Stormwater Report

For
44 Little Harbor Rd.
Cohasset, MA

Date: March 19, 2022
By: Matthew Pike, P.E.
Checked By: Joseph Hannon, P.E.
Atlantic Coast Engineering
88 Front Street, Scituate, MA 02066

PEAK RATE OF DISCHARGE

Table 1 - Peak Rate of Discharge (cfs)

	Design Point	
Design Storm	**Pre-**	**Post-**
2 year, 3.3"	1.59	1.06
10 year, 4.9"	2.94	2.68
100 year, 8.5"	6.83	6.44

RECHARGE

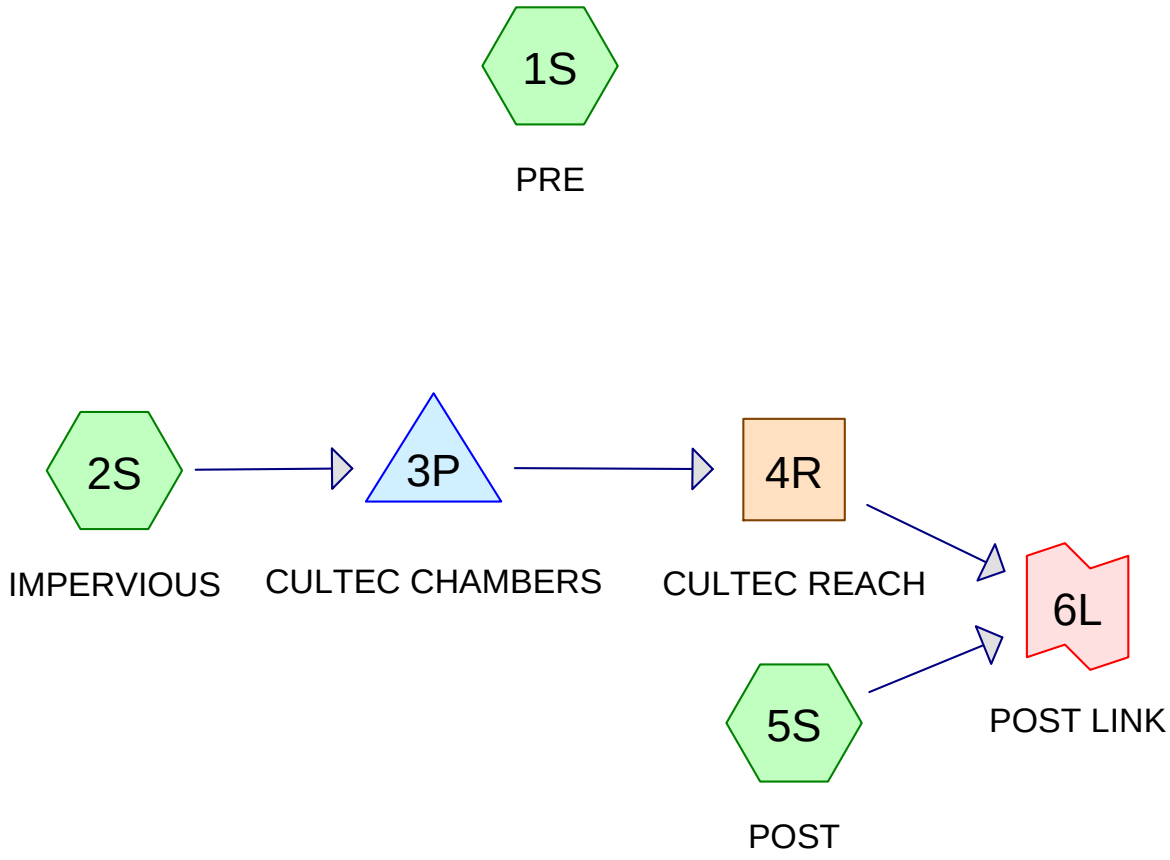
For HSG B Soils
Required Recharge = (0.35 in / 12 in/ft)(Impervious Area in sf)
= (0.35 in / 12 in/ft)(7,030 sf)
= 205 cf Required Recharge

The proposed recharge volume exceeds this volume as the stormwater management system provides 531 cf recharge volume.

WATER QUALITY

Vwq = (0.5 in / 12 in/ft)(Impervious area in sf)
Vwq = (0.5 in / 12 in/ft) (7,030 sf)
Vwq = 293 cf Required Water Quality Volume

The proposed water water quality exceeds this volume as the stormwater management system provides 531 cf water quality volume.



Subcat Reach Pond Link

Drainage Diagram for 44 Little Harbor 3.19.22
Prepared by Atlantic Coast Engineering 3/19/2022

Subcatchment 1S: PRE

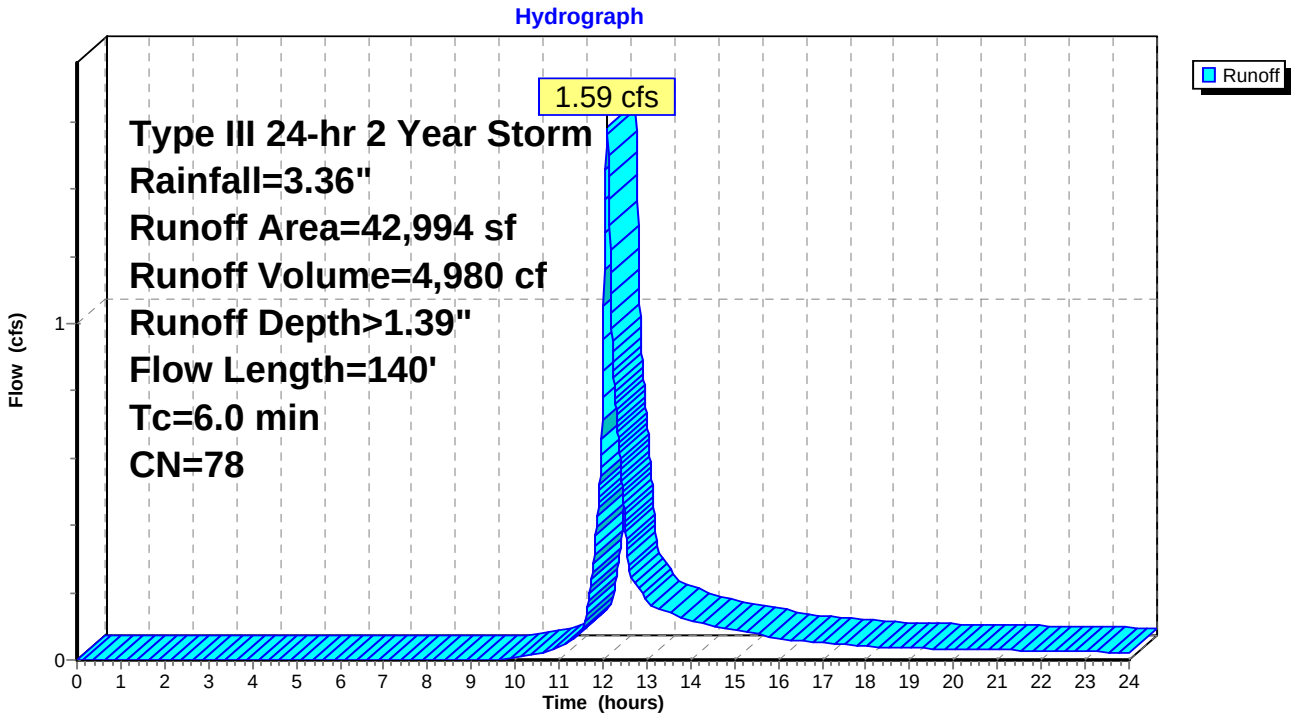
Runoff = 1.59 cfs @ 12.09 hrs, Volume= 4,980 cf, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.36"

Area (sf)	CN	Description
3,218	98	House
3,271	98	Drive
1,744	98	Ledge
7,282	65	Woods/brush comb., Fair, HSG B
8,549	76	Woods/brush comb., Fair, HSG C
8,708	69	Grass cover, Fair, HSG B
10,222	79	Grass cover, Fair, HSG C
42,994	78	Weighted Average
34,761		Pervious Area
8,233		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	140		0.47		**Direct Entry, Direct**
5.0	140	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: PRE



