DRAINAGE STATEMENT

For

220 COLD SOIL ROAD

Proposed Hay Barn

Block 7301, Lot 32.01
Lawrence Township, Mercer County, NJ

Prepared by:

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(609) 689-1100

James Bash, PE
NJ Professional Engineer License #52258

June 2023
VCEA # 2301WOT

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APPENDIX

I. Drainage Summary

This Drainage Statement has been prepared to define and analyze the stormwater drainage conditions that would occur as a result of the proposed development of Block 7301, Lot 32.01 as shown on the Lawrence Township tax map. The subject site consists of 29.4 acres and is a working horse farm. This analysis will focus on the 0.45 acre that will be disturbed as part of the project. This disturbed area will be referred to as "the site" in this report.

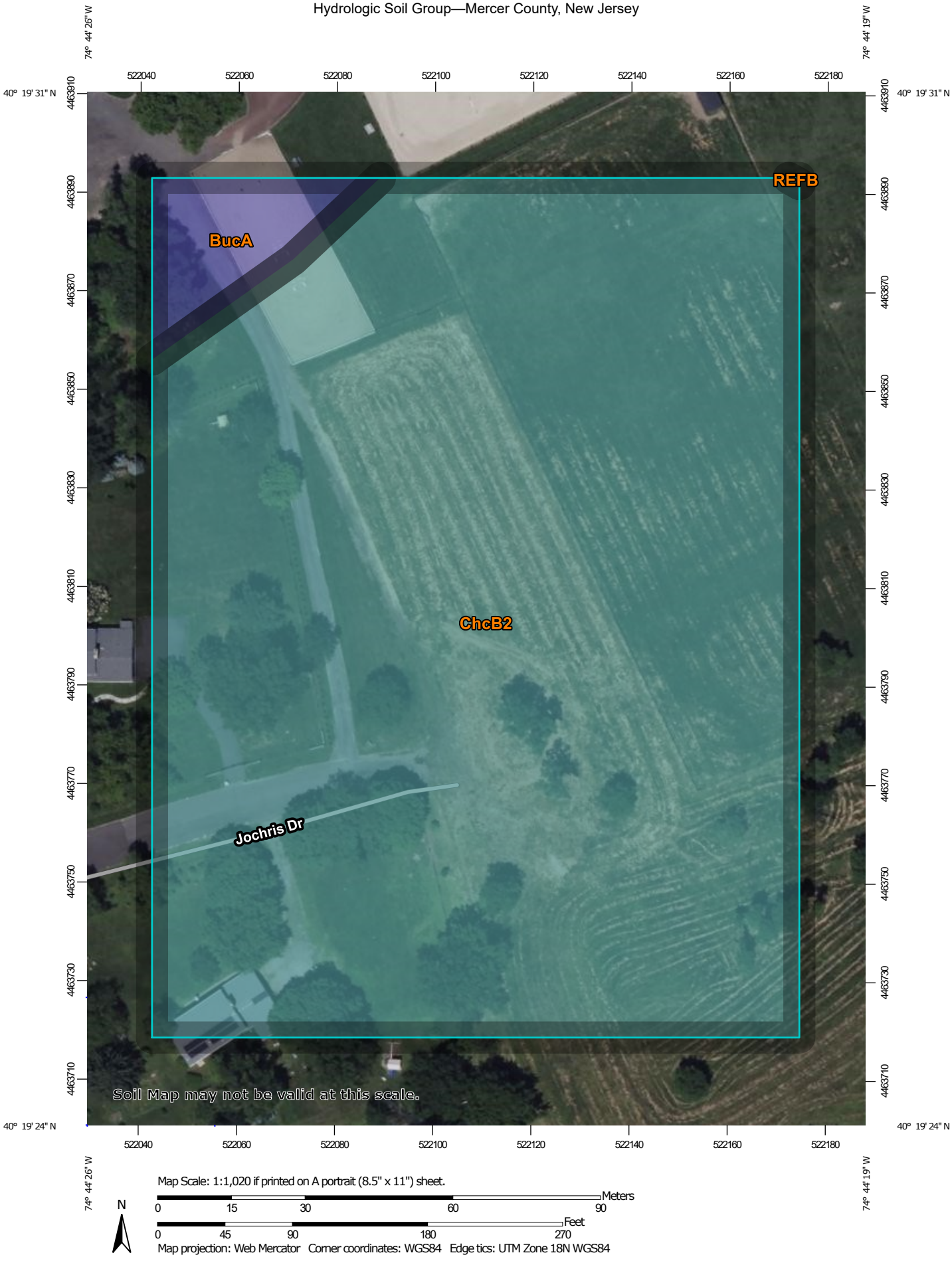
Under the existing conditions the work area is an open grass field. The proposed site improvements will consist of a 10,850 sf barn. The proposed improvements to the site will increase lot coverage by 0.249 acres. No motor vehicle surfaces or additional impervious surfaces are proposed.

