 8,922                | 0                         | 0                                                          |
| 177.08              | 8,922                | 40,149                    | 40,149                                                     |

| Device | Routing  | Invert  | Outlet Devices                                                                                                                                                                                                           |
|--------|----------|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Primary  | 177.08' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                                                              |
| #1     | Device 4 | 173.08' | <b>3.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                               |
| #2     | Device 4 | 173.58' | <b>10.0" Vert. Orifice/Grate</b> C= 0.600 Limited to weir flow at low heads                                                                                                                                              |
| #3     | Device 4 | 175.83' | <b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)                                                                                                                                                     |
| #4     | Primary  | 173.08' | <b>12.0" Round Culvert</b><br>L= 25.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 173.08' / 173.08' S= 0.0000 ' S= 0.0000 ' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf |

**Primary OutFlow** Max=5.73 cfs @ 12.96 hrs HW=176.07' TW=0.00' (Dynamic Tailwater)

↑ **4=Culvert** (Passes 5.73 cfs of 5.97 cfs potential flow)  
↑ **1=Orifice/Grate** (Orifice Controls 0.40 cfs @ 8.15 fps)  
↑ **2=Orifice/Grate** (Orifice Controls 3.78 cfs @ 6.94 fps)  
↑ **3=Sharp-Crested Rectangular Weir** (Weir Controls 1.55 cfs @ 1.61 fps)

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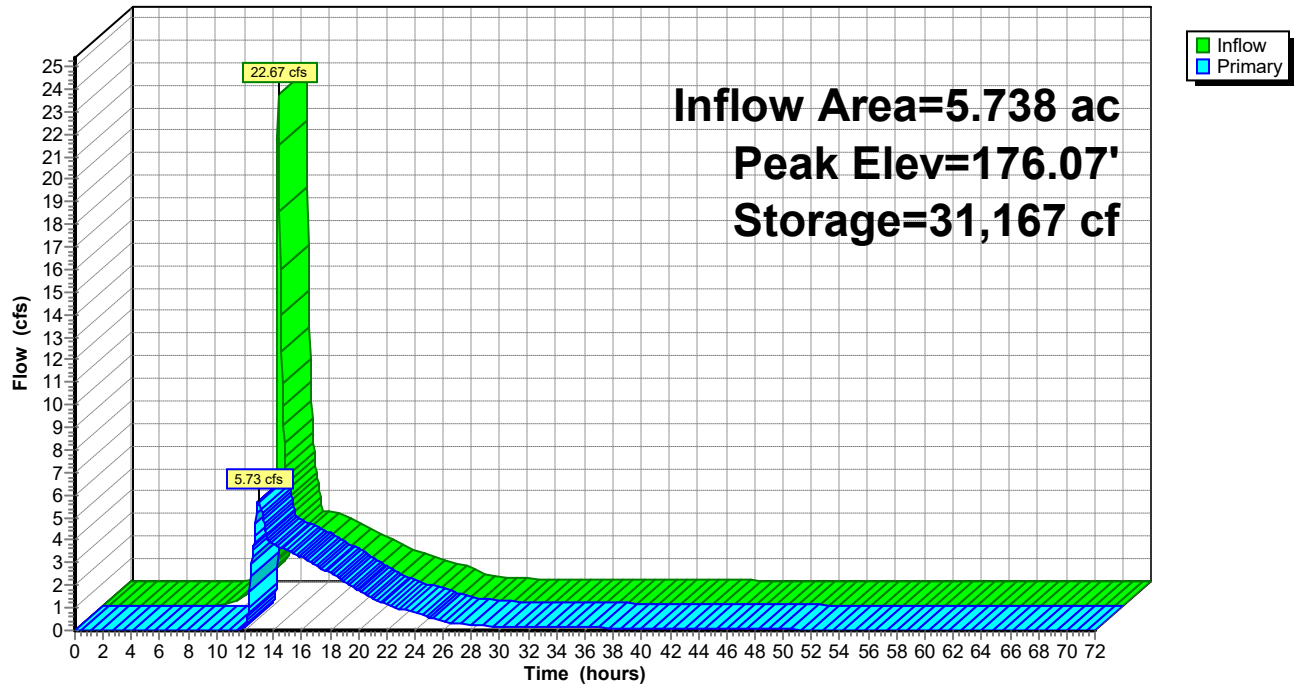
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### Pond 17P: Pond #1B

