

Hydrology Calculations 07-21-20

Type III 24-hr 2 year storm event Rainfall=3.30"

Prepared by DiVesta Civil Engineering Associates, Inc.

Printed 7/27/2020

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 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 Post 1: Post Development - Runoff Area=748 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.06 cfs 0.004 af

Subcatchment Post 2: Post Development - Runoff Area=12,481 sf 19.04% Impervious Runoff Depth=1.62"
Flow Length=148' Tc=7.7 min CN=82 Runoff=0.51 cfs 0.039 af

Subcatchment Post 3: Post Development - Runoff Area=14,097 sf 8.12% Impervious Runoff Depth=1.55"
Flow Length=214' Tc=10.3 min CN=81 Runoff=0.50 cfs 0.042 af

Subcatchment Post 4: Post Development - Runoff Area=8,924 sf 91.10% Impervious Runoff Depth=2.85"
Tc=5.0 min CN=96 Runoff=0.65 cfs 0.049 af

Subcatchment Post 5: Post Development - Runoff Area=66,683 sf 0.93% Impervious Runoff Depth=1.41"
Flow Length=459' Tc=11.4 min CN=79 Runoff=2.08 cfs 0.180 af

Subcatchment Pre 1: Pre Development - Runoff Area=102,931 sf 0.00% Impervious Runoff Depth=1.41"
Flow Length=459' Tc=11.4 min CN=79 Runoff=3.21 cfs 0.278 af

Pond Det 1: Detention Basin # 1 - Pool Peak Elev=97.18' Storage=15 cf Inflow=0.06 cfs 0.004 af
Outflow=0.05 cfs 0.004 af

Pond Det 2: Detention Basin # 2 Peak Elev=72.29' Storage=2,266 cf Inflow=1.57 cfs 0.129 af
Discarded=0.11 cfs 0.116 af Primary=0.06 cfs 0.013 af Outflow=0.17 cfs 0.129 af

Link 1L: (new Link) Inflow=2.13 cfs 0.197 af
Primary=2.13 cfs 0.197 af

Total Runoff Area = 4.726 ac Runoff Volume = 0.592 af Average Runoff Depth = 1.50"
93.68% Pervious = 4.427 ac 6.32% Impervious = 0.299 ac

Summary for Subcatchment Post 1: Post Dvelopment - Sub Catchment # 1

Runoff = 0.06 cfs @ 12.07 hrs, Volume= 0.004 af, Depth= 3.07"

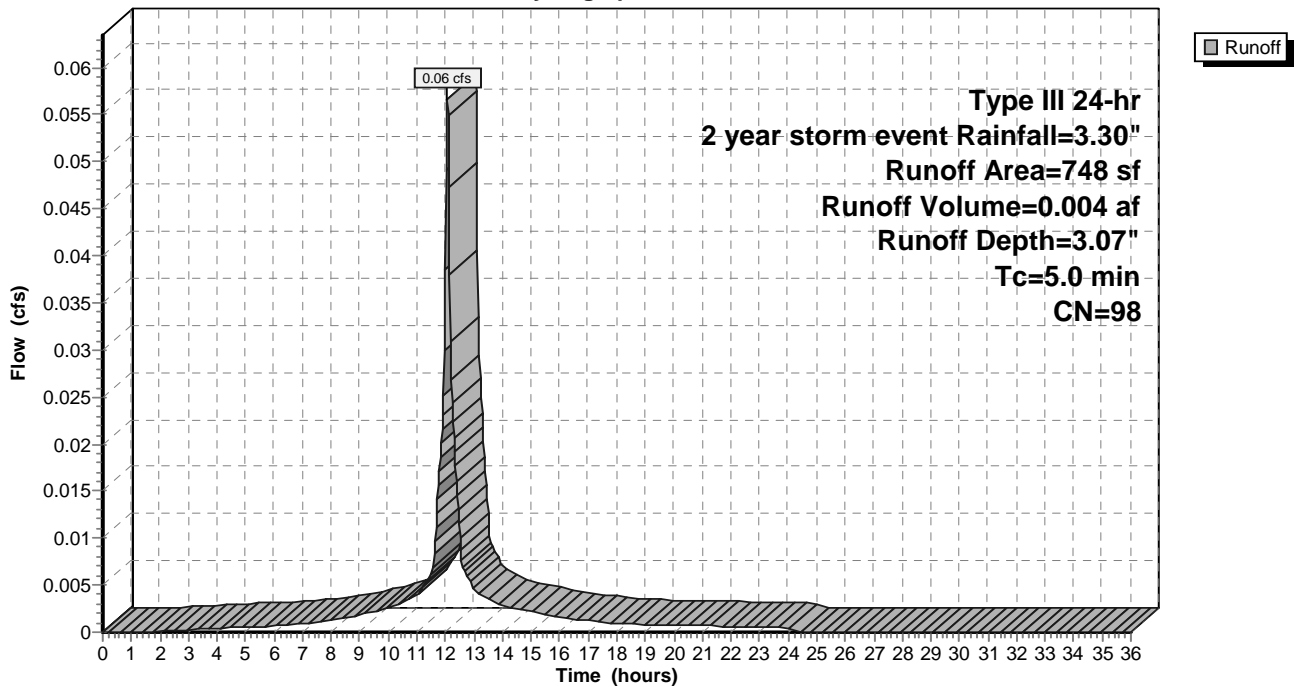
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 2 year storm event Rainfall=3.30"

Area (sf)	CN	Description
* 748	98	Pool
748		100.00% Impervious Area

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

Subcatchment Post 1: Post Dvelopment - Sub Catchment # 1

Hydrograph



Summary for Subcatchment Post 2: Post Development - Sub Catchment # 2

Runoff = 0.51 cfs @ 12.11 hrs, Volume= 0.039 af, Depth= 1.62"

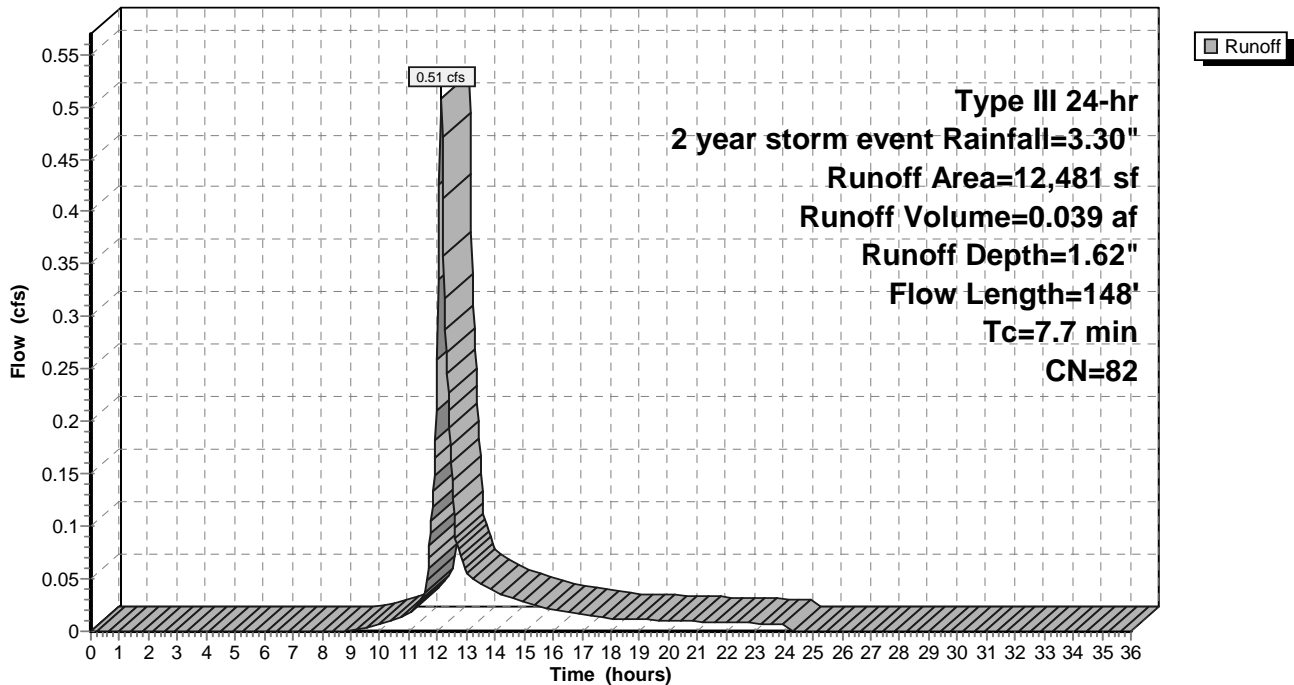
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 2 year storm event Rainfall=3.30"

Area (sf)	CN	Description
* 2,377	98	Pool patio
9,835	79	50-75% Grass cover, Fair, HSG C
269	70	Brush, Fair, HSG C
12,481	82	Weighted Average
10,104		80.96% Pervious Area
2,377		19.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	108	0.1300	0.25		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
0.6	40	0.0030	1.11		Shallow Concentrated Flow, shallow concentrated flow Paved Kv= 20.3 fps
7.7	148	Total			

Subcatchment Post 2: Post Development - Sub Catchment # 2

Hydrograph



Summary for Subcatchment Post 3: Post Development - Sub Catchment # 3

Runoff = 0.50 cfs @ 12.15 hrs, Volume= 0.042 af, Depth= 1.55"

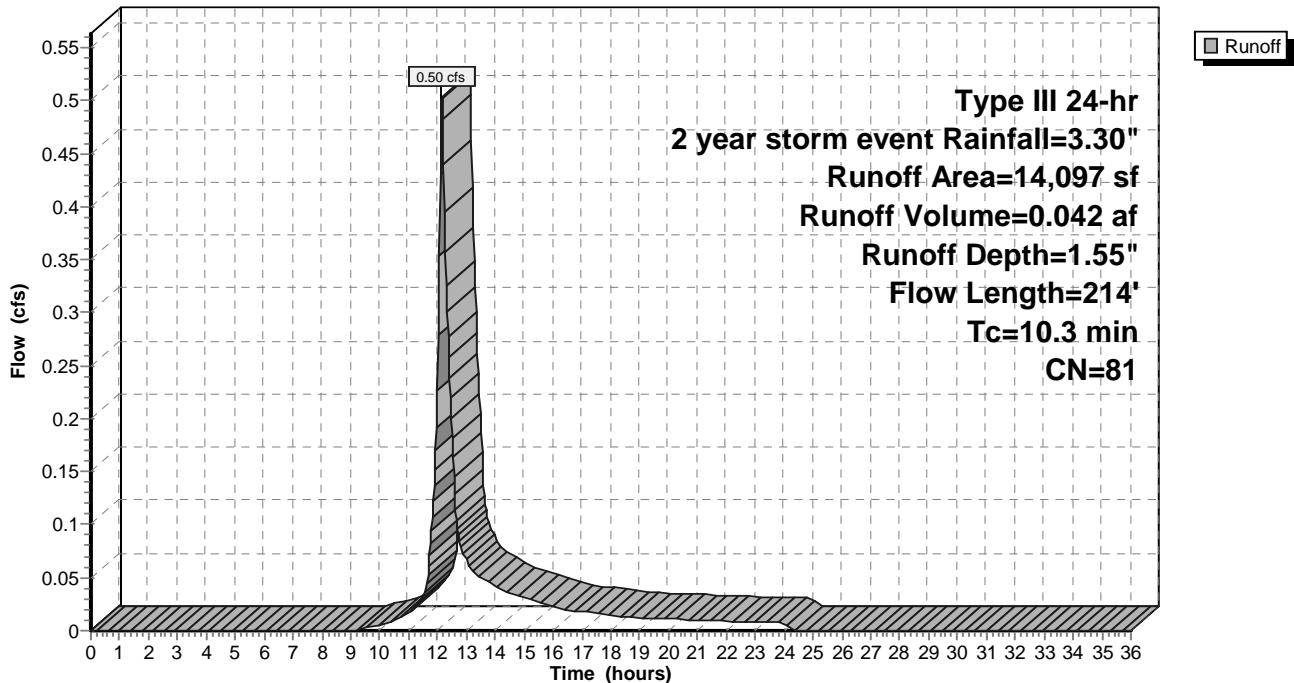
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 2 year storm event Rainfall=3.30"

Area (sf)	CN	Description
12,953	79	50-75% Grass cover, Fair, HSG C
* 1,144	98	Driveway
14,097	81	Weighted Average
12,953		91.88% Pervious Area
1,144		8.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	143	0.1120	0.25		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
0.8	41	0.0150	0.86		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
0.1	30	0.1000	6.42		Shallow Concentrated Flow, shallow concentrated flow Paved Kv= 20.3 fps
10.3	214	Total			

Subcatchment Post 3: Post Development - Sub Catchment # 3

Hydrograph



Summary for Subcatchment Post 4: Post Development - Sub Catchment # 4

Runoff = 0.65 cfs @ 12.07 hrs, Volume= 0.049 af, Depth= 2.85"

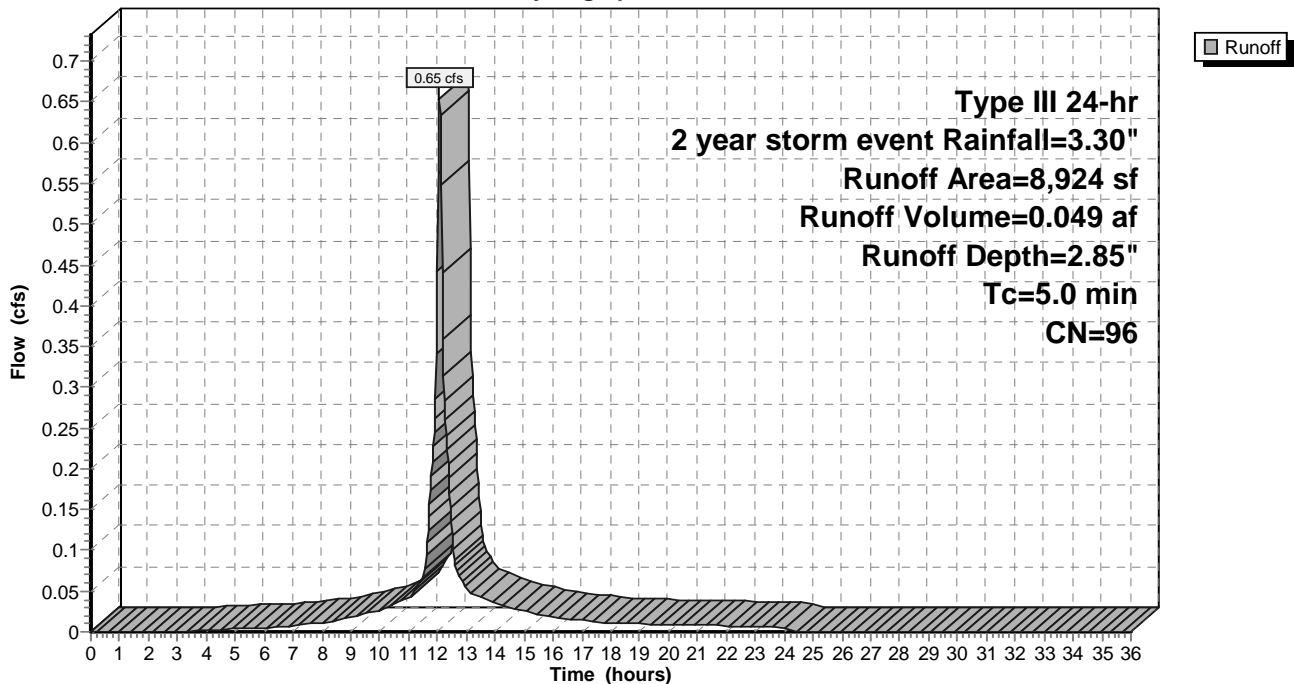
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 2 year storm event Rainfall=3.30"

	Area (sf)	CN	Description
*	3,108	98	House roof area
*	1,018	98	Office roof area
*	1,918	98	parking court
	794	79	50-75% Grass cover, Fair, HSG C
*	2,086	98	Lower driveway
	8,924	96	Weighted Average
	794		8.90% Pervious Area
	8,130		91.10% Impervious Area

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

Subcatchment Post 4: Post Development - Sub Catchment # 4

Hydrograph



Hydrology Calculations 07-21-20

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Summary for Subcatchment Post 5: Post Development - Sub Catchment # 5 Remaining Area

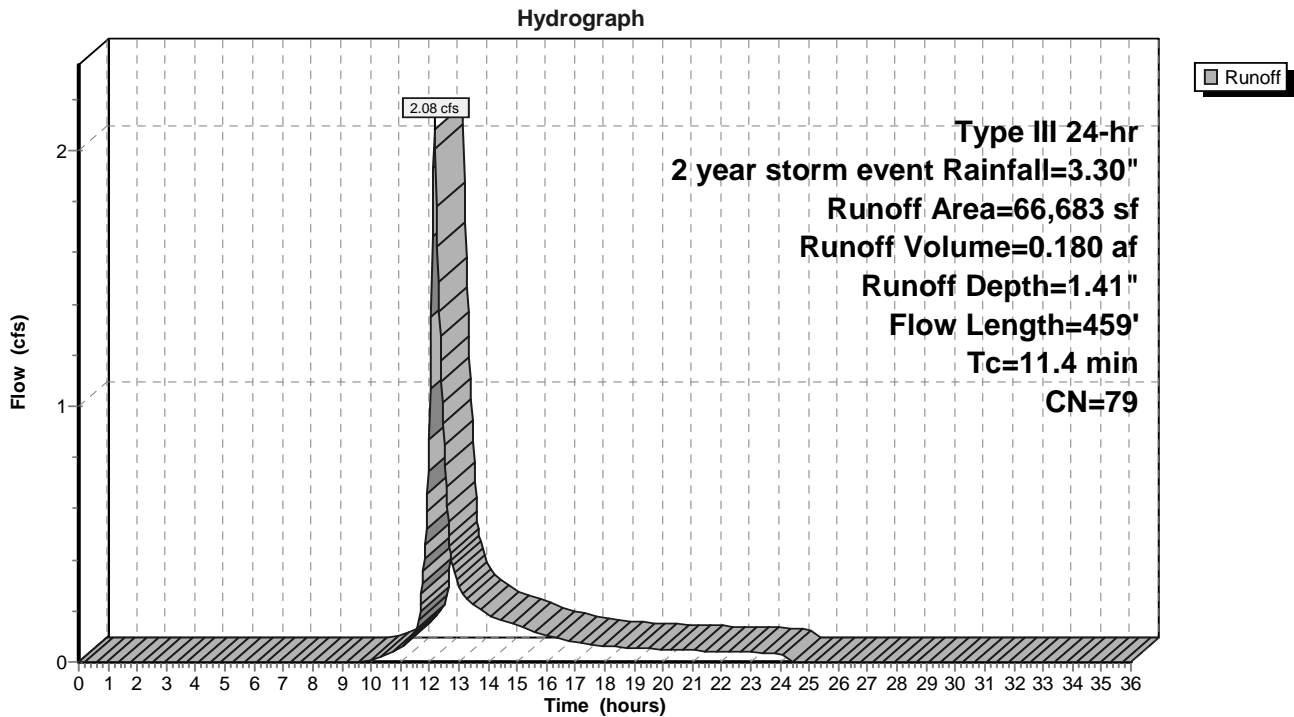
Runoff = 2.08 cfs @ 12.16 hrs, Volume= 0.180 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 2 year storm event Rainfall=3.30"

