STORMWATER MANAGEMENT PLAN

Belland Farms
NW Quad – Main Street & 24th Avenue N
Lino Lakes, Minnesota
Carlson McCain Project No.: 9614-00

Prepared for:

Rehbein Properties
7625 24th Avenue N
Hugo, MN 55038

September 13, 2021
Revised: November 8, 2021
Revised: November 19, 2021

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ENGINEERING \ LAND SURVEYING \ ENVIRONMENTAL

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1.0 INTRODUCTION

This document provides detailed information on the proposed surface water management system for the development of property located in the northwest quadrant of Main Street (CSAH 14) and 24th Avenue N in Lino Lakes, Anoka County, Minnesota. R & R Leasing plans on developing the property into two commercial lots with a public street bisecting the site from east to west. Included in this document are peak elevations for the onsite basin, a rate control analysis, water quality analysis, and a storm sewer design. See Figure 1 for a site location map.

1.1 Existing Conditions

The site is located in the northwest quadrant of the intersection of Main Street and 24th Avenue N in Lino Lakes, Minnesota. The site is bounded on the south by Main Street, on the west by commercial and agricultural land, on the north by agricultural land, and on the east by 24th Avenue N. The site is currently undeveloped and is used for agricultural purposes.

The proposed site boundary, exclusive of right of way, consists of 17.69 acres. The drainage boundary being considered is 11.296 acres, which includes run-on from the west and excludes the portion of the property draining north that is outside of the proposed development limits. The drainage boundary contains 0.303 acres of existing impervious surface, which is the portion of 24th Avenue N draining to the site. There are five wetlands located onsite in the low areas scattered throughout the site.

Elevations of the site are generally around 920 in the eastern and southern portions of the site, down to about 912 at the wetland in the northwest corner of the site. All stormwater from the site either drains to a culvert located in the southeast corner of the site or to the north to the wetland located in the northwest corner of the site. The wetland located in the southwest corner of the site overflows to the culvert located in the southeast corner of the site. See Figure 2 for an existing conditions drainage map.

Clearwater Creek is located approximately 0.4 miles south of the site and ultimately receives all runoff from the site and is listed as impaired for stormwater related parameters.

1.2 Proposed Conditions

Rehbein Properties plans on developing the site into two commercial lots, and reserving an outlot for potential future development. Lot 1, Block 1 is proposed to be a medical office building. Lot 2, Block 1 is proposed to be a daycare facility. A public street is proposed to be constructed along the northern boundaries of Lot 1, Block 1 and Lot 2, Block 1 and will run from east to west. The proposed drainage boundary will contain approximately 2.942 acres of impervious surface, which includes the public street, Lot 1 and Lot 2, Block, for a net increase of 2.639 acres.

One wet sedimentation basin will be constructed to provide water quality and rate control for the site. All stormwater that doesn't flow to the basin will ultimately flow to the culvert located in the southeast corner of the site. See Figure 3 for a proposed conditions drainage map.

1.3 Soil Information

In June of 2021, Braun Intertec drilled seven soil borings to approximate near surface soils. The borings indicate that near surface soils consist primarily of clayey sand and sandy lean clay. These soils generally fall within the Hydrologic Soil Group (HSG) "C".

Groundwater was observed in borings ST-1 (SE corner of site), ST-3 (proposed daycare building location), and ST-7 (far north end of site). Groundwater elevations ranged from 908 to 912. No groundwater was detected in the proposed stormwater pond location.

See Appendix D for soil information.

1.4 Curve Numbers

Curve Numbers (CN) were selected based on the Soil Conservation Service (SCS) Technical Release 55 last revised in 1986.

For existing conditions, the pervious area CN was set at 74, which is consistent with grassy areas in the HSG "C". For proposed conditions, the undisturbed pervious area CN was set to 74 and the disturbed area CN was set to 80, per Rice Creek Watershed District requirements for HSG "C" type soil. The impervious area CN was set at 98.

1.5 Time of Concentration

For existing and proposed conditions, the times of concentration were calculated using a combination of sheet flow and shallow concentrated flow. These methods require the length, slope of the water course and the water course characteristics for calculating the time of concentration, which were measured from the existing and proposed topography. A minimum time of concentration of 6 minutes was used for the analysis. See HydroCAD models in Appendix A and B.

2.0 STORMWATER ANALYSIS

The surface water analysis was completed using HydroCAD software, based on the SCS methodologies with MSE 3 Atlas 14 storms. The peak elevations and runoff rates were modeled for the 2-year (2.80″), 10-year (4.17″), 100-year (7.15″) storm events, and 10-day (7.2″) snowmelt event. See Appendix A and B for HydroCAD models.

2.1 Peak Elevations

For the proposed basin, as well as low areas, culverts and ditches, the 2-year, 10-year, 100-year, and 10-day snow melt high water levels were calculated. See Table 1.

Table 1
High Water Elevations
Belland Farms

Basin	Outlet	2y HWL	10y HWL	100y HWL	10-day HWL
Pond 10P	915.0	916.6	917.1	917.9	916.9
Low Area 20P	916.0	917.0	917.4	918.4	916.9
Low Area 30P	916.0	916.6	917.1	917.9	916.9
Ditch 40P	917.9	918.4	918.6	918.9	918.4
Ditch 50P	916.1	916.7	916.9	917.5	916.5
Ditch 1P	913.7	914.6	915.0	915.8	914.4
Wetland 2P	919.5	918.7	919.1	919.5	919.6

2.2 Rate Control Analysis

All runoff from the site drains to the existing culvert located in the southeast corner of the site. As such, runoff rates have been compared in aggregate for the site. See Table 2.

Table 2
Runoff Comparison 1
Belland Farms

	Runoff in Aggregate			
Condition	**2y Storm (cfs)**	**10y Storm (cfs)**	**100y Storm (cfs)**	**10d Snow (cfs)**
Existing (1P)	4	6.8	10.4	4.2
Proposed (1P)	4	6.1	9.8	2.2

Note that the proposed runoff rates are below existing for all design storms.

2.3 Water Quality Analysis

The MPCA requires sites to provide a water quality volume of one inch of runoff from newly created impervious surfaces. RCWD requires sites to provide a water quality volume of 1.1 inches of runoff from newly created impervious surfaces. Where feasible, the water quality volume is to be provided with volume reduction BMPs. Due to onsite soils consisting primarily of clay type soils at depth, infiltration is not feasible at this site.

To provide the water quality for the site, a wet sedimentation pond is proposed. Per RCWD, the ponds have been designed to provide a minimum permanent pool volume equal to 2.5 inches of runoff from the drainage area of the pond. The ponds have also been designed to meet MPCA requirements, limiting the water quality discharge to 5.66 cfs per surface acre of the pond, skimming, and emergency overflow.

The ponds have been designed to meet and exceed the requirements of RCWD and the MPCA. See Appendix C for pond design calculations.

2.4 Wetland Considerations

There are five wetlands onsite, but only the southeast wetland is proposed to be impacted as a result of the project. The wetland impacts are being permitting through the RCWD and WCA program concurrent to the project.

2.5 Storm Sewer Design

All onsite storm sewers have been designed to accommodate the 10-year storm at a minimum. The rational method was used to determine anticipated flows to each catch basin and the pipes were sized using those flows along with Manning's equation. See Appendix C for storm sewer design calculations and Figure 4 for storm sewer drainage map.

2.6 Conclusion

The wet sedimentation basin provides adequate rate control and water quality treatment for the site per MPCA and RCWD rules. All storm sewers have been adequately sized to convey all flows to the wet sedimentation basin.

3.0 CERTIFICATION

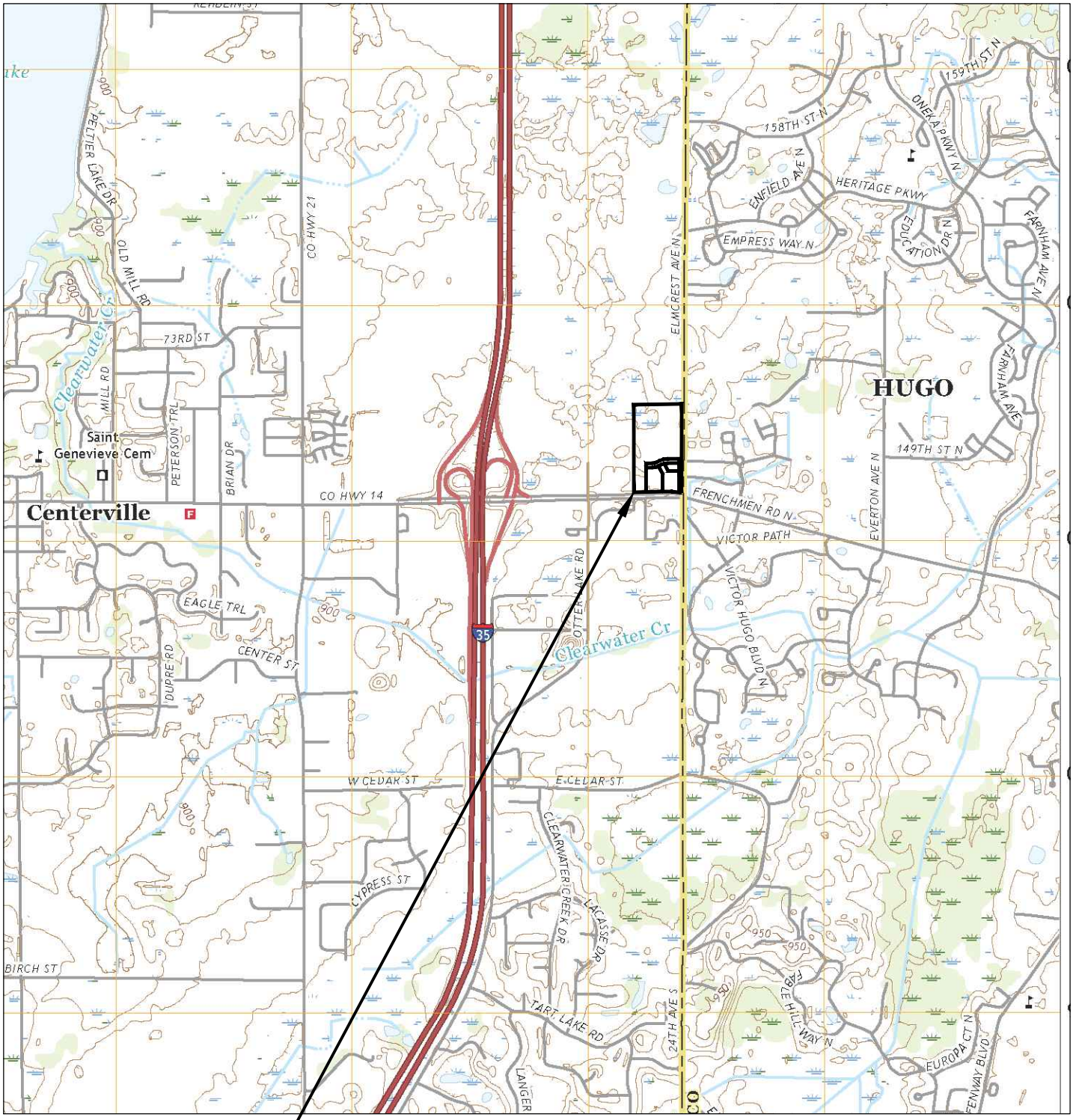
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

This Stormwater Management Plan was prepared by:

Joseph T. Radach, P.E.
License #: 45889

11/19/21
Date

FIGURES



SOURCE: USGS CENTERVILLE 7.5 MIN. QUADRANGLE

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BELLAND FARMS
Lino Lakes, MN

FIGURE 1
SITE LOCATION MAP

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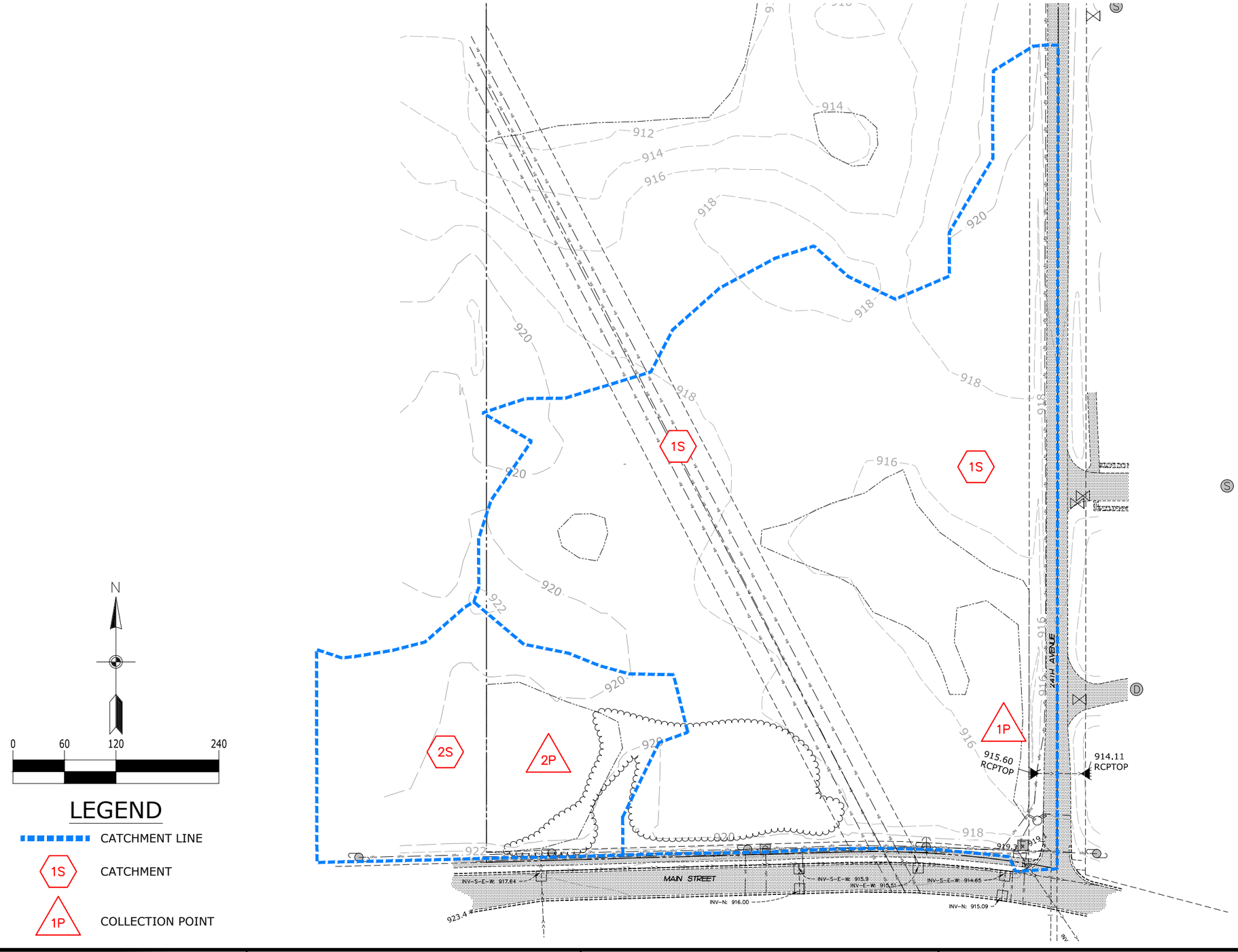

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Notes:

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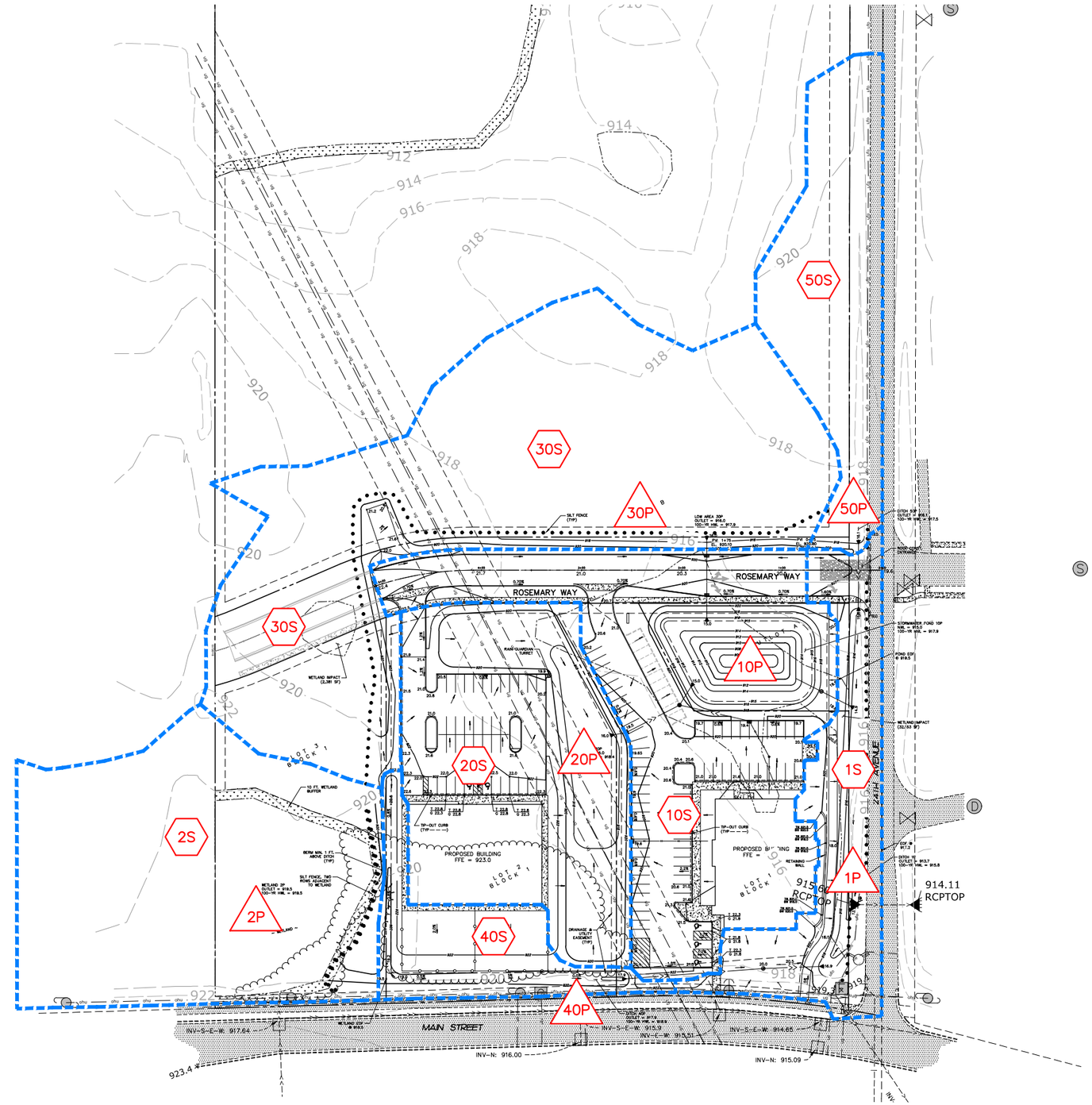
BELLAND FARMS
Lino Lakes, Minnesota

FIGURE 2
EXISTING CONDITIONS
DRAINAGE MAP



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Notes:

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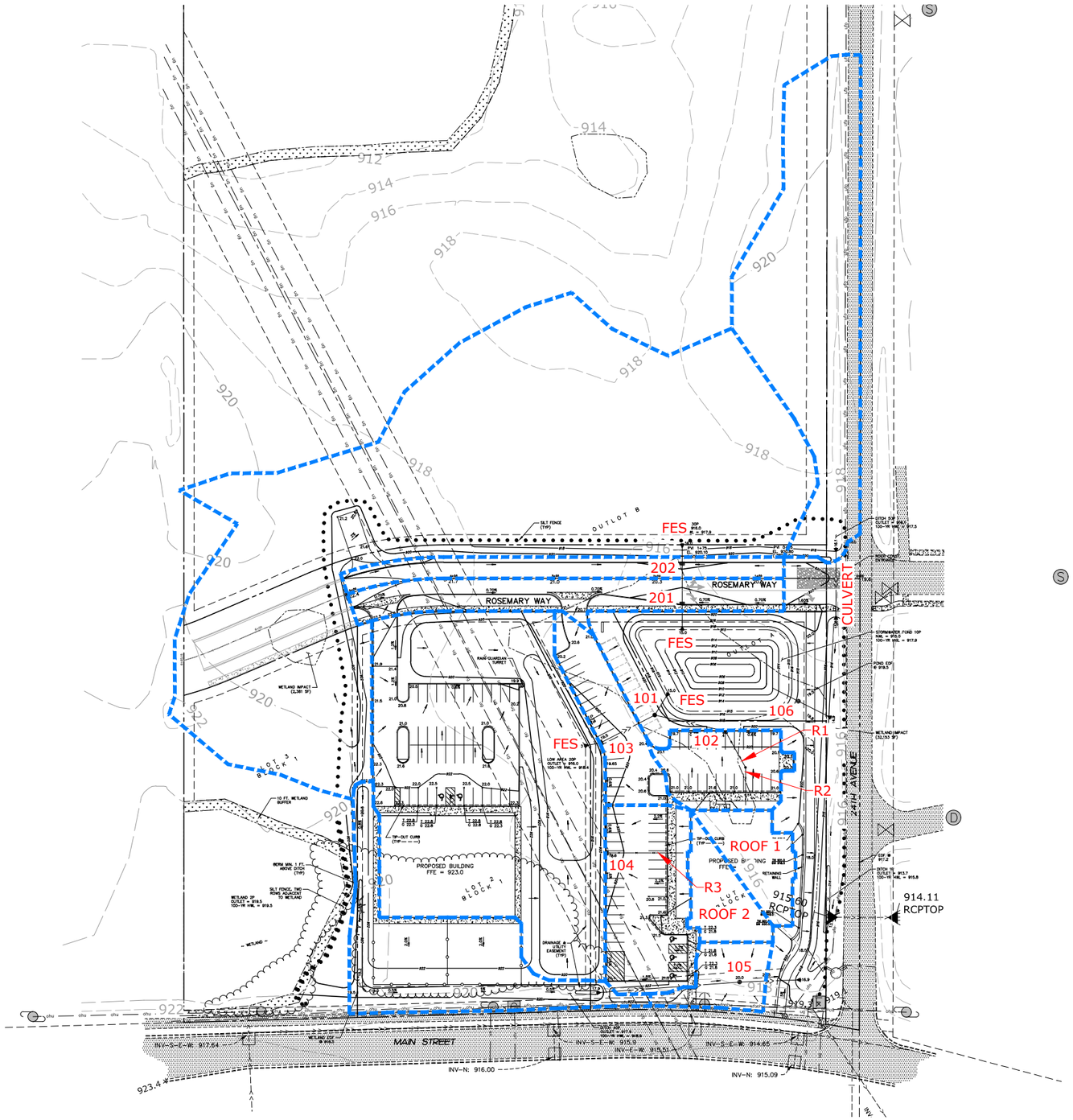
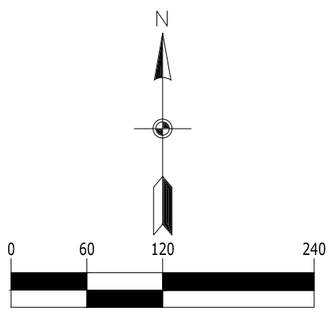
BELLAND FARMS
Lino Lakes, Minnesota

FIGURE 3
PROPOSED CONDITIONS
DRAINAGE MAP





LEGEND

CATCHMENT LINE

106 STRUCTURE

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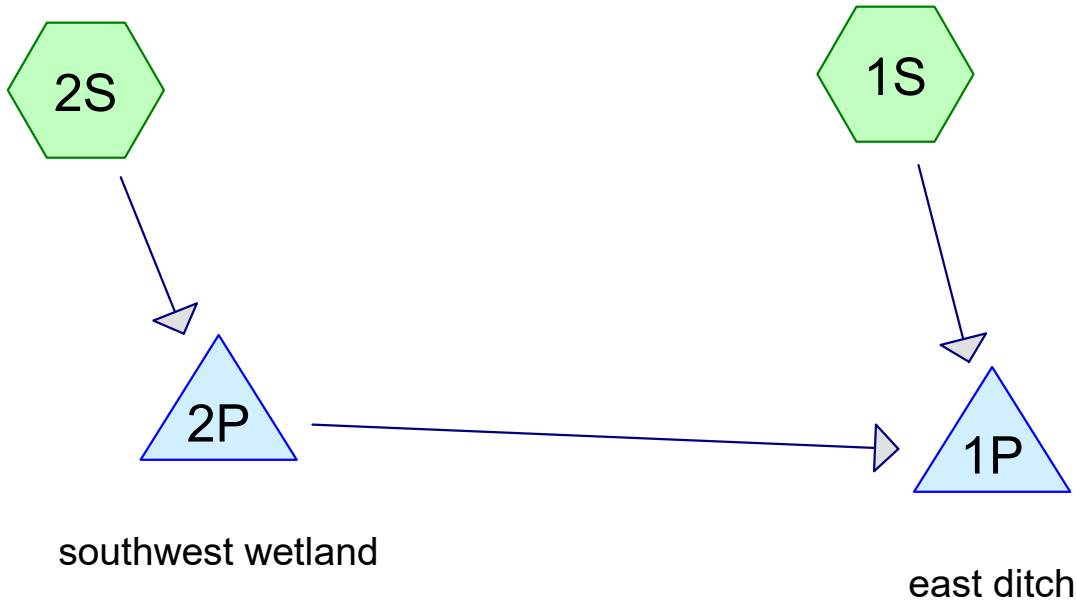
BELLAND FARMS
Lino Lakes, Minnesota

FIGURE 4
STORM SEWER
DRAINAGE MAP

APPENDIX A



Subcat Reach Pond Link

Routing Diagram for 9614_ex
Prepared by Carlson McCain, Inc., Printed 11/4/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
10.993	74	>75% Grass cover, Good, HSG C (1S, 2S)
0.303	98	Paved parking, HSG B (1S)
11.296	**75**	**TOTAL AREA**

Time span=0.00-300.00 hrs, dt=0.01 hrs, 30001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Runoff Area=9.081 ac 3.34% Impervious Runoff Depth=0.84"
Flow Length=868' Tc=22.6 min CN=WQ Runoff=7.40 cfs 0.638 af

Subcatchment 2S: Runoff Area=2.215 ac 0.00% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=74 Runoff=3.14 cfs 0.145 af

Pond 1P: east ditch Peak Elev=914.63' Storage=0.136 af Inflow=7.40 cfs 0.638 af
18.0" Round Culvert n=0.013 L=68.0' S=0.0221 '/' Outflow=3.79 cfs 0.638 af

Pond 2P: southwest wetland Peak Elev=918.75' Storage=0.145 af Inflow=3.14 cfs 0.145 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 11.296 ac Runoff Volume = 0.783 af Average Runoff Depth = 0.83"
97.32% Pervious = 10.993 ac 2.68% Impervious = 0.303 ac

Summary for Subcatchment 1S:

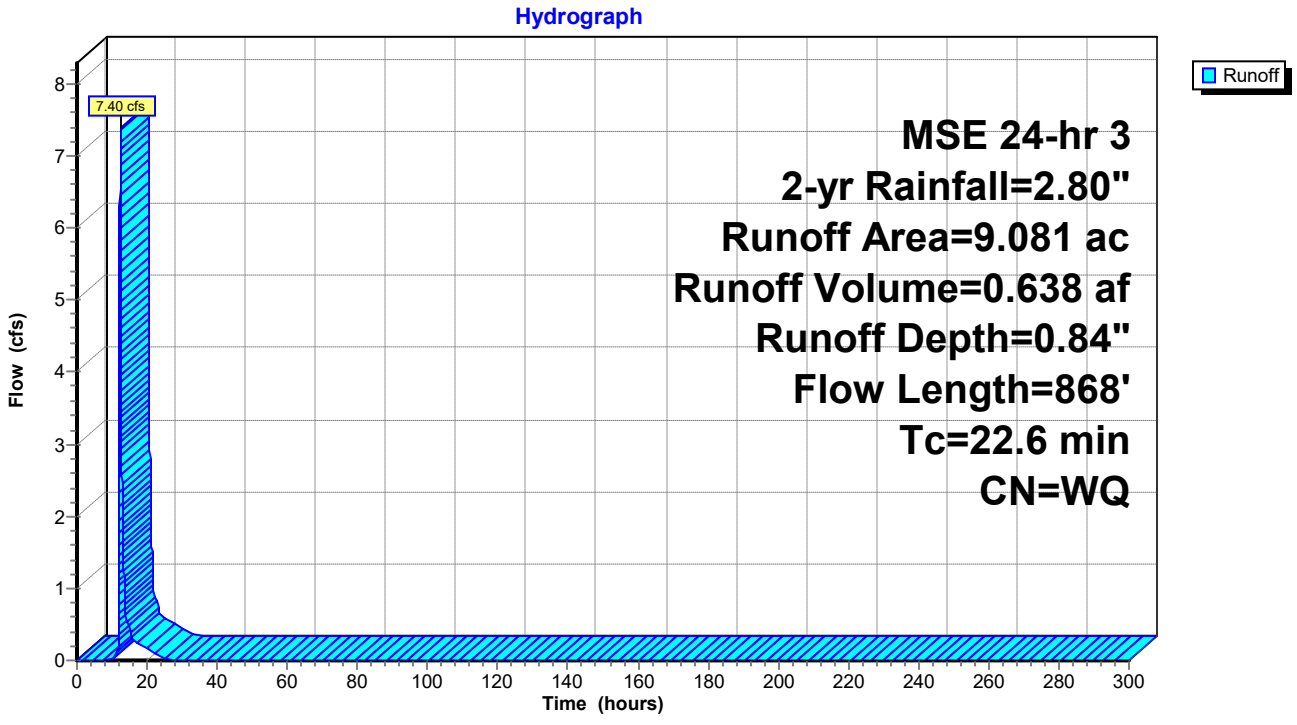
Runoff = 7.40 cfs @ 12.35 hrs, Volume= 0.638 af, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
8.778	74	>75% Grass cover, Good, HSG C
0.303	98	Paved parking, HSG B
9.081		Weighted Average
8.778		96.66% Pervious Area
0.303		3.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0150	0.30		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
17.0	768	0.0070	0.75		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
22.6	868	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

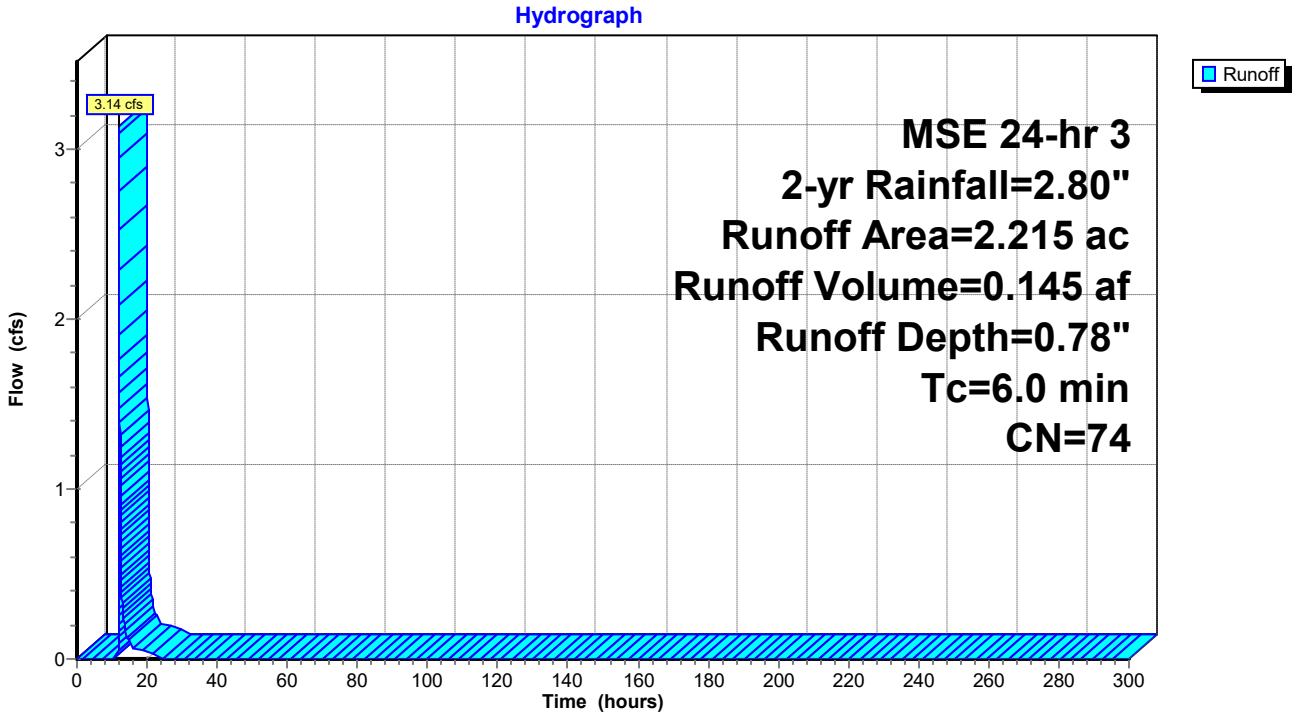
Runoff = 3.14 cfs @ 12.14 hrs, Volume= 0.145 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
2.215	74	>75% Grass cover, Good, HSG C
2.215		100.00% Pervious Area

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

Subcatchment 2S:



Summary for Pond 1P: east ditch

Inflow Area = 11.296 ac, 2.68% Impervious, Inflow Depth = 0.68" for 2-yr event
Inflow = 7.40 cfs @ 12.35 hrs, Volume= 0.638 af
Outflow = 3.79 cfs @ 12.67 hrs, Volume= 0.638 af, Atten= 49%, Lag= 19.1 min
Primary = 3.79 cfs @ 12.67 hrs, Volume= 0.638 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 914.63' @ 12.67 hrs Surf.Area= 0.422 ac Storage= 0.136 af

Plug-Flow detention time= 14.4 min calculated for 0.638 af (100% of inflow)
Center-of-Mass det. time= 14.2 min (856.4 - 842.2)

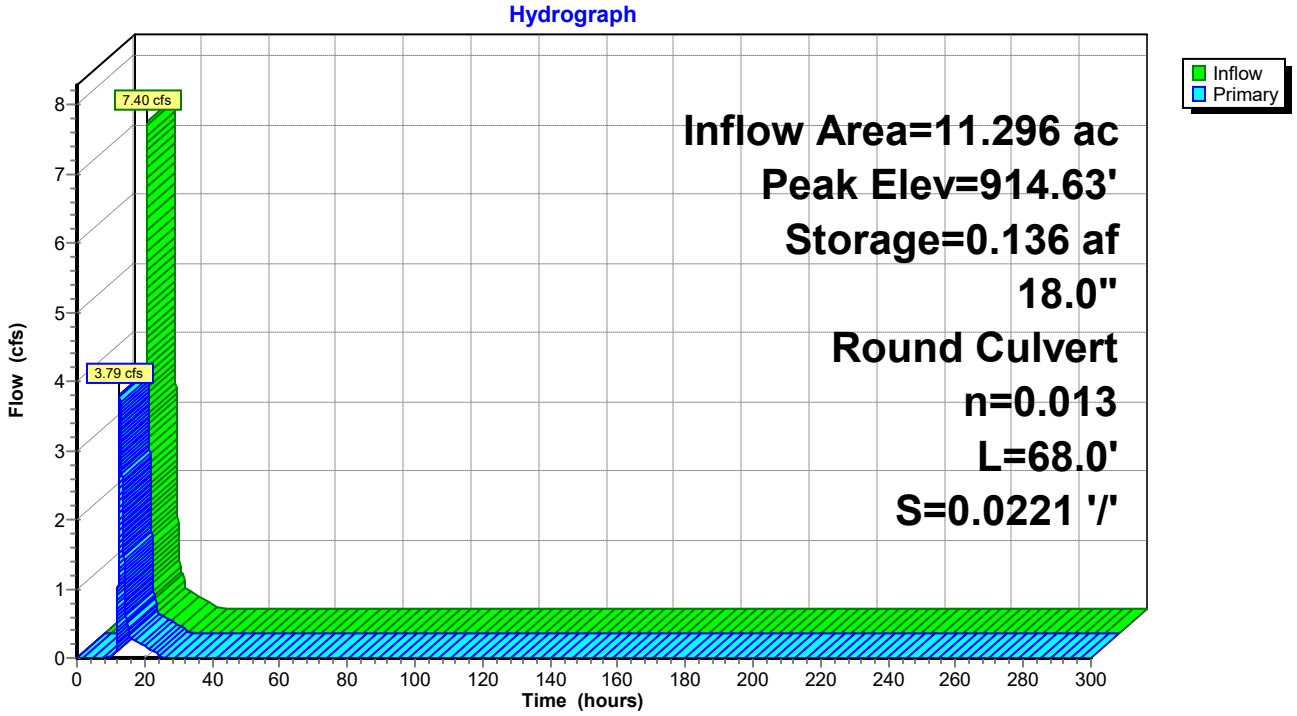
Volume	Invert	Avail.Storage	Storage Description
#1	913.70'	3.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
913.70	0.000	0.000	0.000
914.00	0.006	0.001	0.001
916.00	1.322	1.328	1.329
917.00	2.444	1.883	3.212

Device	Routing	Invert	Outlet Devices
#1	Primary	913.70'	**18.0" Round Culvert** L= 68.0' Ke= 0.500 Inlet / Outlet Invert= 913.70' / 912.20' S= 0.0221 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=3.79 cfs @ 12.67 hrs HW=914.63' (Free Discharge)
1=Culvert (Inlet Controls 3.79 cfs @ 3.29 fps)

Pond 1P: east ditch



Summary for Pond 2P: southwest wetland

Inflow Area = 2.215 ac, 0.00% Impervious, Inflow Depth = 0.78" for 2-yr event
Inflow = 3.14 cfs @ 12.14 hrs, Volume= 0.145 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 918.75' @ 24.34 hrs Surf.Area= 0.383 ac Storage= 0.145 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

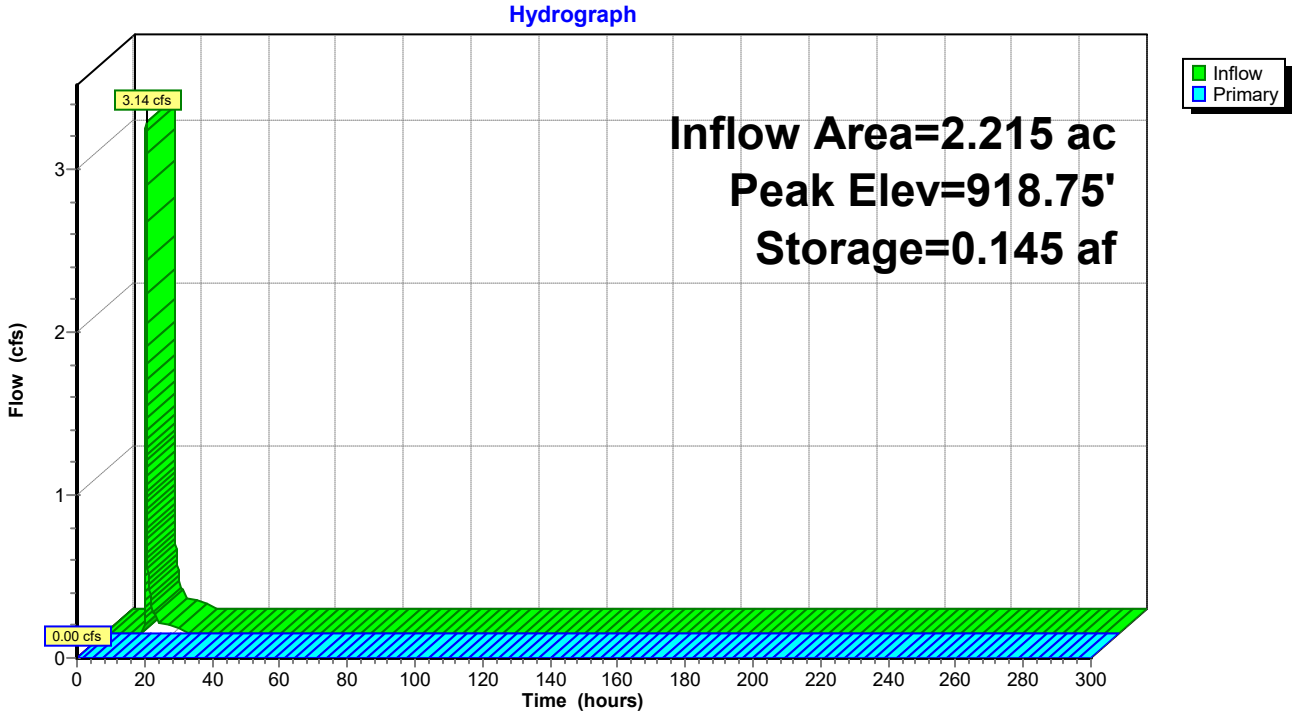
Volume	Invert	Avail.Storage	Storage Description
#1	918.00'	1.054 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
918.00	0.000	0.000	0.000
919.00	0.508	0.254	0.254
920.00	1.093	0.800	1.054

Device	Routing	Invert	Outlet Devices
#1	Primary	919.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=918.00' TW=913.70' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: southwest wetland



Time span=0.00-300.00 hrs, dt=0.01 hrs, 30001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Runoff Area=9.081 ac 3.34% Impervious Runoff Depth=1.80"
Flow Length=868' Tc=22.6 min CN=WQ Runoff=16.83 cfs 1.359 af

Subcatchment 2S: Runoff Area=2.215 ac 0.00% Impervious Runoff Depth=1.72"
Tc=6.0 min CN=74 Runoff=7.12 cfs 0.318 af

Pond 1P: east ditch Peak Elev=915.08' Storage=0.391 af Inflow=16.83 cfs 1.359 af
18.0" Round Culvert n=0.013 L=68.0' S=0.0221 '/' Outflow=6.80 cfs 1.359 af

Pond 2P: southwest wetland Peak Elev=919.12' Storage=0.318 af Inflow=7.12 cfs 0.318 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 11.296 ac Runoff Volume = 1.677 af Average Runoff Depth = 1.78"
97.32% Pervious = 10.993 ac 2.68% Impervious = 0.303 ac

Summary for Subcatchment 1S:

