Stormwater Management Report

CCC – Hudson, OH

750 W Streetsboro St,
Hudson, OH 44236

Date Prepared: March 14, 2025

Revised:

On behalf of:

Christ Community Chapel

Contact:

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Engineer of Record:

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Introduction

This report covers the methodology and calculations used in the design of the stormwater management system for the proposed turf field and seating/stage building addition at the existing Chris Community Chapel campus in Hudson, Ohio.

The stormwater management system is designed in accordance with Chapter 1419 of the City of Hudson's Codified Ordinances. Section 5 of Chapter 1419 has requirements for stormwater quality, stormwater quantity, and major flood path.

- The major flood path is met by directing all runoff towards the proposed detention basin.
- The stormwater quality requirements can be met by adding the water quality volume to the volume of the proposed detention basin and meeting the minimum drawdown time of 48 hours.
- The stormwater quantity requirements for the field's construction and seating/stage area can be met by the proposed detention basin. According to the City of Hudson Stormwater Code, the 25-year peak rate of runoff in the post-developed condition shall not exceed the 2-year peak rate of runoff in the existing condition. The 100-year post developed condition must also be reduced to the 10-yr peak rate of runoff in the existing condition.

Storm routings for this project were performed using HydroCAD. Time of Concentration was determined by using the TR-55 method, within HydroCAD.

The onsite soils were obtained from USDA NRCS Web Soil Survey and can be found in **Appendix D.**

The storm pipe network was designed using Hydraflow Stormsewers Extension for Autodesk Civil. Section 4 of Chapter 4 of the City of Hudson's Codified Ordinances requires that the pipes be sized so that the HGL does not exceed the crown of the pipe for the 10-year storm. Refer to **Appendix C** for the Storm Pipe Calculations and **Appendix E3** for the associated Tributary Drainage area Map.

Existing Conditions

The site is a church on 30.07 acres that has frontage along West Streetsboro St to the north and Terex Road to the west. The site consists of a chapel, parking lot, open field, and stormwater management area. Residential properties border the site to the east and to the south. Existing runoff flows to the stormwater management area via a combination of overland flow and an existing storm sewer system.

The existing runoff consists of one (1) major existing drainage areas as listed below:

- EDA-WEST - This drainage area drains to the north, towards an existing stormwater management area. The Soil Survey indicates this site to have Caneadea Silt Loam, Ellsworth-Urban Land Complex, Geeburg Silt Loam, Sebring Silt Loam, each soil being Hydric Group 'D' type soil. For hydrologic soil group 'D' soils we assumed CN values of 98 for impervious areas and 84 for grass areas in good conditions.

Peak runoff rates from the existing conditions of the site are listed in the following table:

Existing Conditions Peak Runoff Rates							
Drainage Area	**1-year Storm**	**2-year Storm**	**5-year Storm**	**10-year Storm**	**25-year Storm**	**50-year Storm**	**100-year Storm**
EDA-WEST	5.42 CFS	7.38 CFS	10.22 CFS	12.67 CFS	16.25 CFS	19.29 CFS	22.52 CFS

Refer to **Appendix A** for the Existing Conditions Calculations. The Existing Conditions Drainage Area Map can be found in **Appendix E1**.

Proposed Conditions

The proposed development of the site will consist of the construction of a 2,410 SF building, a 38,000 SF turf soccer field, associated site improvements and a stormwater management system. The stormwater management system consists of (Describe the proposed system including the OCS) an extended detention basin, a gravel area with a 6" underdrain, an outlet control structure, and an emergency spillway. The extended detention basin in conjunction with the outlet control structure have been designed to address the water quality and water quantity requirements. The outflow from the stormwater management system will be routed through the outlet structure and directed into the existing storm water management system on site.

The proposed improvements will create one (1) major drainage areas and one (1) detention node

- DA-WEST - This drainage area drains to stormwater management basin.
- POND – Proposed stormwater management basin, which discharges into the existing storm water management system on site.

For hydrologic soil group 'D' soils we assumed CN values of 98 for impervious areas and 84 for grass areas in good conditions.

Stormwater Quality

To satisfy the water quality requirements, Ohio's water quality BMP Compliance Worksheet and Water Quality Calculator were used. The water quality volume was calculated and was incorporated into the detention pond design. A water quality orifice was included to satisfy the requirements, as well as a window on the outlet control structure at the water quality elevation. The orifice has been designed to meet the required minimum drawdown time of 48 hours.

Therefore, the stormwater quality requirements have been satisfied. Refer to **Appendix B1** for Stormwater Quality Calculations.

Stormwater Quantity

The resulting proposed conditions peak runoff rates are listed in the following table:

Proposed Conditions Peak Runoff Rates							
Drainage Area	1-year Storm	2-year Storm	5-year Storm	10-year Storm	25-year Storm	50-year Storm	100-year Storm
PDA-WEST	7.07 CFS	9.08 CFS	12.01 CFS	14.49 CFS	18.07 CFS	21.08 CFS	24.27 CFS

The discharge characteristics for the proposed stormwater management basin are listed in the following table:

Basin		
Storm	Peak Discharge	Water surface Elevation
1-year	2.29 CFS	1010.60 FT
2-year	3.68 CFS	1010.81 FT
5-year	5.13 CFS	1011.14 FT
10-year	6.06 CFS	1011.43 FT
25-year	7.25 CFS	1011.80 FT
50-year	9.47 CFS	1012.02 FT
100-year	11.56 CFS	1012.21 FT

The runoff of the 25-year storm event has been designed to be lower than the existing runoff of the 2-year storm event, as has the 100-year event to the existing 10-year storm event based upon the requirements set forth by the City of Hudson's codified ordinances. Refer to **Appendix B2** for storm calculations.

A summary of the existing conditions peak runoff rates, the allowable peak runoff rates and the proposed conditions peak runoff rates are listed in the following table:

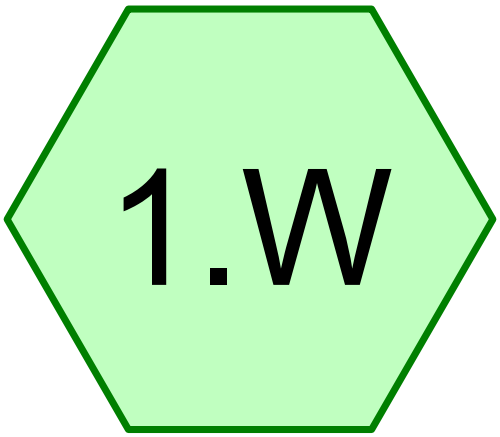
Runoff Reduction Summary			
Storm	**Existing**	**Allowable**	**Proposed**
1-year	5.42 CFS	-	2.29 CFS
2-year	7.38 CFS	-	3.68 CFS
5-year	10.22 CFS	-	5.13 CFS
10-year	12.67 CFS	-	6.06 CFS
25-year	16.25 CFS	7.38 CFS	7.25 CFS
50-year	19.29 CFS	-	9.47 CFS
100-year	22.52 CFS	12.67 CFS	11.56 CFS

Refer to **Appendix B3** for the Stormwater Quantity Calculations. The Proposed Conditions Drainage Area Map can be found in **Appendix E2**.

Summary

The proposed stormwater management system has been successfully designed to manage the increased runoff from associated improvements of the project. The stormwater management system has been designed in accordance with the appropriate regulations, as demonstrated in the previous tables and accompanying calculations.

APPENDIX A:
EXISTING CONDITIONS CALCULATIONS



EDA-WEST

Subcat Reach Pond Link

Routing Diagram for 765295 - HYDROCAD
Prepared by CESO, Inc, Printed 2/6/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	2.04	2
2	2-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	2.44	2
3	5-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	3.02	2
4	10-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	3.51	2
5	25-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	4.22	2
6	50-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	4.82	2
7	100-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	5.46	2

Summary for Subcatchment 1.W: EDA-WEST

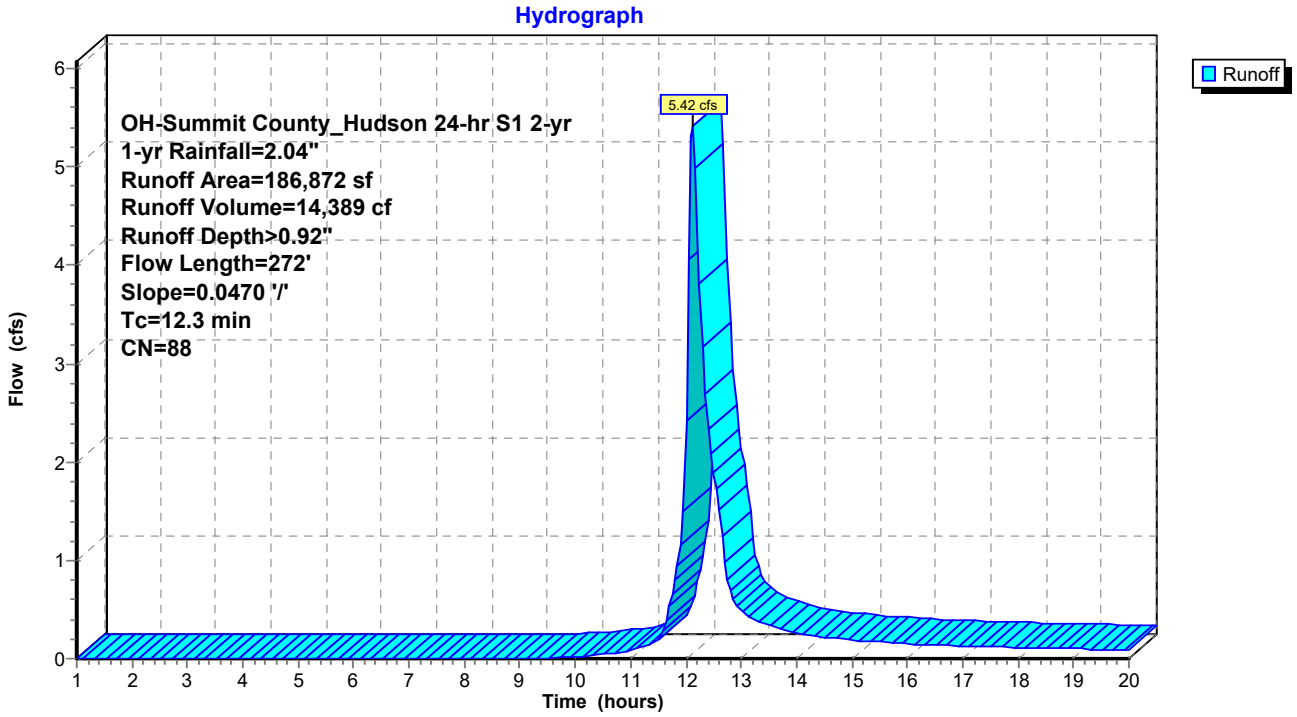
Runoff = 5.42 cfs @ 12.13 hrs, Volume= 14,389 cf, Depth> 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 1-yr Rainfall=2.04"

Area (sf)	CN	Description
133,947	84	50-75% Grass cover, Fair, HSG D
52,925	98	Paved parking, HSG D
186,872	88	Weighted Average
133,947		71.68% Pervious Area
52,925		28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	150	0.0470	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.3	122	0.0470	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.3	272	Total			

Subcatchment 1.W: EDA-WEST



Summary for Subcatchment 1.W: EDA-WEST

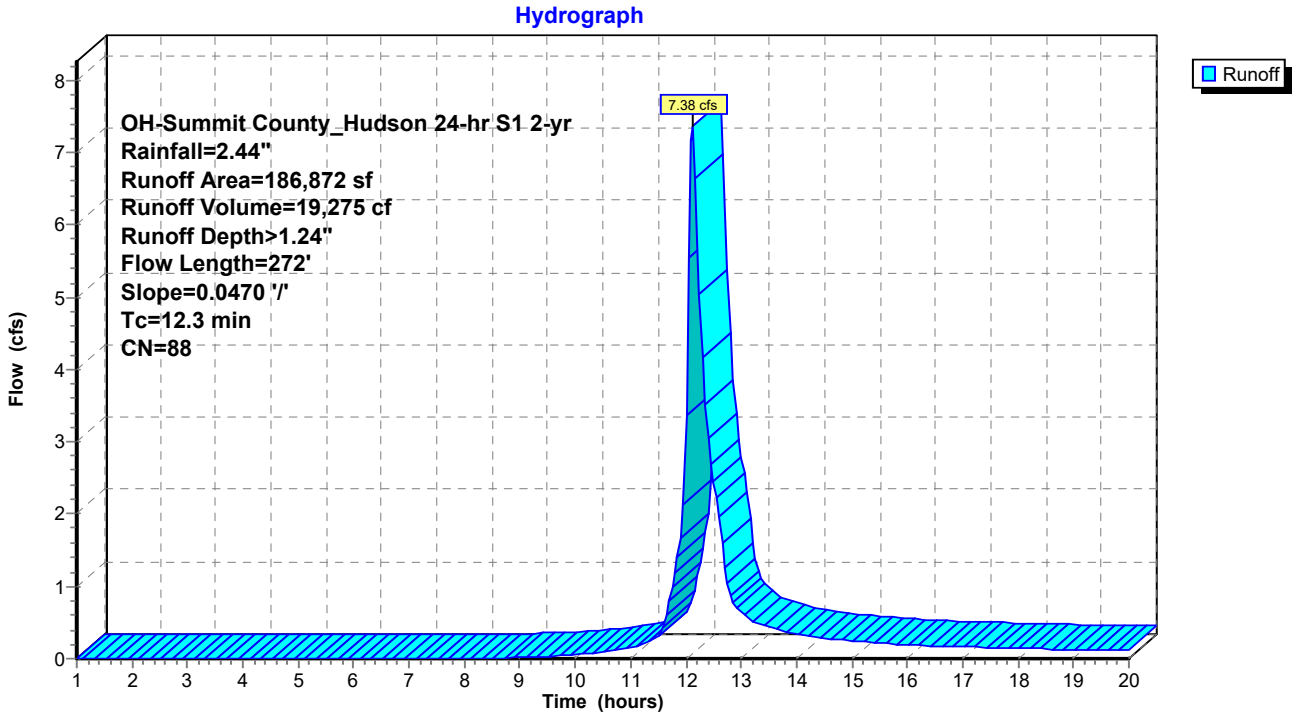
Runoff = 7.38 cfs @ 12.12 hrs, Volume= 19,275 cf, Depth> 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr Rainfall=2.44"

Area (sf)	CN	Description
133,947	84	50-75% Grass cover, Fair, HSG D
52,925	98	Paved parking, HSG D
186,872	88	Weighted Average
133,947		71.68% Pervious Area
52,925		28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	150	0.0470	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.3	122	0.0470	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.3	272	Total			

