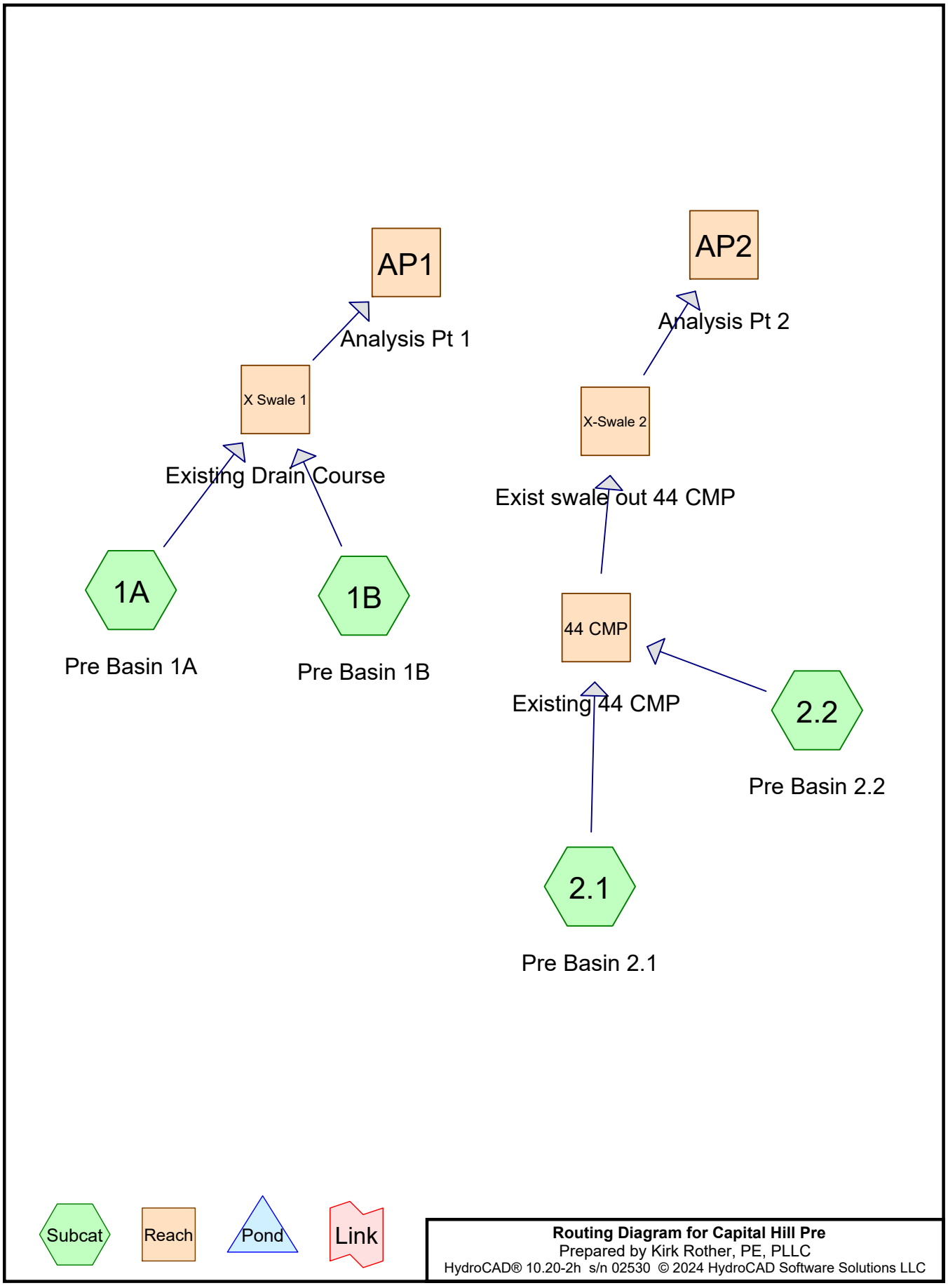
Appendix D

TR-20 HydroCAD Pre and Post Developed Analysis



Routing Diagram for Capital Hill Pre
Prepared by Kirk Rother, PE, PLLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.407	74	>75% Grass cover, Good, HSG C (1A, 1B, 2.1, 2.2)
4.739	98	Impervious Surfaces (1A, 1B, 2.1, 2.2)
81.876	77	Woods, Good, HSG D (1A, 1B, 2.1, 2.2)
92.022	**78**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
5.407	HSG C	1A, 1B, 2.1, 2.2
81.876	HSG D	1A, 1B, 2.1, 2.2
4.739	Other	1A, 1B, 2.1, 2.2
92.022		**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	0.000	5.407	0.000	0.000	5.407	>75% Grass cover, Good	1A, 1B, 2.1, 2.2
0.000	0.000	0.000	0.000	4.739	4.739	Impervious Surfaces	1A, 1B, 2.1, 2.2
0.000	0.000	0.000	81.876	0.000	81.876	Woods, Good	1A, 1B, 2.1, 2.2
0.000	**0.000**	**5.407**	**81.876**	**4.739**	**92.022**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	2.1	0.00	0.00	22.0	0.0586	0.025	0.0	36.0	0.0
2	2.1	0.00	0.00	72.0	0.0330	0.030	44.0	38.0	0.0
3	44 CMP	646.45	644.07	23.0	0.1035	0.013	0.0	44.0	0.0

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 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 1A: Pre Basin 1A Runoff Area=3.170 ac 5.30% Impervious Runoff Depth=0.88"
Flow Length=1,075' Tc=63.0 min CN=78 Runoff=1.18 cfs 0.232 af

Subcatchment 1B: Pre Basin 1B Runoff Area=2.517 ac 1.43% Impervious Runoff Depth=0.83"
Flow Length=789' Tc=36.6 min CN=77 Runoff=1.18 cfs 0.174 af

Subcatchment 2.1: Pre Basin 2.1 Runoff Area=74.363 ac 1.05% Impervious Runoff Depth=0.83"
Flow Length=3,560' Tc=149.9 min CN=77 Runoff=14.29 cfs 5.141 af

Subcatchment 2.2: Pre Basin 2.2 Runoff Area=11.972 ac 31.33% Impervious Runoff Depth=1.16"
Flow Length=1,906' Tc=41.1 min CN=83 Runoff=7.81 cfs 1.160 af

Reach 44 CMP: Existing 44 CMP Avg. Flow Depth=0.52' Max Vel=17.27 fps Inflow=15.69 cfs 6.300 af
44.0" Round Pipe n=0.013 L=23.0' S=0.1035 '/' Capacity=366.39 cfs Outflow=15.69 cfs 6.300 af

Reach AP1: Analysis Pt 1 Inflow=2.12 cfs 0.406 af
Outflow=2.12 cfs 0.406 af

Reach AP2: Analysis Pt 2 Inflow=15.67 cfs 6.300 af
Outflow=15.67 cfs 6.300 af

Reach X Swale 1: Existing Drain Course Avg. Flow Depth=0.67' Max Vel=1.67 fps Inflow=2.12 cfs 0.406 af
n=0.120 L=121.4' S=0.0623 '/' Capacity=45.35 cfs Outflow=2.12 cfs 0.406 af

Reach X-Swale 2: Exist swale out 44 Avg. Flow Depth=0.92' Max Vel=7.13 fps Inflow=15.69 cfs 6.300 af
n=0.040 L=1,237.2' S=0.0857 '/' Capacity=240.78 cfs Outflow=15.67 cfs 6.300 af

Total Runoff Area = 92.022 ac Runoff Volume = 6.707 af Average Runoff Depth = 0.87"
94.85% Pervious = 87.283 ac 5.15% Impervious = 4.739 ac

Summary for Subcatchment 1A: Pre Basin 1A

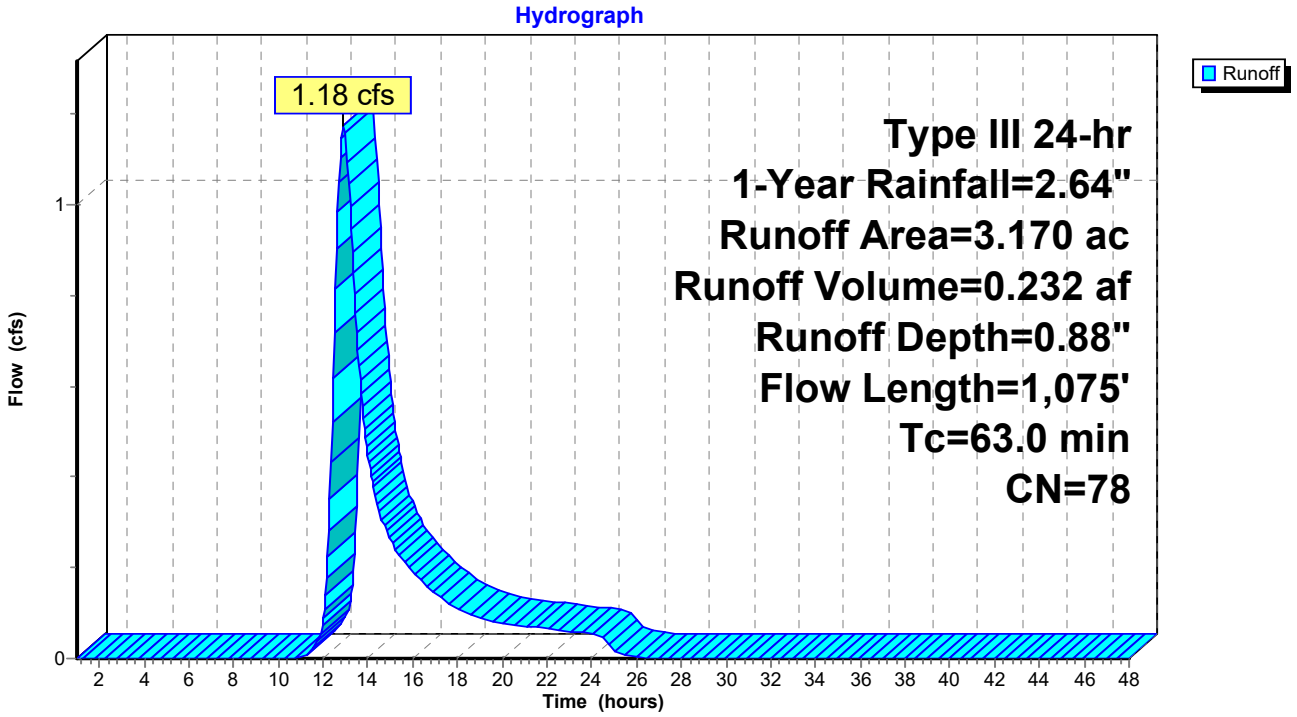
Runoff = 1.18 cfs @ 12.92 hrs, Volume= 0.232 af, Depth= 0.88"
Routed to Reach X Swale 1 : Existing Drain Course

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	0.168	98	Impervious Surfaces
	0.262	74	>75% Grass cover, Good, HSG C
	2.740	77	Woods, Good, HSG D
	3.170	78	Weighted Average
	3.002		94.70% Pervious Area
	0.168		5.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0558	2.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.50"
1.2	80	0.0267	1.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
60.9	760	0.0764	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	135	0.0858	17.74	212.92	**Parabolic Channel,** W=6.00' D=3.00' Area=12.0 sf Perim=8.9' n= 0.030 Earth, clean & winding
63.0	1,075	Total			

Subcatchment 1A: Pre Basin 1A



Summary for Subcatchment 1B: Pre Basin 1B

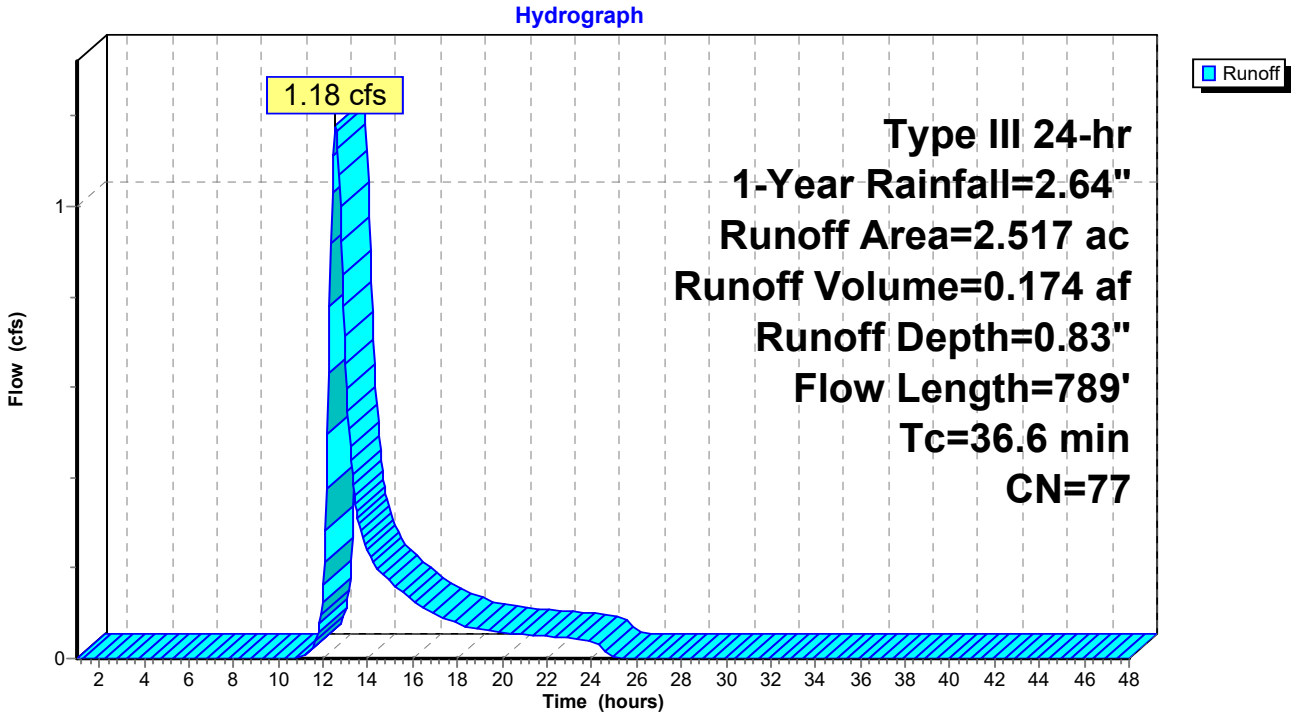
Runoff = 1.18 cfs @ 12.55 hrs, Volume= 0.174 af, Depth= 0.83"
Routed to Reach X Swale 1 : Existing Drain Course

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	0.036	98	Impervious Surfaces
	0.131	74	>75% Grass cover, Good, HSG C
	2.350	77	Woods, Good, HSG D
	2.517	77	Weighted Average
	2.481		98.57% Pervious Area
	0.036		1.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	100	0.0581	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.4	30	0.0413	1.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.9	370	0.1073	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.2	289	0.1084	19.94	239.32	**Parabolic Channel,** W=6.00' D=3.00' Area=12.0 sf Perim=8.9' n= 0.030 Earth, clean & winding
36.6	789	Total			

Subcatchment 1B: Pre Basin 1B



Summary for Subcatchment 2.1: Pre Basin 2.1

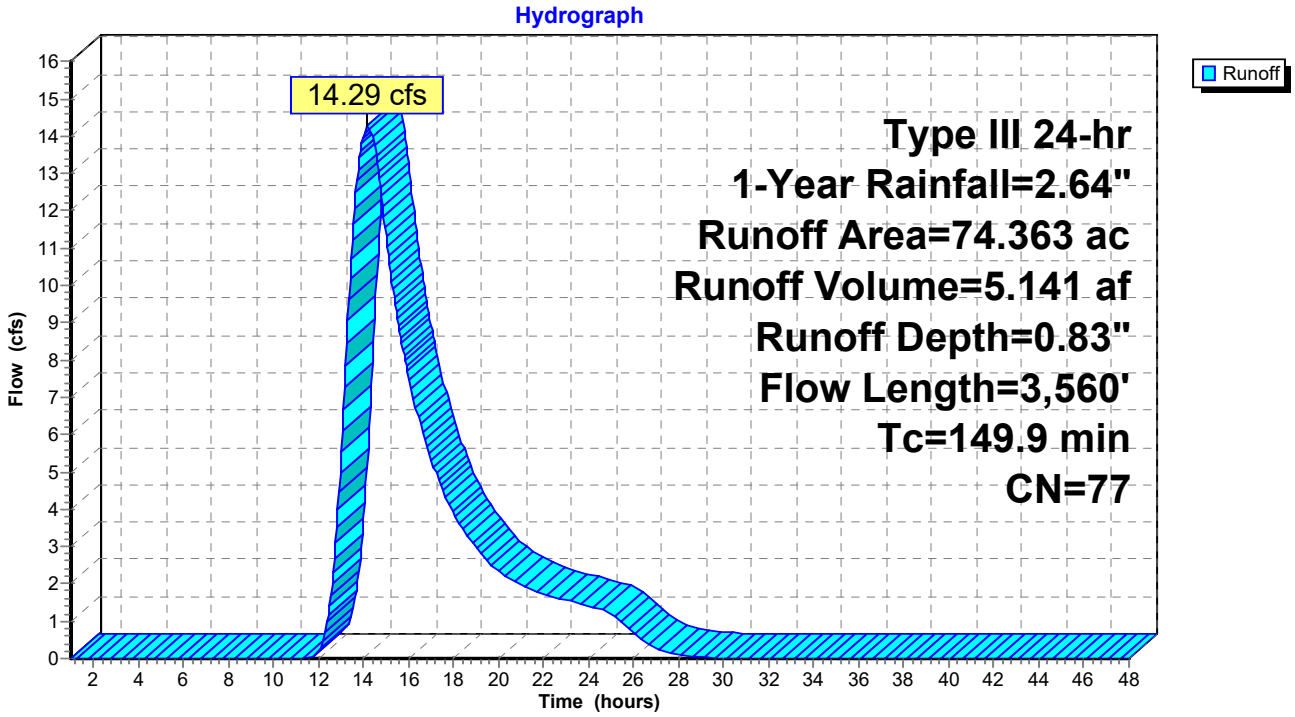
Runoff = 14.29 cfs @ 14.16 hrs, Volume= 5.141 af, Depth= 0.83"
Routed to Reach 44 CMP : Existing 44 CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	0.784	98	Impervious Surfaces
	1.323	74	>75% Grass cover, Good, HSG C
	72.256	77	Woods, Good, HSG D
	74.363	77	Weighted Average
	73.579		98.95% Pervious Area
	0.784		1.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
6.8	560	0.2998	1.37		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.9	372	0.1883	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
127.4	1,338	0.1494	0.18		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
1.1	800	0.1000	12.30	98.36	**Parabolic Channel,** W=6.00' D=2.00' Area=8.0 sf Perim=7.5' n= 0.040 Earth, cobble bottom, clean sides
1.2	126	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	170	0.0732	7.47	39.85	**Parabolic Channel,** W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.040 Earth, cobble bottom, clean sides
0.0	22	0.0586	11.88	83.96	**Pipe Channel, CMP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
0.1	72	0.0330	8.06	73.54	**Pipe Channel,** 44.0" x 38.0" Ellipse Area= 9.1 sf Perim= 10.7' r= 0.85' n= 0.030 Corrugated metal
149.9	3,560	Total			

Subcatchment 2.1: Pre Basin 2.1



Summary for Subcatchment 2.2: Pre Basin 2.2

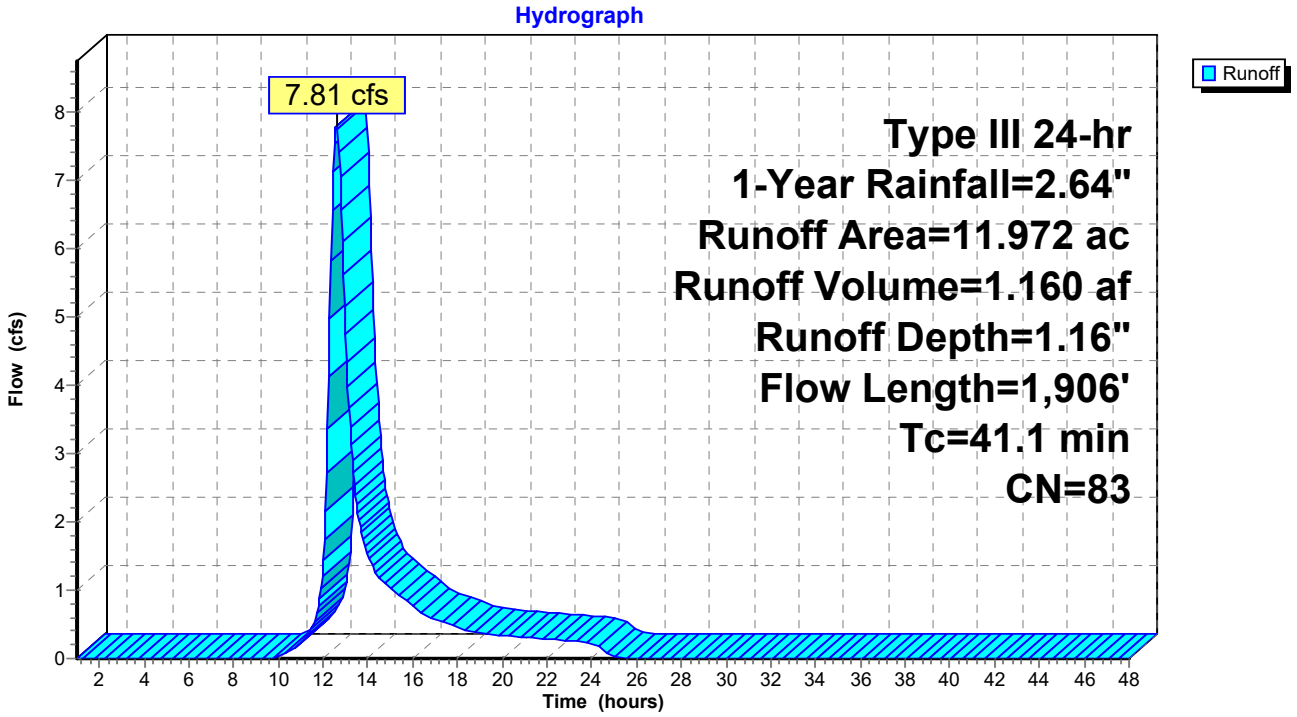
Runoff = 7.81 cfs @ 12.59 hrs, Volume= 1.160 af, Depth= 1.16"
Routed to Reach 44 CMP : Existing 44 CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	3.751	98	Impervious Surfaces
	3.691	74	>75% Grass cover, Good, HSG C
	4.530	77	Woods, Good, HSG D
	11.972	83	Weighted Average
	8.221		68.67% Pervious Area
	3.751		31.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	100	0.0950	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.6	379	0.1254	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	123	0.1382	2.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	100	0.0903	6.10		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	35	0.1416	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	59	0.1186	6.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	67	0.2083	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	48	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	51	0.2058	2.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	54	0.1109	6.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	531	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.9	259	0.0121	2.23		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
41.1	1,906	Total			

Subcatchment 2.2: Pre Basin 2.2



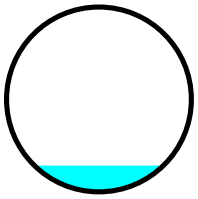
Summary for Reach 44 CMP: Existing 44 CMP

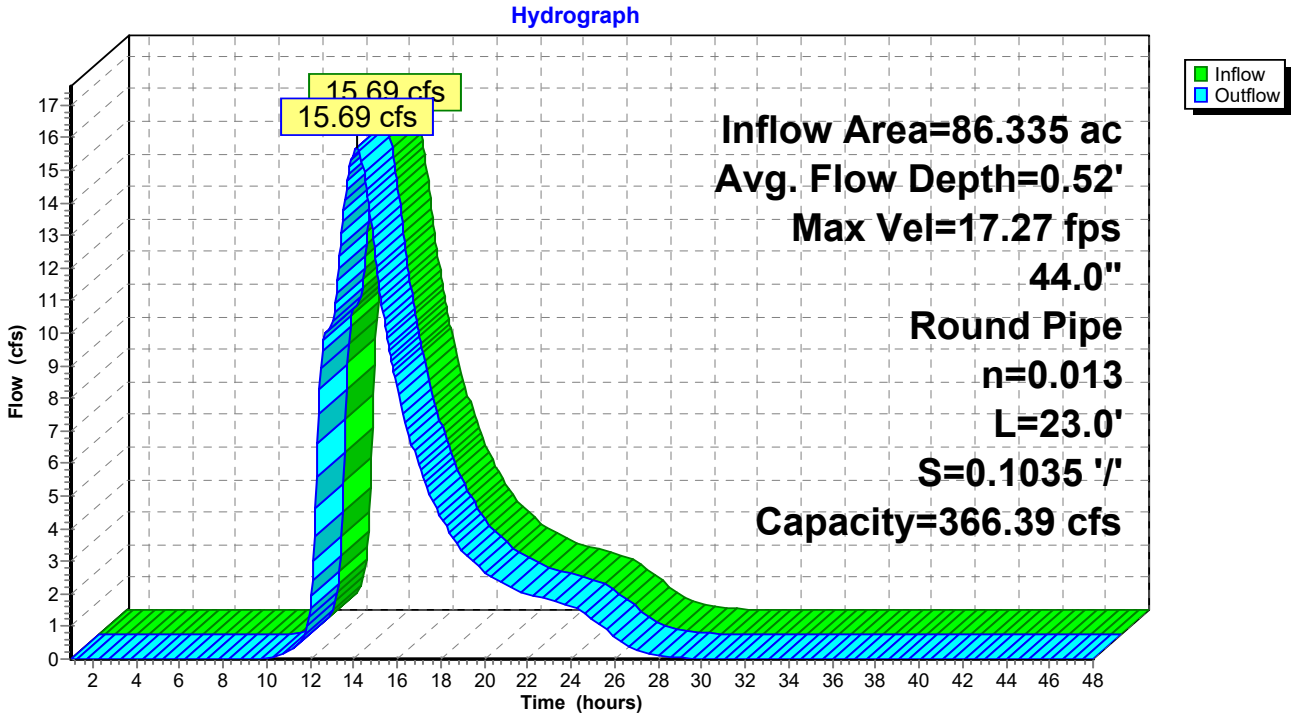
Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 0.88" for 1-Year event
Inflow = 15.69 cfs @ 14.14 hrs, Volume= 6.300 af
Outflow = 15.69 cfs @ 14.14 hrs, Volume= 6.300 af, Atten= 0%, Lag= 0.0 min
Routed to Reach X-Swale 2 : Exist swale out 44 CMP

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 17.27 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 8.76 fps, Avg. Travel Time= 0.0 min

Peak Storage= 21 cf @ 14.14 hrs
Average Depth at Peak Storage= 0.52' , Surface Width= 2.55'
Bank-Full Depth= 3.67' Flow Area= 10.6 sf, Capacity= 366.39 cfs

44.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 23.0' Slope= 0.1035 '/'
Inlet Invert= 646.45', Outlet Invert= 644.07'



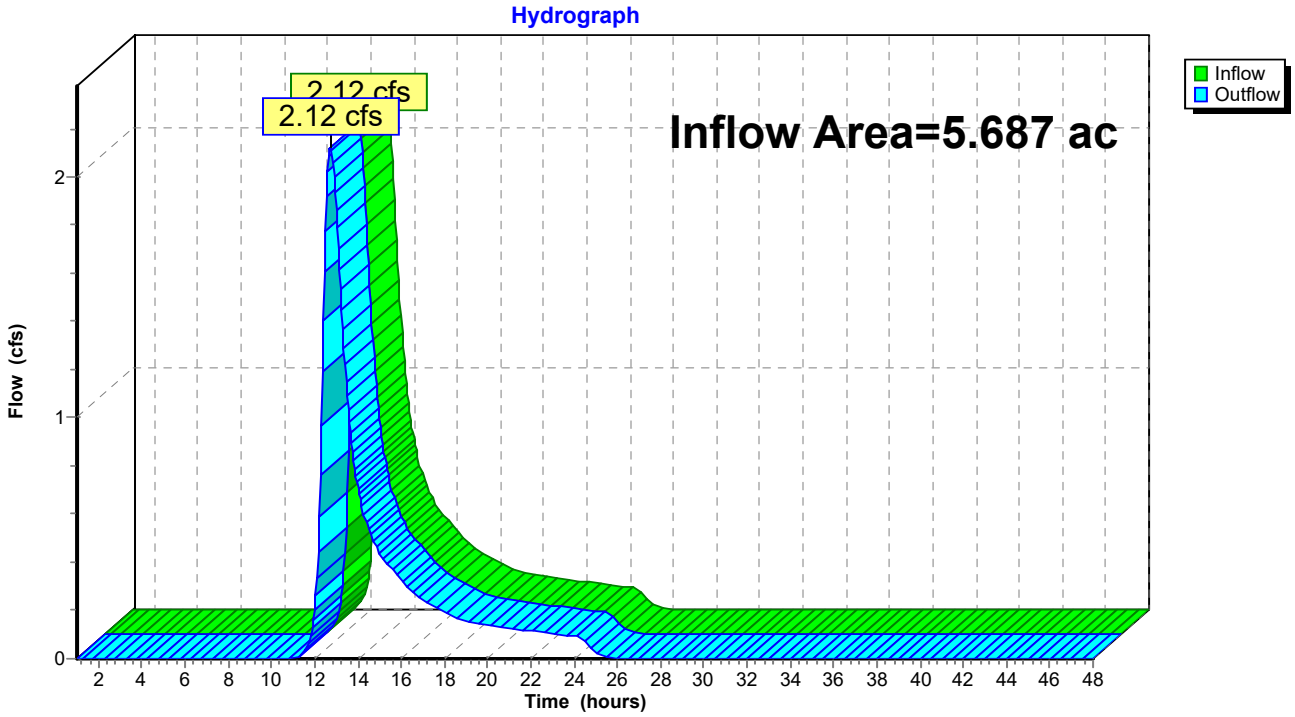


Summary for Reach AP1: Analysis Pt 1

Inflow Area = 5.687 ac, 3.59% Impervious, Inflow Depth = 0.86" for 1-Year event
Inflow = 2.12 cfs @ 12.72 hrs, Volume= 0.406 af
Outflow = 2.12 cfs @ 12.72 hrs, Volume= 0.406 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Reach AP1: Analysis Pt 1

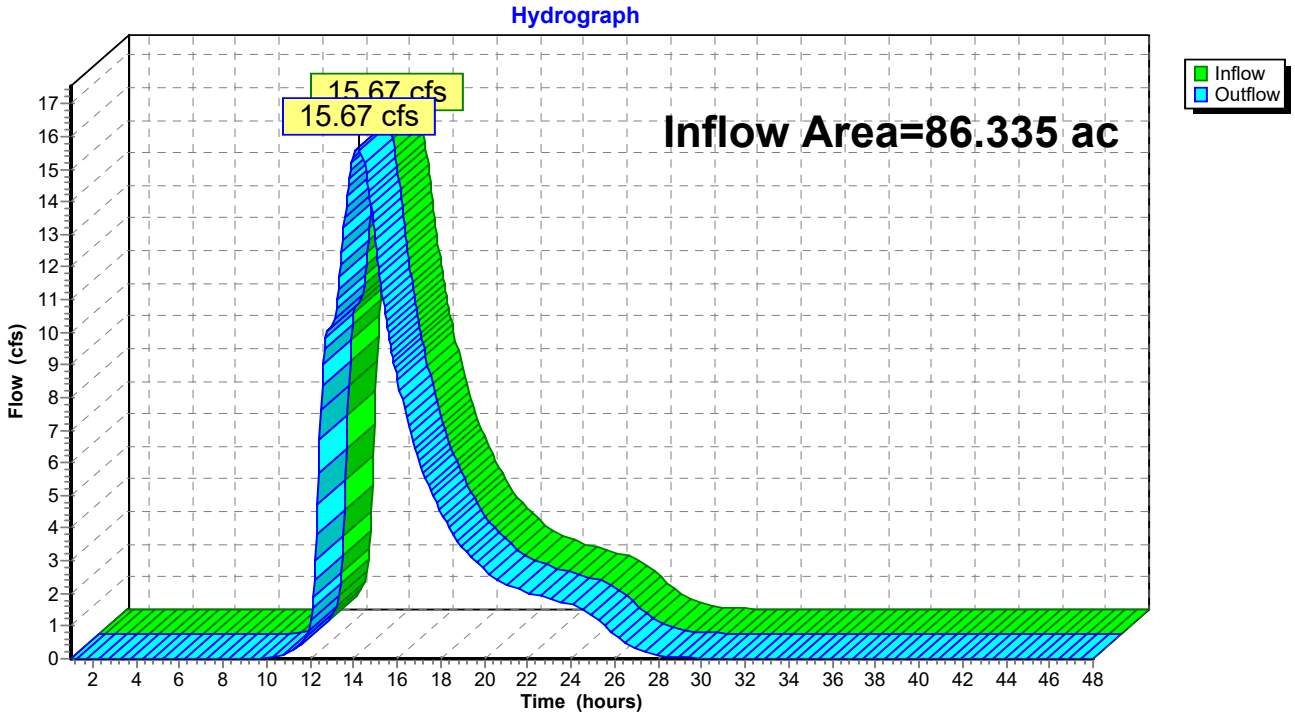


Summary for Reach AP2: Analysis Pt 2

Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 0.88" for 1-Year event
Inflow = 15.67 cfs @ 14.21 hrs, Volume= 6.300 af
Outflow = 15.67 cfs @ 14.21 hrs, Volume= 6.300 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Reach AP2: Analysis Pt 2



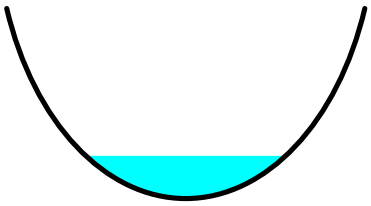
Summary for Reach X Swale 1: Existing Drain Course

Inflow Area = 5.687 ac, 3.59% Impervious, Inflow Depth = 0.86" for 1-Year event
Inflow = 2.12 cfs @ 12.69 hrs, Volume= 0.406 af
Outflow = 2.12 cfs @ 12.72 hrs, Volume= 0.406 af, Atten= 0%, Lag= 2.3 min
Routed to Reach AP1 : Analysis Pt 1

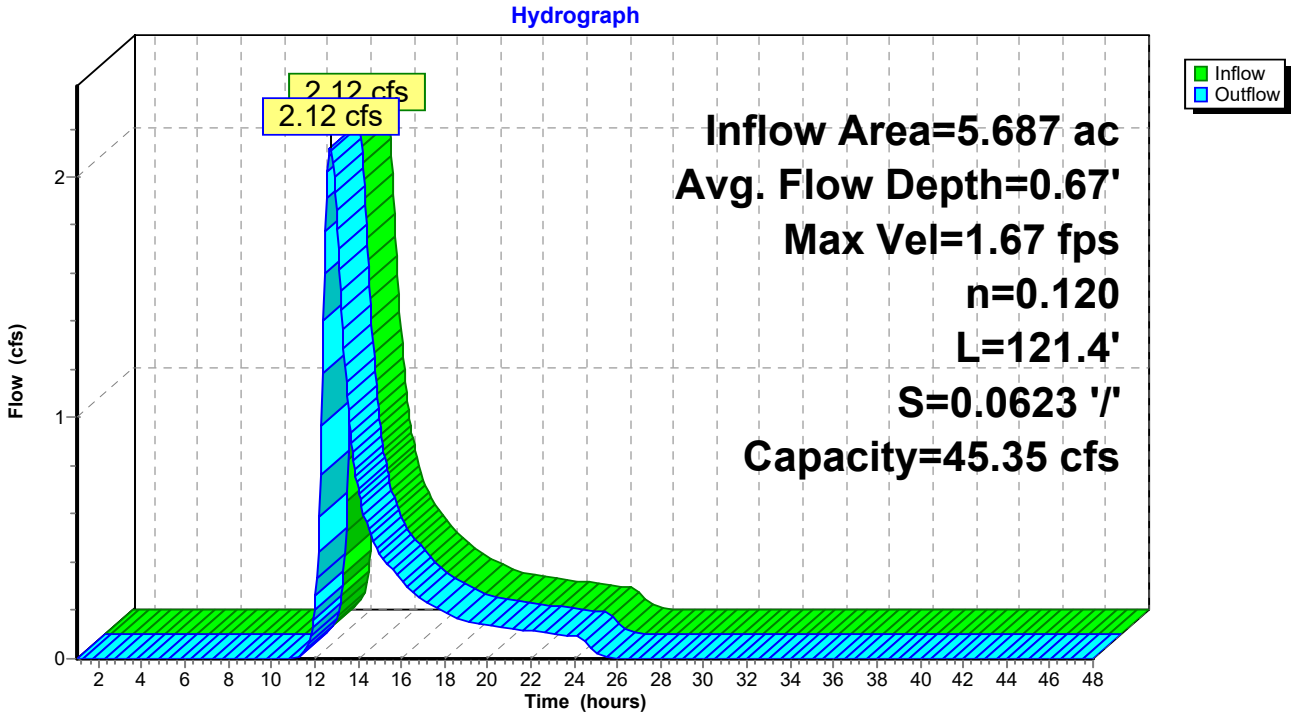
Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.67 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 2.6 min

Peak Storage= 155 cf @ 12.70 hrs
Average Depth at Peak Storage= 0.67' , Surface Width= 2.84'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 45.35 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.120 Earth, long dense weeds
Length= 121.4' Slope= 0.0623 '/'
Inlet Invert= 572.52', Outlet Invert= 564.96'



Reach X Swale 1: Existing Drain Course



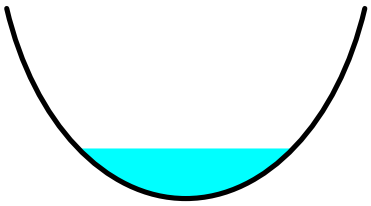
Summary for Reach X-Swale 2: Exist swale out 44 CMP

Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 0.88" for 1-Year event
Inflow = 15.69 cfs @ 14.14 hrs, Volume= 6.300 af
Outflow = 15.67 cfs @ 14.21 hrs, Volume= 6.300 af, Atten= 0%, Lag= 4.3 min
Routed to Reach AP2 : Analysis Pt 2

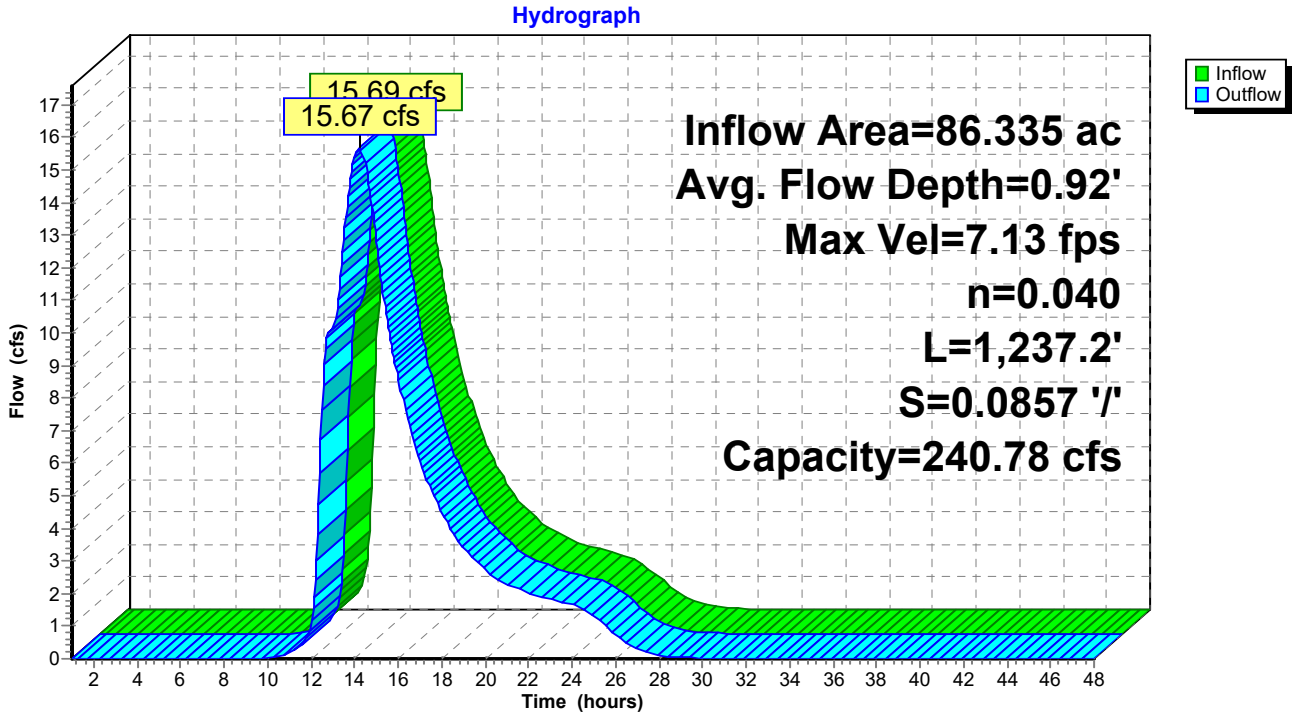
Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.13 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 3.50 fps, Avg. Travel Time= 5.9 min

Peak Storage= 2,719 cf @ 14.17 hrs
Average Depth at Peak Storage= 0.92' , Surface Width= 3.59'
Bank-Full Depth= 3.50' Flow Area= 16.3 sf, Capacity= 240.78 cfs

7.00' x 3.50' deep Parabolic Channel, n= 0.040 Earth, dense weeds
Length= 1,237.2' Slope= 0.0857 '/'
Inlet Invert= 644.07', Outlet Invert= 538.00'



Reach X-Swale 2: Exist swale out 44 CMP



Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 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 1A: Pre Basin 1A Runoff Area=3.170 ac 5.30% Impervious Runoff Depth=2.54"
Flow Length=1,075' Tc=63.0 min CN=78 Runoff=3.60 cfs 0.672 af

Subcatchment 1B: Pre Basin 1B Runoff Area=2.517 ac 1.43% Impervious Runoff Depth=2.46"
Flow Length=789' Tc=36.6 min CN=77 Runoff=3.72 cfs 0.515 af

Subcatchment 2.1: Pre Basin 2.1 Runoff Area=74.363 ac 1.05% Impervious Runoff Depth=2.46"
Flow Length=3,560' Tc=149.9 min CN=77 Runoff=45.28 cfs 15.223 af

Subcatchment 2.2: Pre Basin 2.2 Runoff Area=11.972 ac 31.33% Impervious Runoff Depth=2.99"
Flow Length=1,906' Tc=41.1 min CN=83 Runoff=20.37 cfs 2.987 af

Reach 44 CMP: Existing 44 CMP Avg. Flow Depth=0.90' Max Vel=24.11 fps Inflow=48.70 cfs 18.210 af
44.0" Round Pipe n=0.013 L=23.0' S=0.1035 '/' Capacity=366.39 cfs Outflow=48.71 cfs 18.210 af

Reach AP1: Analysis Pt 1 Inflow=6.63 cfs 1.187 af
Outflow=6.63 cfs 1.187 af

Reach AP2: Analysis Pt 2 Inflow=48.67 cfs 18.210 af
Outflow=48.67 cfs 18.210 af

Reach X Swale 1: Existing Drain Course Avg. Flow Depth=1.16' Max Vel=2.29 fps Inflow=6.64 cfs 1.187 af
n=0.120 L=121.4' S=0.0623 '/' Capacity=45.35 cfs Outflow=6.63 cfs 1.187 af

Reach X-Swale 2: Exist swale out 44 Avg. Flow Depth=1.59' Max Vel=9.74 fps Inflow=48.71 cfs 18.210 af
n=0.040 L=1,237.2' S=0.0857 '/' Capacity=240.78 cfs Outflow=48.67 cfs 18.210 af

Total Runoff Area = 92.022 ac Runoff Volume = 19.397 af Average Runoff Depth = 2.53"
94.85% Pervious = 87.283 ac 5.15% Impervious = 4.739 ac

