Merrill

11-6-24

Stormwater Management Report

November 6, 2024

311 Rockland Street, Hingham Massachusetts

Stormwater Management Summary
311 Rockland Street
Hingham, Massachusetts

November 6, 2024

Project Narrative

The project proponent, Gerry Rankin, proposes to construct a single-family dwelling at 311 Rockland Street in Hingham, Massachusetts as Map 23, Lot 10, Block 0 of the Town of Hingham Assessor's Maps, which is comprised of approximately 1.29 acres of land. The parcel has frontage on Rockland Street to the northwest, and abuts residential lots to the northeast, southeast, west, and southwest. The land is. The property is located within the Residence A (RA) Zoning District as depicted on the Town of Hingham Zoning Map.

The proposed project consists of the construction of a new single-family dwelling, and pool. Also proposed is the construction of a new driveway, site landscaping and associated utility services as shown on the site plan.

Drainage computations were performed using the Natural Resources Conservation Services (NRCS) TR-20 method and HydroCAD® Drainage Calculation Software.

Existing Conditions

The project site has frontage on Rockland Street and is undeveloped except for some sheds near the property lines within the parcel. Based on the existing conditions survey data, there is evidence of ledge and ledge outcrops throughout the site. Woodland area is also abundant throughout. Site slopes are extremely steep in many areas, with slopes ranging from approximately 50-80%.

There is evidence of various resource areas near or within the project site. Through the use of GIS tools and aerial photogrammetry, there is evidence of the Weir River being present on the other side of Rockland Street, which has an associated 200' riverfront area within the site. There is also an associated saltmarsh abutting the river, which has a 100' buffer zone in the site. Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Mapping (FIRM), the site is located within a Zone "AE" and Zone "X" of said map, and is in a special flood hazard area. This flood zone area would be classified as land subject to coastal storm flowage, for a wetland resource.

Site soil data was obtained through the National Resources Conservation Service (NRCS), Web Soil Survey database. Through site mapping in this database, the entire site is located within Soil Map Unit 111C – Chatfield Rock outcrop-Canton, with 8-15% slopes. This soil composition typically includes sandy loam texture, followed by shallow to bedrock areas. Sandy Loam represents a hydrologic soil group B (HSG B), with a design infiltration rate of

1.02 in/hr, per Rawls rates from *Rawls, Brakensiek, and Saxton, 1982*. For further soil data, refer to **Appendix D**.

Through watershed delineation of the site, a total of three (3) design points were analyzed for the purpose of stormwater runoff analysis. Design point 1 is located within Rockland Street, design point 2 at the eastern portion of the lot, and design point 3 within the abutting property at 301 Rockland Street (northwest). Each design point has an associated subcatchment area in which stormwater runoff flows. To see a detailed delineation plan for the subject property, refer to the Existing Watershed Plan within **Appendix A.**

Proposed Conditions/Stormwater Management

The project proponent wishes to construct a single-family dwelling, with a deck and pool in the southwestern portion of the lot. The single-family dwelling will also have site vehicular access via a proposed driveway with a firetruck turnaround, which is accessed from Rockland Street.

Under the proposed conditions, stormwater runoff from the proposed dwelling and driveway area will be directed to 2 separate rain garden areas. The first rain garden will be located next to the dwelling and driveway, with a small gravel diaphragm to be used as pretreatment. The second rain garden will be located next to the bottom of the driveway off Rockland Street. A trench drain will be used as a method of stormwater collection within the driveway area. The proposed rain gardens are sized to treat the proposed site impervious area for required recharge volume and water quality volume.

A total of 6 subcatchment areas were delineated within the total watershed area, with the same 3 design points as within existing conditions. For more information regarding the proposed watershed delineation, refer to the Proposed Watershed Plan within **Appendix A**.

Compliance with Stormwater Management Standards

Stormwater systems and management for this proposed project were designed to meet the Stormwater Management Standards (SMS), within the Massachusetts Stormwater Handbook, and any applicable local stormwater management bylaws or Rules & regulations. Note that calculations completed for this stormwater report are based on NRCS web soil survey (WSS) data, and additional test pit information will be required to verify site soil suitability. See the following standard compliance analyses for more information:

Standard 1 – No New Untreated Discharges
No new stormwater conveyances will discharge untreated impervious runoff into, or cause erosion to downgradient areas.

Standard 2 – Peak Rate Attenuation

Peak rates of runoff were calculated using the TR-20 methodology developed by the National resources Conservation Service (NRCS), within HydroCAD® software. As mentioned within the proposed conditions of this report, three (3) design points were considered for peak stormwater rate and volume analyses.

Results from the HydroCAD® analyses showed that proposed conditions for design points 1 and 2, have lower peak rate and volume values than within the existing conditions.

Design point 1 proposed peak rate and volume values exceed the existing conditions. A waiver is requested to dismiss the requirement for meeting peak flow rates because the site is within Land Subject to Coastal Storm Flowage (LSCSF).

These measures will both detain and infiltrate runoff, mitigating increased rates and volumes of runoff for the 2, 10, 25 and 100-year storms events off site to the extent practicable.

The following is a summary of pre- and post-construction rates and volume of runoff:

	PEAK RATES OF RUNOFF					
	Design Point 1 (Towards Rockland Street)		Design Point 2 (Towards rear abutter SW)		Design Point 3 (Towards Abutting Property NW)	
	EXISTING (cfs)	PROPOSED (cfs)	EXISTING (cfs)	PROPOSED (cfs)	EXISTING (cfs)	PROPOSED (cfs)
2YR	1.05	0.79	0.05	0.05	0.64	0.36
10YR	1.89	1.78	0.14	0.14	1.82	1.76
25YR	2.56	2.45	0.21	0.21	2.89	2.75
100YR	3.91	3.64	0.38	0.38	5.28	4.94

	PEAK VOLUMES					
	Design Point 1 (Towards Rockland Street)		Design Point 2 (Towards rear abutter SW)		Design Point 3 (Towards Abutting Property NW)	
	EXISTING (af)	PROPOSED (af)	EXISTING (af)	PROPOSED (af)	EXISTING (af)	PROPOSED (af)
2YR	0.080	0.064	0.004	0.004	0.057	0.043
10YR	0.145	0.131	0.010	0.010	0.139	0.118
25YR	0.197	0.187	0.016	0.016	0.213	0.186
100YR	0.308	0.305	0.028	0.028	0.383	0.344

Standard 3 – Groundwater Recharge

Proposed impervious runoff will be infiltrated by two rain gardens. The first rain garden is abutting the house by the pool and driveway. The second rain garden is off the driveway right by Rockland Street. The total required groundwater recharge volume for the entire site was calculated to be 239 cubic feet. The proposed rain gardens will provide 718 cubic feet of recharge below the minimum outlet elevation. Refer to **Appendix B** for recharge volume, drawdown and the Site Plan for locations.

Standard 4 – Water Quality

A Long-Term Source Control/Pollution Prevention Plan has been provided in **Appendix C**. The water quality volume was calculated using the one-inch rule. The total required water quality treatment volume was calculated to be 682 cubic feet. The proposed water quality treatment volume provided is 718 cubic feet. Refer to **Appendix B** for water quality calculations for the proposed treatment stream.

