STORMWATER CALCULATIONS

Prepared For:

Salem Heights Church

375 Madrona Avenue S

Salem, OR 97302

Project:

Salem Heights Ministry

375 Madrona Avenue S

Salem, OR 97302

Prepared By:

PRELIMINARY

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J.O. 2886.0000.0 June 2025

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PROJECT OVERVIEW & DESCRIPTION

1.1 SIZE & LOCATION OF PROJECT

The proposed project is located at 375 Madrona Avenue S in Salem, Oregon. The total area to be improved is approximately 12,740 sf. Refer to the Civil Drawings for a site map of the project area.

1.2 BRIEF DESCRIPTION OF PROJECT SCOPE AND PROPOSED IMPROVEMENTS

The project scope is to improve the current property with the addition of a new approximately 4,500 sf ministry building, associated pathways, parking improvements and Green Stormwater Infrastructure (GSI) facilities. The project includes site preparation and construction of these facilities.

1.3 DESCRIPTION OF SIZE OF WATERSHED DRAINING TO THE SITE

The site has been divided into three (3) Basins. Basin 1 is the main basin encompassing most of the improved area at approximately 9,420 sf, this includes the new building and the majority of the green space. Basin 1 flows into Rain Garden 1 which treats for the water quality storm event as well as regulates release rates to predevelopment levels. Basin 2 is an approximately 3,320 sf area that is made up of pathways and parking lot that cannot be captured and treated in Rain Garden 1 due to the topography of the site. This section will drain to the south east and into an existing stormwater catch basins in the existing parking lot. Basin 3 is a 3,650 sf area that can be captured by Rain Garden 2, that is made up of an existing building as well as a portion of the newly disturbed area. It is proposed that capturing, treating and controlling the release rates from Basin 3 be done in lieu of Basin 2. Both Basin 1 and 3 are analyzed as both predeveloped native soils and their developed conditions. Refer to Developed Basin map in Appendix A for details.

1.4 DESCRIPTION OF THE EXISTING SITE CONDITIONS, CONSTRAINTS, SENSITIVE AREAS & WATERWAYS

The existing site is partially developed with existing buildings, asphalt paving, and gravel storage pads. Refer to the Civil Drawings and Basin Maps for more details. The site has no sensitive areas or wetlands.

1.5 SUMMARY OF EXISTING TREES & NATIVE VEGETATION

As mentioned above, the site is partially developed with asphalt paving and compacted gravel. It includes mature Cherry and Oak trees that are to be protected through construction.

1.6 SUMMARY OF GREEN STORMWATER INFRASTRUCTURE

Per the City of Salem (COS) Design Standards, a large project will be considered to have met the maximum extent feasible (MEF) requirement when the stormwater runoff from the total amount of new plus replaced impervious surfaces flows into an area set aside for GSI that is at least 10% of the total area of the new plus replaced impervious surfaces or 80% of all impervious area must be treated by GSI. This design implements GSI for 100% of all new plus replaced impervious surfaces and therefore meets MEF for GSI.

1.7 REGULATORY PERMITS REQUIRED

A 1200-C permit from DEQ is not required since less than one acre is disturbed by the project. City of Salem permits are required. No other permits are required for this project.

1.8 100 YEAR STORM ESCAPE ROUTES

The 100-year emergency overflow for the Developed Basin is provided by Beehive Inlet control structures in each of the Rain Gardens.

METHODOLOGY

2.1 MAXIMUM INFILTRATION AND VEGETATIVE TREATMENT

An infiltration rate of 0.1 inches per hour constant velocity was used in the design of this GSI system. See Geotechnical Report in Appendix E

2.2 SOIL INFORMATION

The pre-developed project site contains hydrologic soil group C-rated soils. Design is based on C-rated soils for both pre-developed and developed conditions. Refer to the Soils Report in Appendix B for more details.

2.3 HAZARDOUS MATERIAL

The owner is not aware of any hazardous material contamination onsite.

ANALYSIS

3.1 METHODS & SOFTWARE USED

HydroCAD modeling software was used to size the stormwater facilities. The Santa Barbara Unit Hydrograph Type 1A storm was used to model the required design storms. Per the City of Salem Design Standards shown in Table 1, the design storms used were the 1.38-inch, 24-hour (water quality storm), half the 2-year, 24-hour, the 10-year, 24-hour, the 25-year, 24-hour, and the 100-year, 24-hour storm events.

Table 1 | City of Salem 24-hour Design Storms

	24-Hour Rainfall Depths for Salem, OR						
Recurrence Interval, Years	WQ	2	5	10	25	50	100
24-Hour Depths, Inches	1.38	2.2	2.7	3.2	3.6	4.1	4.4

Source: City of Salem Administrative Rules Chapter 109 – Division 004 Appendix D

3.2 CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS

Per the COS Design Standards, the pre-developed curve number of 72 was used for hydrologic soil group C-rated soils.

Post developed impervious areas were assigned curve numbers of 98, which corresponds to paved/parking areas per the COS Design Standards. Green Spaces were assigned curve numbers of 74 which corresponds with open space in good condition.

Time of concentration (Tc) for the pre-developed conditions were calculated using sheet flow and shallow concentrated flow calculations. The pre-developed time of concentrations used for design were 14.4 and 14.4 minutes. See the Pre-Developed Basin Map in Appendix A for the flow path used and refer to the HydroCAD Summaries in Appendix C for calculations. A minimum time of concentration of 5 minutes is applied to developed basins due to the minimum time-step used by the HydroCAD modeling software.

3.3 CONVEYANCE CAPACITY CALCULATIONS

The stormwater facilities were designed to convey the developed 100-year, 24-hour storm. This includes Beehive Inlet Controls that meter the release rates from each of the Rain Gardens. These flows are released into the existing 18 inch storm drain that runs under the existing parking lot, down Madrona Ave and eventually leads to Clark Creek. The 100-year, 24-hour developed flows are 0.05 and 0.02 cfs from the Beehive Inlet Control structures.

The outlet pipe from the developed GSI's is designed to convey the developed 100-year, 24-hour storm. Stormwater runoff is conveyed from the facility's by 8-inch pipes. See the Civil Drawings for more detail. The full-flow capacity of these conveyance pipes is

calculated to be 0.87 cfs using a slope of 0.52% and Manning's n of 0.013. This is more than the 100-year storm of 0.05 and 0.02 cfs at Ultimate Build-Out.

3.4 TREATMENT & FLOW CONTROL SIZING CALCULATIONS

The site was analyzed in two conditions for both Basin 1 and 3, the predeveloped conditions and the developed conditions. Basin 2 was not analyzed because it is not feasible to capture the flows produced by its area, Basin 3 was analyzed in its place as discussed above in section 1.3. General basin characteristics of both pre-developed and developed conditions are listed in Table 2. For more detail refer to the Basin Map in Appendix A and the Civil Drawings in Appendix F.

Table 2 | General Basin Characteristics

Basin ID	Source (Roof/Road /Other)	Impervious Area (sf)	Pervious Area (sf)	Design Storm Event				Curve Number (CN)[1]
				½ 2 Year (cfs)	10 Year (cfs)	25 Year (cfs)	100 Year (cfs)	
Predeveloped Basin 1	Native	-	9,420	0.00	0.03	0.04	0.07	72
Predeveloped Basin 3	Native	-	3,650	0.00	0.01	0.02	0.03	72
Developed Basin 1	Roof/ Pavement	6,120	3,300	0.03	0.12	0.14	0.18	89
Developed Basin 3	Roof/ Pavement	2,850	800	0.02	0.05	0.06	0.08	95

[1] Weighted Curve Number

The allowable release rates for the developed site are determined by the flows produced by the Predeveloped Basins for each design storm. These are listed in Table 3.

Table 3 | Allowable Release Rates

Site Condition/Basin	Design Storm (cfs)			
	½ 2 Year	10 Year	25 Year	100 Year
Pre-Developed Basin 1	0.00	0.03	0.04	0.07
Pre-Developed Basin 3	0.00	0.01	0.02	0.03

Stormwater is released from the Rain Garden in each Basin through a Beehive Inlet Control. See Tables 4-5 below for summaries of facility release rates for the Rain Gardens. Refer to the Civil Drawings for details. Tables 4-5 show orifice sizes as accurately as the HydroCAD Software is capable of, Civil details show orifice sizes rounded up to the nearest increment allowed by COS detail NO.251E.

Table 4 | Facility Outlet Sizing and Release Rates –Rain Garden 1

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Rain Garden Release Rate (cfs)	Allowed Release (cfs)	Peak WSE[1] (ft)	Overflow Elevation (ft)
Half 2 Year	0.5	402.5	0.00	0.00	403.05	406.66
WQ	-	-	-	-	405.26	406.66
10 Year	1.1	405.48	0.03	0.03	406.08	406.66
25 Year	-	-	0.04	0.04	406.28	406.66
100 Year	32[2]	406.66	0.05	0.07	406.65	406.66

[1] WSE = water surface elevation
[2] 100-year storm controlled by 32-inch diameter Beehive Inlet Control Grate.

Table 5 | Facility Outlet Sizing and Release Rates –Rain Garden 2

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Rain Garden Release Rate (cfs)	Allowed Release (cfs)	Peak WSE[1] (ft)	Overflow Elevation (ft)
Half 2 Year	0.5	400.25	0.00	0.00	400.54	404.82
WQ	-	-	-	-	402.92	404.82
10 Year	0.5	403.15	0.01	0.01	403.39	404.82
25 Year	-	-	0.02	0.02	403.54	404.82
100 Year	32[2]	404.82	0.02	0.03	403.81	404.82

[1] WSE = water surface elevation
[2] 100-year storm controlled by 32-inch diameter Beehive Inlet Control Grate.

As shown by Tables 4-5, the total release rates from the site are less than or equal to the allowable rates for all design storms.

Rain Garden geometry characteristics are listed below in Table 6.

Table 6 | Facility Sizing Summary

Facility ID[1]	Facility Elevations[2] (ft)		Facility Surface Area[2] (SF)		Depth of Drain Rock (in)
	Top	Bottom	Top	Bottom	
RG 1	407	405	600	200	9
RG 2	404	402.5	340	45	21

[1] All facilities are privately owned and maintained stormwater GSI facilities.
[2] The top facility elevation and corresponding square footage area refer to the top of curb. The bottom elevation and corresponding square footage area refer to the bottom of the 3:1 slope.

The HydroCAD modeled release rates and water surface elevations (WSE) shown in Tables 4-5 assume free-flow though the rain garden growing media. Release from the rain garden facilities can also be controlled by the filtration capacity of the growing media. To verify the entire WQ storm event is filtered through the growing media for treatment, the rain garden hydraulics were also modeled at the facility surface with an assumed constant velocity filtration rate of 3 in/hr per COS Design Standards. The surface tests were calculated using Darcy's Law of hydraulic conductivity with the groundwater elevation set 1.5 feet below the surface to represent the 1.5 feet (18 inches) of growing media thickness per COS Design Standards. The rain gardens provide treatment for the captured area of the developed basin. See the HydroCAD analysis in Appendix C for surface test calculations.

The Rain Gardens have been sized to drain the water quality storm below the growing media in 25 hours from the start of the event, which is less than the required 54 hours per the COS Design Standards. See the HydroCAD Summaries in Appendix C for drain time during the water quality storm.

Table 7 | Surface Filtration Test Summary – WQ Storm

Facility ID[1]	Facility Bottom Elevation (ft)	Max. Treatment Elevation	WSE (ft)
RG 1	405.00	405.48	405.26
RG 2	402.5	403.15	402.92

[1] The facility is a privately owned and maintained rain garden.

3.5 SUMMARY

The stormwater system is designed to release half the 2-year, 24-hour, the 10-year, 24-hour, the 25-year, 24-hour, and the 100-year, 24-hour storm events at rates less than their respective pre-developed storms. The proposed design also treats the water quality storm

event. Therefore, the project meets the flow control and treatment requirements as set forth in Administrative Rule 109 Division 004 - Stormwater System.

APPENDIX A

BASIN MAPS

Pedevelopment Time of Concentration

Basin 1
Sheet Flow
L = 100 ft
S = 0.05 ft/ft
Shallow Concentrated Flow
L = 12 ft
S = 0.08 ft/ft

Baisn 3
Sheet Flow
L = 94 ft
S = 0.043 ft/ft

Basin 1
Total Area = 9,420
Impervious Area = 6,120 sf
Pervious Area = 3,300 sf

Basin 2
Disturbed Area unable to be captured by Infiltration Rain Garden 1
Total = 3,320 sf
Impervious = 3,020 sf
Pervious = 300 sf

Basin 3
Area to be captured by Basin Infiltration Rain Garden 2
Total = 3,650 sf
Impervious Area = 2,850 sf
Pervious Area = 800 sf

Infiltration Rain Garden 1
407 = 600 sf
406 = 370 sf
405 = 200 sf

Bottom of round rock = 402.5
depth of round rock = 9"

Infiltration Rain Garden 2
404= 340 sf
403 = 130 sf
402.5 = 45 sf

Bottom of round rock = 400.15
depth of round rock = 21"

0 5 10 20
FEET

SALEM HEIGHTS CHURCH
JOB #3575.000.0

APPENDIX B
NRCS SOIL REPORT

Hydrologic Soil Group—Marion County Area, Oregon

Map Scale: 1:212 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 3 6 12 18

Feet: 0 10 20 40 60

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Marion County Area, Oregon
Survey Area Data: Version 22, Aug 30, 2024

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

Date(s) aerial images were photographed: May 17, 2023—Jun 3, 2023

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NeC	Nekia silty clay loam, 7 to 12 percent slopes	C	0.2	100.0%
Totals for Area of Interest			**0.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

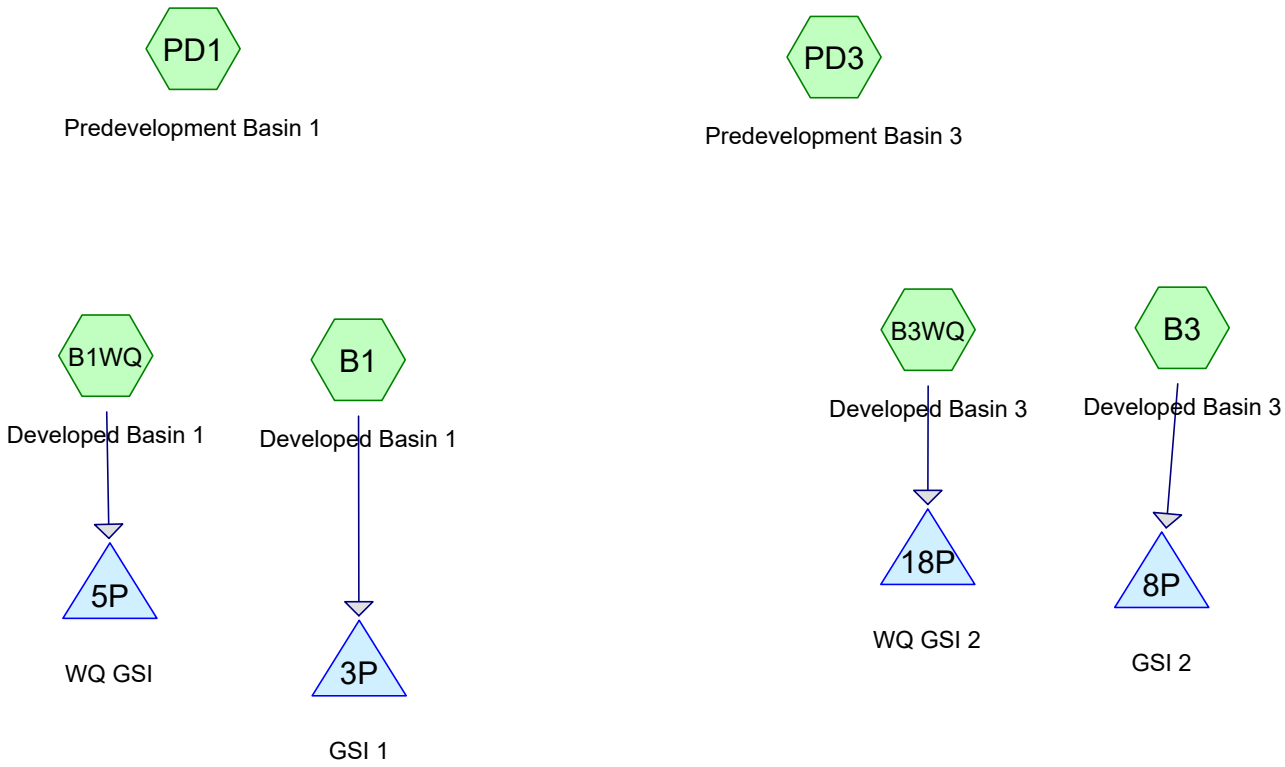
Aggregation Method: Dominant Condition

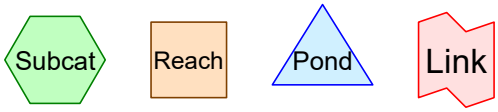
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX C

HYDROCAD SUMMARIES





Routing Diagram for Salem Heights Ministry v3
Prepared by Westech Engineering Inc, Printed 6/26/2025

Summary for Subcatchment B1: Developed Basin 1

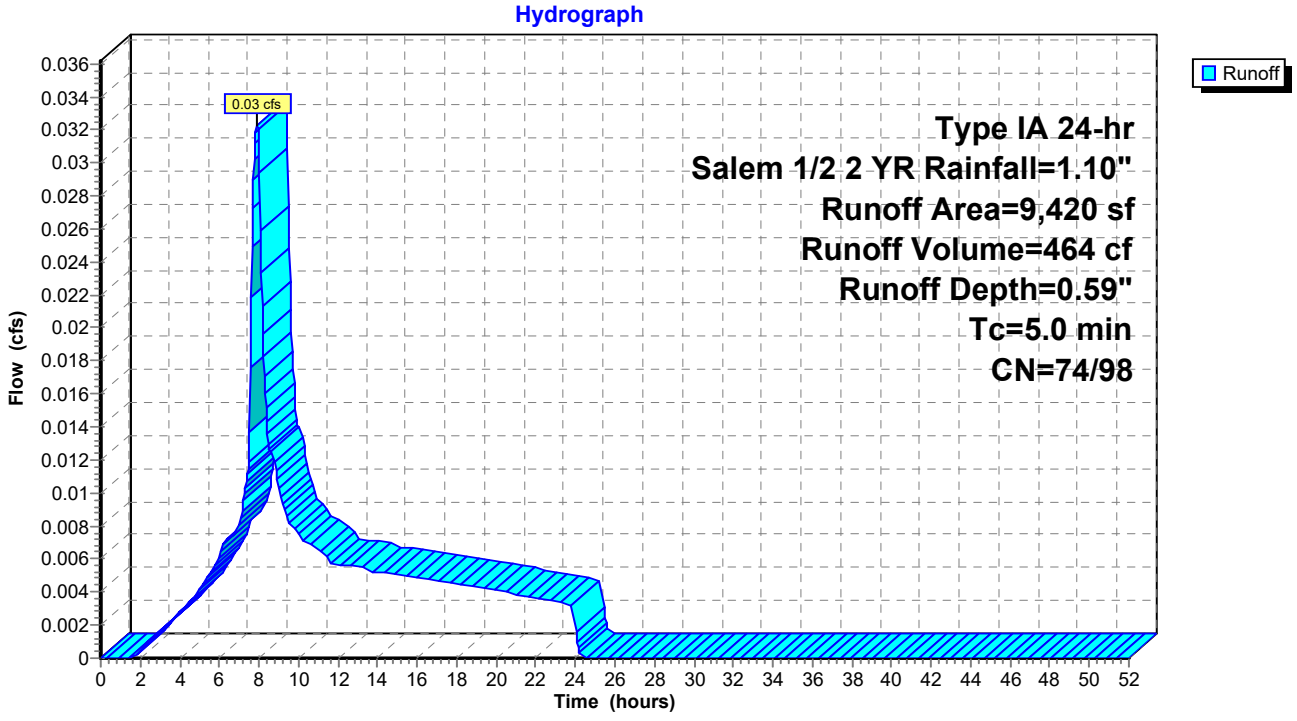
Runoff = 0.03 cfs @ 7.91 hrs, Volume= 464 cf, Depth= 0.59"
Routed to Pond 3P : GSI 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
*	6,120	98	
*	3,300	74	
	9,420	90	Weighted Average
	3,300	74	35.03% Pervious Area
	6,120	98	64.97% Impervious Area