Summary for Subcatchment 1A: Pre Basin 1A

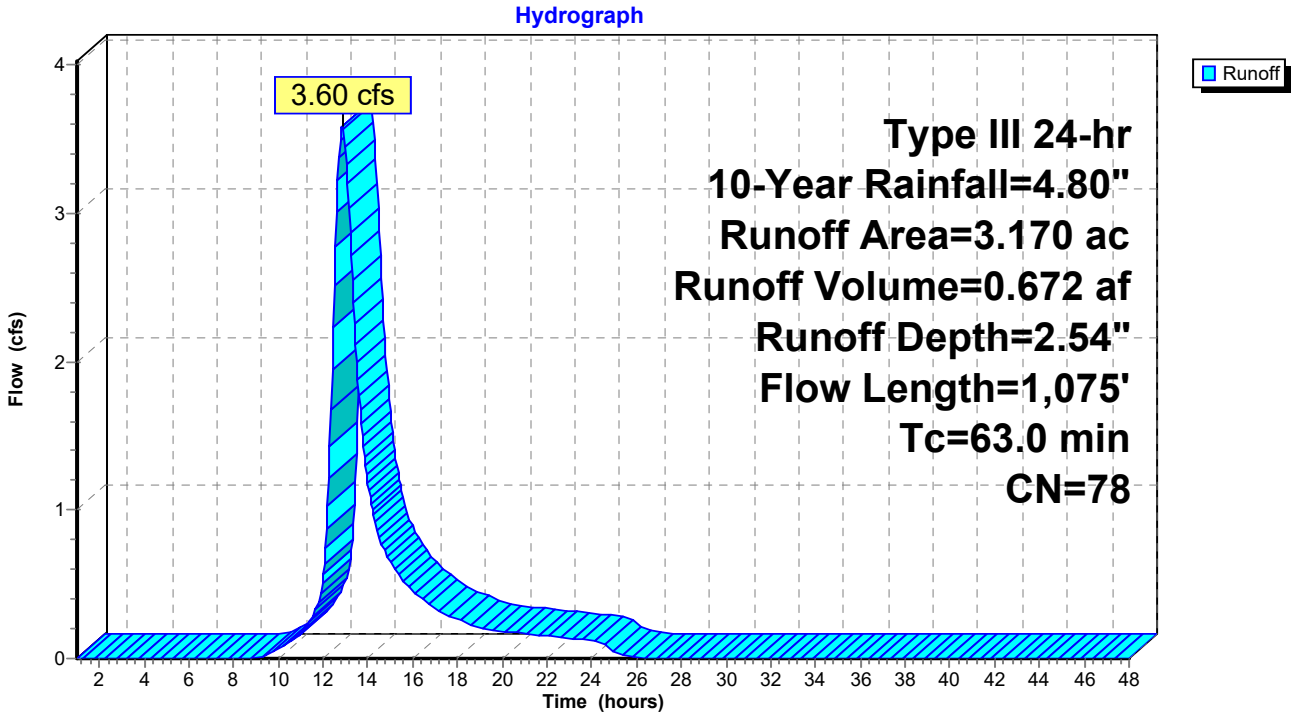
Runoff = 3.60 cfs @ 12.85 hrs, Volume= 0.672 af, Depth= 2.54"
Routed to Reach X Swale 1 : Existing Drain Course

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	0.168	98	Impervious Surfaces
	0.262	74	>75% Grass cover, Good, HSG C
	2.740	77	Woods, Good, HSG D
	3.170	78	Weighted Average
	3.002		94.70% Pervious Area
	0.168		5.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0558	2.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.50"
1.2	80	0.0267	1.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
60.9	760	0.0764	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	135	0.0858	17.74	212.92	**Parabolic Channel,** W=6.00' D=3.00' Area=12.0 sf Perim=8.9' n= 0.030 Earth, clean & winding
63.0	1,075	Total			

Subcatchment 1A: Pre Basin 1A



Summary for Subcatchment 1B: Pre Basin 1B

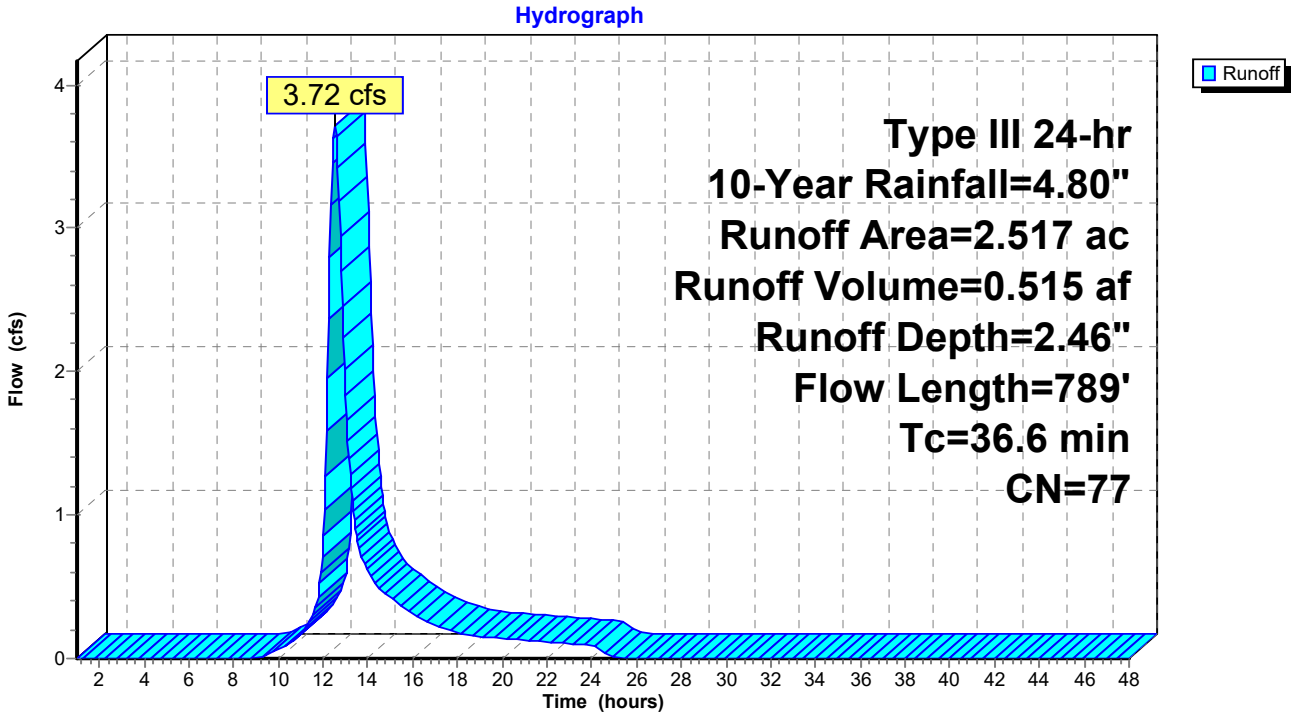
Runoff = 3.72 cfs @ 12.52 hrs, Volume= 0.515 af, Depth= 2.46"
Routed to Reach X Swale 1 : Existing Drain Course

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	0.036	98	Impervious Surfaces
	0.131	74	>75% Grass cover, Good, HSG C
	2.350	77	Woods, Good, HSG D
	2.517	77	Weighted Average
	2.481		98.57% Pervious Area
	0.036		1.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	100	0.0581	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.4	30	0.0413	1.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.9	370	0.1073	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.2	289	0.1084	19.94	239.32	**Parabolic Channel,** W=6.00' D=3.00' Area=12.0 sf Perim=8.9' n= 0.030 Earth, clean & winding
36.6	789	Total			

Subcatchment 1B: Pre Basin 1B



Summary for Subcatchment 2.1: Pre Basin 2.1

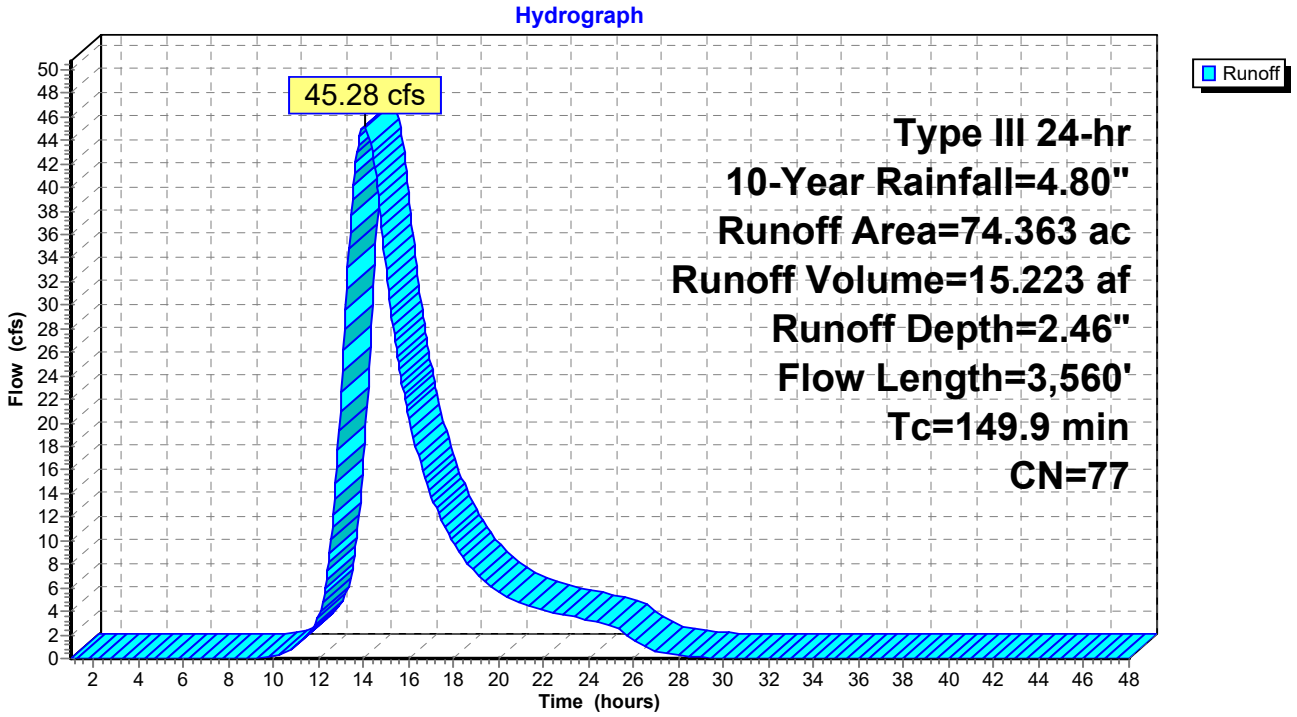
Runoff = 45.28 cfs @ 14.02 hrs, Volume= 15.223 af, Depth= 2.46"
Routed to Reach 44 CMP : Existing 44 CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	0.784	98	Impervious Surfaces
	1.323	74	>75% Grass cover, Good, HSG C
	72.256	77	Woods, Good, HSG D
	74.363	77	Weighted Average
	73.579		98.95% Pervious Area
	0.784		1.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
6.8	560	0.2998	1.37		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.9	372	0.1883	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
127.4	1,338	0.1494	0.18		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
1.1	800	0.1000	12.30	98.36	**Parabolic Channel,** W=6.00' D=2.00' Area=8.0 sf Perim=7.5' n= 0.040 Earth, cobble bottom, clean sides
1.2	126	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	170	0.0732	7.47	39.85	**Parabolic Channel,** W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.040 Earth, cobble bottom, clean sides
0.0	22	0.0586	11.88	83.96	**Pipe Channel, CMP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
0.1	72	0.0330	8.06	73.54	**Pipe Channel,** 44.0" x 38.0" Ellipse Area= 9.1 sf Perim= 10.7' r= 0.85' n= 0.030 Corrugated metal
149.9	3,560	Total			

Subcatchment 2.1: Pre Basin 2.1



Summary for Subcatchment 2.2: Pre Basin 2.2

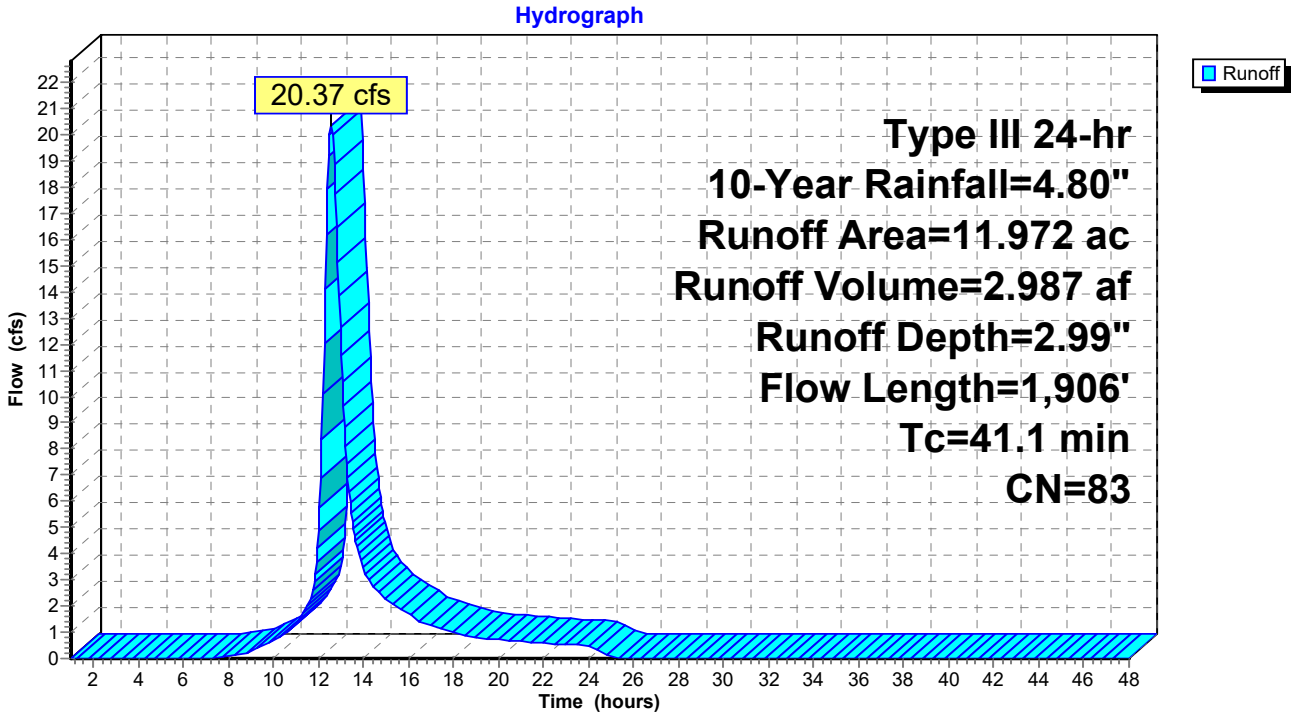
Runoff = 20.37 cfs @ 12.56 hrs, Volume= 2.987 af, Depth= 2.99"
Routed to Reach 44 CMP : Existing 44 CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	3.751	98	Impervious Surfaces
	3.691	74	>75% Grass cover, Good, HSG C
	4.530	77	Woods, Good, HSG D
	11.972	83	Weighted Average
	8.221		68.67% Pervious Area
	3.751		31.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	100	0.0950	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.6	379	0.1254	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	123	0.1382	2.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	100	0.0903	6.10		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	35	0.1416	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	59	0.1186	6.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	67	0.2083	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	48	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	51	0.2058	2.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	54	0.1109	6.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	531	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.9	259	0.0121	2.23		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
41.1	1,906	Total			

Subcatchment 2.2: Pre Basin 2.2



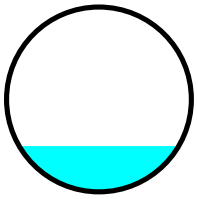
Summary for Reach 44 CMP: Existing 44 CMP

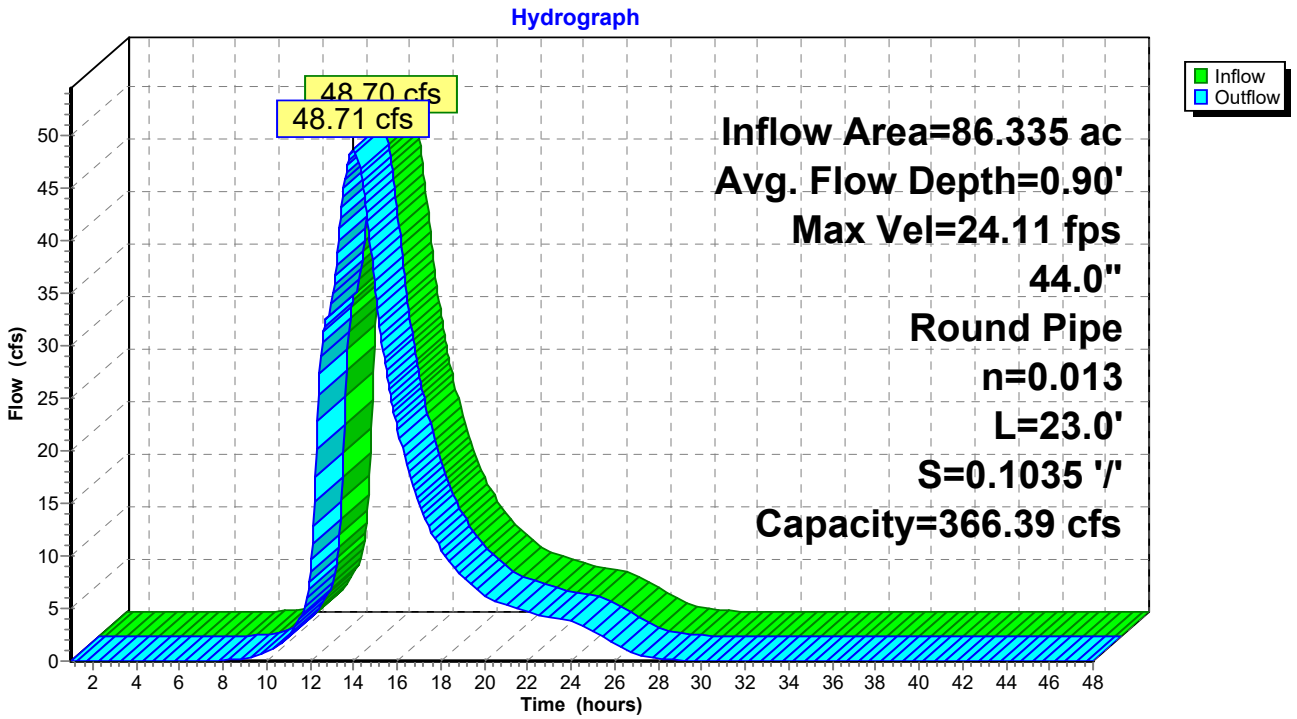
Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 2.53" for 10-Year event
Inflow = 48.70 cfs @ 13.99 hrs, Volume= 18.210 af
Outflow = 48.71 cfs @ 13.99 hrs, Volume= 18.210 af, Atten= 0%, Lag= 0.0 min
Routed to Reach X-Swale 2 : Exist swale out 44 CMP

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 24.11 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 11.07 fps, Avg. Travel Time= 0.0 min

Peak Storage= 46 cf @ 13.99 hrs
Average Depth at Peak Storage= 0.90' , Surface Width= 3.16'
Bank-Full Depth= 3.67' Flow Area= 10.6 sf, Capacity= 366.39 cfs

44.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 23.0' Slope= 0.1035 '/'
Inlet Invert= 646.45', Outlet Invert= 644.07'



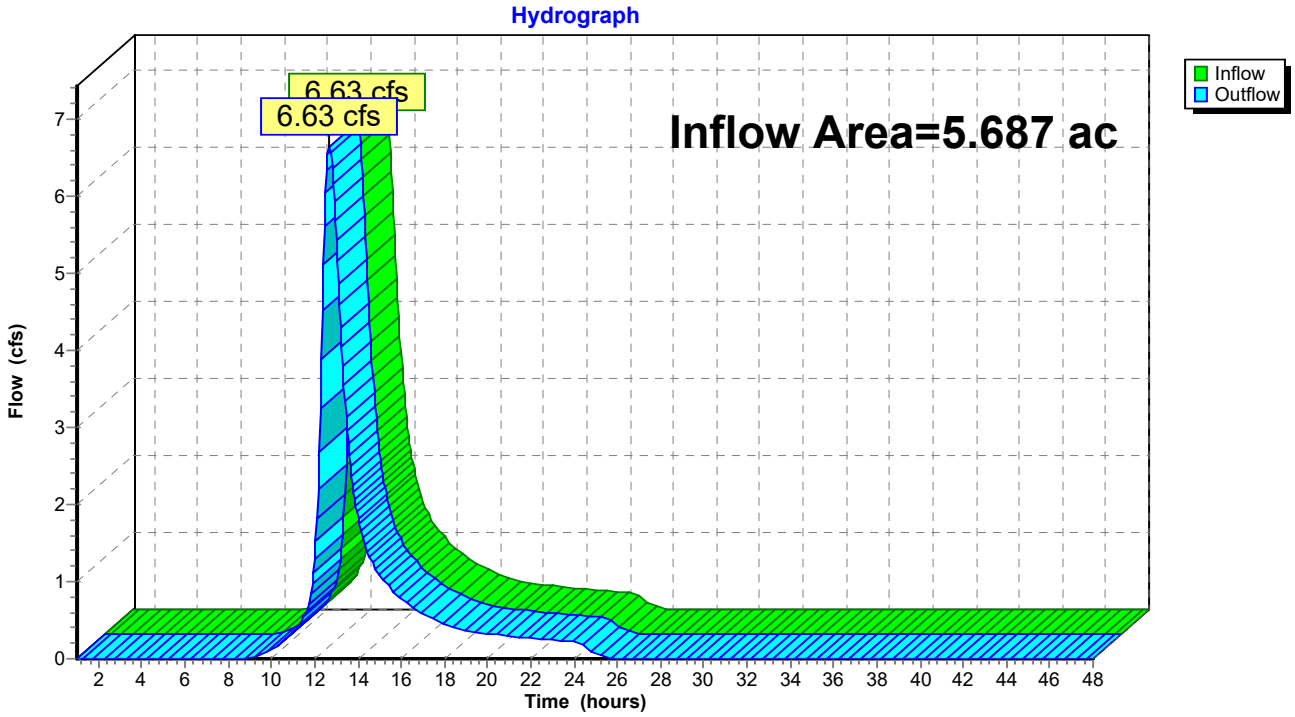


Summary for Reach AP1: Analysis Pt 1

Inflow Area = 5.687 ac, 3.59% Impervious, Inflow Depth = 2.50" for 10-Year event
Inflow = 6.63 cfs @ 12.67 hrs, Volume= 1.187 af
Outflow = 6.63 cfs @ 12.67 hrs, Volume= 1.187 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Reach AP1: Analysis Pt 1

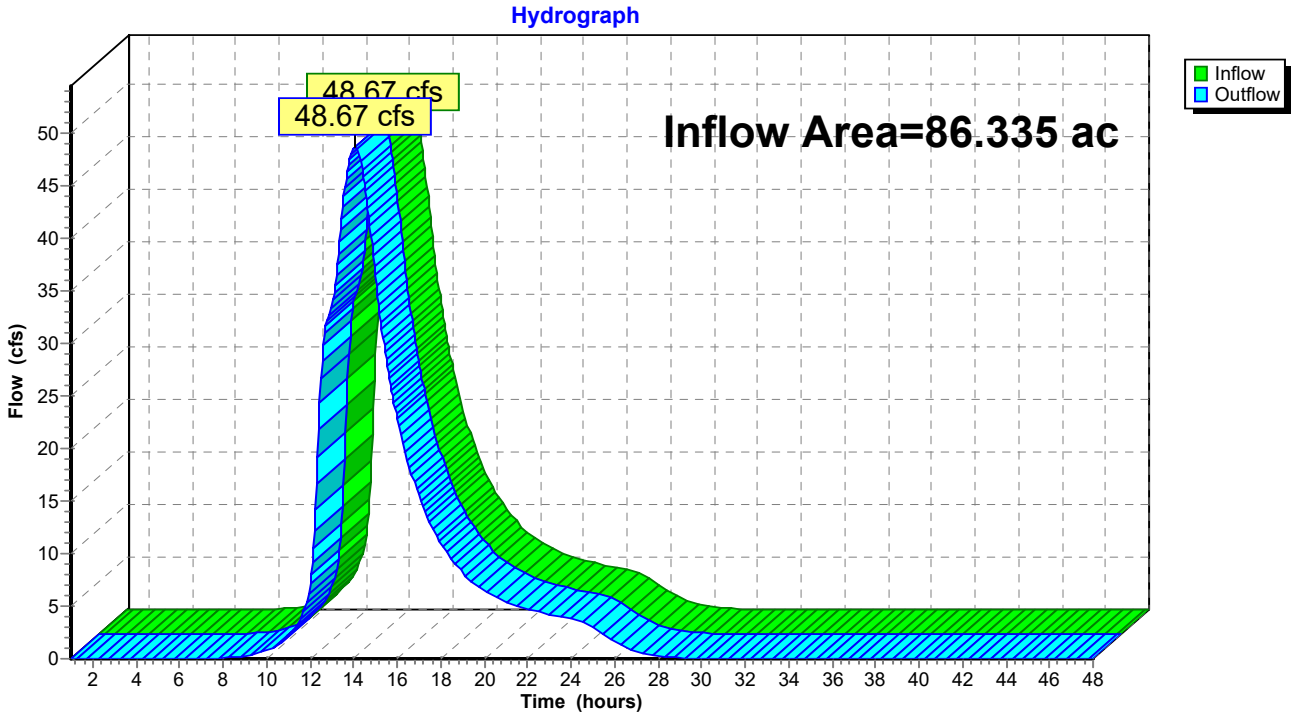


Summary for Reach AP2: Analysis Pt 2

Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 2.53" for 10-Year event
Inflow = 48.67 cfs @ 14.04 hrs, Volume= 18.210 af
Outflow = 48.67 cfs @ 14.04 hrs, Volume= 18.210 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Reach AP2: Analysis Pt 2



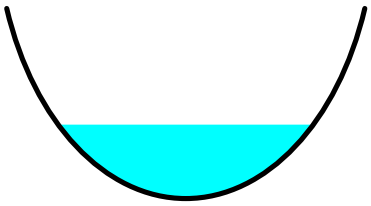
Summary for Reach X Swale 1: Existing Drain Course

Inflow Area = 5.687 ac, 3.59% Impervious, Inflow Depth = 2.50" for 10-Year event
Inflow = 6.64 cfs @ 12.64 hrs, Volume= 1.187 af
Outflow = 6.63 cfs @ 12.67 hrs, Volume= 1.187 af, Atten= 0%, Lag= 1.5 min
Routed to Reach AP1 : Analysis Pt 1

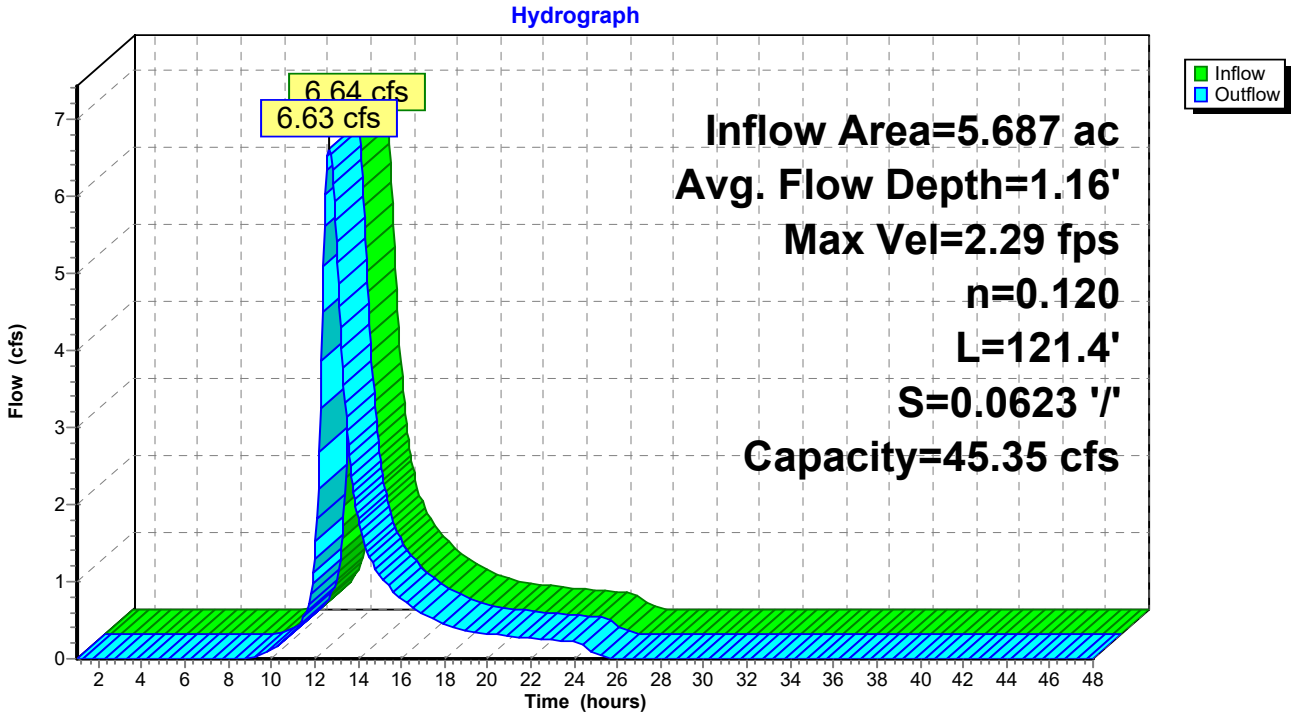
Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.29 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 2.1 min

Peak Storage= 352 cf @ 12.65 hrs
Average Depth at Peak Storage= 1.16' , Surface Width= 3.74'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 45.35 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.120 Earth, long dense weeds
Length= 121.4' Slope= 0.0623 '/'
Inlet Invert= 572.52', Outlet Invert= 564.96'



Reach X Swale 1: Existing Drain Course



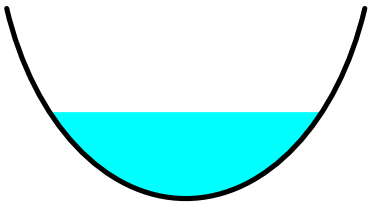
Summary for Reach X-Swale 2: Exist swale out 44 CMP

Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 2.53" for 10-Year event
Inflow = 48.71 cfs @ 13.99 hrs, Volume= 18.210 af
Outflow = 48.67 cfs @ 14.04 hrs, Volume= 18.210 af, Atten= 0%, Lag= 3.2 min
Routed to Reach AP2 : Analysis Pt 2

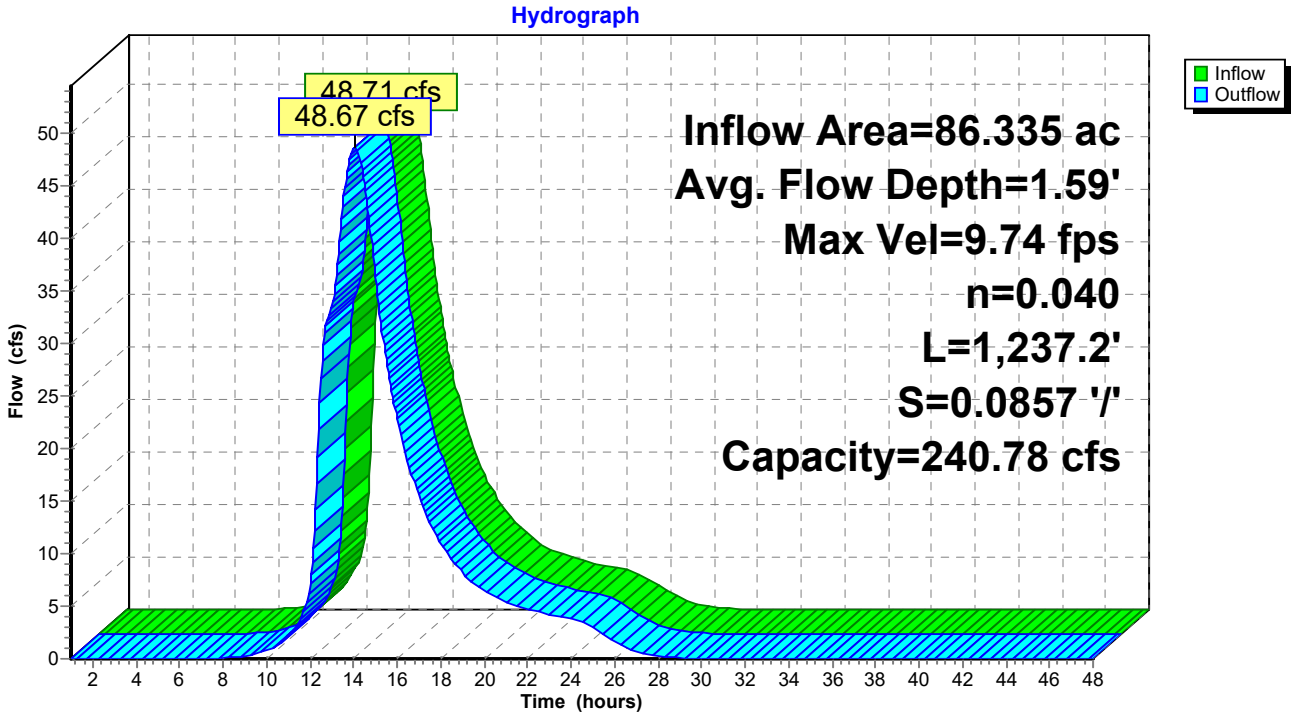
Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.74 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 4.39 fps, Avg. Travel Time= 4.7 min

Peak Storage= 6,182 cf @ 14.00 hrs
Average Depth at Peak Storage= 1.59' , Surface Width= 4.72'
Bank-Full Depth= 3.50' Flow Area= 16.3 sf, Capacity= 240.78 cfs

7.00' x 3.50' deep Parabolic Channel, n= 0.040 Earth, dense weeds
Length= 1,237.2' Slope= 0.0857 '/'
Inlet Invert= 644.07', Outlet Invert= 538.00'



Reach X-Swale 2: Exist swale out 44 CMP



Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 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 1A: Pre Basin 1A Runoff Area=3.170 ac 5.30% Impervious Runoff Depth=5.92"
Flow Length=1,075' Tc=63.0 min CN=78 Runoff=8.35 cfs 1.564 af

Subcatchment 1B: Pre Basin 1B Runoff Area=2.517 ac 1.43% Impervious Runoff Depth=5.80"
Flow Length=789' Tc=36.6 min CN=77 Runoff=8.74 cfs 1.216 af

Subcatchment 2.1: Pre Basin 2.1 Runoff Area=74.363 ac 1.05% Impervious Runoff Depth=5.80"
Flow Length=3,560' Tc=149.9 min CN=77 Runoff=107.75 cfs 35.940 af

Subcatchment 2.2: Pre Basin 2.2 Runoff Area=11.972 ac 31.33% Impervious Runoff Depth=6.52"
Flow Length=1,906' Tc=41.1 min CN=83 Runoff=43.43 cfs 6.508 af

Reach 44 CMP: Existing 44 CMP Avg. Flow Depth=1.41' Max Vel=30.71 fps Inflow=115.01 cfs 42.448 af
44.0" Round Pipe n=0.013 L=23.0' S=0.1035 '/' Capacity=366.39 cfs Outflow=115.01 cfs 42.448 af

Reach AP1: Analysis Pt 1 Inflow=15.55 cfs 2.780 af
Outflow=15.55 cfs 2.780 af

Reach AP2: Analysis Pt 2 Inflow=114.92 cfs 42.448 af
Outflow=114.92 cfs 42.448 af

Reach X Swale 1: Existing Drain Course Avg. Flow Depth=1.76' Max Vel=2.87 fps Inflow=15.57 cfs 2.780 af
n=0.120 L=121.4' S=0.0623 '/' Capacity=45.35 cfs Outflow=15.55 cfs 2.780 af

Reach X-Swale 2: Exist swale out Avg. Flow Depth=2.42' Max Vel=12.22 fps Inflow=115.01 cfs 42.448 af
n=0.040 L=1,237.2' S=0.0857 '/' Capacity=240.78 cfs Outflow=114.92 cfs 42.448 af

Total Runoff Area = 92.022 ac Runoff Volume = 45.228 af Average Runoff Depth = 5.90"
94.85% Pervious = 87.283 ac 5.15% Impervious = 4.739 ac

Summary for Subcatchment 1A: Pre Basin 1A

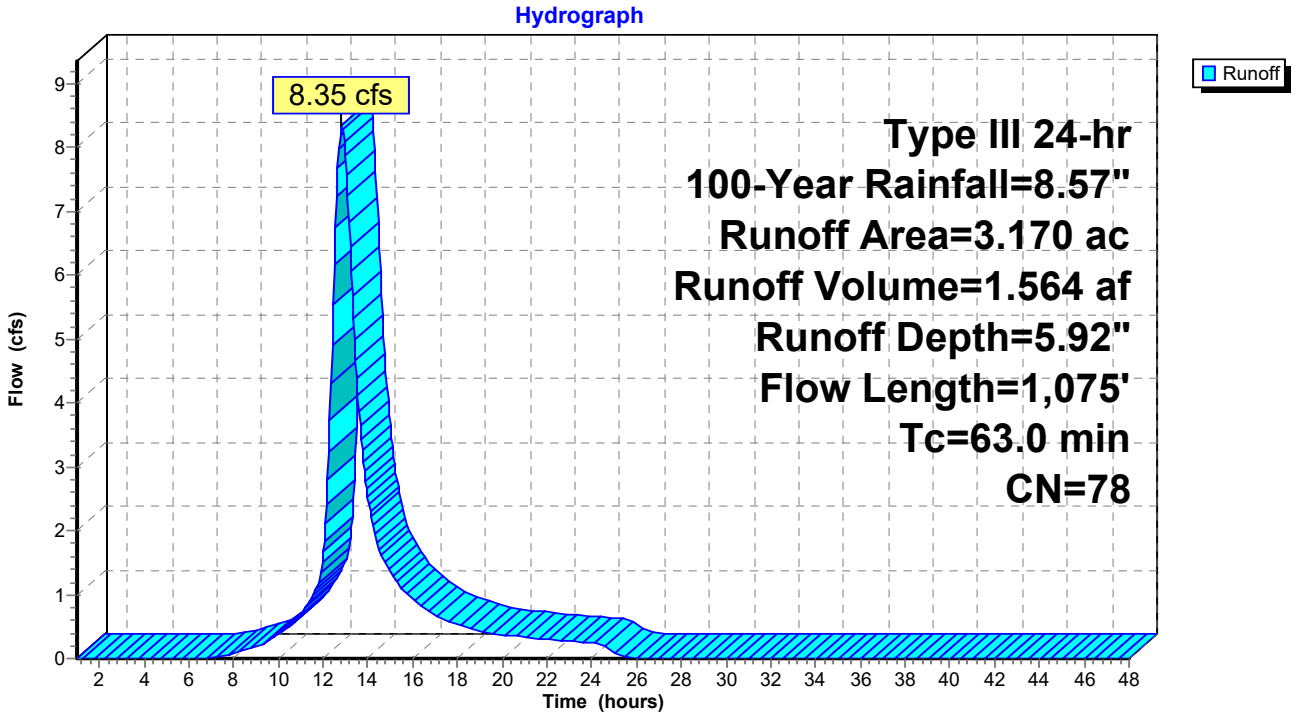
Runoff = 8.35 cfs @ 12.82 hrs, Volume= 1.564 af, Depth= 5.92"
Routed to Reach X Swale 1 : Existing Drain Course

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	0.168	98	Impervious Surfaces
	0.262	74	>75% Grass cover, Good, HSG C
	2.740	77	Woods, Good, HSG D
	3.170	78	Weighted Average
	3.002		94.70% Pervious Area
	0.168		5.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	100	0.0558	2.17		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.50"
1.2	80	0.0267	1.14		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
60.9	760	0.0764	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.1	135	0.0858	17.74	212.92	**Parabolic Channel,** W=6.00' D=3.00' Area=12.0 sf Perim=8.9' n= 0.030 Earth, clean & winding
63.0	1,075	Total			

Subcatchment 1A: Pre Basin 1A



Summary for Subcatchment 1B: Pre Basin 1B

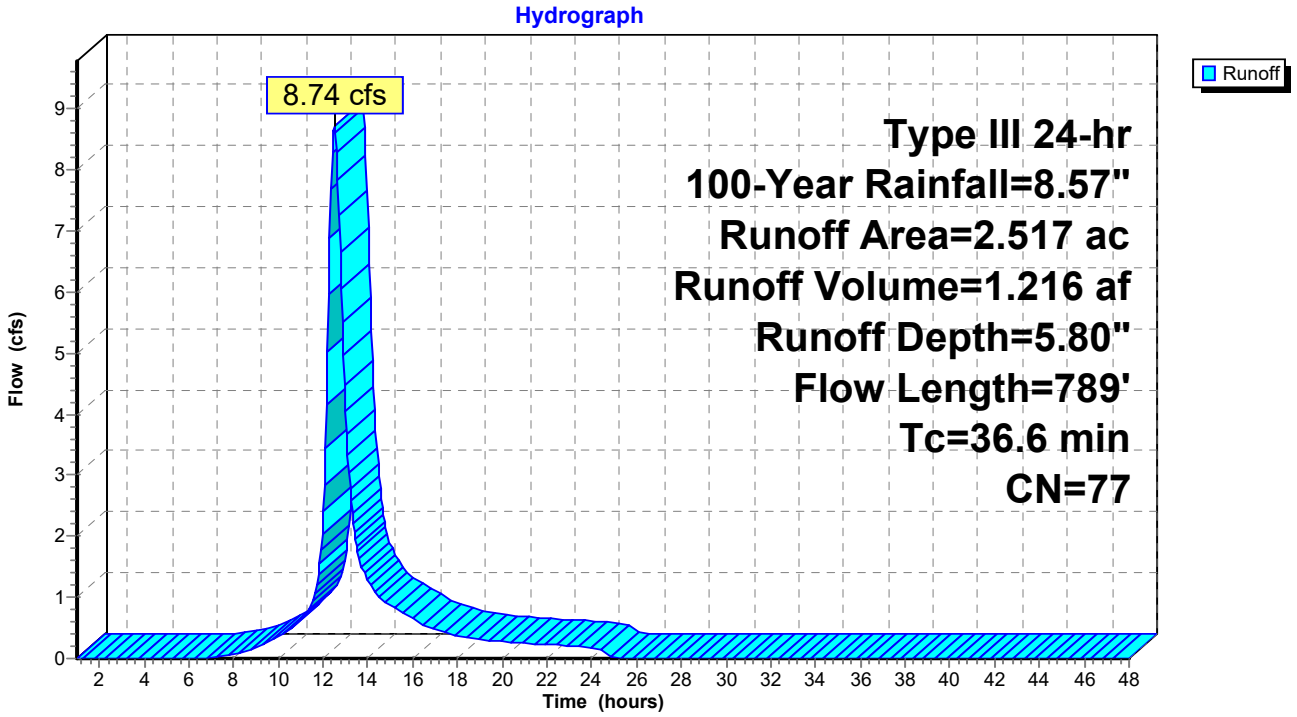
Runoff = 8.74 cfs @ 12.50 hrs, Volume= 1.216 af, Depth= 5.80"
Routed to Reach X Swale 1 : Existing Drain Course

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	0.036	98	Impervious Surfaces
	0.131	74	>75% Grass cover, Good, HSG C
	2.350	77	Woods, Good, HSG D
	2.517	77	Weighted Average
	2.481		98.57% Pervious Area
	0.036		1.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	100	0.0581	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.4	30	0.0413	1.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.9	370	0.1073	0.21		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.2	289	0.1084	19.94	239.32	**Parabolic Channel,** W=6.00' D=3.00' Area=12.0 sf Perim=8.9' n= 0.030 Earth, clean & winding
36.6	789	Total			

