Storm Water Management Calculations

For

Preserve of Hudson Townhomes

City of Hudson – Summit County - Ohio

CALCULATED BY:

POLARIS ENGINEERING & SURVEYING, INC.
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Contact: Kevin T. Hoffman, P.E.
October 21, 2024

Polaris Contract #24189

Table of Contents

Overview

This report analyses the Preserve of Hudson Townhome development. The property consists of approximately 12.54 Ac. located in the City of Hudson in Summit County. To comply with storm water detention and water quality requirements, the site will incorporate a storm water basin on the west side of the property. The SCS method was used to model the pre-developed and post-developed watersheds for the site. Water quality volume was calculated according to the provisions of OEPA storm water permit OHC000006.

Watershed Analysis

Pre-Development

The current condition for the site was determined to be classified as woods/grass combination. The onsite soils for the site are classified as Mahoning Silt Loam (MgB) and Mahoning Silt Loam (MgA) which are both classified under Hydraulic Soil Group D. The property currently slopes from east to west, where it eventually drains into existing wetlands at the south-west corner of the property. The on-site water flow is a part of the Mud Brook watershed. The resulting hydrograph renders a peak outflow of 6.86 CFS for a 1-year storm for the overall area. This area yields a total runoff volume of 35,273 CFS. See Appendix ‘A’ for pre-developed maps and calculations.

Post Development

Upon development of the property, approximately 16.80 Ac. will drain into the proposed storm sewer system and into the storm water management basin, that of which will drain out to the existing wetland location at the south-west of the property. Approximately 1.21 Ac. will bypass the existing basin due to the location of the on-site wetland. A total of 2.88 Ac. of impervious area will be added to the site, rendering a peak combined un-detained outflow of 12.25 CFS. This area yields a total runoff volume of 44,538 CF. See Appendix 'B' for post-developed maps and calculations.

Storm Water Basin Design

The storm water management (SWM) basin is sized according to the City of Hudson Drainage Criteria. The SWM basin is a wet extended water quality basin that has been designed to provide runoff attenuation and serve as a water quality BMP for the site. A multi-stage concrete outlet structure will be utilized to manage the volumes for the basin. A 3" diameter orifice was designed to drain the water quality volume down over the required 24 hours. A 6" diameter orifice will be located above the water quality volume and will be the primary flood control restriction. The SWM basin will outlet to the nearby wetland on-site. Roughly 0.5' of freeboard will be provided above the 100-year high water elevation to the top of the basin. An emergency spillway was designed to pass off any runoff more than the 100-year storm or in the event of a clogged outlet. Refer to Appendix 'C' for data pertaining to the design of the storm water basin.

Critical Storm Analysis

The critical storm for the site was calculated based on the following equation:

$$\%Increase = \frac{postVolume - preVolume}{preVolume} \times 100\%$$

Per request from the City of Hudson, a 25-year critical storm will be utilized. Based on the capacity of the storm water management basins and the flow restrictions placed on the basin outlets, the following hydraulic flows have been calculated for the standard critical storm year frequencies:

Site Outflow Summary							
Storm Frequency	*1-yr*	*2-yr*	*5-yr*	*10-yr*	*25-yr*	*50-yr*	*100-yr*
Pre-Developed Watershed (cfs) Hyd#1	**6.86**	10.61	16.73	22.18	30.60	37.92	45.91
Post-Developed Watershed (cfs) Hyd#6	0.90	1.34	2.46	3.35	**4.59**	5.58	11.30
SWM Basin HWL Top Basin 1094.00 NWL 1088.00	1089.38	1089.91	1090.76	1091.48	1092.51	1093.15	1093.47

The total post-developed outflow for a 25-year storm for was determined to be 4.59 CFS. This is less than the allowable pre-developed peak run-off flow of 6.86 CFS for the 1-year storm. All less frequent storm frequencies are reduced from pre-developed levels dramatically, thus satisfying the critical storm requirement. Report to Appendix 'D' for critical storm calculations and hydrograph analysis.

Storm Sewer Design

The proposed storm sewers are designed to flow full during the 10-year storm frequency and to maintain a desired minimum velocity of 3 ft per second when full. Calculations were also run for the 25-year storm frequency to determine the hydraulic grade line and the time of concentration to be used for modeling the flows thru the storm water management basin. A manning's 'n' value is assumed to be 0.015 pipe was assumed. Refer to Appendix 'E' for the Storm Sewer calculations data sheets.

Appendix A

Pre-Development

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,350 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

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
MgA	Mahoning silt loam, 0 to 2 percent slopes	4.9	17.5%
MgB	Mahoning silt loam, 2 to 6 percent slopes	23.4	82.5%
Totals for Area of Interest		**28.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Summit County, Ohio

MgA—Mahoning silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2v02z
Elevation: 590 to 1,970 feet
Mean annual precipitation: 33 to 52 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Mahoning and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mahoning

Setting

Landform: Till plains
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve, base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap - 0 to 7 inches: silt loam
Eg - 7 to 9 inches: silt loam
Btg - 9 to 12 inches: silty clay loam
Bt1 - 12 to 20 inches: silty clay
Bt2 - 20 to 30 inches: silty clay
BCt - 30 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Ecological site: F139XY002OH - Moist Calcareous Drift Flats
Hydric soil rating: No

Minor Components

Ellsworth

Percent of map unit: 5 percent
Landform: Till plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Trumbull

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Miner

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

MgB—Mahoning silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2v032
Elevation: 590 to 1,970 feet
Mean annual precipitation: 33 to 52 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Mahoning and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mahoning

Setting

Landform: Till plains
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Interfluve, base slope

Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Till

Typical profile

Ap - 0 to 7 inches: silt loam
Eg - 7 to 9 inches: silt loam
Btg - 9 to 12 inches: silty clay loam
Bt1 - 12 to 20 inches: silty clay
Bt2 - 20 to 30 inches: silty clay
BCt - 30 to 36 inches: clay loam
C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 6.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: F139XY002OH - Moist Calcareous Drift Flats
Hydric soil rating: No

Minor Components

Ellsworth

Percent of map unit: 10 percent
Landform: Till plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Trumbull

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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PROJECT Preserve of Hudson

PROJECT NO. 24189 SHEET NO. 1 OF 1

CALCULATED BY NMO DATE 10/18/2024

CHECKED BY _____ DATE _____

SUBJECT CURVE NUMBER CALCULATIONS

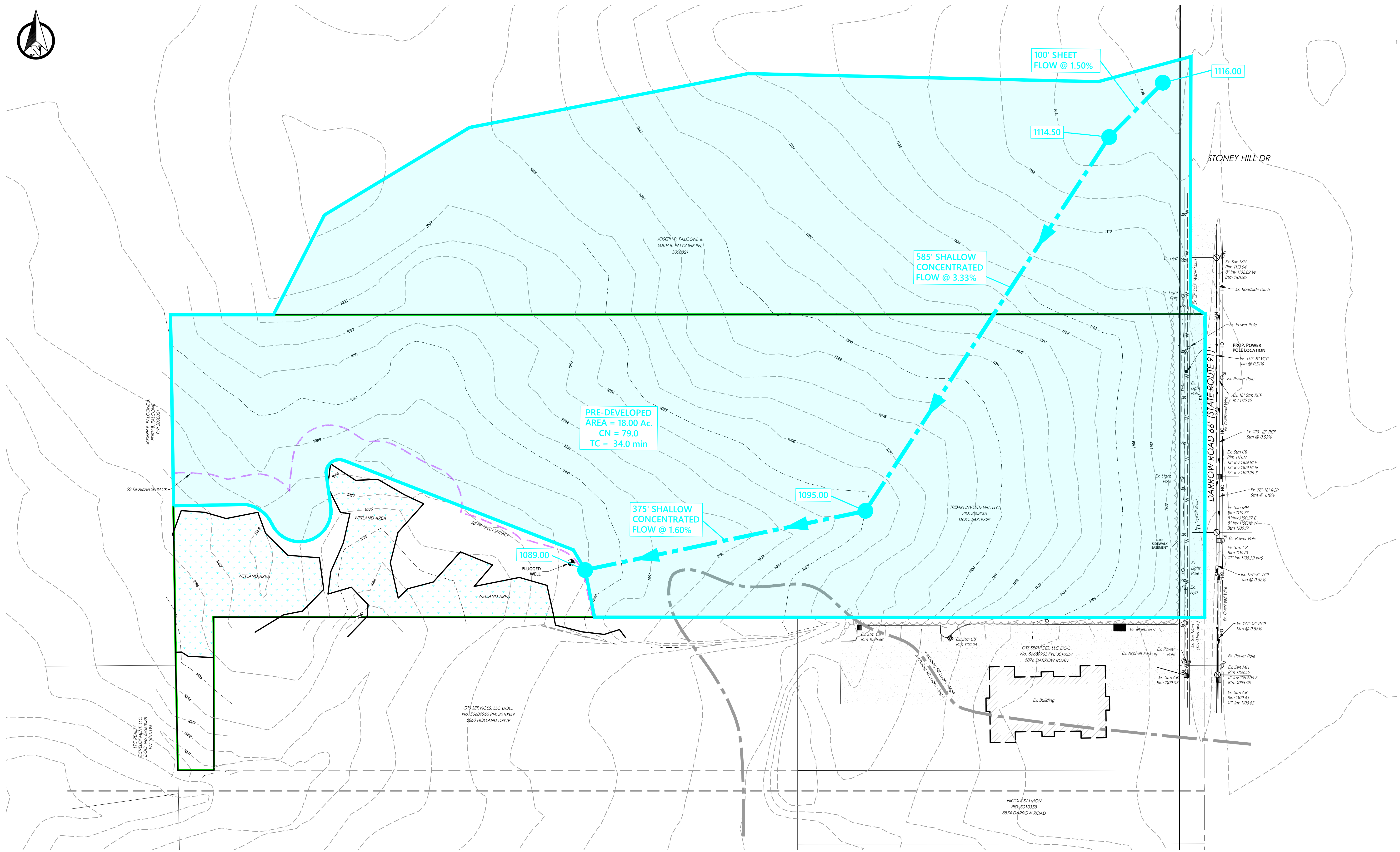
Watershed Description Pre-Developed Watershed (Hyd#1) ☑ Present ☐ Developed

Runoff Curve Number

Soil Name and Hydrologic Group	Cover Description	CN			Area		Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	☑ Acres / ☐ Mi^2 / ☐ %		
Type D	Woods - Grass Combination	79			19.97		1577.63
					Totals	19.97	1577.63

CN (Weighted) $\frac{\text{Total Product}}{\text{Total Area}} = \frac{1577.63}{19.97} =$ 79.00

Use CN	*79.0*



PRESERVE OF HUDSON TOWNHOMES

CITY OF HUDSON - SUMMIT COUNTY - OHIO

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polaris Engineering & Surveying

PRE-DEVELOPED

PREPARED FOR:
KNEZ HOMES
7555 FREDLE DRIVE
PAINESVILLE, OH
PHONE: (440) 346-0098
CONTACT: HANNA COHAN PLESSNER

CONTRACT No.	
24189	
SHEET	OF
01	01

REV. No.		DATE	BY

STATE OF OHIO — KEVIN T. HOFFMAN — 74891 — REGISTERED PROFESSIONAL ENGINEER

DATE: 10/18/24 DRAWN: NMO
SCALE: HOR. 1"=60' VERT. 1"=00'
FOLDER: DWG/Proj. Engineering
FILENAME: 24189 Drainage Maps
TAB: Pre-Developed
BNDY. BY: XXX
BASE. BY: XXX

GRAPHIC SCALE
60 0 30 60 120 240
(IN FEET)
1 INCH = 60 FEET

SYMBOL LEGEND

Ex. Clean Out, Ex. Catch Basin, Prop. Catch Basin, Ex. Yard Drain, Ex. Manhole, Ex. Storm Manhole, Prop. Storm Manhole, Ex. Sanitary Manhole, Prop. Sanitary Manhole, Prop. Curb Inlet, Ex. Curb Inlet, Ex. Storm Inlet MH, Ex. Gas Meter, Ex. Gas Valve, Ex. Gas Marker, Ex. Water Valve, Ex. Water Meter, Ex. Fire Hydrant, Prop. Hydrant, Prop. WL Valve, Ex. Telphone Box, Ex. Electrical Box, Ex. Power Transformer, Cable TV Box, Ex. Power Pole, Ex. Light Power Pole, Ex. Yard Light, Ex. Guy Wire, Ex. Light Pole, Prop. Light Pole, Traffic Signal Pole, Traffic Signal Box, Ex. Tree, Ex. Pine Tree, Ex. Bush, Ex. Stump, Ex. Mailbox, Ex. Sign, Electrical Outlet, Ex. Monument Box, Irrigation Valve, Sprinkler Control Box, Sprinkler Head, Test Bore, Guard Post

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No. 1

Pre-Developed

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.44		0.00		0.00		
Land slope (%)	= 1.50		0.00		0.00		
Travel Time (min)	**= 27.59**	**+**	**0.00**	**+**	**0.00**	**=**	**27.59**
Shallow Concentrated Flow							
Flow length (ft)	= 585.00		375.00		0.00		
Watercourse slope (%)	= 3.33		1.60		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.94		2.04		0.00		
Travel Time (min)	**= 3.31**	**+**	**3.06**	**+**	**0.00**	**=**	**6.37**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 34.00 min

Appendix B

Post-Development

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PROJECT Preserve of Hudson

PROJECT NO. 24189 SHEET NO. 1 OF 1

CALCULATED BY NMO DATE 10/18/2024

CHECKED BY _____ DATE _____

SUBJECT CURVE NUMBER CALCULATIONS

Watershed Description Post-Developed Watershed (Hyd#2)

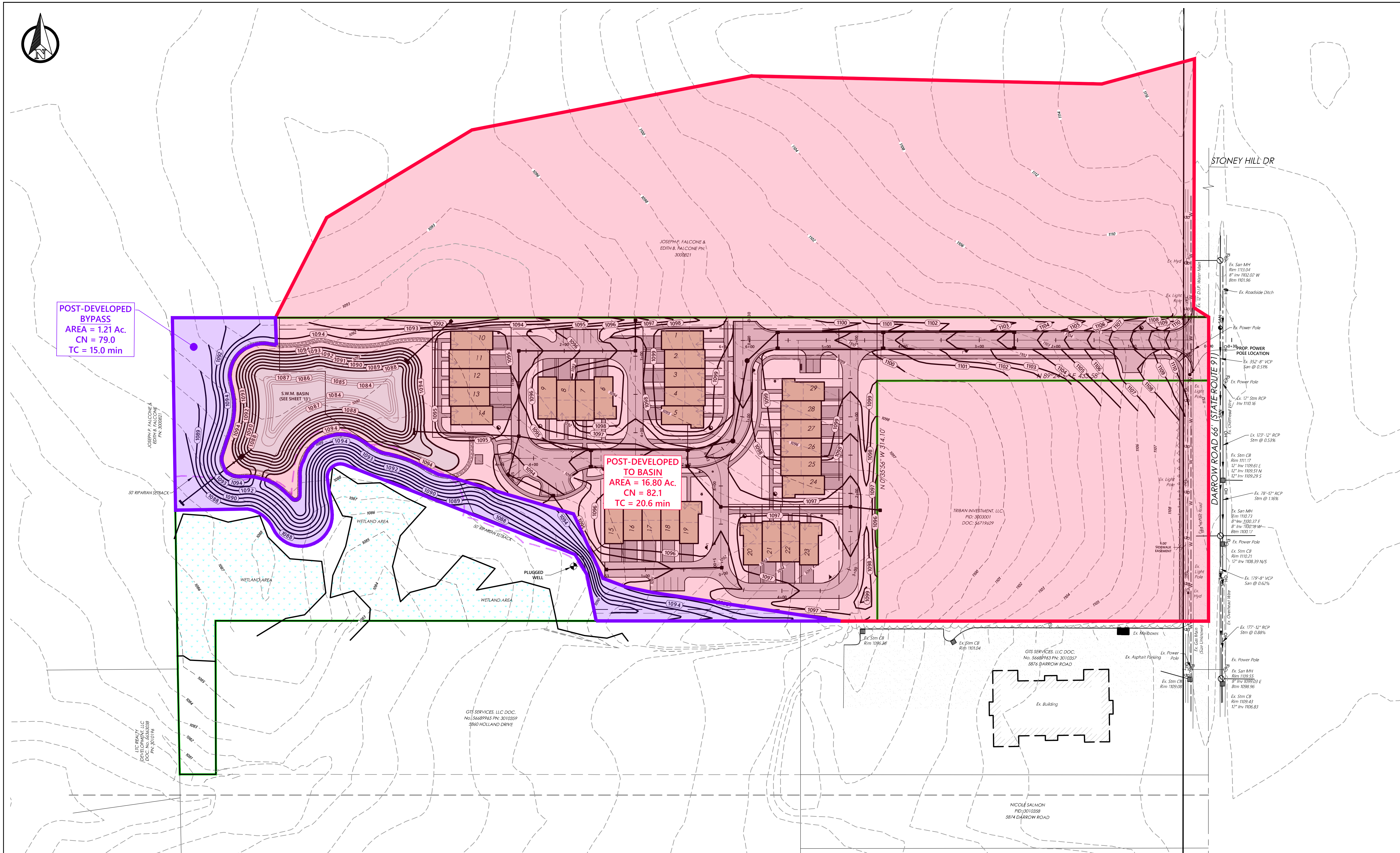
Present ☑ Developed

Runoff Curve Number

Soil Name and Hydrologic Group	Cover Description	CN			Area		Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	☑	Acres	
					☐	Mi^2	
					☐	%	
Type D	Open Space (Good)	80			7.46		596.8
Type D	Woods - Grass Combination	79			9.63		760.77
	Impervious	98			2.88		282.24
				Totals	19.97		1639.81

CN (Weighted) $\frac{\text{Total Product}}{\text{Total Area}} = \frac{1639.81}{19.97} = 82.11$

Use CN	*82.1*



REV. No.		DATE	BY

DATE: 10/18/24 DRAWN: NMO
SCALE: HOR. 1"=60' VERT. 1"=00'
FOLDER: DWG/Proj. Engineering
FILENAME: 24189 Drainage Maps
TAB: Post-Development
BNDY. BY: XXX
BASE. BY: XXX

STATE OF OHIO — KEVIN T. HOFFMAN 74831 — REGISTERED PROFESSIONAL ENGINEER

GRAPHIC SCALE
60 0 30 60 120 240
(IN FEET)
1 INCH = 60 FEET

SYMBOL LEGEND

- Ex. Clean Out
- Ex. Catch Basin
- Prop. Catch Basin
- Ex. Yard Drain
- Ex. Manhole
- Ex. Storm Manhole
- Prop. Storm Manhole
- Ex. Sanitary Manhole
- Prop. Sanitary Manhole
- Prop. Curb Inlet
- Ex. Curb Inlet
- Ex. Storm Inlet MH
- Ex. Gas Meter
- Ex. Gas Valve
- Ex. Gas Marker
- Ex. Water Valve
- Ex. Water Meter
- Ex. Fire Hydrant
- Prop. Hydrant
- Prop. WL Valve
- Ex.Telephone Box
- Ex. Electrical Box
- Ex. Power Transformer
- Cable TV Box
- Ex. Power Pole
- Ex. Light Power Pole
- Ex. Yard Light
- Ex. Guy Wire
- Ex. Light Pole
- Prop. Light Pole
- Traffic Signal Pole
- Traffic Signal Box
- Ex. Tree
- Ex. Pine Tree
- Ex. Bush
- Ex. Stump
- Ex. Mailbox
- Ex. Sign
- Electrical Outlet
- Ex. Monument Box
- Irrigation Valve
- Sprinkler Control Box
- Sprinkler Head
- Test Bore
- Guard Post

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01	01

Appendix C

Storm Water Storage Design

Pond No. 1 - SWM Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1088.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1088.00	14,256	0	0
1.00	1089.00	16,778	15,498	15,498
2.00	1090.00	19,400	18,071	33,570
3.00	1091.00	22,122	20,744	54,314
4.00	1092.00	24,945	23,517	77,831
5.00	1093.00	28,330	26,617	104,448
6.00	1094.00	32,536	30,406	134,853

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	3.00	6.00	0.00
Span (in)	= 18.00	3.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 1088.00	1088.00	1088.75	0.00
Length (ft)	= 70.00	0.00	0.00	0.00
Slope (%)	= 0.71	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	10.00	0.00	0.00
Crest El. (ft)	= 1093.00	1093.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Ciplti	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	1088.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.10	1,550	1088.10	0.02 ic	0.02 ic	0.00	---	0.00	0.00	---	---	---	---	0.019
0.20	3,100	1088.20	0.06 ic	0.06 ic	0.00	---	0.00	0.00	---	---	---	---	0.063
0.30	4,650	1088.30	0.10 ic	0.10 ic	0.00	---	0.00	0.00	---	---	---	---	0.098
0.40	6,199	1088.40	0.12 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.119
0.50	7,749	1088.50	0.14 ic	0.14 ic	0.00	---	0.00	0.00	---	---	---	---	0.138
0.60	9,299	1088.60	0.16 ic	0.16 ic	0.00	---	0.00	0.00	---	---	---	---	0.156
0.70	10,849	1088.70	0.17 ic	0.17 ic	0.00	---	0.00	0.00	---	---	---	---	0.171
0.80	12,399	1088.80	0.20 ic	0.18 ic	0.01 ic	---	0.00	0.00	---	---	---	---	0.193
0.90	13,949	1088.90	0.27 ic	0.19 ic	0.07 ic	---	0.00	0.00	---	---	---	---	0.261
1.00	15,498	1089.00	0.38 ic	0.20 ic	0.17 ic	---	0.00	0.00	---	---	---	---	0.370
1.10	17,305	1089.10	0.52 ic	0.21 ic	0.30 ic	---	0.00	0.00	---	---	---	---	0.508
1.20	19,113	1089.20	0.65 ic	0.22 ic	0.43 ic	---	0.00	0.00	---	---	---	---	0.645
1.30	20,920	1089.30	0.76 ic	0.23 ic	0.52 ic	---	0.00	0.00	---	---	---	---	0.745
1.40	22,727	1089.40	0.84 ic	0.24 ic	0.60 ic	---	0.00	0.00	---	---	---	---	0.834
1.50	24,534	1089.50	0.93 ic	0.25 ic	0.67 ic	---	0.00	0.00	---	---	---	---	0.914
1.60	26,341	1089.60	1.02 ic	0.25 ic	0.73 ic	---	0.00	0.00	---	---	---	---	0.987
1.70	28,148	1089.70	1.06 ic	0.26 ic	0.79 ic	---	0.00	0.00	---	---	---	---	1.055
1.80	29,955	1089.80	1.12 ic	0.27 ic	0.85 ic	---	0.00	0.00	---	---	---	---	1.118
1.90	31,763	1089.90	1.21 ic	0.28 ic	0.90 ic	---	0.00	0.00	---	---	---	---	1.178
2.00	33,570	1090.00	1.26 ic	0.29 ic	0.95 ic	---	0.00	0.00	---	---	---	---	1.235
2.10	35,644	1090.10	1.31 ic	0.30 ic	0.99 ic	---	0.00	0.00	---	---	---	---	1.290
2.20	37,718	1090.20	1.37 ic	0.31 ic	1.04 ic	---	0.00	0.00	---	---	---	---	1.342
2.30	39,793	1090.30	1.42 ic	0.31 ic	1.08 ic	---	0.00	0.00	---	---	---	---	1.392
2.40	41,867	1090.40	1.48 ic	0.32 ic	1.12 ic	---	0.00	0.00	---	---	---	---	1.441
2.50	43,942	1090.50	1.49 ic	0.33 ic	1.16 ic	---	0.00	0.00	---	---	---	---	1.488
2.60	46,016	1090.60	1.53 ic	0.34 ic	1.20 ic	---	0.00	0.00	---	---	---	---	1.534
2.70	48,090	1090.70	1.59 ic	0.35 ic	1.23 ic	---	0.00	0.00	---	---	---	---	1.578
2.80	50,165	1090.80	1.65 ic	0.35 ic	1.27 ic	---	0.00	0.00	---	---	---	---	1.621
2.90	52,239	1090.90	1.66 ic	0.36 ic	1.30 ic	---	0.00	0.00	---	---	---	---	1.663
3.00	54,314	1091.00	1.71 ic	0.37 ic	1.34 ic	---	0.00	0.00	---	---	---	---	1.704
3.10	56,665	1091.10	1.77 ic	0.37 ic	1.37 ic	---	0.00	0.00	---	---	---	---	1.744
3.20	59,017	1091.20	1.78 ic	0.38 ic	1.40 ic	---	0.00	0.00	---	---	---	---	1.783
3.30	61,369	1091.30	1.84 ic	0.39 ic	1.43 ic	---	0.00	0.00	---	---	---	---	1.821
3.40	63,721	1091.40	1.90 ic	0.39 ic	1.46 ic	---	0.00	0.00	---	---	---	---	1.858
3.50	66,072	1091.50	1.90 ic	0.40 ic	1.49 ic	---	0.00	0.00	---	---	---	---	1.896

Continues on next page...