Area (sf)	CN	Description
* 621	98	various walks
23,841	79	Woods, Fair, HSG D
42,221	79	50-75% Grass cover, Fair, HSG C
66,683	79	Weighted Average
66,062		99.07% Pervious Area
621		0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	122	0.0980	0.23		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
1.6	245	0.1320	2.54		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
1.1	92	0.0840	1.45		Shallow Concentrated Flow, shallow concentrated flow Woodland Kv= 5.0 fps
11.4	459	Total			

Subcatchment Post 5: Post Development - Sub Catchment # 5 Remaining Area



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Summary for Subcatchment Pre 1: Pre Development - Sub Catchment # 1

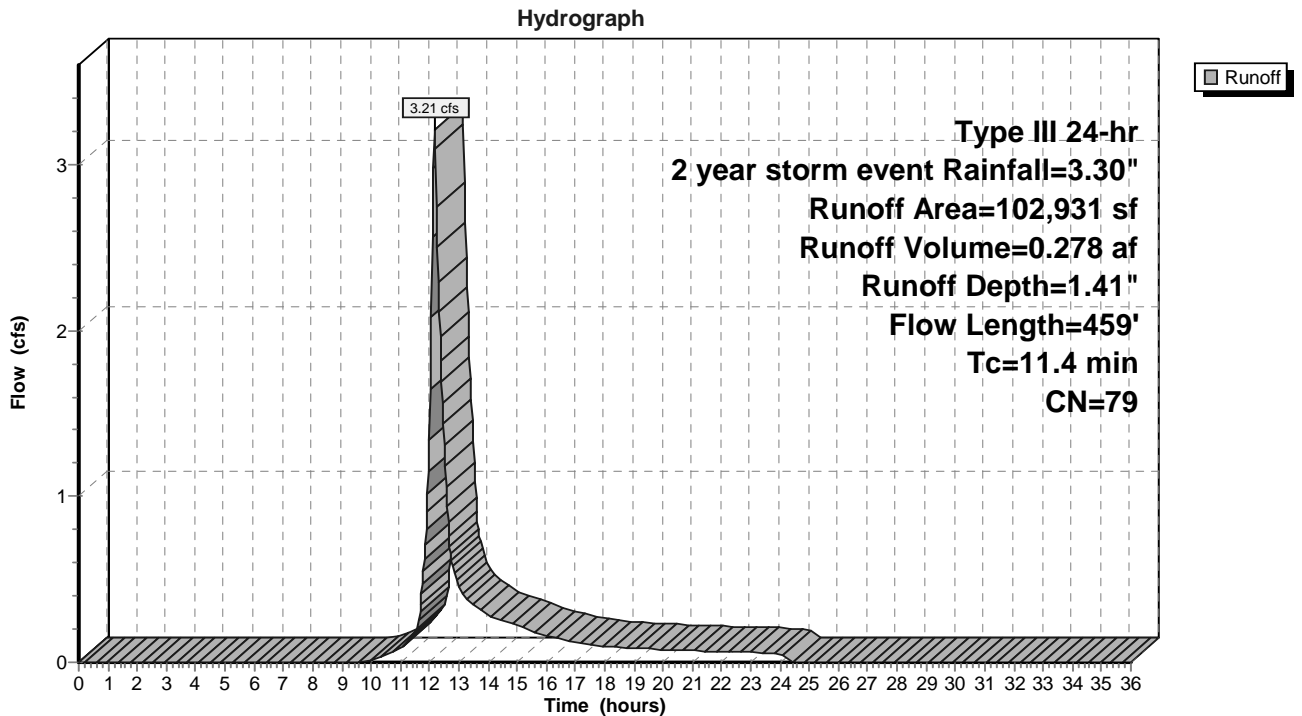
Runoff = 3.21 cfs @ 12.16 hrs, Volume= 0.278 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type III 24-hr 2 year storm event Rainfall=3.30"

Area (sf)	CN	Description
79,090	79	50-75% Grass cover, Fair, HSG C
23,841	79	Woods, Fair, HSG D
102,931	79	Weighted Average
102,931		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	122	0.0980	0.23		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
1.6	245	0.1320	2.54		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
1.1	92	0.0840	1.45		Shallow Concentrated Flow, shallow concentrated flow Woodland Kv= 5.0 fps
11.4	459	Total			

Subcatchment Pre 1: Pre Development - Sub Catchment # 1



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Summary for Pond Det 1: Detention Basin # 1 - Pool

Inflow Area = 0.017 ac, 100.00% Impervious, Inflow Depth = 3.07" for 2 year storm event event
 Inflow = 0.06 cfs @ 12.07 hrs, Volume= 0.004 af
 Outflow = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af, Atten= 16%, Lag= 2.9 min
 Primary = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 97.18' @ 12.12 hrs Surf.Area= 0 sf Storage= 15 cf

Plug-Flow detention time= 6.9 min calculated for 0.004 af (100% of inflow)
 Center-of-Mass det. time= 6.8 min (761.7 - 754.8)

Volume	Invert	Avail.Storage	Storage Description
#1	97.17'	748 cf	Custom Stage Data Listed below

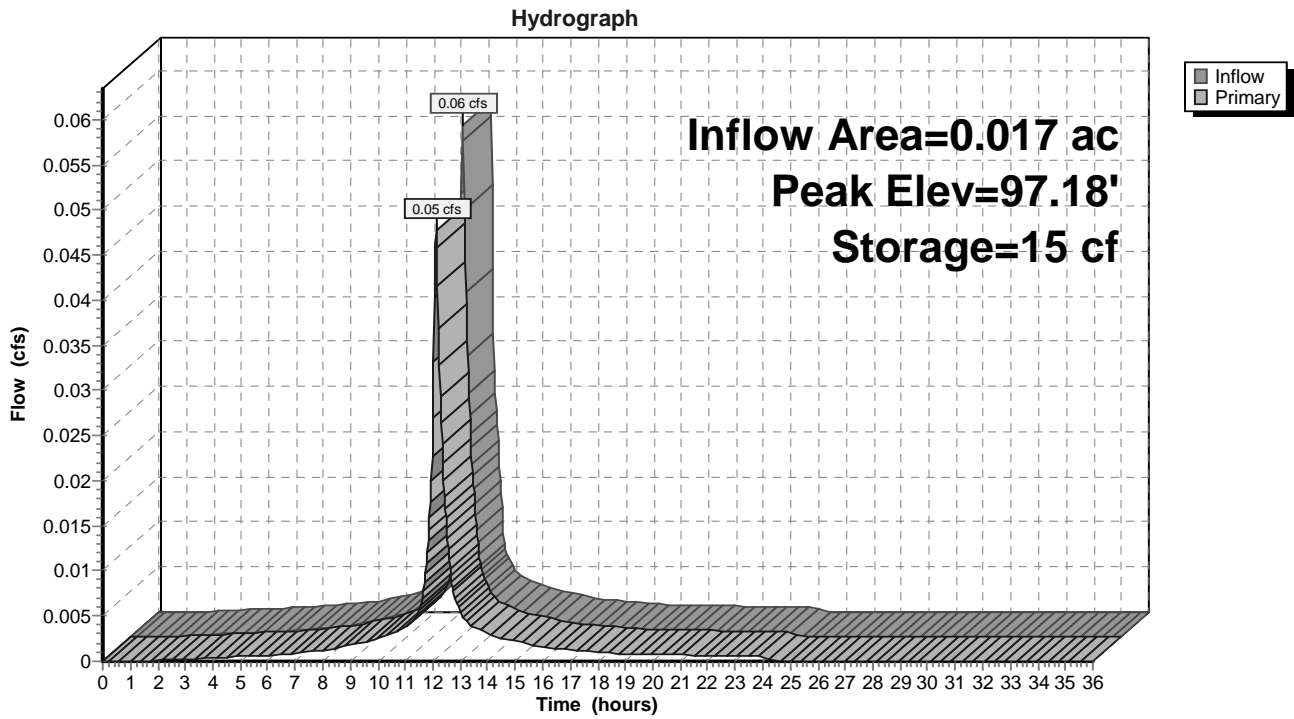
Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.17	0	0
97.67	748	748

Device	Routing	Invert	Outlet Devices
#1	Primary	97.17'	18.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.05 cfs @ 12.12 hrs HW=97.18' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.27 fps)

Pond Det 1: Detention Basin # 1 - Pool



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Summary for Pond Det 2: Detention Basin # 2

Inflow Area = 0.815 ac, 32.82% Impervious, Inflow Depth = 1.90" for 2 year storm event event
Inflow = 1.57 cfs @ 12.10 hrs, Volume= 0.129 af
Outflow = 0.17 cfs @ 13.05 hrs, Volume= 0.129 af, Atten= 89%, Lag= 56.6 min
Discarded = 0.11 cfs @ 11.40 hrs, Volume= 0.116 af
Primary = 0.06 cfs @ 13.05 hrs, Volume= 0.013 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs / 2
Peak Elev= 72.29' @ 13.05 hrs Surf.Area= 7,161 sf Storage= 2,266 cf

Plug-Flow detention time= 156.7 min calculated for 0.129 af (100% of inflow)
Center-of-Mass det. time= 156.7 min (970.7 - 814.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	71.66'	2,338 cf	42.00'W x 170.50'L x 1.21'H Field A 8,653 cf Overall - 2,807 cf Embedded = 5,846 cf x 40.0% Voids
#2A	72.16'	2,807 cf	Cultec FD C-4 x 210 Inside #1 Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.67 sf x 10 rows
		5,145 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	72.16'	8.0" Vert. Orifice/Grate C= 0.600
#2	Discarded	71.66'	0.652 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.11 cfs @ 11.40 hrs HW=71.67' (Free Discharge)
↑**2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.06 cfs @ 13.05 hrs HW=72.29' (Free Discharge)
↑**1=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.24 fps)

Pond Det 2: Detention Basin # 2 - Chamber Wizard Field A

Chamber Model = Cultec FD C-4 (Cultec Contactor® Field Drain C-4)

Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf

Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap

Row Length Adjustment= +0.50' x 1.67 sf x 10 rows

21 Chambers/Row x 8.00' Long +0.50' Row Adjustment = 168.50' Row Length +12.0" End Stone x 2 = 170.50' Base Length

10 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width

6.0" Base + 8.5" Chamber Height = 1.21' Field Height

210 Chambers x 13.3 cf +0.50' Row Adjustment x 1.67 sf x 10 Rows = 2,807.2 cf Chamber Storage

8,652.9 cf Field - 2,807.2 cf Chambers = 5,845.7 cf Stone x 40.0% Voids = 2,338.3 cf Stone Storage

Chamber Storage + Stone Storage = 5,145.5 cf = 0.118 af

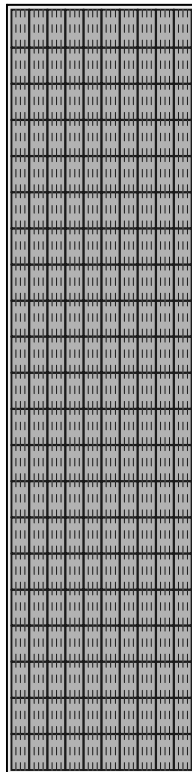
Overall Storage Efficiency = 59.5%

Overall System Size = 170.50' x 42.00' x 1.21'

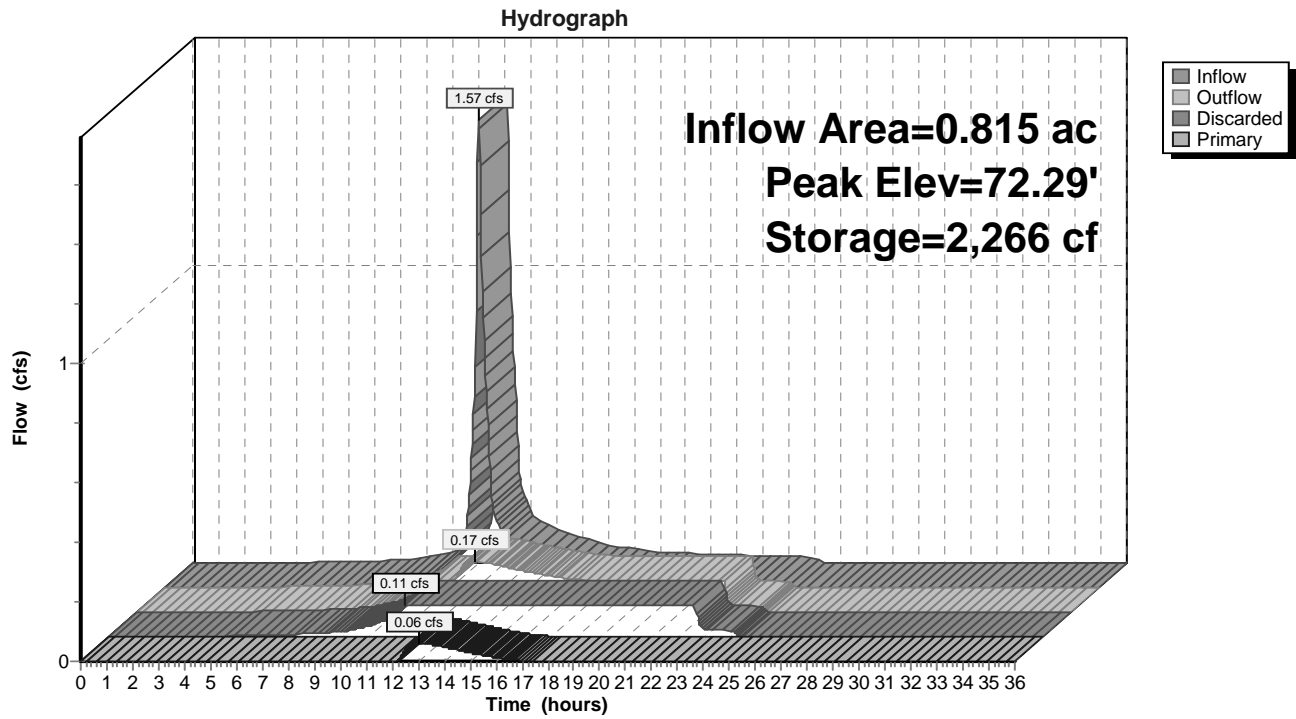
210 Chambers

320.5 cy Field

216.5 cy Stone



Pond Det 2: Detention Basin # 2



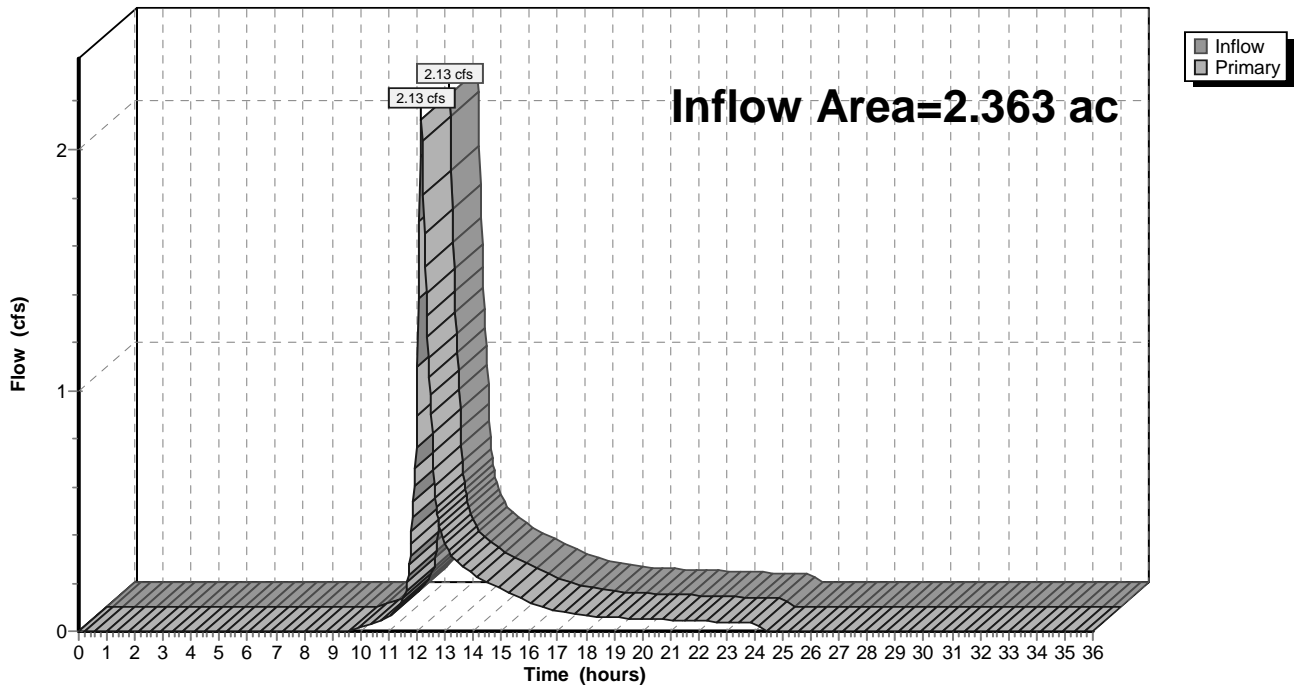
Summary for Link 1L: (new Link)

Inflow Area = 2.363 ac, 12.65% Impervious, Inflow Depth = 1.00" for 2 year storm event
Inflow = 2.13 cfs @ 12.16 hrs, Volume= 0.197 af
Primary = 2.13 cfs @ 12.16 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Link 1L: (new Link)