Subcatchment 1B: Pre Basin 1B



Summary for Subcatchment 2.1: Pre Basin 2.1

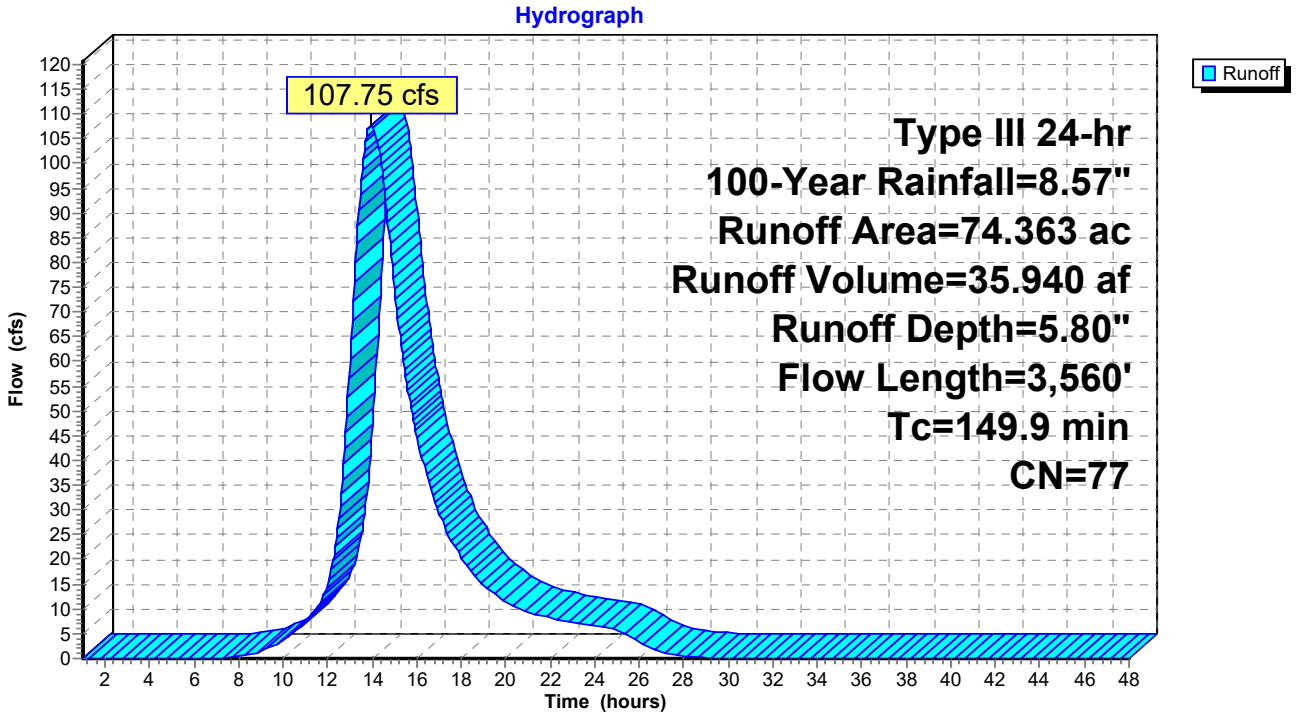
Runoff = 107.75 cfs @ 13.97 hrs, Volume= 35.940 af, Depth= 5.80"
Routed to Reach 44 CMP : Existing 44 CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	0.784	98	Impervious Surfaces
	1.323	74	>75% Grass cover, Good, HSG C
	72.256	77	Woods, Good, HSG D
	74.363	77	Weighted Average
	73.579		98.95% Pervious Area
	0.784		1.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
6.8	560	0.2998	1.37		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.9	372	0.1883	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
127.4	1,338	0.1494	0.18		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
1.1	800	0.1000	12.30	98.36	**Parabolic Channel,** W=6.00' D=2.00' Area=8.0 sf Perim=7.5' n= 0.040 Earth, cobble bottom, clean sides
1.2	126	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	170	0.0732	7.47	39.85	**Parabolic Channel,** W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.040 Earth, cobble bottom, clean sides
0.0	22	0.0586	11.88	83.96	**Pipe Channel, CMP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
0.1	72	0.0330	8.06	73.54	**Pipe Channel,** 44.0" x 38.0" Ellipse Area= 9.1 sf Perim= 10.7' r= 0.85' n= 0.030 Corrugated metal
149.9	3,560	Total			

Subcatchment 2.1: Pre Basin 2.1



Summary for Subcatchment 2.2: Pre Basin 2.2

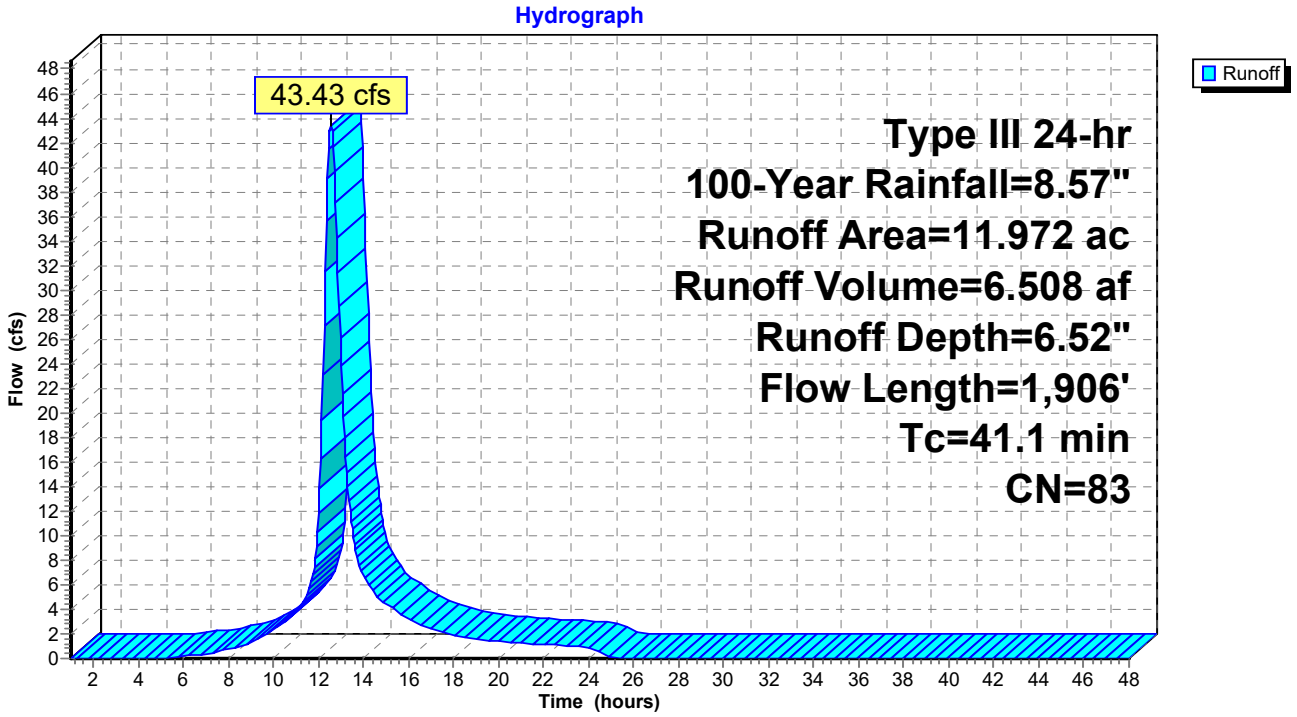
Runoff = 43.43 cfs @ 12.55 hrs, Volume= 6.508 af, Depth= 6.52"
Routed to Reach 44 CMP : Existing 44 CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	3.751	98	Impervious Surfaces
	3.691	74	>75% Grass cover, Good, HSG C
	4.530	77	Woods, Good, HSG D
	11.972	83	Weighted Average
	8.221		68.67% Pervious Area
	3.751		31.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	100	0.0950	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.6	379	0.1254	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	123	0.1382	2.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	100	0.0903	6.10		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	35	0.1416	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	59	0.1186	6.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	67	0.2083	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	48	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	51	0.2058	2.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	54	0.1109	6.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	531	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.9	259	0.0121	2.23		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
41.1	1,906	Total			

Subcatchment 2.2: Pre Basin 2.2



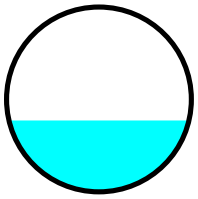
Summary for Reach 44 CMP: Existing 44 CMP

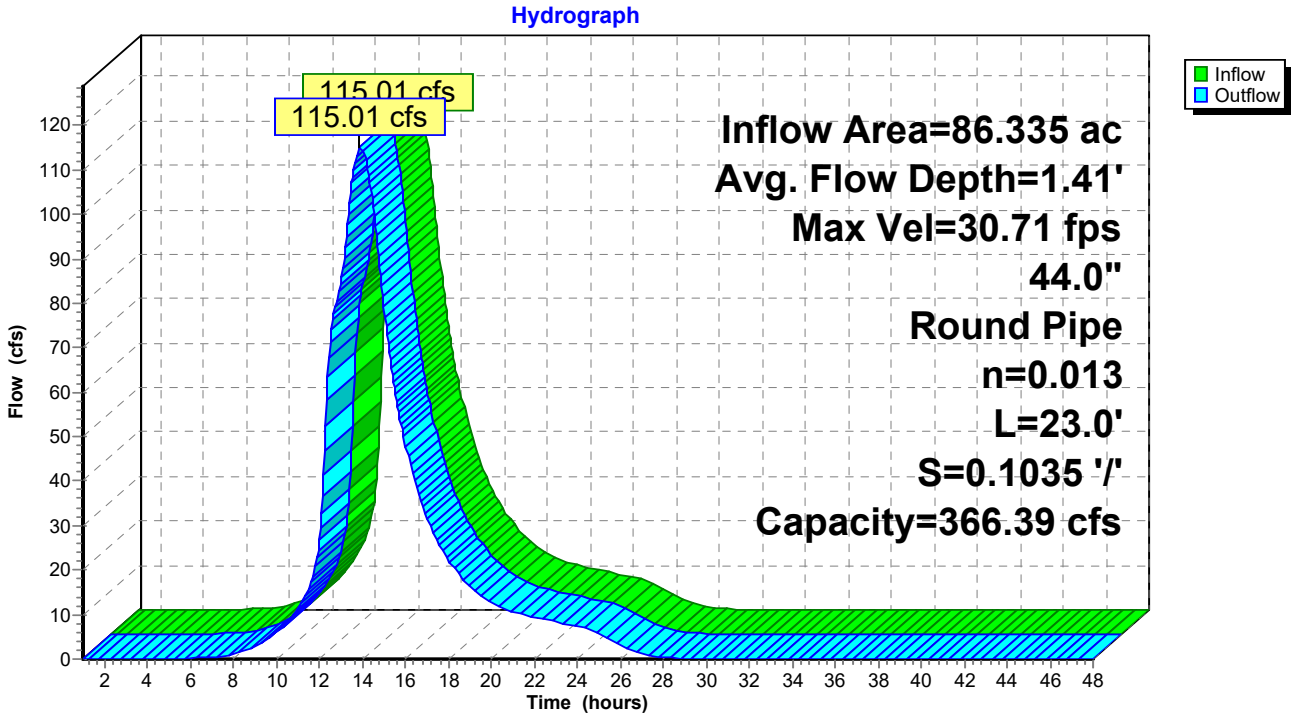
Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 5.90" for 100-Year event
Inflow = 115.01 cfs @ 13.86 hrs, Volume= 42.448 af
Outflow = 115.01 cfs @ 13.86 hrs, Volume= 42.448 af, Atten= 0%, Lag= 0.0 min
Routed to Reach X-Swale 2 : Exist swale out 44 CMP

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 30.71 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 13.54 fps, Avg. Travel Time= 0.0 min

Peak Storage= 86 cf @ 13.86 hrs
Average Depth at Peak Storage= 1.41' , Surface Width= 3.57'
Bank-Full Depth= 3.67' Flow Area= 10.6 sf, Capacity= 366.39 cfs

44.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 23.0' Slope= 0.1035 '/'
Inlet Invert= 646.45', Outlet Invert= 644.07'



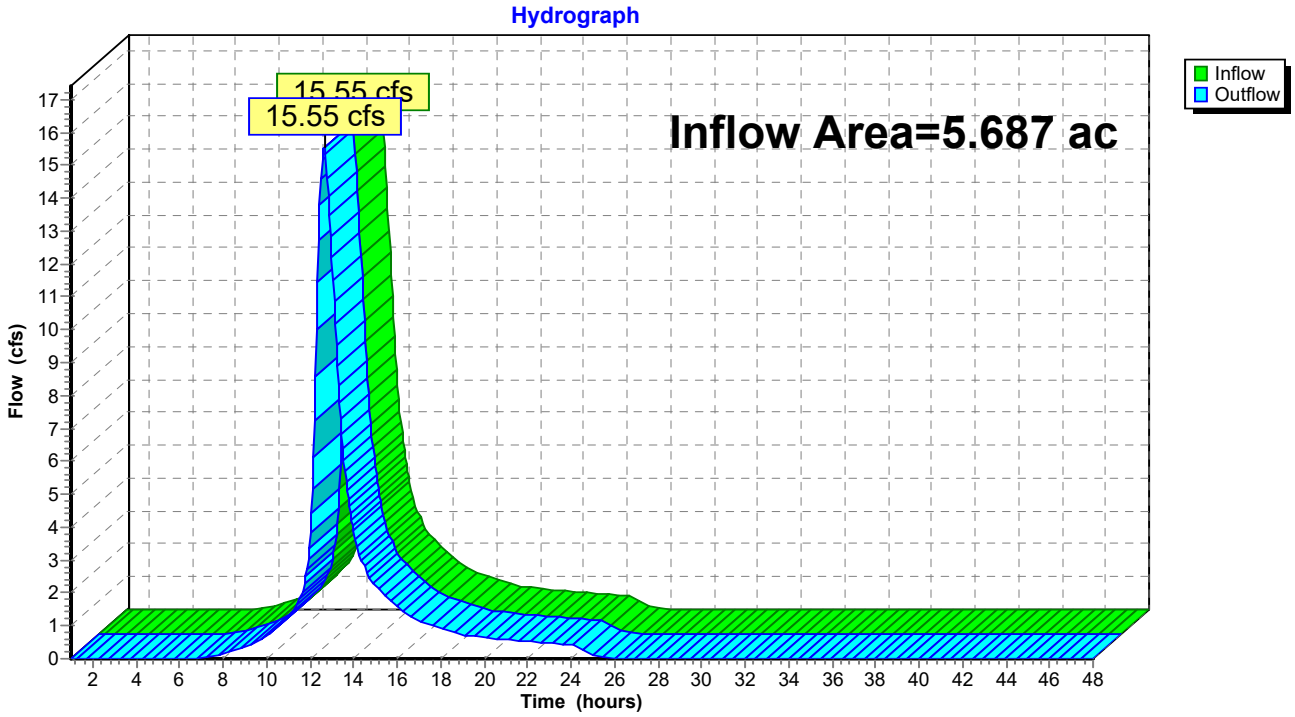


Summary for Reach AP1: Analysis Pt 1

Inflow Area = 5.687 ac, 3.59% Impervious, Inflow Depth = 5.87" for 100-Year event
Inflow = 15.55 cfs @ 12.64 hrs, Volume= 2.780 af
Outflow = 15.55 cfs @ 12.64 hrs, Volume= 2.780 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Reach AP1: Analysis Pt 1

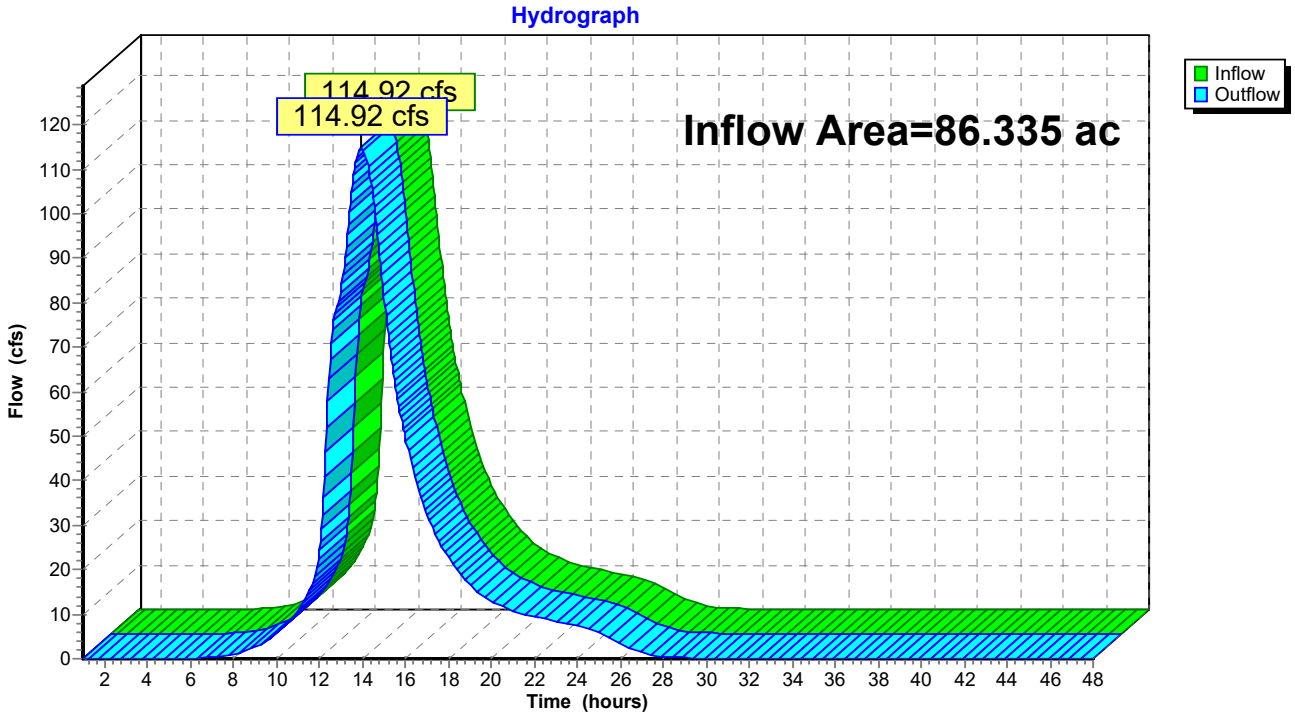


Summary for Reach AP2: Analysis Pt 2

Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 5.90" for 100-Year event
Inflow = 114.92 cfs @ 13.92 hrs, Volume= 42.448 af
Outflow = 114.92 cfs @ 13.92 hrs, Volume= 42.448 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Reach AP2: Analysis Pt 2



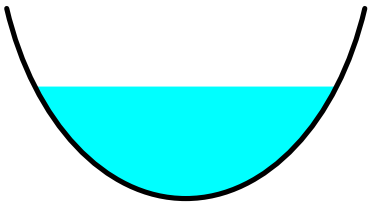
Summary for Reach X Swale 1: Existing Drain Course

Inflow Area = 5.687 ac, 3.59% Impervious, Inflow Depth = 5.87" for 100-Year event
Inflow = 15.57 cfs @ 12.62 hrs, Volume= 2.780 af
Outflow = 15.55 cfs @ 12.64 hrs, Volume= 2.780 af, Atten= 0%, Lag= 1.2 min
Routed to Reach AP1 : Analysis Pt 1

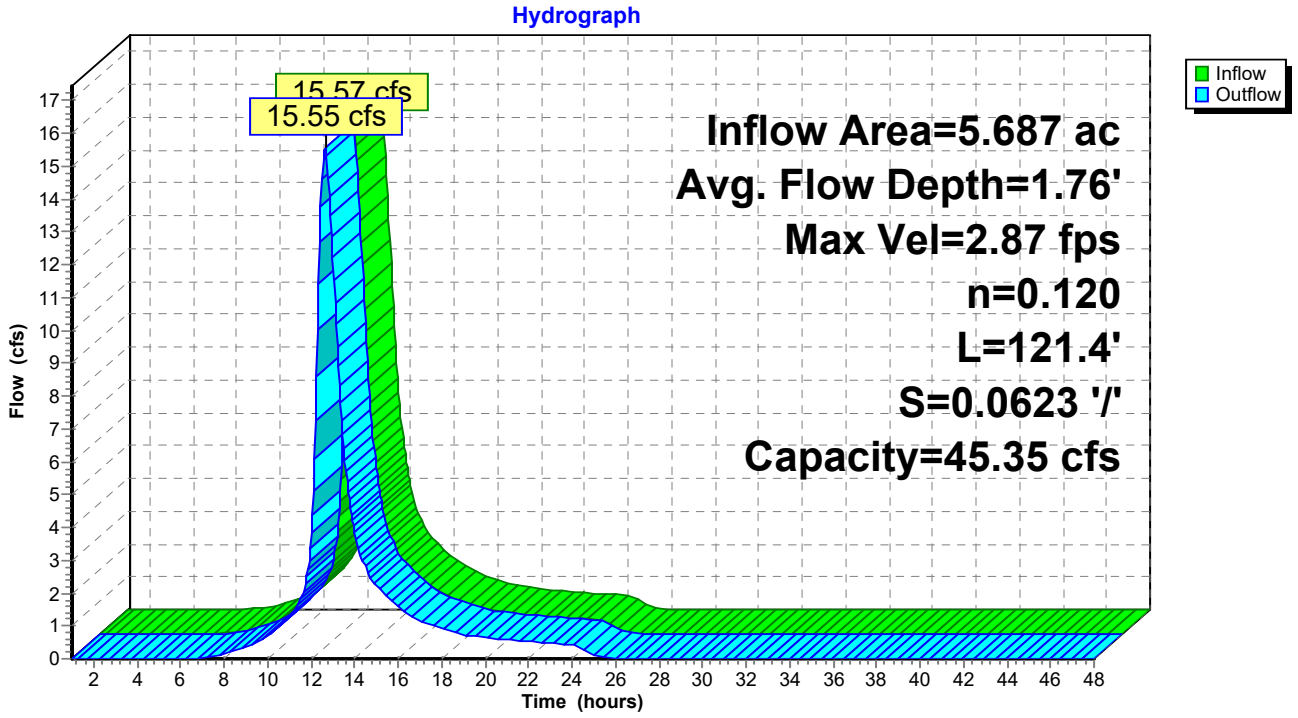
Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.87 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 1.7 min

Peak Storage= 657 cf @ 12.63 hrs
Average Depth at Peak Storage= 1.76' , Surface Width= 4.60'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 45.35 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.120 Earth, long dense weeds
Length= 121.4' Slope= 0.0623 '/'
Inlet Invert= 572.52', Outlet Invert= 564.96'



Reach X Swale 1: Existing Drain Course



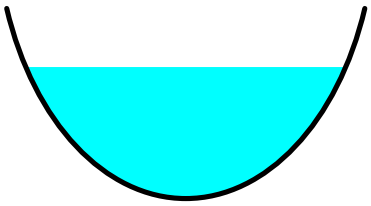
Summary for Reach X-Swale 2: Exist swale out 44 CMP

Inflow Area = 86.335 ac, 5.25% Impervious, Inflow Depth = 5.90" for 100-Year event
Inflow = 115.01 cfs @ 13.86 hrs, Volume= 42.448 af
Outflow = 114.92 cfs @ 13.92 hrs, Volume= 42.448 af, Atten= 0%, Lag= 3.6 min
Routed to Reach AP2 : Analysis Pt 2

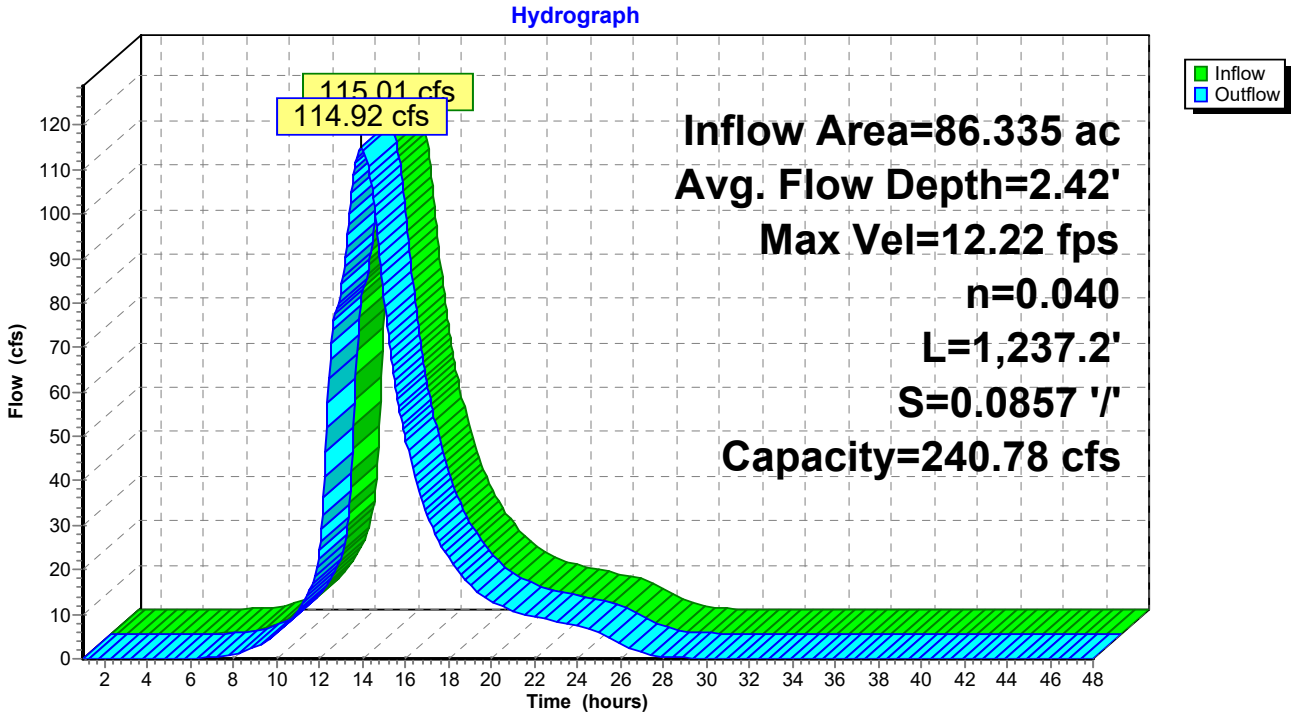
Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.22 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 5.32 fps, Avg. Travel Time= 3.9 min

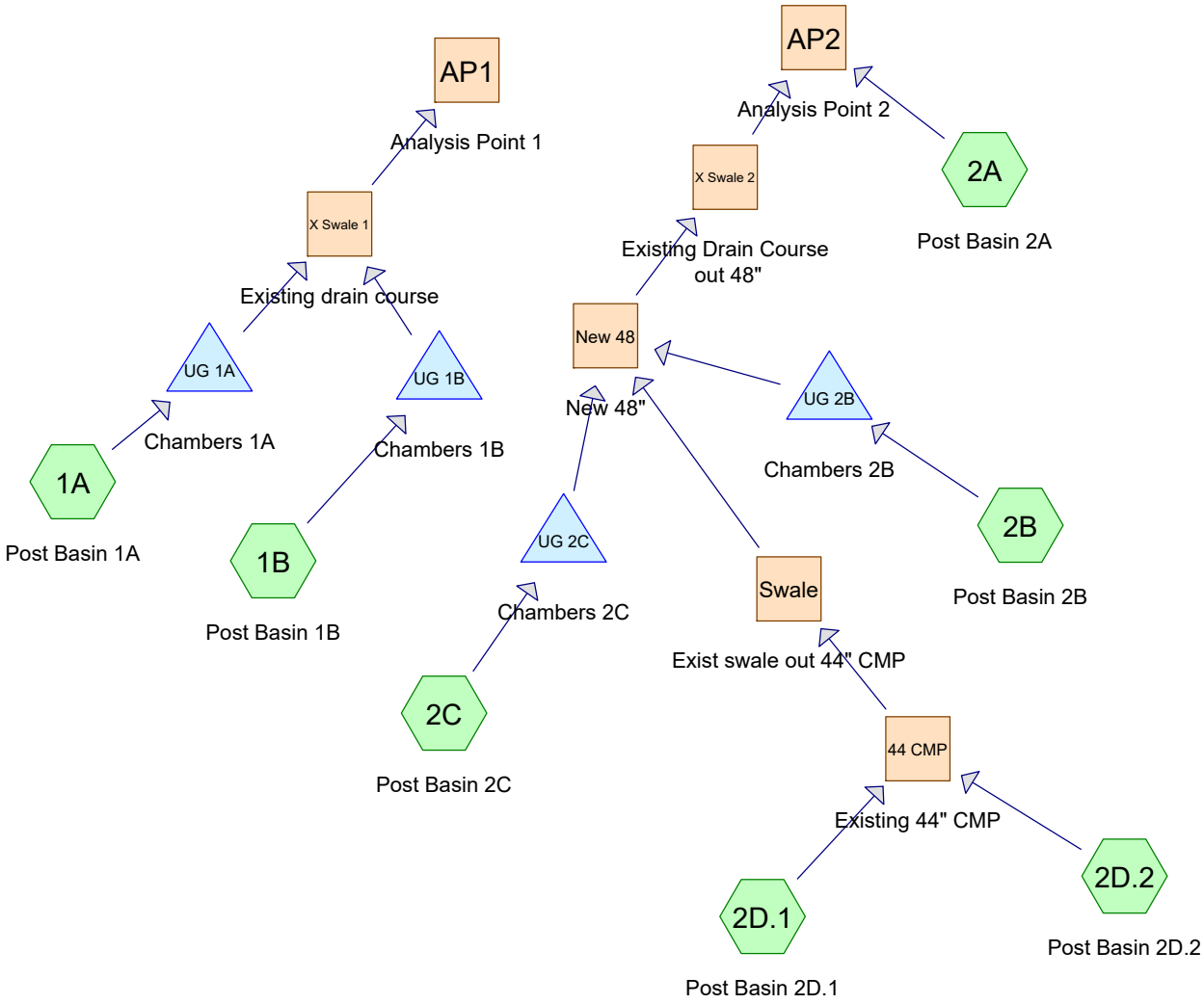
Peak Storage= 11,634 cf @ 13.89 hrs
Average Depth at Peak Storage= 2.42' , Surface Width= 5.82'
Bank-Full Depth= 3.50' Flow Area= 16.3 sf, Capacity= 240.78 cfs

7.00' x 3.50' deep Parabolic Channel, n= 0.040 Earth, dense weeds
Length= 1,237.2' Slope= 0.0857 '/'
Inlet Invert= 644.07', Outlet Invert= 538.00'



Reach X-Swale 2: Exist swale out 44 CMP





Subcat Reach Pond Link

Routing Diagram for Capital Hill Post-2
Prepared by Kirk Rother, PE, PLLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
8.680	74	>75% Grass cover, Good, HSG C (1A, 1B, 2B, 2C, 2D.1, 2D.2)
10.343	98	Impervious Surfaces (1A, 1B, 2B, 2C, 2D.1, 2D.2)
73.184	77	Woods, Good, HSG D (1A, 1B, 2A, 2C, 2D.1, 2D.2)
92.207	**79**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
8.680	HSG C	1A, 1B, 2B, 2C, 2D.1, 2D.2
73.184	HSG D	1A, 1B, 2A, 2C, 2D.1, 2D.2
10.343	Other	1A, 1B, 2B, 2C, 2D.1, 2D.2
92.207		**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	0.000	8.680	0.000	0.000	8.680	>75% Grass cover, Good	1A, 1B, 2B, 2C, 2D.1, 2D.2
0.000	0.000	0.000	0.000	10.343	10.343	Impervious Surfaces	1A, 1B, 2B, 2C, 2D.1, 2D.2
0.000	0.000	0.000	73.184	0.000	73.184	Woods, Good	1A, 1B, 2A, 2C, 2D.1, 2D.2
0.000	**0.000**	**8.680**	**73.184**	**10.343**	**92.207**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1A	0.00	0.00	192.0	0.0651	0.013	0.0	15.0	0.0
2	1B	0.00	0.00	131.0	0.0530	0.013	0.0	15.0	0.0
3	2B	0.00	0.00	60.0	0.0966	0.013	0.0	15.0	0.0
4	2B	0.00	0.00	44.0	0.0200	0.013	0.0	18.0	0.0
5	2C	0.00	0.00	166.0	0.0179	0.013	0.0	15.0	0.0
6	2C	0.00	0.00	32.0	0.0179	0.013	0.0	15.0	0.0
7	2D.1	0.00	0.00	22.0	0.0586	0.025	0.0	36.0	0.0
8	2D.1	0.00	0.00	72.0	0.0330	0.030	44.0	38.0	0.0
9	44 CMP	646.45	644.07	23.0	0.1035	0.013	0.0	44.0	0.0
10	New 48	640.00	571.00	596.0	0.1158	0.012	0.0	48.0	0.0
11	UG 1A	577.85	576.00	187.8	0.0099	0.013	0.0	18.0	0.0
12	UG 1B	612.50	612.00	31.5	0.0159	0.013	0.0	18.0	0.0
13	UG 2B	577.55	575.00	16.0	0.1594	0.013	0.0	18.0	0.0
14	UG 2C	615.50	612.00	12.0	0.2917	0.013	0.0	18.0	0.0

Time span=0.50-48.00 hrs, dt=0.05 hrs, 951 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 1A: Post Basin 1A Runoff Area=3.500 ac 53.37% Impervious Runoff Depth=1.43"
Flow Length=444' Tc=14.9 min CN=87 Runoff=4.43 cfs 0.417 af

Subcatchment 1B: Post Basin 1B Runoff Area=2.517 ac 47.32% Impervious Runoff Depth=1.36"
Flow Length=369' Tc=12.8 min CN=86 Runoff=3.18 cfs 0.285 af

Subcatchment 2A: Post Basin 2A Runoff Area=3.300 ac 0.00% Impervious Runoff Depth=0.83"
Flow Length=663' Tc=67.1 min CN=77 Runoff=1.10 cfs 0.228 af

Subcatchment 2B: Post Basin 2B Runoff Area=2.120 ac 60.75% Impervious Runoff Depth=1.58"
Flow Length=234' Tc=7.9 min CN=89 Runoff=3.62 cfs 0.279 af

Subcatchment 2C: Post Basin 2C Runoff Area=3.270 ac 52.48% Impervious Runoff Depth=1.43"
Flow Length=574' Tc=9.9 min CN=87 Runoff=4.74 cfs 0.389 af

Subcatchment 2D.1: Post Basin 2D.1 Runoff Area=65.430 ac 0.66% Impervious Runoff Depth=0.83"
Flow Length=3,560' Tc=149.9 min CN=77 Runoff=12.58 cfs 4.523 af

Subcatchment 2D.2: Post Basin 2D.2 Runoff Area=12.070 ac 31.90% Impervious Runoff Depth=1.16"
Flow Length=1,906' Tc=41.1 min CN=83 Runoff=7.87 cfs 1.169 af

Reach 44 CMP: Existing 44" CMP Avg. Flow Depth=0.49' Max Vel=16.69 fps Inflow=13.99 cfs 5.692 af
44.0" Round Pipe n=0.013 L=23.0' S=0.1035 '/' Capacity=366.39 cfs Outflow=13.99 cfs 5.692 af

Reach AP1: Analysis Point 1 Inflow=1.58 cfs 0.686 af
Outflow=1.58 cfs 0.686 af

Reach AP2: Analysis Point 2 Inflow=15.00 cfs 6.533 af
Outflow=15.00 cfs 6.533 af

Reach New 48: New 48" Avg. Flow Depth=0.46' Max Vel=18.39 fps Inflow=14.60 cfs 6.305 af
48.0" Round Pipe n=0.012 L=596.0' S=0.1158 '/' Capacity=529.48 cfs Outflow=14.59 cfs 6.305 af

Reach Swale: Exist swale out 44" CMP Avg. Flow Depth=1.18' Max Vel=4.38 fps Inflow=13.99 cfs 5.692 af
n=0.040 L=168.0' S=0.0242 '/' Capacity=128.00 cfs Outflow=13.98 cfs 5.692 af

Reach X Swale 1: Existing drain course Avg. Flow Depth=0.19' Max Vel=8.16 fps Inflow=1.58 cfs 0.686 af
n=0.013 L=157.0' S=0.0828 '/' Capacity=482.69 cfs Outflow=1.58 cfs 0.686 af

Reach X Swale 2: Existing Drain Avg. Flow Depth=0.91' Max Vel=6.28 fps Inflow=14.59 cfs 6.305 af
n=0.040 L=500.0' S=0.0660 '/' Capacity=171.63 cfs Outflow=14.59 cfs 6.305 af

Pond UG 1A: Chambers 1A Peak Elev=580.08' Storage=0.107 af Inflow=4.43 cfs 0.417 af
Outflow=1.28 cfs 0.417 af

Pond UG 1B: Chambers 1B Peak Elev=615.89' Storage=0.147 af Inflow=3.18 cfs 0.285 af
Outflow=0.31 cfs 0.269 af

Pond UG 2B: Chambers 2B Peak Elev=580.40' Storage=0.156 af Inflow=3.62 cfs 0.279 af
Outflow=0.27 cfs 0.257 af

Pond UG 2C: Chambers 2C Peak Elev=619.39' Storage=0.217 af Inflow=4.74 cfs 0.389 af
Outflow=0.36 cfs 0.355 af

Total Runoff Area = 92.207 ac Runoff Volume = 7.291 af Average Runoff Depth = 0.95"
88.78% Pervious = 81.864 ac 11.22% Impervious = 10.343 ac

Summary for Subcatchment 1A: Post Basin 1A

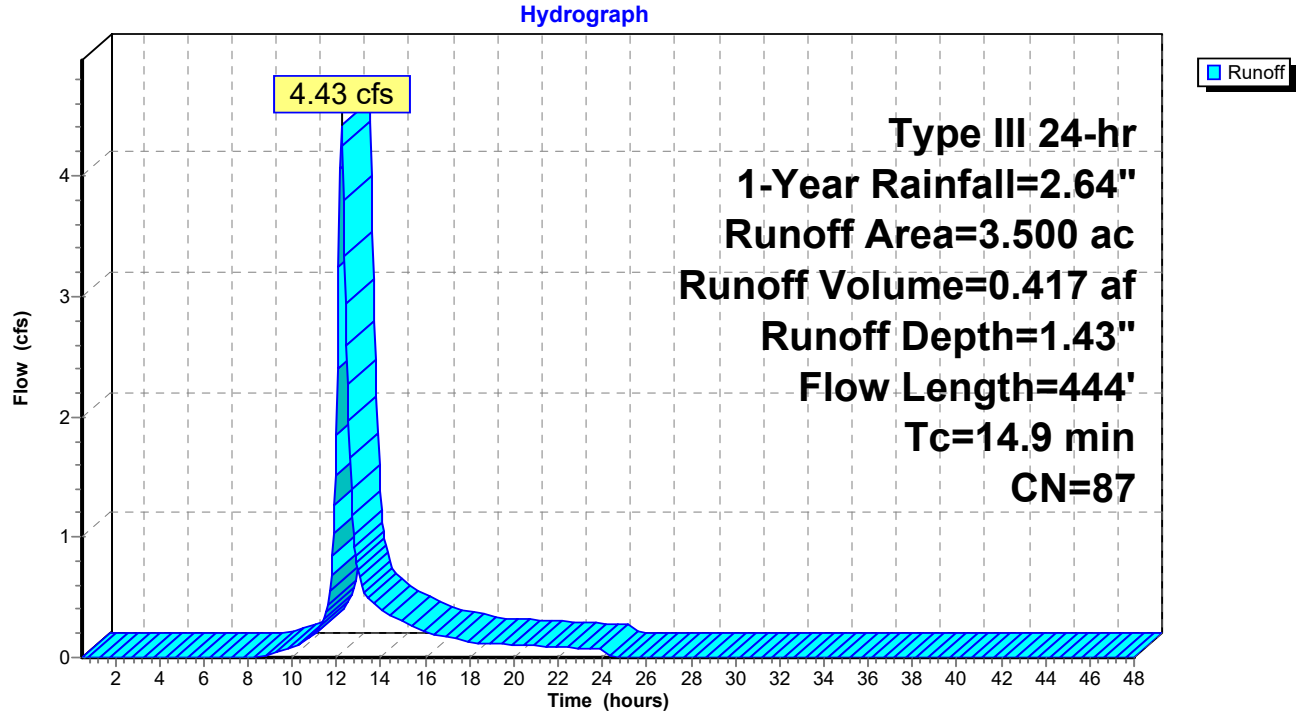
Runoff = 4.43 cfs @ 12.21 hrs, Volume= 0.417 af, Depth= 1.43"
Routed to Pond UG 1A : Chambers 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	1.868	98	Impervious Surfaces
	1.232	74	>75% Grass cover, Good, HSG C
	0.400	77	Woods, Good, HSG D
	3.500	87	Weighted Average
	1.632		46.63% Pervious Area
	1.868		53.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0400	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
7.6	152	0.0789	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.2	192	0.0651	13.43	16.48	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
14.9	444	Total			

Subcatchment 1A: Post Basin 1A



Summary for Subcatchment 1B: Post Basin 1B

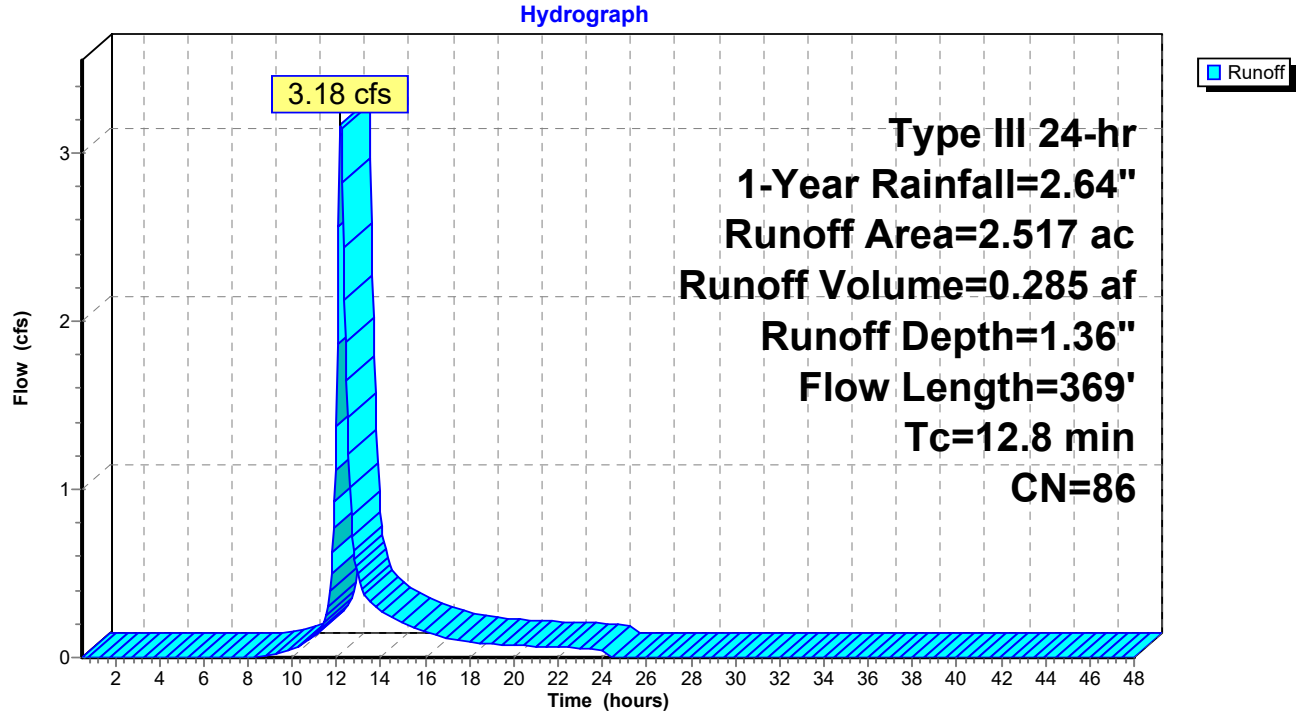
Runoff = 3.18 cfs @ 12.18 hrs, Volume= 0.285 af, Depth= 1.36"
Routed to Pond UG 1B : Chambers 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	1.191	98	Impervious Surfaces
	1.163	74	>75% Grass cover, Good, HSG C
	0.163	77	Woods, Good, HSG D
	2.517	86	Weighted Average
	1.326		52.68% Pervious Area
	1.191		47.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0445	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
5.8	138	0.1268	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.2	131	0.0530	12.12	14.87	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
12.8	369	Total			

Subcatchment 1B: Post Basin 1B



Summary for Subcatchment 2A: Post Basin 2A

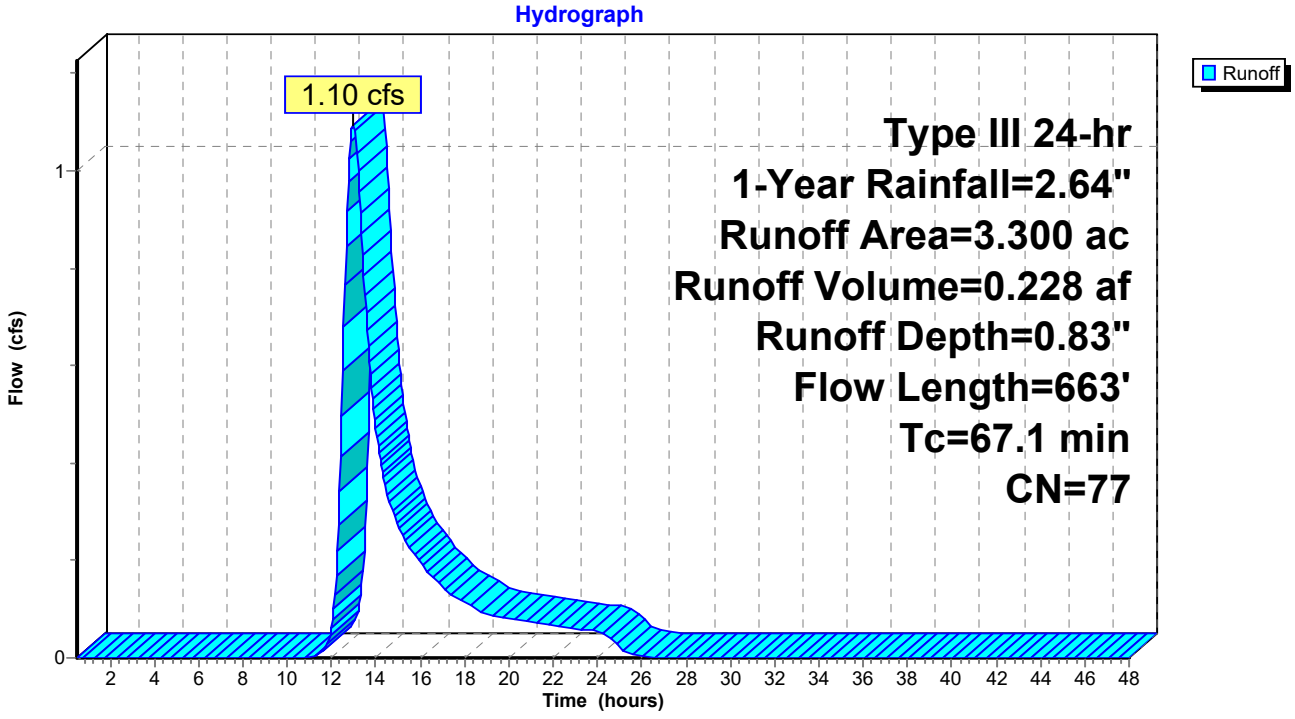
Runoff = 1.10 cfs @ 12.97 hrs, Volume= 0.228 af, Depth= 0.83"
Routed to Reach AP2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