#### Hydrograph



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### Summary for Pond 20P: Pond #2

Inflow Area = 4.183 ac, 76.64% Impervious, Inflow Depth = 7.41" for 100-yr event  
Inflow = 28.80 cfs @ 12.14 hrs, Volume= 2.583 af  
Outflow = 3.20 cfs @ 13.06 hrs, Volume= 2.494 af, Atten= 89%, Lag= 54.9 min  
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
Primary = 3.20 cfs @ 13.06 hrs, Volume= 2.494 af  
Routed to Link 22L : Controlled

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
Peak Elev= 178.83' @ 13.06 hrs Surf.Area= 13,951 sf Storage= 55,324 cf

Plug-Flow detention time= 276.5 min calculated for 2.494 af (97% of inflow)  
Center-of-Mass det. time= 254.7 min ( 1,010.9 - 756.1 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 174.86' | 78,684 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 174.86              | 13,951               | 0                         | 0                         |
| 180.50              | 13,951               | 78,684                    | 78,684                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                   |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 175.09' | <b>12.0" Round Culvert</b><br>L= 352.0' RCP, sq.cut end projecting, Ke= 0.500<br>Inlet / Outlet Invert= 175.09' / 174.58' S= 0.0014 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2     | Discarded | 180.00' | <b>540.0' long (Profile 2) Broad-Crested Rectangular Weir</b><br>Head (feet) 0.49 0.98 1.48<br>Coef. (English) 2.90 3.26 3.44                                                                                    |

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=174.86' (Free Discharge)

↑ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Primary OutFlow** Max=3.20 cfs @ 13.06 hrs HW=178.83' TW=0.00' (Dynamic Tailwater)

↑ **1=Culvert** (Barrel Controls 3.20 cfs @ 4.08 hrs)

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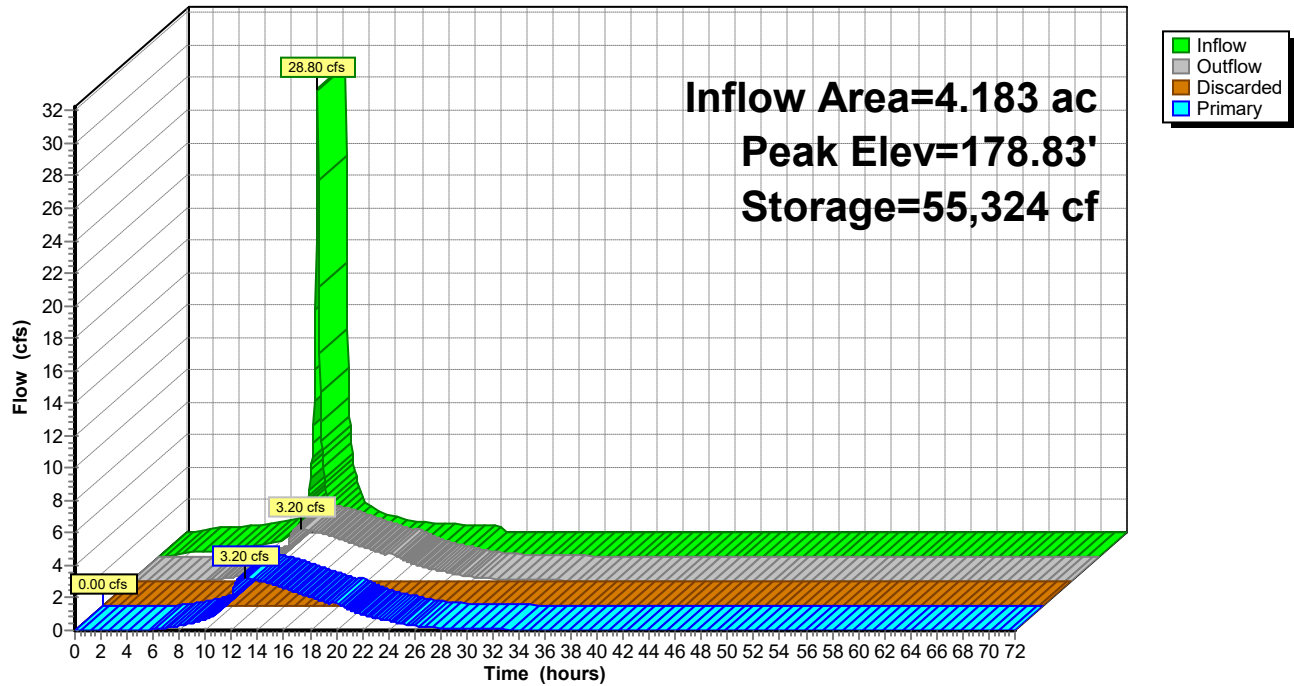
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### Pond 20P: Pond #2