Hydrograph



Hydrology Calculations 07-21-20

Type III 24-hr 10 year storm event Rainfall=5.00"

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 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 Post 1: Post Development - Runoff Area=748 sf 100.00% Impervious Runoff Depth=4.76"
Tc=5.0 min CN=98 Runoff=0.09 cfs 0.007 af

Subcatchment Post 2: Post Development - Runoff Area=12,481 sf 19.04% Impervious Runoff Depth=3.08"
Flow Length=148' Tc=7.7 min CN=82 Runoff=0.97 cfs 0.074 af

Subcatchment Post 3: Post Development - Runoff Area=14,097 sf 8.12% Impervious Runoff Depth=2.99"
Flow Length=214' Tc=10.3 min CN=81 Runoff=0.98 cfs 0.081 af

Subcatchment Post 4: Post Development - Runoff Area=8,924 sf 91.10% Impervious Runoff Depth=4.53"
Tc=5.0 min CN=96 Runoff=1.01 cfs 0.077 af

Subcatchment Post 5: Post Development - Runoff Area=66,683 sf 0.93% Impervious Runoff Depth=2.80"
Flow Length=459' Tc=11.4 min CN=79 Runoff=4.20 cfs 0.357 af

Subcatchment Pre 1: Pre Development - Runoff Area=102,931 sf 0.00% Impervious Runoff Depth=2.80"
Flow Length=459' Tc=11.4 min CN=79 Runoff=6.48 cfs 0.552 af

Pond Det 1: Detention Basin # 1 - Pool Peak Elev=97.18' Storage=20 cf Inflow=0.09 cfs 0.007 af
Outflow=0.08 cfs 0.007 af

Pond Det 2: Detention Basin # 2 Peak Elev=72.58' Storage=3,894 cf Inflow=2.81 cfs 0.231 af
Discarded=0.11 cfs 0.148 af Primary=0.50 cfs 0.083 af Outflow=0.61 cfs 0.231 af

Link 1L: (new Link) Inflow=4.41 cfs 0.447 af
Primary=4.41 cfs 0.447 af

Total Runoff Area = 4.726 ac Runoff Volume = 1.147 af Average Runoff Depth = 2.91"
93.68% Pervious = 4.427 ac 6.32% Impervious = 0.299 ac

Summary for Subcatchment Post 1: Post Dvelopment - Sub Catchment # 1

Runoff = 0.09 cfs @ 12.07 hrs, Volume= 0.007 af, Depth= 4.76"

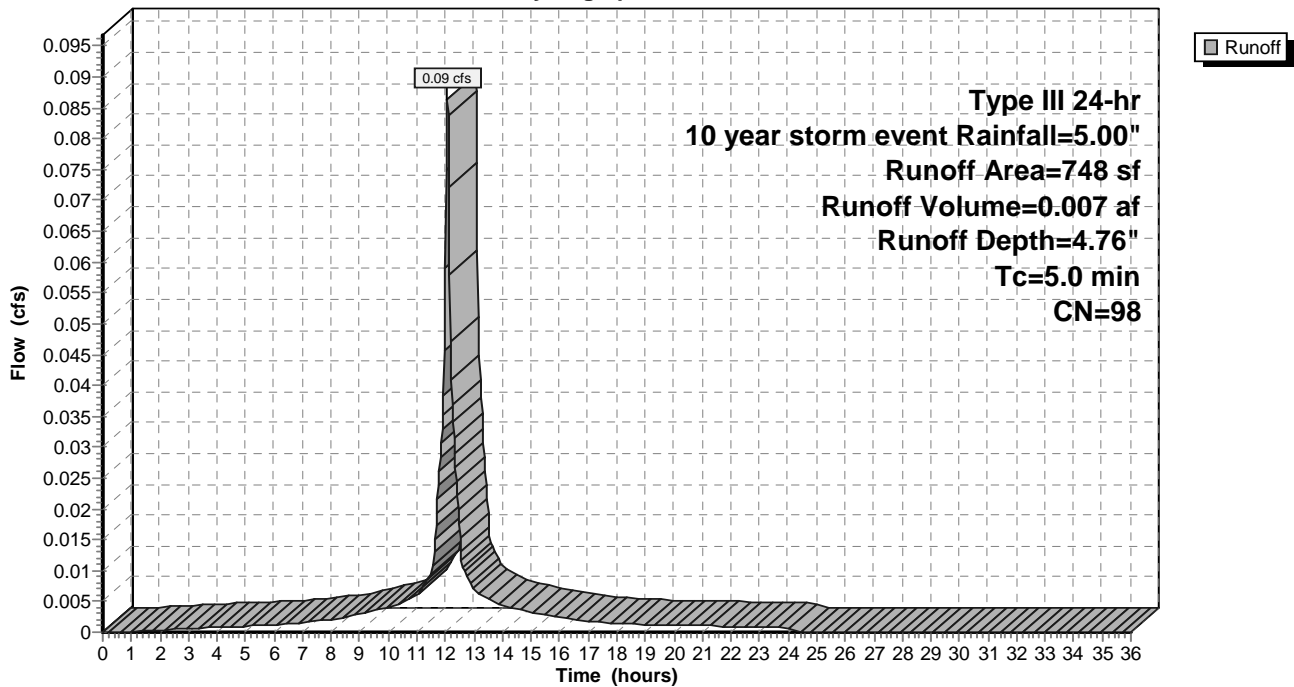
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 year storm event Rainfall=5.00"

Area (sf)	CN	Description
* 748	98	Pool
748		100.00% Impervious Area

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

Subcatchment Post 1: Post Dvelopment - Sub Catchment # 1

Hydrograph



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Type III 24-hr 10 year storm event Rainfall=5.00"

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Summary for Subcatchment Post 2: Post Development - Sub Catchment # 2

Runoff = 0.97 cfs @ 12.11 hrs, Volume= 0.074 af, Depth= 3.08"

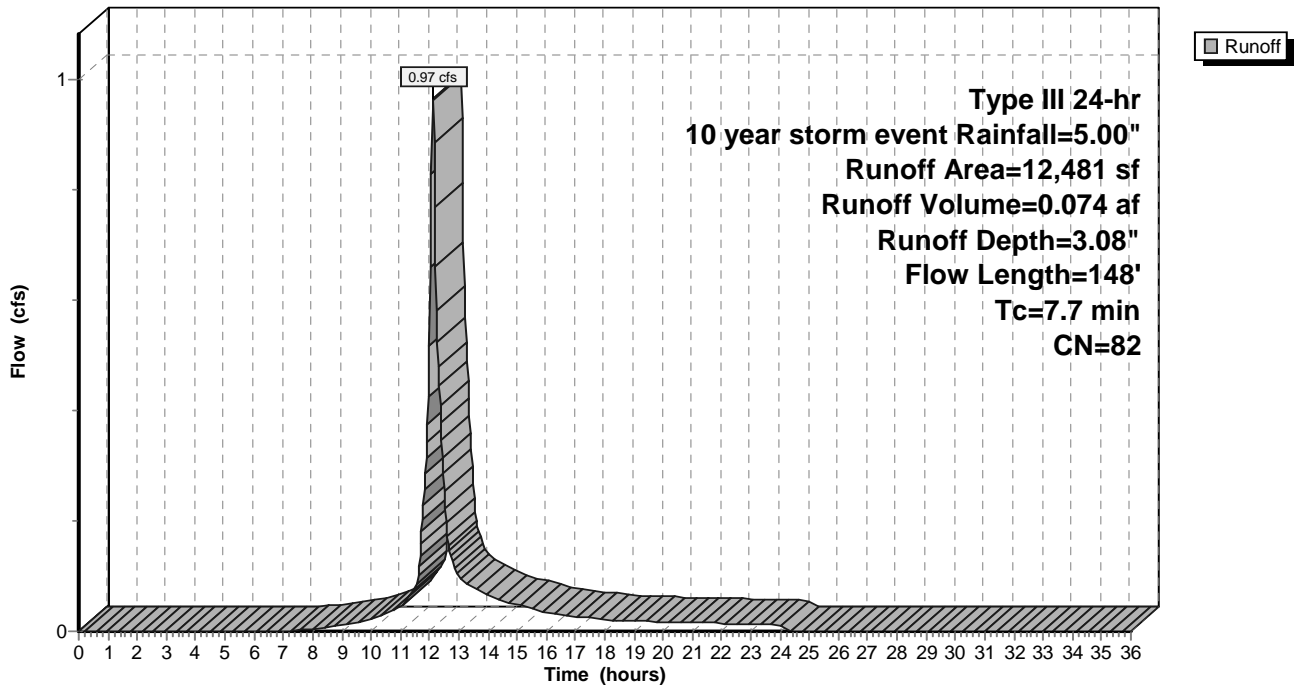
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 year storm event Rainfall=5.00"

Area (sf)	CN	Description
* 2,377	98	Pool patio
9,835	79	50-75% Grass cover, Fair, HSG C
269	70	Brush, Fair, HSG C
12,481	82	Weighted Average
10,104		80.96% Pervious Area
2,377		19.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	108	0.1300	0.25		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
0.6	40	0.0030	1.11		Shallow Concentrated Flow, shallow concentrated flow Paved Kv= 20.3 fps
7.7	148	Total			

Subcatchment Post 2: Post Development - Sub Catchment # 2

Hydrograph



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Type III 24-hr 10 year storm event Rainfall=5.00"

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Summary for Subcatchment Post 3: Post Development - Sub Catchment # 3

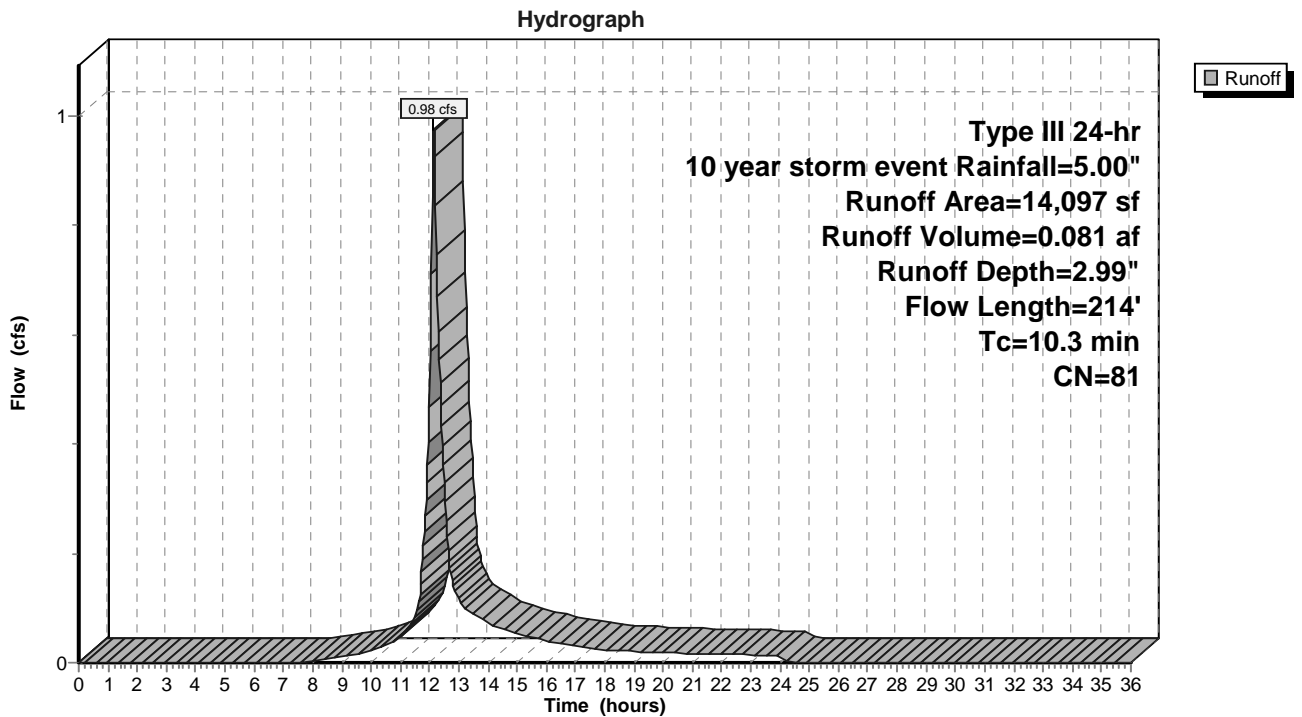
Runoff = 0.98 cfs @ 12.14 hrs, Volume= 0.081 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 year storm event Rainfall=5.00"

Area (sf)	CN	Description
12,953	79	50-75% Grass cover, Fair, HSG C
* 1,144	98	Driveway
14,097	81	Weighted Average
12,953		91.88% Pervious Area
1,144		8.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	143	0.1120	0.25		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
0.8	41	0.0150	0.86		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
0.1	30	0.1000	6.42		Shallow Concentrated Flow, shallow concentrated flow Paved Kv= 20.3 fps
10.3	214	Total			

Subcatchment Post 3: Post Development - Sub Catchment # 3



Summary for Subcatchment Post 4: Post Development - Sub Catchment # 4

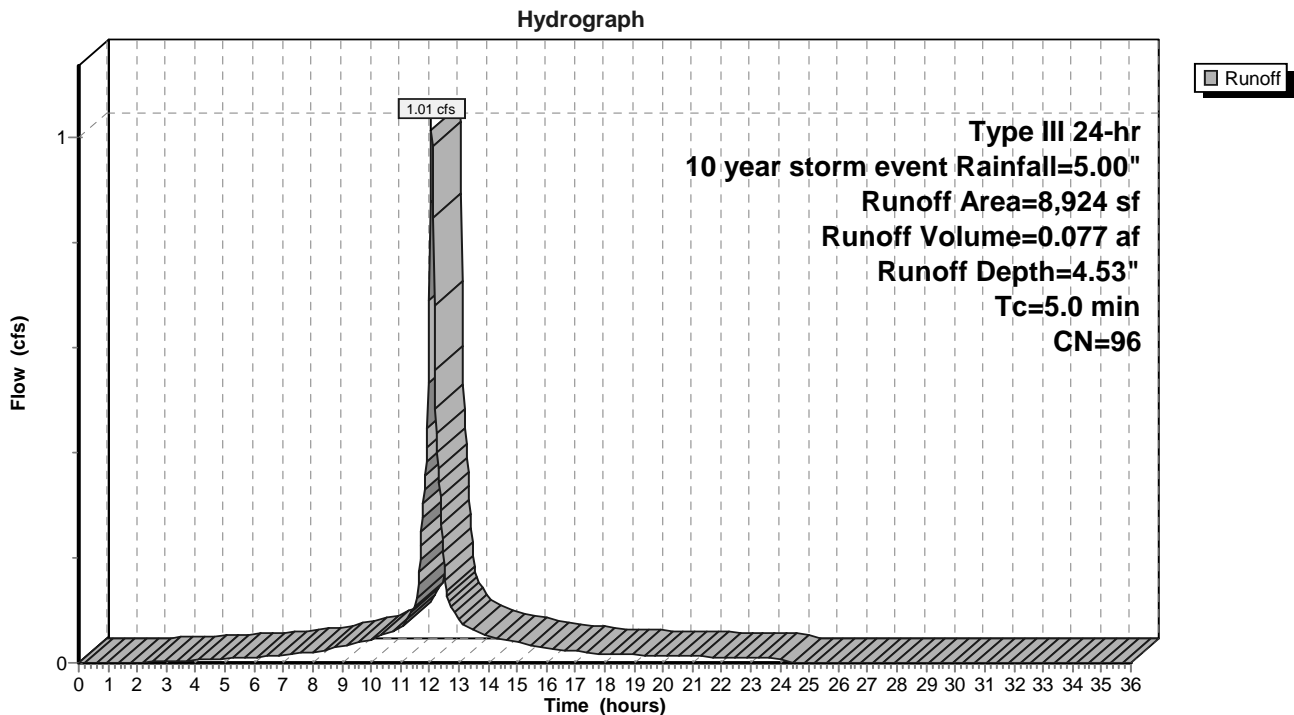
Runoff = 1.01 cfs @ 12.07 hrs, Volume= 0.077 af, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 year storm event Rainfall=5.00"

	Area (sf)	CN	Description
*	3,108	98	House roof area
*	1,018	98	Office roof area
*	1,918	98	parking court
	794	79	50-75% Grass cover, Fair, HSG C
*	2,086	98	Lower driveway
<hr/>			
	8,924	96	Weighted Average
	794		8.90% Pervious Area
	8,130		91.10% Impervious Area

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

Subcatchment Post 4: Post Development - Sub Catchment # 4



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Summary for Subcatchment Post 5: Post Development - Sub Catchment # 5 Remaining Area

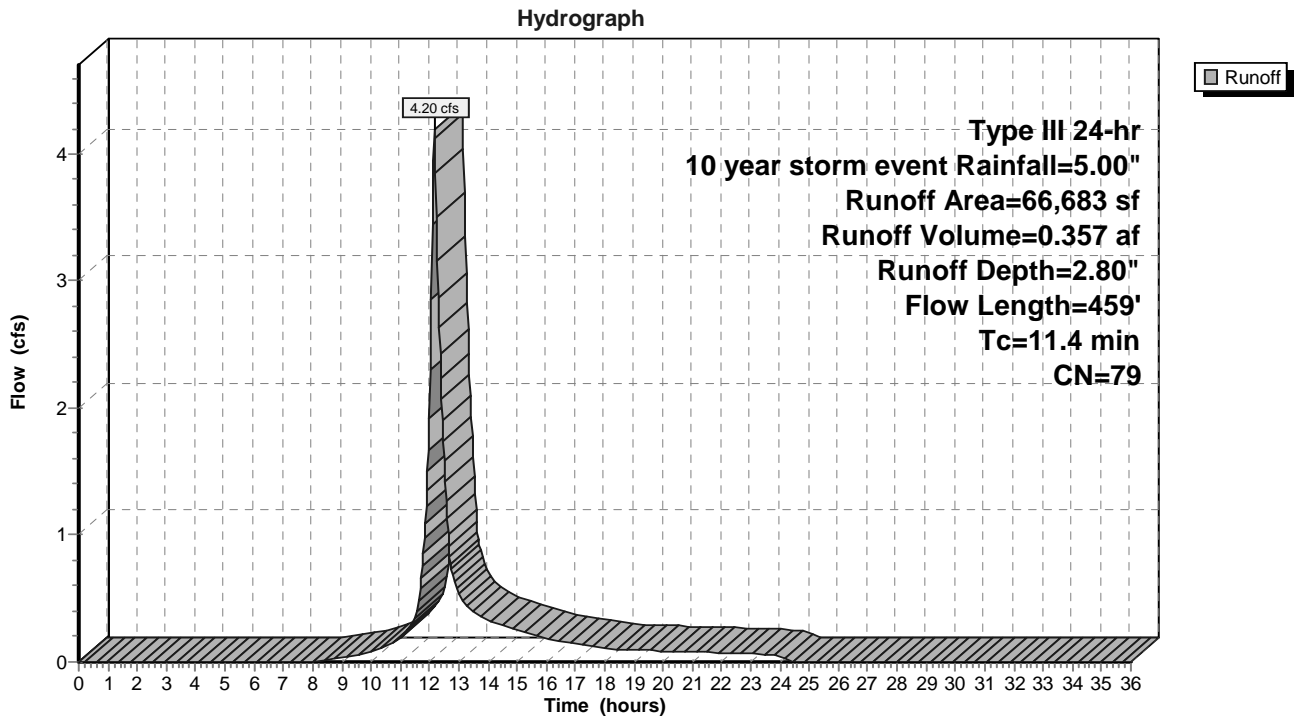
Runoff = 4.20 cfs @ 12.16 hrs, Volume= 0.357 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 10 year storm event Rainfall=5.00"