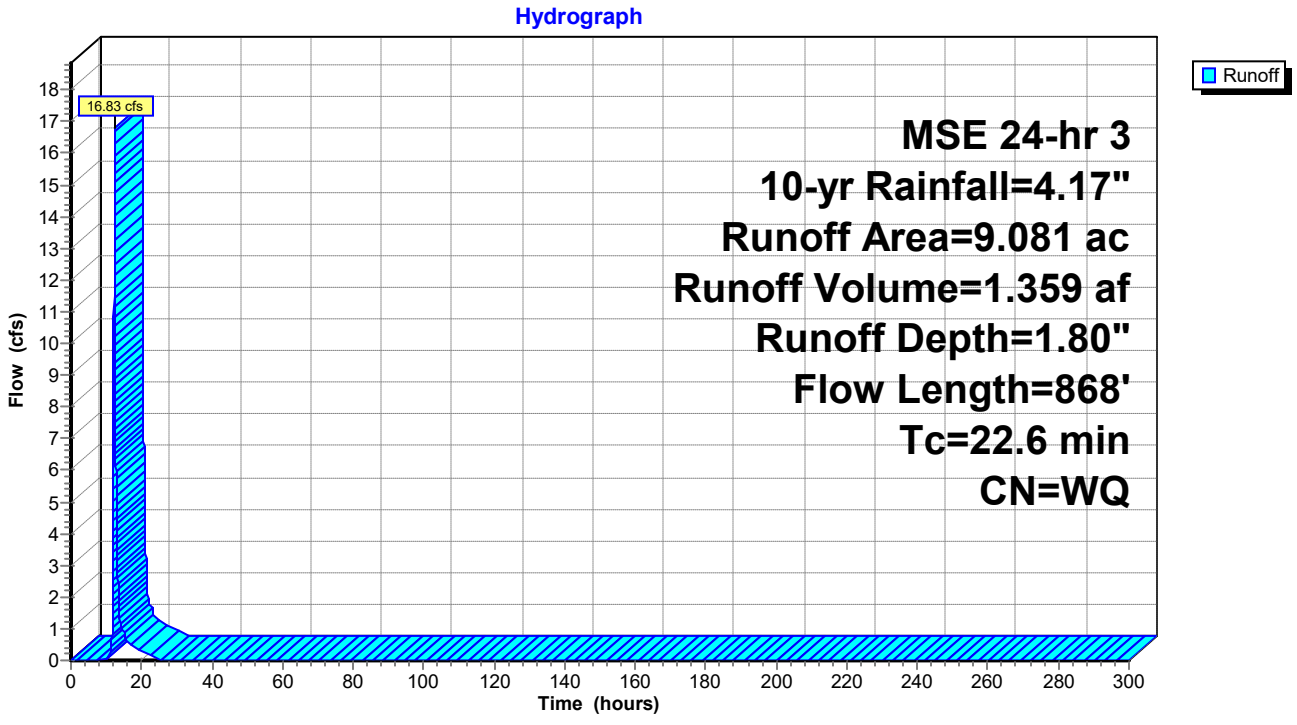
Runoff = 16.83 cfs @ 12.33 hrs, Volume= 1.359 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
8.778	74	>75% Grass cover, Good, HSG C
0.303	98	Paved parking, HSG B
9.081		Weighted Average
8.778		96.66% Pervious Area
0.303		3.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0150	0.30		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
17.0	768	0.0070	0.75		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
22.6	868	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

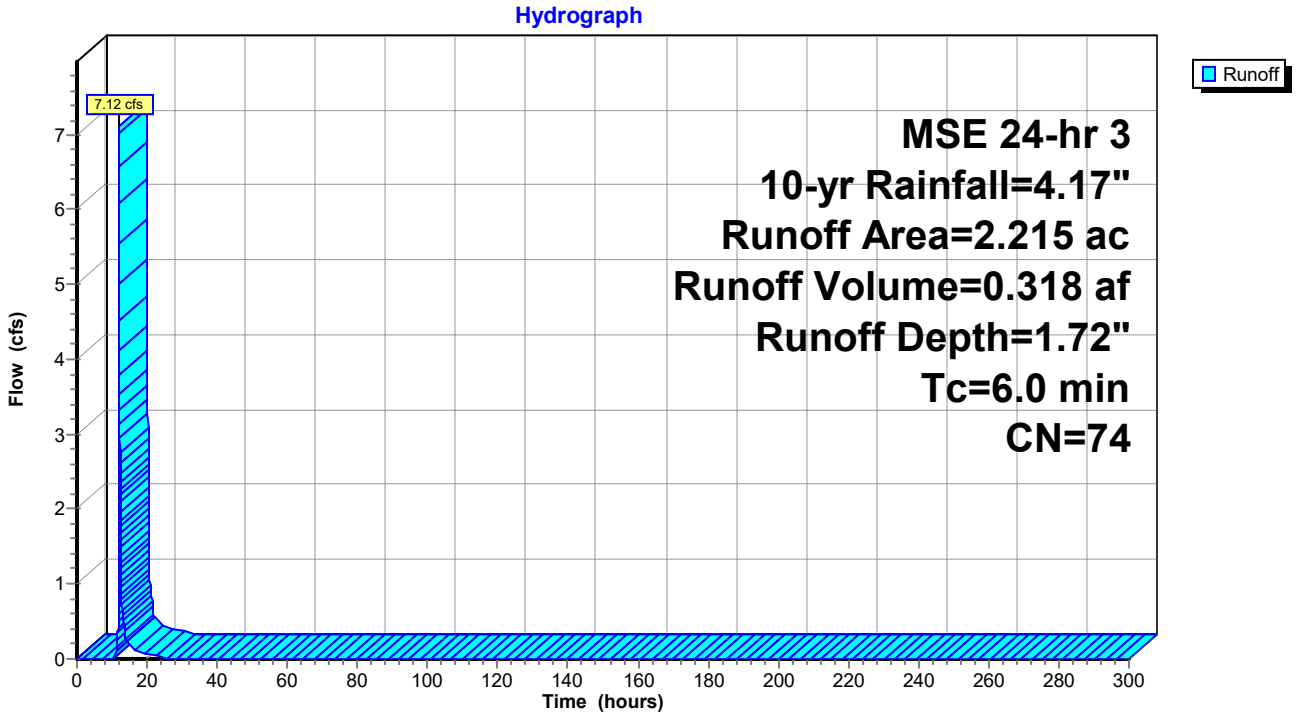
Runoff = 7.12 cfs @ 12.14 hrs, Volume= 0.318 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
2.215	74	>75% Grass cover, Good, HSG C
2.215		100.00% Pervious Area

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

Subcatchment 2S:



Summary for Pond 1P: east ditch

Inflow Area = 11.296 ac, 2.68% Impervious, Inflow Depth = 1.44" for 10-yr event
Inflow = 16.83 cfs @ 12.33 hrs, Volume= 1.359 af
Outflow = 6.80 cfs @ 12.72 hrs, Volume= 1.359 af, Atten= 60%, Lag= 23.2 min
Primary = 6.80 cfs @ 12.72 hrs, Volume= 1.359 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 915.08' @ 12.72 hrs Surf.Area= 0.716 ac Storage= 0.391 af

Plug-Flow detention time= 24.8 min calculated for 1.359 af (100% of inflow)
Center-of-Mass det. time= 24.5 min (852.0 - 827.5)

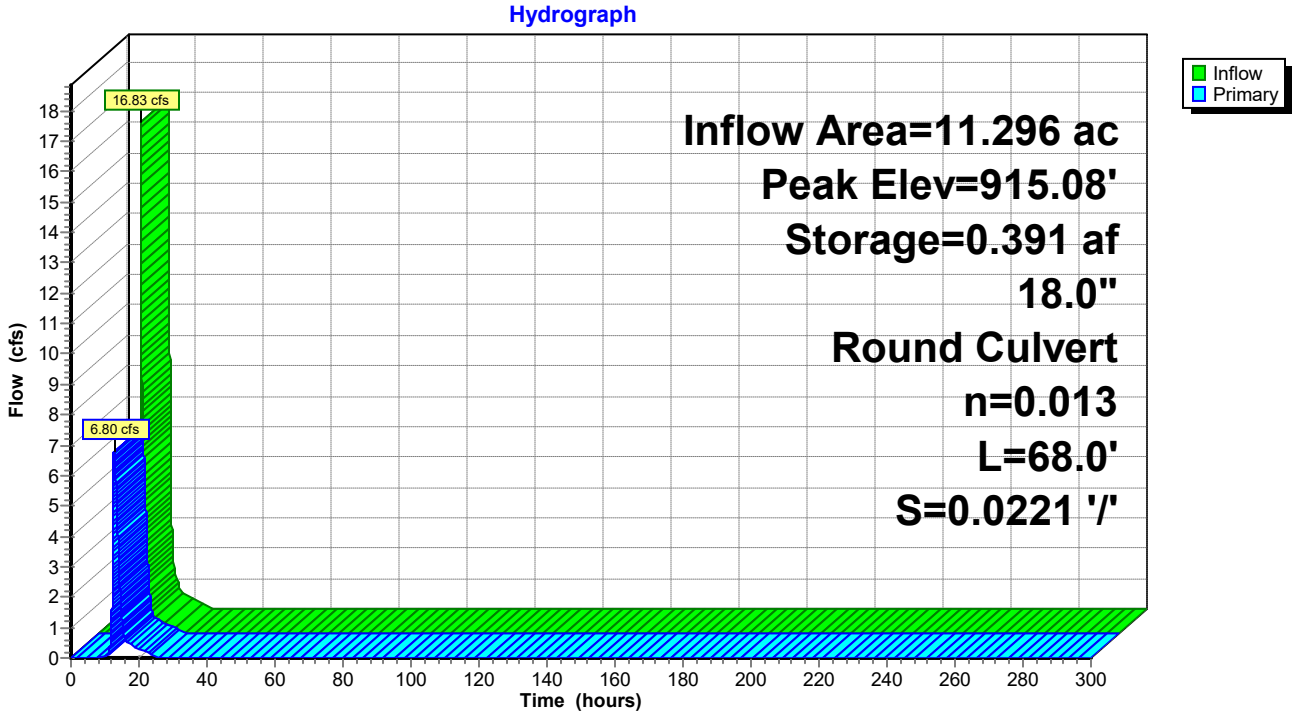
Volume	Invert	Avail.Storage	Storage Description
#1	913.70'	3.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
913.70	0.000	0.000	0.000
914.00	0.006	0.001	0.001
916.00	1.322	1.328	1.329
917.00	2.444	1.883	3.212

Device	Routing	Invert	Outlet Devices
#1	Primary	913.70'	**18.0" Round Culvert** L= 68.0' Ke= 0.500 Inlet / Outlet Invert= 913.70' / 912.20' S= 0.0221 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=6.80 cfs @ 12.72 hrs HW=915.08' (Free Discharge)
1=Culvert (Inlet Controls 6.80 cfs @ 4.00 fps)

Pond 1P: east ditch



Summary for Pond 2P: southwest wetland

Inflow Area = 2.215 ac, 0.00% Impervious, Inflow Depth = 1.72" for 10-yr event
Inflow = 7.12 cfs @ 12.14 hrs, Volume= 0.318 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 919.12' @ 24.34 hrs Surf.Area= 0.577 ac Storage= 0.318 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

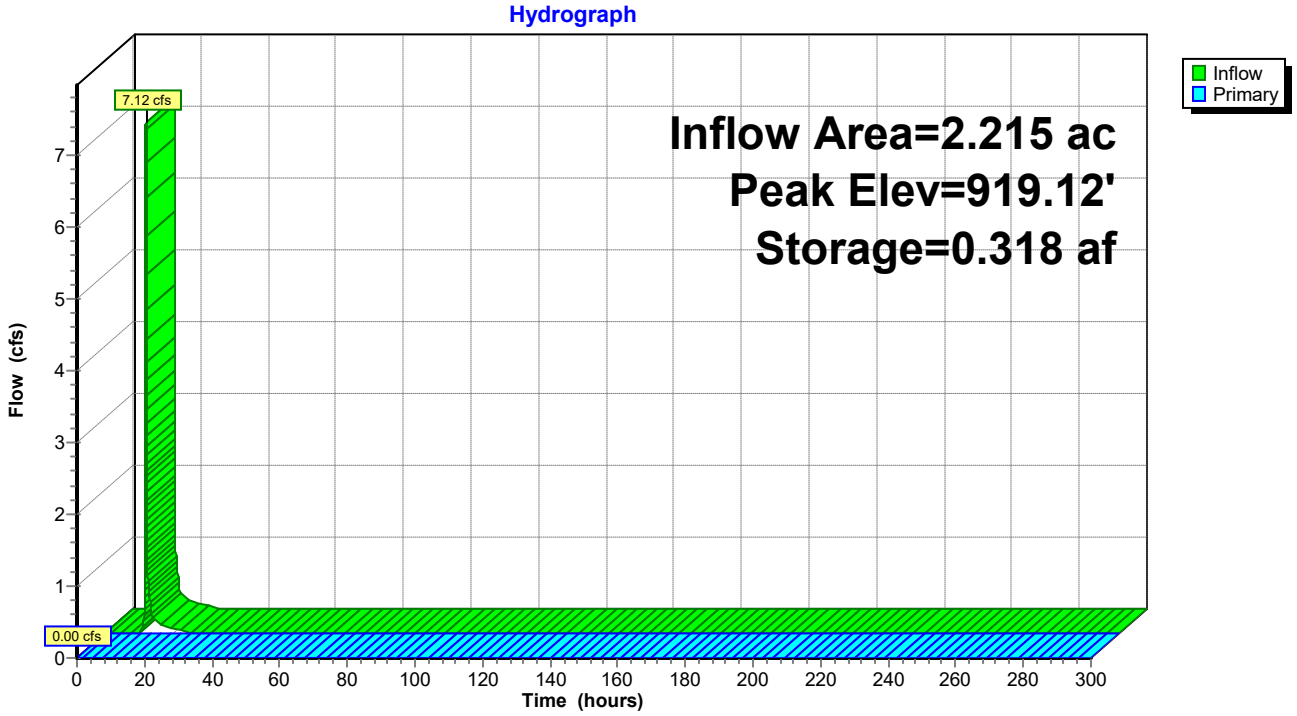
Volume	Invert	Avail.Storage	Storage Description
#1	918.00'	1.054 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
918.00	0.000	0.000	0.000
919.00	0.508	0.254	0.254
920.00	1.093	0.800	1.054

Device	Routing	Invert	Outlet Devices
#1	Primary	919.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=918.00' TW=913.70' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: southwest wetland



Time span=0.00-300.00 hrs, dt=0.01 hrs, 30001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Runoff Area=9.081 ac 3.34% Impervious Runoff Depth=4.26"
Flow Length=868' Tc=22.6 min CN=WQ Runoff=40.64 cfs 3.227 af

Subcatchment 2S: Runoff Area=2.215 ac 0.00% Impervious Runoff Depth=4.17"
Tc=6.0 min CN=74 Runoff=17.03 cfs 0.770 af

Pond 1P: east ditch Peak Elev=915.94' Storage=1.251 af Inflow=40.64 cfs 3.416 af
18.0" Round Culvert n=0.013 L=68.0' S=0.0221 '/' Outflow=10.39 cfs 3.416 af

Pond 2P: southwest wetland Peak Elev=919.54' Storage=0.616 af Inflow=17.03 cfs 0.770 af
Outflow=0.41 cfs 0.189 af

Total Runoff Area = 11.296 ac Runoff Volume = 3.997 af Average Runoff Depth = 4.25"
97.32% Pervious = 10.993 ac 2.68% Impervious = 0.303 ac

Summary for Subcatchment 1S:

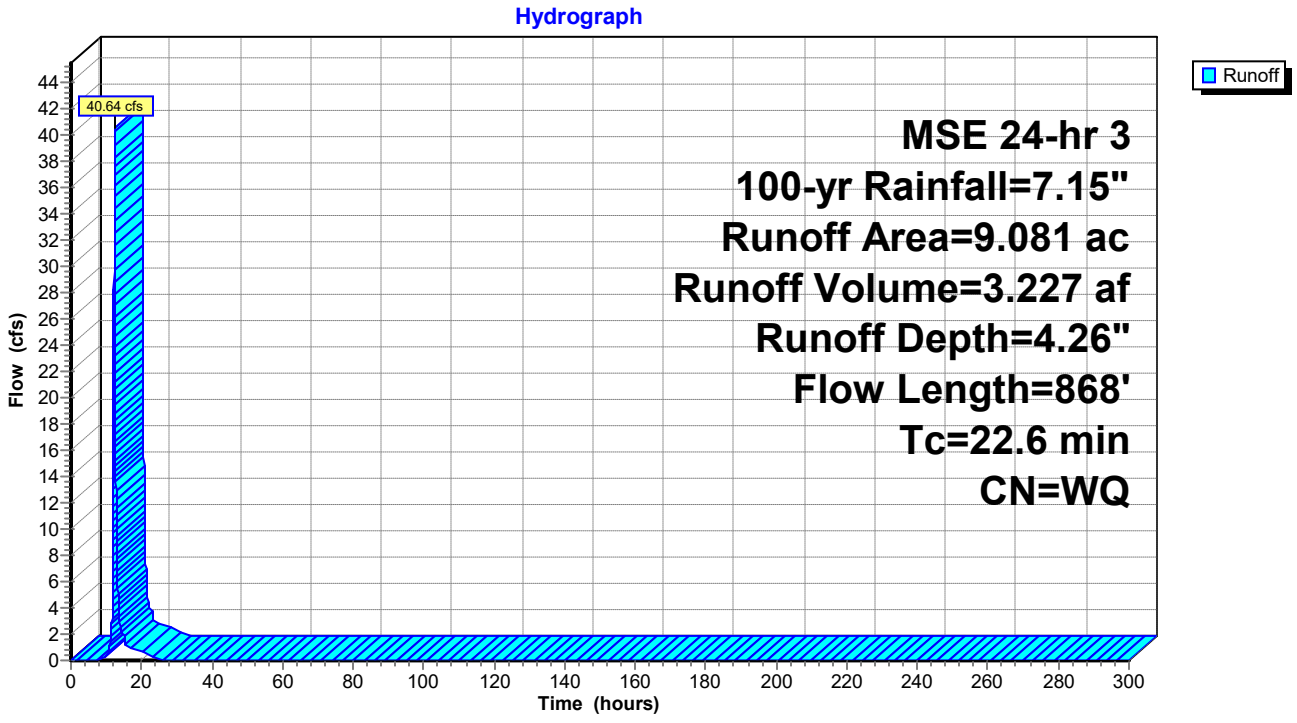
Runoff = 40.64 cfs @ 12.33 hrs, Volume= 3.227 af, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
8.778	74	>75% Grass cover, Good, HSG C
0.303	98	Paved parking, HSG B
9.081		Weighted Average
8.778		96.66% Pervious Area
0.303		3.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0150	0.30		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
17.0	768	0.0070	0.75		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
22.6	868	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

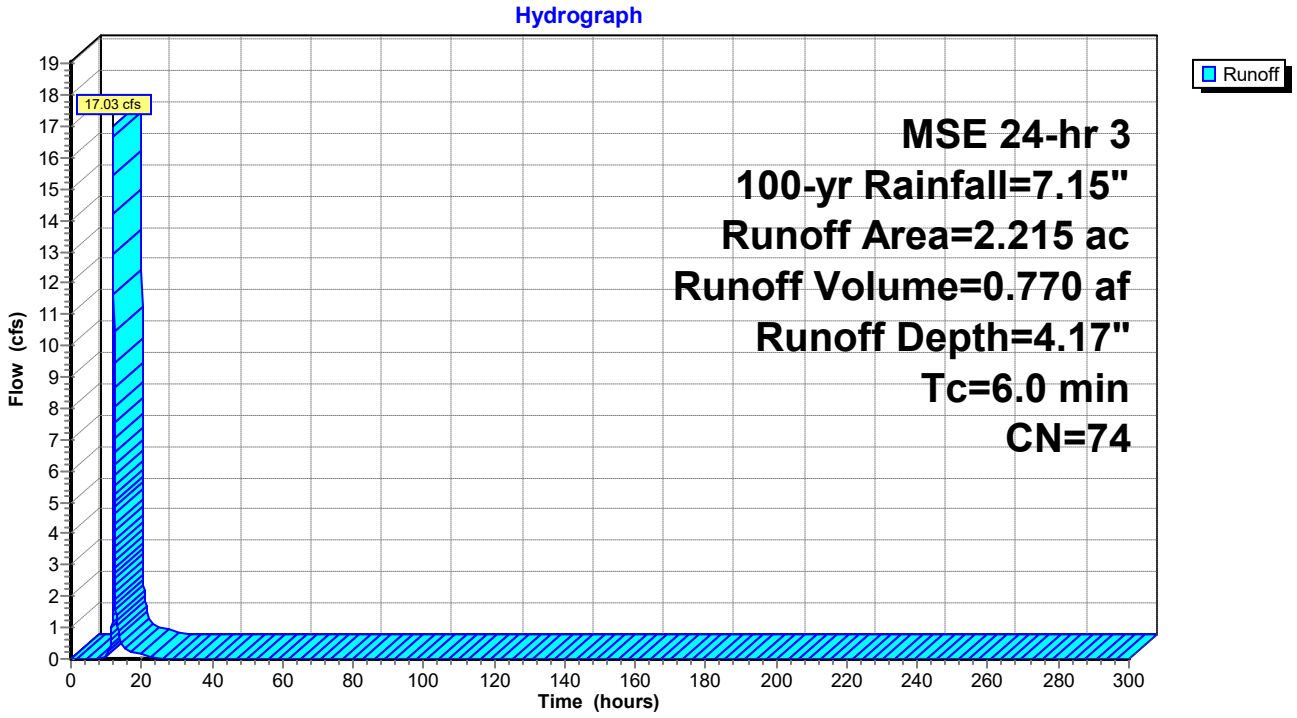
Runoff = 17.03 cfs @ 12.13 hrs, Volume= 0.770 af, Depth= 4.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
2.215	74	>75% Grass cover, Good, HSG C
2.215		100.00% Pervious Area

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

Subcatchment 2S:



Summary for Pond 1P: east ditch

Inflow Area = 11.296 ac, 2.68% Impervious, Inflow Depth = 3.63" for 100-yr event
Inflow = 40.64 cfs @ 12.33 hrs, Volume= 3.416 af
Outflow = 10.39 cfs @ 12.85 hrs, Volume= 3.416 af, Atten= 74%, Lag= 31.5 min
Primary = 10.39 cfs @ 12.85 hrs, Volume= 3.416 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 915.94' @ 12.85 hrs Surf.Area= 1.283 ac Storage= 1.251 af

Plug-Flow detention time= 49.3 min calculated for 3.416 af (100% of inflow)
Center-of-Mass det. time= 49.3 min (876.1 - 826.8)

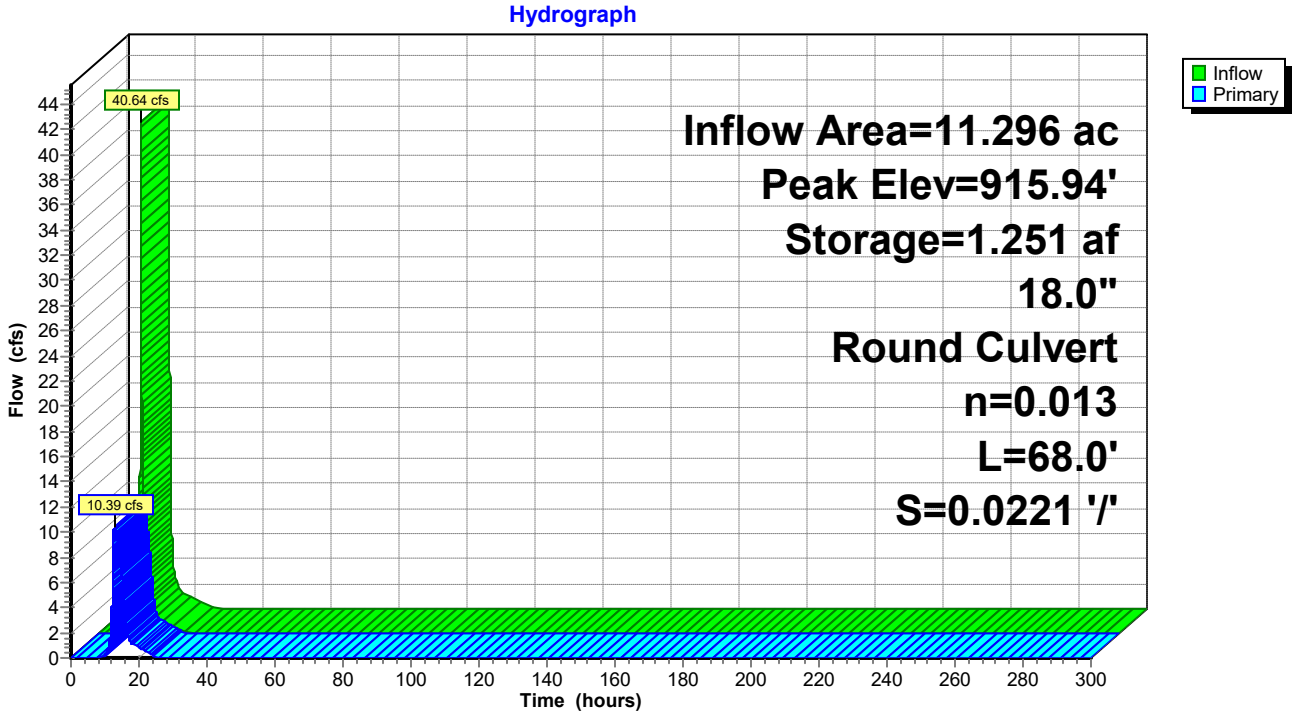
Volume	Invert	Avail.Storage	Storage Description
#1	913.70'	3.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
913.70	0.000	0.000	0.000
914.00	0.006	0.001	0.001
916.00	1.322	1.328	1.329
917.00	2.444	1.883	3.212

Device	Routing	Invert	Outlet Devices
#1	Primary	913.70'	**18.0" Round Culvert** L= 68.0' Ke= 0.500 Inlet / Outlet Invert= 913.70' / 912.20' S= 0.0221 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=10.39 cfs @ 12.85 hrs HW=915.94' (Free Discharge)
1=Culvert (Inlet Controls 10.39 cfs @ 5.88 fps)

Pond 1P: east ditch



Summary for Pond 2P: southwest wetland

Inflow Area = 2.215 ac, 0.00% Impervious, Inflow Depth = 4.17" for 100-yr event
Inflow = 17.03 cfs @ 12.13 hrs, Volume= 0.770 af
Outflow = 0.41 cfs @ 15.06 hrs, Volume= 0.189 af, Atten= 98%, Lag= 175.8 min
Primary = 0.41 cfs @ 15.06 hrs, Volume= 0.189 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 919.54' @ 15.06 hrs Surf.Area= 0.825 ac Storage= 0.616 af

Plug-Flow detention time= 391.3 min calculated for 0.189 af (25% of inflow)
Center-of-Mass det. time= 294.0 min (1,093.0 - 799.0)

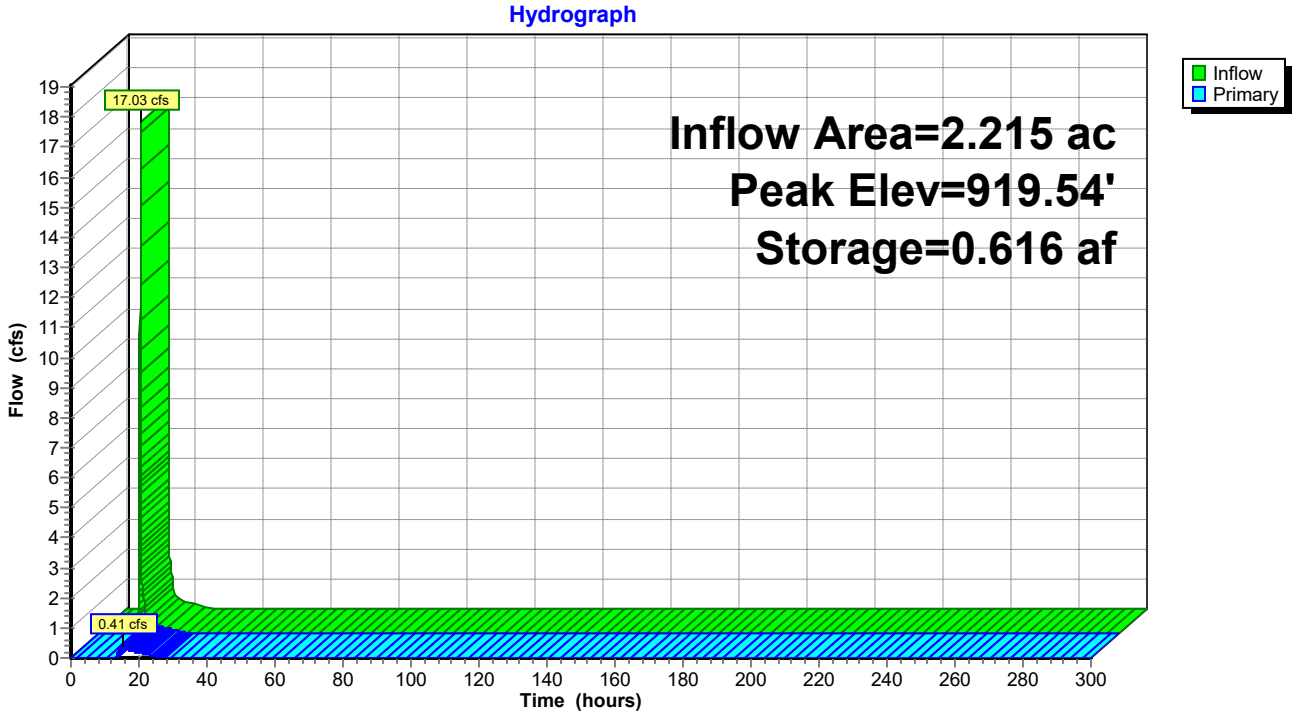
Volume	Invert	Avail.Storage	Storage Description
#1	918.00'	1.054 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
918.00	0.000	0.000	0.000
919.00	0.508	0.254	0.254
920.00	1.093	0.800	1.054

Device	Routing	Invert	Outlet Devices
#1	Primary	919.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.41 cfs @ 15.06 hrs HW=919.54' TW=915.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.41 cfs @ 0.48 fps)

Pond 2P: southwest wetland



Time span=0.00-300.00 hrs, dt=0.01 hrs, 30001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Runoff Area=9.081 ac 3.34% Impervious Runoff Depth=6.96"
Flow Length=868' Tc=22.6 min AMC Adjusted CN=WQ Runoff=4.24 cfs 5.268 af

Subcatchment 2S: Runoff Area=2.215 ac 0.00% Impervious Runoff Depth=6.96"
Tc=6.0 min AMC Adjusted CN=98 Runoff=1.06 cfs 1.285 af

Pond 1P: east ditch Peak Elev=914.69' Storage=0.163 af Inflow=4.76 cfs 5.971 af
18.0" Round Culvert n=0.013 L=68.0' S=0.0221 '/' Outflow=4.21 cfs 5.971 af

Pond 2P: southwest wetland Peak Elev=919.56' Storage=0.634 af Inflow=1.06 cfs 1.285 af
Outflow=0.76 cfs 0.704 af

Total Runoff Area = 11.296 ac Runoff Volume = 6.552 af Average Runoff Depth = 6.96"
97.32% Pervious = 10.993 ac 2.68% Impervious = 0.303 ac

Summary for Subcatchment 1S:

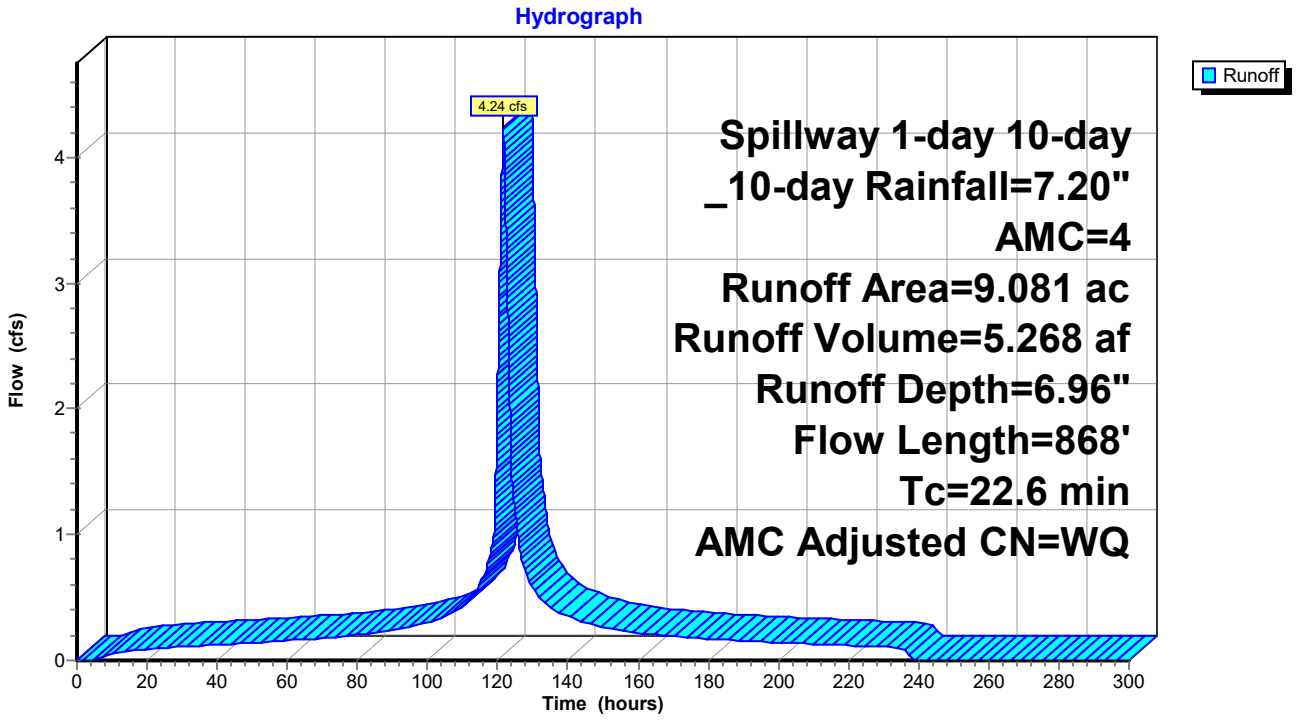
Runoff = 4.24 cfs @ 121.56 hrs, Volume= 5.268 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
8.778	74	98	>75% Grass cover, Good, HSG C
0.303	98	98	Paved parking, HSG B
9.081			Weighted Average
8.778			96.66% Pervious Area
0.303			3.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0150	0.30		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
17.0	768	0.0070	0.75		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
22.6	868	Total			

Subcatchment 1S:



Summary for Subcatchment 2S:

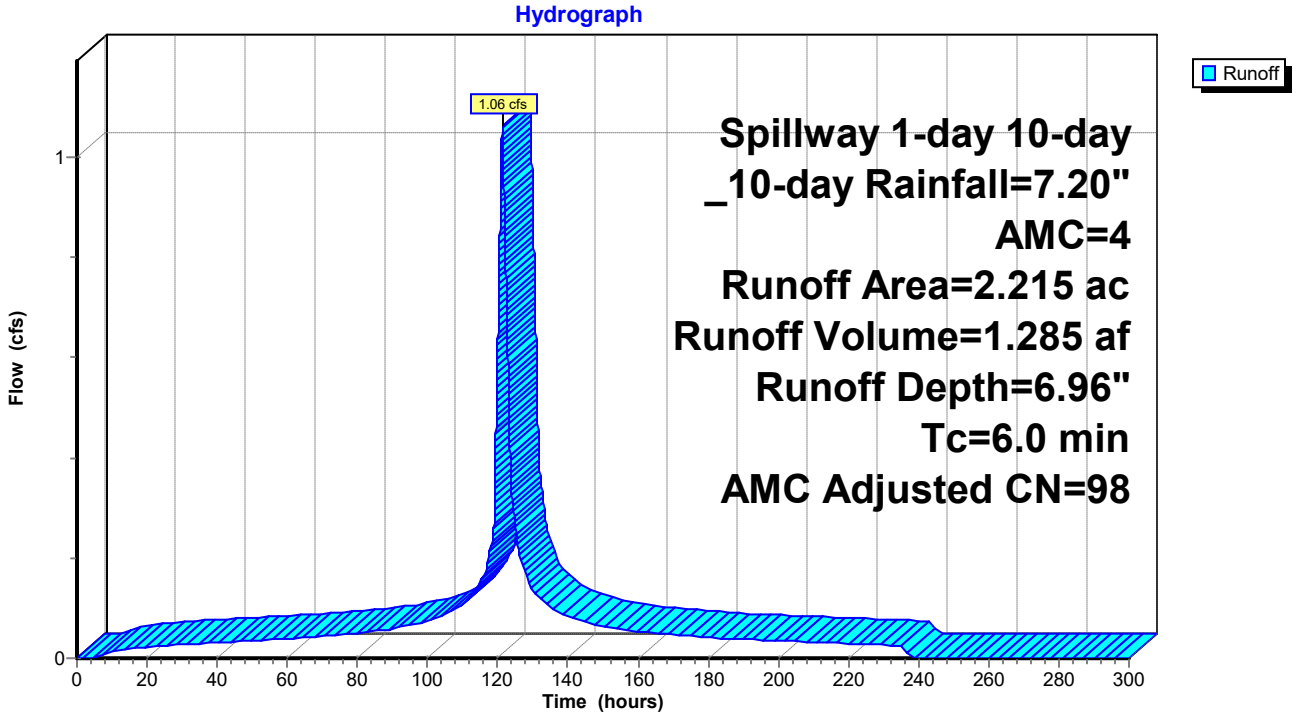
Runoff = 1.06 cfs @ 121.30 hrs, Volume= 1.285 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
2.215	74	98	>75% Grass cover, Good, HSG C
2.215			Weighted Average
2.215			100.00% Pervious Area

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

Subcatchment 2S:



Summary for Pond 1P: east ditch

Inflow Area = 11.296 ac, 2.68% Impervious, Inflow Depth = 6.34" for _10-day event
Inflow = 4.76 cfs @ 121.66 hrs, Volume= 5.971 af
Outflow = 4.21 cfs @ 122.33 hrs, Volume= 5.971 af, Atten= 12%, Lag= 40.3 min
Primary = 4.21 cfs @ 122.33 hrs, Volume= 5.971 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 914.69' @ 122.33 hrs Surf.Area= 0.462 ac Storage= 0.163 af

Plug-Flow detention time= 6.9 min calculated for 5.971 af (100% of inflow)
Center-of-Mass det. time= 6.9 min (7,642.7 - 7,635.9)

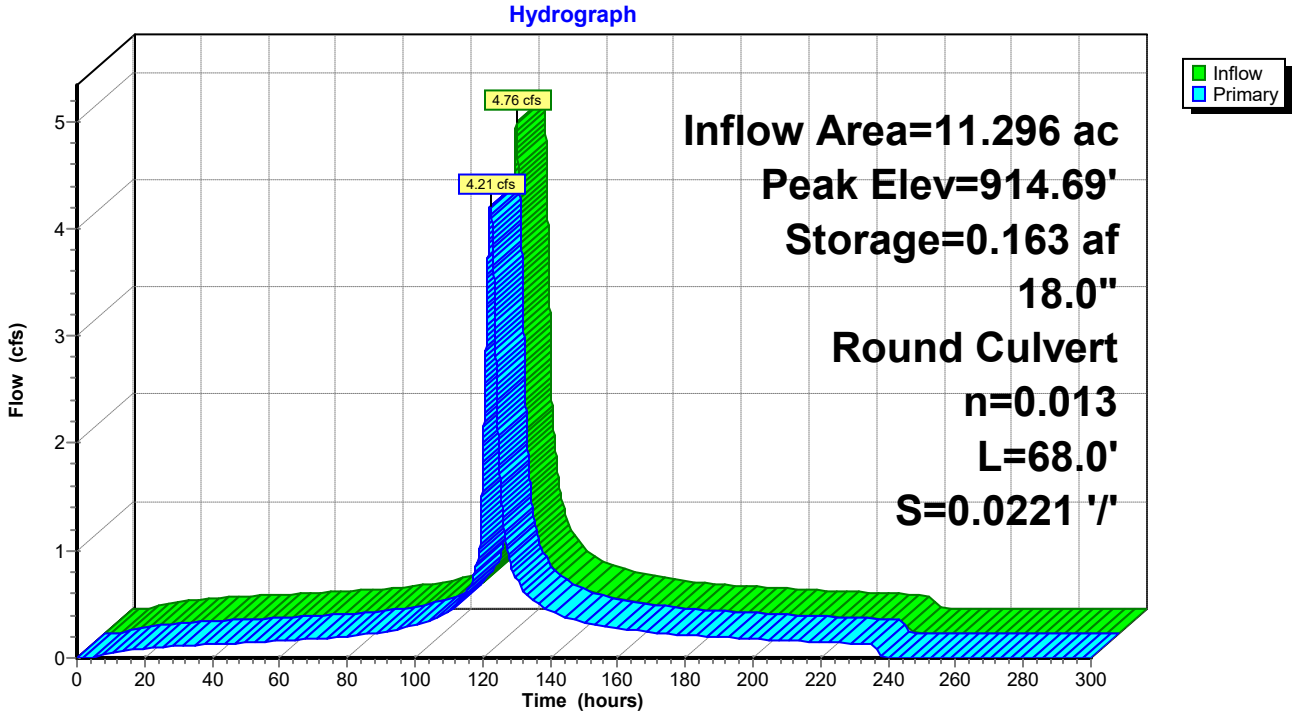
Volume	Invert	Avail.Storage	Storage Description
#1	913.70'	3.212 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
913.70	0.000	0.000	0.000
914.00	0.006	0.001	0.001
916.00	1.322	1.328	1.329
917.00	2.444	1.883	3.212

Device	Routing	Invert	Outlet Devices
#1	Primary	913.70'	**18.0" Round Culvert** L= 68.0' Ke= 0.500 Inlet / Outlet Invert= 913.70' / 912.20' S= 0.0221 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=4.21 cfs @ 122.33 hrs HW=914.69' (Free Discharge)
↑**1=Culvert** (Inlet Controls 4.21 cfs @ 3.39 fps)

Pond 1P: east ditch



Summary for Pond 2P: southwest wetland

Inflow Area = 2.215 ac, 0.00% Impervious, Inflow Depth = 6.96" for _10-day event
Inflow = 1.06 cfs @ 121.30 hrs, Volume= 1.285 af
Outflow = 0.76 cfs @ 122.36 hrs, Volume= 0.704 af, Atten= 29%, Lag= 63.4 min
Primary = 0.76 cfs @ 122.36 hrs, Volume= 0.704 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 919.56' @ 122.36 hrs Surf.Area= 0.838 ac Storage= 0.634 af

