



Land Use Planning Division
 1600 SE 190th Ave.
 Portland OR 97233
 Phone: 503-988-3043
 land.use.planning@multco.us
 https://multco.us/landuse/

REVIEWED	
MULTNOMAH COUNTY - DCS TRANSPORTATION DIVISION	
✓	A. PROCEED
	B. PROCEED AS NOTED
	C. REVISE AND RESUBMIT
By: <i>Andrew D Niemi</i>	Date: 07/22/2021

STORMWATER DRAINAGE CONTROL CERTIFICATE >500 SQUARE FEET OF NEW / REPLACED IMPERVIOUS SURFACES

NOTE TO PROPERTY OWNER/APPLICANT: Please have an Oregon Licensed Professional Engineer fill out this Certificate and attach a signed site plan, stamped and signed storm water system details, and stamped and signed storm water calculations used to support the conclusion. Please note that replacement of existing structures does not provide a credit to the square footage threshold.

Property Address or Legal Description: 31520 Woodard Rd, Troutdale, OR.

Description of Project: Woodard Middle School

The following stormwater drainage control system will be required:

- Use of Gutter, downspout, and splash block drainage control system;
- Natural Infiltration Process; or
- Construction of an on-site storm water drainage control system.

The rate of stormwater runoff attributed to the new/replaced development for a 10-year/24-hour storm event will be no greater than that which existed prior to any development as measured from the property line or from the point of discharge into a water body with the use of the designated system [MCC 39.6235].

I certify the attached signed site plan showing the areas needed for the chosen system type, stamped and signed storm water system design details, and stamped and signed calculations dated 6/15/2021 will meet the requirements listed above.

Signature: *Andrew D Niemi*

Print Name: Andrew D Niemi

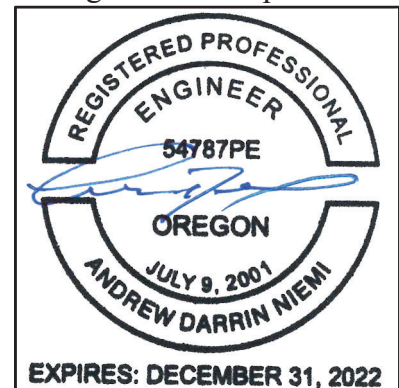
Business Name: Lower Columbia Engineering

Address: 58640 McNulty Way, St Helens, OR.

Phone #: 503 366 0399

Date: June 22, 2021

Engineer's Stamp Below:



NOTE TO ENGINEER: Please check one box above. Multnomah County does not use the City of Portland's storm water ordinance. As part of your review, MCC 39.6235 requires that you must consider all new, replaced, and existing structures and impervious areas and determine that the newly generated stormwater from the new or replaced impervious surfaces is in compliance with Multnomah County Code for a 10-year/24-hour storm event. This Storm Water Drainage Control Certificate does not apply to shingle or roof replacement on lawfully established structures.



Client: Corbett School District

Project: Woodard Rd. Middle School
Type of Project: Public- School
Troutdale, OR

Stormwater Report
June 30th, 2021
LCE Project No. 3177

The above Seal certifies that Andrew D. Niemi, P.E. has general knowledge of the Multnomah County Code, specifically the engineering standards outlined in section 39.6235 pertaining to stormwater drainage control. The drainage modifications proposed for this site have been designed in general accordance with the 2016 City of Portland Stormwater Management Manual and meet the requirements set by Multnomah County.

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*This report refers to project plans that have been assembled by LCE and dated 06/30/2021

This report pertains to the proposed improvements shown in the project plans based on specific requests by our client. Lower Columbia Engineering is not responsible for complying with any conditions of approval or adjacent storm drainage issues that are outside of the project area. Contact Lower Columbia Engineering with any questions or uncertainties. Maintenance of this system and verification of property line locations are the responsibility of others.



Stormwater Narrative

Project Description

Corbett School District is proposing improvements to lot 200 located at 31520 E Woodard Rd., Torutdale, OR. (45.518556N, 122.339524W). This location was previously used for several different purposes, most recently as an environmental high school for Reynolds School District. Improvements to the site include demolition, building renovation, a building addition, grading, utility renovation, and paving for the purposes of establishing the Woodard Campus. The campus includes a new middle school and the Corbett School District offices. Existing conditions on the 3.50 acre site consist of abandoned buildings and infrastructure totaling 2.14 acres of impervious surfaces and 1.36 acres of vegetation. Proposed improvements call for 1.68 acres of impervious surfaces consisting of buildings and pavement along with 1.82 acres of unaffected vegetation and improved landscaping. The site also includes a portion that is characterized as being of significant environmental concern in relation to the Sandy River (SEC-s). None of the SEC-s described area shall be impacted with these improvements.

Stormwater Analysis

The SBUH method was used to calculate runoff for the existing and proposed conditions. The calculation software HydroCAD was used for these calculations. A curve number of 98 was given to all impervious areas. According to the Western Regional Climate Center's Precipitation Frequency Maps, the 2-year 24-hour storm event results in 3.0 inches, 5-year results in 3.5 inches, 10-year results in 4.0 inches, 25-year results in 4.5 inches, and the 100-year storm event results in 5.5 inches of storm depth. A type IA 24-hour storm was applied given the site's location and the Water Quality storm event was designated as half of the 2-year storm event, equaling 1.5 inches. USDA's Web Soil Survey and a professional geotechnical survey were referenced for soil characteristics of the site. Given the high tested infiltration rate, swales will be utilized for the stormwater management of the site. Calculations were performed with an infiltration rate of 2.0 in/hr based on the soil matrix of the proposed swales. See Appendix A for the Calculation Report.

Stormwater Management

Stormwater management for the site is designed to mimic existing conditions while minimizing runoff rates to avoid impact to neighboring properties. Existing topography cause runoff to leave the site across the southern and eastern property lines- feeding into forested slopes that accompany a ravine on the south and the SEC-s area on the east (eventually leading to the Historic Columbia River Highway's ROW). Water quality and quantity are managed through the incorporation of LIDA practices- three bioretention swales shall be installed on the property. Runoff directed to the south is managed by a swale that is offset 10' from the southern property line- this swale is designed to allow stormwater to overflow across the top of the western wall and feed into a rock-lined ditch that further directs the overflow towards the natural ravine southwest of the property. Runoff that is directed to the east is also managed by a swale, including runoff from the northern section of the property which initially flows to a northern swale and then has its overflow conveyed to the eastern swale. This basin is oriented close to the parking areas and is designed to retain runoff through the 25-year storm event. The 100-year storm event overflow will be similarly directed atop the eastern wall and into a rock-lined ditch towards the east. This system minimizes runoff from the site and helps divert any runoff from impacting the neighboring properties. Stormwater quality will be improved to meet requirements through the treatment capabilities of the bioretention swales. The Water Quality storm event will be fully infiltrated by the swales and all greater storms, through the 100-year storm event, will be safely conveyed to the described discharge points.



Conclusion

Improvements for the proposed middle school will result in positive alterations to the stormwater runoff of the subject site. Minimized runoff on neighboring properties and treated stormwater will be accomplished through the 100-year storm event by installing bioretention swales. Proper operation and maintenance of the facilities is paramount to their functionality. It is the responsibility of the owner to maintain these facilities- please see the following Operations and Maintenance Plan.

Operation and Maintenance Plan

The property owner will be responsible for inspecting and maintaining the proposed facilities. Currently Corbett School District is responsible and may be reached by phone at (503) 897 2321.

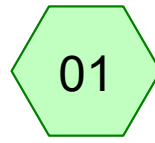
The site contains three bioretention swales. Optimal function occurs when vegetation in the swales is healthy and water doesn't stand for excessive time. As with all plantings, it is likely that a portion will not survive. If this is the case, replant during the appropriate time based on plant species. If excessive failure to take is observed, alternative species may need to be selected. During the first three years, water the plants deeply two times per month during June, July, August, and September to ensure the plantings have the best chance of taking hold. Stormwater basins should be inspected monthly for the first three years, then twice per year after, and no more than 48 hours after a major storm event. During inspection, plant health, erosion, and sedimentation should be examined in addition to documenting visual changes between inspections. In addition to maintaining plant health, the swales shall be kept free of debris and excessive sediment. If the swales hold water for too long (more than 48-hours after a storm event), this may be an indicator that the soil matrix has been compromised by sediment and pollutants and that the swale needs to be renovated.



Appendix A- Calculation Report



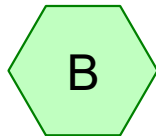
Natural



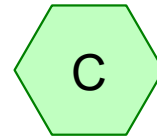
Existing



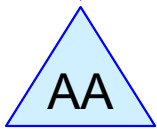
Area to A



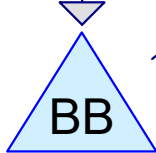
Area to B



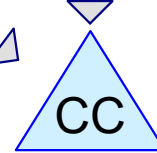
Area to C



South Swale



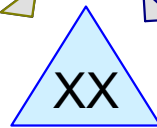
North Swale



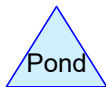
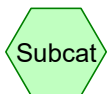
East Swale



5" Storm Pipe



Full Proposed Runoff



Routing Diagram for 3177 Stormwater Calcs 20210624
Prepared by Lower Columbia Engineering, Printed 6/24/2021
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3177 Stormwater Calcs 20210624

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.676	80	>75% Grass cover, Good, HSG D (00)
0.041	98	Bldg 5 (C)
0.071	98	Fire Lane (A)
3.706	98	Impervious (01, A, B, C)
5.494	93	TOTAL AREA

3177 Stormwater Calcs 20210624

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Woodard Middle School

Type IA 24-hr 00- WQ Rainfall=1.50"

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 points

Runoff by SBUH method, Split Pervious/Imperv.

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

Subcatchment 00: Natural	Runoff Area=1.676 ac 0.00% Impervious Runoff Depth=0.29" Tc=0.0 min CN=80/0 Runoff=0.05 cfs 0.040 af
Subcatchment 01: Existing	Runoff Area=93,345 sf 100.00% Impervious Runoff Depth=1.28" Tc=0.0 min CN=0/98 Runoff=0.72 cfs 0.229 af
Subcatchment A: Area to A	Runoff Area=40,256 sf 100.00% Impervious Runoff Depth=1.28" Tc=0.0 min CN=0/98 Runoff=0.31 cfs 0.099 af
Subcatchment B: Area to B	Runoff Area=14,537 sf 100.00% Impervious Runoff Depth=1.28" Tc=0.0 min CN=0/98 Runoff=0.11 cfs 0.036 af
Subcatchment C: Area to C	Runoff Area=18,184 sf 100.00% Impervious Runoff Depth=1.28" Tc=0.0 min CN=0/98 Runoff=0.14 cfs 0.045 af
Reach PIPE: 5" Storm Pipe	Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af 5.0" Round Pipe n=0.011 L=85.0' S=0.0118 '/' Capacity=0.44 cfs Outflow=0.00 cfs 0.000 af
Pond AA: South Swale	Peak Elev=277.75' Storage=899 cf Inflow=0.31 cfs 0.099 af Discarded=0.07 cfs 0.099 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.099 af
Pond BB: North Swale	Peak Elev=281.80' Storage=194 cf Inflow=0.11 cfs 0.036 af Discarded=0.04 cfs 0.036 af Primary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.036 af
Pond CC: East Swale	Peak Elev=279.69' Storage=203 cf Inflow=0.14 cfs 0.045 af Discarded=0.05 cfs 0.045 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.045 af
Pond XX: Full Proposed Runoff	Inflow=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af

Total Runoff Area = 5.494 ac Runoff Volume = 0.447 af Average Runoff Depth = 0.98"
30.50% Pervious = 1.676 ac 69.50% Impervious = 3.818 ac

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Woodard Middle School

Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Subcatchment 00: Natural

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

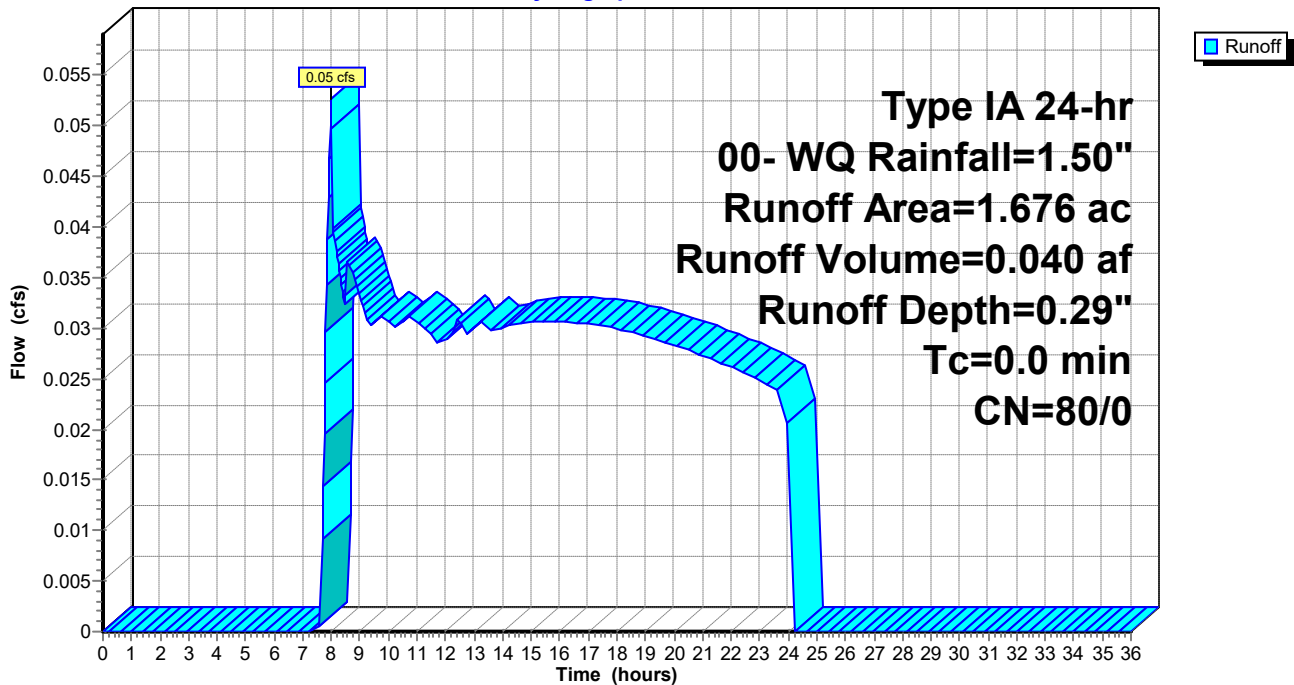
Runoff = 0.05 cfs @ 7.98 hrs, Volume= 0.040 af, Depth= 0.29"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 00- WQ Rainfall=1.50"

Area (ac)	CN	Description
1.676	80	>75% Grass cover, Good, HSG D
1.676	80	100.00% Pervious Area

Subcatchment 00: Natural

Hydrograph



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Woodard Middle School
Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Subcatchment 01: Existing

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

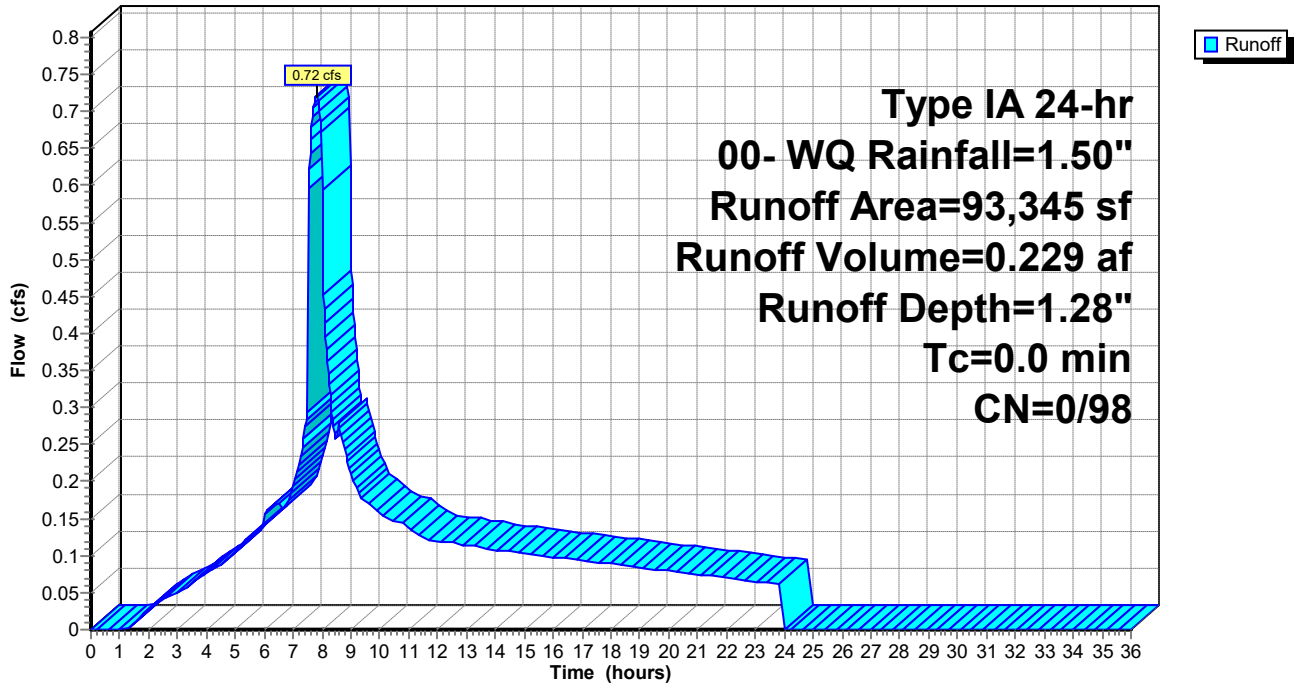
Runoff = 0.72 cfs @ 7.81 hrs, Volume= 0.229 af, Depth= 1.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 00- WQ Rainfall=1.50"

	Area (sf)	CN	Description
*	93,345	98	Impervious
	93,345	98	100.00% Impervious Area

Subcatchment 01: Existing

Hydrograph



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Woodard Middle School

Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Subcatchment A: Area to A

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

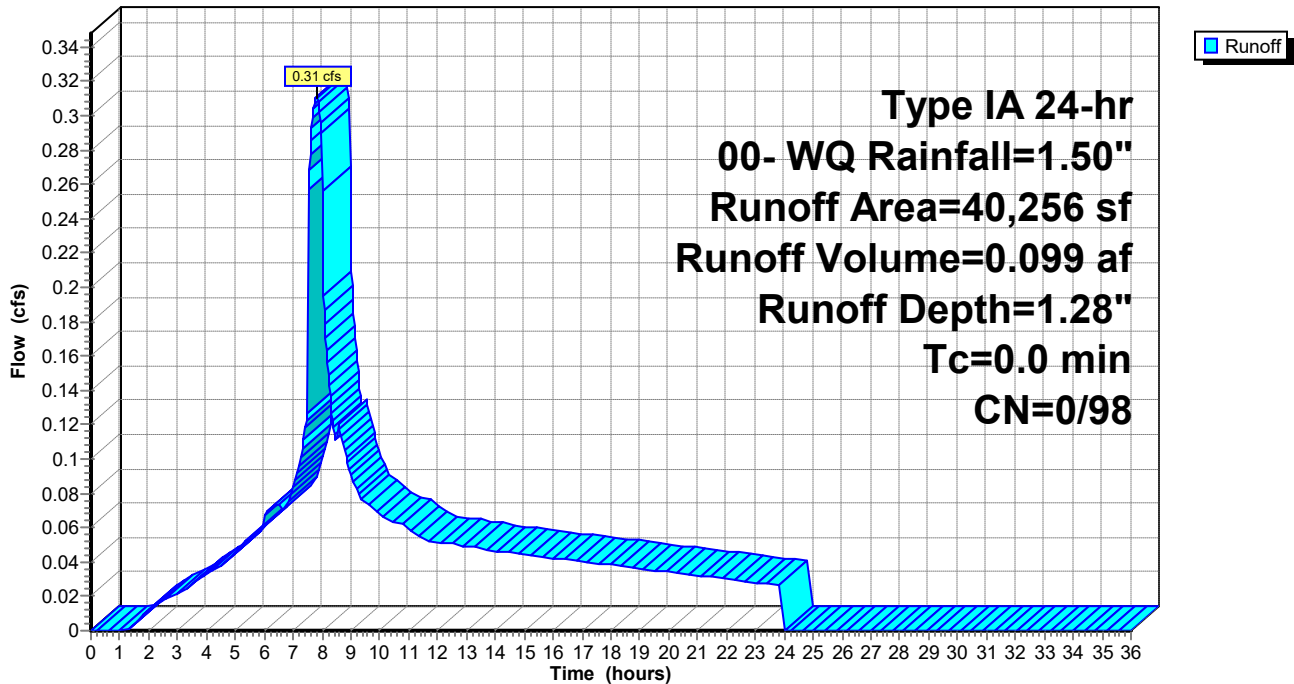
Runoff = 0.31 cfs @ 7.81 hrs, Volume= 0.099 af, Depth= 1.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 00- WQ Rainfall=1.50"

	Area (sf)	CN	Description
*	37,176	98	Impervious
*	3,080	98	Fire Lane
	40,256	98	Weighted Average
	40,256	98	100.00% Impervious Area

Subcatchment A: Area to A

Hydrograph



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Woodard Middle School

Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Subcatchment B: Area to B

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

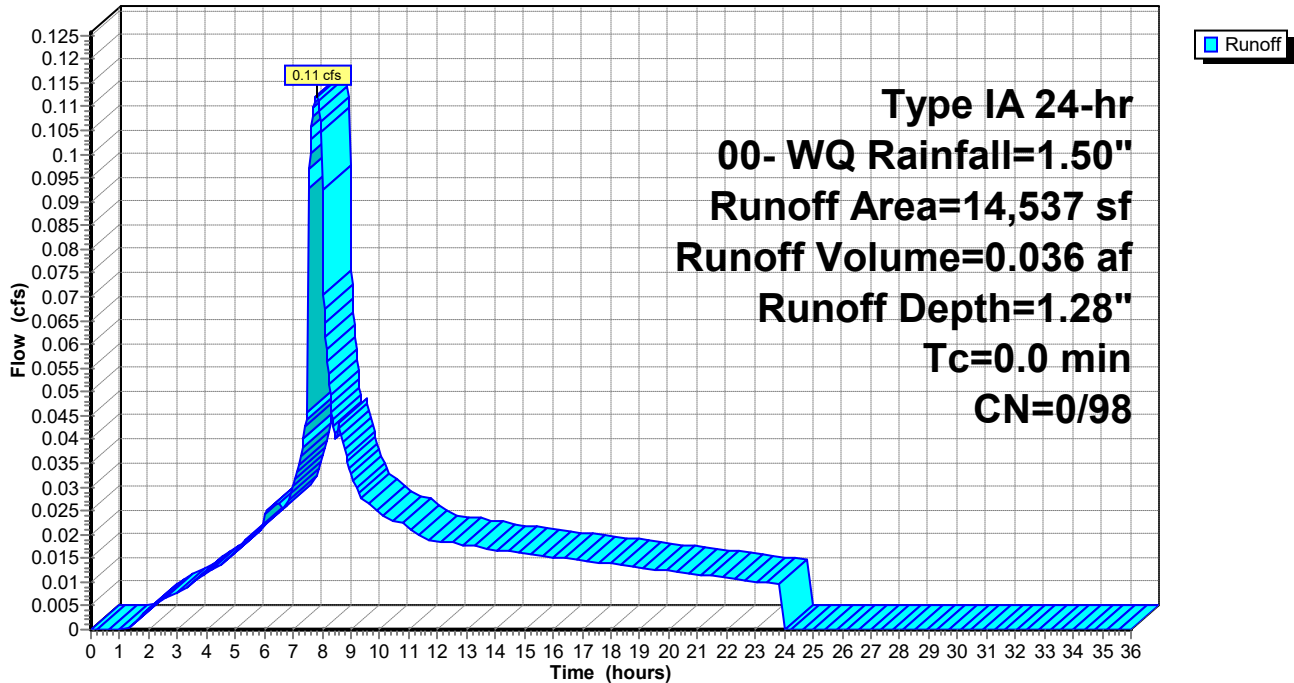
Runoff = 0.11 cfs @ 7.81 hrs, Volume= 0.036 af, Depth= 1.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 00- WQ Rainfall=1.50"

	Area (sf)	CN	Description
*	14,537	98	Impervious
	14,537	98	100.00% Impervious Area

Subcatchment B: Area to B

Hydrograph



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Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Subcatchment C: Area to C

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

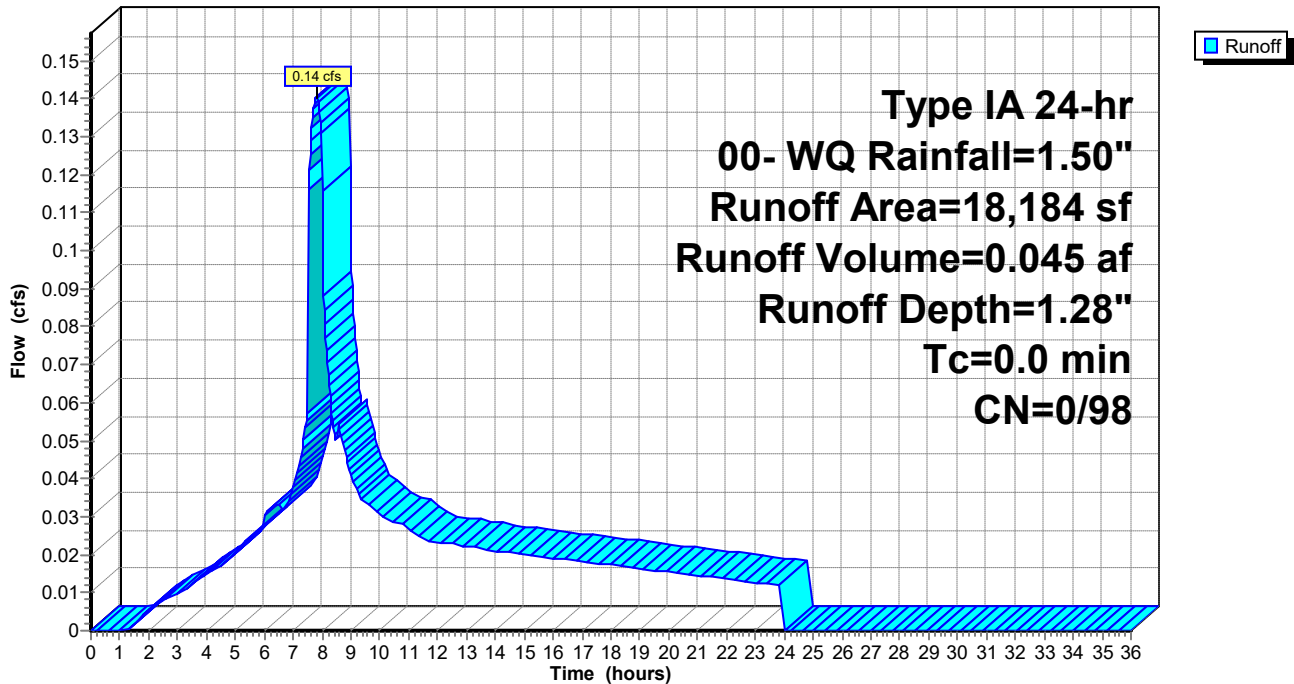
Runoff = 0.14 cfs @ 7.81 hrs, Volume= 0.045 af, Depth= 1.28"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 00- WQ Rainfall=1.50"

	Area (sf)	CN	Description
*	16,385	98	Impervious
*	1,799	98	Bldg 5
	18,184	98	Weighted Average
	18,184	98	100.00% Impervious Area

Subcatchment C: Area to C

Hydrograph



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Woodard Middle School

Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Reach PIPE: 5" Storm Pipe

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 0.00" for 00- WQ event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs

Average Depth at Peak Storage= 0.00'

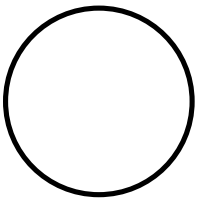
Bank-Full Depth= 0.42' Flow Area= 0.1 sf, Capacity= 0.44 cfs

5.0" Round Pipe

n= 0.011

Length= 85.0' Slope= 0.0118 '/'

Inlet Invert= 282.00', Outlet Invert= 281.00'



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Woodard Middle School

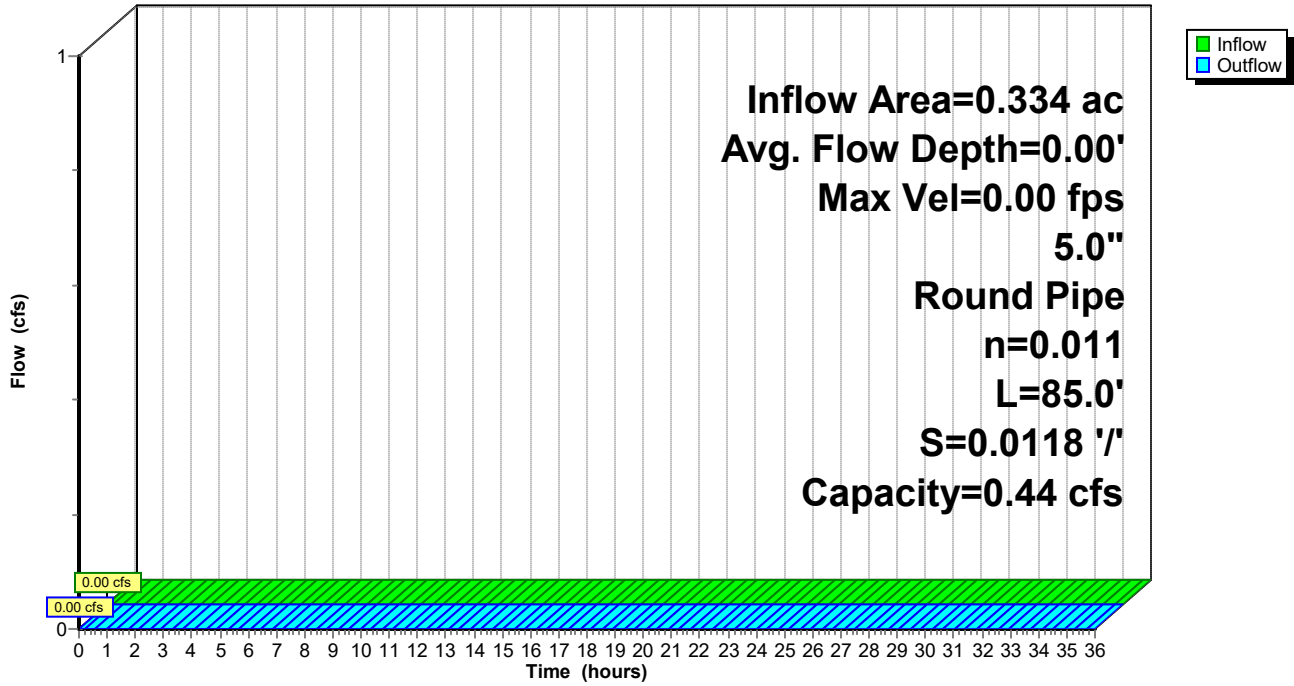
Type IA 24-hr 00- WQ Rainfall=1.50"