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

Subcatchment B1: Developed Basin 1



Summary for Subcatchment B1WQ: Developed Basin 1

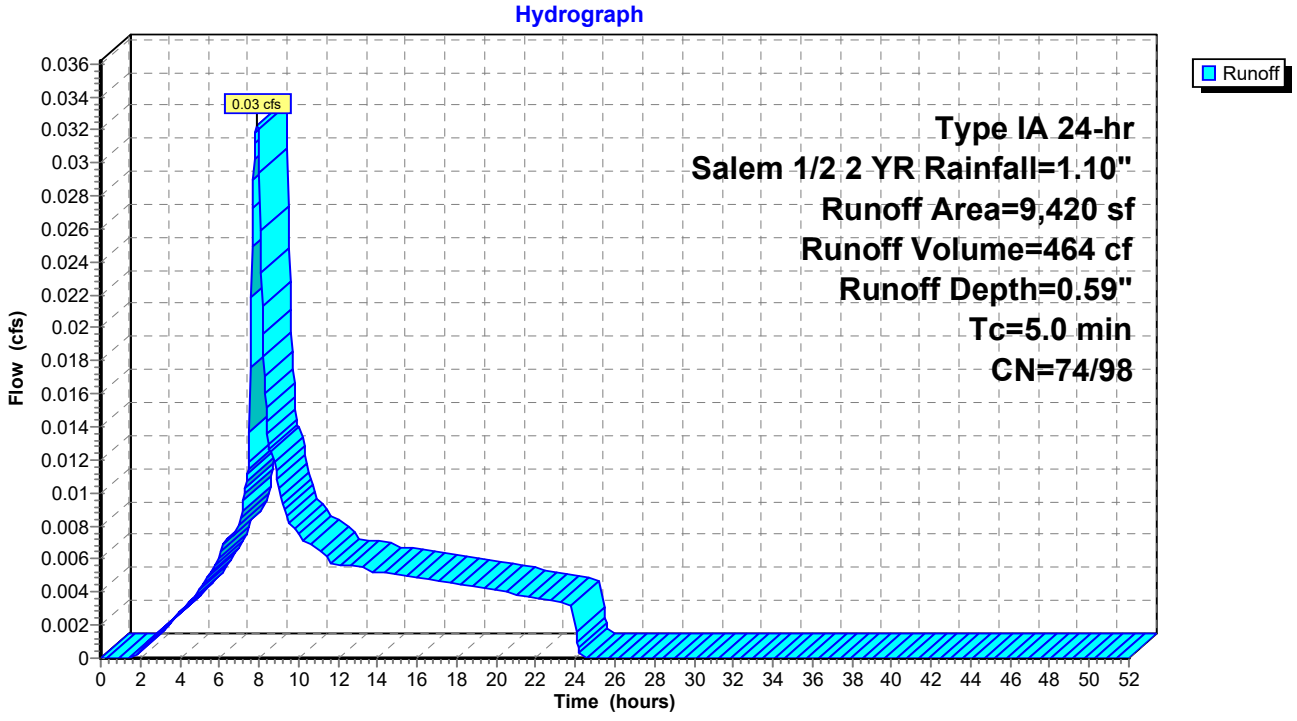
Runoff = 0.03 cfs @ 7.91 hrs, Volume= 464 cf, Depth= 0.59"
Routed to Pond 5P : WQ GSI

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
*	6,120	98	
*	3,300	74	
	9,420	90	Weighted Average
	3,300	74	35.03% Pervious Area
	6,120	98	64.97% Impervious Area

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

Subcatchment B1WQ: Developed Basin 1



Summary for Subcatchment B3: Developed Basin 3

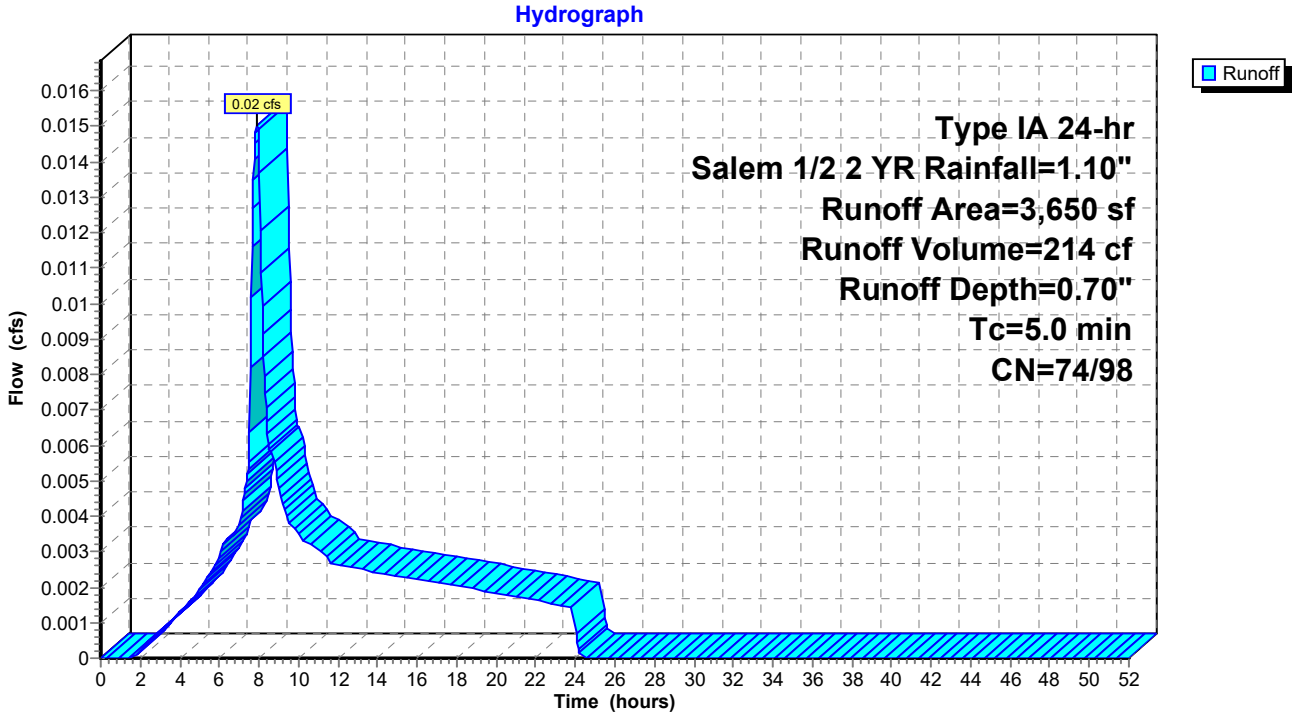
Runoff = 0.02 cfs @ 7.91 hrs, Volume= 214 cf, Depth= 0.70"
Routed to Pond 8P : GSI 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
*	2,850	98	
*	800	74	
	3,650	93	Weighted Average
	800	74	21.92% Pervious Area
	2,850	98	78.08% Impervious Area

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

Subcatchment B3: Developed Basin 3



Summary for Subcatchment B3WQ: Developed Basin 3

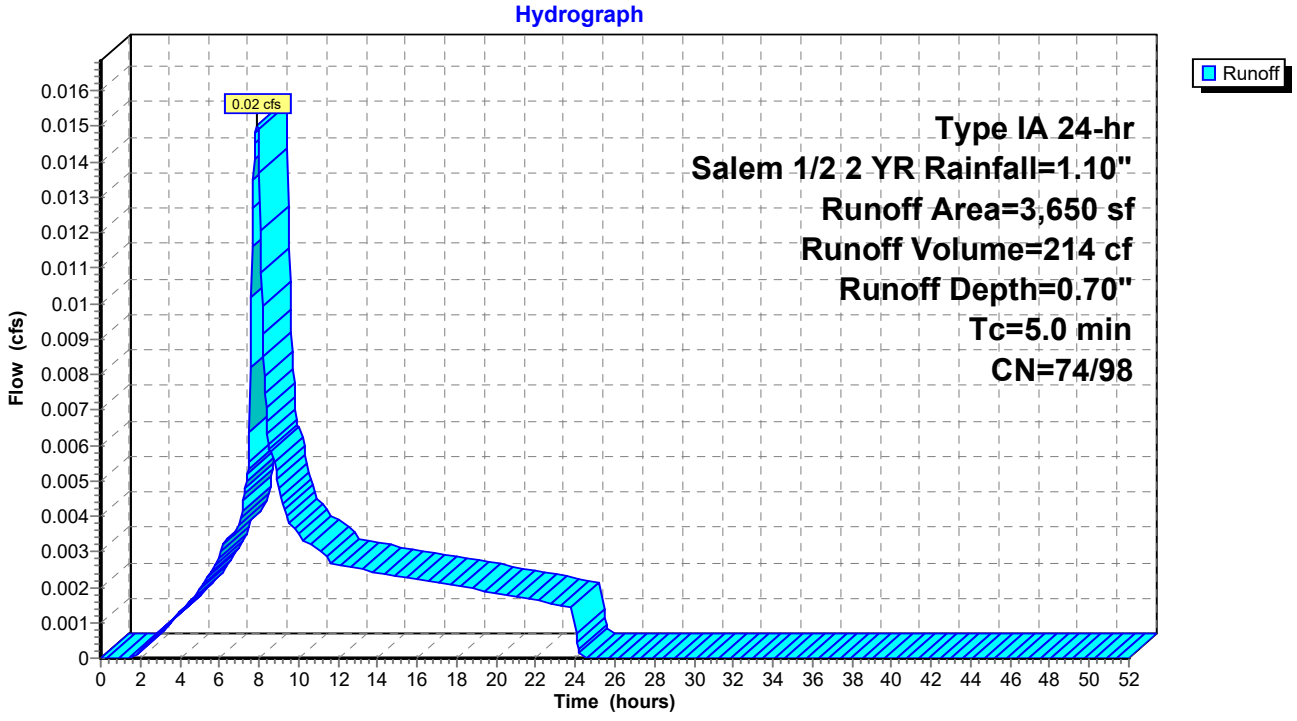
Runoff = 0.02 cfs @ 7.91 hrs, Volume= 214 cf, Depth= 0.70"
Routed to Pond 18P : WQ GSI 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
*	2,850	98	
*	800	74	
	3,650	93	Weighted Average
	800	74	21.92% Pervious Area
	2,850	98	78.08% Impervious Area

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

Subcatchment B3WQ: Developed Basin 3



Summary for Subcatchment PD1: Predevelopment Basin 1

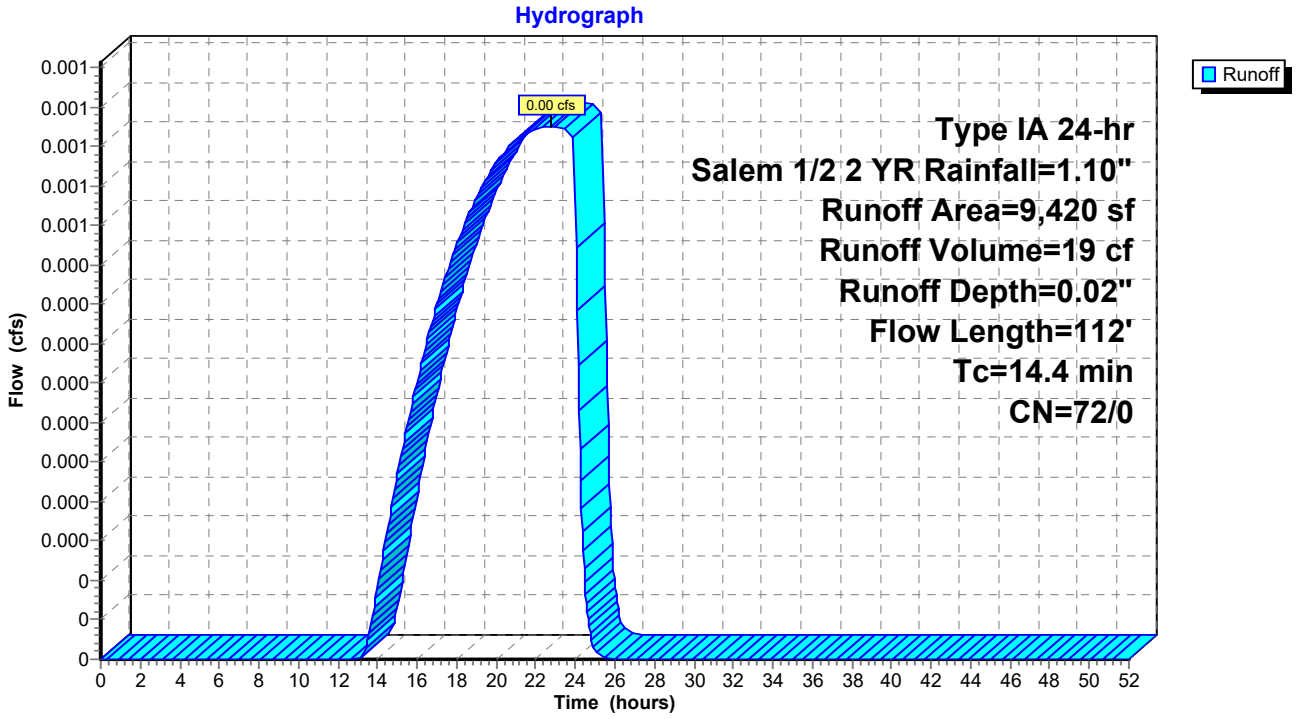
Runoff = 0.00 cfs @ 22.75 hrs, Volume= 19 cf, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
*	9,420	72	
	9,420	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0500	0.12		**Sheet Flow,** n= 0.300 P2= 2.20"
0.1	12	0.0800	1.41		**Shallow Concentrated Flow,** Kv= 5.0 fps
14.4	112	Total			

Subcatchment PD1: Predevelopment Basin 1



Summary for Subcatchment PD3: Predevelopment Basin 3

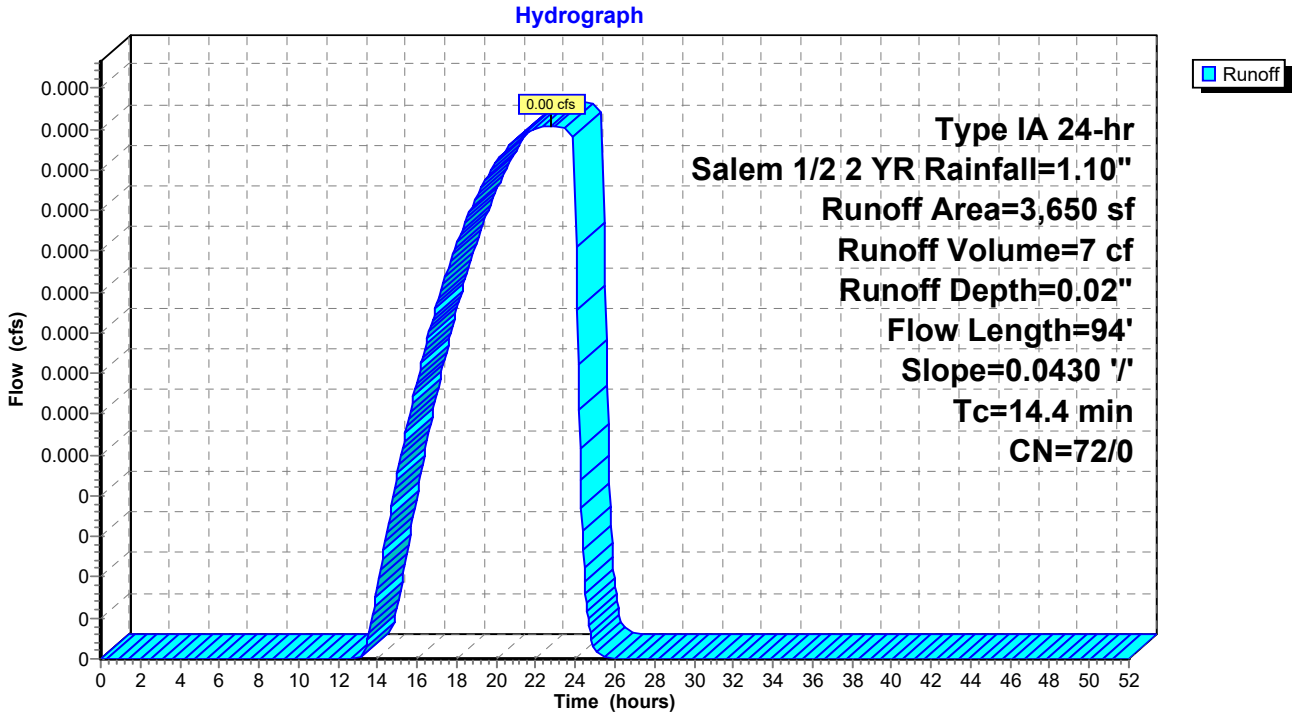
Runoff = 0.00 cfs @ 22.75 hrs, Volume= 7 cf, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
*	3,650	72	
	3,650	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	94	0.0430	0.11		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment PD3: Predevelopment Basin 3



Summary for Pond 3P: GSI 1

Inflow Area = 9,420 sf, 64.97% Impervious, Inflow Depth = 0.59" for Salem 1/2 2 YR event
Inflow = 0.03 cfs @ 7.91 hrs, Volume= 464 cf
Outflow = 0.01 cfs @ 11.37 hrs, Volume= 464 cf, Atten= 81%, Lag= 207.3 min
Discarded = 0.00 cfs @ 3.24 hrs, Volume= 143 cf
Primary = 0.00 cfs @ 11.37 hrs, Volume= 321 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 403.05' @ 11.37 hrs Surf.Area= 600 sf Storage= 134 cf

Plug-Flow detention time= 281.6 min calculated for 464 cf (100% of inflow)
Center-of-Mass det. time= 281.7 min (1,000.3 - 718.6)

Volume	Invert	Avail.Storage	Storage Description
#1	402.49'	1,551 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

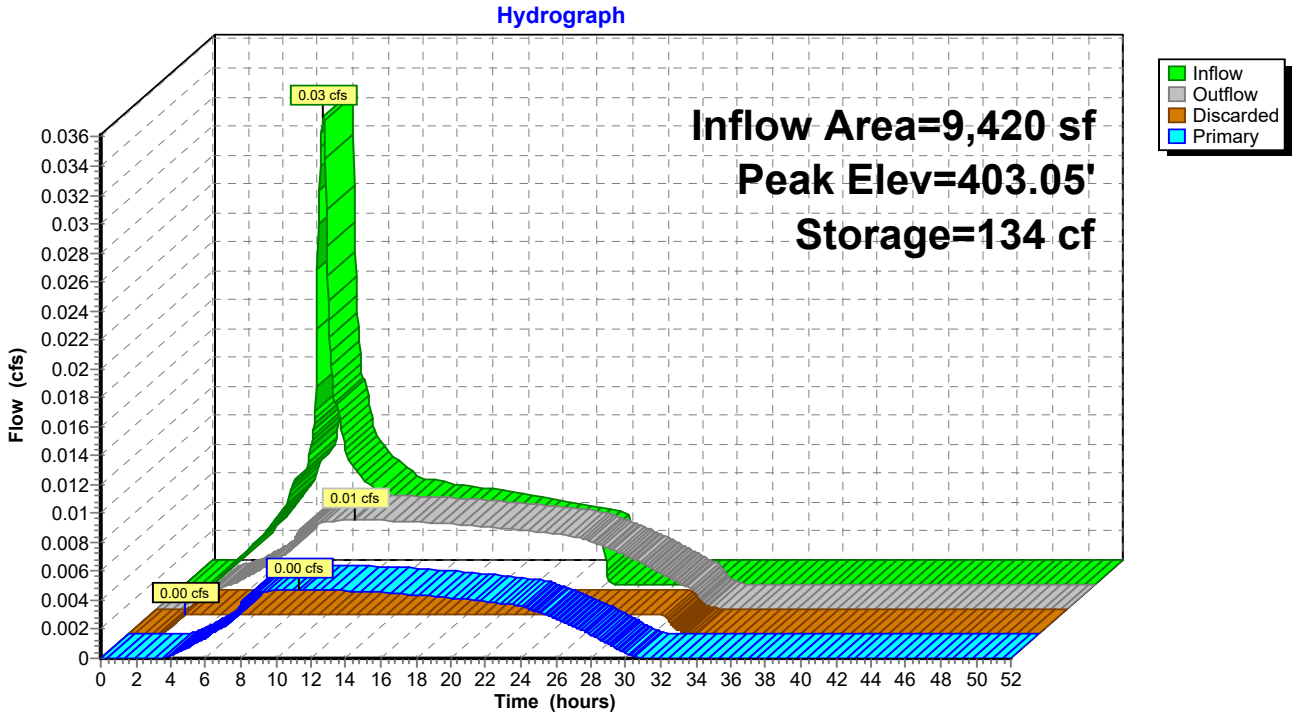
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
402.49	600	0.0	0	0
402.50	600	40.0	2	2
403.24	600	40.0	178	180
403.25	600	0.0	0	180
404.99	0	0.0	0	180
405.00	200	100.0	1	181
406.00	370	100.0	285	466
407.00	600	100.0	485	951
408.00	600	100.0	600	1,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	402.49'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	402.50'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	405.58'	**1.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 3.24 hrs HW=402.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 11.37 hrs HW=403.05' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 3.50 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: GSI 1


Hydrograph
Inflow Area=9,420 sf
Peak Elev=403.05'
Storage=134 cf
Inflow
Outflow
Discarded
Primary
0.03 cfs
0.01 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
0.036
0.034
0.032
0.03
0.028
0.026
0.024
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Time (hours)

Summary for Pond 8P: GSI 2

Inflow Area = 3,650 sf, 78.08% Impervious, Inflow Depth = 0.70" for Salem 1/2 2 YR event
Inflow = 0.02 cfs @ 7.91 hrs, Volume= 214 cf
Outflow = 0.00 cfs @ 9.26 hrs, Volume= 214 cf, Atten= 72%, Lag= 81.0 min
Discarded = 0.00 cfs @ 3.56 hrs, Volume= 80 cf
Primary = 0.00 cfs @ 9.26 hrs, Volume= 134 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 400.54' @ 9.26 hrs Surf.Area= 340 sf Storage= 54 cf

Plug-Flow detention time= 192.3 min calculated for 213 cf (100% of inflow)
Center-of-Mass det. time= 192.5 min (906.3 - 713.8)

Volume	Invert	Avail.Storage	Storage Description
#1	400.14'	1,041 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

