

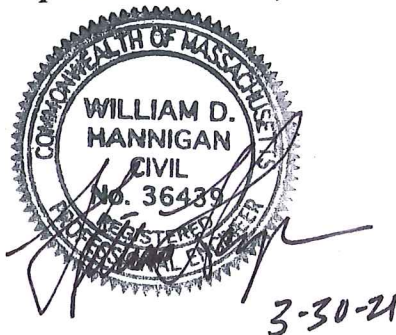
DRAINAGE ANALYSIS

United Ag & Turf NE, LLC

*700 Fort Pond Road
Lancaster, Massachusetts*

Original Issue: February 15, 2012

Updated: March 30, 2021



Prepared for: United Ag & Turf NE, LLC

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1.0
DRAINAGE NARRATIVE

1.0 NARRATIVE

1.1 EXECUTIVE SUMMARY

On behalf of our clients, United Ag & Turf Northeast, LLC, Hannigan Engineering, Inc. has prepared this updated Drainage Analysis and Report as part of the submittal package for the approval of an addition to the existing John Deere facility at 700 Fort Pond Road in Lancaster, Massachusetts. The original project was approved in 2012 and constructed shortly thereafter. Since that time, the ownership of the property has been transferred to United Ag & Turf and its holding company SCF RC Funding IV LLC.

At this time the need for additional service and storage space is required for the continuing operation of the John Deere dealership. The building addition consists of a 3,600 square foot extension of the building on the eastern portion of the site. This is in the location of the existing service doors which will be moved to the end of the building. The existing driveway will be reconfigured to provide access to the new service door location. As part of the construction, the septic tank and pump chamber will be required to be relocated along with the floor drain holding tank. The new locations are depicted on the plans.

The project is situated on approximately 8.8 acres of land on the northerly side of Fort Pond Road in Lancaster, Massachusetts. Under the original review and approval a full drainage analysis was performed to evaluate the site construction and a new drainage system was constructed in compliance with the DEP Stormwater Management Regulations, as well as the Town of Lancaster standards for Site Plan review. Additionally, the project received an Order of Conditions from the Conservation Commission for the project which was closed out upon the completion of construction.

The areas of Bordering Vegetated Wetlands on and abutting the eastern property boundary were recently updated by the project botanist, Caron Environmental. This work was performed in conjunction with a filing with the Commission relative to work being performed by the prior owner within the buffer zone of the BVW. This work was reviewed by the Commission and a negative determination was made relative to the project work. At this time, this office has not received the information relative to the issuance of the actual Determination as it has not been issued by the Commission. Work performed as part of this Building Addition project is outside of the jurisdictional areas relative to Conservation approvals.

The purpose of this updated analysis is to determine if the proposed addition to the building including the reconfiguration of the driveway on the eastern side of the property can be accommodated by the existing drainage system. The post development analysis was modified to reflect the changes to the site relative to this work. The watershed mapping was adjusted and the landuse characteristics within each affected watershed were updated to reflect the proposed conditions. The same methodology and design criteria was utilized in this review as was performed during the original analysis. Additionally, the underlying soil characteristics have not changed in this area and the design points for analysis were maintained. Reference is made to the original Drainage Analysis & Report dated February 15, 2012 and on file with the Town.

Relative to the site, no changes to the approved and constructed drainage infrastructure are proposed by this project. The driveway relocation as part of this project does not require additional drainage structures and the general watershed configuration has been maintained. The drainage system is directed to the existing onsite detention basin on the property, which has the capacity to accommodate the changes in the landuse conditions made as part of this project.

1.2 CONCLUSIONS

The proposed development will encompass the design of the previously discussed detention basin and pipe network system, which will mitigate the increase in peak rates of runoff outlined below:

Design Point		2-yr Storm	10-yr Storm	25-yr Storm	100-yr Storm
1	Pre-	2.86	9.59	14.65	22.72
	Post- (Original)	1.74 (1.75)	7.81 (7.74)	13.26 (12.87)	22.65 (22.30)

As outlined above, the post-development peak rates of runoff have been mitigated in order to assure that no adverse impacts to abutting properties relative to increases in peak rates of runoff will occur due to the proposed development upon the completion of construction. The storm water management as outlined herein and as shown on the accompanying plans has the following positive values relative to storm water management:

- A) The detention basin will retain frequent storms allowing for accumulating pollutants to settle and filter prior to release.
- B) Attenuation of the 2-, 10-, 25- and 100-year storm events has mitigated increases in peak rates of runoff.
- C) On-site roadway and pavement areas are directed to standard catch basins with deep sumps for collection of debris and sediments prior to discharge.
- D) The development complies with applicable provisions of the Massachusetts Stormwater Management Regulations to the extent practicable for redevelopment projects. Full compliance is attained, even though not required.
- E) The Stormwater Operation and Maintenance Plan (OMP) attached, has been prepared to ensure long-term function of the system, as designed.

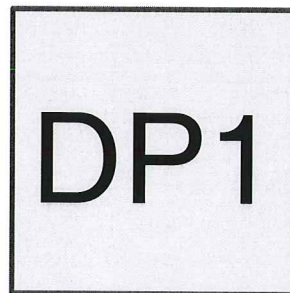
2.0

HYDROLOGICAL CALCULATIONS

2.1
PRE-DEVELOPMENT CALCULATIONS



Existing Watershed

A black arrow pointing downwards, with a vertical line above it and a triangular head.

DESIGN POINT #1



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Type III 24-hr 2-YR STORM Rainfall=3.00"

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2/14/2012

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing Watershed

Runoff Area=875,806 sf Runoff Depth=0.47"

Flow Length=1,677' Tc=70.9 min CN=64 Runoff=2.86 cfs 0.785 af

Reach DP1: DESIGN POINT #1

Inflow=2.86 cfs 0.785 af

Outflow=2.86 cfs 0.785 af

Total Runoff Area = 20.106 ac Runoff Volume = 0.785 af Average Runoff Depth = 0.47"

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Type III 24-hr 2-YR STORM Rainfall=3.00"

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2/14/2012

Subcatchment E1: Existing Watershed

Runoff = 2.86 cfs @ 13.16 hrs, Volume= 0.785 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

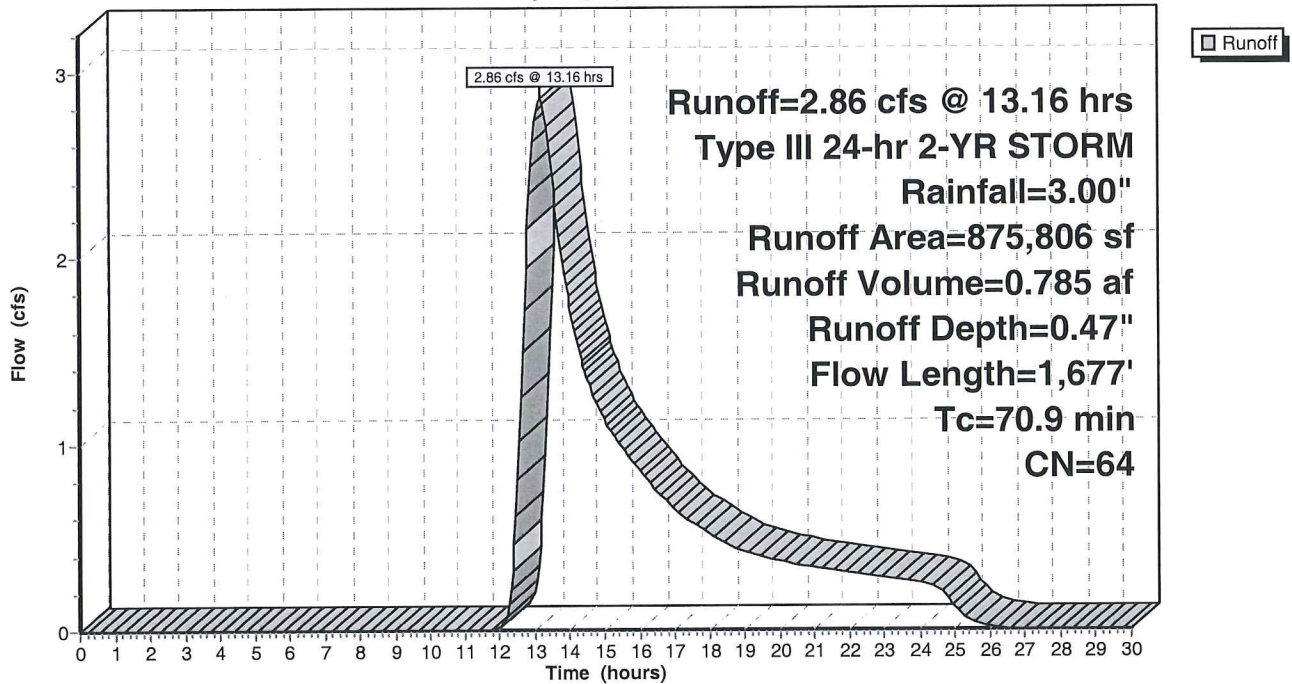
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
40,035	39	>75% Grass cover, Good, HSG A
40,824	74	>75% Grass cover, Good, HSG C
5,377	30	Brush, Good, HSG A
69,917	48	Brush, Good, HSG B
173,122	70	Brush, Fair, HSG C
57,046	30	Woods, Good, HSG A
185,010	55	Woods, Good, HSG B
163,143	70	Woods, Good, HSG C
15,523	82	Dirt roads, HSG B
83,958	87	Dirt roads, HSG C
41,851	98	Paved parking & roofs
875,806	64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
14.7	440	0.0100	0.5		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.5	64	0.0940	2.1		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.4	240	0.0290	1.2		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.8	128	0.0230	0.8		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
39.8	755	0.0040	0.3		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
70.9	1,677	Total			

Subcatchment E1: Existing Watershed

Hydrograph



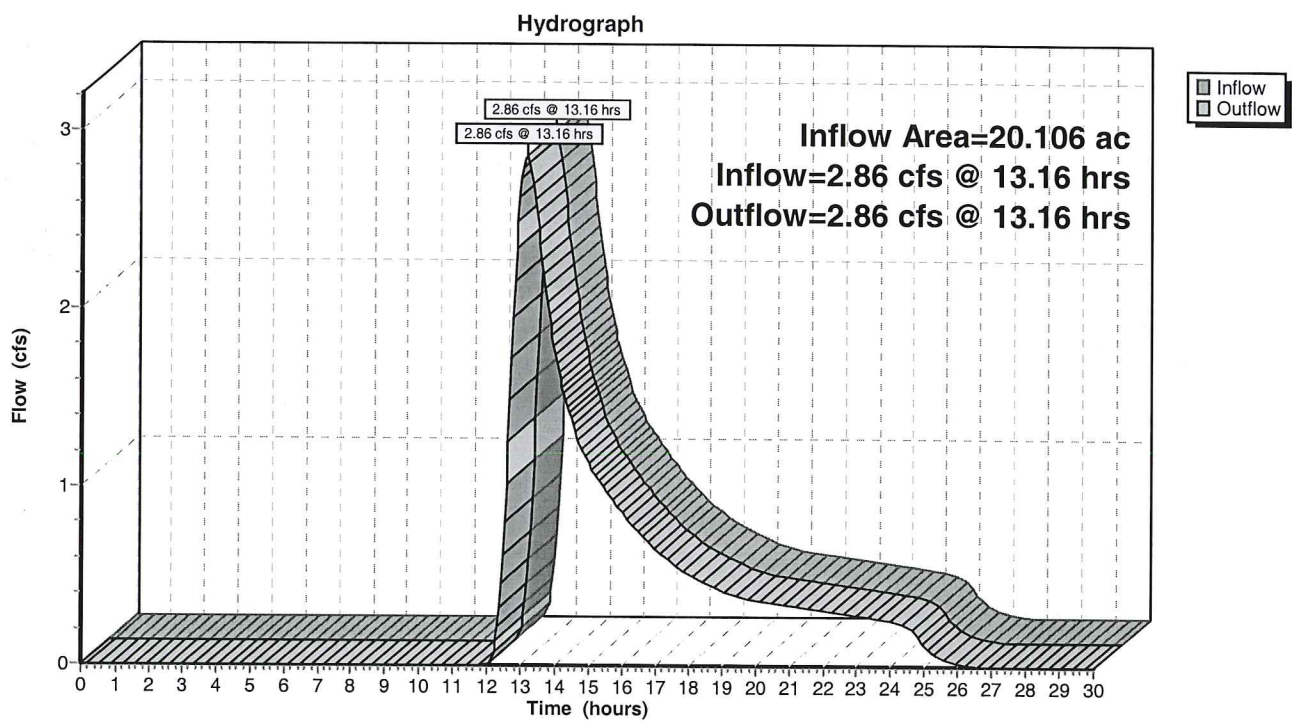
Reach DP1: DESIGN POINT #1

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

Inflow Area = 20.106 ac, Inflow Depth = 0.47" for 2-YR STORM event
Inflow = 2.86 cfs @ 13.16 hrs, Volume= 0.785 af
Outflow = 2.86 cfs @ 13.16 hrs, Volume= 0.785 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1: DESIGN POINT #1



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Type III 24-hr 10-YR STORM Rainfall=4.50"

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Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing Watershed

Runoff Area=875,806 sf Runoff Depth=1.27"

Flow Length=1,677' Tc=70.9 min CN=64 Runoff=9.59 cfs 2.121 af

Reach DP1: DESIGN POINT #1

Inflow=9.59 cfs 2.121 af

Outflow=9.59 cfs 2.121 af

Total Runoff Area = 20.106 ac Runoff Volume = 2.121 af Average Runoff Depth = 1.27"

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Type III 24-hr 10-YR STORM Rainfall=4.50"

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Subcatchment E1: Existing Watershed

Runoff = 9.59 cfs @ 13.03 hrs, Volume= 2.121 af, Depth= 1.27"

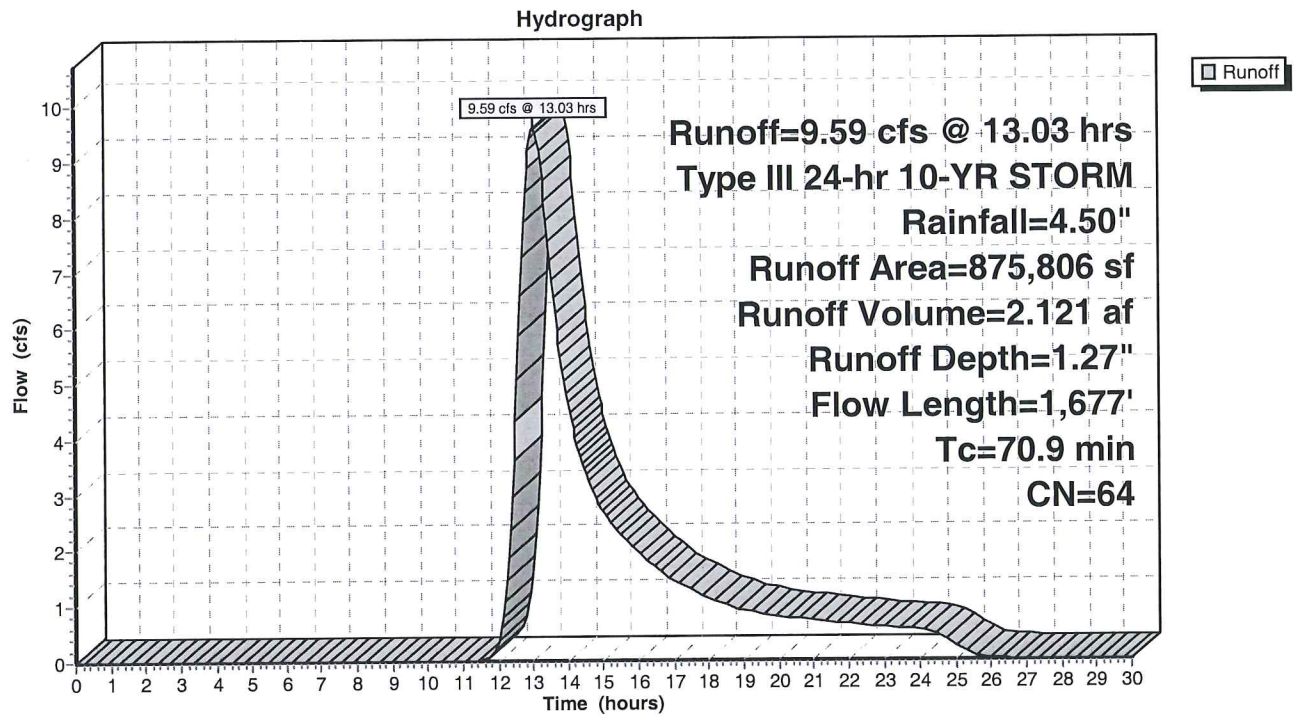
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
40,035	39	>75% Grass cover, Good, HSG A
40,824	74	>75% Grass cover, Good, HSG C
5,377	30	Brush, Good, HSG A
69,917	48	Brush, Good, HSG B
173,122	70	Brush, Fair, HSG C
57,046	30	Woods, Good, HSG A
185,010	55	Woods, Good, HSG B
163,143	70	Woods, Good, HSG C
15,523	82	Dirt roads, HSG B
83,958	87	Dirt roads, HSG C
41,851	98	Paved parking & roofs
875,806	64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
14.7	440	0.0100	0.5		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.5	64	0.0940	2.1		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.4	240	0.0290	1.2		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.8	128	0.0230	0.8		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
39.8	755	0.0040	0.3		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
70.9	1,677	Total			

Subcatchment E1: Existing Watershed



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Type III 24-hr 10-YR STORM Rainfall=4.50"

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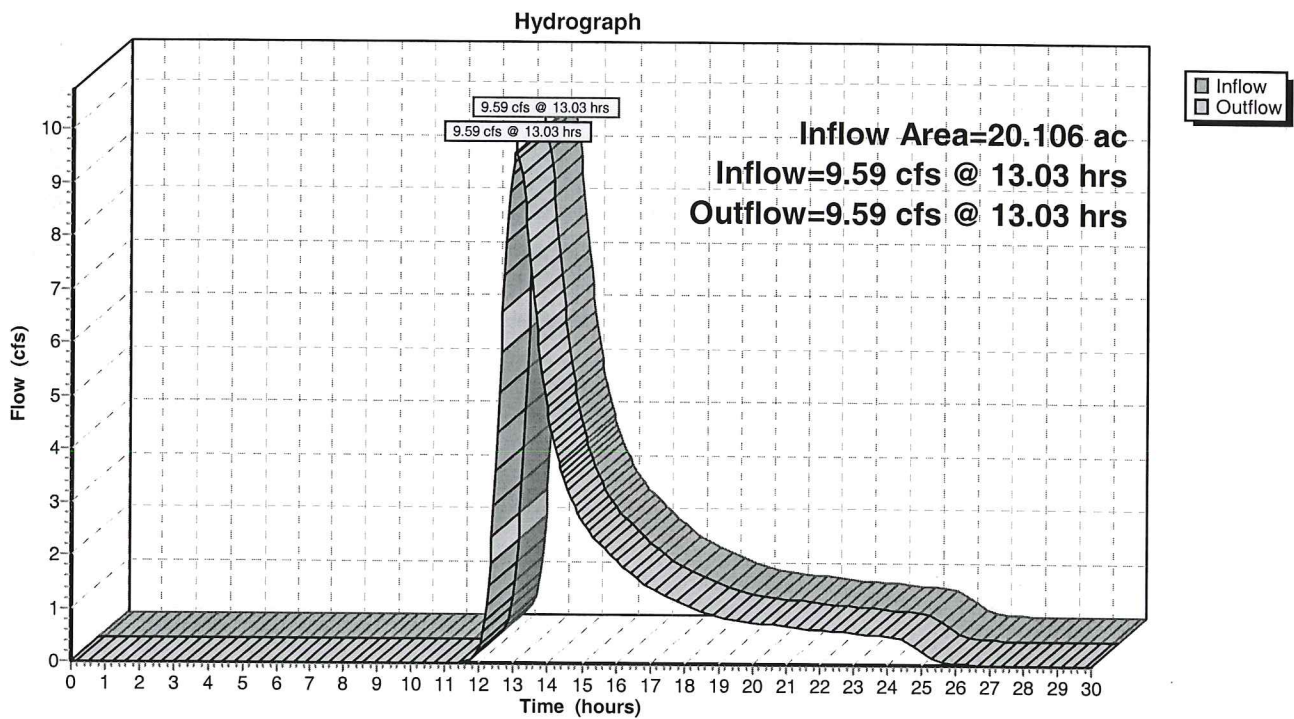
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Reach DP1: DESIGN POINT #1

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

Inflow Area = 20.106 ac, Inflow Depth = 1.27" for 10-YR STORM event
Inflow = 9.59 cfs @ 13.03 hrs, Volume= 2.121 af
Outflow = 9.59 cfs @ 13.03 hrs, Volume= 2.121 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1: DESIGN POINT #1

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Type III 24-hr 25-YR STORM Rainfall=5.40"

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Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing Watershed

Runoff Area=875,806 sf Runoff Depth=1.85"

Flow Length=1,677' Tc=70.9 min CN=64 Runoff=14.65 cfs 3.093 af

Reach DP1: DESIGN POINT #1

Inflow=14.65 cfs 3.093 af

Outflow=14.65 cfs 3.093 af

Total Runoff Area = 20.106 ac Runoff Volume = 3.093 af Average Runoff Depth = 1.85"

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Type III 24-hr 25-YR STORM Rainfall=5.40"

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Subcatchment E1: Existing Watershed

Runoff = 14.65 cfs @ 13.01 hrs, Volume= 3.093 af, Depth= 1.85"

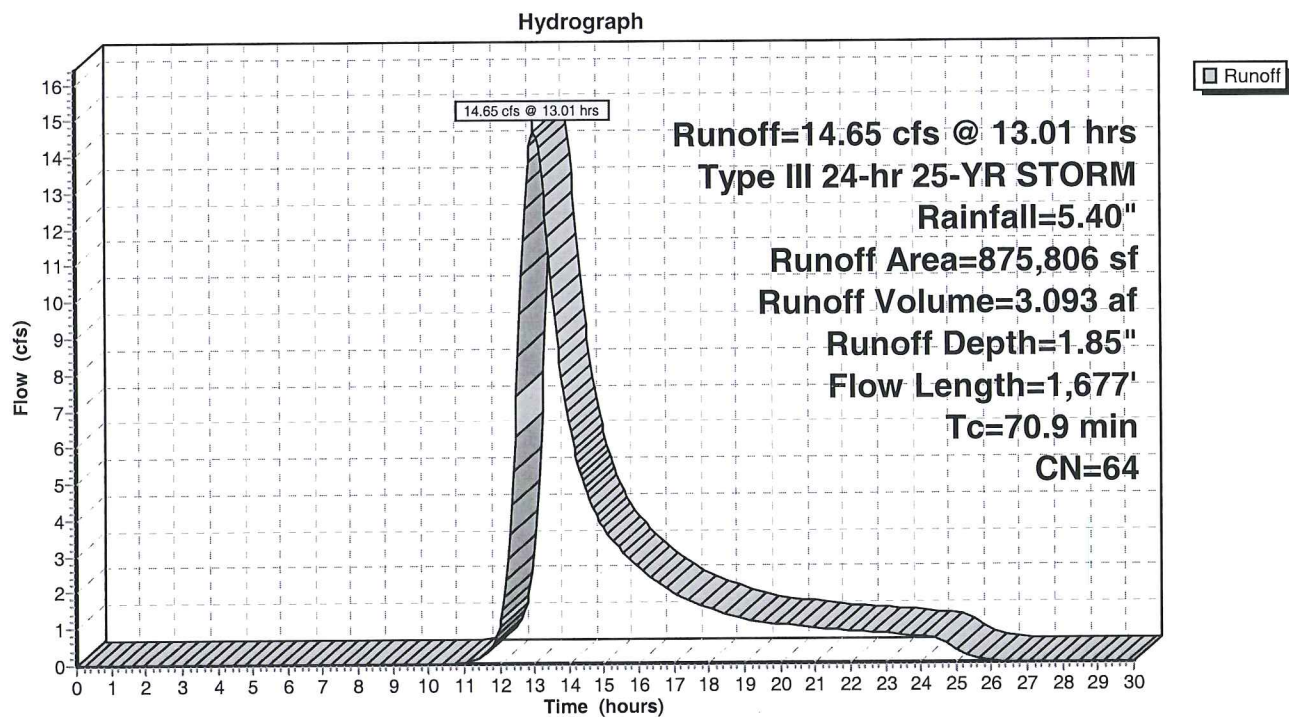
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
40,035	39	>75% Grass cover, Good, HSG A
40,824	74	>75% Grass cover, Good, HSG C
5,377	30	Brush, Good, HSG A
69,917	48	Brush, Good, HSG B
173,122	70	Brush, Fair, HSG C
57,046	30	Woods, Good, HSG A
185,010	55	Woods, Good, HSG B
163,143	70	Woods, Good, HSG C
15,523	82	Dirt roads, HSG B
83,958	87	Dirt roads, HSG C
41,851	98	Paved parking & roofs
875,806	64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
14.7	440	0.0100	0.5		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.5	64	0.0940	2.1		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.4	240	0.0290	1.2		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.8	128	0.0230	0.8		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
39.8	755	0.0040	0.3		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
70.9	1,677	Total			

Subcatchment E1: Existing Watershed



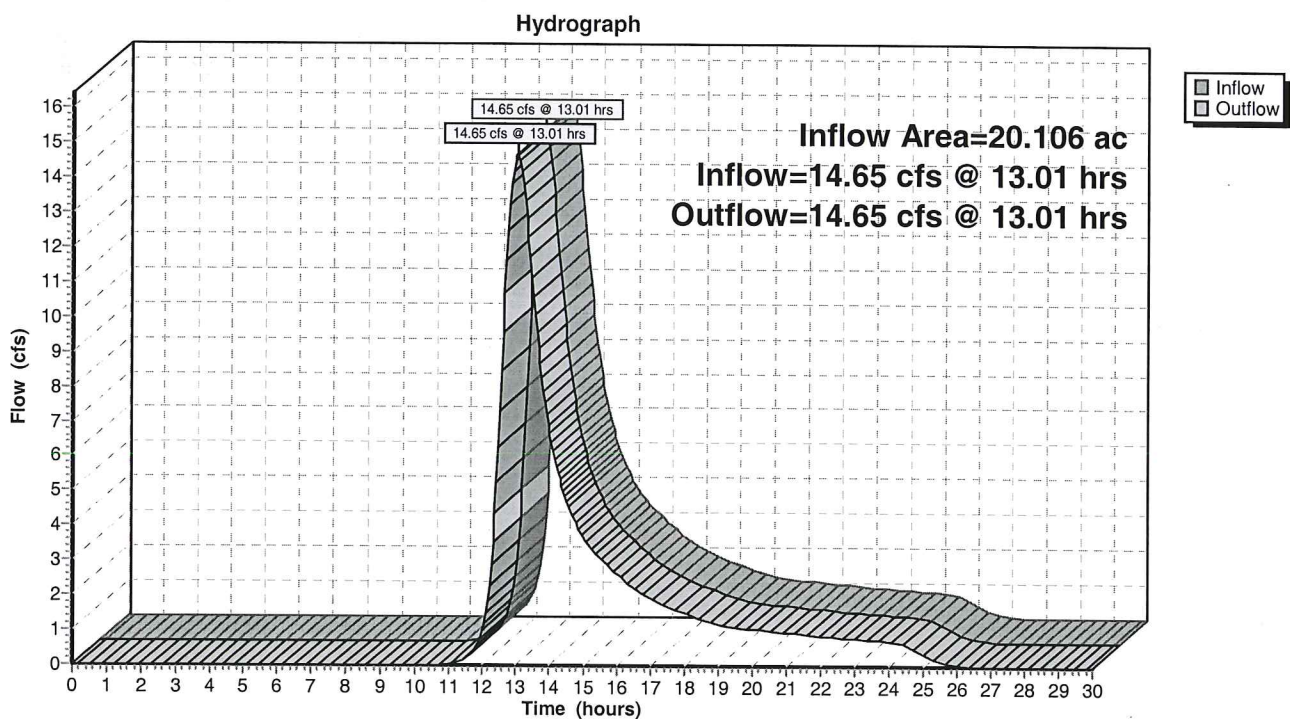
Reach DP1: DESIGN POINT #1

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

Inflow Area = 20.106 ac, Inflow Depth = 1.85" for 25-YR STORM event
Inflow = 14.65 cfs @ 13.01 hrs, Volume= 3.093 af
Outflow = 14.65 cfs @ 13.01 hrs, Volume= 3.093 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1: DESIGN POINT #1



2352-Poulin-Padula PRE*Type III 24-hr 100-YR STORM Rainfall=6.70"*

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Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E1: Existing Watershed

Runoff Area=875,806 sf Runoff Depth=2.78"

Flow Length=1,677' Tc=70.9 min CN=64 Runoff=22.72 cfs 4.650 af

Reach DP1: DESIGN POINT #1

Inflow=22.72 cfs 4.650 af

Outflow=22.72 cfs 4.650 af

Total Runoff Area = 20.106 ac Runoff Volume = 4.650 af Average Runoff Depth = 2.78"

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Type III 24-hr 100-YR STORM Rainfall=6.70"

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Subcatchment E1: Existing Watershed

Runoff = 22.72 cfs @ 13.00 hrs, Volume= 4.650 af, Depth= 2.78"

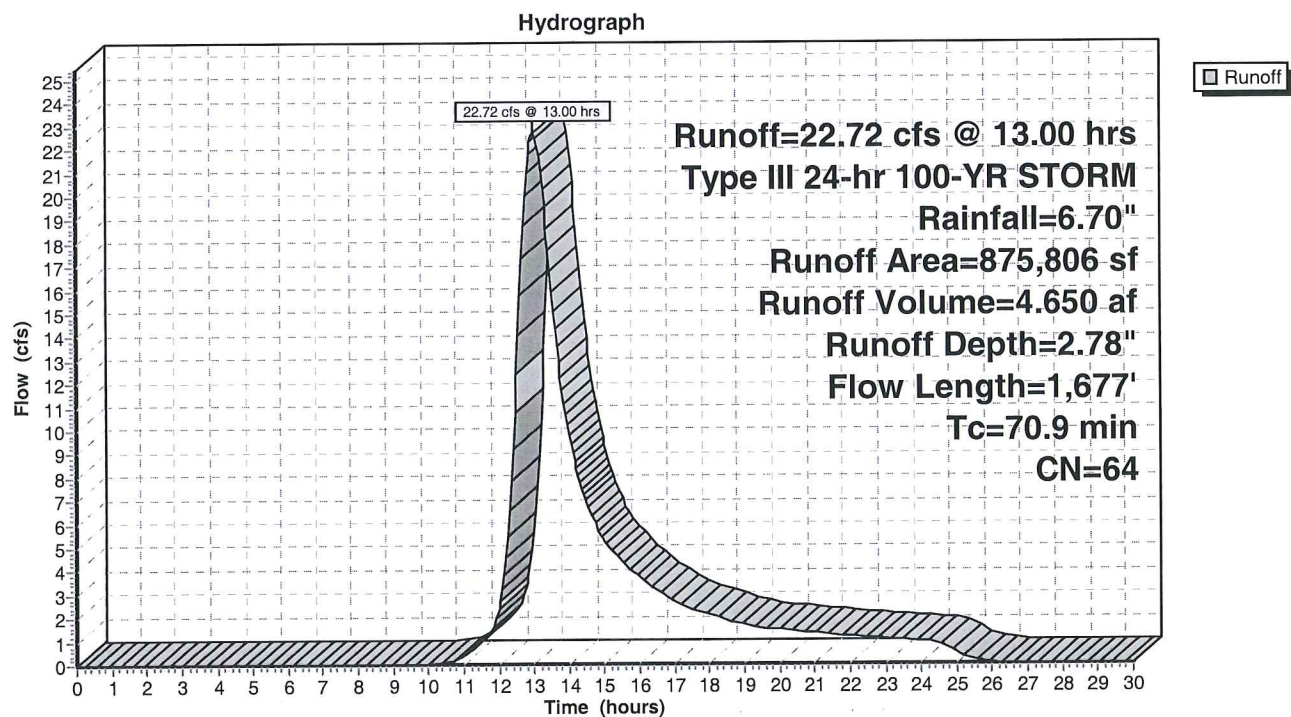
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
40,035	39	>75% Grass cover, Good, HSG A
40,824	74	>75% Grass cover, Good, HSG C
5,377	30	Brush, Good, HSG A
69,917	48	Brush, Good, HSG B
173,122	70	Brush, Fair, HSG C
57,046	30	Woods, Good, HSG A
185,010	55	Woods, Good, HSG B
163,143	70	Woods, Good, HSG C
15,523	82	Dirt roads, HSG B
83,958	87	Dirt roads, HSG C
41,851	98	Paved parking & roofs
875,806	64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
14.7	440	0.0100	0.5		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.5	64	0.0940	2.1		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
3.4	240	0.0290	1.2		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.8	128	0.0230	0.8		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
39.8	755	0.0040	0.3		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
70.9	1,677	Total			

Subcatchment E1: Existing Watershed



Reach DP1: DESIGN POINT #1

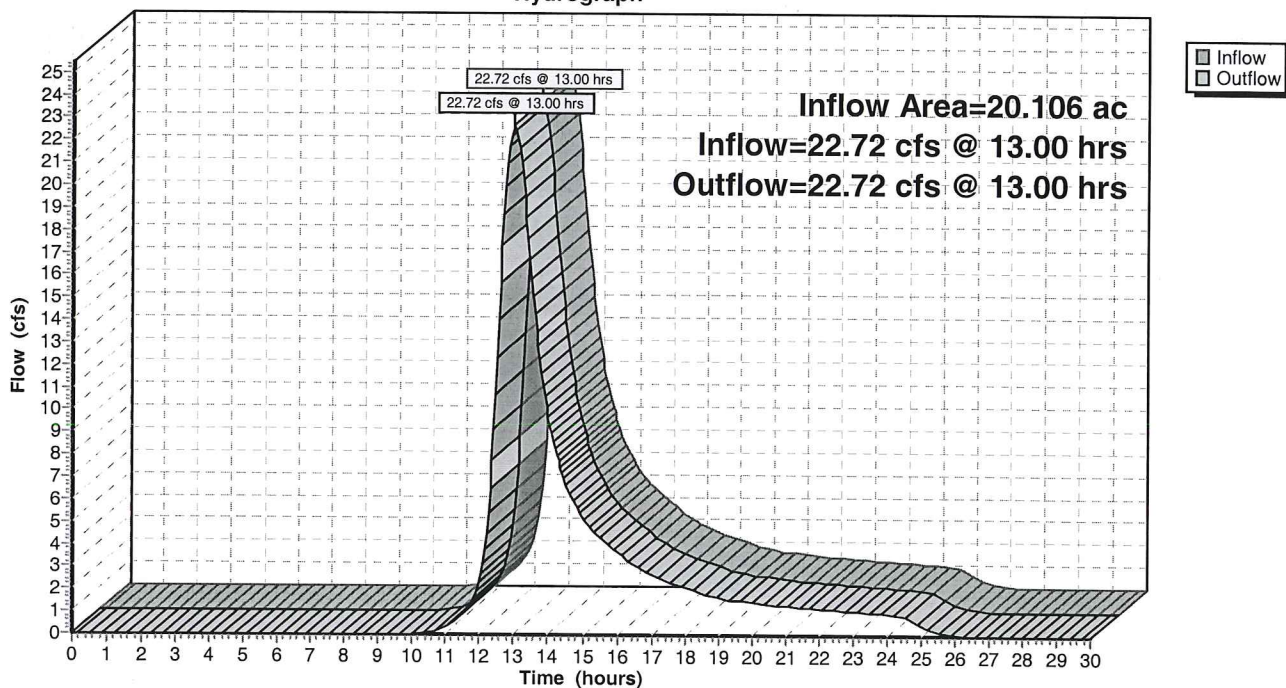
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 20.106 ac, Inflow Depth = 2.78" for 100-YR STORM event
Inflow = 22.72 cfs @ 13.00 hrs, Volume= 4.650 af
Outflow = 22.72 cfs @ 13.00 hrs, Volume= 4.650 af, Atten= 0%, Lag= 0.0 min

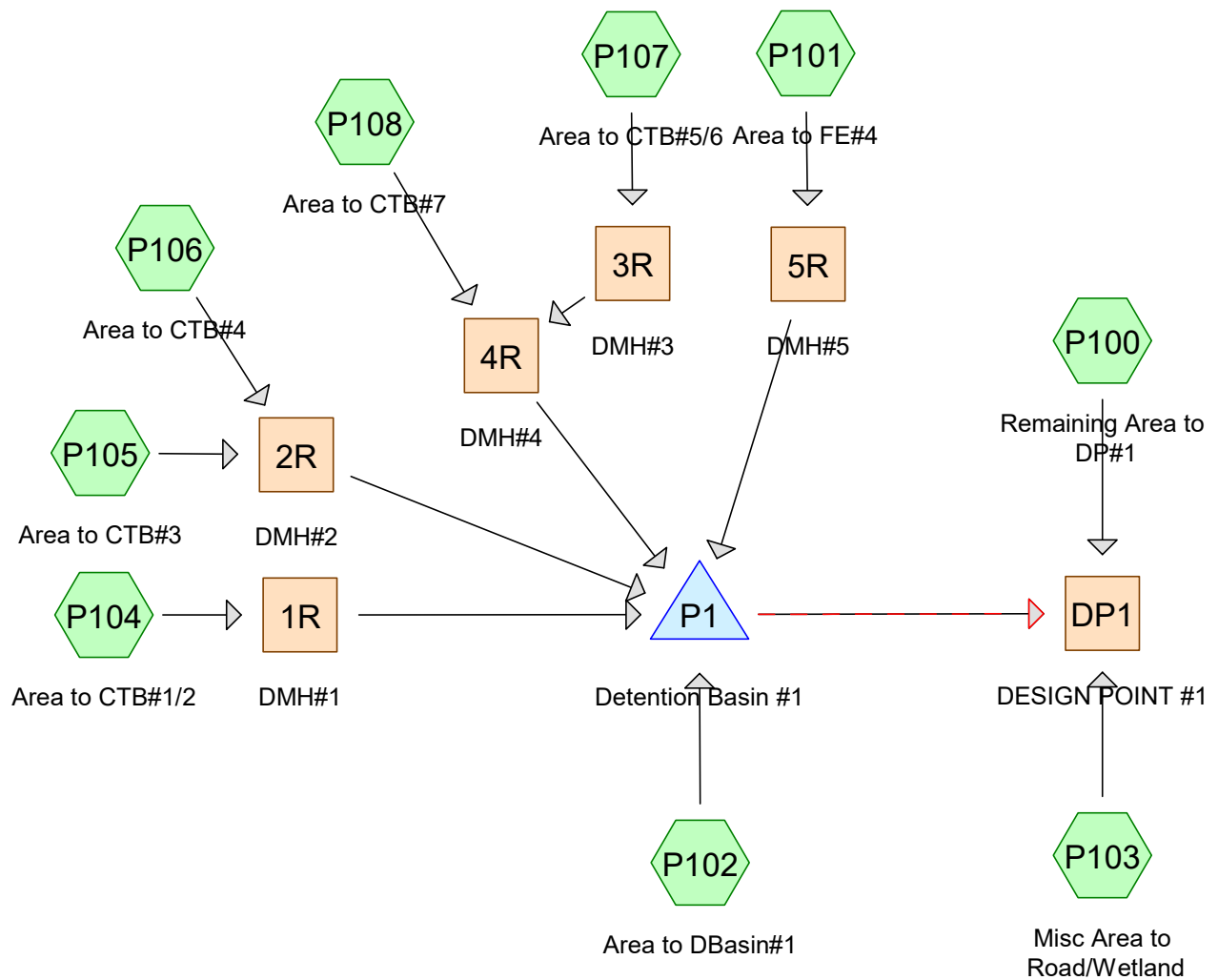
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach DP1: DESIGN POINT #1