Subcatchment 1.W: EDA-WEST



Summary for Subcatchment 1.W: EDA-WEST

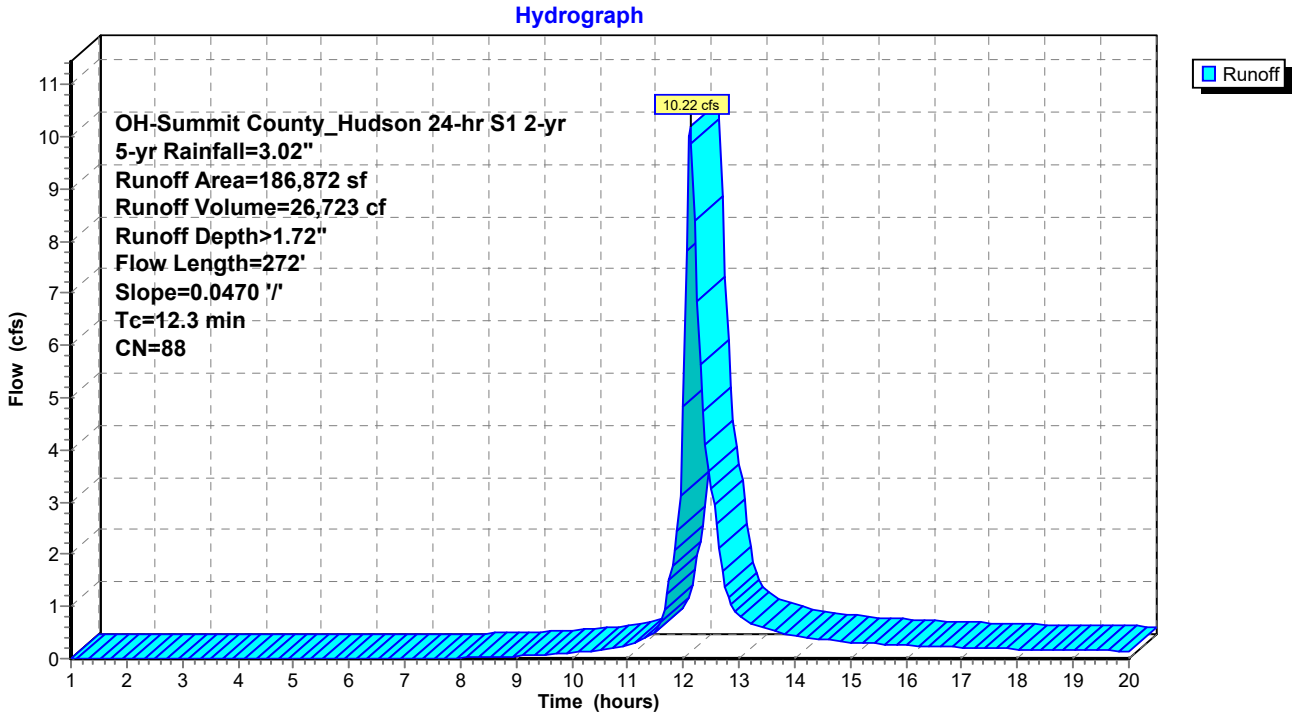
Runoff = 10.22 cfs @ 12.12 hrs, Volume= 26,723 cf, Depth> 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 5-yr Rainfall=3.02"

Area (sf)	CN	Description
133,947	84	50-75% Grass cover, Fair, HSG D
52,925	98	Paved parking, HSG D
186,872	88	Weighted Average
133,947		71.68% Pervious Area
52,925		28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	150	0.0470	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.3	122	0.0470	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.3	272	Total			

Subcatchment 1.W: EDA-WEST



Summary for Subcatchment 1.W: EDA-WEST

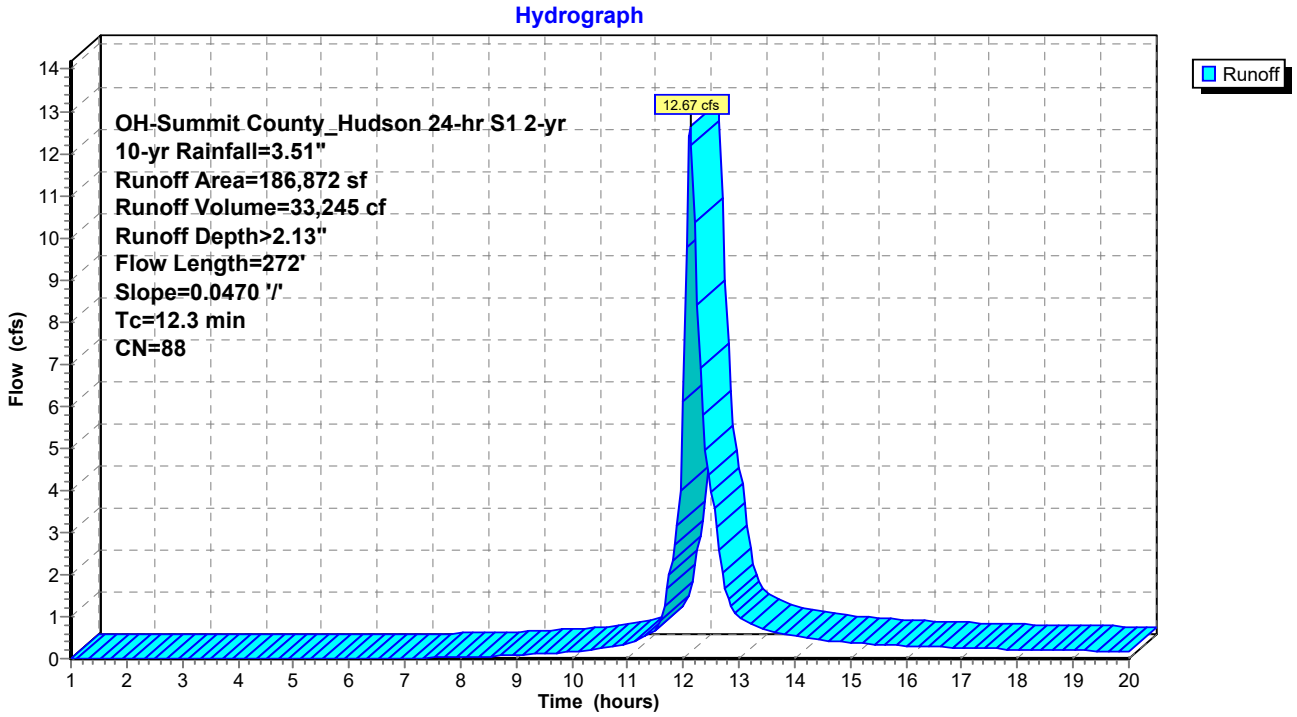
Runoff = 12.67 cfs @ 12.12 hrs, Volume= 33,245 cf, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 10-yr Rainfall=3.51"

Area (sf)	CN	Description
133,947	84	50-75% Grass cover, Fair, HSG D
52,925	98	Paved parking, HSG D
186,872	88	Weighted Average
133,947		71.68% Pervious Area
52,925		28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	150	0.0470	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.3	122	0.0470	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.3	272	Total			

Subcatchment 1.W: EDA-WEST



Summary for Subcatchment 1.W: EDA-WEST

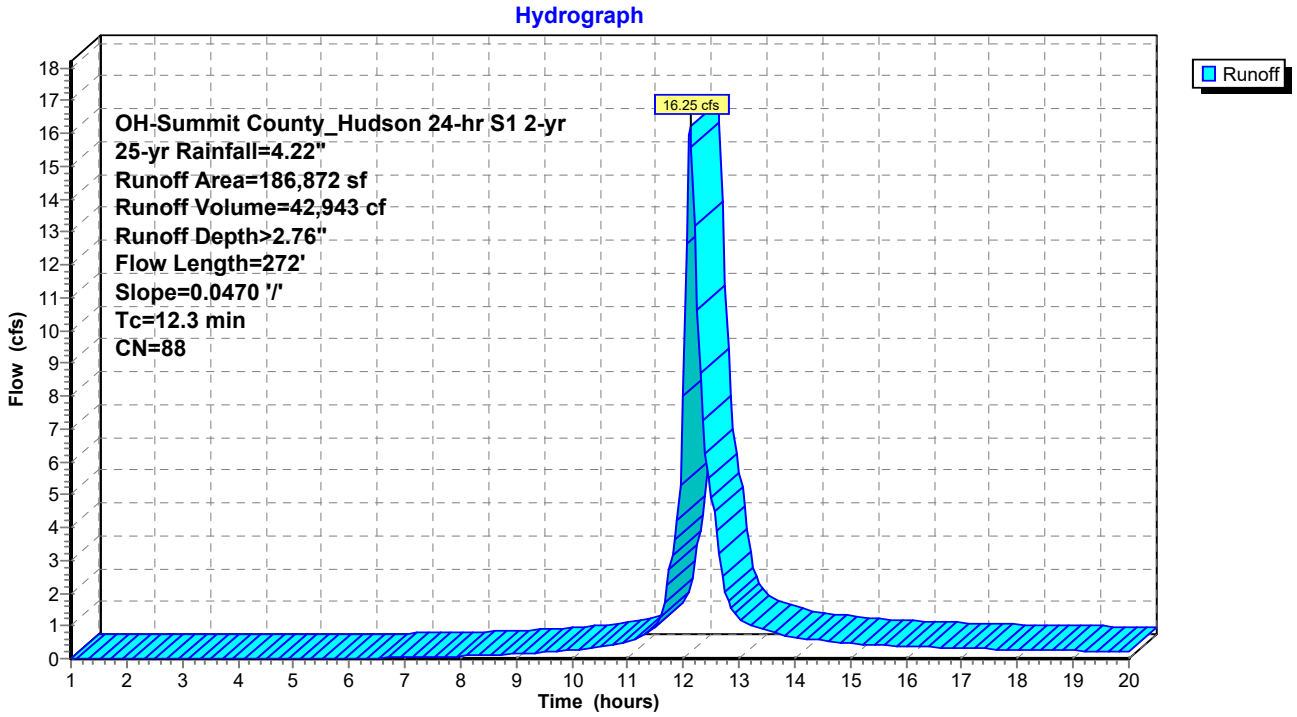
Runoff = 16.25 cfs @ 12.12 hrs, Volume= 42,943 cf, Depth> 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 25-yr Rainfall=4.22"

Area (sf)	CN	Description
133,947	84	50-75% Grass cover, Fair, HSG D
52,925	98	Paved parking, HSG D
186,872	88	Weighted Average
133,947		71.68% Pervious Area
52,925		28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	150	0.0470	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.3	122	0.0470	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.3	272	Total			

Subcatchment 1.W: EDA-WEST



Summary for Subcatchment 1.W: EDA-WEST

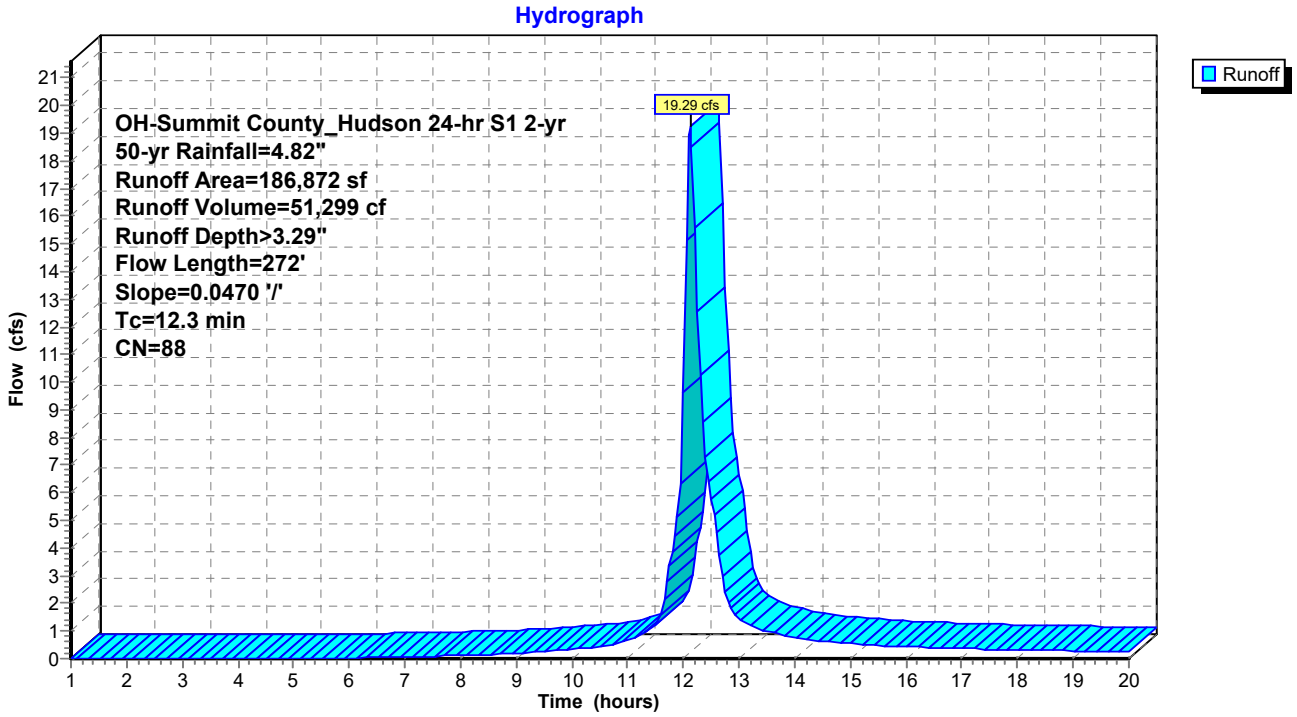
Runoff = 19.29 cfs @ 12.12 hrs, Volume= 51,299 cf, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 50-yr Rainfall=4.82"

Area (sf)	CN	Description
133,947	84	50-75% Grass cover, Fair, HSG D
52,925	98	Paved parking, HSG D
186,872	88	Weighted Average
133,947		71.68% Pervious Area
52,925		28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	150	0.0470	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.3	122	0.0470	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.3	272	Total			

Subcatchment 1.W: EDA-WEST



Summary for Subcatchment 1.W: EDA-WEST

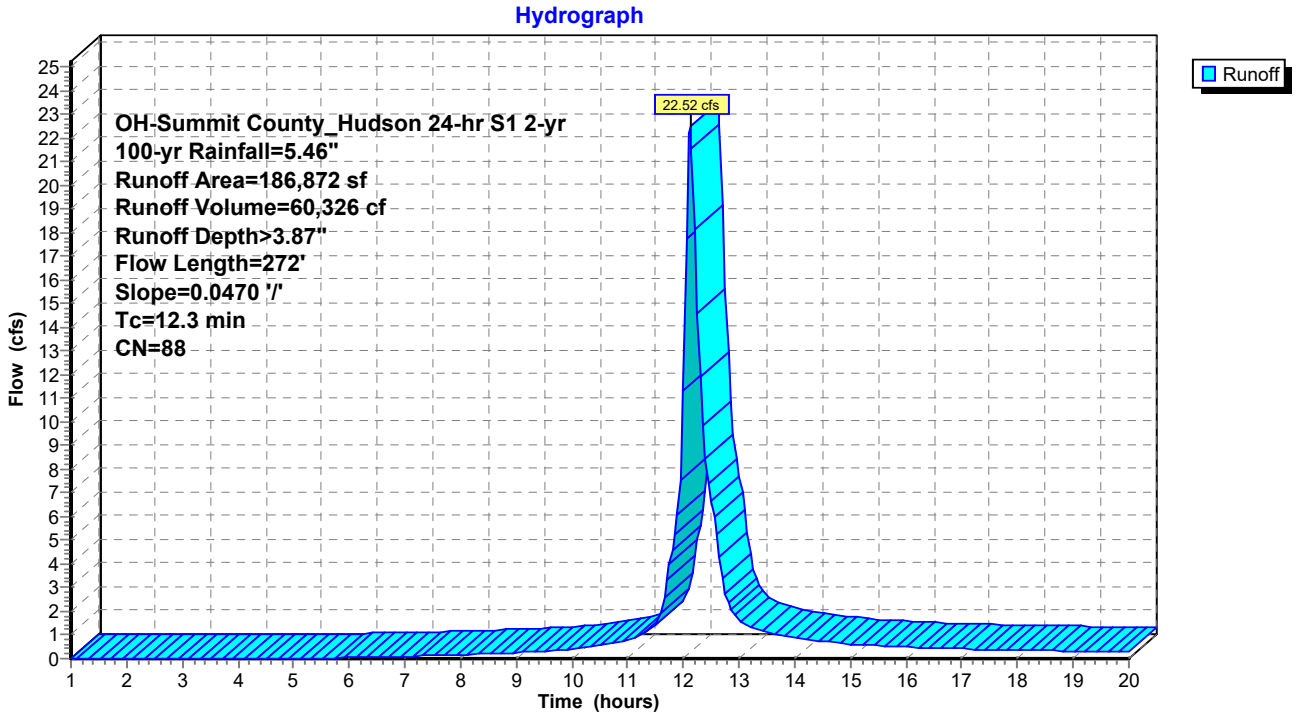
Runoff = 22.52 cfs @ 12.12 hrs, Volume= 60,326 cf, Depth> 3.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 100-yr Rainfall=5.46"