In accordance with the guidelines of the Stormwater Management Policy, the Total Suspended Solids (TSS) Removal was calculated to be 80% or greater for the new treatment trains which will handle the stormwater runoff from the proposed project area. The treatment trains consists of a pea-stone diaphragm or trench drain pretreatment directed into respective rain gardens to achieve the required removal rate of 80% total suspended soils. See **Appendix B** for TSS removal calculations.

Standard 5 – Land Use with Higher Potential Pollutants Loads (LUHPPL)

The proposed project is not considered a LUHPPL. Not Applicable.

Standard 6 – Critical Areas

This area is within an Area of Critical Environmental Concern (ACEC). The ACEC designation is for the Weir River, which provides habitat for numerous bird and fish species. Shellfish habitat areas are associated with this ACEC.

The site is not located within any Zone I, Zone II, Interim Well Protection Areas or any Zone A surface water protection areas.

Stormwater runoff will be treated to the extent practicable and will not be discharged to the Weir River or its abutting wetland areas.

Standard 7 – Redevelopment and Other Projects Subject to the Standards only to the maximum extent practicable

The single-family project on a previously undeveloped site is not considered a redevelopment project. Not Applicable.

Standard 8 – Construction Period Pollutions Prevention and Erosion and Sedimentation Control

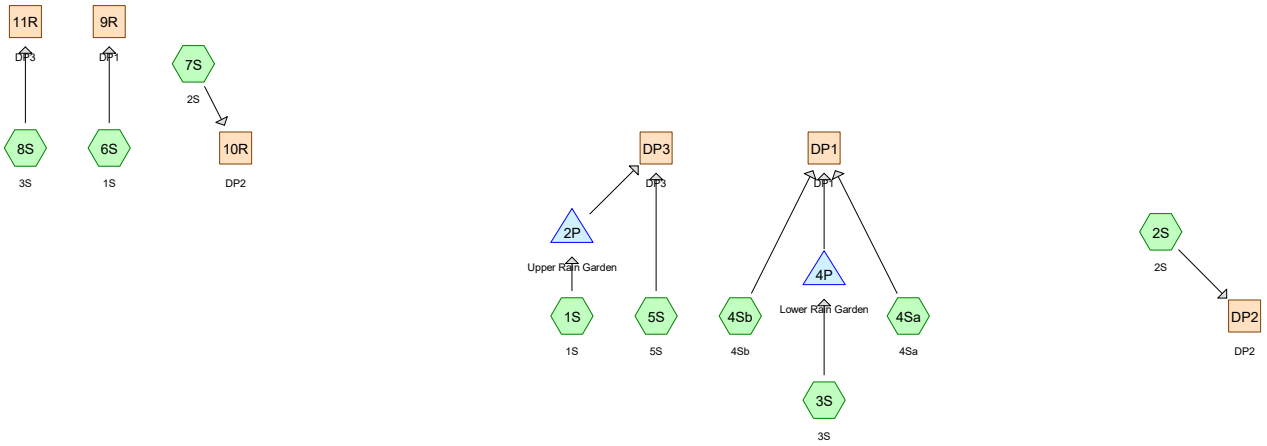
The Construction Period Operation and Maintenance Plan included with this submittal will ensure proper maintenance of the proposed pollution, erosion and sedimentation measures proposed during construction.

Standard 9 – Operation and Maintenance Plan

The Long-Term Source Control/Pollution Prevention Plan and Operation and Maintenance Plan is provided within **Appendix C**.

Standard 10 – Prohibition of Illicit Discharges

No illicit discharges are anticipated on site. Measures to prevent illicit discharges are included in the Long-Term Source Control/Pollution Prevention Plan and provided in **Appendix C**.



Subcat Reach Pond Link

Routing Diagram for 23-360 Exisit -Proposed Conditions 11.6.2024...
Prepared by Merrill Associates Inc, Printed 11/6/2024

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S Runoff Area=6,440 sf 80.28% Impervious Runoff Depth=2.38"
Flow Length=40' Slope=0.0100 '/' Tc=6.0 min CN=91 Runoff=0.40 cfs 0.029 af

Subcatchment 2S: 2S Runoff Area=3,195 sf 16.90% Impervious Runoff Depth=0.71"
Flow Length=75' Tc=6.0 min CN=66 Runoff=0.05 cfs 0.004 af

Subcatchment 3S: 3S Runoff Area=13,760 sf 59.30% Impervious Runoff Depth=1.79"
Flow Length=150' Tc=6.0 min CN=84 Runoff=0.65 cfs 0.047 af

Subcatchment 4Sa: 4Sa Runoff Area=11,755 sf 50.23% Impervious Runoff Depth=1.44"
Flow Length=150' Tc=6.0 min CN=79 Runoff=0.44 cfs 0.032 af

Subcatchment 4Sb: 4Sb Runoff Area=1,280 sf 91.02% Impervious Runoff Depth=2.77"
Flow Length=100' Tc=6.0 min CN=95 Runoff=0.09 cfs 0.007 af

Subcatchment 5S: 5S Runoff Area=36,166 sf 14.39% Impervious Runoff Depth=0.54"
Flow Length=280' Tc=6.5 min CN=62 Runoff=0.36 cfs 0.037 af

Subcatchment 6S: 1S Runoff Area=24,336 sf 60.16% Impervious Runoff Depth=1.72"
Flow Length=190' Tc=7.7 min CN=83 Runoff=1.05 cfs 0.080 af

Subcatchment 7S: 2S Runoff Area=3,195 sf 16.90% Impervious Runoff Depth=0.71"
Flow Length=75' Tc=6.0 min CN=66 Runoff=0.05 cfs 0.004 af

Subcatchment 8S: 3S Runoff Area=45,102 sf 22.51% Impervious Runoff Depth=0.66"
Flow Length=240' Tc=6.0 min CN=65 Runoff=0.64 cfs 0.057 af

Reach 9R: DP1 Inflow=1.05 cfs 0.080 af
Outflow=1.05 cfs 0.080 af

Reach 10R: DP2 Inflow=0.05 cfs 0.004 af
Outflow=0.05 cfs 0.004 af

Reach 11R: DP3 Inflow=0.64 cfs 0.057 af
Outflow=0.64 cfs 0.057 af

Reach DP1: DP1 Inflow=0.97 cfs 0.079 af
Outflow=0.97 cfs 0.079 af

Reach DP2: DP2 Inflow=0.05 cfs 0.004 af
Outflow=0.05 cfs 0.004 af

Reach DP3: DP3 Inflow=0.36 cfs 0.043 af
Outflow=0.36 cfs 0.043 af

Pond 2P: Upper Rain Garden Peak Elev=38.05' Storage=577 cf Inflow=0.40 cfs 0.029 af
Discarded=0.01 cfs 0.020 af Primary=0.12 cfs 0.006 af Outflow=0.13 cfs 0.026 af

Pond 4P: Lower Rain Garden Peak Elev=6.95' Storage=229 cf Inflow=0.65 cfs 0.047 af
Discarded=0.01 cfs 0.007 af Primary=0.50 cfs 0.040 af Outflow=0.51 cfs 0.047 af

Total Runoff Area = 3.334 ac Runoff Volume = 0.299 af Average Runoff Depth = 1.08"
64.56% Pervious = 2.152 ac 35.44% Impervious = 1.182 ac

