Stormwater Management Report

CCC – Hudson, OH

750 W Streetsboro St,
Hudson, OH 44236

Date Prepared: May 19th, 2025

Revised:

On behalf of:

Christ Community Chapel

Contact:

Prepared By: Hannah Okes
Address: 4601 Park Road, Suite 650
Email: Hannah.okes@cesoinc.com
Phone: 234-349-2514
Date: 05/19/2025

Engineer of Record:

Engineer of Record: Jonathan Kocinski, P.E.

5/16/2025

Table of Contents

APPENDICES

Introduction

This report covers the methodology and calculations used in the design of the stormwater management system for the proposed turf field and restroom 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 restroom 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 3D. 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 Street 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 389 SF restroom building, a 44,500 SF turf soccer field, associated site improvements and a stormwater management system. The stormwater management system consists of 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	7.62 CFS	9.89 CFS	13.22 CFS	16.06 CFS	20.16 CFS	23.62 CFS	27.29 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	2.24 CFS	1010.64 FT
2-year	3.23 CFS	1010.87 FT
5-year	4.52 CFS	1011.25 FT
10-year	5.39 CFS	1011.58FT
25-year	7.37 CFS	1011.99 FT
50-year	9.90 CFS	1012.22 FT
100-year	11.66 CFS	1012.46 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 B** 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:

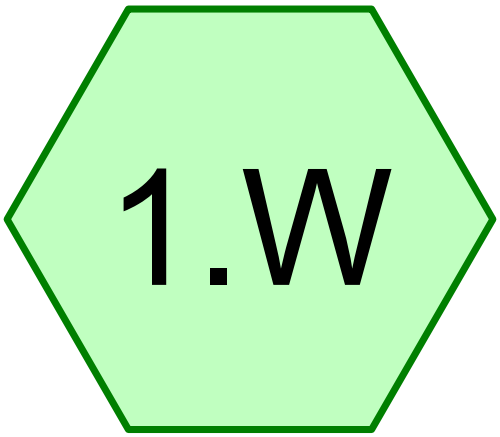
Runoff Reduction Summary			
Storm	**Existing**	**Allowable**	**Proposed**
1-year	5.42 CFS	7.38 CFS	2.24 CFS
2-year	7.38 CFS	7.38 CFS	3.23 CFS
5-year	10.22 CFS	7.38 CFS	4.52 CFS
10-year	12.67 CFS	7.38 CFS	5.39 CFS
25-year	16.25 CFS	7.38 CFS	7.37 CFS
50-year	19.29 CFS	12.67 CFS	9.90 CFS
100-year	22.52 CFS	12.67 CFS	11.66 CFS

Refer to **Appendix B** 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 5/14/2025

Summary for Subcatchment 1.W: EDA-WEST

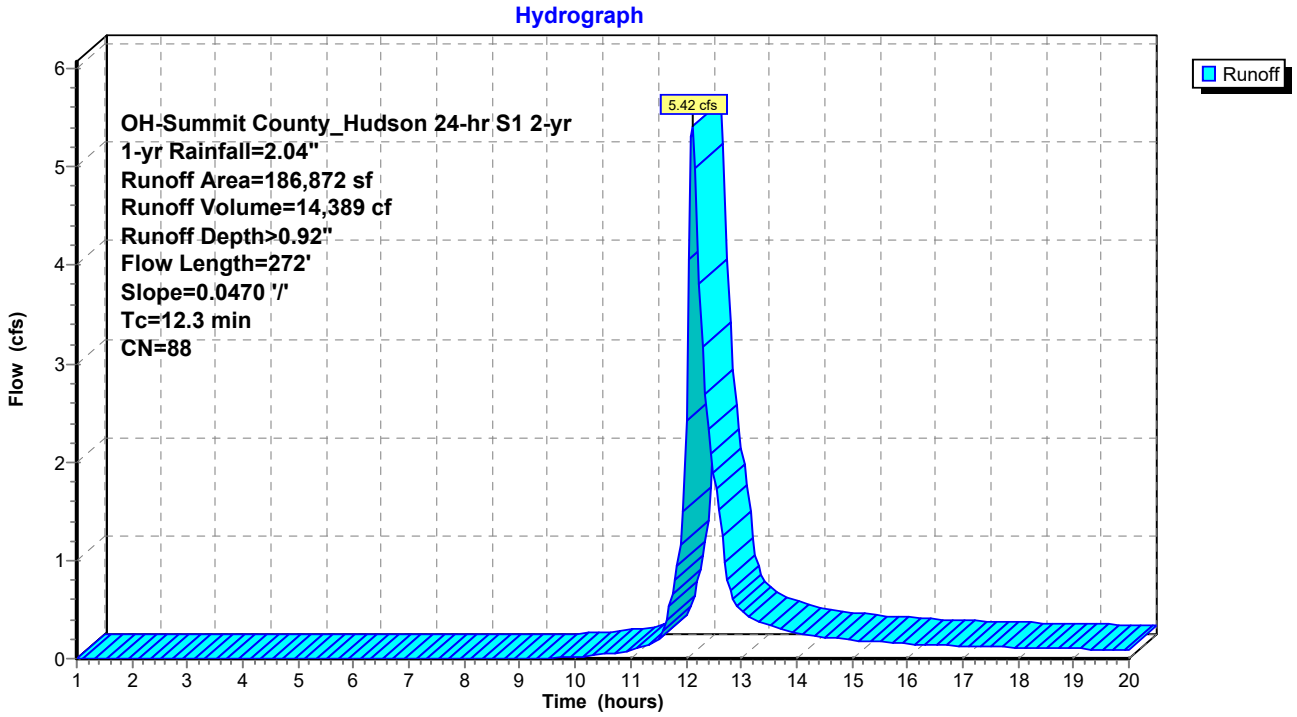
Runoff = 5.42 cfs @ 12.13 hrs, Volume= 14,389 cf, Depth> 0.92"

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

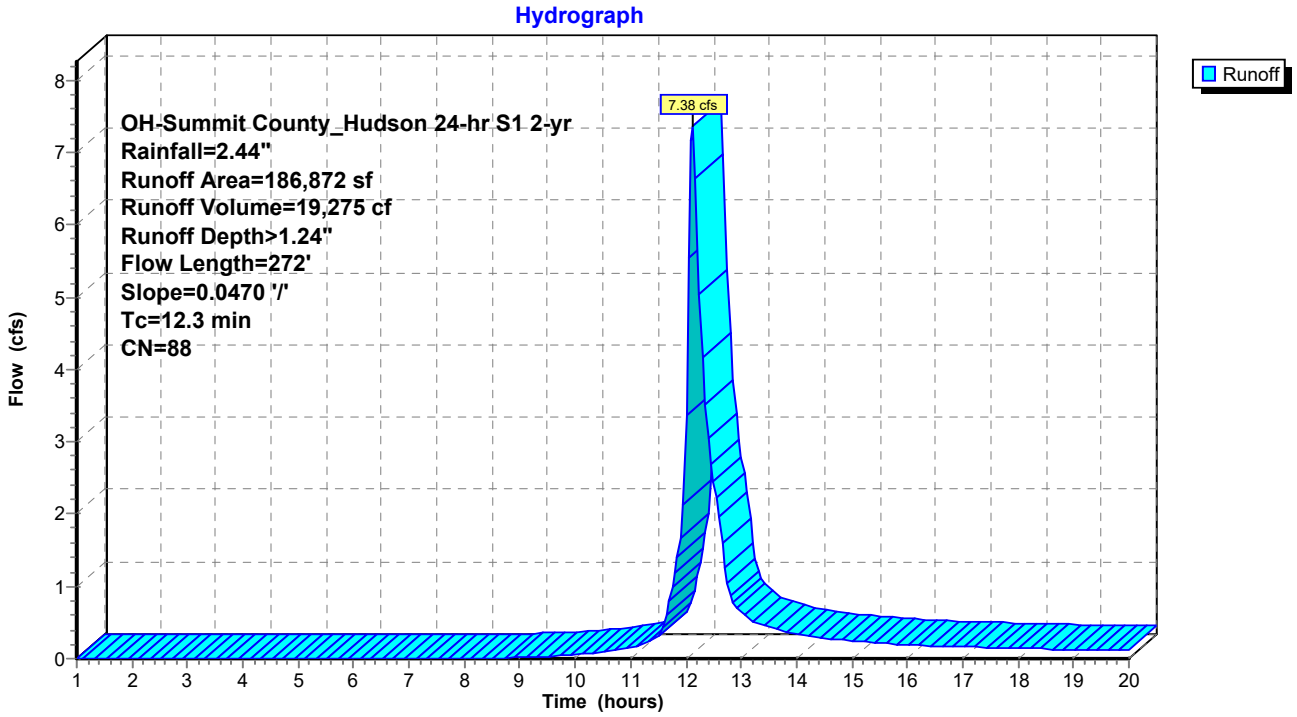
Runoff = 7.38 cfs @ 12.12 hrs, Volume= 19,275 cf, Depth> 1.24"

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

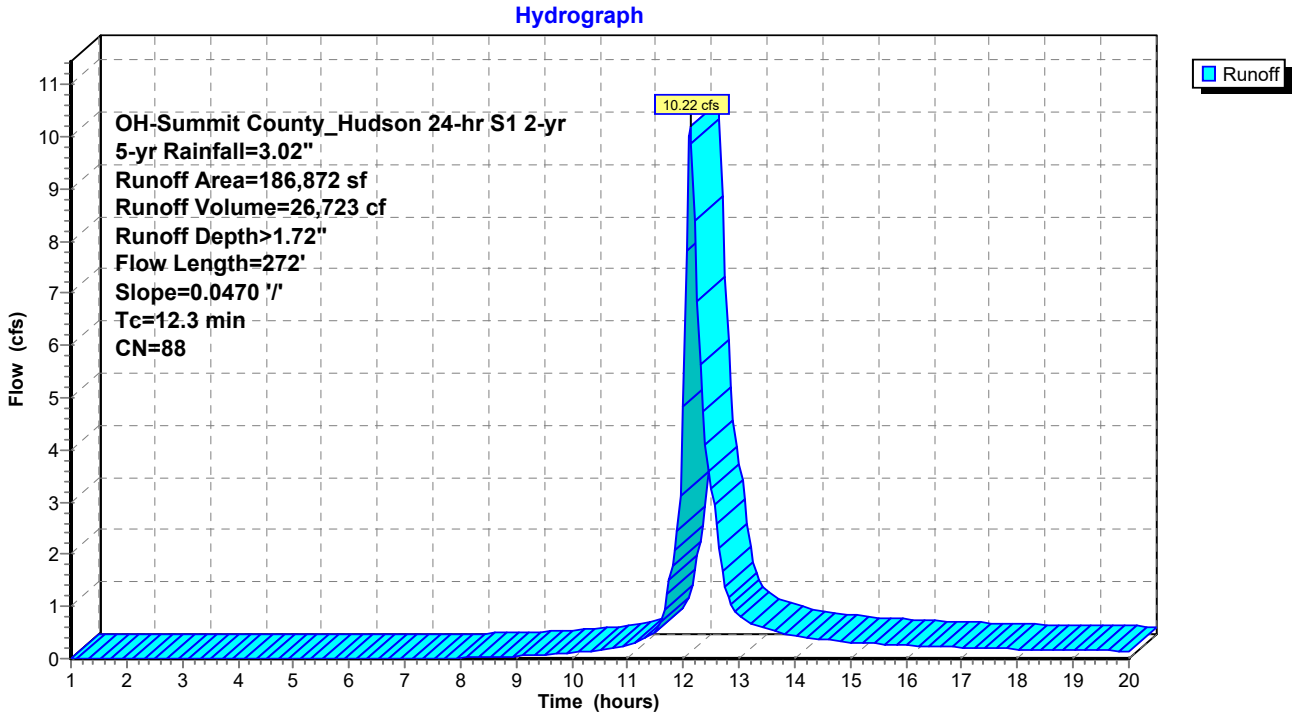
Runoff = 10.22 cfs @ 12.12 hrs, Volume= 26,723 cf, Depth> 1.72"