Subcatchment 2S: IMPERVIOUS

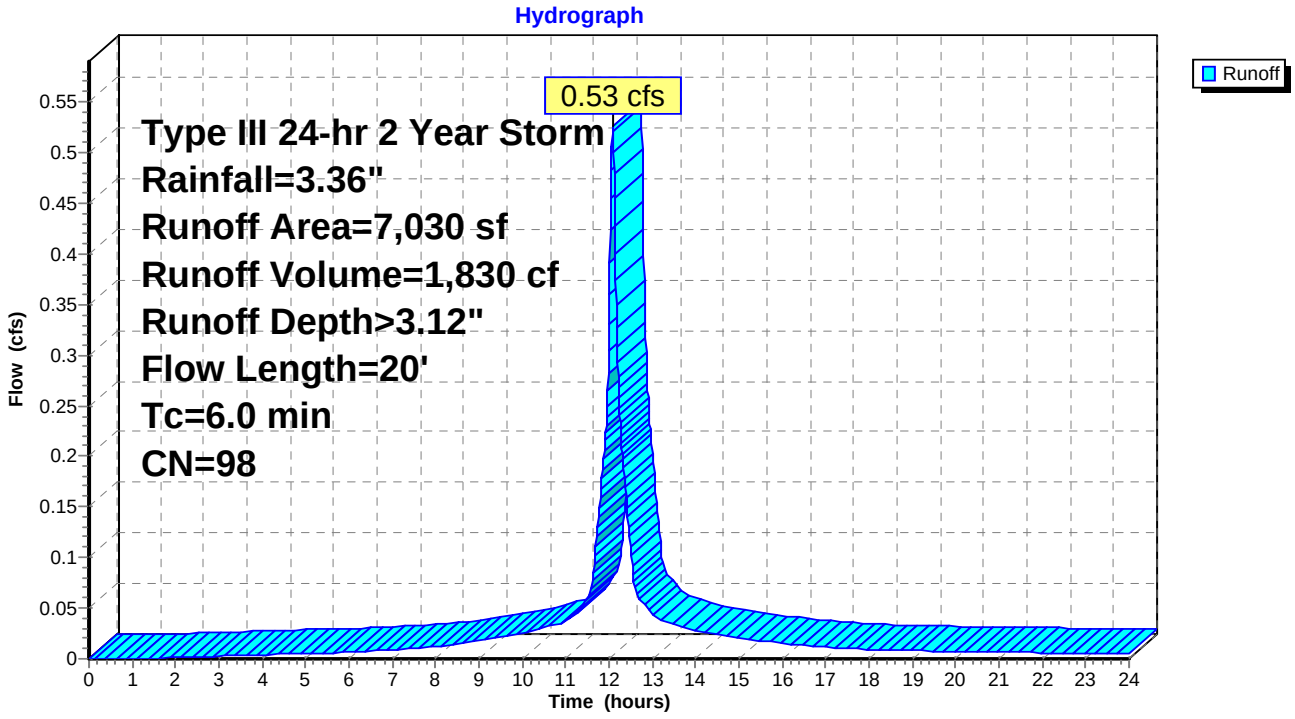
Runoff = 0.53 cfs @ 12.08 hrs, Volume= 1,830 cf, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.36"

Area (sf)	CN	Description
4,097	98	House
2,933	98	Paved
7,030	98	Weighted Average
7,030		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	20		0.07		**Direct Entry, Direct**
5.0	20	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: IMPERVIOUS



Subcatchment 5S: POST

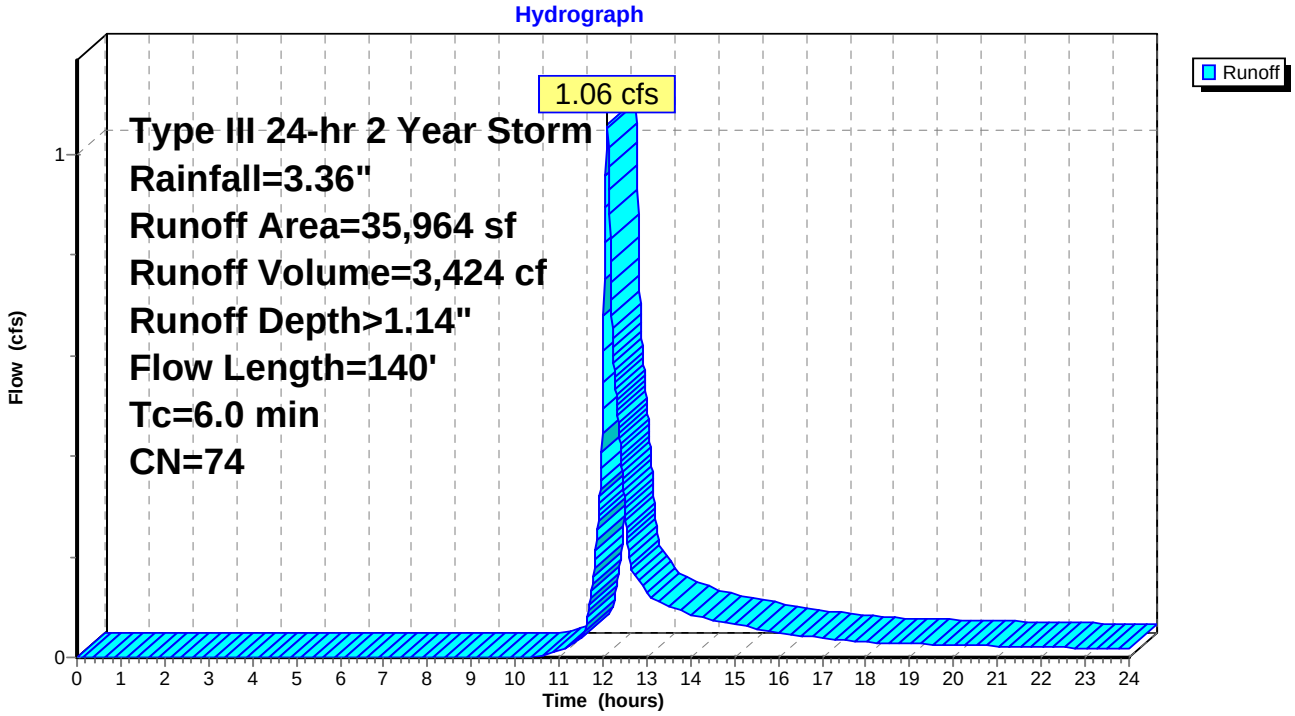
Runoff = 1.06 cfs @ 12.09 hrs, Volume= 3,424 cf, Depth> 1.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.36"

Area (sf)	CN	Description
1,744	98	Ledge
6,972	65	Woods/brush comb., Fair, HSG B
8,184	76	Woods/brush comb., Fair, HSG C
1,813	69	Grass cover, Fair, HSG B
2,128	79	Grass cover, Fair, HSG C
15,123	74	Grass cover, compost amended
35,964	74	Weighted Average
34,220		Pervious Area
1,744		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	140		0.47		**Direct Entry, Direct**
5.0	140	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: POST



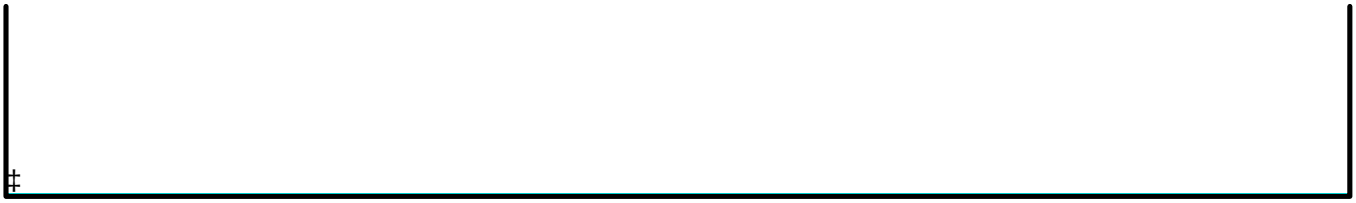
Reach 4R: CULTEC REACH

Inflow Area = 7,030 sf, Inflow Depth = 0.60" for 2 Year Storm event
Inflow = 0.70 cfs @ 12.12 hrs, Volume= 353 cf
Outflow = 0.28 cfs @ 12.25 hrs, Volume= 353 cf, Atten= 60%, Lag= 7.5 min