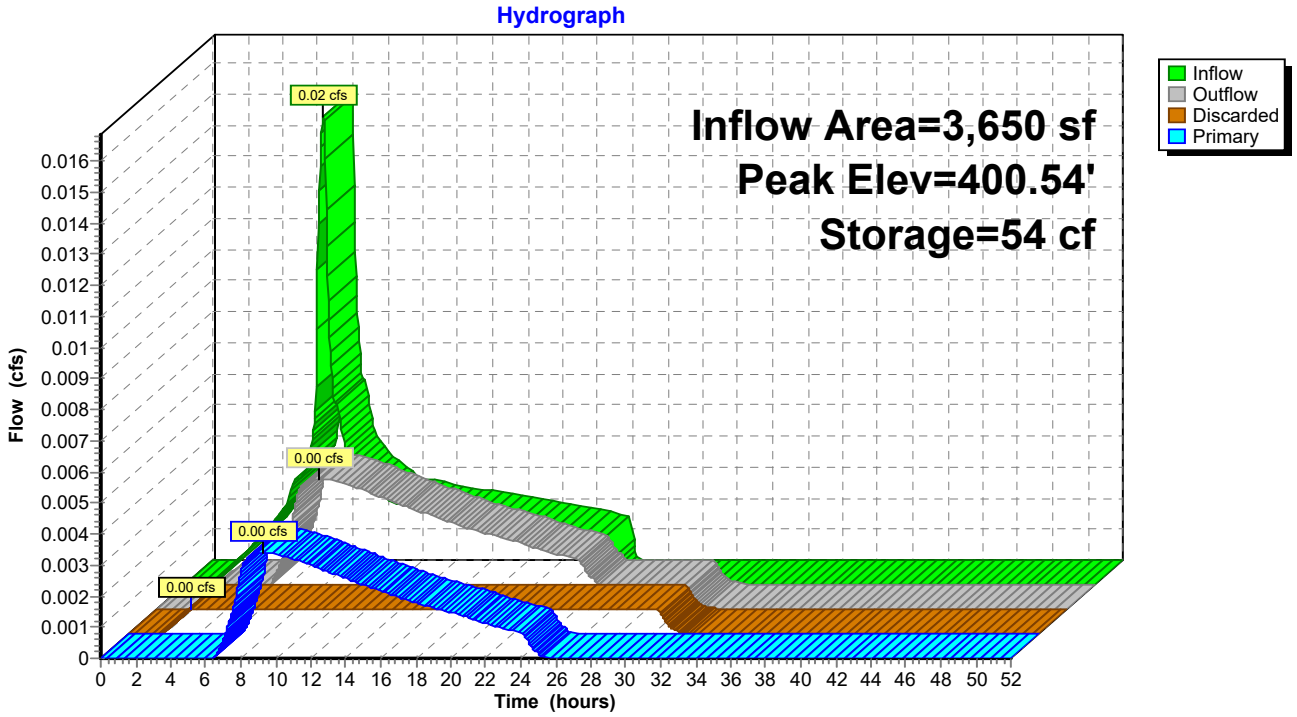
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.14	340	0.0	0	0
400.15	340	40.0	1	1
400.74	340	40.0	80	82
400.75	340	0.0	0	82
402.49	10	0.0	0	82
402.50	45	100.0	0	82
403.00	130	100.0	44	126
404.00	340	100.0	235	361
406.00	340	100.0	680	1,041

Device	Routing	Invert	Outlet Devices
#1	Discarded	400.14'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	400.25'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	403.15'	**0.5" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

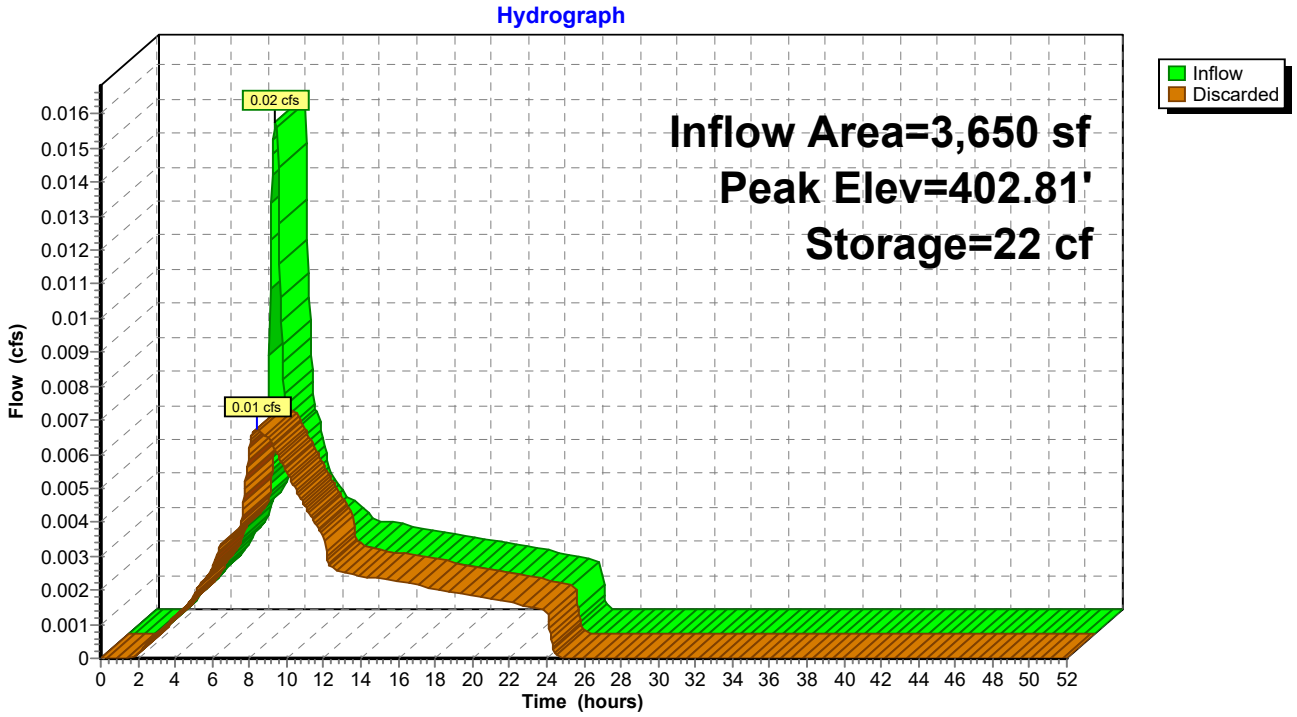
Discarded OutFlow Max=0.00 cfs @ 3.56 hrs HW=400.15' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 9.26 hrs HW=400.54' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 2.49 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 8P: GSI 2


Hydrograph
Inflow Area=3,650 sf
Peak Elev=400.54'
Storage=54 cf
0.02 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0.016
0.015
0.014
0.013
0.012
0.011
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Time (hours)

Pond 18P: WQ GSI 2



Summary for Subcatchment B1: Developed Basin 1

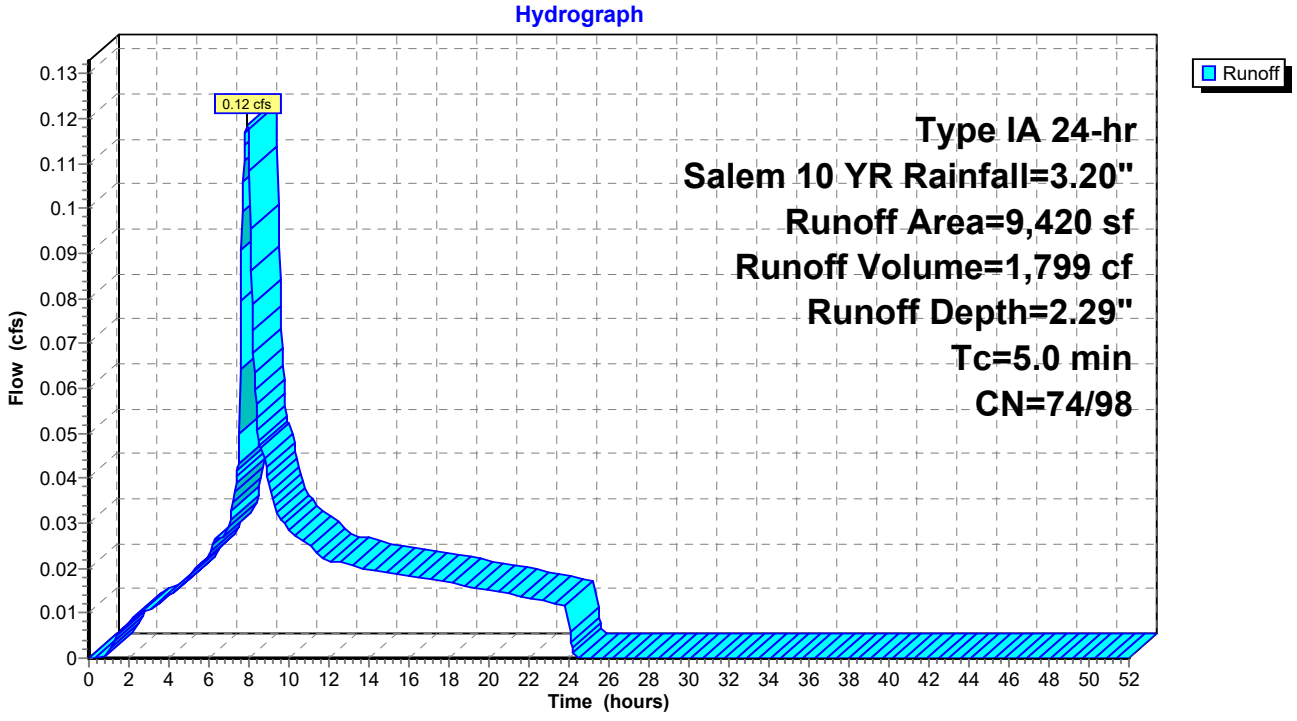
Runoff = 0.12 cfs @ 7.92 hrs, Volume= 1,799 cf, Depth= 2.29"
Routed to Pond 3P : GSI 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
*	6,120	98	
*	3,300	74	
	9,420	90	Weighted Average
	3,300	74	35.03% Pervious Area
	6,120	98	64.97% Impervious Area

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

Subcatchment B1: Developed Basin 1



Summary for Subcatchment B3: Developed Basin 3

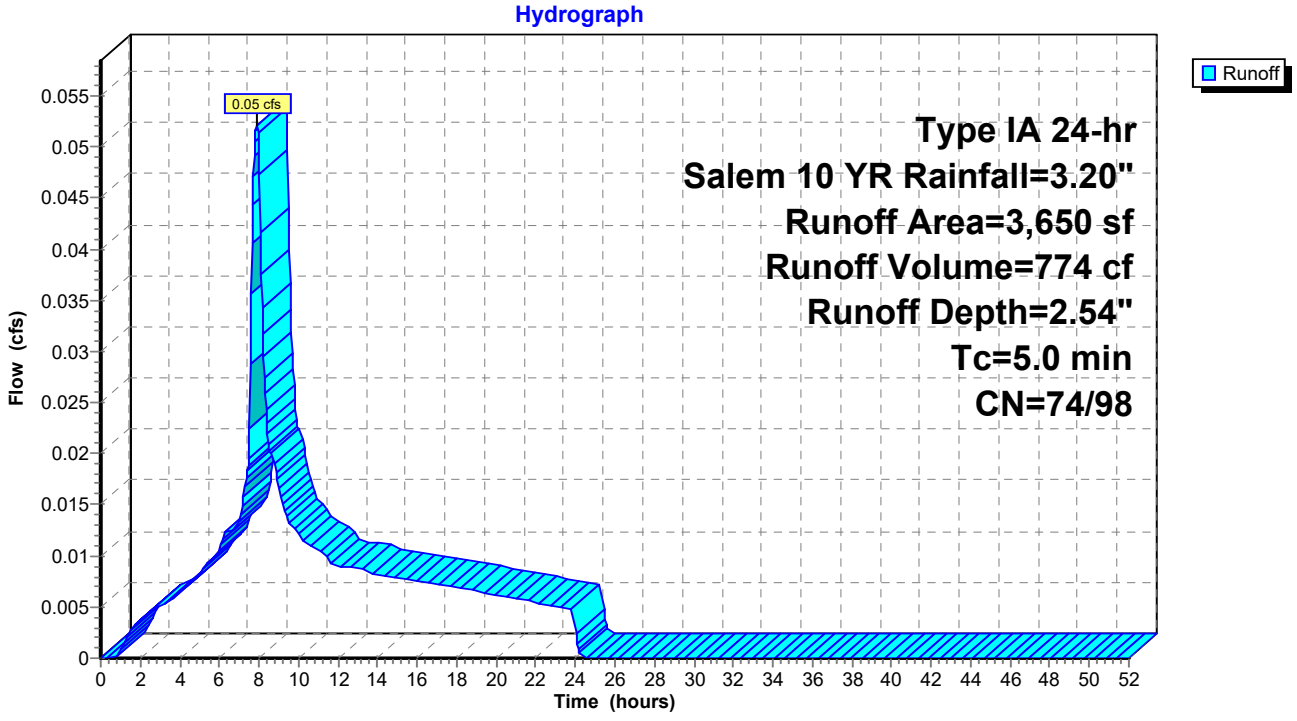
Runoff = 0.05 cfs @ 7.91 hrs, Volume= 774 cf, Depth= 2.54"
Routed to Pond 8P : GSI 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
*	2,850	98	
*	800	74	
	3,650	93	Weighted Average
	800	74	21.92% Pervious Area
	2,850	98	78.08% Impervious Area

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

Subcatchment B3: Developed Basin 3



Summary for Subcatchment PD1: Predevelopment Basin 1

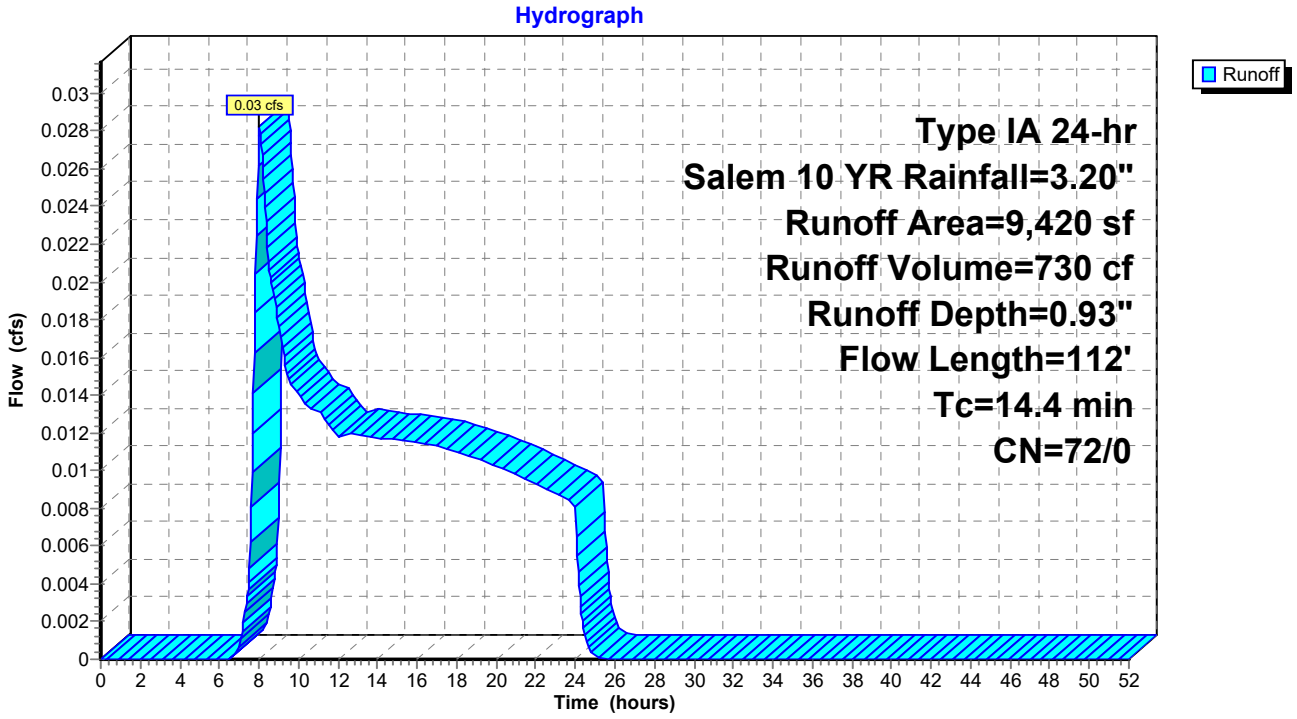
Runoff = 0.03 cfs @ 8.04 hrs, Volume= 730 cf, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
*	9,420	72	
	9,420	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0500	0.12		**Sheet Flow,** n= 0.300 P2= 2.20"
0.1	12	0.0800	1.41		**Shallow Concentrated Flow,** Kv= 5.0 fps
14.4	112	Total			

Subcatchment PD1: Predevelopment Basin 1



Summary for Subcatchment PD3: Predevelopment Basin 3

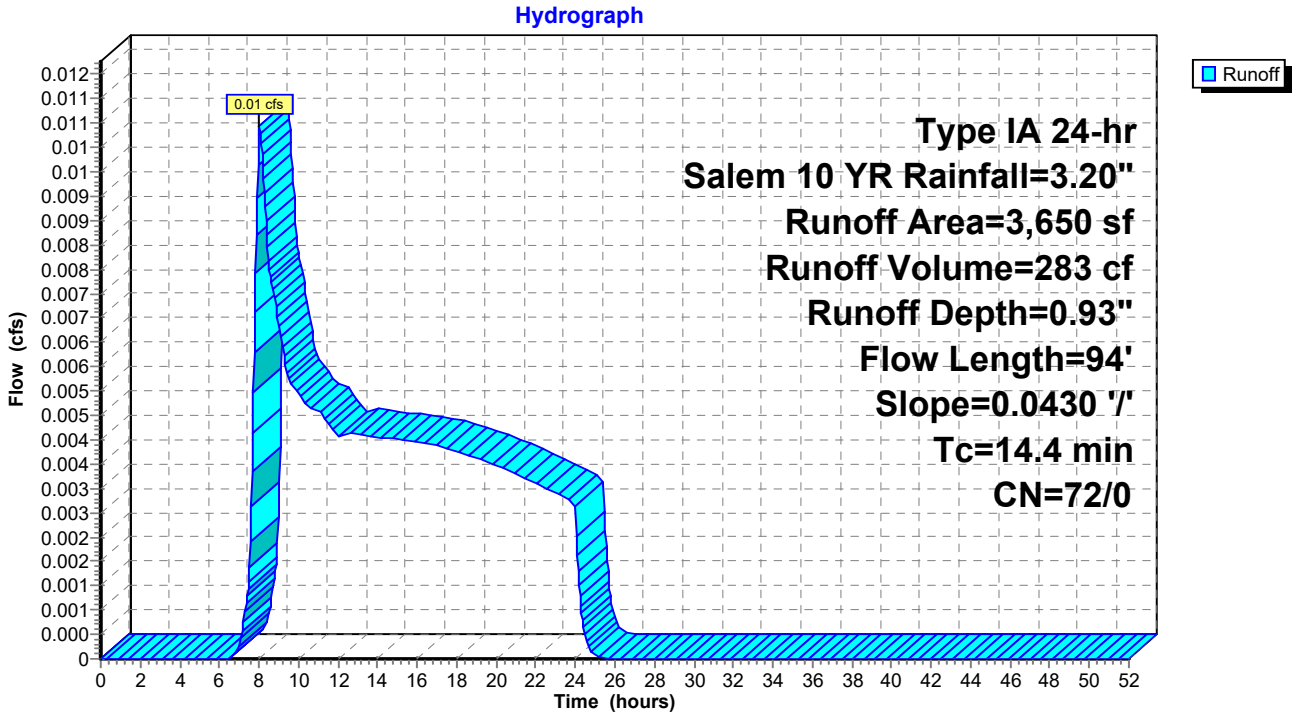
Runoff = 0.01 cfs @ 8.04 hrs, Volume= 283 cf, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
*	3,650	72	
	3,650	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	94	0.0430	0.11		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment PD3: Predevelopment Basin 3



Summary for Pond 3P: GSI 1

Inflow Area = 9,420 sf, 64.97% Impervious, Inflow Depth = 2.29" for Salem 10 YR event
Inflow = 0.12 cfs @ 7.92 hrs, Volume= 1,799 cf
Outflow = 0.04 cfs @ 9.15 hrs, Volume= 1,799 cf, Atten= 70%, Lag= 74.1 min
Discarded = 0.00 cfs @ 1.28 hrs, Volume= 139 cf
Primary = 0.03 cfs @ 9.15 hrs, Volume= 1,660 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 406.08' @ 9.15 hrs Surf.Area= 389 sf Storage= 497 cf

Plug-Flow detention time= 285.7 min calculated for 1,799 cf (100% of inflow)
Center-of-Mass det. time= 285.5 min (983.0 - 697.5)

Volume	Invert	Avail.Storage	Storage Description
#1	402.49'	1,551 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

