APPENDIX A

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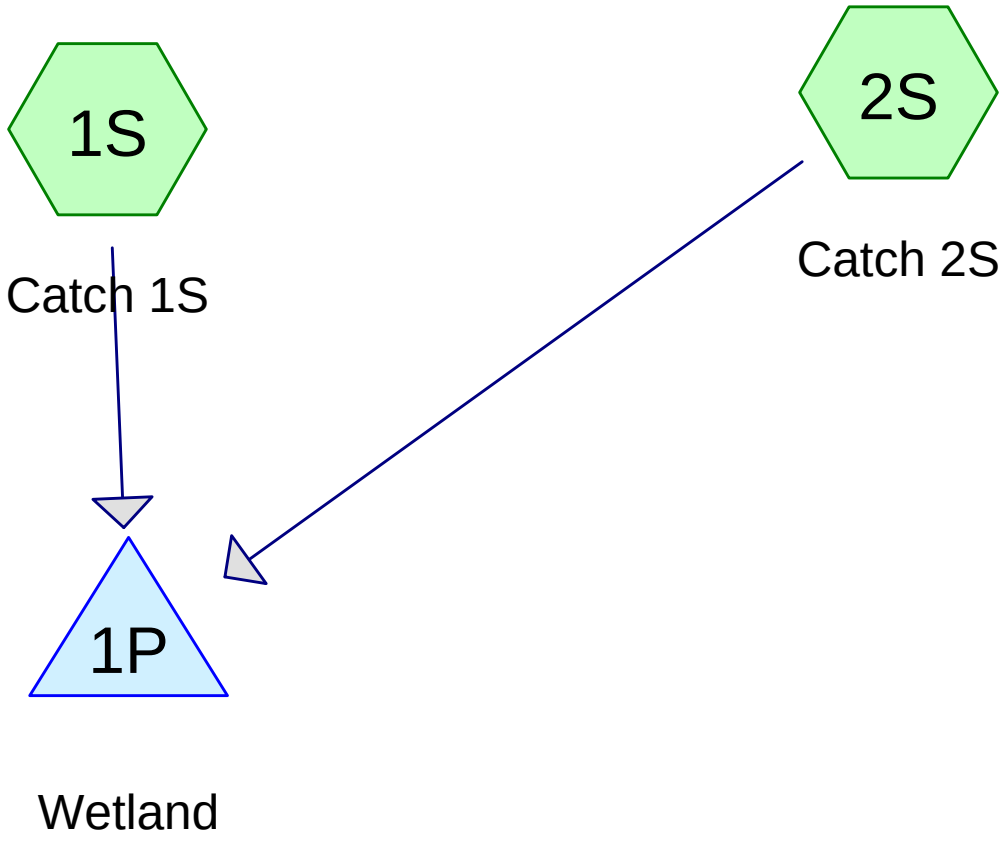
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Subcat Reach Pond Link

Routing Diagram for 2329-01 - Existing
Prepared by Microsoft, Printed 7/25/2017
HydroCAD® 10.00-18 s/n 02881 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.897	61	>75% Grass cover, Good, HSG B (1S, 2S)
0.262	98	Paved parking, HSG A (1S)
2.674	98	Paved parking, HSG B (1S, 2S)
0.071	98	Roofs (off-site), HSG A (1S)
0.267	98	Roofs, HSG B (1S, 2S)
3.702	30	Woods, Good, HSG A (1S)
0.016	55	Woods, Good, HSG B (1S)
0.147	83	Woods, Poor, HSG D (1S)
9.035	**62**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
4.035	HSG A	1S
4.854	HSG B	1S, 2S
0.000	HSG C	
0.147	HSG D	1S
0.000	Other	
9.035		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	1.897	0.000	0.000	0.000	1.897	>75% Grass cover, Good	1S, 2S
0.262	2.674	0.000	0.000	0.000	2.936	Paved parking	1S, 2S
0.000	0.267	0.000	0.000	0.000	0.267	Roofs	1S, 2S
0.071	0.000	0.000	0.000	0.000	0.071	Roofs (off-site)	1S
3.702	0.016	0.000	0.000	0.000	3.717	Woods, Good	1S
0.000	0.000	0.000	0.147	0.000	0.147	Woods, Poor	1S
4.035	**4.854**	**0.000**	**0.147**	**0.000**	**9.035**	**TOTAL AREA**	

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=343,290 sf 36.50% Impervious Runoff Depth>0.32"
Tc=6.0 min CN=60 Runoff=1.78 cfs 0.210 af

Subcatchment 2S: Catch 2S Runoff Area=50,276 sf 34.37% Impervious Runoff Depth>0.89"
Tc=6.0 min CN=74 Runoff=1.22 cfs 0.085 af

Pond 1P: Wetland Inflow=2.95 cfs 0.296 af
Primary=2.95 cfs 0.296 af

Total Runoff Area = 9.035 ac Runoff Volume = 0.296 af Average Runoff Depth = 0.39"
63.77% Pervious = 5.761 ac 36.23% Impervious = 3.274 ac

Summary for Subcatchment 1S: Catch 1S

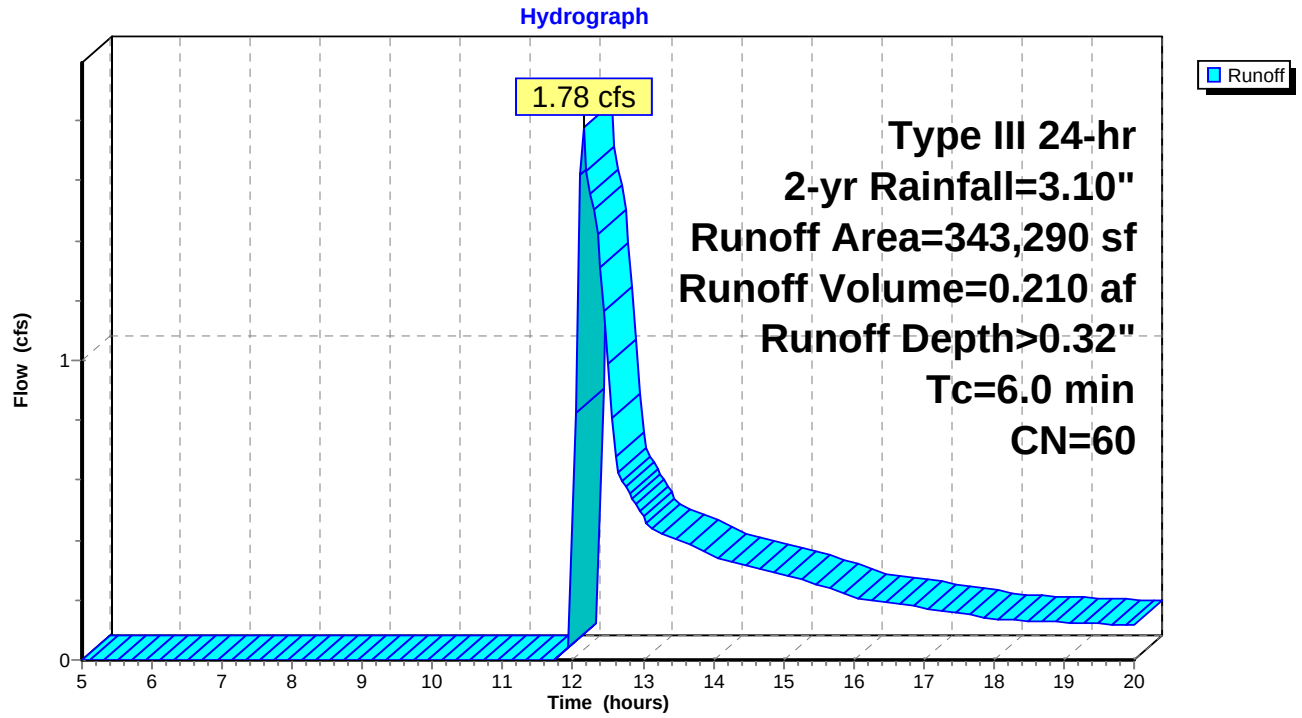
Runoff = 1.78 cfs @ 12.15 hrs, Volume= 0.210 af, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
	161,246	30	Woods, Good, HSG A
	681	55	Woods, Good, HSG B
	6,395	83	Woods, Poor, HSG D
	49,650	61	>75% Grass cover, Good, HSG B
	8,850	98	Roofs, HSG B
*	3,073	98	Roofs (off-site), HSG A
	11,433	98	Paved parking, HSG A
	101,962	98	Paved parking, HSG B
	343,290	60	Weighted Average
	217,972		63.50% Pervious Area
	125,318		36.50% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

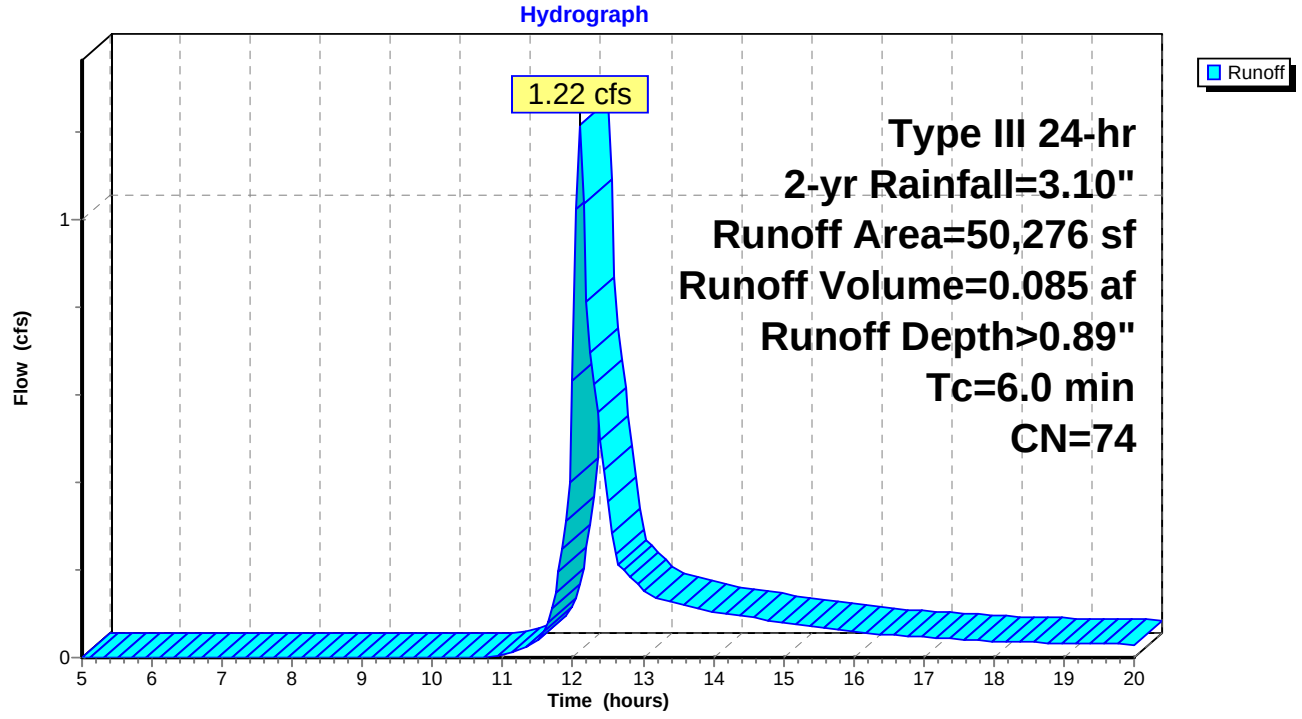
Runoff = 1.22 cfs @ 12.10 hrs, Volume= 0.085 af, Depth> 0.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
32,996	61	>75% Grass cover, Good, HSG B
2,765	98	Roofs, HSG B
14,515	98	Paved parking, HSG B
50,276	74	Weighted Average
32,996		65.63% Pervious Area
17,280		34.37% Impervious Area

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

Subcatchment 2S: Catch 2S



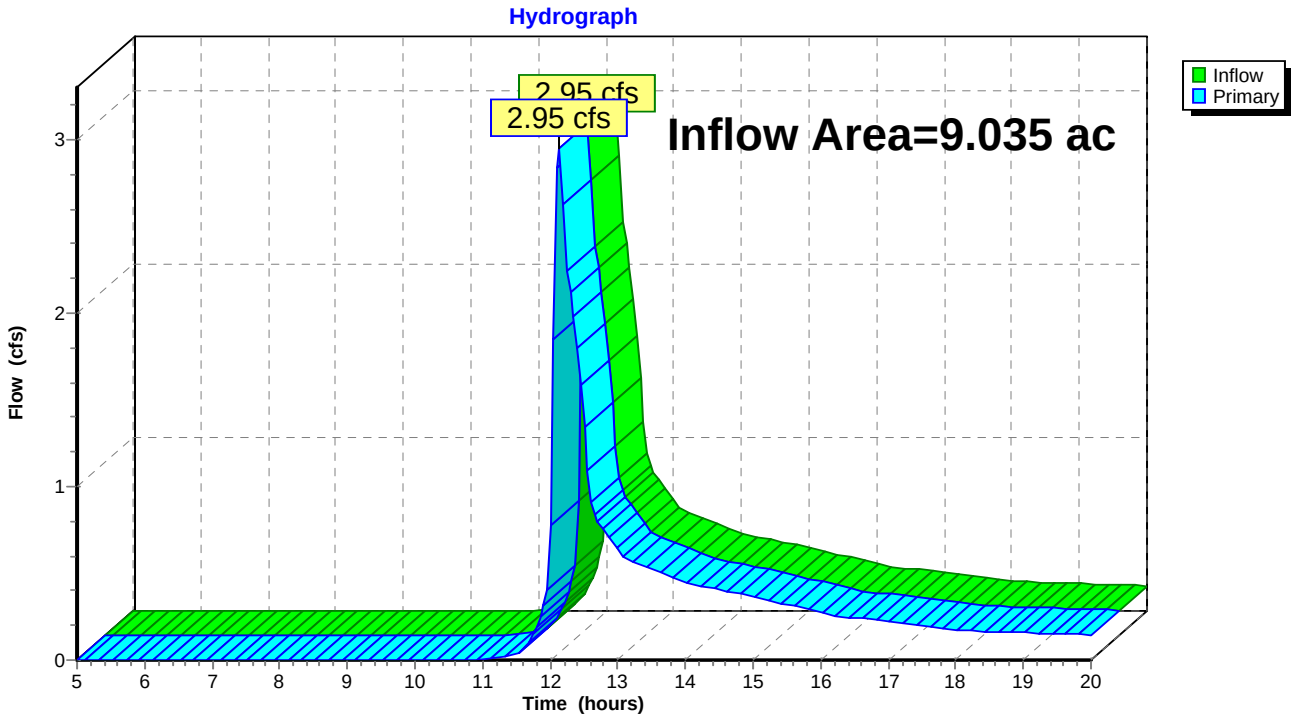
Summary for Pond 1P: Wetland

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

Inflow Area = 9.035 ac, 36.23% Impervious, Inflow Depth > 0.39" for 2-yr event
Inflow = 2.95 cfs @ 12.12 hrs, Volume= 0.296 af
Primary = 2.95 cfs @ 12.12 hrs, Volume= 0.296 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=343,290 sf 36.50% Impervious Runoff Depth>0.97"
Tc=6.0 min CN=60 Runoff=8.46 cfs 0.634 af

Subcatchment 2S: Catch 2S Runoff Area=50,276 sf 34.37% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=74 Runoff=2.70 cfs 0.182 af

Pond 1P: Wetland Inflow=11.15 cfs 0.816 af
Primary=11.15 cfs 0.816 af

Total Runoff Area = 9.035 ac Runoff Volume = 0.816 af Average Runoff Depth = 1.08"
63.77% Pervious = 5.761 ac 36.23% Impervious = 3.274 ac

Summary for Subcatchment 1S: Catch 1S

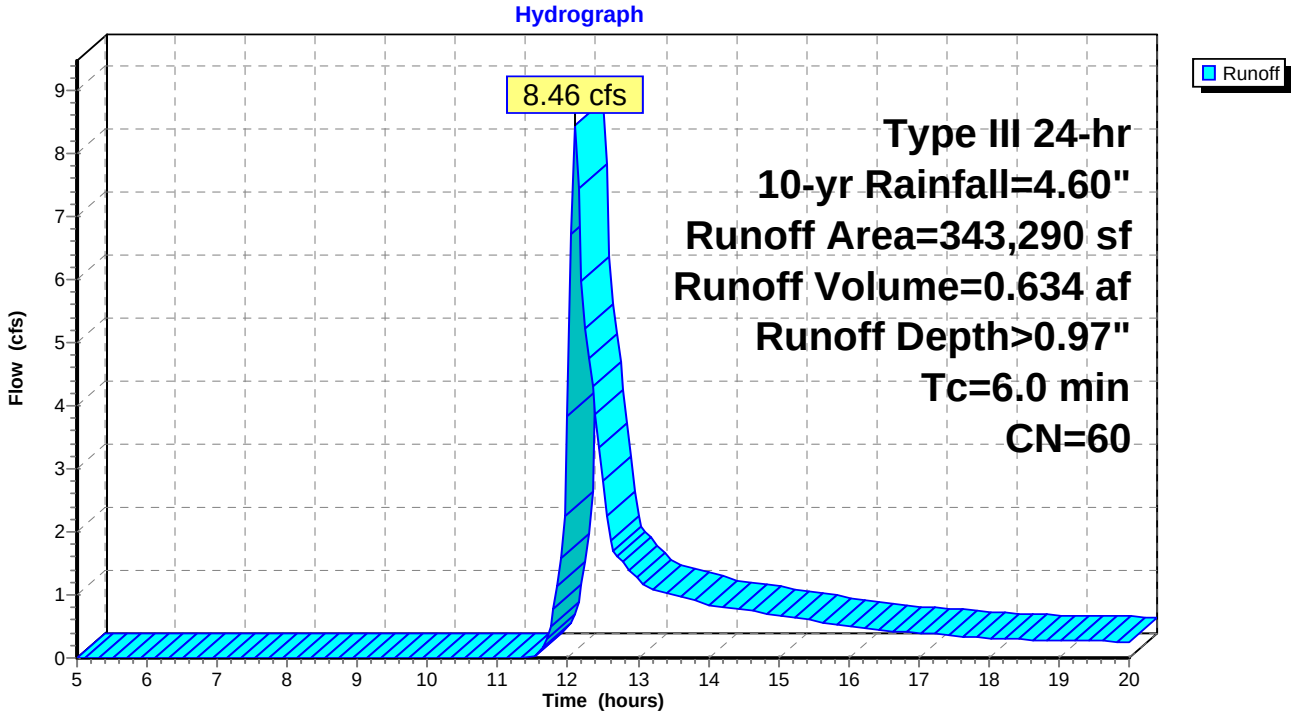
Runoff = 8.46 cfs @ 12.11 hrs, Volume= 0.634 af, Depth> 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
	161,246	30	Woods, Good, HSG A
	681	55	Woods, Good, HSG B
	6,395	83	Woods, Poor, HSG D
	49,650	61	>75% Grass cover, Good, HSG B
	8,850	98	Roofs, HSG B
*	3,073	98	Roofs (off-site), HSG A
	11,433	98	Paved parking, HSG A
	101,962	98	Paved parking, HSG B
	343,290	60	Weighted Average
	217,972		63.50% Pervious Area
	125,318		36.50% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

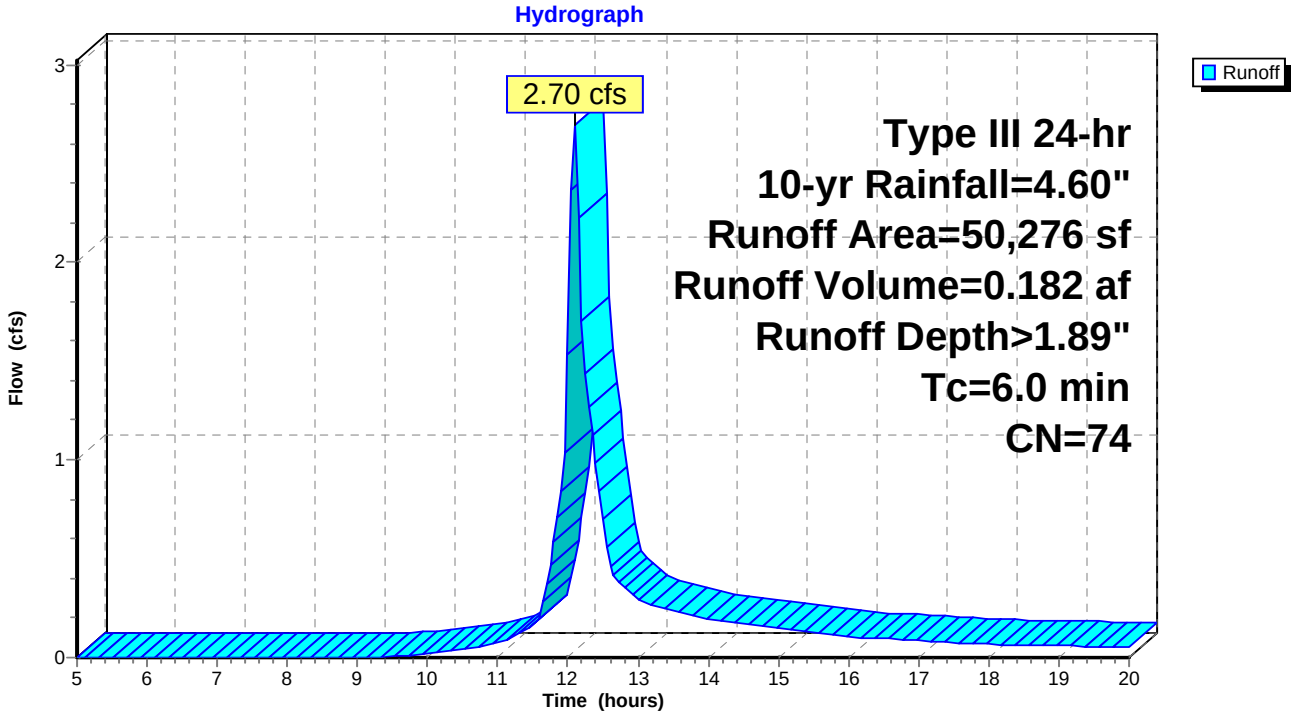
Runoff = 2.70 cfs @ 12.10 hrs, Volume= 0.182 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
32,996	61	>75% Grass cover, Good, HSG B
2,765	98	Roofs, HSG B
14,515	98	Paved parking, HSG B
50,276	74	Weighted Average
32,996		65.63% Pervious Area
17,280		34.37% Impervious Area

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

Subcatchment 2S: Catch 2S



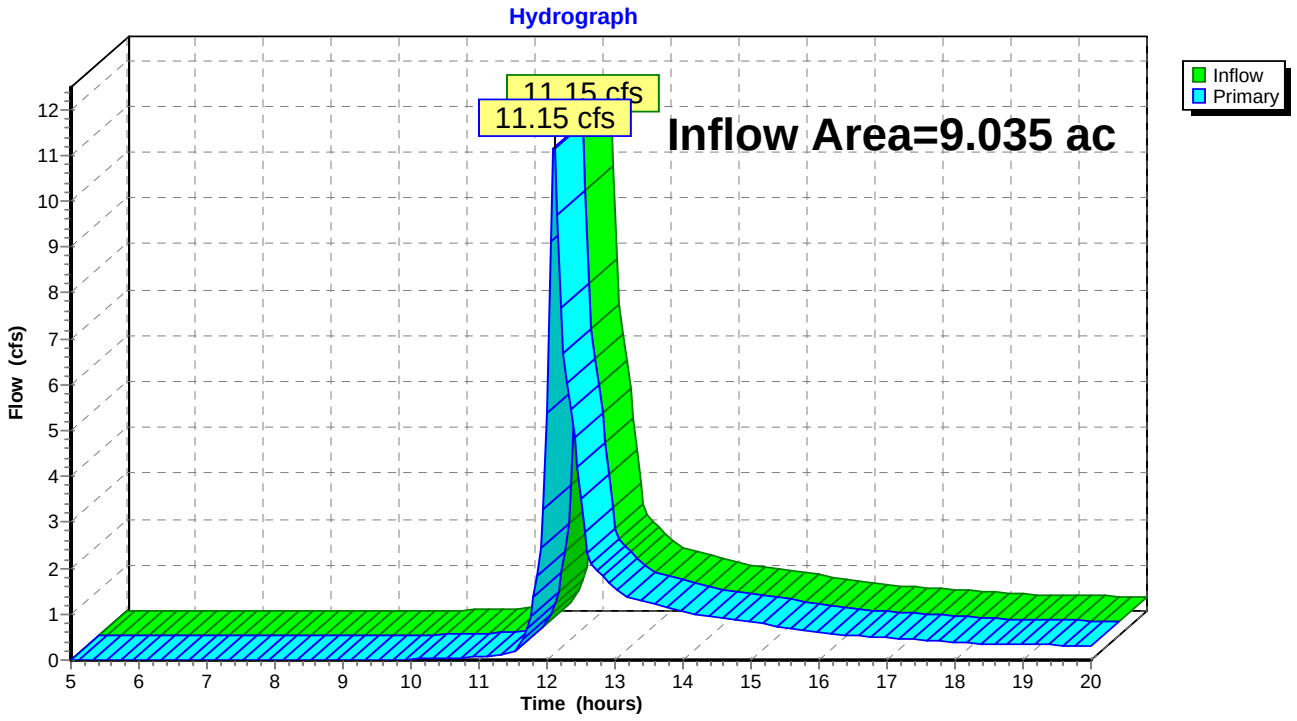
Summary for Pond 1P: Wetland

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

Inflow Area = 9.035 ac, 36.23% Impervious, Inflow Depth > 1.08" for 10-yr event
Inflow = 11.15 cfs @ 12.10 hrs, Volume= 0.816 af
Primary = 11.15 cfs @ 12.10 hrs, Volume= 0.816 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=343,290 sf 36.50% Impervious Runoff Depth>1.45"
Tc=6.0 min CN=60 Runoff=13.49 cfs 0.955 af

Subcatchment 2S: Catch 2S Runoff Area=50,276 sf 34.37% Impervious Runoff Depth>2.57"
Tc=6.0 min CN=74 Runoff=3.67 cfs 0.247 af

Pond 1P: Wetland Inflow=17.15 cfs 1.203 af
Primary=17.15 cfs 1.203 af

Total Runoff Area = 9.035 ac Runoff Volume = 1.203 af Average Runoff Depth = 1.60"
63.77% Pervious = 5.761 ac 36.23% Impervious = 3.274 ac

Summary for Subcatchment 1S: Catch 1S

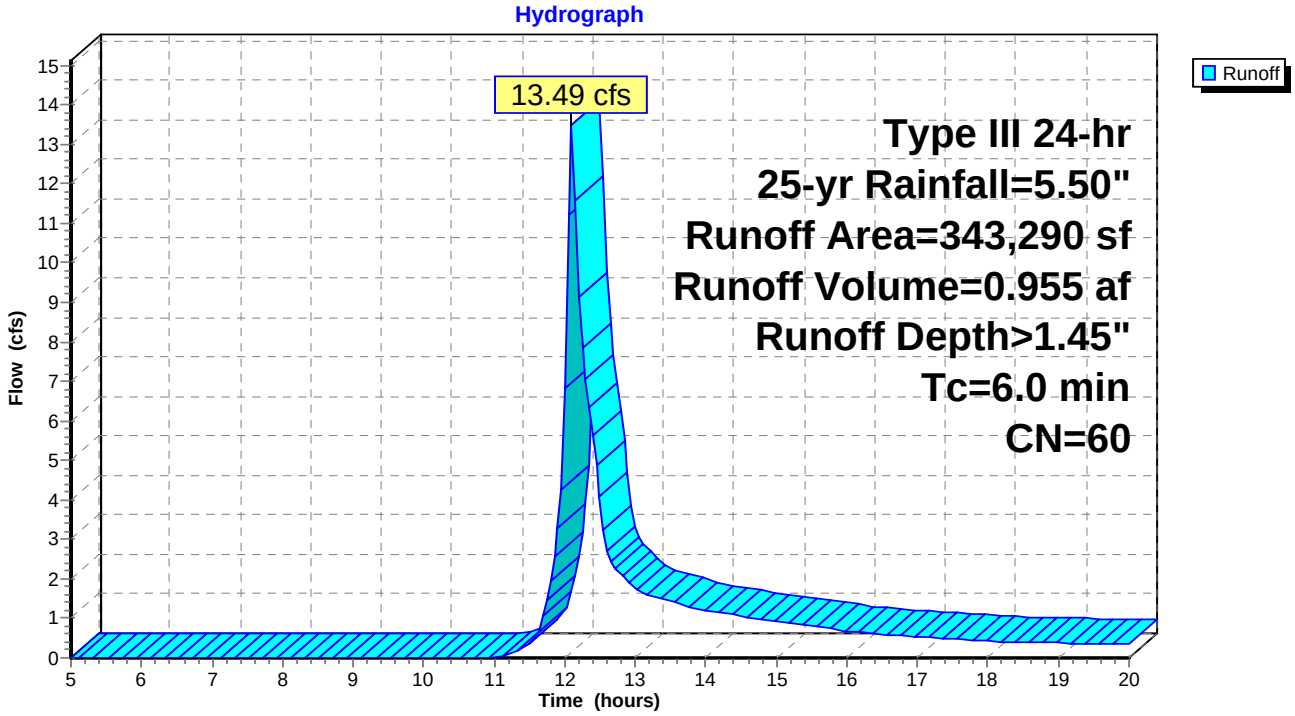
Runoff = 13.49 cfs @ 12.10 hrs, Volume= 0.955 af, Depth> 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
	161,246	30	Woods, Good, HSG A
	681	55	Woods, Good, HSG B
	6,395	83	Woods, Poor, HSG D
	49,650	61	>75% Grass cover, Good, HSG B
	8,850	98	Roofs, HSG B
*	3,073	98	Roofs (off-site), HSG A
	11,433	98	Paved parking, HSG A
	101,962	98	Paved parking, HSG B
	343,290	60	Weighted Average
	217,972		63.50% Pervious Area
	125,318		36.50% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

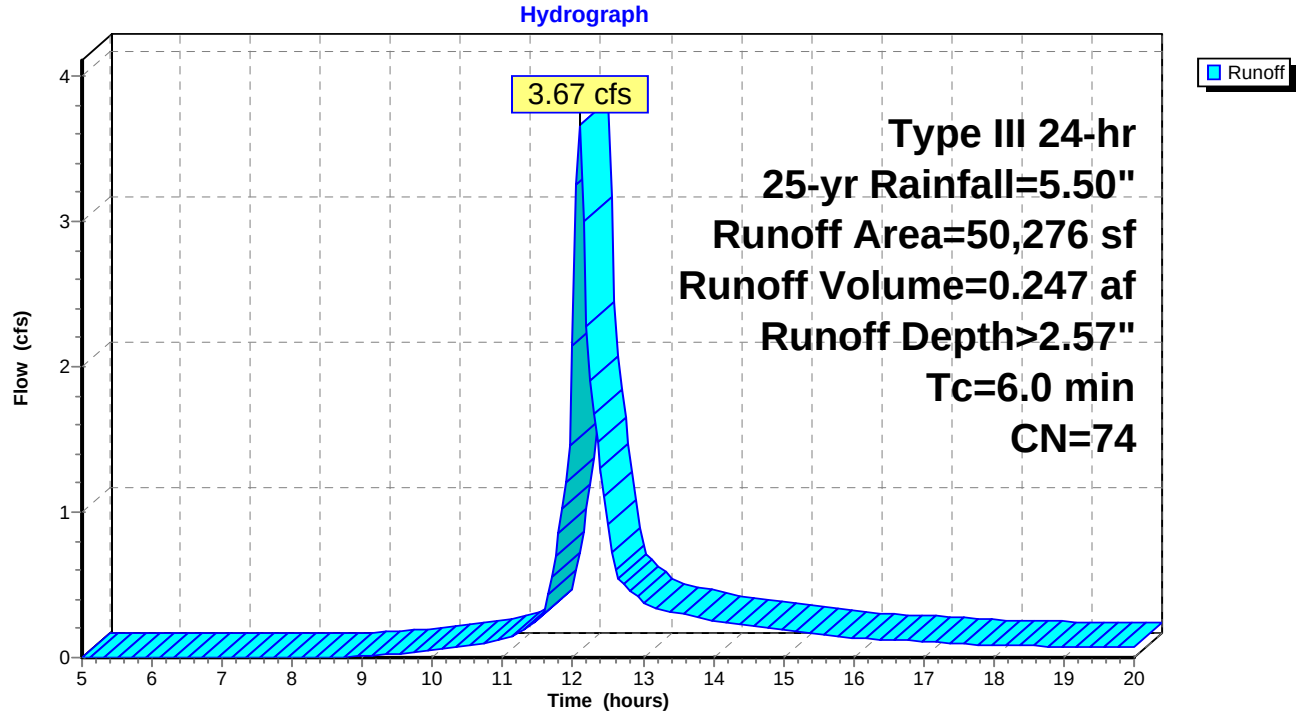
Runoff = 3.67 cfs @ 12.09 hrs, Volume= 0.247 af, Depth> 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
32,996	61	>75% Grass cover, Good, HSG B
2,765	98	Roofs, HSG B
14,515	98	Paved parking, HSG B
50,276	74	Weighted Average
32,996		65.63% Pervious Area
17,280		34.37% Impervious Area

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

Subcatchment 2S: Catch 2S



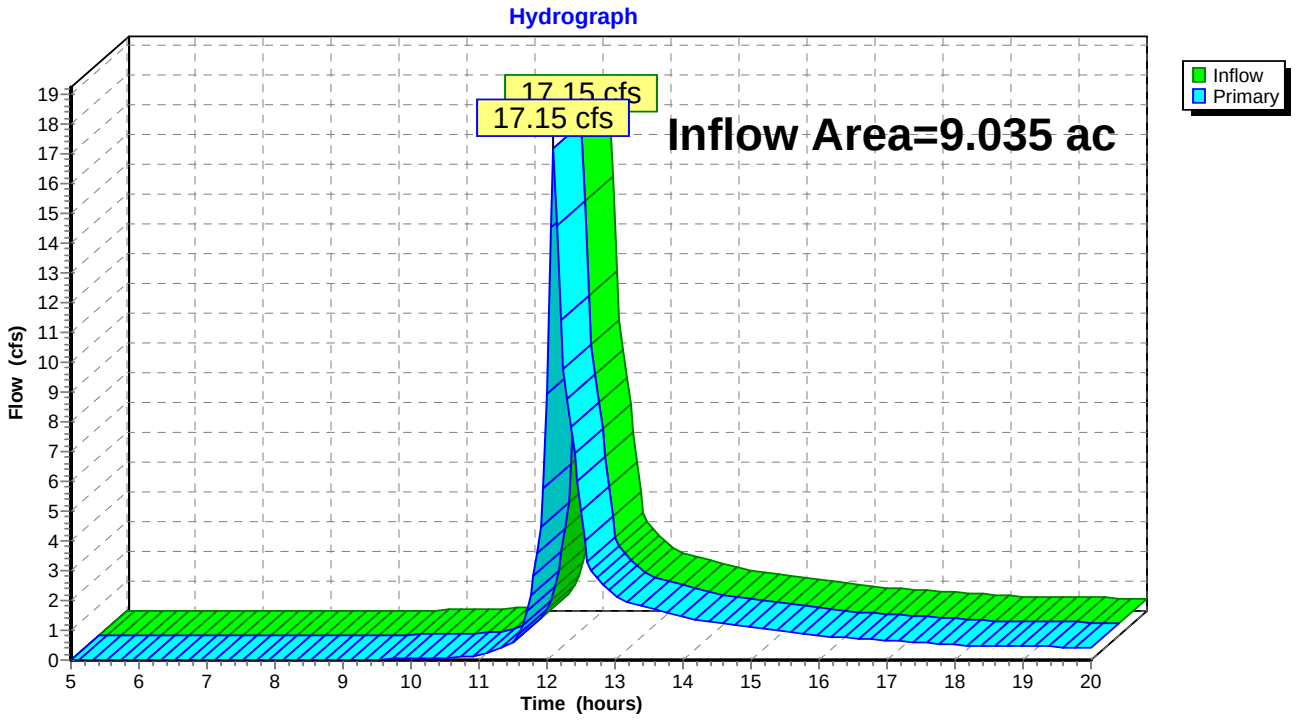
Summary for Pond 1P: Wetland

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

Inflow Area = 9.035 ac, 36.23% Impervious, Inflow Depth > 1.60" for 25-yr event
Inflow = 17.15 cfs @ 12.10 hrs, Volume= 1.203 af
Primary = 17.15 cfs @ 12.10 hrs, Volume= 1.203 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=343,290 sf 36.50% Impervious Runoff Depth>2.13"
Tc=6.0 min CN=60 Runoff=20.33 cfs 1.397 af

Subcatchment 2S: Catch 2S Runoff Area=50,276 sf 34.37% Impervious Runoff Depth>3.45"
Tc=6.0 min CN=74 Runoff=4.90 cfs 0.332 af

Pond 1P: Wetland Inflow=25.22 cfs 1.729 af
Primary=25.22 cfs 1.729 af

Total Runoff Area = 9.035 ac Runoff Volume = 1.729 af Average Runoff Depth = 2.30"
63.77% Pervious = 5.761 ac 36.23% Impervious = 3.274 ac

Summary for Subcatchment 1S: Catch 1S

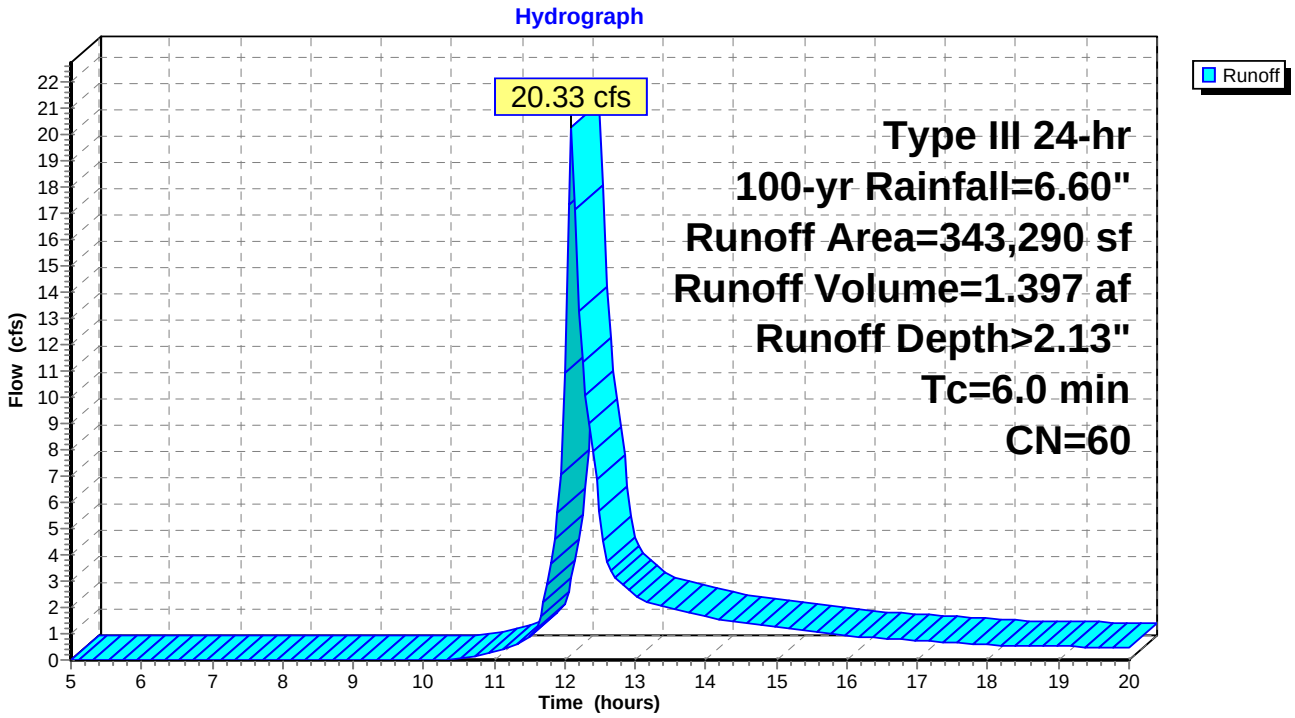
Runoff = 20.33 cfs @ 12.10 hrs, Volume= 1.397 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
	161,246	30	Woods, Good, HSG A
	681	55	Woods, Good, HSG B
	6,395	83	Woods, Poor, HSG D
	49,650	61	>75% Grass cover, Good, HSG B
	8,850	98	Roofs, HSG B
*	3,073	98	Roofs (off-site), HSG A
	11,433	98	Paved parking, HSG A
	101,962	98	Paved parking, HSG B
	343,290	60	Weighted Average
	217,972		63.50% Pervious Area
	125,318		36.50% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

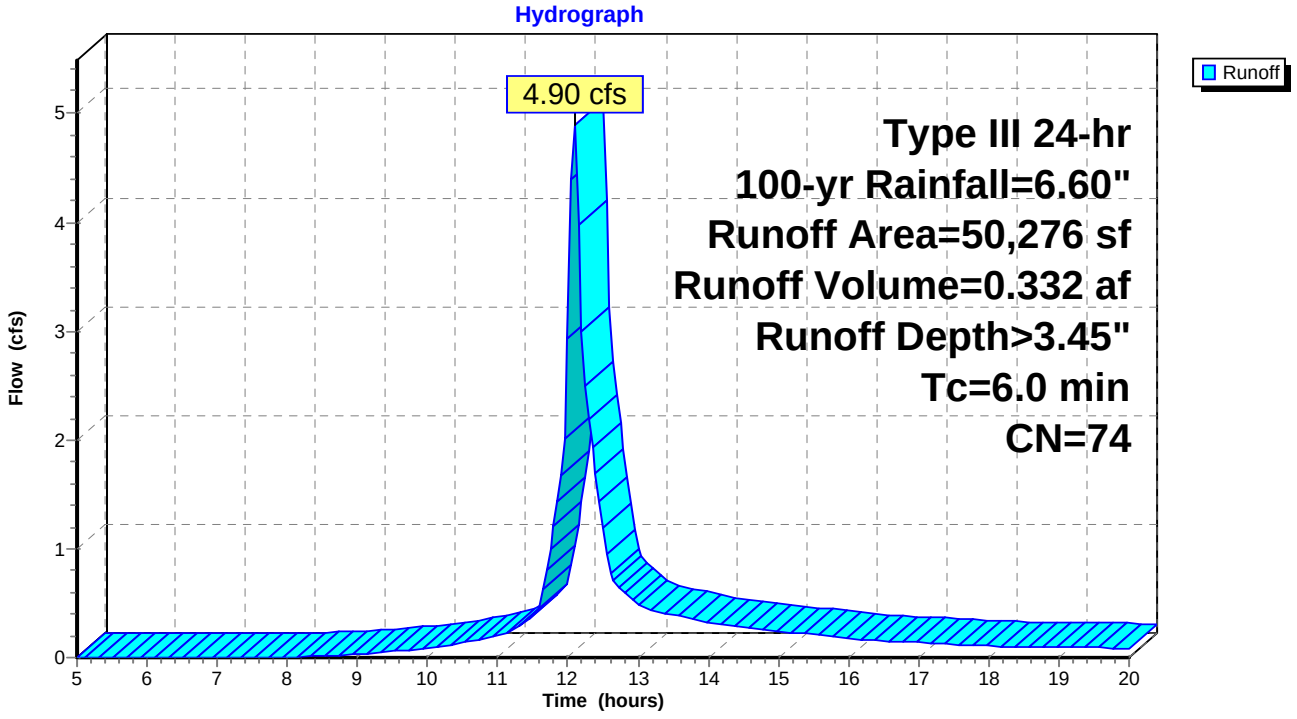
Runoff = 4.90 cfs @ 12.09 hrs, Volume= 0.332 af, Depth> 3.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
32,996	61	>75% Grass cover, Good, HSG B
2,765	98	Roofs, HSG B
14,515	98	Paved parking, HSG B
50,276	74	Weighted Average
32,996		65.63% Pervious Area
17,280		34.37% Impervious Area

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

Subcatchment 2S: Catch 2S



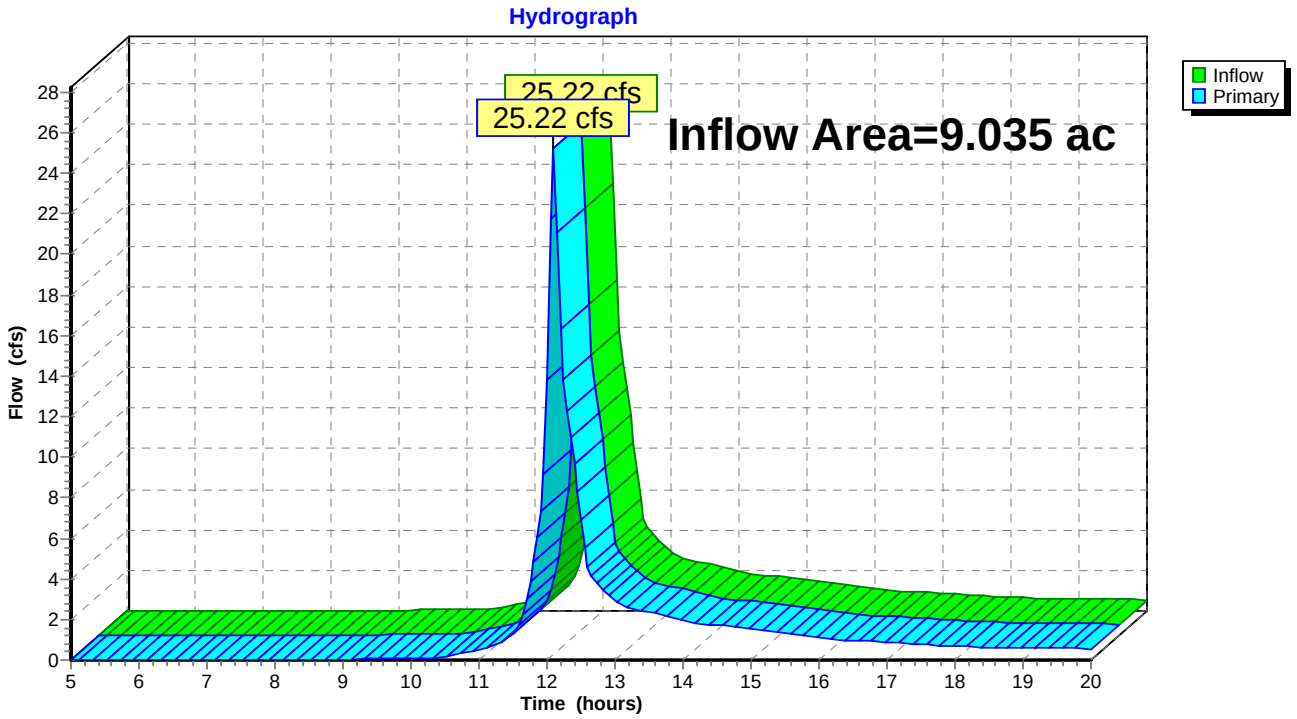
Summary for Pond 1P: Wetland

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

Inflow Area = 9.035 ac, 36.23% Impervious, Inflow Depth > 2.30" for 100-yr event
Inflow = 25.22 cfs @ 12.10 hrs, Volume= 1.729 af
Primary = 25.22 cfs @ 12.10 hrs, Volume= 1.729 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=343,290 sf 36.50% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=60 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Catch 2S Runoff Area=50,276 sf 34.37% Impervious Runoff Depth>0.00"
Tc=6.0 min CN=74 Runoff=0.00 cfs 0.000 af

Pond 1P: Wetland Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 9.035 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
63.77% Pervious = 5.761 ac 36.23% Impervious = 3.274 ac

Summary for Subcatchment 1S: Catch 1S

[45] Hint: Runoff=Zero

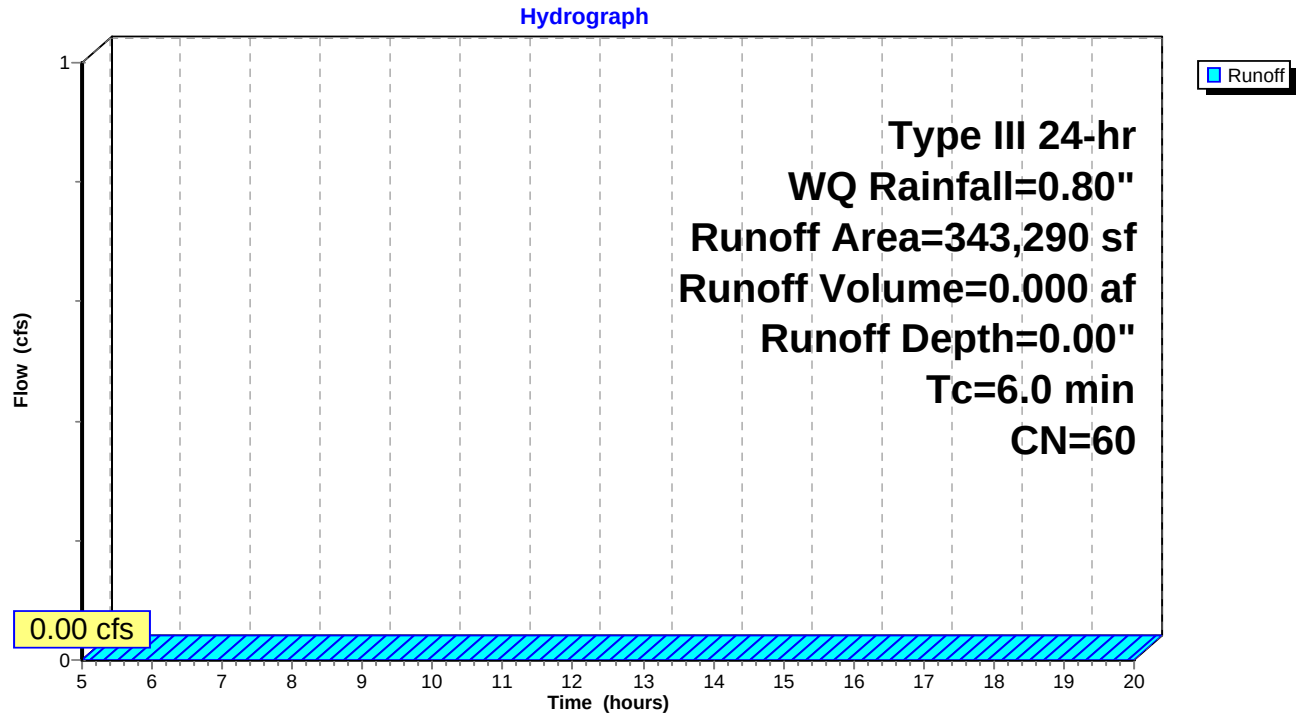
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

	Area (sf)	CN	Description
	161,246	30	Woods, Good, HSG A
	681	55	Woods, Good, HSG B
	6,395	83	Woods, Poor, HSG D
	49,650	61	>75% Grass cover, Good, HSG B
	8,850	98	Roofs, HSG B
*	3,073	98	Roofs (off-site), HSG A
	11,433	98	Paved parking, HSG A
	101,962	98	Paved parking, HSG B
	343,290	60	Weighted Average
	217,972		63.50% Pervious Area
	125,318		36.50% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

[73] Warning: Peak may fall outside time span

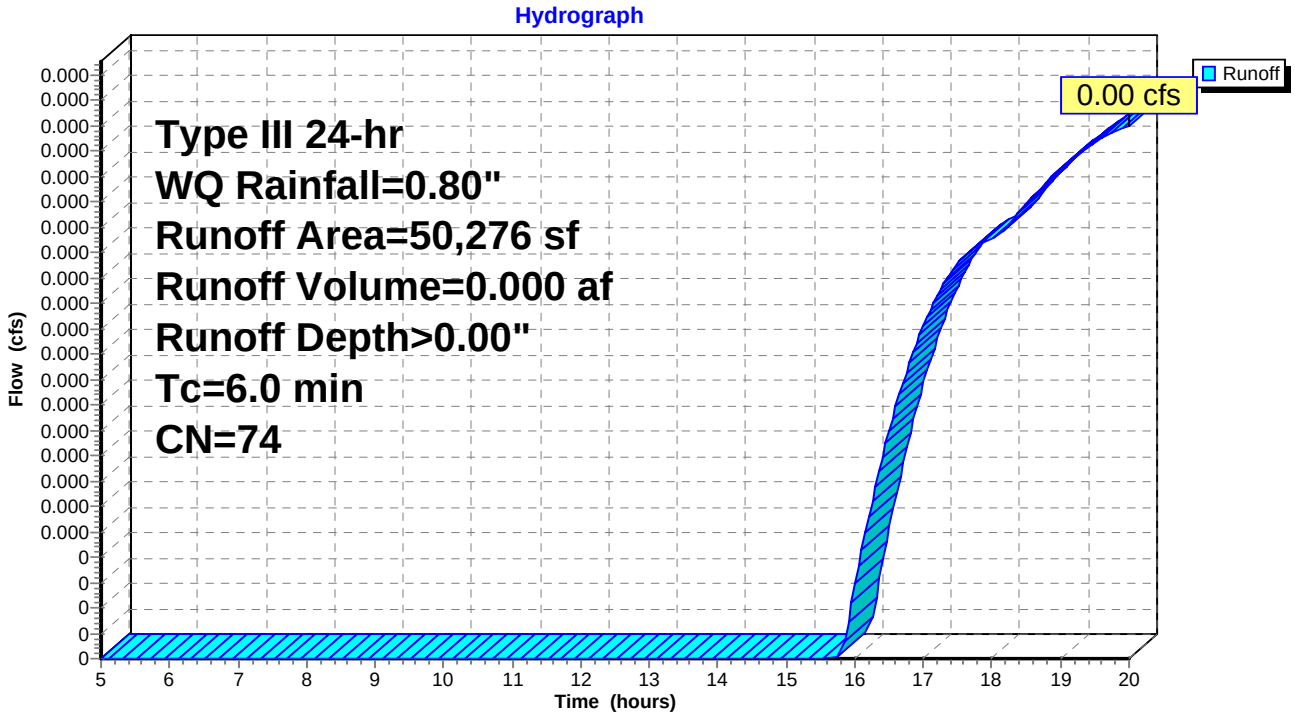
Runoff = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
32,996	61	>75% Grass cover, Good, HSG B
2,765	98	Roofs, HSG B
14,515	98	Paved parking, HSG B
50,276	74	Weighted Average
32,996		65.63% Pervious Area
17,280		34.37% Impervious Area

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

Subcatchment 2S: Catch 2S



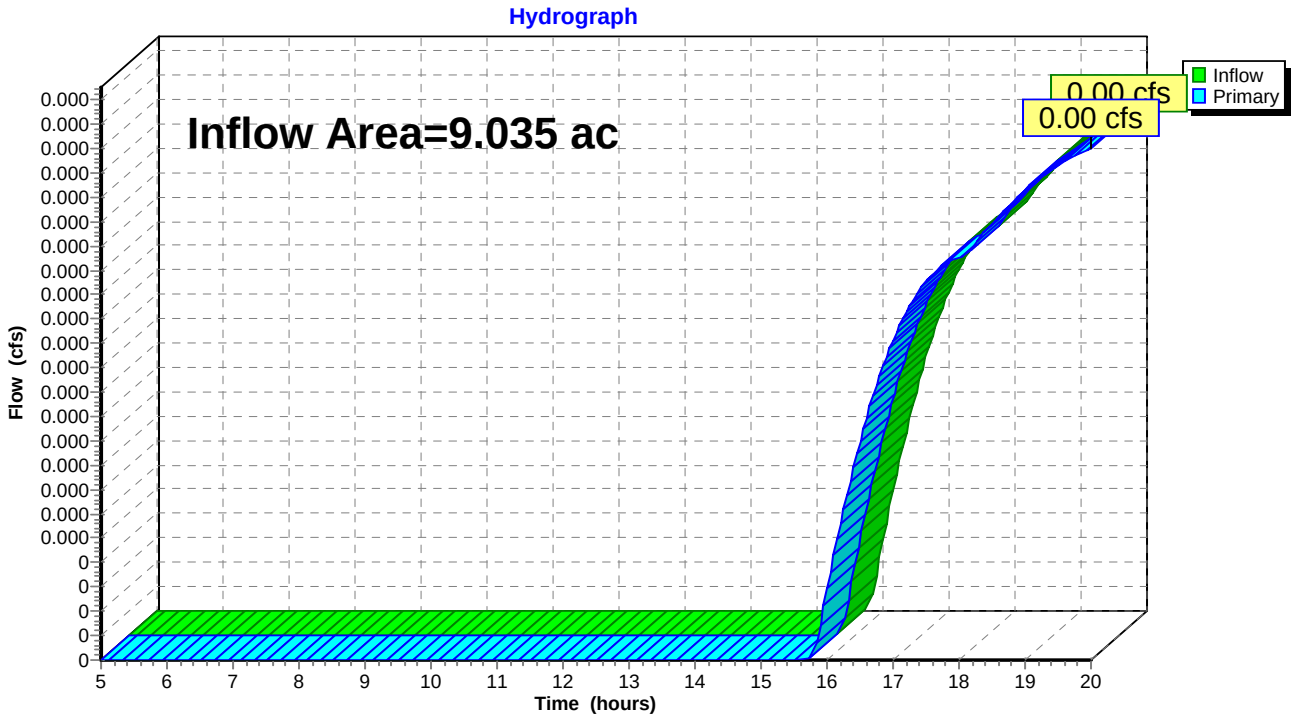
Summary for Pond 1P: Wetland

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

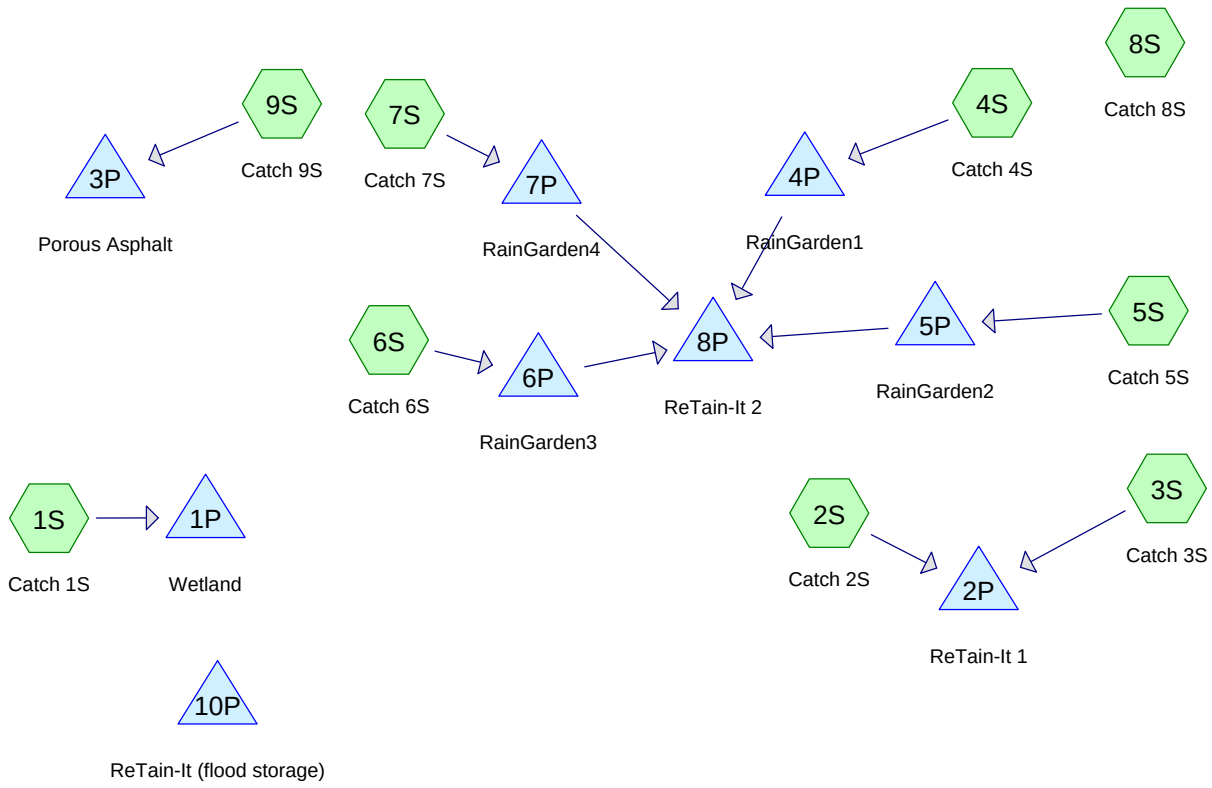
Inflow Area = 9.035 ac, 36.23% Impervious, Inflow Depth > 0.00" for WQ event
Inflow = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 20.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



2 HYDRO-CAD Post-Development



Subcat Reach Pond Link

Routing Diagram for 2329-01 - Proposed
Prepared by Microsoft, Printed 7/25/2017
HydroCAD® 10.00-18 s/n 02881 © 2016 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.575	39	>75% Grass cover, Good, HSG A (1S, 3S, 5S, 6S, 9S)
0.690	61	>75% Grass cover, Good, HSG B (1S, 3S, 4S, 5S, 6S, 7S, 8S, 9S)
0.663	98	Paved parking, HSG A (1S, 3S, 5S, 6S, 9S)
2.503	98	Paved parking, HSG B (1S, 3S, 4S, 5S, 6S, 7S, 8S, 9S)
0.071	98	Roofs (off-site), HSG A (1S)
0.560	98	Roofs, HSG A (2S)
1.767	98	Roofs, HSG B (2S)
2.063	30	Woods, Good, HSG A (1S)
0.147	83	Woods, Poor, HSG D (1S)
9.037	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.932	HSG A	1S, 2S, 3S, 5S, 6S, 9S
4.959	HSG B	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S
0.000	HSG C	
0.147	HSG D	1S
0.000	Other	
9.037		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.575	0.690	0.000	0.000	0.000	1.264	>75% Grass cover, Good	1S, 3S, 4S, 5S, 6S, 7S, 8S, 9S
0.663	2.503	0.000	0.000	0.000	3.166	Paved parking	1S, 3S, 4S, 5S, 6S, 7S, 8S, 9S
0.560	1.767	0.000	0.000	0.000	2.327	Roofs	2S
0.071	0.000	0.000	0.000	0.000	0.071	Roofs (off-site)	1S
2.063	0.000	0.000	0.000	0.000	2.063	Woods, Good	1S
0.000	0.000	0.000	0.147	0.000	0.147	Woods, Poor	1S
3.932	**4.959**	**0.000**	**0.147**	**0.000**	**9.037**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	4P	131.00	130.50	70.0	0.0071	0.012	12.0	0.0	0.0
2	5P	130.50	130.25	25.0	0.0100	0.012	12.0	0.0	0.0
3	6P	130.00	129.50	70.0	0.0071	0.012	12.0	0.0	0.0
4	7P	130.00	129.50	70.0	0.0071	0.012	12.0	0.0	0.0

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=125,792 sf 6.55% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Catch 2S Runoff Area=101,357 sf 100.00% Impervious Runoff Depth>2.68"
Tc=6.0 min CN=98 Runoff=6.83 cfs 0.520 af

Subcatchment 3S: Catch 3S Runoff Area=43,980 sf 74.88% Impervious Runoff Depth>1.79"
Tc=6.0 min CN=88 Runoff=2.21 cfs 0.150 af

Subcatchment 4S: Catch 4S Runoff Area=18,792 sf 67.26% Impervious Runoff Depth>1.63"
Tc=6.0 min CN=86 Runoff=0.87 cfs 0.059 af

Subcatchment 5S: Catch 5S Runoff Area=18,526 sf 68.09% Impervious Runoff Depth>1.63"
Tc=6.0 min CN=86 Runoff=0.85 cfs 0.058 af

Subcatchment 6S: Catch 6S Runoff Area=7,212 sf 76.71% Impervious Runoff Depth>1.87"
Tc=6.0 min CN=89 Runoff=0.38 cfs 0.026 af

Subcatchment 7S: Catch 7S Runoff Area=6,407 sf 83.69% Impervious Runoff Depth>2.13"
Tc=6.0 min CN=92 Runoff=0.37 cfs 0.026 af

Subcatchment 8S: Catch 8S Runoff Area=1,257 sf 90.37% Impervious Runoff Depth>2.31"
Tc=6.0 min CN=94 Runoff=0.08 cfs 0.006 af

Subcatchment 9S: Catch 9S Runoff Area=70,326 sf 88.89% Impervious Runoff Depth>2.22"
Tc=6.0 min CN=93 Runoff=4.22 cfs 0.299 af

Pond 1P: Wetland Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond 2P: ReTain-It 1 Peak Elev=129.58' Storage=0.224 af Inflow=9.04 cfs 0.670 af
Outflow=1.16 cfs 0.670 af

Pond 3P: Porous Asphalt Peak Elev=127.78' Storage=6,694 cf Inflow=4.22 cfs 0.299 af
Outflow=0.24 cfs 0.204 af

Pond 4P: RainGarden1 Peak Elev=132.36' Storage=776 cf Inflow=0.87 cfs 0.059 af
Discarded=0.01 cfs 0.006 af Primary=0.75 cfs 0.038 af Outflow=0.75 cfs 0.043 af

Pond 5P: RainGarden2 Peak Elev=131.92' Storage=670 cf Inflow=0.85 cfs 0.058 af
Discarded=0.01 cfs 0.005 af Primary=0.88 cfs 0.039 af Outflow=0.89 cfs 0.044 af

Pond 6P: RainGarden3 Peak Elev=131.40' Storage=338 cf Inflow=0.38 cfs 0.026 af
Discarded=0.00 cfs 0.003 af Primary=0.39 cfs 0.016 af Outflow=0.39 cfs 0.019 af

Pond 7P: RainGarden4 Peak Elev=131.39' Storage=399 cf Inflow=0.37 cfs 0.026 af
Discarded=0.00 cfs 0.004 af Primary=0.33 cfs 0.014 af Outflow=0.33 cfs 0.018 af

Pond 8P: ReTain-It 2 Peak Elev=129.26' Storage=0.035 af Inflow=2.16 cfs 0.107 af
Outflow=0.40 cfs 0.106 af

Pond 10P: ReTain-It (flood storage) Peak Elev=0.00' Storage=0.000 af
Discarded=0.00 cfs 0.000 af

Total Runoff Area = 9.037 ac Runoff Volume = 1.143 af Average Runoff Depth = 1.52"
38.44% Pervious = 3.474 ac 61.56% Impervious = 5.563 ac

Summary for Subcatchment 1S: Catch 1S

[45] Hint: Runoff=Zero

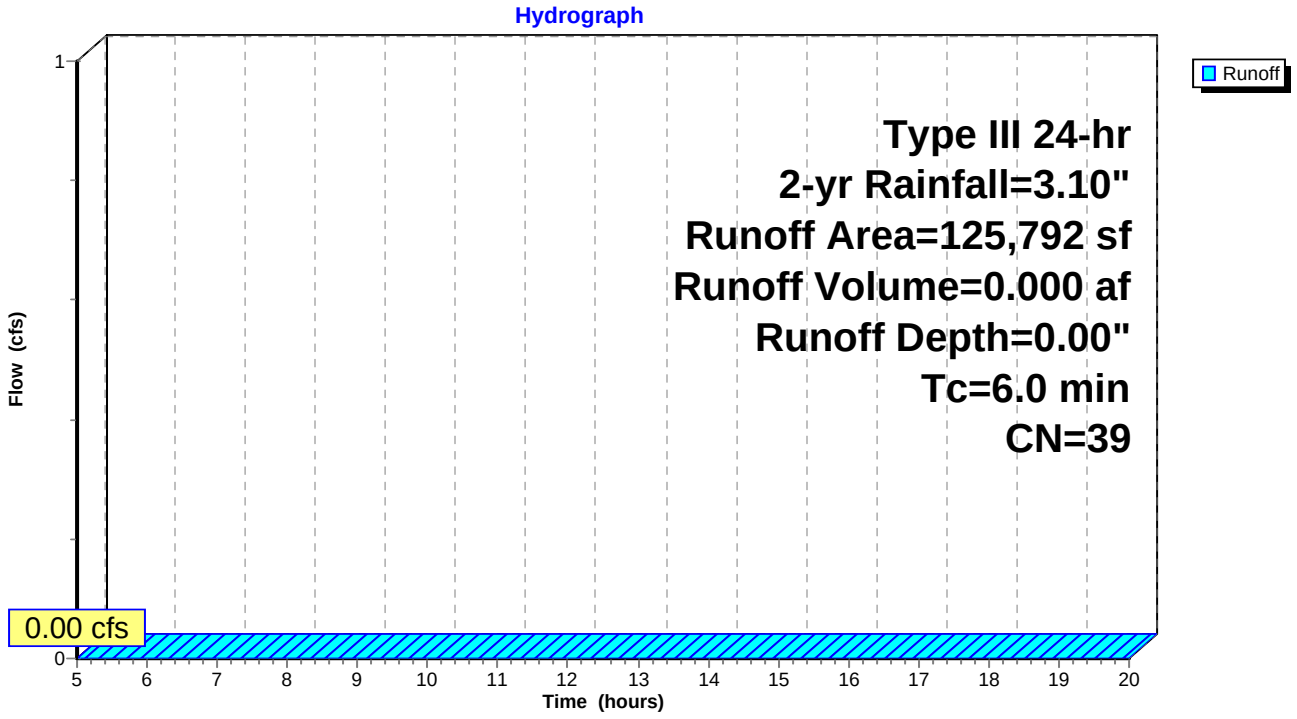
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
	89,852	30	Woods, Good, HSG A
	6,395	83	Woods, Poor, HSG D
	20,867	39	>75% Grass cover, Good, HSG A
	440	61	>75% Grass cover, Good, HSG B
*	3,073	98	Roofs (off-site), HSG A
	5,144	98	Paved parking, HSG A
	21	98	Paved parking, HSG B
	125,792	39	Weighted Average
	117,554		93.45% Pervious Area
	8,238		6.55% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