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

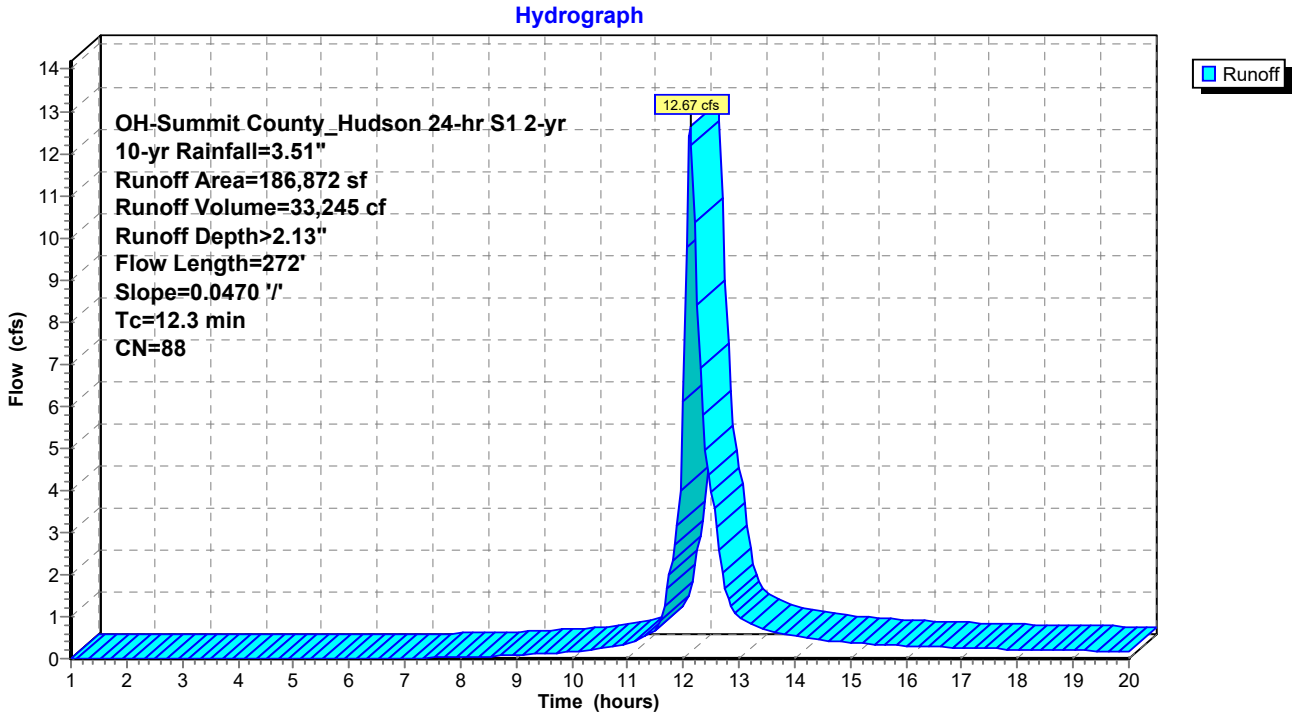
Runoff = 12.67 cfs @ 12.12 hrs, Volume= 33,245 cf, Depth> 2.13"

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

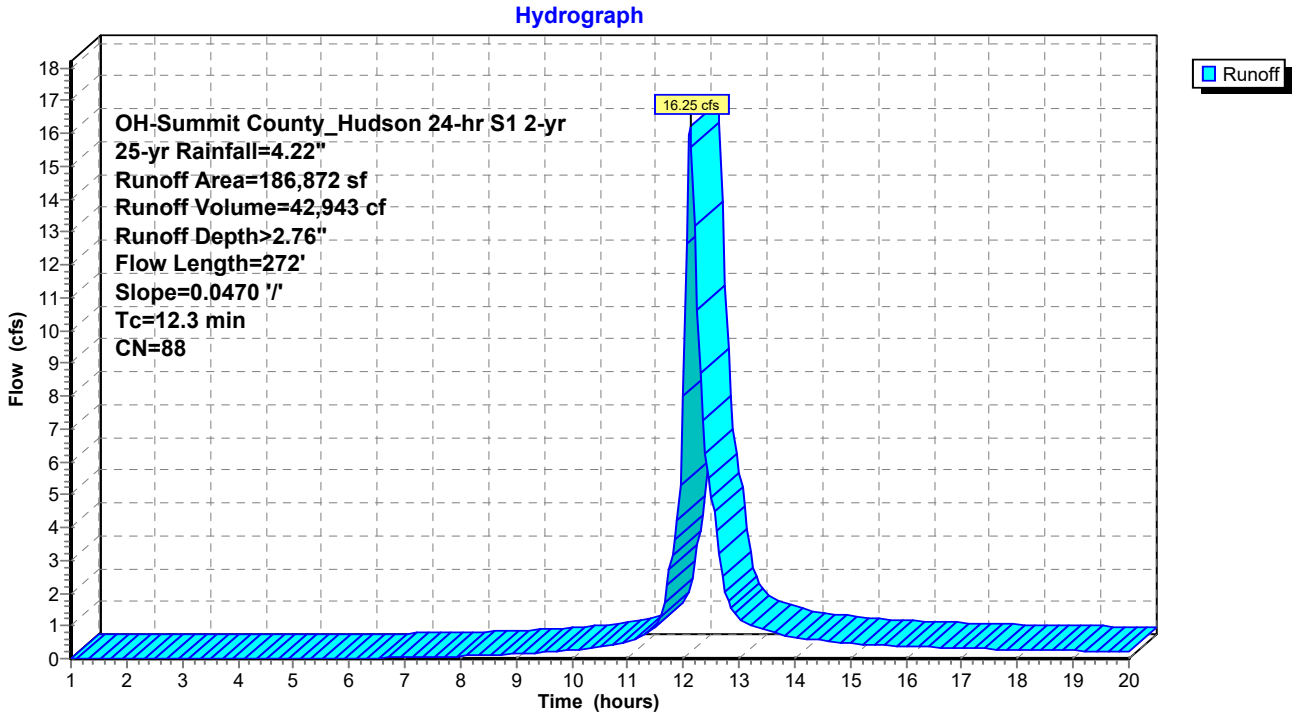
Runoff = 16.25 cfs @ 12.12 hrs, Volume= 42,943 cf, Depth> 2.76"

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

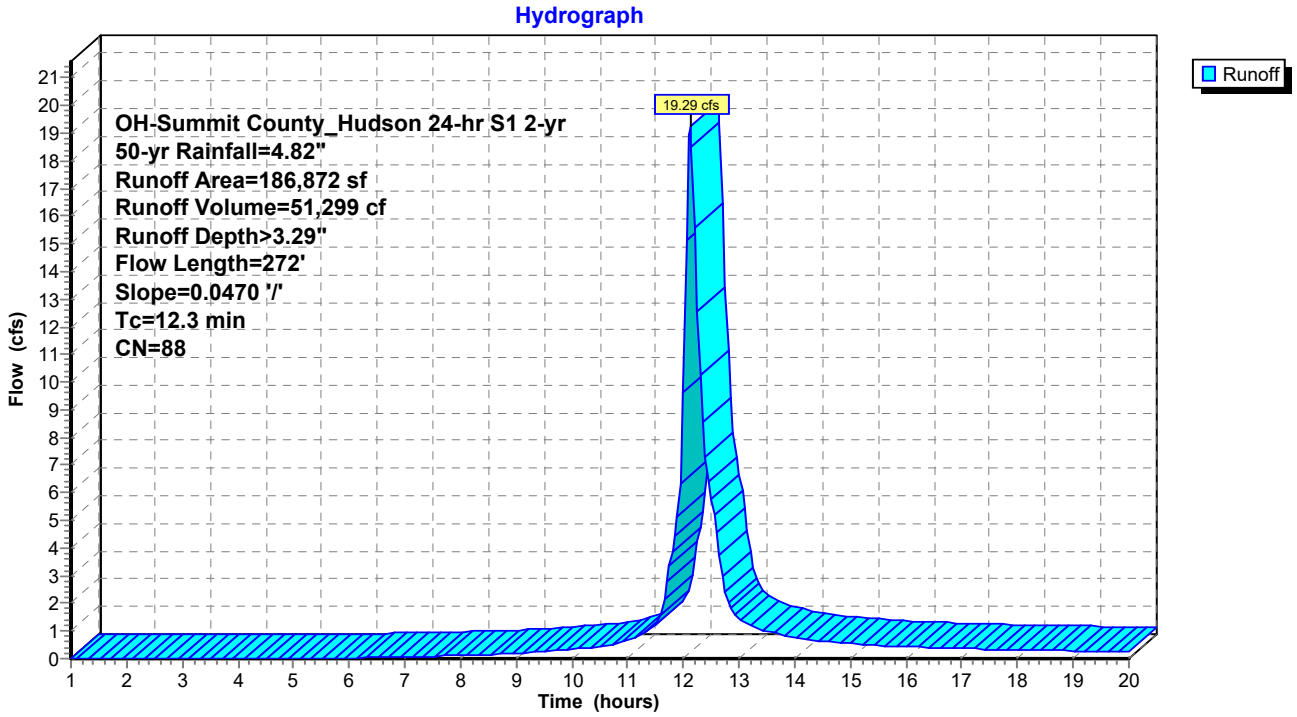
Runoff = 19.29 cfs @ 12.12 hrs, Volume= 51,299 cf, Depth> 3.29"

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

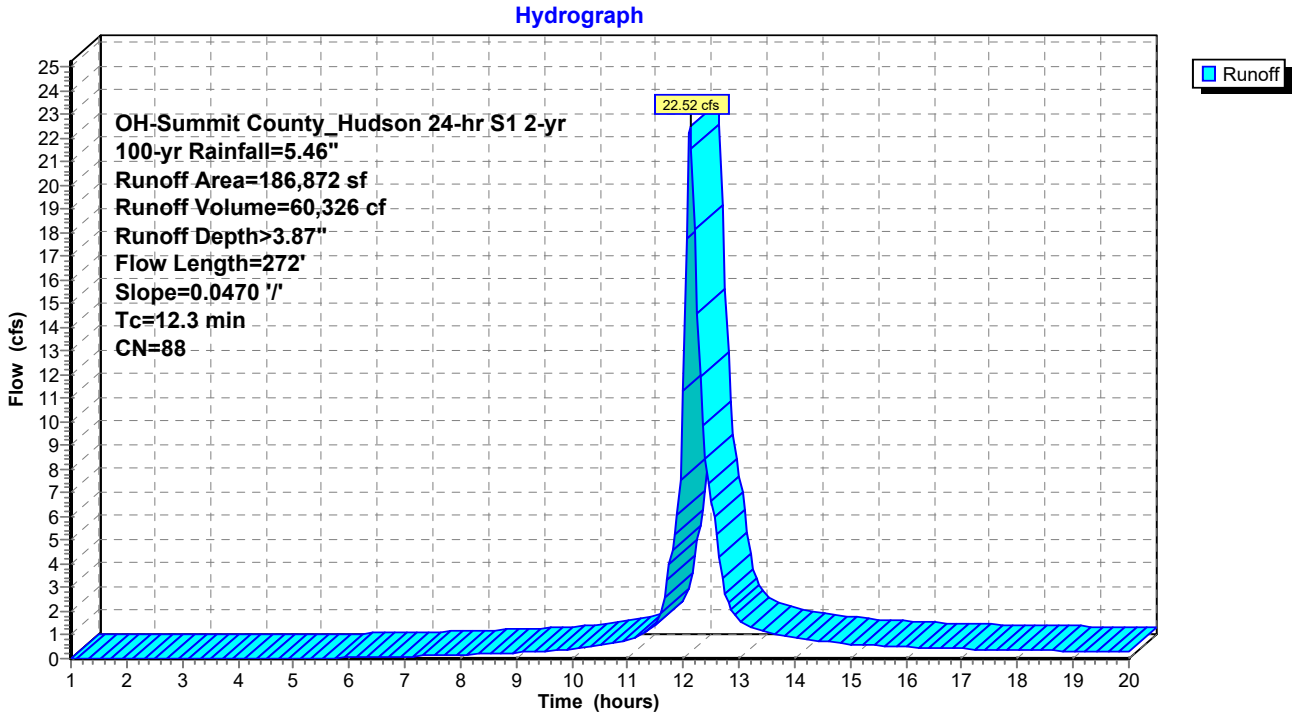
Runoff = 22.52 cfs @ 12.12 hrs, Volume= 60,326 cf, Depth> 3.87"