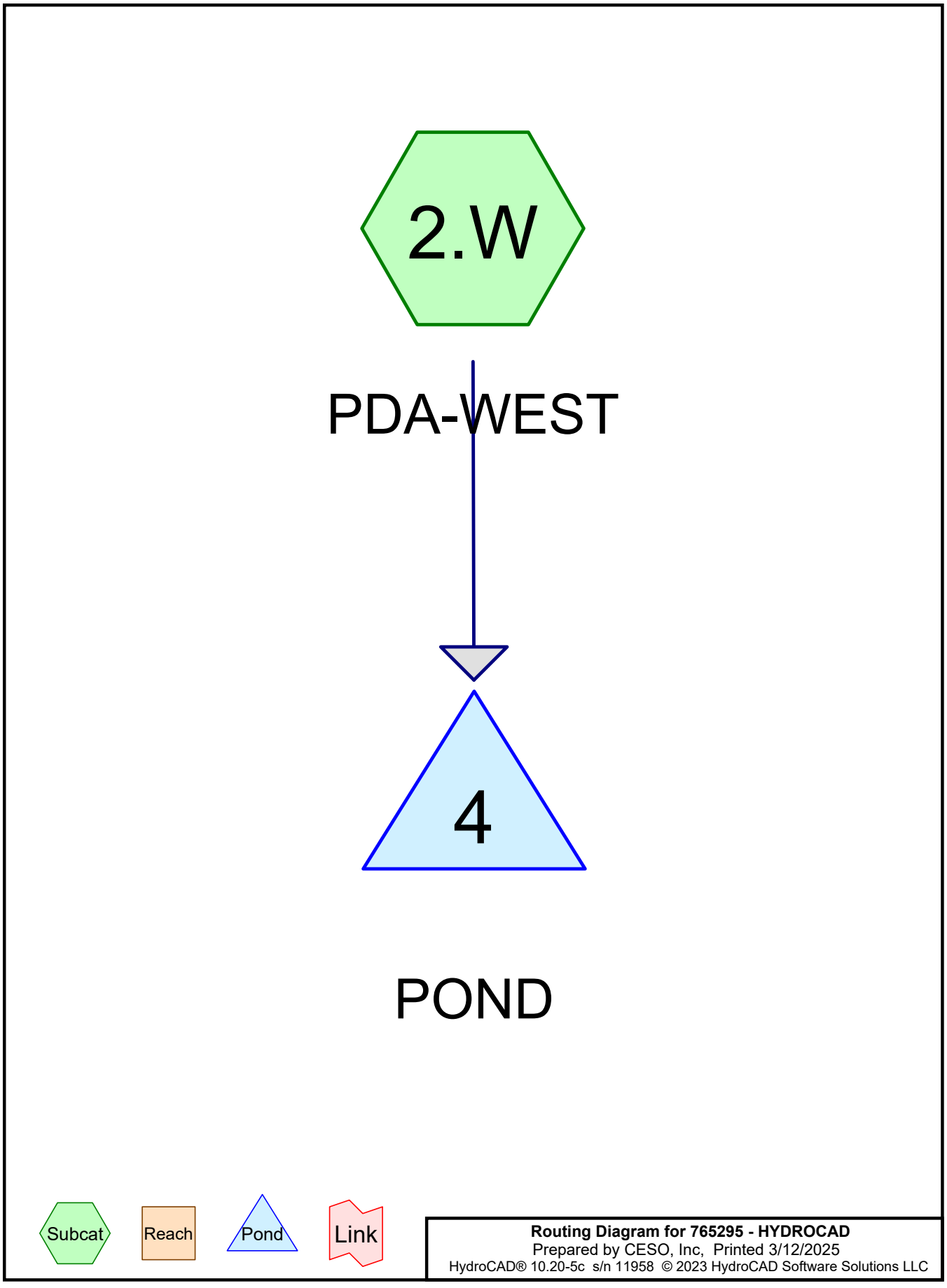
Area (sf)	CN	Description
133,947	84	50-75% Grass cover, Fair, HSG D
52,925	98	Paved parking, HSG D
186,872	88	Weighted Average
133,947		71.68% Pervious Area
52,925		28.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0	150	0.0470	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.3	122	0.0470	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.3	272	Total			

Subcatchment 1.W: EDA-WEST



APPENDIX B:
PROPOSED CONDITIONS CALCULATIONS



Routing Diagram for 765295 - HYDROCAD
Prepared by CESO, Inc, Printed 3/12/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	2.04	2
2	2-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	2.44	2
3	5-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	3.02	2
4	10-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	3.51	2
5	25-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	4.22	2
6	50-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	4.82	2
7	100-yr	OH-Summit County_Hudson 24-hr S1	2-yr	Default	24.00	1	5.46	2

Summary for Subcatchment 2.W: PDA-WEST

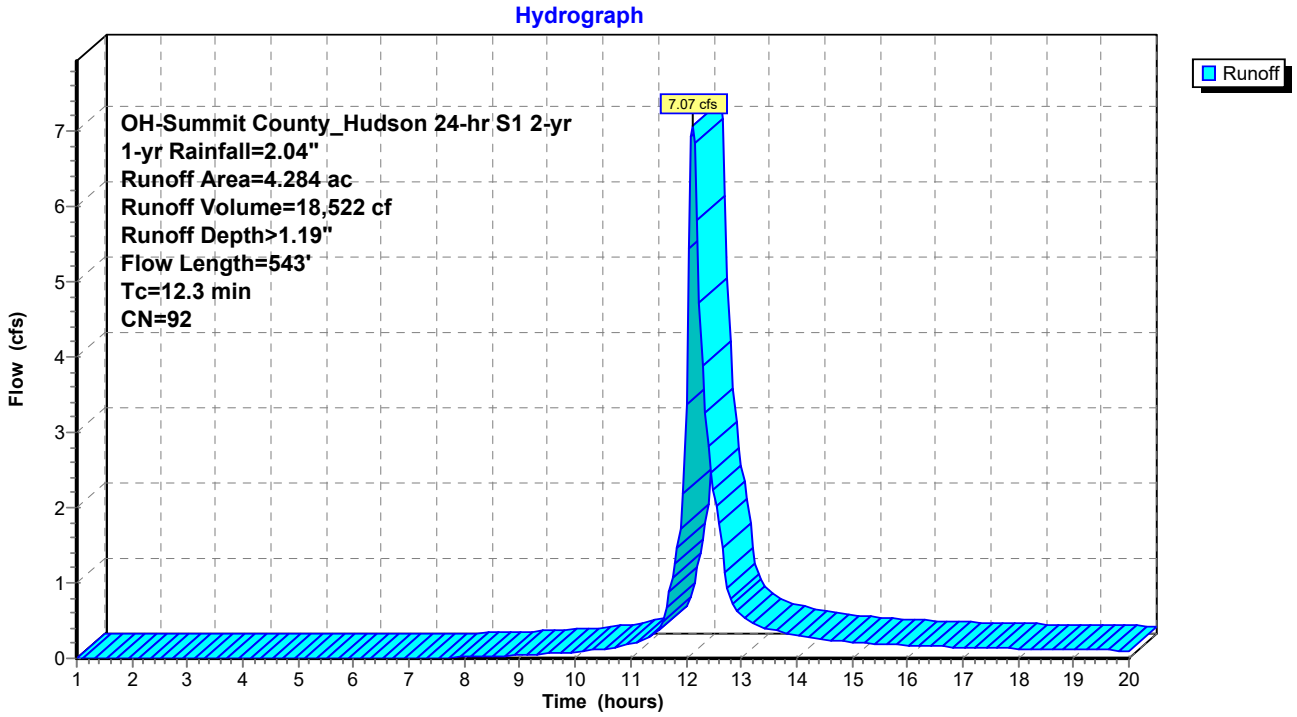
Runoff = 7.07 cfs @ 12.12 hrs, Volume= 18,522 cf, Depth> 1.19"
Routed to Pond 4 : POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 1-yr Rainfall=2.04"

	Area (ac)	CN	Description
*	0.881	95	Permeable Turf Field, HSG D
	1.615	84	50-75% Grass cover, Fair, HSG D
	1.788	98	Paved parking, HSG D
	4.284	92	Weighted Average
	2.496		58.26% Pervious Area
	1.788		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	43	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.9	300	0.0050	2.63	0.52	**Pipe Channel,** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.5	200	0.0100	6.84	8.40	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
12.3	543	Total			

Subcatchment 2.W: PDA-WEST



Summary for Pond 4: POND

Inflow Area = 186,611 sf, 41.74% Impervious, Inflow Depth > 1.19" for 1-yr event
Inflow = 7.07 cfs @ 12.12 hrs, Volume= 18,522 cf
Outflow = 2.29 cfs @ 12.49 hrs, Volume= 11,918 cf, Atten= 68%, Lag= 22.2 min
Primary = 2.29 cfs @ 12.49 hrs, Volume= 11,918 cf
Routed to nonexistent node 5L
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to nonexistent node 5L

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,010.60' @ 12.49 hrs Surf.Area= 7,178 sf Storage= 9,225 cf

Plug-Flow detention time= 122.3 min calculated for 11,918 cf (64% of inflow)
Center-of-Mass det. time= 60.3 min (840.4 - 780.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	41,222 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

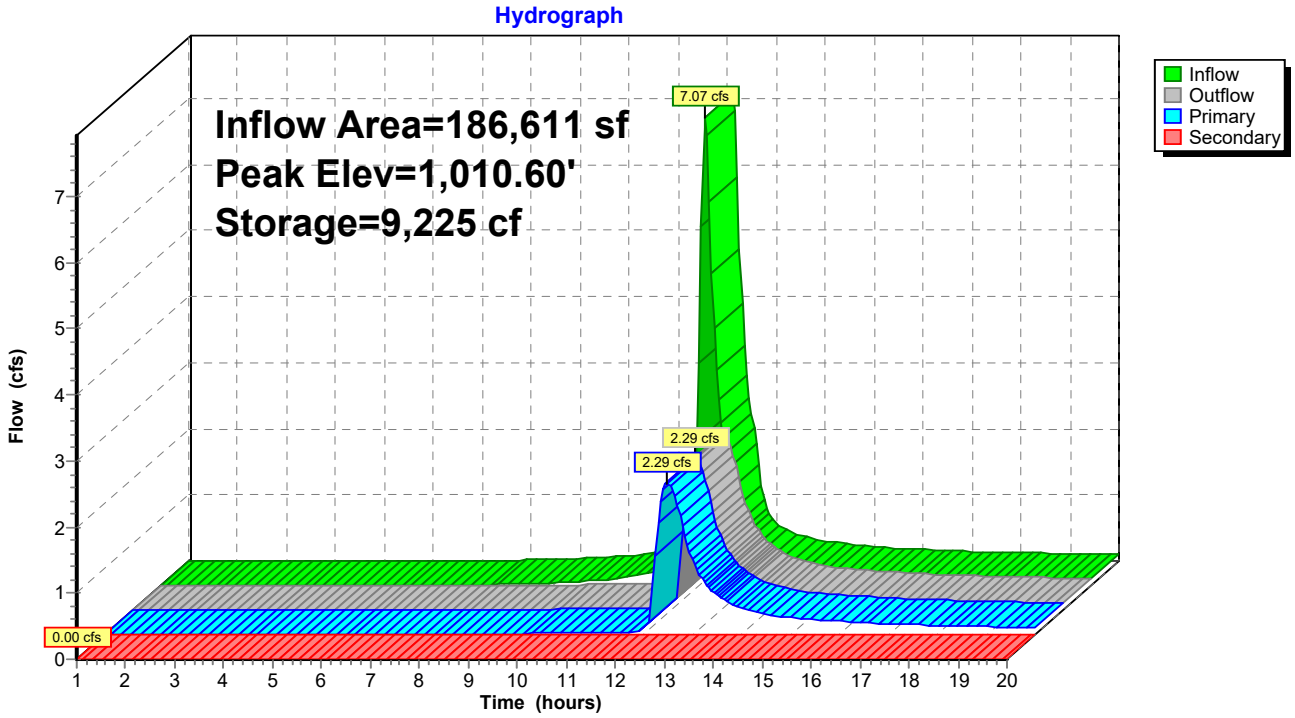
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	5,595	100.0	4,222	5,361
1,011.00	8,212	100.0	6,904	12,264
1,012.00	10,887	100.0	9,550	21,814
1,013.00	13,618	100.0	12,253	34,066
1,013.50	15,004	100.0	7,156	41,222

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,008.00'	**1.2" Vert. Water Quality Orifice** C= 0.600 Limited to weir flow at low heads
#2	Secondary	1,013.00'	**10.0' long + 3.0 '/' SideZ x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 4	1,012.50'	**27.5" x 27.5" Horiz. Rim** C= 0.600 Limited to weir flow at low heads
#4	Primary	1,008.00'	**18.0" Vert. Outlet** C= 0.600 Limited to weir flow at low heads
#5	Device 4	1,011.75'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.18'	**30.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.28 cfs @ 12.49 hrs HW=1,010.60' (Free Discharge)
└─**4=Outlet** (Passes 2.28 cfs of 11.59 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.06 cfs @ 7.70 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Controls 0.00 cfs)
  └─**6=Orifice/Grate** (Orifice Controls 2.22 cfs @ 2.09 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,008.00' (Free Discharge)
└─**2=Spillway** (Controls 0.00 cfs)

Pond 4: POND



Summary for Subcatchment 2.W: PDA-WEST

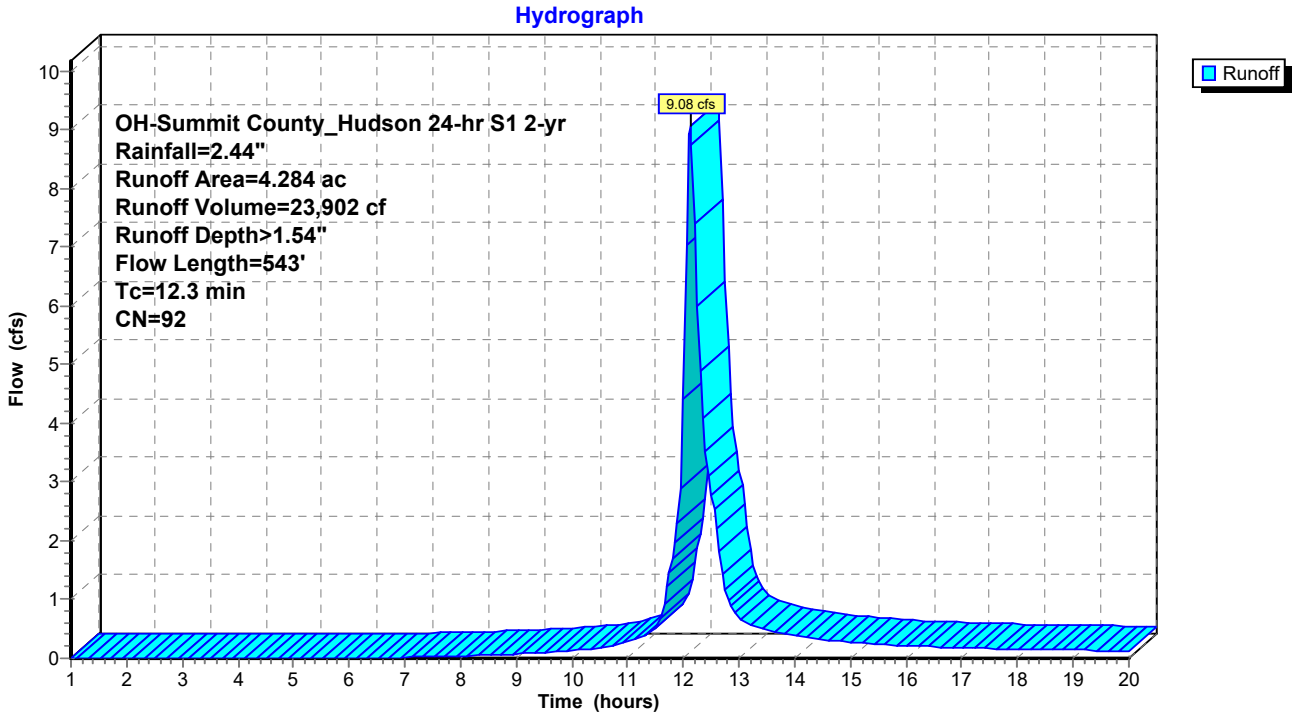
Runoff = 9.08 cfs @ 12.12 hrs, Volume= 23,902 cf, Depth> 1.54"
Routed to Pond 4 : POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr Rainfall=2.44"

