Carroll University Redevelopment

211 & 223 Maple Ave
Waukesha, WI

PREPARED FOR
VJS Construction
W233 N2847 Roundy Circle West
Pewaukee, WI 53072

PREPARED BY

Project Number – 22371
2024/04/19

Michael Garner E.I.T.
Project Engineer

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1. Introduction

This Storm Water Management memo presents the design calculations and considerations for the proposed redevelopment located at 211 & 223 Maple Ave Waukesha, WI. The proposed redevelopment will impact 2.148 acres. This storm water management report serves as a summary of calculations showing the proposed development meets all applicable ordinances.

2. Design Criteria

City of Waukesha Municipal Code Chapter 32

Water Quality

- Total Suspended Solids. BMPs shall be designed, installed, and maintained to control total suspended solids carried in runoff from the post-construction site as follows:
    - For redevelopment, 40% reduction of total suspended solids load from parking areas and roads.

Water Quantity and Management of Peak Runoff

- BMPs shall be designed, installed, and maintained to control the runoff rate (CFS) discharge from the post-construction site as follows:
    - The calculated post-development peak storm water discharge rate shall not exceed the calculated pre-development discharge rates for the 1-year, 2-year, 10-year, and 100-year, 24-hour design storms.

Wisconsin Department of Natural Resources

- WDNR – Technical Standards (NR151 and NR216)

3. Design Analysis

- Rainfall data used in the hydrologic analysis were obtained from the NOAA Atlas 14 precipitation depths, and the appropriate NRCS Wisconsin MSE3 precipitation distribution for 24 hour duration (1-yr, 2-yr, 10-yr, and 100-yr storm events).

1 year	2 year	10 year	100 year
2.40”	2.70”	3.81”	6.18”

- Curve numbers for the soils within the analysis region were selected from the values published in TR-55. Native soil types were determined from NRCS maps and borings.
- Time of concentration values were calculated based on the standard TR-55 method.
- The hydraulic calculations and analysis presented in this report were performed using HydroCad Watershed Modeling software which utilizes the methodologies of TR-55 for a hydrograph based analysis of watershed conditions. Hydrographs were developed using a standard MSE-3 24 hour hydrograph for the various 24-hr storm events.
- Sediment reduction characteristics for the proposed water quality facilities were determined using WinSLAMM (Version 10.5) Source Loading and Management Model.

4. Existing Condition Analysis

The existing site is bounded by Maple Ave to the west, the Wisconsin Southern Railroad to the north, and the Canadian National Railroad to the south and east. The existing site consists of 2 buildings and a parking lot. The northern building is currently used by Carroll University, while the southern building is currently not in use. The condition of the parking lot varies from good to poor and is currently utilized by Carroll University students and staff. The section of the parking lot that is newer and in good condition drains to storm sewer located on the existing site which connects to the storm sewer system located on Maple Ave. The older section of the parking lot that is in poor condition does not currently drain very well. The southern portion of the older parking lot appears to pond until it either enters the previously mentioned storm sewer system, or until it drains directly offsite to the south into the neighboring property. The northwest portion of the older parking lot drains to the north into the ditch that runs parallel to the Wisconsin & Southern Railroad. Runoff entering this ditch ponds at a low point and does not have a clear drainage path that would convey water from this low point. The northeast portion of the older parking lot drains to the ditch that runs parallel to the Canadian National Railroad, where it will then be conveyed to the southwest. The existing building that is unused connects to the Maple Ave storm sewer system via a 12" PVC roof drain.

5. Proposed Developed Conditions Description

The proposed site will involve the demolition of the southern building and the sections of the parking lot that are in poor condition. The demolished area will then be repaved to add 173 new parking spaces that will serve the existing Carrol University building that will remain on the site. The site will also involve the removal of a small portion of the parking lot located east of the existing building. This section of the parking lot will be redeveloped into loading zones for ceramics and an outdoor dog exercise area. In total, the proposed development will disturb 2.148 acres, with 1.776 acres of this area consisting of impervious surfaces. This is a reduction from the existing 1.993 acres of impervious surfaces located within the disturbed area. In order to meet the City's stormwater requirements, an UpFlo Filter Device will be installed inside a proposed manhole. Catch basins will also be installed on site to properly convey runoff to the existing storm sewer systems surrounding the site. The UpFlo Filter Device and catch basins will allow for the proposed development to reach 40% TSS reduction required for redevelopments.

6. Storm Water Quantity Modeling

A summary of results can be viewed in the table below:

Peak Flow Reduction Summary Area=2.148 acres		
Storm Frequency (yr)	Allowable Peak Runoff Discharge Rate on site (cfs)	Post-Development Site Conditions Peak Runoff Discharge Rate (cfs)
1	7.75	5.91
2	8.87	6.84
10	12.98	10.33
100	21.61	17.81

7. Storm Water Quality Modeling

NR 151 City of Waukesha regulations require that the project employ BMPs to reduce sediment load leaving the site by 40% compared to no controls.

Quality Summary Table

Total Suspended Solids Loading	
Total TSS prior to controls/treatment	1,096 lbs
Total TSS After controls/treatment	639.4 lbs
Total Percent TSS Reduction	41.66%

8. Storm Sewer Sizing

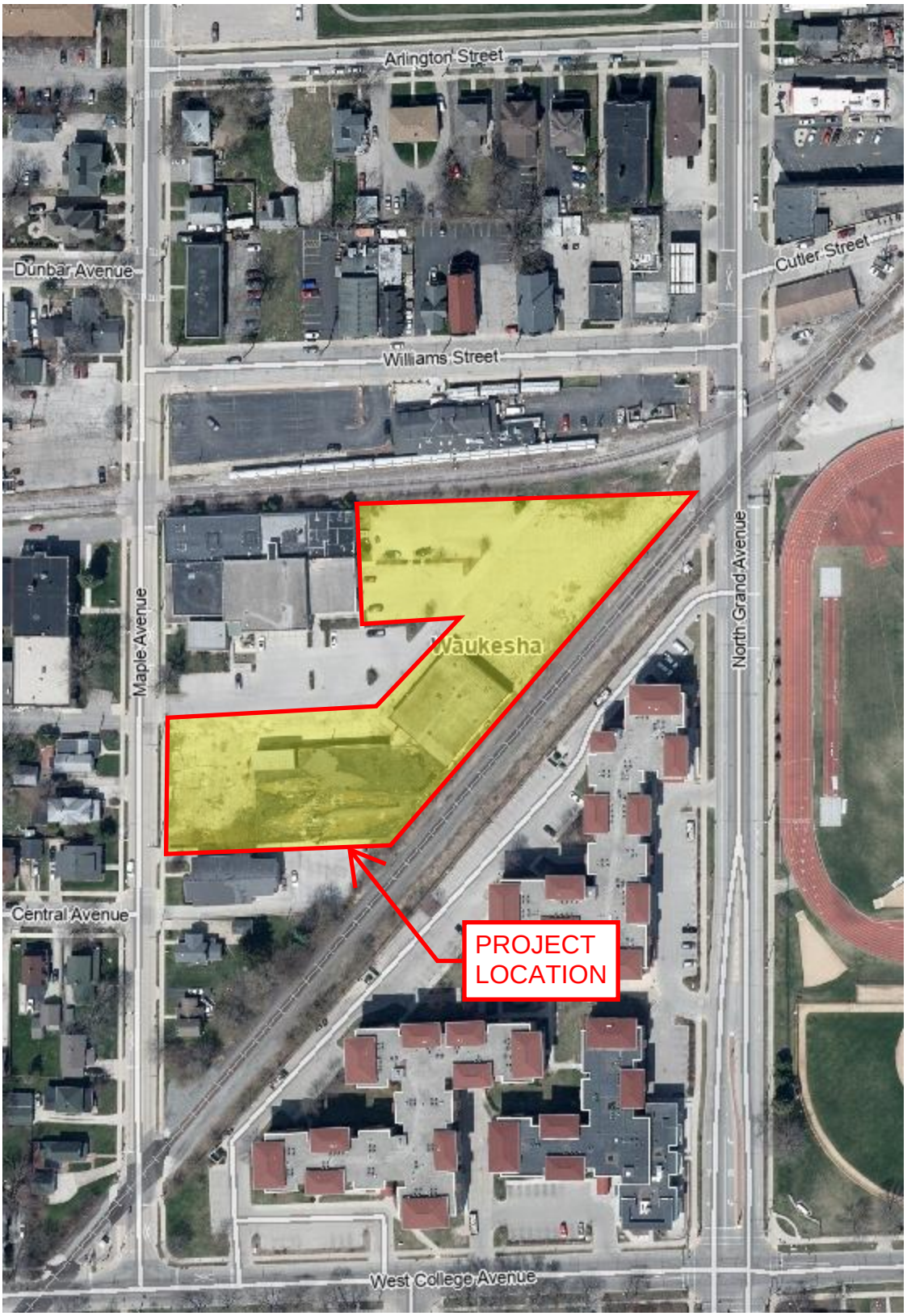
The proposed storm sewer piping has been sized to convey the 100-year storm event with no surcharge to the top of the structure.

9. Conclusion

The proposed stormwater management plan meets the requirements of the local municipality, WDNR, and other regulatory bodies through the implementation of best management practices described within this report to the greatest extent practicable.

Appendix A Site Location Map

Surface Water Data Viewer Map



Legend

Railroads

0.1 0 0.03 0.1 Miles

1: 1,980

NAD_1983_HARN_Wisconsin_TM

Notes

Appendix B USDA Web Soil Survey Map

Map Scale: 1:986 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Milwaukee and Waukesha Counties, Wisconsin
Survey Area Data: Version 19, Sep 8, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 30, 2022—Sep 13, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WeB	Warsaw loam, 2 to 6 percent slopes	B	3.4	100.0%
Totals for Area of Interest			**3.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

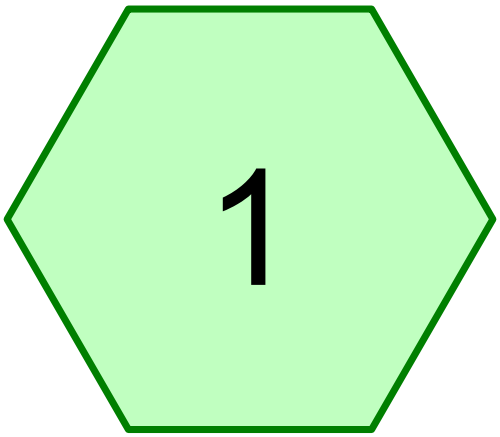
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix C Calculations - Storm Water Quantity (HydroCAD Model)



Subcat 1

Subcat Reach Pond Link

Routing Diagram for Existing SW
Prepared by The Sigma Group Inc, Printed 4/19/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	MSE 24-hr	3	Default	24.00	1	2.40	2
2	2-YR	MSE 24-hr	3	Default	24.00	1	2.70	2
3	10-YR	MSE 24-hr	3	Default	24.00	1	3.81	2
4	100-YR	MSE 24-hr	3	Default	24.00	1	6.18	2

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=2.141 ac 93.09% Impervious Runoff Depth>1.81"
Tc=0.0 min CN=95 Runoff=7.75 cfs 0.322 af

Total Runoff Area = 2.141 ac Runoff Volume = 0.322 af Average Runoff Depth = 1.81"
6.91% Pervious = 0.148 ac 93.09% Impervious = 1.993 ac

Summary for Subcatchment 1: Subcat 1

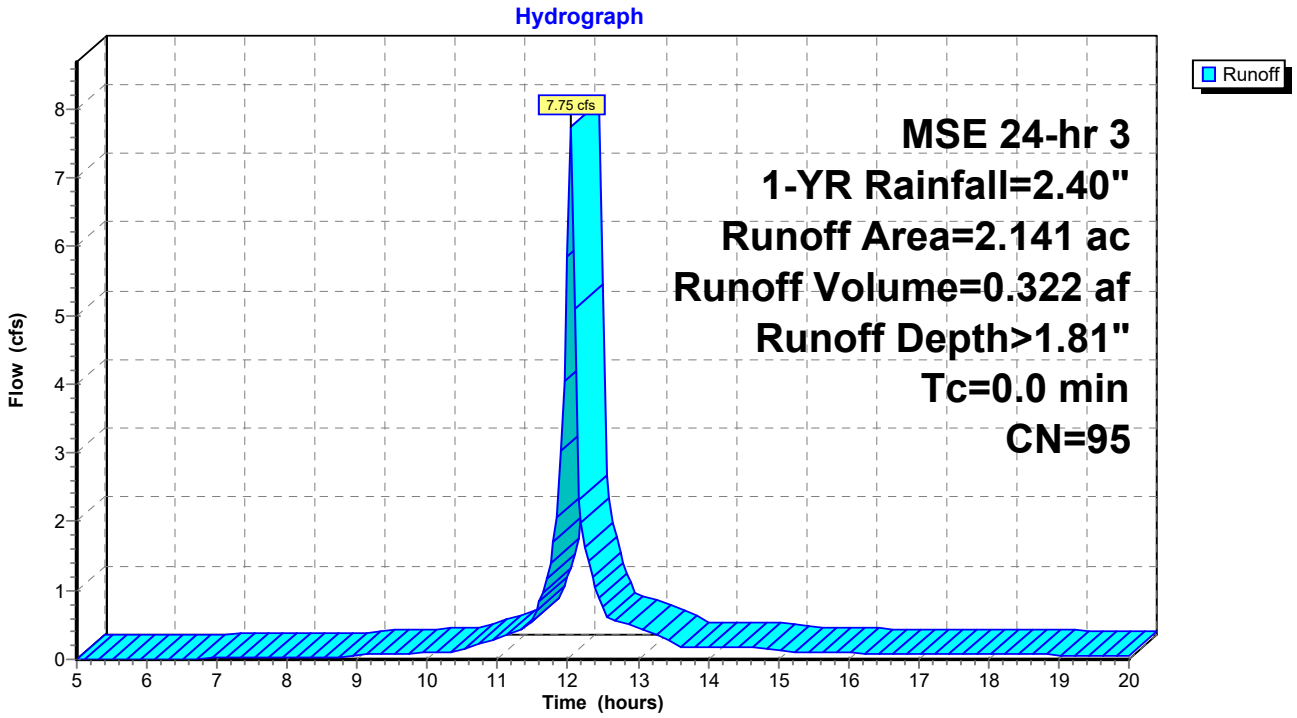
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 7.75 cfs @ 12.05 hrs, Volume= 0.322 af, Depth> 1.81"
Routed to nonexistent node 2L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (ac)	CN	Description
1.396	98	Paved parking, HSG D
0.597	98	Roofs, HSG D
0.148	61	>75% Grass cover, Good, HSG B
2.141	95	Weighted Average
0.148		6.91% Pervious Area
1.993		93.09% Impervious Area

Subcatchment 1: Subcat 1



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=2.141 ac 93.09% Impervious Runoff Depth>2.09"
Tc=0.0 min CN=95 Runoff=8.87 cfs 0.373 af

Total Runoff Area = 2.141 ac Runoff Volume = 0.373 af Average Runoff Depth = 2.09"
6.91% Pervious = 0.148 ac 93.09% Impervious = 1.993 ac

Summary for Subcatchment 1: Subcat 1

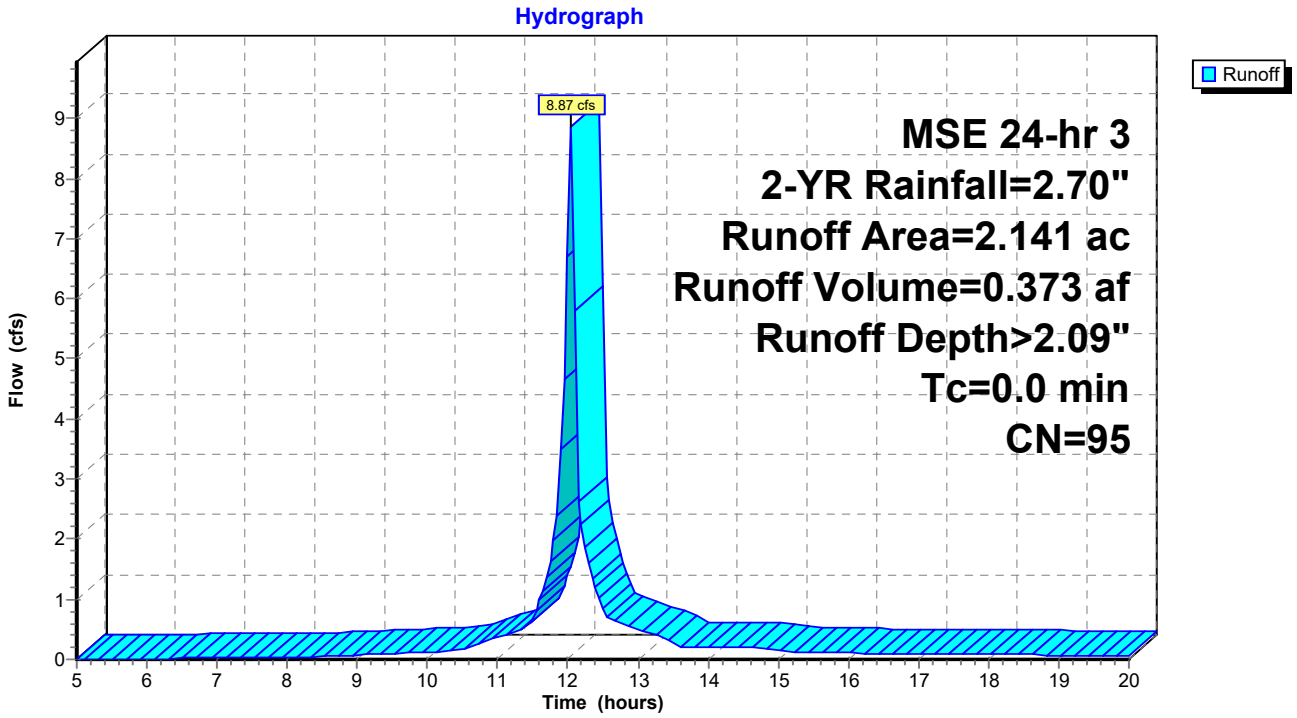
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 8.87 cfs @ 12.05 hrs, Volume= 0.373 af, Depth> 2.09"
Routed to nonexistent node 2L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (ac)	CN	Description
1.396	98	Paved parking, HSG D
0.597	98	Roofs, HSG D
0.148	61	>75% Grass cover, Good, HSG B
2.141	95	Weighted Average
0.148		6.91% Pervious Area
1.993		93.09% Impervious Area

Subcatchment 1: Subcat 1



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=2.141 ac 93.09% Impervious Runoff Depth>3.14"
Tc=0.0 min CN=95 Runoff=12.98 cfs 0.561 af

Total Runoff Area = 2.141 ac Runoff Volume = 0.561 af Average Runoff Depth = 3.14"
6.91% Pervious = 0.148 ac 93.09% Impervious = 1.993 ac

Summary for Subcatchment 1: Subcat 1

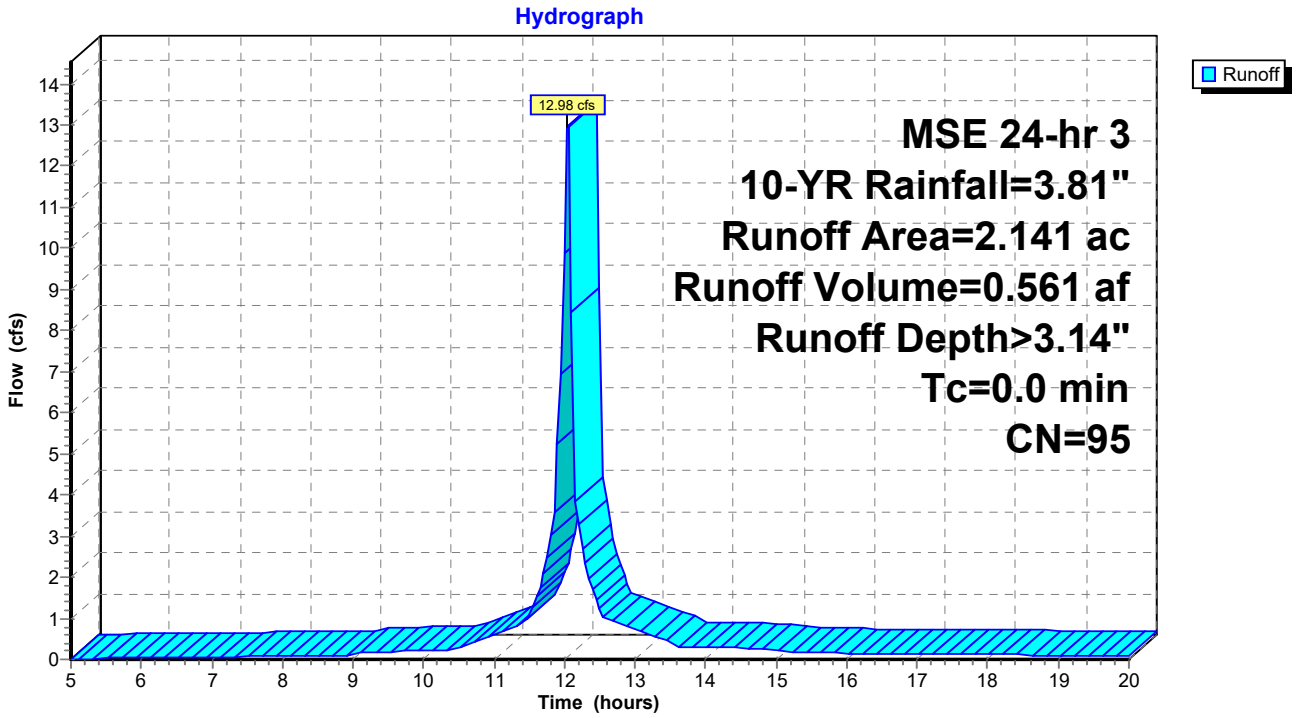
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 12.98 cfs @ 12.05 hrs, Volume= 0.561 af, Depth> 3.14"
Routed to nonexistent node 2L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (ac)	CN	Description
1.396	98	Paved parking, HSG D
0.597	98	Roofs, HSG D
0.148	61	>75% Grass cover, Good, HSG B
2.141	95	Weighted Average
0.148		6.91% Pervious Area
1.993		93.09% Impervious Area

Subcatchment 1: Subcat 1



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=2.141 ac 93.09% Impervious Runoff Depth>5.41"
Tc=0.0 min CN=95 Runoff=21.61 cfs 0.965 af

Total Runoff Area = 2.141 ac Runoff Volume = 0.965 af Average Runoff Depth = 5.41"
6.91% Pervious = 0.148 ac 93.09% Impervious = 1.993 ac