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			

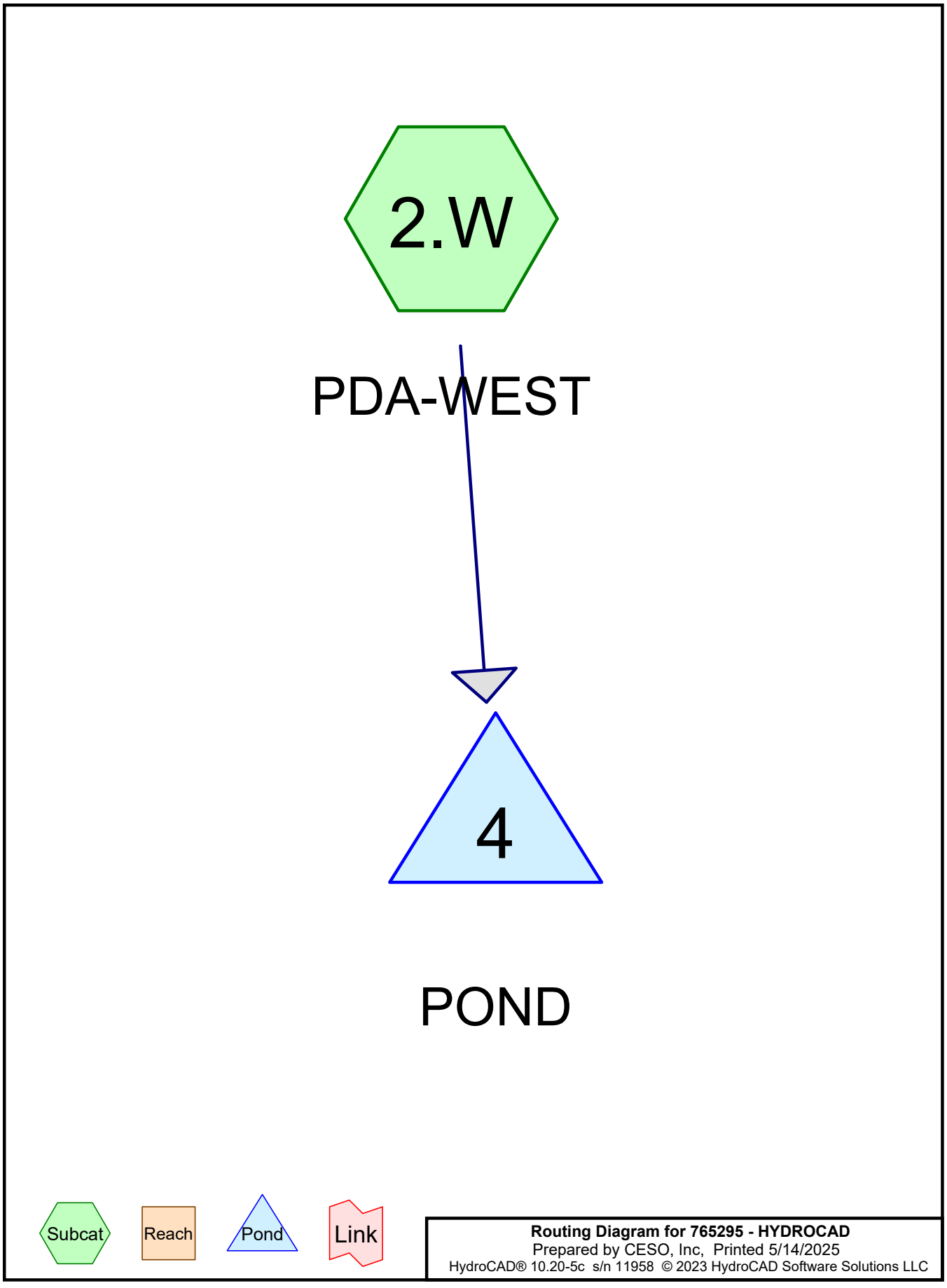
Subcatchment 1.W: EDA-WEST



Events for Subcatchment 1.W: EDA-WEST

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
1-yr	2.04	5.42	14,389	0.92
2-yr	2.44	7.38	19,275	1.24
5-yr	3.02	10.22	26,723	1.72
10-yr	3.51	12.67	33,245	2.13
25-yr	4.22	16.25	42,943	2.76
50-yr	4.82	19.29	51,299	3.29
100-yr	**5.46**	**22.52**	**60,326**	**3.87**

APPENDIX B:
PROPOSED CONDITIONS CALCULATIONS



Routing Diagram for 765295 - HYDROCAD
Prepared by CESO, Inc, Printed 5/14/2025

Summary for Subcatchment 2.W: PDA-WEST

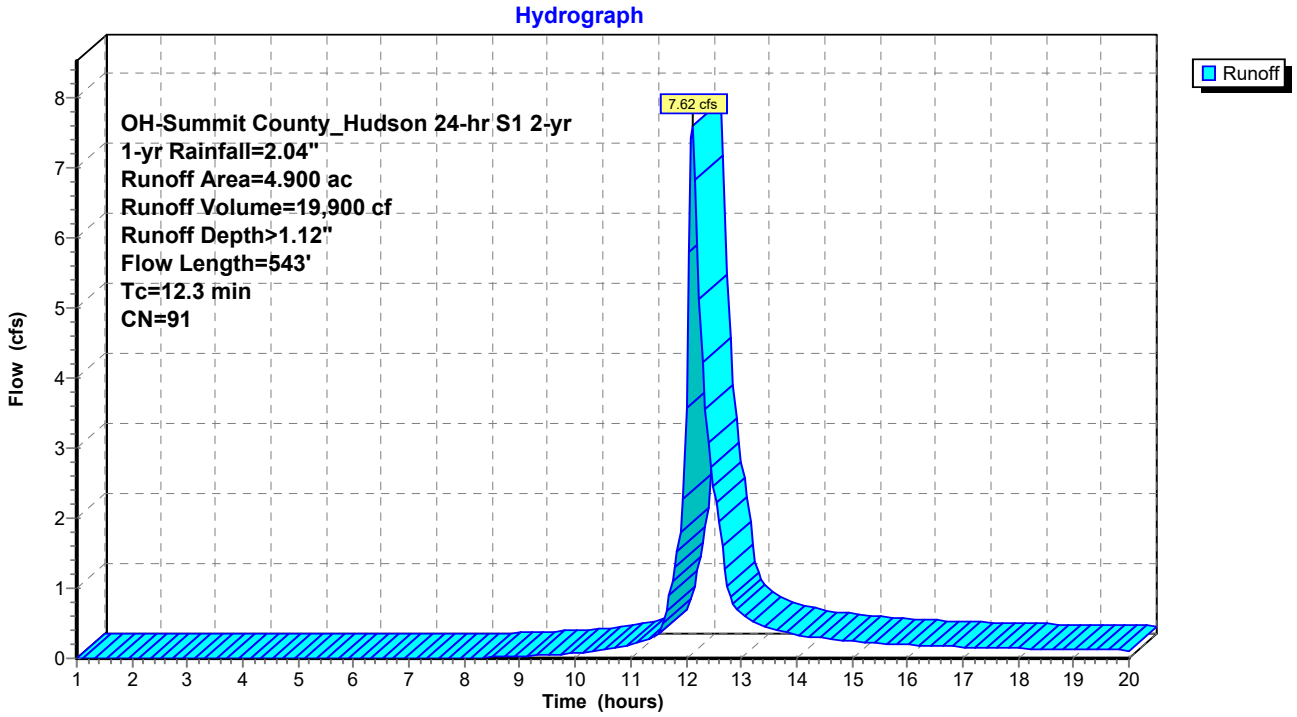
Runoff = 7.62 cfs @ 12.12 hrs, Volume= 19,900 cf, Depth> 1.12"
Routed to Pond 4 : POND

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
*	1.020	95	Permeable Turf Field, HSG D
	2.080	84	50-75% Grass cover, Fair, HSG D
	1.800	98	Paved parking, HSG D
	4.900	91	Weighted Average
	3.100		63.27% Pervious Area
	1.800		36.73% 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 = 213,444 sf, 36.73% Impervious, Inflow Depth > 1.12" for 1-yr event
Inflow = 7.62 cfs @ 12.12 hrs, Volume= 19,900 cf
Outflow = 2.04 cfs @ 12.59 hrs, Volume= 12,091 cf, Atten= 73%, Lag= 27.7 min
Primary = 2.04 cfs @ 12.59 hrs, Volume= 12,091 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= 1,010.64' @ 12.59 hrs Surf.Area= 8,169 sf Storage= 10,563 cf

Plug-Flow detention time= 132.3 min calculated for 12,060 cf (61% of inflow)
Center-of-Mass det. time= 68.7 min (852.6 - 783.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	44,483 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

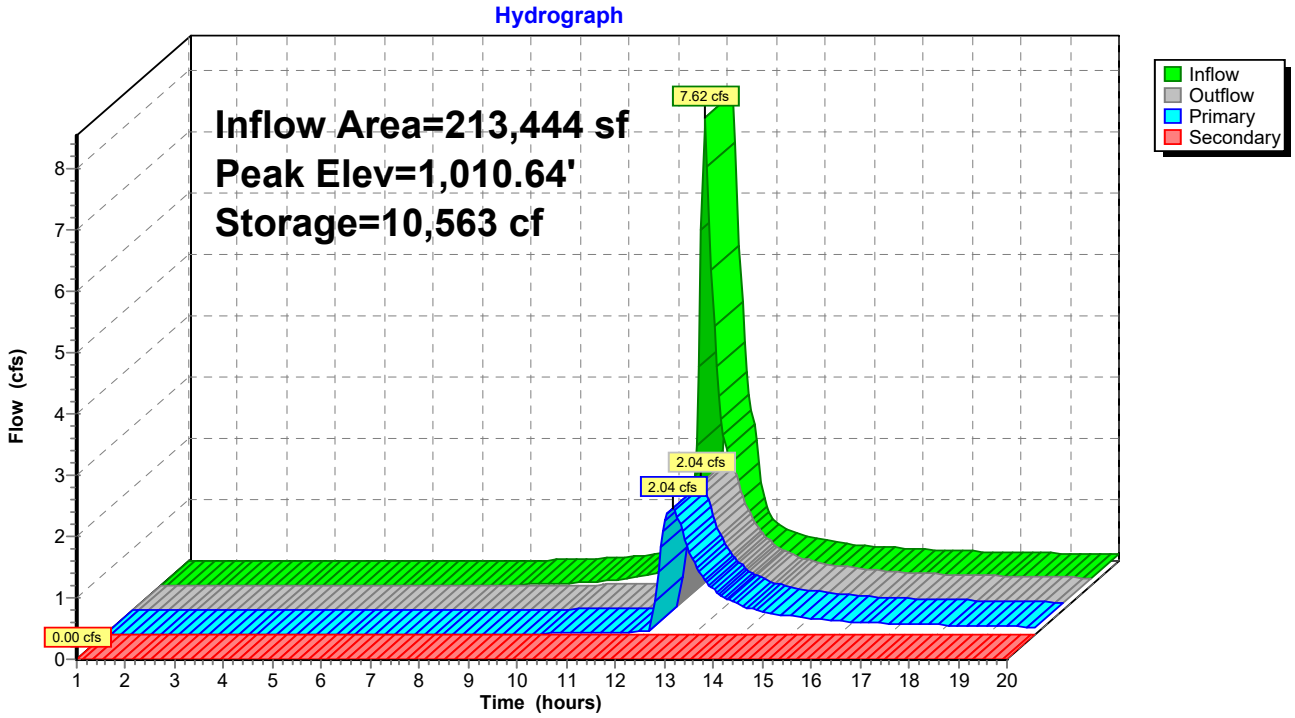
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	6,536	100.0	4,692	5,831
1,011.00	9,073	100.0	7,805	13,636
1,012.00	11,663	100.0	10,368	24,004
1,013.00	14,311	100.0	12,987	36,991
1,013.50	15,658	100.0	7,492	44,483

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	1,012.80'	**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	1,011.80'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.25'	**30.0" W x 5.0" H Vert. WQV Window** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.04 cfs @ 12.59 hrs HW=1,010.64' (Free Discharge)
└─**4=Outlet** (Passes 2.04 cfs of 11.71 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.06 cfs @ 7.75 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Controls 0.00 cfs)
  └─**6=WQV Window** (Orifice Controls 1.98 cfs @ 2.01 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

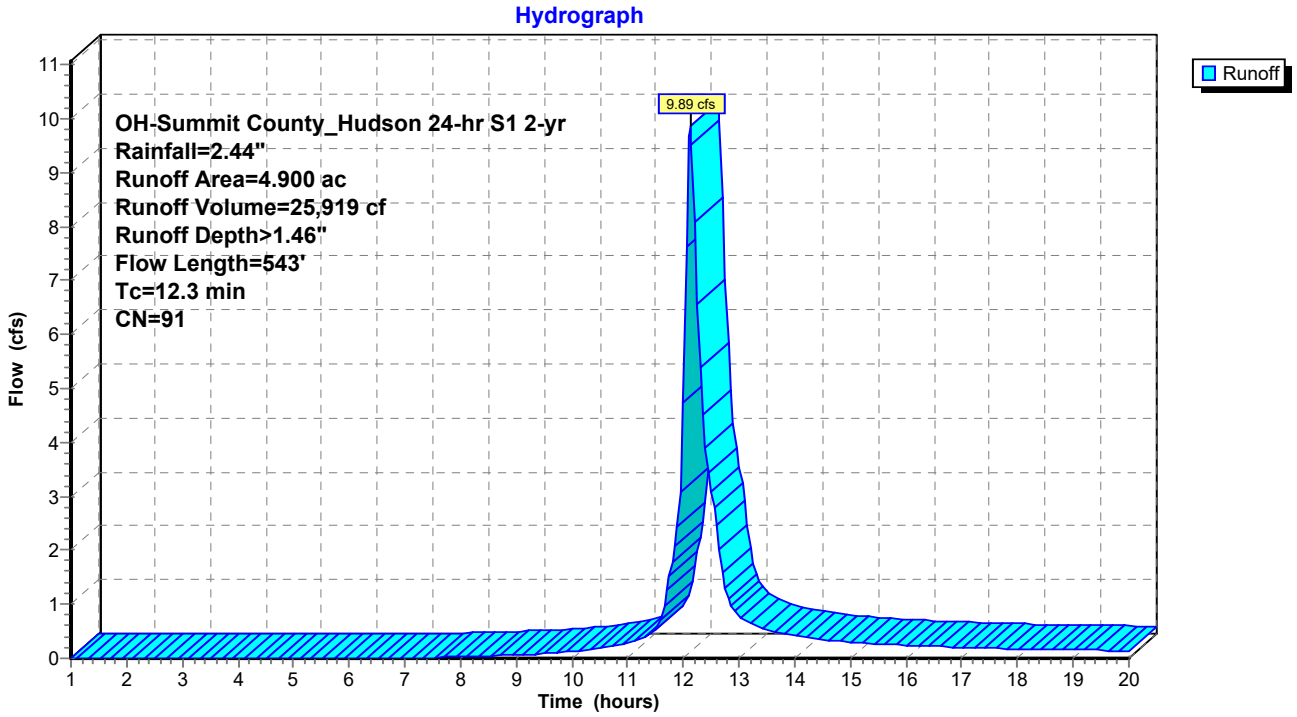
Runoff = 9.89 cfs @ 12.12 hrs, Volume= 25,919 cf, Depth> 1.46"
Routed to Pond 4 : POND