Summary for Subcatchment 1S: 1S

Runoff = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af, Depth= 2.38"
Routed to Pond 2P : Upper Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

Area (sf)	CN	Description
5,170	98	Paved parking, HSG B
1,270	61	>75% Grass cover, Good, HSG B
6,440	91	Weighted Average
1,270		19.72% Pervious Area
5,170		80.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	40	0.0100	0.89		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.8	40	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S: 2S

Runoff = 0.05 cfs @ 12.11 hrs, Volume= 0.004 af, Depth= 0.71"
Routed to Reach DP2 : DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

	Area (sf)	CN	Description
	2,655	60	Woods, Fair, HSG B
*	540	98	Ledge
	3,195	66	Weighted Average
	2,655		83.10% Pervious Area
	540		16.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.4	25	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: 3S

Runoff = 0.65 cfs @ 12.09 hrs, Volume= 0.047 af, Depth= 1.79"
Routed to Pond 4P : Lower Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

	Area (sf)	CN	Description
	2,450	98	Paved parking, HSG B
*	5,710	98	Ledge
	4,070	60	Woods, Fair, HSG B
	970	61	>75% Grass cover, Good, HSG B
*	560	90	Imprv,. driveway
	13,760	84	Weighted Average
	5,600		40.70% Pervious Area
	8,160		59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	32	0.1200	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.1	18	0.2000	2.50		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.2	100	0.2500	10.15		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4Sa: 4Sa

Runoff = 0.44 cfs @ 12.10 hrs, Volume= 0.032 af, Depth= 1.44"
Routed to Reach DP1 : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

	Area (sf)	CN	Description
*	5,905	98	Ledge
	150	85	Gravel roads, HSG B
	5,700	60	Woods, Fair, HSG B
	11,755	79	Weighted Average
	5,850		49.77% Pervious Area
	5,905		50.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	50	0.2800	3.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.1	100	0.3000	11.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4Sb: 4Sb

Runoff = 0.09 cfs @ 12.09 hrs, Volume= 0.007 af, Depth= 2.77"
Routed to Reach DP1 : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

	Area (sf)	CN	Description
*	1,165	98	Ledge
	115	60	Woods, Fair, HSG B
	1,280	95	Weighted Average
	115		8.98% Pervious Area
	1,165		91.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.2400	3.30		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.1	50	0.3600	12.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	100	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: 5S

Runoff = 0.36 cfs @ 12.12 hrs, Volume= 0.037 af, Depth= 0.54"
Routed to Reach DP3 : DP3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

	Area (sf)	CN	Description
*	5,204	98	Ledge
	7,515	61	>75% Grass cover, Good, HSG B
	23,447	55	Woods, Good, HSG B
	36,166	62	Weighted Average
	30,962		85.61% Pervious Area
	5,204		14.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	25	0.2000	2.67		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
3.6	25	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.7	230	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	280	Total			

Summary for Subcatchment 6S: 1S

Runoff = 1.05 cfs @ 12.11 hrs, Volume= 0.080 af, Depth= 1.72"
Routed to Reach 9R : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

	Area (sf)	CN	Description
	9,546	60	Woods, Fair, HSG B
*	14,640	98	Ledge
	150	85	Gravel roads, HSG B
	24,336	83	Weighted Average
	9,696		39.84% Pervious Area
	14,640		60.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.8	140	0.3140	2.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	190	Total			

Summary for Subcatchment 7S: 2S

Runoff = 0.05 cfs @ 12.11 hrs, Volume= 0.004 af, Depth= 0.71"
Routed to Reach 10R : DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

	Area (sf)	CN	Description
	2,655	60	Woods, Fair, HSG B
*	540	98	Ledge
	3,195	66	Weighted Average
	2,655		83.10% Pervious Area
	540		16.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.4	25	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: 3S

Runoff = 0.64 cfs @ 12.11 hrs, Volume= 0.057 af, Depth= 0.66"
Routed to Reach 11R : DP3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.33"

	Area (sf)	CN	Description
*	10,152	98	Ledge
	34,950	55	Woods, Good, HSG B
	45,102	65	Weighted Average
	34,950		77.49% Pervious Area
	10,152		22.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	25	0.2000	2.67		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
3.6	25	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.1	190	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.9	240	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach 9R: DP1

Inflow Area = 0.559 ac, 60.16% Impervious, Inflow Depth = 1.72" for 2 yr event
Inflow = 1.05 cfs @ 12.11 hrs, Volume= 0.080 af
Outflow = 1.05 cfs @ 12.11 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 10R: DP2

Inflow Area = 0.073 ac, 16.90% Impervious, Inflow Depth = 0.71" for 2 yr event
Inflow = 0.05 cfs @ 12.11 hrs, Volume= 0.004 af
Outflow = 0.05 cfs @ 12.11 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 11R: DP3

Inflow Area = 1.035 ac, 22.51% Impervious, Inflow Depth = 0.66" for 2 yr event
Inflow = 0.64 cfs @ 12.11 hrs, Volume= 0.057 af
Outflow = 0.64 cfs @ 12.11 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP1: DP1

Inflow Area = 0.615 ac, 56.84% Impervious, Inflow Depth = 1.54" for 2 yr event
Inflow = 0.97 cfs @ 12.12 hrs, Volume= 0.079 af
Outflow = 0.97 cfs @ 12.12 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: DP2

Inflow Area = 0.073 ac, 16.90% Impervious, Inflow Depth = 0.71" for 2 yr event
Inflow = 0.05 cfs @ 12.11 hrs, Volume= 0.004 af
Outflow = 0.05 cfs @ 12.11 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: DP3

Inflow Area = 0.978 ac, 24.35% Impervious, Inflow Depth = 0.53" for 2 yr event
Inflow = 0.36 cfs @ 12.12 hrs, Volume= 0.043 af
Outflow = 0.36 cfs @ 12.12 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Upper Rain Garden

Inflow Area = 0.148 ac, 80.28% Impervious, Inflow Depth = 2.38" for 2 yr event
Inflow = 0.40 cfs @ 12.09 hrs, Volume= 0.029 af
Outflow = 0.13 cfs @ 12.40 hrs, Volume= 0.026 af, Atten= 67%, Lag= 18.5 min
Discarded = 0.01 cfs @ 12.40 hrs, Volume= 0.020 af
Primary = 0.12 cfs @ 12.40 hrs, Volume= 0.006 af
Routed to Reach DP3 : DP3

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 38.05' @ 12.40 hrs Surf.Area= 625 sf Storage= 577 cf

Plug-Flow detention time= 323.6 min calculated for 0.026 af (88% of inflow)
Center-of-Mass det. time= 268.7 min (1,069.7 - 801.0)

Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	914 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	150	0	0
37.00	280	108	108
38.00	595	438	545
38.50	880	369	914

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	38.00'	**4.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 12.40 hrs HW=38.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.12 cfs @ 12.40 hrs HW=38.05' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.12 cfs @ 0.55 fps)