Summary for Subcatchment 1: Subcat 1

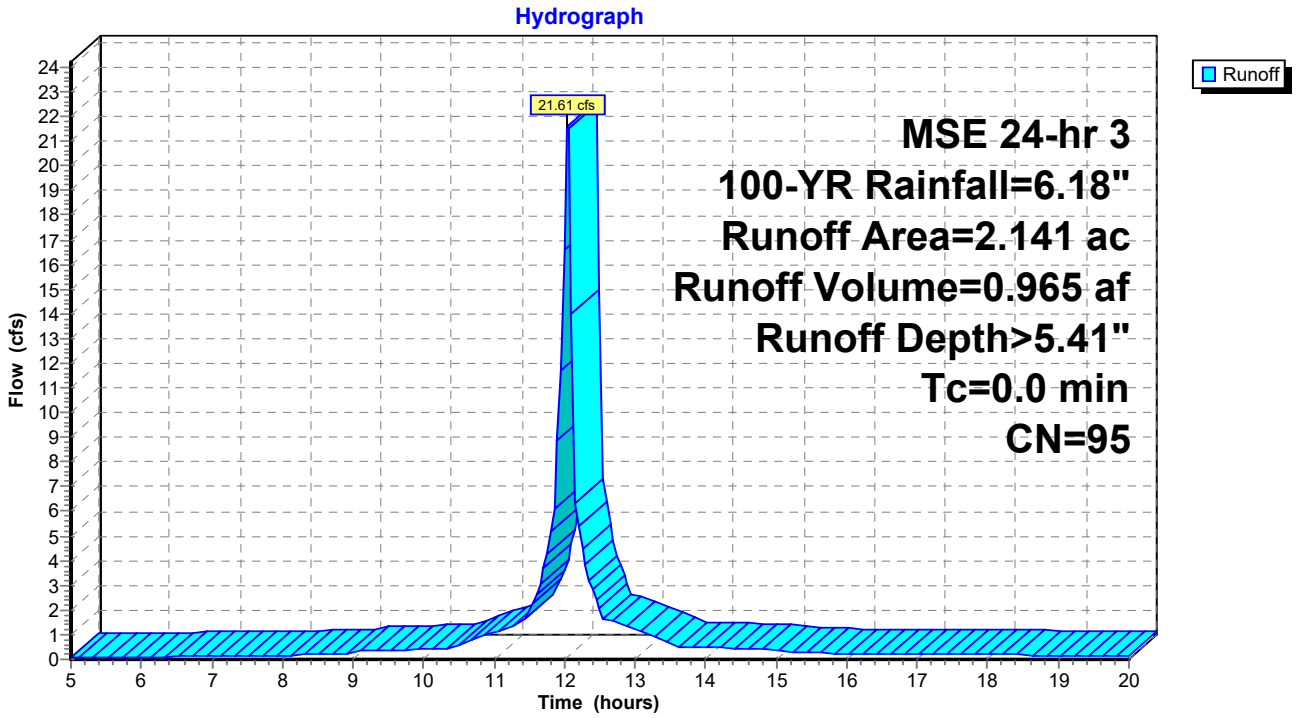
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

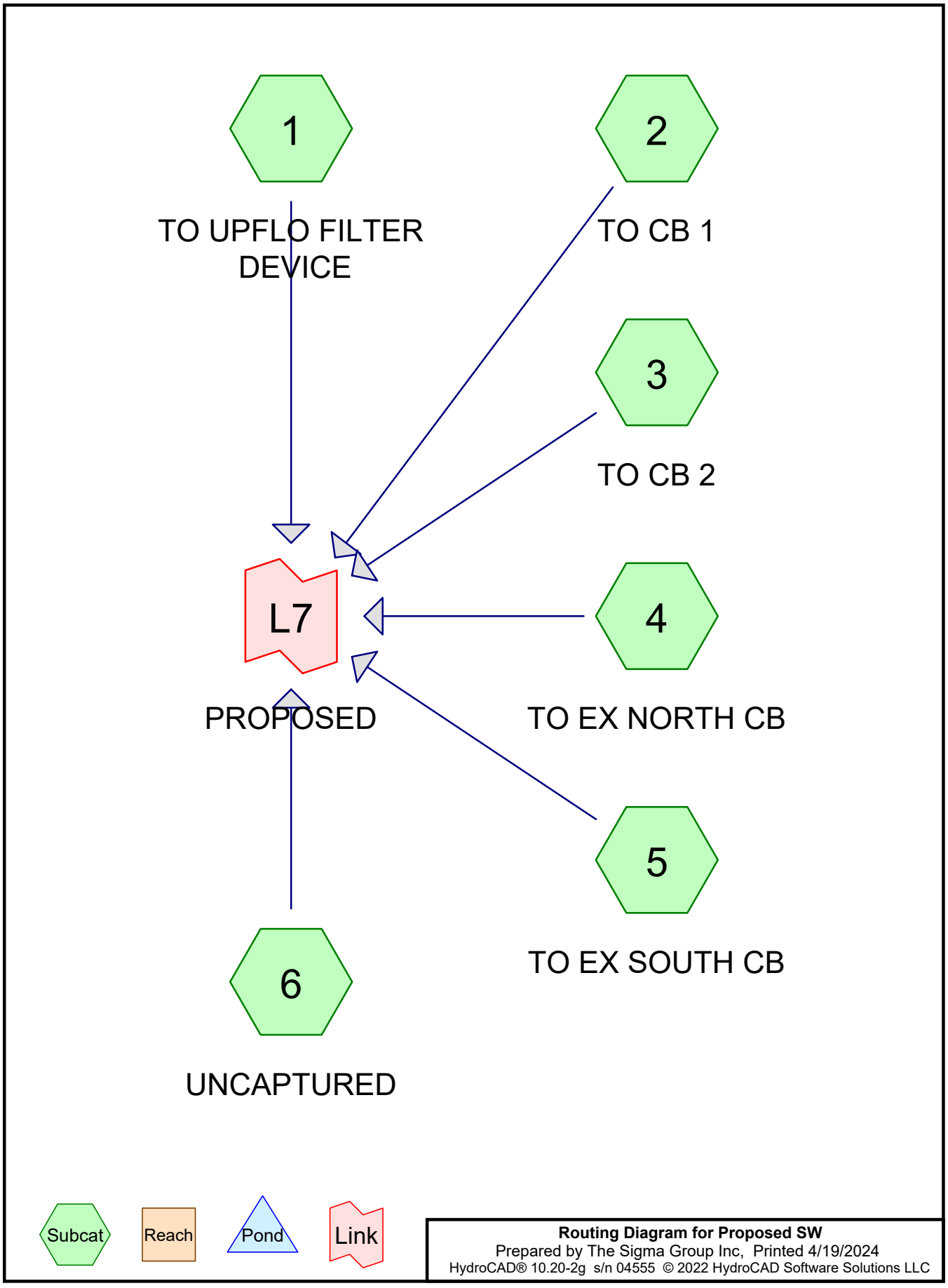
Runoff = 21.61 cfs @ 12.04 hrs, Volume= 0.965 af, Depth> 5.41"
Routed to nonexistent node 2L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (ac)	CN	Description
1.396	98	Paved parking, HSG D
0.597	98	Roofs, HSG D
0.148	61	>75% Grass cover, Good, HSG B
2.141	95	Weighted Average
0.148		6.91% Pervious Area
1.993		93.09% Impervious Area

Subcatchment 1: Subcat 1





Routing Diagram for Proposed SW
Prepared by The Sigma Group Inc, Printed 4/19/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-YR	MSE 24-hr	3	Default	24.00	1	2.40	2
2	2-YR	MSE 24-hr	3	Default	24.00	1	2.70	2
3	10-YR	MSE 24-hr	3	Default	24.00	1	3.81	2
4	100-YR	MSE 24-hr	3	Default	24.00	1	6.18	2

Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: TO UPFLO FILTER Runoff Area=0.661 ac 88.65% Impervious Runoff Depth>1.71"
Tc=6.0 min CN=94 Runoff=1.99 cfs 0.094 af

Subcatchment2: TO CB 1 Runoff Area=0.274 ac 85.04% Impervious Runoff Depth>1.54"
Tc=6.0 min CN=92 Runoff=0.76 cfs 0.035 af

Subcatchment3: TO CB 2 Runoff Area=0.426 ac 95.54% Impervious Runoff Depth>1.90"
Tc=6.0 min CN=96 Runoff=1.37 cfs 0.067 af

Subcatchment4: TO EX NORTH CB Runoff Area=0.269 ac 85.87% Impervious Runoff Depth>1.63"
Tc=6.0 min CN=93 Runoff=0.78 cfs 0.036 af

Subcatchment5: TO EX SOUTH CB Runoff Area=0.210 ac 97.14% Impervious Runoff Depth>2.00"
Tc=6.0 min CN=97 Runoff=0.70 cfs 0.035 af

Subcatchment6: UNCAPTURED Runoff Area=0.303 ac 38.28% Impervious Runoff Depth>0.56"
Tc=6.0 min CN=75 Runoff=0.31 cfs 0.014 af

Link L7: PROPOSED Inflow=5.91 cfs 0.283 af
Primary=5.91 cfs 0.283 af

Total Runoff Area = 2.143 ac Runoff Volume = 0.283 af Average Runoff Depth = 1.58"
17.08% Pervious = 0.366 ac 82.92% Impervious = 1.777 ac

Summary for Subcatchment 1: TO UPFLO FILTER DEVICE

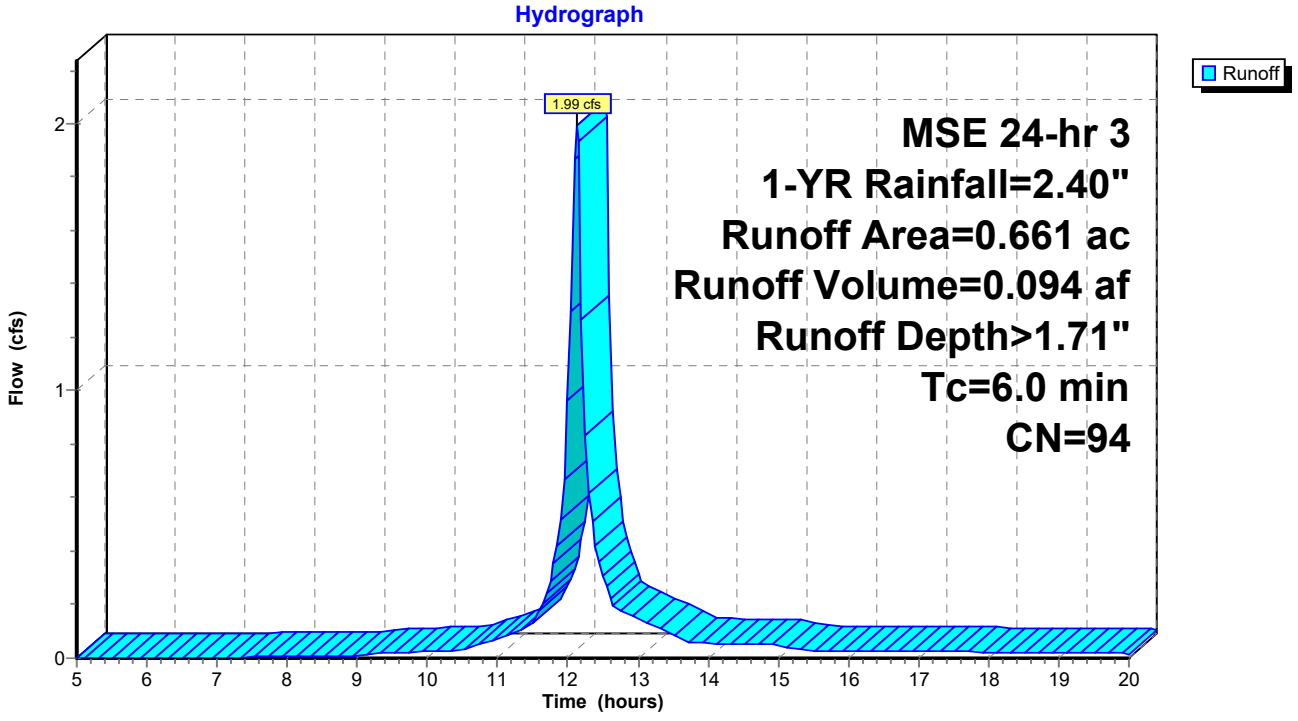
Runoff = 1.99 cfs @ 12.13 hrs, Volume= 0.094 af, Depth> 1.71"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (ac)	CN	Description
0.586	98	Paved parking, HSG B
0.075	61	>75% Grass cover, Good, HSG B
0.661	94	Weighted Average
0.075		11.35% Pervious Area
0.586		88.65% Impervious Area

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

Subcatchment 1: TO UPFLO FILTER DEVICE



Summary for Subcatchment 2: TO CB 1

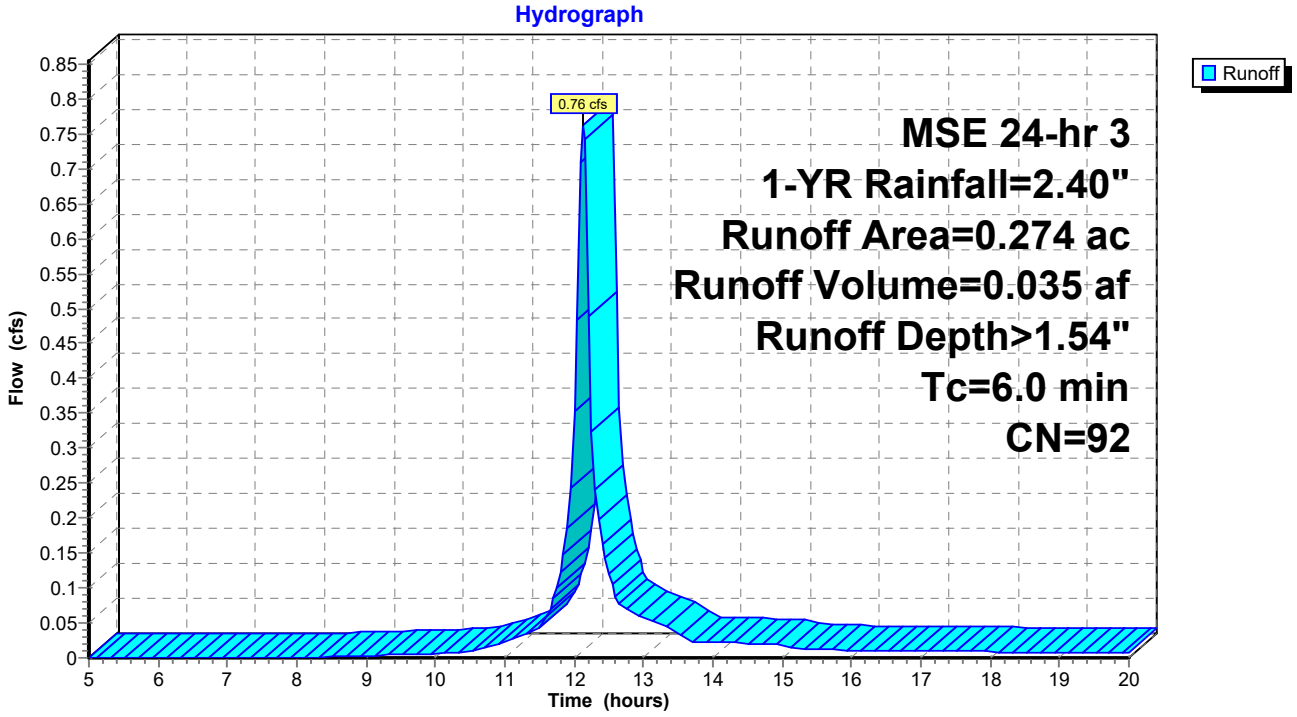
Runoff = 0.76 cfs @ 12.13 hrs, Volume= 0.035 af, Depth> 1.54"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (ac)	CN	Description
0.221	98	Paved parking, HSG B
0.041	61	>75% Grass cover, Good, HSG B
0.012	98	Unconnected pavement, HSG B
0.274	92	Weighted Average
0.041		14.96% Pervious Area
0.233		85.04% Impervious Area
0.012		5.15% Unconnected

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

Subcatchment 2: TO CB 1



Summary for Subcatchment 3: TO CB 2

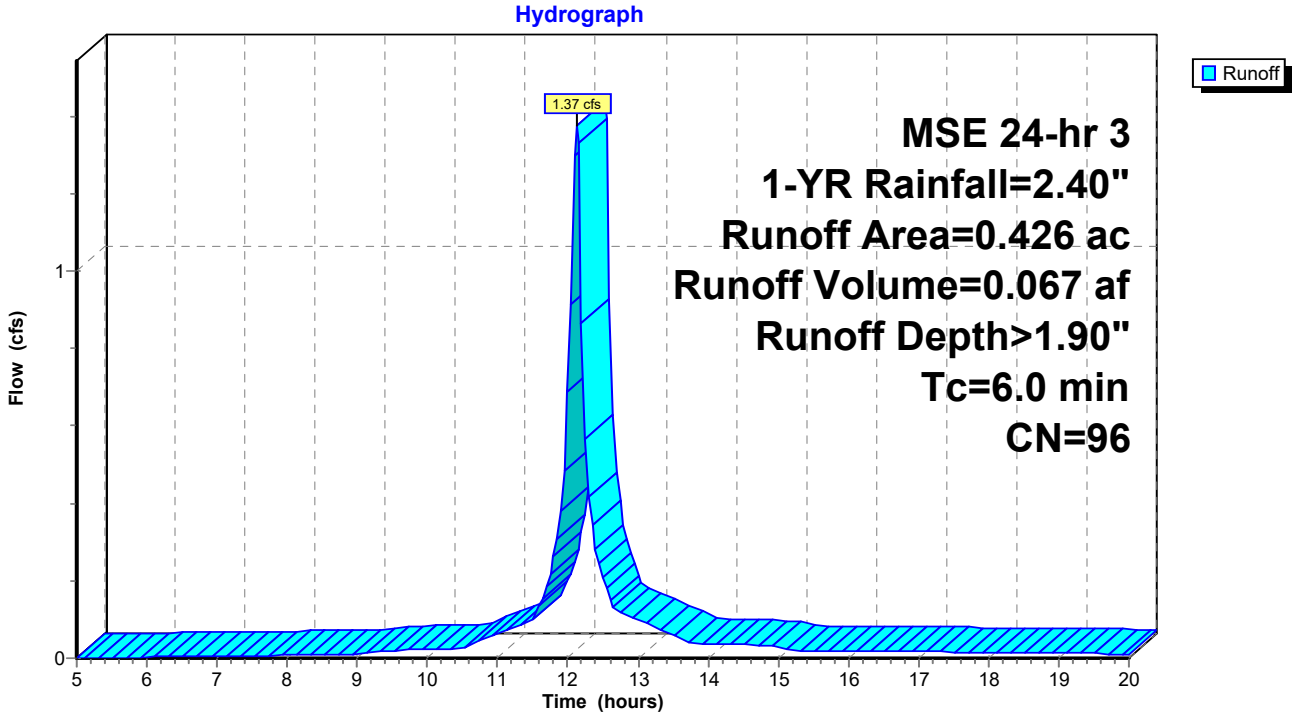
Runoff = 1.37 cfs @ 12.13 hrs, Volume= 0.067 af, Depth> 1.90"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (ac)	CN	Description
0.407	98	Paved parking, HSG B
0.019	61	>75% Grass cover, Good, HSG B
0.426	96	Weighted Average
0.019		4.46% Pervious Area
0.407		95.54% Impervious Area

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

Subcatchment 3: TO CB 2



Summary for Subcatchment 4: TO EX NORTH CB

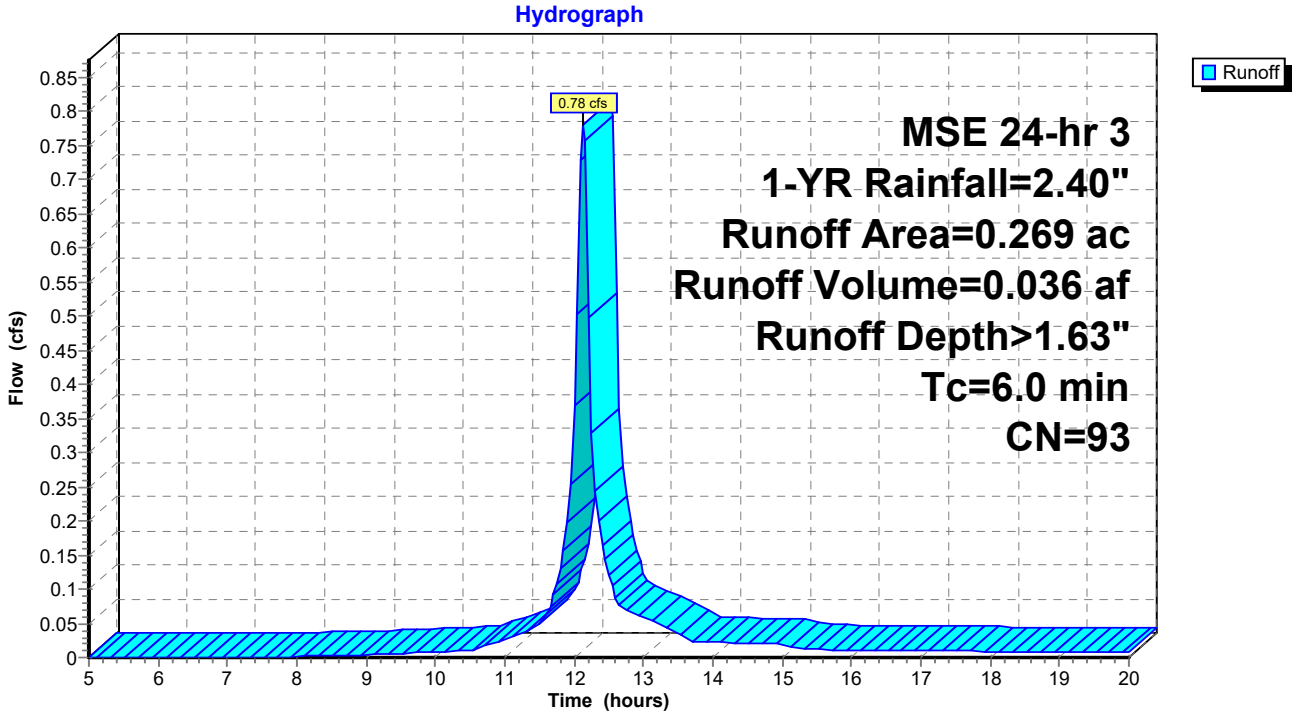
Runoff = 0.78 cfs @ 12.13 hrs, Volume= 0.036 af, Depth> 1.63"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (ac)	CN	Description
0.151	98	Paved parking, HSG B
0.038	61	>75% Grass cover, Good, HSG B
0.054	98	Roofs, HSG B
0.026	98	Unconnected pavement, HSG B
0.269	93	Weighted Average
0.038		14.13% Pervious Area
0.231		85.87% Impervious Area
0.026		11.26% Unconnected