Hydrograph



2.2
POST DEVELOPMENT CALCULATIONS



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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.919	39	>75% Grass cover, Good, HSG A (P100)
1.185	61	>75% Grass cover, Good, HSG B (P100, P102, P107)
2.718	74	>75% Grass cover, Good, HSG C (P100, P101, P102, P103, P104, P105, P106, P107, P108)
1.383	70	Brush, Fair, HSG C (P100, P103)
0.123	30	Brush, Good, HSG A (P100)
0.502	48	Brush, Good, HSG B (P100, P103)
0.145	65	Brush, Good, HSG C (P101)
0.243	85	Gravel roads, HSG B (P102)
1.334	89	Gravel roads, HSG C (P101)
2.348	98	Paved parking & roofs (P100, P101, P103, P104, P105, P106, P107, P108)
1.310	30	Woods, Good, HSG A (P100)
4.247	55	Woods, Good, HSG B (P100)
3.649	70	Woods, Good, HSG C (P100, P101, P103)
20.106	67	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.352	HSG A	P100
6.177	HSG B	P100, P102, P103, P107
9.229	HSG C	P100, P101, P102, P103, P104, P105, P106, P107, P108
0.000	HSG D	
2.348	Other	P100, P101, P103, P104, P105, P106, P107, P108
20.106		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.919	1.185	2.718	0.000	0.000	4.821	>75% Grass cover, Good	P100, P101, P102, P103, P104, P105, P106, P107, P108
0.000	0.000	1.383	0.000	0.000	1.383	Brush, Fair	P100, P103
0.123	0.502	0.145	0.000	0.000	0.771	Brush, Good	P100, P101, P103
0.000	0.243	1.334	0.000	0.000	1.577	Gravel roads	P101, P102
0.000	0.000	0.000	0.000	2.348	2.348	Paved parking & roofs	P100, P101, P103, P104, P105, P106, P107, P108
1.310	4.247	3.649	0.000	0.000	9.206	Woods, Good	P100, P101, P103
2.352	6.177	9.229	0.000	2.348	20.106	TOTAL AREA	

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Type III 24-hr 2-YR STORM Rainfall=3.00"

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

Subcatchment P100: Remaining Area to Runoff Area=545,873 sf 5.72% Impervious Runoff Depth=0.30"
 Flow Length=1,174' Tc=36.0 min CN=59 Runoff=1.29 cfs 0.316 af

Subcatchment P101: Area to FE#4 Runoff Area=171,647 sf 8.66% Impervious Runoff Depth=1.19"
 Flow Length=614' Tc=23.9 min CN=79 Runoff=3.34 cfs 0.390 af

Subcatchment P102: Area to DBasin#1 Runoff Area=53,091 sf 0.00% Impervious Runoff Depth=0.63"
 Flow Length=512' Tc=13.4 min CN=68 Runoff=0.57 cfs 0.064 af

Subcatchment P103: Misc Area to Runoff Area=43,238 sf 22.82% Impervious Runoff Depth=1.02"
 Flow Length=1,094' Tc=26.2 min CN=76 Runoff=0.67 cfs 0.084 af

Subcatchment P104: Area to CTB#1/2 Runoff Area=5,575 sf 73.79% Impervious Runoff Depth=2.16"
 Tc=5.0 min CN=92 Runoff=0.32 cfs 0.023 af

Subcatchment P105: Area to CTB#3 Runoff Area=11,266 sf 75.40% Impervious Runoff Depth=2.16"
 Tc=5.0 min CN=92 Runoff=0.65 cfs 0.047 af

Subcatchment P106: Area to CTB#4 Runoff Area=10,915 sf 84.92% Impervious Runoff Depth=2.35"
 Tc=5.0 min CN=94 Runoff=0.67 cfs 0.049 af

Subcatchment P107: Area to CTB#5/6 Runoff Area=20,262 sf 62.59% Impervious Runoff Depth=1.90"
 Tc=5.0 min CN=89 Runoff=1.03 cfs 0.074 af

Subcatchment P108: Area to CTB#7 Runoff Area=13,953 sf 84.43% Impervious Runoff Depth=2.35"
 Tc=5.0 min CN=94 Runoff=0.85 cfs 0.063 af

Reach 1R: DMH#1 Inflow=0.32 cfs 0.023 af
 Outflow=0.32 cfs 0.023 af

Reach 2R: DMH#2 Inflow=1.31 cfs 0.096 af
 Outflow=1.31 cfs 0.096 af

Reach 3R: DMH#3 Inflow=1.03 cfs 0.074 af
 Outflow=1.03 cfs 0.074 af

Reach 4R: DMH#4 Inflow=1.89 cfs 0.136 af
 Outflow=1.89 cfs 0.136 af

Reach 5R: DMH#5 Inflow=3.34 cfs 0.390 af
 Outflow=3.34 cfs 0.390 af

Reach DP1: DESIGN POINT #1 Inflow=1.74 cfs 0.619 af
 Outflow=1.74 cfs 0.619 af

Pond P1: Detention Basin #1 Peak Elev=421.56' Storage=24,282 cf Inflow=5.27 cfs 0.709 af
 Primary=0.25 cfs 0.218 af Secondary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.218 af

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Type III 24-hr 2-YR STORM Rainfall=3.00"

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Total Runoff Area = 20.106 ac Runoff Volume = 1.109 af Average Runoff Depth = 0.66"
88.32% Pervious = 17.758 ac 11.68% Impervious = 2.348 ac

Summary for Subcatchment P100: Remaining Area to DP#1

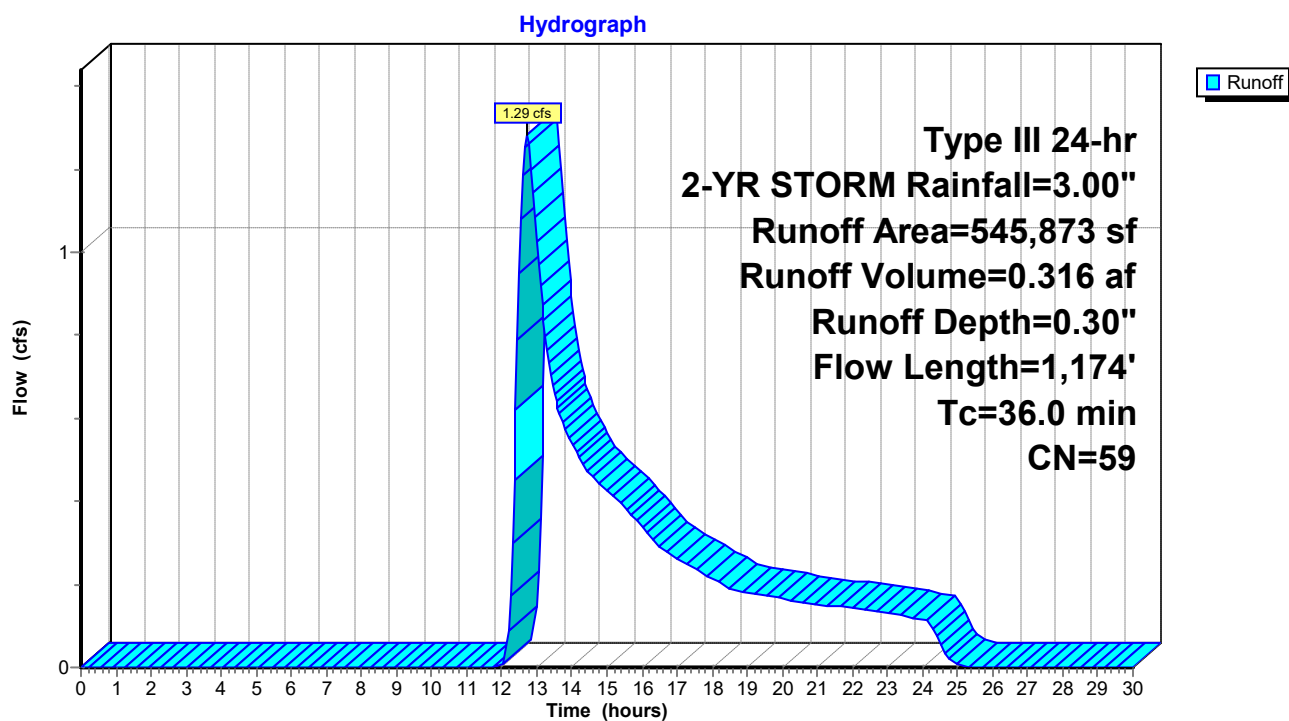
Runoff = 1.29 cfs @ 12.72 hrs, Volume= 0.316 af, Depth= 0.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
40,035	39	>75% Grass cover, Good, HSG A
19,350	61	>75% Grass cover, Good, HSG B
39,460	74	>75% Grass cover, Good, HSG C
5,377	30	Brush, Good, HSG A
16,687	48	Brush, Good, HSG B
52,490	70	Brush, Fair, HSG C
57,046	30	Woods, Good, HSG A
185,010	55	Woods, Good, HSG B
99,211	70	Woods, Good, HSG C
31,207	98	Paved parking & roofs
545,873	59	Weighted Average
514,666		94.28% Pervious Area
31,207		5.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
1.9	119	0.0420	1.02		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.2	40	0.0750	4.41		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.2	62	0.0320	0.89		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.4	53	0.1130	2.35		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
22.6	850	0.0080	0.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
36.0	1,174	Total			

Subcatchment P100: Remaining Area to DP#1



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Type III 24-hr 2-YR STORM Rainfall=3.00"

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Summary for Subcatchment P101: Area to FE#4

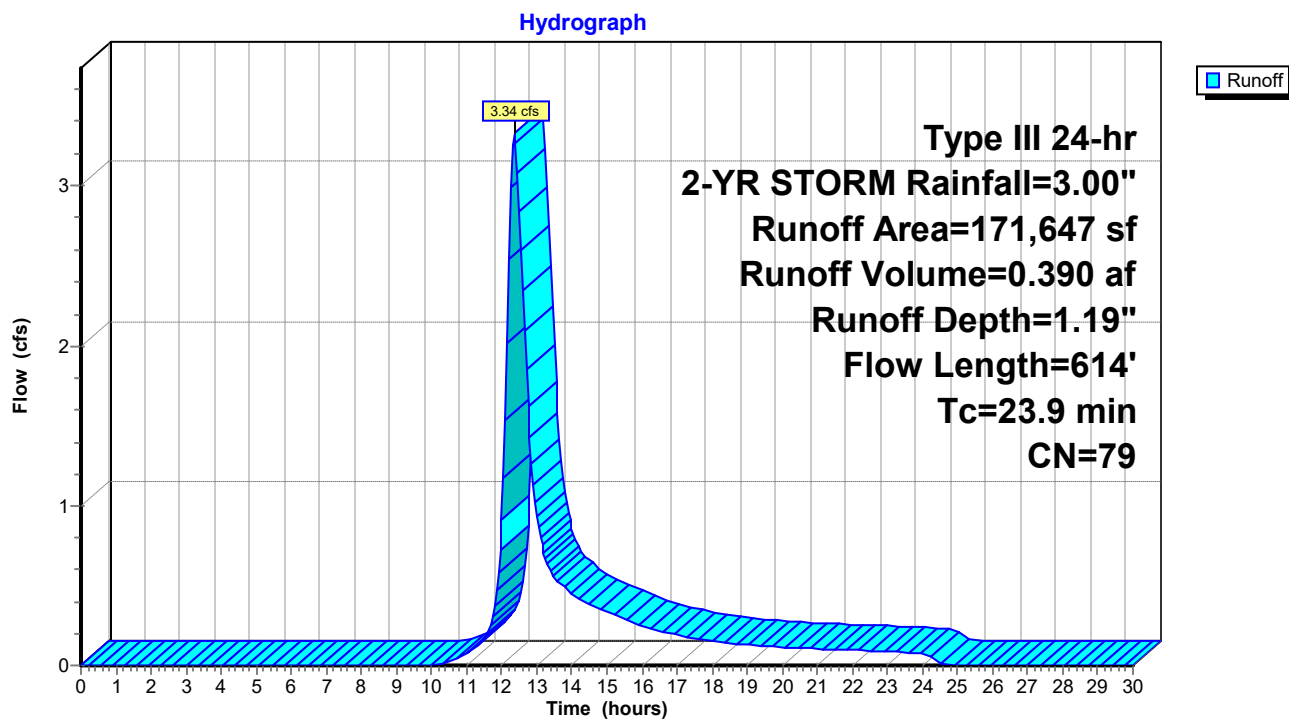
Runoff = 3.34 cfs @ 12.35 hrs, Volume= 0.390 af, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
32,659	74	>75% Grass cover, Good, HSG C
6,334	65	Brush, Good, HSG C
59,669	70	Woods, Good, HSG C
58,118	89	Gravel roads, HSG C
14,867	98	Paved parking & roofs
171,647	79	Weighted Average
156,780		91.34% Pervious Area
14,867		8.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
13.0	389	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.1	58	0.2070	7.33		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.1	117	0.0130	1.84		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
23.9	614	Total			

Subcatchment P101: Area to FE#4



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Type III 24-hr 2-YR STORM Rainfall=3.00"

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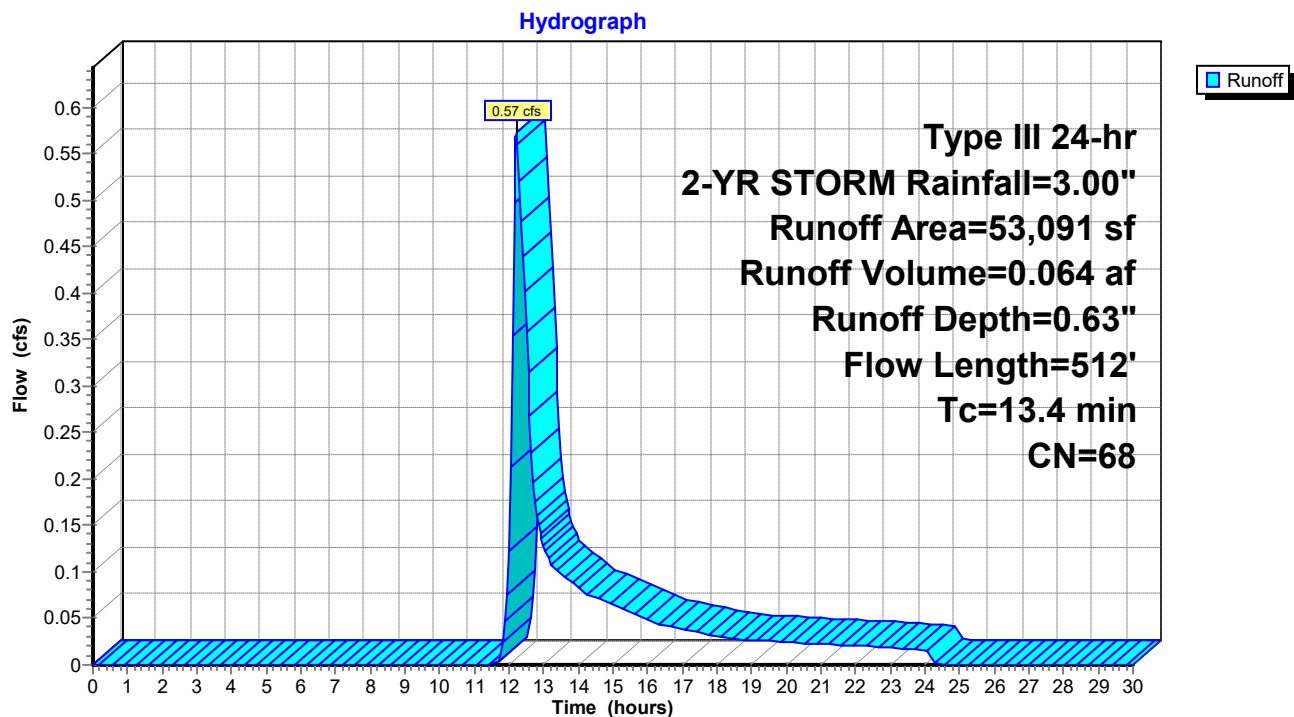
Summary for Subcatchment P102: Area to DBasin#1

Runoff = 0.57 cfs @ 12.22 hrs, Volume= 0.064 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
31,500	61	>75% Grass cover, Good, HSG B
11,025	74	>75% Grass cover, Good, HSG C
10,566	85	Gravel roads, HSG B
53,091	68	Weighted Average
53,091		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	32	0.0200	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.00"
7.5	480	0.0050	1.06		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
13.4	512	Total			

Subcatchment P102: Area to DBasin#1

Summary for Subcatchment P103: Misc Area to Road/Wetland

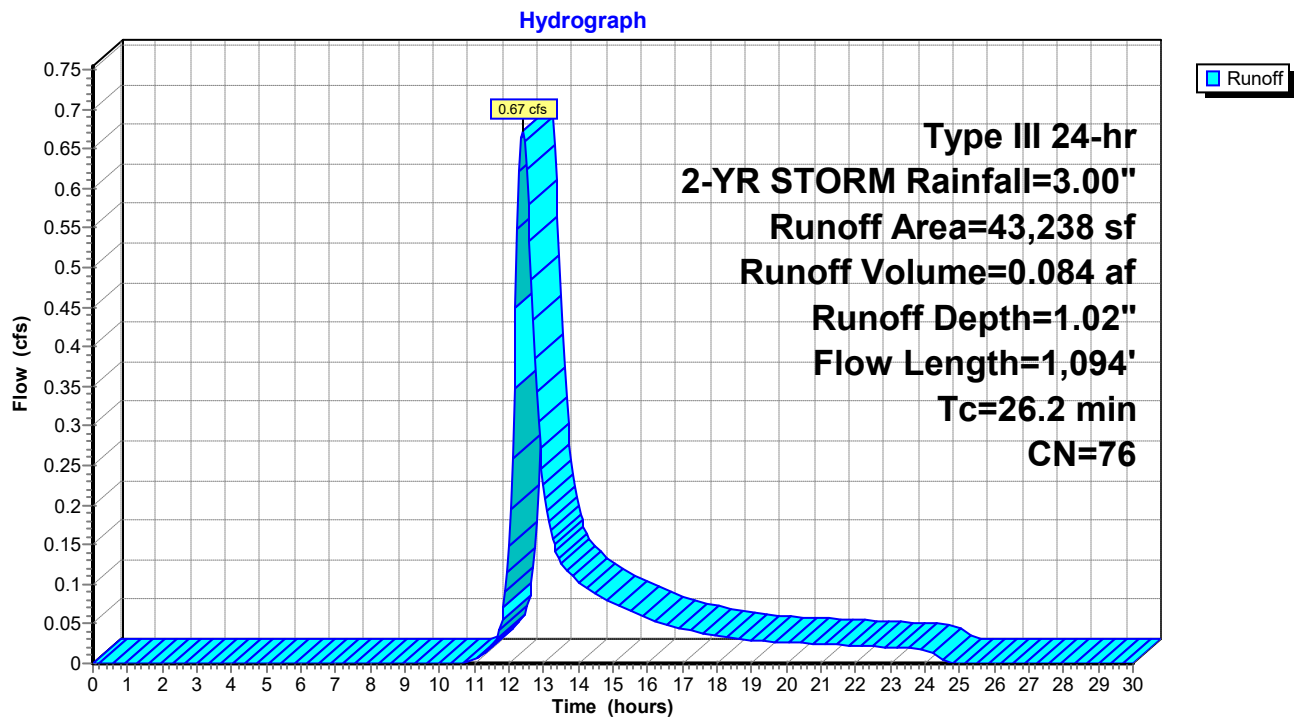
Runoff = 0.67 cfs @ 12.40 hrs, Volume= 0.084 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
20,365	74	>75% Grass cover, Good, HSG C
5,184	48	Brush, Good, HSG B
7,749	70	Brush, Fair, HSG C
75	70	Woods, Good, HSG C
9,865	98	Paved parking & roofs
43,238	76	Weighted Average
33,373		77.18% Pervious Area
9,865		22.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	28	0.0700	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
0.6	80	0.1000	2.21		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
14.1	418	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.6	568	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
26.2	1,094	Total			

Subcatchment P103: Misc Area to Road/Wetland



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Type III 24-hr 2-YR STORM Rainfall=3.00"

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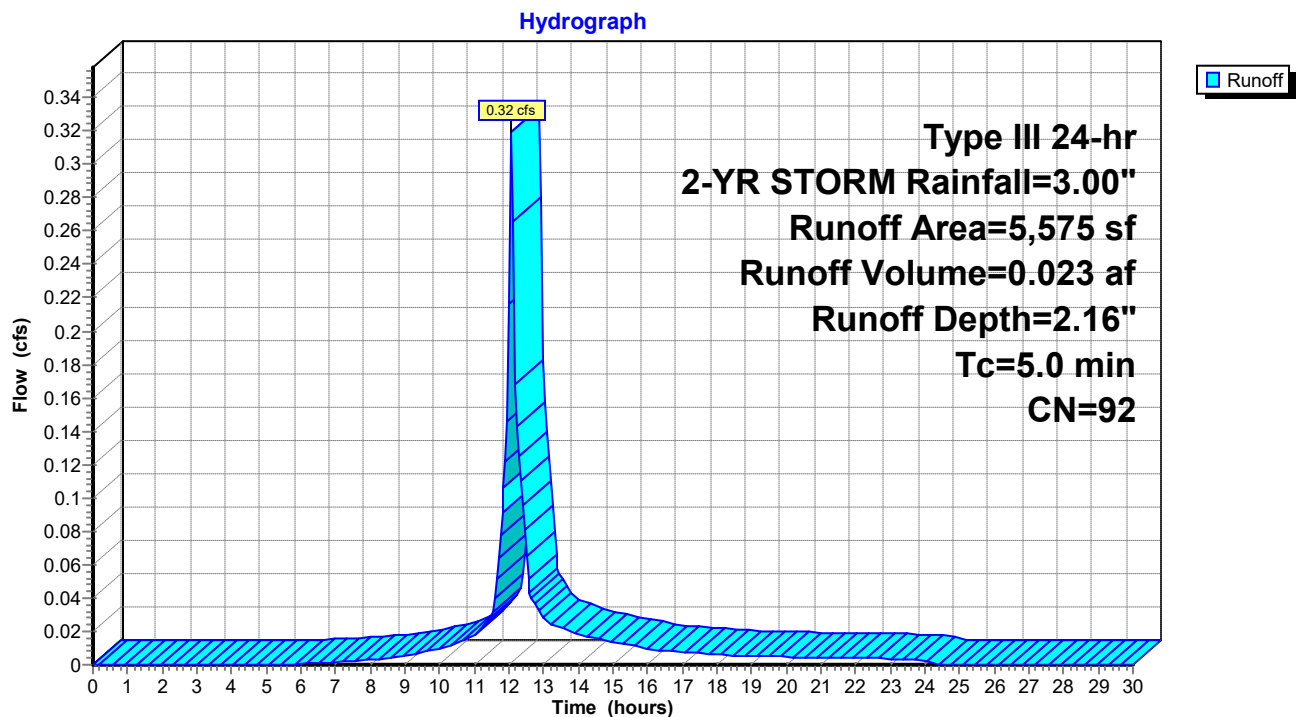
Summary for Subcatchment P104: Area to CTB#1/2

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 0.023 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
1,461	74	>75% Grass cover, Good, HSG C
4,114	98	Paved parking & roofs
5,575	92	Weighted Average
1,461		26.21% Pervious Area
4,114		73.79% Impervious Area

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

Subcatchment P104: Area to CTB#1/2

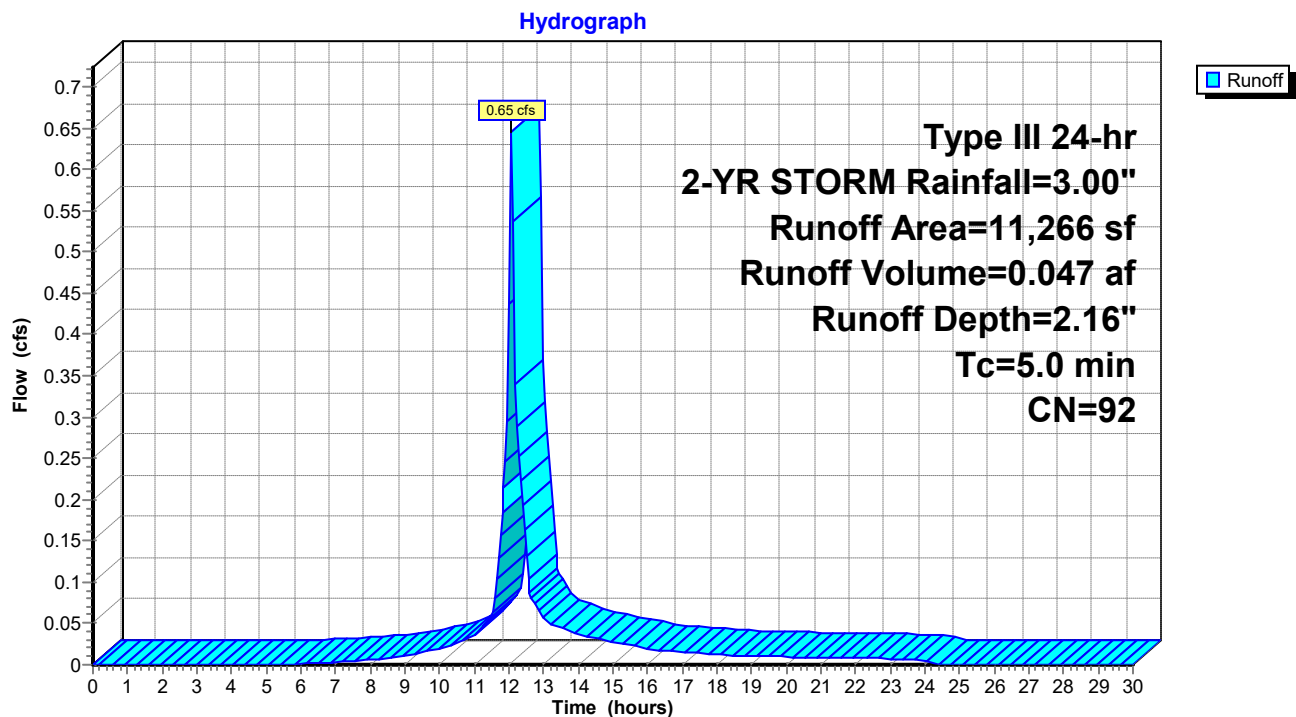
Summary for Subcatchment P105: Area to CTB#3

Runoff = 0.65 cfs @ 12.07 hrs, Volume= 0.047 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
2,771	74	>75% Grass cover, Good, HSG C
8,495	98	Paved parking & roofs
11,266	92	Weighted Average
2,771		24.60% Pervious Area
8,495		75.40% Impervious Area

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

Subcatchment P105: Area to CTB#3

Summary for Subcatchment P106: Area to CTB#4

Runoff = 0.67 cfs @ 12.07 hrs, Volume= 0.049 af, Depth= 2.35"

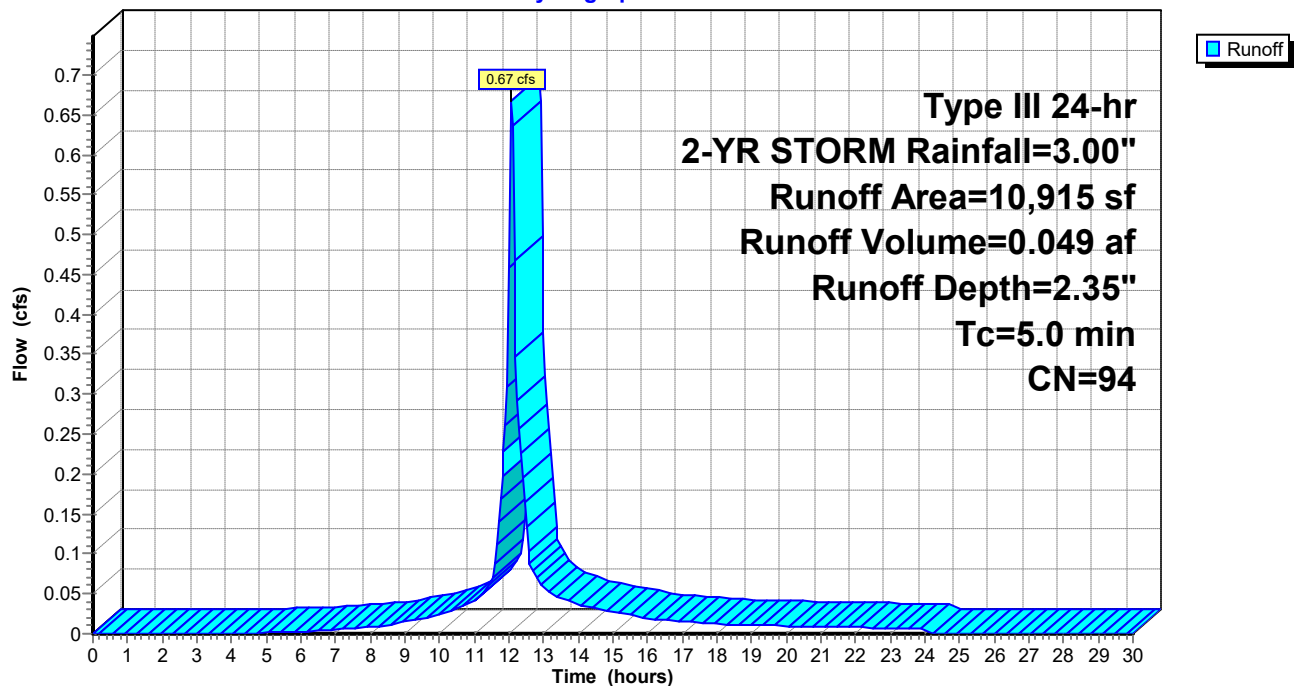
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
1,646	74	>75% Grass cover, Good, HSG C
9,269	98	Paved parking & roofs
10,915	94	Weighted Average
1,646		15.08% Pervious Area
9,269		84.92% Impervious Area

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

Subcatchment P106: Area to CTB#4

Hydrograph



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Type III 24-hr 2-YR STORM Rainfall=3.00"

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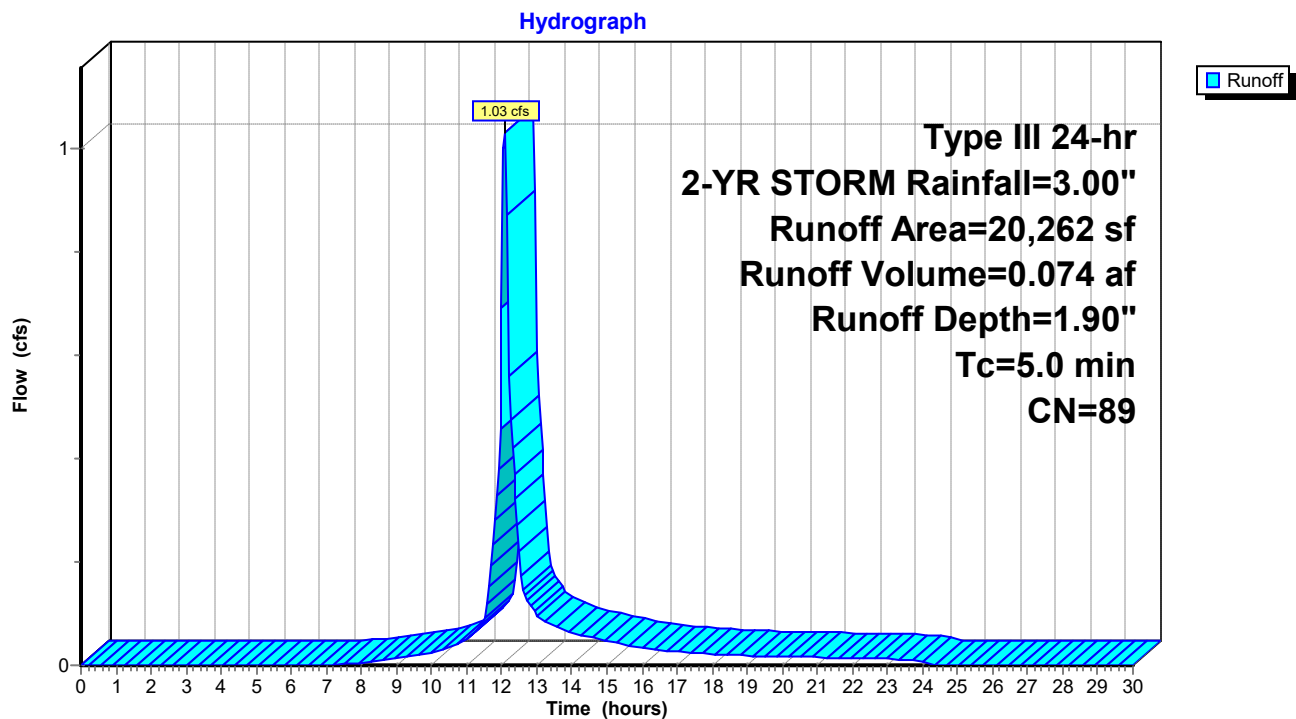
Summary for Subcatchment P107: Area to CTB#5/6

Runoff = 1.03 cfs @ 12.08 hrs, Volume= 0.074 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
759	61	>75% Grass cover, Good, HSG B
6,821	74	>75% Grass cover, Good, HSG C
12,682	98	Paved parking & roofs
20,262	89	Weighted Average
7,580		37.41% Pervious Area
12,682		62.59% Impervious Area

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

Subcatchment P107: Area to CTB#5/6

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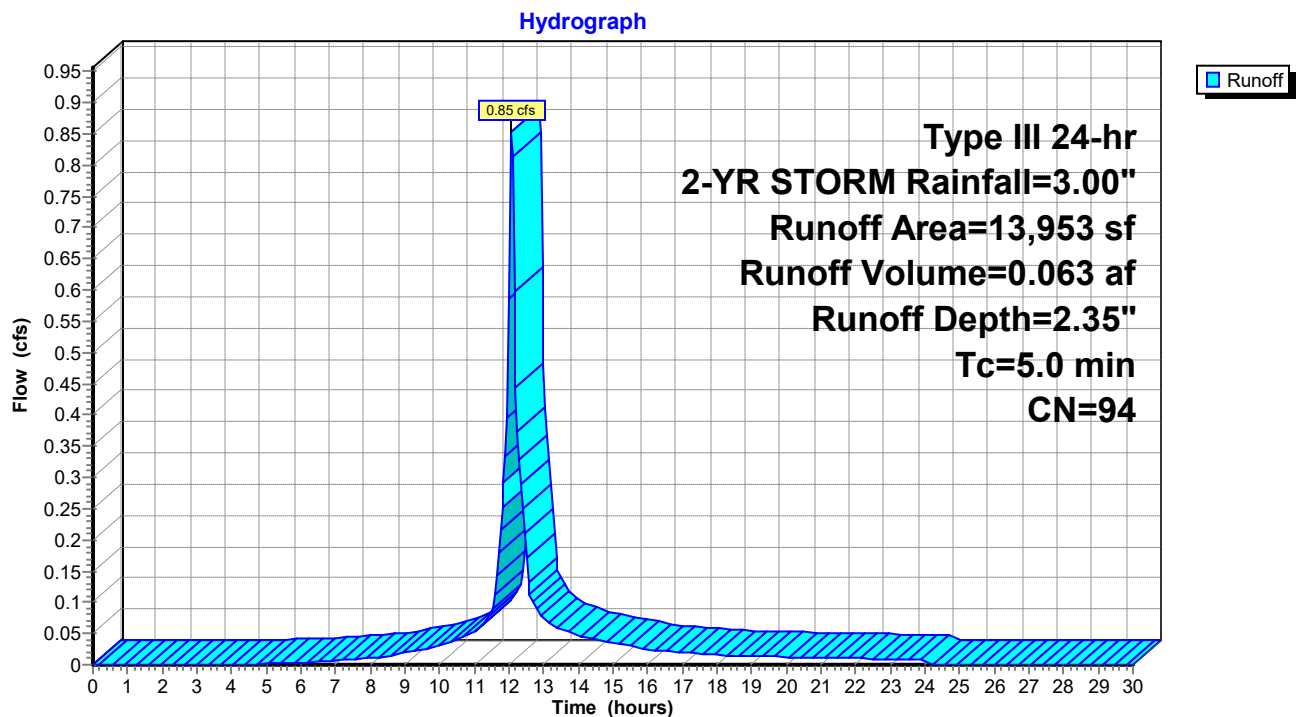
Summary for Subcatchment P108: Area to CTB#7

Runoff = 0.85 cfs @ 12.07 hrs, Volume= 0.063 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR STORM Rainfall=3.00"

Area (sf)	CN	Description
2,172	74	>75% Grass cover, Good, HSG C
11,781	98	Paved parking & roofs
13,953	94	Weighted Average
2,172		15.57% Pervious Area
11,781		84.43% Impervious Area

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

Subcatchment P108: Area to CTB#7

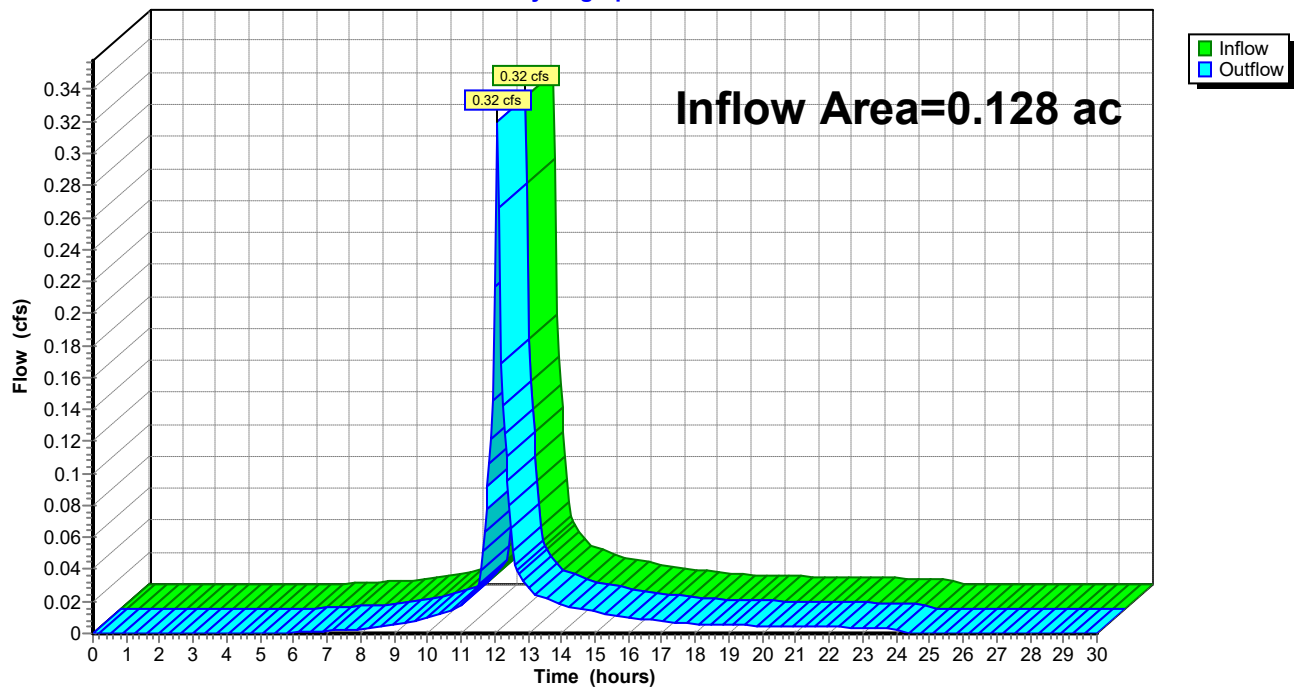
Summary for Reach 1R: DMH#1

Inflow Area = 0.128 ac, 73.79% Impervious, Inflow Depth = 2.16" for 2-YR STORM event
Inflow = 0.32 cfs @ 12.07 hrs, Volume= 0.023 af
Outflow = 0.32 cfs @ 12.07 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