SWM Basin

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.60	68,424	1091.60	1.96 ic	0.41 ic	1.52 ic	---	0.00	0.00	---	---	---	---	1.931
3.70	70,776	1091.70	1.97 ic	0.41 ic	1.55 ic	---	0.00	0.00	---	---	---	---	1.967
3.80	73,127	1091.80	2.03 ic	0.42 ic	1.58 ic	---	0.00	0.00	---	---	---	---	2.002
3.90	75,479	1091.90	2.04 ic	0.43 ic	1.61 ic	---	0.00	0.00	---	---	---	---	2.036
4.00	77,831	1092.00	2.10 ic	0.43 ic	1.64 ic	---	0.00	0.00	---	---	---	---	2.069
4.10	80,492	1092.10	2.10 ic	0.44 ic	1.66 ic	---	0.00	0.00	---	---	---	---	2.103
4.20	83,154	1092.20	2.16 ic	0.44 ic	1.69 ic	---	0.00	0.00	---	---	---	---	2.135
4.30	85,816	1092.30	2.17 ic	0.45 ic	1.72 ic	---	0.00	0.00	---	---	---	---	2.168
4.40	88,477	1092.40	2.23 ic	0.46 ic	1.74 ic	---	0.00	0.00	---	---	---	---	2.199
4.50	91,139	1092.50	2.23 ic	0.46 ic	1.77 ic	---	0.00	0.00	---	---	---	---	2.230
4.60	93,801	1092.60	2.30 ic	0.47 ic	1.79 ic	---	0.00	0.00	---	---	---	---	2.261
4.70	96,463	1092.70	2.30 ic	0.47 ic	1.82 ic	---	0.00	0.00	---	---	---	---	2.291
4.80	99,124	1092.80	2.37 ic	0.48 ic	1.84 ic	---	0.00	0.00	---	---	---	---	2.321
4.90	101,786	1092.90	2.37 ic	0.48 ic	1.87 ic	---	0.00	0.00	---	---	---	---	2.351
5.00	104,448	1093.00	2.38 ic	0.49 ic	1.89 ic	---	0.00	0.00	---	---	---	---	2.380
5.10	107,488	1093.10	3.26 ic	0.49 ic	1.91 ic	---	0.84	0.00	---	---	---	---	3.244
5.20	110,529	1093.20	4.80 ic	0.48 ic	1.92 ic	---	2.38	0.00	---	---	---	---	4.783
5.30	113,569	1093.30	6.65 oc	0.45 ic	1.82 ic	---	4.38	0.00	---	---	---	---	6.648
5.40	116,610	1093.40	8.89 oc	0.43 ic	1.72 ic	---	6.74	0.00	---	---	---	---	8.890
5.50	119,651	1093.50	11.37 oc	0.39 ic	1.56 ic	---	9.42	0.00	---	---	---	---	11.37
5.60	122,691	1093.60	14.01 oc	0.33 ic	1.30 ic	---	12.38	1.05	---	---	---	---	15.06
5.70	125,732	1093.70	16.70 oc	0.22 ic	0.88 ic	---	15.60	2.98	---	---	---	---	19.68
5.80	128,772	1093.80	17.74 oc	0.16 ic	0.65 ic	---	16.93 s	5.47	---	---	---	---	23.21
5.90	131,813	1093.90	18.21 oc	0.14 ic	0.55 ic	---	17.52 s	8.43	---	---	---	---	26.63
6.00	134,853	1094.00	18.57 oc	0.12 ic	0.48 ic	---	17.97 s	11.77	---	---	---	---	30.34

...End

Project and Watershed Information; WQv Calculation

version 3.2 2020-07-07

Project Details

Project Name:	Preserve of Hudson
Project Location:	SR-91 & Stoney Hill Dr.
	Hudson, OH 44236
Project Latitude:	41.226269
Project Longitude:	-81.442003
NPDES Permit Applicant:	
Submitted by:	Kevin Hoffman
Date:	10/18/2024

Subwatershed Details

Subwatershed ID/Label: Post-Developed to Basin

Subwatershed Drainage Area, A_{total} =	**16.80**	**acres**	**=**	**731,808**	**ft^2**
Subwatershed Impervious Area, A_{imp} =	**2.88**	**acres**	**=**	**125,453**	**ft^2**
Imperviousness fraction, i =	**0.17**		**=**	**17**	**%**
Volumetric Runoff Coefficient, Rv =	**0.20**				
Water Quality Volume, WQv =	**11,212**	**ft^3**	**=**	**0.257**	**ac-ft**

Wet Extended Detention Basin WQv Compliance Tool

version 3.2 2020-07-07

Project Summary

Project Name: Preserve of Hudson
Subwatershed ID/Label: Post-Developed to Basin
Submitted by: Kevin Hoffman
Date: 10/18/2024

Subwatershed Drainage Area, A_{total} =	16.80	acres	=	731,808	ft2
Subwatershed Impervious Area, A_{imp} =	2.88	acres	=	125,453	ft2
Imperviousness fraction, i =	0.17			17	%
Water Quality Volume, WQv =	11,212	ft^3	=	0.26	ac-ft

Step 1 - Soil Suitability

Soil Series: Mahoning Silt Loam HSG: D

Step 2 - Wet ED Basin Volume Requirements

Extended Detention Volume, EDv =	11212	ft^3
Minimum Sediment Storage Volume, $V_{sediment}$ =	2242	ft^3
Minimum Permanent Pool Volume, PPv =	13455	ft^3

Step 3 - Basin Stage-Storage Relationship

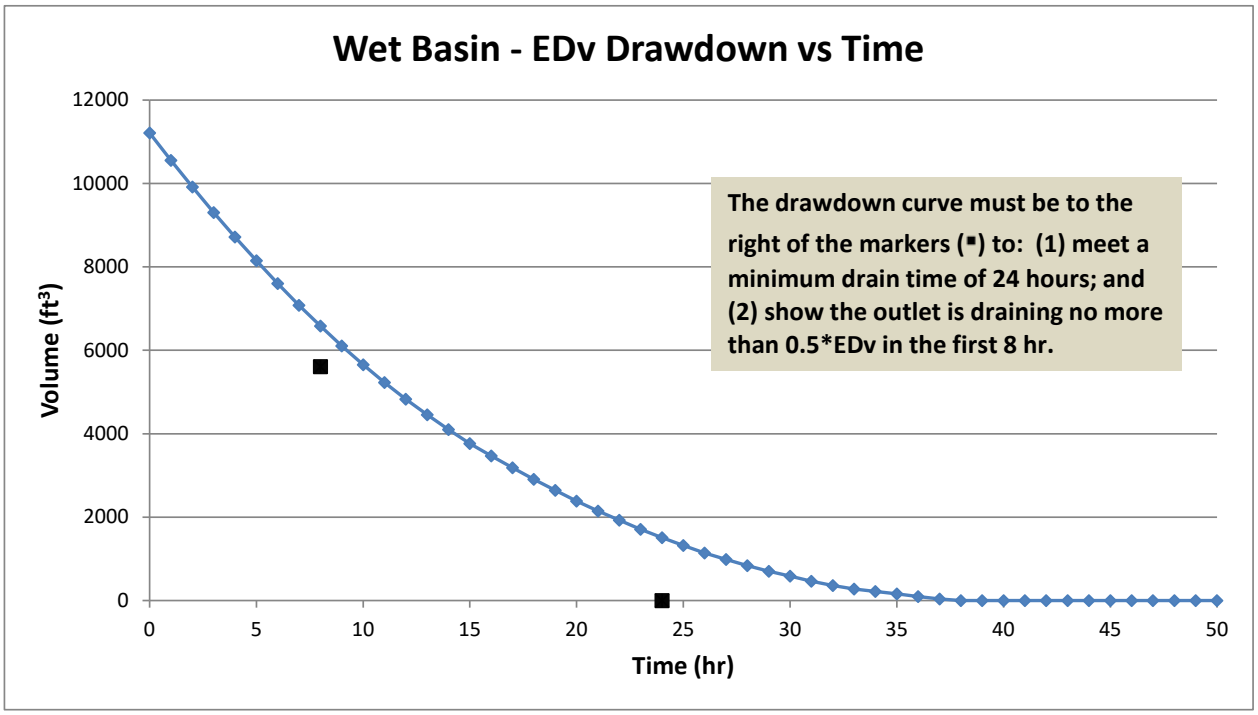
	Elevation ft	Area ft^2		Incremental Volume ft^3	Cumulative Volume ft^3
Bottom of Permanent Micropool =	1084.00	3909			
	1085.00	5213		4,545	4,545
	1086.00	6627		5,906	10,451
	1087.00	8362		7,478	17,929
	1088.00	14256		11,179	29,108
	1089.00	16778		15,500	44,608
	1090.00	19400		18,073	62,681
	1091.00	22122		20,746	83,427
	1092.00	24945		23,519	106,946
	1093.00	26617		25,776	132,723
	1094.00	30406		28,490	161,213

Step 4 - Outlet Elevations and Storage Volumes

WQ Orifice Invert Elevation =	1088.00				
Elevation of Top of EDv =	1088.74				
Secondary Outlet Invert Elevation =	1088.75				OKAY
WQ Treatment Volume Provided, $V_{treatment}$ =	11,387	ft^3			
Treatment Vol Provided Relative to EDv, $V_{treatment}/EDv$ =	1.02		=	102%	OKAY
Permanent Pool Volume Provided, PPv =	29,108	ft^3			
Ratio PPv Provided to PPv Required =	2.16		=	216%	OKAY

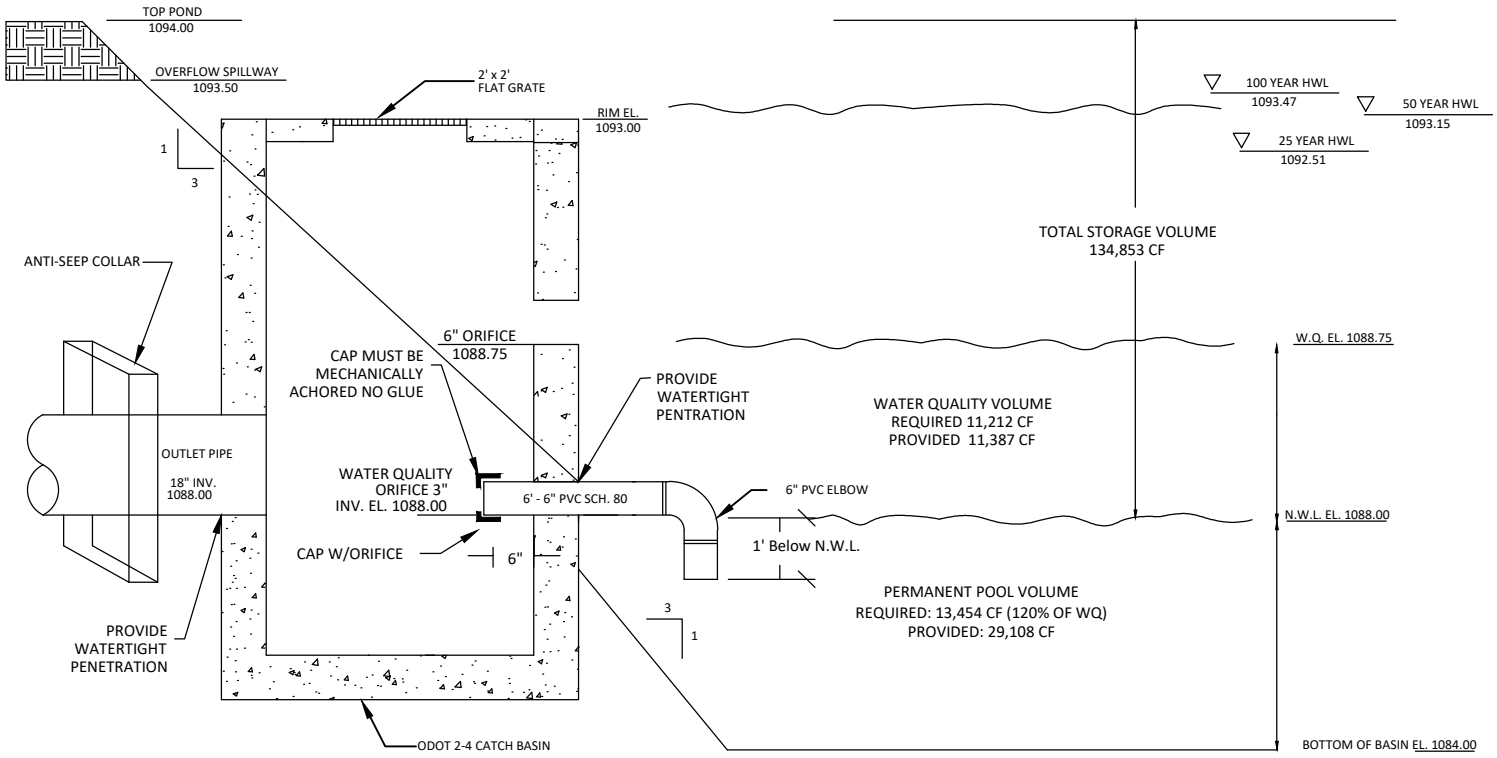
Step 5 - Outlet (Orifice) Sizing

Maximum Hydraulic Head, Hmax =	0.74	ft			
Orifice Coefficient, C =	0.6				
Target (Minimum) Draw-down Time, T_d =	24	hr			
Target Average Discharge, Q_{avg} =	0.13	cfs			
Average Hydraulic Head, H_{avg} =	0.37	ft			
Estimated Orifice Area, $A_{orifice}$ =	6.38	in^2	=	0.044	ft^2
Estimated Orifice Diameter, $D_{orifice}$ =	2.85	in	=	0.24	ft
Design Orifice Diameter, $D_{orifice}$ =	3.00	in	=	0.25	ft
Design Orifice Area, $A_{orifice}$ =	7.02	in^2	=	0.049	ft^2
Time to Completely Drain EDv, T_d =	38	hr	must be ≥ 24 hr		OKAY
Volume Drained in First 8 hr =	4,630	ft^3			
% of EDv =	41.3	%	must be ≤ 50%		OKAY

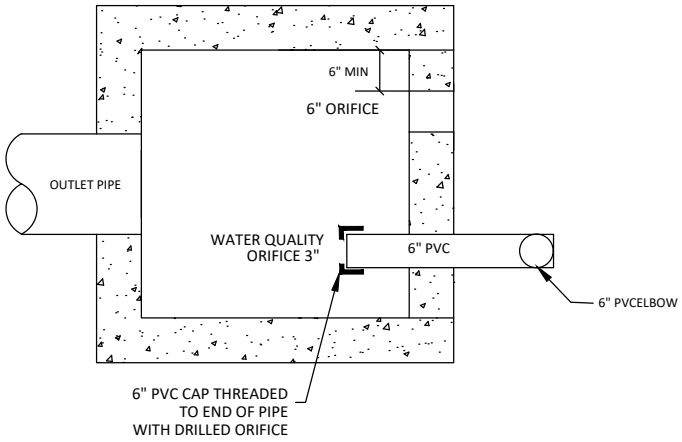


WET EXTENDED DETENTION BASIN

STORM WATER MANAGEMENT BASIN
PERMANENT OUTLET STRUCTURE
NO SCALE



SECTION



PLAN
NOT TO SCALE

NOTES

LOCATION AND ELEVATION:
WHEN GIVEN ON THE PLANS, THE LOCATION AND THE ELEVATION ARE AT THE TOP CENTER OF THE GRATE. THE ORIFICE HOLES SHOULD BE PLACED AT THE ELEVATIONS AS SHOWN ON THE PLANS.

BASIN MATERIALS:
THE BASIN DIMENSIONS, MATERIALS, AND GRATE TO BE PER ODOT DETAIL CB1.2 FOR A 2-4 CATCH BASIN EXCEPT AS DETAILED HEREIN.

Appendix D

Critical Storm Analysis & Site Hydrographs

Hydraflow Table of Contents

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	6.860	10.61	-------	16.73	22.18	30.60	37.92	45.91	Pre-Developed
2	SCS Runoff	------	11.60	16.79	-------	25.06	32.37	43.47	52.93	63.15	Post-Developed to Basin
3	SCS Runoff	------	0.772	1.168	-------	1.817	2.400	3.298	4.071	4.911	Post-Bypass
4	Combine	2, 3	12.25	17.80	-------	26.74	34.57	46.46	56.60	67.55	Total Post-Developed Undetained
5	Reservoir	2	0.813	1.186	-------	1.604	1.887	2.235	4.057	10.70	Route to Basin
6	Combine	3, 5	0.895	1.340	-------	2.457	3.350	4.594	5.583	11.30	Total Post-Developed Outflow

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

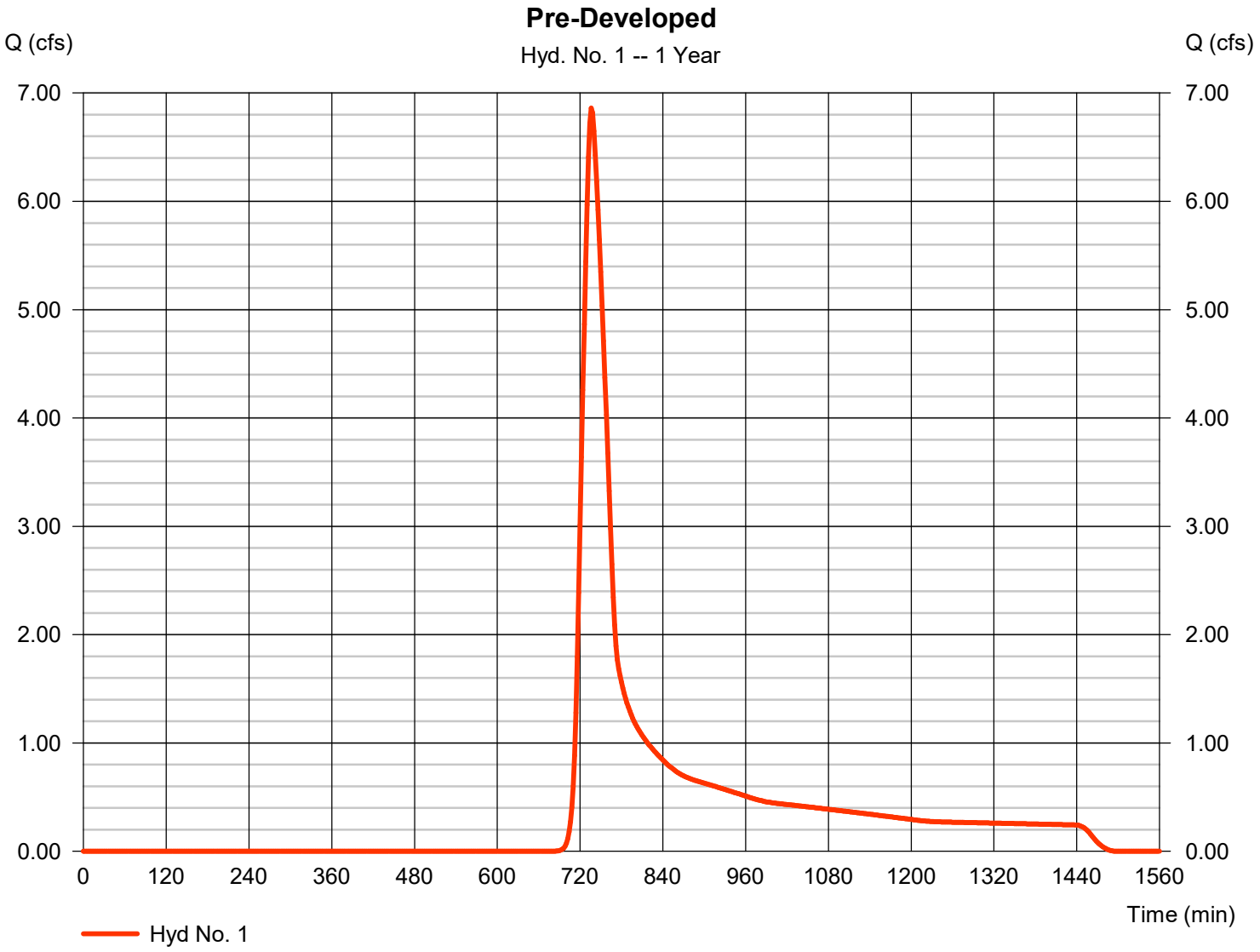
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.860	2	736	35,273	------	------	------	Pre-Developed
2	SCS Runoff	11.60	2	728	42,199	------	------	------	Post-Developed to Basin
3	SCS Runoff	0.772	2	724	2,338	------	------	------	Post-Bypass
4	Combine	12.25	2	728	44,538	2, 3	------	------	Total Post-Developed Undetained
5	Reservoir	0.813	2	850	41,874	2	1089.38	22,294	Route to Basin
6	Combine	0.895	2	724	44,212	3, 5	------	------	Total Post-Developed Outflow

Hydrograph Report

Hyd. No. 1

Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.860 cfs
Storm frequency	=	1 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	35,273 cuft
Drainage area	=	18.000 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.00 min
Total precip.	=	2.04 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

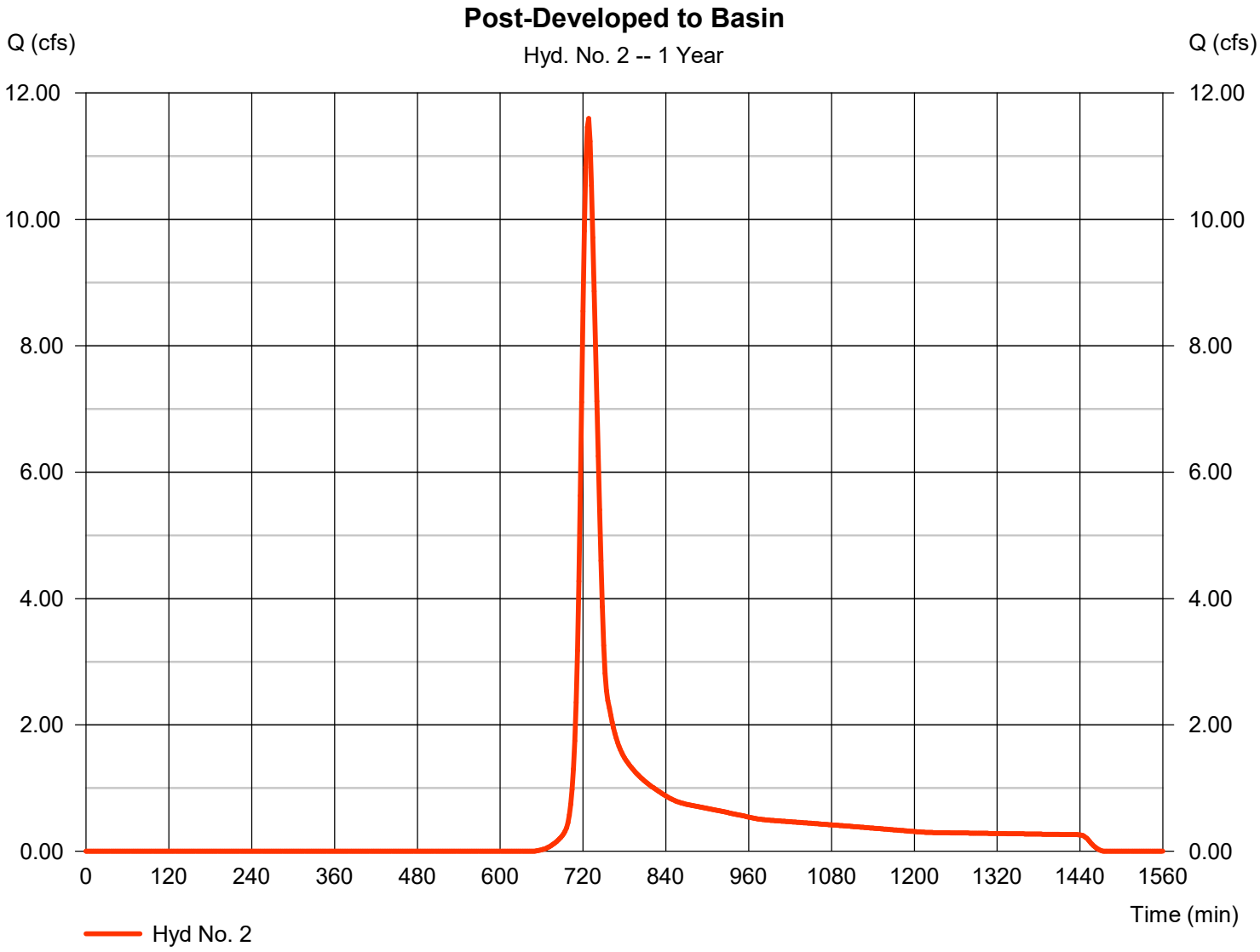


Hydrograph Report

Hyd. No. 2

Post-Developed to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.60 cfs
Storm frequency	=	1 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	42,199 cuft
Drainage area	=	16.800 ac	Curve number	=	82.1
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.60 min
Total precip.	=	2.04 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

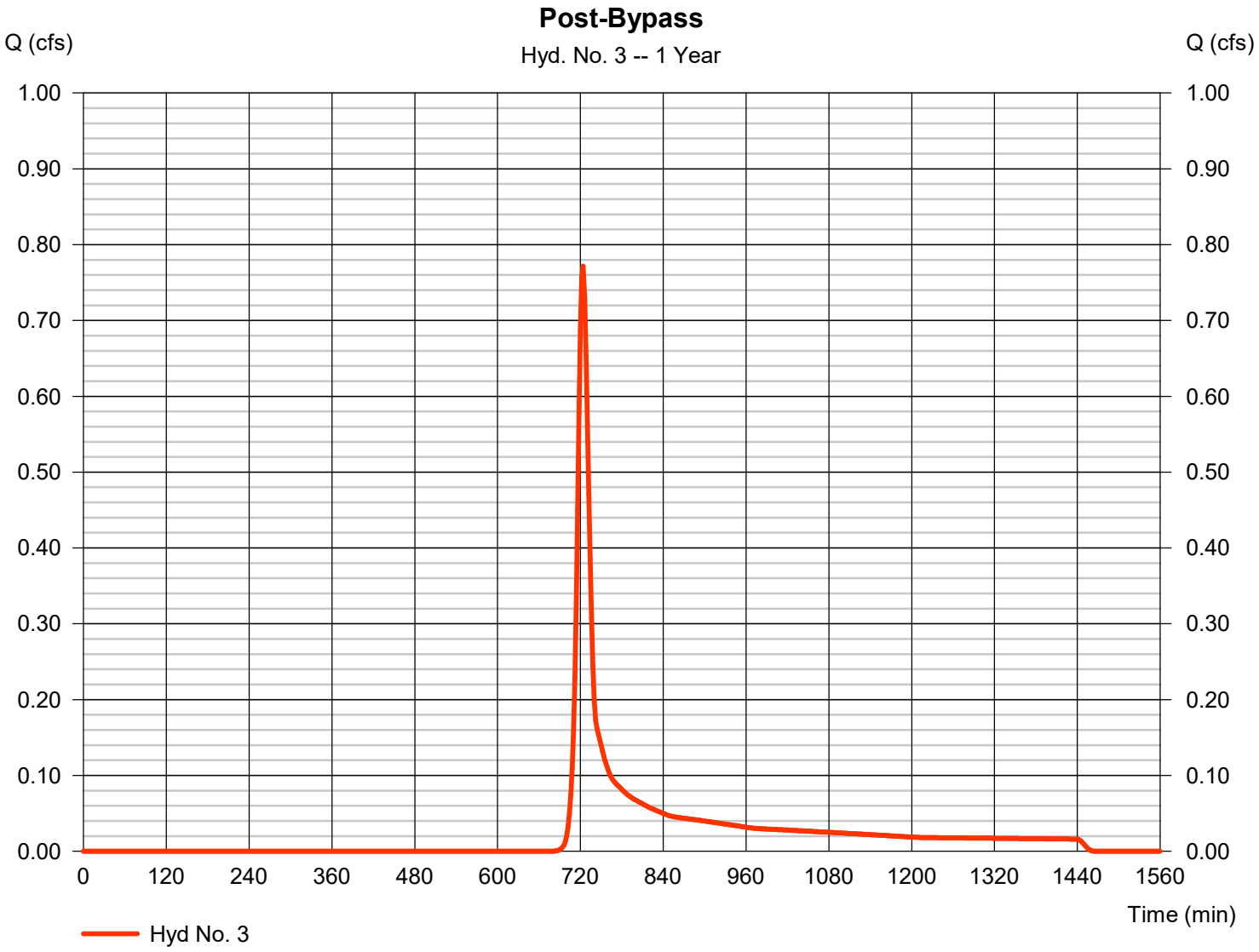


Hydrograph Report

Hyd. No. 3

Post-Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.772 cfs
Storm frequency	=	1 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	2,338 cuft
Drainage area	=	1.210 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	2.04 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