The project consists of less than one (1) acre of disturbance and will not increase the impervious coverage on-site by ¼ acre or more, therefore the proposed project does not meet the definition of a 'major development' and is not subject to the NJDEP Stormwater Management Rules (NJAC 7:8). We analyzed the site runoff in the existing and proposed condition for the 100-year storm. The work area currently has a peak discharge of 2.6 cfs. The proposed plan increases the peak runoff to 3.3 cfs. This is an increase of 0.7 cfs and have no noticeable impact to stormwater runoff on this site or any adjacent properties. The hydrographs have been added to the appendix of this report.

In conclusion, we feel the project has been designed to ensure safe and efficient control of the stormwater runoff in a manner that will not adversely impact the existing drainage patterns, adjacent roadways, or adjacent parcels. Due to the small size of the development, the increase in peak runoff is de minimus. There will be no negative impacts to the surround properties.

Appendix

NRCS Soil Survey



Map Scale: 1:1,020 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 45 90 180 270

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:24,000.

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: Mercer County, New Jersey
Survey Area Data: Version 18, Aug 30, 2022

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

Date(s) aerial images were photographed: Jun 4, 2022—Jul 22, 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
BucA	Bucks silt loam, 0 to 2 percent slopes	B	0.2	4.0%
ChcB2	Chalfont silt loam, 2 to 6 percent slopes, eroded	C	5.5	96.0%
REFB	Readington and Abbottstown silt loams, 2 to 6 percent slopes	C	0.0	0.0%
Totals for Area of Interest			**5.7**	**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.

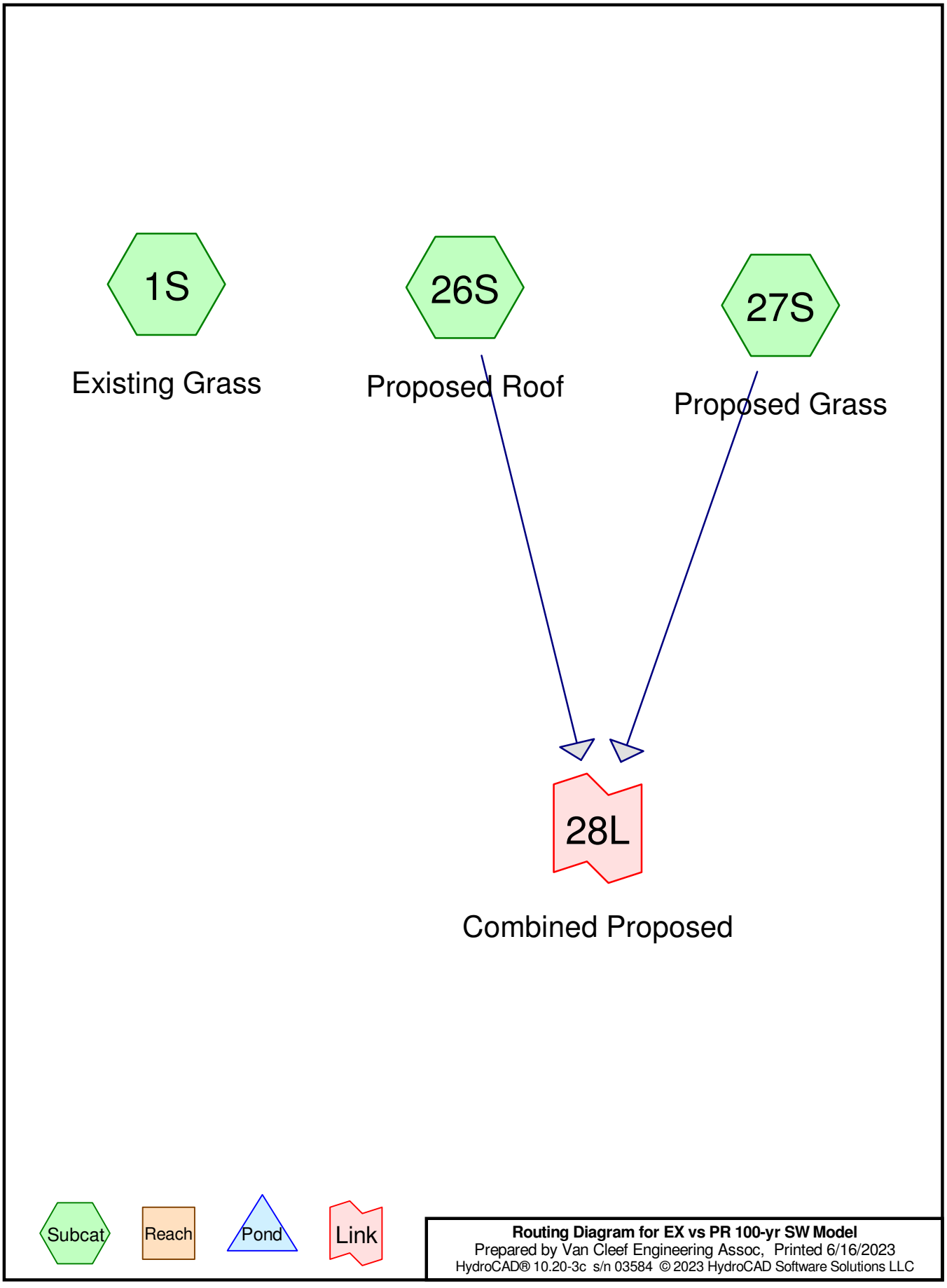
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

