ENGINEER'S REPORT

LIFE CHURCH – NEW GATHERING & WORSHIP SPACE

4928 SENECA STREET
WEST SENECA, NEW YORK

Prepared for:
Life Church
4928 Seneca Street
West Seneca, NY 14224

Prepared by:
C&S ENGINEERS, INC.
141 Elm Street, Suite 100
Buffalo, NY 14203

October 17, 2019
Revised June 24, 2020

Table of Contents

A. GENERAL

1. Existing Site Conditions

The project site is located at 4928 Seneca Street, in the Town of West Seneca, New York. See location map in Appendix A. The project site is 8.41 acres and consists of a single-story residential home(used as the church's office space) along the frontage of the property with associated parking behind the residence, a single-story brick church near the middle of the property with associated asphalt paved parking along three sides of the church and a one-way, paved, ring road which encircles both buildings. Site amenities include a covered pavilion, a playground and utility infrastructure to service the existing buildings. A small portion of the site is wooded and undeveloped, along the north end of the parcel.

The existing drainage patterns on the site consist of three main drainage areas; a north drainage area, a middle drainage area and a south drainage area. The north drainage area consists of the northern portion of the asphalt-paved parking lot, the covered pavilion, playground, lawn areas and the forested/wooded area. The northern drainage area drains in a southwesterly direction and stormwater runoff is conveyed to the adjacent property to the west. The middle drainage area consists of both the single-story residence and the church building, along with the remainder of the asphalt-paved parking and entrance/exit drives. The middle drainage area drains to a drainage swale, which flows across the property. The drainage swale flows into a 12-inch culvert, which discharges to the property to the west. The south drainage area is small and consists of the existing house, a small portion of lawn area and concrete sidewalk, which drains towards and is collected in the Seneca Street drainage system.

The soils on site, per the USDA NRCS web soil survey consist of the following; Canadice silt loam, which is listed as HSG "D", is poorly drained and has a water table at or near the surface; Cayuga silt loam, also listed as HSG "D", is well drained and has a water table at approximately 2-feet below the surface; Churchville silt loam, which is listed as HSG "C/D", is poorly drained and has a water table greater than 1-foot below the surface; and Rhinebeck silt loam, which is listed as HSG "C/D", is poorly drained and has a water table elevation greater than 1-foot below the surface.

A preliminary wetland investigation was performed by Earth Dimensions on October 2, 2019. Based upon their site visit, they identified 0.9+/- acre of wetland as defined by the U.S. Army Corps of Engineers (USACE) wetland delineation manuals within the investigation area (the northern portion of the site, which includes wooded/brush areas). It is their professional opinion that the wetland is likely regulated by the USACE under Section 404 of the Clean Water Act. The New York State Department of Environmental Conservation (NYSDEC) On-line Resource Mapper does not depict any Freshwater Wetlands within or adjacent to the site. Thus, NYSDEC has no apparent jurisdiction over any wetlands under Article 24 of the New York Conservation Law. The proposed improvements on the site have been designed to avoid any impacts to the wetland.

2. Proposed Site Conditions

Development will consist of the demolition of a portion of the existing parking lot to accommodate the construction of a single-story, 11,915 square foot, building addition along with additional parking and associated site improvements. The site, upon project completion, will accommodate a total of 323 parking spaces, including 8 accessible spaces. Site improvements include concrete sidewalks, landscaping, and site utilities. Site utilities will include a stormwater management system, a new private, fire protection service for the new addition and tying the proposed sewer lateral into the existing church building's sewer lateral.

Upon completion, the proposed project will add 2.01 acres of new impervious cover and 1.01 acres of reconstructed impervious areas. The total anticipated ground disturbance during construction of this project will be approximately 4.60 acres. Due to the increase in impervious areas, stormwater detention is required. Additionally, since the construction of this site will disturb more than one acre, a Storm Water Pollution Prevention Plan (SWPPP), in accordance with the New York State Department of Environmental Conservation (NYSDEC) standards must be prepared and a Notice of Intent (NOI) must be filed prior to beginning construction.

B. PROPOSED FACILITIES

1. Stormwater Management

a. Stormwater Conveyance

Under proposed conditions, there will be three main drainage areas; a north drainage area, a middle drainage area and a south drainage area. The north drainage area consists of the forested/wooded area, wetland and a small amount of lawn area. The northern drainage area drains in a southwesterly direction and stormwater runoff will continue to be conveyed to the adjacent property to the west. The middle drainage area consists of all the site improvements on site including the existing building, the proposed addition, existing and proposed parking lots, bioretention basins (all of which will be collected and conveyed to the stormwater detention system), a stormwater wet pond and then ultimately, conveyed to the 12-inch CMP, along the west property line. The south drainage area is small and consists of the existing house, a small portion of lawn area and concrete sidewalk, which drains towards and is collected in the Seneca Street drainage system. The south drainage area will remain unchanged from existing conditions.

b. Quantity Control

New York State Department of Environmental Conservation regulations require design of stormwater detention facilities to limit the peak discharge produced by the 10-year and 100-year storm events to the pre-developed

runoff rates, as well as provide extended detention of the 1-YR, 24-HR storm event (channel protection volume). This project is a redevelopment project with an increase in impervious area. Per the NYSDEC SMDM, specifically Chapter 9.2, the channel protection volume is relaxed for redevelopment projects. However, the 1-yr, 24-yr post-development peak discharge rate will be limited to the 1-yr, 24-hr pre-development peak discharge rate. Additionally, the majority of the site's runoff is directed to an existing 12-inch CMP pipe located along the west property line. The detention system was sized to limit the proposed discharge under a 10-yr storm event to the capacity of the 12-inch CMP in a surcharged condition with 1-foot of head. [Based on the topographic survey, the 12-inch CMP (with an invert elevation of 708.21) could have a maximum of 1-foot of head (elevation 710.2+/-)].

Water quantity control will be provided through the combination of the bioretention basins, the stormwater wet pond and 12-inch and 18-inch diameter HDPE pipe, as well as the pipe's encasing stone.

The bioretention basins will utilize 24" x 24" catch basins and a 12-inch diameter pipe to control the stormwater discharge from each of the basins.

The stormwater detention system will consist of the detention volume above the wet pond's permanent pool elevation along with 1,195 linear feet of 12-inch and 895 linear feet of 18-inch diameter HDPE pipe, as well as the pipe's encasing stone. The system will utilize one 4-foot diameter manhole as a control structure. The manhole will have a weir plate with a 6.5-inch diameter orifice to control the stormwater runoff rates from the site. A 12-inch diameter HDPE pipe will convey the stormwater discharges from the outlet structure to existing 12-inch CMP pipe.

The stormwater discharge rates for the 10 and 100-year storm events under developed conditions, will be at or below the stormwater discharge rates for the 10 and 100-year storm event under pre-developed conditions.

The stormwater detention calculations were completed using HYDROCAD, version 10 software. Following is a summary of the pre and post development discharge rates and associated detention volumes and water surface elevations:

Discharge to West Property

Storm Event	Pre-Development Discharge (cfs)	Post-Development Discharge (cfs)	Detention Volume (cf)	Water Surface Elevation (ft)
1-YR	6.42	2.40	8,430	708.94
10-YR	12.69	4.63	22,080	710.02
100-YR	23.24	21.80	35,290	710.99

Discharge to Seneca Street

Storm Event	Pre-Development Discharge (cfs)	Post-Development Discharge (cfs)
1-YR	0.19	0.19
10-YR	0.49	0.49
100-YR	1.00	1.00

Quality Control:

Chapters 3-5 of the NYSDEC Stormwater Management Design Manual (SMDM) provides a green infrastructure approach to stormwater management to reduce a site's impact on the aquatic ecosystem through the use of site planning techniques, runoff reduction techniques, and standard SMP's. Runoff Reduction Volume (RRv) is the reduction of the total Water Quality Volume (WQv) by application of green infrastructure techniques and SMP's to replicate pre-development hydrology.

The NYSDEC SMDM's intent is for projects to meet 100% of runoff reduction volume through the use of green infrastructure techniques. Projects that do not achieve runoff reduction to pre-construction condition must, at a minimum, provide the minimum RRv as well as provide the remaining WQv in standard SMPs.

A combination of a bioretention basin and a stormwater wet pond will be used to treat 100% of the new impervious area and reconstructed impervious area from the total site disturbance area.

The minimum RRv requirement has been attained through the use of the bioretention basins. Additionally, the water quality volume will be provided through a combination of the bioretention basins and the stormwater wet pond. This project is considered a redevelopment project with an increase in impervious area. Therefore, per Chapter 9.2.1.B.II, a standard SMP will be used to treat 100% of the WQv from new impervious areas and 25% of the WQv from reconstructed impervious areas.

Below is a summary of the water quality volume and runoff reduction volumes attained on site:

Total Water Quality Volume Required (WQv):	**7,797 cf**
WQv req'd from new impervious area:	6,926 cf
WQv req'd from reconsted impervious using standard SMP (=0.25 x 3,485cf):	871 cf
Minimum Runoff Reduction Volume Required (RRv, min)	**1,394 cf**
Northeast Bioretention Basin:	
WQ_v Required	1,089 cf
WQ_v Provided	653 cf
RR_v Provided (Standard SMP with Runoff Reduction Volume) – due to HSG C/D soils, RRv = 40% WQv for that practice	436 cf
Northwest Bioretention Basin:	
WQ_v Required	479 cf
WQ_v Provided	287 cf
RR_v Provided (Standard SMP with Runoff Reduction Volume) – due to HSG C/D soils, RRv = 40% WQv for that practice	192 cf
Middle Bioretention Basin:	
WQ_v Required	1,420 cf
WQ_v Provided	852 cf
RR_v Provided (Standard SMP with Runoff Reduction Volume) – due to HSG C/D soils, RRv = 40% WQv for that practice	568 cf
South Bioretention Basin:	
WQ_v Required	741 cf
WQ_v Provided	444 cf
RR_v Provided (Standard SMP with Runoff Reduction Volume) – due to HSG C/D soils, RRv = 40% WQv for that practice	297 cf
Stormwater Wet Pond	
WQ_v Required	4,068 cf
WQ_v Provided	16,601 cf

Total RRv Provided: 1,493 cf

Total WQv Provided (WQv provided + RRv provided): 20,330 cf

Stormwater calculations are included in Appendix B.

2. Sanitary Sewer

The existing church building is serviced by a 6-inch diameter SDR-35 PVC, private, sanitary sewer lateral. The 6-inch service connects to the existing 12-inch, public sanitary main along the north side of Seneca Street. The proposed building addition will have a 6-inch SDR-35 PVC sewer lateral which will tie into the existing 6-inch SDR-35 PVC sanitary sewer lateral on-site.

All of the private sanitary work is to be performed per the Town of West Seneca standards. Sanitary sewer flow calculations for the project are shown below and are also included in Appendix C.

Design Parameters (Appendix C) –

1) Hydraulic Loading Rate per "Design Standard for Intermediate Sized Wastewater Treatment Works", March 5, 2014 NYSDEC.
2) Table B-3 Typical Per-Unit Hydraulic Loading Rates
   office = 15 gpd/employee
   church(assembly hall) = 3 gpd/seat
3) Per client:
   The existing site consists of the following:
   Existing church = max of 600 parishioners/day (split between 2 services)
   House/Office = max of 5 employees
   Full Buildout will consists of the following:
   Existing church to be used for educational purposes: 10 classrooms with 250 kids maximum
   House/Office = max of 5 employees
   New Addition = 750 seats
4) Existing Average Daily Design Flow = (600 seats)(3 gpd/seat)
   + (5 employees)(15 gpd/employee)
   = 1,875 gpd
5) Proposed Average Daily Flow = (1,000 seats)(3 gpd/seat)
   + (5 employees)(15 gpd/employee)
   = 3,075 gpd
6) Net Increase = Proposed Average Daily Flow – Existing Average Daily Flow
   = 3,075 gpd – 1,875 gpd
   = 1,200 gpd
7) Peak Hourly Flow = (3,075 gpd) (4.50 peak factor)
   = 13,838 gpd = 0.013 mgd = 9.6 gpm

As the net increase in average daily flow is less than 2,500 gpd, the sanitary sewage is not considered a sewer extension in accordance with the NYSDEC's regulations. Accordingly, a downstream sanitary capacity analysis is not required.

3. Water System

A 6-inch ductile iron watermain will be tapped off of the existing 8-inch watermain on Seneca Street with an 8 x 6 tee and valve. The 6-inch watermain will be split at the property line into a 6-inch ductile iron, private fire service and a 2-inch type 'k' copper domestic water service. Both services will be backflow protected within a Hotbox enclosure on the property. The 2-inch service will be metered with a Neptune T-10 meter and backflow protected with a 2-inch Watts 009LF RPZ device. The private fire service will be backflow protected with a 6-inch Watts 957LF RPZ device. The 6-inch private fire service will connect to both the fire sprinkler system within the building and also the private fire hydrant on site. The 2-inch service will provide domestic water service to both the existing church and the proposed addition. The fire sprinkler design and calculations will be provided by the mechanical engineer. Both the existing 2-inch service and the meter pit will be abandoned. The proposed 2-inch service will be reconnected to the existing 2-inch service, after the abandoned meter pit.

Design Criteria (Appendix D):

1)	Domestic Peak Operating Demand:	19 gpm
2)	Static Pressure in watermain on Seneca Street	55 psi
3)	Residual Flow in watermain on Seneca Street	787 gpm w/ 26 psi residual
4)	Friction Loss through 2" domestic service	4 psi
5)	Friction Loss through fittings	1 psi
6)	Friction Loss through 2" Watts 009LF RPZ	13 psi
7)	Friction Loss through Neptune T-10 Meter	0 psi
8)	Residual Pressure @ proposed addition	37 psi
Assuming 500 gpm fire flow required:		
10)	Friction Loss through 6" fire service:	5 psi
11)	Friction Loss through fittings	1 psi
12)	Friction Loss through 6" Watts 957LF RPZ	7 psi
13)	Residual Pressure @ proposed addition with 500 gpm fire flow	42 psi

(Static pressure at the main was provided by the Erie County Water Authority)

Disinfection of water services following construction will be continuous feed, in accordance with AWWA C-651, latest revision requirements. Water demand calculations are included in Appendix D.

4. 100-YR Floodplain Information

Neither the existing church, nor the proposed addition is not located in the 100-year flood plain. See Appendix E.

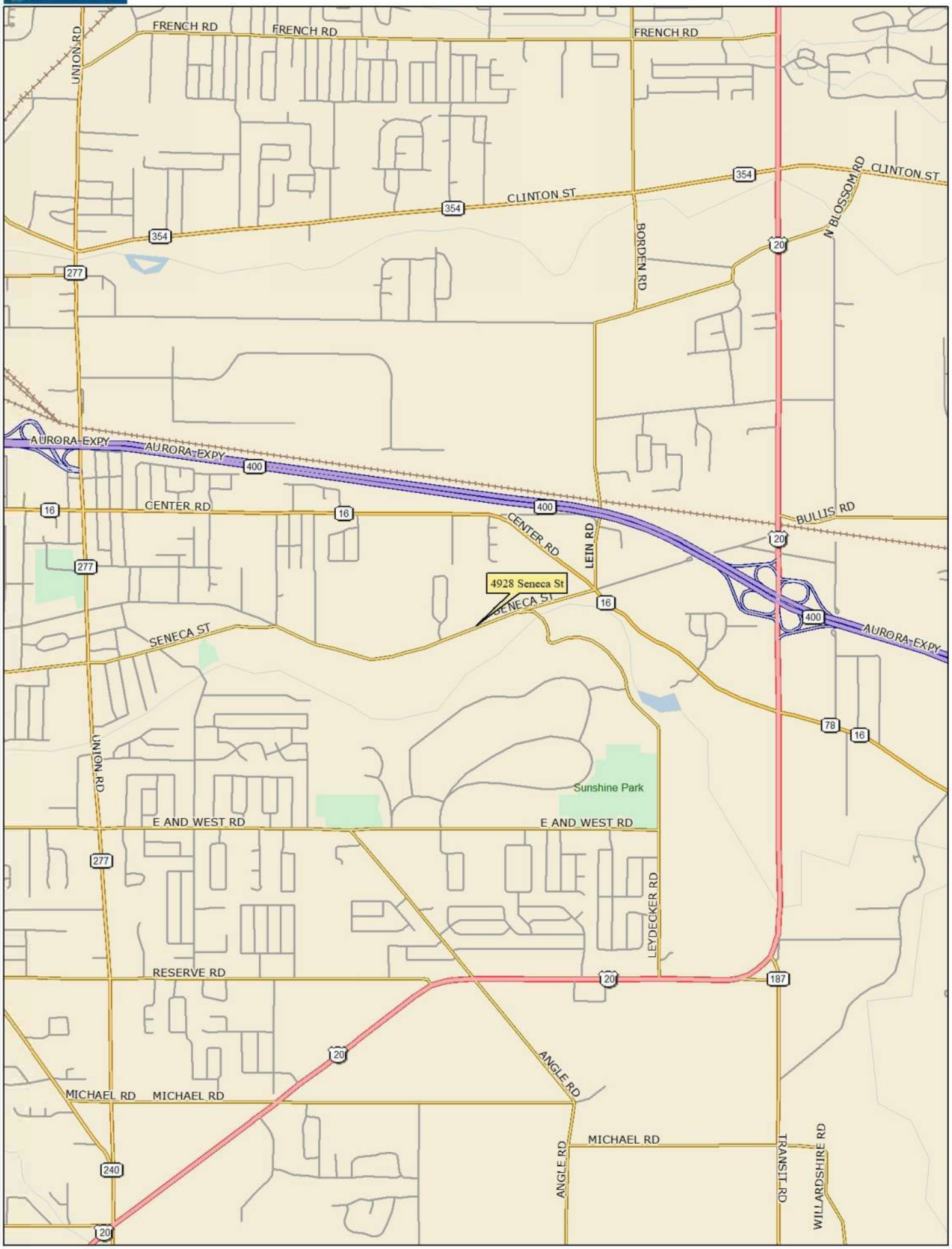
Respectfully Submitted,

C&S ENGINEERS, INC.

Jason Utzig, P.E.
Senior Project Engineer

APPENDIX A

SITE LOCATION MAP



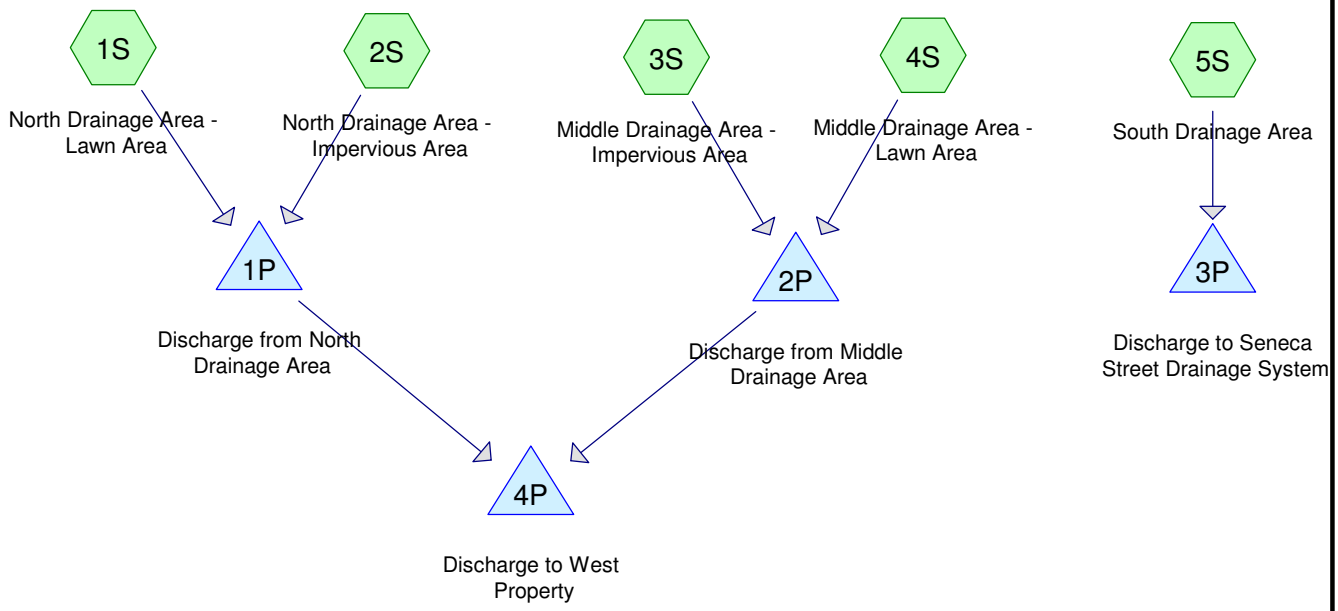
MN (10.8° W)

0 ¼ ½ ¾ 1 mi

Data Zoom 12-5

APPENDIX B

STORMWATER CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for Life Church - Existing Drainage Analysis
Prepared by C&S Companies, Printed 10/17/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.580	80	>75% Grass cover, Good, HSG D (1S, 4S, 5S)
2.520	98	Paved parking, HSG D (2S, 3S, 5S)
1.300	77	Woods, Good, HSG D (1S)
8.400	**85**	**TOTAL AREA**

Summary for Subcatchment 1S: North Drainage Area - Lawn Area

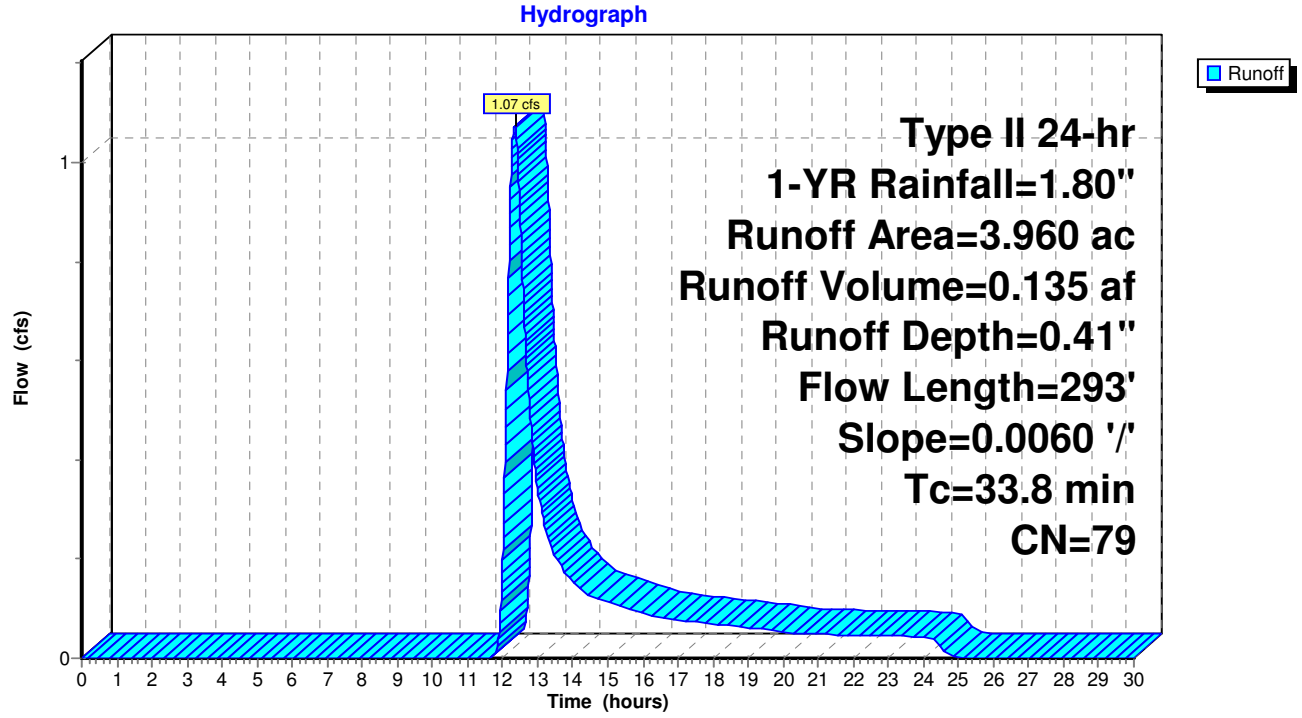
Runoff = 1.07 cfs @ 12.35 hrs, Volume= 0.135 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
2.660	80	>75% Grass cover, Good, HSG D
1.300	77	Woods, Good, HSG D
3.960	79	Weighted Average
3.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	100	0.0060	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
5.9	193	0.0060	0.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
33.8	293	Total			

Subcatchment 1S: North Drainage Area - Lawn Area



Summary for Subcatchment 2S: North Drainage Area - Impervious Area

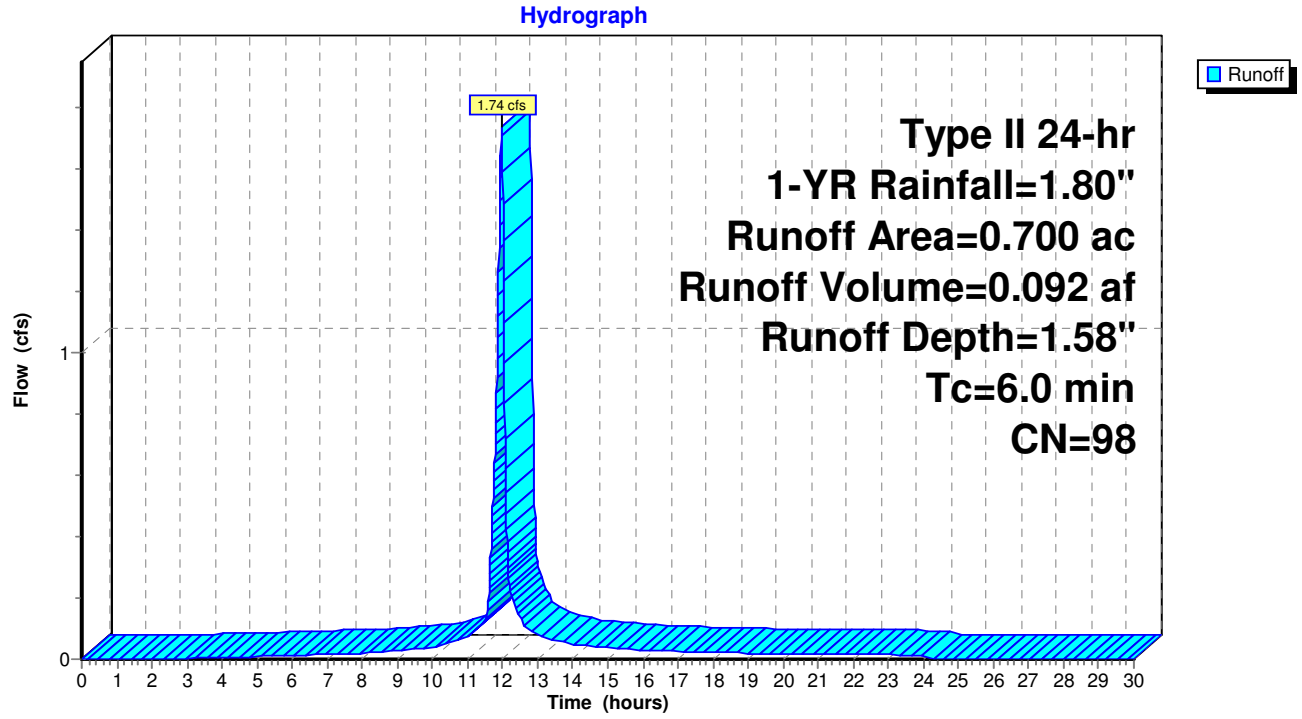
Runoff = 1.74 cfs @ 11.97 hrs, Volume= 0.092 af, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG D
0.700		100.00% Impervious Area

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

Subcatchment 2S: North Drainage Area - Impervious Area



Summary for Subcatchment 3S: Middle Drainage Area - Impervious Area

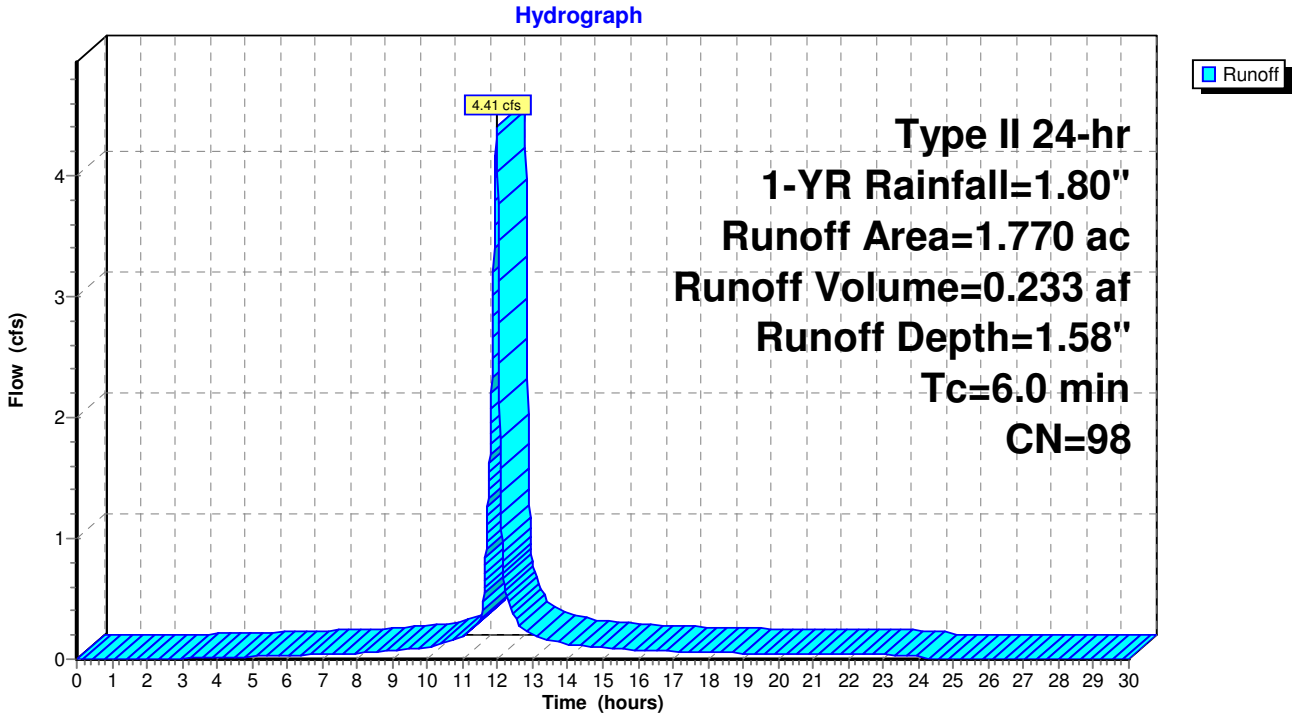
Runoff = 4.41 cfs @ 11.97 hrs, Volume= 0.233 af, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
1.770	98	Paved parking, HSG D
1.770		100.00% Impervious Area

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

Subcatchment 3S: Middle Drainage Area - Impervious Area



Summary for Subcatchment 4S: Middle Drainage Area - Lawn Area

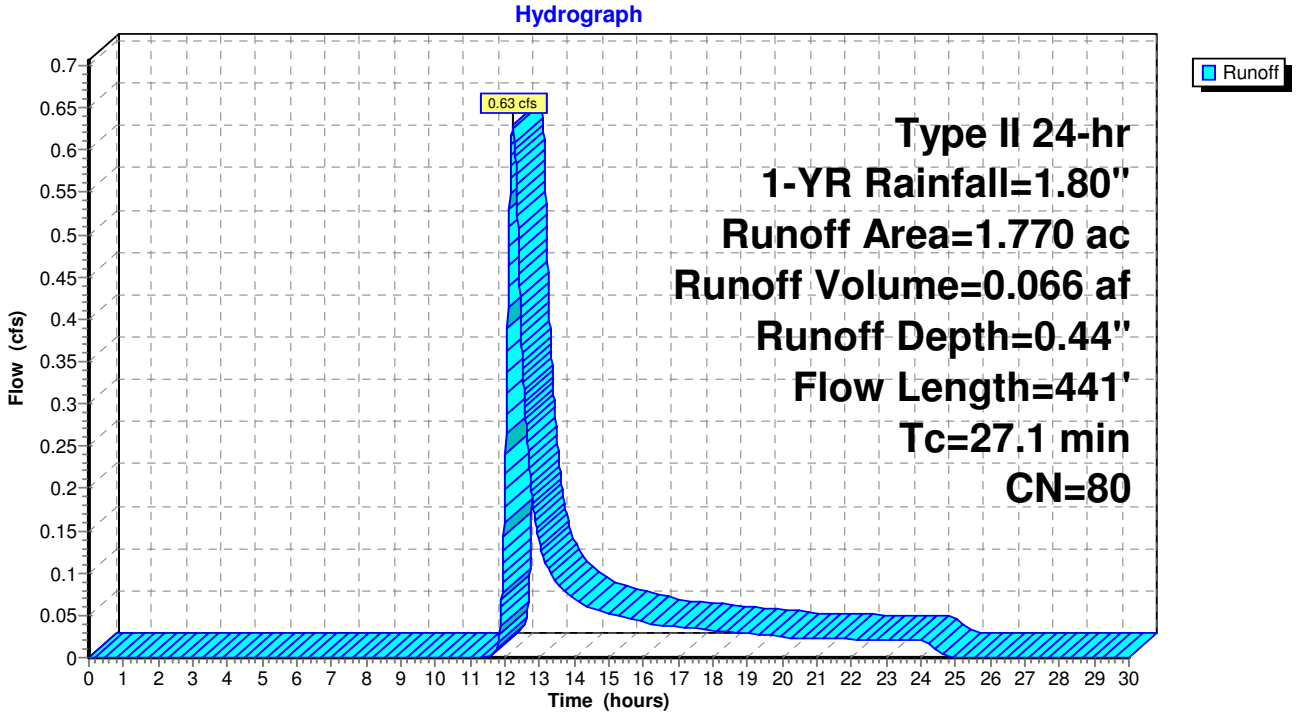
Runoff = 0.63 cfs @ 12.25 hrs, Volume= 0.066 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
1.770	80	>75% Grass cover, Good, HSG D
1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	100	0.0140	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
1.5	73	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0	121	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	79	0.0042	1.53	1.20	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
1.8	68	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.1	441	Total			

Subcatchment 4S: Middle Drainage Area - Lawn Area



Summary for Subcatchment 5S: South Drainage Area

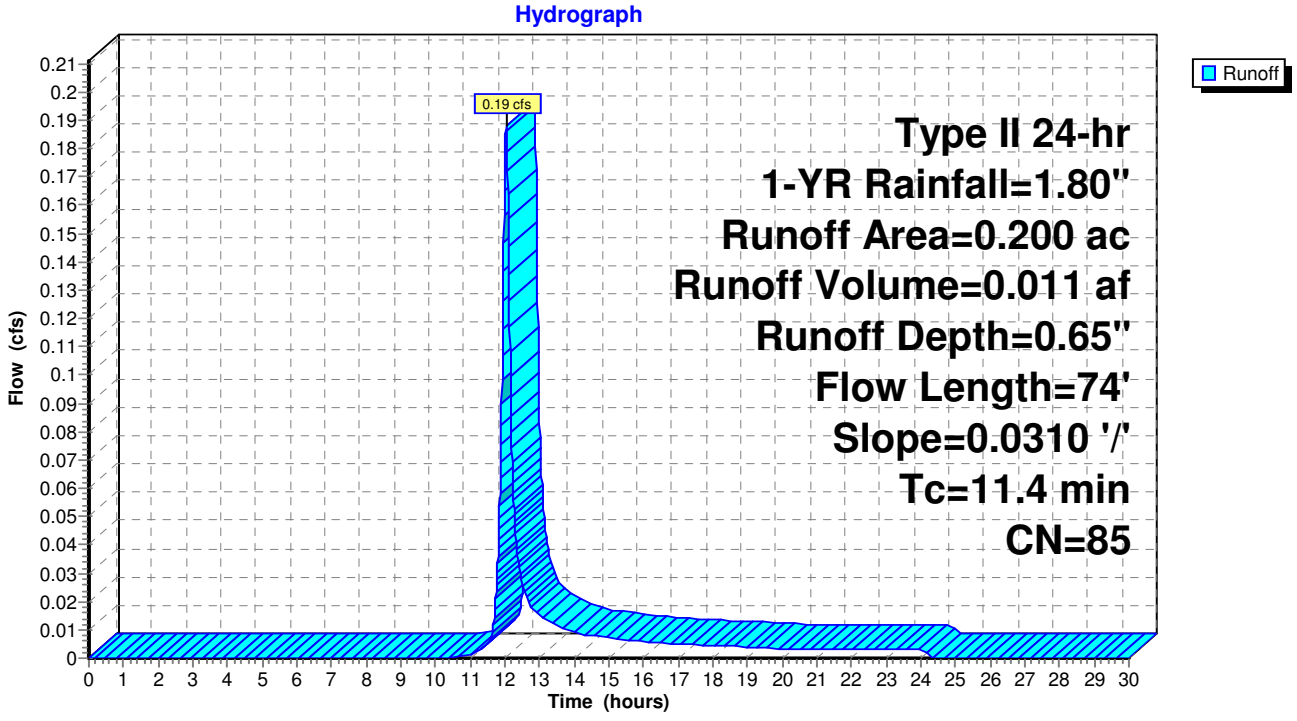
Runoff = 0.19 cfs @ 12.04 hrs, Volume= 0.011 af, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.150	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.200	85	Weighted Average
0.150		75.00% Pervious Area
0.050		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	74	0.0310	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"

Subcatchment 5S: South Drainage Area



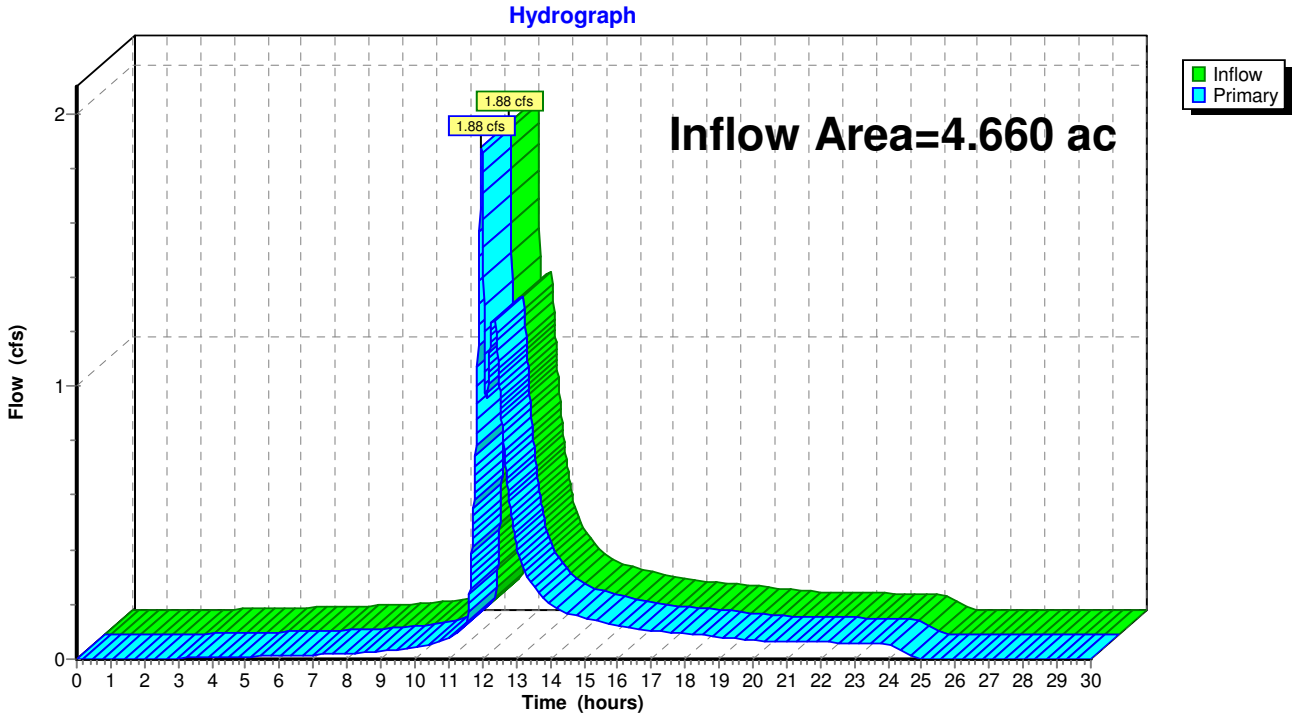
Summary for Pond 1P: Discharge from North Drainage Area

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

Inflow Area = 4.660 ac, 15.02% Impervious, Inflow Depth = 0.58" for 1-YR event
Inflow = 1.88 cfs @ 11.97 hrs, Volume= 0.227 af
Primary = 1.88 cfs @ 11.97 hrs, Volume= 0.227 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 1P: Discharge from North Drainage Area



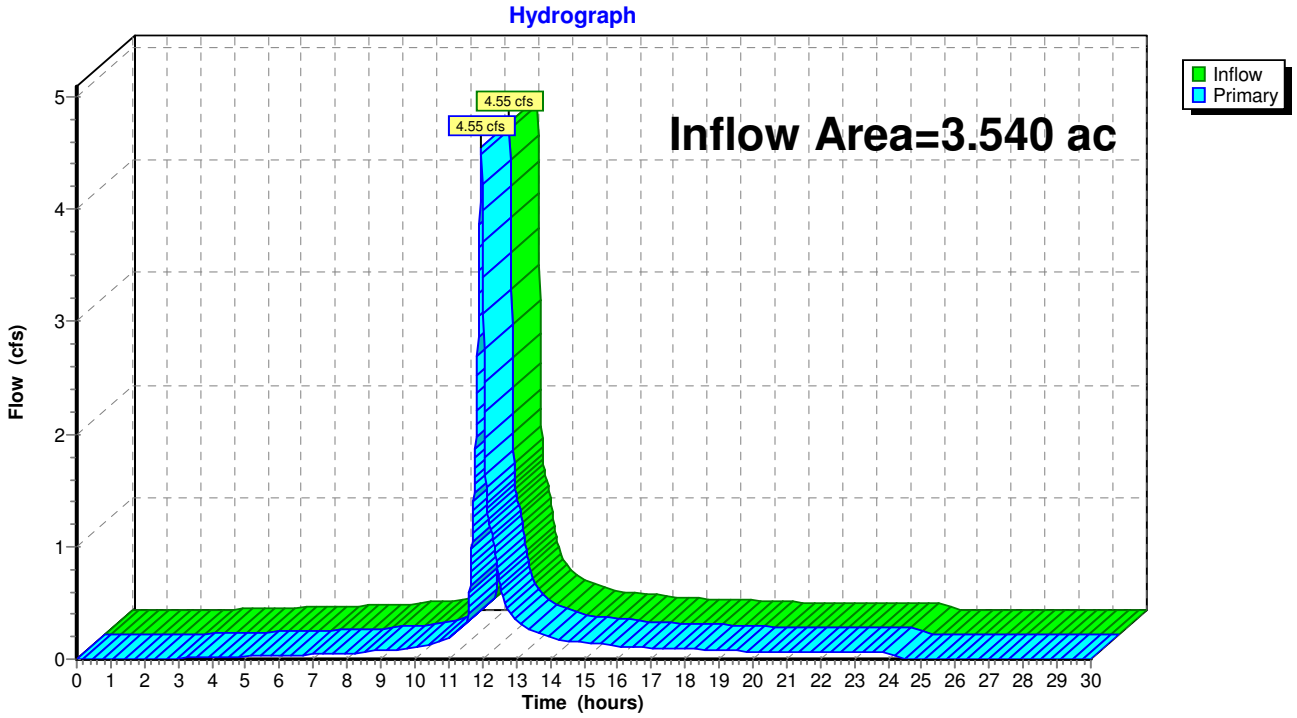
Summary for Pond 2P: Discharge from Middle Drainage Area

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

Inflow Area = 3.540 ac, 50.00% Impervious, Inflow Depth = 1.01" for 1-YR event
Inflow = 4.55 cfs @ 11.97 hrs, Volume= 0.298 af
Primary = 4.55 cfs @ 11.97 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2

Pond 2P: Discharge from Middle Drainage Area



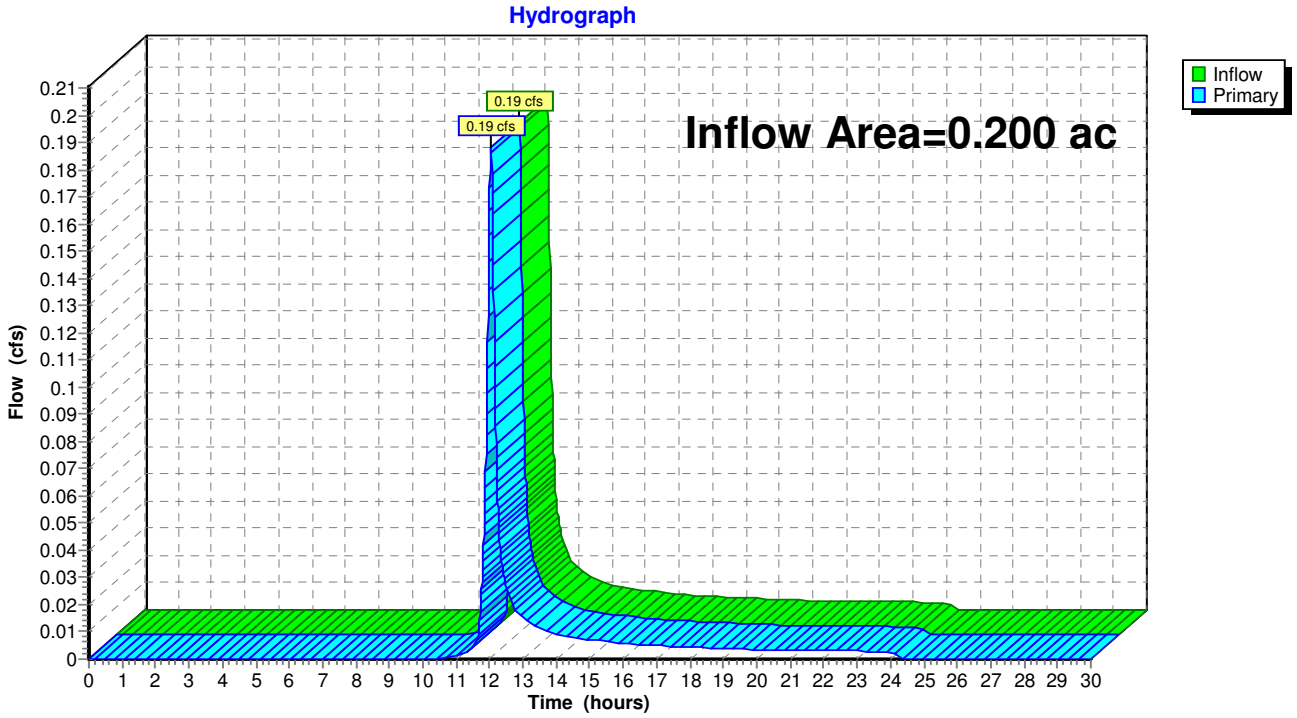
Summary for Pond 3P: Discharge to Seneca Street Drainage System

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

Inflow Area = 0.200 ac, 25.00% Impervious, Inflow Depth = 0.65" for 1-YR event
Inflow = 0.19 cfs @ 12.04 hrs, Volume= 0.011 af
Primary = 0.19 cfs @ 12.04 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 3P: Discharge to Seneca Street Drainage System



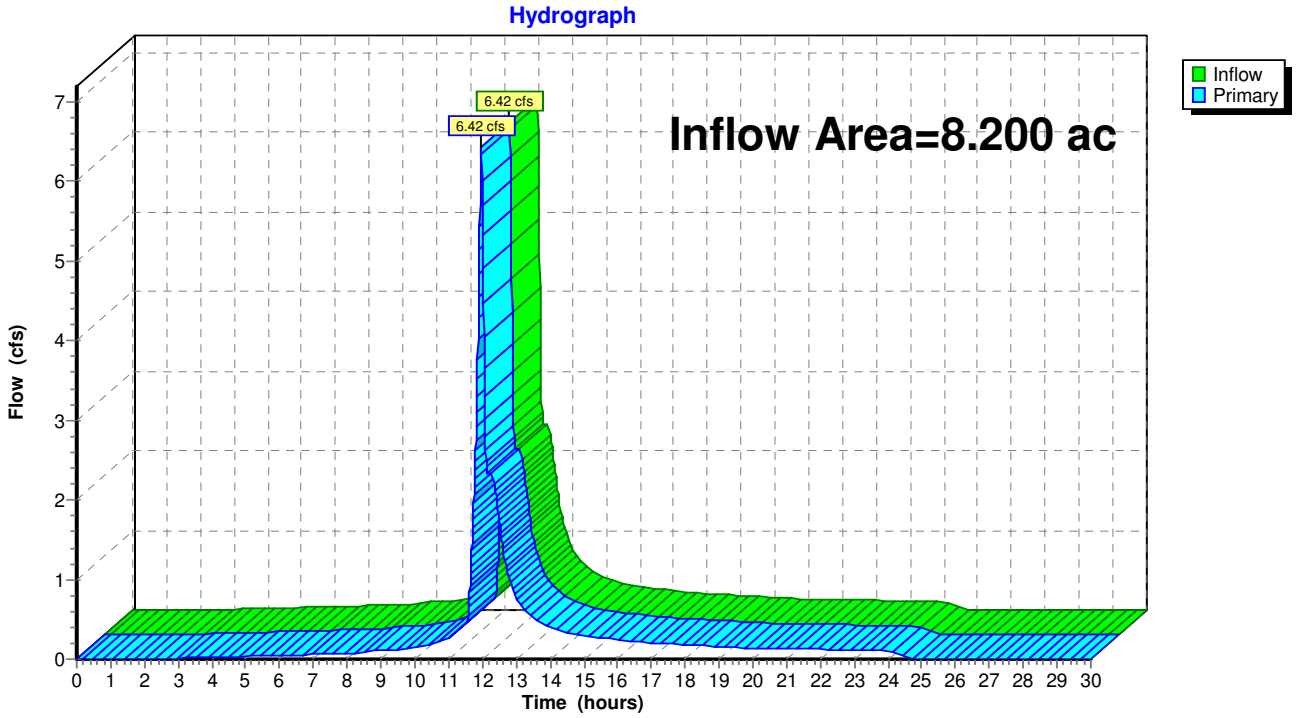
Summary for Pond 4P: Discharge to West Property

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

Inflow Area = 8.200 ac, 30.12% Impervious, Inflow Depth = 0.77" for 1-YR event
Inflow = 6.42 cfs @ 11.97 hrs, Volume= 0.525 af
Primary = 6.42 cfs @ 11.97 hrs, Volume= 0.525 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 4P: Discharge to West Property



Summary for Subcatchment 1S: North Drainage Area - Lawn Area

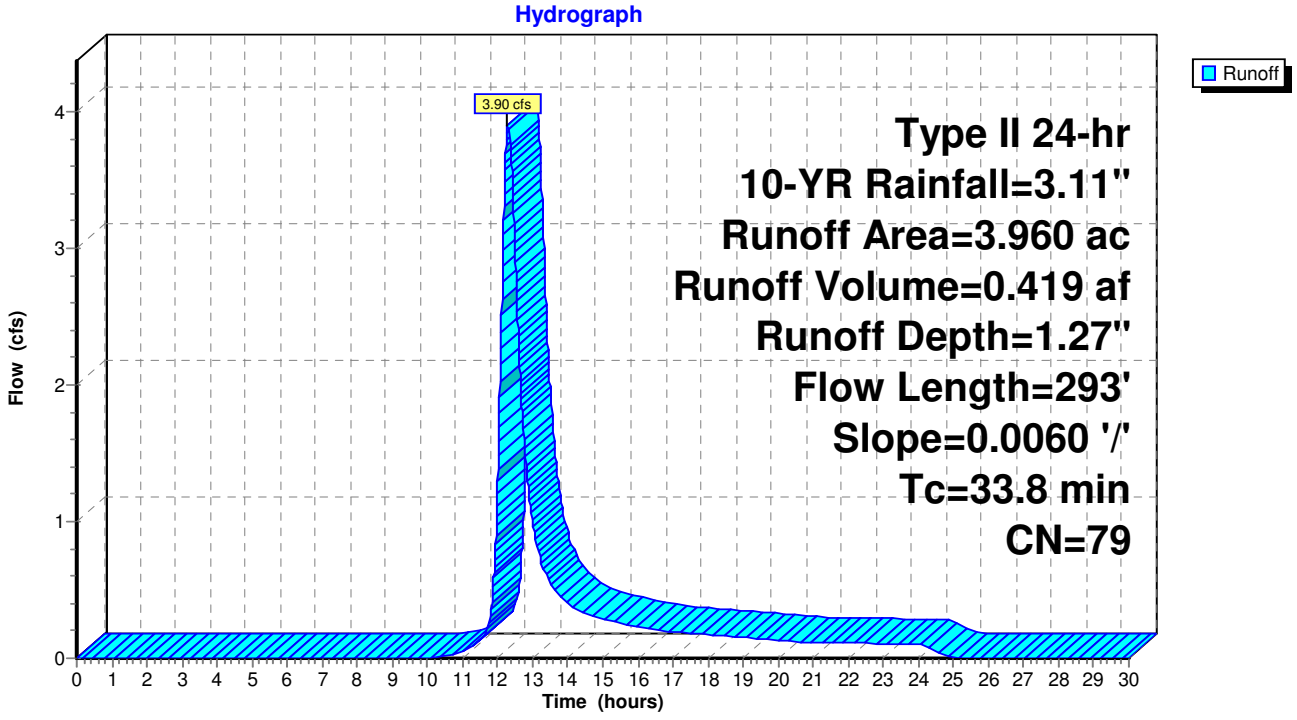
Runoff = 3.90 cfs @ 12.29 hrs, Volume= 0.419 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
2.660	80	>75% Grass cover, Good, HSG D
1.300	77	Woods, Good, HSG D
3.960	79	Weighted Average
3.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	100	0.0060	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
5.9	193	0.0060	0.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
33.8	293	Total			