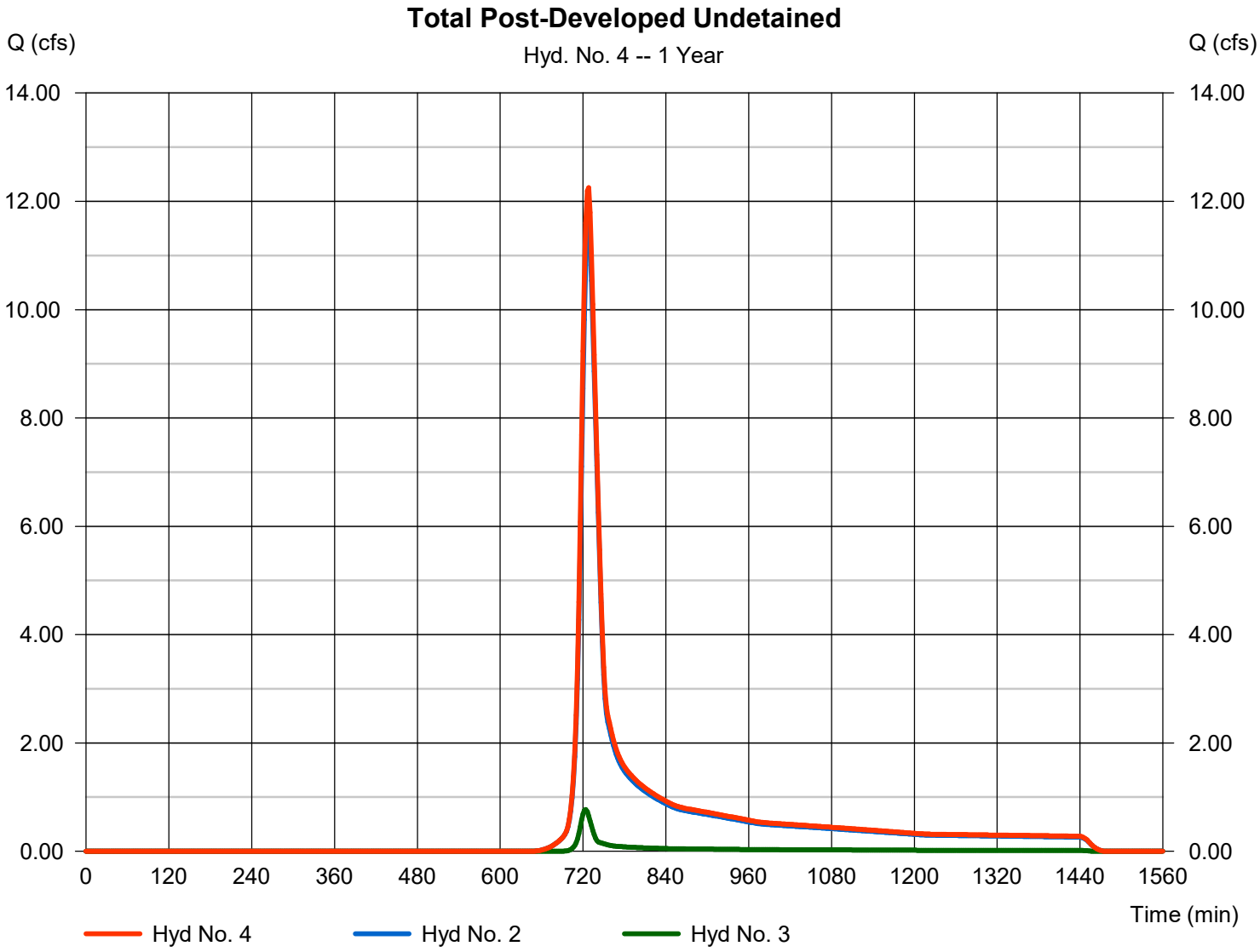


Hydrograph Report

Hyd. No. 4

Total Post-Developed Undetained

Hydrograph type	= Combine	Peak discharge	= 12.25 cfs
Storm frequency	= 1 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 44,538 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 18.010 ac



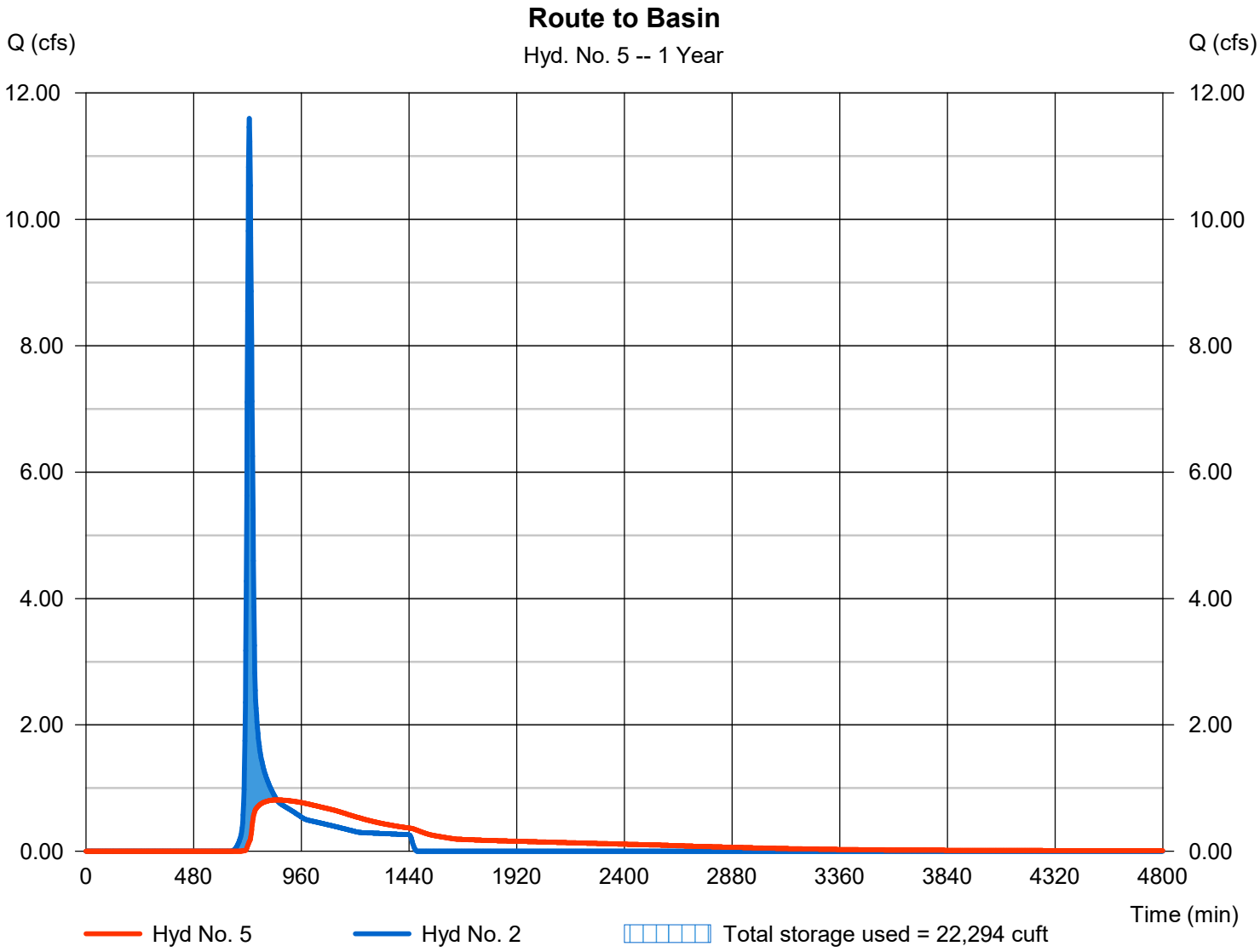
Hydrograph Report

Hyd. No. 5

Route to Basin

Hydrograph type	=	Reservoir	Peak discharge	=	0.813 cfs
Storm frequency	=	1 yrs	Time to peak	=	850 min
Time interval	=	2 min	Hyd. volume	=	41,874 cuft
Inflow hyd. No.	=	2 - Post-Developed to Basin	Max. Elevation	=	1089.38 ft
Reservoir name	=	SWM Basin	Max. Storage	=	22,294 cuft

Storage Indication method used.

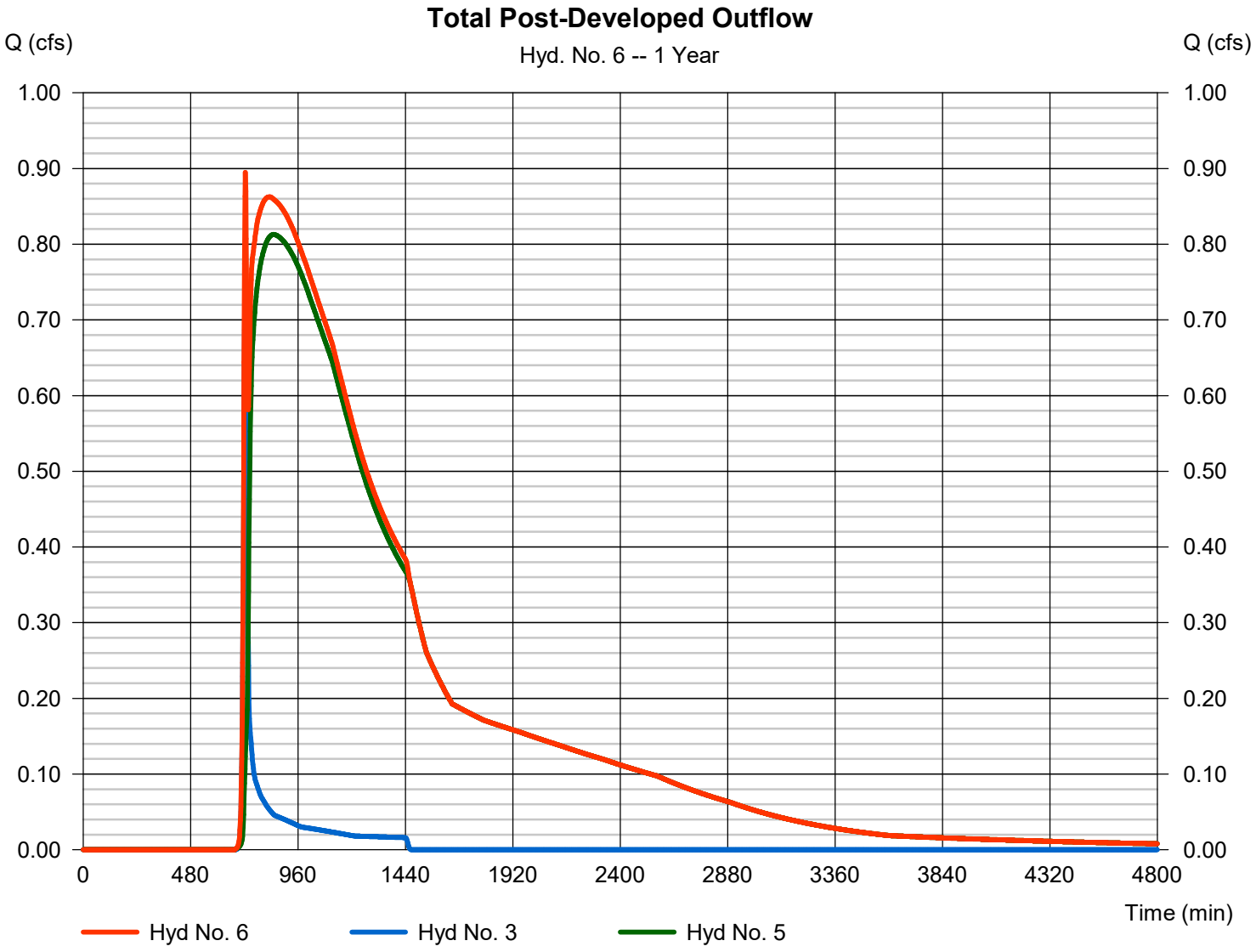


Hydrograph Report

Hyd. No. 6

Total Post-Developed Outflow

Hydrograph type	= Combine	Peak discharge	= 0.895 cfs
Storm frequency	= 1 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 44,212 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 1.210 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

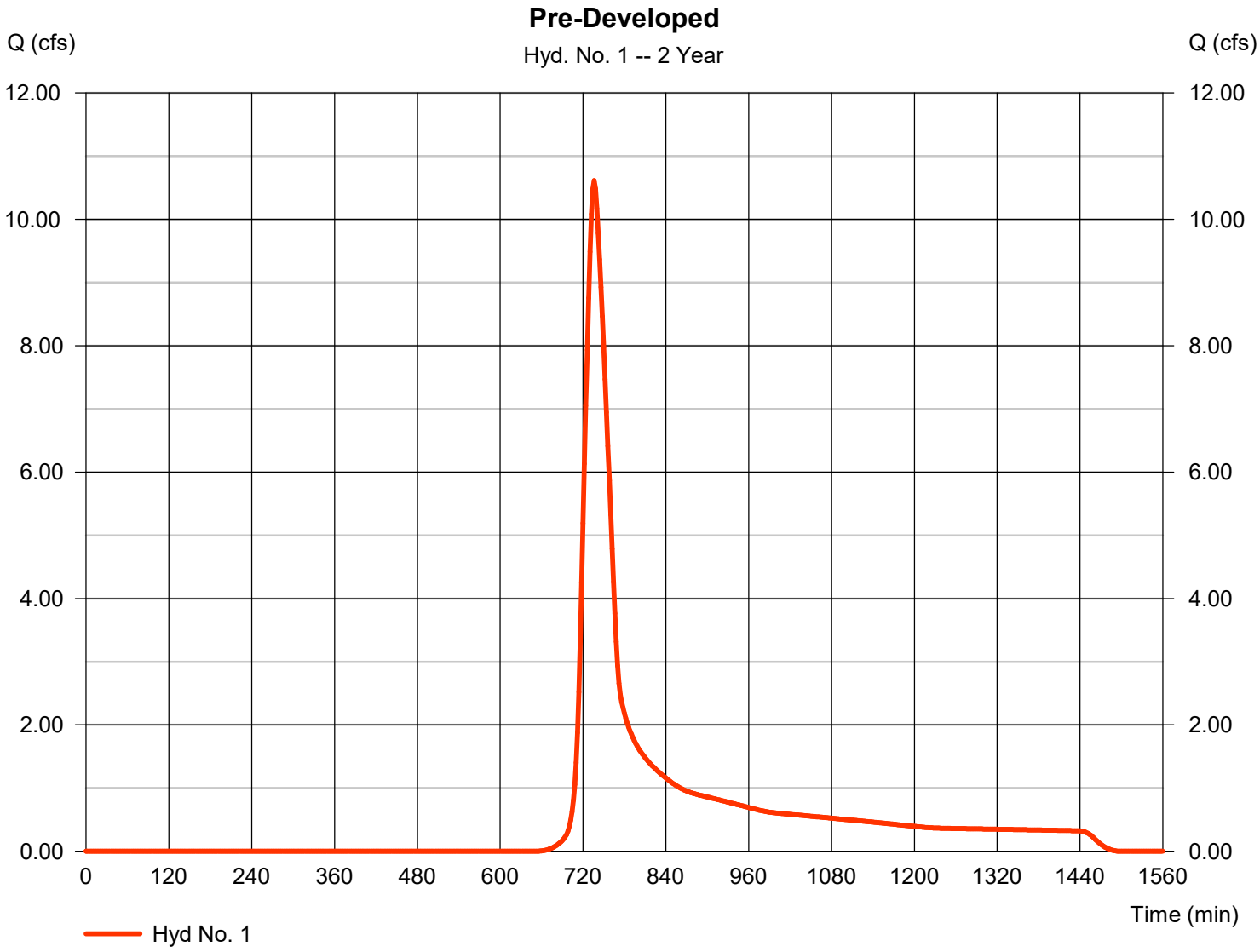
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	10.61	2	736	51,516	------	------	------	Pre-Developed
2	SCS Runoff	16.79	2	728	59,575	------	------	------	Post-Developed to Basin
3	SCS Runoff	1.168	2	724	3,415	------	------	------	Post-Bypass
4	Combine	17.80	2	726	62,990	2, 3	------	------	Total Post-Developed Undetained
5	Reservoir	1.186	2	838	59,224	2	1089.91	32,011	Route to Basin
6	Combine	1.340	2	724	62,639	3, 5	------	------	Total Post-Developed Outflow

Hydrograph Report

Hyd. No. 1

Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.61 cfs
Storm frequency	=	2 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	51,516 cuft
Drainage area	=	18.000 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.00 min
Total precip.	=	2.44 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

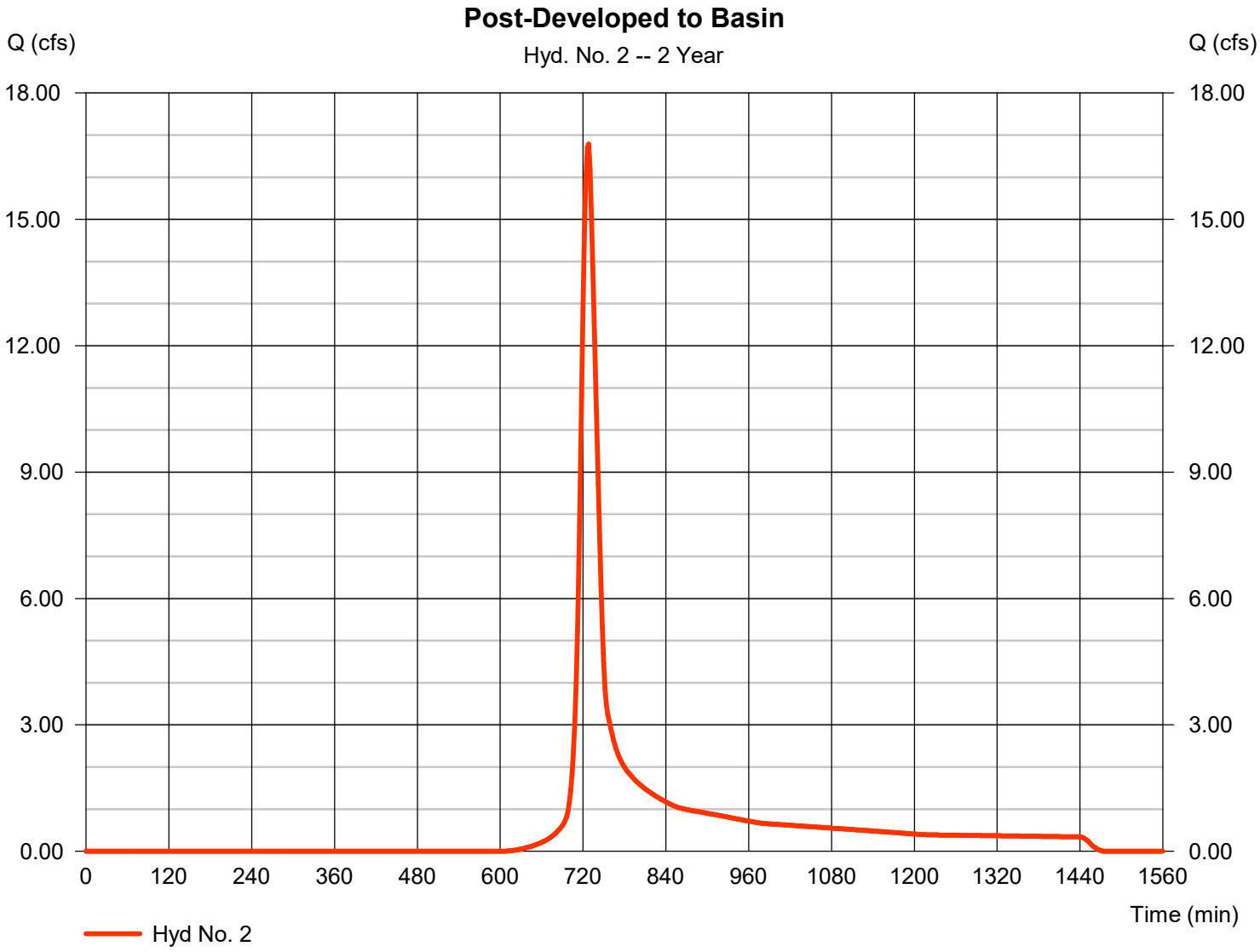


Hydrograph Report

Hyd. No. 2

Post-Developed to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.79 cfs
Storm frequency	=	2 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	59,575 cuft
Drainage area	=	16.800 ac	Curve number	=	82.1
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.60 min
Total precip.	=	2.44 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

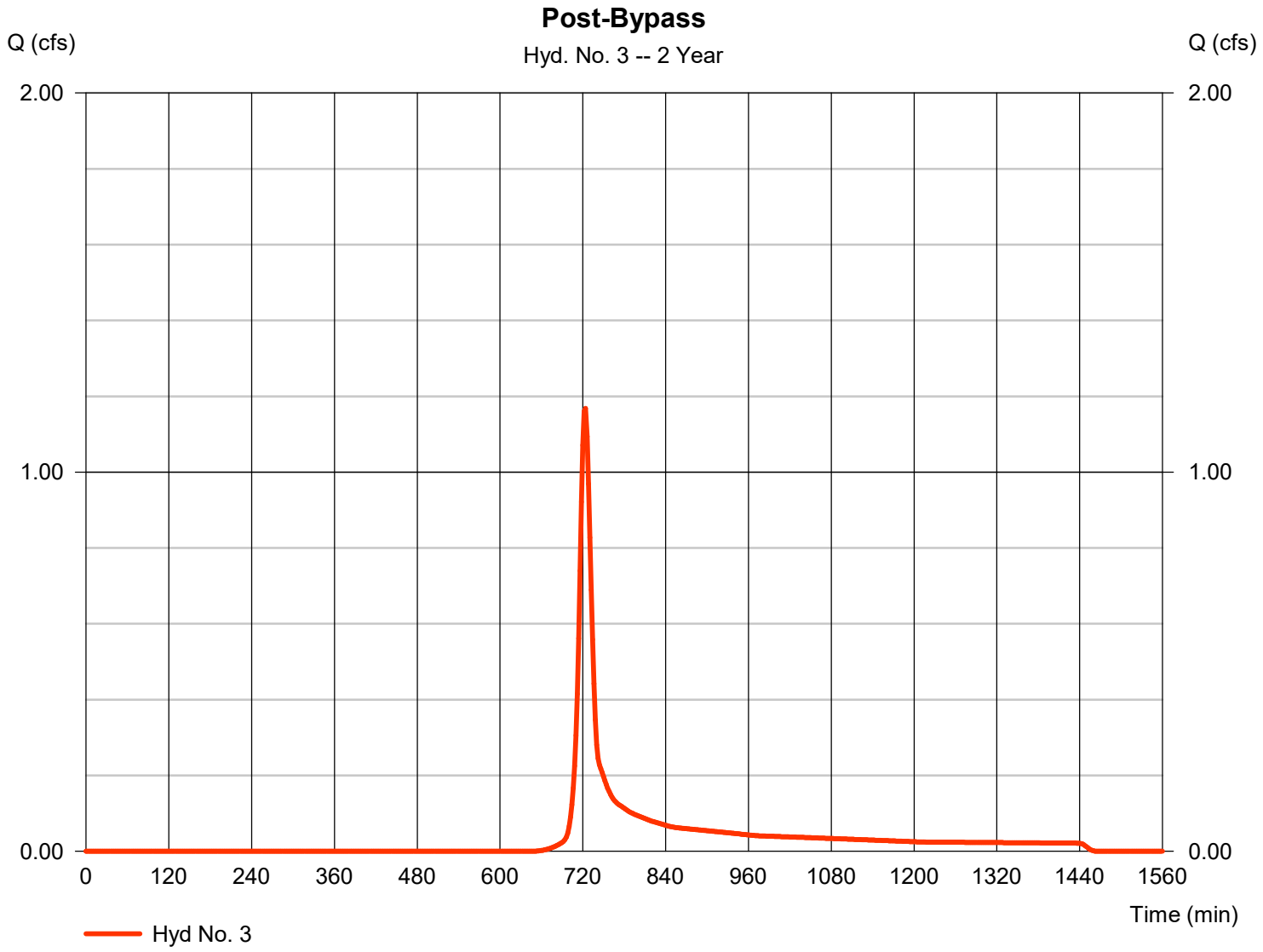


Hydrograph Report

Hyd. No. 3

Post-Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.168 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	3,415 cuft
Drainage area	=	1.210 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	2.44 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