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Reach PIPE: 5" Storm Pipe

Hydrograph



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Woodard Middle School

Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Pond AA: South Swale

Inflow Area = 0.924 ac, 100.00% Impervious, Inflow Depth = 1.28" for 00- WQ event
 Inflow = 0.31 cfs @ 7.81 hrs, Volume= 0.099 af
 Outflow = 0.07 cfs @ 10.05 hrs, Volume= 0.099 af, Atten= 78%, Lag= 134.6 min
 Discarded = 0.07 cfs @ 10.05 hrs, Volume= 0.099 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 277.75' @ 10.05 hrs Surf.Area= 1,371 sf Storage= 899 cf

Plug-Flow detention time= 128.9 min calculated for 0.099 af (100% of inflow)
 Center-of-Mass det. time= 128.8 min (816.6 - 687.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	277.00'	2,988 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)	
277.00	1,031	224.3	0	0	1,031	
278.00	1,494	238.2	1,255	1,255	1,592	
279.00	1,982	250.7	1,732	2,988	2,137	

Device	Routing	Invert	Outlet Devices	
#1	Primary	278.75'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	277.00'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.07 cfs @ 10.05 hrs HW=277.75' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=277.00' (Free Discharge)
 ↳ **1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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Woodard Middle School

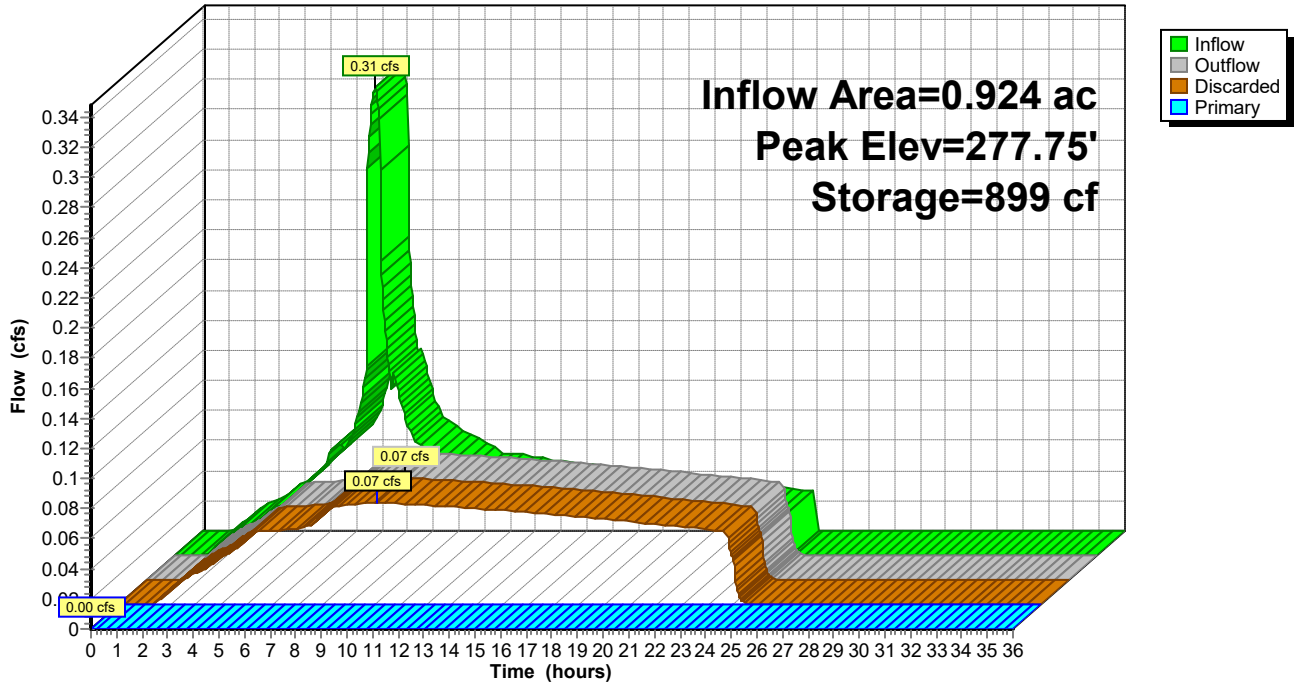
Type IA 24-hr 00- WQ Rainfall=1.50"

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Pond AA: South Swale

Hydrograph



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Woodard Middle School

Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Pond BB: North Swale

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 1.28" for 00- WQ event
 Inflow = 0.11 cfs @ 7.81 hrs, Volume= 0.036 af
 Outflow = 0.04 cfs @ 8.83 hrs, Volume= 0.036 af, Atten= 67%, Lag= 61.4 min
 Discarded = 0.04 cfs @ 8.83 hrs, Volume= 0.036 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 281.80' @ 8.83 hrs Surf.Area= 744 sf Storage= 194 cf

Plug-Flow detention time= 30.1 min calculated for 0.036 af (100% of inflow)
 Center-of-Mass det. time= 30.0 min (717.9 - 687.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	281.50'	888 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)	
281.50	571	331.9	0	0	571	
282.50	1,248	344.5	888	888	1,329	

Device	Routing	Invert	Outlet Devices	
#1	Primary	282.00'	6.0" Vert. Orifice/Grate C= 0.600	
#2	Discarded	281.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.04 cfs @ 8.83 hrs HW=281.80' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=281.50' (Free Discharge)
 ↑ **1=Orifice/Grate** (Controls 0.00 cfs)

3177 Stormwater Calcs 20210624

Prepared by Lower Columbia Engineering

HydroCAD® 10.00-26 s/n 07313 © 2020 HydroCAD Software Solutions LLC

Woodard Middle School

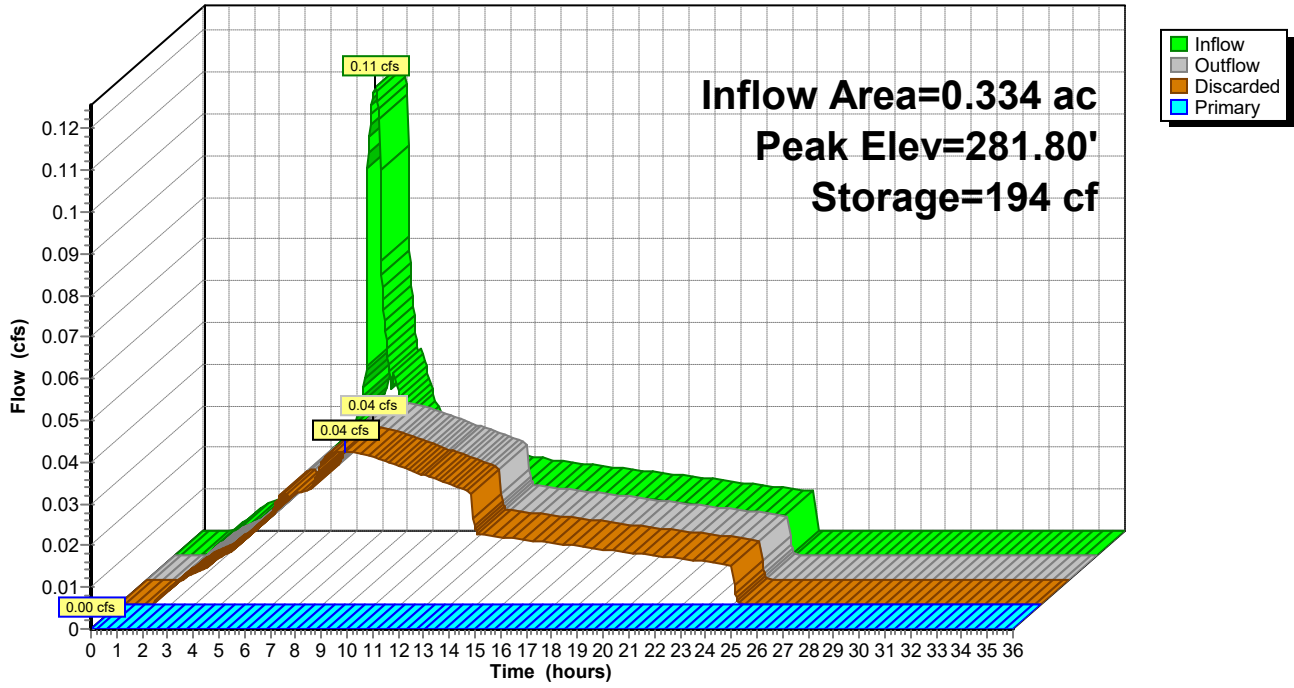
Type IA 24-hr 00- WQ Rainfall=1.50"

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Pond BB: North Swale

Hydrograph



3177 Stormwater Calcs 20210624

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Woodard Middle School

Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Pond CC: East Swale

Inflow Area = 0.751 ac, 100.00% Impervious, Inflow Depth = 0.71" for 00- WQ event
 Inflow = 0.14 cfs @ 7.81 hrs, Volume= 0.045 af
 Outflow = 0.05 cfs @ 8.65 hrs, Volume= 0.045 af, Atten= 64%, Lag= 50.8 min
 Discarded = 0.05 cfs @ 8.65 hrs, Volume= 0.045 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 279.69' @ 8.65 hrs Surf.Area= 1,109 sf Storage= 203 cf

Plug-Flow detention time= 21.5 min calculated for 0.045 af (100% of inflow)
 Center-of-Mass det. time= 21.4 min (709.2 - 687.8)

Volume	Invert	Avail.Storage	Storage Description		
#1	279.50'	3,307 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)
279.50	993	318.6	0	0	993
280.50	1,660	328.0	1,312	1,312	1,575
281.50	2,350	359.7	1,995	3,307	3,343

Device	Routing	Invert	Outlet Devices	
#1	Primary	281.25'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	279.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.05 cfs @ 8.65 hrs HW=279.69' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=279.50' (Free Discharge)

↑**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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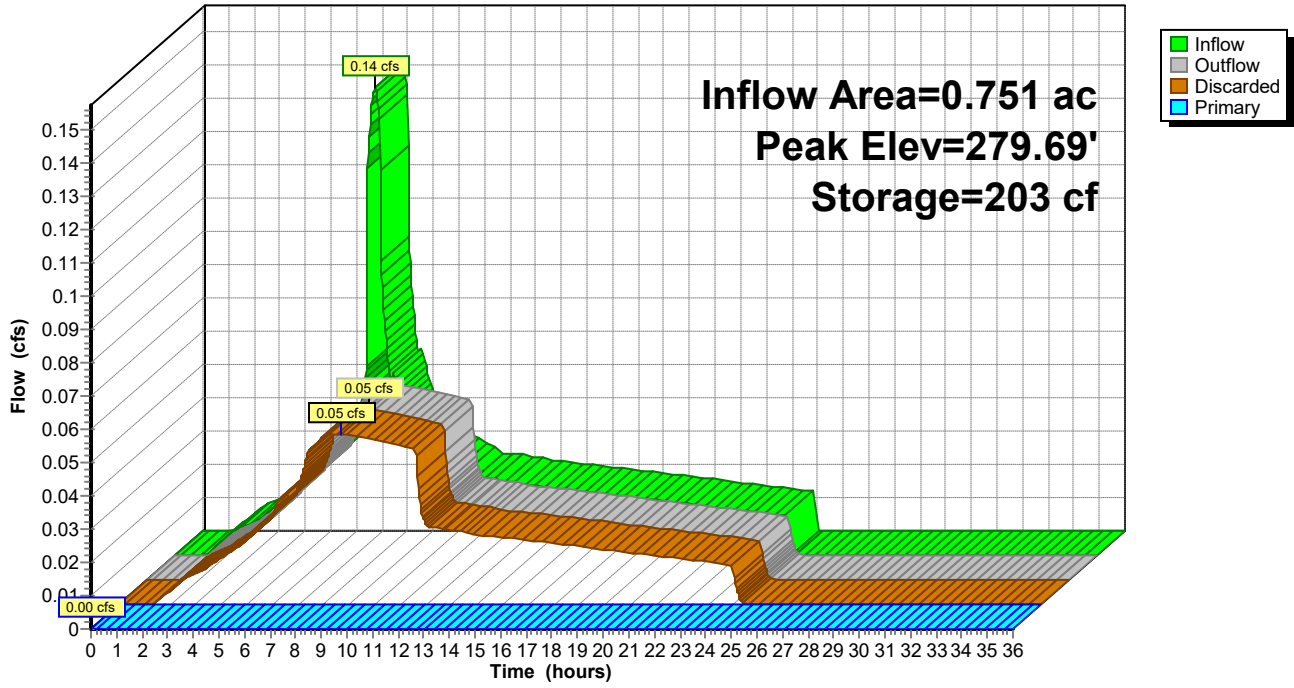
Woodard Middle School
Type IA 24-hr 00- WQ Rainfall=1.50"

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Pond CC: East Swale

Hydrograph



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Type IA 24-hr 00- WQ Rainfall=1.50"

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Summary for Pond XX: Full Proposed Runoff

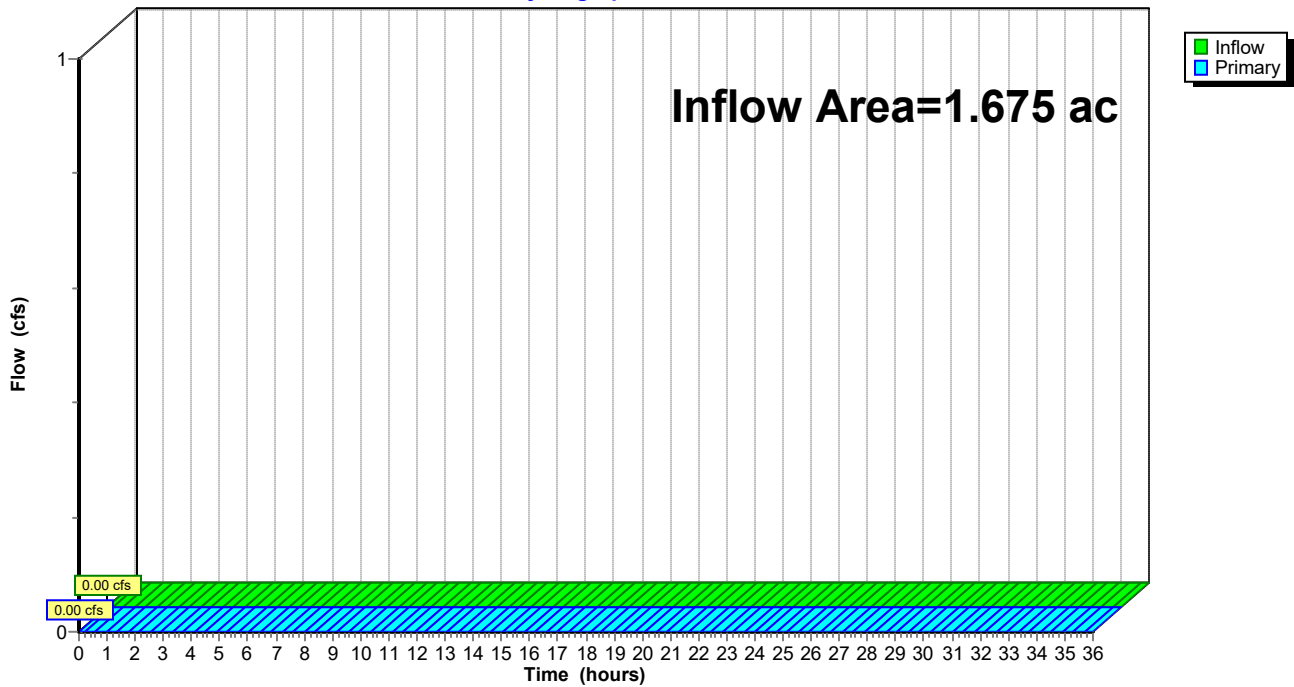
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.675 ac, 100.00% Impervious, Inflow Depth = 0.00" for 00- WQ event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Pond XX: Full Proposed Runoff

Hydrograph



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Type IA 24-hr 2YR Rainfall=3.00"

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 points

Runoff by SBUH method, Split Pervious/Imperv.

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

Subcatchment 00: Natural	Runoff Area=1.676 ac 0.00% Impervious Runoff Depth=1.25" Tc=0.0 min CN=80/0 Runoff=0.46 cfs 0.175 af
Subcatchment 01: Existing	Runoff Area=93,345 sf 100.00% Impervious Runoff Depth=2.77" Tc=0.0 min CN=0/98 Runoff=1.53 cfs 0.494 af
Subcatchment A: Area to A	Runoff Area=40,256 sf 100.00% Impervious Runoff Depth=2.77" Tc=0.0 min CN=0/98 Runoff=0.66 cfs 0.213 af
Subcatchment B: Area to B	Runoff Area=14,537 sf 100.00% Impervious Runoff Depth=2.77" Tc=0.0 min CN=0/98 Runoff=0.24 cfs 0.077 af
Subcatchment C: Area to C	Runoff Area=18,184 sf 100.00% Impervious Runoff Depth=2.77" Tc=0.0 min CN=0/98 Runoff=0.30 cfs 0.096 af
Reach PIPE: 5" Storm Pipe	Avg. Flow Depth=0.13' Max Vel=2.60 fps Inflow=0.10 cfs 0.009 af 5.0" Round Pipe n=0.011 L=85.0' S=0.0118 '/' Capacity=0.44 cfs Outflow=0.10 cfs 0.009 af
Pond AA: South Swale	Peak Elev=278.78' Storage=2,556 cf Inflow=0.66 cfs 0.213 af Discarded=0.09 cfs 0.195 af Primary=0.14 cfs 0.018 af Outflow=0.23 cfs 0.213 af
Pond BB: North Swale	Peak Elev=282.19' Storage=534 cf Inflow=0.24 cfs 0.077 af Discarded=0.05 cfs 0.068 af Primary=0.10 cfs 0.009 af Outflow=0.15 cfs 0.077 af
Pond CC: East Swale	Peak Elev=280.44' Storage=1,207 cf Inflow=0.36 cfs 0.106 af Discarded=0.07 cfs 0.106 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.106 af
Pond XX: Full Proposed Runoff	Inflow=0.14 cfs 0.018 af Primary=0.14 cfs 0.018 af

Total Runoff Area = 5.494 ac Runoff Volume = 1.055 af Average Runoff Depth = 2.31"
30.50% Pervious = 1.676 ac 69.50% Impervious = 3.818 ac

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Type IA 24-hr 2YR Rainfall=3.00"
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Summary for Subcatchment 00: Natural

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

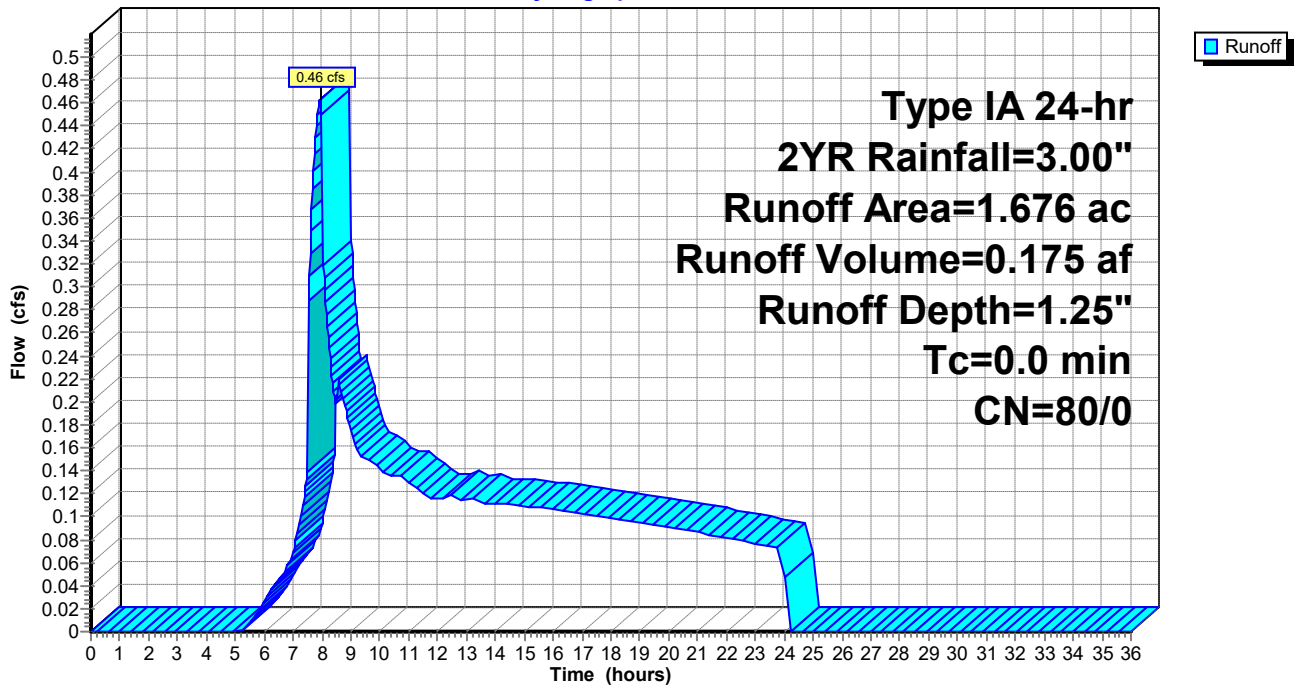
Runoff = 0.46 cfs @ 7.93 hrs, Volume= 0.175 af, Depth= 1.25"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 2YR Rainfall=3.00"

Area (ac)	CN	Description
1.676	80	>75% Grass cover, Good, HSG D
1.676	80	100.00% Pervious Area

Subcatchment 00: Natural

Hydrograph



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Woodard Middle School
Type IA 24-hr 2YR Rainfall=3.00"

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Summary for Subcatchment 01: Existing

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

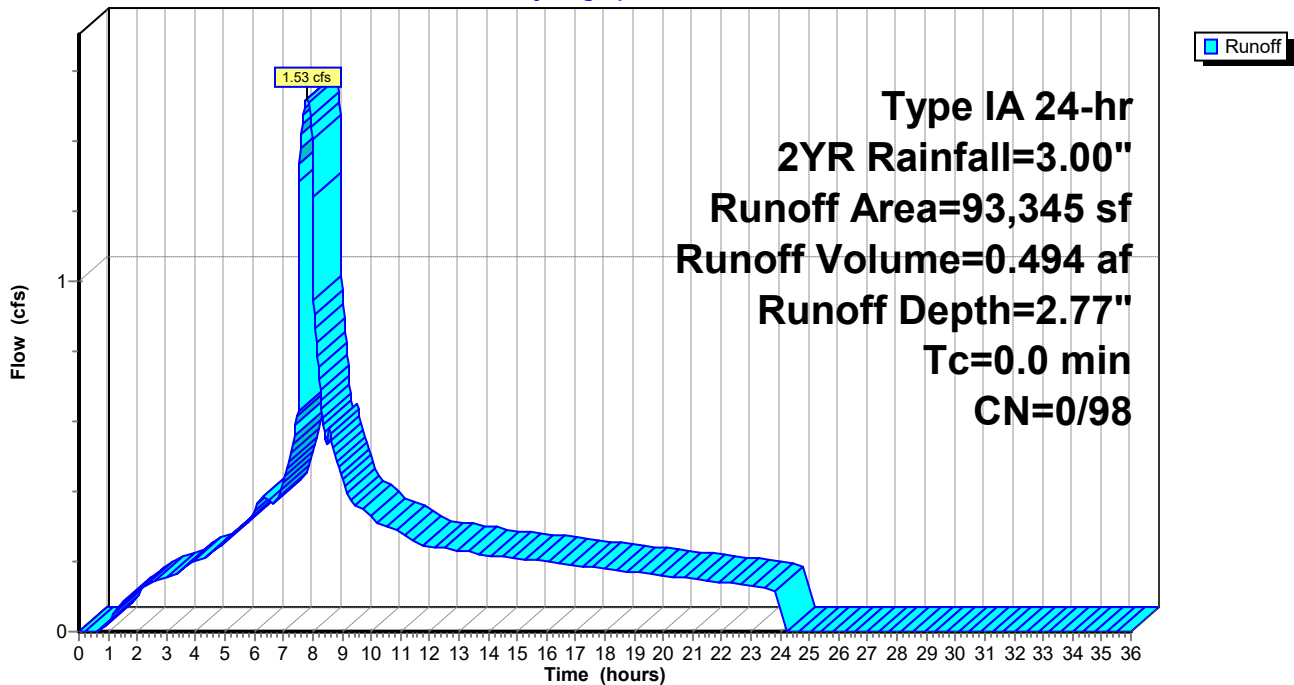
Runoff = 1.53 cfs @ 7.80 hrs, Volume= 0.494 af, Depth= 2.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 2YR Rainfall=3.00"

	Area (sf)	CN	Description
*	93,345	98	Impervious
	93,345	98	100.00% Impervious Area

Subcatchment 01: Existing

Hydrograph



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Summary for Subcatchment A: Area to A

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

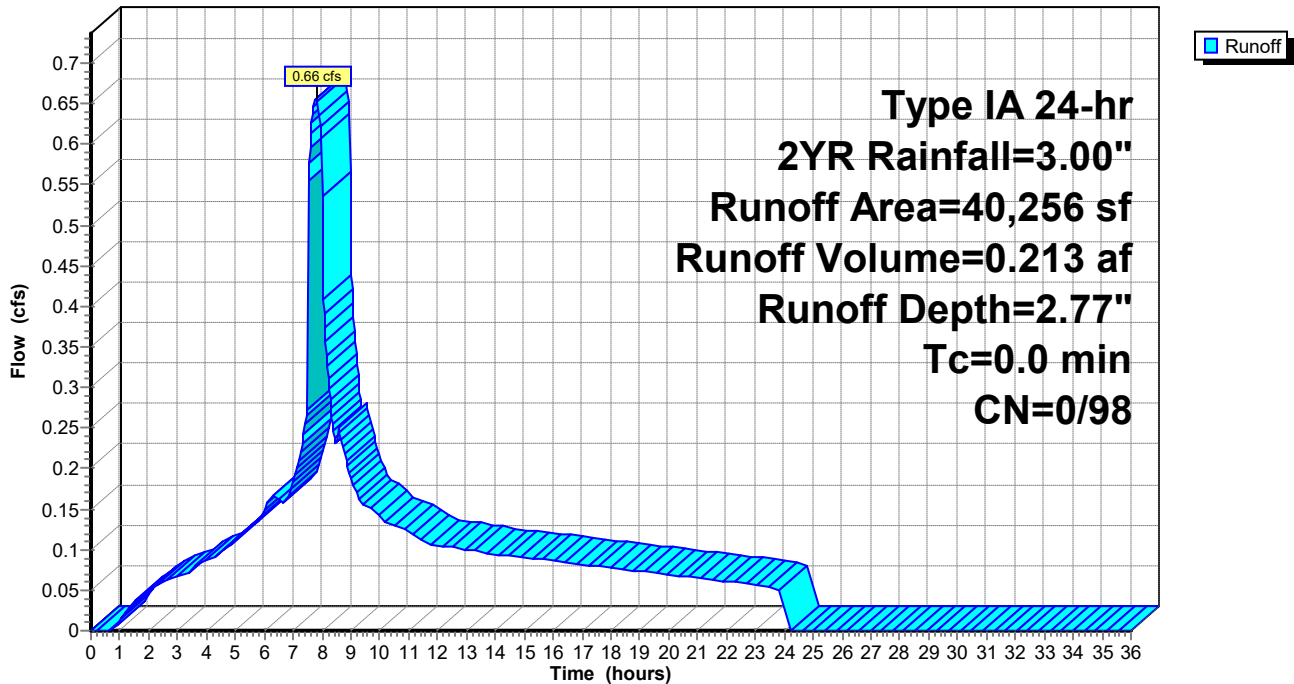
Runoff = 0.66 cfs @ 7.80 hrs, Volume= 0.213 af, Depth= 2.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 2YR Rainfall=3.00"

	Area (sf)	CN	Description
*	37,176	98	Impervious
*	3,080	98	Fire Lane
	40,256	98	Weighted Average
	40,256	98	100.00% Impervious Area

Subcatchment A: Area to A

Hydrograph



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Type IA 24-hr 2YR Rainfall=3.00"

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Summary for Subcatchment B: Area to B