Subcatchment 1S: North Drainage Area - Lawn Area



Summary for Subcatchment 2S: North Drainage Area - Impervious Area

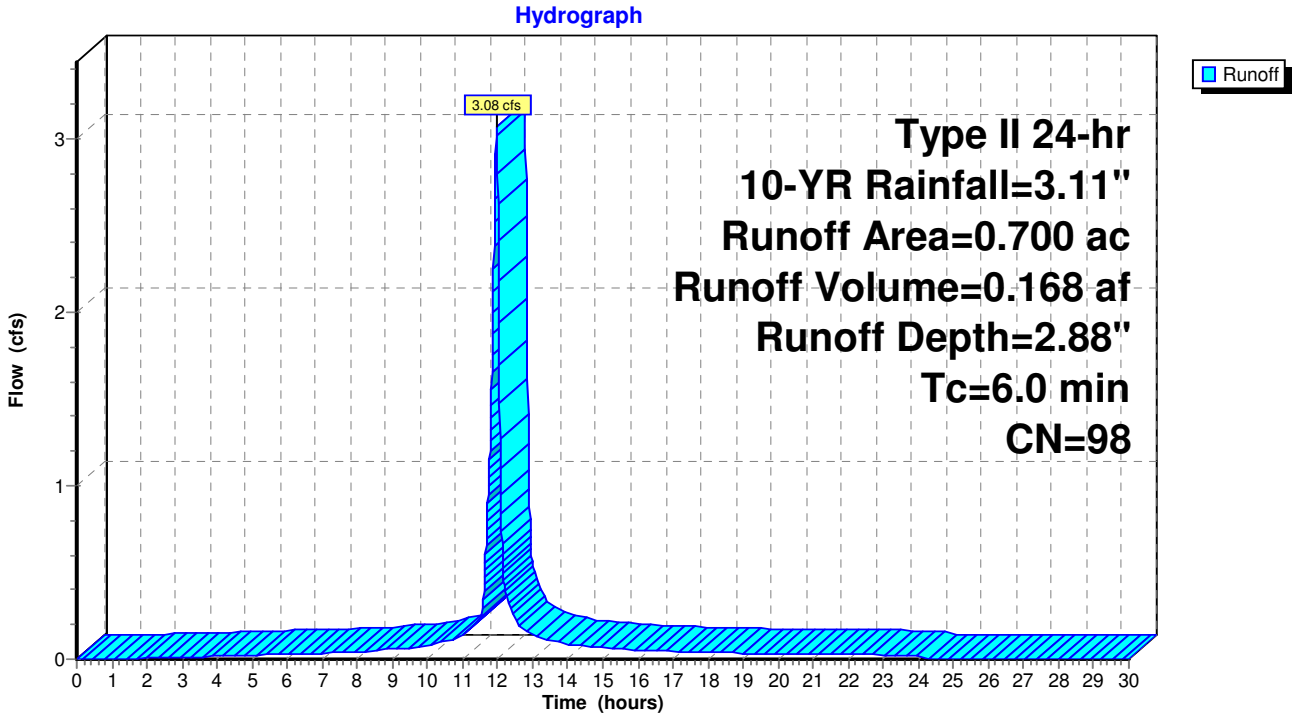
Runoff = 3.08 cfs @ 11.97 hrs, Volume= 0.168 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG D
0.700		100.00% Impervious Area

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

Subcatchment 2S: North Drainage Area - Impervious Area



Summary for Subcatchment 3S: Middle Drainage Area - Impervious Area

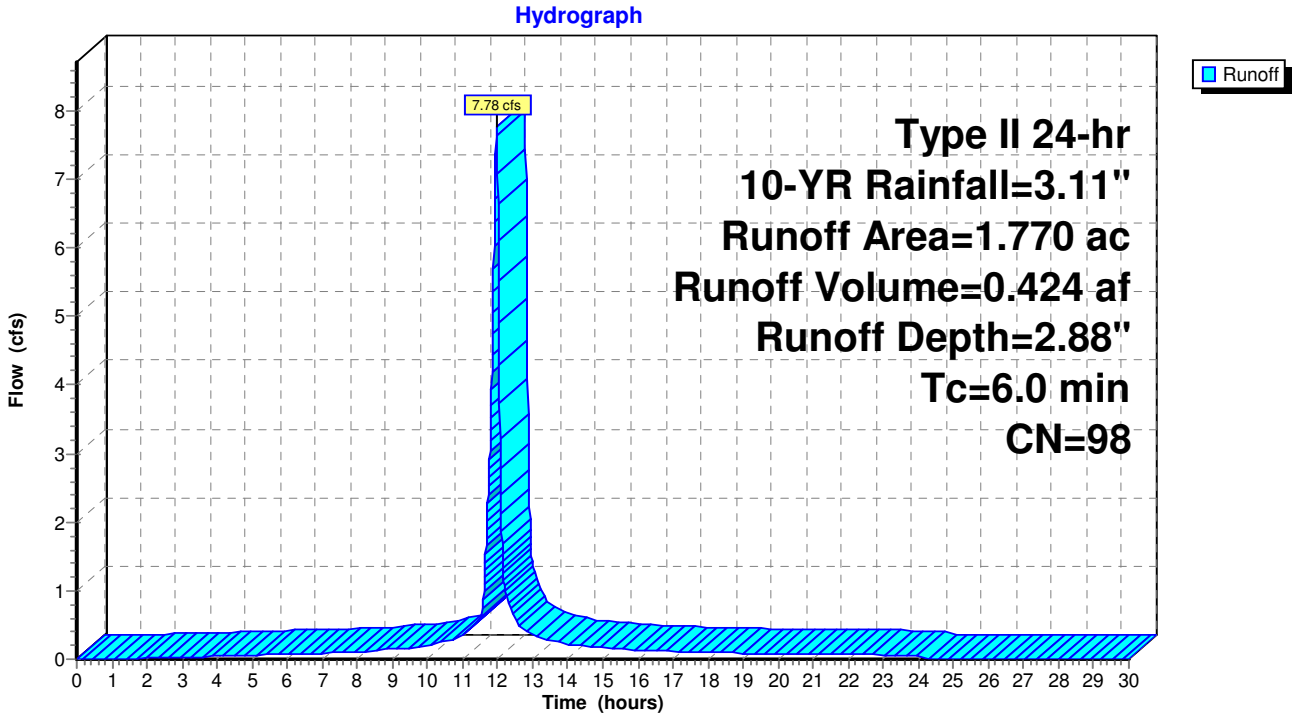
Runoff = 7.78 cfs @ 11.97 hrs, Volume= 0.424 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
1.770	98	Paved parking, HSG D
1.770		100.00% Impervious Area

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

Subcatchment 3S: Middle Drainage Area - Impervious Area



Summary for Subcatchment 4S: Middle Drainage Area - Lawn Area

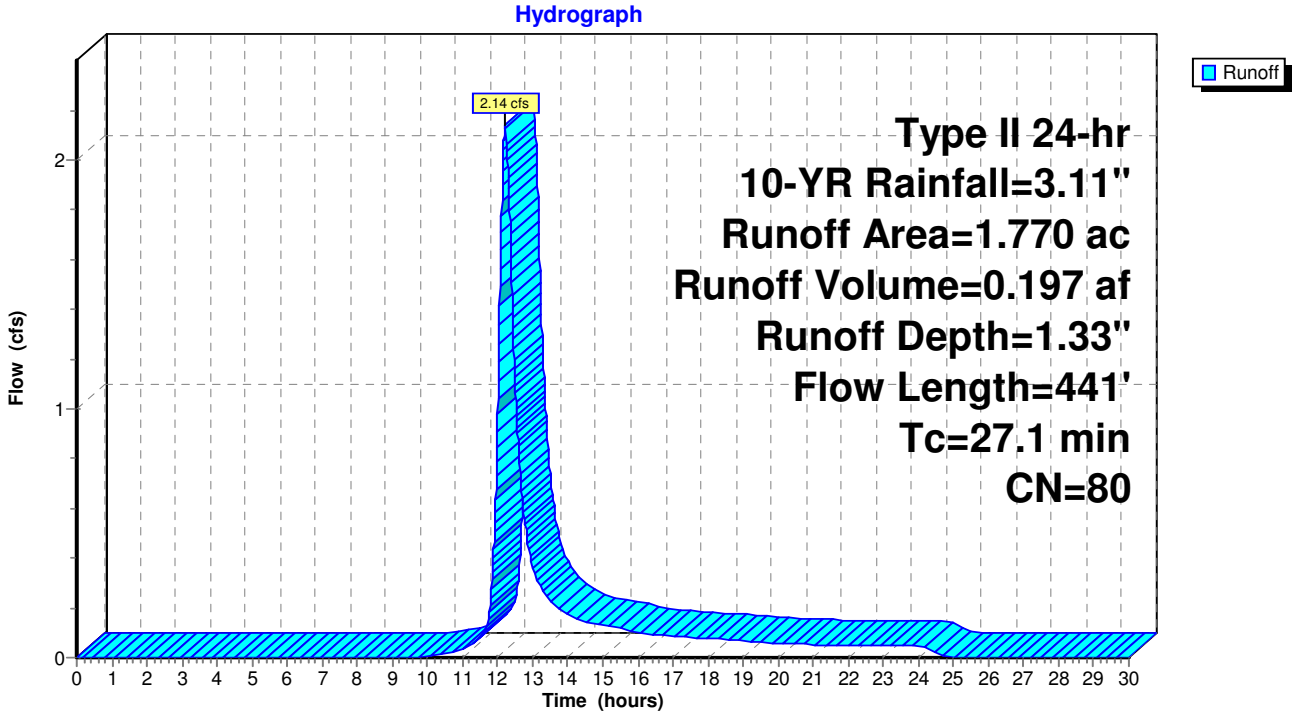
Runoff = 2.14 cfs @ 12.22 hrs, Volume= 0.197 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
1.770	80	>75% Grass cover, Good, HSG D
1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	100	0.0140	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
1.5	73	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0	121	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	79	0.0042	1.53	1.20	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
1.8	68	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.1	441	Total			

Subcatchment 4S: Middle Drainage Area - Lawn Area



Summary for Subcatchment 5S: South Drainage Area

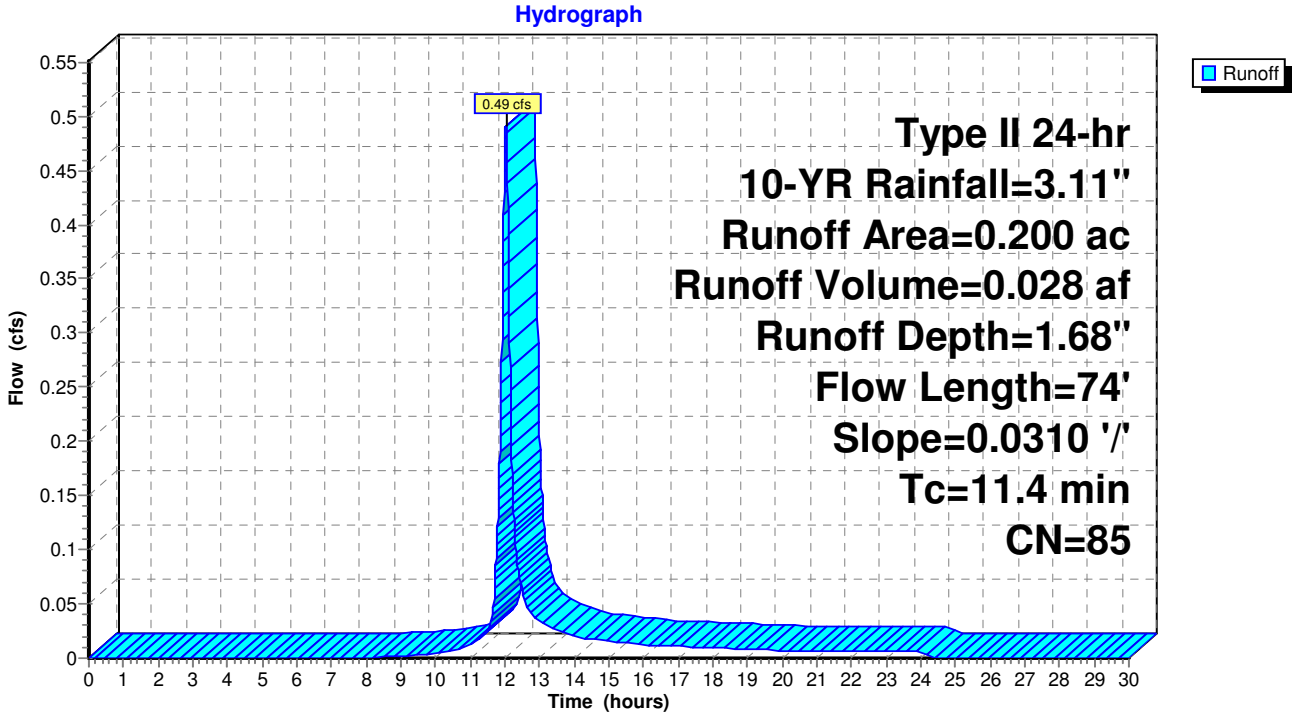
Runoff = 0.49 cfs @ 12.03 hrs, Volume= 0.028 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.150	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.200	85	Weighted Average
0.150		75.00% Pervious Area
0.050		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	74	0.0310	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"

Subcatchment 5S: South Drainage Area



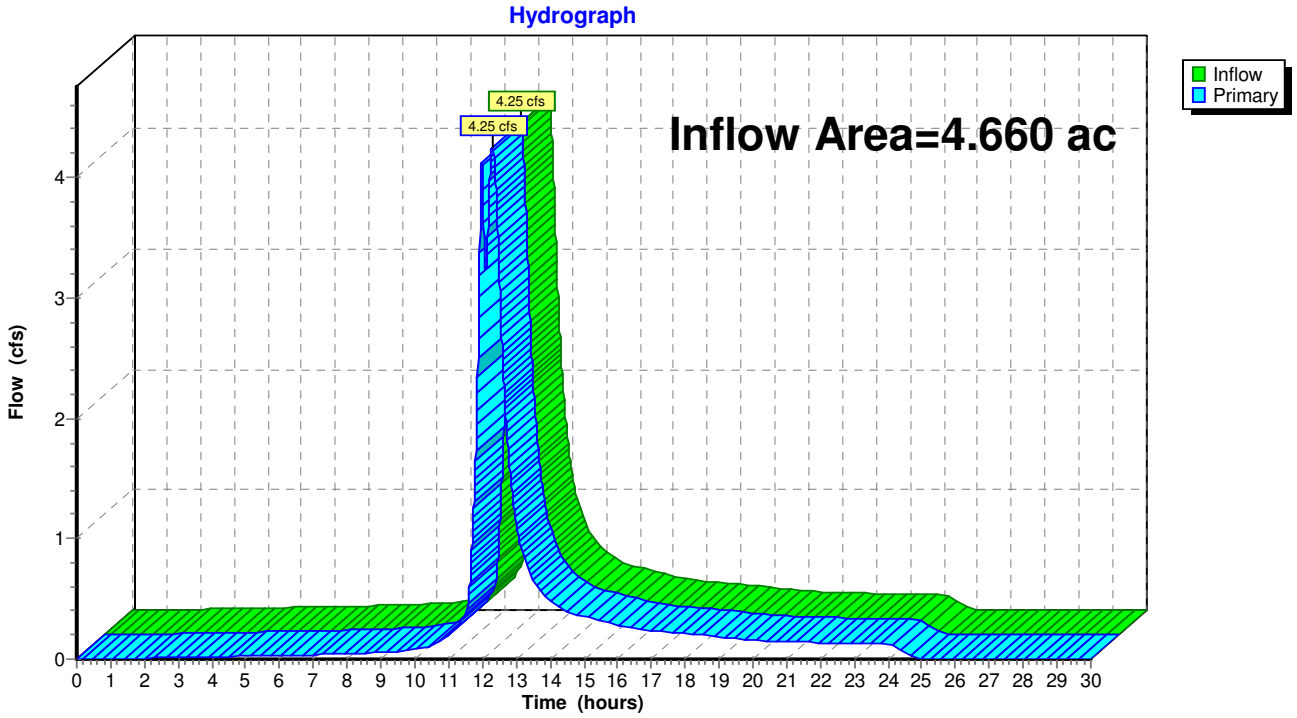
Summary for Pond 1P: Discharge from North Drainage Area

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

Inflow Area = 4.660 ac, 15.02% Impervious, Inflow Depth = 1.51" for 10-YR event
Inflow = 4.25 cfs @ 12.28 hrs, Volume= 0.587 af
Primary = 4.25 cfs @ 12.28 hrs, Volume= 0.587 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 1P: Discharge from North Drainage Area



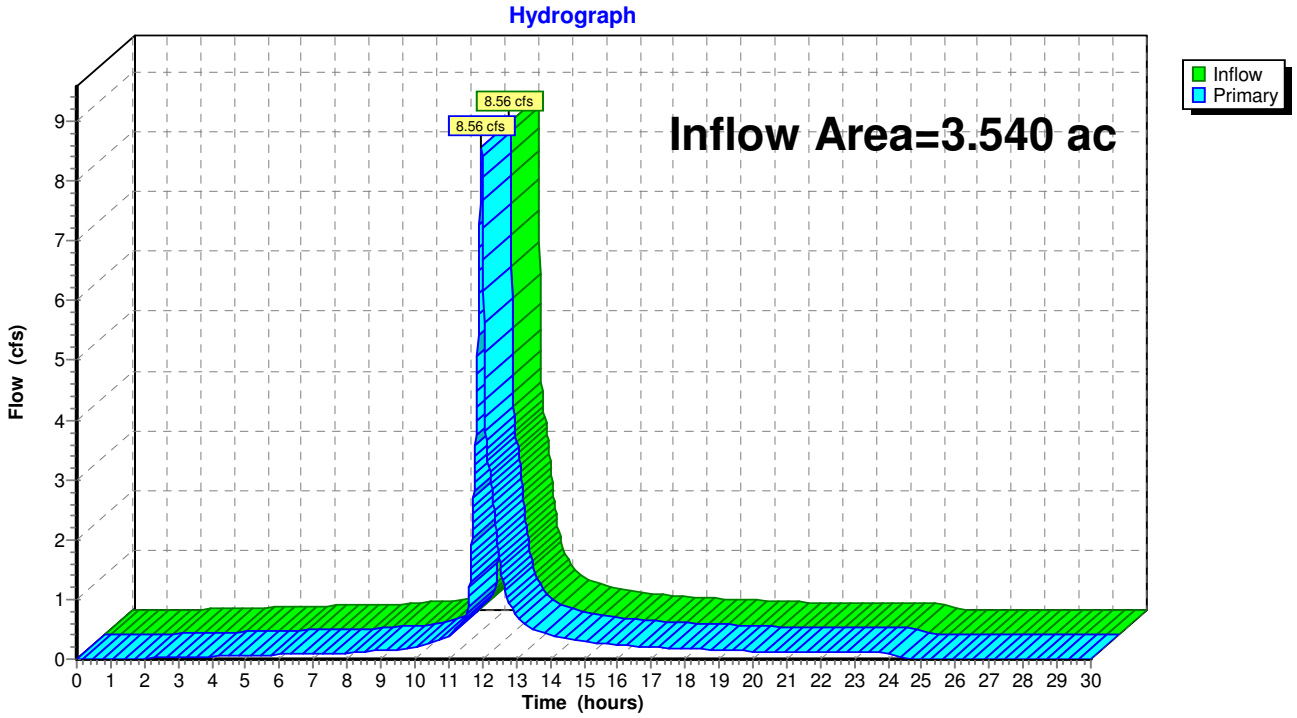
Summary for Pond 2P: Discharge from Middle Drainage Area

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

Inflow Area = 3.540 ac, 50.00% Impervious, Inflow Depth = 2.11" for 10-YR event
Inflow = 8.56 cfs @ 11.97 hrs, Volume= 0.621 af
Primary = 8.56 cfs @ 11.97 hrs, Volume= 0.621 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2

Pond 2P: Discharge from Middle Drainage Area



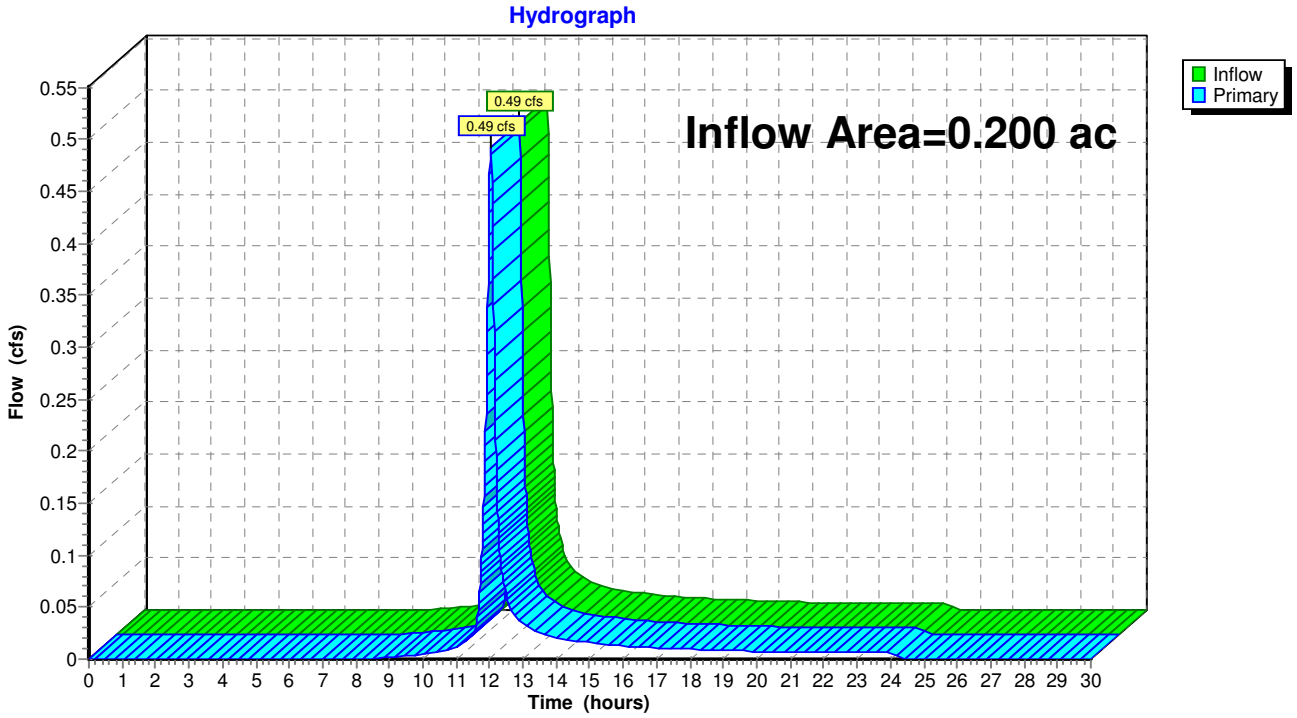
Summary for Pond 3P: Discharge to Seneca Street Drainage System

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

Inflow Area = 0.200 ac, 25.00% Impervious, Inflow Depth = 1.68" for 10-YR event
Inflow = 0.49 cfs @ 12.03 hrs, Volume= 0.028 af
Primary = 0.49 cfs @ 12.03 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 3P: Discharge to Seneca Street Drainage System



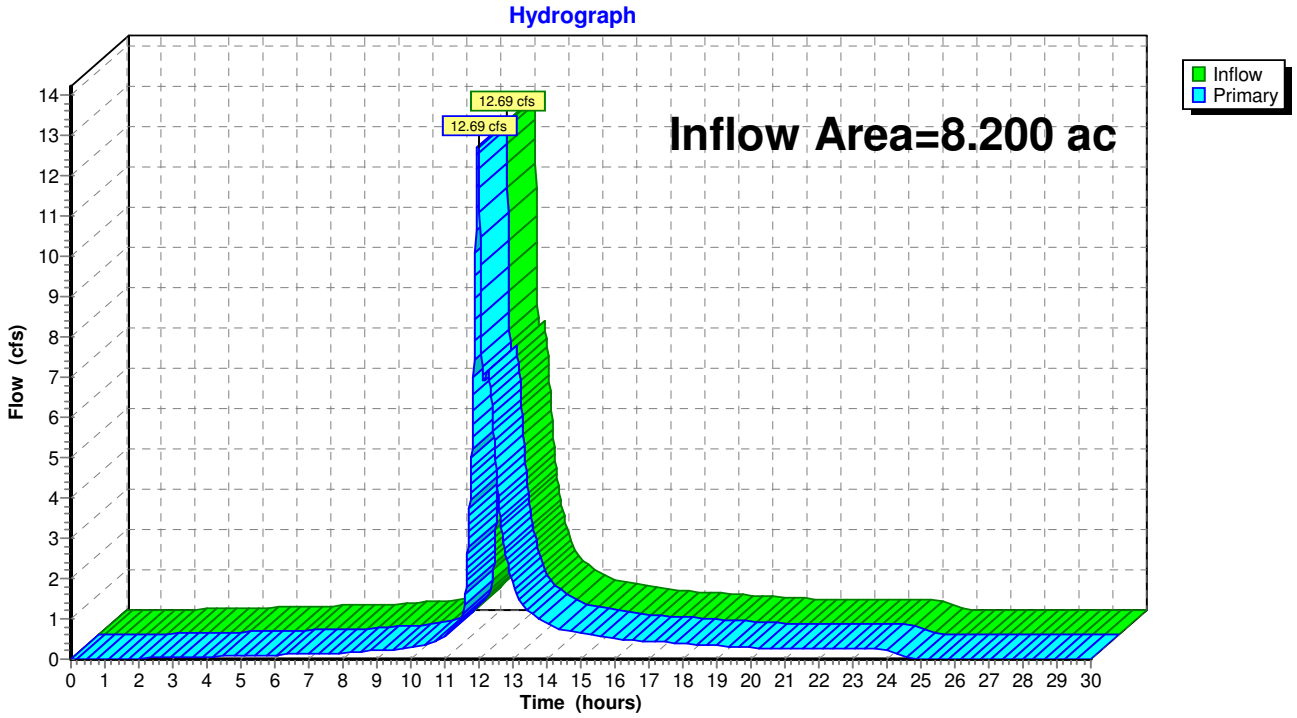
Summary for Pond 4P: Discharge to West Property

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

Inflow Area = 8.200 ac, 30.12% Impervious, Inflow Depth = 1.77" for 10-YR event
Inflow = 12.69 cfs @ 11.97 hrs, Volume= 1.208 af
Primary = 12.69 cfs @ 11.97 hrs, Volume= 1.208 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 4P: Discharge to West Property



Summary for Subcatchment 1S: North Drainage Area - Lawn Area

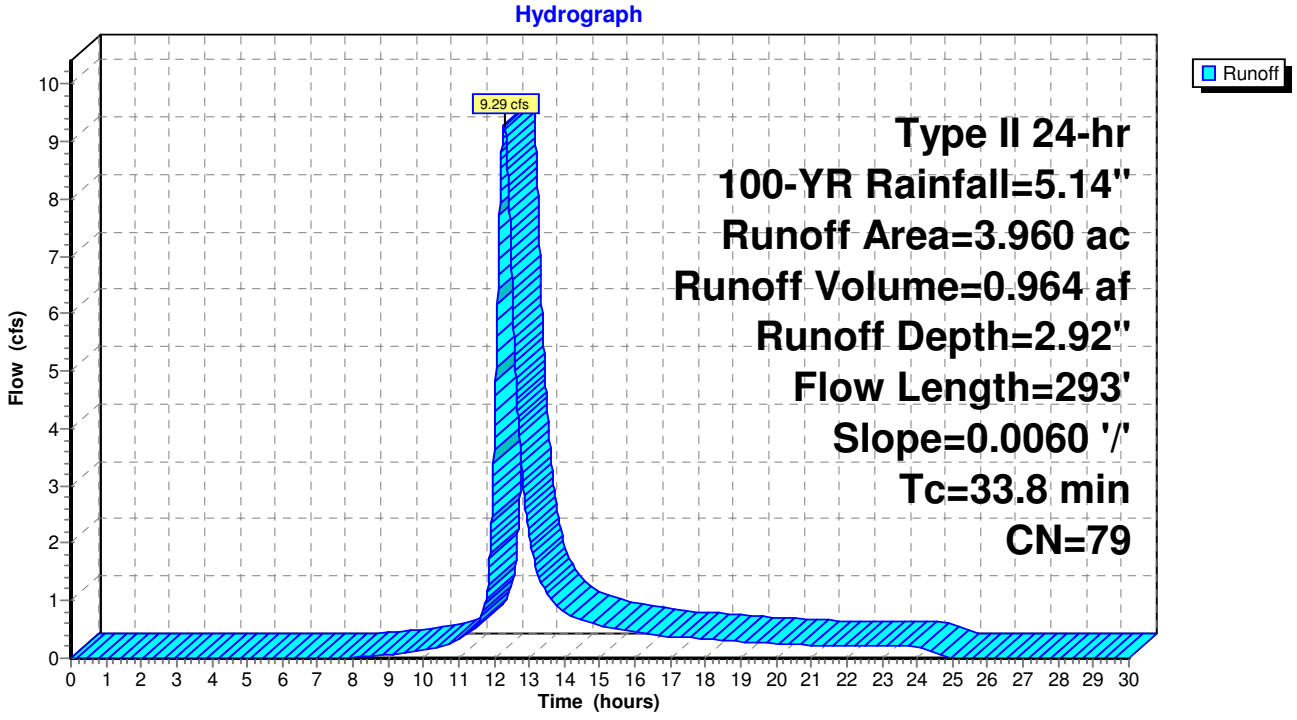
Runoff = 9.29 cfs @ 12.28 hrs, Volume= 0.964 af, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
2.660	80	>75% Grass cover, Good, HSG D
1.300	77	Woods, Good, HSG D
3.960	79	Weighted Average
3.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	100	0.0060	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
5.9	193	0.0060	0.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
33.8	293	Total			

Subcatchment 1S: North Drainage Area - Lawn Area



Summary for Subcatchment 2S: North Drainage Area - Impervious Area

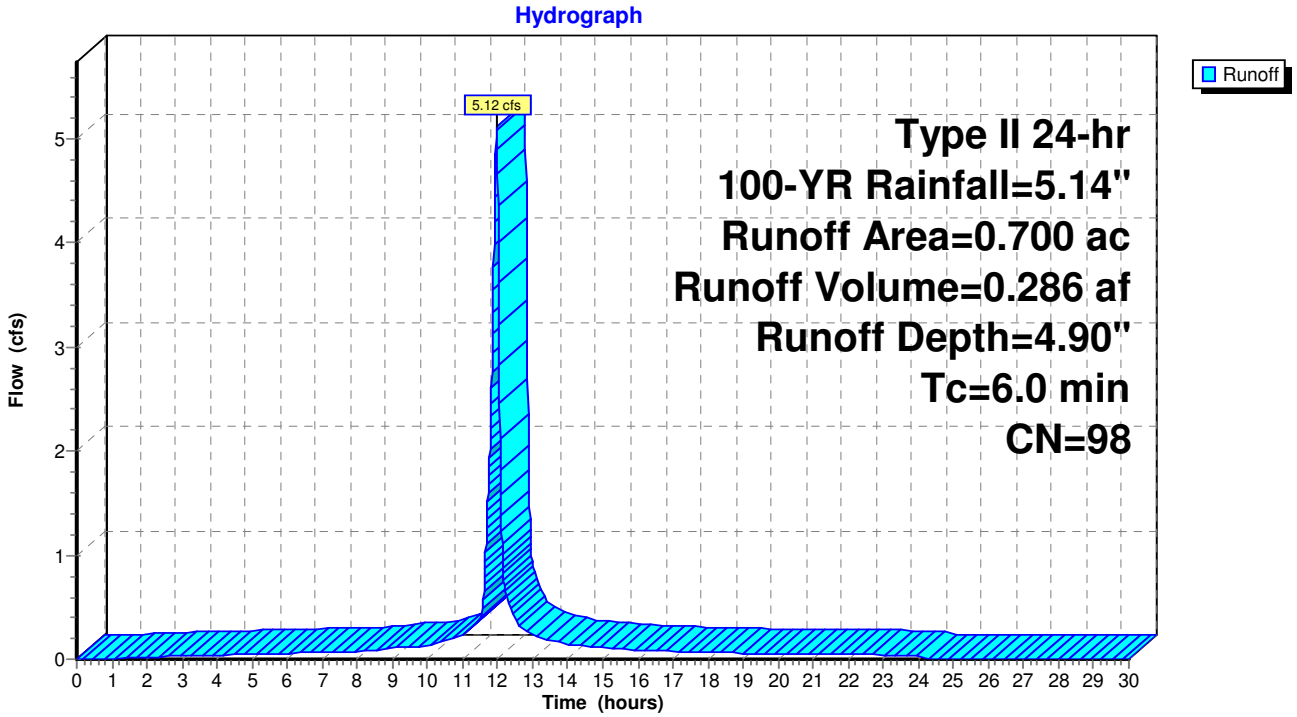
Runoff = 5.12 cfs @ 11.97 hrs, Volume= 0.286 af, Depth= 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.700	98	Paved parking, HSG D
0.700		100.00% Impervious Area

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

Subcatchment 2S: North Drainage Area - Impervious Area



Summary for Subcatchment 3S: Middle Drainage Area - Impervious Area

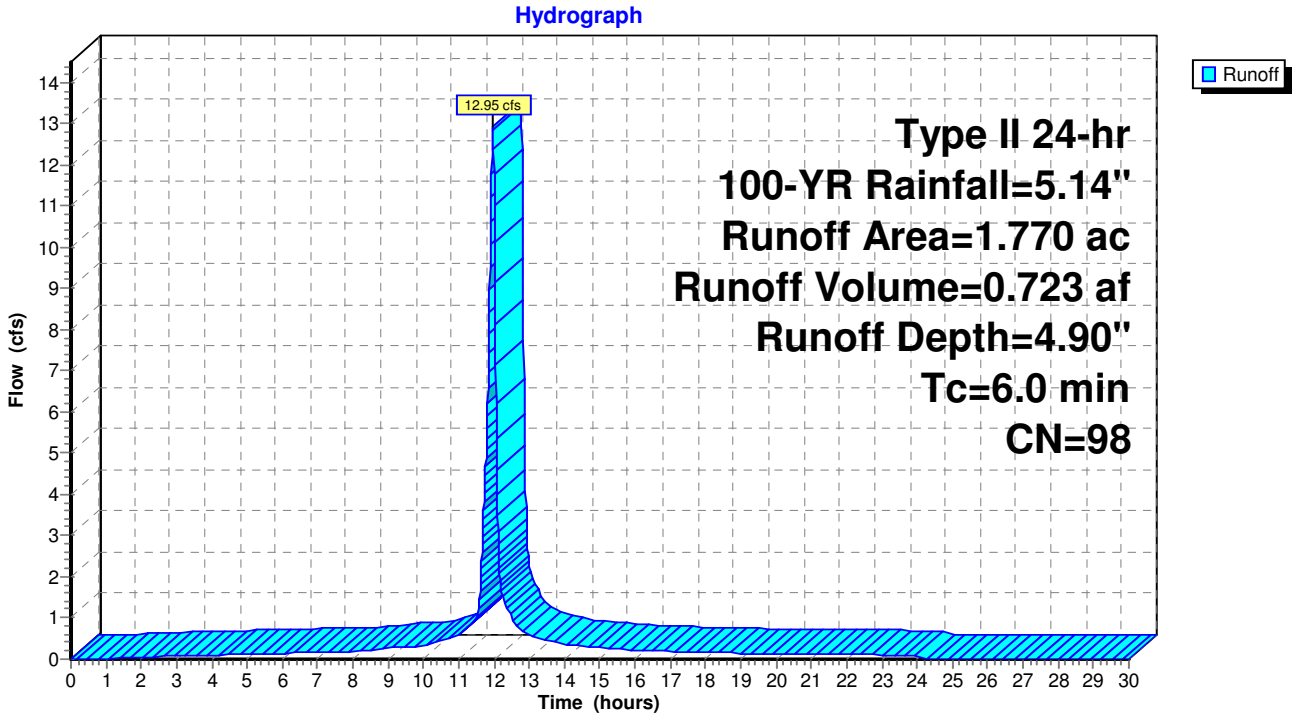
Runoff = 12.95 cfs @ 11.97 hrs, Volume= 0.723 af, Depth= 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
1.770	98	Paved parking, HSG D
1.770		100.00% Impervious Area

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

Subcatchment 3S: Middle Drainage Area - Impervious Area



Summary for Subcatchment 4S: Middle Drainage Area - Lawn Area

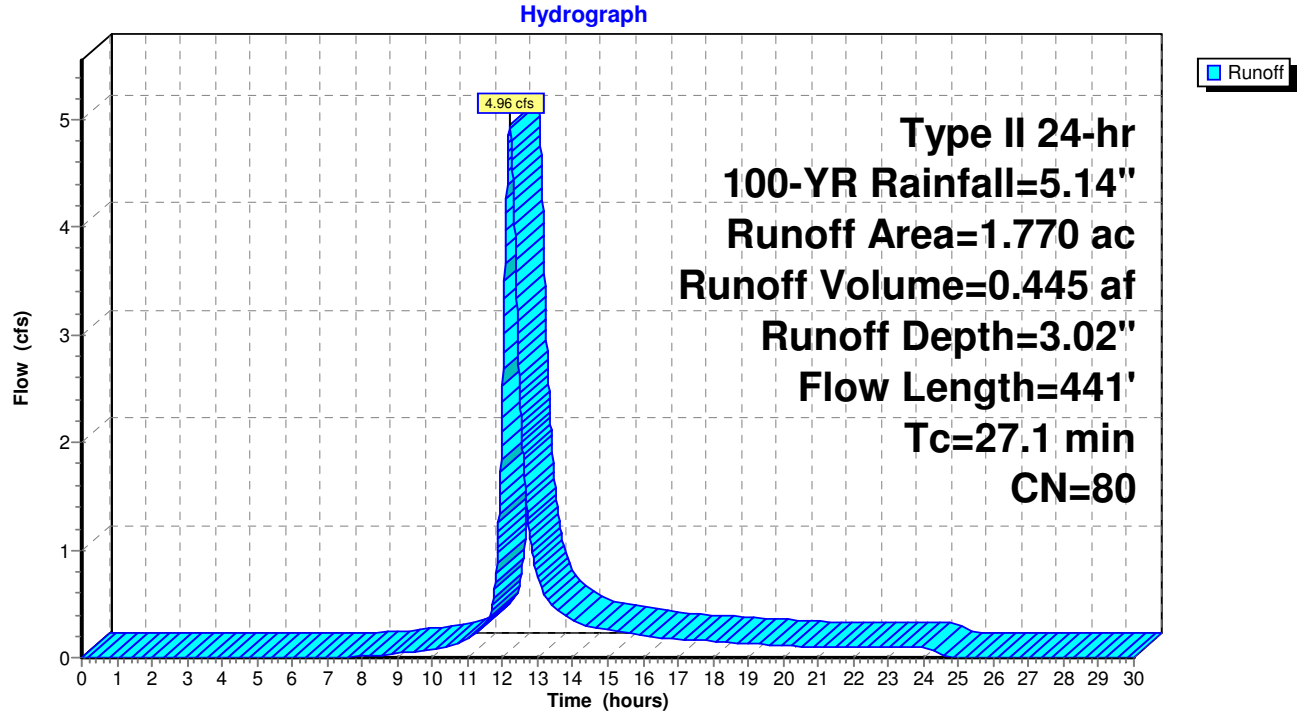
Runoff = 4.96 cfs @ 12.20 hrs, Volume= 0.445 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
1.770	80	>75% Grass cover, Good, HSG D
1.770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.9	100	0.0140	0.08		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
1.5	73	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.0	121	0.0090	0.66		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.9	79	0.0042	1.53	1.20	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.025 Corrugated metal
1.8	68	0.0080	0.63		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
27.1	441	Total			

Subcatchment 4S: Middle Drainage Area - Lawn Area



Summary for Subcatchment 5S: South Drainage Area

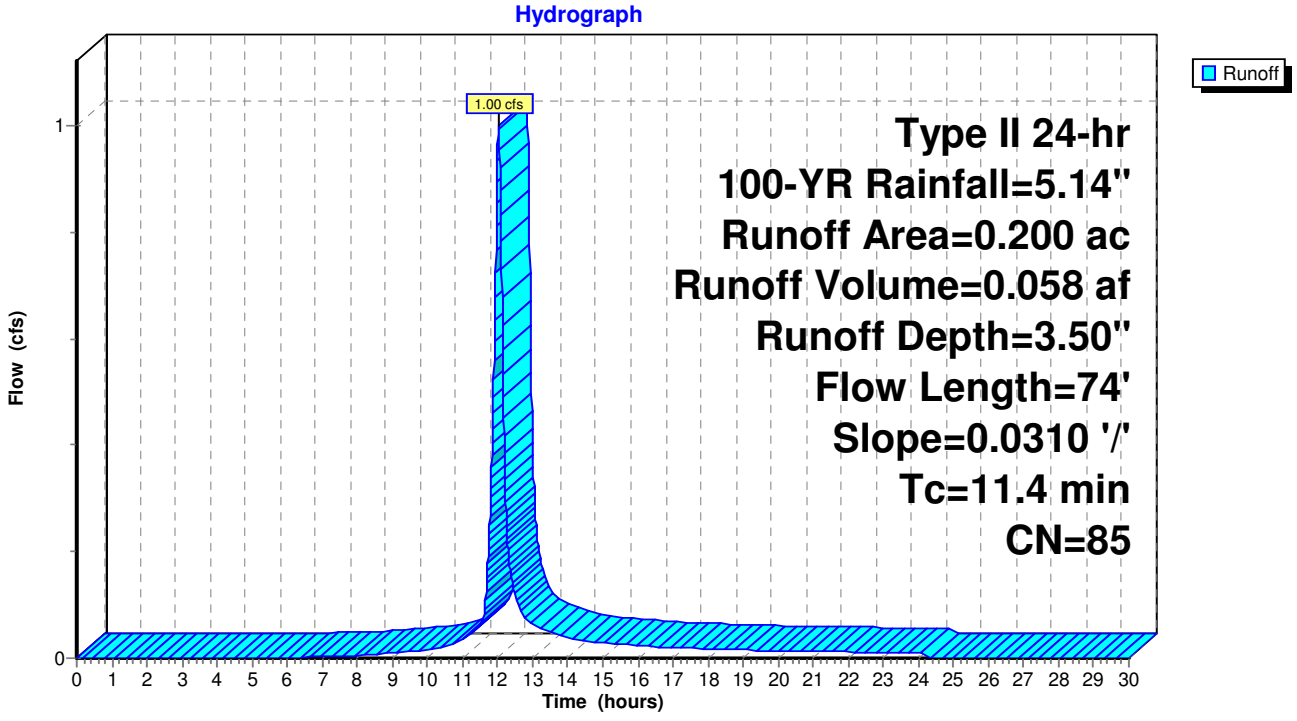
Runoff = 1.00 cfs @ 12.03 hrs, Volume= 0.058 af, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.150	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.200	85	Weighted Average
0.150		75.00% Pervious Area
0.050		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	74	0.0310	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"

Subcatchment 5S: South Drainage Area



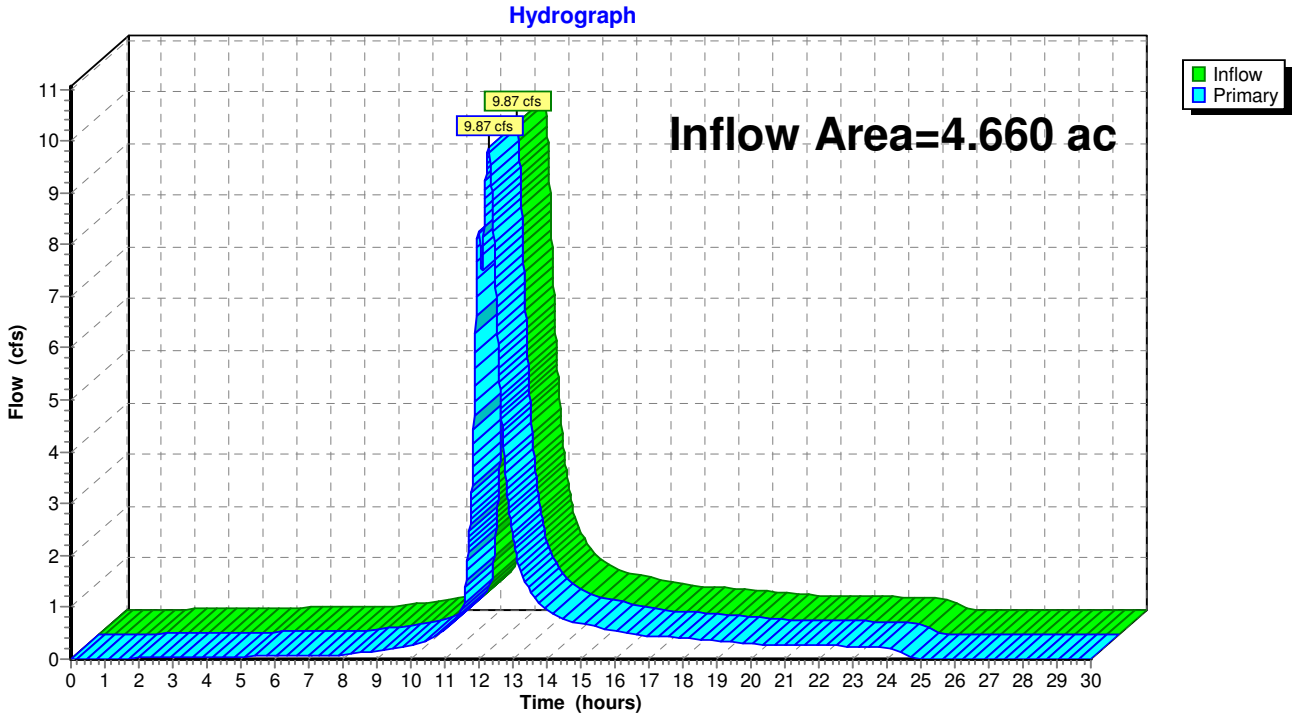
Summary for Pond 1P: Discharge from North Drainage Area

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

Inflow Area = 4.660 ac, 15.02% Impervious, Inflow Depth = 3.22" for 100-YR event
Inflow = 9.87 cfs @ 12.28 hrs, Volume= 1.250 af
Primary = 9.87 cfs @ 12.28 hrs, Volume= 1.250 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 1P: Discharge from North Drainage Area



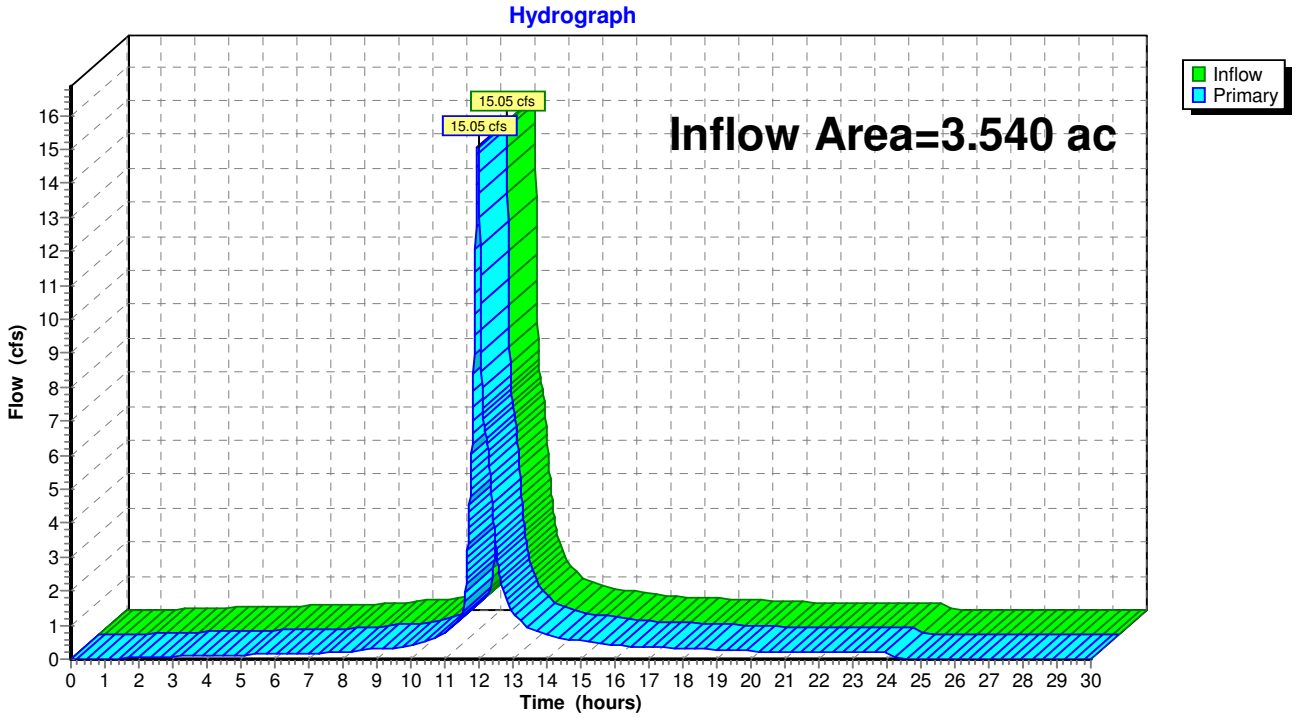
Summary for Pond 2P: Discharge from Middle Drainage Area

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

Inflow Area = 3.540 ac, 50.00% Impervious, Inflow Depth = 3.96" for 100-YR event
Inflow = 15.05 cfs @ 11.97 hrs, Volume= 1.168 af
Primary = 15.05 cfs @ 11.97 hrs, Volume= 1.168 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2

Pond 2P: Discharge from Middle Drainage Area



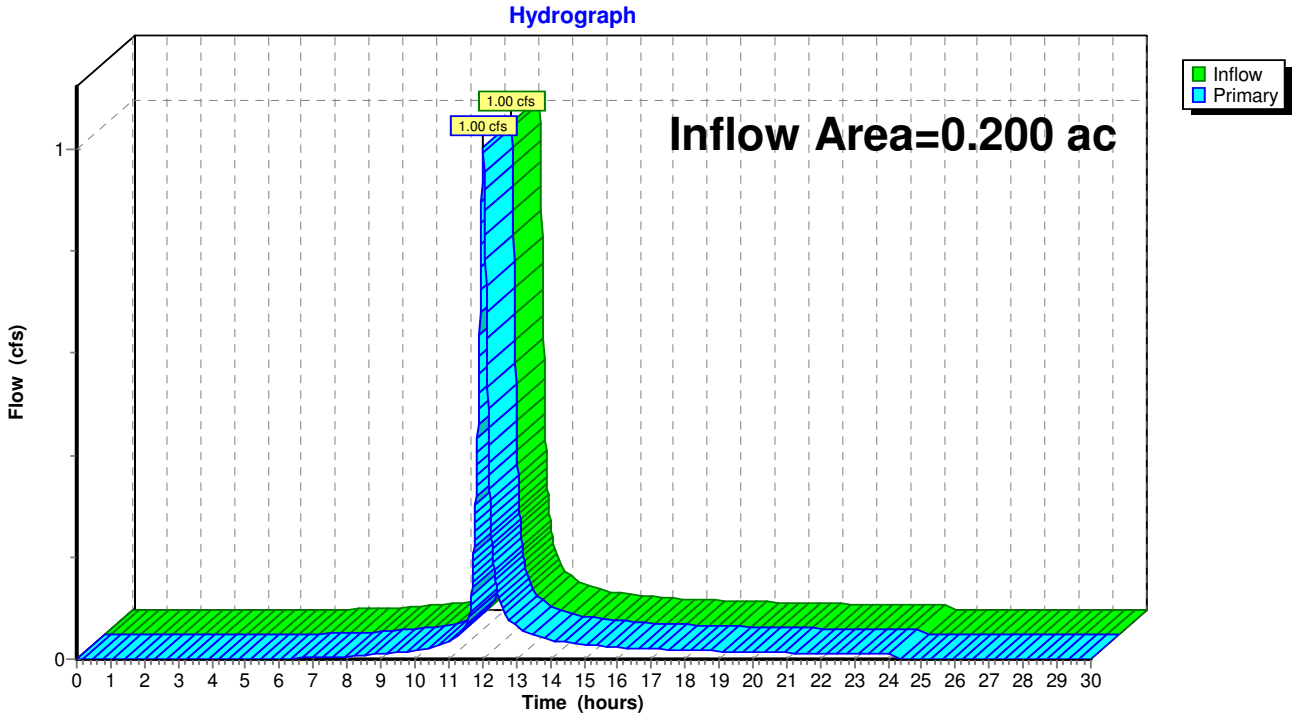
Summary for Pond 3P: Discharge to Seneca Street Drainage System

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

Inflow Area = 0.200 ac, 25.00% Impervious, Inflow Depth = 3.50" for 100-YR event
Inflow = 1.00 cfs @ 12.03 hrs, Volume= 0.058 af
Primary = 1.00 cfs @ 12.03 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 3P: Discharge to Seneca Street Drainage System



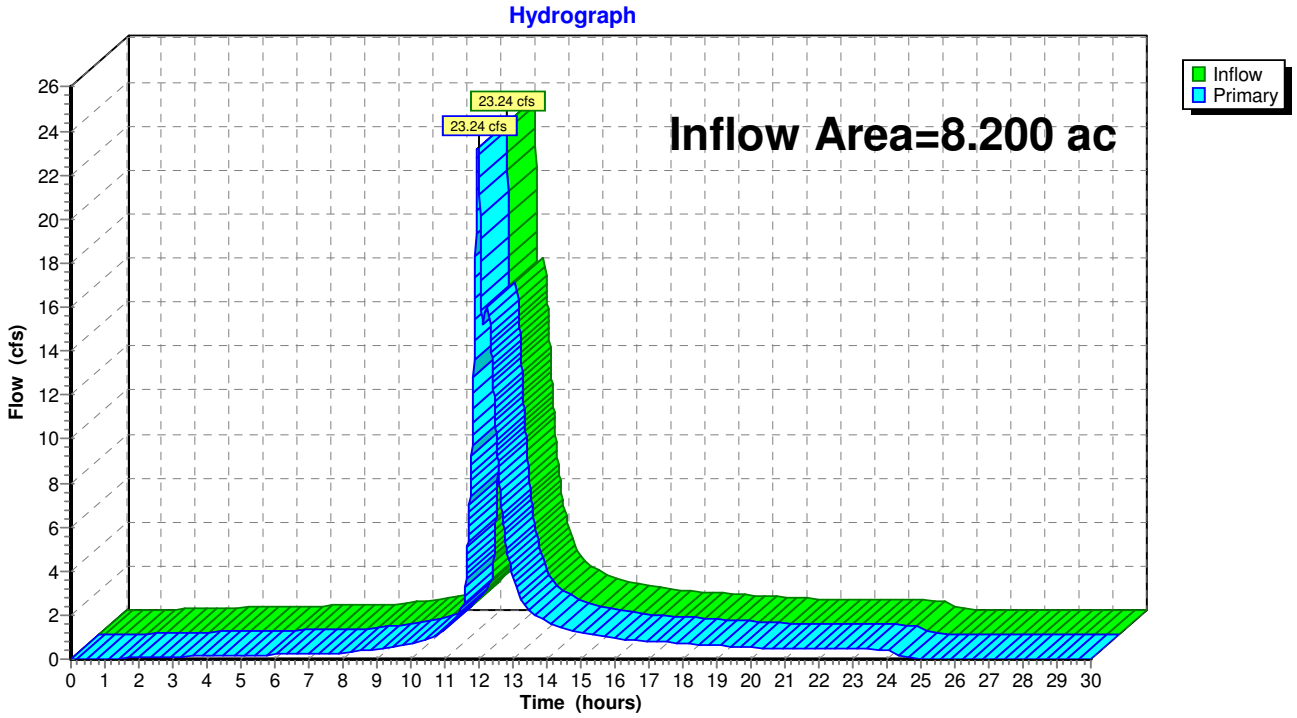
Summary for Pond 4P: Discharge to West Property

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

Inflow Area = 8.200 ac, 30.12% Impervious, Inflow Depth = 3.54" for 100-YR event
Inflow = 23.24 cfs @ 11.98 hrs, Volume= 2.418 af
Primary = 23.24 cfs @ 11.98 hrs, Volume= 2.418 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 4P: Discharge to West Property



PLAN NORTH

NORTH DRAINAGE AREA (NODES 1S & 2S)

MIDDLE DRAINAGE AREA (NODES 3S & 4S)

SOUTH DRAINAGE AREA (NODE 5S)

SENECA STREET (66.0' WIDE)

EXISTING DRAINAGE ANALYSIS MAP

LEGEND

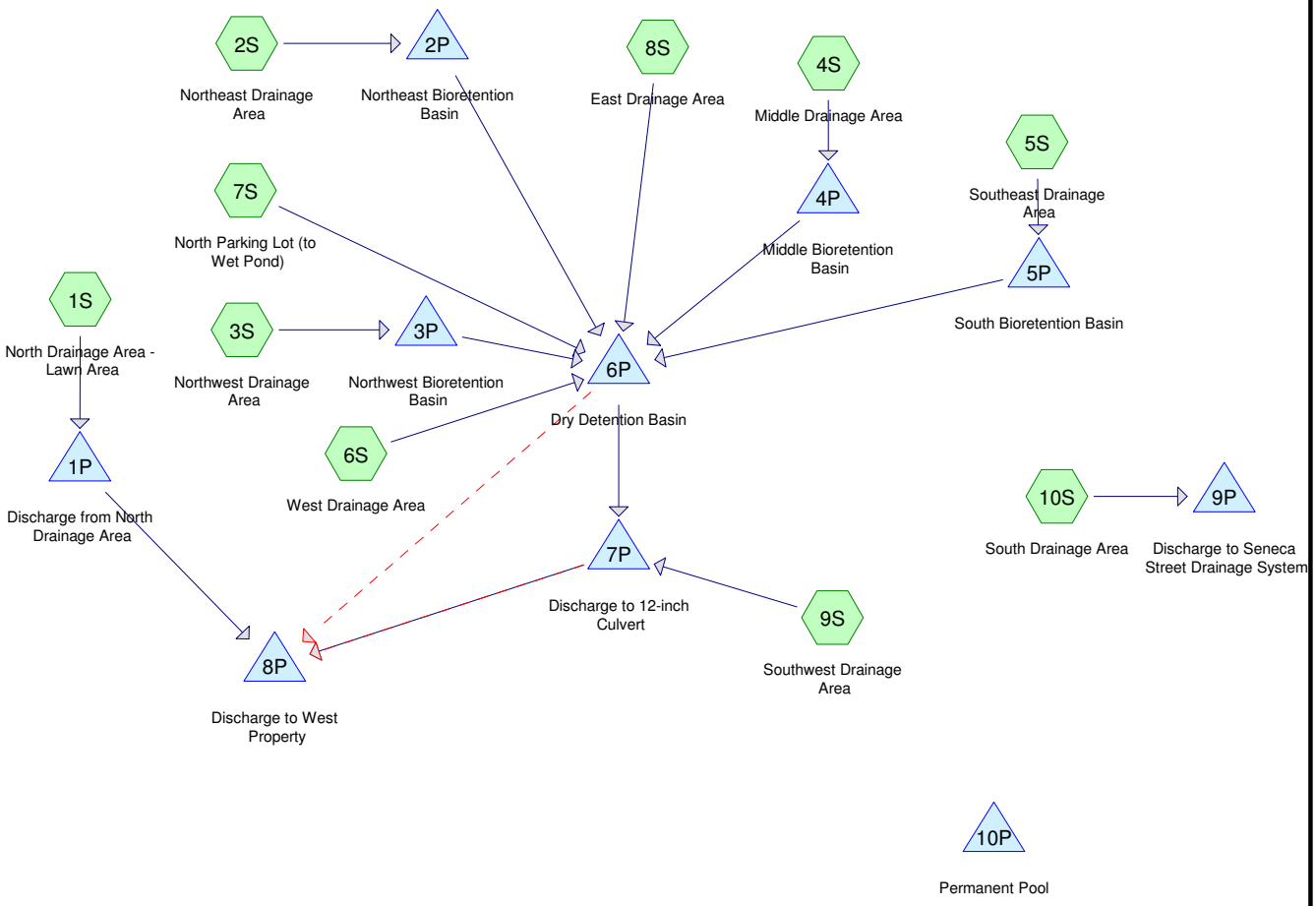
DRAINAGE AREA

IMPERVIOUS AREA

Tc PATH

80 0 80 160 Ft.