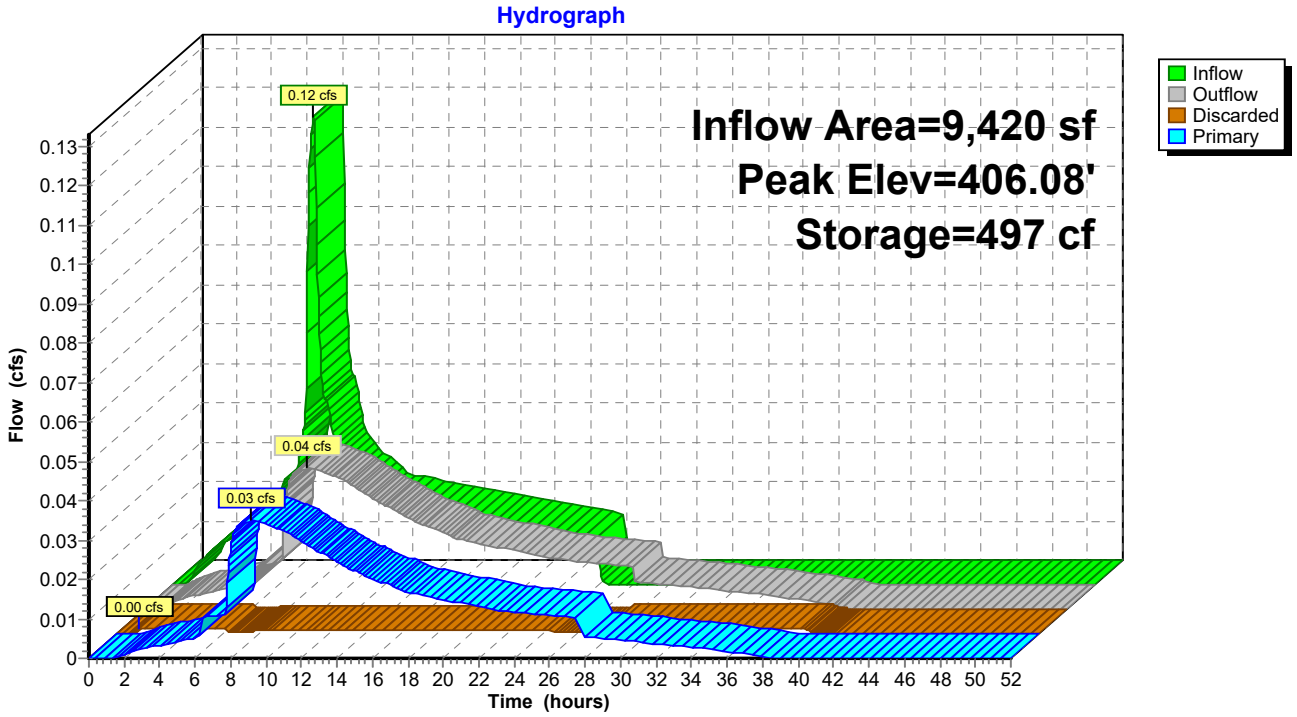
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
402.49	600	0.0	0	0
402.50	600	40.0	2	2
403.24	600	40.0	178	180
403.25	600	0.0	0	180
404.99	0	0.0	0	180
405.00	200	100.0	1	181
406.00	370	100.0	285	466
407.00	600	100.0	485	951
408.00	600	100.0	600	1,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	402.49'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	402.50'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	405.58'	**1.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 1.28 hrs HW=402.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.03 cfs @ 9.15 hrs HW=406.08' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 9.09 fps)
└**3=Orifice/Grate** (Orifice Controls 0.02 cfs @ 3.41 fps)

Pond 3P: GSI 1


Hydrograph
Inflow Area=9,420 sf
Peak Elev=406.08'
Storage=497 cf
Inflow
Outflow
Discarded
Primary
0.12 cfs
0.04 cfs
0.03 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond 8P: GSI 2

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=42)

Inflow Area = 3,650 sf, 78.08% Impervious, Inflow Depth = 2.54" for Salem 10 YR event
Inflow = 0.05 cfs @ 7.91 hrs, Volume= 774 cf
Outflow = 0.02 cfs @ 9.15 hrs, Volume= 774 cf, Atten= 71%, Lag= 74.4 min
Discarded = 0.00 cfs @ 1.36 hrs, Volume= 77 cf
Primary = 0.01 cfs @ 9.15 hrs, Volume= 697 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 403.39' @ 9.15 hrs Surf.Area= 213 sf Storage= 193 cf

Plug-Flow detention time= 198.0 min calculated for 773 cf (100% of inflow)
Center-of-Mass det. time= 198.4 min (882.2 - 683.8)

Volume	Invert	Avail.Storage	Storage Description
#1	400.14'	1,041 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

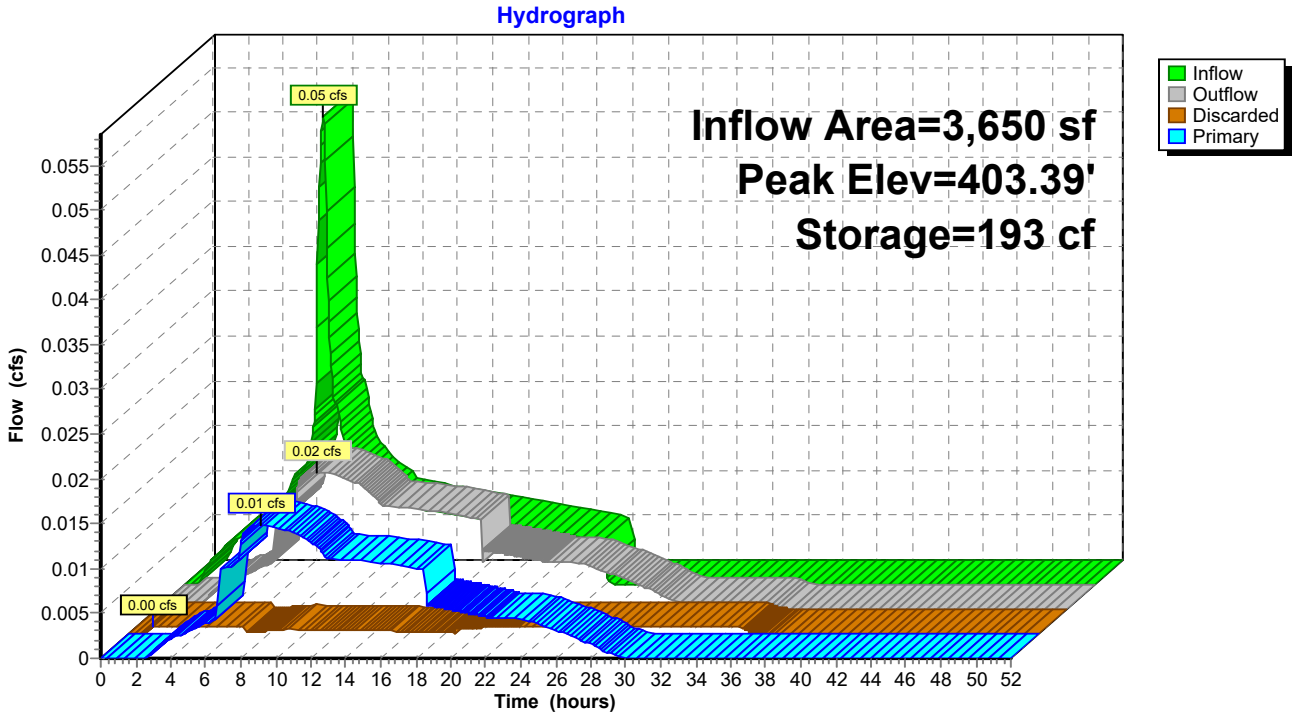
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.14	340	0.0	0	0
400.15	340	40.0	1	1
400.74	340	40.0	80	82
400.75	340	0.0	0	82
402.49	10	0.0	0	82
402.50	45	100.0	0	82
403.00	130	100.0	44	126
404.00	340	100.0	235	361
406.00	340	100.0	680	1,041

Device	Routing	Invert	Outlet Devices
#1	Discarded	400.14'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	400.25'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	403.15'	**0.5" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 1.36 hrs HW=400.15' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.01 cfs @ 9.15 hrs HW=403.39' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 8.51 fps)
└**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 2.38 fps)

Pond 8P: GSI 2


Hydrograph
Inflow Area=3,650 sf
Peak Elev=403.39'
Storage=193 cf
0.05 cfs
0.02 cfs
0.01 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0 0.005 0.01 0.015 0.02 0.025 0.03 0.035 0.04 0.045 0.05 0.055
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52

Summary for Subcatchment B1: Developed Basin 1

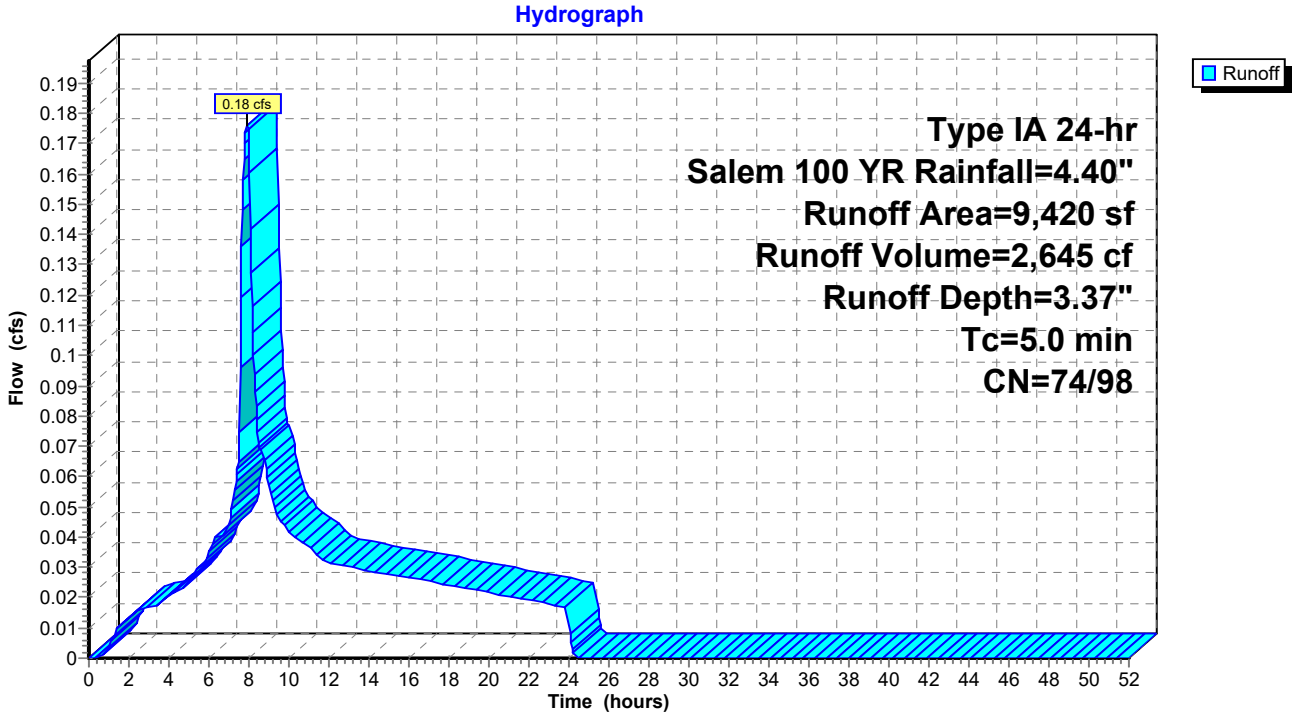
Runoff = 0.18 cfs @ 7.91 hrs, Volume= 2,645 cf, Depth= 3.37"
Routed to Pond 3P : GSI 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

	Area (sf)	CN	Description
*	6,120	98	
*	3,300	74	
	9,420	90	Weighted Average
	3,300	74	35.03% Pervious Area
	6,120	98	64.97% Impervious Area

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

Subcatchment B1: Developed Basin 1



Summary for Subcatchment B3: Developed Basin 3

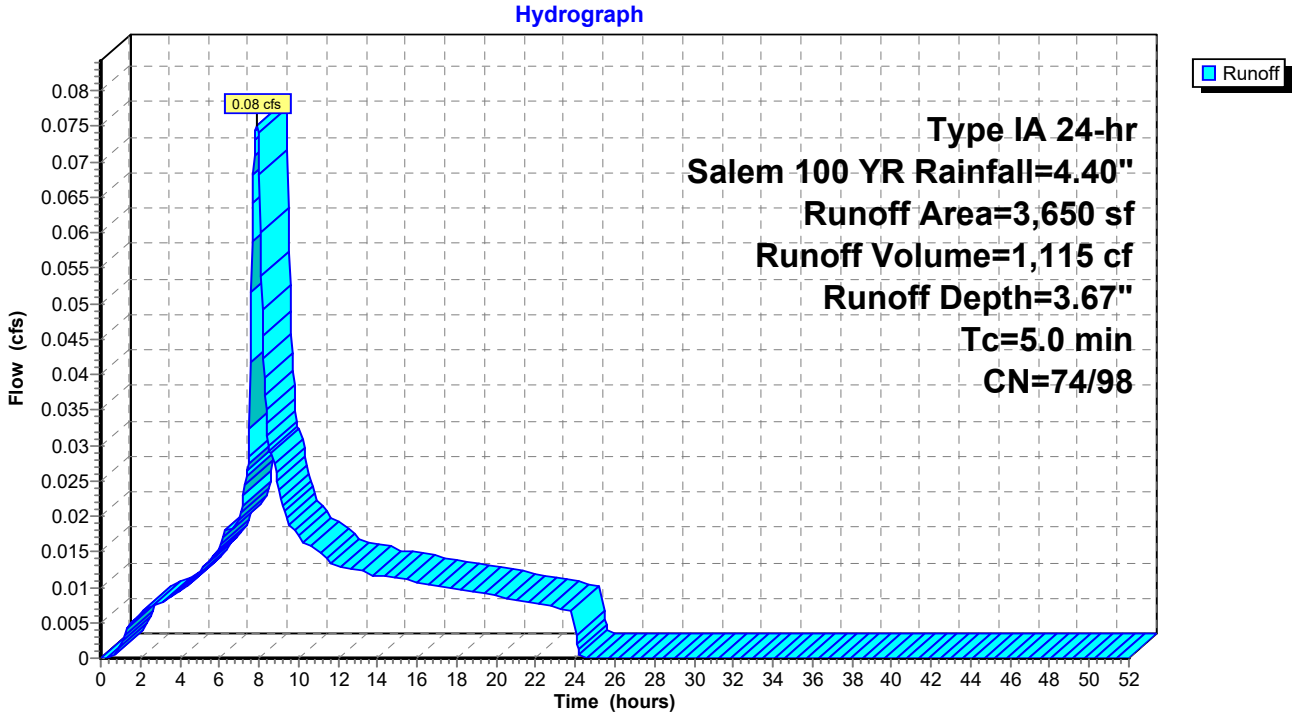
Runoff = 0.08 cfs @ 7.90 hrs, Volume= 1,115 cf, Depth= 3.67"
Routed to Pond 8P : GSI 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

	Area (sf)	CN	Description
*	2,850	98	
*	800	74	
	3,650	93	Weighted Average
	800	74	21.92% Pervious Area
	2,850	98	78.08% Impervious Area

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

Subcatchment B3: Developed Basin 3



Summary for Subcatchment PD1: Predevelopment Basin 1

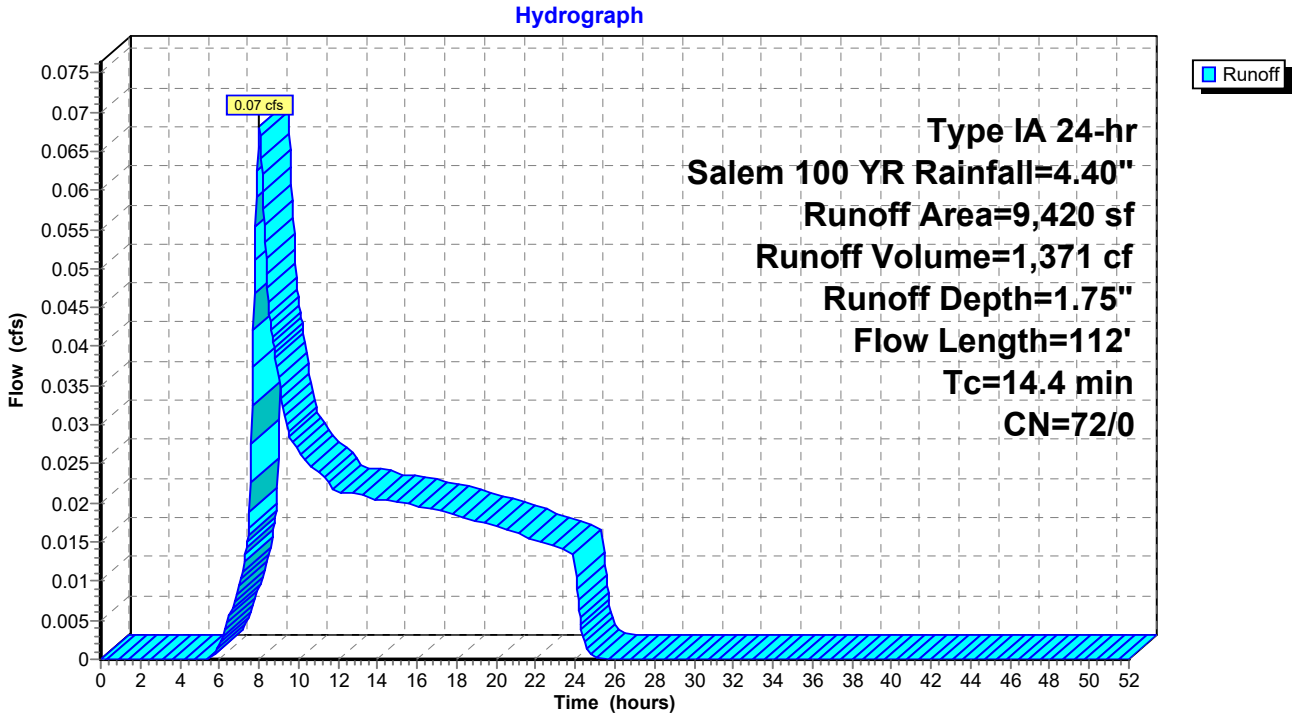
Runoff = 0.07 cfs @ 8.02 hrs, Volume= 1,371 cf, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

	Area (sf)	CN	Description
*	9,420	72	
	9,420	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0500	0.12		**Sheet Flow,** n= 0.300 P2= 2.20"
0.1	12	0.0800	1.41		**Shallow Concentrated Flow,** Kv= 5.0 fps
14.4	112	Total			

Subcatchment PD1: Predevelopment Basin 1



Summary for Subcatchment PD3: Predevelopment Basin 3

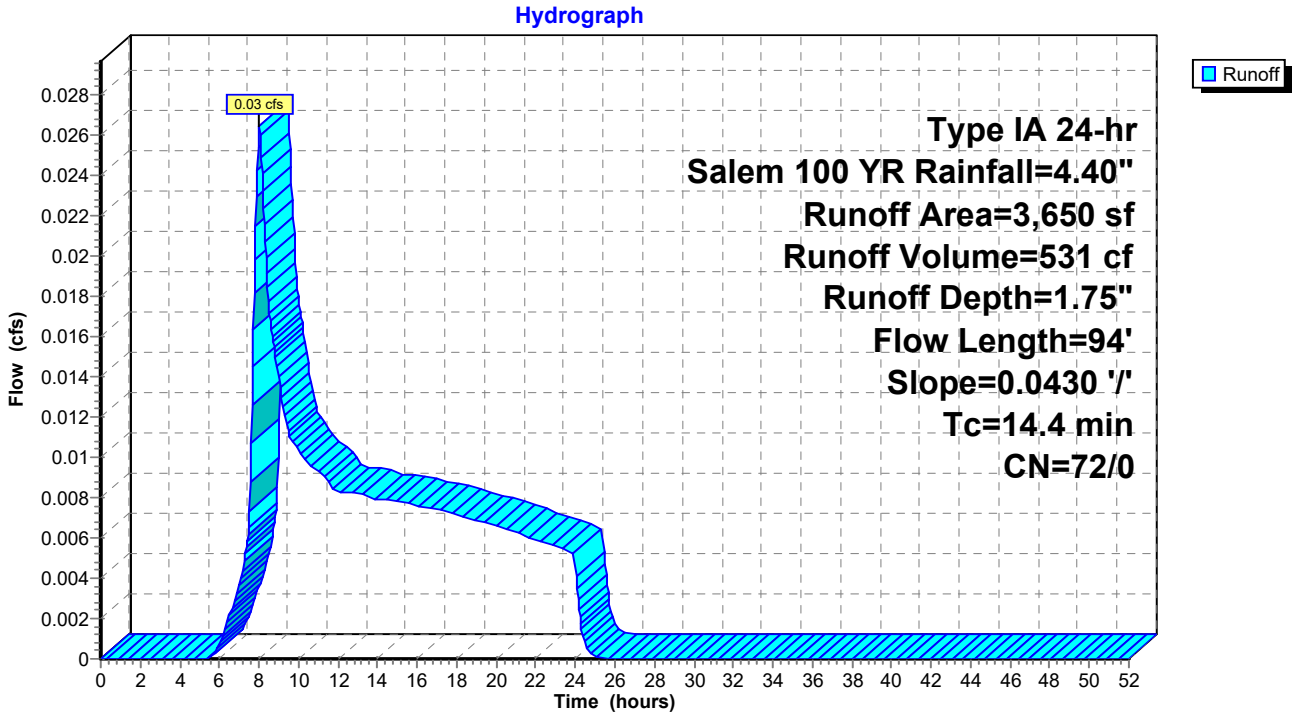
Runoff = 0.03 cfs @ 8.02 hrs, Volume= 531 cf, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