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

Subcatchment 4: TO EX NORTH CB



Summary for Subcatchment 5: TO EX SOUTH CB

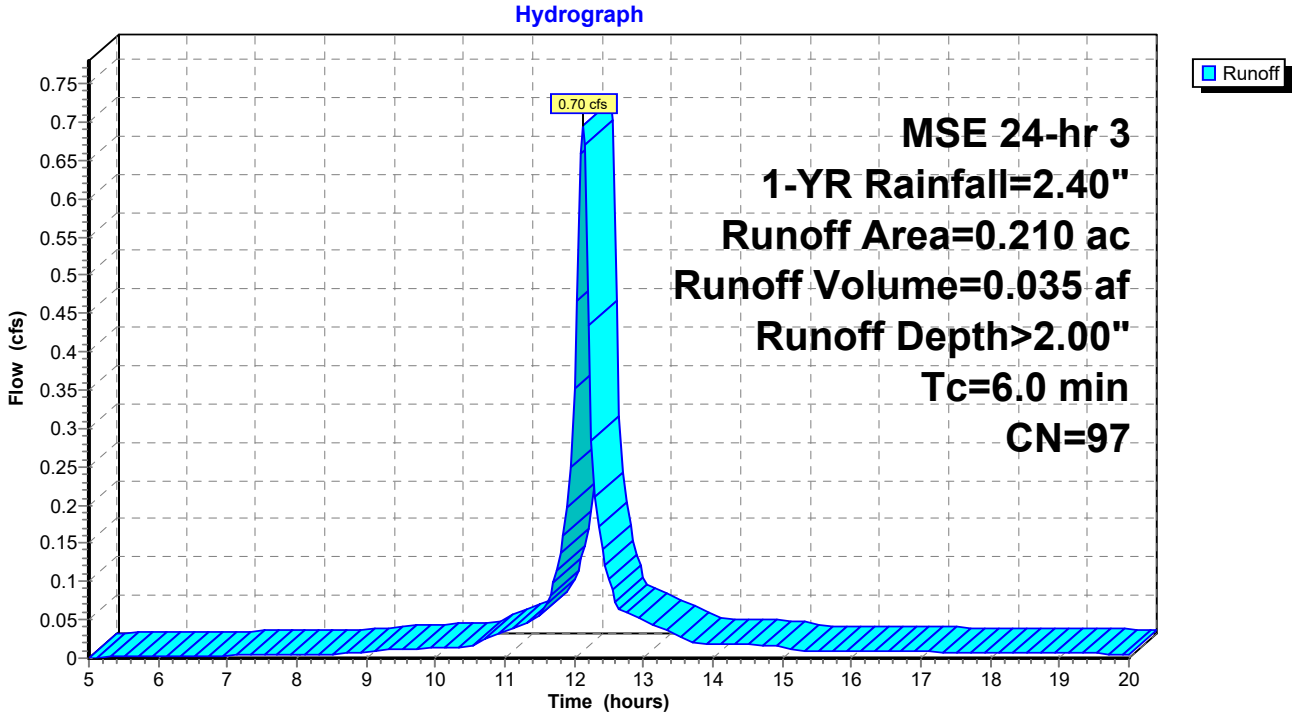
Runoff = 0.70 cfs @ 12.13 hrs, Volume= 0.035 af, Depth> 2.00"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (ac)	CN	Description
0.204	98	Paved parking, HSG B
0.006	61	>75% Grass cover, Good, HSG B
0.210	97	Weighted Average
0.006		2.86% Pervious Area
0.204		97.14% Impervious Area

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

Subcatchment 5: TO EX SOUTH CB



Summary for Subcatchment 6: UNCAPTURED

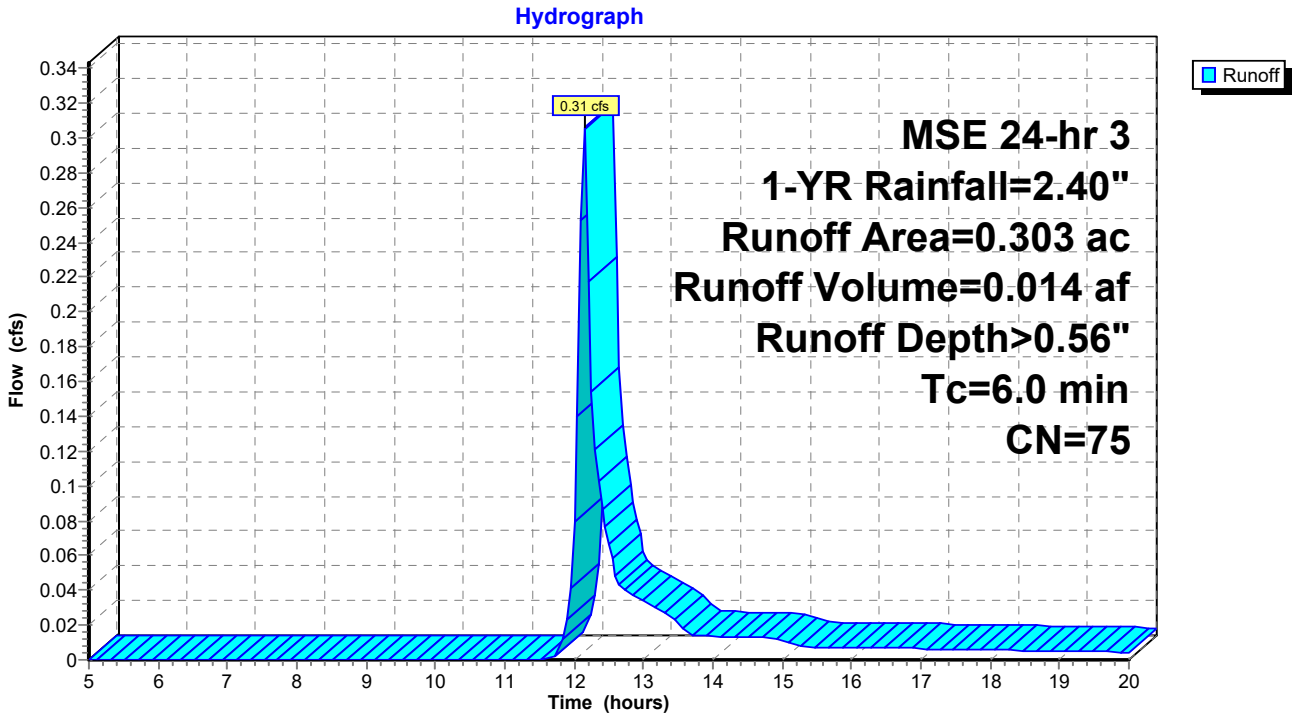
Runoff = 0.31 cfs @ 12.14 hrs, Volume= 0.014 af, Depth> 0.56"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 1-YR Rainfall=2.40"

Area (ac)	CN	Description
0.099	98	Paved parking, HSG B
0.187	61	>75% Grass cover, Good, HSG B
0.017	98	Unconnected pavement, HSG B
0.303	75	Weighted Average
0.187		61.72% Pervious Area
0.116		38.28% Impervious Area
0.017		14.66% Unconnected

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

Subcatchment 6: UNCAPTURED

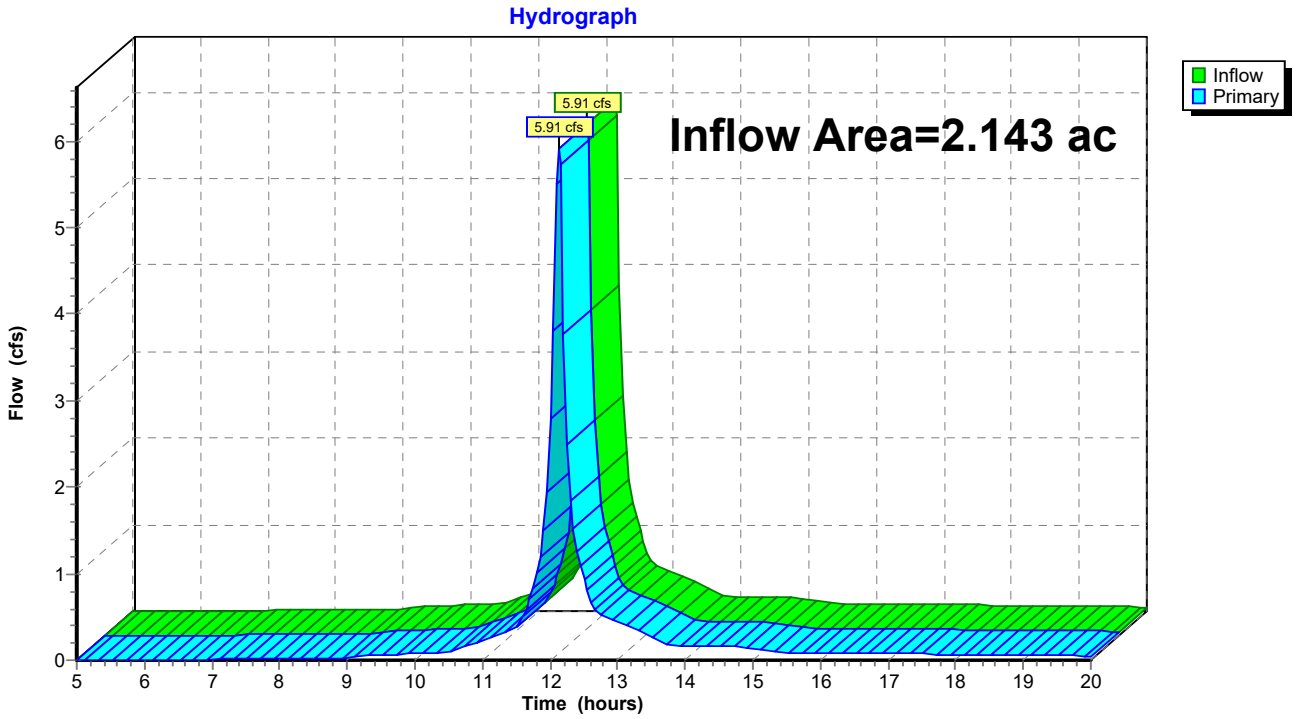


Summary for Link L7: PROPOSED

Inflow Area = 2.143 ac, 82.92% Impervious, Inflow Depth > 1.58" for 1-YR event
Inflow = 5.91 cfs @ 12.13 hrs, Volume= 0.283 af
Primary = 5.91 cfs @ 12.13 hrs, Volume= 0.283 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link L7: PROPOSED



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: TO UPFLO FILTER Runoff Area=0.661 ac 88.65% Impervious Runoff Depth>1.99"
Tc=6.0 min CN=94 Runoff=2.29 cfs 0.110 af

Subcatchment2: TO CB 1 Runoff Area=0.274 ac 85.04% Impervious Runoff Depth>1.81"
Tc=6.0 min CN=92 Runoff=0.89 cfs 0.041 af

Subcatchment3: TO CB 2 Runoff Area=0.426 ac 95.54% Impervious Runoff Depth>2.19"
Tc=6.0 min CN=96 Runoff=1.57 cfs 0.078 af

Subcatchment4: TO EX NORTH CB Runoff Area=0.269 ac 85.87% Impervious Runoff Depth>1.90"
Tc=6.0 min CN=93 Runoff=0.90 cfs 0.043 af

Subcatchment5: TO EX SOUTH CB Runoff Area=0.210 ac 97.14% Impervious Runoff Depth>2.29"
Tc=6.0 min CN=97 Runoff=0.79 cfs 0.040 af

Subcatchment6: UNCAPTURED Runoff Area=0.303 ac 38.28% Impervious Runoff Depth>0.73"
Tc=6.0 min CN=75 Runoff=0.41 cfs 0.018 af

Link L7: PROPOSED Inflow=6.84 cfs 0.330 af
Primary=6.84 cfs 0.330 af

Total Runoff Area = 2.143 ac Runoff Volume = 0.330 af Average Runoff Depth = 1.85"
17.08% Pervious = 0.366 ac 82.92% Impervious = 1.777 ac

Summary for Subcatchment 1: TO UPFLO FILTER DEVICE

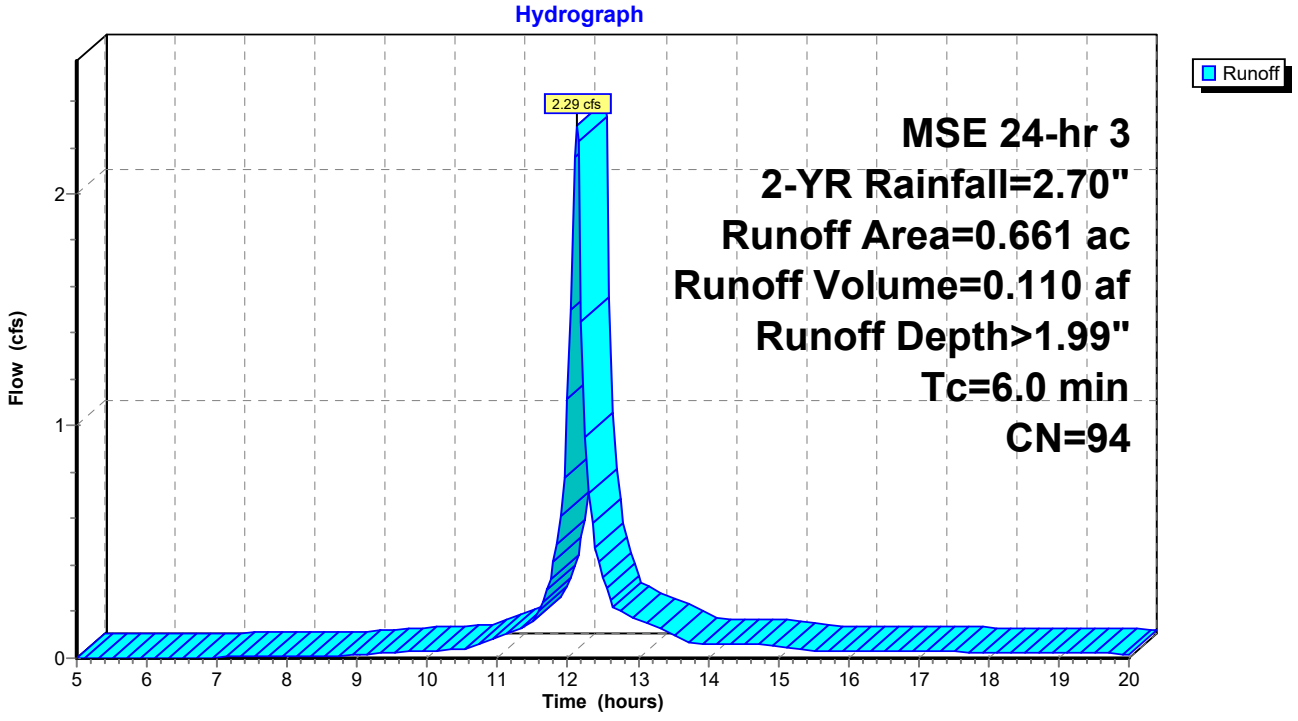
Runoff = 2.29 cfs @ 12.13 hrs, Volume= 0.110 af, Depth> 1.99"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (ac)	CN	Description
0.586	98	Paved parking, HSG B
0.075	61	>75% Grass cover, Good, HSG B
0.661	94	Weighted Average
0.075		11.35% Pervious Area
0.586		88.65% Impervious Area

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

Subcatchment 1: TO UPFLO FILTER DEVICE



Summary for Subcatchment 2: TO CB 1

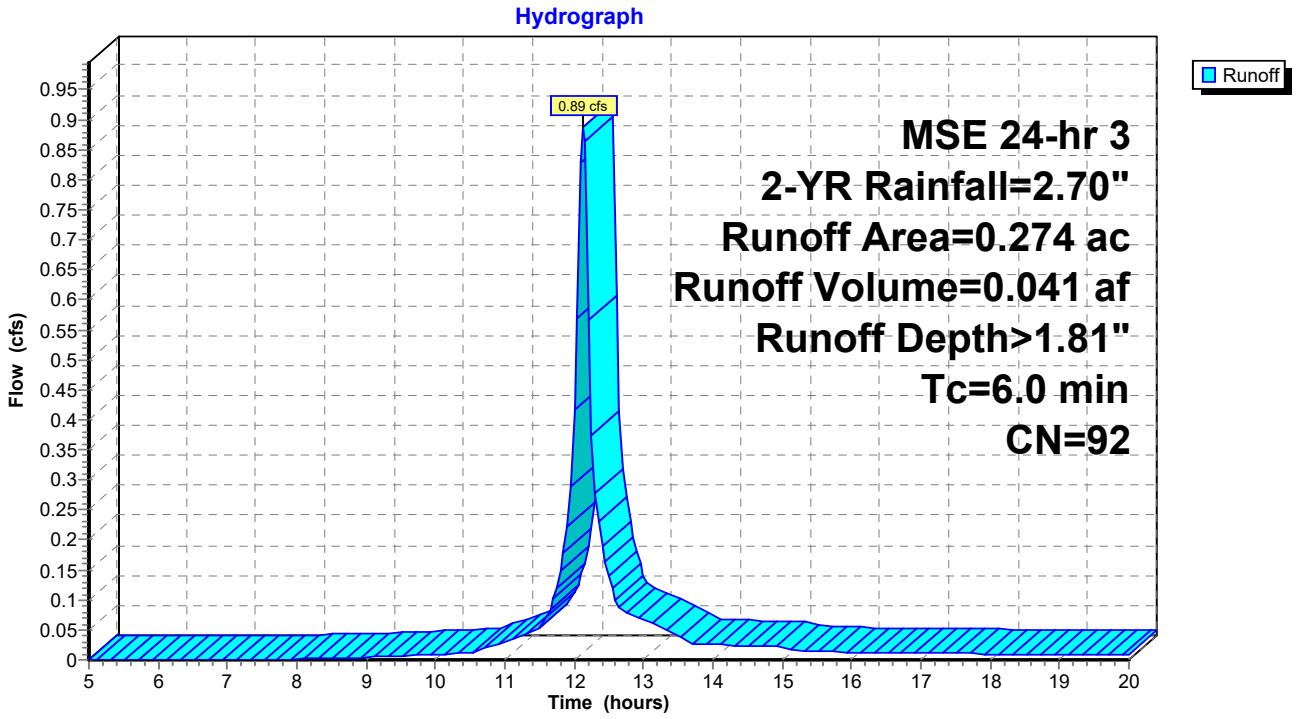
Runoff = 0.89 cfs @ 12.13 hrs, Volume= 0.041 af, Depth> 1.81"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (ac)	CN	Description
0.221	98	Paved parking, HSG B
0.041	61	>75% Grass cover, Good, HSG B
0.012	98	Unconnected pavement, HSG B
0.274	92	Weighted Average
0.041		14.96% Pervious Area
0.233		85.04% Impervious Area
0.012		5.15% Unconnected

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

Subcatchment 2: TO CB 1



Summary for Subcatchment 3: TO CB 2

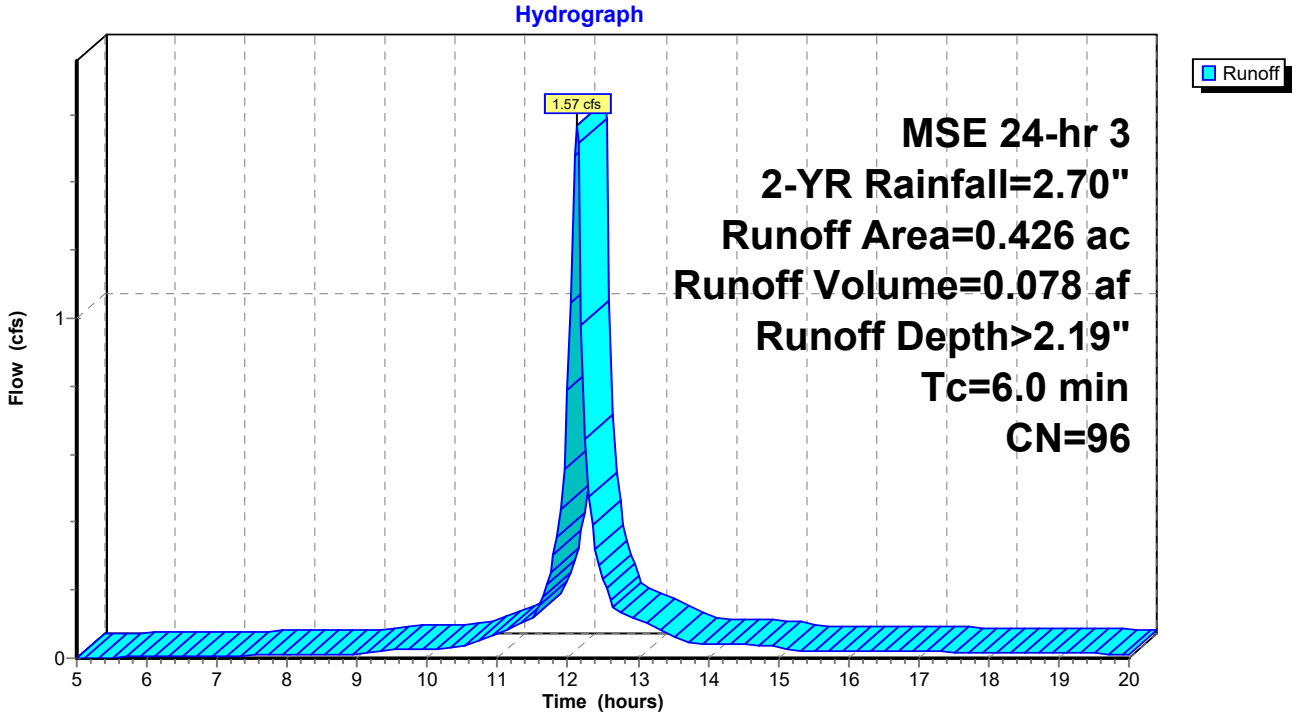
Runoff = 1.57 cfs @ 12.13 hrs, Volume= 0.078 af, Depth> 2.19"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (ac)	CN	Description
0.407	98	Paved parking, HSG B
0.019	61	>75% Grass cover, Good, HSG B
0.426	96	Weighted Average
0.019		4.46% Pervious Area
0.407		95.54% Impervious Area

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

Subcatchment 3: TO CB 2



Summary for Subcatchment 4: TO EX NORTH CB

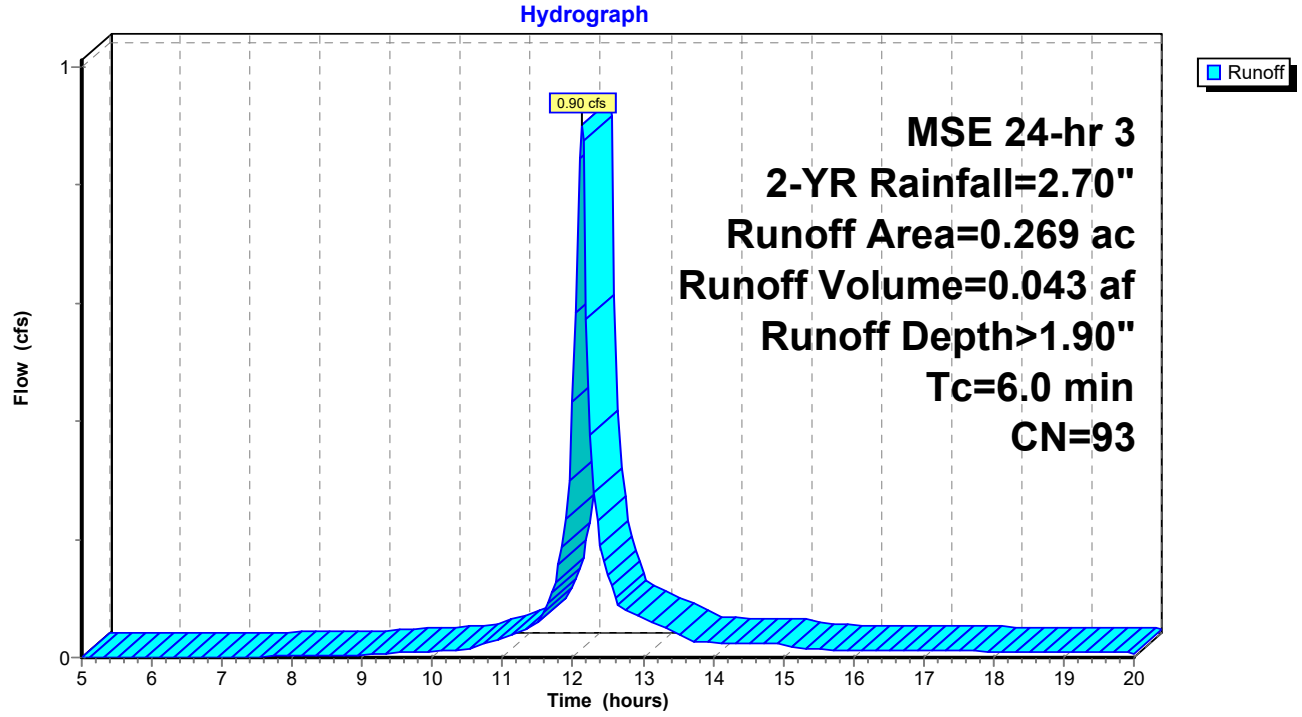
Runoff = 0.90 cfs @ 12.13 hrs, Volume= 0.043 af, Depth> 1.90"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (ac)	CN	Description
0.151	98	Paved parking, HSG B
0.038	61	>75% Grass cover, Good, HSG B
0.054	98	Roofs, HSG B
0.026	98	Unconnected pavement, HSG B
0.269	93	Weighted Average
0.038		14.13% Pervious Area
0.231		85.87% Impervious Area
0.026		11.26% Unconnected