80'



Subcat Reach Pond Link

Routing Diagram for Life Church - Proposed Drainage Analysis
Prepared by C&S Companies, Printed 6/24/2020

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	Type II 24-hr		Default	24.00	1	1.80	2
2	10-YR	Type II 24-hr		Default	24.00	1	3.11	2
3	100-YR	Type II 24-hr		Default	24.00	1	5.14	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.102	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S)
4.310	98	Paved parking, HSG D (2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S)
1.000	77	Woods, Good, HSG D (1S)
8.412	**89**	**TOTAL AREA**

Summary for Subcatchment 1S: North Drainage Area - Lawn Area

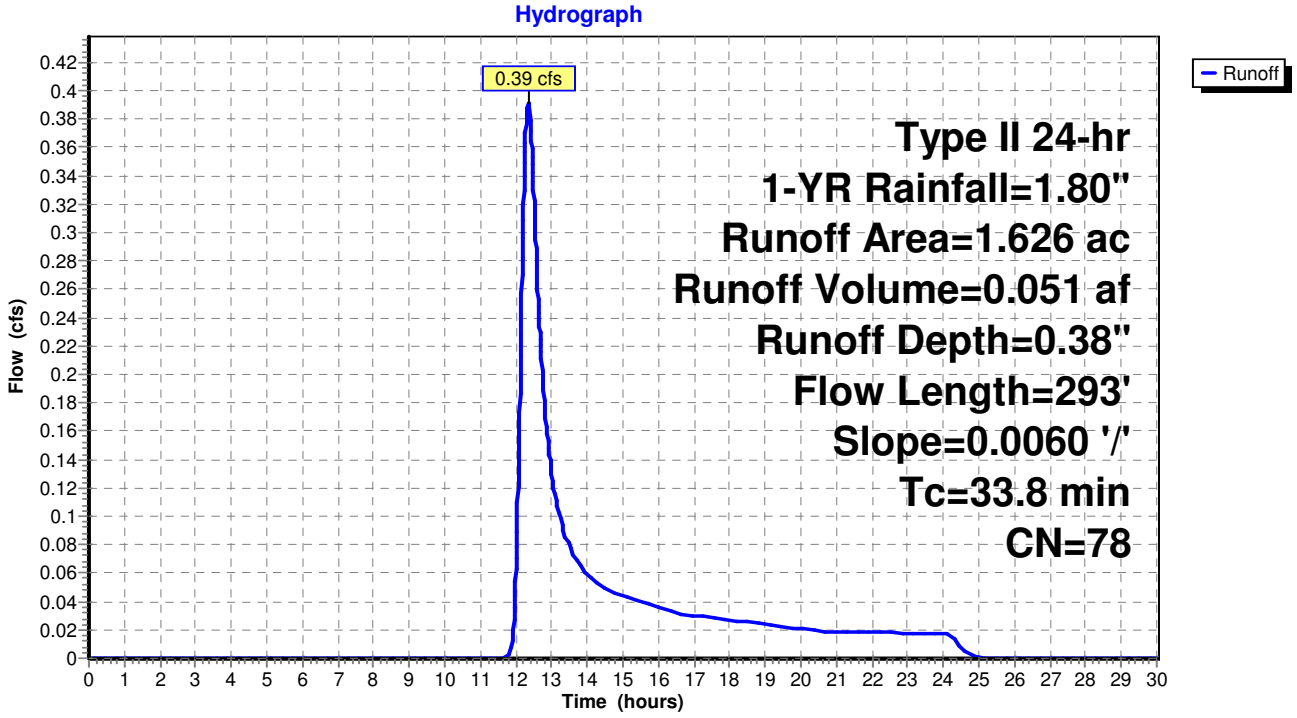
Runoff = 0.39 cfs @ 12.35 hrs, Volume= 0.051 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.626	80	>75% Grass cover, Good, HSG D
1.000	77	Woods, Good, HSG D
1.626	78	Weighted Average
1.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	100	0.0060	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
5.9	193	0.0060	0.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
33.8	293	Total			

Subcatchment 1S: North Drainage Area - Lawn Area



Summary for Subcatchment 2S: Northeast Drainage Area

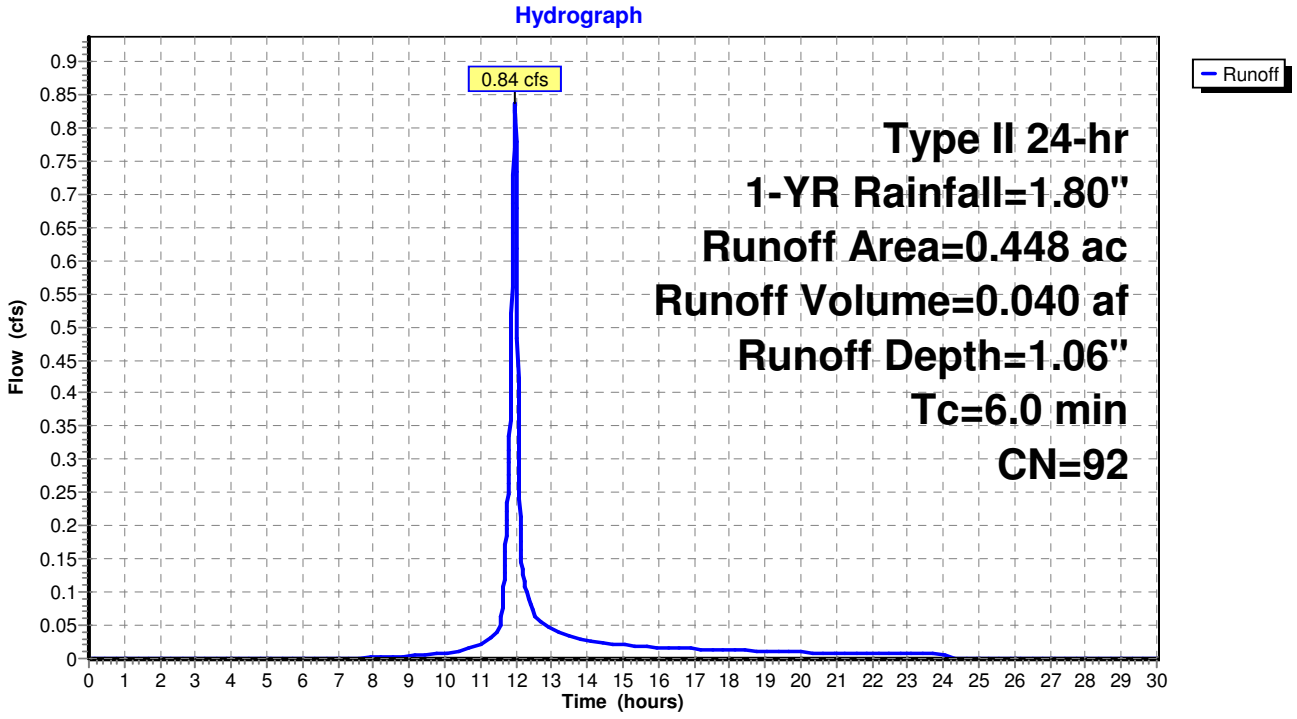
Runoff = 0.84 cfs @ 11.97 hrs, Volume= 0.040 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.306	98	Paved parking, HSG D
0.142	80	>75% Grass cover, Good, HSG D
0.448	92	Weighted Average
0.142		31.70% Pervious Area
0.306		68.30% Impervious Area

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

Subcatchment 2S: Northeast Drainage Area



Summary for Subcatchment 3S: Northwest Drainage Area

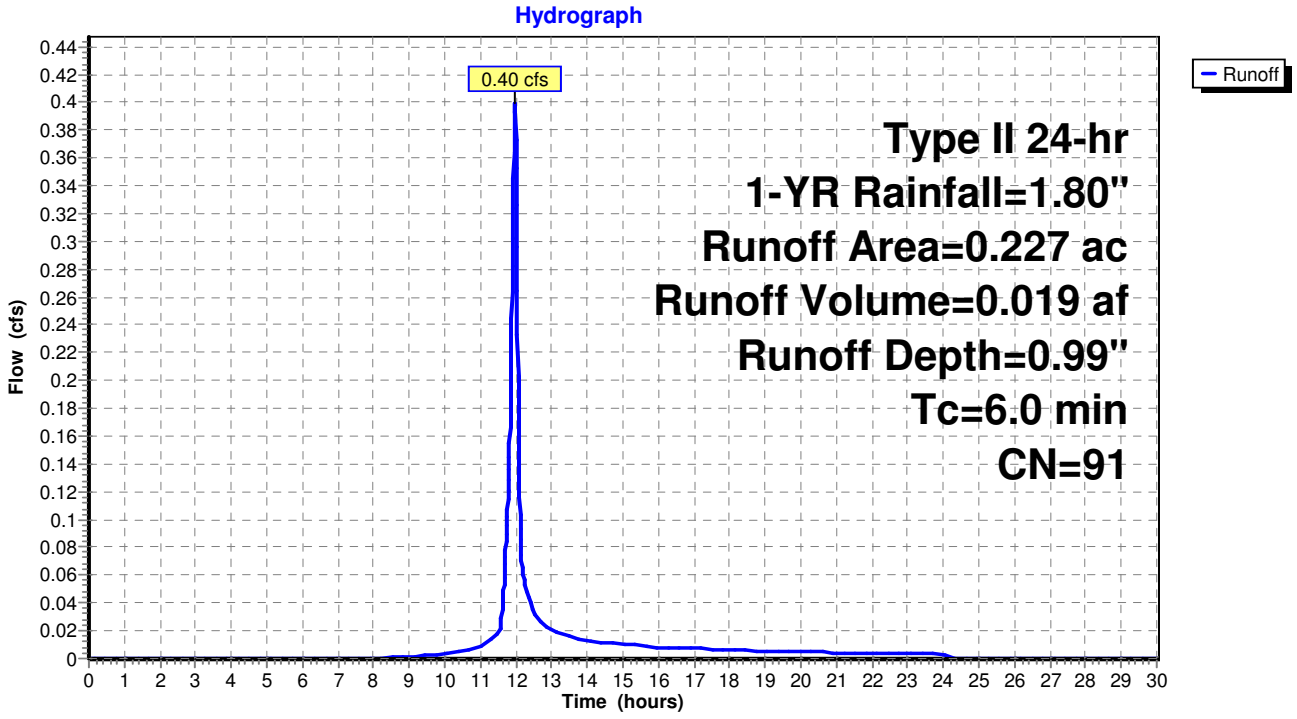
Runoff = 0.40 cfs @ 11.97 hrs, Volume= 0.019 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.133	98	Paved parking, HSG D
0.094	80	>75% Grass cover, Good, HSG D
0.227	91	Weighted Average
0.094		41.41% Pervious Area
0.133		58.59% Impervious Area

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

Subcatchment 3S: Northwest Drainage Area



Summary for Subcatchment 4S: Middle Drainage Area

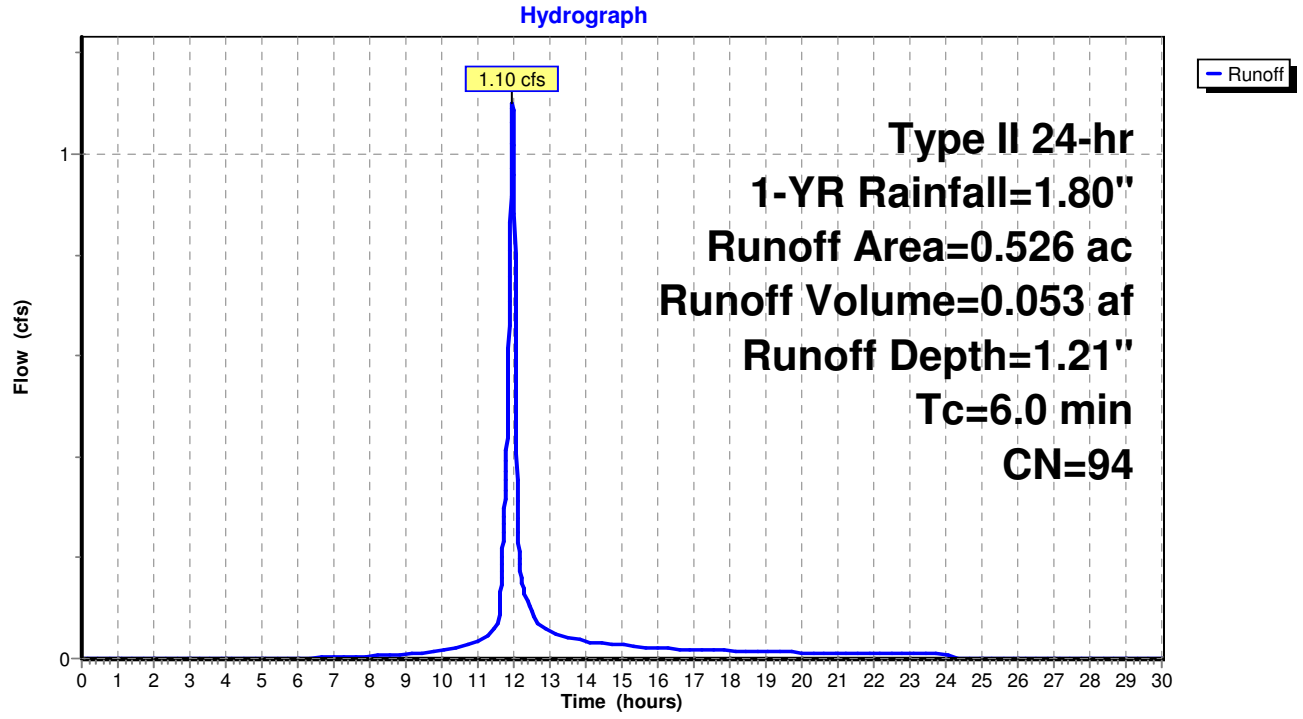
Runoff = 1.10 cfs @ 11.97 hrs, Volume= 0.053 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.406	98	Paved parking, HSG D
0.120	80	>75% Grass cover, Good, HSG D
0.526	94	Weighted Average
0.120		22.81% Pervious Area
0.406		77.19% Impervious Area

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

Subcatchment 4S: Middle Drainage Area



Summary for Subcatchment 5S: Southeast Drainage Area

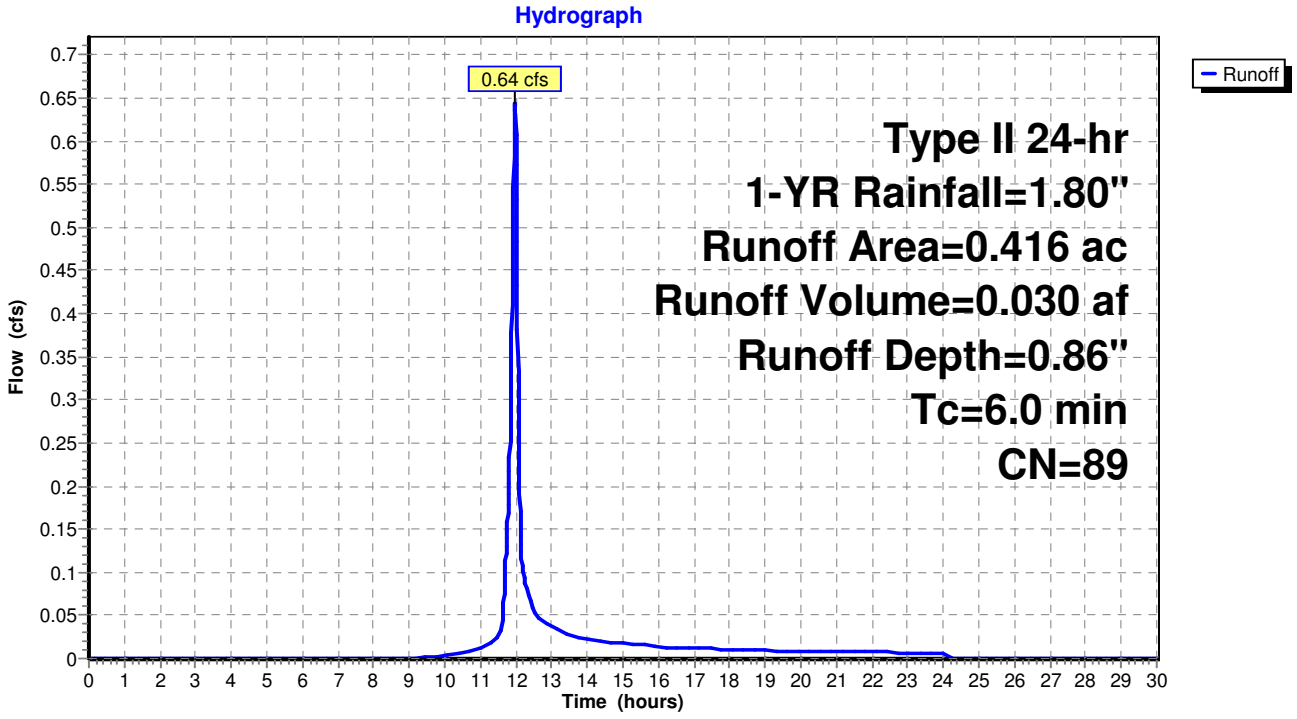
Runoff = 0.64 cfs @ 11.97 hrs, Volume= 0.030 af, Depth= 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.201	98	Paved parking, HSG D
0.215	80	>75% Grass cover, Good, HSG D
0.416	89	Weighted Average
0.215		51.68% Pervious Area
0.201		48.32% Impervious Area

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

Subcatchment 5S: Southeast Drainage Area



Summary for Subcatchment 6S: West Drainage Area

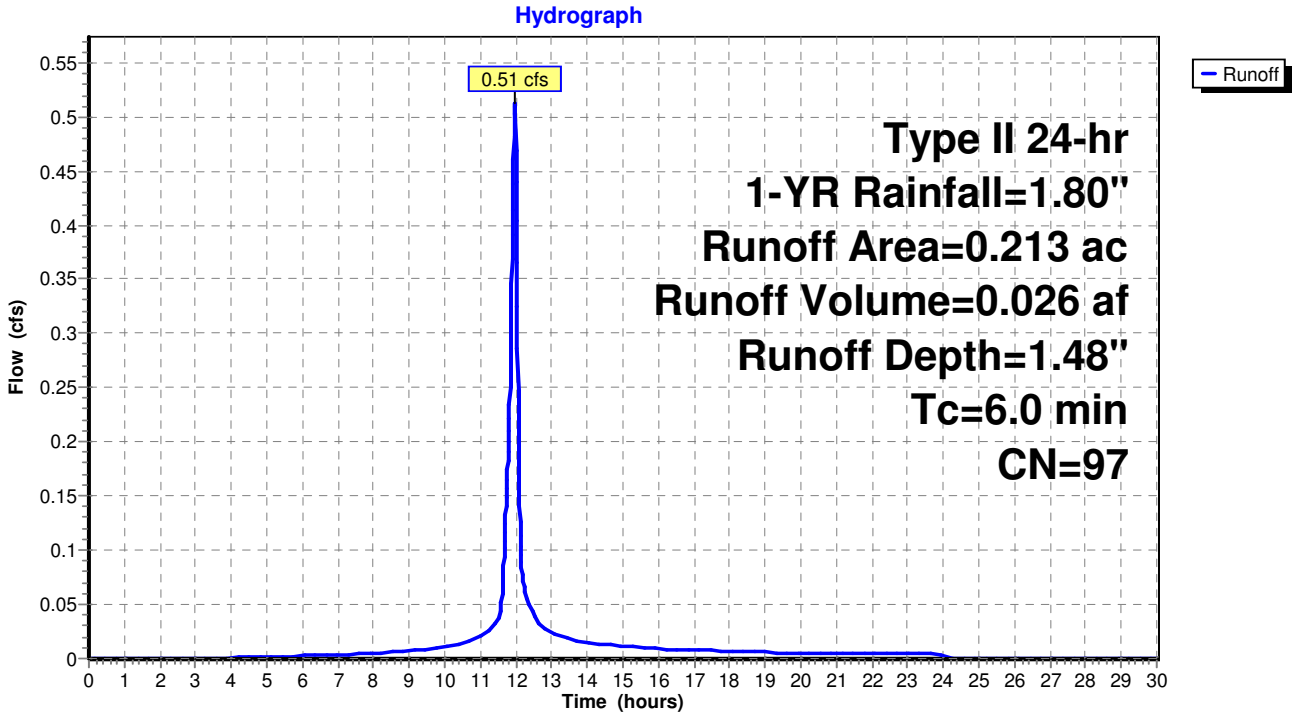
Runoff = 0.51 cfs @ 11.97 hrs, Volume= 0.026 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.196	98	Paved parking, HSG D
0.017	80	>75% Grass cover, Good, HSG D
0.213	97	Weighted Average
0.017		7.98% Pervious Area
0.196		92.02% Impervious Area

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

Subcatchment 6S: West Drainage Area



Summary for Subcatchment 7S: North Parking Lot (to Wet Pond)

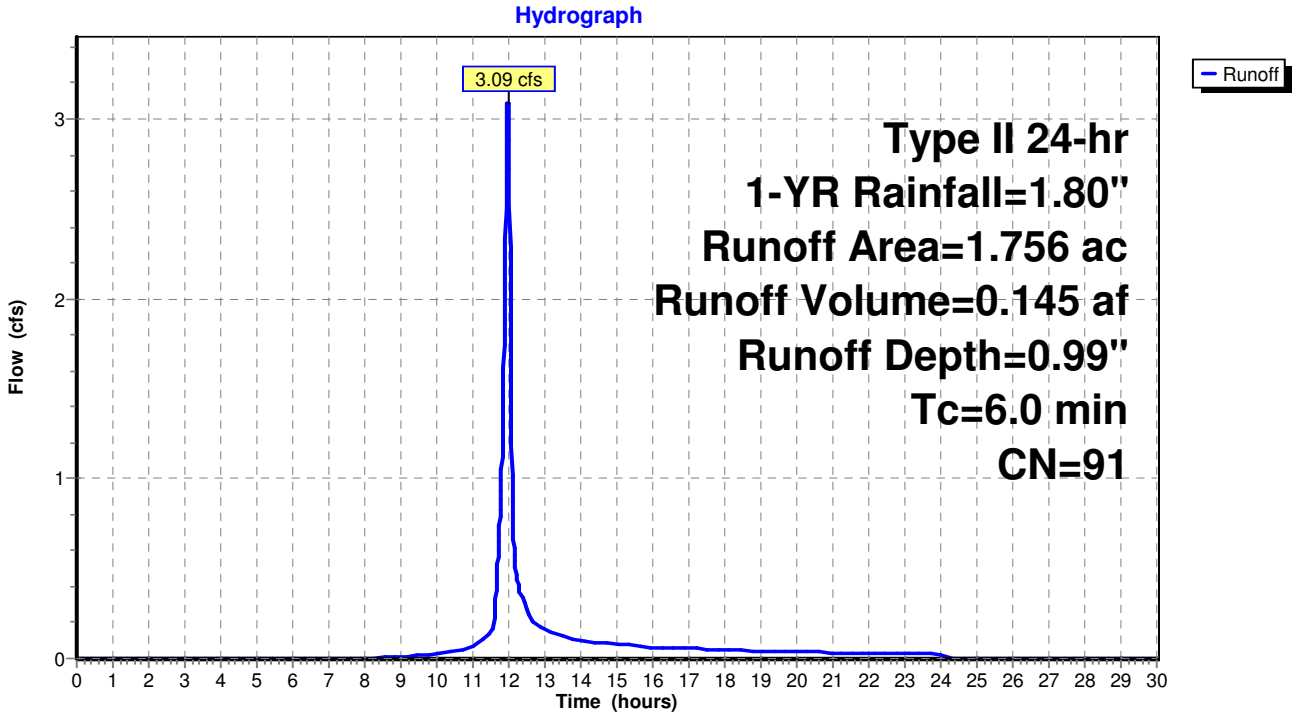
Runoff = 3.09 cfs @ 11.97 hrs, Volume= 0.145 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
1.074	98	Paved parking, HSG D
0.682	80	>75% Grass cover, Good, HSG D
1.756	91	Weighted Average
0.682		38.84% Pervious Area
1.074		61.16% Impervious Area

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

Subcatchment 7S: North Parking Lot (to Wet Pond)



Summary for Subcatchment 8S: East Drainage Area

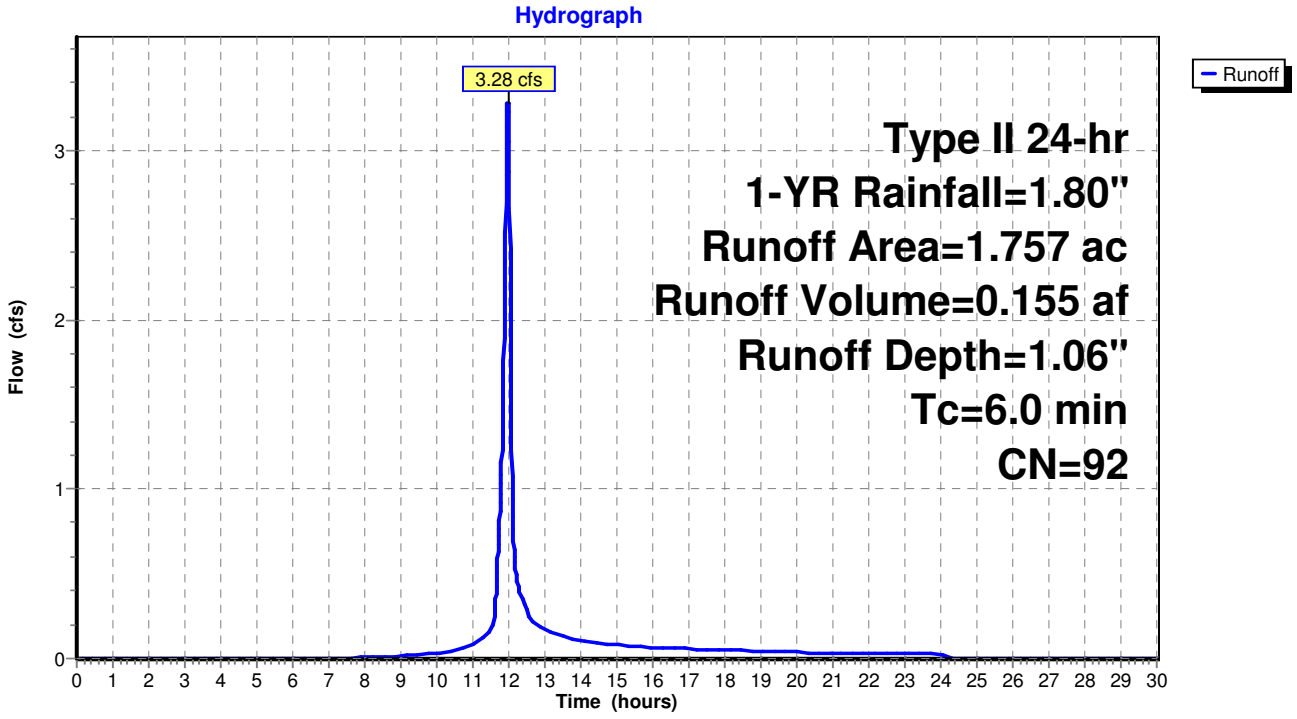
Runoff = 3.28 cfs @ 11.97 hrs, Volume= 0.155 af, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
1.198	98	Paved parking, HSG D
0.559	80	>75% Grass cover, Good, HSG D
1.757	92	Weighted Average
0.559		31.82% Pervious Area
1.198		68.18% Impervious Area

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

Subcatchment 8S: East Drainage Area



Summary for Subcatchment 9S: Southwest Drainage Area

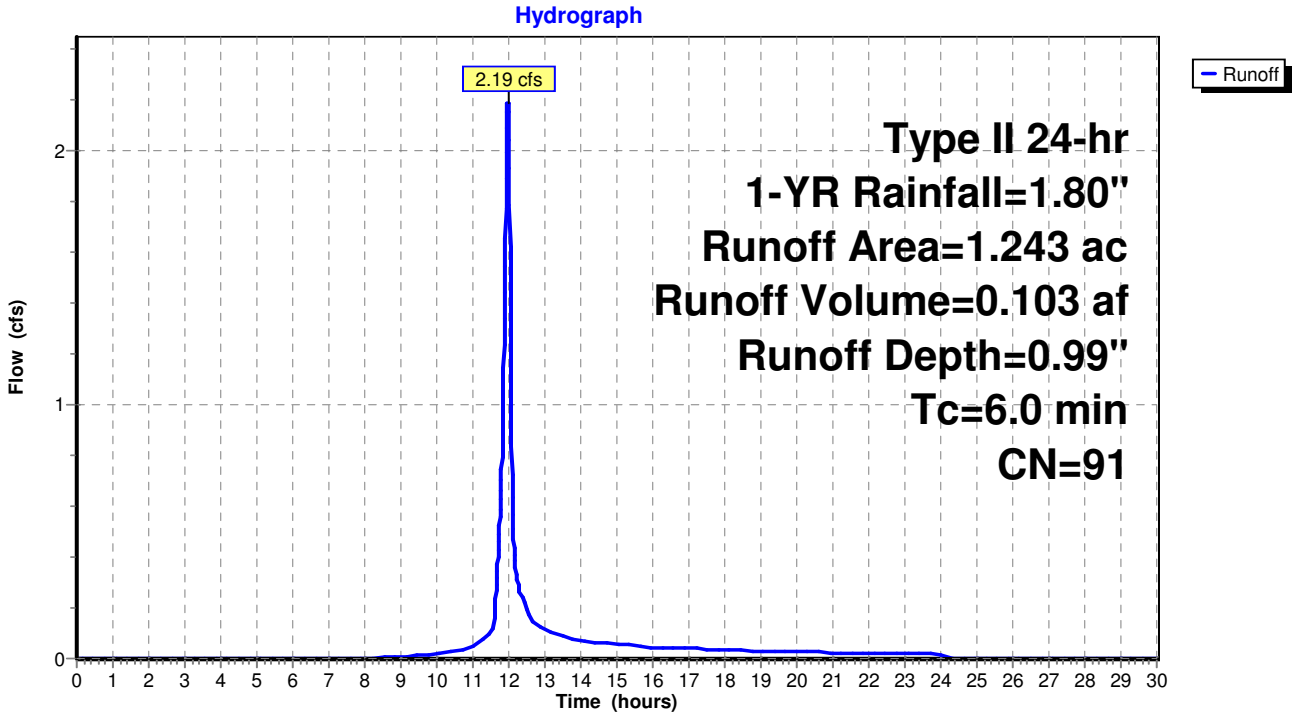
Runoff = 2.19 cfs @ 11.97 hrs, Volume= 0.103 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.746	98	Paved parking, HSG D
0.497	80	>75% Grass cover, Good, HSG D
1.243	91	Weighted Average
0.497		39.98% Pervious Area
0.746		60.02% Impervious Area

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

Subcatchment 9S: Southwest Drainage Area



Summary for Subcatchment 10S: South Drainage Area

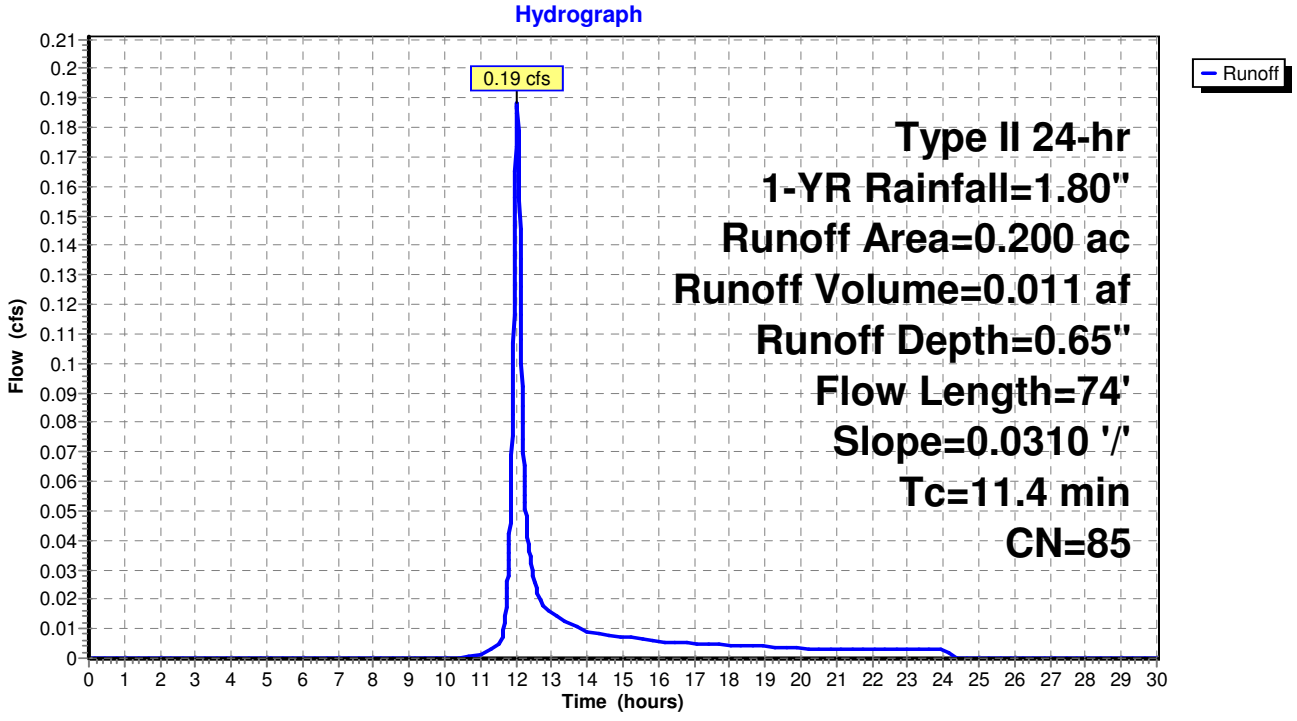
Runoff = 0.19 cfs @ 12.04 hrs, Volume= 0.011 af, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-YR Rainfall=1.80"

Area (ac)	CN	Description
0.150	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.200	85	Weighted Average
0.150		75.00% Pervious Area
0.050		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	74	0.0310	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"

Subcatchment 10S: South Drainage Area



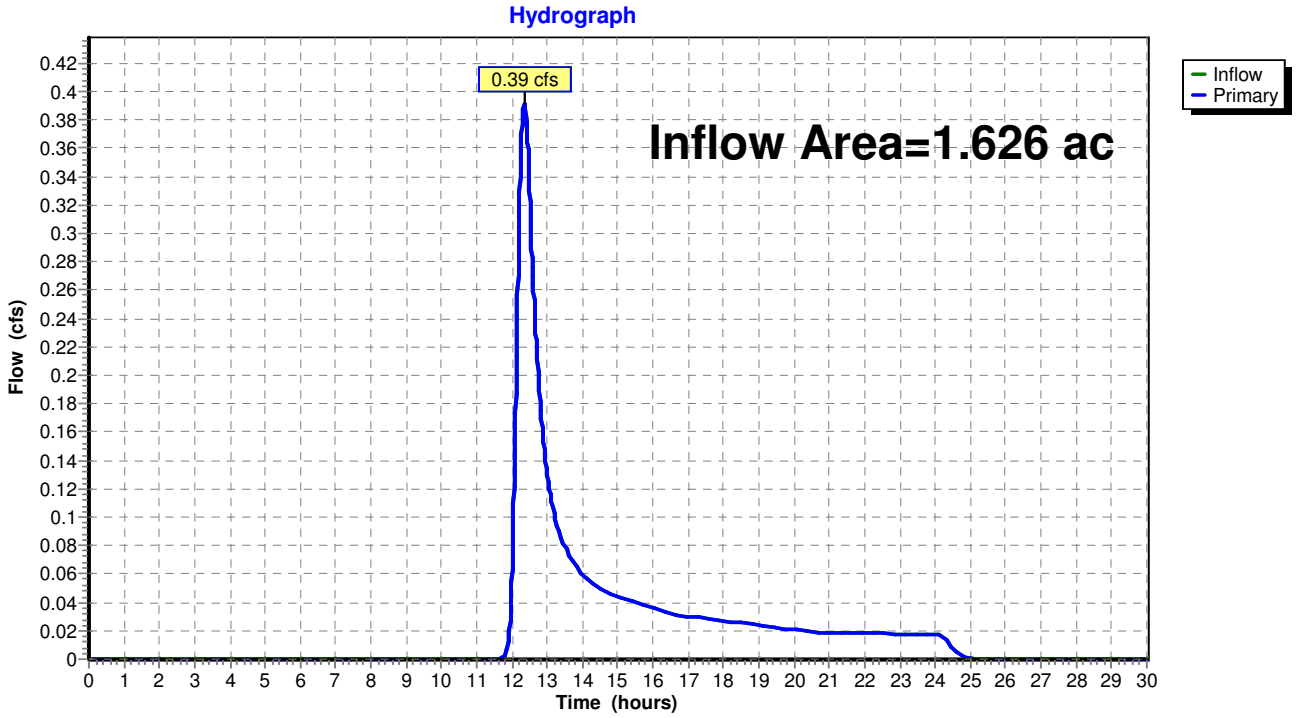
Summary for Pond 1P: Discharge from North Drainage Area

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

Inflow Area = 1.626 ac, 0.00% Impervious, Inflow Depth = 0.38" for 1-YR event
Inflow = 0.39 cfs @ 12.35 hrs, Volume= 0.051 af
Primary = 0.39 cfs @ 12.35 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 1P: Discharge from North Drainage Area



Summary for Pond 2P: Northeast Bioretention Basin

Inflow Area = 0.448 ac, 68.30% Impervious, Inflow Depth = 1.06" for 1-YR event
Inflow = 0.84 cfs @ 11.97 hrs, Volume= 0.040 af
Outflow = 0.55 cfs @ 12.04 hrs, Volume= 0.026 af, Atten= 34%, Lag= 4.1 min
Primary = 0.55 cfs @ 12.04 hrs, Volume= 0.026 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.58' @ 12.04 hrs Surf.Area= 1,388 sf Storage= 706 cf

Plug-Flow detention time= 198.1 min calculated for 0.026 af (67% of inflow)
Center-of-Mass det. time= 93.5 min (910.7 - 817.2)

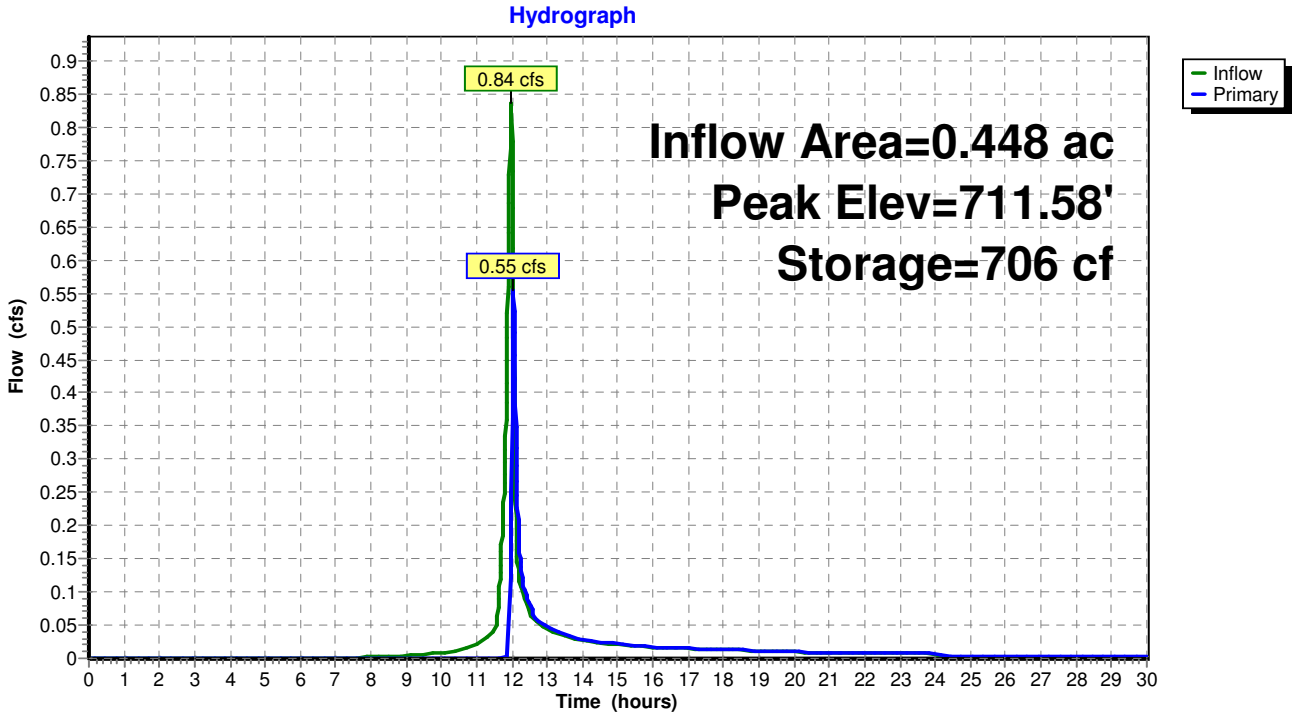
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	2,312 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	1,070	133.0	0	0	1,070
712.00	1,649	158.0	1,349	1,349	1,667
712.50	2,218	180.0	963	2,312	2,265

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 170.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 1,070 sf

Primary OutFlow Max=0.55 cfs @ 12.04 hrs HW=711.58' (Free Discharge)
└**1=Culvert** (Passes 0.55 cfs of 3.57 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 0.55 cfs @ 0.90 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 2.27 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 2P: Northeast Bioretention Basin



Summary for Pond 3P: Northwest Bioretention Basin

Inflow Area = 0.227 ac, 58.59% Impervious, Inflow Depth = 0.99" for 1-YR event
Inflow = 0.40 cfs @ 11.97 hrs, Volume= 0.019 af
Outflow = 0.24 cfs @ 12.05 hrs, Volume= 0.012 af, Atten= 41%, Lag= 4.6 min
Primary = 0.24 cfs @ 12.05 hrs, Volume= 0.012 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 712.04' @ 12.05 hrs Surf.Area= 783 sf Storage= 342 cf

Plug-Flow detention time= 228.5 min calculated for 0.012 af (66% of inflow)
Center-of-Mass det. time= 121.2 min (944.0 - 822.8)

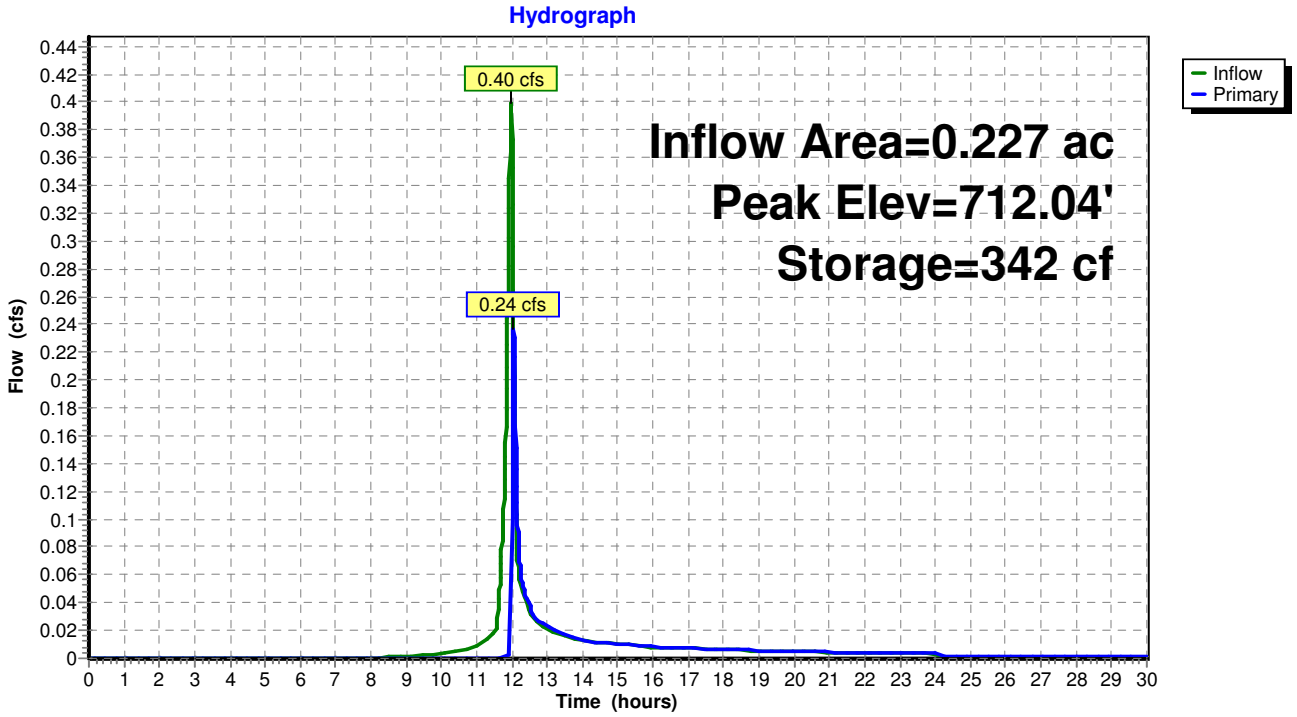
Volume	Invert	Avail.Storage	Storage Description
#1	711.50'	1,373 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.50	487	131.0	0	0	487
712.00	759	144.0	309	309	780
713.00	1,402	171.0	1,064	1,373	1,475

Device	Routing	Invert	Outlet Devices
#1	Primary	708.75'	**12.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.75' / 708.25' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	712.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.75'	**8.0" Round Underdrain** L= 51.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.75' / 708.75' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.50'	**0.250 in/hr Exfiltration over Surface area above 711.50'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 487 sf

Primary OutFlow Max=0.23 cfs @ 12.05 hrs HW=712.04' (Free Discharge)
└**1=Culvert** (Passes 0.23 cfs of 4.99 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 0.23 cfs @ 0.68 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 2.11 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 3P: Northwest Bioretention Basin



Summary for Pond 4P: Middle Bioretention Basin

Inflow Area = 0.526 ac, 77.19% Impervious, Inflow Depth = 1.21" for 1-YR event
Inflow = 1.10 cfs @ 11.97 hrs, Volume= 0.053 af
Outflow = 0.37 cfs @ 12.09 hrs, Volume= 0.031 af, Atten= 67%, Lag= 7.1 min
Primary = 0.37 cfs @ 12.09 hrs, Volume= 0.031 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.56' @ 12.09 hrs Surf.Area= 2,386 sf Storage= 1,162 cf

Plug-Flow detention time= 244.5 min calculated for 0.031 af (58% of inflow)
Center-of-Mass det. time= 135.8 min (940.5 - 804.6)

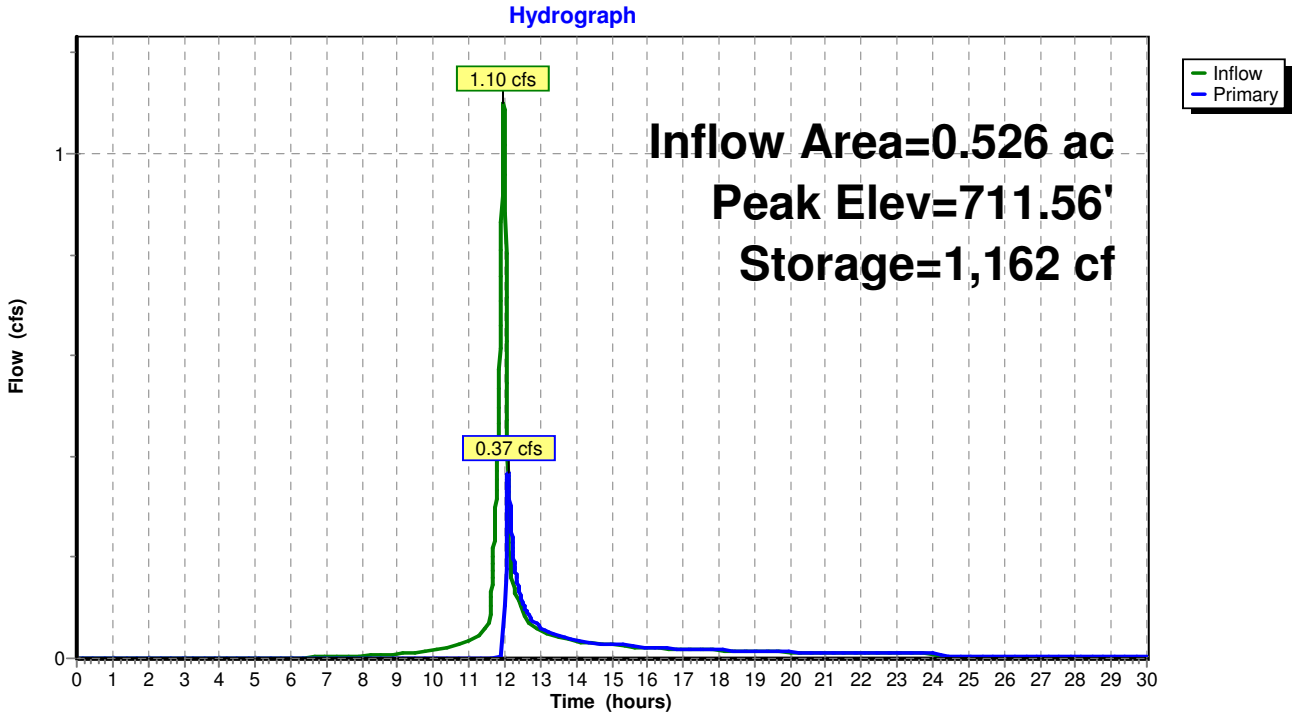
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	3,947 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	1,795	362.0	0	0	1,795
712.00	2,915	400.0	2,332	2,332	4,131
712.50	3,555	418.0	1,615	3,947	5,320