	Area (sf)	CN	Description
*	3,650	72	
	3,650	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	94	0.0430	0.11		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment PD3: Predevelopment Basin 3



Summary for Pond 3P: GSI 1

Inflow Area = 9,420 sf, 64.97% Impervious, Inflow Depth = 3.37" for Salem 100 YR event
Inflow = 0.18 cfs @ 7.91 hrs, Volume= 2,645 cf
Outflow = 0.05 cfs @ 9.37 hrs, Volume= 2,645 cf, Atten= 73%, Lag= 87.5 min
Discarded = 0.00 cfs @ 1.04 hrs, Volume= 148 cf
Primary = 0.05 cfs @ 9.37 hrs, Volume= 2,497 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 406.65' @ 9.37 hrs Surf.Area= 518 sf Storage= 753 cf

Plug-Flow detention time= 261.4 min calculated for 2,645 cf (100% of inflow)
Center-of-Mass det. time= 261.2 min (952.2 - 691.0)

Volume	Invert	Avail.Storage	Storage Description
#1	402.49'	1,551 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

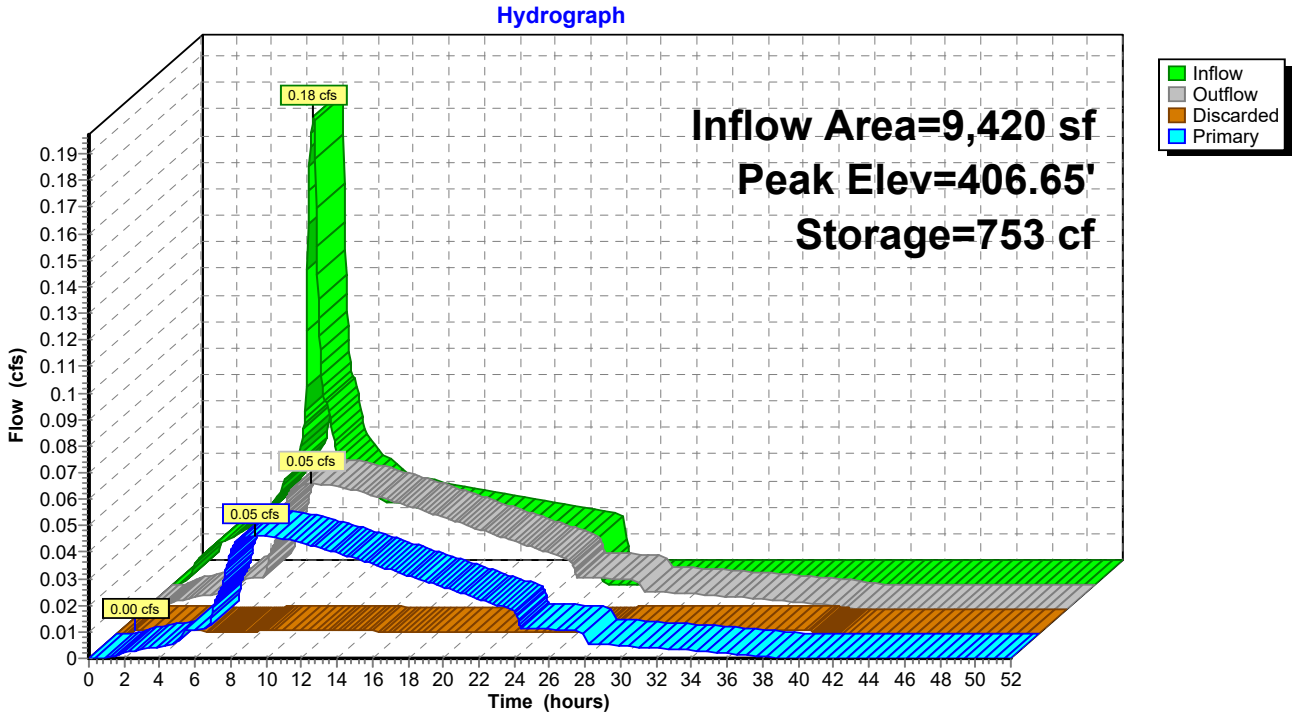
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
402.49	600	0.0	0	0
402.50	600	40.0	2	2
403.24	600	40.0	178	180
403.25	600	0.0	0	180
404.99	0	0.0	0	180
405.00	200	100.0	1	181
406.00	370	100.0	285	466
407.00	600	100.0	485	951
408.00	600	100.0	600	1,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	402.49'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	402.50'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	405.58'	**1.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 1.04 hrs HW=402.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.05 cfs @ 9.37 hrs HW=406.65' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 9.78 fps)
└**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.97 fps)

Pond 3P: GSI 1


Hydrograph
Inflow Area=9,420 sf
Peak Elev=406.65'
Storage=753 cf
Inflow
Outflow
Discarded
Primary
0.18 cfs
0.05 cfs
0.05 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond 8P: GSI 2

Inflow Area = 3,650 sf, 78.08% Impervious, Inflow Depth = 3.67" for Salem 100 YR event
Inflow = 0.08 cfs @ 7.90 hrs, Volume= 1,115 cf
Outflow = 0.02 cfs @ 9.75 hrs, Volume= 1,115 cf, Atten= 76%, Lag= 110.8 min
Discarded = 0.00 cfs @ 1.08 hrs, Volume= 76 cf
Primary = 0.02 cfs @ 9.75 hrs, Volume= 1,039 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 403.81' @ 9.75 hrs Surf.Area= 300 sf Storage= 300 cf

Plug-Flow detention time= 219.2 min calculated for 1,115 cf (100% of inflow)
Center-of-Mass det. time= 219.6 min (896.6 - 677.1)

Volume	Invert	Avail.Storage	Storage Description
#1	400.14'	1,041 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

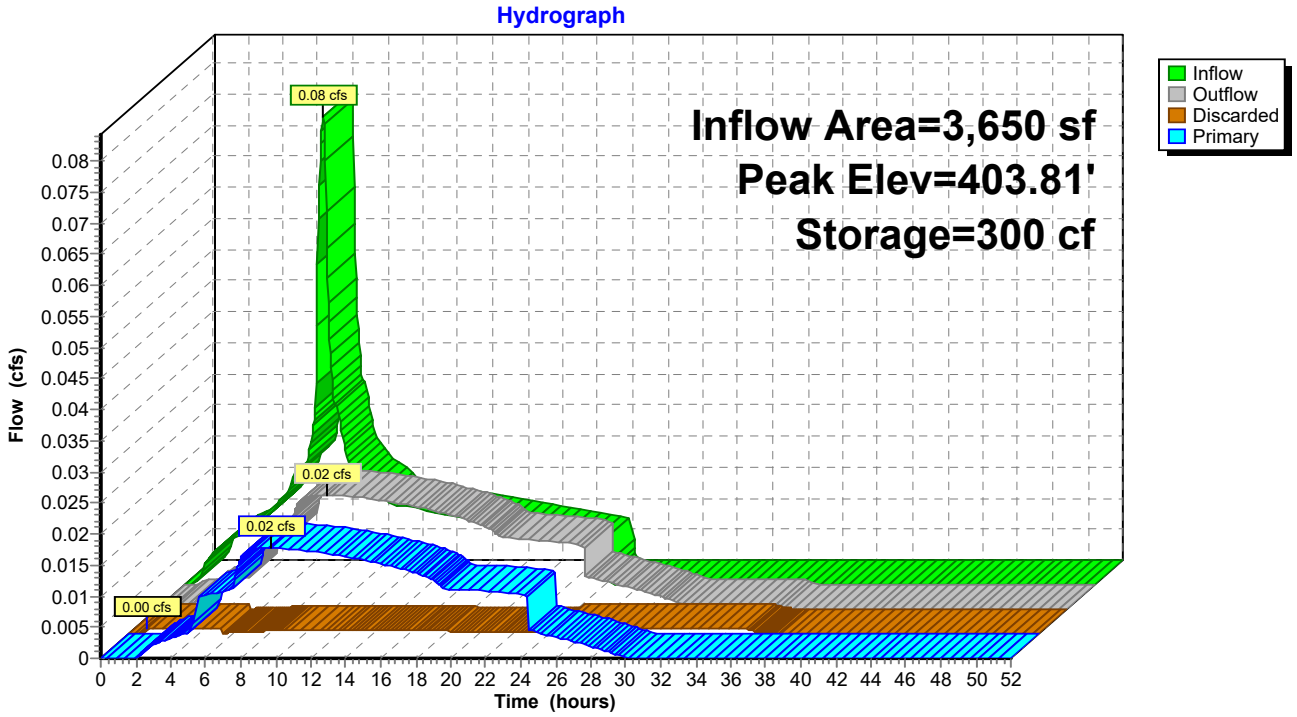
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.14	340	0.0	0	0
400.15	340	40.0	1	1
400.74	340	40.0	80	82
400.75	340	0.0	0	82
402.49	10	0.0	0	82
402.50	45	100.0	0	82
403.00	130	100.0	44	126
404.00	340	100.0	235	361
406.00	340	100.0	680	1,041

Device	Routing	Invert	Outlet Devices
#1	Discarded	400.14'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	400.25'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	403.15'	**0.5" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 1.08 hrs HW=400.15' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.02 cfs @ 9.75 hrs HW=403.81' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 9.06 fps)
└**3=Orifice/Grate** (Orifice Controls 0.01 cfs @ 3.92 fps)

Pond 8P: GSI 2


Hydrograph
Inflow Area=3,650 sf
Peak Elev=403.81'
Storage=300 cf
Inflow
Outflow
Discarded
Primary
0.08 cfs
0.02 cfs
0.02 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Subcatchment B1: Developed Basin 1

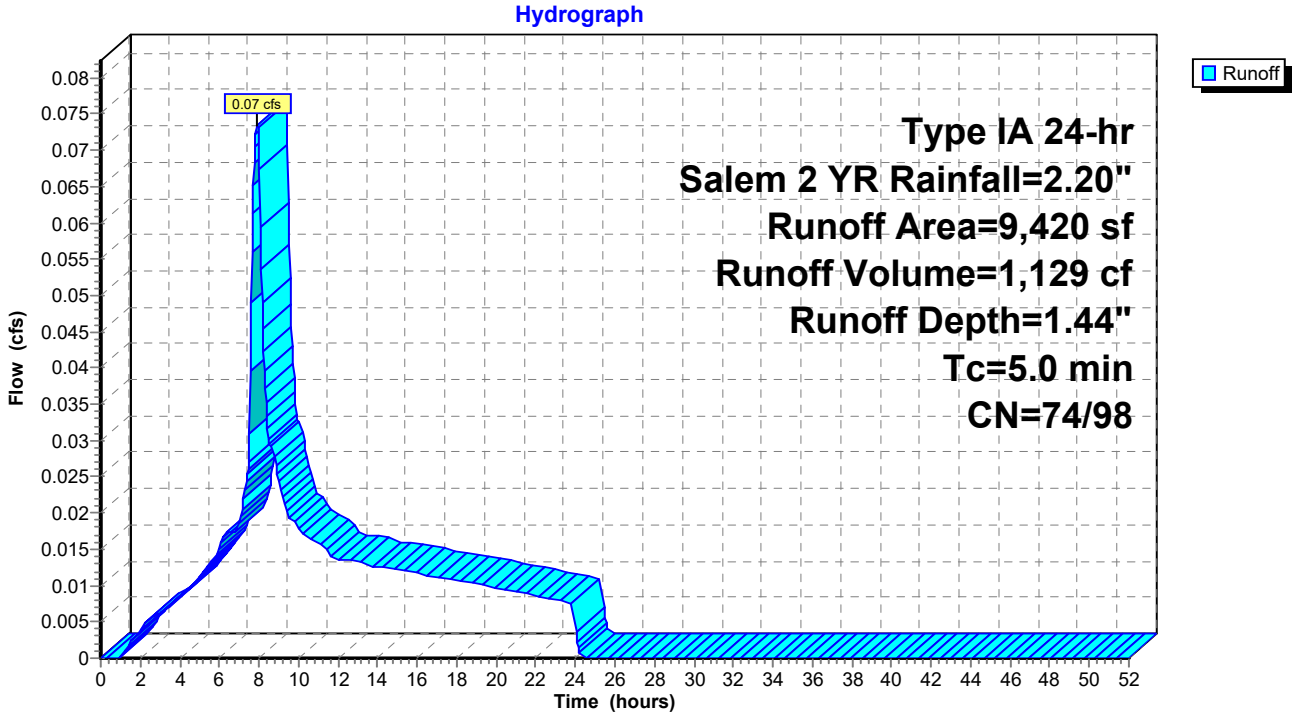
Runoff = 0.07 cfs @ 7.92 hrs, Volume= 1,129 cf, Depth= 1.44"
Routed to Pond 3P : GSI 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 2 YR Rainfall=2.20"

	Area (sf)	CN	Description
*	6,120	98	
*	3,300	74	
	9,420	90	Weighted Average
	3,300	74	35.03% Pervious Area
	6,120	98	64.97% Impervious Area

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

Subcatchment B1: Developed Basin 1



Summary for Subcatchment B3: Developed Basin 3

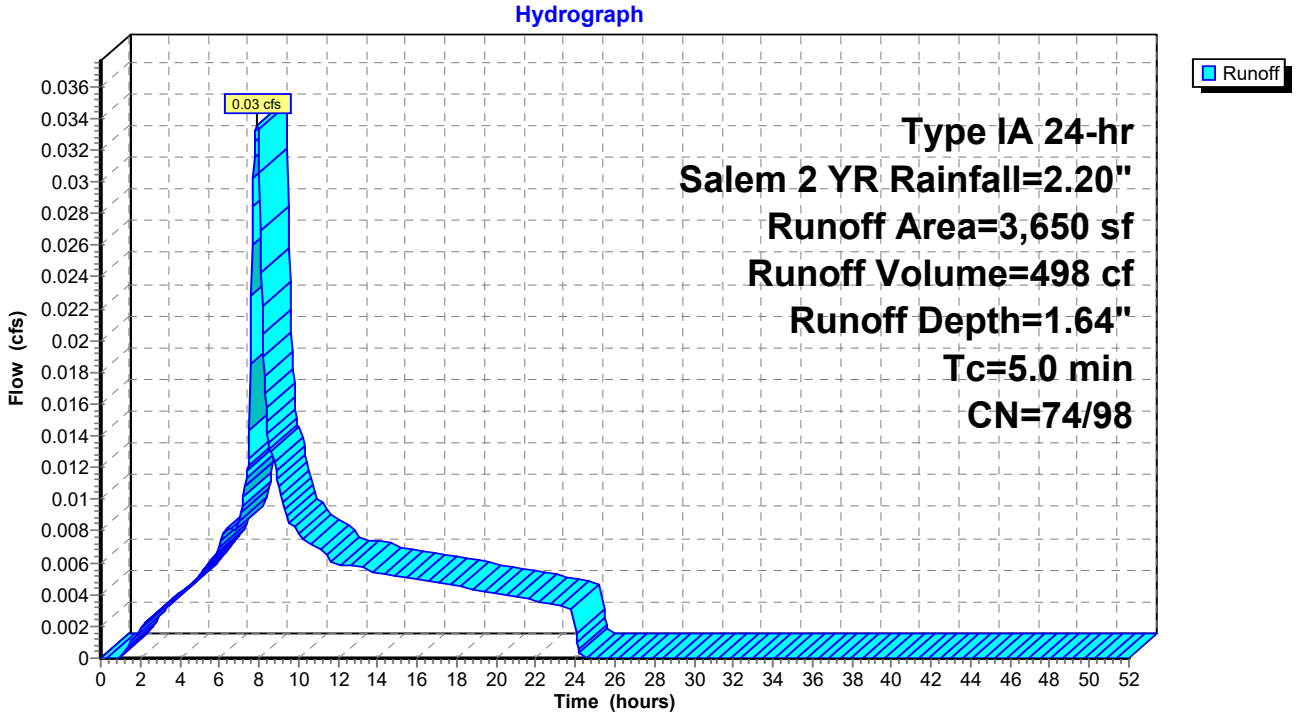
Runoff = 0.03 cfs @ 7.91 hrs, Volume= 498 cf, Depth= 1.64"
Routed to Pond 8P : GSI 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 2 YR Rainfall=2.20"

	Area (sf)	CN	Description
*	2,850	98	
*	800	74	
	3,650	93	Weighted Average
	800	74	21.92% Pervious Area
	2,850	98	78.08% Impervious Area

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

Subcatchment B3: Developed Basin 3



Summary for Subcatchment PD1: Predevelopment Basin 1

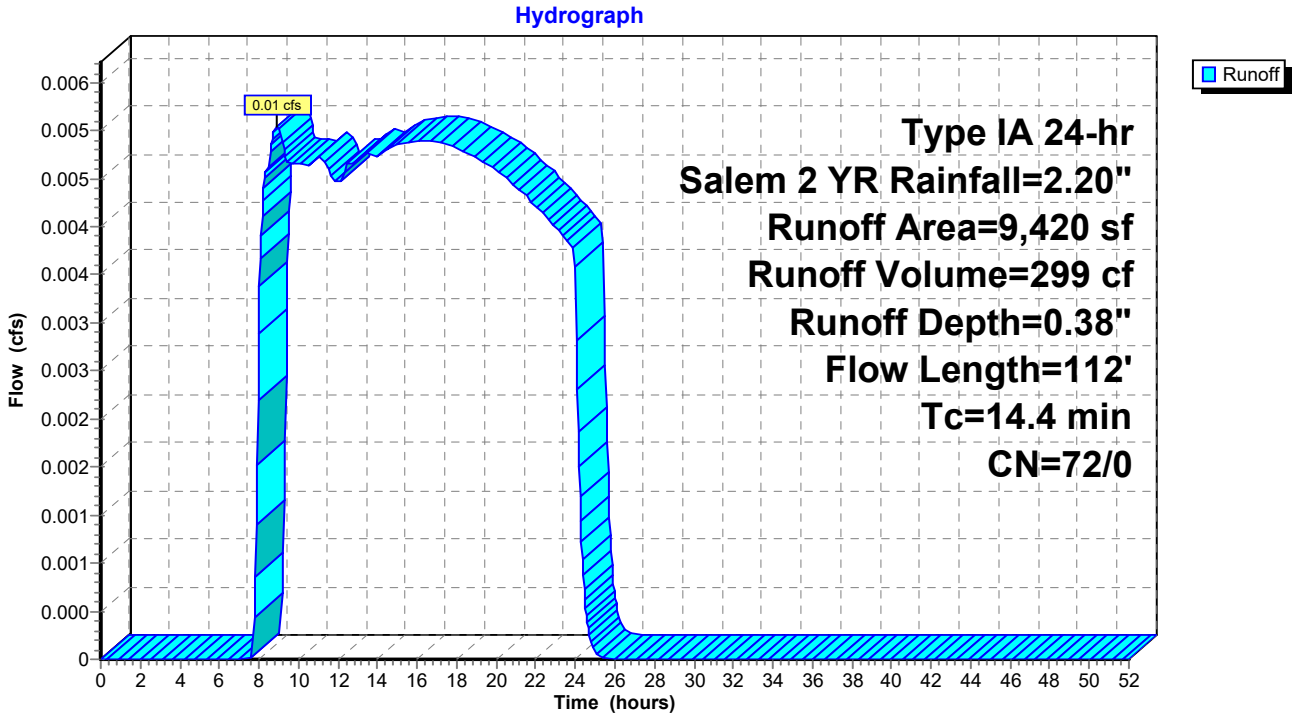
Runoff = 0.01 cfs @ 8.90 hrs, Volume= 299 cf, Depth= 0.38"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 2 YR Rainfall=2.20"

	Area (sf)	CN	Description
*	9,420	72	
	9,420	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0500	0.12		**Sheet Flow,** n= 0.300 P2= 2.20"
0.1	12	0.0800	1.41		**Shallow Concentrated Flow,** Kv= 5.0 fps
14.4	112	Total			