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
*	1.020	95	Permeable Turf Field, HSG D
	2.080	84	50-75% Grass cover, Fair, HSG D
	1.800	98	Paved parking, HSG D
	4.900	91	Weighted Average
	3.100		63.27% Pervious Area
	1.800		36.73% 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 = 213,444 sf, 36.73% Impervious, Inflow Depth > 1.46" for 2-yr event
Inflow = 9.89 cfs @ 12.12 hrs, Volume= 25,919 cf
Outflow = 3.23 cfs @ 12.48 hrs, Volume= 18,014 cf, Atten= 67%, Lag= 21.6 min
Primary = 3.23 cfs @ 12.48 hrs, Volume= 18,014 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= 1,010.87' @ 12.48 hrs Surf.Area= 8,731 sf Storage= 12,436 cf

Plug-Flow detention time= 114.0 min calculated for 18,014 cf (70% of inflow)
Center-of-Mass det. time= 55.2 min (833.9 - 778.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	44,483 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

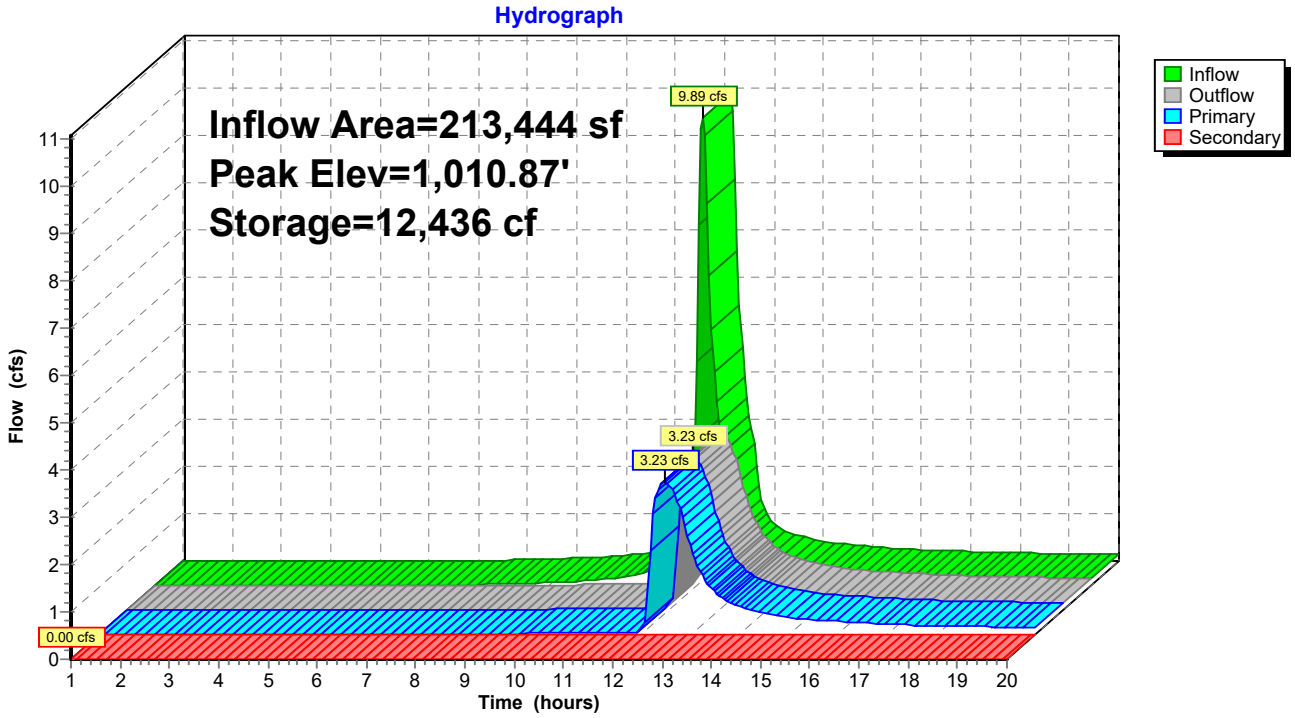
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	6,536	100.0	4,692	5,831
1,011.00	9,073	100.0	7,805	13,636
1,012.00	11,663	100.0	10,368	24,004
1,013.00	14,311	100.0	12,987	36,991
1,013.50	15,658	100.0	7,492	44,483

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	1,012.80'	**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	1,011.80'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.25'	**30.0" W x 5.0" H Vert. WQV Window** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.22 cfs @ 12.48 hrs HW=1,010.86' (Free Discharge)
└─**4=Outlet** (Passes 3.22 cfs of 12.37 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.06 cfs @ 8.08 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Controls 0.00 cfs)
  └─**6=WQV Window** (Orifice Controls 3.16 cfs @ 3.03 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

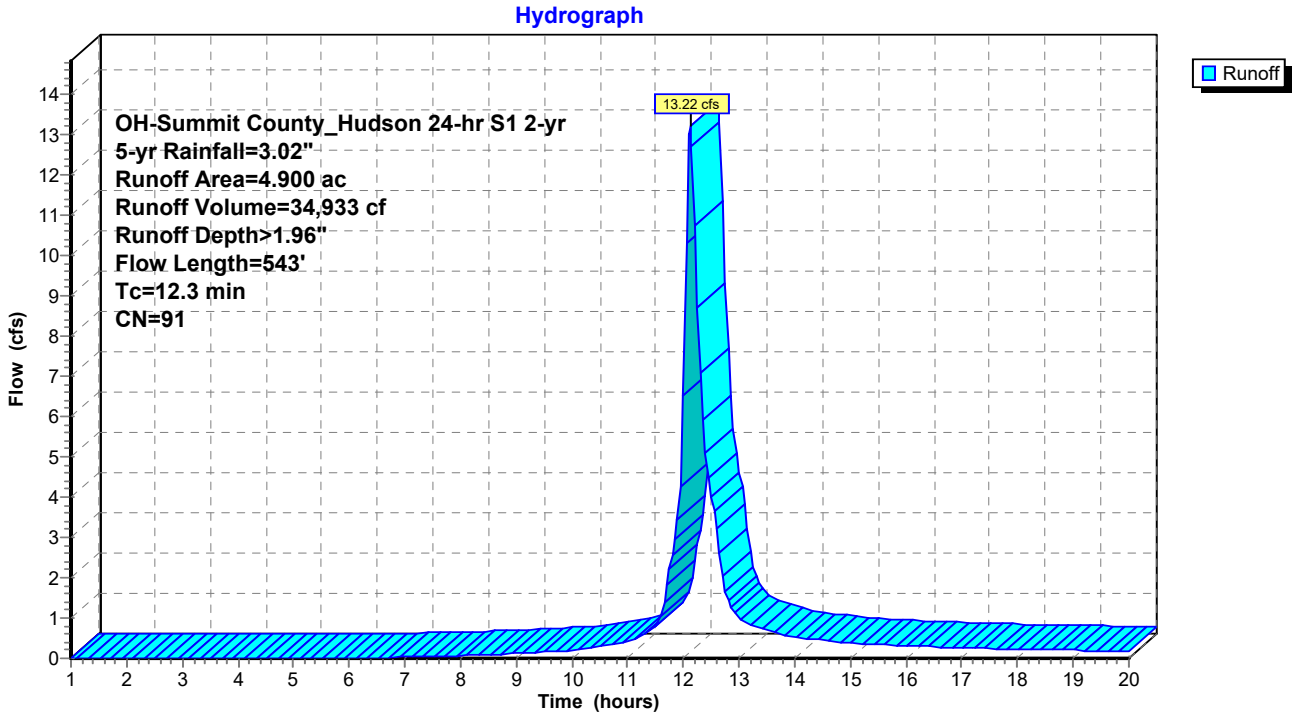
Runoff = 13.22 cfs @ 12.12 hrs, Volume= 34,933 cf, Depth> 1.96"
Routed to Pond 4 : POND

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
*	1.020	95	Permeable Turf Field, HSG D
	2.080	84	50-75% Grass cover, Fair, HSG D
	1.800	98	Paved parking, HSG D
	4.900	91	Weighted Average
	3.100		63.27% Pervious Area
	1.800		36.73% 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 = 213,444 sf, 36.73% Impervious, Inflow Depth > 1.96" for 5-yr event
Inflow = 13.22 cfs @ 12.12 hrs, Volume= 34,933 cf
Outflow = 4.52 cfs @ 12.45 hrs, Volume= 26,925 cf, Atten= 66%, Lag= 19.8 min
Primary = 4.52 cfs @ 12.45 hrs, Volume= 26,925 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= 1,011.25' @ 12.45 hrs Surf.Area= 9,727 sf Storage= 16,009 cf

Plug-Flow detention time= 101.4 min calculated for 26,854 cf (77% of inflow)
Center-of-Mass det. time= 49.8 min (822.4 - 772.6)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	44,483 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

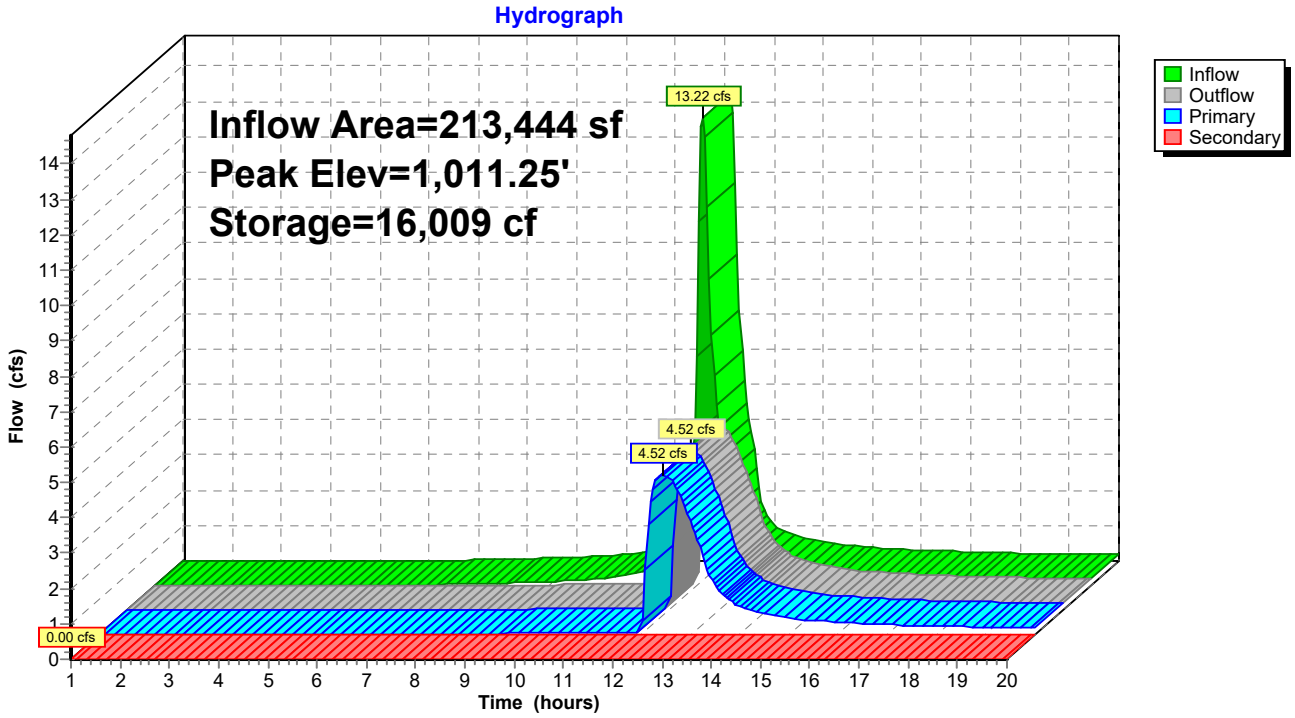
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	6,536	100.0	4,692	5,831
1,011.00	9,073	100.0	7,805	13,636
1,012.00	11,663	100.0	10,368	24,004
1,013.00	14,311	100.0	12,987	36,991
1,013.50	15,658	100.0	7,492	44,483

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	1,012.80'	**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	1,011.80'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.25'	**30.0" W x 5.0" H Vert. WQV Window** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.52 cfs @ 12.45 hrs HW=1,011.25' (Free Discharge)
└**4=Outlet** (Passes 4.52 cfs of 13.46 cfs potential flow)
  ├**1=Water Quality Orifice** (Orifice Controls 0.07 cfs @ 8.62 fps)
  ├**3=Rim** (Controls 0.00 cfs)
  ├**5=Window** (Controls 0.00 cfs)
  └**6=WQV Window** (Orifice Controls 4.46 cfs @ 4.28 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