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

Reach 1R: DMH#1

Hydrograph



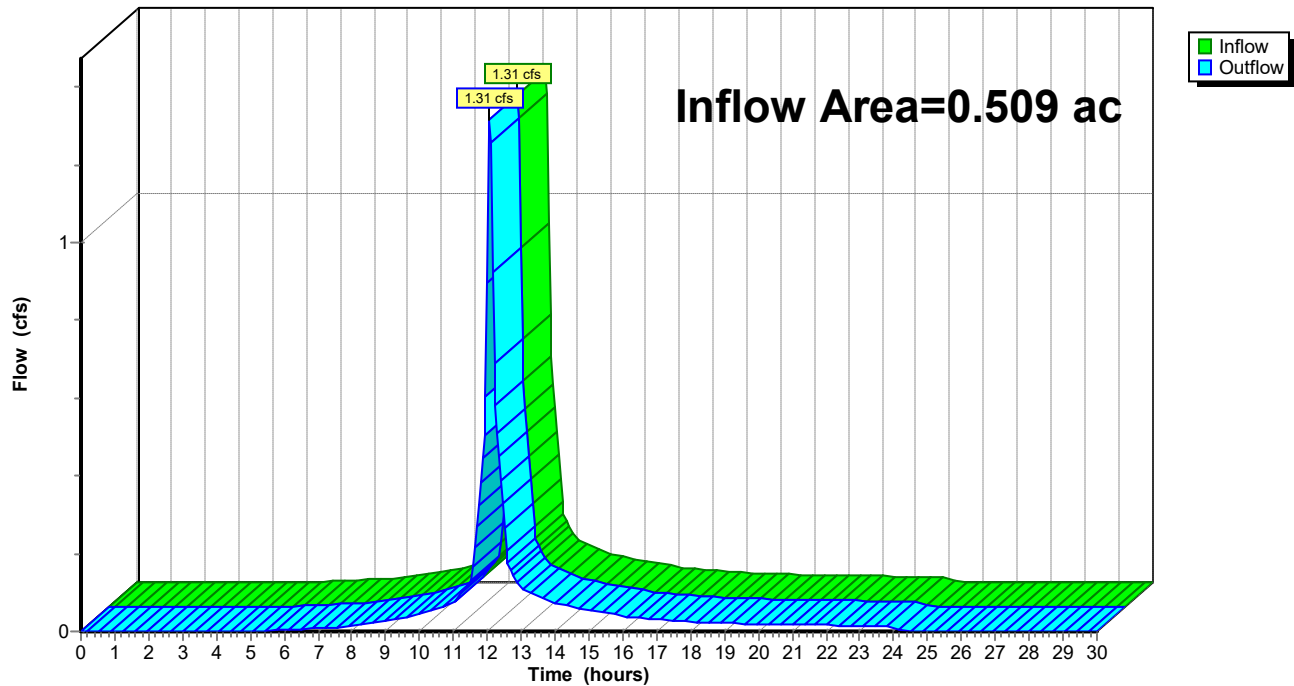
Summary for Reach 2R: DMH#2

Inflow Area = 0.509 ac, 80.09% Impervious, Inflow Depth = 2.25" for 2-YR STORM event
Inflow = 1.31 cfs @ 12.07 hrs, Volume= 0.096 af
Outflow = 1.31 cfs @ 12.07 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: DMH#2

Hydrograph



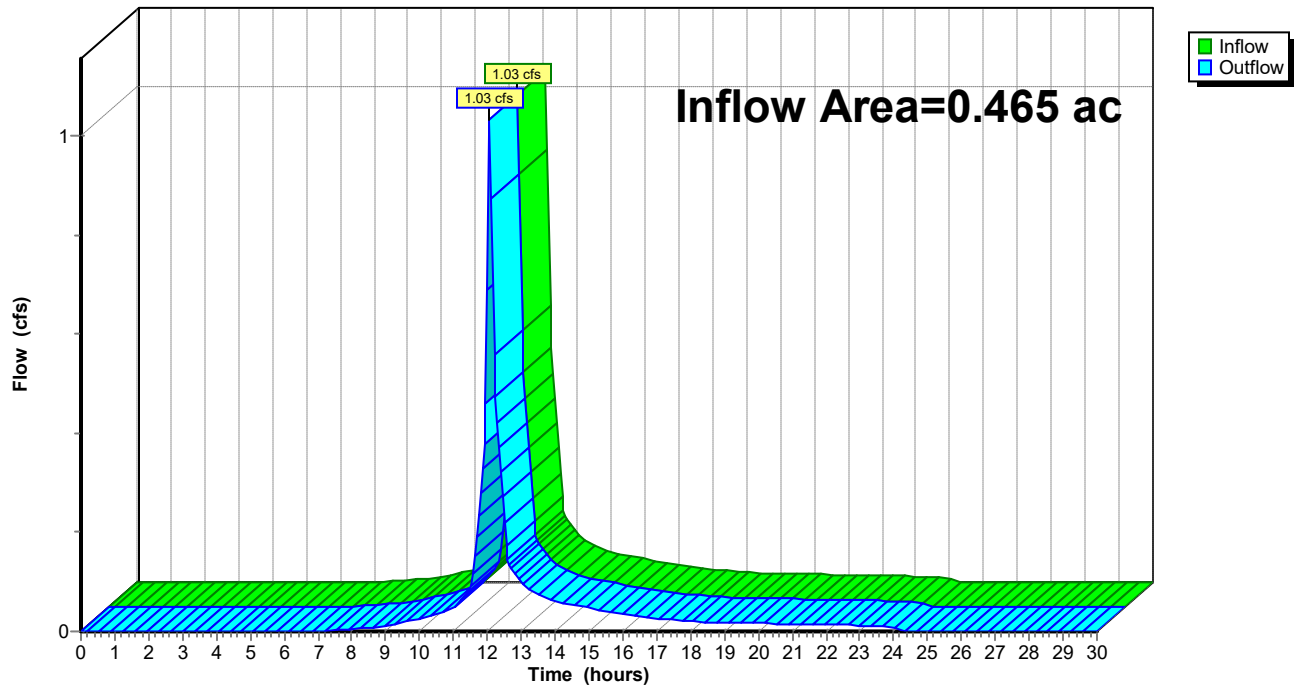
Summary for Reach 3R: DMH#3

Inflow Area = 0.465 ac, 62.59% Impervious, Inflow Depth = 1.90" for 2-YR STORM event
Inflow = 1.03 cfs @ 12.08 hrs, Volume= 0.074 af
Outflow = 1.03 cfs @ 12.08 hrs, Volume= 0.074 af, Atten= 0%, Lag= 0.0 min

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

Reach 3R: DMH#3

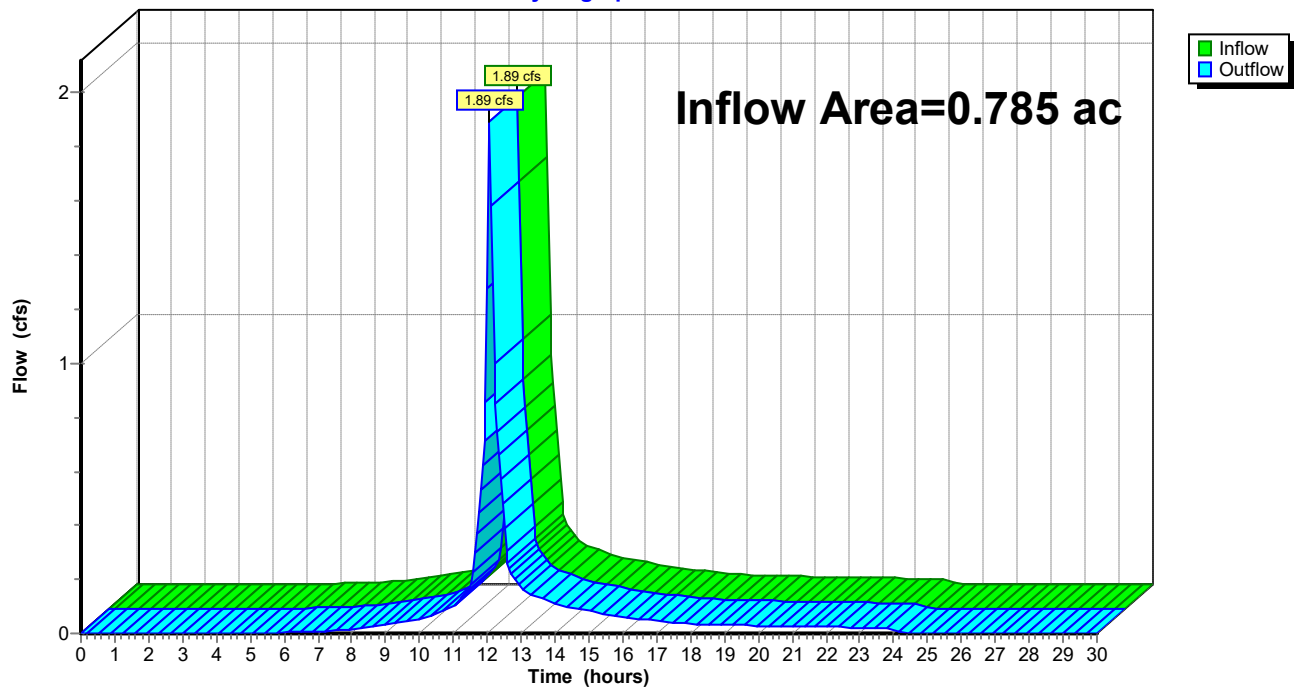
Hydrograph



Summary for Reach 4R: DMH#4

Inflow Area = 0.785 ac, 71.50% Impervious, Inflow Depth = 2.08" for 2-YR STORM event
Inflow = 1.89 cfs @ 12.07 hrs, Volume= 0.136 af
Outflow = 1.89 cfs @ 12.07 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.0 min

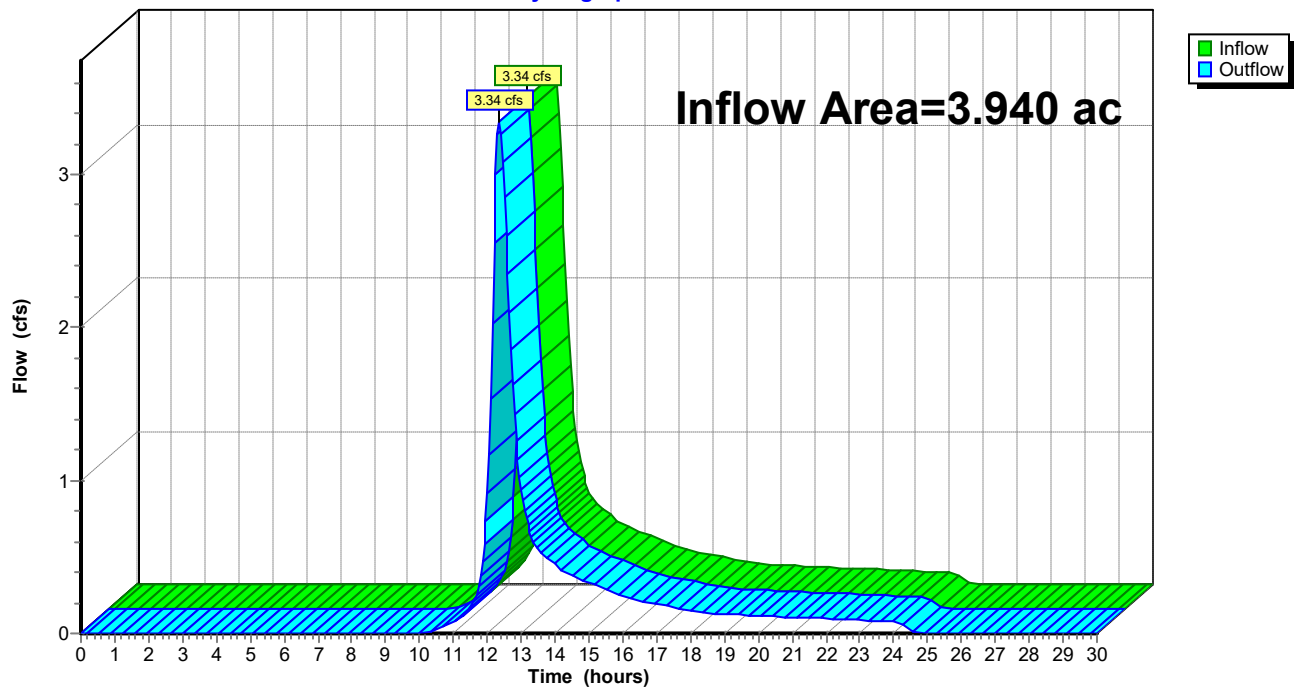
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 4R: DMH#4**Hydrograph**

Summary for Reach 5R: DMH#5

Inflow Area = 3.940 ac, 8.66% Impervious, Inflow Depth = 1.19" for 2-YR STORM event
Inflow = 3.34 cfs @ 12.35 hrs, Volume= 0.390 af
Outflow = 3.34 cfs @ 12.35 hrs, Volume= 0.390 af, Atten= 0%, Lag= 0.0 min

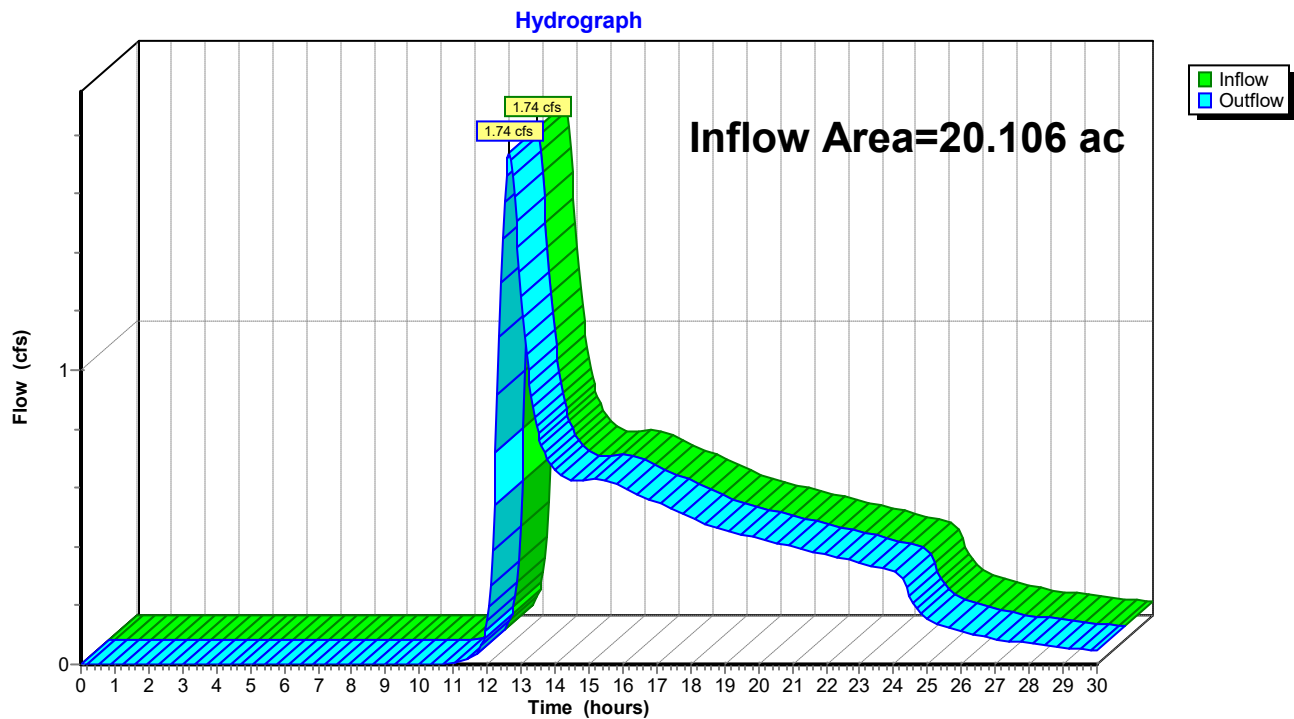
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 5R: DMH#5**Hydrograph**

Summary for Reach DP1: DESIGN POINT #1

Inflow Area = 20.106 ac, 11.68% Impervious, Inflow Depth > 0.37" for 2-YR STORM event
Inflow = 1.74 cfs @ 12.65 hrs, Volume= 0.619 af
Outflow = 1.74 cfs @ 12.65 hrs, Volume= 0.619 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1: DESIGN POINT #1

Summary for Pond P1: Detention Basin #1

Inflow Area = 6.582 ac, 21.35% Impervious, Inflow Depth = 1.29" for 2-YR STORM event
 Inflow = 5.27 cfs @ 12.11 hrs, Volume= 0.709 af
 Outflow = 0.25 cfs @ 17.88 hrs, Volume= 0.218 af, Atten= 95%, Lag= 346.6 min
 Primary = 0.25 cfs @ 17.88 hrs, Volume= 0.218 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 421.56' @ 17.88 hrs Surf.Area= 18,276 sf Storage= 24,282 cf

Plug-Flow detention time= 549.5 min calculated for 0.218 af (31% of inflow)
 Center-of-Mass det. time= 405.9 min (1,250.2 - 844.3)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	91,703 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	12,517	0	0
421.00	16,535	14,526	14,526
422.00	19,642	18,089	32,615
424.00	26,026	45,668	78,283
424.50	27,657	13,421	91,703

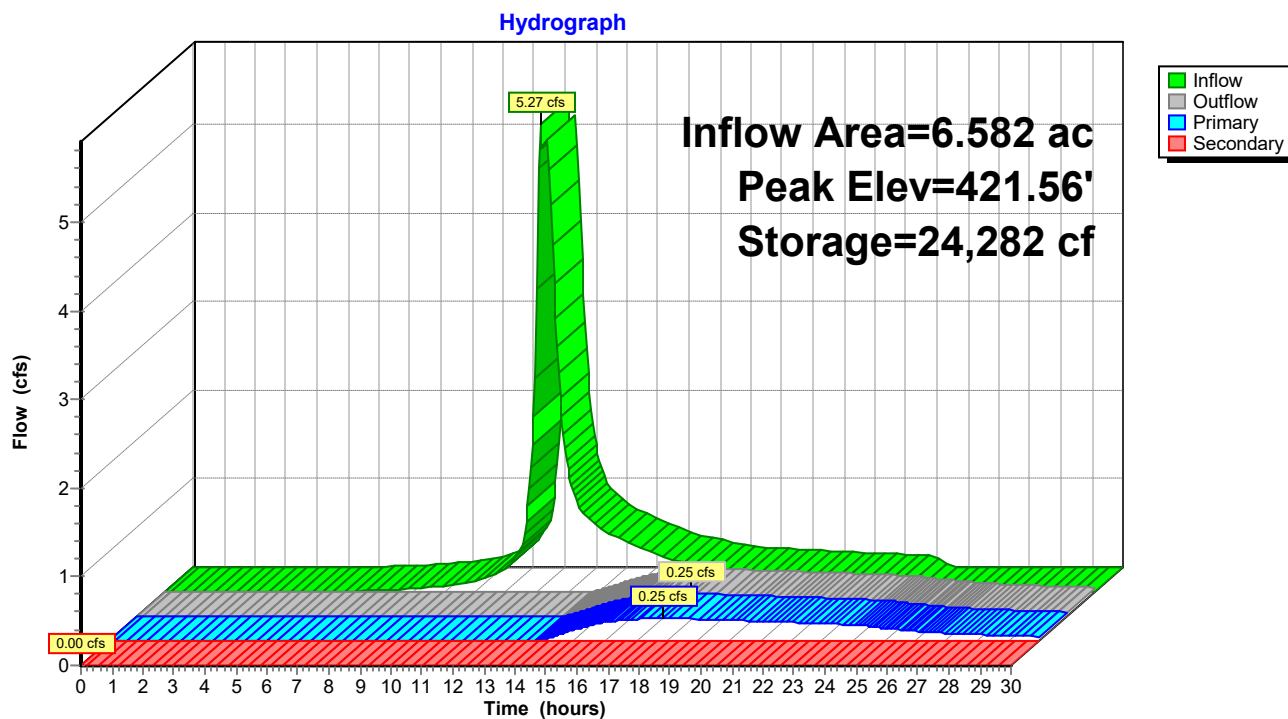
Device	Routing	Invert	Outlet Devices
#1	Primary	421.30'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600
#2	Primary	421.80'	10.0" Vert. Orifice/Grate C= 0.600
#3	Primary	422.30'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Secondary	423.50'	10.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Primary OutFlow Max=0.25 cfs @ 17.88 hrs HW=421.56' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.25 cfs @ 1.74 fps)
 — **2=Orifice/Grate** (Controls 0.00 cfs)
 — **3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.00' (Free Discharge)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Detention Basin #1

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Stage-Discharge for Pond P1: Detention Basin #1

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)	Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
420.00	0.00	0.00	0.00	422.60	2.84	2.84	0.00
420.05	0.00	0.00	0.00	422.65	3.00	3.00	0.00
420.10	0.00	0.00	0.00	422.70	3.16	3.16	0.00
420.15	0.00	0.00	0.00	422.75	3.32	3.32	0.00
420.20	0.00	0.00	0.00	422.80	3.46	3.46	0.00
420.25	0.00	0.00	0.00	422.85	3.60	3.60	0.00
420.30	0.00	0.00	0.00	422.90	3.73	3.73	0.00
420.35	0.00	0.00	0.00	422.95	3.86	3.86	0.00
420.40	0.00	0.00	0.00	423.00	3.98	3.98	0.00
420.45	0.00	0.00	0.00	423.05	4.10	4.10	0.00
420.50	0.00	0.00	0.00	423.10	4.21	4.21	0.00
420.55	0.00	0.00	0.00	423.15	4.32	4.32	0.00
420.60	0.00	0.00	0.00	423.20	4.43	4.43	0.00
420.65	0.00	0.00	0.00	423.25	4.54	4.54	0.00
420.70	0.00	0.00	0.00	423.30	4.64	4.64	0.00
420.75	0.00	0.00	0.00	423.35	4.74	4.74	0.00
420.80	0.00	0.00	0.00	423.40	4.84	4.84	0.00
420.85	0.00	0.00	0.00	423.45	4.93	4.93	0.00
420.90	0.00	0.00	0.00	423.50	5.03	5.03	0.00
420.95	0.00	0.00	0.00	423.55	5.45	5.12	0.33
421.00	0.00	0.00	0.00	423.60	6.13	5.21	0.92
421.05	0.00	0.00	0.00	423.65	7.00	5.30	1.70
421.10	0.00	0.00	0.00	423.70	8.00	5.39	2.61
421.15	0.00	0.00	0.00	423.75	9.12	5.47	3.65
421.20	0.00	0.00	0.00	423.80	10.36	5.56	4.80
421.25	0.00	0.00	0.00	423.85	11.69	5.64	6.05
421.30	0.00	0.00	0.00	423.90	13.11	5.72	7.39
421.35	0.01	0.01	0.00	423.95	14.62	5.81	8.81
421.40	0.05	0.05	0.00	424.00	16.24	5.89	10.36
421.45	0.10	0.10	0.00	424.05	18.10	5.96	12.14
421.50	0.17	0.17	0.00	424.10	20.08	6.04	14.04
421.55	0.24	0.24	0.00	424.15	22.19	6.12	16.07
421.60	0.31	0.31	0.00	424.20	24.43	6.19	18.23
421.65	0.36	0.36	0.00	424.25	26.79	6.27	20.52
421.70	0.41	0.41	0.00	424.30	29.27	6.34	22.93
421.75	0.45	0.45	0.00	424.35	31.89	6.42	25.47
421.80	0.49	0.49	0.00	424.40	34.63	6.49	28.15
421.85	0.53	0.53	0.00	424.45	37.51	6.56	30.95
421.90	0.59	0.59	0.00	424.50	40.42	6.63	33.79
421.95	0.67	0.67	0.00				
422.00	0.77	0.77	0.00				
422.05	0.88	0.88	0.00				
422.10	1.00	1.00	0.00				
422.15	1.13	1.13	0.00				
422.20	1.28	1.28	0.00				
422.25	1.43	1.43	0.00				
422.30	1.59	1.59	0.00				
422.35	1.77	1.77	0.00				
422.40	1.97	1.97	0.00				
422.45	2.19	2.19	0.00				
422.50	2.41	2.41	0.00				
422.55	2.64	2.64	0.00				

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Type III 24-hr 10-YR STORM Rainfall=4.50"

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

Subcatchment P100: Remaining Area to Runoff Area=545,873 sf 5.72% Impervious Runoff Depth=0.96"
 Flow Length=1,174' Tc=36.0 min CN=59 Runoff=6.16 cfs 1.004 af

Subcatchment P101: Area to FE#4 Runoff Area=171,647 sf 8.66% Impervious Runoff Depth=2.38"
 Flow Length=614' Tc=23.9 min CN=79 Runoff=6.84 cfs 0.780 af

Subcatchment P102: Area to DBasin#1 Runoff Area=53,091 sf 0.00% Impervious Runoff Depth=1.53"
 Flow Length=512' Tc=13.4 min CN=68 Runoff=1.63 cfs 0.156 af

Subcatchment P103: Misc Area to Runoff Area=43,238 sf 22.82% Impervious Runoff Depth=2.13"
 Flow Length=1,094' Tc=26.2 min CN=76 Runoff=1.48 cfs 0.176 af

Subcatchment P104: Area to CTB#1/2 Runoff Area=5,575 sf 73.79% Impervious Runoff Depth=3.60"
 Tc=5.0 min CN=92 Runoff=0.52 cfs 0.038 af

Subcatchment P105: Area to CTB#3 Runoff Area=11,266 sf 75.40% Impervious Runoff Depth=3.60"
 Tc=5.0 min CN=92 Runoff=1.05 cfs 0.078 af

Subcatchment P106: Area to CTB#4 Runoff Area=10,915 sf 84.92% Impervious Runoff Depth=3.82"
 Tc=5.0 min CN=94 Runoff=1.06 cfs 0.080 af

Subcatchment P107: Area to CTB#5/6 Runoff Area=20,262 sf 62.59% Impervious Runoff Depth=3.30"
 Tc=5.0 min CN=89 Runoff=1.77 cfs 0.128 af

Subcatchment P108: Area to CTB#7 Runoff Area=13,953 sf 84.43% Impervious Runoff Depth=3.82"
 Tc=5.0 min CN=94 Runoff=1.35 cfs 0.102 af

Reach 1R: DMH#1 Inflow=0.52 cfs 0.038 af
 Outflow=0.52 cfs 0.038 af

Reach 2R: DMH#2 Inflow=2.11 cfs 0.157 af
 Outflow=2.11 cfs 0.157 af

Reach 3R: DMH#3 Inflow=1.77 cfs 0.128 af
 Outflow=1.77 cfs 0.128 af

Reach 4R: DMH#4 Inflow=3.12 cfs 0.230 af
 Outflow=3.12 cfs 0.230 af

Reach 5R: DMH#5 Inflow=6.84 cfs 0.780 af
 Outflow=6.84 cfs 0.780 af

Reach DP1: DESIGN POINT #1 Inflow=7.81 cfs 2.031 af
 Outflow=7.81 cfs 2.031 af

Pond P1: Detention Basin #1 Peak Elev=422.18' Storage=36,121 cf Inflow=10.38 cfs 1.361 af
 Primary=1.21 cfs 0.850 af Secondary=0.00 cfs 0.000 af Outflow=1.21 cfs 0.850 af

2352-Poulin-Padula Post 2021.1

Type III 24-hr 10-YR STORM Rainfall=4.50"

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Total Runoff Area = 20.106 ac Runoff Volume = 2.542 af Average Runoff Depth = 1.52"
88.32% Pervious = 17.758 ac 11.68% Impervious = 2.348 ac

Summary for Subcatchment P100: Remaining Area to DP#1

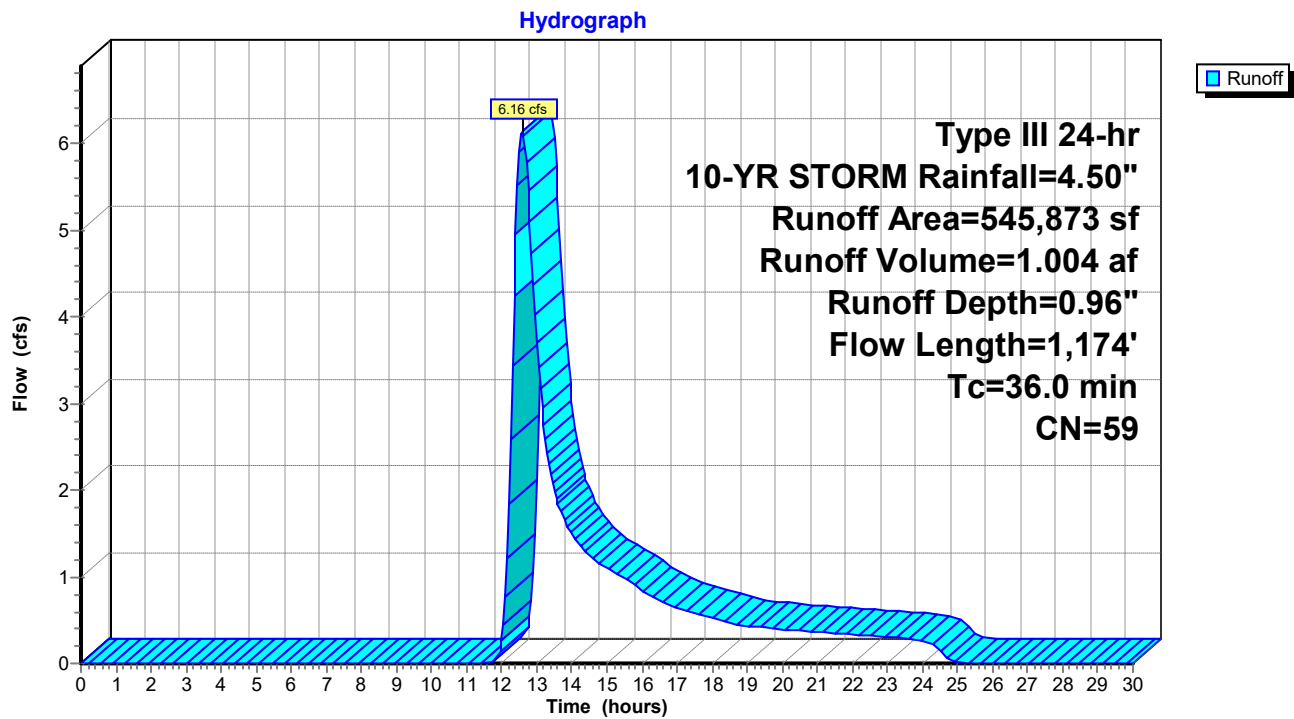
Runoff = 6.16 cfs @ 12.59 hrs, Volume= 1.004 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
40,035	39	>75% Grass cover, Good, HSG A
19,350	61	>75% Grass cover, Good, HSG B
39,460	74	>75% Grass cover, Good, HSG C
5,377	30	Brush, Good, HSG A
16,687	48	Brush, Good, HSG B
52,490	70	Brush, Fair, HSG C
57,046	30	Woods, Good, HSG A
185,010	55	Woods, Good, HSG B
99,211	70	Woods, Good, HSG C
31,207	98	Paved parking & roofs
545,873	59	Weighted Average
514,666		94.28% Pervious Area
31,207		5.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
1.9	119	0.0420	1.02		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.2	40	0.0750	4.41		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.2	62	0.0320	0.89		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.4	53	0.1130	2.35		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
22.6	850	0.0080	0.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
36.0	1,174	Total			

Subcatchment P100: Remaining Area to DP#1



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Type III 24-hr 10-YR STORM Rainfall=4.50"

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Summary for Subcatchment P101: Area to FE#4

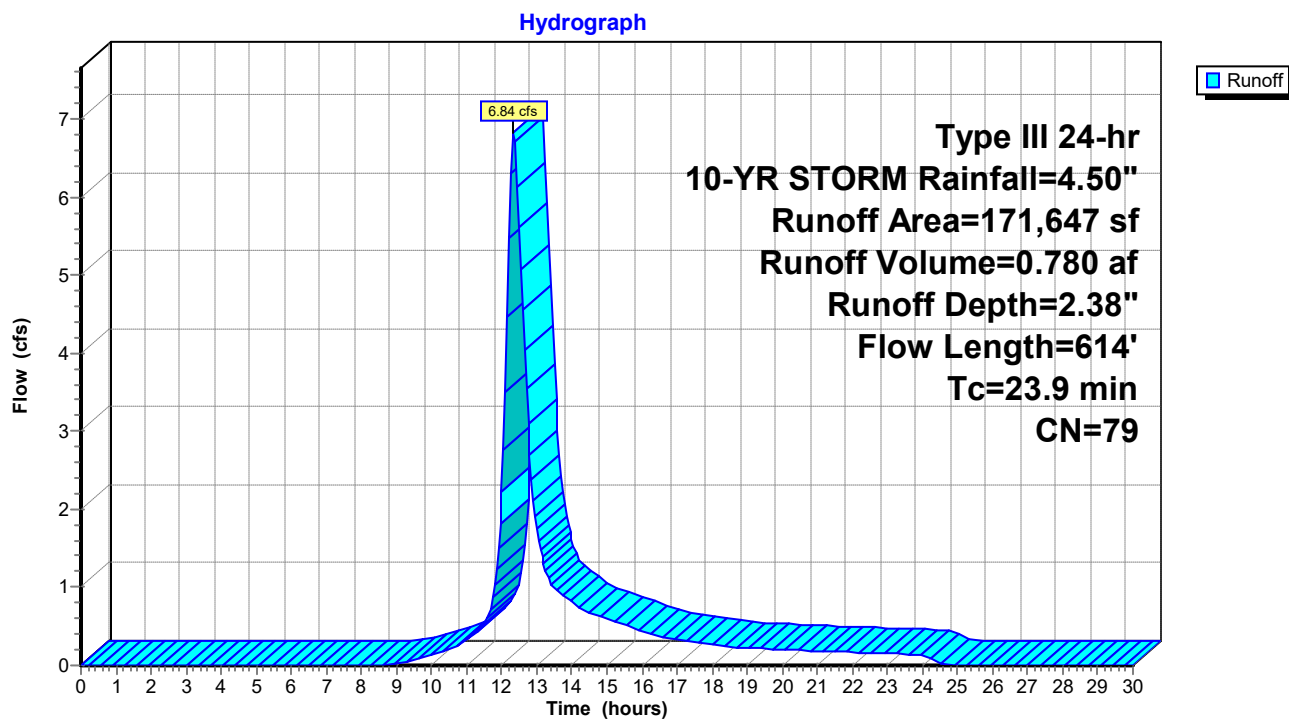
Runoff = 6.84 cfs @ 12.34 hrs, Volume= 0.780 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
32,659	74	>75% Grass cover, Good, HSG C
6,334	65	Brush, Good, HSG C
59,669	70	Woods, Good, HSG C
58,118	89	Gravel roads, HSG C
14,867	98	Paved parking & roofs
171,647	79	Weighted Average
156,780		91.34% Pervious Area
14,867		8.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
13.0	389	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.1	58	0.2070	7.33		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.1	117	0.0130	1.84		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
23.9	614	Total			

Subcatchment P101: Area to FE#4



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Type III 24-hr 10-YR STORM Rainfall=4.50"

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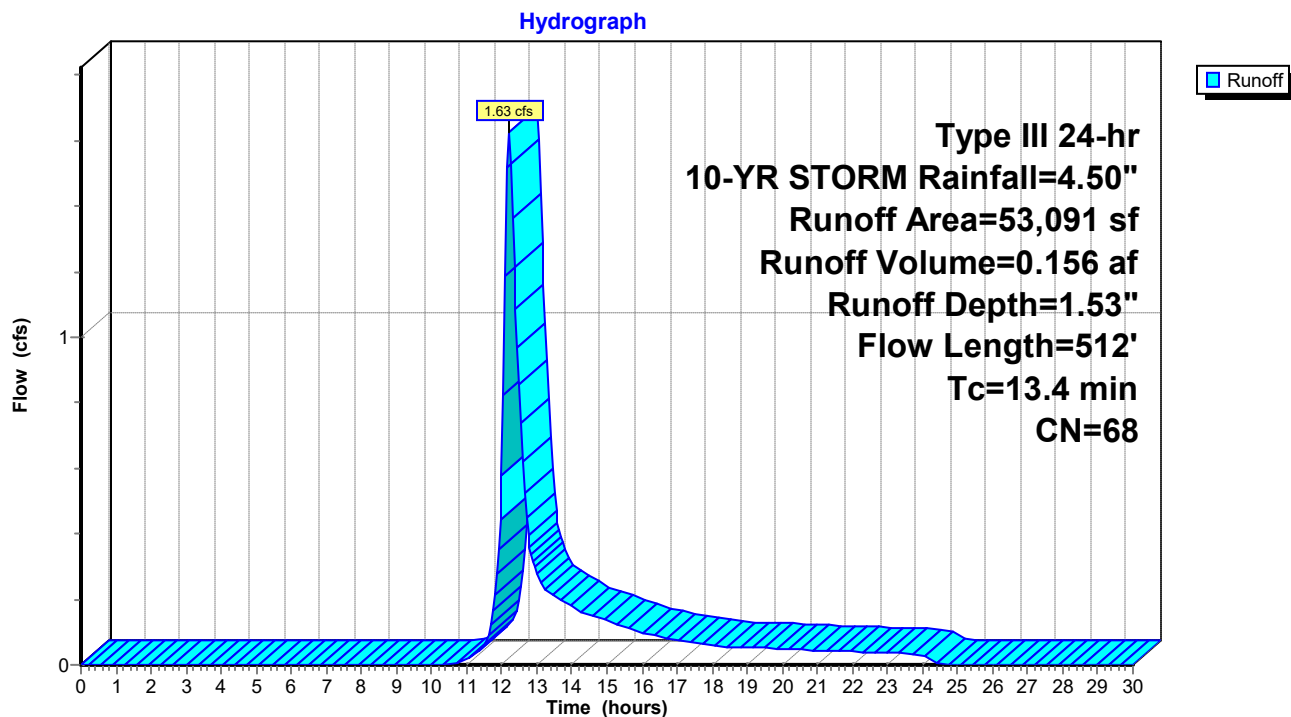
Summary for Subcatchment P102: Area to DBasin#1

Runoff = 1.63 cfs @ 12.20 hrs, Volume= 0.156 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
31,500	61	>75% Grass cover, Good, HSG B
11,025	74	>75% Grass cover, Good, HSG C
10,566	85	Gravel roads, HSG B
53,091	68	Weighted Average
53,091		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	32	0.0200	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.00"
7.5	480	0.0050	1.06		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
13.4	512	Total			

Subcatchment P102: Area to DBasin#1

Summary for Subcatchment P103: Misc Area to Road/Wetland

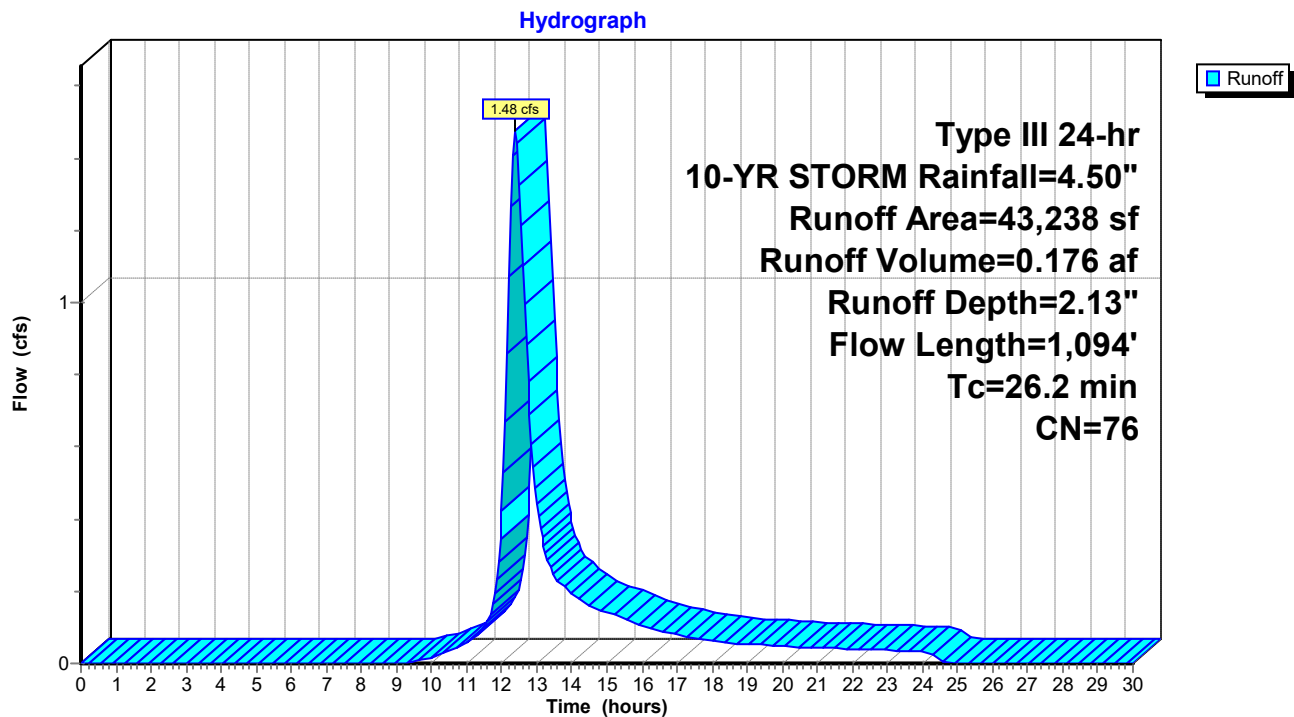
Runoff = 1.48 cfs @ 12.37 hrs, Volume= 0.176 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
20,365	74	>75% Grass cover, Good, HSG C
5,184	48	Brush, Good, HSG B
7,749	70	Brush, Fair, HSG C
75	70	Woods, Good, HSG C
9,865	98	Paved parking & roofs
43,238	76	Weighted Average
33,373		77.18% Pervious Area
9,865		22.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	28	0.0700	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
0.6	80	0.1000	2.21		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
14.1	418	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.6	568	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
26.2	1,094	Total			