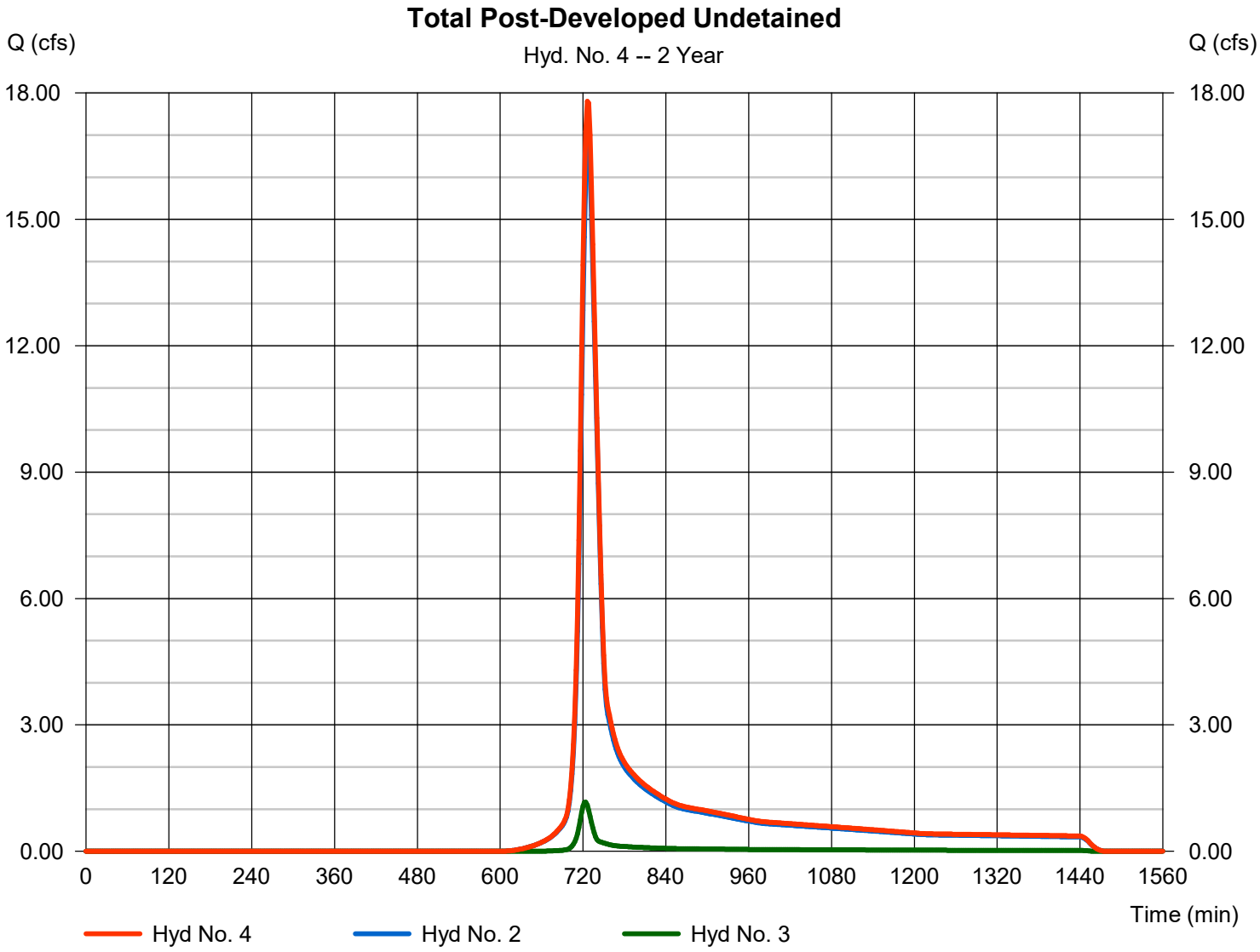


Hydrograph Report

Hyd. No. 4

Total Post-Developed Undetained

Hydrograph type	= Combine	Peak discharge	= 17.80 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 62,990 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 18.010 ac



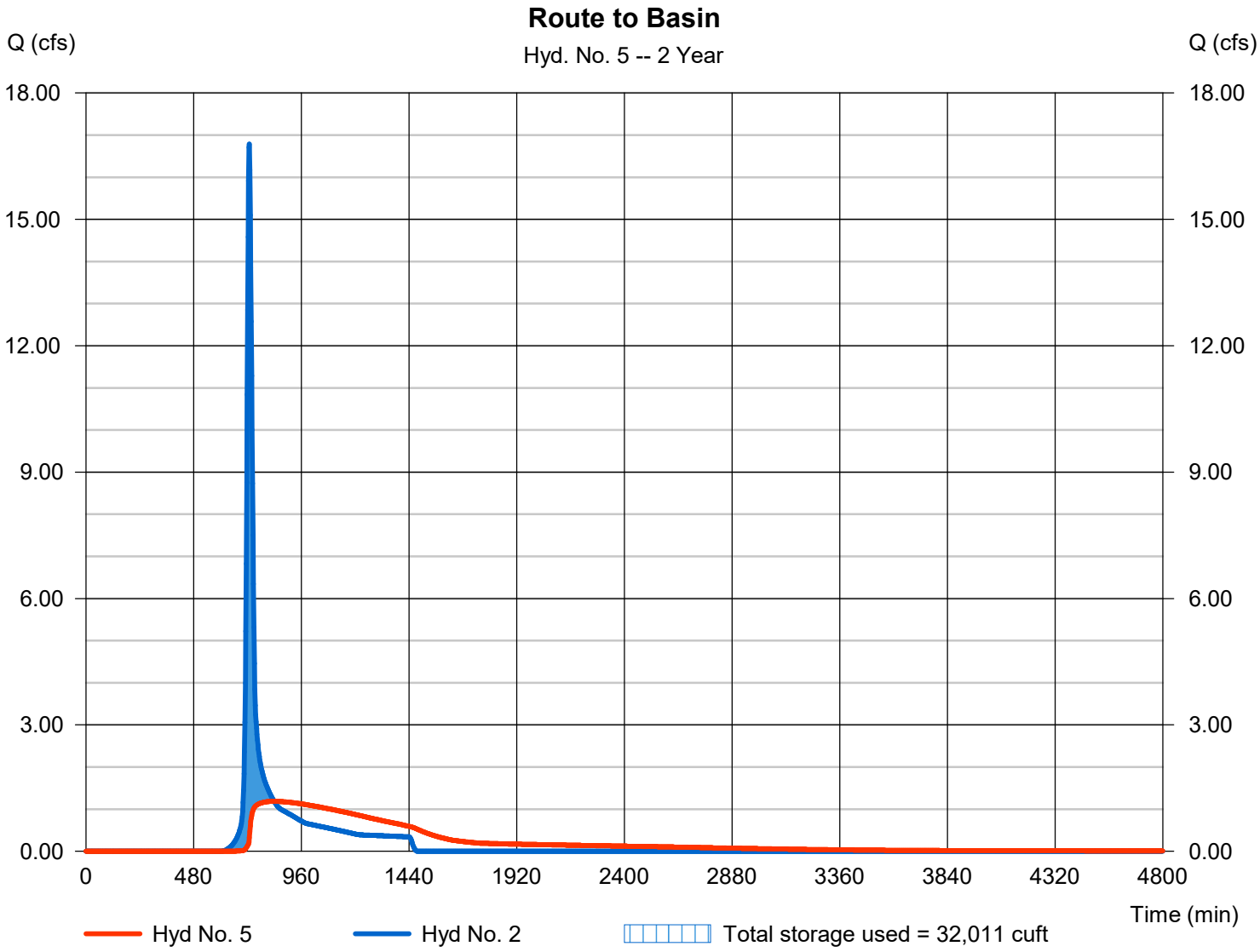
Hydrograph Report

Hyd. No. 5

Route to Basin

Hydrograph type	=	Reservoir	Peak discharge	=	1.186 cfs
Storm frequency	=	2 yrs	Time to peak	=	838 min
Time interval	=	2 min	Hyd. volume	=	59,224 cuft
Inflow hyd. No.	=	2 - Post-Developed to Basin	Max. Elevation	=	1089.91 ft
Reservoir name	=	SWM Basin	Max. Storage	=	32,011 cuft

Storage Indication method used.

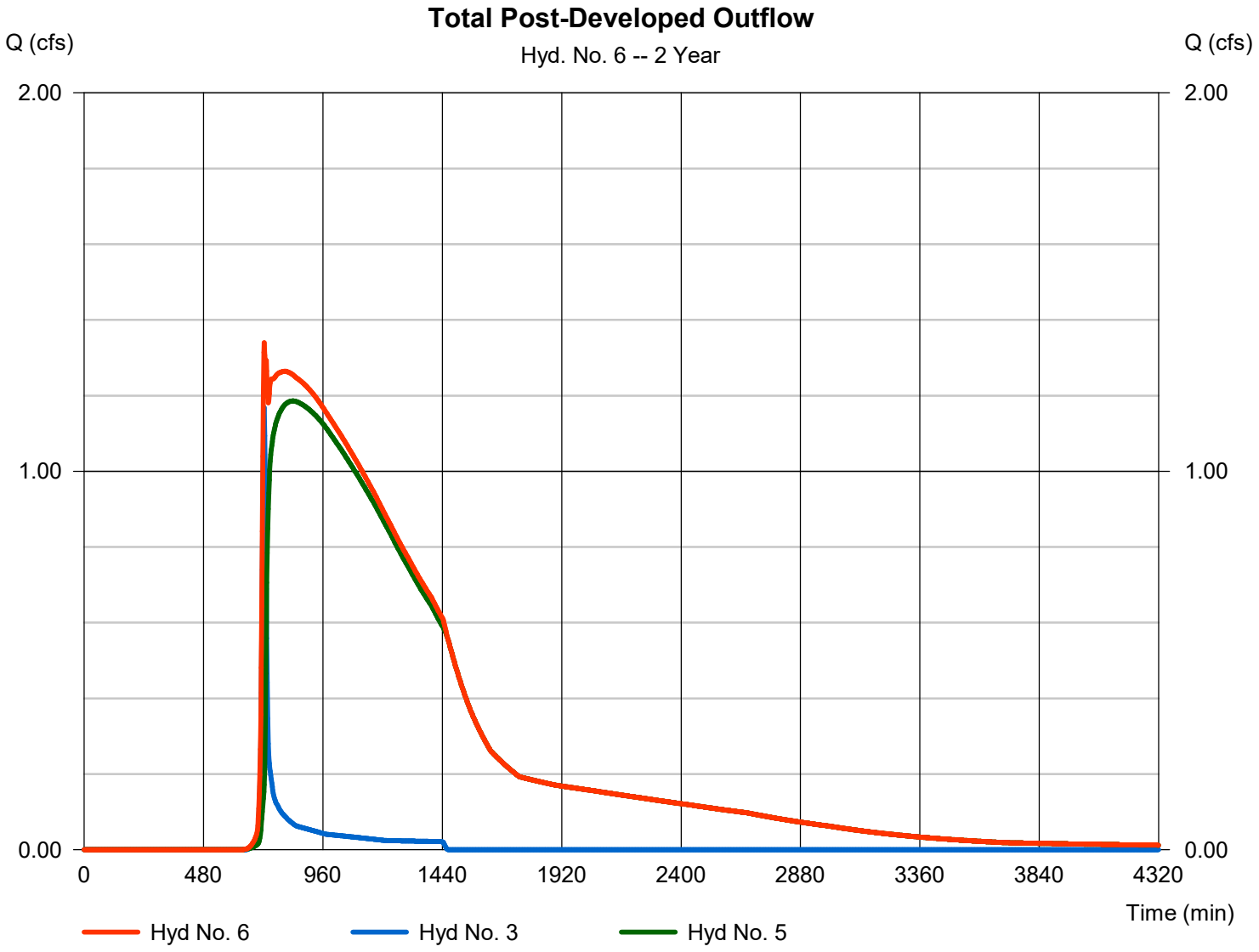


Hydrograph Report

Hyd. No. 6

Total Post-Developed Outflow

Hydrograph type	= Combine	Peak discharge	= 1.340 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 62,639 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 1.210 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

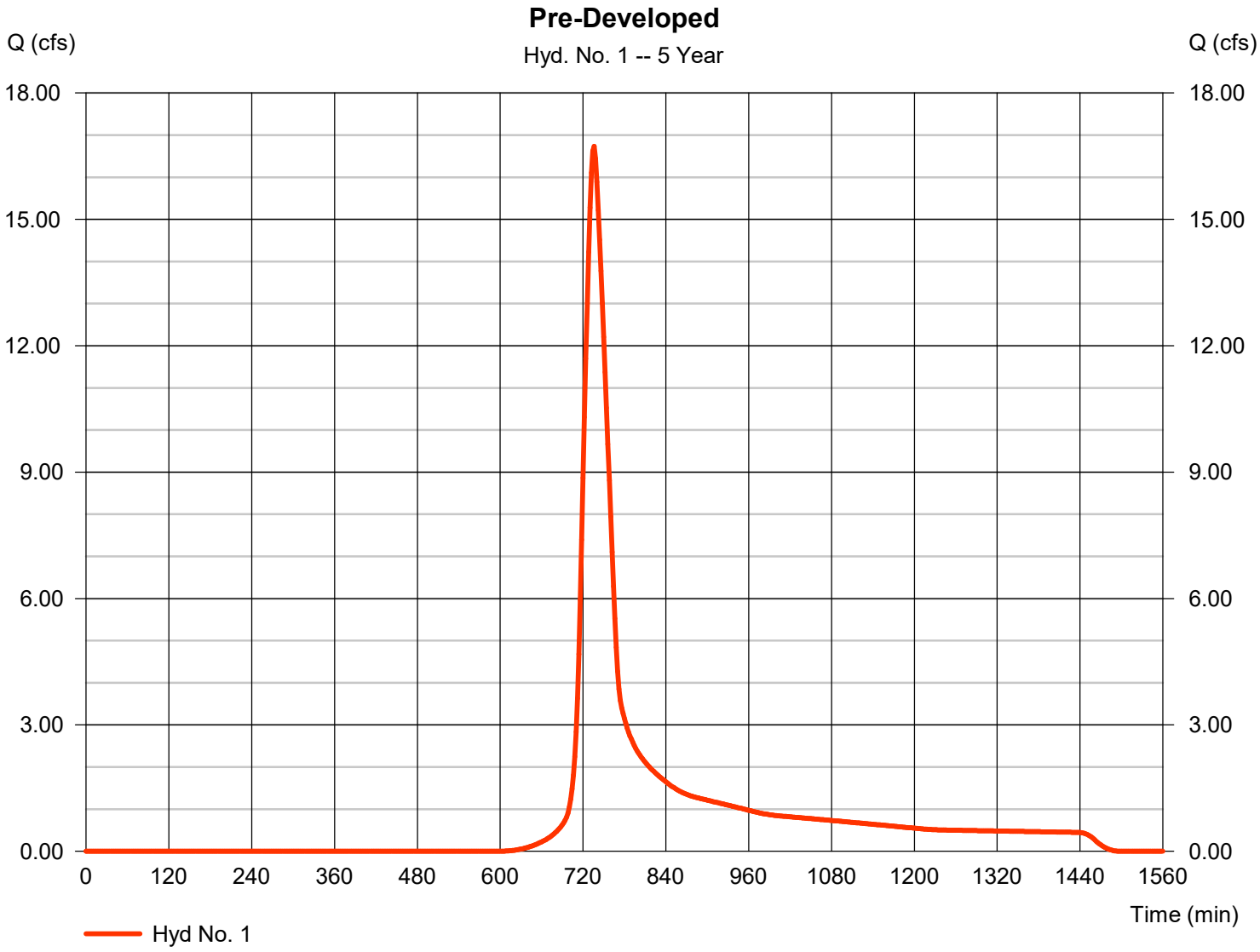
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	16.73	2	736	78,192	------	------	------	Pre-Developed
2	SCS Runoff	25.06	2	726	87,483	------	------	------	Post-Developed to Basin
3	SCS Runoff	1.817	2	722	5,184	------	------	------	Post-Bypass
4	Combine	26.74	2	726	92,667	2, 3	------	------	Total Post-Developed Undetained
5	Reservoir	1.604	2	842	87,084	2	1090.76	49,349	Route to Basin
6	Combine	2.457	2	726	92,267	3, 5	------	------	Total Post-Developed Outflow

Hydrograph Report

Hyd. No. 1

Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.73 cfs
Storm frequency	=	5 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	78,192 cuft
Drainage area	=	18.000 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.00 min
Total precip.	=	3.03 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

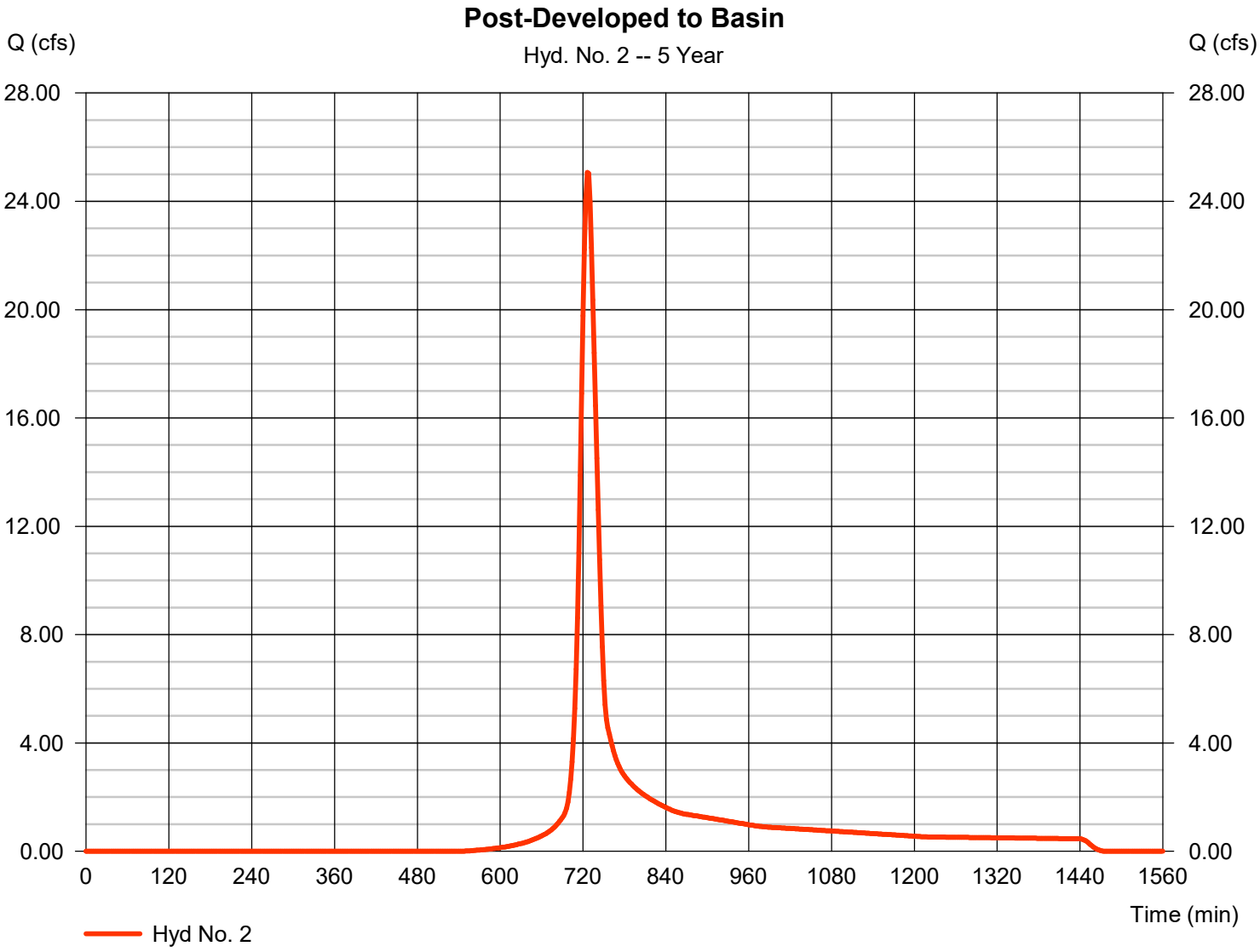


Hydrograph Report

Hyd. No. 2

Post-Developed to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.06 cfs
Storm frequency	=	5 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	87,483 cuft
Drainage area	=	16.800 ac	Curve number	=	82.1
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.60 min
Total precip.	=	3.03 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

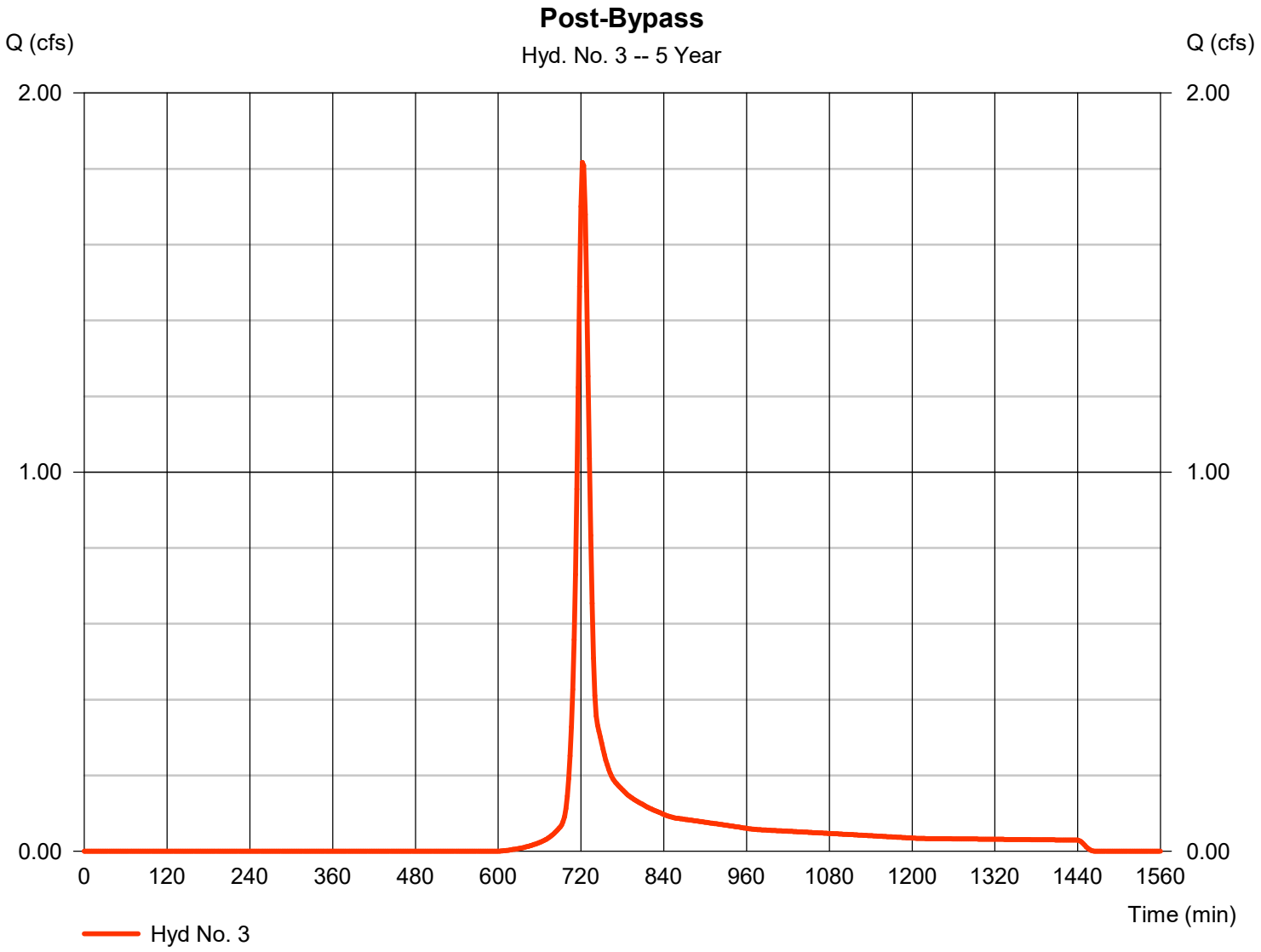


Hydrograph Report

Hyd. No. 3

Post-Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.817 cfs
Storm frequency	=	5 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	5,184 cuft
Drainage area	=	1.210 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.03 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