Summary for Pond 4P: Lower Rain Garden

Inflow Area = 0.316 ac, 59.30% Impervious, Inflow Depth = 1.79" for 2 yr event
Inflow = 0.65 cfs @ 12.09 hrs, Volume= 0.047 af
Outflow = 0.51 cfs @ 12.16 hrs, Volume= 0.047 af, Atten= 22%, Lag= 4.2 min
Discarded = 0.01 cfs @ 12.16 hrs, Volume= 0.007 af
Primary = 0.50 cfs @ 12.16 hrs, Volume= 0.040 af
Routed to Reach DP1 : DP1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 6.95' @ 12.16 hrs Surf.Area= 376 sf Storage= 229 cf

Plug-Flow detention time= 29.9 min calculated for 0.047 af (100% of inflow)
Center-of-Mass det. time= 30.3 min (858.0 - 827.7)

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	734 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)
6.00	128	78.0	0	0	128
7.00	393	98.0	248	248	422
8.00	585	114.0	486	734	712

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	7.90'	**3.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Primary	6.30'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	6.80'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.16 hrs HW=6.94' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.49 cfs @ 12.16 hrs HW=6.94' (Free Discharge)
├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
├─**3=Orifice/Grate** (Orifice Controls 0.43 cfs @ 3.17 fps)
└─**4=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.28 fps)

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S Runoff Area=6,440 sf 80.28% Impervious Runoff Depth=3.91"
Flow Length=40' Slope=0.0100 '/' Tc=6.0 min CN=91 Runoff=0.64 cfs 0.048 af

Subcatchment 2S: 2S Runoff Area=3,195 sf 16.90% Impervious Runoff Depth=1.68"
Flow Length=75' Tc=6.0 min CN=66 Runoff=0.14 cfs 0.010 af

Subcatchment 3S: 3S Runoff Area=13,760 sf 59.30% Impervious Runoff Depth=3.21"
Flow Length=150' Tc=6.0 min CN=84 Runoff=1.15 cfs 0.084 af

Subcatchment 4Sa: 4Sa Runoff Area=11,755 sf 50.23% Impervious Runoff Depth=2.74"
Flow Length=150' Tc=6.0 min CN=79 Runoff=0.85 cfs 0.062 af

Subcatchment 4Sb: 4Sb Runoff Area=1,280 sf 91.02% Impervious Runoff Depth=4.35"
Flow Length=100' Tc=6.0 min CN=95 Runoff=0.13 cfs 0.011 af

Subcatchment 5S: 5S Runoff Area=36,166 sf 14.39% Impervious Runoff Depth=1.40"
Flow Length=280' Tc=6.5 min CN=62 Runoff=1.21 cfs 0.097 af

Subcatchment 6S: 1S Runoff Area=24,336 sf 60.16% Impervious Runoff Depth=3.11"
Flow Length=190' Tc=7.7 min CN=83 Runoff=1.89 cfs 0.145 af

Subcatchment 7S: 2S Runoff Area=3,195 sf 16.90% Impervious Runoff Depth=1.68"
Flow Length=75' Tc=6.0 min CN=66 Runoff=0.14 cfs 0.010 af

Subcatchment 8S: 3S Runoff Area=45,102 sf 22.51% Impervious Runoff Depth=1.61"
Flow Length=240' Tc=6.0 min CN=65 Runoff=1.82 cfs 0.139 af

Reach 9R: DP1 Inflow=1.89 cfs 0.145 af
Outflow=1.89 cfs 0.145 af

Reach 10R: DP2 Inflow=0.14 cfs 0.010 af
Outflow=0.14 cfs 0.010 af

Reach 11R: DP3 Inflow=1.82 cfs 0.139 af
Outflow=1.82 cfs 0.139 af

Reach DP1: DP1 Inflow=1.88 cfs 0.148 af
Outflow=1.88 cfs 0.148 af

Reach DP2: DP2 Inflow=0.14 cfs 0.010 af
Outflow=0.14 cfs 0.010 af

Reach DP3: DP3 Inflow=1.76 cfs 0.118 af
Outflow=1.76 cfs 0.118 af

Pond 2P: Upper Rain Garden Peak Elev=38.15' Storage=640 cf Inflow=0.64 cfs 0.048 af
Discarded=0.02 cfs 0.022 af Primary=0.55 cfs 0.021 af Outflow=0.57 cfs 0.043 af

Pond 4P: Lower Rain Garden Peak Elev=7.23' Storage=344 cf Inflow=1.15 cfs 0.084 af
Discarded=0.01 cfs 0.008 af Primary=0.96 cfs 0.076 af Outflow=0.97 cfs 0.084 af

Total Runoff Area = 3.334 ac Runoff Volume = 0.606 af Average Runoff Depth = 2.18"
64.56% Pervious = 2.152 ac 35.44% Impervious = 1.182 ac

Summary for Subcatchment 1S: 1S

Runoff = 0.64 cfs @ 12.09 hrs, Volume= 0.048 af, Depth= 3.91"
Routed to Pond 2P : Upper Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

Area (sf)	CN	Description
5,170	98	Paved parking, HSG B
1,270	61	>75% Grass cover, Good, HSG B
6,440	91	Weighted Average
1,270		19.72% Pervious Area
5,170		80.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	40	0.0100	0.89		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.8	40	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S: 2S

Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 1.68"
Routed to Reach DP2 : DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

	Area (sf)	CN	Description
	2,655	60	Woods, Fair, HSG B
*	540	98	Ledge
	3,195	66	Weighted Average
	2,655		83.10% Pervious Area
	540		16.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.4	25	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: 3S

Runoff = 1.15 cfs @ 12.09 hrs, Volume= 0.084 af, Depth= 3.21"
Routed to Pond 4P : Lower Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

	Area (sf)	CN	Description
	2,450	98	Paved parking, HSG B
*	5,710	98	Ledge
	4,070	60	Woods, Fair, HSG B
	970	61	>75% Grass cover, Good, HSG B
*	560	90	Imprv,. driveway
	13,760	84	Weighted Average
	5,600		40.70% Pervious Area
	8,160		59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	32	0.1200	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.1	18	0.2000	2.50		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.2	100	0.2500	10.15		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4Sa: 4Sa

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.062 af, Depth= 2.74"
Routed to Reach DP1 : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

	Area (sf)	CN	Description
*	5,905	98	Ledge
	150	85	Gravel roads, HSG B
	5,700	60	Woods, Fair, HSG B
	11,755	79	Weighted Average
	5,850		49.77% Pervious Area
	5,905		50.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	50	0.2800	3.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.1	100	0.3000	11.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4Sb: 4Sb

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 4.35"
Routed to Reach DP1 : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

	Area (sf)	CN	Description
*	1,165	98	Ledge
	115	60	Woods, Fair, HSG B
	1,280	95	Weighted Average
	115		8.98% Pervious Area
	1,165		91.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.2400	3.30		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.1	50	0.3600	12.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	100	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: 5S

Runoff = 1.21 cfs @ 12.11 hrs, Volume= 0.097 af, Depth= 1.40"
Routed to Reach DP3 : DP3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

	Area (sf)	CN	Description
*	5,204	98	Ledge
	7,515	61	>75% Grass cover, Good, HSG B
	23,447	55	Woods, Good, HSG B
	36,166	62	Weighted Average
	30,962		85.61% Pervious Area
	5,204		14.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	25	0.2000	2.67		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
3.6	25	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.7	230	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	280	Total			