Area (sf)	CN	Description
* 621	98	various walks
23,841	79	Woods, Fair, HSG D
42,221	79	50-75% Grass cover, Fair, HSG C
66,683	79	Weighted Average
66,062		99.07% Pervious Area
621		0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	122	0.0980	0.23		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
1.6	245	0.1320	2.54		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
1.1	92	0.0840	1.45		Shallow Concentrated Flow, shallow concentrated flow Woodland Kv= 5.0 fps
11.4	459	Total			

Subcatchment Post 5: Post Development - Sub Catchment # 5 Remaining Area



Hydrology Calculations 07-21-20

Type III 24-hr 10 year storm event Rainfall=5.00"

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Summary for Subcatchment Pre 1: Pre Development - Sub Catchment # 1

Runoff = 6.48 cfs @ 12.16 hrs, Volume= 0.552 af, Depth= 2.80"

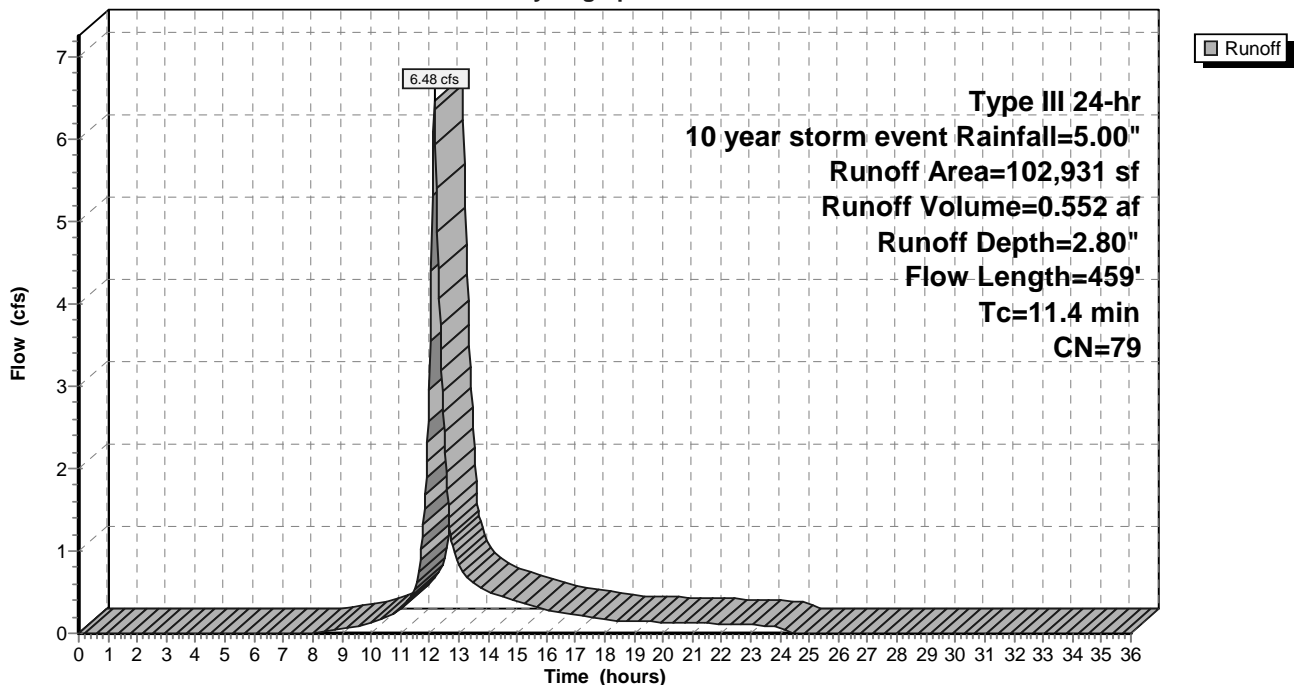
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type III 24-hr 10 year storm event Rainfall=5.00"

Area (sf)	CN	Description
79,090	79	50-75% Grass cover, Fair, HSG C
23,841	79	Woods, Fair, HSG D
102,931	79	Weighted Average
102,931		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	122	0.0980	0.23		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
1.6	245	0.1320	2.54		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
1.1	92	0.0840	1.45		Shallow Concentrated Flow, shallow concentrated flow Woodland Kv= 5.0 fps
11.4	459	Total			

Subcatchment Pre 1: Pre Development - Sub Catchment # 1

Hydrograph



Hydrology Calculations 07-21-20

Type III 24-hr 10 year storm event Rainfall=5.00"

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Summary for Pond Det 1: Detention Basin # 1 - Pool

Inflow Area = 0.017 ac, 100.00% Impervious, Inflow Depth = 4.76" for 10 year storm event event
 Inflow = 0.09 cfs @ 12.07 hrs, Volume= 0.007 af
 Outflow = 0.08 cfs @ 12.11 hrs, Volume= 0.007 af, Atten= 13%, Lag= 2.5 min
 Primary = 0.08 cfs @ 12.11 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 97.18' @ 12.11 hrs Surf.Area= 0 sf Storage= 20 cf

Plug-Flow detention time= 6.5 min calculated for 0.007 af (100% of inflow)
 Center-of-Mass det. time= 6.5 min (753.6 - 747.1)

Volume	Invert	Avail.Storage	Storage Description
#1	97.17'	748 cf	Custom Stage Data Listed below

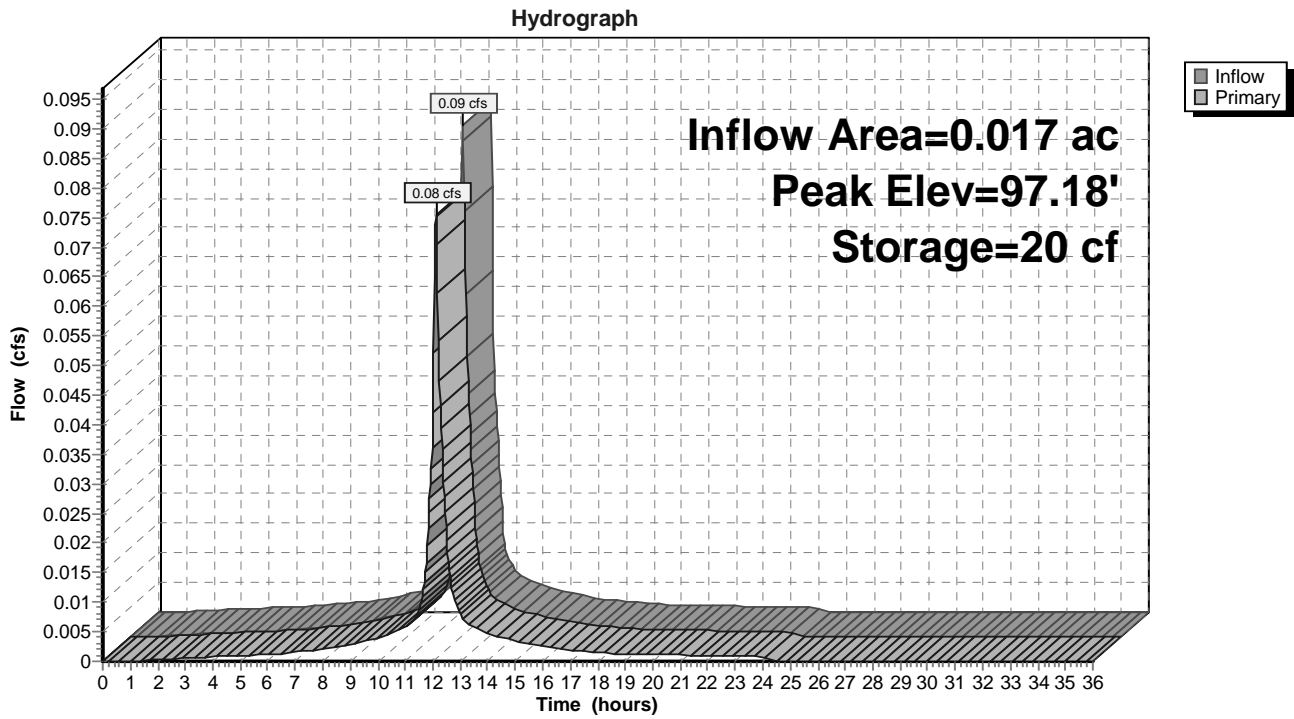
Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.17	0	0
97.67	748	748

Device	Routing	Invert	Outlet Devices
#1	Primary	97.17'	18.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.07 cfs @ 12.11 hrs HW=97.18' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir** (Weir Controls 0.07 cfs @ 0.31 fps)

Pond Det 1: Detention Basin # 1 - Pool



Summary for Pond Det 2: Detention Basin # 2

Inflow Area = 0.815 ac, 32.82% Impervious, Inflow Depth = 3.41" for 10 year storm event event
 Inflow = 2.81 cfs @ 12.10 hrs, Volume= 0.231 af
 Outflow = 0.61 cfs @ 12.56 hrs, Volume= 0.231 af, Atten= 78%, Lag= 27.7 min
 Discarded = 0.11 cfs @ 10.41 hrs, Volume= 0.148 af
 Primary = 0.50 cfs @ 12.56 hrs, Volume= 0.083 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 72.58' @ 12.56 hrs Surf.Area= 7,161 sf Storage= 3,894 cf

Plug-Flow detention time= 142.9 min calculated for 0.231 af (100% of inflow)
 Center-of-Mass det. time= 142.8 min (943.6 - 800.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	71.66'	2,338 cf	42.00'W x 170.50'L x 1.21'H Field A 8,653 cf Overall - 2,807 cf Embedded = 5,846 cf x 40.0% Voids
#2A	72.16'	2,807 cf	Cultec FD C-4 x 210 Inside #1 Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.67 sf x 10 rows
		5,145 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	72.16'	8.0" Vert. Orifice/Grate C= 0.600
#2	Discarded	71.66'	0.652 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.11 cfs @ 10.41 hrs HW=71.67' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.50 cfs @ 12.56 hrs HW=72.58' (Free Discharge)
 ↑ **1=Orifice/Grate** (Orifice Controls 0.50 cfs @ 2.19 fps)

Pond Det 2: Detention Basin # 2 - Chamber Wizard Field A

Chamber Model = Cultec FD C-4 (Cultec Contactor® Field Drain C-4)

Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf

Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap

Row Length Adjustment= +0.50' x 1.67 sf x 10 rows

21 Chambers/Row x 8.00' Long +0.50' Row Adjustment = 168.50' Row Length +12.0" End Stone x 2 = 170.50' Base Length

10 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width

6.0" Base + 8.5" Chamber Height = 1.21' Field Height

210 Chambers x 13.3 cf +0.50' Row Adjustment x 1.67 sf x 10 Rows = 2,807.2 cf Chamber Storage

8,652.9 cf Field - 2,807.2 cf Chambers = 5,845.7 cf Stone x 40.0% Voids = 2,338.3 cf Stone Storage

Chamber Storage + Stone Storage = 5,145.5 cf = 0.118 af

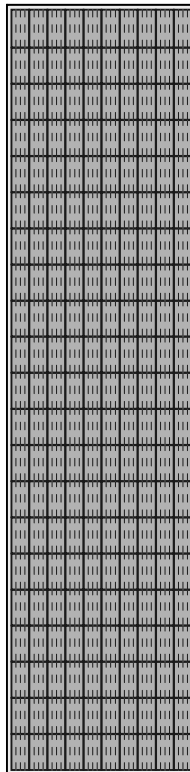
Overall Storage Efficiency = 59.5%

Overall System Size = 170.50' x 42.00' x 1.21'

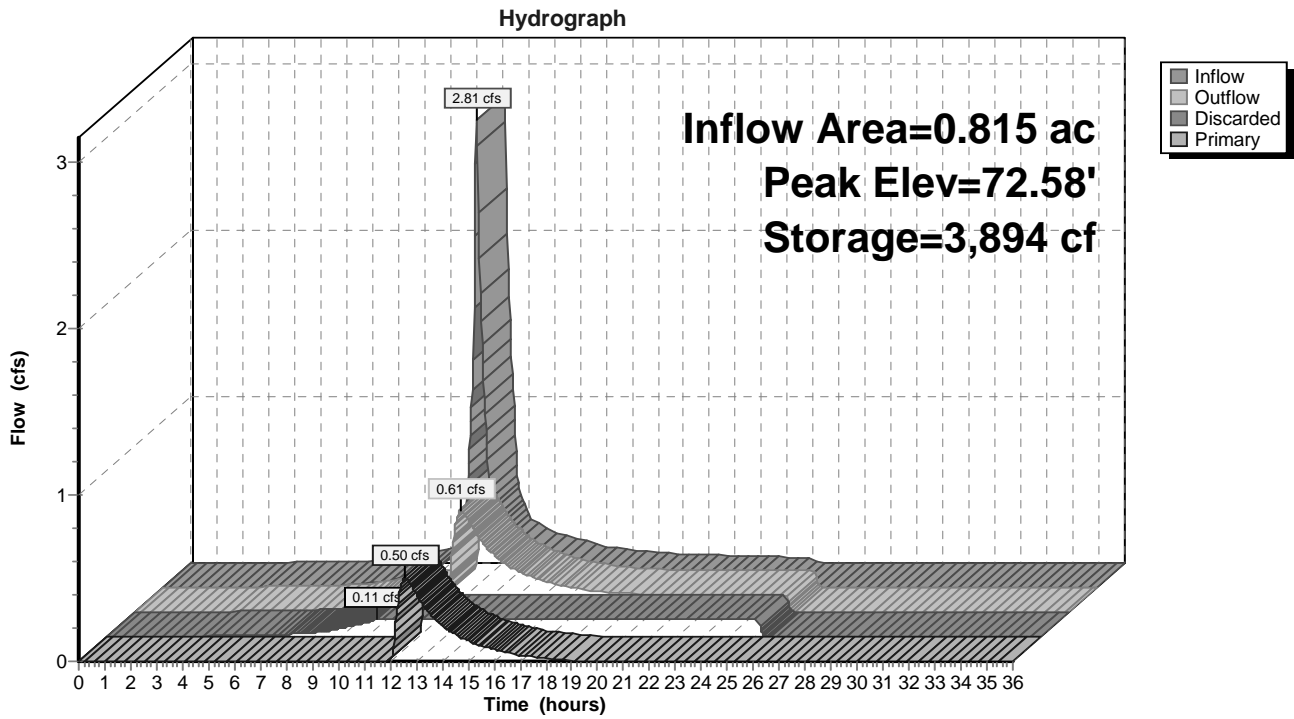
210 Chambers

320.5 cy Field

216.5 cy Stone



Pond Det 2: Detention Basin # 2



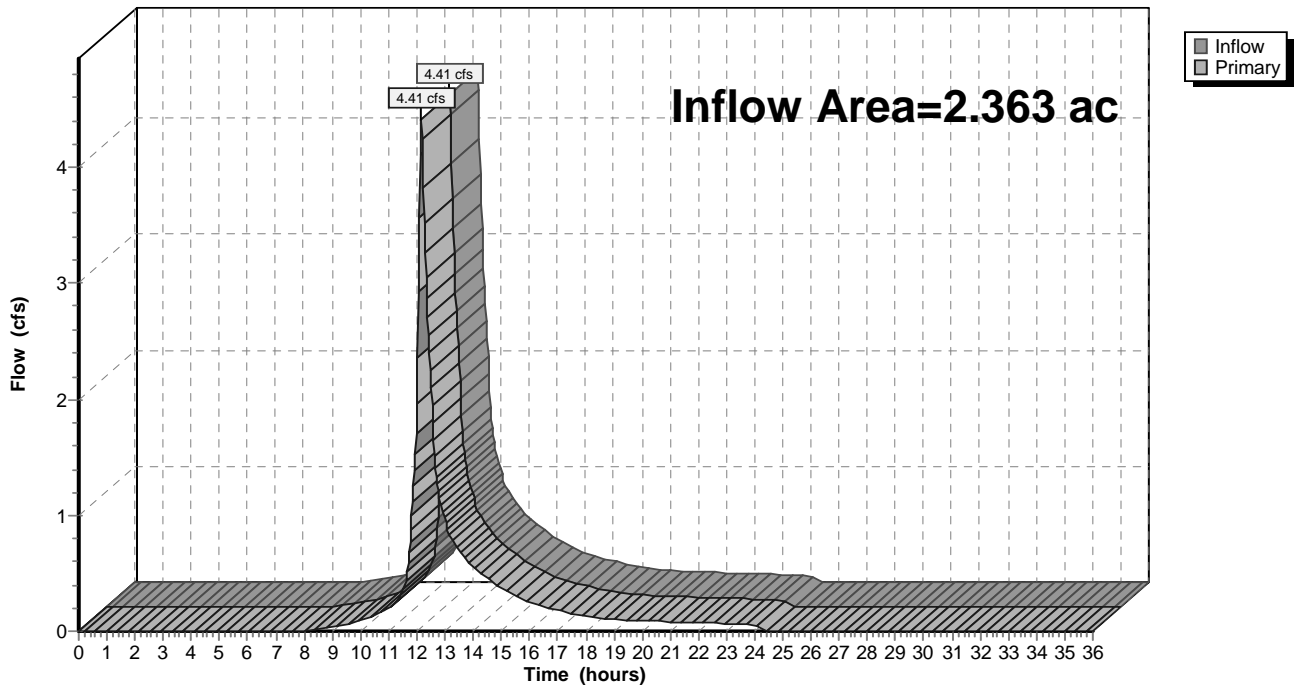
Summary for Link 1L: (new Link)