	Area (ac)	CN	Description
*	0.881	95	Permeable Turf Field, HSG D
	1.615	84	50-75% Grass cover, Fair, HSG D
	1.788	98	Paved parking, HSG D
	4.284	92	Weighted Average
	2.496		58.26% Pervious Area
	1.788		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	43	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.9	300	0.0050	2.63	0.52	**Pipe Channel,** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.5	200	0.0100	6.84	8.40	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
12.3	543	Total			

Subcatchment 2.W: PDA-WEST



Summary for Pond 4: POND

Inflow Area = 186,611 sf, 41.74% Impervious, Inflow Depth > 1.54" for 2-yr event
Inflow = 9.08 cfs @ 12.12 hrs, Volume= 23,902 cf
Outflow = 3.68 cfs @ 12.39 hrs, Volume= 17,239 cf, Atten= 59%, Lag= 16.1 min
Primary = 3.68 cfs @ 12.39 hrs, Volume= 17,239 cf
Routed to nonexistent node 5L
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to nonexistent node 5L

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,010.81' @ 12.39 hrs Surf.Area= 7,704 sf Storage= 10,720 cf

Plug-Flow detention time= 105.6 min calculated for 17,194 cf (72% of inflow)
Center-of-Mass det. time= 49.8 min (824.8 - 775.0)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	41,222 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

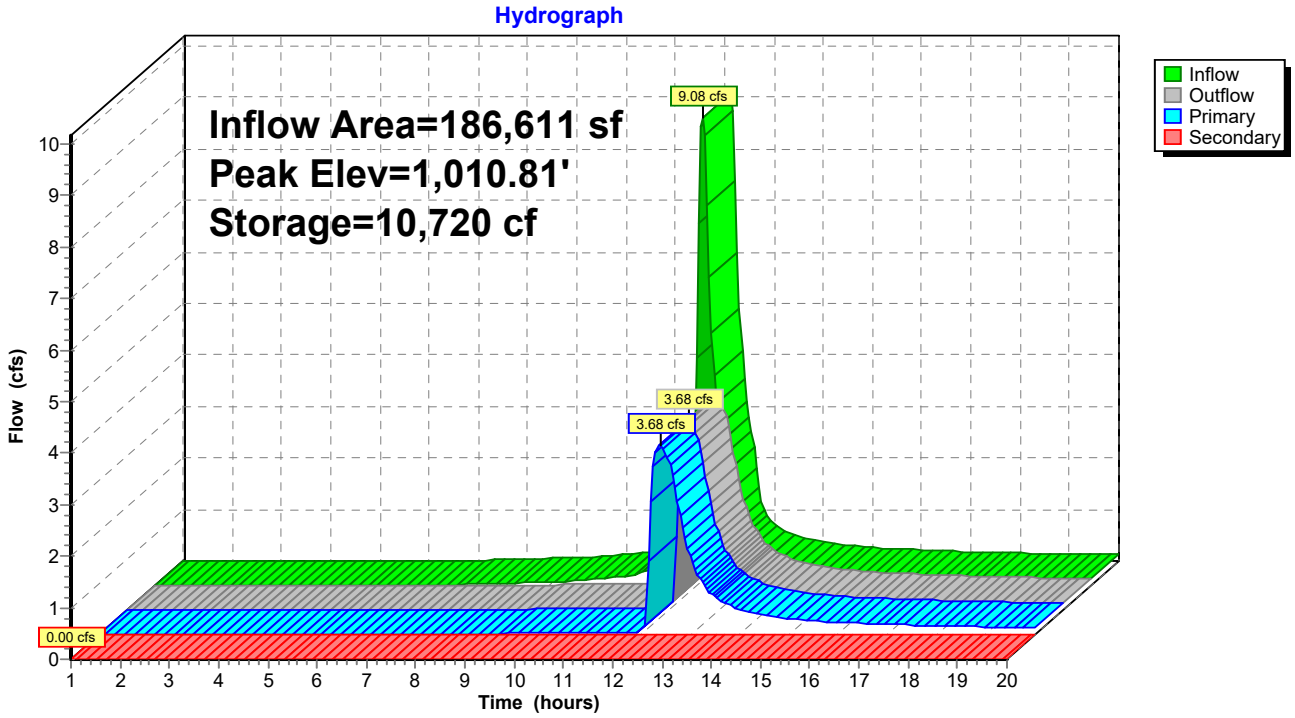
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	5,595	100.0	4,222	5,361
1,011.00	8,212	100.0	6,904	12,264
1,012.00	10,887	100.0	9,550	21,814
1,013.00	13,618	100.0	12,253	34,066
1,013.50	15,004	100.0	7,156	41,222

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,008.00'	**1.2" Vert. Water Quality Orifice** C= 0.600 Limited to weir flow at low heads
#2	Secondary	1,013.00'	**10.0' long + 3.0 '/' SideZ x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 4	1,012.50'	**27.5" x 27.5" Horiz. Rim** C= 0.600 Limited to weir flow at low heads
#4	Primary	1,008.00'	**18.0" Vert. Outlet** C= 0.600 Limited to weir flow at low heads
#5	Device 4	1,011.75'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.18'	**30.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.67 cfs @ 12.39 hrs HW=1,010.80' (Free Discharge)
└─**4=Outlet** (Passes 3.67 cfs of 12.20 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.06 cfs @ 7.99 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Controls 0.00 cfs)
  └─**6=Orifice/Grate** (Orifice Controls 3.61 cfs @ 2.89 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,008.00' (Free Discharge)
└─**2=Spillway** (Controls 0.00 cfs)

Pond 4: POND



Summary for Subcatchment 2.W: PDA-WEST

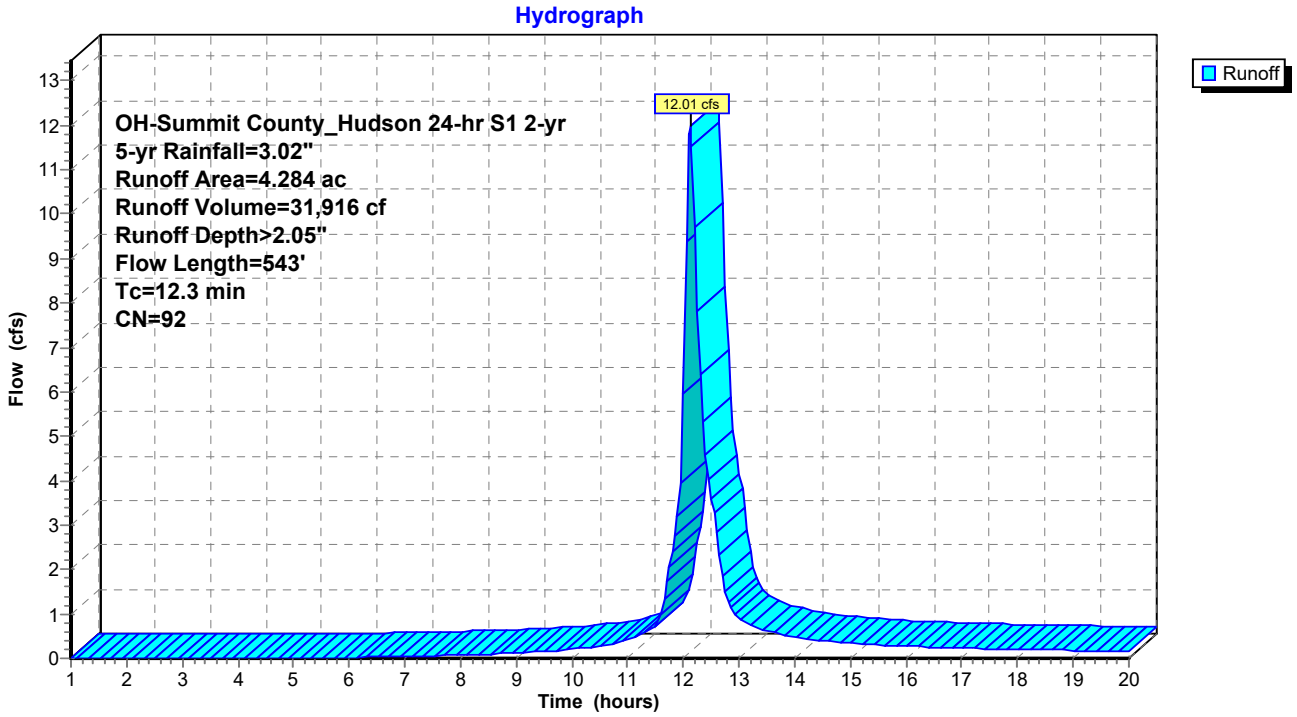
Runoff = 12.01 cfs @ 12.12 hrs, Volume= 31,916 cf, Depth> 2.05"
Routed to Pond 4 : POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 5-yr Rainfall=3.02"

	Area (ac)	CN	Description
*	0.881	95	Permeable Turf Field, HSG D
	1.615	84	50-75% Grass cover, Fair, HSG D
	1.788	98	Paved parking, HSG D
	4.284	92	Weighted Average
	2.496		58.26% Pervious Area
	1.788		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	43	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.9	300	0.0050	2.63	0.52	**Pipe Channel,** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.5	200	0.0100	6.84	8.40	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
12.3	543	Total			

Subcatchment 2.W: PDA-WEST



Summary for Pond 4: POND

Inflow Area = 186,611 sf, 41.74% Impervious, Inflow Depth > 2.05" for 5-yr event
Inflow = 12.01 cfs @ 12.12 hrs, Volume= 31,916 cf
Outflow = 5.13 cfs @ 12.37 hrs, Volume= 25,168 cf, Atten= 57%, Lag= 14.8 min
Primary = 5.13 cfs @ 12.37 hrs, Volume= 25,168 cf
Routed to nonexistent node 5L
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to nonexistent node 5L

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,011.14' @ 12.37 hrs Surf.Area= 8,598 sf Storage= 13,476 cf

Plug-Flow detention time= 94.4 min calculated for 25,102 cf (79% of inflow)
Center-of-Mass det. time= 44.8 min (813.8 - 768.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	41,222 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

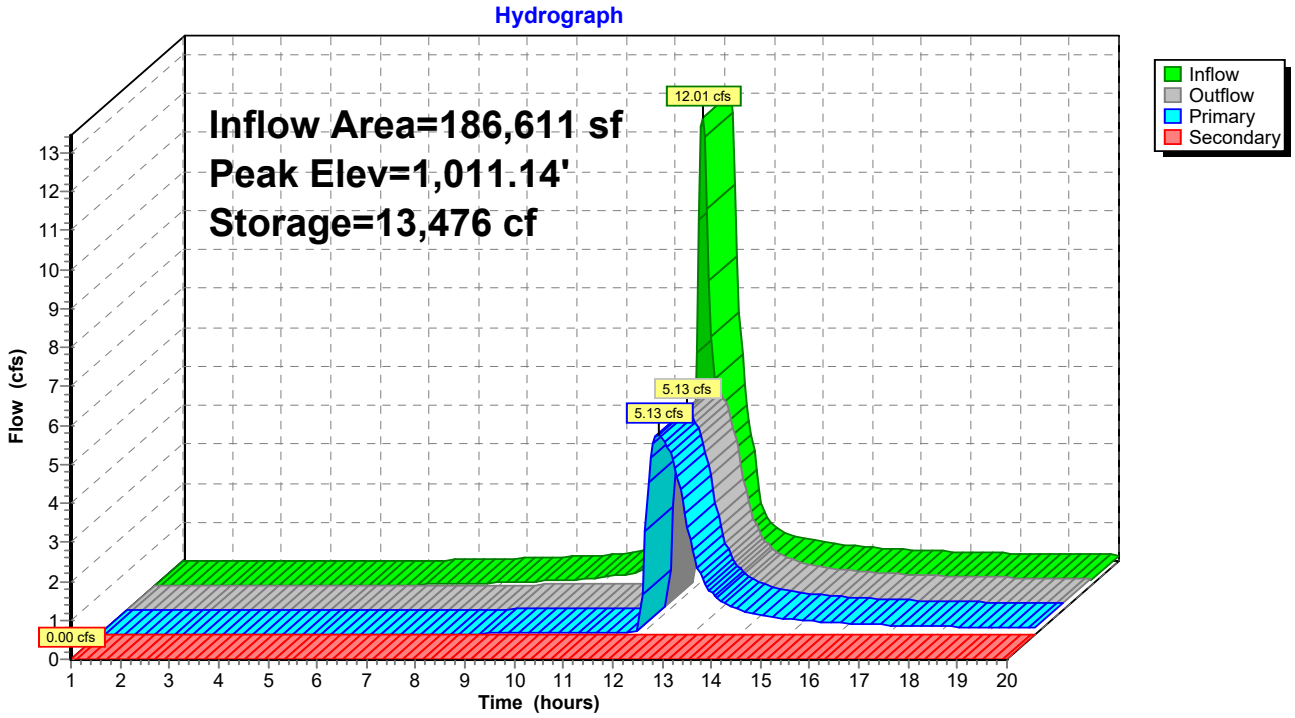
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	5,595	100.0	4,222	5,361
1,011.00	8,212	100.0	6,904	12,264
1,012.00	10,887	100.0	9,550	21,814
1,013.00	13,618	100.0	12,253	34,066
1,013.50	15,004	100.0	7,156	41,222

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,008.00'	**1.2" Vert. Water Quality Orifice** C= 0.600 Limited to weir flow at low heads
#2	Secondary	1,013.00'	**10.0' long + 3.0 '/' SideZ x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 4	1,012.50'	**27.5" x 27.5" Horiz. Rim** C= 0.600 Limited to weir flow at low heads
#4	Primary	1,008.00'	**18.0" Vert. Outlet** C= 0.600 Limited to weir flow at low heads
#5	Device 4	1,011.75'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.18'	**30.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.12 cfs @ 12.37 hrs HW=1,011.14' (Free Discharge)
└─**4=Outlet** (Passes 5.12 cfs of 13.16 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.07 cfs @ 8.47 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Controls 0.00 cfs)
  └─**6=Orifice/Grate** (Orifice Controls 5.05 cfs @ 4.04 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,008.00' (Free Discharge)
└─**2=Spillway** (Controls 0.00 cfs)