Plug-Flow detention time= 3,522.7 min calculated for 0.704 af (55% of inflow)
Center-of-Mass det. time= 1,801.9 min (9,211.9 - 7,409.9)

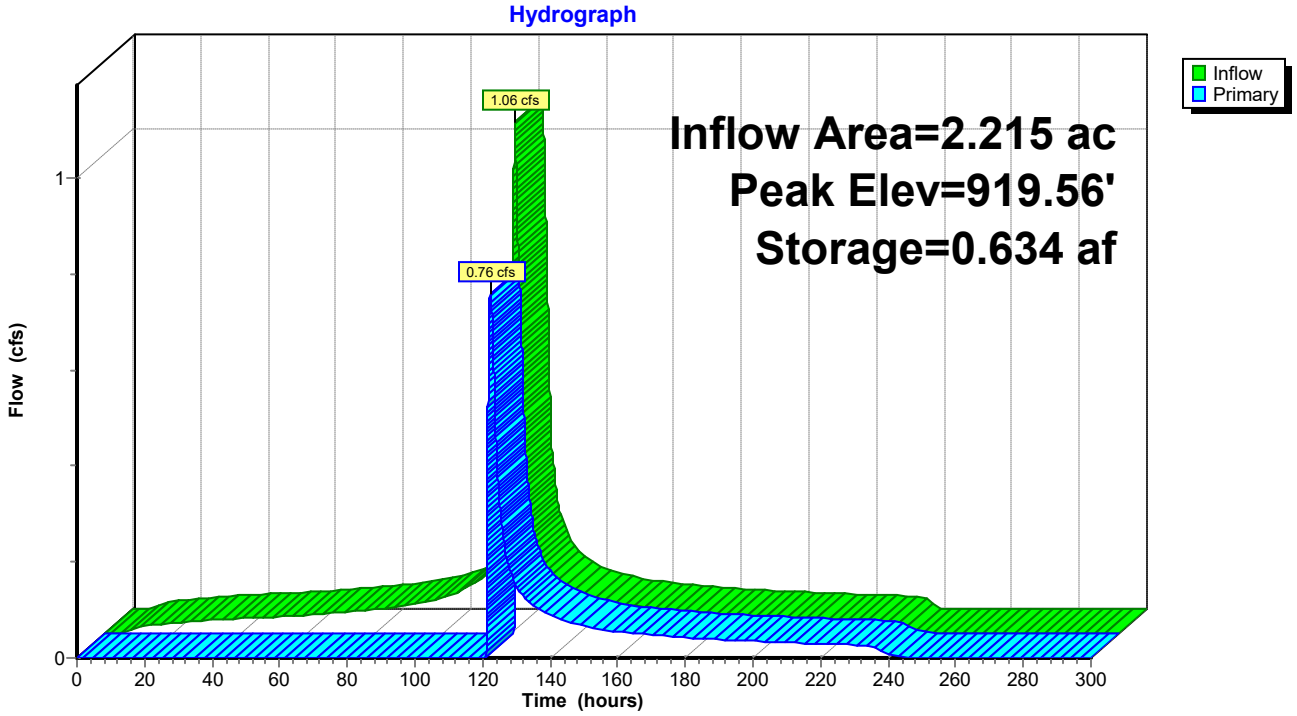
Volume	Invert	Avail.Storage	Storage Description
#1	918.00'	1.054 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
918.00	0.000	0.000	0.000
919.00	0.508	0.254	0.254
920.00	1.093	0.800	1.054

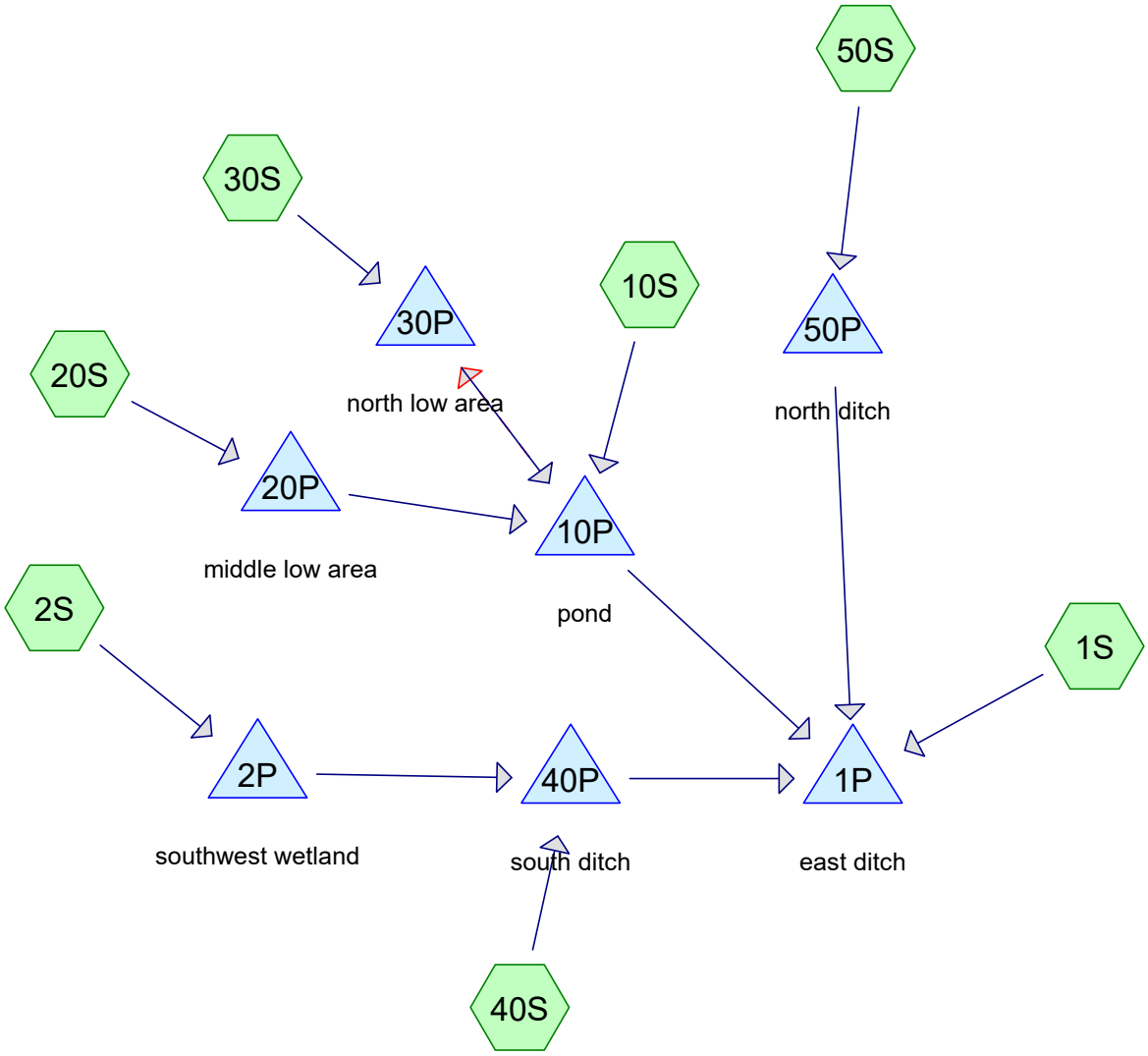
Device	Routing	Invert	Outlet Devices
#1	Primary	919.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.76 cfs @ 122.36 hrs HW=919.56' TW=914.69' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.76 cfs @ 0.59 fps)

Pond 2P: southwest wetland



APPENDIX B



Subcat Reach Pond Link

Routing Diagram for 9614_pr
Prepared by Carlson McCain, Inc., Printed 11/19/2021

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
6.068	74	>75% Grass cover, Good, HSG C (2S, 30S, 50S)
2.051	80	>75% Grass cover, Good, HSG D (1S, 10S, 20S, 40S)
2.942	98	Paved parking, HSG D (1S, 10S, 20S, 30S, 40S, 50S)
0.235	98	Water Surface, 0% imp, HSG D (10S)
11.296	**82**	**TOTAL AREA**

Time span=0.00-300.00 hrs, dt=0.01 hrs, 30001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Runoff Area=0.856 ac 35.05% Impervious Runoff Depth=1.62"
Flow Length=657' Slope=0.0050 '/' Tc=10.3 min CN=WQ Runoff=1.98 cfs 0.115 af

Subcatchment 2S: Runoff Area=2.084 ac 0.00% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=74 Runoff=2.95 cfs 0.136 af

Subcatchment 10S: Runoff Area=2.134 ac 68.42% Impervious Runoff Depth=2.27"
Tc=6.0 min CN=WQ Runoff=7.89 cfs 0.403 af

Subcatchment 20S: Runoff Area=1.571 ac 49.01% Impervious Runoff Depth=1.82"
Flow Length=220' Slope=0.0200 '/' Tc=11.3 min CN=WQ Runoff=3.89 cfs 0.238 af

Subcatchment 30S: Runoff Area=3.225 ac 0.84% Impervious Runoff Depth=0.80"
Flow Length=580' Tc=19.7 min CN=WQ Runoff=2.69 cfs 0.215 af

Subcatchment 40S: Runoff Area=0.503 ac 49.30% Impervious Runoff Depth=1.83"
Flow Length=500' Slope=0.0050 '/' Tc=16.8 min CN=WQ Runoff=1.04 cfs 0.077 af

Subcatchment 50S: Runoff Area=0.923 ac 14.84% Impervious Runoff Depth=1.05"
Flow Length=510' Tc=12.7 min CN=WQ Runoff=1.25 cfs 0.081 af

Pond 1P: east ditch Peak Elev=914.62' Storage=0.025 af Inflow=4.10 cfs 1.128 af
18.0" Round Culvert n=0.013 L=68.0' S=0.0221 '/' Outflow=3.69 cfs 1.128 af

Pond 2P: southwest wetland Peak Elev=918.73' Storage=0.136 af Inflow=2.95 cfs 0.136 af
Outflow=0.00 cfs 0.000 af

Pond 10P: pond Peak Elev=916.57' Storage=0.404 af Inflow=9.48 cfs 0.857 af
Primary=0.77 cfs 0.855 af Secondary=0.07 cfs 0.001 af Outflow=0.82 cfs 0.856 af

Pond 20P: middle low area Peak Elev=916.96' Storage=0.041 af Inflow=3.89 cfs 0.238 af
12.0" Round Culvert n=0.013 L=16.0' S=0.0138 '/' Outflow=2.40 cfs 0.238 af

Pond 30P: north low area Peak Elev=916.58' Storage=0.118 af Inflow=2.69 cfs 0.215 af
15.0" Round Culvert n=0.013 L=18.0' S=0.0100 '/' Outflow=0.36 cfs 0.215 af

Pond 40P: south ditch Peak Elev=918.43' Storage=0.005 af Inflow=1.04 cfs 0.077 af
15.0" Round Culvert n=0.013 L=201.0' S=0.0050 '/' Outflow=0.95 cfs 0.077 af

Pond 50P: north ditch Peak Elev=916.67' Storage=0.007 af Inflow=1.25 cfs 0.081 af
15.0" Round Culvert n=0.013 L=70.0' S=0.0050 '/' Outflow=1.06 cfs 0.081 af

Total Runoff Area = 11.296 ac Runoff Volume = 1.265 af Average Runoff Depth = 1.34"
73.96% Pervious = 8.354 ac 26.04% Impervious = 2.942 ac

Summary for Subcatchment 1S:

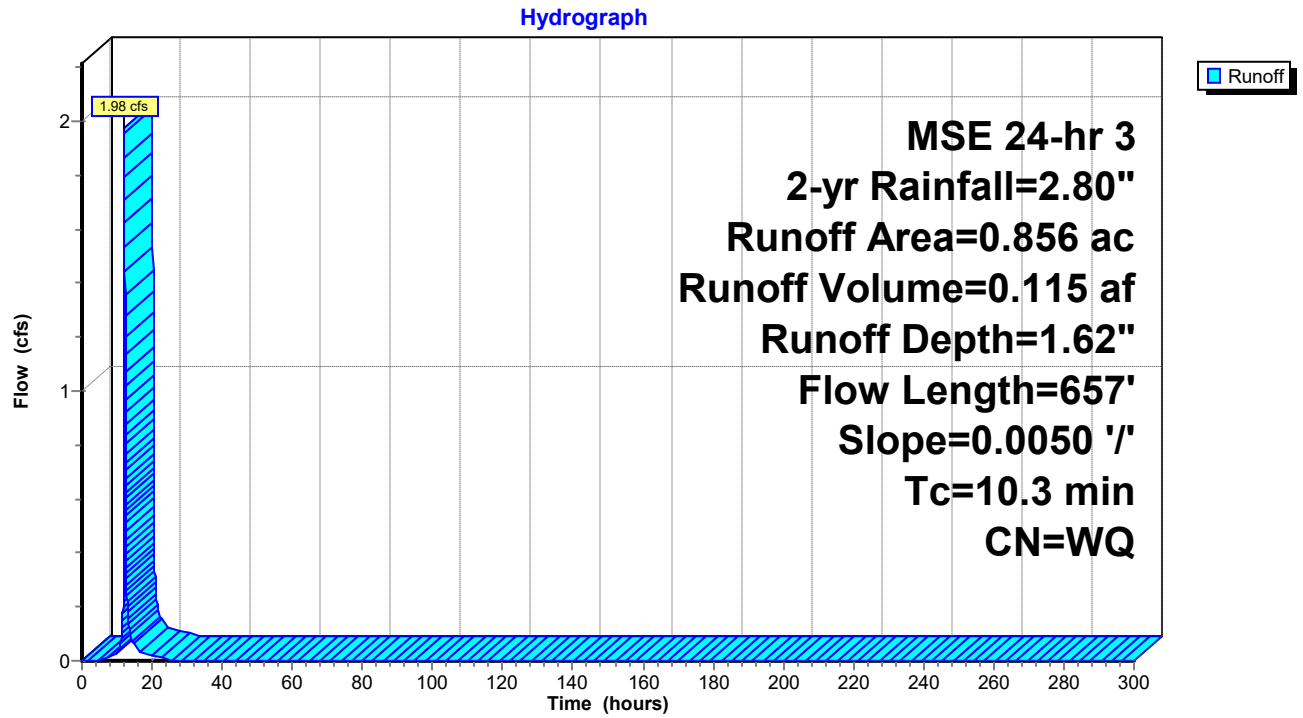
Runoff = 1.98 cfs @ 12.18 hrs, Volume= 0.115 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
0.556	80	>75% Grass cover, Good, HSG D
0.300	98	Paved parking, HSG D
0.856		Weighted Average
0.556		64.95% Pervious Area
0.300		35.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.0050	1.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Subcatchment 1S:



Summary for Subcatchment 2S:

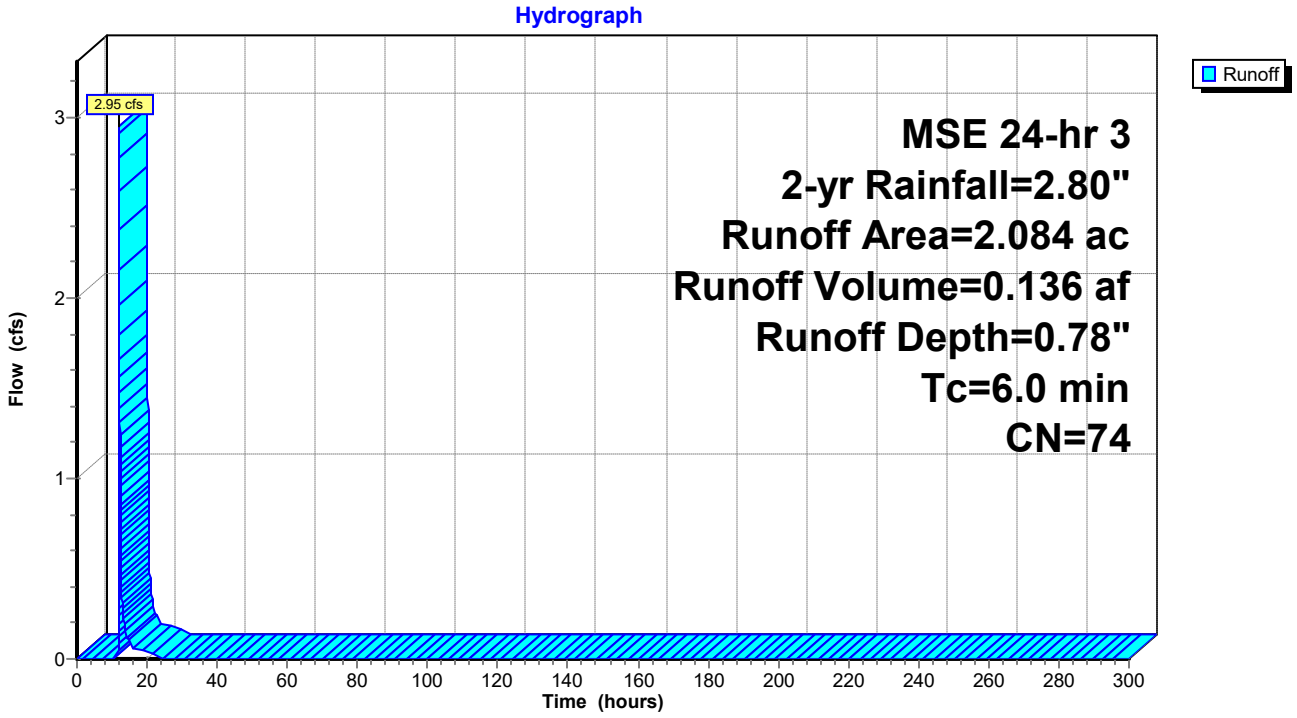
Runoff = 2.95 cfs @ 12.14 hrs, Volume= 0.136 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
2.084	74	>75% Grass cover, Good, HSG C
2.084		100.00% Pervious Area

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

Subcatchment 2S:



Summary for Subcatchment 10S:

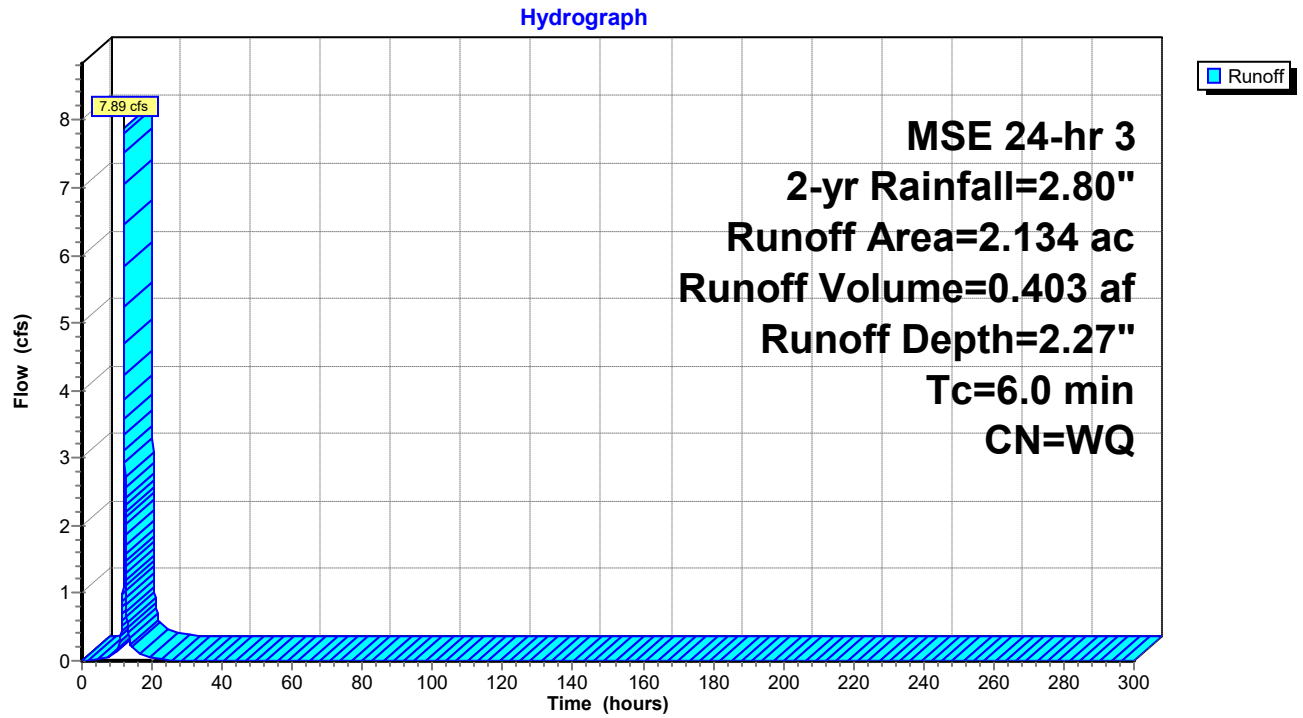
Runoff = 7.89 cfs @ 12.13 hrs, Volume= 0.403 af, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
1.460	98	Paved parking, HSG D
0.439	80	>75% Grass cover, Good, HSG D
0.235	98	Water Surface, 0% imp, HSG D
2.134		Weighted Average
0.674		31.58% Pervious Area
1.460		68.42% Impervious Area

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

Subcatchment 10S:



Summary for Subcatchment 20S:

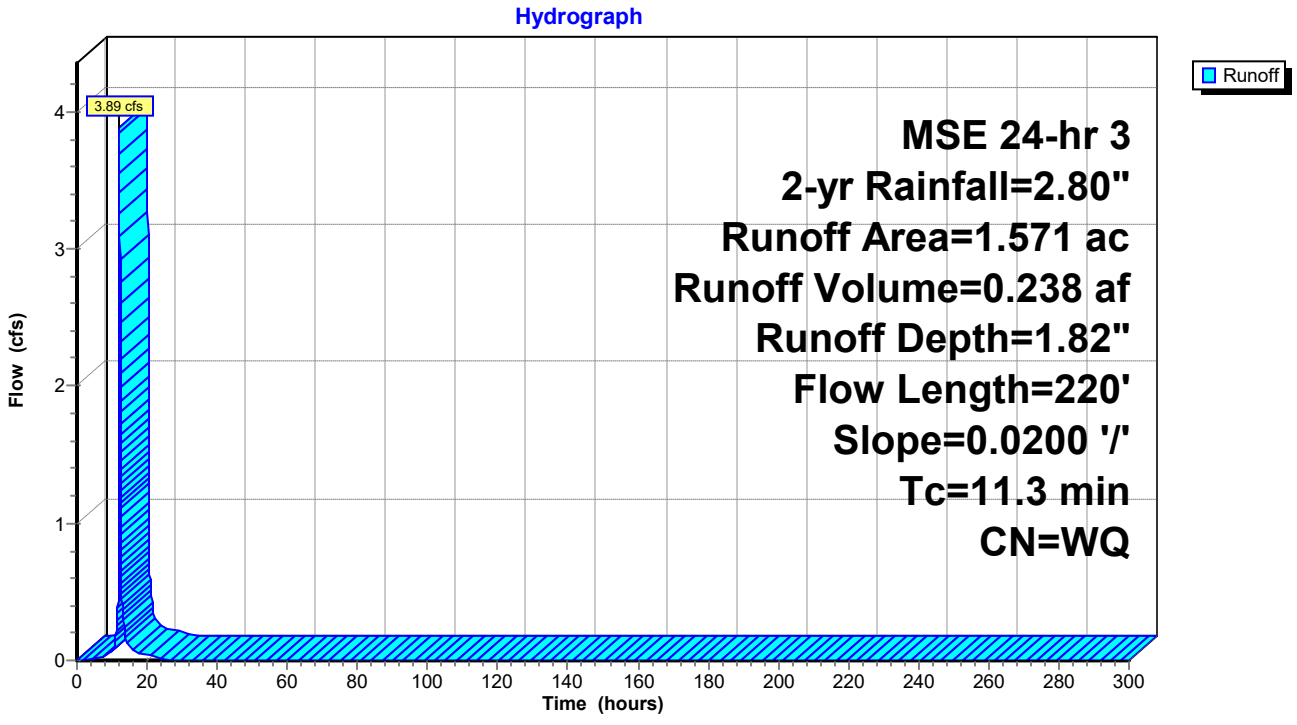
Runoff = 3.89 cfs @ 12.19 hrs, Volume= 0.238 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
0.801	80	>75% Grass cover, Good, HSG D
0.770	98	Paved parking, HSG D
1.571		Weighted Average
0.801		50.99% Pervious Area
0.770		49.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0200	0.18		**Sheet Flow,** Range n= 0.130 P2= 2.80"
2.0	120	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	220	Total			

Subcatchment 20S:



Summary for Subcatchment 30S:

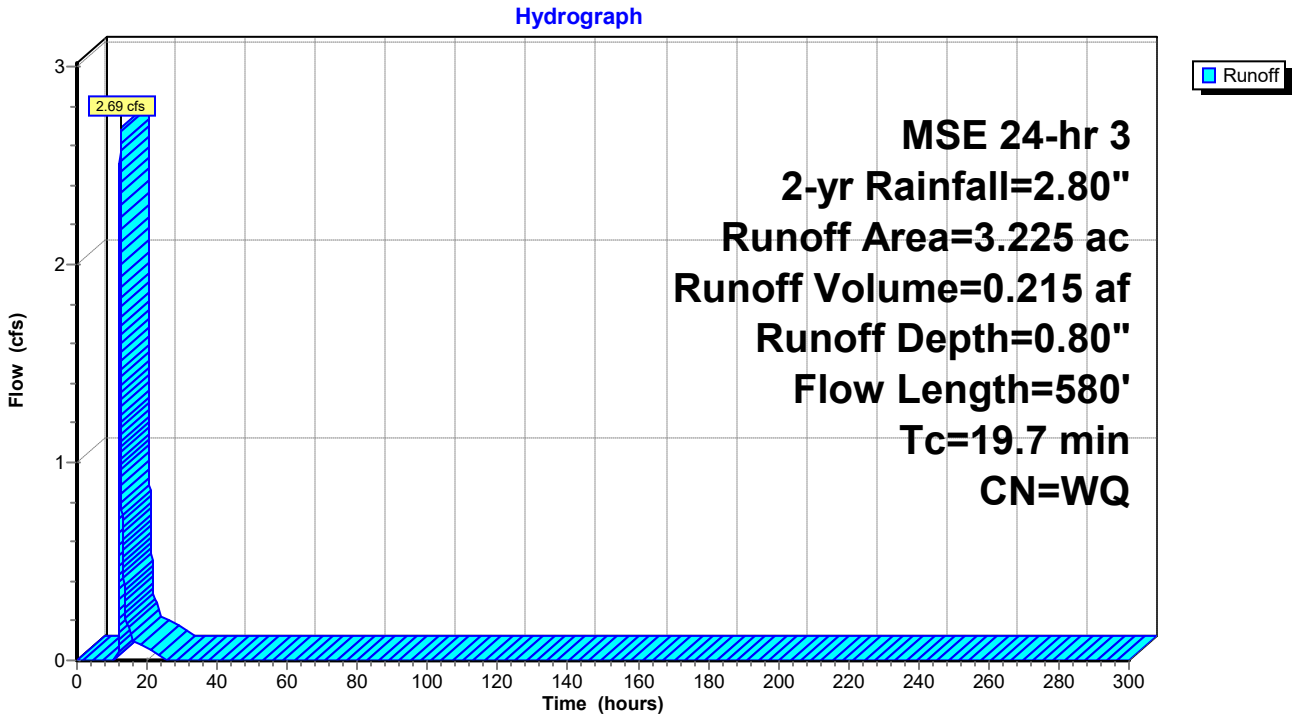
Runoff = 2.69 cfs @ 12.32 hrs, Volume= 0.215 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
3.198	74	>75% Grass cover, Good, HSG C
0.027	98	Paved parking, HSG D
3.225		Weighted Average
3.198		99.16% Pervious Area
0.027		0.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0150	0.30		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
14.1	480	0.0040	0.57		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
19.7	580	Total			

Subcatchment 30S:



Summary for Subcatchment 40S:

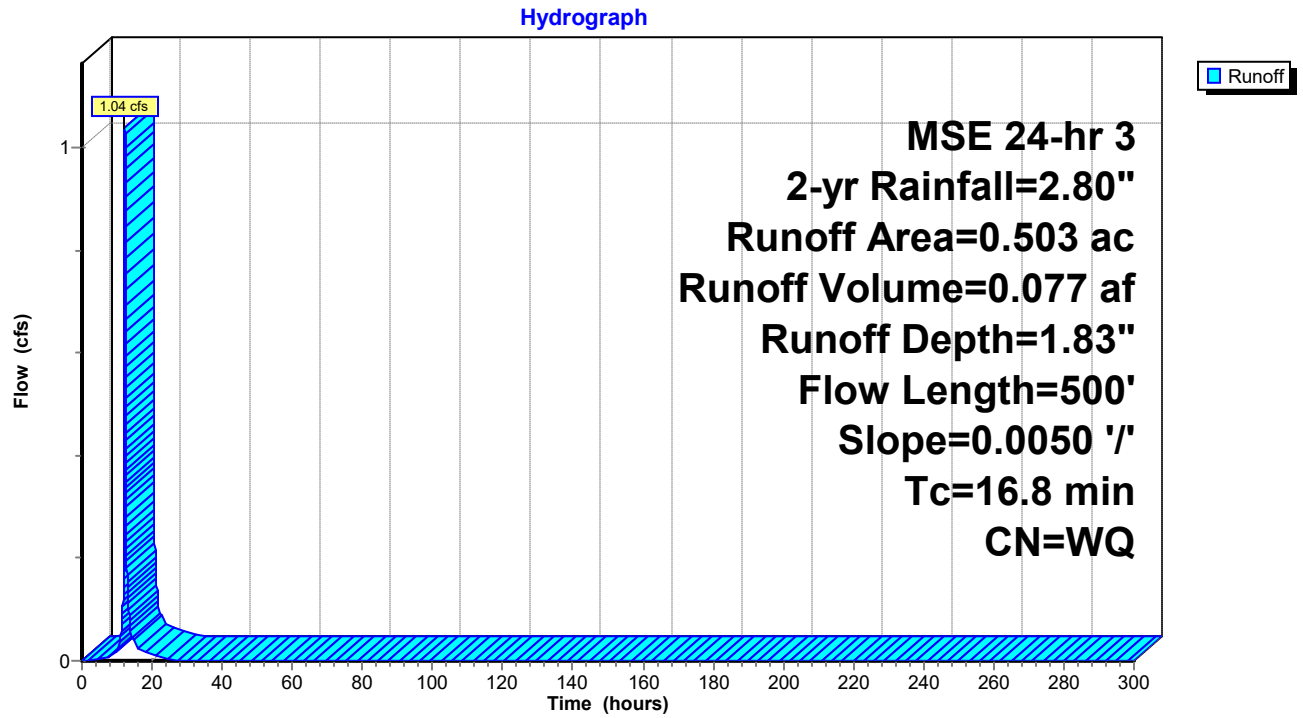
Runoff = 1.04 cfs @ 12.25 hrs, Volume= 0.077 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
0.255	80	>75% Grass cover, Good, HSG D
0.248	98	Paved parking, HSG D
0.503		Weighted Average
0.255		50.70% Pervious Area
0.248		49.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	500	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Subcatchment 40S:



Summary for Subcatchment 50S:

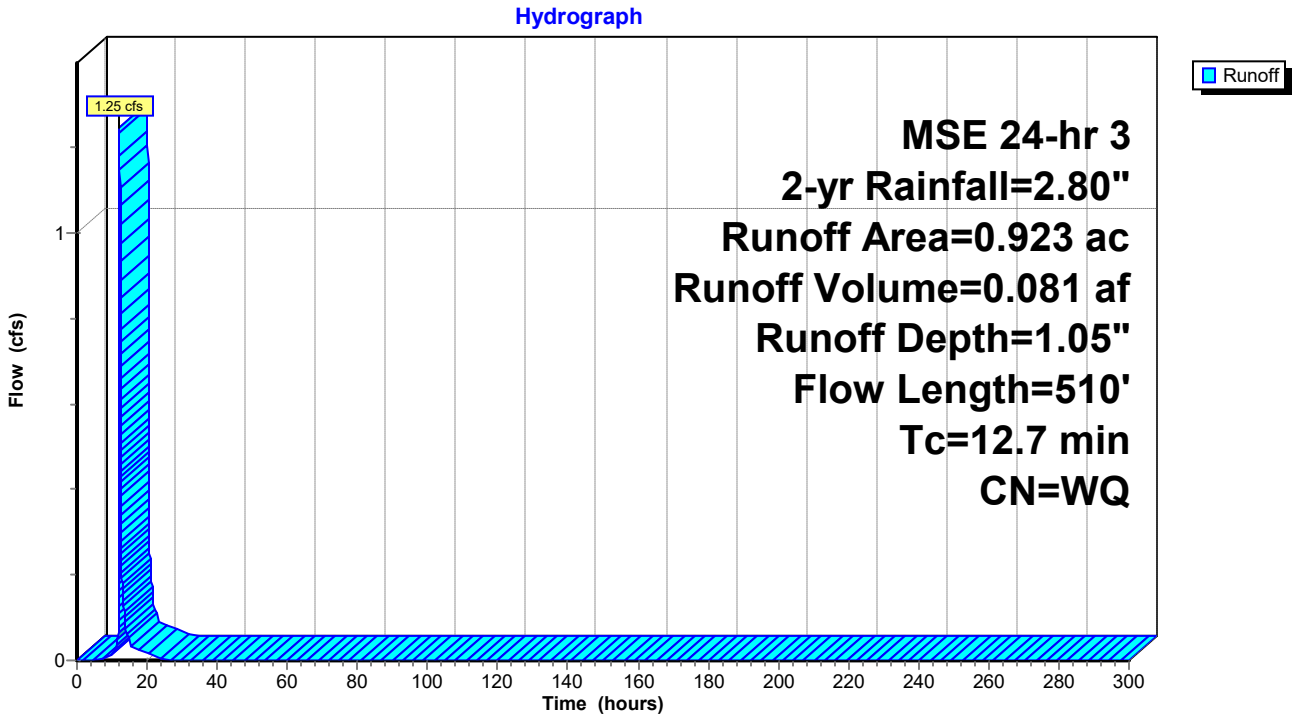
Runoff = 1.25 cfs @ 12.21 hrs, Volume= 0.081 af, Depth= 1.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 2-yr Rainfall=2.80"

Area (ac)	CN	Description
0.786	74	>75% Grass cover, Good, HSG C
0.137	98	Paved parking, HSG D
0.923		Weighted Average
0.786		85.16% Pervious Area
0.137		14.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0150	0.26		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
9.5	460	0.0080	0.80		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.7	510	Total			

Subcatchment 50S:



Summary for Pond 1P: east ditch

Inflow	=	4.10 cfs @	12.22 hrs,	Volume=	1.128 af
Outflow	=	3.69 cfs @	12.32 hrs,	Volume=	1.128 af, Atten= 10%, Lag= 6.0 min
Primary	=	3.69 cfs @	12.32 hrs,	Volume=	1.128 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 914.62' @ 12.32 hrs Surf.Area= 0.055 ac Storage= 0.025 af

Plug-Flow detention time= 4.4 min calculated for 1.128 af (100% of inflow)
Center-of-Mass det. time= 4.3 min (1,112.9 - 1,108.6)

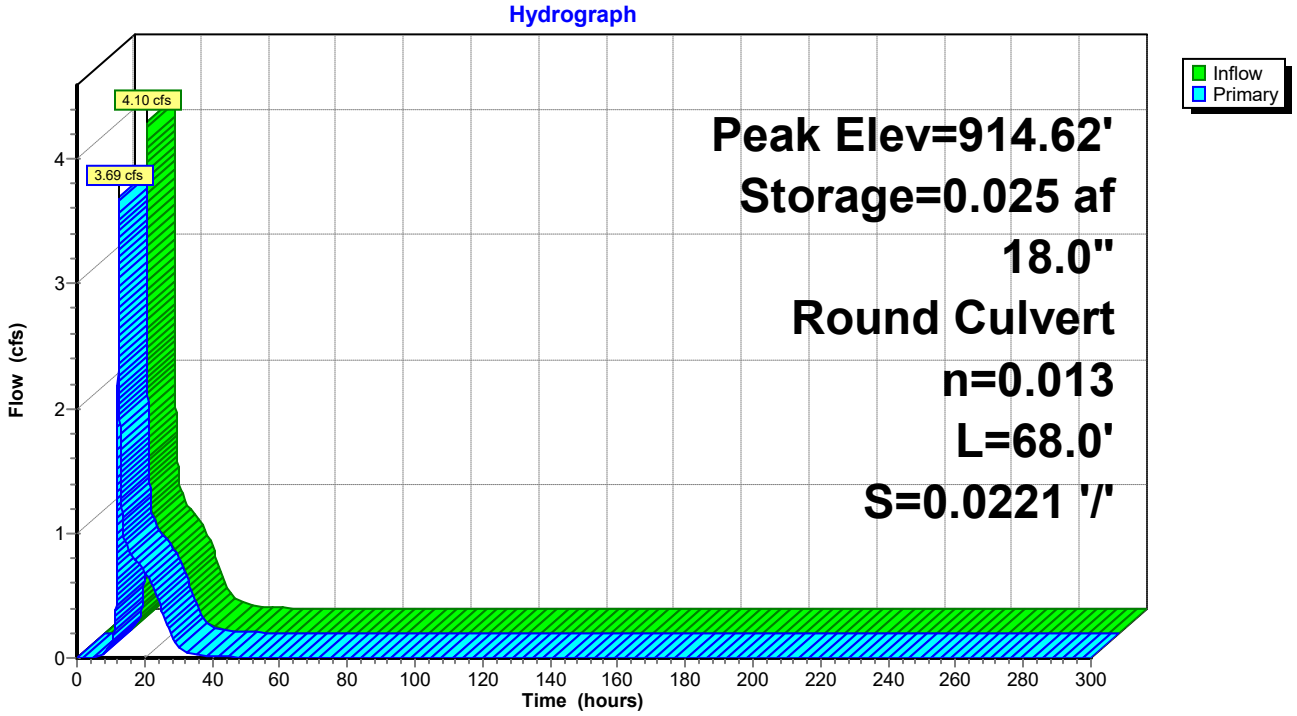
Volume	Invert	Avail.Storage	Storage Description
#1	913.70'	0.332 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
913.70	0.000	0.000	0.000
916.00	0.137	0.158	0.158
917.00	0.212	0.174	0.332

Device	Routing	Invert	Outlet Devices
#1	Primary	913.70'	**18.0" Round Culvert** L= 68.0' Ke= 0.500 Inlet / Outlet Invert= 913.70' / 912.20' S= 0.0221 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=3.69 cfs @ 12.32 hrs HW=914.62' (Free Discharge)
1=Culvert (Inlet Controls 3.69 cfs @ 3.26 fps)

Pond 1P: east ditch



Summary for Pond 2P: southwest wetland

Inflow Area = 2.084 ac, 0.00% Impervious, Inflow Depth = 0.78" for 2-yr event
Inflow = 2.95 cfs @ 12.14 hrs, Volume= 0.136 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 918.73' @ 24.34 hrs Surf.Area= 0.372 ac Storage= 0.136 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

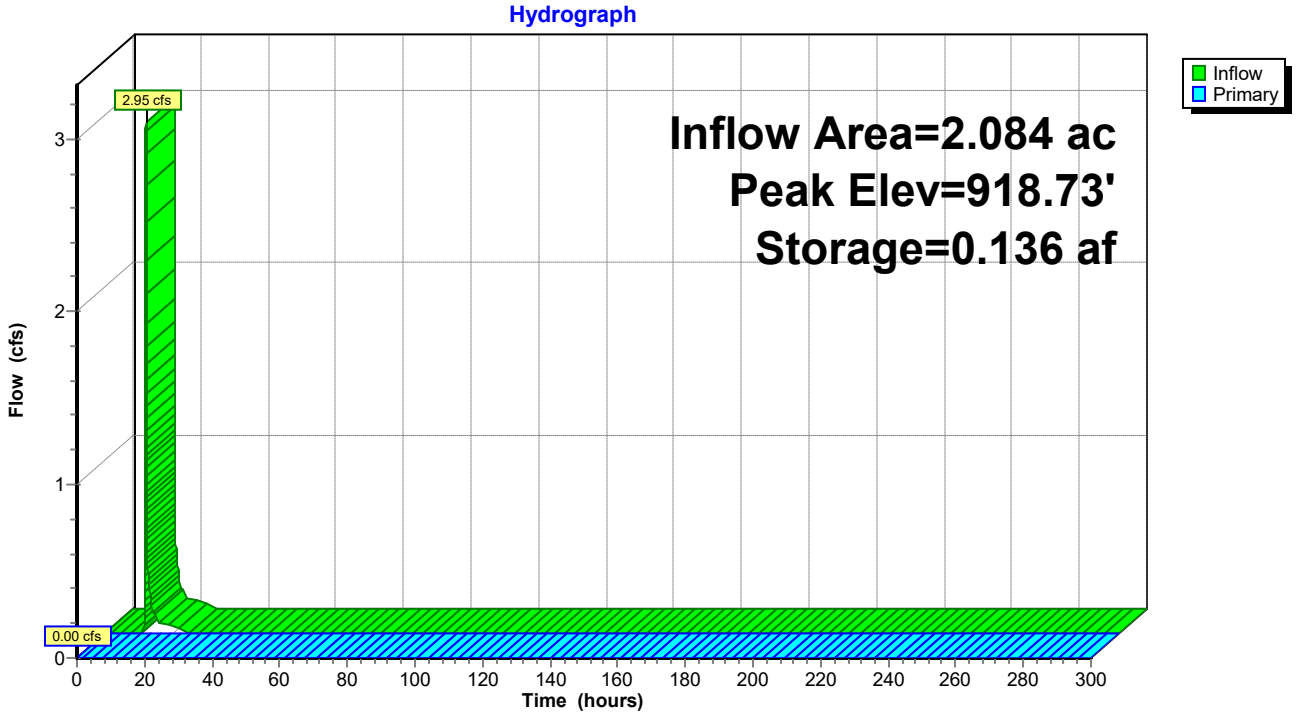
Volume	Invert	Avail.Storage	Storage Description
#1	918.00'	1.054 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
918.00	0.000	0.000	0.000
919.00	0.508	0.254	0.254
920.00	1.093	0.800	1.054

Device	Routing	Invert	Outlet Devices
#1	Primary	919.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=918.00' TW=917.90' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: southwest wetland