Area (ac)	CN	Description
3.300	77	Woods, Good, HSG D
3.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	100	0.0600	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
5.2	328	0.1768	1.05		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
38.9	235	0.0893	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
67.1	663	Total			

Subcatchment 2A: Post Basin 2A



Summary for Subcatchment 2B: Post Basin 2B

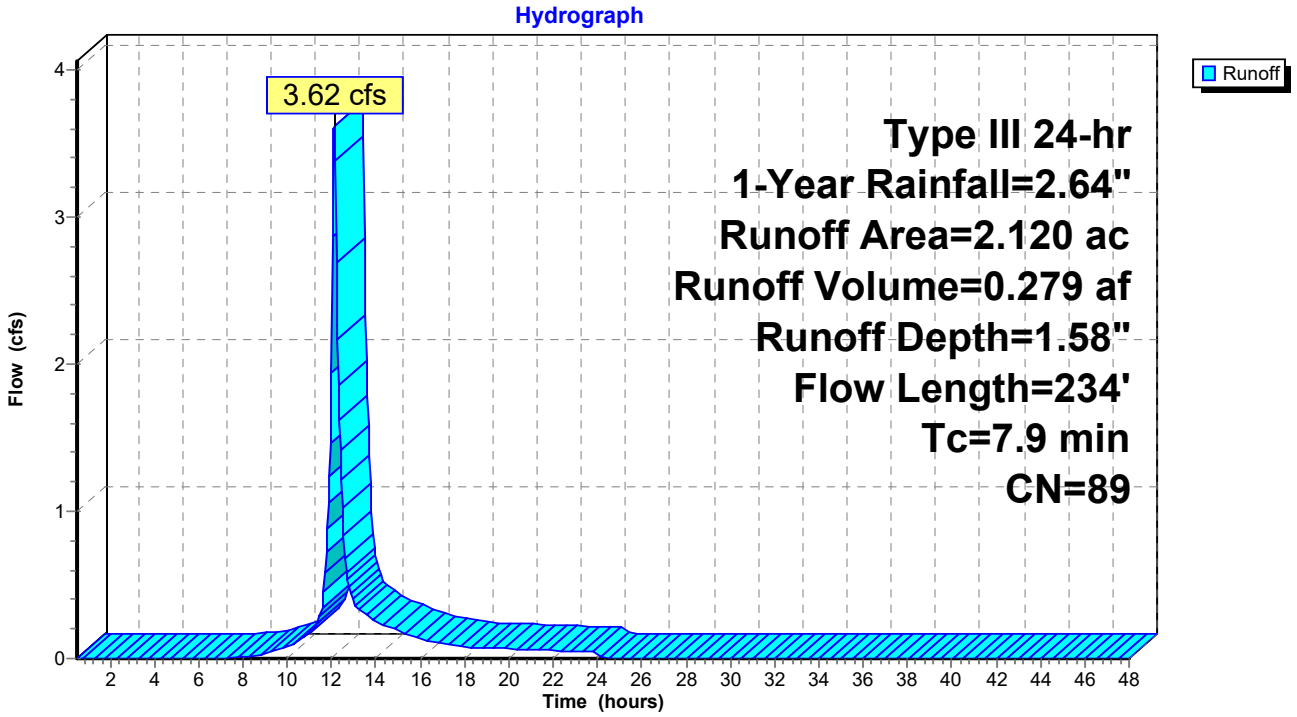
Runoff = 3.62 cfs @ 12.11 hrs, Volume= 0.279 af, Depth= 1.58"
Routed to Pond UG 2B : Chambers 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	1.288	98	Impervious Surfaces
	0.832	74	>75% Grass cover, Good, HSG C
	2.120	89	Weighted Average
	0.832		39.25% Pervious Area
	1.288		60.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.1398	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
3.4	30	0.0233	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	60	0.0966	16.36	20.08	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.1	44	0.0200	8.41	14.86	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
7.9	234	Total			

Subcatchment 2B: Post Basin 2B



Summary for Subcatchment 2C: Post Basin 2C

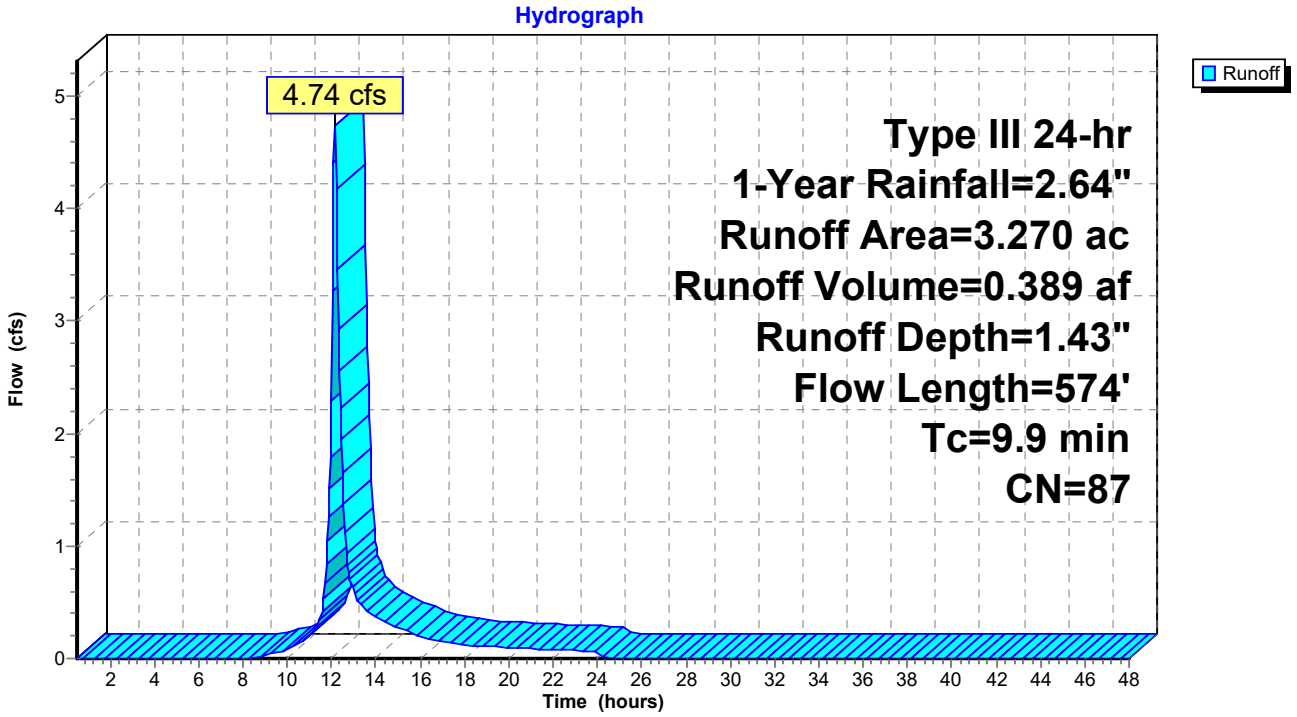
Runoff = 4.74 cfs @ 12.14 hrs, Volume= 0.389 af, Depth= 1.43"
Routed to Pond UG 2C : Chambers 2C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	1.716	98	Impervious Surfaces
	1.193	74	>75% Grass cover, Good, HSG C
	0.361	77	Woods, Good, HSG D
	3.270	87	Weighted Average
	1.554		47.52% Pervious Area
	1.716		52.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0336	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.3	186	0.1183	2.41		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	90	0.0220	3.01		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	166	0.0179	7.04	8.64	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.1	32	0.0179	7.04	8.64	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
9.9	574	Total			

Subcatchment 2C: Post Basin 2C



Summary for Subcatchment 2D.1: Post Basin 2D.1

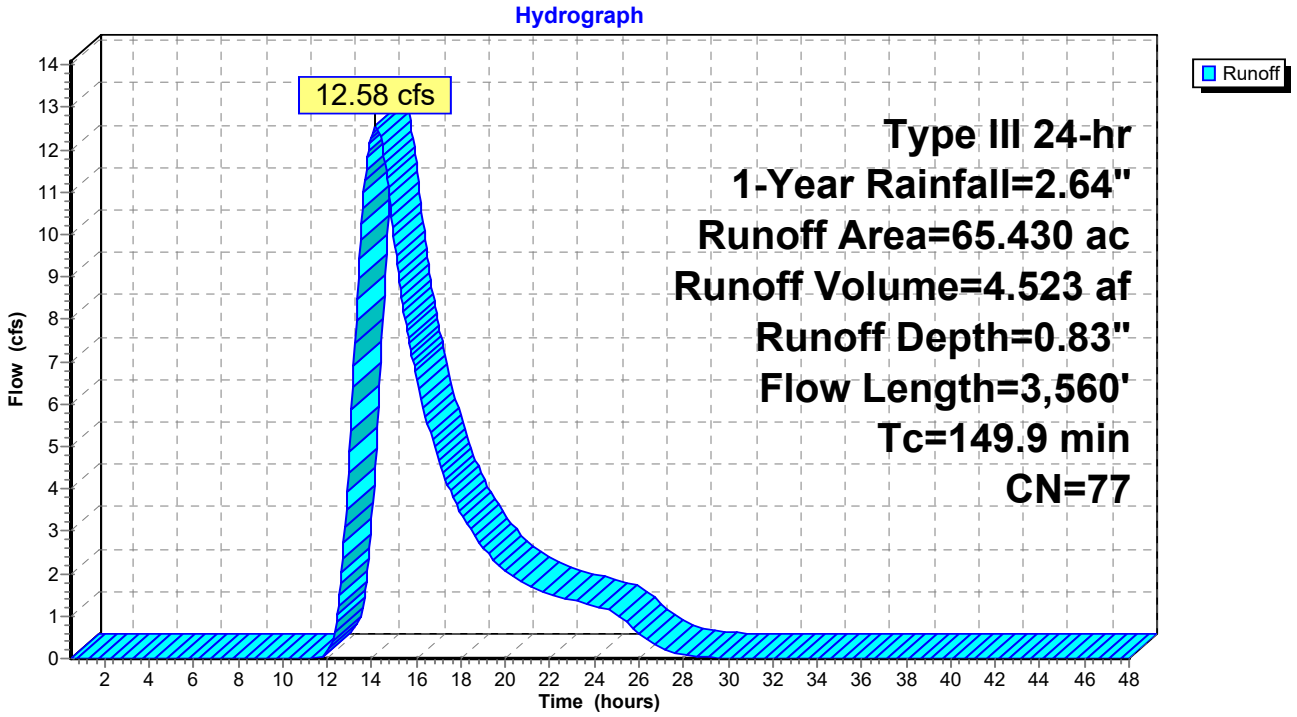
Runoff = 12.58 cfs @ 14.16 hrs, Volume= 4.523 af, Depth= 0.83"
Routed to Reach 44 CMP : Existing 44" CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	0.430	98	Impervious Surfaces
	0.570	74	>75% Grass cover, Good, HSG C
	64.430	77	Woods, Good, HSG D
	65.430	77	Weighted Average
	65.000		99.34% Pervious Area
	0.430		0.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
6.8	560	0.2998	1.37		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.9	372	0.1883	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
127.4	1,338	0.1494	0.18		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
1.1	800	0.1000	12.30	98.36	**Parabolic Channel,** W=6.00' D=2.00' Area=8.0 sf Perim=7.5' n= 0.040 Earth, cobble bottom, clean sides
1.2	126	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	170	0.0732	7.47	39.85	**Parabolic Channel,** W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.040 Earth, cobble bottom, clean sides
0.0	22	0.0586	11.88	83.96	**Pipe Channel, CMP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
0.1	72	0.0330	8.06	73.54	**Pipe Channel,** 44.0" x 38.0" Ellipse Area= 9.1 sf Perim= 10.7' r= 0.85' n= 0.030 Corrugated metal
149.9	3,560	Total			

Subcatchment 2D.1: Post Basin 2D.1



Summary for Subcatchment 2D.2: Post Basin 2D.2

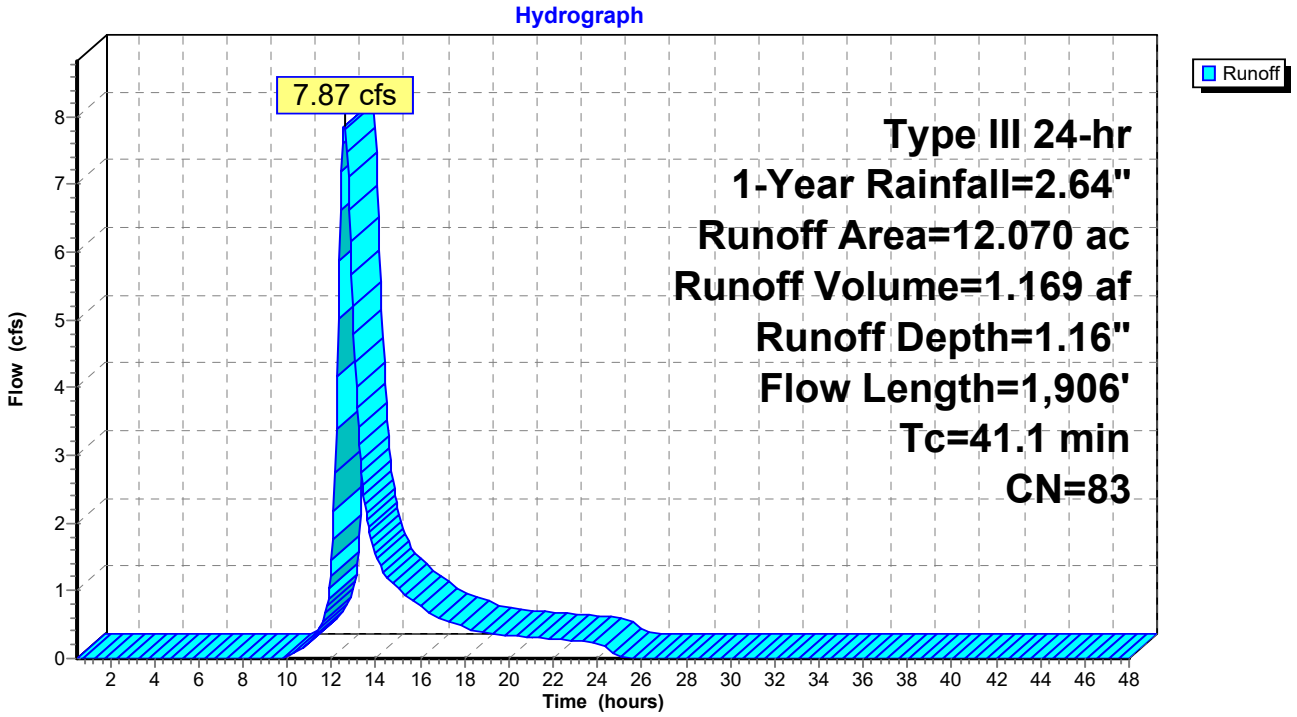
Runoff = 7.87 cfs @ 12.59 hrs, Volume= 1.169 af, Depth= 1.16"
Routed to Reach 44 CMP : Existing 44" CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.64"

	Area (ac)	CN	Description
*	3.850	98	Impervious Surfaces
	3.690	74	>75% Grass cover, Good, HSG C
	4.530	77	Woods, Good, HSG D
	12.070	83	Weighted Average
	8.220		68.10% Pervious Area
	3.850		31.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	100	0.0950	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.6	379	0.1254	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	123	0.1382	2.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	100	0.0903	6.10		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	35	0.1416	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	59	0.1186	6.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	67	0.2083	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	48	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	51	0.2058	2.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	54	0.1109	6.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	531	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.9	259	0.0121	2.23		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
41.1	1,906	Total			

Subcatchment 2D.2: Post Basin 2D.2



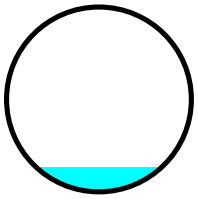
Summary for Reach 44 CMP: Existing 44" CMP

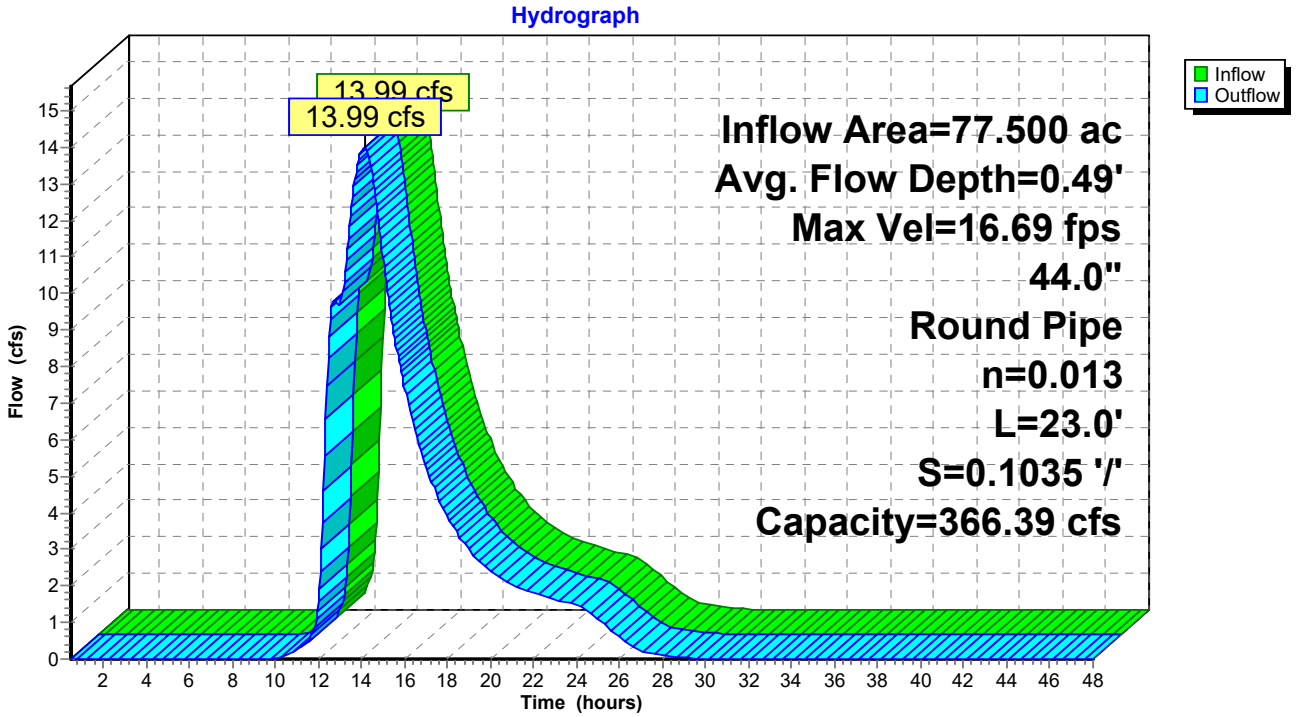
Inflow Area = 77.500 ac, 5.52% Impervious, Inflow Depth = 0.88" for 1-Year event
Inflow = 13.99 cfs @ 14.14 hrs, Volume= 5.692 af
Outflow = 13.99 cfs @ 14.14 hrs, Volume= 5.692 af, Atten= 0%, Lag= 0.0 min
Routed to Reach Swale : Exist swale out 44" CMP

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 16.69 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 8.53 fps, Avg. Travel Time= 0.0 min

Peak Storage= 19 cf @ 14.14 hrs
Average Depth at Peak Storage= 0.49' , Surface Width= 2.49'
Bank-Full Depth= 3.67' Flow Area= 10.6 sf, Capacity= 366.39 cfs

44.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 23.0' Slope= 0.1035 '/'
Inlet Invert= 646.45', Outlet Invert= 644.07'



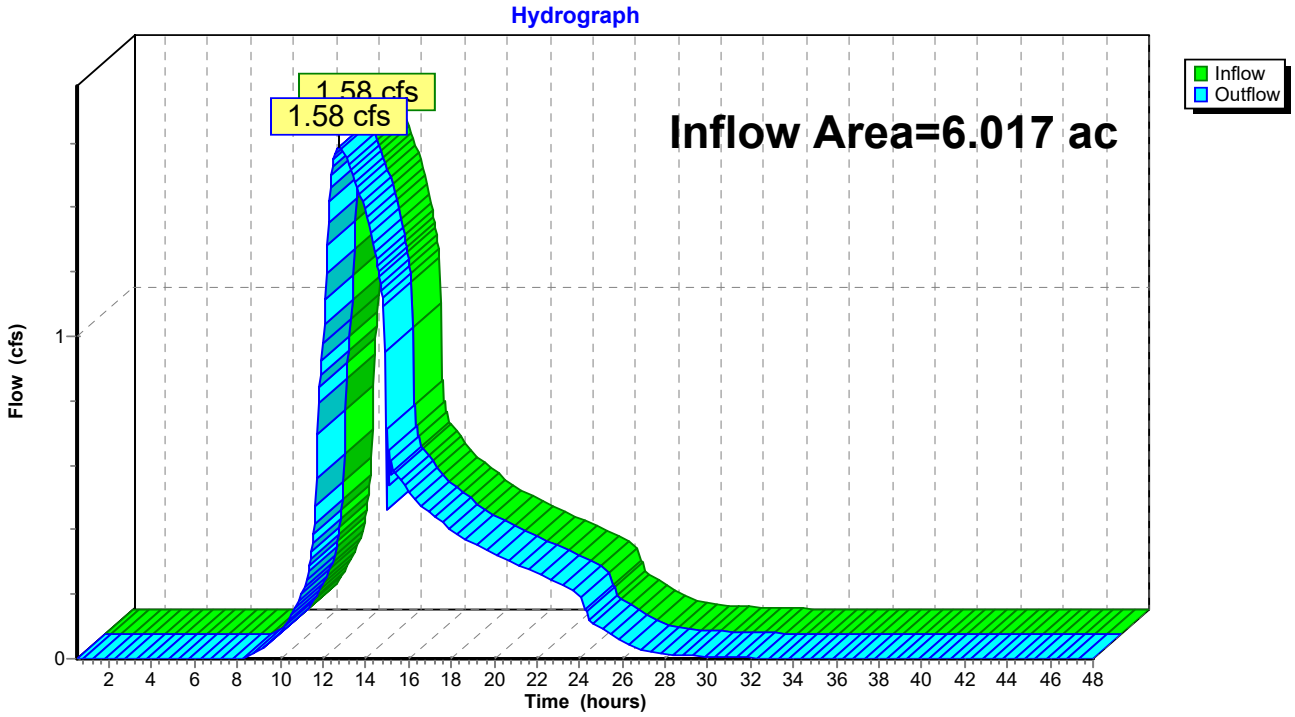


Summary for Reach AP1: Analysis Point 1

Inflow Area = 6.017 ac, 50.84% Impervious, Inflow Depth > 1.37" for 1-Year event
Inflow = 1.58 cfs @ 12.73 hrs, Volume= 0.686 af
Outflow = 1.58 cfs @ 12.73 hrs, Volume= 0.686 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs

Reach AP1: Analysis Point 1

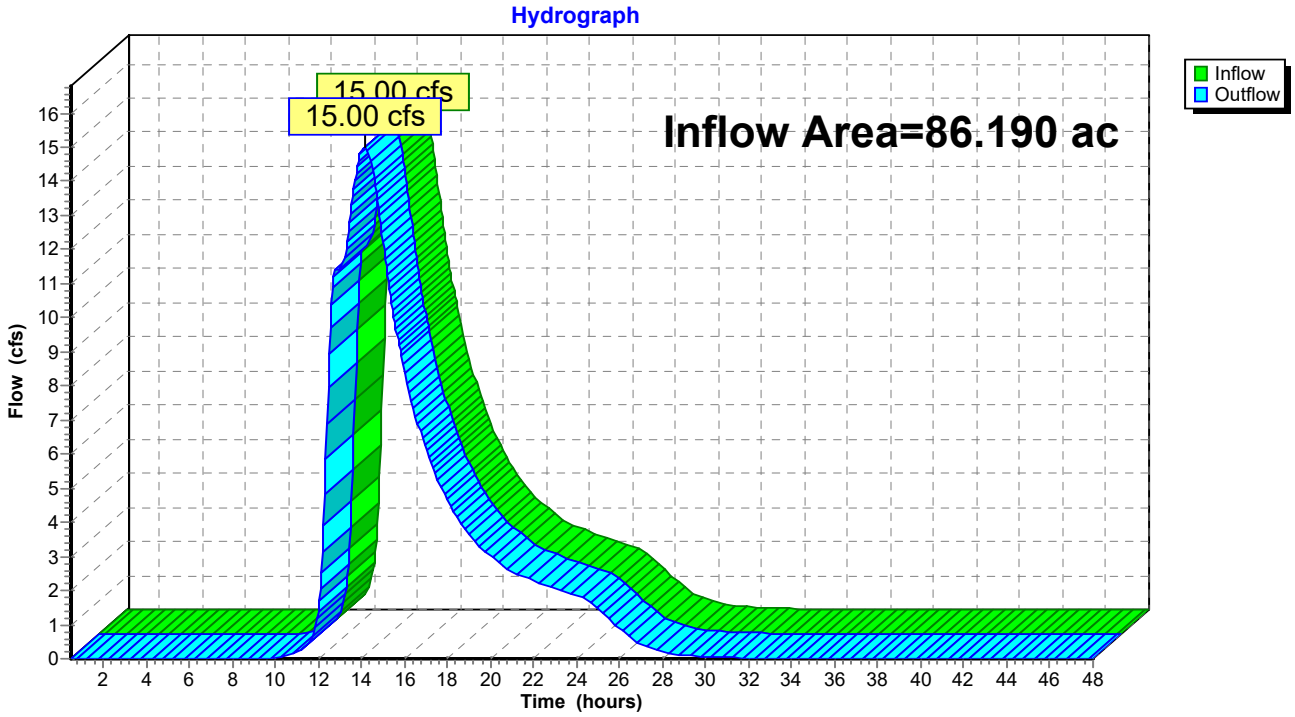


Summary for Reach AP2: Analysis Point 2

Inflow Area = 86.190 ac, 8.45% Impervious, Inflow Depth > 0.91" for 1-Year event
Inflow = 15.00 cfs @ 14.18 hrs, Volume= 6.533 af
Outflow = 15.00 cfs @ 14.18 hrs, Volume= 6.533 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs

Reach AP2: Analysis Point 2



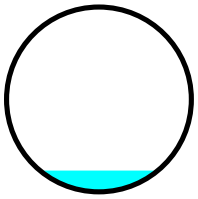
Summary for Reach New 48: New 48"

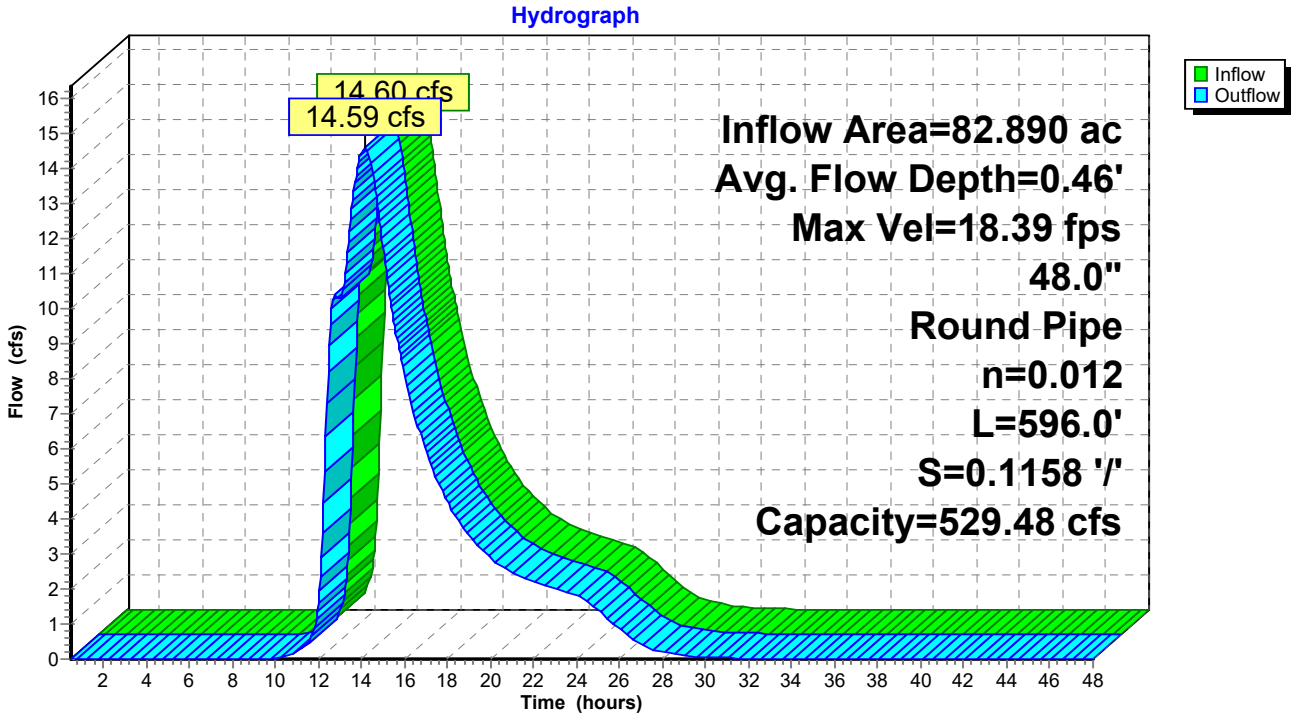
Inflow Area = 82.890 ac, 8.79% Impervious, Inflow Depth > 0.91" for 1-Year event
Inflow = 14.60 cfs @ 14.15 hrs, Volume= 6.305 af
Outflow = 14.59 cfs @ 14.16 hrs, Volume= 6.305 af, Atten= 0%, Lag= 0.7 min
Routed to Reach X Swale 2 : Existing Drain Course out 48"

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 18.39 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 7.28 fps, Avg. Travel Time= 1.4 min

Peak Storage= 473 cf @ 14.15 hrs
Average Depth at Peak Storage= 0.46' , Surface Width= 2.54'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 529.48 cfs

48.0" Round Pipe
n= 0.012
Length= 596.0' Slope= 0.1158 '/'
Inlet Invert= 640.00', Outlet Invert= 571.00'





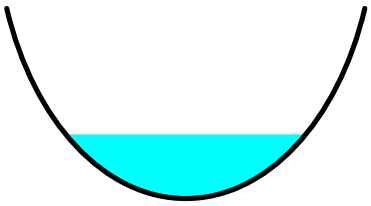
Summary for Reach Swale: Exist swale out 44" CMP

Inflow Area = 77.500 ac, 5.52% Impervious, Inflow Depth = 0.88" for 1-Year event
Inflow = 13.99 cfs @ 14.14 hrs, Volume= 5.692 af
Outflow = 13.98 cfs @ 14.15 hrs, Volume= 5.692 af, Atten= 0%, Lag= 0.6 min
Routed to Reach New 48 : New 48"

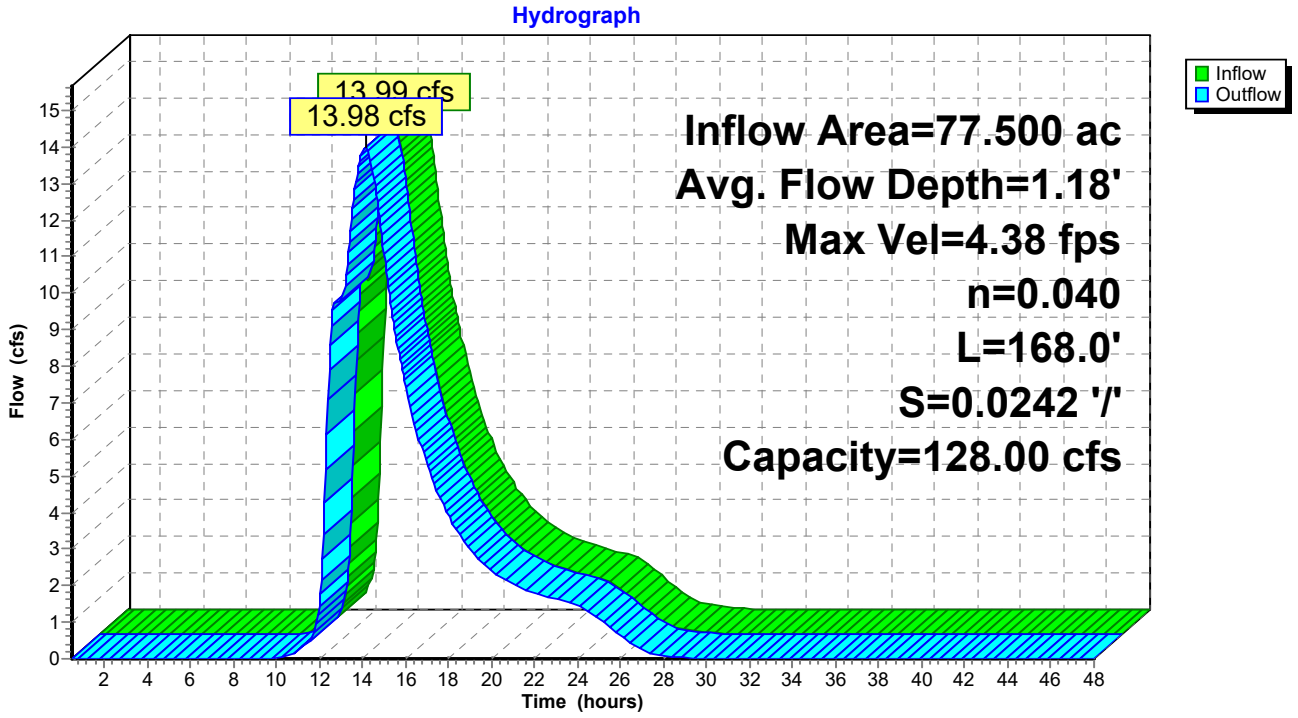
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.38 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.20 fps, Avg. Travel Time= 1.3 min

Peak Storage= 536 cf @ 14.14 hrs
Average Depth at Peak Storage= 1.18' , Surface Width= 4.06'
Bank-Full Depth= 3.50' Flow Area= 16.3 sf, Capacity= 128.00 cfs

7.00' x 3.50' deep Parabolic Channel, n= 0.040 Earth, dense weeds
Length= 168.0' Slope= 0.0242 '/'
Inlet Invert= 644.07', Outlet Invert= 640.00'



Reach Swale: Exist swale out 44" CMP



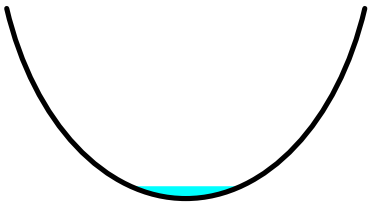
Summary for Reach X Swale 1: Existing drain course

Inflow Area = 6.017 ac, 50.84% Impervious, Inflow Depth > 1.37" for 1-Year event
Inflow = 1.58 cfs @ 12.72 hrs, Volume= 0.686 af
Outflow = 1.58 cfs @ 12.73 hrs, Volume= 0.686 af, Atten= 0%, Lag= 0.5 min
Routed to Reach AP1 : Analysis Point 1

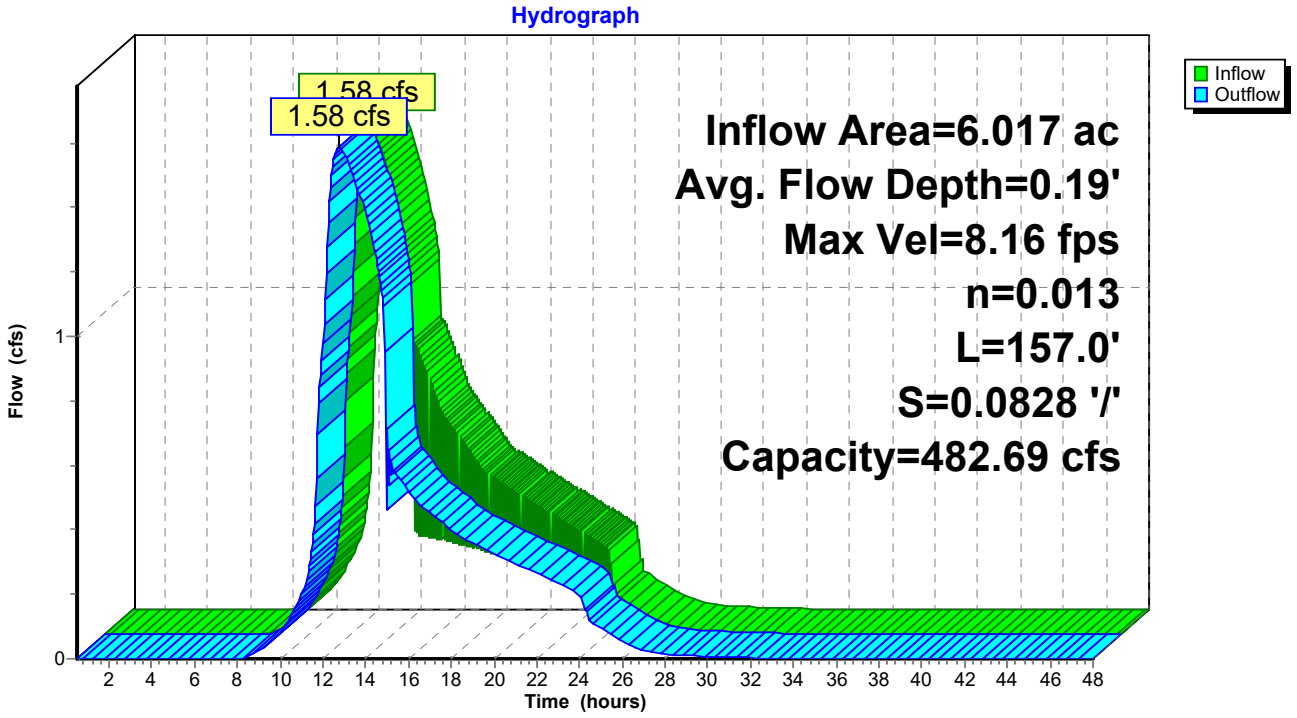
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.16 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.69 fps, Avg. Travel Time= 0.7 min

Peak Storage= 30 cf @ 12.72 hrs
Average Depth at Peak Storage= 0.19' , Surface Width= 1.52'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 482.69 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.013 Corrugated PE, smooth interior
Length= 157.0' Slope= 0.0828 '/'
Inlet Invert= 578.00', Outlet Invert= 565.00'



Reach X Swale 1: Existing drain course



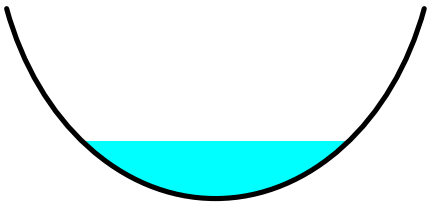
Summary for Reach X Swale 2: Existing Drain Course out 48"

Inflow Area = 82.890 ac, 8.79% Impervious, Inflow Depth > 0.91" for 1-Year event
Inflow = 14.59 cfs @ 14.16 hrs, Volume= 6.305 af
Outflow = 14.59 cfs @ 14.19 hrs, Volume= 6.305 af, Atten= 0%, Lag= 1.9 min
Routed to Reach AP2 : Analysis Point 2

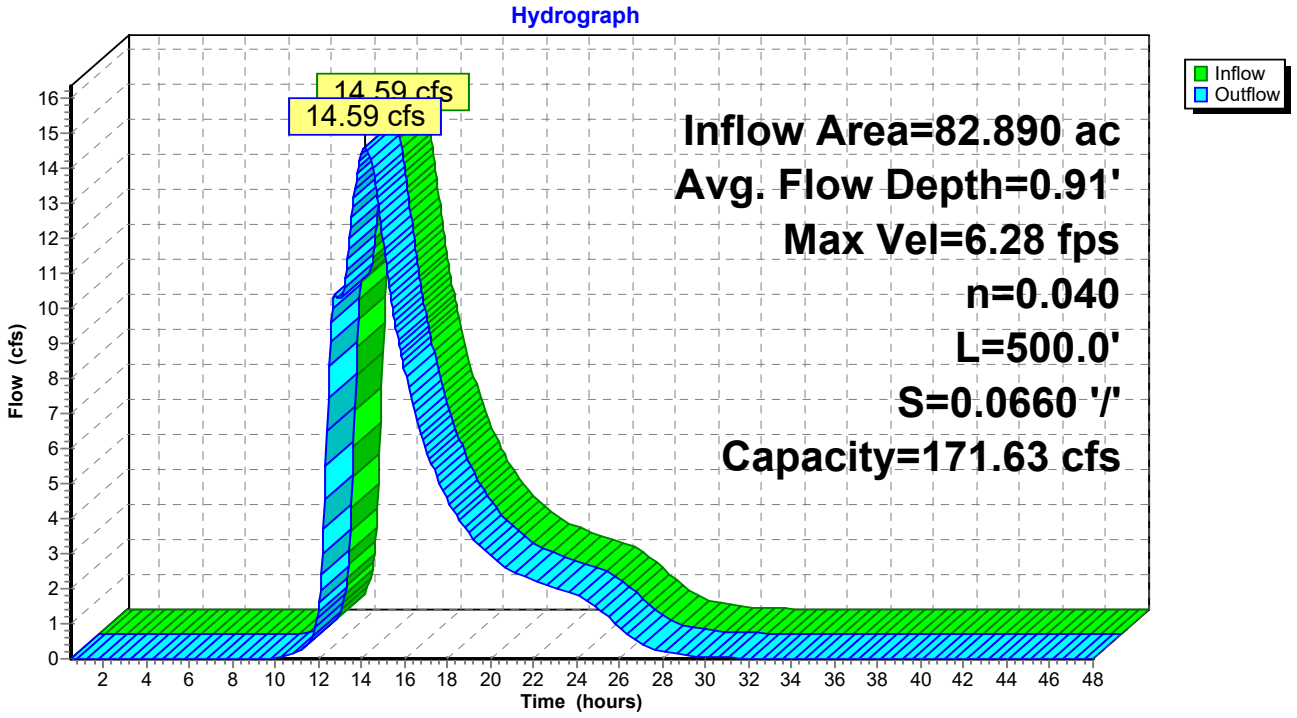
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.28 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 2.25 fps, Avg. Travel Time= 3.7 min

Peak Storage= 1,162 cf @ 14.18 hrs
Average Depth at Peak Storage= 0.91' , Surface Width= 3.85'
Bank-Full Depth= 3.00' Flow Area= 14.0 sf, Capacity= 171.63 cfs

7.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 500.0' Slope= 0.0660 '/'
Inlet Invert= 571.00', Outlet Invert= 538.00'



Reach X Swale 2: Existing Drain Course out 48"



Summary for Pond UG 1A: Chambers 1A

Inflow Area = 3.500 ac, 53.37% Impervious, Inflow Depth = 1.43" for 1-Year event
Inflow = 4.43 cfs @ 12.21 hrs, Volume= 0.417 af
Outflow = 1.28 cfs @ 12.68 hrs, Volume= 0.417 af, Atten= 71%, Lag= 28.1 min
Primary = 1.28 cfs @ 12.68 hrs, Volume= 0.417 af
Routed to Reach X Swale 1 : Existing drain course