#### Hydrograph



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**Summary for Pond 24P: Permeable**

Inflow Area = 2.362 ac, 61.75% Impervious, Inflow Depth = 7.27" for 100-yr event  
 Inflow = 15.48 cfs @ 12.16 hrs, Volume= 1.431 af  
 Outflow = 4.66 cfs @ 12.44 hrs, Volume= 1.418 af, Atten= 70%, Lag= 16.9 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Primary = 4.66 cfs @ 12.44 hrs, Volume= 1.418 af  
 Routed to Link 18L : Ultimate

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs  
 Peak Elev= 177.16' @ 12.44 hrs Surf.Area= 41,292 sf Storage= 24,399 cf  
 Flood Elev= 178.50' Surf.Area= 41,292 sf Storage= 46,516 cf

Plug-Flow detention time= 172.9 min calculated for 1.417 af (99% of inflow)  
 Center-of-Mass det. time= 167.0 min ( 932.4 - 765.4 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                            |
|--------|---------|---------------|------------------------------------------------------------------------------------------------|
| #1     | 175.17' | 54,774 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>136,936 cf Overall x 40.0% Voids |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 175.17              | 4,401                | 0                         | 0                         |
| 175.74              | 4,401                | 2,509                     | 2,509                     |
| 175.75              | 41,292               | 228                       | 2,737                     |
| 179.00              | 41,292               | 134,199                   | 136,936                   |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                  |
|--------|-----------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #0     | Discarded | 179.00' | <b>Automatic Storage Overflow</b> (Discharged without head)                                                                                                                     |
| #1     | Device 6  | 175.42' | <b>6.0" Round Culvert X 3.00</b> L= 440.0' Ke= 1.000<br>Inlet / Outlet Invert= 175.42' / 175.42' S= 0.0000 '/' Cc= 0.900<br>n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf   |
| #2     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #3     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #4     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #5     | Device 1  | 175.50' | <b>0.4" W x 0.4" H Vert. Orifice/Grate X 999.00</b> C= 0.600<br>Limited to weir flow at low heads                                                                               |
| #6     | Primary   | 175.25' | <b>18.0" Round Culvert</b><br>L= 66.0' CPP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 175.25' / 174.94' S= 0.0047 '/' Cc= 0.900<br>n= 0.013, Flow Area= 1.77 sf |
| #7     | Device 6  | 176.33' | <b>48.0" W x 8.0" H Vert. Orifice/Grate X 0.40</b> C= 0.600<br>Limited to weir flow at low heads                                                                                |

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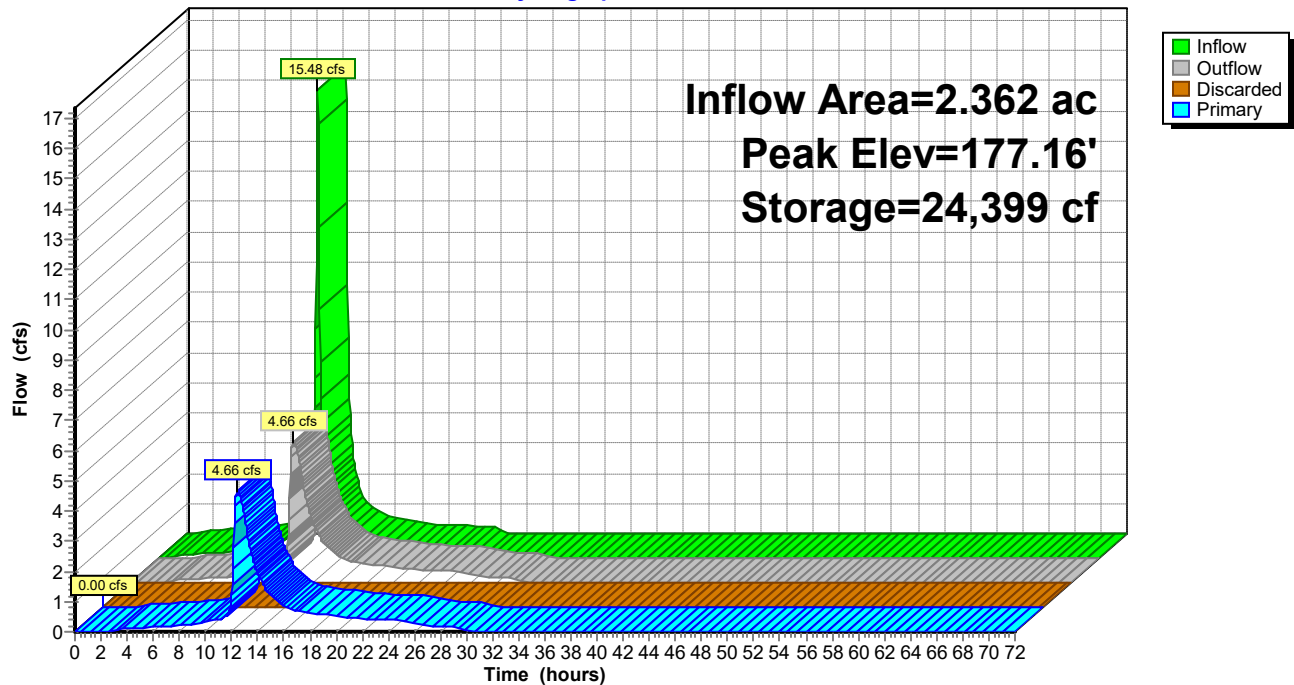
**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=175.17' (Free Discharge)