Summary for Pond 10P: pond

Inflow	=	9.48 cfs @	12.14 hrs,	Volume=	0.857 af
Outflow	=	0.82 cfs @	12.76 hrs,	Volume=	0.856 af, Atten= 91%, Lag= 37.2 min
Primary	=	0.77 cfs @	13.57 hrs,	Volume=	0.855 af
Secondary	=	0.07 cfs @	12.75 hrs,	Volume=	0.001 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.57' @ 13.57 hrs Surf.Area= 0.281 ac Storage= 0.404 af

Plug-Flow detention time= 369.9 min calculated for 0.856 af (100% of inflow)
Center-of-Mass det. time= 368.8 min (1,207.9 - 839.1)

Volume	Invert	Avail.Storage	Storage Description
#1	915.00'	1.553 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

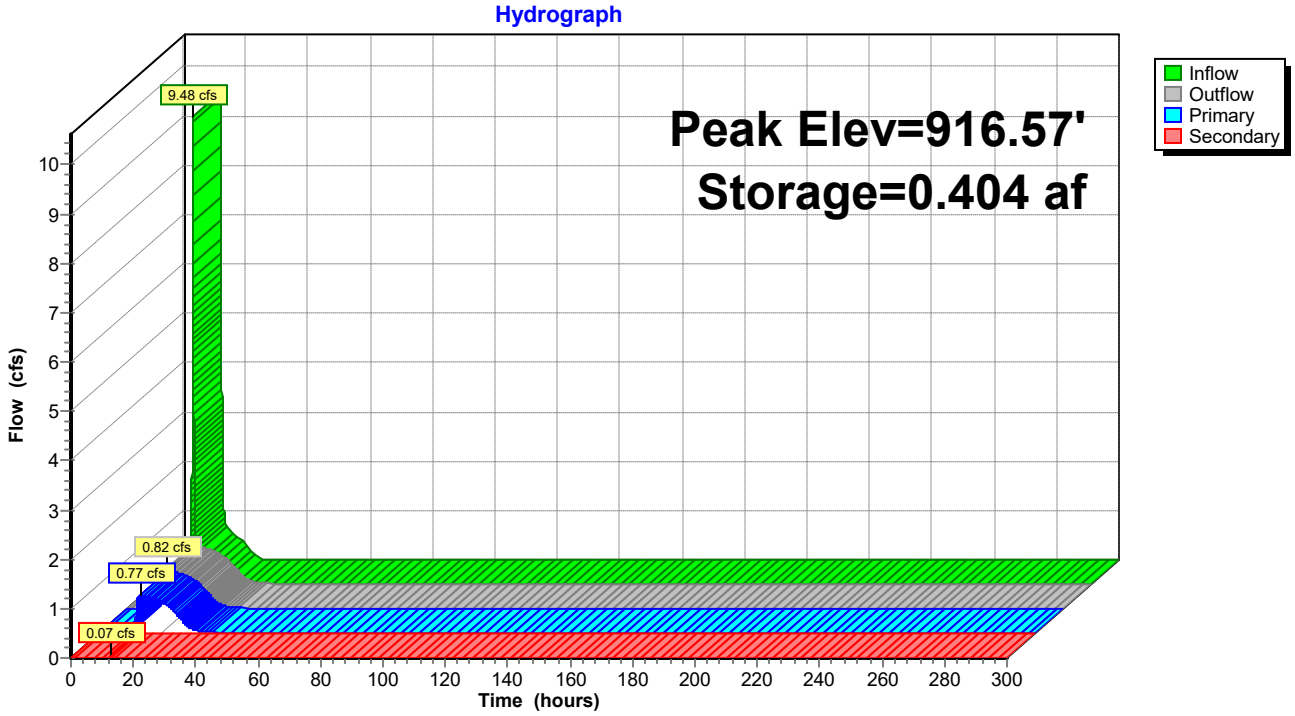
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
915.00	0.235	0.000	0.000
916.00	0.263	0.249	0.249
918.00	0.325	0.588	0.837
920.00	0.391	0.716	1.553

Device	Routing	Invert	Outlet Devices
#1	Primary	915.00'	**15.0" Round Culvert** L= 35.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 915.00' / 914.88' S= 0.0034 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	915.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	918.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	916.00'	**15.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 915.82' / 916.00' S= -0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.77 cfs @ 13.57 hrs HW=916.57' TW=914.17' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.77 cfs of 4.67 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.77 cfs @ 5.62 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 12.75 hrs HW=916.51' TW=916.51' (Dynamic Tailwater)
└─**4=Culvert** (Controls 0.00 cfs)

Pond 10P: pond



Summary for Pond 20P: middle low area

Inflow Area = 1.571 ac, 49.01% Impervious, Inflow Depth = 1.82" for 2-yr event
Inflow = 3.89 cfs @ 12.19 hrs, Volume= 0.238 af
Outflow = 2.40 cfs @ 12.31 hrs, Volume= 0.238 af, Atten= 38%, Lag= 7.3 min
Primary = 2.40 cfs @ 12.31 hrs, Volume= 0.238 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.96' @ 12.31 hrs Surf.Area= 0.086 ac Storage= 0.041 af

Plug-Flow detention time= 24.0 min calculated for 0.238 af (100% of inflow)
Center-of-Mass det. time= 24.0 min (803.2 - 779.2)

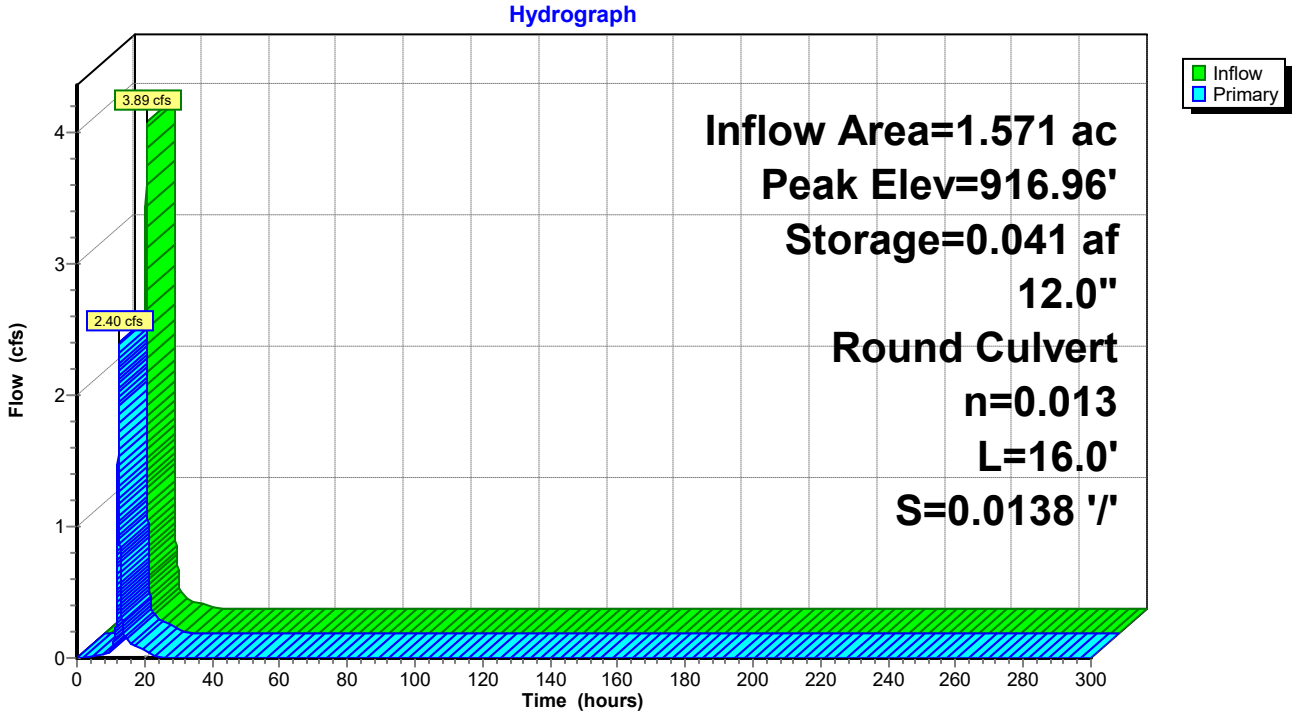
Volume	Invert	Avail.Storage	Storage Description
#1	916.00'	0.916 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.00	0.000	0.000	0.000
918.00	0.178	0.178	0.178
920.00	0.560	0.738	0.916

Device	Routing	Invert	Outlet Devices
#1	Primary	916.00'	**12.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 916.00' / 915.78' S= 0.0138 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.40 cfs @ 12.31 hrs HW=916.96' TW=916.19' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 2.40 cfs @ 3.95 fps)

Pond 20P: middle low area



Summary for Pond 30P: north low area

Inflow	=	2.69 cfs @	12.32 hrs,	Volume=	0.215 af
Outflow	=	0.36 cfs @	12.42 hrs,	Volume=	0.215 af, Atten= 87%, Lag= 6.0 min
Primary	=	0.36 cfs @	12.42 hrs,	Volume=	0.215 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.58' @ 13.74 hrs Surf.Area= 0.403 ac Storage= 0.118 af

Plug-Flow detention time= 180.2 min calculated for 0.215 af (100% of inflow)
Center-of-Mass det. time= 180.3 min (1,025.6 - 845.3)

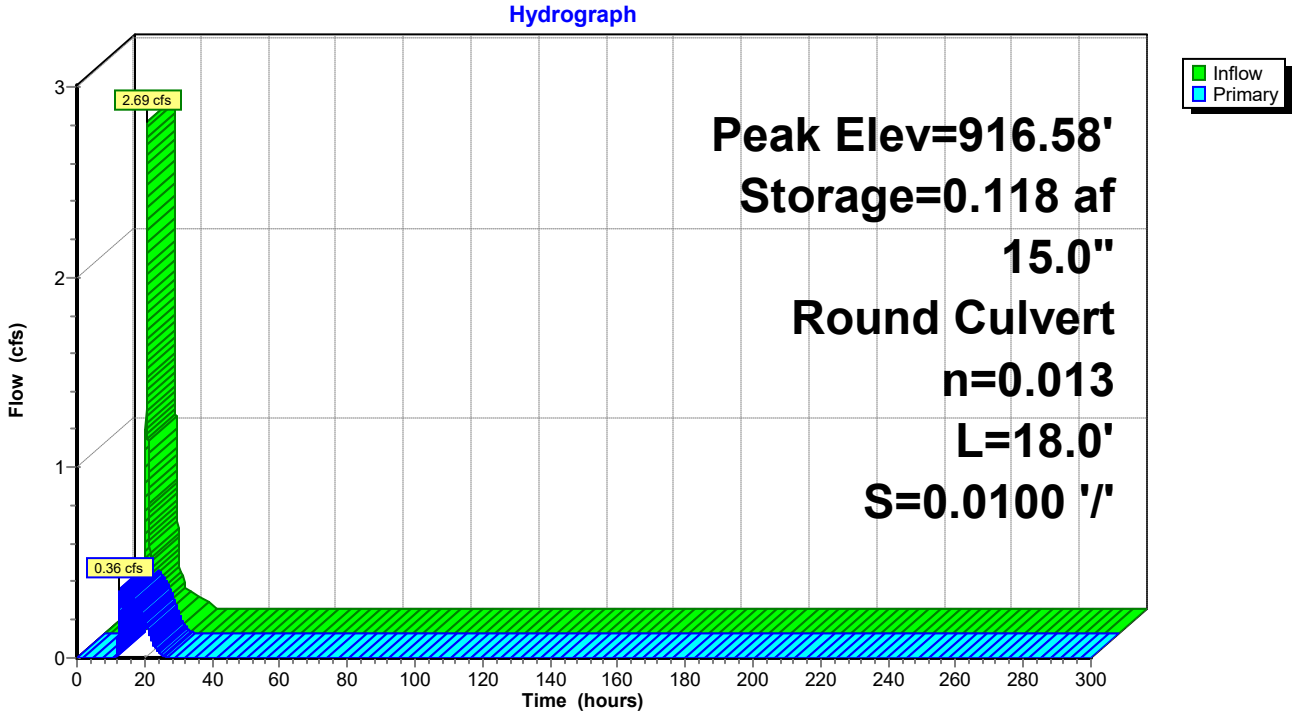
Volume	Invert	Avail.Storage	Storage Description
#1	916.00'	1.380 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.00	0.000	0.000	0.000
918.00	1.380	1.380	1.380

Device	Routing	Invert	Outlet Devices
#1	Primary	916.00'	**15.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 916.00' / 915.82' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.34 cfs @ 12.42 hrs HW=916.40' TW=916.32' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.34 cfs @ 1.51 fps)

Pond 30P: north low area



Summary for Pond 40P: south ditch

Inflow Area = 2.587 ac, 9.59% Impervious, Inflow Depth = 0.35" for 2-yr event
Inflow = 1.04 cfs @ 12.25 hrs, Volume= 0.077 af
Outflow = 0.95 cfs @ 12.32 hrs, Volume= 0.077 af, Atten= 9%, Lag= 3.9 min
Primary = 0.95 cfs @ 12.32 hrs, Volume= 0.077 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 918.43' @ 12.32 hrs Surf.Area= 0.022 ac Storage= 0.005 af

Plug-Flow detention time= 3.4 min calculated for 0.077 af (100% of inflow)
Center-of-Mass det. time= 3.1 min (787.2 - 784.1)

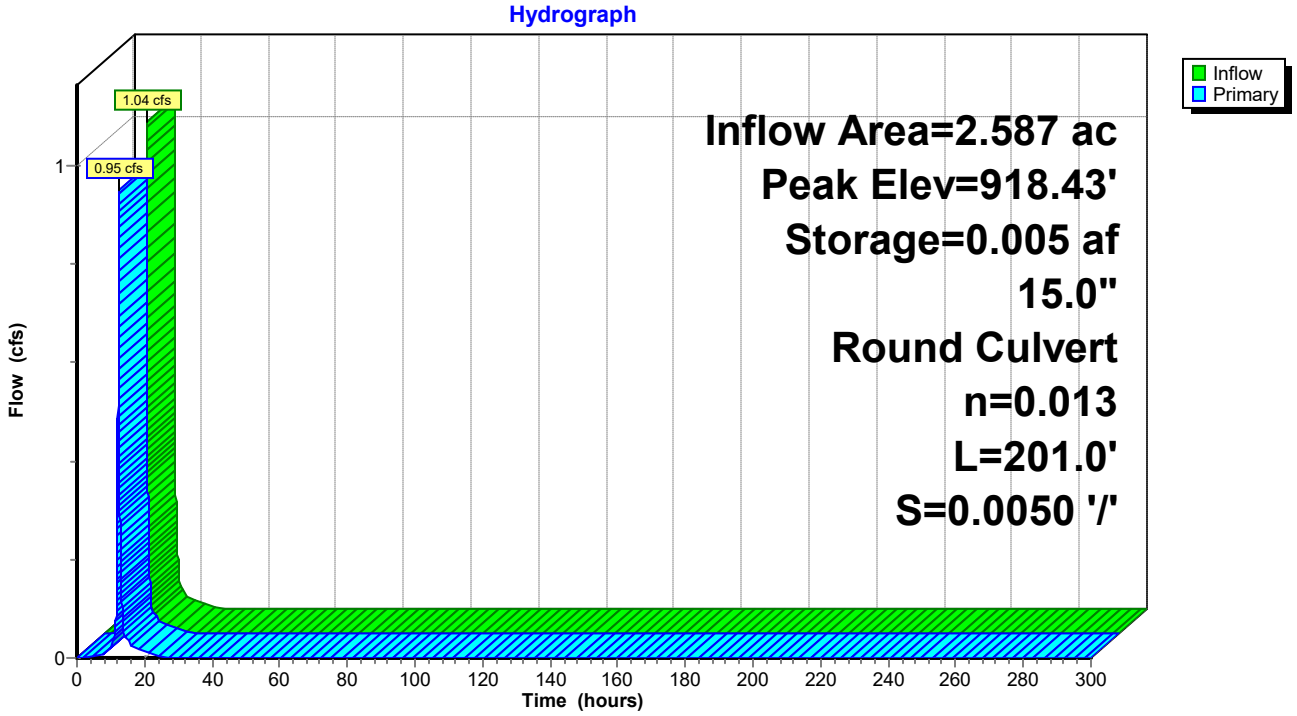
Volume	Invert	Avail.Storage	Storage Description
#1	917.90'	0.097 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
917.90	0.000	0.000	0.000
918.00	0.002	0.000	0.000
920.00	0.095	0.097	0.097

Device	Routing	Invert	Outlet Devices
#1	Primary	917.90'	**15.0" Round Culvert** L= 201.0' Ke= 0.500 Inlet / Outlet Invert= 917.90' / 916.90' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.95 cfs @ 12.32 hrs HW=918.43' TW=914.62' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.95 cfs @ 2.87 fps)

Pond 40P: south ditch



Summary for Pond 50P: north ditch

Inflow Area = 0.923 ac, 14.84% Impervious, Inflow Depth = 1.05" for 2-yr event
Inflow = 1.25 cfs @ 12.21 hrs, Volume= 0.081 af
Outflow = 1.06 cfs @ 12.29 hrs, Volume= 0.081 af, Atten= 15%, Lag= 4.4 min
Primary = 1.06 cfs @ 12.29 hrs, Volume= 0.081 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.67' @ 12.29 hrs Surf.Area= 0.026 ac Storage= 0.007 af

Plug-Flow detention time= 5.3 min calculated for 0.081 af (100% of inflow)
Center-of-Mass det. time= 5.1 min (816.9 - 811.8)

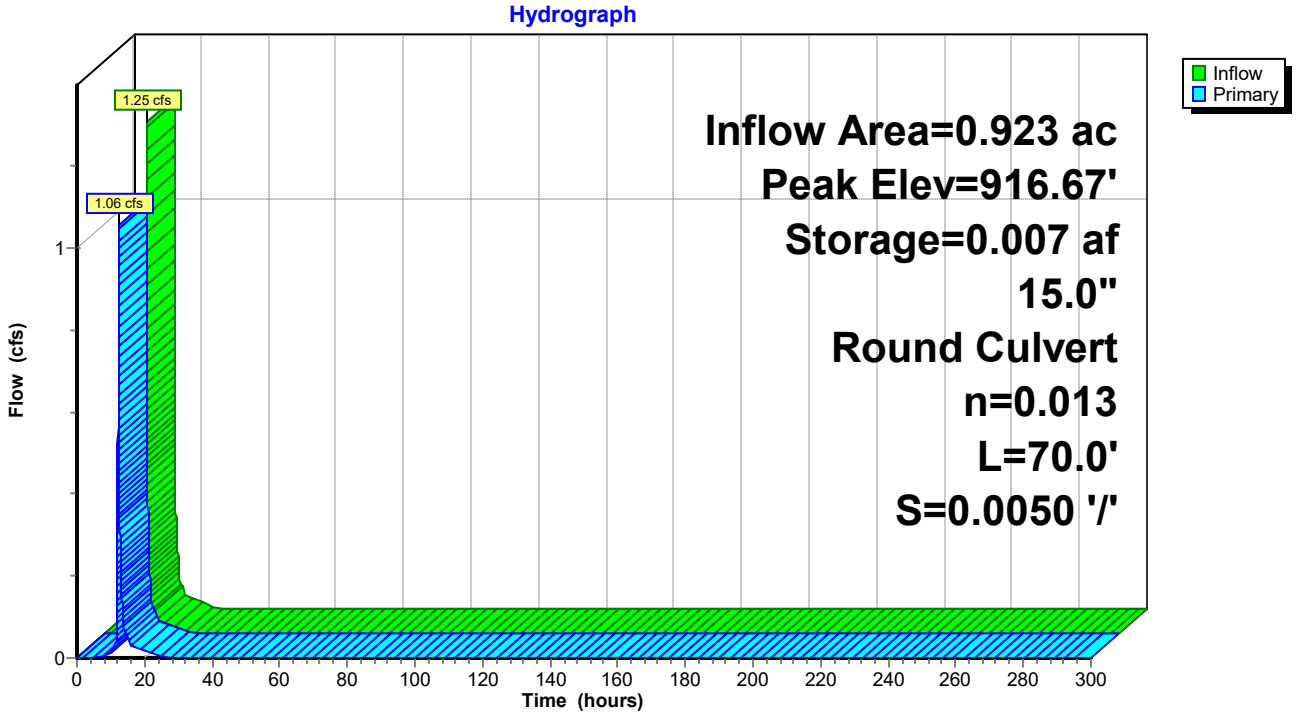
Volume	Invert	Avail.Storage	Storage Description
#1	916.10'	0.083 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.10	0.000	0.000	0.000
918.00	0.087	0.083	0.083

Device	Routing	Invert	Outlet Devices
#1	Primary	916.10'	**15.0" Round Culvert** L= 70.0' Ke= 0.500 Inlet / Outlet Invert= 916.10' / 915.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=1.06 cfs @ 12.29 hrs HW=916.67' TW=914.61' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.06 cfs @ 2.86 fps)

Pond 50P: north ditch



Time span=0.00-300.00 hrs, dt=0.01 hrs, 30001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Runoff Area=0.856 ac 35.05% Impervious Runoff Depth=2.80"
Flow Length=657' Slope=0.0050 '/' Tc=10.3 min CN=WQ Runoff=3.43 cfs 0.200 af

Subcatchment 2S: Runoff Area=2.084 ac 0.00% Impervious Runoff Depth=1.72"
Tc=6.0 min CN=74 Runoff=6.70 cfs 0.299 af

Subcatchment 10S: Runoff Area=2.134 ac 68.42% Impervious Runoff Depth=3.57"
Tc=6.0 min CN=WQ Runoff=12.28 cfs 0.636 af

Subcatchment 20S: Runoff Area=1.571 ac 49.01% Impervious Runoff Depth=3.04"
Flow Length=220' Slope=0.0200 '/' Tc=11.3 min CN=WQ Runoff=6.49 cfs 0.398 af

Subcatchment 30S: Runoff Area=3.225 ac 0.84% Impervious Runoff Depth=1.74"
Flow Length=580' Tc=19.7 min CN=WQ Runoff=6.23 cfs 0.468 af

Subcatchment 40S: Runoff Area=0.503 ac 49.30% Impervious Runoff Depth=3.05"
Flow Length=500' Slope=0.0050 '/' Tc=16.8 min CN=WQ Runoff=1.74 cfs 0.128 af

Subcatchment 50S: Runoff Area=0.923 ac 14.84% Impervious Runoff Depth=2.05"
Flow Length=510' Tc=12.7 min CN=WQ Runoff=2.54 cfs 0.158 af

Pond 1P: east ditch Peak Elev=914.97' Storage=0.048 af Inflow=7.03 cfs 1.985 af
18.0" Round Culvert n=0.013 L=68.0' S=0.0221 '/' Outflow=6.09 cfs 1.985 af

Pond 2P: southwest wetland Peak Elev=919.08' Storage=0.299 af Inflow=6.70 cfs 0.299 af
Outflow=0.00 cfs 0.000 af

Pond 10P: pond Peak Elev=917.08' Storage=0.550 af Inflow=14.75 cfs 1.587 af
Primary=0.90 cfs 1.500 af Secondary=1.54 cfs 0.085 af Outflow=2.37 cfs 1.585 af

Pond 20P: middle low area Peak Elev=917.36' Storage=0.083 af Inflow=6.49 cfs 0.398 af
12.0" Round Culvert n=0.013 L=16.0' S=0.0138 '/' Outflow=2.98 cfs 0.398 af

Pond 30P: north low area Peak Elev=917.08' Storage=0.404 af Inflow=7.74 cfs 0.553 af
15.0" Round Culvert n=0.013 L=18.0' S=0.0100 '/' Outflow=0.47 cfs 0.553 af

Pond 40P: south ditch Peak Elev=918.59' Storage=0.009 af Inflow=1.74 cfs 0.128 af
15.0" Round Culvert n=0.013 L=201.0' S=0.0050 '/' Outflow=1.56 cfs 0.128 af

Pond 50P: north ditch Peak Elev=916.94' Storage=0.016 af Inflow=2.54 cfs 0.158 af
15.0" Round Culvert n=0.013 L=70.0' S=0.0050 '/' Outflow=2.10 cfs 0.158 af

Total Runoff Area = 11.296 ac Runoff Volume = 2.286 af Average Runoff Depth = 2.43"
73.96% Pervious = 8.354 ac 26.04% Impervious = 2.942 ac

Summary for Subcatchment 1S:

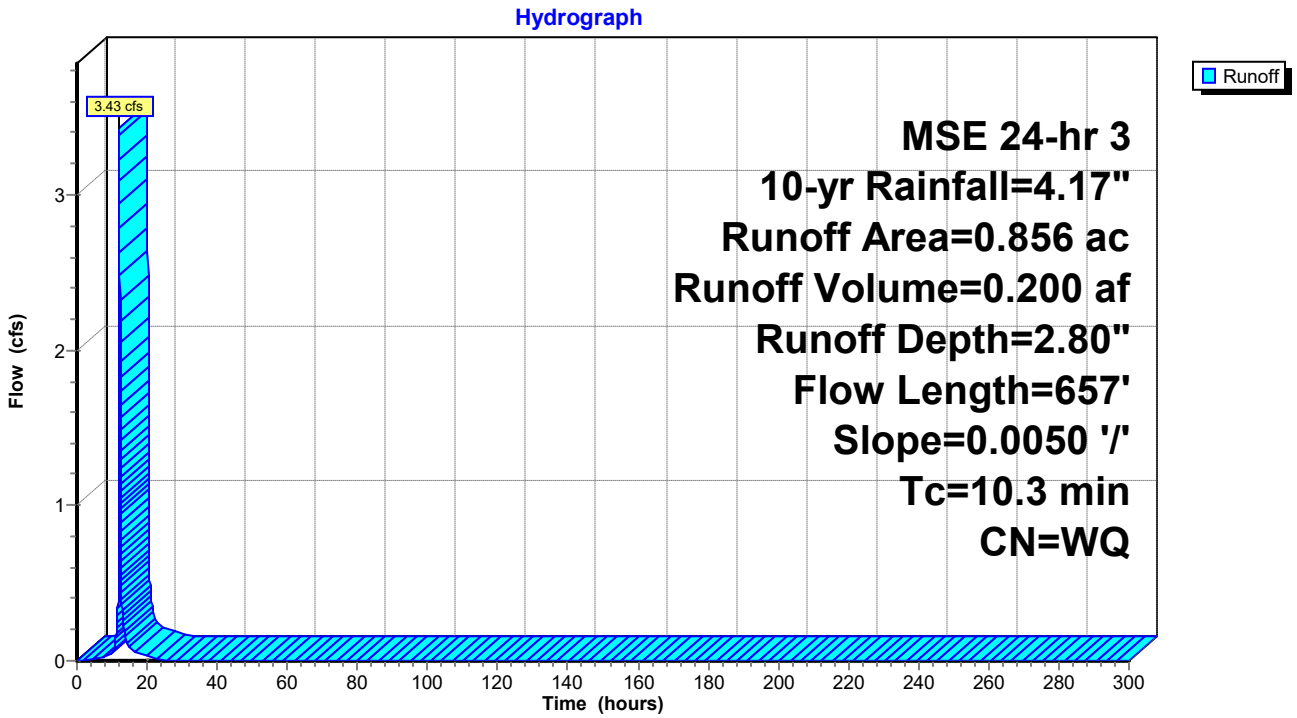
Runoff = 3.43 cfs @ 12.18 hrs, Volume= 0.200 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
0.556	80	>75% Grass cover, Good, HSG D
0.300	98	Paved parking, HSG D
0.856		Weighted Average
0.556		64.95% Pervious Area
0.300		35.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.0050	1.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Subcatchment 1S:



Summary for Subcatchment 2S:

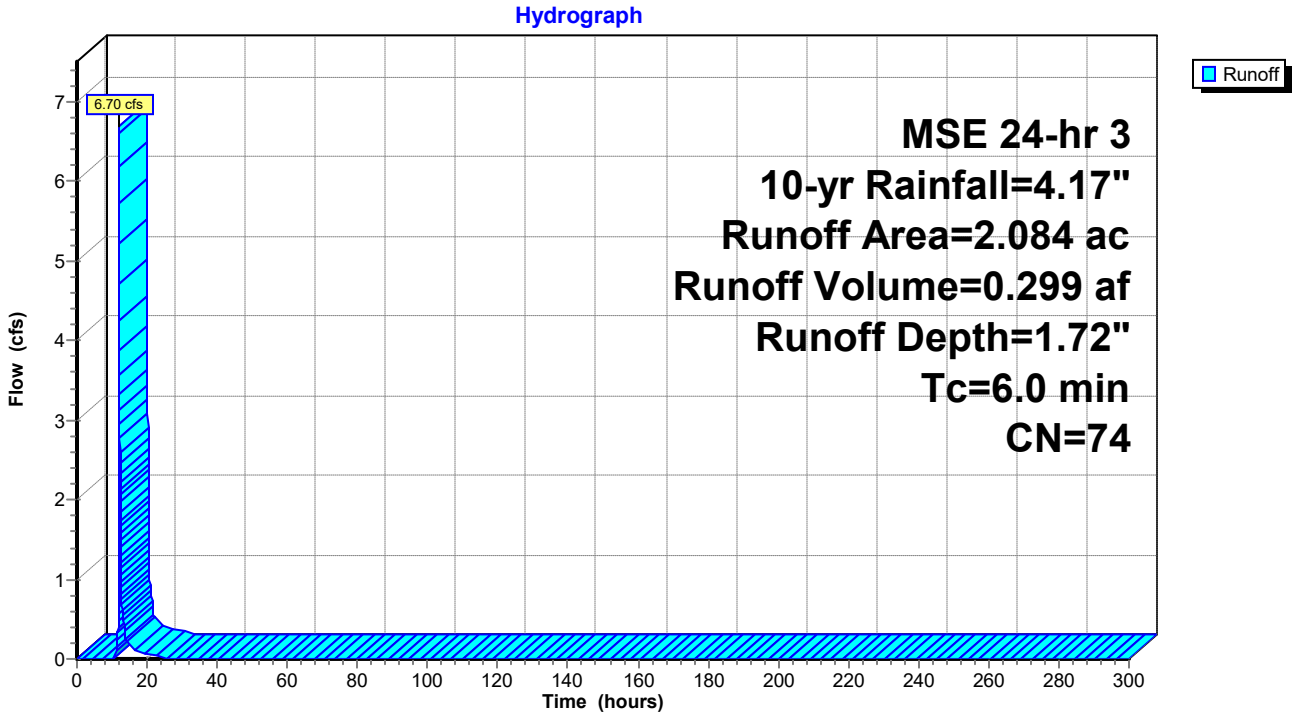
Runoff = 6.70 cfs @ 12.14 hrs, Volume= 0.299 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
2.084	74	>75% Grass cover, Good, HSG C
2.084		100.00% Pervious Area

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

Subcatchment 2S:



Summary for Subcatchment 10S:

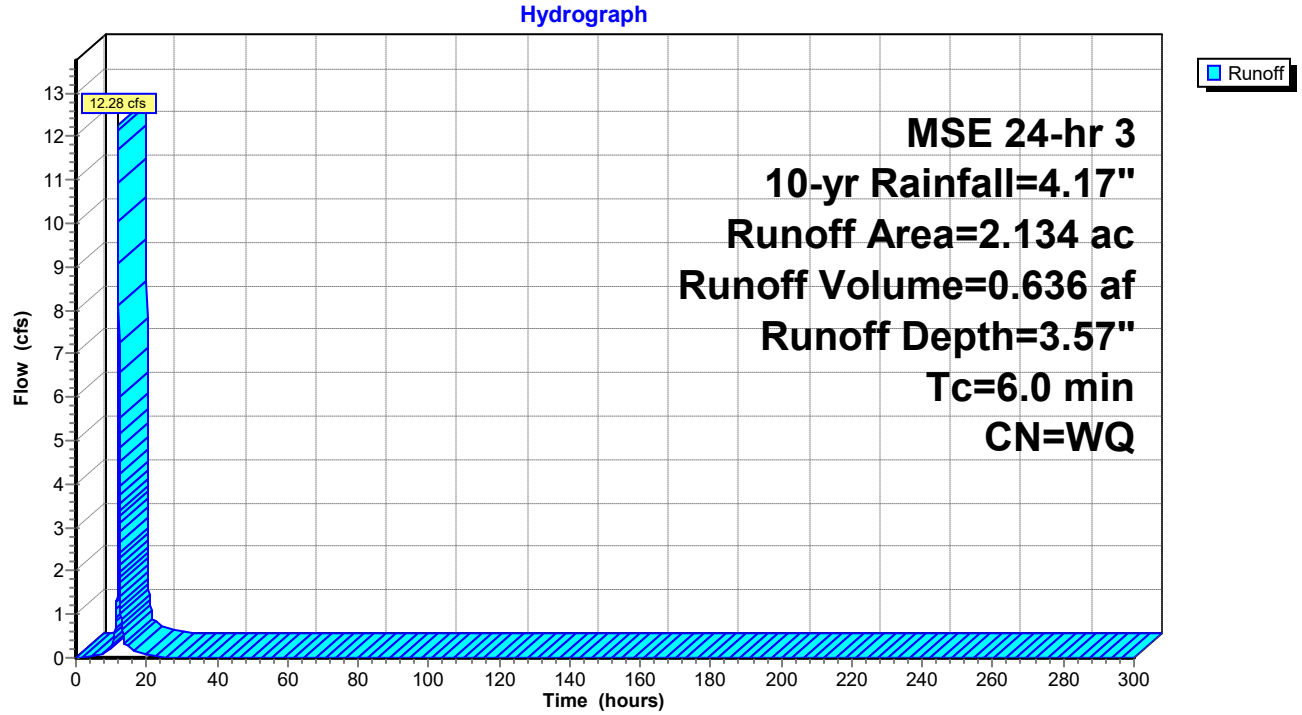
Runoff = 12.28 cfs @ 12.13 hrs, Volume= 0.636 af, Depth= 3.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
1.460	98	Paved parking, HSG D
0.439	80	>75% Grass cover, Good, HSG D
0.235	98	Water Surface, 0% imp, HSG D
2.134		Weighted Average
0.674		31.58% Pervious Area
1.460		68.42% Impervious Area

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

Subcatchment 10S:



Summary for Subcatchment 20S:

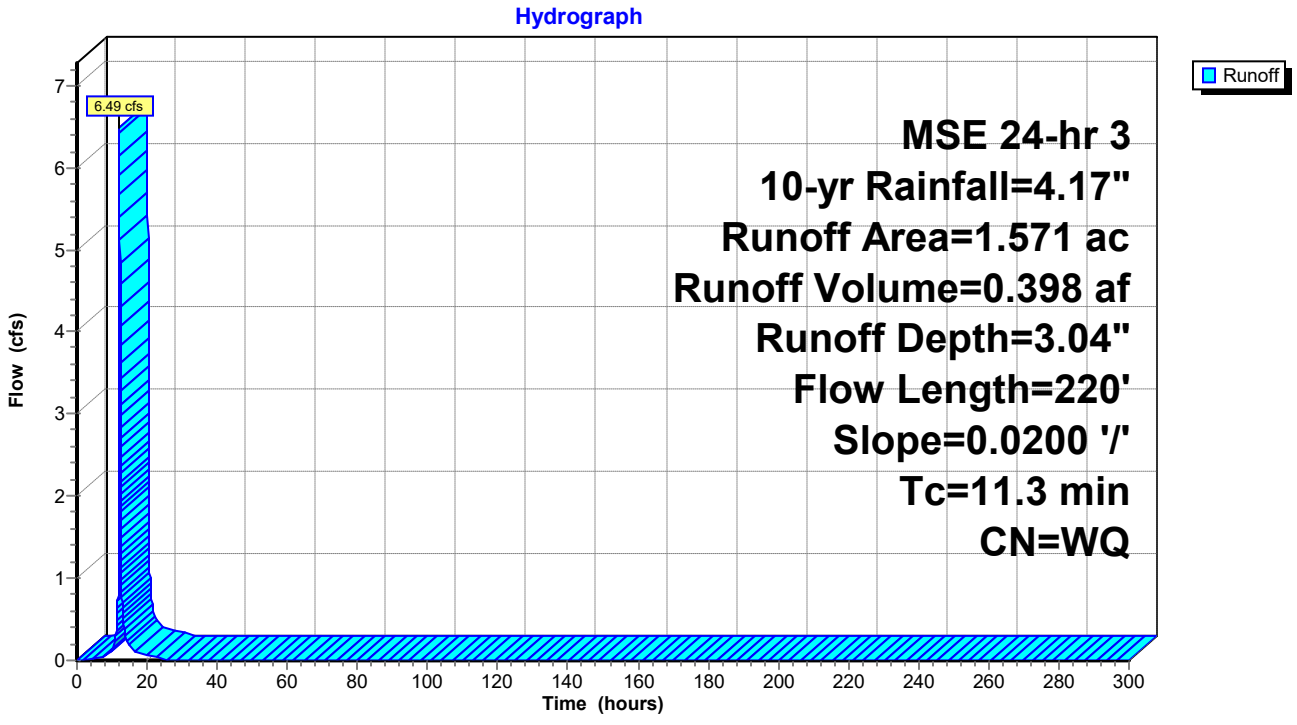
Runoff = 6.49 cfs @ 12.19 hrs, Volume= 0.398 af, Depth= 3.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
0.801	80	>75% Grass cover, Good, HSG D
0.770	98	Paved parking, HSG D
1.571		Weighted Average
0.801		50.99% Pervious Area
0.770		49.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0200	0.18		**Sheet Flow,** Range n= 0.130 P2= 2.80"
2.0	120	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	220	Total			

Subcatchment 20S:



Summary for Subcatchment 30S:

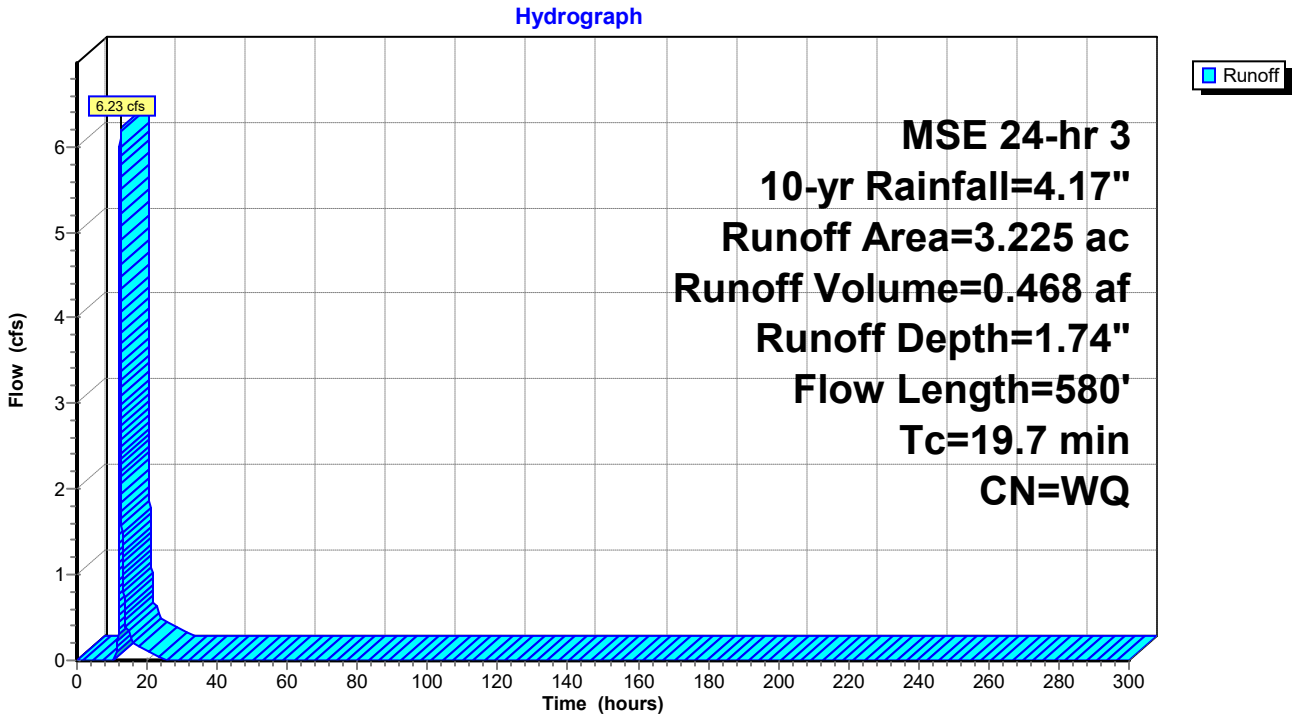
Runoff = 6.23 cfs @ 12.30 hrs, Volume= 0.468 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
3.198	74	>75% Grass cover, Good, HSG C
0.027	98	Paved parking, HSG D
3.225		Weighted Average
3.198		99.16% Pervious Area
0.027		0.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0150	0.30		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
14.1	480	0.0040	0.57		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
19.7	580	Total			

Subcatchment 30S:



Summary for Subcatchment 40S:

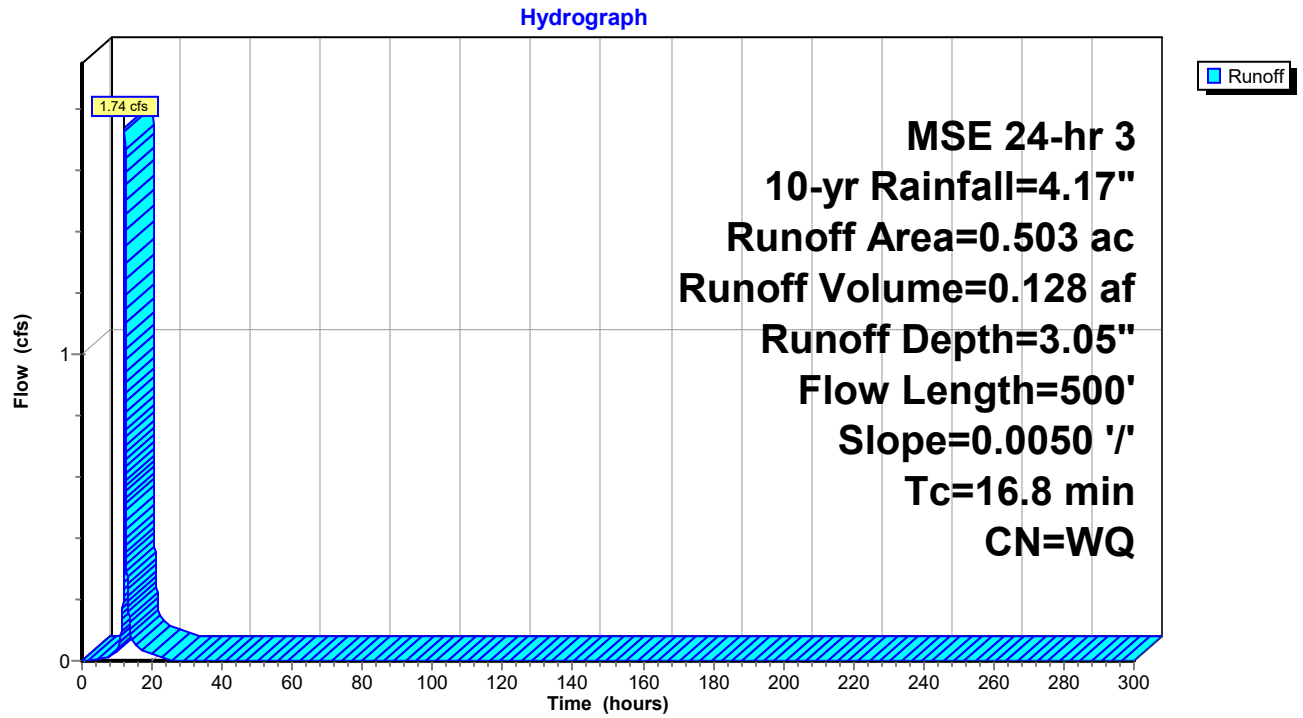
Runoff = 1.74 cfs @ 12.25 hrs, Volume= 0.128 af, Depth= 3.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
0.255	80	>75% Grass cover, Good, HSG D
0.248	98	Paved parking, HSG D
0.503		Weighted Average
0.255		50.70% Pervious Area
0.248		49.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	500	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Subcatchment 40S:



Summary for Subcatchment 50S:

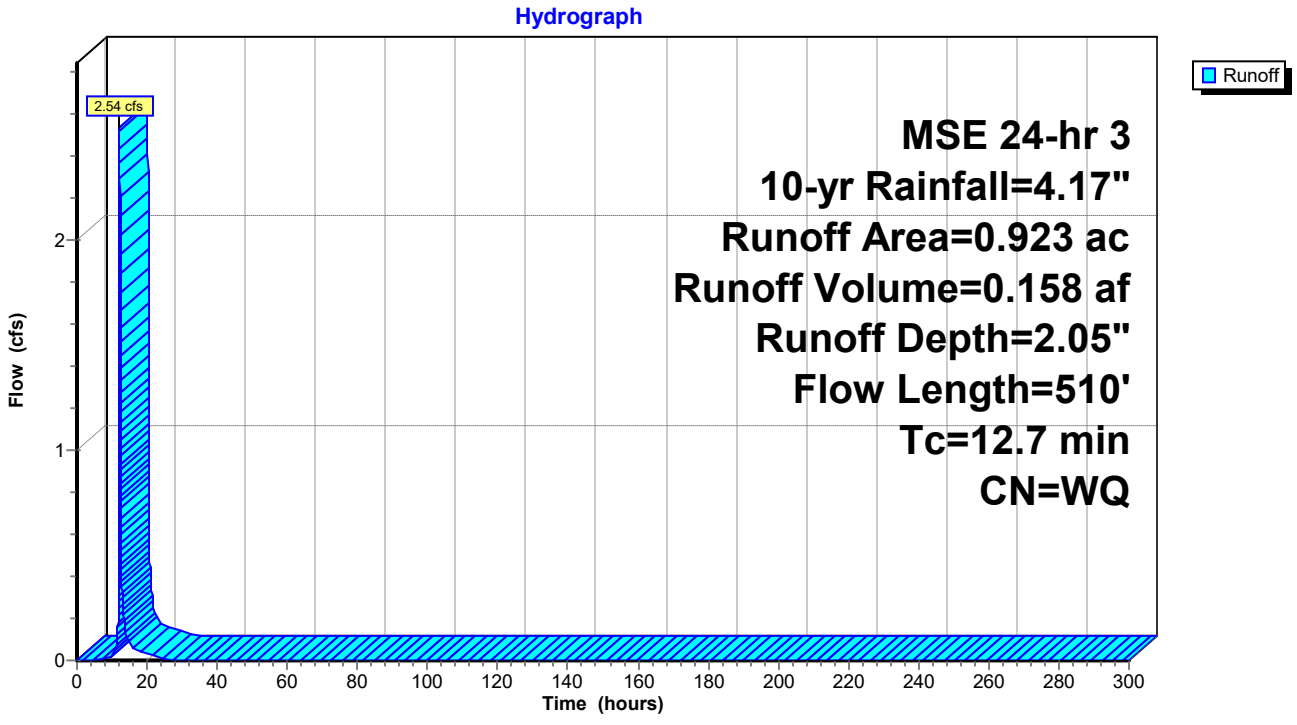
Runoff = 2.54 cfs @ 12.21 hrs, Volume= 0.158 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 10-yr Rainfall=4.17"

Area (ac)	CN	Description
0.786	74	>75% Grass cover, Good, HSG C
0.137	98	Paved parking, HSG D
0.923		Weighted Average
0.786		85.16% Pervious Area
0.137		14.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0150	0.26		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
9.5	460	0.0080	0.80		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.7	510	Total			

Subcatchment 50S:



Summary for Pond 1P: east ditch

Inflow	=	7.03 cfs @	12.21 hrs, Volume=	1.985 af
Outflow	=	6.09 cfs @	12.33 hrs, Volume=	1.985 af, Atten= 13%, Lag= 7.1 min
Primary	=	6.09 cfs @	12.33 hrs, Volume=	1.985 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 914.97' @ 12.33 hrs Surf.Area= 0.075 ac Storage= 0.048 af

Plug-Flow detention time= 4.4 min calculated for 1.985 af (100% of inflow)
Center-of-Mass det. time= 4.4 min (1,228.9 - 1,224.5)

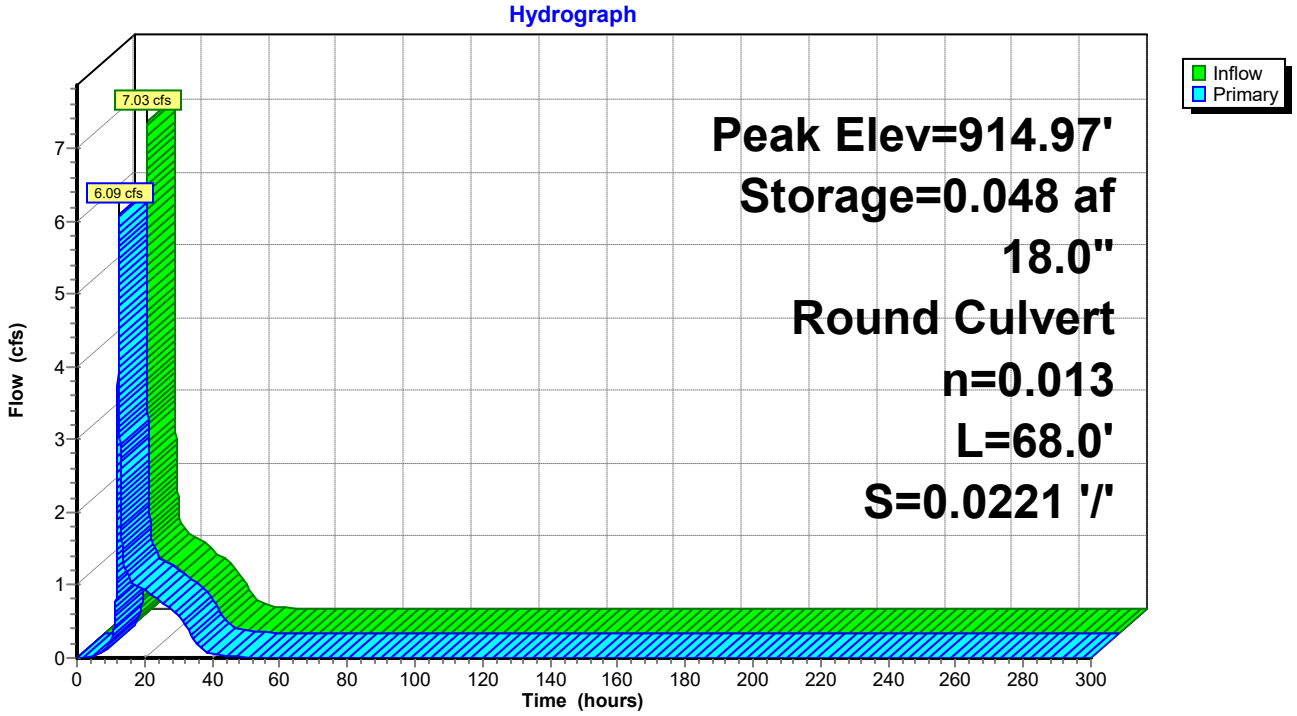
Volume	Invert	Avail.Storage	Storage Description
#1	913.70'	0.332 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
913.70	0.000	0.000	0.000
916.00	0.137	0.158	0.158
917.00	0.212	0.174	0.332

Device	Routing	Invert	Outlet Devices
#1	Primary	913.70'	**18.0" Round Culvert** L= 68.0' Ke= 0.500 Inlet / Outlet Invert= 913.70' / 912.20' S= 0.0221 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=6.09 cfs @ 12.33 hrs HW=914.97' (Free Discharge)
1=Culvert (Inlet Controls 6.09 cfs @ 3.83 fps)

Pond 1P: east ditch



Summary for Pond 2P: southwest wetland

Inflow Area = 2.084 ac, 0.00% Impervious, Inflow Depth = 1.72" for 10-yr event
Inflow = 6.70 cfs @ 12.14 hrs, Volume= 0.299 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 919.08' @ 24.34 hrs Surf.Area= 0.557 ac Storage= 0.299 af

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

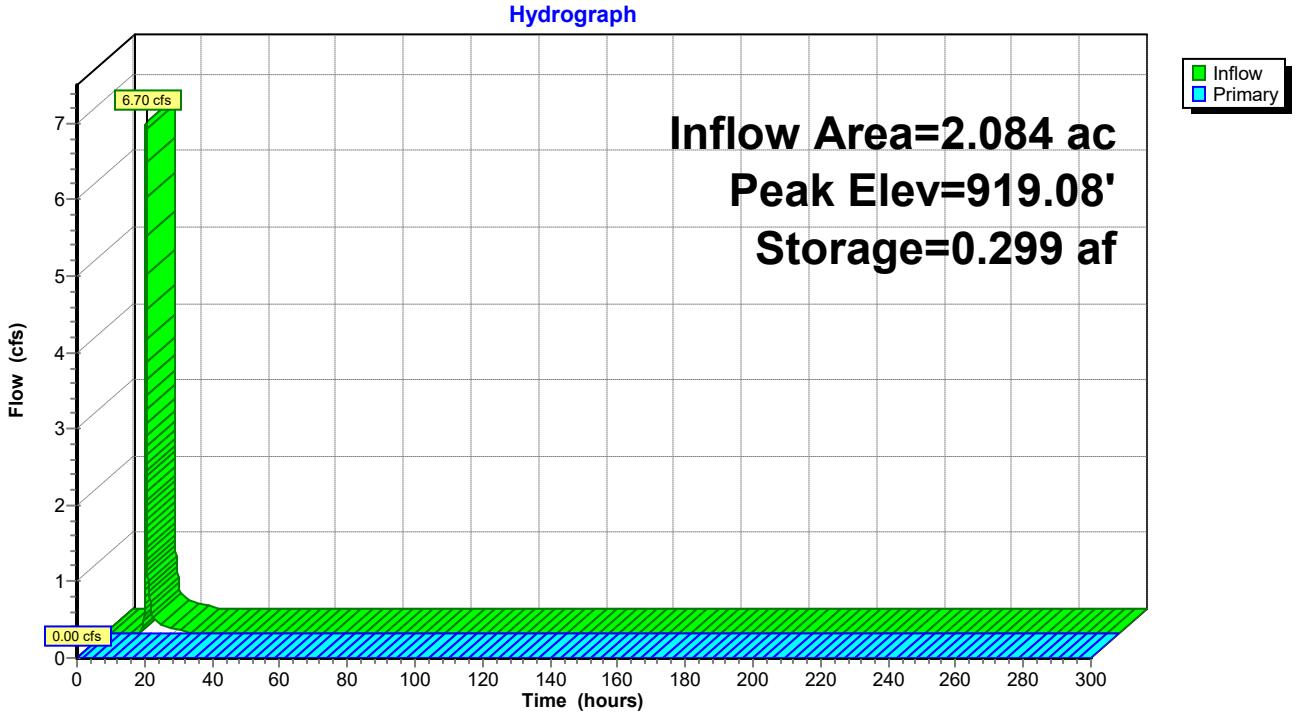
Volume	Invert	Avail.Storage	Storage Description
#1	918.00'	1.054 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
918.00	0.000	0.000	0.000
919.00	0.508	0.254	0.254
920.00	1.093	0.800	1.054

Device	Routing	Invert	Outlet Devices
#1	Primary	919.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=918.00' TW=917.90' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: southwest wetland



Summary for Pond 10P: pond

Inflow	=	14.75 cfs @	12.13 hrs,	Volume=	1.587 af
Outflow	=	2.37 cfs @	12.37 hrs,	Volume=	1.585 af, Atten= 84%, Lag= 14.4 min
Primary	=	0.90 cfs @	14.12 hrs,	Volume=	1.500 af
Secondary	=	1.54 cfs @	12.36 hrs,	Volume=	0.085 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 917.08' @ 14.12 hrs Surf.Area= 0.296 ac Storage= 0.550 af

Plug-Flow detention time= 380.4 min calculated for 1.585 af (100% of inflow)
Center-of-Mass det. time= 379.5 min (1,332.1 - 952.6)

Volume	Invert	Avail.Storage	Storage Description
#1	915.00'	1.553 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

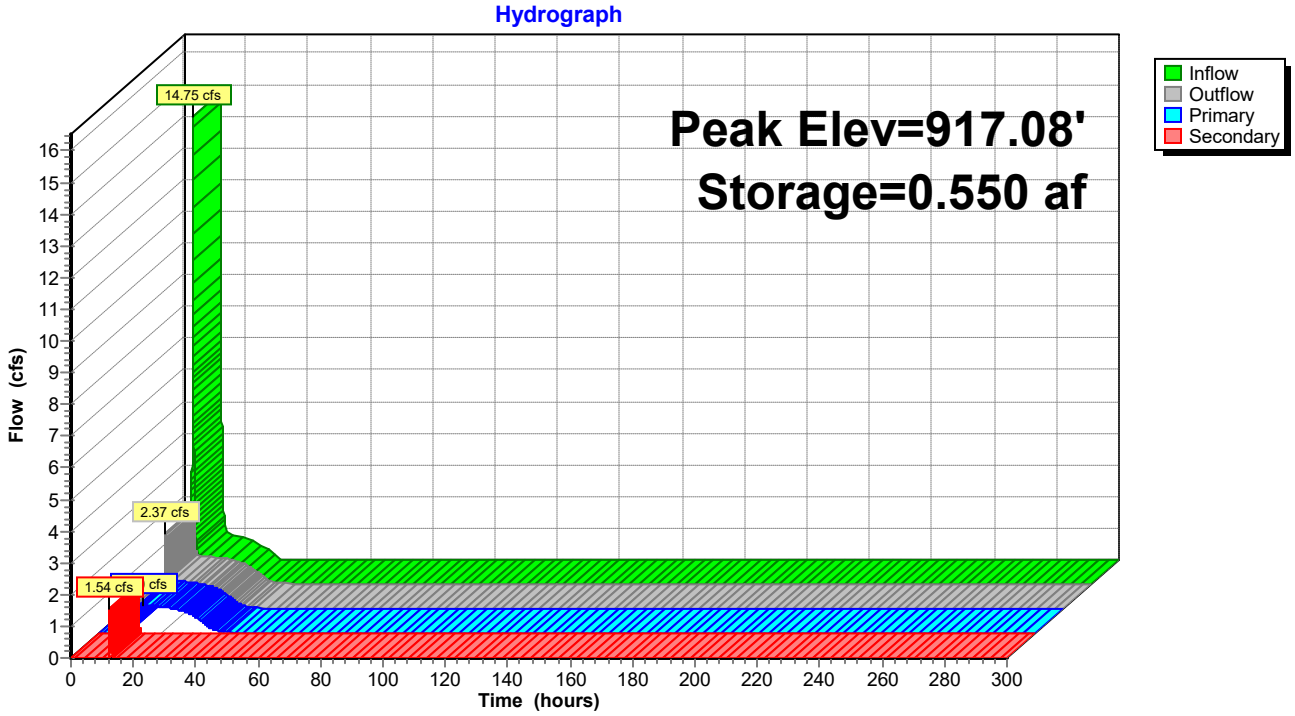
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
915.00	0.235	0.000	0.000
916.00	0.263	0.249	0.249
918.00	0.325	0.588	0.837
920.00	0.391	0.716	1.553

Device	Routing	Invert	Outlet Devices
#1	Primary	915.00'	**15.0" Round Culvert** L= 35.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 915.00' / 914.88' S= 0.0034 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	915.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	918.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	916.00'	**15.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 915.82' / 916.00' S= -0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.90 cfs @ 14.12 hrs HW=917.08' TW=914.19' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.90 cfs of 6.30 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.90 cfs @ 6.58 fps)
  - **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=1.47 cfs @ 12.36 hrs HW=916.80' TW=916.67' (Dynamic Tailwater)
- **4=Culvert** (Inlet Controls 1.47 cfs @ 1.76 fps)

Pond 10P: pond



Summary for Pond 20P: middle low area

Inflow Area = 1.571 ac, 49.01% Impervious, Inflow Depth = 3.04" for 10-yr event
Inflow = 6.49 cfs @ 12.19 hrs, Volume= 0.398 af
Outflow = 2.98 cfs @ 12.26 hrs, Volume= 0.398 af, Atten= 54%, Lag= 4.1 min
Primary = 2.98 cfs @ 12.26 hrs, Volume= 0.398 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 917.36' @ 12.38 hrs Surf.Area= 0.121 ac Storage= 0.083 af

Plug-Flow detention time= 81.2 min calculated for 0.398 af (100% of inflow)
Center-of-Mass det. time= 81.2 min (854.9 - 773.7)

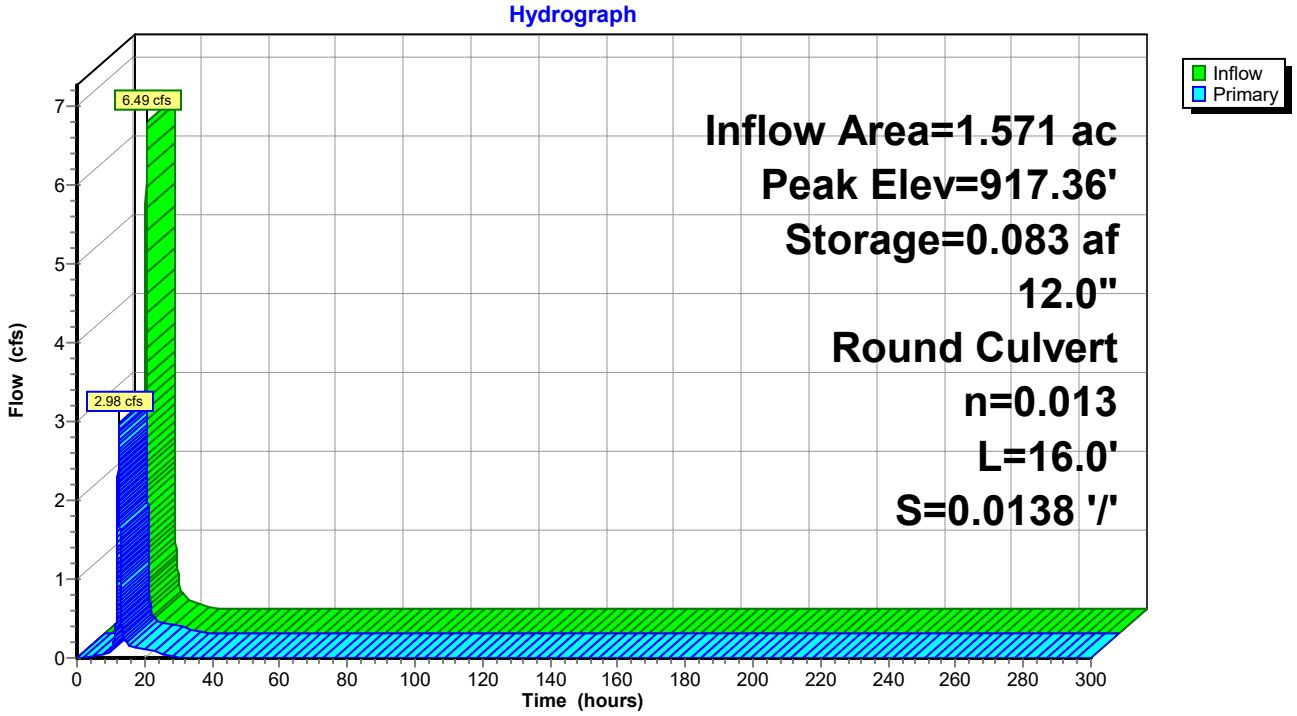
Volume	Invert	Avail.Storage	Storage Description
#1	916.00'	0.916 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.00	0.000	0.000	0.000
918.00	0.178	0.178	0.178
920.00	0.560	0.738	0.916

Device	Routing	Invert	Outlet Devices
#1	Primary	916.00'	**12.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 916.00' / 915.78' S= 0.0138 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.94 cfs @ 12.26 hrs HW=917.28' TW=916.68' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.94 cfs @ 3.74 fps)

Pond 20P: middle low area



Summary for Pond 30P: north low area

Inflow	=	7.74 cfs @	12.31 hrs, Volume=	0.553 af
Outflow	=	0.47 cfs @	18.57 hrs, Volume=	0.553 af, Atten= 94%, Lag= 375.7 min
Primary	=	0.47 cfs @	18.57 hrs, Volume=	0.553 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 917.08' @ 14.13 hrs Surf.Area= 0.746 ac Storage= 0.404 af

Plug-Flow detention time= 433.5 min calculated for 0.553 af (100% of inflow)
Center-of-Mass det. time= 433.3 min (1,250.3 - 817.0)

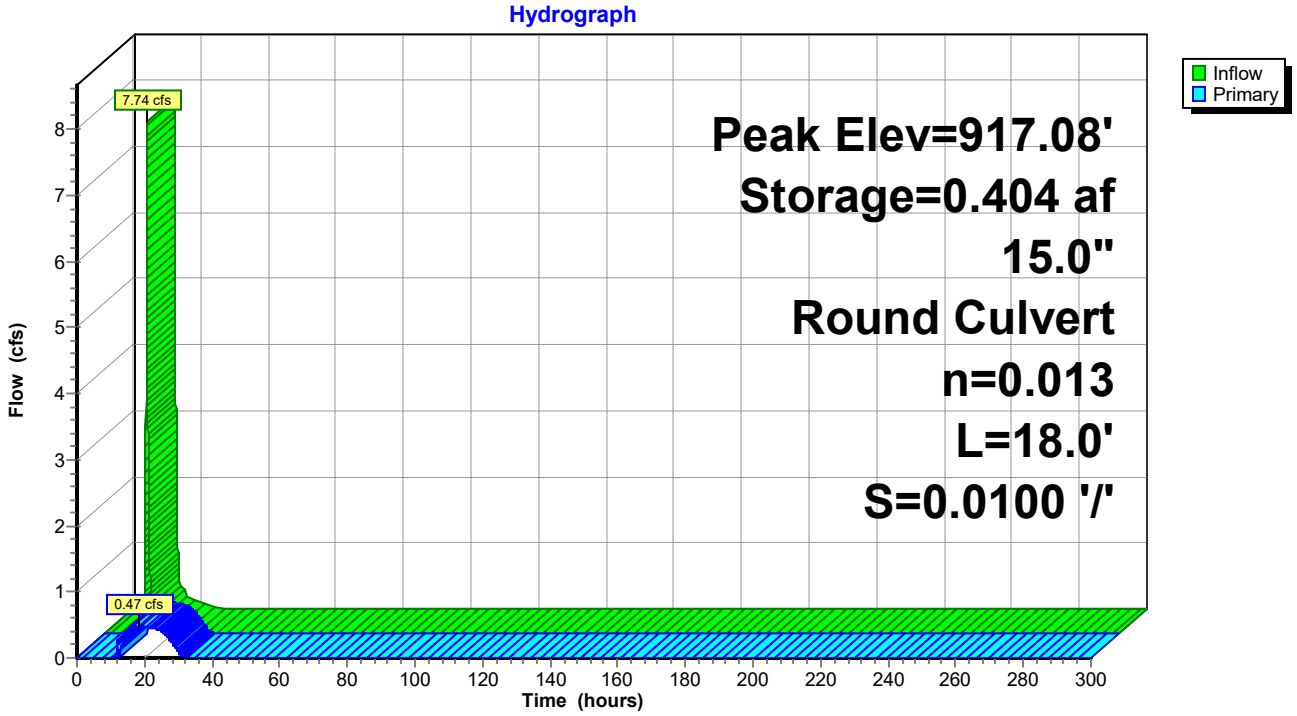
Volume	Invert	Avail.Storage	Storage Description
#1	916.00'	1.380 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.00	0.000	0.000	0.000
918.00	1.380	1.380	1.380

Device	Routing	Invert	Outlet Devices
#1	Primary	916.00'	**15.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 916.00' / 915.82' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.48 cfs @ 18.57 hrs HW=916.96' TW=916.95' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.48 cfs @ 0.66 fps)

Pond 30P: north low area



Summary for Pond 40P: south ditch

Inflow Area = 2.587 ac, 9.59% Impervious, Inflow Depth = 0.59" for 10-yr event
Inflow = 1.74 cfs @ 12.25 hrs, Volume= 0.128 af
Outflow = 1.56 cfs @ 12.32 hrs, Volume= 0.128 af, Atten= 10%, Lag= 4.3 min
Primary = 1.56 cfs @ 12.32 hrs, Volume= 0.128 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 918.59' @ 12.32 hrs Surf.Area= 0.029 ac Storage= 0.009 af

Plug-Flow detention time= 3.3 min calculated for 0.128 af (100% of inflow)
Center-of-Mass det. time= 3.3 min (781.9 - 778.6)

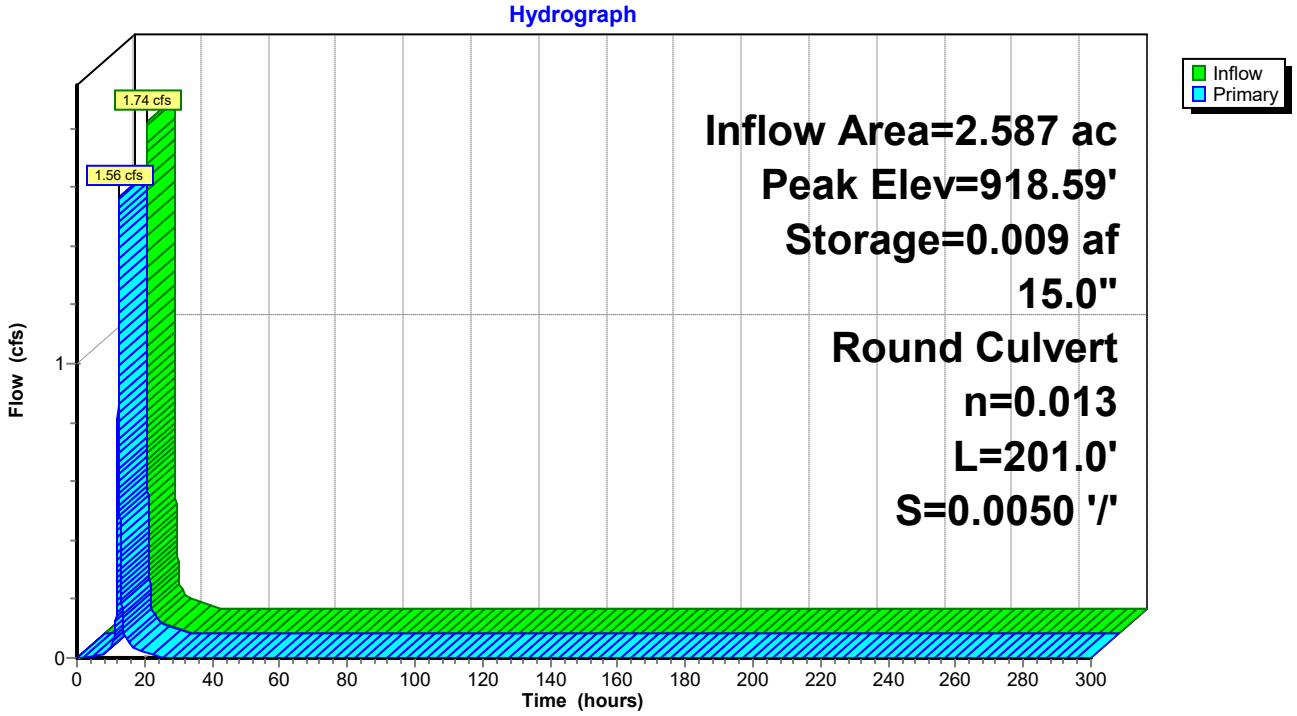
Volume	Invert	Avail.Storage	Storage Description
#1	917.90'	0.097 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
917.90	0.000	0.000	0.000
918.00	0.002	0.000	0.000
920.00	0.095	0.097	0.097

Device	Routing	Invert	Outlet Devices
#1	Primary	917.90'	**15.0" Round Culvert** L= 201.0' Ke= 0.500 Inlet / Outlet Invert= 917.90' / 916.90' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=1.56 cfs @ 12.32 hrs HW=918.59' TW=914.96' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.56 cfs @ 3.27 fps)

Pond 40P: south ditch



Summary for Pond 50P: north ditch

Inflow Area = 0.923 ac, 14.84% Impervious, Inflow Depth = 2.05" for 10-yr event
Inflow = 2.54 cfs @ 12.21 hrs, Volume= 0.158 af
Outflow = 2.10 cfs @ 12.29 hrs, Volume= 0.158 af, Atten= 17%, Lag= 4.7 min
Primary = 2.10 cfs @ 12.29 hrs, Volume= 0.158 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.94' @ 12.29 hrs Surf.Area= 0.038 ac Storage= 0.016 af

Plug-Flow detention time= 5.4 min calculated for 0.158 af (100% of inflow)
Center-of-Mass det. time= 5.1 min (808.7 - 803.6)

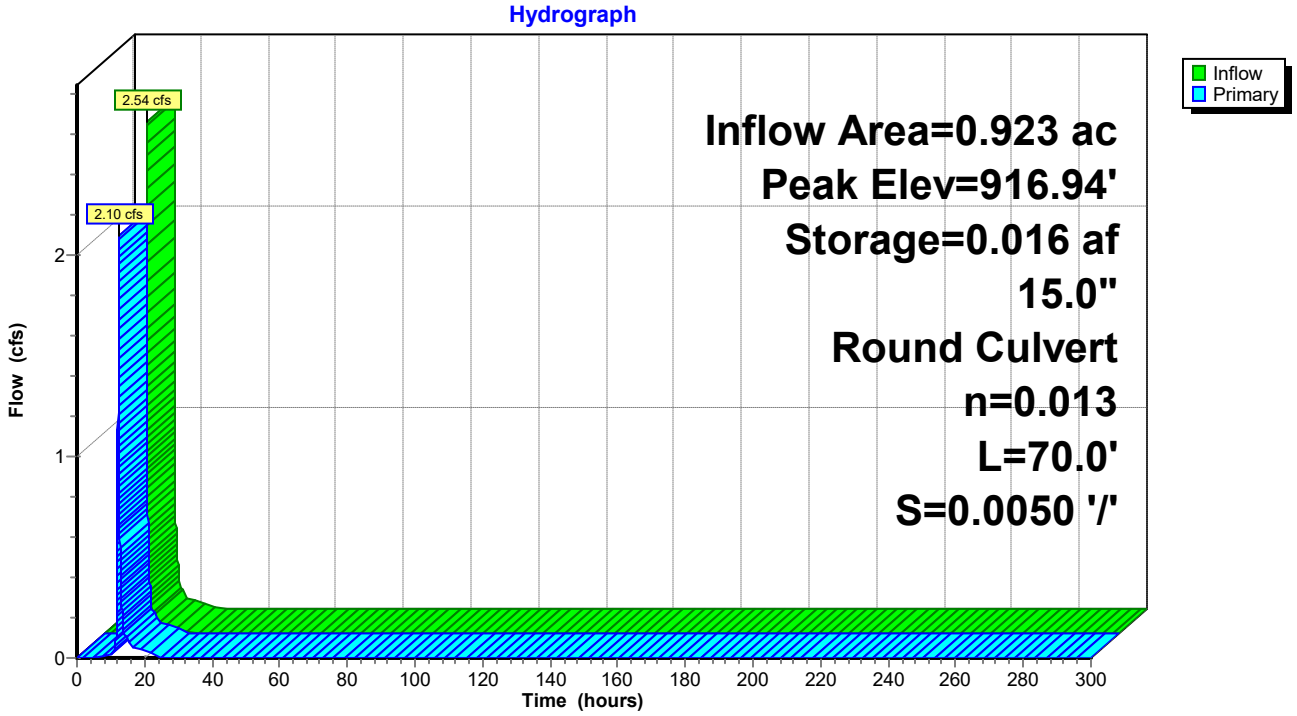
Volume	Invert	Avail.Storage	Storage Description
#1	916.10'	0.083 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.10	0.000	0.000	0.000
918.00	0.087	0.083	0.083

Device	Routing	Invert	Outlet Devices
#1	Primary	916.10'	**15.0" Round Culvert** L= 70.0' Ke= 0.500 Inlet / Outlet Invert= 916.10' / 915.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=2.10 cfs @ 12.29 hrs HW=916.94' TW=914.95' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 2.10 cfs @ 3.40 fps)

Pond 50P: north ditch



Time span=0.00-300.00 hrs, dt=0.01 hrs, 30001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Runoff Area=0.856 ac 35.05% Impervious Runoff Depth=5.56"
Flow Length=657' Slope=0.0050 '/' Tc=10.3 min CN=WQ Runoff=6.75 cfs 0.397 af

Subcatchment 2S: Runoff Area=2.084 ac 0.00% Impervious Runoff Depth=4.17"
Tc=6.0 min CN=74 Runoff=16.02 cfs 0.725 af

Subcatchment 10S: Runoff Area=2.134 ac 68.42% Impervious Runoff Depth=6.48"
Tc=6.0 min CN=WQ Runoff=21.92 cfs 1.153 af

Subcatchment 20S: Runoff Area=1.571 ac 49.01% Impervious Runoff Depth=5.85"
Flow Length=220' Slope=0.0200 '/' Tc=11.3 min CN=WQ Runoff=12.36 cfs 0.766 af

Subcatchment 30S: Runoff Area=3.225 ac 0.84% Impervious Runoff Depth=4.20"
Flow Length=580' Tc=19.7 min CN=WQ Runoff=15.22 cfs 1.128 af

Subcatchment 40S: Runoff Area=0.503 ac 49.30% Impervious Runoff Depth=5.86"
Flow Length=500' Slope=0.0050 '/' Tc=16.8 min CN=WQ Runoff=3.31 cfs 0.246 af

Subcatchment 50S: Runoff Area=0.923 ac 14.84% Impervious Runoff Depth=4.58"
Flow Length=510' Tc=12.7 min CN=WQ Runoff=5.72 cfs 0.352 af

Pond 1P: east ditch Peak Elev=915.77' Storage=0.127 af Inflow=13.30 cfs 4.183 af
18.0" Round Culvert n=0.013 L=68.0' S=0.0221 '/' Outflow=9.77 cfs 4.183 af

Pond 2P: southwest wetland Peak Elev=919.53' Storage=0.606 af Inflow=16.02 cfs 0.725 af
Outflow=0.25 cfs 0.144 af

Pond 10P: pond Peak Elev=917.91' Storage=0.809 af Inflow=23.99 cfs 3.427 af
Primary=1.08 cfs 3.045 af Secondary=4.83 cfs 0.380 af Outflow=5.79 cfs 3.425 af

Pond 20P: middle low area Peak Elev=918.35' Storage=0.251 af Inflow=12.36 cfs 0.766 af
12.0" Round Culvert n=0.013 L=16.0' S=0.0138 '/' Outflow=2.85 cfs 0.766 af

Pond 30P: north low area Peak Elev=917.92' Storage=1.269 af Inflow=19.86 cfs 1.508 af
15.0" Round Culvert n=0.013 L=18.0' S=0.0100 '/' Outflow=0.74 cfs 1.508 af

Pond 40P: south ditch Peak Elev=918.89' Storage=0.020 af Inflow=3.31 cfs 0.389 af
15.0" Round Culvert n=0.013 L=201.0' S=0.0050 '/' Outflow=2.88 cfs 0.389 af

Pond 50P: north ditch Peak Elev=917.46' Storage=0.043 af Inflow=5.72 cfs 0.352 af
15.0" Round Culvert n=0.013 L=70.0' S=0.0050 '/' Outflow=4.32 cfs 0.352 af

Total Runoff Area = 11.296 ac Runoff Volume = 4.766 af Average Runoff Depth = 5.06"
73.96% Pervious = 8.354 ac 26.04% Impervious = 2.942 ac

Summary for Subcatchment 1S:

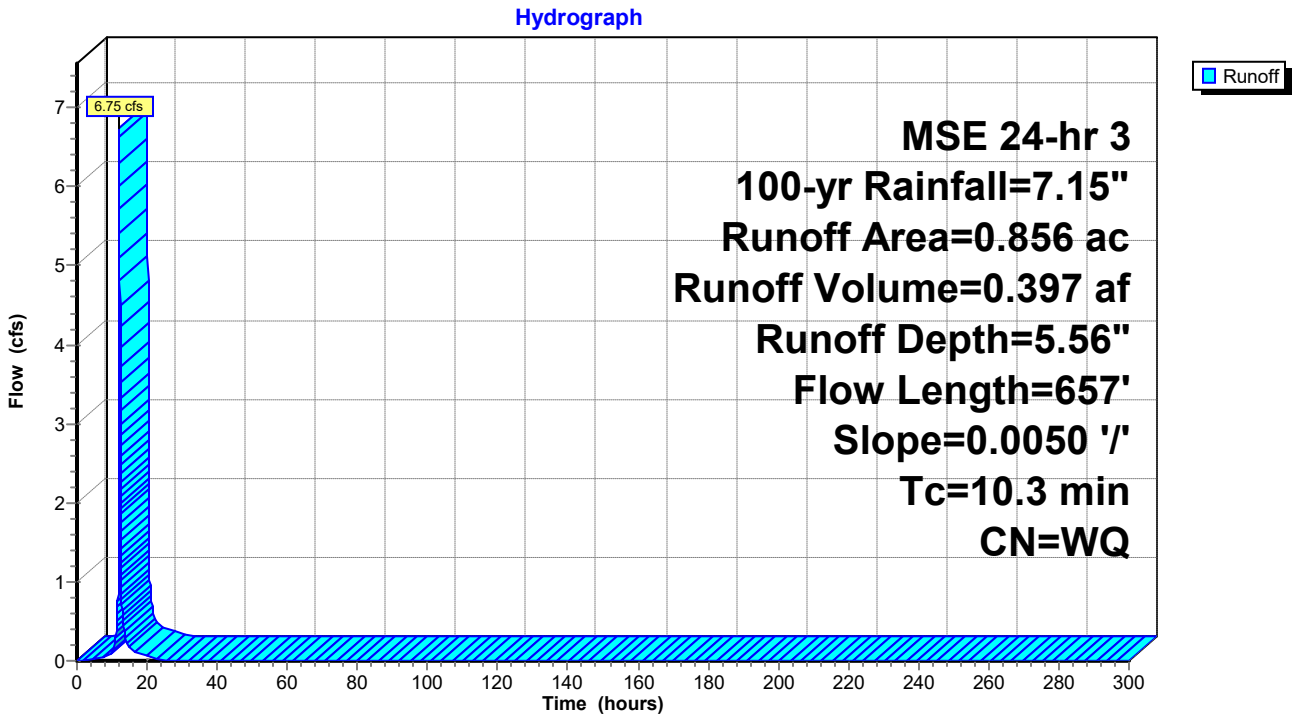
Runoff = 6.75 cfs @ 12.18 hrs, Volume= 0.397 af, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
0.556	80	>75% Grass cover, Good, HSG D
0.300	98	Paved parking, HSG D
0.856		Weighted Average
0.556		64.95% Pervious Area
0.300		35.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.0050	1.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Subcatchment 1S:



Summary for Subcatchment 2S:

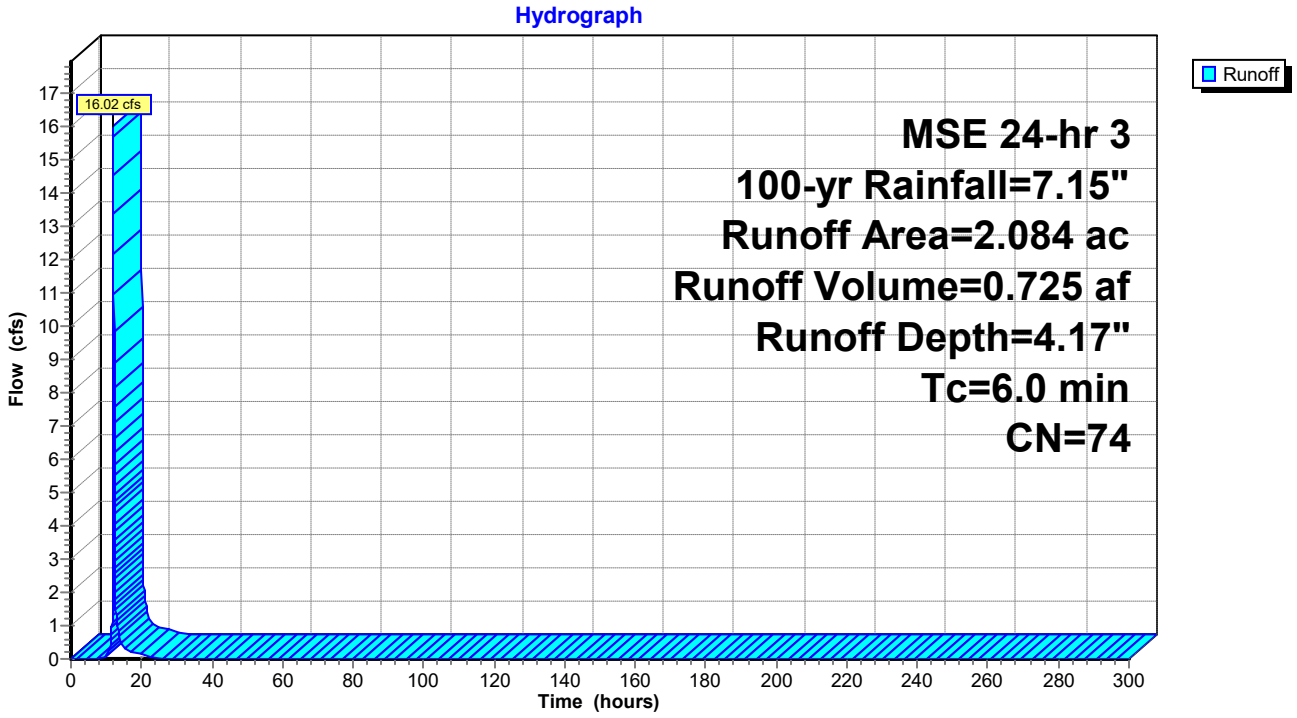
Runoff = 16.02 cfs @ 12.13 hrs, Volume= 0.725 af, Depth= 4.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
2.084	74	>75% Grass cover, Good, HSG C
2.084		100.00% Pervious Area