Subcatchment P103: Misc Area to Road/Wetland



Summary for Subcatchment P104: Area to CTB#1/2

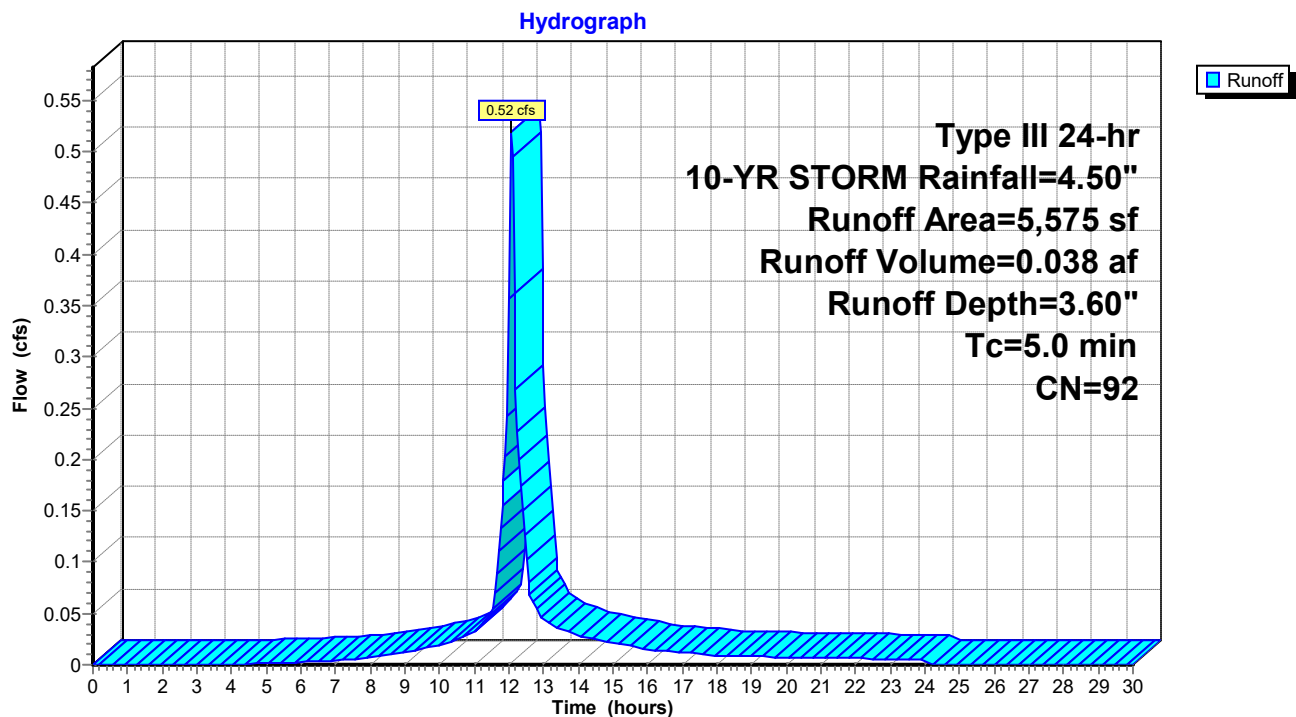
Runoff = 0.52 cfs @ 12.07 hrs, Volume= 0.038 af, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
1,461	74	>75% Grass cover, Good, HSG C
4,114	98	Paved parking & roofs
5,575	92	Weighted Average
1,461		26.21% Pervious Area
4,114		73.79% Impervious Area

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

Subcatchment P104: Area to CTB#1/2



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Type III 24-hr 10-YR STORM Rainfall=4.50"

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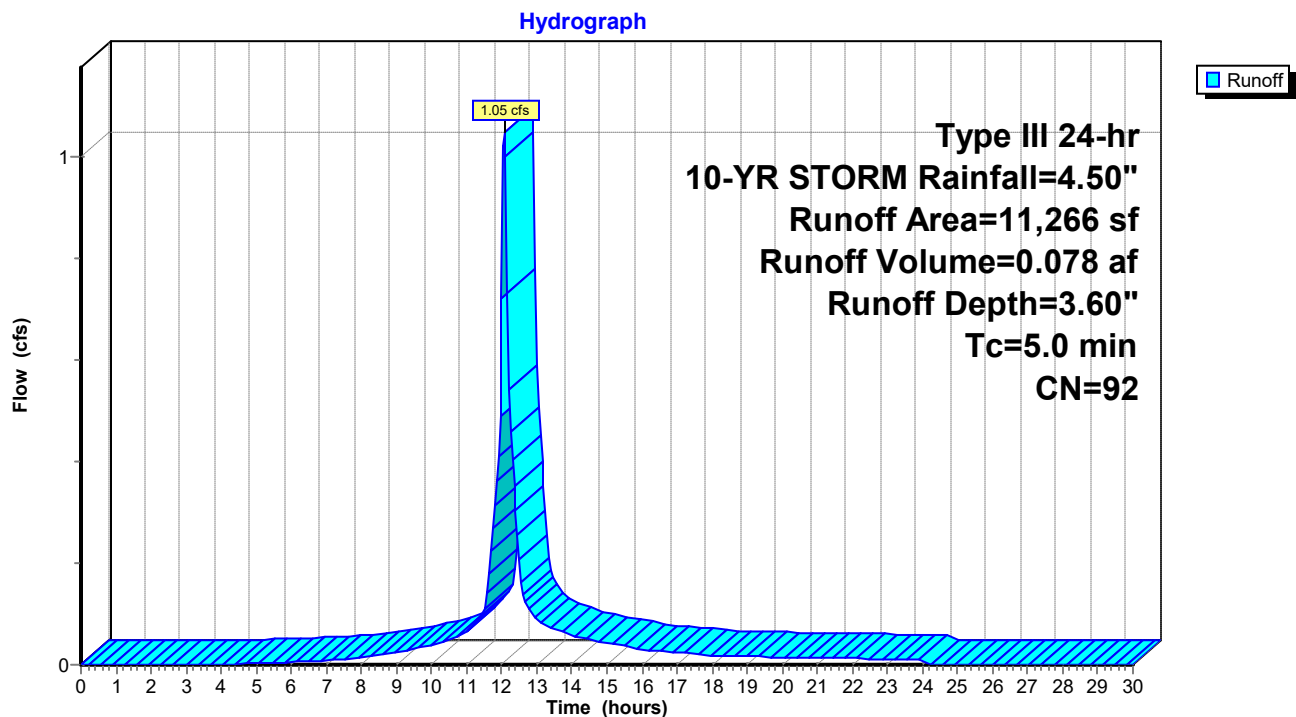
Summary for Subcatchment P105: Area to CTB#3

Runoff = 1.05 cfs @ 12.07 hrs, Volume= 0.078 af, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
2,771	74	>75% Grass cover, Good, HSG C
8,495	98	Paved parking & roofs
11,266	92	Weighted Average
2,771		24.60% Pervious Area
8,495		75.40% Impervious Area

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

Subcatchment P105: Area to CTB#3

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Type III 24-hr 10-YR STORM Rainfall=4.50"

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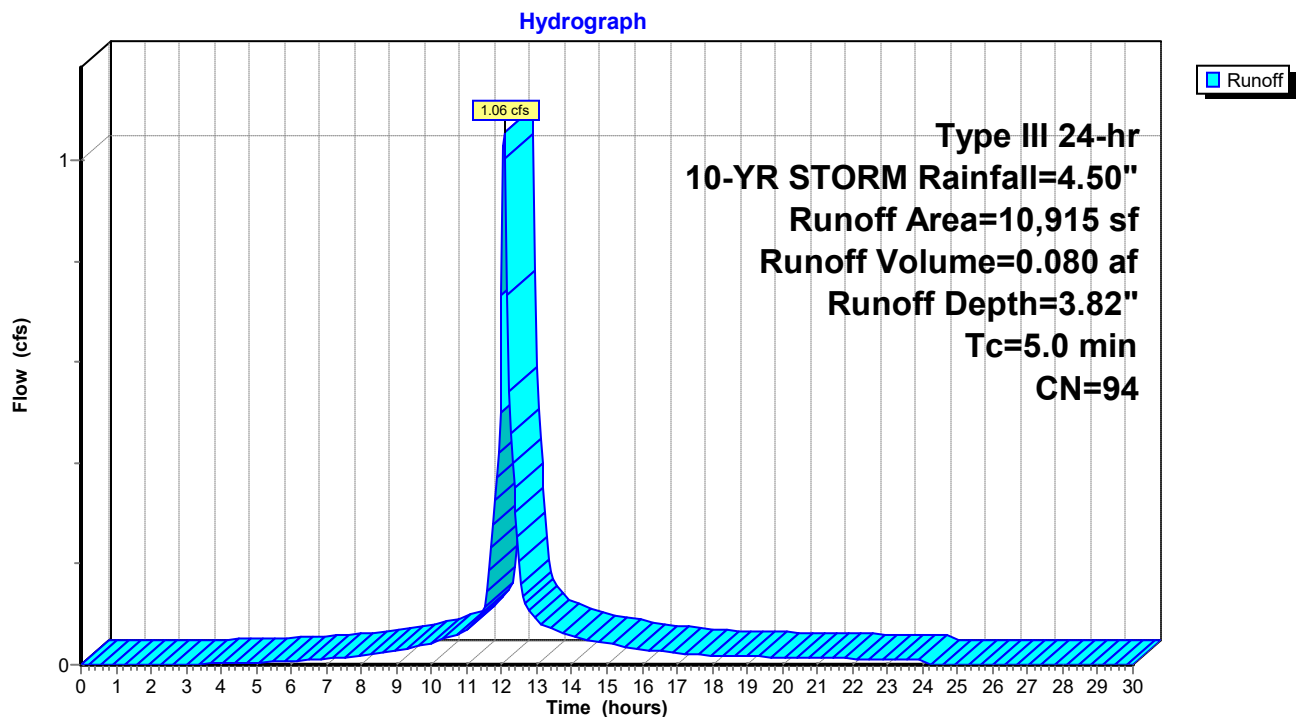
Summary for Subcatchment P106: Area to CTB#4

Runoff = 1.06 cfs @ 12.07 hrs, Volume= 0.080 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
1,646	74	>75% Grass cover, Good, HSG C
9,269	98	Paved parking & roofs
10,915	94	Weighted Average
1,646		15.08% Pervious Area
9,269		84.92% Impervious Area

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

Subcatchment P106: Area to CTB#4

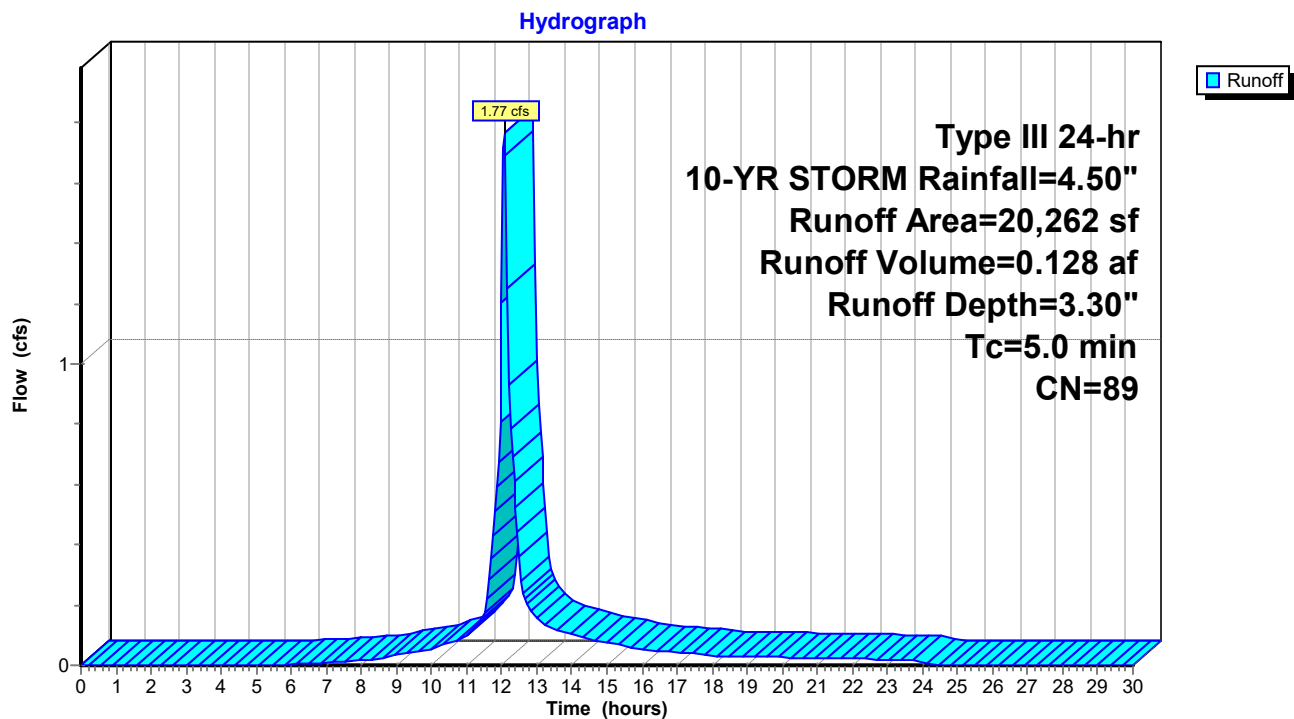
Summary for Subcatchment P107: Area to CTB#5/6

Runoff = 1.77 cfs @ 12.07 hrs, Volume= 0.128 af, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
759	61	>75% Grass cover, Good, HSG B
6,821	74	>75% Grass cover, Good, HSG C
12,682	98	Paved parking & roofs
20,262	89	Weighted Average
7,580		37.41% Pervious Area
12,682		62.59% Impervious Area

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

Subcatchment P107: Area to CTB#5/6

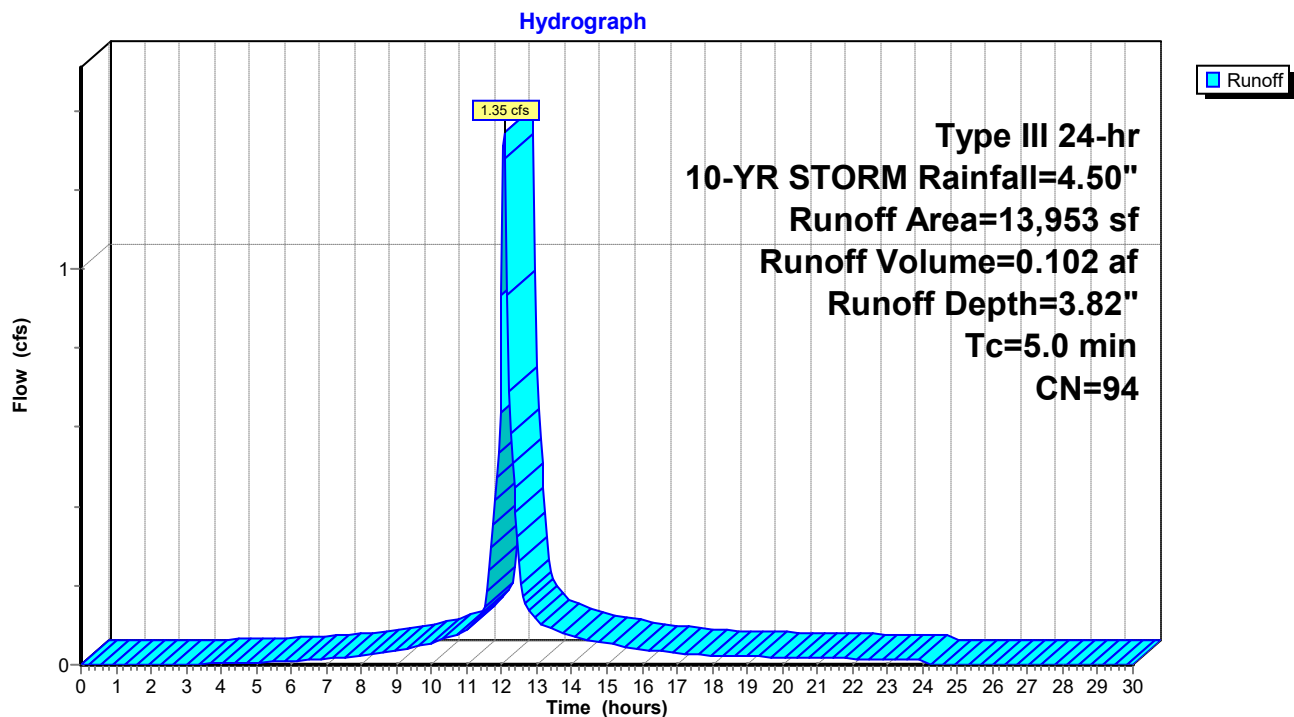
Summary for Subcatchment P108: Area to CTB#7

Runoff = 1.35 cfs @ 12.07 hrs, Volume= 0.102 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR STORM Rainfall=4.50"

Area (sf)	CN	Description
2,172	74	>75% Grass cover, Good, HSG C
11,781	98	Paved parking & roofs
13,953	94	Weighted Average
2,172		15.57% Pervious Area
11,781		84.43% Impervious Area

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

Subcatchment P108: Area to CTB#7

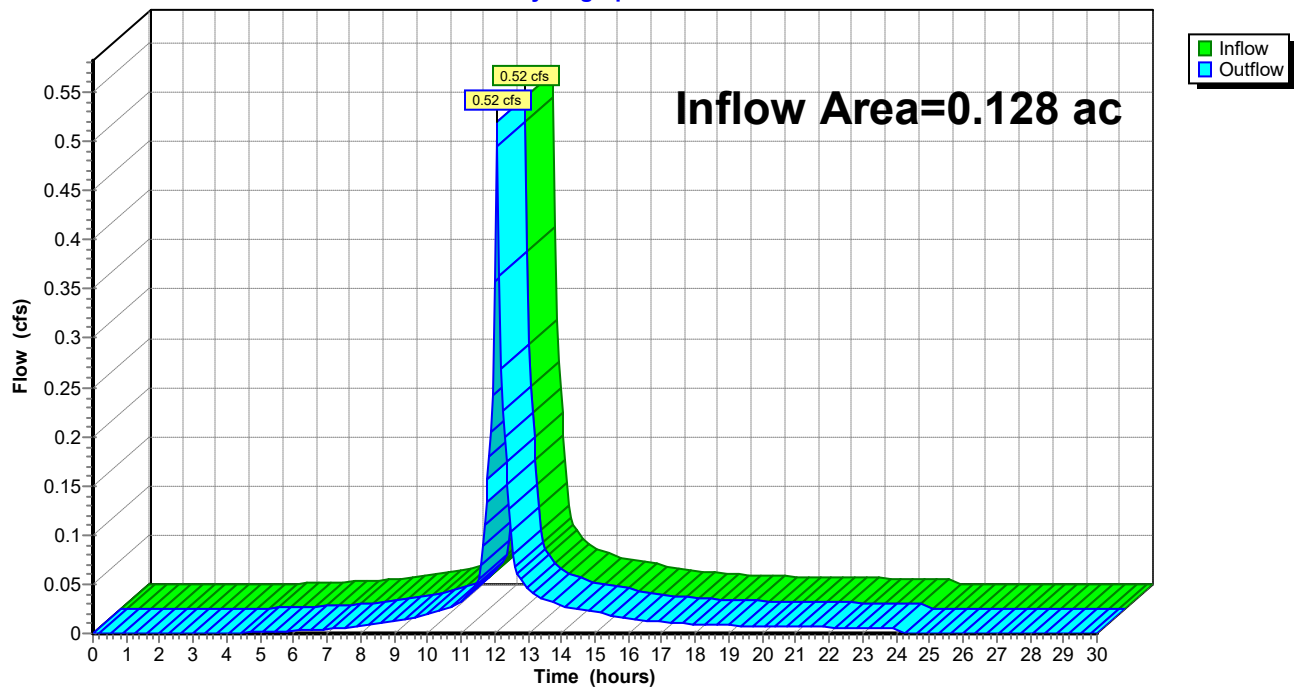
Summary for Reach 1R: DMH#1

Inflow Area = 0.128 ac, 73.79% Impervious, Inflow Depth = 3.60" for 10-YR STORM event
Inflow = 0.52 cfs @ 12.07 hrs, Volume= 0.038 af
Outflow = 0.52 cfs @ 12.07 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

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

Reach 1R: DMH#1

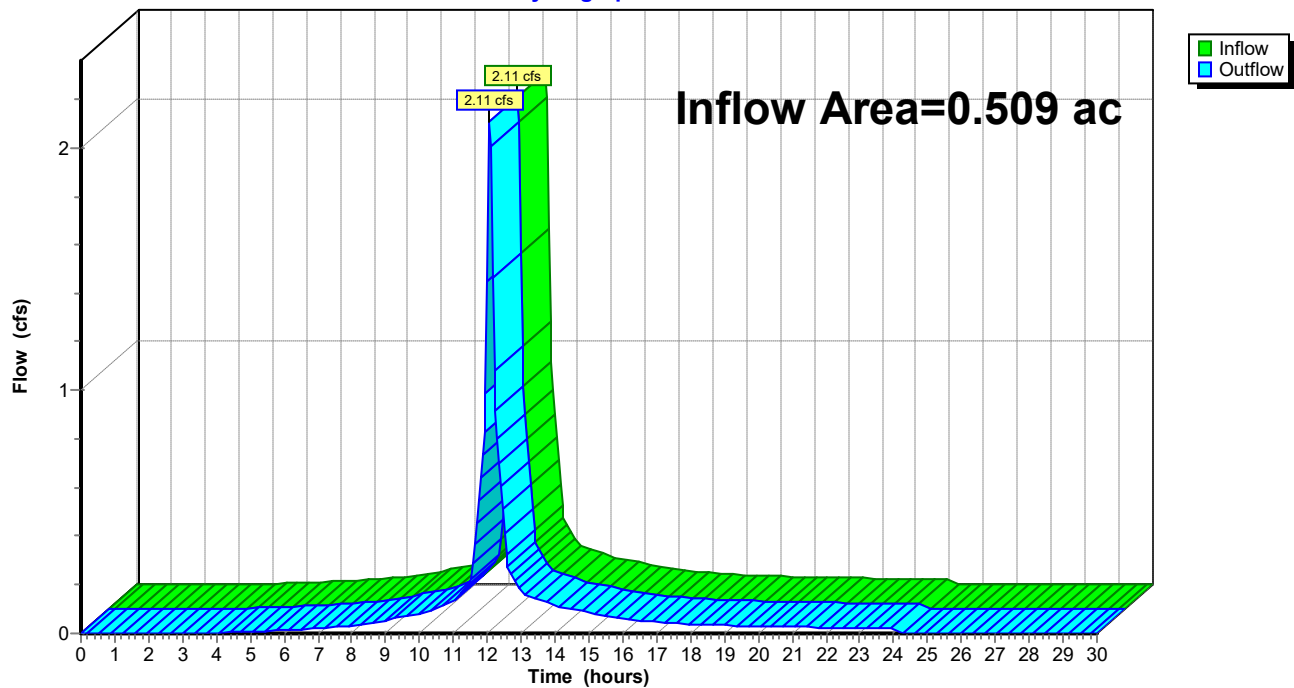
Hydrograph



Summary for Reach 2R: DMH#2

Inflow Area = 0.509 ac, 80.09% Impervious, Inflow Depth = 3.71" for 10-YR STORM event
Inflow = 2.11 cfs @ 12.07 hrs, Volume= 0.157 af
Outflow = 2.11 cfs @ 12.07 hrs, Volume= 0.157 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: DMH#2**Hydrograph**

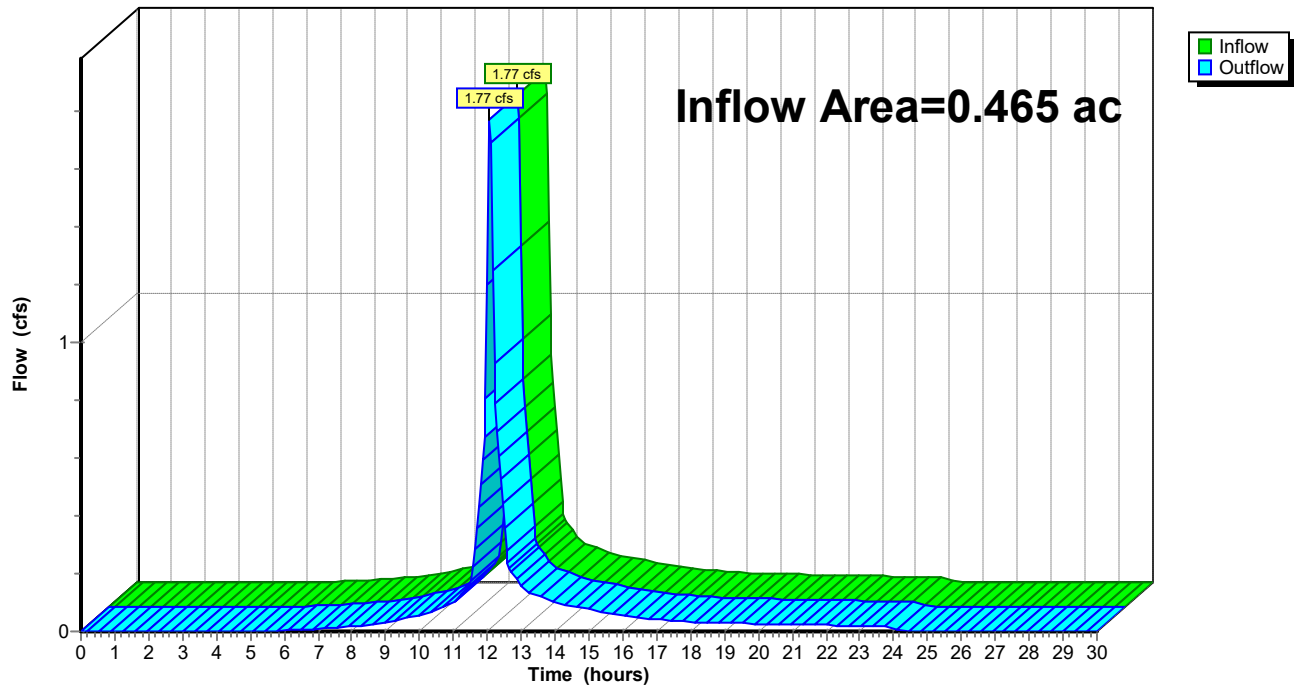
Summary for Reach 3R: DMH#3

Inflow Area = 0.465 ac, 62.59% Impervious, Inflow Depth = 3.30" for 10-YR STORM event
Inflow = 1.77 cfs @ 12.07 hrs, Volume= 0.128 af
Outflow = 1.77 cfs @ 12.07 hrs, Volume= 0.128 af, Atten= 0%, Lag= 0.0 min

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

Reach 3R: DMH#3

Hydrograph



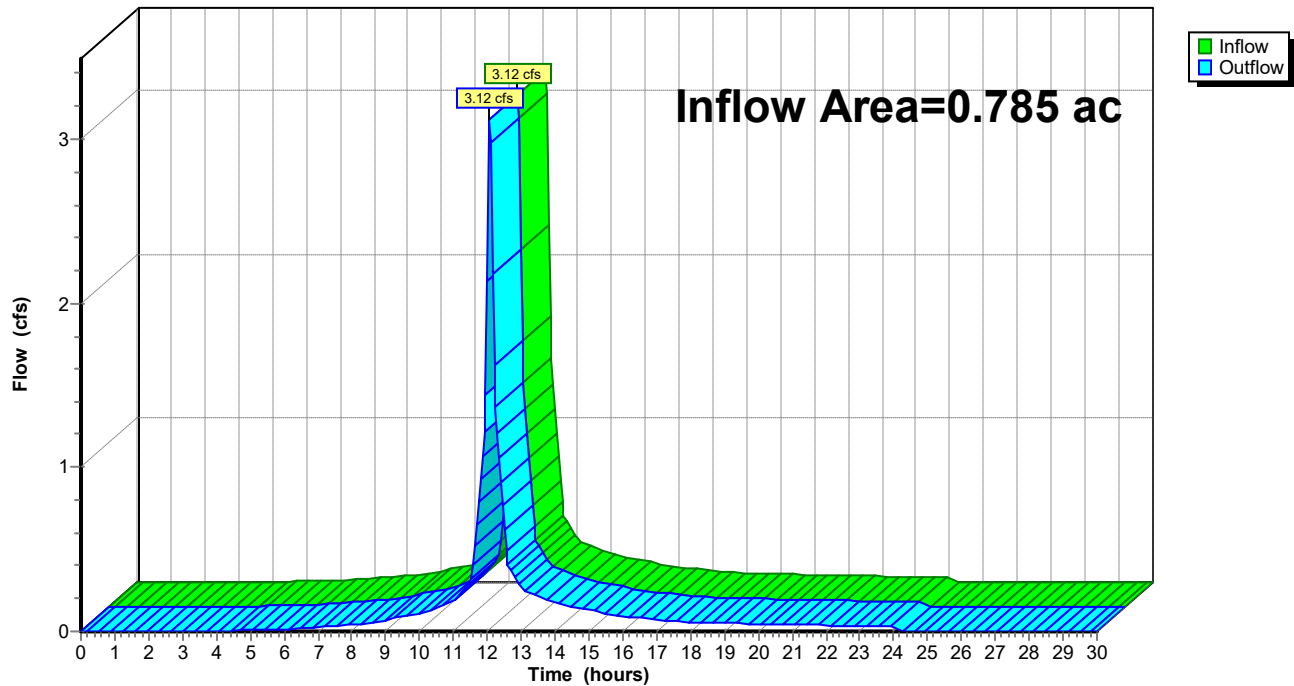
Summary for Reach 4R: DMH#4

Inflow Area = 0.785 ac, 71.50% Impervious, Inflow Depth = 3.51" for 10-YR STORM event
Inflow = 3.12 cfs @ 12.07 hrs, Volume= 0.230 af
Outflow = 3.12 cfs @ 12.07 hrs, Volume= 0.230 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: DMH#4

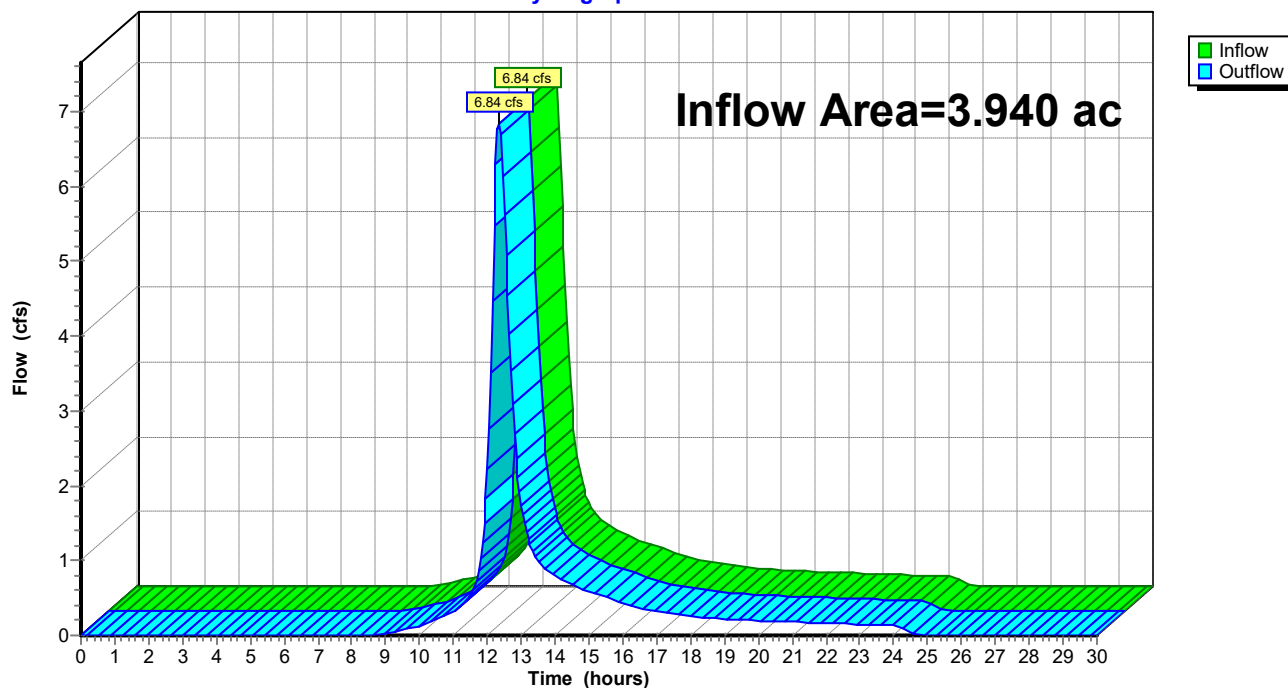
Hydrograph



Summary for Reach 5R: DMH#5

Inflow Area = 3.940 ac, 8.66% Impervious, Inflow Depth = 2.38" for 10-YR STORM event
Inflow = 6.84 cfs @ 12.34 hrs, Volume= 0.780 af
Outflow = 6.84 cfs @ 12.34 hrs, Volume= 0.780 af, Atten= 0%, Lag= 0.0 min

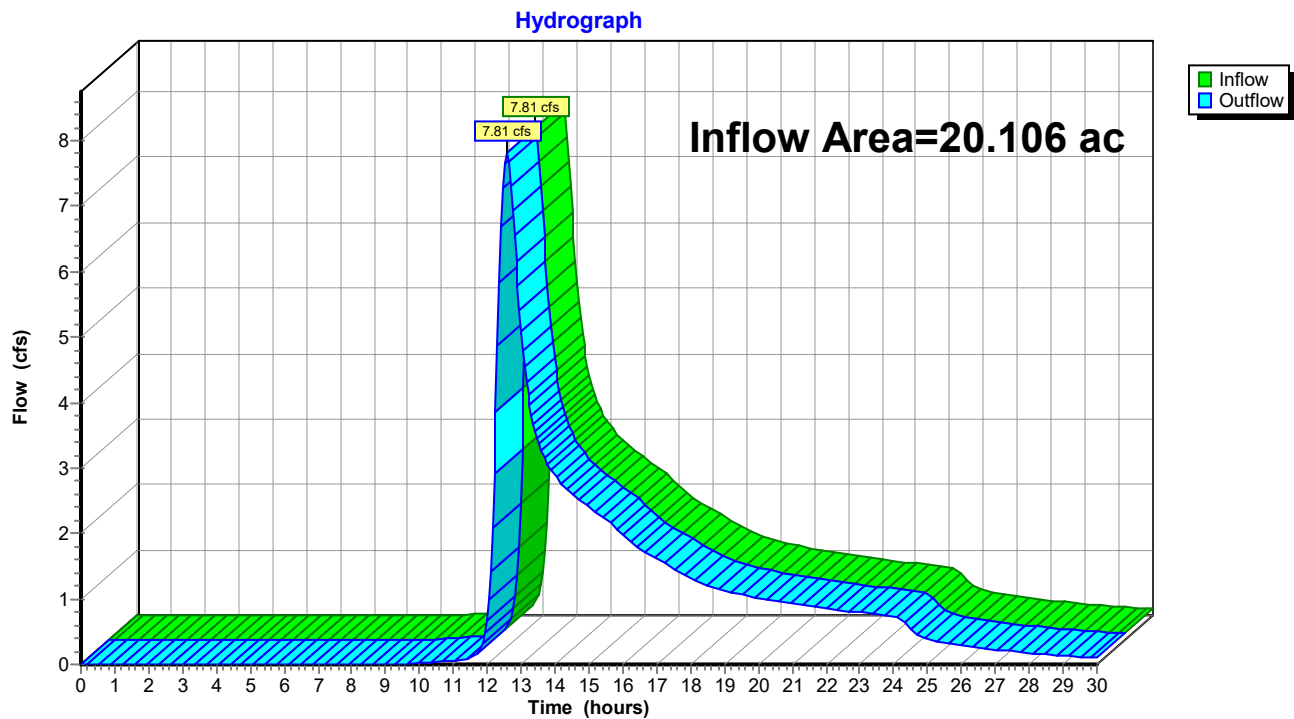
Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Reach 5R: DMH#5**Hydrograph**

Summary for Reach DP1: DESIGN POINT #1

Inflow Area = 20.106 ac, 11.68% Impervious, Inflow Depth > 1.21" for 10-YR STORM event
Inflow = 7.81 cfs @ 12.57 hrs, Volume= 2.031 af
Outflow = 7.81 cfs @ 12.57 hrs, Volume= 2.031 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1: DESIGN POINT #1

Summary for Pond P1: Detention Basin #1

Inflow Area = 6.582 ac, 21.35% Impervious, Inflow Depth = 2.48" for 10-YR STORM event
 Inflow = 10.38 cfs @ 12.27 hrs, Volume= 1.361 af
 Outflow = 1.21 cfs @ 14.19 hrs, Volume= 0.850 af, Atten= 88%, Lag= 115.3 min
 Primary = 1.21 cfs @ 14.19 hrs, Volume= 0.850 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 422.18' @ 14.19 hrs Surf.Area= 20,204 sf Storage= 36,121 cf

Plug-Flow detention time= 388.0 min calculated for 0.850 af (62% of inflow)
 Center-of-Mass det. time= 280.7 min (1,109.7 - 829.0)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	91,703 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	12,517	0	0
421.00	16,535	14,526	14,526
422.00	19,642	18,089	32,615
424.00	26,026	45,668	78,283
424.50	27,657	13,421	91,703