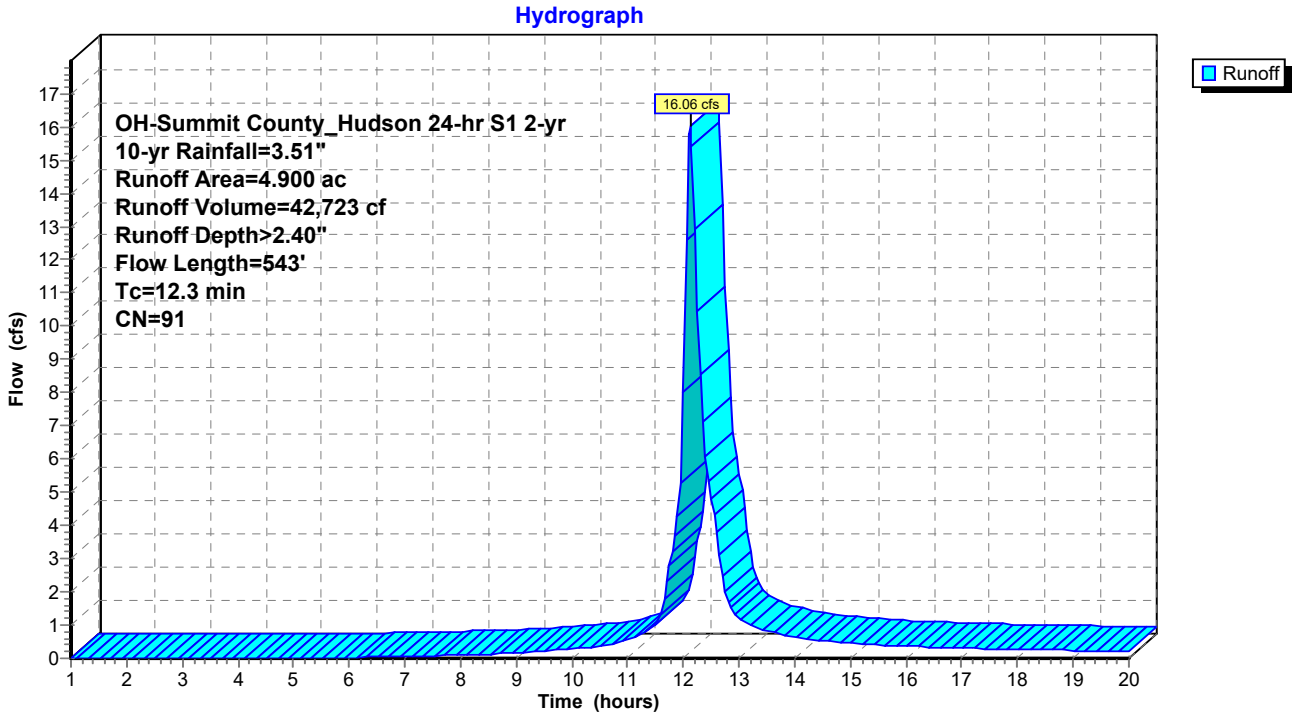
Runoff = 16.06 cfs @ 12.12 hrs, Volume= 42,723 cf, Depth> 2.40"
Routed to Pond 4 : POND

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
*	1.020	95	Permeable Turf Field, HSG D
	2.080	84	50-75% Grass cover, Fair, HSG D
	1.800	98	Paved parking, HSG D
	4.900	91	Weighted Average
	3.100		63.27% Pervious Area
	1.800		36.73% 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 = 213,444 sf, 36.73% Impervious, Inflow Depth > 2.40" for 10-yr event
Inflow = 16.06 cfs @ 12.12 hrs, Volume= 42,723 cf
Outflow = 5.39 cfs @ 12.45 hrs, Volume= 34,644 cf, Atten= 66%, Lag= 19.9 min
Primary = 5.39 cfs @ 12.45 hrs, Volume= 34,644 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= 1,011.58' @ 12.45 hrs Surf.Area= 10,588 sf Storage= 19,387 cf

Plug-Flow detention time= 96.8 min calculated for 34,553 cf (81% of inflow)
Center-of-Mass det. time= 49.8 min (818.2 - 768.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	44,483 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

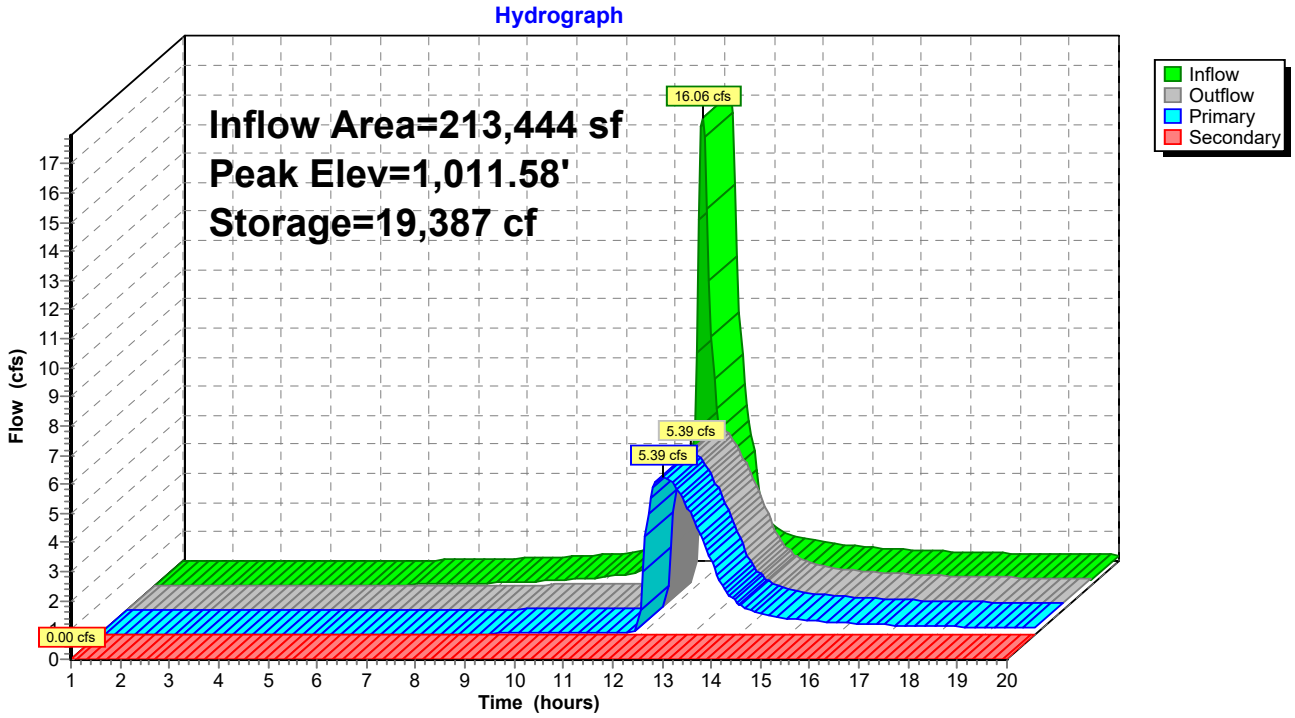
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	6,536	100.0	4,692	5,831
1,011.00	9,073	100.0	7,805	13,636
1,012.00	11,663	100.0	10,368	24,004
1,013.00	14,311	100.0	12,987	36,991
1,013.50	15,658	100.0	7,492	44,483

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	1,012.80'	**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	1,011.80'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.25'	**30.0" W x 5.0" H Vert. WQV Window** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.39 cfs @ 12.45 hrs HW=1,011.58' (Free Discharge)
└─**4=Outlet** (Passes 5.39 cfs of 14.33 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.07 cfs @ 9.05 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Controls 0.00 cfs)
  └─**6=WQV Window** (Orifice Controls 5.32 cfs @ 5.10 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

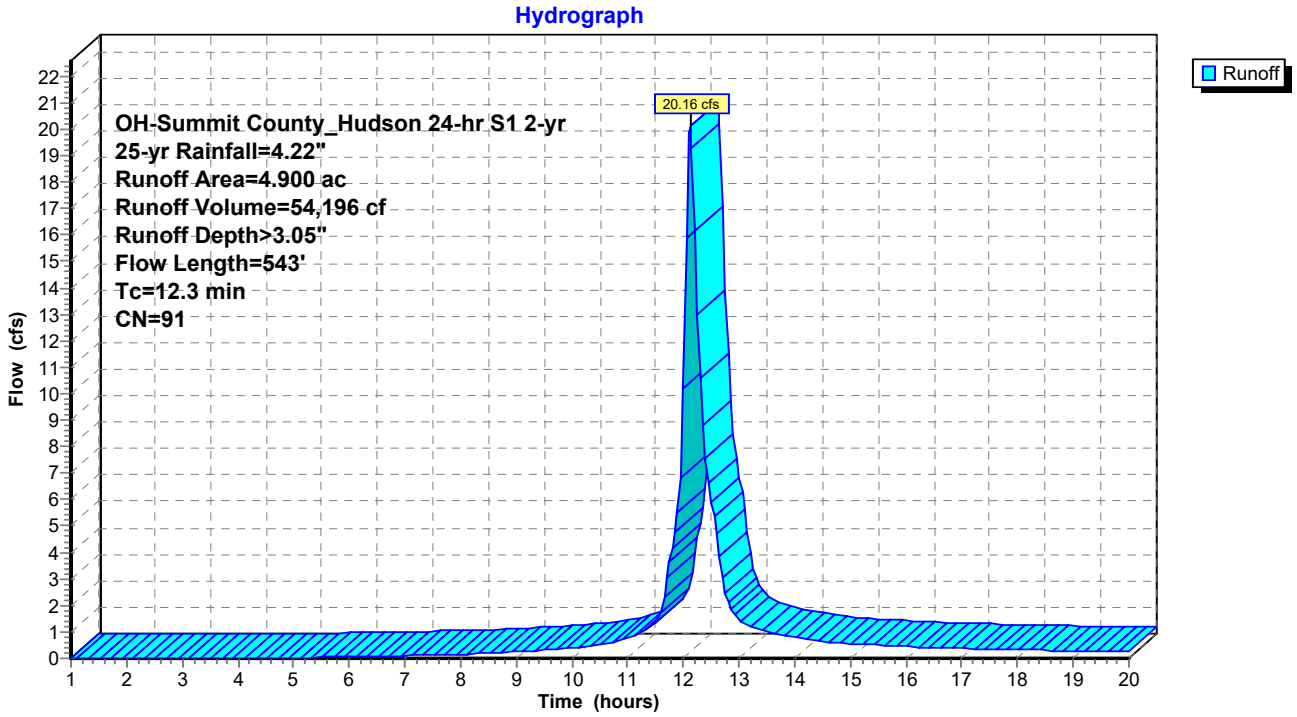
Runoff = 20.16 cfs @ 12.12 hrs, Volume= 54,196 cf, Depth> 3.05"
Routed to Pond 4 : POND

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 25-yr Rainfall=4.22"

	Area (ac)	CN	Description
*	1.020	95	Permeable Turf Field, HSG D
	2.080	84	50-75% Grass cover, Fair, HSG D
	1.800	98	Paved parking, HSG D
	4.900	91	Weighted Average
	3.100		63.27% Pervious Area
	1.800		36.73% 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 = 213,444 sf, 36.73% Impervious, Inflow Depth > 3.05" for 25-yr event
Inflow = 20.16 cfs @ 12.12 hrs, Volume= 54,196 cf
Outflow = 7.37 cfs @ 12.41 hrs, Volume= 46,014 cf, Atten= 63%, Lag= 17.7 min
Primary = 7.37 cfs @ 12.41 hrs, Volume= 46,014 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= 1,011.99' @ 12.41 hrs Surf.Area= 11,642 sf Storage= 23,911 cf

Plug-Flow detention time= 92.2 min calculated for 45,893 cf (85% of inflow)
Center-of-Mass det. time= 50.6 min (813.9 - 763.3)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	44,483 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