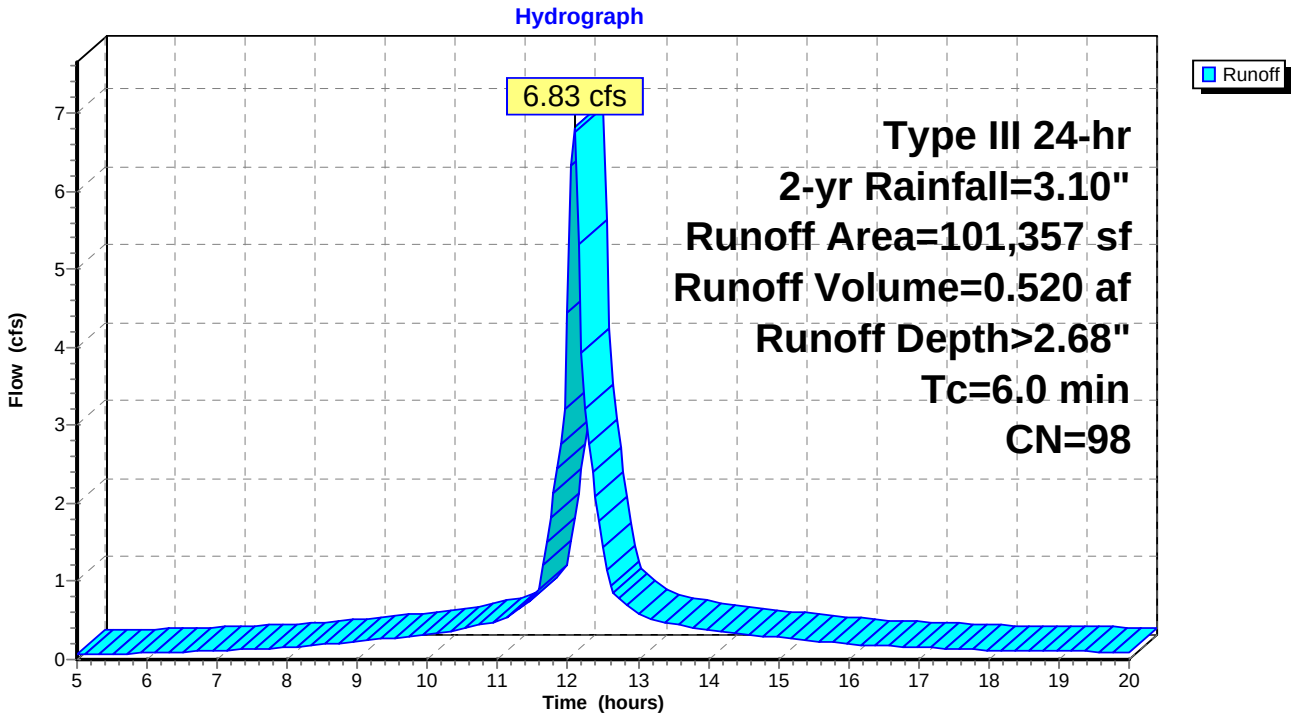
Runoff = 6.83 cfs @ 12.09 hrs, Volume= 0.520 af, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
24,408	98	Roofs, HSG A
76,949	98	Roofs, HSG B
101,357	98	Weighted Average
101,357		100.00% Impervious Area

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

Subcatchment 2S: Catch 2S



Summary for Subcatchment 3S: Catch 3S

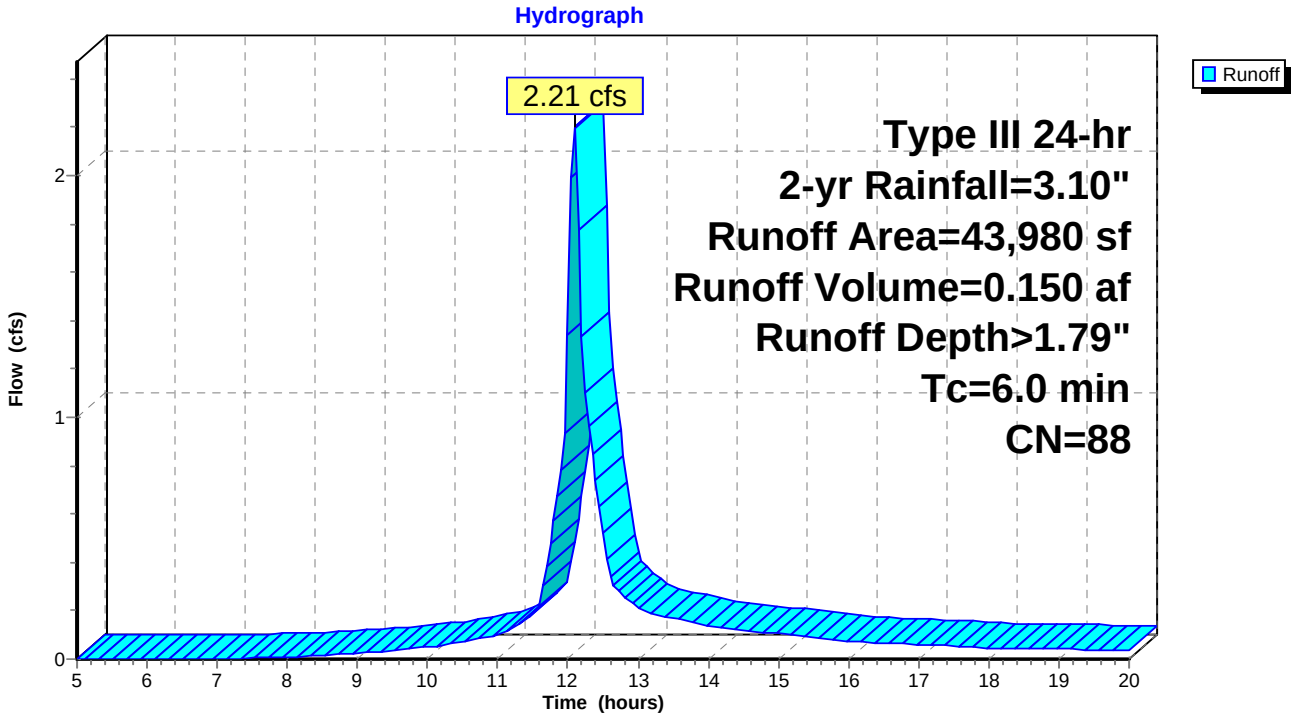
Runoff = 2.21 cfs @ 12.09 hrs, Volume= 0.150 af, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
551	39	>75% Grass cover, Good, HSG A
10,497	61	>75% Grass cover, Good, HSG B
2,432	98	Paved parking, HSG A
30,500	98	Paved parking, HSG B
43,980	88	Weighted Average
11,048		25.12% Pervious Area
32,932		74.88% Impervious Area

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

Subcatchment 3S: Catch 3S



Summary for Subcatchment 4S: Catch 4S

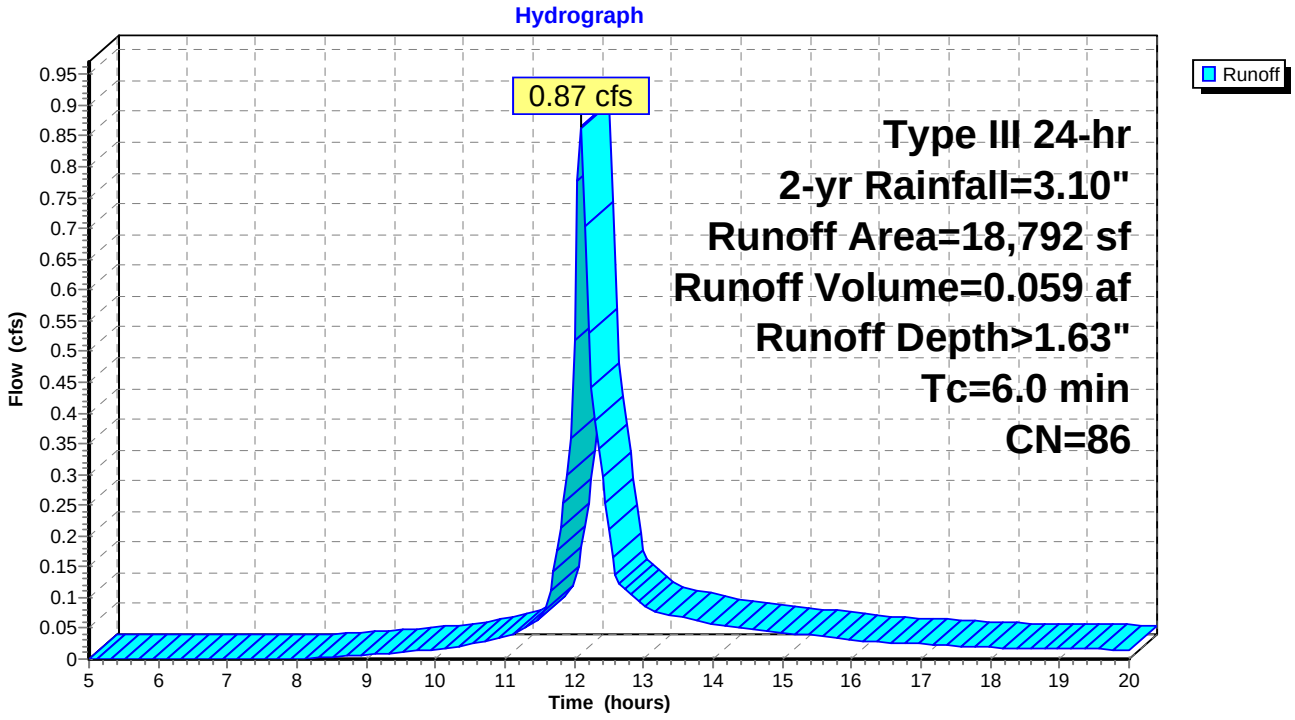
Runoff = 0.87 cfs @ 12.09 hrs, Volume= 0.059 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
6,153	61	>75% Grass cover, Good, HSG B
12,639	98	Paved parking, HSG B
18,792	86	Weighted Average
6,153		32.74% Pervious Area
12,639		67.26% Impervious Area

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

Subcatchment 4S: Catch 4S



Summary for Subcatchment 5S: Catch 5S

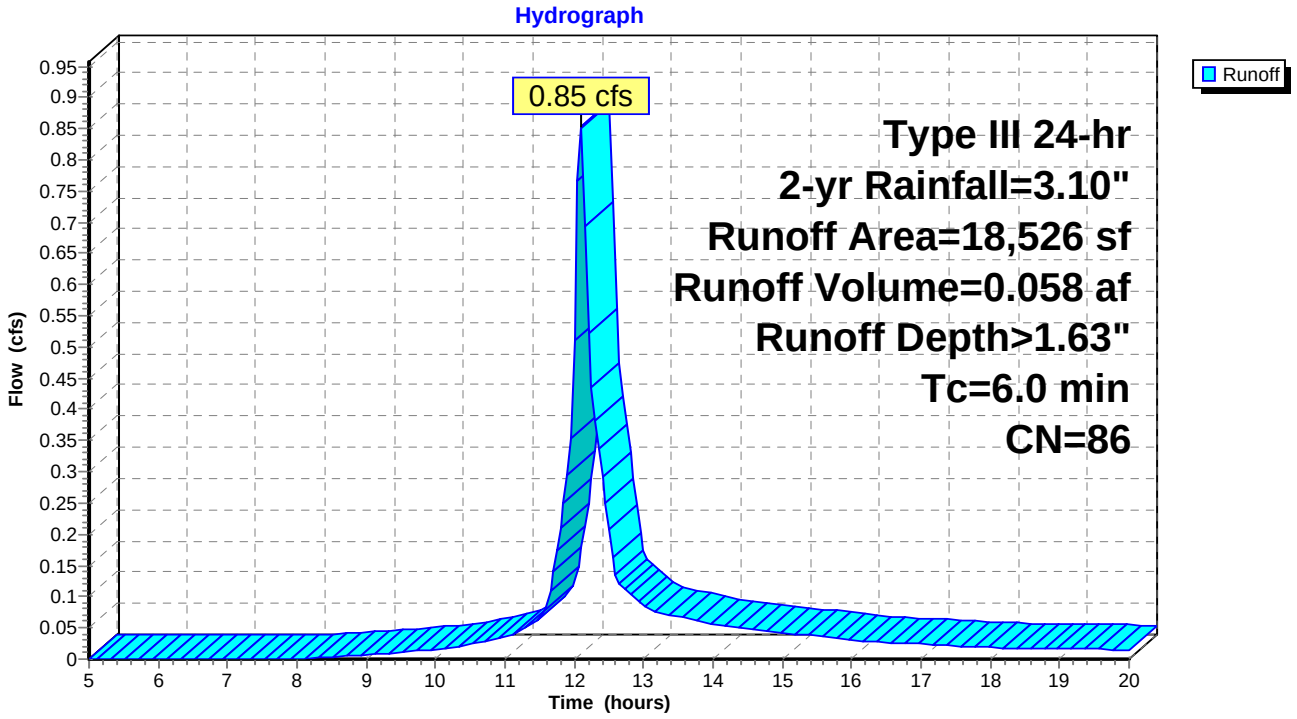
Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.058 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
87	39	>75% Grass cover, Good, HSG A
5,825	61	>75% Grass cover, Good, HSG B
42	98	Paved parking, HSG A
12,572	98	Paved parking, HSG B
18,526	86	Weighted Average
5,912		31.91% Pervious Area
12,614		68.09% Impervious Area

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

Subcatchment 5S: Catch 5S



Summary for Subcatchment 6S: Catch 6S

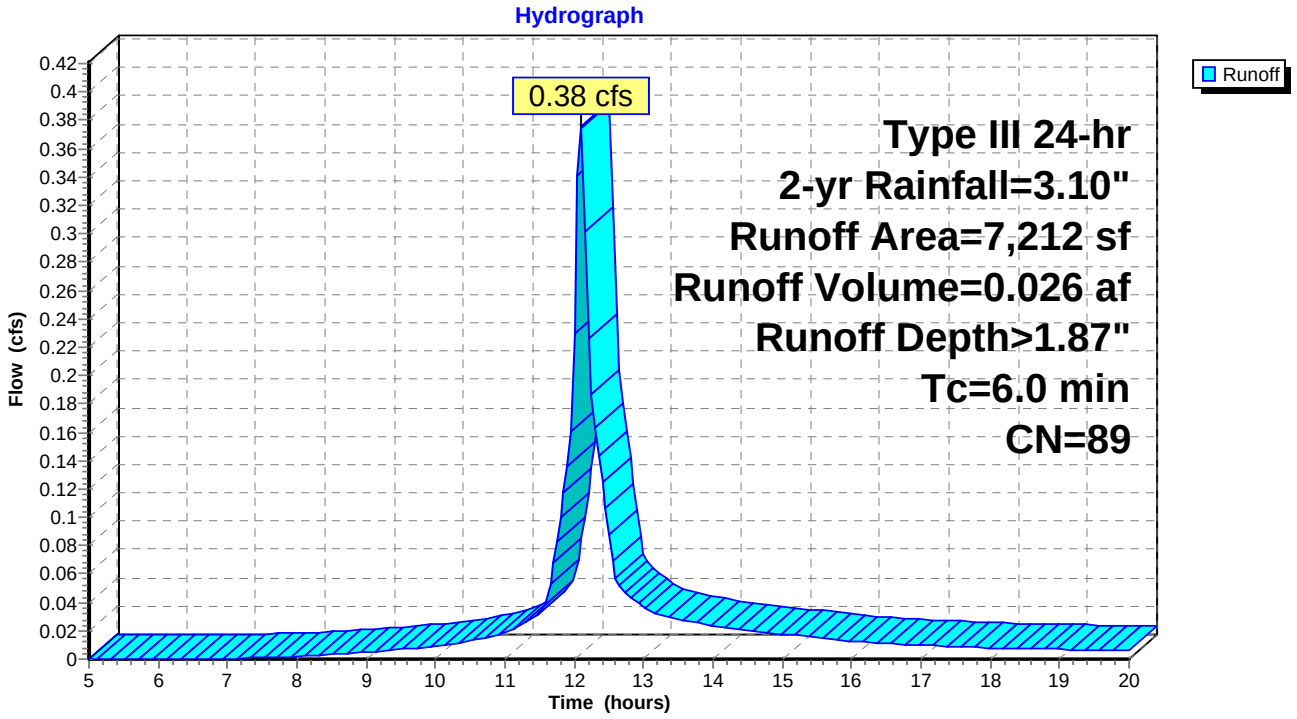
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.026 af, Depth> 1.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
106	39	>75% Grass cover, Good, HSG A
1,574	61	>75% Grass cover, Good, HSG B
1,400	98	Paved parking, HSG A
4,132	98	Paved parking, HSG B
7,212	89	Weighted Average
1,680		23.29% Pervious Area
5,532		76.71% Impervious Area

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

Subcatchment 6S: Catch 6S



Summary for Subcatchment 7S: Catch 7S

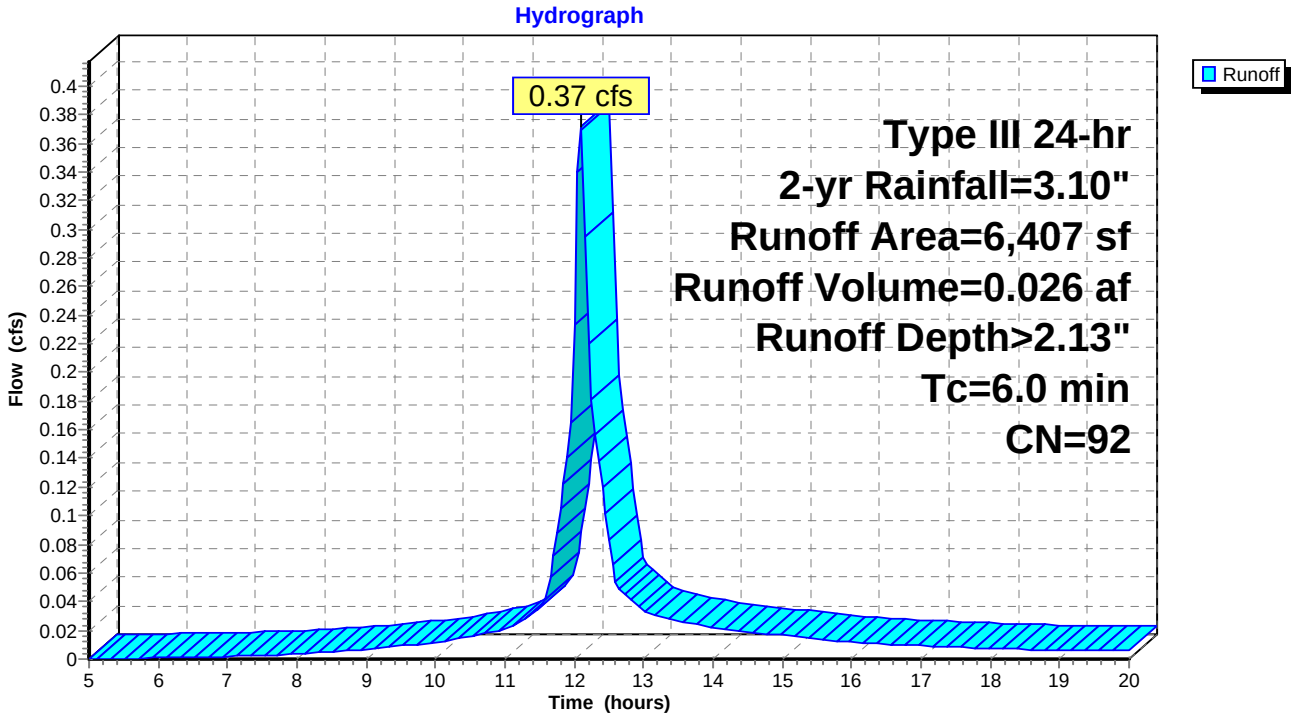
Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.026 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
1,045	61	>75% Grass cover, Good, HSG B
5,362	98	Paved parking, HSG B
6,407	92	Weighted Average
1,045		16.31% Pervious Area
5,362		83.69% Impervious Area

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

Subcatchment 7S: Catch 7S



Summary for Subcatchment 8S: Catch 8S

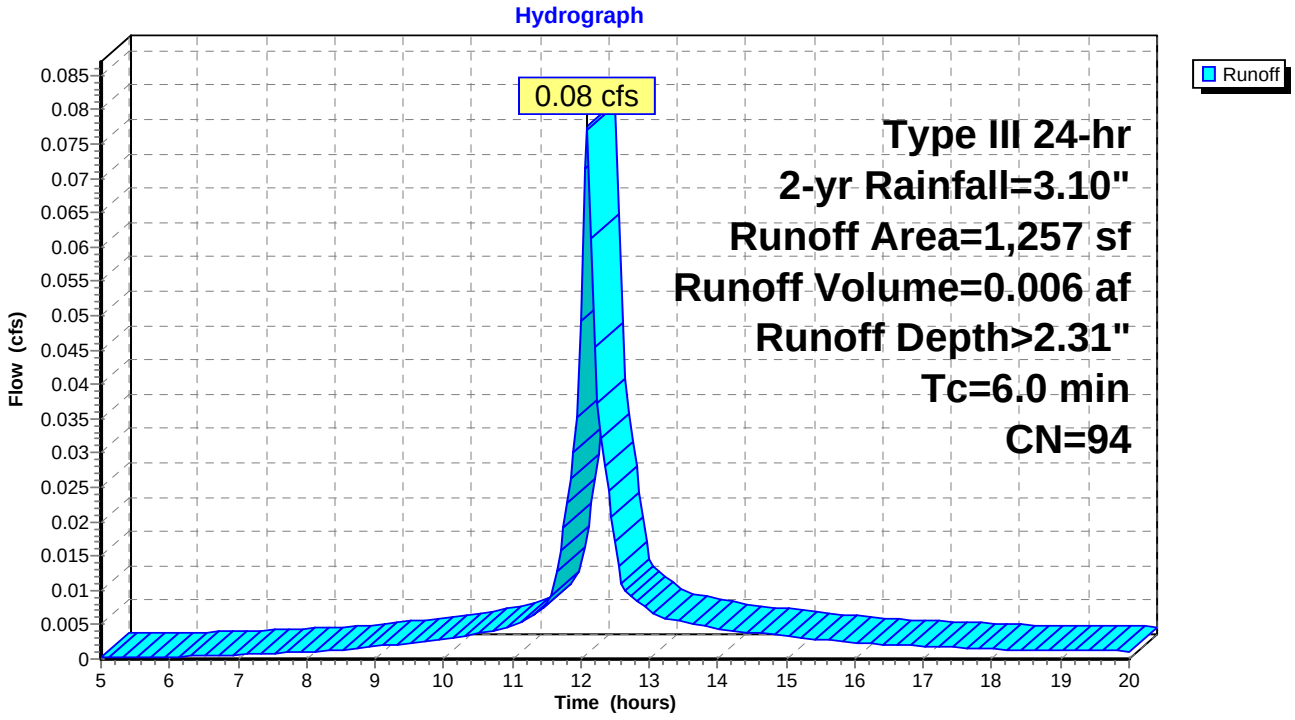
Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth> 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
121	61	>75% Grass cover, Good, HSG B
1,136	98	Paved parking, HSG B
1,257	94	Weighted Average
121		9.63% Pervious Area
1,136		90.37% Impervious Area

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

Subcatchment 8S: Catch 8S



Summary for Subcatchment 9S: Catch 9S

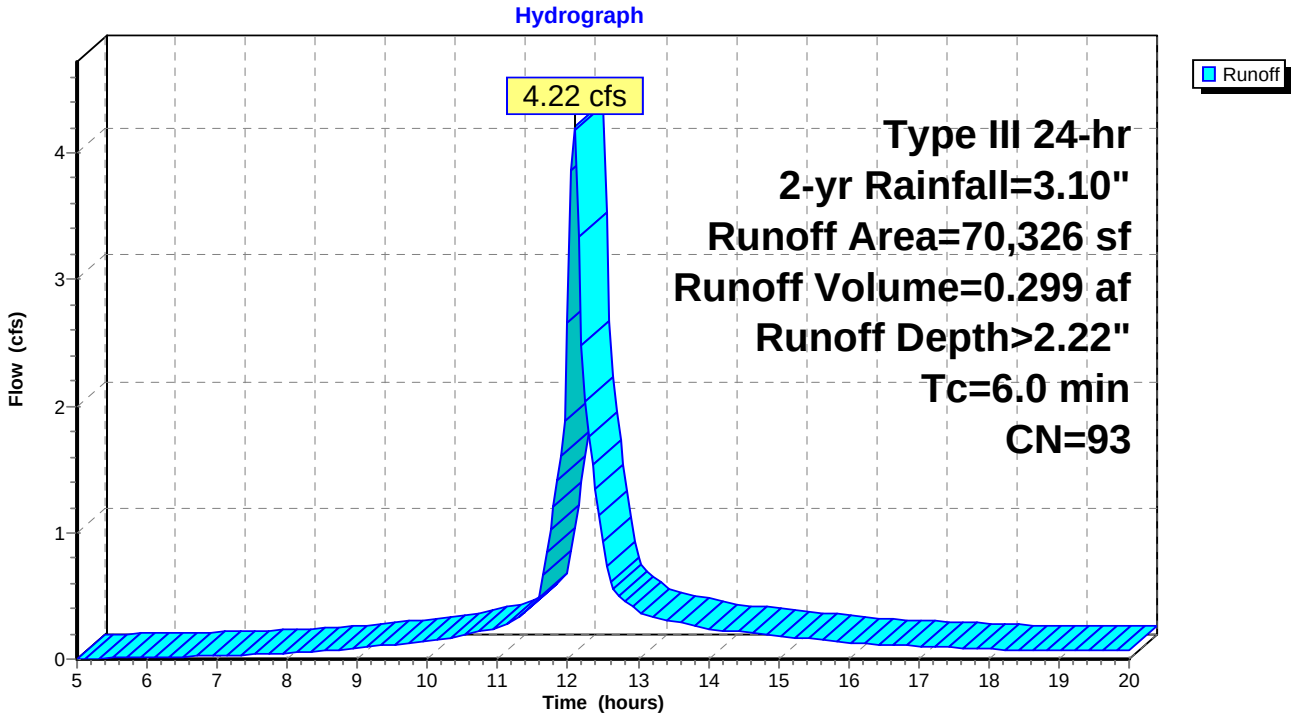
Runoff = 4.22 cfs @ 12.09 hrs, Volume= 0.299 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
3,430	39	>75% Grass cover, Good, HSG A
4,383	61	>75% Grass cover, Good, HSG B
19,865	98	Paved parking, HSG A
42,648	98	Paved parking, HSG B
70,326	93	Weighted Average
7,813		11.11% Pervious Area
62,513		88.89% Impervious Area

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

Subcatchment 9S: Catch 9S



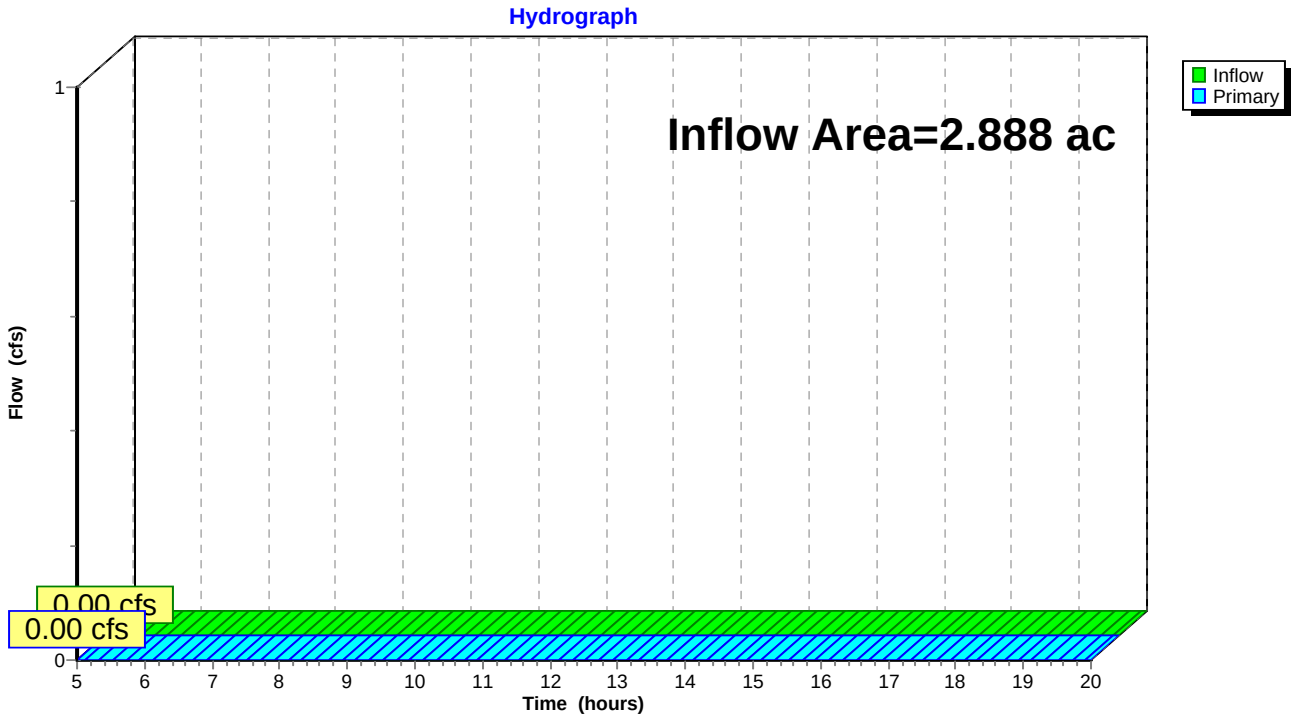
Summary for Pond 1P: Wetland

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

Inflow Area = 2.888 ac, 6.55% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Summary for Pond 2P: ReTain-It 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 3.336 ac, 92.40% Impervious, Inflow Depth > 2.41" for 2-yr event
Inflow = 9.04 cfs @ 12.09 hrs, Volume= 0.670 af
Outflow = 1.16 cfs @ 11.65 hrs, Volume= 0.670 af, Atten= 87%, Lag= 0.0 min
Discarded = 1.16 cfs @ 11.65 hrs, Volume= 0.670 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.58' @ 12.65 hrs Surf.Area= 0.479 ac Storage= 0.224 af

Plug-Flow detention time= 58.9 min calculated for 0.669 af (100% of inflow)
Center-of-Mass det. time= 58.2 min (806.9 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.232 af	**26.00'W x 802.00'L x 3.67'H Field A** 1.755 af Overall - 1.175 af Embedded = 0.580 af x 40.0% Voids
#2A	129.25'	0.751 af	**retain_it 2.0'** x 300 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 389.4 cf perimeter wall
		0.982 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=1.16 cfs @ 11.65 hrs HW=128.79' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.16 cfs)

Pond 2P: ReTain-It 1 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 389.4 cf perimeter wall

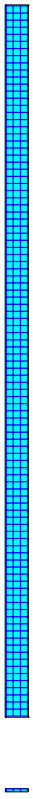
100 Chambers/Row x 8.00' Long = 800.00' Row Length +12.0" End Stone x 2 = 802.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 100 x 2 + 1.9 cf Endwall x 3 x 2 = 389.4 cf Perimeter Wall
300 Chambers x 110.3 cf - 389.4 cf Perimeter wall = 32,694.5 cf Chamber Storage
300 Chambers x 170.7 cf = 51,200.0 cf Displacement

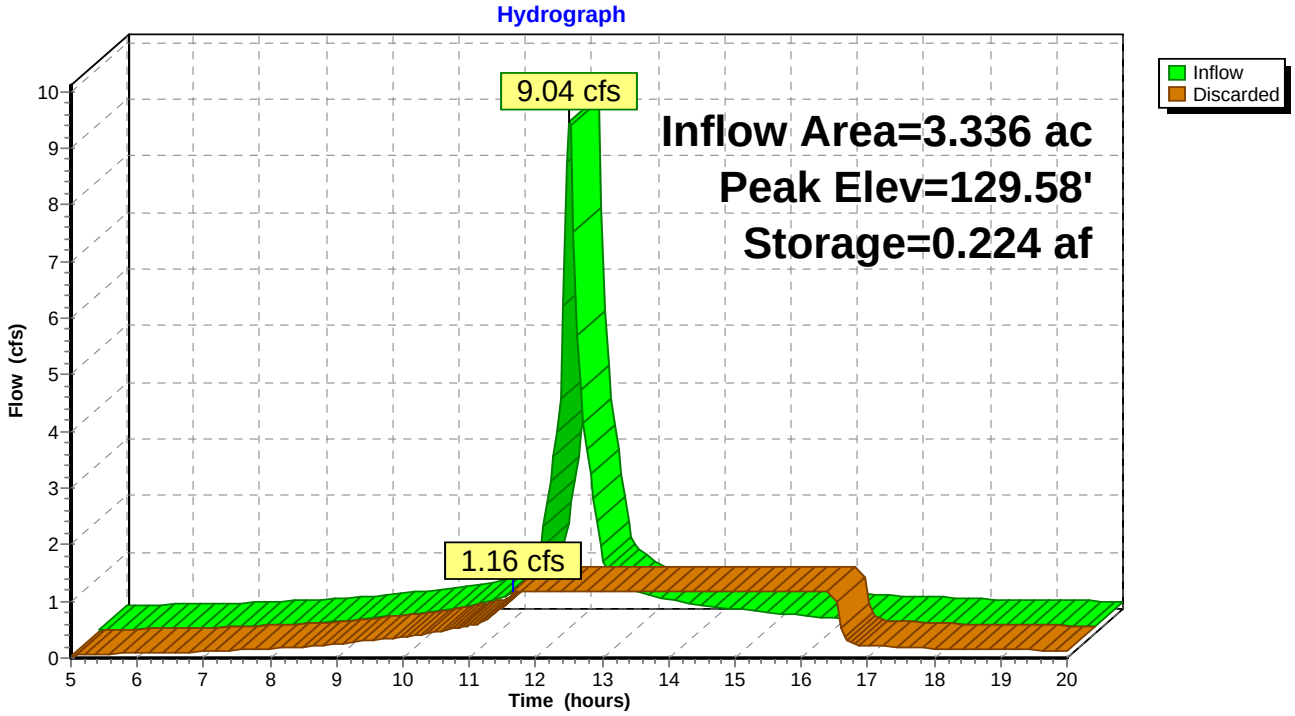
76,457.3 cf Field - 51,200.0 cf Chambers = 25,257.3 cf Stone x 40.0% Voids = 10,102.9 cf Stone Storage

Chamber Storage + Stone Storage = 42,797.5 cf = 0.982 af
Overall Storage Efficiency = 56.0%
Overall System Size = 802.00' x 26.00' x 3.67'

300 Chambers
2,831.8 cy Field
935.5 cy Stone



Pond 2P: ReTain-It 1



Summary for Pond 3P: Porous Asphalt

Inflow Area = 1.614 ac, 88.89% Impervious, Inflow Depth > 2.22" for 2-yr event
Inflow = 4.22 cfs @ 12.09 hrs, Volume= 0.299 af
Outflow = 0.24 cfs @ 11.35 hrs, Volume= 0.204 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.24 cfs @ 11.35 hrs, Volume= 0.204 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 127.78' @ 14.04 hrs Surf.Area= 60,636 sf Storage= 6,694 cf

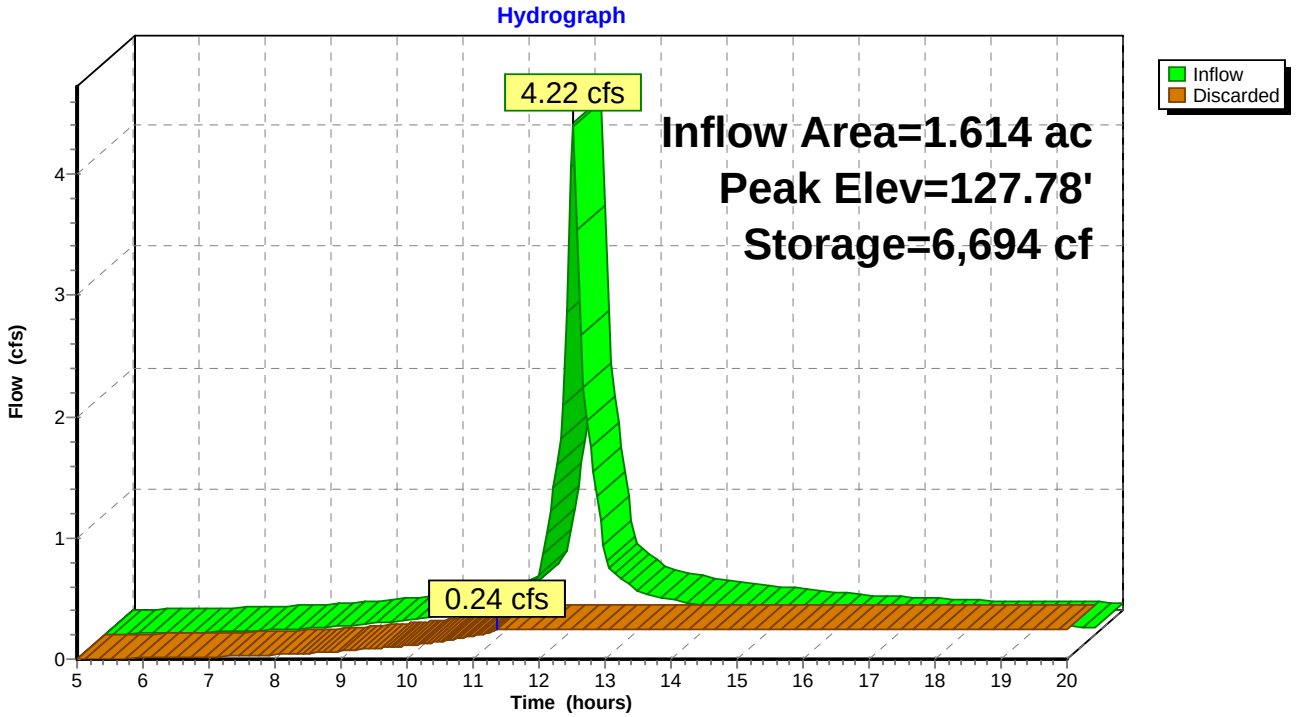
Plug-Flow detention time= 188.5 min calculated for 0.204 af (68% of inflow)
Center-of-Mass det. time= 120.5 min (883.8 - 763.3)

Volume	Invert	Avail.Storage	Storage Description
#1	127.50'	48,509 cf	**186.00'W x 326.00'L x 2.00'H Prismatoid** 121,272 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.50'	**0.170 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 11.35 hrs HW=127.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.24 cfs)

Pond 3P: Porous Asphalt



Summary for Pond 4P: RainGarden1

Inflow Area = 0.431 ac, 67.26% Impervious, Inflow Depth > 1.63" for 2-yr event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 0.059 af
Outflow = 0.75 cfs @ 12.16 hrs, Volume= 0.043 af, Atten= 13%, Lag= 4.1 min
Discarded = 0.01 cfs @ 12.16 hrs, Volume= 0.006 af
Primary = 0.75 cfs @ 12.16 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 132.36' @ 12.16 hrs Surf.Area= 1,091 sf Storage= 776 cf

Plug-Flow detention time= 98.1 min calculated for 0.043 af (74% of inflow)
Center-of-Mass det. time= 35.8 min (824.6 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,253 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

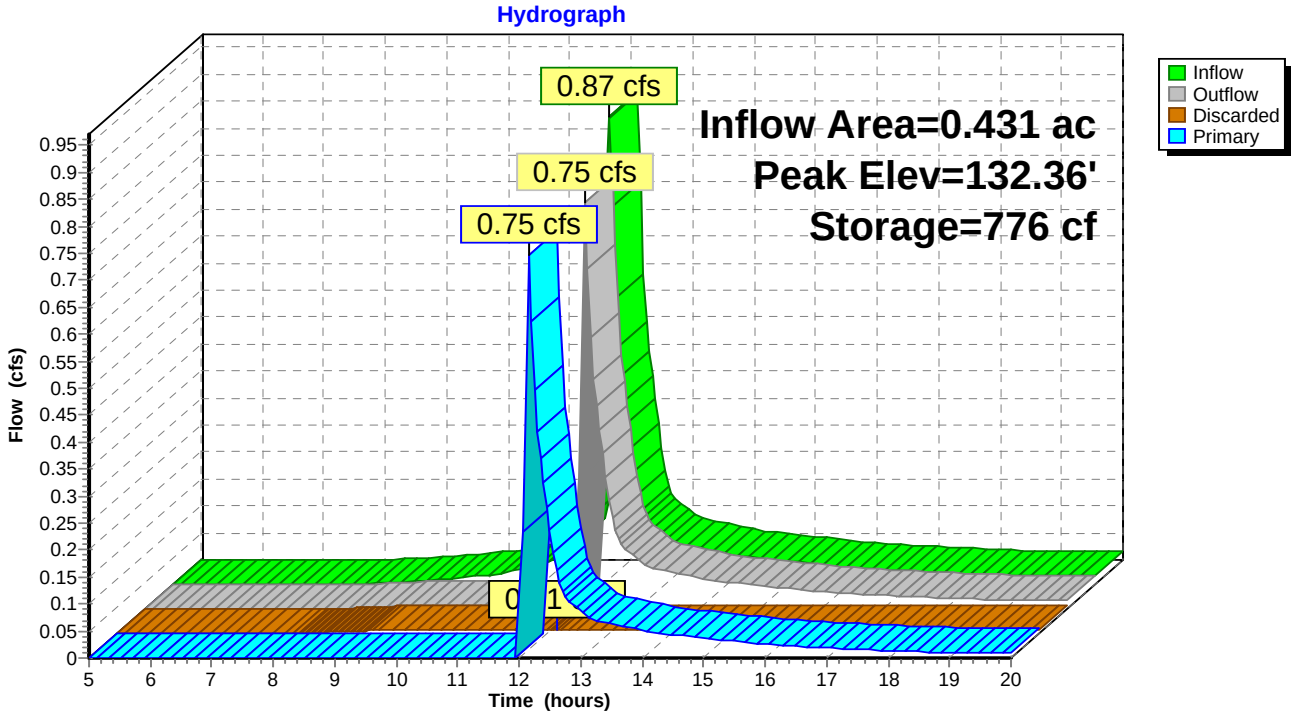
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	853	0.0	0	0
132.00	853	20.0	427	427
132.75	1,350	100.0	826	1,253

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	131.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 131.00' / 130.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	132.25'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.16 hrs HW=132.36' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.71 cfs @ 12.16 hrs HW=132.36' (Free Discharge)
↑└**2=Culvert** (Passes 0.71 cfs of 6.17 cfs potential flow)
↑└**3=Orifice/Grate** (Weir Controls 0.71 cfs @ 1.07 fps)

Pond 4P: RainGarden1



Summary for Pond 5P: RainGarden2

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.425 ac, 68.09% Impervious, Inflow Depth > 1.63" for 2-yr event
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 0.058 af
Outflow = 0.89 cfs @ 12.12 hrs, Volume= 0.044 af, Atten= 0%, Lag= 1.6 min
Discarded = 0.01 cfs @ 12.12 hrs, Volume= 0.005 af
Primary = 0.88 cfs @ 12.12 hrs, Volume= 0.039 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.92' @ 12.12 hrs Surf.Area= 968 sf Storage= 670 cf

Plug-Flow detention time= 88.9 min calculated for 0.044 af (77% of inflow)
Center-of-Mass det. time= 31.4 min (820.2 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,309 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

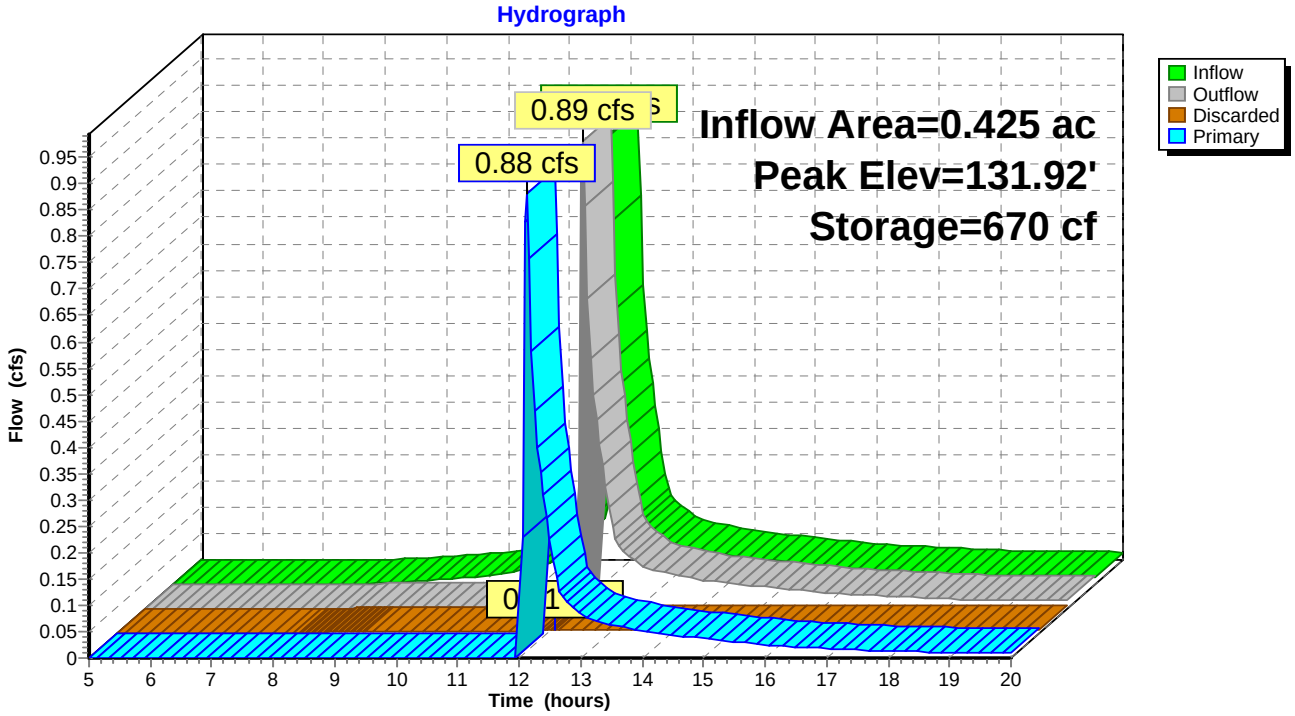
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	759	0.0	0	0
131.50	759	20.0	304	304
132.50	1,251	100.0	1,005	1,309

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.50'	**12.0" Round Culvert X 3.00** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.50' / 130.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.83'	**12.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.12 hrs HW=131.92' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.79 cfs @ 12.12 hrs HW=131.92' (Free Discharge)
↑—**2=Culvert** (Passes 0.79 cfs of 9.59 cfs potential flow)
↑—**3=Orifice/Grate** (Weir Controls 0.79 cfs @ 0.97 fps)

Pond 5P: RainGarden2



Summary for Pond 6P: RainGarden3

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.166 ac, 76.71% Impervious, Inflow Depth > 1.87" for 2-yr event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 0.026 af
Outflow = 0.39 cfs @ 12.12 hrs, Volume= 0.019 af, Atten= 0%, Lag= 1.8 min
Discarded = 0.00 cfs @ 12.12 hrs, Volume= 0.003 af
Primary = 0.39 cfs @ 12.12 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.40' @ 12.12 hrs Surf.Area= 554 sf Storage= 338 cf

Plug-Flow detention time= 97.8 min calculated for 0.019 af (73% of inflow)
Center-of-Mass det. time= 36.1 min (815.2 - 779.2)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	748 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

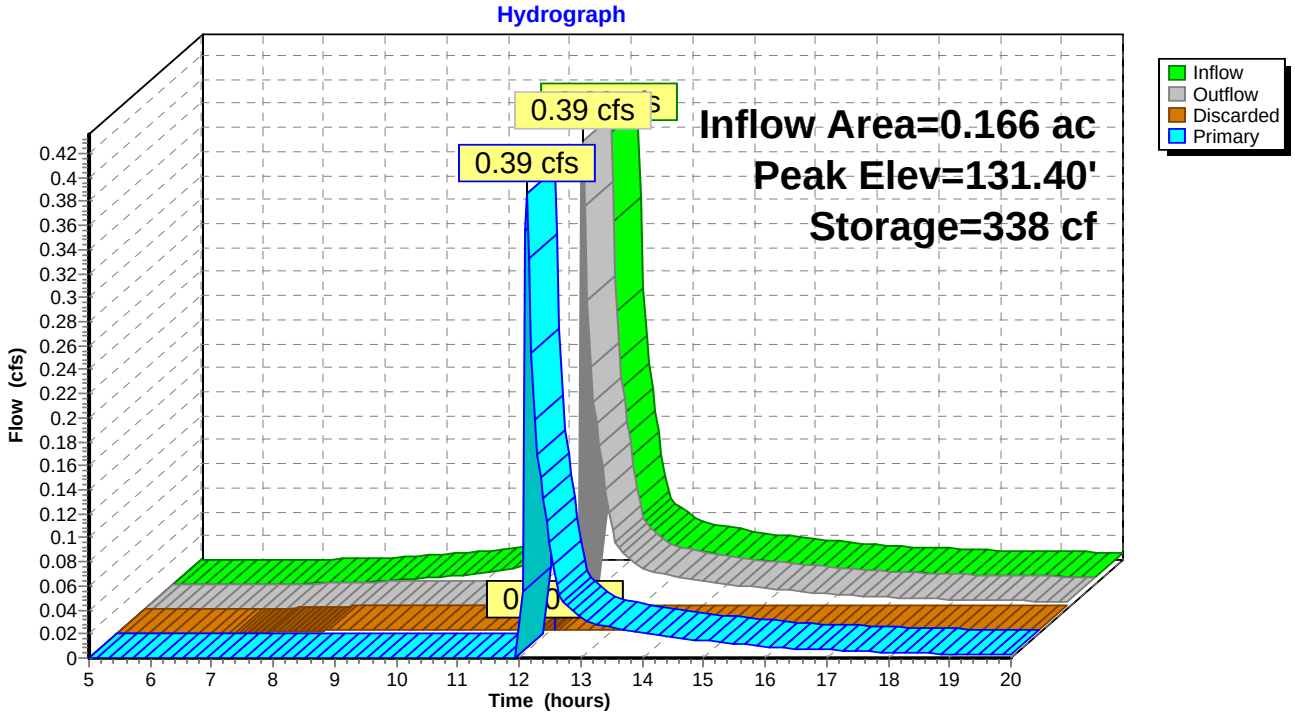
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	377	0.0	0	0
131.00	377	20.0	151	151
132.00	817	100.0	597	748

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.12 hrs HW=131.40' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.34 cfs @ 12.12 hrs HW=131.40' (Free Discharge)
↑**2=Culvert** (Passes 0.34 cfs of 6.31 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 0.34 cfs @ 0.84 fps)

Pond 6P: RainGarden3



Summary for Pond 7P: RainGarden4

Inflow Area = 0.147 ac, 83.69% Impervious, Inflow Depth > 2.13" for 2-yr event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 0.026 af
Outflow = 0.33 cfs @ 12.16 hrs, Volume= 0.018 af, Atten= 10%, Lag= 3.9 min
Discarded = 0.00 cfs @ 12.16 hrs, Volume= 0.004 af
Primary = 0.33 cfs @ 12.16 hrs, Volume= 0.014 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.39' @ 12.16 hrs Surf.Area= 654 sf Storage= 399 cf

Plug-Flow detention time= 109.9 min calculated for 0.018 af (68% of inflow)
Center-of-Mass det. time= 41.9 min (809.6 - 767.7)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	890 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

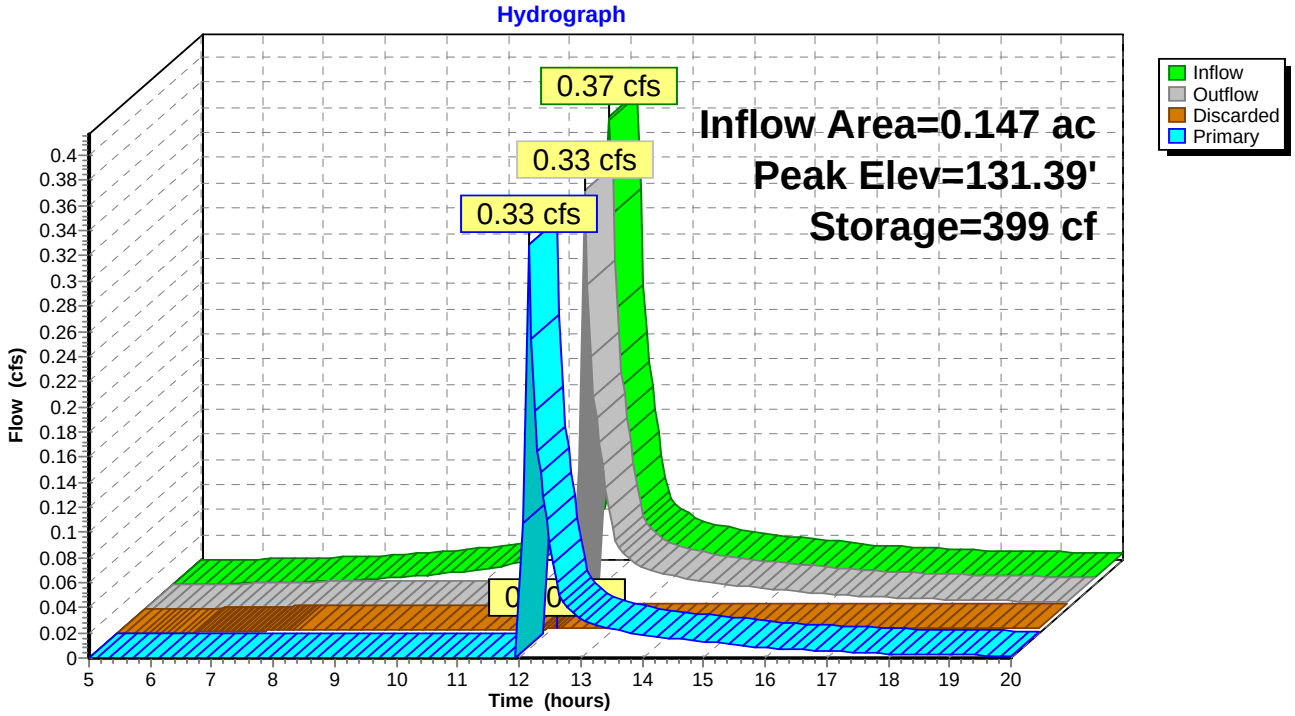
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	453	0.0	0	0
131.00	453	20.0	181	181
132.00	965	100.0	709	890

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.16 hrs HW=131.39' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.31 cfs @ 12.16 hrs HW=131.39' (Free Discharge)
└**2=Culvert** (Passes 0.31 cfs of 6.30 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.31 cfs @ 0.81 fps)

Pond 7P: RainGarden4



Summary for Pond 8P: ReTain-It 2

Inflow Area = 1.169 ac, 70.96% Impervious, Inflow Depth > 1.09" for 2-yr event
Inflow = 2.16 cfs @ 12.14 hrs, Volume= 0.107 af
Outflow = 0.40 cfs @ 12.10 hrs, Volume= 0.106 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.40 cfs @ 12.10 hrs, Volume= 0.106 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.26' @ 12.63 hrs Surf.Area= 0.164 ac Storage= 0.035 af

Plug-Flow detention time= 31.1 min calculated for 0.106 af (100% of inflow)
Center-of-Mass det. time= 30.5 min (842.9 - 812.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.080 af	**26.00'W x 274.00'L x 3.67'H Field A** 0.600 af Overall - 0.400 af Embedded = 0.200 af x 40.0% Voids
#2A	129.25'	0.255 af	**retain_it 2.0'** x 102 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 139.9 cf perimeter wall
		0.335 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.40 cfs @ 12.10 hrs HW=128.81' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.40 cfs)

Pond 8P: ReTain-It 2 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 139.9 cf perimeter wall

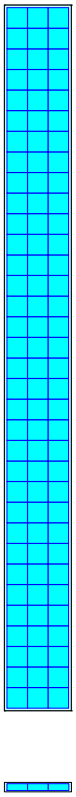
34 Chambers/Row x 8.00' Long = 272.00' Row Length +12.0" End Stone x 2 = 274.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 34 x 2 + 1.9 cf Endwall x 3 x 2 = 139.9 cf Perimeter Wall
102 Chambers x 110.3 cf - 139.9 cf Perimeter wall = 11,108.7 cf Chamber Storage
102 Chambers x 170.7 cf = 17,408.0 cf Displacement

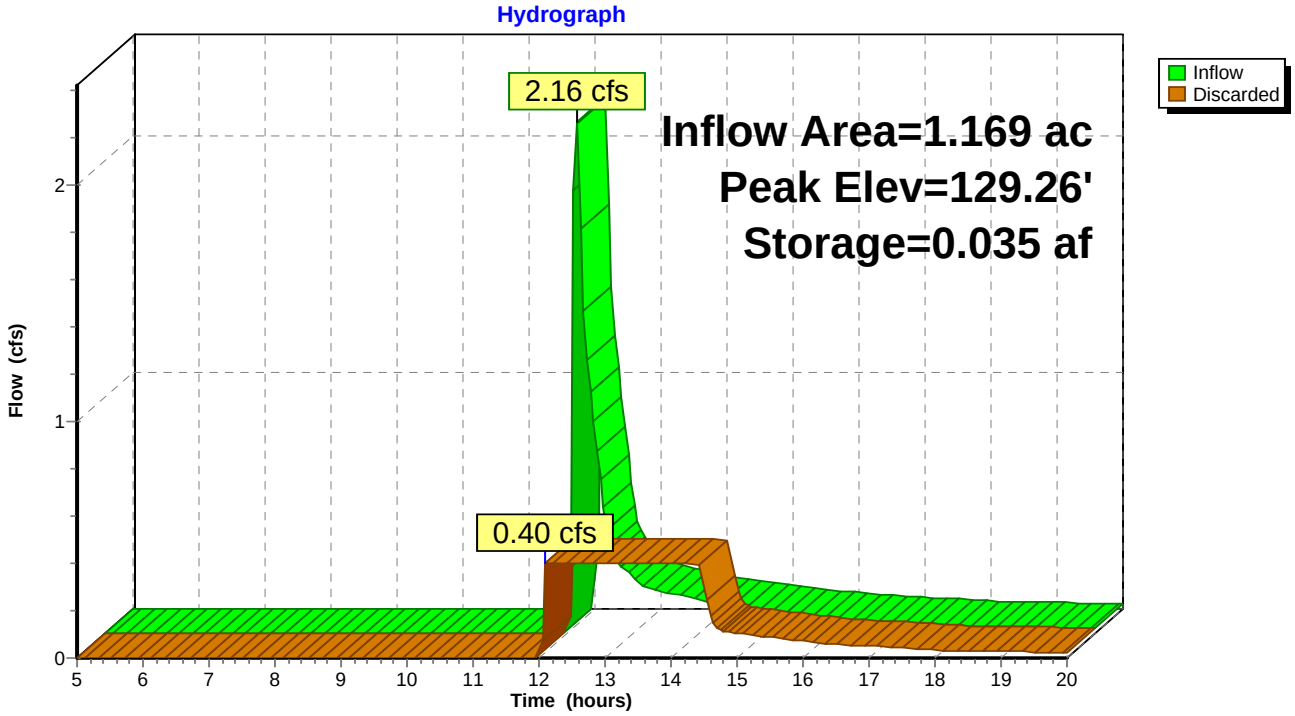
26,121.3 cf Field - 17,408.0 cf Chambers = 8,713.3 cf Stone x 40.0% Voids = 3,485.3 cf Stone Storage

Chamber Storage + Stone Storage = 14,594.0 cf = 0.335 af
Overall Storage Efficiency = 55.9%
Overall System Size = 274.00' x 26.00' x 3.67'

102 Chambers
967.5 cy Field
322.7 cy Stone



Pond 8P: ReTain-It 2



Summary for Pond 10P: ReTain-It (flood storage)

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

Volume	Invert	Avail.Storage	Storage Description
#1A	127.58'	0.057 af	**18.00'W x 250.00'L x 4.17'H Field A** 0.430 af Overall - 0.288 af Embedded = 0.142 af x 40.0% Voids
#2A	128.08'	0.195 af	**retain_it 2.5'** x 62 Inside #1 Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf 2 Rows adjusted for 217.8 cf perimeter wall
		0.252 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.58'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Pond 10P: ReTain-It (flood storage) - Chamber Wizard Field A

Chamber Model = retain_it 2.5' (retain-it® 2.5' tall)
Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf
Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf
2 Rows adjusted for 217.8 cf perimeter wall

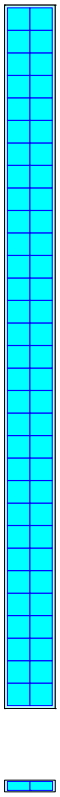
31 Chambers/Row x 8.00' Long = 248.00' Row Length +12.0" End Stone x 2 = 250.00' Base Length
2 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Base + 38.0" Chamber Height + 6.0" Cover = 4.17' Field Height

3.3 cf Sidewall x 31 x 2 + 3.3 cf Endwall x 2 x 2 = 217.8 cf Perimeter Wall
62 Chambers x 140.4 cf - 217.8 cf Perimeter wall = 8,489.5 cf Chamber Storage
62 Chambers x 202.7 cf = 12,565.3 cf Displacement

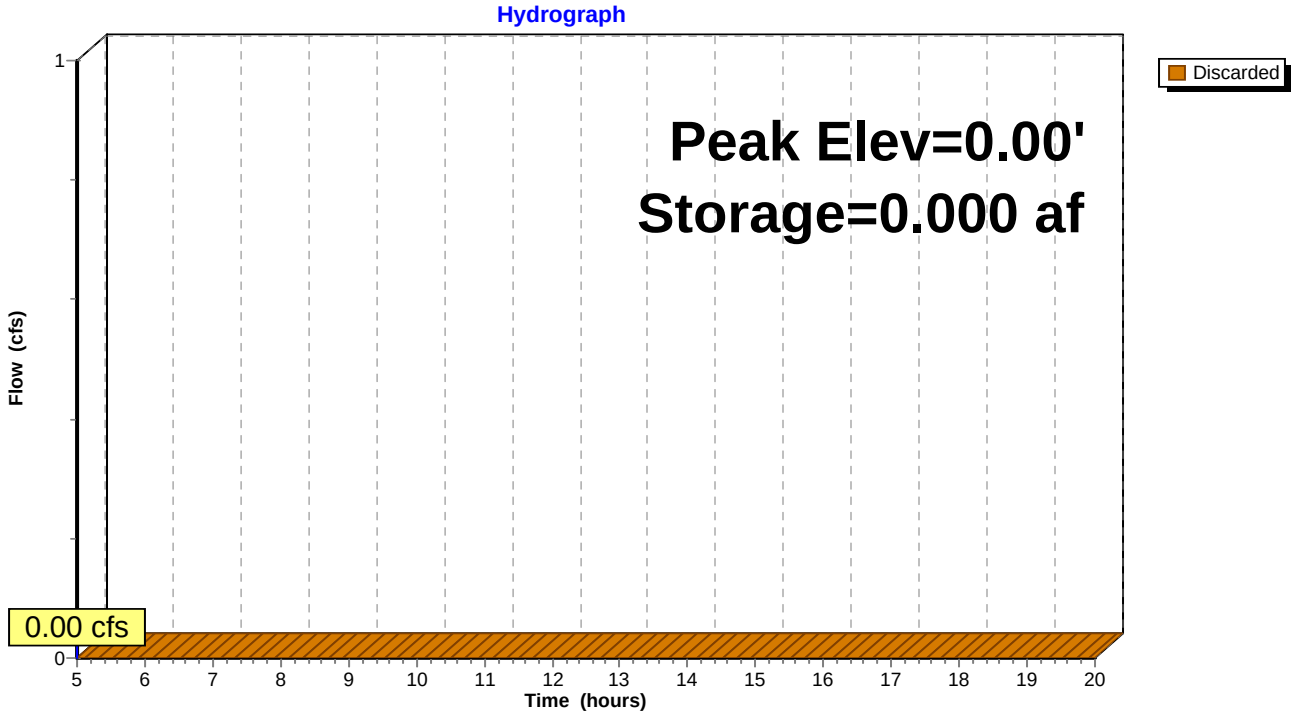
18,750.0 cf Field - 12,565.3 cf Chambers = 6,184.7 cf Stone x 40.0% Voids = 2,473.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,963.4 cf = 0.252 af
Overall Storage Efficiency = 58.5%
Overall System Size = 250.00' x 18.00' x 4.17'

62 Chambers
694.4 cy Field
229.1 cy Stone



Pond 10P: ReTain-It (flood storage)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=125,792 sf 6.55% Impervious Runoff Depth>0.10"
Tc=6.0 min CN=39 Runoff=0.05 cfs 0.023 af

Subcatchment 2S: Catch 2S Runoff Area=101,357 sf 100.00% Impervious Runoff Depth>4.05"
Tc=6.0 min CN=98 Runoff=10.21 cfs 0.786 af

Subcatchment 3S: Catch 3S Runoff Area=43,980 sf 74.88% Impervious Runoff Depth>3.10"
Tc=6.0 min CN=88 Runoff=3.74 cfs 0.261 af

Subcatchment 4S: Catch 4S Runoff Area=18,792 sf 67.26% Impervious Runoff Depth>2.91"
Tc=6.0 min CN=86 Runoff=1.52 cfs 0.105 af

Subcatchment 5S: Catch 5S Runoff Area=18,526 sf 68.09% Impervious Runoff Depth>2.91"
Tc=6.0 min CN=86 Runoff=1.50 cfs 0.103 af

Subcatchment 6S: Catch 6S Runoff Area=7,212 sf 76.71% Impervious Runoff Depth>3.20"
Tc=6.0 min CN=89 Runoff=0.63 cfs 0.044 af

Subcatchment 7S: Catch 7S Runoff Area=6,407 sf 83.69% Impervious Runoff Depth>3.50"
Tc=6.0 min CN=92 Runoff=0.60 cfs 0.043 af

Subcatchment 8S: Catch 8S Runoff Area=1,257 sf 90.37% Impervious Runoff Depth>3.69"
Tc=6.0 min CN=94 Runoff=0.12 cfs 0.009 af

Subcatchment 9S: Catch 9S Runoff Area=70,326 sf 88.89% Impervious Runoff Depth>3.60"
Tc=6.0 min CN=93 Runoff=6.65 cfs 0.484 af

Pond 1P: Wetland Inflow=0.05 cfs 0.023 af
Primary=0.05 cfs 0.023 af

Pond 2P: ReTain-It 1 Peak Elev=130.07' Storage=0.416 af Inflow=13.95 cfs 1.047 af
Outflow=1.16 cfs 1.041 af

Pond 3P: Porous Asphalt Peak Elev=128.02' Storage=12,597 cf Inflow=6.65 cfs 0.484 af
Outflow=0.24 cfs 0.231 af

Pond 4P: RainGarden1 Peak Elev=132.42' Storage=844 cf Inflow=1.52 cfs 0.105 af
Discarded=0.01 cfs 0.007 af Primary=1.45 cfs 0.083 af Outflow=1.46 cfs 0.089 af

Pond 5P: RainGarden2 Peak Elev=131.96' Storage=706 cf Inflow=1.50 cfs 0.103 af
Discarded=0.01 cfs 0.006 af Primary=1.46 cfs 0.084 af Outflow=1.47 cfs 0.090 af

Pond 6P: RainGarden3 Peak Elev=131.43' Storage=351 cf Inflow=0.63 cfs 0.044 af
Discarded=0.00 cfs 0.003 af Primary=0.61 cfs 0.034 af Outflow=0.62 cfs 0.037 af

Pond 7P: RainGarden4 Peak Elev=131.42' Storage=418 cf Inflow=0.60 cfs 0.043 af
Discarded=0.00 cfs 0.004 af Primary=0.58 cfs 0.030 af Outflow=0.58 cfs 0.035 af

Pond 8P: ReTain-It 2 Peak Elev=129.84' Storage=0.111 af Inflow=4.10 cfs 0.230 af
Outflow=0.40 cfs 0.230 af