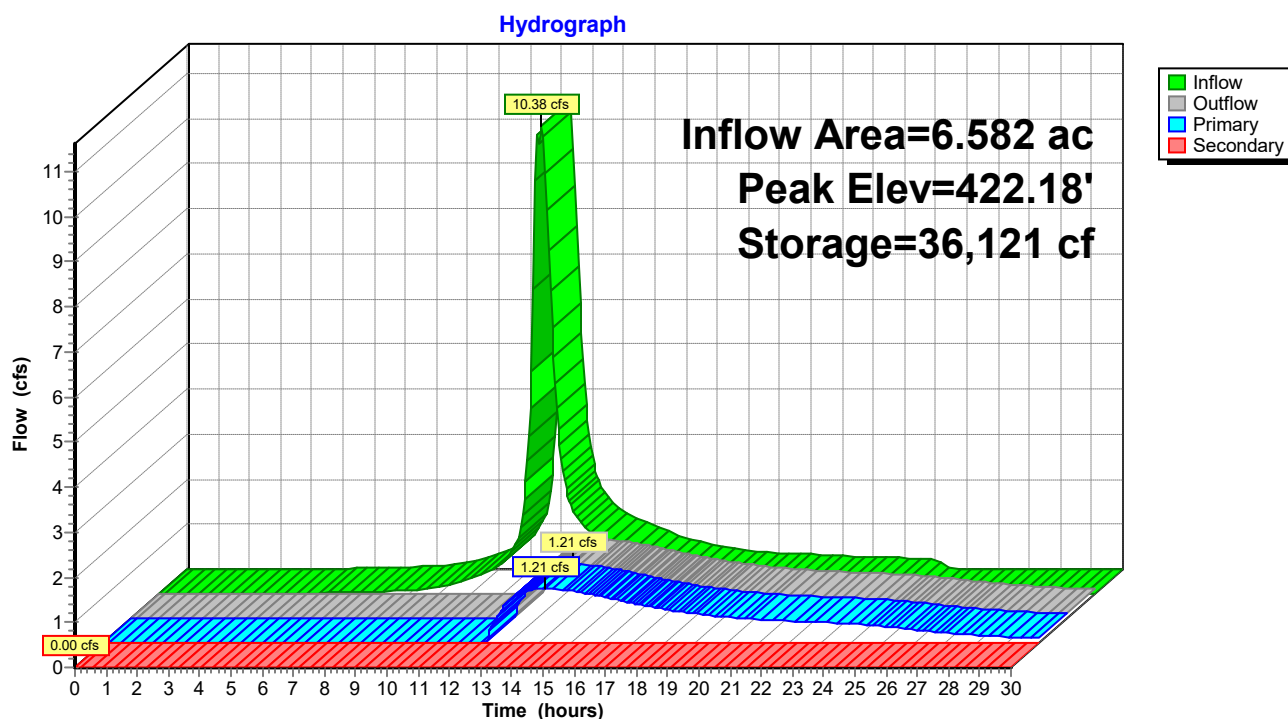
Device	Routing	Invert	Outlet Devices
#1	Primary	421.30'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600
#2	Primary	421.80'	10.0" Vert. Orifice/Grate C= 0.600
#3	Primary	422.30'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Secondary	423.50'	10.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Primary OutFlow Max=1.21 cfs @ 14.19 hrs HW=422.18' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.71 cfs @ 4.06 fps)
 — **2=Orifice/Grate** (Orifice Controls 0.50 cfs @ 2.09 fps)
 — **3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.00' (Free Discharge)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Detention Basin #1

2352-Poulin-Padula Post 2021.1

Type III 24-hr 10-YR STORM Rainfall=4.50"

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Stage-Discharge for Pond P1: Detention Basin #1

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)	Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
420.00	0.00	0.00	0.00	422.60	2.84	2.84	0.00
420.05	0.00	0.00	0.00	422.65	3.00	3.00	0.00
420.10	0.00	0.00	0.00	422.70	3.16	3.16	0.00
420.15	0.00	0.00	0.00	422.75	3.32	3.32	0.00
420.20	0.00	0.00	0.00	422.80	3.46	3.46	0.00
420.25	0.00	0.00	0.00	422.85	3.60	3.60	0.00
420.30	0.00	0.00	0.00	422.90	3.73	3.73	0.00
420.35	0.00	0.00	0.00	422.95	3.86	3.86	0.00
420.40	0.00	0.00	0.00	423.00	3.98	3.98	0.00
420.45	0.00	0.00	0.00	423.05	4.10	4.10	0.00
420.50	0.00	0.00	0.00	423.10	4.21	4.21	0.00
420.55	0.00	0.00	0.00	423.15	4.32	4.32	0.00
420.60	0.00	0.00	0.00	423.20	4.43	4.43	0.00
420.65	0.00	0.00	0.00	423.25	4.54	4.54	0.00
420.70	0.00	0.00	0.00	423.30	4.64	4.64	0.00
420.75	0.00	0.00	0.00	423.35	4.74	4.74	0.00
420.80	0.00	0.00	0.00	423.40	4.84	4.84	0.00
420.85	0.00	0.00	0.00	423.45	4.93	4.93	0.00
420.90	0.00	0.00	0.00	423.50	5.03	5.03	0.00
420.95	0.00	0.00	0.00	423.55	5.45	5.12	0.33
421.00	0.00	0.00	0.00	423.60	6.13	5.21	0.92
421.05	0.00	0.00	0.00	423.65	7.00	5.30	1.70
421.10	0.00	0.00	0.00	423.70	8.00	5.39	2.61
421.15	0.00	0.00	0.00	423.75	9.12	5.47	3.65
421.20	0.00	0.00	0.00	423.80	10.36	5.56	4.80
421.25	0.00	0.00	0.00	423.85	11.69	5.64	6.05
421.30	0.00	0.00	0.00	423.90	13.11	5.72	7.39
421.35	0.01	0.01	0.00	423.95	14.62	5.81	8.81
421.40	0.05	0.05	0.00	424.00	16.24	5.89	10.36
421.45	0.10	0.10	0.00	424.05	18.10	5.96	12.14
421.50	0.17	0.17	0.00	424.10	20.08	6.04	14.04
421.55	0.24	0.24	0.00	424.15	22.19	6.12	16.07
421.60	0.31	0.31	0.00	424.20	24.43	6.19	18.23
421.65	0.36	0.36	0.00	424.25	26.79	6.27	20.52
421.70	0.41	0.41	0.00	424.30	29.27	6.34	22.93
421.75	0.45	0.45	0.00	424.35	31.89	6.42	25.47
421.80	0.49	0.49	0.00	424.40	34.63	6.49	28.15
421.85	0.53	0.53	0.00	424.45	37.51	6.56	30.95
421.90	0.59	0.59	0.00	424.50	40.42	6.63	33.79
421.95	0.67	0.67	0.00				
422.00	0.77	0.77	0.00				
422.05	0.88	0.88	0.00				
422.10	1.00	1.00	0.00				
422.15	1.13	1.13	0.00				
422.20	1.28	1.28	0.00				
422.25	1.43	1.43	0.00				
422.30	1.59	1.59	0.00				
422.35	1.77	1.77	0.00				
422.40	1.97	1.97	0.00				
422.45	2.19	2.19	0.00				
422.50	2.41	2.41	0.00				
422.55	2.64	2.64	0.00				

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Type III 24-hr 25-YR STORM Rainfall=5.40"

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

Subcatchment P100: Remaining Area to Runoff Area=545,873 sf 5.72% Impervious Runoff Depth=1.47"
 Flow Length=1,174' Tc=36.0 min CN=59 Runoff=10.14 cfs 1.532 af

Subcatchment P101: Area to FE#4 Runoff Area=171,647 sf 8.66% Impervious Runoff Depth=3.15"
 Flow Length=614' Tc=23.9 min CN=79 Runoff=9.07 cfs 1.034 af

Subcatchment P102: Area to DBasin#1 Runoff Area=53,091 sf 0.00% Impervious Runoff Depth=2.17"
 Flow Length=512' Tc=13.4 min CN=68 Runoff=2.37 cfs 0.220 af

Subcatchment P103: Misc Area to Runoff Area=43,238 sf 22.82% Impervious Runoff Depth=2.87"
 Flow Length=1,094' Tc=26.2 min CN=76 Runoff=2.00 cfs 0.237 af

Subcatchment P104: Area to CTB#1/2 Runoff Area=5,575 sf 73.79% Impervious Runoff Depth=4.48"
 Tc=5.0 min CN=92 Runoff=0.64 cfs 0.048 af

Subcatchment P105: Area to CTB#3 Runoff Area=11,266 sf 75.40% Impervious Runoff Depth=4.48"
 Tc=5.0 min CN=92 Runoff=1.29 cfs 0.097 af

Subcatchment P106: Area to CTB#4 Runoff Area=10,915 sf 84.92% Impervious Runoff Depth=4.70"
 Tc=5.0 min CN=94 Runoff=1.29 cfs 0.098 af

Subcatchment P107: Area to CTB#5/6 Runoff Area=20,262 sf 62.59% Impervious Runoff Depth=4.16"
 Tc=5.0 min CN=89 Runoff=2.20 cfs 0.161 af

Subcatchment P108: Area to CTB#7 Runoff Area=13,953 sf 84.43% Impervious Runoff Depth=4.70"
 Tc=5.0 min CN=94 Runoff=1.64 cfs 0.126 af

Reach 1R: DMH#1 Inflow=0.64 cfs 0.048 af
 Outflow=0.64 cfs 0.048 af

Reach 2R: DMH#2 Inflow=2.58 cfs 0.195 af
 Outflow=2.58 cfs 0.195 af

Reach 3R: DMH#3 Inflow=2.20 cfs 0.161 af
 Outflow=2.20 cfs 0.161 af

Reach 4R: DMH#4 Inflow=3.85 cfs 0.287 af
 Outflow=3.85 cfs 0.287 af

Reach 5R: DMH#5 Inflow=9.07 cfs 1.034 af
 Outflow=9.07 cfs 1.034 af

Reach DP1: DESIGN POINT #1 Inflow=13.26 cfs 3.034 af
 Outflow=13.26 cfs 3.034 af

Pond P1: Detention Basin #1 Peak Elev=422.53' Storage=43,391 cf Inflow=13.73 cfs 1.784 af
 Primary=2.53 cfs 1.265 af Secondary=0.00 cfs 0.000 af Outflow=2.53 cfs 1.265 af

2352-Poulin-Padula Post 2021.1

Type III 24-hr 25-YR STORM Rainfall=5.40"

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Total Runoff Area = 20.106 ac Runoff Volume = 3.553 af Average Runoff Depth = 2.12"
88.32% Pervious = 17.758 ac 11.68% Impervious = 2.348 ac

Summary for Subcatchment P100: Remaining Area to DP#1

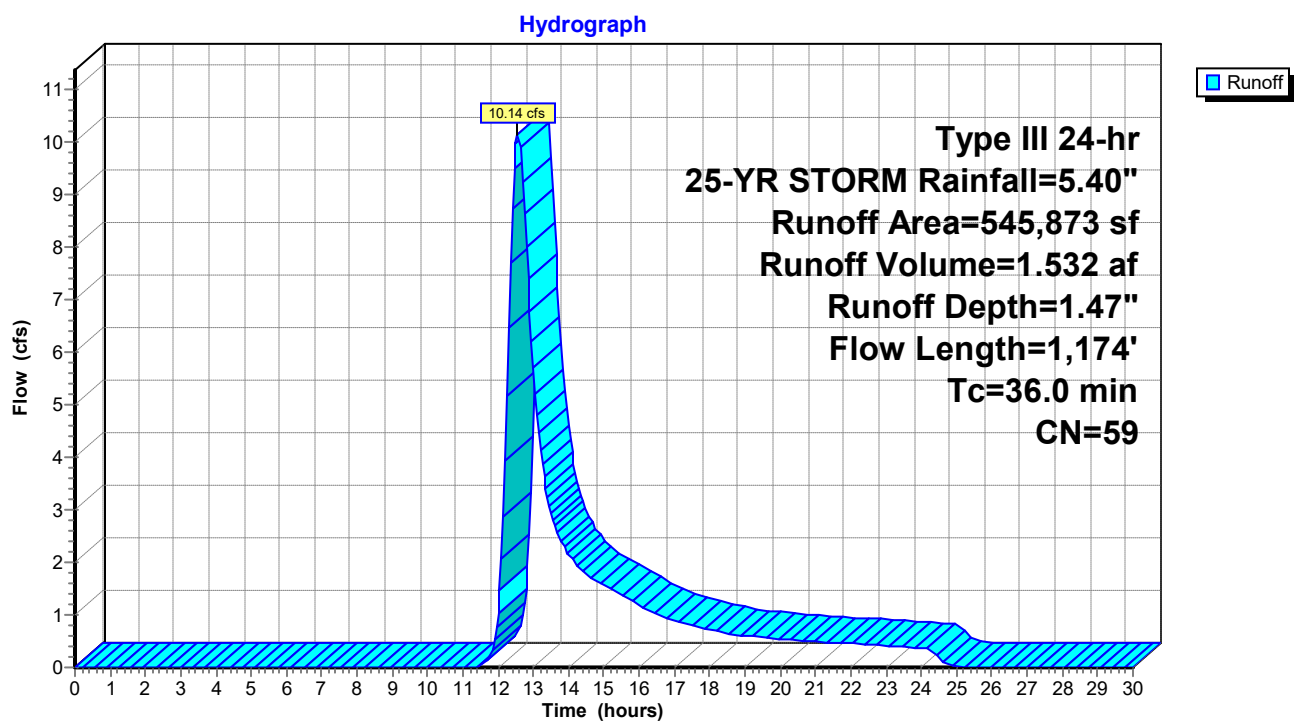
Runoff = 10.14 cfs @ 12.56 hrs, Volume= 1.532 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
40,035	39	>75% Grass cover, Good, HSG A
19,350	61	>75% Grass cover, Good, HSG B
39,460	74	>75% Grass cover, Good, HSG C
5,377	30	Brush, Good, HSG A
16,687	48	Brush, Good, HSG B
52,490	70	Brush, Fair, HSG C
57,046	30	Woods, Good, HSG A
185,010	55	Woods, Good, HSG B
99,211	70	Woods, Good, HSG C
31,207	98	Paved parking & roofs
545,873	59	Weighted Average
514,666		94.28% Pervious Area
31,207		5.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
1.9	119	0.0420	1.02		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.2	40	0.0750	4.41		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.2	62	0.0320	0.89		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.4	53	0.1130	2.35		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
22.6	850	0.0080	0.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
36.0	1,174	Total			

Subcatchment P100: Remaining Area to DP#1



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Type III 24-hr 25-YR STORM Rainfall=5.40"

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Summary for Subcatchment P101: Area to FE#4

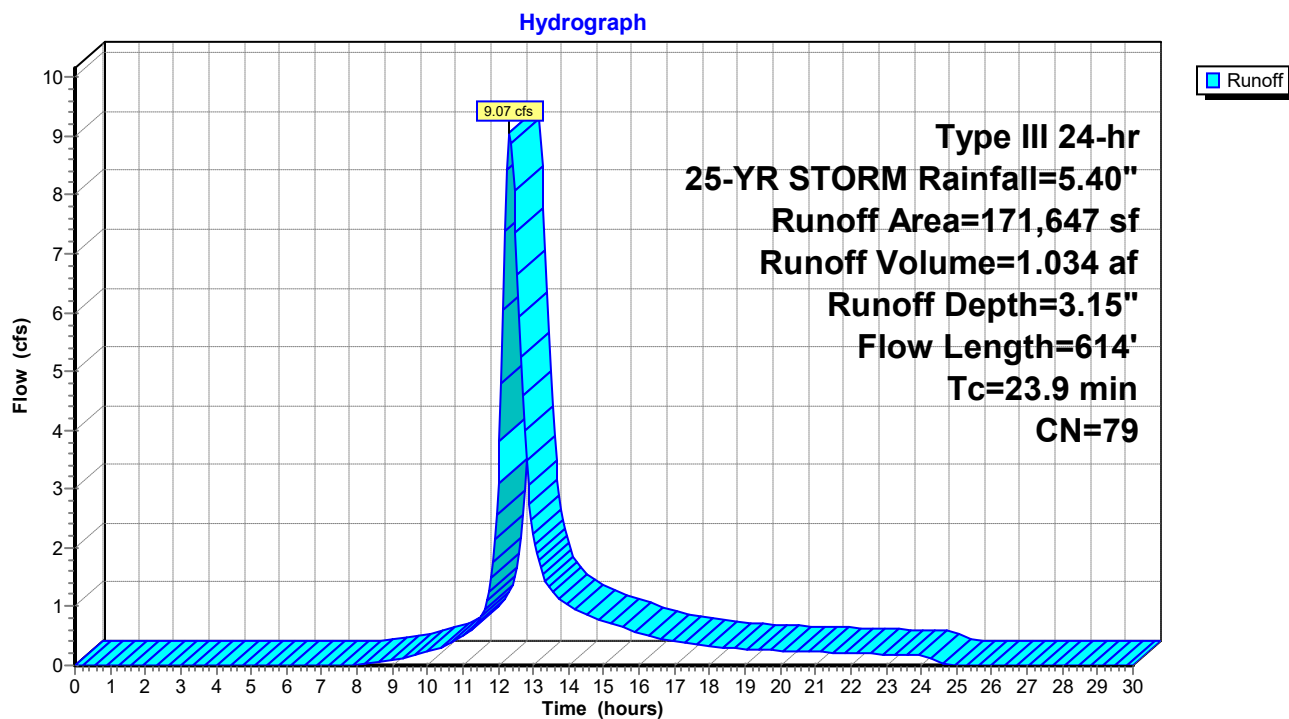
Runoff = 9.07 cfs @ 12.33 hrs, Volume= 1.034 af, Depth= 3.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
32,659	74	>75% Grass cover, Good, HSG C
6,334	65	Brush, Good, HSG C
59,669	70	Woods, Good, HSG C
58,118	89	Gravel roads, HSG C
14,867	98	Paved parking & roofs
171,647	79	Weighted Average
156,780		91.34% Pervious Area
14,867		8.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
13.0	389	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.1	58	0.2070	7.33		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.1	117	0.0130	1.84		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
23.9	614	Total			

Subcatchment P101: Area to FE#4



2352-Poulin-Padula Post 2021.1

Type III 24-hr 25-YR STORM Rainfall=5.40"

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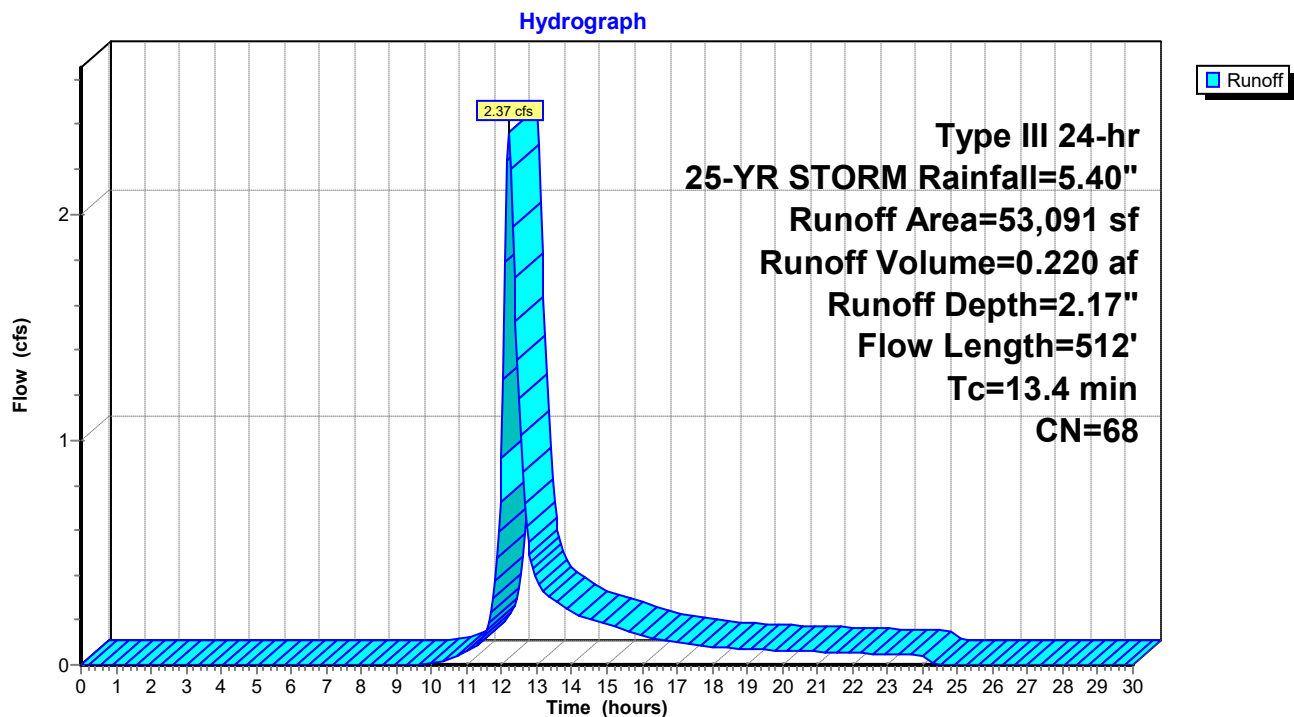
Summary for Subcatchment P102: Area to DBasin#1

Runoff = 2.37 cfs @ 12.20 hrs, Volume= 0.220 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
31,500	61	>75% Grass cover, Good, HSG B
11,025	74	>75% Grass cover, Good, HSG C
10,566	85	Gravel roads, HSG B
53,091	68	Weighted Average
53,091		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	32	0.0200	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.00"
7.5	480	0.0050	1.06		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
13.4	512	Total			

Subcatchment P102: Area to DBasin#1

Summary for Subcatchment P103: Misc Area to Road/Wetland

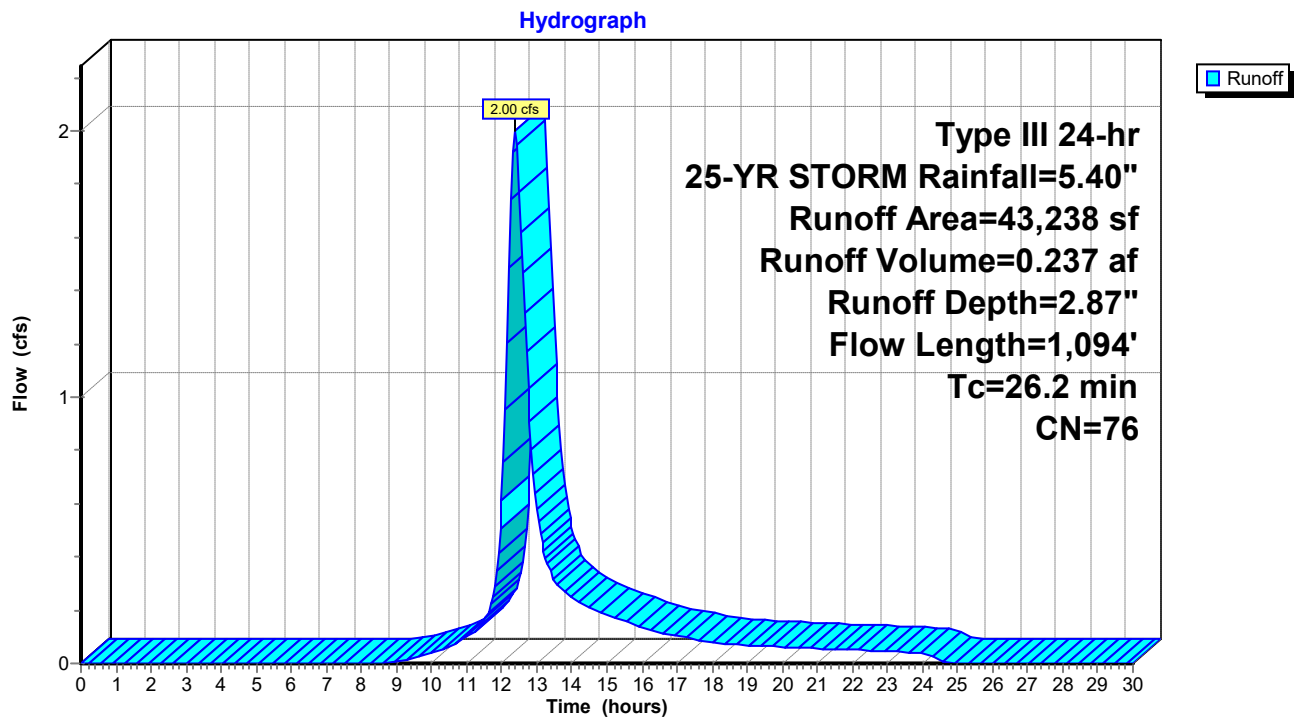
Runoff = 2.00 cfs @ 12.37 hrs, Volume= 0.237 af, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
20,365	74	>75% Grass cover, Good, HSG C
5,184	48	Brush, Good, HSG B
7,749	70	Brush, Fair, HSG C
75	70	Woods, Good, HSG C
9,865	98	Paved parking & roofs
43,238	76	Weighted Average
33,373		77.18% Pervious Area
9,865		22.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	28	0.0700	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
0.6	80	0.1000	2.21		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
14.1	418	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.6	568	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
26.2	1,094	Total			

Subcatchment P103: Misc Area to Road/Wetland



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Type III 24-hr 25-YR STORM Rainfall=5.40"

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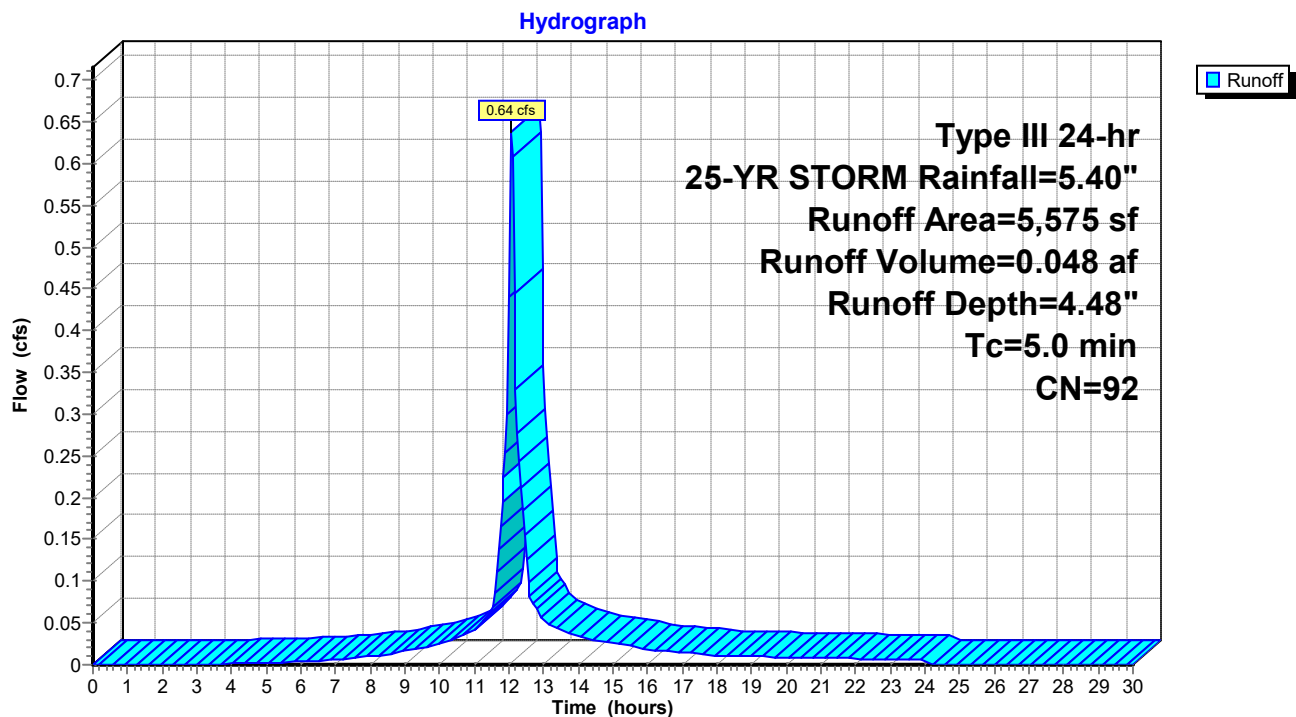
Summary for Subcatchment P104: Area to CTB#1/2

Runoff = 0.64 cfs @ 12.07 hrs, Volume= 0.048 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
1,461	74	>75% Grass cover, Good, HSG C
4,114	98	Paved parking & roofs
5,575	92	Weighted Average
1,461		26.21% Pervious Area
4,114		73.79% Impervious Area

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

Subcatchment P104: Area to CTB#1/2

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Type III 24-hr 25-YR STORM Rainfall=5.40"

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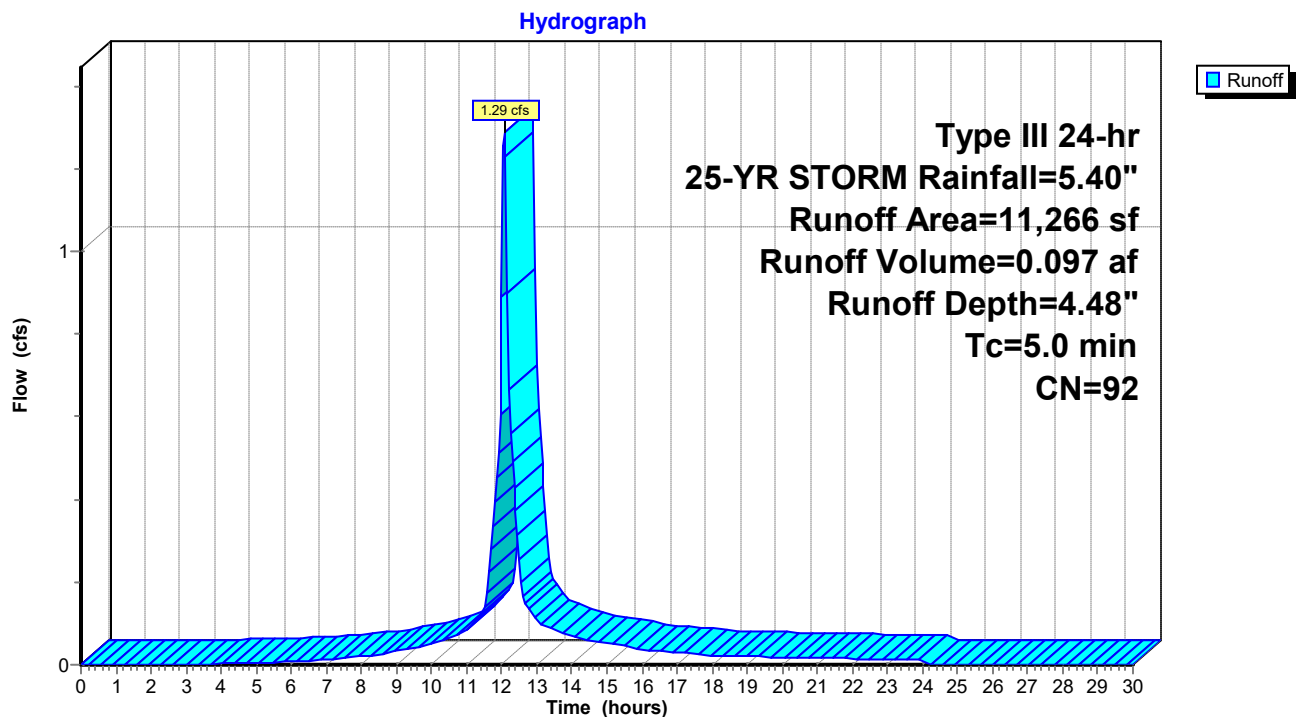
Summary for Subcatchment P105: Area to CTB#3

Runoff = 1.29 cfs @ 12.07 hrs, Volume= 0.097 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
2,771	74	>75% Grass cover, Good, HSG C
8,495	98	Paved parking & roofs
11,266	92	Weighted Average
2,771		24.60% Pervious Area
8,495		75.40% Impervious Area

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

Subcatchment P105: Area to CTB#3

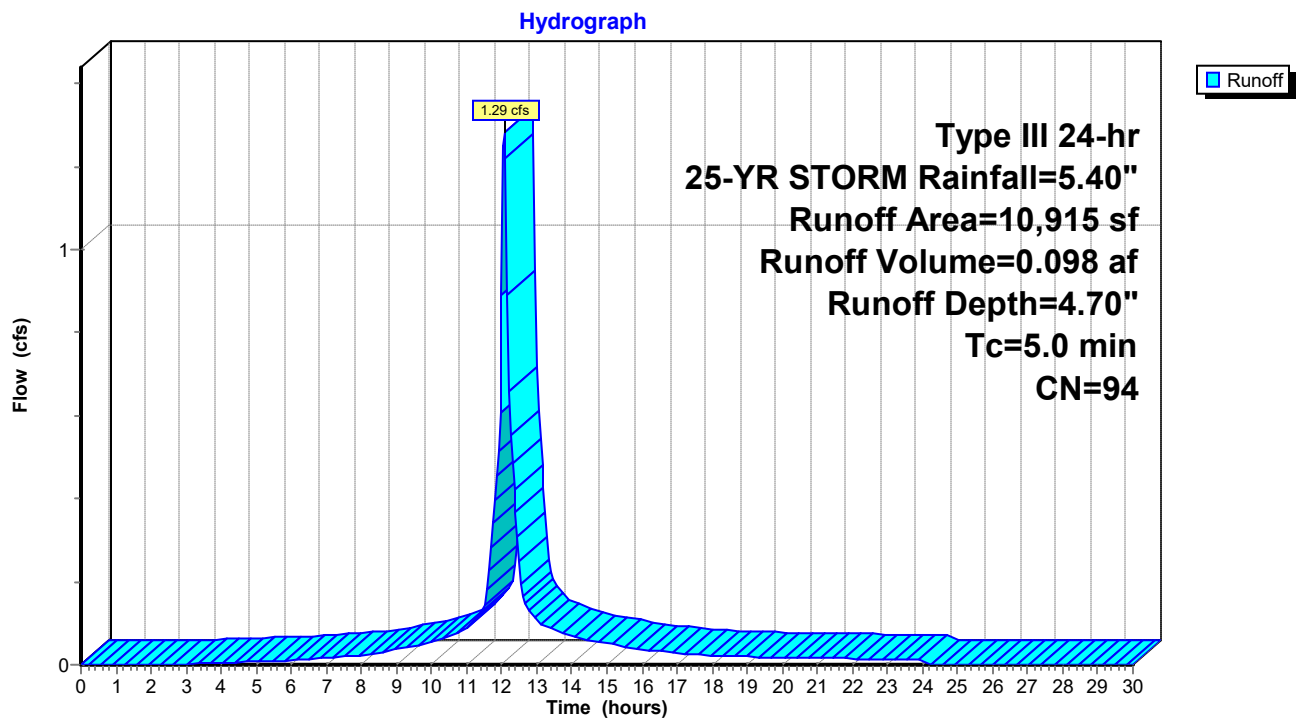
Summary for Subcatchment P106: Area to CTB#4

Runoff = 1.29 cfs @ 12.07 hrs, Volume= 0.098 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
1,646	74	>75% Grass cover, Good, HSG C
9,269	98	Paved parking & roofs
10,915	94	Weighted Average
1,646		15.08% Pervious Area
9,269		84.92% Impervious Area

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

Subcatchment P106: Area to CTB#4

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Type III 24-hr 25-YR STORM Rainfall=5.40"

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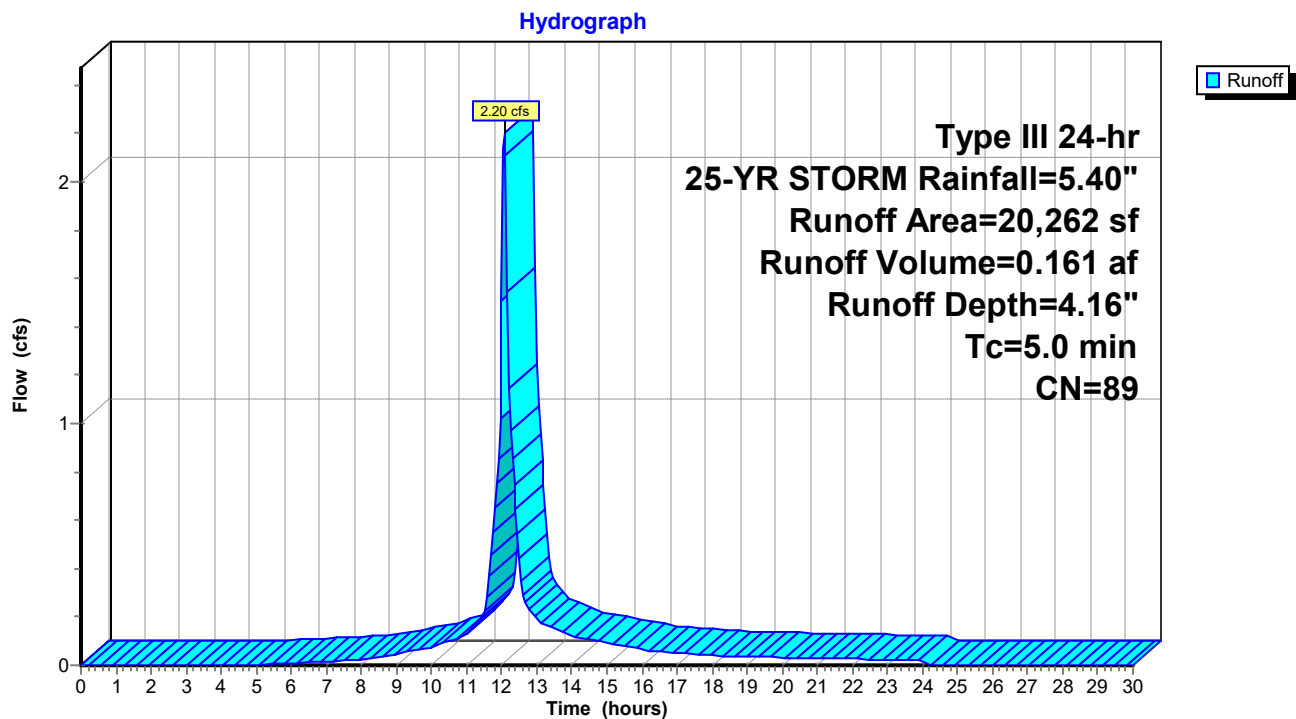
Summary for Subcatchment P107: Area to CTB#5/6

Runoff = 2.20 cfs @ 12.07 hrs, Volume= 0.161 af, Depth= 4.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
759	61	>75% Grass cover, Good, HSG B
6,821	74	>75% Grass cover, Good, HSG C
12,682	98	Paved parking & roofs
20,262	89	Weighted Average
7,580		37.41% Pervious Area
12,682		62.59% Impervious Area

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

Subcatchment P107: Area to CTB#5/6

Summary for Subcatchment P108: Area to CTB#7

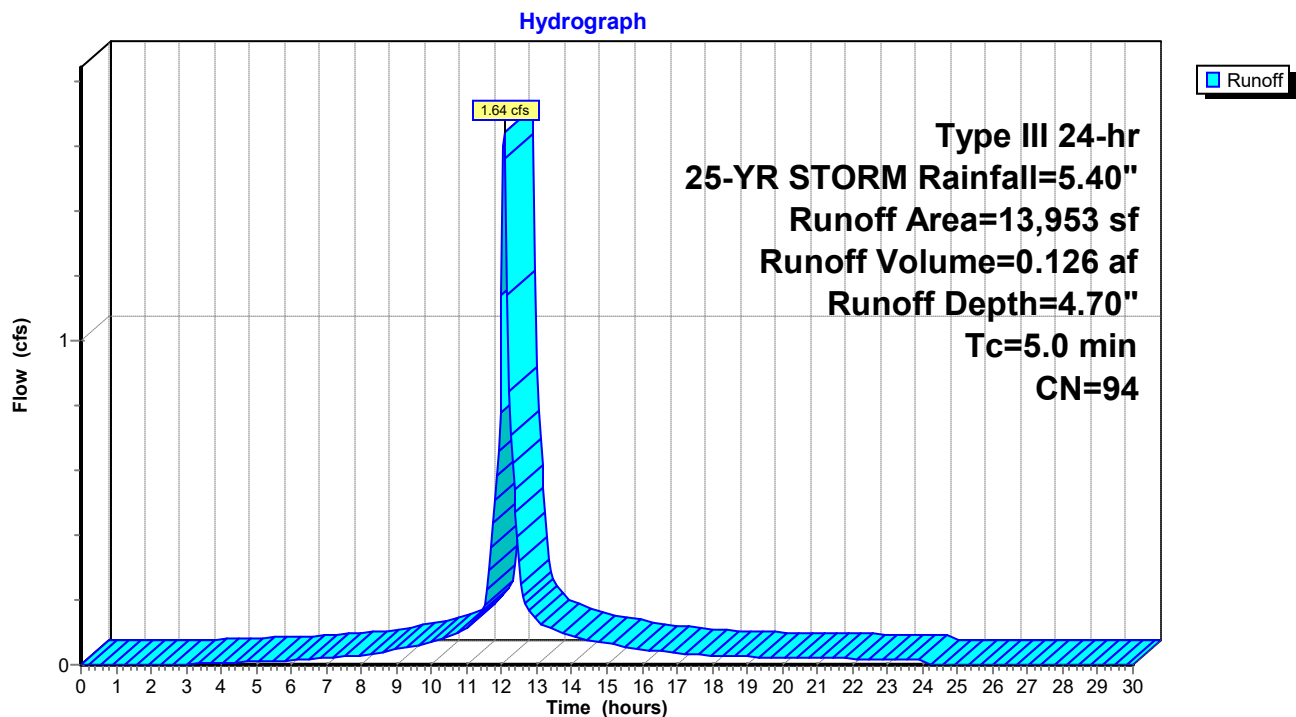
Runoff = 1.64 cfs @ 12.07 hrs, Volume= 0.126 af, Depth= 4.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR STORM Rainfall=5.40"