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

Subcatchment 4: TO EX NORTH CB



Summary for Subcatchment 5: TO EX SOUTH CB

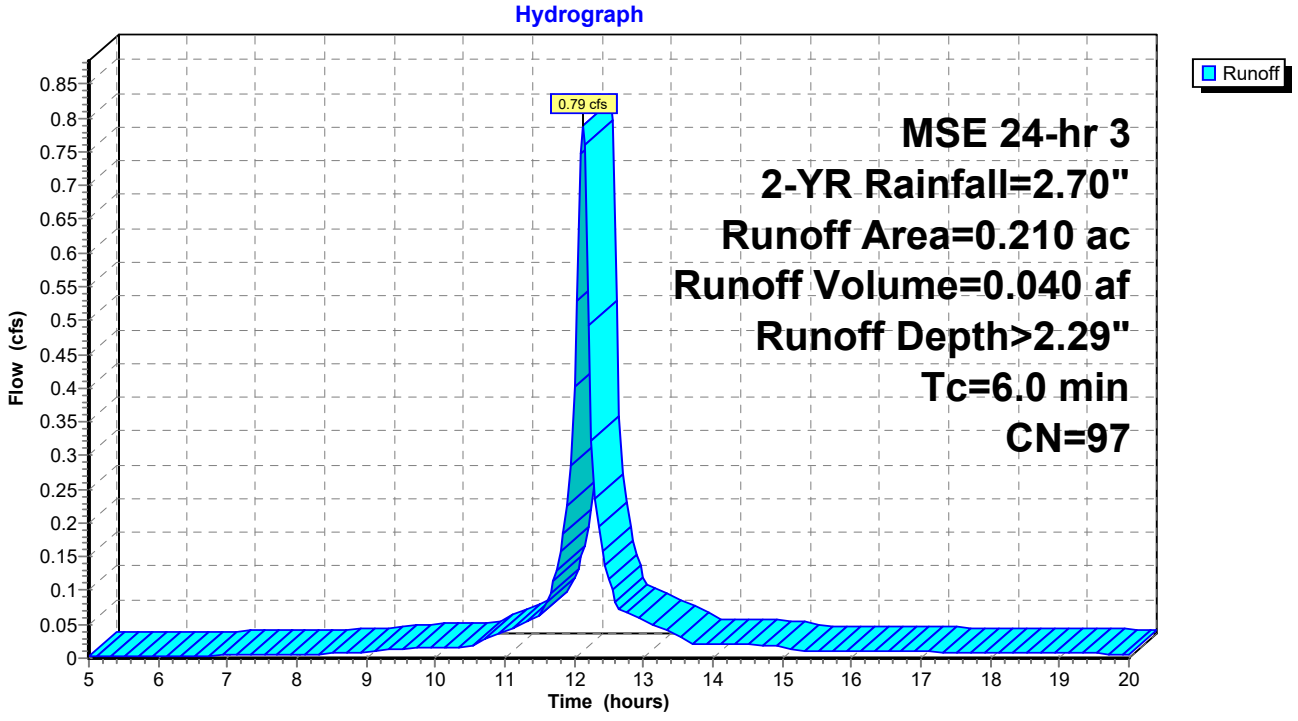
Runoff = 0.79 cfs @ 12.13 hrs, Volume= 0.040 af, Depth> 2.29"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (ac)	CN	Description
0.204	98	Paved parking, HSG B
0.006	61	>75% Grass cover, Good, HSG B
0.210	97	Weighted Average
0.006		2.86% Pervious Area
0.204		97.14% Impervious Area

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

Subcatchment 5: TO EX SOUTH CB



Summary for Subcatchment 6: UNCAPTURED

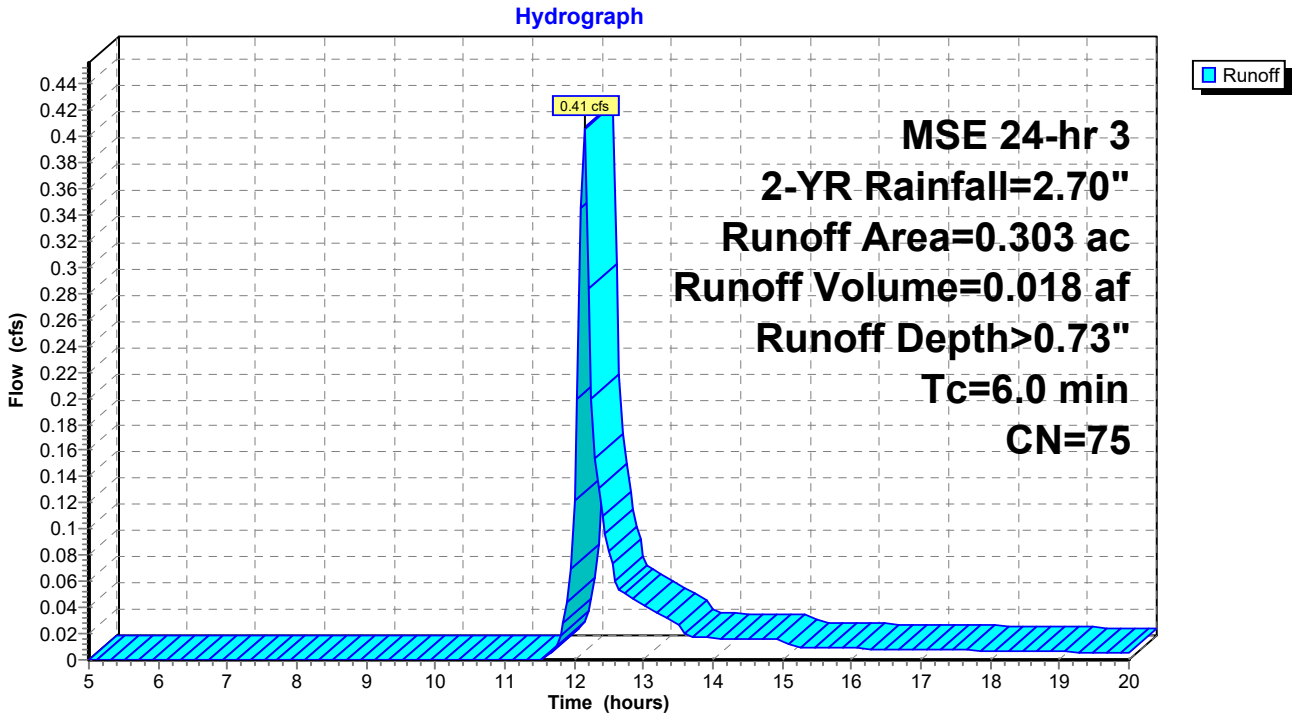
Runoff = 0.41 cfs @ 12.14 hrs, Volume= 0.018 af, Depth> 0.73"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 2-YR Rainfall=2.70"

Area (ac)	CN	Description
0.099	98	Paved parking, HSG B
0.187	61	>75% Grass cover, Good, HSG B
0.017	98	Unconnected pavement, HSG B
0.303	75	Weighted Average
0.187		61.72% Pervious Area
0.116		38.28% Impervious Area
0.017		14.66% Unconnected

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

Subcatchment 6: UNCAPTURED

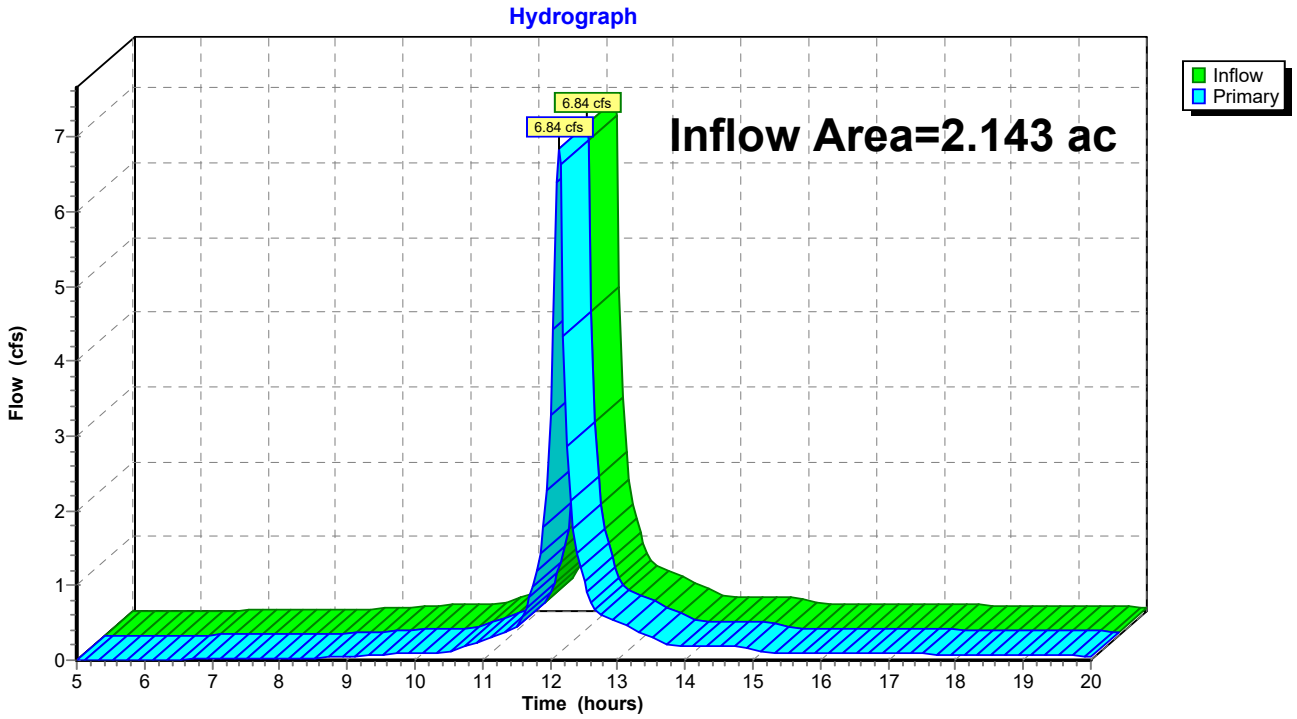


Summary for Link L7: PROPOSED

Inflow Area = 2.143 ac, 82.92% Impervious, Inflow Depth > 1.85" for 2-YR event
Inflow = 6.84 cfs @ 12.13 hrs, Volume= 0.330 af
Primary = 6.84 cfs @ 12.13 hrs, Volume= 0.330 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link L7: PROPOSED



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: TO UPFLO FILTER Runoff Area=0.661 ac 88.65% Impervious Runoff Depth>3.04"
Tc=6.0 min CN=94 Runoff=3.40 cfs 0.167 af

Subcatchment2: TO CB 1 Runoff Area=0.274 ac 85.04% Impervious Runoff Depth>2.84"
Tc=6.0 min CN=92 Runoff=1.35 cfs 0.065 af

Subcatchment3: TO CB 2 Runoff Area=0.426 ac 95.54% Impervious Runoff Depth>3.24"
Tc=6.0 min CN=96 Runoff=2.27 cfs 0.115 af

Subcatchment4: TO EX NORTH CB Runoff Area=0.269 ac 85.87% Impervious Runoff Depth>2.94"
Tc=6.0 min CN=93 Runoff=1.36 cfs 0.066 af

Subcatchment5: TO EX SOUTH CB Runoff Area=0.210 ac 97.14% Impervious Runoff Depth>3.35"
Tc=6.0 min CN=97 Runoff=1.13 cfs 0.059 af

Subcatchment6: UNCAPTURED Runoff Area=0.303 ac 38.28% Impervious Runoff Depth>1.45"
Tc=6.0 min CN=75 Runoff=0.83 cfs 0.037 af

Link L7: PROPOSED Inflow=10.33 cfs 0.508 af
Primary=10.33 cfs 0.508 af

Total Runoff Area = 2.143 ac Runoff Volume = 0.508 af Average Runoff Depth = 2.85"
17.08% Pervious = 0.366 ac 82.92% Impervious = 1.777 ac

Summary for Subcatchment 1: TO UPFLO FILTER DEVICE

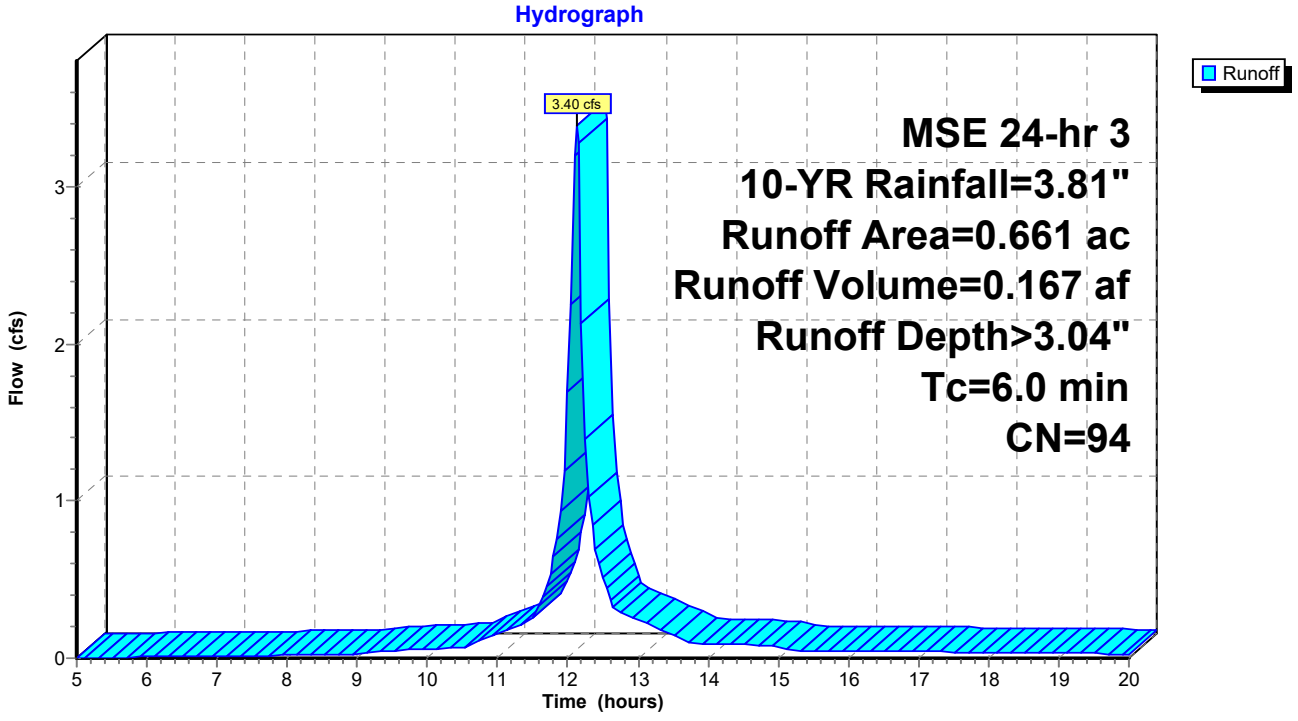
Runoff = 3.40 cfs @ 12.13 hrs, Volume= 0.167 af, Depth> 3.04"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (ac)	CN	Description
0.586	98	Paved parking, HSG B
0.075	61	>75% Grass cover, Good, HSG B
0.661	94	Weighted Average
0.075		11.35% Pervious Area
0.586		88.65% Impervious Area

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

Subcatchment 1: TO UPFLO FILTER DEVICE



Summary for Subcatchment 2: TO CB 1

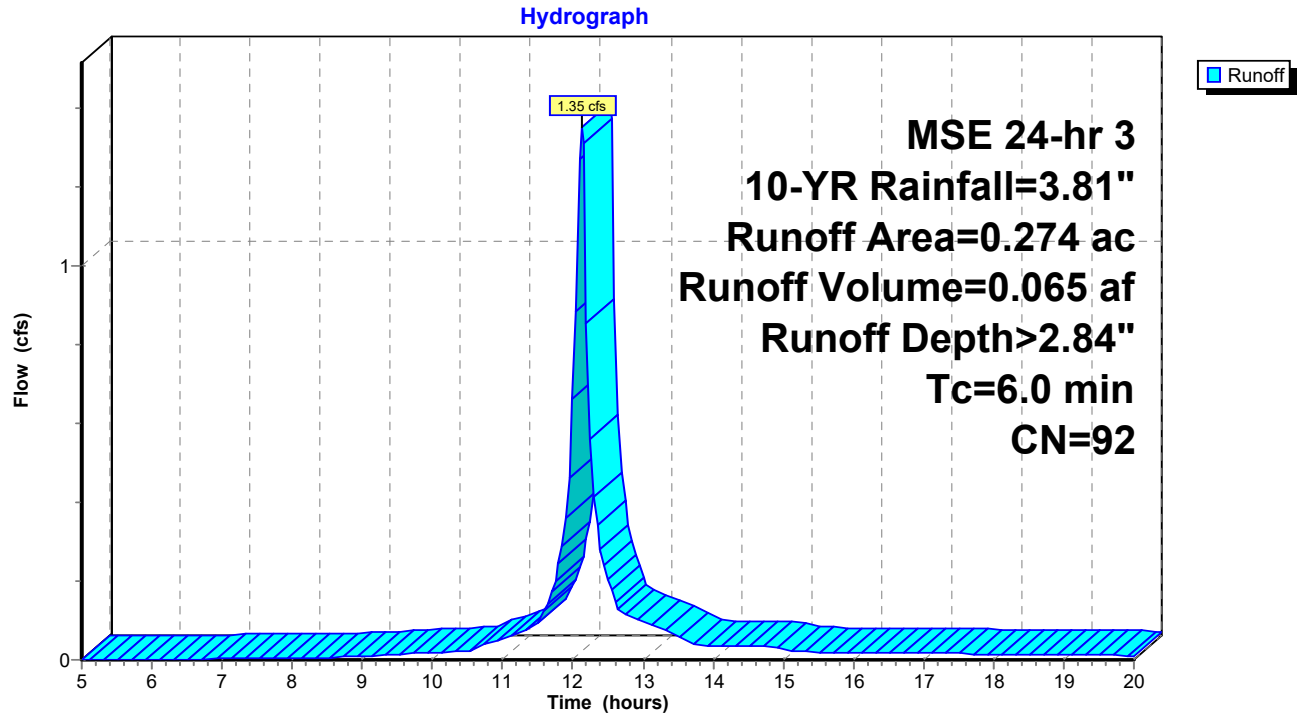
Runoff = 1.35 cfs @ 12.13 hrs, Volume= 0.065 af, Depth> 2.84"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (ac)	CN	Description
0.221	98	Paved parking, HSG B
0.041	61	>75% Grass cover, Good, HSG B
0.012	98	Unconnected pavement, HSG B
0.274	92	Weighted Average
0.041		14.96% Pervious Area
0.233		85.04% Impervious Area
0.012		5.15% Unconnected

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

Subcatchment 2: TO CB 1



Summary for Subcatchment 3: TO CB 2

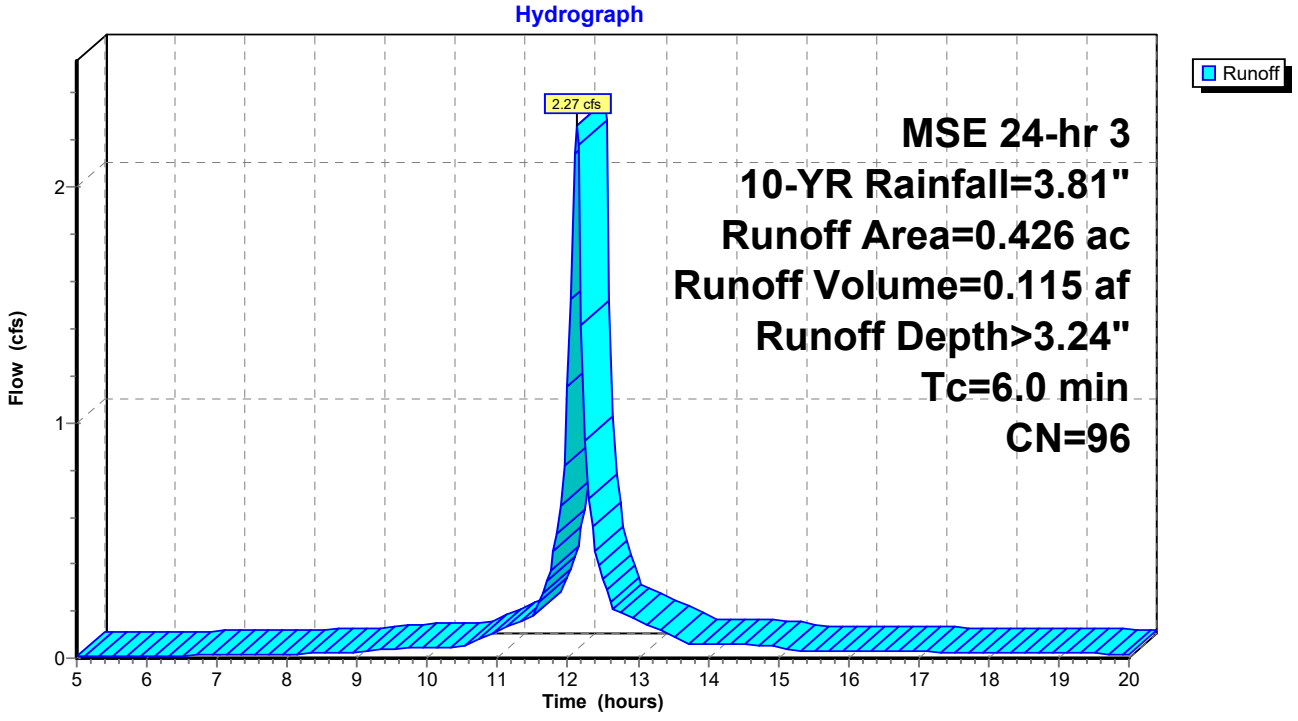
Runoff = 2.27 cfs @ 12.13 hrs, Volume= 0.115 af, Depth> 3.24"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (ac)	CN	Description
0.407	98	Paved parking, HSG B
0.019	61	>75% Grass cover, Good, HSG B
0.426	96	Weighted Average
0.019		4.46% Pervious Area
0.407		95.54% Impervious Area