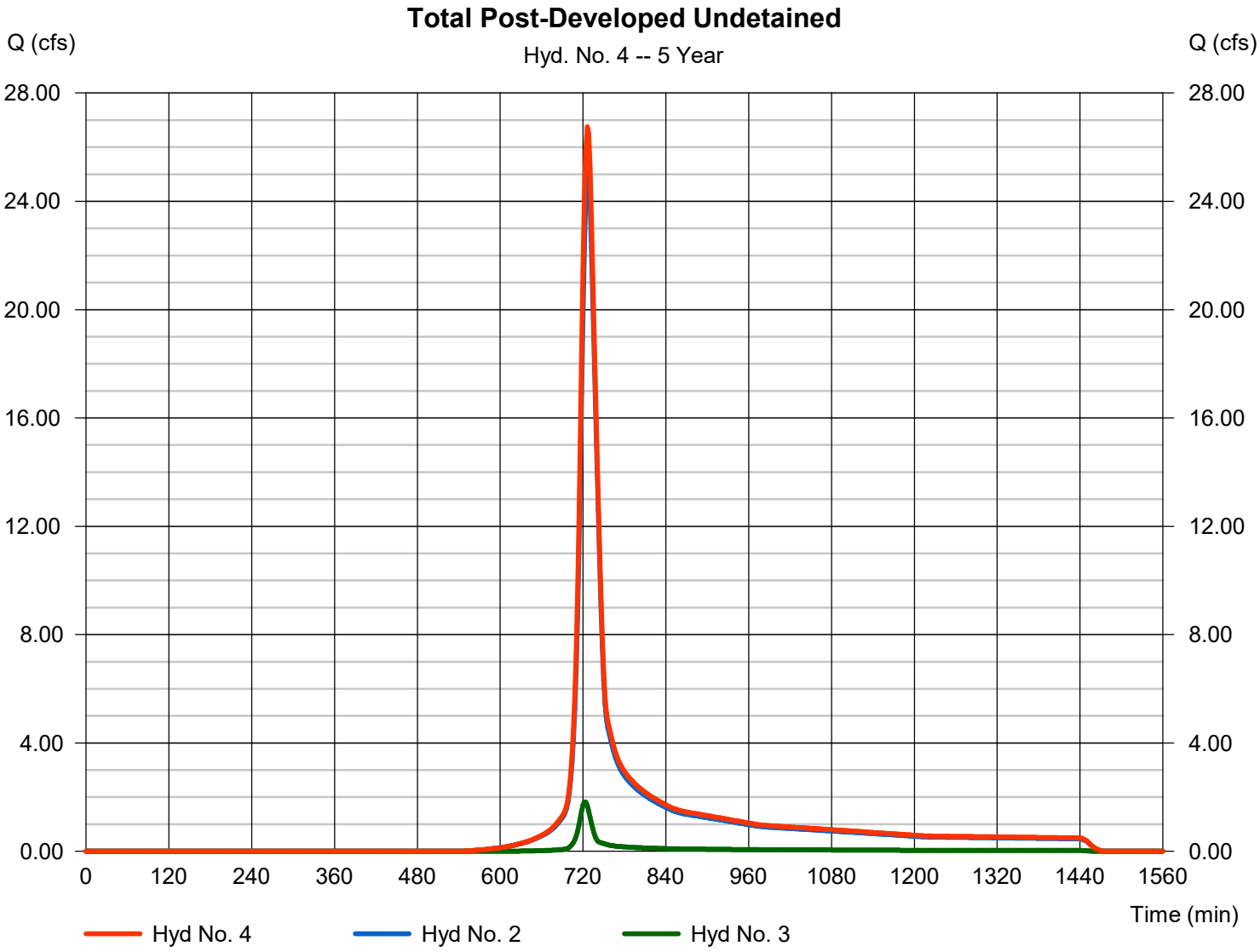


Hydrograph Report

Hyd. No. 4

Total Post-Developed Undetained

Hydrograph type	= Combine	Peak discharge	= 26.74 cfs
Storm frequency	= 5 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 92,667 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 18.010 ac



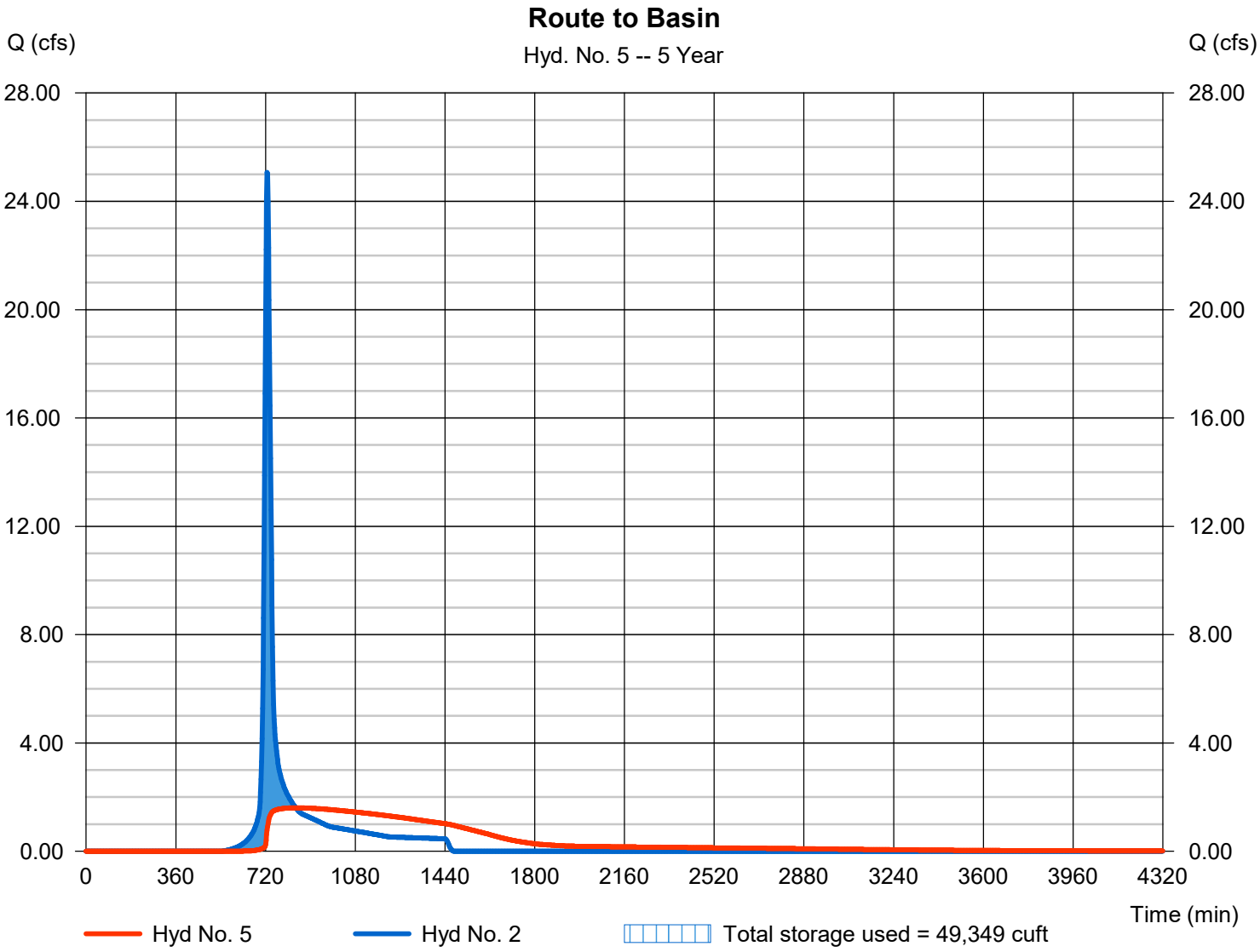
Hydrograph Report

Hyd. No. 5

Route to Basin

Hydrograph type	=	Reservoir	Peak discharge	=	1.604 cfs
Storm frequency	=	5 yrs	Time to peak	=	842 min
Time interval	=	2 min	Hyd. volume	=	87,084 cuft
Inflow hyd. No.	=	2 - Post-Developed to Basin	Max. Elevation	=	1090.76 ft
Reservoir name	=	SWM Basin	Max. Storage	=	49,349 cuft

Storage Indication method used.

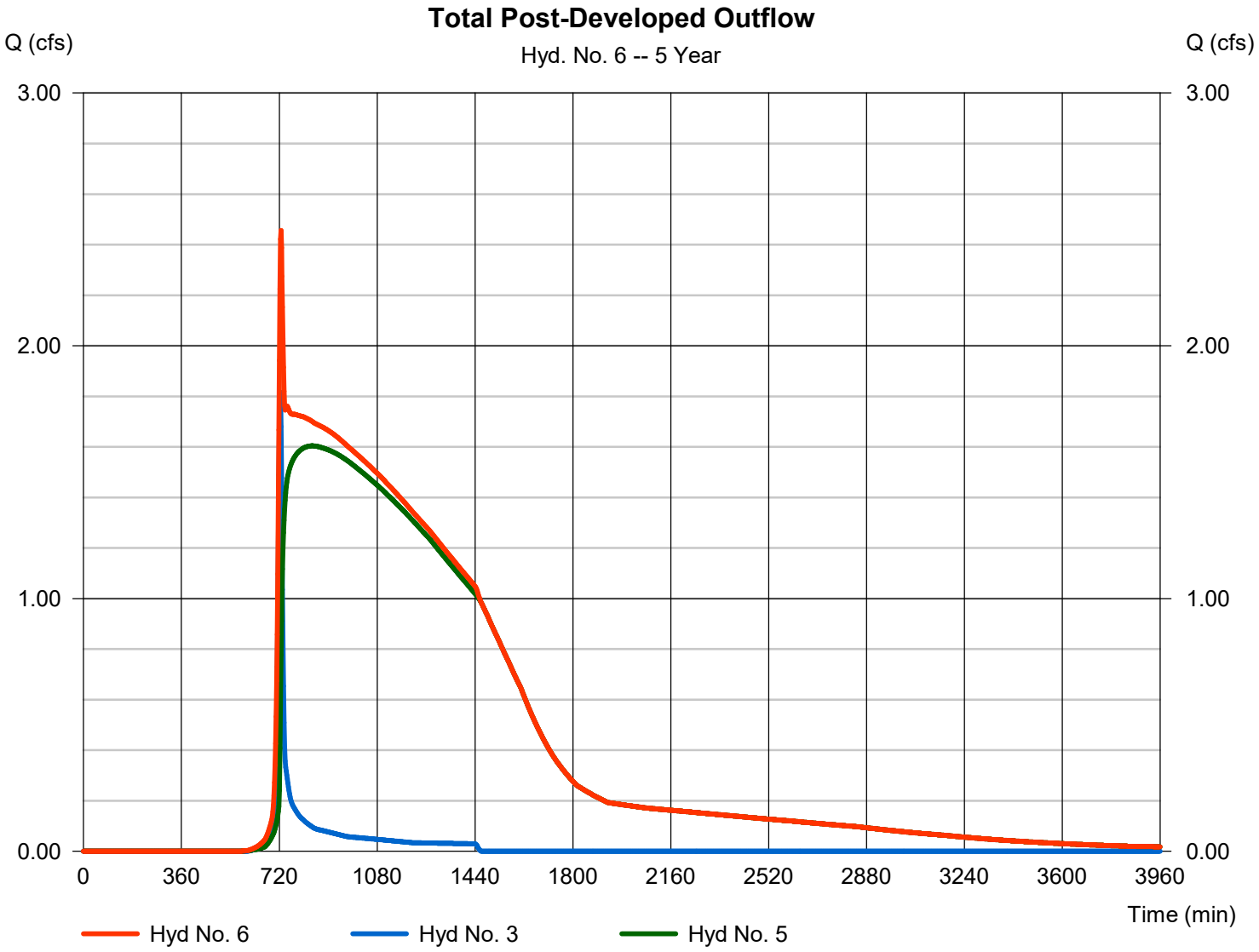


Hydrograph Report

Hyd. No. 6

Total Post-Developed Outflow

Hydrograph type	=	Combine	Peak discharge	=	2.457 cfs
Storm frequency	=	5 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	92,267 cuft
Inflow hyds.	=	3, 5	Contrib. drain. area	=	1.210 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

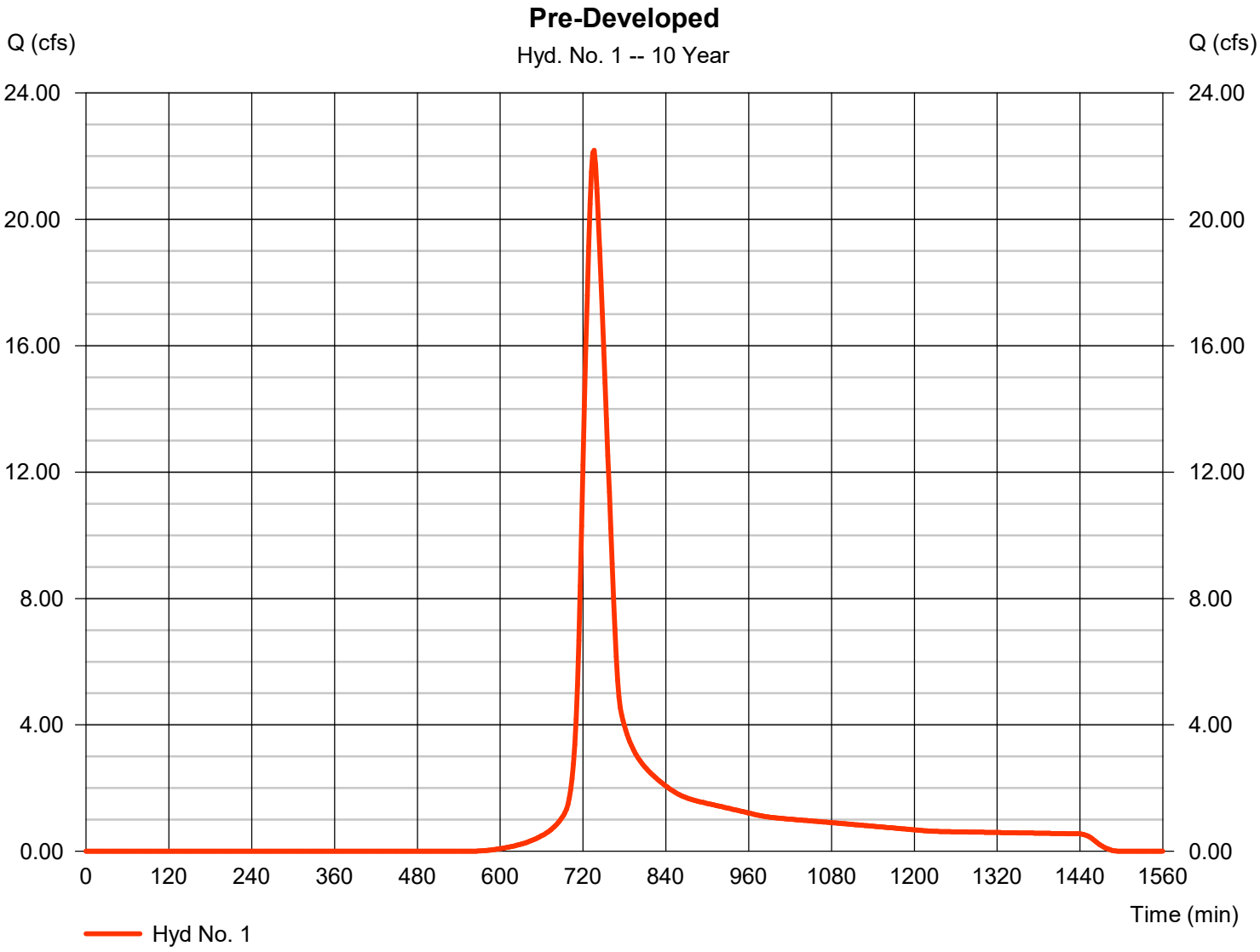
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	22.18	2	736	102,163	------	------	------	Pre-Developed
2	SCS Runoff	32.37	2	726	112,146	------	------	------	Post-Developed to Basin
3	SCS Runoff	2.400	2	722	6,773	------	------	------	Post-Bypass
4	Combine	34.57	2	726	118,919	2, 3	------	------	Total Post-Developed Undetained
5	Reservoir	1.887	2	848	111,700	2	1091.48	65,553	Route to Basin
6	Combine	3.350	2	724	118,473	3, 5	------	------	Total Post-Developed Outflow

Hydrograph Report

Hyd. No. 1

Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.18 cfs
Storm frequency	=	10 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	102,163 cuft
Drainage area	=	18.000 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.00 min
Total precip.	=	3.52 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

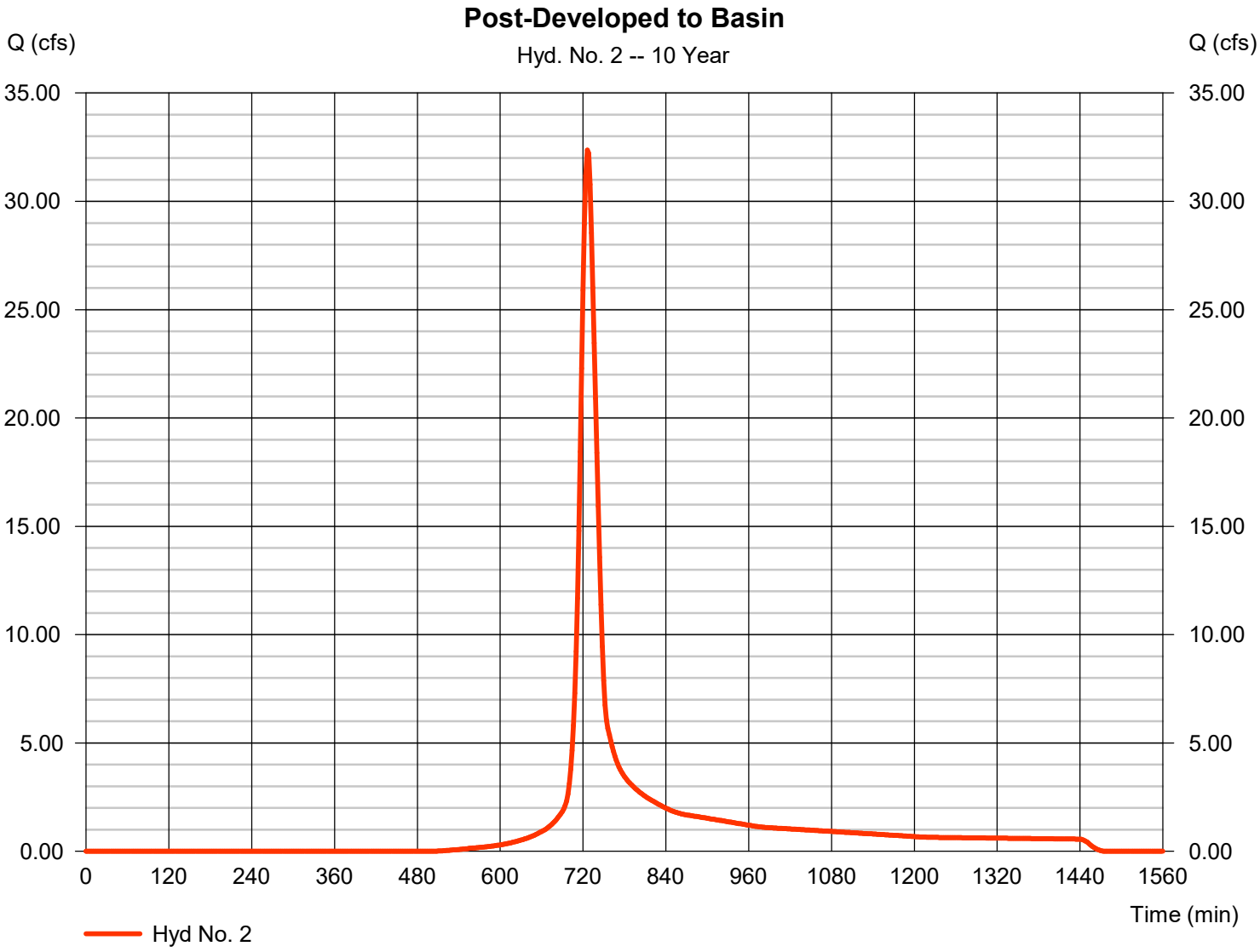


Hydrograph Report

Hyd. No. 2

Post-Developed to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.37 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	112,146 cuft
Drainage area	=	16.800 ac	Curve number	=	82.1
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.60 min
Total precip.	=	3.52 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

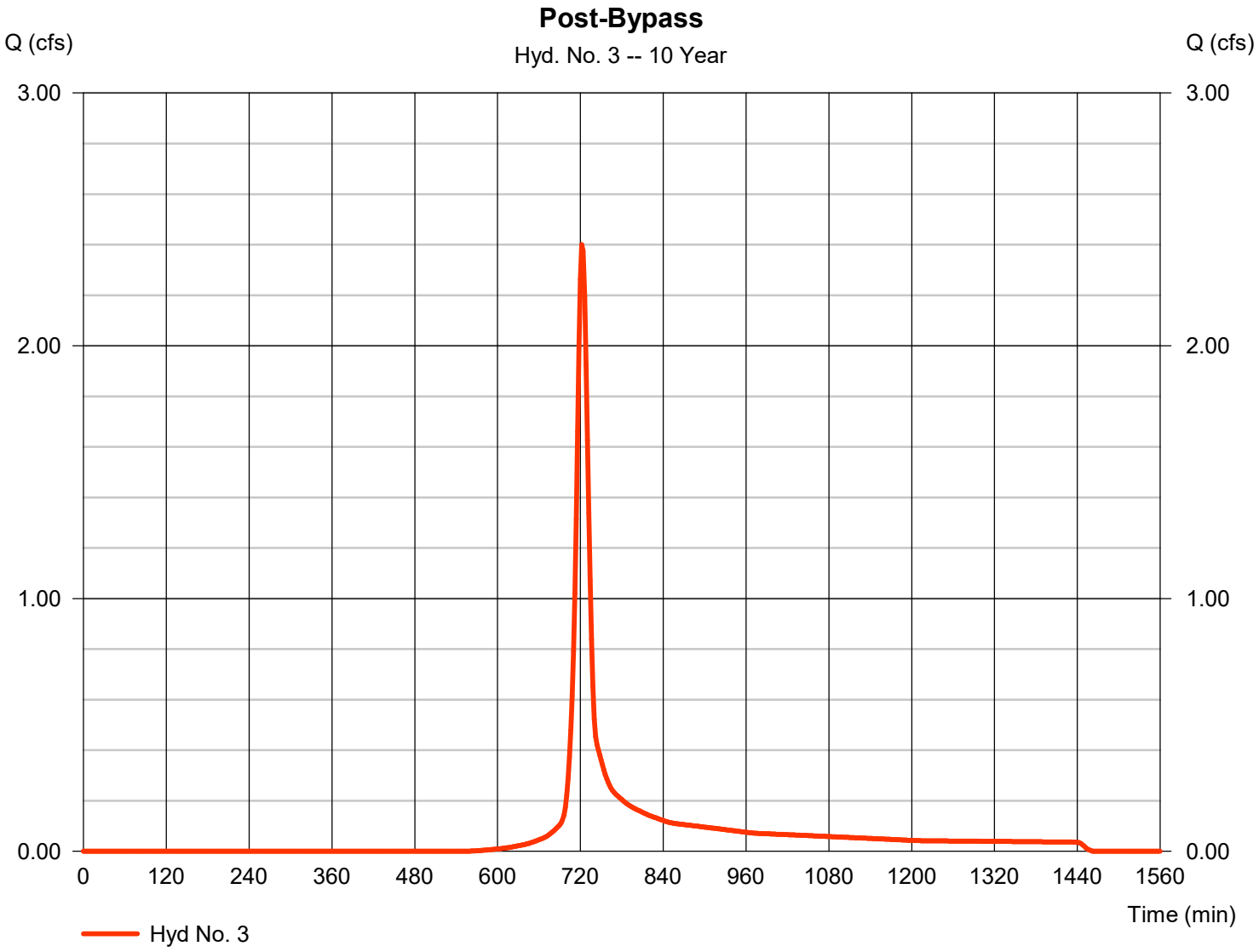


Hydrograph Report

Hyd. No. 3

Post-Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.400 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	6,773 cuft
Drainage area	=	1.210 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.52 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

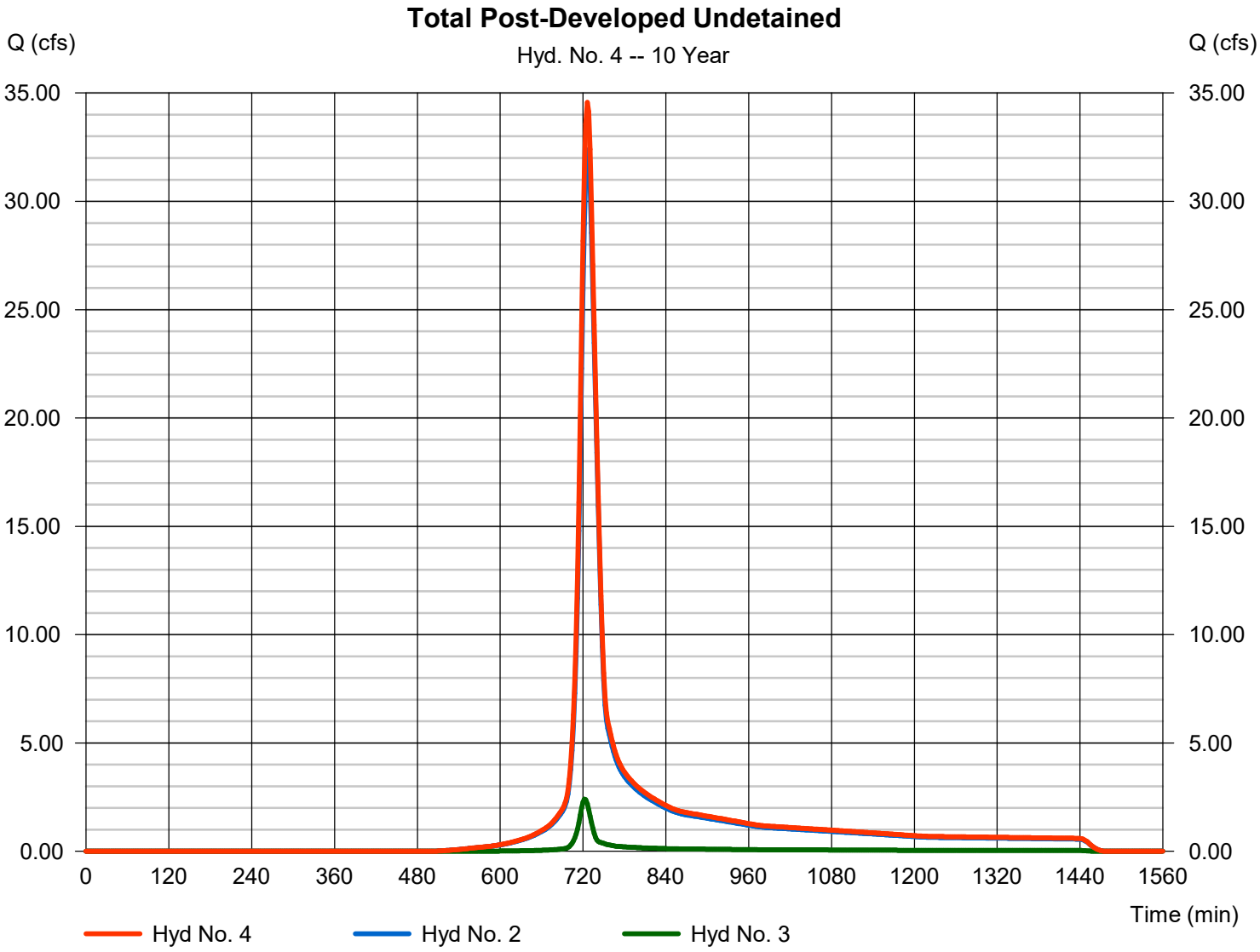


Hydrograph Report

Hyd. No. 4

Total Post-Developed Undetained

Hydrograph type	= Combine	Peak discharge	= 34.57 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 118,919 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 18.010 ac