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

Subcatchment 2S:



Summary for Subcatchment 10S:

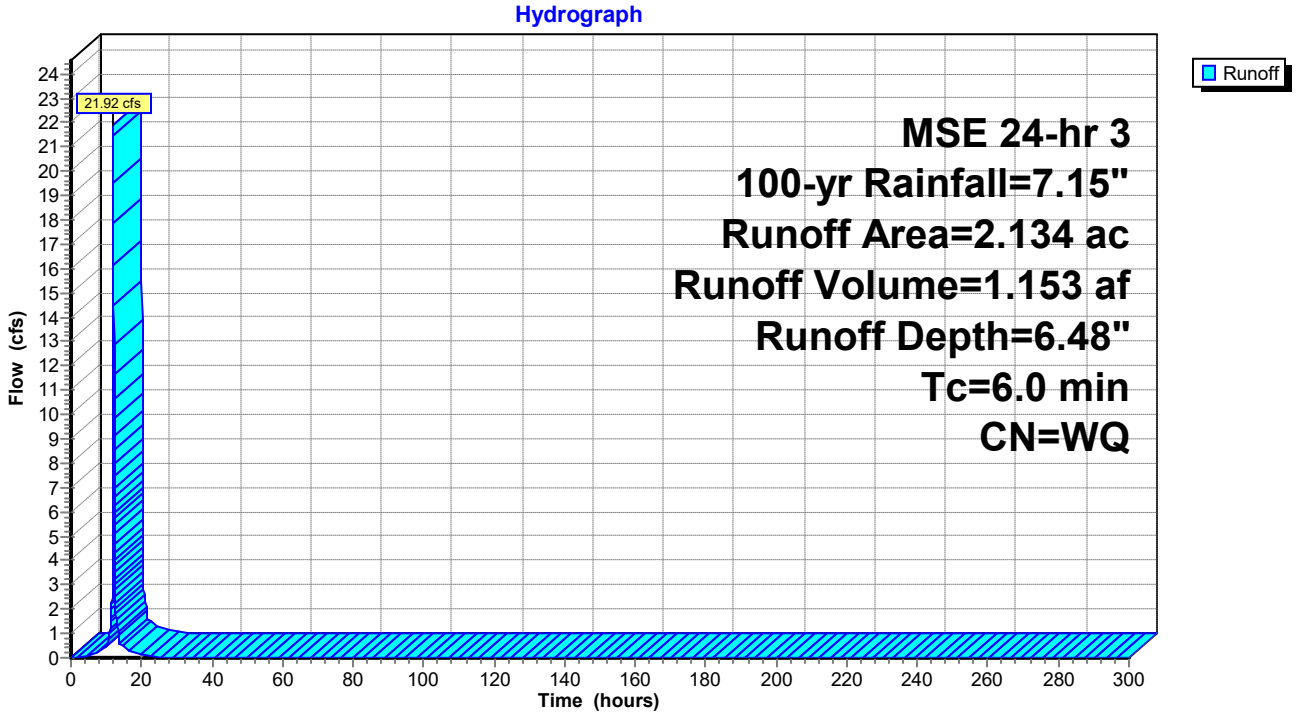
Runoff = 21.92 cfs @ 12.13 hrs, Volume= 1.153 af, Depth= 6.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
1.460	98	Paved parking, HSG D
0.439	80	>75% Grass cover, Good, HSG D
0.235	98	Water Surface, 0% imp, HSG D
2.134		Weighted Average
0.674		31.58% Pervious Area
1.460		68.42% Impervious Area

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

Subcatchment 10S:



Summary for Subcatchment 20S:

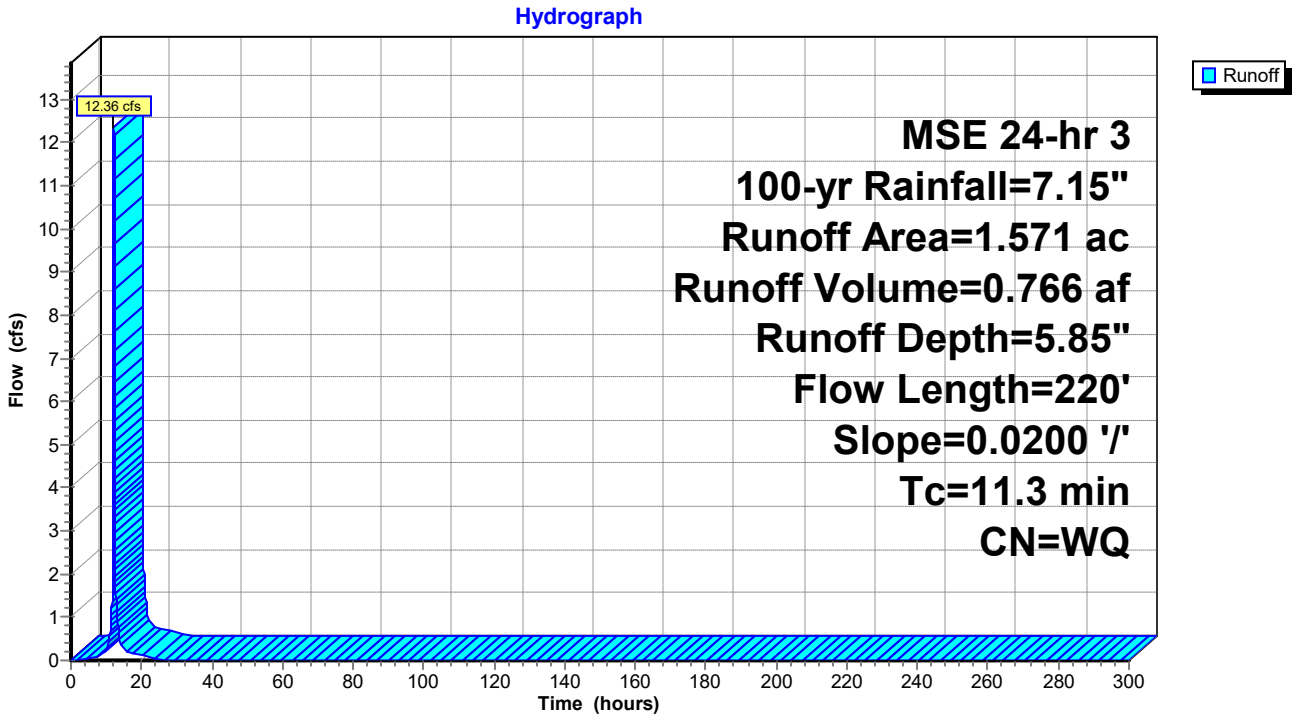
Runoff = 12.36 cfs @ 12.19 hrs, Volume= 0.766 af, Depth= 5.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
0.801	80	>75% Grass cover, Good, HSG D
0.770	98	Paved parking, HSG D
1.571		Weighted Average
0.801		50.99% Pervious Area
0.770		49.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0200	0.18		**Sheet Flow,** Range n= 0.130 P2= 2.80"
2.0	120	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	220	Total			

Subcatchment 20S:



Summary for Subcatchment 30S:

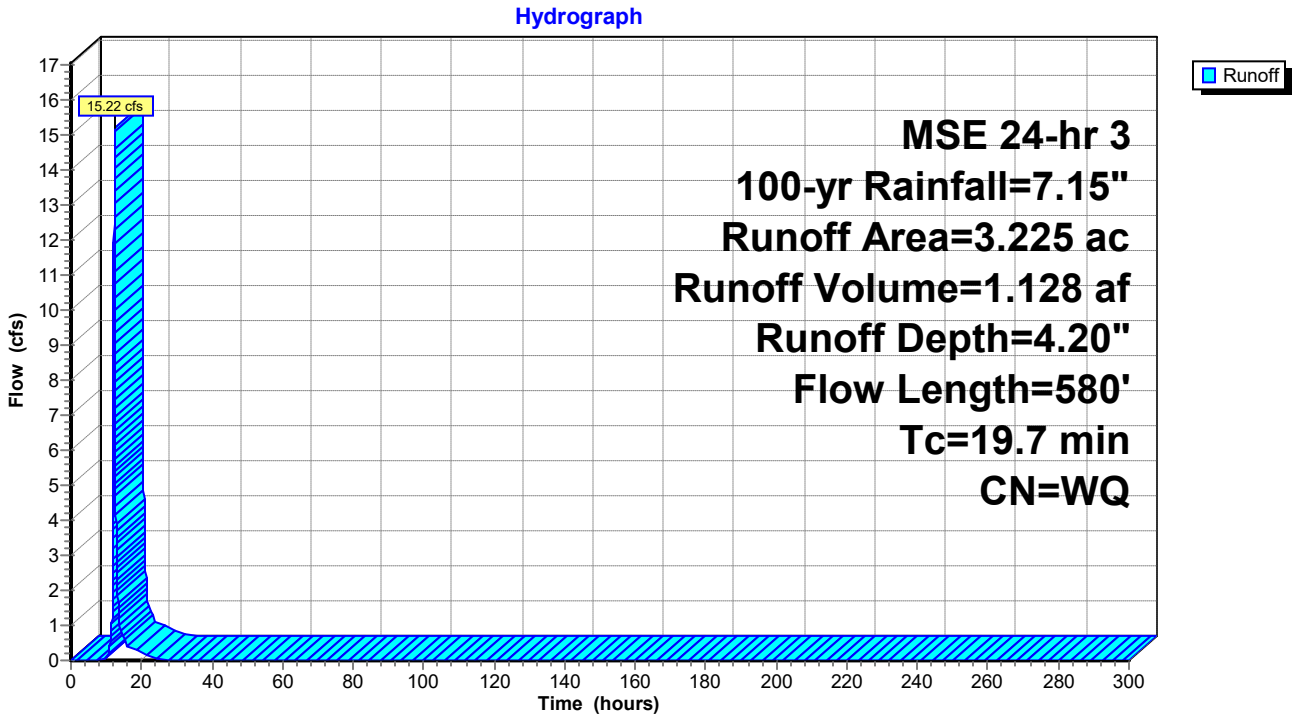
Runoff = 15.22 cfs @ 12.29 hrs, Volume= 1.128 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
3.198	74	>75% Grass cover, Good, HSG C
0.027	98	Paved parking, HSG D
3.225		Weighted Average
3.198		99.16% Pervious Area
0.027		0.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0150	0.30		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
14.1	480	0.0040	0.57		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
19.7	580	Total			

Subcatchment 30S:



Summary for Subcatchment 40S:

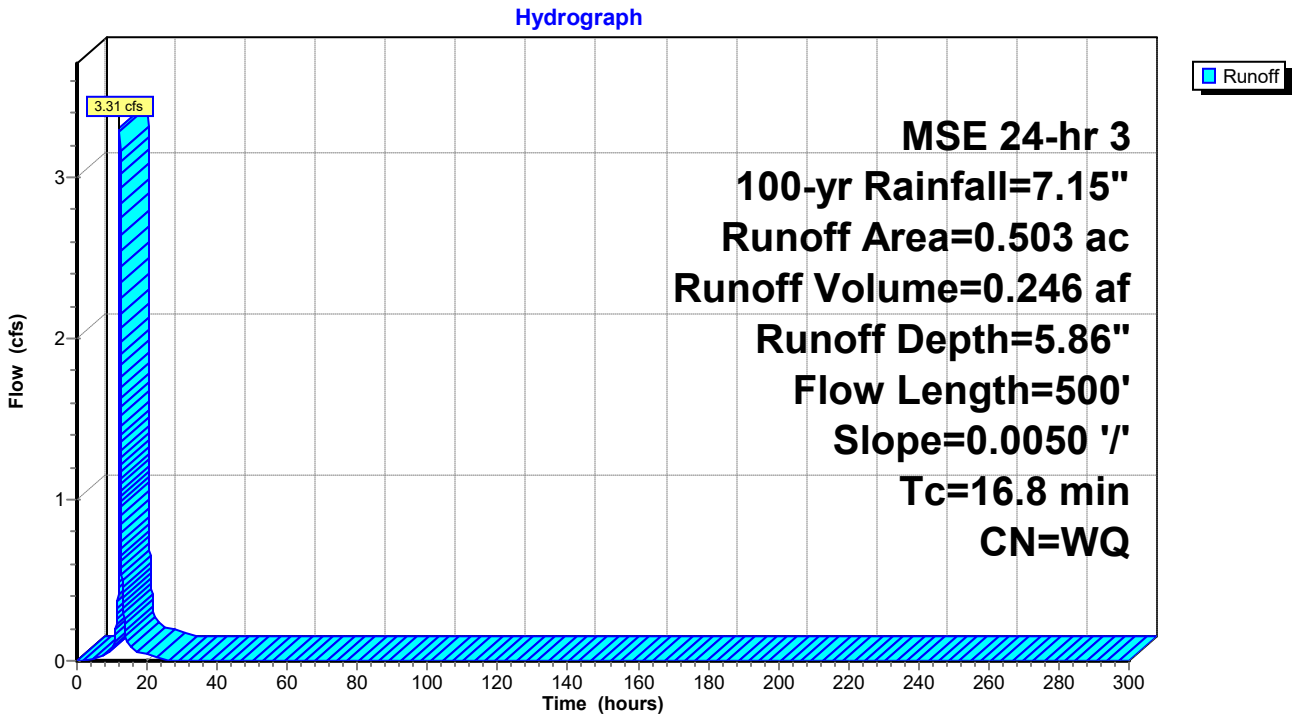
Runoff = 3.31 cfs @ 12.25 hrs, Volume= 0.246 af, Depth= 5.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
0.255	80	>75% Grass cover, Good, HSG D
0.248	98	Paved parking, HSG D
0.503		Weighted Average
0.255		50.70% Pervious Area
0.248		49.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	500	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Subcatchment 40S:



Summary for Subcatchment 50S:

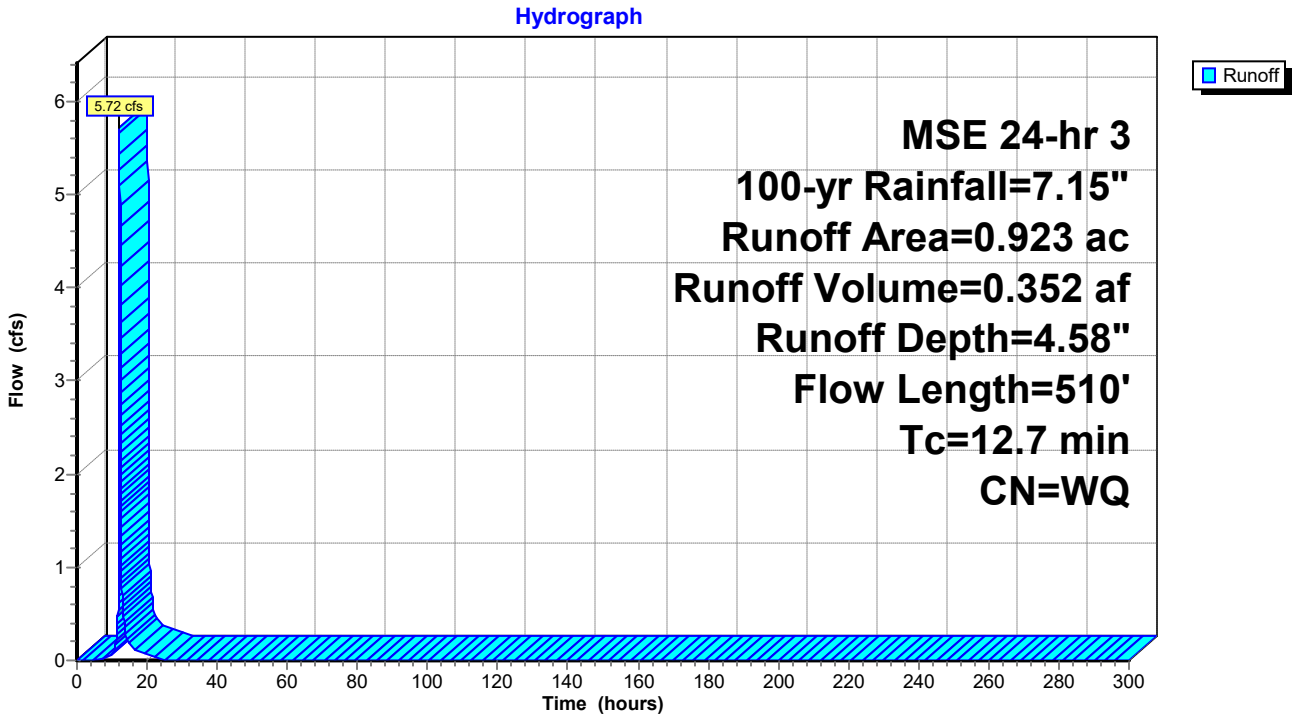
Runoff = 5.72 cfs @ 12.21 hrs, Volume= 0.352 af, Depth= 4.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 100-yr Rainfall=7.15"

Area (ac)	CN	Description
0.786	74	>75% Grass cover, Good, HSG C
0.137	98	Paved parking, HSG D
0.923		Weighted Average
0.786		85.16% Pervious Area
0.137		14.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0150	0.26		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
9.5	460	0.0080	0.80		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.7	510	Total			

Subcatchment 50S:



Summary for Pond 1P: east ditch

Inflow	=	13.30 cfs @	12.21 hrs,	Volume=	4.183 af
Outflow	=	9.77 cfs @	12.41 hrs,	Volume=	4.183 af, Atten= 27%, Lag= 12.0 min
Primary	=	9.77 cfs @	12.41 hrs,	Volume=	4.183 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 915.77' @ 12.41 hrs Surf.Area= 0.123 ac Storage= 0.127 af

Plug-Flow detention time= 4.8 min calculated for 4.183 af (100% of inflow)
Center-of-Mass det. time= 4.8 min (1,506.4 - 1,501.6)

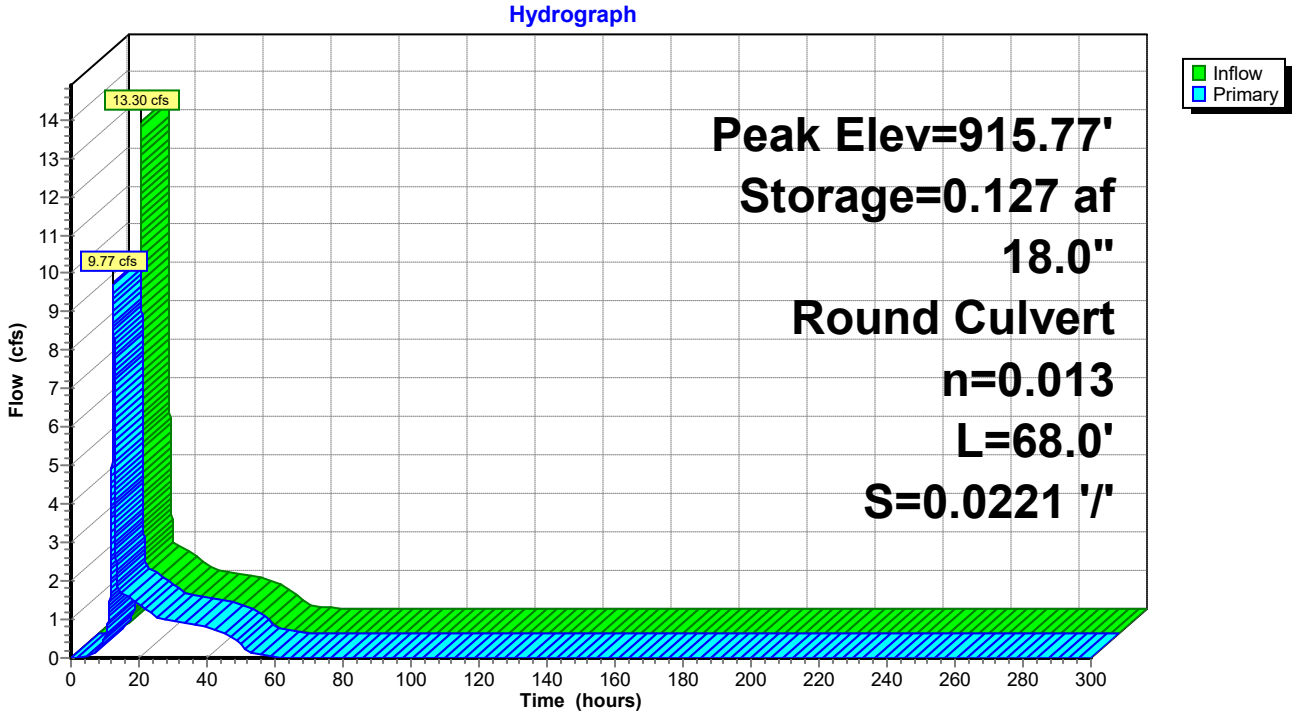
Volume	Invert	Avail.Storage	Storage Description
#1	913.70'	0.332 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
913.70	0.000	0.000	0.000
916.00	0.137	0.158	0.158
917.00	0.212	0.174	0.332

Device	Routing	Invert	Outlet Devices
#1	Primary	913.70'	**18.0" Round Culvert** L= 68.0' Ke= 0.500 Inlet / Outlet Invert= 913.70' / 912.20' S= 0.0221 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=9.77 cfs @ 12.41 hrs HW=915.77' (Free Discharge)
1=Culvert (Inlet Controls 9.77 cfs @ 5.53 fps)

Pond 1P: east ditch



Summary for Pond 2P: southwest wetland

Inflow Area = 2.084 ac, 0.00% Impervious, Inflow Depth = 4.17" for 100-yr event
Inflow = 16.02 cfs @ 12.13 hrs, Volume= 0.725 af
Outflow = 0.25 cfs @ 15.68 hrs, Volume= 0.144 af, Atten= 98%, Lag= 212.9 min
Primary = 0.25 cfs @ 15.68 hrs, Volume= 0.144 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 919.53' @ 15.68 hrs Surf.Area= 0.818 ac Storage= 0.606 af

Plug-Flow detention time= 447.9 min calculated for 0.144 af (20% of inflow)
Center-of-Mass det. time= 346.1 min (1,145.0 - 799.0)

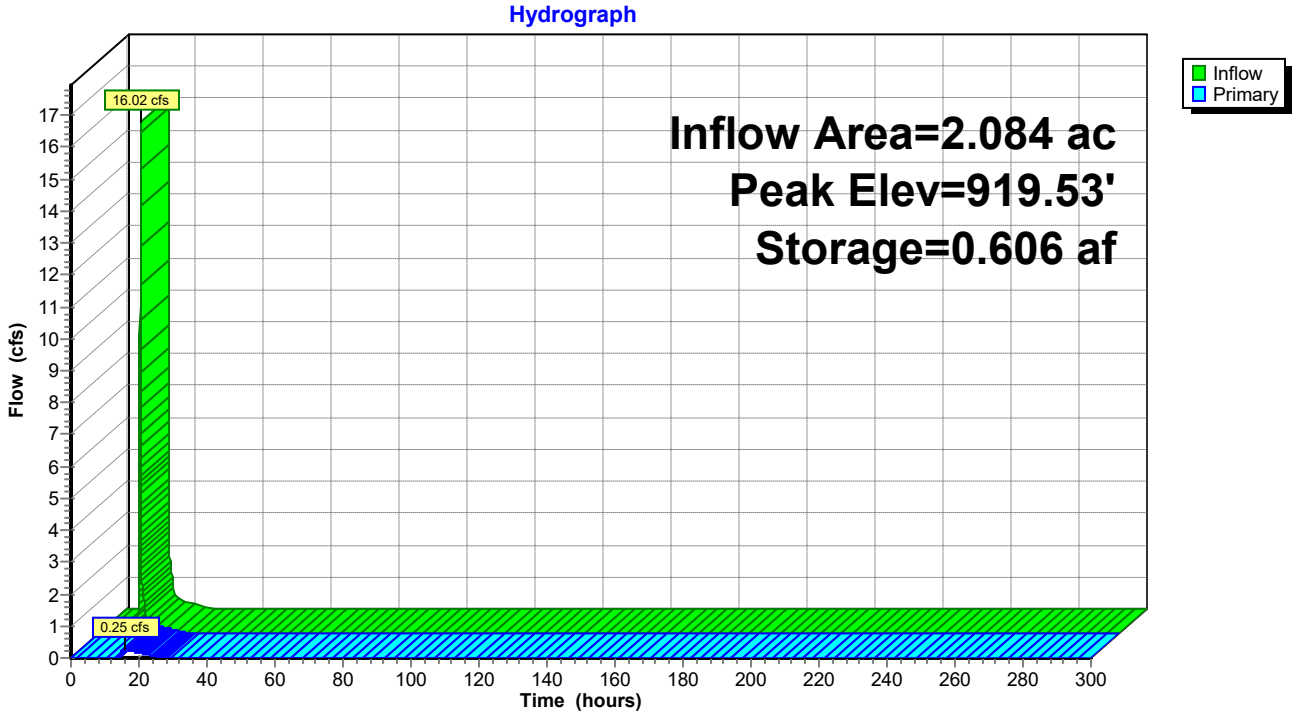
Volume	Invert	Avail.Storage	Storage Description
#1	918.00'	1.054 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
918.00	0.000	0.000	0.000
919.00	0.508	0.254	0.254
920.00	1.093	0.800	1.054

Device	Routing	Invert	Outlet Devices
#1	Primary	919.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.25 cfs @ 15.68 hrs HW=919.53' TW=918.20' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.25 cfs @ 0.41 fps)

Pond 2P: southwest wetland



Summary for Pond 10P: pond

Inflow	=	23.99 cfs @	12.13 hrs,	Volume=	3.427 af
Outflow	=	5.79 cfs @	12.21 hrs,	Volume=	3.425 af, Atten= 76%, Lag= 5.1 min
Primary	=	1.08 cfs @	15.09 hrs,	Volume=	3.045 af
Secondary	=	4.83 cfs @	12.21 hrs,	Volume=	0.380 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 917.91' @ 15.09 hrs Surf.Area= 0.322 ac Storage= 0.809 af

Plug-Flow detention time= 411.7 min calculated for 3.425 af (100% of inflow)
Center-of-Mass det. time= 411.4 min (1,643.1 - 1,231.7)

Volume	Invert	Avail.Storage	Storage Description
#1	915.00'	1.553 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

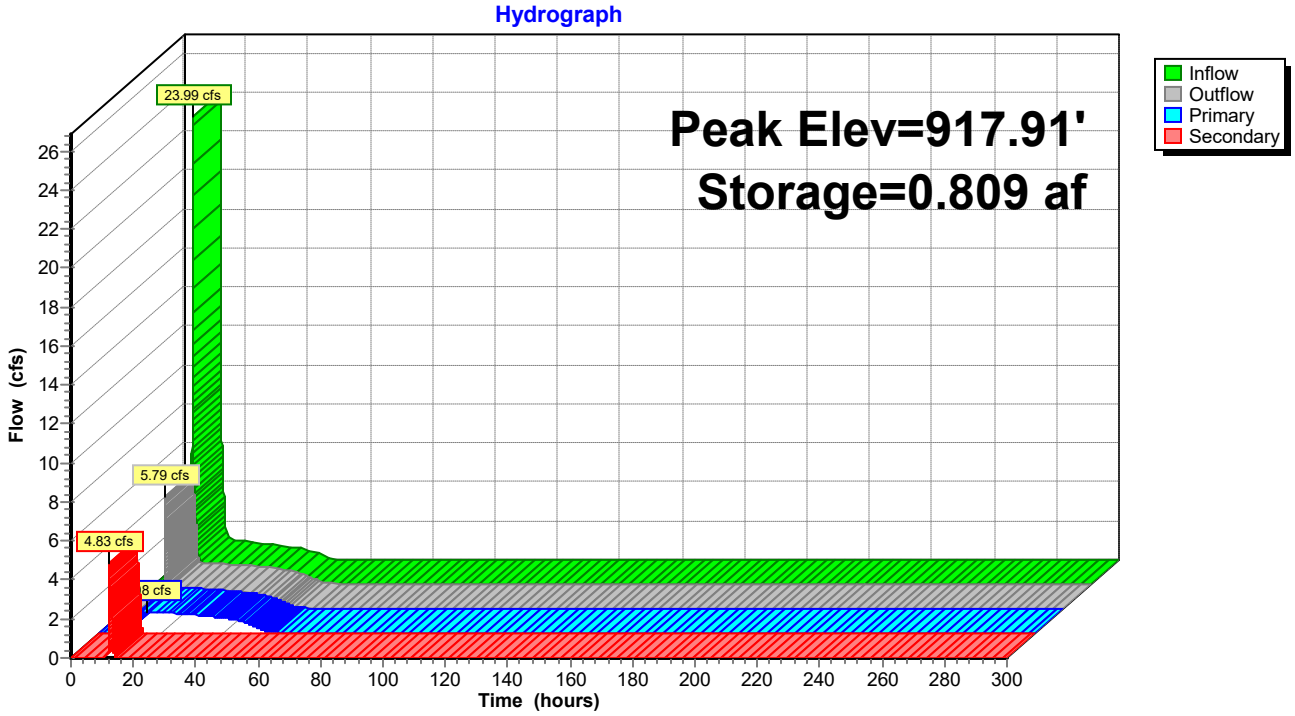
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
915.00	0.235	0.000	0.000
916.00	0.263	0.249	0.249
918.00	0.325	0.588	0.837
920.00	0.391	0.716	1.553

Device	Routing	Invert	Outlet Devices
#1	Primary	915.00'	**15.0" Round Culvert** L= 35.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 915.00' / 914.88' S= 0.0034 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	915.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	918.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	916.00'	**15.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 915.82' / 916.00' S= -0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=1.08 cfs @ 15.09 hrs HW=917.91' TW=914.31' (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.08 cfs of 8.64 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.08 cfs @ 7.92 fps)
  └─**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=4.73 cfs @ 12.21 hrs HW=917.55' TW=916.91' (Dynamic Tailwater)
└─**4=Culvert** (Inlet Controls 4.73 cfs @ 3.85 fps)

Pond 10P: pond



Summary for Pond 20P: middle low area

Inflow Area = 1.571 ac, 49.01% Impervious, Inflow Depth = 5.85" for 100-yr event
Inflow = 12.36 cfs @ 12.19 hrs, Volume= 0.766 af
Outflow = 2.85 cfs @ 12.42 hrs, Volume= 0.766 af, Atten= 77%, Lag= 13.8 min
Primary = 2.85 cfs @ 12.42 hrs, Volume= 0.766 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 918.35' @ 12.53 hrs Surf.Area= 0.244 ac Storage= 0.251 af

Plug-Flow detention time= 242.8 min calculated for 0.766 af (100% of inflow)
Center-of-Mass det. time= 242.6 min (1,008.7 - 766.1)

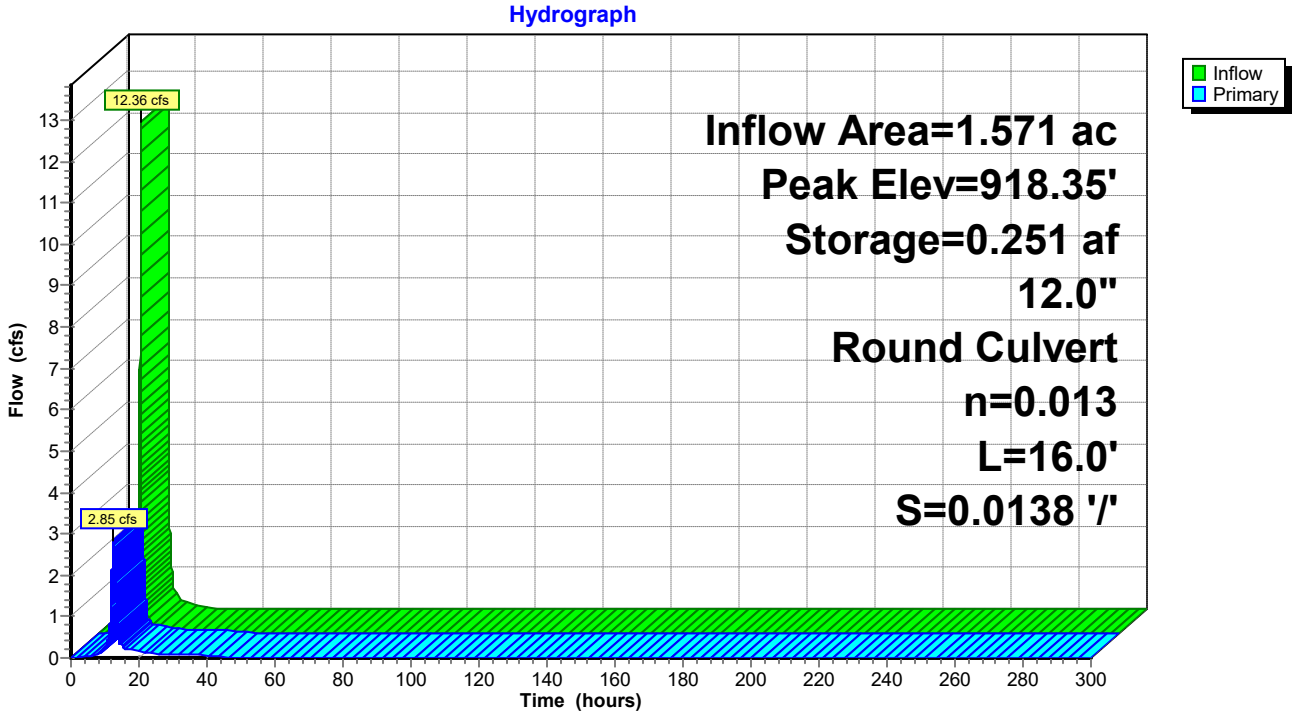
Volume	Invert	Avail.Storage	Storage Description
#1	916.00'	0.916 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.00	0.000	0.000	0.000
918.00	0.178	0.178	0.178
920.00	0.560	0.738	0.916

Device	Routing	Invert	Outlet Devices
#1	Primary	916.00'	**12.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 916.00' / 915.78' S= 0.0138 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=2.84 cfs @ 12.42 hrs HW=918.32' TW=917.76' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 2.84 cfs @ 3.61 fps)

Pond 20P: middle low area



Summary for Pond 30P: north low area

Inflow	=	19.86 cfs @	12.28 hrs,	Volume=	1.508 af
Outflow	=	0.74 cfs @	24.45 hrs,	Volume=	1.508 af, Atten= 96%, Lag= 730.3 min
Primary	=	0.74 cfs @	24.45 hrs,	Volume=	1.508 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 917.92' @ 15.33 hrs Surf.Area= 1.324 ac Storage= 1.269 af

Plug-Flow detention time= 916.5 min calculated for 1.508 af (100% of inflow)
Center-of-Mass det. time= 916.5 min (1,714.6 - 798.1)

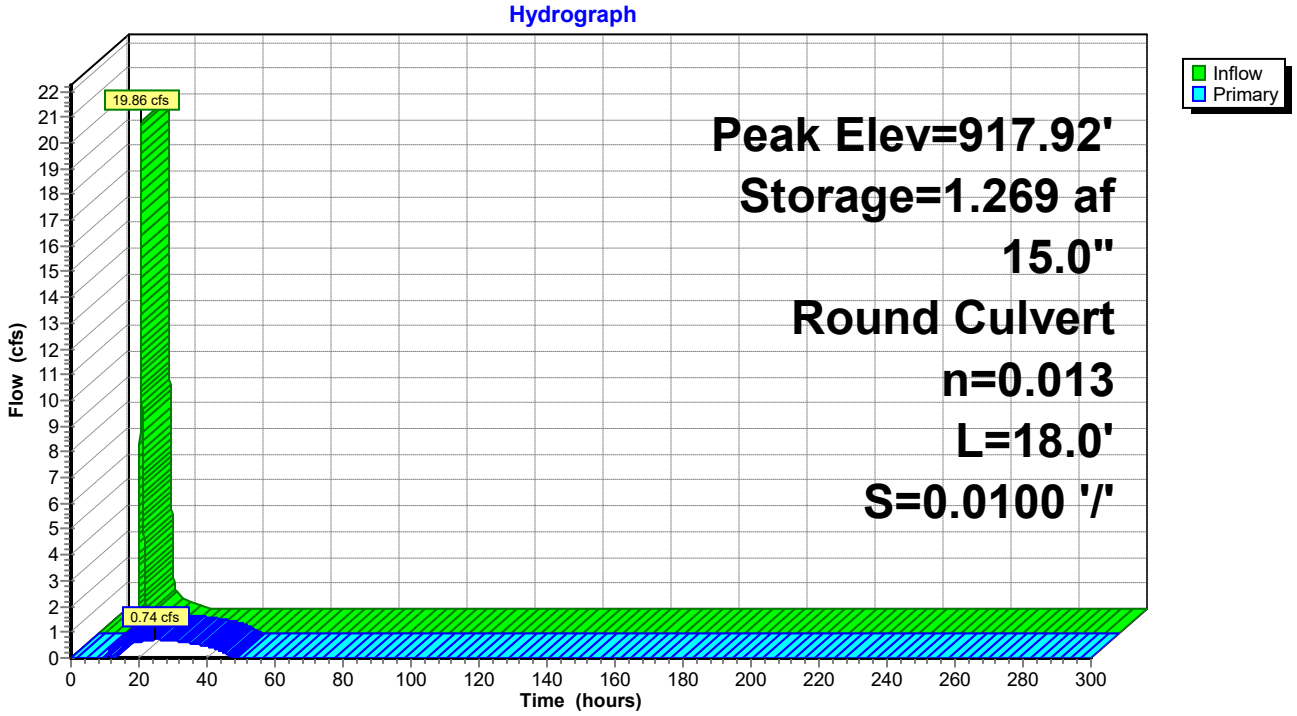
Volume	Invert	Avail.Storage	Storage Description
#1	916.00'	1.380 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.00	0.000	0.000	0.000
918.00	1.380	1.380	1.380

Device	Routing	Invert	Outlet Devices
#1	Primary	916.00'	**15.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 916.00' / 915.82' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.75 cfs @ 24.45 hrs HW=917.68' TW=917.66' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.75 cfs @ 0.61 fps)

Pond 30P: north low area



Summary for Pond 40P: south ditch

Inflow Area = 2.587 ac, 9.59% Impervious, Inflow Depth = 1.81" for 100-yr event
Inflow = 3.31 cfs @ 12.25 hrs, Volume= 0.389 af
Outflow = 2.88 cfs @ 12.33 hrs, Volume= 0.389 af, Atten= 13%, Lag= 5.0 min
Primary = 2.88 cfs @ 12.33 hrs, Volume= 0.389 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 918.89' @ 12.33 hrs Surf.Area= 0.043 ac Storage= 0.020 af

Plug-Flow detention time= 3.6 min calculated for 0.389 af (100% of inflow)
Center-of-Mass det. time= 3.6 min (912.7 - 909.1)

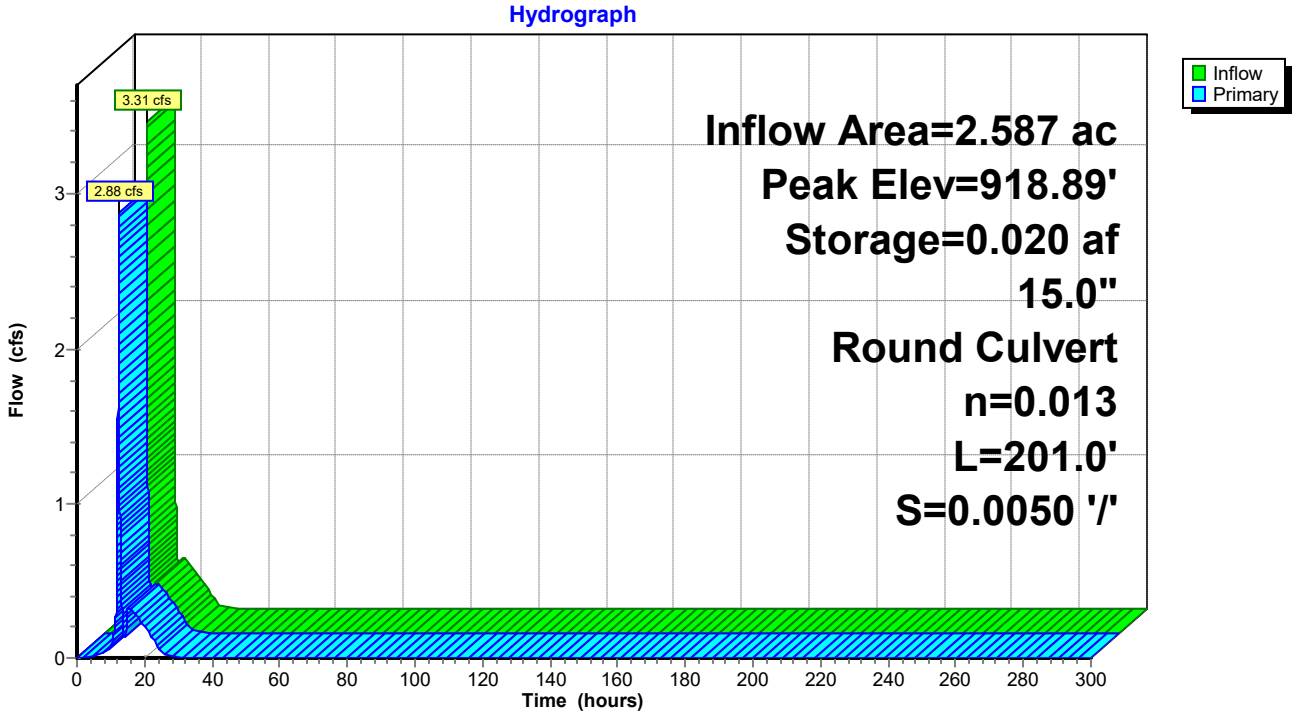
Volume	Invert	Avail.Storage	Storage Description
#1	917.90'	0.097 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
917.90	0.000	0.000	0.000
918.00	0.002	0.000	0.000
920.00	0.095	0.097	0.097