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 580.08' @ 12.68 hrs Surf.Area= 0.204 ac Storage= 0.107 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 24.6 min (860.2 - 835.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	577.85'	0.000 af	**38.75'W x 229.00'L x 7.95'H Field A** 1.620 af Overall - 0.715 af Embedded = 0.905 af x 0.0% Voids
#2A	578.85'	0.715 af	**Xerxes 6'** x 1100 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 1100 Chambers in 5 Rows Cap Storage= 55.1 cf x 2 x 5 rows = 550.7 cf
		0.715 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	577.85'	**18.0" Round Culvert** L= 187.8' Ke= 0.500 Inlet / Outlet Invert= 577.85' / 576.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	578.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	581.75'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	583.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	584.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=1.28 cfs @ 12.68 hrs HW=580.08' (Free Discharge)
- **1=Culvert** (Passes 1.28 cfs of 10.25 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 1.28 cfs @ 6.51 fps)
  - **3=Orifice/Grate** (Controls 0.00 cfs)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UG 1A: Chambers 1A - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 5 rows = 550.7 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

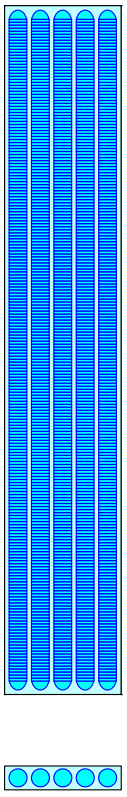
220 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 226.00' Row Length +18.0" End Gravel x 2 = 229.00' Base Length
5 Rows x 71.4" Wide + 18.0" Spacing x 4 + 18.0" Side Gravel x 2 = 38.75' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

1,100 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 5 Rows = 31,136.3 cf Chamber Storage

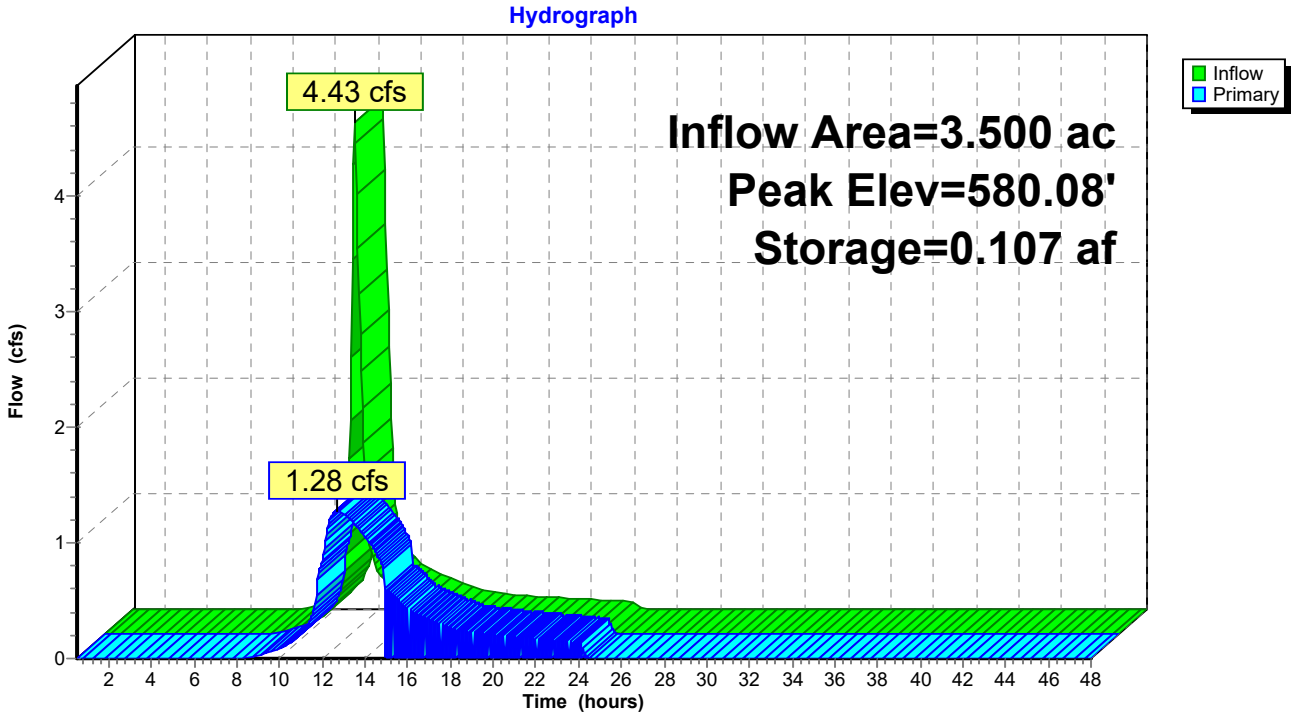
70,546.3 cf Field - 31,136.3 cf Chambers = 39,410.0 cf Gravel

Chamber Storage = 31,136.3 cf = 0.715 af
Overall Storage Efficiency = 44.1%
Overall System Size = 229.00' x 38.75' x 7.95'

1,100 Chambers
2,612.8 cy Field
1,459.6 cy Gravel



Pond UG 1A: Chambers 1A



Summary for Pond UG 1B: Chambers 1B

Inflow Area = 2.517 ac, 47.32% Impervious, Inflow Depth = 1.36" for 1-Year event
Inflow = 3.18 cfs @ 12.18 hrs, Volume= 0.285 af
Outflow = 0.31 cfs @ 13.69 hrs, Volume= 0.269 af, Atten= 90%, Lag= 90.6 min
Primary = 0.31 cfs @ 13.69 hrs, Volume= 0.269 af
Routed to Reach X Swale 1 : Existing drain course

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 615.89' @ 13.69 hrs Surf.Area= 0.114 ac Storage= 0.147 af

Plug-Flow detention time= 274.9 min calculated for 0.269 af (94% of inflow)
Center-of-Mass det. time= 244.5 min (1,081.9 - 837.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	612.50'	0.000 af	**23.85'W x 209.00'L x 7.95'H Field A** 0.910 af Overall - 0.391 af Embedded = 0.519 af x 0.0% Voids
#2A	613.50'	0.391 af	**Xerxes 6'** x 600 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 600 Chambers in 3 Rows Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	612.50'	**18.0" Round Culvert** L= 31.5' Ke= 0.500 Inlet / Outlet Invert= 612.50' / 612.00' S= 0.0159 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	614.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	616.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	618.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	619.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=0.31 cfs @ 13.69 hrs HW=615.89' (Free Discharge)
└**1=Culvert** (Passes 0.31 cfs of 13.83 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.31 cfs @ 6.40 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UG 1B: Chambers 1B - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

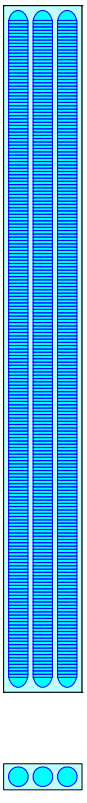
200 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 206.00' Row Length +18.0" End Gravel x 2 = 209.00' Base Length
3 Rows x 71.4" Wide + 18.0" Spacing x 2 + 18.0" Side Gravel x 2 = 23.85' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

600 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 3 Rows = 17,013.5 cf Chamber Storage

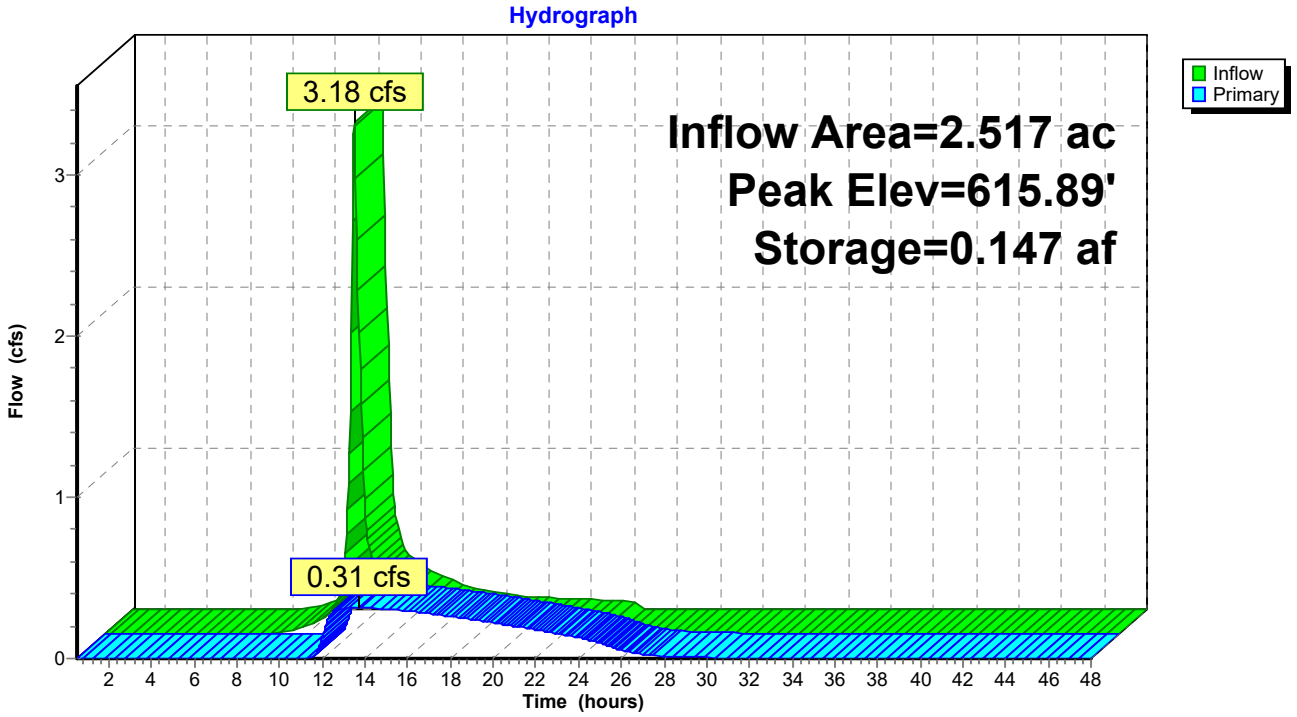
39,628.0 cf Field - 17,013.5 cf Chambers = 22,614.5 cf Gravel

Chamber Storage = 17,013.5 cf = 0.391 af
Overall Storage Efficiency = 42.9%
Overall System Size = 209.00' x 23.85' x 7.95'

600 Chambers
1,467.7 cy Field
837.6 cy Gravel



Pond UG 1B: Chambers 1B



Summary for Pond UG 2B: Chambers 2B

Inflow Area = 2.120 ac, 60.75% Impervious, Inflow Depth = 1.58" for 1-Year event
Inflow = 3.62 cfs @ 12.11 hrs, Volume= 0.279 af
Outflow = 0.27 cfs @ 13.82 hrs, Volume= 0.257 af, Atten= 93%, Lag= 102.4 min
Primary = 0.27 cfs @ 13.82 hrs, Volume= 0.257 af
Routed to Reach New 48 : New 48"

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 580.40' @ 13.82 hrs Surf.Area= 0.169 ac Storage= 0.156 af

Plug-Flow detention time= 343.4 min calculated for 0.257 af (92% of inflow)
Center-of-Mass det. time= 305.5 min (1,126.2 - 820.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	577.55'	0.000 af	**46.20'W x 159.00'L x 7.95'H Field A** 1.341 af Overall - 0.590 af Embedded = 0.751 af x 0.0% Voids
#2A	578.55'	0.590 af	**Xerxes 6'** x 900 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 900 Chambers in 6 Rows Cap Storage= 55.1 cf x 2 x 6 rows = 660.9 cf
		0.590 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	577.55'	**18.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 577.55' / 575.00' S= 0.1594 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	579.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	581.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	583.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	584.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=0.27 cfs @ 13.82 hrs HW=580.40' (Free Discharge)
└**1=Culvert** (Passes 0.27 cfs of 12.32 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.27 cfs @ 5.43 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UG 2B: Chambers 2B - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 6 rows = 660.9 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

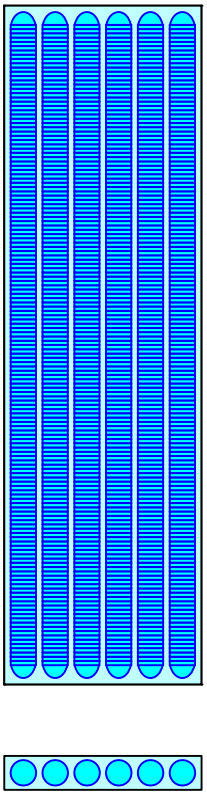
150 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 156.00' Row Length +18.0" End Gravel x 2 = 159.00' Base Length
6 Rows x 71.4" Wide + 18.0" Spacing x 5 + 18.0" Side Gravel x 2 = 46.20' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

900 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 6 Rows = 25,685.4 cf Chamber Storage

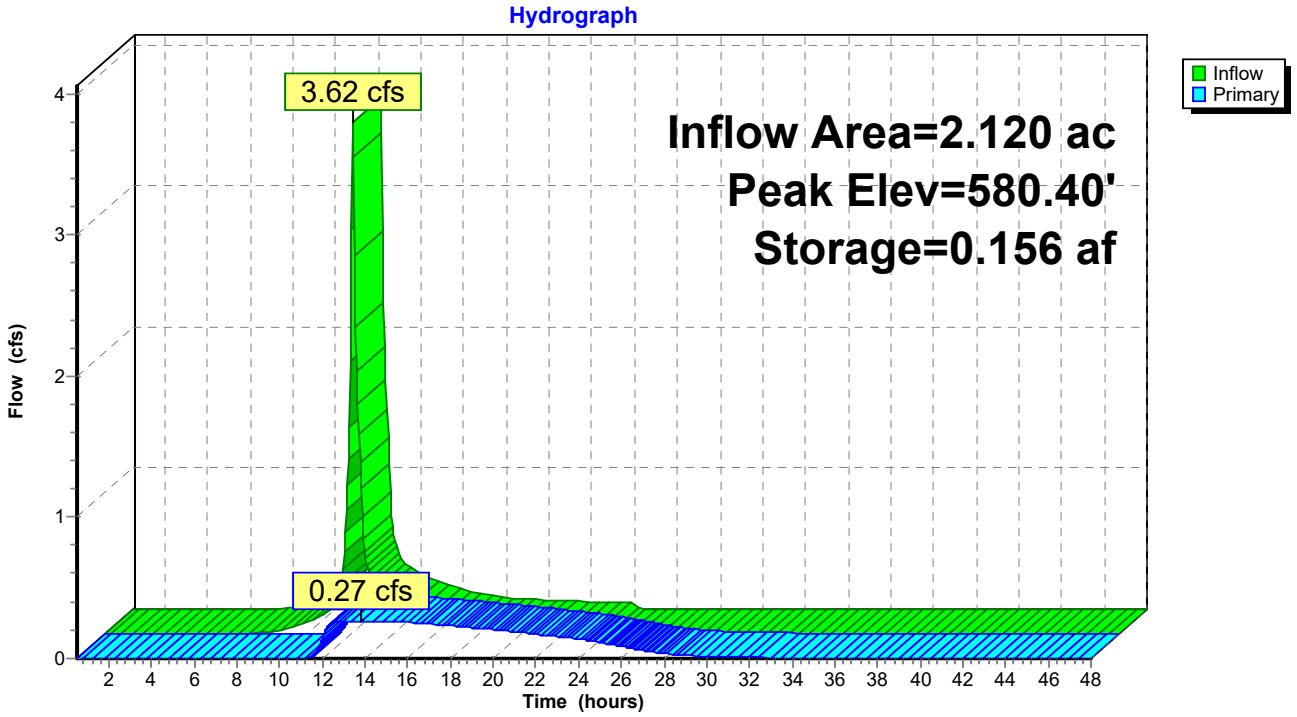
58,399.1 cf Field - 25,685.4 cf Chambers = 32,713.7 cf Gravel

Chamber Storage = 25,685.4 cf = 0.590 af
Overall Storage Efficiency = 44.0%
Overall System Size = 159.00' x 46.20' x 7.95'

900 Chambers
2,162.9 cy Field
1,211.6 cy Gravel



Pond UG 2B: Chambers 2B



Summary for Pond UG 2C: Chambers 2C

Inflow Area = 3.270 ac, 52.48% Impervious, Inflow Depth = 1.43" for 1-Year event
Inflow = 4.74 cfs @ 12.14 hrs, Volume= 0.389 af
Outflow = 0.36 cfs @ 14.06 hrs, Volume= 0.355 af, Atten= 93%, Lag= 115.2 min
Primary = 0.36 cfs @ 14.06 hrs, Volume= 0.355 af
Routed to Reach New 48 : New 48"

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 619.39' @ 14.06 hrs Surf.Area= 0.114 ac Storage= 0.217 af

Plug-Flow detention time= 354.4 min calculated for 0.354 af (91% of inflow)
Center-of-Mass det. time= 311.4 min (1,142.2 - 830.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	615.15'	0.000 af	**23.85'W x 209.00'L x 7.95'H Field A** 0.910 af Overall - 0.391 af Embedded = 0.519 af x 0.0% Voids
#2A	616.15'	0.391 af	**Xerxes 6'** x 600 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 600 Chambers in 3 Rows Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	615.50'	**18.0" Round Culvert** L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 615.50' / 612.00' S= 0.2917 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	617.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	619.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	621.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	622.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=0.36 cfs @ 14.06 hrs HW=619.39' (Free Discharge)
└**1=Culvert** (Passes 0.36 cfs of 15.07 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.36 cfs @ 7.24 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UG 2C: Chambers 2C - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

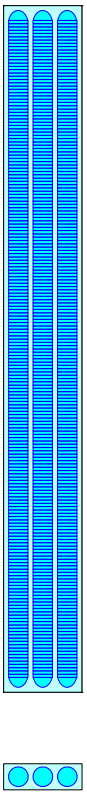
200 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 206.00' Row Length +18.0" End Gravel x 2 = 209.00' Base Length
3 Rows x 71.4" Wide + 18.0" Spacing x 2 + 18.0" Side Gravel x 2 = 23.85' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

600 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 3 Rows = 17,013.5 cf Chamber Storage

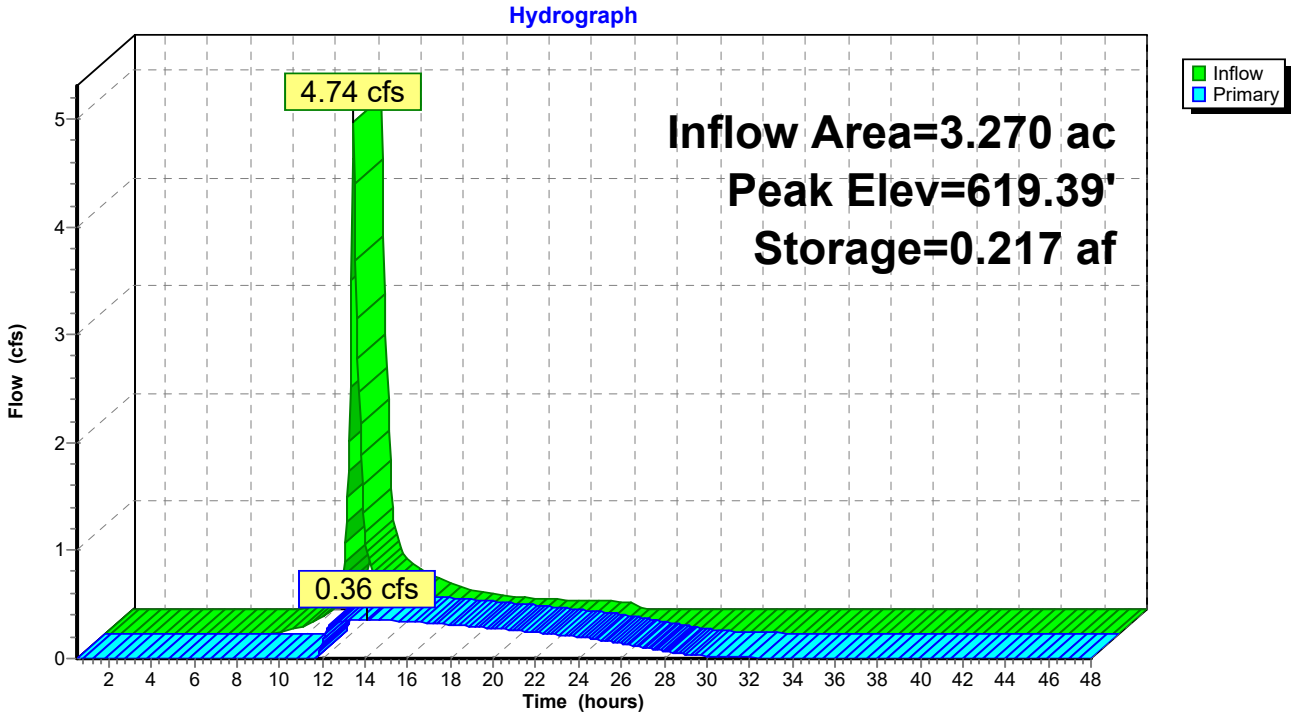
39,628.0 cf Field - 17,013.5 cf Chambers = 22,614.5 cf Gravel

Chamber Storage = 17,013.5 cf = 0.391 af
Overall Storage Efficiency = 42.9%
Overall System Size = 209.00' x 23.85' x 7.95'

600 Chambers
1,467.7 cy Field
837.6 cy Gravel



Pond UG 2C: Chambers 2C



Time span=0.50-48.00 hrs, dt=0.05 hrs, 951 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 1A: Post Basin 1A Runoff Area=3.500 ac 53.37% Impervious Runoff Depth=3.38"
Flow Length=444' Tc=14.9 min CN=87 Runoff=10.34 cfs 0.986 af

Subcatchment 1B: Post Basin 1B Runoff Area=2.517 ac 47.32% Impervious Runoff Depth=3.28"
Flow Length=369' Tc=12.8 min CN=86 Runoff=7.65 cfs 0.688 af

Subcatchment 2A: Post Basin 2A Runoff Area=3.300 ac 0.00% Impervious Runoff Depth=2.46"
Flow Length=663' Tc=67.1 min CN=77 Runoff=3.49 cfs 0.676 af

Subcatchment 2B: Post Basin 2B Runoff Area=2.120 ac 60.75% Impervious Runoff Depth=3.58"
Flow Length=234' Tc=7.9 min CN=89 Runoff=8.02 cfs 0.633 af

Subcatchment 2C: Post Basin 2C Runoff Area=3.270 ac 52.48% Impervious Runoff Depth=3.38"
Flow Length=574' Tc=9.9 min CN=87 Runoff=11.04 cfs 0.921 af

Subcatchment 2D.1: Post Basin 2D.1 Runoff Area=65.430 ac 0.66% Impervious Runoff Depth=2.46"
Flow Length=3,560' Tc=149.9 min CN=77 Runoff=39.84 cfs 13.394 af

Subcatchment 2D.2: Post Basin 2D.2 Runoff Area=12.070 ac 31.90% Impervious Runoff Depth=2.99"
Flow Length=1,906' Tc=41.1 min CN=83 Runoff=20.54 cfs 3.011 af

Reach 44 CMP: Existing 44" CMP Avg. Flow Depth=0.85' Max Vel=23.30 fps Inflow=43.30 cfs 16.406 af
44.0" Round Pipe n=0.013 L=23.0' S=0.1035 '/' Capacity=366.39 cfs Outflow=43.30 cfs 16.406 af

Reach AP1: Analysis Point 1 Inflow=2.76 cfs 1.658 af
Outflow=2.76 cfs 1.658 af

Reach AP2: Analysis Point 2 Inflow=46.11 cfs 18.585 af
Outflow=46.11 cfs 18.585 af

Reach New 48: New 48" Avg. Flow Depth=0.79' Max Vel=25.67 fps Inflow=44.83 cfs 17.909 af
48.0" Round Pipe n=0.012 L=596.0' S=0.1158 '/' Capacity=529.48 cfs Outflow=44.82 cfs 17.909 af

Reach Swale: Exist swale out 44" CMP Avg. Flow Depth=2.04' Max Vel=5.94 fps Inflow=43.30 cfs 16.406 af
n=0.040 L=168.0' S=0.0242 '/' Capacity=128.00 cfs Outflow=43.29 cfs 16.406 af

Reach X Swale 1: Existing drain course Avg. Flow Depth=0.25' Max Vel=9.62 fps Inflow=2.76 cfs 1.658 af
n=0.013 L=157.0' S=0.0828 '/' Capacity=482.69 cfs Outflow=2.76 cfs 1.658 af

Reach X Swale 2: Existing Drain Avg. Flow Depth=1.55' Max Vel=8.59 fps Inflow=44.82 cfs 17.909 af
n=0.040 L=500.0' S=0.0660 '/' Capacity=171.63 cfs Outflow=44.81 cfs 17.909 af

Pond UG 1A: Chambers 1A Peak Elev=581.79' Storage=0.352 af Inflow=10.34 cfs 0.986 af
Outflow=1.78 cfs 0.986 af

Pond UG 1B: Chambers 1B Peak Elev=618.61' Storage=0.357 af Inflow=7.65 cfs 0.688 af
Outflow=0.98 cfs 0.672 af

Pond UG 2B: Chambers 2B Peak Elev=582.15' Storage=0.373 af Inflow=8.02 cfs 0.633 af
Outflow=0.53 cfs 0.611 af

Pond UG 2C: Chambers 2C Peak Elev=624.29' Storage=0.391 af Inflow=11.04 cfs 0.921 af
Outflow=9.14 cfs 0.893 af

Total Runoff Area = 92.207 ac Runoff Volume = 20.308 af Average Runoff Depth = 2.64"
88.78% Pervious = 81.864 ac 11.22% Impervious = 10.343 ac

Summary for Subcatchment 1A: Post Basin 1A

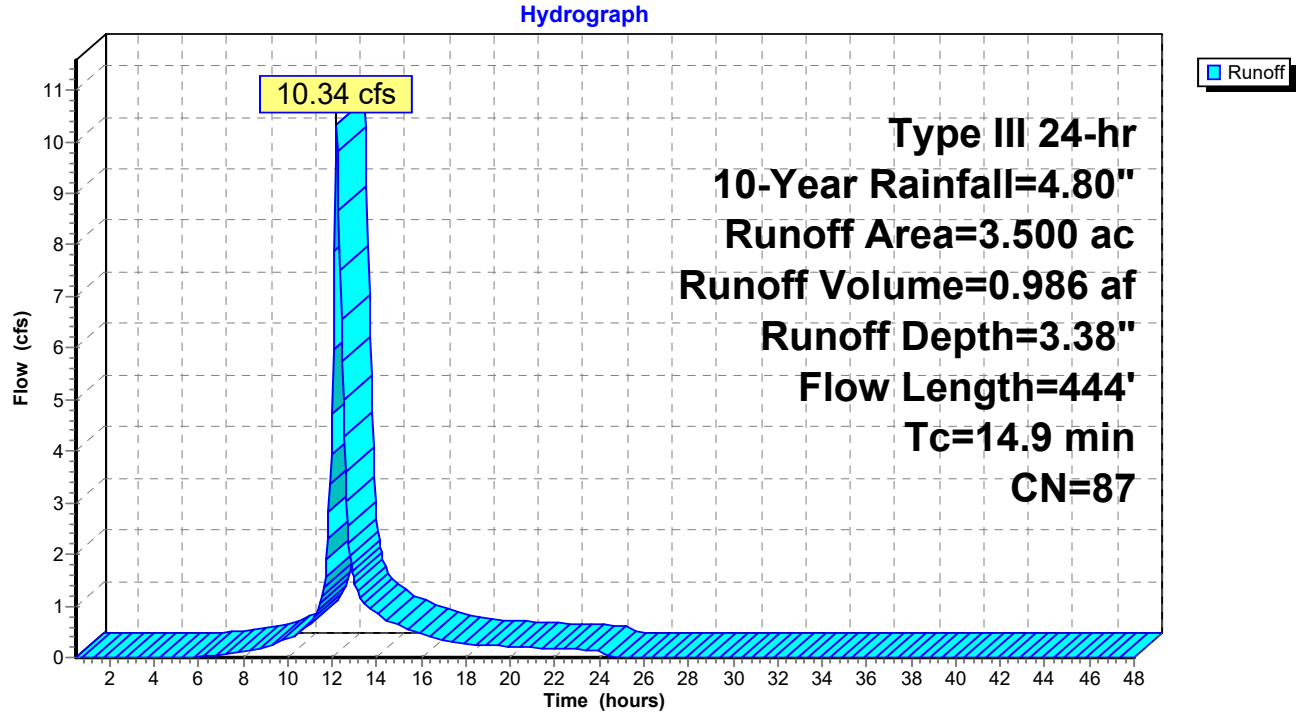
Runoff = 10.34 cfs @ 12.20 hrs, Volume= 0.986 af, Depth= 3.38"
Routed to Pond UG 1A : Chambers 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	1.868	98	Impervious Surfaces
	1.232	74	>75% Grass cover, Good, HSG C
	0.400	77	Woods, Good, HSG D
	3.500	87	Weighted Average
	1.632		46.63% Pervious Area
	1.868		53.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0400	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
7.6	152	0.0789	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.2	192	0.0651	13.43	16.48	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
14.9	444	Total			

Subcatchment 1A: Post Basin 1A



Summary for Subcatchment 1B: Post Basin 1B

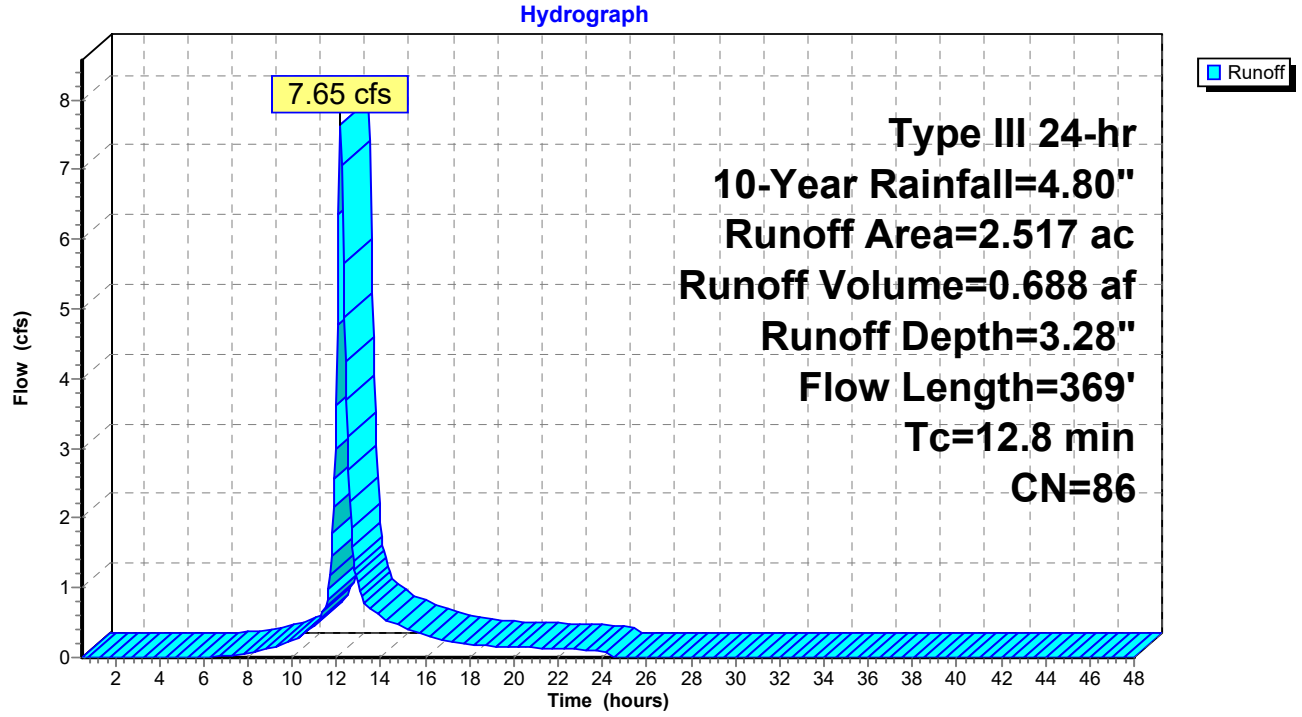
Runoff = 7.65 cfs @ 12.17 hrs, Volume= 0.688 af, Depth= 3.28"
Routed to Pond UG 1B : Chambers 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	1.191	98	Impervious Surfaces
	1.163	74	>75% Grass cover, Good, HSG C
	0.163	77	Woods, Good, HSG D
	2.517	86	Weighted Average
	1.326		52.68% Pervious Area
	1.191		47.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0445	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
5.8	138	0.1268	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.2	131	0.0530	12.12	14.87	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
12.8	369	Total			

Subcatchment 1B: Post Basin 1B



Summary for Subcatchment 2A: Post Basin 2A

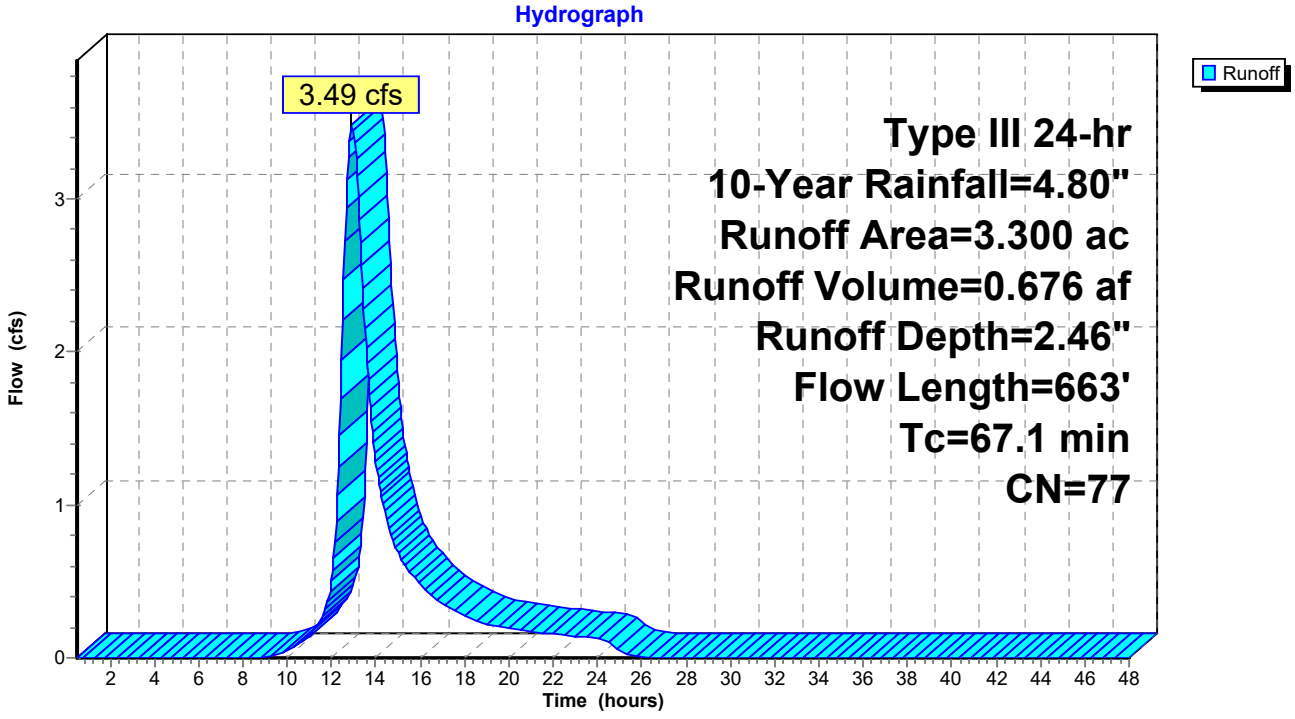
Runoff = 3.49 cfs @ 12.91 hrs, Volume= 0.676 af, Depth= 2.46"
Routed to Reach AP2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (ac)	CN	Description
3.300	77	Woods, Good, HSG D
3.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	100	0.0600	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
5.2	328	0.1768	1.05		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
38.9	235	0.0893	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
67.1	663	Total			

Subcatchment 2A: Post Basin 2A



Summary for Subcatchment 2B: Post Basin 2B

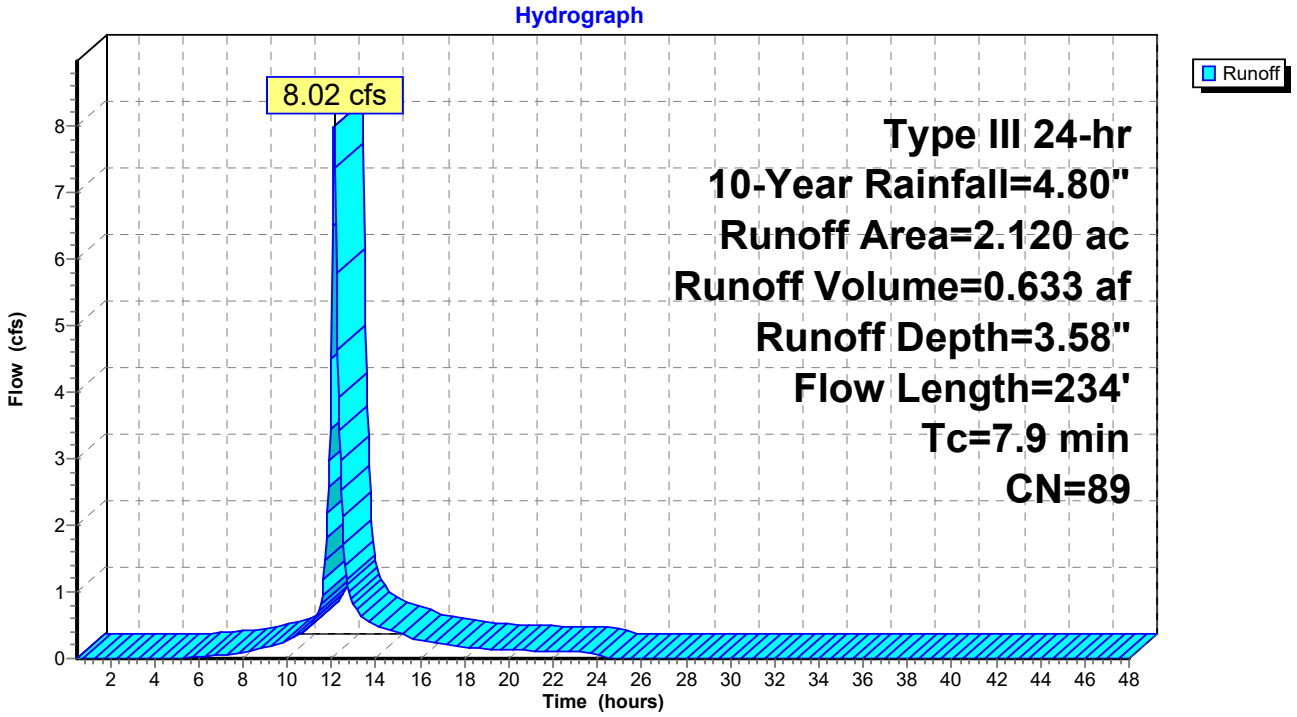
Runoff = 8.02 cfs @ 12.11 hrs, Volume= 0.633 af, Depth= 3.58"
Routed to Pond UG 2B : Chambers 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	1.288	98	Impervious Surfaces
	0.832	74	>75% Grass cover, Good, HSG C
	2.120	89	Weighted Average
	0.832		39.25% Pervious Area
	1.288		60.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.1398	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
3.4	30	0.0233	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	60	0.0966	16.36	20.08	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.1	44	0.0200	8.41	14.86	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
7.9	234	Total			

Subcatchment 2B: Post Basin 2B



Summary for Subcatchment 2C: Post Basin 2C

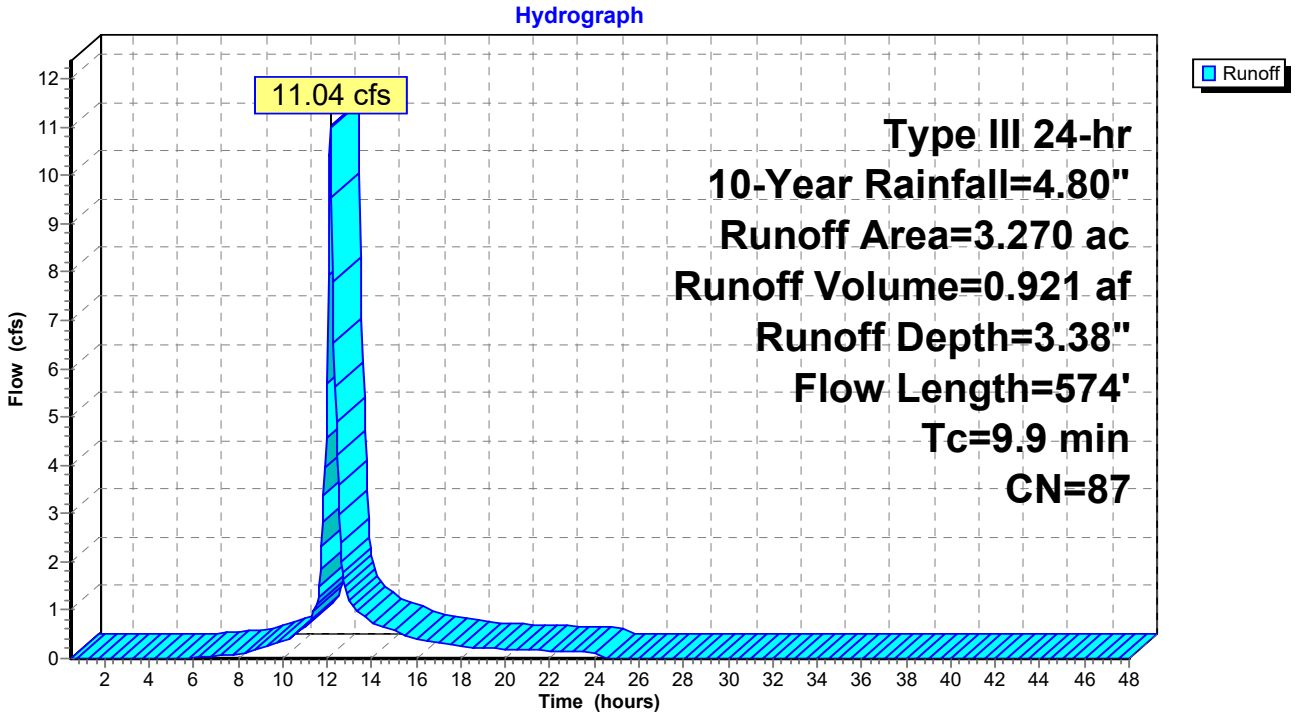
Runoff = 11.04 cfs @ 12.14 hrs, Volume= 0.921 af, Depth= 3.38"
Routed to Pond UG 2C : Chambers 2C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	1.716	98	Impervious Surfaces
	1.193	74	>75% Grass cover, Good, HSG C
	0.361	77	Woods, Good, HSG D
	3.270	87	Weighted Average
	1.554		47.52% Pervious Area
	1.716		52.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0336	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.3	186	0.1183	2.41		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	90	0.0220	3.01		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	166	0.0179	7.04	8.64	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.1	32	0.0179	7.04	8.64	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
9.9	574	Total			