Summary for Subcatchment 6S: 1S

Runoff = 1.89 cfs @ 12.11 hrs, Volume= 0.145 af, Depth= 3.11"
Routed to Reach 9R : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

	Area (sf)	CN	Description
	9,546	60	Woods, Fair, HSG B
*	14,640	98	Ledge
	150	85	Gravel roads, HSG B
	24,336	83	Weighted Average
	9,696		39.84% Pervious Area
	14,640		60.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.8	140	0.3140	2.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	190	Total			

Summary for Subcatchment 7S: 2S

Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 1.68"
Routed to Reach 10R : DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

	Area (sf)	CN	Description
	2,655	60	Woods, Fair, HSG B
*	540	98	Ledge
	3,195	66	Weighted Average
	2,655		83.10% Pervious Area
	540		16.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.4	25	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: 3S

Runoff = 1.82 cfs @ 12.10 hrs, Volume= 0.139 af, Depth= 1.61"
Routed to Reach 11R : DP3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10yr Rainfall=4.93"

	Area (sf)	CN	Description
*	10,152	98	Ledge
	34,950	55	Woods, Good, HSG B
	45,102	65	Weighted Average
	34,950		77.49% Pervious Area
	10,152		22.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	25	0.2000	2.67		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
3.6	25	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.1	190	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.9	240	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach 9R: DP1

Inflow Area = 0.559 ac, 60.16% Impervious, Inflow Depth = 3.11" for 10yr event
Inflow = 1.89 cfs @ 12.11 hrs, Volume= 0.145 af
Outflow = 1.89 cfs @ 12.11 hrs, Volume= 0.145 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 10R: DP2

Inflow Area = 0.073 ac, 16.90% Impervious, Inflow Depth = 1.68" for 10yr event
Inflow = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af
Outflow = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 11R: DP3

Inflow Area = 1.035 ac, 22.51% Impervious, Inflow Depth = 1.61" for 10yr event
Inflow = 1.82 cfs @ 12.10 hrs, Volume= 0.139 af
Outflow = 1.82 cfs @ 12.10 hrs, Volume= 0.139 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP1: DP1

Inflow Area = 0.615 ac, 56.84% Impervious, Inflow Depth = 2.89" for 10yr event
Inflow = 1.88 cfs @ 12.11 hrs, Volume= 0.148 af
Outflow = 1.88 cfs @ 12.11 hrs, Volume= 0.148 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: DP2

Inflow Area = 0.073 ac, 16.90% Impervious, Inflow Depth = 1.68" for 10yr event
Inflow = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af
Outflow = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: DP3

Inflow Area = 0.978 ac, 24.35% Impervious, Inflow Depth = 1.45" for 10yr event
Inflow = 1.76 cfs @ 12.12 hrs, Volume= 0.118 af
Outflow = 1.76 cfs @ 12.12 hrs, Volume= 0.118 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Upper Rain Garden

Inflow Area = 0.148 ac, 80.28% Impervious, Inflow Depth = 3.91" for 10yr event
Inflow = 0.64 cfs @ 12.09 hrs, Volume= 0.048 af
Outflow = 0.57 cfs @ 12.13 hrs, Volume= 0.043 af, Atten= 11%, Lag= 2.7 min
Discarded = 0.02 cfs @ 12.13 hrs, Volume= 0.022 af
Primary = 0.55 cfs @ 12.13 hrs, Volume= 0.021 af
Routed to Reach DP3 : DP3

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 38.15' @ 12.13 hrs Surf.Area= 680 sf Storage= 640 cf

Plug-Flow detention time= 214.3 min calculated for 0.043 af (90% of inflow)
Center-of-Mass det. time= 166.2 min (953.5 - 787.3)

Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	914 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	150	0	0
37.00	280	108	108
38.00	595	438	545
38.50	880	369	914

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	38.00'	**4.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.02 cfs @ 12.13 hrs HW=38.15' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.54 cfs @ 12.13 hrs HW=38.15' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.54 cfs @ 0.91 fps)

Summary for Pond 4P: Lower Rain Garden

Inflow Area = 0.316 ac, 59.30% Impervious, Inflow Depth = 3.21" for 10yr event
Inflow = 1.15 cfs @ 12.09 hrs, Volume= 0.084 af
Outflow = 0.97 cfs @ 12.15 hrs, Volume= 0.084 af, Atten= 16%, Lag= 3.4 min
Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.008 af
Primary = 0.96 cfs @ 12.15 hrs, Volume= 0.076 af
Routed to Reach DP1 : DP1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 7.23' @ 12.15 hrs Surf.Area= 434 sf Storage= 344 cf

Plug-Flow detention time= 21.0 min calculated for 0.084 af (100% of inflow)
Center-of-Mass det. time= 21.0 min (832.1 - 811.1)

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	734 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)
6.00	128	78.0	0	0	128
7.00	393	98.0	248	248	422
8.00	585	114.0	486	734	712

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	7.90'	**3.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Primary	6.30'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	6.80'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=7.23' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.96 cfs @ 12.15 hrs HW=7.23' (Free Discharge)
├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
├─**3=Orifice/Grate** (Orifice Controls 0.56 cfs @ 4.09 fps)
└─**4=Orifice/Grate** (Orifice Controls 0.40 cfs @ 2.23 fps)

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S Runoff Area=6,440 sf 80.28% Impervious Runoff Depth=5.11"
Flow Length=40' Slope=0.0100 '/' Tc=6.0 min CN=91 Runoff=0.82 cfs 0.063 af

Subcatchment 2S: 2S Runoff Area=3,195 sf 16.90% Impervious Runoff Depth=2.56"
Flow Length=75' Tc=6.0 min CN=66 Runoff=0.21 cfs 0.016 af

Subcatchment 3S: 3S Runoff Area=13,760 sf 59.30% Impervious Runoff Depth=4.35"
Flow Length=150' Tc=6.0 min CN=84 Runoff=1.55 cfs 0.114 af

Subcatchment 4Sa: 4Sa Runoff Area=11,755 sf 50.23% Impervious Runoff Depth=3.82"
Flow Length=150' Tc=6.0 min CN=79 Runoff=1.18 cfs 0.086 af

Subcatchment 4Sb: 4Sb Runoff Area=1,280 sf 91.02% Impervious Runoff Depth=5.57"
Flow Length=100' Tc=6.0 min CN=95 Runoff=0.17 cfs 0.014 af

Subcatchment 5S: 5S Runoff Area=36,166 sf 14.39% Impervious Runoff Depth=2.20"
Flow Length=280' Tc=6.5 min CN=62 Runoff=2.00 cfs 0.152 af

Subcatchment 6S: 1S Runoff Area=24,336 sf 60.16% Impervious Runoff Depth=4.24"
Flow Length=190' Tc=7.7 min CN=83 Runoff=2.56 cfs 0.197 af

Subcatchment 7S: 2S Runoff Area=3,195 sf 16.90% Impervious Runoff Depth=2.56"
Flow Length=75' Tc=6.0 min CN=66 Runoff=0.21 cfs 0.016 af

Subcatchment 8S: 3S Runoff Area=45,102 sf 22.51% Impervious Runoff Depth=2.47"
Flow Length=240' Tc=6.0 min CN=65 Runoff=2.89 cfs 0.213 af