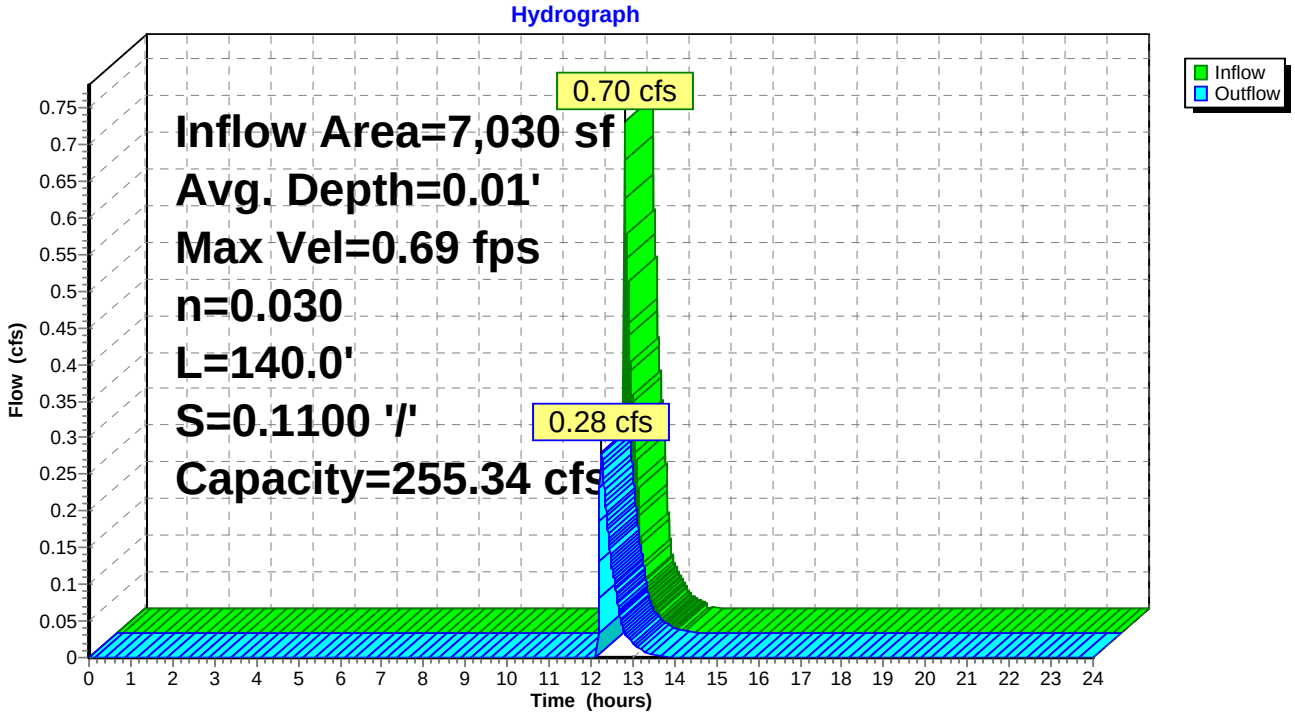
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.69 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 4.7 min

Peak Storage= 56 cf @ 12.19 hrs, Average Depth at Peak Storage= 0.01'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 255.34 cfs

50.00' x 0.50' deep channel, n= 0.030 Short grass
Length= 140.0' Slope= 0.1100 '/'
Inlet Invert= 20.00', Outlet Invert= 4.60'



Reach 4R: CULTEC REACH



Pond 3P: CULTEC CHAMBERS

Inflow Area = 7,030 sf, Inflow Depth > 3.12" for 2 Year Storm event
Inflow = 0.53 cfs @ 12.08 hrs, Volume= 1,830 cf
Outflow = 0.73 cfs @ 12.12 hrs, Volume= 1,783 cf, Atten= 0%, Lag= 2.2 min
Discarded = 0.03 cfs @ 12.11 hrs, Volume= 1,430 cf
Primary = 0.70 cfs @ 12.12 hrs, Volume= 353 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 22.91' @ 12.12 hrs Surf.Area= 375 sf Storage= 531 cf

Plug-Flow detention time= 141.2 min calculated for 1,783 cf (97% of inflow)
Center-of-Mass det. time= 125.1 min (879.9 - 754.8)

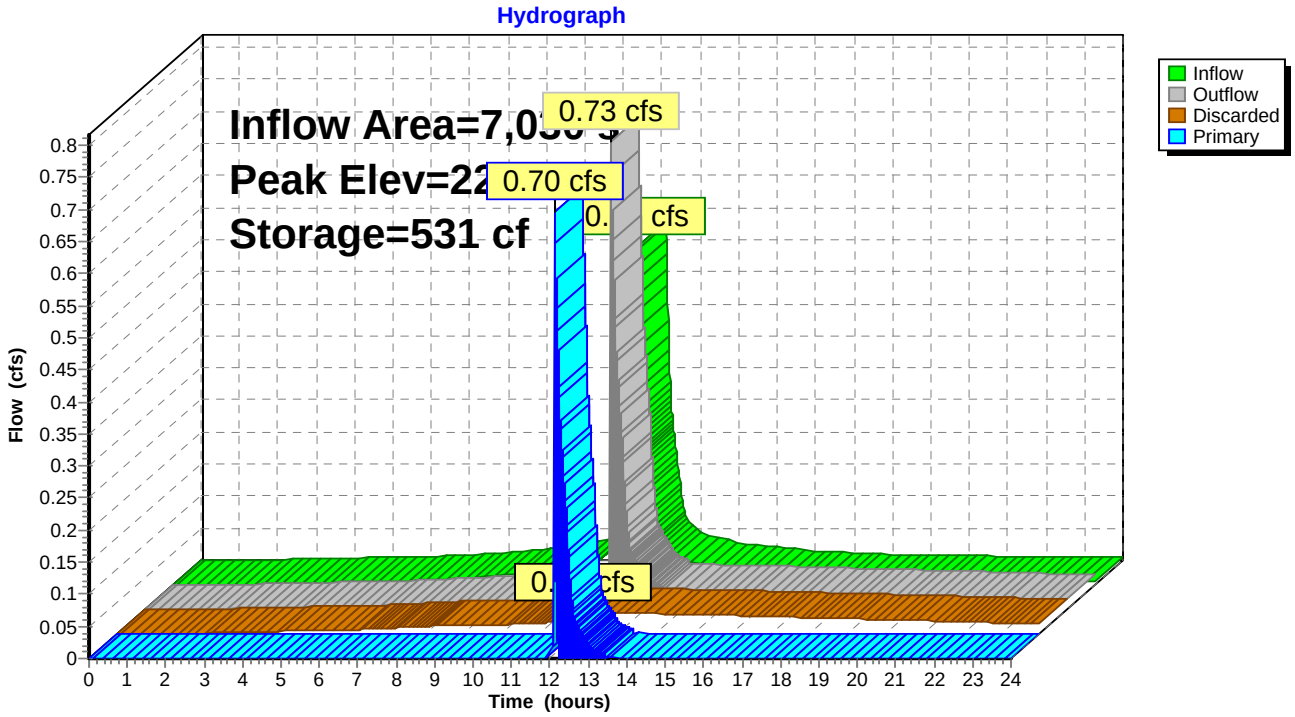
Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	218 cf	**33.6"W x 20.0"H x 6.33'L Cultec R-180** x 10 Inside #2
#2	20.00'	313 cf	**5.00'W x 15.00'L x 2.67'H Prismatoid** x 5 1,001 cf Overall - 218 cf Embedded = 784 cf x 40.0% Voids
		531 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.500 in/hr Exfiltration over Wetted area**
#2	Primary	22.67'	**4.0" x 10.0' long Culvert X 5.00** Box, headwall w/3 rounded edges, Ke= 0.200 Outlet Invert= 22.47' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Discarded OutFlow Max=0.03 cfs @ 12.11 hrs HW=22.79' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.69 cfs @ 12.12 hrs HW=22.91' (Free Discharge)
↑**2=Culvert** (Inlet Controls 0.69 cfs @ 2.07 fps)