Subcatchment PD1: Predevelopment Basin 1



Summary for Subcatchment PD3: Predevelopment Basin 3

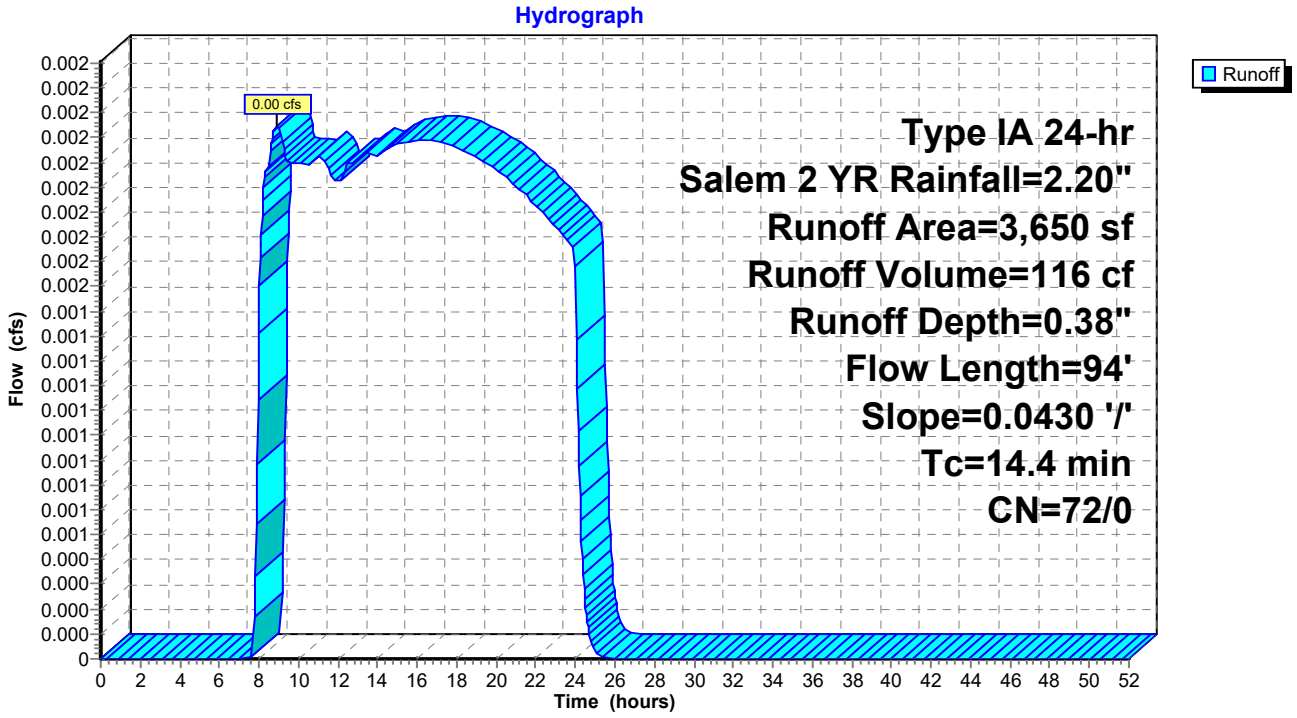
Runoff = 0.00 cfs @ 8.90 hrs, Volume= 116 cf, Depth= 0.38"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 2 YR Rainfall=2.20"

	Area (sf)	CN	Description
*	3,650	72	
	3,650	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	94	0.0430	0.11		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment PD3: Predevelopment Basin 3



Summary for Pond 3P: GSI 1

Inflow Area = 9,420 sf, 64.97% Impervious, Inflow Depth = 1.44" for Salem 2 YR event
Inflow = 0.07 cfs @ 7.92 hrs, Volume= 1,129 cf
Outflow = 0.02 cfs @ 9.71 hrs, Volume= 1,129 cf, Atten= 74%, Lag= 107.0 min
Discarded = 0.00 cfs @ 1.72 hrs, Volume= 133 cf
Primary = 0.02 cfs @ 9.71 hrs, Volume= 996 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 405.63' @ 9.71 hrs Surf.Area= 307 sf Storage= 340 cf

Plug-Flow detention time= 356.3 min calculated for 1,129 cf (100% of inflow)
Center-of-Mass det. time= 356.0 min (1,060.9 - 704.9)

Volume	Invert	Avail.Storage	Storage Description
#1	402.49'	1,551 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

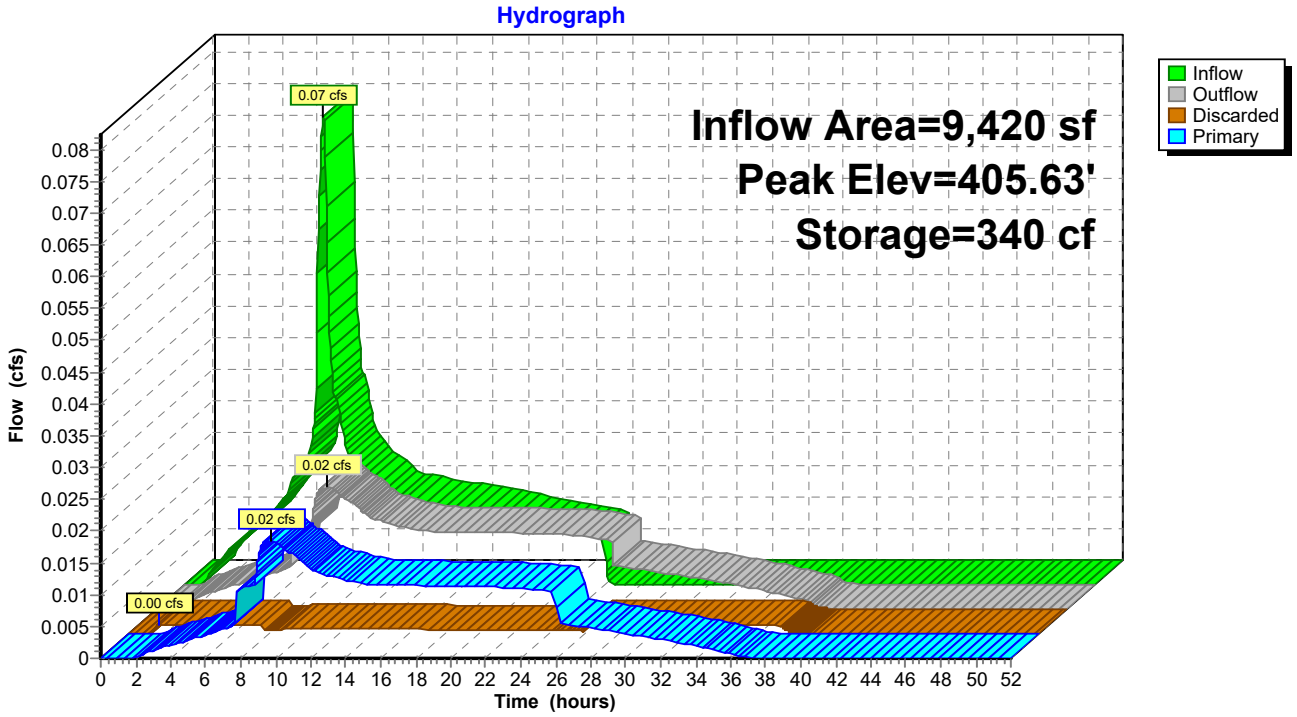
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
402.49	600	0.0	0	0
402.50	600	40.0	2	2
403.24	600	40.0	178	180
403.25	600	0.0	0	180
404.99	0	0.0	0	180
405.00	200	100.0	1	181
406.00	370	100.0	285	466
407.00	600	100.0	485	951
408.00	600	100.0	600	1,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	402.49'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	402.50'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	405.58'	**1.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 1.72 hrs HW=402.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.02 cfs @ 9.71 hrs HW=405.63' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 8.49 fps)
└**3=Orifice/Grate** (Orifice Controls 0.01 cfs @ 1.06 fps)

Pond 3P: GSI 1


Hydrograph
Inflow Area=9,420 sf
Peak Elev=405.63'
Storage=340 cf
Inflow
Outflow
Discarded
Primary
0.07 cfs
0.02 cfs
0.02 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond 8P: GSI 2

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=22)

Inflow Area = 3,650 sf, 78.08% Impervious, Inflow Depth = 1.64" for Salem 2 YR event
Inflow = 0.03 cfs @ 7.91 hrs, Volume= 498 cf
Outflow = 0.01 cfs @ 8.98 hrs, Volume= 498 cf, Atten= 67%, Lag= 63.9 min
Discarded = 0.00 cfs @ 1.80 hrs, Volume= 83 cf
Primary = 0.01 cfs @ 8.98 hrs, Volume= 415 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 402.96' @ 8.98 hrs Surf.Area= 124 sf Storage= 121 cf

Plug-Flow detention time= 206.3 min calculated for 498 cf (100% of inflow)
Center-of-Mass det. time= 206.1 min (898.8 - 692.7)

Volume	Invert	Avail.Storage	Storage Description
#1	400.14'	1,041 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

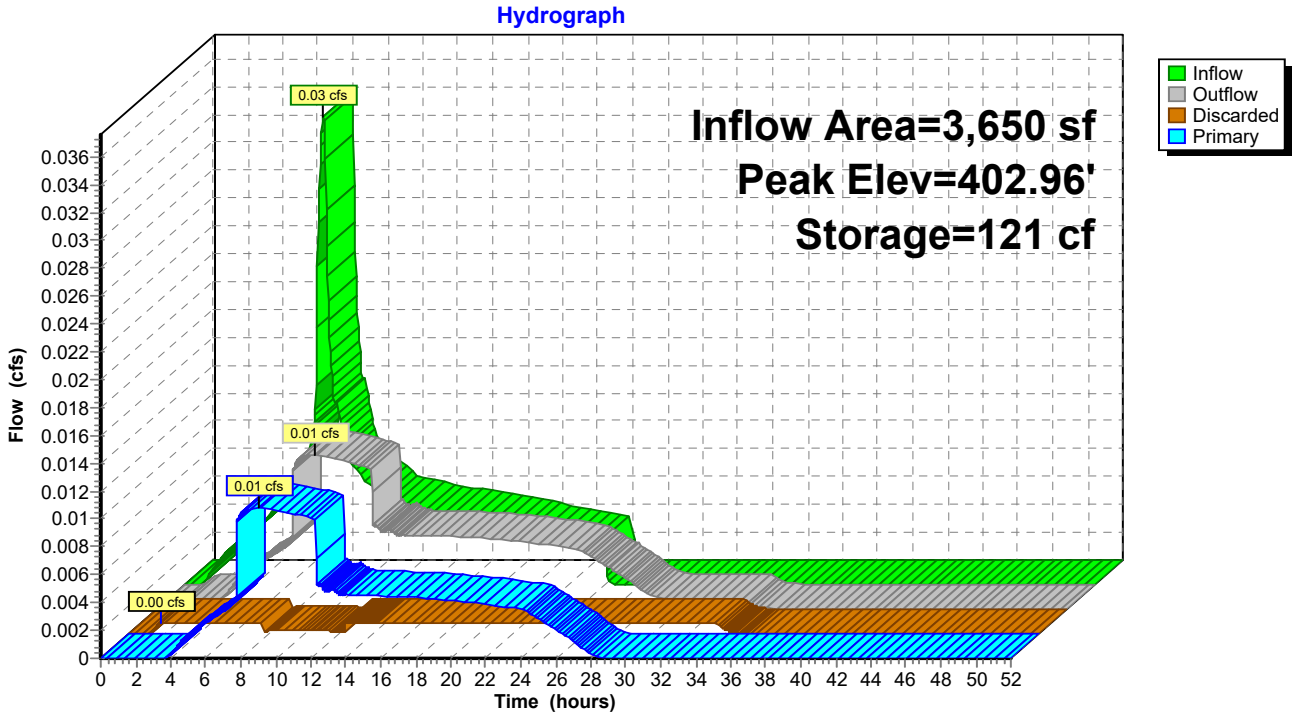
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.14	340	0.0	0	0
400.15	340	40.0	1	1
400.74	340	40.0	80	82
400.75	340	0.0	0	82
402.49	10	0.0	0	82
402.50	45	100.0	0	82
403.00	130	100.0	44	126
404.00	340	100.0	235	361
406.00	340	100.0	680	1,041

Device	Routing	Invert	Outlet Devices
#1	Discarded	400.14'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	400.25'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	403.15'	**0.5" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 1.80 hrs HW=400.15' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.01 cfs @ 8.98 hrs HW=402.96' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 7.90 fps)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 8P: GSI 2


Hydrograph
Inflow Area=3,650 sf
Peak Elev=402.96'
Storage=121 cf
Inflow
Outflow
Discarded
Primary
0.03 cfs
0.01 cfs
0.01 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Subcatchment B1: Developed Basin 1

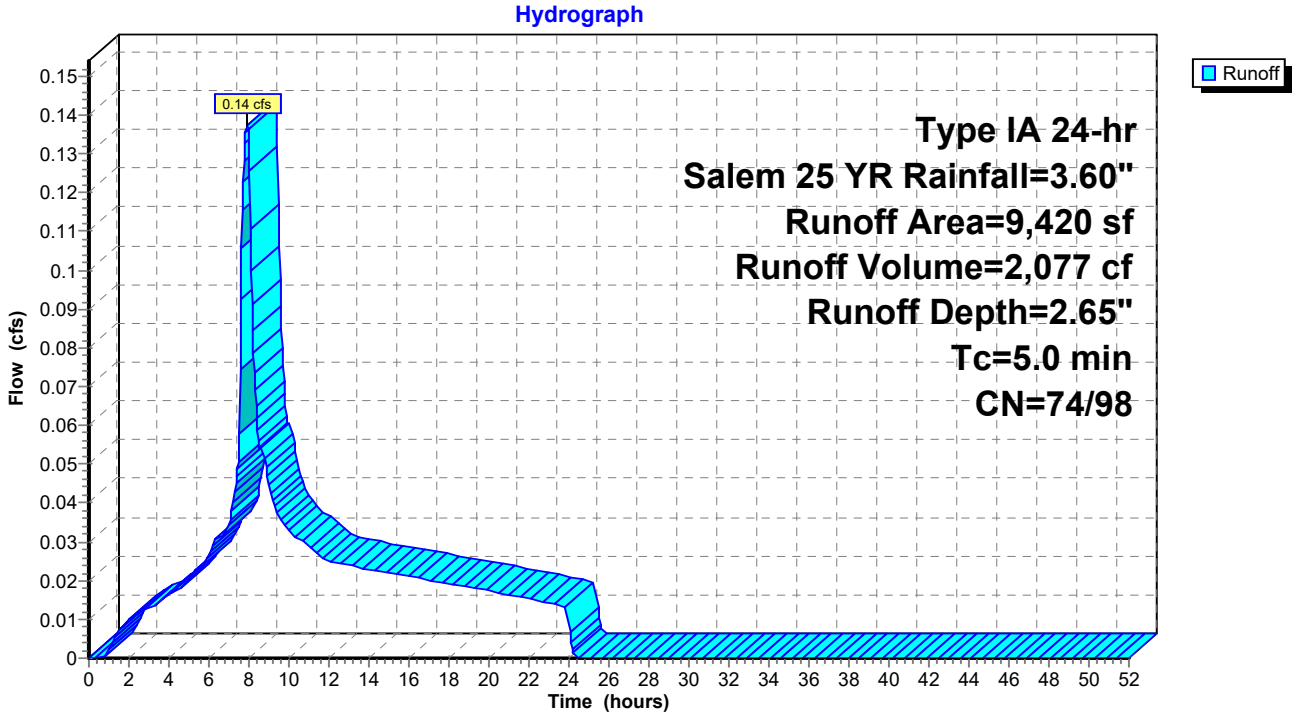
Runoff = 0.14 cfs @ 7.92 hrs, Volume= 2,077 cf, Depth= 2.65"
Routed to Pond 3P : GSI 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

	Area (sf)	CN	Description
*	6,120	98	
*	3,300	74	
	9,420	90	Weighted Average
	3,300	74	35.03% Pervious Area
	6,120	98	64.97% Impervious Area

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

Subcatchment B1: Developed Basin 1



Summary for Subcatchment B3: Developed Basin 3

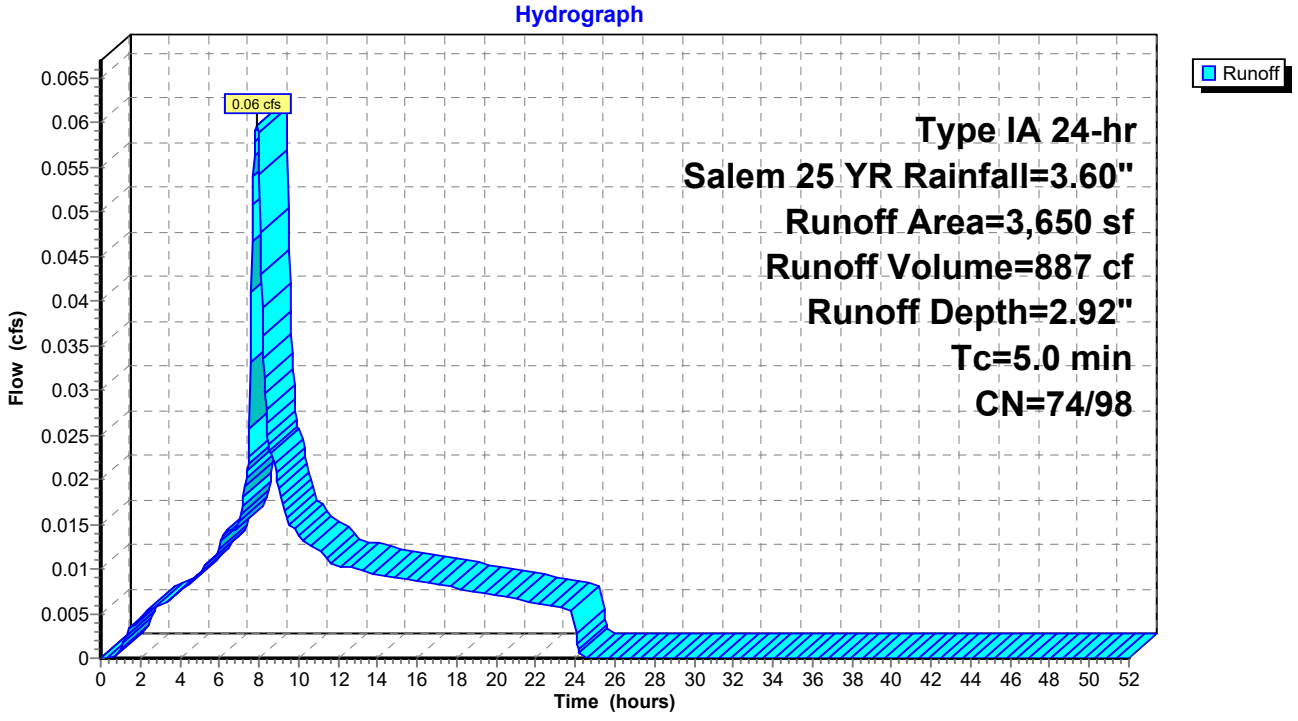
Runoff = 0.06 cfs @ 7.91 hrs, Volume= 887 cf, Depth= 2.92"
Routed to Pond 8P : GSI 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

	Area (sf)	CN	Description
*	2,850	98	
*	800	74	
	3,650	93	Weighted Average
	800	74	21.92% Pervious Area
	2,850	98	78.08% Impervious Area

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

Subcatchment B3: Developed Basin 3



Summary for Subcatchment PD1: Predevelopment Basin 1

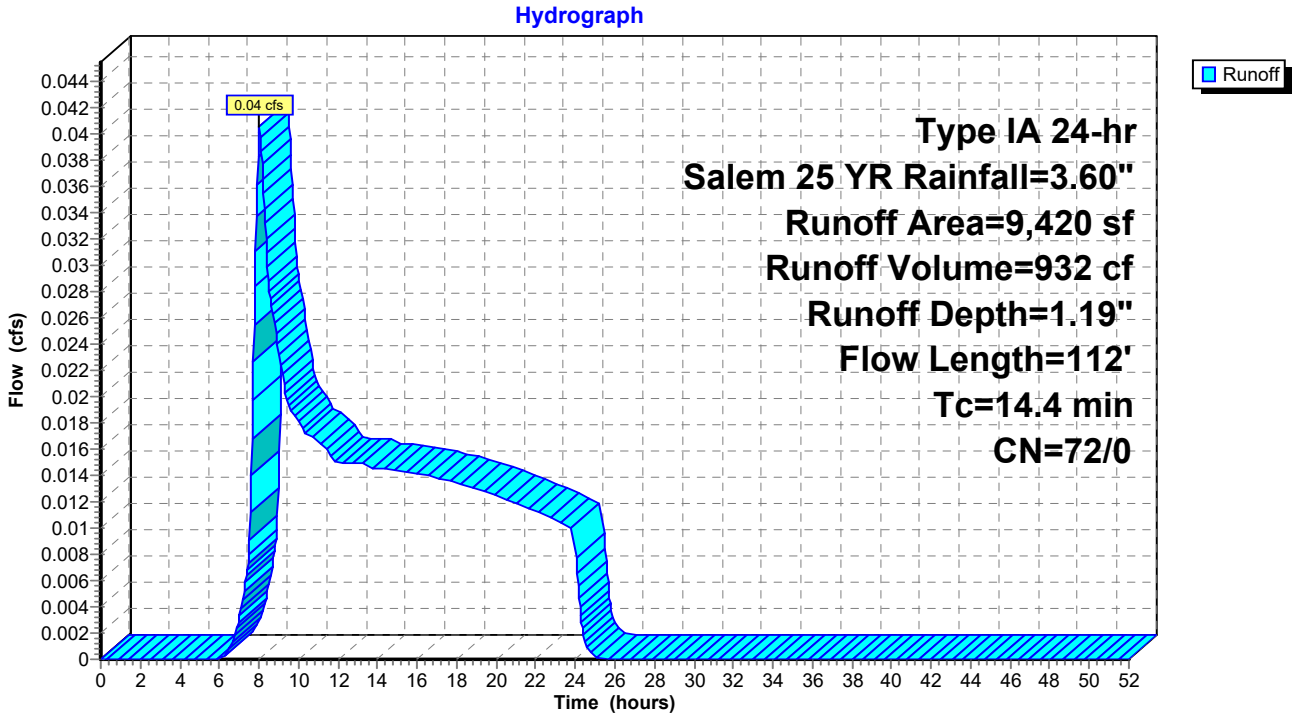
Runoff = 0.04 cfs @ 8.03 hrs, Volume= 932 cf, Depth= 1.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

	Area (sf)	CN	Description
*	9,420	72	
	9,420	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0500	0.12		**Sheet Flow,** n= 0.300 P2= 2.20"
0.1	12	0.0800	1.41		**Shallow Concentrated Flow,** Kv= 5.0 fps
14.4	112	Total			