Pond 10P: ReTain-It (flood storage) Peak Elev=0.00' Storage=0.000 af
Discarded=0.00 cfs 0.000 af

Total Runoff Area = 9.037 ac Runoff Volume = 1.857 af Average Runoff Depth = 2.47"
38.44% Pervious = 3.474 ac 61.56% Impervious = 5.563 ac

Summary for Subcatchment 1S: Catch 1S

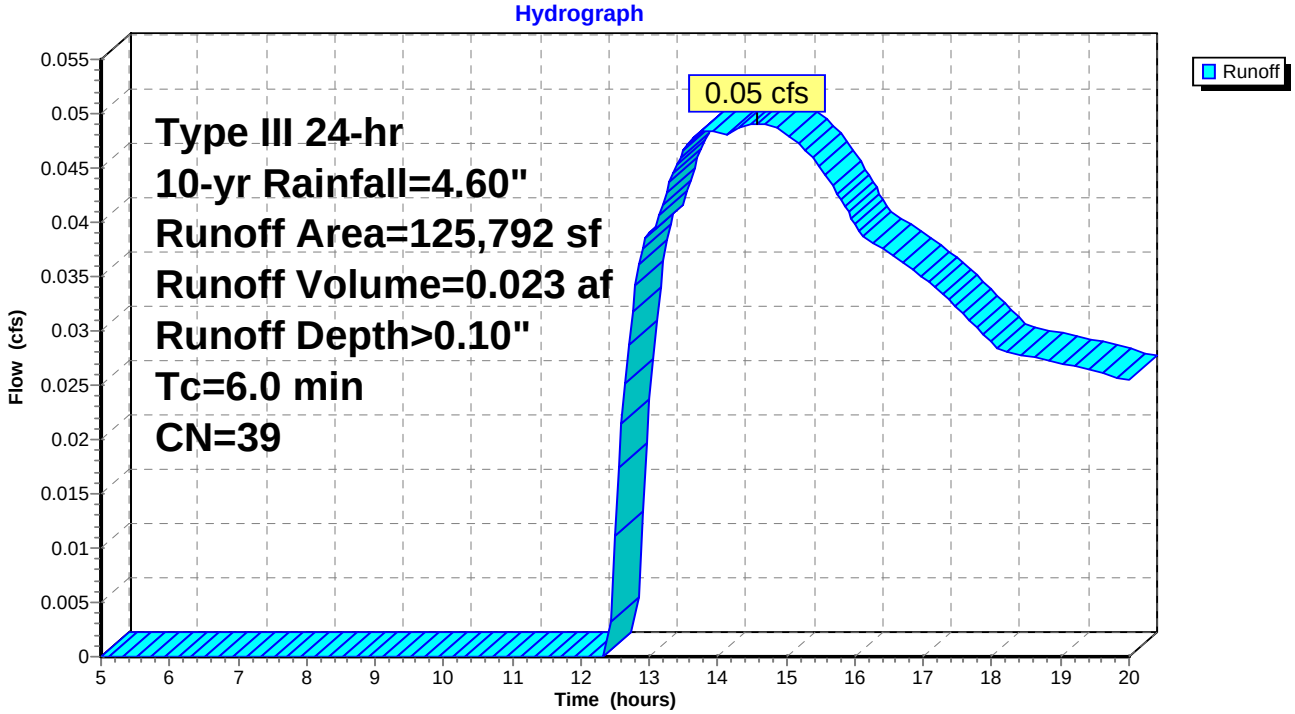
Runoff = 0.05 cfs @ 14.58 hrs, Volume= 0.023 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

	Area (sf)	CN	Description
	89,852	30	Woods, Good, HSG A
	6,395	83	Woods, Poor, HSG D
	20,867	39	>75% Grass cover, Good, HSG A
	440	61	>75% Grass cover, Good, HSG B
*	3,073	98	Roofs (off-site), HSG A
	5,144	98	Paved parking, HSG A
	21	98	Paved parking, HSG B
	125,792	39	Weighted Average
	117,554		93.45% Pervious Area
	8,238		6.55% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

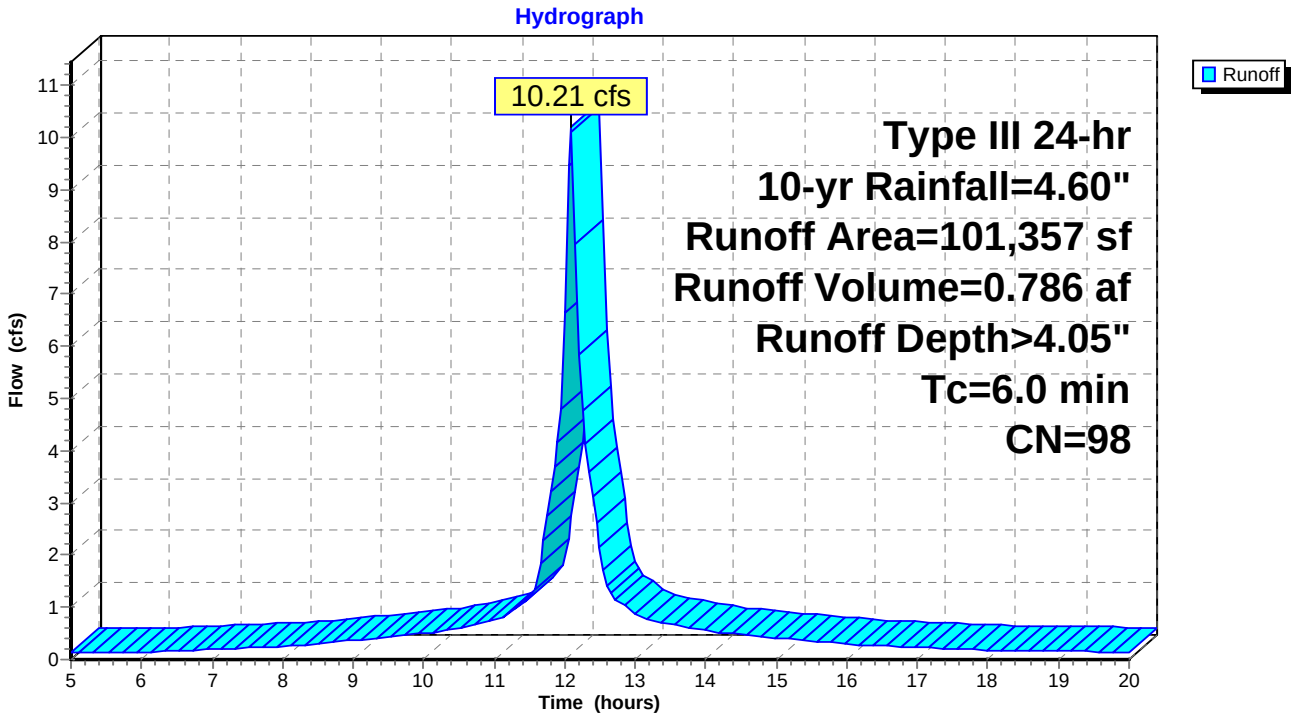
Runoff = 10.21 cfs @ 12.09 hrs, Volume= 0.786 af, Depth> 4.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
24,408	98	Roofs, HSG A
76,949	98	Roofs, HSG B
101,357	98	Weighted Average
101,357		100.00% Impervious Area

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

Subcatchment 2S: Catch 2S



Summary for Subcatchment 3S: Catch 3S

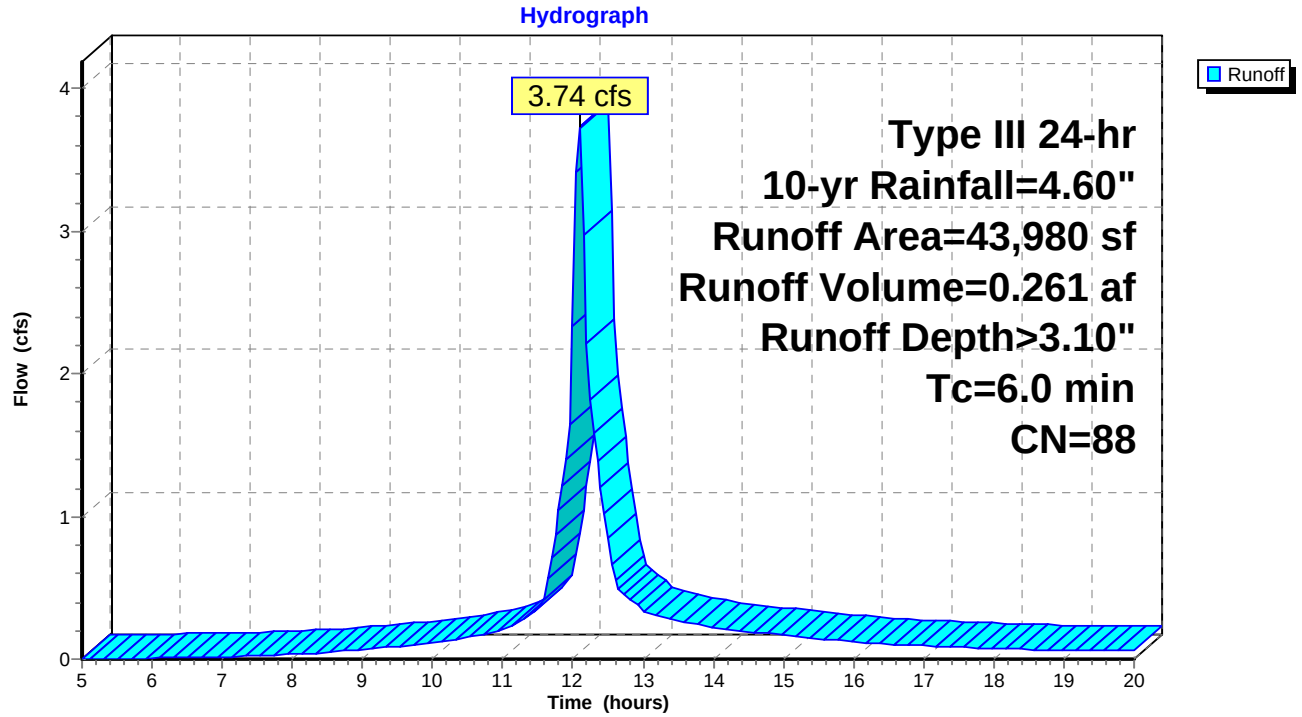
Runoff = 3.74 cfs @ 12.09 hrs, Volume= 0.261 af, Depth> 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
551	39	>75% Grass cover, Good, HSG A
10,497	61	>75% Grass cover, Good, HSG B
2,432	98	Paved parking, HSG A
30,500	98	Paved parking, HSG B
43,980	88	Weighted Average
11,048		25.12% Pervious Area
32,932		74.88% Impervious Area

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

Subcatchment 3S: Catch 3S



Summary for Subcatchment 4S: Catch 4S

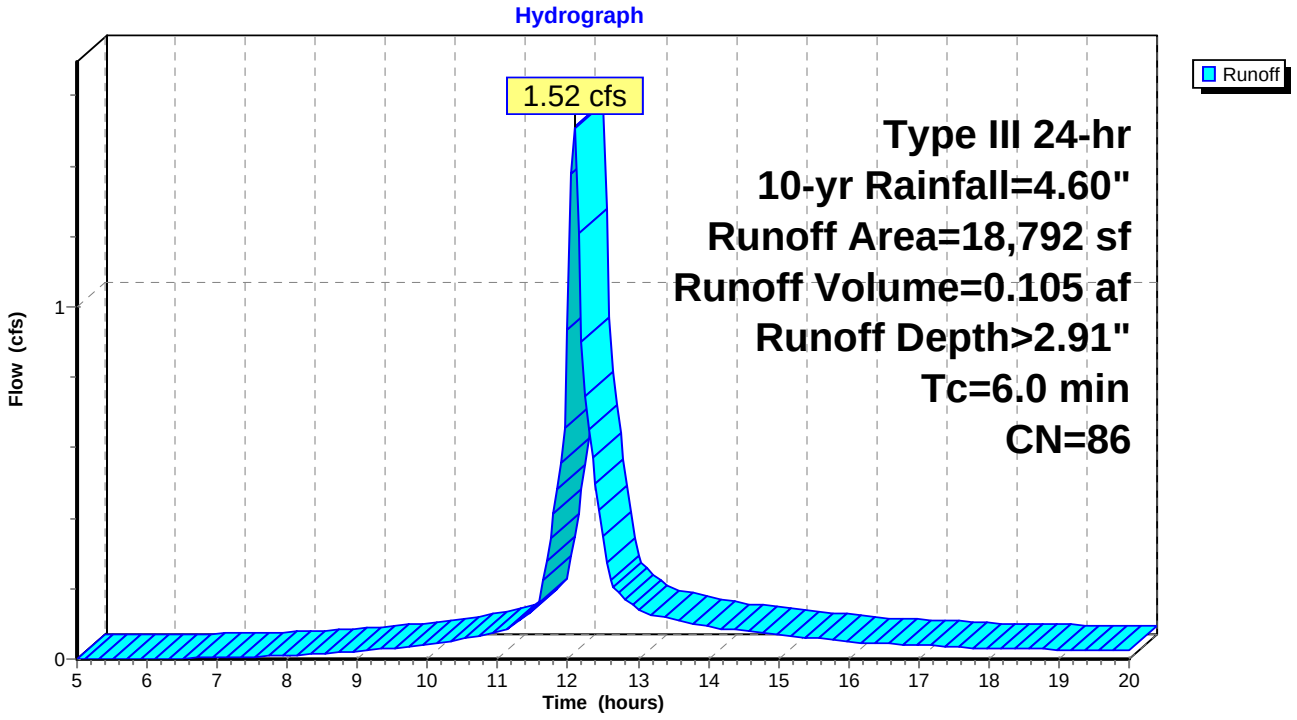
Runoff = 1.52 cfs @ 12.09 hrs, Volume= 0.105 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
6,153	61	>75% Grass cover, Good, HSG B
12,639	98	Paved parking, HSG B
18,792	86	Weighted Average
6,153		32.74% Pervious Area
12,639		67.26% Impervious Area

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

Subcatchment 4S: Catch 4S



Summary for Subcatchment 5S: Catch 5S

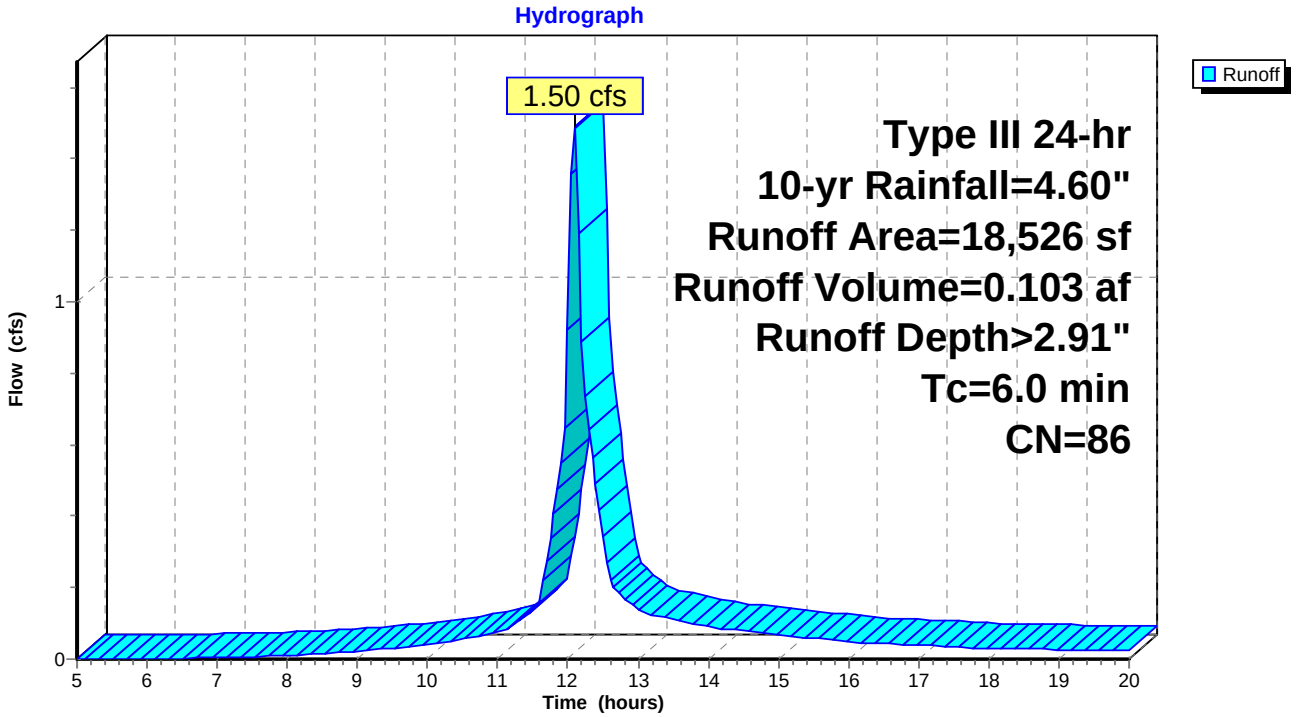
Runoff = 1.50 cfs @ 12.09 hrs, Volume= 0.103 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
87	39	>75% Grass cover, Good, HSG A
5,825	61	>75% Grass cover, Good, HSG B
42	98	Paved parking, HSG A
12,572	98	Paved parking, HSG B
18,526	86	Weighted Average
5,912		31.91% Pervious Area
12,614		68.09% Impervious Area

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

Subcatchment 5S: Catch 5S



Summary for Subcatchment 6S: Catch 6S

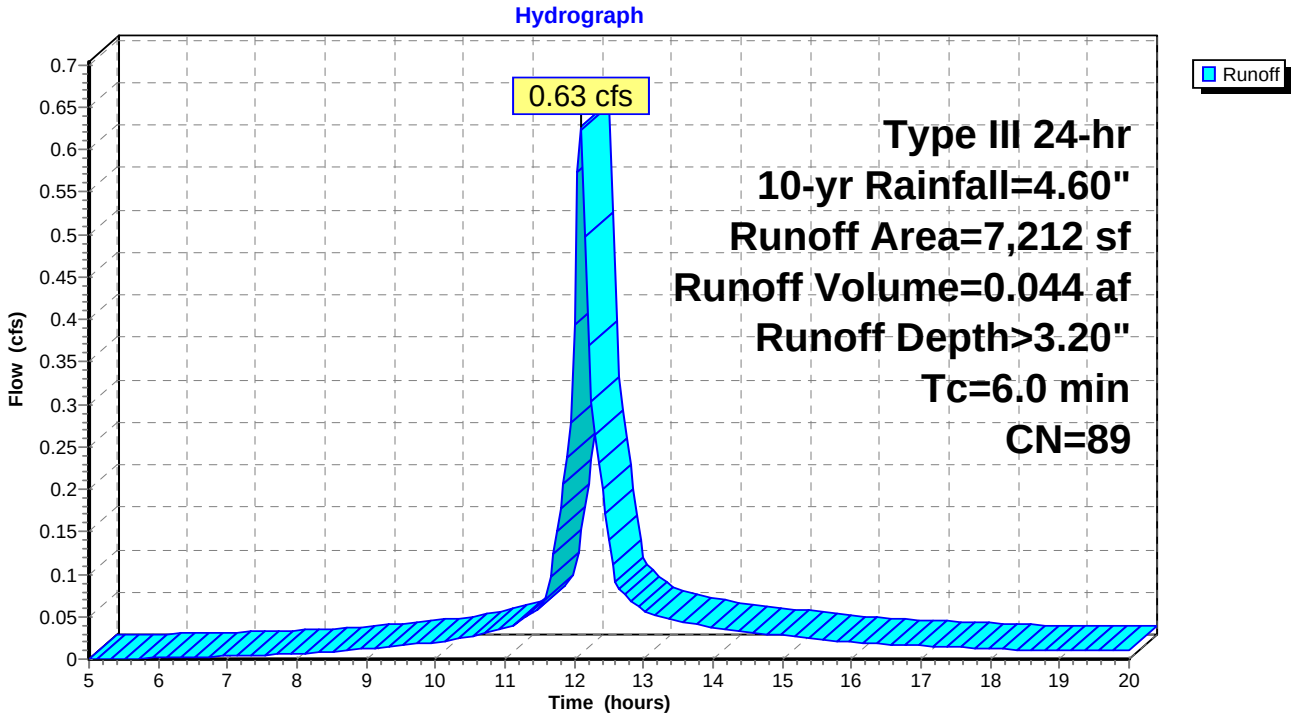
Runoff = 0.63 cfs @ 12.09 hrs, Volume= 0.044 af, Depth> 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
106	39	>75% Grass cover, Good, HSG A
1,574	61	>75% Grass cover, Good, HSG B
1,400	98	Paved parking, HSG A
4,132	98	Paved parking, HSG B
7,212	89	Weighted Average
1,680		23.29% Pervious Area
5,532		76.71% Impervious Area

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

Subcatchment 6S: Catch 6S



Summary for Subcatchment 7S: Catch 7S

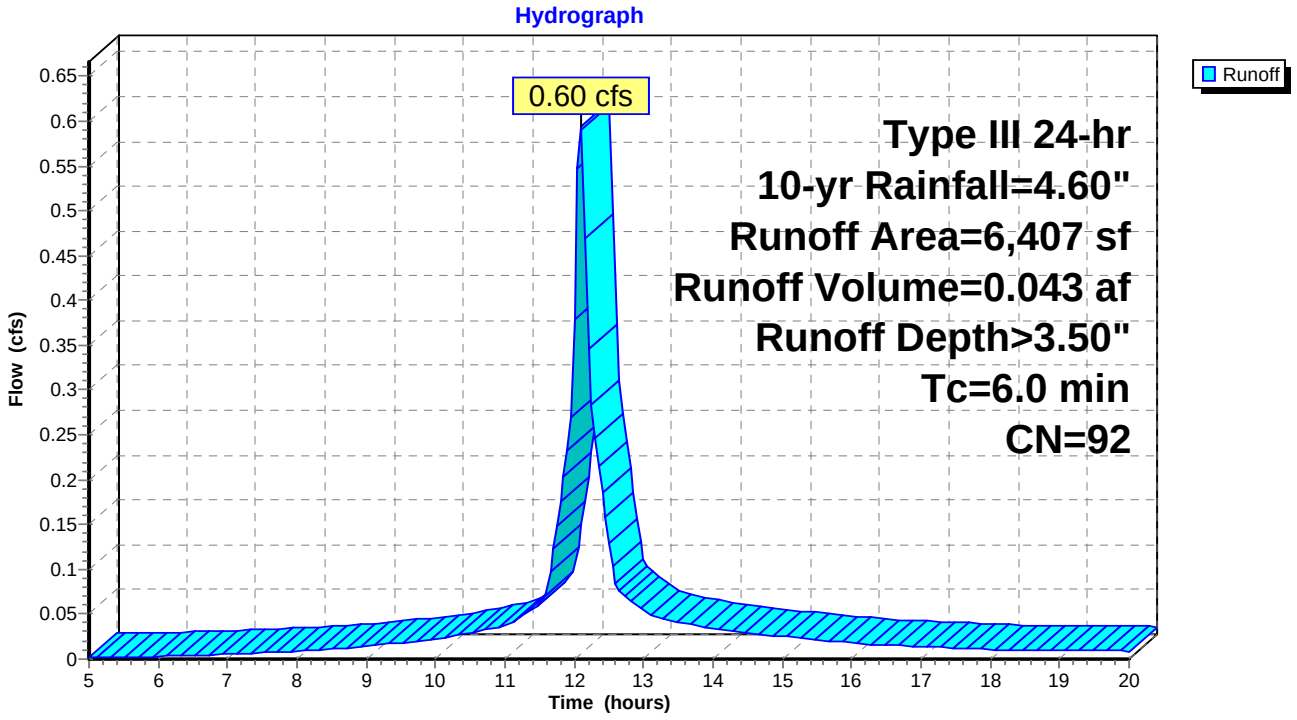
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 0.043 af, Depth> 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
1,045	61	>75% Grass cover, Good, HSG B
5,362	98	Paved parking, HSG B
6,407	92	Weighted Average
1,045		16.31% Pervious Area
5,362		83.69% Impervious Area

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

Subcatchment 7S: Catch 7S



Summary for Subcatchment 8S: Catch 8S

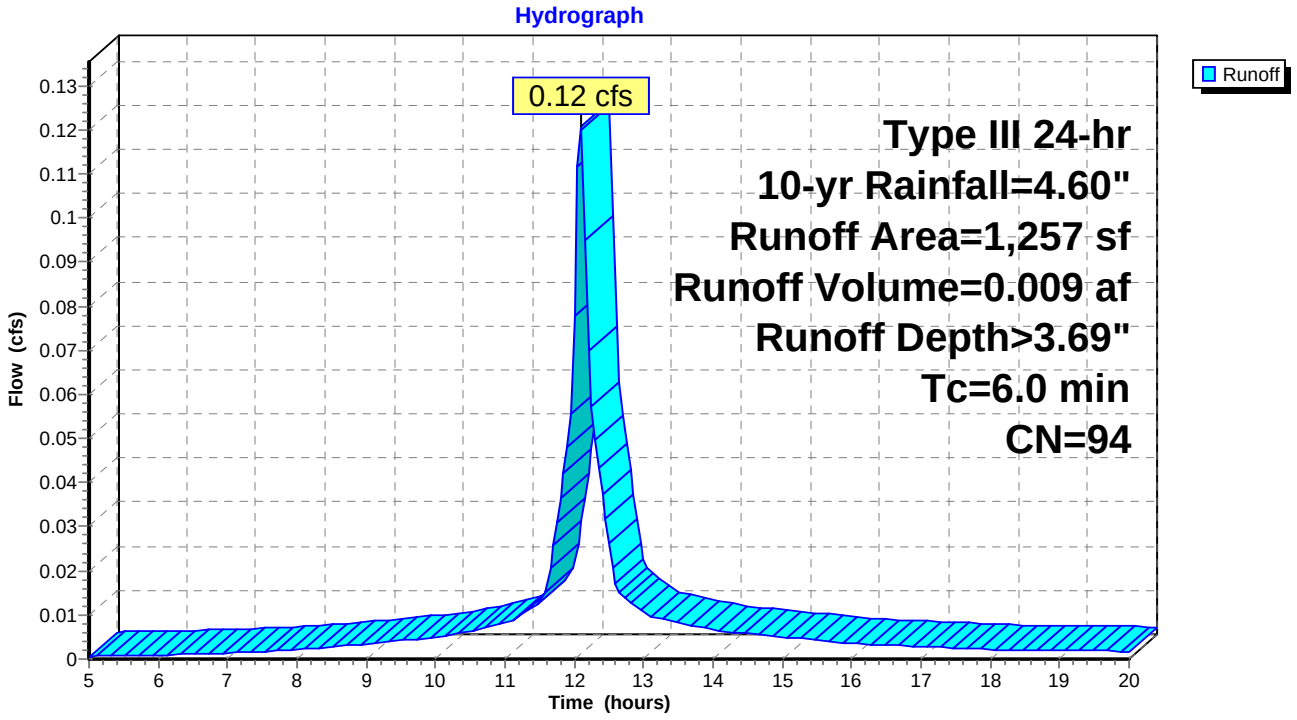
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af, Depth> 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
121	61	>75% Grass cover, Good, HSG B
1,136	98	Paved parking, HSG B
1,257	94	Weighted Average
121		9.63% Pervious Area
1,136		90.37% Impervious Area

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

Subcatchment 8S: Catch 8S



Summary for Subcatchment 9S: Catch 9S

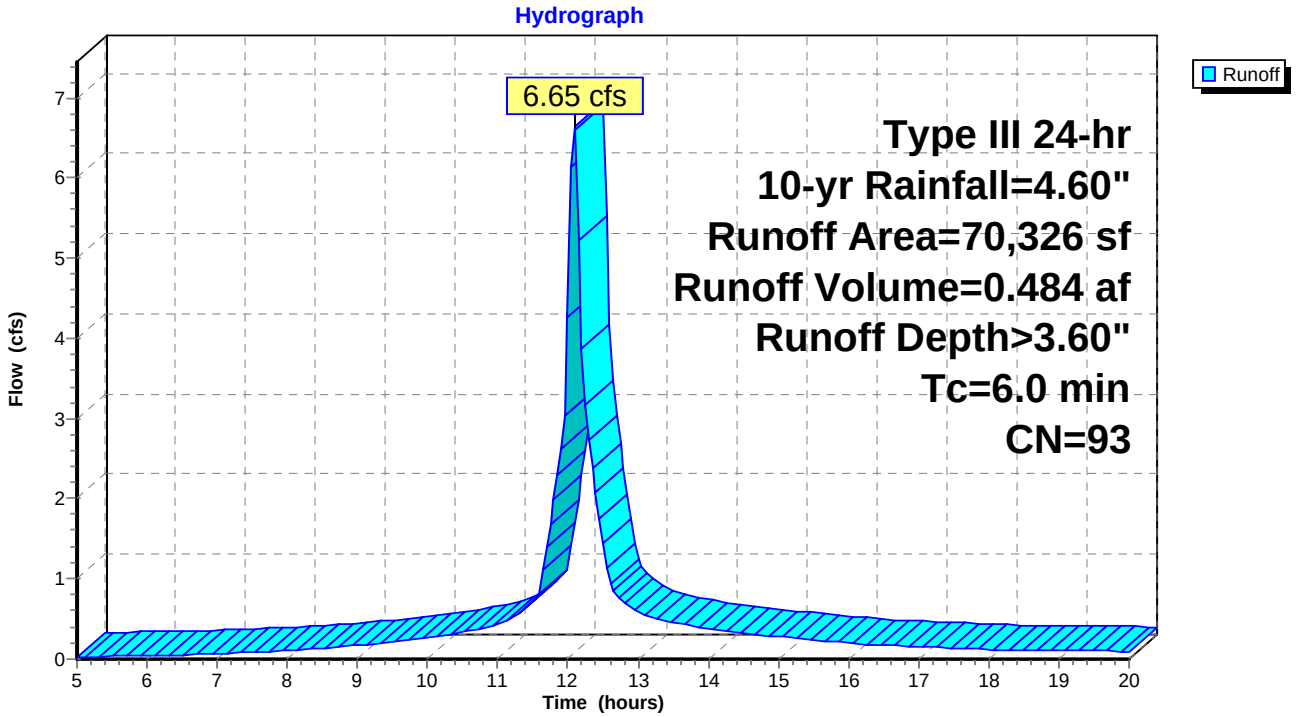
Runoff = 6.65 cfs @ 12.09 hrs, Volume= 0.484 af, Depth> 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.60"

Area (sf)	CN	Description
3,430	39	>75% Grass cover, Good, HSG A
4,383	61	>75% Grass cover, Good, HSG B
19,865	98	Paved parking, HSG A
42,648	98	Paved parking, HSG B
70,326	93	Weighted Average
7,813		11.11% Pervious Area
62,513		88.89% Impervious Area

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

Subcatchment 9S: Catch 9S



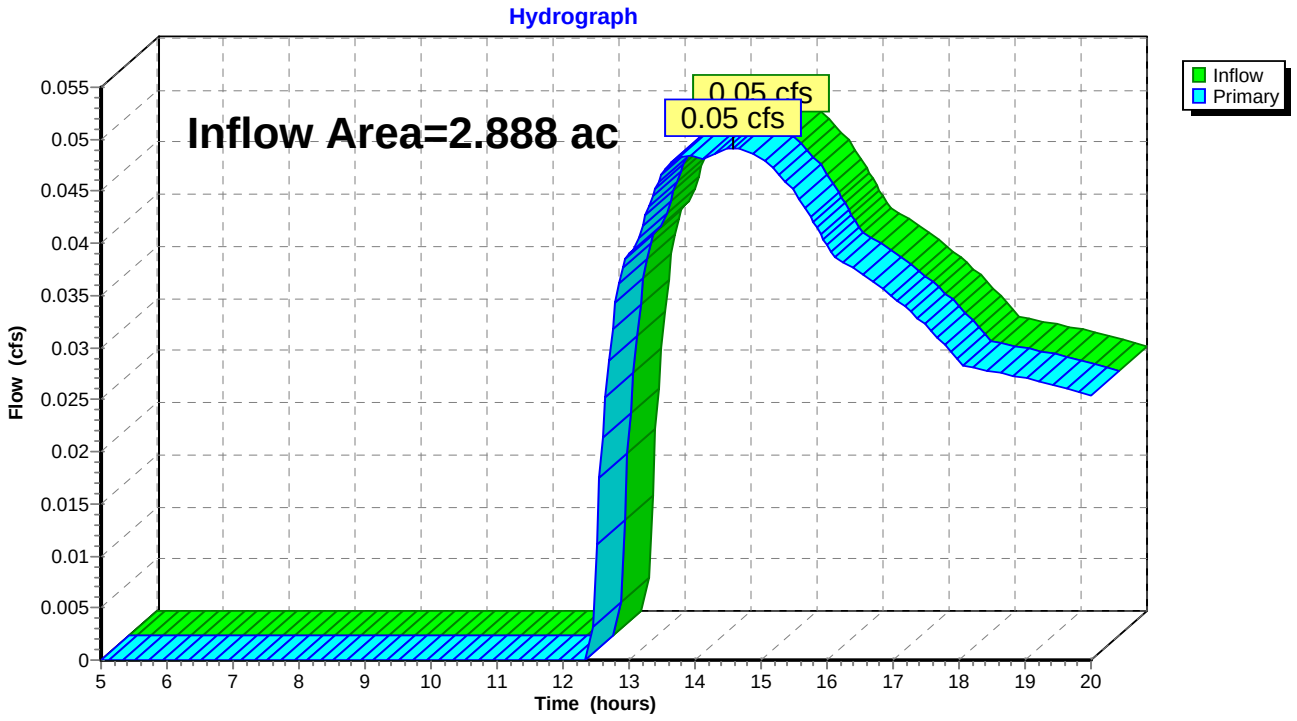
Summary for Pond 1P: Wetland

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

Inflow Area = 2.888 ac, 6.55% Impervious, Inflow Depth > 0.10" for 10-yr event
Inflow = 0.05 cfs @ 14.58 hrs, Volume= 0.023 af
Primary = 0.05 cfs @ 14.58 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Summary for Pond 2P: ReTain-It 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 3.336 ac, 92.40% Impervious, Inflow Depth > 3.77" for 10-yr event
Inflow = 13.95 cfs @ 12.09 hrs, Volume= 1.047 af
Outflow = 1.16 cfs @ 11.30 hrs, Volume= 1.041 af, Atten= 92%, Lag= 0.0 min
Discarded = 1.16 cfs @ 11.30 hrs, Volume= 1.041 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 130.07' @ 13.05 hrs Surf.Area= 0.479 ac Storage= 0.416 af

Plug-Flow detention time= 124.4 min calculated for 1.040 af (99% of inflow)
Center-of-Mass det. time= 121.5 min (865.6 - 744.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.232 af	**26.00'W x 802.00'L x 3.67'H Field A** 1.755 af Overall - 1.175 af Embedded = 0.580 af x 40.0% Voids
#2A	129.25'	0.751 af	**retain_it 2.0'** x 300 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 389.4 cf perimeter wall
		0.982 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=1.16 cfs @ 11.30 hrs HW=128.79' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.16 cfs)

Pond 2P: ReTain-It 1 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 389.4 cf perimeter wall

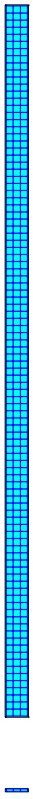
100 Chambers/Row x 8.00' Long = 800.00' Row Length +12.0" End Stone x 2 = 802.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 100 x 2 + 1.9 cf Endwall x 3 x 2 = 389.4 cf Perimeter Wall
300 Chambers x 110.3 cf - 389.4 cf Perimeter wall = 32,694.5 cf Chamber Storage
300 Chambers x 170.7 cf = 51,200.0 cf Displacement

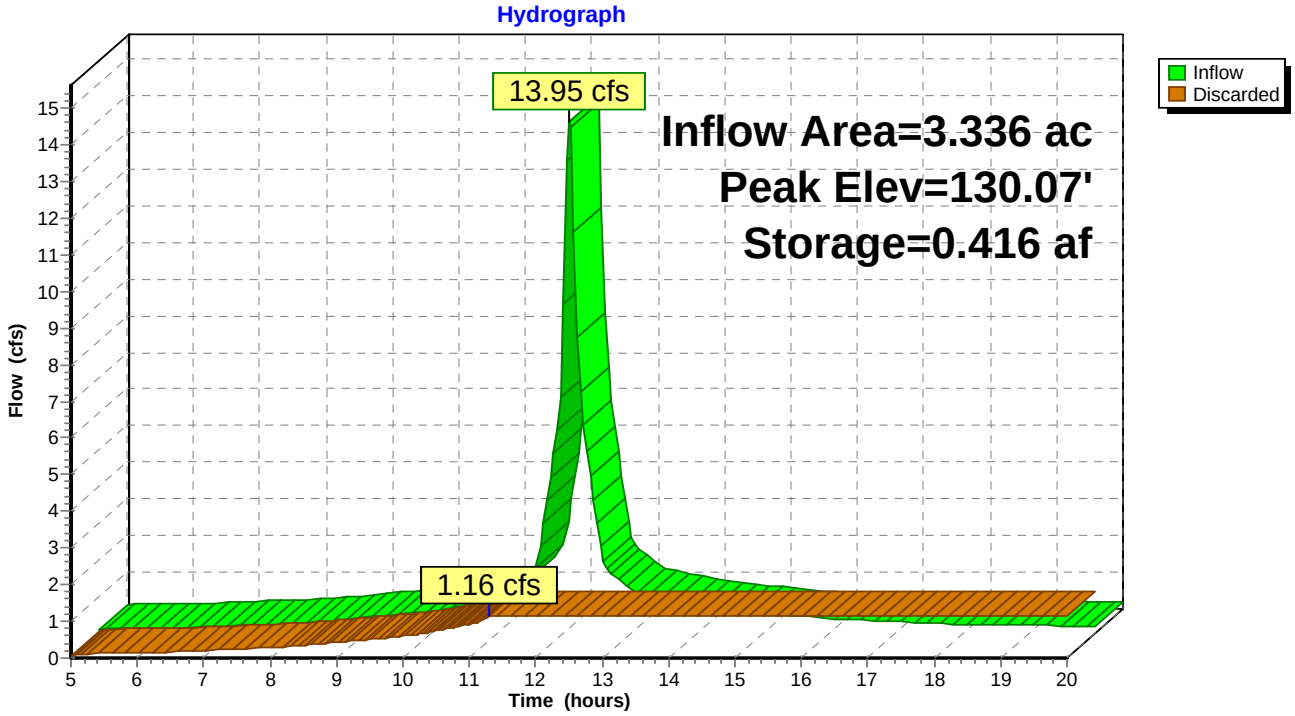
76,457.3 cf Field - 51,200.0 cf Chambers = 25,257.3 cf Stone x 40.0% Voids = 10,102.9 cf Stone Storage

Chamber Storage + Stone Storage = 42,797.5 cf = 0.982 af
Overall Storage Efficiency = 56.0%
Overall System Size = 802.00' x 26.00' x 3.67'

300 Chambers
2,831.8 cy Field
935.5 cy Stone



Pond 2P: ReTain-It 1



Summary for Pond 3P: Porous Asphalt

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.614 ac, 88.89% Impervious, Inflow Depth > 3.60" for 10-yr event
Inflow = 6.65 cfs @ 12.09 hrs, Volume= 0.484 af
Outflow = 0.24 cfs @ 10.30 hrs, Volume= 0.231 af, Atten= 96%, Lag= 0.0 min
Discarded = 0.24 cfs @ 10.30 hrs, Volume= 0.231 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 128.02' @ 15.51 hrs Surf.Area= 60,636 sf Storage= 12,597 cf

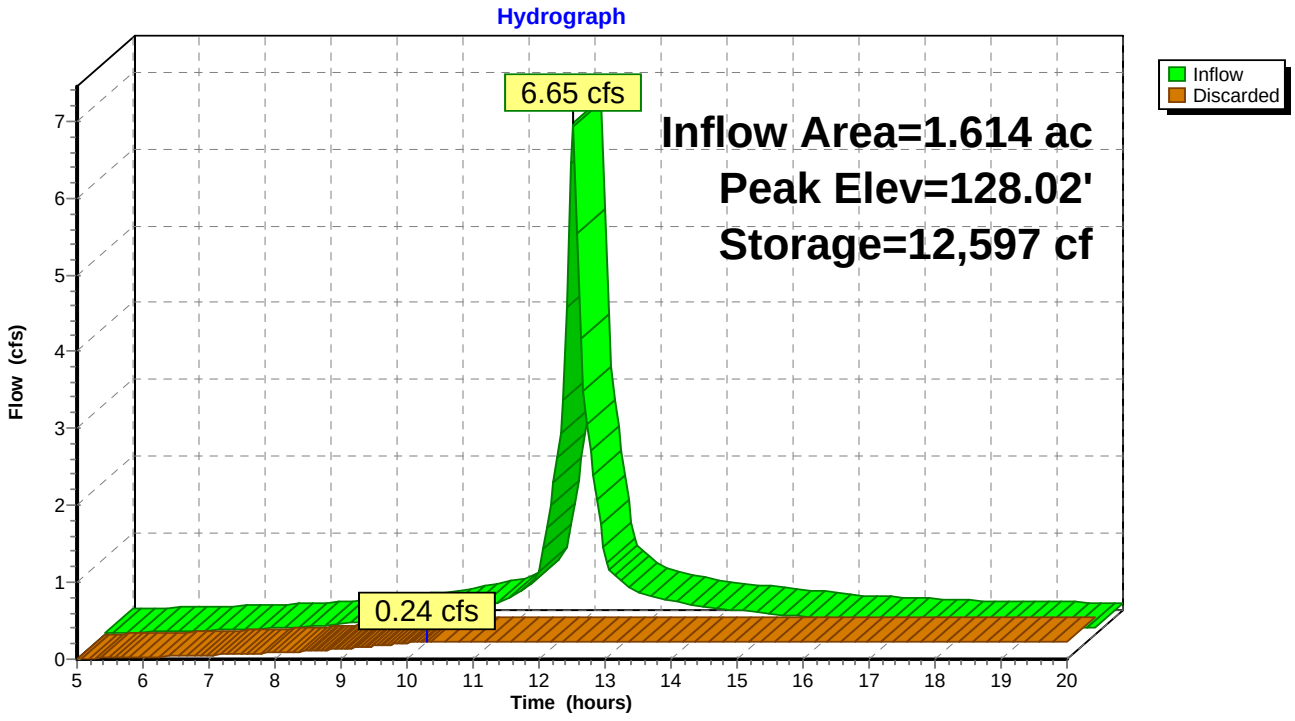
Plug-Flow detention time= 181.5 min calculated for 0.230 af (48% of inflow)
Center-of-Mass det. time= 90.9 min (844.2 - 753.3)

Volume	Invert	Avail.Storage	Storage Description
#1	127.50'	48,509 cf	**186.00'W x 326.00'L x 2.00'H Prismatoid** 121,272 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.50'	**0.170 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 10.30 hrs HW=127.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.24 cfs)

Pond 3P: Porous Asphalt



Summary for Pond 4P: RainGarden1

Inflow Area = 0.431 ac, 67.26% Impervious, Inflow Depth > 2.91" for 10-yr event
Inflow = 1.52 cfs @ 12.09 hrs, Volume= 0.105 af
Outflow = 1.46 cfs @ 12.11 hrs, Volume= 0.089 af, Atten= 4%, Lag= 1.5 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.007 af
Primary = 1.45 cfs @ 12.11 hrs, Volume= 0.083 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 132.42' @ 12.11 hrs Surf.Area= 1,132 sf Storage= 844 cf

Plug-Flow detention time= 68.5 min calculated for 0.089 af (85% of inflow)
Center-of-Mass det. time= 25.2 min (800.4 - 775.2)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,253 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

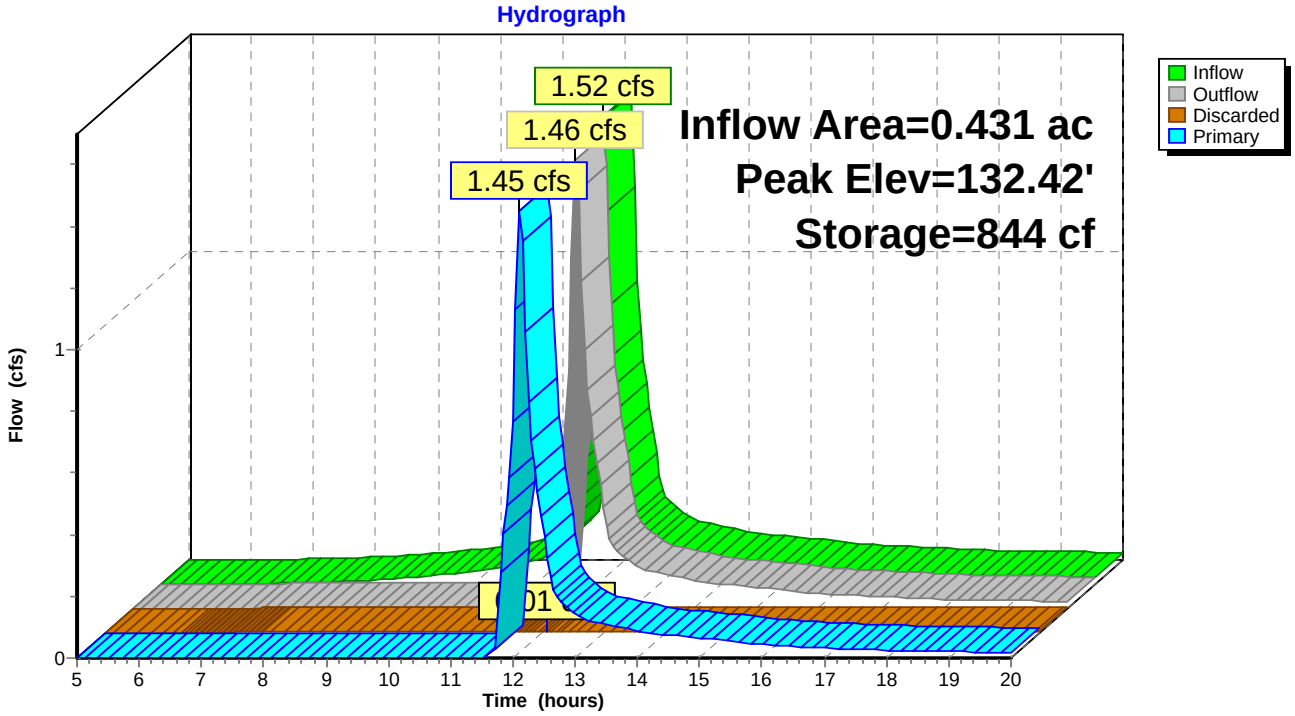
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	853	0.0	0	0
132.00	853	20.0	427	427
132.75	1,350	100.0	826	1,253

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	131.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 131.00' / 130.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	132.25'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=132.42' (Free Discharge)
└**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=1.41 cfs @ 12.11 hrs HW=132.42' (Free Discharge)
└**2=Culvert** (Passes 1.41 cfs of 6.39 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 1.41 cfs @ 1.34 fps)

Pond 4P: RainGarden1



Summary for Pond 5P: RainGarden2

Inflow Area = 0.425 ac, 68.09% Impervious, Inflow Depth > 2.91" for 10-yr event
Inflow = 1.50 cfs @ 12.09 hrs, Volume= 0.103 af
Outflow = 1.47 cfs @ 12.11 hrs, Volume= 0.090 af, Atten= 2%, Lag= 1.0 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.006 af
Primary = 1.46 cfs @ 12.11 hrs, Volume= 0.084 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.96' @ 12.11 hrs Surf.Area= 986 sf Storage= 706 cf

Plug-Flow detention time= 62.8 min calculated for 0.090 af (87% of inflow)
Center-of-Mass det. time= 22.9 min (798.1 - 775.2)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,309 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

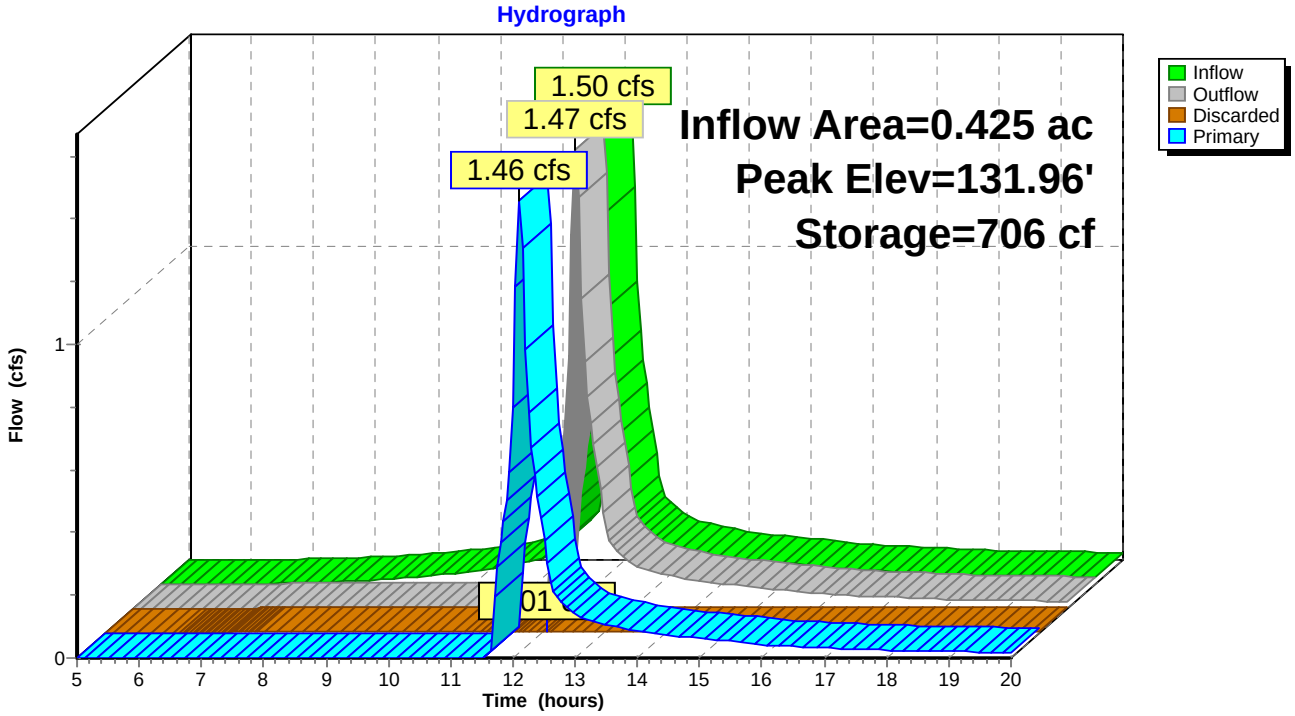
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	759	0.0	0	0
131.50	759	20.0	304	304
132.50	1,251	100.0	1,005	1,309

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.50'	**12.0" Round Culvert X 3.00** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.50' / 130.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.83'	**12.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=131.96' (Free Discharge)
└**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=1.43 cfs @ 12.11 hrs HW=131.96' (Free Discharge)
└**2=Culvert** (Passes 1.43 cfs of 9.81 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 1.43 cfs @ 1.18 fps)

Pond 5P: RainGarden2



Summary for Pond 6P: RainGarden3

Inflow Area = 0.166 ac, 76.71% Impervious, Inflow Depth > 3.20" for 10-yr event
Inflow = 0.63 cfs @ 12.09 hrs, Volume= 0.044 af
Outflow = 0.62 cfs @ 12.11 hrs, Volume= 0.037 af, Atten= 2%, Lag= 1.0 min
Discarded = 0.00 cfs @ 12.11 hrs, Volume= 0.003 af
Primary = 0.61 cfs @ 12.11 hrs, Volume= 0.034 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.43' @ 12.11 hrs Surf.Area= 564 sf Storage= 351 cf

Plug-Flow detention time= 73.0 min calculated for 0.037 af (84% of inflow)
Center-of-Mass det. time= 27.5 min (793.8 - 766.3)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	748 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

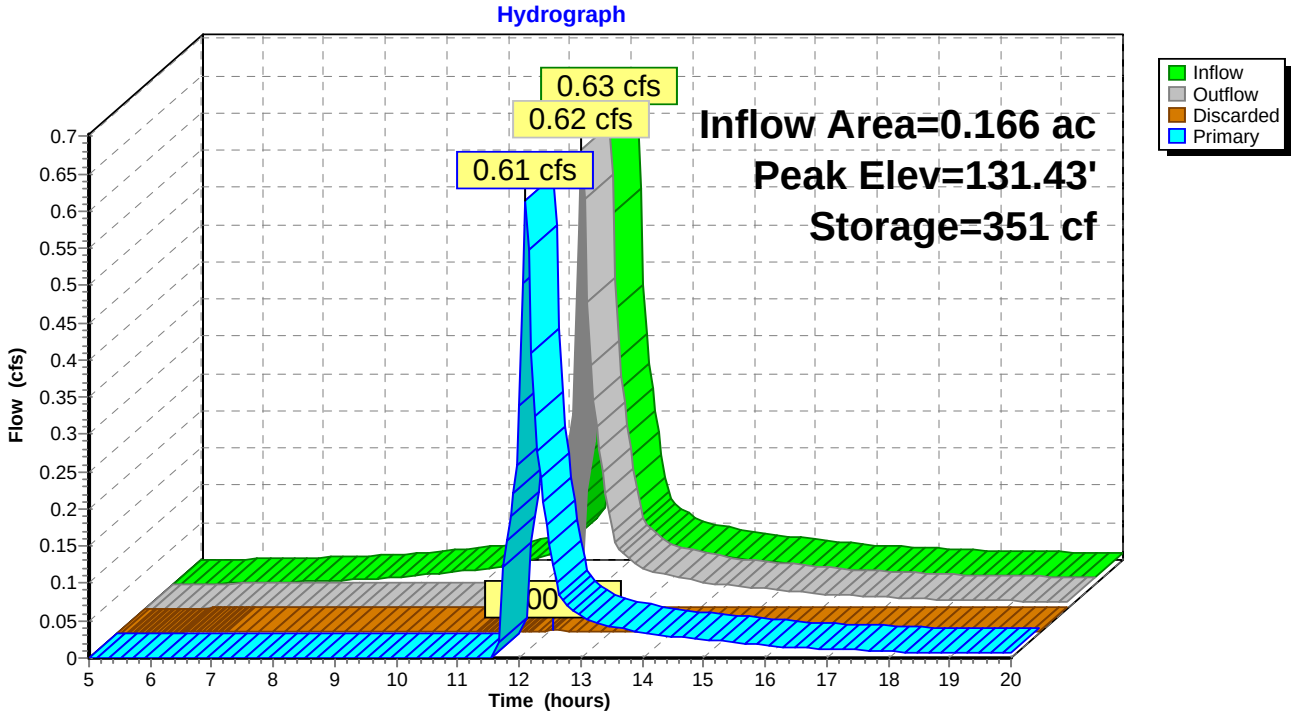
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	377	0.0	0	0
131.00	377	20.0	151	151
132.00	817	100.0	597	748

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=131.42' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.60 cfs @ 12.11 hrs HW=131.42' (Free Discharge)
↑**2=Culvert** (Passes 0.60 cfs of 6.41 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 0.60 cfs @ 1.01 fps)

Pond 6P: RainGarden3



Summary for Pond 7P: RainGarden4

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.147 ac, 83.69% Impervious, Inflow Depth > 3.50" for 10-yr event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 0.043 af
Outflow = 0.58 cfs @ 12.11 hrs, Volume= 0.035 af, Atten= 2%, Lag= 1.2 min
Discarded = 0.00 cfs @ 12.11 hrs, Volume= 0.004 af
Primary = 0.58 cfs @ 12.11 hrs, Volume= 0.030 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.42' @ 12.11 hrs Surf.Area= 669 sf Storage= 418 cf

Plug-Flow detention time= 85.9 min calculated for 0.035 af (81% of inflow)
Center-of-Mass det. time= 33.5 min (790.1 - 756.6)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	890 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

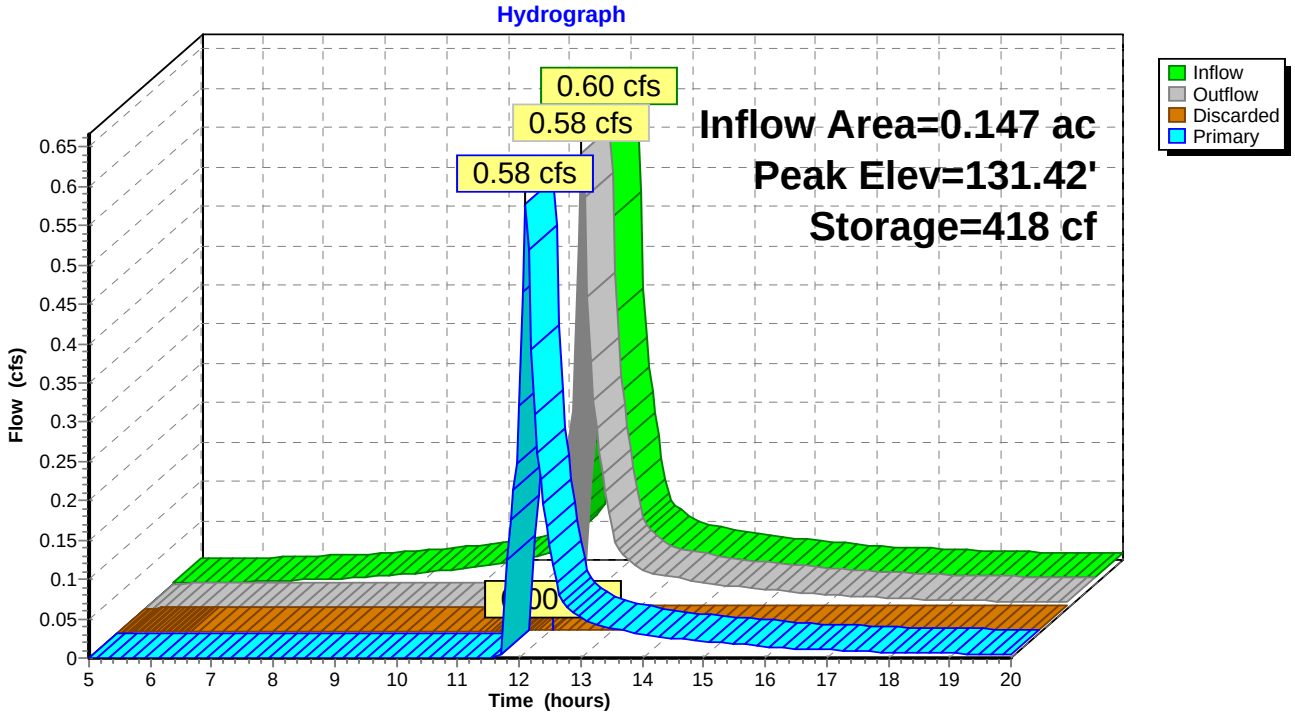
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	453	0.0	0	0
131.00	453	20.0	181	181
132.00	965	100.0	709	890

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=131.42' (Free Discharge)
1=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=0.56 cfs @ 12.11 hrs HW=131.42' (Free Discharge)
2=Culvert (Passes 0.56 cfs of 6.40 cfs potential flow)
3=Orifice/Grate (Weir Controls 0.56 cfs @ 0.98 fps)

Pond 7P: RainGarden4



Summary for Pond 8P: ReTain-It 2

[79] Warning: Submerged Pond 6P Primary device # 2 OUTLET by 0.34'
[79] Warning: Submerged Pond 7P Primary device # 2 OUTLET by 0.34'

Inflow Area = 1.169 ac, 70.96% Impervious, Inflow Depth > 2.36" for 10-yr event
Inflow = 4.10 cfs @ 12.11 hrs, Volume= 0.230 af
Outflow = 0.40 cfs @ 11.80 hrs, Volume= 0.230 af, Atten= 90%, Lag= 0.0 min
Discarded = 0.40 cfs @ 11.80 hrs, Volume= 0.230 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.84' @ 12.99 hrs Surf.Area= 0.164 ac Storage= 0.111 af

Plug-Flow detention time= 121.0 min calculated for 0.229 af (100% of inflow)
Center-of-Mass det. time= 120.1 min (915.5 - 795.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.080 af	**26.00'W x 274.00'L x 3.67'H Field A** 0.600 af Overall - 0.400 af Embedded = 0.200 af x 40.0% Voids
#2A	129.25'	0.255 af	**retain_it 2.0'** x 102 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 139.9 cf perimeter wall
		0.335 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.40 cfs @ 11.80 hrs HW=128.80' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.40 cfs)

Pond 8P: ReTain-It 2 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 139.9 cf perimeter wall

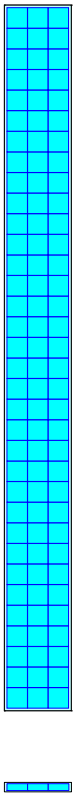
34 Chambers/Row x 8.00' Long = 272.00' Row Length +12.0" End Stone x 2 = 274.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 34 x 2 + 1.9 cf Endwall x 3 x 2 = 139.9 cf Perimeter Wall
102 Chambers x 110.3 cf - 139.9 cf Perimeter wall = 11,108.7 cf Chamber Storage
102 Chambers x 170.7 cf = 17,408.0 cf Displacement

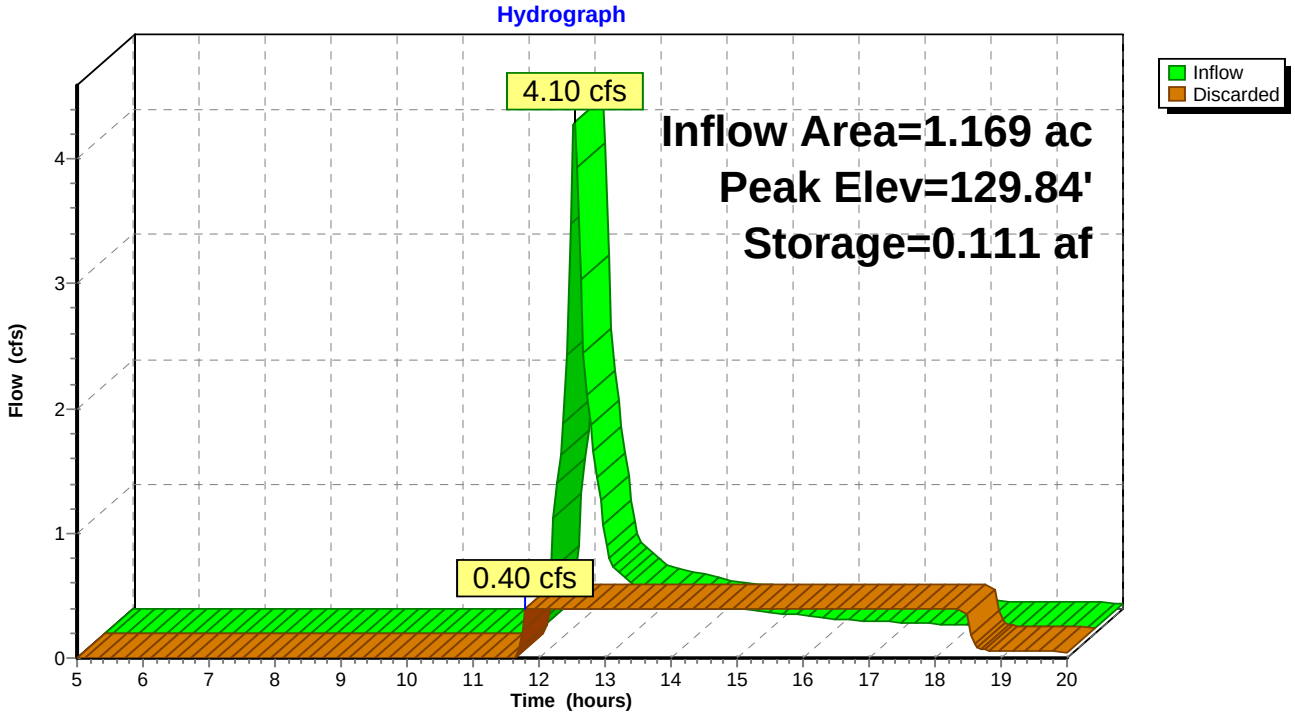
26,121.3 cf Field - 17,408.0 cf Chambers = 8,713.3 cf Stone x 40.0% Voids = 3,485.3 cf Stone Storage

Chamber Storage + Stone Storage = 14,594.0 cf = 0.335 af
Overall Storage Efficiency = 55.9%
Overall System Size = 274.00' x 26.00' x 3.67'

102 Chambers
967.5 cy Field
322.7 cy Stone



Pond 8P: ReTain-It 2



Summary for Pond 10P: ReTain-It (flood storage)

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

Volume	Invert	Avail.Storage	Storage Description
#1A	127.58'	0.057 af	**18.00'W x 250.00'L x 4.17'H Field A** 0.430 af Overall - 0.288 af Embedded = 0.142 af x 40.0% Voids
#2A	128.08'	0.195 af	**retain_it 2.5'** x 62 Inside #1 Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf 2 Rows adjusted for 217.8 cf perimeter wall
		0.252 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.58'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Pond 10P: ReTain-It (flood storage) - Chamber Wizard Field A

Chamber Model = retain_it 2.5' (retain-it® 2.5' tall)
Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf
Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf
2 Rows adjusted for 217.8 cf perimeter wall

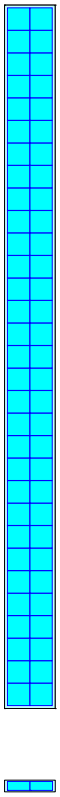
31 Chambers/Row x 8.00' Long = 248.00' Row Length +12.0" End Stone x 2 = 250.00' Base Length
2 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Base + 38.0" Chamber Height + 6.0" Cover = 4.17' Field Height

3.3 cf Sidewall x 31 x 2 + 3.3 cf Endwall x 2 x 2 = 217.8 cf Perimeter Wall
62 Chambers x 140.4 cf - 217.8 cf Perimeter wall = 8,489.5 cf Chamber Storage
62 Chambers x 202.7 cf = 12,565.3 cf Displacement

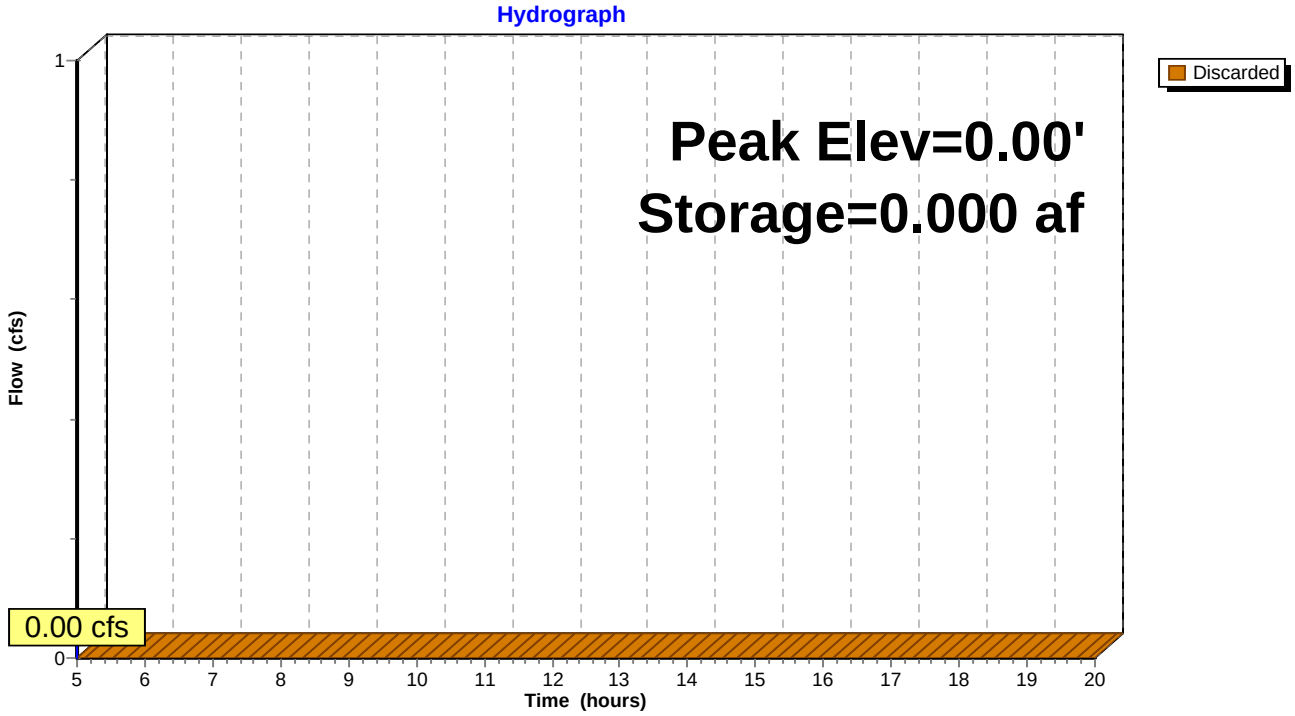
18,750.0 cf Field - 12,565.3 cf Chambers = 6,184.7 cf Stone x 40.0% Voids = 2,473.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,963.4 cf = 0.252 af
Overall Storage Efficiency = 58.5%
Overall System Size = 250.00' x 18.00' x 4.17'