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

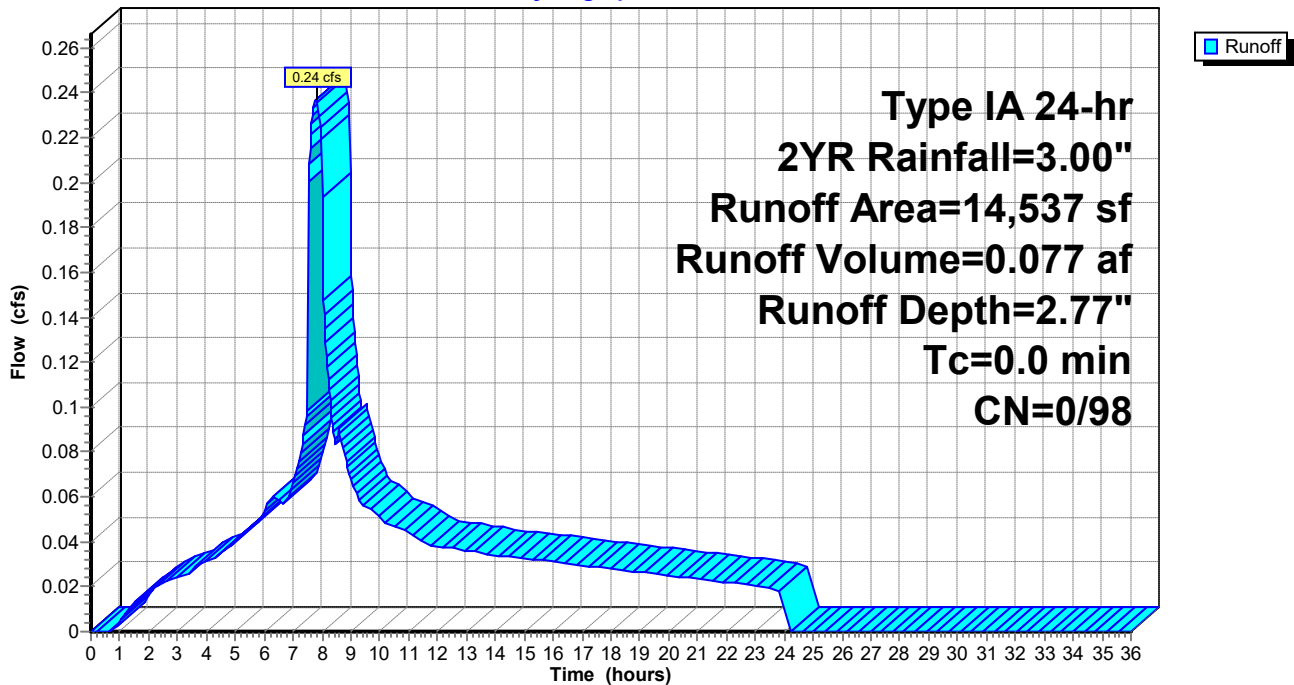
Runoff = 0.24 cfs @ 7.80 hrs, Volume= 0.077 af, Depth= 2.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 2YR Rainfall=3.00"

	Area (sf)	CN	Description
*	14,537	98	Impervious
	14,537	98	100.00% Impervious Area

Subcatchment B: Area to B

Hydrograph



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Summary for Subcatchment C: Area to C

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

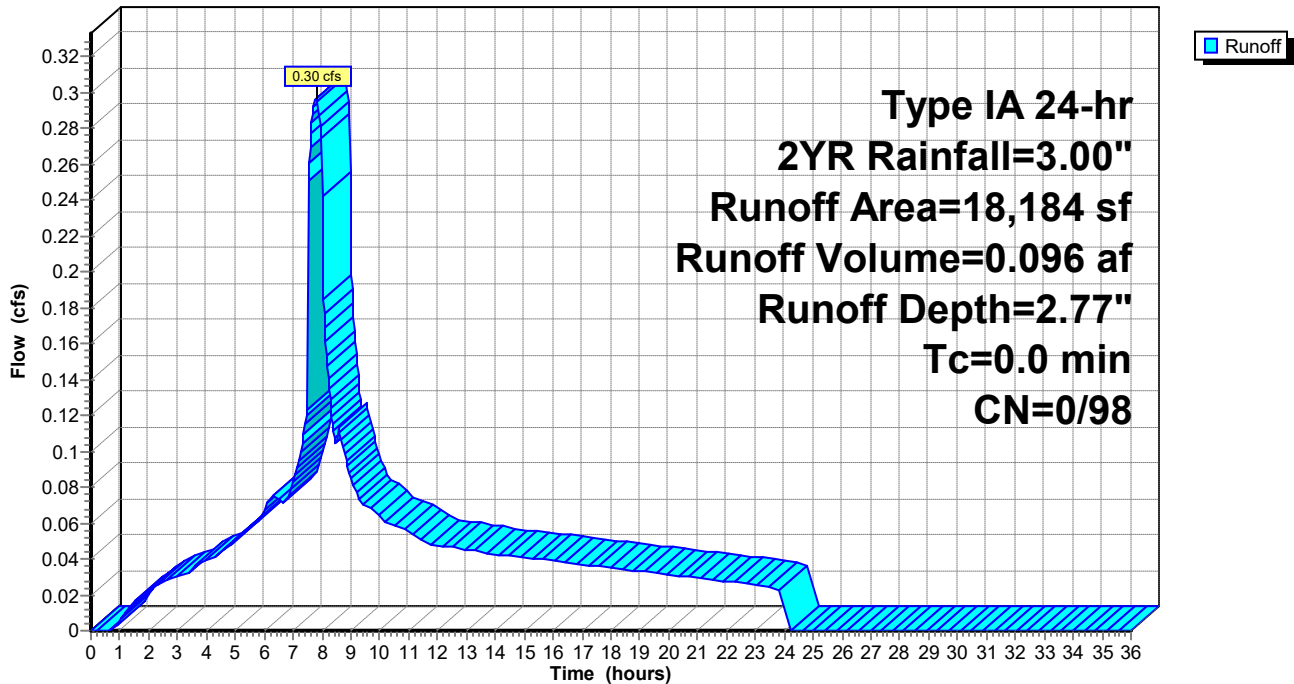
Runoff = 0.30 cfs @ 7.80 hrs, Volume= 0.096 af, Depth= 2.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 2YR Rainfall=3.00"

	Area (sf)	CN	Description
*	16,385	98	Impervious
*	1,799	98	Bldg 5
	18,184	98	Weighted Average
	18,184	98	100.00% Impervious Area

Subcatchment C: Area to C

Hydrograph



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Summary for Reach PIPE: 5" Storm Pipe

[52] Hint: Inlet/Outlet conditions not evaluated

[81] Warning: Exceeded Pond BB by 0.06' @ 14.43 hrs

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 0.34" for 2YR event
Inflow = 0.10 cfs @ 8.05 hrs, Volume= 0.009 af
Outflow = 0.10 cfs @ 8.07 hrs, Volume= 0.009 af, Atten= 0%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Max. Velocity= 2.60 fps, Min. Travel Time= 0.5 min

Avg. Velocity = 1.43 fps, Avg. Travel Time= 1.0 min

Peak Storage= 3 cf @ 8.06 hrs

Average Depth at Peak Storage= 0.13'

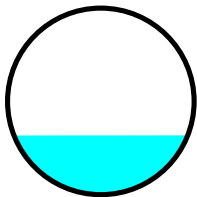
Bank-Full Depth= 0.42' Flow Area= 0.1 sf, Capacity= 0.44 cfs

5.0" Round Pipe

n= 0.011

Length= 85.0' Slope= 0.0118 '/'

Inlet Invert= 282.00', Outlet Invert= 281.00'



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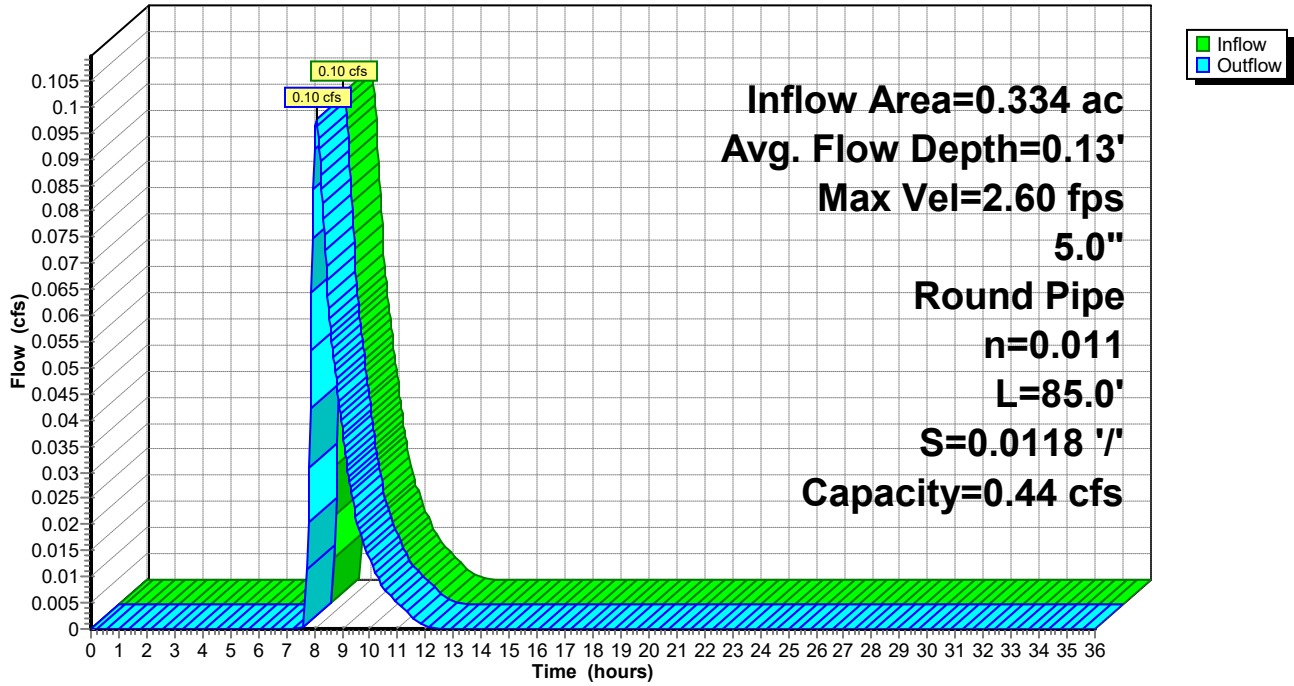
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Reach PIPE: 5" Storm Pipe

Hydrograph



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Summary for Pond AA: South Swale

Inflow Area = 0.924 ac, 100.00% Impervious, Inflow Depth = 2.77" for 2YR event
 Inflow = 0.66 cfs @ 7.80 hrs, Volume= 0.213 af
 Outflow = 0.23 cfs @ 8.66 hrs, Volume= 0.213 af, Atten= 64%, Lag= 51.8 min
 Discarded = 0.09 cfs @ 8.66 hrs, Volume= 0.195 af
 Primary = 0.14 cfs @ 8.66 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 278.78' @ 8.66 hrs Surf.Area= 1,867 sf Storage= 2,556 cf

Plug-Flow detention time= 311.3 min calculated for 0.213 af (100% of inflow)
 Center-of-Mass det. time= 311.5 min (974.1 - 662.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	277.00'	2,988 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)	
277.00	1,031	224.3	0	0	1,031	
278.00	1,494	238.2	1,255	1,255	1,592	
279.00	1,982	250.7	1,732	2,988	2,137	

Device	Routing	Invert	Outlet Devices	
#1	Primary	278.75'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	277.00'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.09 cfs @ 8.66 hrs HW=278.78' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.14 cfs @ 8.66 hrs HW=278.78' (Free Discharge)
 ↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.14 cfs @ 0.53 fps)

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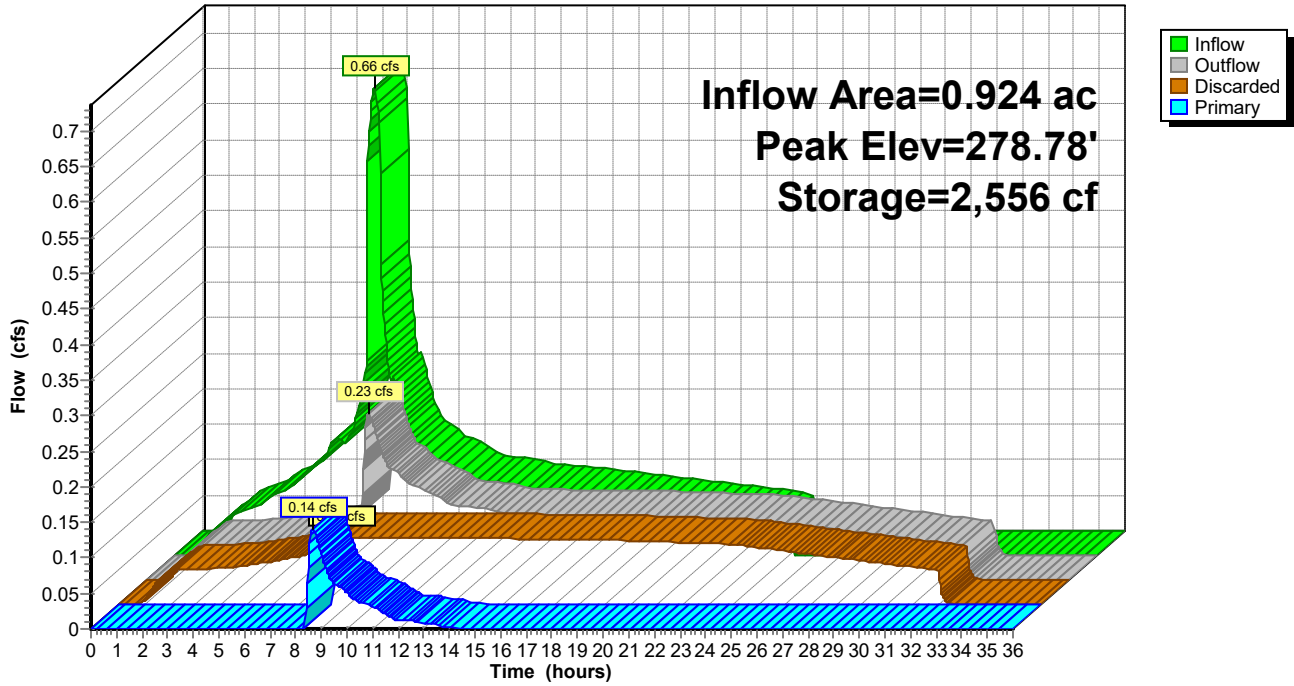
Woodard Middle School
Type IA 24-hr 2YR Rainfall=3.00"

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Pond AA: South Swale

Hydrograph



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 Type IA 24-hr 2YR Rainfall=3.00"
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Summary for Pond BB: North Swale

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 2.77" for 2YR event
 Inflow = 0.24 cfs @ 7.80 hrs, Volume= 0.077 af
 Outflow = 0.15 cfs @ 8.05 hrs, Volume= 0.077 af, Atten= 38%, Lag= 15.3 min
 Discarded = 0.05 cfs @ 8.05 hrs, Volume= 0.068 af
 Primary = 0.10 cfs @ 8.05 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 282.19' @ 8.05 hrs Surf.Area= 1,007 sf Storage= 534 cf

Plug-Flow detention time= 82.4 min calculated for 0.077 af (100% of inflow)
 Center-of-Mass det. time= 82.3 min (745.0 - 662.6)

Volume	Invert	Avail.Storage	Storage Description			
#1	281.50'	888 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)	
281.50	571	331.9	0	0	571	
282.50	1,248	344.5	888	888	1,329	

Device	Routing	Invert	Outlet Devices	
#1	Primary	282.00'	6.0" Vert. Orifice/Grate C= 0.600	
#2	Discarded	281.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.05 cfs @ 8.05 hrs HW=282.19' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.10 cfs @ 8.05 hrs HW=282.19' (Free Discharge)
 ↑**1=Orifice/Grate** (Orifice Controls 0.10 cfs @ 1.47 fps)

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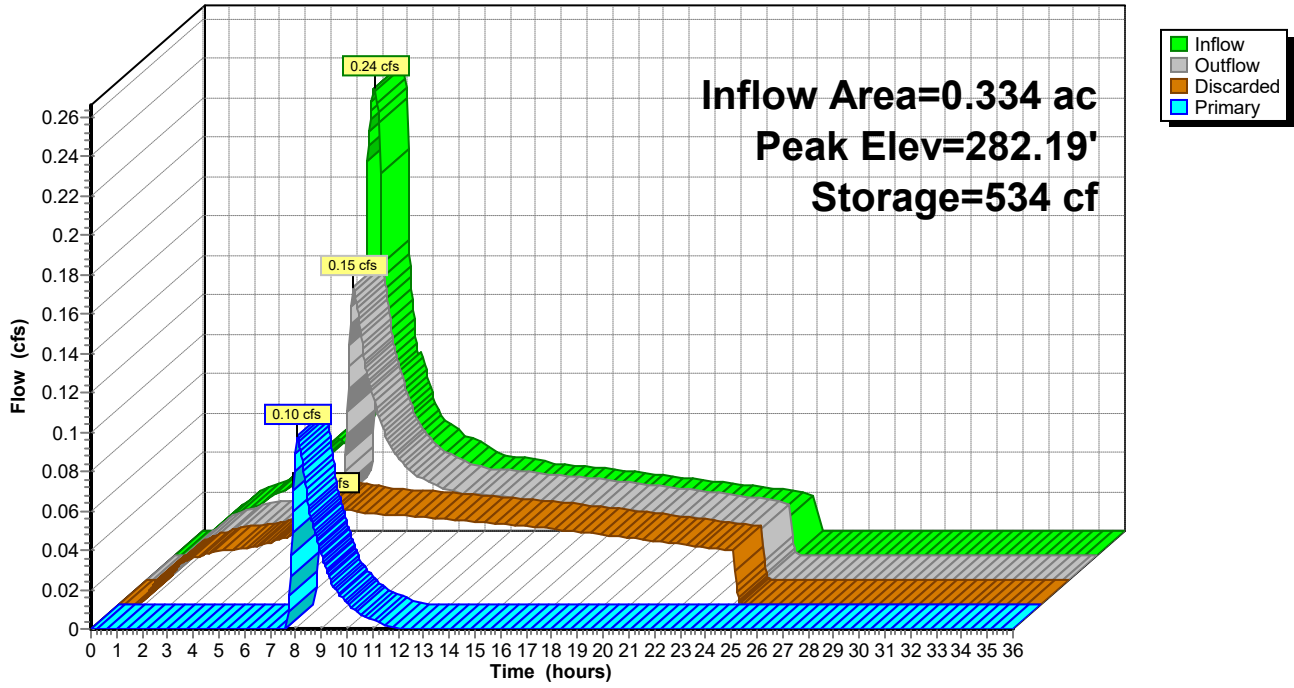
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Pond BB: North Swale

Hydrograph



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Summary for Pond CC: East Swale

Inflow Area = 0.751 ac, 100.00% Impervious, Inflow Depth = 1.69" for 2YR event
Inflow = 0.36 cfs @ 7.97 hrs, Volume= 0.106 af
Outflow = 0.07 cfs @ 10.21 hrs, Volume= 0.106 af, Atten= 80%, Lag= 134.3 min
Discarded = 0.07 cfs @ 10.21 hrs, Volume= 0.106 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Peak Elev= 280.44' @ 10.21 hrs Surf.Area= 1,612 sf Storage= 1,207 cf

Plug-Flow detention time= 159.9 min calculated for 0.106 af (100% of inflow)
Center-of-Mass det. time= 159.8 min (810.4 - 650.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	279.50'	3,307 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)
279.50	993	318.6	0	0	993
280.50	1,660	328.0	1,312	1,312	1,575
281.50	2,350	359.7	1,995	3,307	3,343

Device	Routing	Invert	Outlet Devices	
#1	Primary	281.25'	10.0' long Sharp-Crested Rectangular Weir	2 End Contraction(s)
#2	Discarded	279.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.07 cfs @ 10.21 hrs HW=280.44' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.07 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=279.50' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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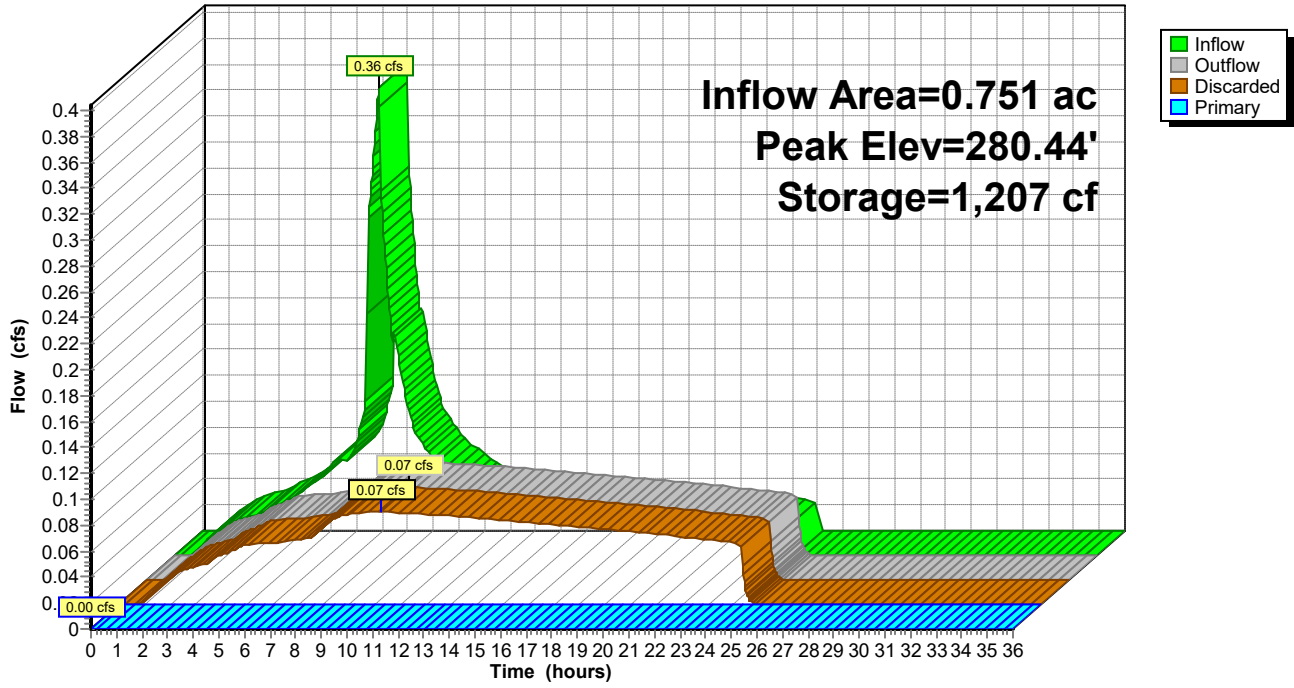
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Pond CC: East Swale

Hydrograph



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Summary for Pond XX: Full Proposed Runoff

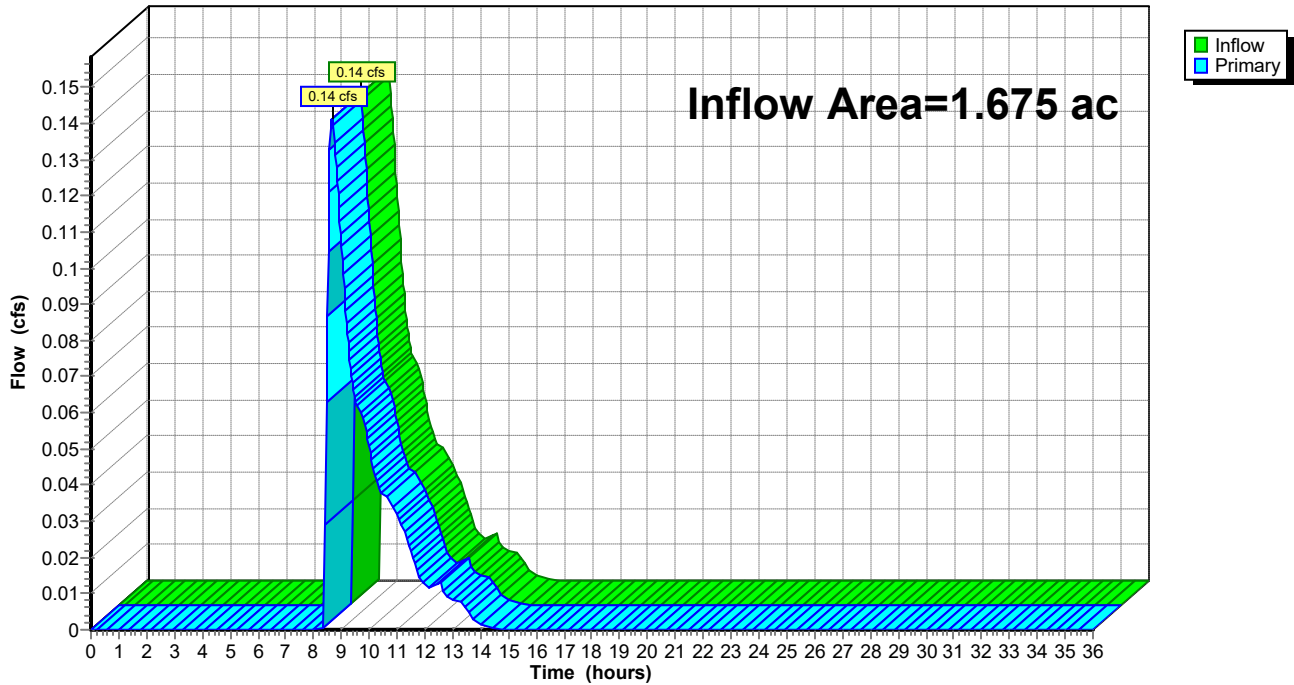
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.675 ac, 100.00% Impervious, Inflow Depth = 0.13" for 2YR event
Inflow = 0.14 cfs @ 8.66 hrs, Volume= 0.018 af
Primary = 0.14 cfs @ 8.66 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Pond XX: Full Proposed Runoff

Hydrograph



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Type IA 24-hr 5YR Rainfall=3.50"

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 points

Runoff by SBUH method, Split Pervious/Imperv.

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

Subcatchment 00: Natural	Runoff Area=1.676 ac 0.00% Impervious Runoff Depth=1.64" Tc=0.0 min CN=80/0 Runoff=0.64 cfs 0.229 af
Subcatchment 01: Existing	Runoff Area=93,345 sf 100.00% Impervious Runoff Depth=3.27" Tc=0.0 min CN=0/98 Runoff=1.79 cfs 0.583 af
Subcatchment A: Area to A	Runoff Area=40,256 sf 100.00% Impervious Runoff Depth=3.27" Tc=0.0 min CN=0/98 Runoff=0.77 cfs 0.252 af
Subcatchment B: Area to B	Runoff Area=14,537 sf 100.00% Impervious Runoff Depth=3.27" Tc=0.0 min CN=0/98 Runoff=0.28 cfs 0.091 af
Subcatchment C: Area to C	Runoff Area=18,184 sf 100.00% Impervious Runoff Depth=3.27" Tc=0.0 min CN=0/98 Runoff=0.35 cfs 0.114 af
Reach PIPE: 5" Storm Pipe	Avg. Flow Depth=0.18' Max Vel=3.01 fps Inflow=0.17 cfs 0.016 af 5.0" Round Pipe n=0.011 L=85.0' S=0.0118 '/' Capacity=0.44 cfs Outflow=0.17 cfs 0.016 af
Pond AA: South Swale	Peak Elev=278.81' Storage=2,627 cf Inflow=0.77 cfs 0.252 af Discarded=0.09 cfs 0.206 af Primary=0.53 cfs 0.046 af Outflow=0.62 cfs 0.252 af
Pond BB: North Swale	Peak Elev=282.25' Storage=599 cf Inflow=0.28 cfs 0.091 af Discarded=0.05 cfs 0.075 af Primary=0.17 cfs 0.016 af Outflow=0.22 cfs 0.091 af
Pond CC: East Swale	Peak Elev=280.71' Storage=1,673 cf Inflow=0.48 cfs 0.130 af Discarded=0.09 cfs 0.130 af Primary=0.00 cfs 0.000 af Outflow=0.09 cfs 0.130 af
Pond XX: Full Proposed Runoff	Inflow=0.53 cfs 0.046 af Primary=0.53 cfs 0.046 af

Total Runoff Area = 5.494 ac Runoff Volume = 1.268 af Average Runoff Depth = 2.77"
30.50% Pervious = 1.676 ac 69.50% Impervious = 3.818 ac

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Summary for Subcatchment 00: Natural

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

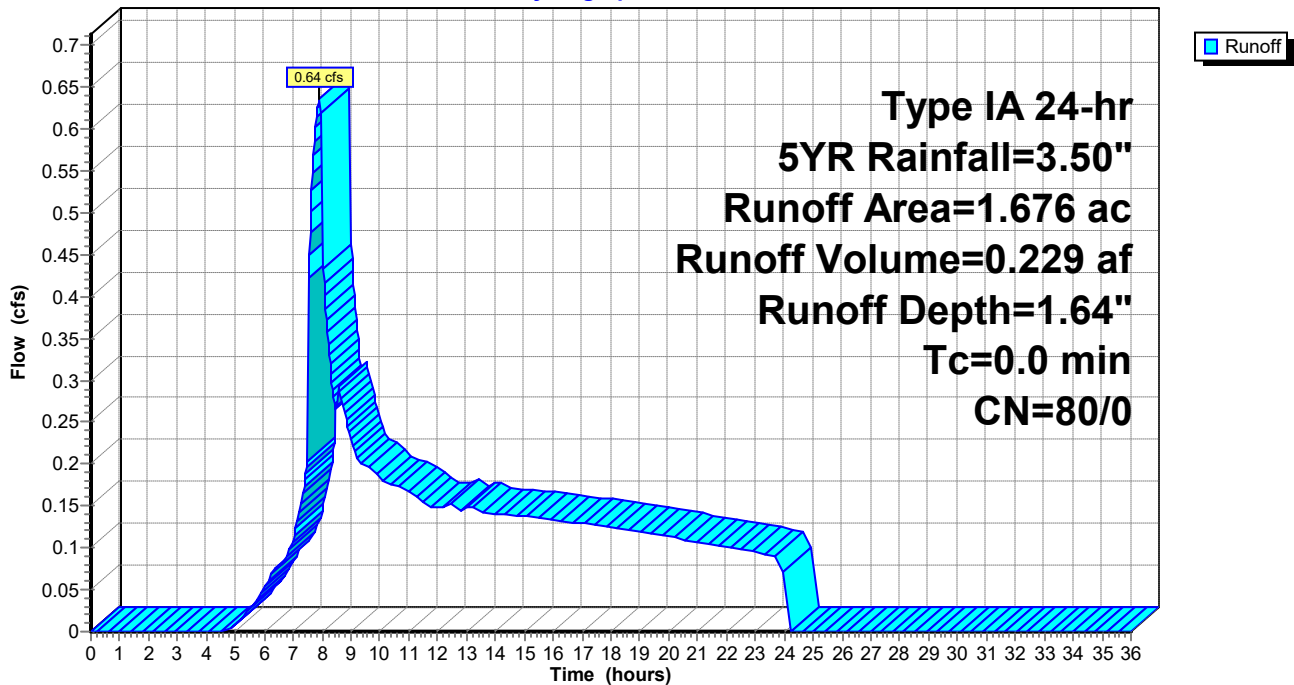
Runoff = 0.64 cfs @ 7.91 hrs, Volume= 0.229 af, Depth= 1.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 5YR Rainfall=3.50"