Pond 3P: CULTEC CHAMBERS

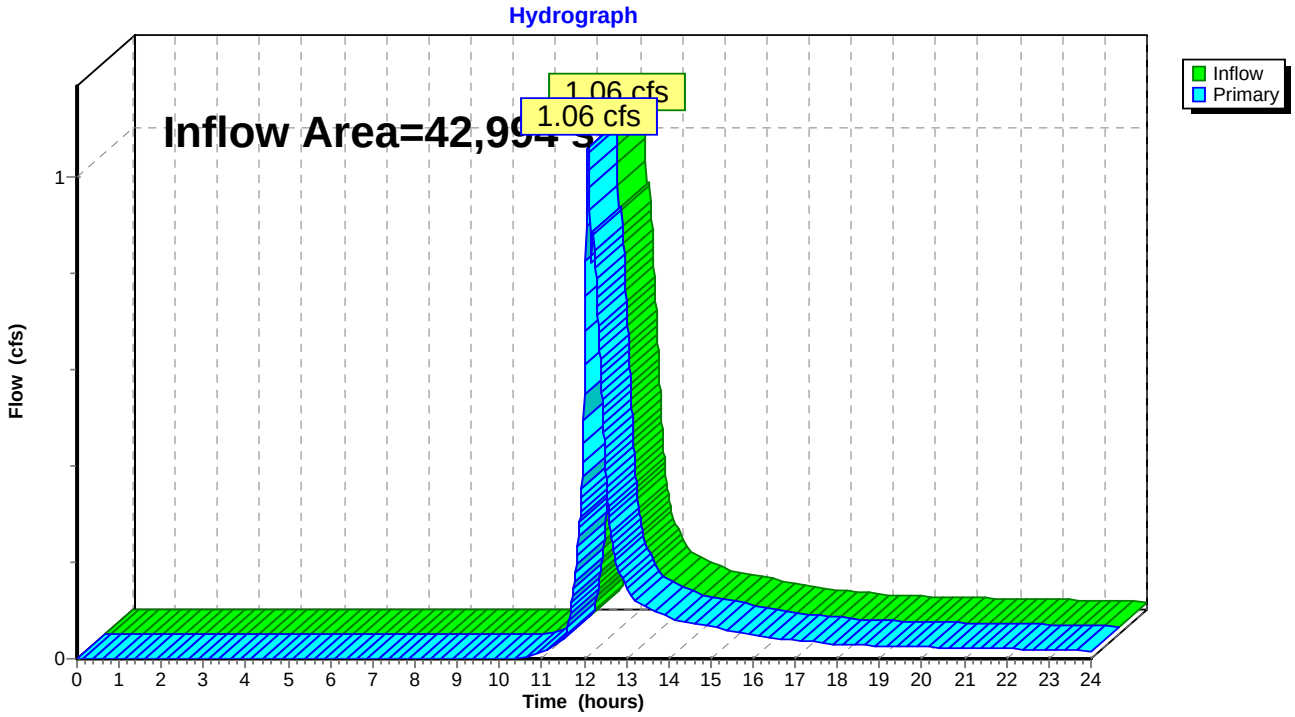


Link 6L: POST LINK

Inflow Area = 42,994 sf, Inflow Depth > 1.05" for 2 Year Storm event
Inflow = 1.06 cfs @ 12.09 hrs, Volume= 3,778 cf
Primary = 1.06 cfs @ 12.09 hrs, Volume= 3,778 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6L: POST LINK



Subcatchment 1S: PRE

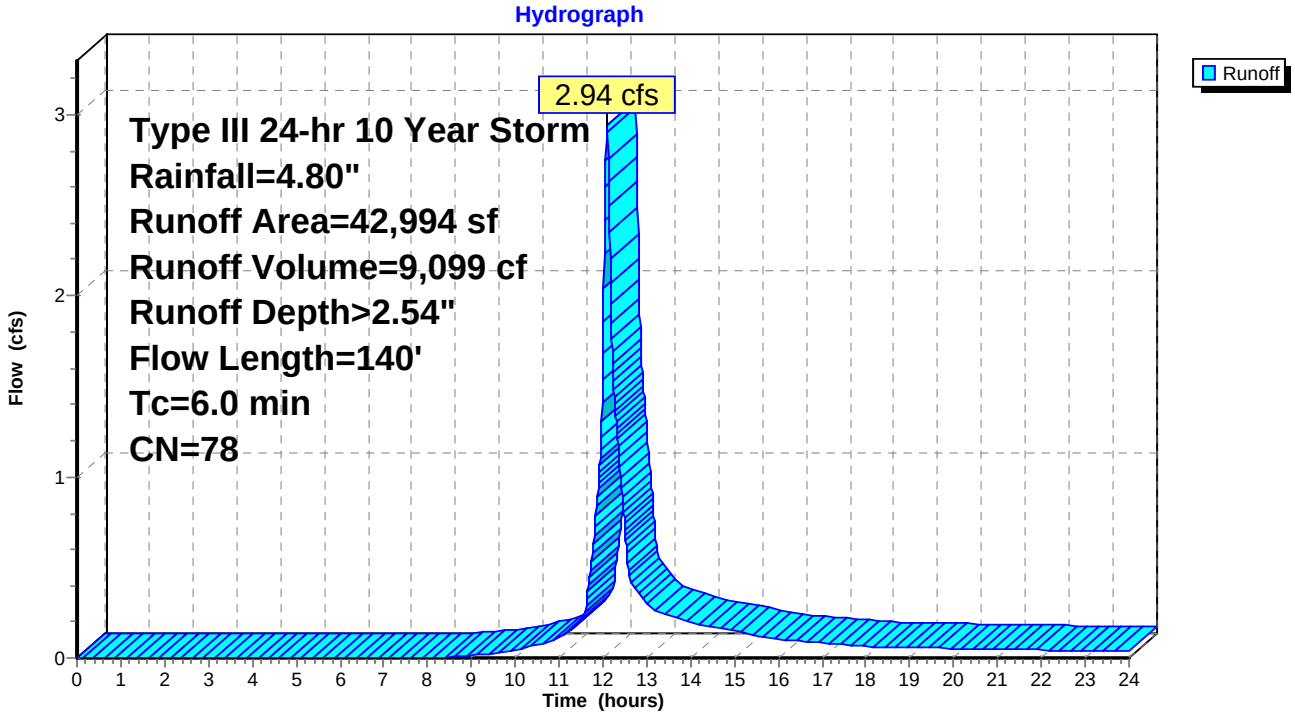
Runoff = 2.94 cfs @ 12.09 hrs, Volume= 9,099 cf, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
3,218	98	House
3,271	98	Drive
1,744	98	Ledge
7,282	65	Woods/brush comb., Fair, HSG B
8,549	76	Woods/brush comb., Fair, HSG C
8,708	69	Grass cover, Fair, HSG B
10,222	79	Grass cover, Fair, HSG C
42,994	78	Weighted Average
34,761		Pervious Area
8,233		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	140		0.47		**Direct Entry, Direct**
5.0	140	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: PRE



Subcatchment 2S: IMPERVIOUS

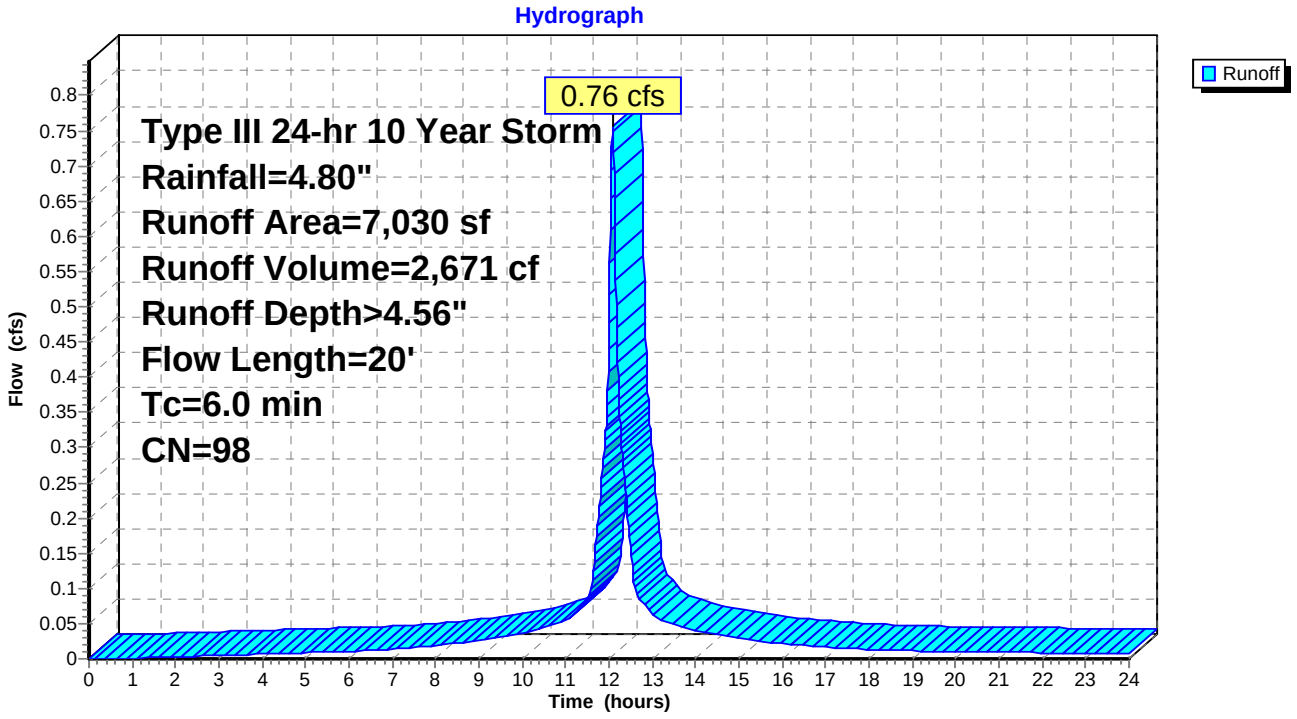
Runoff = 0.76 cfs @ 12.08 hrs, Volume= 2,671 cf, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
4,097	98	House
2,933	98	Paved
7,030	98	Weighted Average
7,030		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	20		0.07		**Direct Entry, Direct**
5.0	20	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: IMPERVIOUS