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 144.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 1,795 sf

Primary OutFlow Max=0.37 cfs @ 12.09 hrs HW=711.56' (Free Discharge)
└**1=Culvert** (Passes 0.37 cfs of 4.84 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 0.36 cfs @ 0.78 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 1.46 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 4P: Middle Bioretention Basin



Summary for Pond 5P: South Bioretention Basin

Inflow Area = 0.416 ac, 48.32% Impervious, Inflow Depth = 0.86" for 1-YR event
Inflow = 0.64 cfs @ 11.97 hrs, Volume= 0.030 af
Outflow = 0.36 cfs @ 12.05 hrs, Volume= 0.020 af, Atten= 44%, Lag= 4.8 min
Primary = 0.36 cfs @ 12.05 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.56' @ 12.05 hrs Surf.Area= 1,088 sf Storage= 512 cf

Plug-Flow detention time= 208.7 min calculated for 0.020 af (68% of inflow)
Center-of-Mass det. time= 100.4 min (933.5 - 833.1)

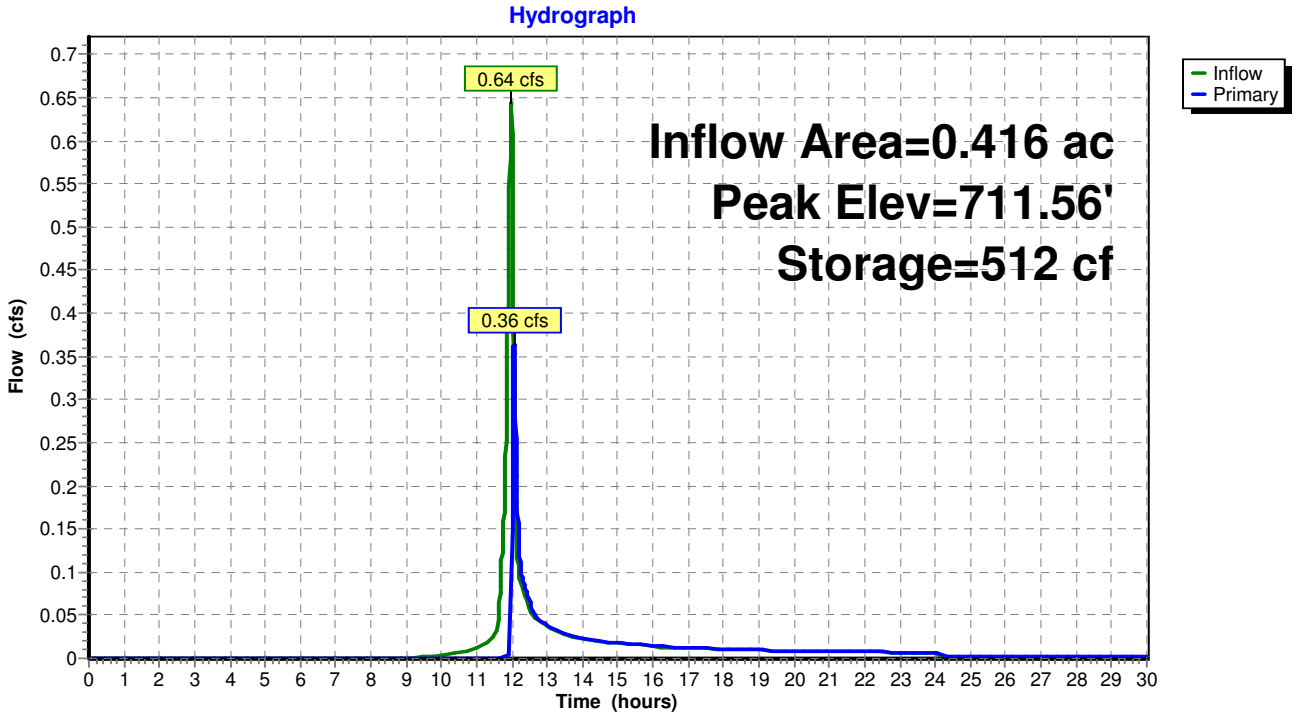
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	1,834 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	760	184.0	0	0	760
712.00	1,390	209.0	1,059	1,059	1,566
712.50	1,716	221.0	775	1,834	1,991

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 760 sf

Primary OutFlow Max=0.36 cfs @ 12.05 hrs HW=711.56' (Free Discharge)
└**1=Culvert** (Passes 0.36 cfs of 4.64 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 0.36 cfs @ 0.78 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 1.95 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 5P: South Bioretention Basin



Summary for Pond 6P: Dry Detention Basin

[79] Warning: Submerged Pond 2P Primary device # 1 by 0.69'
[79] Warning: Submerged Pond 3P Primary device # 1 INLET by 0.19'
[79] Warning: Submerged Pond 4P Primary device # 1 by 0.69'
[79] Warning: Submerged Pond 5P Primary device # 1 by 0.69'

Inflow Area = 5.343 ac, 65.77% Impervious, Inflow Depth > 0.94" for 1-YR event
Inflow = 6.98 cfs @ 11.98 hrs, Volume= 0.416 af
Outflow = 0.72 cfs @ 12.61 hrs, Volume= 0.377 af, Atten= 90%, Lag= 37.7 min
Primary = 0.72 cfs @ 12.61 hrs, Volume= 0.377 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 708.94' @ 12.61 hrs Surf.Area= 13,145 sf Storage= 8,430 cf

Plug-Flow detention time= 226.7 min calculated for 0.377 af (91% of inflow)
Center-of-Mass det. time= 174.4 min (1,015.7 - 841.3)

Volume	Invert	Avail.Storage	Storage Description
#1	708.25'	48,387 cf	**Dry Detention Basin (Irregular)** Listed below (Recalc)
#2	708.25'	939 cf	**12.0" Round 12" Diameter Pipe Storage** L= 1,195.0'
#3	708.25'	1,582 cf	**18.0" Round 18" Diameter Pipe Storage** L= 895.0'
		50,907 cf	Total Available Storage

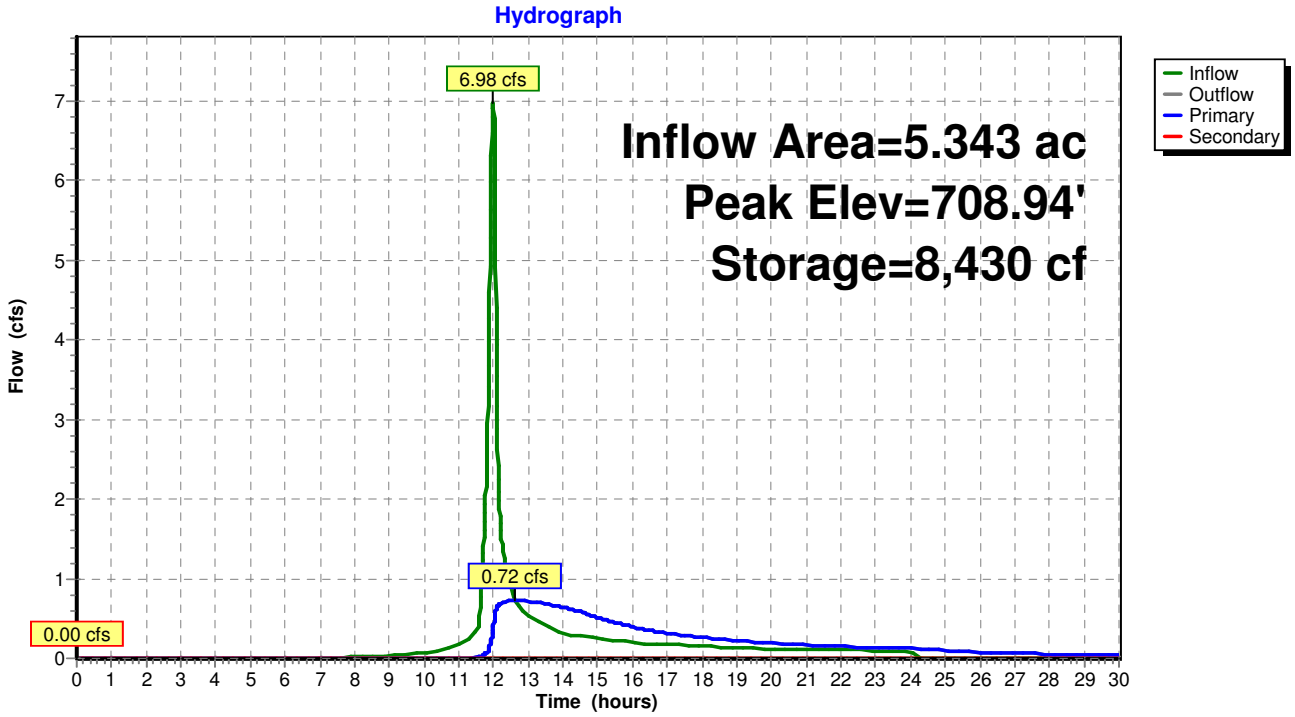
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
708.25	9,511	421.0	0	0	9,511
709.00	10,804	440.0	7,613	7,613	10,852
710.00	12,614	465.0	11,697	19,310	12,709
711.00	14,524	490.0	13,558	32,868	14,668
712.00	16,535	515.0	15,519	48,387	16,729

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	708.25'	**6.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	710.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.72 cfs @ 12.61 hrs HW=708.94' (Free Discharge)
└**1=Culvert** (Passes 0.72 cfs of 0.87 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.72 cfs @ 3.13 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=708.25' (Free Discharge)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Dry Detention Basin



Summary for Pond 7P: Discharge to 12-inch Culvert

[81] Warning: Exceeded Pond 6P by 0.36' @ 11.98 hrs

Inflow Area = 6.586 ac, 64.68% Impervious, Inflow Depth > 0.87" for 1-YR event
Inflow = 2.54 cfs @ 11.98 hrs, Volume= 0.480 af
Outflow = 2.32 cfs @ 12.02 hrs, Volume= 0.480 af, Atten= 9%, Lag= 2.1 min
Primary = 2.32 cfs @ 12.02 hrs, Volume= 0.480 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 709.09' @ 12.02 hrs Surf.Area= 780 sf Storage= 204 cf

Plug-Flow detention time= 0.5 min calculated for 0.480 af (100% of inflow)
Center-of-Mass det. time= 0.5 min (974.9 - 974.4)

Volume	Invert	Avail.Storage	Storage Description
#1	708.21'	4,370 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

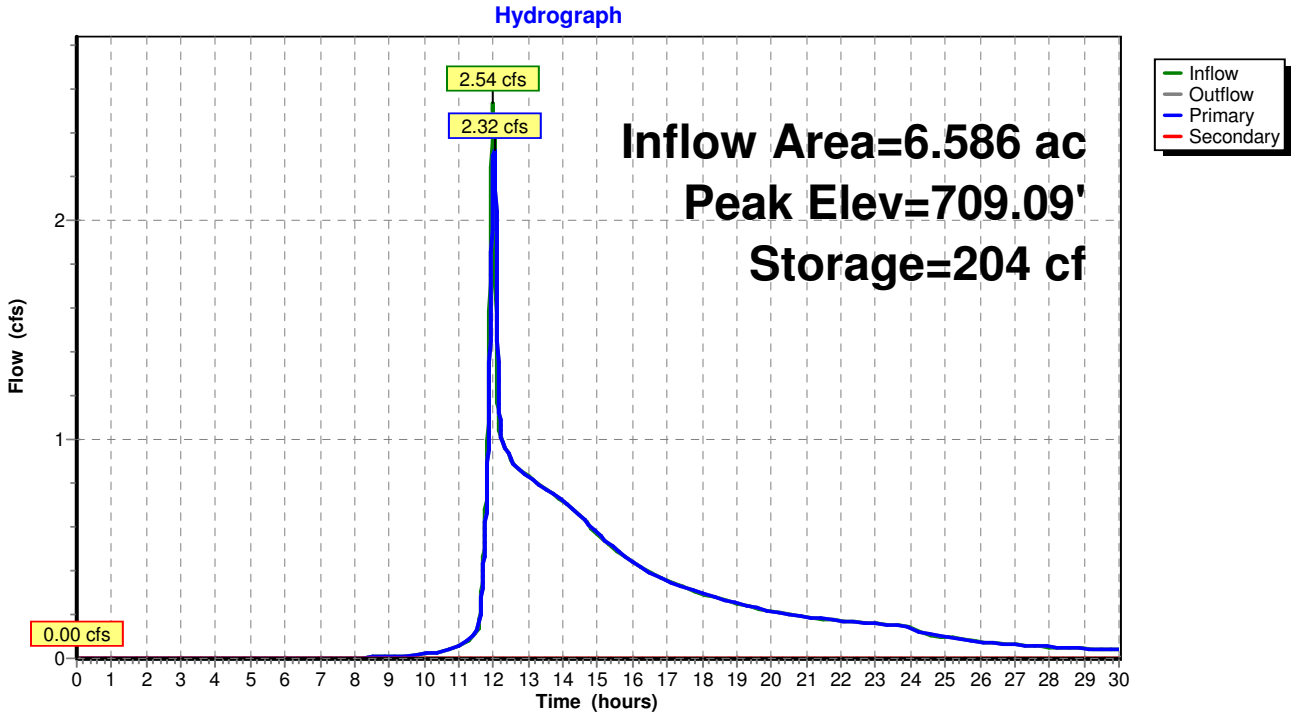
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
708.21	0	0.0	0	0	0
709.00	560	269.0	147	147	5,759
710.00	5,437	618.0	2,581	2,728	30,398
710.25	7,765	634.0	1,642	4,370	31,999

Device	Routing	Invert	Outlet Devices
#1	Primary	708.21'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	710.00'	**180.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.32 cfs @ 12.02 hrs HW=709.08' (Free Discharge)
1=Orifice/Grate (Orifice Controls 2.32 cfs @ 3.18 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=708.21' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 7P: Discharge to 12-inch Culvert



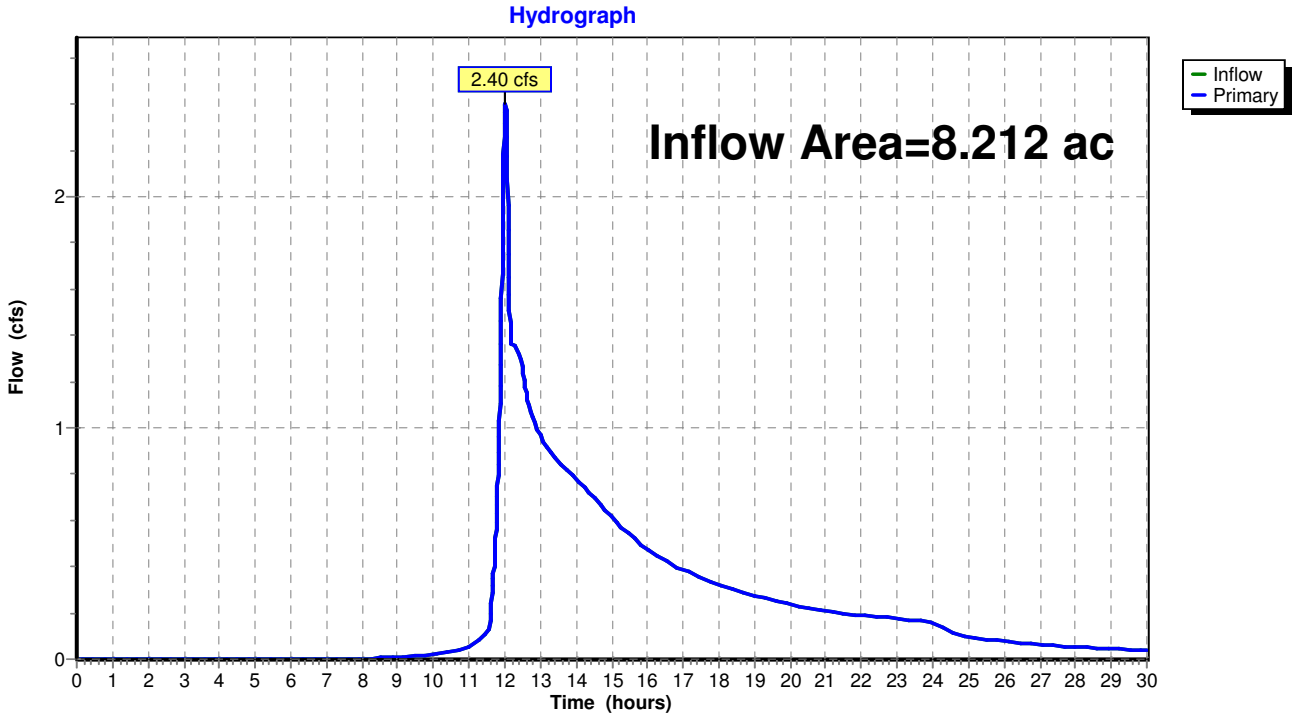
Summary for Pond 8P: Discharge to West Property

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

Inflow Area = 8.212 ac, 51.88% Impervious, Inflow Depth > 0.78" for 1-YR event
Inflow = 2.40 cfs @ 12.02 hrs, Volume= 0.531 af
Primary = 2.40 cfs @ 12.02 hrs, Volume= 0.531 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 8P: Discharge to West Property



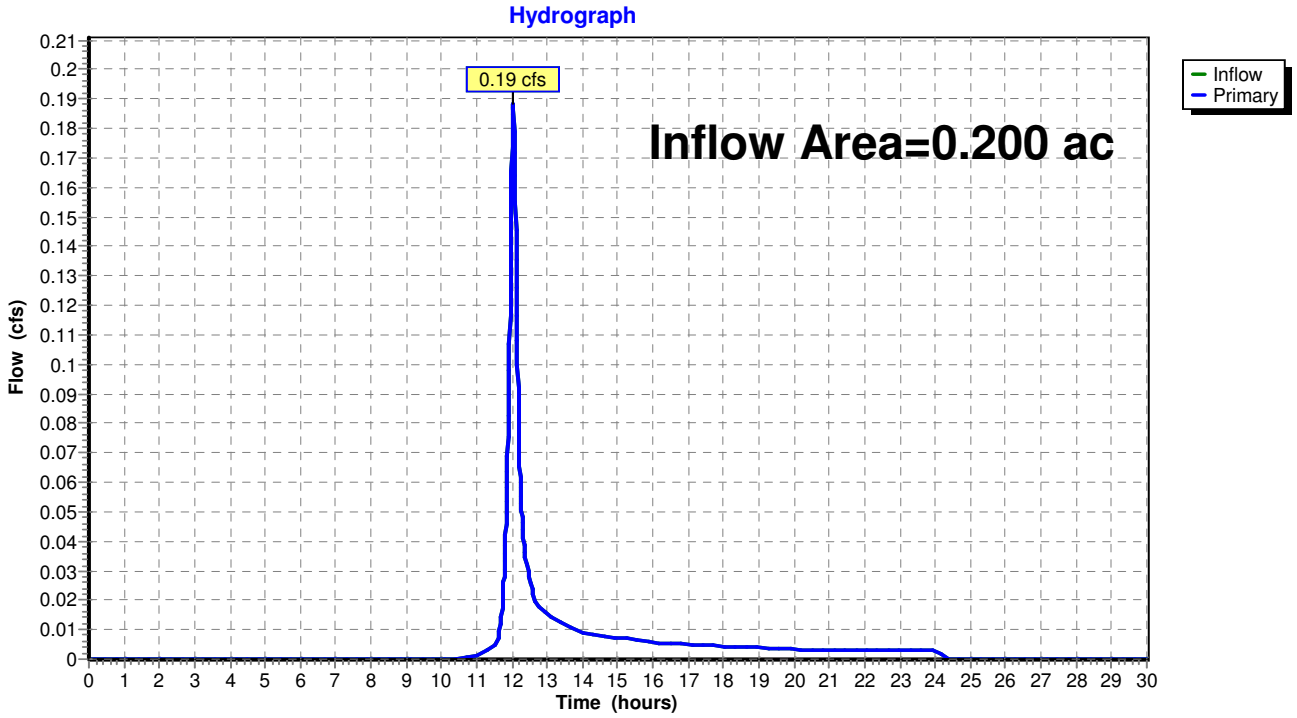
Summary for Pond 9P: Discharge to Seneca Street Drainage System

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

Inflow Area = 0.200 ac, 25.00% Impervious, Inflow Depth = 0.65" for 1-YR event
Inflow = 0.19 cfs @ 12.04 hrs, Volume= 0.011 af
Primary = 0.19 cfs @ 12.04 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 9P: Discharge to Seneca Street Drainage System



Summary for Pond 10P: Permanent Pool

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	702.00'	16,601 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
702.00	1,398	157.0	0	0	1,398
703.00	1,732	170.0	1,562	1,562	1,774
704.00	2,082	182.0	1,904	3,466	2,153
705.00	2,468	196.0	2,272	5,739	2,615
706.00	2,870	208.0	2,666	8,405	3,050
707.00	3,286	220.0	3,076	11,481	3,512
708.00	3,754	233.0	3,517	14,998	4,032
708.25	9,511	421.0	1,603	16,601	13,817

Summary for Subcatchment 1S: North Drainage Area - Lawn Area

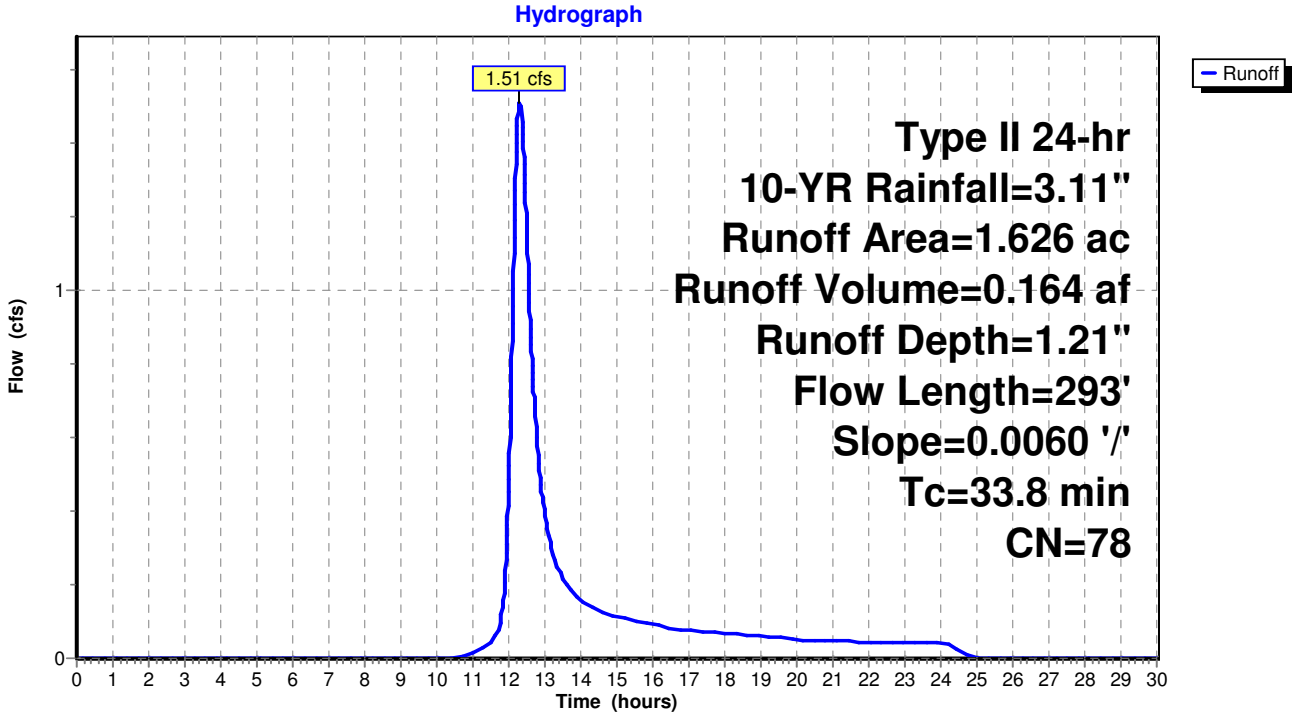
Runoff = 1.51 cfs @ 12.29 hrs, Volume= 0.164 af, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.626	80	>75% Grass cover, Good, HSG D
1.000	77	Woods, Good, HSG D
1.626	78	Weighted Average
1.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	100	0.0060	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
5.9	193	0.0060	0.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
33.8	293	Total			

Subcatchment 1S: North Drainage Area - Lawn Area



Summary for Subcatchment 2S: Northeast Drainage Area

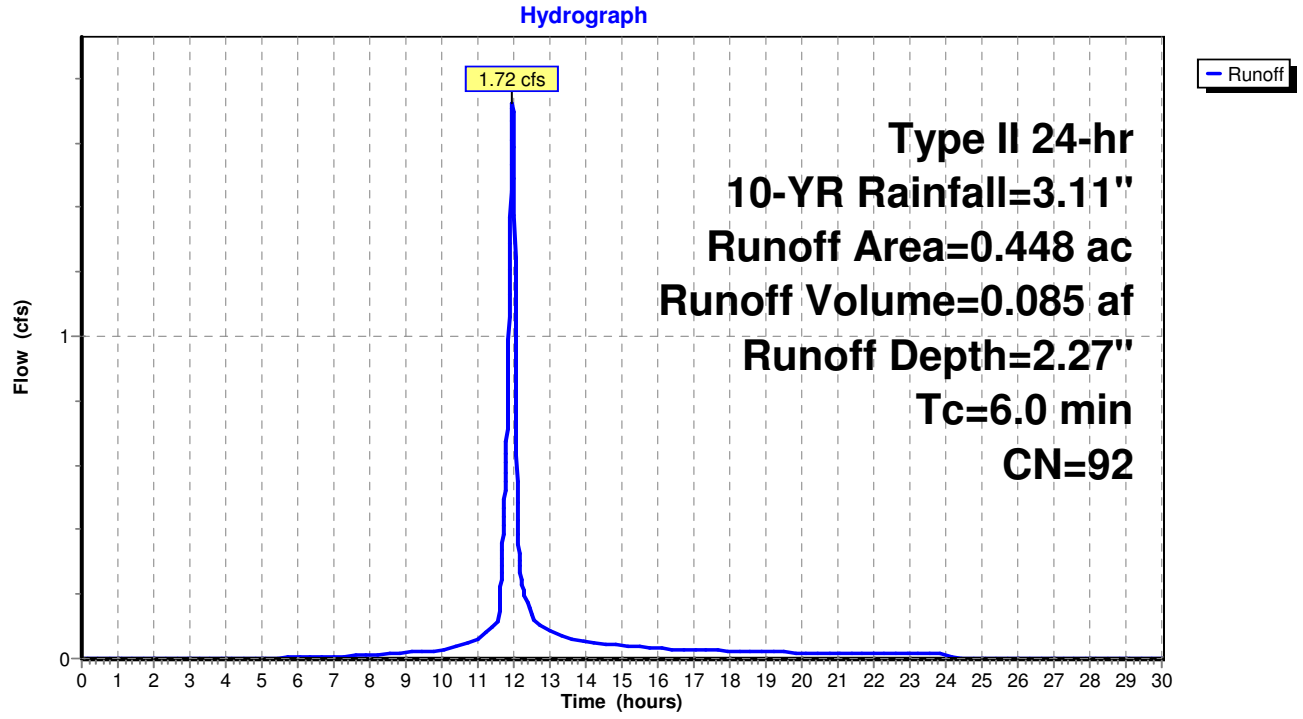
Runoff = 1.72 cfs @ 11.97 hrs, Volume= 0.085 af, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.306	98	Paved parking, HSG D
0.142	80	>75% Grass cover, Good, HSG D
0.448	92	Weighted Average
0.142		31.70% Pervious Area
0.306		68.30% Impervious Area

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

Subcatchment 2S: Northeast Drainage Area



Summary for Subcatchment 3S: Northwest Drainage Area

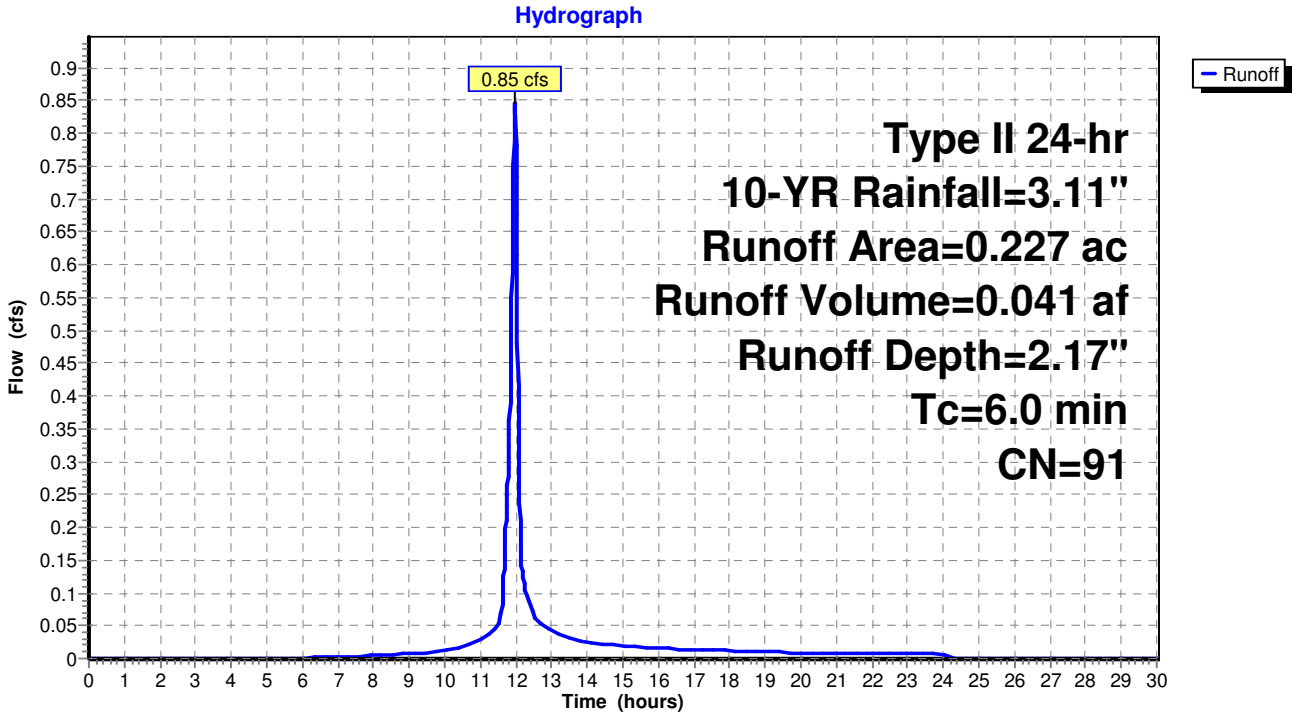
Runoff = 0.85 cfs @ 11.97 hrs, Volume= 0.041 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.133	98	Paved parking, HSG D
0.094	80	>75% Grass cover, Good, HSG D
0.227	91	Weighted Average
0.094		41.41% Pervious Area
0.133		58.59% Impervious Area

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

Subcatchment 3S: Northwest Drainage Area



Summary for Subcatchment 4S: Middle Drainage Area

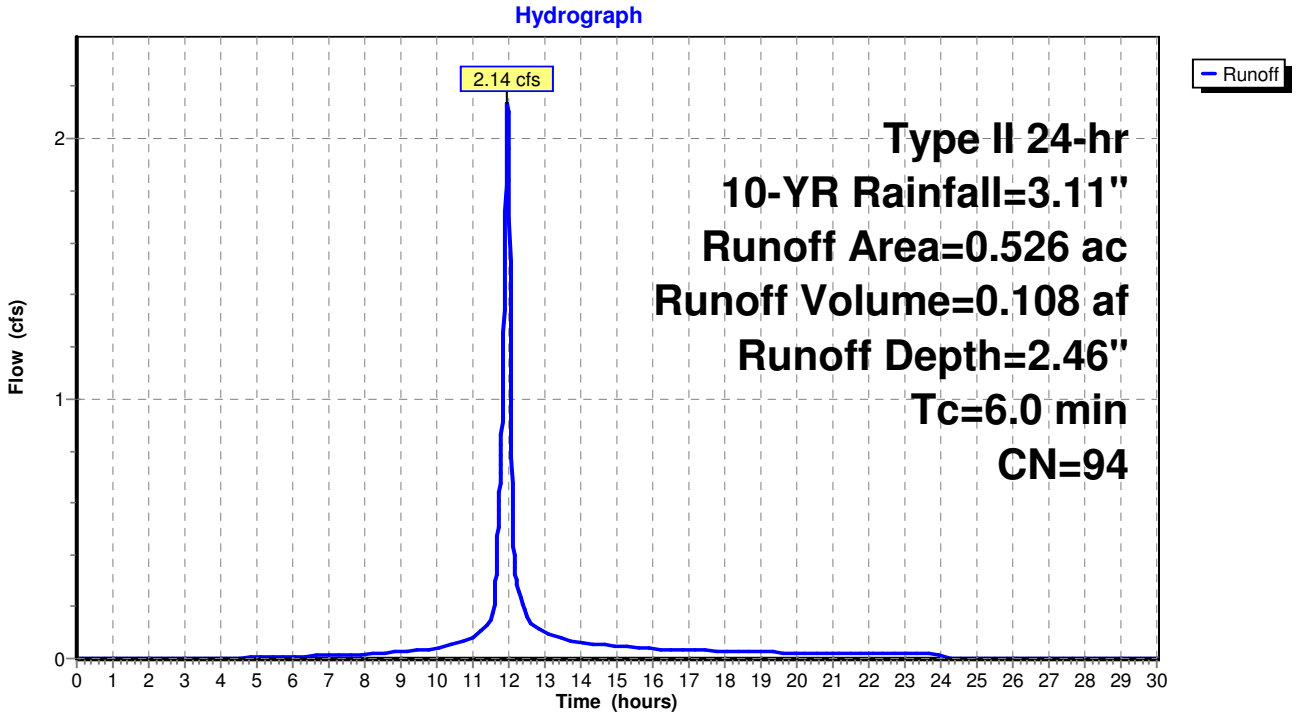
Runoff = 2.14 cfs @ 11.97 hrs, Volume= 0.108 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.406	98	Paved parking, HSG D
0.120	80	>75% Grass cover, Good, HSG D
0.526	94	Weighted Average
0.120		22.81% Pervious Area
0.406		77.19% Impervious Area

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

Subcatchment 4S: Middle Drainage Area



Summary for Subcatchment 5S: Southeast Drainage Area

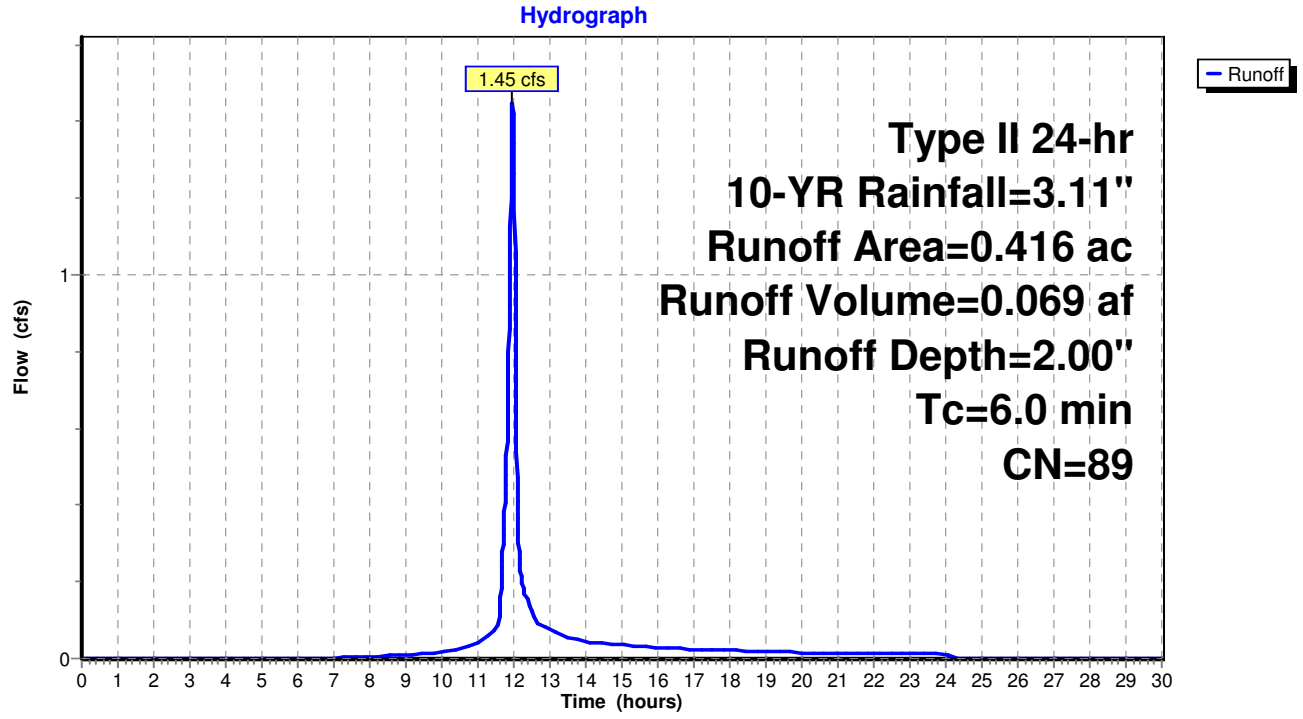
Runoff = 1.45 cfs @ 11.97 hrs, Volume= 0.069 af, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.201	98	Paved parking, HSG D
0.215	80	>75% Grass cover, Good, HSG D
0.416	89	Weighted Average
0.215		51.68% Pervious Area
0.201		48.32% Impervious Area

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

Subcatchment 5S: Southeast Drainage Area



Summary for Subcatchment 6S: West Drainage Area

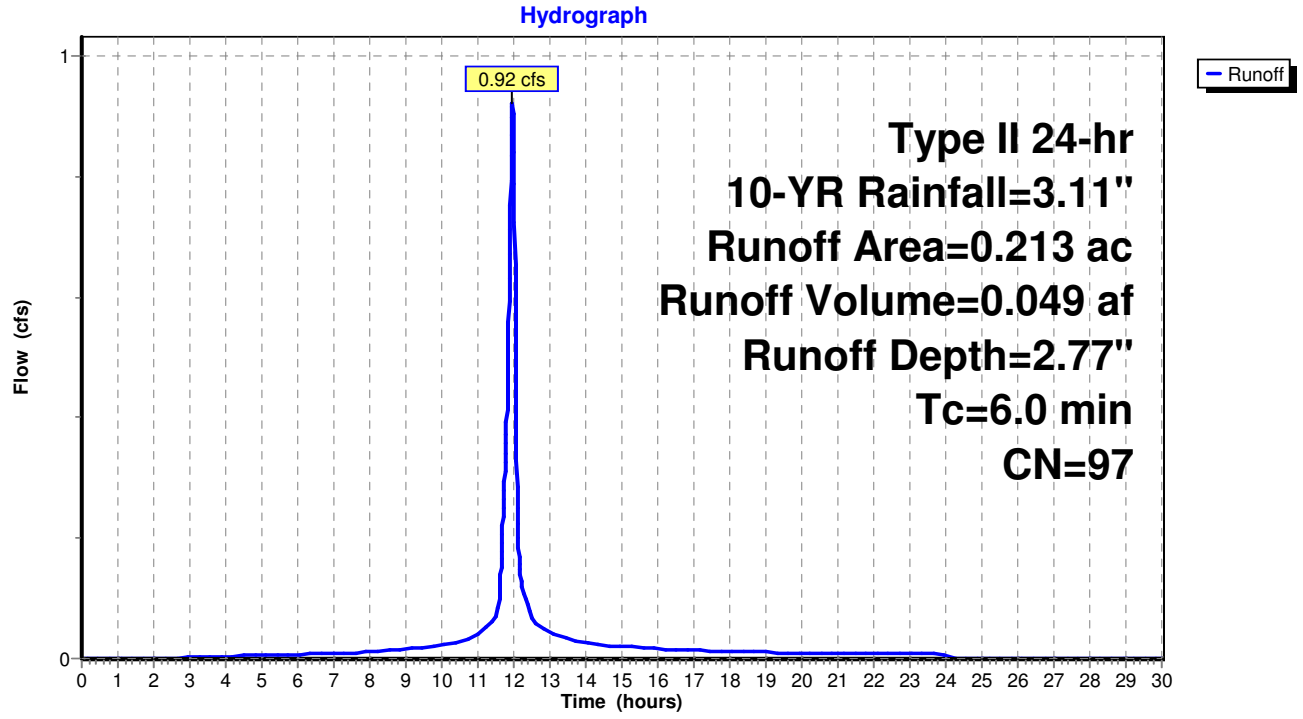
Runoff = 0.92 cfs @ 11.97 hrs, Volume= 0.049 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.196	98	Paved parking, HSG D
0.017	80	>75% Grass cover, Good, HSG D
0.213	97	Weighted Average
0.017		7.98% Pervious Area
0.196		92.02% Impervious Area

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

Subcatchment 6S: West Drainage Area



Summary for Subcatchment 7S: North Parking Lot (to Wet Pond)

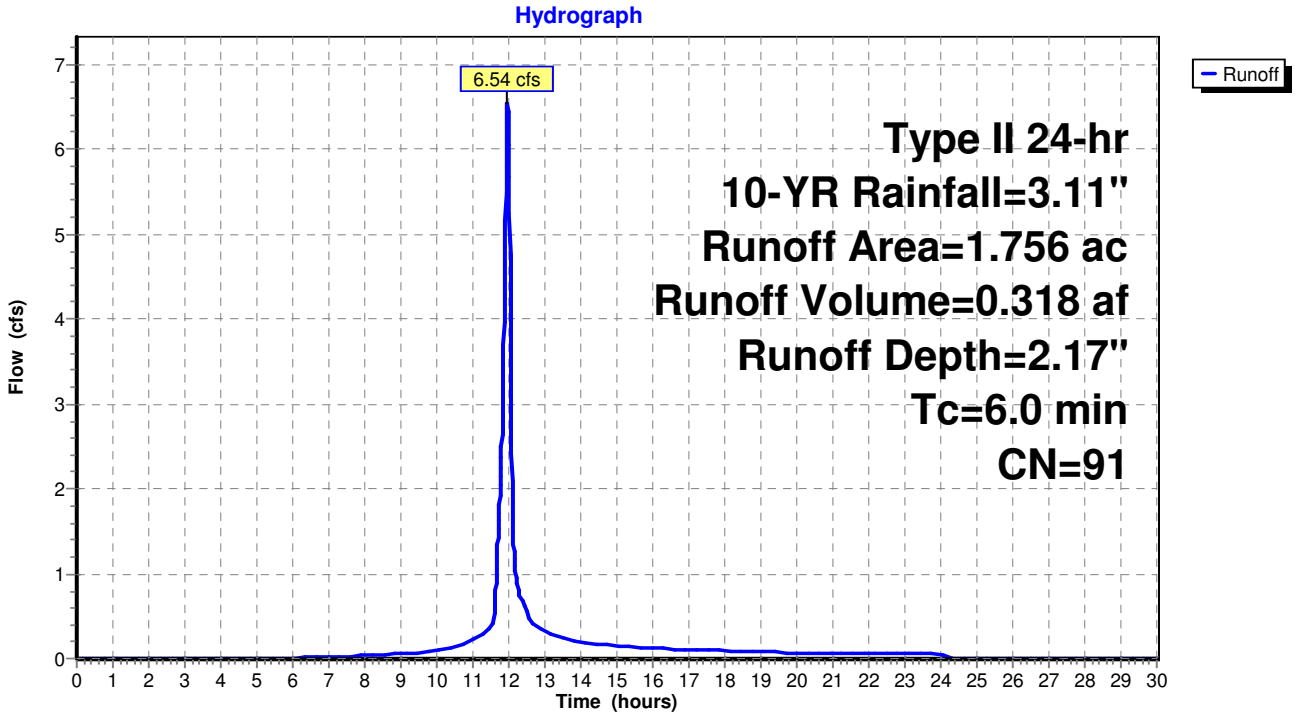
Runoff = 6.54 cfs @ 11.97 hrs, Volume= 0.318 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
1.074	98	Paved parking, HSG D
0.682	80	>75% Grass cover, Good, HSG D
1.756	91	Weighted Average
0.682		38.84% Pervious Area
1.074		61.16% Impervious Area

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

Subcatchment 7S: North Parking Lot (to Wet Pond)



Summary for Subcatchment 8S: East Drainage Area

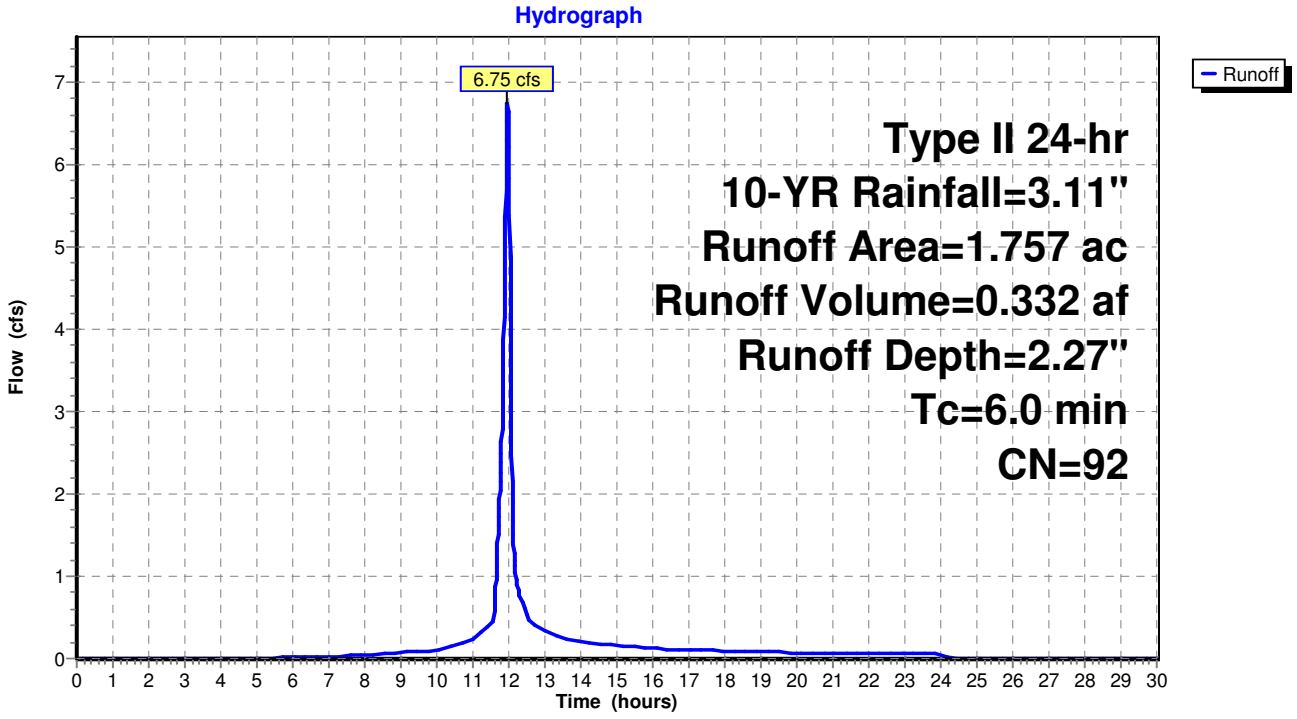
Runoff = 6.75 cfs @ 11.97 hrs, Volume= 0.332 af, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
1.198	98	Paved parking, HSG D
0.559	80	>75% Grass cover, Good, HSG D
1.757	92	Weighted Average
0.559		31.82% Pervious Area
1.198		68.18% Impervious Area

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

Subcatchment 8S: East Drainage Area



Summary for Subcatchment 9S: Southwest Drainage Area

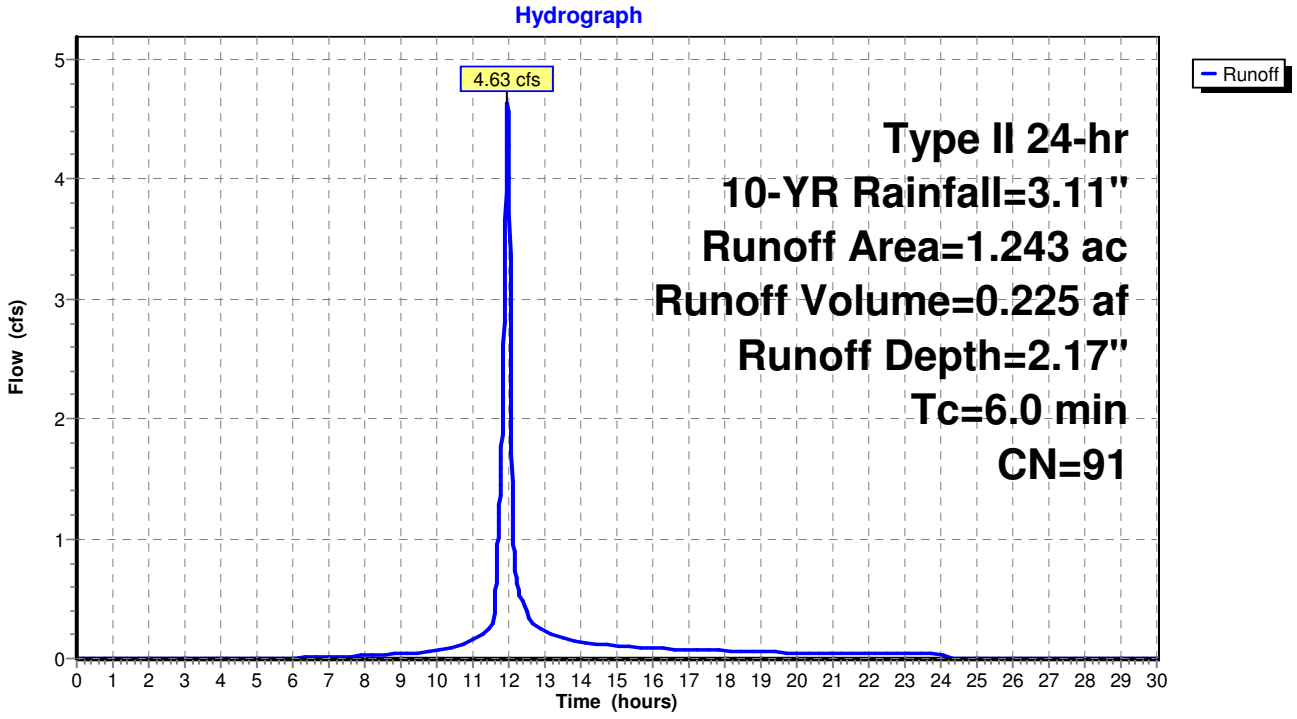
Runoff = 4.63 cfs @ 11.97 hrs, Volume= 0.225 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.746	98	Paved parking, HSG D
0.497	80	>75% Grass cover, Good, HSG D
1.243	91	Weighted Average
0.497		39.98% Pervious Area
0.746		60.02% Impervious Area

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

Subcatchment 9S: Southwest Drainage Area



Summary for Subcatchment 10S: South Drainage Area

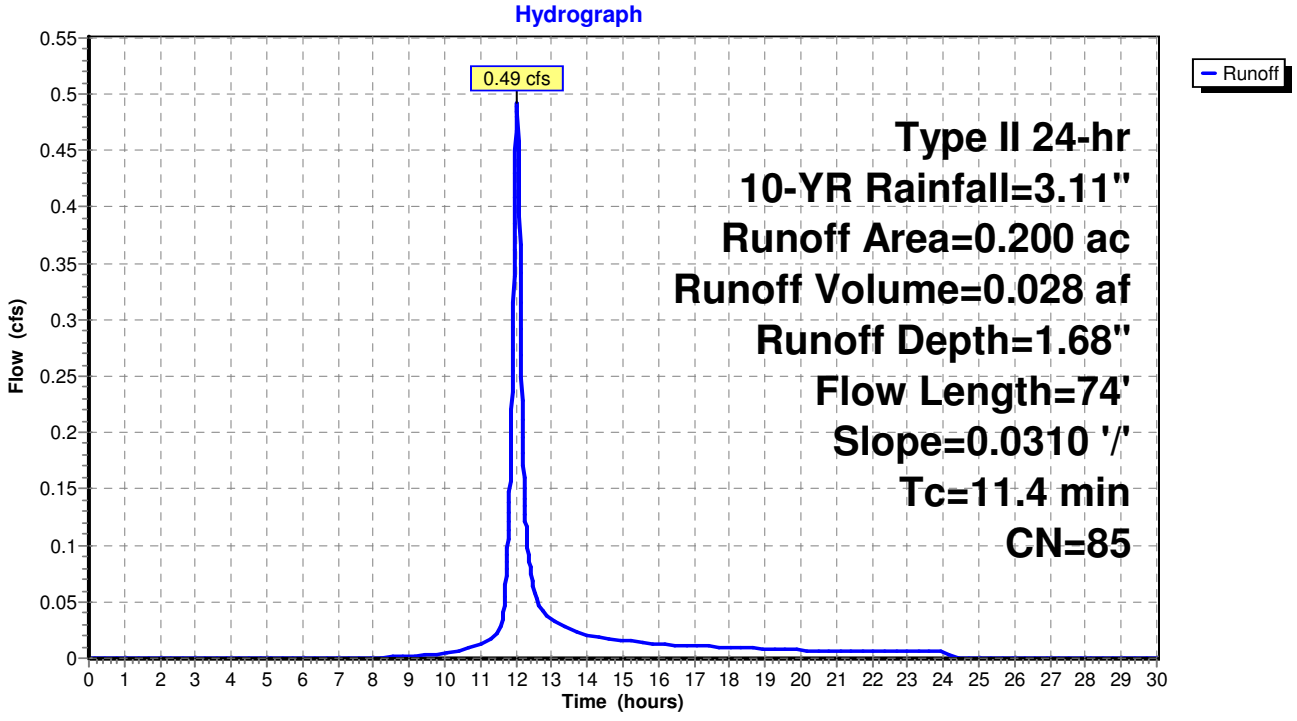
Runoff = 0.49 cfs @ 12.03 hrs, Volume= 0.028 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=3.11"