Area (ac)	CN	Description
1.676	80	>75% Grass cover, Good, HSG D
1.676	80	100.00% Pervious Area

Subcatchment 00: Natural

Hydrograph



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Woodard Middle School
Type IA 24-hr 5YR Rainfall=3.50"

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Summary for Subcatchment 01: Existing

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

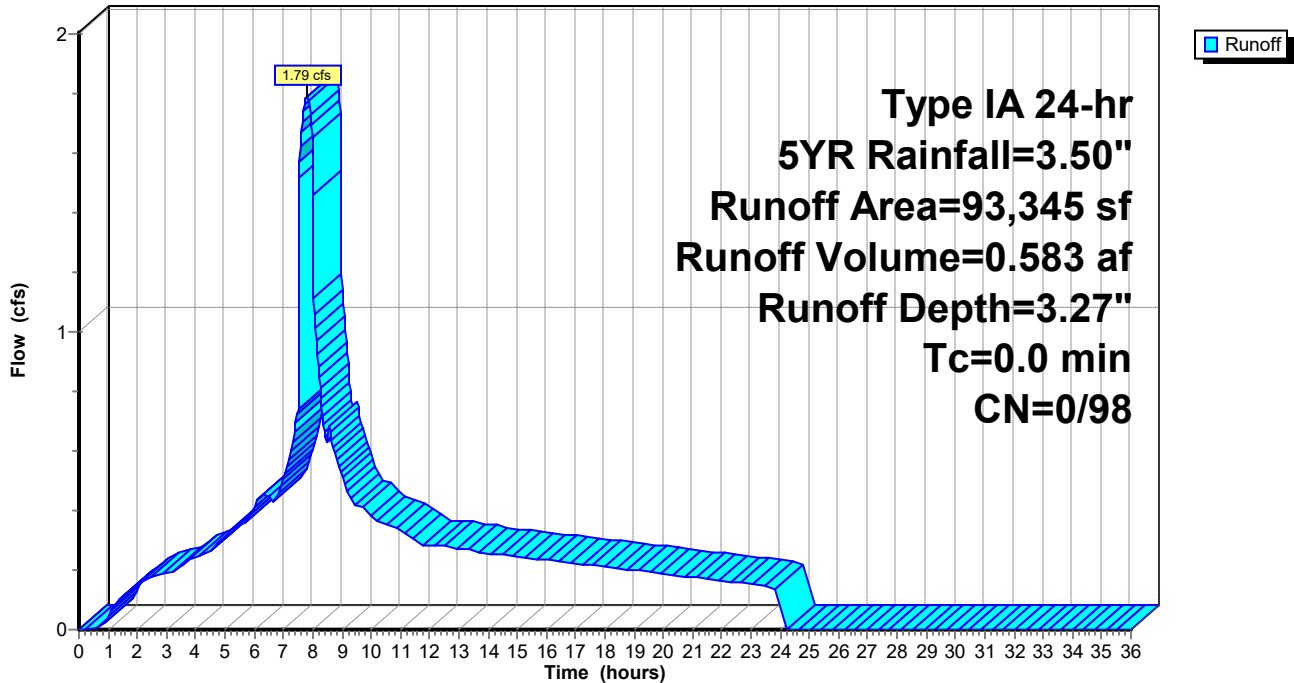
Runoff = 1.79 cfs @ 7.79 hrs, Volume= 0.583 af, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 5YR Rainfall=3.50"

	Area (sf)	CN	Description
*	93,345	98	Impervious
	93,345	98	100.00% Impervious Area

Subcatchment 01: Existing

Hydrograph



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Type IA 24-hr 5YR Rainfall=3.50"

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Summary for Subcatchment A: Area to A

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

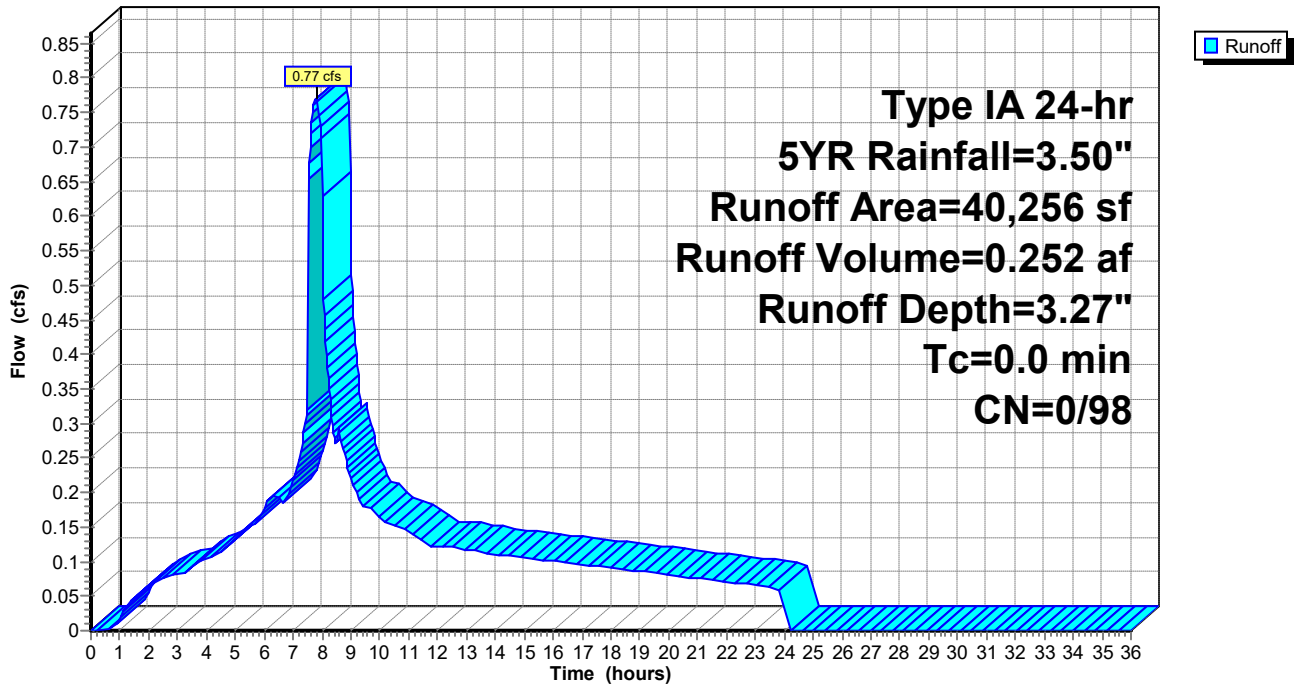
Runoff = 0.77 cfs @ 7.79 hrs, Volume= 0.252 af, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 5YR Rainfall=3.50"

	Area (sf)	CN	Description
*	37,176	98	Impervious
*	3,080	98	Fire Lane
	40,256	98	Weighted Average
	40,256	98	100.00% Impervious Area

Subcatchment A: Area to A

Hydrograph



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Type IA 24-hr 5YR Rainfall=3.50"

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Summary for Subcatchment B: Area to B

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

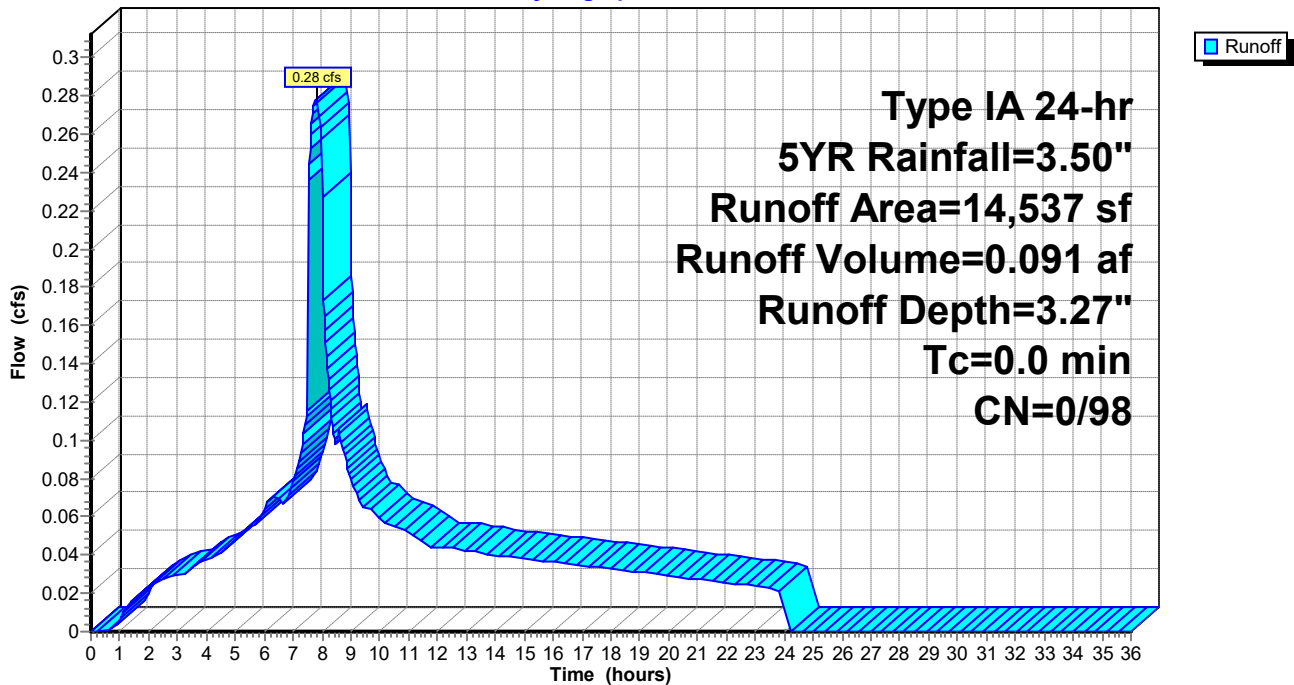
Runoff = 0.28 cfs @ 7.79 hrs, Volume= 0.091 af, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 5YR Rainfall=3.50"

	Area (sf)	CN	Description
*	14,537	98	Impervious
	14,537	98	100.00% Impervious Area

Subcatchment B: Area to B

Hydrograph



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Type IA 24-hr 5YR Rainfall=3.50"
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Summary for Subcatchment C: Area to C

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

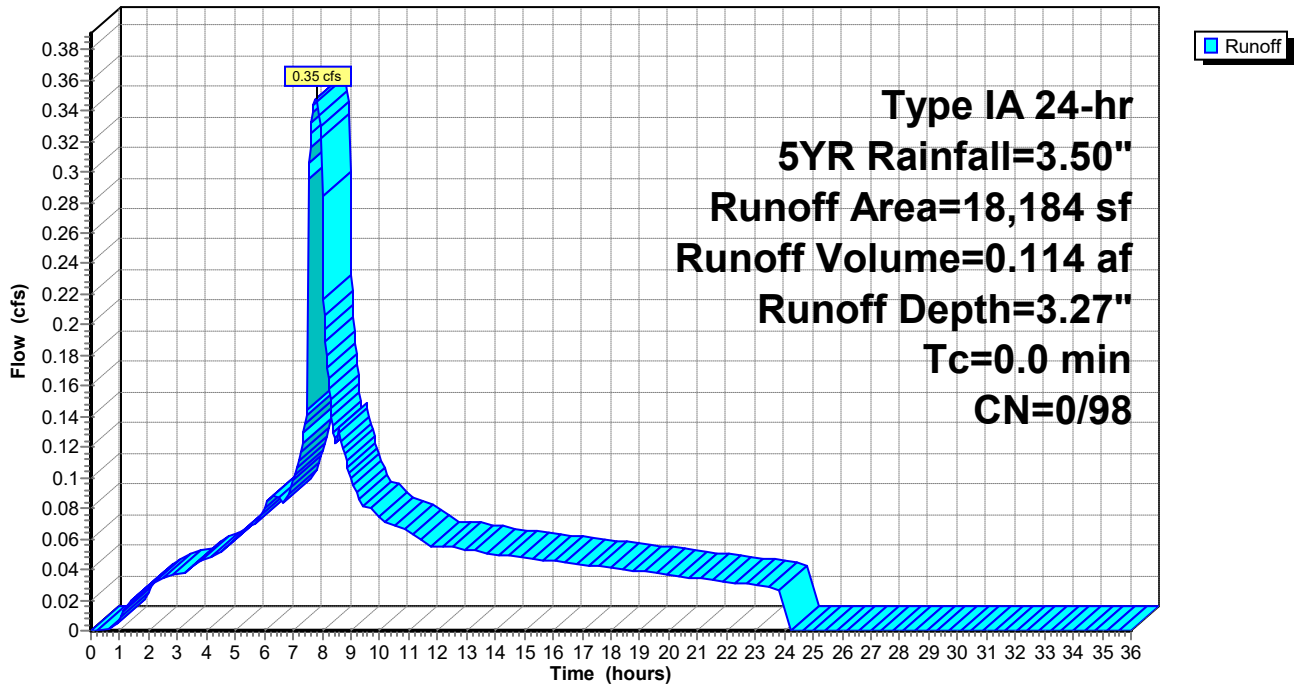
Runoff = 0.35 cfs @ 7.79 hrs, Volume= 0.114 af, Depth= 3.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 5YR Rainfall=3.50"

	Area (sf)	CN	Description
*	16,385	98	Impervious
*	1,799	98	Bldg 5
	18,184	98	Weighted Average
	18,184	98	100.00% Impervious Area

Subcatchment C: Area to C

Hydrograph



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Woodard Middle School

Type IA 24-hr 5YR Rainfall=3.50"

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Summary for Reach PIPE: 5" Storm Pipe

[52] Hint: Inlet/Outlet conditions not evaluated

[81] Warning: Exceeded Pond BB by 0.05' @ 16.23 hrs

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 0.58" for 5YR event
Inflow = 0.17 cfs @ 8.01 hrs, Volume= 0.016 af
Outflow = 0.17 cfs @ 8.03 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Max. Velocity= 3.01 fps, Min. Travel Time= 0.5 min

Avg. Velocity = 1.45 fps, Avg. Travel Time= 1.0 min

Peak Storage= 5 cf @ 8.02 hrs

Average Depth at Peak Storage= 0.18'

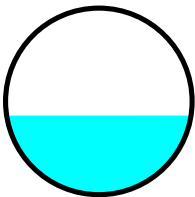
Bank-Full Depth= 0.42' Flow Area= 0.1 sf, Capacity= 0.44 cfs

5.0" Round Pipe

n= 0.011

Length= 85.0' Slope= 0.0118 '/'

Inlet Invert= 282.00', Outlet Invert= 281.00'



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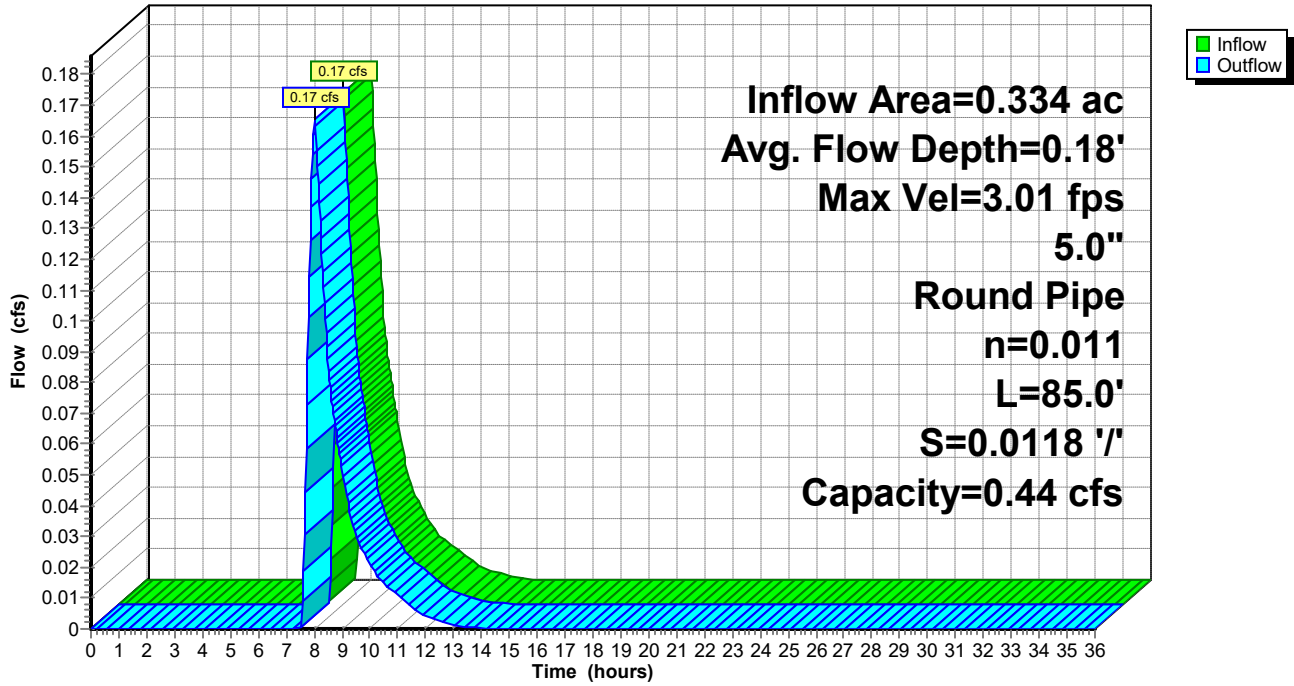
Woodard Middle School
Type IA 24-hr 5YR Rainfall=3.50"

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Reach PIPE: 5" Storm Pipe

Hydrograph



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Type IA 24-hr 5YR Rainfall=3.50"

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Summary for Pond AA: South Swale

Inflow Area = 0.924 ac, 100.00% Impervious, Inflow Depth = 3.27" for 5YR event
 Inflow = 0.77 cfs @ 7.79 hrs, Volume= 0.252 af
 Outflow = 0.62 cfs @ 8.01 hrs, Volume= 0.252 af, Atten= 20%, Lag= 13.1 min
 Discarded = 0.09 cfs @ 8.01 hrs, Volume= 0.206 af
 Primary = 0.53 cfs @ 8.01 hrs, Volume= 0.046 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 278.81' @ 8.01 hrs Surf.Area= 1,886 sf Storage= 2,627 cf

Plug-Flow detention time= 288.0 min calculated for 0.252 af (100% of inflow)
 Center-of-Mass det. time= 287.9 min (946.3 - 658.4)

Volume	Invert	Avail.Storage	Storage Description			
#1	277.00'	2,988 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)	
277.00	1,031	224.3	0	0	1,031	
278.00	1,494	238.2	1,255	1,255	1,592	
279.00	1,982	250.7	1,732	2,988	2,137	

Device	Routing	Invert	Outlet Devices	
#1	Primary	278.75'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	277.00'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.09 cfs @ 8.01 hrs HW=278.81' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.52 cfs @ 8.01 hrs HW=278.81' (Free Discharge)
 ↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 0.82 fps)

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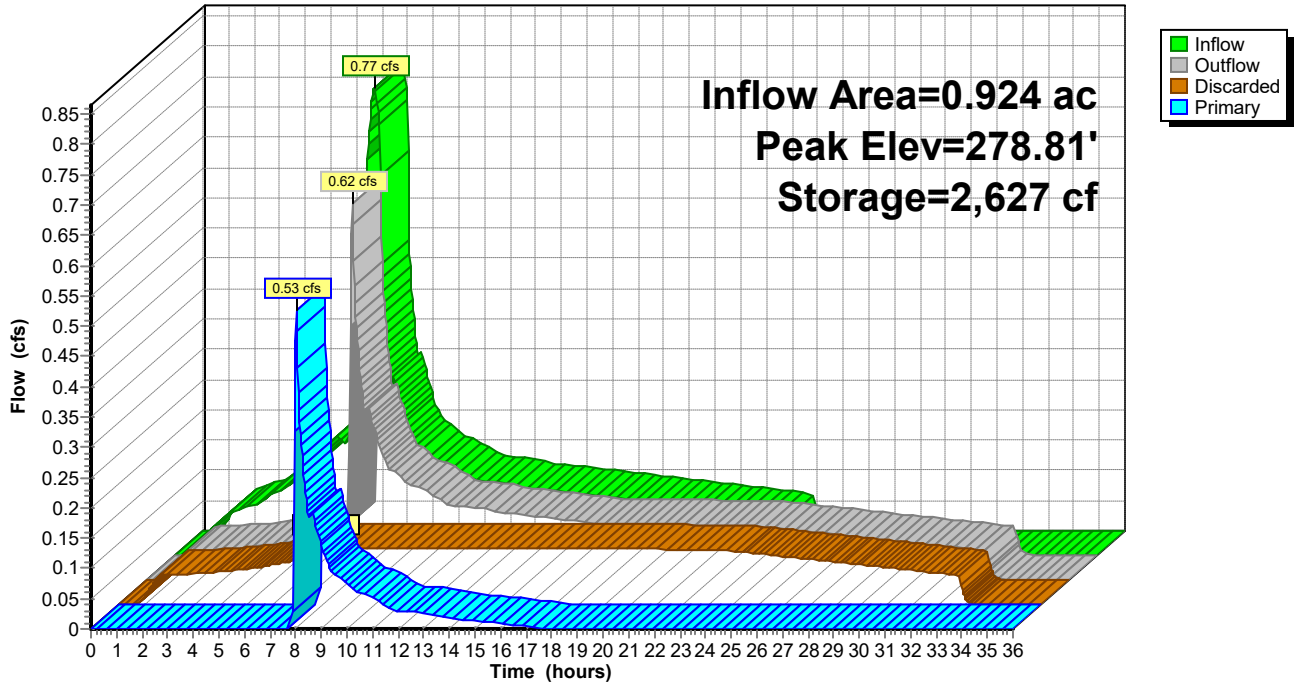
Woodard Middle School
Type IA 24-hr 5YR Rainfall=3.50"

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Pond AA: South Swale

Hydrograph



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Type IA 24-hr 5YR Rainfall=3.50"
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Summary for Pond BB: North Swale

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 3.27" for 5YR event
Inflow = 0.28 cfs @ 7.79 hrs, Volume= 0.091 af
Outflow = 0.22 cfs @ 8.01 hrs, Volume= 0.091 af, Atten= 22%, Lag= 13.1 min
Discarded = 0.05 cfs @ 8.01 hrs, Volume= 0.075 af
Primary = 0.17 cfs @ 8.01 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Peak Elev= 282.25' @ 8.01 hrs Surf.Area= 1,054 sf Storage= 599 cf

Plug-Flow detention time= 88.2 min calculated for 0.091 af (100% of inflow)
Center-of-Mass det. time= 88.2 min (746.6 - 658.4)

Volume	Invert	Avail.Storage	Storage Description			
#1	281.50'	888 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)	
281.50	571	331.9	0	0	571	
282.50	1,248	344.5	888	888	1,329	

Device	Routing	Invert	Outlet Devices	
#1	Primary	282.00'	6.0" Vert. Orifice/Grate C= 0.600	
#2	Discarded	281.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.05 cfs @ 8.01 hrs HW=282.25' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.17 cfs @ 8.01 hrs HW=282.25' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.17 cfs @ 1.70 fps)

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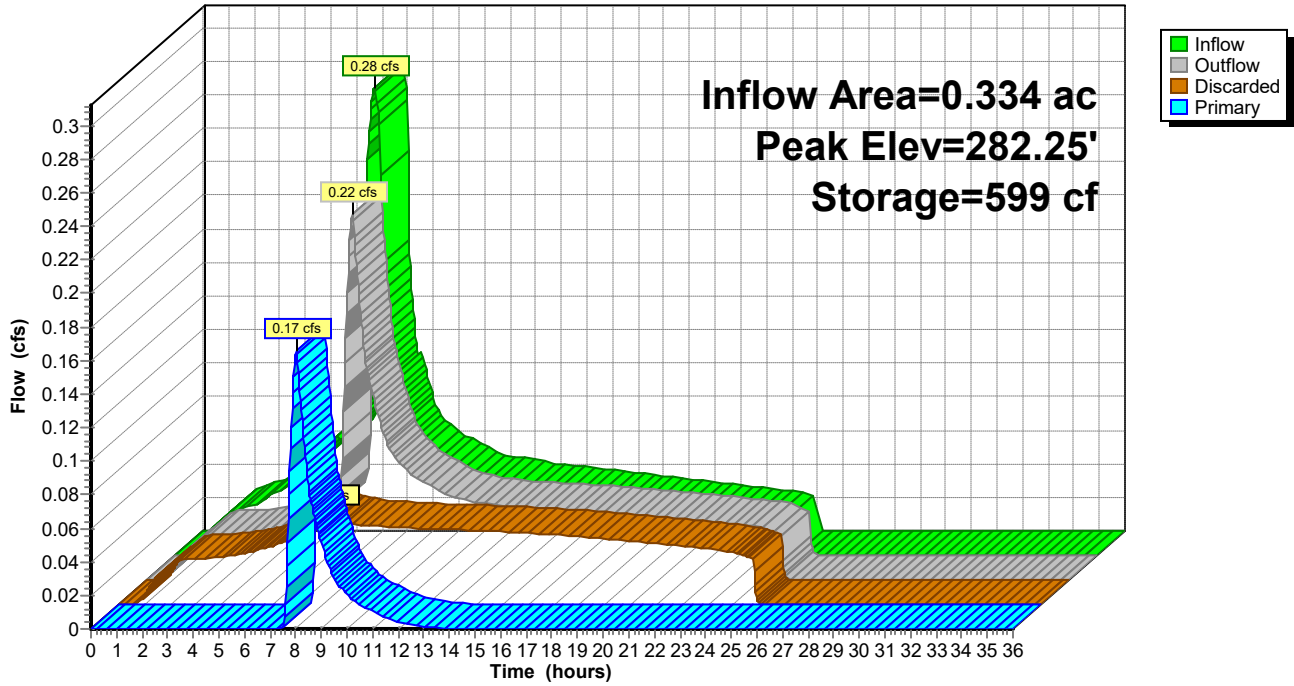
Woodard Middle School
Type IA 24-hr 5YR Rainfall=3.50"

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Pond BB: North Swale

Hydrograph



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Type IA 24-hr 5YR Rainfall=3.50"
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Summary for Pond CC: East Swale

Inflow Area = 0.751 ac, 100.00% Impervious, Inflow Depth = 2.07" for 5YR event
Inflow = 0.48 cfs @ 7.95 hrs, Volume= 0.130 af
Outflow = 0.09 cfs @ 10.18 hrs, Volume= 0.130 af, Atten= 82%, Lag= 133.8 min
Discarded = 0.09 cfs @ 10.18 hrs, Volume= 0.130 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Peak Elev= 280.71' @ 10.18 hrs Surf.Area= 1,794 sf Storage= 1,673 cf

Plug-Flow detention time= 208.2 min calculated for 0.130 af (100% of inflow)
Center-of-Mass det. time= 208.1 min (850.4 - 642.3)

Volume	Invert	Avail.Storage	Storage Description		
#1	279.50'	3,307 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)
279.50	993	318.6	0	0	993
280.50	1,660	328.0	1,312	1,312	1,575
281.50	2,350	359.7	1,995	3,307	3,343

Device	Routing	Invert	Outlet Devices	
#1	Primary	281.25'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	279.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.09 cfs @ 10.18 hrs HW=280.71' (Free Discharge)
↑2=Exfiltration (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=279.50' (Free Discharge)
↑1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

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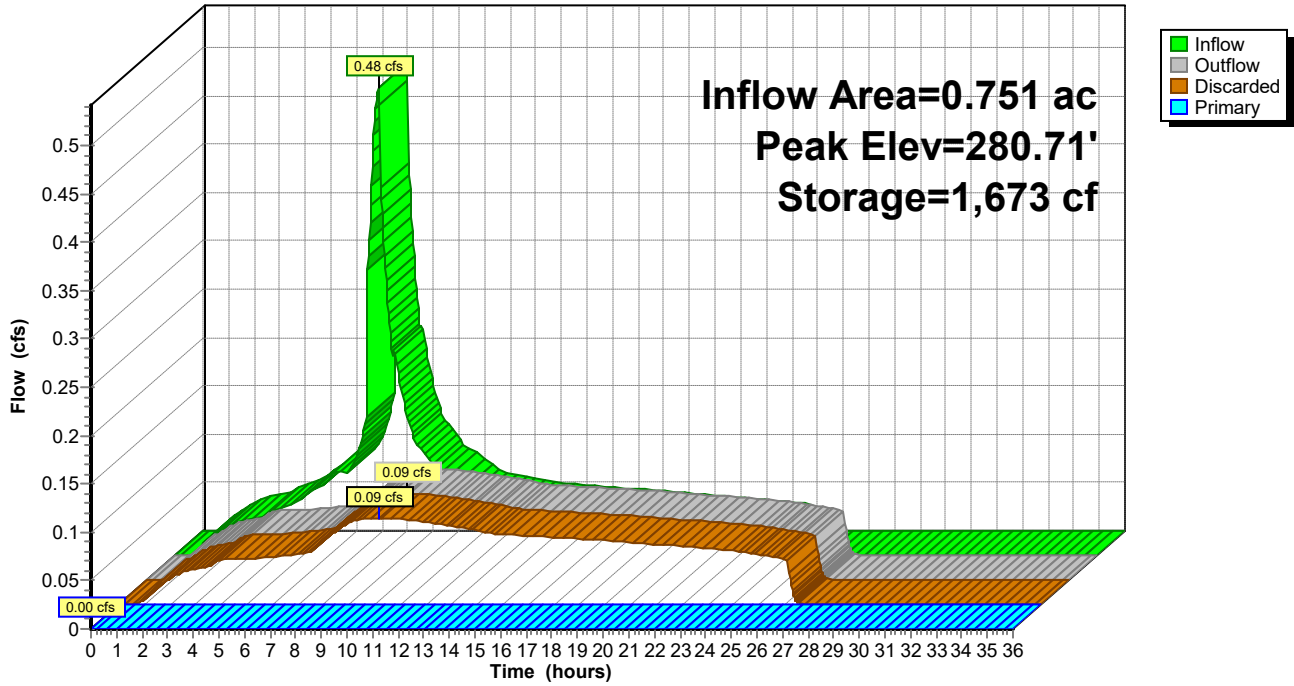
Woodard Middle School
Type IA 24-hr 5YR Rainfall=3.50"

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Pond CC: East Swale

Hydrograph



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Type IA 24-hr 5YR Rainfall=3.50"

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Summary for Pond XX: Full Proposed Runoff

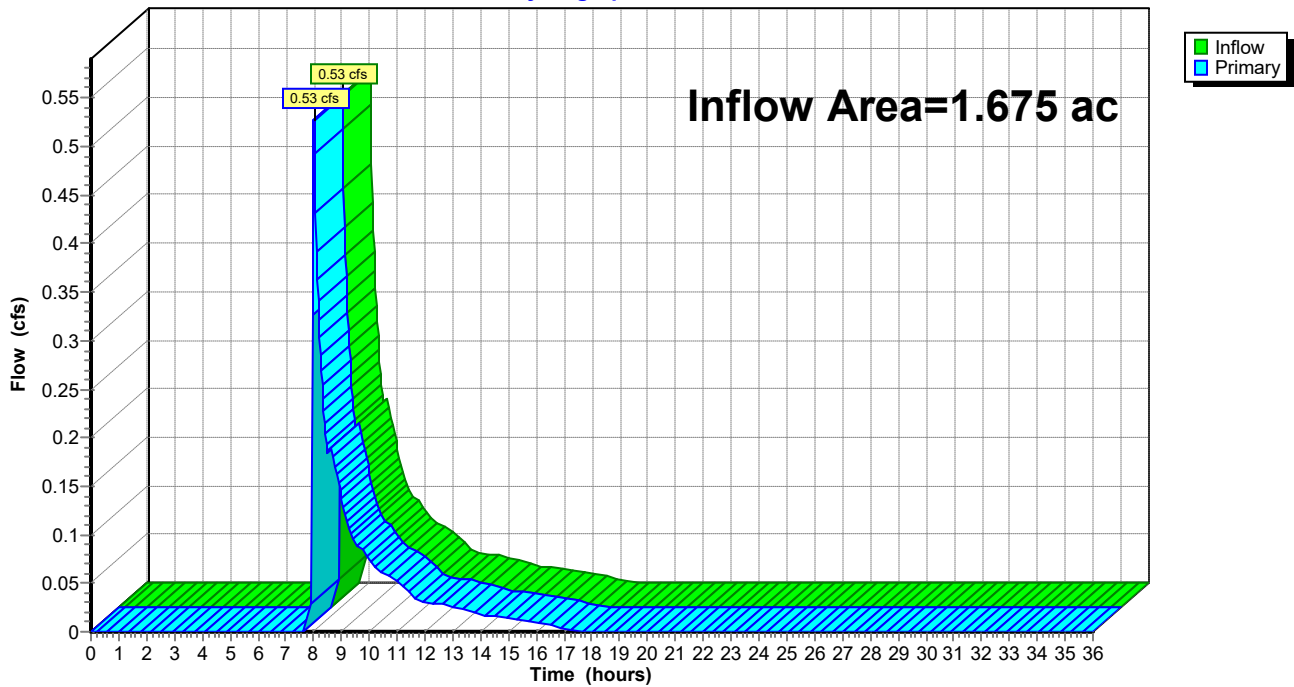
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.675 ac, 100.00% Impervious, Inflow Depth = 0.33" for 5YR event
Inflow = 0.53 cfs @ 8.01 hrs, Volume= 0.046 af
Primary = 0.53 cfs @ 8.01 hrs, Volume= 0.046 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Pond XX: Full Proposed Runoff

Hydrograph



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Type IA 24-hr 10YR Rainfall=4.00"

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 points

Runoff by SBUH method, Split Pervious/Imperv.