Subcatchment PD1: Predevelopment Basin 1



Summary for Subcatchment PD3: Predevelopment Basin 3

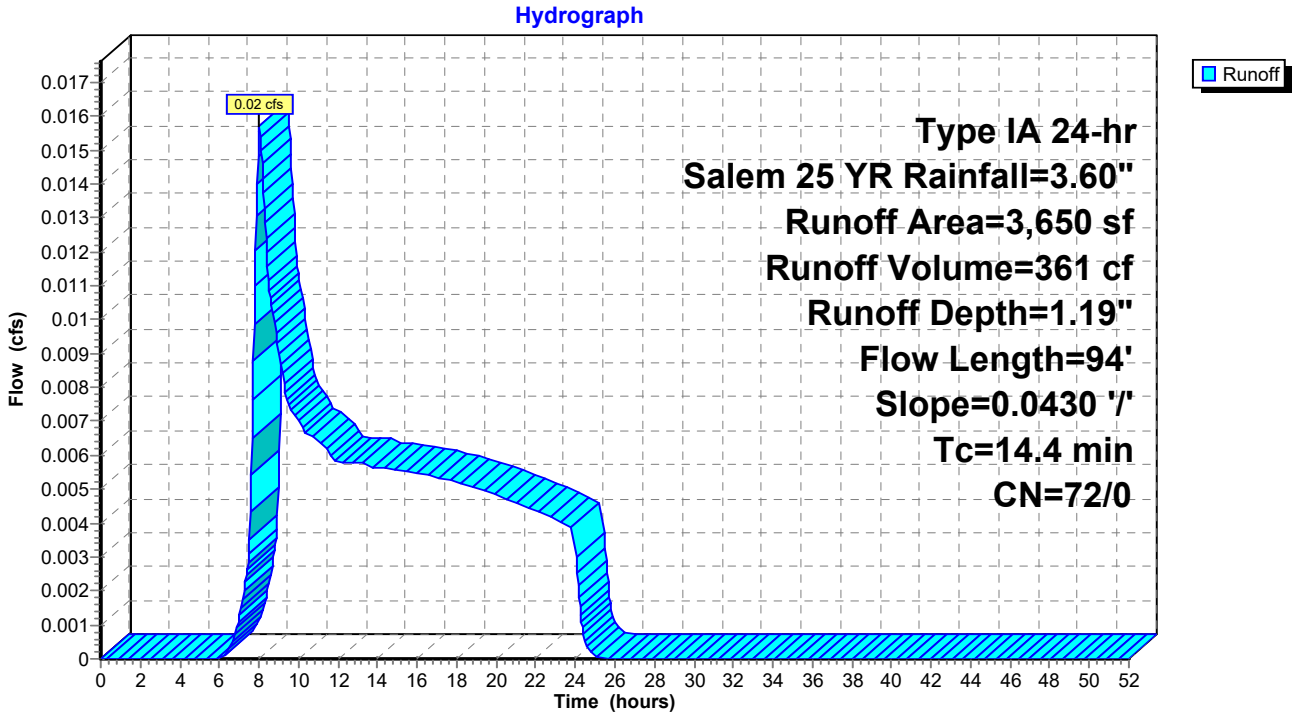
Runoff = 0.02 cfs @ 8.03 hrs, Volume= 361 cf, Depth= 1.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

	Area (sf)	CN	Description
*	3,650	72	
	3,650	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	94	0.0430	0.11		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment PD3: Predevelopment Basin 3



Summary for Pond 3P: GSI 1

Inflow Area = 9,420 sf, 64.97% Impervious, Inflow Depth = 2.65" for Salem 25 YR event
Inflow = 0.14 cfs @ 7.92 hrs, Volume= 2,077 cf
Outflow = 0.04 cfs @ 9.20 hrs, Volume= 2,077 cf, Atten= 71%, Lag= 76.8 min
Discarded = 0.00 cfs @ 1.20 hrs, Volume= 141 cf
Primary = 0.04 cfs @ 9.20 hrs, Volume= 1,935 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 406.28' @ 9.20 hrs Surf.Area= 435 sf Storage= 580 cf

Plug-Flow detention time= 271.0 min calculated for 2,077 cf (100% of inflow)
Center-of-Mass det. time= 270.8 min (965.9 - 695.1)

Volume	Invert	Avail.Storage	Storage Description
#1	402.49'	1,551 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

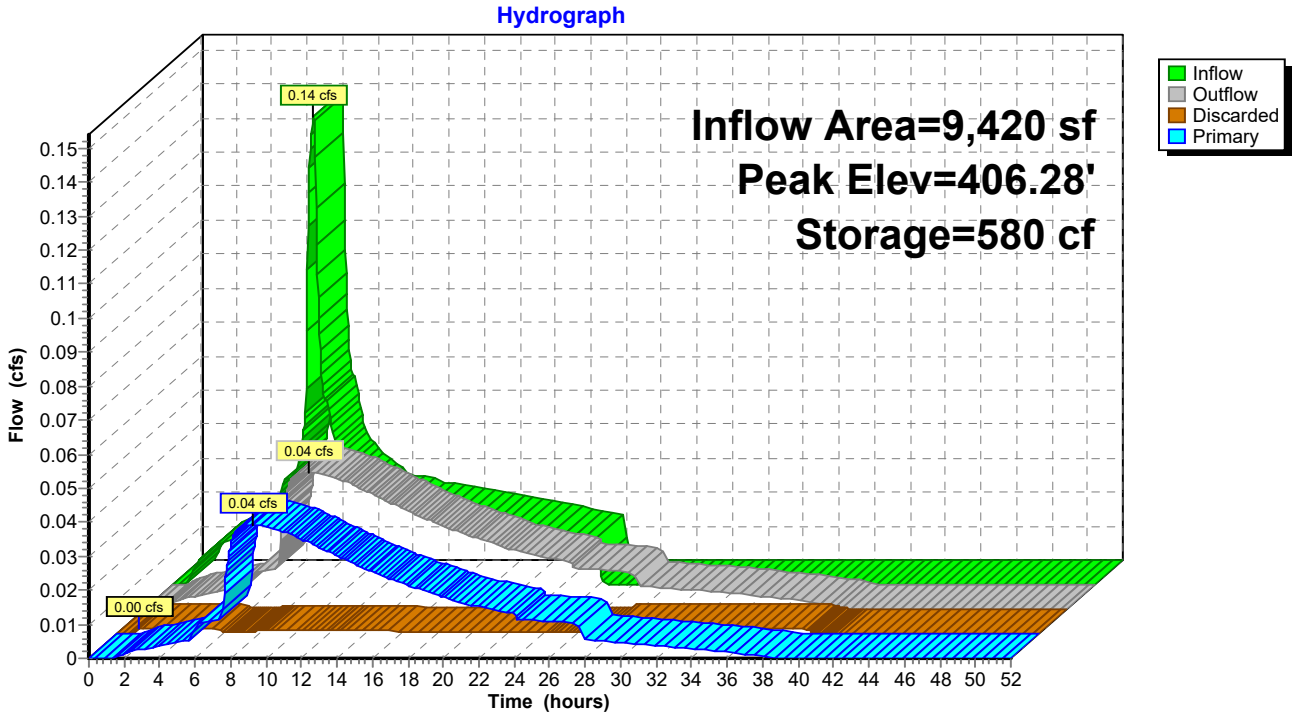
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
402.49	600	0.0	0	0
402.50	600	40.0	2	2
403.24	600	40.0	178	180
403.25	600	0.0	0	180
404.99	0	0.0	0	180
405.00	200	100.0	1	181
406.00	370	100.0	285	466
407.00	600	100.0	485	951
408.00	600	100.0	600	1,551

Device	Routing	Invert	Outlet Devices
#1	Discarded	402.49'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	402.50'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	405.58'	**1.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 1.20 hrs HW=402.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.04 cfs @ 9.20 hrs HW=406.28' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 9.34 fps)
└**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.04 fps)

Pond 3P: GSI 1


Hydrograph
Inflow Area=9,420 sf
Peak Elev=406.28'
Storage=580 cf
Inflow
Outflow
Discarded
Primary
0.14 cfs
0.04 cfs
0.04 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond 8P: GSI 2

Inflow Area = 3,650 sf, 78.08% Impervious, Inflow Depth = 2.92" for Salem 25 YR event
Inflow = 0.06 cfs @ 7.91 hrs, Volume= 887 cf
Outflow = 0.02 cfs @ 9.26 hrs, Volume= 887 cf, Atten= 72%, Lag= 81.2 min
Discarded = 0.00 cfs @ 1.24 hrs, Volume= 74 cf
Primary = 0.02 cfs @ 9.26 hrs, Volume= 812 cf
Routed to nonexistent node 18L

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 403.54' @ 9.26 hrs Surf.Area= 243 sf Storage= 226 cf

Plug-Flow detention time= 200.0 min calculated for 886 cf (100% of inflow)
Center-of-Mass det. time= 200.4 min (881.6 - 681.3)

Volume	Invert	Avail.Storage	Storage Description
#1	400.14'	1,041 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

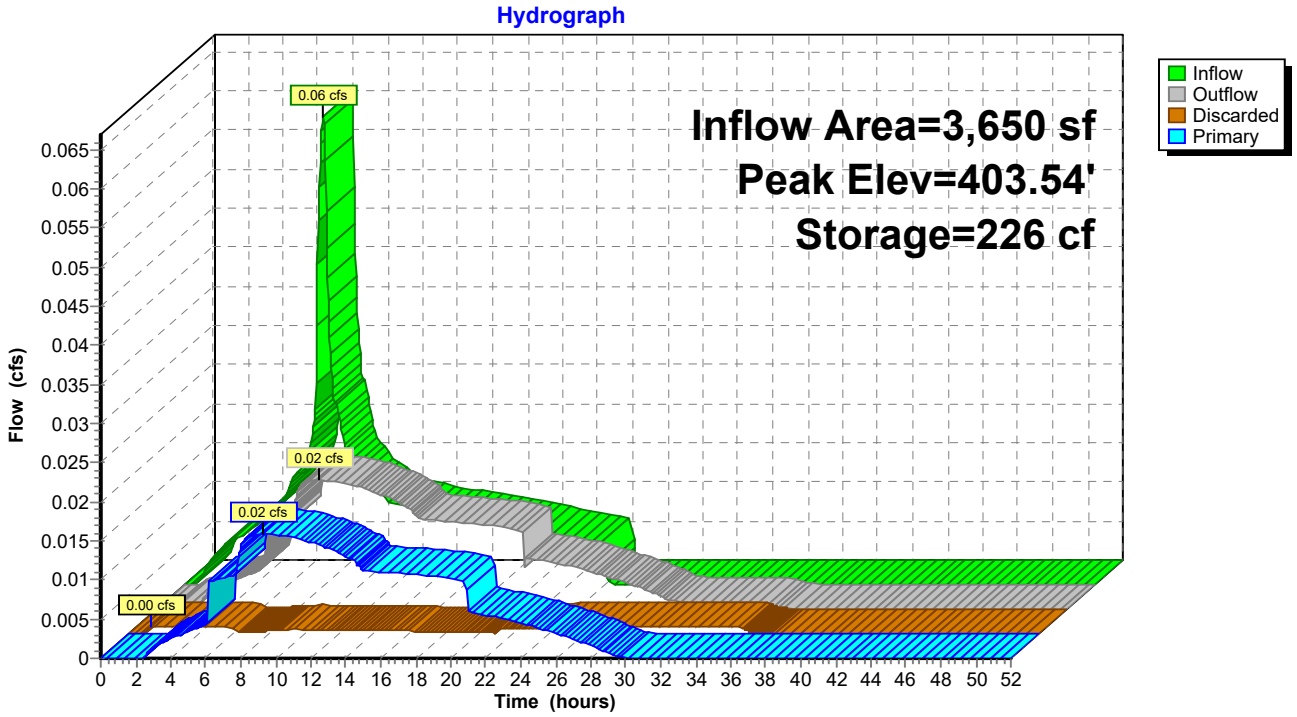
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
400.14	340	0.0	0	0
400.15	340	40.0	1	1
400.74	340	40.0	80	82
400.75	340	0.0	0	82
402.49	10	0.0	0	82
402.50	45	100.0	0	82
403.00	130	100.0	44	126
404.00	340	100.0	235	361
406.00	340	100.0	680	1,041

Device	Routing	Invert	Outlet Devices
#1	Discarded	400.14'	**0.100 in/hr Exfiltration over Surface area**
#2	Primary	400.25'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	403.15'	**0.5" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 1.24 hrs HW=400.15' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.00 cfs)

Primary OutFlow Max=0.02 cfs @ 9.26 hrs HW=403.54' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 8.70 fps)
└**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 3.00 fps)

Pond 8P: GSI 2


Hydrograph
Inflow Area=3,650 sf
Peak Elev=403.54'
Storage=226 cf
0.06 cfs
0.02 cfs
0.02 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
0
0.005
0.01
0.015
0.02
0.025
0.03
0.035
0.04
0.045
0.05
0.055
0.06
0.065
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52
Time (hours)

Summary for Subcatchment B1WQ: Developed Basin 1

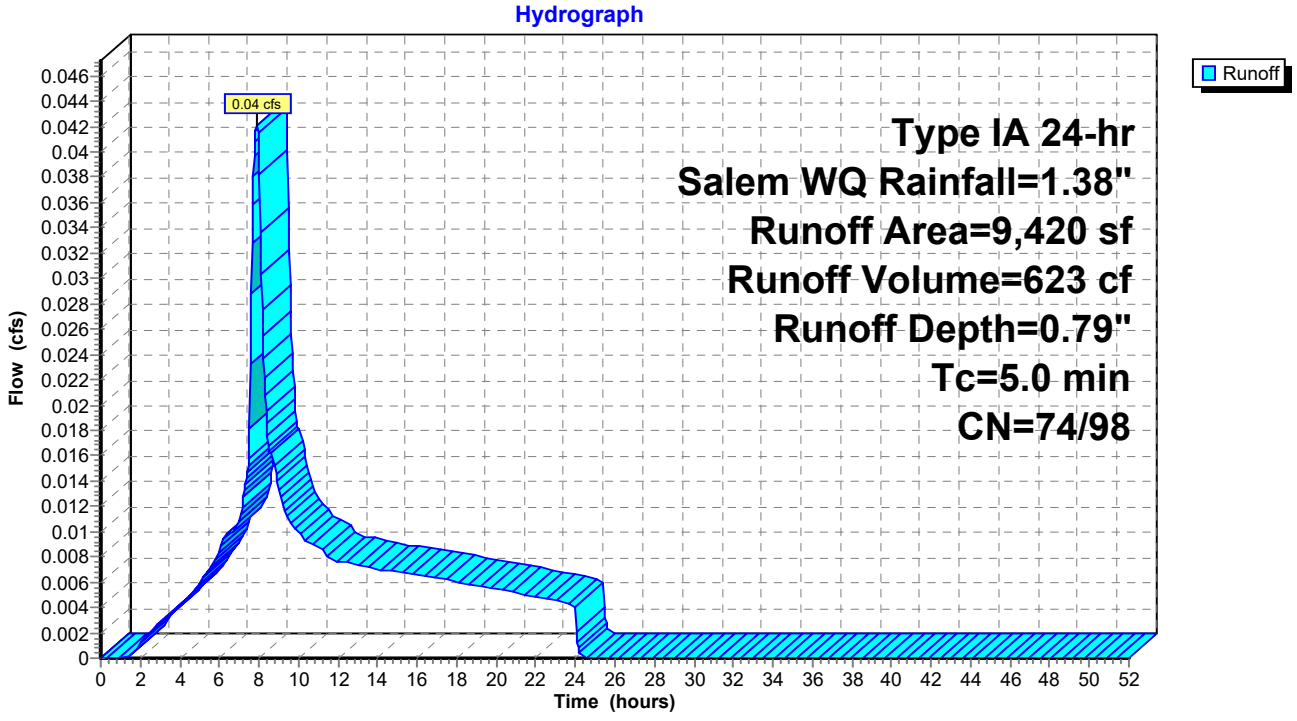
Runoff = 0.04 cfs @ 7.91 hrs, Volume= 623 cf, Depth= 0.79"
Routed to Pond 5P : WQ GSI

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	6,120	98	
*	3,300	74	
	9,420	90	Weighted Average
	3,300	74	35.03% Pervious Area
	6,120	98	64.97% Impervious Area

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

Subcatchment B1WQ: Developed Basin 1



Summary for Subcatchment B3WQ: Developed Basin 3

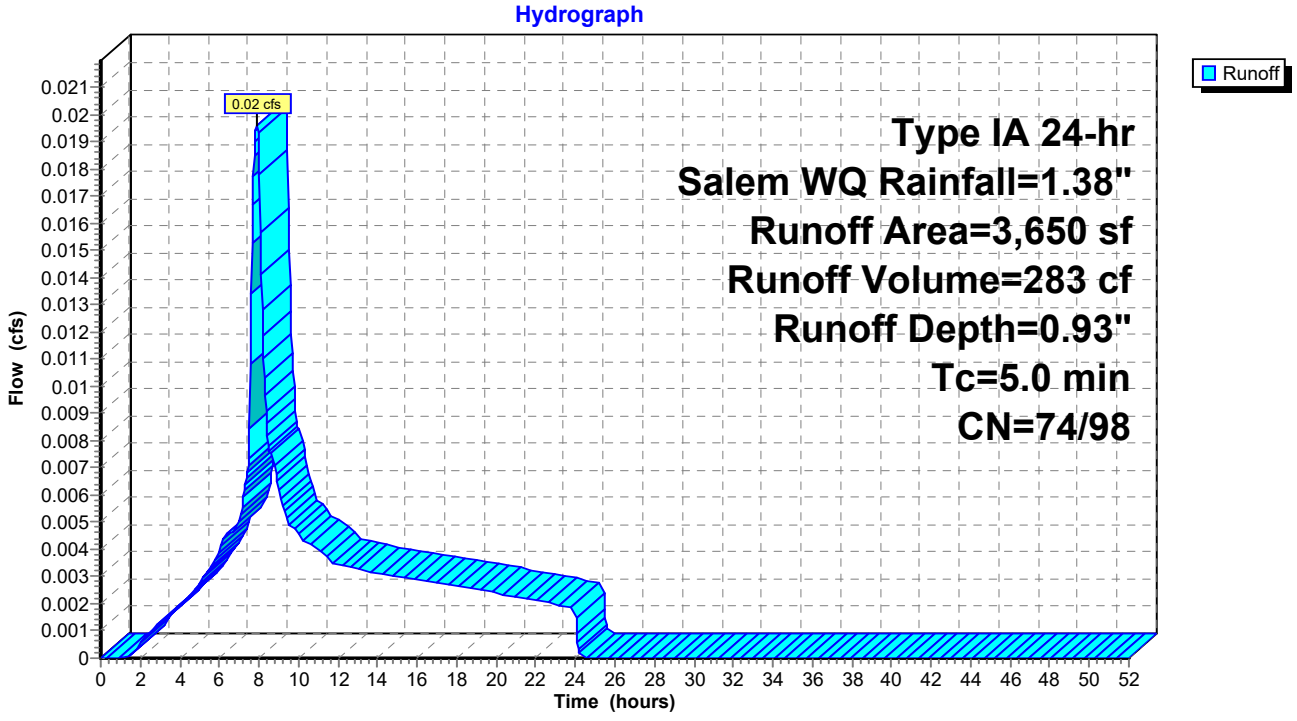
Runoff = 0.02 cfs @ 7.91 hrs, Volume= 283 cf, Depth= 0.93"
Routed to Pond 18P : WQ GSI 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	2,850	98	
*	800	74	
	3,650	93	Weighted Average
	800	74	21.92% Pervious Area
	2,850	98	78.08% Impervious Area

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

Subcatchment B3WQ: Developed Basin 3



Summary for Subcatchment PD1: Predevelopment Basin 1

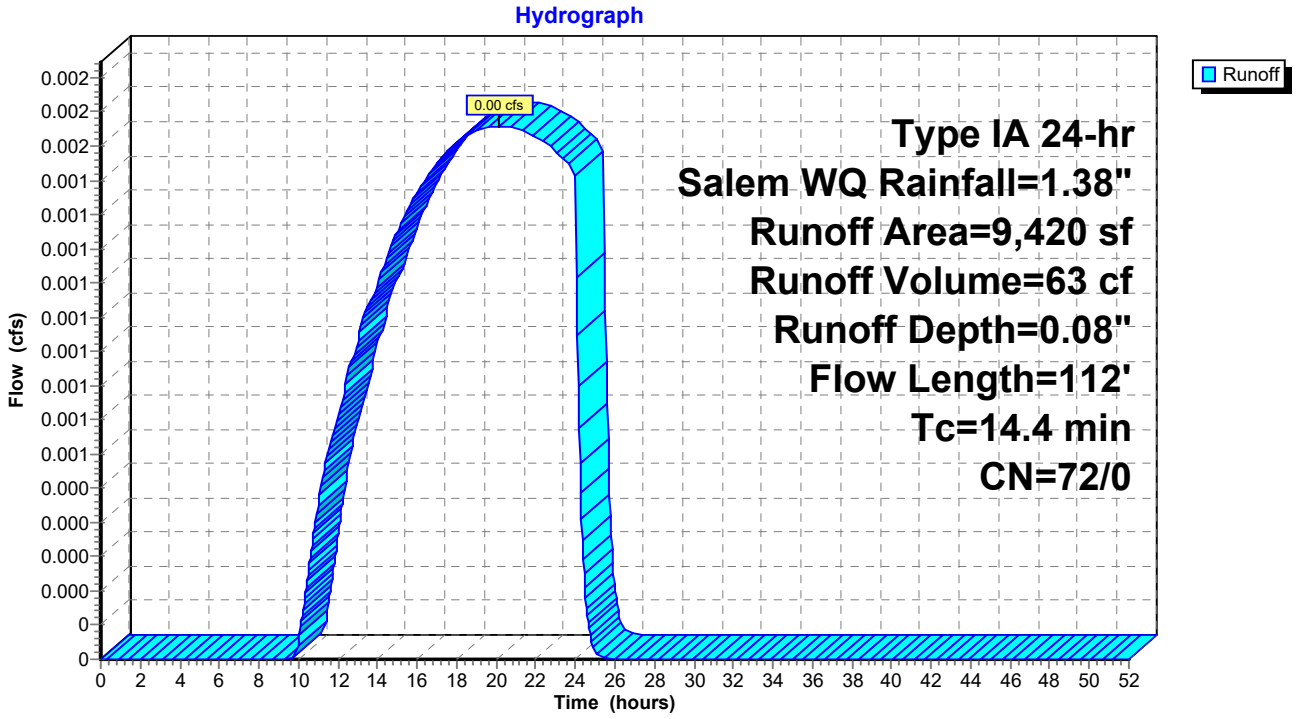
Runoff = 0.00 cfs @ 20.15 hrs, Volume= 63 cf, Depth= 0.08"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	9,420	72	
	9,420	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0500	0.12		**Sheet Flow,** n= 0.300 P2= 2.20"
0.1	12	0.0800	1.41		**Shallow Concentrated Flow,** Kv= 5.0 fps
14.4	112	Total			