Subcatchment 5S: POST

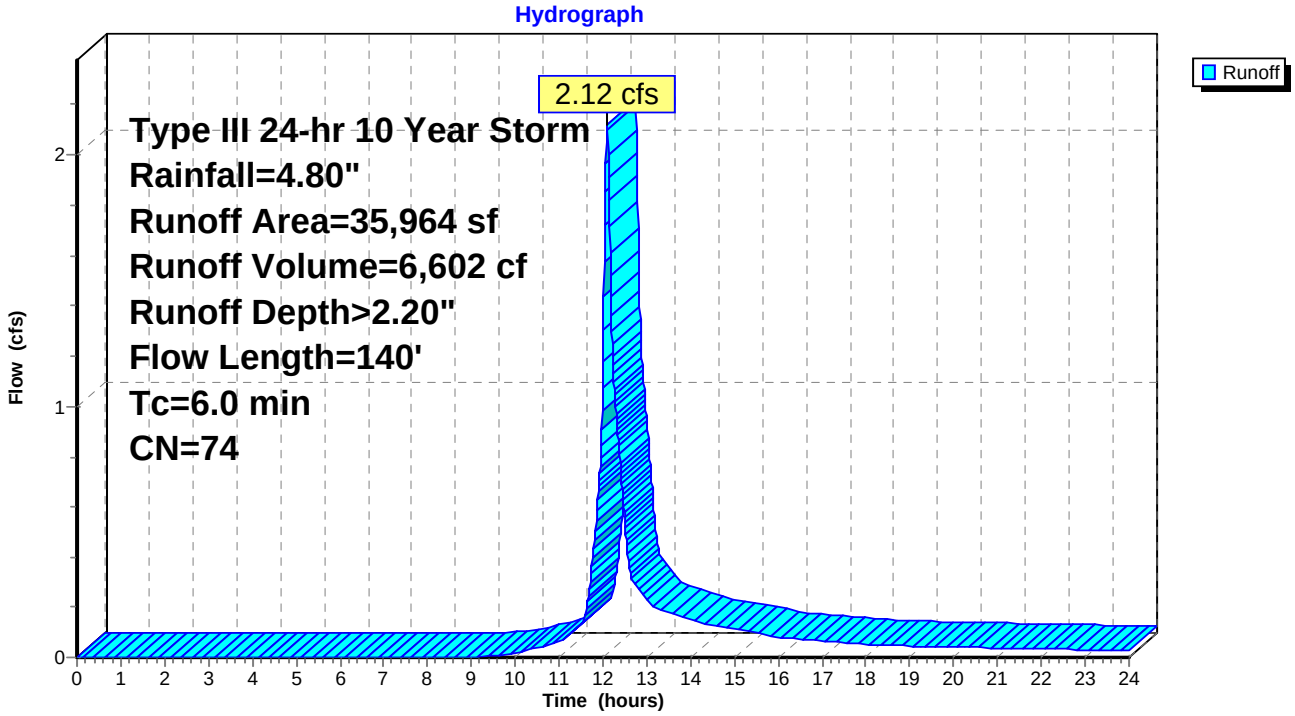
Runoff = 2.12 cfs @ 12.09 hrs, Volume= 6,602 cf, Depth> 2.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.80"

Area (sf)	CN	Description
1,744	98	Ledge
6,972	65	Woods/brush comb., Fair, HSG B
8,184	76	Woods/brush comb., Fair, HSG C
1,813	69	Grass cover, Fair, HSG B
2,128	79	Grass cover, Fair, HSG C
15,123	74	Grass cover, compost amended
35,964	74	Weighted Average
34,220		Pervious Area
1,744		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	140		0.47		**Direct Entry, Direct**
5.0	140	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: POST



Reach 4R: CULTEC REACH

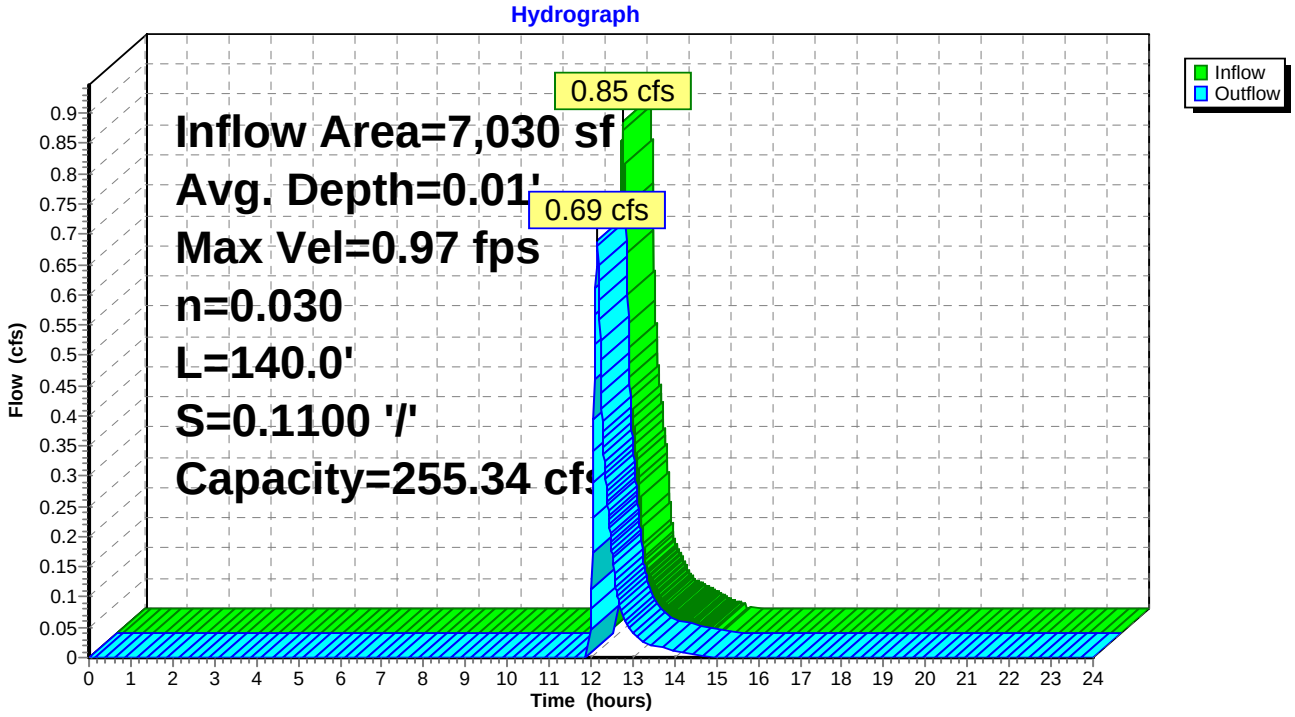
Inflow Area = 7,030 sf, Inflow Depth = 1.58" for 10 Year Storm event
Inflow = 0.85 cfs @ 12.08 hrs, Volume= 925 cf
Outflow = 0.69 cfs @ 12.15 hrs, Volume= 925 cf, Atten= 18%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.97 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 4.4 min

Peak Storage= 99 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.01'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 255.34 cfs

50.00' x 0.50' deep channel, n= 0.030 Short grass
Length= 140.0' Slope= 0.1100 '/'
Inlet Invert= 20.00', Outlet Invert= 4.60'

Reach 4R: CULTEC REACH



Pond 3P: CULTEC CHAMBERS

Inflow Area = 7,030 sf, Inflow Depth > 4.56" for 10 Year Storm event
Inflow = 0.76 cfs @ 12.08 hrs, Volume= 2,671 cf
Outflow = 0.88 cfs @ 12.08 hrs, Volume= 2,548 cf, Atten= 0%, Lag= 0.0 min
Discarded = 0.03 cfs @ 11.95 hrs, Volume= 1,623 cf
Primary = 0.85 cfs @ 12.08 hrs, Volume= 925 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 22.94' @ 12.08 hrs Surf.Area= 375 sf Storage= 531 cf

Plug-Flow detention time= 116.6 min calculated for 2,548 cf (95% of inflow)
Center-of-Mass det. time= 89.4 min (837.5 - 748.2)