62 Chambers
694.4 cy Field
229.1 cy Stone



Pond 10P: ReTain-It (flood storage)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=125,792 sf 6.55% Impervious Runoff Depth>0.26"
Tc=6.0 min CN=39 Runoff=0.28 cfs 0.061 af

Subcatchment 2S: Catch 2S Runoff Area=101,357 sf 100.00% Impervious Runoff Depth>4.87"
Tc=6.0 min CN=98 Runoff=12.24 cfs 0.945 af

Subcatchment 3S: Catch 3S Runoff Area=43,980 sf 74.88% Impervious Runoff Depth>3.91"
Tc=6.0 min CN=88 Runoff=4.66 cfs 0.329 af

Subcatchment 4S: Catch 4S Runoff Area=18,792 sf 67.26% Impervious Runoff Depth>3.71"
Tc=6.0 min CN=86 Runoff=1.91 cfs 0.133 af

Subcatchment 5S: Catch 5S Runoff Area=18,526 sf 68.09% Impervious Runoff Depth>3.71"
Tc=6.0 min CN=86 Runoff=1.88 cfs 0.131 af

Subcatchment 6S: Catch 6S Runoff Area=7,212 sf 76.71% Impervious Runoff Depth>4.02"
Tc=6.0 min CN=89 Runoff=0.78 cfs 0.055 af

Subcatchment 7S: Catch 7S Runoff Area=6,407 sf 83.69% Impervious Runoff Depth>4.33"
Tc=6.0 min CN=92 Runoff=0.73 cfs 0.053 af

Subcatchment 8S: Catch 8S Runoff Area=1,257 sf 90.37% Impervious Runoff Depth>4.53"
Tc=6.0 min CN=94 Runoff=0.15 cfs 0.011 af

Subcatchment 9S: Catch 9S Runoff Area=70,326 sf 88.89% Impervious Runoff Depth>4.43"
Tc=6.0 min CN=93 Runoff=8.10 cfs 0.596 af

Pond 1P: Wetland Inflow=0.28 cfs 0.061 af
Primary=0.28 cfs 0.061 af

Pond 2P: ReTain-It 1 Peak Elev=130.40' Storage=0.545 af Inflow=16.90 cfs 1.274 af
Outflow=1.16 cfs 1.089 af

Pond 3P: Porous Asphalt Peak Elev=128.18' Storage=16,522 cf Inflow=8.10 cfs 0.596 af
Outflow=0.24 cfs 0.243 af

Pond 4P: RainGarden1 Peak Elev=132.45' Storage=877 cf Inflow=1.91 cfs 0.133 af
Discarded=0.01 cfs 0.007 af Primary=1.84 cfs 0.111 af Outflow=1.84 cfs 0.118 af

Pond 5P: RainGarden2 Peak Elev=131.98' Storage=728 cf Inflow=1.88 cfs 0.131 af
Discarded=0.01 cfs 0.006 af Primary=1.85 cfs 0.112 af Outflow=1.86 cfs 0.118 af

Pond 6P: RainGarden3 Peak Elev=131.44' Storage=360 cf Inflow=0.78 cfs 0.055 af
Discarded=0.00 cfs 0.004 af Primary=0.77 cfs 0.045 af Outflow=0.77 cfs 0.049 af

Pond 7P: RainGarden4 Peak Elev=131.44' Storage=427 cf Inflow=0.73 cfs 0.053 af
Discarded=0.00 cfs 0.004 af Primary=0.71 cfs 0.040 af Outflow=0.71 cfs 0.045 af

Pond 8P: ReTain-It 2 Peak Elev=130.20' Storage=0.158 af Inflow=5.16 cfs 0.308 af
Outflow=0.40 cfs 0.284 af

Pond 10P: ReTain-It (flood storage) Peak Elev=0.00' Storage=0.000 af
Discarded=0.00 cfs 0.000 af

Total Runoff Area = 9.037 ac Runoff Volume = 2.316 af Average Runoff Depth = 3.07"
38.44% Pervious = 3.474 ac 61.56% Impervious = 5.563 ac

Summary for Subcatchment 1S: Catch 1S

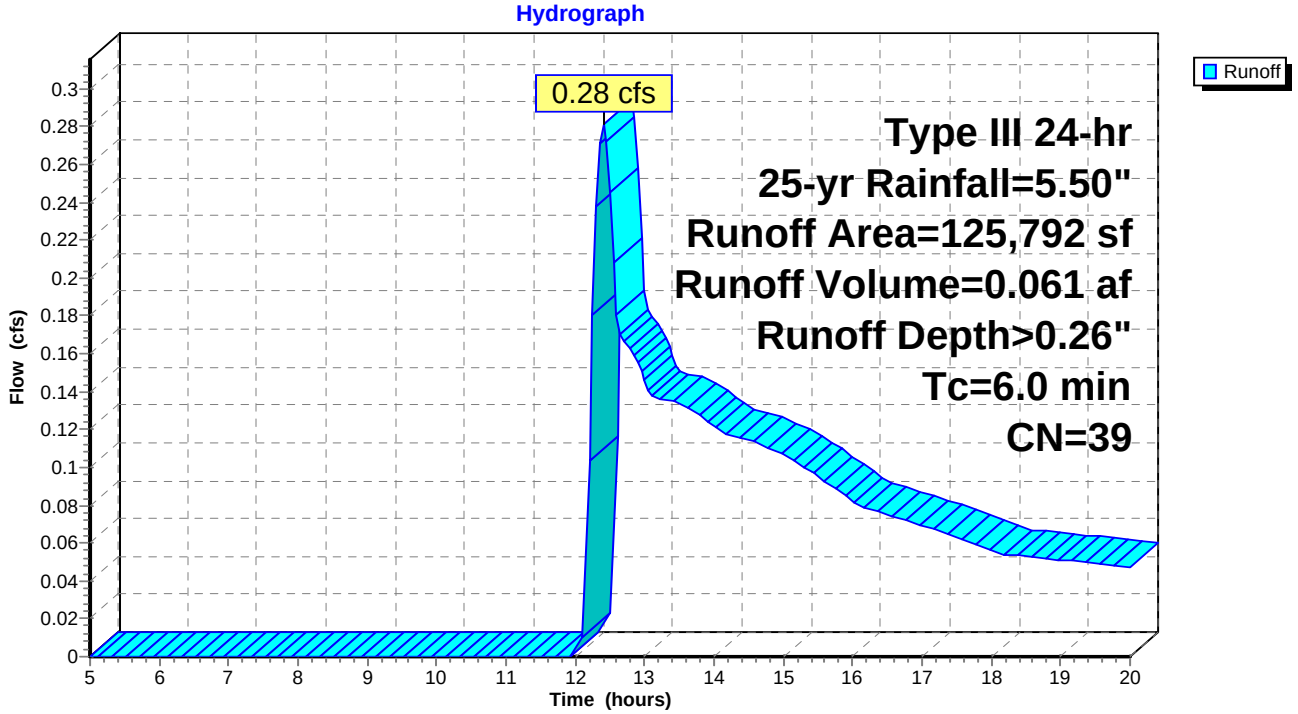
Runoff = 0.28 cfs @ 12.40 hrs, Volume= 0.061 af, Depth> 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

	Area (sf)	CN	Description
	89,852	30	Woods, Good, HSG A
	6,395	83	Woods, Poor, HSG D
	20,867	39	>75% Grass cover, Good, HSG A
	440	61	>75% Grass cover, Good, HSG B
*	3,073	98	Roofs (off-site), HSG A
	5,144	98	Paved parking, HSG A
	21	98	Paved parking, HSG B
	125,792	39	Weighted Average
	117,554		93.45% Pervious Area
	8,238		6.55% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

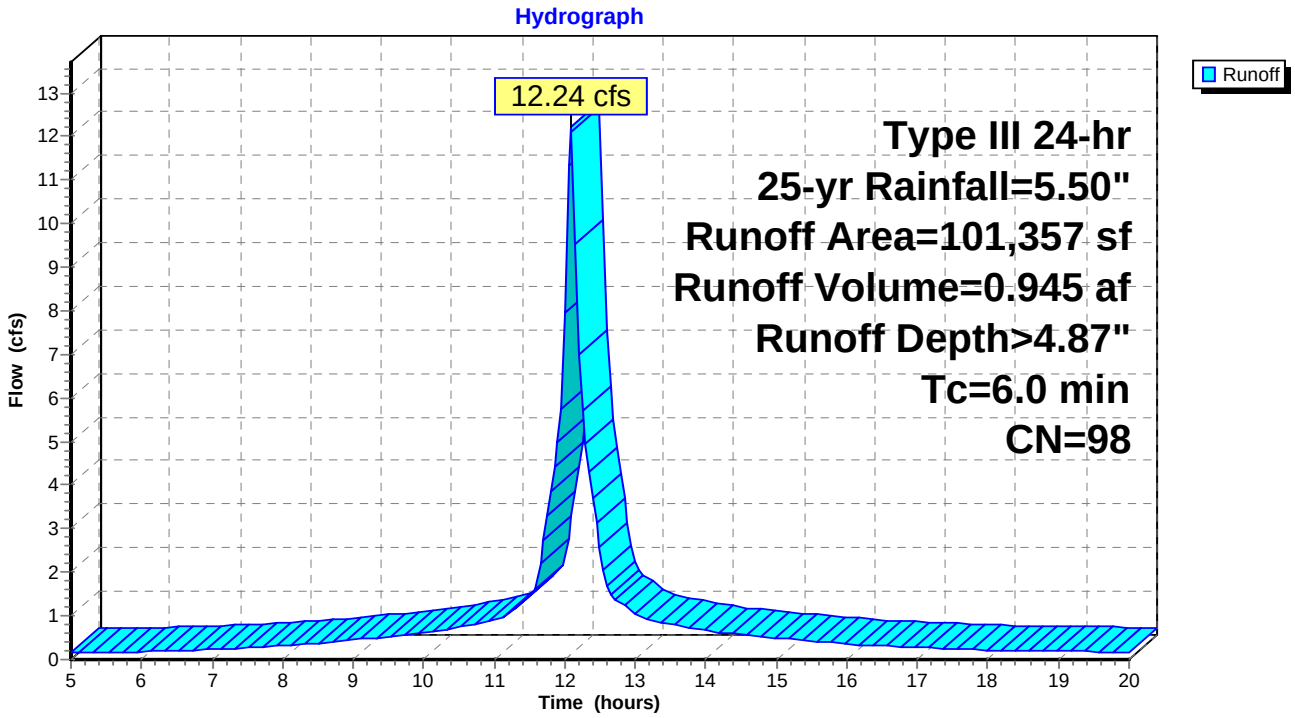
Runoff = 12.24 cfs @ 12.09 hrs, Volume= 0.945 af, Depth> 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
24,408	98	Roofs, HSG A
76,949	98	Roofs, HSG B
101,357	98	Weighted Average
101,357		100.00% Impervious Area

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

Subcatchment 2S: Catch 2S



Summary for Subcatchment 3S: Catch 3S

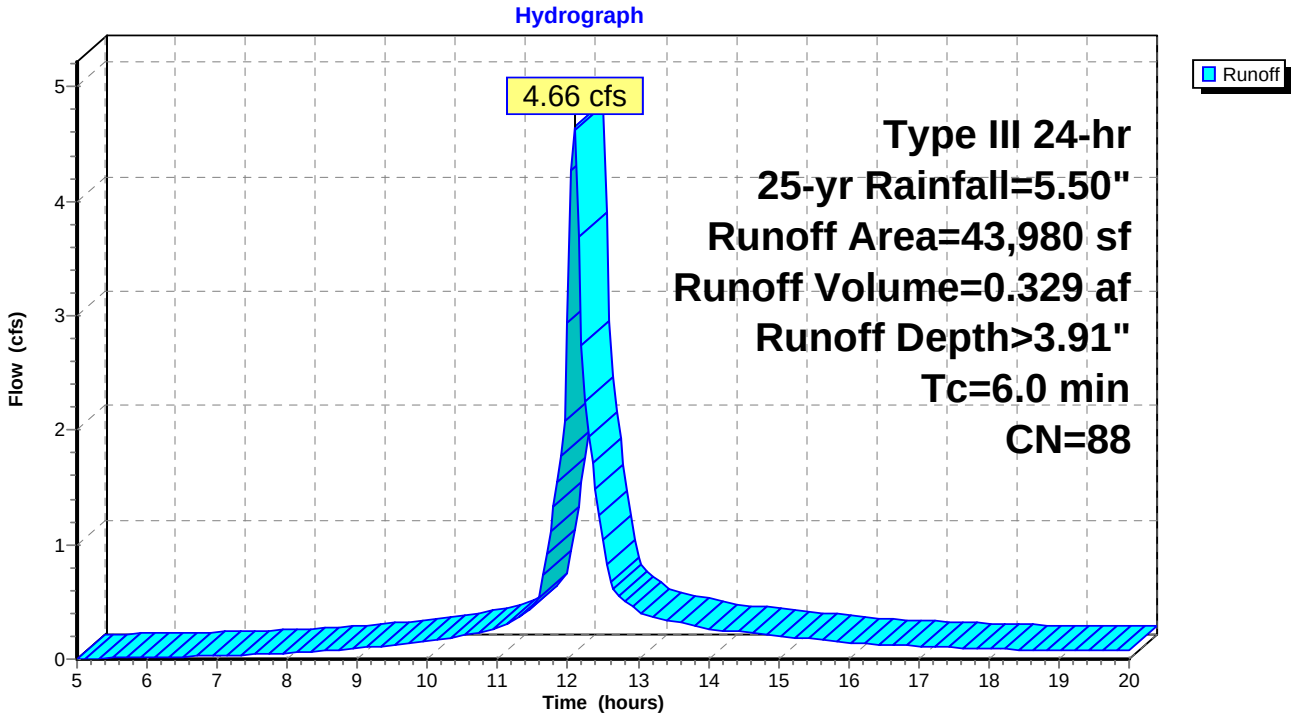
Runoff = 4.66 cfs @ 12.09 hrs, Volume= 0.329 af, Depth> 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
551	39	>75% Grass cover, Good, HSG A
10,497	61	>75% Grass cover, Good, HSG B
2,432	98	Paved parking, HSG A
30,500	98	Paved parking, HSG B
43,980	88	Weighted Average
11,048		25.12% Pervious Area
32,932		74.88% Impervious Area

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

Subcatchment 3S: Catch 3S



Summary for Subcatchment 4S: Catch 4S

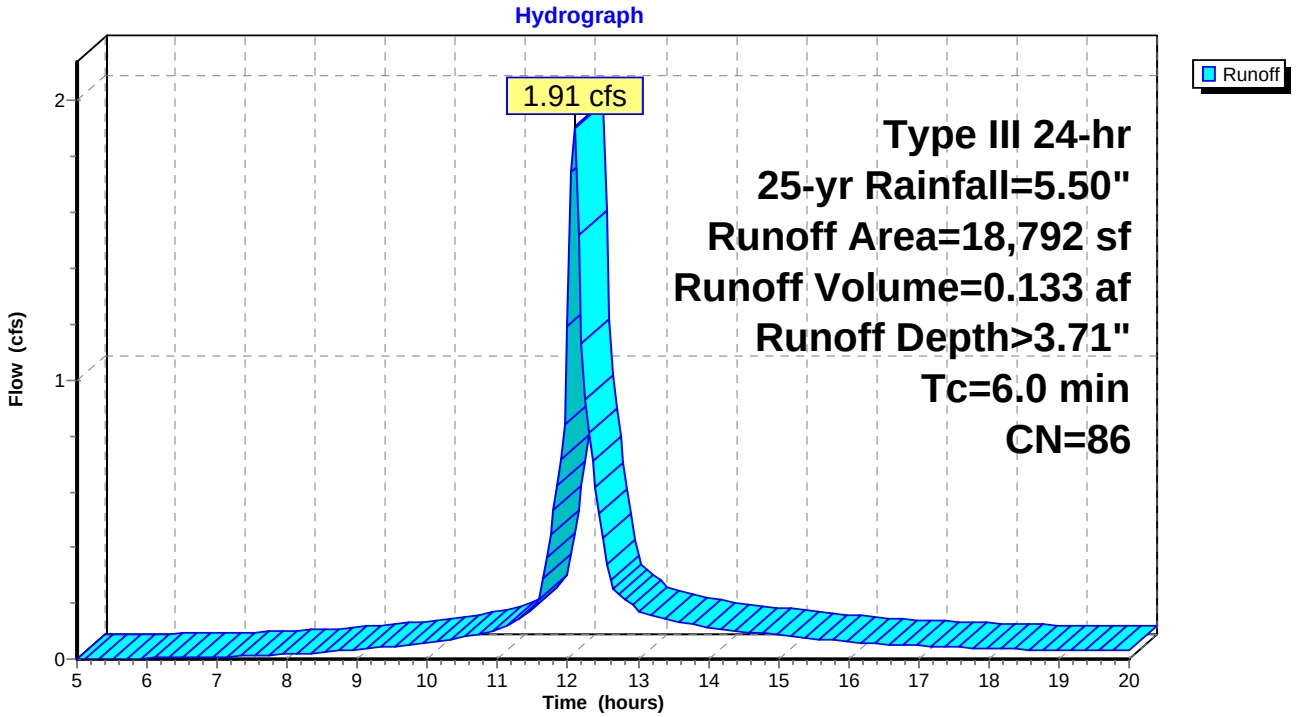
Runoff = 1.91 cfs @ 12.09 hrs, Volume= 0.133 af, Depth> 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
6,153	61	>75% Grass cover, Good, HSG B
12,639	98	Paved parking, HSG B
18,792	86	Weighted Average
6,153		32.74% Pervious Area
12,639		67.26% Impervious Area

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

Subcatchment 4S: Catch 4S



Summary for Subcatchment 5S: Catch 5S

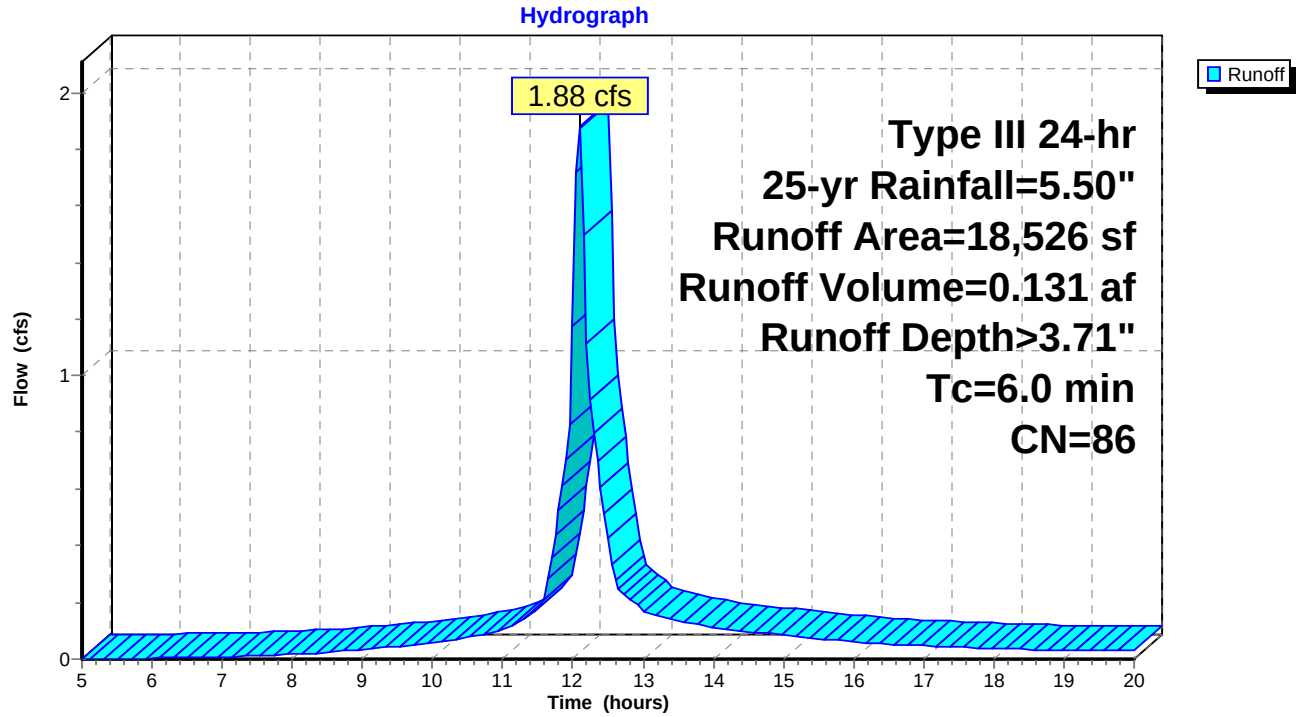
Runoff = 1.88 cfs @ 12.09 hrs, Volume= 0.131 af, Depth> 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
87	39	>75% Grass cover, Good, HSG A
5,825	61	>75% Grass cover, Good, HSG B
42	98	Paved parking, HSG A
12,572	98	Paved parking, HSG B
18,526	86	Weighted Average
5,912		31.91% Pervious Area
12,614		68.09% Impervious Area

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

Subcatchment 5S: Catch 5S



Summary for Subcatchment 6S: Catch 6S

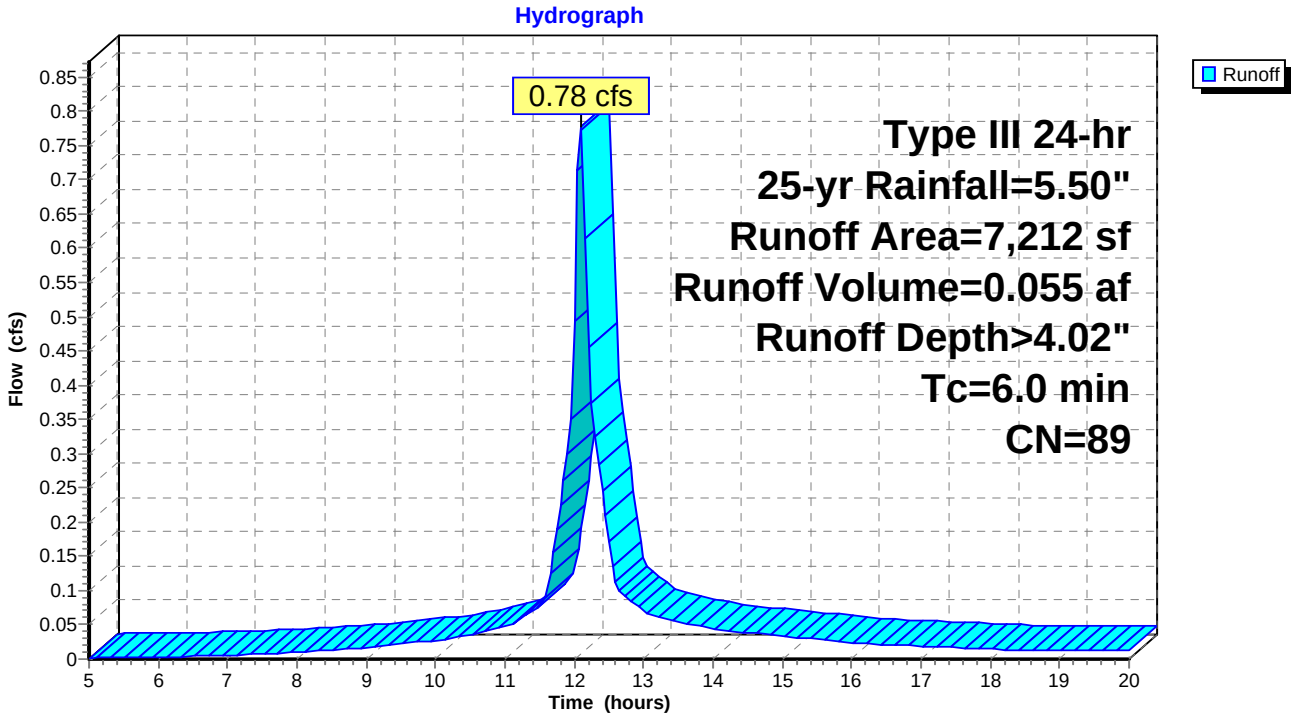
Runoff = 0.78 cfs @ 12.09 hrs, Volume= 0.055 af, Depth> 4.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
106	39	>75% Grass cover, Good, HSG A
1,574	61	>75% Grass cover, Good, HSG B
1,400	98	Paved parking, HSG A
4,132	98	Paved parking, HSG B
7,212	89	Weighted Average
1,680		23.29% Pervious Area
5,532		76.71% Impervious Area

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

Subcatchment 6S: Catch 6S



Summary for Subcatchment 7S: Catch 7S

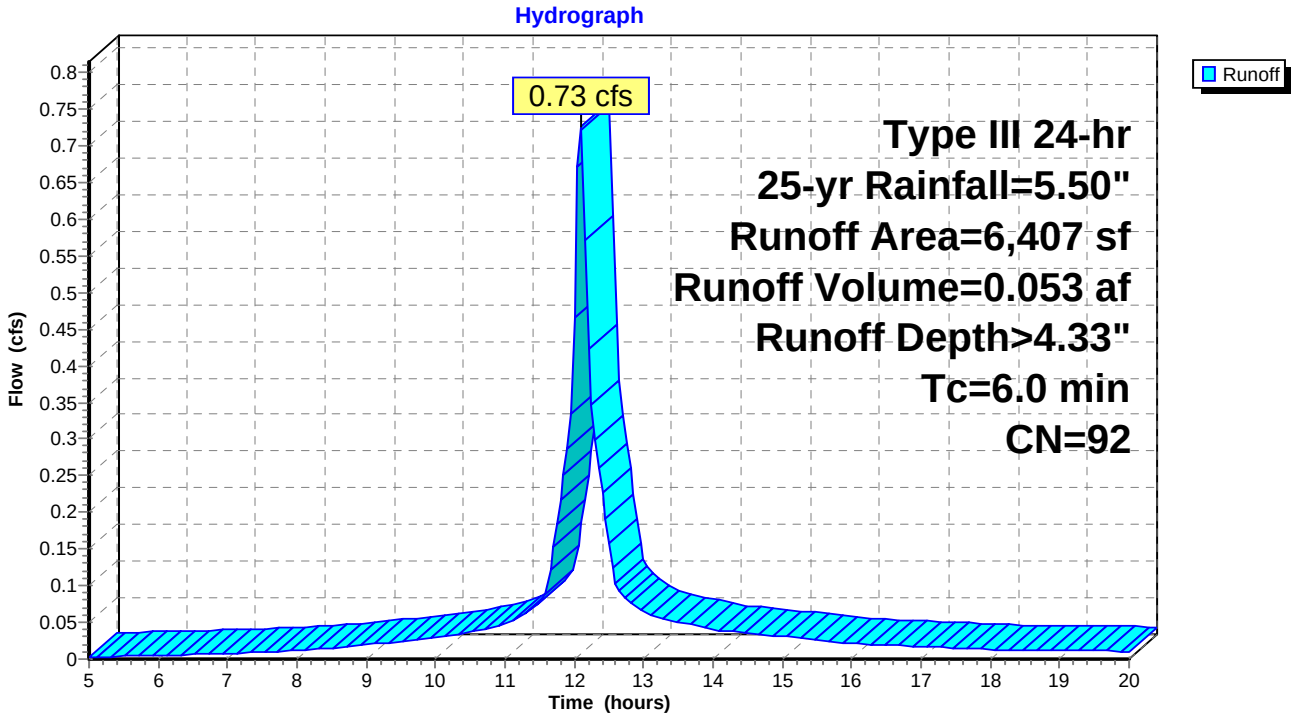
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.053 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
1,045	61	>75% Grass cover, Good, HSG B
5,362	98	Paved parking, HSG B
6,407	92	Weighted Average
1,045		16.31% Pervious Area
5,362		83.69% Impervious Area

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

Subcatchment 7S: Catch 7S



Summary for Subcatchment 8S: Catch 8S

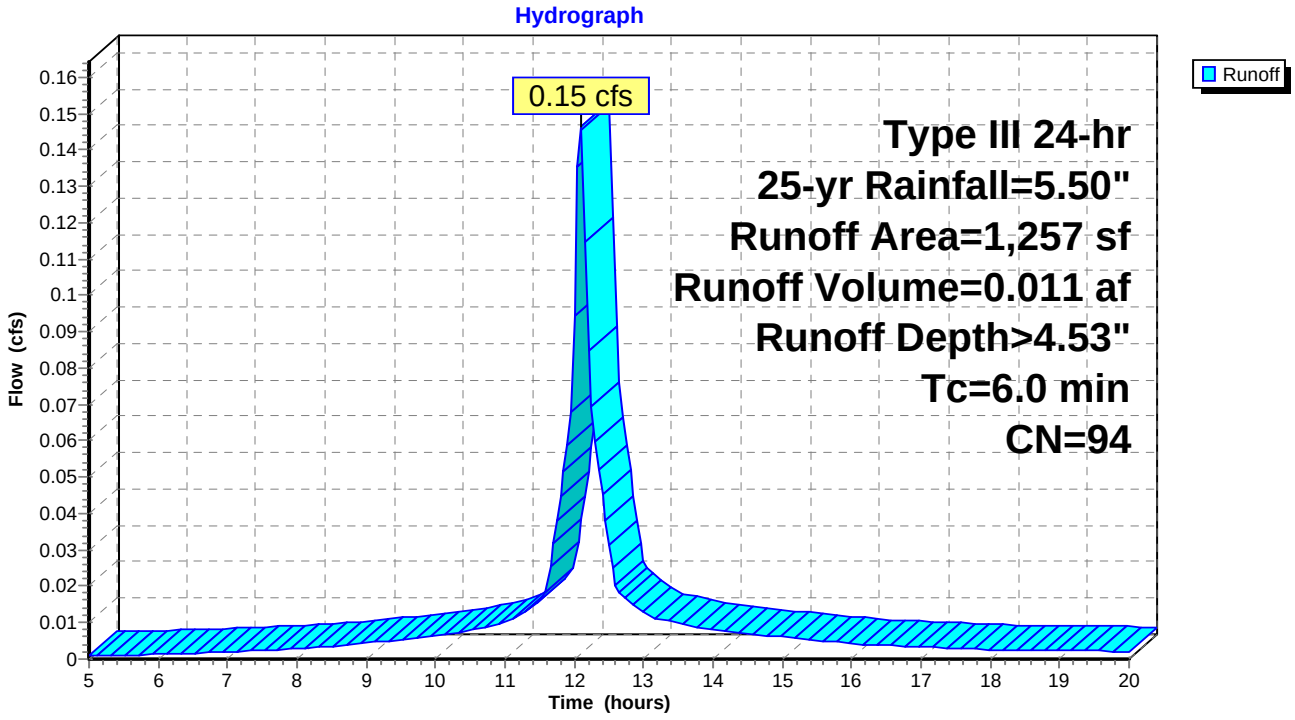
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
121	61	>75% Grass cover, Good, HSG B
1,136	98	Paved parking, HSG B
1,257	94	Weighted Average
121		9.63% Pervious Area
1,136		90.37% Impervious Area

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

Subcatchment 8S: Catch 8S



Summary for Subcatchment 9S: Catch 9S

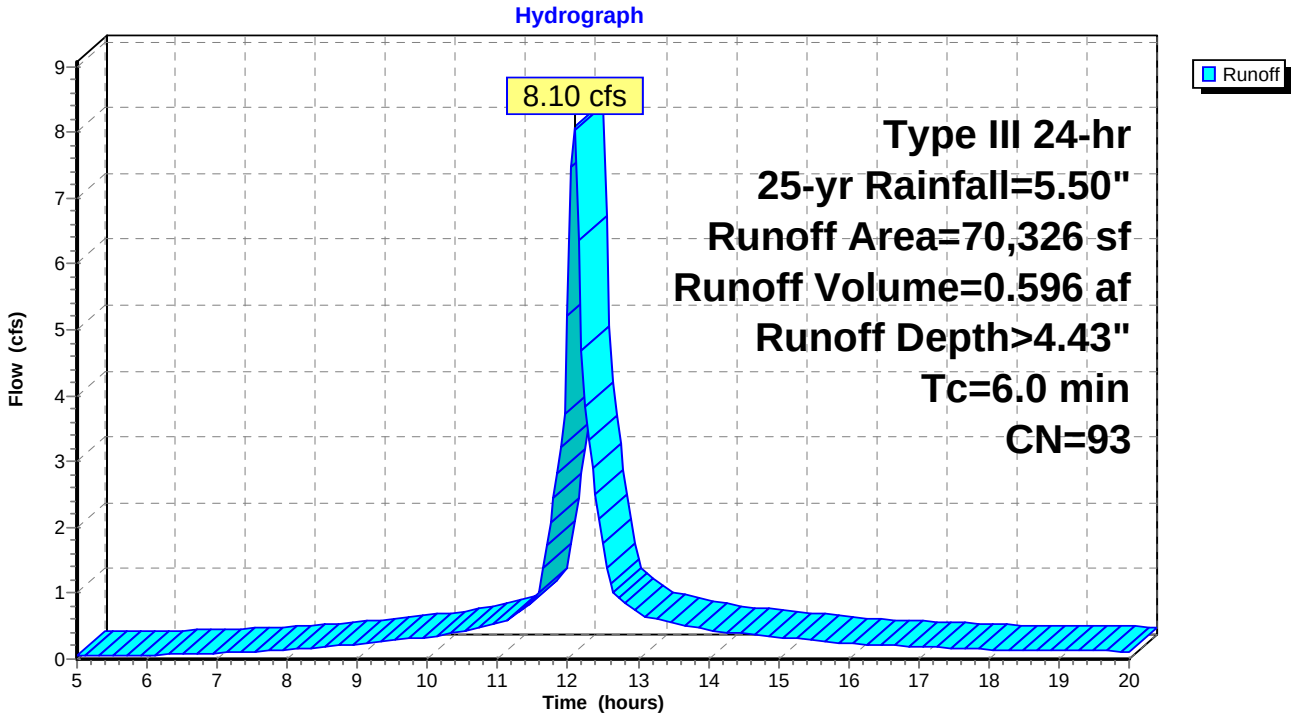
Runoff = 8.10 cfs @ 12.09 hrs, Volume= 0.596 af, Depth> 4.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.50"

Area (sf)	CN	Description
3,430	39	>75% Grass cover, Good, HSG A
4,383	61	>75% Grass cover, Good, HSG B
19,865	98	Paved parking, HSG A
42,648	98	Paved parking, HSG B
70,326	93	Weighted Average
7,813		11.11% Pervious Area
62,513		88.89% Impervious Area

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

Subcatchment 9S: Catch 9S



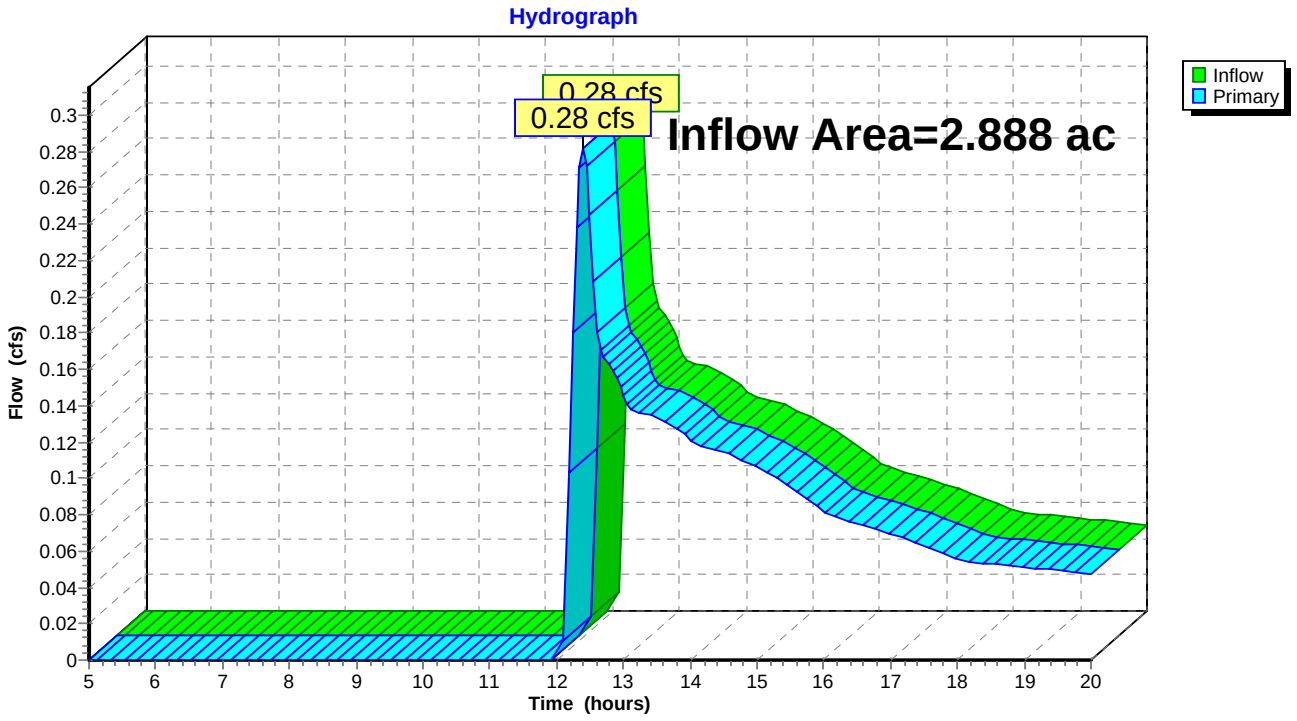
Summary for Pond 1P: Wetland

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

Inflow Area = 2.888 ac, 6.55% Impervious, Inflow Depth > 0.26" for 25-yr event
Inflow = 0.28 cfs @ 12.40 hrs, Volume= 0.061 af
Primary = 0.28 cfs @ 12.40 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Summary for Pond 2P: ReTain-It 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 3.336 ac, 92.40% Impervious, Inflow Depth > 4.58" for 25-yr event
Inflow = 16.90 cfs @ 12.09 hrs, Volume= 1.274 af
Outflow = 1.16 cfs @ 11.10 hrs, Volume= 1.089 af, Atten= 93%, Lag= 0.0 min
Discarded = 1.16 cfs @ 11.10 hrs, Volume= 1.089 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 130.40' @ 13.46 hrs Surf.Area= 0.479 ac Storage= 0.545 af

Plug-Flow detention time= 153.2 min calculated for 1.085 af (85% of inflow)
Center-of-Mass det. time= 109.1 min (851.3 - 742.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.232 af	**26.00'W x 802.00'L x 3.67'H Field A** 1.755 af Overall - 1.175 af Embedded = 0.580 af x 40.0% Voids
#2A	129.25'	0.751 af	**retain_it 2.0'** x 300 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 389.4 cf perimeter wall
		0.982 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=1.16 cfs @ 11.10 hrs HW=128.79' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.16 cfs)

Pond 2P: ReTain-It 1 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 389.4 cf perimeter wall

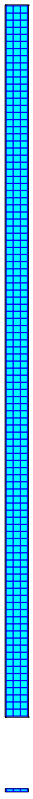
100 Chambers/Row x 8.00' Long = 800.00' Row Length +12.0" End Stone x 2 = 802.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 100 x 2 + 1.9 cf Endwall x 3 x 2 = 389.4 cf Perimeter Wall
300 Chambers x 110.3 cf - 389.4 cf Perimeter wall = 32,694.5 cf Chamber Storage
300 Chambers x 170.7 cf = 51,200.0 cf Displacement

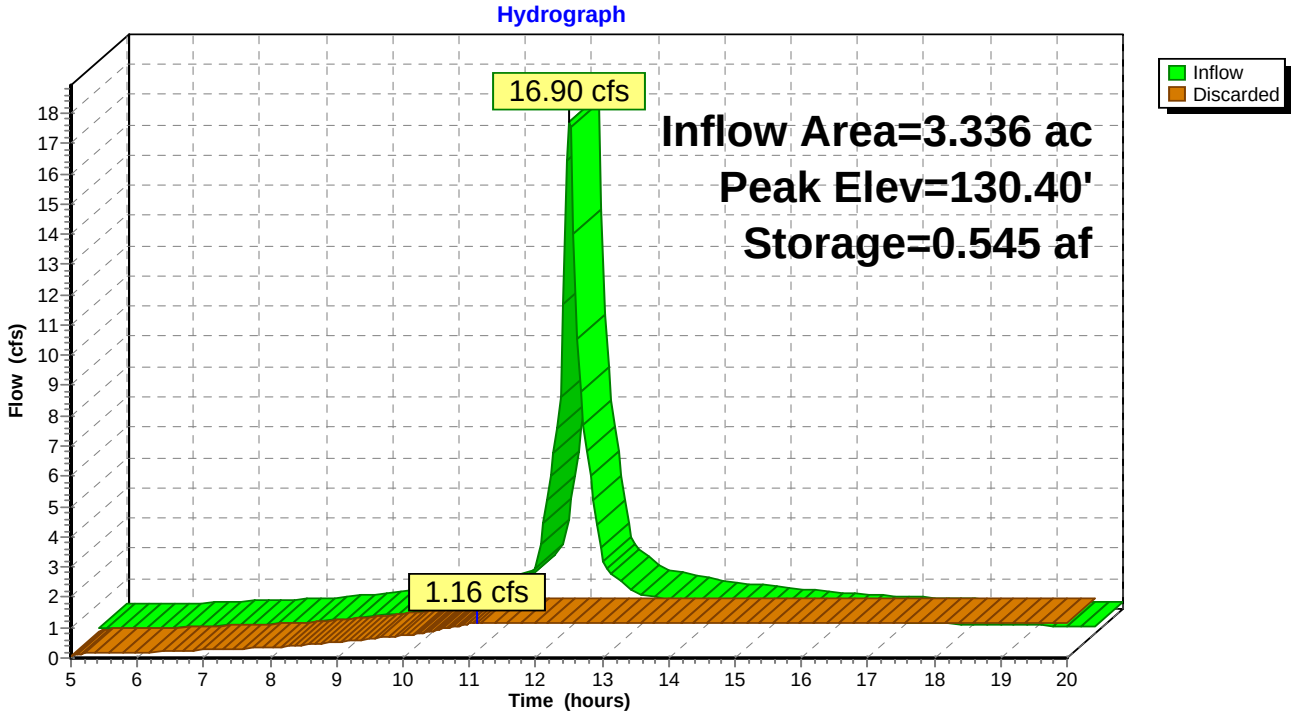
76,457.3 cf Field - 51,200.0 cf Chambers = 25,257.3 cf Stone x 40.0% Voids = 10,102.9 cf Stone Storage

Chamber Storage + Stone Storage = 42,797.5 cf = 0.982 af
Overall Storage Efficiency = 56.0%
Overall System Size = 802.00' x 26.00' x 3.67'

300 Chambers
2,831.8 cy Field
935.5 cy Stone



Pond 2P: ReTain-It 1



Summary for Pond 3P: Porous Asphalt

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.614 ac, 88.89% Impervious, Inflow Depth > 4.43" for 25-yr event
Inflow = 8.10 cfs @ 12.09 hrs, Volume= 0.596 af
Outflow = 0.24 cfs @ 9.65 hrs, Volume= 0.243 af, Atten= 97%, Lag= 0.0 min
Discarded = 0.24 cfs @ 9.65 hrs, Volume= 0.243 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 128.18' @ 15.99 hrs Surf.Area= 60,636 sf Storage= 16,522 cf

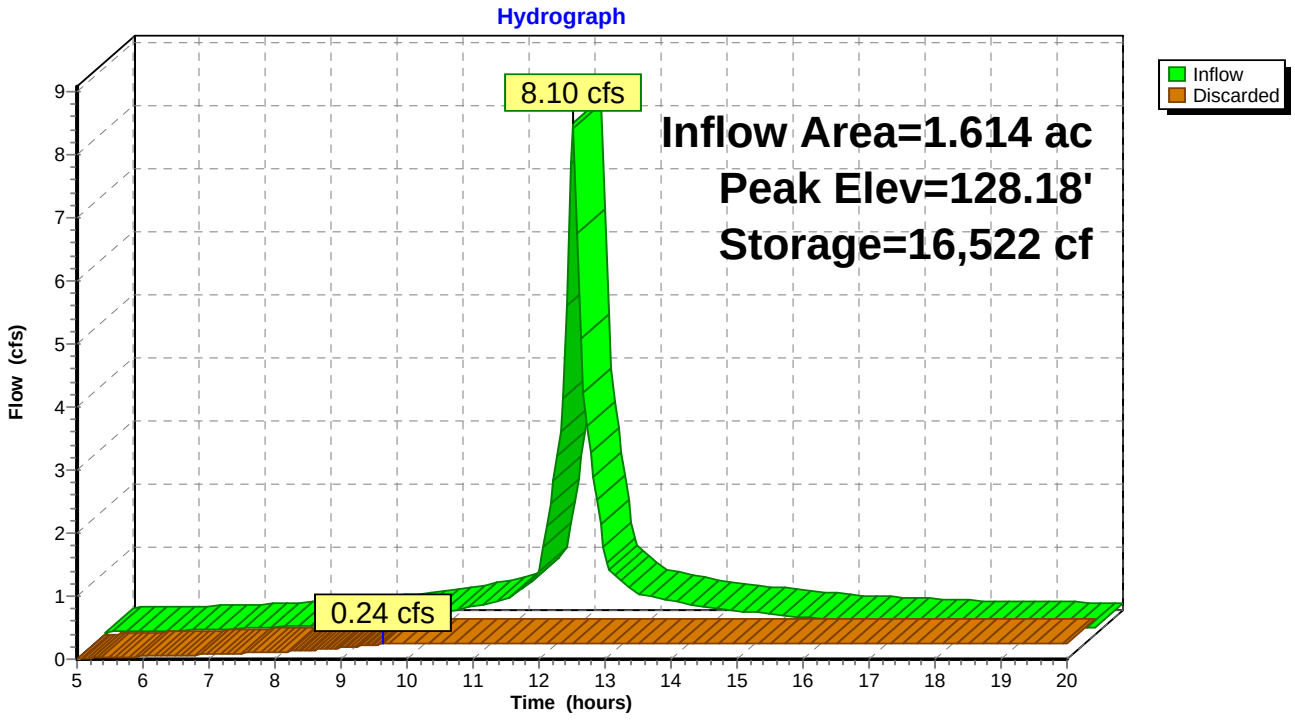
Plug-Flow detention time= 182.3 min calculated for 0.243 af (41% of inflow)
Center-of-Mass det. time= 77.5 min (827.1 - 749.5)

Volume	Invert	Avail.Storage	Storage Description
#1	127.50'	48,509 cf	**186.00'W x 326.00'L x 2.00'H Prismatoid** 121,272 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.50'	**0.170 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 9.65 hrs HW=127.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.24 cfs)

Pond 3P: Porous Asphalt



Summary for Pond 4P: RainGarden1

Inflow Area = 0.431 ac, 67.26% Impervious, Inflow Depth > 3.71" for 25-yr event
Inflow = 1.91 cfs @ 12.09 hrs, Volume= 0.133 af
Outflow = 1.84 cfs @ 12.11 hrs, Volume= 0.118 af, Atten= 3%, Lag= 1.4 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.007 af
Primary = 1.84 cfs @ 12.11 hrs, Volume= 0.111 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 132.45' @ 12.11 hrs Surf.Area= 1,151 sf Storage= 877 cf

Plug-Flow detention time= 60.1 min calculated for 0.118 af (88% of inflow)
Center-of-Mass det. time= 23.4 min (792.8 - 769.4)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,253 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

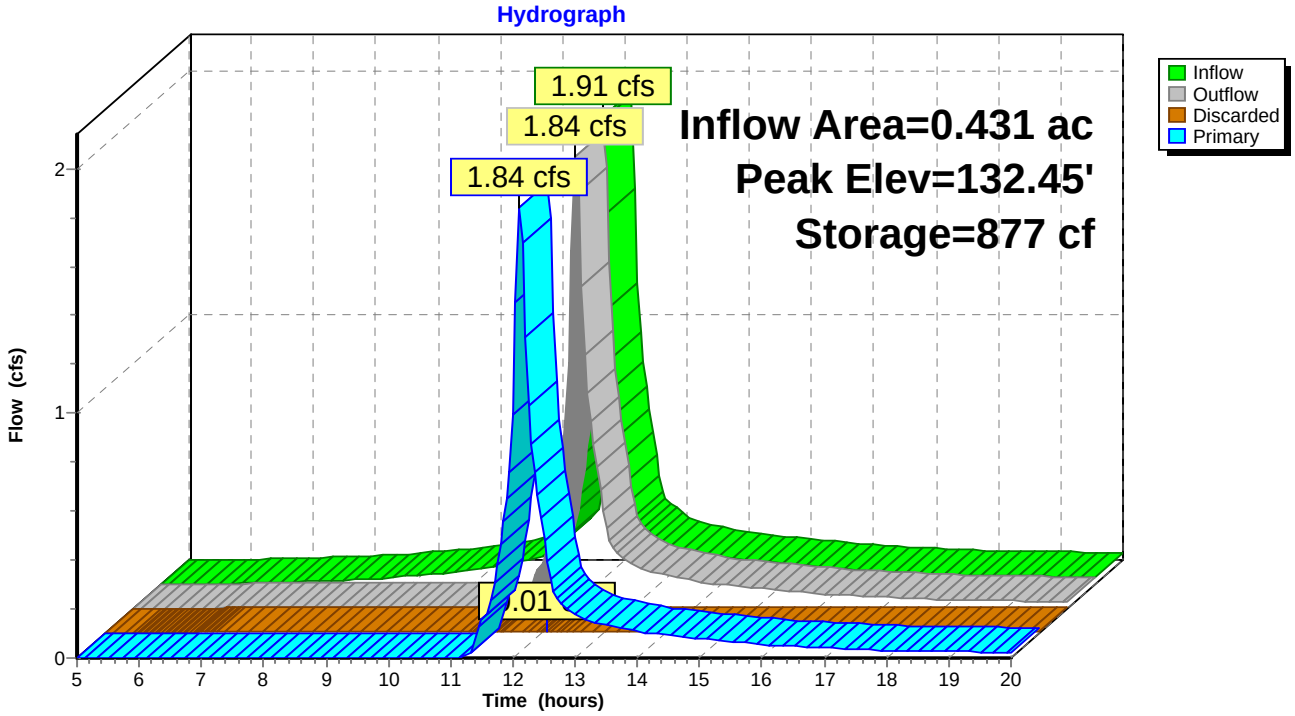
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	853	0.0	0	0
132.00	853	20.0	427	427
132.75	1,350	100.0	826	1,253

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	131.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 131.00' / 130.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	132.25'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=132.45' (Free Discharge)
↑**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=1.79 cfs @ 12.11 hrs HW=132.45' (Free Discharge)
↑**2=Culvert** (Passes 1.79 cfs of 6.49 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 1.79 cfs @ 1.45 fps)

Pond 4P: RainGarden1



Summary for Pond 5P: RainGarden2

Inflow Area = 0.425 ac, 68.09% Impervious, Inflow Depth > 3.71" for 25-yr event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 0.131 af
Outflow = 1.86 cfs @ 12.11 hrs, Volume= 0.118 af, Atten= 1%, Lag= 1.0 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.006 af
Primary = 1.85 cfs @ 12.11 hrs, Volume= 0.112 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.98' @ 12.11 hrs Surf.Area= 997 sf Storage= 728 cf

Plug-Flow detention time= 54.3 min calculated for 0.118 af (89% of inflow)
Center-of-Mass det. time= 21.3 min (790.7 - 769.4)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,309 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

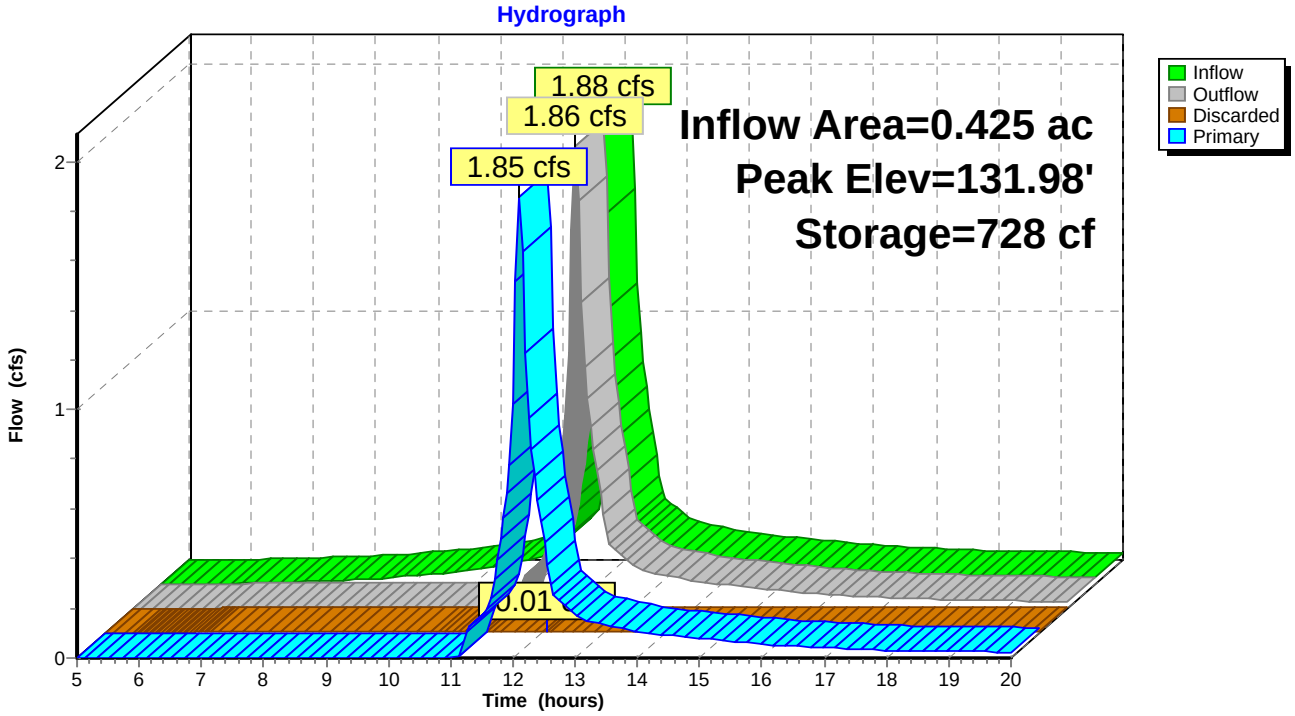
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	759	0.0	0	0
131.50	759	20.0	304	304
132.50	1,251	100.0	1,005	1,309

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.50'	**12.0" Round Culvert X 3.00** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.50' / 130.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.83'	**12.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=131.98' (Free Discharge)
↑**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=1.82 cfs @ 12.11 hrs HW=131.98' (Free Discharge)
↑**2=Culvert** (Passes 1.82 cfs of 9.92 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 1.82 cfs @ 1.27 fps)

Pond 5P: RainGarden2



Summary for Pond 6P: RainGarden3

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.166 ac, 76.71% Impervious, Inflow Depth > 4.02" for 25-yr event
Inflow = 0.78 cfs @ 12.09 hrs, Volume= 0.055 af
Outflow = 0.77 cfs @ 12.10 hrs, Volume= 0.049 af, Atten= 1%, Lag= 1.0 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 0.004 af
Primary = 0.77 cfs @ 12.10 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.44' @ 12.10 hrs Surf.Area= 571 sf Storage= 360 cf

Plug-Flow detention time= 64.3 min calculated for 0.048 af (87% of inflow)
Center-of-Mass det. time= 26.0 min (787.1 - 761.1)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	748 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

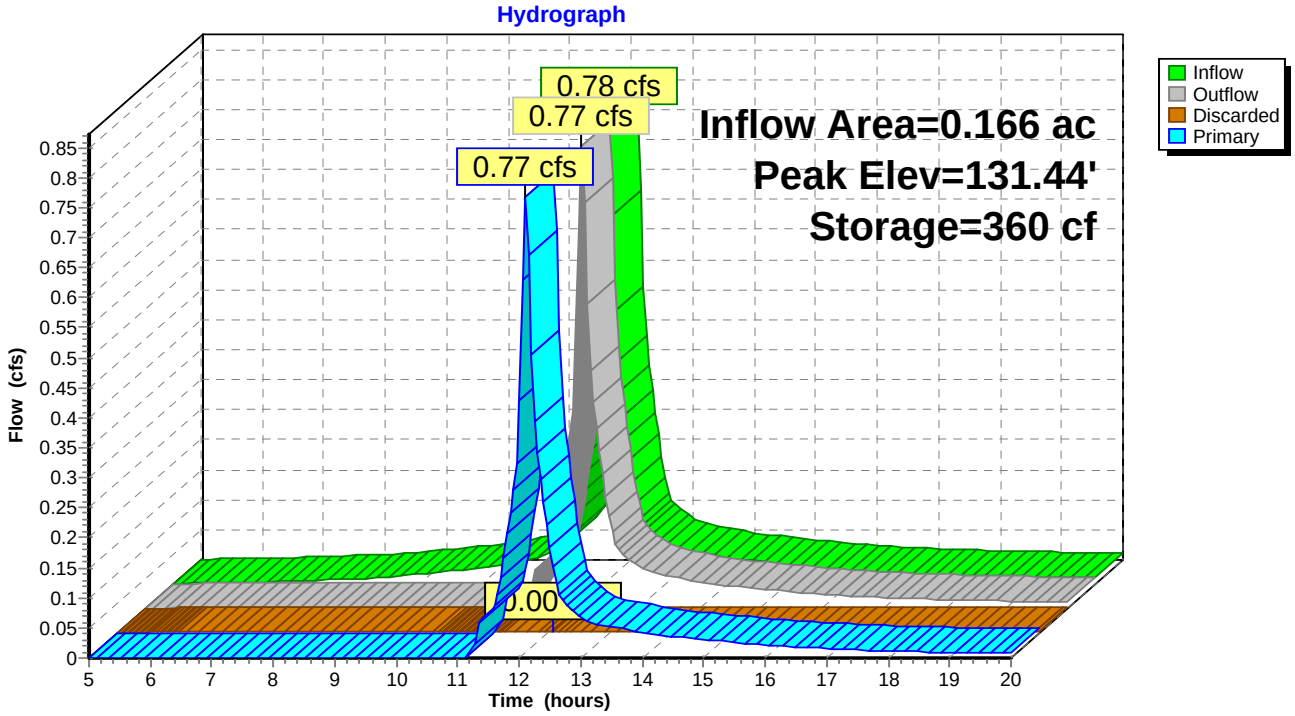
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	377	0.0	0	0
131.00	377	20.0	151	151
132.00	817	100.0	597	748

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=131.44' (Free Discharge)
1=Exfiltration (Controls 0.00 cfs)

Primary OutFlow Max=0.75 cfs @ 12.10 hrs HW=131.44' (Free Discharge)
2=Culvert (Passes 0.75 cfs of 6.47 cfs potential flow)
3=Orifice/Grate (Weir Controls 0.75 cfs @ 1.09 fps)

Pond 6P: RainGarden3



Summary for Pond 7P: RainGarden4

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.147 ac, 83.69% Impervious, Inflow Depth > 4.33" for 25-yr event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 0.053 af
Outflow = 0.71 cfs @ 12.11 hrs, Volume= 0.045 af, Atten= 2%, Lag= 1.1 min
Discarded = 0.00 cfs @ 12.11 hrs, Volume= 0.004 af
Primary = 0.71 cfs @ 12.11 hrs, Volume= 0.040 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.44' @ 12.11 hrs Surf.Area= 676 sf Storage= 427 cf

Plug-Flow detention time= 78.2 min calculated for 0.045 af (84% of inflow)
Center-of-Mass det. time= 32.2 min (784.7 - 752.5)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	890 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

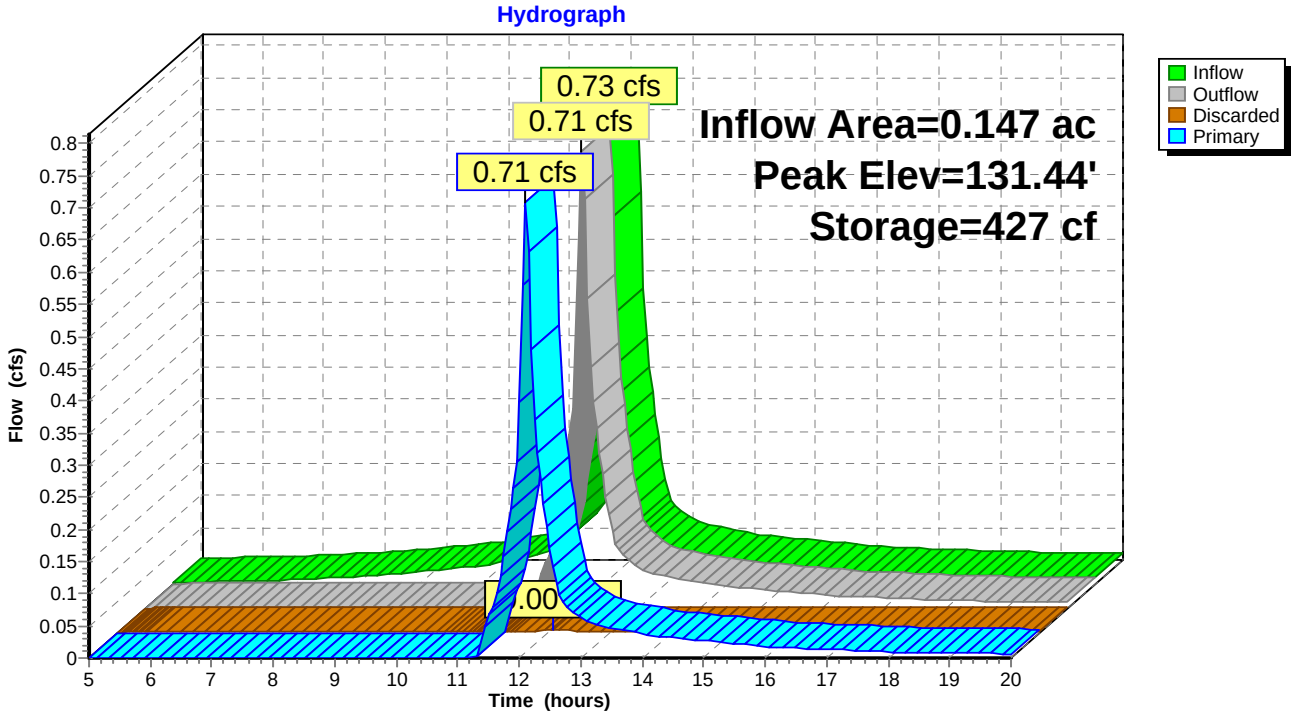
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	453	0.0	0	0
131.00	453	20.0	181	181
132.00	965	100.0	709	890

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=131.43' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.69 cfs @ 12.11 hrs HW=131.43' (Free Discharge)
↑—**2=Culvert** (Passes 0.69 cfs of 6.45 cfs potential flow)
↑—**3=Orifice/Grate** (Weir Controls 0.69 cfs @ 1.06 fps)

Pond 7P: RainGarden4



Summary for Pond 8P: ReTain-It 2

[79] Warning: Submerged Pond 6P Primary device # 2 INLET by 0.20'
[79] Warning: Submerged Pond 7P Primary device # 2 INLET by 0.20'

Inflow Area = 1.169 ac, 70.96% Impervious, Inflow Depth > 3.16" for 25-yr event
Inflow = 5.16 cfs @ 12.11 hrs, Volume= 0.308 af
Outflow = 0.40 cfs @ 11.55 hrs, Volume= 0.284 af, Atten= 92%, Lag= 0.0 min
Discarded = 0.40 cfs @ 11.55 hrs, Volume= 0.284 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 130.20' @ 13.28 hrs Surf.Area= 0.164 ac Storage= 0.158 af

Plug-Flow detention time= 177.8 min calculated for 0.283 af (92% of inflow)
Center-of-Mass det. time= 152.8 min (942.3 - 789.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.080 af	**26.00'W x 274.00'L x 3.67'H Field A** 0.600 af Overall - 0.400 af Embedded = 0.200 af x 40.0% Voids
#2A	129.25'	0.255 af	**retain_it 2.0'** x 102 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 139.9 cf perimeter wall
		0.335 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.40 cfs @ 11.55 hrs HW=128.79' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.40 cfs)

Pond 8P: ReTain-It 2 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 139.9 cf perimeter wall

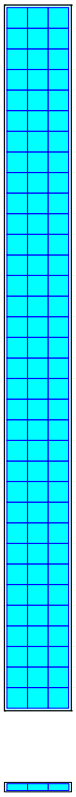
34 Chambers/Row x 8.00' Long = 272.00' Row Length +12.0" End Stone x 2 = 274.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 34 x 2 + 1.9 cf Endwall x 3 x 2 = 139.9 cf Perimeter Wall
102 Chambers x 110.3 cf - 139.9 cf Perimeter wall = 11,108.7 cf Chamber Storage
102 Chambers x 170.7 cf = 17,408.0 cf Displacement

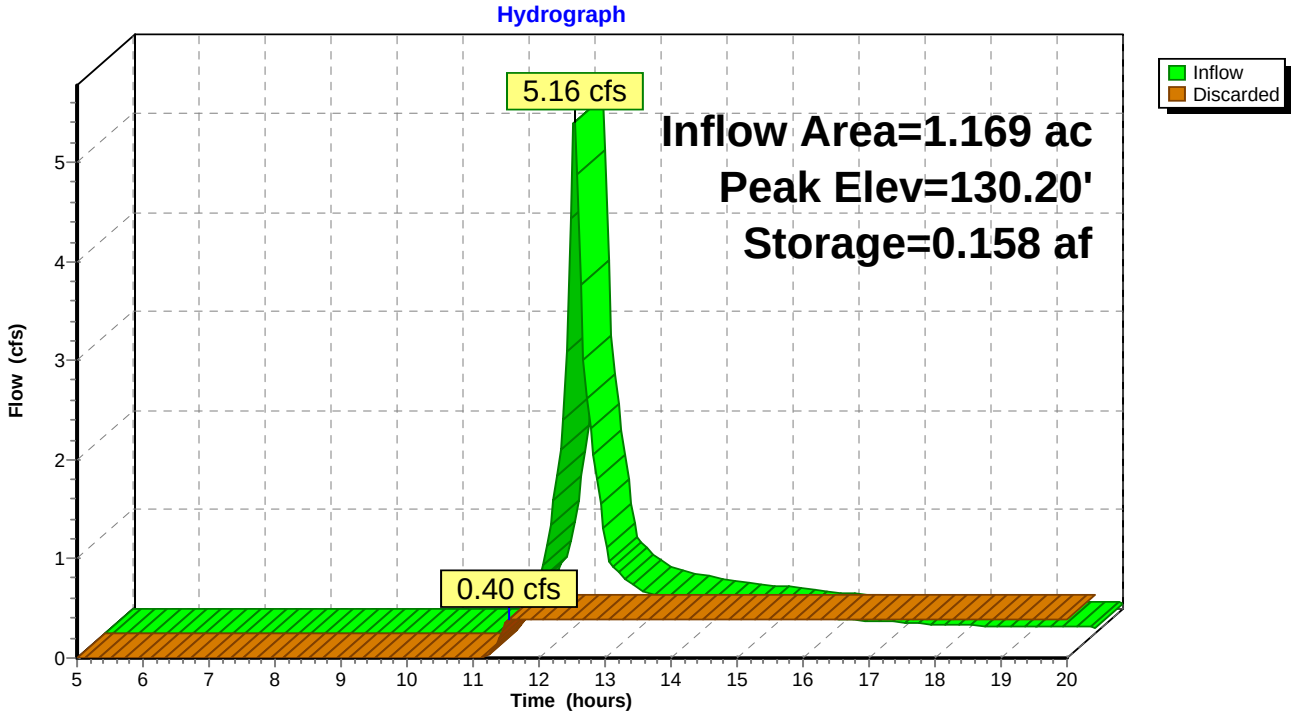
26,121.3 cf Field - 17,408.0 cf Chambers = 8,713.3 cf Stone x 40.0% Voids = 3,485.3 cf Stone Storage

Chamber Storage + Stone Storage = 14,594.0 cf = 0.335 af
Overall Storage Efficiency = 55.9%
Overall System Size = 274.00' x 26.00' x 3.67'

102 Chambers
967.5 cy Field
322.7 cy Stone



Pond 8P: ReTain-It 2



Summary for Pond 10P: ReTain-It (flood storage)

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

Volume	Invert	Avail.Storage	Storage Description
#1A	127.58'	0.057 af	**18.00'W x 250.00'L x 4.17'H Field A** 0.430 af Overall - 0.288 af Embedded = 0.142 af x 40.0% Voids
#2A	128.08'	0.195 af	**retain_it 2.5'** x 62 Inside #1 Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf 2 Rows adjusted for 217.8 cf perimeter wall
		0.252 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.58'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Pond 10P: ReTain-It (flood storage) - Chamber Wizard Field A

Chamber Model = retain_it 2.5' (retain-it® 2.5' tall)
Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf
Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf
2 Rows adjusted for 217.8 cf perimeter wall