Area (ac)	CN	Description
0.150	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.200	85	Weighted Average
0.150		75.00% Pervious Area
0.050		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	74	0.0310	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"

Subcatchment 10S: South Drainage Area



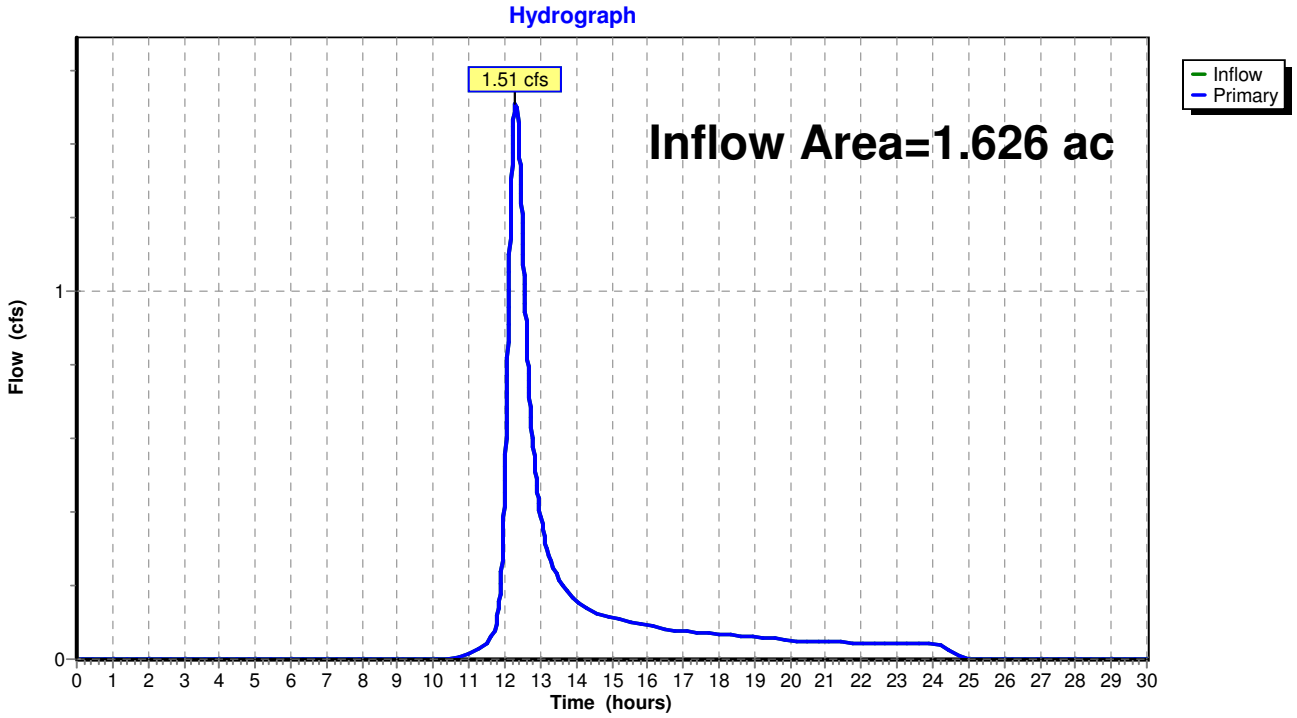
Summary for Pond 1P: Discharge from North Drainage Area

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

Inflow Area = 1.626 ac, 0.00% Impervious, Inflow Depth = 1.21" for 10-YR event
Inflow = 1.51 cfs @ 12.29 hrs, Volume= 0.164 af
Primary = 1.51 cfs @ 12.29 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 1P: Discharge from North Drainage Area



Summary for Pond 2P: Northeast Bioretention Basin

Inflow Area = 0.448 ac, 68.30% Impervious, Inflow Depth = 2.27" for 10-YR event
Inflow = 1.72 cfs @ 11.97 hrs, Volume= 0.085 af
Outflow = 1.65 cfs @ 11.99 hrs, Volume= 0.071 af, Atten= 4%, Lag= 1.3 min
Primary = 1.65 cfs @ 11.99 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.66' @ 11.99 hrs Surf.Area= 1,437 sf Storage= 822 cf

Plug-Flow detention time= 116.2 min calculated for 0.071 af (84% of inflow)
Center-of-Mass det. time= 47.0 min (842.6 - 795.6)

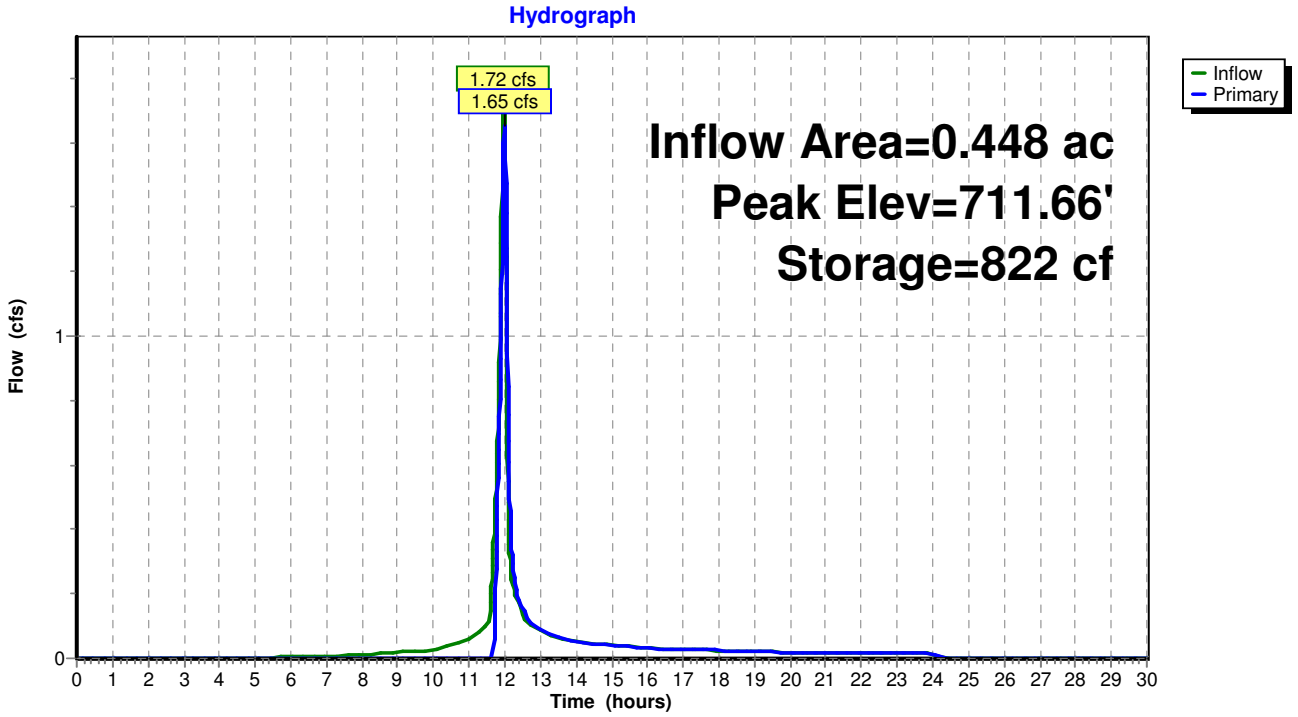
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	2,312 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	1,070	133.0	0	0	1,070
712.00	1,649	158.0	1,349	1,349	1,667
712.50	2,218	180.0	963	2,312	2,265

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 170.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 1,070 sf

Primary OutFlow Max=1.65 cfs @ 11.99 hrs HW=711.66' (Free Discharge)
└**1=Culvert** (Passes 1.65 cfs of 3.64 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 1.64 cfs @ 1.30 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 2.30 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 2P: Northeast Bioretention Basin



Summary for Pond 3P: Northwest Bioretention Basin

Inflow Area = 0.227 ac, 58.59% Impervious, Inflow Depth = 2.17" for 10-YR event
Inflow = 0.85 cfs @ 11.97 hrs, Volume= 0.041 af
Outflow = 0.82 cfs @ 11.99 hrs, Volume= 0.035 af, Atten= 2%, Lag= 1.0 min
Primary = 0.82 cfs @ 11.99 hrs, Volume= 0.035 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 712.10' @ 11.99 hrs Surf.Area= 814 sf Storage= 387 cf

Plug-Flow detention time= 123.0 min calculated for 0.035 af (84% of inflow)
Center-of-Mass det. time= 53.3 min (853.8 - 800.4)

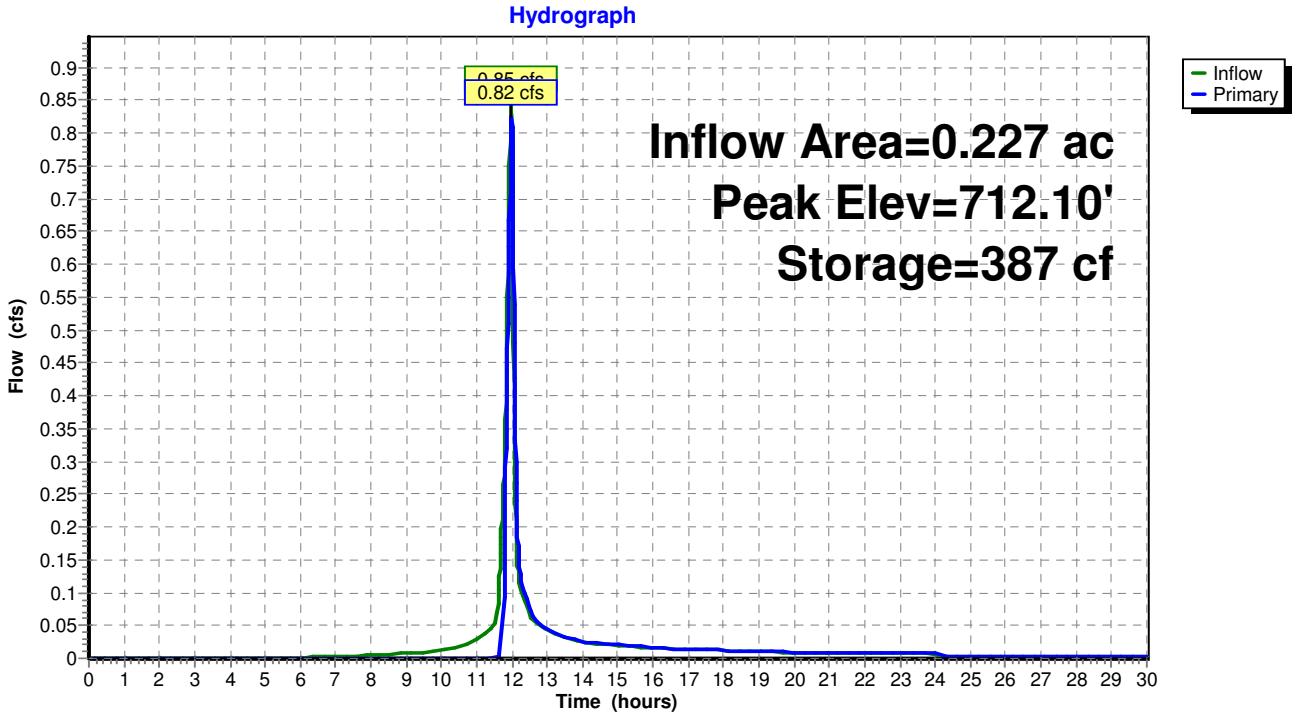
Volume	Invert	Avail.Storage	Storage Description
#1	711.50'	1,373 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.50	487	131.0	0	0	487
712.00	759	144.0	309	309	780
713.00	1,402	171.0	1,064	1,373	1,475

Device	Routing	Invert	Outlet Devices
#1	Primary	708.75'	**12.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.75' / 708.25' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	712.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.75'	**8.0" Round Underdrain** L= 51.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.75' / 708.75' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.50'	**0.250 in/hr Exfiltration over Surface area above 711.50'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 487 sf

Primary OutFlow Max=0.82 cfs @ 11.99 hrs HW=712.10' (Free Discharge)
└**1=Culvert** (Passes 0.82 cfs of 5.04 cfs potential flow)
  └**2=Orifice/Grate** (Weir Controls 0.82 cfs @ 1.03 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 2.13 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 3P: Northwest Bioretention Basin



Summary for Pond 4P: Middle Bioretention Basin

Inflow Area = 0.526 ac, 77.19% Impervious, Inflow Depth = 2.46" for 10-YR event
Inflow = 2.14 cfs @ 11.97 hrs, Volume= 0.108 af
Outflow = 1.94 cfs @ 12.00 hrs, Volume= 0.085 af, Atten= 9%, Lag= 2.0 min
Primary = 1.94 cfs @ 12.00 hrs, Volume= 0.085 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.68' @ 12.00 hrs Surf.Area= 2,523 sf Storage= 1,453 cf

Plug-Flow detention time= 148.2 min calculated for 0.085 af (79% of inflow)
Center-of-Mass det. time= 66.9 min (851.6 - 784.8)

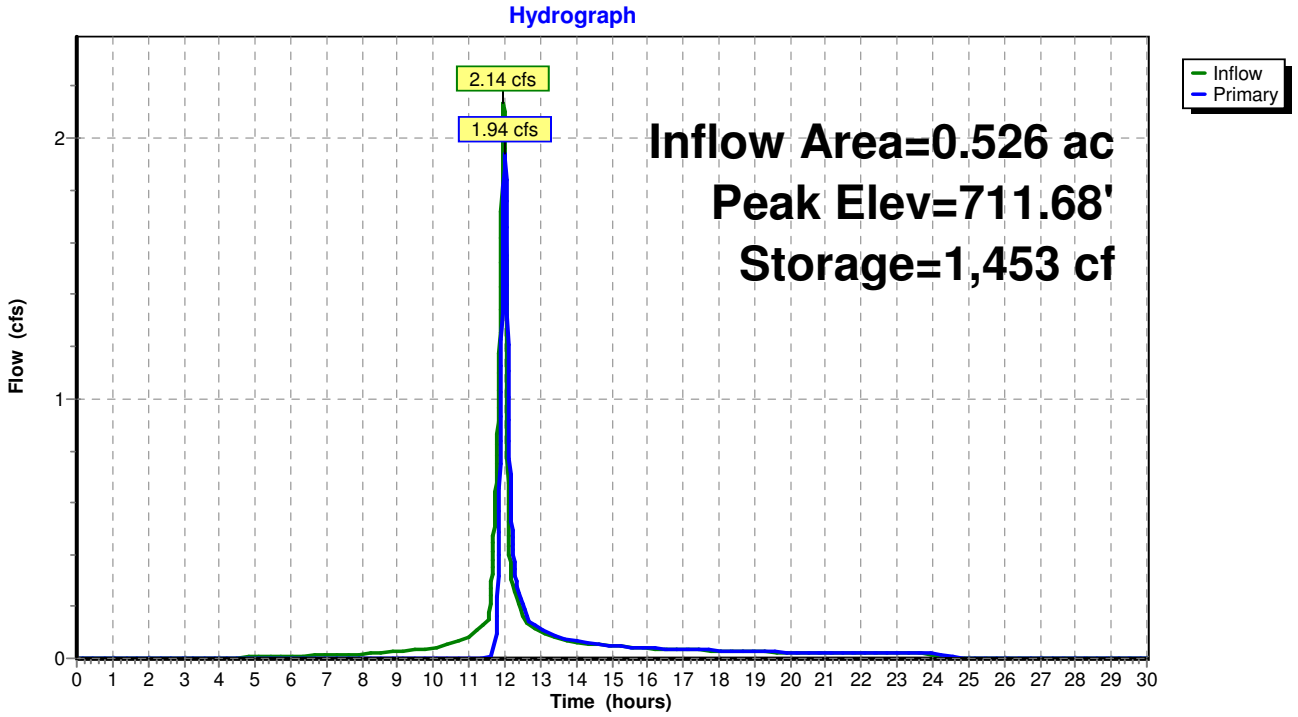
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	3,947 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	1,795	362.0	0	0	1,795
712.00	2,915	400.0	2,332	2,332	4,131
712.50	3,555	418.0	1,615	3,947	5,320

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 144.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 1,795 sf

Primary OutFlow Max=1.94 cfs @ 12.00 hrs HW=711.68' (Free Discharge)
- **1=Culvert** (Passes 1.94 cfs of 4.97 cfs potential flow)
  - **2=Orifice/Grate** (Weir Controls 1.93 cfs @ 1.37 fps)
  - **3=Underdrain** (Passes 0.00 cfs of 1.50 cfs potential flow)
    - **4=Exfiltration** (Controls 0.00 cfs)

Pond 4P: Middle Bioretention Basin



Summary for Pond 5P: South Bioretention Basin

Inflow Area = 0.416 ac, 48.32% Impervious, Inflow Depth = 2.00" for 10-YR event
Inflow = 1.45 cfs @ 11.97 hrs, Volume= 0.069 af
Outflow = 1.40 cfs @ 11.99 hrs, Volume= 0.060 af, Atten= 3%, Lag= 1.1 min
Primary = 1.40 cfs @ 11.99 hrs, Volume= 0.060 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.64' @ 11.99 hrs Surf.Area= 1,143 sf Storage= 607 cf

Plug-Flow detention time= 106.9 min calculated for 0.060 af (86% of inflow)
Center-of-Mass det. time= 42.3 min (851.5 - 809.1)

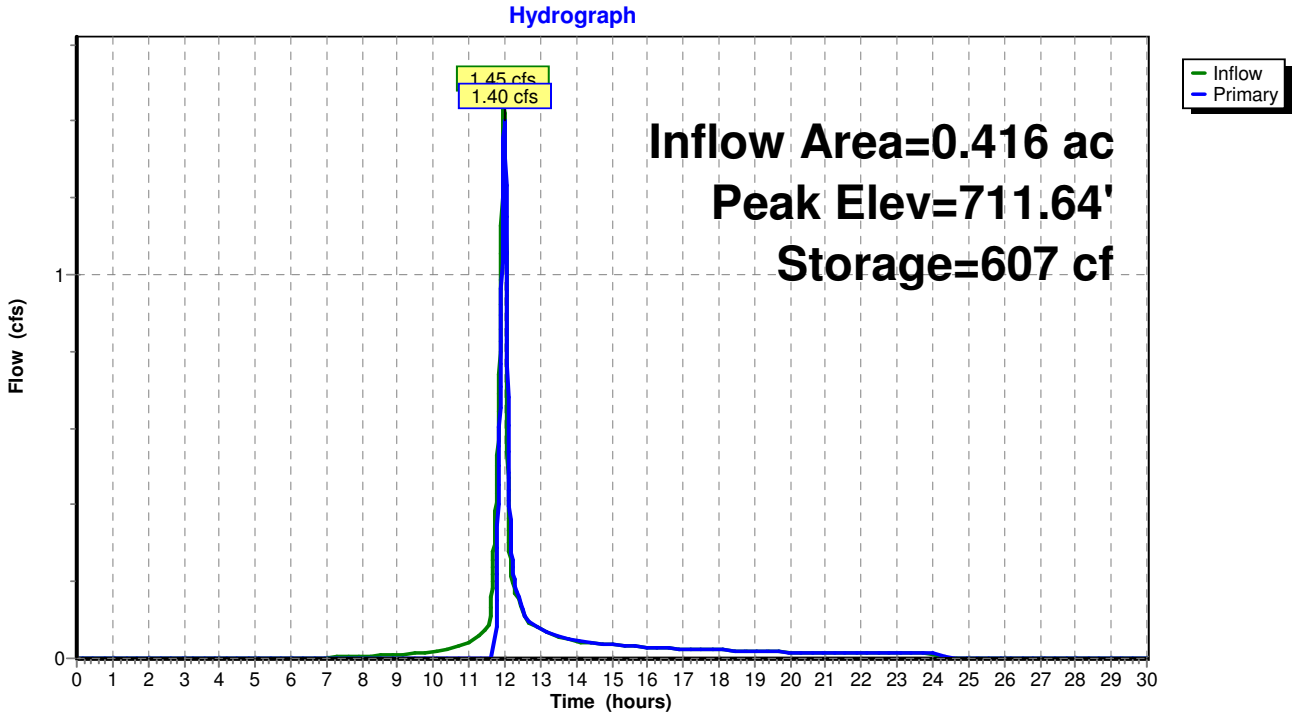
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	1,834 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	760	184.0	0	0	760
712.00	1,390	209.0	1,059	1,059	1,566
712.50	1,716	221.0	775	1,834	1,991

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 760 sf

Primary OutFlow Max=1.40 cfs @ 11.99 hrs HW=711.64' (Free Discharge)
└**1=Culvert** (Passes 1.40 cfs of 4.73 cfs potential flow)
  └**2=Orifice/Grate** (Weir Controls 1.40 cfs @ 1.23 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 1.98 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 5P: South Bioretention Basin



Summary for Pond 6P: Dry Detention Basin

[79] Warning: Submerged Pond 2P Primary device # 1 by 1.77'
[79] Warning: Submerged Pond 3P Primary device # 1 INLET by 1.27'
[79] Warning: Submerged Pond 4P Primary device # 1 by 1.77'
[79] Warning: Submerged Pond 5P Primary device # 1 by 1.77'

Inflow Area = 5.343 ac, 65.77% Impervious, Inflow Depth > 2.13" for 10-YR event
Inflow = 19.84 cfs @ 11.98 hrs, Volume= 0.950 af
Outflow = 1.36 cfs @ 12.63 hrs, Volume= 0.905 af, Atten= 93%, Lag= 39.3 min
Primary = 1.36 cfs @ 12.63 hrs, Volume= 0.905 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 710.02' @ 12.63 hrs Surf.Area= 12,650 sf Storage= 22,080 cf

Plug-Flow detention time= 232.7 min calculated for 0.904 af (95% of inflow)
Center-of-Mass det. time= 203.8 min (1,013.6 - 809.8)

Volume	Invert	Avail.Storage	Storage Description
#1	708.25'	48,387 cf	**Dry Detention Basin (Irregular)** Listed below (Recalc)
#2	708.25'	939 cf	**12.0" Round 12" Diameter Pipe Storage** L= 1,195.0'
#3	708.25'	1,582 cf	**18.0" Round 18" Diameter Pipe Storage** L= 895.0'
		50,907 cf	Total Available Storage

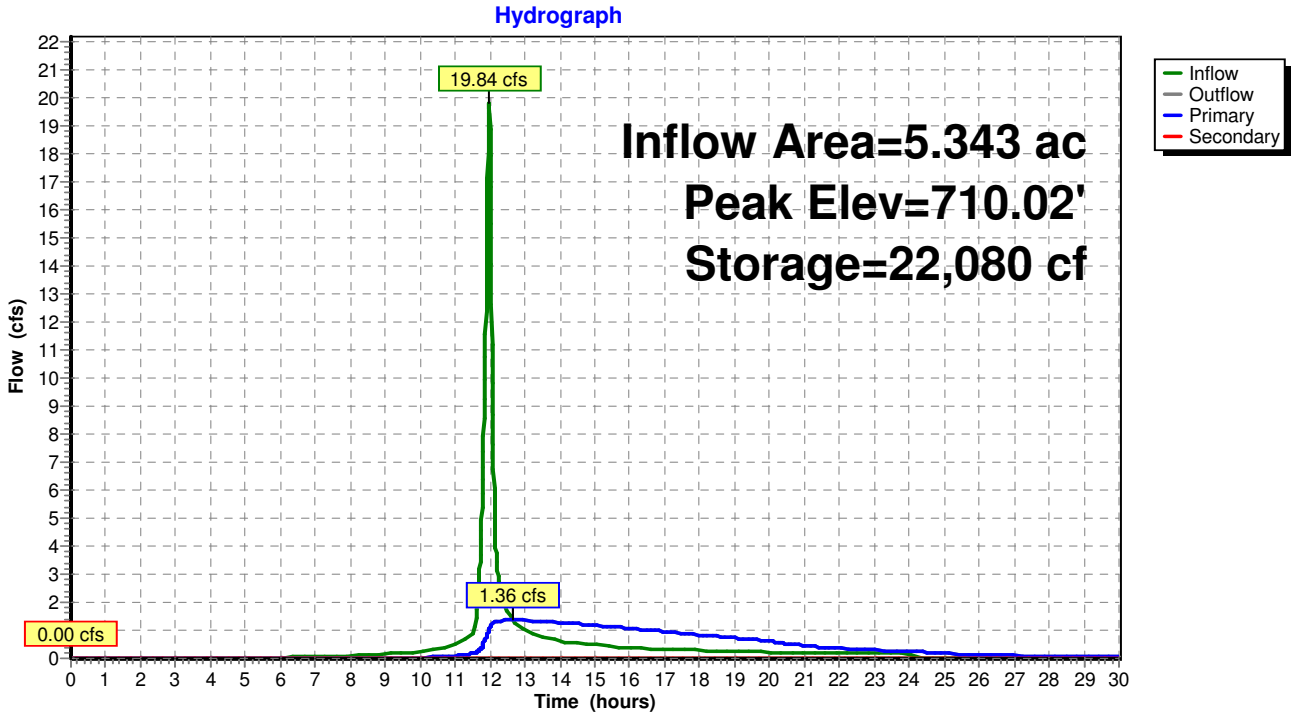
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
708.25	9,511	421.0	0	0	9,511
709.00	10,804	440.0	7,613	7,613	10,852
710.00	12,614	465.0	11,697	19,310	12,709
711.00	14,524	490.0	13,558	32,868	14,668
712.00	16,535	515.0	15,519	48,387	16,729

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	708.25'	**6.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	710.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.36 cfs @ 12.63 hrs HW=710.02' (Free Discharge)
↑—**1=Culvert** (Passes 1.36 cfs of 3.36 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 1.36 cfs @ 5.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=708.25' (Free Discharge)
↑—**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: Dry Detention Basin



Summary for Pond 7P: Discharge to 12-inch Culvert

[81] Warning: Exceeded Pond 6P by 0.25' @ 11.89 hrs

Inflow Area = 6.586 ac, 64.68% Impervious, Inflow Depth > 2.06" for 10-YR event
Inflow = 5.65 cfs @ 11.97 hrs, Volume= 1.130 af
Outflow = 3.70 cfs @ 12.05 hrs, Volume= 1.130 af, Atten= 35%, Lag= 4.8 min
Primary = 3.70 cfs @ 12.05 hrs, Volume= 1.130 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 709.67' @ 12.05 hrs Surf.Area= 3,250 sf Storage= 1,293 cf

Plug-Flow detention time= 1.1 min calculated for 1.130 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (972.2 - 971.1)

Volume	Invert	Avail.Storage	Storage Description
#1	708.21'	4,370 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

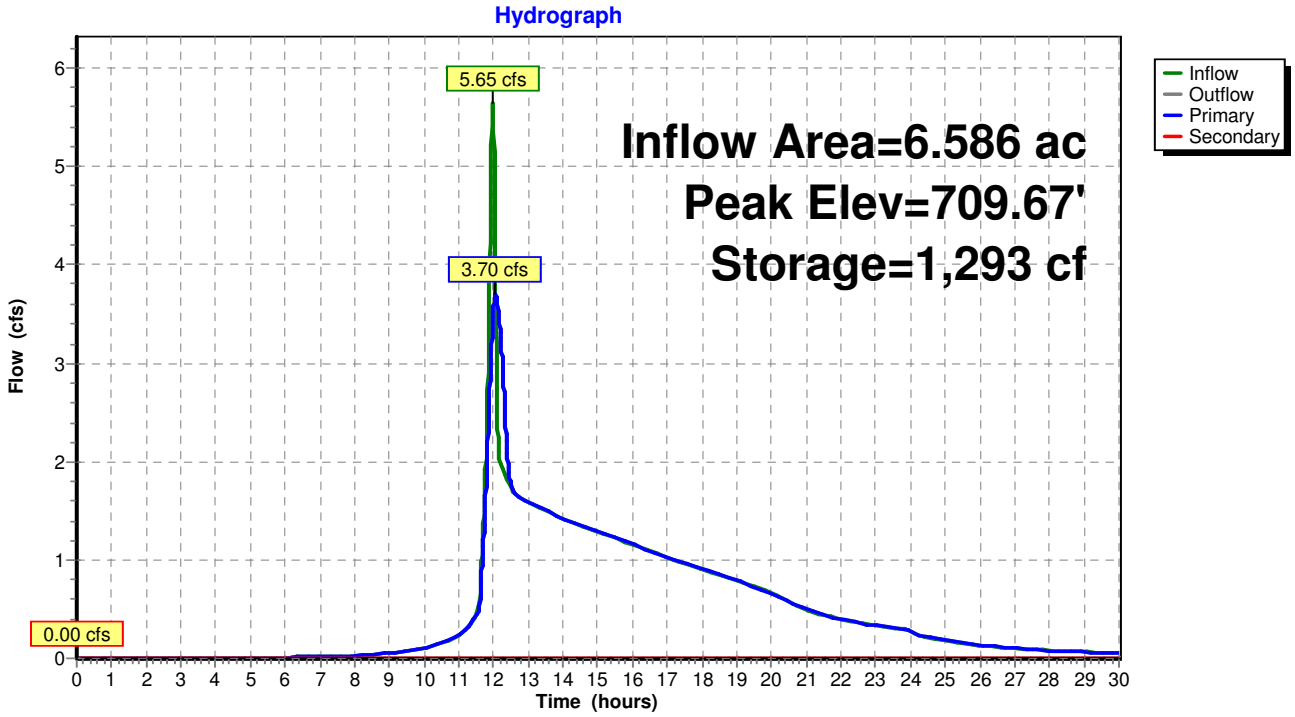
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
708.21	0	0.0	0	0	0
709.00	560	269.0	147	147	5,759
710.00	5,437	618.0	2,581	2,728	30,398
710.25	7,765	634.0	1,642	4,370	31,999

Device	Routing	Invert	Outlet Devices
#1	Primary	708.21'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	710.00'	**180.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=3.70 cfs @ 12.05 hrs HW=709.67' (Free Discharge)
1=Orifice/Grate (Orifice Controls 3.70 cfs @ 4.71 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=708.21' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 7P: Discharge to 12-inch Culvert



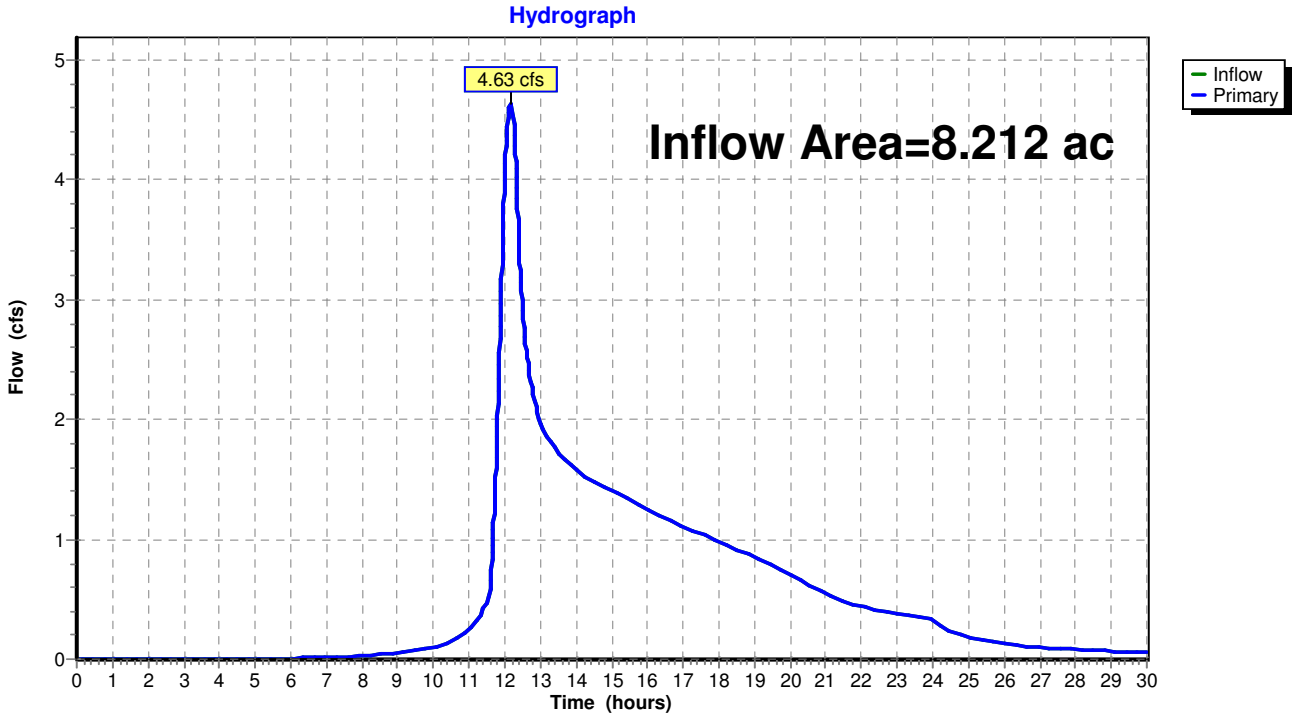
Summary for Pond 8P: Discharge to West Property

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

Inflow Area = 8.212 ac, 51.88% Impervious, Inflow Depth > 1.89" for 10-YR event
Inflow = 4.63 cfs @ 12.17 hrs, Volume= 1.293 af
Primary = 4.63 cfs @ 12.17 hrs, Volume= 1.293 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 8P: Discharge to West Property



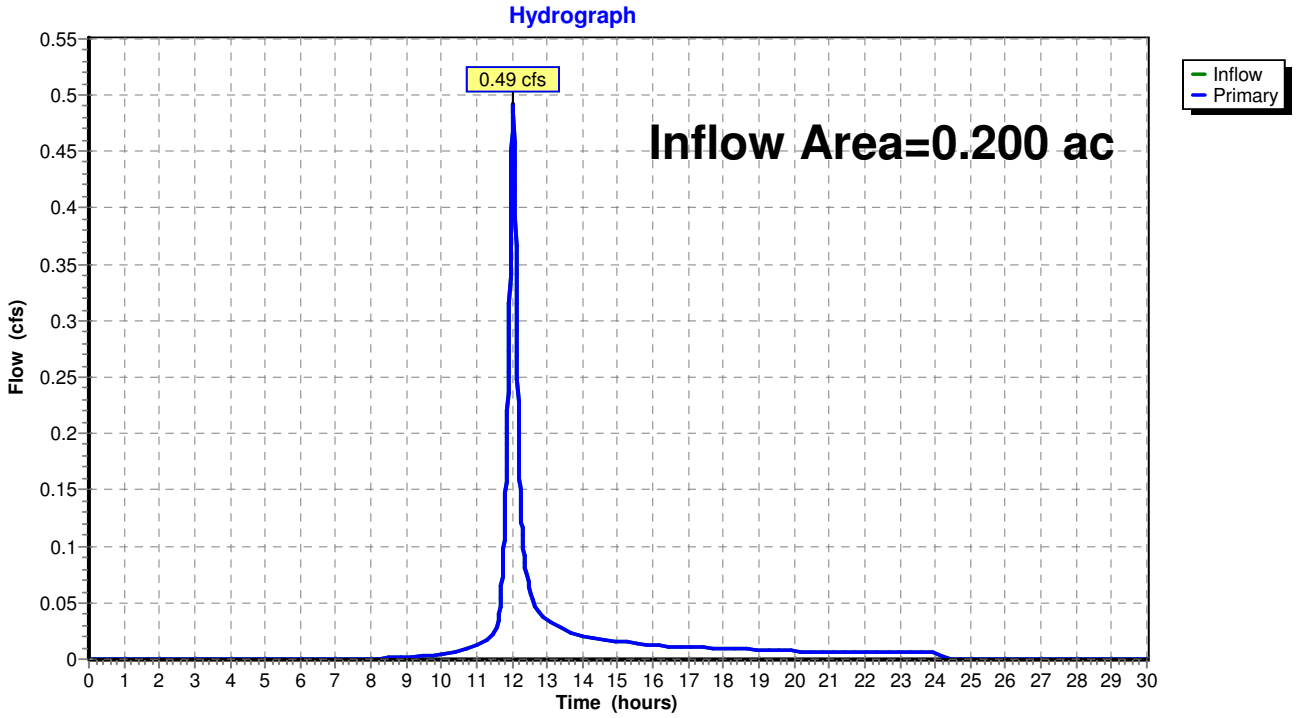
Summary for Pond 9P: Discharge to Seneca Street Drainage System

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

Inflow Area = 0.200 ac, 25.00% Impervious, Inflow Depth = 1.68" for 10-YR event
Inflow = 0.49 cfs @ 12.03 hrs, Volume= 0.028 af
Primary = 0.49 cfs @ 12.03 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 9P: Discharge to Seneca Street Drainage System



Summary for Pond 10P: Permanent Pool

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	702.00'	16,601 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
702.00	1,398	157.0	0	0	1,398
703.00	1,732	170.0	1,562	1,562	1,774
704.00	2,082	182.0	1,904	3,466	2,153
705.00	2,468	196.0	2,272	5,739	2,615
706.00	2,870	208.0	2,666	8,405	3,050
707.00	3,286	220.0	3,076	11,481	3,512
708.00	3,754	233.0	3,517	14,998	4,032
708.25	9,511	421.0	1,603	16,601	13,817

Summary for Subcatchment 1S: North Drainage Area - Lawn Area

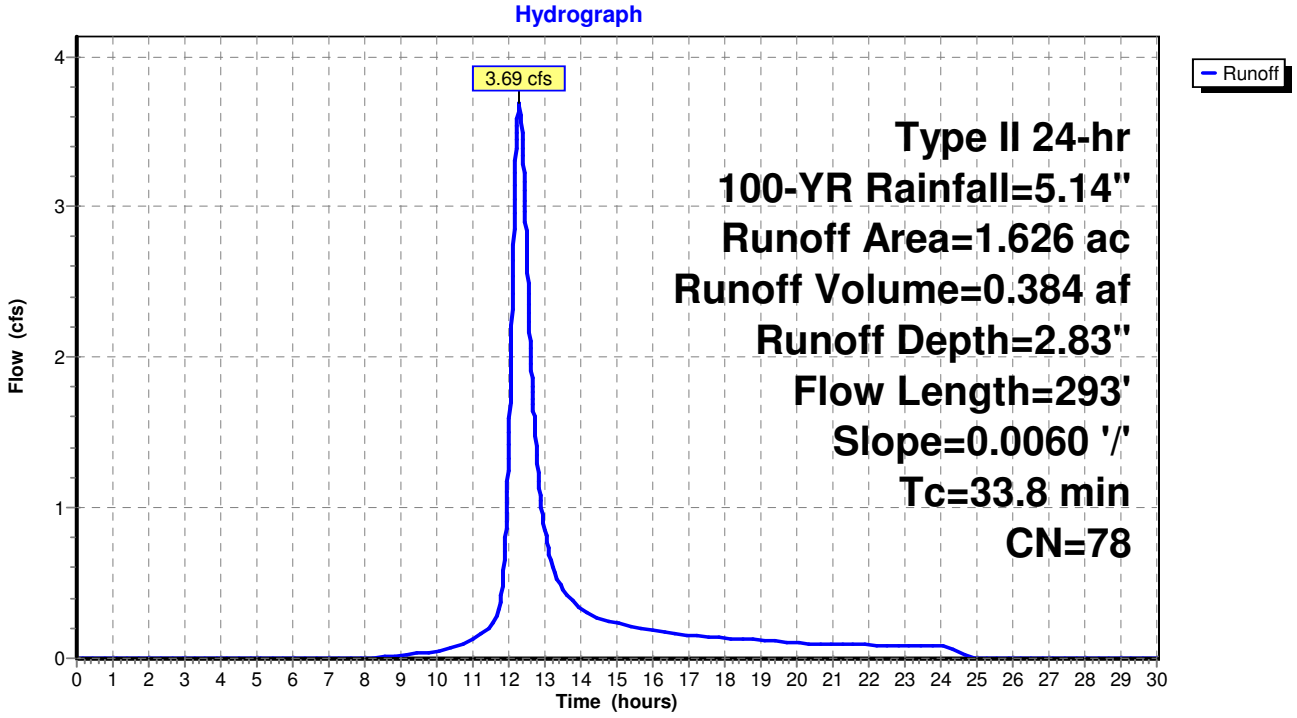
Runoff = 3.69 cfs @ 12.28 hrs, Volume= 0.384 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.626	80	>75% Grass cover, Good, HSG D
1.000	77	Woods, Good, HSG D
1.626	78	Weighted Average
1.626		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.9	100	0.0060	0.06		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"
5.9	193	0.0060	0.54		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
33.8	293	Total			

Subcatchment 1S: North Drainage Area - Lawn Area



Summary for Subcatchment 2S: Northeast Drainage Area

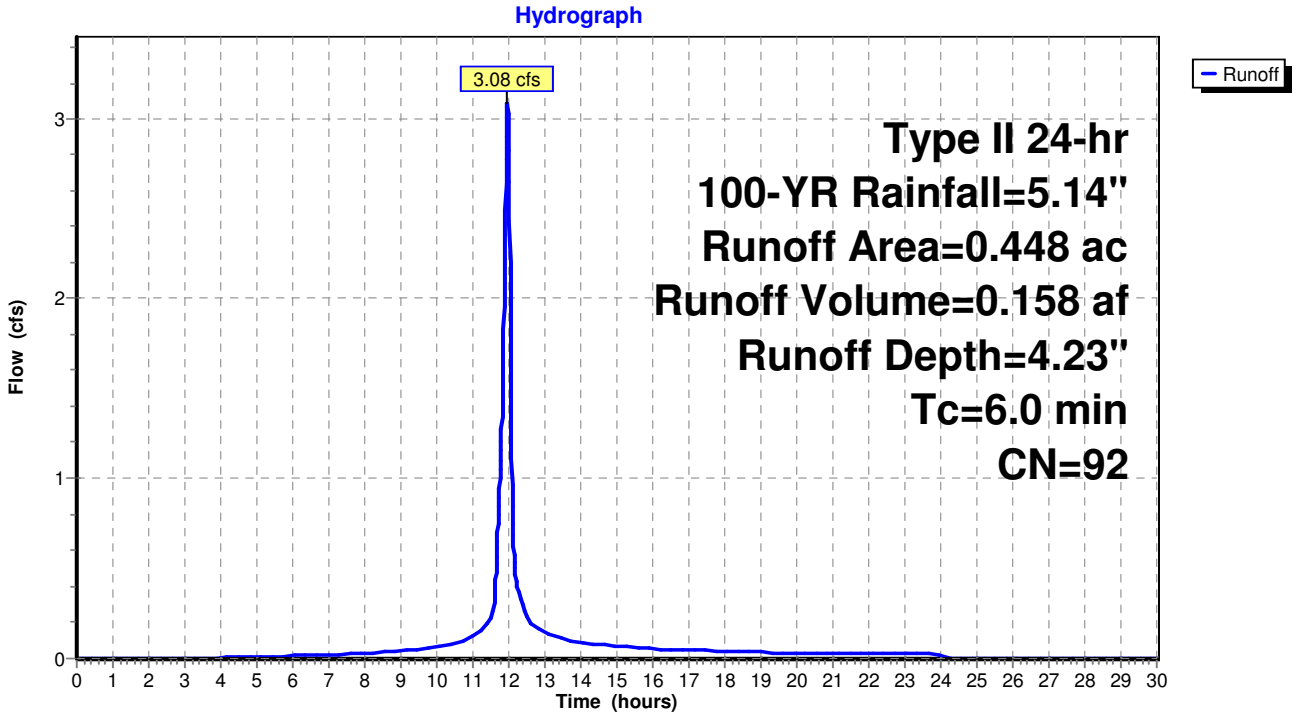
Runoff = 3.08 cfs @ 11.97 hrs, Volume= 0.158 af, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.306	98	Paved parking, HSG D
0.142	80	>75% Grass cover, Good, HSG D
0.448	92	Weighted Average
0.142		31.70% Pervious Area
0.306		68.30% Impervious Area

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

Subcatchment 2S: Northeast Drainage Area



Summary for Subcatchment 3S: Northwest Drainage Area

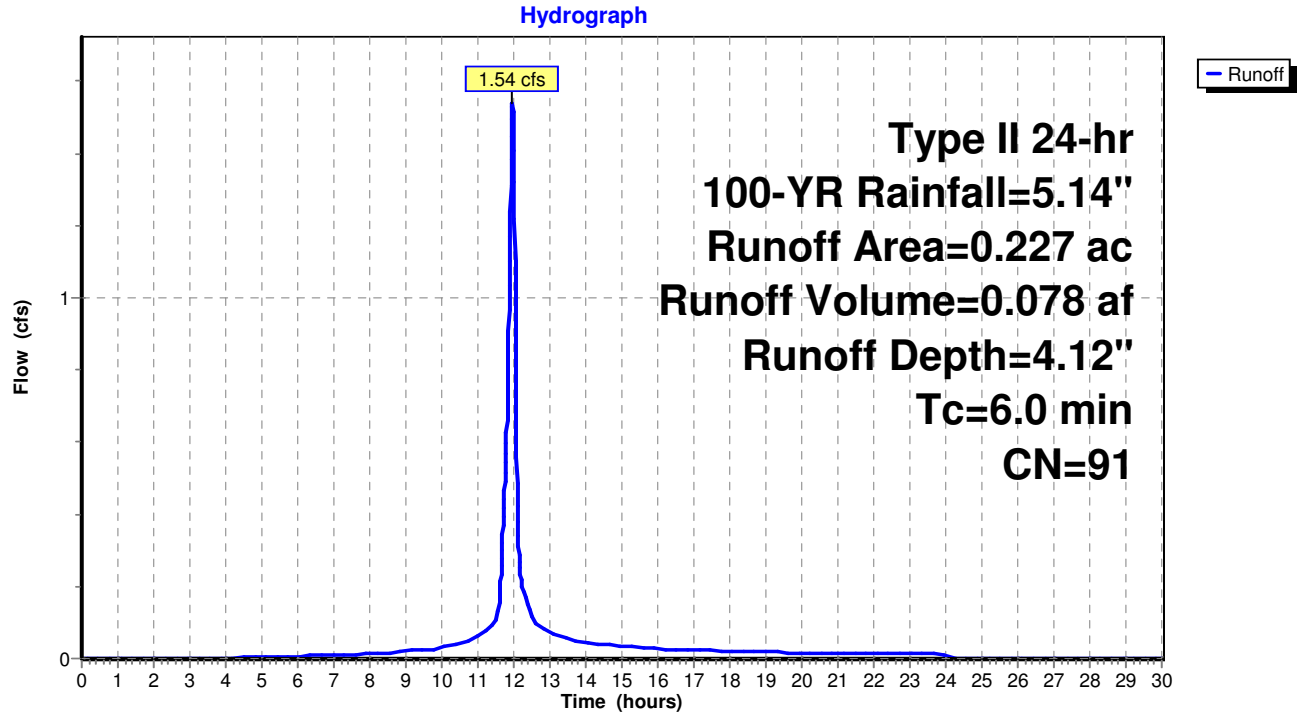
Runoff = 1.54 cfs @ 11.97 hrs, Volume= 0.078 af, Depth= 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.133	98	Paved parking, HSG D
0.094	80	>75% Grass cover, Good, HSG D
0.227	91	Weighted Average
0.094		41.41% Pervious Area
0.133		58.59% Impervious Area

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

Subcatchment 3S: Northwest Drainage Area



Summary for Subcatchment 4S: Middle Drainage Area

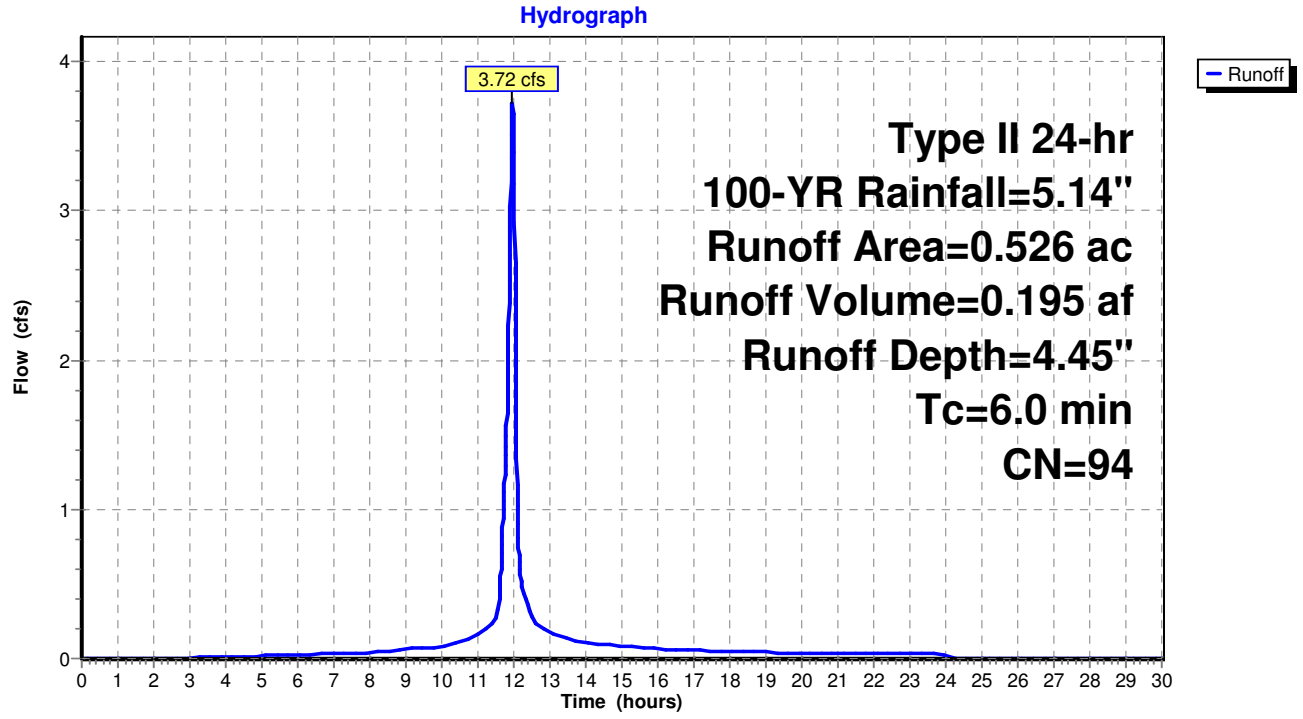
Runoff = 3.72 cfs @ 11.97 hrs, Volume= 0.195 af, Depth= 4.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.406	98	Paved parking, HSG D
0.120	80	>75% Grass cover, Good, HSG D
0.526	94	Weighted Average
0.120		22.81% Pervious Area
0.406		77.19% Impervious Area

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

Subcatchment 4S: Middle Drainage Area



Summary for Subcatchment 5S: Southeast Drainage Area

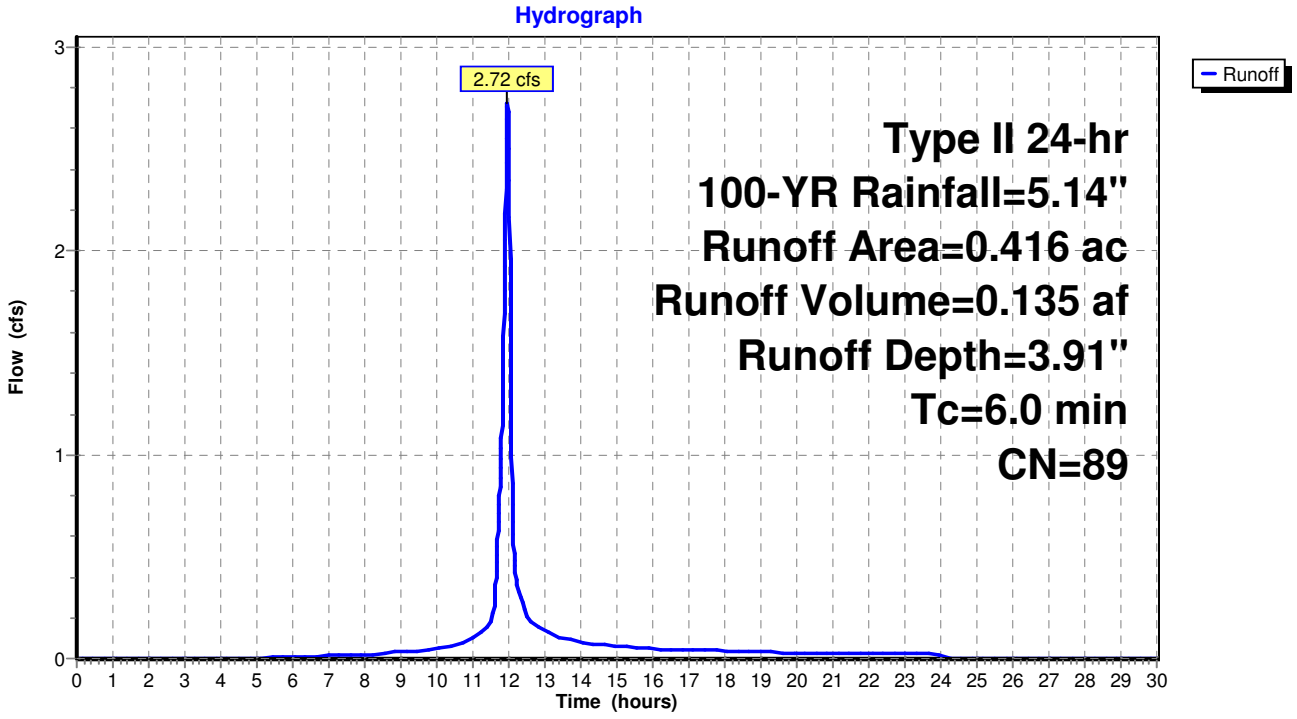
Runoff = 2.72 cfs @ 11.97 hrs, Volume= 0.135 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.201	98	Paved parking, HSG D
0.215	80	>75% Grass cover, Good, HSG D
0.416	89	Weighted Average
0.215		51.68% Pervious Area
0.201		48.32% Impervious Area