Reach 9R: DP1 Inflow=2.56 cfs 0.197 af
Outflow=2.56 cfs 0.197 af

Reach 10R: DP2 Inflow=0.21 cfs 0.016 af
Outflow=0.21 cfs 0.016 af

Reach 11R: DP3 Inflow=2.89 cfs 0.213 af
Outflow=2.89 cfs 0.213 af

Reach DP1: DP1 Inflow=2.51 cfs 0.205 af
Outflow=2.51 cfs 0.205 af

Reach DP2: DP2 Inflow=0.21 cfs 0.016 af
Outflow=0.21 cfs 0.016 af

Reach DP3: DP3 Inflow=2.75 cfs 0.186 af
Outflow=2.75 cfs 0.186 af

Pond 2P: Upper Rain Garden Peak Elev=38.18' Storage=664 cf Inflow=0.82 cfs 0.063 af
Discarded=0.02 cfs 0.024 af Primary=0.75 cfs 0.034 af Outflow=0.77 cfs 0.058 af

Pond 4P: Lower Rain Garden Peak Elev=7.45' Storage=445 cf Inflow=1.55 cfs 0.114 af
Discarded=0.01 cfs 0.009 af Primary=1.24 cfs 0.105 af Outflow=1.25 cfs 0.114 af

Total Runoff Area = 3.334 ac Runoff Volume = 0.871 af Average Runoff Depth = 3.13"
64.56% Pervious = 2.152 ac 35.44% Impervious = 1.182 ac

Summary for Subcatchment 1S: 1S

Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 5.11"
Routed to Pond 2P : Upper Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

Area (sf)	CN	Description
5,170	98	Paved parking, HSG B
1,270	61	>75% Grass cover, Good, HSG B
6,440	91	Weighted Average
1,270		19.72% Pervious Area
5,170		80.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	40	0.0100	0.89		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.8	40	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S: 2S

Runoff = 0.21 cfs @ 12.10 hrs, Volume= 0.016 af, Depth= 2.56"
Routed to Reach DP2 : DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

	Area (sf)	CN	Description
	2,655	60	Woods, Fair, HSG B
*	540	98	Ledge
	3,195	66	Weighted Average
	2,655		83.10% Pervious Area
	540		16.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.4	25	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: 3S

Runoff = 1.55 cfs @ 12.09 hrs, Volume= 0.114 af, Depth= 4.35"
Routed to Pond 4P : Lower Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

	Area (sf)	CN	Description
	2,450	98	Paved parking, HSG B
*	5,710	98	Ledge
	4,070	60	Woods, Fair, HSG B
	970	61	>75% Grass cover, Good, HSG B
*	560	90	Imprv,. driveway
	13,760	84	Weighted Average
	5,600		40.70% Pervious Area
	8,160		59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	32	0.1200	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.1	18	0.2000	2.50		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.2	100	0.2500	10.15		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4Sa: 4Sa

Runoff = 1.18 cfs @ 12.09 hrs, Volume= 0.086 af, Depth= 3.82"
Routed to Reach DP1 : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

	Area (sf)	CN	Description
*	5,905	98	Ledge
	150	85	Gravel roads, HSG B
	5,700	60	Woods, Fair, HSG B
	11,755	79	Weighted Average
	5,850		49.77% Pervious Area
	5,905		50.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	50	0.2800	3.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.1	100	0.3000	11.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4Sb: 4Sb

Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 5.57"
Routed to Reach DP1 : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

	Area (sf)	CN	Description
*	1,165	98	Ledge
	115	60	Woods, Fair, HSG B
	1,280	95	Weighted Average
	115		8.98% Pervious Area
	1,165		91.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.2400	3.30		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.1	50	0.3600	12.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	100	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: 5S

Runoff = 2.00 cfs @ 12.10 hrs, Volume= 0.152 af, Depth= 2.20"
Routed to Reach DP3 : DP3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

	Area (sf)	CN	Description
*	5,204	98	Ledge
	7,515	61	>75% Grass cover, Good, HSG B
	23,447	55	Woods, Good, HSG B
	36,166	62	Weighted Average
	30,962		85.61% Pervious Area
	5,204		14.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	25	0.2000	2.67		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
3.6	25	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.7	230	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	280	Total			

Summary for Subcatchment 6S: 1S

Runoff = 2.56 cfs @ 12.11 hrs, Volume= 0.197 af, Depth= 4.24"
Routed to Reach 9R : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

	Area (sf)	CN	Description
	9,546	60	Woods, Fair, HSG B
*	14,640	98	Ledge
	150	85	Gravel roads, HSG B
	24,336	83	Weighted Average
	9,696		39.84% Pervious Area
	14,640		60.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.8	140	0.3140	2.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	190	Total			

Summary for Subcatchment 7S: 2S

Runoff = 0.21 cfs @ 12.10 hrs, Volume= 0.016 af, Depth= 2.56"
Routed to Reach 10R : DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

	Area (sf)	CN	Description
	2,655	60	Woods, Fair, HSG B
*	540	98	Ledge
	3,195	66	Weighted Average
	2,655		83.10% Pervious Area
	540		16.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.4	25	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: 3S

Runoff = 2.89 cfs @ 12.10 hrs, Volume= 0.213 af, Depth= 2.47"
Routed to Reach 11R : DP3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Rainfall=6.16"

	Area (sf)	CN	Description
*	10,152	98	Ledge
	34,950	55	Woods, Good, HSG B
	45,102	65	Weighted Average
	34,950		77.49% Pervious Area
	10,152		22.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	25	0.2000	2.67		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
3.6	25	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.1	190	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.9	240	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach 9R: DP1

Inflow Area = 0.559 ac, 60.16% Impervious, Inflow Depth = 4.24" for 25yr event
Inflow = 2.56 cfs @ 12.11 hrs, Volume= 0.197 af
Outflow = 2.56 cfs @ 12.11 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 10R: DP2

Inflow Area = 0.073 ac, 16.90% Impervious, Inflow Depth = 2.56" for 25yr event
Inflow = 0.21 cfs @ 12.10 hrs, Volume= 0.016 af
Outflow = 0.21 cfs @ 12.10 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 11R: DP3

Inflow Area = 1.035 ac, 22.51% Impervious, Inflow Depth = 2.47" for 25yr event
Inflow = 2.89 cfs @ 12.10 hrs, Volume= 0.213 af
Outflow = 2.89 cfs @ 12.10 hrs, Volume= 0.213 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP1: DP1

Inflow Area = 0.615 ac, 56.84% Impervious, Inflow Depth = 4.00" for 25yr event
Inflow = 2.51 cfs @ 12.11 hrs, Volume= 0.205 af
Outflow = 2.51 cfs @ 12.11 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: DP2

Inflow Area = 0.073 ac, 16.90% Impervious, Inflow Depth = 2.56" for 25yr event
Inflow = 0.21 cfs @ 12.10 hrs, Volume= 0.016 af
Outflow = 0.21 cfs @ 12.10 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: DP3

Inflow Area = 0.978 ac, 24.35% Impervious, Inflow Depth = 2.29" for 25yr event
Inflow = 2.75 cfs @ 12.11 hrs, Volume= 0.186 af
Outflow = 2.75 cfs @ 12.11 hrs, Volume= 0.186 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Upper Rain Garden