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

Subcatchment 00: Natural	Runoff Area=1.676 ac 0.00% Impervious Runoff Depth=2.04" Tc=0.0 min CN=80/0 Runoff=0.82 cfs 0.285 af
Subcatchment 01: Existing	Runoff Area=93,345 sf 100.00% Impervious Runoff Depth=3.77" Tc=0.0 min CN=0/98 Runoff=2.05 cfs 0.672 af
Subcatchment A: Area to A	Runoff Area=40,256 sf 100.00% Impervious Runoff Depth=3.77" Tc=0.0 min CN=0/98 Runoff=0.89 cfs 0.290 af
Subcatchment B: Area to B	Runoff Area=14,537 sf 100.00% Impervious Runoff Depth=3.77" Tc=0.0 min CN=0/98 Runoff=0.32 cfs 0.105 af
Subcatchment C: Area to C	Runoff Area=18,184 sf 100.00% Impervious Runoff Depth=3.77" Tc=0.0 min CN=0/98 Runoff=0.40 cfs 0.131 af
Reach PIPE: 5" Storm Pipe	Avg. Flow Depth=0.21' Max Vel=3.24 fps Inflow=0.22 cfs 0.024 af 5.0" Round Pipe n=0.011 L=85.0' S=0.0118 '/' Capacity=0.44 cfs Outflow=0.22 cfs 0.024 af
Pond AA: South Swale	Peak Elev=278.83' Storage=2,662 cf Inflow=0.89 cfs 0.290 af Discarded=0.09 cfs 0.213 af Primary=0.77 cfs 0.077 af Outflow=0.87 cfs 0.290 af
Pond BB: North Swale	Peak Elev=282.29' Storage=645 cf Inflow=0.32 cfs 0.105 af Discarded=0.05 cfs 0.081 af Primary=0.22 cfs 0.024 af Outflow=0.27 cfs 0.105 af
Pond CC: East Swale	Peak Elev=280.95' Storage=2,132 cf Inflow=0.59 cfs 0.155 af Discarded=0.11 cfs 0.155 af Primary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.155 af
Pond XX: Full Proposed Runoff	Inflow=0.77 cfs 0.077 af Primary=0.77 cfs 0.077 af

Total Runoff Area = 5.494 ac Runoff Volume = 1.483 af Average Runoff Depth = 3.24"
30.50% Pervious = 1.676 ac 69.50% Impervious = 3.818 ac

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Type IA 24-hr 10YR Rainfall=4.00"

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Summary for Subcatchment 00: Natural

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

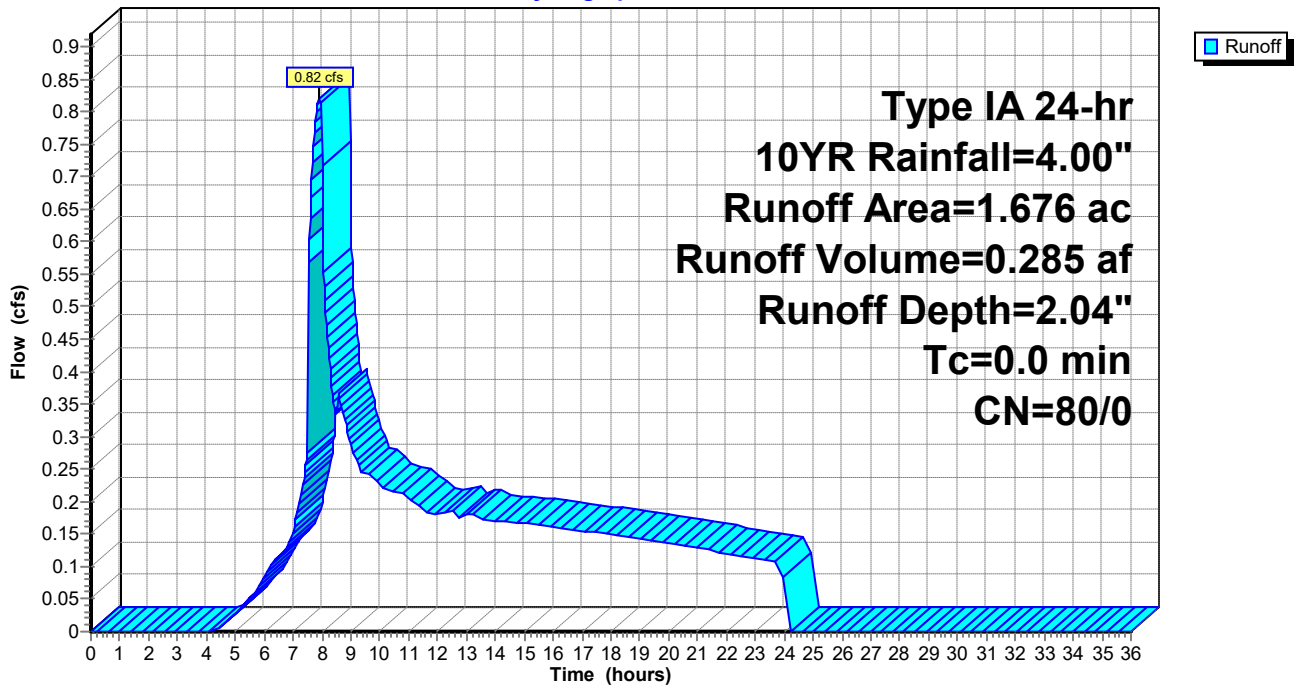
Runoff = 0.82 cfs @ 7.90 hrs, Volume= 0.285 af, Depth= 2.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 10YR Rainfall=4.00"

Area (ac)	CN	Description
1.676	80	>75% Grass cover, Good, HSG D
1.676	80	100.00% Pervious Area

Subcatchment 00: Natural

Hydrograph



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Type IA 24-hr 10YR Rainfall=4.00"

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Summary for Subcatchment 01: Existing

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

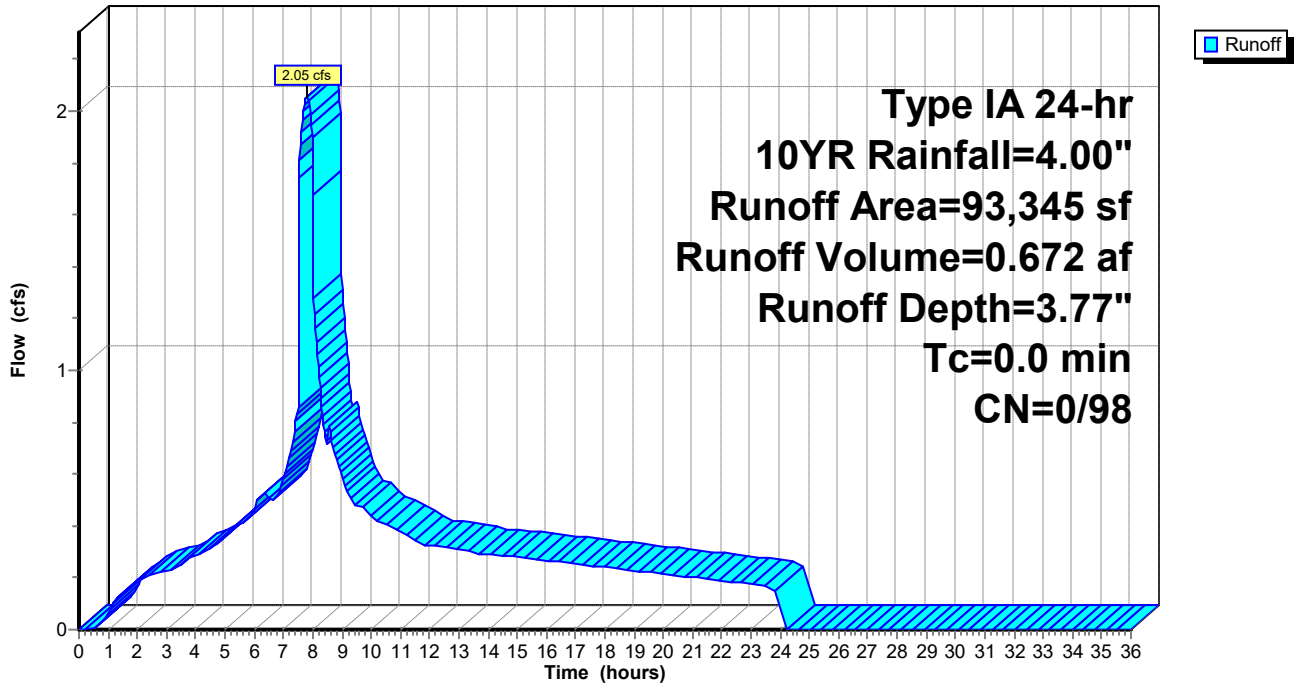
Runoff = 2.05 cfs @ 7.79 hrs, Volume= 0.672 af, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 10YR Rainfall=4.00"

	Area (sf)	CN	Description
*	93,345	98	Impervious
	93,345	98	100.00% Impervious Area

Subcatchment 01: Existing

Hydrograph



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Summary for Subcatchment A: Area to A

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

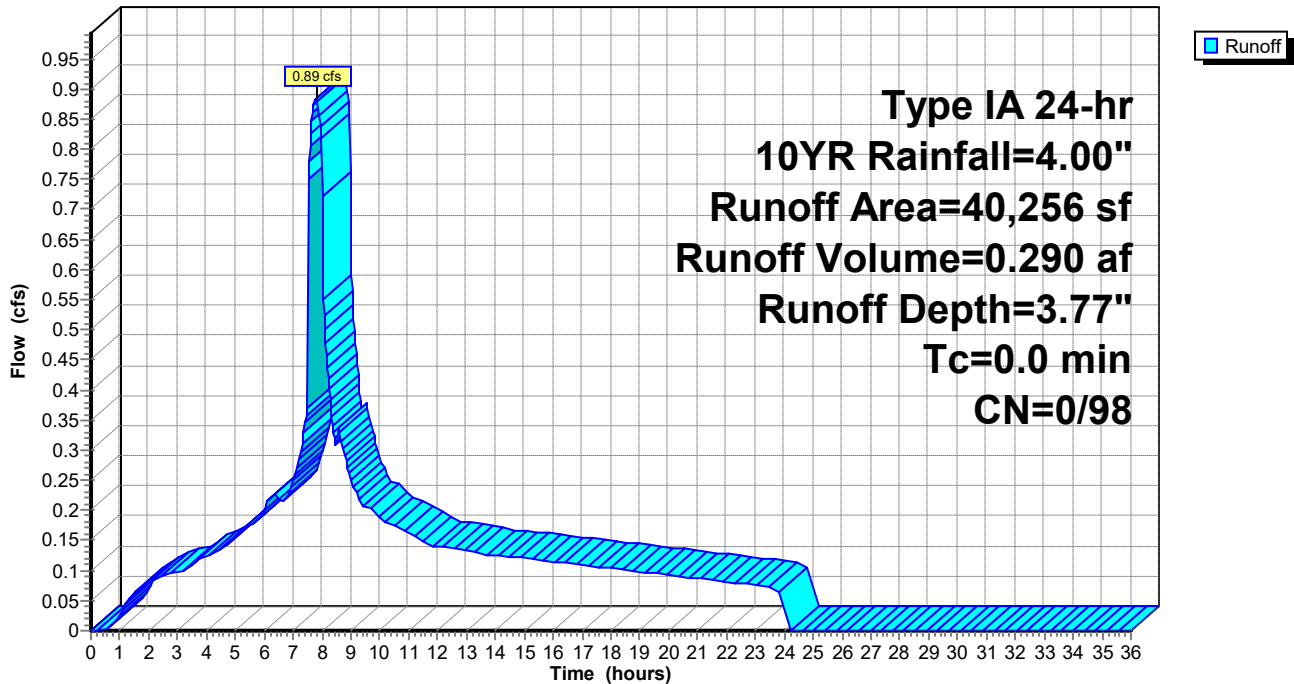
Runoff = 0.89 cfs @ 7.79 hrs, Volume= 0.290 af, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 10YR Rainfall=4.00"

	Area (sf)	CN	Description
*	37,176	98	Impervious
*	3,080	98	Fire Lane
	40,256	98	Weighted Average
	40,256	98	100.00% Impervious Area

Subcatchment A: Area to A

Hydrograph



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Type IA 24-hr 10YR Rainfall=4.00"

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Summary for Subcatchment B: Area to B

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

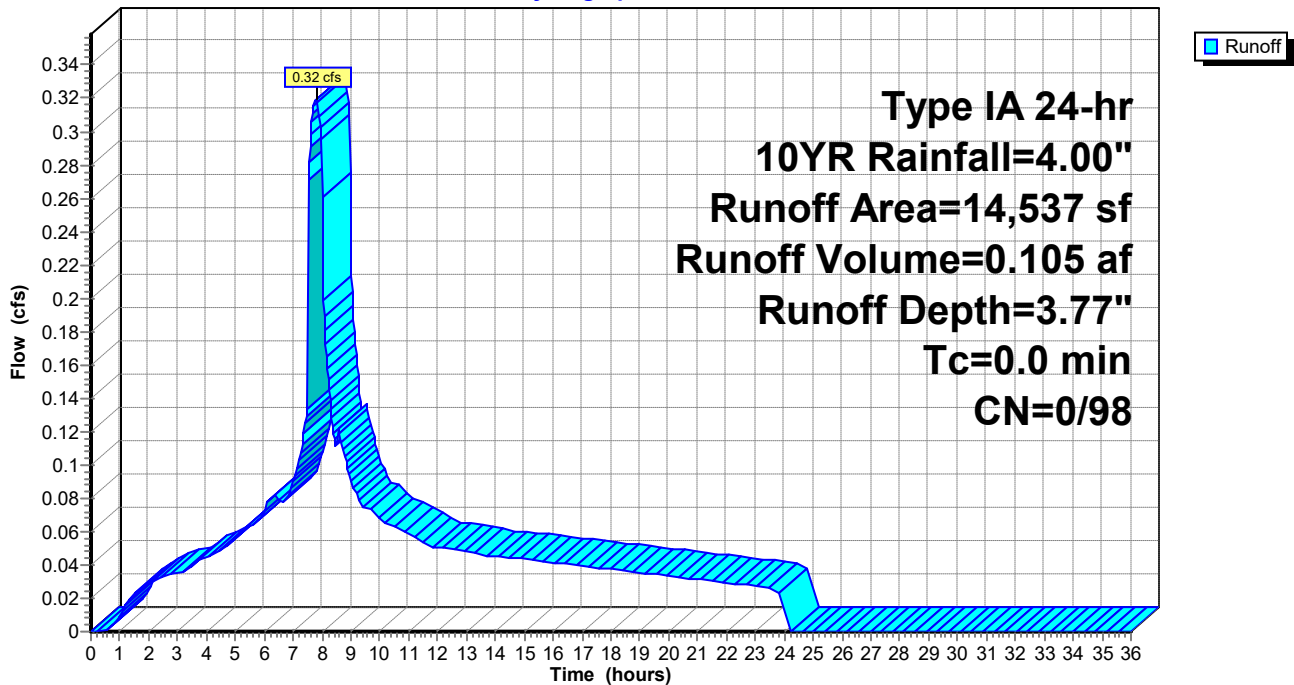
Runoff = 0.32 cfs @ 7.79 hrs, Volume= 0.105 af, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 10YR Rainfall=4.00"

	Area (sf)	CN	Description
*	14,537	98	Impervious
	14,537	98	100.00% Impervious Area

Subcatchment B: Area to B

Hydrograph



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Type IA 24-hr 10YR Rainfall=4.00"

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Summary for Subcatchment C: Area to C

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

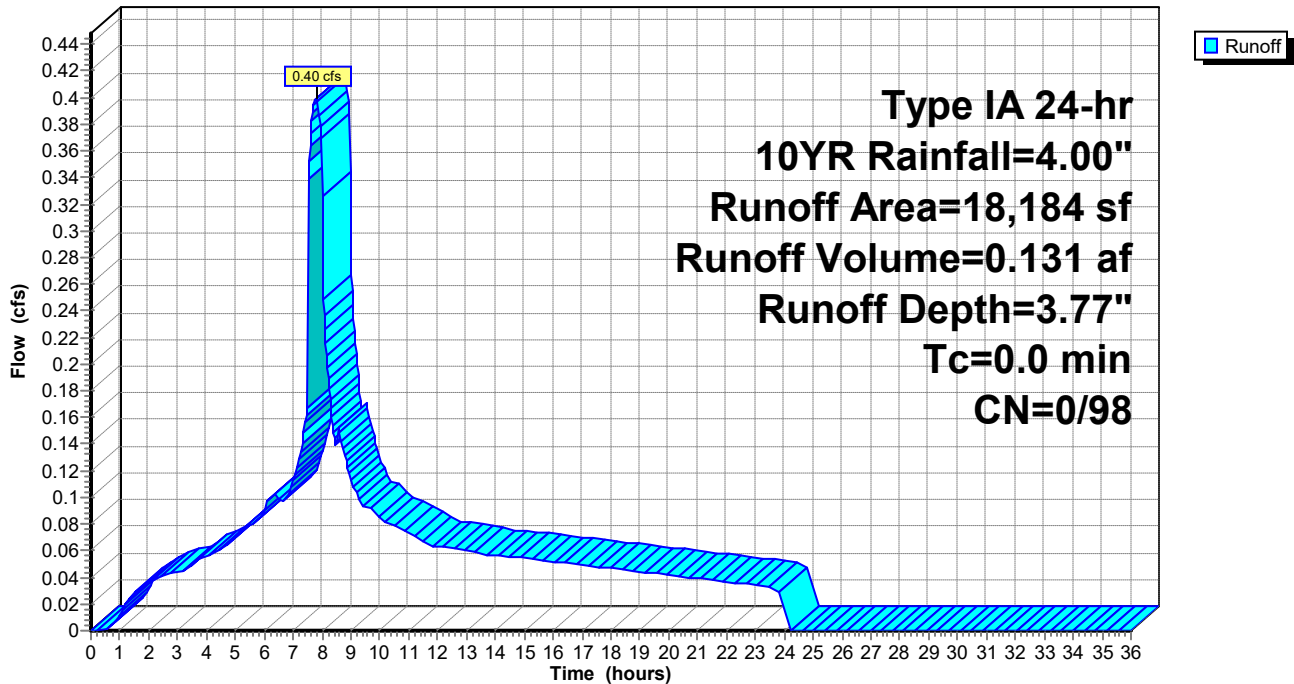
Runoff = 0.40 cfs @ 7.79 hrs, Volume= 0.131 af, Depth= 3.77"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 10YR Rainfall=4.00"

	Area (sf)	CN	Description
*	16,385	98	Impervious
*	1,799	98	Bldg 5
	18,184	98	Weighted Average
	18,184	98	100.00% Impervious Area

Subcatchment C: Area to C

Hydrograph



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Type IA 24-hr 10YR Rainfall=4.00"

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Summary for Reach PIPE: 5" Storm Pipe

[52] Hint: Inlet/Outlet conditions not evaluated

[81] Warning: Exceeded Pond BB by 0.04' @ 18.75 hrs

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 0.86" for 10YR event
Inflow = 0.22 cfs @ 8.00 hrs, Volume= 0.024 af
Outflow = 0.22 cfs @ 8.01 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Max. Velocity= 3.24 fps, Min. Travel Time= 0.4 min

Avg. Velocity = 1.43 fps, Avg. Travel Time= 1.0 min

Peak Storage= 6 cf @ 8.00 hrs

Average Depth at Peak Storage= 0.21'

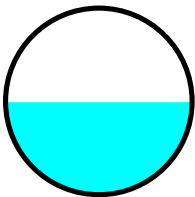
Bank-Full Depth= 0.42' Flow Area= 0.1 sf, Capacity= 0.44 cfs

5.0" Round Pipe

n= 0.011

Length= 85.0' Slope= 0.0118 '/'

Inlet Invert= 282.00', Outlet Invert= 281.00'



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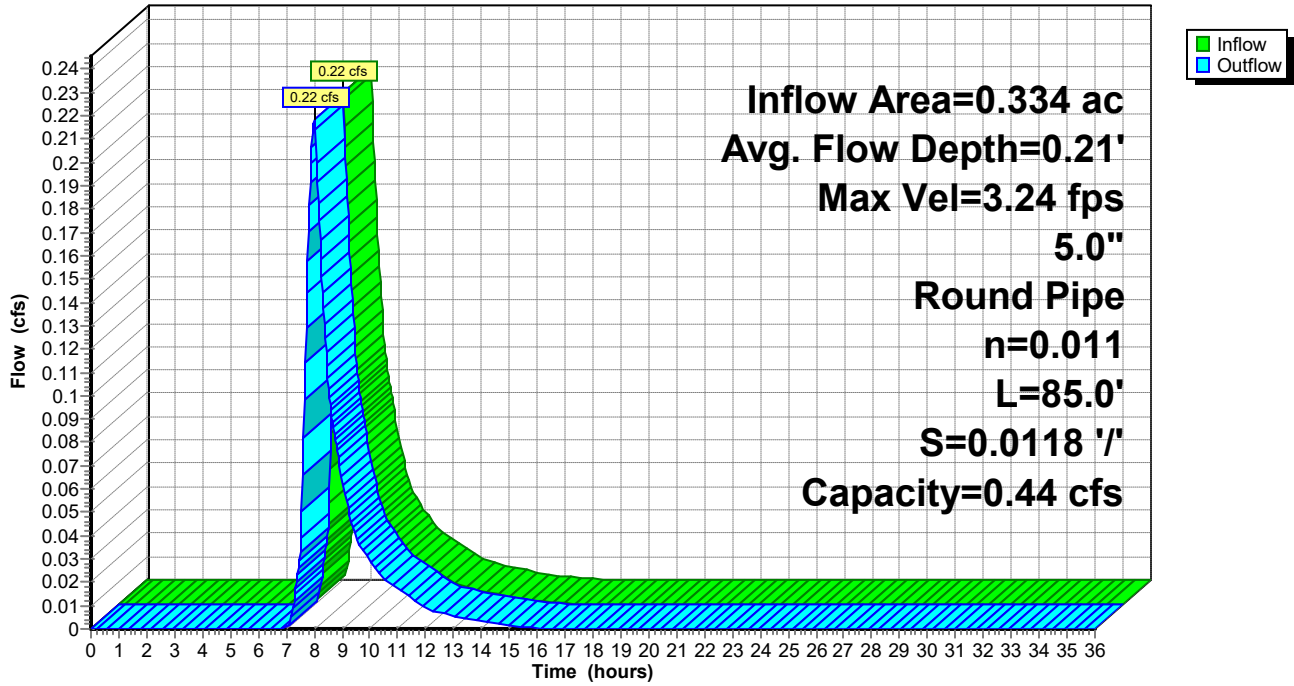
Woodard Middle School
Type IA 24-hr 10YR Rainfall=4.00"

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Reach PIPE: 5" Storm Pipe

Hydrograph



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Summary for Pond AA: South Swale

Inflow Area = 0.924 ac, 100.00% Impervious, Inflow Depth = 3.77" for 10YR event
 Inflow = 0.89 cfs @ 7.79 hrs, Volume= 0.290 af
 Outflow = 0.87 cfs @ 7.89 hrs, Volume= 0.290 af, Atten= 2%, Lag= 6.1 min
 Discarded = 0.09 cfs @ 7.89 hrs, Volume= 0.213 af
 Primary = 0.77 cfs @ 7.89 hrs, Volume= 0.077 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 278.83' @ 7.89 hrs Surf.Area= 1,895 sf Storage= 2,662 cf

Plug-Flow detention time= 264.2 min calculated for 0.290 af (100% of inflow)
 Center-of-Mass det. time= 264.1 min (919.2 - 655.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	277.00'	2,988 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)	
277.00	1,031	224.3	0	0	1,031	
278.00	1,494	238.2	1,255	1,255	1,592	
279.00	1,982	250.7	1,732	2,988	2,137	

Device	Routing	Invert	Outlet Devices	
#1	Primary	278.75'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	277.00'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.09 cfs @ 7.89 hrs HW=278.83' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.77 cfs @ 7.89 hrs HW=278.83' (Free Discharge)
 ↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.77 cfs @ 0.94 fps)

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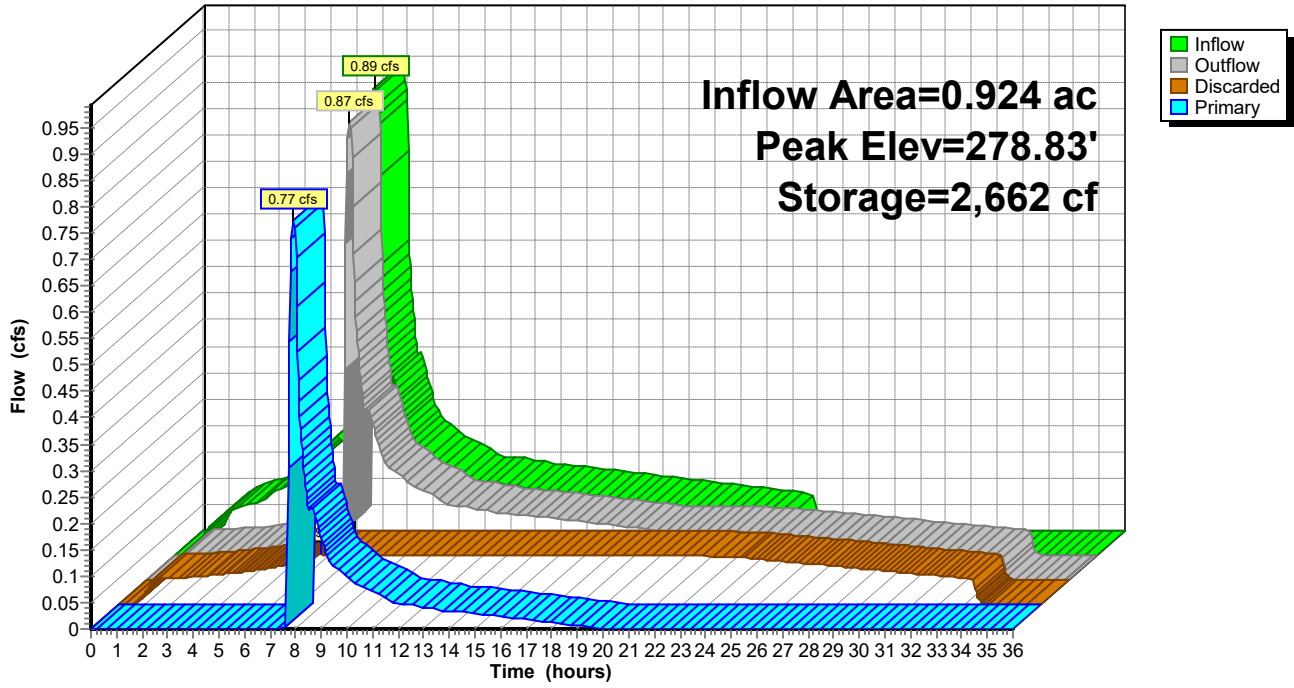
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Pond AA: South Swale