100-YEAR HYDROGRAPHS



Routing Diagram for EX vs PR 100-yr SW Model
Prepared by Van Cleef Engineering Assoc, Printed 6/16/2023

Time span=0.00-20.00 hrs, dt=0.05 hrs, 401 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 1S: Existing Grass Runoff Area=19,745 sf 0.00% Impervious Runoff Depth>4.84"
Flow Length=174' Slope=0.0230 '/' Tc=10.3 min CN=74 Runoff=2.6 cfs 0.183 af

Subcatchment 26S: Proposed Roof Runoff Area=10,850 sf 100.00% Impervious Runoff Depth>7.69"
Flow Length=35' Slope=0.2900 '/' Tc=0.2 min CN=98 Runoff=2.4 cfs 0.160 af

Subcatchment 27S: Proposed Grass Runoff Area=8,895 sf 0.00% Impervious Runoff Depth>4.85"
Flow Length=67' Slope=0.0200 '/' Tc=7.0 min CN=74 Runoff=1.3 cfs 0.082 af

Link 28L: Combined Proposed Inflow=3.3 cfs 0.242 af
Primary=3.3 cfs 0.242 af

Total Runoff Area = 0.907 ac Runoff Volume = 0.425 af Average Runoff Depth = 5.62"
72.52% Pervious = 0.657 ac 27.48% Impervious = 0.249 ac

Summary for Subcatchment 1S: Existing Grass

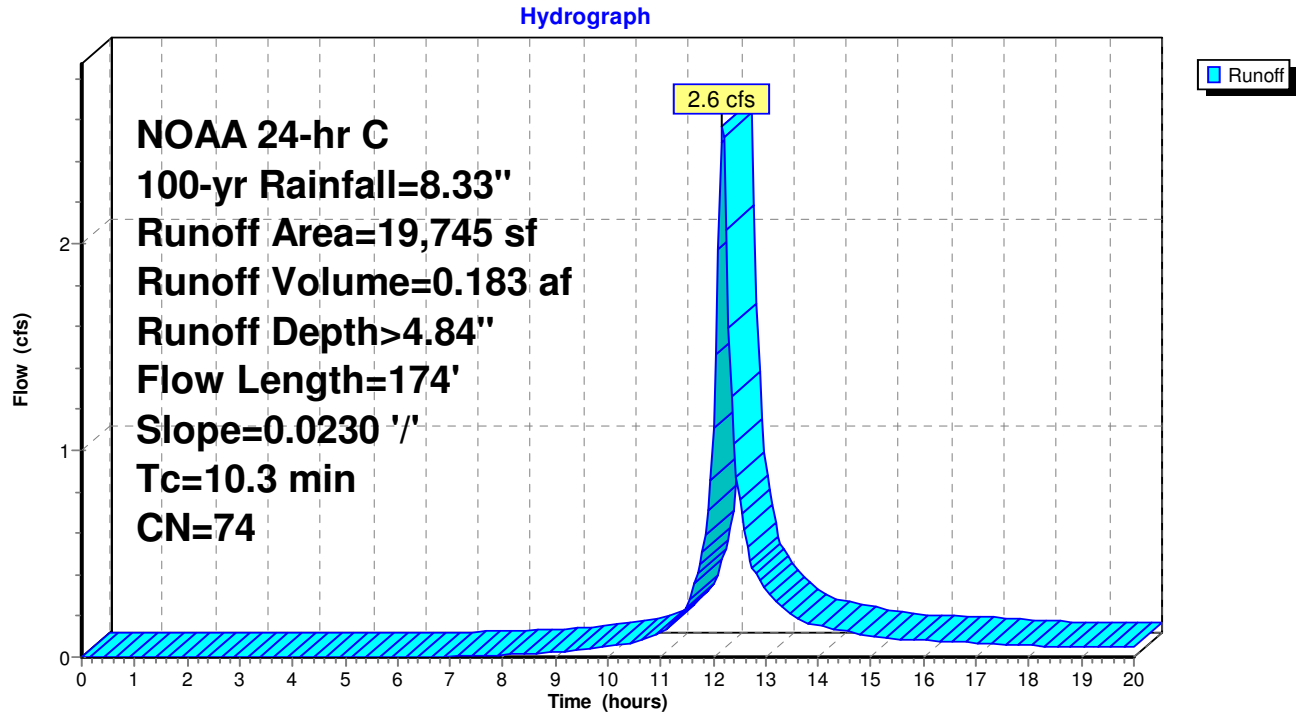
Runoff = 2.6 cfs @ 12.18 hrs, Volume= 0.183 af, Depth> 4.84"
Routed to nonexistent node 4P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-yr Rainfall=8.33"