Pond 4: POND



Summary for Subcatchment 2.W: PDA-WEST

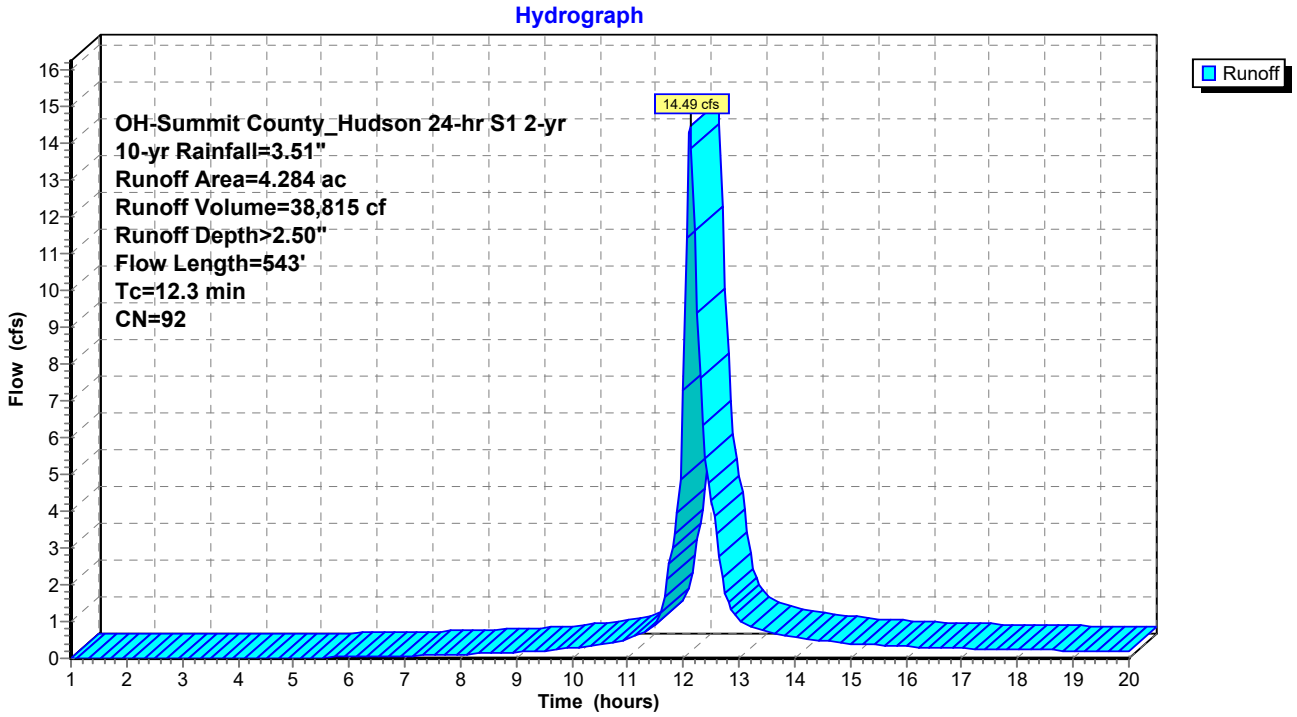
Runoff = 14.49 cfs @ 12.12 hrs, Volume= 38,815 cf, Depth> 2.50"
Routed to Pond 4 : POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 10-yr Rainfall=3.51"

	Area (ac)	CN	Description
*	0.881	95	Permeable Turf Field, HSG D
	1.615	84	50-75% Grass cover, Fair, HSG D
	1.788	98	Paved parking, HSG D
	4.284	92	Weighted Average
	2.496		58.26% Pervious Area
	1.788		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	43	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.9	300	0.0050	2.63	0.52	**Pipe Channel,** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.5	200	0.0100	6.84	8.40	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
12.3	543	Total			

Subcatchment 2.W: PDA-WEST



Summary for Pond 4: POND

Inflow Area = 186,611 sf, 41.74% Impervious, Inflow Depth > 2.50" for 10-yr event
Inflow = 14.49 cfs @ 12.12 hrs, Volume= 38,815 cf
Outflow = 6.06 cfs @ 12.37 hrs, Volume= 31,997 cf, Atten= 58%, Lag= 14.9 min
Primary = 6.06 cfs @ 12.37 hrs, Volume= 31,997 cf
Routed to nonexistent node 5L
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to nonexistent node 5L

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,011.43' @ 12.37 hrs Surf.Area= 9,354 sf Storage= 16,012 cf

Plug-Flow detention time= 89.2 min calculated for 31,913 cf (82% of inflow)
Center-of-Mass det. time= 44.1 min (808.9 - 764.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	41,222 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

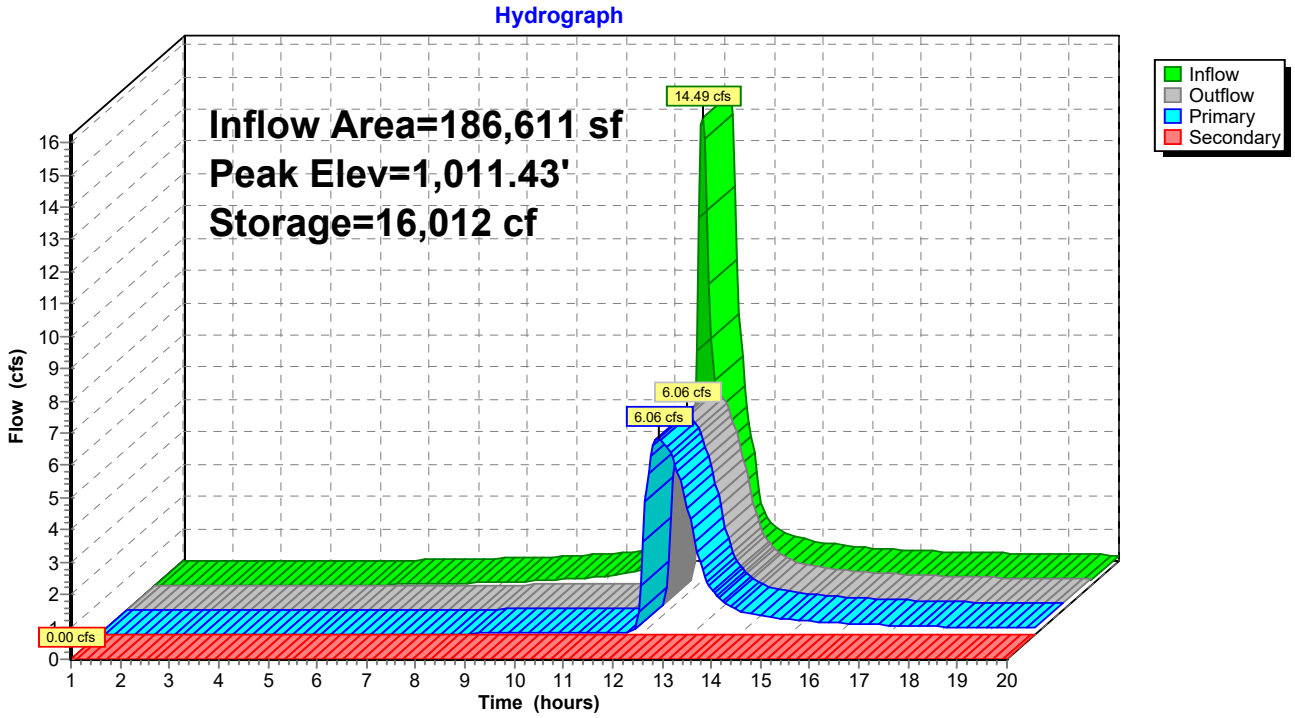
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	5,595	100.0	4,222	5,361
1,011.00	8,212	100.0	6,904	12,264
1,012.00	10,887	100.0	9,550	21,814
1,013.00	13,618	100.0	12,253	34,066
1,013.50	15,004	100.0	7,156	41,222

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,008.00'	**1.2" Vert. Water Quality Orifice** C= 0.600 Limited to weir flow at low heads
#2	Secondary	1,013.00'	**10.0' long + 3.0 '/' SideZ x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 4	1,012.50'	**27.5" x 27.5" Horiz. Rim** C= 0.600 Limited to weir flow at low heads
#4	Primary	1,008.00'	**18.0" Vert. Outlet** C= 0.600 Limited to weir flow at low heads
#5	Device 4	1,011.75'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.18'	**30.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=6.05 cfs @ 12.37 hrs HW=1,011.42' (Free Discharge)
└─**4=Outlet** (Passes 6.05 cfs of 13.91 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.07 cfs @ 8.84 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Controls 0.00 cfs)
  └─**6=Orifice/Grate** (Orifice Controls 5.99 cfs @ 4.79 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,008.00' (Free Discharge)
└─**2=Spillway** (Controls 0.00 cfs)

Pond 4: POND



Summary for Subcatchment 2.W: PDA-WEST

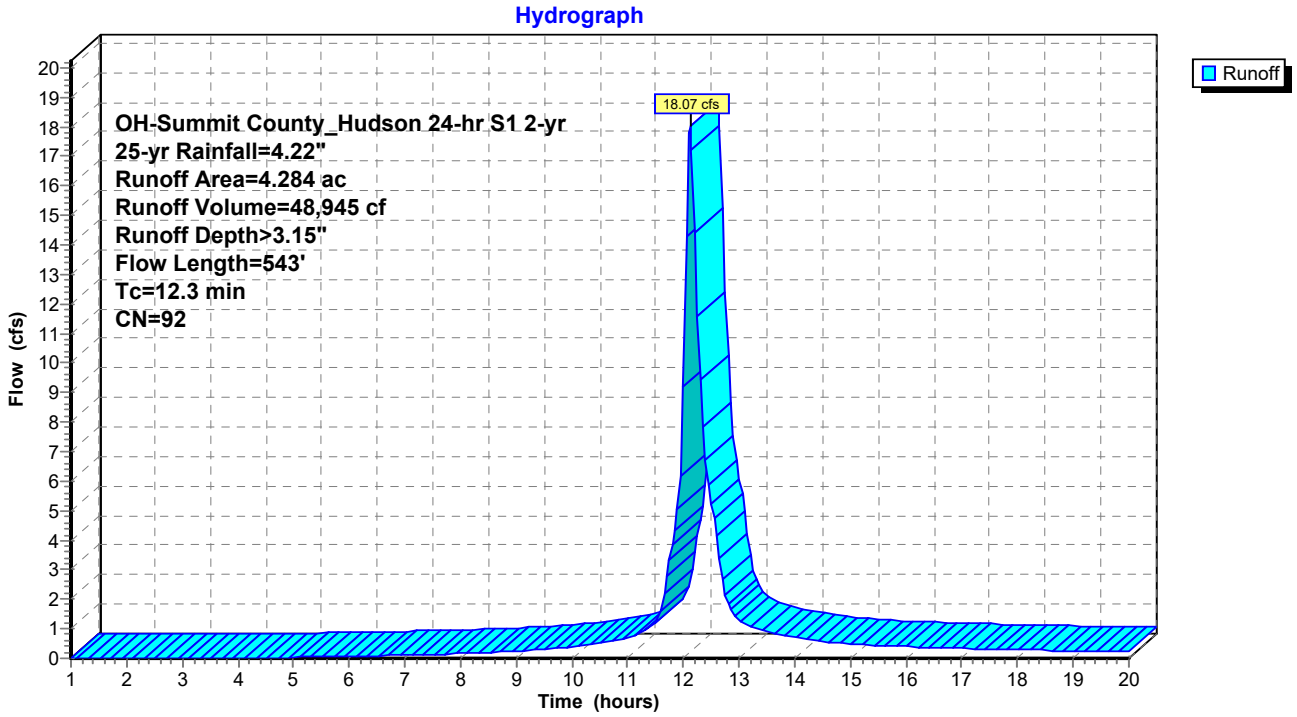
Runoff = 18.07 cfs @ 12.12 hrs, Volume= 48,945 cf, Depth> 3.15"
Routed to Pond 4 : POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 25-yr Rainfall=4.22"

	Area (ac)	CN	Description
*	0.881	95	Permeable Turf Field, HSG D
	1.615	84	50-75% Grass cover, Fair, HSG D
	1.788	98	Paved parking, HSG D
	4.284	92	Weighted Average
	2.496		58.26% Pervious Area
	1.788		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	43	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.9	300	0.0050	2.63	0.52	**Pipe Channel,** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.5	200	0.0100	6.84	8.40	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
12.3	543	Total			

Subcatchment 2.W: PDA-WEST



Summary for Pond 4: POND

Inflow Area = 186,611 sf, 41.74% Impervious, Inflow Depth > 3.15" for 25-yr event
Inflow = 18.07 cfs @ 12.12 hrs, Volume= 48,945 cf
Outflow = 7.25 cfs @ 12.38 hrs, Volume= 42,047 cf, Atten= 60%, Lag= 15.5 min
Primary = 7.25 cfs @ 12.38 hrs, Volume= 42,047 cf
Routed to nonexistent node 5L
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to nonexistent node 5L

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,011.80' @ 12.38 hrs Surf.Area= 10,350 sf Storage= 19,684 cf

Plug-Flow detention time= 85.4 min calculated for 42,047 cf (86% of inflow)
Center-of-Mass det. time= 44.9 min (804.7 - 759.8)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	41,222 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

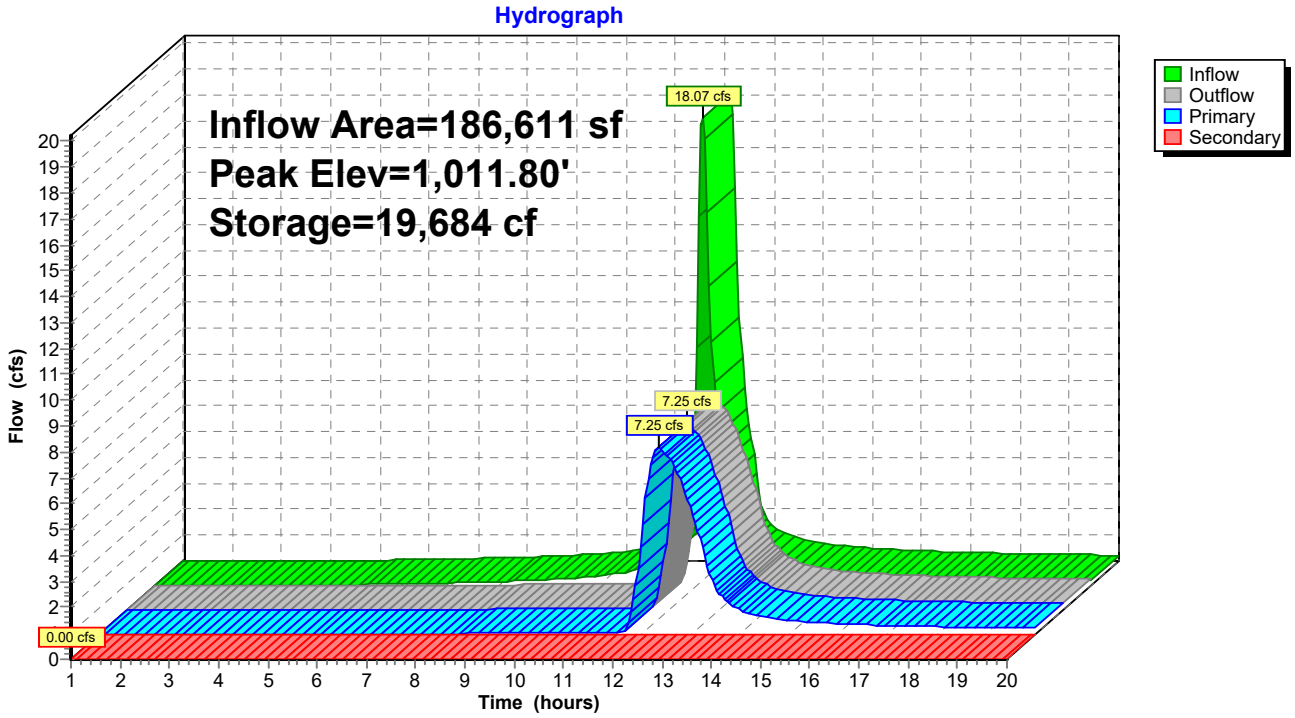
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	5,595	100.0	4,222	5,361
1,011.00	8,212	100.0	6,904	12,264
1,012.00	10,887	100.0	9,550	21,814
1,013.00	13,618	100.0	12,253	34,066
1,013.50	15,004	100.0	7,156	41,222

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,008.00'	**1.2" Vert. Water Quality Orifice** C= 0.600 Limited to weir flow at low heads
#2	Secondary	1,013.00'	**10.0' long + 3.0 '/' SideZ x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 4	1,012.50'	**27.5" x 27.5" Horiz. Rim** C= 0.600 Limited to weir flow at low heads
#4	Primary	1,008.00'	**18.0" Vert. Outlet** C= 0.600 Limited to weir flow at low heads
#5	Device 4	1,011.75'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.18'	**30.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.23 cfs @ 12.38 hrs HW=1,011.80' (Free Discharge)
└**4=Outlet** (Passes 7.23 cfs of 14.85 cfs potential flow)
  ├**1=Water Quality Orifice** (Orifice Controls 0.07 cfs @ 9.32 fps)
  ├**3=Rim** (Controls 0.00 cfs)
  ├**5=Window** (Orifice Controls 0.13 cfs @ 0.70 fps)
  └**6=Orifice/Grate** (Orifice Controls 7.03 cfs @ 5.62 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,008.00' (Free Discharge)
└**2=Spillway** (Controls 0.00 cfs)