Inflow Area = 0.148 ac, 80.28% Impervious, Inflow Depth = 5.11" for 25yr event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 0.77 cfs @ 12.12 hrs, Volume= 0.058 af, Atten= 6%, Lag= 1.8 min
Discarded = 0.02 cfs @ 12.12 hrs, Volume= 0.024 af
Primary = 0.75 cfs @ 12.12 hrs, Volume= 0.034 af
Routed to Reach DP3 : DP3

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 38.18' @ 12.12 hrs Surf.Area= 700 sf Storage= 664 cf

Plug-Flow detention time= 172.6 min calculated for 0.057 af (91% of inflow)
Center-of-Mass det. time= 129.5 min (909.7 - 780.2)

Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	914 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	150	0	0
37.00	280	108	108
38.00	595	438	545
38.50	880	369	914

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	38.00'	**4.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.02 cfs @ 12.12 hrs HW=38.18' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.73 cfs @ 12.12 hrs HW=38.18' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.73 cfs @ 1.01 fps)

Summary for Pond 4P: Lower Rain Garden

Inflow Area = 0.316 ac, 59.30% Impervious, Inflow Depth = 4.35" for 25yr event
Inflow = 1.55 cfs @ 12.09 hrs, Volume= 0.114 af
Outflow = 1.25 cfs @ 12.15 hrs, Volume= 0.114 af, Atten= 19%, Lag= 3.8 min
Discarded = 0.01 cfs @ 12.15 hrs, Volume= 0.009 af
Primary = 1.24 cfs @ 12.15 hrs, Volume= 0.105 af
Routed to Reach DP1 : DP1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 7.45' @ 12.15 hrs Surf.Area= 475 sf Storage= 445 cf

Plug-Flow detention time= 17.2 min calculated for 0.114 af (100% of inflow)
Center-of-Mass det. time= 17.6 min (820.1 - 802.5)

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	734 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)
6.00	128	78.0	0	0	128
7.00	393	98.0	248	248	422
8.00	585	114.0	486	734	712

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	7.90'	**3.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Primary	6.30'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	6.80'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.15 hrs HW=7.45' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.24 cfs @ 12.15 hrs HW=7.45' (Free Discharge)
├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
├─**3=Orifice/Grate** (Orifice Controls 0.64 cfs @ 4.67 fps)
└─**4=Orifice/Grate** (Orifice Controls 0.60 cfs @ 3.05 fps)

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: 1S Runoff Area=6,440 sf 80.28% Impervious Runoff Depth=7.59"
Flow Length=40' Slope=0.0100 '/' Tc=6.0 min CN=91 Runoff=1.19 cfs 0.093 af

Subcatchment 2S: 2S Runoff Area=3,195 sf 16.90% Impervious Runoff Depth=4.56"
Flow Length=75' Tc=6.0 min CN=66 Runoff=0.38 cfs 0.028 af

Subcatchment 3S: 3S Runoff Area=13,760 sf 59.30% Impervious Runoff Depth=6.74"
Flow Length=150' Tc=6.0 min CN=84 Runoff=2.35 cfs 0.177 af

Subcatchment 4Sa: 4Sa Runoff Area=11,755 sf 50.23% Impervious Runoff Depth=6.13"
Flow Length=150' Tc=6.0 min CN=79 Runoff=1.87 cfs 0.138 af

Subcatchment 4Sb: 4Sb Runoff Area=1,280 sf 91.02% Impervious Runoff Depth=8.07"
Flow Length=100' Tc=6.0 min CN=95 Runoff=0.24 cfs 0.020 af

Subcatchment 5S: 5S Runoff Area=36,166 sf 14.39% Impervious Runoff Depth=4.08"
Flow Length=280' Tc=6.5 min CN=62 Runoff=3.83 cfs 0.282 af

Subcatchment 6S: 1S Runoff Area=24,336 sf 60.16% Impervious Runoff Depth=6.62"
Flow Length=190' Tc=7.7 min CN=83 Runoff=3.91 cfs 0.308 af

Subcatchment 7S: 2S Runoff Area=3,195 sf 16.90% Impervious Runoff Depth=4.56"
Flow Length=75' Tc=6.0 min CN=66 Runoff=0.38 cfs 0.028 af

Subcatchment 8S: 3S Runoff Area=45,102 sf 22.51% Impervious Runoff Depth=4.44"
Flow Length=240' Tc=6.0 min CN=65 Runoff=5.28 cfs 0.383 af

Reach 9R: DP1 Inflow=3.91 cfs 0.308 af
Outflow=3.91 cfs 0.308 af

Reach 10R: DP2 Inflow=0.38 cfs 0.028 af
Outflow=0.38 cfs 0.028 af

Reach 11R: DP3 Inflow=5.28 cfs 0.383 af
Outflow=5.28 cfs 0.383 af

Reach DP1: DP1 Inflow=3.67 cfs 0.325 af
Outflow=3.67 cfs 0.325 af

Reach DP2: DP2 Inflow=0.38 cfs 0.028 af
Outflow=0.38 cfs 0.028 af

Reach DP3: DP3 Inflow=4.94 cfs 0.344 af
Outflow=4.94 cfs 0.344 af

Pond 2P: Upper Rain Garden Peak Elev=38.24' Storage=702 cf Inflow=1.19 cfs 0.093 af
Discarded=0.02 cfs 0.026 af Primary=1.11 cfs 0.062 af Outflow=1.13 cfs 0.087 af

Pond 4P: Lower Rain Garden Peak Elev=7.95' Storage=707 cf Inflow=2.35 cfs 0.177 af
Discarded=0.01 cfs 0.010 af Primary=1.76 cfs 0.167 af Outflow=1.77 cfs 0.177 af

Total Runoff Area = 3.334 ac Runoff Volume = 1.458 af Average Runoff Depth = 5.25"
64.56% Pervious = 2.152 ac 35.44% Impervious = 1.182 ac

Summary for Subcatchment 1S: 1S

Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.093 af, Depth= 7.59"
Routed to Pond 2P : Upper Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

Area (sf)	CN	Description
5,170	98	Paved parking, HSG B
1,270	61	>75% Grass cover, Good, HSG B
6,440	91	Weighted Average
1,270		19.72% Pervious Area
5,170		80.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	40	0.0100	0.89		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.8	40	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2S: 2S

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 4.56"
Routed to Reach DP2 : DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

	Area (sf)	CN	Description
	2,655	60	Woods, Fair, HSG B
*	540	98	Ledge
	3,195	66	Weighted Average
	2,655		83.10% Pervious Area
	540		16.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.4	25	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3S: 3S

Runoff = 2.35 cfs @ 12.09 hrs, Volume= 0.177 af, Depth= 6.74"
Routed to Pond 4P : Lower Rain Garden

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

	Area (sf)	CN	Description
	2,450	98	Paved parking, HSG B
*	5,710	98	Ledge
	4,070	60	Woods, Fair, HSG B
	970	61	>75% Grass cover, Good, HSG B
*	560	90	Imprv,. driveway
	13,760	84	Weighted Average
	5,600		40.70% Pervious Area
	8,160		59.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	32	0.1200	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.1	18	0.2000	2.50		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.2	100	0.2500	10.15		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
4.4	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4Sa: 4Sa