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

Subcatchment 3: TO CB 2



Summary for Subcatchment 4: TO EX NORTH CB

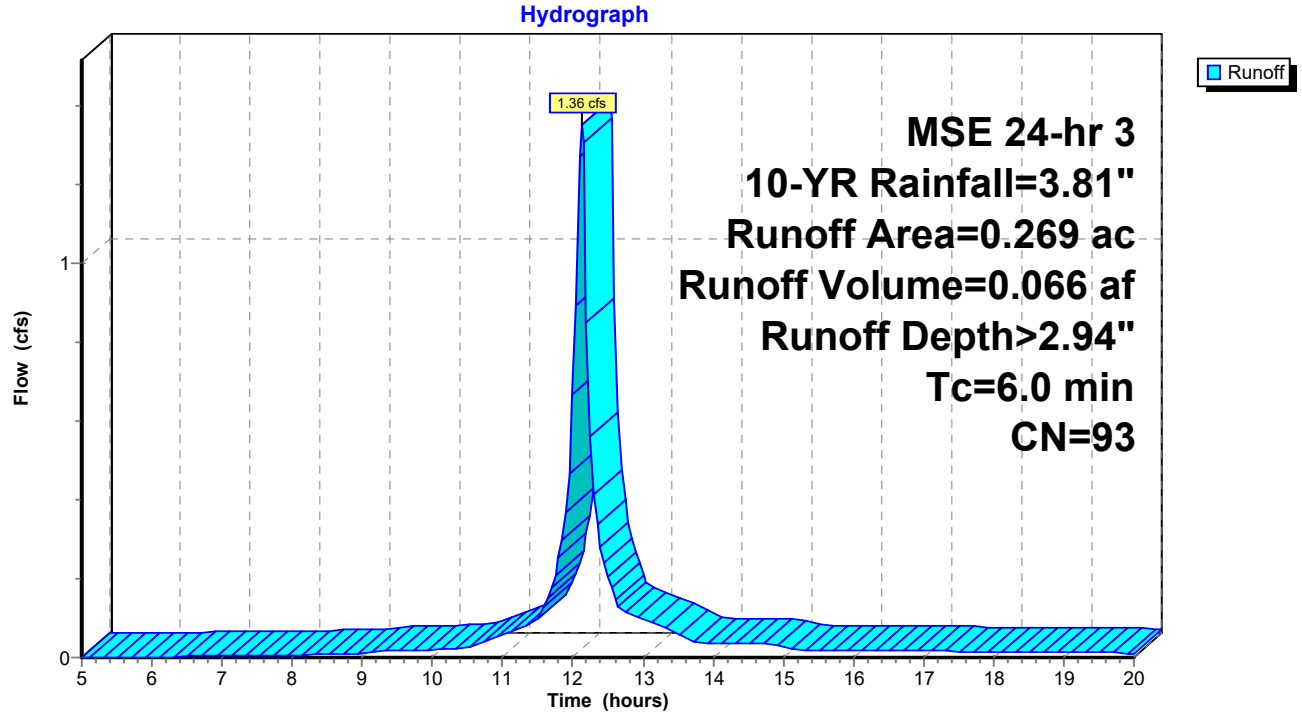
Runoff = 1.36 cfs @ 12.13 hrs, Volume= 0.066 af, Depth> 2.94"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (ac)	CN	Description
0.151	98	Paved parking, HSG B
0.038	61	>75% Grass cover, Good, HSG B
0.054	98	Roofs, HSG B
0.026	98	Unconnected pavement, HSG B
0.269	93	Weighted Average
0.038		14.13% Pervious Area
0.231		85.87% Impervious Area
0.026		11.26% Unconnected

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

Subcatchment 4: TO EX NORTH CB



Summary for Subcatchment 5: TO EX SOUTH CB

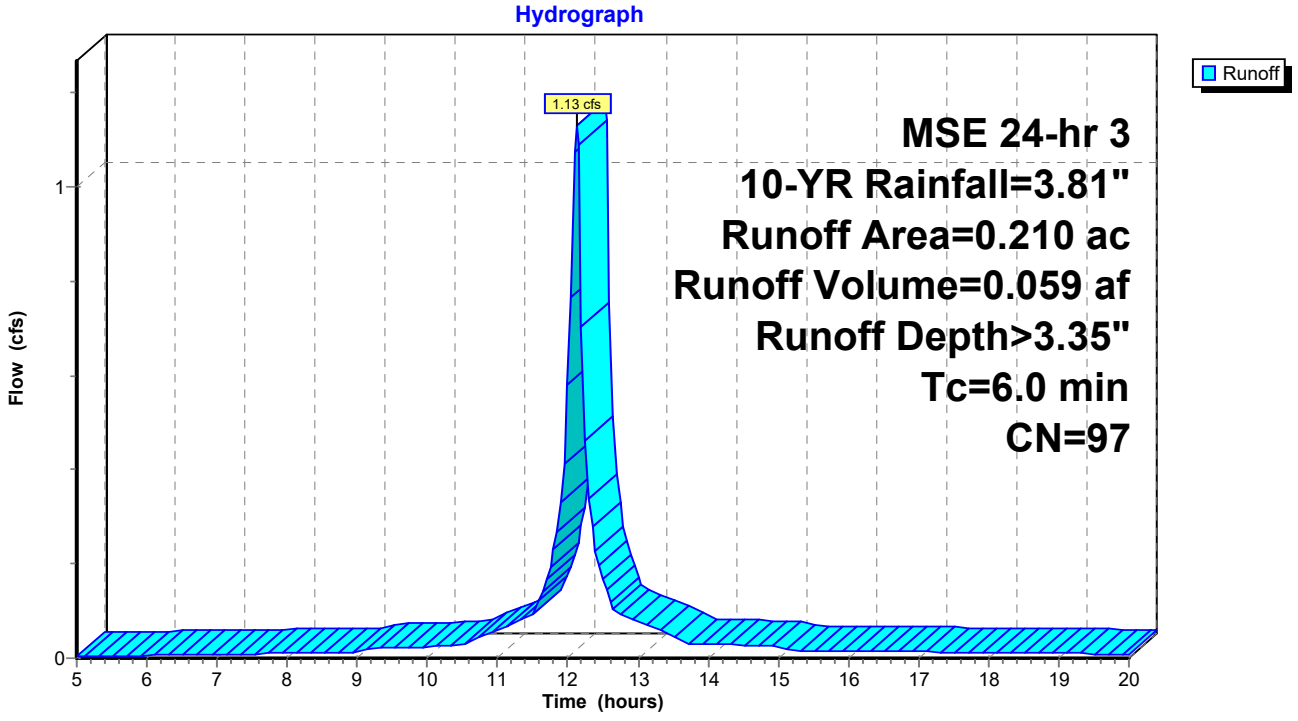
Runoff = 1.13 cfs @ 12.13 hrs, Volume= 0.059 af, Depth> 3.35"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (ac)	CN	Description
0.204	98	Paved parking, HSG B
0.006	61	>75% Grass cover, Good, HSG B
0.210	97	Weighted Average
0.006		2.86% Pervious Area
0.204		97.14% Impervious Area

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

Subcatchment 5: TO EX SOUTH CB



Summary for Subcatchment 6: UNCAPTURED

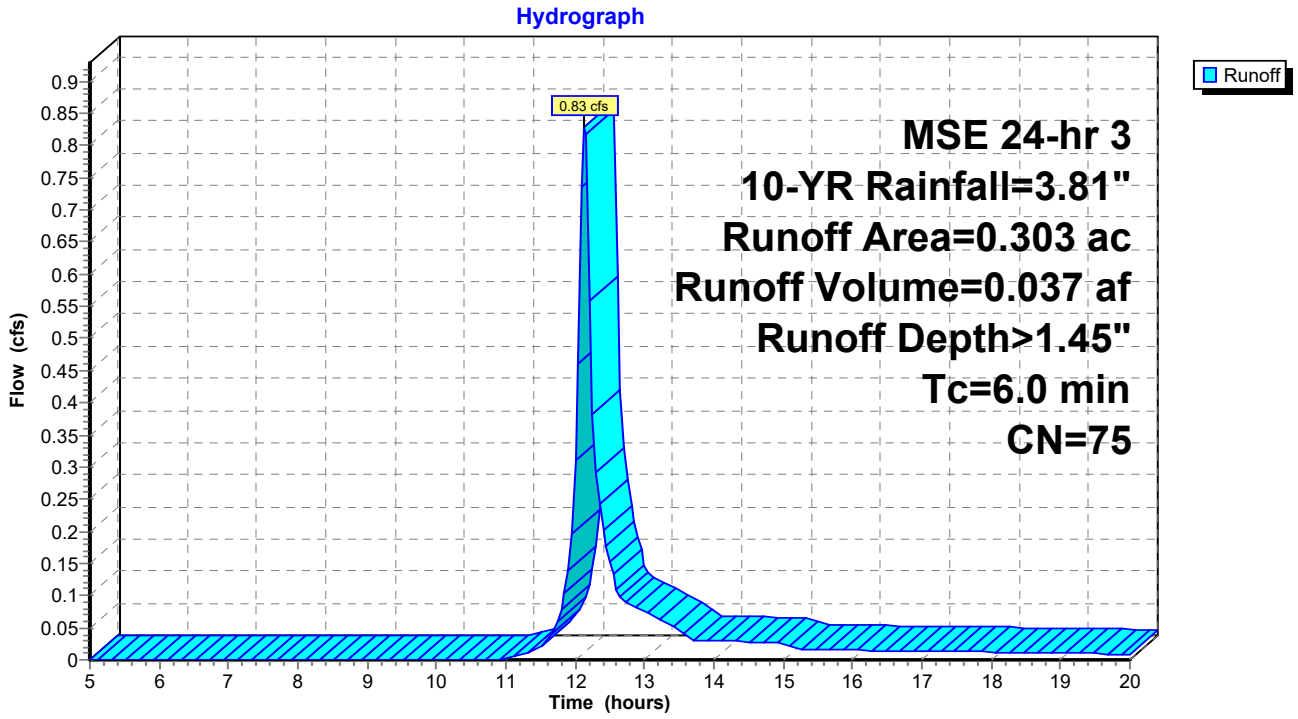
Runoff = 0.83 cfs @ 12.14 hrs, Volume= 0.037 af, Depth> 1.45"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 10-YR Rainfall=3.81"

Area (ac)	CN	Description
0.099	98	Paved parking, HSG B
0.187	61	>75% Grass cover, Good, HSG B
0.017	98	Unconnected pavement, HSG B
0.303	75	Weighted Average
0.187		61.72% Pervious Area
0.116		38.28% Impervious Area
0.017		14.66% Unconnected

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

Subcatchment 6: UNCAPTURED

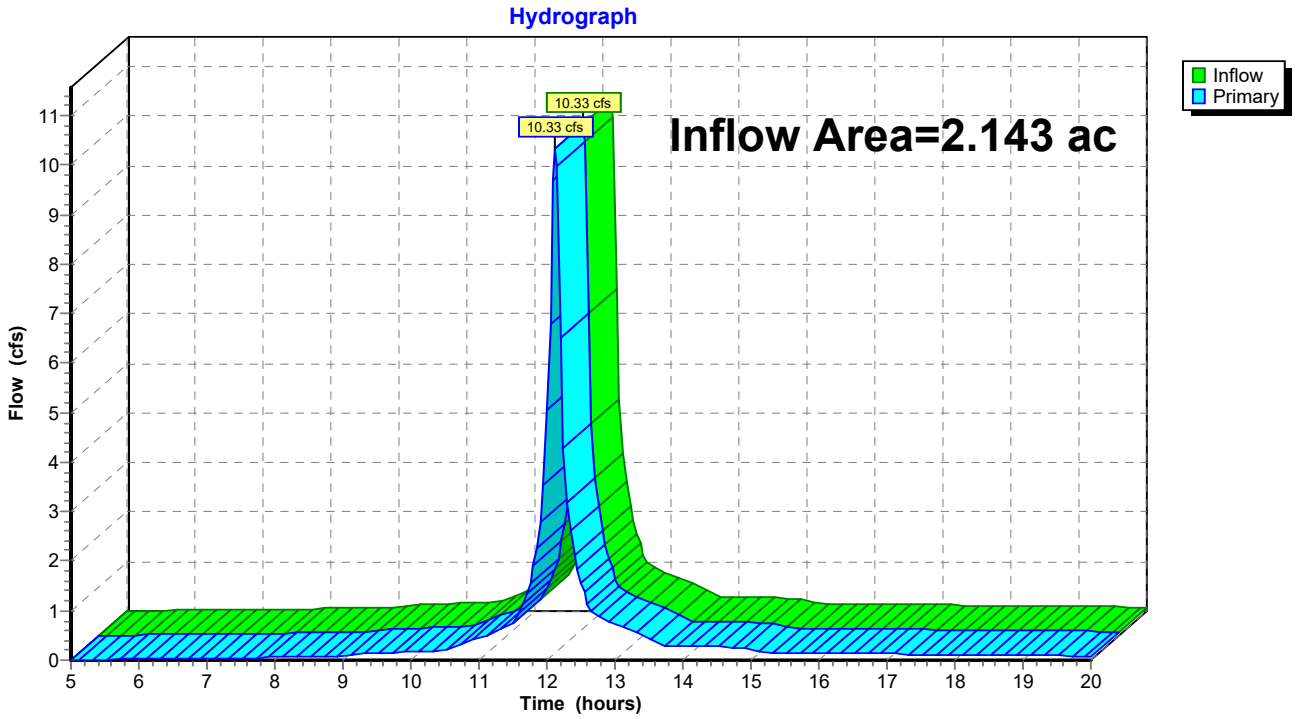


Summary for Link L7: PROPOSED

Inflow Area = 2.143 ac, 82.92% Impervious, Inflow Depth > 2.85" for 10-YR event
Inflow = 10.33 cfs @ 12.13 hrs, Volume= 0.508 af
Primary = 10.33 cfs @ 12.13 hrs, Volume= 0.508 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link L7: PROPOSED



Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: TO UPFLO FILTER Runoff Area=0.661 ac 88.65% Impervious Runoff Depth>5.30"
Tc=6.0 min CN=94 Runoff=5.72 cfs 0.292 af

Subcatchment2: TO CB 1 Runoff Area=0.274 ac 85.04% Impervious Runoff Depth>5.08"
Tc=6.0 min CN=92 Runoff=2.32 cfs 0.116 af

Subcatchment3: TO CB 2 Runoff Area=0.426 ac 95.54% Impervious Runoff Depth>5.51"
Tc=6.0 min CN=96 Runoff=3.75 cfs 0.195 af

Subcatchment4: TO EX NORTH CB Runoff Area=0.269 ac 85.87% Impervious Runoff Depth>5.19"
Tc=6.0 min CN=93 Runoff=2.31 cfs 0.116 af

Subcatchment5: TO EX SOUTH CB Runoff Area=0.210 ac 97.14% Impervious Runoff Depth>5.60"
Tc=6.0 min CN=97 Runoff=1.86 cfs 0.098 af

Subcatchment6: UNCAPTURED Runoff Area=0.303 ac 38.28% Impervious Runoff Depth>3.29"
Tc=6.0 min CN=75 Runoff=1.85 cfs 0.083 af

Link L7: PROPOSED Inflow=17.81 cfs 0.901 af
Primary=17.81 cfs 0.901 af

Total Runoff Area = 2.143 ac Runoff Volume = 0.901 af Average Runoff Depth = 5.04"
17.08% Pervious = 0.366 ac 82.92% Impervious = 1.777 ac

Summary for Subcatchment 1: TO UPFLO FILTER DEVICE

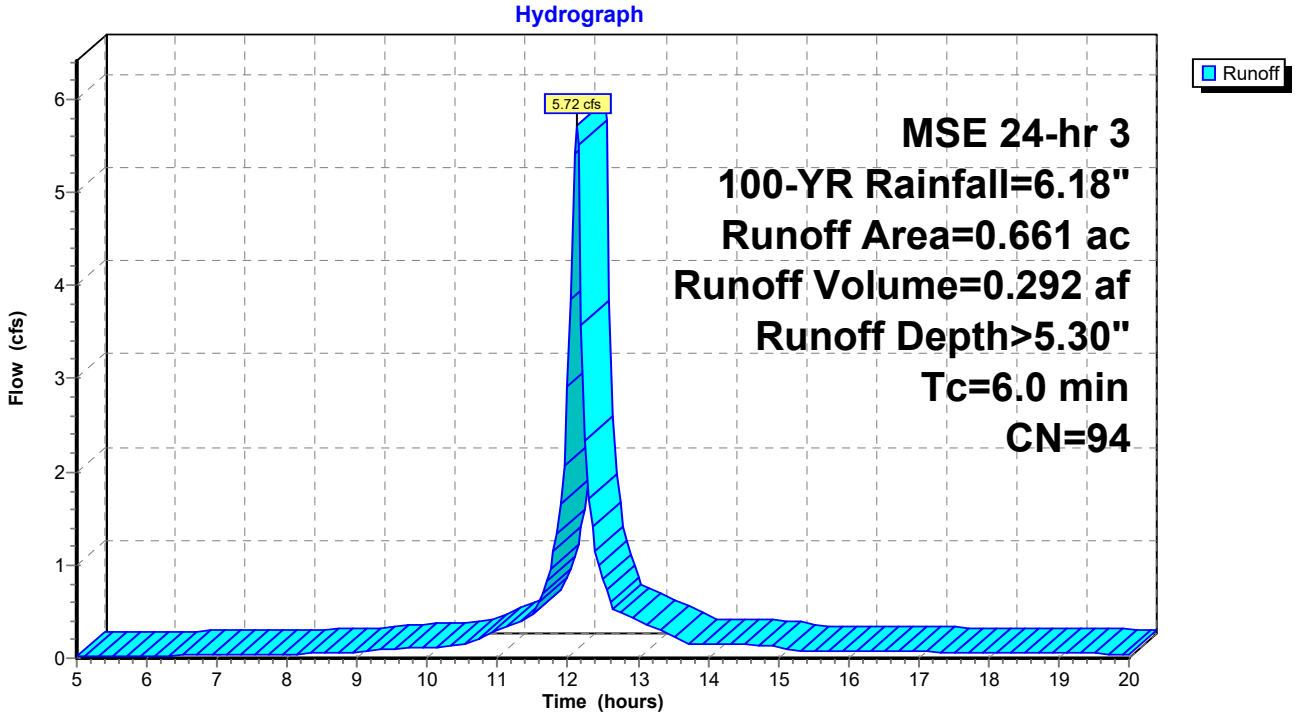
Runoff = 5.72 cfs @ 12.13 hrs, Volume= 0.292 af, Depth> 5.30"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (ac)	CN	Description
0.586	98	Paved parking, HSG B
0.075	61	>75% Grass cover, Good, HSG B
0.661	94	Weighted Average
0.075		11.35% Pervious Area
0.586		88.65% Impervious Area

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

Subcatchment 1: TO UPFLO FILTER DEVICE



Summary for Subcatchment 2: TO CB 1

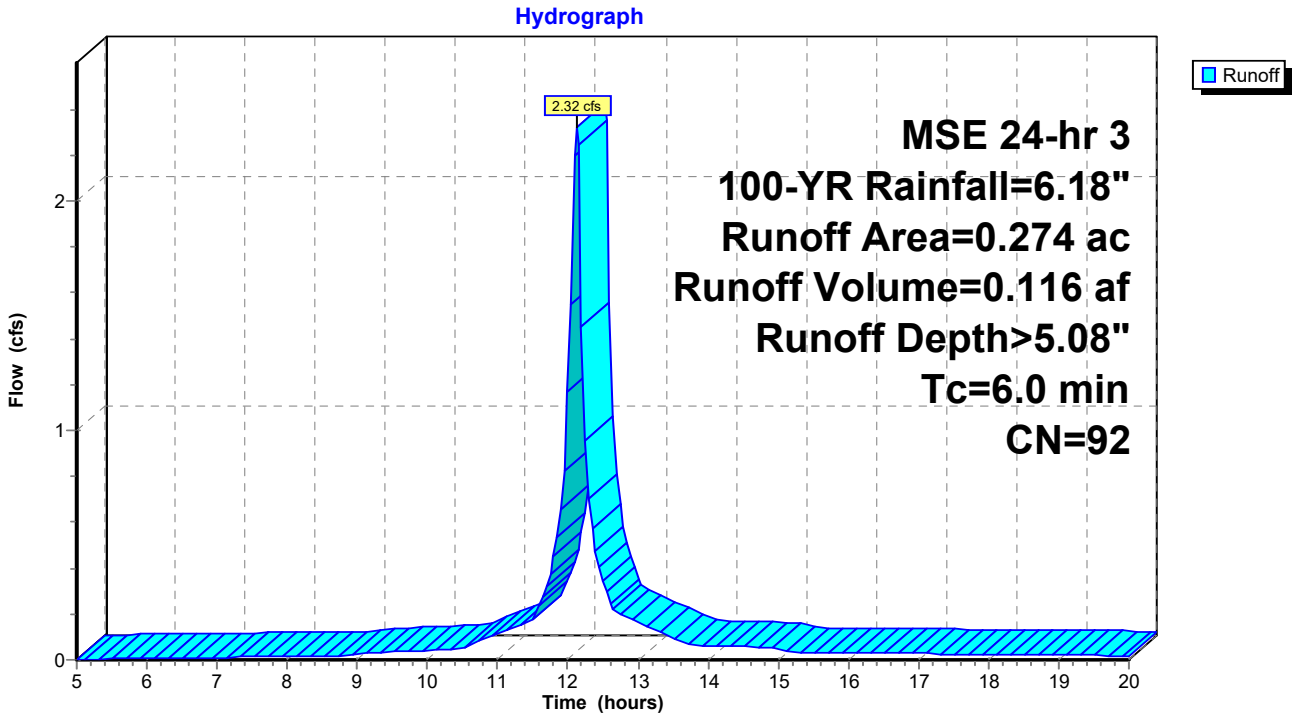
Runoff = 2.32 cfs @ 12.13 hrs, Volume= 0.116 af, Depth> 5.08"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (ac)	CN	Description
0.221	98	Paved parking, HSG B
0.041	61	>75% Grass cover, Good, HSG B
0.012	98	Unconnected pavement, HSG B
0.274	92	Weighted Average
0.041		14.96% Pervious Area
0.233		85.04% Impervious Area
0.012		5.15% Unconnected