	Area (sf)	CN	Description
*	19,745	74	>75% Grass cover, Good, HSG B
	19,745		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	100	0.0230	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"
1.2	74	0.0230	1.06		**Shallow Concentrated Flow, Shallow Conc** Short Grass Pasture Kv= 7.0 fps
10.3	174	Total			

Subcatchment 1S: Existing Grass



Hydrograph for Subcatchment 1S: Existing Grass

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
0.25	0.02	0.00	0.0
0.50	0.05	0.00	0.0
0.75	0.07	0.00	0.0
1.00	0.09	0.00	0.0
1.25	0.11	0.00	0.0
1.50	0.14	0.00	0.0
1.75	0.16	0.00	0.0
2.00	0.19	0.00	0.0
2.25	0.21	0.00	0.0
2.50	0.24	0.00	0.0
2.75	0.27	0.00	0.0
3.00	0.29	0.00	0.0
3.25	0.32	0.00	0.0
3.50	0.35	0.00	0.0
3.75	0.38	0.00	0.0
4.00	0.41	0.00	0.0
4.25	0.44	0.00	0.0
4.50	0.47	0.00	0.0
4.75	0.50	0.00	0.0
5.00	0.53	0.00	0.0
5.25	0.56	0.00	0.0
5.50	0.59	0.00	0.0
5.75	0.63	0.00	0.0
6.00	0.66	0.00	0.0
6.25	0.70	0.00	0.0
6.50	0.73	0.00	0.0
6.75	0.77	0.00	0.0
7.00	0.81	0.00	0.0
7.25	0.86	0.01	0.0
7.50	0.90	0.01	0.0
7.75	0.95	0.02	0.0
8.00	1.00	0.02	0.0
8.25	1.05	0.03	0.0
8.50	1.10	0.04	0.0
8.75	1.16	0.05	0.0
9.00	1.22	0.07	0.0
9.25	1.28	0.08	0.0
9.50	1.35	0.10	0.0
9.75	1.43	0.13	0.0
10.00	1.52	0.15	0.1
10.25	1.61	0.19	0.1
10.50	1.72	0.23	0.1
10.75	1.84	0.28	0.1
11.00	2.00	0.35	0.1
11.25	2.20	0.45	0.2
11.50	2.46	0.59	0.2
11.75	2.93	0.86	0.4
12.00	3.97	1.57	**1.1**
12.25	5.40	2.69	**2.1**
12.50	5.87	3.07	0.8
12.75	6.13	3.29	0.4
13.00	6.33	3.47	0.3
13.25	6.49	3.60	0.3
13.50	6.61	3.71	0.2
13.75	6.72	3.80	0.2
14.00	6.81	3.88	0.2
14.25	6.90	3.95	0.1
14.50	6.98	4.02	0.1
14.75	7.05	4.09	0.1
15.00	7.11	4.14	0.1
15.25	7.17	4.19	0.1
15.50	7.23	4.24	0.1
15.75	7.28	4.29	0.1
16.00	7.33	4.33	0.1
16.25	7.38	4.38	0.1
16.50	7.43	4.42	0.1
16.75	7.47	4.46	0.1
17.00	7.52	4.50	0.1
17.25	7.56	4.53	0.1
17.50	7.60	4.57	0.1
17.75	7.63	4.60	0.1
18.00	7.67	4.63	0.1
18.25	7.70	4.66	0.1
18.50	7.74	4.69	0.1
18.75	7.77	4.72	0.1
19.00	7.80	4.75	0.1
19.25	7.83	4.78	0.1
19.50	7.86	4.80	0.1
19.75	7.89	4.83	0.0
20.00	**7.92**	**4.86**	0.0