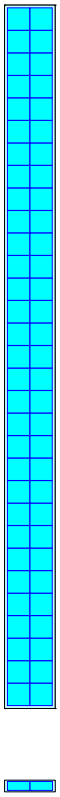
31 Chambers/Row x 8.00' Long = 248.00' Row Length +12.0" End Stone x 2 = 250.00' Base Length
2 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Base + 38.0" Chamber Height + 6.0" Cover = 4.17' Field Height

3.3 cf Sidewall x 31 x 2 + 3.3 cf Endwall x 2 x 2 = 217.8 cf Perimeter Wall
62 Chambers x 140.4 cf - 217.8 cf Perimeter wall = 8,489.5 cf Chamber Storage
62 Chambers x 202.7 cf = 12,565.3 cf Displacement

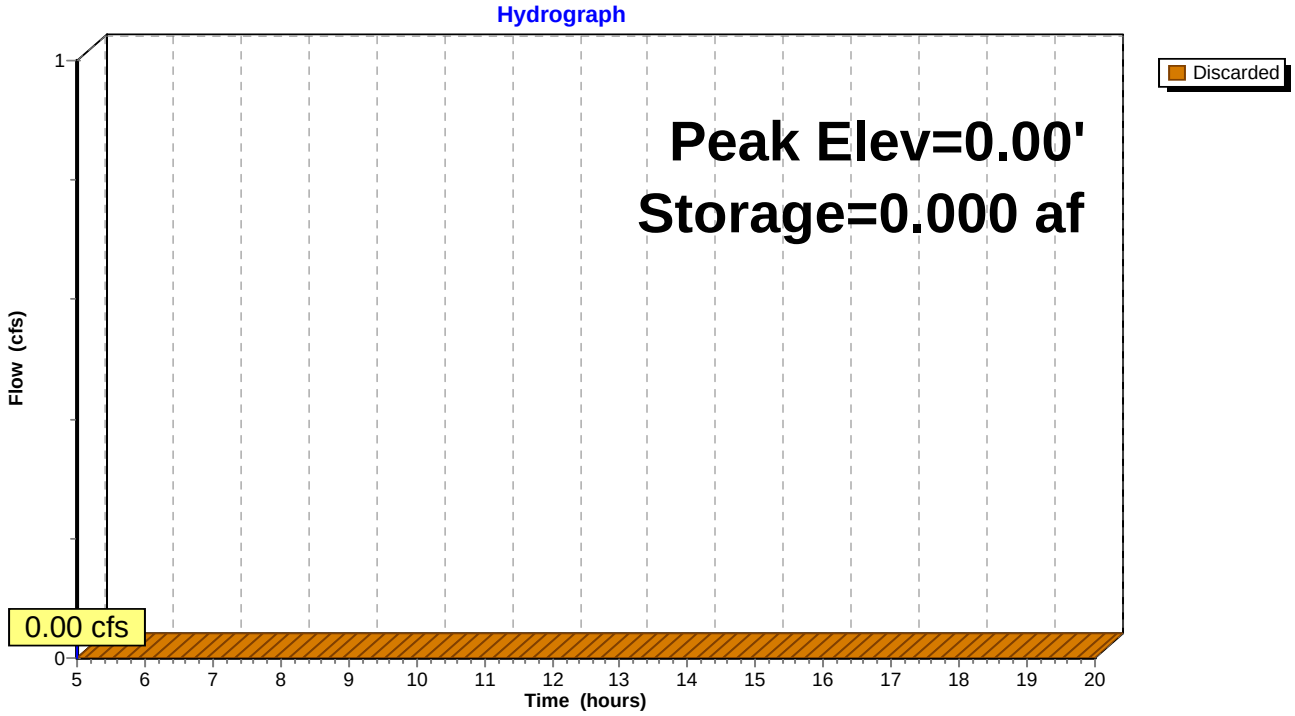
18,750.0 cf Field - 12,565.3 cf Chambers = 6,184.7 cf Stone x 40.0% Voids = 2,473.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,963.4 cf = 0.252 af
Overall Storage Efficiency = 58.5%
Overall System Size = 250.00' x 18.00' x 4.17'

62 Chambers
694.4 cy Field
229.1 cy Stone



Pond 10P: ReTain-It (flood storage)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=125,792 sf 6.55% Impervious Runoff Depth>0.40"
Tc=6.0 min CN=39 Runoff=0.56 cfs 0.096 af

Subcatchment 2S: Catch 2S Runoff Area=101,357 sf 100.00% Impervious Runoff Depth>5.42"
Tc=6.0 min CN=98 Runoff=13.58 cfs 1.051 af

Subcatchment 3S: Catch 3S Runoff Area=43,980 sf 74.88% Impervious Runoff Depth>4.46"
Tc=6.0 min CN=88 Runoff=5.27 cfs 0.375 af

Subcatchment 4S: Catch 4S Runoff Area=18,792 sf 67.26% Impervious Runoff Depth>4.25"
Tc=6.0 min CN=86 Runoff=2.17 cfs 0.153 af

Subcatchment 5S: Catch 5S Runoff Area=18,526 sf 68.09% Impervious Runoff Depth>4.25"
Tc=6.0 min CN=86 Runoff=2.14 cfs 0.151 af

Subcatchment 6S: Catch 6S Runoff Area=7,212 sf 76.71% Impervious Runoff Depth>4.57"
Tc=6.0 min CN=89 Runoff=0.88 cfs 0.063 af

Subcatchment 7S: Catch 7S Runoff Area=6,407 sf 83.69% Impervious Runoff Depth>4.88"
Tc=6.0 min CN=92 Runoff=0.82 cfs 0.060 af

Subcatchment 8S: Catch 8S Runoff Area=1,257 sf 90.37% Impervious Runoff Depth>5.08"
Tc=6.0 min CN=94 Runoff=0.16 cfs 0.012 af

Subcatchment 9S: Catch 9S Runoff Area=70,326 sf 88.89% Impervious Runoff Depth>4.98"
Tc=6.0 min CN=93 Runoff=9.06 cfs 0.670 af

Pond 1P: Wetland Inflow=0.56 cfs 0.096 af
Primary=0.56 cfs 0.096 af

Pond 2P: ReTain-It 1 Peak Elev=130.64' Storage=0.639 af Inflow=18.86 cfs 1.426 af
Outflow=1.16 cfs 1.118 af

Pond 3P: Porous Asphalt Peak Elev=128.29' Storage=19,241 cf Inflow=9.06 cfs 0.670 af
Outflow=0.24 cfs 0.249 af

Pond 4P: RainGarden1 Peak Elev=132.47' Storage=898 cf Inflow=2.17 cfs 0.153 af
Discarded=0.01 cfs 0.007 af Primary=2.10 cfs 0.130 af Outflow=2.10 cfs 0.137 af

Pond 5P: RainGarden2 Peak Elev=132.00' Storage=742 cf Inflow=2.14 cfs 0.151 af
Discarded=0.01 cfs 0.007 af Primary=2.11 cfs 0.131 af Outflow=2.12 cfs 0.137 af

Pond 6P: RainGarden3 Peak Elev=131.45' Storage=365 cf Inflow=0.88 cfs 0.063 af
Discarded=0.00 cfs 0.004 af Primary=0.87 cfs 0.052 af Outflow=0.87 cfs 0.056 af

Pond 7P: RainGarden4 Peak Elev=131.44' Storage=433 cf Inflow=0.82 cfs 0.060 af
Discarded=0.00 cfs 0.004 af Primary=0.80 cfs 0.047 af Outflow=0.80 cfs 0.052 af

Pond 8P: ReTain-It 2 Peak Elev=130.43' Storage=0.190 af Inflow=5.87 cfs 0.360 af
Outflow=0.40 cfs 0.293 af

Pond 10P: ReTain-It (flood storage) Peak Elev=0.00' Storage=0.000 af
Discarded=0.00 cfs 0.000 af

Total Runoff Area = 9.037 ac Runoff Volume = 2.631 af Average Runoff Depth = 3.49"
38.44% Pervious = 3.474 ac 61.56% Impervious = 5.563 ac

Summary for Subcatchment 1S: Catch 1S

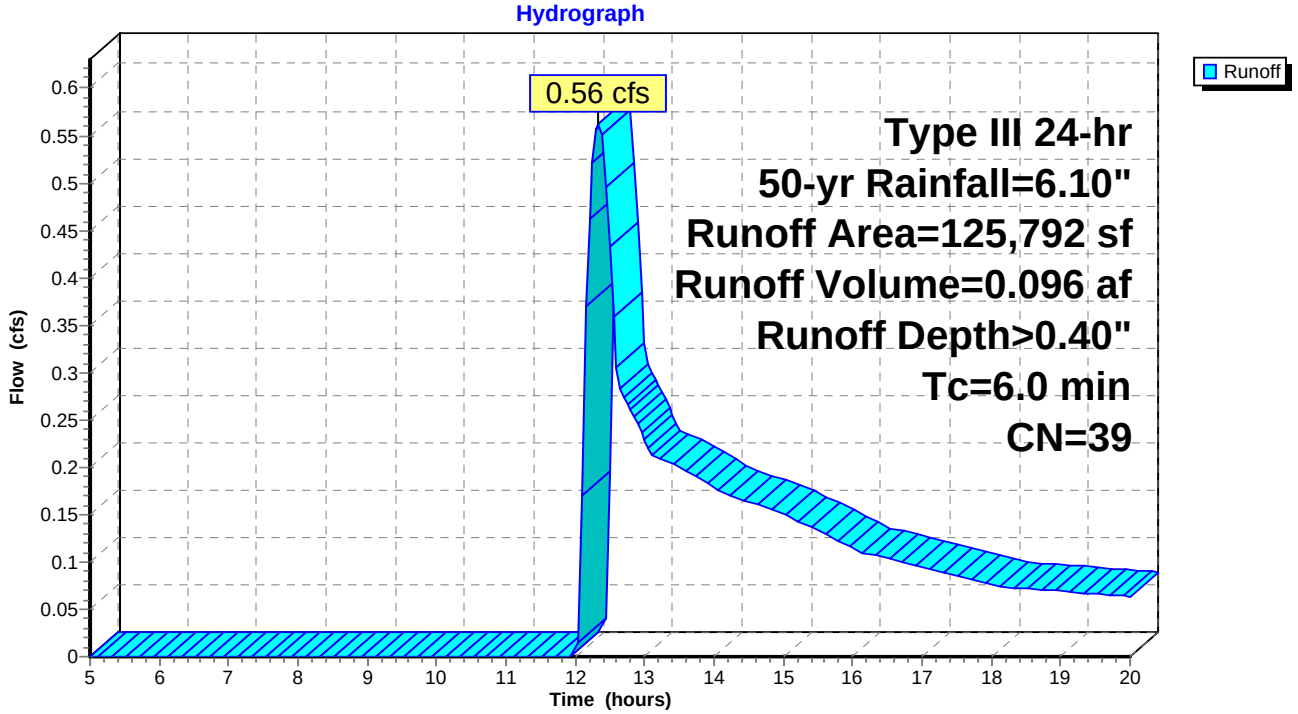
Runoff = 0.56 cfs @ 12.33 hrs, Volume= 0.096 af, Depth> 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

	Area (sf)	CN	Description
	89,852	30	Woods, Good, HSG A
	6,395	83	Woods, Poor, HSG D
	20,867	39	>75% Grass cover, Good, HSG A
	440	61	>75% Grass cover, Good, HSG B
*	3,073	98	Roofs (off-site), HSG A
	5,144	98	Paved parking, HSG A
	21	98	Paved parking, HSG B
	125,792	39	Weighted Average
	117,554		93.45% Pervious Area
	8,238		6.55% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

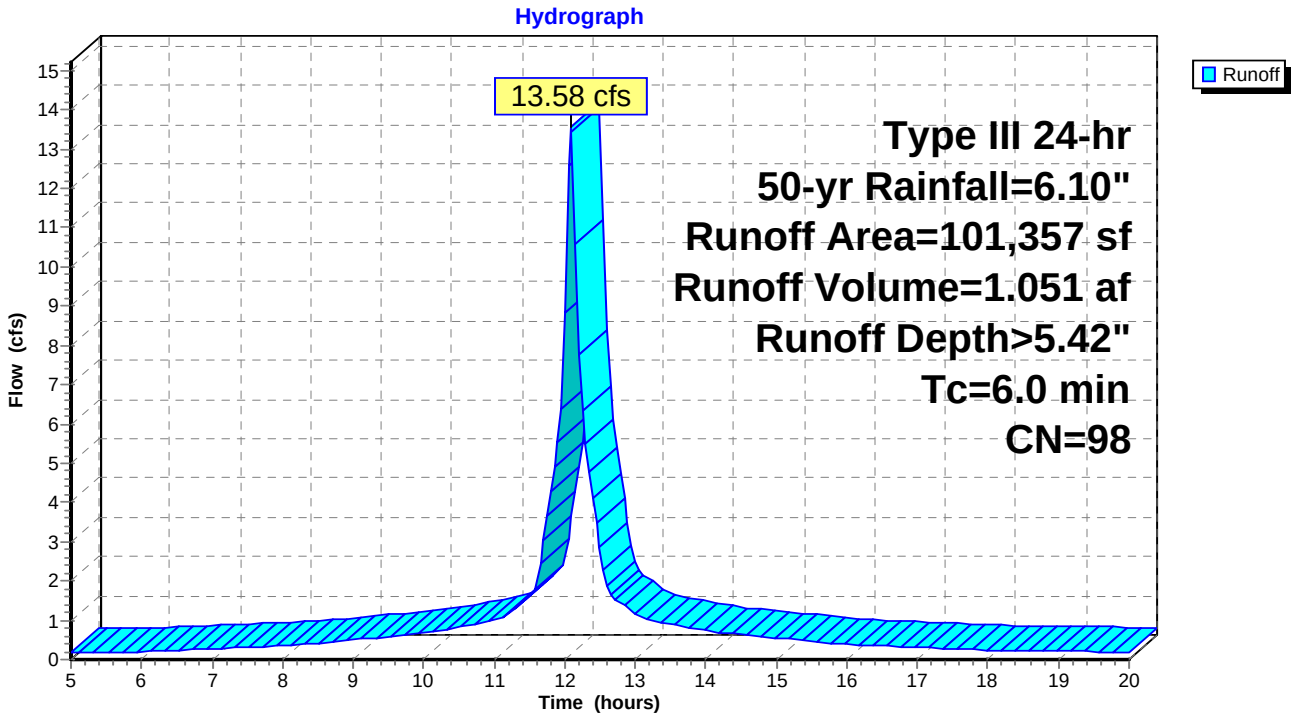
Runoff = 13.58 cfs @ 12.09 hrs, Volume= 1.051 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

Area (sf)	CN	Description
24,408	98	Roofs, HSG A
76,949	98	Roofs, HSG B
101,357	98	Weighted Average
101,357		100.00% Impervious Area

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

Subcatchment 2S: Catch 2S



Summary for Subcatchment 3S: Catch 3S

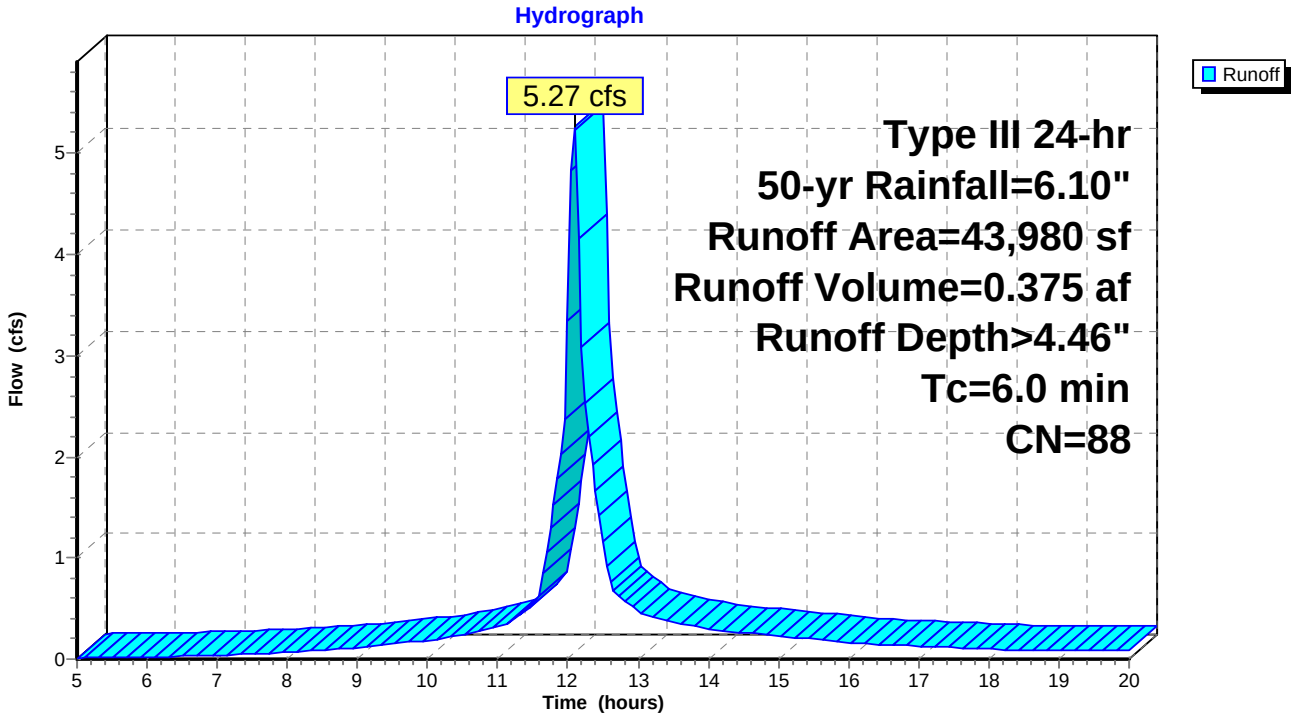
Runoff = 5.27 cfs @ 12.09 hrs, Volume= 0.375 af, Depth> 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

Area (sf)	CN	Description
551	39	>75% Grass cover, Good, HSG A
10,497	61	>75% Grass cover, Good, HSG B
2,432	98	Paved parking, HSG A
30,500	98	Paved parking, HSG B
43,980	88	Weighted Average
11,048		25.12% Pervious Area
32,932		74.88% Impervious Area

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

Subcatchment 3S: Catch 3S



Summary for Subcatchment 4S: Catch 4S

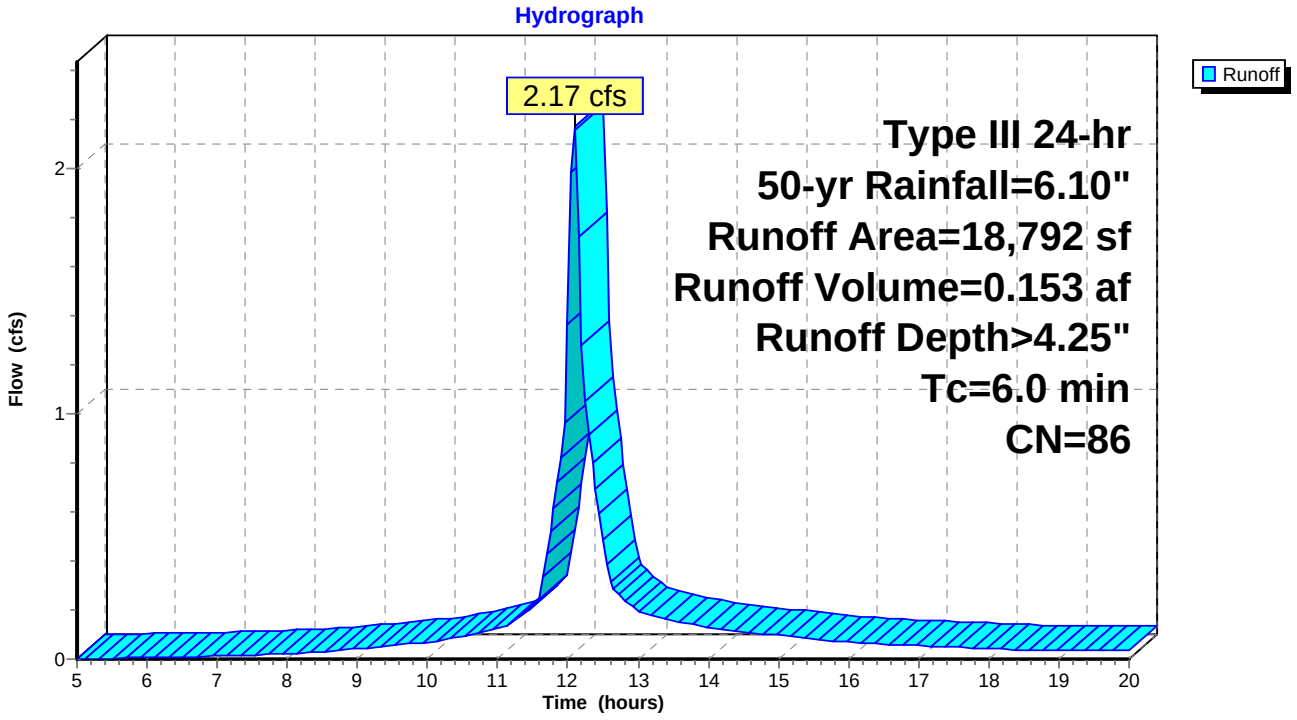
Runoff = 2.17 cfs @ 12.09 hrs, Volume= 0.153 af, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

Area (sf)	CN	Description
6,153	61	>75% Grass cover, Good, HSG B
12,639	98	Paved parking, HSG B
18,792	86	Weighted Average
6,153		32.74% Pervious Area
12,639		67.26% Impervious Area

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

Subcatchment 4S: Catch 4S



Summary for Subcatchment 5S: Catch 5S

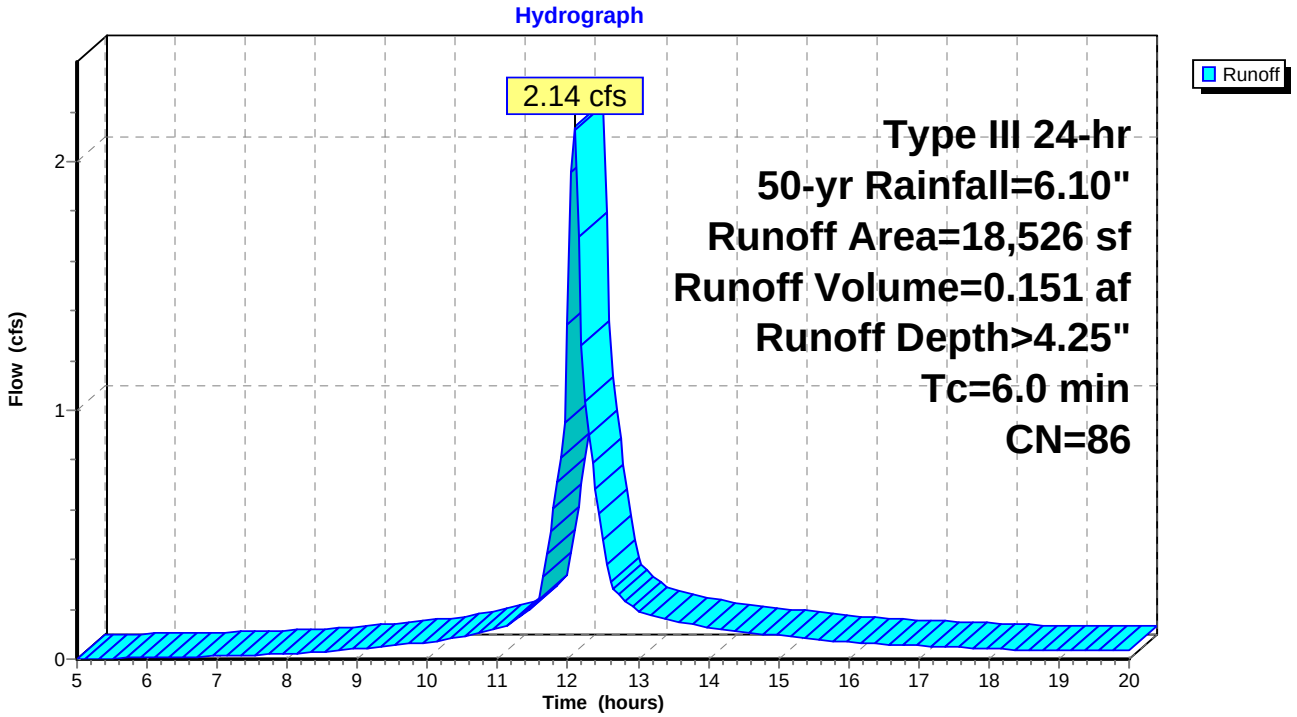
Runoff = 2.14 cfs @ 12.09 hrs, Volume= 0.151 af, Depth> 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

Area (sf)	CN	Description
87	39	>75% Grass cover, Good, HSG A
5,825	61	>75% Grass cover, Good, HSG B
42	98	Paved parking, HSG A
12,572	98	Paved parking, HSG B
18,526	86	Weighted Average
5,912		31.91% Pervious Area
12,614		68.09% Impervious Area

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

Subcatchment 5S: Catch 5S



Summary for Subcatchment 6S: Catch 6S

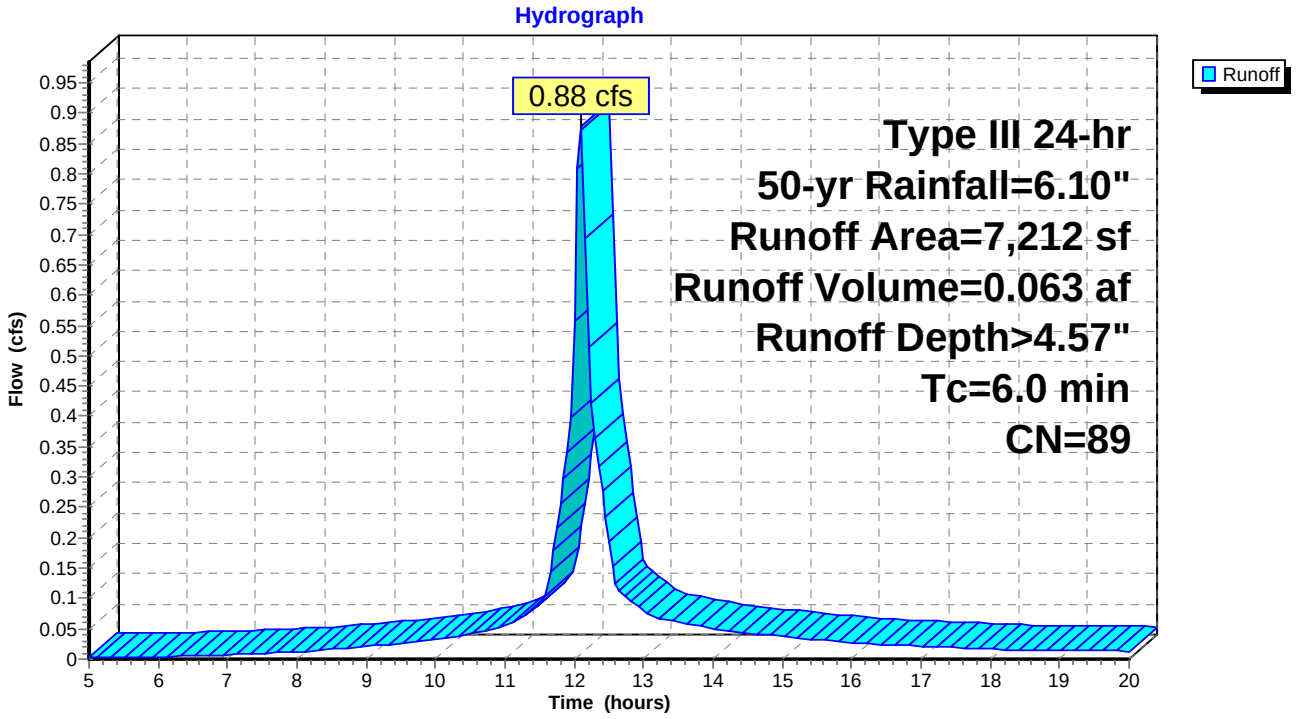
Runoff = 0.88 cfs @ 12.09 hrs, Volume= 0.063 af, Depth> 4.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

Area (sf)	CN	Description
106	39	>75% Grass cover, Good, HSG A
1,574	61	>75% Grass cover, Good, HSG B
1,400	98	Paved parking, HSG A
4,132	98	Paved parking, HSG B
7,212	89	Weighted Average
1,680		23.29% Pervious Area
5,532		76.71% Impervious Area

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

Subcatchment 6S: Catch 6S



Summary for Subcatchment 7S: Catch 7S

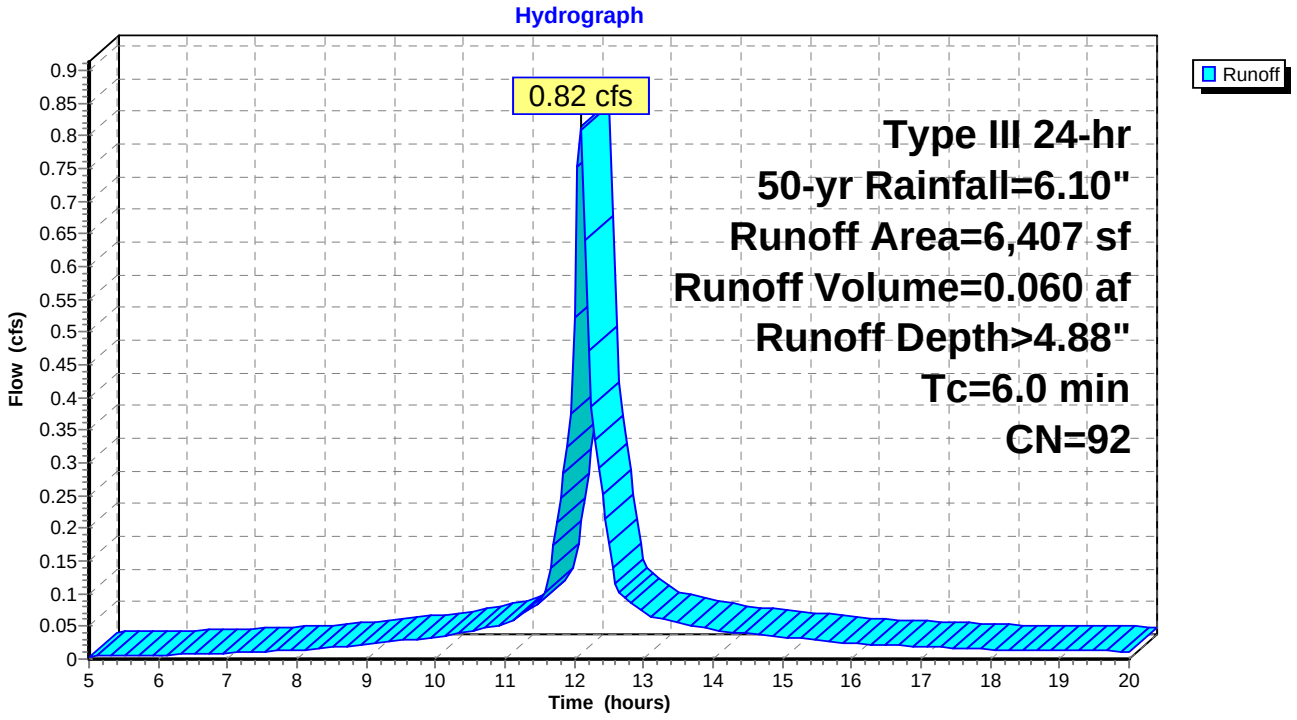
Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.060 af, Depth> 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

Area (sf)	CN	Description
1,045	61	>75% Grass cover, Good, HSG B
5,362	98	Paved parking, HSG B
6,407	92	Weighted Average
1,045		16.31% Pervious Area
5,362		83.69% Impervious Area

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

Subcatchment 7S: Catch 7S



Summary for Subcatchment 8S: Catch 8S

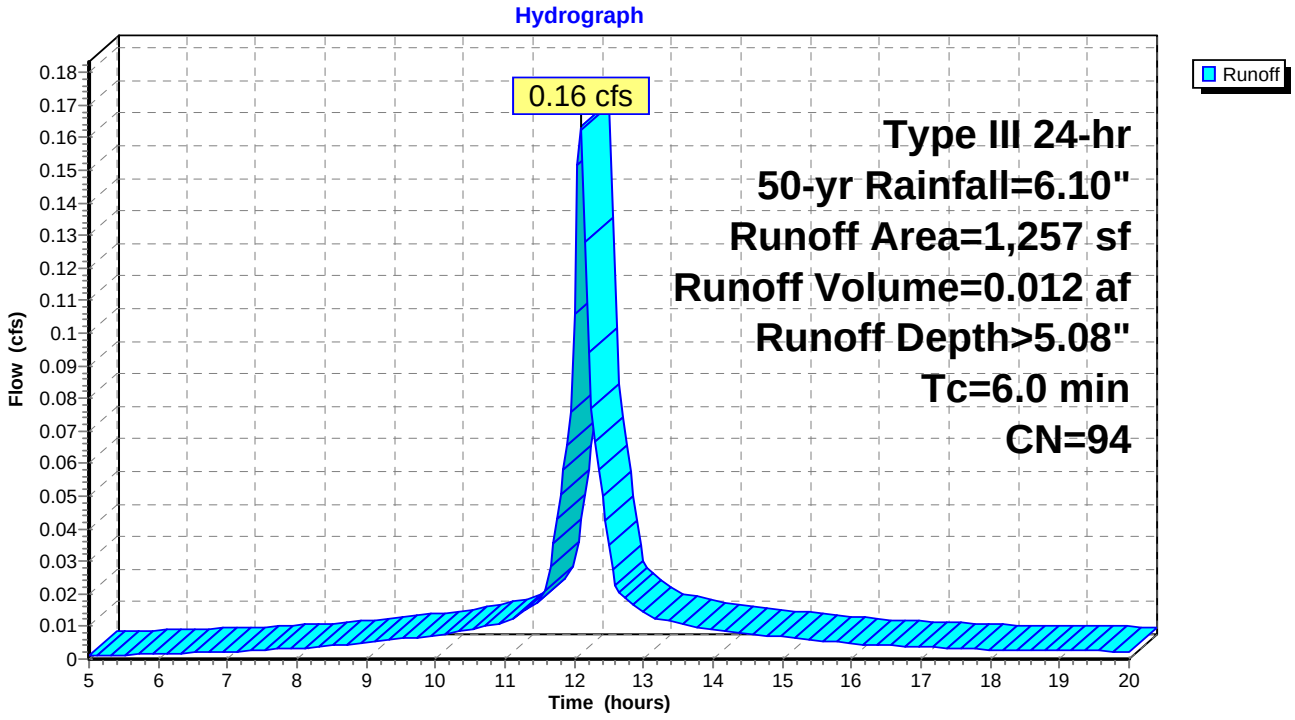
Runoff = 0.16 cfs @ 12.09 hrs, Volume= 0.012 af, Depth> 5.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

Area (sf)	CN	Description
121	61	>75% Grass cover, Good, HSG B
1,136	98	Paved parking, HSG B
1,257	94	Weighted Average
121		9.63% Pervious Area
1,136		90.37% Impervious Area

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

Subcatchment 8S: Catch 8S



Summary for Subcatchment 9S: Catch 9S

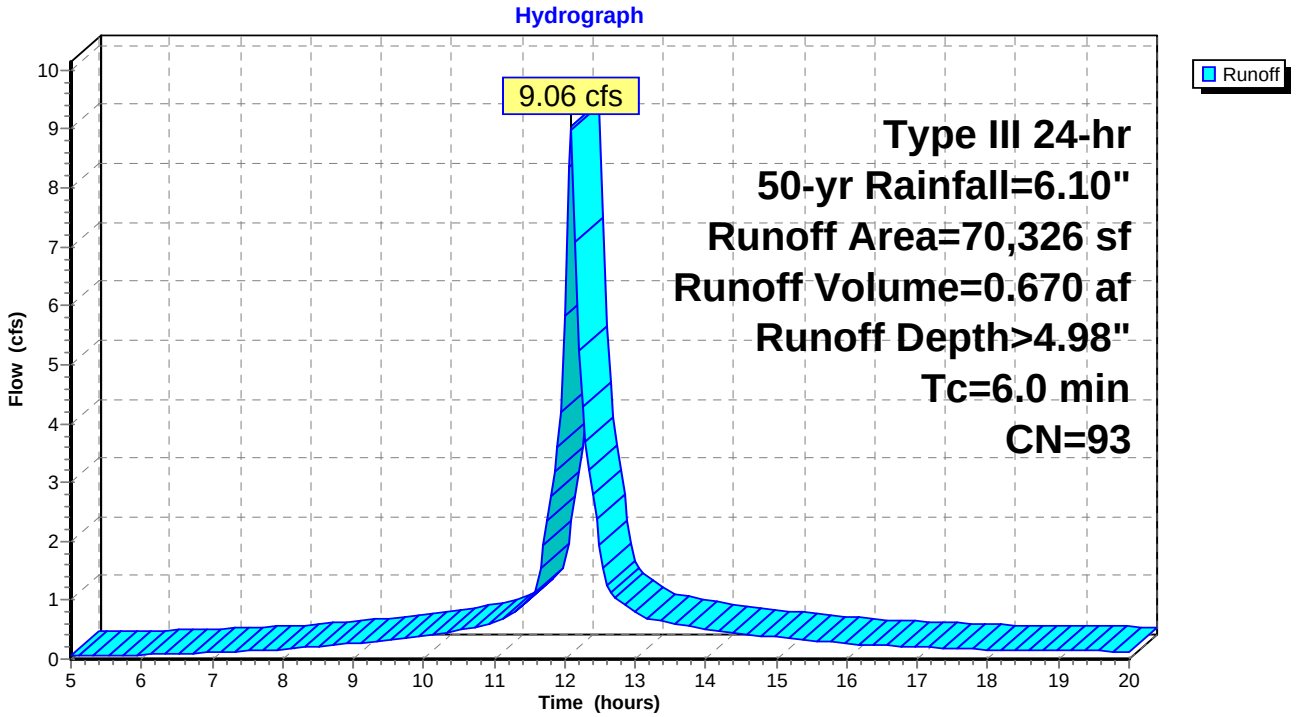
Runoff = 9.06 cfs @ 12.09 hrs, Volume= 0.670 af, Depth> 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.10"

Area (sf)	CN	Description
3,430	39	>75% Grass cover, Good, HSG A
4,383	61	>75% Grass cover, Good, HSG B
19,865	98	Paved parking, HSG A
42,648	98	Paved parking, HSG B
70,326	93	Weighted Average
7,813		11.11% Pervious Area
62,513		88.89% Impervious Area

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

Subcatchment 9S: Catch 9S



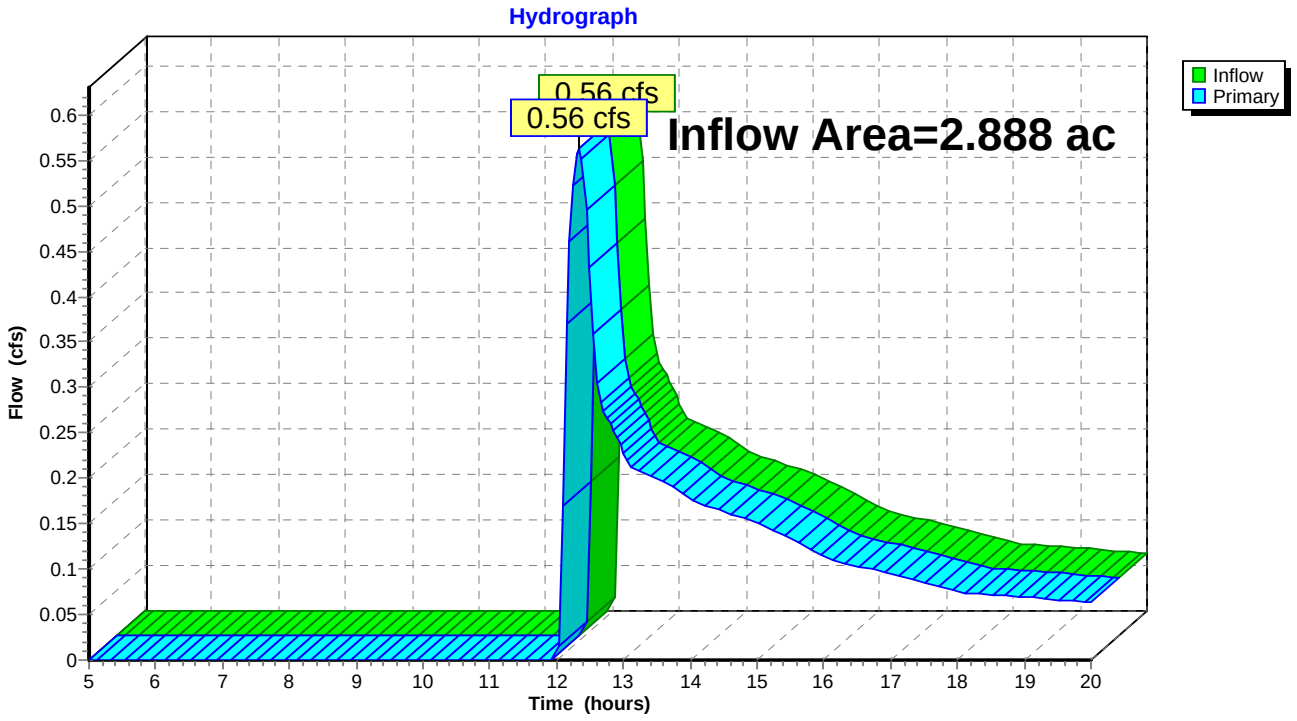
Summary for Pond 1P: Wetland

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

Inflow Area = 2.888 ac, 6.55% Impervious, Inflow Depth > 0.40" for 50-yr event
Inflow = 0.56 cfs @ 12.33 hrs, Volume= 0.096 af
Primary = 0.56 cfs @ 12.33 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Summary for Pond 2P: ReTain-It 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 3.336 ac, 92.40% Impervious, Inflow Depth > 5.13" for 50-yr event
Inflow = 18.86 cfs @ 12.09 hrs, Volume= 1.426 af
Outflow = 1.16 cfs @ 10.80 hrs, Volume= 1.118 af, Atten= 94%, Lag= 0.0 min
Discarded = 1.16 cfs @ 10.80 hrs, Volume= 1.118 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 130.64' @ 13.73 hrs Surf.Area= 0.479 ac Storage= 0.639 af

Plug-Flow detention time= 158.1 min calculated for 1.114 af (78% of inflow)
Center-of-Mass det. time= 101.7 min (842.9 - 741.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.232 af	**26.00'W x 802.00'L x 3.67'H Field A** 1.755 af Overall - 1.175 af Embedded = 0.580 af x 40.0% Voids
#2A	129.25'	0.751 af	**retain_it 2.0'** x 300 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 389.4 cf perimeter wall
		0.982 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=1.16 cfs @ 10.80 hrs HW=128.79' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.16 cfs)

Pond 2P: ReTain-It 1 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 389.4 cf perimeter wall

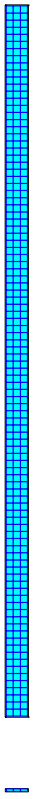
100 Chambers/Row x 8.00' Long = 800.00' Row Length +12.0" End Stone x 2 = 802.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 100 x 2 + 1.9 cf Endwall x 3 x 2 = 389.4 cf Perimeter Wall
300 Chambers x 110.3 cf - 389.4 cf Perimeter wall = 32,694.5 cf Chamber Storage
300 Chambers x 170.7 cf = 51,200.0 cf Displacement

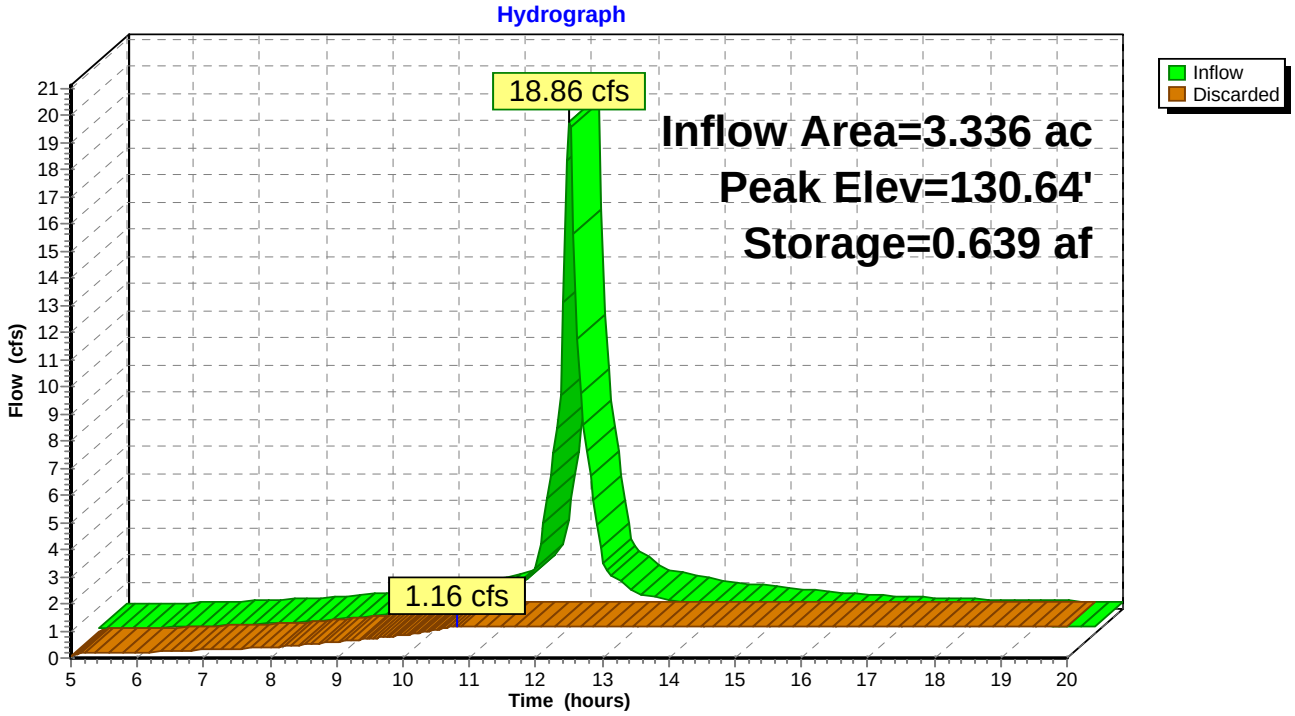
76,457.3 cf Field - 51,200.0 cf Chambers = 25,257.3 cf Stone x 40.0% Voids = 10,102.9 cf Stone Storage

Chamber Storage + Stone Storage = 42,797.5 cf = 0.982 af
Overall Storage Efficiency = 56.0%
Overall System Size = 802.00' x 26.00' x 3.67'

300 Chambers
2,831.8 cy Field
935.5 cy Stone



Pond 2P: ReTain-It 1



Summary for Pond 3P: Porous Asphalt

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.614 ac, 88.89% Impervious, Inflow Depth > 4.98" for 50-yr event
Inflow = 9.06 cfs @ 12.09 hrs, Volume= 0.670 af
Outflow = 0.24 cfs @ 9.30 hrs, Volume= 0.249 af, Atten= 97%, Lag= 0.0 min
Discarded = 0.24 cfs @ 9.30 hrs, Volume= 0.249 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 128.29' @ 16.41 hrs Surf.Area= 60,636 sf Storage= 19,241 cf

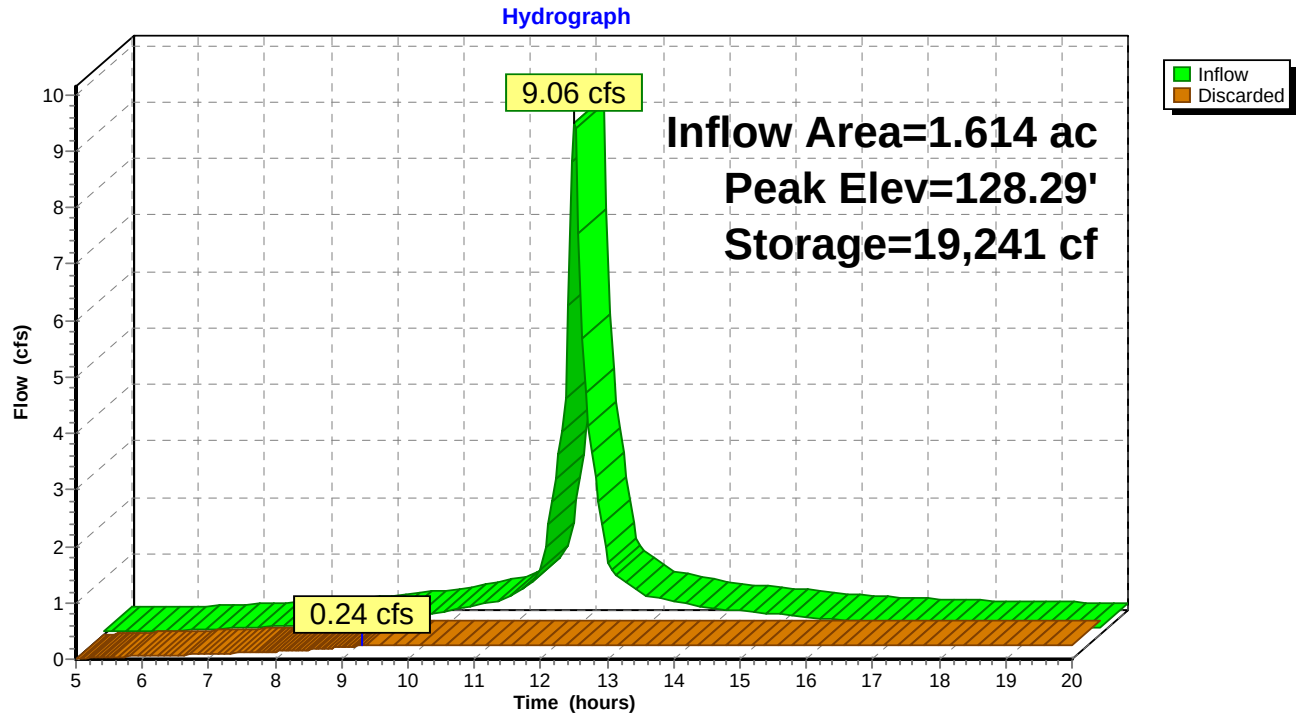
Plug-Flow detention time= 182.8 min calculated for 0.248 af (37% of inflow)
Center-of-Mass det. time= 70.1 min (817.7 - 747.6)

Volume	Invert	Avail.Storage	Storage Description
#1	127.50'	48,509 cf	**186.00'W x 326.00'L x 2.00'H Prismatoid** 121,272 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.50'	**0.170 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 9.30 hrs HW=127.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.24 cfs)

Pond 3P: Porous Asphalt



Summary for Pond 4P: RainGarden1

Inflow Area = 0.431 ac, 67.26% Impervious, Inflow Depth > 4.25" for 50-yr event
Inflow = 2.17 cfs @ 12.09 hrs, Volume= 0.153 af
Outflow = 2.10 cfs @ 12.11 hrs, Volume= 0.137 af, Atten= 3%, Lag= 1.3 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.007 af
Primary = 2.10 cfs @ 12.11 hrs, Volume= 0.130 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 132.47' @ 12.11 hrs Surf.Area= 1,163 sf Storage= 898 cf

Plug-Flow detention time= 55.9 min calculated for 0.137 af (90% of inflow)
Center-of-Mass det. time= 22.5 min (788.6 - 766.1)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,253 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

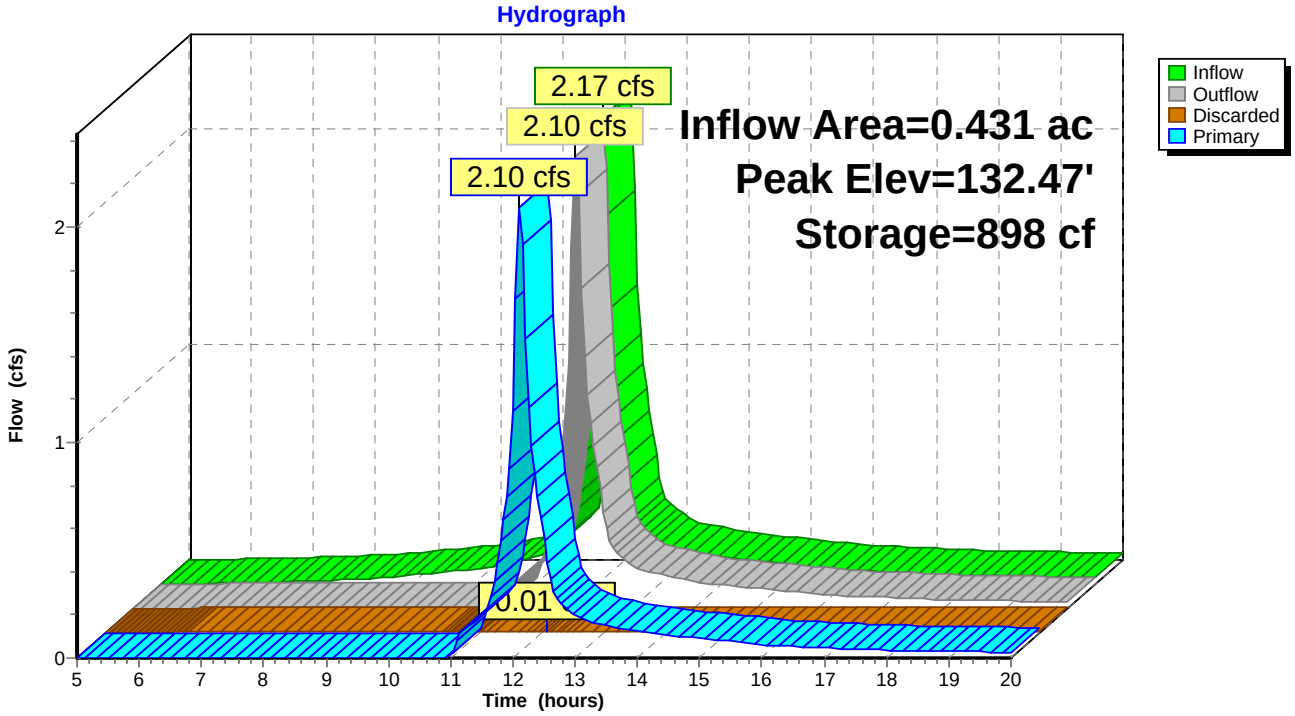
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	853	0.0	0	0
132.00	853	20.0	427	427
132.75	1,350	100.0	826	1,253

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	131.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 131.00' / 130.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	132.25'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=132.46' (Free Discharge)
↑**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=2.04 cfs @ 12.11 hrs HW=132.46' (Free Discharge)
↑**2=Culvert** (Passes 2.04 cfs of 6.55 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 2.04 cfs @ 1.51 fps)

Pond 4P: RainGarden1



Summary for Pond 5P: RainGarden2

Inflow Area = 0.425 ac, 68.09% Impervious, Inflow Depth > 4.25" for 50-yr event
Inflow = 2.14 cfs @ 12.09 hrs, Volume= 0.151 af
Outflow = 2.12 cfs @ 12.10 hrs, Volume= 0.137 af, Atten= 1%, Lag= 0.9 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.007 af
Primary = 2.11 cfs @ 12.10 hrs, Volume= 0.131 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 132.00' @ 12.10 hrs Surf.Area= 1,004 sf Storage= 742 cf

Plug-Flow detention time= 50.3 min calculated for 0.137 af (91% of inflow)
Center-of-Mass det. time= 20.4 min (786.6 - 766.1)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,309 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

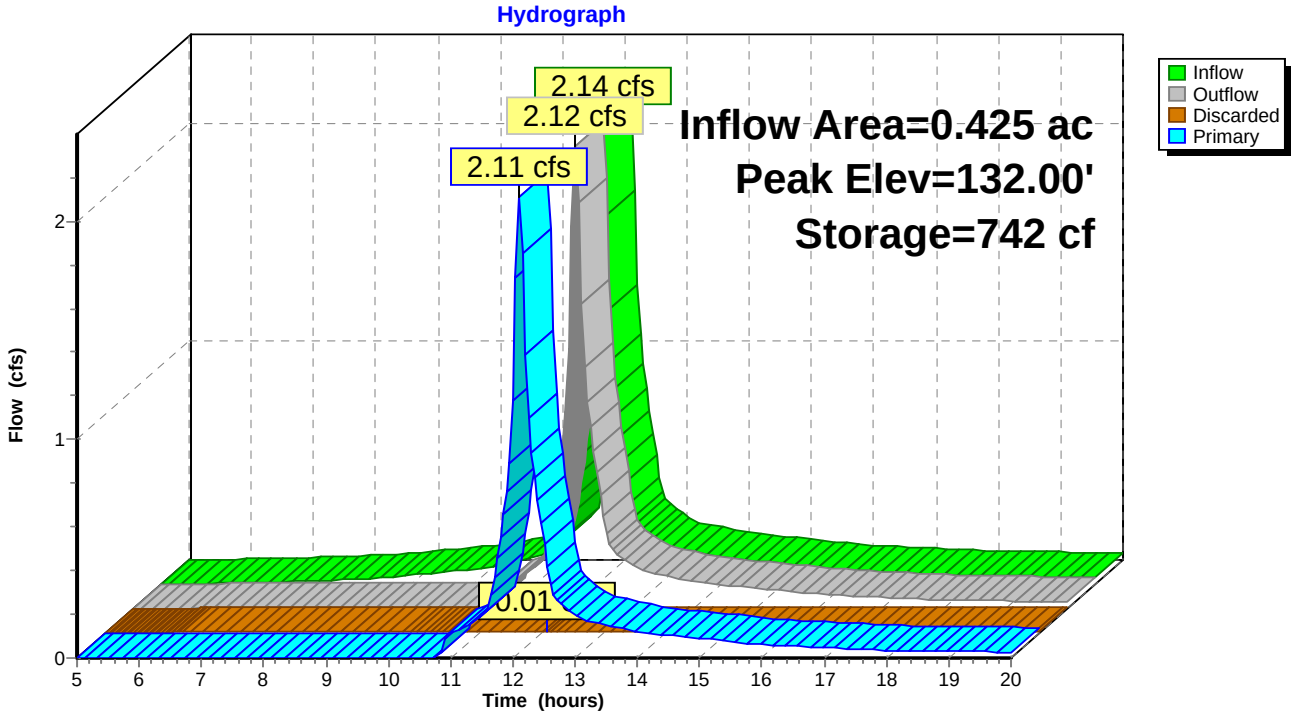
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	759	0.0	0	0
131.50	759	20.0	304	304
132.50	1,251	100.0	1,005	1,309

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.50'	**12.0" Round Culvert X 3.00** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.50' / 130.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.83'	**12.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=132.00' (Free Discharge)
↑**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=2.08 cfs @ 12.10 hrs HW=132.00' (Free Discharge)
↑**2=Culvert** (Passes 2.08 cfs of 9.99 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 2.08 cfs @ 1.33 fps)

Pond 5P: RainGarden2



Summary for Pond 6P: RainGarden3

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.166 ac, 76.71% Impervious, Inflow Depth > 4.57" for 50-yr event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 0.87 cfs @ 12.10 hrs, Volume= 0.056 af, Atten= 1%, Lag= 0.9 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 0.004 af
Primary = 0.87 cfs @ 12.10 hrs, Volume= 0.052 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.45' @ 12.10 hrs Surf.Area= 575 sf Storage= 365 cf

Plug-Flow detention time= 60.3 min calculated for 0.056 af (89% of inflow)
Center-of-Mass det. time= 25.1 min (783.5 - 758.4)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	748 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

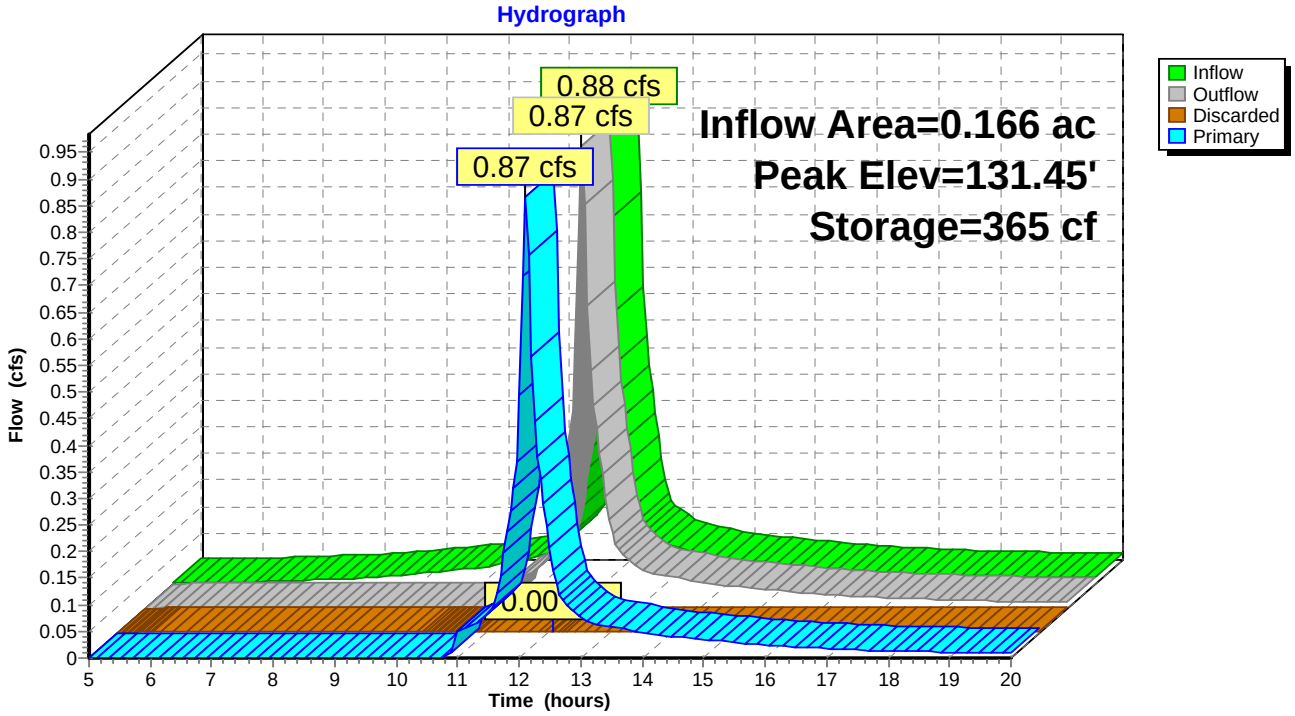
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	377	0.0	0	0
131.00	377	20.0	151	151
132.00	817	100.0	597	748

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=131.45' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.85 cfs @ 12.10 hrs HW=131.45' (Free Discharge)
↑**2=Culvert** (Passes 0.85 cfs of 6.50 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 0.85 cfs @ 1.13 fps)

Pond 6P: RainGarden3



Summary for Pond 7P: RainGarden4

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.147 ac, 83.69% Impervious, Inflow Depth > 4.88" for 50-yr event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.80 cfs @ 12.11 hrs, Volume= 0.052 af, Atten= 2%, Lag= 1.1 min
Discarded = 0.00 cfs @ 12.11 hrs, Volume= 0.004 af
Primary = 0.80 cfs @ 12.11 hrs, Volume= 0.047 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.44' @ 12.11 hrs Surf.Area= 680 sf Storage= 433 cf

Plug-Flow detention time= 74.0 min calculated for 0.052 af (86% of inflow)
Center-of-Mass det. time= 31.4 min (781.8 - 750.3)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	890 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

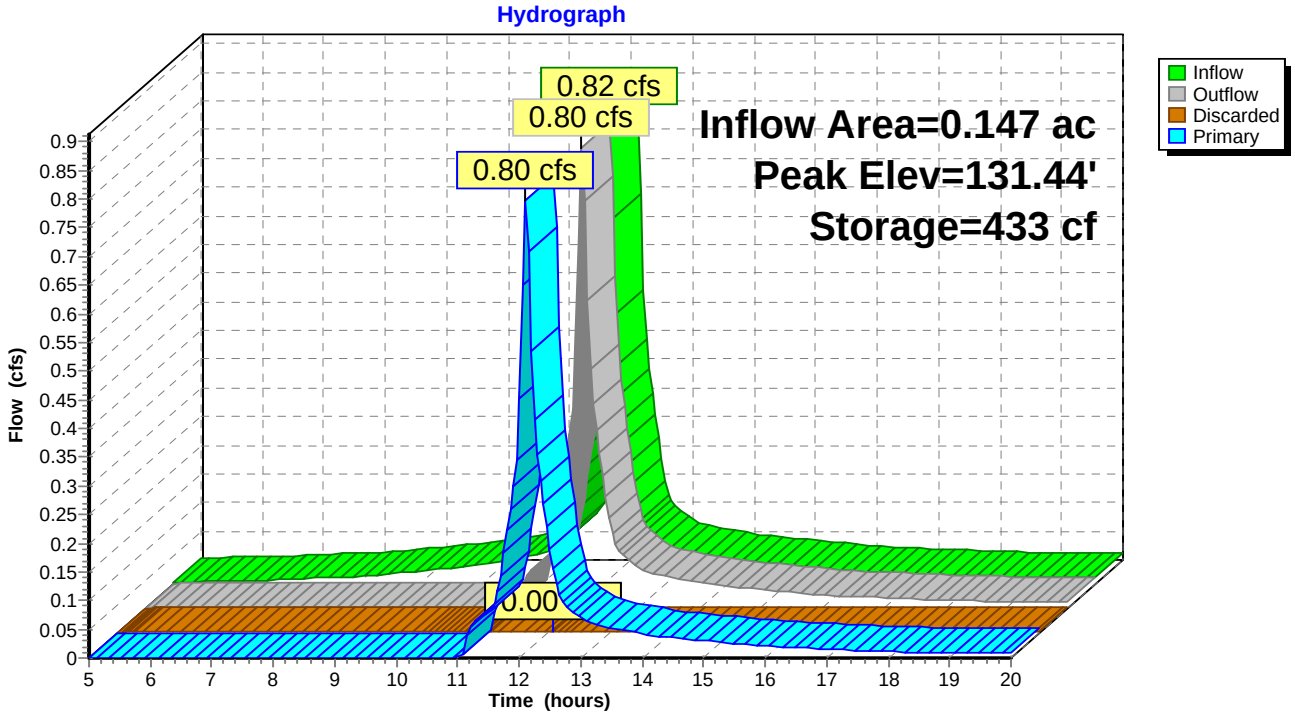
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	453	0.0	0	0
131.00	453	20.0	181	181
132.00	965	100.0	709	890

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=131.44' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.78 cfs @ 12.11 hrs HW=131.44' (Free Discharge)
↑**2=Culvert** (Passes 0.78 cfs of 6.48 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 0.78 cfs @ 1.10 fps)

Pond 7P: RainGarden4



Summary for Pond 8P: ReTain-It 2

[79] Warning: Submerged Pond 5P Primary device # 2 OUTLET by 0.18'
[79] Warning: Submerged Pond 6P Primary device # 2 INLET by 0.43'
[79] Warning: Submerged Pond 7P Primary device # 2 INLET by 0.43'

Inflow Area = 1.169 ac, 70.96% Impervious, Inflow Depth > 3.70" for 50-yr event
Inflow = 5.87 cfs @ 12.11 hrs, Volume= 0.360 af
Outflow = 0.40 cfs @ 11.35 hrs, Volume= 0.293 af, Atten= 93%, Lag= 0.0 min
Discarded = 0.40 cfs @ 11.35 hrs, Volume= 0.293 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 130.43' @ 13.60 hrs Surf.Area= 0.164 ac Storage= 0.190 af

Plug-Flow detention time= 193.0 min calculated for 0.292 af (81% of inflow)
Center-of-Mass det. time= 147.5 min (933.5 - 786.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.080 af	**26.00'W x 274.00'L x 3.67'H Field A** 0.600 af Overall - 0.400 af Embedded = 0.200 af x 40.0% Voids
#2A	129.25'	0.255 af	**retain_it 2.0'** x 102 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 139.9 cf perimeter wall
		0.335 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.40 cfs @ 11.35 hrs HW=128.79' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.40 cfs)

Pond 8P: ReTain-It 2 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 139.9 cf perimeter wall

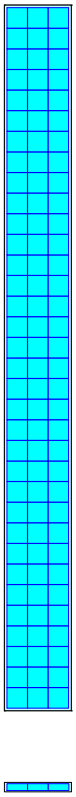
34 Chambers/Row x 8.00' Long = 272.00' Row Length +12.0" End Stone x 2 = 274.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 34 x 2 + 1.9 cf Endwall x 3 x 2 = 139.9 cf Perimeter Wall
102 Chambers x 110.3 cf - 139.9 cf Perimeter wall = 11,108.7 cf Chamber Storage
102 Chambers x 170.7 cf = 17,408.0 cf Displacement