**Primary OutFlow** Max=4.65 cfs @ 12.44 hrs HW=177.16' TW=0.00' (Dynamic Tailwater)

- 6=Culvert (Passes 4.65 cfs of 7.81 cfs potential flow)
  - 1=Culvert (Barrel Controls 1.11 cfs @ 1.88 fps)
  - 2=Orifice/Grate (Passes < 6.85 cfs potential flow)
  - 3=Orifice/Grate (Passes < 6.85 cfs potential flow)
  - 4=Orifice/Grate (Passes < 6.85 cfs potential flow)
  - 5=Orifice/Grate (Passes < 6.85 cfs potential flow)
  - 7=Orifice/Grate (Orifice Controls 3.55 cfs @ 1.33 fps)

### Pond 24P: Permeable

#### Hydrograph



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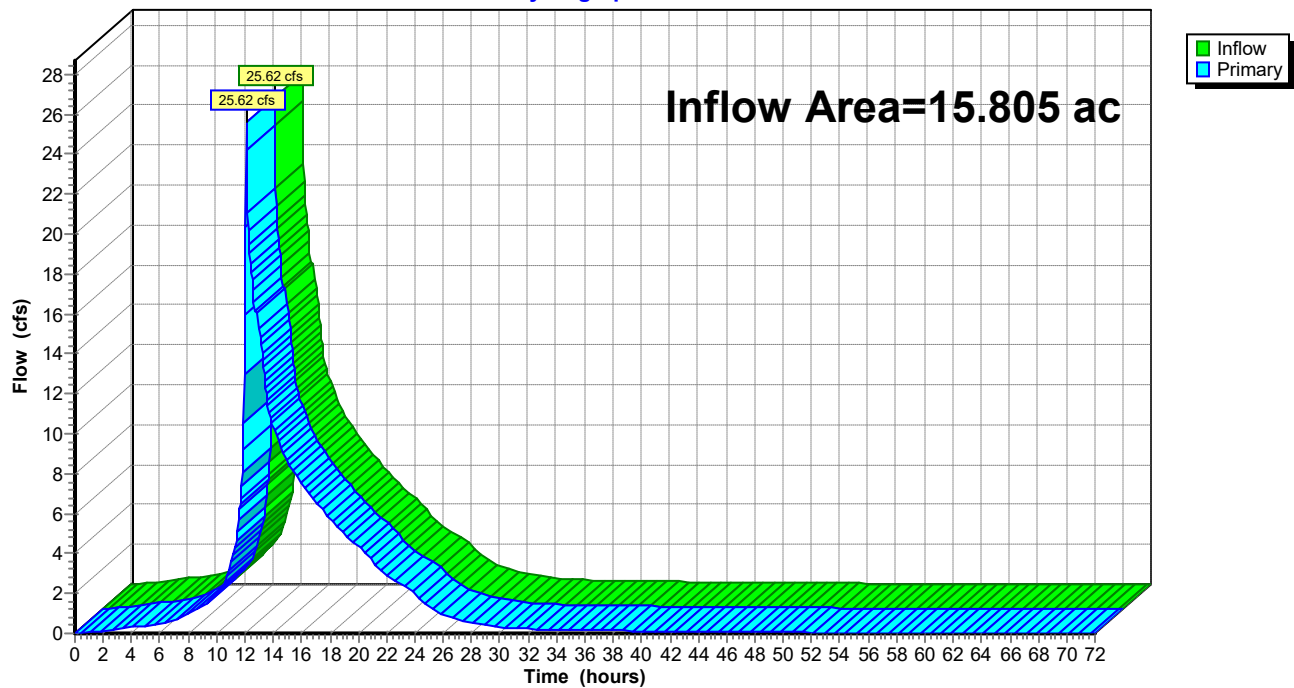
### Summary for Link 18L: Ultimate