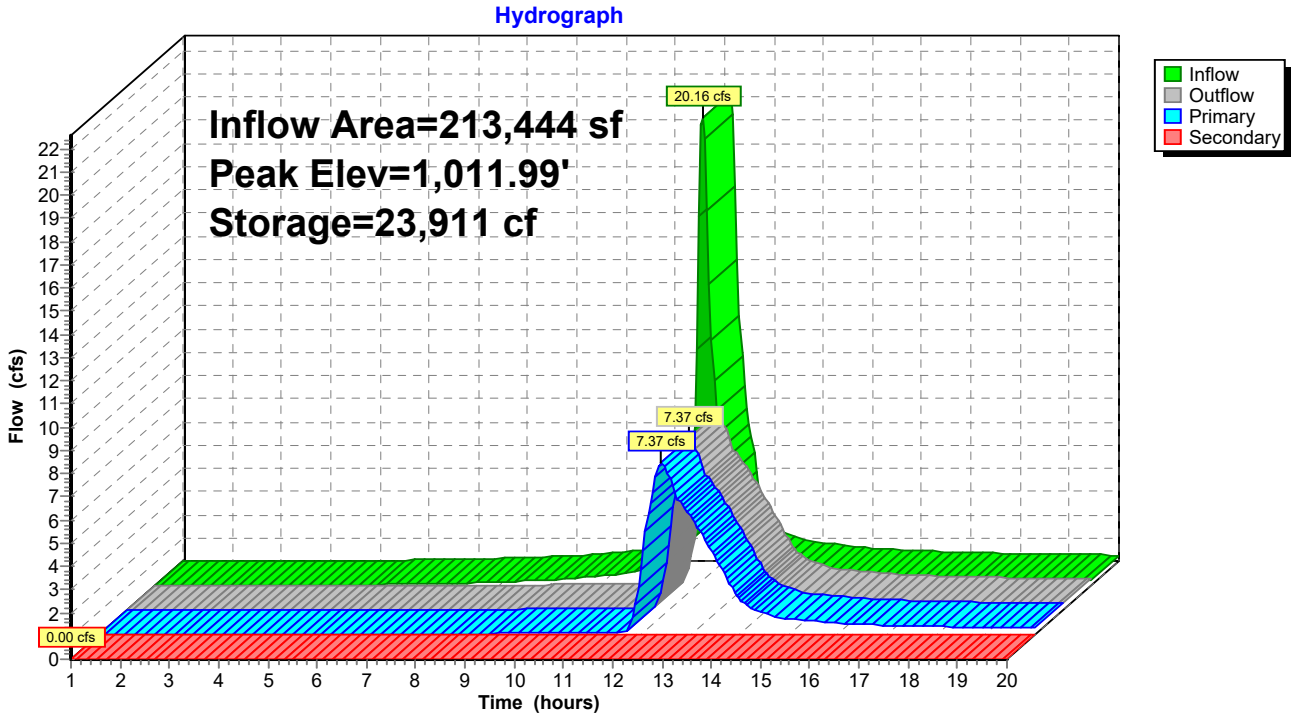
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	6,536	100.0	4,692	5,831
1,011.00	9,073	100.0	7,805	13,636
1,012.00	11,663	100.0	10,368	24,004
1,013.00	14,311	100.0	12,987	36,991
1,013.50	15,658	100.0	7,492	44,483

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	1,012.80'	**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	1,011.80'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.25'	**30.0" W x 5.0" H Vert. WQV Window** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.34 cfs @ 12.41 hrs HW=1,011.99' (Free Discharge)
└─**4=Outlet** (Passes 7.34 cfs of 15.32 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.08 cfs @ 9.56 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Orifice Controls 1.07 cfs @ 1.40 fps)
  └─**6=WQV Window** (Orifice Controls 6.20 cfs @ 5.96 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

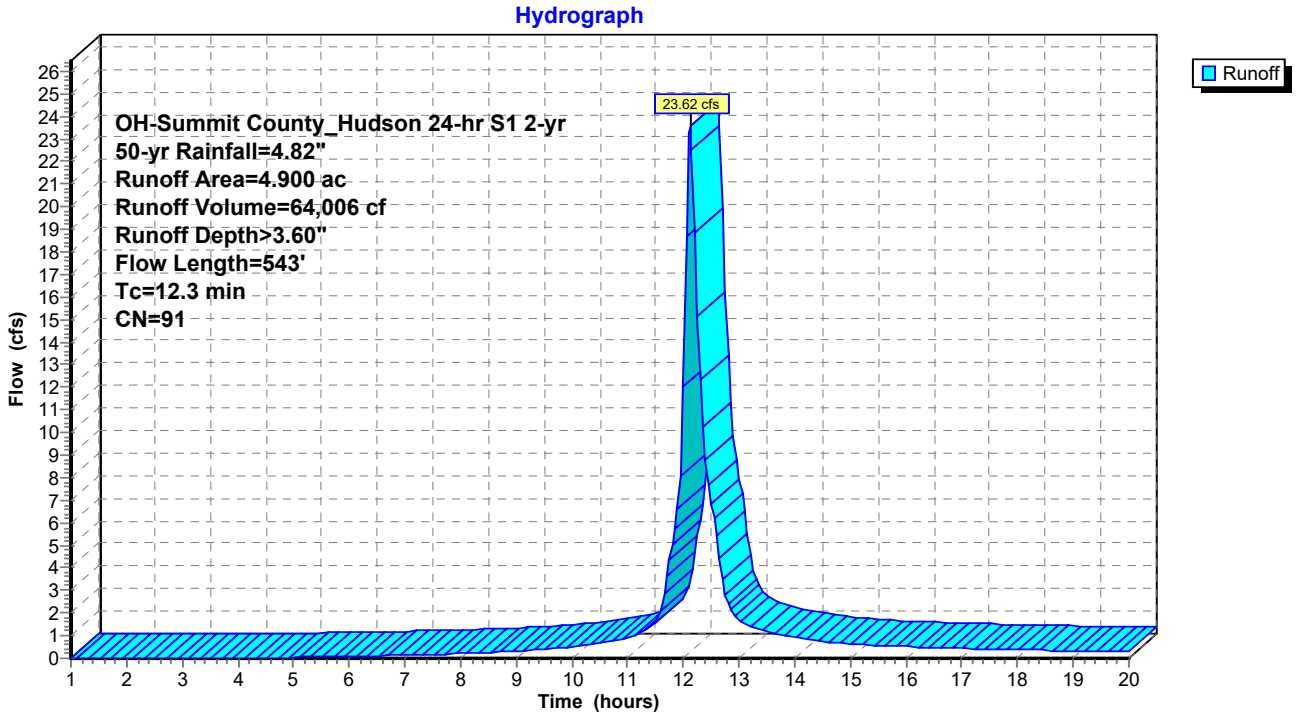
Runoff = 23.62 cfs @ 12.12 hrs, Volume= 64,006 cf, Depth> 3.60"
Routed to Pond 4 : POND

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
*	1.020	95	Permeable Turf Field, HSG D
	2.080	84	50-75% Grass cover, Fair, HSG D
	1.800	98	Paved parking, HSG D
	4.900	91	Weighted Average
	3.100		63.27% Pervious Area
	1.800		36.73% 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 = 213,444 sf, 36.73% Impervious, Inflow Depth > 3.60" for 50-yr event
Inflow = 23.62 cfs @ 12.12 hrs, Volume= 64,006 cf
Outflow = 9.90 cfs @ 12.36 hrs, Volume= 55,739 cf, Atten= 58%, Lag= 14.8 min
Primary = 9.90 cfs @ 12.36 hrs, Volume= 55,739 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= 1,012.22' @ 12.36 hrs Surf.Area= 12,248 sf Storage= 26,647 cf

Plug-Flow detention time= 87.3 min calculated for 55,593 cf (87% of inflow)
Center-of-Mass det. time= 49.4 min (809.1 - 759.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	44,483 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

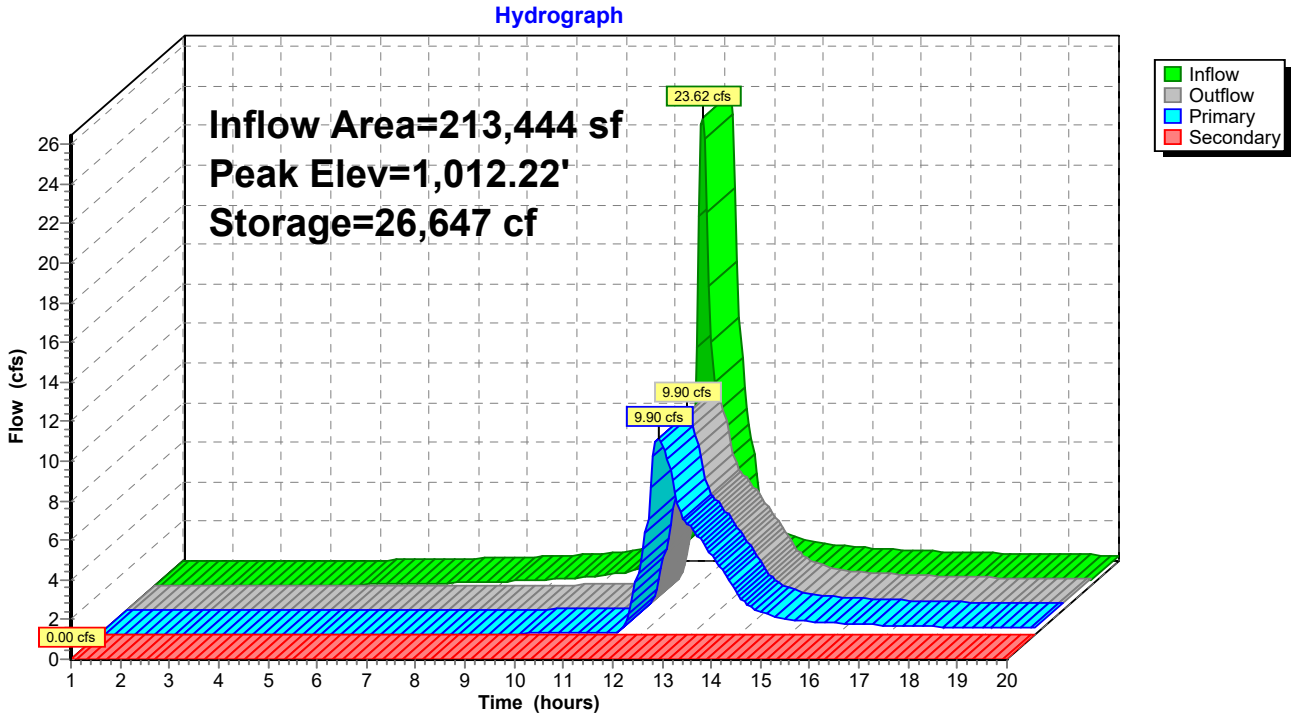
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	6,536	100.0	4,692	5,831
1,011.00	9,073	100.0	7,805	13,636
1,012.00	11,663	100.0	10,368	24,004
1,013.00	14,311	100.0	12,987	36,991
1,013.50	15,658	100.0	7,492	44,483

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	1,012.80'	**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	1,011.80'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.25'	**30.0" W x 5.0" H Vert. WQV Window** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=9.88 cfs @ 12.36 hrs HW=1,012.22' (Free Discharge)
└─**4=Outlet** (Passes 9.88 cfs of 15.85 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.08 cfs @ 9.83 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Orifice Controls 3.16 cfs @ 2.37 fps)
  └─**6=WQV Window** (Orifice Controls 6.65 cfs @ 6.38 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

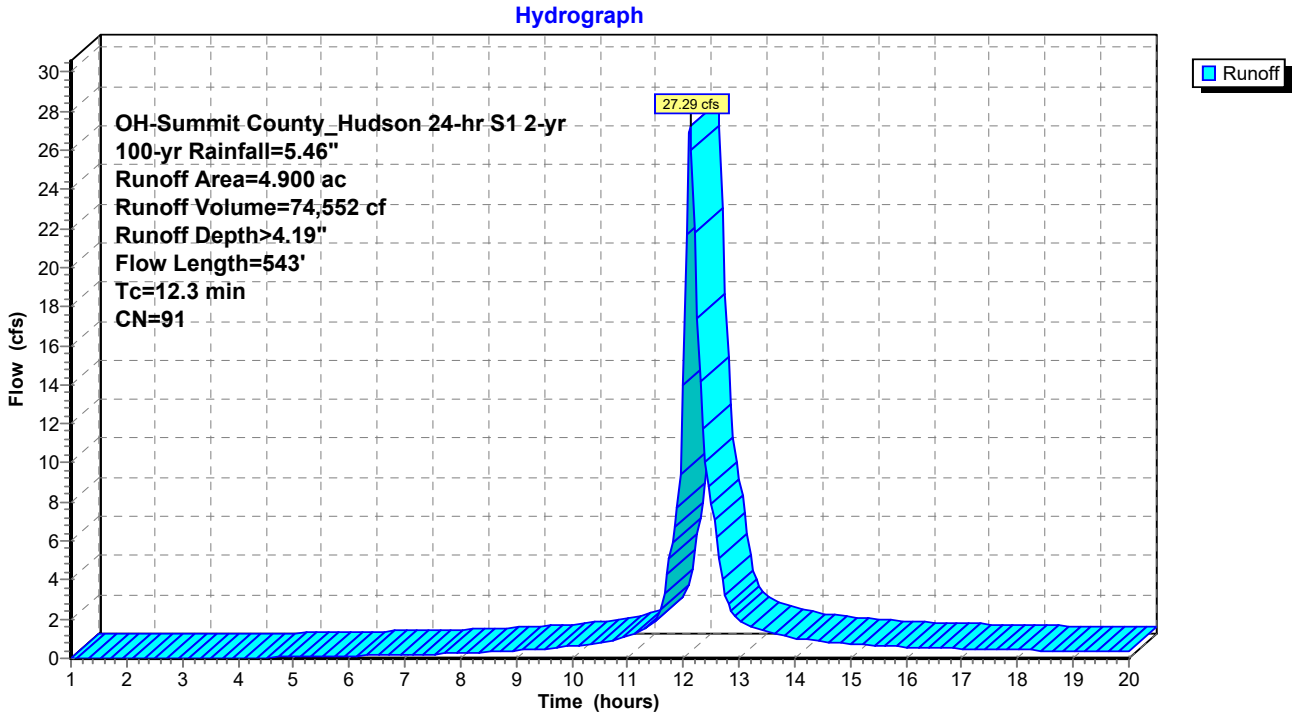
Runoff = 27.29 cfs @ 12.12 hrs, Volume= 74,552 cf, Depth> 4.19"
Routed to Pond 4 : POND