Inflow Area = 2.363 ac, 12.65% Impervious, Inflow Depth = 2.27" for 10 year storm event event
Inflow = 4.41 cfs @ 12.16 hrs, Volume= 0.447 af
Primary = 4.41 cfs @ 12.16 hrs, Volume= 0.447 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Link 1L: (new Link)

Hydrograph



Hydrology Calculations 07-21-20*Type III 24-hr 25 year storm event Rainfall=5.70"*

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 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 Post 1: Post Development - Runoff Area=748 sf 100.00% Impervious Runoff Depth=5.46"
 Tc=5.0 min CN=98 Runoff=0.10 cfs 0.008 af

Subcatchment Post 2: Post Development - Runoff Area=12,481 sf 19.04% Impervious Runoff Depth=3.71"
 Flow Length=148' Tc=7.7 min CN=82 Runoff=1.16 cfs 0.089 af

Subcatchment Post 3: Post Development - Runoff Area=14,097 sf 8.12% Impervious Runoff Depth=3.61"
 Flow Length=214' Tc=10.3 min CN=81 Runoff=1.18 cfs 0.097 af

Subcatchment Post 4: Post Development - Runoff Area=8,924 sf 91.10% Impervious Runoff Depth=5.23"
 Tc=5.0 min CN=96 Runoff=1.16 cfs 0.089 af

Subcatchment Post 5: Post Development - Runoff Area=66,683 sf 0.93% Impervious Runoff Depth=3.41"
 Flow Length=459' Tc=11.4 min CN=79 Runoff=5.11 cfs 0.435 af

Subcatchment Pre 1: Pre Development - Runoff Area=102,931 sf 0.00% Impervious Runoff Depth=3.41"
 Flow Length=459' Tc=11.4 min CN=79 Runoff=7.89 cfs 0.672 af

Pond Det 1: Detention Basin # 1 - Pool Peak Elev=97.18' Storage=22 cf Inflow=0.10 cfs 0.008 af
 Outflow=0.09 cfs 0.008 af

Pond Det 2: Detention Basin # 2 Peak Elev=72.70' Storage=4,537 cf Inflow=3.33 cfs 0.275 af
 Discarded=0.11 cfs 0.158 af Primary=0.76 cfs 0.117 af Outflow=0.87 cfs 0.275 af

Link 1L: (new Link) Inflow=5.51 cfs 0.560 af
 Primary=5.51 cfs 0.560 af

Total Runoff Area = 4.726 ac Runoff Volume = 1.391 af Average Runoff Depth = 3.53"
93.68% Pervious = 4.427 ac 6.32% Impervious = 0.299 ac

Summary for Subcatchment Post 1: Post Dvelopment - Sub Catchment # 1

Runoff = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af, Depth= 5.46"

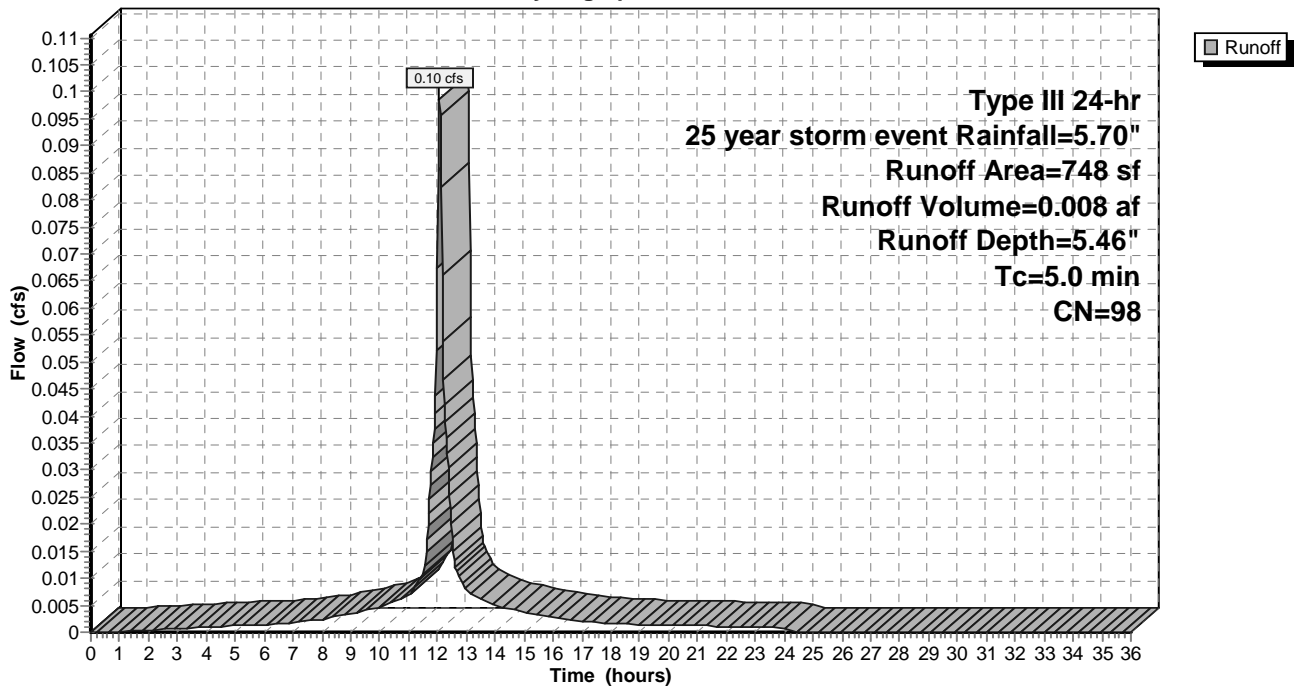
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 25 year storm event Rainfall=5.70"

Area (sf)	CN	Description
* 748	98	Pool
748		100.00% Impervious Area

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

Subcatchment Post 1: Post Dvelopment - Sub Catchment # 1

Hydrograph



Summary for Subcatchment Post 2: Post Development - Sub Catchment # 2

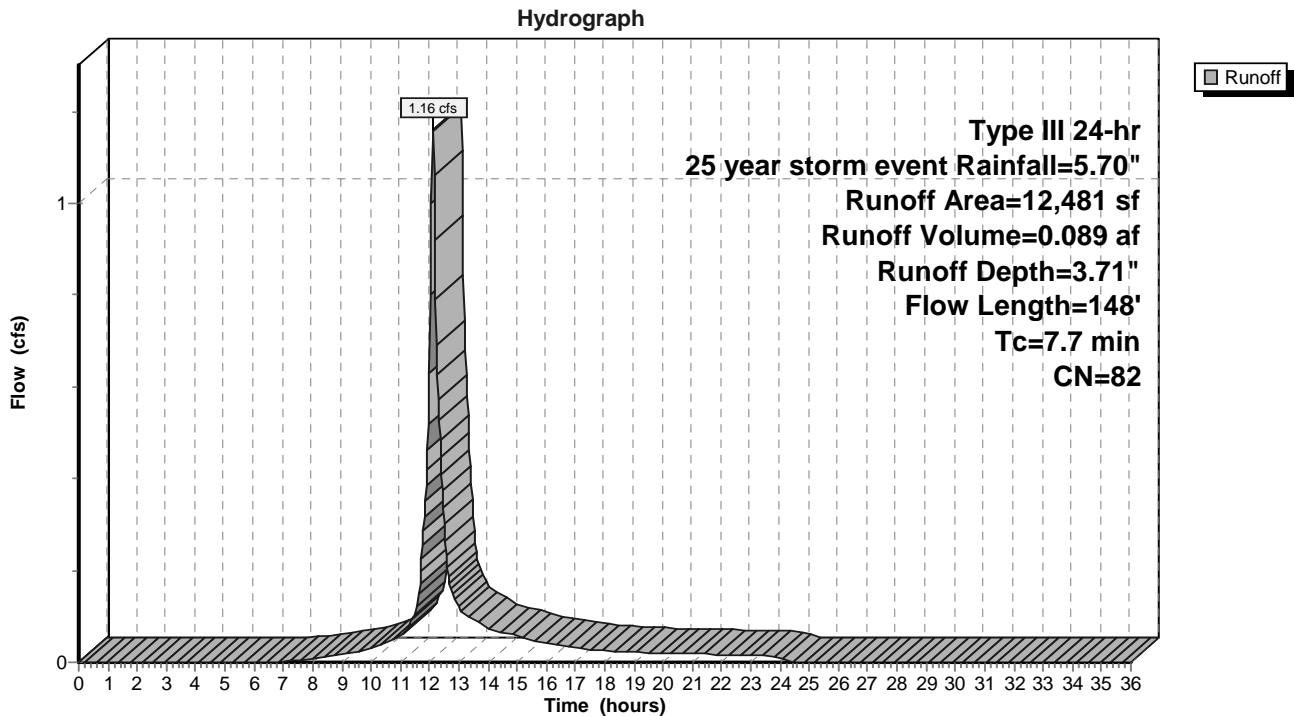
Runoff = 1.16 cfs @ 12.11 hrs, Volume= 0.089 af, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 25 year storm event Rainfall=5.70"

Area (sf)	CN	Description
* 2,377	98	Pool patio
9,835	79	50-75% Grass cover, Fair, HSG C
269	70	Brush, Fair, HSG C
12,481	82	Weighted Average
10,104		80.96% Pervious Area
2,377		19.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	108	0.1300	0.25		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
0.6	40	0.0030	1.11		Shallow Concentrated Flow, shallow concentrated flow Paved Kv= 20.3 fps
7.7	148	Total			

Subcatchment Post 2: Post Development - Sub Catchment # 2



Summary for Subcatchment Post 3: Post Development - Sub Catchment # 3

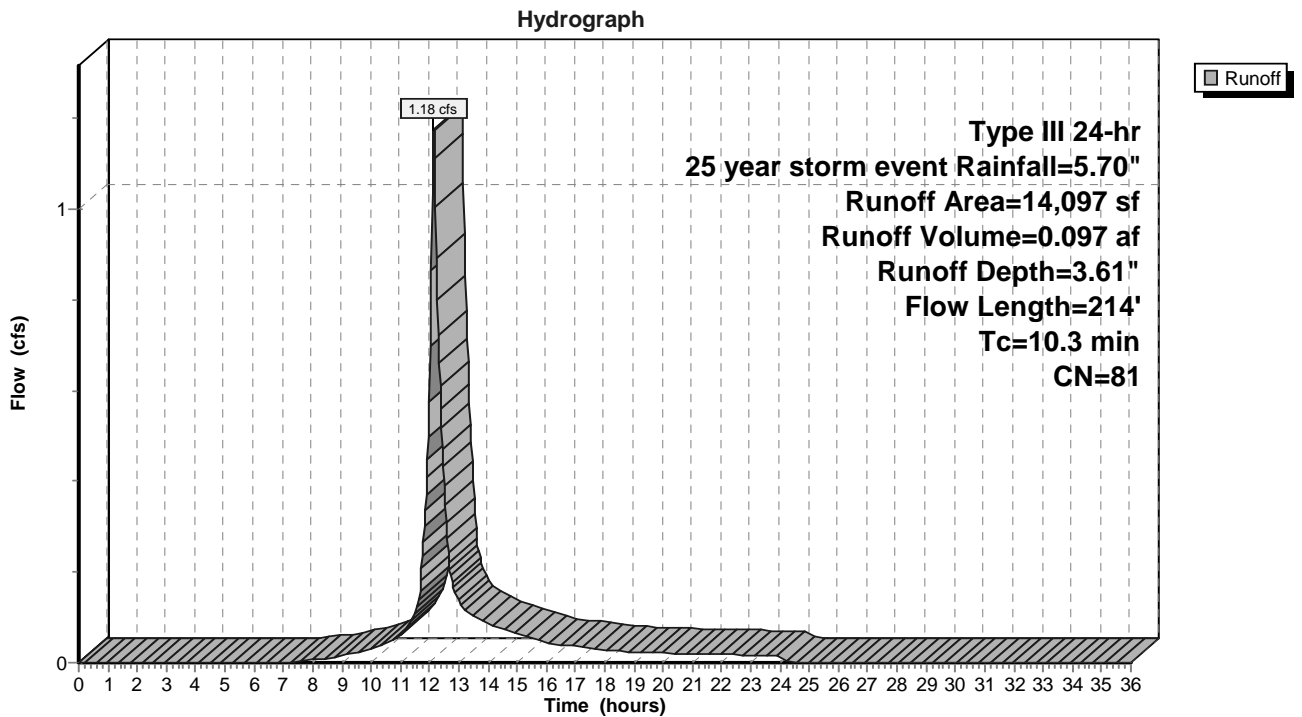
Runoff = 1.18 cfs @ 12.14 hrs, Volume= 0.097 af, Depth= 3.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 25 year storm event Rainfall=5.70"

Area (sf)	CN	Description
12,953	79	50-75% Grass cover, Fair, HSG C
* 1,144	98	Driveway
14,097	81	Weighted Average
12,953		91.88% Pervious Area
1,144		8.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	143	0.1120	0.25		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
0.8	41	0.0150	0.86		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
0.1	30	0.1000	6.42		Shallow Concentrated Flow, shallow concentrated flow Paved Kv= 20.3 fps
10.3	214	Total			

Subcatchment Post 3: Post Development - Sub Catchment # 3



Summary for Subcatchment Post 4: Post Development - Sub Catchment # 4

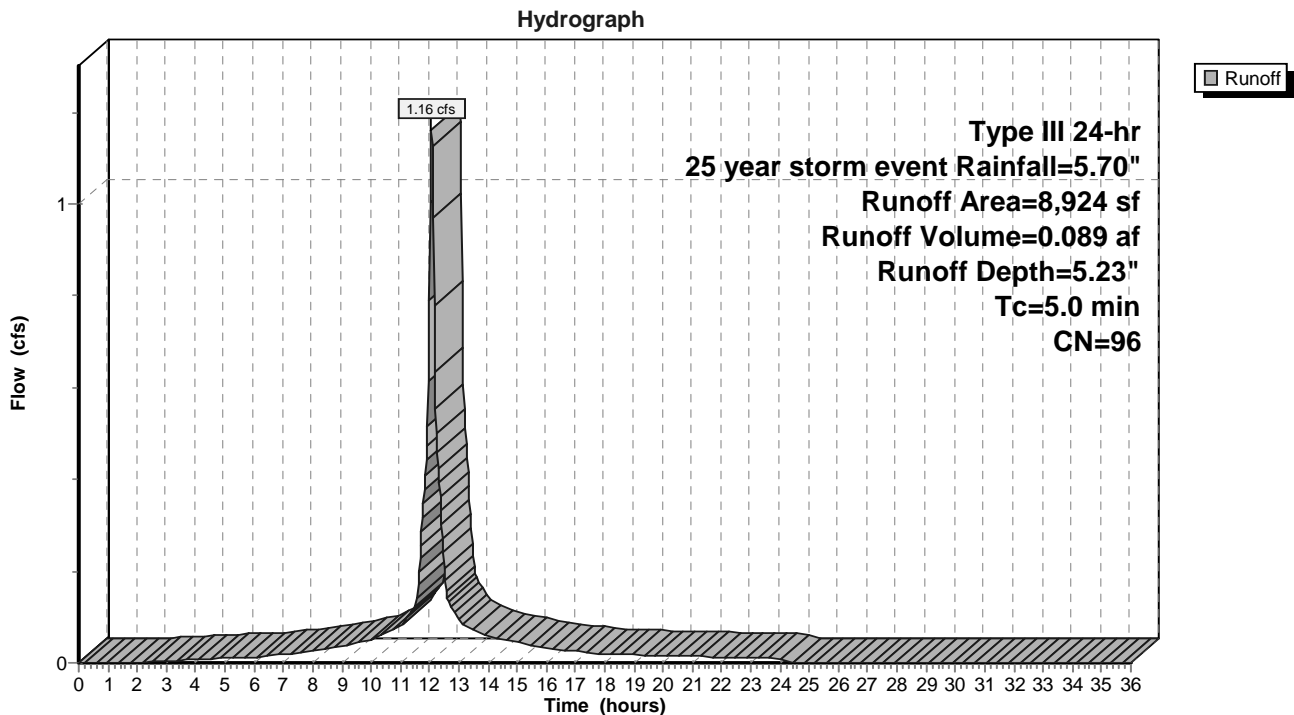
Runoff = 1.16 cfs @ 12.07 hrs, Volume= 0.089 af, Depth= 5.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 25 year storm event Rainfall=5.70"

	Area (sf)	CN	Description
*	3,108	98	House roof area
*	1,018	98	Office roof area
*	1,918	98	parking court
	794	79	50-75% Grass cover, Fair, HSG C
*	2,086	98	Lower driveway
	8,924	96	Weighted Average
	794		8.90% Pervious Area
	8,130		91.10% Impervious Area

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

Subcatchment Post 4: Post Development - Sub Catchment # 4



Hydrology Calculations 07-21-20

Type III 24-hr 25 year storm event Rainfall=5.70"

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Summary for Subcatchment Post 5: Post Development - Sub Catchment # 5 Remaining Area