Subcatchment 2C: Post Basin 2C



Summary for Subcatchment 2D.1: Post Basin 2D.1

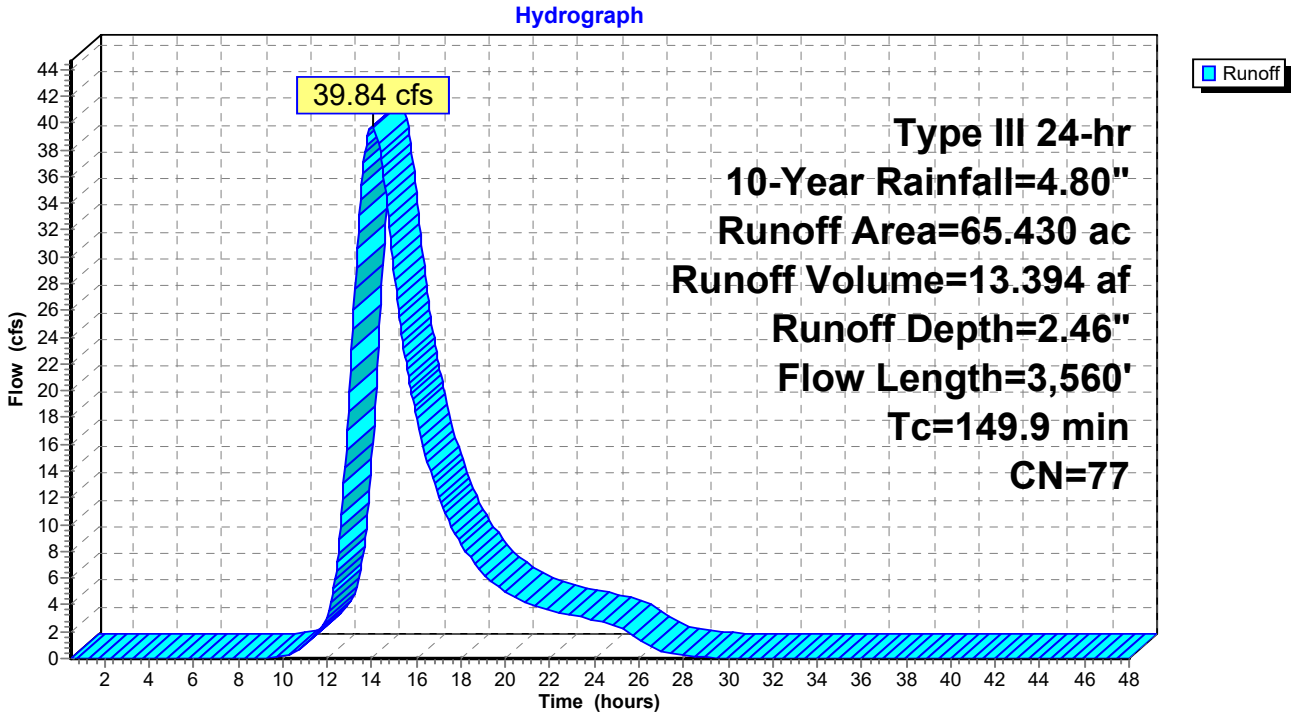
Runoff = 39.84 cfs @ 14.02 hrs, Volume= 13.394 af, Depth= 2.46"
Routed to Reach 44 CMP : Existing 44" CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	0.430	98	Impervious Surfaces
	0.570	74	>75% Grass cover, Good, HSG C
	64.430	77	Woods, Good, HSG D
	65.430	77	Weighted Average
	65.000		99.34% Pervious Area
	0.430		0.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
6.8	560	0.2998	1.37		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.9	372	0.1883	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
127.4	1,338	0.1494	0.18		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
1.1	800	0.1000	12.30	98.36	**Parabolic Channel,** W=6.00' D=2.00' Area=8.0 sf Perim=7.5' n= 0.040 Earth, cobble bottom, clean sides
1.2	126	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	170	0.0732	7.47	39.85	**Parabolic Channel,** W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.040 Earth, cobble bottom, clean sides
0.0	22	0.0586	11.88	83.96	**Pipe Channel, CMP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
0.1	72	0.0330	8.06	73.54	**Pipe Channel,** 44.0" x 38.0" Ellipse Area= 9.1 sf Perim= 10.7' r= 0.85' n= 0.030 Corrugated metal
149.9	3,560	Total			

Subcatchment 2D.1: Post Basin 2D.1



Summary for Subcatchment 2D.2: Post Basin 2D.2

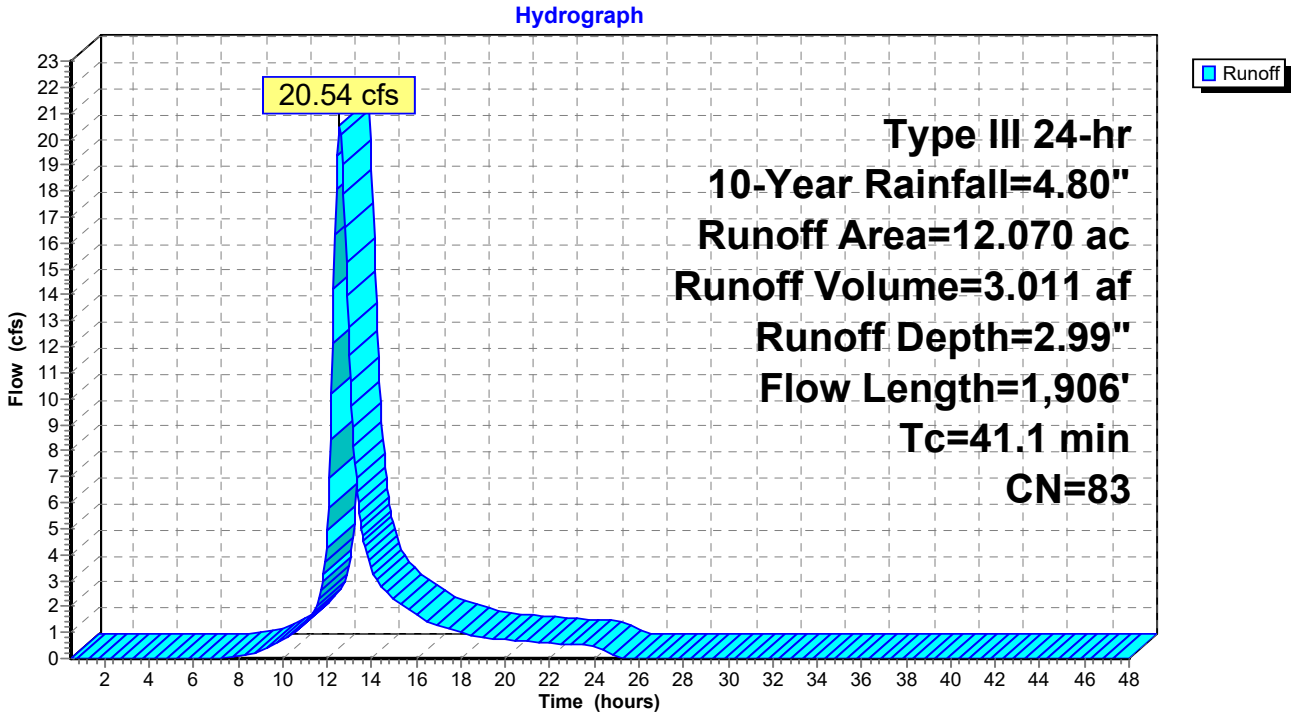
Runoff = 20.54 cfs @ 12.56 hrs, Volume= 3.011 af, Depth= 2.99"
Routed to Reach 44 CMP : Existing 44" CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

	Area (ac)	CN	Description
*	3.850	98	Impervious Surfaces
	3.690	74	>75% Grass cover, Good, HSG C
	4.530	77	Woods, Good, HSG D
	12.070	83	Weighted Average
	8.220		68.10% Pervious Area
	3.850		31.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	100	0.0950	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.6	379	0.1254	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	123	0.1382	2.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	100	0.0903	6.10		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	35	0.1416	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	59	0.1186	6.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	67	0.2083	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	48	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	51	0.2058	2.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	54	0.1109	6.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	531	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.9	259	0.0121	2.23		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
41.1	1,906	Total			

Subcatchment 2D.2: Post Basin 2D.2



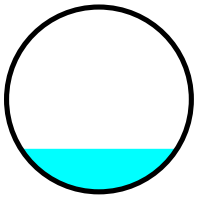
Summary for Reach 44 CMP: Existing 44" CMP

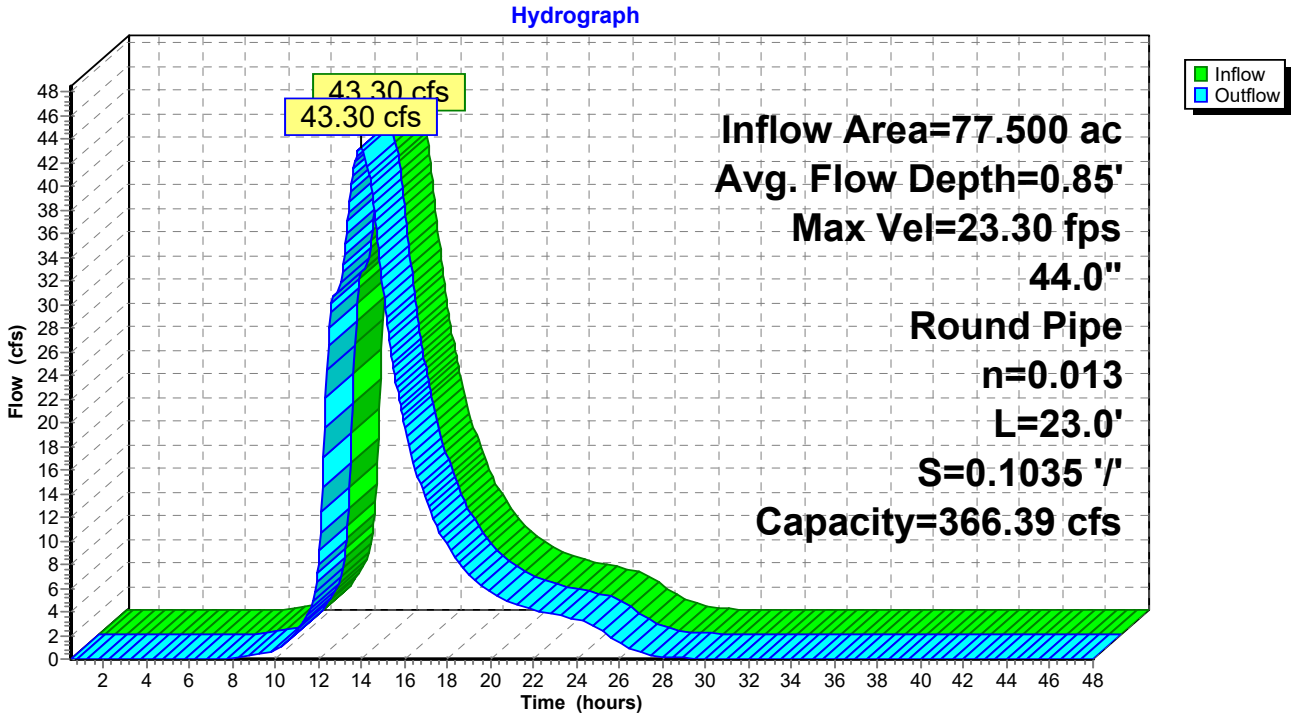
Inflow Area = 77.500 ac, 5.52% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 43.30 cfs @ 13.98 hrs, Volume= 16.406 af
Outflow = 43.30 cfs @ 13.98 hrs, Volume= 16.406 af, Atten= 0%, Lag= 0.1 min
Routed to Reach Swale : Exist swale out 44" CMP

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 23.30 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 10.77 fps, Avg. Travel Time= 0.0 min

Peak Storage= 43 cf @ 13.98 hrs
Average Depth at Peak Storage= 0.85' , Surface Width= 3.10'
Bank-Full Depth= 3.67' Flow Area= 10.6 sf, Capacity= 366.39 cfs

44.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 23.0' Slope= 0.1035 '/'
Inlet Invert= 646.45', Outlet Invert= 644.07'



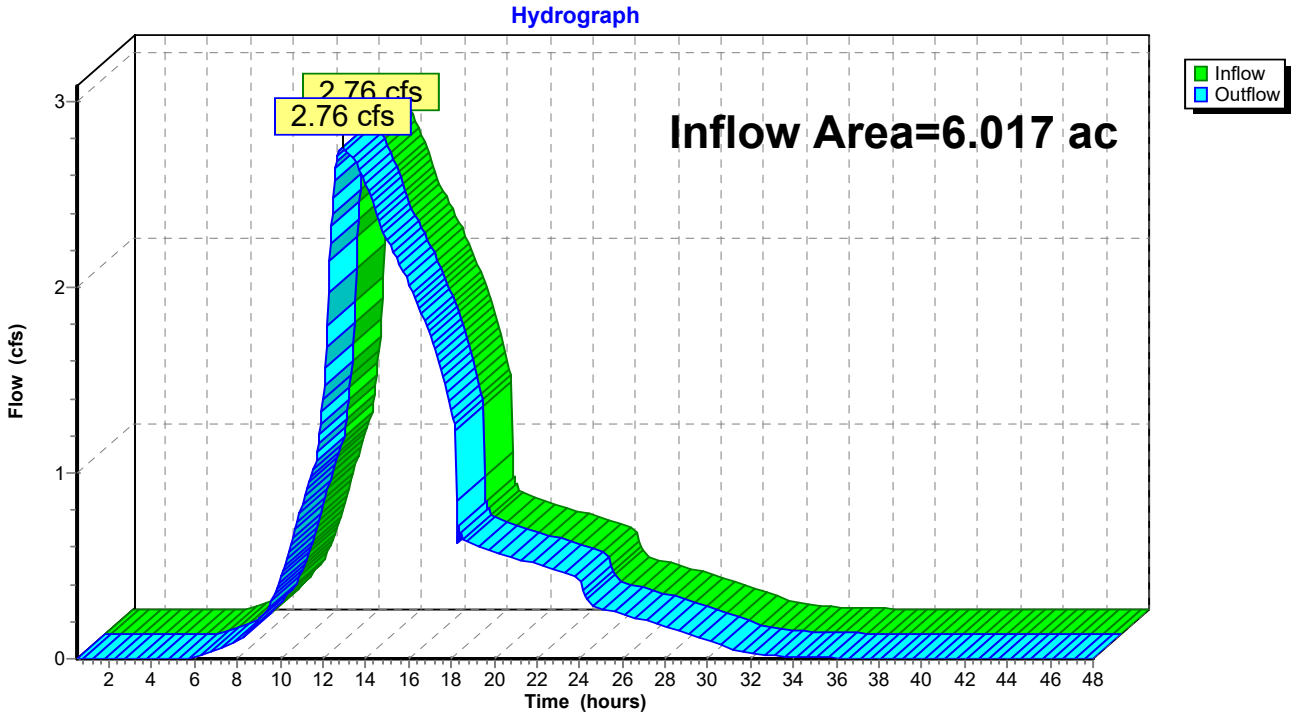


Summary for Reach AP1: Analysis Point 1

Inflow Area = 6.017 ac, 50.84% Impervious, Inflow Depth > 3.31" for 10-Year event
Inflow = 2.76 cfs @ 12.92 hrs, Volume= 1.658 af
Outflow = 2.76 cfs @ 12.92 hrs, Volume= 1.658 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs

Reach AP1: Analysis Point 1

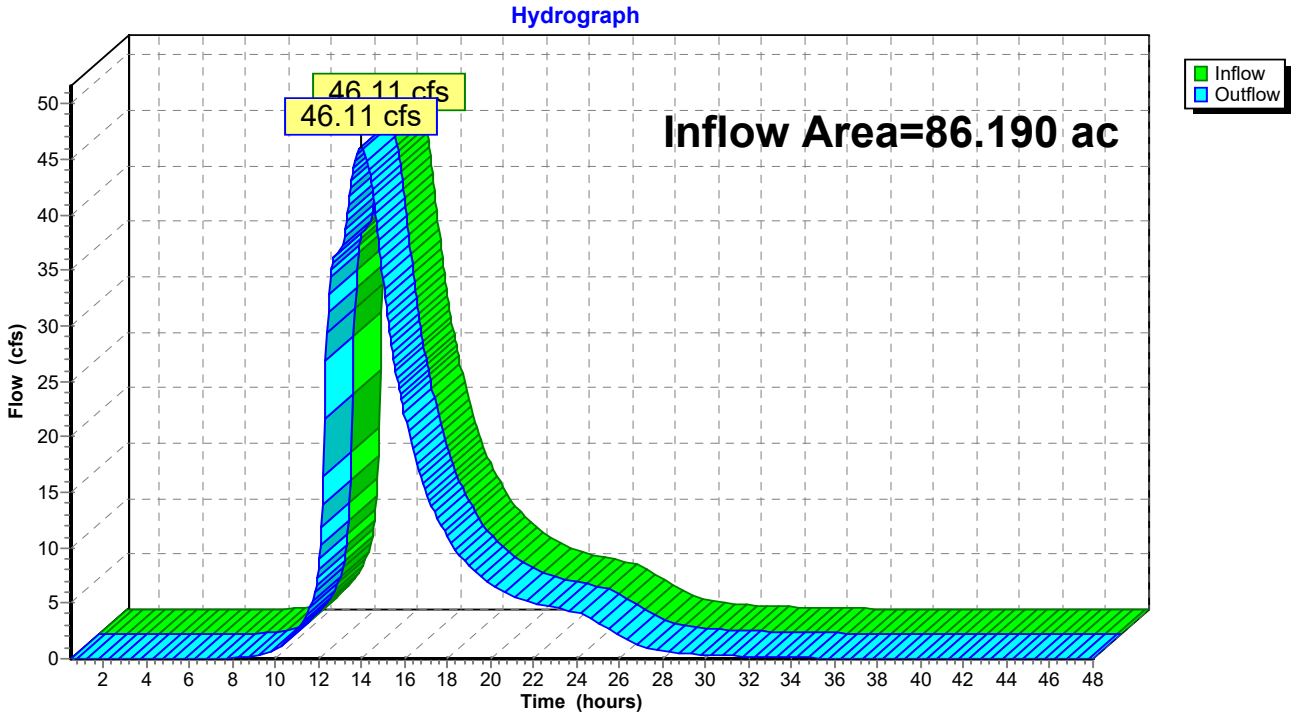


Summary for Reach AP2: Analysis Point 2

Inflow Area = 86.190 ac, 8.45% Impervious, Inflow Depth = 2.59" for 10-Year event
Inflow = 46.11 cfs @ 13.95 hrs, Volume= 18.585 af
Outflow = 46.11 cfs @ 13.95 hrs, Volume= 18.585 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs

Reach AP2: Analysis Point 2



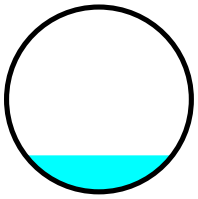
Summary for Reach New 48: New 48"

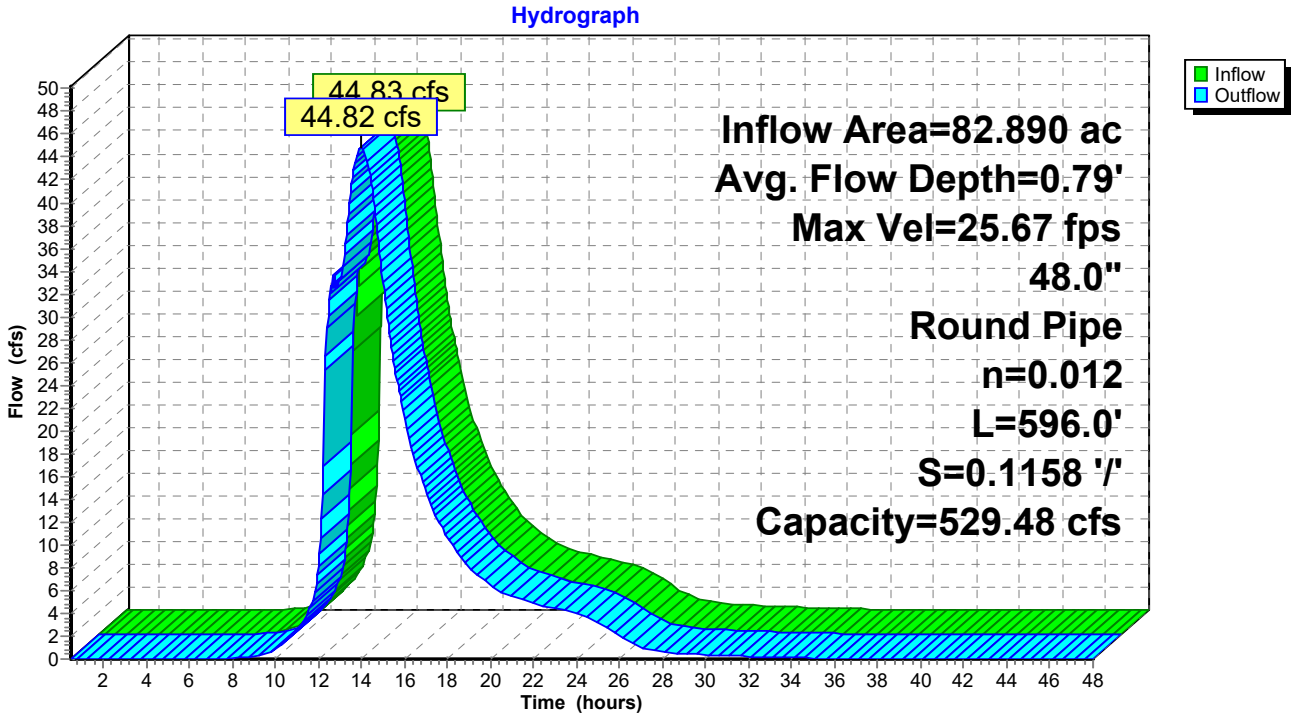
Inflow Area = 82.890 ac, 8.79% Impervious, Inflow Depth = 2.59" for 10-Year event
Inflow = 44.83 cfs @ 13.99 hrs, Volume= 17.909 af
Outflow = 44.82 cfs @ 13.99 hrs, Volume= 17.909 af, Atten= 0%, Lag= 0.3 min
Routed to Reach X Swale 2 : Existing Drain Course out 48"

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 25.67 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 9.23 fps, Avg. Travel Time= 1.1 min

Peak Storage= 1,041 cf @ 13.99 hrs
Average Depth at Peak Storage= 0.79' , Surface Width= 3.18'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 529.48 cfs

48.0" Round Pipe
n= 0.012
Length= 596.0' Slope= 0.1158 '/'
Inlet Invert= 640.00', Outlet Invert= 571.00'





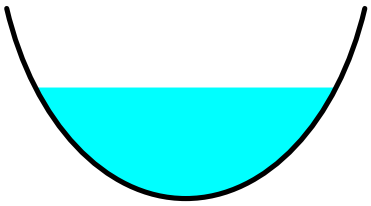
Summary for Reach Swale: Exist swale out 44" CMP

Inflow Area = 77.500 ac, 5.52% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 43.30 cfs @ 13.98 hrs, Volume= 16.406 af
Outflow = 43.29 cfs @ 13.99 hrs, Volume= 16.406 af, Atten= 0%, Lag= 0.5 min
Routed to Reach New 48 : New 48"

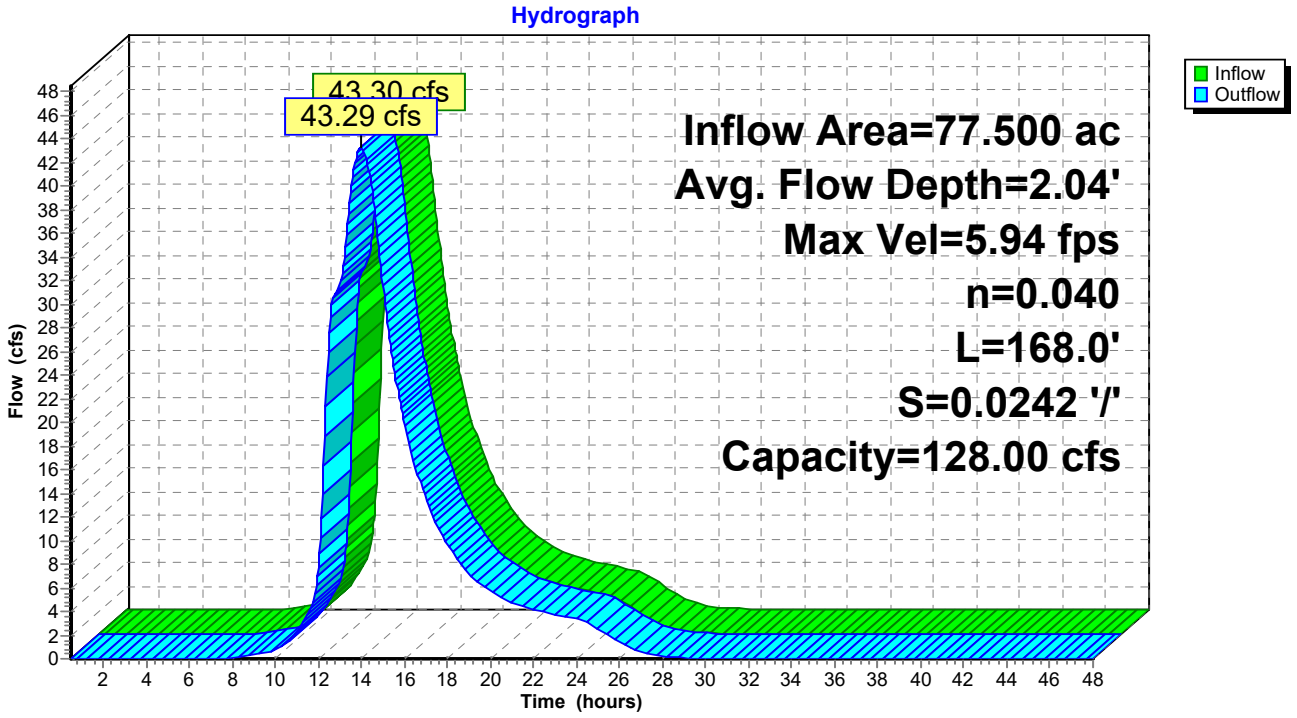
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.94 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.78 fps, Avg. Travel Time= 1.0 min

Peak Storage= 1,225 cf @ 13.99 hrs
Average Depth at Peak Storage= 2.04' , Surface Width= 5.35'
Bank-Full Depth= 3.50' Flow Area= 16.3 sf, Capacity= 128.00 cfs

7.00' x 3.50' deep Parabolic Channel, n= 0.040 Earth, dense weeds
Length= 168.0' Slope= 0.0242 '/'
Inlet Invert= 644.07', Outlet Invert= 640.00'



Reach Swale: Exist swale out 44" CMP



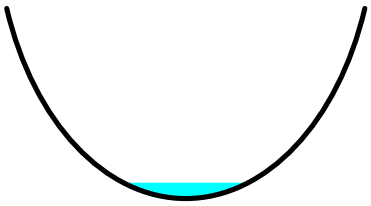
Summary for Reach X Swale 1: Existing drain course

Inflow Area = 6.017 ac, 50.84% Impervious, Inflow Depth > 3.31" for 10-Year event
Inflow = 2.76 cfs @ 12.92 hrs, Volume= 1.658 af
Outflow = 2.76 cfs @ 12.92 hrs, Volume= 1.658 af, Atten= 0%, Lag= 0.1 min
Routed to Reach AP1 : Analysis Point 1

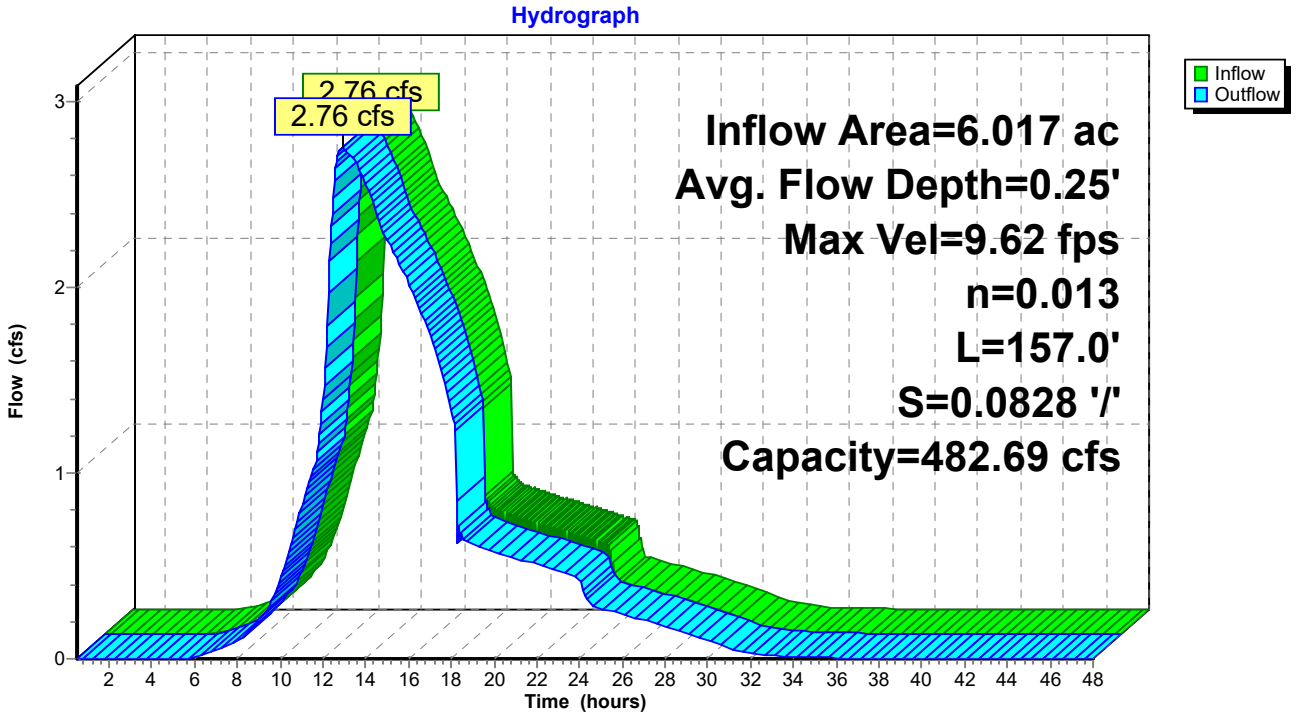
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.62 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 4.47 fps, Avg. Travel Time= 0.6 min

Peak Storage= 45 cf @ 12.92 hrs
Average Depth at Peak Storage= 0.25' , Surface Width= 1.73'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 482.69 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.013 Corrugated PE, smooth interior
Length= 157.0' Slope= 0.0828 '/'
Inlet Invert= 578.00', Outlet Invert= 565.00'



Reach X Swale 1: Existing drain course



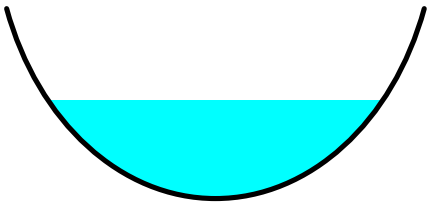
Summary for Reach X Swale 2: Existing Drain Course out 48"

Inflow Area = 82.890 ac, 8.79% Impervious, Inflow Depth = 2.59" for 10-Year event
Inflow = 44.82 cfs @ 13.99 hrs, Volume= 17.909 af
Outflow = 44.81 cfs @ 14.01 hrs, Volume= 17.909 af, Atten= 0%, Lag= 1.3 min
Routed to Reach AP2 : Analysis Point 2

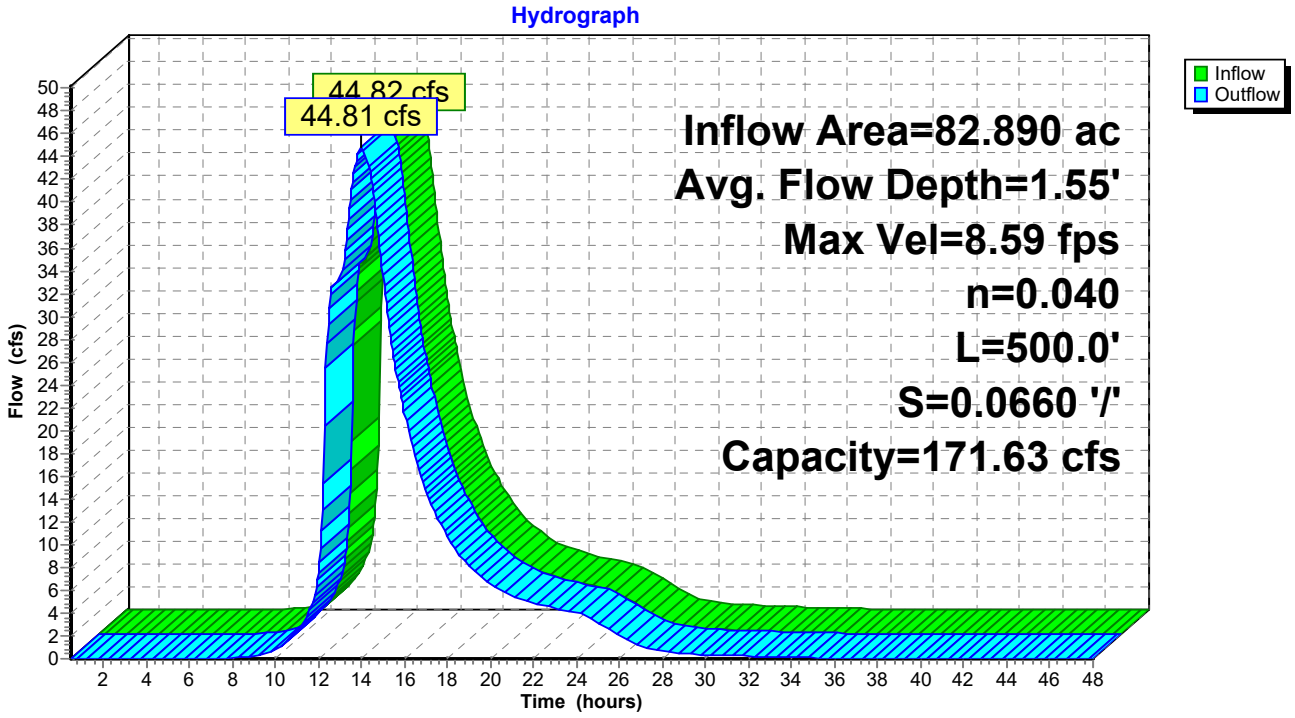
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.59 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 3.00 fps, Avg. Travel Time= 2.8 min

Peak Storage= 2,610 cf @ 14.00 hrs
Average Depth at Peak Storage= 1.55' , Surface Width= 5.04'
Bank-Full Depth= 3.00' Flow Area= 14.0 sf, Capacity= 171.63 cfs

7.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 500.0' Slope= 0.0660 '/'
Inlet Invert= 571.00', Outlet Invert= 538.00'



Reach X Swale 2: Existing Drain Course out 48"



Summary for Pond UG 1A: Chambers 1A

Inflow Area = 3.500 ac, 53.37% Impervious, Inflow Depth = 3.38" for 10-Year event
Inflow = 10.34 cfs @ 12.20 hrs, Volume= 0.986 af
Outflow = 1.78 cfs @ 12.85 hrs, Volume= 0.986 af, Atten= 83%, Lag= 39.1 min
Primary = 1.78 cfs @ 12.85 hrs, Volume= 0.986 af
Routed to Reach X Swale 1 : Existing drain course

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 581.79' @ 12.85 hrs Surf.Area= 0.204 ac Storage= 0.352 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 72.4 min (883.4 - 811.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	577.85'	0.000 af	**38.75'W x 229.00'L x 7.95'H Field A** 1.620 af Overall - 0.715 af Embedded = 0.905 af x 0.0% Voids
#2A	578.85'	0.715 af	**Xerxes 6'** x 1100 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 1100 Chambers in 5 Rows Cap Storage= 55.1 cf x 2 x 5 rows = 550.7 cf
		0.715 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	577.85'	**18.0" Round Culvert** L= 187.8' Ke= 0.500 Inlet / Outlet Invert= 577.85' / 576.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	578.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	581.75'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	583.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	584.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=1.78 cfs @ 12.85 hrs HW=581.79' (Free Discharge)
- **1=Culvert** (Passes 1.78 cfs of 13.22 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 1.78 cfs @ 9.06 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.65 fps)
  - **4=Orifice/Grate** (Controls 0.00 cfs)
- **5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UG 1A: Chambers 1A - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 5 rows = 550.7 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

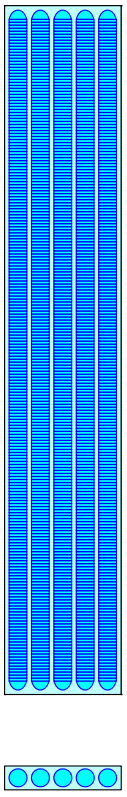
220 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 226.00' Row Length +18.0" End Gravel x 2 = 229.00' Base Length
5 Rows x 71.4" Wide + 18.0" Spacing x 4 + 18.0" Side Gravel x 2 = 38.75' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

1,100 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 5 Rows = 31,136.3 cf Chamber Storage

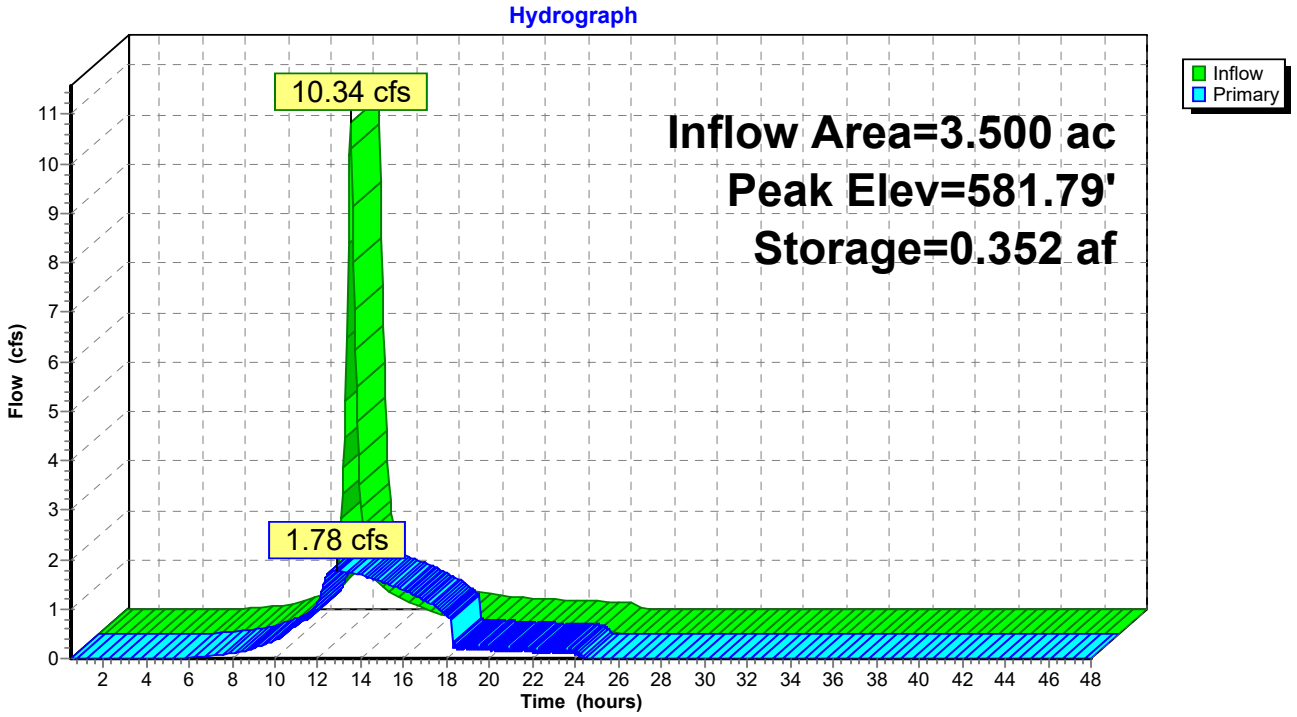
70,546.3 cf Field - 31,136.3 cf Chambers = 39,410.0 cf Gravel

Chamber Storage = 31,136.3 cf = 0.715 af
Overall Storage Efficiency = 44.1%
Overall System Size = 229.00' x 38.75' x 7.95'

1,100 Chambers
2,612.8 cy Field
1,459.6 cy Gravel



Pond UG 1A: Chambers 1A



Summary for Pond UG 1B: Chambers 1B

Inflow Area = 2.517 ac, 47.32% Impervious, Inflow Depth = 3.28" for 10-Year event
Inflow = 7.65 cfs @ 12.17 hrs, Volume= 0.688 af
Outflow = 0.98 cfs @ 13.01 hrs, Volume= 0.672 af, Atten= 87%, Lag= 50.4 min
Primary = 0.98 cfs @ 13.01 hrs, Volume= 0.672 af
Routed to Reach X Swale 1 : Existing drain course

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 618.61' @ 13.01 hrs Surf.Area= 0.114 ac Storage= 0.357 af

Plug-Flow detention time= 302.1 min calculated for 0.671 af (98% of inflow)
Center-of-Mass det. time= 289.0 min (1,101.3 - 812.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	612.50'	0.000 af	**23.85'W x 209.00'L x 7.95'H Field A** 0.910 af Overall - 0.391 af Embedded = 0.519 af x 0.0% Voids
#2A	613.50'	0.391 af	**Xerxes 6'** x 600 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 600 Chambers in 3 Rows Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	612.50'	**18.0" Round Culvert** L= 31.5' Ke= 0.500 Inlet / Outlet Invert= 612.50' / 612.00' S= 0.0159 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	614.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	616.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	618.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	619.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=0.98 cfs @ 13.01 hrs HW=618.61' (Free Discharge)
└**1=Culvert** (Passes 0.98 cfs of 19.70 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.50 cfs @ 10.20 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.31 cfs @ 6.34 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.16 cfs @ 3.36 fps)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UG 1B: Chambers 1B - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

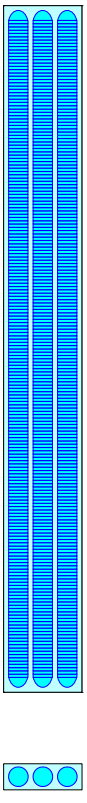
200 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 206.00' Row Length +18.0" End Gravel x 2 = 209.00' Base Length
3 Rows x 71.4" Wide + 18.0" Spacing x 2 + 18.0" Side Gravel x 2 = 23.85' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

600 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 3 Rows = 17,013.5 cf Chamber Storage

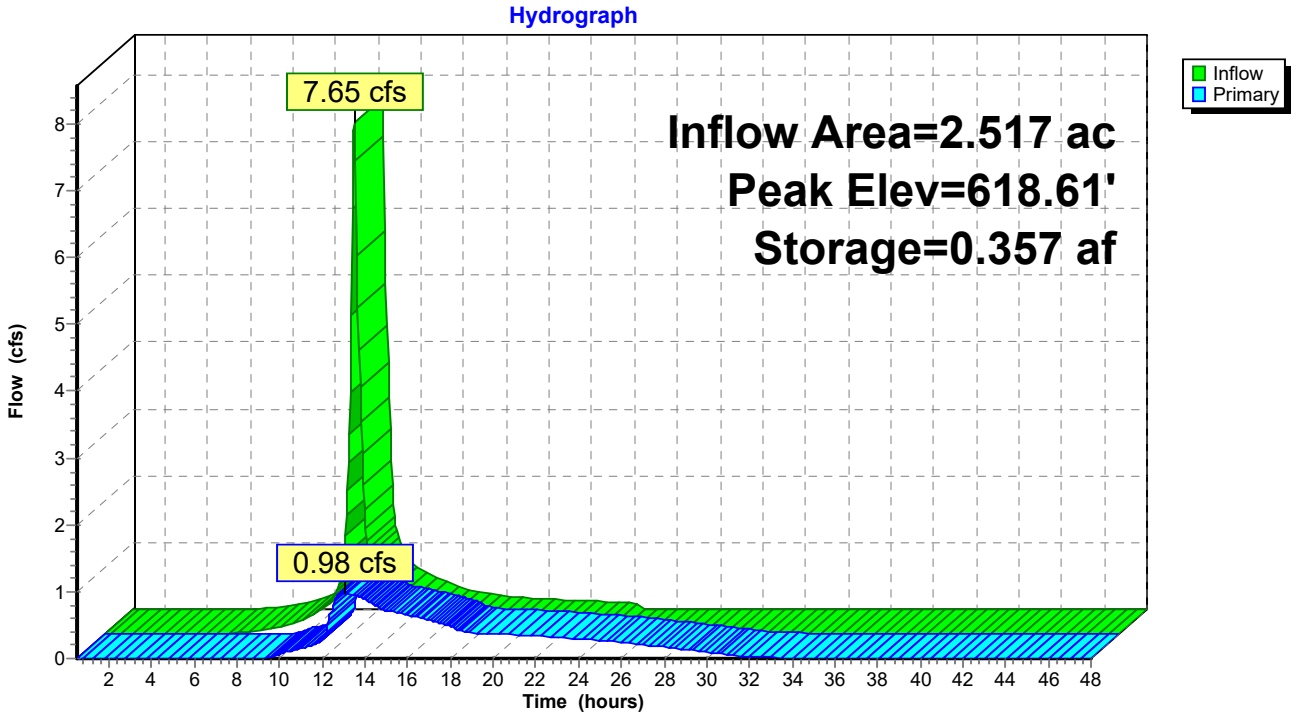
39,628.0 cf Field - 17,013.5 cf Chambers = 22,614.5 cf Gravel

Chamber Storage = 17,013.5 cf = 0.391 af
Overall Storage Efficiency = 42.9%
Overall System Size = 209.00' x 23.85' x 7.95'

600 Chambers
1,467.7 cy Field
837.6 cy Gravel



Pond UG 1B: Chambers 1B



Summary for Pond UG 2B: Chambers 2B

Inflow Area = 2.120 ac, 60.75% Impervious, Inflow Depth = 3.58" for 10-Year event
Inflow = 8.02 cfs @ 12.11 hrs, Volume= 0.633 af
Outflow = 0.53 cfs @ 13.84 hrs, Volume= 0.611 af, Atten= 93%, Lag= 104.0 min
Primary = 0.53 cfs @ 13.84 hrs, Volume= 0.611 af
Routed to Reach New 48 : New 48"