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

Subcatchment 5S: Southeast Drainage Area



Summary for Subcatchment 6S: West Drainage Area

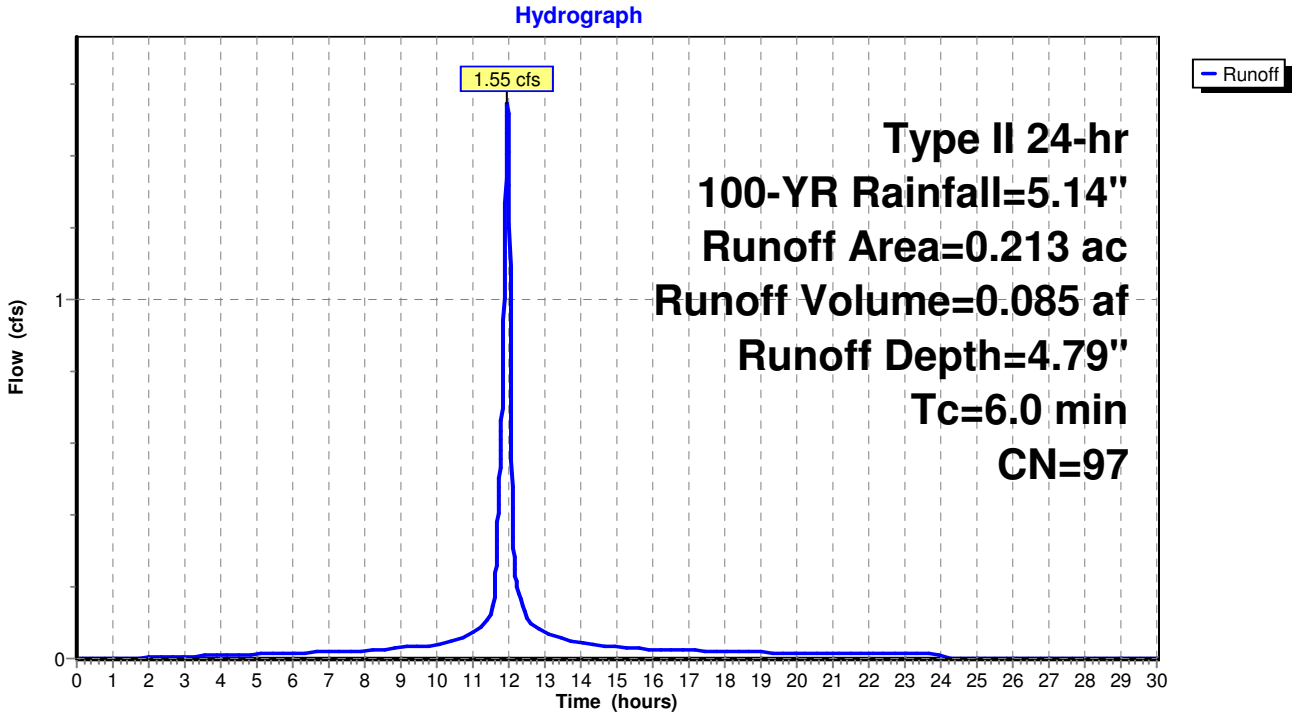
Runoff = 1.55 cfs @ 11.97 hrs, Volume= 0.085 af, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.196	98	Paved parking, HSG D
0.017	80	>75% Grass cover, Good, HSG D
0.213	97	Weighted Average
0.017		7.98% Pervious Area
0.196		92.02% Impervious Area

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

Subcatchment 6S: West Drainage Area



Summary for Subcatchment 7S: North Parking Lot (to Wet Pond)

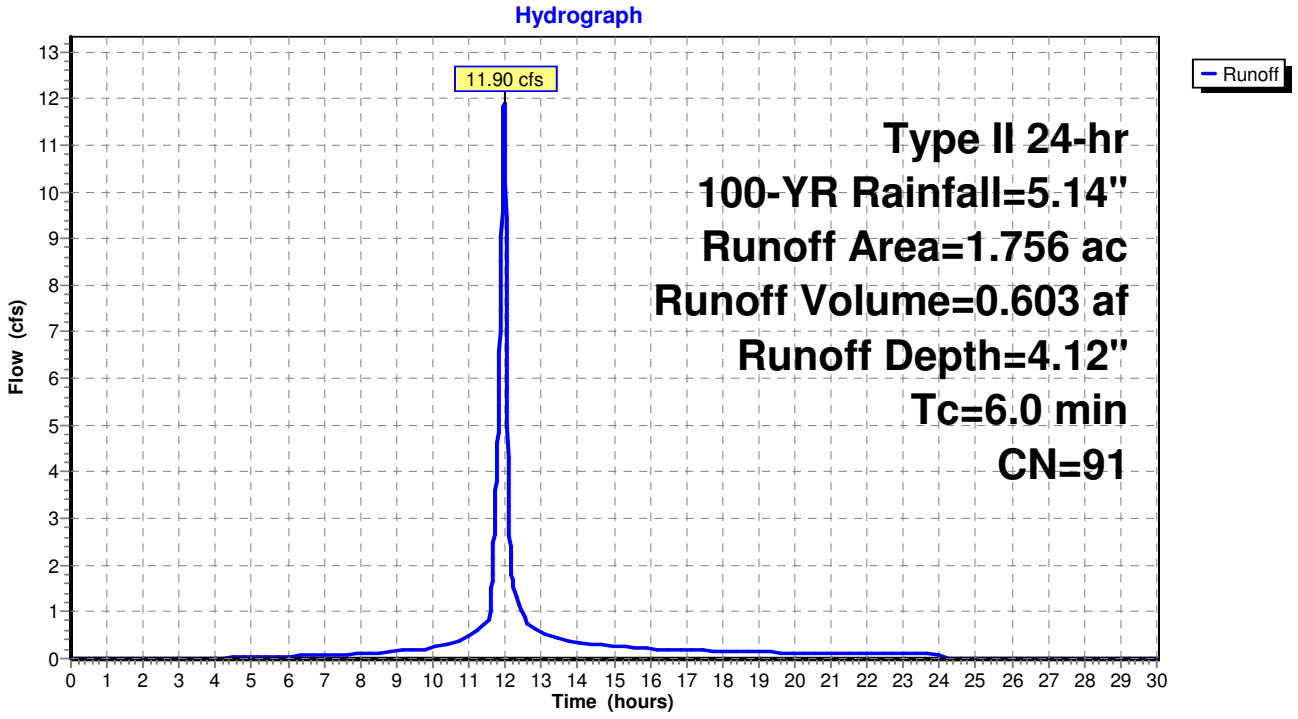
Runoff = 11.90 cfs @ 11.97 hrs, Volume= 0.603 af, Depth= 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
1.074	98	Paved parking, HSG D
0.682	80	>75% Grass cover, Good, HSG D
1.756	91	Weighted Average
0.682		38.84% Pervious Area
1.074		61.16% Impervious Area

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

Subcatchment 7S: North Parking Lot (to Wet Pond)



Summary for Subcatchment 8S: East Drainage Area

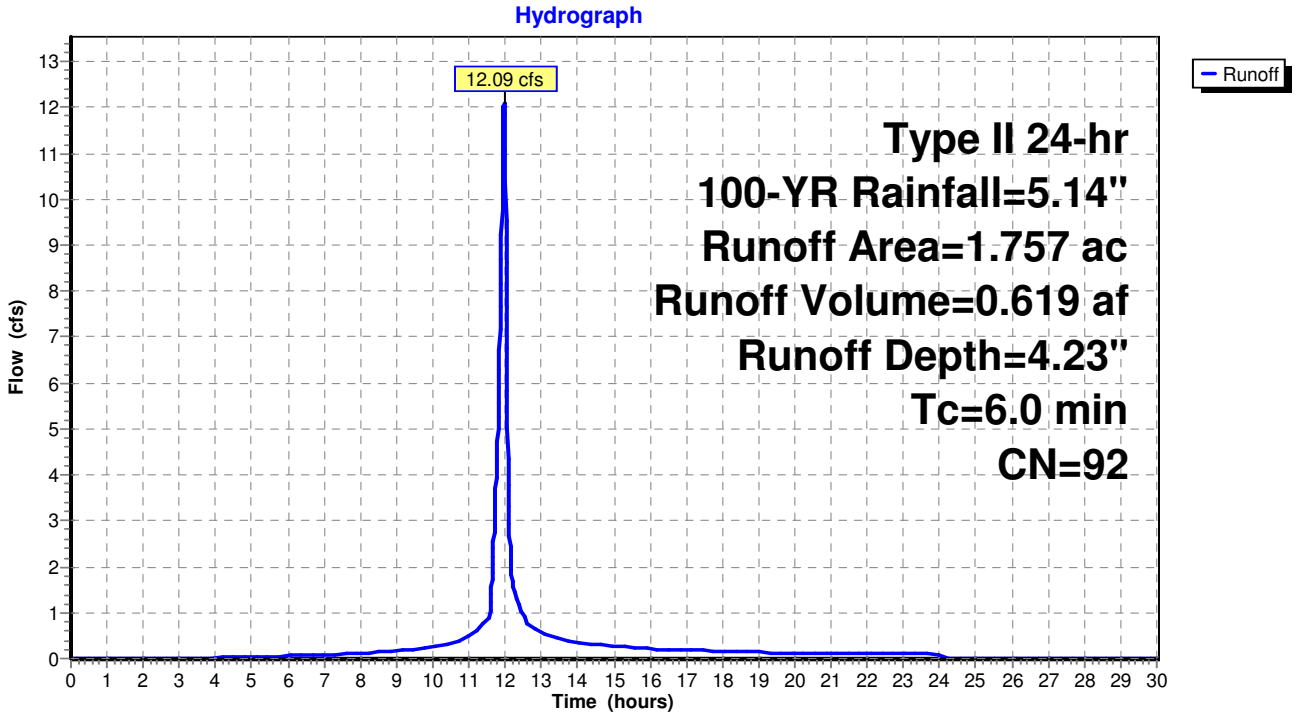
Runoff = 12.09 cfs @ 11.97 hrs, Volume= 0.619 af, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
1.198	98	Paved parking, HSG D
0.559	80	>75% Grass cover, Good, HSG D
1.757	92	Weighted Average
0.559		31.82% Pervious Area
1.198		68.18% Impervious Area

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

Subcatchment 8S: East Drainage Area



Summary for Subcatchment 9S: Southwest Drainage Area

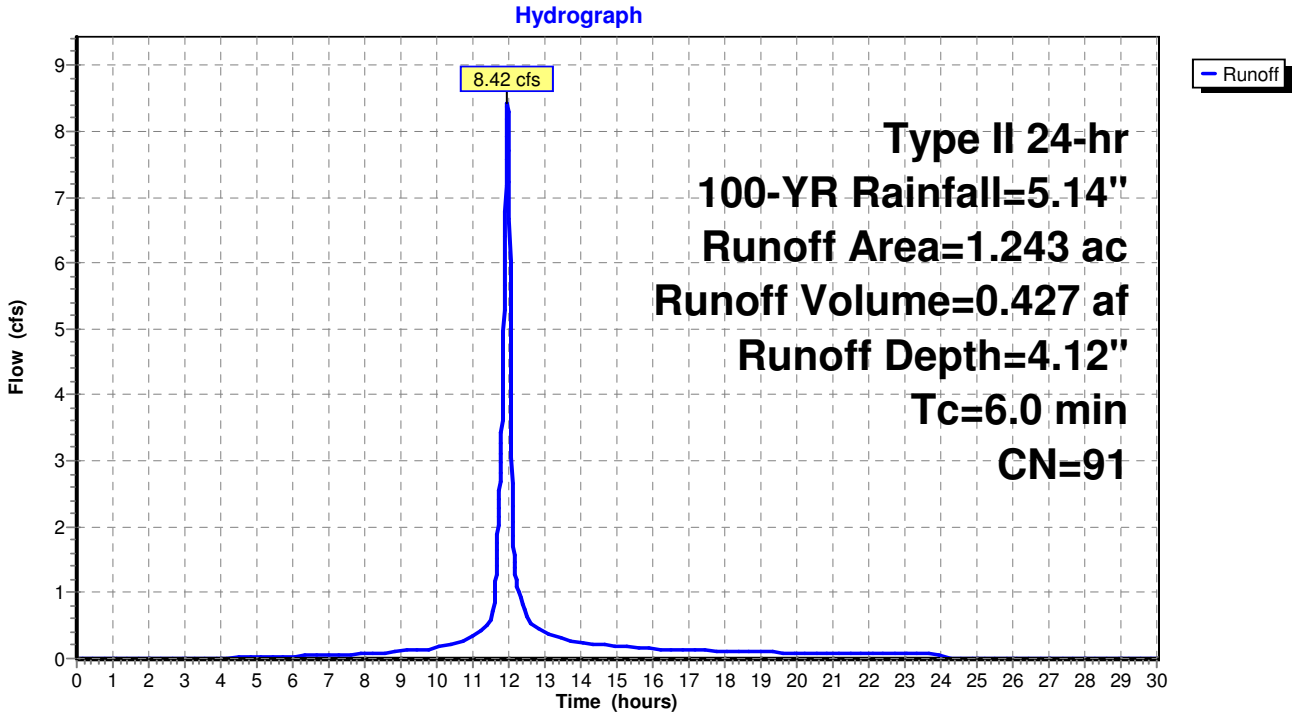
Runoff = 8.42 cfs @ 11.97 hrs, Volume= 0.427 af, Depth= 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.746	98	Paved parking, HSG D
0.497	80	>75% Grass cover, Good, HSG D
1.243	91	Weighted Average
0.497		39.98% Pervious Area
0.746		60.02% Impervious Area

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

Subcatchment 9S: Southwest Drainage Area



Summary for Subcatchment 10S: South Drainage Area

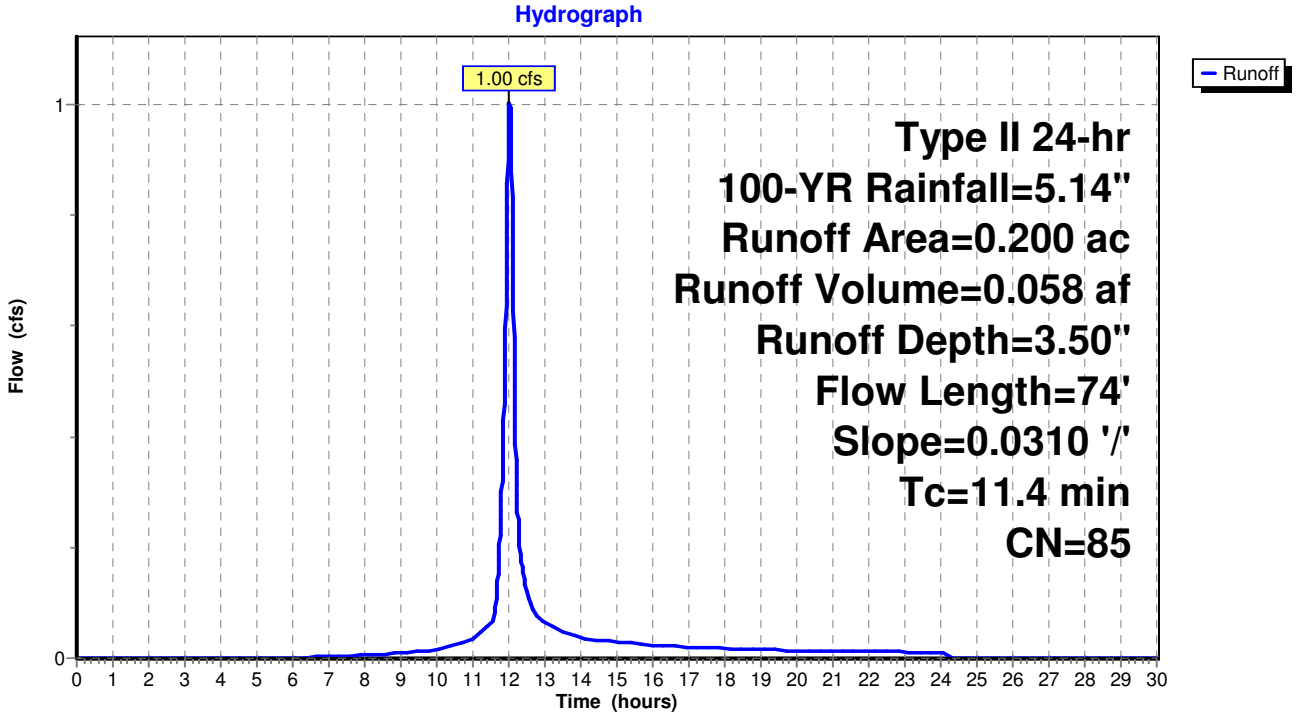
Runoff = 1.00 cfs @ 12.03 hrs, Volume= 0.058 af, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=5.14"

Area (ac)	CN	Description
0.150	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.200	85	Weighted Average
0.150		75.00% Pervious Area
0.050		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	74	0.0310	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.19"

Subcatchment 10S: South Drainage Area



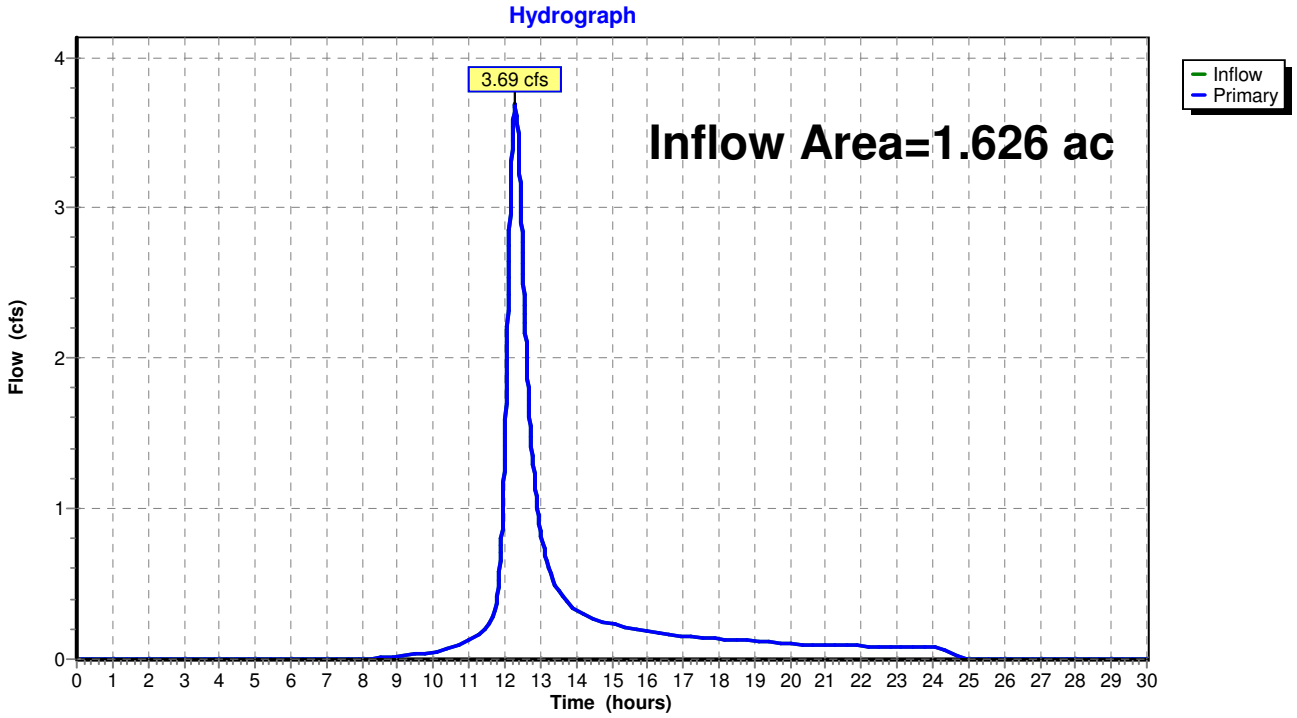
Summary for Pond 1P: Discharge from North Drainage Area

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

Inflow Area = 1.626 ac, 0.00% Impervious, Inflow Depth = 2.83" for 100-YR event
Inflow = 3.69 cfs @ 12.28 hrs, Volume= 0.384 af
Primary = 3.69 cfs @ 12.28 hrs, Volume= 0.384 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 1P: Discharge from North Drainage Area



Summary for Pond 2P: Northeast Bioretention Basin

Inflow Area = 0.448 ac, 68.30% Impervious, Inflow Depth = 4.23" for 100-YR event
Inflow = 3.08 cfs @ 11.97 hrs, Volume= 0.158 af
Outflow = 2.99 cfs @ 11.99 hrs, Volume= 0.145 af, Atten= 3%, Lag= 1.1 min
Primary = 2.99 cfs @ 11.99 hrs, Volume= 0.145 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.74' @ 11.99 hrs Surf.Area= 1,484 sf Storage= 935 cf

Plug-Flow detention time= 80.2 min calculated for 0.145 af (92% of inflow)
Center-of-Mass det. time= 35.6 min (814.1 - 778.5)

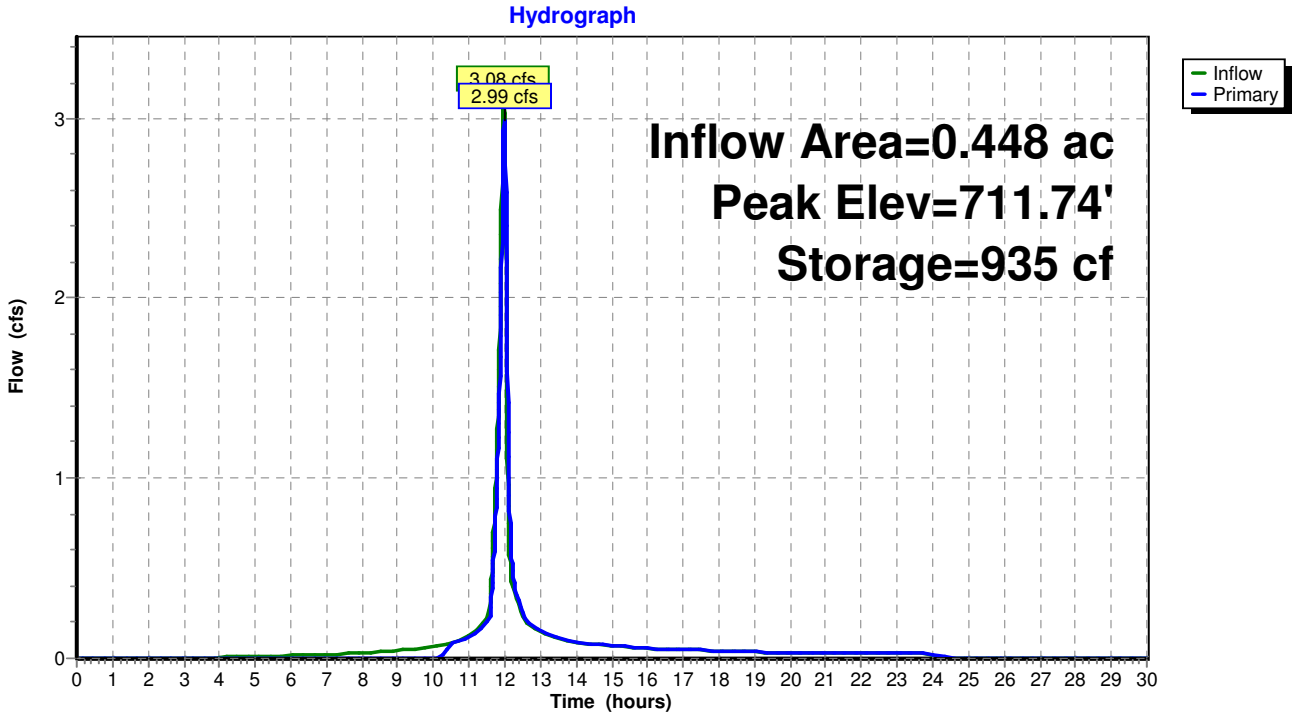
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	2,312 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	1,070	133.0	0	0	1,070
712.00	1,649	158.0	1,349	1,349	1,667
712.50	2,218	180.0	963	2,312	2,265

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 170.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 1,070 sf

Primary OutFlow Max=2.98 cfs @ 11.99 hrs HW=711.74' (Free Discharge)
- **1=Culvert** (Passes 2.98 cfs of 3.69 cfs potential flow)
  - **2=Orifice/Grate** (Weir Controls 2.98 cfs @ 1.59 fps)
  - **3=Underdrain** (Passes 0.00 cfs of 2.34 cfs potential flow)
    - **4=Exfiltration** (Controls 0.00 cfs)

Pond 2P: Northeast Bioretention Basin



Summary for Pond 3P: Northwest Bioretention Basin

Inflow Area = 0.227 ac, 58.59% Impervious, Inflow Depth = 4.12" for 100-YR event
Inflow = 1.54 cfs @ 11.97 hrs, Volume= 0.078 af
Outflow = 1.51 cfs @ 11.98 hrs, Volume= 0.072 af, Atten= 2%, Lag= 0.8 min
Primary = 1.51 cfs @ 11.98 hrs, Volume= 0.072 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 712.15' @ 11.98 hrs Surf.Area= 843 sf Storage= 428 cf

Plug-Flow detention time= 81.6 min calculated for 0.072 af (92% of inflow)
Center-of-Mass det. time= 37.5 min (820.2 - 782.6)

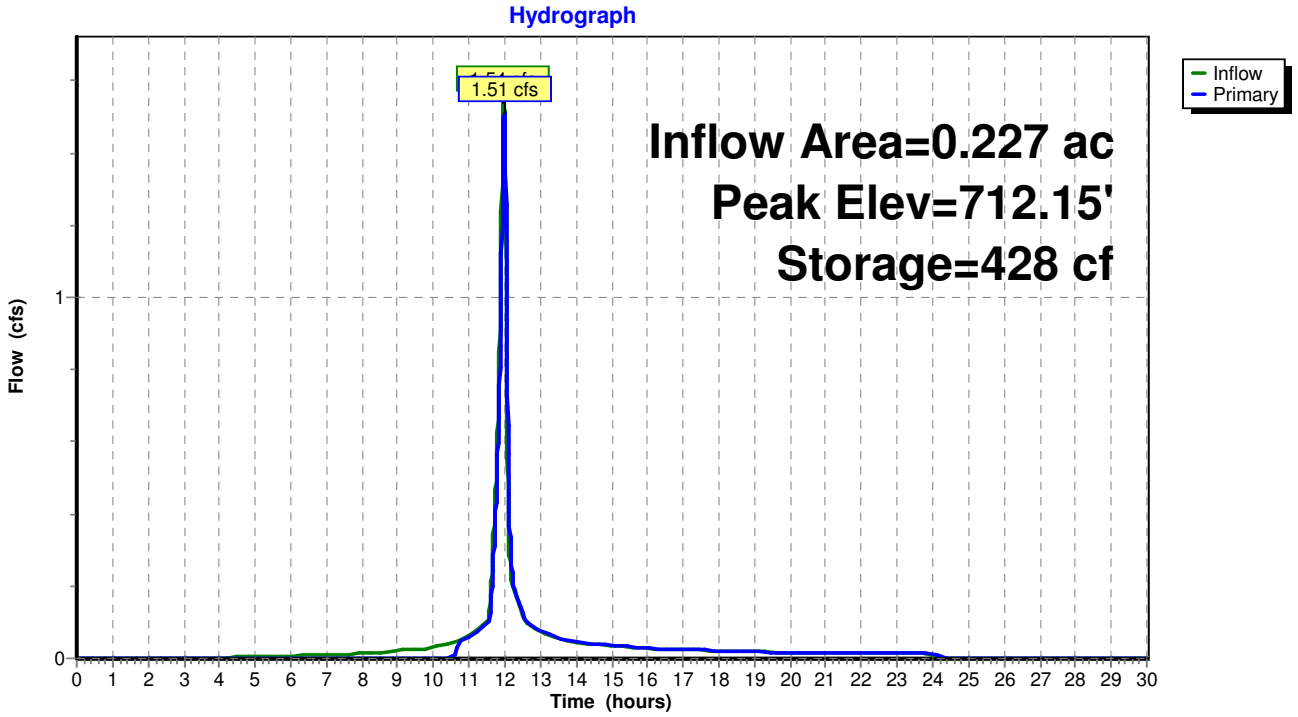
Volume	Invert	Avail.Storage	Storage Description
#1	711.50'	1,373 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.50	487	131.0	0	0	487
712.00	759	144.0	309	309	780
713.00	1,402	171.0	1,064	1,373	1,475

Device	Routing	Invert	Outlet Devices
#1	Primary	708.75'	**12.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.75' / 708.25' S= 0.0109 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	712.00'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.75'	**8.0" Round Underdrain** L= 51.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.75' / 708.75' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.50'	**0.250 in/hr Exfiltration over Surface area above 711.50'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 487 sf

Primary OutFlow Max=1.51 cfs @ 11.98 hrs HW=712.15' (Free Discharge)
└**1=Culvert** (Passes 1.51 cfs of 5.08 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 1.51 cfs @ 1.26 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 2.15 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 3P: Northwest Bioretention Basin



Summary for Pond 4P: Middle Bioretention Basin

Inflow Area = 0.526 ac, 77.19% Impervious, Inflow Depth = 4.45" for 100-YR event
Inflow = 3.72 cfs @ 11.97 hrs, Volume= 0.195 af
Outflow = 3.47 cfs @ 12.00 hrs, Volume= 0.173 af, Atten= 7%, Lag= 1.7 min
Primary = 3.47 cfs @ 12.00 hrs, Volume= 0.173 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.76' @ 12.00 hrs Surf.Area= 2,621 sf Storage= 1,667 cf

Plug-Flow detention time= 106.7 min calculated for 0.173 af (89% of inflow)
Center-of-Mass det. time= 50.2 min (819.4 - 769.2)

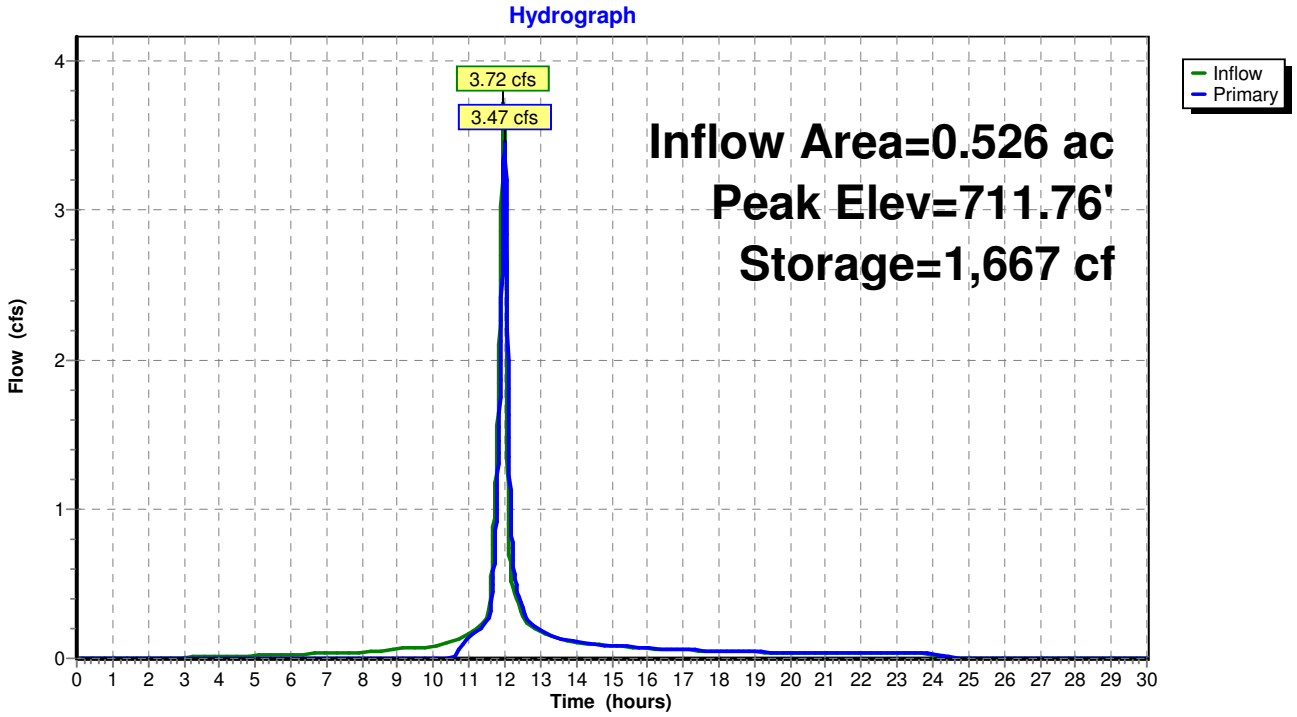
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	3,947 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	1,795	362.0	0	0	1,795
712.00	2,915	400.0	2,332	2,332	4,131
712.50	3,555	418.0	1,615	3,947	5,320

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 144.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 1,795 sf

Primary OutFlow Max=3.46 cfs @ 12.00 hrs HW=711.76' (Free Discharge)
└**1=Culvert** (Passes 3.46 cfs of 5.05 cfs potential flow)
  └**2=Orifice/Grate** (Weir Controls 3.45 cfs @ 1.67 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 1.52 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 4P: Middle Bioretention Basin



Summary for Pond 5P: South Bioretention Basin

Inflow Area = 0.416 ac, 48.32% Impervious, Inflow Depth = 3.91" for 100-YR event
Inflow = 2.72 cfs @ 11.97 hrs, Volume= 0.135 af
Outflow = 2.66 cfs @ 11.99 hrs, Volume= 0.126 af, Atten= 2%, Lag= 1.0 min
Primary = 2.66 cfs @ 11.99 hrs, Volume= 0.126 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 711.72' @ 11.99 hrs Surf.Area= 1,193 sf Storage= 695 cf

Plug-Flow detention time= 69.0 min calculated for 0.126 af (93% of inflow)
Center-of-Mass det. time= 29.9 min (820.2 - 790.2)

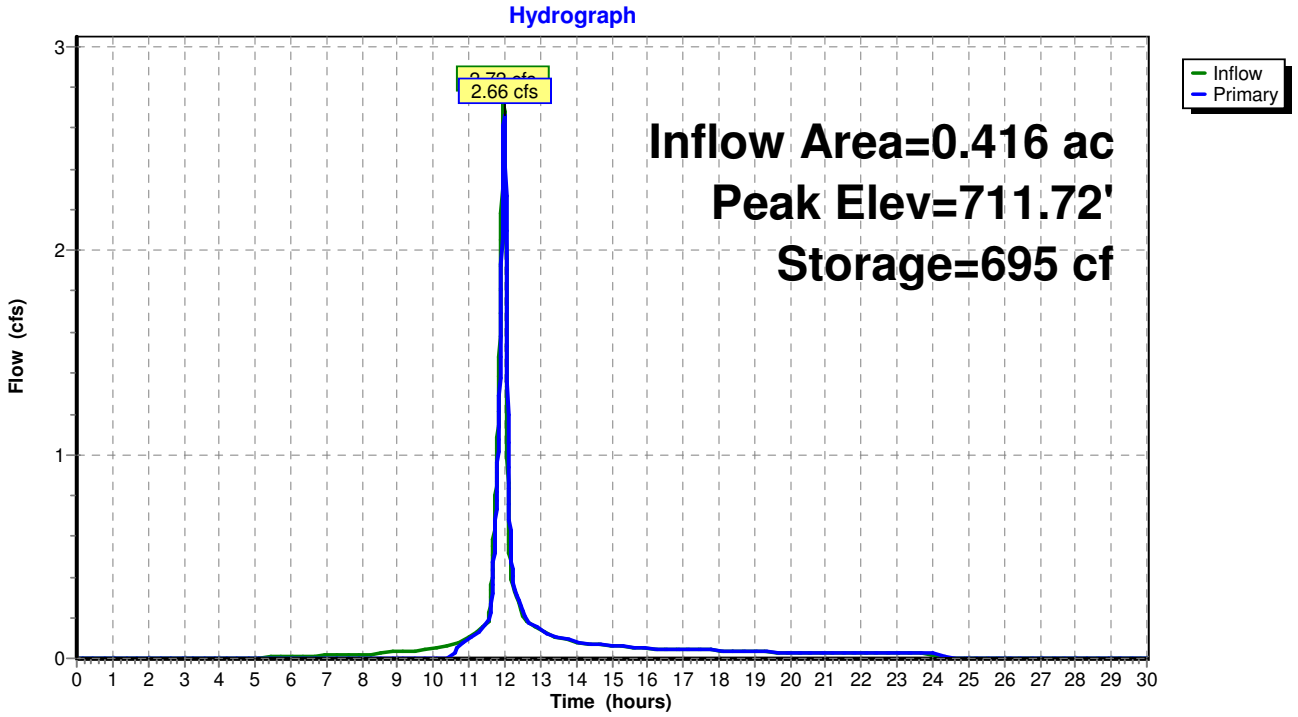
Volume	Invert	Avail.Storage	Storage Description
#1	711.00'	1,834 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
711.00	760	184.0	0	0	760
712.00	1,390	209.0	1,059	1,059	1,566
712.50	1,716	221.0	775	1,834	1,991

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 75.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	711.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	708.25'	**8.0" Round Underdrain** L= 66.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#4	Device 3	711.00'	**0.250 in/hr Exfiltration over Surface area above 711.00'** Conductivity to Groundwater Elevation = 0.00' Excluded Surface area = 760 sf

Primary OutFlow Max=2.65 cfs @ 11.99 hrs HW=711.72' (Free Discharge)
└**1=Culvert** (Passes 2.65 cfs of 4.80 cfs potential flow)
  ├**2=Orifice/Grate** (Weir Controls 2.65 cfs @ 1.52 fps)
  └**3=Underdrain** (Passes 0.00 cfs of 2.01 cfs potential flow)
    └**4=Exfiltration** (Controls 0.00 cfs)

Pond 5P: South Bioretention Basin



Summary for Pond 6P: Dry Detention Basin

[79] Warning: Submerged Pond 2P Primary device # 1 by 2.74'
[79] Warning: Submerged Pond 3P Primary device # 1 INLET by 2.24'
[79] Warning: Submerged Pond 4P Primary device # 1 by 2.74'
[79] Warning: Submerged Pond 5P Primary device # 1 by 2.74'

Inflow Area = 5.343 ac, 65.77% Impervious, Inflow Depth > 4.09" for 100-YR event
Inflow = 35.91 cfs @ 11.97 hrs, Volume= 1.821 af
Outflow = 15.24 cfs @ 12.08 hrs, Volume= 1.768 af, Atten= 58%, Lag= 6.4 min
Primary = 1.74 cfs @ 12.08 hrs, Volume= 1.332 af
Secondary = 13.50 cfs @ 12.08 hrs, Volume= 0.436 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 710.99' @ 12.08 hrs Surf.Area= 14,511 sf Storage= 35,290 cf

Plug-Flow detention time= 186.9 min calculated for 1.768 af (97% of inflow)
Center-of-Mass det. time= 168.6 min (958.4 - 789.8)

Volume	Invert	Avail.Storage	Storage Description
#1	708.25'	48,387 cf	**Dry Detention Basin (Irregular)** Listed below (Recalc)
#2	708.25'	939 cf	**12.0" Round 12" Diameter Pipe Storage** L= 1,195.0'
#3	708.25'	1,582 cf	**18.0" Round 18" Diameter Pipe Storage** L= 895.0'
		50,907 cf	Total Available Storage

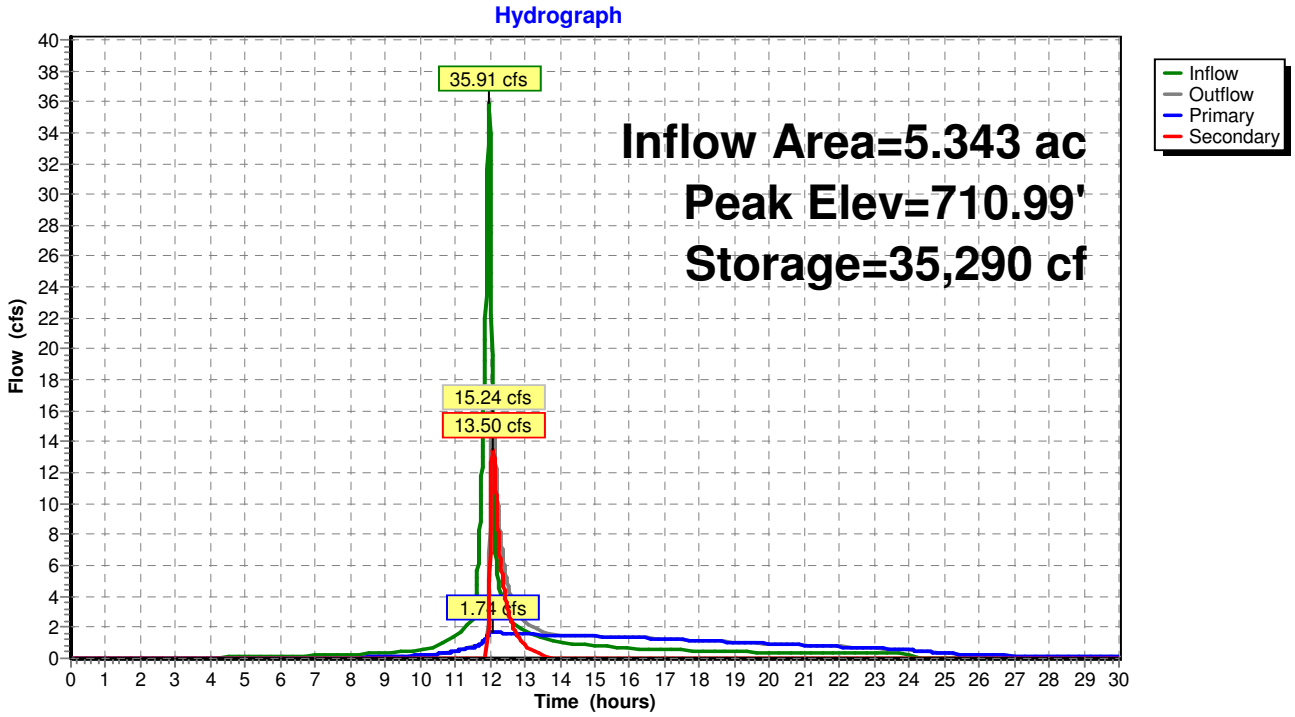
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
708.25	9,511	421.0	0	0	9,511
709.00	10,804	440.0	7,613	7,613	10,852
710.00	12,614	465.0	11,697	19,310	12,709
711.00	14,524	490.0	13,558	32,868	14,668
712.00	16,535	515.0	15,519	48,387	16,729

Device	Routing	Invert	Outlet Devices
#1	Primary	708.25'	**12.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 708.25' / 708.25' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	708.25'	**6.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	710.35'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.74 cfs @ 12.08 hrs HW=710.99' (Free Discharge)
└**1=Culvert** (Passes 1.74 cfs of 4.47 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 1.74 cfs @ 7.57 fps)

Secondary OutFlow Max=13.49 cfs @ 12.08 hrs HW=710.99' (Free Discharge)
└**3=Orifice/Grate** (Weir Controls 13.49 cfs @ 2.62 fps)

Pond 6P: Dry Detention Basin



Summary for Pond 7P: Discharge to 12-inch Culvert

[79] Warning: Submerged Pond 6P Primary device # 1 by 1.80'

Inflow Area = 6.586 ac, 64.68% Impervious, Inflow Depth > 3.20" for 100-YR event
Inflow = 9.99 cfs @ 11.97 hrs, Volume= 1.759 af
Outflow = 9.15 cfs @ 12.01 hrs, Volume= 1.759 af, Atten= 8%, Lag= 2.1 min
Primary = 4.37 cfs @ 12.01 hrs, Volume= 1.728 af
Secondary = 4.77 cfs @ 12.01 hrs, Volume= 0.031 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Peak Elev= 710.05' @ 12.01 hrs Surf.Area= 5,854 sf Storage= 3,000 cf

Plug-Flow detention time= 1.8 min calculated for 1.758 af (100% of inflow)
Center-of-Mass det. time= 1.8 min (971.8 - 970.0)

Volume	Invert	Avail.Storage	Storage Description
#1	708.21'	4,370 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

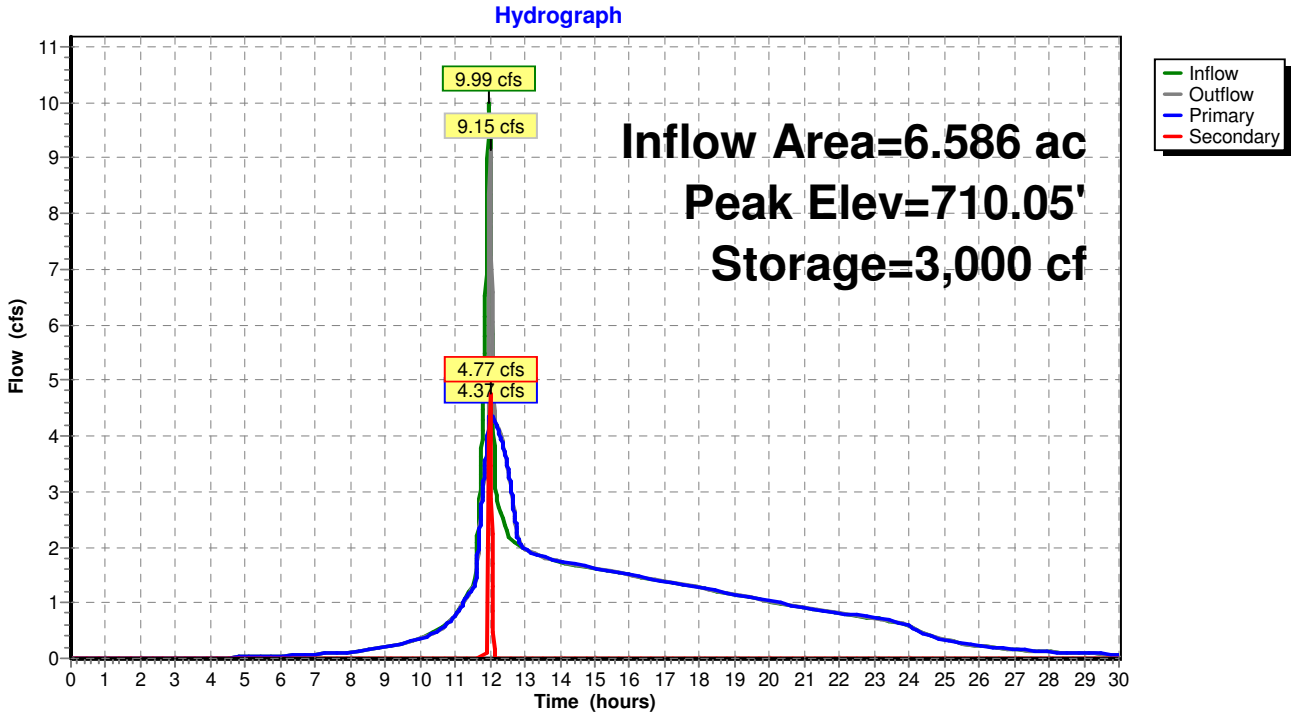
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
708.21	0	0.0	0	0	0
709.00	560	269.0	147	147	5,759
710.00	5,437	618.0	2,581	2,728	30,398
710.25	7,765	634.0	1,642	4,370	31,999

Device	Routing	Invert	Outlet Devices
#1	Primary	708.21'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	710.00'	**180.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=4.37 cfs @ 12.01 hrs HW=710.05' (Free Discharge)
1=Orifice/Grate (Orifice Controls 4.37 cfs @ 5.57 fps)

Secondary OutFlow Max=4.70 cfs @ 12.01 hrs HW=710.05' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 4.70 cfs @ 0.55 fps)

Pond 7P: Discharge to 12-inch Culvert



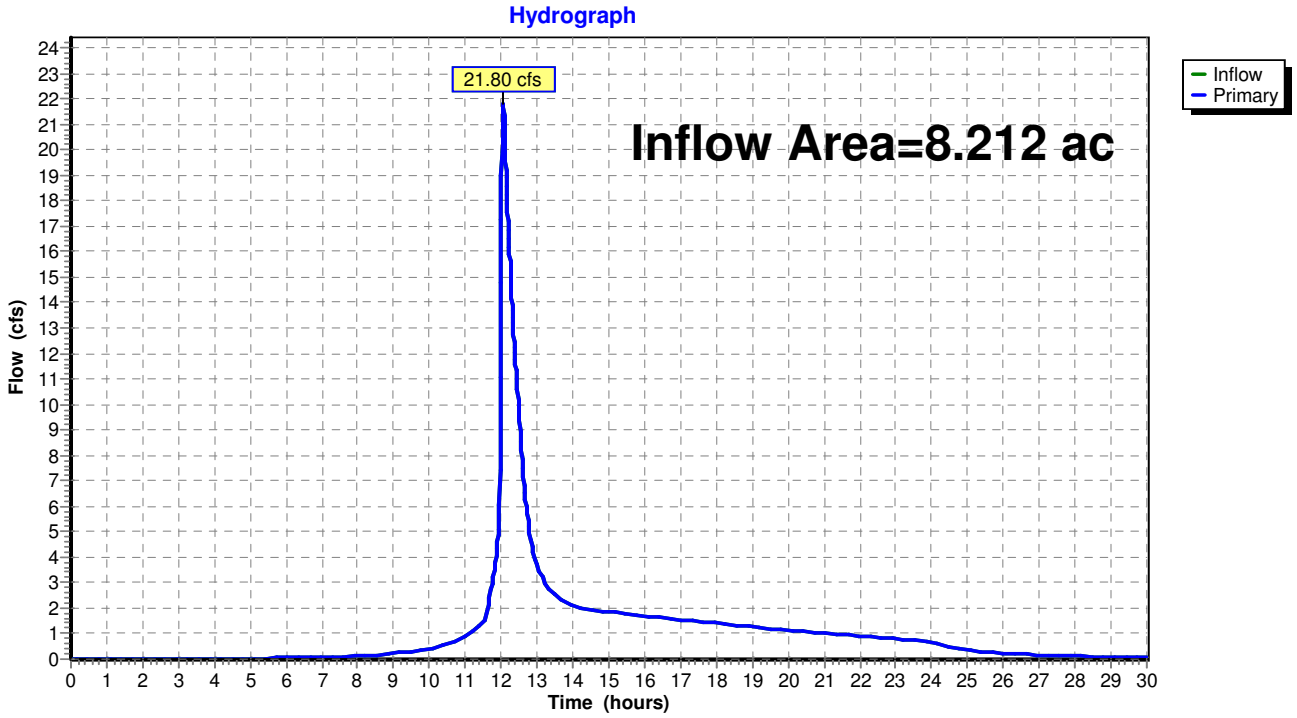
Summary for Pond 8P: Discharge to West Property

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

Inflow Area = 8.212 ac, 51.88% Impervious, Inflow Depth > 3.77" for 100-YR event
Inflow = 21.80 cfs @ 12.05 hrs, Volume= 2.578 af
Primary = 21.80 cfs @ 12.05 hrs, Volume= 2.578 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 8P: Discharge to West Property



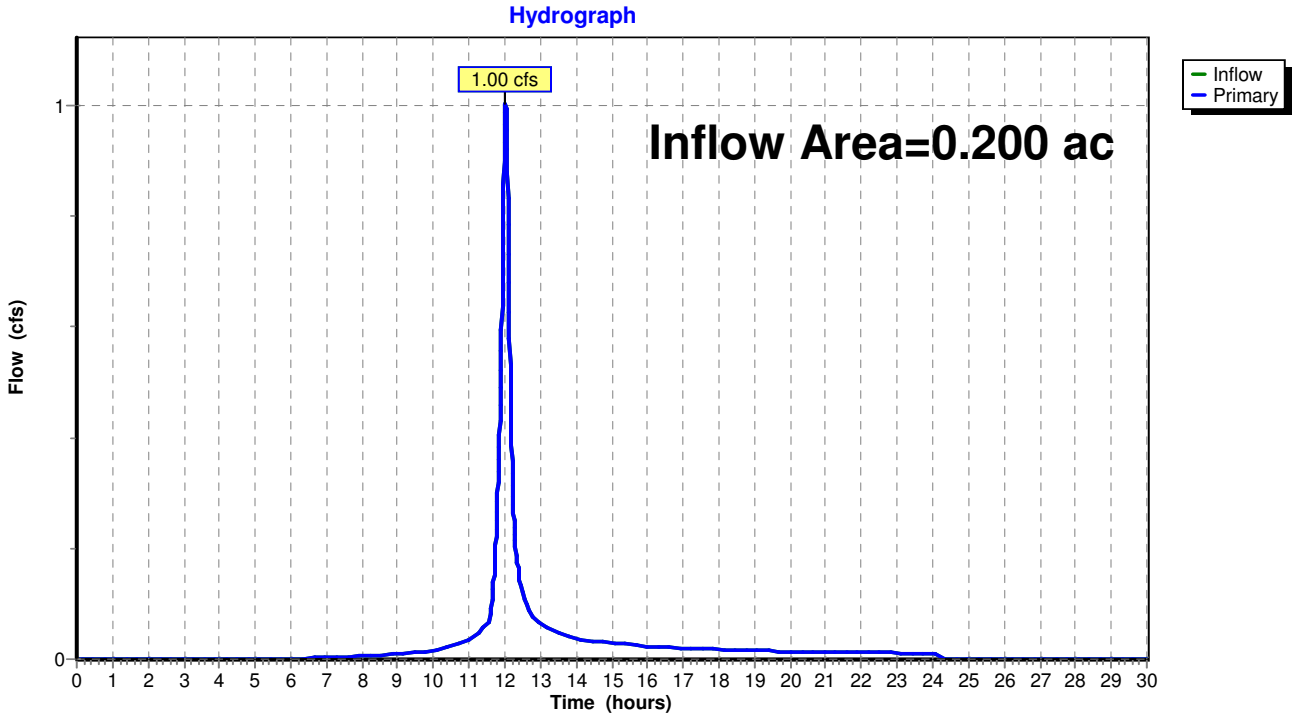
Summary for Pond 9P: Discharge to Seneca Street Drainage System

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

Inflow Area = 0.200 ac, 25.00% Impervious, Inflow Depth = 3.50" for 100-YR event
Inflow = 1.00 cfs @ 12.03 hrs, Volume= 0.058 af
Primary = 1.00 cfs @ 12.03 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Pond 9P: Discharge to Seneca Street Drainage System



Summary for Pond 10P: Permanent Pool

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	702.00'	16,601 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
702.00	1,398	157.0	0	0	1,398
703.00	1,732	170.0	1,562	1,562	1,774
704.00	2,082	182.0	1,904	3,466	2,153
705.00	2,468	196.0	2,272	5,739	2,615
706.00	2,870	208.0	2,666	8,405	3,050
707.00	3,286	220.0	3,076	11,481	3,512
708.00	3,754	233.0	3,517	14,998	4,032
708.25	9,511	421.0	1,603	16,601	13,817

PROPOSED DRAINAGE ANALYSIS MAP

LEGEND

DRAINAGE AREA

IMPERVIOUS AREA

Tc PATH

80 0 80 160 Ft.