Device	Routing	Invert	Outlet Devices
#1	Primary	917.90'	**15.0" Round Culvert** L= 201.0' Ke= 0.500 Inlet / Outlet Invert= 917.90' / 916.90' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=2.88 cfs @ 12.33 hrs HW=918.89' TW=915.72' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 2.88 cfs @ 3.79 fps)

Pond 40P: south ditch



Summary for Pond 50P: north ditch

Inflow Area = 0.923 ac, 14.84% Impervious, Inflow Depth = 4.58" for 100-yr event
Inflow = 5.72 cfs @ 12.21 hrs, Volume= 0.352 af
Outflow = 4.32 cfs @ 12.30 hrs, Volume= 0.352 af, Atten= 25%, Lag= 5.7 min
Primary = 4.32 cfs @ 12.30 hrs, Volume= 0.352 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 917.46' @ 12.30 hrs Surf.Area= 0.062 ac Storage= 0.043 af

Plug-Flow detention time= 5.9 min calculated for 0.352 af (100% of inflow)
Center-of-Mass det. time= 5.6 min (797.8 - 792.2)

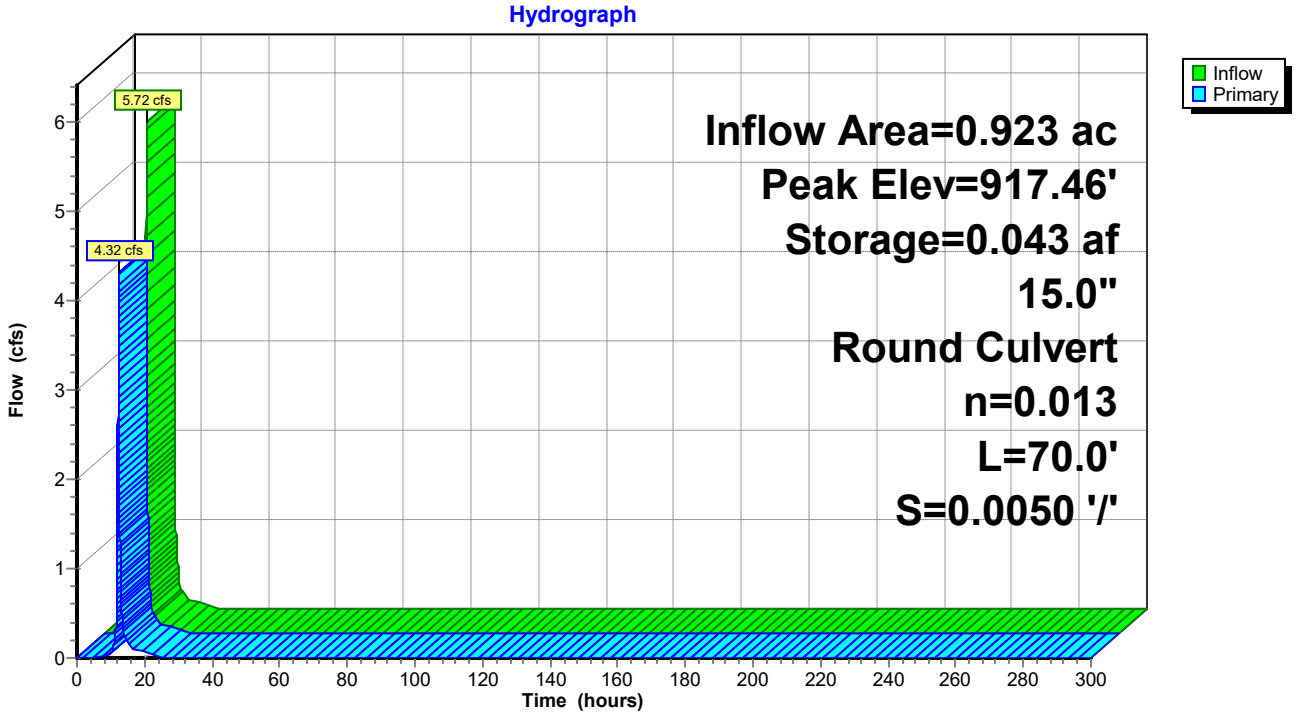
Volume	Invert	Avail.Storage	Storage Description
#1	916.10'	0.083 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.10	0.000	0.000	0.000
918.00	0.087	0.083	0.083

Device	Routing	Invert	Outlet Devices
#1	Primary	916.10'	**15.0" Round Culvert** L= 70.0' Ke= 0.500 Inlet / Outlet Invert= 916.10' / 915.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=4.32 cfs @ 12.30 hrs HW=917.46' TW=915.68' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 4.32 cfs @ 4.02 fps)

Pond 50P: north ditch



Time span=0.00-300.00 hrs, dt=0.01 hrs, 30001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Sim-Route method - Pond routing by Sim-Route method

Subcatchment 1S: Runoff Area=0.856 ac 35.05% Impervious Runoff Depth=6.96"
Flow Length=657' Slope=0.0050 '/' Tc=10.3 min AMC Adjusted CN=WQ Runoff=0.41 cfs 0.497 af

Subcatchment 2S: Runoff Area=2.084 ac 0.00% Impervious Runoff Depth=6.96"
Tc=6.0 min AMC Adjusted CN=98 Runoff=1.00 cfs 1.209 af

Subcatchment 10S: Runoff Area=2.134 ac 68.42% Impervious Runoff Depth=6.96"
Tc=6.0 min AMC Adjusted CN=WQ Runoff=1.02 cfs 1.238 af

Subcatchment 20S: Runoff Area=1.571 ac 49.01% Impervious Runoff Depth=6.96"
Flow Length=220' Slope=0.0200 '/' Tc=11.3 min AMC Adjusted CN=WQ Runoff=0.75 cfs 0.911 af

Subcatchment 30S: Runoff Area=3.225 ac 0.84% Impervious Runoff Depth=6.96"
Flow Length=580' Tc=19.7 min AMC Adjusted CN=WQ Runoff=1.51 cfs 1.871 af

Subcatchment 40S: Runoff Area=0.503 ac 49.30% Impervious Runoff Depth=6.96"
Flow Length=500' Slope=0.0050 '/' Tc=16.8 min AMC Adjusted CN=WQ Runoff=0.24 cfs 0.292 af

Subcatchment 50S: Runoff Area=0.923 ac 14.84% Impervious Runoff Depth=6.96"
Flow Length=510' Tc=12.7 min AMC Adjusted CN=WQ Runoff=0.44 cfs 0.535 af

Pond 1P: east ditch Peak Elev=914.38' Storage=0.014 af Inflow=2.18 cfs 5.967 af
18.0" Round Culvert n=0.013 L=68.0' S=0.0221 '/' Outflow=2.17 cfs 5.967 af

Pond 2P: southwest wetland Peak Elev=919.56' Storage=0.626 af Inflow=1.00 cfs 1.209 af
Outflow=0.60 cfs 0.628 af

Pond 10P: pond Peak Elev=916.87' Storage=0.490 af Inflow=2.20 cfs 4.020 af
Primary=0.85 cfs 4.016 af Secondary=0.00 cfs 0.000 af Outflow=0.85 cfs 4.016 af

Pond 20P: middle low area Peak Elev=916.87' Storage=0.034 af Inflow=0.75 cfs 0.911 af
12.0" Round Culvert n=0.013 L=16.0' S=0.0138 '/' Outflow=0.58 cfs 0.911 af

Pond 30P: north low area Peak Elev=916.88' Storage=0.268 af Inflow=1.51 cfs 1.871 af
15.0" Round Culvert n=0.013 L=18.0' S=0.0100 '/' Outflow=0.70 cfs 1.871 af

Pond 40P: south ditch Peak Elev=918.37' Storage=0.004 af Inflow=0.77 cfs 0.919 af
15.0" Round Culvert n=0.013 L=201.0' S=0.0050 '/' Outflow=0.76 cfs 0.919 af

Pond 50P: north ditch Peak Elev=916.46' Storage=0.003 af Inflow=0.44 cfs 0.535 af
15.0" Round Culvert n=0.013 L=70.0' S=0.0050 '/' Outflow=0.44 cfs 0.535 af

Total Runoff Area = 11.296 ac Runoff Volume = 6.552 af Average Runoff Depth = 6.96"
73.96% Pervious = 8.354 ac 26.04% Impervious = 2.942 ac

Summary for Subcatchment 1S:

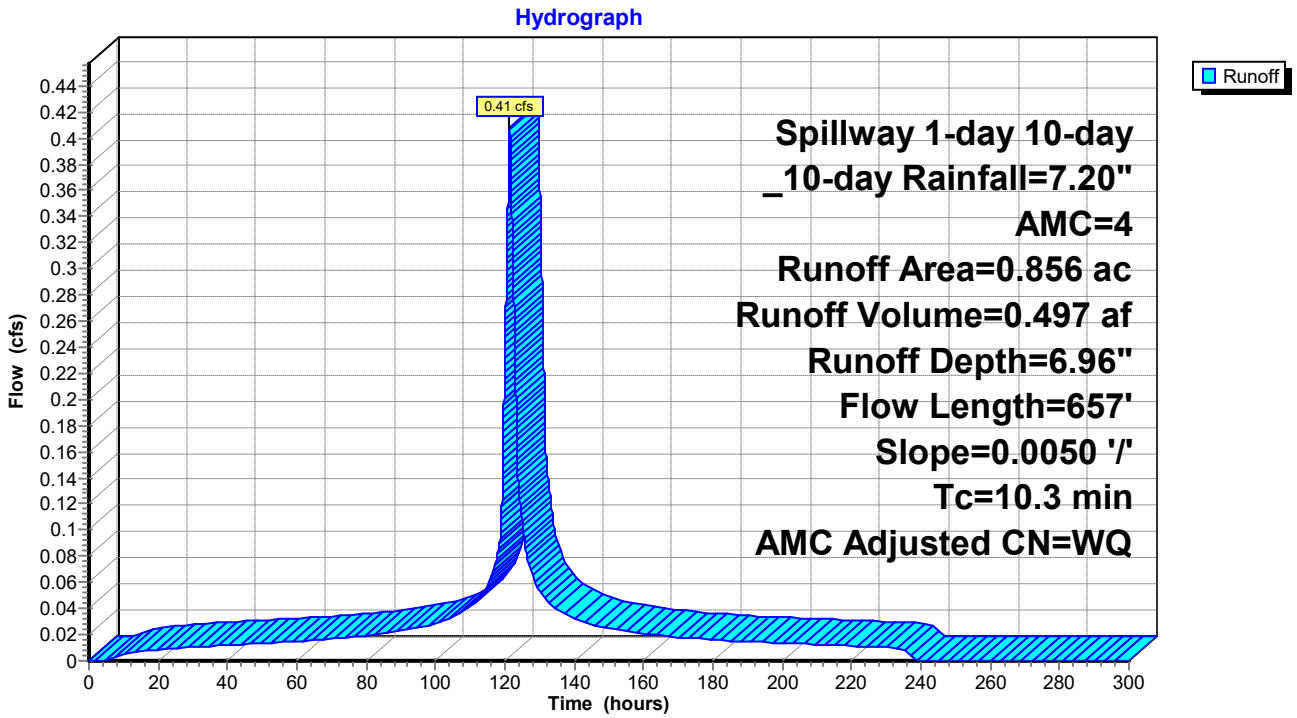
Runoff = 0.41 cfs @ 121.37 hrs, Volume= 0.497 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
0.556	80	98	>75% Grass cover, Good, HSG D
0.300	98	98	Paved parking, HSG D
0.856			Weighted Average
0.556			64.95% Pervious Area
0.300			35.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	657	0.0050	1.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Subcatchment 1S:



Summary for Subcatchment 2S:

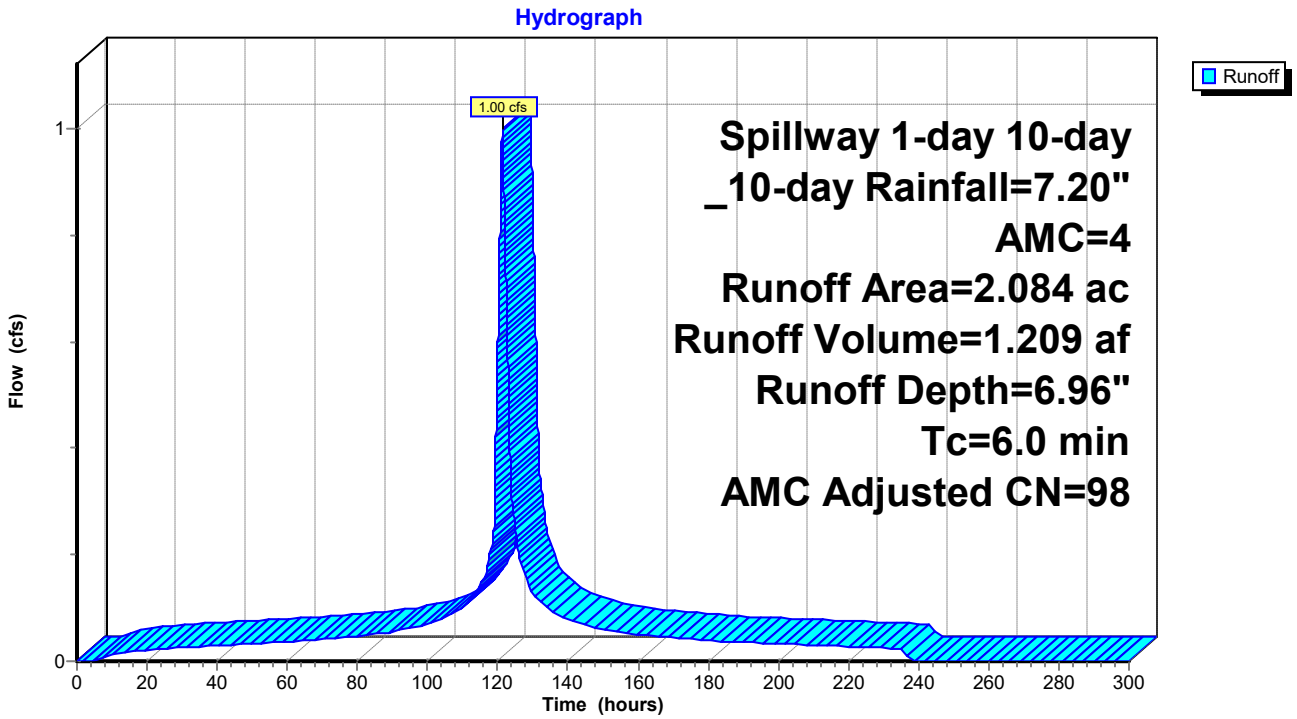
Runoff = 1.00 cfs @ 121.30 hrs, Volume= 1.209 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
2.084	74	98	>75% Grass cover, Good, HSG C
2.084			Weighted Average
2.084			100.00% Pervious Area

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

Subcatchment 2S:



Summary for Subcatchment 10S:

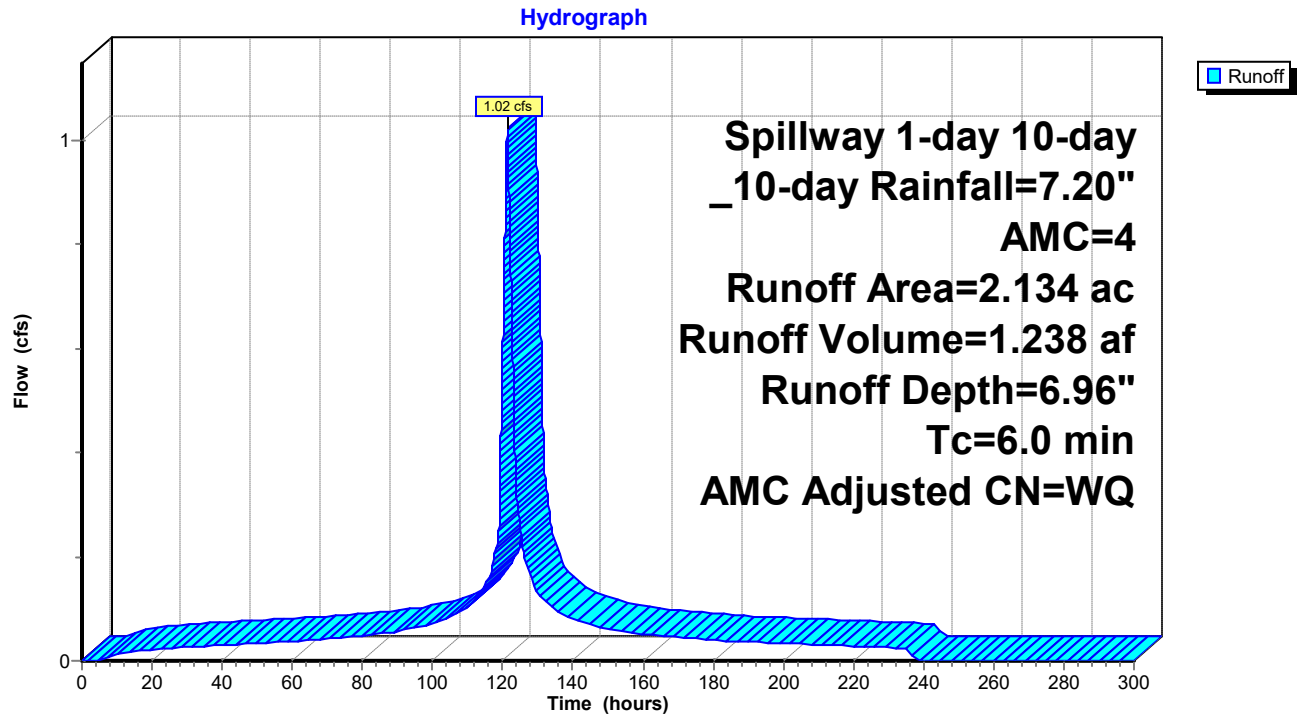
Runoff = 1.02 cfs @ 121.30 hrs, Volume= 1.238 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
1.460	98	98	Paved parking, HSG D
0.439	80	98	>75% Grass cover, Good, HSG D
0.235	98	98	Water Surface, 0% imp, HSG D
2.134			Weighted Average
0.674			31.58% Pervious Area
1.460			68.42% Impervious Area

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

Subcatchment 10S:



Summary for Subcatchment 20S:

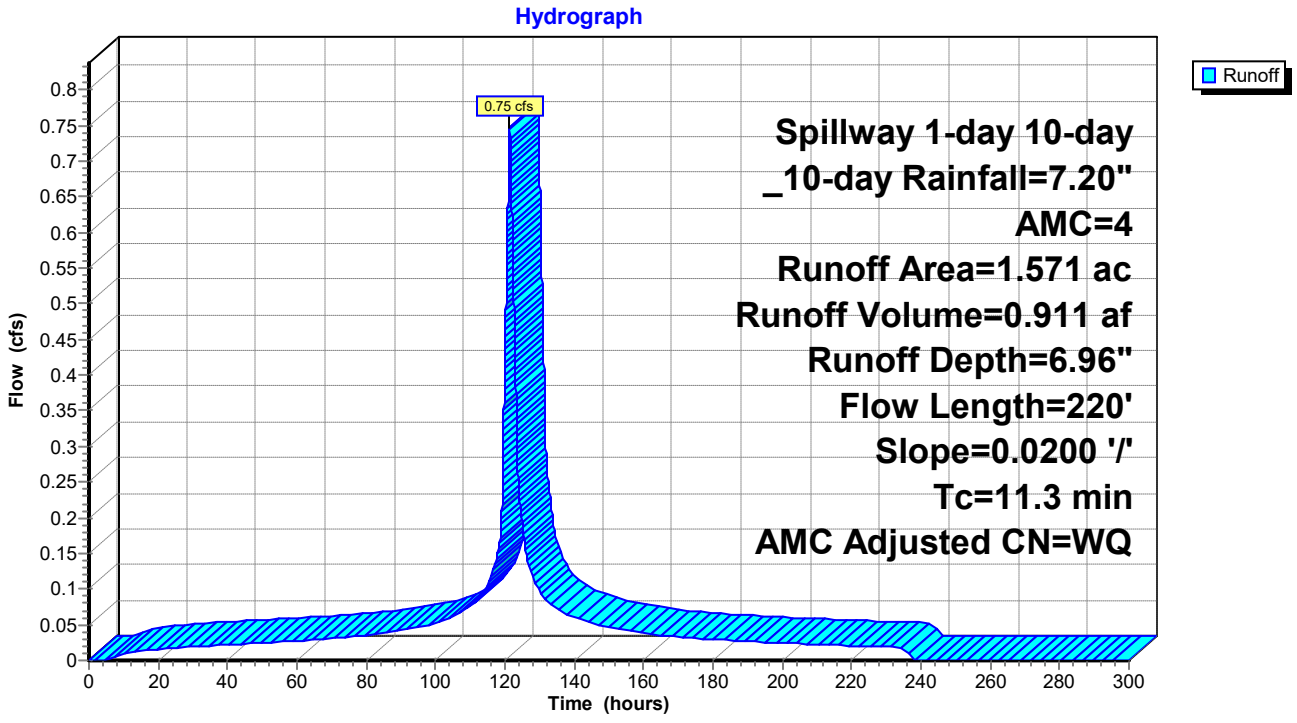
Runoff = 0.75 cfs @ 121.37 hrs, Volume= 0.911 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
0.801	80	98	>75% Grass cover, Good, HSG D
0.770	98	98	Paved parking, HSG D
1.571			Weighted Average
0.801			50.99% Pervious Area
0.770			49.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	100	0.0200	0.18		**Sheet Flow,** Range n= 0.130 P2= 2.80"
2.0	120	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	220	Total			

Subcatchment 20S:



Summary for Subcatchment 30S:

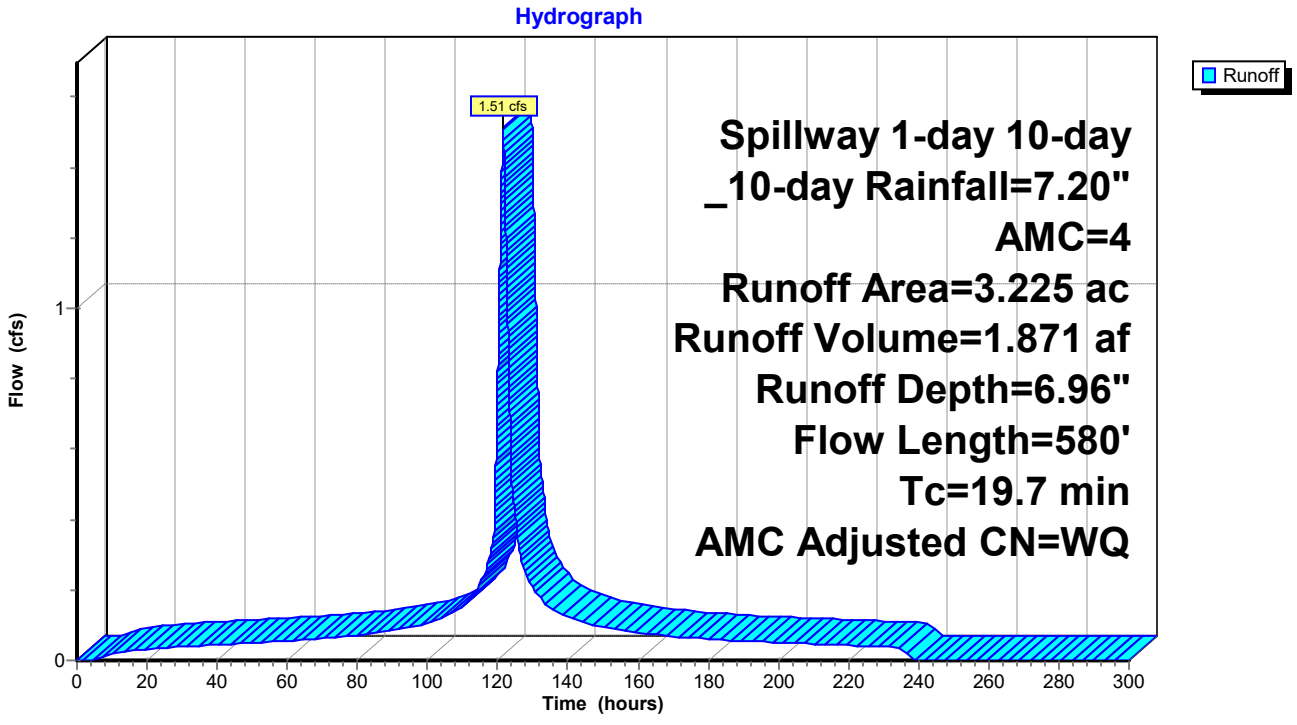
Runoff = 1.51 cfs @ 121.50 hrs, Volume= 1.871 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
3.198	74	98	>75% Grass cover, Good, HSG C
0.027	98	98	Paved parking, HSG D
3.225			Weighted Average
3.198			99.16% Pervious Area
0.027			0.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	100	0.0150	0.30		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
14.1	480	0.0040	0.57		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
19.7	580	Total			

Subcatchment 30S:



Summary for Subcatchment 40S:

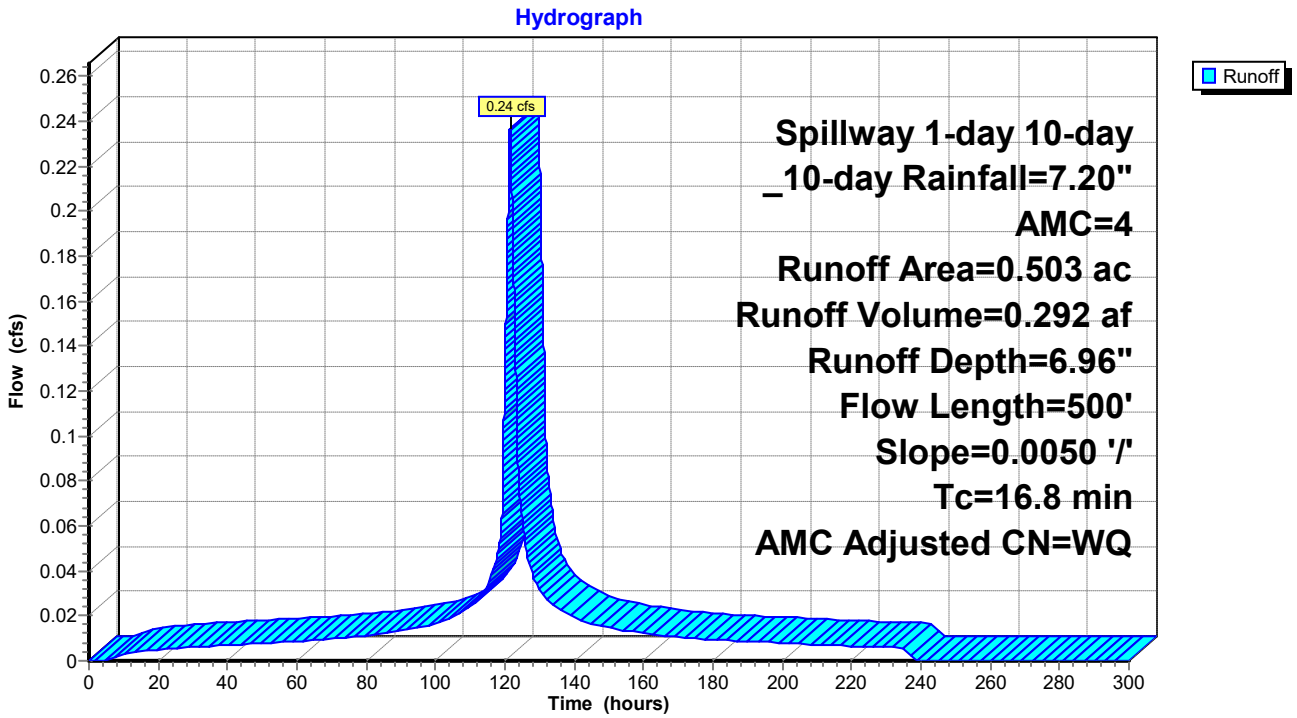
Runoff = 0.24 cfs @ 121.46 hrs, Volume= 0.292 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
0.255	80	98	>75% Grass cover, Good, HSG D
0.248	98	98	Paved parking, HSG D
0.503			Weighted Average
0.255			50.70% Pervious Area
0.248			49.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.8	500	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps

Subcatchment 40S:



Summary for Subcatchment 50S:

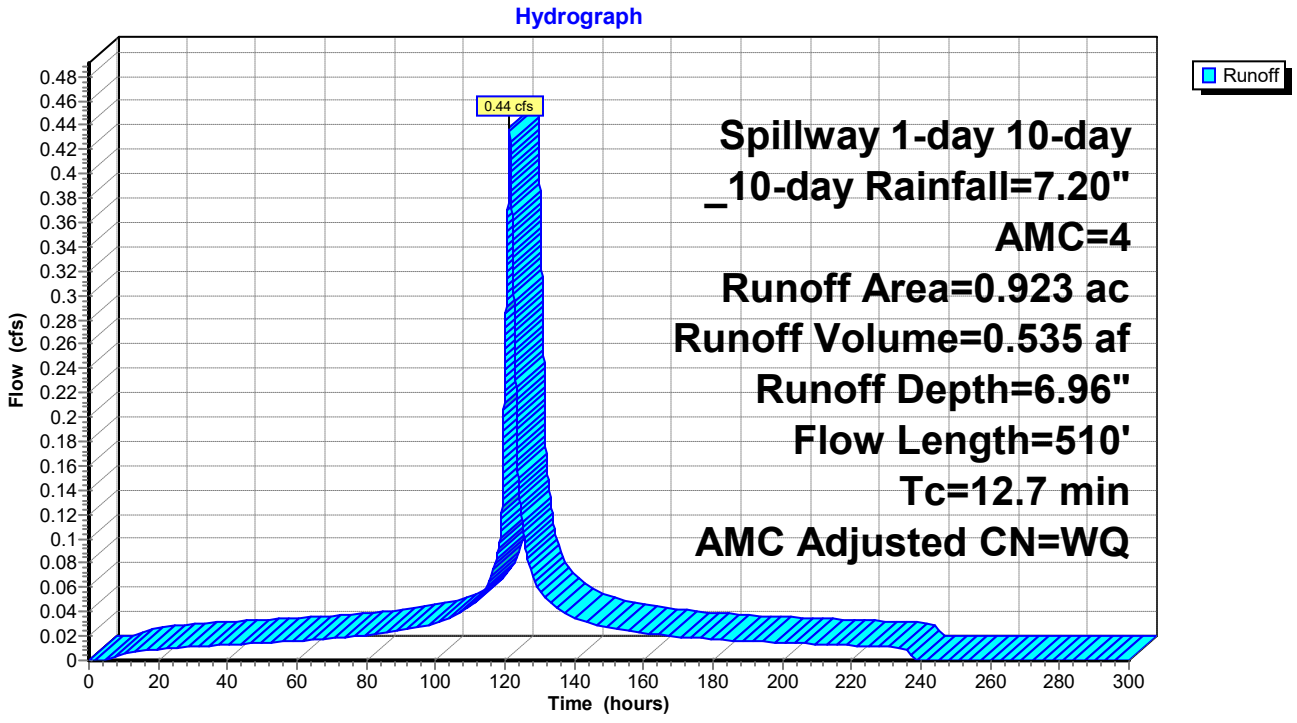
Runoff = 0.44 cfs @ 121.40 hrs, Volume= 0.535 af, Depth= 6.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Spillway 1-day 10-day _10-day Rainfall=7.20", AMC=4

Area (ac)	CN	Adj	Description
0.786	74	98	>75% Grass cover, Good, HSG C
0.137	98	98	Paved parking, HSG D
0.923			Weighted Average
0.786			85.16% Pervious Area
0.137			14.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	50	0.0150	0.26		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.80"
9.5	460	0.0080	0.80		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
12.7	510	Total			

Subcatchment 50S:



Summary for Pond 1P: east ditch

Inflow	=	2.18 cfs @ 122.40 hrs, Volume=	5.967 af
Outflow	=	2.17 cfs @ 122.49 hrs, Volume=	5.967 af, Atten= 0%, Lag= 5.3 min
Primary	=	2.17 cfs @ 122.49 hrs, Volume=	5.967 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 914.38' @ 122.49 hrs Surf.Area= 0.040 ac Storage= 0.014 af

Plug-Flow detention time= 4.2 min calculated for 5.967 af (100% of inflow)
Center-of-Mass det. time= 4.2 min (7,890.2 - 7,886.0)

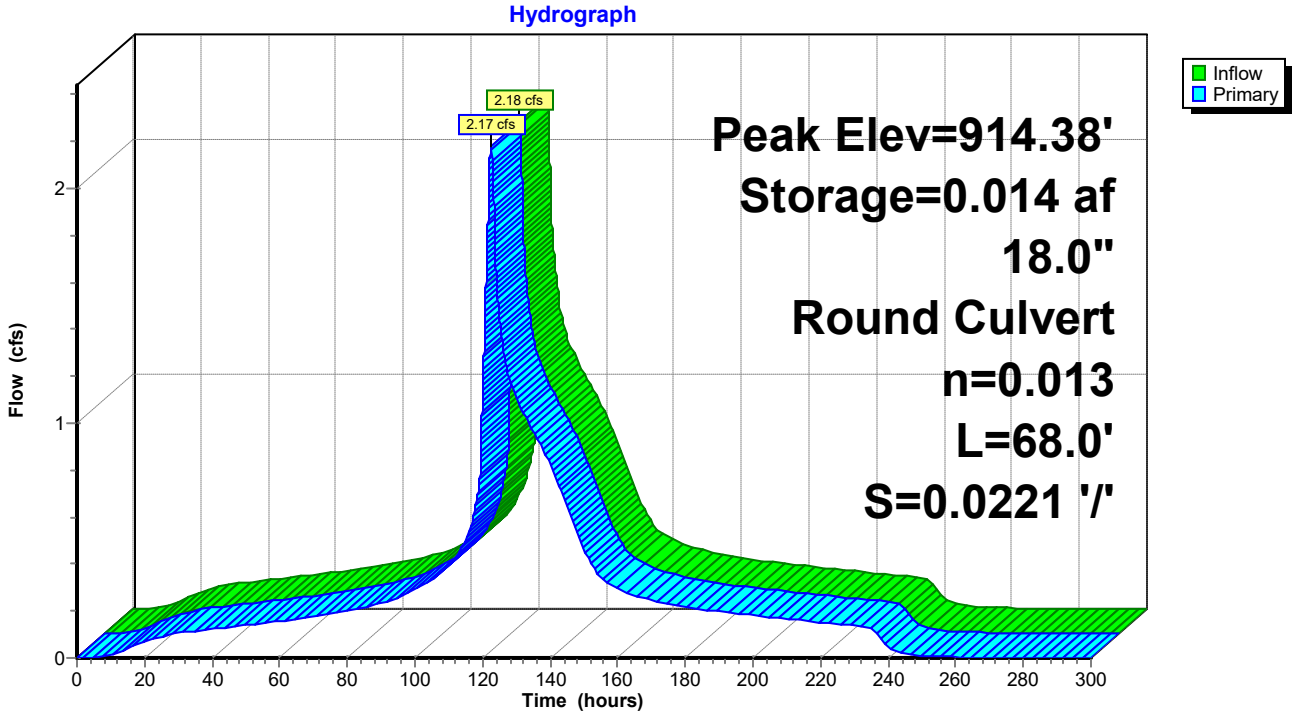
Volume	Invert	Avail.Storage	Storage Description
#1	913.70'	0.332 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
913.70	0.000	0.000	0.000
916.00	0.137	0.158	0.158
917.00	0.212	0.174	0.332

Device	Routing	Invert	Outlet Devices
#1	Primary	913.70'	**18.0" Round Culvert** L= 68.0' Ke= 0.500 Inlet / Outlet Invert= 913.70' / 912.20' S= 0.0221 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=2.17 cfs @ 122.49 hrs HW=914.38' (Free Discharge)
1=Culvert (Inlet Controls 2.17 cfs @ 2.80 fps)

Pond 1P: east ditch



Summary for Pond 2P: southwest wetland

Inflow Area = 2.084 ac, 0.00% Impervious, Inflow Depth = 6.96" for _10-day event
Inflow = 1.00 cfs @ 121.30 hrs, Volume= 1.209 af
Outflow = 0.60 cfs @ 122.74 hrs, Volume= 0.628 af, Atten= 40%, Lag= 86.5 min
Primary = 0.60 cfs @ 122.74 hrs, Volume= 0.628 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 919.56' @ 122.74 hrs Surf.Area= 0.833 ac Storage= 0.626 af

Plug-Flow detention time= 3,718.9 min calculated for 0.628 af (52% of inflow)
Center-of-Mass det. time= 1,907.8 min (9,317.7 - 7,409.9)

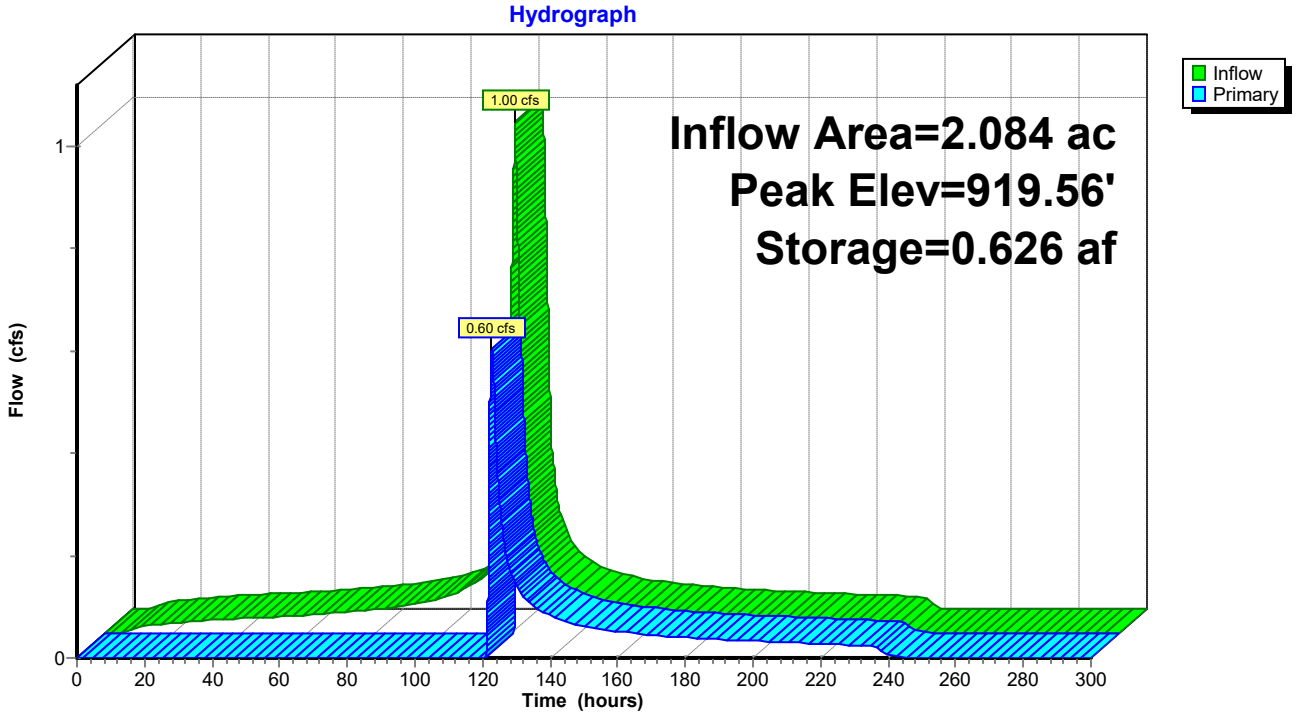
Volume	Invert	Avail.Storage	Storage Description
#1	918.00'	1.054 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
918.00	0.000	0.000	0.000
919.00	0.508	0.254	0.254
920.00	1.093	0.800	1.054

Device	Routing	Invert	Outlet Devices
#1	Primary	919.50'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.60 cfs @ 122.74 hrs HW=919.56' TW=918.37' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.60 cfs @ 0.55 fps)

Pond 2P: southwest wetland



Summary for Pond 10P: pond

Inflow	=	2.20 cfs @ 121.26 hrs,	Volume=	4.020 af
Outflow	=	0.85 cfs @ 125.02 hrs,	Volume=	4.016 af, Atten= 61%, Lag= 225.9 min
Primary	=	0.85 cfs @ 125.02 hrs,	Volume=	4.016 af
Secondary	=	0.00 cfs @ 0.00 hrs,	Volume=	0.000 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.87' @ 125.02 hrs Surf.Area= 0.290 ac Storage= 0.490 af

Plug-Flow detention time= 332.2 min calculated for 4.016 af (100% of inflow)
Center-of-Mass det. time= 325.2 min (7,815.8 - 7,490.6)

Volume	Invert	Avail.Storage	Storage Description
#1	915.00'	1.553 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

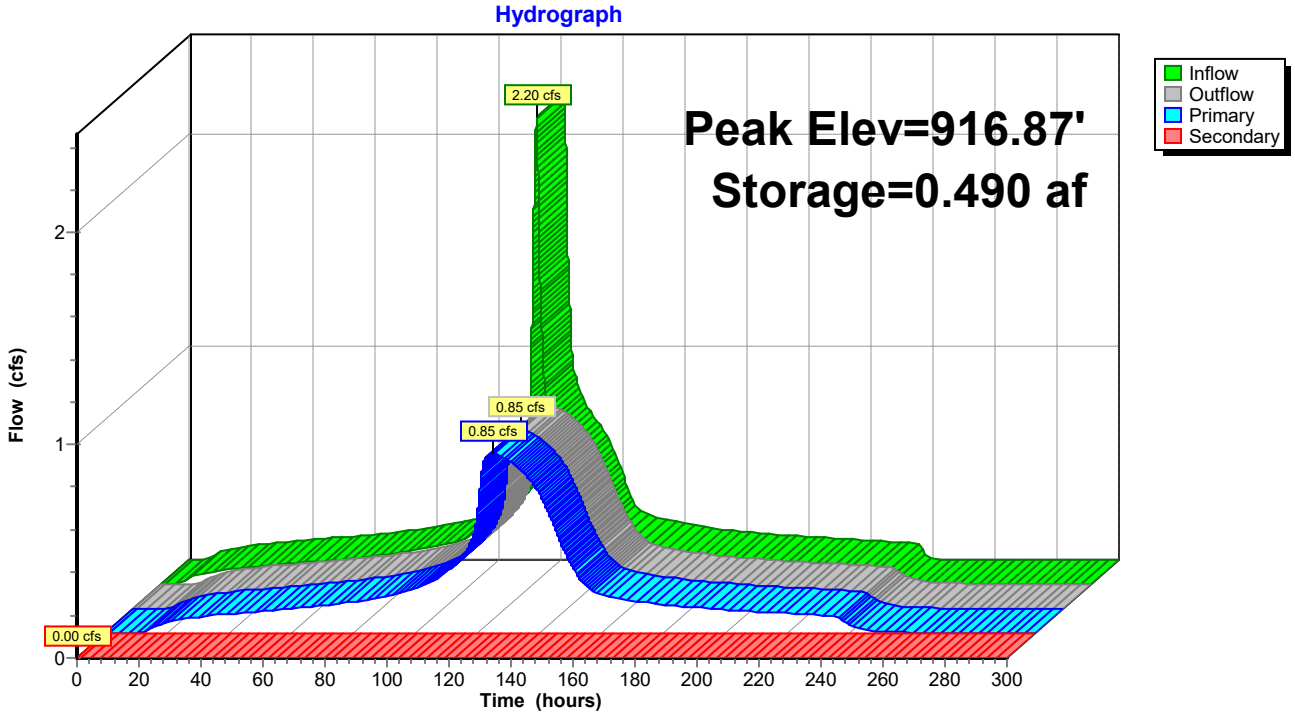
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
915.00	0.235	0.000	0.000
916.00	0.263	0.249	0.249
918.00	0.325	0.588	0.837
920.00	0.391	0.716	1.553