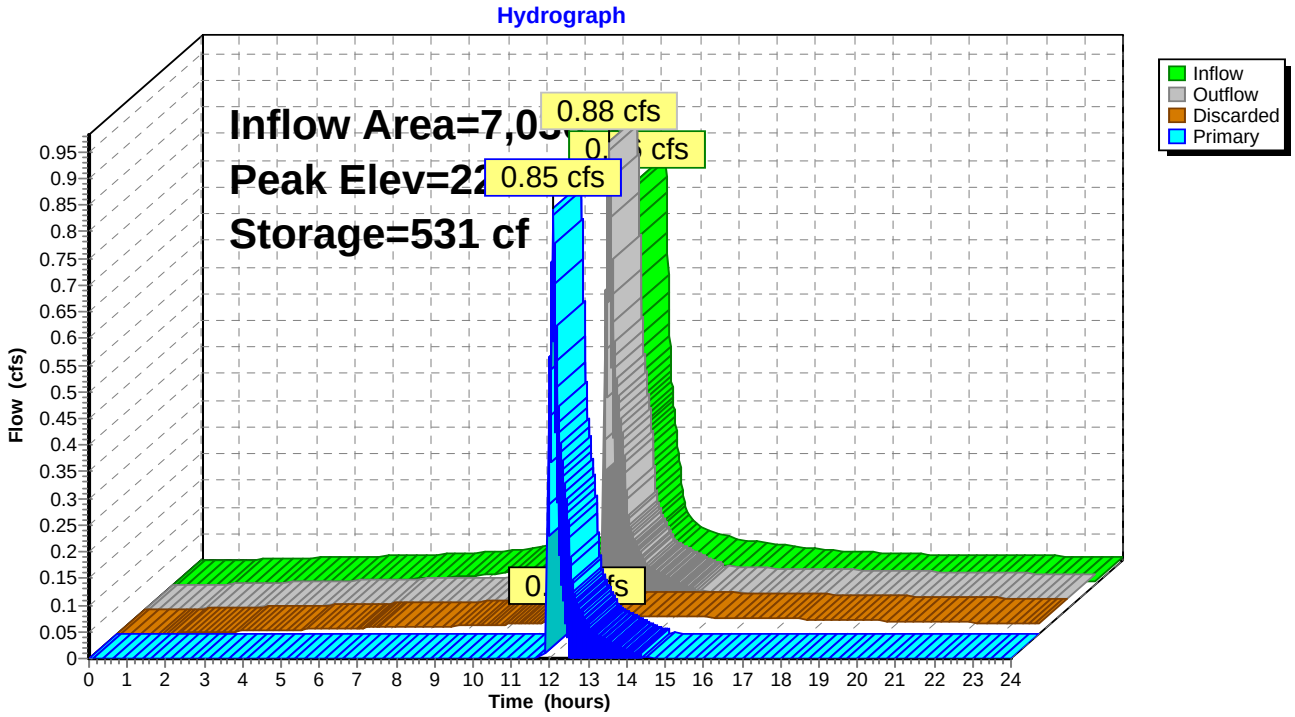
Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	218 cf	**33.6"W x 20.0"H x 6.33'L Cultec R-180** x 10 Inside #2
#2	20.00'	313 cf	**5.00'W x 15.00'L x 2.67'H Prismatoid** x 5 1,001 cf Overall - 218 cf Embedded = 784 cf x 40.0% Voids
		531 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.500 in/hr Exfiltration over Wetted area**
#2	Primary	22.67'	**4.0" x 10.0' long Culvert X 5.00** Box, headwall w/3 rounded edges, Ke= 0.200 Outlet Invert= 22.47' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Discarded OutFlow Max=0.03 cfs @ 11.95 hrs HW=22.78' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.84 cfs @ 12.08 hrs HW=22.94' (Free Discharge)
2=Culvert (Barrel Controls 0.84 cfs @ 3.02 fps)

Pond 3P: CULTEC CHAMBERS

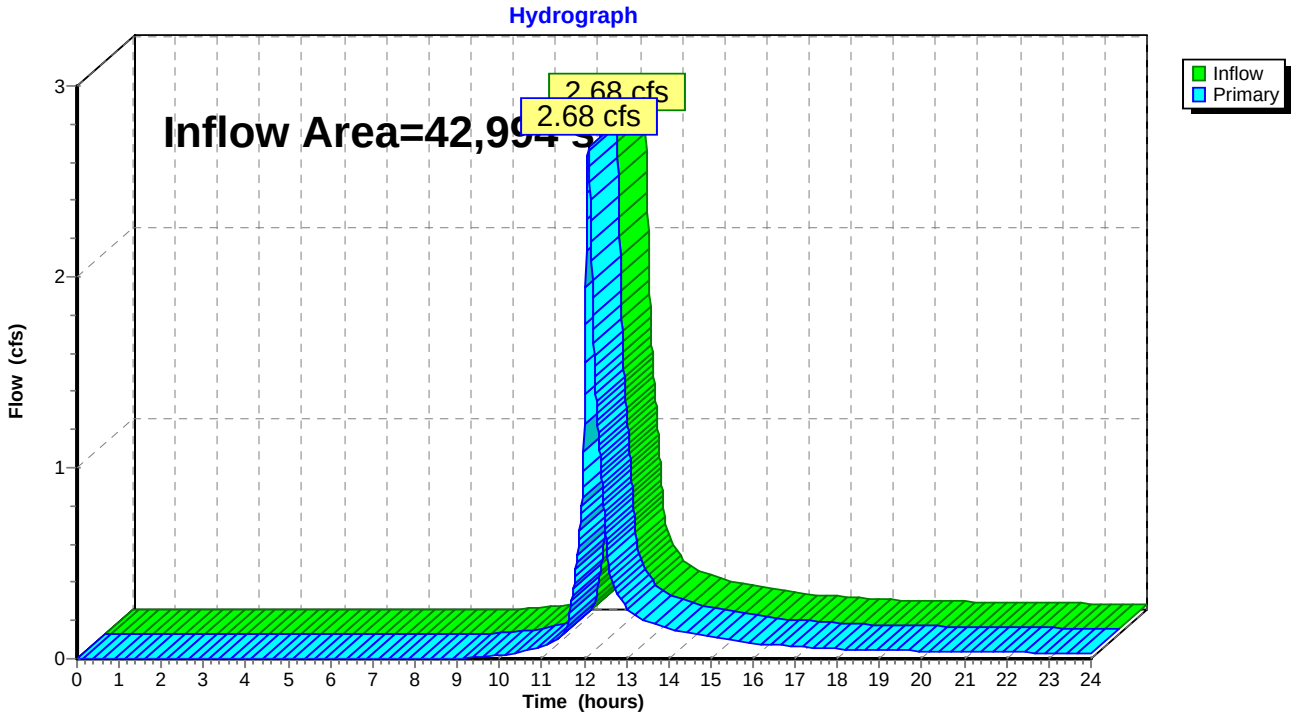


Link 6L: POST LINK

Inflow Area = 42,994 sf, Inflow Depth > 2.10" for 10 Year Storm event
Inflow = 2.68 cfs @ 12.11 hrs, Volume= 7,528 cf
Primary = 2.68 cfs @ 12.11 hrs, Volume= 7,528 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6L: POST LINK



Subcatchment 1S: PRE

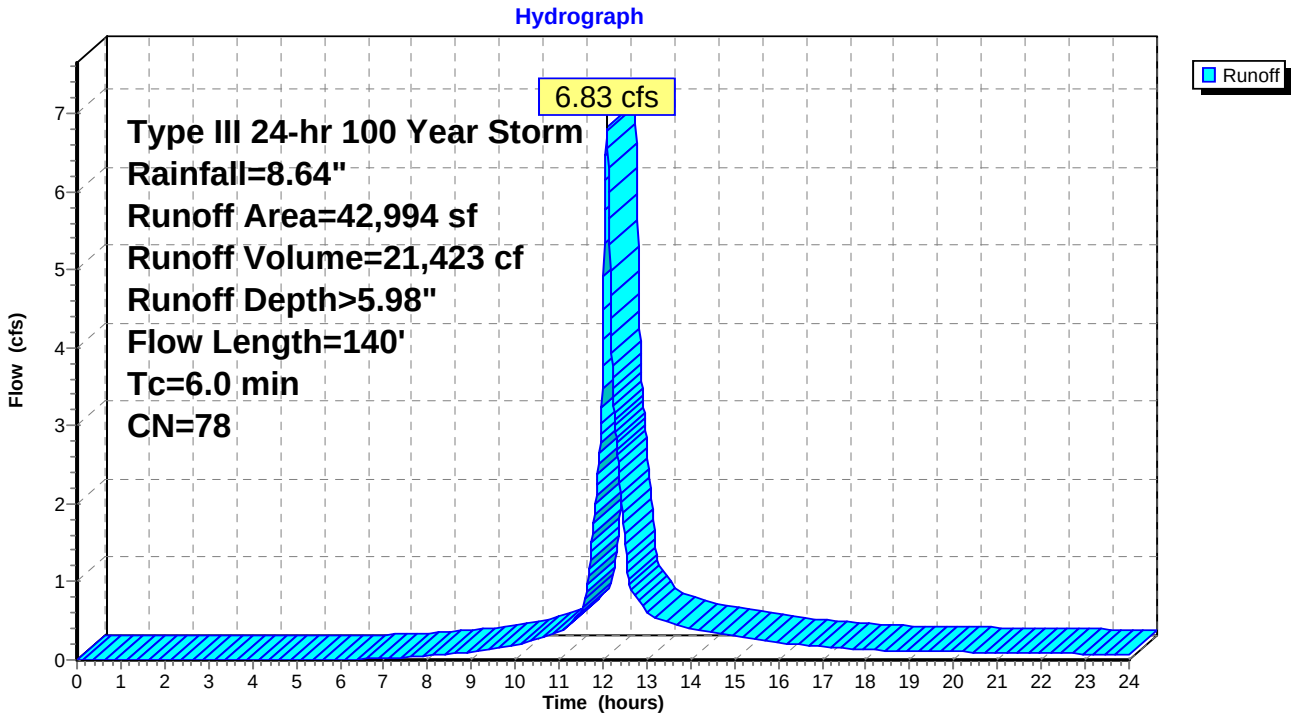
Runoff = 6.83 cfs @ 12.09 hrs, Volume= 21,423 cf, Depth> 5.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.64"