Hydrograph



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Summary for Pond BB: North Swale

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 3.77" for 10YR event
Inflow = 0.32 cfs @ 7.79 hrs, Volume= 0.105 af
Outflow = 0.27 cfs @ 8.00 hrs, Volume= 0.105 af, Atten= 15%, Lag= 12.3 min
Discarded = 0.05 cfs @ 8.00 hrs, Volume= 0.081 af
Primary = 0.22 cfs @ 8.00 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Peak Elev= 282.29' @ 8.00 hrs Surf.Area= 1,086 sf Storage= 645 cf

Plug-Flow detention time= 91.0 min calculated for 0.105 af (100% of inflow)
Center-of-Mass det. time= 91.0 min (746.2 - 655.1)

Volume	Invert	Avail.Storage	Storage Description			
#1	281.50'	888 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)	
281.50	571	331.9	0	0	571	
282.50	1,248	344.5	888	888	1,329	

Device	Routing	Invert	Outlet Devices	
#1	Primary	282.00'	6.0" Vert. Orifice/Grate C= 0.600	
#2	Discarded	281.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.05 cfs @ 8.00 hrs HW=282.29' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.22 cfs @ 8.00 hrs HW=282.29' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.22 cfs @ 1.84 fps)

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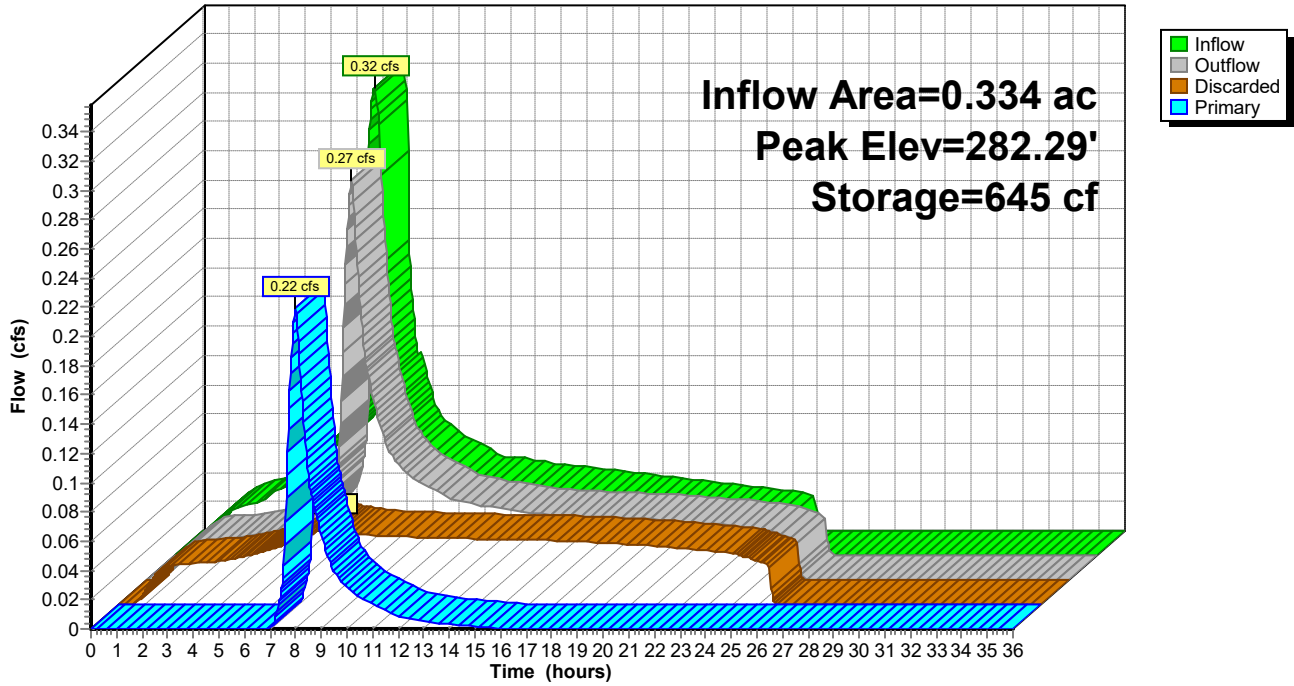
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Pond BB: North Swale

Hydrograph



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Summary for Pond CC: East Swale

Inflow Area = 0.751 ac, 100.00% Impervious, Inflow Depth = 2.48" for 10YR event
 Inflow = 0.59 cfs @ 7.92 hrs, Volume= 0.155 af
 Outflow = 0.11 cfs @ 10.13 hrs, Volume= 0.155 af, Atten= 82%, Lag= 132.6 min
 Discarded = 0.11 cfs @ 10.13 hrs, Volume= 0.155 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 280.95' @ 10.13 hrs Surf.Area= 1,958 sf Storage= 2,132 cf

Plug-Flow detention time= 236.4 min calculated for 0.155 af (100% of inflow)
 Center-of-Mass det. time= 236.4 min (873.2 - 636.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	279.50'	3,307 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)
279.50	993	318.6	0	0	993
280.50	1,660	328.0	1,312	1,312	1,575
281.50	2,350	359.7	1,995	3,307	3,343

Device	Routing	Invert	Outlet Devices	
#1	Primary	281.25'	10.0' long Sharp-Crested Rectangular Weir	2 End Contraction(s)
#2	Discarded	279.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.11 cfs @ 10.13 hrs HW=280.95' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=279.50' (Free Discharge)

↑**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

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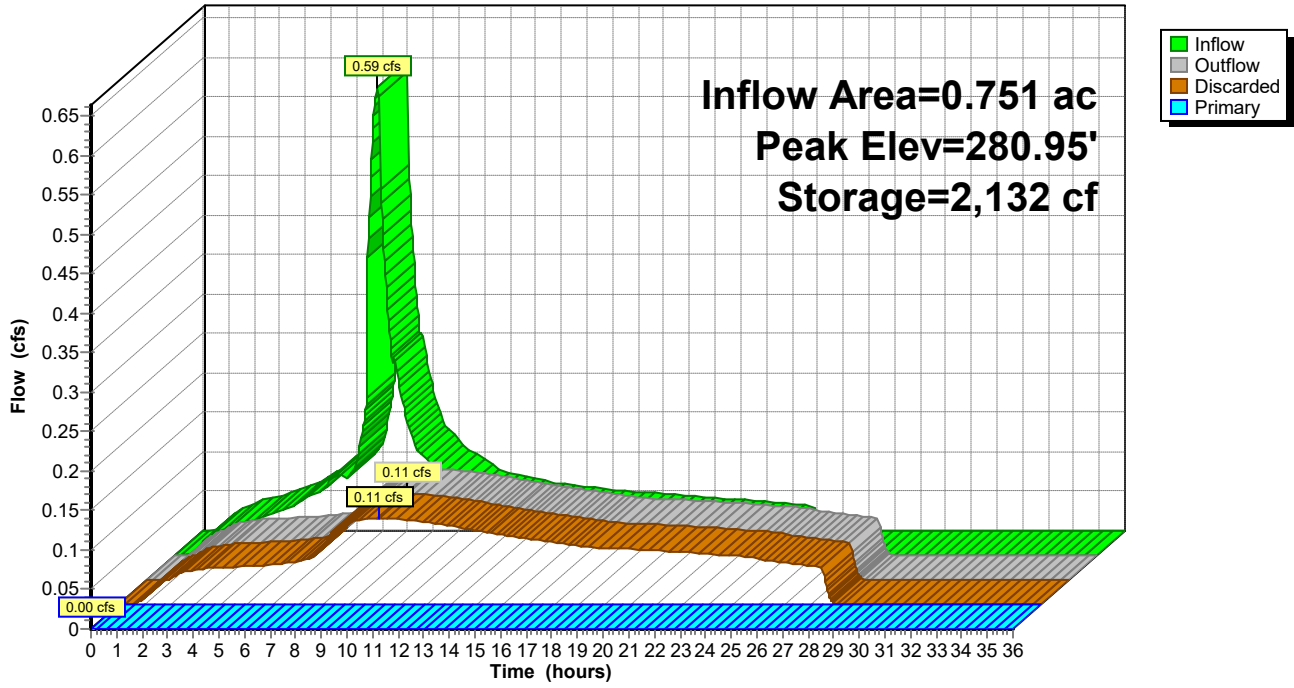
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Pond CC: East Swale

Hydrograph



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Summary for Pond XX: Full Proposed Runoff

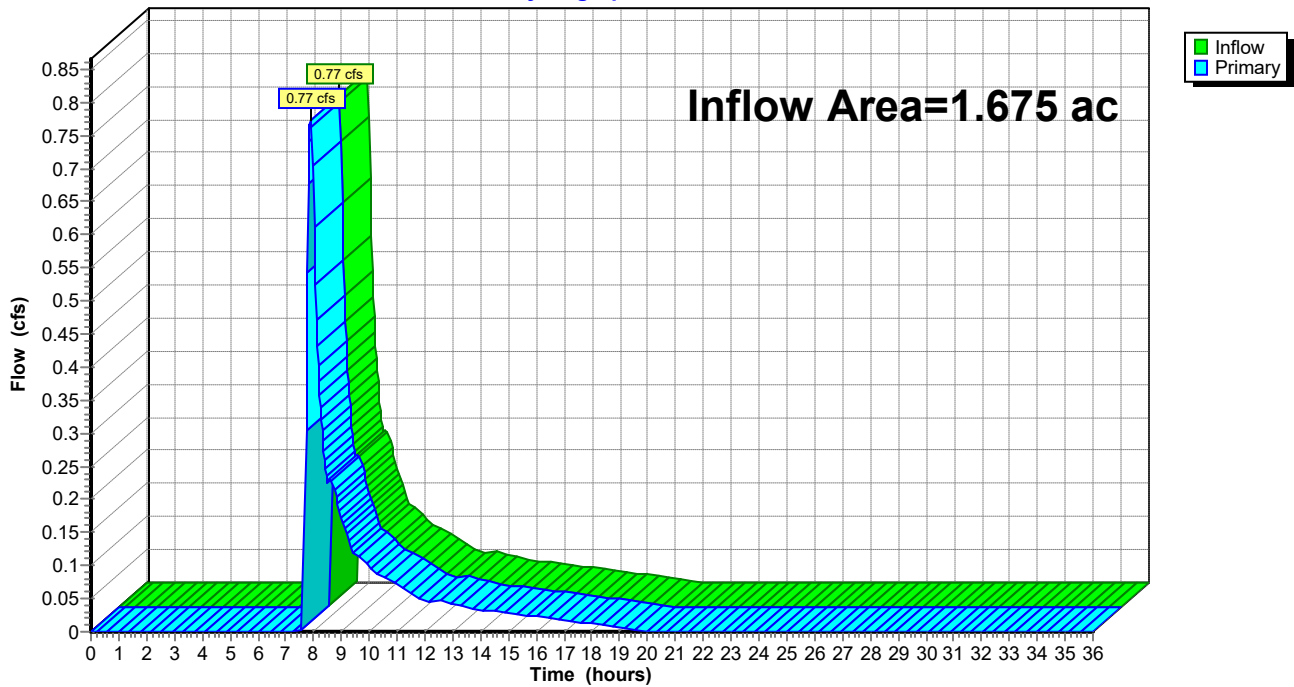
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.675 ac, 100.00% Impervious, Inflow Depth = 0.55" for 10YR event
Inflow = 0.77 cfs @ 7.89 hrs, Volume= 0.077 af
Primary = 0.77 cfs @ 7.89 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Pond XX: Full Proposed Runoff

Hydrograph



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Type IA 24-hr 25YR Rainfall=4.50"

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 points

Runoff by SBUH method, Split Pervious/Imperv.

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

Subcatchment 00: Natural	Runoff Area=1.676 ac 0.00% Impervious Runoff Depth=2.46" Tc=0.0 min CN=80/0 Runoff=1.01 cfs 0.344 af
Subcatchment 01: Existing	Runoff Area=93,345 sf 100.00% Impervious Runoff Depth=4.26" Tc=0.0 min CN=0/98 Runoff=2.32 cfs 0.761 af
Subcatchment A: Area to A	Runoff Area=40,256 sf 100.00% Impervious Runoff Depth=4.26" Tc=0.0 min CN=0/98 Runoff=1.00 cfs 0.328 af
Subcatchment B: Area to B	Runoff Area=14,537 sf 100.00% Impervious Runoff Depth=4.26" Tc=0.0 min CN=0/98 Runoff=0.36 cfs 0.119 af
Subcatchment C: Area to C	Runoff Area=18,184 sf 100.00% Impervious Runoff Depth=4.26" Tc=0.0 min CN=0/98 Runoff=0.45 cfs 0.148 af
Reach PIPE: 5" Storm Pipe	Avg. Flow Depth=0.23' Max Vel=3.37 fps Inflow=0.26 cfs 0.033 af 5.0" Round Pipe n=0.011 L=85.0' S=0.0118 '/' Capacity=0.44 cfs Outflow=0.26 cfs 0.033 af
Pond AA: South Swale	Peak Elev=278.84' Storage=2,680 cf Inflow=1.00 cfs 0.328 af Discarded=0.09 cfs 0.218 af Primary=0.90 cfs 0.111 af Outflow=1.00 cfs 0.328 af
Pond BB: North Swale	Peak Elev=282.32' Storage=680 cf Inflow=0.36 cfs 0.119 af Discarded=0.06 cfs 0.085 af Primary=0.26 cfs 0.033 af Outflow=0.32 cfs 0.119 af
Pond CC: East Swale	Peak Elev=281.19' Storage=2,607 cf Inflow=0.69 cfs 0.181 af Discarded=0.13 cfs 0.181 af Primary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.181 af
Pond XX: Full Proposed Runoff	Inflow=0.90 cfs 0.111 af Primary=0.90 cfs 0.111 af

Total Runoff Area = 5.494 ac Runoff Volume = 1.701 af Average Runoff Depth = 3.71"
30.50% Pervious = 1.676 ac 69.50% Impervious = 3.818 ac

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Summary for Subcatchment 00: Natural

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

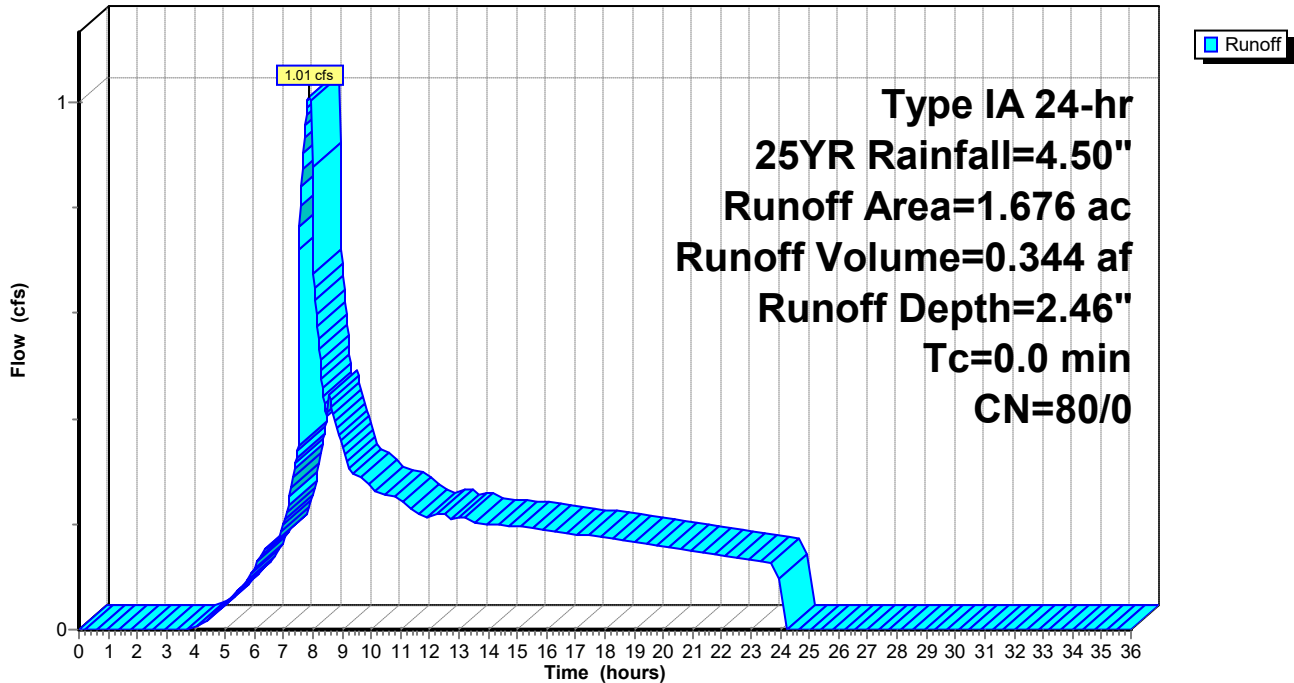
Runoff = 1.01 cfs @ 7.89 hrs, Volume= 0.344 af, Depth= 2.46"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 25YR Rainfall=4.50"

Area (ac)	CN	Description
1.676	80	>75% Grass cover, Good, HSG D
1.676	80	100.00% Pervious Area

Subcatchment 00: Natural

Hydrograph



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Summary for Subcatchment 01: Existing

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

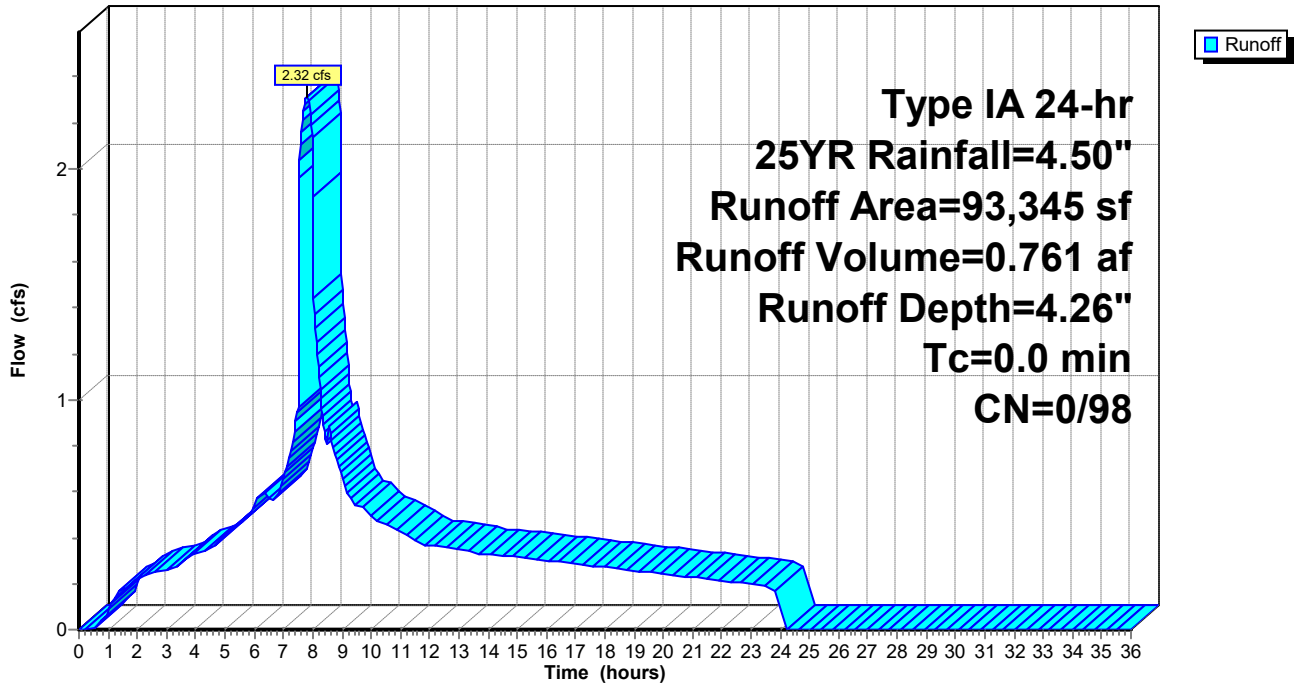
Runoff = 2.32 cfs @ 7.79 hrs, Volume= 0.761 af, Depth= 4.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 25YR Rainfall=4.50"

	Area (sf)	CN	Description
*	93,345	98	Impervious
	93,345	98	100.00% Impervious Area

Subcatchment 01: Existing

Hydrograph



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Summary for Subcatchment A: Area to A

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

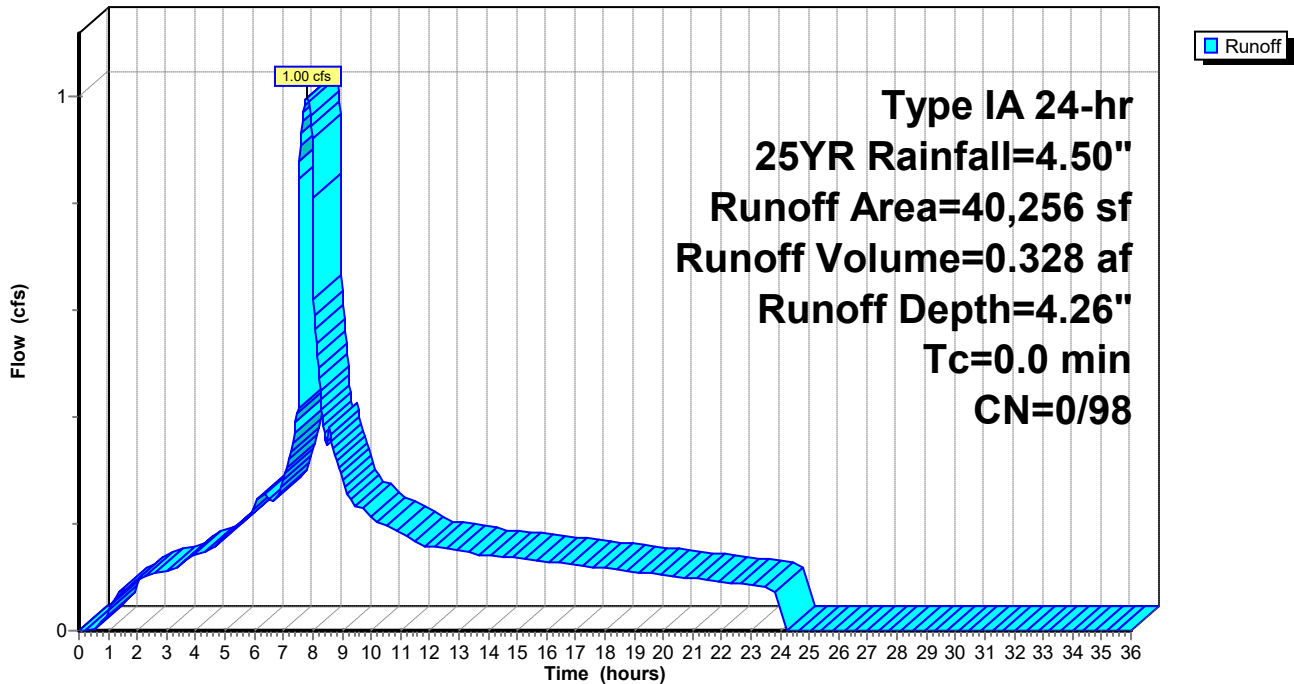
Runoff = 1.00 cfs @ 7.79 hrs, Volume= 0.328 af, Depth= 4.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 25YR Rainfall=4.50"

	Area (sf)	CN	Description
*	37,176	98	Impervious
*	3,080	98	Fire Lane
	40,256	98	Weighted Average
	40,256	98	100.00% Impervious Area

Subcatchment A: Area to A

Hydrograph



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Summary for Subcatchment B: Area to B

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

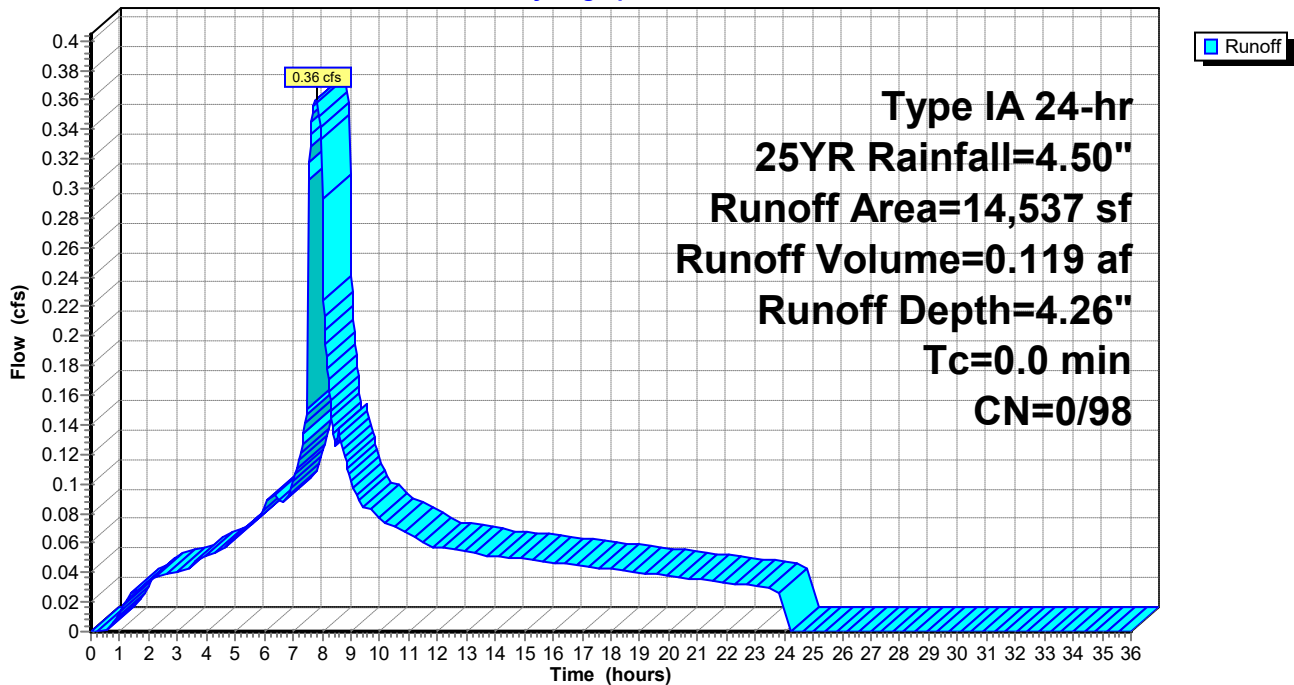
Runoff = 0.36 cfs @ 7.79 hrs, Volume= 0.119 af, Depth= 4.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 25YR Rainfall=4.50"

	Area (sf)	CN	Description
*	14,537	98	Impervious
	14,537	98	100.00% Impervious Area

Subcatchment B: Area to B

Hydrograph



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Summary for Subcatchment C: Area to C

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

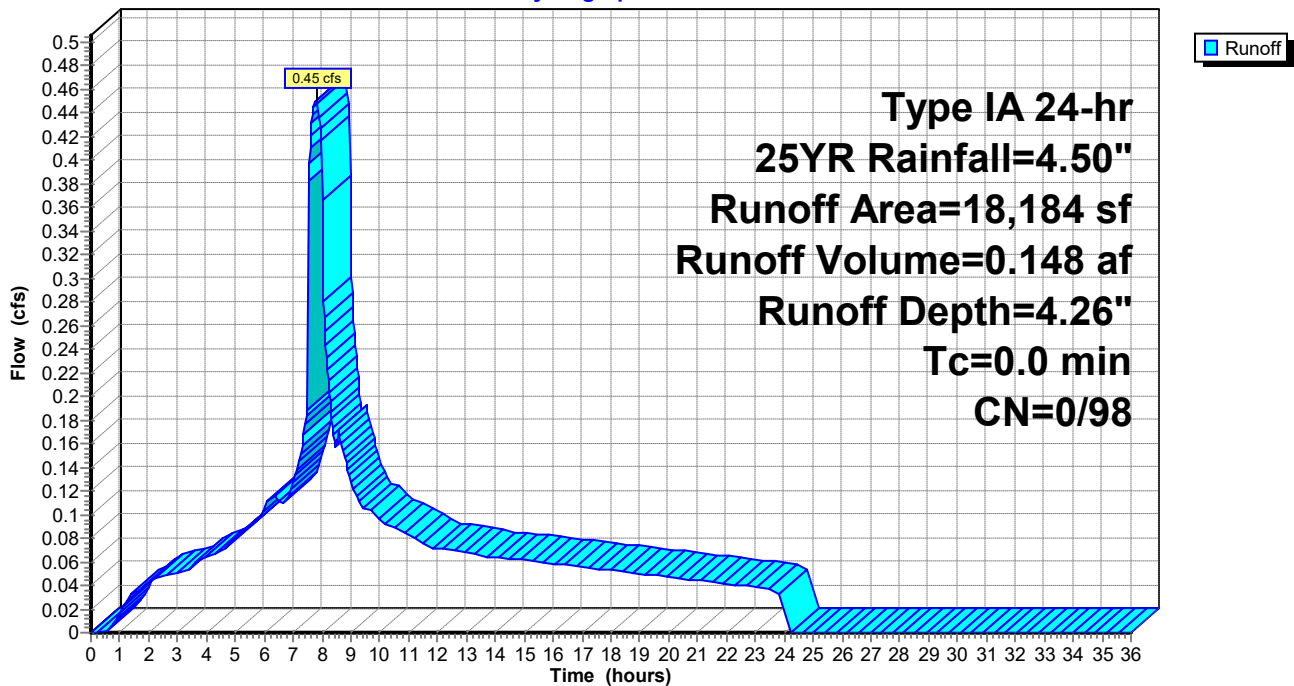
Runoff = 0.45 cfs @ 7.79 hrs, Volume= 0.148 af, Depth= 4.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 25YR Rainfall=4.50"