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 100-yr Rainfall=5.46"

	Area (ac)	CN	Description
*	1.020	95	Permeable Turf Field, HSG D
	2.080	84	50-75% Grass cover, Fair, HSG D
	1.800	98	Paved parking, HSG D
	4.900	91	Weighted Average
	3.100		63.27% Pervious Area
	1.800		36.73% 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 = 213,444 sf, 36.73% Impervious, Inflow Depth > 4.19" for 100-yr event
Inflow = 27.29 cfs @ 12.12 hrs, Volume= 74,552 cf
Outflow = 11.66 cfs @ 12.36 hrs, Volume= 66,197 cf, Atten= 57%, Lag= 14.4 min
Primary = 11.66 cfs @ 12.36 hrs, Volume= 66,197 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= 1,012.46' @ 12.36 hrs Surf.Area= 12,881 sf Storage= 29,649 cf

Plug-Flow detention time= 83.4 min calculated for 66,024 cf (89% of inflow)
Center-of-Mass det. time= 48.7 min (805.1 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1	1,008.00'	44,483 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

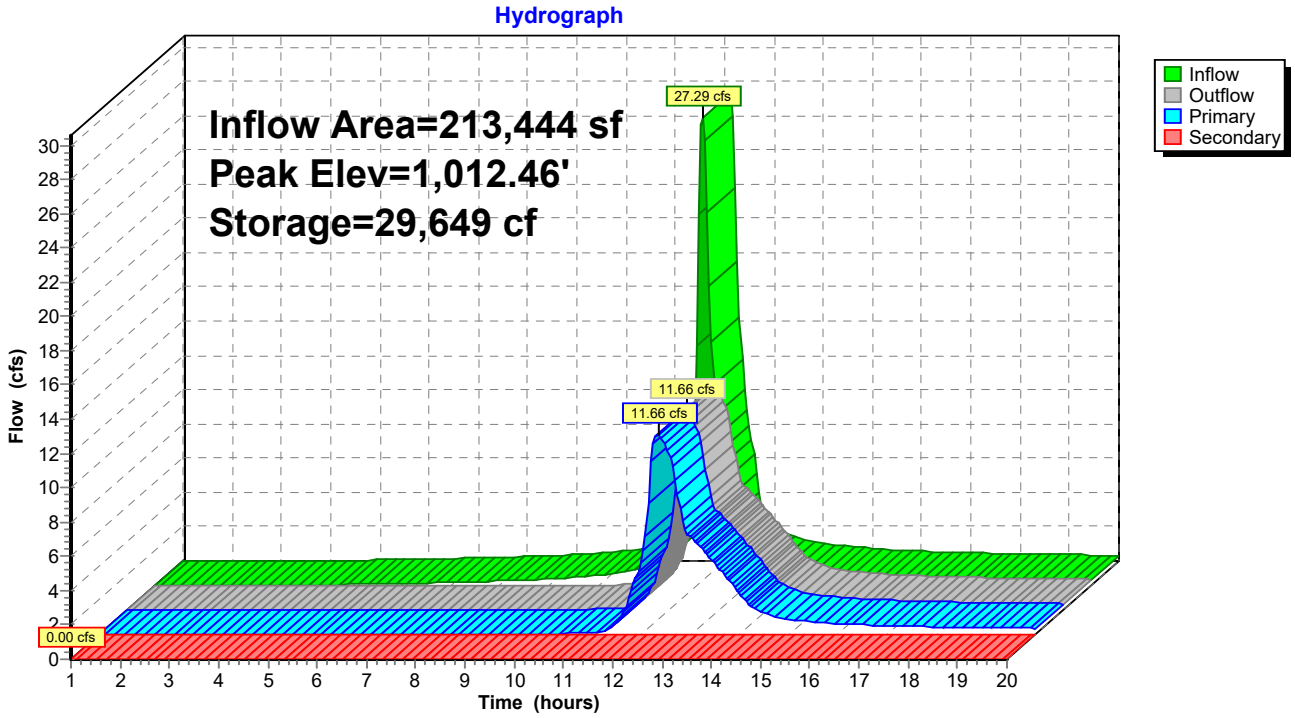
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,008.00	2,848	0.0	0	0
1,009.00	2,848	40.0	1,139	1,139
1,010.00	6,536	100.0	4,692	5,831
1,011.00	9,073	100.0	7,805	13,636
1,012.00	11,663	100.0	10,368	24,004
1,013.00	14,311	100.0	12,987	36,991
1,013.50	15,658	100.0	7,492	44,483

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	1,012.80'	**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	1,011.80'	**48.0" W x 4.0" H Vert. Window** C= 0.600 Limited to weir flow at low heads
#6	Device 4	1,010.25'	**30.0" W x 5.0" H Vert. WQV Window** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=11.65 cfs @ 12.36 hrs HW=1,012.46' (Free Discharge)
└─**4=Outlet** (Passes 11.65 cfs of 16.38 cfs potential flow)
  ├─**1=Water Quality Orifice** (Orifice Controls 0.08 cfs @ 10.11 fps)
  ├─**3=Rim** (Controls 0.00 cfs)
  ├─**5=Window** (Orifice Controls 4.48 cfs @ 3.36 fps)
  └─**6=WQV Window** (Orifice Controls 7.09 cfs @ 6.81 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



Events for Subcatchment 2.W: PDA-WEST

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
1-yr	2.04	7.62	19,900	1.12
2-yr	2.44	9.89	25,919	1.46
5-yr	3.02	13.22	34,933	1.96
10-yr	3.51	16.06	42,723	2.40
25-yr	4.22	20.16	54,196	3.05
50-yr	4.82	23.62	64,006	3.60
100-yr	**5.46**	**27.29**	**74,552**	**4.19**

Events for Pond 4: POND

Event	Inflow (cfs)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-yr	7.62	2.04	2.04	**0.00**	1,010.64	10,563
2-yr	9.89	3.23	3.23	0.00	1,010.87	12,436
5-yr	13.22	4.52	4.52	0.00	1,011.25	16,009
10-yr	16.06	5.39	5.39	0.00	1,011.58	19,387
25-yr	20.16	7.37	7.37	0.00	1,011.99	23,911
50-yr	23.62	9.90	9.90	0.00	1,012.22	26,647
100-yr	**27.29**	**11.66**	**11.66**	0.00	**1,012.46**	**29,649**

APPENDIX B1:
STORMWATER QUALITY CALCULATIONS

Post-Construction Water Quality Volume
As Required Under Ohio NPDES Construction General Permit No. OHC000006

version 1.2 2023-5-15

This spreadsheet calculates the Water Quality Volume required for both new development and redevelopment projects. Green boxes indicate user input for 1) the total area disturbed, 2) planned total impervious surface and, if redevelopment, 3) total existing impervious surface, each in acres. The user must select new or redevelopment from the dropdown menu to apply the proper equation. Use the separate BMP Compliance Spreadsheets to verify a designed practice or combination of practices meets the applicable requirements including the required Water Quality Volume calculated here. This spreadsheet does not account for factors that may affect the final practice design, including offsite run-on or sediment storage volume.

Project Details

Project Name:	**Christ Community Chapel**		
Project ID:			
Project Location:	**750 W Streetsboro St** **Hudson, OH 44236**		
Project Latitude:	**41.23116**	**Longitude:**	**-81.48405**
NPDES Permit Applicant:			
Submitted By:	**5/19/2025**		
Date:	**5/14/2025**		

Required Water Quality Volume Calculation

Total Disturbed Area, A = **3.930** **acres**

Type of Development: Redevelopment

Water Quality Volume Equation: WQvr = 0.90 in. * A * [(Rv1*0.2)+(Rv2-Rv1)] / 12 [Equation 3]
where, Rv = 0.05 + 0.9(i)

PRE-CONSTRUCTION CONDITIONS		PROPOSED POST-CONSTRUCTION CONDITIONS	
Ex. Impervious Surface =	**0.100** **acres**	**Total Impervious Surface Area =**	**1.740** **acres**
Ex. Impervious Fraction, i =	**0.025**	**Impervious Fraction, i =**	**0.443**
Rv1 =	**0.073**	**Volumetric Runoff Coefficient, Rv2 =**	**0.448**
		ΔRv =	**515 %**

Water Quality Volume, WQv = **0.115 ac-ft** **=** **5,009 cu. ft.**

Message Center: *The minimum impervious area to treat with a practice is 1.614 acres*

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:	5/14/2025				
Subwatershed Drainage Area, A_{total} =	5.00	acres	=	217,800	ft2
Subwatershed Impervious Area, A_{imp} =	2.82	acres	=	122,839	ft2
Imperviousness fraction, i =	0.56			56	%
Water Quality Volume, WQv =	9,108	ft^3	=	0.21	ac-ft

Step 1 - Soil Suitability

Soil Series		HSG	D

Step 2 - Dry ED Basin Volume Requirements

Extended Detention Volume, EDv =	9108	ft^3
Minimum Sediment Storage Volume, $V_{sediment}$ =	1822	ft^3
Minimum Forebay Volume, $V_{forebay}$ =	911	ft^3
Minimum Permanent Micropool Volume, $V_{micropool}$ =	911	ft^3

Step 3 - Basin Stage-Storage Relationship

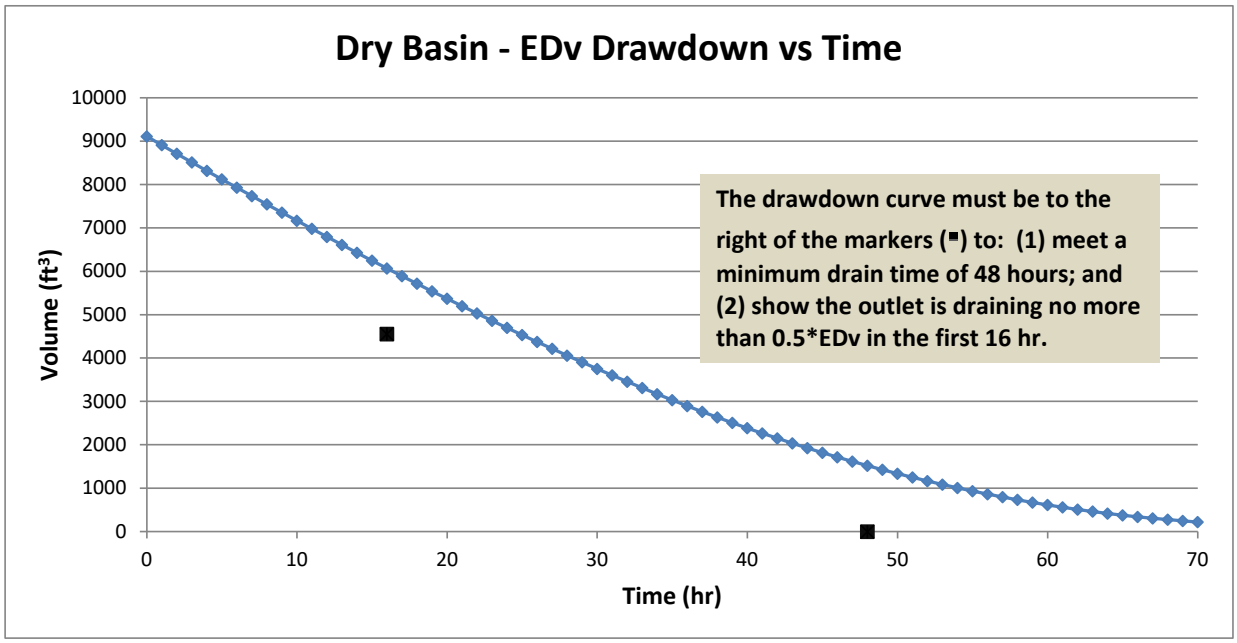
	Elevation ft	Area ft^2		Incremental Volume ft^3	Cumulative Volume ft^3
Bottom of Permanent Micropool =	1008.00	2,848			
(include forebay area if below EDv)	1009.00	2,848		2,848	2,848
	1010.00	6,536		4,566	7,414
	1011.00	9,073		7,770	15,184
	1012.00	11,663		10,341	25,525
	1013.00	14,311		12,964	38,489
	1013.50	15,658		7,490	45,979

Step 4 - Outlet Elevations and Storage Volumes

WQ Orifice Invert Elevation =	1008.00				
Elevation of Top of EDv =	1010.25				
Secondary Outlet Invert Elevation =	1011.75				OKAY
WQ Treatment Volume Provided, $V_{treatment}$ =	22,694	ft^3			
Treatment Vol Provided Relative to EDv, $V_{treatment}/EDv$ =	2.49		=	249%	OKAY
Permanent Pool Volume Provided, PPv =	0	ft^3			
Forebay Volume Provided, $V_{forebay}$ =	0	ft^3	=	0.00	
Is forebay volume below WQ outlet? (Yes or No)	No		=	0%	NOT MET
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, $V_{sediment}$ =	0	ft^3			
Ratio $V_{sediment}$ Provided to $V_{sediment}$ Required =	0.00		=	0%	NOT MET