80'

Project	LIFE CHURCH	Sheet	1 of
	STORMWATER CALCS	File #	
Prepared by	JU	Date	10/4/19
Checked by		Date	REV 6/24/20

DRAINAGE AREAS

EXISTING IMPERVIOUS AREA = 2.52 ACRES (SEE EXISTING DRAINAGE ANALYSIS MAP)

PROPOSED IMPERVIOUS AREA = 4.53 ACRES (SEE PROPOSED DRAINAGE ANALYSIS MAP)

NEW IMPERVIOUS AREA = PROPOSED - EXISTING = 4.53 - 2.52 = 2.01 ACRES

EXISTING IMPERVIOUS AREA TO REMAIN = 1.51 ACRES

RECONSTRUCTED IMPERVIOUS AREA = PROPOSED IMPERV. AREA - (NEW IMPERV AREA + EXISTING IMPERV. AREA TO REMAIN)

= 4.53 ACRES - (2.01 ACRES + 1.51 ACRES)

= 1.01 ACRES

WATER QUALITY VOLUME REQ'D (WQ$_V$ REQUIRED)

(1) NEW IMPERVIOUS AREA

$$WQ_V = \frac{P(R_V)(A)}{12}$$

$$= \frac{(1.0)(0.95)(2.01 \text{ ACRES})}{12}$$

= 0.159 AC-FT

= 6,926 CF

WHERE: P = 90% RAINFALL EVENT
= 1.0 INCH
A = 2.01 ACRES
I = 100%
$R_V = 0.05 + 0.009(I)$
$= 0.05 + 0.009(100)$
= 0.95

(2) RECONSTRUCTED IMPERVIOUS AREA

$$WQ_V = \frac{P(R_V)(A)}{12}$$

$$= \frac{(1.0)(0.95)(1.01 \text{ ACRES})}{12}$$

= 0.080 AC-FT

= 3,485 CF

WHERE: P = 1.0 INCH
A = 1.01 ACRES
I = 100%
R_V = 0.95

⇒ THIS PROJECT IS CONSIDERED A REDEVELOPMENT PROJECT W/ AN INCREASE IN IMPERVIOUS AREA. THEREFORE, CHAPTER 4 AND 9.2.B.II OF THE NYSDEC WILL BE USED

WQ_v TO BE TREATED = 100% NEW IMPERV. WQ_v + 25% RECONST. IMPERV WQ_v W/A STANDARD SMP

$= 1.0(6{,}926\ CF) + 0.25(3{,}485\ CF)$

WQ_v REQ'D = **7,797 CF**

RUNOFF REDUCTION VOLUME MINIMUM (RR_v MIN)

⇒ ONLY IMPLIES TO NEW IMPERVIOUS AREA

$$RR_v \text{ MIN.} = \frac{P(\overline{R_v})(AiC)(S)}{12}$$

$$= \frac{1.0(0.95)(2.01\ AC)(0.20)}{12}$$

$= 0.032$ AC-FT

RR_v MIN. = **1,394 CF**

WHERE: P = 1.0 INCH

AiC = TOTAL AREA OF NEW IMPERV. COVER = 2.01 ACRES

$\overline{R_v} = 0.05 + 0.009(I)$ WHERE I = 100% = 0.95

S = HSG SOIL REDUCTION FACTOR = 0.20 (HSG 'D' SOILS)

CHANNEL PROTECTION VOLUME (CP_V)

⇒ FOR REDEVELOPMENT PROJECTS, CP_V IS RELAXED (NYSDEC SMDM, CH. 9.2)

WATER QUALITY VOLUME (WQ_v) & RR PROVIDED

NORTHEAST BIORETENTION BASIN

$$WQ_v = \frac{P(R_v)(A)}{12}$$

WHERE: $P = 1.0$ INCH

$A = 19,521$ SF $= 0.448$ AC

$I = \frac{13,317\ SF}{19,521\ SF} \times 100 = 68.2\%$

$R_v = 0.05 + 0.009(68.2)$

$= 0.6638$

$$WQ_v = \frac{1.0(0.6638)(0.45\ AC)}{12}$$

$= 0.025$ AC-FT

$= \underline{1,089\ CF}$

WQ_v REQUIRED $= 1,089$ CF

RR_v PROVIDED $= 40\%\ WQ_v = 0.40(1,089\ CF) = \underline{436\ CF}$

WQ_v PROVIDED $= 1,089\ CF - 436\ CF = \underline{653\ CF}$

REQ'D FILTER BED AREA (A_f)

$$A_f = \frac{WQ_v(d_f)}{K(h_f + d_f)t_f}$$

WHERE: $WQ_v = 1,089$ CF

A_f = SURFACE AREA OF FILTER BED (SF)

d_f = DEPTH OF FILTER BED $= 2.5$ FT

K = COEFF OF PERMEABILITY

$= 0.5$ FT/DAY (BIORET. SOIL)

h_f = AVG. HT OF WATER ABOVE BED

$= 0.5$ FT

t_f = DESIGN FILTER BED DRAIN TIME

$= 2$ DAYS

$$= \frac{(1,089\ CF)(2.5\ FT)}{0.50\frac{FT}{DAY}(0.5\ FT + 2.5\ FT)(2\ DAYS)}$$

$= 908$ SF

A_f PROVIDED $= 1,070$ SF

NORTHWEST BIORETENTION BASIN

$$WQ_v = \frac{P(R_v)(A)}{12}$$

WHERE: $P = 1.0$ INCH
$A = 9{,}884$ SF $= 0.227$ ACRES
$I = \frac{5{,}789\ SF}{9{,}884\ SF} \times 100\% = 59\%$
$R_v = 0.05 + 0.009(59)$
$= 0.581$

$$WQ_v = \frac{1.0(0.581)(0.227\ AC)}{12}$$

$= 0.011$ AC-FT
$= 479$ CF

WQ_v REQUIRED $= 479$ CF
RR_v PROVIDED $= 40\%(WQ_v) = 0.40(479\ CF) = \underline{192\ CF}$
WQ_v PROVIDED $= 479\ CF - 192\ CF = \underline{287\ CF}$

REQ'D FILTER BED AREA

$$A_f = \frac{WQ_v(d_f)}{K(h_f + d_f)t_f}$$

WHERE: $WQ_v = 479$ CF
$A_f = ?$
$d_f = 2.5$ FT
$K = 0.5$ FT/DAY
$h_f = 0.5$ FT
$t_f = 2$ DAYS

$$= \frac{(479\ CF)(2.5\ FT)}{(0.5\ FT/DAY)(0.5FT + 2.5FT)(2\ DAYS)}$$

$= 399$ SF

A_f PROVIDED $= 487$ SF

MIDDLE BIORETENTION BASIN

$$WQ_v = \frac{P(R_v)(A)}{12}$$

WHERE: $P = 1.0$ INCH
$A = 22,918\ SF = 0.526\ ACRES$
$I = \frac{17,676\ SF}{22,918\ SF} \times 100 = 77.1\%$
$R_v = 0.05 + 0.009(77.1)$
$= 0.7439$

$$= \frac{1.0(0.7439)(0.526\ AC)}{12}$$

$= 0.0326$ AC-FT
$= 1,420$ CF

WQ_v REQUIRED $= 1,420$ CF

RR_v PROVIDED $= 40\%(WQ_v) = 0.40(1,420\ CF) = \underline{568\ CF}$
WQ_v PROVIDED $= 1,420\ CF - 568\ CF = \underline{852\ CF}$

REQ'D FILTER BED AREA (A_f)

$$A_f = \frac{WQ_v(d_f)}{K(h_f + d_f)t_f}$$

WHERE: $WQ_v = 1,420$ CF
$A_f = ?$
$d_f = 2.5$ FT
$K = 0.5$ FT/DAY
$h_f = 0.5$ FT
$t_f = 2$ DAYS

$$= \frac{(1,420\ CF)(2.5\ FT)}{(0.5\ FT/DAY)(0.5\ FT + 2.5\ FT)(2\ DAYS)}$$

$= 1,183$ SF

A_f PROVIDED $= 1,645$ SF

SOUTH BIORETENTION BASIN

$WQ_v = \frac{P(R_v)(A)}{12}$

$= \frac{1.0(0.4847)(0.416\,AC)}{12}$

$= 0.017$ AC-FT

$= 741$ CF

WHERE: P = 1.0 INCH

A = 18,124 SF = 0.416 ACRES

$I = \frac{8,760\,SF}{18,124\,SF} \times 100 = 48.3\%$

$R_v = 0.05 + 0.009(I)$

$= 0.05 + 0.009(48.3)$

$= 0.4847$

WQ_v REQUIRED = 741 CF

RR_v PROVIDED = 40% (WQ_v PROVIDED) = 0.40(741 CF) = 297 CF

WQ_v PROVIDED = 741 CF − 297 CF = 444 CF

REQ'D FILTER BED AREA (A_f)

$A_f = \frac{WQ_v(d_f)}{K(h_f + d_f)t_f}$

$= \frac{(741\,CF)(2.5\,FT)}{(0.5\,FT/DAY)(0.5\,FT + 2.5\,FT)(2\,DAYS)}$

$= 618$ SF

WHERE: $WQ_v = 741$ CF

$A_f =$

$d_f = 2.5$ FT

$K = 0.50$ FT/DAY

$h_f = 0.5$ FT

$t_f = 2$ DAYS

A_f PROVIDED = 640 SF

REMAINING WQ_v = WQ_v REQ'D − (WQ_v + RR_v PROVIDED IN BIORETENTION)
= 7,797 CF − (1,089 + 479 + 1,420 + 741)
= 7,797 CF − 3,729 CF
= 4,068 CF

REMAINING WQ_v TO BE PROVIDED IN WET POOL OF STORMWATER POND

WQ_v PROVIDED IN WET POND (ELEV. 702 TO ELEV 708.25) = 16,601 CF

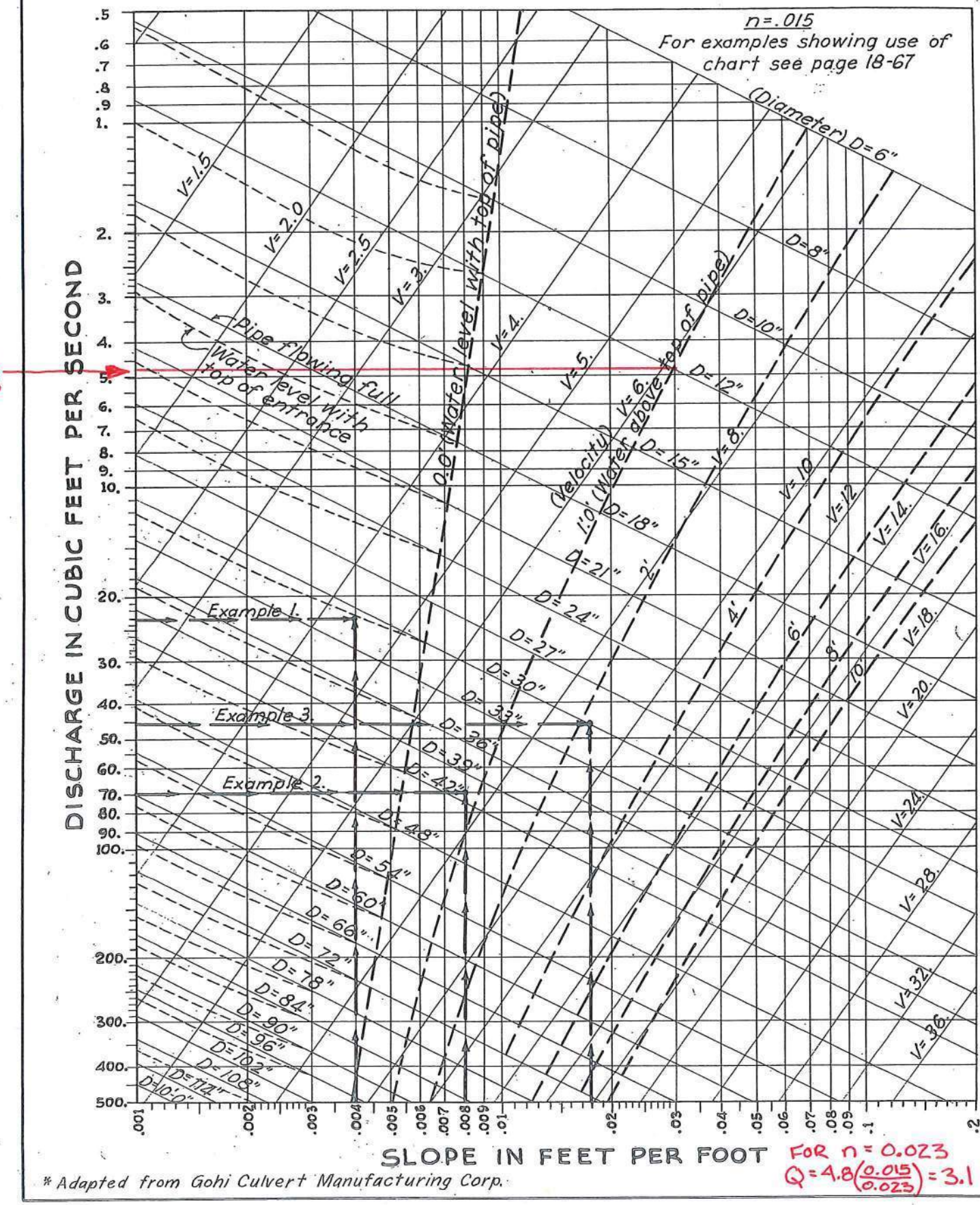
WQ_v + RR_v SUMMARY

WQ_v REQUIRED = 7,797 CF
WQ_v PROVIDED = BIORETENTION + WET POND
= (653 CF + 287 CF + 852 CF + 444 CF) + 16,601 CF
= 18,837 CF

RR_v MIN = 1,394 CF
RR_v PROVIDED = IN BIORETENTION
= 436 CF + 192 CF + 568 CF + 297 CF
= 1,493 CF

TOTAL WQ_v PROVIDED = WQ_v PROVIDED + RR_v PROVIDED
= 18,837 CF + 1,493 CF
= 20,330 CF

DRAINAGE & SEWERAGE – PIPE CAPACITIES-1



* Adapted from Gohi Culvert Manufacturing Corp.

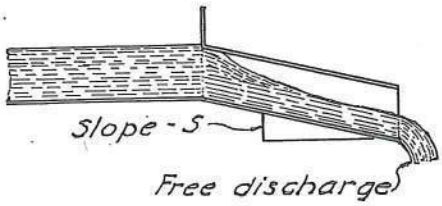
FOR n = 0.023
$Q = 4.8\left(\frac{0.015}{0.023}\right) = 3.1$

DRAINAGE & SEWERAGE – PIPE CAPACITIES-2

EXAMPLES SHOWING USE OF CHART PG. 18-66

Capacities and velocities in chart page 18-66 are for $n = 0.015$. For other values of n, given on page 5-26, multiply charted values by $\frac{0.015}{n}$

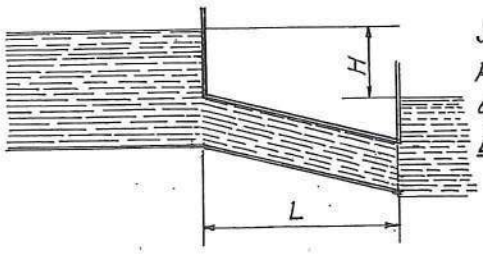
Case 1.



Dash lines to left of 0-0 line give values when water is level with top of pipe at entrance. Velocity of approach and entrance loss neglected.

Example 1. - Given: Q = 23 c.f.s.; S = 0.004; n = 0.015.
Required: D and V.
Solution: Enter Chart at 23 c.f.s.; read D = 30" at S = 0.004, and V = 4.4 Ft./Sec.

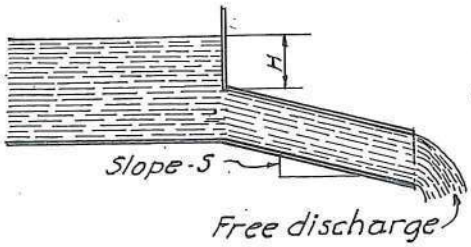
Case 2.



Solid D lines give values by Manning Formula (see page 18-69) for pipe flowing full. In this case $S = \frac{H}{L}$ = slope of hydraulic gradient. Minor losses neglected.

Example 2. - Given: Q = 70 c.f.s.; H = 4 ft.; L = 500 ft. $\therefore S = \frac{H}{L} = 0.008$
Required: D and V.
Solution: Enter Chart at 70 c.f.s. intersect. S = 0.008. Read D = 42" (nearest adequate size).
V = 7.5 Ft./Sec.

Case 3.



Dash lines to right of 0-0 line indicate limits of capacities with inlets submerged to depths shown, from orifice formula $Q = a \times 0.62\sqrt{2gh}$

Example 3. - Given: Q = 46 c.f.s.; S = 0.018.
Required: D with a back up H not more than 3 ft.
Solution: Enter Chart at 46 c.f.s. intersect. S = 0.018 - Read D = 30" (H = 2.3 ft.).

Notation:

- Q = Discharge in cubic feet per second.
- V = Velocity of flow in feet per second.
- S = Slope or hydraulic gradient.
- H = Hydraulic head.
- D = Diameter of pipe.
- L = Length of pipe.
- n = Coefficient of roughness.
- g = Acceleration of gravity = 32.16.

C&S COMPANIES®
www.cscos.com

Project LIFE CHURCH	Sheet of
ROCK OUTLET PROTECTION	File #
Prepared by	Date
Checked by	Date

INLET TO DETENTION BASIN

Q = 100-YR INFLOW FROM NORTH PARKING LOT, NE D.A. + NW D.A. = 16.3 CFS

(1) ASSUME MINIMUM TAILWATER CONDITION

w/ Q = 16.3 CFS, D_o = 18-INCH } FIGURE 3.16 ⇒ d_{50} = 6 INCH, L_a = 14 FT

$W = D_o + L_a = 1.5 + 14 = 15.5$ FT ⇒ SAY 16 FEET

w/ D_{50} = 6 INCHES ⇒ d_{MAX} = 9 INCHES, MIN BLANKET THICKNESS = 14 INCHES

(2) ASSUME MAX. TAILWATER CONDITION

w/ Q = 16.3 CFS, D_o = 18-INCH } FIGURE 3.17 ⇒ d_{50} = R-3 = 0.25 = 3 INCH, L_a = 24 FT

$W = D_o + 0.4 L_a = 1.5 + 0.4(24') = 11.1$ ⇒ SAY 11-FEET

w/ D_{50} = 3 INCHES ⇒ $d_{MAX} = 1.5(3\text{-IN}) = 4.5$ INCHES = 5 INCHES

MIN BLANKET THICKNESS = $1.5(D_{MAX}) = 1.5(5 \text{ INCHES}) = 7.5 \text{ INCHES} = 8 \text{ INCHES}$

STANDARD AND SPECIFICATIONS FOR ROCK OUTLET PROTECTION

Definition & Scope

A **permanent** section of rock protection placed at the outlet end of the culverts, conduits, or channels to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Conditions Where Practice Applies

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This applies to:

1. Culvert outlets of all types.
2. Pipe conduits from all sediment basins, dry storm water ponds, and permanent type ponds.
3. New channels constructed as outlets for culverts and conduits.

Design Criteria

The design of rock outlet protection depends entirely on the location. Pipe outlet at the top of cuts or on slopes steeper than 10 percent, cannot be protected by rock aprons or riprap sections due to re-concentration of flows and high velocities encountered after the flow leaves the apron.

Many counties and state agencies have regulations and design procedures already established for dimensions, type and size of materials, and locations where outlet protection is required. Where these requirements exist, they shall be followed.

Tailwater Depth

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tailwater depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition; see Figure 3.17 on page 3.43 as an example. Pipes which outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example.

Apron Size

The apron length and width shall be determined from the curves according to the tailwater conditions:

Minimum Tailwater – Use Figure 3.16 on page 3.42
Maximum Tailwater – Use Figure 3.17 on page 3.43

If the pipe discharges directly into a well defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

The upstream end of the apron, adjacent to the pipe, shall have a width two (2) times the diameter of the outlet pipe, or conform to pipe end section if used.

Bottom Grade

The outlet protection apron shall be constructed with no slope along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the elevation of the receiving channel or adjacent ground.

Alignment

The outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials

The outlet protection may be done using rock riprap, grouted riprap, or gabions. Outlets constructed on the bank of a stream or wetland shall not use grouted rip-rap, gabions or concrete.

Riprap shall be composed of a well-graded mixture of rock size so that 50 percent of the pieces, by weight, shall be larger than the d_{50} size determined by using the charts. A

well-graded mixture, as used herein, is defined as a mixture composed primarily of larger rock sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the rocks. The diameter of the largest rock size in such a mixture shall be 1.5 times the d_{50} size.

Thickness

The minimum thickness of the riprap layer shall be 1.5 times the maximum rock diameter for d_{50} of 15 inches or less; and 1.2 times the maximum rock size for d_{50} greater than 15 inches. The following chart lists some examples:

D_{50} (inches)	d_{max} (inches)	Minimum Blanket Thickness (inches)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

Rock Quality

Rock for riprap shall consist of field rock or rough unhewn quarry rock. The rock shall be hard and angular and of a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual rocks shall be at least 2.5.

Filter

A filter is a layer of material placed between the riprap and the underlying soil surface to prevent soil movement into and through the riprap. Riprap shall have a filter placed under it in all cases.

A filter can be of two general forms: a gravel layer or a plastic filter cloth. The plastic filter cloth can be woven or non-woven monofilament yarns, and shall meet these base requirements: thickness 20-60 mils, grab strength 90-120 lbs; and shall conform to ASTM D-1777 and ASTM D-1682.

Gravel filter blanket, when used, shall be designed by comparing particle sizes of the overlying material and the base material. Design criteria are available in Standard and Specification for Anchored Slope and Channel Stabilization on page 4.7.

Gabions

Gabions shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. The maximum linear dimension of the mesh opening shall not exceed 4 ½ inches and the area of the mesh opening shall not exceed 10 square inches.

Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into a rectangular basket of the specified sizes. Gabions shall be of single unit construction and shall be installed according to manufacturer's recommendations.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap, and filter cloth shall be placed under all gabions. Where necessary, key, or tie, the structure into the bank to prevent undermining of the main gabion structure.

Maintenance

Once a riprap outlet has been installed, the maintenance needs are very low. It should be inspected after high flows for evidence of scour beneath the riprap or for dislodged rocks. Repairs should be made immediately.

Design Procedure

1. Investigate the downstream channel to assure that nonerosive velocities can be maintained.

2. Determine the tailwater condition at the outlet to establish which curve to use.

3. Use the appropriate chart with the design discharge to determine the riprap size and apron length required. It is noted that references to pipe diameters in the charts are based on full flow. For other than full pipe flow, the parameters of depth of flow and velocity must be used to adjust the design discharges.

4. Calculate apron width at the downstream end if a flare section is to be employed.

Design Examples are demonstrated in Appendix B.

Construction Specifications

1. The subgrade for the filter, riprap, or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.

2. The rock or gravel shall conform to the specified grad-

ing limits when installed respectively in the riprap or filter.

3. Filter cloth shall be protected from punching, cutting, or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps, whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.

4. Rock for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller rocks and spalls filling the voids between the larger rocks. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

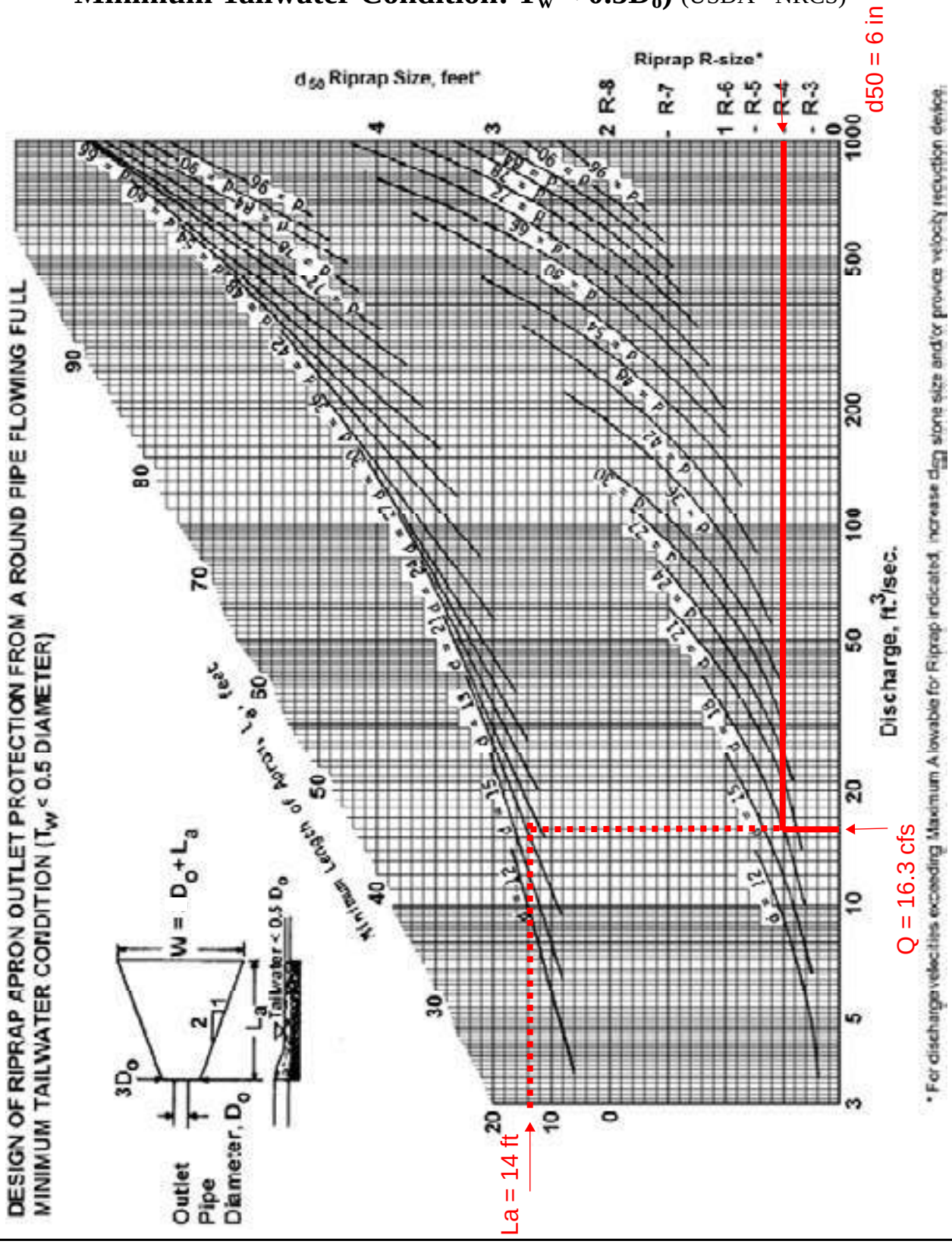


Figure 3.17
Outlet Protection Design—Maximum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Maximum Tailwater Condition: $T_w \geq 0.5D_o$) (USDA - NRCS)

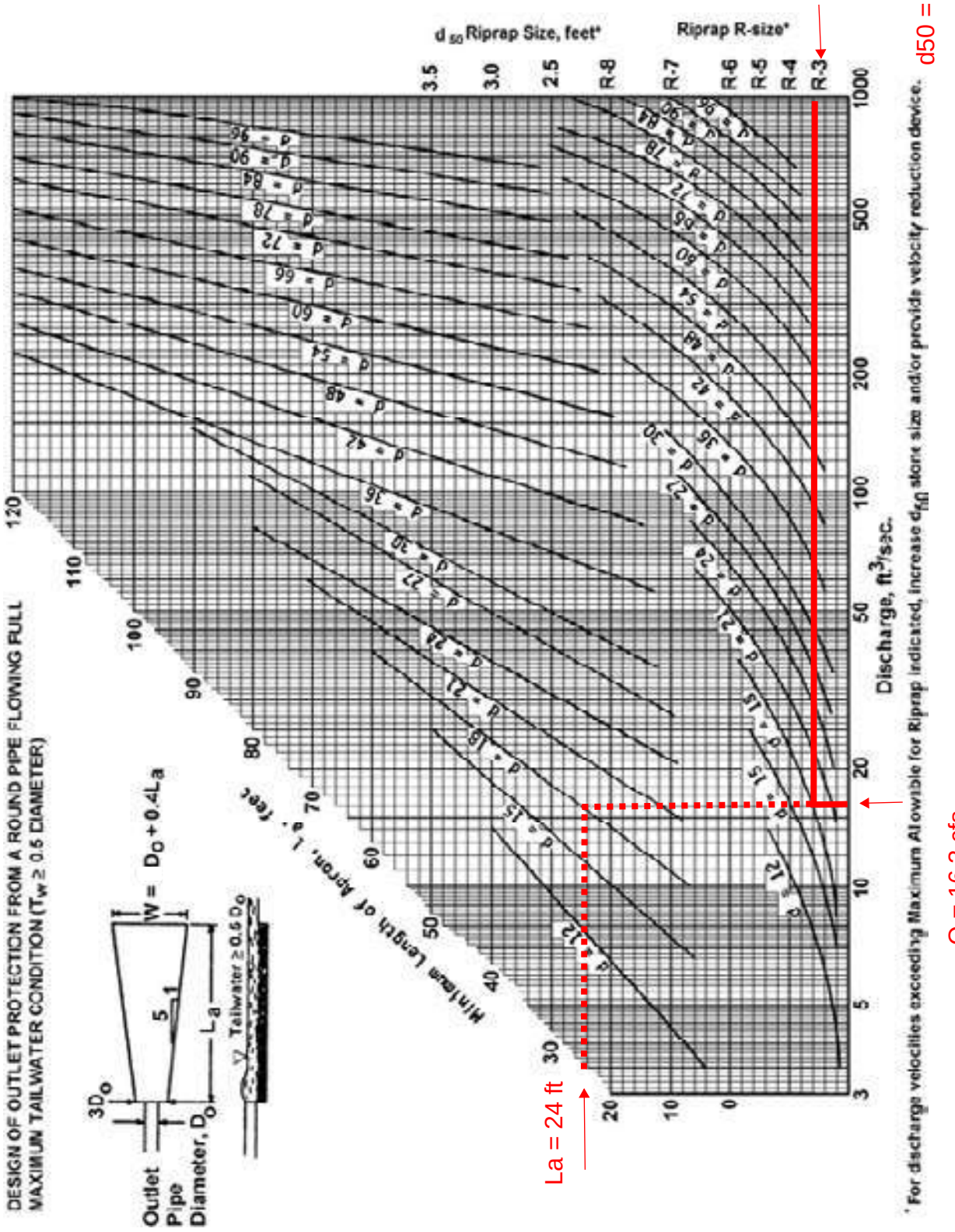


Figure 3.18
Riprap Outlet Protection Detail (1)

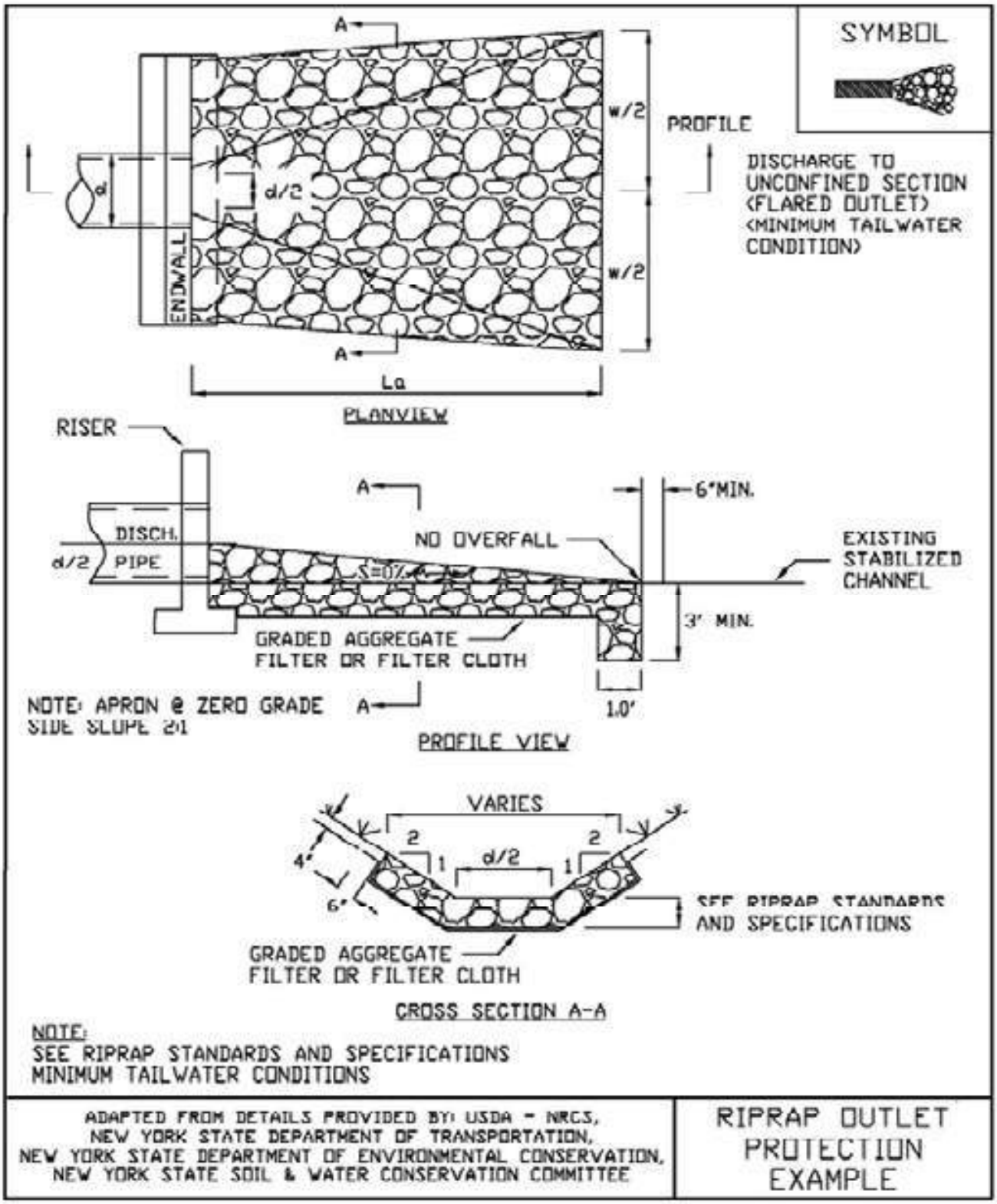


Figure 3.19
Riprap Outlet Protection Detail (2)

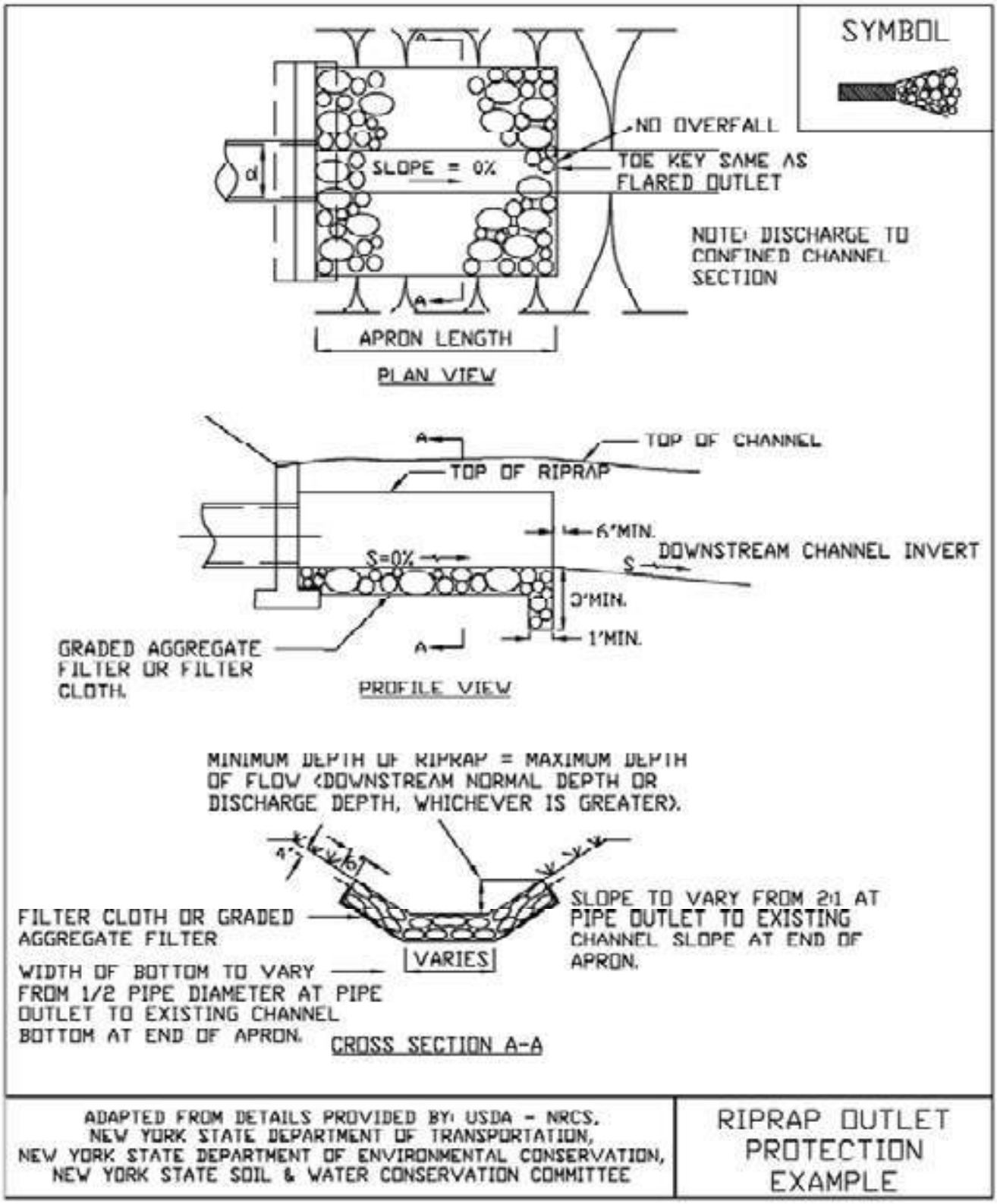
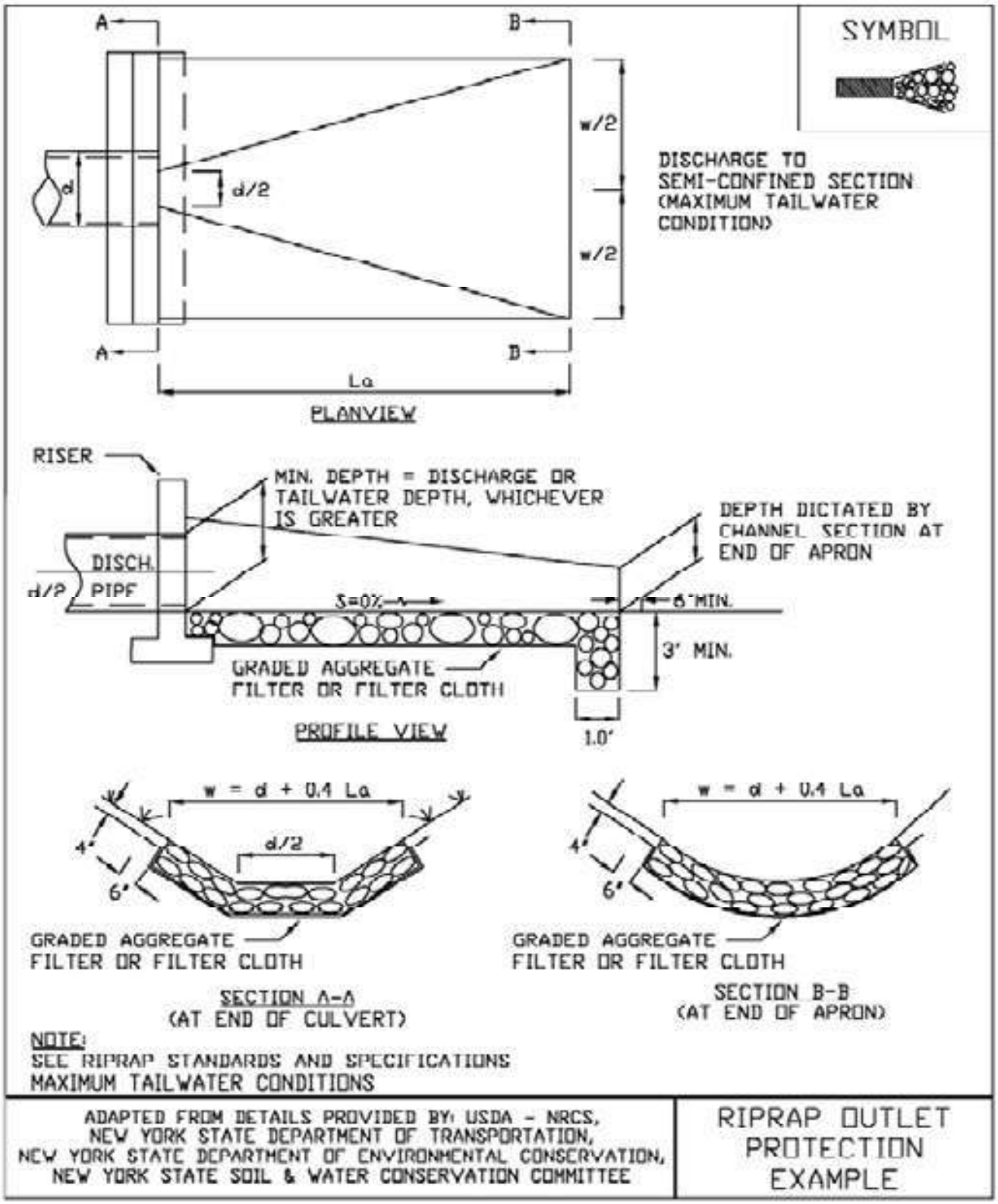


Figure 3.20
Riprap Outlet Protection Detail (3)



Hydrologic Soil Group—Erie County, New York
(Life Church - 4928 Seneca Street, West Seneca, NY)

Map Scale: 1:2,020 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:15,800.

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: Erie County, New York
Survey Area Data: Version 18, Sep 2, 2018

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

Date(s) aerial images were photographed: Jul 29, 2011—Oct 18, 2016

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ca	Canadice silt loam	D	2.3	32.8%
CfB	Cayuga silt loam, 3 to 8 percent slopes	D	0.2	2.4%
CoA	Churchville silt loam, 0 to 3 percent slopes	C/D	1.8	25.3%
RgA	Rhinebeck silt loam, 0 to 3 percent slopes	C/D	2.8	39.5%
Totals for Area of Interest			**7.0**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX C

SANITARY SEWER CALCULATIONS

Project	LIFE CHURCH	Sheet	1 of 2
	SANITARY SEWER LOADING	File #	
Prepared by	JU	Date	10/3/19
Checked by		Date	

SANITARY SEWER

REFERENCE: "NYS DESIGN STANDARDS FOR INTERMEDIATE SIZED WASTEWATER TREATMENT SYSTEMS, MARCH 5, 2014"

TABLE B-3; TYPICAL PER UNIT HYDRAULIC LOADING RATES
OFFICE = 15 GPD/EMPLOYEE
CHURCH (ASSEMBLY HALL) = 3 GPD/SEAT

EXISTING BLDGS
CURRENT CHURCH = 600 PARISHONERS A DAY BETWEEN 2 SERVICES (EASTER OR CHRISTMAS)
HOUSE/OFFICE SPACE = MAX 5 PEOPLE

EXISTING AVERAGE DAILY FLOW = (600 SEATS)(3 GPD/SEAT) + (5 PEOPLE)(15 GPD/PERSON)
= 1,800 GPD + 75 GPD
= 1,875 GPD

FULL BUILDOUT
EXISTING CHURCH: TO BE USED FOR EDUCATIONAL PURPOSES
10 CLASSROOMS W/ 250 KIDS MAX
HOUSE/OFFICE SPACE: MAX 5 PEOPLE
NEW ADDITION = 750 SEATS

PROPOSED AVERAGE DAILY FLOW = (1,000 SEATS)(3 GPD/SEAT) + (5 PEOPLE)(15 GPD/PERSON)
= 3,000 GPD + 75 GPD
= 3,075 GPD

NET INCREASE = PROPOSED - EXISTING
= 3,075 - 1,875
= 1,200 GPD INCREASE

⇒ SINCE PROPOSED INCREASE IS LESS THAN 2,500 GPD, THE NEW SEWER LOADING IS NOT CONSIDERED A SEWER EXTENSION

PER 10-STATES STANDARDS (2014 EDITION), FIGURE 1:

$$\frac{Q\ \text{PEAK HOURLY}}{Q\ \text{DESIGN AVERAGE}} = \frac{18+\sqrt{P}}{4+\sqrt{P}} = \text{PEAK FACTOR}$$

WHERE P = POPULATION IN THOUSANDS $= \frac{1,000}{1,000} = 1$

$$\text{PEAK FACTOR} = \frac{18+\sqrt{1}}{4+\sqrt{1}} = 4.5$$

$$Q\ \text{PEAK HOURLY} = (Q\ \text{DESIGN AVG})(\text{PEAK FACTOR})$$
$$= (3,075\ \text{GPD})(4.5)$$
$$= \underline{13,838\ \text{GPD}}$$

APPENDIX D

WATER CALCULATIONS

Project	LIFE CHURCH	Sheet	1 of
	WATER CALCS	File #	
Prepared by	JU	Date	10/3/19
Checked by		Date	

WATER

WATER DEMAND ≅ AUG. DAILY SEWER FLOW = 3,075 GPD

PEAK OPERATING DEMAND ≅ SEWER Q PEAK HOURLY = $13,838 \text{ GPD} \times \frac{1 \text{ DAY}}{12 \text{ HRS}} \times \frac{1 \text{ HR}}{60 \text{ MIN}}$

= 19 GPM

STATIC PRESSURE IN 8" MAIN ON SENECA ST = 55 PSI
RESIDUAL FLOW = 787 GPM W/ 26 PSI RESIDUAL
} PER ECWA FLOW DATA

DOMESTIC SERVICE

⇒ THERE IS AN EXISTING 2-INCH SERVICE FOR THE EXISTING CHURCH
⇒ PROPOSE TO EXTEND 2-INCH SERVICE TO NEW ADDITION

FRICTION LOSS THRU 2-INCH SERVICE: L = 850 FT
D = 2-INCH
C = 140
Q = 19 GPM

$$h_L = \frac{10.44(L)(Q)^{1.85}}{C^{1.85} D^{4.87}} = \frac{10.44(850\text{FT})(19\text{GPM})^{1.85}}{140^{1.85}(2\text{-IN})^{4.87}} = 7.5 \text{ FT}$$

$$h_{L(PSI)} = 7.5 \text{ FT}(0.434 \text{ PSI/FT}) = 3.2 \text{ PSI} \Rightarrow \text{SAY } 4 \text{ PSI}$$

FRICTION LOSS THRU FITTINGS ⇒ SAY 1 PSI
ELEVATION LOSS ⇒ 0 PSI
HEAD LOSS THROUGH 2" WATTS 009 RPZ @ 19 GPM = 13 PSI
HEAD LOSS THROUGH 2" T-10 METER @ 19 GPM = 0 PSI

RESIDUAL PRESSURE @ NEW ADDITION = STATIC $- \sum h_L$

$55 - (4+1+13)$

= 37 PSI

Project LIFE CHURCH	Sheet 2 of
WATER CALCS	File #
Prepared by JH	Date 10/3/19
Checked by	Date

AVAILABLE FIRE FLOW

⇒ ASSUMING 500 GPM FIRE FLOW REQ'D

FRICTION LOSS THRU 6-INCH SERVICE: $L = 640$ FT
$D = 6$-INCH
$C = 140$
$Q = 500$ GPM

$$h_L = \frac{10.44(L)(Q)^{1.85}}{C^{1.85} D^{4.87}} = \frac{10.44(640\text{ FT})(500\text{ GPM})^{1.85}}{140^{1.85}(6\text{-INCH})^{4.87}} = 11.4\text{ FT}$$

$$h_{L(PSI)} = 0.433\, h_{L(FT)} = 0.433(11.4\text{ FT}) = 5\text{ PSI}$$

FRICTION LOSS THRU FITTINGS = 1 PSI
ELEVATION LOSS = 0 PSI
FRICTION LOSS THROUGH 6" WATTS 957 RPZ @ 500 GPM = 7 PSI

RESIDUAL PRESSURE @ BLDG = STATIC $- \Sigma h_L$
w/ 500 GPM FIRE FLOW = $55 - (5 + 1 + 7)$
= 42 PSI

For Health Hazard Applications

Job Name _____

Job Location _____

Engineer _____

Approval _____

Contractor _____

Approval _____

Contractor's P.O. No. _____

Representative _____

Series 009
Reduced Pressure Zone Assemblies

Sizes: ¼" – 2"

Series 009 Reduced Pressure Zone Assemblies are designed to protect potable water supplies in accordance with national plumbing codes and water authority requirements. This series is designed to protect drinking water supplies from dangerous cross-connections in accordance with national plumbing codes and water authority requirements for non-potable service applications such as irrigation, fireline, or industrial processing.

This series features two in-line, independent check valves, captured springs and replaceable check seats with an intermediate relief valve. Its compact modular design facilitates easy maintenance and assembly access. Sizes ¼" – 1" shutoffs have tee handles.

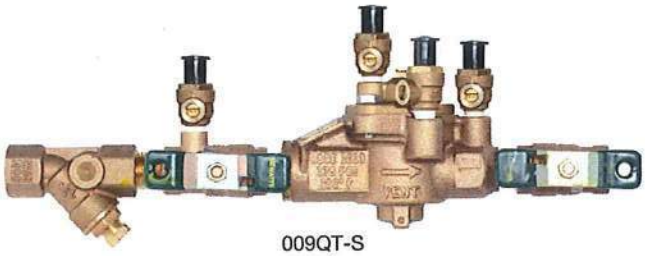
Features

- Single access cover and modular check construction for ease of maintenance
- Top entry - all internals immediately accessible
- Captured springs for safe maintenance
- Internal relief valve for reduced installation clearances
- Replaceable seats for economical repair
- Bronze body construction for durability ¼" – 2"
- Ball valve test cocks — screwdriver slotted ¼" – 2"
- Large body passages provides low pressure drop
- Compact, space saving design
- No special tools required for servicing

Specifications

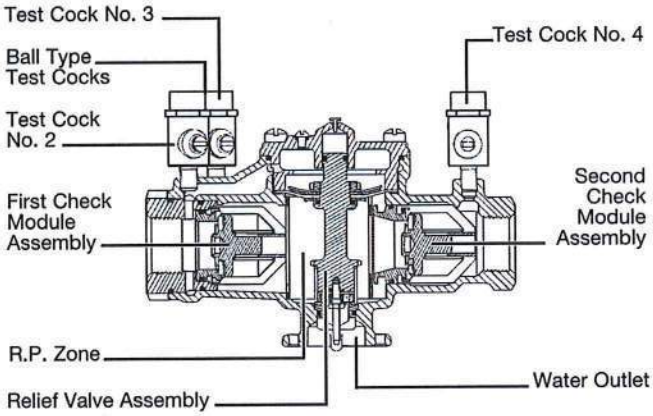
A Reduced Pressure Zone Assembly shall be installed at each potential health hazard location to prevent backflow due to backsiphonage and/or backpressure. The assembly shall consist of an internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs. Seats and seat discs shall be replaceable in both check modules and the relief valve. There shall be no threads or screws in the waterway exposed to line fluids. Service of all internal components shall be through a single access bronze cover secured with stainless steel bolts. The assembly shall also include two resilient seated isolation valves, four resilient seated test cocks and an air gap drain fitting. The assembly shall meet the requirements of: USC; ASSE Std. 1013; AWWA Std. C511-92; CSA B64.4. Shall be a Watts Series 009.

†Does not indicate approval status. Refer to Page 2 for approved sizes & models.



009QT-S

009M2QT



Now Available
WattsBox Insulated Enclosures.
For more information, send for literature ES-WB.

NOTICE

Inquire with governing authorities for local installation requirements

NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

WATTS®

Available Models: ¼" – 2"

Suffix:

QT – quarter-turn ball valves

S – bronze strainer

LF – without shutoff valves

AQT – elbow fittings for 360° rotation ¾" – 2" only

PC – internal Polymer Coating

SH – stainless steel ball valve handles

HC – 2½" inlet/outlet fire hydrant fitting (2" valve)

Prefix:

C – clean and check strainer ¾" – 1" only

U – union connections (see ES-U009)

Materials: ¼" – 2"

Bronze body construction, silicone rubber disc material in the first and second check plus the relief valve. Replaceable polymer check seats for first and second checks. Removable Relief valve seats. Stainless steel cover bolts.

Standardly furnished with NPT body connections. For optional bronze union inlet and outlet connections, specify prefix U (½" – 2"). Series 009QT furnished with quarter turn, full port, resilient seated, bronze ball valve shutoffs.

Pressure / Temperature

Series 009 ¼" – 2" Suitable for supply pressure up to 175psi (12.1 bar). Water temperature: 33°F – 180°F (0.5°C – 75°C).

Standards

USC

ASSE No. 1013

AWWA C511-92

CSA B64.4

IAPMO File No. 1563.

†Does not indicate approval status. See below for approved models.

Approvals

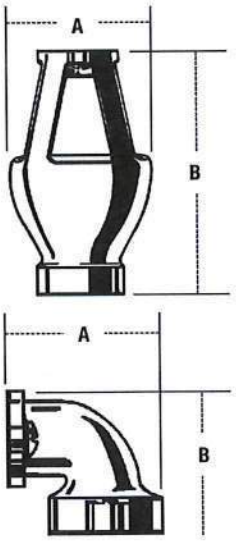
ASSE, AWWA, CSA, IAPMO

Approved by the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California.