Area (sf)	CN	Description
2,172	74	>75% Grass cover, Good, HSG C
11,781	98	Paved parking & roofs
13,953	94	Weighted Average
2,172		15.57% Pervious Area
11,781		84.43% Impervious Area

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

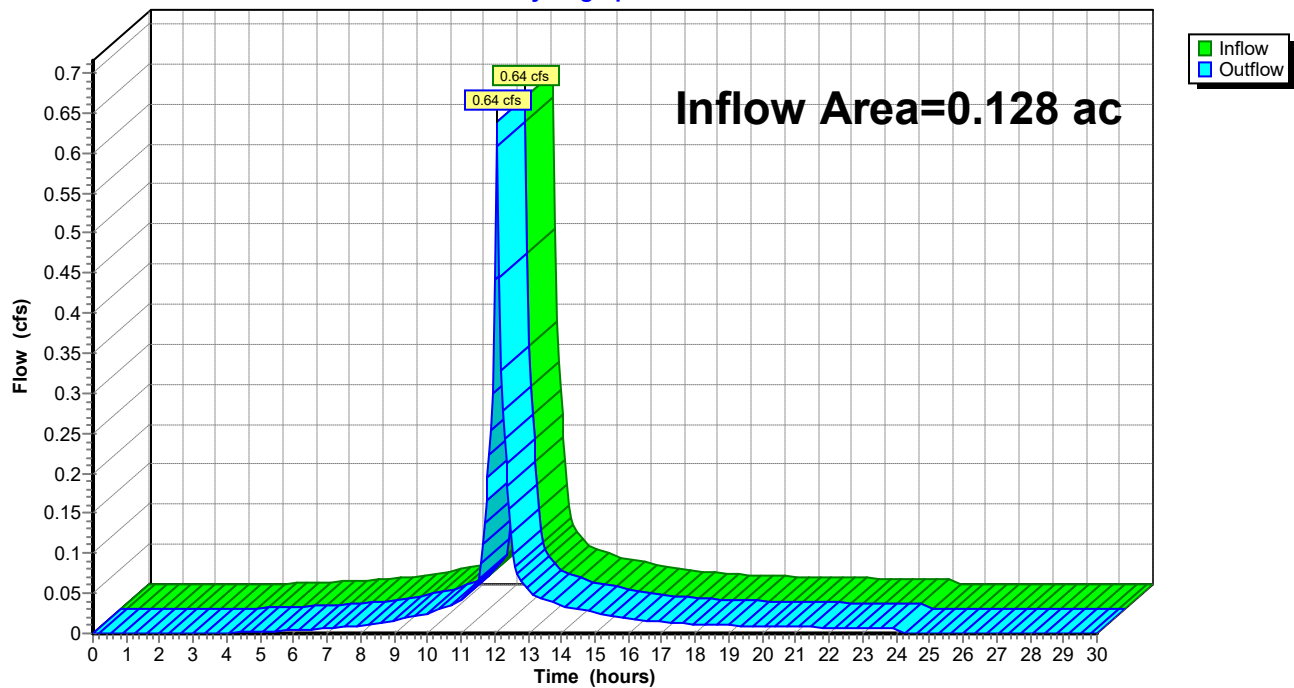
Subcatchment P108: Area to CTB#7



Summary for Reach 1R: DMH#1

Inflow Area = 0.128 ac, 73.79% Impervious, Inflow Depth = 4.48" for 25-YR STORM event
Inflow = 0.64 cfs @ 12.07 hrs, Volume= 0.048 af
Outflow = 0.64 cfs @ 12.07 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

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

Reach 1R: DMH#1**Hydrograph**

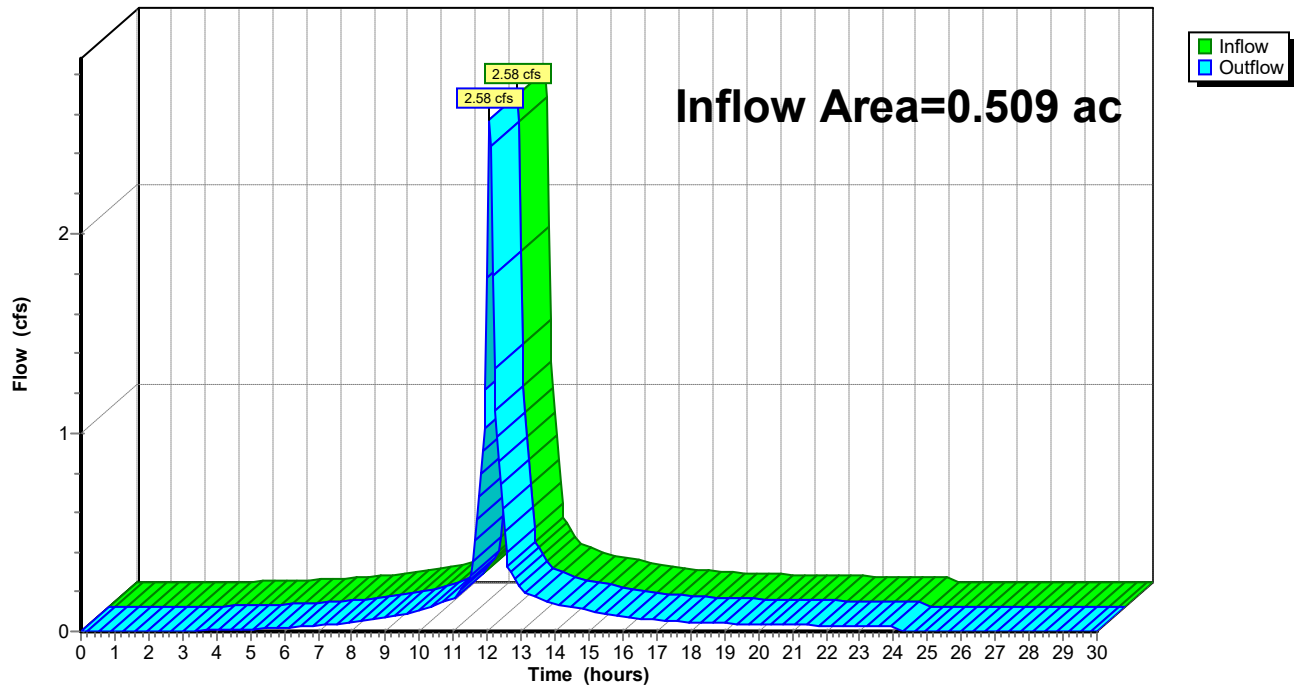
Summary for Reach 2R: DMH#2

Inflow Area = 0.509 ac, 80.09% Impervious, Inflow Depth = 4.59" for 25-YR STORM event
Inflow = 2.58 cfs @ 12.07 hrs, Volume= 0.195 af
Outflow = 2.58 cfs @ 12.07 hrs, Volume= 0.195 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: DMH#2

Hydrograph



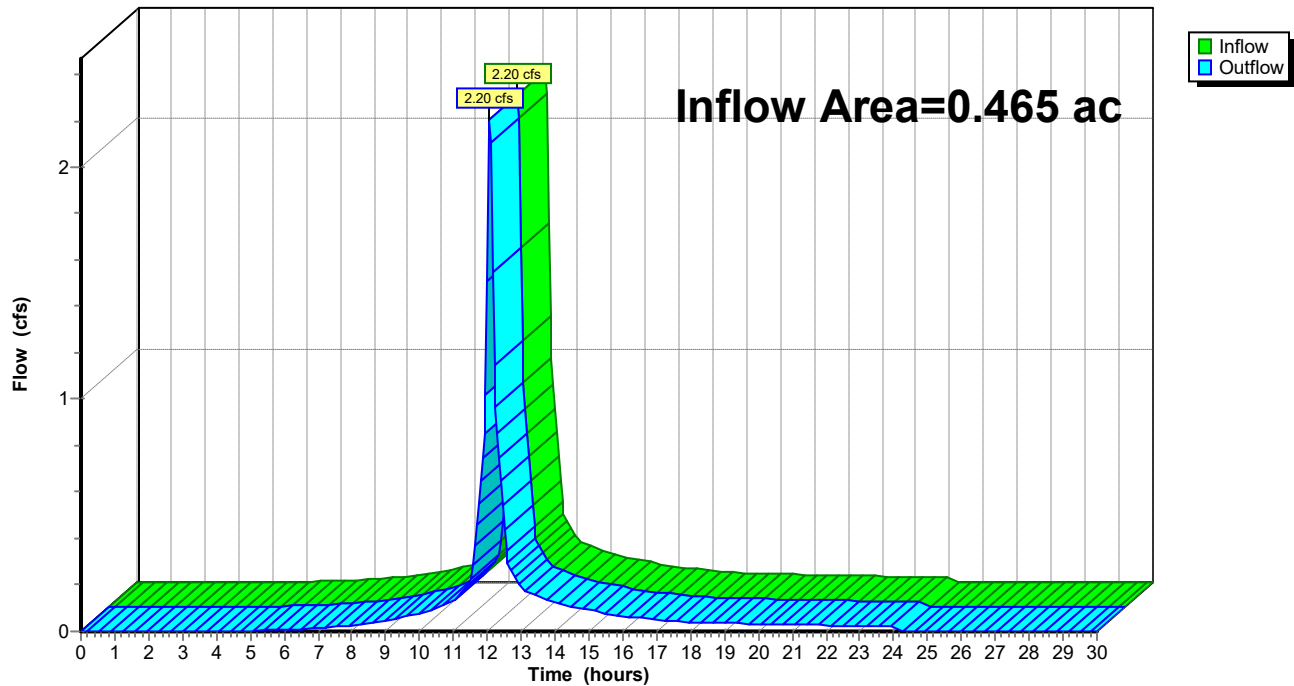
Summary for Reach 3R: DMH#3

Inflow Area = 0.465 ac, 62.59% Impervious, Inflow Depth = 4.16" for 25-YR STORM event
Inflow = 2.20 cfs @ 12.07 hrs, Volume= 0.161 af
Outflow = 2.20 cfs @ 12.07 hrs, Volume= 0.161 af, Atten= 0%, Lag= 0.0 min

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

Reach 3R: DMH#3

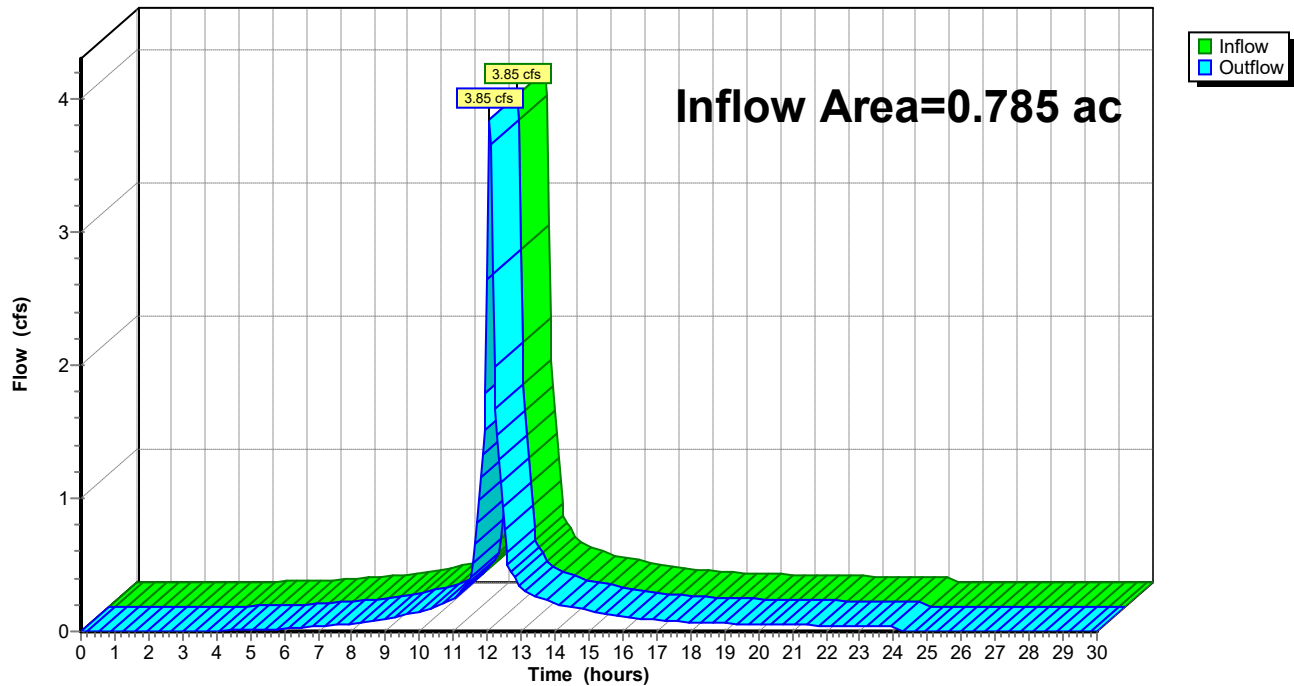
Hydrograph



Summary for Reach 4R: DMH#4

Inflow Area = 0.785 ac, 71.50% Impervious, Inflow Depth = 4.38" for 25-YR STORM event
Inflow = 3.85 cfs @ 12.07 hrs, Volume= 0.287 af
Outflow = 3.85 cfs @ 12.07 hrs, Volume= 0.287 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: DMH#4**Hydrograph**

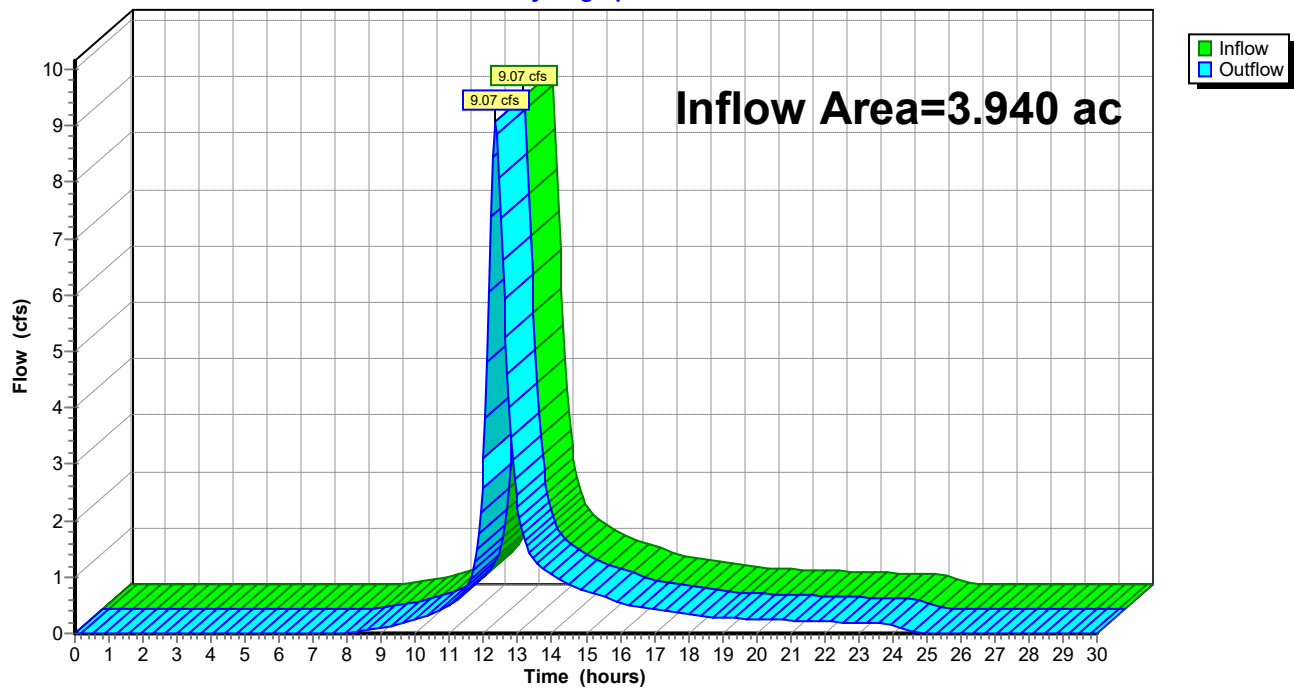
Summary for Reach 5R: DMH#5

Inflow Area = 3.940 ac, 8.66% Impervious, Inflow Depth = 3.15" for 25-YR STORM event
Inflow = 9.07 cfs @ 12.33 hrs, Volume= 1.034 af
Outflow = 9.07 cfs @ 12.33 hrs, Volume= 1.034 af, Atten= 0%, Lag= 0.0 min

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

Reach 5R: DMH#5

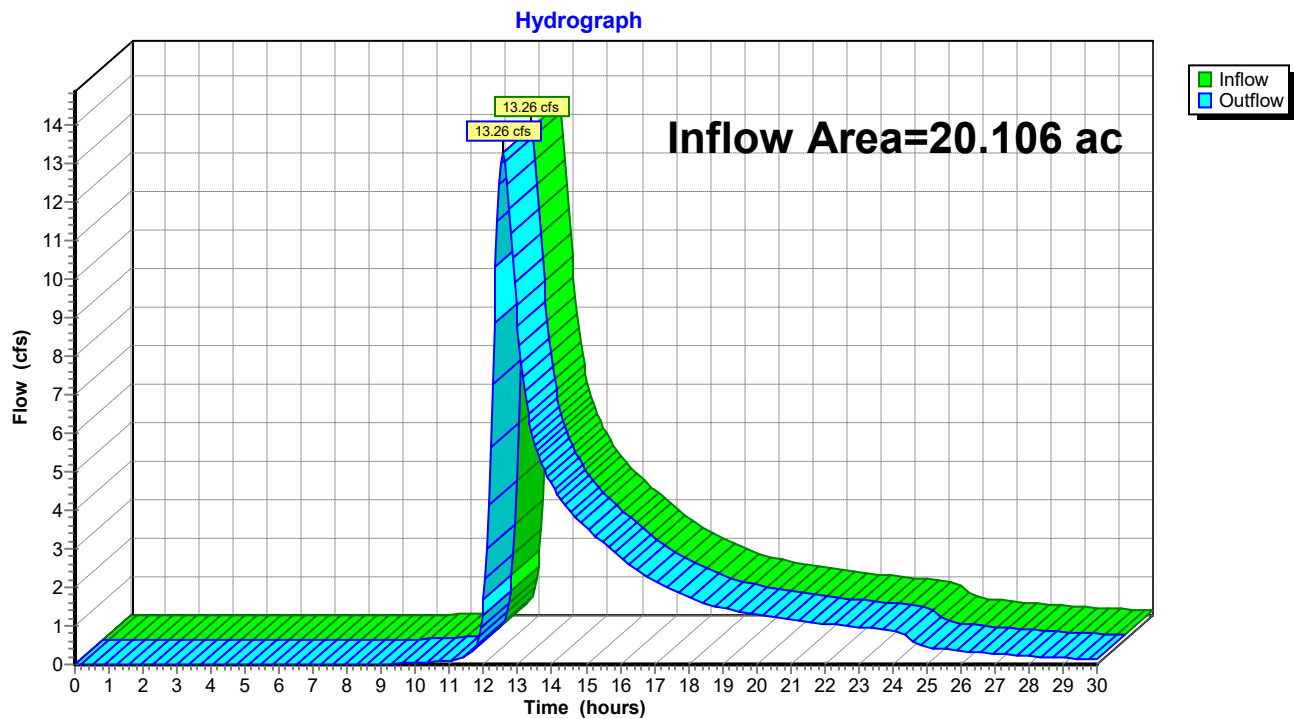
Hydrograph



Summary for Reach DP1: DESIGN POINT #1

Inflow Area = 20.106 ac, 11.68% Impervious, Inflow Depth > 1.81" for 25-YR STORM event
Inflow = 13.26 cfs @ 12.57 hrs, Volume= 3.034 af
Outflow = 13.26 cfs @ 12.57 hrs, Volume= 3.034 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1: DESIGN POINT #1

Summary for Pond P1: Detention Basin #1

Inflow Area = 6.582 ac, 21.35% Impervious, Inflow Depth = 3.25" for 25-YR STORM event
 Inflow = 13.73 cfs @ 12.26 hrs, Volume= 1.784 af
 Outflow = 2.53 cfs @ 13.19 hrs, Volume= 1.265 af, Atten= 82%, Lag= 55.6 min
 Primary = 2.53 cfs @ 13.19 hrs, Volume= 1.265 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 422.53' @ 13.19 hrs Surf.Area= 21,322 sf Storage= 43,391 cf

Plug-Flow detention time= 325.9 min calculated for 1.263 af (71% of inflow)
 Center-of-Mass det. time= 232.3 min (1,054.8 - 822.5)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	91,703 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	12,517	0	0
421.00	16,535	14,526	14,526
422.00	19,642	18,089	32,615
424.00	26,026	45,668	78,283
424.50	27,657	13,421	91,703

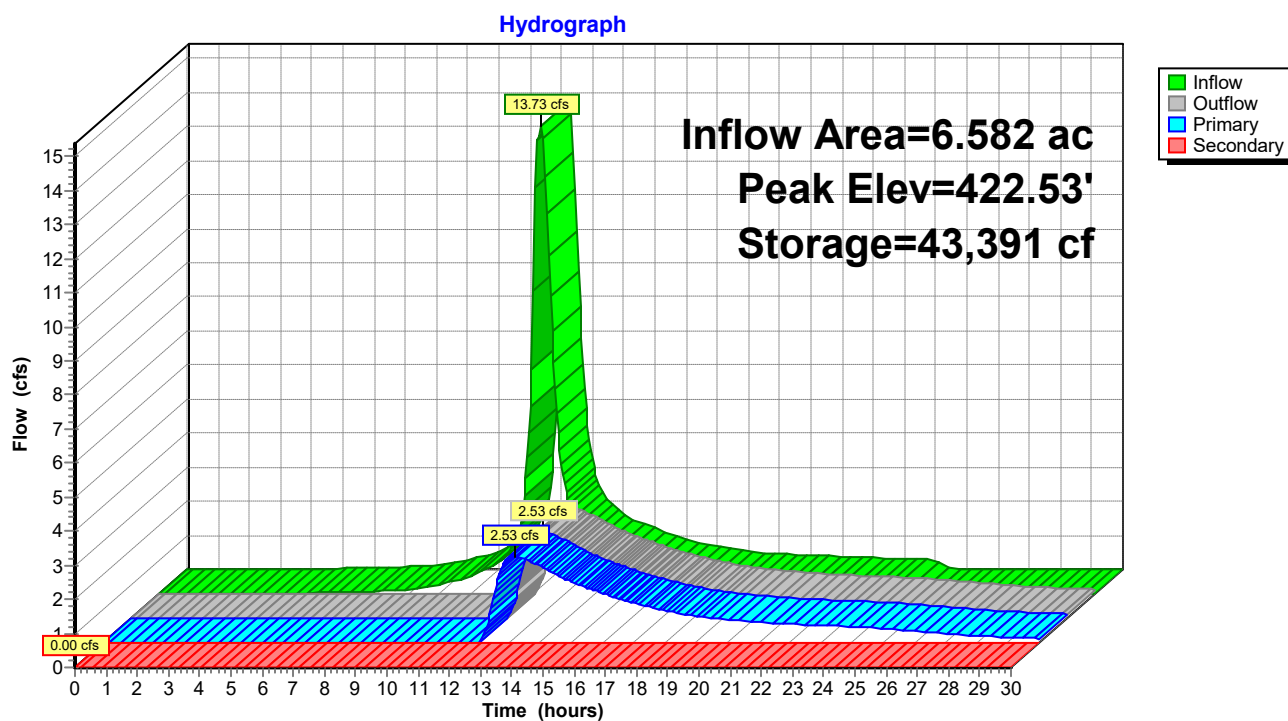
Device	Routing	Invert	Outlet Devices
#1	Primary	421.30'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600
#2	Primary	421.80'	10.0" Vert. Orifice/Grate C= 0.600
#3	Primary	422.30'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Secondary	423.50'	10.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Primary OutFlow Max=2.53 cfs @ 13.19 hrs HW=422.53' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 0.86 cfs @ 4.96 fps)
 — **2=Orifice/Grate** (Orifice Controls 1.46 cfs @ 2.90 fps)
 — **3=Orifice/Grate** (Orifice Controls 0.20 cfs @ 1.62 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.00' (Free Discharge)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Detention Basin #1

2352-Poulin-Padula Post 2021.1*Type III 24-hr 25-YR STORM Rainfall=5.40"*

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Stage-Discharge for Pond P1: Detention Basin #1

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)	Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
420.00	0.00	0.00	0.00	422.60	2.84	2.84	0.00
420.05	0.00	0.00	0.00	422.65	3.00	3.00	0.00
420.10	0.00	0.00	0.00	422.70	3.16	3.16	0.00
420.15	0.00	0.00	0.00	422.75	3.32	3.32	0.00
420.20	0.00	0.00	0.00	422.80	3.46	3.46	0.00
420.25	0.00	0.00	0.00	422.85	3.60	3.60	0.00
420.30	0.00	0.00	0.00	422.90	3.73	3.73	0.00
420.35	0.00	0.00	0.00	422.95	3.86	3.86	0.00
420.40	0.00	0.00	0.00	423.00	3.98	3.98	0.00
420.45	0.00	0.00	0.00	423.05	4.10	4.10	0.00
420.50	0.00	0.00	0.00	423.10	4.21	4.21	0.00
420.55	0.00	0.00	0.00	423.15	4.32	4.32	0.00
420.60	0.00	0.00	0.00	423.20	4.43	4.43	0.00
420.65	0.00	0.00	0.00	423.25	4.54	4.54	0.00
420.70	0.00	0.00	0.00	423.30	4.64	4.64	0.00
420.75	0.00	0.00	0.00	423.35	4.74	4.74	0.00
420.80	0.00	0.00	0.00	423.40	4.84	4.84	0.00
420.85	0.00	0.00	0.00	423.45	4.93	4.93	0.00
420.90	0.00	0.00	0.00	423.50	5.03	5.03	0.00
420.95	0.00	0.00	0.00	423.55	5.45	5.12	0.33
421.00	0.00	0.00	0.00	423.60	6.13	5.21	0.92
421.05	0.00	0.00	0.00	423.65	7.00	5.30	1.70
421.10	0.00	0.00	0.00	423.70	8.00	5.39	2.61
421.15	0.00	0.00	0.00	423.75	9.12	5.47	3.65
421.20	0.00	0.00	0.00	423.80	10.36	5.56	4.80
421.25	0.00	0.00	0.00	423.85	11.69	5.64	6.05
421.30	0.00	0.00	0.00	423.90	13.11	5.72	7.39
421.35	0.01	0.01	0.00	423.95	14.62	5.81	8.81
421.40	0.05	0.05	0.00	424.00	16.24	5.89	10.36
421.45	0.10	0.10	0.00	424.05	18.10	5.96	12.14
421.50	0.17	0.17	0.00	424.10	20.08	6.04	14.04
421.55	0.24	0.24	0.00	424.15	22.19	6.12	16.07
421.60	0.31	0.31	0.00	424.20	24.43	6.19	18.23
421.65	0.36	0.36	0.00	424.25	26.79	6.27	20.52
421.70	0.41	0.41	0.00	424.30	29.27	6.34	22.93
421.75	0.45	0.45	0.00	424.35	31.89	6.42	25.47
421.80	0.49	0.49	0.00	424.40	34.63	6.49	28.15
421.85	0.53	0.53	0.00	424.45	37.51	6.56	30.95
421.90	0.59	0.59	0.00	424.50	40.42	6.63	33.79
421.95	0.67	0.67	0.00				
422.00	0.77	0.77	0.00				
422.05	0.88	0.88	0.00				
422.10	1.00	1.00	0.00				
422.15	1.13	1.13	0.00				
422.20	1.28	1.28	0.00				
422.25	1.43	1.43	0.00				
422.30	1.59	1.59	0.00				
422.35	1.77	1.77	0.00				
422.40	1.97	1.97	0.00				
422.45	2.19	2.19	0.00				
422.50	2.41	2.41	0.00				
422.55	2.64	2.64	0.00				

2352-Poulin-Padula Post 2021.1

Type III 24-hr 100-YR STORM Rainfall=6.70"

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

Subcatchment P100: Remaining Area to Runoff Area=545,873 sf 5.72% Impervious Runoff Depth=2.30"
Flow Length=1,174' Tc=36.0 min CN=59 Runoff=16.73 cfs 2.402 af

Subcatchment P101: Area to FE#4 Runoff Area=171,647 sf 8.66% Impervious Runoff Depth=4.31"
Flow Length=614' Tc=23.9 min CN=79 Runoff=12.37 cfs 1.416 af

Subcatchment P102: Area to DBasin#1 Runoff Area=53,091 sf 0.00% Impervious Runoff Depth=3.17"
Flow Length=512' Tc=13.4 min CN=68 Runoff=3.52 cfs 0.322 af

Subcatchment P103: Misc Area to Runoff Area=43,238 sf 22.82% Impervious Runoff Depth=3.99"
Flow Length=1,094' Tc=26.2 min CN=76 Runoff=2.78 cfs 0.330 af

Subcatchment P104: Area to CTB#1/2 Runoff Area=5,575 sf 73.79% Impervious Runoff Depth=5.76"
Tc=5.0 min CN=92 Runoff=0.81 cfs 0.061 af

Subcatchment P105: Area to CTB#3 Runoff Area=11,266 sf 75.40% Impervious Runoff Depth=5.76"
Tc=5.0 min CN=92 Runoff=1.64 cfs 0.124 af

Subcatchment P106: Area to CTB#4 Runoff Area=10,915 sf 84.92% Impervious Runoff Depth=5.99"
Tc=5.0 min CN=94 Runoff=1.62 cfs 0.125 af

Subcatchment P107: Area to CTB#5/6 Runoff Area=20,262 sf 62.59% Impervious Runoff Depth=5.42"
Tc=5.0 min CN=89 Runoff=2.83 cfs 0.210 af

Subcatchment P108: Area to CTB#7 Runoff Area=13,953 sf 84.43% Impervious Runoff Depth=5.99"
Tc=5.0 min CN=94 Runoff=2.07 cfs 0.160 af

Reach 1R: DMH#1 Inflow=0.81 cfs 0.061 af
Outflow=0.81 cfs 0.061 af

Reach 2R: DMH#2 Inflow=3.25 cfs 0.249 af
Outflow=3.25 cfs 0.249 af

Reach 3R: DMH#3 Inflow=2.83 cfs 0.210 af
Outflow=2.83 cfs 0.210 af

Reach 4R: DMH#4 Inflow=4.90 cfs 0.370 af
Outflow=4.90 cfs 0.370 af

Reach 5R: DMH#5 Inflow=12.37 cfs 1.416 af
Outflow=12.37 cfs 1.416 af

Reach DP1: DESIGN POINT #1 Inflow=22.65 cfs 4.622 af
Outflow=22.65 cfs 4.622 af

Pond P1: Detention Basin #1 Peak Elev=423.10' Storage=56,164 cf Inflow=18.72 cfs 2.418 af
Primary=4.21 cfs 1.890 af Secondary=0.00 cfs 0.000 af Outflow=4.21 cfs 1.890 af

2352-Poulin-Padula Post 2021.1

Type III 24-hr 100-YR STORM Rainfall=6.70"

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Total Runoff Area = 20.106 ac Runoff Volume = 5.150 af Average Runoff Depth = 3.07"
88.32% Pervious = 17.758 ac 11.68% Impervious = 2.348 ac

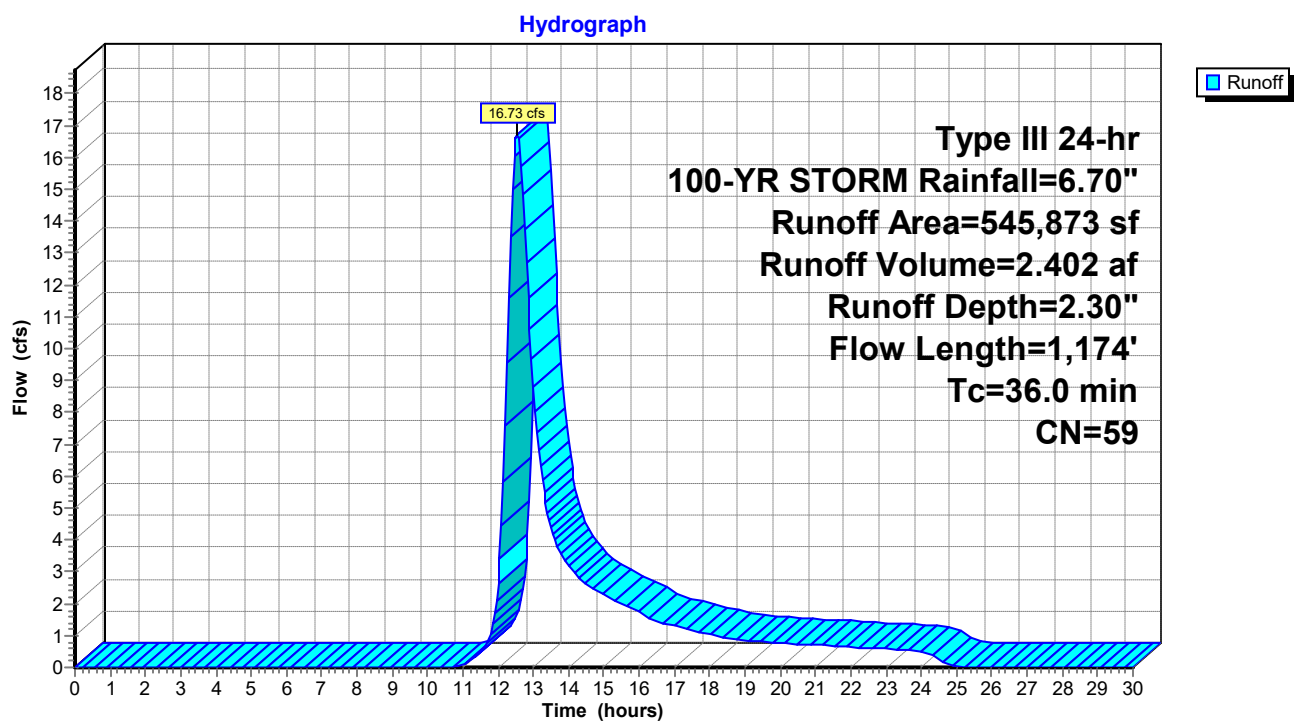
Summary for Subcatchment P100: Remaining Area to DP#1

Runoff = 16.73 cfs @ 12.54 hrs, Volume= 2.402 af, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
40,035	39	>75% Grass cover, Good, HSG A
19,350	61	>75% Grass cover, Good, HSG B
39,460	74	>75% Grass cover, Good, HSG C
5,377	30	Brush, Good, HSG A
16,687	48	Brush, Good, HSG B
52,490	70	Brush, Fair, HSG C
57,046	30	Woods, Good, HSG A
185,010	55	Woods, Good, HSG B
99,211	70	Woods, Good, HSG C
31,207	98	Paved parking & roofs
545,873	59	Weighted Average
514,666		94.28% Pervious Area
31,207		5.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
1.9	119	0.0420	1.02		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.2	40	0.0750	4.41		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.2	62	0.0320	0.89		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.4	53	0.1130	2.35		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
22.6	850	0.0080	0.63		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
36.0	1,174	Total			

Subcatchment P100: Remaining Area to DP#1

Summary for Subcatchment P101: Area to FE#4

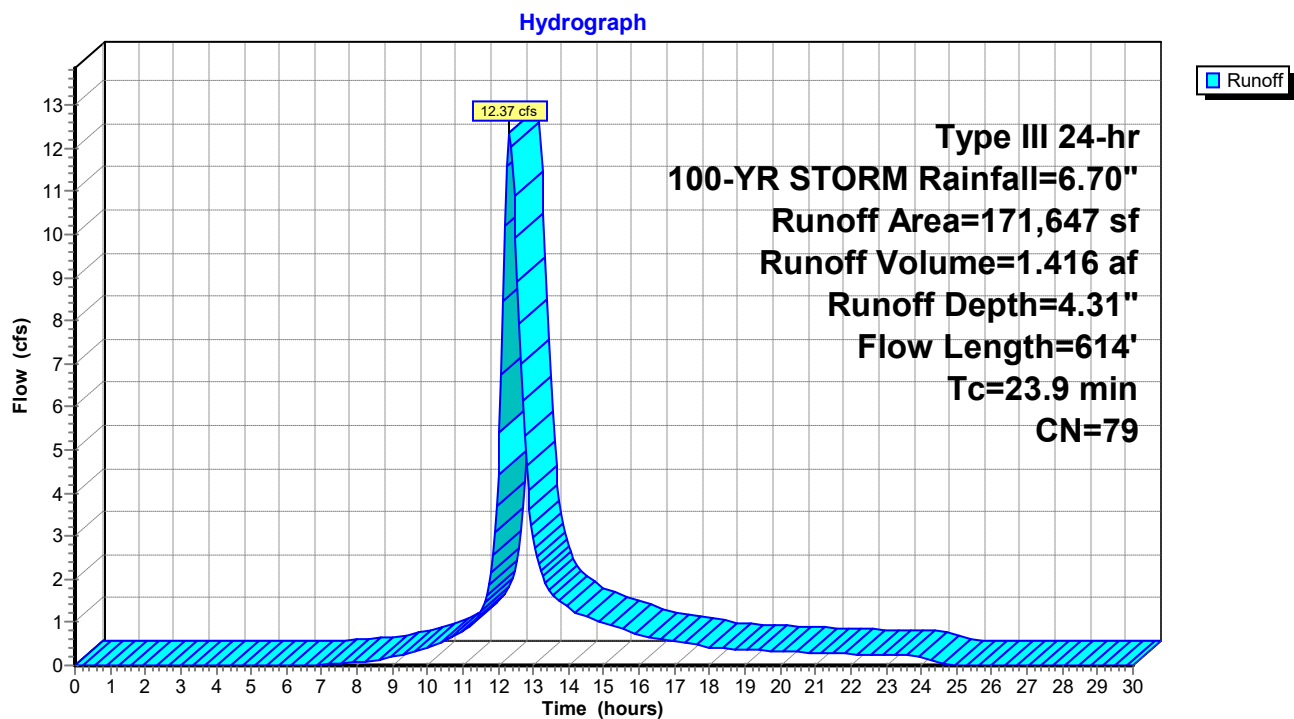
Runoff = 12.37 cfs @ 12.33 hrs, Volume= 1.416 af, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
32,659	74	>75% Grass cover, Good, HSG C
6,334	65	Brush, Good, HSG C
59,669	70	Woods, Good, HSG C
58,118	89	Gravel roads, HSG C
14,867	98	Paved parking & roofs
171,647	79	Weighted Average
156,780		91.34% Pervious Area
14,867		8.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	50	0.0400	0.09		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
13.0	389	0.0100	0.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.1	58	0.2070	7.33		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.1	117	0.0130	1.84		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
23.9	614	Total			

Subcatchment P101: Area to FE#4



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Type III 24-hr 100-YR STORM Rainfall=6.70"