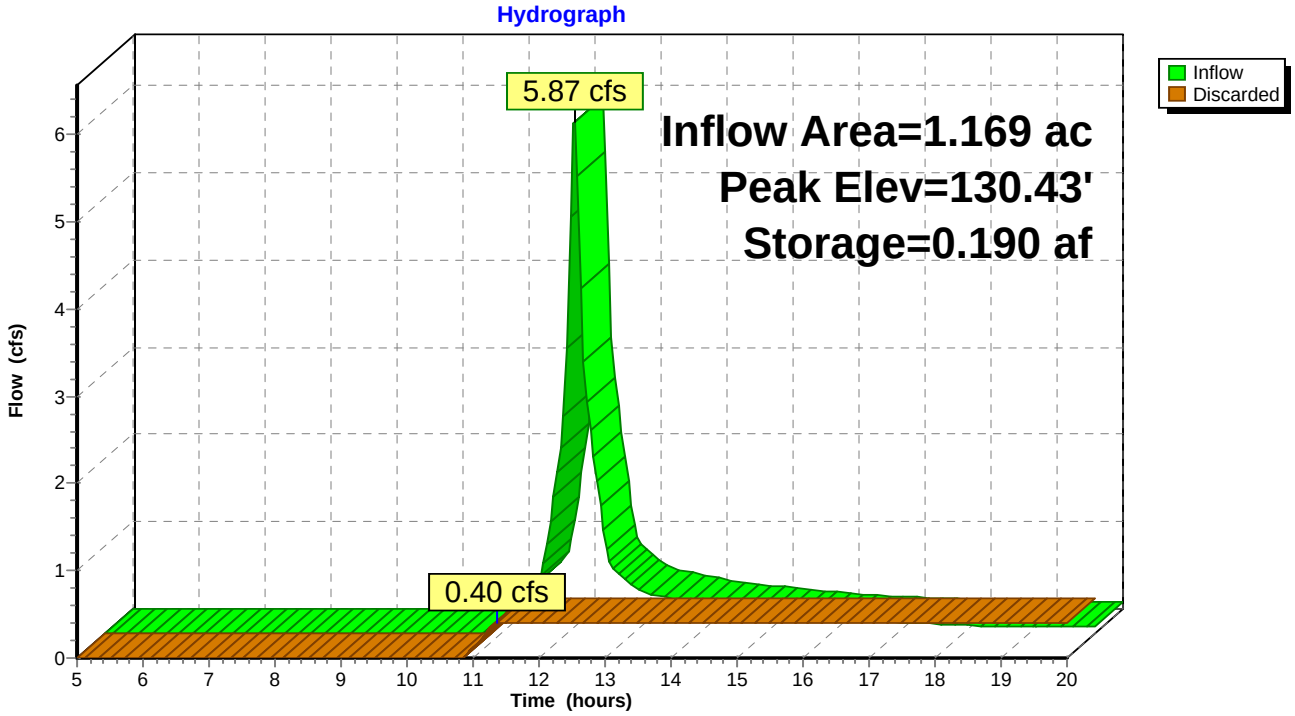
26,121.3 cf Field - 17,408.0 cf Chambers = 8,713.3 cf Stone x 40.0% Voids = 3,485.3 cf Stone Storage

Chamber Storage + Stone Storage = 14,594.0 cf = 0.335 af
Overall Storage Efficiency = 55.9%
Overall System Size = 274.00' x 26.00' x 3.67'

102 Chambers
967.5 cy Field
322.7 cy Stone



Pond 8P: ReTain-It 2



Summary for Pond 10P: ReTain-It (flood storage)

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

Volume	Invert	Avail.Storage	Storage Description
#1A	127.58'	0.057 af	**18.00'W x 250.00'L x 4.17'H Field A** 0.430 af Overall - 0.288 af Embedded = 0.142 af x 40.0% Voids
#2A	128.08'	0.195 af	**retain_it 2.5'** x 62 Inside #1 Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf 2 Rows adjusted for 217.8 cf perimeter wall
		0.252 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.58'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Pond 10P: ReTain-It (flood storage) - Chamber Wizard Field A

Chamber Model = retain_it 2.5' (retain-it® 2.5' tall)
Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf
Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf
2 Rows adjusted for 217.8 cf perimeter wall

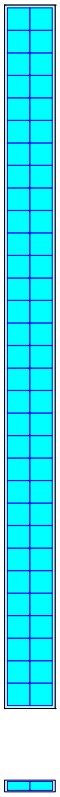
31 Chambers/Row x 8.00' Long = 248.00' Row Length +12.0" End Stone x 2 = 250.00' Base Length
2 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Base + 38.0" Chamber Height + 6.0" Cover = 4.17' Field Height

3.3 cf Sidewall x 31 x 2 + 3.3 cf Endwall x 2 x 2 = 217.8 cf Perimeter Wall
62 Chambers x 140.4 cf - 217.8 cf Perimeter wall = 8,489.5 cf Chamber Storage
62 Chambers x 202.7 cf = 12,565.3 cf Displacement

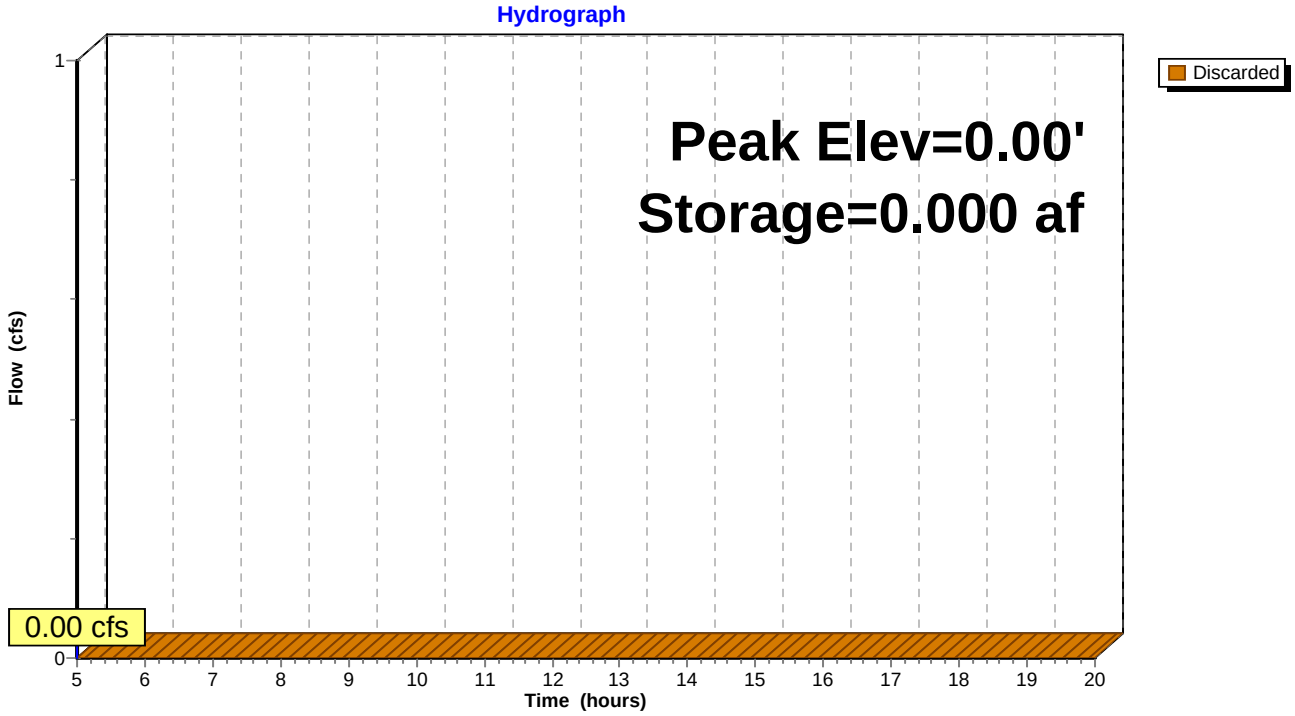
18,750.0 cf Field - 12,565.3 cf Chambers = 6,184.7 cf Stone x 40.0% Voids = 2,473.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,963.4 cf = 0.252 af
Overall Storage Efficiency = 58.5%
Overall System Size = 250.00' x 18.00' x 4.17'

62 Chambers
694.4 cy Field
229.1 cy Stone



Pond 10P: ReTain-It (flood storage)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=125,792 sf 6.55% Impervious Runoff Depth>0.54"
Tc=6.0 min CN=39 Runoff=0.85 cfs 0.129 af

Subcatchment 2S: Catch 2S Runoff Area=101,357 sf 100.00% Impervious Runoff Depth>5.87"
Tc=6.0 min CN=98 Runoff=14.71 cfs 1.139 af

Subcatchment 3S: Catch 3S Runoff Area=43,980 sf 74.88% Impervious Runoff Depth>4.92"
Tc=6.0 min CN=88 Runoff=5.78 cfs 0.414 af

Subcatchment 4S: Catch 4S Runoff Area=18,792 sf 67.26% Impervious Runoff Depth>4.70"
Tc=6.0 min CN=86 Runoff=2.39 cfs 0.169 af

Subcatchment 5S: Catch 5S Runoff Area=18,526 sf 68.09% Impervious Runoff Depth>4.70"
Tc=6.0 min CN=86 Runoff=2.36 cfs 0.167 af

Subcatchment 6S: Catch 6S Runoff Area=7,212 sf 76.71% Impervious Runoff Depth>5.03"
Tc=6.0 min CN=89 Runoff=0.96 cfs 0.069 af

Subcatchment 7S: Catch 7S Runoff Area=6,407 sf 83.69% Impervious Runoff Depth>5.34"
Tc=6.0 min CN=92 Runoff=0.89 cfs 0.065 af

Subcatchment 8S: Catch 8S Runoff Area=1,257 sf 90.37% Impervious Runoff Depth>5.54"
Tc=6.0 min CN=94 Runoff=0.18 cfs 0.013 af

Subcatchment 9S: Catch 9S Runoff Area=70,326 sf 88.89% Impervious Runoff Depth>5.44"
Tc=6.0 min CN=93 Runoff=9.86 cfs 0.732 af

Pond 1P: Wetland Inflow=0.85 cfs 0.129 af
Primary=0.85 cfs 0.129 af

Pond 2P: ReTain-It 1 Peak Elev=130.85' Storage=0.721 af Inflow=20.49 cfs 1.553 af
Outflow=1.16 cfs 1.140 af

Pond 3P: Porous Asphalt Peak Elev=128.39' Storage=21,564 cf Inflow=9.86 cfs 0.732 af
Outflow=0.24 cfs 0.254 af

Pond 4P: RainGarden1 Peak Elev=132.48' Storage=916 cf Inflow=2.39 cfs 0.169 af
Discarded=0.01 cfs 0.007 af Primary=2.31 cfs 0.146 af Outflow=2.32 cfs 0.154 af

Pond 5P: RainGarden2 Peak Elev=132.01' Storage=753 cf Inflow=2.36 cfs 0.167 af
Discarded=0.01 cfs 0.007 af Primary=2.33 cfs 0.146 af Outflow=2.34 cfs 0.153 af

Pond 6P: RainGarden3 Peak Elev=131.46' Storage=370 cf Inflow=0.96 cfs 0.069 af
Discarded=0.00 cfs 0.004 af Primary=0.95 cfs 0.059 af Outflow=0.95 cfs 0.062 af

Pond 7P: RainGarden4 Peak Elev=131.45' Storage=438 cf Inflow=0.89 cfs 0.065 af
Discarded=0.00 cfs 0.004 af Primary=0.87 cfs 0.053 af Outflow=0.87 cfs 0.057 af

Pond 8P: ReTain-It 2 Peak Elev=130.64' Storage=0.217 af Inflow=6.46 cfs 0.404 af
Outflow=0.40 cfs 0.302 af

Pond 10P: ReTain-It (flood storage) Peak Elev=0.00' Storage=0.000 af
Discarded=0.00 cfs 0.000 af

Total Runoff Area = 9.037 ac Runoff Volume = 2.899 af Average Runoff Depth = 3.85"
38.44% Pervious = 3.474 ac 61.56% Impervious = 5.563 ac

Summary for Subcatchment 1S: Catch 1S

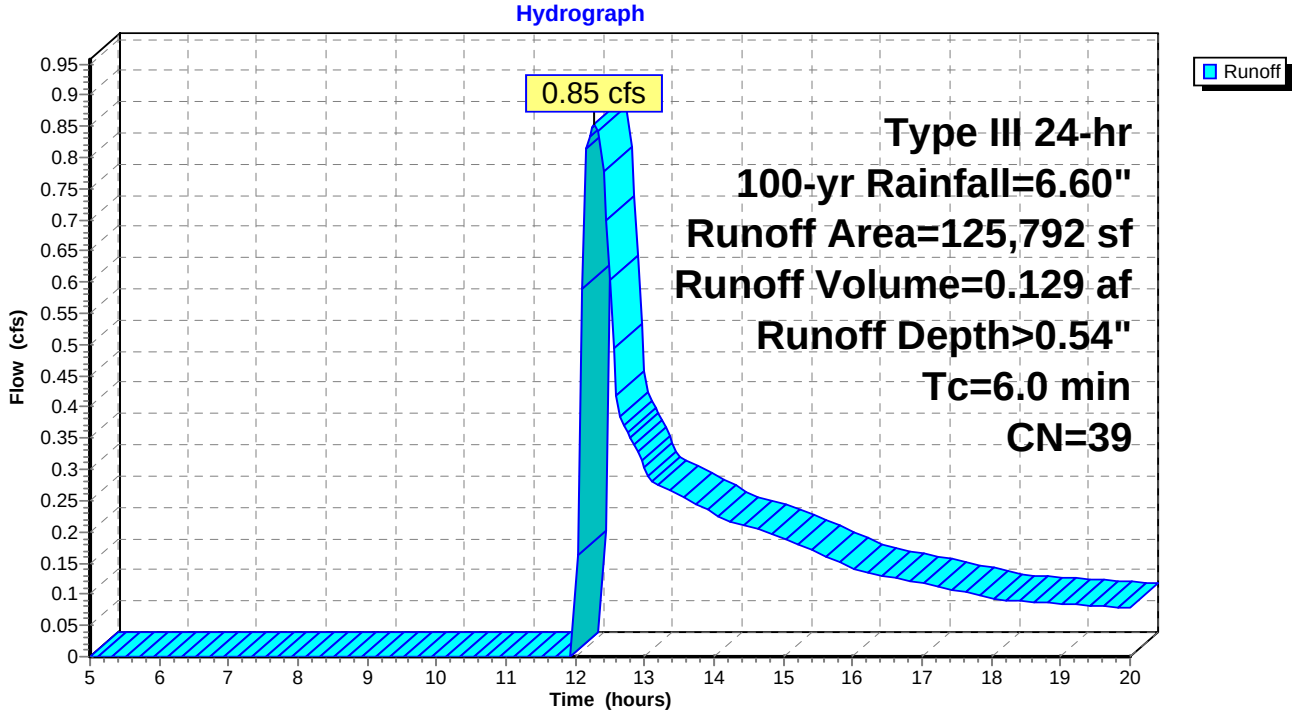
Runoff = 0.85 cfs @ 12.28 hrs, Volume= 0.129 af, Depth> 0.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

	Area (sf)	CN	Description
	89,852	30	Woods, Good, HSG A
	6,395	83	Woods, Poor, HSG D
	20,867	39	>75% Grass cover, Good, HSG A
	440	61	>75% Grass cover, Good, HSG B
*	3,073	98	Roofs (off-site), HSG A
	5,144	98	Paved parking, HSG A
	21	98	Paved parking, HSG B
	125,792	39	Weighted Average
	117,554		93.45% Pervious Area
	8,238		6.55% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

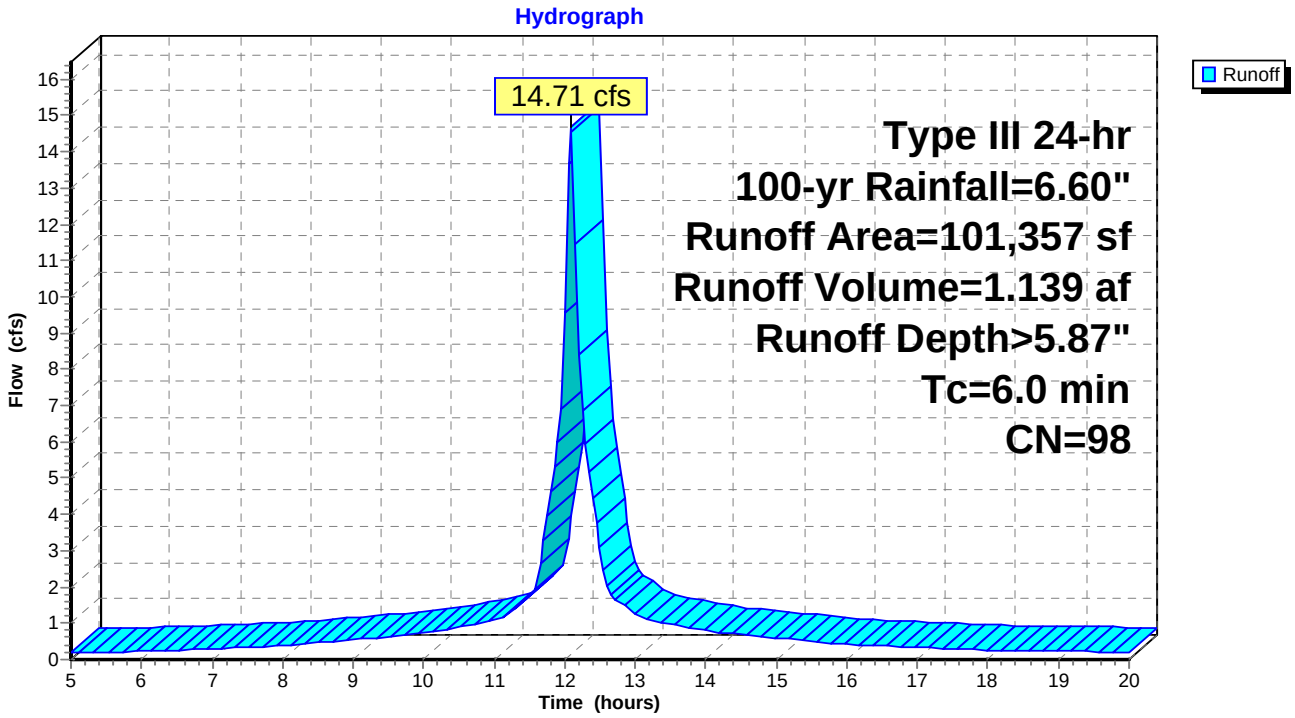
Runoff = 14.71 cfs @ 12.09 hrs, Volume= 1.139 af, Depth> 5.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
24,408	98	Roofs, HSG A
76,949	98	Roofs, HSG B
101,357	98	Weighted Average
101,357		100.00% Impervious Area

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

Subcatchment 2S: Catch 2S



Summary for Subcatchment 3S: Catch 3S

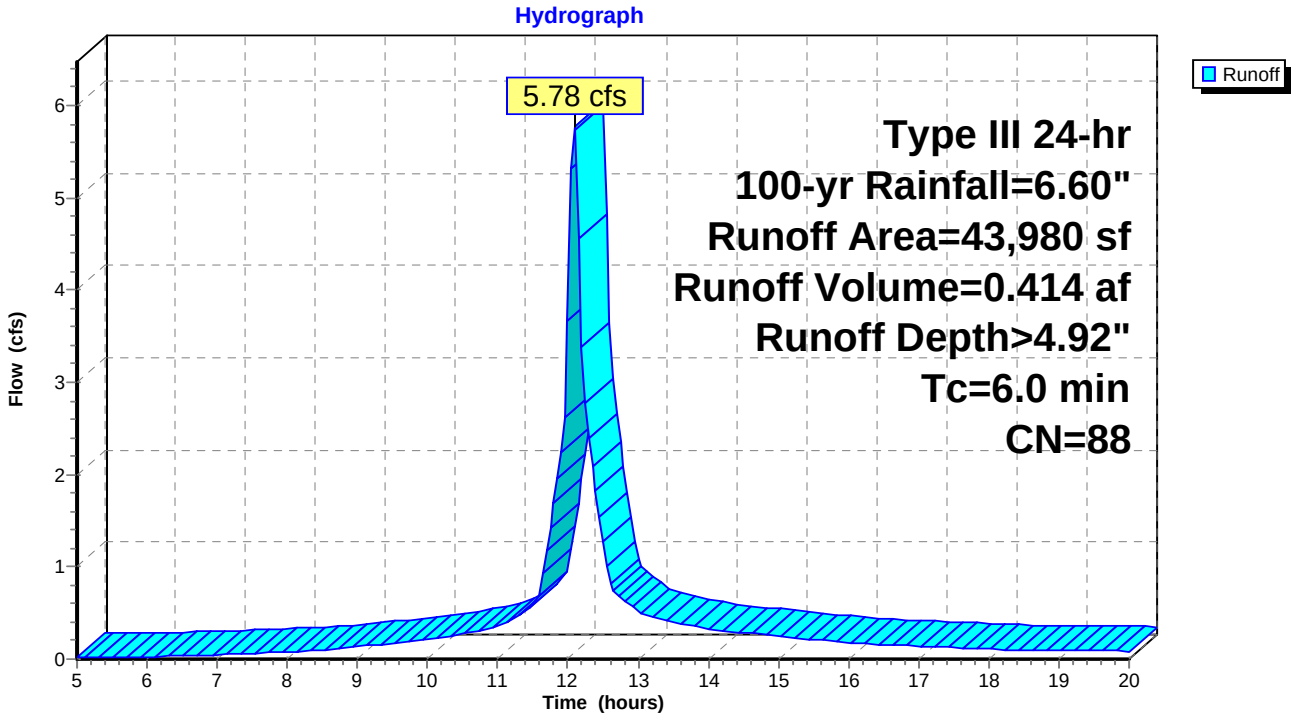
Runoff = 5.78 cfs @ 12.09 hrs, Volume= 0.414 af, Depth> 4.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
551	39	>75% Grass cover, Good, HSG A
10,497	61	>75% Grass cover, Good, HSG B
2,432	98	Paved parking, HSG A
30,500	98	Paved parking, HSG B
43,980	88	Weighted Average
11,048		25.12% Pervious Area
32,932		74.88% Impervious Area

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

Subcatchment 3S: Catch 3S



Summary for Subcatchment 4S: Catch 4S

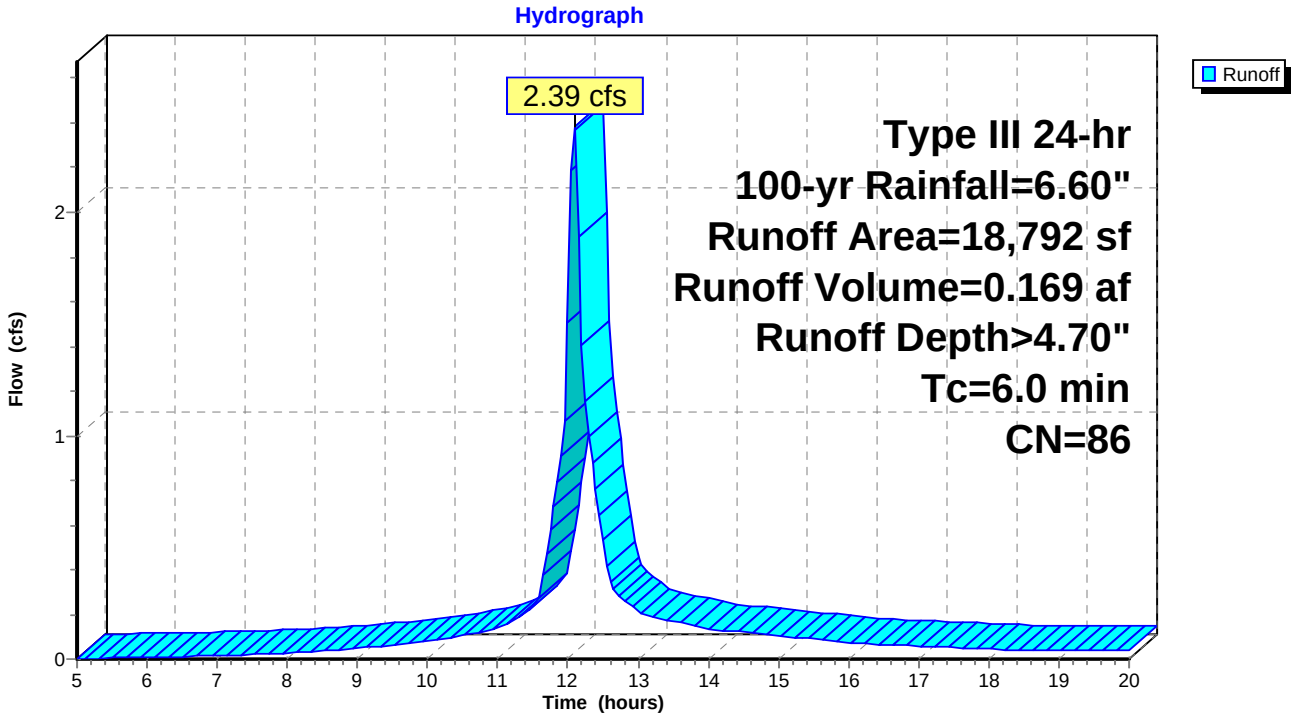
Runoff = 2.39 cfs @ 12.09 hrs, Volume= 0.169 af, Depth> 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
6,153	61	>75% Grass cover, Good, HSG B
12,639	98	Paved parking, HSG B
18,792	86	Weighted Average
6,153		32.74% Pervious Area
12,639		67.26% Impervious Area

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

Subcatchment 4S: Catch 4S



Summary for Subcatchment 5S: Catch 5S

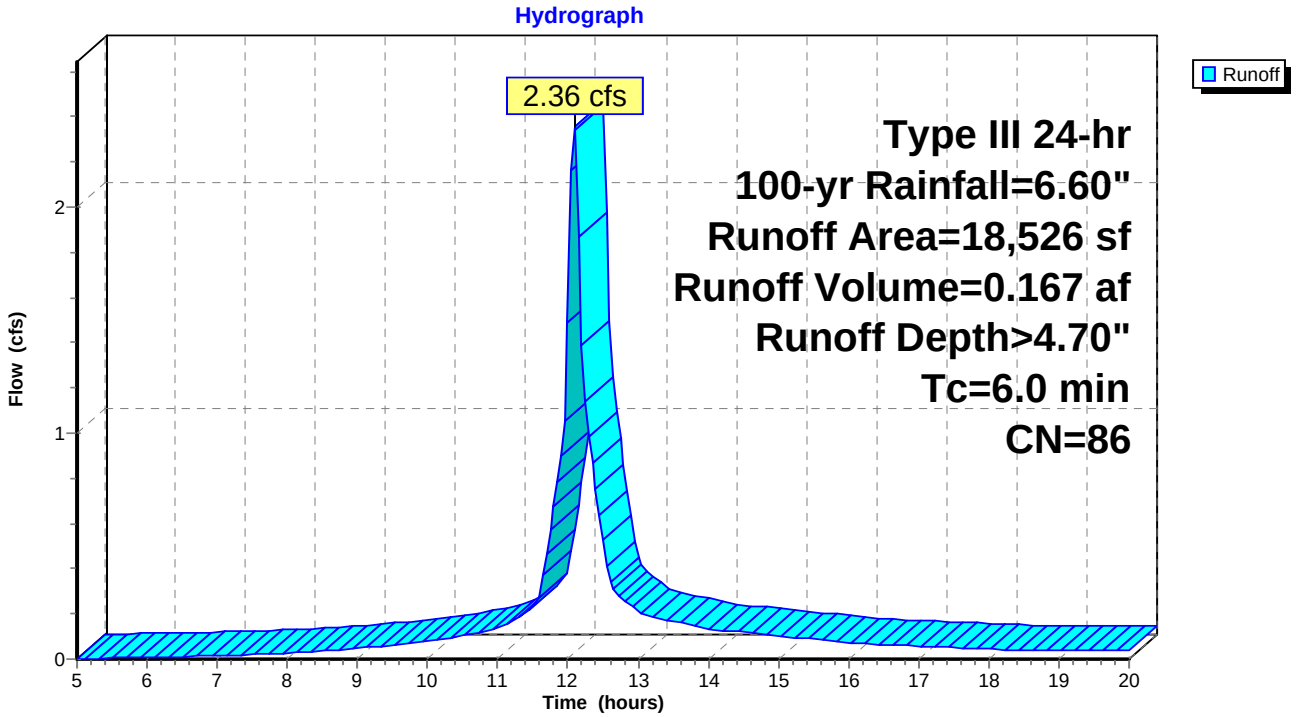
Runoff = 2.36 cfs @ 12.09 hrs, Volume= 0.167 af, Depth> 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
87	39	>75% Grass cover, Good, HSG A
5,825	61	>75% Grass cover, Good, HSG B
42	98	Paved parking, HSG A
12,572	98	Paved parking, HSG B
18,526	86	Weighted Average
5,912		31.91% Pervious Area
12,614		68.09% Impervious Area

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

Subcatchment 5S: Catch 5S



Summary for Subcatchment 6S: Catch 6S

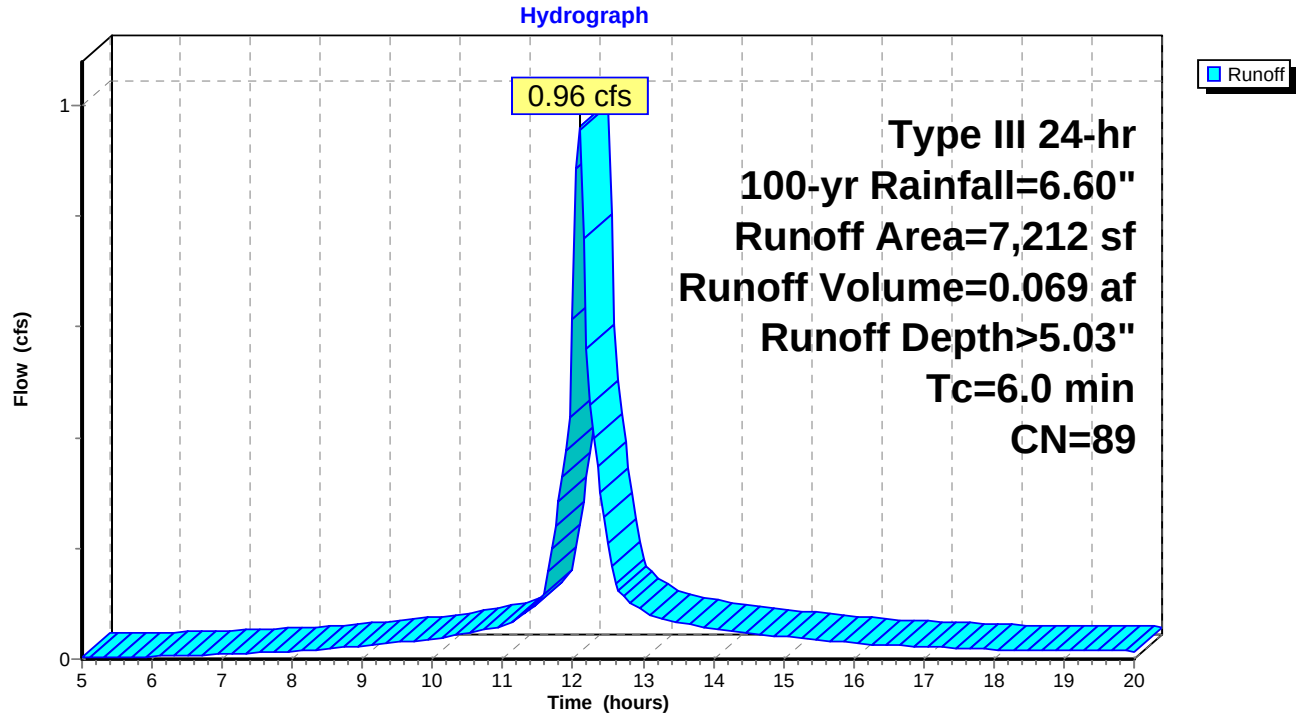
Runoff = 0.96 cfs @ 12.09 hrs, Volume= 0.069 af, Depth> 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
106	39	>75% Grass cover, Good, HSG A
1,574	61	>75% Grass cover, Good, HSG B
1,400	98	Paved parking, HSG A
4,132	98	Paved parking, HSG B
7,212	89	Weighted Average
1,680		23.29% Pervious Area
5,532		76.71% Impervious Area

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

Subcatchment 6S: Catch 6S



Summary for Subcatchment 7S: Catch 7S

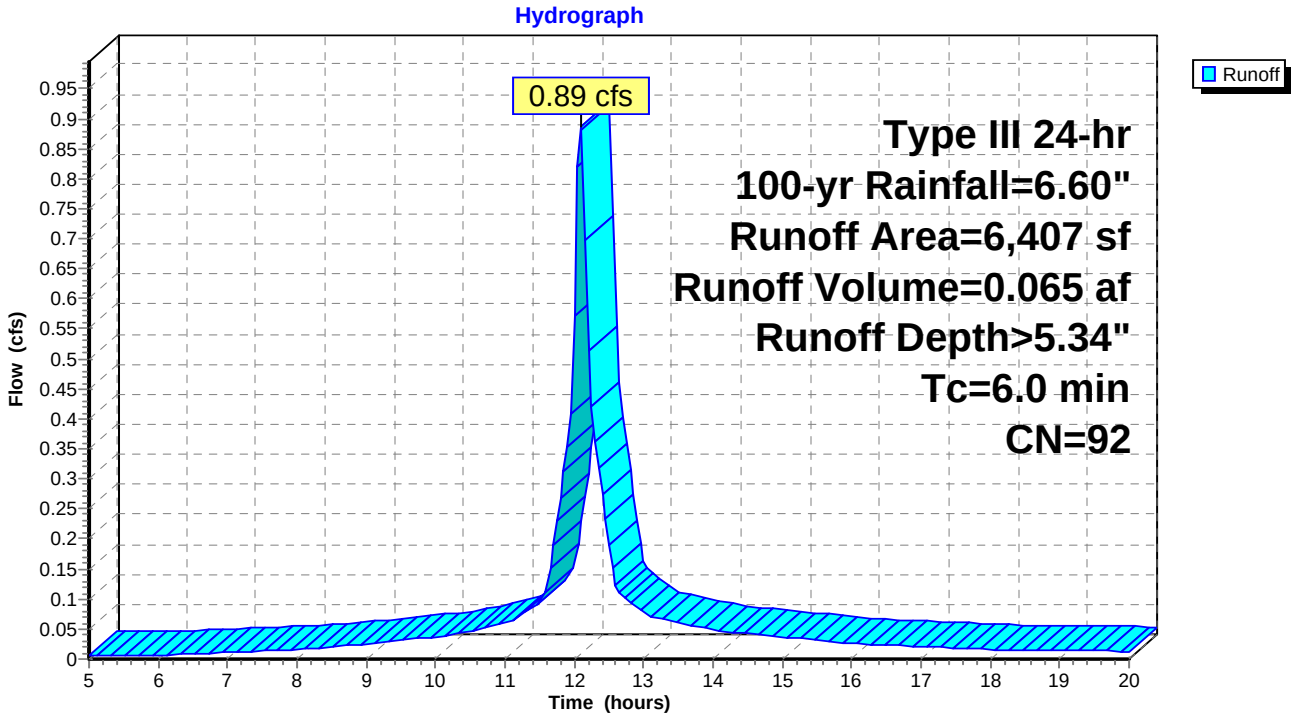
Runoff = 0.89 cfs @ 12.09 hrs, Volume= 0.065 af, Depth> 5.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
1,045	61	>75% Grass cover, Good, HSG B
5,362	98	Paved parking, HSG B
6,407	92	Weighted Average
1,045		16.31% Pervious Area
5,362		83.69% Impervious Area

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

Subcatchment 7S: Catch 7S



Summary for Subcatchment 8S: Catch 8S

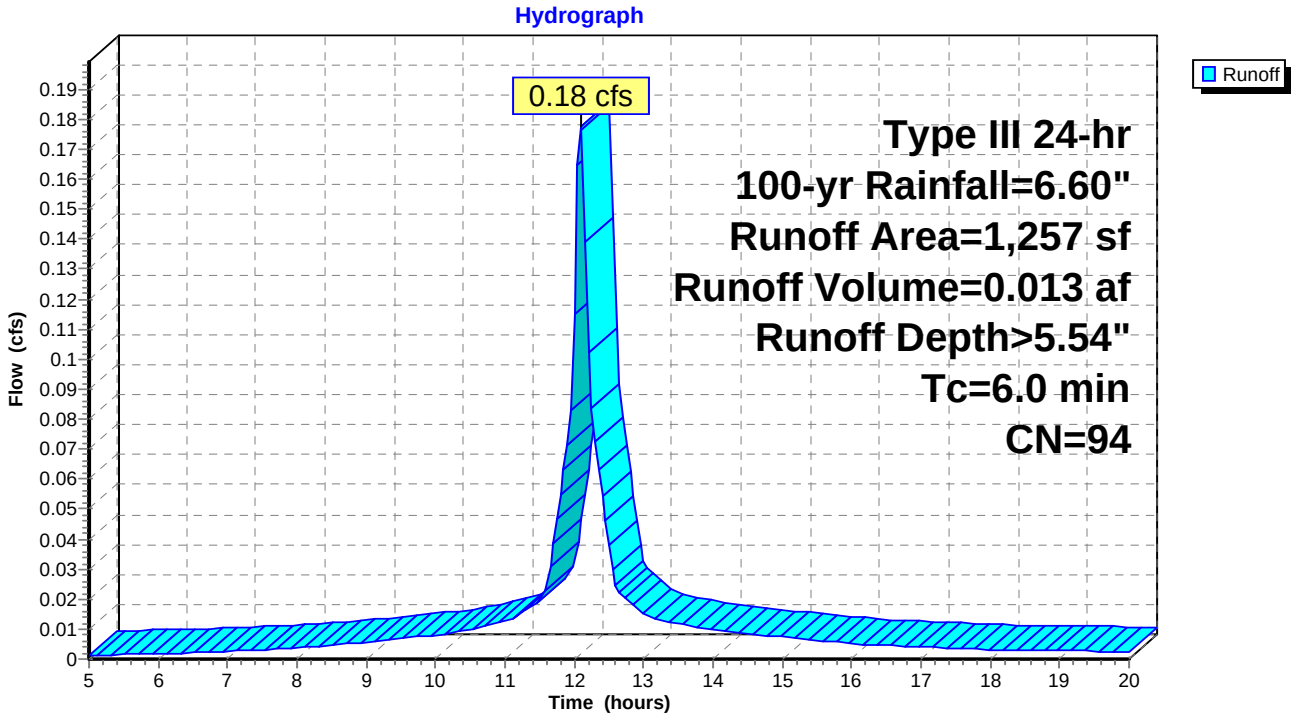
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.013 af, Depth> 5.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
121	61	>75% Grass cover, Good, HSG B
1,136	98	Paved parking, HSG B
1,257	94	Weighted Average
121		9.63% Pervious Area
1,136		90.37% Impervious Area

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

Subcatchment 8S: Catch 8S



Summary for Subcatchment 9S: Catch 9S

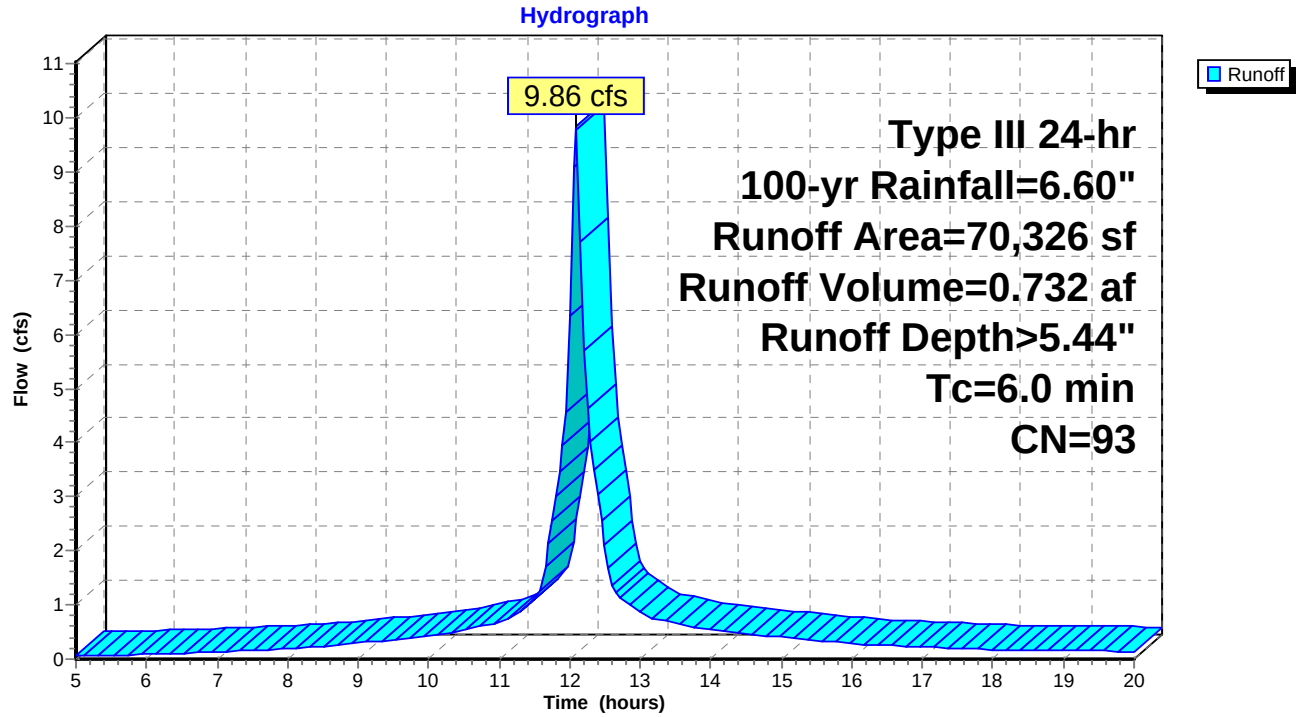
Runoff = 9.86 cfs @ 12.09 hrs, Volume= 0.732 af, Depth> 5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=6.60"

Area (sf)	CN	Description
3,430	39	>75% Grass cover, Good, HSG A
4,383	61	>75% Grass cover, Good, HSG B
19,865	98	Paved parking, HSG A
42,648	98	Paved parking, HSG B
70,326	93	Weighted Average
7,813		11.11% Pervious Area
62,513		88.89% Impervious Area

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

Subcatchment 9S: Catch 9S



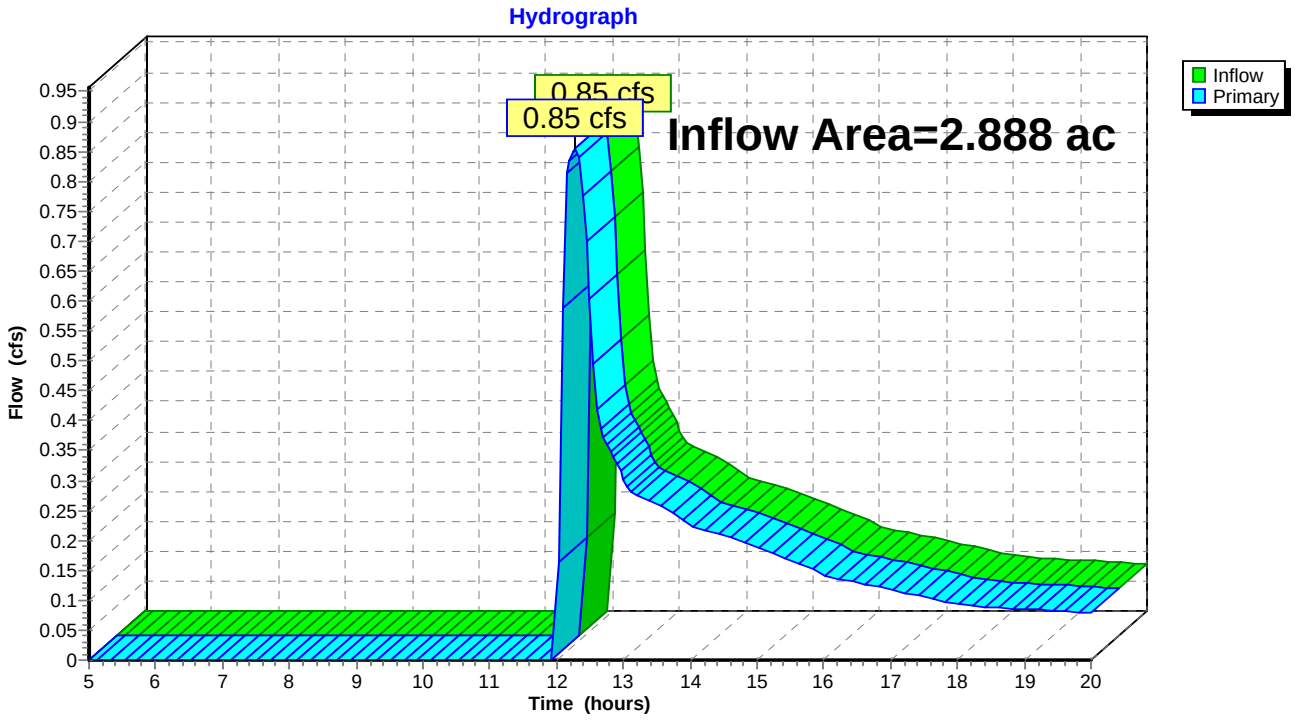
Summary for Pond 1P: Wetland

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

Inflow Area = 2.888 ac, 6.55% Impervious, Inflow Depth > 0.54" for 100-yr event
Inflow = 0.85 cfs @ 12.28 hrs, Volume= 0.129 af
Primary = 0.85 cfs @ 12.28 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Summary for Pond 2P: ReTain-It 1

[82] Warning: Early inflow requires earlier time span

Inflow Area = 3.336 ac, 92.40% Impervious, Inflow Depth > 5.59" for 100-yr event
Inflow = 20.49 cfs @ 12.09 hrs, Volume= 1.553 af
Outflow = 1.16 cfs @ 10.60 hrs, Volume= 1.140 af, Atten= 94%, Lag= 0.0 min
Discarded = 1.16 cfs @ 10.60 hrs, Volume= 1.140 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 130.85' @ 13.92 hrs Surf.Area= 0.479 ac Storage= 0.721 af

Plug-Flow detention time= 160.2 min calculated for 1.140 af (73% of inflow)
Center-of-Mass det. time= 96.1 min (836.5 - 740.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.232 af	**26.00'W x 802.00'L x 3.67'H Field A** 1.755 af Overall - 1.175 af Embedded = 0.580 af x 40.0% Voids
#2A	129.25'	0.751 af	**retain_it 2.0'** x 300 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 389.4 cf perimeter wall
		0.982 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=1.16 cfs @ 10.60 hrs HW=128.79' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.16 cfs)

Pond 2P: ReTain-It 1 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 389.4 cf perimeter wall

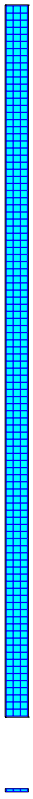
100 Chambers/Row x 8.00' Long = 800.00' Row Length +12.0" End Stone x 2 = 802.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 100 x 2 + 1.9 cf Endwall x 3 x 2 = 389.4 cf Perimeter Wall
300 Chambers x 110.3 cf - 389.4 cf Perimeter wall = 32,694.5 cf Chamber Storage
300 Chambers x 170.7 cf = 51,200.0 cf Displacement

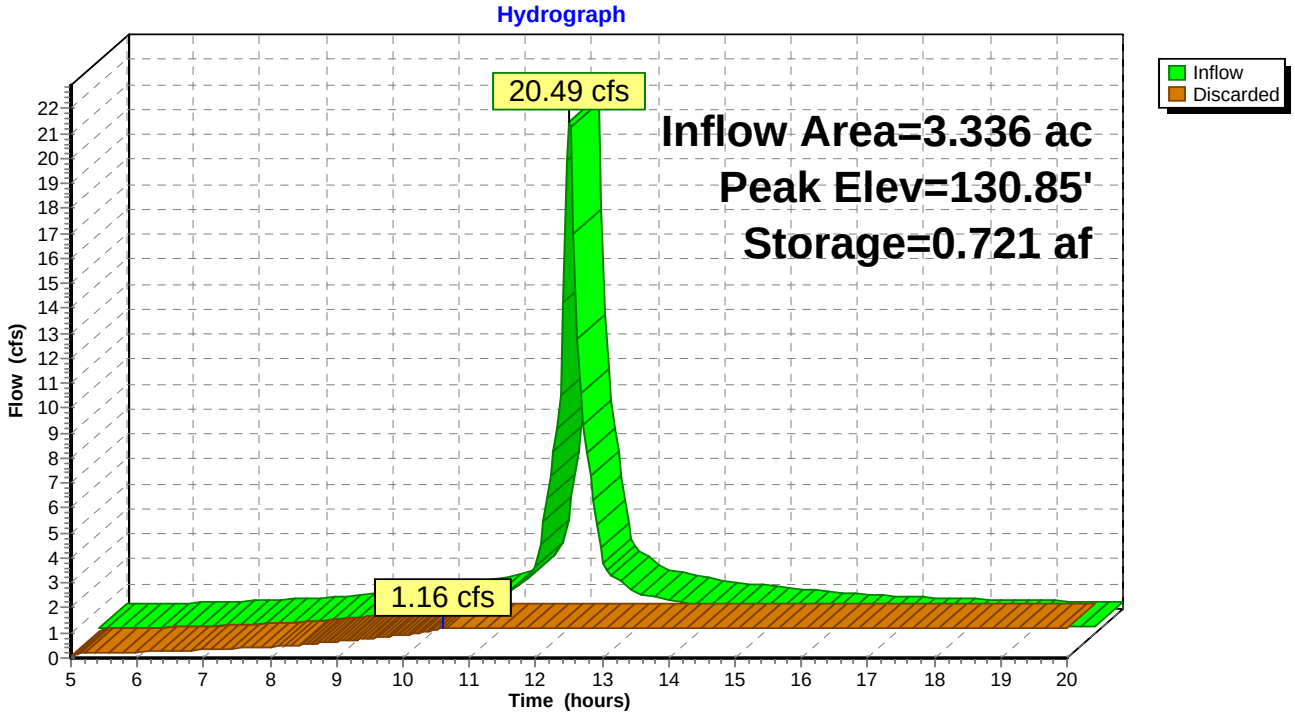
76,457.3 cf Field - 51,200.0 cf Chambers = 25,257.3 cf Stone x 40.0% Voids = 10,102.9 cf Stone Storage

Chamber Storage + Stone Storage = 42,797.5 cf = 0.982 af
Overall Storage Efficiency = 56.0%
Overall System Size = 802.00' x 26.00' x 3.67'

300 Chambers
2,831.8 cy Field
935.5 cy Stone



Pond 2P: ReTain-It 1



Summary for Pond 3P: Porous Asphalt

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.614 ac, 88.89% Impervious, Inflow Depth > 5.44" for 100-yr event
Inflow = 9.86 cfs @ 12.09 hrs, Volume= 0.732 af
Outflow = 0.24 cfs @ 9.00 hrs, Volume= 0.254 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.24 cfs @ 9.00 hrs, Volume= 0.254 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 128.39' @ 16.79 hrs Surf.Area= 60,636 sf Storage= 21,564 cf

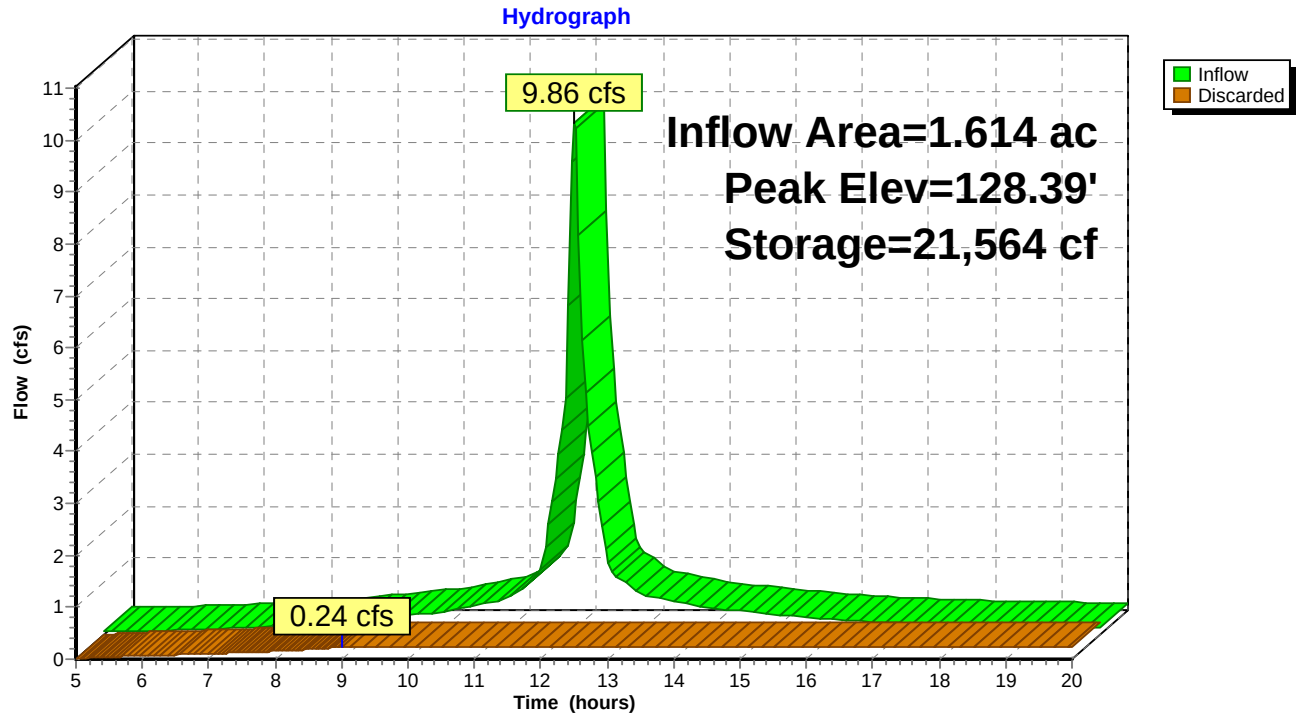
Plug-Flow detention time= 184.7 min calculated for 0.253 af (35% of inflow)
Center-of-Mass det. time= 64.5 min (810.8 - 746.2)

Volume	Invert	Avail.Storage	Storage Description
#1	127.50'	48,509 cf	**186.00'W x 326.00'L x 2.00'H Prismatoid** 121,272 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.50'	**0.170 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 9.00 hrs HW=127.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.24 cfs)

Pond 3P: Porous Asphalt



Summary for Pond 4P: RainGarden1

Inflow Area = 0.431 ac, 67.26% Impervious, Inflow Depth > 4.70" for 100-yr event
Inflow = 2.39 cfs @ 12.09 hrs, Volume= 0.169 af
Outflow = 2.32 cfs @ 12.11 hrs, Volume= 0.154 af, Atten= 3%, Lag= 1.3 min
Discarded = 0.01 cfs @ 12.11 hrs, Volume= 0.007 af
Primary = 2.31 cfs @ 12.11 hrs, Volume= 0.146 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 132.48' @ 12.11 hrs Surf.Area= 1,173 sf Storage= 916 cf

Plug-Flow detention time= 52.3 min calculated for 0.153 af (91% of inflow)
Center-of-Mass det. time= 21.9 min (785.6 - 763.8)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,253 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

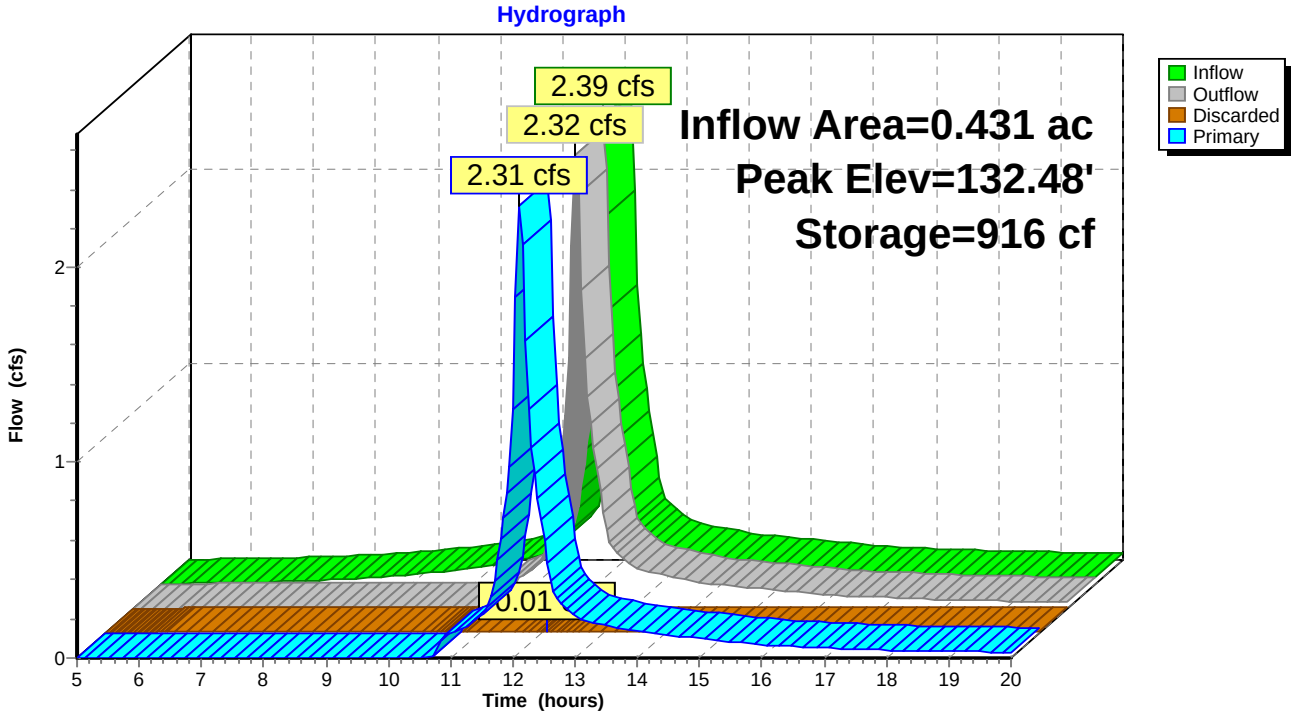
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	853	0.0	0	0
132.00	853	20.0	427	427
132.75	1,350	100.0	826	1,253

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	131.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 131.00' / 130.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	132.25'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.11 hrs HW=132.48' (Free Discharge)
↑**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=2.26 cfs @ 12.11 hrs HW=132.48' (Free Discharge)
↑**2=Culvert** (Passes 2.26 cfs of 6.60 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 2.26 cfs @ 1.57 fps)

Pond 4P: RainGarden1



Summary for Pond 5P: RainGarden2

Inflow Area = 0.425 ac, 68.09% Impervious, Inflow Depth > 4.70" for 100-yr event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 0.167 af
Outflow = 2.34 cfs @ 12.10 hrs, Volume= 0.153 af, Atten= 1%, Lag= 0.9 min
Discarded = 0.01 cfs @ 12.10 hrs, Volume= 0.007 af
Primary = 2.33 cfs @ 12.10 hrs, Volume= 0.146 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 132.01' @ 12.10 hrs Surf.Area= 1,009 sf Storage= 753 cf

Plug-Flow detention time= 47.5 min calculated for 0.153 af (92% of inflow)
Center-of-Mass det. time= 19.8 min (783.5 - 763.8)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,309 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

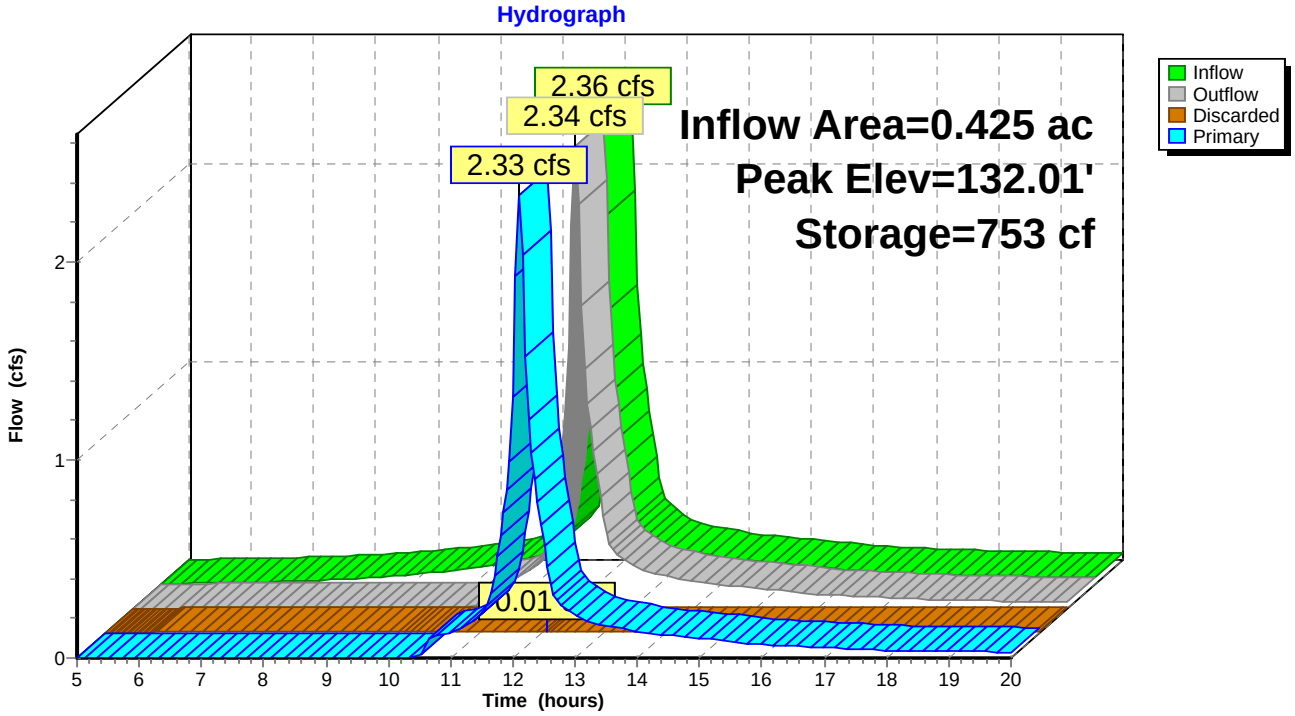
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	759	0.0	0	0
131.50	759	20.0	304	304
132.50	1,251	100.0	1,005	1,309

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.50'	**12.0" Round Culvert X 3.00** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.50' / 130.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.83'	**12.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.10 hrs HW=132.01' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=2.30 cfs @ 12.10 hrs HW=132.01' (Free Discharge)
↑└**2=Culvert** (Passes 2.30 cfs of 10.05 cfs potential flow)
↑└**3=Orifice/Grate** (Weir Controls 2.30 cfs @ 1.38 fps)

Pond 5P: RainGarden2



Summary for Pond 6P: RainGarden3

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.166 ac, 76.71% Impervious, Inflow Depth > 5.03" for 100-yr event
Inflow = 0.96 cfs @ 12.09 hrs, Volume= 0.069 af
Outflow = 0.95 cfs @ 12.10 hrs, Volume= 0.062 af, Atten= 1%, Lag= 0.9 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 0.004 af
Primary = 0.95 cfs @ 12.10 hrs, Volume= 0.059 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.46' @ 12.10 hrs Surf.Area= 579 sf Storage= 370 cf

Plug-Flow detention time= 57.9 min calculated for 0.062 af (90% of inflow)
Center-of-Mass det. time= 24.5 min (780.9 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	748 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

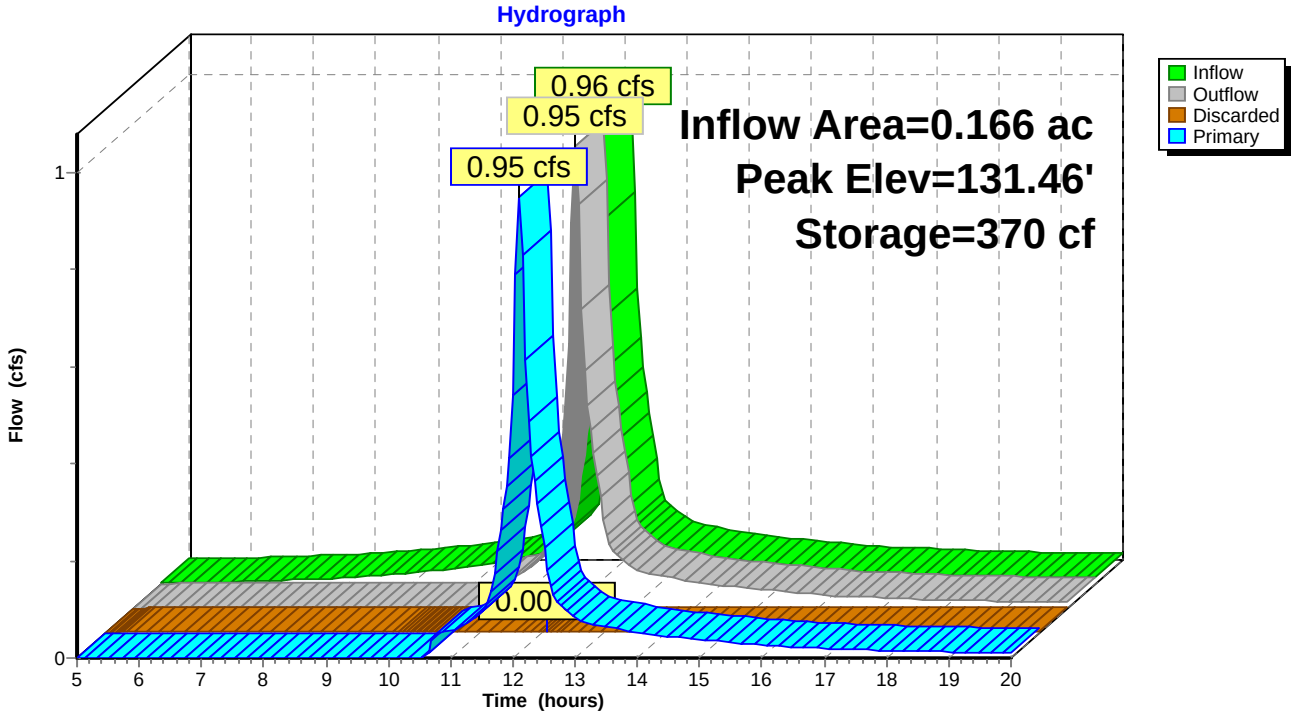
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	377	0.0	0	0
131.00	377	20.0	151	151
132.00	817	100.0	597	748

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.10 hrs HW=131.46' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.94 cfs @ 12.10 hrs HW=131.46' (Free Discharge)
↑**2=Culvert** (Passes 0.94 cfs of 6.53 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 0.94 cfs @ 1.17 fps)

Pond 6P: RainGarden3



Summary for Pond 7P: RainGarden4

[82] Warning: Early inflow requires earlier time span

Inflow Area = 0.147 ac, 83.69% Impervious, Inflow Depth > 5.34" for 100-yr event
Inflow = 0.89 cfs @ 12.09 hrs, Volume= 0.065 af
Outflow = 0.87 cfs @ 12.11 hrs, Volume= 0.057 af, Atten= 2%, Lag= 1.1 min
Discarded = 0.00 cfs @ 12.11 hrs, Volume= 0.004 af
Primary = 0.87 cfs @ 12.11 hrs, Volume= 0.053 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 131.45' @ 12.11 hrs Surf.Area= 684 sf Storage= 438 cf

Plug-Flow detention time= 70.0 min calculated for 0.057 af (87% of inflow)
Center-of-Mass det. time= 30.7 min (779.5 - 748.8)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	890 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