UL Classified ¾" – 2"
(LF models only except 009M3LF)

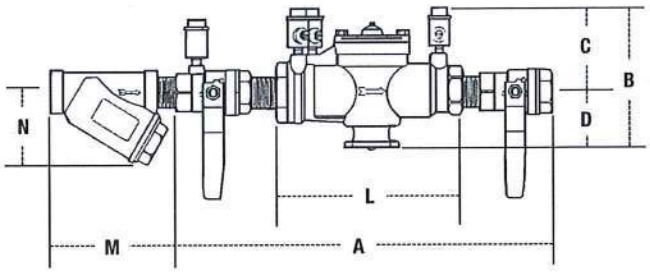
Air Gaps and Elbows

MODEL		DRAIN OUTLET		DIMENSIONS				WEIGHT	
	for 909, 009 and 993 sizes			A		B			
		in.	mm	in.	mm	in.	mm	lbs.	kgs.
909AGA	¼"–½" 009, ¾" 009M2/M3	½	13	2⅜	60	3⅛	79	0.625	0.28
909AGC	¾"–1" 009/909, 1"–1½" 009M2	1	25	3¼	83	4⅞	124	1.5	0.68
909AGF	1¼"–2" 009M1, 1¼"–3" 009/909, 2" 009M2, 4"–6" 993	2	51	4⅜	111	6¾	171	3.25	1.47
909AGK	4"–6" 909, 8"–10" 909M1	3	76	6⅜	162	9⅝	244	6.25	2.83
909AGM	8"–10" 909	4	102	7⅛	187	11¼	286	15.5	7.03
909ELA	¼"–½" 009, ¾" 009M2/M3	–	–	–	–	–	–	–	–
909ELC	¾"–1" 009/909	–	–	2⅜	60	2⅜	60	0.38	0.17
* 909ELF	1¼"-2" 009M1, 1¼"–2" 009/909, 2" 009M2, 4"–6" 993	–	–	3⅝	92	3⅝	92	2	0.91
* 909ELH Vertical	2½"–3" 009/909	–	–	–	–	–	–	–	–



* Epoxy coated

Dimensions and Weight: ¼" – 2" 009



009 ¼" – 2"

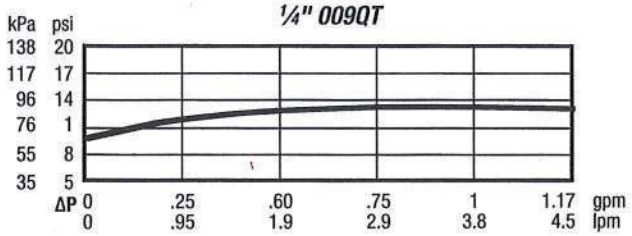
SIZE	DIMENSIONS (APPROX.)										STRAINER DIMENSIONS				WEIGHT	
	A		B		C		D		L		M		N			
in.	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.
¼	10	250	4⅝	117	3⅜	86	1¼	32	5½	140	2⅜	60	2½	64	5	2
⅜	10	250	4⅝	117	3⅜	86	1¼	32	5½	140	2⅜	60	2½	64	5	2
½	10	250	4⅝	117	3⅜	86	1¼	32	5½	140	2¾	70	2¼	57	5	2
¾	10¾	273	5	127	3½	89	1½	38	6¾	171	3 3/16	81	2¾	70	6	3
1	14½	368	5½	140	3	76	2½	64	9½	241	3¾	95	3	76	12	5
1¼	17⅜	441	6	150	3½	89	2½	64	11⅜	289	4 7/16	113	3½	89	15	6
1½	17⅞	454	6	150	3½	89	2½	64	11⅛	283	4⅞	124	4	102	16	7
2	21⅜	543	7¾	197	4½	114	3¼	83	13½	343	5 15/16	151	5	127	30	13

Suffix HC – Fire Hydrant Fittings dimension 'A' = 25"

Capacity

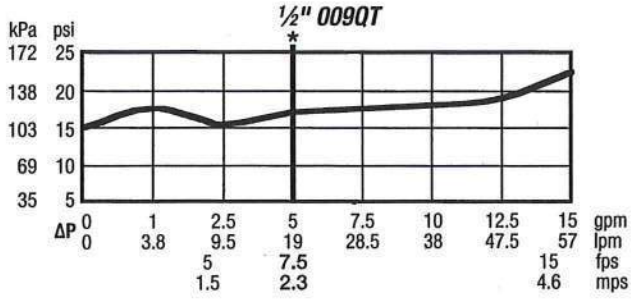
Performance as established by an independent testing laboratory. *Typical maximum system flow rate (7.5 feet/sec., 2.3 meters/sec.)

¼" 009QT

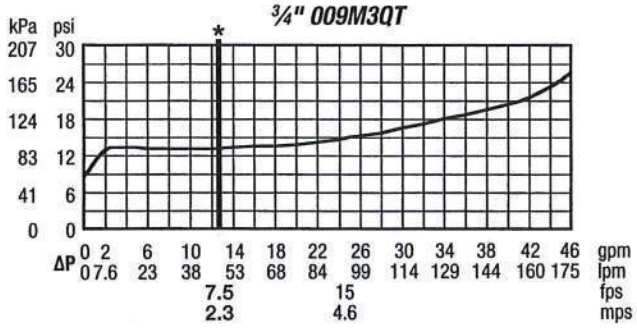


⅜" 009QT

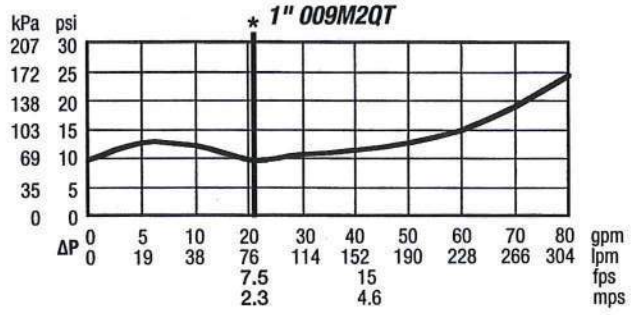
½" 009QT



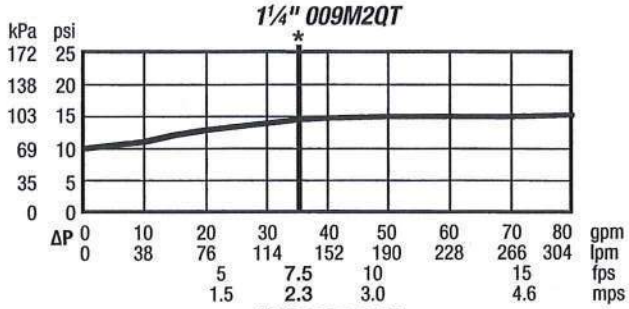
¾" 009M3QT



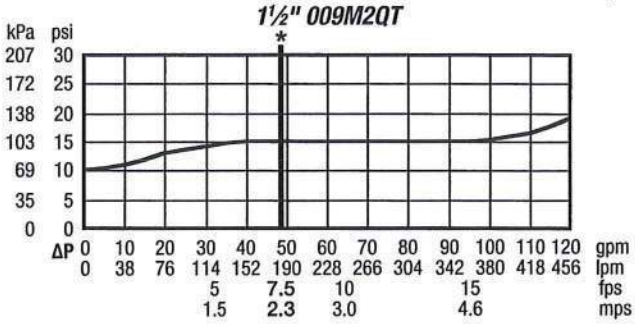
1" 009M2QT



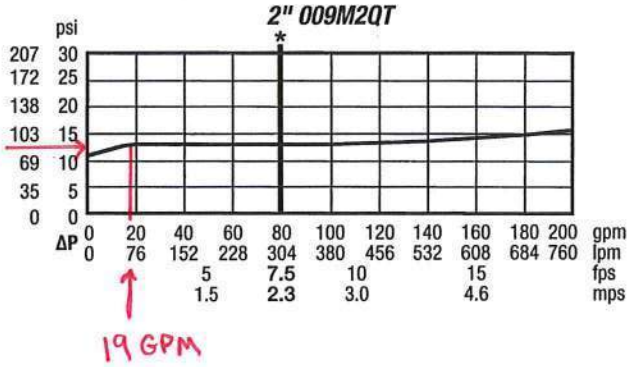
1¼" 009M2QT



1½" 009M2QT



2" 009M2QT



WATTS®

USA: T: (978) 689-6066 • F: (978) 975-8350 • Watts.com
Canada: T: (905) 332-4090 • F: (905) 332-7068 • Watts.ca
Latin America: T: (52) 81-1001-8600 • Watts.com

A PRODUCT SHEET OF NEPTUNE TECHNOLOGY GROUP

T-10® METER

SIZES: 1 ½" and 2"

Construction

Every Neptune® T-10® water meter meets or exceeds the latest AWWA C700 Standard. Its nutating disc, positive displacement principle has been time-proven for accuracy and dependability since 1892, ensuring maximum utility revenue.

The T-10 water meter consists of three major assemblies: a register, a lead free, high-copper alloy maincase, and a nutating disc measuring chamber.

The T-10 meter is available with a variety of register types. For reading convenience, the register can be mounted in one of four positions on the meter.

The corrosion-resistant, lead-free, high-copper alloy maincase will withstand most service conditions: internal water pressure, rough handling, and in-line piping stress.

The innovative floating chamber design of the nutating disc measuring element protects the chamber from frost damage while the unique chamber seal extends the low-flow accuracy by sealing the chamber outlet port to the maincase outlet port. The nutating disc measuring element utilizes corrosion-resistant materials throughout and a thrust roller to minimize wear.

Warranty

See Neptune Meter Warranty Statement for warranty details.

When desired, maintenance is easily accomplished either by replacement of major assemblies or individual components.

KEY FEATURES

Register

- Magnetic-driven, low-torque registration ensures accuracy
- Impact-resistant register
- High-resolution, low-flow leak detection
- Bayonet-style register mount allows in-line serviceability
- Tamperproof seal pin deters theft
- Date of manufacture, size, and model stamped on dial face

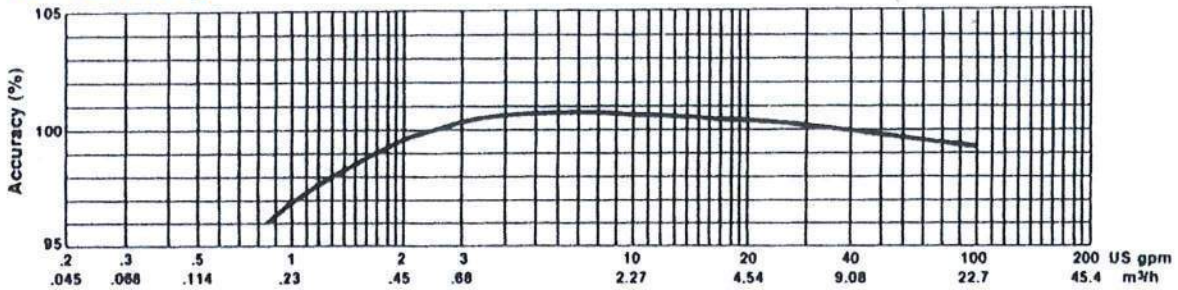
Lead Free Maincase

- Made from lead free, high-copper alloy
- NSF/ANSI 61 Certified
- NSF/ANSI 372 Certified
- Lifetime guarantee
- Resists internal pressure stresses and external damage
- Handles in-line piping variations and stresses
- Lead free, high-copper alloy provides residual value vs. plastic
- Electrical grounding continuity

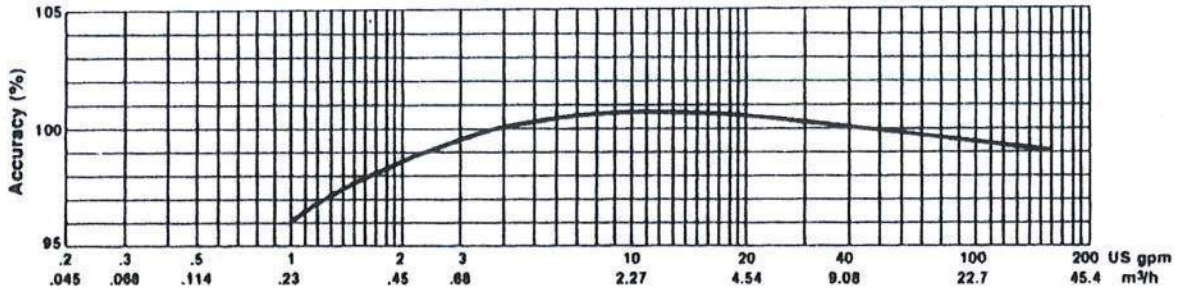
Nutating Disc Measuring Chamber

- Positive displacement
- Widest effective flow range for maximum revenue
- Proprietary polymer materials maximize long-term accuracy
- Floating chamber design is unaffected by meter position or in-line piping stresses

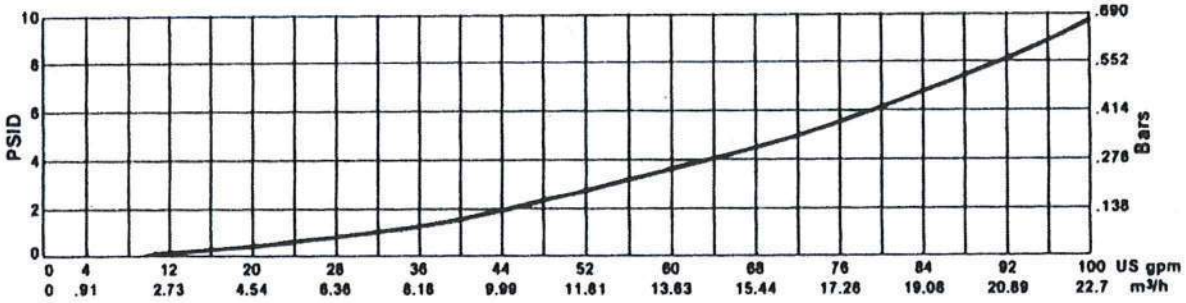
1 ½" Accuracy



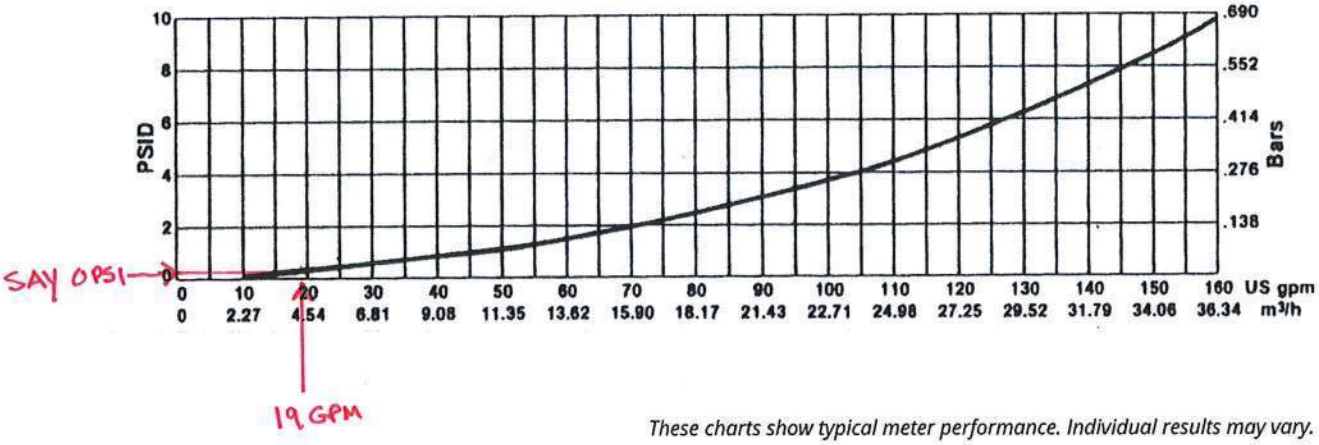
2" Accuracy



1 ½" Pressure Loss



2" Pressure Loss



These charts show typical meter performance. Individual results may vary.

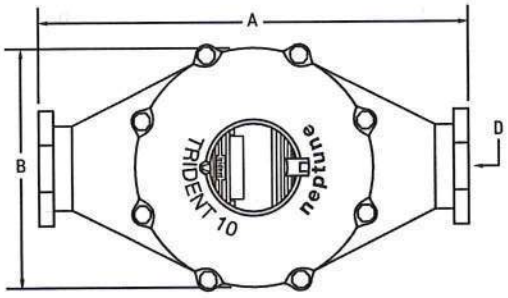
Operating Characteristics

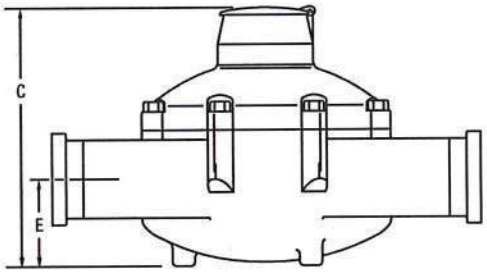
Meter Size	Normal Operating Range @100% Accuracy (±1.5%)	AWWA Standard	Low Flow @ 95% Accuracy
1 ½"	2 to 100 US gpm 0.46 to 22.73 m³/h	5 to 100 US gpm 1.1 to 22.7 m³/h	¾ US gpm 0.17 m³/h
2"	2 ½ to 160 US gpm 0.57 to 36.36 m³/h	8 to 160 US gpm 1.8 to 36.3 m³/h	1 US gpm 0.23 m³/h

Dimensions

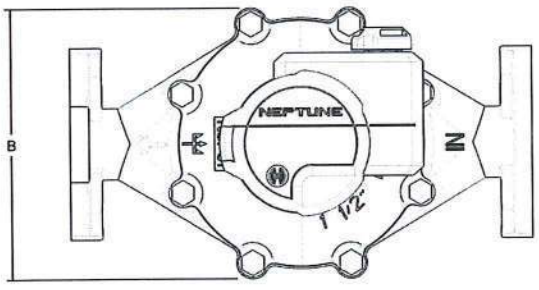
Meter Size	A in/mm	B in/mm	C-Std. in/mm	C-ARB in/mm	C- E-CODER®) R900i™ or ProCoder™) R900i™	D- Threads per inch	D- Thread Type	E in/mm	Weight lbs/kg
1 ½" Screw End	12 5/8 321	8 1/16 205	8 1/8 206	8 13/16 220.3	8 3/8 213	11 1/2	1 1/2 NPT	2 9/16 65	31 14.1
1 ½" Flanged End	13 330	8 1/16 205	8 1/8 206	8 13/16 220.3	8 3/8 213	—	—	2 9/16 65	35 15.9
2" Screw End	15 1/4 387	9 7/16 240	9 5/16 237	9 15/16 248.4	9 1/2 241	11 1/2	2" NPT	3 1/8 79	40 18.1
2" Flanged End	17 432	9 7/16 240	9 5/16 237	9 15/16 248.4	9 1/2 241	—	—	3 1/8 79	44 20.0

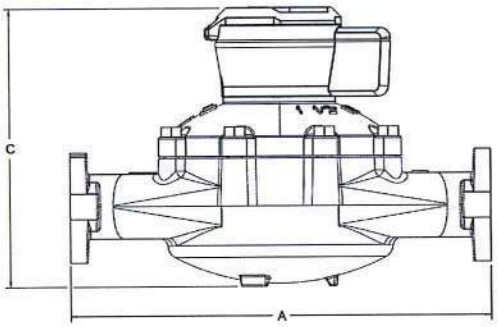
T-10 With Standard Register





T-10 With E-CODER®)R900i™ or ProCoder™)R900i™ Pit Register





Guaranteed Systems Compatibility

All T-10 meters are guaranteed adaptable to our ARB®V, ProRead™ (ARB VI), ProCoder™, E-CODER® (ARB VII), E-CODER®)R900*i*™,E-CODER®)R450*i*™, E-CODER®)L900*i*™, TRICON®/S, TRICON/E®3, and Neptune ARB® Utility Systems™ without removing the meter from service.

Specifications

Certification

- NSF/ANSI 61, NSF/ANSI 372

Application

- Cold water measurement of flow in one direction

Maximum Operating Water Pressure

- 150 psi (1,034 kPa)

Maximum Operating Water Temperature

- 80°F

Measuring Chamber

- Nutating disc technology design made from proprietary synthetic polymer

Registration

ProRead Registration (per sweep hand revolution)		**1 ½"**	**2"**
100	US Gallons	✓	✓
100	Imperial Gallons	✓	✓
10	Cubic Feet	✓	✓
1	Cubic Metre		✓
.01	Cubic Metre	✓	
Register Capacity ProRead, ProCoder, and E-CODER		**1 ½"**	**2"**
100,000,000	US Gallons	✓	✓
100,000,000	Imperial Gallons	✓	✓
10,000,000	Cubic Feet	✓	✓
100,000	Cubic Metres	✓*	
1,000,000	Cubic Metres	✓**	✓
E-CODER High Resolution (8-digit reading)		**1 ½"**	**2"**
1	US Gallons	✓	✓
1	Imperial Gallons	✓	✓
0.1	Cubic Feet	✓	✓
0.01	Cubic Metres		✓
0.001	Cubic Metres	✓	
ProCoder High Resolution (8-digit reading)		**1 ½"**	**2"**
1	US Gallons	✓	✓
1	Imperial Gallons	✓	✓
0.1	Cubic Feet	✓	✓
0.01	Cubic Metres	✓	✓

**ProRead and E-CODER only **ProCoder only*

Options

Sizes

- 1 ½" flanged or threaded end
- 2" flanged or threaded end

Units of Measure

- U.S. gallons, imperial gallons, cubic feet, cubic metres

Register Types

- Direct reading: Bronze box and cover
- Remote reading: ProRead Absolute Encoder, ProCoder, E-CODER, E-CODER)R900*i*, E-CODER)R450*i*, E-CODER)L900*i*, TRICON/S, TRICON/E3
- Reclaim

Measuring Chamber

- Synthetic polymer

Companion Flanges

- Lead free, high-copper alloy

Environmental Conditions

- Operating temperature: +33°F to +49°F (0°C to +65°C)
- Storage temperature:
- +33°F to +158°F (0°C to +70°C)

Test Ports

- 1" (optional)

NEPTUNE TECHNOLOGY GROUP

#winyourday
neptunetg.com

Neptune Technology Group
1600 Alabama Highway 229
Tallassee, AL 36078
800-633-8754 f 334-283-7293

Job Name _____ Contractor _____

Job Location _____ Approval _____

Engineer _____ Contractor's P.O. No. _____

Approval _____ Representative _____

LEAD FREE*

Series 957, 957N, 957Z

Reduced Pressure Zone Assemblies

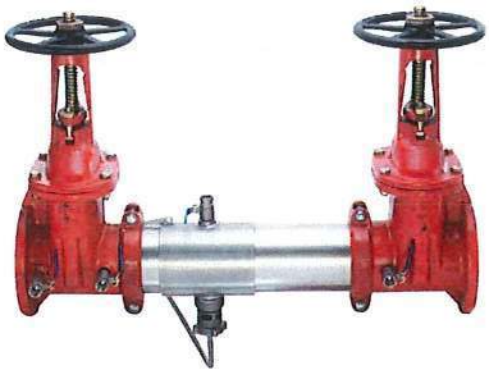
Sizes: 2½" – 10" (65 – 250 mm)

Series 957, 957N, 957Z Reduced Pressure Zone Assemblies provide protection to the potable water system from contamination in accordance with national plumbing codes. Series 957, 957N, 957Z are normally used in health hazard applications for protection against backsiphonage or backpressure.

Series 957 is also available with SentryPlus™ Alert technology to detect catastrophic relief valve discharge that could potentially cause flooding, and issue a multi-channel alert (call, email, text) to selected users so they can take action to avoid potentially costly flooding.

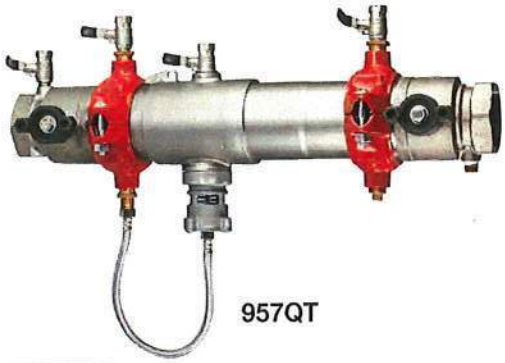
Features

- 2½", 3" and 4" (65, 80 and 100mm) sizes available with quarter-turn ball valve shutoffs
- Replaceable check disc rubber
- Extremely compact design
- 70% Lighter than traditional designs
- 304 (Schedule 40) stainless steel housing & sleeve
- Groove fittings allow integral pipeline adjustment
- Patented torsion spring checks provide lowest pressure loss
- Unmatched ease of serviceability
- Bottom mounted cast stainless steel relief valve
- Available with grooved butterfly valve shutoffs



957OSY

957ZBFG



957QT

NOTICE

Inquire with governing authorities for local installation requirements

***The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.**

NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

WATTS®

Specifications

The Reduced Pressure Zone Assembly shall consist of two independent torsion spring check modules, a differential pressure relief valve located between and below the two modules, two drip tight shutoff valves, and required torsion spring check modules and relief valve shall be contained with a sleeve accessible single housing constructed from 304 (Schedule 40) stainless steel pipe with groove end connections. Torsion spring checks shall have replaceable elastomer discs and in operation produce drip tight closure against the reverse flow of liquid caused by backpressure or backsiphonage. Assembly shall be a Watts Regulator Company Series 957, 957N, 957Z.

NOTICE

When installing a drain line on Series 957 backflow preventers, use 957AG air gaps. See ES-AG/EL/TC for additional information.

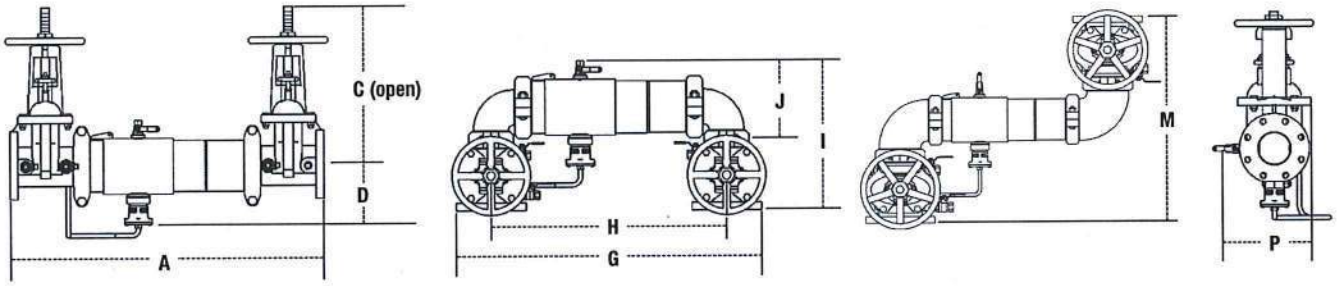
Available Models & Options

Suffix:

NRS –	non-rising stem, resilient seated gate valves
OSY –	UL/FM outside stem and yoke resilient seated gate valves
BFG –	UL/FM grooved gear operated butterfly valves with tamper switch
QT –	2½" - 4" (65 - 100mm) quarter-turn ball valves
*OSY FxG –	Flanged inlet gate connection and grooved outlet gate connection
**OSY GxF –	Grooved inlet gate connection and flanged outlet gate connection
***OSY GxG –	Grooved inlet gate connection and grooved outlet gate connection
****ALERT	with SentryPlus™ Alert flood detection system

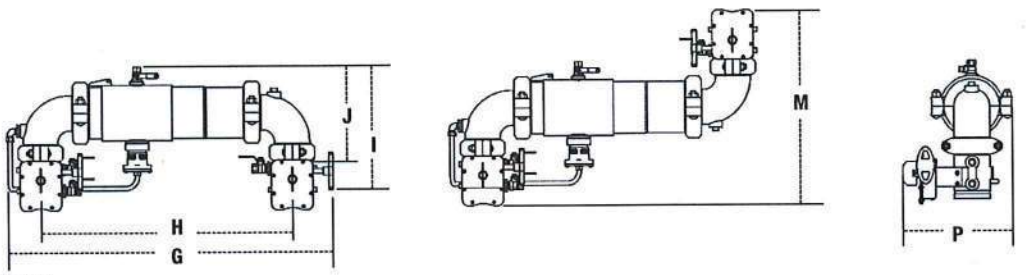
*Available with grooved NRS gate valves – consult factory
**Post indicator plate and operating nut available – consult factory
***Consult factory for dimensions

**** Not available with the 957N or 957Z



957, 957N, 957Z

SIZE (DN)		DIMENSIONS																		WEIGHT					
		A		C (OSY)		C (NRS)		D		G		H		I		J		M		P		957NRS		957OSY		957N NRS		957N OSY	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.	lbs.	kgs.
2½	65	30¾	781	16⅜	416	9⅜	238	6½	165	29 1/16	738	21½	546	15½	393	8 13/16	223	21¼	540	9 3/16	234	118	54	128	58	126	57	136	62
3	80	31¾	806	18⅞	479	10¼	260	6 11/16	170	30¼	768	22¼	565	17⅛	435	9 3/16	233	23	584	10½	267	134	61	148	67	147	67	161	73
4	100	33¾	857	22¾	578	12 3/16	310	7	178	33	838	23½	597	18½	470	9 15/16	252	26¼	667	11 3/16	284	164	74	164	74	187	85	187	85
6	150	43½	1105	30⅛	765	16	406	8½	216	44¾	1137	33½	851	23 3/16	589	13 1/16	332	34¼	870	15	381	276	125	298	135	317	144	339	154
8	200	49¾	1264	37¾	959	19 15/16	506	9 11/16	246	54⅛	1375	40⅛	1019	27 1/16	697	15 11/16	399	36⅞	937	17 3/16	437	441	200	483	219	516	234	558	253
10	250	57¾	1467	45¾	1162	23 13/16	605	11 3/16	285	66	1676	49½	1257	32½	826	17 5/16	440	44½	1124	20	508	723	328	783	355	893	405	950	431



957NBFG, 957ZBFG

SIZE (DN)		DIMENSIONS												WEIGHT	
		G		H		I		J		M		P		957N/957Z	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.
2½	65	32½	826	23	584	15½	394	9½	241	19¾	502	11 13/16	300	67	30
3	80	34	864	24	610	16 5/16	414	10 1/16	256	21¼	540	12⅛	308	70	32
4	100	35⅝	905	25½	648	17 3/16	437	10 15/16	279	23½	597	12⅝	321	87	39
6	150	46½	1181	35¼	895	20½	521	13½	343	27¼	692	15	382	160	73

Noryl® is a registered trademark of SABIC Innovative Plastics Holding BV.

Dimensions — Weight

Materials

Housing & Sleeve: 304 (Schedule 40) Stainless Steel
Elastomers: EPDM, Silicone and Buna-N
Torsion Spring Checks: Noryl®, Stainless Steel
Check Discs: Reversible Silicone or EPDM
Test Cocks: Bronze Body Nickel Plated
Pins & Fasteners: 300 Series Stainless Steel
Springs: Stainless Steel

Pressure — Temperature

Temperature Range: 33°F – 140°F (0.5°C – 60°C)
Maximum Working Pressure: 175psi (12.1 bar)

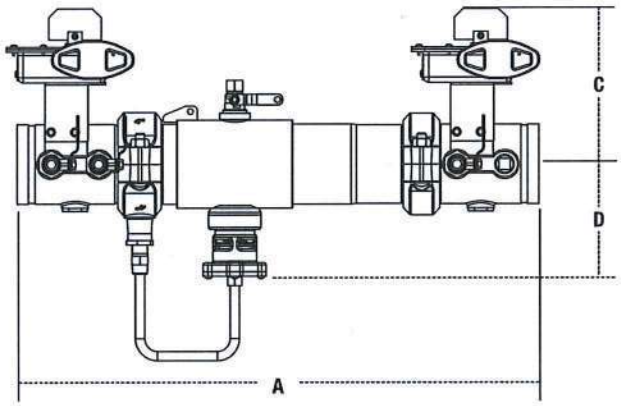
Approvals

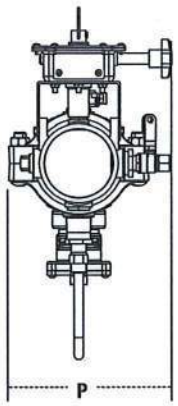
- Approved by the Foundation for Cross-Connection Control and Hydraulic Research at The University of Southern California (FCCCHR-USC)
  (Excluding 'N' Pattern – 10", 'Z' Pattern – 6" and 10")
- AWWA C551-92

1013 B64.4 (**BFG & OSY Only)

For additional approval information please contact the factory or visit our website at Watts.com

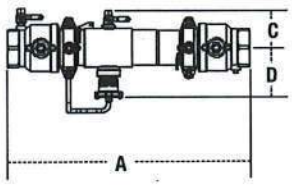
Dimensions — Weight continued

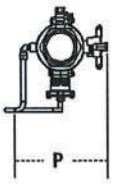


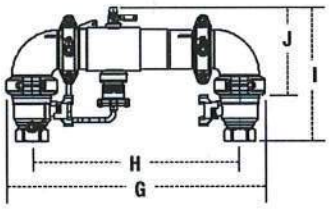


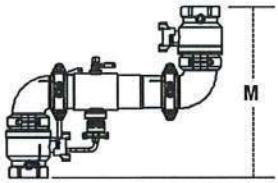
957 BFG

SIZE (DN)		DIMENSIONS								WEIGHT	
		A		C		D		P			
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.
4	100	29	737	7¾	197	6⅜	162	9½	241	66	30
6	150	36½	927	9 11/16	246	7 7/16	189	14¼	362	122	55









957QT

SIZE (DN)		DIMENSIONS																		WEIGHT	
		A		C		D		G		H		I		J		M		P		P1		QT		QTN	
in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kgs.	lbs.	kgs.
2 1/2	65	27½	698	4⅞	124	6⅞	175	30¼	768	21½	546	16 1/16	407	11⅜	289	19⅞	505	11 5/16	287	11 5/16	287	46	21	57	26
3	80	28	711	4⅞	124	6⅞	175	30¼	768	22¼	565	16 9/16	420	11⅜	289	20⅞	531	11 5/16	287	11 5/16	287	56	25	67	30
4	100	28¾	730	4⅞	124	6⅞	175	30¼	768	23½	597	18 5/16	465	11⅜	289	24⅜	619	11 5/16	287	11 5/16	287	76	34	87	39

Capacity

Series 957, 957N, 957Z flow curves as tested by Underwriters Laboratory.

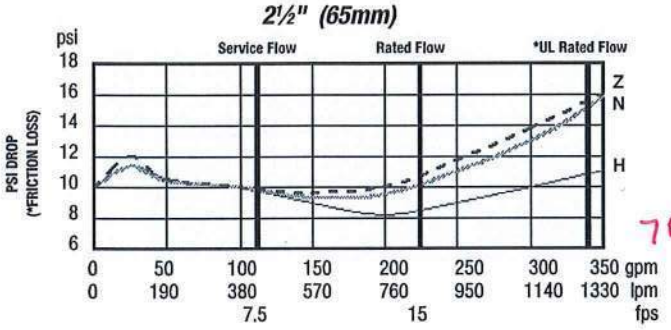
Flow characteristics collected using butterfly shutoff valves

——— Horizontal ——— N-Pattern ----- Z-Pattern

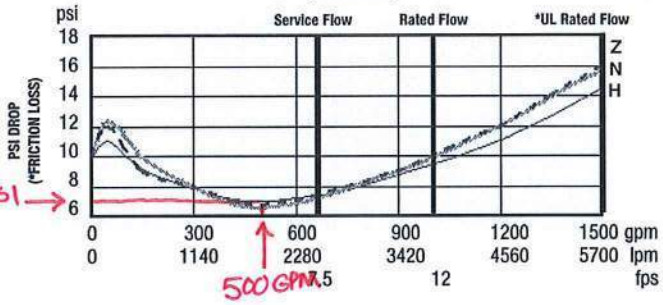
Flow capacity chart identifies valve performance based upon rated water velocity up to 25fps

- Service Flow is typically determined by a rated velocity of 7.5fps based upon schedule 40 pipe.
- Rated Flow identifies maximum continuous duty performance determined by AWWA.
- UL Flow Rate is 150% of Rated Flow and is not recommended for continuous duty.
- AWWA Manual M22 [Appendix C] recommends that the maximum water velocity in services be not more than 10fps.

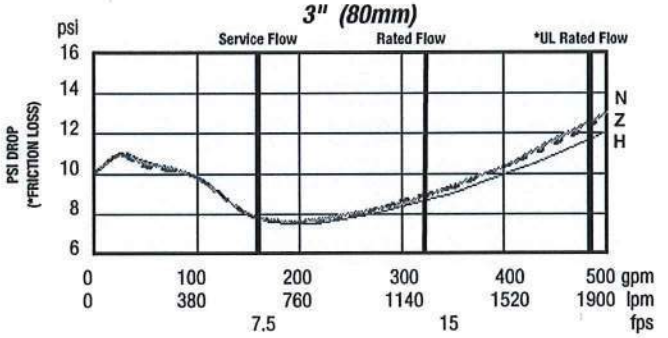
2½" (65mm)



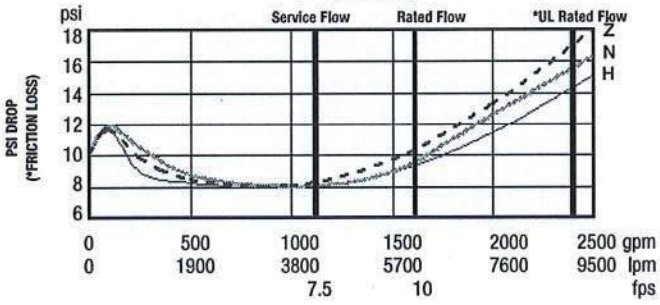
6" (150mm)



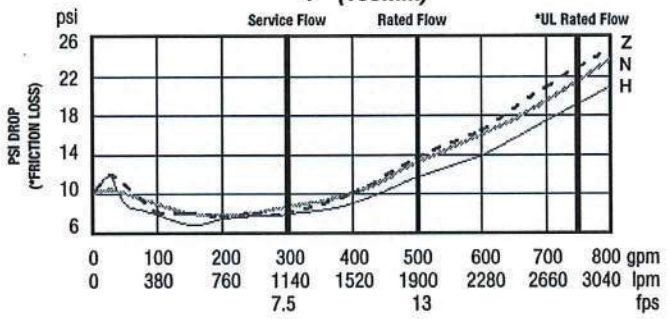
3" (80mm)



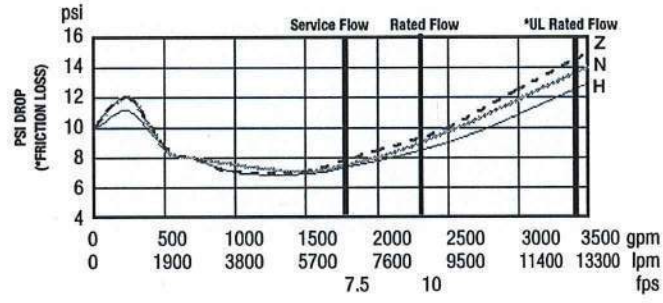
8" (200mm)



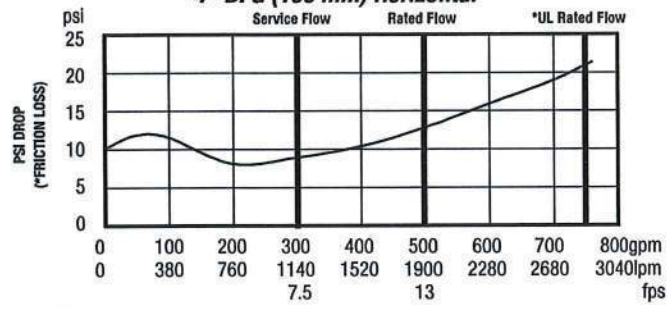
4" (100mm)



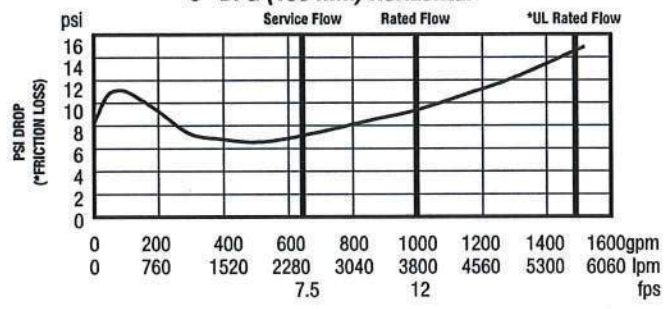
10" (250mm)



4" BFG (100 mm) Horizontal

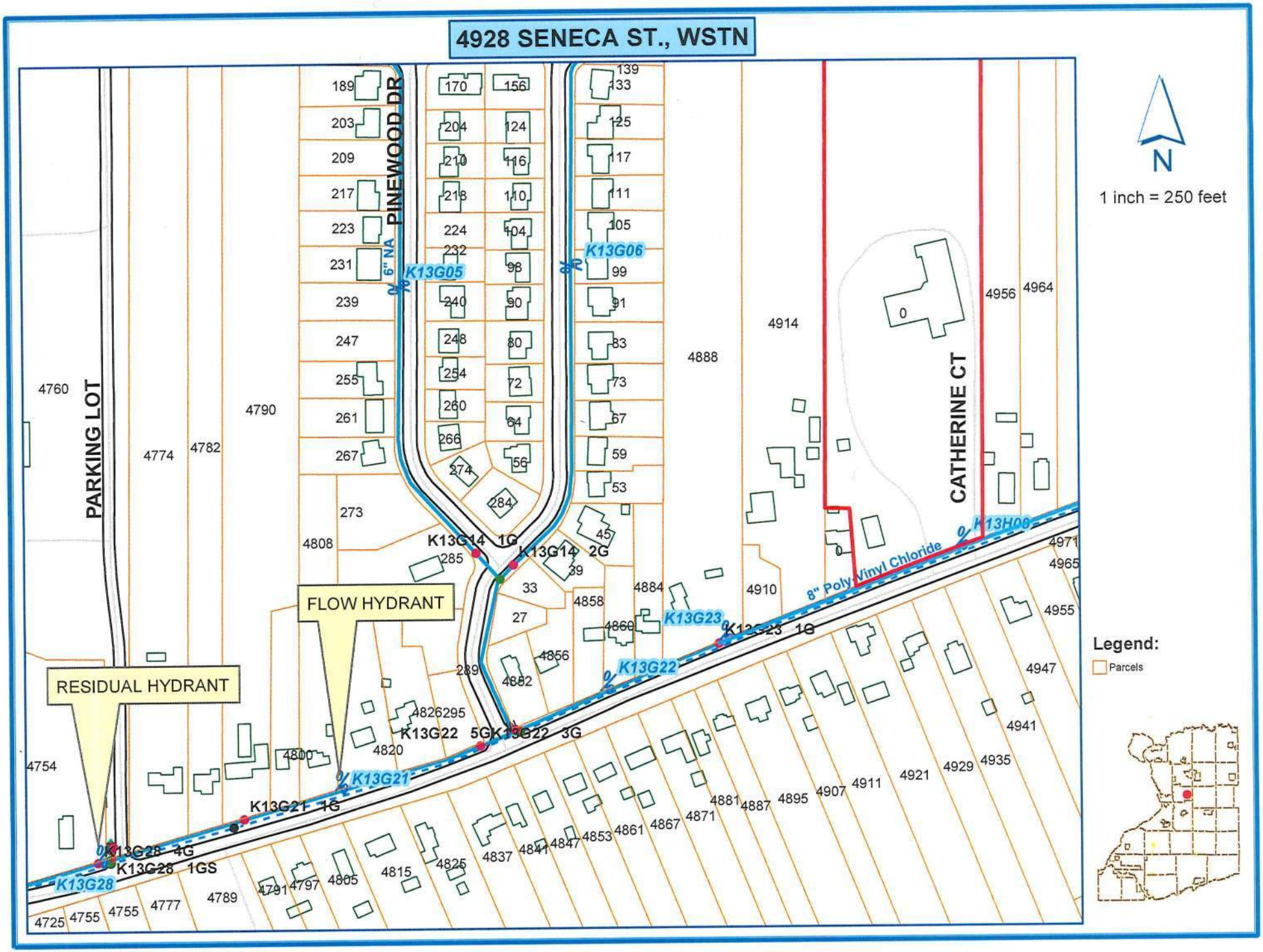


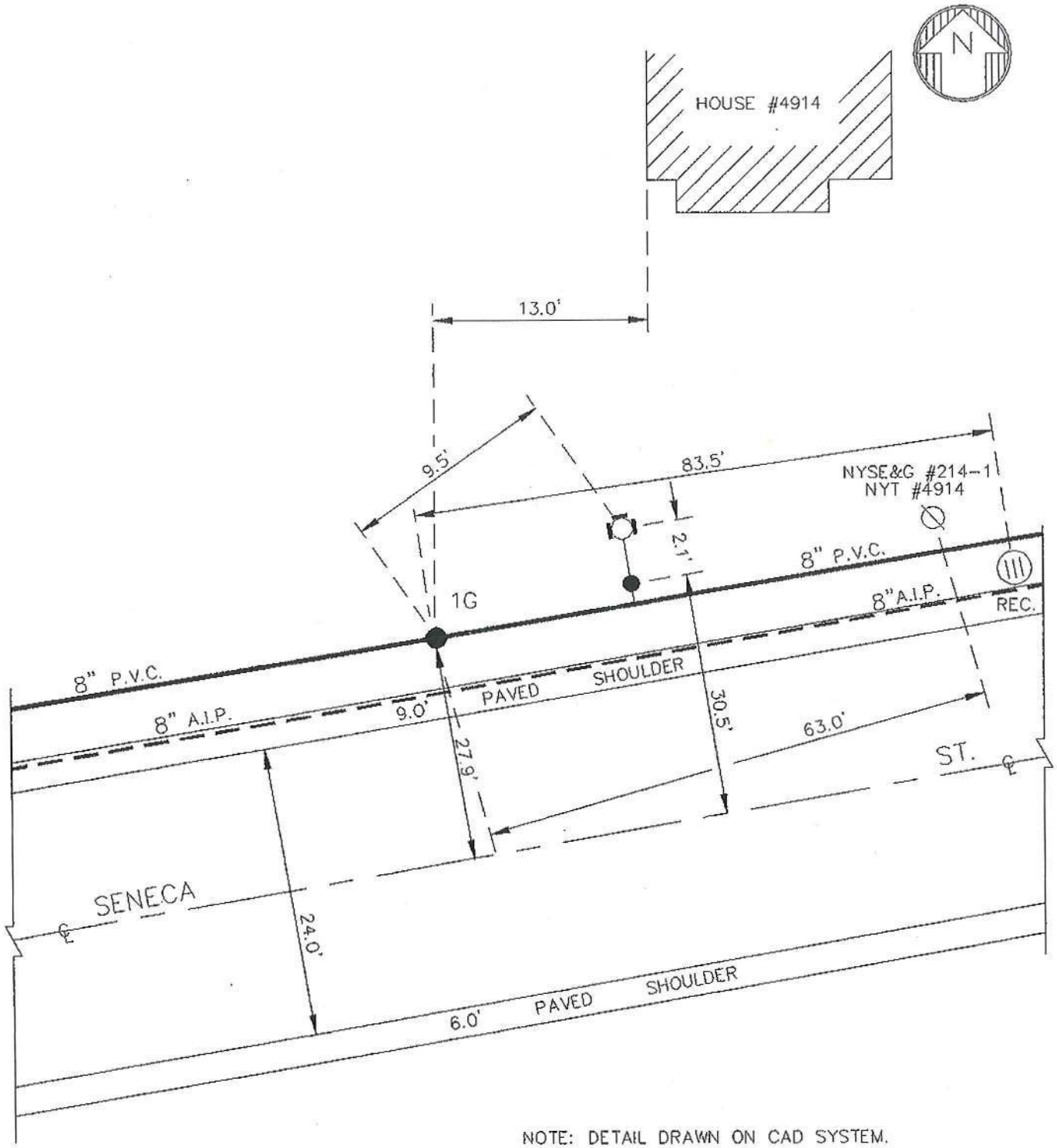
6" BFG (150 mm) Horizontal



WATTS®

USA: Tel: (978) 689-6066 • Fax: (978) 975-8350 • Watts.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
Latin America: Tel: (52) 81-1001-8600 • Watts.com


4928 SENECA ST., WSTN
PINEWOOD DR
PARKING LOT
CATHERINE CT
N
1 inch = 250 feet
Legend:
Parcels
FLOW HYDRANT
RESIDUAL HYDRANT
K13G05
K13G06
K13G14 1G
K13G14 2G
K13G23
K13G22
K13G21
K13G28
K13H08
8" Poly Vinyl Chloride
6" NA
K13G22 5G
K13G22 3G
K13G21 1G
K13G28 4G
K13G28 1GS
189
203
209
217
223
231
239
247
255
261
267
273
274
284
285
170
156
204
124
210
116
218
110
224
104
232
98
240
90
248
80
254
72
260
64
266
56
139
133
125
117
111
105
99
91
83
73
67
59
53
45
39
33
27
289
4760
4790
4774
4782
4808
4754
4800
4820
4826295
4725
4755
4755
4777
4789
4791
4797
4805
4815
4825
4837
4841
4847
4853
4861
4867
4871
4881
4887
4895
4907
4911
4921
4929
4935
4941
4947
4955
4965
4971
4964
4956
4914
4888
4884
4910
4858
4860
4856
4852
0



NOTE: DETAIL DRAWN ON CAD SYSTEM.

WSTN-799-9301-FDT-105

ERIE COUNTY WATER AUTHORITY BUFFALO, NEW YORK	DR. DCC DATE: 6-20-94 N.T.S.	TOWN OF WEST SENECA W.D. #1	K13-G23 DETAIL SHEET NO.

Hydrant FLow Test

Print Date: 10/01/2019

Residual Hydrant: K13G28 **Test Date/Time:** 4/18/2005 10:15

Location.....: 4754 SENECA ST 2ND HYD W/O PINEWOOD DR
TOWN OF WEST SENECA

Size of Main/Branch: 8"/6" Fire District: 68023 FIRE DIST 4 Water District: 601 WEST SENECA #1

Performed By: BM, CM Comments: HYDRANT FLOW TEST REQUESTED BY JOSEPH TARRANOVA
CANON DESIGN, PHONE: 773-6800, FAX: 773-5909

Dischrge Coef: 090 Elvtn Usgs(ft): Static(psi): 55 Residual(psi): 26 Required Residual Pressure(psi): 20
Gallons Used..: 2,370 Total Flow(gpm): 787 Flow at Reqd Resid Pressure: 871

Flow Hydrants:

Flow Hyd	Location	Main/Brnch	Nzle	Size	Pitot	Flow	Comments
K13 G21	4808 SENECA ST 1ST W/O PINEWOOD DR	8"/6"	1: 2: 3:	2.50	22.0	787	Total Flow: 787

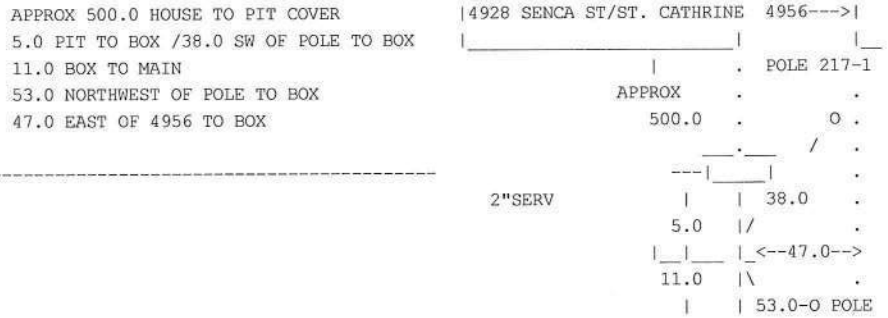
MES2 Water Service Connection Info-Acct: 60549914-5 Serv: 601003006 Locatn Id: 53584 Tap: Gis Id: 405438 CMI172-B

Acct Name & Service Address	Meter Location	ECWA Service Information:
LIFE CHURCH	E-CODER / METER PIT	Service Size...: 2" Depth: Type.:
4928 SENECA ST	1' R/O DRIVE, 13'9" FRT	Matl @ Main/Src: COPPER DB
WSTN TOWN OF WEST SENECA	EDGE OF ROAD	Matl @ Box/Src.: COPPER DB
Cycle: 12C		Main Size: 8.000 Type: PV Color: Side of Strt:
Dist.: 601 WEST SENECA #1		
Cross Streets		Customer Line Information:
NSEW:		Line Size.....:
NSEW:		Matl @ Box/Src.:
House NSEW:	Meter Set Type: PIT	Matl @ Met/Src.:

Foreman:
Field Book: 334 Page:
Contr..:
Materls:
2" CORP
COPPER
C+C STOP
145R BOX
Util Conflict:
Serv Started: 4/23/1970
Date Tapped.: 4/23/1970 Replaced:
Repaired....: Thawed..:

Curb Box Measurements
APPROX 500.0 HOUSE TO PIT COVER
5.0 PIT TO BOX /38.0 SW OF POLE TO BOX
11.0 BOX TO MAIN
53.0 NORTHWEST OF POLE TO BOX
47.0 EAST OF 4956 TO BOX

Diagram of Service



ENTER=Page 2 F3=Exit F5=Redisplay F6=Maint F7=Service Appl F24=More Keys

MES2 Water Service Connection Info-Acct: 60549915-7 Serv: 601889064 Locatn Id: 53585 Tap: Gis Id: 405439 CMI172-B

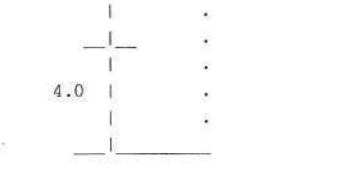
Acct Name & Service Address	Meter Location	ECWA Service Information:
LIFE CHURCH	E-CODER	Service Size...: 3/4 Depth: Type.:
4928 SENECA ST	DOG	Matl @ Main/Src:
WSTN TOWN OF WEST SENECA		Matl @ Box/Src.:
Cycle: 12C		Main Size: Type: PV Color: Side of Strt:
Dist.: 601 WEST SENECA #1		Customer Line Information:
Cross Streets		Line Size.....:
NSEW:		Matl @ Box/Src.:
NSEW:		Matl @ Met/Src.:
House NSEW:	Meter Set Type:	

Foreman:
Field Book: Page:
Contr..:
Materls:

Curb Box Measurements

75.3 HOUSE TO BOX,
4.0 BOX TO MAIN
15.0 LEFT OF LHC,
RETAP 8/6/93

Diagram of Service



Util Conflict:
Serv Started: 10/08/1974
Date Tapped.: Replaced:
Repaired....: Thawed..:

ENTER=Page 2 F3=Exit F5=Redisplay F6=Maint F7=Service Appl F24=More Keys

APPENDIX E

FEMA FIRM MAP

National Flood Hazard Layer FIRMette

FEMA

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/27/2019 at 8:26:58 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

www.cscos.com | (877) CS-SOLVE

printed on 50% recycled paper, including 25% post-consumer waste