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

Subcatchment 2: TO CB 1



Summary for Subcatchment 3: TO CB 2

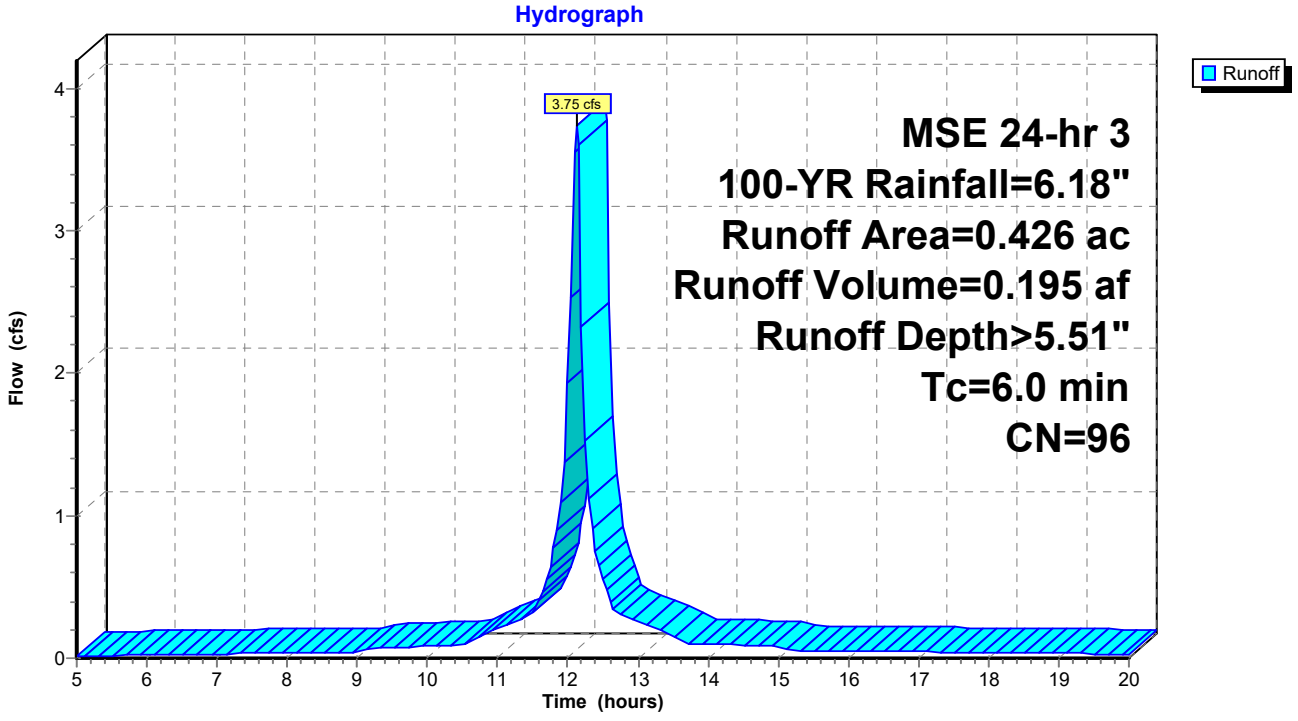
Runoff = 3.75 cfs @ 12.13 hrs, Volume= 0.195 af, Depth> 5.51"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (ac)	CN	Description
0.407	98	Paved parking, HSG B
0.019	61	>75% Grass cover, Good, HSG B
0.426	96	Weighted Average
0.019		4.46% Pervious Area
0.407		95.54% Impervious Area

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

Subcatchment 3: TO CB 2



Summary for Subcatchment 4: TO EX NORTH CB

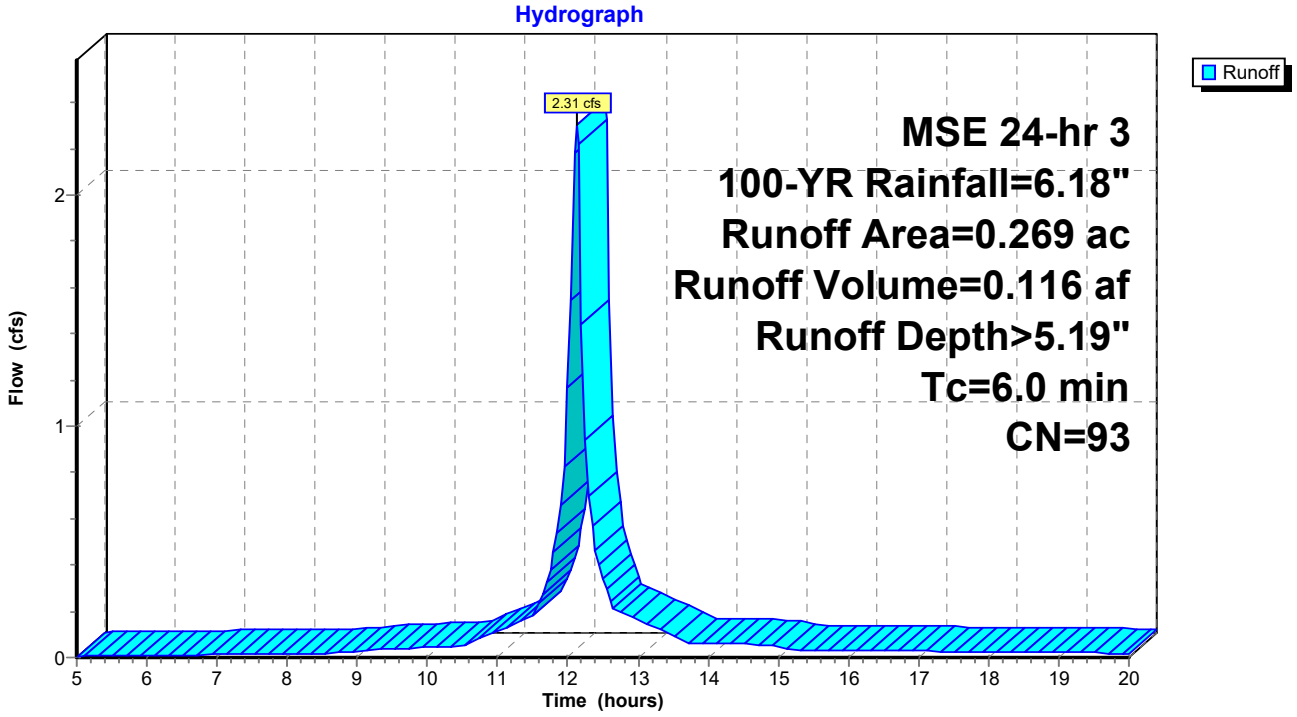
Runoff = 2.31 cfs @ 12.13 hrs, Volume= 0.116 af, Depth> 5.19"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (ac)	CN	Description
0.151	98	Paved parking, HSG B
0.038	61	>75% Grass cover, Good, HSG B
0.054	98	Roofs, HSG B
0.026	98	Unconnected pavement, HSG B
0.269	93	Weighted Average
0.038		14.13% Pervious Area
0.231		85.87% Impervious Area
0.026		11.26% Unconnected

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

Subcatchment 4: TO EX NORTH CB



Summary for Subcatchment 5: TO EX SOUTH CB

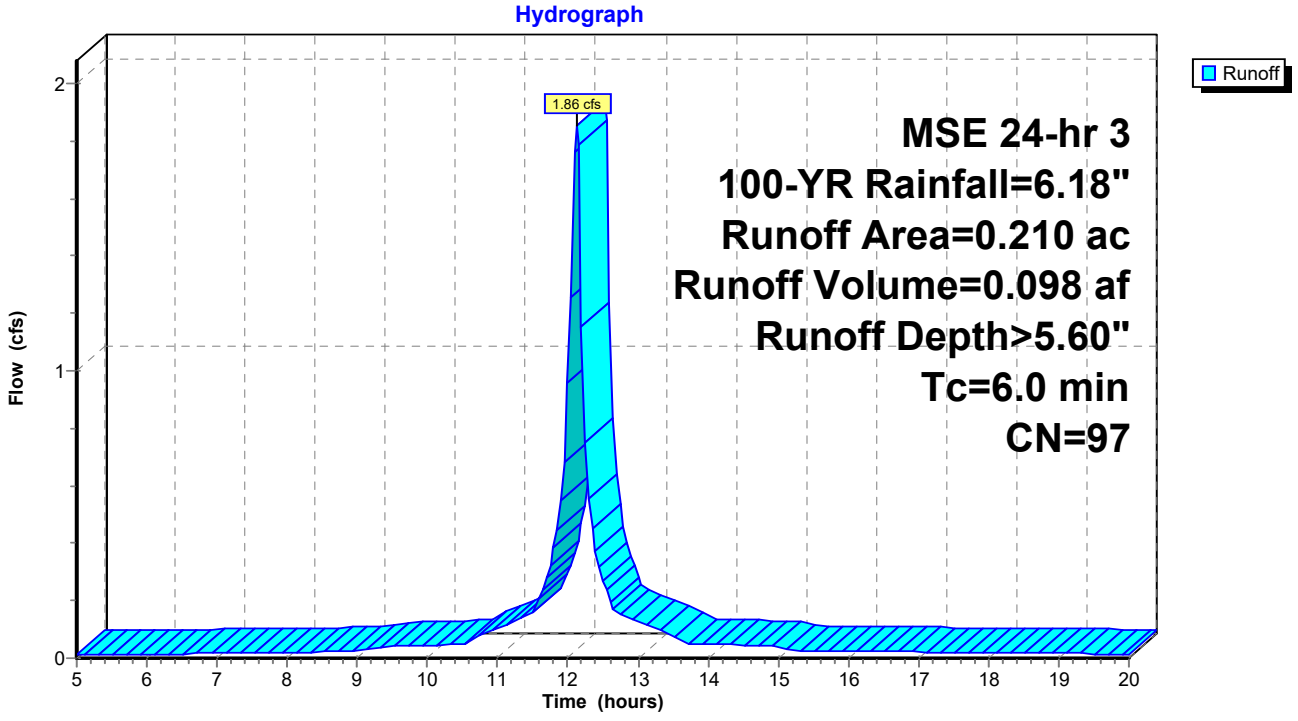
Runoff = 1.86 cfs @ 12.13 hrs, Volume= 0.098 af, Depth> 5.60"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (ac)	CN	Description
0.204	98	Paved parking, HSG B
0.006	61	>75% Grass cover, Good, HSG B
0.210	97	Weighted Average
0.006		2.86% Pervious Area
0.204		97.14% Impervious Area

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

Subcatchment 5: TO EX SOUTH CB



Summary for Subcatchment 6: UNCAPTURED

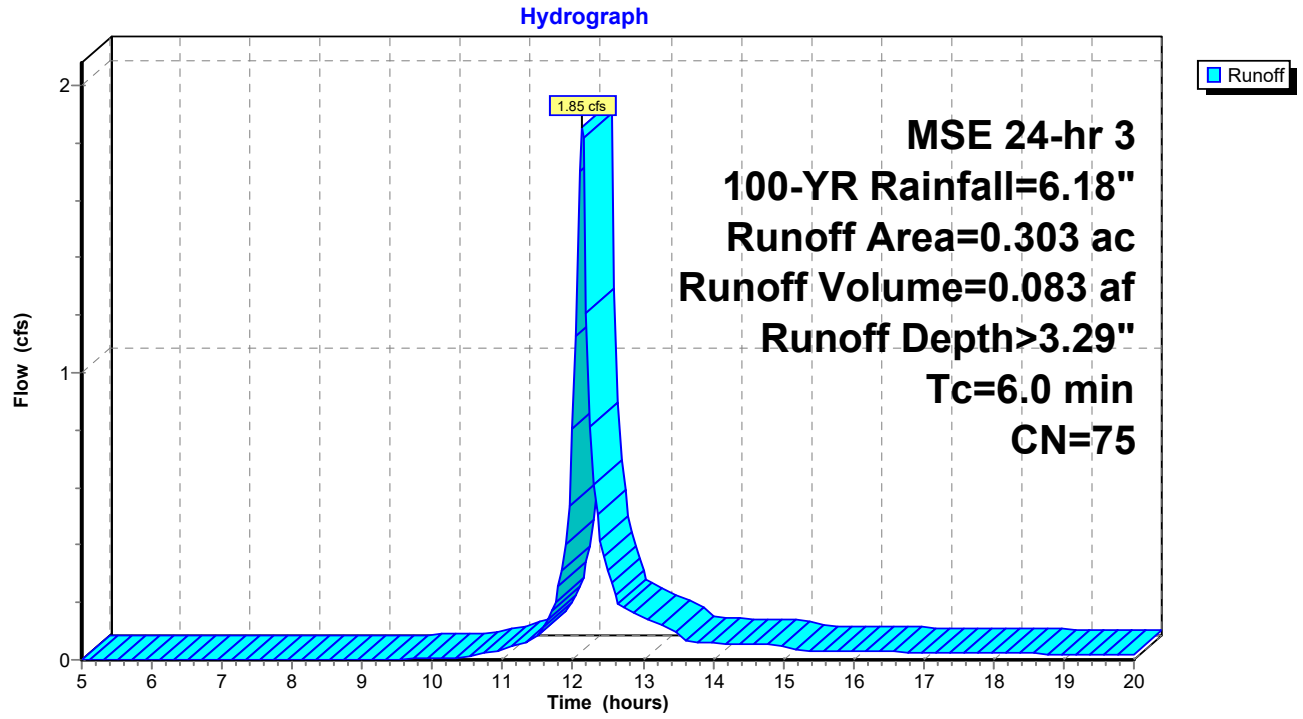
Runoff = 1.85 cfs @ 12.13 hrs, Volume= 0.083 af, Depth> 3.29"
Routed to Link L7 : PROPOSED

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
MSE 24-hr 3 100-YR Rainfall=6.18"

Area (ac)	CN	Description
0.099	98	Paved parking, HSG B
0.187	61	>75% Grass cover, Good, HSG B
0.017	98	Unconnected pavement, HSG B
0.303	75	Weighted Average
0.187		61.72% Pervious Area
0.116		38.28% Impervious Area
0.017		14.66% Unconnected

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

Subcatchment 6: UNCAPTURED

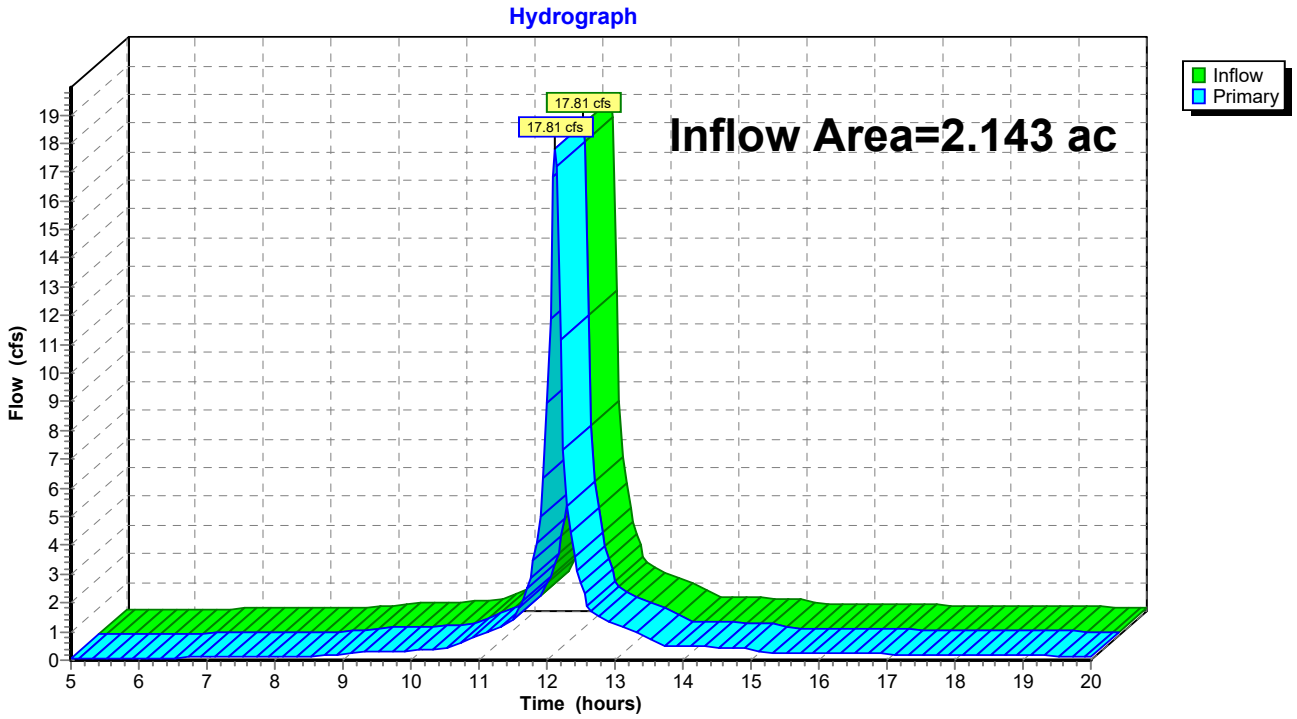


Summary for Link L7: PROPOSED

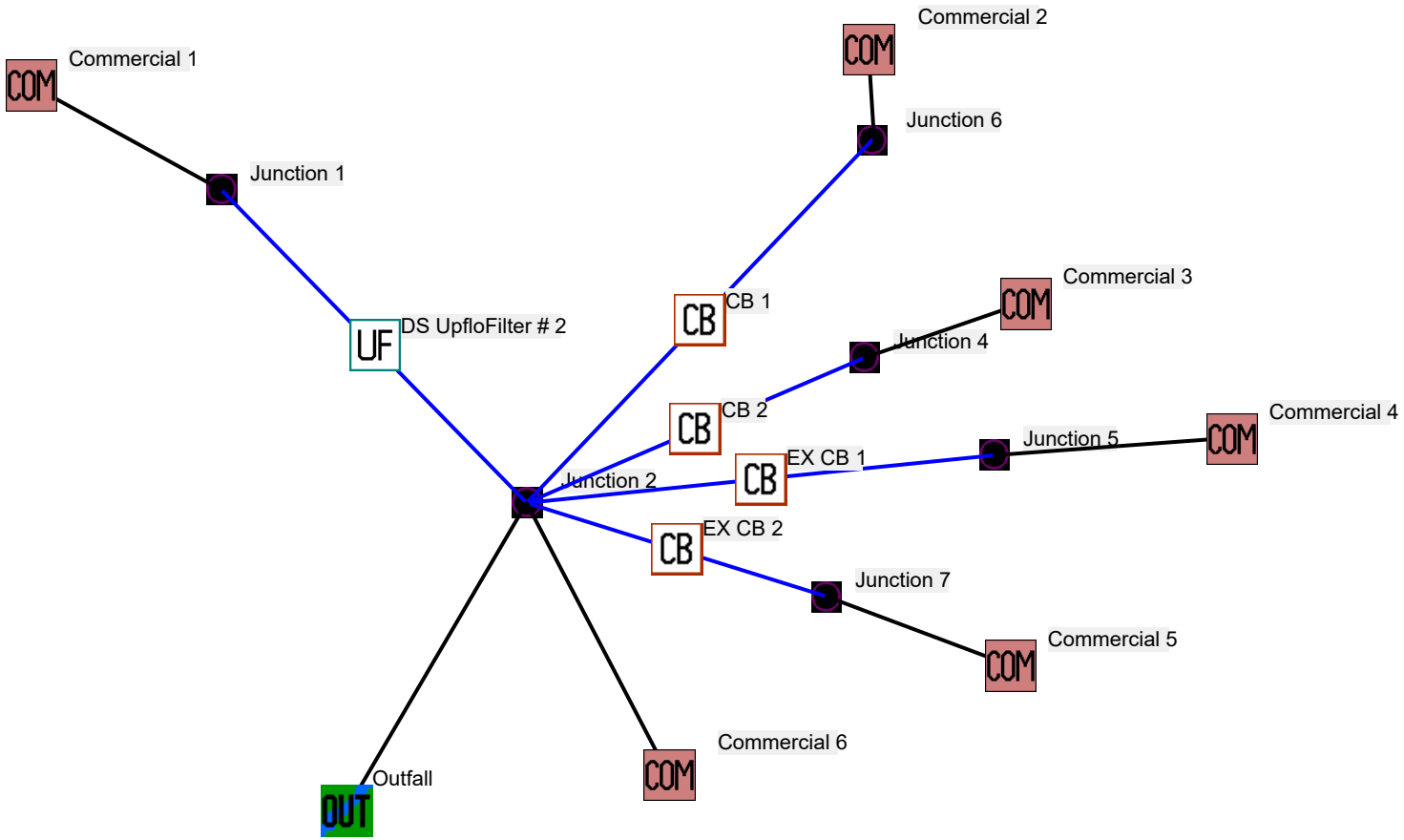
Inflow Area = 2.143 ac, 82.92% Impervious, Inflow Depth > 5.04" for 100-YR event
Inflow = 17.81 cfs @ 12.13 hrs, Volume= 0.901 af
Primary = 17.81 cfs @ 12.13 hrs, Volume= 0.901 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Link L7: PROPOSED



Appendix D Calculations - Storm Water Quality (WinSLAMM)


Commercial 1
COM
Junction 1
UF
DS UpfloFilter # 2
Commercial 2
COM
Junction 6
CB
CB 1
Commercial 3
COM
Junction 4
CB
CB 2
CB
EX CB 1
Junction 5
Commercial 4
COM
Junction 2
CB
EX CB 2
Junction 7
Commercial 5
COM
Commercial 6
COM
Outfall
OUT

Data file name: I:\VJS Construction\22371 - Carroll University Redevelopment\060 CAD\800_SWMP\040_WinSLAMM\WinSLAMM Model.mdb
WinSLAMM Version 10.5.0
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Date: 04-19-2024 Time: 09:35:26
Site information:

LU# 1 - Commercial: Commercial 1 Total area (ac): 0.661
  13 - Paved Parking 1: 0.586 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  45 - Large Landscaped Areas 1: 0.075 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#2

LU# 2 - Commercial: Commercial 2 Total area (ac): 0.274
  13 - Paved Parking 1: 0.221 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  31 - Sidewalks 1: 0.012 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#13
  45 - Large Landscaped Areas 1: 0.041 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#1

LU# 3 - Commercial: Commercial 3 Total area (ac): 0.426
  13 - Paved Parking 1: 0.407 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
  46 - Large Landscaped Areas 2: 0.019 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#4

LU# 4 - Commercial: Commercial 4 Total area (ac): 0.269

1 - Roofs 1: 0.054 ac. Flat Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#6
13 - Paved Parking 1: 0.151 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.026 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#14
45 - Large Landscaped Areas 1: 0.038 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#7

LU# 5 - Commercial: Commercial 5 Total area (ac): 0.210
13 - Paved Parking 1: 0.204 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.006 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#8

LU# 6 - Commercial: Commercial 6 Total area (ac): 0.303
13 - Paved Parking 1: 0.099 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz
31 - Sidewalks 1: 0.017 ac. Connected Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#15
45 - Large Landscaped Areas 1: 0.187 ac. Normal Silty Source Area PSD File: C:\WinSLAMM Files\NURP.cpz OD-CP#12

Control Practice 1: Other Device CP# 1 (SA) - SA Device, LU# 2 ,SA# 45
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 2: Other Device CP# 2 (SA) - SA Device, LU# 1 ,SA# 45
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 3: Catchbasin Cleaning CP# 1 (DS) - CB 1
1. Fraction of area served by catchbasins = 1.00
2. Number of catchbasins = 1
3. Average sump depth below catchbasin outlet invert (feet) = 2
4. Depth of sediment in catchbasin sump at beginning of study period (ft) = 0
5. Typical outlet pipe diameter (ft) = 1
6. Typical outlet pipe Mannings n = 0.012
7. Typical outlet pipe slope (ft/ft) = 0.007
8. Typical catchbasin sump surface area (square feet) = 12.6
9. Total catchbasin depth (feet) = 5.1
10. Inflow hydrograph peak to average flow ratio = 3.8
11. Leakage rate through sump bottom (in/hr) = 0
12. Catchbasin Critical Particle Size File Name: Not needed - calculated

by program

Control Practice 4: Other Device CP# 3 (SA) - SA Device, LU# 3 ,SA# 46
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 5: Catchbasin Cleaning CP# 2 (DS) - CB 2
1. Fraction of area served by catchbasins = 1.00
2. Number of catchbasins = 1
3. Average sump depth below catchbasin outlet invert (feet) = 2
4. Depth of sediment in catchbasin sump at beginning of study period (ft) = 0
5. Typical outlet pipe diameter (ft) = 1.25
6. Typical outlet pipe Mannings n = 0.012
7. Typical outlet pipe slope (ft/ft) = 0.007
8. Typical catchbasin sump surface area (square feet) = 12.6
9. Total catchbasin depth (feet) = 5.9
10. Inflow hydrograph peak to average flow ratio = 3.8
11. Leakage rate through sump bottom (in/hr) = 0
12. Catchbasin Critical Particle Size File Name: Not needed - calculated by program