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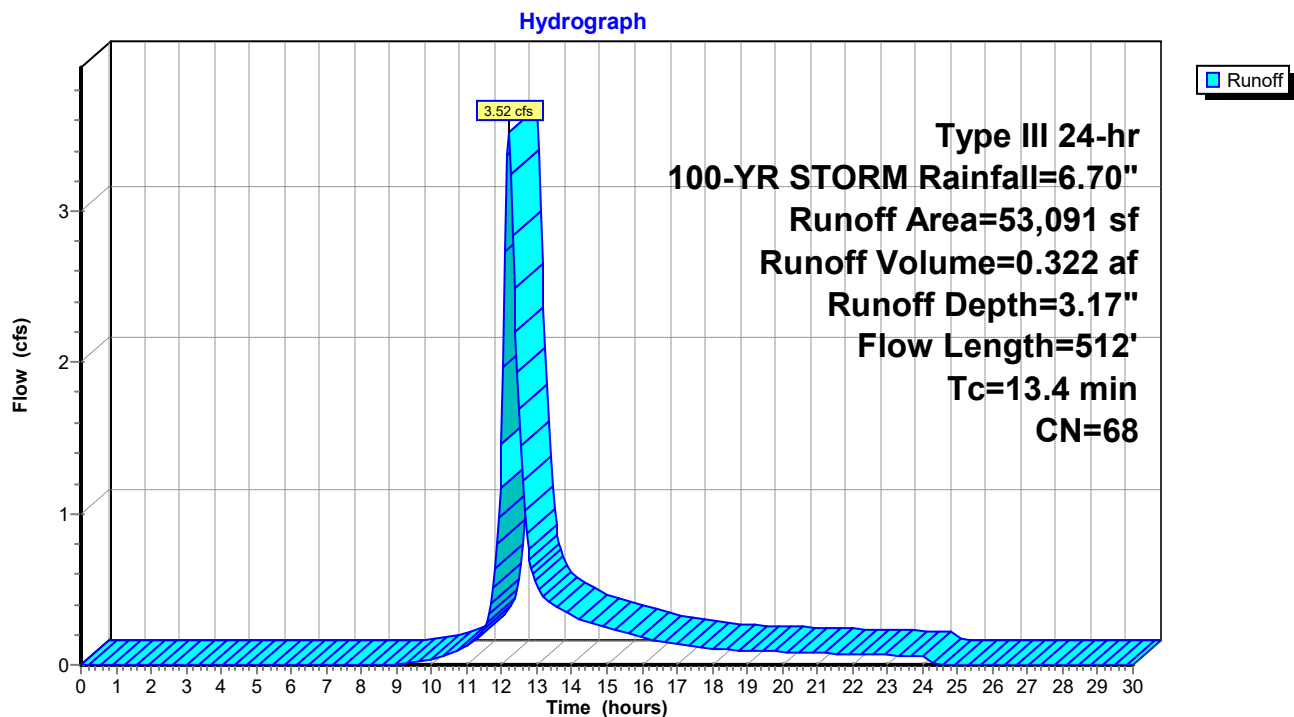
Summary for Subcatchment P102: Area to DBasin#1

Runoff = 3.52 cfs @ 12.19 hrs, Volume= 0.322 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
31,500	61	>75% Grass cover, Good, HSG B
11,025	74	>75% Grass cover, Good, HSG C
10,566	85	Gravel roads, HSG B
53,091	68	Weighted Average
53,091		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	32	0.0200	0.09		Sheet Flow, Grass: Dense n= 0.240 P2= 3.00"
7.5	480	0.0050	1.06		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
13.4	512	Total			

Subcatchment P102: Area to DBasin#1

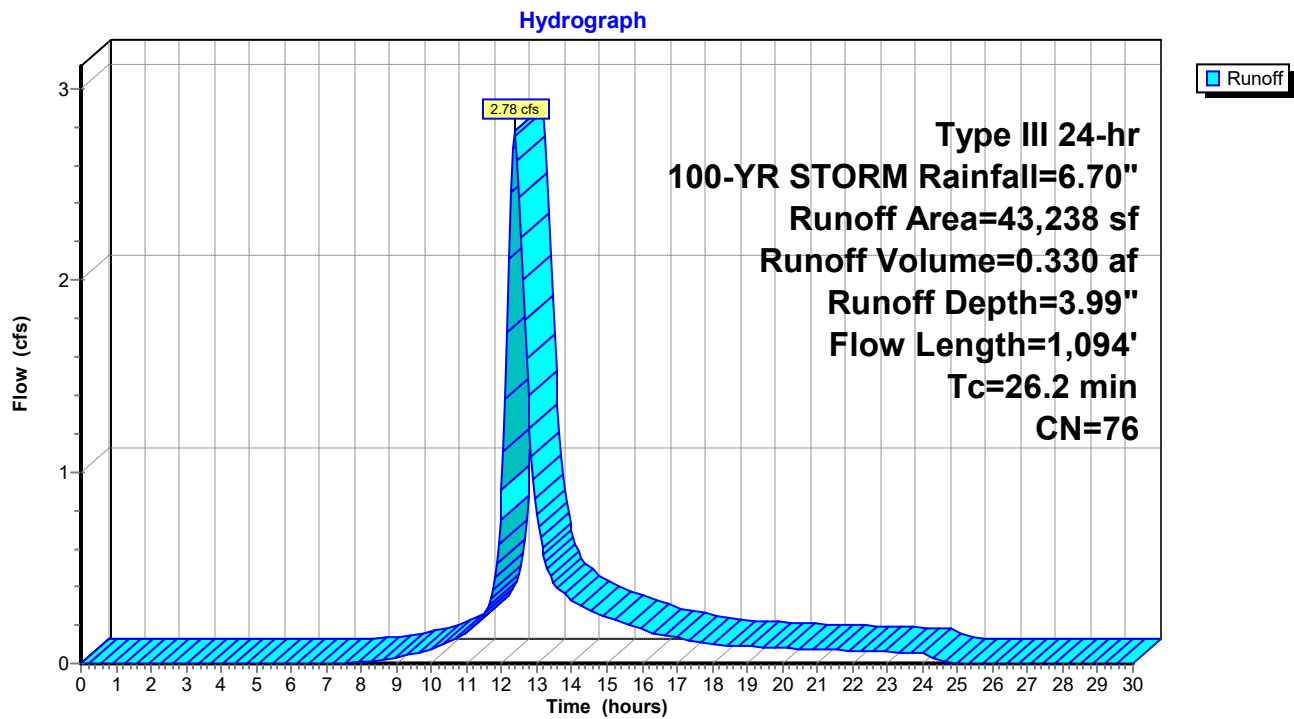
Summary for Subcatchment P103: Misc Area to Road/Wetland

Runoff = 2.78 cfs @ 12.36 hrs, Volume= 0.330 af, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
20,365	74	>75% Grass cover, Good, HSG C
5,184	48	Brush, Good, HSG B
7,749	70	Brush, Fair, HSG C
75	70	Woods, Good, HSG C
9,865	98	Paved parking & roofs
43,238	76	Weighted Average
33,373		77.18% Pervious Area
9,865		22.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	28	0.0700	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.00"
0.6	80	0.1000	2.21		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
14.1	418	0.0050	0.49		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
6.6	568	0.0050	1.44		Shallow Concentrated Flow, Paved Kv= 20.3 fps
26.2	1,094	Total			

Subcatchment P103: Misc Area to Road/Wetland

Summary for Subcatchment P104: Area to CTB#1/2

Runoff = 0.81 cfs @ 12.07 hrs, Volume= 0.061 af, Depth= 5.76"

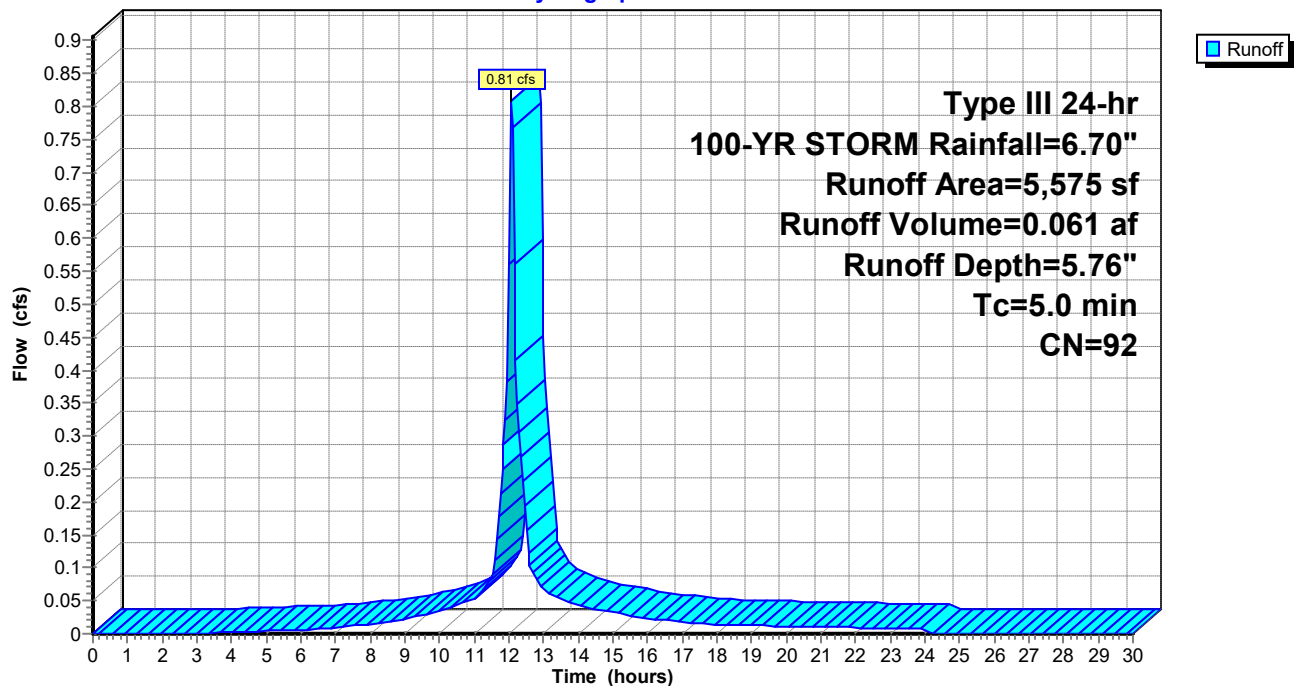
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
1,461	74	>75% Grass cover, Good, HSG C
4,114	98	Paved parking & roofs
5,575	92	Weighted Average
1,461		26.21% Pervious Area
4,114		73.79% Impervious Area

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

Subcatchment P104: Area to CTB#1/2

Hydrograph



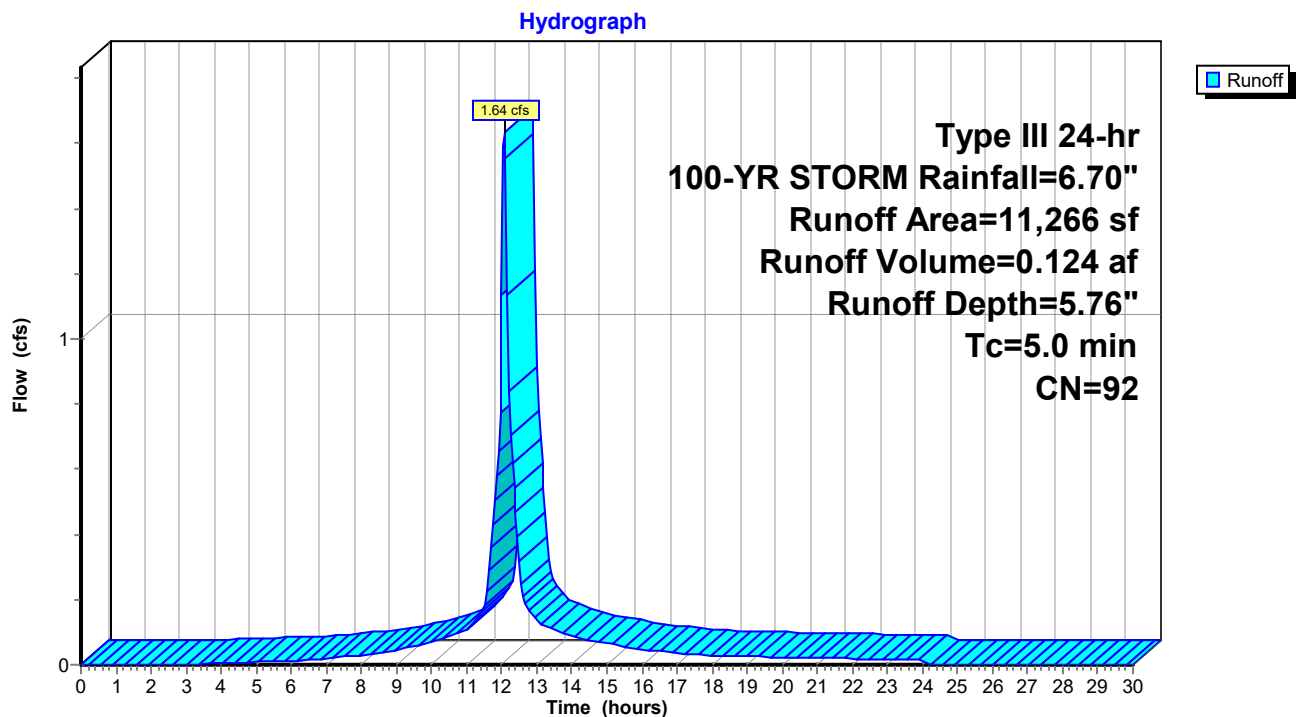
Summary for Subcatchment P105: Area to CTB#3

Runoff = 1.64 cfs @ 12.07 hrs, Volume= 0.124 af, Depth= 5.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
2,771	74	>75% Grass cover, Good, HSG C
8,495	98	Paved parking & roofs
11,266	92	Weighted Average
2,771		24.60% Pervious Area
8,495		75.40% Impervious Area

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

Subcatchment P105: Area to CTB#3

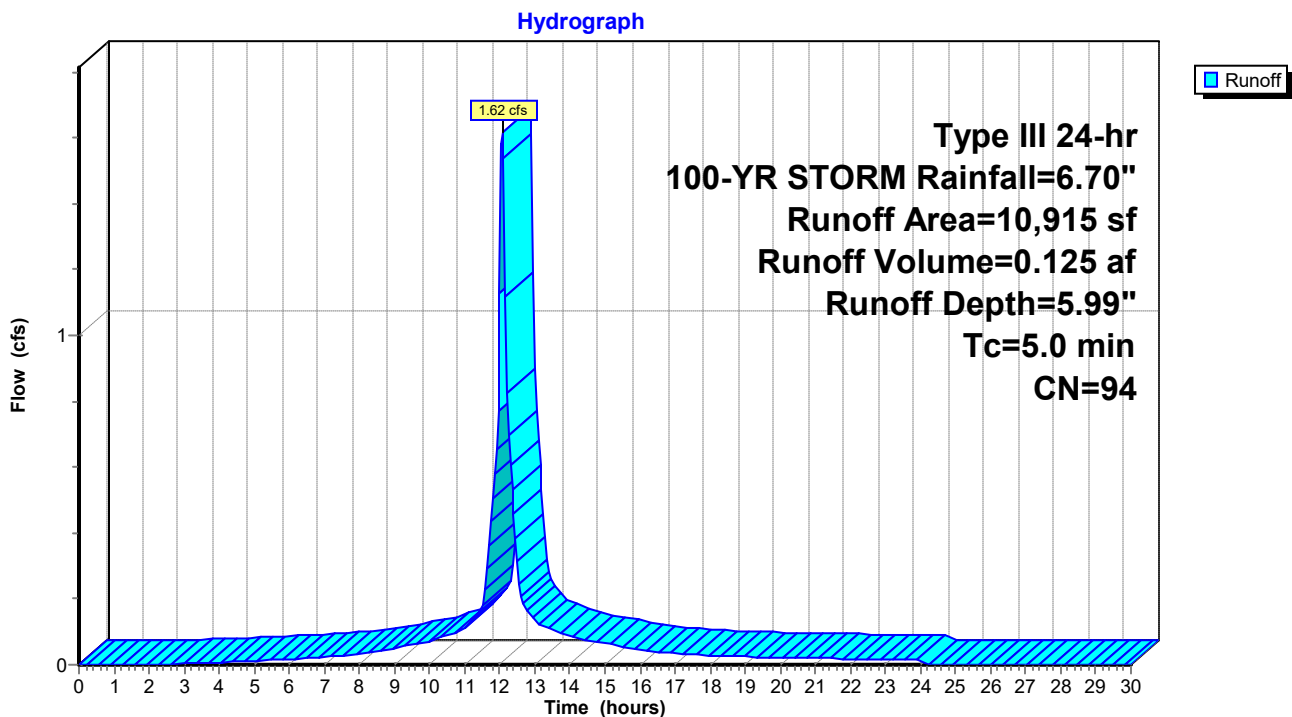
Summary for Subcatchment P106: Area to CTB#4

Runoff = 1.62 cfs @ 12.07 hrs, Volume= 0.125 af, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
1,646	74	>75% Grass cover, Good, HSG C
9,269	98	Paved parking & roofs
10,915	94	Weighted Average
1,646		15.08% Pervious Area
9,269		84.92% Impervious Area

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

Subcatchment P106: Area to CTB#4

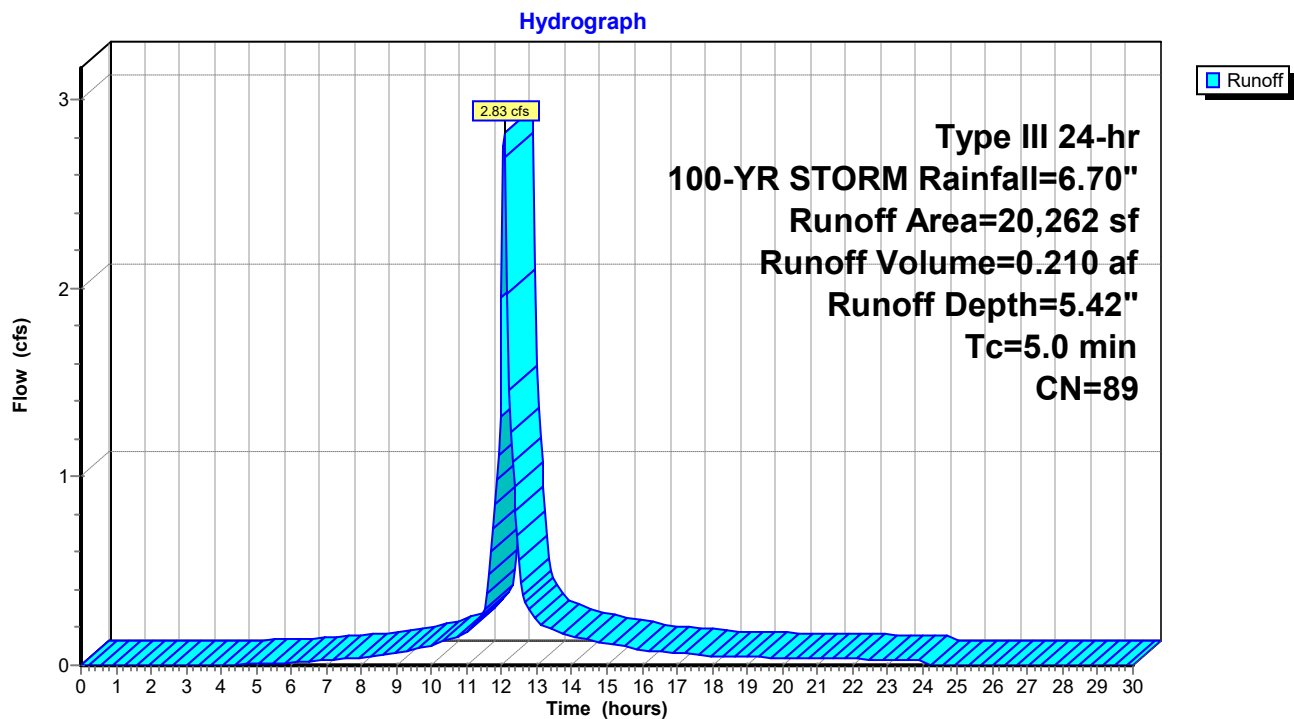
Summary for Subcatchment P107: Area to CTB#5/6

Runoff = 2.83 cfs @ 12.07 hrs, Volume= 0.210 af, Depth= 5.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
759	61	>75% Grass cover, Good, HSG B
6,821	74	>75% Grass cover, Good, HSG C
12,682	98	Paved parking & roofs
20,262	89	Weighted Average
7,580		37.41% Pervious Area
12,682		62.59% Impervious Area

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

Subcatchment P107: Area to CTB#5/6

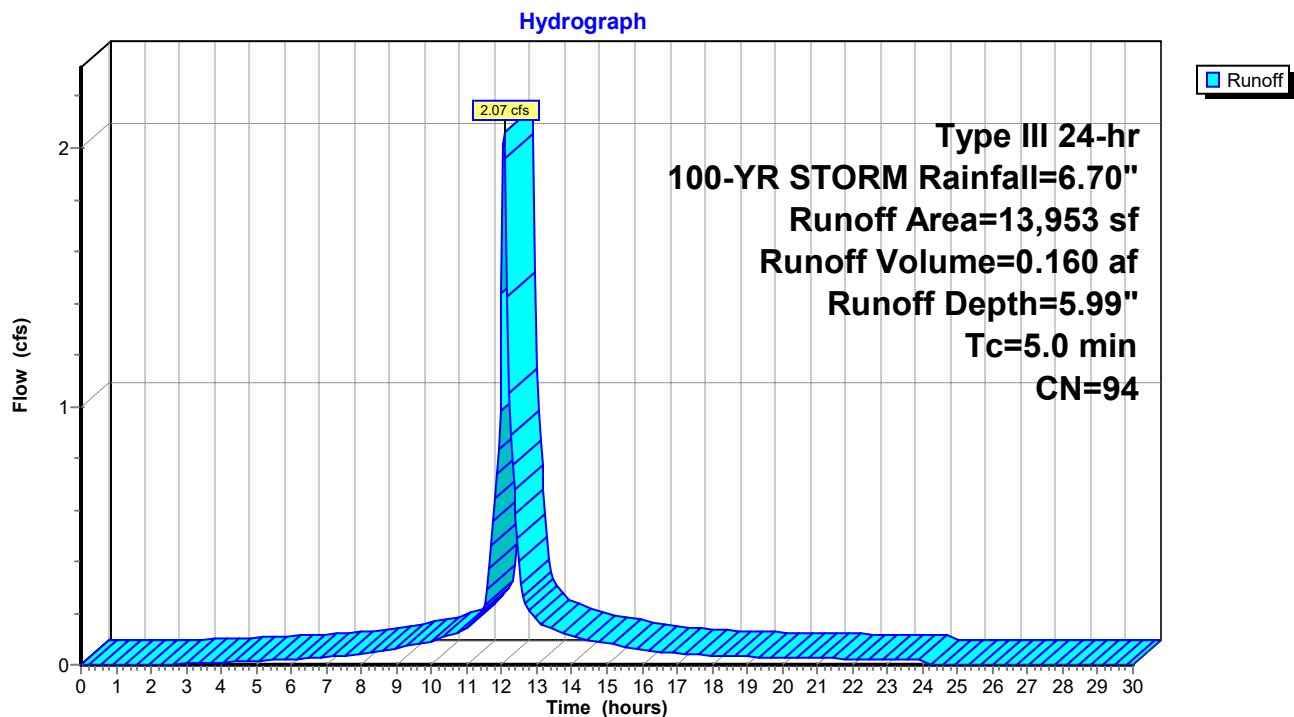
Summary for Subcatchment P108: Area to CTB#7

Runoff = 2.07 cfs @ 12.07 hrs, Volume= 0.160 af, Depth= 5.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR STORM Rainfall=6.70"

Area (sf)	CN	Description
2,172	74	>75% Grass cover, Good, HSG C
11,781	98	Paved parking & roofs
13,953	94	Weighted Average
2,172		15.57% Pervious Area
11,781		84.43% Impervious Area

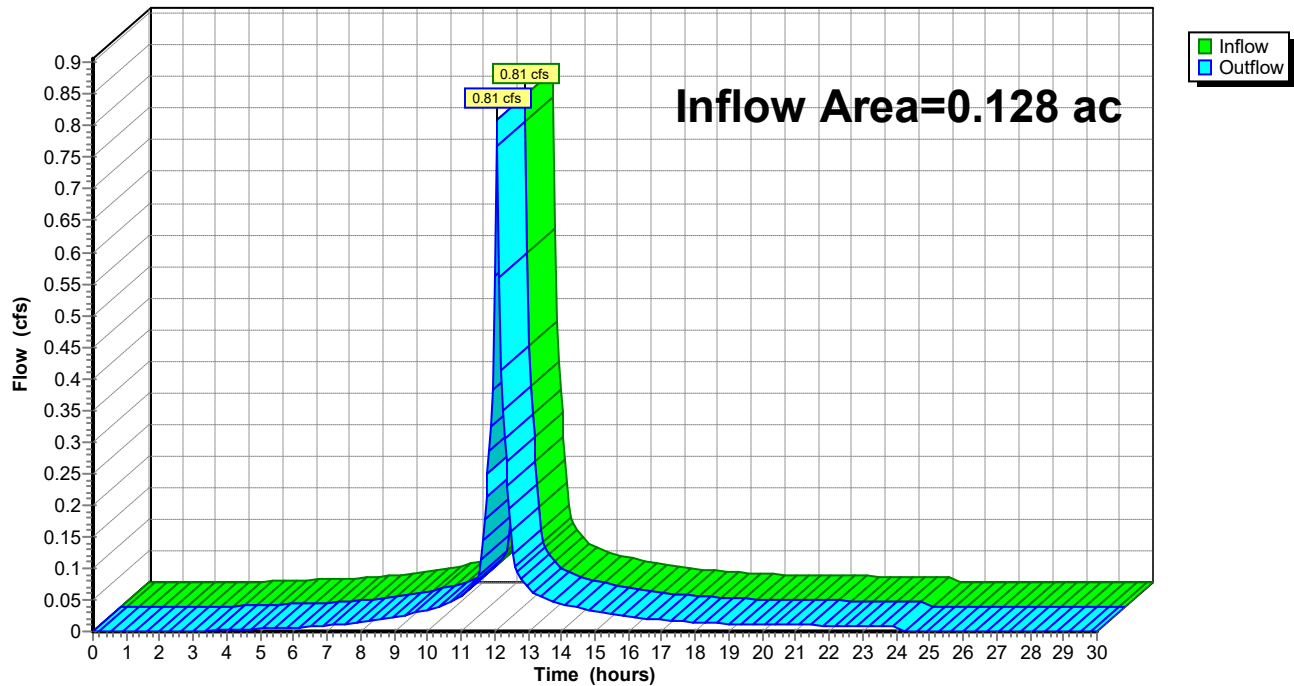
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P108: Area to CTB#7

Summary for Reach 1R: DMH#1

Inflow Area = 0.128 ac, 73.79% Impervious, Inflow Depth = 5.76" for 100-YR STORM event
Inflow = 0.81 cfs @ 12.07 hrs, Volume= 0.061 af
Outflow = 0.81 cfs @ 12.07 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

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

Reach 1R: DMH#1**Hydrograph**

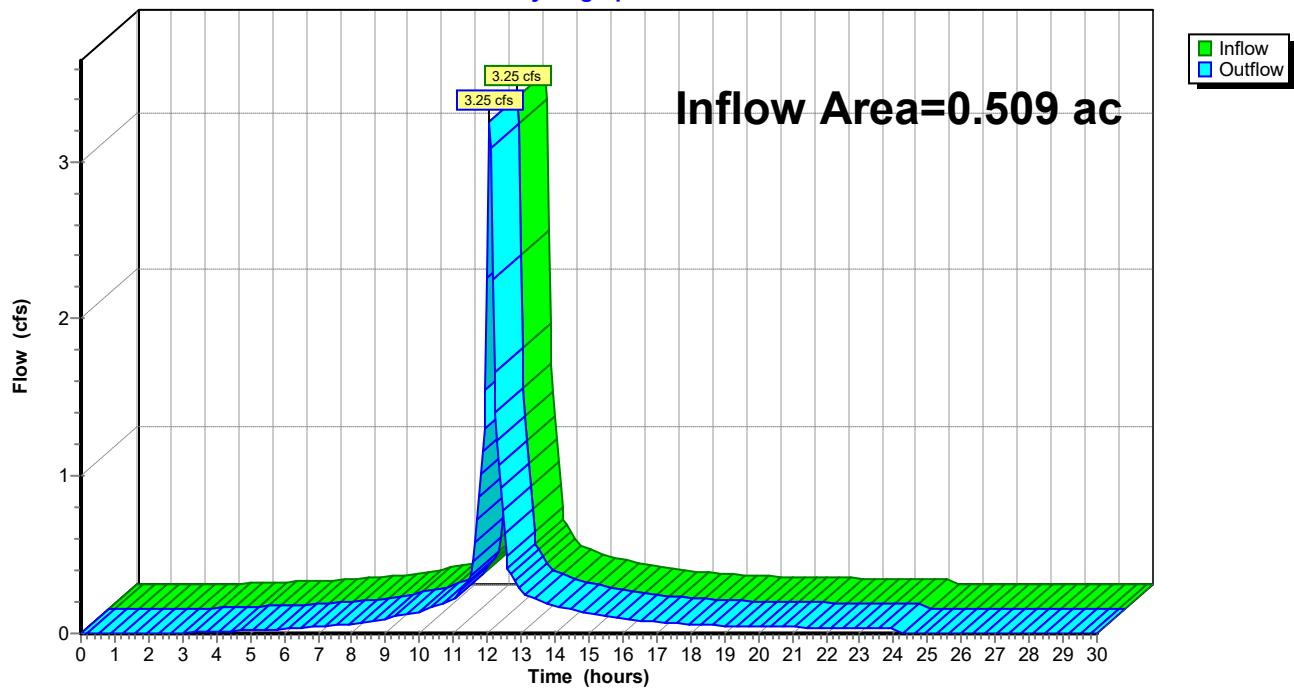
Summary for Reach 2R: DMH#2

Inflow Area = 0.509 ac, 80.09% Impervious, Inflow Depth = 5.87" for 100-YR STORM event
Inflow = 3.25 cfs @ 12.07 hrs, Volume= 0.249 af
Outflow = 3.25 cfs @ 12.07 hrs, Volume= 0.249 af, Atten= 0%, Lag= 0.0 min

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

Reach 2R: DMH#2

Hydrograph



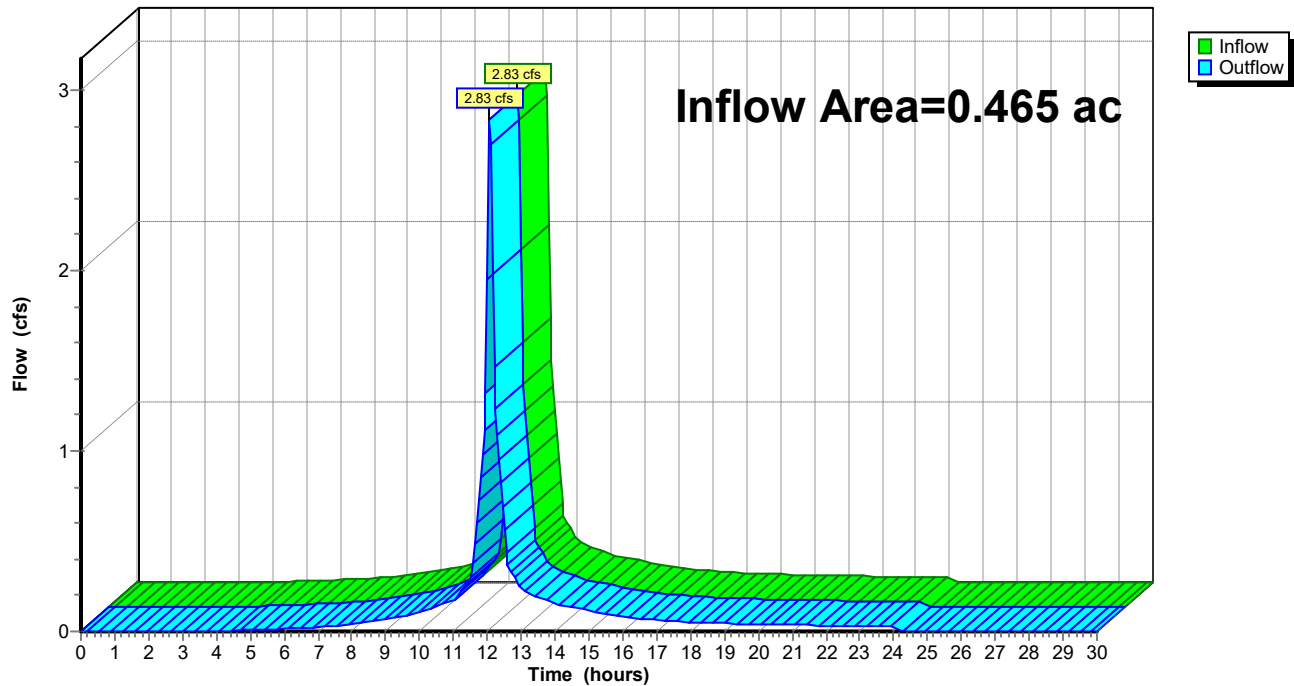
Summary for Reach 3R: DMH#3

Inflow Area = 0.465 ac, 62.59% Impervious, Inflow Depth = 5.42" for 100-YR STORM event
Inflow = 2.83 cfs @ 12.07 hrs, Volume= 0.210 af
Outflow = 2.83 cfs @ 12.07 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min

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

Reach 3R: DMH#3

Hydrograph



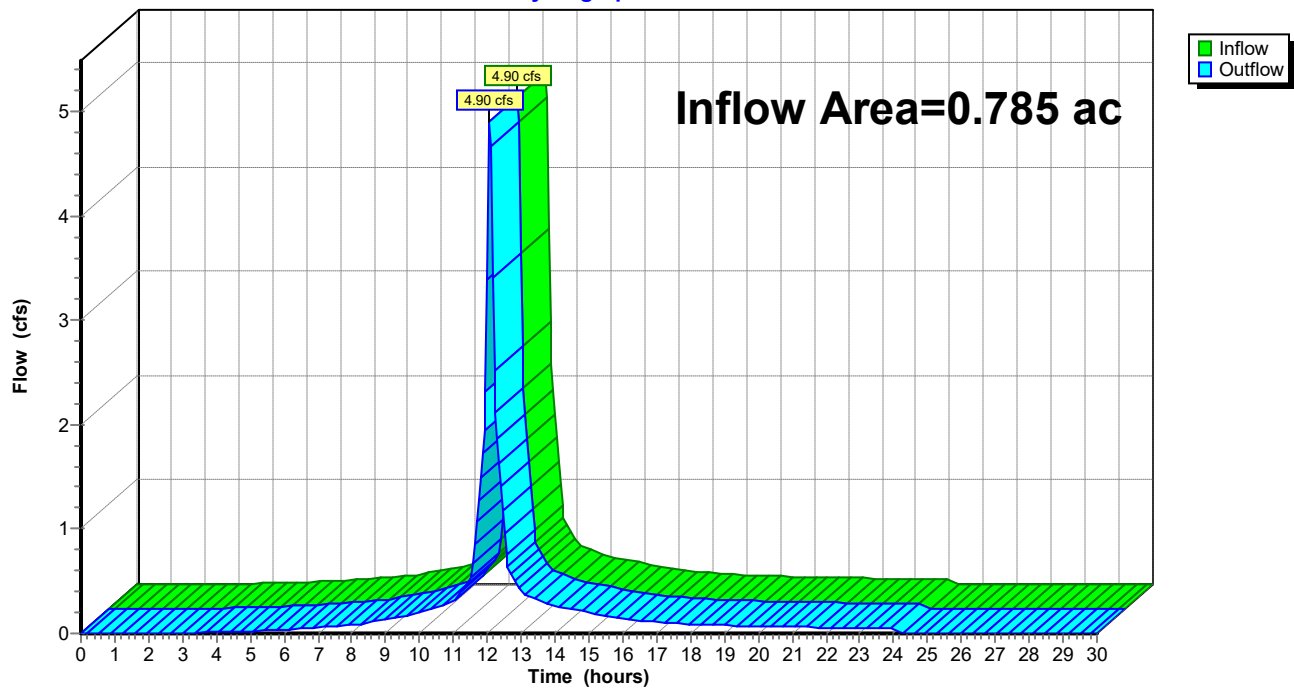
Summary for Reach 4R: DMH#4

Inflow Area = 0.785 ac, 71.50% Impervious, Inflow Depth = 5.65" for 100-YR STORM event
Inflow = 4.90 cfs @ 12.07 hrs, Volume= 0.370 af
Outflow = 4.90 cfs @ 12.07 hrs, Volume= 0.370 af, Atten= 0%, Lag= 0.0 min

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

Reach 4R: DMH#4

Hydrograph



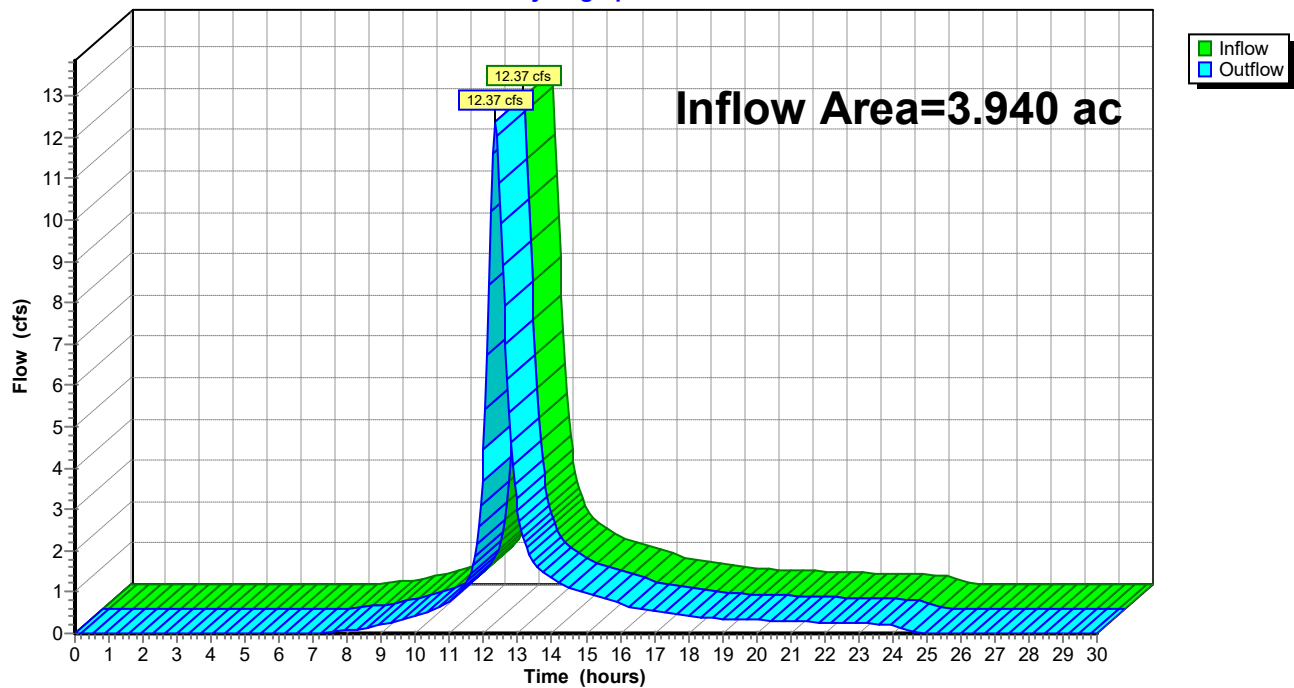
Summary for Reach 5R: DMH#5

Inflow Area = 3.940 ac, 8.66% Impervious, Inflow Depth = 4.31" for 100-YR STORM event
Inflow = 12.37 cfs @ 12.33 hrs, Volume= 1.416 af
Outflow = 12.37 cfs @ 12.33 hrs, Volume= 1.416 af, Atten= 0%, Lag= 0.0 min