Device	Routing	Invert	Outlet Devices
#1	Primary	915.00'	**15.0" Round Culvert** L= 35.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 915.00' / 914.88' S= 0.0034 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	915.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	918.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Secondary	916.00'	**15.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 915.82' / 916.00' S= -0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.85 cfs @ 125.02 hrs HW=916.87' TW=914.24' (Dynamic Tailwater)
- **1=Culvert** (Passes 0.85 cfs of 5.57 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.85 cfs @ 6.21 fps)
  - **3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=915.00' TW=916.00' (Dynamic Tailwater)
- **4=Culvert** (Controls 0.00 cfs)

Pond 10P: pond



Summary for Pond 20P: middle low area

Inflow Area = 1.571 ac, 49.01% Impervious, Inflow Depth = 6.96" for _10-day event
Inflow = 0.75 cfs @ 121.37 hrs, Volume= 0.911 af
Outflow = 0.58 cfs @ 121.36 hrs, Volume= 0.911 af, Atten= 23%, Lag= 0.0 min
Primary = 0.58 cfs @ 121.36 hrs, Volume= 0.911 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.87' @ 124.97 hrs Surf.Area= 0.078 ac Storage= 0.034 af

Plug-Flow detention time= 31.6 min calculated for 0.911 af (100% of inflow)
Center-of-Mass det. time= 31.6 min (7,446.4 - 7,414.9)

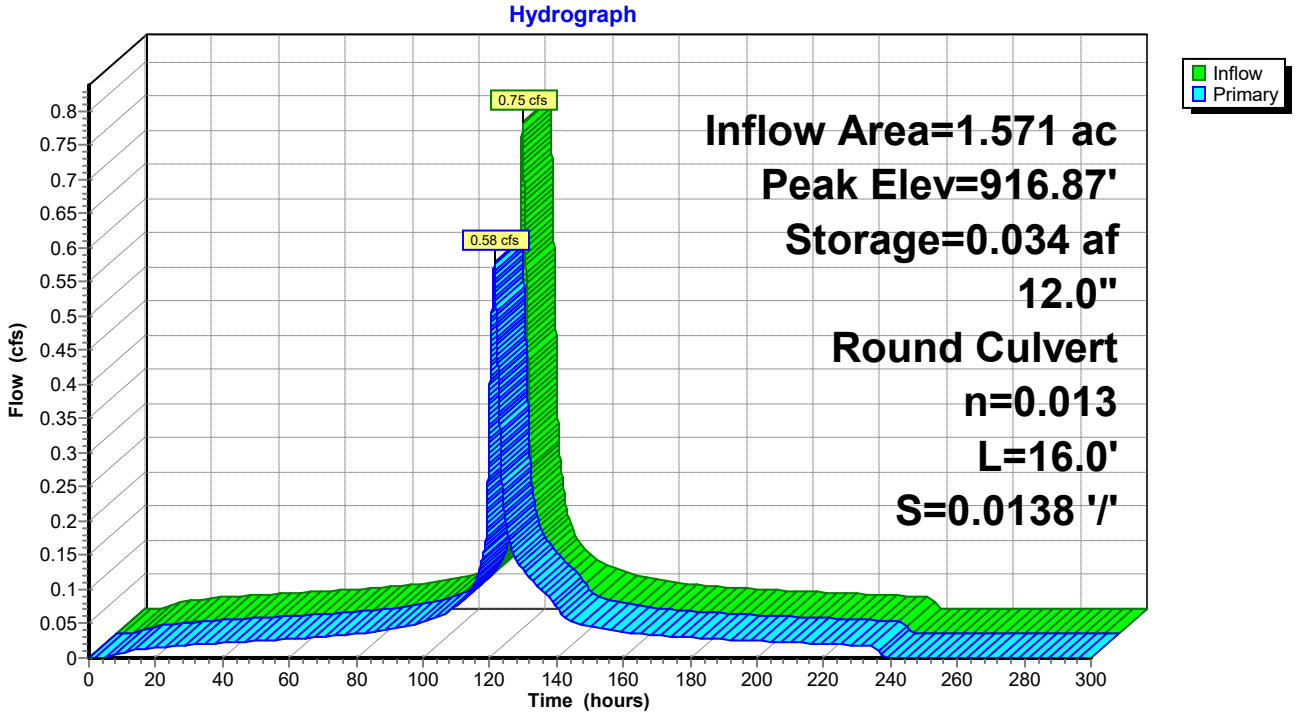
Volume	Invert	Avail.Storage	Storage Description
#1	916.00'	0.916 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.00	0.000	0.000	0.000
918.00	0.178	0.178	0.178
920.00	0.560	0.738	0.916

Device	Routing	Invert	Outlet Devices
#1	Primary	916.00'	**12.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 916.00' / 915.78' S= 0.0138 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.57 cfs @ 121.36 hrs HW=916.56' TW=916.46' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.57 cfs @ 1.80 fps)

Pond 20P: middle low area



Summary for Pond 30P: north low area

Inflow	=	1.51 cfs @ 121.50 hrs,	Volume=	1.871 af
Outflow	=	0.70 cfs @ 120.66 hrs,	Volume=	1.871 af, Atten= 54%, Lag= 0.0 min
Primary	=	0.70 cfs @ 120.66 hrs,	Volume=	1.871 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.88' @ 125.13 hrs Surf.Area= 0.608 ac Storage= 0.268 af

Plug-Flow detention time= 142.9 min calculated for 1.871 af (100% of inflow)
Center-of-Mass det. time= 142.9 min (7,565.5 - 7,422.7)

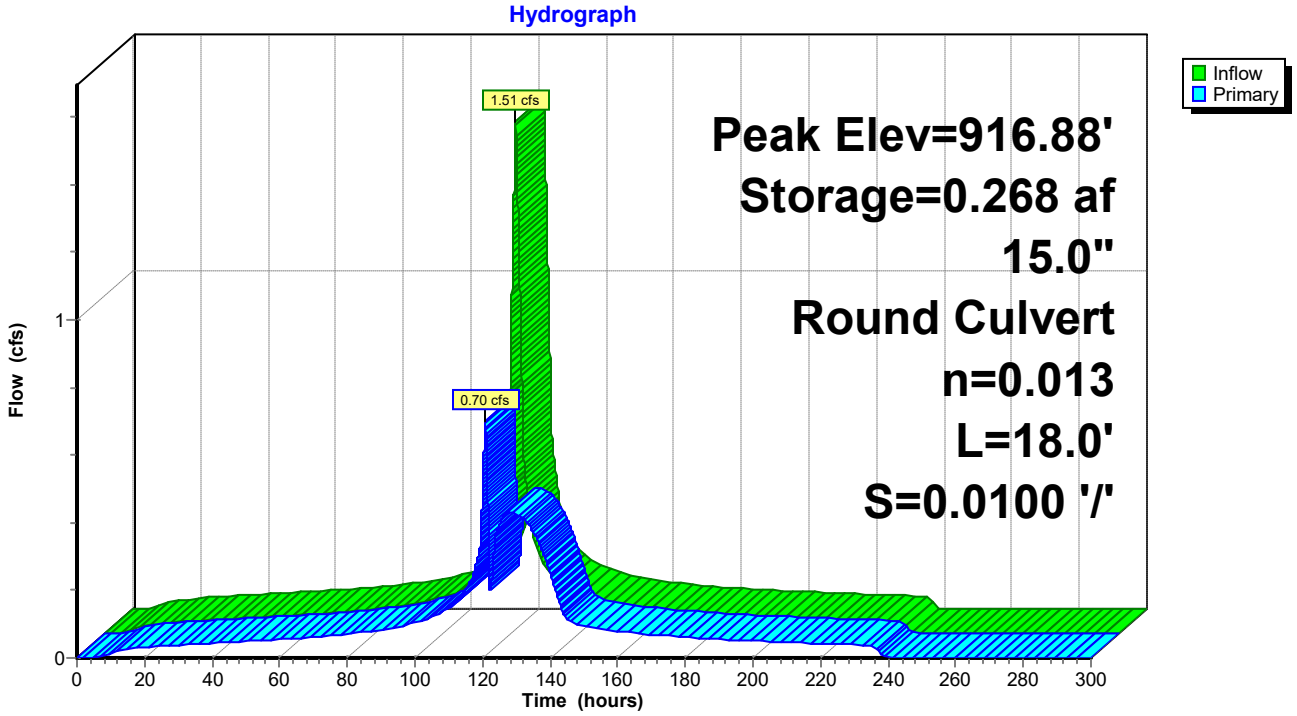
Volume	Invert	Avail.Storage	Storage Description
#1	916.00'	1.380 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.00	0.000	0.000	0.000
918.00	1.380	1.380	1.380

Device	Routing	Invert	Outlet Devices
#1	Primary	916.00'	**15.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 916.00' / 915.82' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.69 cfs @ 120.66 hrs HW=916.43' TW=916.15' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 0.69 cfs @ 2.79 fps)

Pond 30P: north low area



Summary for Pond 40P: south ditch

Inflow Area = 2.587 ac, 9.59% Impervious, Inflow Depth = 4.27" for _10-day event
Inflow = 0.77 cfs @ 122.62 hrs, Volume= 0.919 af
Outflow = 0.76 cfs @ 122.69 hrs, Volume= 0.919 af, Atten= 0%, Lag= 4.1 min
Primary = 0.76 cfs @ 122.69 hrs, Volume= 0.919 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 918.37' @ 122.69 hrs Surf.Area= 0.019 ac Storage= 0.004 af

Plug-Flow detention time= 2.8 min calculated for 0.919 af (100% of inflow)
Center-of-Mass det. time= 2.8 min (8,718.3 - 8,715.5)

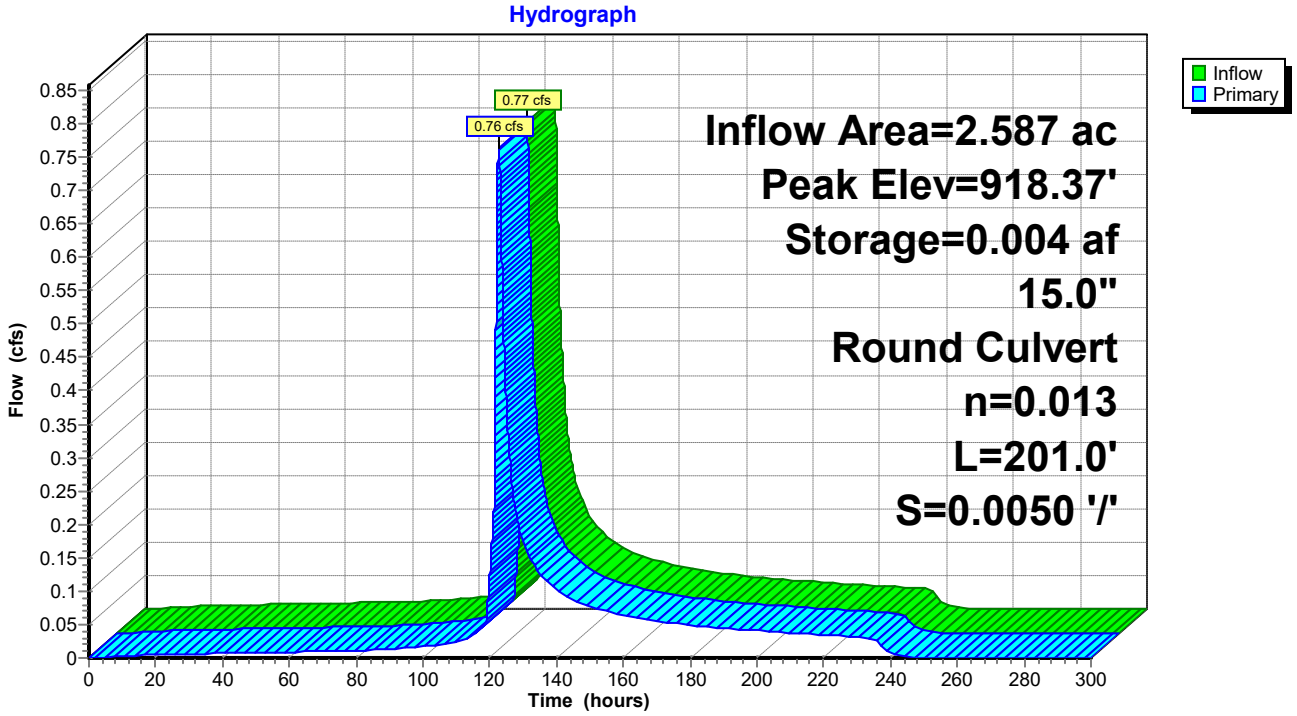
Volume	Invert	Avail.Storage	Storage Description
#1	917.90'	0.097 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
917.90	0.000	0.000	0.000
918.00	0.002	0.000	0.000
920.00	0.095	0.097	0.097

Device	Routing	Invert	Outlet Devices
#1	Primary	917.90'	**15.0" Round Culvert** L= 201.0' Ke= 0.500 Inlet / Outlet Invert= 917.90' / 916.90' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.76 cfs @ 122.69 hrs HW=918.37' TW=914.38' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.76 cfs @ 2.70 fps)

Pond 40P: south ditch



Summary for Pond 50P: north ditch

Inflow Area = 0.923 ac, 14.84% Impervious, Inflow Depth = 6.96" for _10-day event
Inflow = 0.44 cfs @ 121.40 hrs, Volume= 0.535 af
Outflow = 0.44 cfs @ 121.47 hrs, Volume= 0.535 af, Atten= 1%, Lag= 4.6 min
Primary = 0.44 cfs @ 121.47 hrs, Volume= 0.535 af

Routing by Sim-Route method, Time Span= 0.00-300.00 hrs, dt= 0.01 hrs
Peak Elev= 916.46' @ 121.47 hrs Surf.Area= 0.016 ac Storage= 0.003 af

Plug-Flow detention time= 5.2 min calculated for 0.535 af (100% of inflow)
Center-of-Mass det. time= 5.2 min (7,421.3 - 7,416.2)

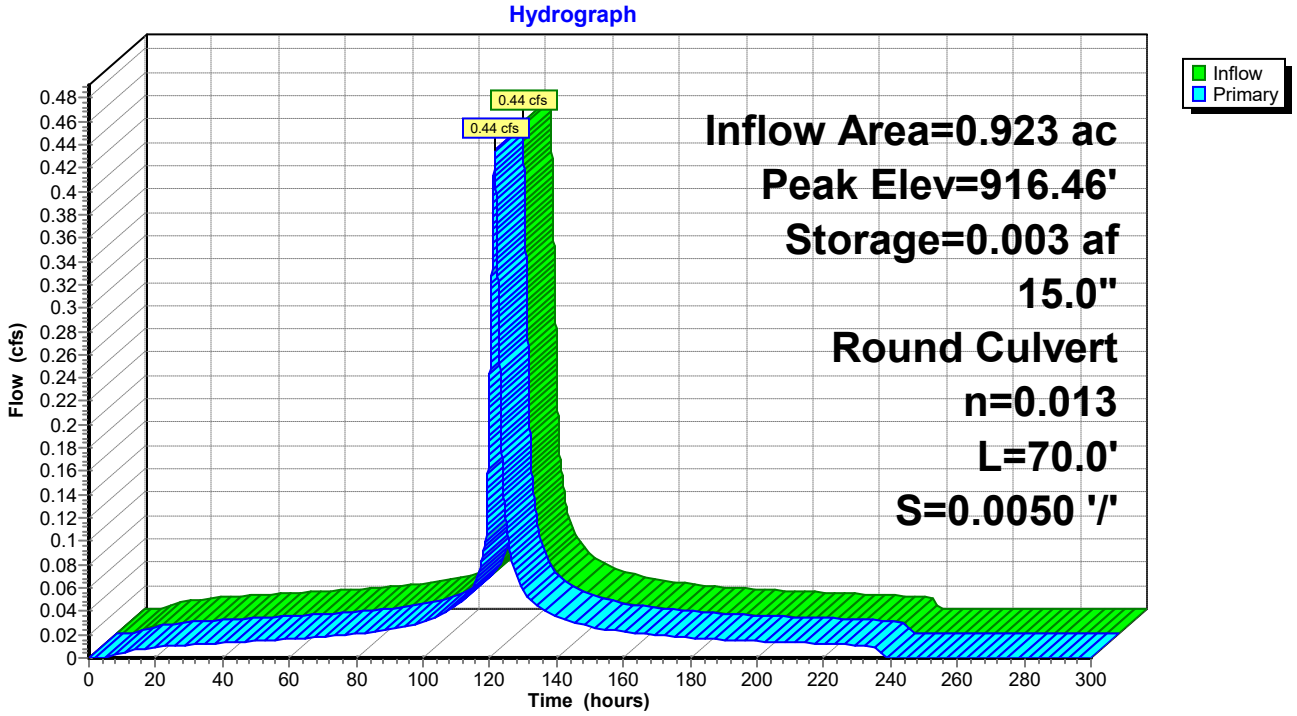
Volume	Invert	Avail.Storage	Storage Description
#1	916.10'	0.083 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
916.10	0.000	0.000	0.000
918.00	0.087	0.083	0.083

Device	Routing	Invert	Outlet Devices
#1	Primary	916.10'	**15.0" Round Culvert** L= 70.0' Ke= 0.500 Inlet / Outlet Invert= 916.10' / 915.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=0.44 cfs @ 121.47 hrs HW=916.46' TW=914.31' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 0.44 cfs @ 2.27 fps)

Pond 50P: north ditch



APPENDIX C

PROJECT NAME: Belland Farms
PROJECT LOCATION: Lino Lakes, MN
CARLSON MCCAIN PROJECT NO.: 9614
DATE: 11/19/21
BY: JTR

POND DESIGN - POND 10

COVER DESCRIPTION	CN	AREA	Product of CN & AREA
Impervious	98	2.257	221.19
Impervious - not to pond	98	0.382	37.44
Pervious	80	4.437	354.96
Water Surface	98	0.235	23.03
	Totals	7.311	636.61

Weighted CN	86
2.5" Total Runoff	1.243

REQUIRED POND TREATMENT VOLUME

MPCA Permanent Pool Volume (1,800 CF - Total Area)	**0.302**	acre-feet
NURP Permanent Pool Volume (2.5" Runoff - Total Area)	**0.758**	acre-feet
Water Quality Volume (1.1" Runoff - Impervious Area)	**0.242**	acre-feet

ACTUAL POND TREATMENT VOLUME

Permanent Pool Volume

	Elevation	Area (ac.)	Volume (af)	
NWL	915	0.235	0.191	
	914	0.148	0.253	
	912	0.105	0.171	
	910	0.067	0.103	
	908	0.036	0.049	
Invert	906	0.013		
		Total	**0.768**	acre-feet

Live Storage Volume

	Elevation	Area (ac.)	Volume (af)	
Overflow	919.5	0.373	0.523	
	918	0.325	0.588	
	916	0.263	0.249	
NWL	915	0.235		
		Total	**1.361**	acre-feet

Water Level at Water Quality Volume:	915.98	feet
Surface Area at Water Quality Volume:	0.262	acre
Allowable Discharge at Water Quality Volume (5.66 cfs/ac)	1.48	cfs
Actual Discharge at Water Quality Volume	0.58	cfs

PROJECT NAME: Belland Farms
PROJECT LOCATION: Lino Lakes, MN
CARLSON PROJECT NO.: 9614-00
DATE: 11/19/21
BY: JTR

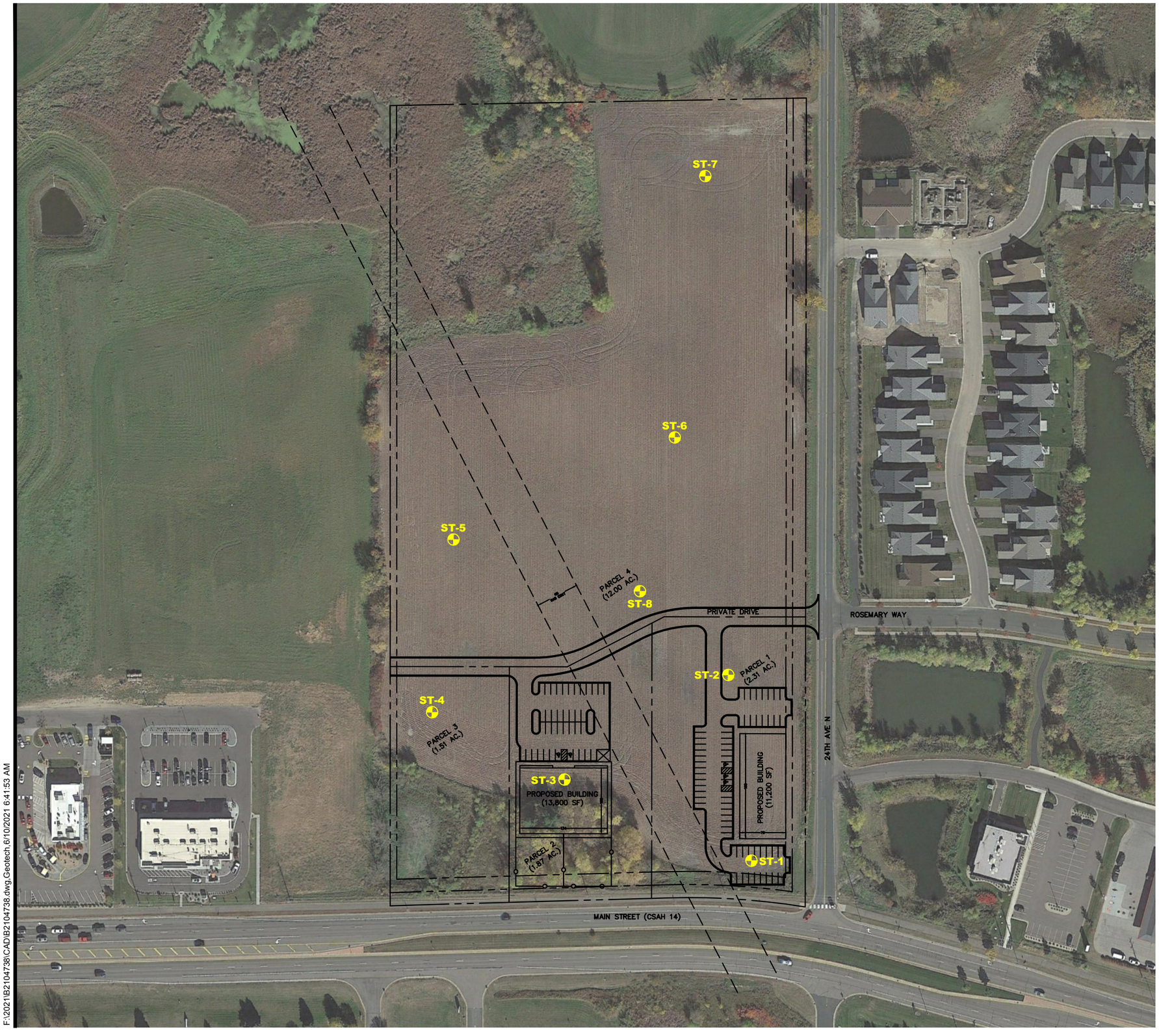
DESIGN CRITERIA	
Storm Frequency	10 year
Manning's "n"	0.013
"C" coefficient	varies

CARLSON McCAIN

PROPOSED CONDITIONS STORM SEWER DESIGN

LOCATION		MH SIZE	AREA			"C" COEFFICIENT			GENERAL		DESIGN						PROFILE INFORMATION			
CBMH (from)	CBMH (to)	Diameter (in)	Impervious (sf)	Pervious (sf)	Total Area (ac)	Inc. "C"	Inc. CA	Cum. CA	T (min)	I (in/hr)	Q = CAI (cfs)	D (in)	% Grade	Q_{full} (cfs)	V_{full} (fps)	L (ft)	Invert (in)	Invert (out)	Rim El.	Build (ft)
fes	202	48	1164	139536	3.23	100y from HydroCAD					0.70	15	1.00%	6.45	5.26	18	916.00	915.82	916.00	0.00
202	201	48	7146	1984	0.21	0.75	0.16	0.16	10	5.8	1.61	15	1.00%	6.45	5.26	41	915.54	915.13	919.61	4.08
201	fes	48	11661	2316	0.32	0.78	0.25	0.41	10	5.8	3.07	15	0.50%	4.56	3.72	25	915.13	915.00	919.39	4.26
CV north	CV south	na	5982	34217	0.92	100y from HydroCAD					4.32	15	0.50%	4.56	3.72	70	916.10	915.75	916.10	0.00
end	106	na										15	6.90%	16.95	13.81	29	912.00	914.00	912.00	0.00
106	fes	48										15	0.35%	3.82	3.11	36	915.00	914.87	918.30	3.30
fes	105	na	14138	11116	0.58	0.59	0.34	0.34	10	5.8	1.99	15	0.50%	4.56	3.72	141	917.90	917.20	917.90	0.00
105	fes	48	156	4563	0.11	0.22	0.02	0.37	10	5.8	2.13	15	0.50%	4.56	3.72	60	917.20	916.90	920.00	2.81
Roof 2	R3	na	5878	0	0.13	0.90	0.12	0.12	10	5.8	0.70	10	1.00%	2.19	4.01	0	917.14	917.14	922.50	5.36
Roof 1	R2	na	6427	0	0.15	0.90	0.13	0.13	10	5.8	0.77	10	1.00%	2.19	4.01	0	916.72	916.72	922.50	5.78
R3	104	na	0	0	0.00	0.00	0.00	0.12	10	5.8	0.70	10	1.00%	2.19	4.01	76	917.14	916.38	922.50	5.36
R2	R1	na	0	0	0.00	0.00	0.00	0.13	10	5.8	0.77	10	1.00%	2.19	4.01	37	916.72	916.35	922.50	5.78
R1	102	na	0	0	0.00	0.00	0.00	0.13	10	5.8	0.77	10	1.00%	2.19	4.01	41	916.35	915.94	920.50	4.15
fes	103	48	30280	34241	1.48	100y from HydroCAD					2.85	12	1.39%	4.19	5.34	16	916.00	915.78	916.00	0.00
104	103	48	13172	2432	0.36	0.79	0.28	0.40	10	5.8	2.35	12	0.45%	2.39	3.04	108	916.26	915.78	919.43	3.17
103	101	48	8338	796	0.21	0.84	0.18	0.58	10	5.8	6.22	18	0.45%	7.04	3.98	60	915.45	915.18	919.33	3.89
102	101	48	8291	750	0.21	0.84	0.17	0.31	10	5.8	1.78	12	0.45%	2.39	3.04	71	915.83	915.51	919.23	3.40
101	fes	60	0	0	0.00	0.00	0.00	0.89	10	5.8	8.00	18	0.70%	8.78	4.97	25	915.18	915.00	920.00	4.83

APPENDIX D



DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

75' 0 150'

SCALE: 1"= 150'

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11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Drawing Information

Project No: B2104738

Drawing No: B2104738

Drawn By:	JAG
Date Drawn:	5/27/21
Checked By:	JLW
Last Modified:	6/10/21

Project Information

Rehbein Development

Northwest Quadrant of Main Street and 24th Avenue N.

Lino Lakes, Minnesota

Soil Boring Location Sketch

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2104738
Geotechnical Evaluation
Rehbein - Lino Lakes
NW Quadrant of Main Street & 24th Avenue N
Lino Lakes, Minnesota

BORING: **ST-1**

LOCATION: See attached sketch

NORTHING: 147221 EASTING: 563435

DRILLER: B. Kammermeier | LOGGED BY: K. Shatzer | START DATE: 06/04/21 | END DATE: 06/04/21

SURFACE ELEVATION: 917.5 ft | RIG: 7506 | METHOD: 3 1/4" HSA | SURFACING: Field | WEATHER: Sun, 90°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
916.8		SILTY SAND (SM), fine to medium-grained, gray, moist (TOPSOIL)					
0.7		CLAYEY SAND (SC), with Sand seams, gray and brown, moist to wet, medium to stiff (GLACIAL TILL)		2-4-7 (11) 10"		18	
	▼			4-2-5 (7) 14"		17	P200=35%
910.5			5				
7.0	▽	SANDY LEAN CLAY (CL), with Sand seams, trace Gravel, gray, moist, medium to very stiff (GLACIAL TILL)		3-4-5 (9) 14"	1.5		
			10	7-7-7 (14)	1		
				3-4-5 (9) 14"	1.25		
			15	2-3-4 (7) 12"	1.25		
896.5			20	2-4-4 (8) 16"			
21.0		END OF BORING Boring immediately backfilled with bentonite grout	25				Water observed at 7.5 feet while drilling. Water observed at 4.0 feet at end of drilling.
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2104738
Geotechnical Evaluation
Rehbein - Lino Lakes
NW Quadrant of Main Street & 24th Avenue N
Lino Lakes, Minnesota

BORING: **ST-2**
LOCATION: See attached sketch
NORTHING: 147504 EASTING: 563401
START DATE: 06/04/21 END DATE: 06/04/21
SURFACE ELEVATION: 915.3 ft
DRILLER: B. Kammermeier LOGGED BY: K. Shatzer
RIG: 7506 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Sun, 90°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
~~914.9~~ 0.4		CLAYEY SAND (SC), fine to medium-grained, slightly organic, gray, moist (TOPSOIL)					
		ORGANIC CLAY (OL), dark brown, moist (SWAMP DEPOSIT)		0-1-2 (3) 10"		26	OC=5%
911.3 4.0		SANDY LEAN CLAY (CL), trace Gravel, gray, moist, medium to stiff (GLACIAL TILL)		2-3-3 (6) 14"	0.5	18	
5				2-3-4 (7) 14"	1		
10				2-3-4 (7) 14"	1		
900.8 14.5		END OF BORING Boring immediately backfilled		4-5-5 (10) 10"	0.5		Water not observed while drilling.
15							
20							
25							
30							

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2104738
Geotechnical Evaluation
Rehbein - Lino Lakes
NW Quadrant of Main Street & 24th Avenue N
Lino Lakes, Minnesota

BORING: **ST-3**

LOCATION: See attached sketch

NORTHING: 147345 EASTING: 563152

DRILLER: B. Kammermeier | LOGGED BY: K. Shatzer | START DATE: 06/04/21 | END DATE: 06/04/21

SURFACE ELEVATION: 919.2 ft | RIG: 7506 | METHOD: 3 1/4" HSA | SURFACING: Field | WEATHER: Sun, 90°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
919.1		SILTY SAND (SM), gray, moist (TOPSOIL)					
0.1		CLAYEY SAND (SC), fine to medium-grained, trace Gravel, brown and gray, moist, medium (GLACIAL TILL)		2-3-3 (6) 15"		16	
915.2							
4.0		SANDY LEAN CLAY (CL), trace Gravel, gray and brown, wet to moist, medium to very stiff (GLACIAL TILL)		3-3-4 (7) 15"	1		
	▽			4-6-8 (14) 15"		17	
				4-6-8 (14) 15"	5		
				3-4-5 (9) 15"	1.5		
				2-3-5 (8) 15"	1.5		
				4-4-5 (9) 15"	1.25		
898.2							
21.0		END OF BORING					Water observed at 7.0 feet while drilling.
		Boring immediately backfilled with bentonite grout					

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2104738
Geotechnical Evaluation
Rehbein - Lino Lakes
NW Quadrant of Main Street & 24th Avenue N
Lino Lakes, Minnesota

BORING: **ST-4**
LOCATION: See attached sketch
NORTHING: 147447 EASTING: 562950
DRILLER: B. Kammermeier LOGGED BY: K. Shatzer
START DATE: 06/04/21 END DATE: 06/04/21
SURFACE ELEVATION: 920.9 ft RIG: 7506 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Sun, 90°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
920.1		SILTY SAND (SM), fine to medium-grained, trace Gravel, brown (TOPSOIL)					
0.8		CLAYEY SAND (SC), trace Gravel, gray and brown, moist, medium to stiff (GLACIAL TILL)		2-4-4 (8) 14"		19	
			5	3-4-5 (9) 12"		17	P200=47%
913.9							
7.0		SANDY LEAN CLAY (CL), brown and gray, moist, stiff to very stiff (GLACIAL TILL)		3-5-7 (12) 15"	1.5		
			10	6-8-8 (16) 13"	2		
				11-10-9 (19) 16"	1.5		
906.4							
14.5		END OF BORING	15				Water not observed while drilling.
		Boring immediately backfilled					
			20				
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2104738
Geotechnical Evaluation
Rehbein - Lino Lakes
NW Quadrant of Main Street & 24th Avenue N
Lino Lakes, Minnesota

BORING: **ST-5**

LOCATION: See attached sketch

NORTHING: 147711 EASTING: 562982

DRILLER: B. Kammermeier LOGGED BY: K. Shatzer START DATE: 06/04/21 END DATE: 06/04/21

SURFACE ELEVATION: 919.2 ft RIG: 7506 METHOD: 3 1/4" HSA SURFACING: Field WEATHER: Sun, 90°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
918.4		SILTY SAND (SM), fine to medium-grained, trace roots, trace Gravel, gray, moist (TOPSOIL)					
0.8		CLAYEY SAND (SC), trace Gravel, gray and brown, moist, medium to stiff (GLACIAL TILL)		2-3-5 (8) 12"			
				3-4-6 (10) 12"		15	
				4-5-5 (10) 14"			
				5-6-9 (15) 15"			
907.2							
12.0		SANDY LEAN CLAY (CL), gray, moist, very stiff (GLACIAL TILL)		10-11-15 (26) 15"		16	
904.7							
14.5		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled					

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2104738
Geotechnical Evaluation
Rehbein - Lino Lakes
NW Quadrant of Main Street & 24th Avenue N
Lino Lakes, Minnesota

BORING: **ST-6**
LOCATION: See attached sketch
NORTHING: 147865 EASTING: 563320
DRILLER: B. Kammermeier LOGGED BY: K. Shatzer
START DATE: 06/04/21 END DATE: 06/04/21
SURFACE ELEVATION: 917.8 ft RIG: 7506 METHOD: 3 1/4" HSA
SURFACING: Field WEATHER: Sun, 90°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
917.1		SILTY SAND (SM), fine to medium-grained, trace roots, gray, moist (TOPSOIL)					
0.7		CLAYEY SAND (SC), trace Gravel, gray and brown, moist, stiff (GLACIAL TILL)		3-4-5 (9) 16"		17	
			5	2-4-6 (10) 16"		19	P200=50%
910.8							
7.0		SANDY LEAN CLAY (CL), trace Gravel, gray, moist, medium to stiff (GLACIAL TILL)		3-5-7 (12) 16"	2		
			10	3-5-7 (12)			
				3-5-8 (13) 16"	2		
			15	3-3-5 (8) 16"	2		
			20	2-3-5 (8) 16"			
896.8							
21.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled with bentonite grout					
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2104738
Geotechnical Evaluation
Rehbein - Lino Lakes
NW Quadrant of Main Street & 24th Avenue N
Lino Lakes, Minnesota

BORING: **ST-7**

LOCATION: See attached sketch

NORTHING: 148265 EASTING: 563368

DRILLER: B. Kammermeier | LOGGED BY: K. Shatzer | START DATE: 06/04/21 | END DATE: 06/04/21

SURFACE ELEVATION: 915.1 ft | RIG: 7506 | METHOD: 3 1/4" HSA | SURFACING: Field | WEATHER: Sun, 90°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
913.7		SILTY SAND (SM), fine to medium-grained, trace Gravel, gray, moist (TOPSOIL)					
1.4		CLAYEY SAND (SC), fine to medium-grained, slightly organic, trace Gravel, gray and brown, moist, soft to medium (GLACIAL TILL)		1-1-3 (4) 18"			
			5	1-2-3 (5) 18"		16	P200=95%
	▼			1-1-2 (3) 18"		20	
906.1							
9.0		SANDY LEAN CLAY (CL), trace Gravel, gray, moist, medium (GLACIAL TILL)	10	1-2-4 (6) 18"	0.5		
				2-3-4 (7) 18"	1		
			15	2-3-4 (7) 18"	1		
			20	2-2-4 (6) 18"			
894.1	▽						
21.0		END OF BORING Boring immediately backfilled with bentonite grout					Water observed at 21.0 feet while drilling. Water observed at 7.0 feet at end of drilling.
			25				
			30				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B2104738
Geotechnical Evaluation
Rehbein - Lino Lakes
NW Quadrant of Main Street & 24th Avenue N
Lino Lakes, Minnesota

BORING: **ST-8**

LOCATION: See attached sketch

NORTHING: 147632 EASTING: 563267

DRILLER: B. Kammermeier | LOGGED BY: K. Shatzer | START DATE: 06/04/21 | END DATE: 06/04/21

SURFACE ELEVATION: 917.3 ft | RIG: 7506 | METHOD: 3 1/4" HSA | SURFACING: Field | WEATHER: Sun, 90°F

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
915.7		SANDY SILT (ML), trace roots, gray, moist (TOPSOIL)					
1.6		CLAYEY SAND (SC), trace Gravel, gray and brown, moist, medium to stiff (GLACIAL TILL)		2-3-4 (7) 12"			
			5	2-3-4 (7) 15"		15	
				3-4-7 (11) 15"			
908.3							
9.0		SANDY LEAN CLAY (CL), trace Gravel, gray, moist, stiff (GLACIAL TILL)	10	3-4-5 (9) 15"	1		
				6-7-7 (14) 18"	1.5		
902.8							
14.5		END OF BORING Boring immediately backfilled	15				Water not observed while drilling.
			20				
			25				
			30				

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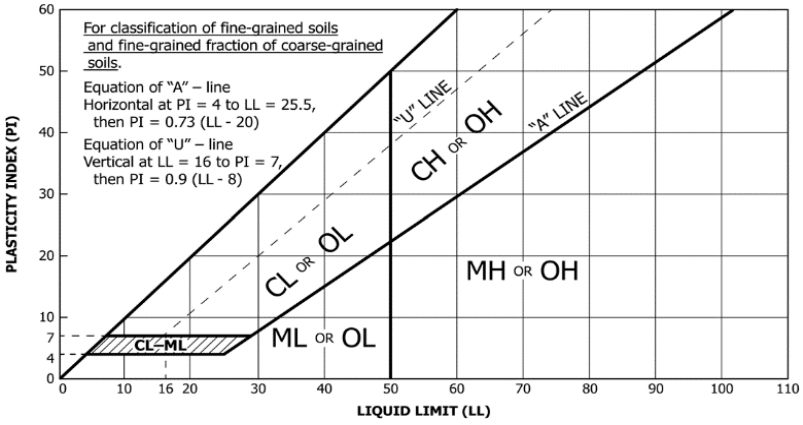
Descriptive Terminology of Soil

Based on Standards ASTM D2487/2488
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines[C])	$C_u \geq 4$ and $1 \leq C_c \leq 3$[D]	GW	Well-graded gravel[E]
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$)[D]	GP	Poorly graded gravel[E]
		Gravels with Fines (More than 12% fines[C])	Fines classify as ML or MH	GM	Silty gravel[E F G]
			Fines Classify as CL or CH	GC	Clayey gravel[E F G]
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines[H])	$C_u \geq 6$ and $1 \leq C_c \leq 3$[D]	SW	Well-graded sand[I]
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$)[D]	SP	Poorly graded sand[I]
		Sands with Fines (More than 12% fines[H])	Fines classify as ML or MH	SM	Silty sand[F G I]
			Fines classify as CL or CH	SC	Clayey sand[F G I]
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K L M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OL	Organic clay[K L M N] / Organic silt[K L M O]
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K L M]
			PI plots below "A" line	MH	Elastic silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OH	Organic clay[K L M P] / Organic silt[K L M Q]
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
N. PI ≥ 4 and plots on or above "A" line.
O. PI < 4 or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	**q_p**	Pocket penetrometer strength, tsf
WD	Wet density, pcf	**q_U**	Unconfined compression test, tsf
P200	% Passing #200 sieve	**LL**	Liquid limit
MC	Moisture content, %	**PL**	Plastic limit
OC	Organic content, %	**PI**	Plasticity index

Particle Size Identification

Boulders..... over 12"
Cobbles..... 3" to 12"
Gravel
  Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
  Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
  Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
  Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
  Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt..... No. 200 (0.075 mm) to .005 mm
Clay..... < .005 mm

Relative Proportions[L, M]

trace..... 0 to 5%
little..... 6 to 14%
with..... ≥ 15%

Inclusion Thicknesses

lens..... 0 to 1/8"
seam..... 1/8" to 1"
layer..... over 1"

Apparent Relative Density of Cohesionless Soils

Very loose ..... 0 to 4 BPF
Loose ..... 5 to 10 BPF
Medium dense..... 11 to 30 BPF
Dense..... 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft	0 to 1 BPF	< 0.25 tsf
Soft	2 to 4 BPF	0.25 to 0.5 tsf
Medium	5 to 8 BPF	0.5 to 1 tsf
Stiff	9 to 15 BPF	1 to 2 tsf
Very Stiff	16 to 30 BPF	2 to 4 tsf
Hard	over 30 BPF	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

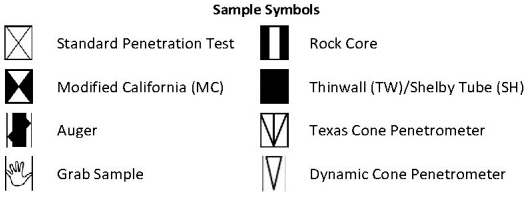
Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (▽), at the end of drilling (▼), or at some time after drilling (▼).

Sample Symbols



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