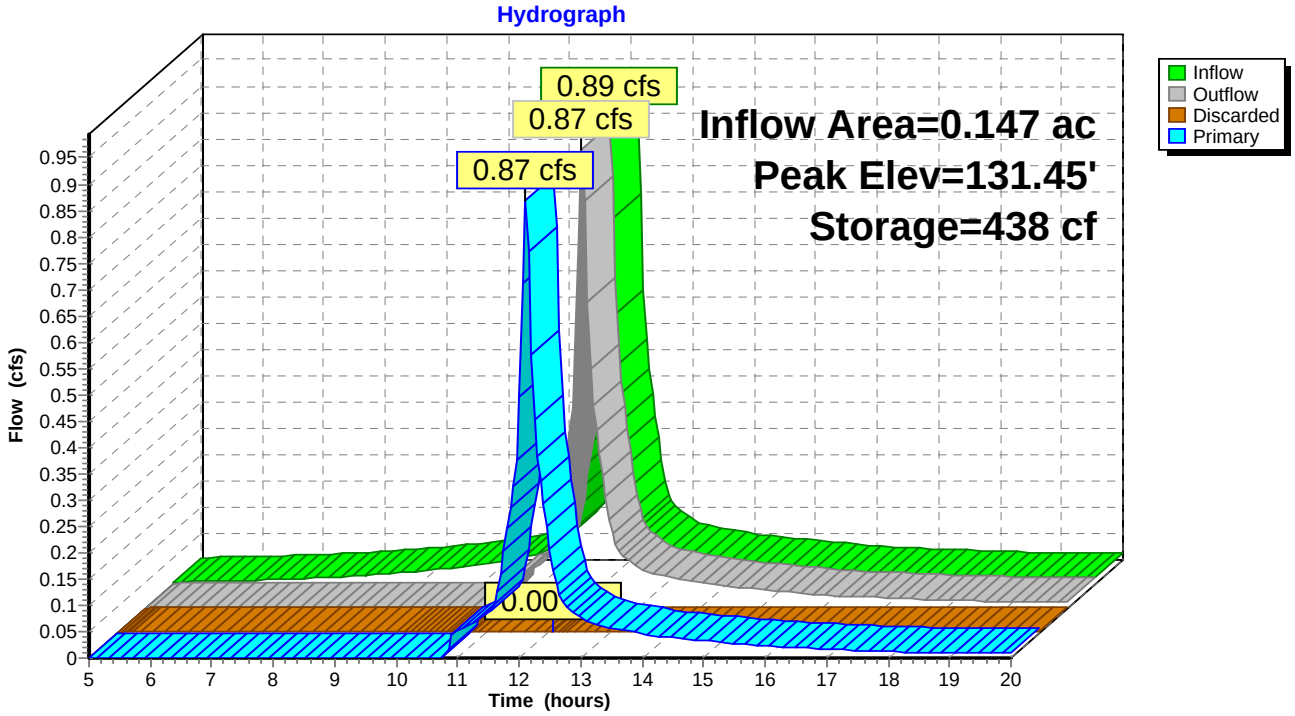
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	453	0.0	0	0
131.00	453	20.0	181	181
132.00	965	100.0	709	890

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.11 hrs HW=131.45' (Free Discharge)
↑**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.85 cfs @ 12.11 hrs HW=131.45' (Free Discharge)
↑**2=Culvert** (Passes 0.85 cfs of 6.50 cfs potential flow)
↑**3=Orifice/Grate** (Weir Controls 0.85 cfs @ 1.13 fps)

Pond 7P: RainGarden4



Summary for Pond 8P: ReTain-It 2

[79] Warning: Submerged Pond 4P Primary device # 2 OUTLET by 0.14'
[79] Warning: Submerged Pond 5P Primary device # 2 INLET by 0.14'
[79] Warning: Submerged Pond 6P Primary device # 2 INLET by 0.64'
[79] Warning: Submerged Pond 7P Primary device # 2 INLET by 0.64'

Inflow Area = 1.169 ac, 70.96% Impervious, Inflow Depth > 4.15" for 100-yr event
Inflow = 6.46 cfs @ 12.11 hrs, Volume= 0.404 af
Outflow = 0.40 cfs @ 11.20 hrs, Volume= 0.302 af, Atten= 94%, Lag= 0.0 min
Discarded = 0.40 cfs @ 11.20 hrs, Volume= 0.302 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 130.64' @ 13.82 hrs Surf.Area= 0.164 ac Storage= 0.217 af

Plug-Flow detention time= 197.3 min calculated for 0.302 af (75% of inflow)
Center-of-Mass det. time= 142.7 min (926.0 - 783.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.080 af	**26.00'W x 274.00'L x 3.67'H Field A** 0.600 af Overall - 0.400 af Embedded = 0.200 af x 40.0% Voids
#2A	129.25'	0.255 af	**retain_it 2.0'** x 102 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 139.9 cf perimeter wall
		0.335 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.40 cfs @ 11.20 hrs HW=128.79' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Pond 8P: ReTain-It 2 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 139.9 cf perimeter wall

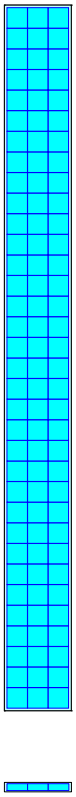
34 Chambers/Row x 8.00' Long = 272.00' Row Length +12.0" End Stone x 2 = 274.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 34 x 2 + 1.9 cf Endwall x 3 x 2 = 139.9 cf Perimeter Wall
102 Chambers x 110.3 cf - 139.9 cf Perimeter wall = 11,108.7 cf Chamber Storage
102 Chambers x 170.7 cf = 17,408.0 cf Displacement

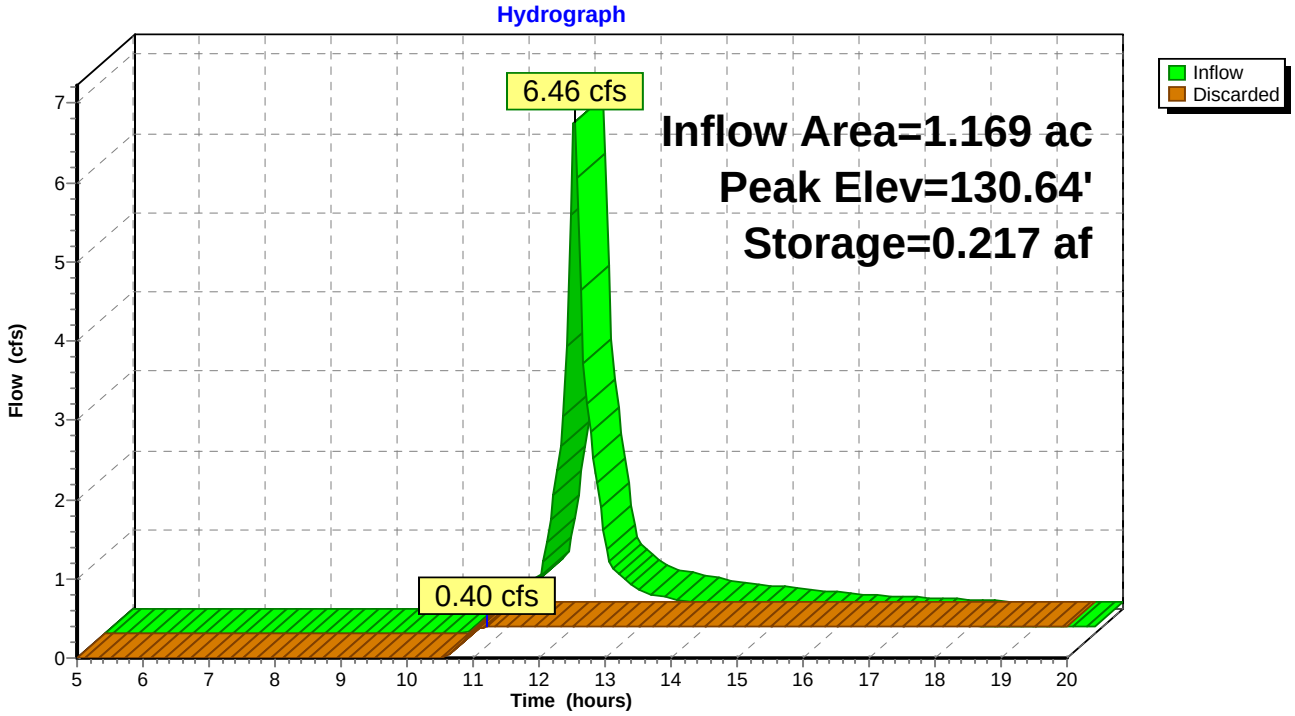
26,121.3 cf Field - 17,408.0 cf Chambers = 8,713.3 cf Stone x 40.0% Voids = 3,485.3 cf Stone Storage

Chamber Storage + Stone Storage = 14,594.0 cf = 0.335 af
Overall Storage Efficiency = 55.9%
Overall System Size = 274.00' x 26.00' x 3.67'

102 Chambers
967.5 cy Field
322.7 cy Stone



Pond 8P: ReTain-It 2



Summary for Pond 10P: ReTain-It (flood storage)

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

Volume	Invert	Avail.Storage	Storage Description
#1A	127.58'	0.057 af	**18.00'W x 250.00'L x 4.17'H Field A** 0.430 af Overall - 0.288 af Embedded = 0.142 af x 40.0% Voids
#2A	128.08'	0.195 af	**retain_it 2.5'** x 62 Inside #1 Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf 2 Rows adjusted for 217.8 cf perimeter wall
		0.252 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.58'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Pond 10P: ReTain-It (flood storage) - Chamber Wizard Field A

Chamber Model = retain_it 2.5' (retain-it® 2.5' tall)
Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf
Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf
2 Rows adjusted for 217.8 cf perimeter wall

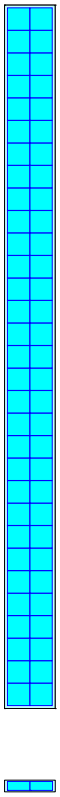
31 Chambers/Row x 8.00' Long = 248.00' Row Length +12.0" End Stone x 2 = 250.00' Base Length
2 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Base + 38.0" Chamber Height + 6.0" Cover = 4.17' Field Height

3.3 cf Sidewall x 31 x 2 + 3.3 cf Endwall x 2 x 2 = 217.8 cf Perimeter Wall
62 Chambers x 140.4 cf - 217.8 cf Perimeter wall = 8,489.5 cf Chamber Storage
62 Chambers x 202.7 cf = 12,565.3 cf Displacement

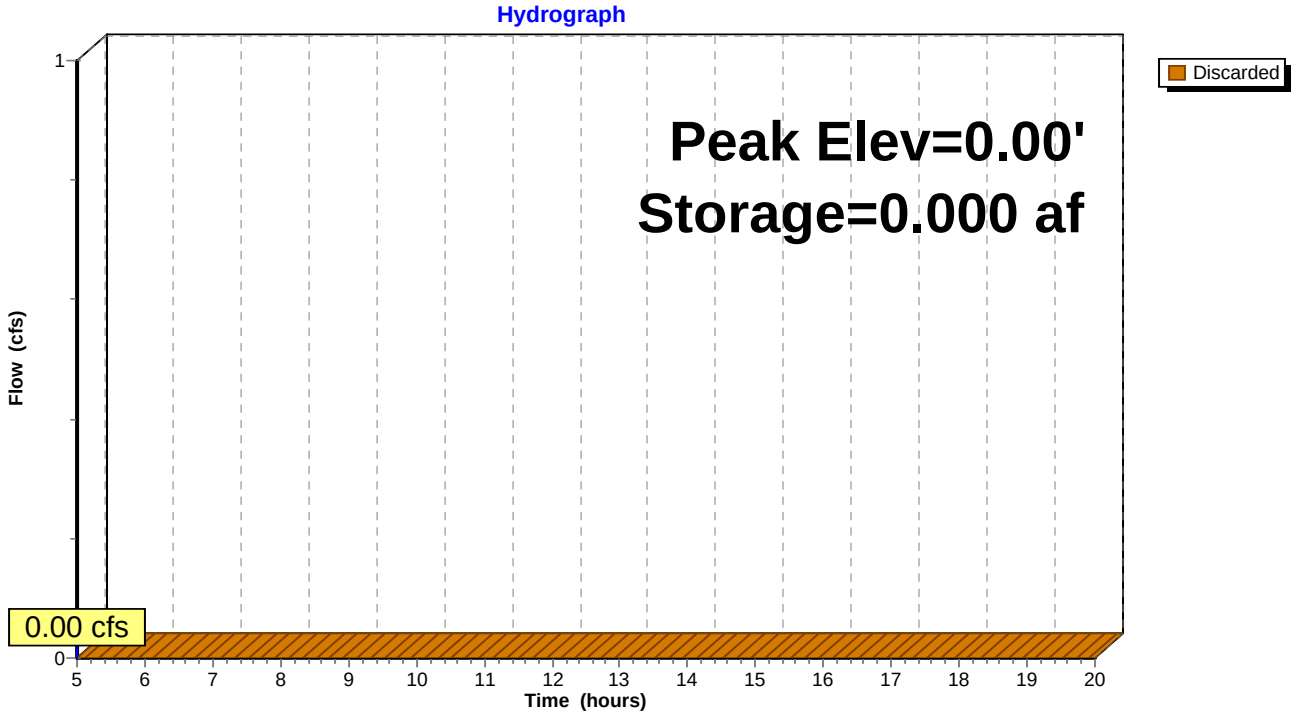
18,750.0 cf Field - 12,565.3 cf Chambers = 6,184.7 cf Stone x 40.0% Voids = 2,473.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,963.4 cf = 0.252 af
Overall Storage Efficiency = 58.5%
Overall System Size = 250.00' x 18.00' x 4.17'

62 Chambers
694.4 cy Field
229.1 cy Stone



Pond 10P: ReTain-It (flood storage)



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 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: Catch 1S Runoff Area=125,792 sf 6.55% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Catch 2S Runoff Area=101,357 sf 100.00% Impervious Runoff Depth>0.56"
Tc=6.0 min CN=98 Runoff=1.55 cfs 0.110 af

Subcatchment 3S: Catch 3S Runoff Area=43,980 sf 74.88% Impervious Runoff Depth>0.13"
Tc=6.0 min CN=88 Runoff=0.13 cfs 0.011 af

Subcatchment 4S: Catch 4S Runoff Area=18,792 sf 67.26% Impervious Runoff Depth>0.09"
Tc=6.0 min CN=86 Runoff=0.03 cfs 0.003 af

Subcatchment 5S: Catch 5S Runoff Area=18,526 sf 68.09% Impervious Runoff Depth>0.09"
Tc=6.0 min CN=86 Runoff=0.03 cfs 0.003 af

Subcatchment 6S: Catch 6S Runoff Area=7,212 sf 76.71% Impervious Runoff Depth>0.15"
Tc=6.0 min CN=89 Runoff=0.03 cfs 0.002 af

Subcatchment 7S: Catch 7S Runoff Area=6,407 sf 83.69% Impervious Runoff Depth>0.24"
Tc=6.0 min CN=92 Runoff=0.04 cfs 0.003 af

Subcatchment 8S: Catch 8S Runoff Area=1,257 sf 90.37% Impervious Runoff Depth>0.32"
Tc=6.0 min CN=94 Runoff=0.01 cfs 0.001 af

Subcatchment 9S: Catch 9S Runoff Area=70,326 sf 88.89% Impervious Runoff Depth>0.28"
Tc=6.0 min CN=93 Runoff=0.54 cfs 0.037 af

Pond 1P: Wetland Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond 2P: ReTain-It 1 Peak Elev=128.80' Storage=0.010 af Inflow=1.68 cfs 0.121 af
Outflow=1.16 cfs 0.120 af

Pond 3P: Porous Asphalt Peak Elev=127.52' Storage=427 cf Inflow=0.54 cfs 0.037 af
Outflow=0.21 cfs 0.037 af

Pond 4P: RainGarden1 Peak Elev=129.76' Storage=45 cf Inflow=0.03 cfs 0.003 af
Discarded=0.01 cfs 0.003 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.003 af

Pond 5P: RainGarden2 Peak Elev=129.82' Storage=48 cf Inflow=0.03 cfs 0.003 af
Discarded=0.00 cfs 0.003 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.003 af

Pond 6P: RainGarden3 Peak Elev=129.54' Storage=41 cf Inflow=0.03 cfs 0.002 af
Discarded=0.00 cfs 0.002 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.002 af

Pond 7P: RainGarden4 Peak Elev=129.71' Storage=64 cf Inflow=0.04 cfs 0.003 af
Discarded=0.00 cfs 0.002 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.002 af

Pond 8P: ReTain-It 2 Peak Elev=128.75' Storage=0.000 af Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 10P: ReTain-It (flood storage) Peak Elev=0.00' Storage=0.000 af
Discarded=0.00 cfs 0.000 af

Total Runoff Area = 9.037 ac Runoff Volume = 0.170 af Average Runoff Depth = 0.23"
38.44% Pervious = 3.474 ac 61.56% Impervious = 5.563 ac

Summary for Subcatchment 1S: Catch 1S

[45] Hint: Runoff=Zero

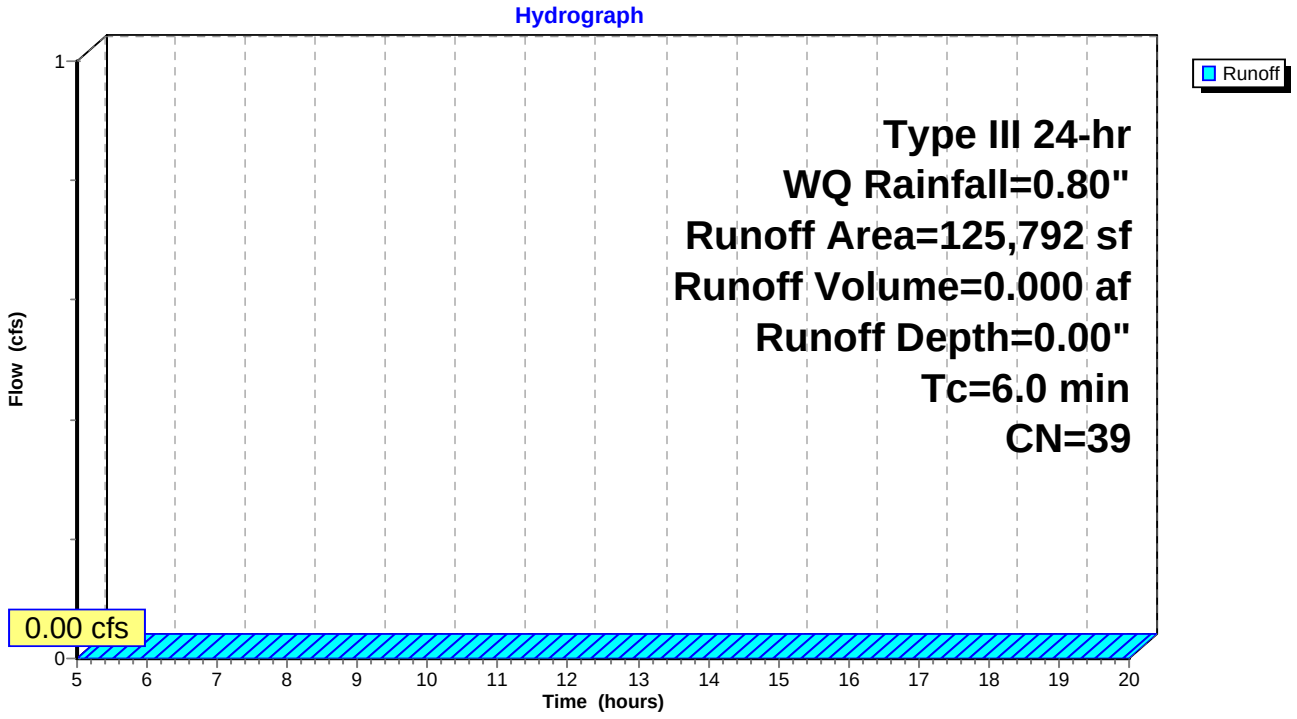
Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

	Area (sf)	CN	Description
	89,852	30	Woods, Good, HSG A
	6,395	83	Woods, Poor, HSG D
	20,867	39	>75% Grass cover, Good, HSG A
	440	61	>75% Grass cover, Good, HSG B
*	3,073	98	Roofs (off-site), HSG A
	5,144	98	Paved parking, HSG A
	21	98	Paved parking, HSG B
	125,792	39	Weighted Average
	117,554		93.45% Pervious Area
	8,238		6.55% Impervious Area

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

Subcatchment 1S: Catch 1S



Summary for Subcatchment 2S: Catch 2S

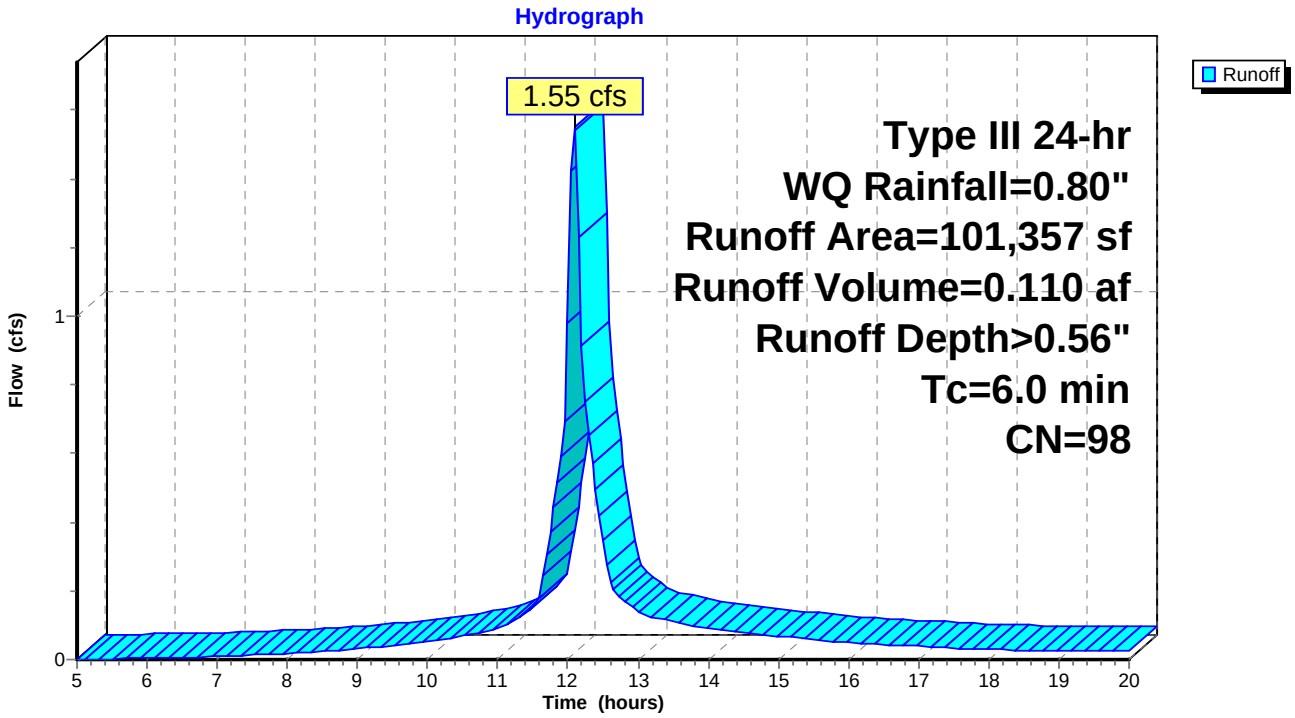
Runoff = 1.55 cfs @ 12.09 hrs, Volume= 0.110 af, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
24,408	98	Roofs, HSG A
76,949	98	Roofs, HSG B
101,357	98	Weighted Average
101,357		100.00% Impervious Area

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

Subcatchment 2S: Catch 2S



Summary for Subcatchment 3S: Catch 3S

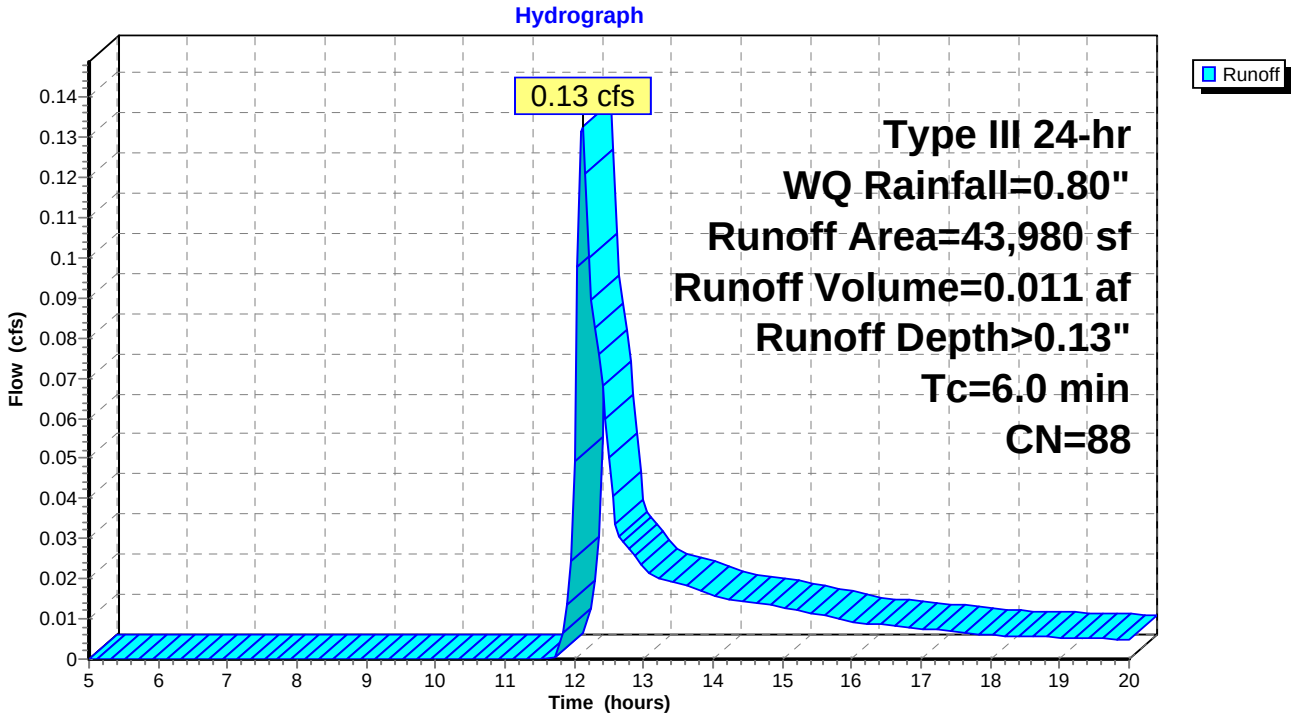
Runoff = 0.13 cfs @ 12.11 hrs, Volume= 0.011 af, Depth> 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
551	39	>75% Grass cover, Good, HSG A
10,497	61	>75% Grass cover, Good, HSG B
2,432	98	Paved parking, HSG A
30,500	98	Paved parking, HSG B
43,980	88	Weighted Average
11,048		25.12% Pervious Area
32,932		74.88% Impervious Area

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

Subcatchment 3S: Catch 3S



Summary for Subcatchment 4S: Catch 4S

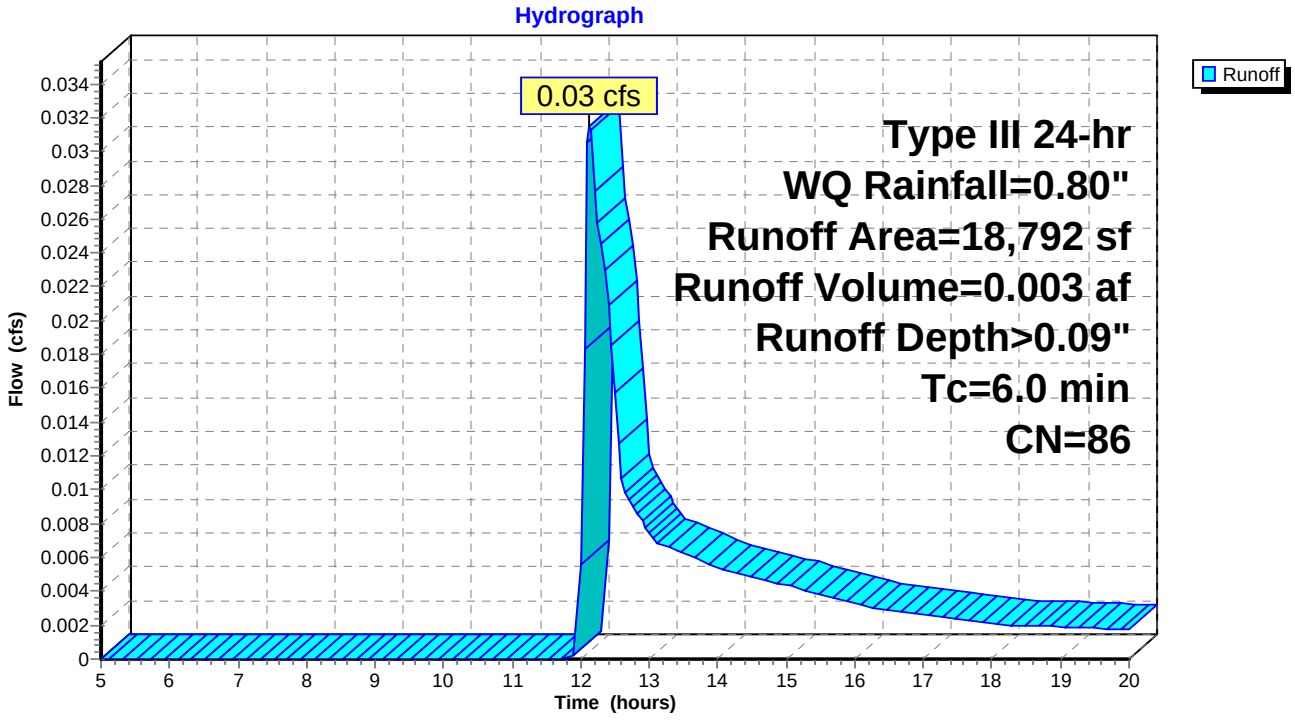
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.003 af, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
6,153	61	>75% Grass cover, Good, HSG B
12,639	98	Paved parking, HSG B
18,792	86	Weighted Average
6,153		32.74% Pervious Area
12,639		67.26% Impervious Area

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

Subcatchment 4S: Catch 4S



Summary for Subcatchment 5S: Catch 5S

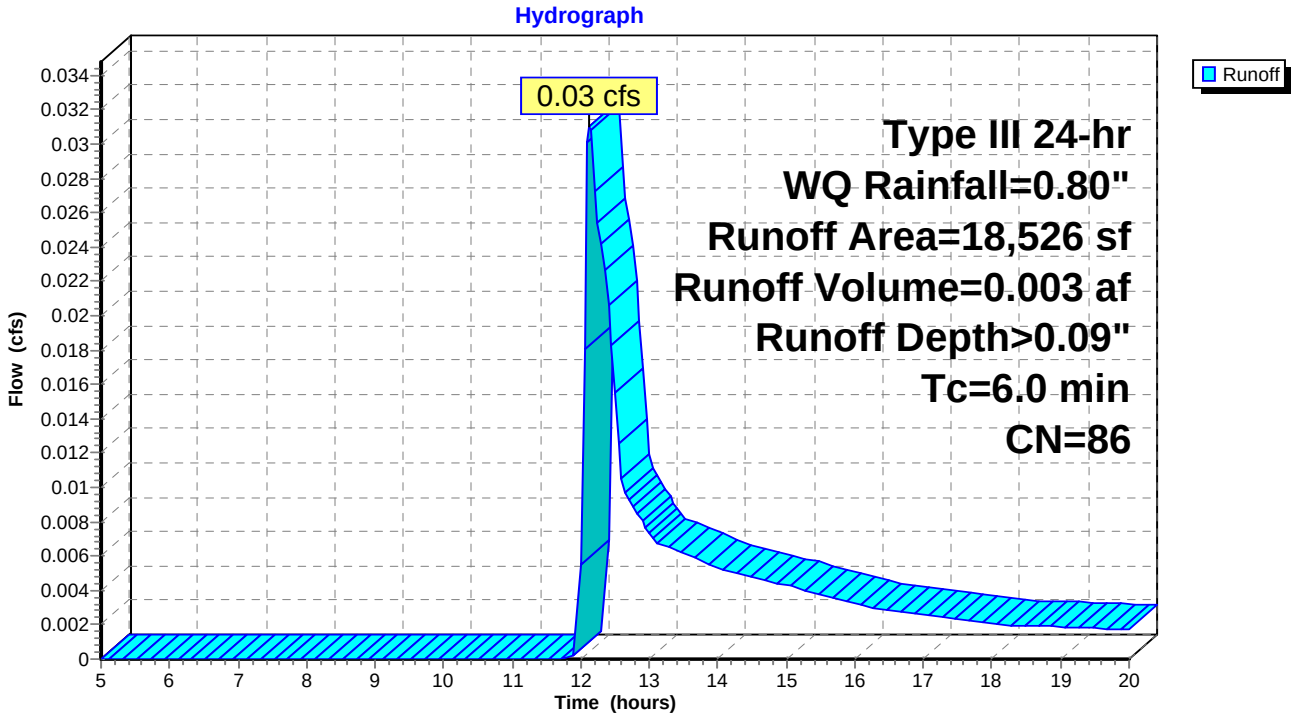
Runoff = 0.03 cfs @ 12.13 hrs, Volume= 0.003 af, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
87	39	>75% Grass cover, Good, HSG A
5,825	61	>75% Grass cover, Good, HSG B
42	98	Paved parking, HSG A
12,572	98	Paved parking, HSG B
18,526	86	Weighted Average
5,912		31.91% Pervious Area
12,614		68.09% Impervious Area

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

Subcatchment 5S: Catch 5S



Summary for Subcatchment 6S: Catch 6S

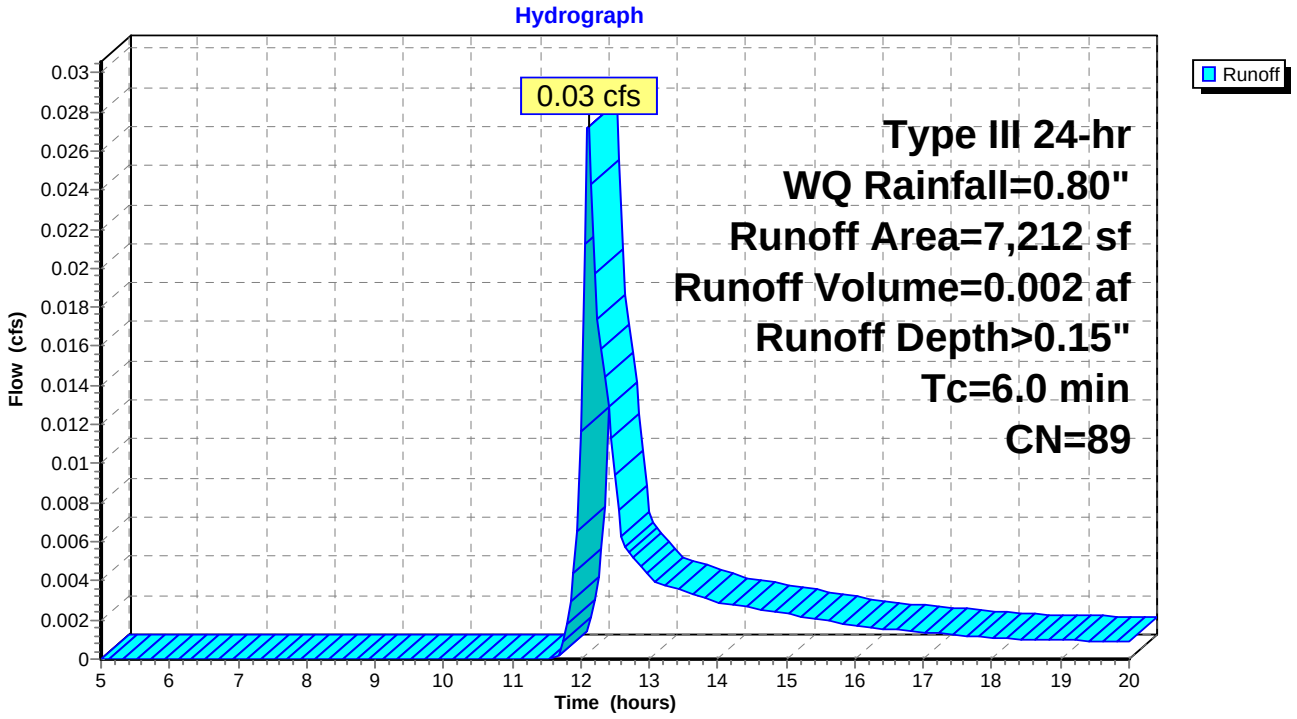
Runoff = 0.03 cfs @ 12.11 hrs, Volume= 0.002 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
106	39	>75% Grass cover, Good, HSG A
1,574	61	>75% Grass cover, Good, HSG B
1,400	98	Paved parking, HSG A
4,132	98	Paved parking, HSG B
7,212	89	Weighted Average
1,680		23.29% Pervious Area
5,532		76.71% Impervious Area

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

Subcatchment 6S: Catch 6S



Summary for Subcatchment 7S: Catch 7S

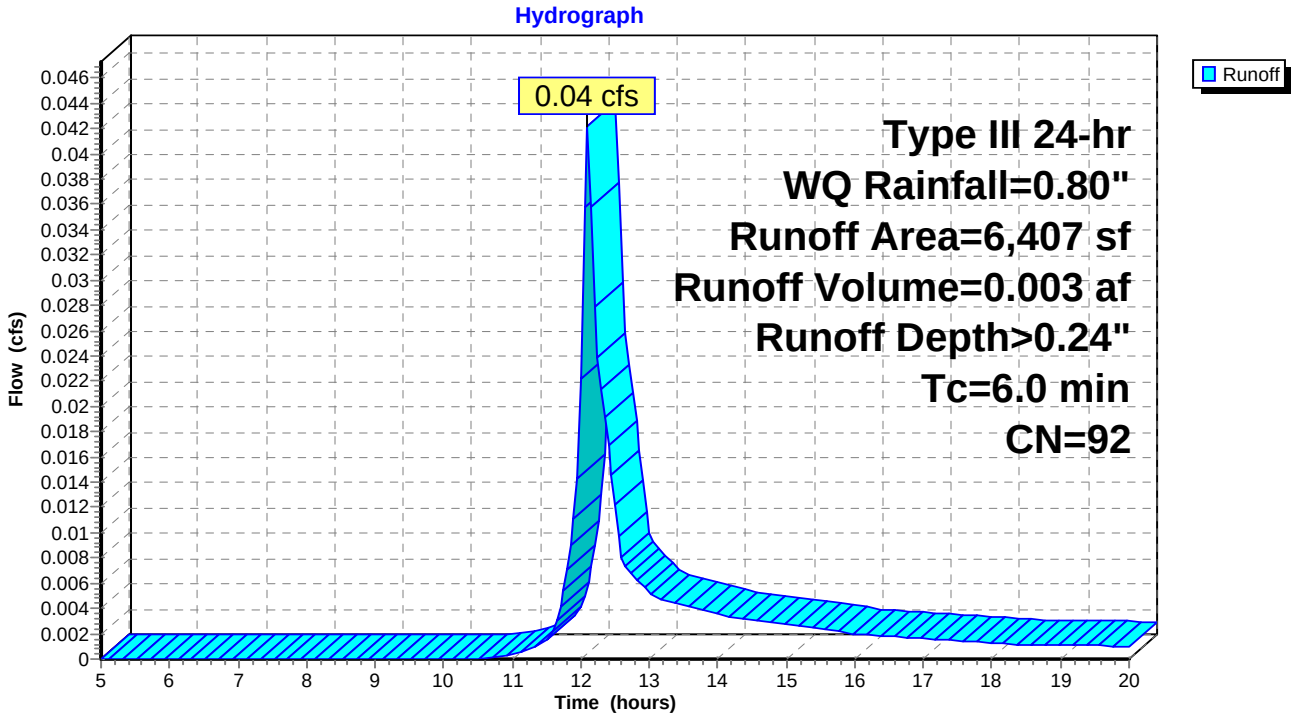
Runoff = 0.04 cfs @ 12.10 hrs, Volume= 0.003 af, Depth> 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
1,045	61	>75% Grass cover, Good, HSG B
5,362	98	Paved parking, HSG B
6,407	92	Weighted Average
1,045		16.31% Pervious Area
5,362		83.69% Impervious Area

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

Subcatchment 7S: Catch 7S



Summary for Subcatchment 8S: Catch 8S

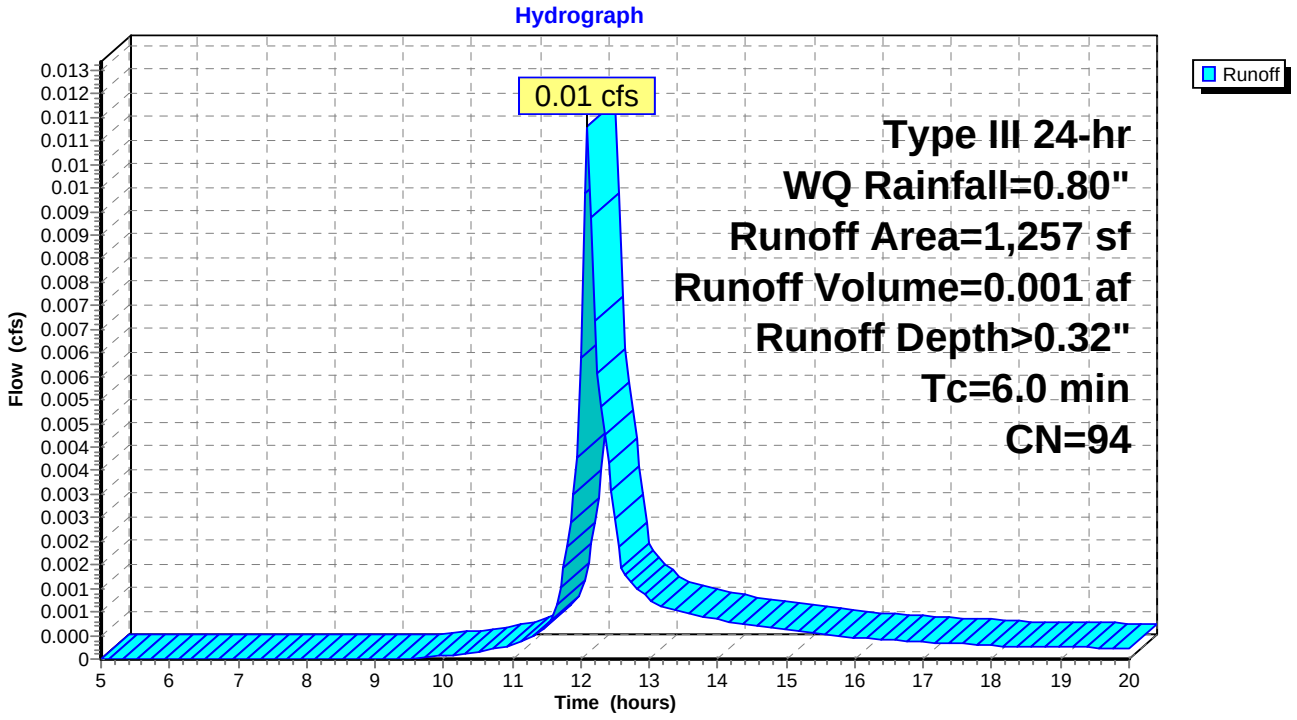
Runoff = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
121	61	>75% Grass cover, Good, HSG B
1,136	98	Paved parking, HSG B
1,257	94	Weighted Average
121		9.63% Pervious Area
1,136		90.37% Impervious Area

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

Subcatchment 8S: Catch 8S



Summary for Subcatchment 9S: Catch 9S

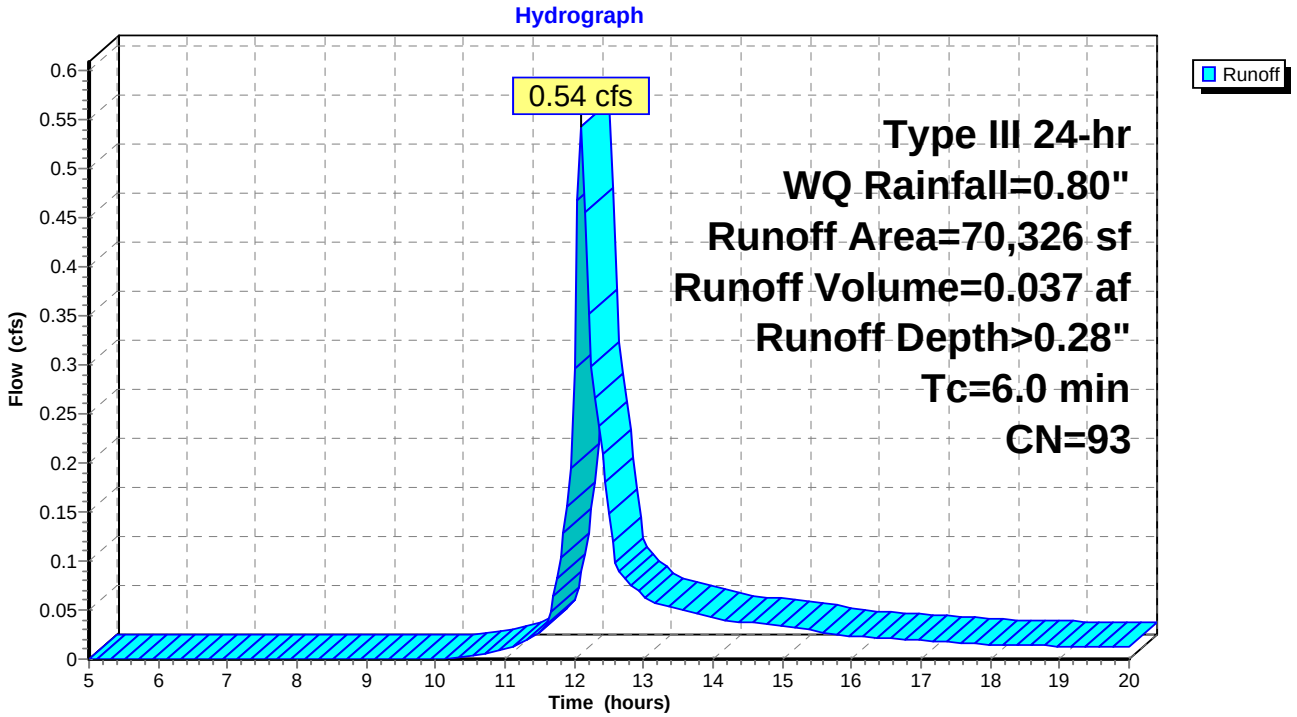
Runoff = 0.54 cfs @ 12.10 hrs, Volume= 0.037 af, Depth> 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Rainfall=0.80"

Area (sf)	CN	Description
3,430	39	>75% Grass cover, Good, HSG A
4,383	61	>75% Grass cover, Good, HSG B
19,865	98	Paved parking, HSG A
42,648	98	Paved parking, HSG B
70,326	93	Weighted Average
7,813		11.11% Pervious Area
62,513		88.89% Impervious Area

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

Subcatchment 9S: Catch 9S



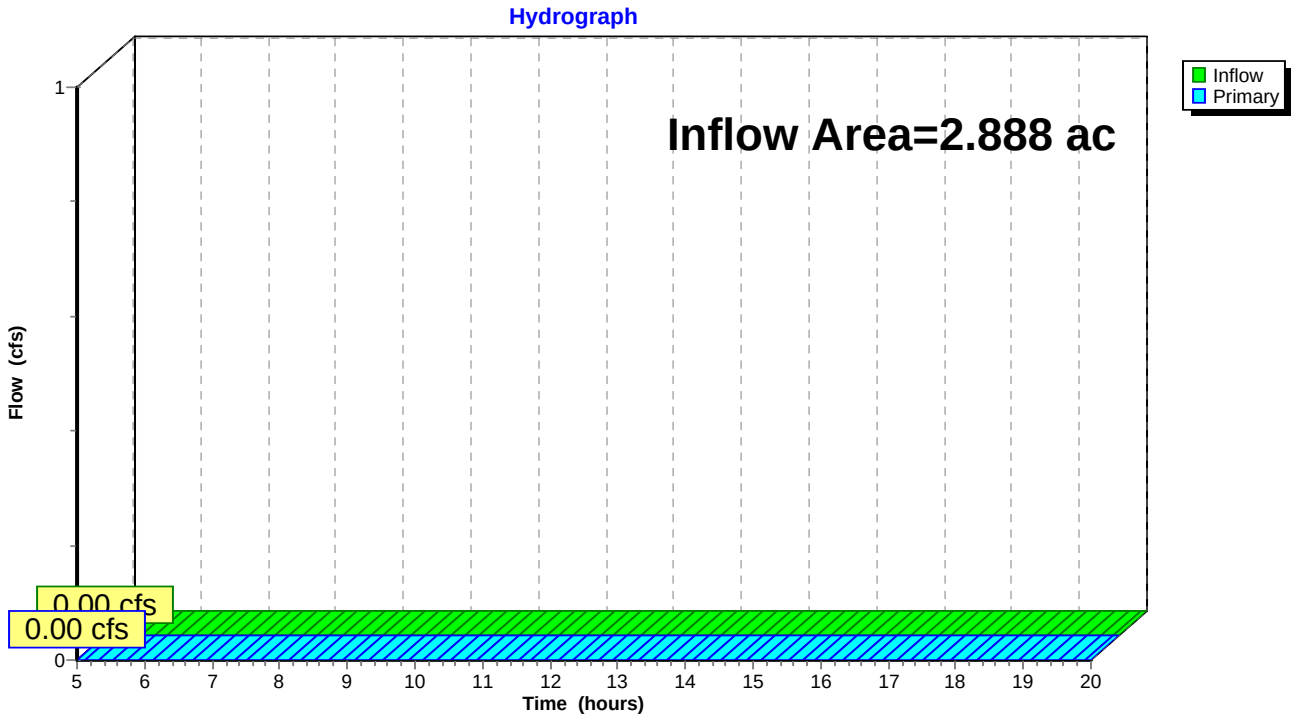
Summary for Pond 1P: Wetland

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

Inflow Area = 2.888 ac, 6.55% Impervious, Inflow Depth = 0.00" for WQ event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond 1P: Wetland



Summary for Pond 2P: ReTain-It 1

Inflow Area = 3.336 ac, 92.40% Impervious, Inflow Depth > 0.43" for WQ event
Inflow = 1.68 cfs @ 12.09 hrs, Volume= 0.121 af
Outflow = 1.16 cfs @ 12.10 hrs, Volume= 0.120 af, Atten= 31%, Lag= 0.5 min
Discarded = 1.16 cfs @ 12.10 hrs, Volume= 0.120 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 128.80' @ 12.18 hrs Surf.Area= 0.479 ac Storage= 0.010 af

Plug-Flow detention time= 4.6 min calculated for 0.120 af (100% of inflow)
Center-of-Mass det. time= 4.0 min (775.9 - 772.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.232 af	**26.00'W x 802.00'L x 3.67'H Field A** 1.755 af Overall - 1.175 af Embedded = 0.580 af x 40.0% Voids
#2A	129.25'	0.751 af	**retain_it 2.0'** x 300 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 389.4 cf perimeter wall
		0.982 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=1.16 cfs @ 12.10 hrs HW=128.79' (Free Discharge)
1=Exfiltration (Exfiltration Controls 1.16 cfs)

Pond 2P: ReTain-It 1 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 389.4 cf perimeter wall

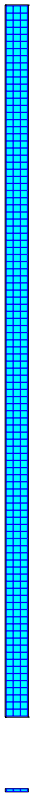
100 Chambers/Row x 8.00' Long = 800.00' Row Length +12.0" End Stone x 2 = 802.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 100 x 2 + 1.9 cf Endwall x 3 x 2 = 389.4 cf Perimeter Wall
300 Chambers x 110.3 cf - 389.4 cf Perimeter wall = 32,694.5 cf Chamber Storage
300 Chambers x 170.7 cf = 51,200.0 cf Displacement

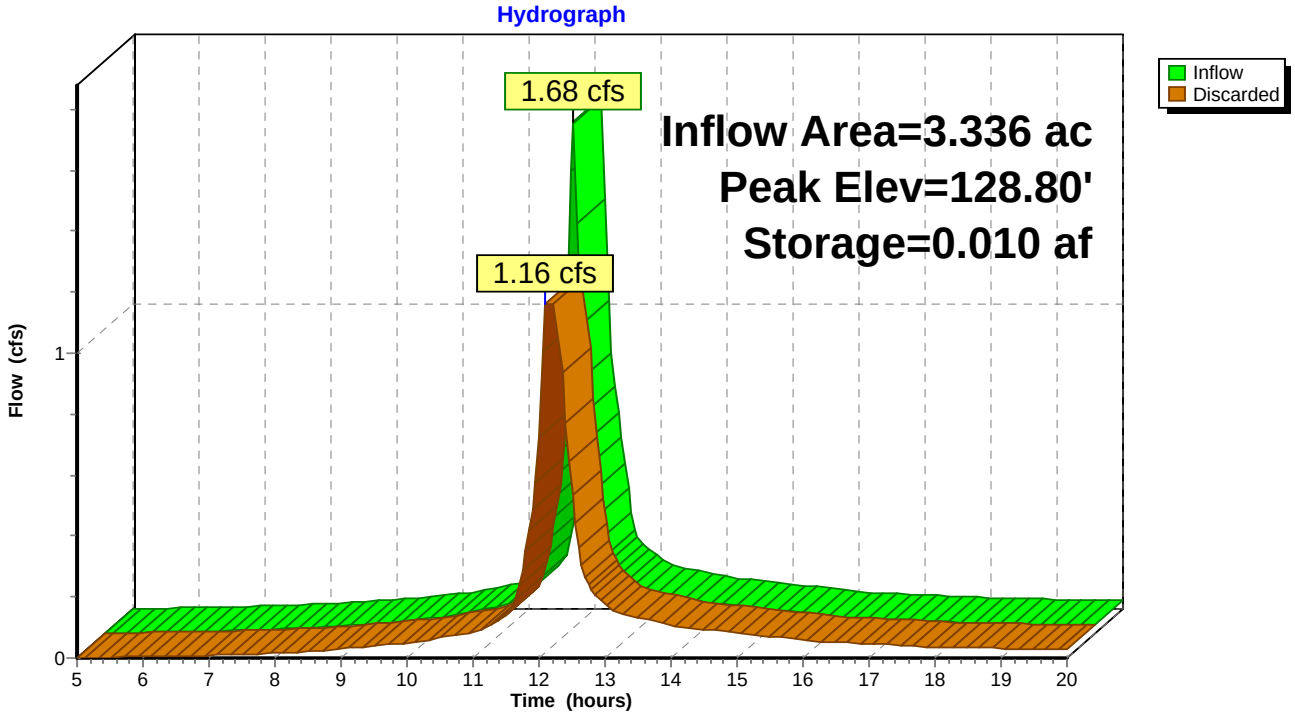
76,457.3 cf Field - 51,200.0 cf Chambers = 25,257.3 cf Stone x 40.0% Voids = 10,102.9 cf Stone Storage

Chamber Storage + Stone Storage = 42,797.5 cf = 0.982 af
Overall Storage Efficiency = 56.0%
Overall System Size = 802.00' x 26.00' x 3.67'

300 Chambers
2,831.8 cy Field
935.5 cy Stone



Pond 2P: ReTain-It 1



Summary for Pond 3P: Porous Asphalt

Inflow Area = 1.614 ac, 88.89% Impervious, Inflow Depth > 0.28" for WQ event
Inflow = 0.54 cfs @ 12.10 hrs, Volume= 0.037 af
Outflow = 0.21 cfs @ 12.40 hrs, Volume= 0.037 af, Atten= 61%, Lag= 18.1 min
Discarded = 0.21 cfs @ 12.40 hrs, Volume= 0.037 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 127.52' @ 12.40 hrs Surf.Area= 60,636 sf Storage= 427 cf

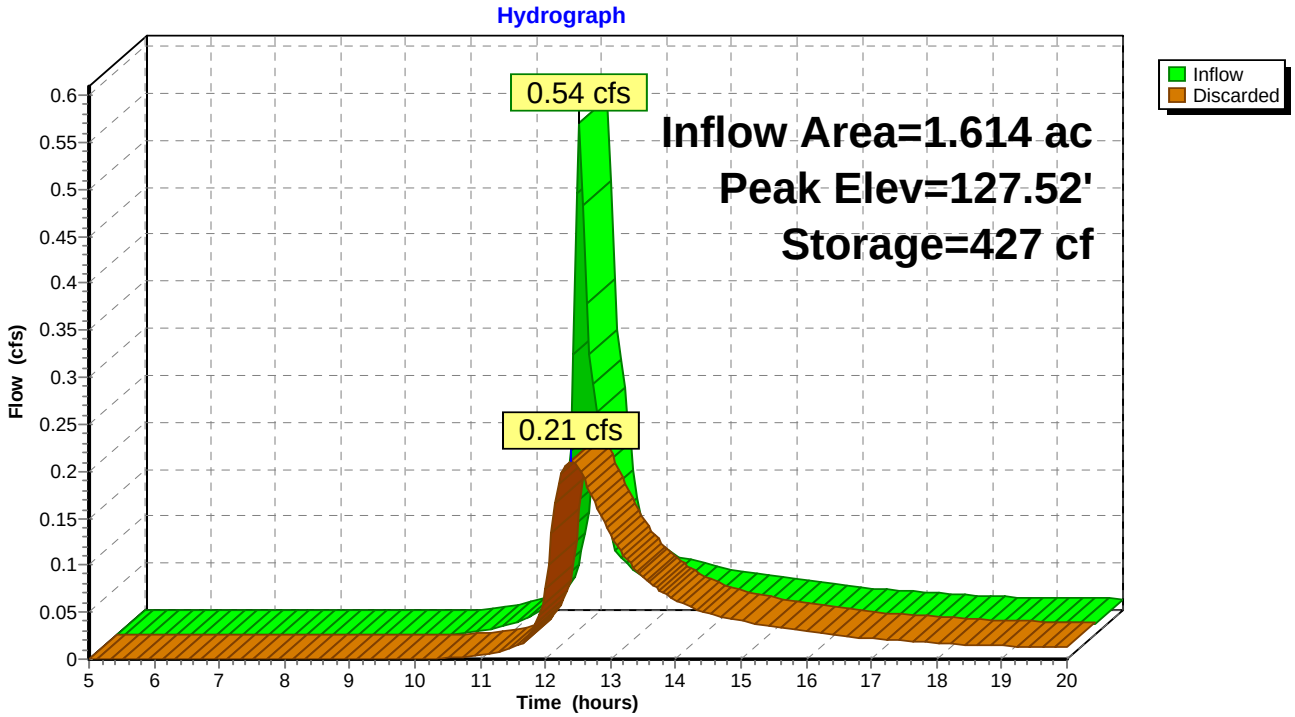
Plug-Flow detention time= 33.6 min calculated for 0.036 af (98% of inflow)
Center-of-Mass det. time= 27.6 min (839.0 - 811.4)

Volume	Invert	Avail.Storage	Storage Description
#1	127.50'	48,509 cf	**186.00'W x 326.00'L x 2.00'H Prismatoid** 121,272 cf Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.50'	**0.170 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.24 cfs @ 12.40 hrs HW=127.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.24 cfs)

Pond 3P: Porous Asphalt



Summary for Pond 4P: RainGarden1

Inflow Area = 0.431 ac, 67.26% Impervious, Inflow Depth > 0.09" for WQ event
Inflow = 0.03 cfs @ 12.13 hrs, Volume= 0.003 af
Outflow = 0.01 cfs @ 14.01 hrs, Volume= 0.003 af, Atten= 83%, Lag= 112.8 min
Discarded = 0.01 cfs @ 14.01 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.76' @ 14.01 hrs Surf.Area= 853 sf Storage= 45 cf

Plug-Flow detention time= 94.4 min calculated for 0.003 af (99% of inflow)
Center-of-Mass det. time= 89.9 min (948.6 - 858.7)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,253 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

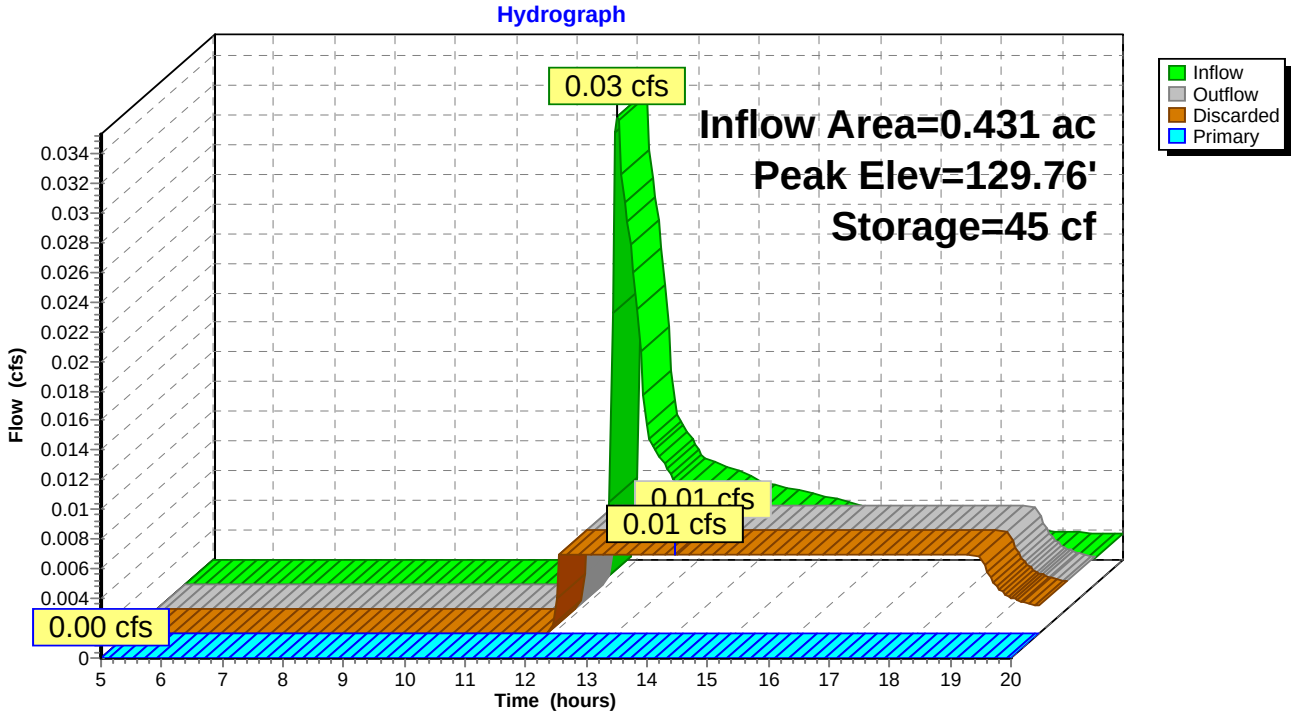
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	853	0.0	0	0
132.00	853	20.0	427	427
132.75	1,350	100.0	826	1,253

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	131.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 131.00' / 130.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	132.25'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 14.01 hrs HW=129.76' (Free Discharge)
└**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=129.50' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 4P: RainGarden1



Summary for Pond 5P: RainGarden2

Inflow Area = 0.425 ac, 68.09% Impervious, Inflow Depth > 0.09" for WQ event
Inflow = 0.03 cfs @ 12.13 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 14.53 hrs, Volume= 0.003 af, Atten= 85%, Lag= 143.9 min
Discarded = 0.00 cfs @ 14.53 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.82' @ 14.53 hrs Surf.Area= 759 sf Storage= 48 cf

Plug-Flow detention time= 120.3 min calculated for 0.003 af (95% of inflow)
Center-of-Mass det. time= 103.3 min (961.9 - 858.7)

Volume	Invert	Avail.Storage	Storage Description
#1	129.50'	1,309 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

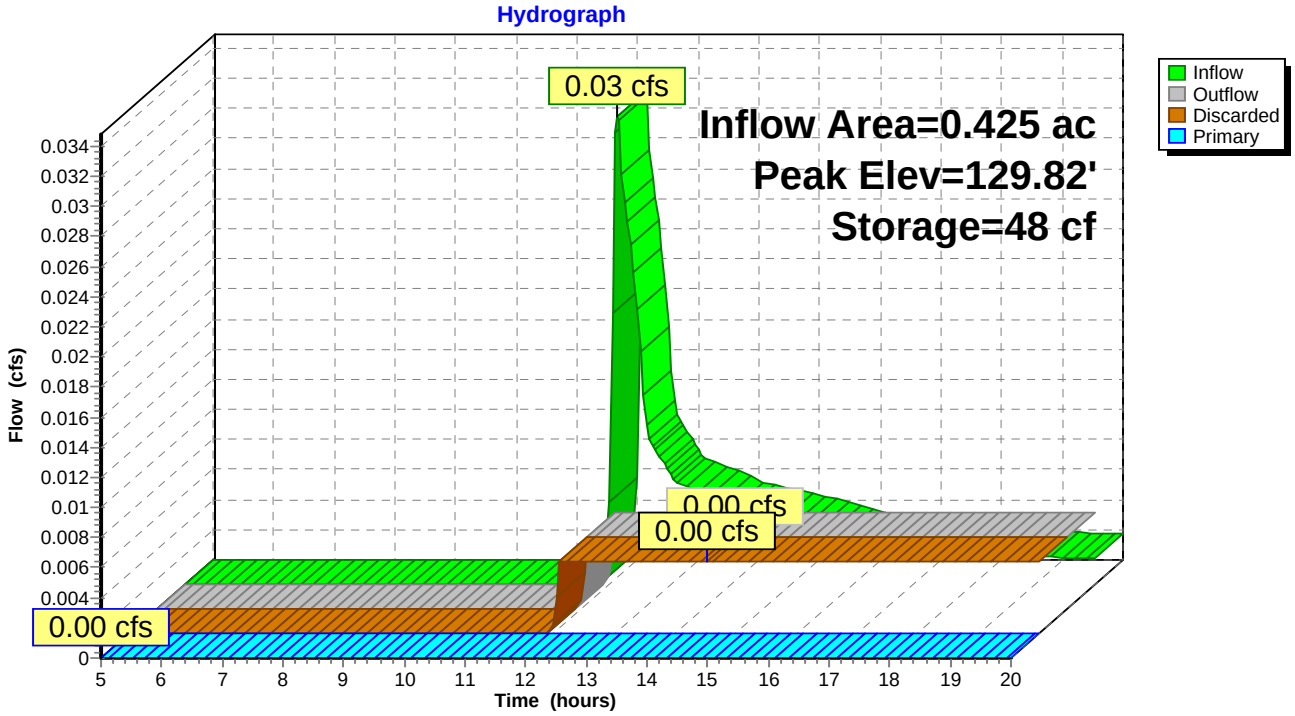
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.50	759	0.0	0	0
131.50	759	20.0	304	304
132.50	1,251	100.0	1,005	1,309

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.50'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.50'	**12.0" Round Culvert X 3.00** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.50' / 130.25' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.83'	**12.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 14.53 hrs HW=129.82' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=129.50' (Free Discharge)
↑└**2=Culvert** (Controls 0.00 cfs)
↑└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 5P: RainGarden2



Summary for Pond 6P: RainGarden3

Inflow Area = 0.166 ac, 76.71% Impervious, Inflow Depth > 0.15" for WQ event
Inflow = 0.03 cfs @ 12.11 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 14.93 hrs, Volume= 0.002 af, Atten= 91%, Lag= 169.5 min
Discarded = 0.00 cfs @ 14.93 hrs, Volume= 0.002 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.54' @ 14.93 hrs Surf.Area= 377 sf Storage= 41 cf

Plug-Flow detention time= 184.5 min calculated for 0.002 af (75% of inflow)
Center-of-Mass det. time= 120.3 min (957.2 - 836.9)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	748 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

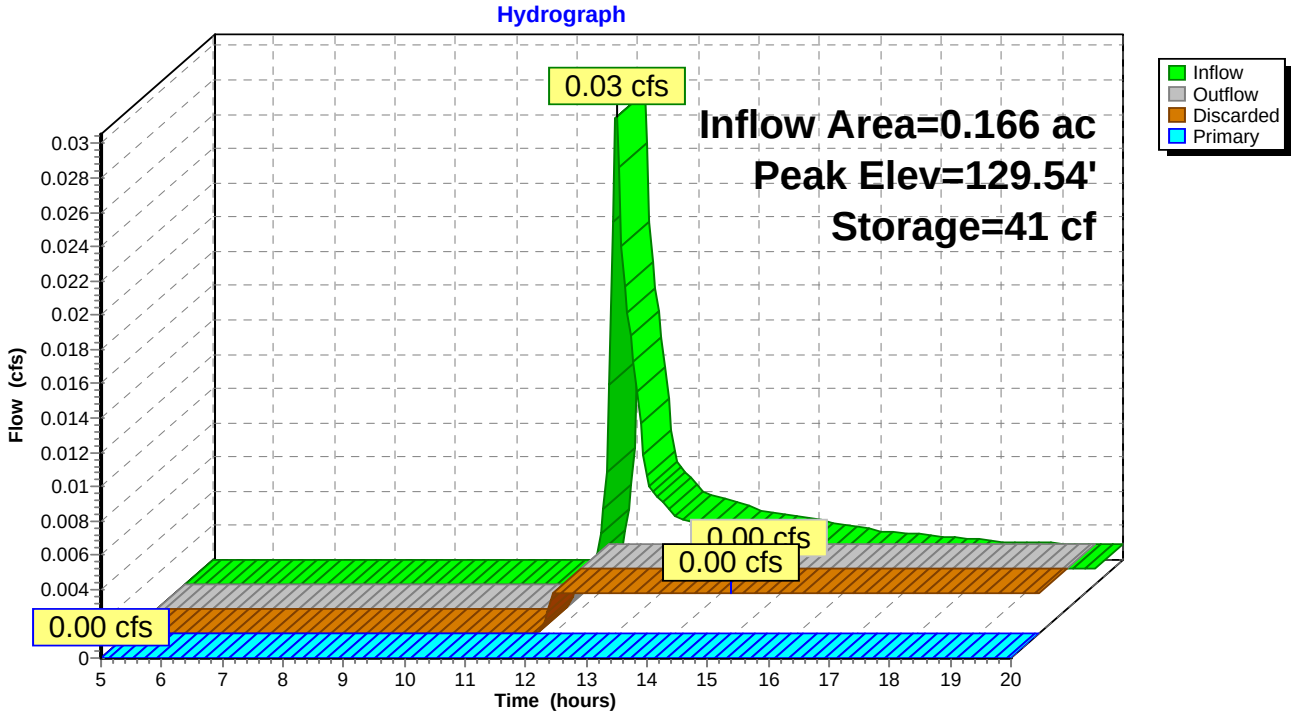
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	377	0.0	0	0
131.00	377	20.0	151	151
132.00	817	100.0	597	748