	Area (sf)	CN	Description
*	16,385	98	Impervious
*	1,799	98	Bldg 5
	18,184	98	Weighted Average
	18,184	98	100.00% Impervious Area

Subcatchment C: Area to C

Hydrograph



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Summary for Reach PIPE: 5" Storm Pipe

[52] Hint: Inlet/Outlet conditions not evaluated

[81] Warning: Exceeded Pond BB by 0.05' @ 21.09 hrs

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 1.19" for 25YR event
Inflow = 0.26 cfs @ 7.99 hrs, Volume= 0.033 af
Outflow = 0.26 cfs @ 8.00 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Max. Velocity= 3.37 fps, Min. Travel Time= 0.4 min

Avg. Velocity = 1.49 fps, Avg. Travel Time= 1.0 min

Peak Storage= 7 cf @ 8.00 hrs

Average Depth at Peak Storage= 0.23'

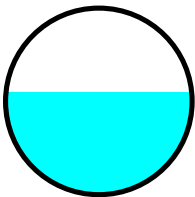
Bank-Full Depth= 0.42' Flow Area= 0.1 sf, Capacity= 0.44 cfs

5.0" Round Pipe

n= 0.011

Length= 85.0' Slope= 0.0118 '/'

Inlet Invert= 282.00', Outlet Invert= 281.00'



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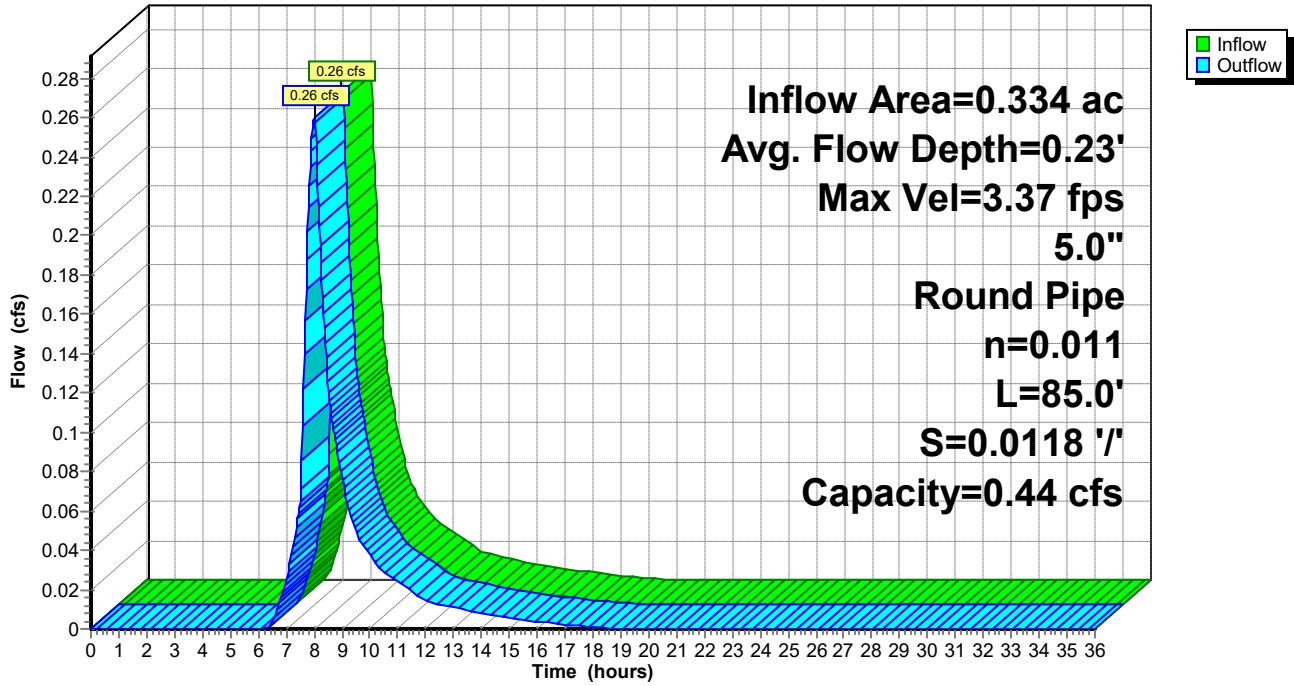
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Type IA 24-hr 25YR Rainfall=4.50"

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Reach PIPE: 5" Storm Pipe

Hydrograph



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Summary for Pond AA: South Swale

Inflow Area = 0.924 ac, 100.00% Impervious, Inflow Depth = 4.26" for 25YR event
 Inflow = 1.00 cfs @ 7.79 hrs, Volume= 0.328 af
 Outflow = 1.00 cfs @ 7.83 hrs, Volume= 0.328 af, Atten= 0%, Lag= 2.3 min
 Discarded = 0.09 cfs @ 7.83 hrs, Volume= 0.218 af
 Primary = 0.90 cfs @ 7.83 hrs, Volume= 0.111 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 278.84' @ 7.83 hrs Surf.Area= 1,900 sf Storage= 2,680 cf

Plug-Flow detention time= 242.4 min calculated for 0.328 af (100% of inflow)
 Center-of-Mass det. time= 242.3 min (894.8 - 652.5)

Volume	Invert	Avail.Storage	Storage Description		
#1	277.00'	2,988 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)
277.00	1,031	224.3	0	0	1,031
278.00	1,494	238.2	1,255	1,255	1,592
279.00	1,982	250.7	1,732	2,988	2,137

Device	Routing	Invert	Outlet Devices	
#1	Primary	278.75'	10.0' long Sharp-Crested Rectangular Weir	2 End Contraction(s)
#2	Discarded	277.00'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.09 cfs @ 7.83 hrs HW=278.84' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=0.90 cfs @ 7.83 hrs HW=278.84' (Free Discharge)

↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.90 cfs @ 0.99 fps)

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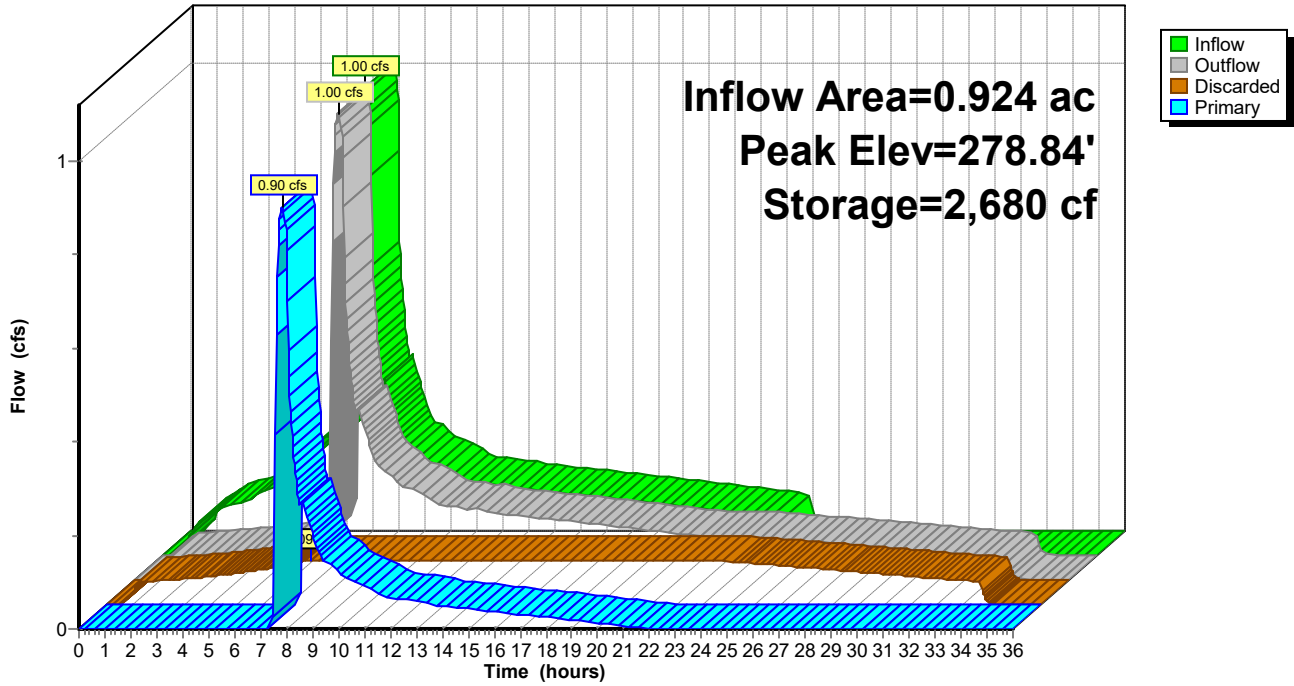
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Pond AA: South Swale

Hydrograph



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Summary for Pond BB: North Swale

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 4.26" for 25YR event
 Inflow = 0.36 cfs @ 7.79 hrs, Volume= 0.119 af
 Outflow = 0.32 cfs @ 7.99 hrs, Volume= 0.119 af, Atten= 13%, Lag= 12.0 min
 Discarded = 0.06 cfs @ 7.99 hrs, Volume= 0.085 af
 Primary = 0.26 cfs @ 7.99 hrs, Volume= 0.033 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 282.32' @ 7.99 hrs Surf.Area= 1,109 sf Storage= 680 cf

Plug-Flow detention time= 90.9 min calculated for 0.118 af (100% of inflow)
 Center-of-Mass det. time= 90.9 min (743.4 - 652.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	281.50'	888 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)	
281.50	571	331.9	0	0	571	
282.50	1,248	344.5	888	888	1,329	

Device	Routing	Invert	Outlet Devices	
#1	Primary	282.00'	6.0" Vert. Orifice/Grate C= 0.600	
#2	Discarded	281.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.06 cfs @ 7.99 hrs HW=282.32' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.26 cfs @ 7.99 hrs HW=282.32' (Free Discharge)
 ↑**1=Orifice/Grate** (Orifice Controls 0.26 cfs @ 1.94 fps)

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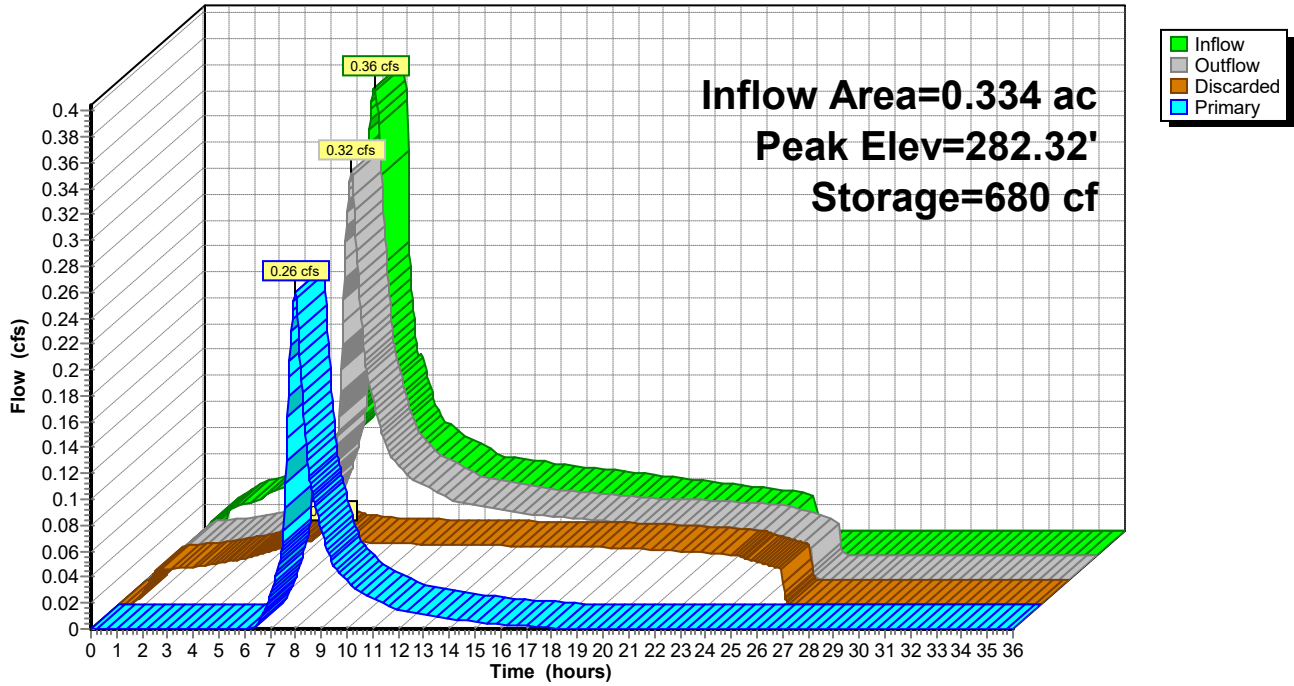
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Pond BB: North Swale

Hydrograph



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Summary for Pond CC: East Swale

[62] Hint: Exceeded Reach PIPE OUTLET depth by 0.11' @ 10.41 hrs

Inflow Area = 0.751 ac, 100.00% Impervious, Inflow Depth = 2.90" for 25YR event
 Inflow = 0.69 cfs @ 7.90 hrs, Volume= 0.181 af
 Outflow = 0.13 cfs @ 10.10 hrs, Volume= 0.181 af, Atten= 81%, Lag= 132.0 min
 Discarded = 0.13 cfs @ 10.10 hrs, Volume= 0.181 af
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 281.19' @ 10.10 hrs Surf.Area= 2,121 sf Storage= 2,607 cf

Plug-Flow detention time= 257.9 min calculated for 0.181 af (100% of inflow)
 Center-of-Mass det. time= 257.9 min (891.5 - 633.5)

Volume	Invert	Avail.Storage	Storage Description		
#1	279.50'	3,307 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)
279.50	993	318.6	0	0	993
280.50	1,660	328.0	1,312	1,312	1,575
281.50	2,350	359.7	1,995	3,307	3,343

Device	Routing	Invert	Outlet Devices	
#1	Primary	281.25'	10.0' long Sharp-Crested Rectangular Weir	2 End Contraction(s)
#2	Discarded	279.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.13 cfs @ 10.10 hrs HW=281.19' (Free Discharge)
 ↑2=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=279.50' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

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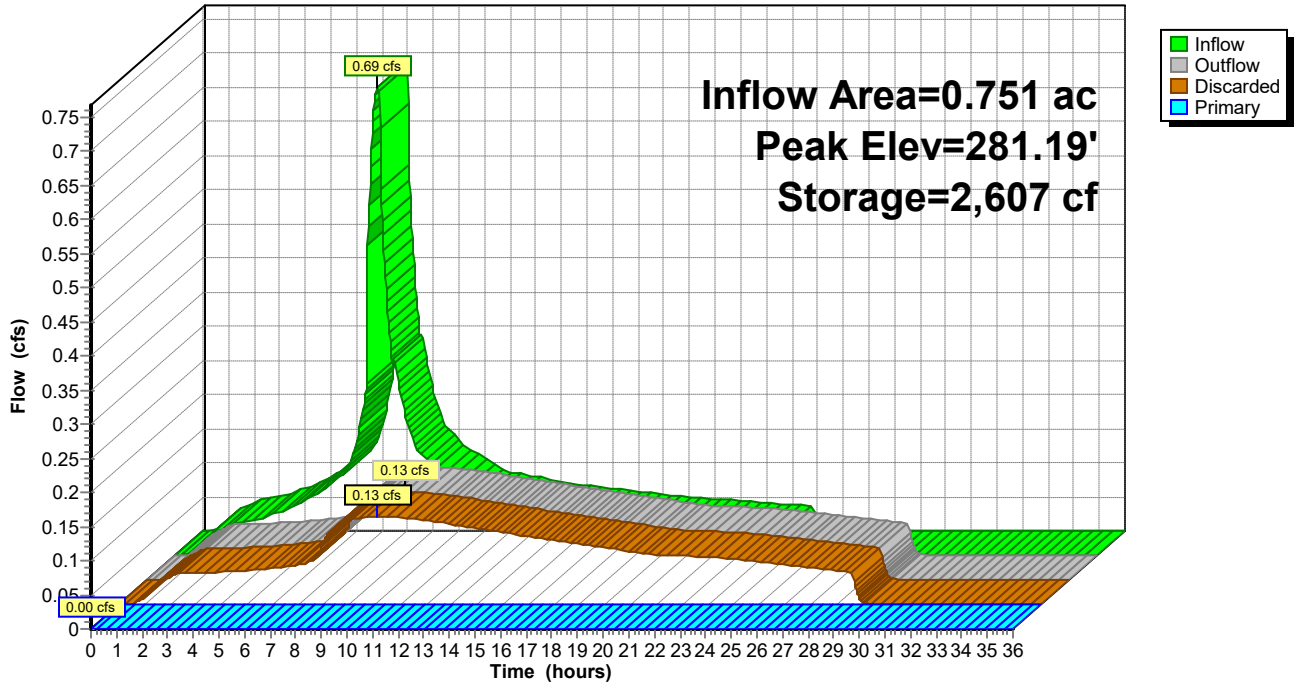
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Type IA 24-hr 25YR Rainfall=4.50"

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Pond CC: East Swale

Hydrograph



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Summary for Pond XX: Full Proposed Runoff

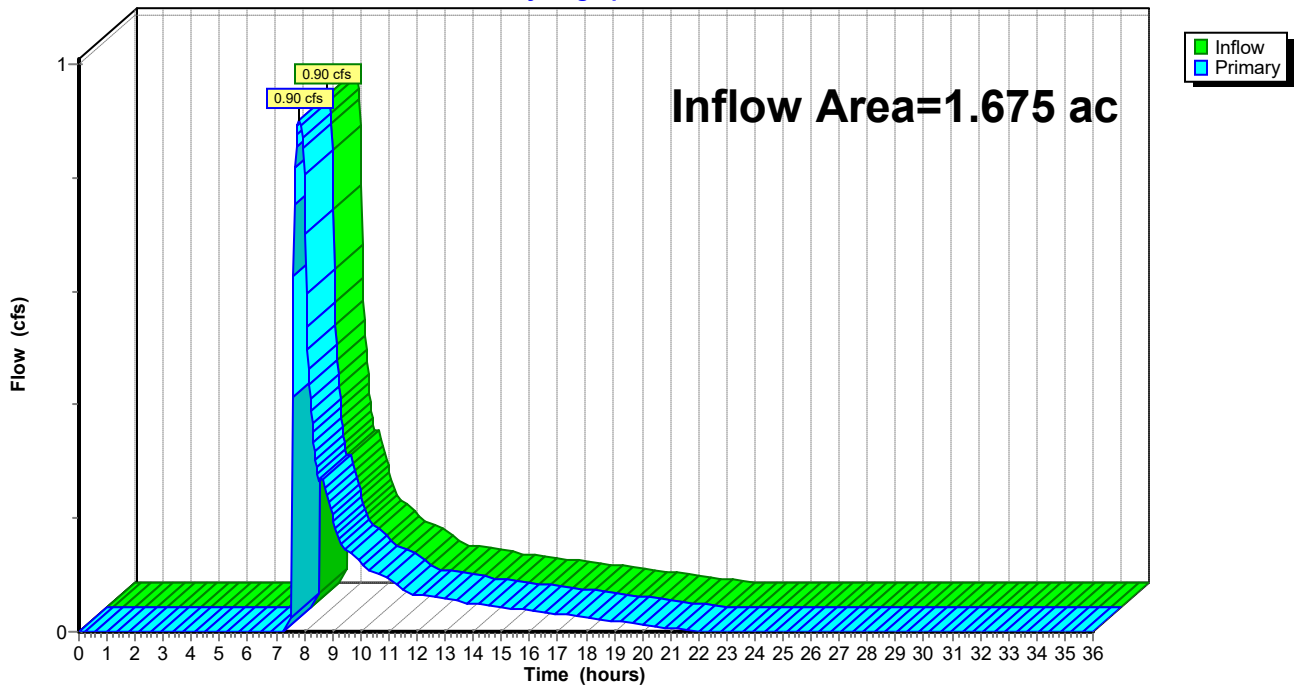
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.675 ac, 100.00% Impervious, Inflow Depth = 0.79" for 25YR event
Inflow = 0.90 cfs @ 7.83 hrs, Volume= 0.111 af
Primary = 0.90 cfs @ 7.83 hrs, Volume= 0.111 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Pond XX: Full Proposed Runoff

Hydrograph



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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 points

Runoff by SBUH method, Split Pervious/Imperv.

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

Subcatchment 00: Natural	Runoff Area=1.676 ac 0.00% Impervious Runoff Depth=3.33" Tc=0.0 min CN=80/0 Runoff=1.41 cfs 0.466 af
Subcatchment 01: Existing	Runoff Area=93,345 sf 100.00% Impervious Runoff Depth=5.26" Tc=0.0 min CN=0/98 Runoff=2.84 cfs 0.940 af
Subcatchment A: Area to A	Runoff Area=40,256 sf 100.00% Impervious Runoff Depth=5.26" Tc=0.0 min CN=0/98 Runoff=1.23 cfs 0.405 af
Subcatchment B: Area to B	Runoff Area=14,537 sf 100.00% Impervious Runoff Depth=5.26" Tc=0.0 min CN=0/98 Runoff=0.44 cfs 0.146 af
Subcatchment C: Area to C	Runoff Area=18,184 sf 100.00% Impervious Runoff Depth=5.26" Tc=0.0 min CN=0/98 Runoff=0.55 cfs 0.183 af
Reach PIPE: 5" Storm Pipe	Avg. Flow Depth=0.27' Max Vel=3.56 fps Inflow=0.33 cfs 0.054 af 5.0" Round Pipe n=0.011 L=85.0' S=0.0118 '/' Capacity=0.44 cfs Outflow=0.33 cfs 0.054 af
Pond AA: South Swale	Peak Elev=278.86' Storage=2,708 cf Inflow=1.23 cfs 0.405 af Discarded=0.10 cfs 0.223 af Primary=1.13 cfs 0.182 af Outflow=1.22 cfs 0.405 af
Pond BB: North Swale	Peak Elev=282.38' Storage=741 cf Inflow=0.44 cfs 0.146 af Discarded=0.06 cfs 0.092 af Primary=0.33 cfs 0.054 af Outflow=0.39 cfs 0.146 af
Pond CC: East Swale	Peak Elev=281.30' Storage=2,845 cf Inflow=0.86 cfs 0.237 af Discarded=0.14 cfs 0.213 af Primary=0.33 cfs 0.025 af Outflow=0.47 cfs 0.237 af
Pond XX: Full Proposed Runoff	Inflow=1.13 cfs 0.207 af Primary=1.13 cfs 0.207 af

Total Runoff Area = 5.494 ac Runoff Volume = 2.140 af Average Runoff Depth = 4.67"
30.50% Pervious = 1.676 ac 69.50% Impervious = 3.818 ac

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Type IA 24-hr 100YR Rainfall=5.50"

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Summary for Subcatchment 00: Natural

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

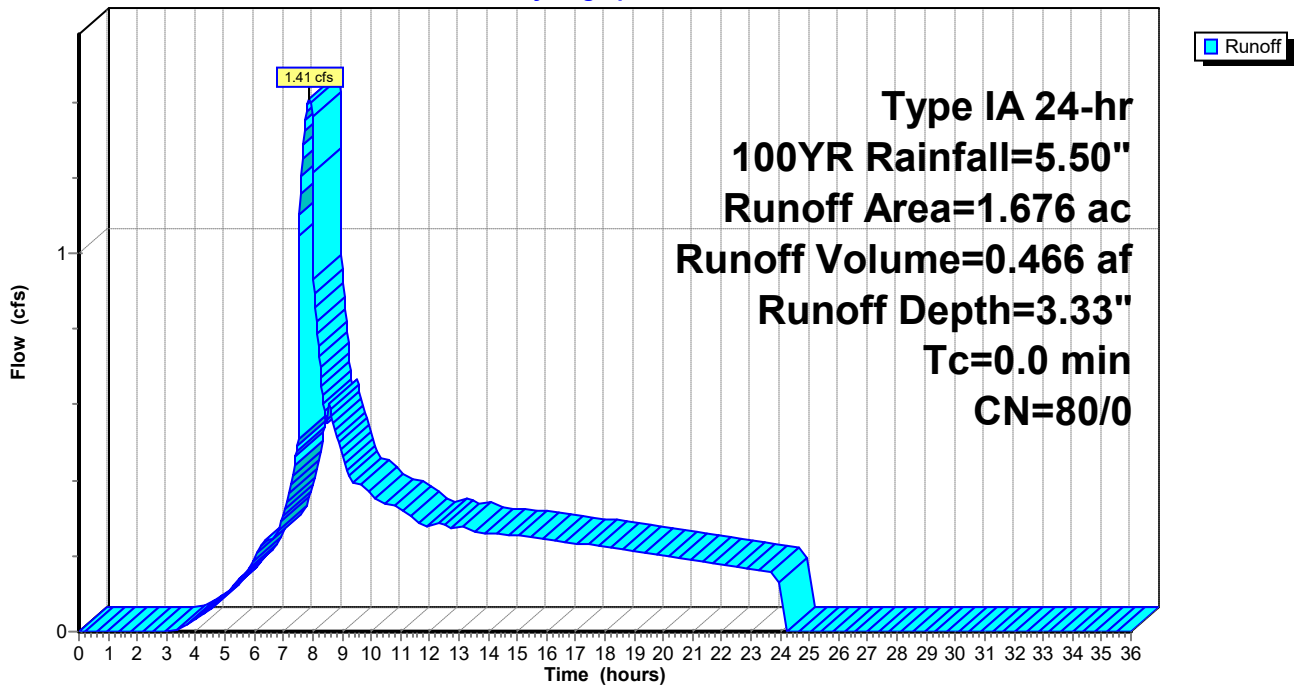
Runoff = 1.41 cfs @ 7.87 hrs, Volume= 0.466 af, Depth= 3.33"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 100YR Rainfall=5.50"

Area (ac)	CN	Description
1.676	80	>75% Grass cover, Good, HSG D
1.676	80	100.00% Pervious Area

Subcatchment 00: Natural

Hydrograph



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Summary for Subcatchment 01: Existing

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

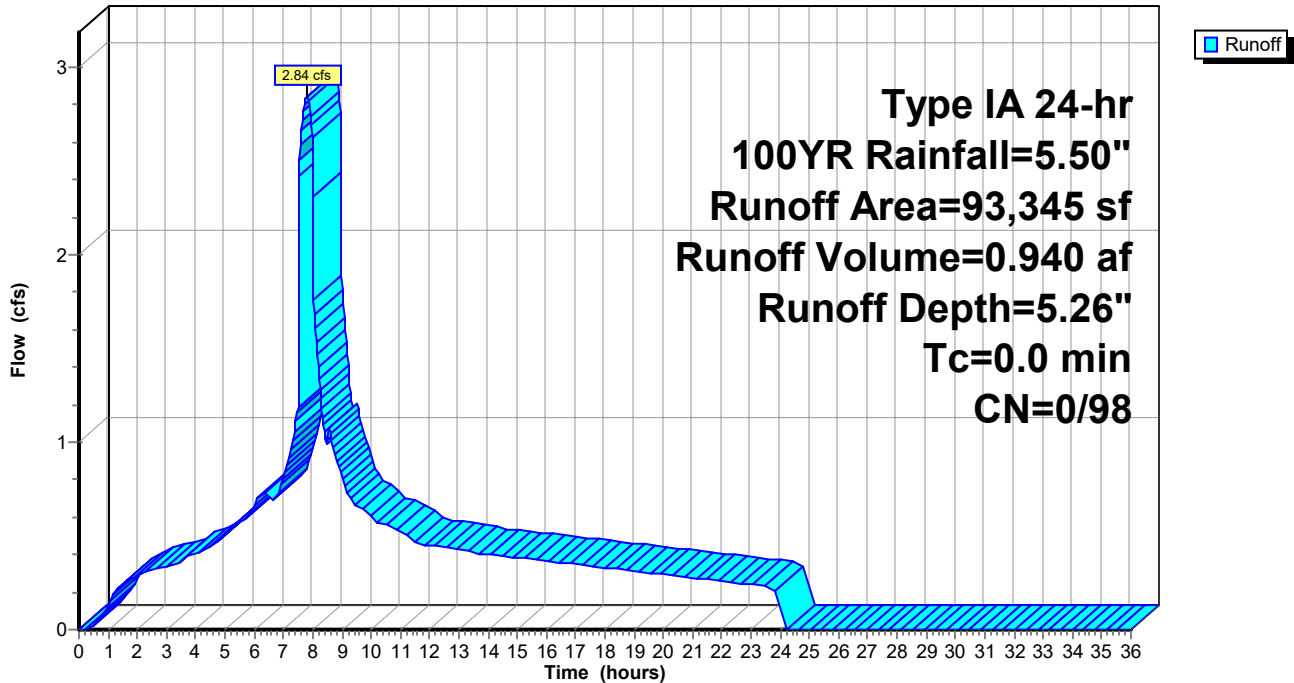
Runoff = 2.84 cfs @ 7.79 hrs, Volume= 0.940 af, Depth= 5.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 100YR Rainfall=5.50"

	Area (sf)	CN	Description
*	93,345	98	Impervious
	93,345	98	100.00% Impervious Area

Subcatchment 01: Existing

Hydrograph



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Summary for Subcatchment A: Area to A