Summary for Subcatchment 26S: Proposed Roof

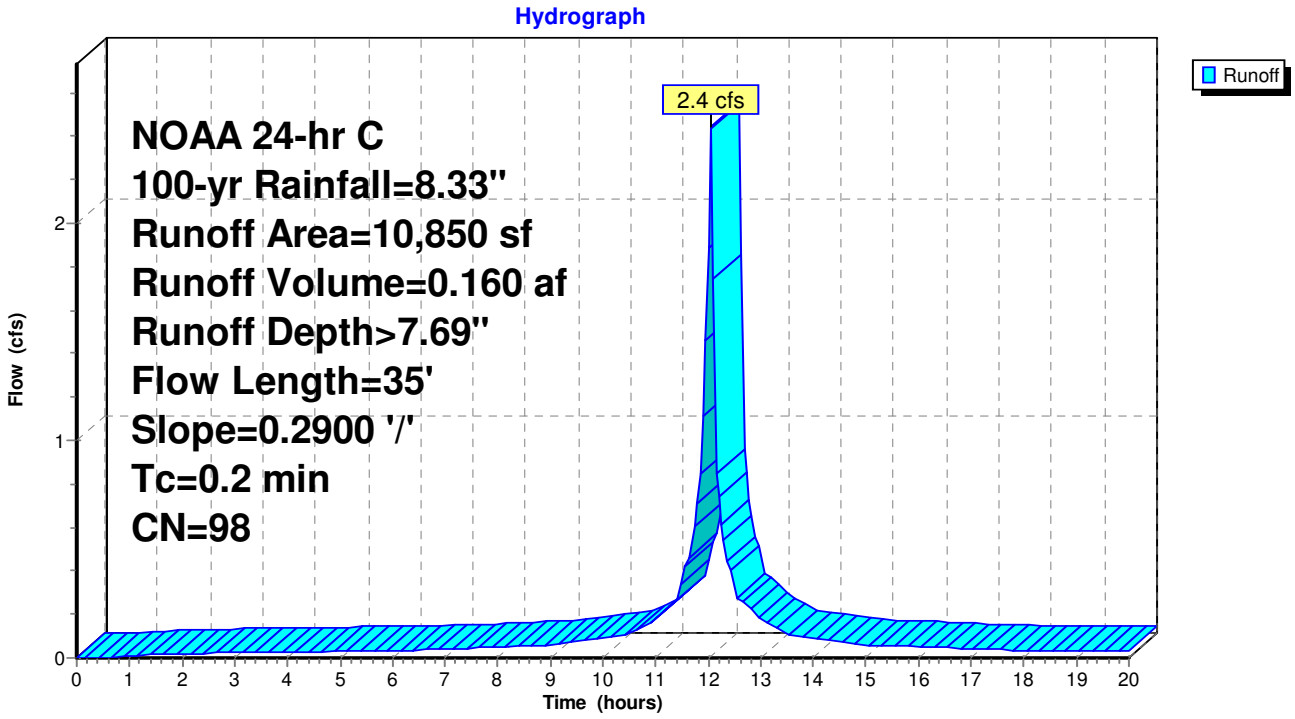
Runoff = 2.4 cfs @ 12.05 hrs, Volume= 0.160 af, Depth> 7.69"
Routed to Link 28L : Combined Proposed

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-yr Rainfall=8.33"

Area (sf)	CN	Description
10,850	98	Paved parking, HSG A
10,850		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	35	0.2900	3.31		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.31"

Subcatchment 26S: Proposed Roof



Hydrograph for Subcatchment 26S: Proposed Roof

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
0.25	0.02	0.00	0.0
0.50	0.05	0.00	0.0
0.75	0.07	0.00	0.0
1.00	0.09	0.01	0.0
1.25	0.11	0.02	0.0
1.50	0.14	0.03	0.0
1.75	0.16	0.05	0.0
2.00	0.19	0.06	0.0
2.25	0.21	0.08	0.0
2.50	0.24	0.10	0.0
2.75	0.27	0.12	0.0
3.00	0.29	0.14	0.0
3.25	0.32	0.16	0.0
3.50	0.35	0.19	0.0
3.75	0.38	0.21	0.0
4.00	0.41	0.24	0.0
4.25	0.44	0.26	0.0
4.50	0.47	0.29	0.0
4.75	0.50	0.32	0.0
5.00	0.53	0.34	0.0
5.25	0.56	0.37	0.0
5.50	0.59	0.40	0.0
5.75	0.63	0.43	0.0
6.00	0.66	0.47	0.0
6.25	0.70	0.50	0.0
6.50	0.73	0.53	0.0
6.75	0.77	0.57	0.0
7.00	0.81	0.61	0.0
7.25	0.86	0.65	0.0
7.50	0.90	0.70	0.0
7.75	0.95	0.74	0.0
8.00	1.00	0.79	0.0
8.25	1.05	0.84	0.1
8.50	1.10	0.89	0.1
8.75	1.16	0.95	0.1
9.00	1.22	1.00	0.1
9.25	1.28	1.06	0.1
9.50	1.35	1.13	0.1
9.75	1.43	1.21	0.1
10.00	1.52	1.30	0.1
10.25	1.61	1.39	0.1
10.50	1.72	1.49	0.1
10.75	1.84	1.62	0.1
11.00	2.00	1.77	0.2
11.25	2.20	1.98	0.2
11.50	2.46	2.23	0.3
11.75	2.93	2.70	0.6
12.00	3.97	3.74	**1.9**
12.25	5.40	5.16	**0.6**
12.50	5.87	5.63	0.4
12.75	6.13	5.89	0.2
13.00	6.33	6.09	0.2
13.25	6.49	6.25	0.1
13.50	6.61	6.37	0.1
13.75	6.72	6.48	0.1
14.00	6.81	6.57	0.1
14.25	6.90	6.66	0.1
14.50	6.98	6.74	0.1
14.75	7.05	6.81	0.1
15.00	7.11	6.87	0.1
15.25	7.17	6.93	0.1
15.50	7.23	6.99	0.1
15.75	7.28	7.04	0.1
16.00	7.33	7.09	0.1
16.25	7.38	7.14	0.0
16.50	7.43	7.19	0.0
16.75	7.47	7.23	0.0
17.00	7.52	7.28	0.0
17.25	7.56	7.32	0.0
17.50	7.60	7.36	0.0
17.75	7.63	7.40	0.0
18.00	7.67	7.43	0.0
18.25	7.70	7.46	0.0
18.50	7.74	7.50	0.0
18.75	7.77	7.53	0.0
19.00	7.80	7.56	0.0
19.25	7.83	7.59	0.0
19.50	7.86	7.62	0.0
19.75	7.89	7.65	0.0
20.00	**7.92**	**7.68**	0.0