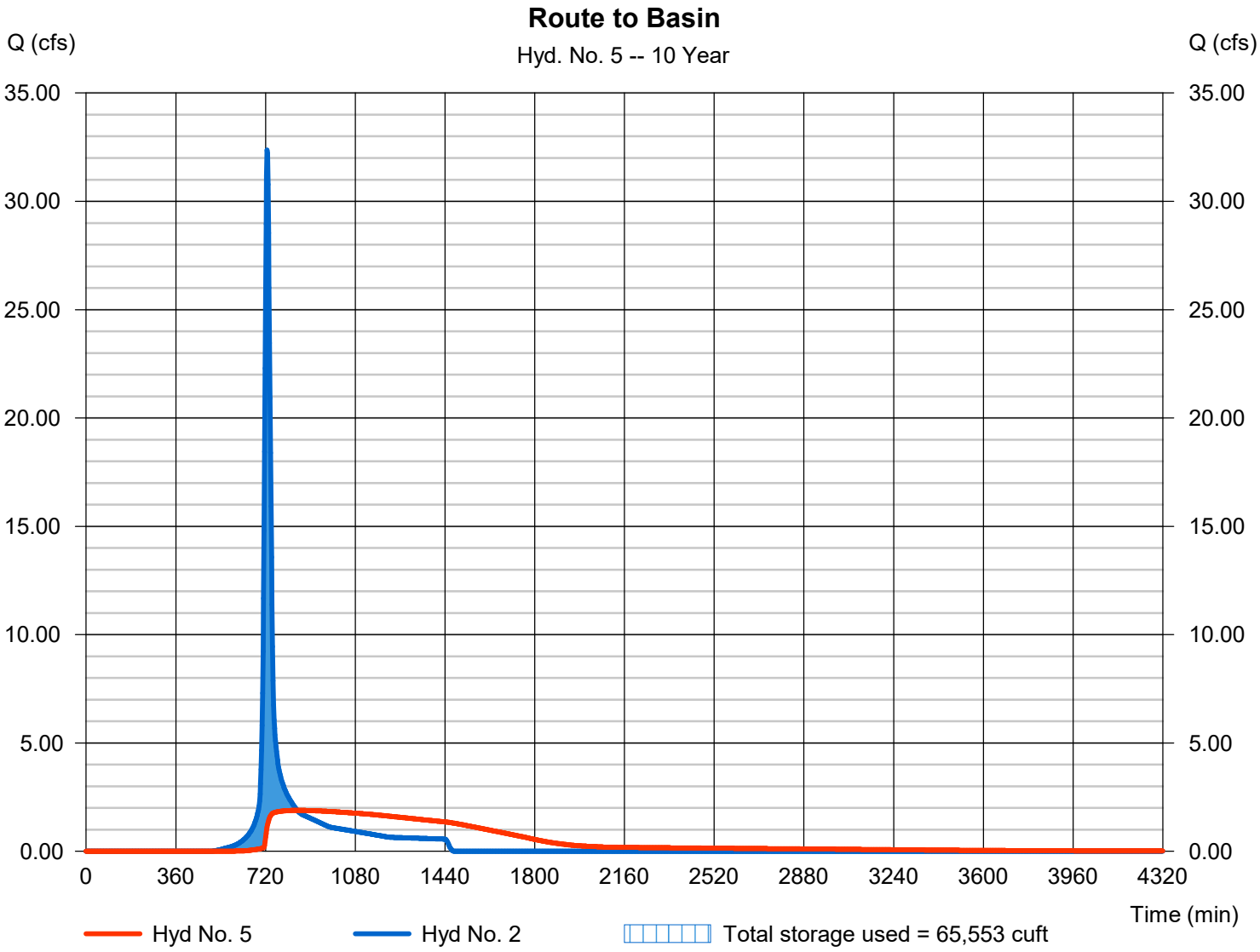
Hydrograph Report

Hyd. No. 5

Route to Basin

Hydrograph type	=	Reservoir	Peak discharge	=	1.887 cfs
Storm frequency	=	10 yrs	Time to peak	=	848 min
Time interval	=	2 min	Hyd. volume	=	111,700 cuft
Inflow hyd. No.	=	2 - Post-Developed to Basin	Max. Elevation	=	1091.48 ft
Reservoir name	=	SWM Basin	Max. Storage	=	65,553 cuft

Storage Indication method used.

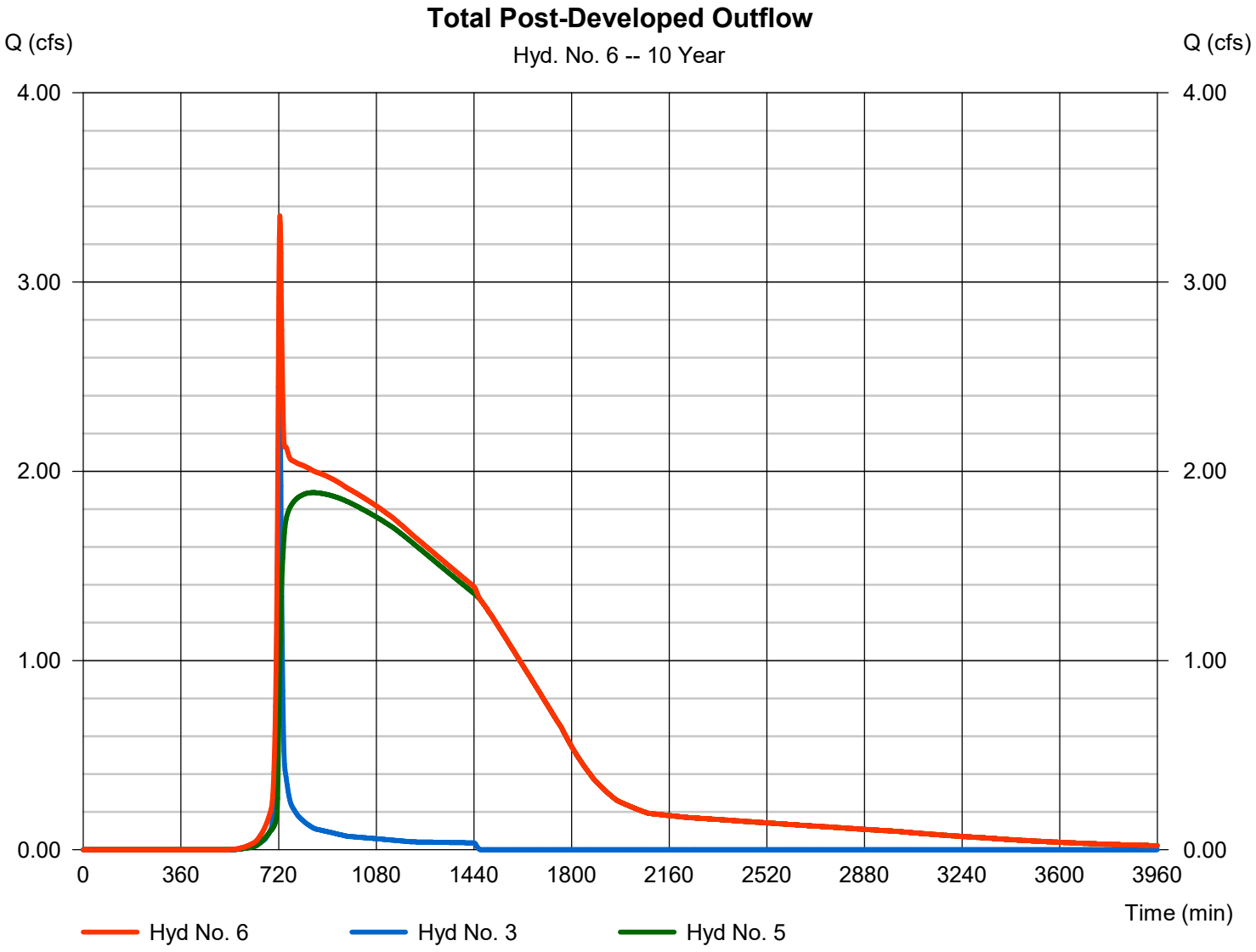


Hydrograph Report

Hyd. No. 6

Total Post-Developed Outflow

Hydrograph type	= Combine	Peak discharge	= 3.350 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 118,473 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 1.210 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

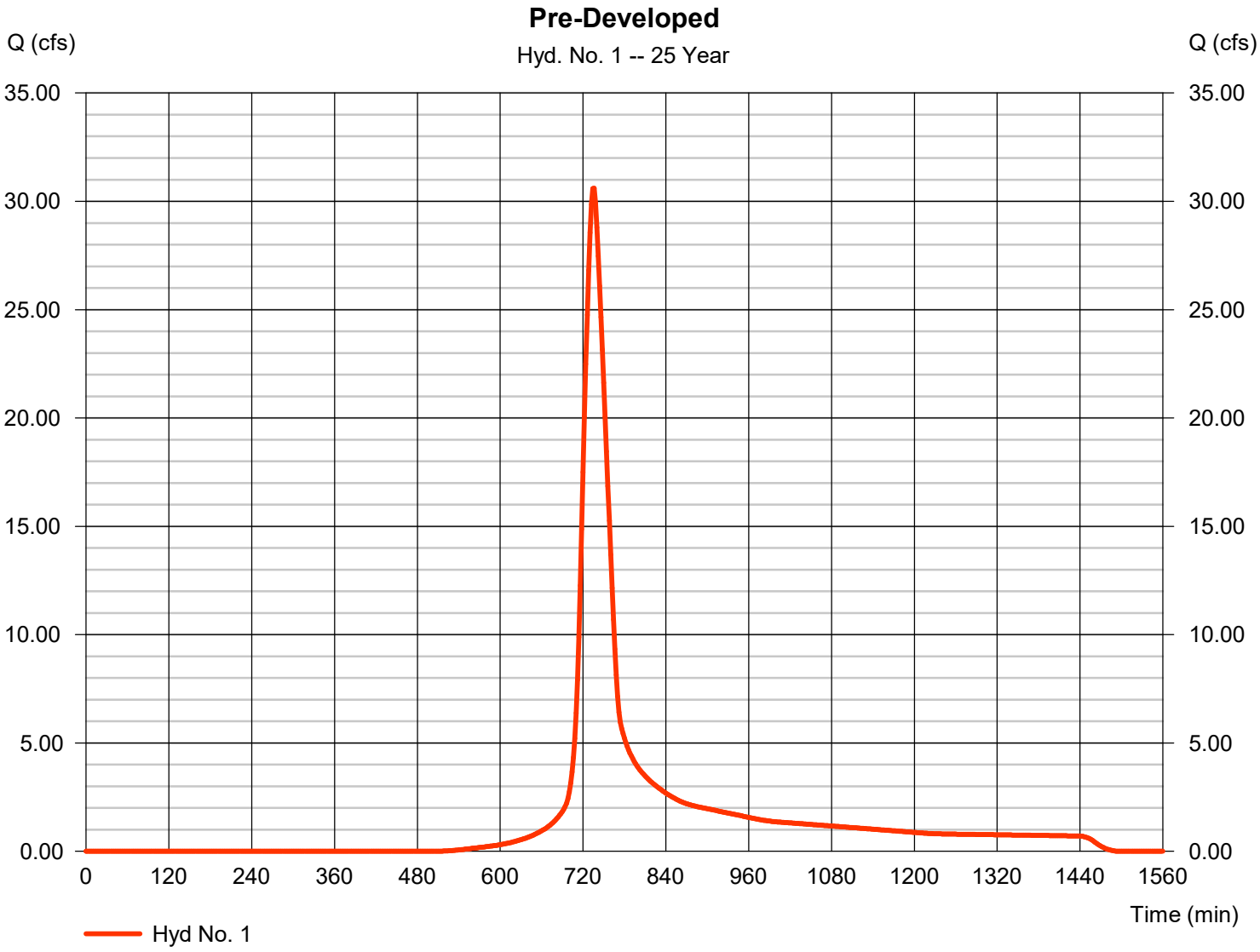
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	30.60	2	736	139,531	------	------	------	Pre-Developed
2	SCS Runoff	43.47	2	726	150,094	------	------	------	Post-Developed to Basin
3	SCS Runoff	3.298	2	722	9,250	------	------	------	Post-Bypass
4	Combine	46.46	2	726	159,345	2, 3	------	------	Total Post-Developed Undetained
5	Reservoir	2.235	2	860	149,572	2	1092.51	91,506	Route to Basin
6	Combine	4.594	2	724	158,822	3, 5	------	------	Total Post-Developed Outflow

Hydrograph Report

Hyd. No. 1

Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	30.60 cfs
Storm frequency	=	25 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	139,531 cuft
Drainage area	=	18.000 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.00 min
Total precip.	=	4.24 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

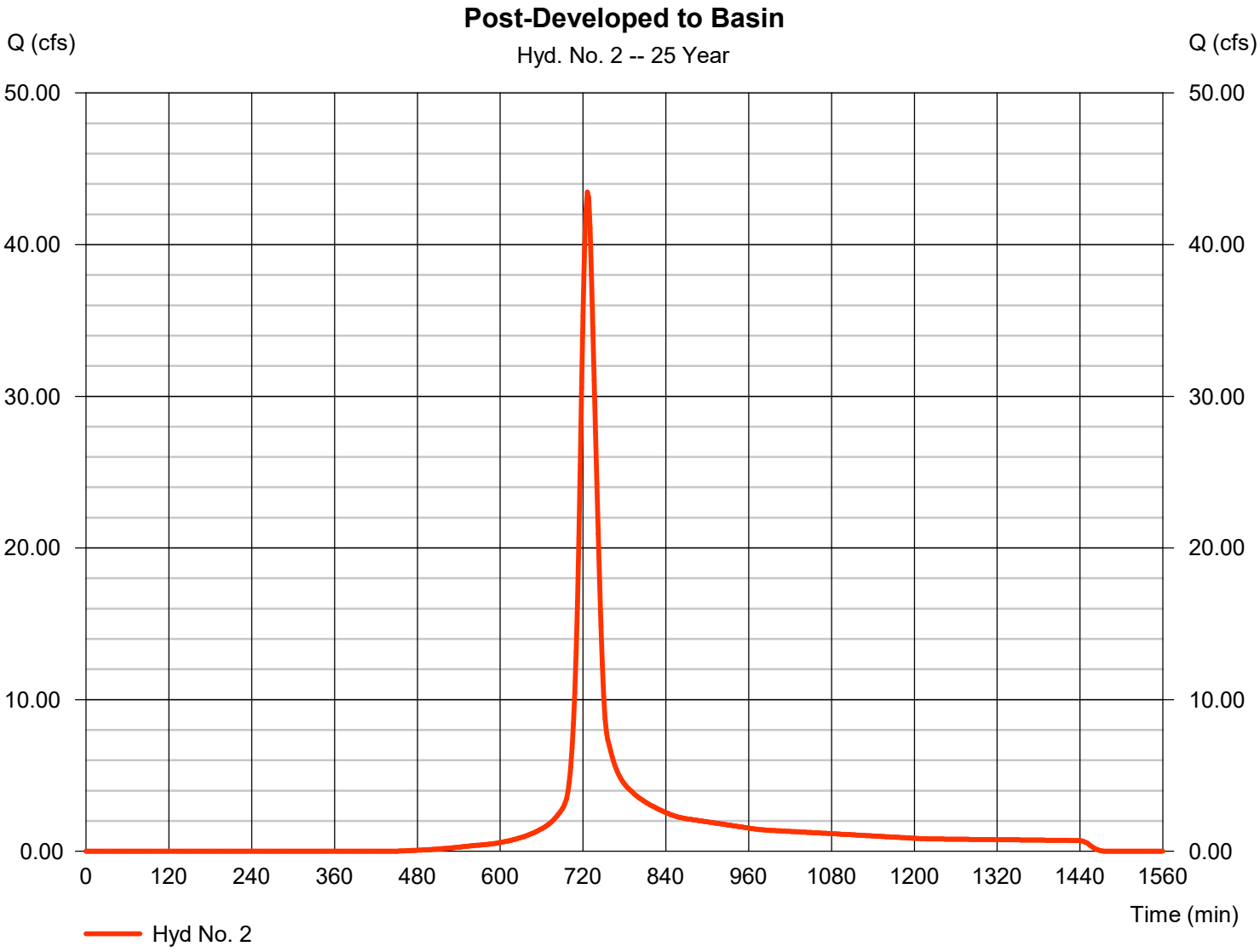


Hydrograph Report

Hyd. No. 2

Post-Developed to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	43.47 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	150,094 cuft
Drainage area	=	16.800 ac	Curve number	=	82.1
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.60 min
Total precip.	=	4.24 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

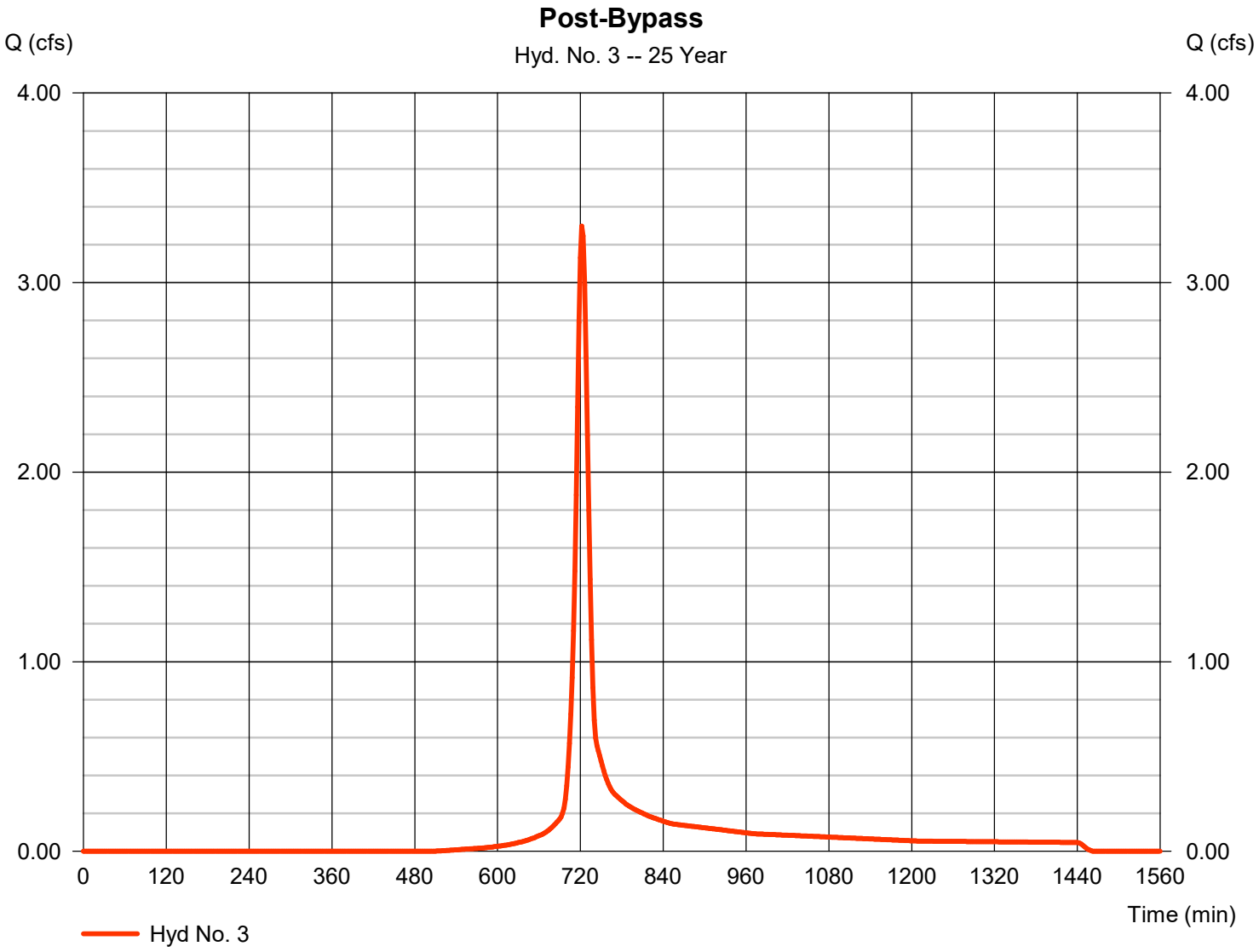


Hydrograph Report

Hyd. No. 3

Post-Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.298 cfs
Storm frequency	=	25 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	9,250 cuft
Drainage area	=	1.210 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.24 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

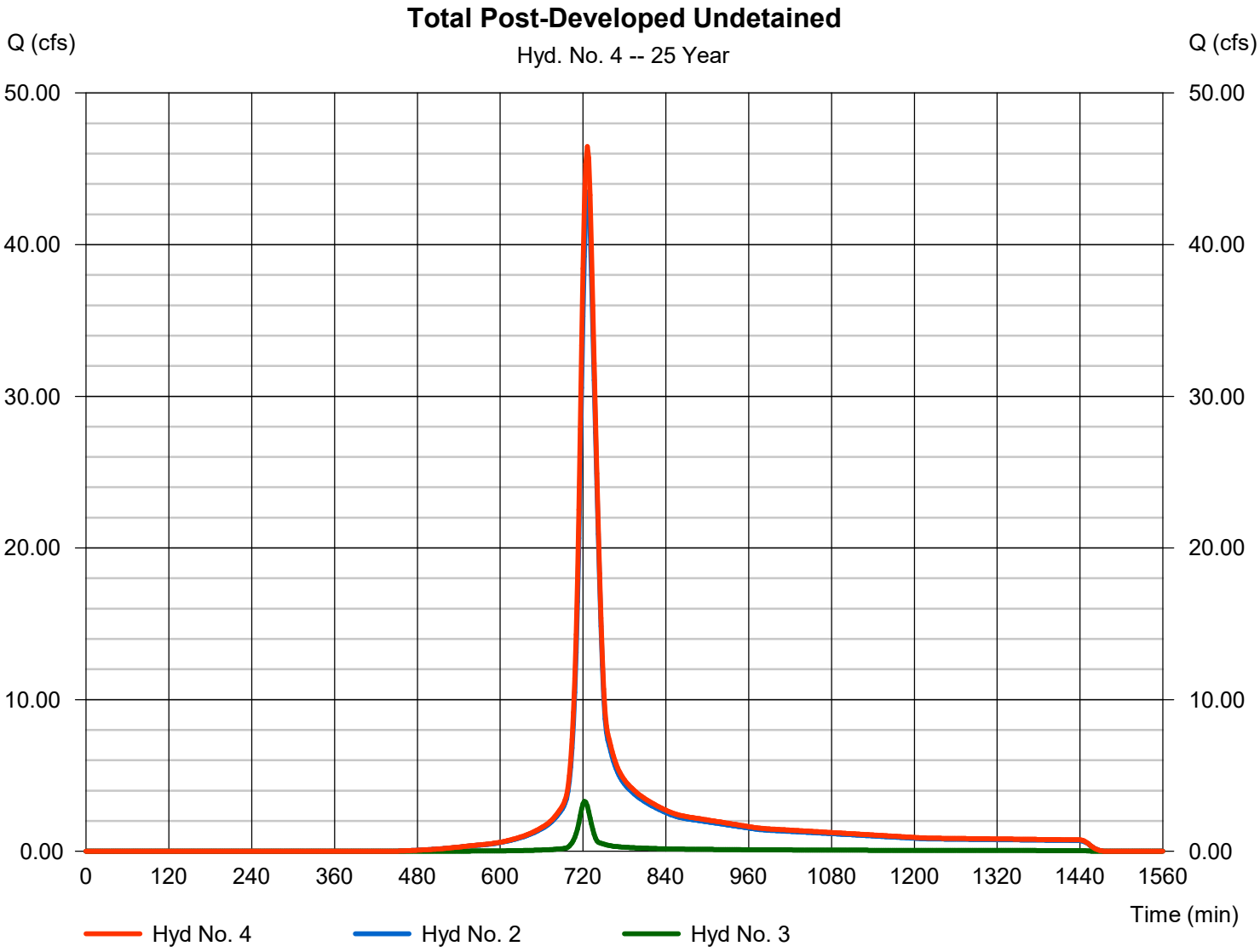


Hydrograph Report

Hyd. No. 4

Total Post-Developed Undetained

Hydrograph type	= Combine	Peak discharge	= 46.46 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 159,345 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 18.010 ac



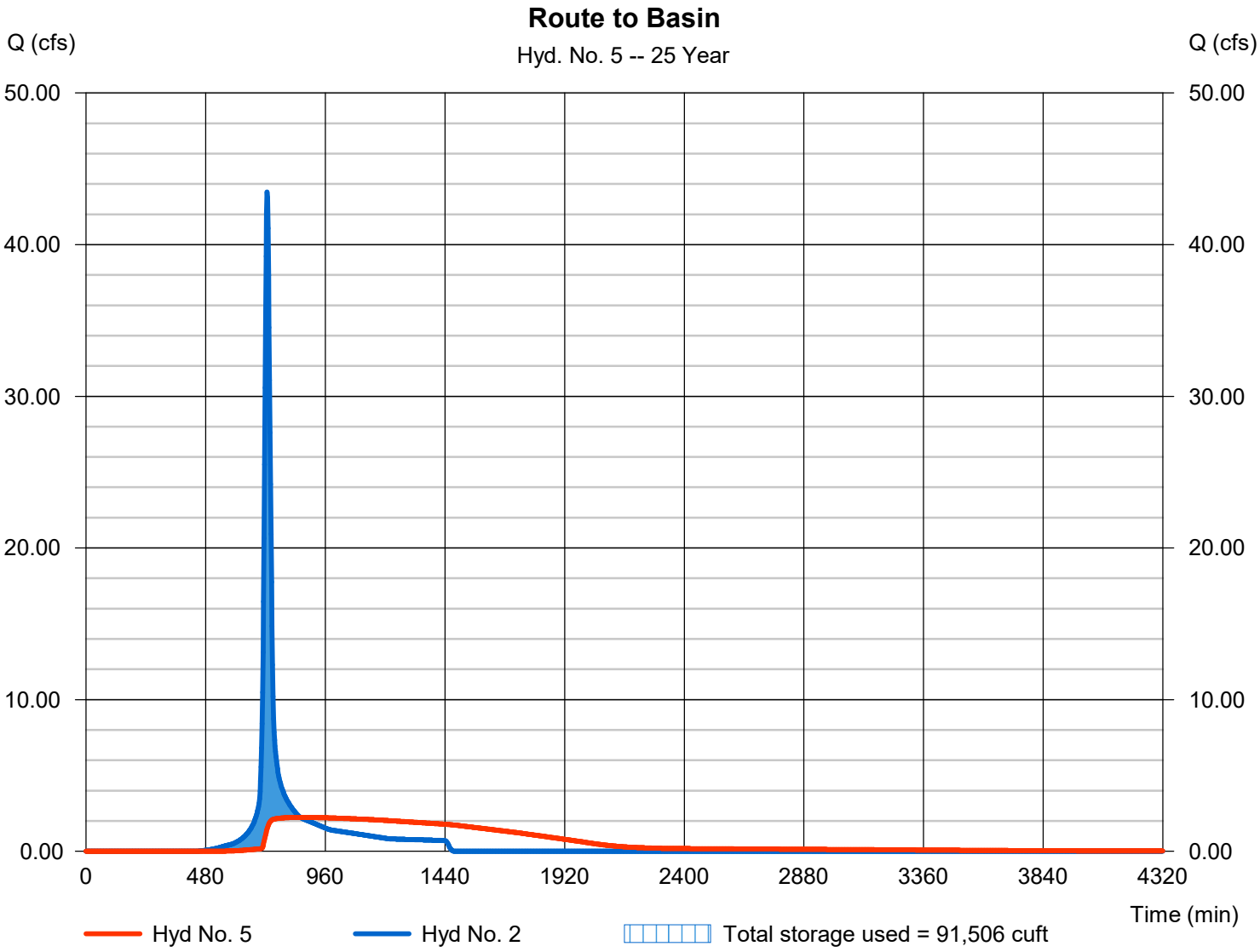
Hydrograph Report

Hyd. No. 5

Route to Basin

Hydrograph type	=	Reservoir	Peak discharge	=	2.235 cfs
Storm frequency	=	25 yrs	Time to peak	=	860 min
Time interval	=	2 min	Hyd. volume	=	149,572 cuft
Inflow hyd. No.	=	2 - Post-Developed to Basin	Max. Elevation	=	1092.51 ft
Reservoir name	=	SWM Basin	Max. Storage	=	91,506 cuft

Storage Indication method used.