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

Reach 5R: DMH#5

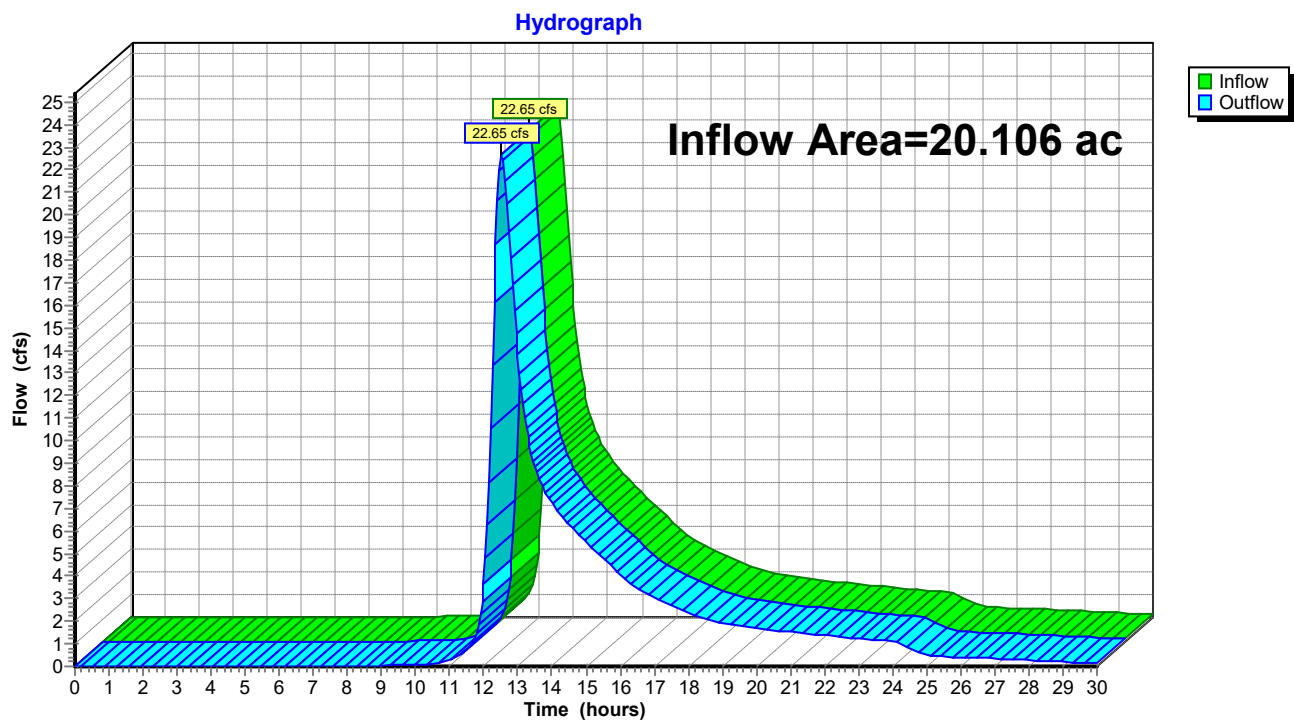
Hydrograph



Summary for Reach DP1: DESIGN POINT #1

Inflow Area = 20.106 ac, 11.68% Impervious, Inflow Depth > 2.76" for 100-YR STORM event
Inflow = 22.65 cfs @ 12.53 hrs, Volume= 4.622 af
Outflow = 22.65 cfs @ 12.53 hrs, Volume= 4.622 af, Atten= 0%, Lag= 0.0 min

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

Reach DP1: DESIGN POINT #1

Summary for Pond P1: Detention Basin #1

Inflow Area = 6.582 ac, 21.35% Impervious, Inflow Depth = 4.41" for 100-YR STORM event
 Inflow = 18.72 cfs @ 12.26 hrs, Volume= 2.418 af
 Outflow = 4.21 cfs @ 13.01 hrs, Volume= 1.890 af, Atten= 77%, Lag= 45.0 min
 Primary = 4.21 cfs @ 13.01 hrs, Volume= 1.890 af
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
 Peak Elev= 423.10' @ 13.01 hrs Surf.Area= 23,155 sf Storage= 56,164 cf

Plug-Flow detention time= 277.3 min calculated for 1.887 af (78% of inflow)
 Center-of-Mass det. time= 197.7 min (1,012.8 - 815.1)

Volume	Invert	Avail.Storage	Storage Description
#1	420.00'	91,703 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
420.00	12,517	0	0
421.00	16,535	14,526	14,526
422.00	19,642	18,089	32,615
424.00	26,026	45,668	78,283
424.50	27,657	13,421	91,703

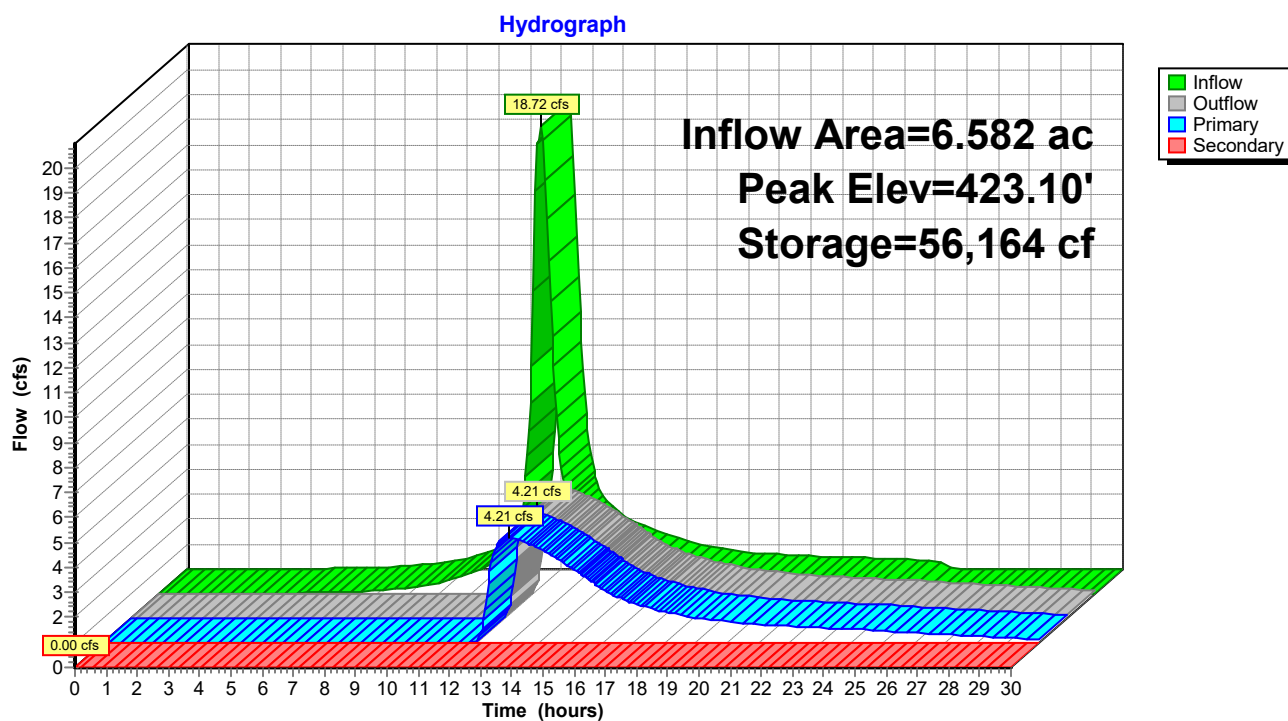
Device	Routing	Invert	Outlet Devices
#1	Primary	421.30'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600
#2	Primary	421.80'	10.0" Vert. Orifice/Grate C= 0.600
#3	Primary	422.30'	4.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Secondary	423.50'	10.0' long (Profile 1) Broad-Crested Rectangular Weir Head (feet) 0.49 0.98 1.48 Coef. (English) 2.92 3.37 3.59

Primary OutFlow Max=4.21 cfs @ 13.01 hrs HW=423.10' (Free Discharge)

↑ **1=Orifice/Grate** (Orifice Controls 1.07 cfs @ 6.15 fps)
 — **2=Orifice/Grate** (Orifice Controls 2.47 cfs @ 4.53 fps)
 — **3=Orifice/Grate** (Orifice Controls 0.67 cfs @ 3.83 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=420.00' (Free Discharge)

↑ **4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P1: Detention Basin #1

2352-Poulin-Padula Post 2021.1*Type III 24-hr 100-YR STORM Rainfall=6.70"*

Prepared by HANNIGAN ENGINEERING, INC.

Printed 3/31/2021

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Stage-Discharge for Pond P1: Detention Basin #1

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)	Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
420.00	0.00	0.00	0.00	422.60	2.84	2.84	0.00
420.05	0.00	0.00	0.00	422.65	3.00	3.00	0.00
420.10	0.00	0.00	0.00	422.70	3.16	3.16	0.00
420.15	0.00	0.00	0.00	422.75	3.32	3.32	0.00
420.20	0.00	0.00	0.00	422.80	3.46	3.46	0.00
420.25	0.00	0.00	0.00	422.85	3.60	3.60	0.00
420.30	0.00	0.00	0.00	422.90	3.73	3.73	0.00
420.35	0.00	0.00	0.00	422.95	3.86	3.86	0.00
420.40	0.00	0.00	0.00	423.00	3.98	3.98	0.00
420.45	0.00	0.00	0.00	423.05	4.10	4.10	0.00
420.50	0.00	0.00	0.00	423.10	4.21	4.21	0.00
420.55	0.00	0.00	0.00	423.15	4.32	4.32	0.00
420.60	0.00	0.00	0.00	423.20	4.43	4.43	0.00
420.65	0.00	0.00	0.00	423.25	4.54	4.54	0.00
420.70	0.00	0.00	0.00	423.30	4.64	4.64	0.00
420.75	0.00	0.00	0.00	423.35	4.74	4.74	0.00
420.80	0.00	0.00	0.00	423.40	4.84	4.84	0.00
420.85	0.00	0.00	0.00	423.45	4.93	4.93	0.00
420.90	0.00	0.00	0.00	423.50	5.03	5.03	0.00
420.95	0.00	0.00	0.00	423.55	5.45	5.12	0.33
421.00	0.00	0.00	0.00	423.60	6.13	5.21	0.92
421.05	0.00	0.00	0.00	423.65	7.00	5.30	1.70
421.10	0.00	0.00	0.00	423.70	8.00	5.39	2.61
421.15	0.00	0.00	0.00	423.75	9.12	5.47	3.65
421.20	0.00	0.00	0.00	423.80	10.36	5.56	4.80
421.25	0.00	0.00	0.00	423.85	11.69	5.64	6.05
421.30	0.00	0.00	0.00	423.90	13.11	5.72	7.39
421.35	0.01	0.01	0.00	423.95	14.62	5.81	8.81
421.40	0.05	0.05	0.00	424.00	16.24	5.89	10.36
421.45	0.10	0.10	0.00	424.05	18.10	5.96	12.14
421.50	0.17	0.17	0.00	424.10	20.08	6.04	14.04
421.55	0.24	0.24	0.00	424.15	22.19	6.12	16.07
421.60	0.31	0.31	0.00	424.20	24.43	6.19	18.23
421.65	0.36	0.36	0.00	424.25	26.79	6.27	20.52
421.70	0.41	0.41	0.00	424.30	29.27	6.34	22.93
421.75	0.45	0.45	0.00	424.35	31.89	6.42	25.47
421.80	0.49	0.49	0.00	424.40	34.63	6.49	28.15
421.85	0.53	0.53	0.00	424.45	37.51	6.56	30.95
421.90	0.59	0.59	0.00	424.50	40.42	6.63	33.79
421.95	0.67	0.67	0.00				
422.00	0.77	0.77	0.00				
422.05	0.88	0.88	0.00				
422.10	1.00	1.00	0.00				
422.15	1.13	1.13	0.00				
422.20	1.28	1.28	0.00				
422.25	1.43	1.43	0.00				
422.30	1.59	1.59	0.00				
422.35	1.77	1.77	0.00				
422.40	1.97	1.97	0.00				
422.45	2.19	2.19	0.00				
422.50	2.41	2.41	0.00				
422.55	2.64	2.64	0.00				

2.3
MISCELLANEOUS CALCULATIONS
(February 15, 2012)



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



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Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

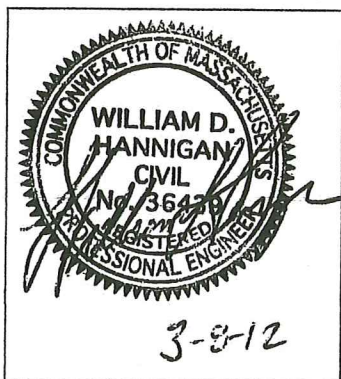
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



William D. Hannigan
Signature and Date

3-8-12

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☒ New development
- ☐ Redevelopment
- ☐ Mix of New Development and Redevelopment



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Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
 - ☐ Credit 1
 - ☐ Credit 2
 - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Forebay Treatment/Water Quality Devices/Deep Sump Catchbasins/Level Spreaders

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



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Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☒ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



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Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent. (See Plans – Sheet 3)
 - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



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Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☐ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted *prior to* the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does *not* cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has *not* been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



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Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☐ Redevelopment Project
 - ☐ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report. (See Plans – Details Sheet)



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☒ Name of the stormwater management system owners;
 - ☒ Party responsible for operation and maintenance;
 - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☐ Description and delineation of public safety features;
 - ☐ Estimated operation and maintenance budget; and
 - ☐ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☐ An Illicit Discharge Compliance Statement is attached;
- ☒ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Stormwater Compliance Documentation

Updated March 30, 2021

Standard 1: No Untreated Discharges or Erosion to Wetlands

Stormwater runoff from the area proposed for development will be captured by the onsite drainage system and directed to the Detention Basin on the site. The discharge from this Detention Basin will be directed to an outfall structure near the wetlands on the eastern portion of the site. The stormwater on the site shall be treated by deep sump catch basins, water quality structure, forebay, and a detention basin prior to discharge.

The rate of the discharge is less than the rate calculated for pre-development for all storms evaluated. Any scour or erosion attributed to this outlet in the pre-development condition has been decreased as a result of the proposed stormwater management system.

UPDATE: The project update consists of an addition to the existing structure and the relocation of the access drive to the new bay doors. The result is an increase in impervious area on the project of 0.07 acres (3,050 sf). The majority of this area is captured by the drainage system and directed to the onsite detention basin for treatment prior to discharge. Due to the change in the configuration of the site, the watershed areas are reconfigured. As a result, a decrease in peak rate of runoff is realized over the 2012 existing condition.

Standard 2: Peak Rate Attenuation

The peak rate of discharge from the site has been decreased in all design storms. See the HydroCAD calculations for further information.

UPDATE: The project update consists of an addition to the existing structure and the relocation of the access drive to the new bay doors. The result is an increase in impervious area on the project of 0.07 acres (3,050 sf). The majority of this area is captured by the drainage system and directed to the onsite detention basin for treatment prior to discharge. Due to the change in the configuration of the site, the watershed areas are reconfigured. As a result, a decrease in peak rate of runoff is realized over the 2021 existing condition.

Standard 3: Stormwater Recharge (Updated February 4, 2021)

Impervious Area Proposed: (This area includes all proposed buildings, driveways, and the subdivision roadway.) The soils within the developed area are classified as HSG B & C.

The soils within the development classified as HSG B:
Net New Impervious HSG B = 63 sf + 363 sf new = 426 sf

The soils within the development classified as HSG C:
Net New Impervious HSG C = 91,955 sf + 2,687 sf new = 94,642 sf
(Includes gravel yard area at rear of building.)

Required Recharge Volume:

Net Impervious HSG B to D-Basin #1 = 426 sf

HSG B: 426 sf x (0.35 in/12) = 12 c.f.

Net Impervious HSG C to D-Basin #1 = 17,957 sf + 2,687 sf = 20,644 sf

HSG C: 94,642 sf x (0.25 in/12) = 1,972 cf

Required Recharge Volume = 1,972 c.f.

Capture Rate Adjustment

Capture Rate: (426+20,644)/94,642 = 22.3%

Adjustment Factor: 94,642/(426+20,644) = 4.49

Adjusted Recharge Volume: (1,972)(4.49) = 8,854 cf

Storage Volume Provided:

Volume below lowest orifice invert within detention facility.

D-Basin #1: 19,586 c.f. of storage volume provided.

Infiltration Provided:

Infiltration on this project is being considered through the Water Quality Volume and the Drawdown that occurs below the lowest outlet. This consideration is being utilized in Detention Basins #1.

Recharge Volume Required: = 8,854 cubic feet.

D-Basin #1: 19,586 c.f. of storage volume provided to
be utilized as Infiltration on this project (2.2 x of the required volume).

Drawdown Time: (72 Hours Max.)

Time = Storage Volume / (K x Bottom Area)

Where K = Saturated Hydraulic Conductivity (inches/hour) (From table 2.3.3 1982 Rawls Rates – Mass Stormwater Handbook)

D-Basin #1: 19,586 c.f. of storage volume provided.

Time = 19,586 c.f. / (1.02 in/hr x (1 ft/ 12 in) x 12,517 s.f.) = **18.4 hrs**

(Mounding Analysis is not required since infiltration is not used as a mechanism for peak rate mitigation.)

Standard 4: Water Quality

Water Quality Volume (WQV) = Water Quality Depth x Impervious Area

Water Quality Depth = ½ inch

D-Basin #1: WQV = 0.5 in/12 x 91,955 = 3,832 c.f. Required

Total Volume Provided in Detention Basin #1 = 19,586 c.f.

(The total volume provided is the volume of water that is stored below the first orifice of the detention basin outlet structure.)

TSS Removal Calculations: TSS Removal forms attached for each stormwater outlet.

Standard 5: Land Uses with Higher Potential Pollutant Loads

Not Applicable

Standard 6: Critical Areas

Not Applicable

Standard 7: Redevelopment

Not Applicable

Standard 8: Construction Period Controls

Proper erosion controls have been incorporated into the submitted plans and details to ensure compliance with the standard.

Standard 9: Operation and Maintenance Plan

Operation and Maintenance plans for the project have been incorporated into the submitted plans and details to ensure compliance with the standard.

Standard 10: Illicit Discharges to Drainage System

No Illicit discharges to the drainage system will occur as a result of this proposed project.

FOREBAY (WATER QUALITY INLET) SIZING

**PROPOSED PADULA BROS., INC. SITE
FORT POND ROAD
Lancaster, MA
February 15, 2012**

Forebay #1:

Contributing Impervious Area	=	1.04 Acres +/-	
Water Quality Inlet Sizing	=	0.1" volume over contributing area	
	=	0.1"/12 x 1.04 Ac. x 43,560 ft ³ /acre	
	=	<u>378 ft³</u>	(Required Volume)
Volume Provided within Forebay #1:			
	=	<u>2,399 ft³</u>	(Provided Volume)

Forebay #2:

Contributing Impervious Area	=	1.04 Acres +/- *	
Water Quality Inlet Sizing	=	0.1" volume over contributing area	
	=	0.1"/12 x 1.04 Ac. x 43,560 ft ³ /acre	
	=	<u>378 ft³</u>	(Required Volume)
Volume Provided within Forebay #1:			
	=	<u>565 ft³</u>	(Provided Volume)

*Includes gravel yard area at rear of building.

Hydrodynamic Separation Product Calculator

Padula Dealership 2021-Design

DMH#5

CDS 2015-4

Project Information					
Project Name	Padula Dealership 2021-Design			Option #	A
Country	UNITED_STATES	State	Massachusetts	City	Leominster

Contact Information			
First Name	Christopher	Last Name	Anderson
Company	Hannigan Engineering, Inc.	Phone #	978-534-1234
Email	canderson@hanniganengineering.com		

Design Criteria					
Site Designation	DMH#5			Sizing Method	Net Annual
Screening Required?	No	Drainage Area (ac)	3.94	Peak Flow (cfs)	12.37
Groundwater Depth (ft)	>15	Pipe Invert Depth (ft)	0 - 5	Bedrock Depth (ft)	>15
Multiple Inlets?	No	Grate Inlet Required?	No	Pipe Size (in)	12.00
Required Particle Size Distribution?	No	90° between two inlets?	N/A	180° between inlet and outlet?	No
Runoff Coefficient	0.59	Rainfall Station	70 - East Brimfield Lake, MA	TC (Min)	5

Treatment Selection					
Treatment Unit	CDS	System Model	2015-4		
Target Removal	80%	Particle Size Distribution (PSD)	125	Predicted Net Annual Removal	83.93%

Revised 2021 TSS Removal
DMH#5

COMPUTATION OF COMPOSITE "C" FOR RATIONAL METHOD

	area received	TOTAL AREA Ac.	impv. area	coeff. x 0.95	lawn area	coeff. x 0.35	woods area	coeff. x 0.30	sum coeff.	"C" s/a	
A	P101	3.94	1.67	1.587	0.90	0.315	1.37	0.411	2.313	0.59	2021 revision
B	P104	0.13	0.09	0.086	0.04	0.014	0.00	0.000	0.100	0.77	
C	P105	0.26	0.19	0.181	0.07	0.025	0.00	0.000	0.205	0.79	
D	P106	0.25	0.21	0.200	0.04	0.014	0.00	0.000	0.214	0.85	
E	P107	0.46	0.33	0.314	0.13	0.046	0.00	0.000	0.359	0.78	
F	P108	0.25	0.21	0.200	0.04	0.014	0.00	0.000	0.214	0.85	

Assumptions:

"C" = 0.95 for impervious areas

"C" = 0.35 for lawn/yard/landscaped areas

"C" = 0.30 for wooded areas

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Non-automated: Mar. 4, 2008

Location: DBASIN #1

A	B	C		D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)	
Deep Sump Hooded Catch Basin	0.25	1.00	0.25	0.75	
Water Quality Structure (Stormceptor)	0.52	0.75	0.39	0.36	
Forebay	0.25	0.36	0.09	0.27	
Detention Basin w/Forebay	0.50	0.27	0.14	0.14	

**TSS Removal
Calculation Worksheet**

Separate Form Needs to
be Completed for Each
Outlet or BMP Train

Total TSS Removal =

87%

Project: Padula Bros., Inc.

Prepared By: Hannigan Engineering, Inc.

Date: 2/15/2012

*Equals remaining load from previous BMP (E)
which enters the BMP

Note: WATER QUALITY STRUCTURES ARE CURRENTLY BEING SIZED BY MANUFACTURE. COMPLIANT DEVICES REQUIRED.

Rational Method Pipe Sizing
 2352-DR POULIN - PADULA BROS., INC.
 Lancaster, MA

February 15, 2012

COMPUTATION OF COMPOSITE "C" FOR RATIONAL METHOD

	area received	TOTAL AREA Ac.	impv.	coeff.	lawn	coeff.	woods	coeff.	sum	"C"
			area	x 0.95	area	x 0.35	area	x 0.30	coeff.	s/a
A	P101	3.81	1.04	0.988	0.81	0.284	1.96	0.588	1.860	0.49
B	P104	0.13	0.09	0.086	0.04	0.014	0.00	0.000	0.100	0.77
C	P105	0.26	0.19	0.181	0.07	0.025	0.00	0.000	0.205	0.79
D	P106	0.25	0.21	0.200	0.04	0.014	0.00	0.000	0.214	0.85
E	P107	0.46	0.33	0.314	0.13	0.046	0.00	0.000	0.359	0.78
F	P108	0.25	0.21	0.200	0.04	0.014	0.00	0.000	0.214	0.85

Assumptions:

"C" = 0.95 for impervious areas

"C" = 0.35 for lawn/yard/landscaped areas

"C" = 0.30 for wooded areas

Rational Method Pipe Sizing
2352-DR POULIN - PADULA BROS., INC.
Lancaster, MA

2/14/2012

Subcatchment Areas to Catch Basins

Item Key	INLET #	Area Received	(hydrocad)			(25-yr storm)		
			AREA Ac.	CN	Tc	Estimated "C"	I $I=K/tc+b$	Q "CIA" cfs
A	FE#5	P101	3.81	77	23.9	0.49	4.27	7.93
B	CTB 1/2	P104	0.13	92	5.0	0.77	6.57	0.65
C	CTB 3	P105	0.26	92	5.0	0.79	6.57	1.35
D	CTB 4	P106	0.25	96	5.0	0.85	6.57	1.40
E	CTB 5/6	P107	0.46	91	5.0	0.78	6.57	2.36
F	CTB 7	P108	0.25	95	5.0	0.85	6.57	1.40

K and b values for region #3 (Includes all of Massachusetts)

<u>storm</u>	<u>K</u>	<u>b</u>
2	106	17
4	131	19
10	170	23
25	230	30
50	250	27
100	290	31

"Coefficients for Steel Formula"

Areas and Tc correspond to those values used for the Hydrocad Drainage Analysis

Rational Method Pipe Sizing
2352-DR POULIN - PADULA BROS., INC.
Lancaster, MA

2/14/2012

PIPES SIZED FOR 25-YR STORM:

Pipe Section		Item IDs (SUM)	Q (25-yr) (cfs)	Pipe Size (in.)	Pipe Lgth. (ft.)	slope (ft./ft.)	A sq.ft.	R R=A/P	Pipe capacity (cfs)
From	To								
DMH1	FE#1	C	0.65	12	24	0.0050	0.79	0.25	2.52
DMH2	FE#2	D, E	2.75	12	45	0.0110	0.79	0.25	3.74
DMH3	DMH4	F	2.36	12	54	0.0100	0.79	0.25	3.56
DMH4	FE#3	F,G	3.76	12	23	0.0120	0.79	0.25	3.90
DMH5	FE#4	A	7.93	18	288	0.0120	1.77	0.38	11.51
OS#1	FE#6	FROM HYDROCAD	3.99	15	62	0.0050	1.23	0.31	4.57

Pipe Capacity =

$$Q = (1.486/n) \times AR^{2/3} \times S^{1/2}$$

where: n = (0.013), typical for RCP [(0.012) used for PVC or ADS pipes]

A = area (ft²)

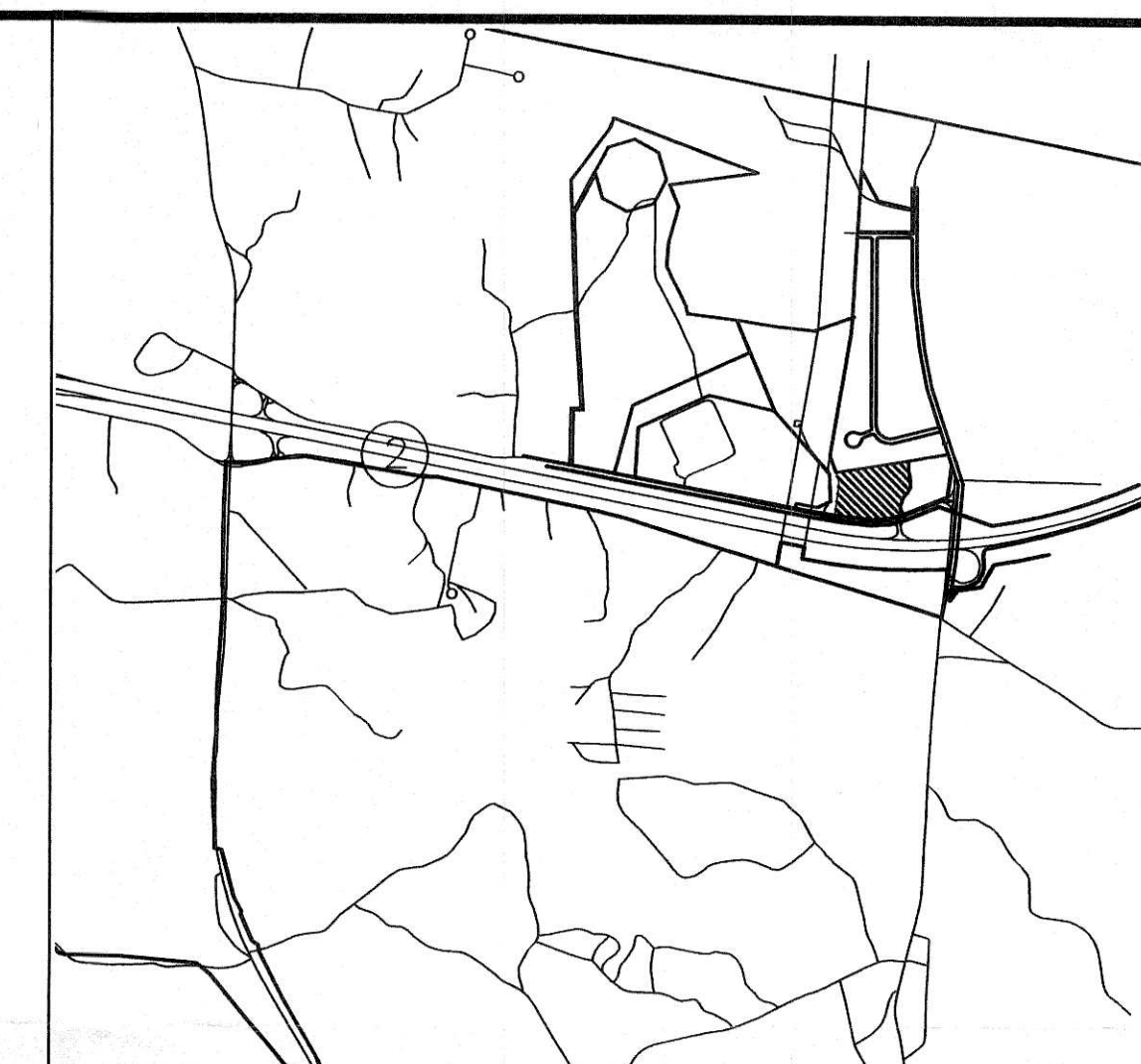
R = A/P

S = slope of pipe (ft./ft.)

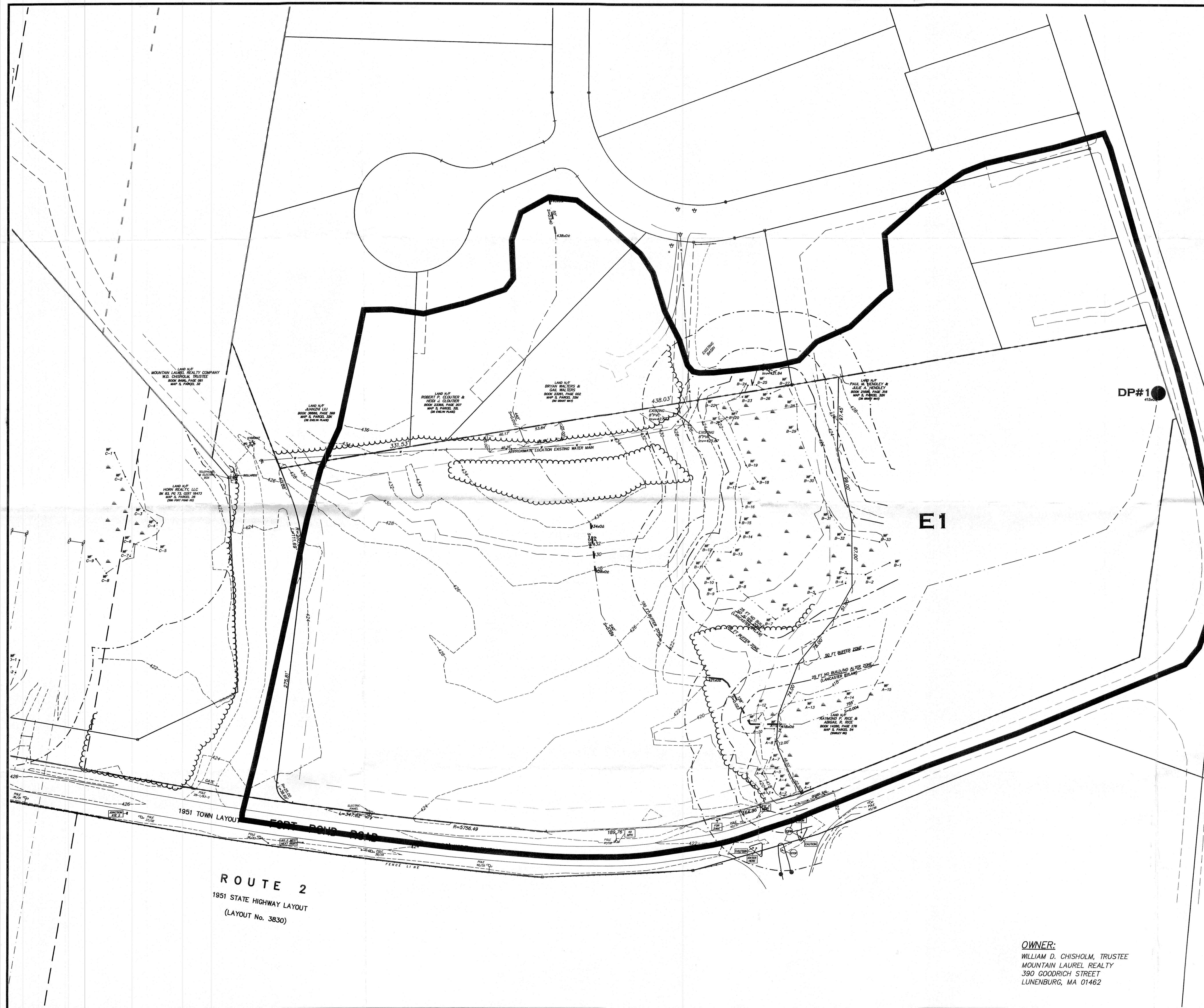
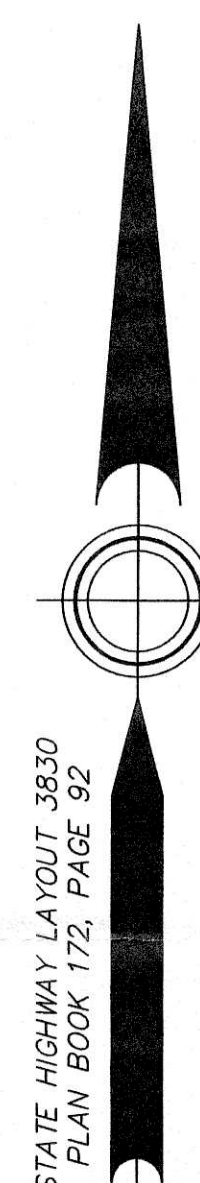
P = wetted perimeter, ft. (flowing full equals $2 \pi r$)

FIGURE 1
LOCUS & SOILS MAPS

FIGURE 2
PRE-DEVELOPMENT WATERSHED MAP



SCALE: 1" = 200'



OWNER:
WILLIAM D. CHISHOLM, TRUSTEE
MOUNTAIN LAUREL REALTY
390 GOODRICH STREET
LUNENBURG, MA 01462

**HANNIGAN
ENGINEERING, INC.**

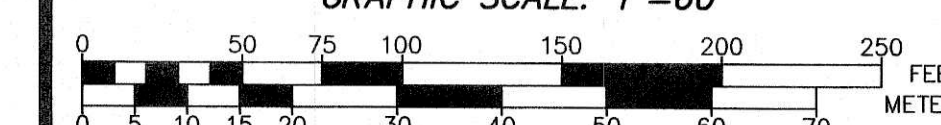
CIVIL ENGINEERS & LAND SURVEYORS

8 MONUMENT SQUARE (978) 534-1234 (T)
LEOMINSTER, MASSACHUSETTS 01453 (978) 534-6060 (F)
www.hanniganengineering.com

PRE-DEVELOPMENT WATERSHEDS IN LANCASTER, MASSACHUSETTS

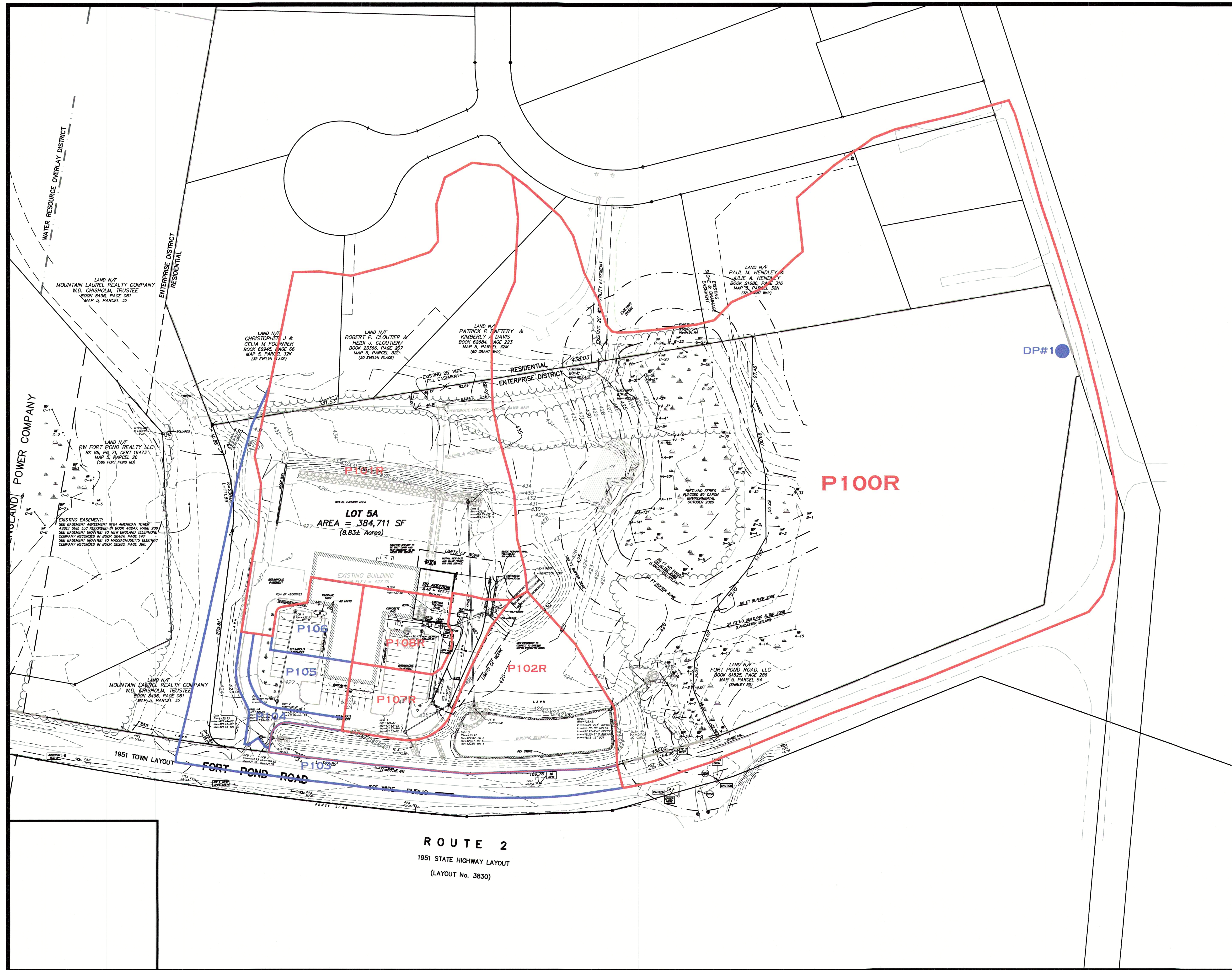
PREPARED FOR:
D.R. POULIN CONSTRUCTION, INC.
SEAN PEPPER
59 DUCK MILL ROAD
FITCHBURG, MASSACHUSETTS
TEL: (978) 353-6740

GRAPHIC SCALE: 1"=60'



CALC: LRS	DRWN: WDH	SCALE: 1" = 60'
CHKD: WDH	APPD: LRS	DATE: FEB 15, 2012
SRV: JHG/JEF	FB: E.2352011312	JOB NO: 2352
TAB: PRE-WS	SHEET 1 OF 1	PLAN NO: C-10-21

FIGURE 3
POST-DEVELOPMENT WATERSHED MAP



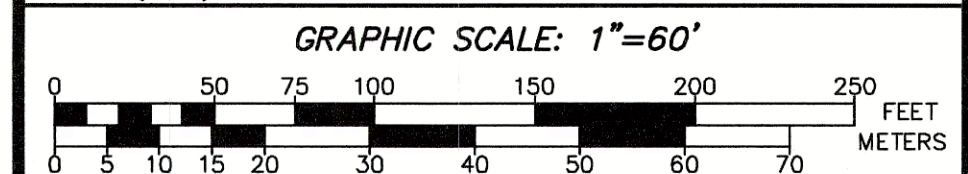
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LEOMINSTER, MASSACHUSETTS 01453 (978) 534-6060 (F)
www.hanniganengineering.com

**PROPOSED WATERSHEDS
IN
LANCASTER, MASSACHUSETTS**

PREPARED FOR:
UNITED AG & TURF NORTHEAST
DAVE HAMMOND, CBO
PO BOX 30
FAIRFIELD, MAINE 04937
TEL: (207) 314-1140



CALC: WDH	DRWN: WDH/CMA	SCALE: 1"=60'
CHKD: WDH	APPD: CMA	DATE: FEB 5, 2021
SRV: JEF/JHG	FB: E.2352011312	JOB NO: 2352.1
TAB: WS	SHEET 1 OF 1	PLAN NO: C-10-21