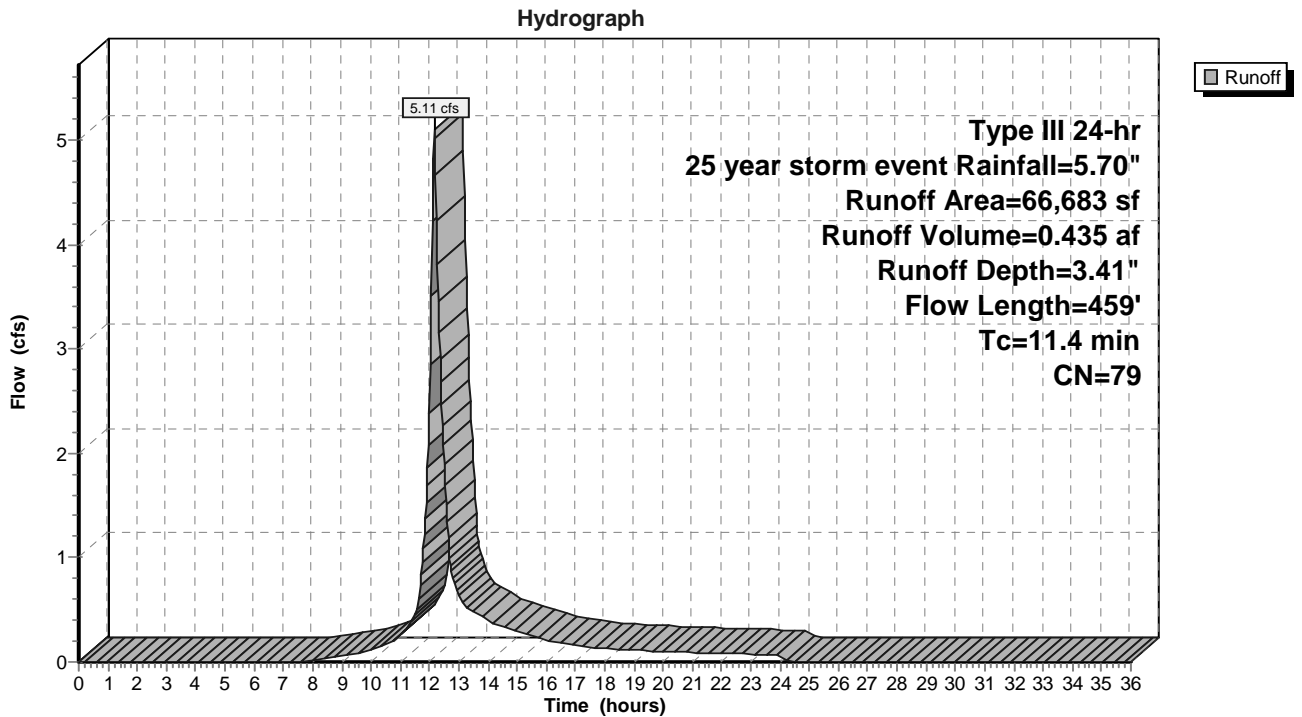
Runoff = 5.11 cfs @ 12.16 hrs, Volume= 0.435 af, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 25 year storm event Rainfall=5.70"

Area (sf)	CN	Description
* 621	98	various walks
23,841	79	Woods, Fair, HSG D
42,221	79	50-75% Grass cover, Fair, HSG C
66,683	79	Weighted Average
66,062		99.07% Pervious Area
621		0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	122	0.0980	0.23		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
1.6	245	0.1320	2.54		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
1.1	92	0.0840	1.45		Shallow Concentrated Flow, shallow concentrated flow Woodland Kv= 5.0 fps
11.4	459	Total			

Subcatchment Post 5: Post Development - Sub Catchment # 5 Remaining Area



Hydrology Calculations 07-21-20

Type III 24-hr 25 year storm event Rainfall=5.70"

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Summary for Subcatchment Pre 1: Pre Development - Sub Catchment # 1

Runoff = 7.89 cfs @ 12.16 hrs, Volume= 0.672 af, Depth= 3.41"

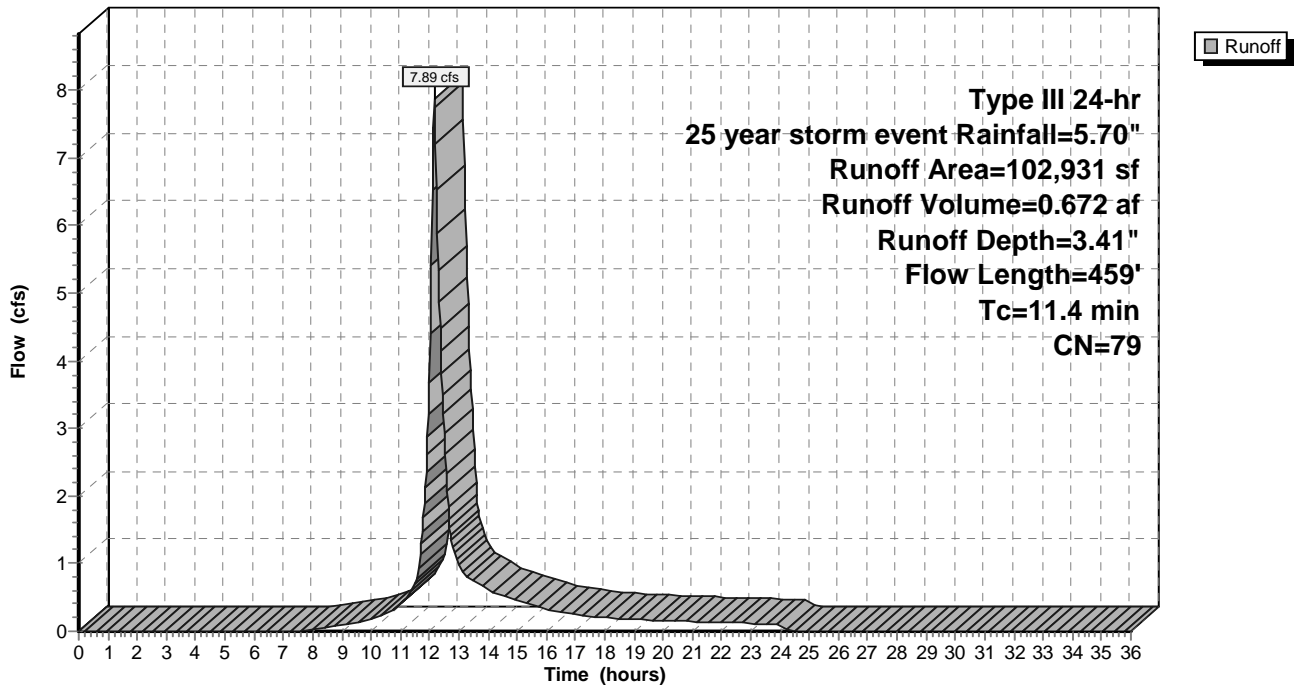
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 25 year storm event Rainfall=5.70"

Area (sf)	CN	Description
79,090	79	50-75% Grass cover, Fair, HSG C
23,841	79	Woods, Fair, HSG D
102,931	79	Weighted Average
102,931		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	122	0.0980	0.23		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
1.6	245	0.1320	2.54		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
1.1	92	0.0840	1.45		Shallow Concentrated Flow, shallow concentrated flow Woodland Kv= 5.0 fps
11.4	459	Total			

Subcatchment Pre 1: Pre Development - Sub Catchment # 1

Hydrograph



Hydrology Calculations 07-21-20

Type III 24-hr 25 year storm event Rainfall=5.70"

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Summary for Pond Det 1: Detention Basin # 1 - Pool

Inflow Area = 0.017 ac, 100.00% Impervious, Inflow Depth = 5.46" for 25 year storm event event
 Inflow = 0.10 cfs @ 12.07 hrs, Volume= 0.008 af
 Outflow = 0.09 cfs @ 12.11 hrs, Volume= 0.008 af, Atten= 12%, Lag= 2.5 min
 Primary = 0.09 cfs @ 12.11 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 97.18' @ 12.11 hrs Surf.Area= 0 sf Storage= 22 cf

Plug-Flow detention time= 6.5 min calculated for 0.008 af (100% of inflow)
 Center-of-Mass det. time= 6.5 min (751.5 - 745.0)

Volume	Invert	Avail.Storage	Storage Description
#1	97.17'	748 cf	Custom Stage Data Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.17	0	0
97.67	748	748

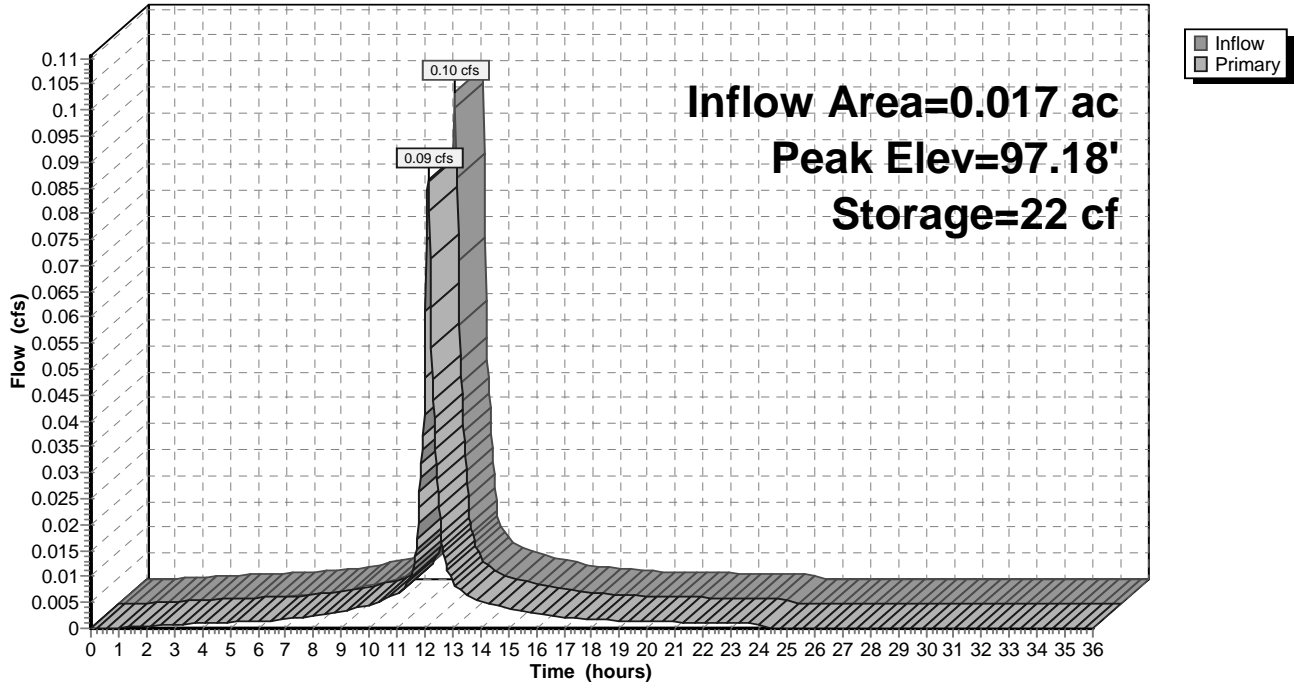
Device	Routing	Invert	Outlet Devices
#1	Primary	97.17'	18.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.09 cfs @ 12.11 hrs HW=97.18' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.09 cfs @ 0.33 fps)

Pond Det 1: Detention Basin # 1 - Pool

Hydrograph



Hydrology Calculations 07-21-20

Type III 24-hr 25 year storm event Rainfall=5.70"

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Summary for Pond Det 2: Detention Basin # 2

Inflow Area = 0.815 ac, 32.82% Impervious, Inflow Depth = 4.05" for 25 year storm event event
 Inflow = 3.33 cfs @ 12.10 hrs, Volume= 0.275 af
 Outflow = 0.87 cfs @ 12.52 hrs, Volume= 0.275 af, Atten= 74%, Lag= 24.9 min
 Discarded = 0.11 cfs @ 10.02 hrs, Volume= 0.158 af
 Primary = 0.76 cfs @ 12.52 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 72.70' @ 12.52 hrs Surf.Area= 7,161 sf Storage= 4,537 cf

Plug-Flow detention time= 135.3 min calculated for 0.275 af (100% of inflow)
 Center-of-Mass det. time= 135.3 min (932.1 - 796.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	71.66'	2,338 cf	42.00'W x 170.50'L x 1.21'H Field A 8,653 cf Overall - 2,807 cf Embedded = 5,846 cf x 40.0% Voids
#2A	72.16'	2,807 cf	Cultec FD C-4 x 210 Inside #1 Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.67 sf x 10 rows
		5,145 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	72.16'	8.0" Vert. Orifice/Grate C= 0.600
#2	Discarded	71.66'	0.652 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.11 cfs @ 10.02 hrs HW=71.67' (Free Discharge)
 ↑ **2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.76 cfs @ 12.52 hrs HW=72.70' (Free Discharge)
 ↑ **1=Orifice/Grate** (Orifice Controls 0.76 cfs @ 2.51 fps)

Pond Det 2: Detention Basin # 2 - Chamber Wizard Field A

Chamber Model = Cultec FD C-4 (Cultec Contactor® Field Drain C-4)

Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf

Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap

Row Length Adjustment= +0.50' x 1.67 sf x 10 rows

21 Chambers/Row x 8.00' Long +0.50' Row Adjustment = 168.50' Row Length +12.0" End Stone x 2 = 170.50' Base Length

10 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width

6.0" Base + 8.5" Chamber Height = 1.21' Field Height

210 Chambers x 13.3 cf +0.50' Row Adjustment x 1.67 sf x 10 Rows = 2,807.2 cf Chamber Storage

8,652.9 cf Field - 2,807.2 cf Chambers = 5,845.7 cf Stone x 40.0% Voids = 2,338.3 cf Stone Storage

Chamber Storage + Stone Storage = 5,145.5 cf = 0.118 af

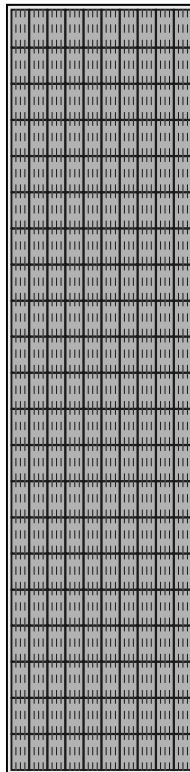
Overall Storage Efficiency = 59.5%

Overall System Size = 170.50' x 42.00' x 1.21'

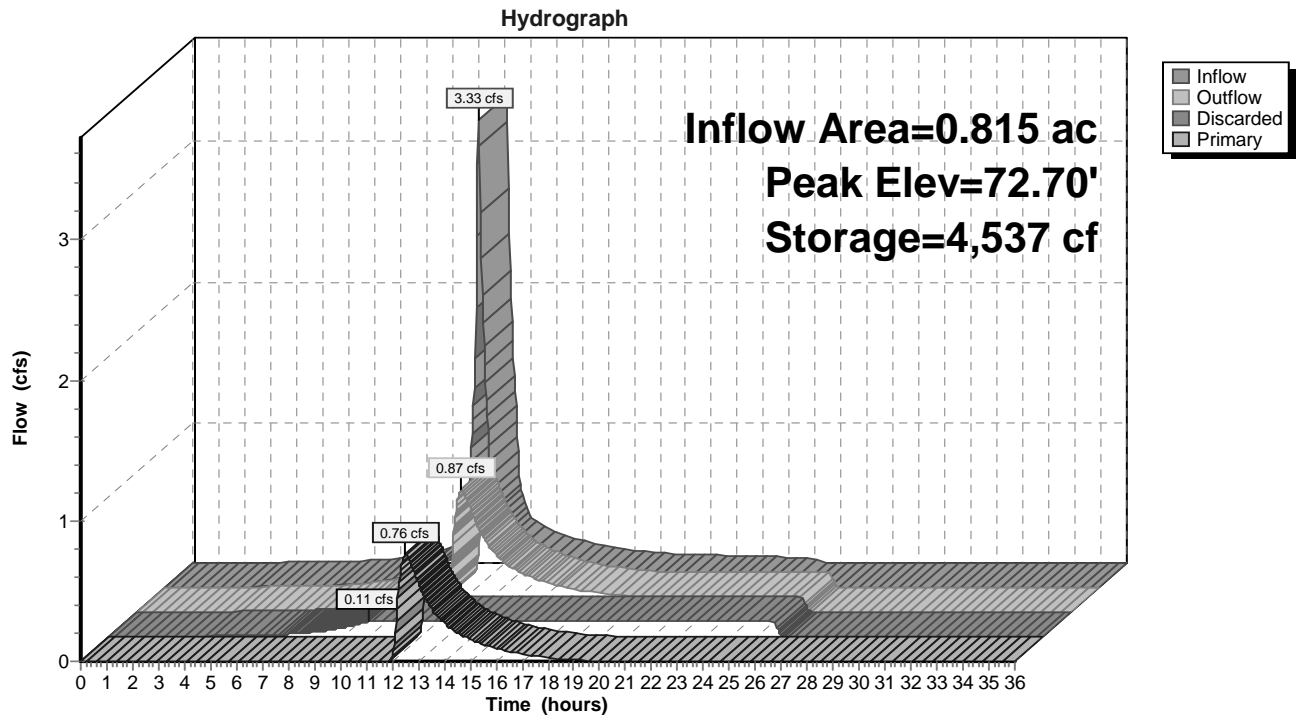
210 Chambers

320.5 cy Field

216.5 cy Stone



Pond Det 2: Detention Basin # 2



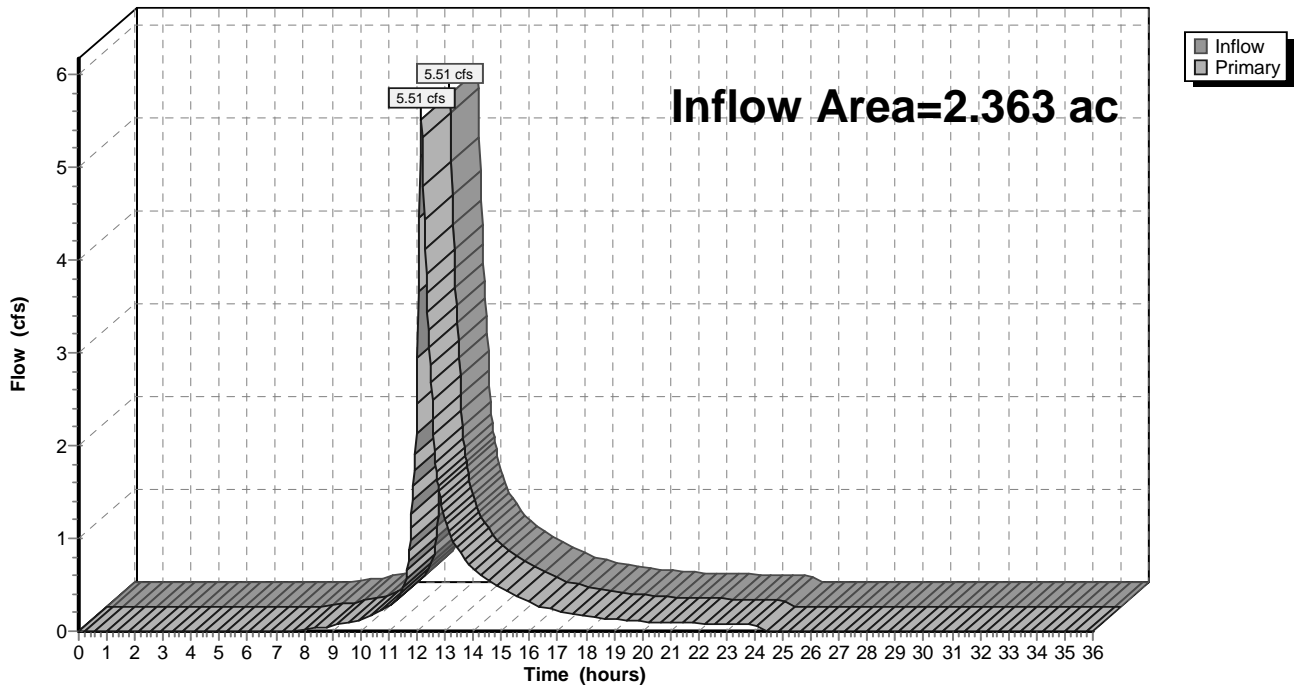
Summary for Link 1L: (new Link)