Summary for Subcatchment 27S: Proposed Grass

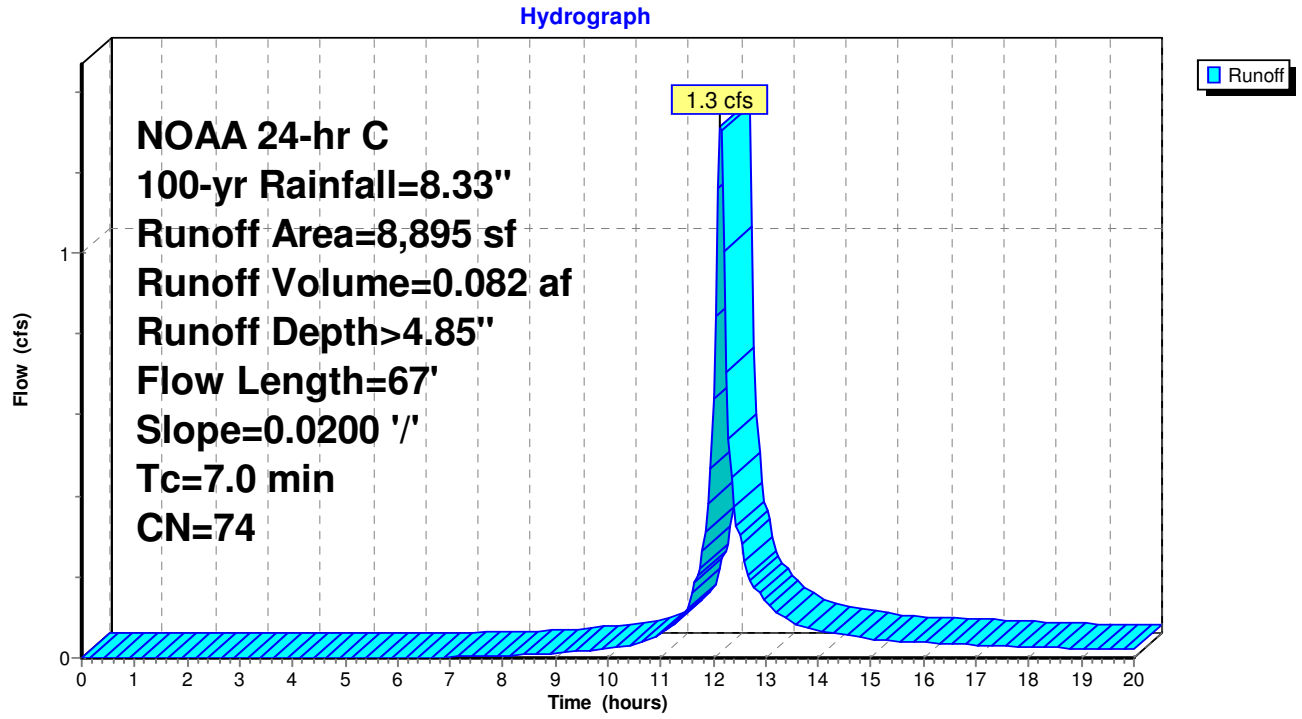
Runoff = 1.3 cfs @ 12.14 hrs, Volume= 0.082 af, Depth> 4.85"
Routed to Link 28L : Combined Proposed

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 100-yr Rainfall=8.33"

	Area (sf)	CN	Description
*	8,895	74	>75% Grass cover, Good, HSG B
	8,895		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	67	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.31"