Inflow Area = 15.805 ac, 48.25% Impervious, Inflow Depth > 6.67" for 100-yr event  
Inflow = 25.62 cfs @ 12.12 hrs, Volume= 8.785 af  
Primary = 25.62 cfs @ 12.12 hrs, Volume= 8.785 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 18L: Ultimate

Hydrograph



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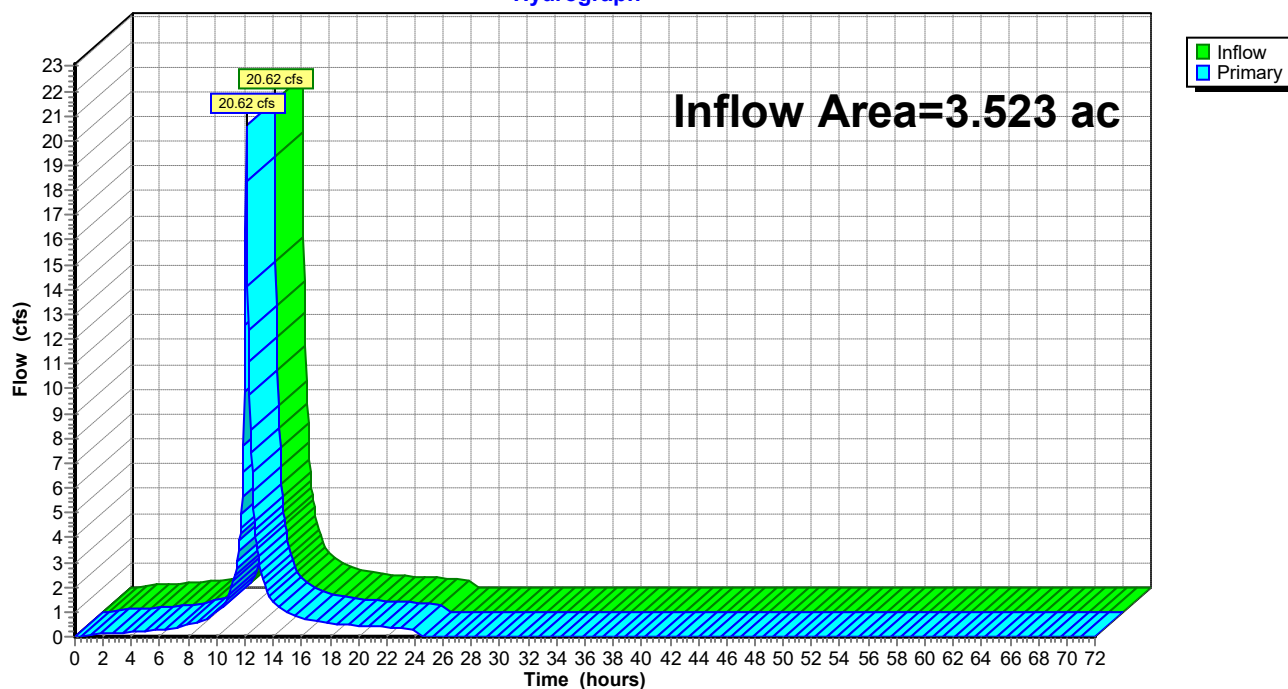
### Summary for Link 21L: Uncontrolled

Inflow Area = 3.523 ac, 40.28% Impervious, Inflow Depth = 6.98" for 100-yr event  
Inflow = 20.62 cfs @ 12.11 hrs, Volume= 2.049 af  
Primary = 20.62 cfs @ 12.11 hrs, Volume= 2.049 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 18L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 21L: Uncontrolled