Step 5 - Outlet (Orifice) Sizing

Maximum Hydraulic Head, Hmax =	2.25	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} =	1.13	ft			
Estimated Orifice Area, $A_{orifice}$ =	1.49	in^2	=	0.010	ft^2
Estimated Orifice Diameter, $D_{orifice}$ =	1.38	in	=	0.11	ft
Design Orifice Diameter, $D_{orifice}$ =	1.20	in	=	0.10	ft
Design Orifice Area, $A_{orifice}$ =	1.12	in^2	=	0.008	ft^2
Time to Completely Drain EDv, T_d =	>72	hr	must be ≥ 48 hr		OKAY
Volume Drained in First 16 hr =	3,042	ft^3			
% of EDv =	33.4	%	must be ≤ 50%		OKAY



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	33.236	18	1.50	0.52	1.32	4.03	12.88	1009.50	1010.00	1010.08	1011.71	1010.77	1014.95	Comb.	0.30	5.43	3.45	7.4	
2	104	58.165	15	1.00	0.06	0.80	2.35	6.45	1010.00	1010.58	1010.77	1014.95	1011.19 j	1014.25	Comb.	0.10	3.46	2.42	6.9	
3	24	55.426	15	1.01	0.06	0.74	2.29	6.49	1010.58	1011.14	1011.19	1014.25	1011.75 j	1014.44	Comb.	0.10	3.86	2.05	6.5	
4	25	52.202	15	1.00	0.55	0.68	2.23	6.44	1011.14	1011.66	1011.75	1014.44	1012.26 j	1015.25	Comb.	0.30	3.83	2.34	6.0	
5	26	25.304	12	0.99	0.13	0.13	0.33	3.54	1011.66	1011.91	1012.26	1015.25	1012.15	1015.75	Comb.	0.13	1.50	2.84	5.0	
6	27	29.000	24	0.52	0.10	0.57	11.61	16.27	1010.00	1010.15	1011.25	1012.71	1011.40	1013.89	Comb.	0.11	5.62	1.74	6.2	
7	28	164.000	24	0.50	0.13	0.47	11.50	15.99	1010.14	1010.96	1011.65	1013.89	1012.18	1014.88	Comb.	0.12	5.13	1.92	5.4	
8	148	95.991	24	0.50	0.34	0.34	11.24	15.99	1010.96	1011.44	1012.94	1014.88	1013.11	1014.69	Comb.	0.22	3.80	1.25	5.0	
9	150	7.012	18	12.26	0.00	0.00	10.50	36.77	1011.44	1012.30	1013.48	1014.69	1013.54	1016.41	MH	....	6.32	2.61	0.0	
10	153	34.919	15	9.99	0.10	0.10	0.14	20.41	1006.02	1009.51	1006.10	1017.08	1009.66	1019.50	Comb.	0.11	3.30	8.74	5.0	

Project File: stm.stm | Number of lines: 10 | Date: 5/9/2025

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

TOTAL EXISTING DRAINAGE AREA
A: 14.45 AC
CN: 92

EXISTING EAST AREA
A: 10.16 AC
CN: 92

EXISTING WEST AREA
A: 4.29 AC
CN: 88

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

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

STATE OF OHIO
ERIC LALONE
LA.2001534
REGISTERED
LANDSCAPE ARCHITECT
2025-03-14

SOL HARRIS/DAY ARCHITECTURE

CHRIST COMMUNITY CHAPEL

750 W. STREETSBORO STREET
HUDSON, OH 44236

Revisions / Submissions

ID	Description	Date

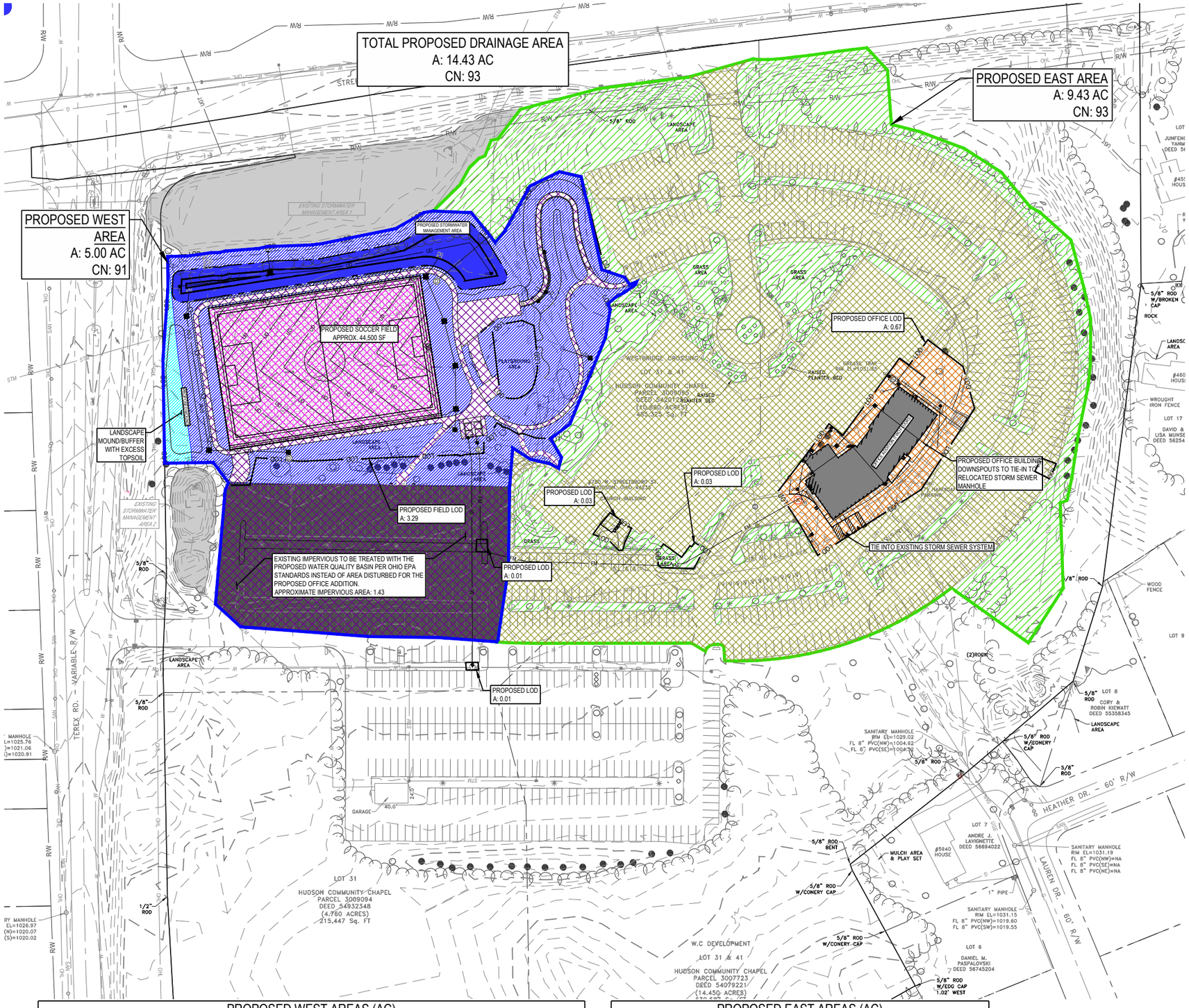
Project Number:	765295
Scale:	AS SHOWN
Drawn By:	JWH
Checked By:	JTK
Date:	5/19/2025
Issue:	PERMIT SET

Drawing Title:
EXISTING DRAINAGE PLAN

EDP

C:\DC\ACDocs\CESO\CCC - Hudson - Civil Master Plan Study\Project Files_CESO\03-CIVIL\DAT AIS\TM\765295 - EXISTING DA MAP.dwg - 5/9/2025 - Tommy Pillow

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	1.72	1.80	1.02	0.36	5.00

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	
2.87	5.82	0.67	9.36

FIELD LOD	3.29 AC
OFFICE LOD	0.67 AC
TOTAL LOD	3.96 AC

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

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

STATE OF OHIO
ERIC LALONE
LA.2001534
REGISTERED
LANDSCAPE ARCHITECT
2025-03-14

SOL HARRIS/DAY ARCHITECTURE

CHRIST COMMUNITY CHAPEL

750 W. STREETSBORO STREET
HUDSON, OH 44236

Revisions / Submissions

ID	Description	Date

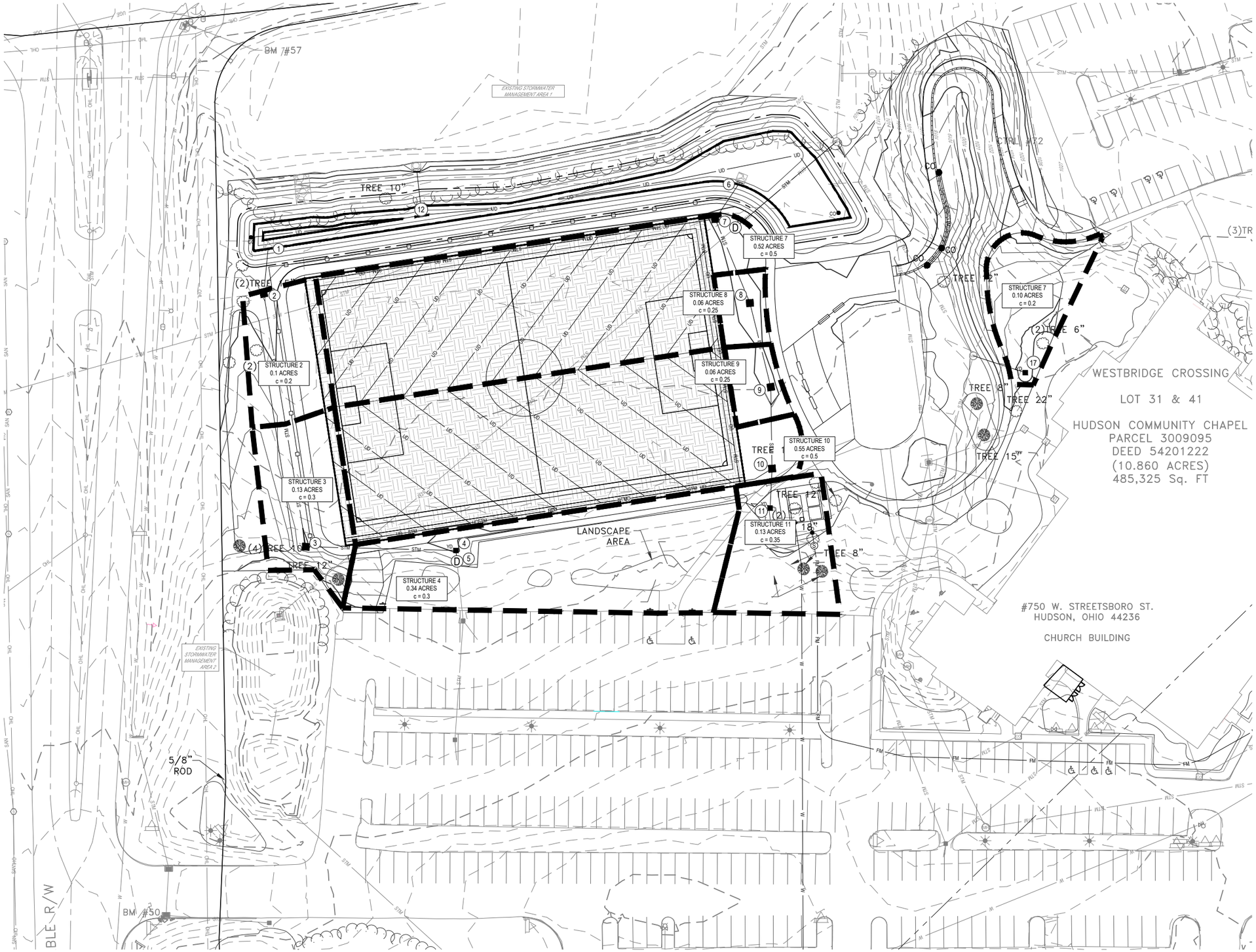
Project Number:	765295
Scale:	AS SHOWN
Drawn By:	JWH
Checked By:	JTK
Date:	5/19/2025
Issue:	PERMIT SET

Drawing Title:
PROPOSED DRAINAGE PLAN

PDP

C:\DC\ACCDocs\CESO\CCC - Hudson - Civil Master Plan Study\Project Files_CESO\03-CIVIL\DATA\STM\765295 - PROPOSED DA MAP.dwg - 5/14/2025 - Tommy Pitlow

APPENDIX E3:
TRIBUTARY DRAINAGE AREA MAP



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

STATE OF OHIO
ERIC LALONE
LA.2001534
REGISTERED
LANDSCAPE ARCHITECT
2025-03-14

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:	5/19/2025
Issue:	PERMIT SET

Drawing Title:
TRIBUTARY MAP

TRIB

C:\DC\ACCDocs\CESO\CCC - Hudson - Civil Master Plan Study\Project Files_CESO\03-CIVIL\DATA\STM\765295 - TRIBUTARY MAP.dwg - 5/14/2025 - Tommy Pitlow