Subcatchment 27S: Proposed Grass



Hydrograph for Subcatchment 27S: Proposed Grass

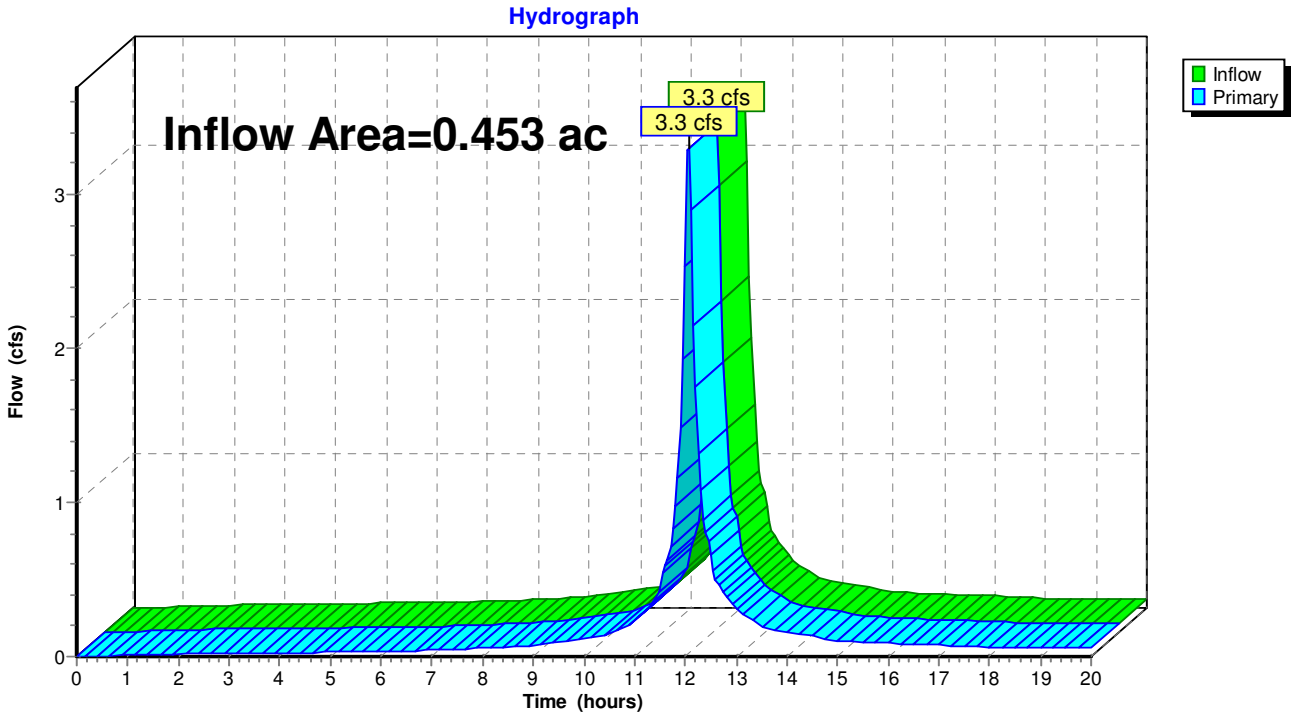
Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
0.25	0.02	0.00	0.0
0.50	0.05	0.00	0.0
0.75	0.07	0.00	0.0
1.00	0.09	0.00	0.0
1.25	0.11	0.00	0.0
1.50	0.14	0.00	0.0
1.75	0.16	0.00	0.0
2.00	0.19	0.00	0.0
2.25	0.21	0.00	0.0
2.50	0.24	0.00	0.0
2.75	0.27	0.00	0.0
3.00	0.29	0.00	0.0
3.25	0.32	0.00	0.0
3.50	0.35	0.00	0.0
3.75	0.38	0.00	0.0
4.00	0.41	0.00	0.0
4.25	0.44	0.00	0.0
4.50	0.47	0.00	0.0
4.75	0.50	0.00	0.0
5.00	0.53	0.00	0.0
5.25	0.56	0.00	0.0
5.50	0.59	0.00	0.0
5.75	0.63	0.00	0.0
6.00	0.66	0.00	0.0
6.25	0.70	0.00	0.0
6.50	0.73	0.00	0.0
6.75	0.77	0.00	0.0
7.00	0.81	0.00	0.0
7.25	0.86	0.01	0.0
7.50	0.90	0.01	0.0
7.75	0.95	0.02	0.0
8.00	1.00	0.02	0.0
8.25	1.05	0.03	0.0
8.50	1.10	0.04	0.0
8.75	1.16	0.05	0.0
9.00	1.22	0.07	0.0
9.25	1.28	0.08	0.0
9.50	1.35	0.10	0.0
9.75	1.43	0.13	0.0
10.00	1.52	0.15	0.0
10.25	1.61	0.19	0.0
10.50	1.72	0.23	0.0
10.75	1.84	0.28	0.0
11.00	2.00	0.35	0.1
11.25	2.20	0.45	0.1
11.50	2.46	0.59	0.1
11.75	2.93	0.86	0.2
12.00	3.97	1.57	**0.6**
12.25	5.40	2.69	**0.7**
12.50	5.87	3.07	0.3
12.75	6.13	3.29	0.2
13.00	6.33	3.47	0.1
13.25	6.49	3.60	0.1
13.50	6.61	3.71	0.1
13.75	6.72	3.80	0.1
14.00	6.81	3.88	0.1
14.25	6.90	3.95	0.1
14.50	6.98	4.02	0.1
14.75	7.05	4.09	0.1
15.00	7.11	4.14	0.0
15.25	7.17	4.19	0.0
15.50	7.23	4.24	0.0
15.75	7.28	4.29	0.0
16.00	7.33	4.33	0.0
16.25	7.38	4.38	0.0
16.50	7.43	4.42	0.0
16.75	7.47	4.46	0.0
17.00	7.52	4.50	0.0
17.25	7.56	4.53	0.0
17.50	7.60	4.57	0.0
17.75	7.63	4.60	0.0
18.00	7.67	4.63	0.0
18.25	7.70	4.66	0.0
18.50	7.74	4.69	0.0
18.75	7.77	4.72	0.0
19.00	7.80	4.75	0.0
19.25	7.83	4.78	0.0
19.50	7.86	4.80	0.0
19.75	7.89	4.83	0.0
20.00	**7.92**	**4.86**	0.0