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

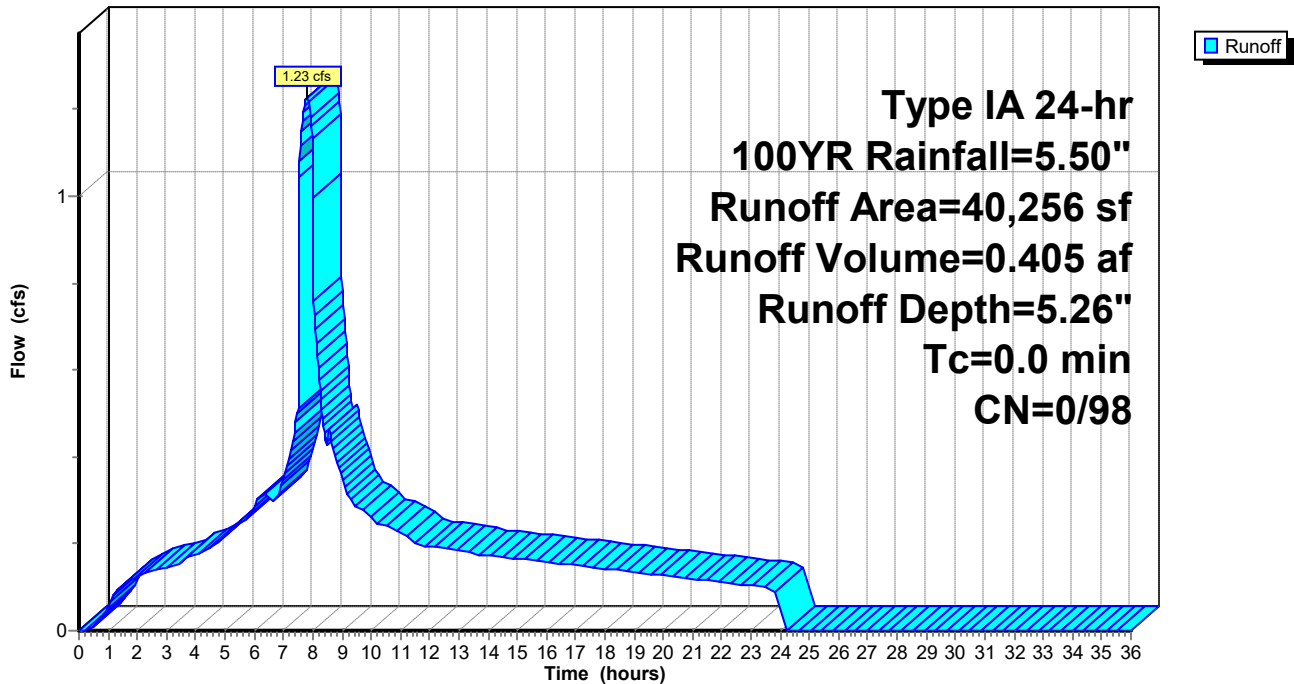
Runoff = 1.23 cfs @ 7.79 hrs, Volume= 0.405 af, Depth= 5.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 100YR Rainfall=5.50"

	Area (sf)	CN	Description
*	37,176	98	Impervious
*	3,080	98	Fire Lane
	40,256	98	Weighted Average
	40,256	98	100.00% Impervious Area

Subcatchment A: Area to A

Hydrograph



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Summary for Subcatchment B: Area to B

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

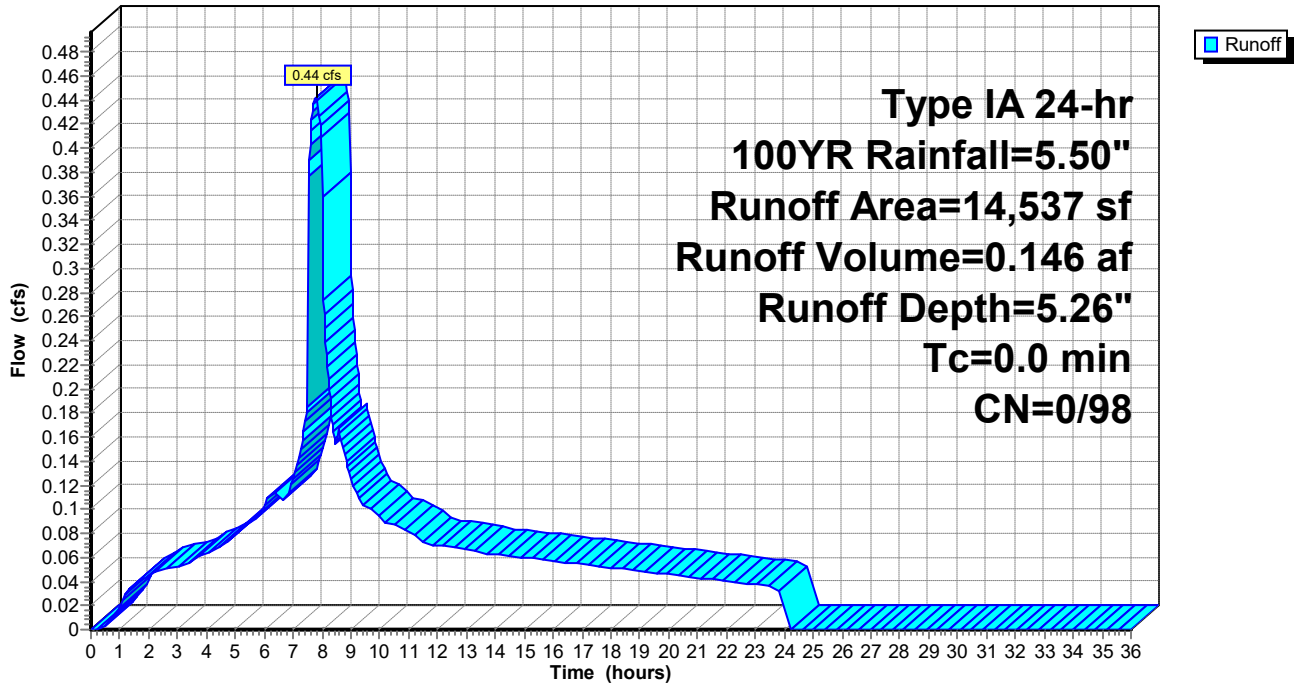
Runoff = 0.44 cfs @ 7.79 hrs, Volume= 0.146 af, Depth= 5.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 100YR Rainfall=5.50"

	Area (sf)	CN	Description
*	14,537	98	Impervious
	14,537	98	100.00% Impervious Area

Subcatchment B: Area to B

Hydrograph



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Summary for Subcatchment C: Area to C

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

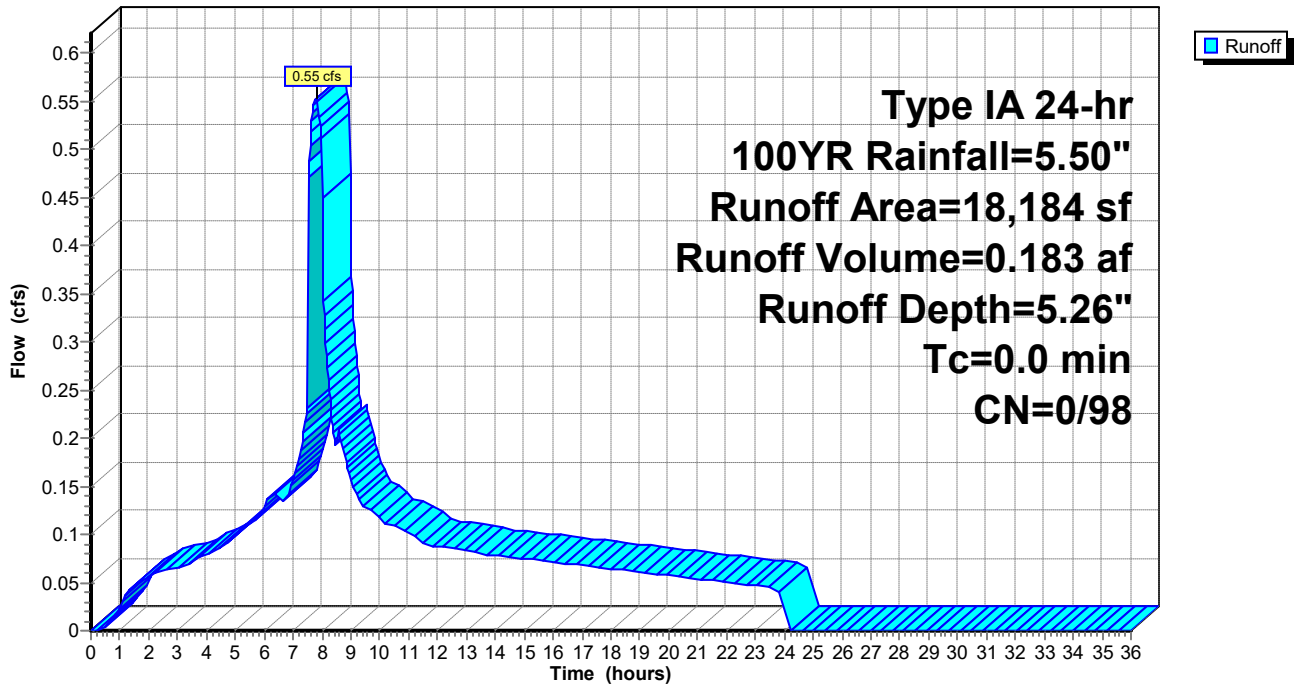
Runoff = 0.55 cfs @ 7.79 hrs, Volume= 0.183 af, Depth= 5.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type IA 24-hr 100YR Rainfall=5.50"

	Area (sf)	CN	Description
*	16,385	98	Impervious
*	1,799	98	Bldg 5
	18,184	98	Weighted Average
	18,184	98	100.00% Impervious Area

Subcatchment C: Area to C

Hydrograph



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Type IA 24-hr 100YR Rainfall=5.50"

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Summary for Reach PIPE: 5" Storm Pipe

[52] Hint: Inlet/Outlet conditions not evaluated

[81] Warning: Exceeded Pond BB by 0.12' @ 24.48 hrs

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 1.96" for 100YR event
Inflow = 0.33 cfs @ 7.99 hrs, Volume= 0.054 af
Outflow = 0.33 cfs @ 8.00 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Max. Velocity= 3.56 fps, Min. Travel Time= 0.4 min

Avg. Velocity = 1.65 fps, Avg. Travel Time= 0.9 min

Peak Storage= 8 cf @ 8.00 hrs

Average Depth at Peak Storage= 0.27'

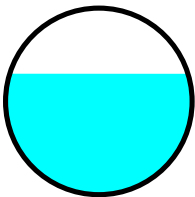
Bank-Full Depth= 0.42' Flow Area= 0.1 sf, Capacity= 0.44 cfs

5.0" Round Pipe

n= 0.011

Length= 85.0' Slope= 0.0118 '/'

Inlet Invert= 282.00', Outlet Invert= 281.00'



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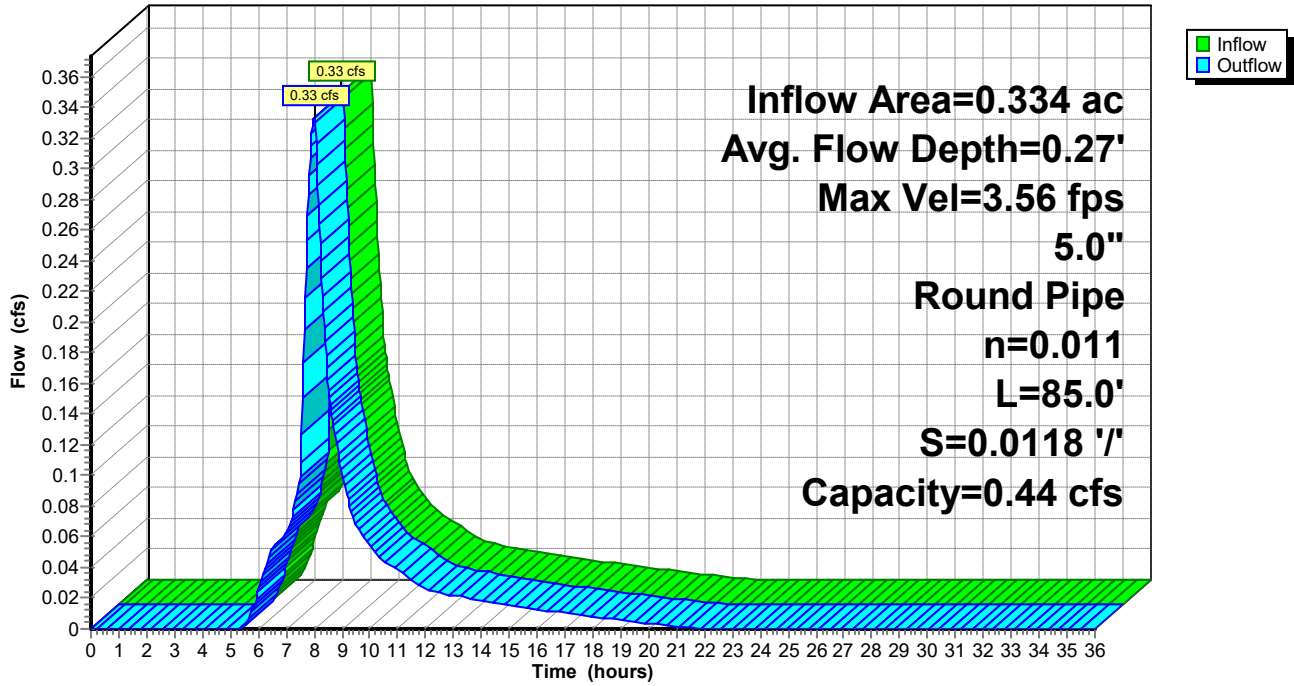
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Reach PIPE: 5" Storm Pipe

Hydrograph



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Summary for Pond AA: South Swale

Inflow Area = 0.924 ac, 100.00% Impervious, Inflow Depth = 5.26" for 100YR event
 Inflow = 1.23 cfs @ 7.79 hrs, Volume= 0.405 af
 Outflow = 1.22 cfs @ 7.83 hrs, Volume= 0.405 af, Atten= 0%, Lag= 2.1 min
 Discarded = 0.10 cfs @ 7.83 hrs, Volume= 0.223 af
 Primary = 1.13 cfs @ 7.83 hrs, Volume= 0.182 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 278.86' @ 7.83 hrs Surf.Area= 1,907 sf Storage= 2,708 cf

Plug-Flow detention time= 205.7 min calculated for 0.405 af (100% of inflow)
 Center-of-Mass det. time= 205.7 min (854.2 - 648.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	277.00'	2,988 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)	
277.00	1,031	224.3	0	0	1,031	
278.00	1,494	238.2	1,255	1,255	1,592	
279.00	1,982	250.7	1,732	2,988	2,137	

Device	Routing	Invert	Outlet Devices	
#1	Primary	278.75'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	277.00'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.10 cfs @ 7.83 hrs HW=278.86' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=1.13 cfs @ 7.83 hrs HW=278.86' (Free Discharge)
 ↳ **1=Sharp-Crested Rectangular Weir** (Weir Controls 1.13 cfs @ 1.06 fps)

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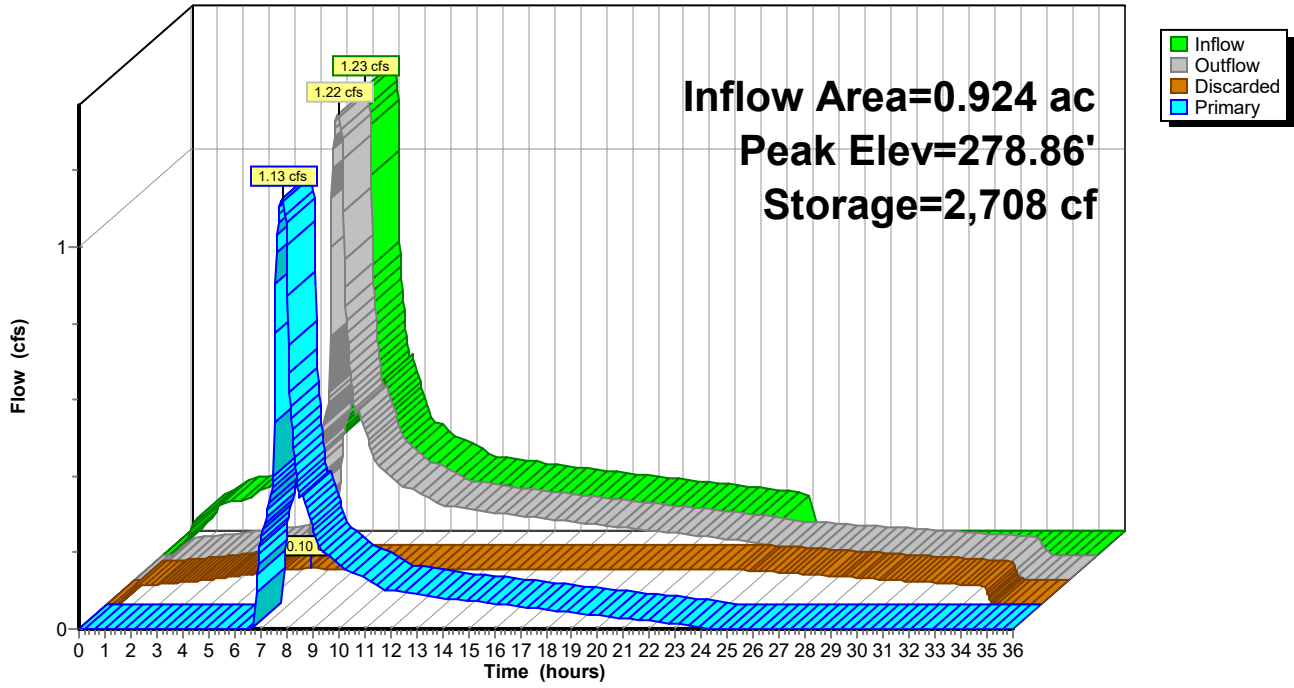
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Pond AA: South Swale

Hydrograph



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Summary for Pond BB: North Swale

Inflow Area = 0.334 ac, 100.00% Impervious, Inflow Depth = 5.26" for 100YR event
 Inflow = 0.44 cfs @ 7.79 hrs, Volume= 0.146 af
 Outflow = 0.39 cfs @ 7.99 hrs, Volume= 0.146 af, Atten= 12%, Lag= 11.8 min
 Discarded = 0.06 cfs @ 7.99 hrs, Volume= 0.092 af
 Primary = 0.33 cfs @ 7.99 hrs, Volume= 0.054 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 282.38' @ 7.99 hrs Surf.Area= 1,151 sf Storage= 741 cf

Plug-Flow detention time= 86.1 min calculated for 0.146 af (100% of inflow)
 Center-of-Mass det. time= 86.1 min (734.6 - 648.5)

Volume	Invert	Avail.Storage	Storage Description			
#1	281.50'	888 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)	
281.50	571	331.9	0	0	571	
282.50	1,248	344.5	888	888	1,329	

Device	Routing	Invert	Outlet Devices	
#1	Primary	282.00'	6.0" Vert. Orifice/Grate C= 0.600	
#2	Discarded	281.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.06 cfs @ 7.99 hrs HW=282.38' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.33 cfs @ 7.99 hrs HW=282.38' (Free Discharge)
 ↑**1=Orifice/Grate** (Orifice Controls 0.33 cfs @ 2.09 fps)

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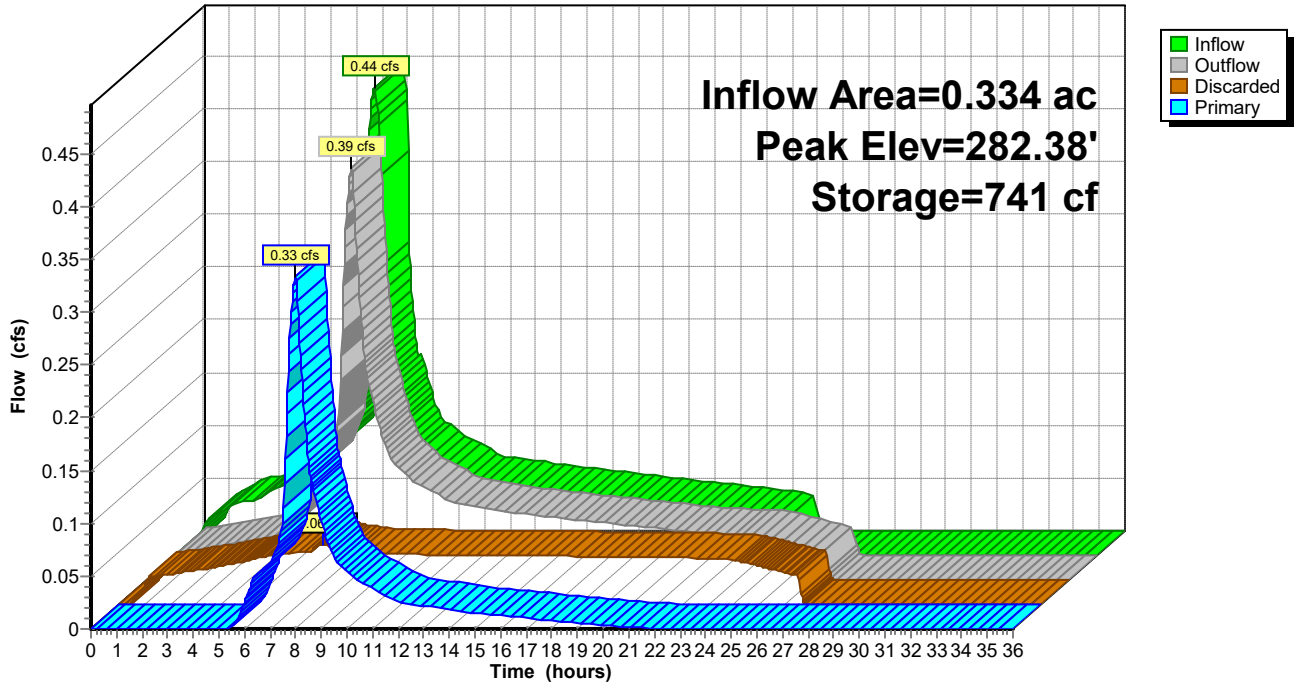
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Pond BB: North Swale

Hydrograph



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Summary for Pond CC: East Swale

[62] Hint: Exceeded Reach PIPE OUTLET depth by 0.17' @ 11.52 hrs

Inflow Area = 0.751 ac, 100.00% Impervious, Inflow Depth = 3.79" for 100YR event
 Inflow = 0.86 cfs @ 7.90 hrs, Volume= 0.237 af
 Outflow = 0.47 cfs @ 8.28 hrs, Volume= 0.237 af, Atten= 45%, Lag= 23.2 min
 Discarded = 0.14 cfs @ 8.28 hrs, Volume= 0.213 af
 Primary = 0.33 cfs @ 8.28 hrs, Volume= 0.025 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Peak Elev= 281.30' @ 8.28 hrs Surf.Area= 2,200 sf Storage= 2,845 cf

Plug-Flow detention time= 247.7 min calculated for 0.237 af (100% of inflow)
 Center-of-Mass det. time= 247.8 min (879.6 - 631.8)

Volume	Invert	Avail.Storage	Storage Description			
#1	279.50'	3,307 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)	
279.50	993	318.6	0	0	993	
280.50	1,660	328.0	1,312	1,312	1,575	
281.50	2,350	359.7	1,995	3,307	3,343	

Device	Routing	Invert	Outlet Devices	
#1	Primary	281.25'	10.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)	
#2	Discarded	279.50'	2.000 in/hr Exfiltration over Wetted area	

Discarded OutFlow Max=0.14 cfs @ 8.28 hrs HW=281.30' (Free Discharge)
 ↑2=Exfiltration (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.33 cfs @ 8.28 hrs HW=281.30' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Weir Controls 0.33 cfs @ 0.71 fps)

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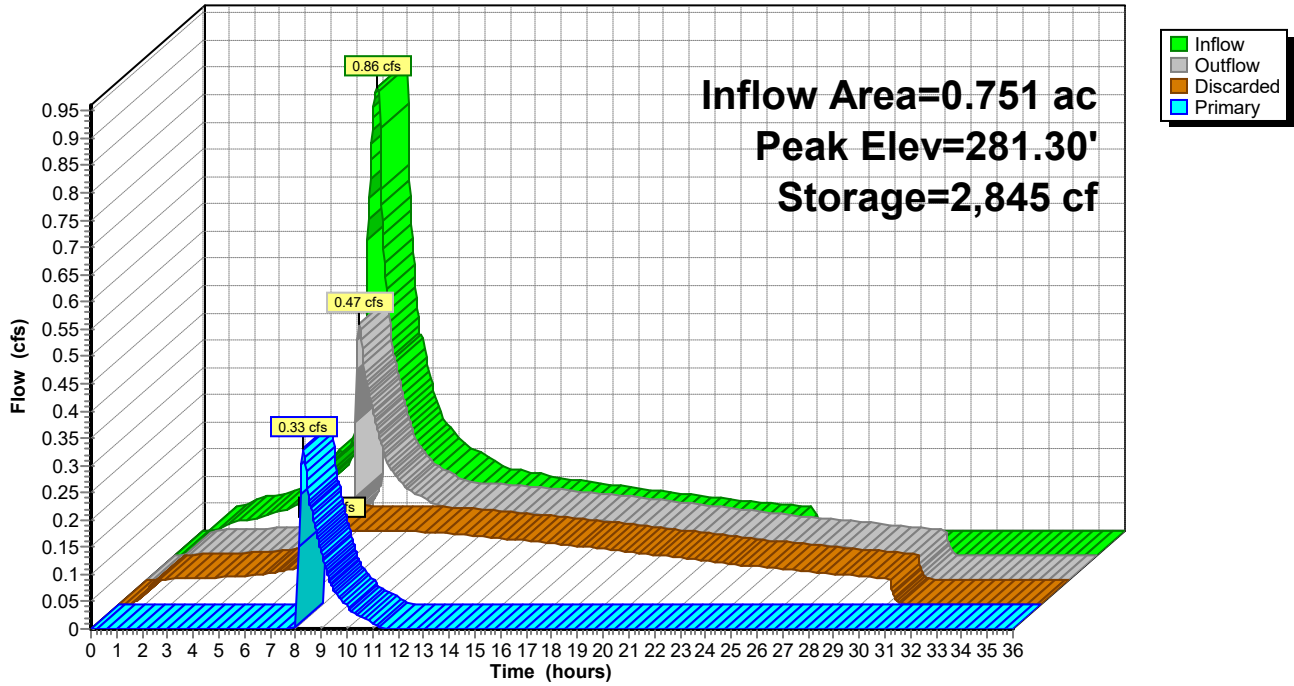
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Pond CC: East Swale

Hydrograph



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Summary for Pond XX: Full Proposed Runoff

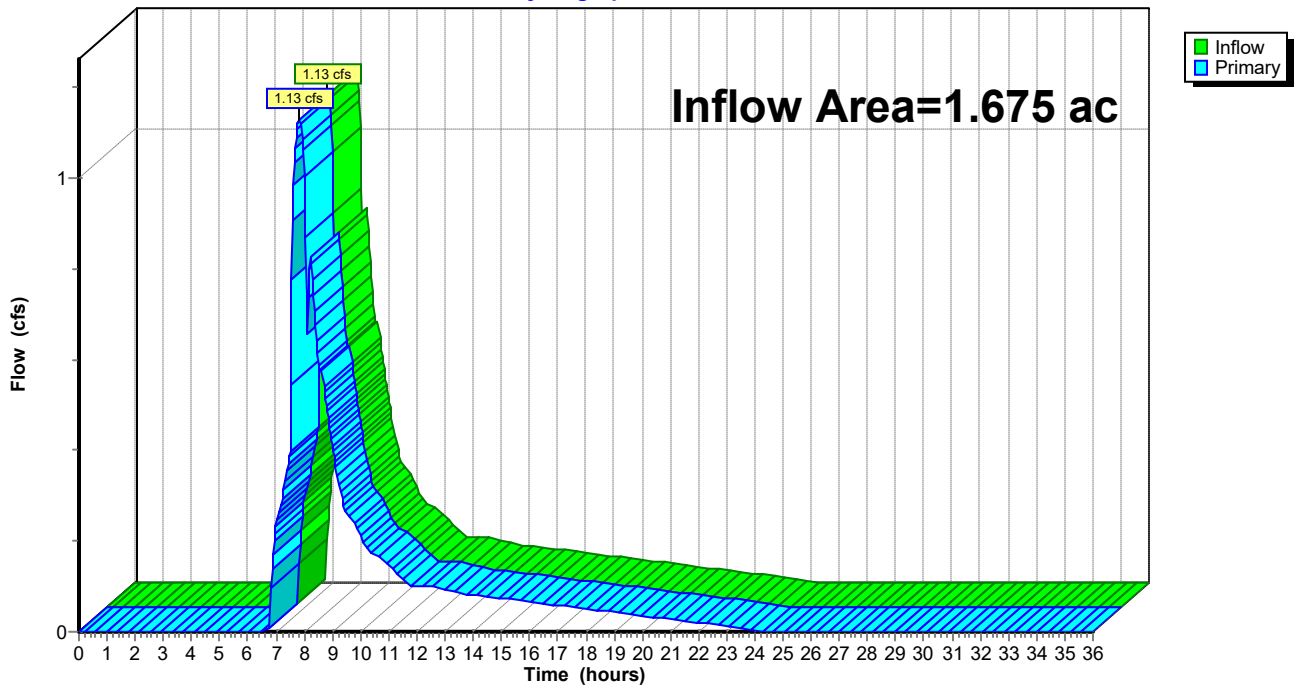
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 1.675 ac, 100.00% Impervious, Inflow Depth = 1.48" for 100YR event
Inflow = 1.13 cfs @ 7.83 hrs, Volume= 0.207 af
Primary = 1.13 cfs @ 7.83 hrs, Volume= 0.207 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Pond XX: Full Proposed Runoff

Hydrograph





Project

Consultant

Revisions

No.	Description	Date

Stamp

Issuance

**TRANSPORTATION
PLANNING REVIEW**

Date

06/07/2021

Project Number

20019

Drawing Title

CIVIL SITE PLAN

Sheet No.

C3.01