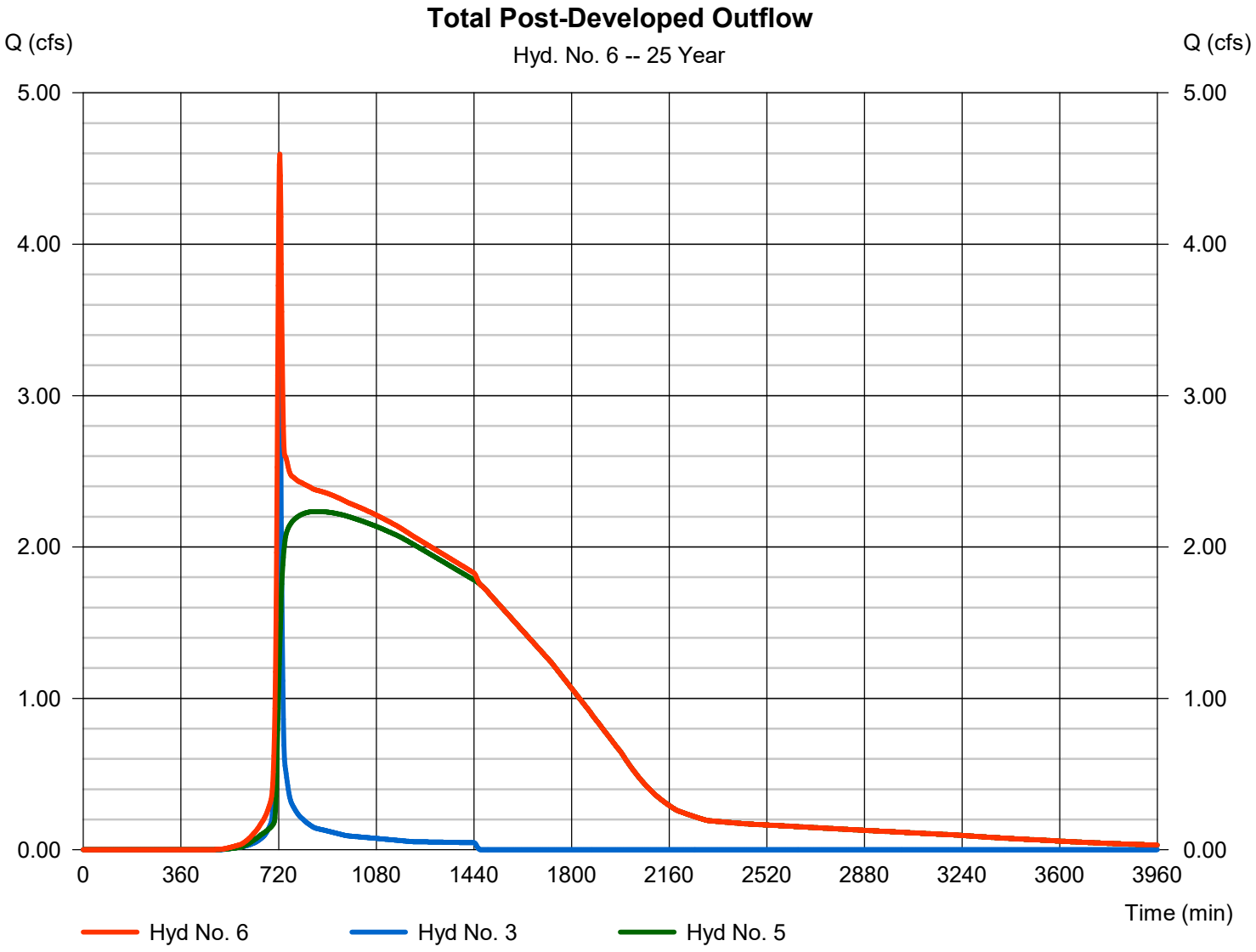


Hydrograph Report

Hyd. No. 6

Total Post-Developed Outflow

Hydrograph type	=	Combine	Peak discharge	=	4.594 cfs
Storm frequency	=	25 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	158,822 cuft
Inflow hyds.	=	3, 5	Contrib. drain. area	=	1.210 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

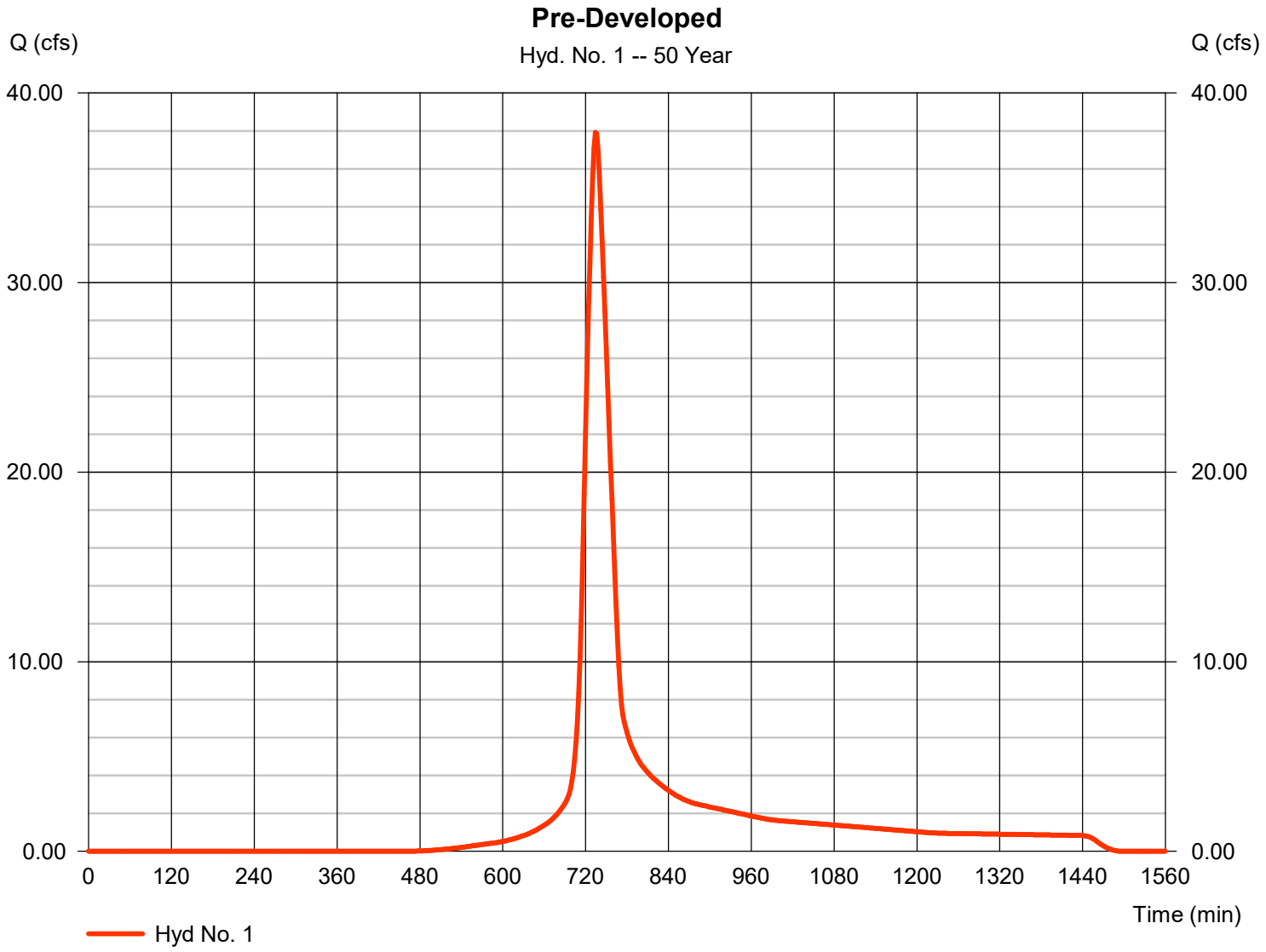
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	37.92	2	734	172,115	------	------	------	Pre-Developed
2	SCS Runoff	52.93	2	726	182,845	------	------	------	Post-Developed to Basin
3	SCS Runoff	4.071	2	722	11,410	------	------	------	Post-Bypass
4	Combine	56.60	2	726	194,255	2, 3	------	------	Total Post-Developed Undetained
5	Reservoir	4.057	2	804	182,273	2	1093.15	109,095	Route to Basin
6	Combine	5.583	2	724	193,683	3, 5	------	------	Total Post-Developed Outflow

Hydrograph Report

Hyd. No. 1

Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	37.92 cfs
Storm frequency	=	50 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	172,115 cuft
Drainage area	=	18.000 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

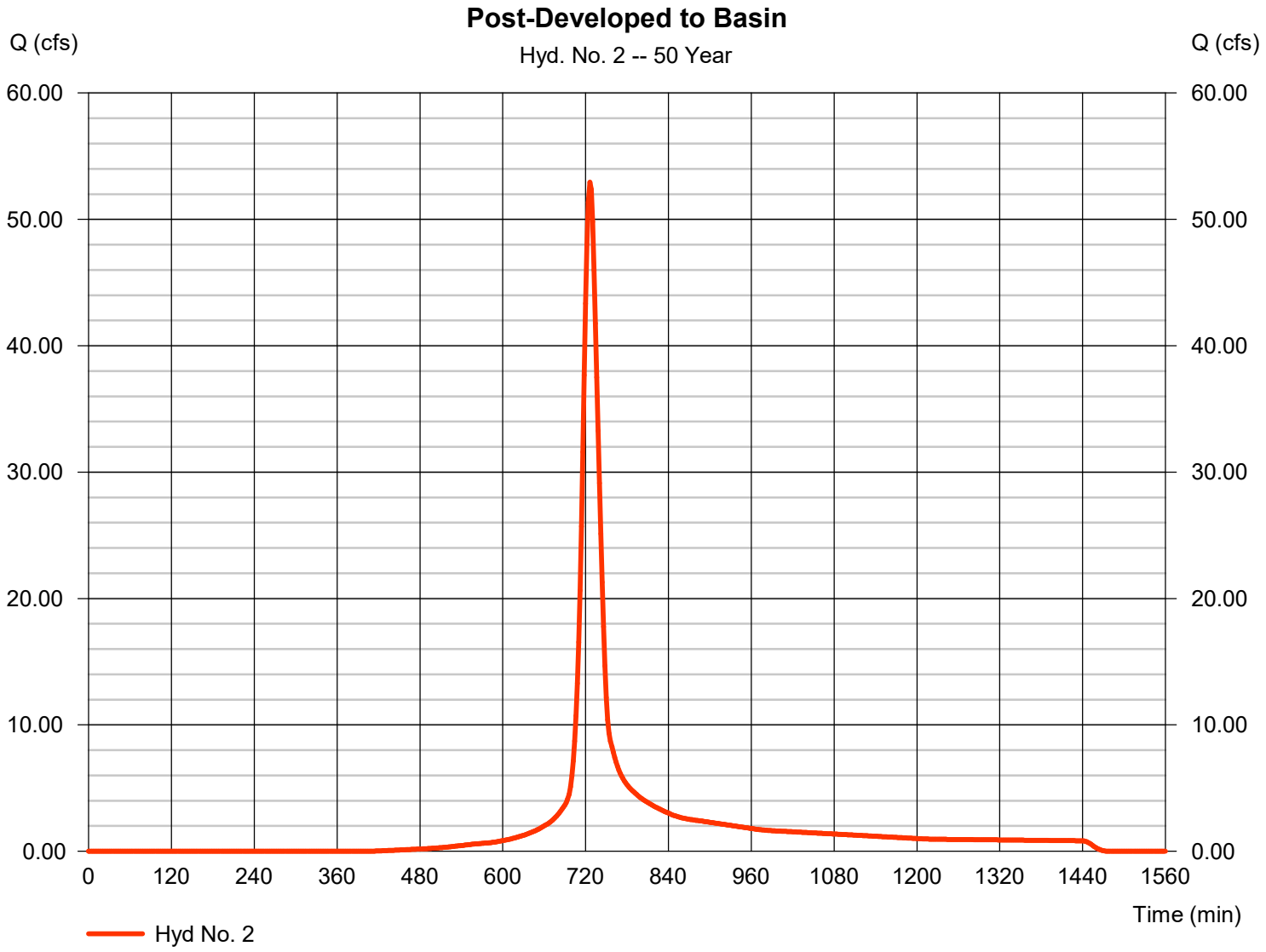


Hydrograph Report

Hyd. No. 2

Post-Developed to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	52.93 cfs
Storm frequency	=	50 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	182,845 cuft
Drainage area	=	16.800 ac	Curve number	=	82.1
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.60 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

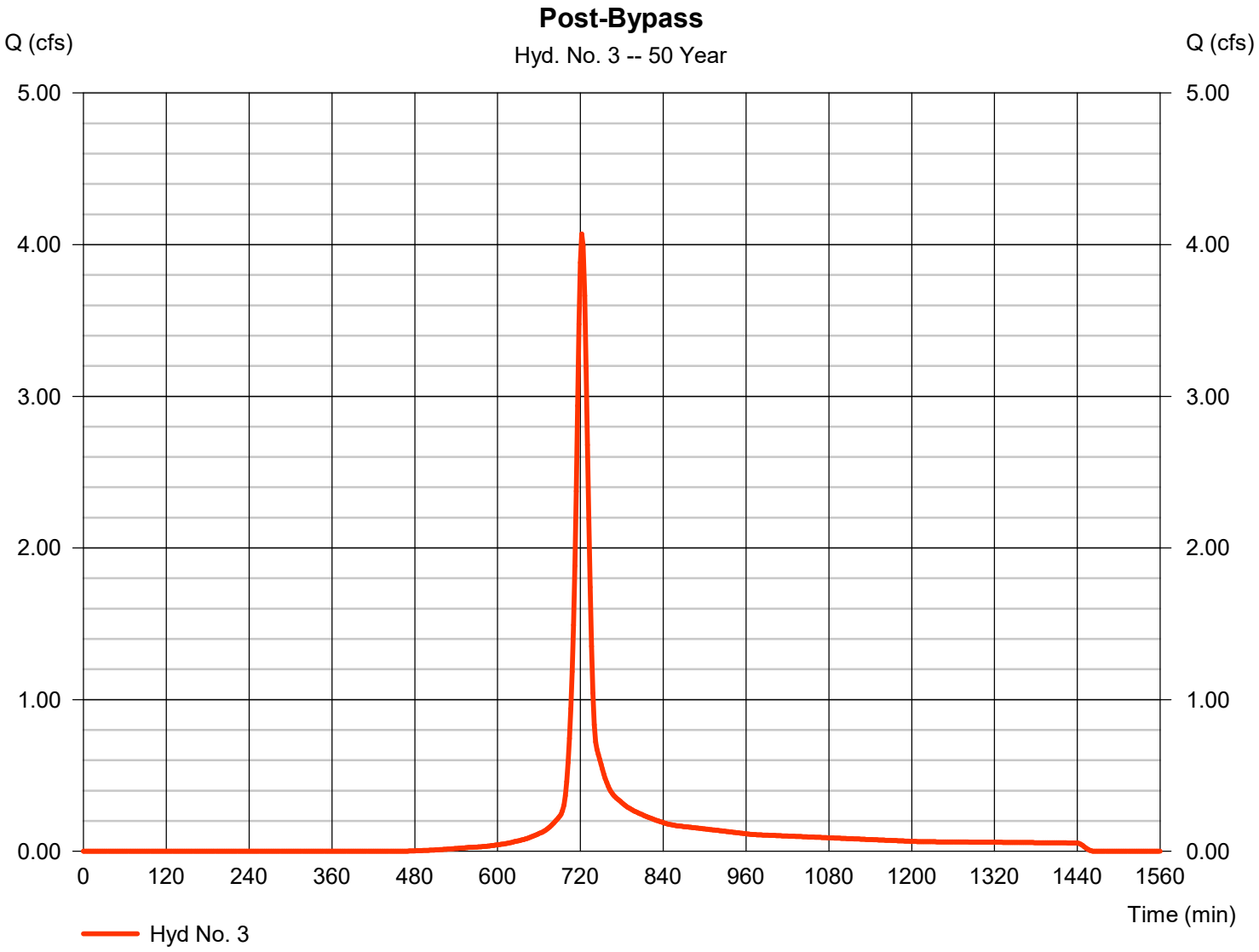


Hydrograph Report

Hyd. No. 3

Post-Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.071 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	11,410 cuft
Drainage area	=	1.210 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.84 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

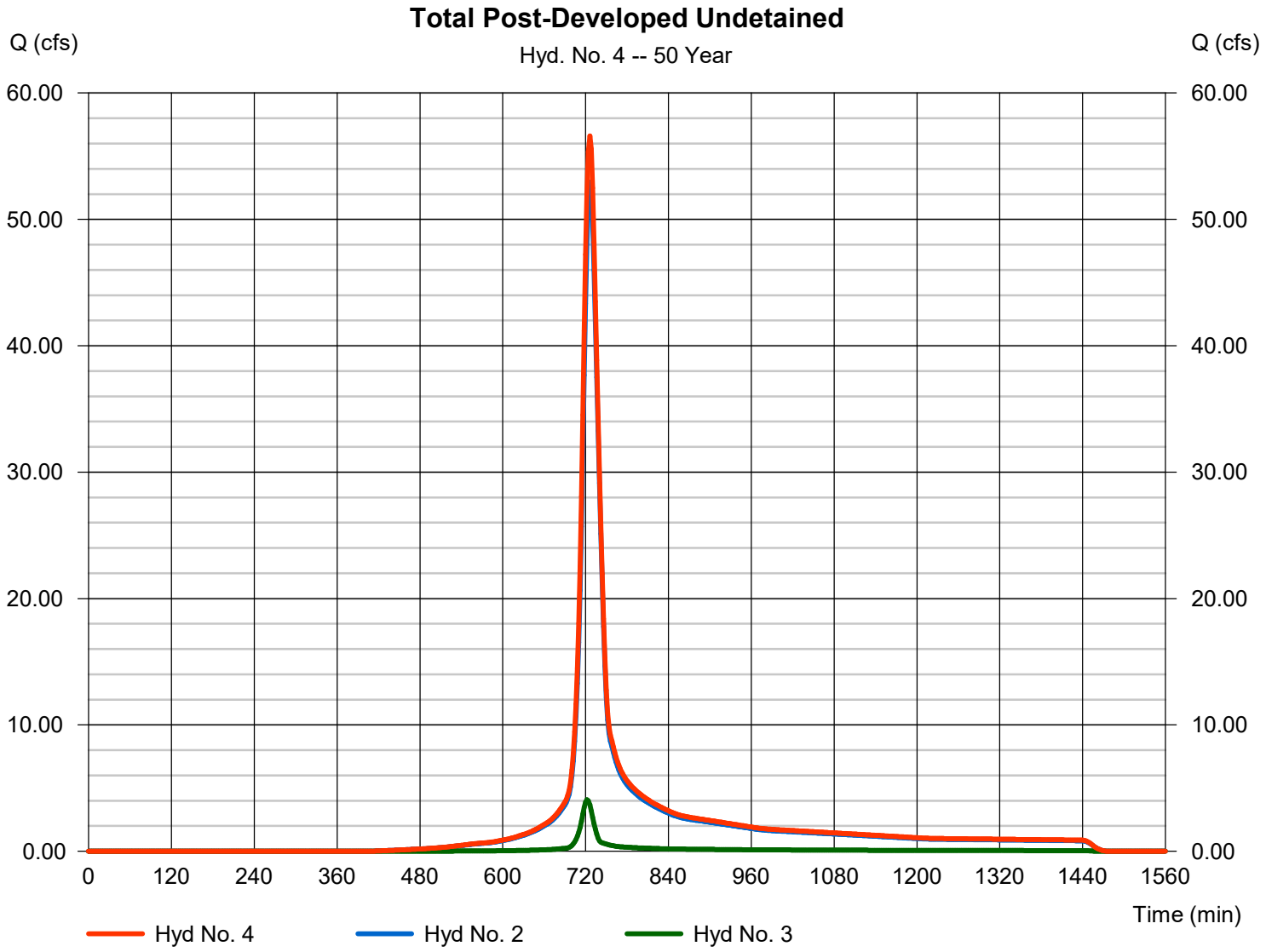


Hydrograph Report

Hyd. No. 4

Total Post-Developed Undetained

Hydrograph type	=	Combine	Peak discharge	=	56.60 cfs
Storm frequency	=	50 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	194,255 cuft
Inflow hyds.	=	2, 3	Contrib. drain. area	=	18.010 ac



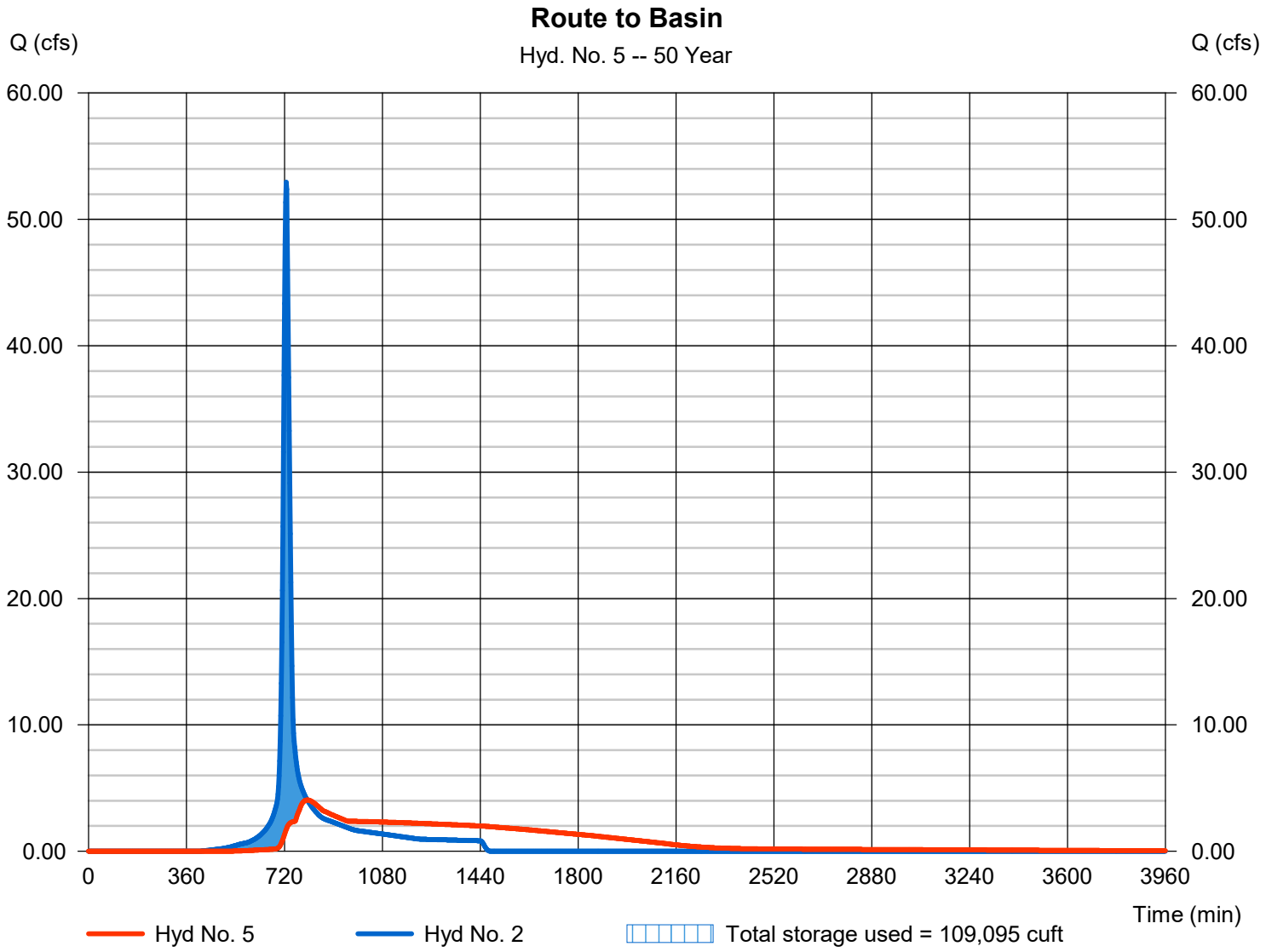
Hydrograph Report

Hyd. No. 5

Route to Basin

Hydrograph type	=	Reservoir	Peak discharge	=	4.057 cfs
Storm frequency	=	50 yrs	Time to peak	=	804 min
Time interval	=	2 min	Hyd. volume	=	182,273 cuft
Inflow hyd. No.	=	2 - Post-Developed to Basin	Max. Elevation	=	1093.15 ft
Reservoir name	=	SWM Basin	Max. Storage	=	109,095 cuft

Storage Indication method used.