Area (sf)	CN	Description
3,218	98	House
3,271	98	Drive
1,744	98	Ledge
7,282	65	Woods/brush comb., Fair, HSG B
8,549	76	Woods/brush comb., Fair, HSG C
8,708	69	Grass cover, Fair, HSG B
10,222	79	Grass cover, Fair, HSG C
42,994	78	Weighted Average
34,761		Pervious Area
8,233		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	140		0.47		**Direct Entry, Direct**
5.0	140	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: PRE



Subcatchment 2S: IMPERVIOUS

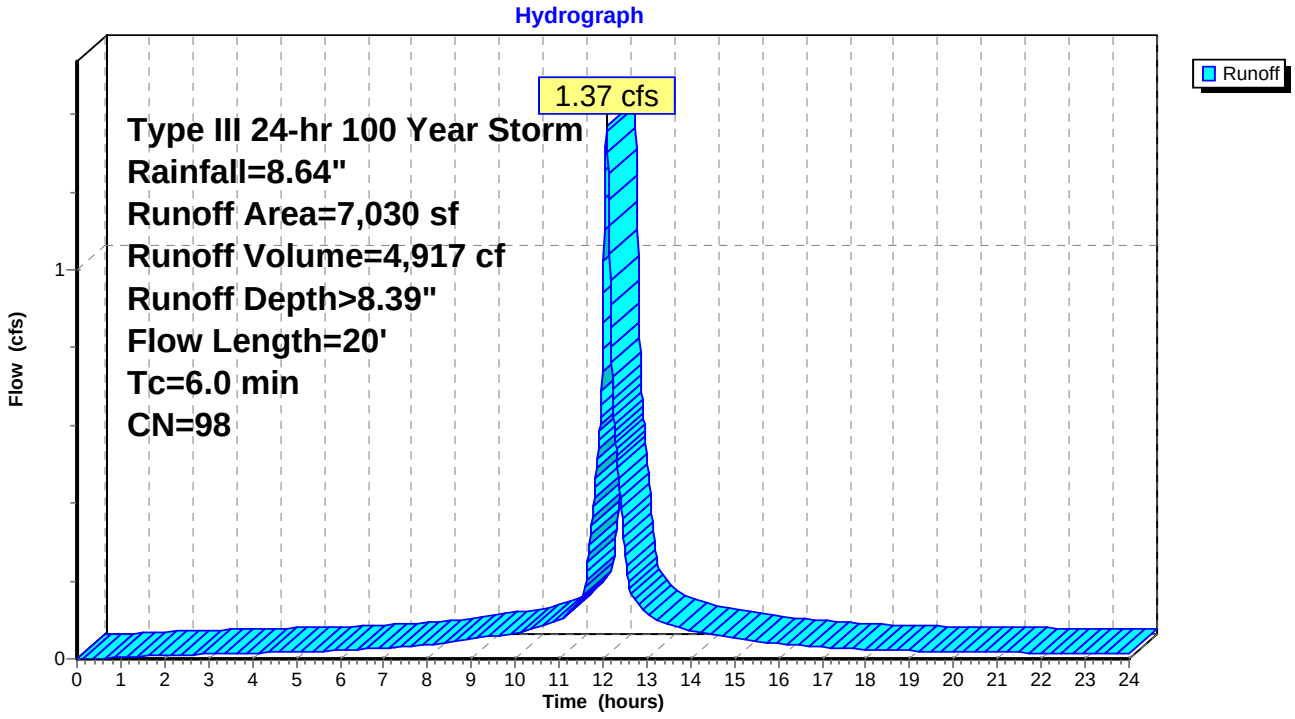
Runoff = 1.37 cfs @ 12.08 hrs, Volume= 4,917 cf, Depth> 8.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.64"

Area (sf)	CN	Description
4,097	98	House
2,933	98	Paved
7,030	98	Weighted Average
7,030		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	20		0.07		**Direct Entry, Direct**
5.0	20	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: IMPERVIOUS



Subcatchment 5S: POST

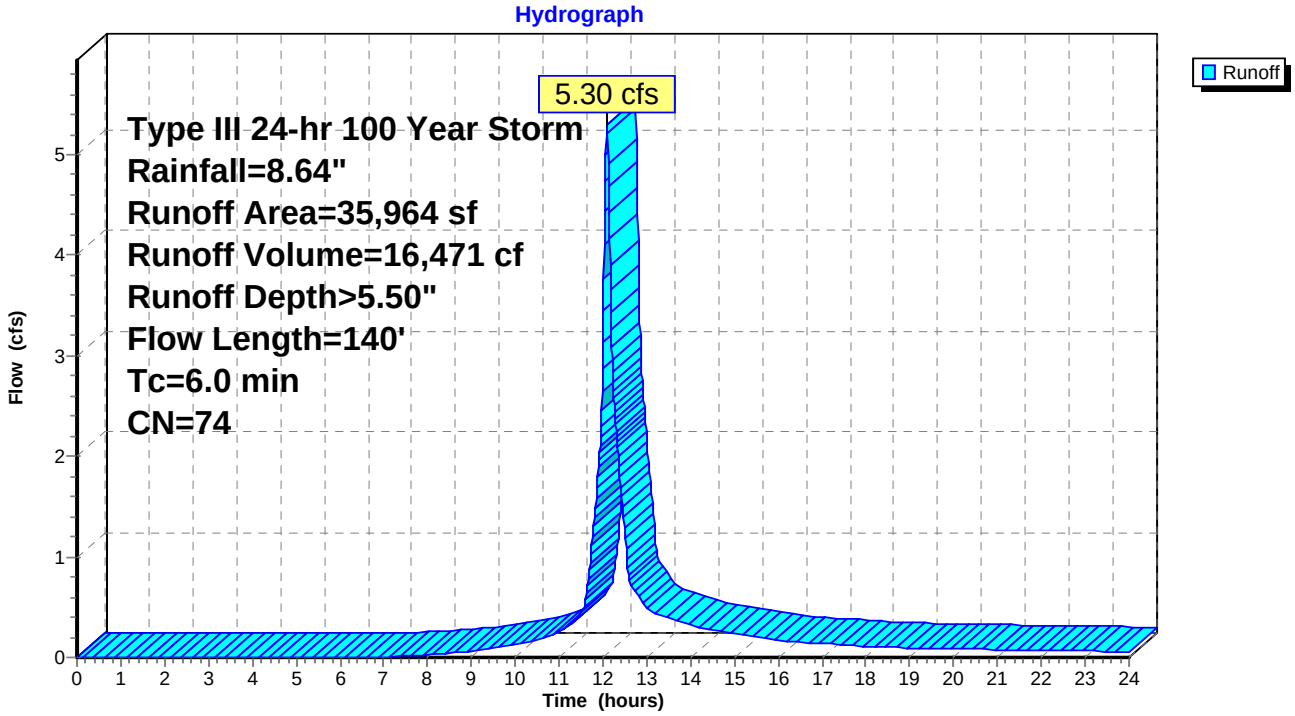
Runoff = 5.30 cfs @ 12.09 hrs, Volume= 16,471 cf, Depth> 5.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.64"

Area (sf)	CN	Description
1,744	98	Ledge
6,972	65	Woods/brush comb., Fair, HSG B
8,184	76	Woods/brush comb., Fair, HSG C
1,813	69	Grass cover, Fair, HSG B
2,128	79	Grass cover, Fair, HSG C
15,123	74	Grass cover, compost amended
35,964	74	Weighted Average
34,220		Pervious Area
1,744		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	140		0.47		**Direct Entry, Direct**
5.0	140	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 5S: POST