Subcatchment PD1: Predevelopment Basin 1



Summary for Subcatchment PD3: Predevelopment Basin 3

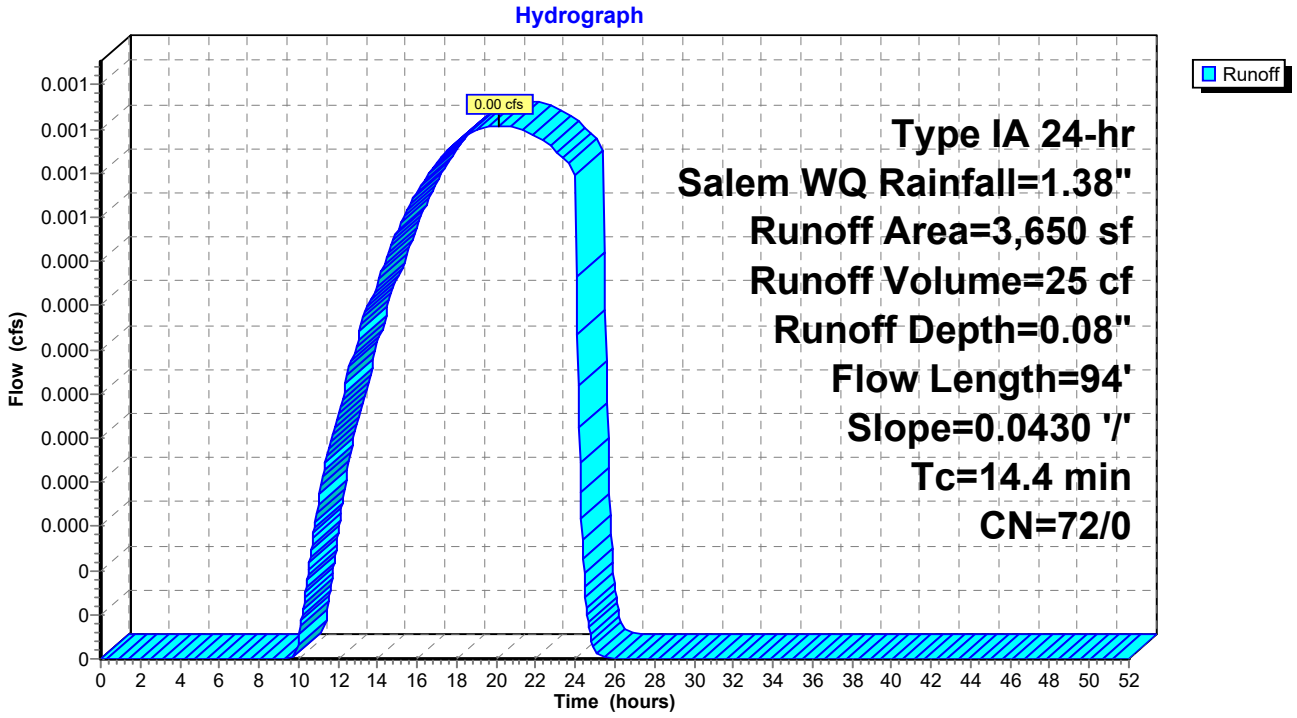
Runoff = 0.00 cfs @ 20.15 hrs, Volume= 25 cf, Depth= 0.08"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	3,650	72	
	3,650	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.4	94	0.0430	0.11		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment PD3: Predevelopment Basin 3



Summary for Pond 5P: WQ GSI

Inflow Area = 9,420 sf, 64.97% Impervious, Inflow Depth = 0.79" for Salem WQ event
Inflow = 0.04 cfs @ 7.91 hrs, Volume= 623 cf
Outflow = 0.02 cfs @ 8.48 hrs, Volume= 623 cf, Atten= 60%, Lag= 34.2 min
Discarded = 0.02 cfs @ 8.48 hrs, Volume= 623 cf

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 405.26' @ 8.48 hrs Surf.Area= 244 sf Storage= 57 cf

Plug-Flow detention time= 16.3 min calculated for 622 cf (100% of inflow)
Center-of-Mass det. time= 16.3 min (730.2 - 713.9)

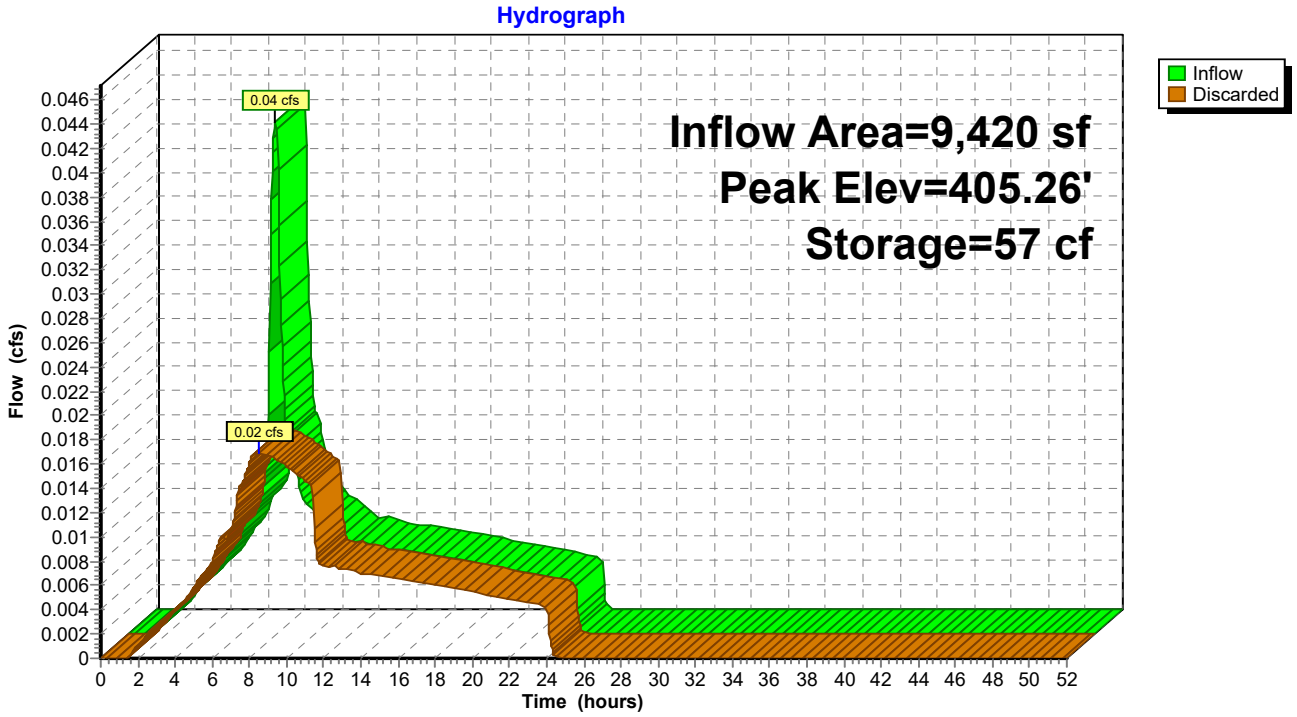
Volume	Invert	Avail.Storage	Storage Description
#1	405.00'	770 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
405.00	200	0	0
406.00	370	285	285
407.00	600	485	770

Device	Routing	Invert	Outlet Devices
#1	Discarded	405.00'	**3.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 1.75'

Discarded OutFlow Max=0.02 cfs @ 8.48 hrs HW=405.26' (Free Discharge)
↑**1=Exfiltration** (Controls 0.02 cfs)

Pond 5P: WQ GSI



Summary for Pond 18P: WQ GSI 2

Inflow Area = 3,650 sf, 78.08% Impervious, Inflow Depth = 0.93" for Salem WQ event
Inflow = 0.02 cfs @ 7.91 hrs, Volume= 283 cf
Outflow = 0.01 cfs @ 8.45 hrs, Volume= 283 cf, Atten= 59%, Lag= 32.9 min
Discarded = 0.01 cfs @ 8.45 hrs, Volume= 283 cf

Routing by Stor-Ind method, Time Span= 0.00-52.00 hrs, dt= 0.04 hrs
Peak Elev= 402.92' @ 8.45 hrs Surf.Area= 116 sf Storage= 34 cf

Plug-Flow detention time= 28.2 min calculated for 283 cf (100% of inflow)
Center-of-Mass det. time= 28.1 min (734.1 - 706.0)

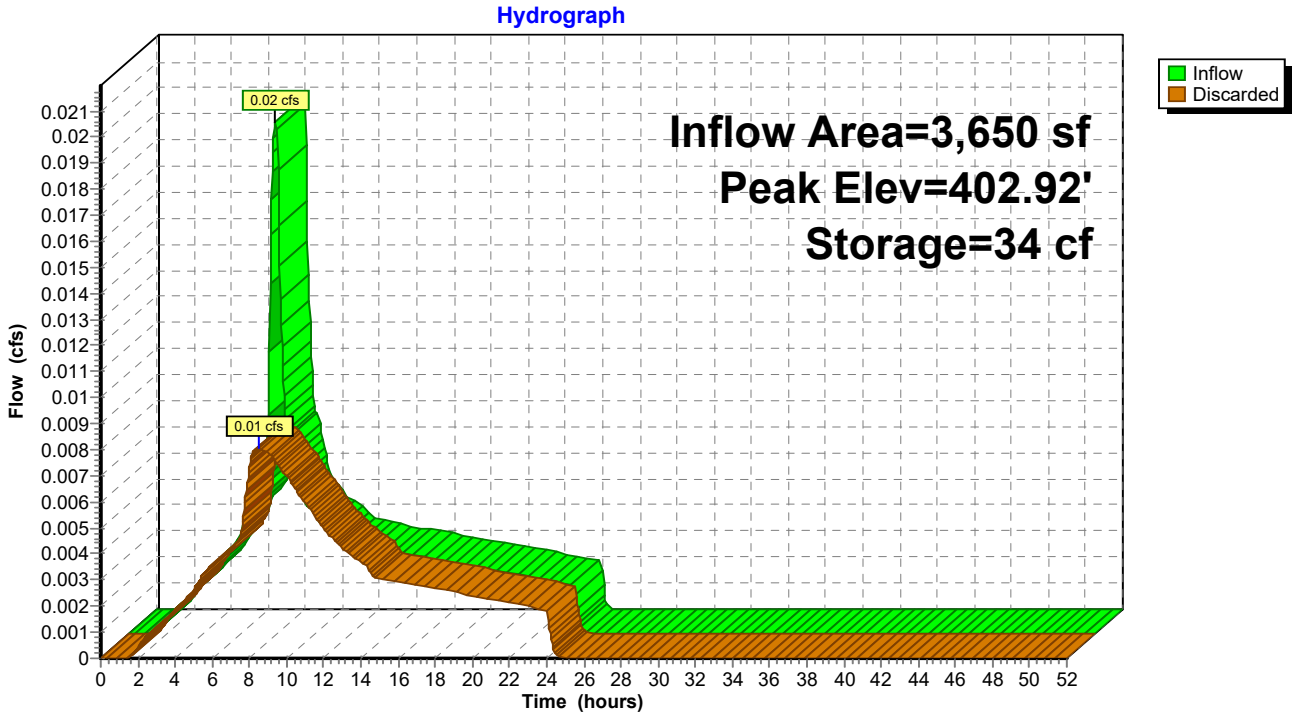
Volume	Invert	Avail.Storage	Storage Description
#1	402.50'	959 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
402.50	45	0	0
403.00	130	44	44
404.00	340	235	279
406.00	340	680	959

Device	Routing	Invert	Outlet Devices
#1	Discarded	402.50'	**3.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 1.75'

Discarded OutFlow Max=0.01 cfs @ 8.45 hrs HW=402.92' (Free Discharge)
↑**1=Exfiltration** (Controls 0.01 cfs)

Pond 18P: WQ GSI 2



APPENDIX D

O & M MANUAL

2. Rain Gardens

Rain gardens are small, vegetated basins that provide short-term ponding of stormwater while it infiltrates into the underlying soil. Filtration rain gardens treat and convey stormwater to the receiving system via a perforated underdrain or outlet pipes, and are sometimes installed with impermeable liners beneath the soil to prevent further infiltration. Infiltration rain gardens are installed without liners and convey infiltrated stormwater directly to groundwater and/or a perforated underdrain. Partial infiltration rain gardens infiltrate and convey filtered stormwater simultaneously. All rain garden types are sized to accept runoff and temporarily store stormwater within the rain garden side slopes. All filtration, infiltration, and partial infiltration rain gardens should infiltrate or drain all stormwater within 48 hours after a storm event.

Inspections

All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, and two times per year thereafter. It is recommended that a visual inspection be made within 48 hours after each major storm event to ensure proper function. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Date: ____ / ____ / ____ (*Day / Month / Year*) **Inspector's Name:** _____ (*Please print*)

Downspouts from rooftop or sheet flow from pavement allow unimpeded stormwater flow to the rain garden.

- ☐ Debris shall be removed routinely and upon discovery.
- ☐ Damaged pipe shall be repaired upon discovery.

Inspection comments:

Splash blocks, forebays, and rock splash pads prevent erosion and sedimentation from areas around the rain garden inlets and convey stormwater without disrupting soil.

- ☐ Rock splash pads shall be cleaned when sediment and debris have accumulated or rock replenished if erosion is occurring around the inlets.
- ☐ Accumulated sediment and debris shall be removed from splash blocks and forebays when sump capacity has reached 50%.

Inspection comments:

Curbcuts and inlet pipes ensure unrestricted stormwater flow into the rain garden.

- ☐ Sources of erosion shall be identified and controlled when native soil is exposed or erosive channels have formed.
- ☐ All inlets shall be kept clear at all times.
- ☐ Inlet pipes shall be secured and grout-sealed.
- ☐ Damaged curbcuts and inlet pipes shall be repaired or replaced upon discovery.

Inspection comments:

Outlet pipes and overflow structures safely convey treated flow and excess flow to the stormwater receiving system.

- ☐ All outlet pipes and overflow structures shall be kept clear at all times.
- ☐ Damaged outlet pipes and overflow structures shall be repaired or replaced upon discovery.
- ☐ If installed, beehive overflows and/or Type 3 catch basin overflow grates shall be secured, and casings shall be intact and grout-sealed.
- ☐ Outlet pipes shall be secured and grout-sealed.

☐ Standpipe overflows shall be intact, undamaged, and clear of debris.

Inspection comments:

Underdrains shall ensure unrestricted movement of water through the growing medium and off-site in infiltration and partial infiltration rain gardens.

☐ If cracks exist, underdrain pipes shall be repaired or replaced.

☐ If clogged with sediment or debris, underdrain pipes shall be cleaned or replaced as necessary to ensure free movement of stormwater.

Inspection comments:

Side slopes retain water in the rain garden.

☐ Structural deficiencies shall be corrected upon discovery.

☐ Side slopes shall be stabilized using appropriate erosion control measures when soil is exposed or erosive channels have formed.

☐ Sources of erosion damage shall be identified and controlled.

Inspection comments:

Emergency spillway conveys flow exceeding rain garden capacity to the approved stormwater receiving system.

☐ Emergency spillways shall be kept clear at all times.

☐ Sources of erosion damage shall be identified and controlled when soil is exposed.

☐ Rocks or other armament shall be replaced when only one layer of rock exists.

Inspection comments:

Growing medium shall allow stormwater to infiltrate uniformly through the rain garden. If water remains ponded 48 hours after a storm event, sources of possible clogging shall be identified and corrected. Rain garden shall be raked and, if necessary, growing medium shall be excavated and replaced.

☐ Sources of clogging shall be identified and corrected.

☐ Soil shall be replaced when rain garden is observed ponding water more than 48 hours after a storm event.

☐ Holes caused by erosion or pests shall be refilled and compacted.

☐ Sediment and debris accumulation shall be removed carefully by hand if it is more than 2 inches in depth, interfering with vegetation health, or obstructing inlets, outlets, or overflows. Use proper erosion control measures and minimize damage to surrounding vegetation.

☐ Growing medium shall be used to fill and compact any erosive channels in the rain garden, including channels which form between plants.

☐ Litter and debris shall be removed.

Inspection comments:

Vegetation shall be healthy and dense enough to promote filtration and infiltration while protecting underlying soils from erosion. Proper horticultural practices shall be employed to ensure plants are healthy.

- ☐ Mulch shall be replenished as needed but shall not inhibit water flow.
- ☐ Vegetation, large shrubs, or trees that limit access or interfere with rain garden function shall be pruned or removed.
- ☐ Fallen leaves and debris shall be raked and removed.
- ☐ Nuisance, noxious, and invasive plants as defined by Oregon Department of Agriculture and the City of Salem's Non-Native Invasive Plant list shall be removed when discovered.
  - *The use of herbicides and fertilizers is strongly discouraged because of the negative impacts to receiving waters. If herbicides or fertilizers are required, products approved for aquatic use shall be used by a licensed applicator.*
- ☐ Dead vegetation shall be removed and replaced upon discovery to promote filtration and infiltration and to minimize erosion.
- ☐ Vegetation shall be replaced per original planting plan, or per City of Salem Stormwater Design Standards if no planting plan exists.

Inspection comments:

Debris and litter shall be removed to ensure stormwater infiltration, to prevent interference with plant growth, and to prevent clogging of inlets, outlets, and overflows.

- ☐ Restricted sources of sediment and debris, such as discarded lawn clippings, shall be identified and prevented.

Inspection comments:

Spill prevention measures shall be exercised when handling substances that contaminate stormwater.

- ☐ Releases of pollutants shall be corrected as soon as identified.

Inspection comments:

Training and/or written guidance information for operating and maintaining rain gardens shall be provided to all property owners and property managers. This Facility Maintenance Form can be used to meet this requirement.

Inspection comments:

Access to the rain garden shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- ☐ Obstacles preventing maintenance personnel and/or equipment access to the rain garden shall be removed.
- ☐ Gravel or ground cover shall be added if erosion has occurred.
- ☐ Facility shall be safe, efficient, and accessible by facility owner and City of Salem staff. If facility is secured, City staff shall be provided access for inspections upon request.

Inspection comments:

Nuisance insects and rodents shall not be harbored in the rain garden. Pest control measures shall be taken when nuisance insects/rodents are found to be present.

- ☐ Holes in the soil located in and around the rain garden shall be filled and compacted upon discovery.
- ☐ Manual pest control measures shall be used in the rain garden.
  - *The use of pesticides is strongly discouraged because of the negative impacts to receiving waters. If pesticides are required, products approved for aquatic use shall be used by a licensed applicator.*

Inspection comments:

Fences, if applicable, shall be maintained to preserve their functionality and appearance.

- ☐ Collapsed fences shall be restored to an upright position.
- ☐ Jagged edges and damaged fences shall be repaired or replaced.
- ☐ Structures or fences that impede the flow of water in the rain garden shall be removed.

Inspection comments:

Flow control structures (e.g., weirs, orifices, baffles, etc.), if applicable, shall direct stormwater and reduce flow velocity. Structural deficiencies shall be corrected upon discovery:

- ☐ Flow control structures shall remain unobstructed to allow water to drain from the rain garden.
- ☐ Sediment and debris shall be removed from flow control structures when 50% of sump capacity is reached, or when the flow of stormwater is impeded in either direction for structures without sumps.
- ☐ Standpipes shall be repaired if cracked or broken.

Inspection comments:

Impermeable liners, if applicable, shall be intact and prevent stormwater infiltration to groundwater. Structural deficiencies shall be corrected upon discovery:

- ☐ Damaged or torn impermeable liners shall be replaced upon discovery. If liner is exposed but otherwise in good shape, replenish growing medium to proper depth.

Inspection comments:

APPENDIX E

GEOTECHNICAL REPORT

APPENDIX F

CIVIL DRAWINGS