Pond 4: POND



Summary for Subcatchment 2.W: PDA-WEST

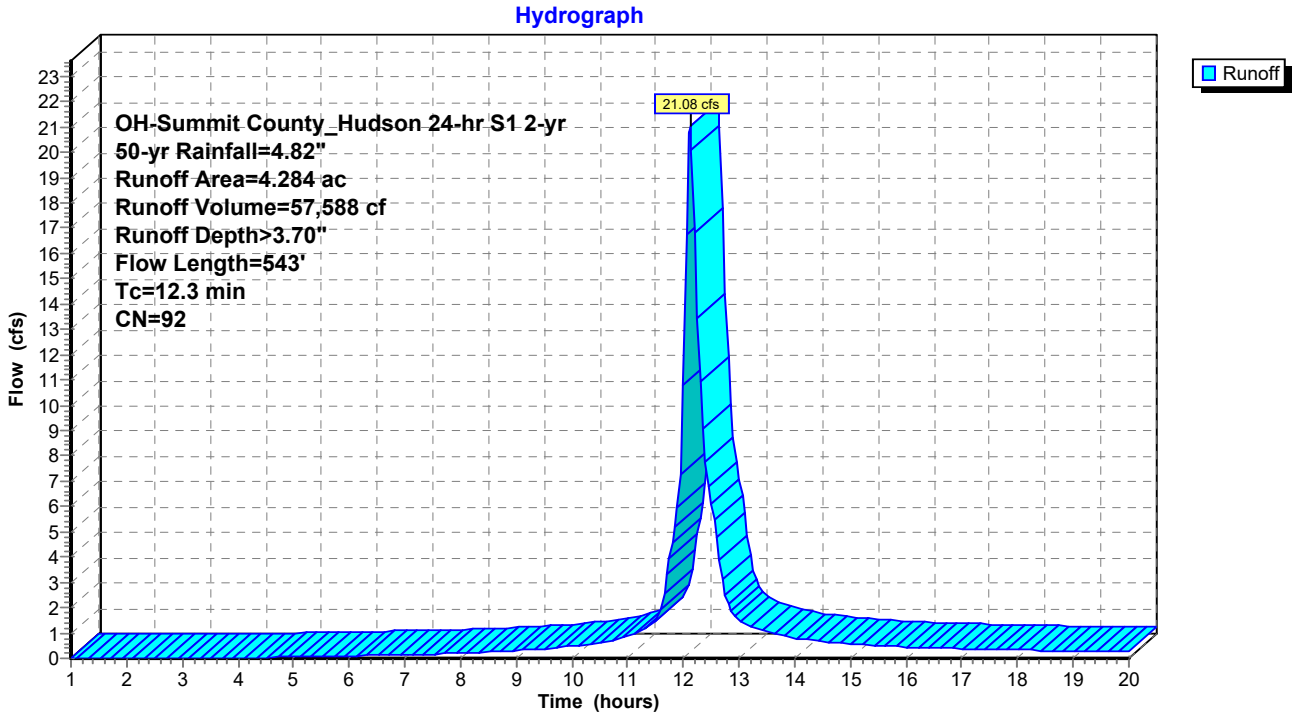
Runoff = 21.08 cfs @ 12.12 hrs, Volume= 57,588 cf, Depth> 3.70"
Routed to Pond 4 : POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 50-yr Rainfall=4.82"

	Area (ac)	CN	Description
*	0.881	95	Permeable Turf Field, HSG D
	1.615	84	50-75% Grass cover, Fair, HSG D
	1.788	98	Paved parking, HSG D
	4.284	92	Weighted Average
	2.496		58.26% Pervious Area
	1.788		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	43	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.9	300	0.0050	2.63	0.52	**Pipe Channel,** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.5	200	0.0100	6.84	8.40	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
12.3	543	Total			

Subcatchment 2.W: PDA-WEST



Summary for Pond 4: POND

Inflow Area = 186,611 sf, 41.74% Impervious, Inflow Depth > 3.70" for 50-yr event
Inflow = 21.08 cfs @ 12.12 hrs, Volume= 57,588 cf
Outflow = 9.47 cfs @ 12.34 hrs, Volume= 50,631 cf, Atten= 55%, Lag= 13.6 min
Primary = 9.47 cfs @ 12.34 hrs, Volume= 50,631 cf
Routed to nonexistent node 5L
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to nonexistent node 5L

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,012.02' @ 12.34 hrs Surf.Area= 10,943 sf Storage= 22,038 cf

Plug-Flow detention time= 81.6 min calculated for 50,631 cf (88% of inflow)
Center-of-Mass det. time= 44.7 min (800.9 - 756.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	41,222 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

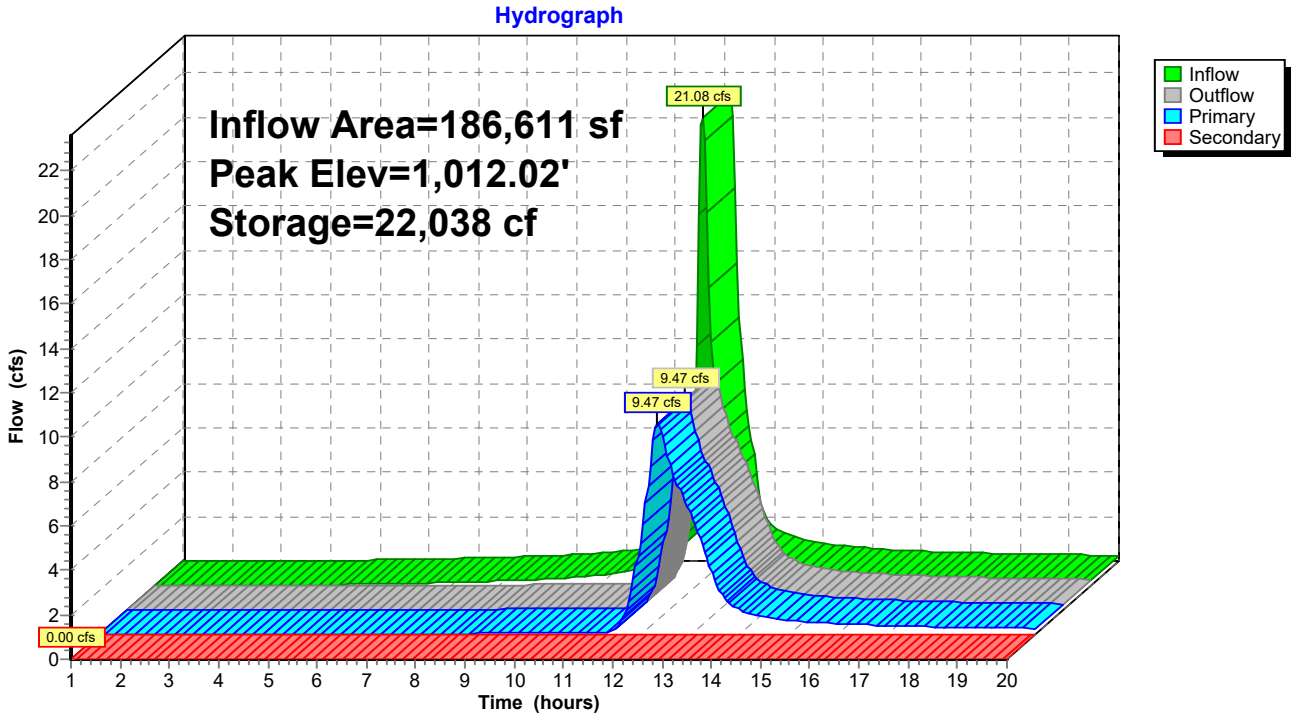
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	5,595	100.0	4,222	5,361
1,011.00	8,212	100.0	6,904	12,264
1,012.00	10,887	100.0	9,550	21,814
1,013.00	13,618	100.0	12,253	34,066
1,013.50	15,004	100.0	7,156	41,222

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,008.00'	**1.2" Vert. Water Quality Orifice** C= 0.600 Limited to weir flow at low heads
#2	Secondary	1,013.00'	**10.0' long + 3.0 '/' SideZ x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 4	1,012.50'	**27.5" x 27.5" Horiz. Rim** C= 0.600 Limited to weir flow at low heads
#4	Primary	1,008.00'	**18.0" Vert. Outlet** C= 0.600 Limited to weir flow at low heads
#5	Device 4	1,011.75'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.18'	**30.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=9.45 cfs @ 12.34 hrs HW=1,012.02' (Free Discharge)
└─**4=Outlet** (Passes 9.45 cfs of 15.38 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.08 cfs @ 9.59 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Orifice Controls 1.79 cfs @ 1.67 fps)
  └─**6=Orifice/Grate** (Orifice Controls 7.58 cfs @ 6.06 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,008.00' (Free Discharge)
└─**2=Spillway** (Controls 0.00 cfs)

Pond 4: POND



Summary for Subcatchment 2.W: PDA-WEST

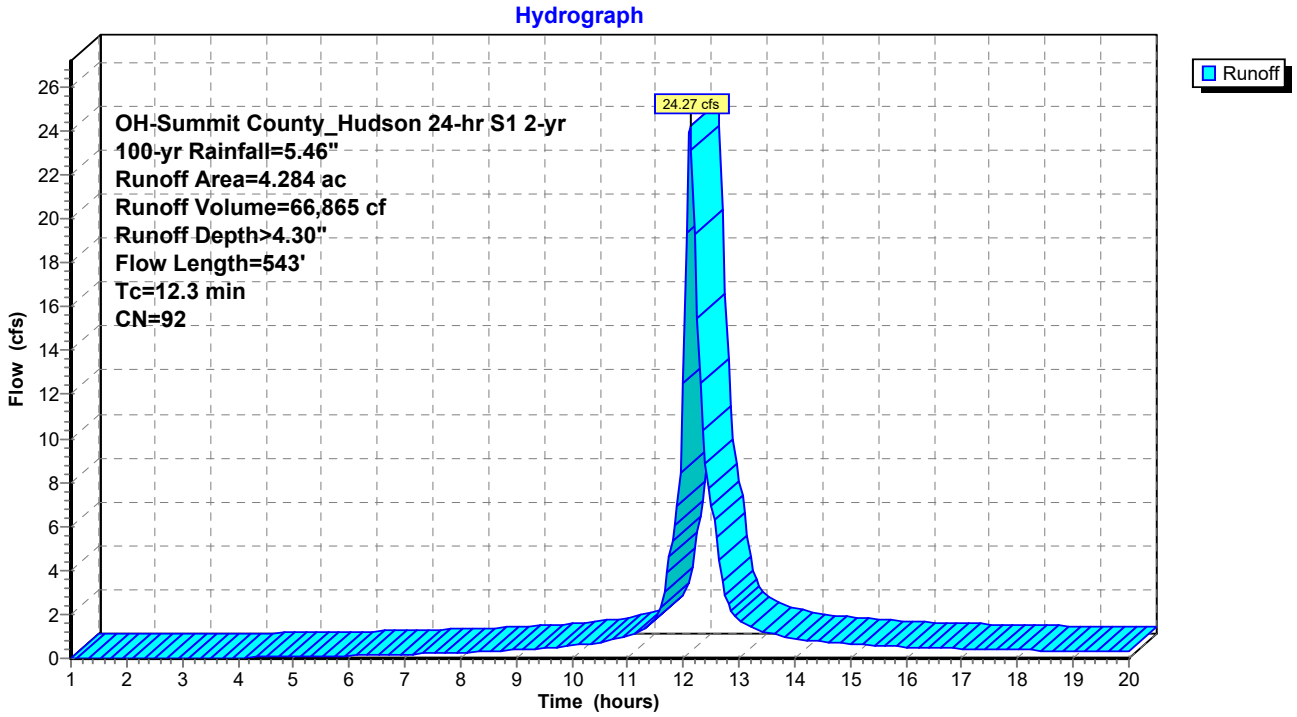
Runoff = 24.27 cfs @ 12.12 hrs, Volume= 66,865 cf, Depth> 4.30"
Routed to Pond 4 : POND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
OH-Summit County_Hudson 24-hr S1 2-yr 100-yr Rainfall=5.46"

	Area (ac)	CN	Description
*	0.881	95	Permeable Turf Field, HSG D
	1.615	84	50-75% Grass cover, Fair, HSG D
	1.788	98	Paved parking, HSG D
	4.284	92	Weighted Average
	2.496		58.26% Pervious Area
	1.788		41.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	43	0.0050	0.07		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.44"
1.9	300	0.0050	2.63	0.52	**Pipe Channel,** 6.0" Round Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010
0.5	200	0.0100	6.84	8.40	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.010
12.3	543	Total			

Subcatchment 2.W: PDA-WEST



Summary for Pond 4: POND

Inflow Area = 186,611 sf, 41.74% Impervious, Inflow Depth > 4.30" for 100-yr event
Inflow = 24.27 cfs @ 12.12 hrs, Volume= 66,865 cf
Outflow = 11.56 cfs @ 12.32 hrs, Volume= 59,846 cf, Atten= 52%, Lag= 12.4 min
Primary = 11.56 cfs @ 12.32 hrs, Volume= 59,846 cf
Routed to nonexistent node 5L
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0 cf
Routed to nonexistent node 5L

Routing by Stor-Ind method, Time Span= 1.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 1,012.21' @ 12.32 hrs Surf.Area= 11,472 sf Storage= 24,210 cf

Plug-Flow detention time= 77.2 min calculated for 59,689 cf (89% of inflow)
Center-of-Mass det. time= 44.0 min (797.0 - 753.1)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	41,222 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

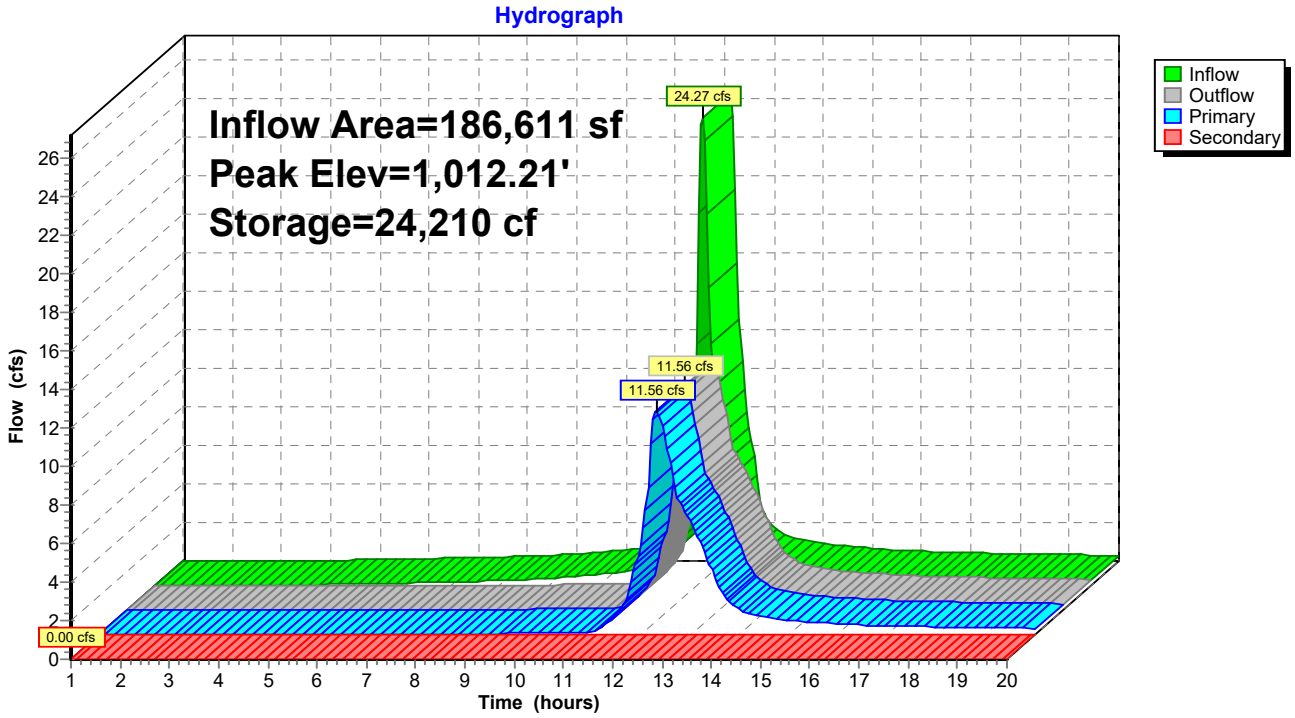
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	5,595	100.0	4,222	5,361
1,011.00	8,212	100.0	6,904	12,264
1,012.00	10,887	100.0	9,550	21,814
1,013.00	13,618	100.0	12,253	34,066
1,013.50	15,004	100.0	7,156	41,222