Runoff = 1.87 cfs @ 12.09 hrs, Volume= 0.138 af, Depth= 6.13"
Routed to Reach DP1 : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

	Area (sf)	CN	Description
*	5,905	98	Ledge
	150	85	Gravel roads, HSG B
	5,700	60	Woods, Fair, HSG B
	11,755	79	Weighted Average
	5,850		49.77% Pervious Area
	5,905		50.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	50	0.2800	3.51		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.1	100	0.3000	11.12		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	150	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4Sb: 4Sb

Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.020 af, Depth= 8.07"
Routed to Reach DP1 : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

	Area (sf)	CN	Description
*	1,165	98	Ledge
	115	60	Woods, Fair, HSG B
	1,280	95	Weighted Average
	115		8.98% Pervious Area
	1,165		91.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.2400	3.30		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
0.1	50	0.3600	12.18		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	100	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5S: 5S

Runoff = 3.83 cfs @ 12.10 hrs, Volume= 0.282 af, Depth= 4.08"
Routed to Reach DP3 : DP3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

	Area (sf)	CN	Description
*	5,204	98	Ledge
	7,515	61	>75% Grass cover, Good, HSG B
	23,447	55	Woods, Good, HSG B
	36,166	62	Weighted Average
	30,962		85.61% Pervious Area
	5,204		14.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	25	0.2000	2.67		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
3.6	25	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.7	230	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.5	280	Total			

Summary for Subcatchment 6S: 1S

Runoff = 3.91 cfs @ 12.11 hrs, Volume= 0.308 af, Depth= 6.62"
Routed to Reach 9R : DP1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

	Area (sf)	CN	Description
	9,546	60	Woods, Fair, HSG B
*	14,640	98	Ledge
	150	85	Gravel roads, HSG B
	24,336	83	Weighted Average
	9,696		39.84% Pervious Area
	14,640		60.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.8	140	0.3140	2.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.7	190	Total			

Summary for Subcatchment 7S: 2S

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 4.56"
Routed to Reach 10R : DP2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

	Area (sf)	CN	Description
	2,655	60	Woods, Fair, HSG B
*	540	98	Ledge
	3,195	66	Weighted Average
	2,655		83.10% Pervious Area
	540		16.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
0.4	25	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7	75	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8S: 3S

Runoff = 5.28 cfs @ 12.09 hrs, Volume= 0.383 af, Depth= 4.44"
Routed to Reach 11R : DP3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100yr Rainfall=8.67"

	Area (sf)	CN	Description
*	10,152	98	Ledge
	34,950	55	Woods, Good, HSG B
	45,102	65	Weighted Average
	34,950		77.49% Pervious Area
	10,152		22.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	25	0.2000	2.67		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.33"
3.6	25	0.1000	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.1	190	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.9	240	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach 9R: DP1

Inflow Area = 0.559 ac, 60.16% Impervious, Inflow Depth = 6.62" for 100yr event
Inflow = 3.91 cfs @ 12.11 hrs, Volume= 0.308 af
Outflow = 3.91 cfs @ 12.11 hrs, Volume= 0.308 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 10R: DP2

Inflow Area = 0.073 ac, 16.90% Impervious, Inflow Depth = 4.56" for 100yr event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af
Outflow = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach 11R: DP3

Inflow Area = 1.035 ac, 22.51% Impervious, Inflow Depth = 4.44" for 100yr event
Inflow = 5.28 cfs @ 12.09 hrs, Volume= 0.383 af
Outflow = 5.28 cfs @ 12.09 hrs, Volume= 0.383 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP1: DP1

Inflow Area = 0.615 ac, 56.84% Impervious, Inflow Depth = 6.34" for 100yr event
Inflow = 3.67 cfs @ 12.11 hrs, Volume= 0.325 af
Outflow = 3.67 cfs @ 12.11 hrs, Volume= 0.325 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP2: DP2

Inflow Area = 0.073 ac, 16.90% Impervious, Inflow Depth = 4.56" for 100yr event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af
Outflow = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Reach DP3: DP3

Inflow Area = 0.978 ac, 24.35% Impervious, Inflow Depth = 4.22" for 100yr event
Inflow = 4.94 cfs @ 12.10 hrs, Volume= 0.344 af
Outflow = 4.94 cfs @ 12.10 hrs, Volume= 0.344 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Summary for Pond 2P: Upper Rain Garden

Inflow Area = 0.148 ac, 80.28% Impervious, Inflow Depth = 7.59" for 100yr event
Inflow = 1.19 cfs @ 12.09 hrs, Volume= 0.093 af
Outflow = 1.13 cfs @ 12.11 hrs, Volume= 0.087 af, Atten= 5%, Lag= 1.6 min
Discarded = 0.02 cfs @ 12.11 hrs, Volume= 0.026 af
Primary = 1.11 cfs @ 12.11 hrs, Volume= 0.062 af
Routed to Reach DP3 : DP3

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 38.24' @ 12.11 hrs Surf.Area= 730 sf Storage= 702 cf

Plug-Flow detention time= 127.9 min calculated for 0.087 af (93% of inflow)
Center-of-Mass det. time= 92.1 min (862.5 - 770.4)

Volume	Invert	Avail.Storage	Storage Description
#1	36.50'	914 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
36.50	150	0	0
37.00	280	108	108
38.00	595	438	545
38.50	880	369	914

Device	Routing	Invert	Outlet Devices
#1	Discarded	36.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	38.00'	**4.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.02 cfs @ 12.11 hrs HW=38.23' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=1.08 cfs @ 12.11 hrs HW=38.23' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 1.08 cfs @ 1.16 fps)

Summary for Pond 4P: Lower Rain Garden

Inflow Area = 0.316 ac, 59.30% Impervious, Inflow Depth = 6.74" for 100yr event
Inflow = 2.35 cfs @ 12.09 hrs, Volume= 0.177 af
Outflow = 1.77 cfs @ 12.16 hrs, Volume= 0.177 af, Atten= 25%, Lag= 4.2 min
Discarded = 0.01 cfs @ 12.16 hrs, Volume= 0.010 af
Primary = 1.76 cfs @ 12.16 hrs, Volume= 0.167 af
Routed to Reach DP1 : DP1

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 7.95' @ 12.16 hrs Surf.Area= 575 sf Storage= 707 cf

Plug-Flow detention time= 13.7 min calculated for 0.177 af (100% of inflow)
Center-of-Mass det. time= 14.1 min (804.4 - 790.3)

Volume	Invert	Avail.Storage	Storage Description
#1	6.00'	734 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)
6.00	128	78.0	0	0	128
7.00	393	98.0	248	248	422
8.00	585	114.0	486	734	712

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	7.90'	**3.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Primary	6.30'	**5.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	6.80'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.16 hrs HW=7.94' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.73 cfs @ 12.16 hrs HW=7.94' (Free Discharge)
├─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.06 cfs @ 0.47 fps)
├─**3=Orifice/Grate** (Orifice Controls 0.79 cfs @ 5.76 fps)
└─**4=Orifice/Grate** (Orifice Controls 0.89 cfs @ 4.54 fps)

TABLE OF CONTENTS