Inflow Area = 2.363 ac, 12.65% Impervious, Inflow Depth = 2.85" for 25 year storm event event
Inflow = 5.51 cfs @ 12.16 hrs, Volume= 0.560 af
Primary = 5.51 cfs @ 12.16 hrs, Volume= 0.560 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Link 1L: (new Link)

Hydrograph



Hydrology Calculations 07-21-20

Type III 24-hr 50 year storm event Rainfall=6.40"

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Time span=0.00-36.00 hrs, dt=0.03 hrs, 1201 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 Post 1: Post Development - Runoff Area=748 sf 100.00% Impervious Runoff Depth=6.16"
Tc=5.0 min CN=98 Runoff=0.11 cfs 0.009 af

Subcatchment Post 2: Post Development - Runoff Area=12,481 sf 19.04% Impervious Runoff Depth=4.36"
Flow Length=148' Tc=7.7 min CN=82 Runoff=1.36 cfs 0.104 af

Subcatchment Post 3: Post Development - Runoff Area=14,097 sf 8.12% Impervious Runoff Depth=4.25"
Flow Length=214' Tc=10.3 min CN=81 Runoff=1.38 cfs 0.115 af

Subcatchment Post 4: Post Development - Runoff Area=8,924 sf 91.10% Impervious Runoff Depth=5.93"
Tc=5.0 min CN=96 Runoff=1.31 cfs 0.101 af

Subcatchment Post 5: Post Development - Runoff Area=66,683 sf 0.93% Impervious Runoff Depth=4.04"
Flow Length=459' Tc=11.4 min CN=79 Runoff=6.03 cfs 0.515 af

Subcatchment Pre 1: Pre Development - Runoff Area=102,931 sf 0.00% Impervious Runoff Depth=4.04"
Flow Length=459' Tc=11.4 min CN=79 Runoff=9.31 cfs 0.795 af

Pond Det 1: Detention Basin # 1 - Pool Peak Elev=97.19' Storage=24 cf Inflow=0.11 cfs 0.009 af
Outflow=0.10 cfs 0.009 af

Pond Det 2: Detention Basin # 2 Peak Elev=72.93' Storage=5,145 cf Inflow=3.85 cfs 0.320 af
Discarded=0.11 cfs 0.167 af Primary=1.10 cfs 0.153 af Outflow=1.21 cfs 0.319 af

Link 1L: (new Link) Inflow=6.67 cfs 0.677 af
Primary=6.67 cfs 0.677 af

Total Runoff Area = 4.726 ac Runoff Volume = 1.639 af Average Runoff Depth = 4.16"
93.68% Pervious = 4.427 ac 6.32% Impervious = 0.299 ac

Summary for Subcatchment Post 1: Post Dvelopment - Sub Catchment # 1

Runoff = 0.11 cfs @ 12.07 hrs, Volume= 0.009 af, Depth= 6.16"

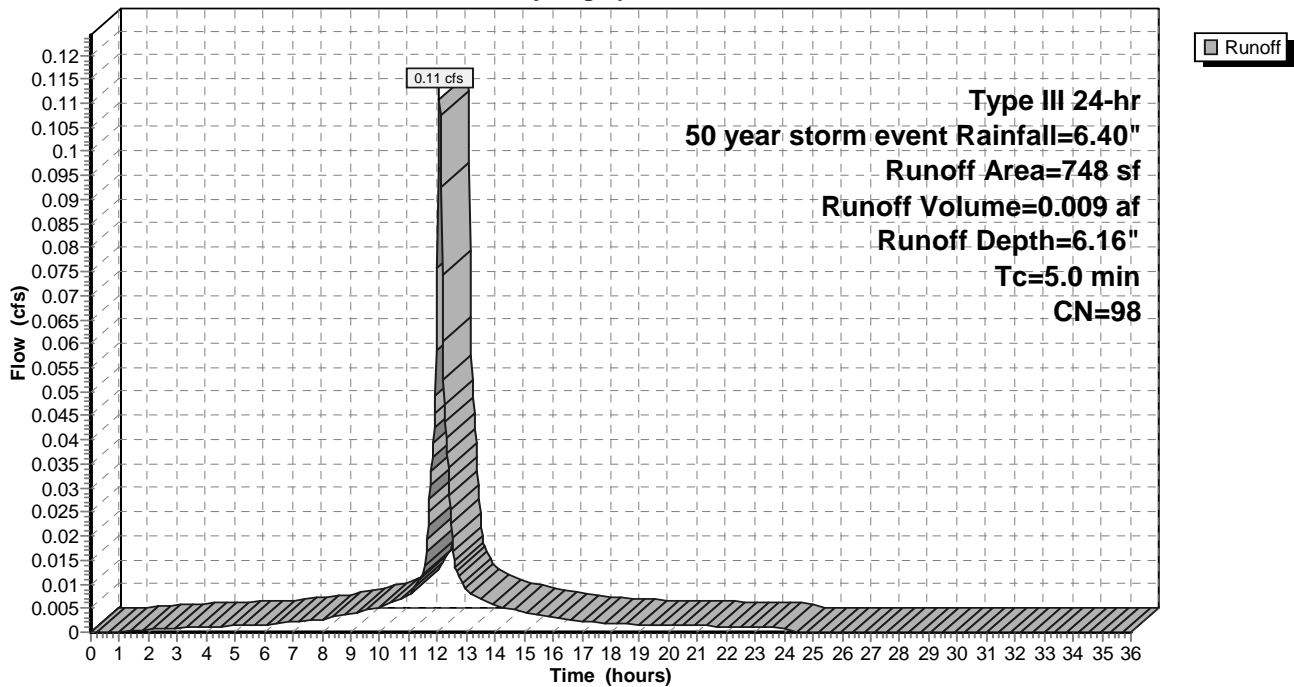
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 50 year storm event Rainfall=6.40"

Area (sf)	CN	Description
* 748	98	Pool
748		100.00% Impervious Area

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

Subcatchment Post 1: Post Dvelopment - Sub Catchment # 1

Hydrograph



Summary for Subcatchment Post 2: Post Development - Sub Catchment # 2

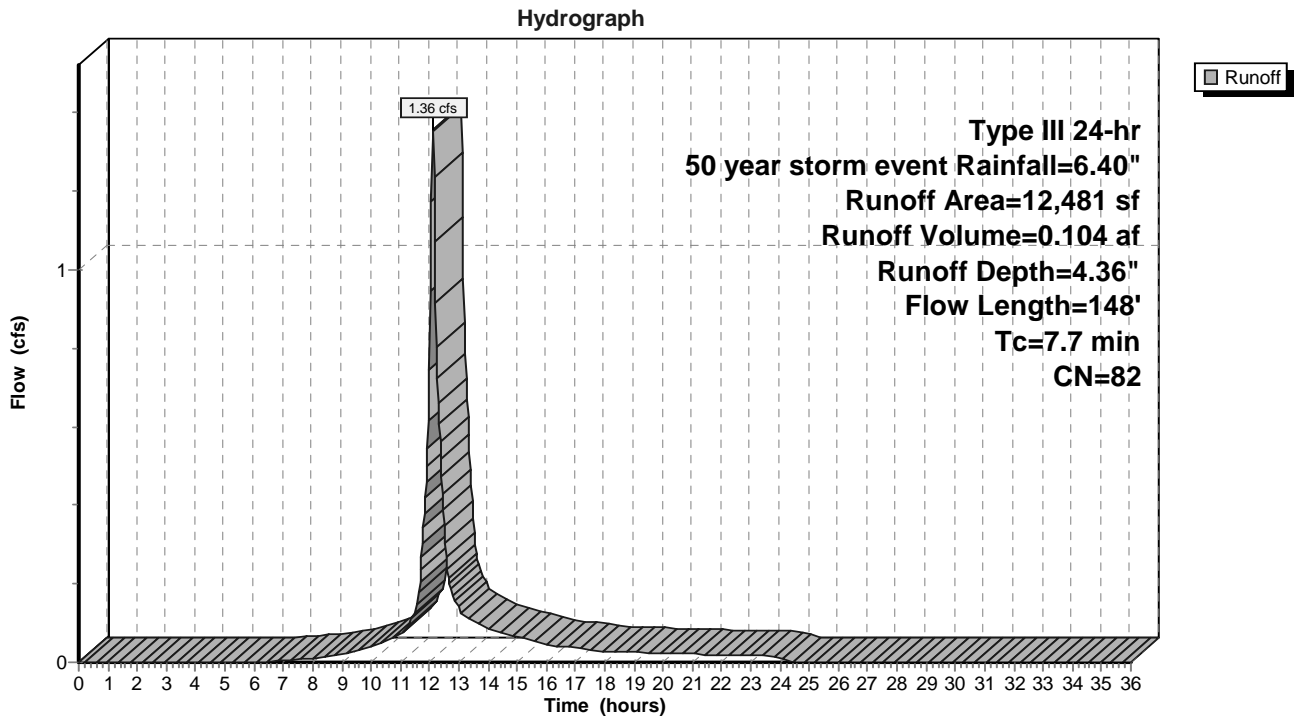
Runoff = 1.36 cfs @ 12.11 hrs, Volume= 0.104 af, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 50 year storm event Rainfall=6.40"

Area (sf)	CN	Description
* 2,377	98	Pool patio
9,835	79	50-75% Grass cover, Fair, HSG C
269	70	Brush, Fair, HSG C
12,481	82	Weighted Average
10,104		80.96% Pervious Area
2,377		19.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	108	0.1300	0.25		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
0.6	40	0.0030	1.11		Shallow Concentrated Flow, shallow concentrated flow Paved Kv= 20.3 fps
7.7	148	Total			

Subcatchment Post 2: Post Development - Sub Catchment # 2



Hydrology Calculations 07-21-20

Type III 24-hr 50 year storm event Rainfall=6.40"

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Summary for Subcatchment Post 3: Post Development - Sub Catchment # 3

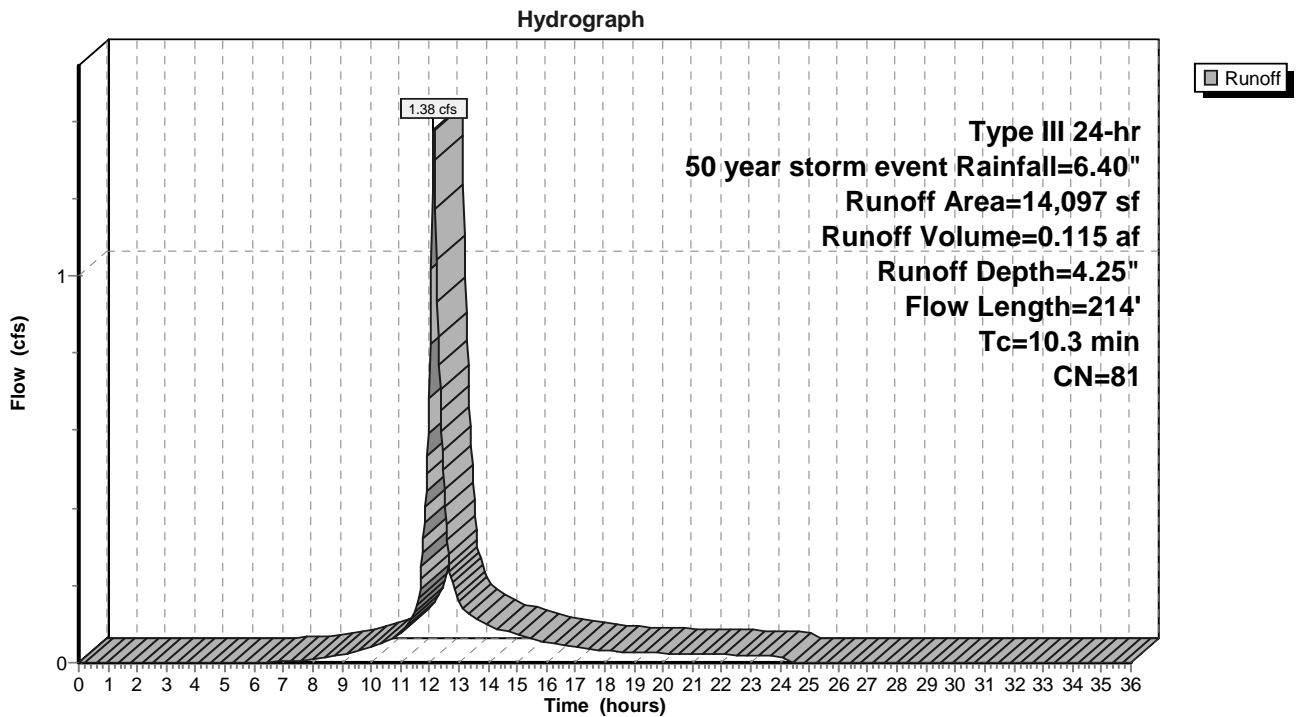
Runoff = 1.38 cfs @ 12.14 hrs, Volume= 0.115 af, Depth= 4.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 50 year storm event Rainfall=6.40"

Area (sf)	CN	Description
12,953	79	50-75% Grass cover, Fair, HSG C
* 1,144	98	Driveway
14,097	81	Weighted Average
12,953		91.88% Pervious Area
1,144		8.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	143	0.1120	0.25		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
0.8	41	0.0150	0.86		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
0.1	30	0.1000	6.42		Shallow Concentrated Flow, shallow concentrated flow Paved Kv= 20.3 fps
10.3	214	Total			

Subcatchment Post 3: Post Development - Sub Catchment # 3



Summary for Subcatchment Post 4: Post Development - Sub Catchment # 4

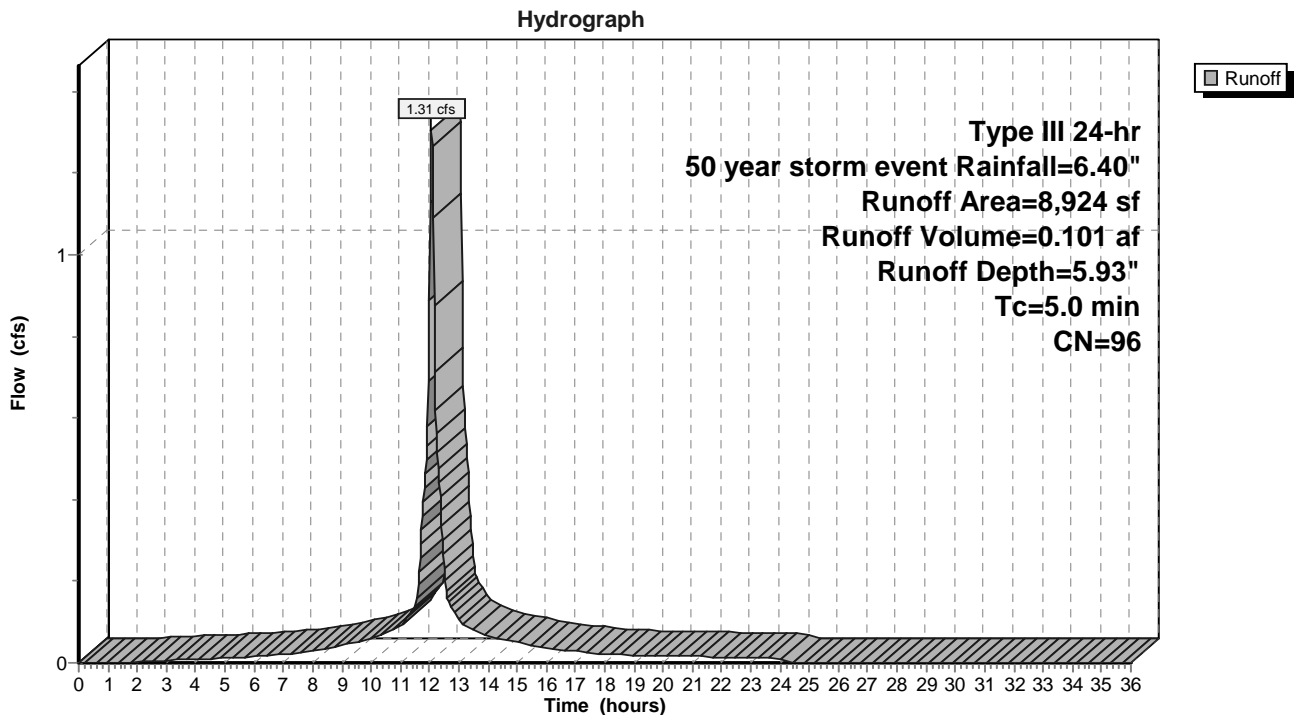
Runoff = 1.31 cfs @ 12.07 hrs, Volume= 0.101 af, Depth= 5.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 50 year storm event Rainfall=6.40"

	Area (sf)	CN	Description
*	3,108	98	House roof area
*	1,018	98	Office roof area
*	1,918	98	parking court
	794	79	50-75% Grass cover, Fair, HSG C
*	2,086	98	Lower driveway
<hr/>			
	8,924	96	Weighted Average
	794		8.90% Pervious Area
	8,130		91.10% Impervious Area

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

Subcatchment Post 4: Post Development - Sub Catchment # 4



Hydrology Calculations 07-21-20

Type III 24-hr 50 year storm event Rainfall=6.40"

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Summary for Subcatchment Post 5: Post Development - Sub Catchment # 5 Remaining Area