Control Practice 6: Other Device CP# 4 (SA) - SA Device, LU# 4 ,SA# 1
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 7: Other Device CP# 5 (SA) - SA Device, LU# 4 ,SA# 45
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 8: Other Device CP# 6 (SA) - SA Device, LU# 5 ,SA# 45
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 9: Catchbasin Cleaning CP# 3 (DS) - EX CB 1
1. Fraction of area served by catchbasins = 1.00
2. Number of catchbasins = 1
3. Average sump depth below catchbasin outlet invert (feet) = 1.01
4. Depth of sediment in catchbasin sump at beginning of study period (ft) = 0
5. Typical outlet pipe diameter (ft) = 1
6. Typical outlet pipe Mannings n = 0.012

7. Typical outlet pipe slope (ft/ft) = 0.007
8. Typical catchbasin sump surface area (square feet) = 7.1
9. Total catchbasin depth (feet) = 4.5
10. Inflow hydrograph peak to average flow ratio = 3.8
11. Leakage rate through sump bottom (in/hr) = 0
12. Catchbasin Critical Particle Size File Name: Not needed - calculated by program

Control Practice 10: Upflo Filter CP# 1 (DS) - DS UpfloFilter # 2
Media Type: CPZ
Fraction of Area Served by Upflo Filters (0-1): 1.0
Height from Outlet Invert to Structure Top (ft): 5.4
Sump Depth (ft): 3.00
Sump Cleaning/Filter Replacement is not considered during the model run
Solve for Given Conditions
Number of filters: 7

Control Practice 11: Catchbasin Cleaning CP# 4 (DS) - EX CB 2
1. Fraction of area served by catchbasins = 1.00
2. Number of catchbasins = 1
3. Average sump depth below catchbasin outlet invert (feet) = 1.01
4. Depth of sediment in catchbasin sump at beginning of study period (ft) = 0
5. Typical outlet pipe diameter (ft) = 1.25
6. Typical outlet pipe Mannings n = 0.012
7. Typical outlet pipe slope (ft/ft) = 0.005
8. Typical catchbasin sump surface area (square feet) = 12.6
9. Total catchbasin depth (feet) = 5.5
10. Inflow hydrograph peak to average flow ratio = 3.8
11. Leakage rate through sump bottom (in/hr) = 0
12. Catchbasin Critical Particle Size File Name: Not needed - calculated by program

Control Practice 12: Other Device CP# 7 (SA) - SA Device, LU# 6 ,SA# 45
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 13: Other Device CP# 8 (SA) - SA Device, LU# 2 ,SA# 31
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

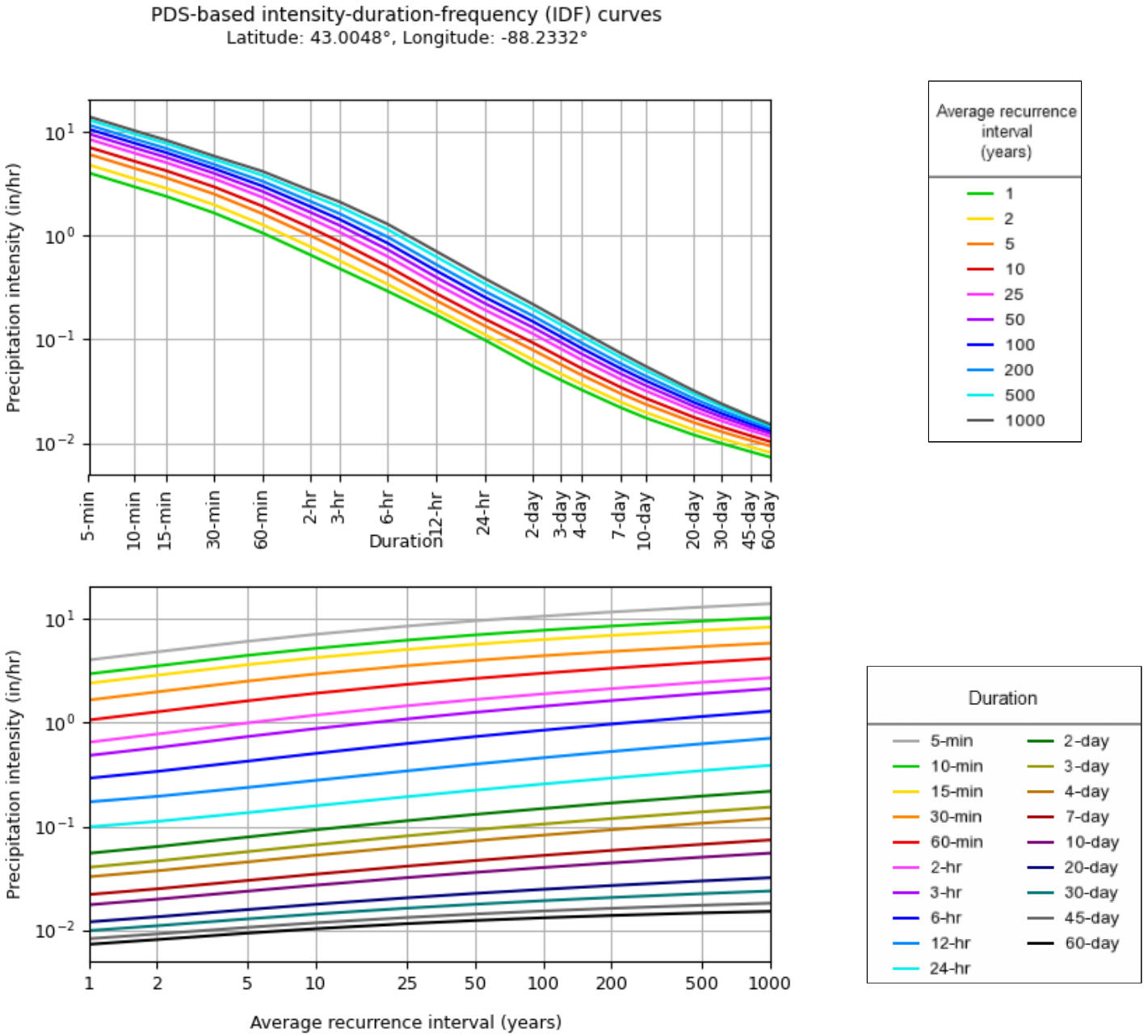
Control Practice 14: Other Device CP# 9 (SA) - SA Device, LU# 4 ,SA# 31
Fraction of drainage area served by device (ac) = 1.00
Particulate Concentration reduction fraction = 1.00
Filterable Concentration reduction fraction = 0.00
Runoff volume reduction fraction = 0

Control Practice 15: Other Device CP# 10 (SA) - SA Device, LU# 6 ,SA# 31
   Fraction of drainage area served by device (ac) = 1.00
   Particulate Concentration reduction fraction = 1.00
   Filterable Concentration reduction fraction = 0.00
   Runoff volume reduction fraction = 0

Data file name: I:\VJS Construction\22371 - Carroll University Redevelopment\060 CAD\800_SWMP\040_WinSLAMM\WinSLAMM Model.mdb
WinSLAMM Version 10.5.0
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/06 End of Winter Season: 03/28
Model Run Start Date: 01/05/69 Model Run End Date: 12/31/69
Date of run: 04-19-2024 Time of run: 09:36:20
Total Area Modeled (acres): 2.143
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	138688	-	126.6	1096	-
Outfall Total with Controls:	138739	-0.04%	73.83	639.4	41.66%
Annualized Total After Outfall Controls:	140666			648.3	

Appendix E Storm Sewer Sizing



NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Wed Feb 14 22:07:19 2024

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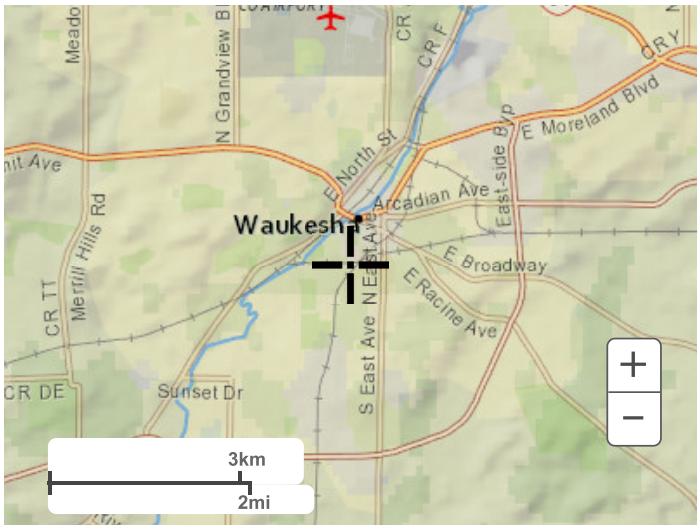
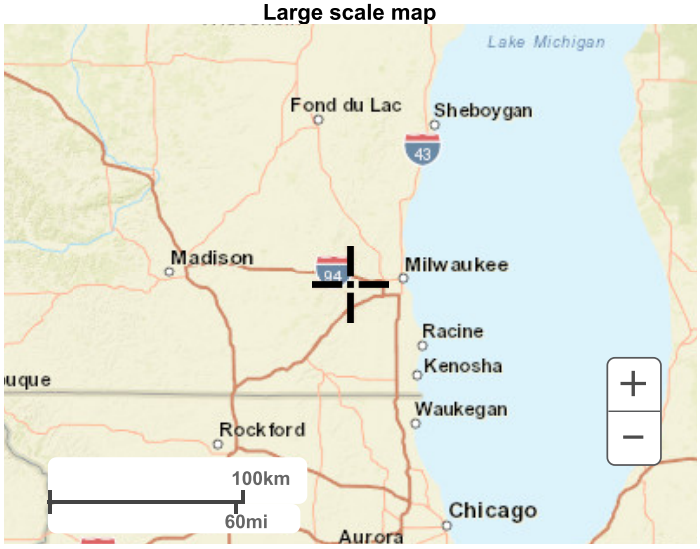
Maps & aerials

Small scale terrain

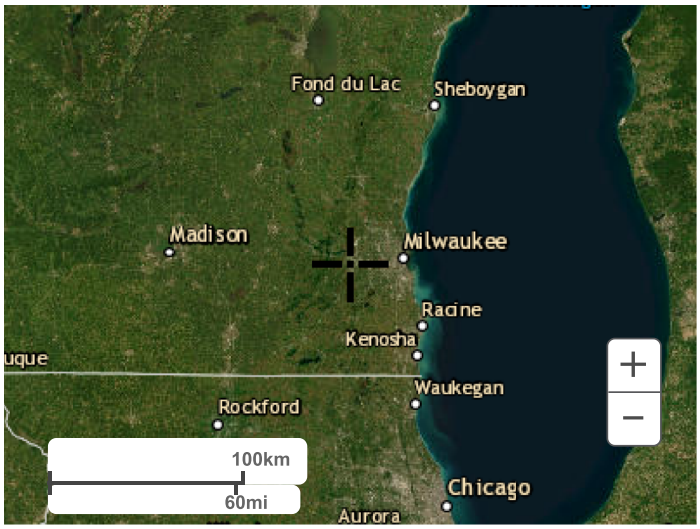


Large scale terrain

Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Hydraflow IDF Report

Return Period (Yrs)	Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	0.0000	0.0000	0.0000	--------
3	0.0000	0.0000	0.0000	--------
5	0.0000	0.0000	0.0000	--------
10	35.5617	5.0000	0.6993	--------
25	0.0000	0.0000	0.0000	--------
50	0.0000	0.0000	0.0000	--------
100	35.5162	2.6000	0.5974	--------

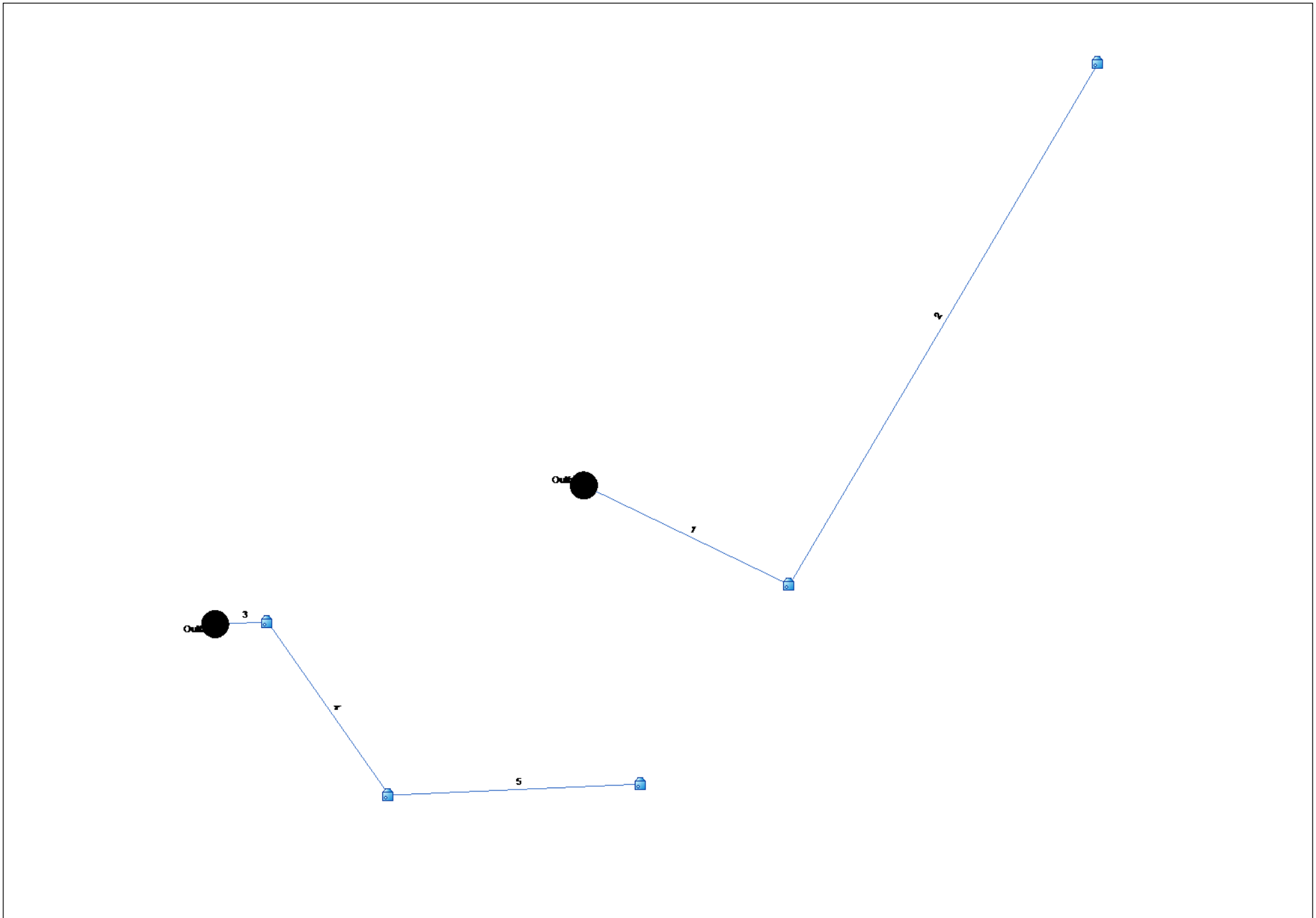
I:\VJS Construction\22371 - Carroll University Redevelopment\060 CAD\800_SWMP\050_Storm Sewer Sizing\Waukesha IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	7.11	5.35	4.38	3.75	3.30	2.96	2.70	2.48	2.31	2.16	2.03	1.92
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	10.57	7.82	6.40	5.51	4.89	4.43	4.07	3.78	3.53	3.33	3.15	3.00

Tc = time in minutes. Min Tc = 5

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: HGLs.stm	Number of lines: 5	Date: 4/19/2024

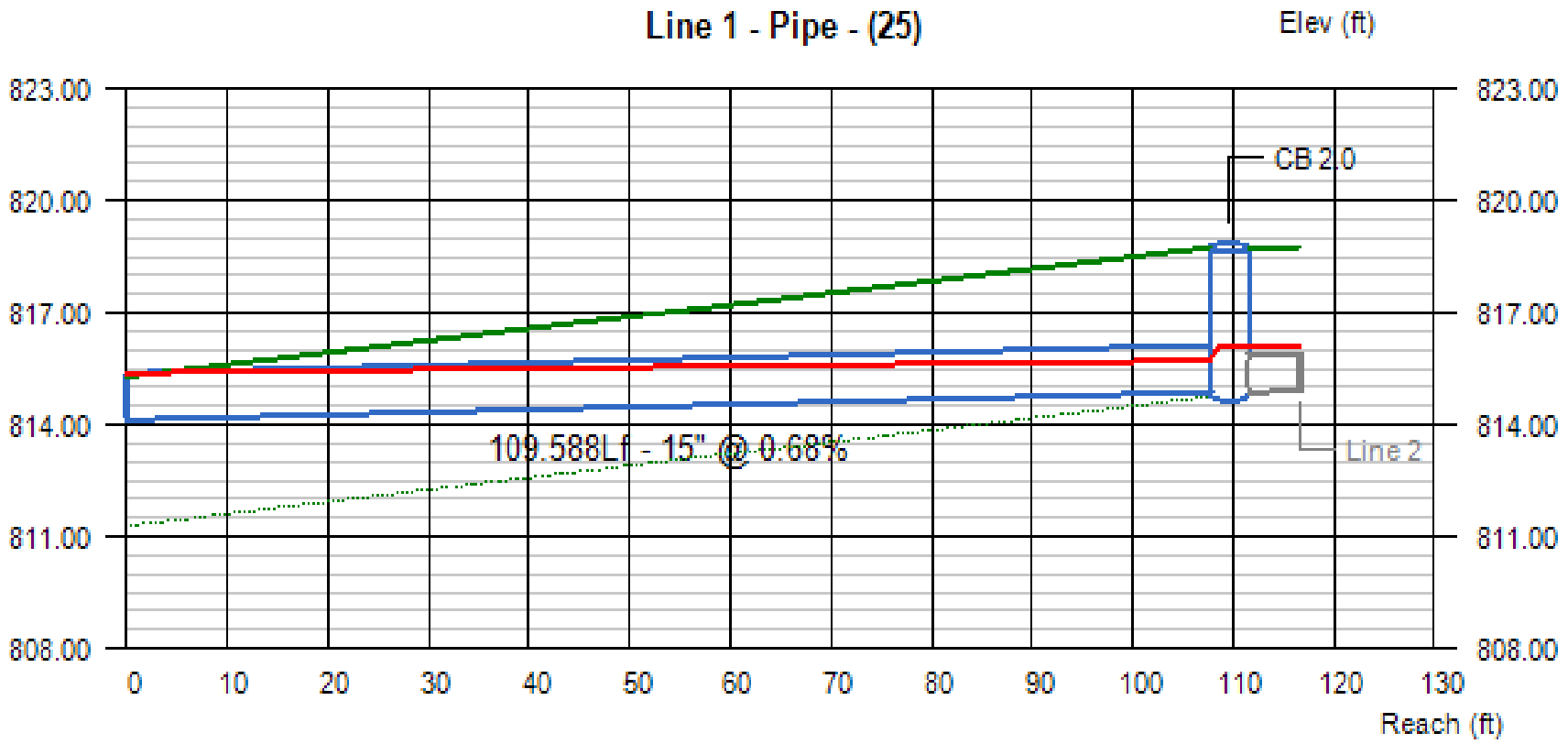
Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	109.588	0.43	0.70	0.87	0.37	0.59	10.0	12.3	7.1	4.16	5.75	4.07	15	0.68	814.13	814.87	815.38	815.71	815.28	818.74	Pipe - (25)
2	1	291.300	0.27	0.27	0.79	0.21	0.21	10.0	10.0	7.8	1.67	3.16	2.95	12	0.67	814.87	816.83	816.06	817.38	818.74	819.91	Pipe - (23)
3	End	25.360	0.00	0.66	0.00	0.00	0.54	0.0	11.0	7.5	4.04	2.44	5.14	12	0.40	814.11	814.21	815.11	815.39	815.19	819.62	Pipe - (22)
4	3	101.441	0.30	0.66	0.82	0.25	0.54	10.0	10.7	7.6	4.10	2.45	5.22	12	0.40	814.21	814.62	815.75	816.89	819.62	818.10	Pipe - (27)
5	4	121.501	0.36	0.36	0.82	0.30	0.30	10.0	10.0	7.8	2.31	2.42	2.94	12	0.40	814.62	815.10	817.26	817.69	818.10	818.10	Pipe - (26)

Project File: HGLs.stm | Number of lines: 5 | Run Date: 4/19/2024

NOTES:Intensity = 35.52 / (Inlet time + 2.60) ^ 0.60; Return period =Yrs. 100 ; c = cir e = ellip b = box

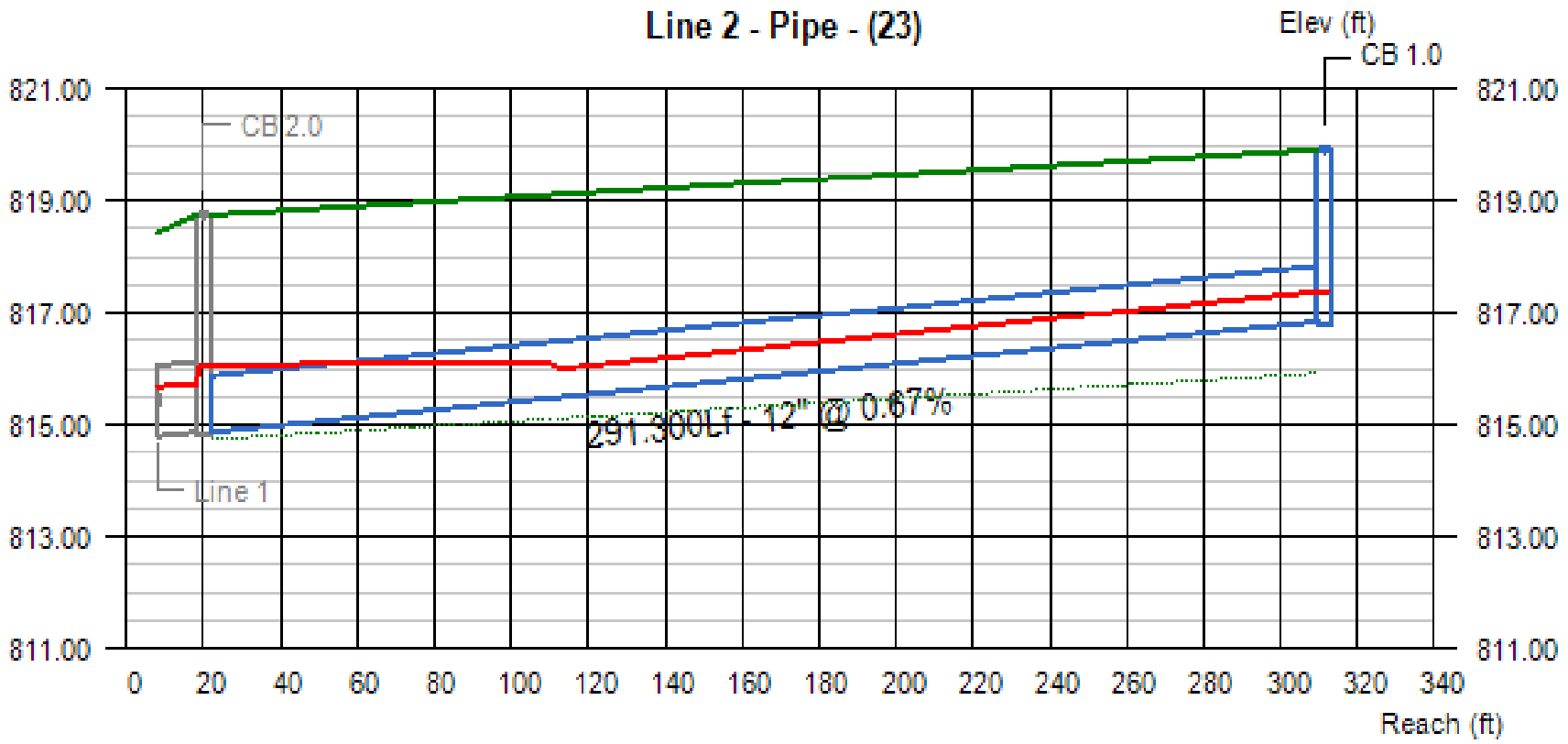
Line Profile (Line 1) - Pipe - (25)