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 582.15' @ 13.84 hrs Surf.Area= 0.169 ac Storage= 0.373 af

Plug-Flow detention time= 459.5 min calculated for 0.610 af (96% of inflow)
Center-of-Mass det. time= 440.3 min (1,237.9 - 797.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	577.55'	0.000 af	**46.20'W x 159.00'L x 7.95'H Field A** 1.341 af Overall - 0.590 af Embedded = 0.751 af x 0.0% Voids
#2A	578.55'	0.590 af	**Xerxes 6'** x 900 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 900 Chambers in 6 Rows Cap Storage= 55.1 cf x 2 x 6 rows = 660.9 cf
		0.590 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	577.55'	**18.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 577.55' / 575.00' S= 0.1594 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	579.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	581.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	583.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	584.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=0.53 cfs @ 13.84 hrs HW=582.15' (Free Discharge)
└**1=Culvert** (Passes 0.53 cfs of 16.69 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.41 cfs @ 8.37 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.12 cfs @ 2.50 fps)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UG 2B: Chambers 2B - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 6 rows = 660.9 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

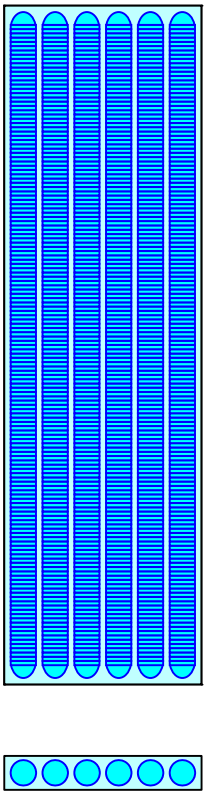
150 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 156.00' Row Length +18.0" End Gravel x 2 = 159.00' Base Length
6 Rows x 71.4" Wide + 18.0" Spacing x 5 + 18.0" Side Gravel x 2 = 46.20' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

900 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 6 Rows = 25,685.4 cf Chamber Storage

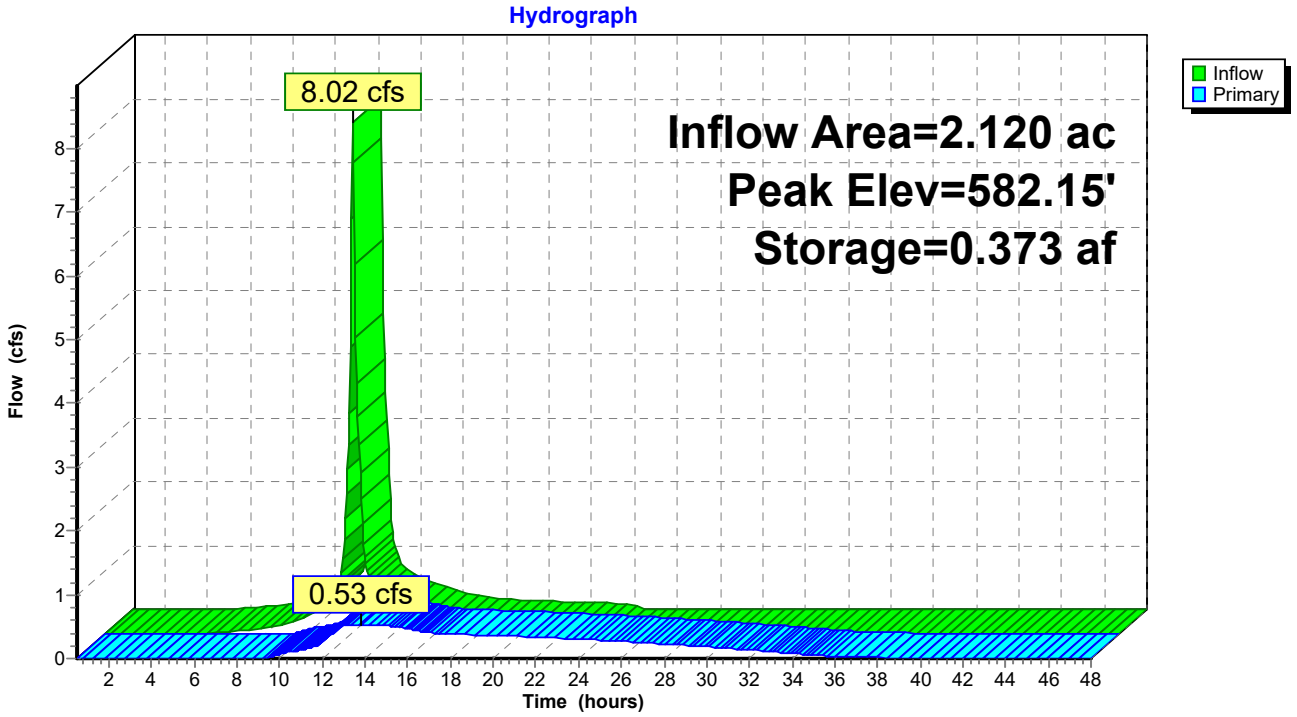
58,399.1 cf Field - 25,685.4 cf Chambers = 32,713.7 cf Gravel

Chamber Storage = 25,685.4 cf = 0.590 af
Overall Storage Efficiency = 44.0%
Overall System Size = 159.00' x 46.20' x 7.95'

900 Chambers
2,162.9 cy Field
1,211.6 cy Gravel



Pond UG 2B: Chambers 2B



Summary for Pond UG 2C: Chambers 2C

Inflow Area = 3.270 ac, 52.48% Impervious, Inflow Depth = 3.38" for 10-Year event
Inflow = 11.04 cfs @ 12.14 hrs, Volume= 0.921 af
Outflow = 9.14 cfs @ 12.30 hrs, Volume= 0.893 af, Atten= 17%, Lag= 9.9 min
Primary = 9.14 cfs @ 12.30 hrs, Volume= 0.893 af
Routed to Reach New 48 : New 48"

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 624.29' @ 12.31 hrs Surf.Area= 0.114 ac Storage= 0.391 af

Plug-Flow detention time= 277.5 min calculated for 0.892 af (97% of inflow)
Center-of-Mass det. time= 260.9 min (1,067.3 - 806.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	615.15'	0.000 af	**23.85'W x 209.00'L x 7.95'H Field A** 0.910 af Overall - 0.391 af Embedded = 0.519 af x 0.0% Voids
#2A	616.15'	0.391 af	**Xerxes 6'** x 600 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 600 Chambers in 3 Rows Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	615.50'	**18.0" Round Culvert** L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 615.50' / 612.00' S= 0.2917 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	617.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	619.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	621.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	622.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=8.62 cfs @ 12.30 hrs HW=624.13' (Free Discharge)
└**1=Culvert** (Passes 8.62 cfs of 23.89 cfs potential flow)
├**2=Orifice/Grate** (Orifice Controls 0.63 cfs @ 12.74 fps)
├**3=Orifice/Grate** (Orifice Controls 0.49 cfs @ 9.93 fps)
├**4=Orifice/Grate** (Orifice Controls 0.41 cfs @ 8.35 fps)
└**5=Sharp-Crested Rectangular Weir** (Weir Controls 7.09 cfs @ 4.08 fps)

Pond UG 2C: Chambers 2C - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

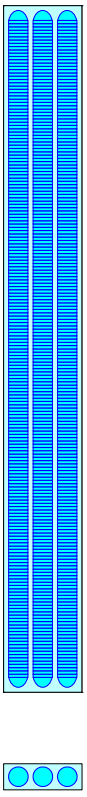
200 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 206.00' Row Length +18.0" End Gravel x 2 = 209.00' Base Length
3 Rows x 71.4" Wide + 18.0" Spacing x 2 + 18.0" Side Gravel x 2 = 23.85' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

600 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 3 Rows = 17,013.5 cf Chamber Storage

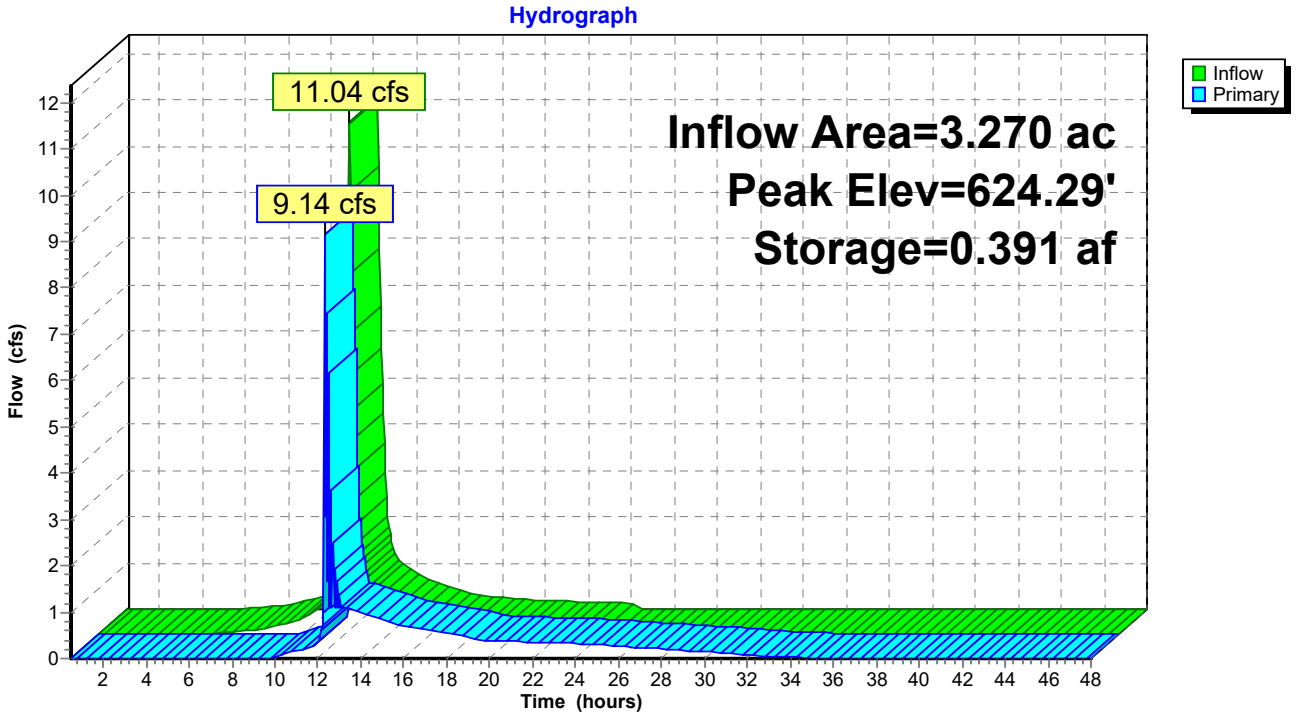
39,628.0 cf Field - 17,013.5 cf Chambers = 22,614.5 cf Gravel

Chamber Storage = 17,013.5 cf = 0.391 af
Overall Storage Efficiency = 42.9%
Overall System Size = 209.00' x 23.85' x 7.95'

600 Chambers
1,467.7 cy Field
837.6 cy Gravel



Pond UG 2C: Chambers 2C



Time span=0.50-48.00 hrs, dt=0.05 hrs, 951 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 1A: Post Basin 1A Runoff Area=3.500 ac 53.37% Impervious Runoff Depth=7.01"
Flow Length=444' Tc=14.9 min CN=87 Runoff=20.74 cfs 2.043 af

Subcatchment 1B: Post Basin 1B Runoff Area=2.517 ac 47.32% Impervious Runoff Depth=6.88"
Flow Length=369' Tc=12.8 min CN=86 Runoff=15.56 cfs 1.444 af

Subcatchment 2A: Post Basin 2A Runoff Area=3.300 ac 0.00% Impervious Runoff Depth=5.80"
Flow Length=663' Tc=67.1 min CN=77 Runoff=8.23 cfs 1.595 af

Subcatchment 2B: Post Basin 2B Runoff Area=2.120 ac 60.75% Impervious Runoff Depth=7.25"
Flow Length=234' Tc=7.9 min CN=89 Runoff=15.64 cfs 1.280 af

Subcatchment 2C: Post Basin 2C Runoff Area=3.270 ac 52.48% Impervious Runoff Depth=7.01"
Flow Length=574' Tc=9.9 min CN=87 Runoff=22.10 cfs 1.909 af

Subcatchment 2D.1: Post Basin 2D.1 Runoff Area=65.430 ac 0.66% Impervious Runoff Depth=5.80"
Flow Length=3,560' Tc=149.9 min CN=77 Runoff=94.80 cfs 31.623 af

Subcatchment 2D.2: Post Basin 2D.2 Runoff Area=12.070 ac 31.90% Impervious Runoff Depth=6.52"
Flow Length=1,906' Tc=41.1 min CN=83 Runoff=43.78 cfs 6.561 af

Reach 44 CMP: Existing 44" CMP Avg. Flow Depth=1.32' Max Vel=29.73 fps Inflow=102.15 cfs 38.184 af
44.0" Round Pipe n=0.013 L=23.0' S=0.1035 '/' Capacity=366.39 cfs Outflow=102.15 cfs 38.184 af

Reach AP1: Analysis Point 1 Inflow=25.05 cfs 3.472 af
Outflow=25.05 cfs 3.472 af

Reach AP2: Analysis Point 2 Inflow=107.84 cfs 42.919 af
Outflow=107.84 cfs 42.919 af

Reach New 48: New 48" Avg. Flow Depth=1.21' Max Vel=32.80 fps Inflow=105.22 cfs 41.324 af
48.0" Round Pipe n=0.012 L=596.0' S=0.1158 '/' Capacity=529.48 cfs Outflow=104.81 cfs 41.324 af

Reach Swale: Exist swale out 44" Avg. Flow Depth=3.13' Max Vel=7.41 fps Inflow=102.15 cfs 38.184 af
n=0.040 L=168.0' S=0.0242 '/' Capacity=128.00 cfs Outflow=102.12 cfs 38.184 af

Reach X Swale 1: Existing drain Avg. Flow Depth=0.73' Max Vel=18.43 fps Inflow=27.83 cfs 3.472 af
n=0.013 L=157.0' S=0.0828 '/' Capacity=482.69 cfs Outflow=25.05 cfs 3.472 af

Reach X Swale 2: Existing Drain Avg. Flow Depth=2.35' Max Vel=10.78 fps Inflow=104.81 cfs 41.324 af
n=0.040 L=500.0' S=0.0660 '/' Capacity=171.63 cfs Outflow=104.74 cfs 41.324 af

Pond UG 1A: Chambers 1A Peak Elev=585.69' Storage=0.715 af Inflow=20.74 cfs 2.043 af
Outflow=9.94 cfs 2.044 af

Pond UG 1B: Chambers 1B Peak Elev=623.92' Storage=0.391 af Inflow=15.56 cfs 1.444 af
Outflow=25.95 cfs 1.428 af

Pond UG 2B: Chambers 2B Peak Elev=587.13' Storage=0.590 af Inflow=15.64 cfs 1.280 af
Outflow=15.15 cfs 1.258 af

Pond UG 2C: Chambers 2C Peak Elev=626.60' Storage=0.391 af Inflow=22.10 cfs 1.909 af
Outflow=23.00 cfs 1.882 af

Total Runoff Area = 92.207 ac Runoff Volume = 46.456 af Average Runoff Depth = 6.05"
88.78% Pervious = 81.864 ac 11.22% Impervious = 10.343 ac

Summary for Subcatchment 1A: Post Basin 1A

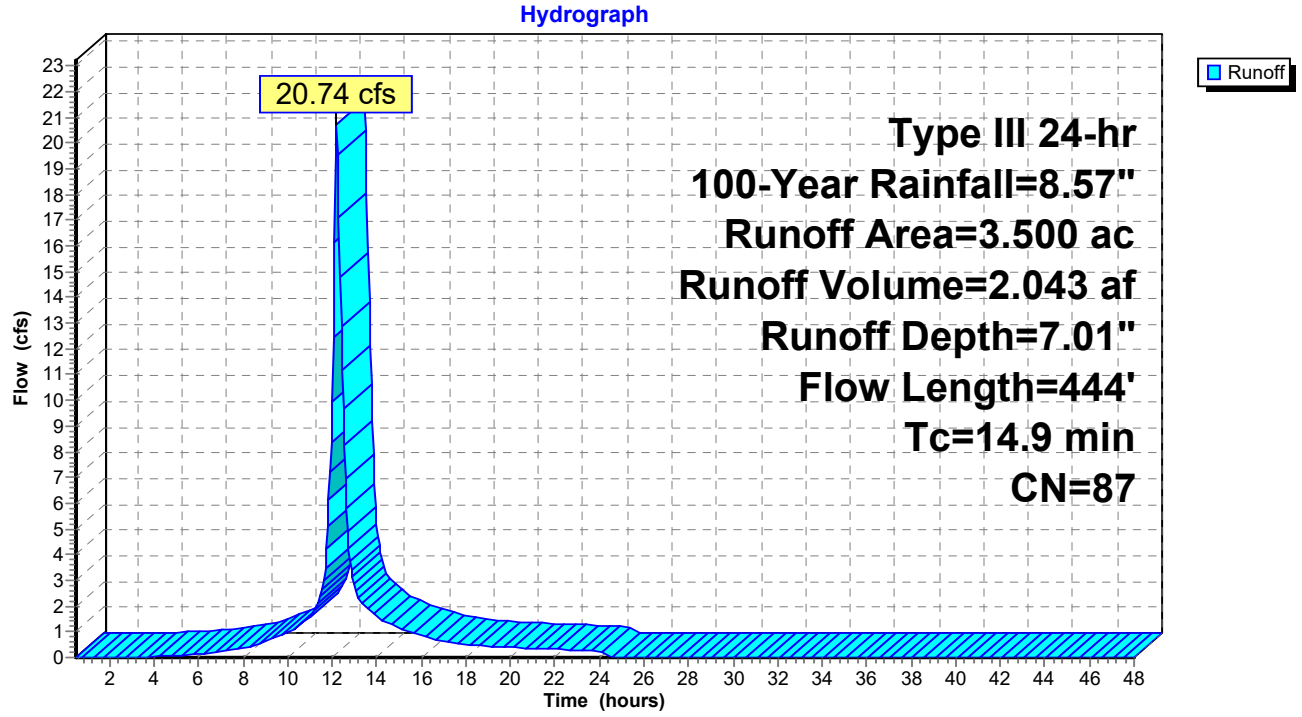
Runoff = 20.74 cfs @ 12.20 hrs, Volume= 2.043 af, Depth= 7.01"
Routed to Pond UG 1A : Chambers 1A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	1.868	98	Impervious Surfaces
	1.232	74	>75% Grass cover, Good, HSG C
	0.400	77	Woods, Good, HSG D
	3.500	87	Weighted Average
	1.632		46.63% Pervious Area
	1.868		53.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0400	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
7.6	152	0.0789	0.33		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.2	192	0.0651	13.43	16.48	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
14.9	444	Total			

Subcatchment 1A: Post Basin 1A



Summary for Subcatchment 1B: Post Basin 1B

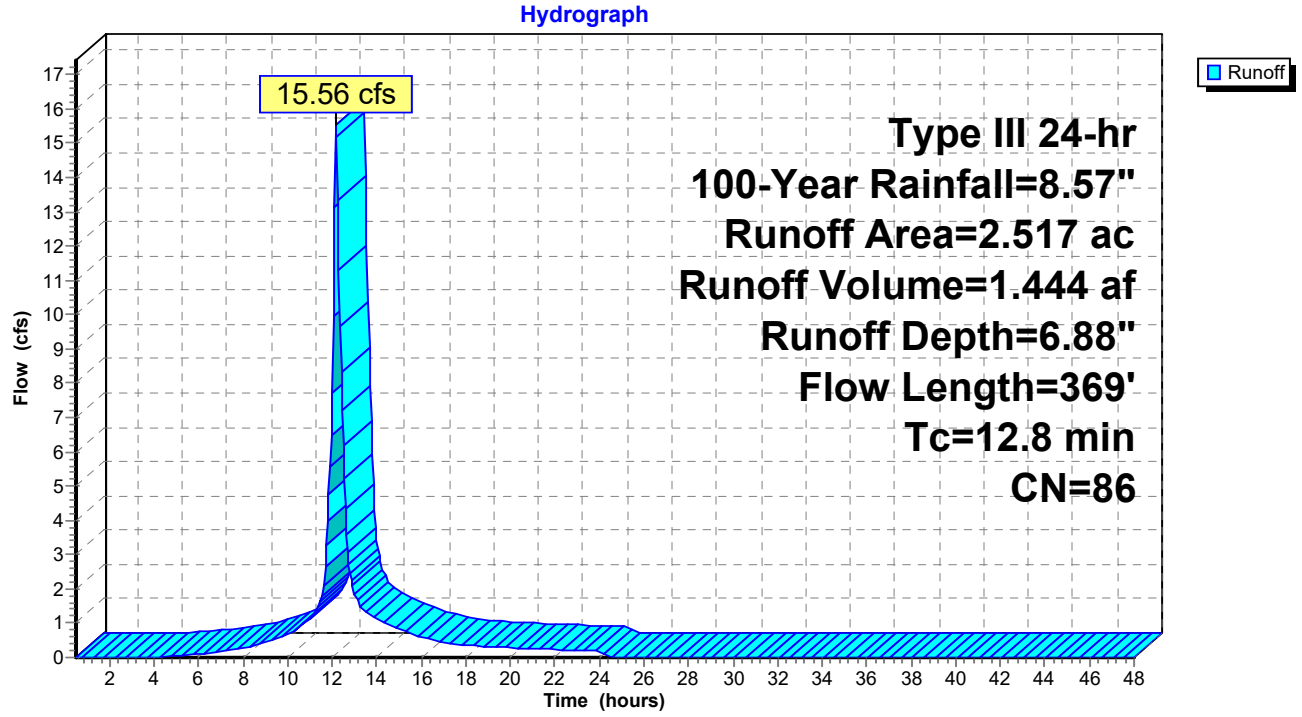
Runoff = 15.56 cfs @ 12.17 hrs, Volume= 1.444 af, Depth= 6.88"
Routed to Pond UG 1B : Chambers 1B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	1.191	98	Impervious Surfaces
	1.163	74	>75% Grass cover, Good, HSG C
	0.163	77	Woods, Good, HSG D
	2.517	86	Weighted Average
	1.326		52.68% Pervious Area
	1.191		47.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	100	0.0445	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
5.8	138	0.1268	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.2	131	0.0530	12.12	14.87	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
12.8	369	Total			

Subcatchment 1B: Post Basin 1B



Summary for Subcatchment 2A: Post Basin 2A

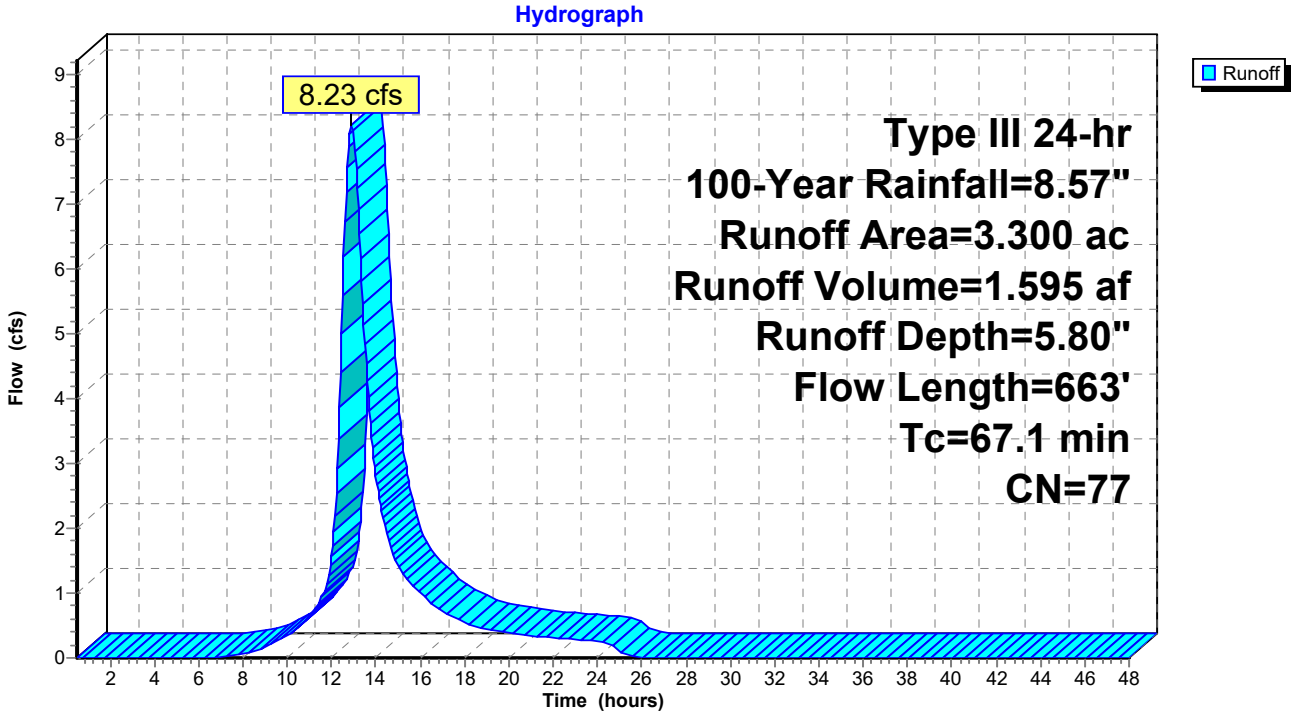
Runoff = 8.23 cfs @ 12.89 hrs, Volume= 1.595 af, Depth= 5.80"
Routed to Reach AP2 : Analysis Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

Area (ac)	CN	Description
3.300	77	Woods, Good, HSG D
3.300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	100	0.0600	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
5.2	328	0.1768	1.05		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
38.9	235	0.0893	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
67.1	663	Total			

Subcatchment 2A: Post Basin 2A



Summary for Subcatchment 2B: Post Basin 2B

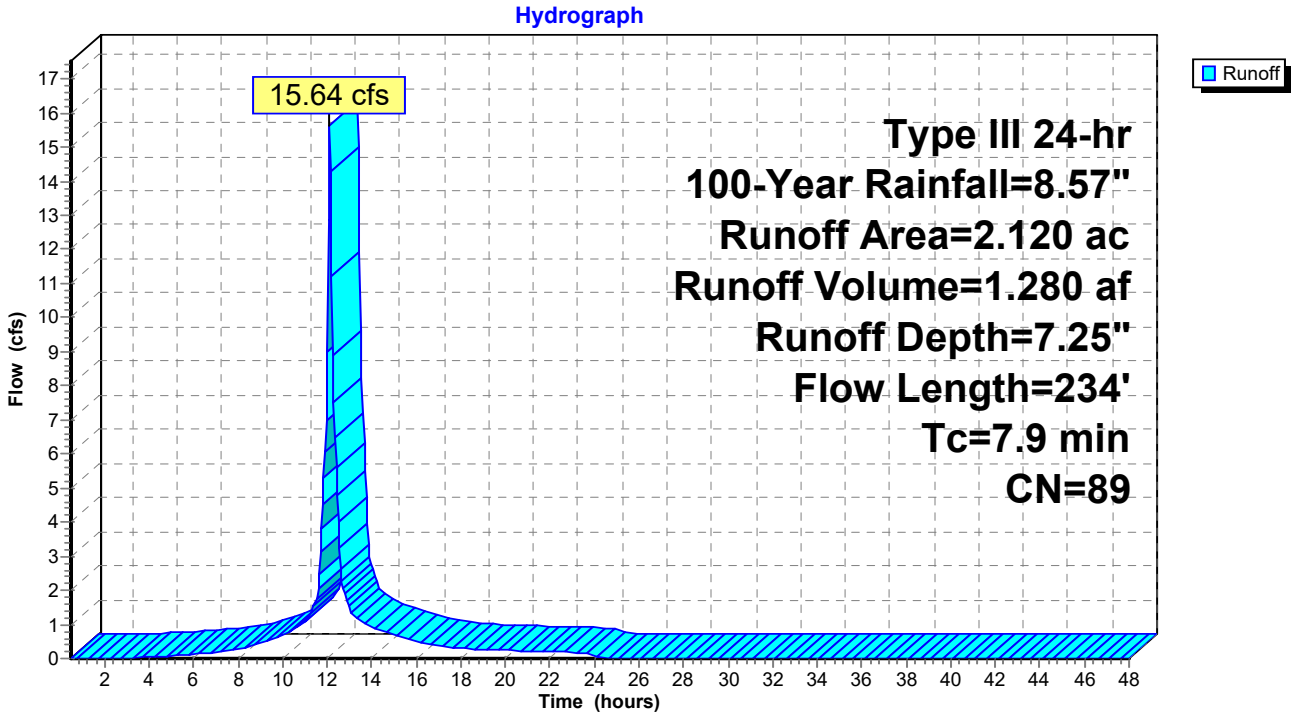
Runoff = 15.64 cfs @ 12.11 hrs, Volume= 1.280 af, Depth= 7.25"
Routed to Pond UG 2B : Chambers 2B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	1.288	98	Impervious Surfaces
	0.832	74	>75% Grass cover, Good, HSG C
	2.120	89	Weighted Average
	0.832		39.25% Pervious Area
	1.288		60.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.1398	0.39		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
3.4	30	0.0233	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	60	0.0966	16.36	20.08	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.1	44	0.0200	8.41	14.86	**Pipe Channel,** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
7.9	234	Total			

Subcatchment 2B: Post Basin 2B



Summary for Subcatchment 2C: Post Basin 2C

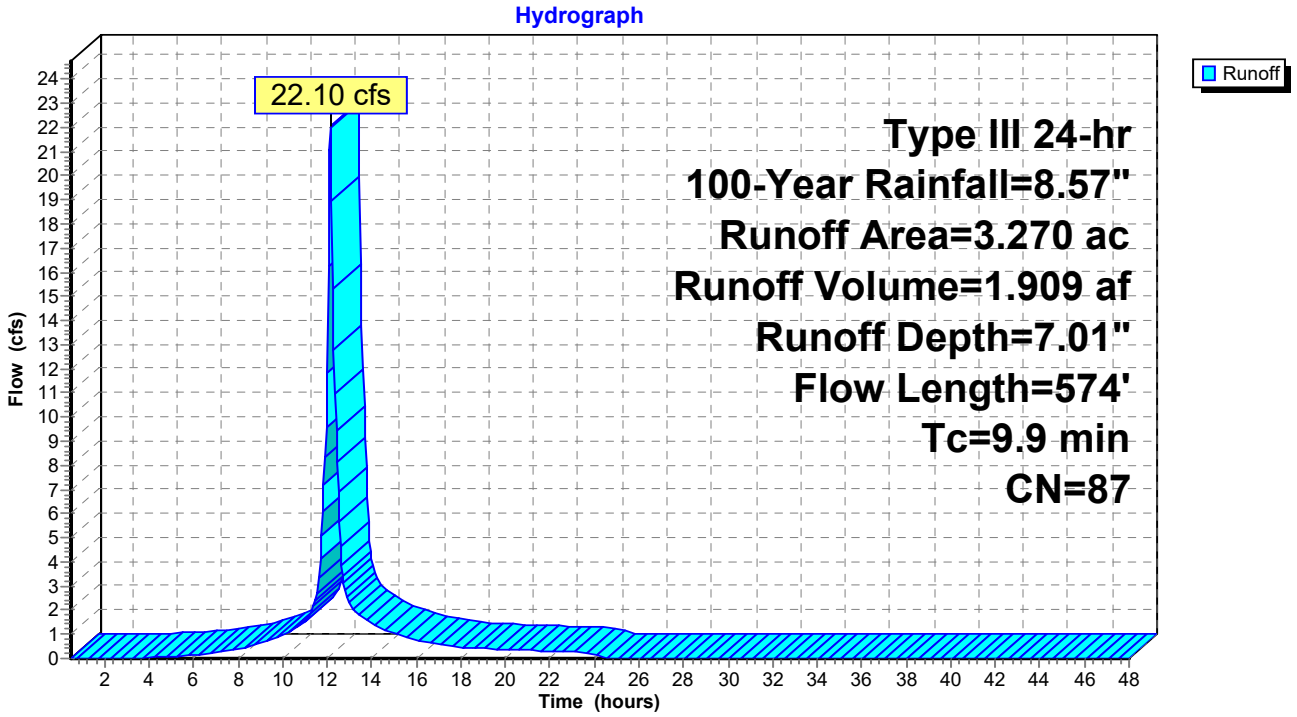
Runoff = 22.10 cfs @ 12.14 hrs, Volume= 1.909 af, Depth= 7.01"
Routed to Pond UG 2C : Chambers 2C

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	1.716	98	Impervious Surfaces
	1.193	74	>75% Grass cover, Good, HSG C
	0.361	77	Woods, Good, HSG D
	3.270	87	Weighted Average
	1.554		47.52% Pervious Area
	1.716		52.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	100	0.0336	0.22		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.3	186	0.1183	2.41		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	90	0.0220	3.01		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	166	0.0179	7.04	8.64	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.1	32	0.0179	7.04	8.64	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
9.9	574	Total			

Subcatchment 2C: Post Basin 2C



Summary for Subcatchment 2D.1: Post Basin 2D.1

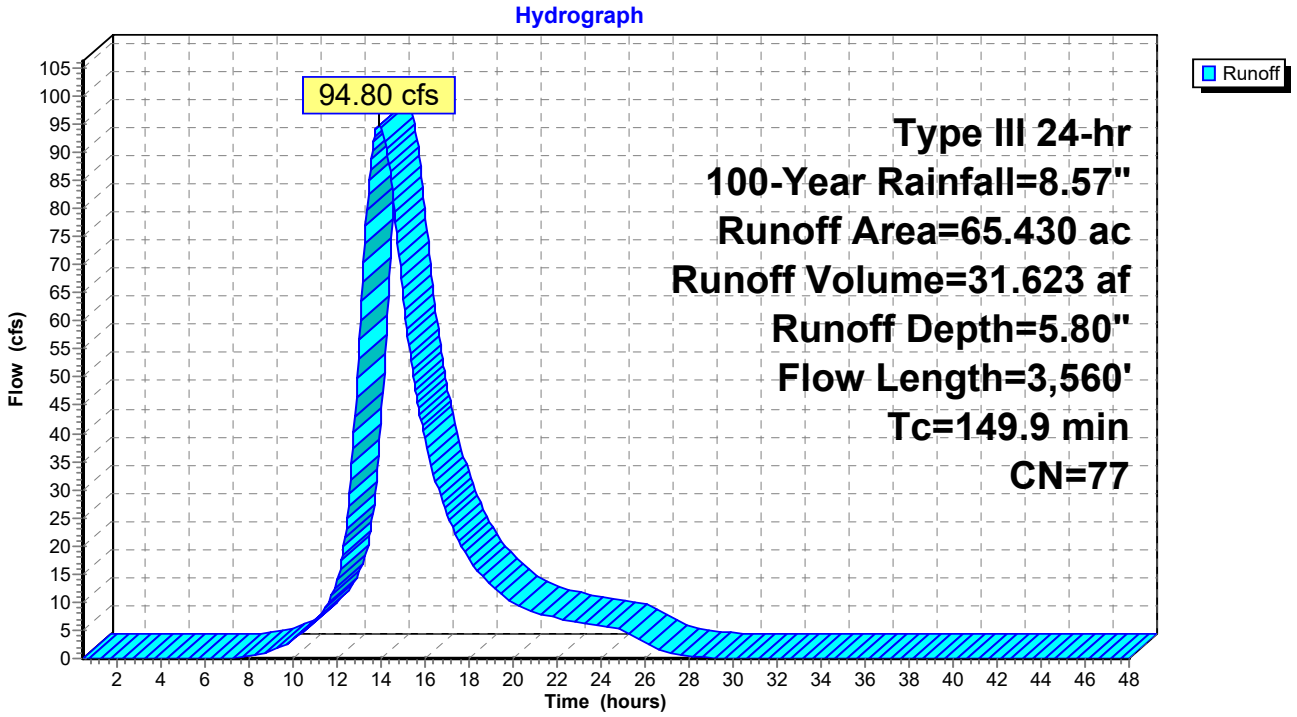
Runoff = 94.80 cfs @ 13.97 hrs, Volume= 31.623 af, Depth= 5.80"
Routed to Reach 44 CMP : Existing 44" CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	0.430	98	Impervious Surfaces
	0.570	74	>75% Grass cover, Good, HSG C
	64.430	77	Woods, Good, HSG D
	65.430	77	Weighted Average
	65.000		99.34% Pervious Area
	0.430		0.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.1200	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
6.8	560	0.2998	1.37		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.9	372	0.1883	2.17		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
127.4	1,338	0.1494	0.18		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
1.1	800	0.1000	12.30	98.36	**Parabolic Channel,** W=6.00' D=2.00' Area=8.0 sf Perim=7.5' n= 0.040 Earth, cobble bottom, clean sides
1.2	126	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	170	0.0732	7.47	39.85	**Parabolic Channel,** W=8.00' D=1.00' Area=5.3 sf Perim=8.3' n= 0.040 Earth, cobble bottom, clean sides
0.0	22	0.0586	11.88	83.96	**Pipe Channel, CMP_Round 36"** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.025 Corrugated metal
0.1	72	0.0330	8.06	73.54	**Pipe Channel,** 44.0" x 38.0" Ellipse Area= 9.1 sf Perim= 10.7' r= 0.85' n= 0.030 Corrugated metal
149.9	3,560	Total			

Subcatchment 2D.1: Post Basin 2D.1



Summary for Subcatchment 2D.2: Post Basin 2D.2

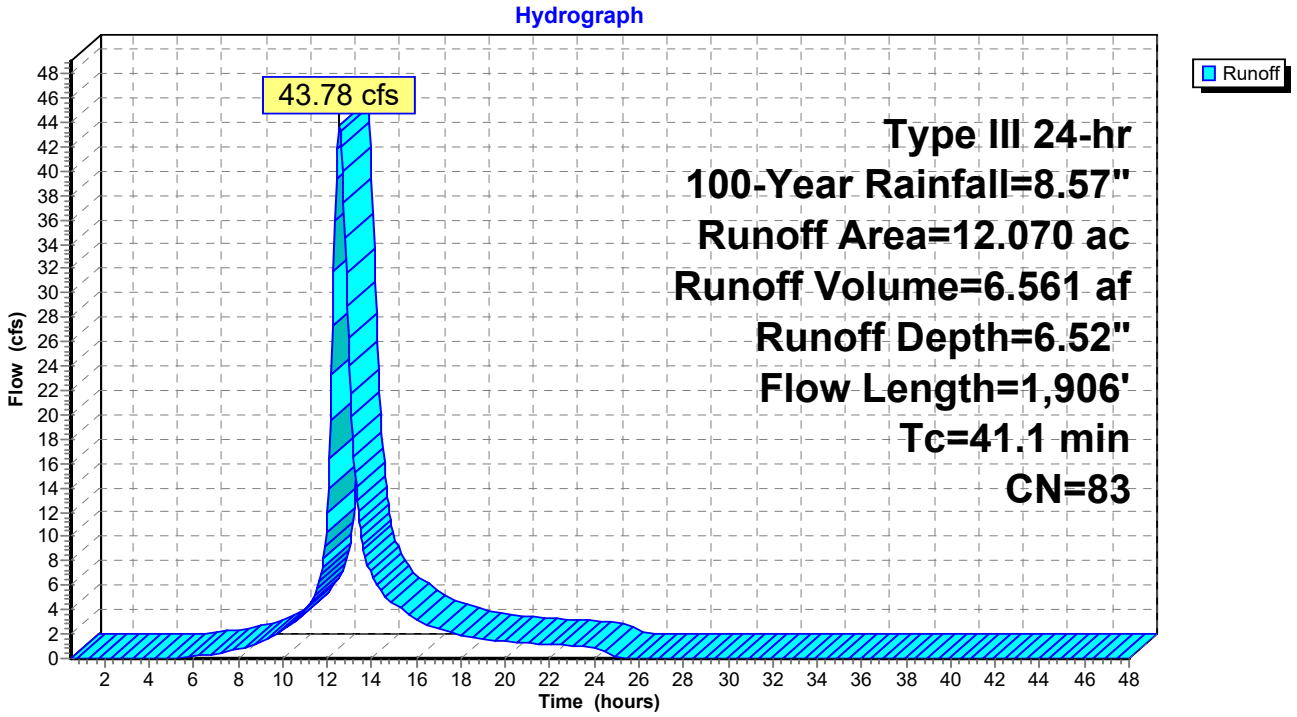
Runoff = 43.78 cfs @ 12.55 hrs, Volume= 6.561 af, Depth= 6.52"
Routed to Reach 44 CMP : Existing 44" CMP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.57"

	Area (ac)	CN	Description
*	3.850	98	Impervious Surfaces
	3.690	74	>75% Grass cover, Good, HSG C
	4.530	77	Woods, Good, HSG D
	12.070	83	Weighted Average
	8.220		68.10% Pervious Area
	3.850		31.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	100	0.0950	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.6	379	0.1254	1.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.8	123	0.1382	2.60		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	100	0.0903	6.10		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	35	0.1416	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	59	0.1186	6.99		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	67	0.2083	0.42		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.1	48	0.0726	5.47		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.4	51	0.2058	2.27		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	54	0.1109	6.76		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
5.0	531	0.1261	1.78		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1	100	0.0900	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.9	259	0.0121	2.23		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
41.1	1,906	Total			

Subcatchment 2D.2: Post Basin 2D.2



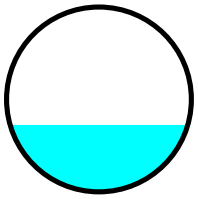
Summary for Reach 44 CMP: Existing 44" CMP

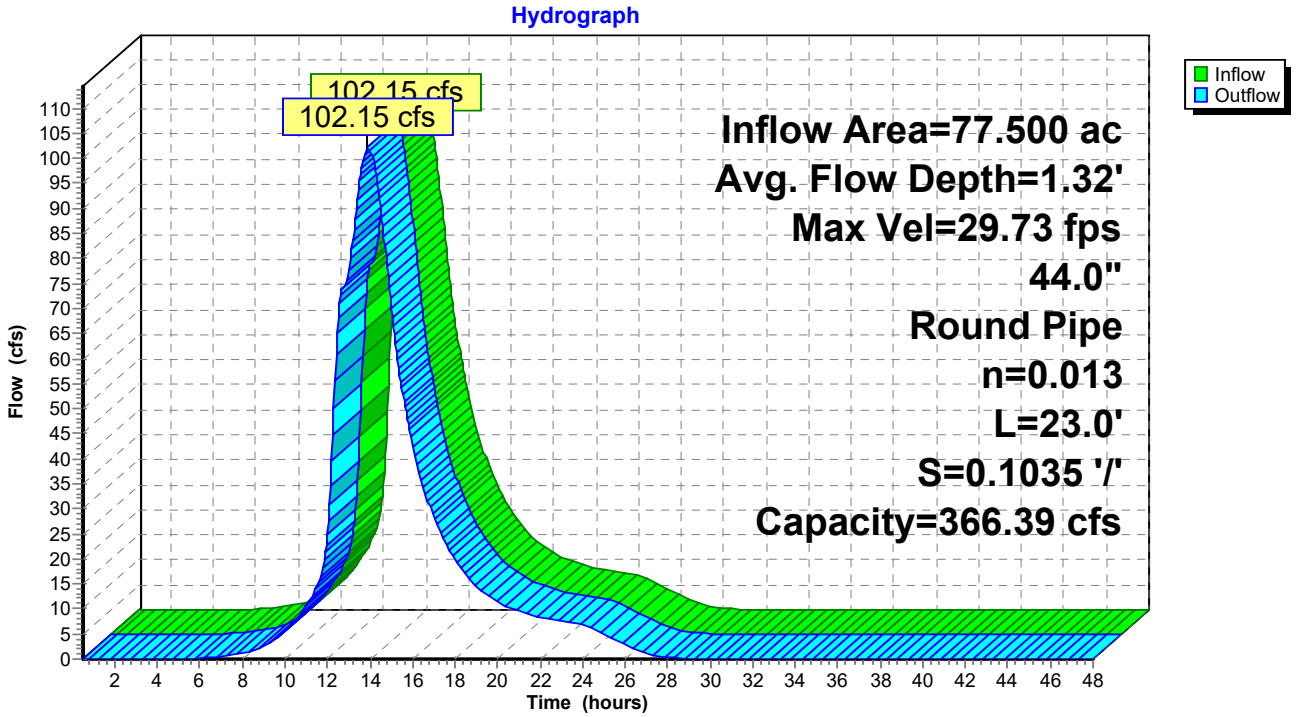
Inflow Area = 77.500 ac, 5.52% Impervious, Inflow Depth = 5.91" for 100-Year event
Inflow = 102.15 cfs @ 13.86 hrs, Volume= 38.184 af
Outflow = 102.15 cfs @ 13.86 hrs, Volume= 38.184 af, Atten= 0%, Lag= 0.0 min
Routed to Reach Swale : Exist swale out 44" CMP