Device	Routing	Invert	Outlet Devices
#1	Device 4	1,008.00'	**1.2" Vert. Water Quality Orifice** C= 0.600 Limited to weir flow at low heads
#2	Secondary	1,013.00'	**10.0' long + 3.0 '/' SideZ x 4.0' breadth Spillway** 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Device 4	1,012.50'	**27.5" x 27.5" Horiz. Rim** C= 0.600 Limited to weir flow at low heads
#4	Primary	1,008.00'	**18.0" Vert. Outlet** C= 0.600 Limited to weir flow at low heads
#5	Device 4	1,011.75'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.18'	**30.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.52 cfs @ 12.32 hrs HW=1,012.21' (Free Discharge)
└─**4=Outlet** (Passes 11.52 cfs of 15.82 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.08 cfs @ 9.82 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Orifice Controls 3.42 cfs @ 2.57 fps)
  └─**6=Orifice/Grate** (Orifice Controls 8.02 cfs @ 6.42 fps)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=1,008.00' (Free Discharge)
└─**2=Spillway** (Controls 0.00 cfs)

Pond 4: POND



APPENDIX B1:
STORMWATER QUALITY CALCULATIONS

Dry Extended Detention Basin WQv Compliance Tool

version 3.2 2020-07-07

Project Summary

Project Name: Christ Community Chapel
Subwatershed ID/Label:
Submitted by: CESO, Inc.
Date: 2/7/2025

Subwatershed Drainage Area, A_{total} =	4.36	acres	=	189,922	ft2
Subwatershed Impervious Area, A_{imp} =	2.48	acres	=	108,029	ft2
Imperviousness fraction, i =	0.57			57	%
Water Quality Volume, WQv =	8,004	ft^3	=	0.18	ac-ft

Step 1 - Soil Suitability

Soil Series: | HSG: D

Step 2 - Dry ED Basin Volume Requirements

Extended Detention Volume, EDv =	8004	ft^3
Minimum Sediment Storage Volume, $V_{sediment}$ =	1601	ft^3
Minimum Forebay Volume, $V_{forebay}$ =	800	ft^3
Minimum Permanent Micropool Volume, $V_{micropool}$ =	800	ft^3

Step 3 - Basin Stage-Storage Relationship

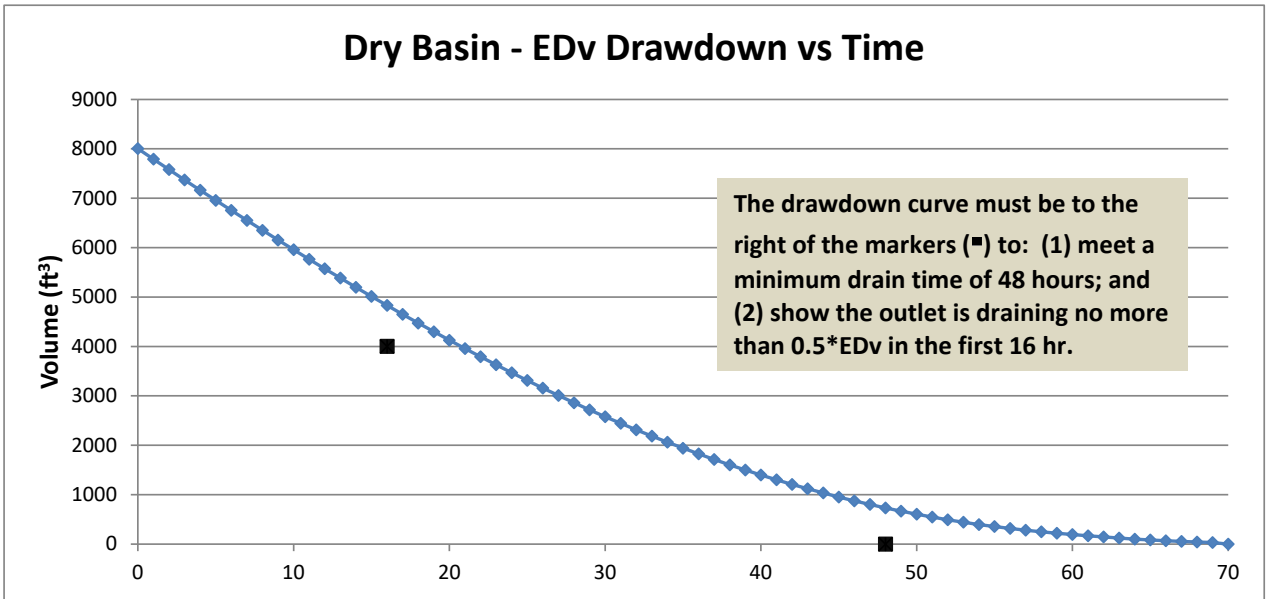
	Elevation ft	Area ft^2		Incremental Volume ft^3	Cumulative Volume ft^3
Bottom of Permanent Micropool =	1008.00	2,848			
(include forebay area if below EDv)	1009.00	2,848		2,848	2,848
	1010.00	5,701		4,193	7,041
	1011.00	8,321		6,970	14,011
	1012.00	13,732		10,914	24,925

Step 4 - Outlet Elevations and Storage Volumes

WQ Orifice Invert Elevation =	1008.00				
Elevation of Top of EDv =	1010.17				
Secondary Outlet Invert Elevation =	1011.75				OKAY
WQ Treatment Volume Provided, $V_{treatment}$ =	21,678	ft^3			
Treatment Vol Provided Relative to EDv, $V_{treatment}/EDv$ =	2.71		=	271%	OKAY
Permanent Pool Volume Provided, PPv =	0	ft^3			
Forebay Volume Provided, $V_{forebay}$ =		ft^3	=		
Is forebay volume below WQ outlet? (Yes or No)			=		
Permanent Micropool Volume Provided, $V_{micropool}$ =	0	ft^3			
Ratio $V_{micropool}$ Provided to $V_{micropool}$ Required =	0.00		=	0%	NOT MET
Sediment Storage Volume Provided, $V_{sediment}$ =		ft^3			
Ratio $V_{sediment}$ Provided to $V_{sediment}$ Required =			=		

Step 5 - Outlet (Orifice) Sizing

Maximum Hydraulic Head, Hmax =	2.17	ft			
Orifice Coefficient, C =	0.6				
Target (Minimum) Draw-down Time, T_d =	48	hr			
Target Average Discharge, Q_{avg} =	0.05	cfs			
Average Hydraulic Head, H_{avg} =	1.08	ft			
Estimated Orifice Area, $A_{orifice}$ =	1.33	in^2	=	0.009	ft^2
Estimated Orifice Diameter, $D_{orifice}$ =	1.30	in	=	0.11	ft
Design Orifice Diameter, $D_{orifice}$ =	1.25	in	=	0.10	ft
Design Orifice Area, $A_{orifice}$ =	1.22	in^2	=	0.008	ft^2
Time to Completely Drain EDv, T_d =	70	hr	must be ≥ 48 hr		OKAY
Volume Drained in First 16 hr =	3,174	ft^3			
% of EDv =	39.7	%	must be ≤ 50%		OKAY



Time (hr)

APPENDIX B2:
STORMWATER QUANTITY CALCULATIONS

Critical Storm Calculations

Project Name	Christian Community Chapel		
Project Location	Hudson, OH	Project Number	765295
Designed By	Tommy Pillow	Date:	2/6/25
Checked By		Date:	

1 Yr-24 Hour Storm (P):	2.08 Inches

Present

Soil Type	Soil Group	Description	CN	Area (SF)	Area (Acre)	S	Ia	Q (In/hr)	Volume (CF)
Canfield-Urban (CeC)	D	Open Space - Good	84	133,947	3.08	1.90	0.38	0.80	8,941.31
		Impervious	98	52,925	1.21	0.20	0.04	1.85	8,175.45
		Total	88	186,872.00	4.29	1.37	0.27	1.03	16,006.53

Developed

Soil Type	Soil Group	Description	CN	Area (SF)	Area (Acre)	S	Ia	Q (In/hr)	Volume (CF)
Canfield-Urban (CeC)	D	Open Space - Good	84	77,363	1.78	1.90	0.38	0.80	5,164.18
			95	38,333.00	0.88	0.53	0.11	1.56	4,980.66
		Impervious	98	69,696.00	1.60	0.20	0.04	1.85	10,766.11
		Total	92	185,392.00	4.26	0.92	0.18	1.27	19,678.50

Existing Runoff	16,006.53	CF
Developed Runoff	19,678.50	CF
Percent Increase in Runoff	23	%
Critial Year Storm	5	year

Percent Increase in Runoff		Critical Storm	
Equal to or greater	and less than		
-	10	1	year
10	20	2	year
20	50	5	year
50	100	10	year
100	250	25	year
250	500	50	year
500	-	100	year

APPENDIX C:
STORMWATER PIPE CALCULATIONS

MyReport

Line No.	Line ID	Line Length (ft)	Line Size (in)	Line Slope (%)	Drng Area (ac)	Total Area (ac)	Flow Rate (cfs)	Capac Full (cfs)	Invert Dn (ft)	Invert Up (ft)	HGL Dn (ft)	Gnd/Rim El Dn (ft)	HGL Up (ft)	Gnd/Rim El Up (ft)	Junct Type	Inlet Depth (ft)	Vel Ave (ft/s)	Cover Up (ft)	Tc (min)	
1	35	27.854	18	1.80	0.54	1.70	3.07	14.07	1009.50	1010.00	1010.17	1011.71	1010.67 j	1014.25	Comb.	0.18	4.04	2.75	7.2	
2	104	56.693	15	0.88	0.06	1.16	2.40	6.06	1010.00	1010.50	1010.67	1014.25	1011.12 j	1014.25	Comb.	0.10	3.78	2.50	6.8	
3	24	55.426	15	0.90	0.06	1.10	2.34	6.13	1010.50	1011.00	1011.12	1014.25	1011.61 j	1014.25	Comb.	0.10	3.89	2.00	6.3	
4	25	52.202	15	0.96	0.57	0.84	1.86	6.32	1011.00	1011.50	1011.61	1014.25	1012.04 j	1015.46	Comb.	0.18	3.39	2.71	5.7	
5	26	19.903	12	1.26	0.05	0.27	1.07	3.99	1011.50	1011.75	1012.04	1015.46	1012.19 j	1016.15	Comb.	0.07	2.86	3.40	5.5	
6	114	85.000	8	1.18	0.22	0.22	1.04	1.42	1011.75	1012.75	1012.19	1016.15	1013.23	1013.94	Comb.	0.21	4.06	0.52	5.0	
7	107	54.079	6	1.39	0.20	0.20	0.43	0.72	1011.25	1012.00	1011.61	1014.25	1012.34 j	1014.97	Comb.	0.14	2.98	2.47	5.0	
8	27	28.738	18	1.74	0.10	1.61	7.87	13.85	1010.00	1010.50	1011.09	1012.71	1011.59 j	1014.37	Comb.	0.10	5.73	2.37	5.9	
9	28	169.250	18	0.89	0.20	1.51	7.93	9.89	1010.50	1012.00	1011.59	1014.37	1013.09	1017.00	Comb.	0.14	5.77	3.50	5.3	
10	116	108.292	15	2.63	1.31	1.31	7.59	10.48	1012.00	1014.85	1013.09	1017.00	1015.94	0.00	Grate	0.30	6.67	n/a	5.0	

Project File: stm.stm | Number of lines: 10 | Date: 2/6/2025

NOTES: ** Critical depth

APPENDIX D:
USDA NRCS Web Soil Survey

Soil Map—Summit County, Ohio
(CCC Hudson, OH)

Map Scale: 1:2,920 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Summit County, Ohio
Survey Area Data: Version 21, Aug 29, 2024

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

Date(s) aerial images were photographed: Sep 12, 2020—Sep 21, 2020

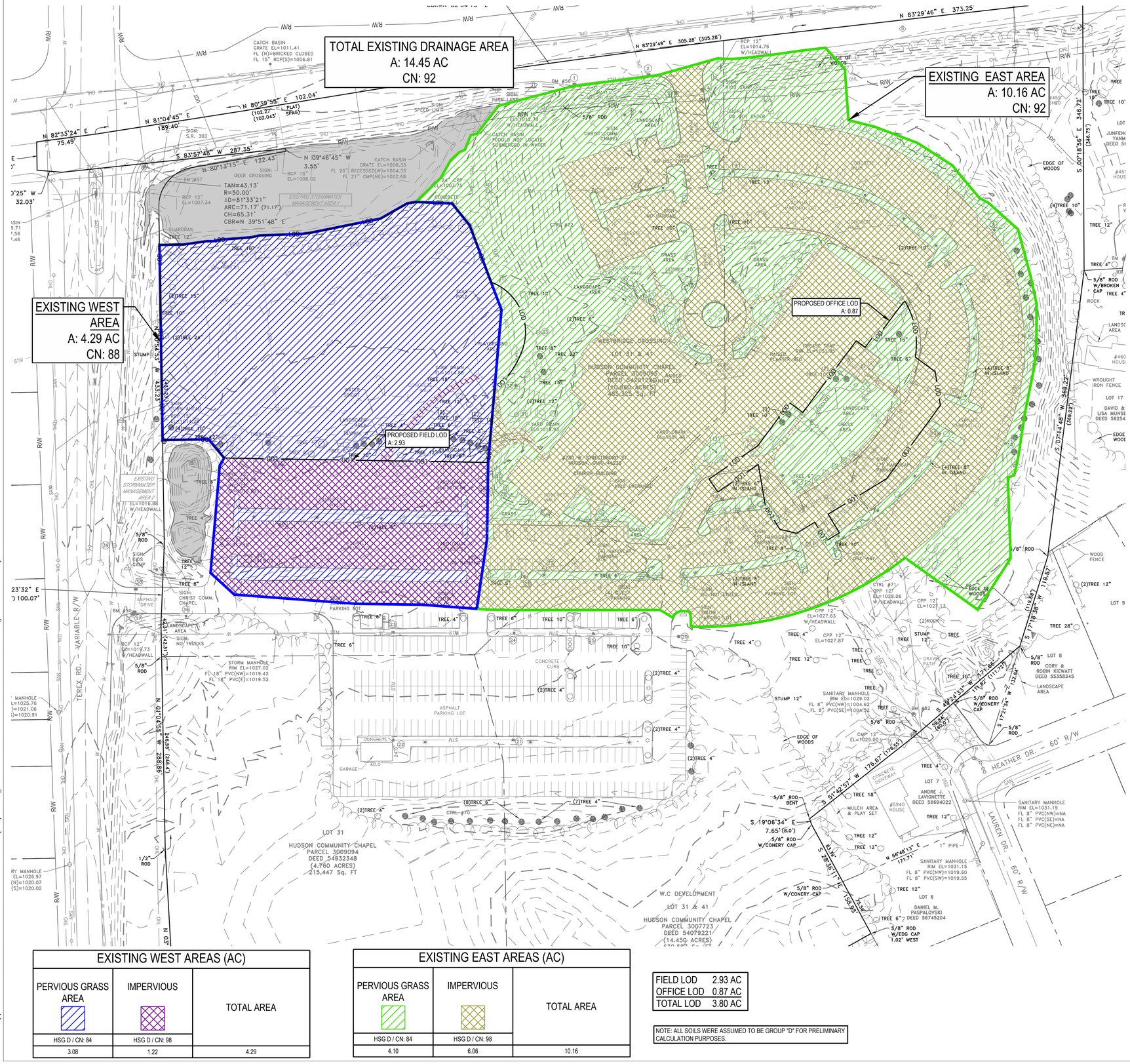
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ca	Canadice silty clay loam	0.2	0.5%
CcB	Caneadea silt loam, 2 to 6 percent slopes	15.1	46.9%
CoC2	Chili gravelly loam, 6 to 12 percent slopes, moderately eroded	2.2	6.9%
EuC	Ellsworth-Urban land complex, 6 to 18 percent slopes	2.3	7.2%
GbC2	Geeburg silt loam, 6 to 12 percent slopes, moderately eroded	6.2	19.3%
GbD2	Geeburg silt loam, 12 to 18 percent slopes, moderately eroded	0.5	1.6%
Mn	Mahoning-Urban land complex, 0 to 2 percent slopes	2.9	9.0%
Sb	Sebring silt loam, 0 to 2 percent slopes	0.6	1.9%
WrB	Wheeling silt loam, 2 to 6 percent slopes	2.2	6.7%
Totals for Area of Interest		**32.2**	**100.0%**