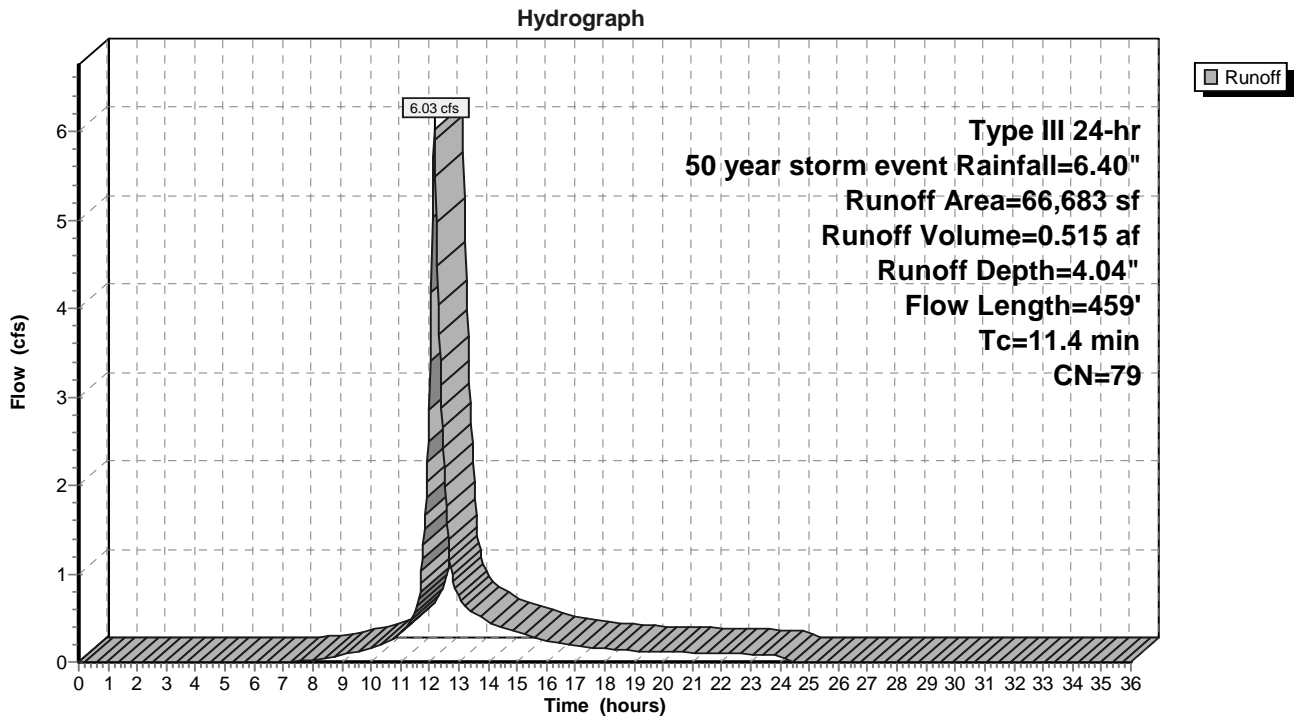
Runoff = 6.03 cfs @ 12.16 hrs, Volume= 0.515 af, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
Type III 24-hr 50 year storm event Rainfall=6.40"

Area (sf)	CN	Description
* 621	98	various walks
23,841	79	Woods, Fair, HSG D
42,221	79	50-75% Grass cover, Fair, HSG C
66,683	79	Weighted Average
66,062		99.07% Pervious Area
621		0.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	122	0.0980	0.23		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
1.6	245	0.1320	2.54		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
1.1	92	0.0840	1.45		Shallow Concentrated Flow, shallow concentrated flow Woodland Kv= 5.0 fps
11.4	459	Total			

Subcatchment Post 5: Post Development - Sub Catchment # 5 Remaining Area



Hydrology Calculations 07-21-20

Type III 24-hr 50 year storm event Rainfall=6.40"

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Summary for Subcatchment Pre 1: Pre Development - Sub Catchment # 1

Runoff = 9.31 cfs @ 12.16 hrs, Volume= 0.795 af, Depth= 4.04"

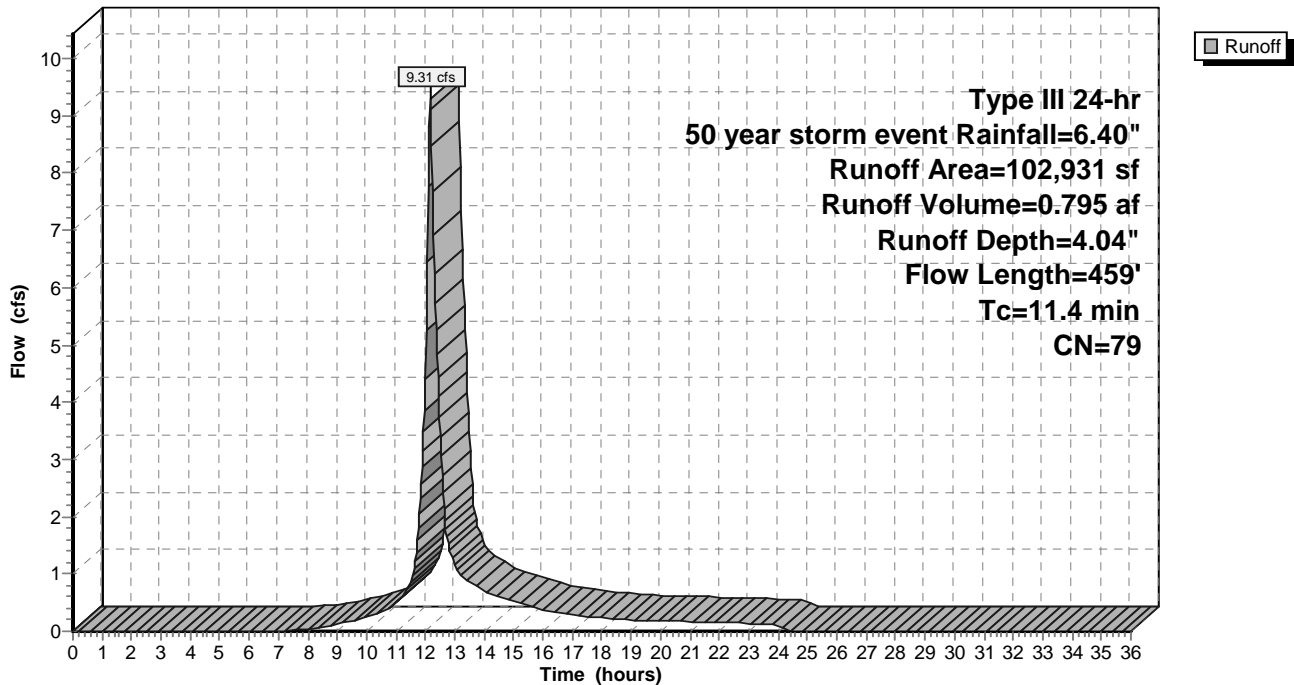
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs
 Type III 24-hr 50 year storm event Rainfall=6.40"

Area (sf)	CN	Description
79,090	79	50-75% Grass cover, Fair, HSG C
23,841	79	Woods, Fair, HSG D
102,931	79	Weighted Average
102,931		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	122	0.0980	0.23		Sheet Flow, sheet flow Grass: Dense n= 0.240 P2= 3.30"
1.6	245	0.1320	2.54		Shallow Concentrated Flow, shallow concentrated flow Short Grass Pasture Kv= 7.0 fps
1.1	92	0.0840	1.45		Shallow Concentrated Flow, shallow concentrated flow Woodland Kv= 5.0 fps
11.4	459	Total			

Subcatchment Pre 1: Pre Development - Sub Catchment # 1

Hydrograph



Hydrology Calculations 07-21-20

Type III 24-hr 50 year storm event Rainfall=6.40"

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Summary for Pond Det 1: Detention Basin # 1 - Pool

Inflow Area = 0.017 ac, 100.00% Impervious, Inflow Depth = 6.16" for 50 year storm event event
 Inflow = 0.11 cfs @ 12.07 hrs, Volume= 0.009 af
 Outflow = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af, Atten= 11%, Lag= 2.4 min
 Primary = 0.10 cfs @ 12.11 hrs, Volume= 0.009 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 97.19' @ 12.11 hrs Surf.Area= 0 sf Storage= 24 cf

Plug-Flow detention time= 6.5 min calculated for 0.009 af (100% of inflow)
 Center-of-Mass det. time= 6.4 min (749.7 - 743.3)

Volume	Invert	Avail.Storage	Storage Description
#1	97.17'	748 cf	Custom Stage Data Listed below

Elevation (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
97.17	0	0
97.67	748	748

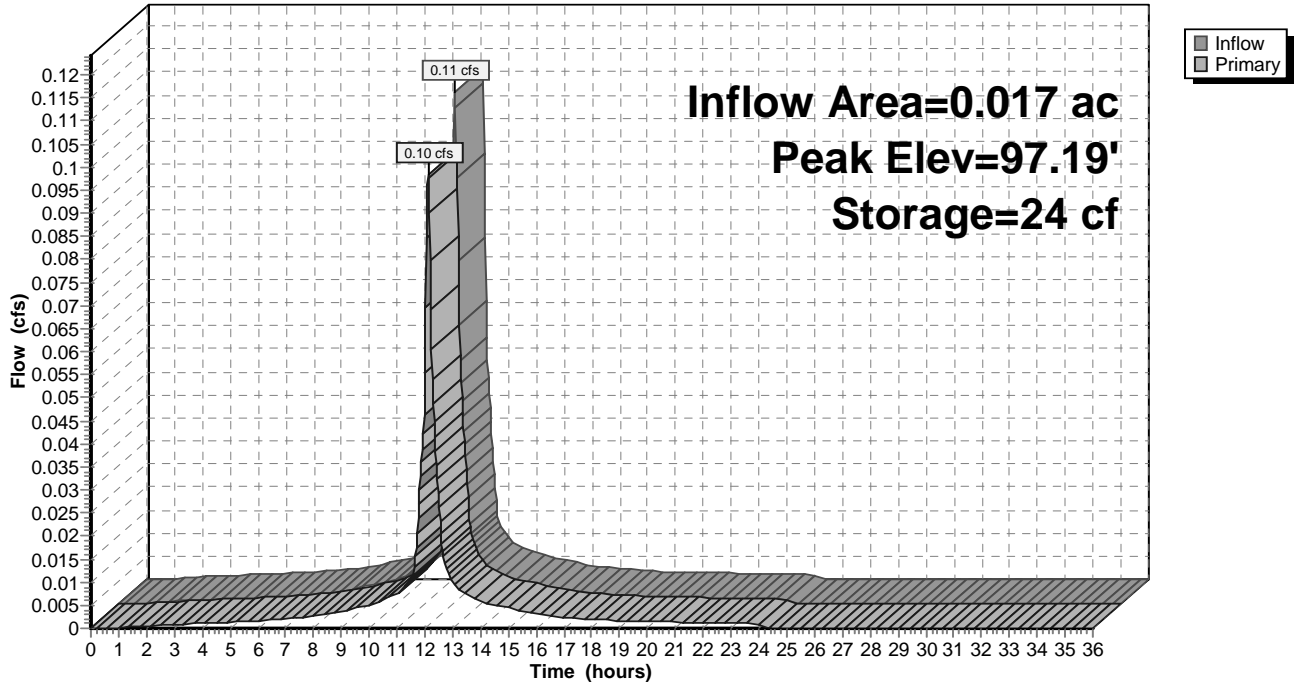
Device	Routing	Invert	Outlet Devices
#1	Primary	97.17'	18.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.10 cfs @ 12.11 hrs HW=97.19' (Free Discharge)

↑1=**Broad-Crested Rectangular Weir** (Weir Controls 0.10 cfs @ 0.34 fps)

Pond Det 1: Detention Basin # 1 - Pool

Hydrograph



Hydrology Calculations 07-21-20

Type III 24-hr 50 year storm event Rainfall=6.40"

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Summary for Pond Det 2: Detention Basin # 2

Inflow Area = 0.815 ac, 32.82% Impervious, Inflow Depth = 4.71" for 50 year storm event event
 Inflow = 3.85 cfs @ 12.10 hrs, Volume= 0.320 af
 Outflow = 1.21 cfs @ 12.45 hrs, Volume= 0.319 af, Atten= 68%, Lag= 20.8 min
 Discarded = 0.11 cfs @ 9.57 hrs, Volume= 0.167 af
 Primary = 1.10 cfs @ 12.45 hrs, Volume= 0.153 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 72.93' @ 12.45 hrs Surf.Area= 7,161 sf Storage= 5,145 cf

Plug-Flow detention time= 130.1 min calculated for 0.319 af (100% of inflow)
 Center-of-Mass det. time= 129.1 min (922.4 - 793.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	71.66'	2,338 cf	42.00'W x 170.50'L x 1.21'H Field A 8,653 cf Overall - 2,807 cf Embedded = 5,846 cf x 40.0% Voids
#2A	72.16'	2,807 cf	Cultec FD C-4 x 210 Inside #1 Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap Row Length Adjustment= +0.50' x 1.67 sf x 10 rows
		5,145 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	72.16'	8.0" Vert. Orifice/Grate C= 0.600
#2	Discarded	71.66'	0.652 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.11 cfs @ 9.57 hrs HW=71.67' (Free Discharge)
 ↑**2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=1.10 cfs @ 12.45 hrs HW=72.93' (Free Discharge)
 ↑**1=Orifice/Grate** (Orifice Controls 1.10 cfs @ 3.16 fps)

Pond Det 2: Detention Basin # 2 - Chamber Wizard Field A

Chamber Model = Cultec FD C-4 (Cultec Contactor® Field Drain C-4)

Effective Size= 42.0"W x 8.0"H => 1.67 sf x 8.00'L = 13.3 cf

Overall Size= 48.0"W x 8.5"H x 8.50'L with 0.50' Overlap

Row Length Adjustment= +0.50' x 1.67 sf x 10 rows

21 Chambers/Row x 8.00' Long +0.50' Row Adjustment = 168.50' Row Length +12.0" End Stone x 2 = 170.50' Base Length

10 Rows x 48.0" Wide + 12.0" Side Stone x 2 = 42.00' Base Width

6.0" Base + 8.5" Chamber Height = 1.21' Field Height

210 Chambers x 13.3 cf +0.50' Row Adjustment x 1.67 sf x 10 Rows = 2,807.2 cf Chamber Storage

8,652.9 cf Field - 2,807.2 cf Chambers = 5,845.7 cf Stone x 40.0% Voids = 2,338.3 cf Stone Storage

Chamber Storage + Stone Storage = 5,145.5 cf = 0.118 af

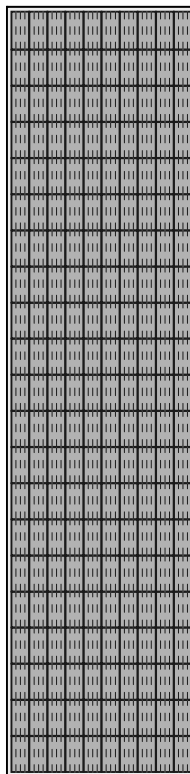
Overall Storage Efficiency = 59.5%

Overall System Size = 170.50' x 42.00' x 1.21'

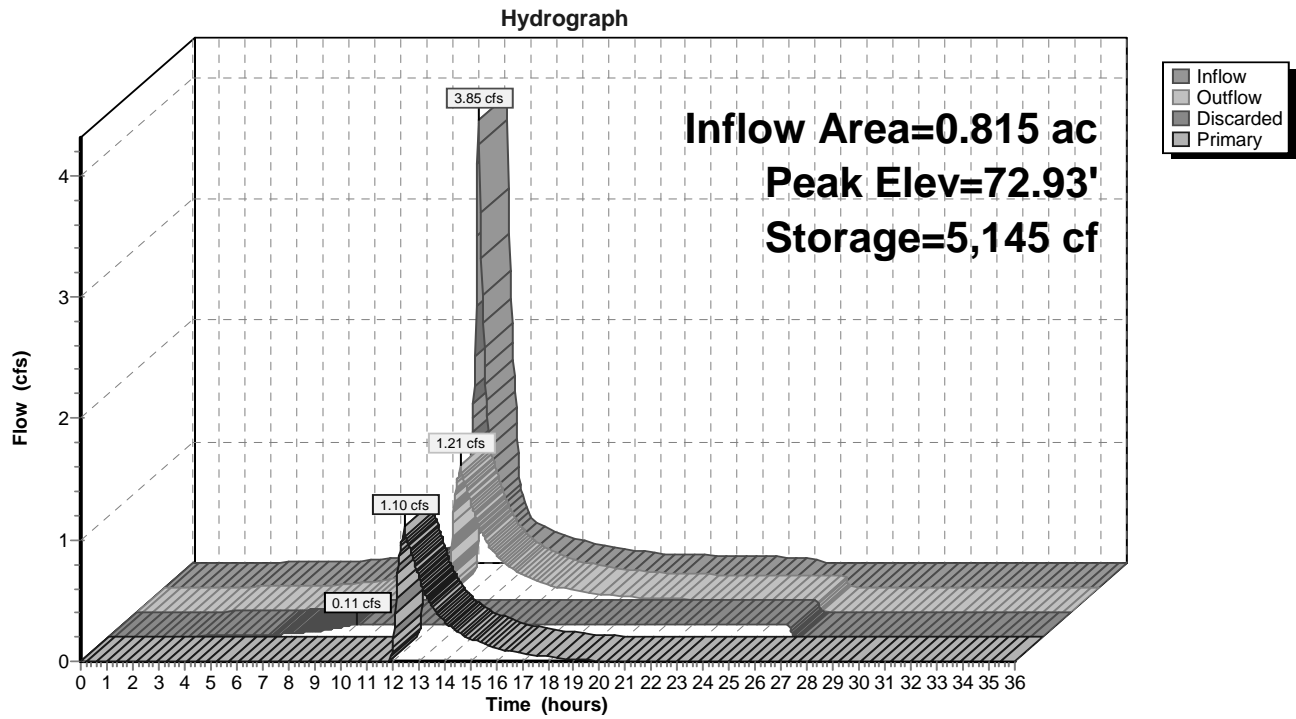
210 Chambers

320.5 cy Field

216.5 cy Stone



Pond Det 2: Detention Basin # 2



Summary for Link 1L: (new Link)

Inflow Area = 2.363 ac, 12.65% Impervious, Inflow Depth = 3.44" for 50 year storm event event
Inflow = 6.67 cfs @ 12.16 hrs, Volume= 0.677 af
Primary = 6.67 cfs @ 12.16 hrs, Volume= 0.677 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.03 hrs

Link 1L: (new Link)

Hydrograph