Hydrograph



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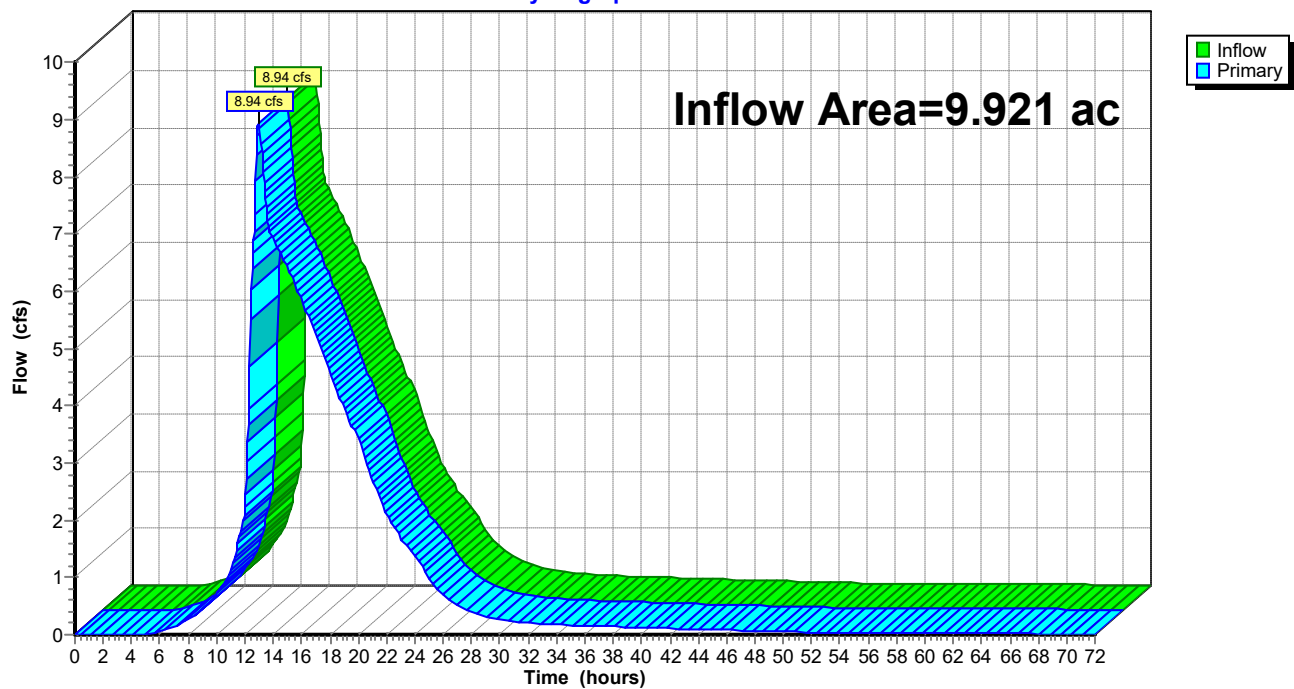
### Summary for Link 22L: Controlled

Inflow Area = 9.921 ac, 47.87% Impervious, Inflow Depth > 6.43" for 100-yr event  
Inflow = 8.94 cfs @ 12.96 hrs, Volume= 5.318 af  
Primary = 8.94 cfs @ 12.96 hrs, Volume= 5.318 af, Atten= 0%, Lag= 0.0 min  
Routed to Link 18L : Ultimate

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

### Link 22L: Controlled

Hydrograph



DARMOFALSKI ENGINEERING ASSOCIATES, INC.

Stormwater Drainage Report  
#30 Hillview Road, Pequannock, Morris County

September 8, 2022

**Appendix D**

Regulated Motor Vehicle Surface Sketch

**Appendix E**

Impervious Surface Sketch

**Appendix F**

Existing Drainage Area Map

DARMOFALSKI ENGINEERING ASSOCIATES, INC.

Stormwater Drainage Report  
#30 Hillview Road, Pequannock, Morris County

September 8, 2022

**Appendix G**  
Proposed Drainage Area Map

DARMOFALSKI ENGINEERING ASSOCIATES, INC.

Stormwater Drainage Report  
#30 Hillview Road, Pequannock, Morris County

September 8, 2022

**Appendix H**  
Drainage Drawings