Summary for Link 28L: Combined Proposed

Inflow Area = 0.453 ac, 54.95% Impervious, Inflow Depth > 6.41" for 100-yr event
Inflow = 3.3 cfs @ 12.06 hrs, Volume= 0.242 af
Primary = 3.3 cfs @ 12.06 hrs, Volume= 0.242 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.05 hrs

Link 28L: Combined Proposed



Hydrograph for Link 28L: Combined Proposed

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0
0.25	0.0	0.00	0.0
0.50	0.0	0.00	0.0
0.75	0.0	0.00	0.0
1.00	0.0	0.00	0.0
1.25	0.0	0.00	0.0
1.50	0.0	0.00	0.0
1.75	0.0	0.00	0.0
2.00	0.0	0.00	0.0
2.25	0.0	0.00	0.0
2.50	0.0	0.00	0.0
2.75	0.0	0.00	0.0
3.00	0.0	0.00	0.0
3.25	0.0	0.00	0.0
3.50	0.0	0.00	0.0
3.75	0.0	0.00	0.0
4.00	0.0	0.00	0.0
4.25	0.0	0.00	0.0
4.50	0.0	0.00	0.0
4.75	0.0	0.00	0.0
5.00	0.0	0.00	0.0
5.25	0.0	0.00	0.0
5.50	0.0	0.00	0.0
5.75	0.0	0.00	0.0
6.00	0.0	0.00	0.0
6.25	0.0	0.00	0.0
6.50	0.0	0.00	0.0
6.75	0.0	0.00	0.0
7.00	0.0	0.00	0.0
7.25	0.0	0.00	0.0
7.50	0.0	0.00	0.0
7.75	0.1	0.00	0.1
8.00	0.1	0.00	0.1
8.25	0.1	0.00	0.1
8.50	0.1	0.00	0.1
8.75	0.1	0.00	0.1
9.00	0.1	0.00	0.1
9.25	0.1	0.00	0.1
9.50	0.1	0.00	0.1
9.75	0.1	0.00	0.1
10.00	0.1	0.00	0.1
10.25	0.1	0.00	0.1
10.50	0.1	0.00	0.1
10.75	0.2	0.00	0.2
11.00	0.2	0.00	0.2
11.25	0.3	0.00	0.3
11.50	0.5	0.00	0.5
11.75	0.8	0.00	0.8
12.00	**2.5**	0.00	**2.5**
12.25	**1.3**	0.00	**1.3**
12.50	0.7	0.00	0.7
12.75	0.4	0.00	0.4
13.00	0.3	0.00	0.3
13.25	0.3	0.00	0.3
13.50	0.2	0.00	0.2
13.75	0.2	0.00	0.2
14.00	0.2	0.00	0.2
14.25	0.1	0.00	0.1
14.50	0.1	0.00	0.1
14.75	0.1	0.00	0.1
15.00	0.1	0.00	0.1
15.25	0.1	0.00	0.1
15.50	0.1	0.00	0.1
15.75	0.1	0.00	0.1
16.00	0.1	0.00	0.1
16.25	0.1	0.00	0.1
16.50	0.1	0.00	0.1
16.75	0.1	0.00	0.1
17.00	0.1	0.00	0.1
17.25	0.1	0.00	0.1
17.50	0.1	0.00	0.1
17.75	0.1	0.00	0.1
18.00	0.1	0.00	0.1
18.25	0.1	0.00	0.1
18.50	0.1	0.00	0.1
18.75	0.1	0.00	0.1
19.00	0.1	0.00	0.1
19.25	0.1	0.00	0.1
19.50	0.1	0.00	0.1
19.75	0.1	0.00	0.1
20.00	0.1	0.00	0.1

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