Reach 4R: CULTEC REACH

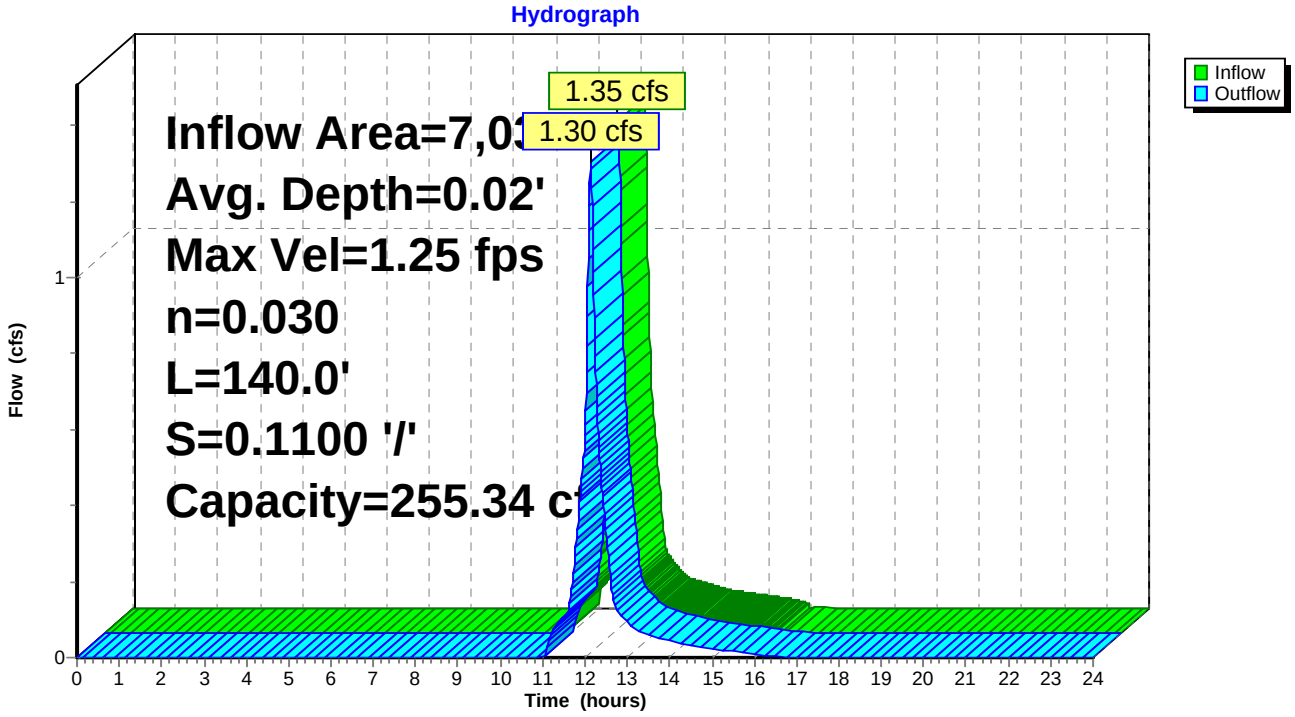
Inflow Area = 7,030 sf, Inflow Depth = 4.54" for 100 Year Storm event
Inflow = 1.35 cfs @ 12.09 hrs, Volume= 2,662 cf
Outflow = 1.30 cfs @ 12.13 hrs, Volume= 2,662 cf, Atten= 3%, Lag= 2.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.25 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.54 fps, Avg. Travel Time= 4.3 min

Peak Storage= 146 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 255.34 cfs

50.00' x 0.50' deep channel, n= 0.030 Short grass
Length= 140.0' Slope= 0.1100 '/'
Inlet Invert= 20.00', Outlet Invert= 4.60'

Reach 4R: CULTEC REACH



Pond 3P: CULTEC CHAMBERS

Inflow Area = 7,030 sf, Inflow Depth > 8.39" for 100 Year Storm event
Inflow = 1.37 cfs @ 12.08 hrs, Volume= 4,917 cf
Outflow = 1.38 cfs @ 12.09 hrs, Volume= 4,627 cf, Atten= 0%, Lag= 0.3 min
Discarded = 0.03 cfs @ 11.05 hrs, Volume= 1,965 cf
Primary = 1.35 cfs @ 12.09 hrs, Volume= 2,662 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 23.10' @ 12.09 hrs Surf.Area= 375 sf Storage= 531 cf

Plug-Flow detention time= 82.9 min calculated for 4,627 cf (94% of inflow)
Center-of-Mass det. time= 49.2 min (788.9 - 739.7)

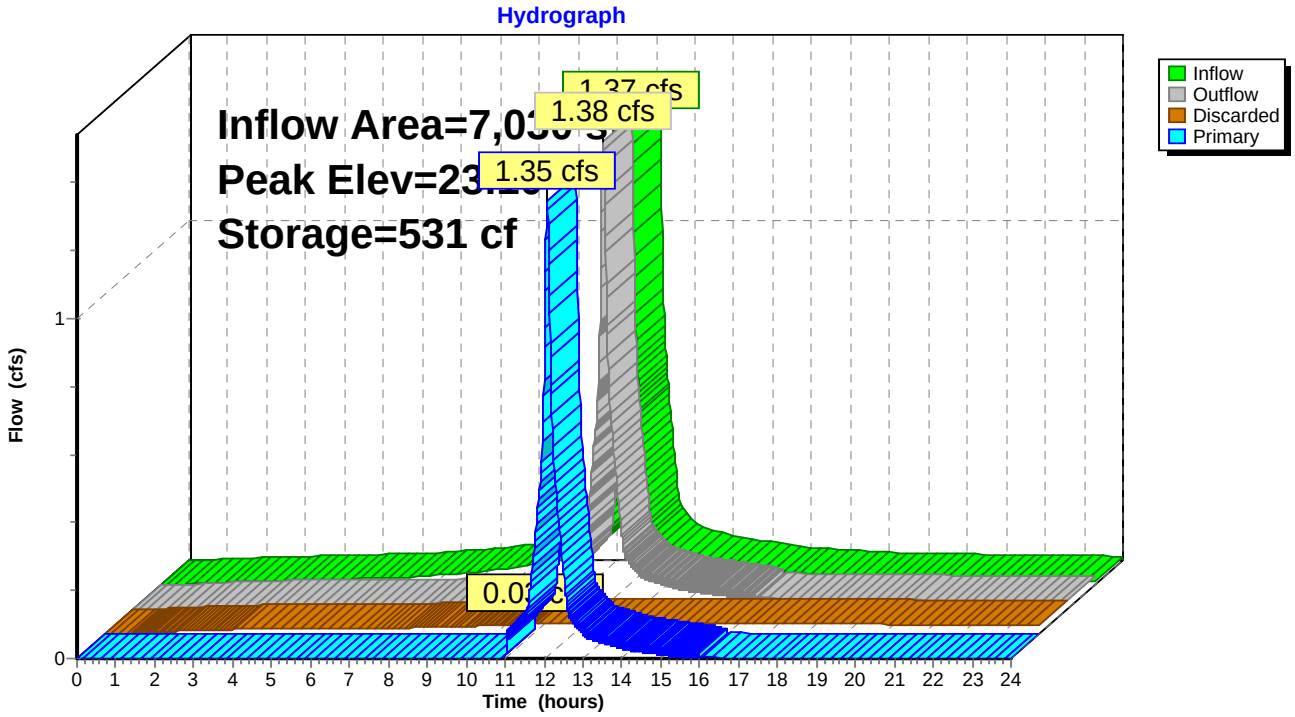
Volume	Invert	Avail.Storage	Storage Description
#1	21.00'	218 cf	**33.6"W x 20.0"H x 6.33'L Cultec R-180** x 10 Inside #2
#2	20.00'	313 cf	**5.00'W x 15.00'L x 2.67'H Prismatoid** x 5 1,001 cf Overall - 218 cf Embedded = 784 cf x 40.0% Voids
		531 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**1.500 in/hr Exfiltration over Wetted area**
#2	Primary	22.67'	**4.0" x 10.0' long Culvert X 5.00** Box, headwall w/3 rounded edges, Ke= 0.200 Outlet Invert= 22.47' S= 0.0200 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Discarded OutFlow Max=0.03 cfs @ 11.05 hrs HW=22.74' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.34 cfs @ 12.09 hrs HW=23.10' (Free Discharge)
└**2=Culvert** (Inlet Controls 1.34 cfs @ 3.08 fps)

Pond 3P: CULTEC CHAMBERS



Link 6L: POST LINK

Inflow Area = 42,994 sf, Inflow Depth > 5.34" for 100 Year Storm event
Inflow = 6.44 cfs @ 12.10 hrs, Volume= 19,133 cf
Primary = 6.44 cfs @ 12.10 hrs, Volume= 19,133 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 6L: POST LINK