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 29.73 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 13.15 fps, Avg. Travel Time= 0.0 min

Peak Storage= 79 cf @ 13.86 hrs
Average Depth at Peak Storage= 1.32' , Surface Width= 3.52'
Bank-Full Depth= 3.67' Flow Area= 10.6 sf, Capacity= 366.39 cfs

44.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 23.0' Slope= 0.1035 '/'
Inlet Invert= 646.45', Outlet Invert= 644.07'



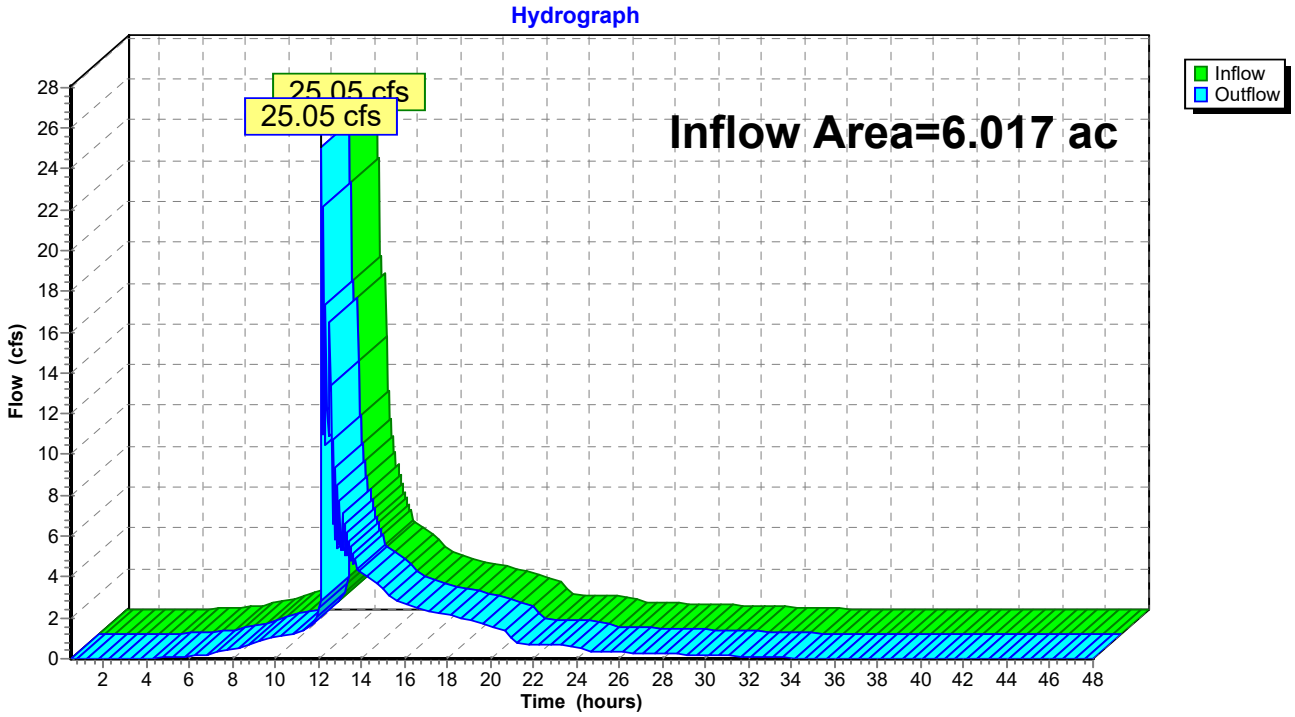


Summary for Reach AP1: Analysis Point 1

Inflow Area = 6.017 ac, 50.84% Impervious, Inflow Depth = 6.92" for 100-Year event
Inflow = 25.05 cfs @ 12.16 hrs, Volume= 3.472 af
Outflow = 25.05 cfs @ 12.16 hrs, Volume= 3.472 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs

Reach AP1: Analysis Point 1

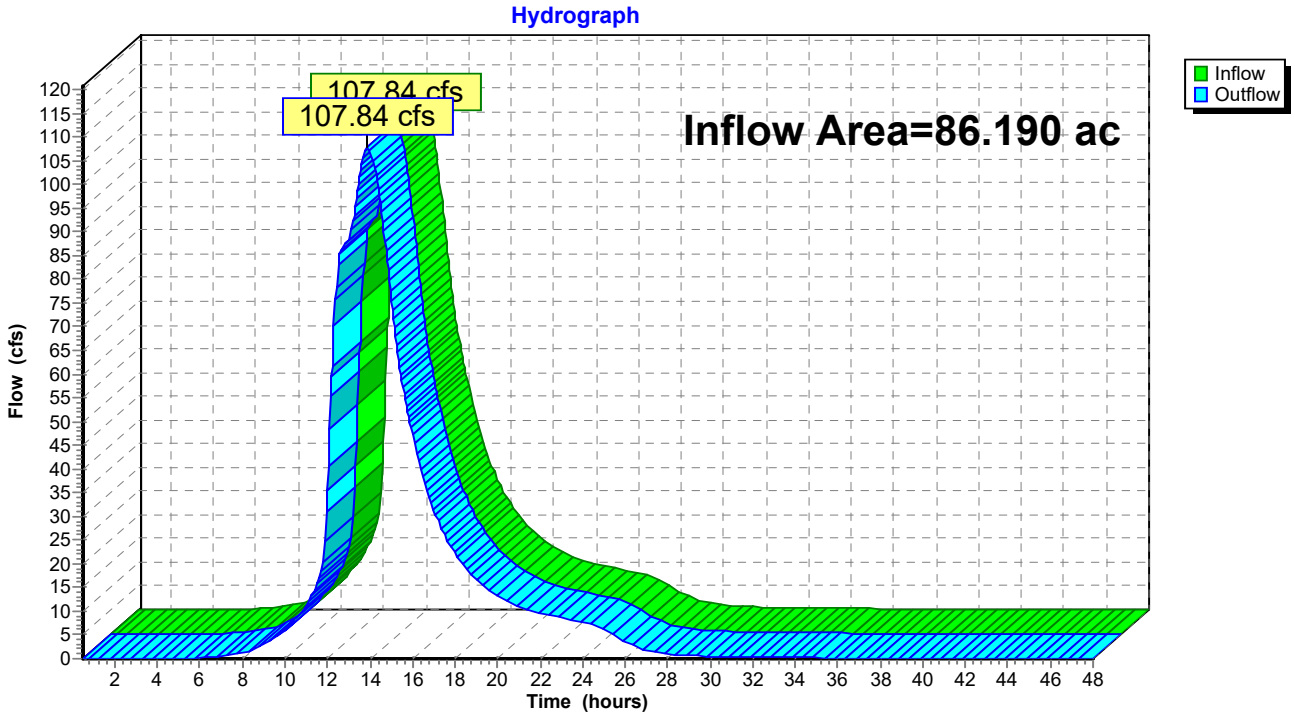


Summary for Reach AP2: Analysis Point 2

Inflow Area = 86.190 ac, 8.45% Impervious, Inflow Depth = 5.98" for 100-Year event
Inflow = 107.84 cfs @ 13.88 hrs, Volume= 42.919 af
Outflow = 107.84 cfs @ 13.88 hrs, Volume= 42.919 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs

Reach AP2: Analysis Point 2



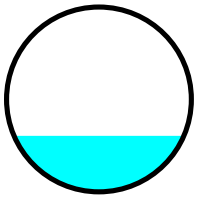
Summary for Reach New 48: New 48"

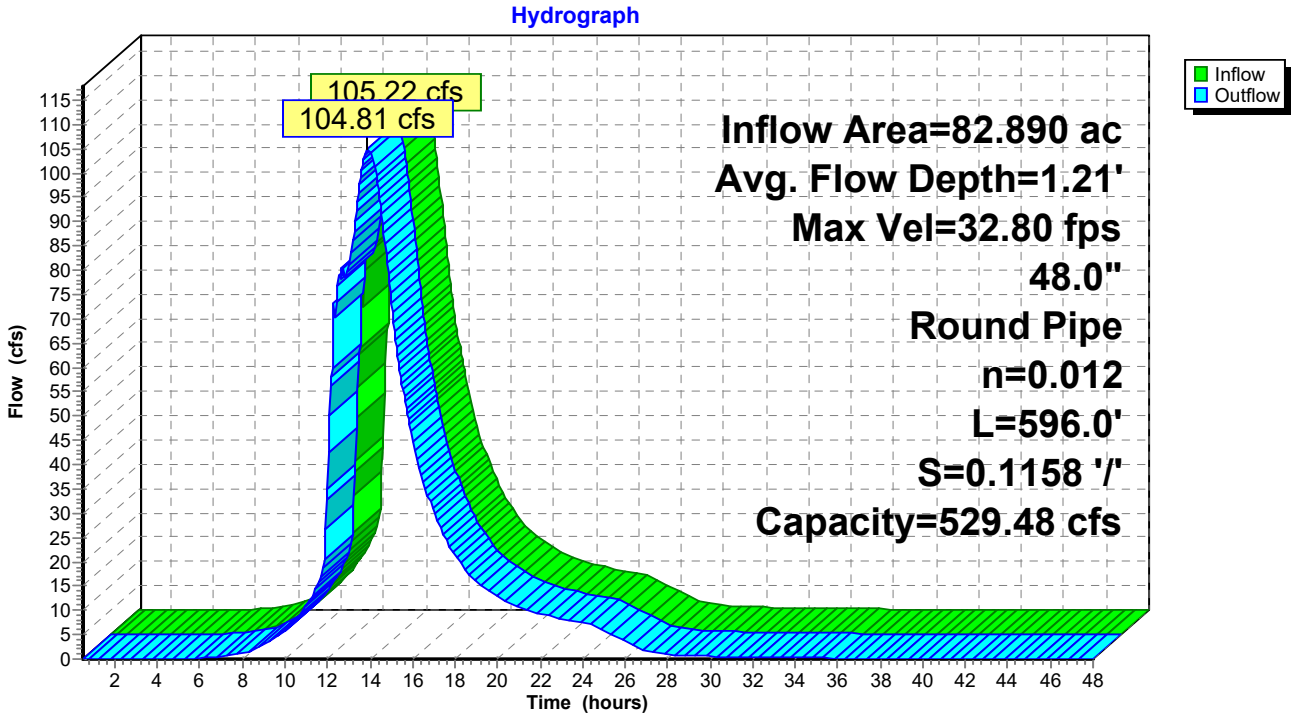
Inflow Area = 82.890 ac, 8.79% Impervious, Inflow Depth = 5.98" for 100-Year event
Inflow = 105.22 cfs @ 13.85 hrs, Volume= 41.324 af
Outflow = 104.81 cfs @ 13.89 hrs, Volume= 41.324 af, Atten= 0%, Lag= 2.1 min
Routed to Reach X Swale 2 : Existing Drain Course out 48"

Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 32.80 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 11.24 fps, Avg. Travel Time= 0.9 min

Peak Storage= 1,905 cf @ 13.89 hrs
Average Depth at Peak Storage= 1.21' , Surface Width= 3.67'
Bank-Full Depth= 4.00' Flow Area= 12.6 sf, Capacity= 529.48 cfs

48.0" Round Pipe
n= 0.012
Length= 596.0' Slope= 0.1158 '/'
Inlet Invert= 640.00', Outlet Invert= 571.00'





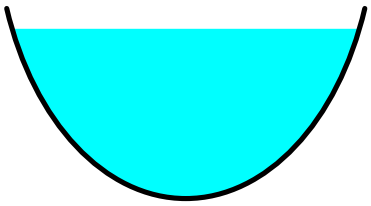
Summary for Reach Swale: Exist swale out 44" CMP

Inflow Area = 77.500 ac, 5.52% Impervious, Inflow Depth = 5.91" for 100-Year event
Inflow = 102.15 cfs @ 13.86 hrs, Volume= 38.184 af
Outflow = 102.12 cfs @ 13.87 hrs, Volume= 38.184 af, Atten= 0%, Lag= 0.6 min
Routed to Reach New 48 : New 48"

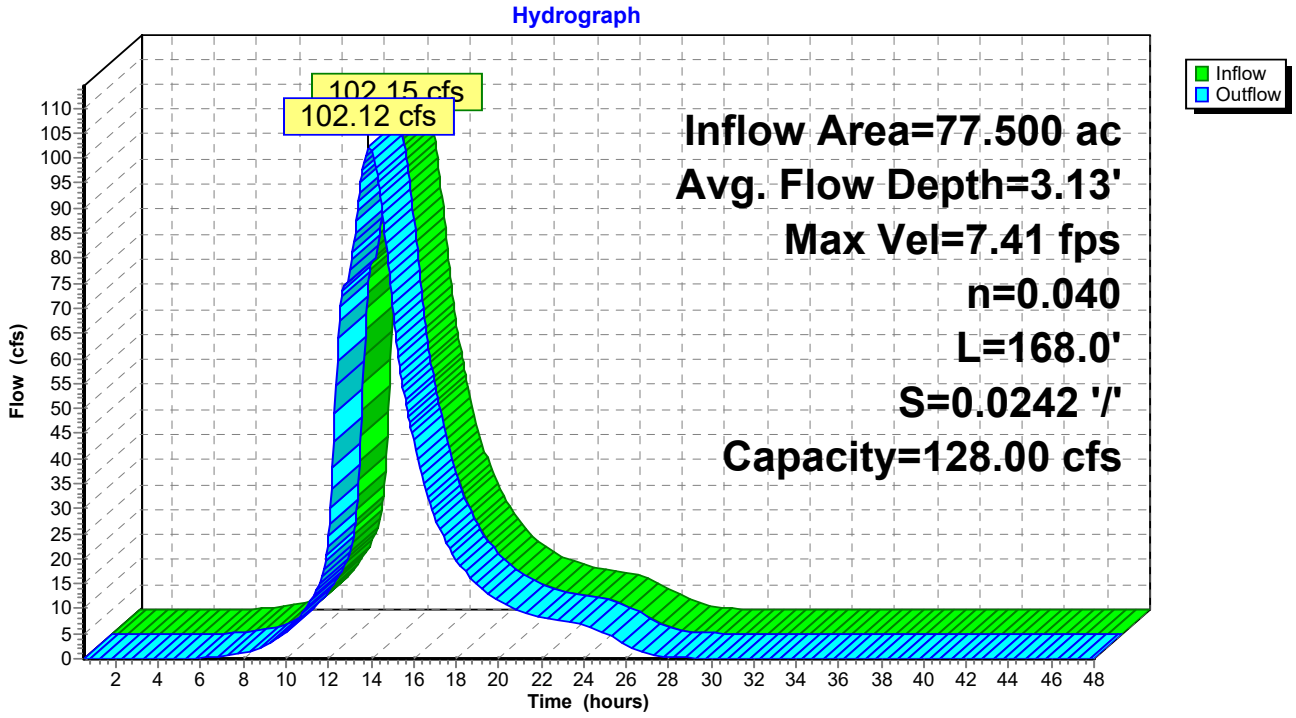
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.41 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.37 fps, Avg. Travel Time= 0.8 min

Peak Storage= 2,317 cf @ 13.86 hrs
Average Depth at Peak Storage= 3.13' , Surface Width= 6.62'
Bank-Full Depth= 3.50' Flow Area= 16.3 sf, Capacity= 128.00 cfs

7.00' x 3.50' deep Parabolic Channel, n= 0.040 Earth, dense weeds
Length= 168.0' Slope= 0.0242 '/'
Inlet Invert= 644.07', Outlet Invert= 640.00'



Reach Swale: Exist swale out 44" CMP



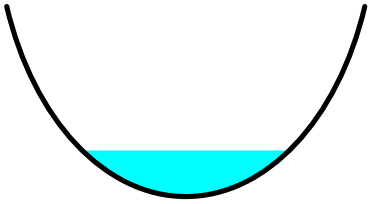
Summary for Reach X Swale 1: Existing drain course

Inflow Area = 6.017 ac, 50.84% Impervious, Inflow Depth = 6.92" for 100-Year event
Inflow = 27.83 cfs @ 12.15 hrs, Volume= 3.472 af
Outflow = 25.05 cfs @ 12.16 hrs, Volume= 3.472 af, Atten= 10%, Lag= 0.3 min
Routed to Reach AP1 : Analysis Point 1

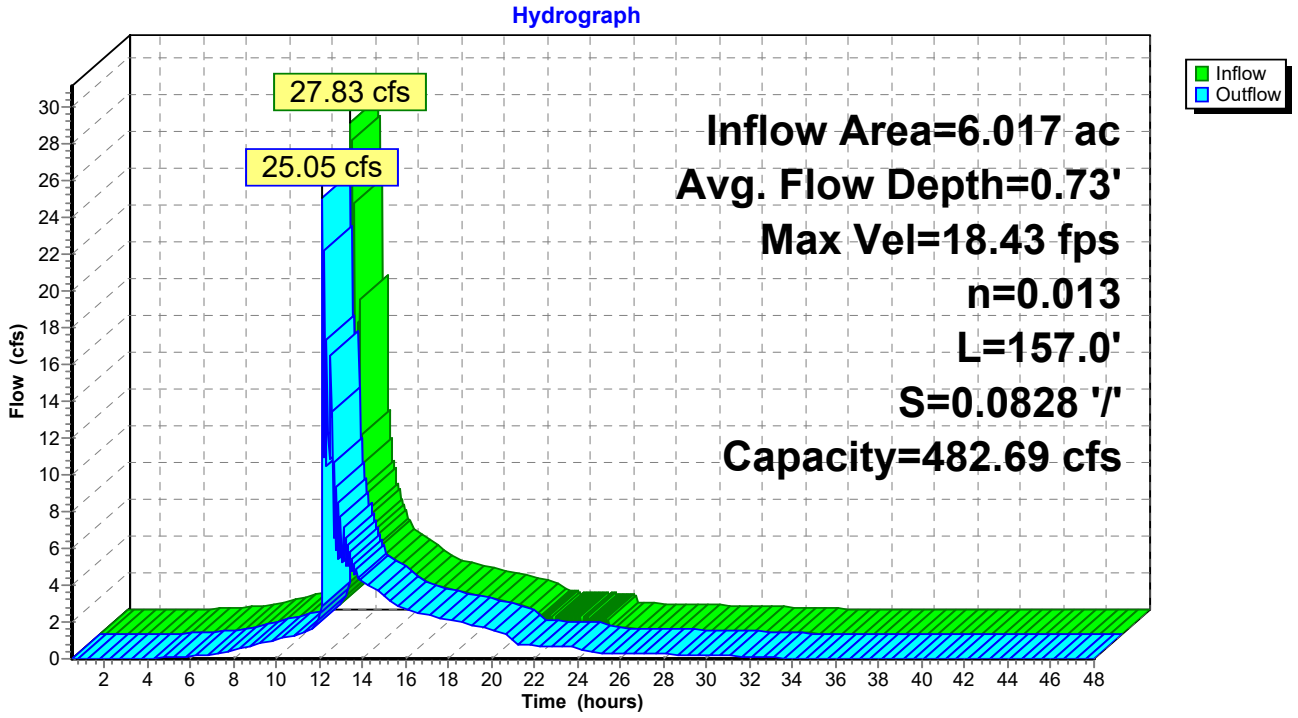
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 18.43 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.21 fps, Avg. Travel Time= 0.5 min

Peak Storage= 223 cf @ 12.16 hrs
Average Depth at Peak Storage= 0.73' , Surface Width= 2.95'
Bank-Full Depth= 3.00' Flow Area= 12.0 sf, Capacity= 482.69 cfs

6.00' x 3.00' deep Parabolic Channel, n= 0.013 Corrugated PE, smooth interior
Length= 157.0' Slope= 0.0828 '/'
Inlet Invert= 578.00', Outlet Invert= 565.00'



Reach X Swale 1: Existing drain course



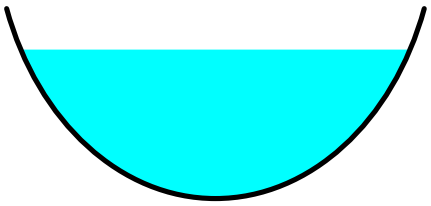
Summary for Reach X Swale 2: Existing Drain Course out 48"

Inflow Area = 82.890 ac, 8.79% Impervious, Inflow Depth = 5.98" for 100-Year event
Inflow = 104.81 cfs @ 13.89 hrs, Volume= 41.324 af
Outflow = 104.74 cfs @ 13.91 hrs, Volume= 41.324 af, Atten= 0%, Lag= 1.0 min
Routed to Reach AP2 : Analysis Point 2

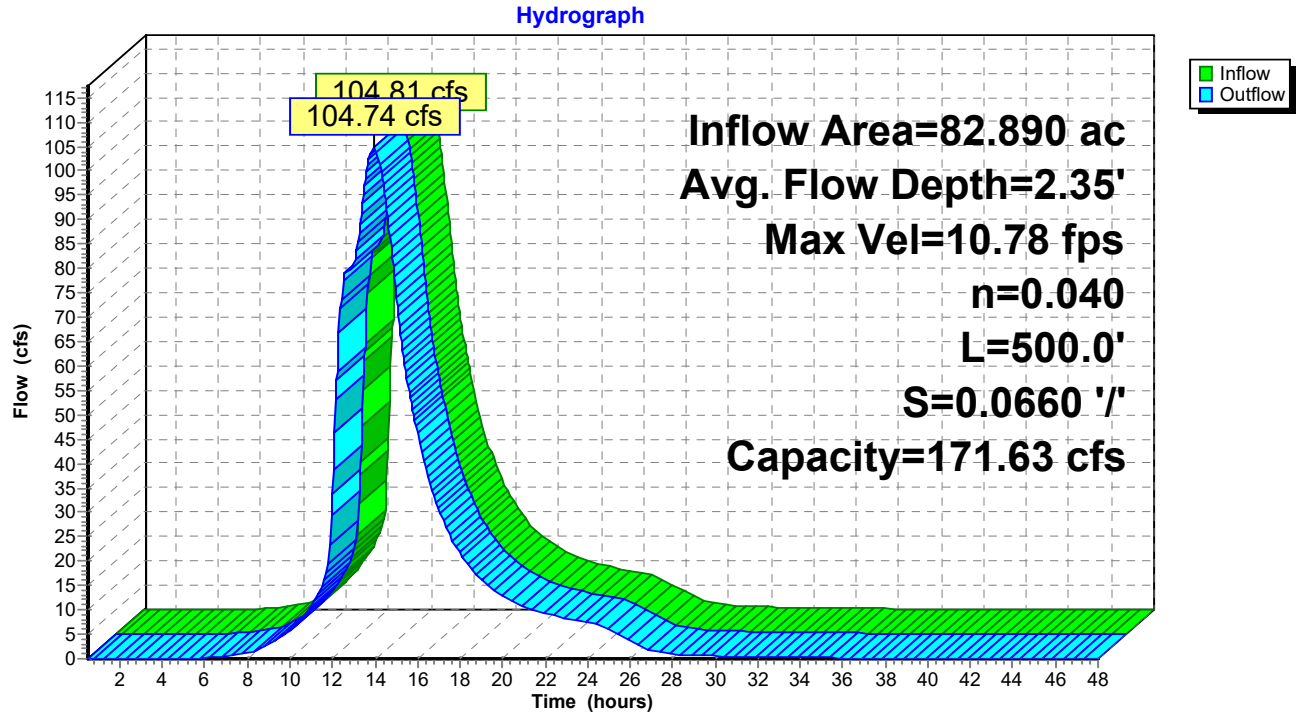
Routing by Stor-Ind+Trans method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.78 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 3.72 fps, Avg. Travel Time= 2.2 min

Peak Storage= 4,858 cf @ 13.89 hrs
Average Depth at Peak Storage= 2.35' , Surface Width= 6.20'
Bank-Full Depth= 3.00' Flow Area= 14.0 sf, Capacity= 171.63 cfs

7.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 500.0' Slope= 0.0660 '/'
Inlet Invert= 571.00', Outlet Invert= 538.00'



Reach X Swale 2: Existing Drain Course out 48"



Summary for Pond UG 1A: Chambers 1A

Inflow Area = 3.500 ac, 53.37% Impervious, Inflow Depth = 7.01" for 100-Year event
Inflow = 20.74 cfs @ 12.20 hrs, Volume= 2.043 af
Outflow = 9.94 cfs @ 12.51 hrs, Volume= 2.044 af, Atten= 52%, Lag= 18.8 min
Primary = 9.94 cfs @ 12.51 hrs, Volume= 2.044 af
Routed to Reach X Swale 1 : Existing drain course

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 585.69' @ 12.52 hrs Surf.Area= 0.204 ac Storage= 0.715 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 85.9 min (876.9 - 791.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	577.85'	0.000 af	**38.75'W x 229.00'L x 7.95'H Field A** 1.620 af Overall - 0.715 af Embedded = 0.905 af x 0.0% Voids
#2A	578.85'	0.715 af	**Xerxes 6'** x 1100 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 1100 Chambers in 5 Rows Cap Storage= 55.1 cf x 2 x 5 rows = 550.7 cf
		0.715 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	577.85'	**18.0" Round Culvert** L= 187.8' Ke= 0.500 Inlet / Outlet Invert= 577.85' / 576.00' S= 0.0099 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	578.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	581.75'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	583.00'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	584.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=9.32 cfs @ 12.51 hrs HW=585.56' (Free Discharge)
- **1=Culvert** (Passes 5.78 cfs of 18.12 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 2.56 cfs @ 13.02 fps)
  - **3=Orifice/Grate** (Orifice Controls 1.78 cfs @ 9.08 fps)
  - **4=Orifice/Grate** (Orifice Controls 1.44 cfs @ 7.31 fps)
- **5=Sharp-Crested Rectangular Weir** (Weir Controls 3.54 cfs @ 3.11 fps)

Pond UG 1A: Chambers 1A - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 5 rows = 550.7 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

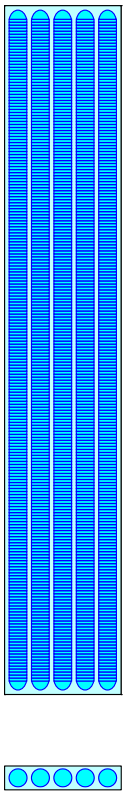
220 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 226.00' Row Length +18.0" End Gravel x 2 = 229.00' Base Length
5 Rows x 71.4" Wide + 18.0" Spacing x 4 + 18.0" Side Gravel x 2 = 38.75' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

1,100 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 5 Rows = 31,136.3 cf Chamber Storage

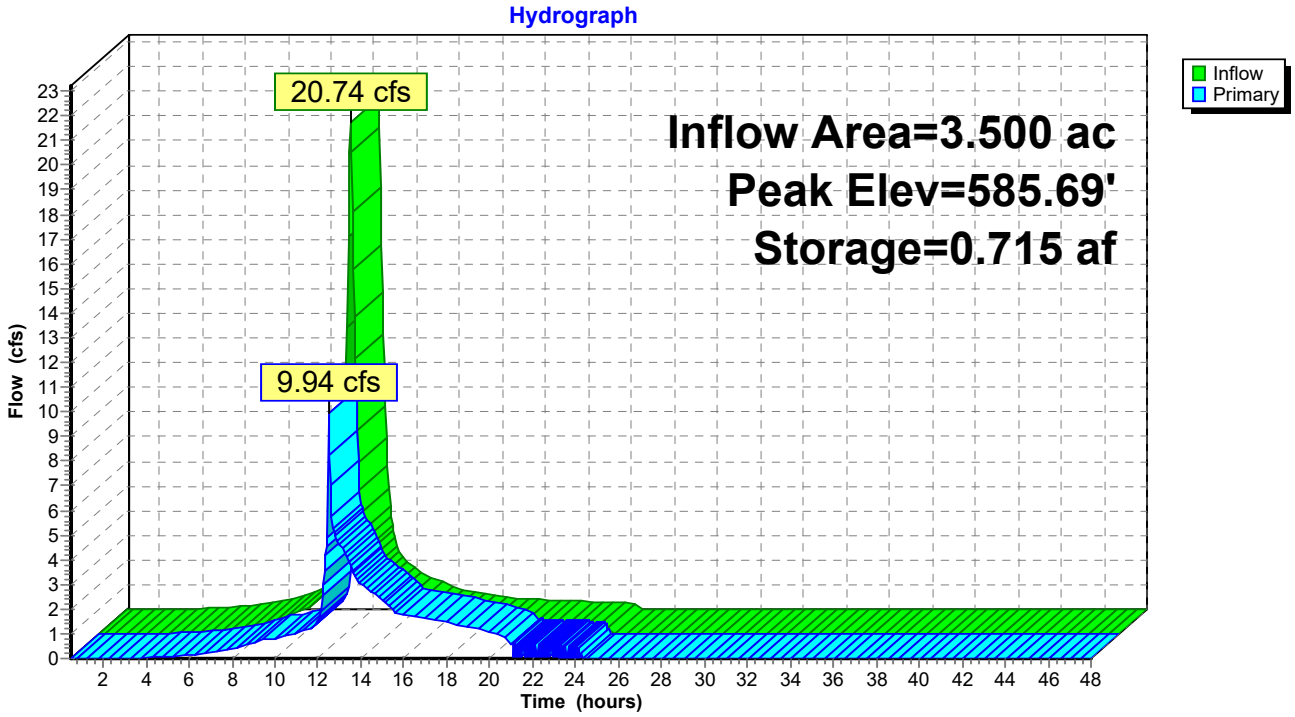
70,546.3 cf Field - 31,136.3 cf Chambers = 39,410.0 cf Gravel

Chamber Storage = 31,136.3 cf = 0.715 af
Overall Storage Efficiency = 44.1%
Overall System Size = 229.00' x 38.75' x 7.95'

1,100 Chambers
2,612.8 cy Field
1,459.6 cy Gravel



Pond UG 1A: Chambers 1A



Summary for Pond UG 1B: Chambers 1B

Inflow Area = 2.517 ac, 47.32% Impervious, Inflow Depth = 6.88" for 100-Year event
Inflow = 15.56 cfs @ 12.17 hrs, Volume= 1.444 af
Outflow = 25.95 cfs @ 12.15 hrs, Volume= 1.428 af, Atten= 0%, Lag= 0.0 min
Primary = 25.95 cfs @ 12.15 hrs, Volume= 1.428 af
Routed to Reach X Swale 1 : Existing drain course

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 623.92' @ 12.15 hrs Surf.Area= 0.114 ac Storage= 0.391 af

Plug-Flow detention time= 199.0 min calculated for 1.428 af (99% of inflow)
Center-of-Mass det. time= 191.7 min (983.6 - 791.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	612.50'	0.000 af	**23.85'W x 209.00'L x 7.95'H Field A** 0.910 af Overall - 0.391 af Embedded = 0.519 af x 0.0% Voids
#2A	613.50'	0.391 af	**Xerxes 6'** x 600 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 600 Chambers in 3 Rows Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	612.50'	**18.0" Round Culvert** L= 31.5' Ke= 0.500 Inlet / Outlet Invert= 612.50' / 612.00' S= 0.0159 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	614.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	616.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	618.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	619.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=24.74 cfs @ 12.15 hrs HW=623.79' (Free Discharge)
└─**1=Culvert** (Passes 24.74 cfs of 27.62 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.73 cfs @ 14.97 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.62 cfs @ 12.66 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 0.56 cfs @ 11.46 fps)
  └─**5=Sharp-Crested Rectangular Weir** (Weir Controls 22.82 cfs @ 7.44 fps)

Pond UG 1B: Chambers 1B - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

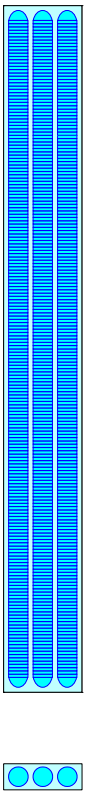
200 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 206.00' Row Length +18.0" End Gravel x 2 = 209.00' Base Length
3 Rows x 71.4" Wide + 18.0" Spacing x 2 + 18.0" Side Gravel x 2 = 23.85' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

600 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 3 Rows = 17,013.5 cf Chamber Storage

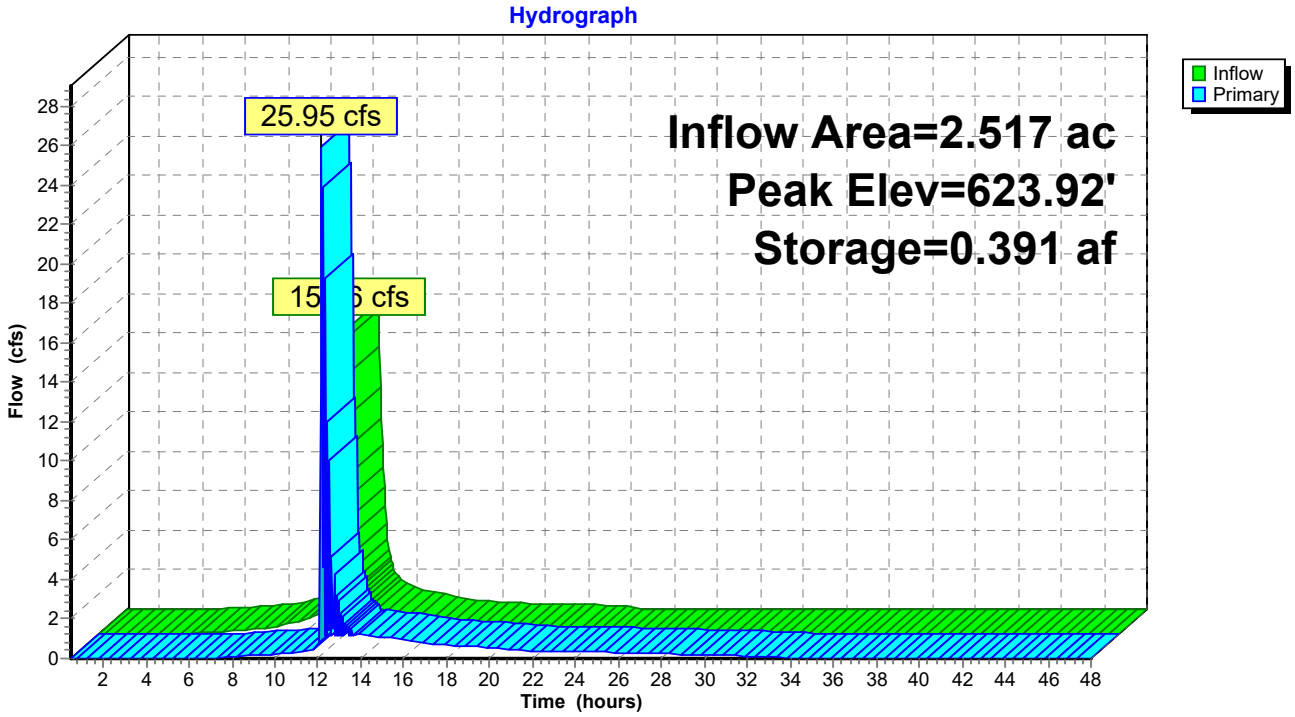
39,628.0 cf Field - 17,013.5 cf Chambers = 22,614.5 cf Gravel

Chamber Storage = 17,013.5 cf = 0.391 af
Overall Storage Efficiency = 42.9%
Overall System Size = 209.00' x 23.85' x 7.95'

600 Chambers
1,467.7 cy Field
837.6 cy Gravel



Pond UG 1B: Chambers 1B



Summary for Pond UG 2B: Chambers 2B

Inflow Area = 2.120 ac, 60.75% Impervious, Inflow Depth = 7.25" for 100-Year event
Inflow = 15.64 cfs @ 12.11 hrs, Volume= 1.280 af
Outflow = 15.15 cfs @ 12.30 hrs, Volume= 1.258 af, Atten= 3%, Lag= 11.4 min
Primary = 15.15 cfs @ 12.30 hrs, Volume= 1.258 af
Routed to Reach New 48 : New 48"

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs
Peak Elev= 587.13' @ 12.30 hrs Surf.Area= 0.169 ac Storage= 0.590 af

Plug-Flow detention time= 368.4 min calculated for 1.258 af (98% of inflow)
Center-of-Mass det. time= 357.3 min (1,136.1 - 778.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	577.55'	0.000 af	**46.20'W x 159.00'L x 7.95'H Field A** 1.341 af Overall - 0.590 af Embedded = 0.751 af x 0.0% Voids
#2A	578.55'	0.590 af	**Xerxes 6'** x 900 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 900 Chambers in 6 Rows Cap Storage= 55.1 cf x 2 x 6 rows = 660.9 cf
		0.590 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	577.55'	**18.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 577.55' / 575.00' S= 0.1594 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	579.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	581.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	583.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	584.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=15.13 cfs @ 12.30 hrs HW=587.12' (Free Discharge)
└**1=Culvert** (Passes 15.13 cfs of 25.27 cfs potential flow)
├**2=Orifice/Grate** (Orifice Controls 0.67 cfs @ 13.62 fps)
├**3=Orifice/Grate** (Orifice Controls 0.54 cfs @ 11.03 fps)
├**4=Orifice/Grate** (Orifice Controls 0.47 cfs @ 9.63 fps)
└**5=Sharp-Crested Rectangular Weir** (Weir Controls 13.45 cfs @ 5.47 fps)

Pond UG 2B: Chambers 2B - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 6 rows = 660.9 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

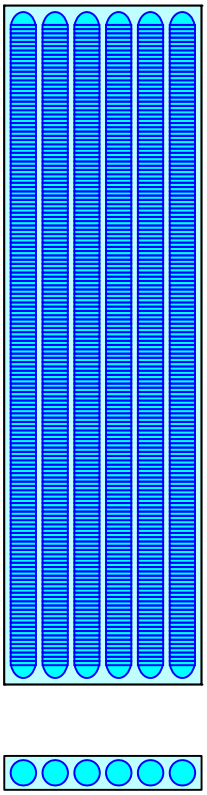
150 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 156.00' Row Length +18.0" End Gravel x 2 = 159.00' Base Length
6 Rows x 71.4" Wide + 18.0" Spacing x 5 + 18.0" Side Gravel x 2 = 46.20' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

900 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 6 Rows = 25,685.4 cf Chamber Storage

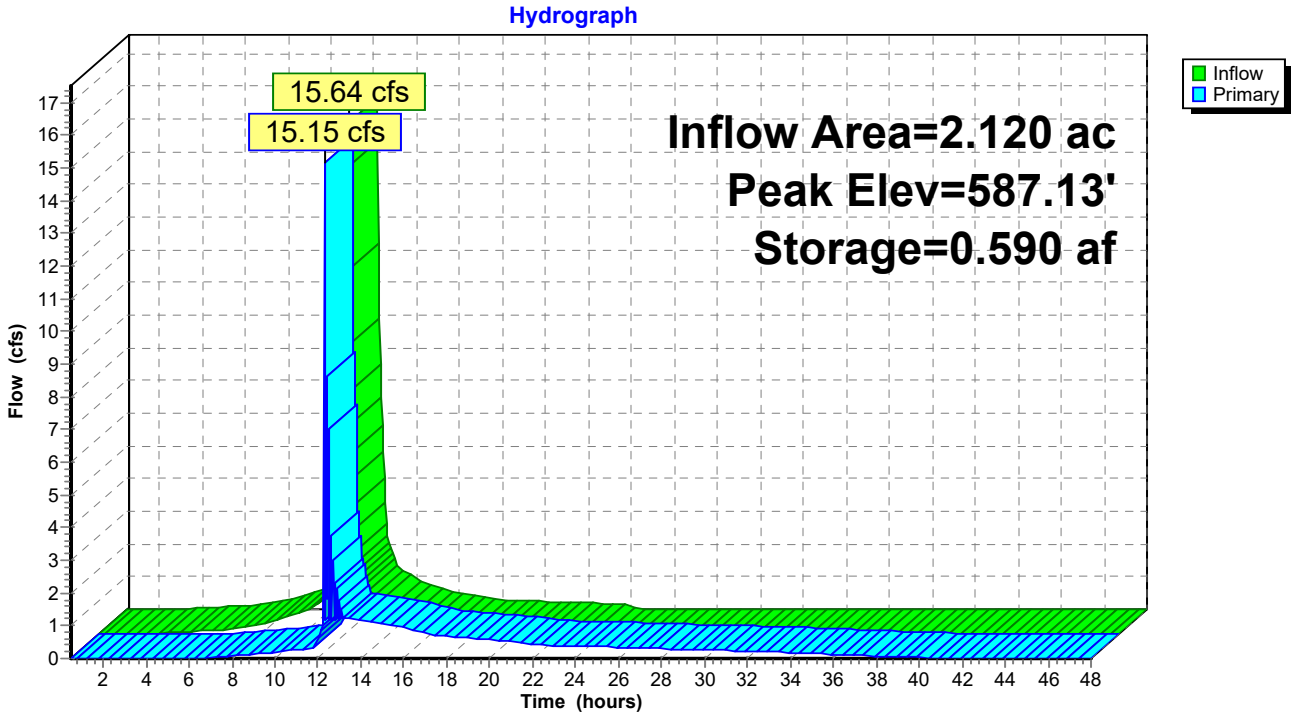
58,399.1 cf Field - 25,685.4 cf Chambers = 32,713.7 cf Gravel

Chamber Storage = 25,685.4 cf = 0.590 af
Overall Storage Efficiency = 44.0%
Overall System Size = 159.00' x 46.20' x 7.95'

900 Chambers
2,162.9 cy Field
1,211.6 cy Gravel



Pond UG 2B: Chambers 2B



Summary for Pond UG 2C: Chambers 2C

Inflow Area = 3.270 ac, 52.48% Impervious, Inflow Depth = 7.01" for 100-Year event
Inflow = 22.10 cfs @ 12.14 hrs, Volume= 1.909 af
Outflow = 23.00 cfs @ 12.14 hrs, Volume= 1.882 af, Atten= 0%, Lag= 0.4 min
Primary = 23.00 cfs @ 12.14 hrs, Volume= 1.882 af
Routed to Reach New 48 : New 48"

Routing by Stor-Ind method, Time Span= 0.50-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 626.60' @ 12.14 hrs Surf.Area= 0.114 ac Storage= 0.391 af

Plug-Flow detention time= 173.3 min calculated for 1.880 af (99% of inflow)
Center-of-Mass det. time= 165.7 min (952.2 - 786.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	615.15'	0.000 af	**23.85'W x 209.00'L x 7.95'H Field A** 0.910 af Overall - 0.391 af Embedded = 0.519 af x 0.0% Voids
#2A	616.15'	0.391 af	**Xerxes 6'** x 600 Inside #1 Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf Overall Size= 71.4"W x 71.4"H x 1.00'L 600 Chambers in 3 Rows Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf
		0.391 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	615.50'	**18.0" Round Culvert** L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 615.50' / 612.00' S= 0.2917 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	617.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	619.75'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	621.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	622.70'	**1.5' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=22.27 cfs @ 12.14 hrs HW=626.51' (Free Discharge)
└**1=Culvert** (Passes 22.27 cfs of 27.26 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.72 cfs @ 14.75 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.61 cfs @ 12.40 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.55 cfs @ 11.18 fps)
  └**5=Sharp-Crested Rectangular Weir** (Weir Controls 20.38 cfs @ 7.13 fps)

Pond UG 2C: Chambers 2C - Chamber Wizard Field A

Chamber Model = Xerxes 6' (Xerxes Tanks (custom length))
Effective Size= 71.4"W x 71.4"H => 27.81 sf x 1.00'L = 27.8 cf
Overall Size= 71.4"W x 71.4"H x 1.00'L
Cap Storage= 55.1 cf x 2 x 3 rows = 330.4 cf

71.4" Wide + 18.0" Spacing = 89.4" C-C Row Spacing

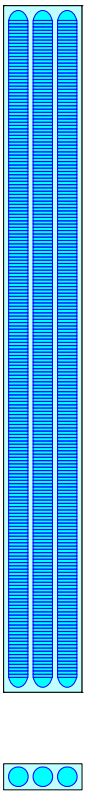
200 Chambers/Row x 1.00' Long +3.00' Cap Length x 2 = 206.00' Row Length +18.0" End Gravel x 2 = 209.00' Base Length
3 Rows x 71.4" Wide + 18.0" Spacing x 2 + 18.0" Side Gravel x 2 = 23.85' Base Width
12.0" Gravel Base + 71.4" Chamber Height + 12.0" Gravel Cover = 7.95' Field Height

600 Chambers x 27.8 cf + 55.1 cf Cap Volume x 2 x 3 Rows = 17,013.5 cf Chamber Storage

39,628.0 cf Field - 17,013.5 cf Chambers = 22,614.5 cf Gravel

Chamber Storage = 17,013.5 cf = 0.391 af
Overall Storage Efficiency = 42.9%
Overall System Size = 209.00' x 23.85' x 7.95'

600 Chambers
1,467.7 cy Field
837.6 cy Gravel



Pond UG 2C: Chambers 2C