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 14.93 hrs HW=129.54' (Free Discharge)
↑└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=129.00' (Free Discharge)
↑└**2=Culvert** (Controls 0.00 cfs)
↑└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 6P: RainGarden3



Summary for Pond 7P: RainGarden4

Inflow Area = 0.147 ac, 83.69% Impervious, Inflow Depth > 0.24" for WQ event
Inflow = 0.04 cfs @ 12.10 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 14.87 hrs, Volume= 0.002 af, Atten= 93%, Lag= 166.0 min
Discarded = 0.00 cfs @ 14.87 hrs, Volume= 0.002 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 129.71' @ 14.87 hrs Surf.Area= 453 sf Storage= 64 cf

Plug-Flow detention time= 201.9 min calculated for 0.002 af (68% of inflow)
Center-of-Mass det. time= 128.7 min (946.6 - 817.9)

Volume	Invert	Avail.Storage	Storage Description
#1	129.00'	890 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

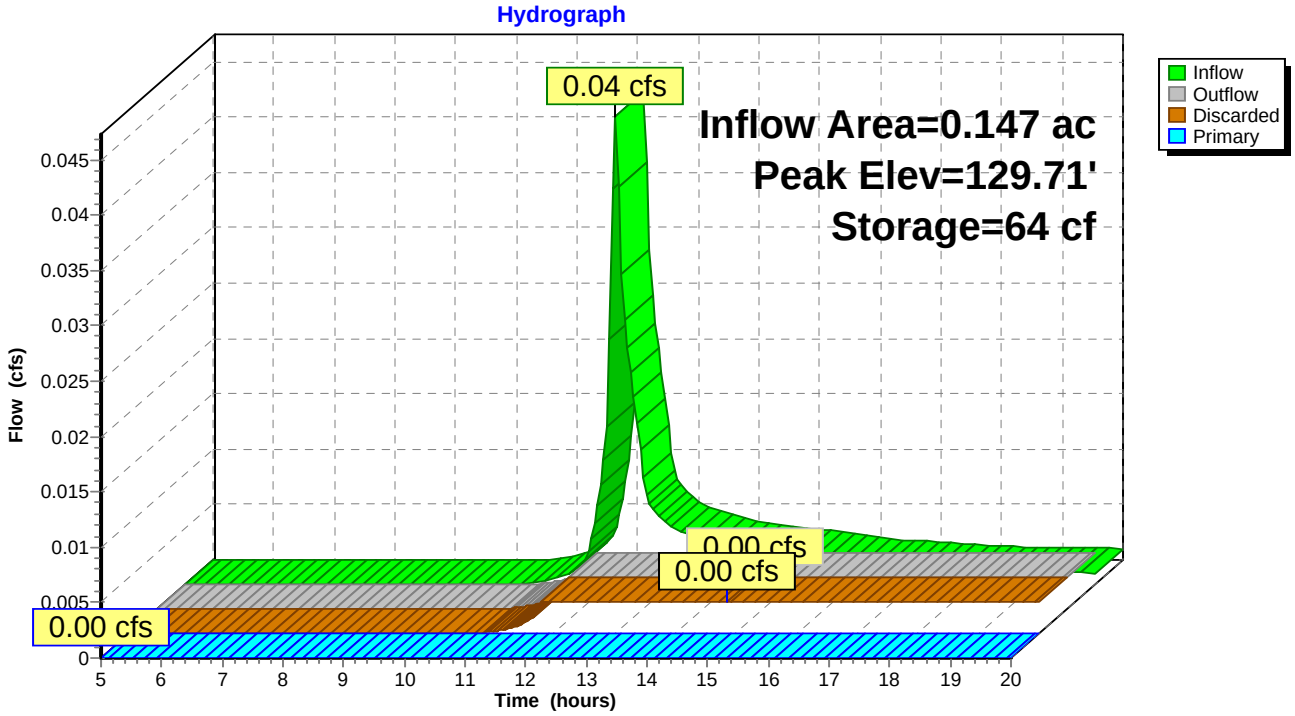
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
129.00	453	0.0	0	0
131.00	453	20.0	181	181
132.00	965	100.0	709	890

Device	Routing	Invert	Outlet Devices
#1	Discarded	129.00'	**0.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Primary	130.00'	**12.0" Round Culvert X 2.00** L= 70.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 130.00' / 129.50' S= 0.0071 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	131.33'	**12.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 14.87 hrs HW=129.71' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=129.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 7P: RainGarden4



Summary for Pond 8P: ReTain-It 2

Inflow Area = 1.169 ac, 70.96% Impervious, Inflow Depth = 0.00" for WQ event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 128.75' @ 5.00 hrs Surf.Area= 0.164 ac Storage= 0.000 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1A	128.75'	0.080 af	**26.00'W x 274.00'L x 3.67'H Field A** 0.600 af Overall - 0.400 af Embedded = 0.200 af x 40.0% Voids
#2A	129.25'	0.255 af	**retain_it 2.0'** x 102 Inside #1 Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf 3 Rows adjusted for 139.9 cf perimeter wall
		0.335 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	128.75'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=128.75' (Free Discharge)
1=Exfiltration (Passes 0.00 cfs of 0.40 cfs potential flow)

Pond 8P: ReTain-It 2 - Chamber Wizard Field A

Chamber Model = retain_it 2.0' (retain-it® 2.0' tall)
Inside= 84.0"W x 24.0"H => 13.78 sf x 8.00'L = 110.3 cf
Outside= 96.0"W x 32.0"H => 21.33 sf x 8.00'L = 170.7 cf
3 Rows adjusted for 139.9 cf perimeter wall

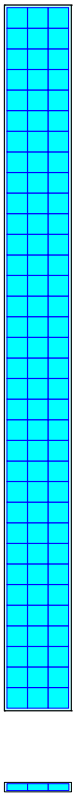
34 Chambers/Row x 8.00' Long = 272.00' Row Length +12.0" End Stone x 2 = 274.00' Base Length
3 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 26.00' Base Width
6.0" Base + 32.0" Chamber Height + 6.0" Cover = 3.67' Field Height

1.9 cf Sidewall x 34 x 2 + 1.9 cf Endwall x 3 x 2 = 139.9 cf Perimeter Wall
102 Chambers x 110.3 cf - 139.9 cf Perimeter wall = 11,108.7 cf Chamber Storage
102 Chambers x 170.7 cf = 17,408.0 cf Displacement

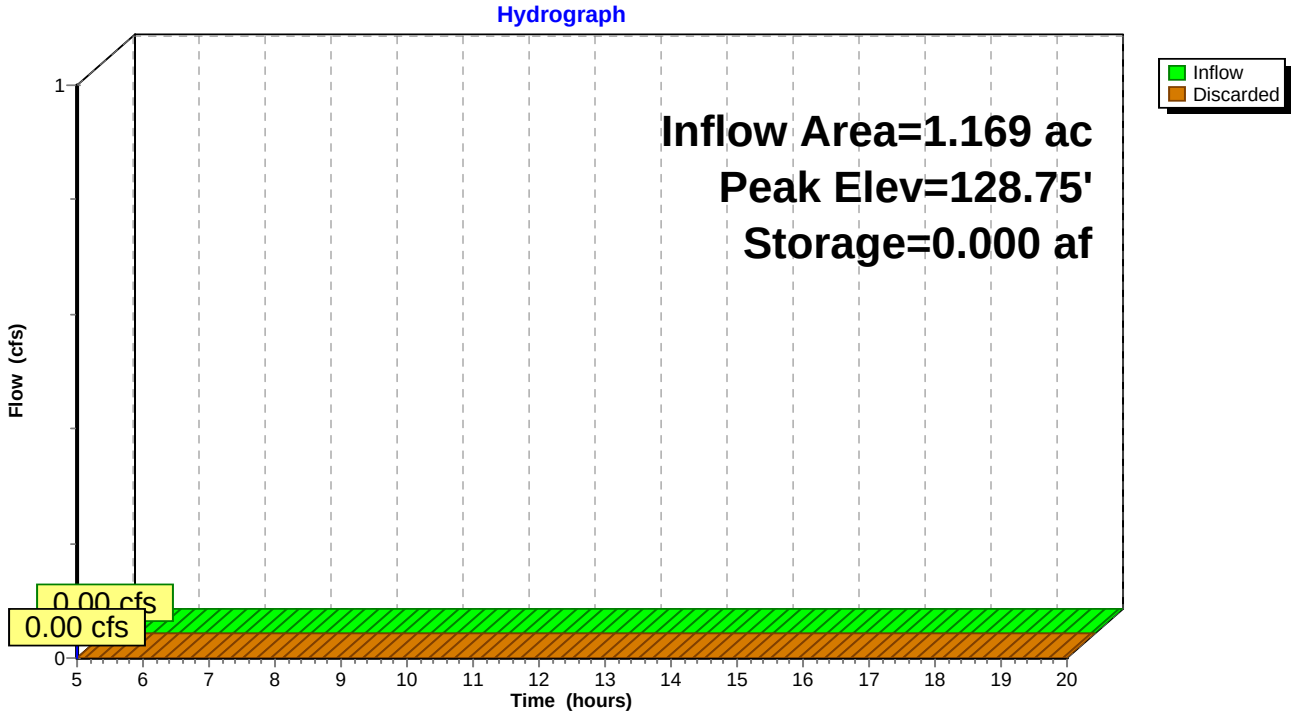
26,121.3 cf Field - 17,408.0 cf Chambers = 8,713.3 cf Stone x 40.0% Voids = 3,485.3 cf Stone Storage

Chamber Storage + Stone Storage = 14,594.0 cf = 0.335 af
Overall Storage Efficiency = 55.9%
Overall System Size = 274.00' x 26.00' x 3.67'

102 Chambers
967.5 cy Field
322.7 cy Stone



Pond 8P: ReTain-It 2



Summary for Pond 10P: ReTain-It (flood storage)

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

Volume	Invert	Avail.Storage	Storage Description
#1A	127.58'	0.057 af	**18.00'W x 250.00'L x 4.17'H Field A** 0.430 af Overall - 0.288 af Embedded = 0.142 af x 40.0% Voids
#2A	128.08'	0.195 af	**retain_it 2.5'** x 62 Inside #1 Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf 2 Rows adjusted for 217.8 cf perimeter wall
		0.252 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	127.58'	**2.410 in/hr Exfiltration over Horizontal area**

Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Pond 10P: ReTain-It (flood storage) - Chamber Wizard Field A

Chamber Model = retain_it 2.5' (retain-it® 2.5' tall)
Inside= 84.0"W x 30.0"H => 17.56 sf x 8.00'L = 140.4 cf
Outside= 96.0"W x 38.0"H => 25.33 sf x 8.00'L = 202.7 cf
2 Rows adjusted for 217.8 cf perimeter wall

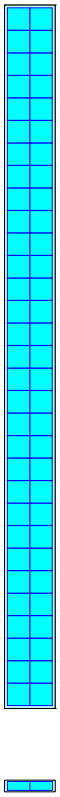
31 Chambers/Row x 8.00' Long = 248.00' Row Length +12.0" End Stone x 2 = 250.00' Base Length
2 Rows x 96.0" Wide + 12.0" Side Stone x 2 = 18.00' Base Width
6.0" Base + 38.0" Chamber Height + 6.0" Cover = 4.17' Field Height

3.3 cf Sidewall x 31 x 2 + 3.3 cf Endwall x 2 x 2 = 217.8 cf Perimeter Wall
62 Chambers x 140.4 cf - 217.8 cf Perimeter wall = 8,489.5 cf Chamber Storage
62 Chambers x 202.7 cf = 12,565.3 cf Displacement

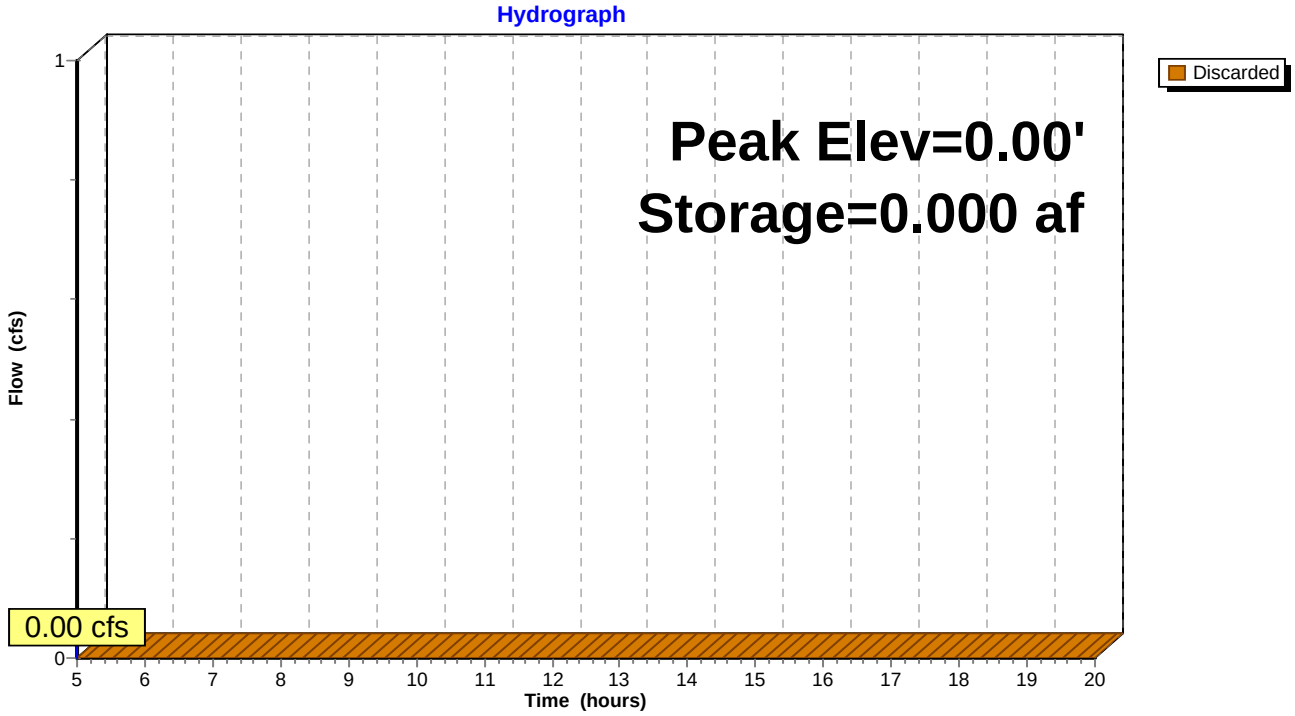
18,750.0 cf Field - 12,565.3 cf Chambers = 6,184.7 cf Stone x 40.0% Voids = 2,473.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,963.4 cf = 0.252 af
Overall Storage Efficiency = 58.5%
Overall System Size = 250.00' x 18.00' x 4.17'

62 Chambers
694.4 cy Field
229.1 cy Stone



Pond 10P: ReTain-It (flood storage)



3 Appendix

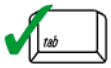
Checklist for Stormwater Report

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.





A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Paul G Matos 4-13-17
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☒ Use of "country drainage" versus curb and gutter conveyance and pipe

☒ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☒ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☒ Redevelopment Project

☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☐ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

TSS Calculation Worksheet

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Wellesley Sports Center Porous Pavement

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 5%	**0.05**	**1.00**	**0.05**	**0.95**
Porous Pavement	**0.80**	**0.95**	**0.76**	**0.19**
	0.00	**0.19**	**0.00**	**0.19**
	0.00	**0.19**	**0.00**	**0.19**
	0.00	**0.19**	**0.00**	**0.19**

Total TSS Removal = **81%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Wellesley Sports Center

Prepared By: PGM

Date: 4/12/2017

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Wellesley Sports Center Retain-It West Side

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 5%	0.05	1.00	0.05	0.95
Rain Garden	0.90	0.95	0.86	0.10
Subsurface Infiltration Structure	0.80	0.10	0.08	0.02
	0.00	0.02	0.00	0.02
	0.00	0.02	0.00	0.02

Total TSS Removal = 98%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Wellesley Sports Center
Prepared By: PGM
Date: 4/12/2017

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Wellesley Sports Center Grass Channel

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 5%	0.05	1.00	0.05	0.95
Grass Channel	0.50	0.95	0.48	0.48
Sediment Forebay	0.25	0.48	0.12	0.36
	0.00	0.36	0.00	0.36
	0.00	0.36	0.00	0.36

Total TSS Removal = 64%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Wellesley Sports Center

Prepared By: PGM

Date: 4/12/2017

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: Wellesley Sports Center ReTain-It East side

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Street Sweeping	5%	**1.00**	0.05	0.95
Proprietary Contech VS HS 36 Unit	60% (see attached)	0.95	0.57	0.38
Subsurface Infiltration Structure (ReTain It)	80%	0.38	0.30	0.08

Total TSS Removal = 92%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Wellesley Sports Center

Prepared By: PGM

Date: 4/12/17

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Project: Wellesley Sports Complex
Location: Wellesley, MA
Prepared For: Paul Matos, Allen & Major Associates - Lakeville, MA

CONTECH ENGINEERED SOLUTIONS

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1.0" of runoff.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Given:

Structure Name	Impv. (acres)	A ($miles^2$)	t_c (min)	t_c (hr)	WQV (in)
PCB 1	0.16	0.0002500	5.0	0.083	1.00
PCB 2	0.22	0.0003438	5.0	0.083	1.00
PCB 3	0.19	0.0002969	5.0	0.083	1.00
PCB 4	0.18	0.0002813	5.0	0.083	1.00

Procedure:

Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Structure Name	qu (csm/in.)
PCB 1	795.00
PCB 2	795.00
PCB 3	795.00
PCB 4	795.00

1. Compute Q Rate using the following equation:

$$Q_1 = (qu)\ (A)\ (WQV)$$

where:

Q_1 = flow rate associated with first 1.0" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1.0" in this case)

Structure Name	Q_1 (cfs)
PCB 1	0.20
PCB 2	0.27
PCB 3	0.24
PCB 4	0.22

VortSentry® HS Estimated Net Annual TSS Reduction

WELLESLEY SPORTS COMPLEX
WELLESLEY, MA
Model VSHS36
System PCB 1

CONTECH ENGINEERED SOLUTIONS

Design Ratio[1] = $\frac{\text{0.16 acres x 0.9}}{\text{27 ft3}}$ **= 0.005**

Rainfall Intensity "/hr	Flow Rate cfs	Operating Rate[2] cfs/ft[3]	% Total Rainfall Depth[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.02	0.00	0.00011	10.2%	98.0%	10.0%
0.04	0.01	0.00022	9.6%	98.0%	9.5%
0.06	0.01	0.00033	9.4%	98.0%	9.3%
0.08	0.01	0.00043	7.7%	98.0%	7.6%
0.10	0.01	0.00054	8.6%	98.0%	8.4%
0.12	0.02	0.00065	6.3%	98.0%	6.2%
0.14	0.02	0.00076	4.7%	98.0%	4.6%
0.16	0.02	0.00087	4.6%	98.0%	4.5%
0.18	0.03	0.00098	3.5%	98.0%	3.5%
0.20	0.03	0.00109	4.3%	98.0%	4.3%
0.25	0.04	0.00136	8.0%	98.0%	7.8%
0.30	0.04	0.00163	5.6%	98.0%	5.5%
0.35	0.05	0.00190	4.4%	98.0%	4.3%
0.40	0.06	0.00217	2.5%	98.0%	2.5%
0.45	0.06	0.00244	2.5%	98.0%	2.5%
0.50	0.07	0.00272	1.4%	98.0%	1.4%
0.75	0.11	0.00407	5.0%	98.0%	4.9%
1.00	0.14	0.00543	1.0%	98.0%	1.0%
1.50	0.22	0.00815	0.0%	97.9%	0.0%
2.00	0.29	0.01086	0.0%	94.4%	0.0%
3.00	0.43	0.01630	0.5%	88.7%	0.4%
					98.0%
				% rain falling at >3"/hr =	0.0%
				Removal Efficiency Adjustment[4] =	6.5%
				Predicted Net Annual Load Removal Efficiency =	**91.5%**

1 - Design Ratio = (Total Drainage Area x Runoff Coefficient) / VortSentry HS Treatment Volume
= The Total Drainage Area and Runoff Coefficient are specified by the site engineer.

2 - Operating Rate (cfs/ft^3) = Rainfall Intensity ("/hr) x Design Ratio

3 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

4 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by: CJA	Date: 04/12/17	Checked by:	Date:

VortSentry® HS Estimated Net Annual TSS Reduction

WELLESLEY SPORTS COMPLEX
WELLESLEY, MA
Model VSHS36
System PCB 2

CONTECH ENGINEERED SOLUTIONS

Design Ratio[1] = $\frac{\text{0.22 acres x 0.9}}{\text{27 ft3}}$ **= 0.007**

Rainfall Intensity "/hr	Flow Rate cfs	Operating Rate[2] cfs/ft^3	% Total Rainfall Depth[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.02	0.00	0.00015	10.2%	98.0%	10.0%
0.04	0.01	0.00030	9.6%	98.0%	9.5%
0.06	0.01	0.00045	9.4%	98.0%	9.3%
0.08	0.02	0.00060	7.7%	98.0%	7.6%
0.10	0.02	0.00075	8.6%	98.0%	8.4%
0.12	0.02	0.00090	6.3%	98.0%	6.2%
0.14	0.03	0.00105	4.7%	98.0%	4.6%
0.16	0.03	0.00120	4.6%	98.0%	4.5%
0.18	0.04	0.00134	3.5%	98.0%	3.5%
0.20	0.04	0.00149	4.3%	98.0%	4.3%
0.25	0.05	0.00187	8.0%	98.0%	7.8%
0.30	0.06	0.00224	5.6%	98.0%	5.5%
0.35	0.07	0.00261	4.4%	98.0%	4.3%
0.40	0.08	0.00299	2.5%	98.0%	2.5%
0.45	0.09	0.00336	2.5%	98.0%	2.5%
0.50	0.10	0.00373	1.4%	98.0%	1.4%
0.75	0.15	0.00560	5.0%	98.0%	4.9%
1.00	0.20	0.00747	1.0%	97.9%	1.0%
1.50	0.30	0.01120	0.0%	93.7%	0.0%
2.00	0.40	0.01494	0.0%	89.2%	0.0%
3.00	0.59	0.02241	0.5%	73.8%	0.4%
					97.9%
				% rain falling at >3"/hr =	0.0%
				Removal Efficiency Adjustment[4] =	6.5%
				Predicted Net Annual Load Removal Efficiency =	**91.4%**

1 - Design Ratio = (Total Drainage Area x Runoff Coefficient) / VortSentry HS Treatment Volume
= The Total Drainage Area and Runoff Coefficient are specified by the site engineer.

2 - Operating Rate (cfs/ft^3) = Rainfall Intensity ("/hr) x Design Ratio

3 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

4 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by: CJA	Date: 04/12/17	Checked by:	Date:

VortSentry® HS Estimated Net Annual TSS Reduction

WELLESLEY SPORTS COMPLEX
WELLESLEY, MA
Model VSHS36
System PCB 3

CONTECH ENGINEERED SOLUTIONS

Design Ratio[1] = $\frac{\text{0.19 acres x 0.9}}{\text{27 ft3}}$ **= 0.006**

Rainfall Intensity "/hr	Flow Rate cfs	Operating Rate[2] cfs/ft^3	% Total Rainfall Depth[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.02	0.00	0.00013	10.2%	98.0%	10.0%
0.04	0.01	0.00026	9.6%	98.0%	9.5%
0.06	0.01	0.00039	9.4%	98.0%	9.3%
0.08	0.01	0.00052	7.7%	98.0%	7.6%
0.10	0.02	0.00065	8.6%	98.0%	8.4%
0.12	0.02	0.00077	6.3%	98.0%	6.2%
0.14	0.02	0.00090	4.7%	98.0%	4.6%
0.16	0.03	0.00103	4.6%	98.0%	4.5%
0.18	0.03	0.00116	3.5%	98.0%	3.5%
0.20	0.03	0.00129	4.3%	98.0%	4.3%
0.25	0.04	0.00161	8.0%	98.0%	7.8%
0.30	0.05	0.00194	5.6%	98.0%	5.5%
0.35	0.06	0.00226	4.4%	98.0%	4.3%
0.40	0.07	0.00258	2.5%	98.0%	2.5%
0.45	0.08	0.00290	2.5%	98.0%	2.5%
0.50	0.09	0.00323	1.4%	98.0%	1.4%
0.75	0.13	0.00484	5.0%	98.0%	4.9%
1.00	0.17	0.00645	1.0%	98.0%	1.0%
1.50	0.26	0.00968	0.0%	96.4%	0.0%
2.00	0.34	0.01290	0.0%	90.3%	0.0%
3.00	0.51	0.01935	0.5%	84.5%	0.4%
					97.9%
				% rain falling at >3"/hr =	0.0%
				Removal Efficiency Adjustment[4] =	6.5%
				Predicted Net Annual Load Removal Efficiency =	**91.4%**

1 - Design Ratio = (Total Drainage Area x Runoff Coefficient) / VortSentry HS Treatment Volume
= The Total Drainage Area and Runoff Coefficient are specified by the site engineer.

2 - Operating Rate (cfs/ft^3) = Rainfall Intensity ("/hr) x Design Ratio

3 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

4 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by: CJA	Date: 04/12/17	Checked by:	Date:

VortSentry® HS Estimated Net Annual TSS Reduction

WELLESLEY SPORTS COMPLEX
WELLESLEY, MA
Model VSHS36
System PCB 4

CONTECH ENGINEERED SOLUTIONS

Design Ratio[1] = $\frac{\text{0.18 acres x 0.9}}{\text{27 ft3}}$ **= 0.006**

Rainfall Intensity "/hr	Flow Rate cfs	Operating Rate[2] cfs/ft^3	% Total Rainfall Depth[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.02	0.00	0.00012	10.2%	98.0%	10.0%
0.04	0.01	0.00024	9.6%	98.0%	9.5%
0.06	0.01	0.00037	9.4%	98.0%	9.3%
0.08	0.01	0.00049	7.7%	98.0%	7.6%
0.10	0.02	0.00061	8.6%	98.0%	8.4%
0.12	0.02	0.00073	6.3%	98.0%	6.2%
0.14	0.02	0.00086	4.7%	98.0%	4.6%
0.16	0.03	0.00098	4.6%	98.0%	4.5%
0.18	0.03	0.00110	3.5%	98.0%	3.5%
0.20	0.03	0.00122	4.3%	98.0%	4.3%
0.25	0.04	0.00153	8.0%	98.0%	7.8%
0.30	0.05	0.00183	5.6%	98.0%	5.5%
0.35	0.06	0.00214	4.4%	98.0%	4.3%
0.40	0.06	0.00244	2.5%	98.0%	2.5%
0.45	0.07	0.00275	2.5%	98.0%	2.5%
0.50	0.08	0.00306	1.4%	98.0%	1.4%
0.75	0.12	0.00458	5.0%	98.0%	4.9%
1.00	0.16	0.00611	1.0%	98.0%	1.0%
1.50	0.24	0.00917	0.0%	97.8%	0.0%
2.00	0.32	0.01222	0.0%	91.6%	0.0%
3.00	0.49	0.01833	0.5%	88.2%	0.4%
					98.0%
				% rain falling at >3"/hr =	0.0%
				Removal Efficiency Adjustment[4] =	6.5%
				Predicted Net Annual Load Removal Efficiency =	**91.5%**

1 - Design Ratio = (Total Drainage Area x Runoff Coefficient) / VortSentry HS Treatment Volume
= The Total Drainage Area and Runoff Coefficient are specified by the site engineer.

2 - Operating Rate (cfs/ft^3) = Rainfall Intensity ("/hr) x Design Ratio

3 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

4 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by: CJA	Date: 04/12/17	Checked by:	Date:

Illicit Discharge Statement

ILLICIT DISCHARGE STATEMENT

Project: Wellesley Sports Center
900 Worcester Street
Wellesley, MA 02482

Date: April 12, 2017

The stormwater management system proposed shall not be connected to the wastewater management system and shall not be contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease per Massachusetts DEP stormwater standard 10. As an undeveloped site, there are no existing illicit discharges.

Engineer:

Allen & Major Associates, Inc.
10 Main Street
Lakeville, MA 02347

Paul G Matos
Print Name


Signature

Owner:

Wellesley Sports Center, LLC
41 North Road, Suite 203
Bedford, MA 01730

_____
Print Name

_____
Signature

Soil Information

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts

Wellesley Sports Center



March 15, 2017

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,520 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 12, Sep 15, 2016

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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

Map Unit Legend

Norfolk and Suffolk Counties, Massachusetts (MA616)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
253D	Hinckley loamy sand, 15 to 35 percent slopes	2.8	34.4%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	0.0	0.2%
602	Urban land, 0 to 15 percent slopes	5.4	65.4%
Totals for Area of Interest		**8.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Norfolk and Suffolk Counties, Massachusetts

253D—Hinckley loamy sand, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2svmd
Elevation: 0 to 860 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Crest, nose slope, side slope, head slope, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Linear, concave, convex
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor
Percent of map unit: 10 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Crest, nose slope, side slope, head slope, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Linear, concave, convex
Hydric soil rating: No

Merrimac
Percent of map unit: 3 percent
Landform: Eskers, kames, kame terraces, outwash plains, outwash terraces, moraines
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope, nose slope, crest, riser
Down-slope shape: Convex, linear, concave
Across-slope shape: Linear, convex, concave
Hydric soil rating: No

Sudbury
Percent of map unit: 2 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, outwash deltas
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Hydric soil rating: No

260B—Sudbury fine sandy loam, 2 to 8 percent slopes

Map Unit Setting
National map unit symbol: vky4
Elevation: 0 to 2,100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Sudbury and similar soils: 85 percent
Minor components: 15 percent

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

Description of Sudbury

Setting

Landform: Outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable coarse-loamy eolian deposits over loose sandy glaciofluvial deposits

Typical profile

H1 - 0 to 11 inches: sandy loam
H2 - 11 to 22 inches: sandy loam
H3 - 22 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Hydric soil rating: No

Walpole

Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: Yes

Deerfield

Percent of map unit: 5 percent
Landform: Outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

602—Urban land, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: vkyj
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 99 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Rock outcrops

Percent of map unit: 1 percent
Hydric soil rating: Unranked

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SOIL EVALUATOR FORM

Location Address or Lot No. 900 Worcester Street Wellesley, Ma

On-site Review

Deep Hole Number: TP-1 Date: 4-6-15 Time: 9:00 am Weather: Sunny 50 degrees

Location (Identify on site plan): See Map

Land Use: Parking Lot Slope (%): 0-5 Surface Stones: None

Vegetation: N/A

Landform:

Position on Landscape (sketch on the back):

Distances from:

Open Water Body: _____ feet Drainage way: _____ feet

Possible Wet Area: _____ feet Property Line: _____ feet

Drinking Water Well: _____ feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-4	Pavement				Pavement
4-16	Fill				Base/Gravel
16-20	Buried Topsoil				
20-66	Silty Sand				Roots, gravel

Notes:

.

Weeping likely from snow melt.

Parent Material (geologic) N/A Depth to Bedrock: None

Depth to Groundwater: 36” Weeping from Pit Face: 24”

Estimated Seasonal High Ground Water:

SOIL EVALUATOR FORM

Location Address or Lot No. 900 Worcester Street Wellesley, Ma

On-site Review

Deep Hole Number: TP-2 Date: 4-6-15 Time: 9:00 am Weather: Sunny 50 degrees

Location (Identify on site plan): See Map

Land Use: Parking Lot Slope (%): 0-5 Surface Stones: None

Vegetation: N/A

Landform:

Position on Landscape (sketch on the back):

Distances from:

Open Water Body: _____ feet Drainage way: _____ feet

Possible Wet Area: _____ feet Property Line: _____ feet

Drinking Water Well: _____ feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-4	Pavement				
4-16	Fill				Base/Gravel
16-30	Fill				Gravel, stones, some debris
30-34	Buried Topsoil				Buried Topsoil
34-66	Silty Sand				Roots, Gravel

Notes:

.

Parent Material (geologic) N/A Depth to Bedrock: None

Depth to Groundwater: 42” Weeping from Pit Face: 24”

Estimated Seasonal High Ground Water:

SOIL EVALUATOR FORM

Location Address or Lot No. 900 Worcester Street Wellesley, Ma

On-site Review

Deep Hole Number: TP-3 Date: 4-6-15 Time: 9:00 am Weather: Sunny 50 degrees

Location (Identify on site plan): See Map

Land Use: Parking Lot Slope (%): 0-5 Surface Stones: None

Vegetation: N/A

Landform:

Position on Landscape (sketch on the back):

Distances from:

Open Water Body: _____ feet Drainage way: _____ feet

Possible Wet Area: _____ feet Property Line: _____ feet

Drinking Water Well: _____ feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-4	Pavement				
4-16	Fill				Base/Gravel
16-36	Fill				Debris, Roots, Brick, and Mud
36-42	Topsoil Buried				Roots
42-66	Silty Sand				

Notes:

.

Parent Material (geologic) N/A Depth to Bedrock: None

Depth to Groundwater: 42" Weeping from Pit Face: 30"

Estimated Seasonal High Ground Water:

SOIL EVALUATOR FORM

Location Address or Lot No. 900 Worcester Street Wellesley, Ma

On-site Review

Deep Hole Number: TP-4 Date: 4-6-15 Time: 9:00 am Weather: Sunny 50 degrees

Location (Identify on site plan): See Map

Land Use: Parking Lot Slope (%): 0-5 Surface Stones: None

Vegetation: N/A

Landform:

Position on Landscape (sketch on the back):

Distances from:

Open Water Body: _____ feet Drainage way: _____ feet

Possible Wet Area: _____ feet Property Line: _____ feet

Drinking Water Well: _____ feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-6	Pavement				Base/Gravel
6-12	Fill				Loamy Sand, some gravel
12-36	Fill				
36-40	Coarse Sand				
40-72	Loamy Sand				

Notes:

.

Parent Material (geologic) N/A Depth to Bedrock: None

Depth to Groundwater: 66" Weeping from Pit Face: N/A

Estimated Seasonal High Ground Water: 54"

SOIL EVALUATOR FORM

Location Address or Lot No. 900 Worcester Street Wellesley, Ma

On-site Review

Deep Hole Number: TP-5 Date: 4-6-15 Time: 9:00 am Weather: Sunny 50 degrees

Location (Identify on site plan): See Map

Land Use: Parking Lot Slope (%): 0-5 Surface Stones: None

Vegetation: N/A

Landform:

Position on Landscape (sketch on the back):

Distances from:

Open Water Body: _____ feet Drainage way: _____ feet

Possible Wet Area: _____ feet Property Line: _____ feet

Drinking Water Well: _____ feet Other: _____

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-3	Pavement				
3-14	Fill				Base/Gravel
14-24	Fill				Loamy Sand, gravel, brick, debris
24-36	Topsoil				Topsoil
30-72	Loamy Sand				Large Stones

Notes:

.

Parent Material (geologic) N/A Depth to Bedrock: None

Depth to Groundwater: 66” Weeping from Pit Face: N/A

Estimated Seasonal High Ground Water: 48”

BLSF INCREMENTAL VOLUME REPORT

CALCULATION SHEET

Project Number:	2329-01	**Sheet:**	1 of 1	
Client:	BLSF Calculations			
Project:	Wellelsey Sports Center	**Location:**		
Calculated by:	PLC	**Date:**	7/21/2017	
Checked by:	PLC	**Date:**	7/21/2017	

ALLEN & MAJOR ASSOCIATES, INC.
10 Main Street
Lakeville, MA 02347
Phone 508-923-1010
Fax 508923-6309

Existing BLSF (Surface Volume Storage)						Proposed BLSF (Surface Volume Storage)						Mitigating Chambers (Subsurface Storage Volume at equivalent elevation)					
Contour Elevation (ft)	Contour Area (ft^2)	Average Surface Area (ft^2)	Depth (ft)	Incremental Volume (ft^3)	Cumulative Volume (ft^3)	Contour Elevation (ft)	Contour Area (ft^2)	Average Surface Area (ft^2)	Depth (ft)	Incremental Volume (ft^3)	Cumulative Volume (ft^3)	Contour Elevation (ft)	Contour Area (ft^2)	Average Surface Area (ft^2)	Depth (ft)	Incremental Volume (ft^3)	Cumulative Volume (ft^3)
128.55	0	0	0.0	0	0	128.55	0	0	0.0	0	0	127.58	3,753	0	0.00	0	0
129.00	2,230	1,115	0.4	502	502	129.00	0	0	0.0	0	0	128.00	3,753	3,753	0.42	1,763	1,763
129.50	7,811	5,021	0.5	2,510	3,012	129.10	0	0	0.0	0	0	128.08	3,753	3,753	0.08	401	2,164
130.00	24,211	16,011	0.5	8,006	11,018	129.50	2,042	1,021	0.4	408	408	128.50	3,753	3,753	0.42	2,105	4,269
130.50	54,043	39,127	0.5	19,564	30,581	129.60	189	1,116	0.1	112	520	128.55	3,753	3,753	0.05	251	4,519
						130.00	23,243	12,643	0.5	6,321	6,841	128.58	3,753	3,753	0.03	150	4,670
						130.50	49,246	36,245	0.5	18,122	24,963	129.00	3,753	3,753	0.42	2,105	6,775
												129.08	3,753	3,753	0.08	401	7,176
												129.50	3,753	3,753	0.42	2,105	9,281
												129.58	3,753	3,753	0.08	401	9,682
												130.00	3,753	3,753	0.42	2,105	11,787
												130.08	3,753	3,753	0.08	401	12,188
												130.50	3,753	3,753	0.42	2,105	14,294
												130.58	3,753	3,753	0.08	401	14,695

-Highlighted cells reflect compensatory sotrage volumes. Volume above or below these values is additional volume available not pertinent to the claculations
-Incremental storage volumes and area based on manufacturer's specifications to account for loss due to concrete, and stone void ratio of 40%, etc.

Total Proposed BLSF Volume				
Contour Elevation (ft)	Proposed Incremental Volume	Proposed Total Volume	Existing Incremental Volume	Increase/Decrease
128.55	251	251	0	251
129.00	2,105	2,356	502	1,603
129.50	2,514	4,869	2,510	3
130.00	8,426	13,296	8,006	421
130.50	20,227	33,523	19,564	664

Increase
Decrease

WILDLIFE HABITAT ASSESSMENT

BSC GROUP
Transportation ▪ Energy ▪ Land Development

33 Waldo Street
Worcester, MA 01608

Tel: 508-792-4500
800-288-8123

www.bscgroup.com

July 12, 2017

Brian Devellis
Marathon Sports Center, LLC
41 North Road, Ste 203
Bedford, MA 01730

RE: 900 Worcester Street, Wellesley, MA
Wildlife Habitat Assessment

Dear Mr. Devellis:

On July 10, 2017, Mr. P. Chase Bernier, CWB, a Certified Wildlife Biologist by The Wildlife Society and Project Manager with BSC Group, Inc. (BSC), completed a Wildlife Habitat Assessment of the property located at 900 Worcester Street in Wellesley, Massachusetts (the Site) in accordance with Section 2.10(1)(d) of the Wellesley Wetlands Protection Regulations. The Site is located south of Worcester Street and bounded between Dale Street to the west and an office building complex at 888-892 Worcester Street to the east. Bay View Road borders the Site to the south. Figure 1 (Attachment A) depicts the site on an U.S. Geologic Survey (USGS) Topographic Map. The following provides a detailed description of the existing habitats.

Landscape Position

The Site is located in western Wellesley within the larger Boston metro area. Numerous heavily travelled roads including Interstates and State Routes bisect the landscape in conjunction with heavily-developed commercial, industrial, and residential centers. This Site is located within a densely-developed area which has been heavily altered by previous anthropogenic impacts and is fragmented from any larger, contiguous tracts of undeveloped land by heavily travelled roads (i.e., Worcester St) and adjacent commercial and residential developments.

Topography

The Site is positioned approximately 125-165 feet above mean sea level (MSL) within the Charles Watershed (Hydrologic Unit Code [HUC] 01090001). Topography is generally sloped towards the northwest portion of the Site with the lowest elevation occurring in the center of the existing large paved parking area (Figure 2, Attachment 1A). Steep slopes border the Site along the southwestern portion of the Site with the remainder of the Site generally containing gentle slopes with isolated undulations in microtopography. Sporadic mounds of fill containing concrete, asphalt, sand, urban refuse (i.e., trash) and other materials occur throughout the southern wooded portions of the area.

Engineers
Environmental Scientists
Custom Software Developers
Landscape Architects
Planners
Surveyors

There are two isolated wet depressions located within the southern wooded area of the Site. Both depressions are likely resultant from past excavations of soil which subsequently collected precipitation and overland surface stormwater which accumulated fine sediments and organic matter.

Vegetation Communities

Three distinct vegetative communities exist on the Site: cultural grassland, successional northern hardwood forest, and developed land. Photographs of the Site are included in Attachment B. Cultural grassland occurs in the northeastern portion of the Site. The area is dominated by grasses and other herbaceous species interspersed with landscaped trees. Dominant species include purple clover (*Trifolium pratense*), thistle (*Cirsium* spp.), wild rye (*Elymus virginicus*), honeylocust (*Gleditsia traicanthos*), red maple (*Acer rubrum*), spotted knapweed (*Centaurea maculosa*), goldenrods (*Solidago* spp.), yellow damesrocket (*Hesperis matronalis*), black-eyed susan (*Rudbeckia hirta*), Queen Anne's lace (*Daucus carota*), butterfly weed (*Asclepias tuberosa*), common milkweed (*Asclepias syriaca*), indian hemp (*Apocynum cannabinum*), blue false indigo (*Baptisia australis*), ashy sunflower (*Helianthus mollis*), evening primrose (*Oeonothera* spp.) and various grasses. Trees were approximately 18-inches diameter at breast height (dbh) and 30-feet tall with 20 percent canopy cover. The herbaceous layer ranged 12-48 inches with 100 percent canopy cover.

The successional northern hardwood forest occurs within the hedgerows and forested habitat in the eastern, southern, and western portions of the Site. This habitat includes successional deciduous and coniferous species including eastern cottonwood, red maple, black locust (*Robinia pseudoacacia*), Norway maple (*Acer platanoides*), sugar maple (*Acer saccharum*), white pine (*Pinus strobus*), red oak (*Quercus rubra*), and black oak (*Quercus velutina*). Trees range 6-36 inches dbh and 20 to 40 feet tall. The percent canopy cover is approximately 80 percent. The sapling/shrub understory consist of Tartarian honeysuckle (*Lonicera tatarica*), Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), glossy buckthorn (*Frangula alnus*), white birch (*Betula papyrifera*), and black cherry (*Prunus serotina*). Canopy height ranged 4-15 feet and consist of approximately 35 percent canopy cover. The herbaceous layer ranges 10-90 percent cover. Dominant species include jewelweed (*Impatiens capensis*), Virginia creeper (*Parthenocissus quinquefolia*), Japanese knotweed (*Fallopia japonica*), English ivy (*Hedera helix*), daylily (*Hemerocallis fulva*), garlic mustard (*Alliaria petiolata*), sensitive fern (*Onoclea sensibilis*), poison ivy (*Toxicodendron radicans*), and wood violet (*Viola seronia*). The height of the herbaceous layer ranges less than 12 inches to 36 inches tall. Percent cover in this stratum ranges from less than 10 percent to approximately 85 percent. The vine stratum is dominated by porcelain berry (*Ampelopsis brevipenducnulata*). Porcelain berry occurs on the majority of the trees throughout this habitat and ranges 1-6 inches dbh.

Developed land occurs within the northern portion of the Site and consists of the paved areas. Vegetation within this area is sparse and occurs within the cracked pavement. Dominant species include various grasses including crab grass (*Digitaria* spp.), quack grass (*Elymus repens*), and common dandelion (*Taraxacum officinale*).

Soils Composition

Three soil types are mapped within the Site. Sudbury fine sandy loam, Urban land, and Hinckley loamy sand. Sudbury soils are mapped within a small portion of the western

bordering hedgerow between the paved parking area and Dale Street. However, on-Site conditions do not accurately reflect that mapping. Soils within this area are generally comprised of urban fill consisting of broken concrete, asphalt, sand, and other similar materials constructed as a berm between Dale Street and the paved parking area. There was approximately 1-inch of detritus organic material underlain by the urban fill. A satisfactory soil boring was not possible in this habitat due to refusal at approximately 2 inches below grade. No hydrology was encountered.

Urban land is mapped throughout the northern portion of the Site, including the majority of the previously developed areas, hedgerows, and street front. On-Site conditions confirm this mapping. Excluding the paved areas, soils within this area consist of well drained, previously impacted soil that does not contain any definitive profile. A detritus layer of approximately 1-inch was observed which was underlain by 7.5YR 4/4 soils from 0-6 inches. Below 6 inches, the soil consisted of sandy gravel resulting in auger refusal. No hydrology was encountered.

Hinkley loamy sand is mapped in the southern forested portion of the Site. In-field conditions confirmed that the majority of this area is mapped accurately. However, there are numerous piles of fill consisting of broken concrete, sand, boulders, and other material that was likely deposited in this area by previous anthropogenic alterations. It appears that large portions of this area have been impacted by previous grading, dumping, and other landform changes. Upland soils within this area generally consist of 1 inch of detritus with 10YR 4/3 loamy sands to a depth of 4 inches below grade underlain by 7.5YR 4/4 sandy soils to 8 inches. Below 8 inches, the soils consist of sandy gravel resulting in auger refusal. No hydrology was encountered in these areas. Soils within the wet depressions consist of approximately 2 inches of detritus with 10YR 3/1 loamy sands to a depth of 4 inches underlain by 10YR 4/2 loamy sands to a depth of 10 inches. At 10 inches the soils consist of sandy gravel resulting in auger refusal. Wet soils were encountered at grade; however, heavy rains during the previous week are likely the result of soil saturation and are not an indicator of a groundwater interface.

Hydrologic Regime

Hydrology has been heavily altered by past anthropogenic impacts including the installation of impervious materials (i.e., pavement), grading, fill, and drainage improvements. There are no watercourses or defined hydrologic connections within the Site. The hydrologic features described below (i.e., puddling and wet depressions) are all supported by precipitation and overland stormwater sheetflow. Groundwater was not encountered and is mapped as occurring more than 6 feet below grade according to soil type classifications.

Puddling was observed within the paved parking area in the northwest. Puddling was persistent long enough to develop sporadic algal mats; however, these areas likely do not persist long and the algal mats are likely resultant of heavy nutrient loading from adjacent residences, road stormwater runoff, etc. At the time of the in-field investigation, the depth within the puddles was approximately 2 inches at the deepest.

Within the forested habitat to the south, two isolated wet depressions were observed. Both depressions were resultant of previous anthropogenic alterations to the landscape. Fine sediments and organic material have collected in those depressions which now support hydric soils and hydrophytic vegetation. The depressions also exhibited multiple indicators of hydrology including water-stained leaves, sparsely-vegetated surfaces, and geomorphic position. There was no ponding observed at the time of the in-field investigation.

The closest water body, Morses Pond, is located approximately 285 feet to the southwest at the closest point. However, the Site is geographically isolated from that body of water by upland topography. More specifically, lands west of Dale Street and South of Bay View Road drain towards Morses Pond whereas lands east and north of the those points, respectively, drain towards the Site.

Wildlife Habitat Features

Several typical wildlife habitat features were observed including snags; tree cavities; large woody debris; and hard-mast trees, fruit bearing vegetation, and nectar species. In total, 16 snags were identified which ranged 4-18 inches dbh and ranged in height 15-40 feet (Figure 2). The majority of the snags were located in the southern portion of the Site in the successional forest. The majority of the snags were resultant from vines (English ivy and porcelain berry) choking and outcompeting the tree. Snags consisted of numerous species including maple, eastern cottonwood, cherry, and white pine. Many of the snags contained shaggy bark and showed signs of heavy insect activity. In addition, woodpecker (Picidae spp.) holes were present on numerous snags. Tree cavities, likely from pileated woodpeckers (*Dryocopus pileatus*) were present on two snags. Cavities ranged in size from 2-inch diameter to 4-inch by 6-inch. A total of seven cavities were identified.

Large woody debris was present throughout the successional forest and was resultant from fallen snags. Fallen trees ranged 6-20 inches dbh. Many of the fallen trees were covered in porcelain berry vines.

Hard-mast trees and fruit-bearing vegetation was present throughout the successional forest portions of the Site. Trees (e.g., oak, maple, and cherry); shrubs (e.g., barberry, multiflora rose, and buckthorn); and vines (e.g., poison ivy) all provide food sources for wildlife. Additionally, the cultural grasslands included a wide variety of flowering herbaceous species that serve as valuable forage species for pollinators such as black-eyed Susan, Queen Anne's lace, butterfly weed, milkweeds, Indian hemp, blue false indigo, ashy sunflower, and evening primrose. Milkweed is also a host species for monarch butterflies (*Danaus plexippus*); however, no monarchs (caterpillars, chrysalises, or adults) were observed and only seven milkweed plants were identified.

Habitat Degradation

The Site has been heavily impacted by anthropogenic alterations and impacts of varying intensity. The impervious pavement throughout the northern portion of the Site reduces infiltration of stormwater, increases sedimentation, and contributes to the degradation of adjacent habitats. Urban fill consisting of broken concrete, asphalt, sand, and other debris is frequent throughout the Site. Additionally, urban refuse (i.e., trash) is located in abundant amounts throughout all areas of the Site. The successional forest in the southern portion of the Site is particularly littered with copious quantities of refuse including large amounts of plastic waste (e.g., plant containers, bottles, bags, etc.), car parts (e.g., engine pieces, batteries, scrap metal, etc.), and various other trash. The Site is also infested with numerous non-native invasive species including black locust, Norway maple, glossy buckthorn, Japanese barberry, multiflora rose, garlic mustard, Japanese knotweed, English ivy, and porcelain berry.

Wildlife Utilization

Wildlife utilization of the Site is minimal. Observations of wildlife include white-tail deer (*Odocoileus virginianus*) tracks; eastern striped chipmunk (*Tamias striatus*) encounters and burrows; and house sparrow (*Passer domesticus*), blue jay (*Cyanocitta cristata*), American goldfinch (*Spinus tristis*), and eastern towhee (*Pipilo erythrophthalmus*) songs. All of the species observed are common in the northeastern United States, are highly mobile, and are highly tolerant of anthropogenic impacts.

Summary

The Site includes a mosaic of available habitat types ranging from developed land to successional forest. However, the area is located in a densely-populated area and fragmented from other larger, contiguous undeveloped lands. In addition, the Site has been significantly degraded by previous anthropogenic impacts including landform alterations, deposition of urban refuse, and the introduction of invasive species. The quality of available wildlife habitat on this Site is low. Evidence of wildlife utilization of the Site was minimal and was dominated by highly-mobile common species that are extremely tolerant of anthropogenic influences.

Please do not hesitate to contact our office with any inquiries you may have.

Very truly yours,

BSC Group, Inc.



P. Chase Bernier, CWB
Project Manager

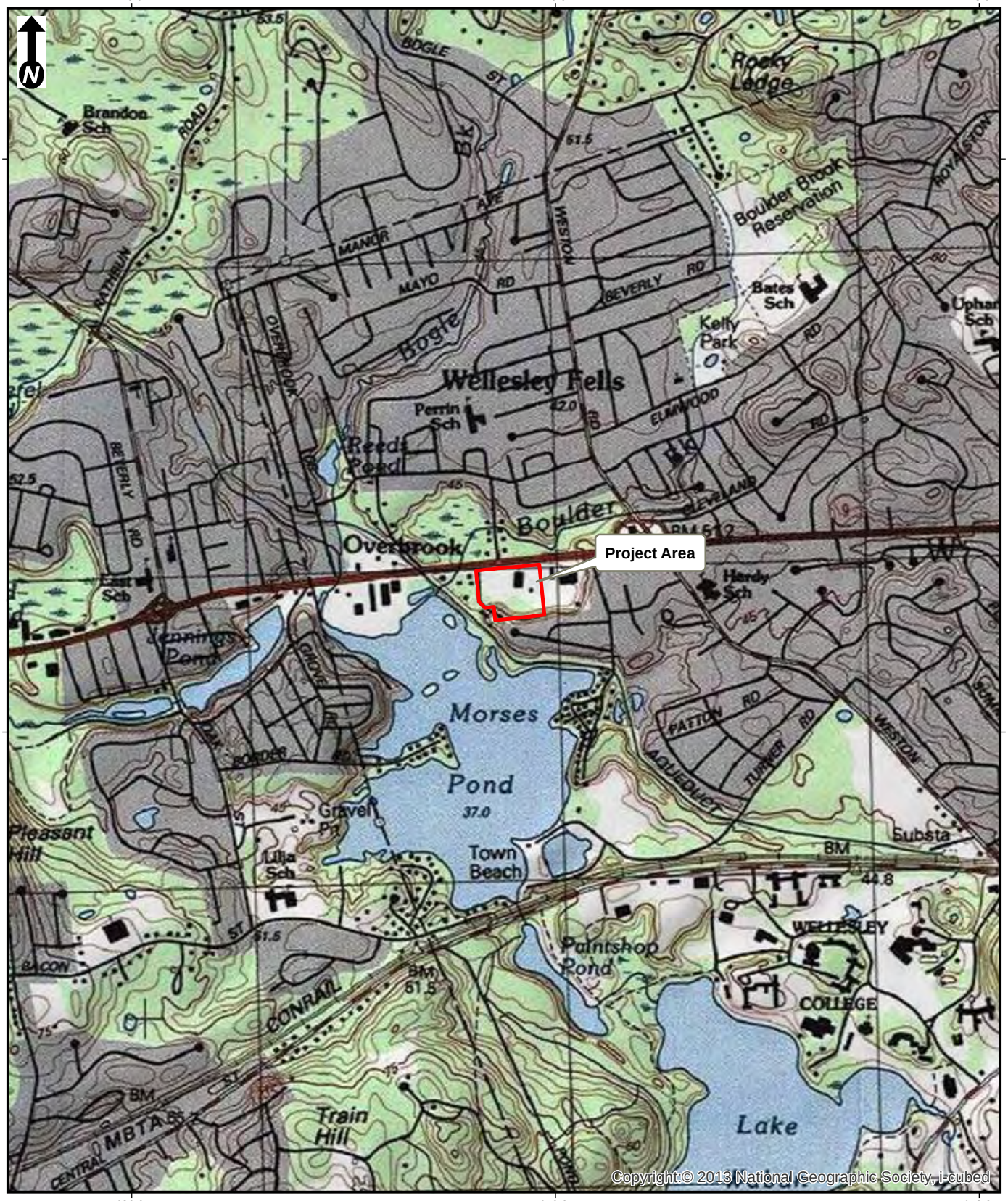
Attachment A

900 Worcester Street
Wellesley, MA
Wildlife Habitat Assessment

FIGURES

BSC GROUP

Document Path: \\bscbos\wor\GIS-WOR\GISPrj\8957500\Output\Maps\MXD\ReportMaps\WellesleySnags_USGSLocus_20170712.mxd
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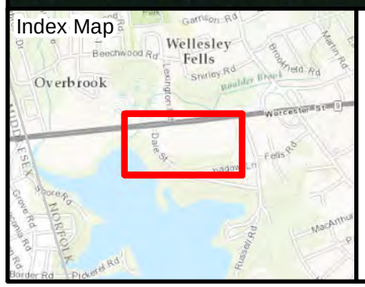


Scale: 1 inch = 2,000 feet *(page size: 8.5 X 11)* 0 1,000 2,000 Feet	**USGS SITE LOCATION MAP** **Wellesley, MA**	Source: 2013 National Geographic Society, i-cubed BSC GROUP

THIS DOCUMENT IS INTENDED FOR GENERAL PLANNING & INFORMATION PURPOSES ONLY. ALL MEASUREMENTS & LOCATIONS ARE APPROXIMATE

File Location: \\bscbos\wor\GIS-WOR\GISPrj\8957500\Output\Maps\MXD\ReportMaps\WellesleySnags_SnagMap_20170712.mxd
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Legend

- Tree Snag
- Property Boundary

Land Type

- Developed
- Cultural Grassland
- Successional Forest

N

1 inch = 100 feet

0 100 200

Feet

Source:
-MassGIS
Basemap & Environmental Data
-Aerial & Topo Imagery
ESRI, DigitalGlobe, GeoEye, i-cubed, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., AEX, GEBCO, USDA, USGS, FAO, NPS, NRCAN, GeoBase, Getmapping, Aerogrid, IGP, IGN, Kadaster NL, Ordnance Survey, ESRI japan, METI, ESRI China (Hong Kong), swisstopo, & the GIS User Community

AERIAL MAP

Wellesley, MA

BSC GROUP

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Attachment B

900 Worcester Street
Wellesley, MA
Wildlife Habitat Assessment

SITE PHOTOGRAPHS

BSC GROUP



Photo #1: : View of the existing paved parking area. *Facing northwest.*



Photo #2. View of the ponding within the paved parking area. *Facing southwest.*



Photo #3: View of the streetscape. *Facing west.*



Photo #4. : View of other paved access roads in the northeast. *Facing north.*



Photo #5: View of cultural grasslands. *Facing southwest.*



Photo #6. View of the cultural grasslands with landscaped trees. *Facing northeast.*



Photo #7: View of the northern successional forest. Notice the large woody debris in the foreground. *Facing south.*



Photo #8. View of the northern successional forest and the steep slopes in the southern portion of the Site. *Facing south.*



Photo #9: View of the western wet depression within the northern successional forest. *Facing south.*



Photo #10. View of the eastern wet depression in the northern successional forest. *Facing southwest.*



Photo #11: White-tail deer track in the northern successional forest in the south portion of the Site. *Facing west.*



Photo #12. View of the previous grading/dumping of sand in the southern portion of the Site. Notice the white-tail deer tracks outlined in red. *Facing east.*



Photo #13: Snags in the northern successional forest in the south of the Site (red arrows). *Facing southwest.*



Photo #14. Snag with woodpecker activity (cavities). *Facing north.*



Photo #15: Snag choked by porcelain berry. F*acing northeast.*



Photo #16. Old fill pile in the south portion of the Site. *Facing east.*

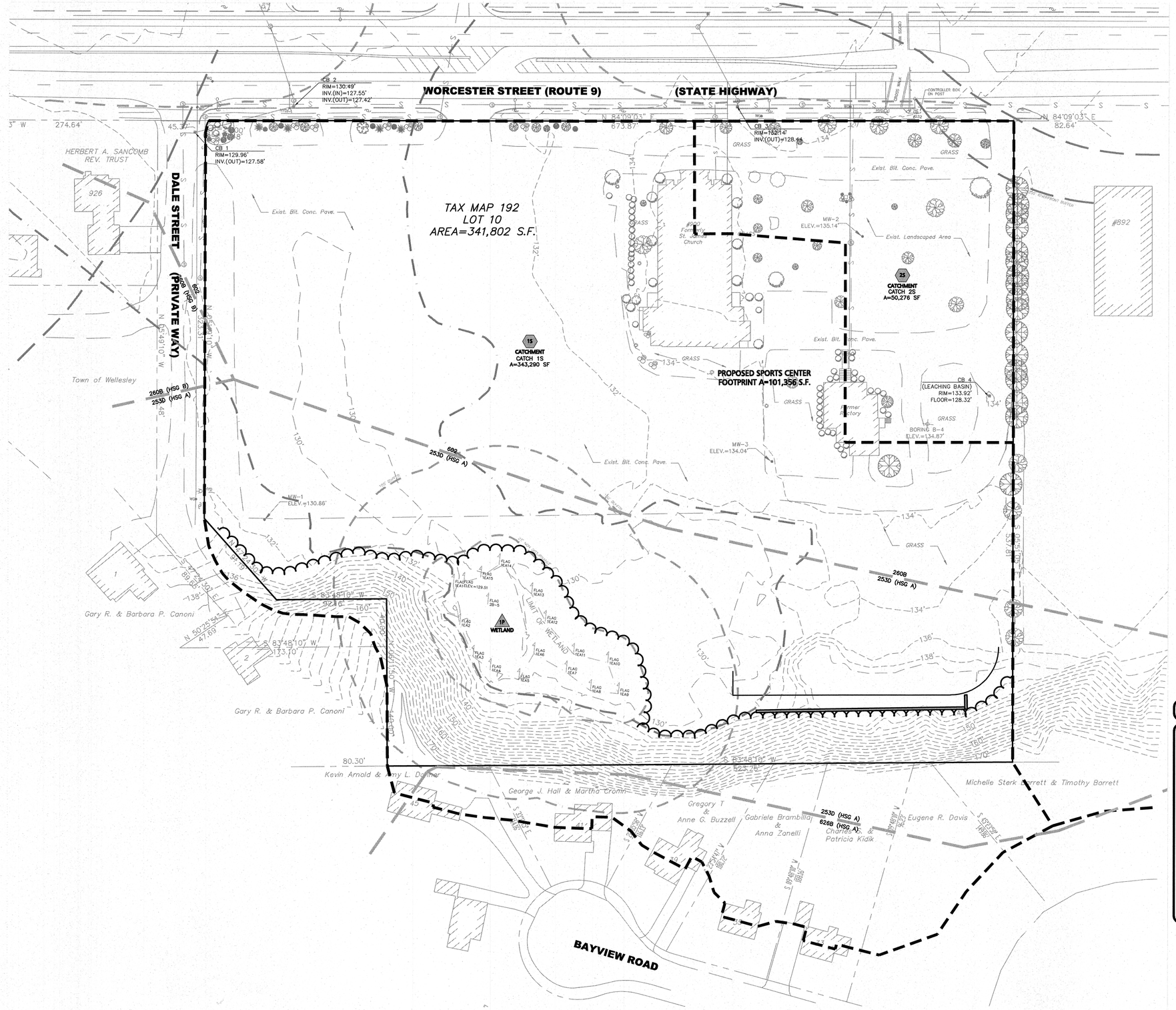


Photo #17: Butterfly weed (a nectar species) in the cultural grasslands. F*acing north.*



Photo #18. Relic small mammal burrow in the cultural grassland. *Facing west.*

4 Watershed Plans



ISSUED FOR PROJECT OF SIGNIFICANT IMPACT

APRIL 12, 2017

COMMONWEALTH OF MASSACHUSETTS
PHILIP L. CORDEIRO
CIVIL
No. 47003
REGISTERED PROFESSIONAL ENGINEER

4-12-17

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:

WELLESLEY SPORTS CENTER, LLC
41 NORTH ROAD, SUITE 203
BEDFORD, MA 01730

PROJECT:

WELLESLEY SPORTS CENTER
900 WORCESTER STREET
WELLESLEY, MA

PROJECT NO.	2329-01	DATE:	04-12-17
SCALE:	1"=40'	DWG. NAME:	C2329-01
DESIGNED BY:	PGM	CHECKED BY:	PLC

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil & structural engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
10 MAIN STREET
LAKEVILLE, MA 02347-1674
TEL: (508) 923-1010
FAX: (508) 923-6309
WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

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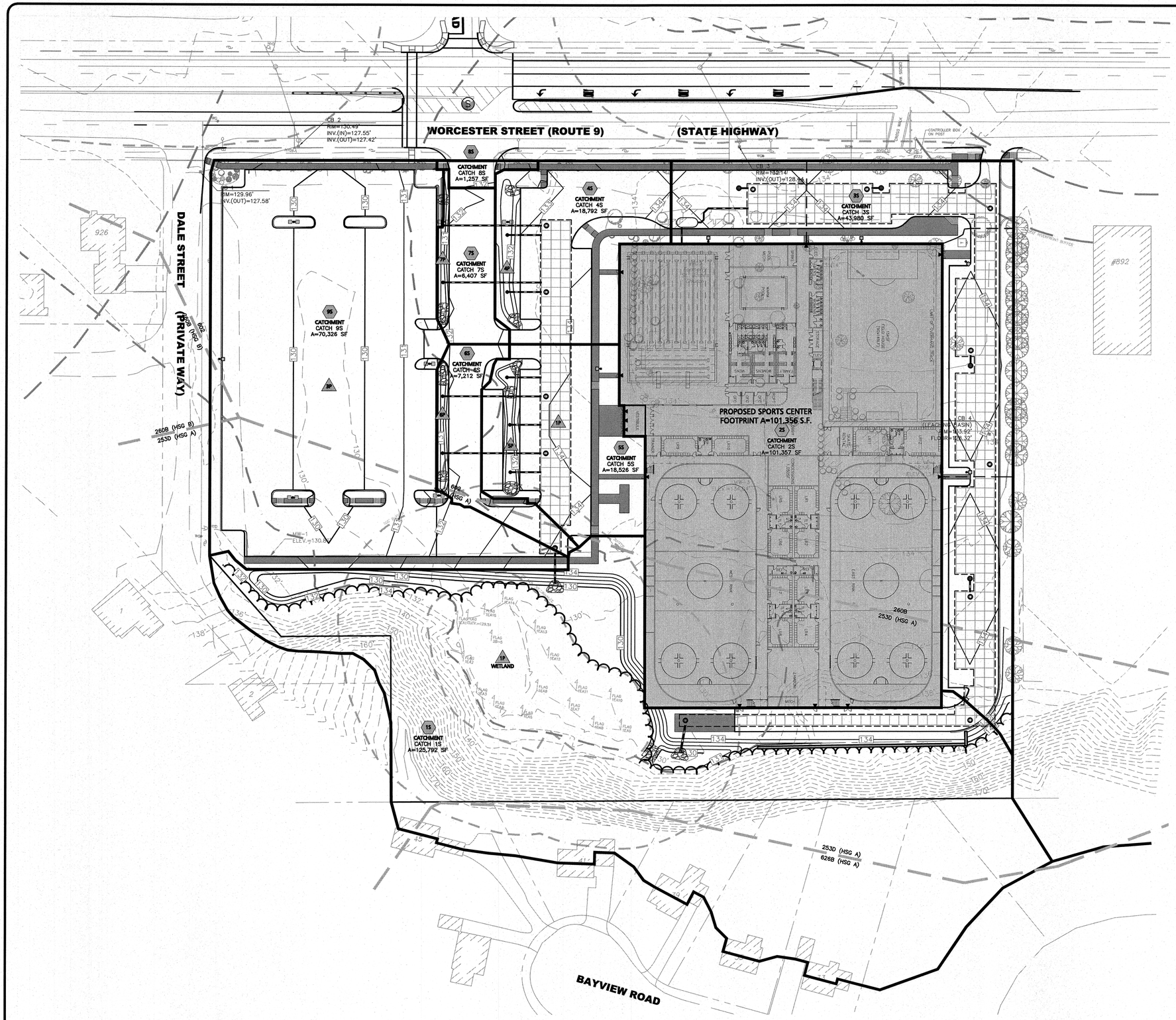
DRAWING TITLE:

WATERSHED PLAN
PRE-DEVELOPMENT

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SHEET No.

WS-1



POSTDEVELOPED

LEGEND:

- PROP. PROPERTY LINE
- EX. PROPERTY LINE
- POST–DEV. WATERSHED AREA
- SCS SOILS BOUNDARY
- Tc FLOW PATH (A — B)
- WETLAND
- WETLAND BUFFER 25'
- WETLAND BUFFER 50'
- WETLAND BUFFER 100'
- SHORELINE/EDGE OF WATER
- FLOODPLAIN
- WETLAND DISTURBANCE
- WETLAND REPLICATION

1S CATCHMENT
CATCH 1S
A=24,531 SF
PAVE=18,668 SF
LANDSCAPE=5,863 SF

1P POND

1L DESIGN POINT

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)

ISSUED FOR PROJECT OF SIGNIFICANT IMPACT
APRIL 12, 2017

COMMONWEALTH OF MASSACHUSETTS
PHILIP L. CORDEIRO
CIVIL
No. 47083
REGISTERED PROFESSIONAL ENGINEER
4-12-17
PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:
WELLESLEY SPORTS CENTER, LLC
41 NORTH ROAD, SUITE 203
BEDFORD, MA 01730

PROJECT:
WELLESLEY SPORTS CENTER
900 WORCESTER STREET
WELLESLEY, MA

PROJECT NO.	2329-01	DATE:	04-12-17
SCALE:	1"=40'	DWG. NAME:	C2329-01
DESIGNED BY:	PGM	CHECKED BY:	PLC

PREPARED BY:

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www.allenmajor.com
10 MAIN STREET
LAKEVILLE, MA 02347-1674
TEL: (508) 923-1010
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DRAWING TITLE:
WATERSHED PLAN
POST-DEVELOPMENT

SHEET No.
WS-2

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APPENDIX B