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
1	4.16	814.13	814.87	1.25	0.84	1.19	815.38	815.71	816.06	3.39	4.74	-0.10	2.62

Project File: | No. Lines: 5 | Run Date: 4/19/2024

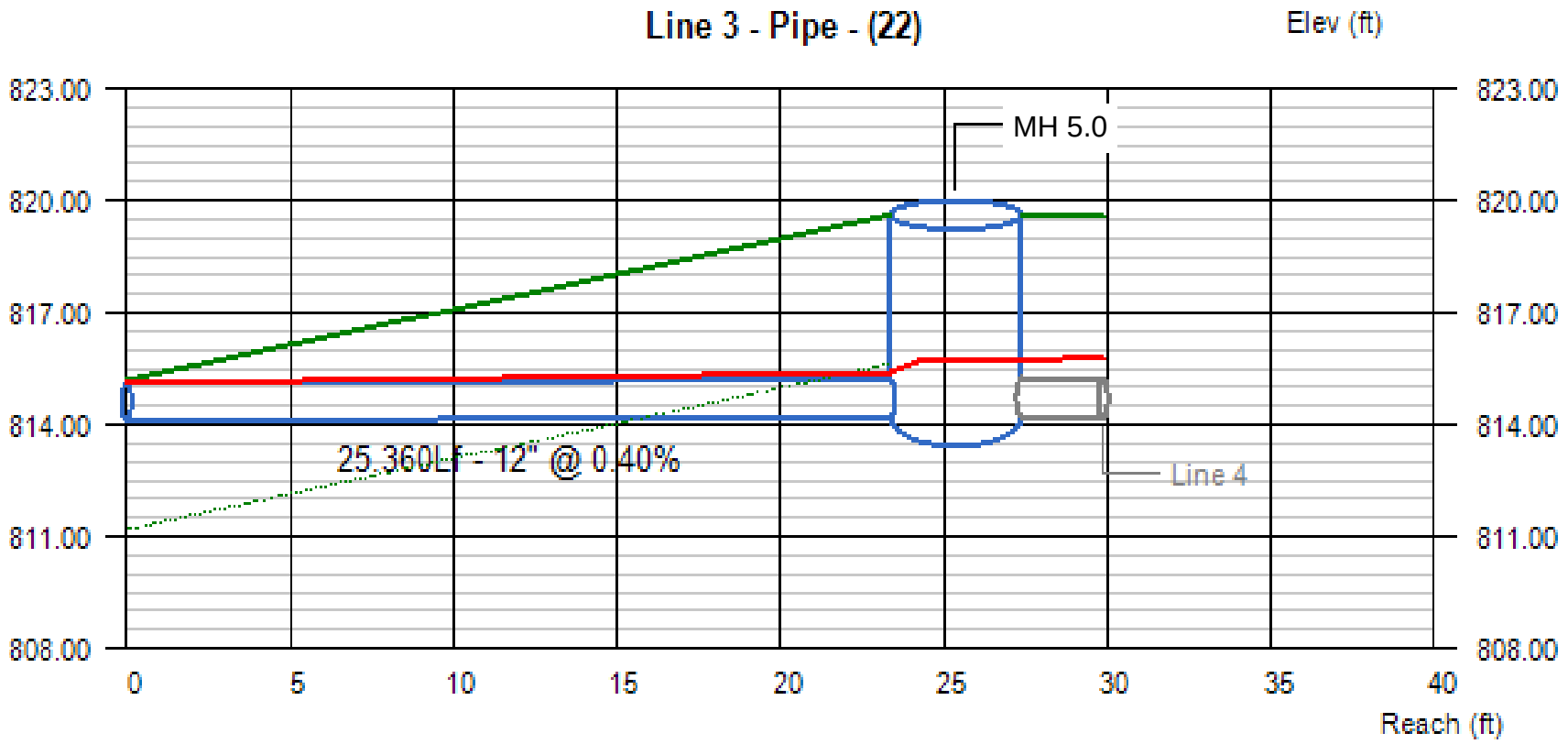
Line Profile (Line 2) - Pipe - (23)



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
2	1.67	814.87	816.83	1.00	0.55	0.55	816.06	817.38 j	817.38	2.12	3.78	2.87	2.08

Project File: | No. Lines: 5 | Run Date: 4/19/2024

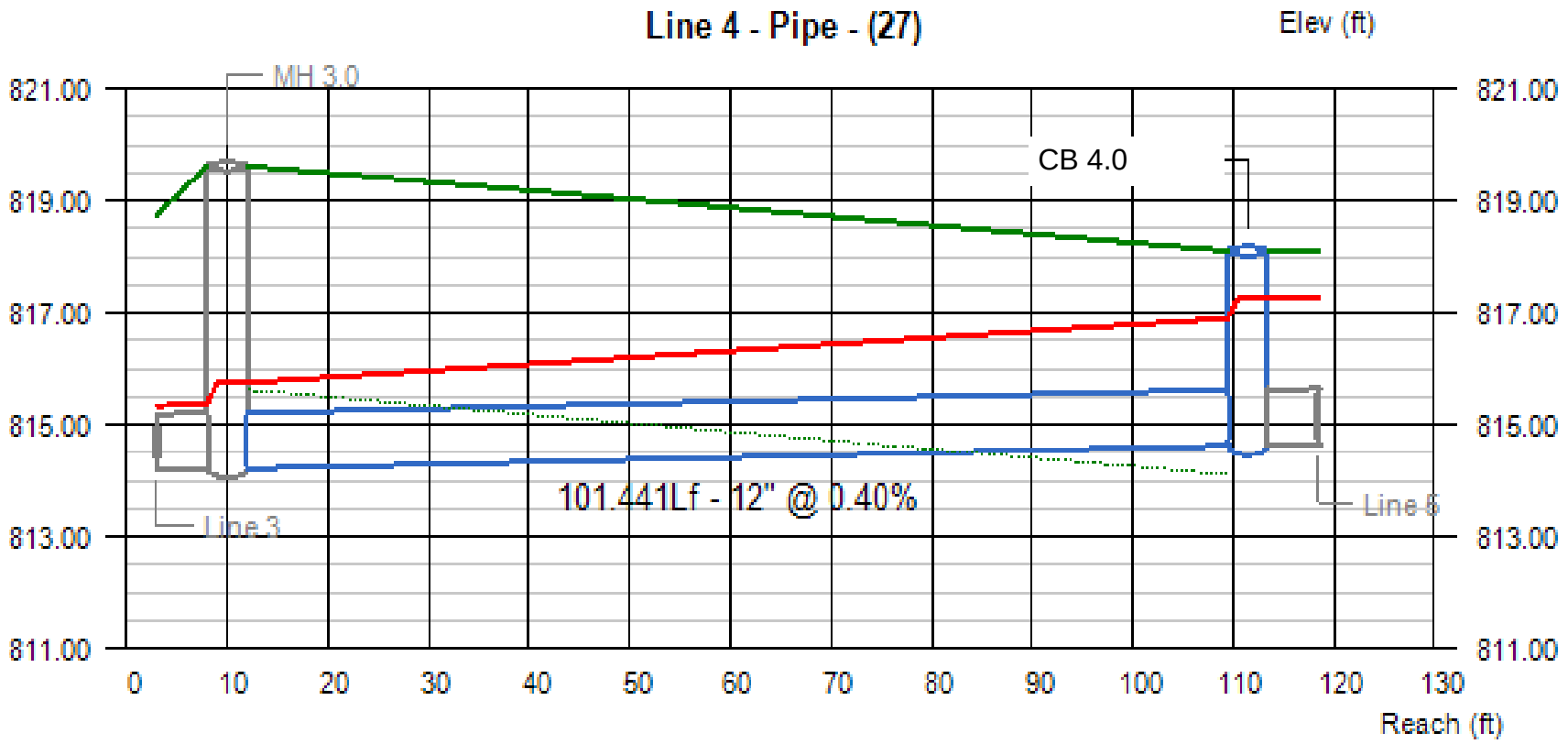
Line Profile (Line 3) - Pipe - (22)



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
3	4.04	814.11	814.21	1.00	1.00	1.53	815.11	815.39	815.75	5.14	5.14	0.08	4.41

Project File: | No. Lines: 5 | Run Date: 4/19/2024

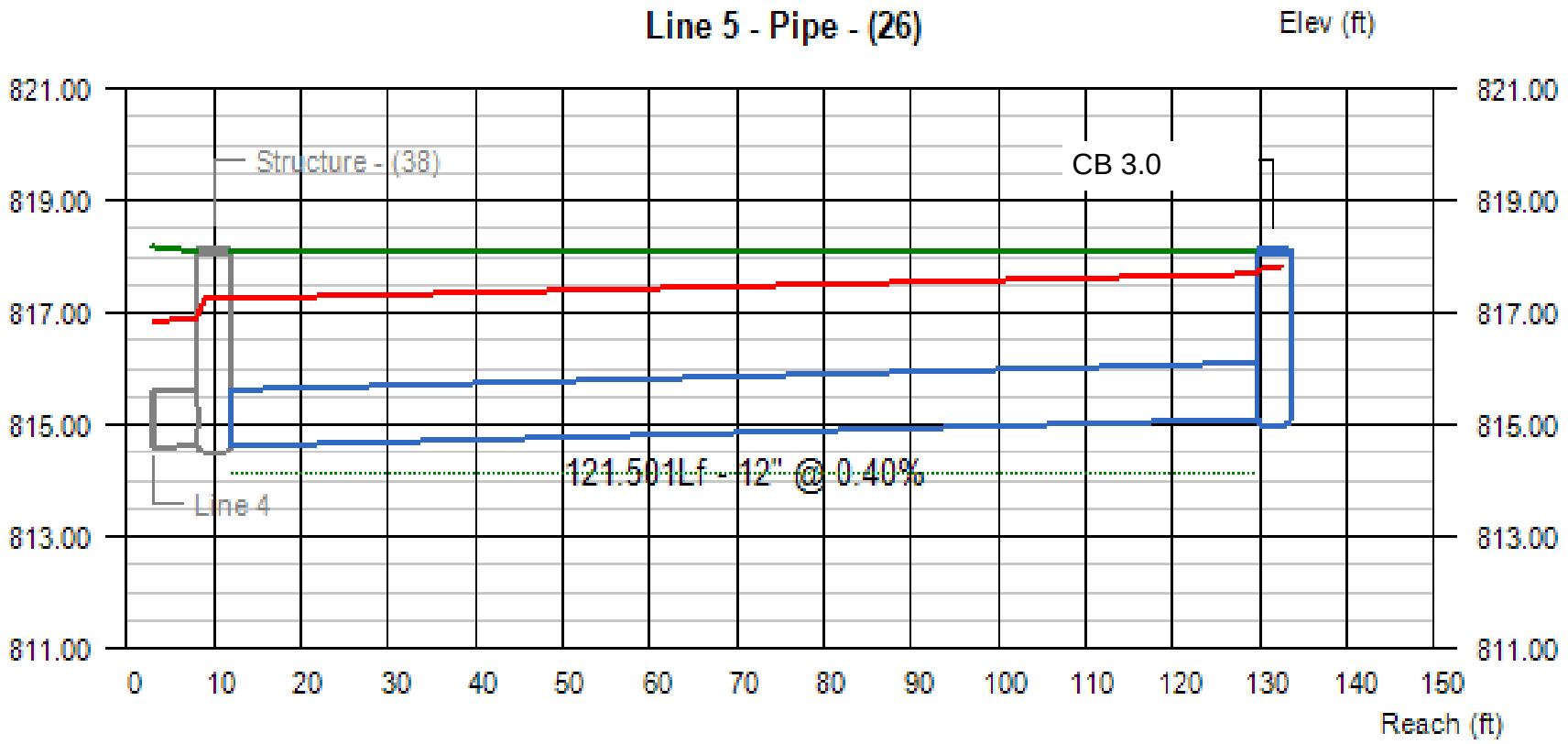
Line Profile (Line 4) - Pipe - (27)



Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
4	4.10	814.21	814.62	1.00	1.00	2.64	815.75	816.89	817.26	5.22	5.22	4.41	2.48

Project File: | No. Lines: 5 | Run Date: 4/19/2024

Line Profile (Line 5) - Pipe - (26)



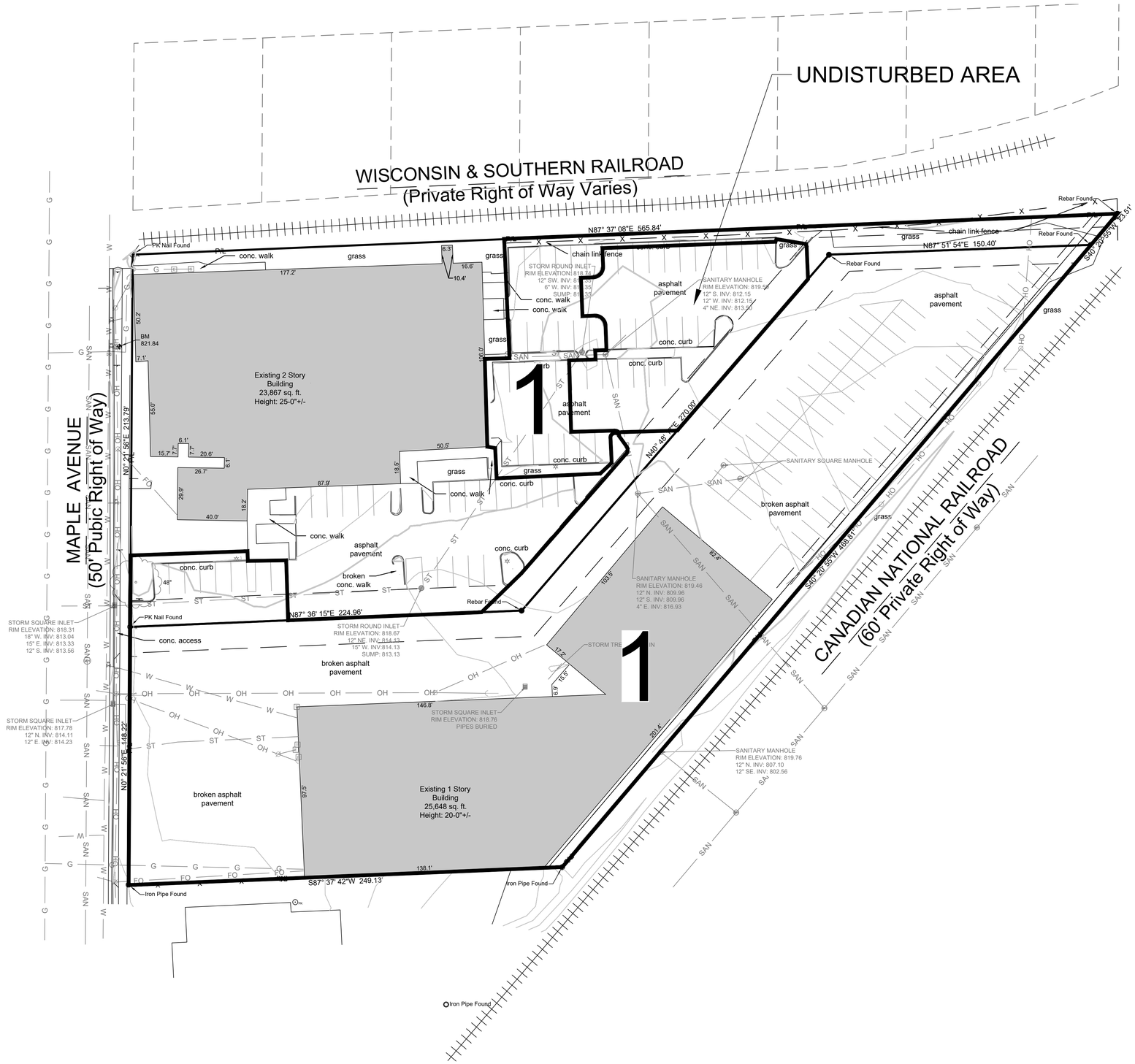
Line #	Q	Invert Elevation		Depth of Flow			Hydraulic Grade Line			Velocity		Cover	
	(cfs)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Hw (ft)	Dn (ft)	Up (ft)	Jnct (ft)	Dn (ft/s)	Up (ft/s)	Dn (ft)	Up (ft)
5	2.31	814.62	815.10	1.00	1.00	2.73	817.26	817.69	817.83	2.94	2.94	2.48	2.00

Project File: | No. Lines: 5 | Run Date: 4/19/2024

Appendix F Figures

2024.04.19

WATERSHED AREA 1			
Tc = 6.0 min.	SF	ACRE	CN
PROPOSED			
GREENSPACE	6454	0.15	61
PAVEMENT	60807	1.40	98
ROOF	26005	0.60	98
TOTAL	93266	2.14	95



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GRAPHIC SCALE
0 30 60

CARROLL UNIVERSITY REDEVELOPMENT
211 & 223 MAPLE AVE
WAUKESHA, WI

EXISTING CONDITIONS

PRELIMINARY NOT FOR CONSTRUCTION

ISSUANCE	DATE

NO.	REVISION	DATE

PROJECT NO:	22371
DESIGN DATE:	----
PLOT DATE:	2024.04.19
DRAWN BY:	HLY
CHECKED BY:	PJI
APPROVED BY:	CTC
SHEET NO:	SW1.0

MGARNER
SW1.0
22371

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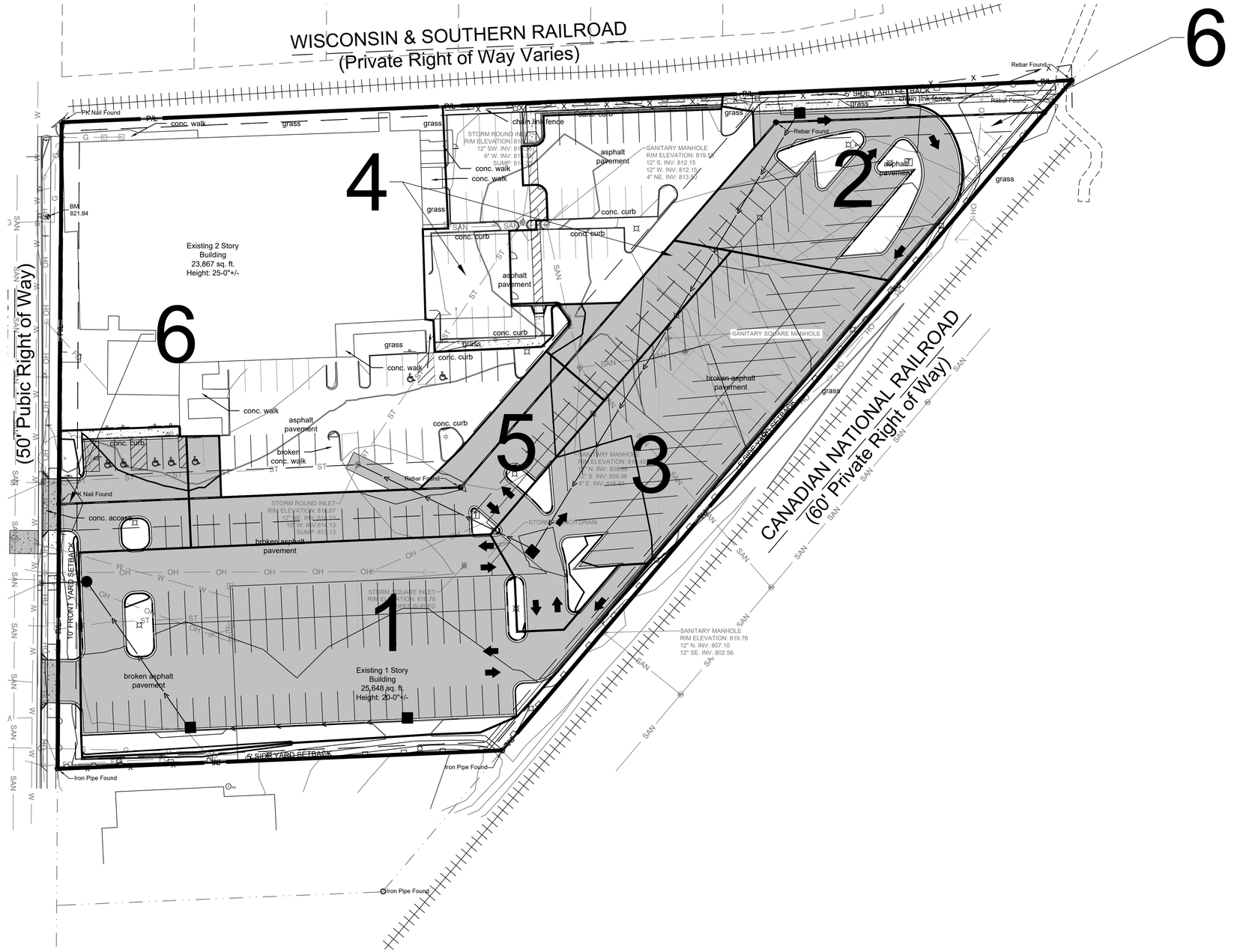

1 TO UPFLO FILTER DEVICE			
Tc = 6.0 min.	SF	ACRE	CN
PROPOSED			
GREENSPACE	3278	0.08	61
PAVEMENT	25541	0.59	98
TOTAL	28819	0.66	94

2 TO CB 1			
Tc = 6.0 min.	SF	ACRE	CN
PROPOSED			
GREENSPACE	1790	0.04	61
PAVEMENT	10132	0.23	98
ROOF	0	0.00	98
TOTAL	11922	0.27	92

3 TO CB 2			
Tc = 6.0 min.	SF	ACRE	CN
PROPOSED			
GREENSPACE	816	0.02	61
PAVEMENT	17750	0.41	98
ROOF	0	0.00	98
TOTAL	18566	0.43	96

4 TO EXISTING NORTH CB			
Tc = 6.0 min.	SF	ACRE	CN
PROPOSED			
GREENSPACE	1641	0.04	61
PAVEMENT	7690	0.18	98
ROOF	2333	0.05	98
TOTAL	11664	0.27	93

5 TO EXISTING SOUTH CB			
Tc = 6.0 min.	SF	ACRE	CN
PROPOSED			
GREENSPACE	254	0.01	61
PAVEMENT	8869	0.20	98
ROOF	0	0.00	98
TOTAL	9123	0.21	97

6 UNCAPTURED			
Tc = 6.0 min.	SF	ACRE	CN
PROPOSED			
GREENSPACE	8140	0.19	61
PAVEMENT	5029	0.12	98
ROOF	0	0.00	98
TOTAL	13169	0.30	75

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SW2.0

2024.04.19
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