APPENDIX E:
DRAINAGE AREA MAPS

APPENDIX E1:
EXISTING CONDITIONS DRAINAGE AREA MAP



EXISTING WEST AREAS (AC)		
PERVIOUS GRASS AREA	IMPERVIOUS	TOTAL AREA
HSG D / CN: 84	HSG D / CN: 98	
3.08	1.22	4.29

EXISTING EAST AREAS (AC)		
PERVIOUS GRASS AREA	IMPERVIOUS	TOTAL AREA
HSG D / CN: 84	HSG D / CN: 98	
4.10	6.06	10.16

FIELD LOD	2.93 AC
OFFICE LOD	0.87 AC
TOTAL LOD	3.80 AC

NOTE: ALL SOILS WERE ASSUMED TO BE GROUP "D" FOR PRELIMINARY CALCULATION PURPOSES.

GRAPHIC SCALE (IN FEET)
1 in. = 60 ft.

CESO
WWW.CESOINC.COM
175 Montrose West Ave., Suite 400
Akron, OH 44321
Phone: 330.665.0660 Fax: 888.208.4826

SOL HARRIS/DAY ARCHITECTURE

CHRIST COMMUNITY CHAPEL

750 W. STREETSBORO STREET
HUDSON, OH 44236

Revisions / Submissions

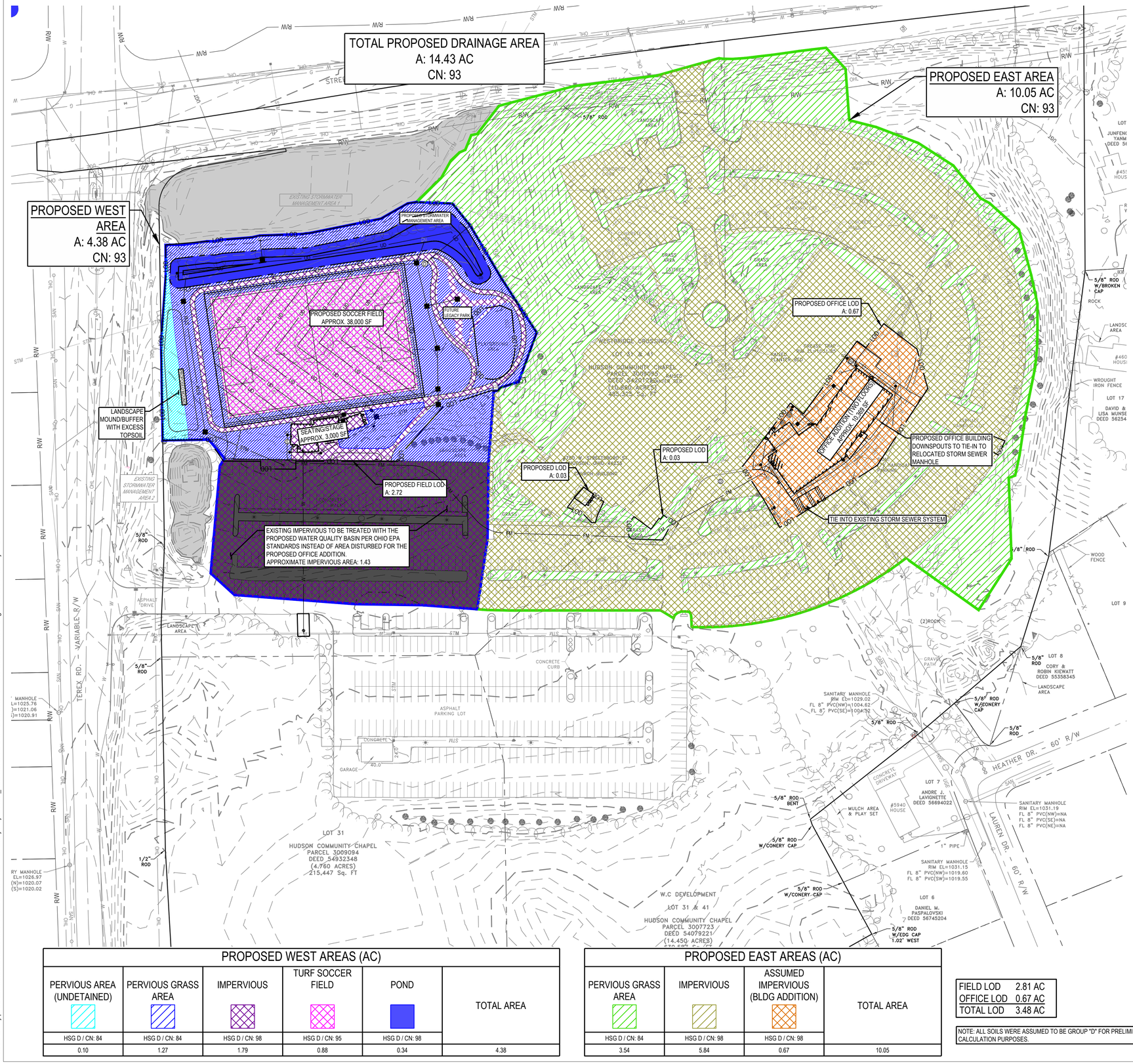
ID	Description	Date

Project Number:	765295
Scale:	AS SHOWN
Drawn By:	JWH
Checked By:	JTK
Date:	03/14/25
Issue:	PERMIT SET

Drawing Title:
EXISTING DRAINAGE PLAN

EDP

APPENDIX E2:
PROPOSED CONDITIONS DRAINAGE AREA MAP



PROPOSED WEST AREAS (AC)					
PERVIOUS AREA (UNDETAINED)	PERVIOUS GRASS AREA	IMPERVIOUS	TURF SOCCER FIELD	POND	TOTAL AREA
HSG D / CN: 84	HSG D / CN: 84	HSG D / CN: 98	HSG D / CN: 95	HSG D / CN: 98	
0.10	1.27	1.79	0.88	0.34	4.38

PROPOSED EAST AREAS (AC)			
PERVIOUS GRASS AREA	IMPERVIOUS	ASSUMED IMPERVIOUS (BLDG ADDITION)	TOTAL AREA
HSG D / CN: 84	HSG D / CN: 98	HSG D / CN: 98	
3.54	5.84	0.67	10.05

FIELD LOD	2.81 AC
OFFICE LOD	0.67 AC
TOTAL LOD	3.48 AC

NOTE: ALL SOILS WERE ASSUMED TO BE GROUP "D" FOR PRELIMINARY CALCULATION PURPOSES.

N

60 0 60 120

GRAPHIC SCALE (IN FEET)
1 in. = 60 ft.

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SOL HARRIS/DAY ARCHITECTURE

CHRIST COMMUNITY CHAPEL

750 W. STREETSBORO STREET
HUDSON, OH 44236

Revisions / Submissions

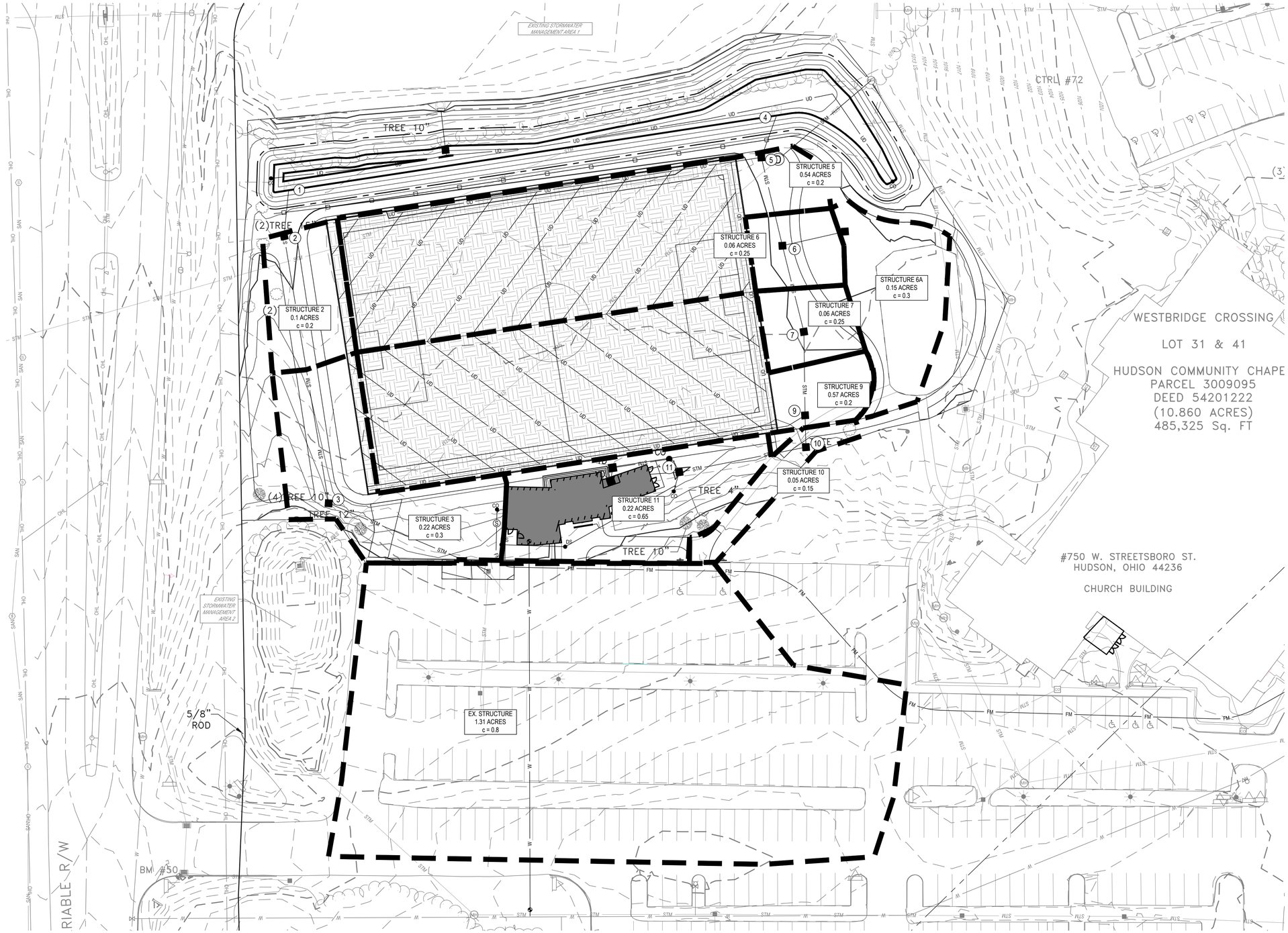
ID	Description	Date

Project Number:	765295
Scale:	AS SHOWN
Drawn By:	JWH
Checked By:	JTK
Date:	03/14/25
Issue:	PERMIT SET

Drawing Title:
PROPOSED DRAINAGE PLAN

PDP

APPENDIX E3:
TRIBUTARY DRAINAGE AREA MAP



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SOL HARRIS/DAY ARCHITECTURE

CHRIST COMMUNITY CHAPEL

750 W. STREETSBORO STREET
HUDSON, OH 44236

Revisions / Submissions

ID	Description	Date

Project Number:	765295
Scale:	AS SHOWN
Drawn By:	KAN
Checked By:	JMS
Date:	03/14/25
Issue:	PERMIT SET

Drawing Title:
TRIBUTARY MAP

TRIB

175 Montrose West Ave, Suite 400
Akron, OH 44321
330.665.0660

CESO
cesoinc.com

April 9, 2025

Community Development
ATTN: Nick Sugar
1140 Terex Road
Hudson, OH 44236

RE: Christ Community Chapel – Hudson, OH – Field Addition

To Whom it May Concern:

In response to a comment received from Nick Sugar on April 7, 2025, CESO has the following response to Stormwater Management/Drainage/Erosion Control, Section 1207.07.d.(1), of the City's Regulations:

1207.07 STORMWATER MANAGEMENT/DRAINAGE/EROSION CONTROL.

(d) Additional Regulations.

(1) In addition to the requirements of the Engineering Standards for Infrastructure Construction, the following additional regulations shall be adhered to:

A. Retention/detention basins. Developers constructing detention basins are encouraged to design them for use as neighborhood open space and recreation components and to consider designs based on Summit County Soil and Water Conservation District recommendations or guidelines from the Center for Watershed Protection. Adequate signage declaring the intended use of the basin shall be conspicuously displayed along with appropriate warnings about storms. All such signs shall be approved by the City.

B. To the maximum extent feasible, the applicant's stormwater management plan shall include the following non-structural control techniques. Where the applicant proposes the use of detention/retention facilities, he must first utilize one or more of the following runoff reduction measures. The applicant shall provide a written justification of the utilization of the following in calculating storage capacities of the detention/retention facilities:

1. *Areas undisturbed (cleared) by construction;* The areas being disturbed by this project are within the previously developed area of the Church as part of the original construction activities.
2. *Restriction of development on steep slopes;* The proposed Stormwater management area needs to fit within the confines of the existing basin and proposed soccer field. The basin was proposed with stabilized erosion control blankets and was designed to fit in the constraints of existing site to the maximum extents feasible.
3. *Maintenance of vegetation buffers;* The proposed stormwater management practice is draining into an existing stormwater management basin. Due to the proposed stormwater elevations and to maximize stormwater quality and detention volumes the existing brush will need to be removed along the south (site side) of the basin.
4. *Minimization of impervious surfaces and use of pervious surfaces;* The artificial turf field is more pervious than the existing lawn area by draining to a stone and underdrain system. The additional stormwater management areas help control higher flows through the system and meet required water quality volume.

C. Use of terraces, contoured landscapes, tiered pond systems, runoff spreaders, grass or rock-lined waterways; and/or The additional stormwater management, while not necessarily a tiered pond system, provides an additional BMP practice upstream of the existing basin with a gravel lined bottom, which helps control runoff and sediment storage prior to draining to the existing stormwater basin.

D. Use of infiltration trenches. The bottom of the basin provides a stone channel and underdrain maximizing the potential for infiltration. The soils on site do not appear conducive to infiltration practices, however, an attempt was made to promote infiltration.

If you have any additional questions or concerns, please do not hesitate to contact me at (440) 668-2307 or kocinski@cesoinc.com.

Respectfully,

Jonathan Kocinski, PE