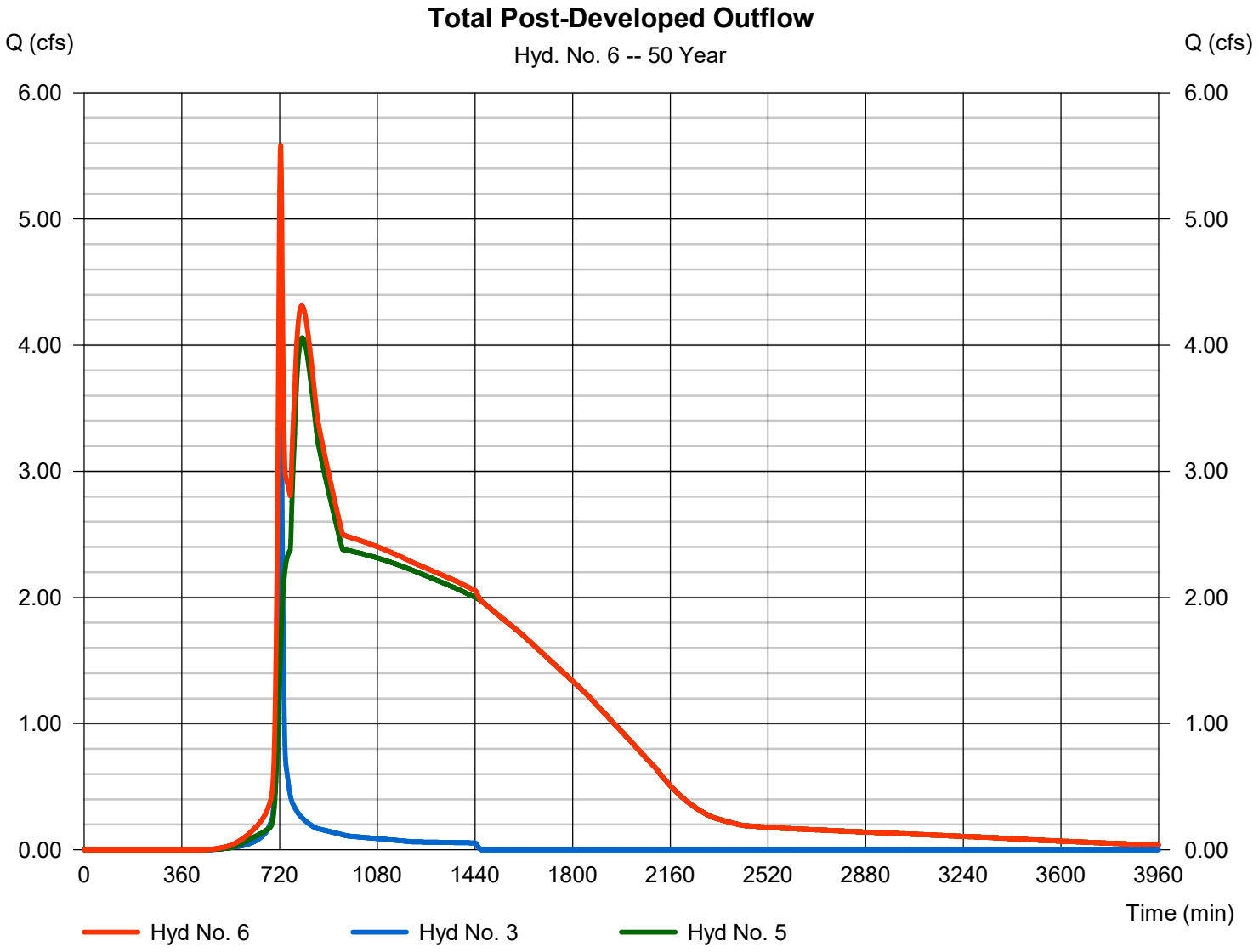


Hydrograph Report

Hyd. No. 6

Total Post-Developed Outflow

Hydrograph type	= Combine	Peak discharge	= 5.583 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 193,683 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 1.210 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

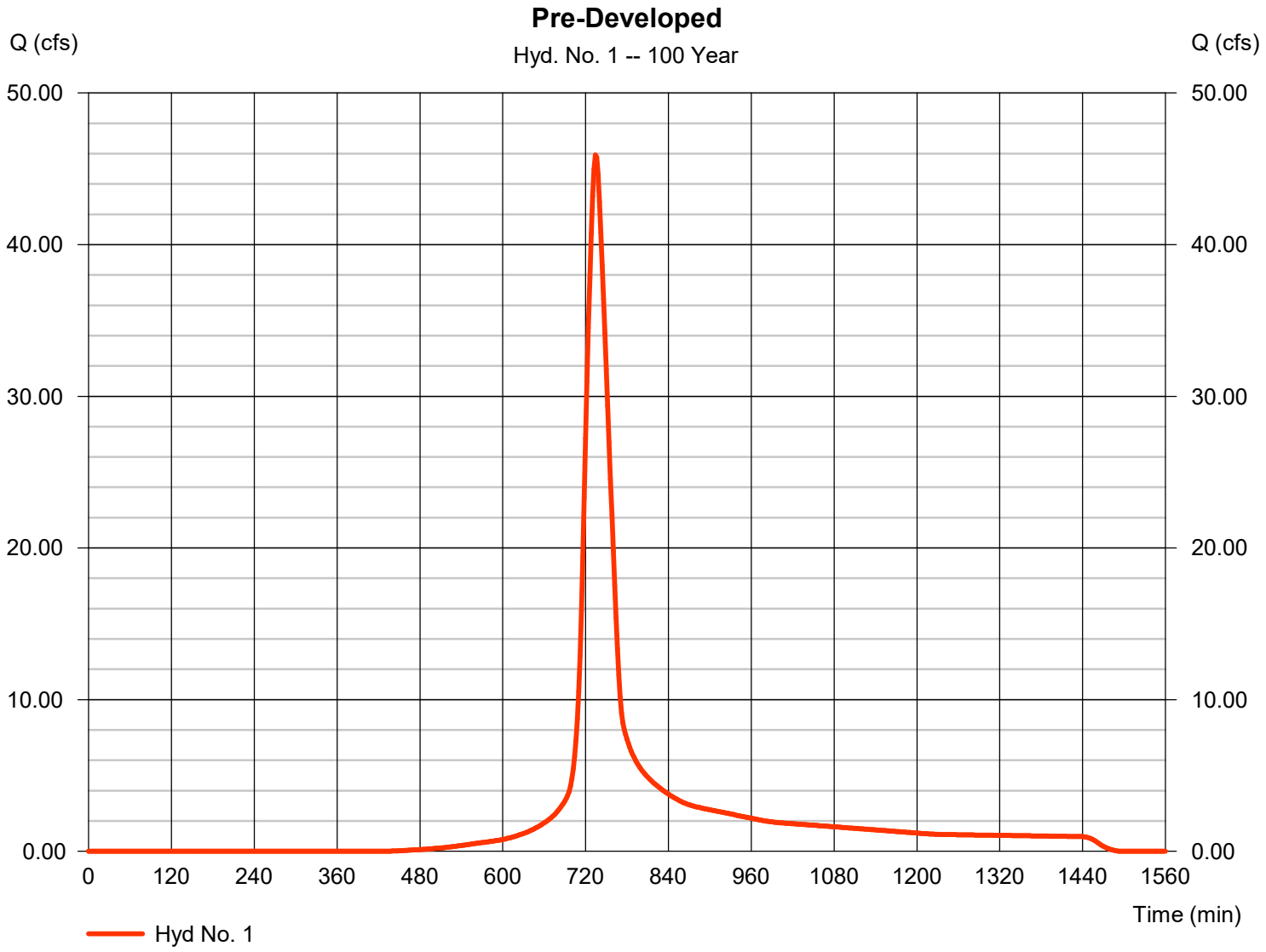
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	45.91	2	734	207,945	------	------	------	Pre-Developed
2	SCS Runoff	63.15	2	726	218,602	------	------	------	Post-Developed to Basin
3	SCS Runoff	4.911	2	722	13,786	------	------	------	Post-Bypass
4	Combine	67.55	2	726	232,387	2, 3	------	------	Total Post-Developed Undetained
5	Reservoir	10.70	2	754	218,012	2	1093.47	118,742	Route to Basin
6	Combine	11.30	2	754	231,798	3, 5	------	------	Total Post-Developed Outflow

Hydrograph Report

Hyd. No. 1

Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	45.91 cfs
Storm frequency	=	100 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	207,945 cuft
Drainage area	=	18.000 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.00 min
Total precip.	=	5.48 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

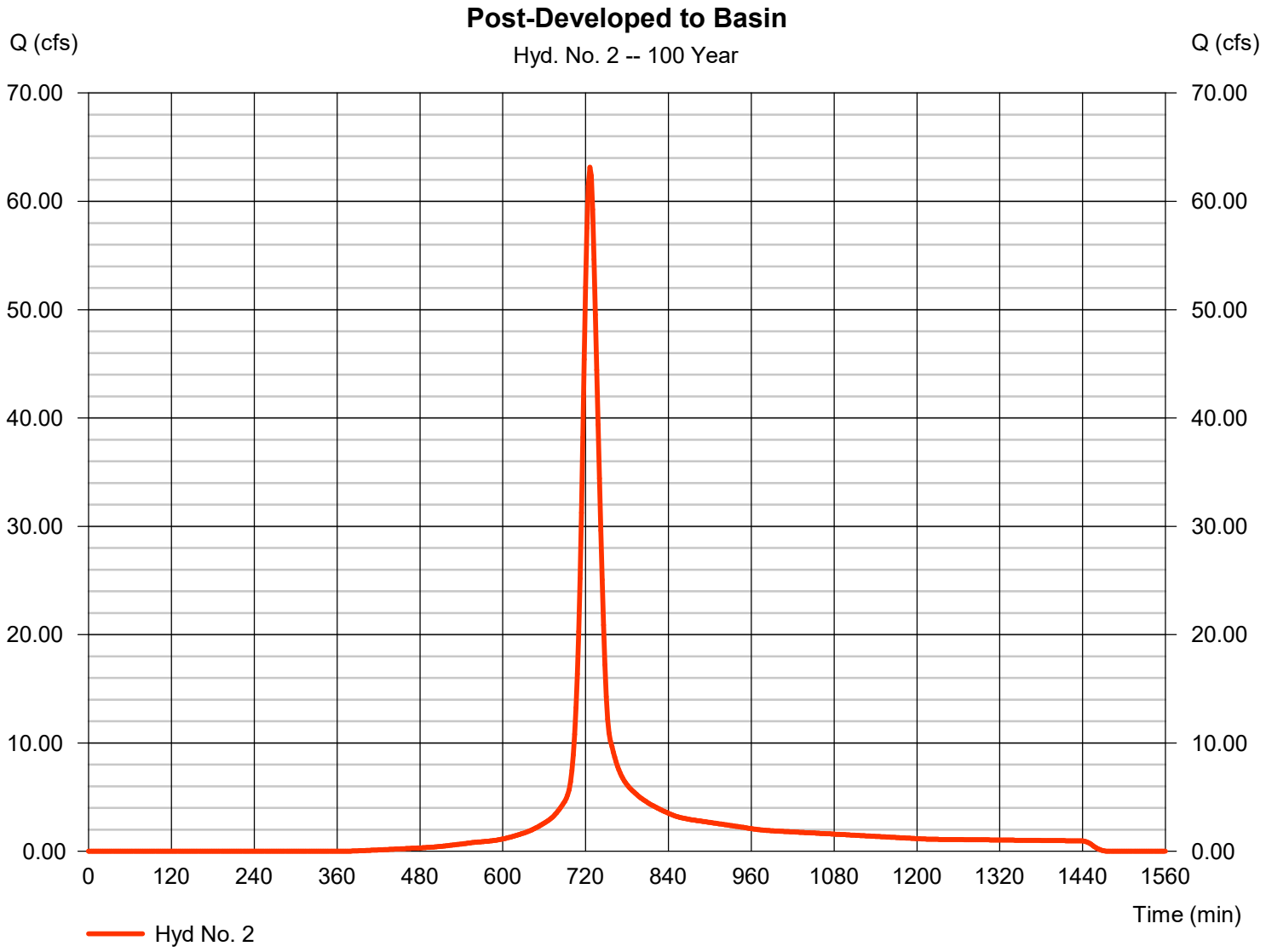


Hydrograph Report

Hyd. No. 2

Post-Developed to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	63.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	218,602 cuft
Drainage area	=	16.800 ac	Curve number	=	82.1
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.60 min
Total precip.	=	5.48 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

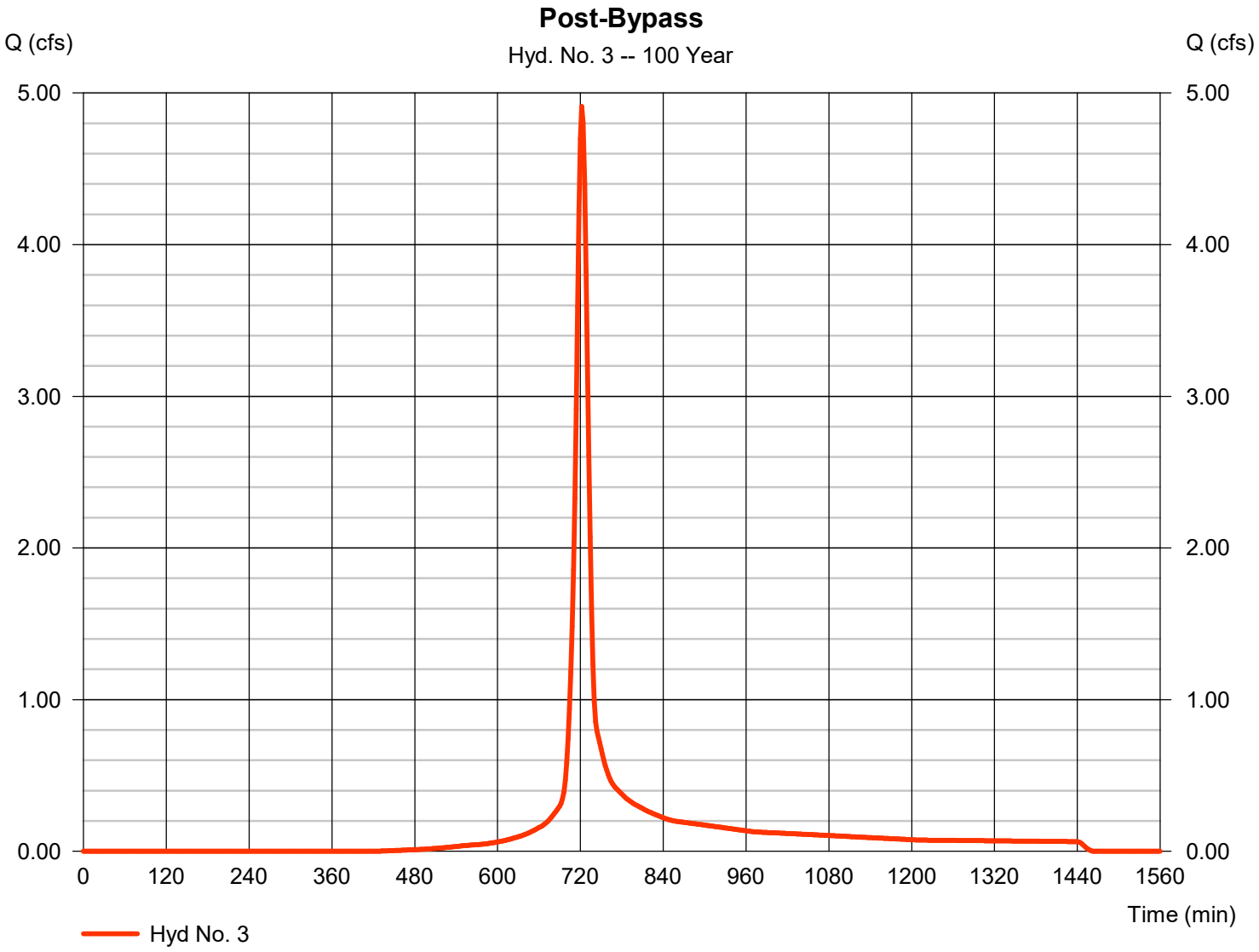


Hydrograph Report

Hyd. No. 3

Post-Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.911 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	13,786 cuft
Drainage area	=	1.210 ac	Curve number	=	79
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.48 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

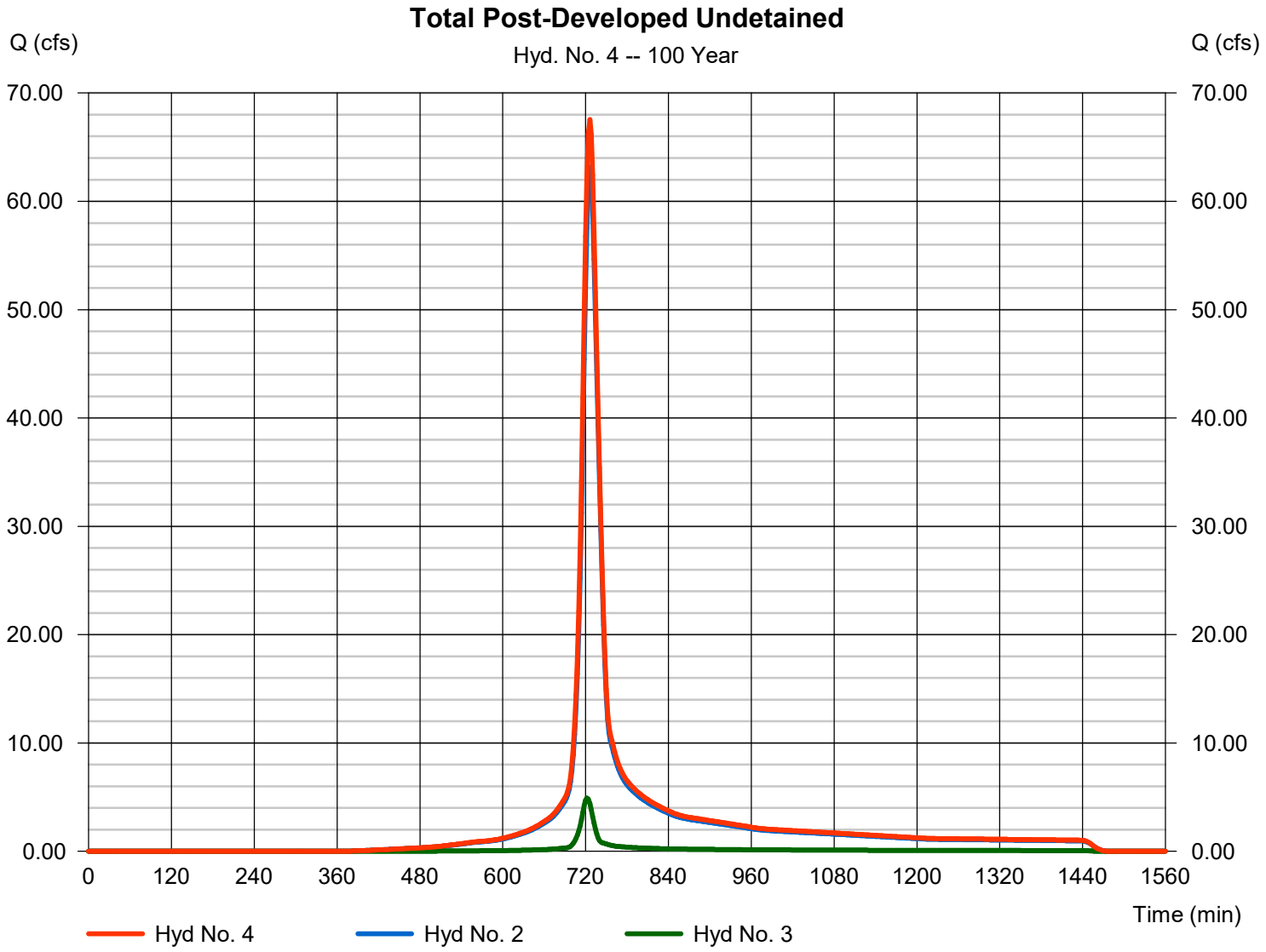


Hydrograph Report

Hyd. No. 4

Total Post-Developed Undetained

Hydrograph type	= Combine	Peak discharge	= 67.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 232,387 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 18.010 ac



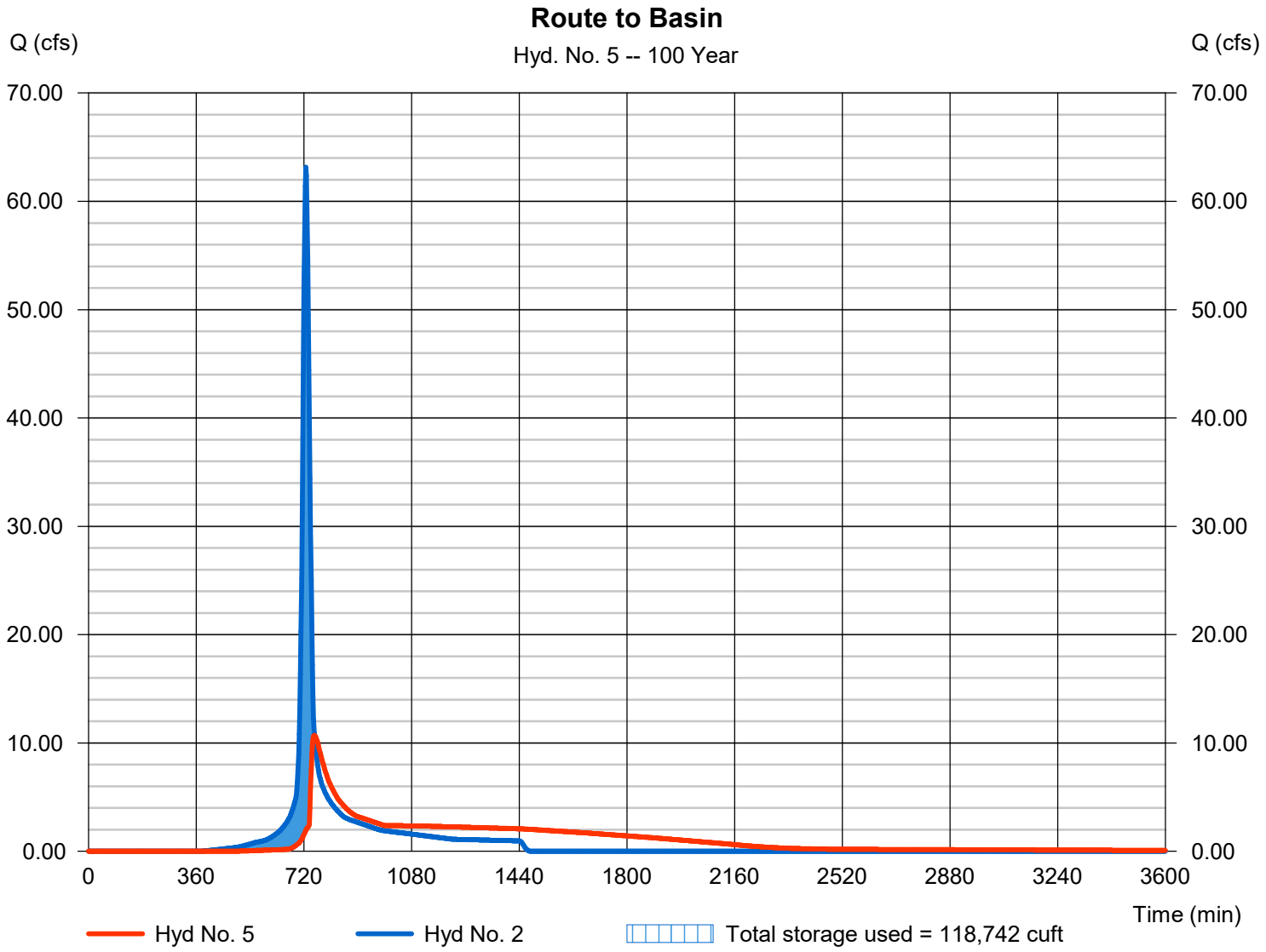
Hydrograph Report

Hyd. No. 5

Route to Basin

Hydrograph type	=	Reservoir	Peak discharge	=	10.70 cfs
Storm frequency	=	100 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	218,012 cuft
Inflow hyd. No.	=	2 - Post-Developed to Basin	Max. Elevation	=	1093.47 ft
Reservoir name	=	SWM Basin	Max. Storage	=	118,742 cuft

Storage Indication method used.

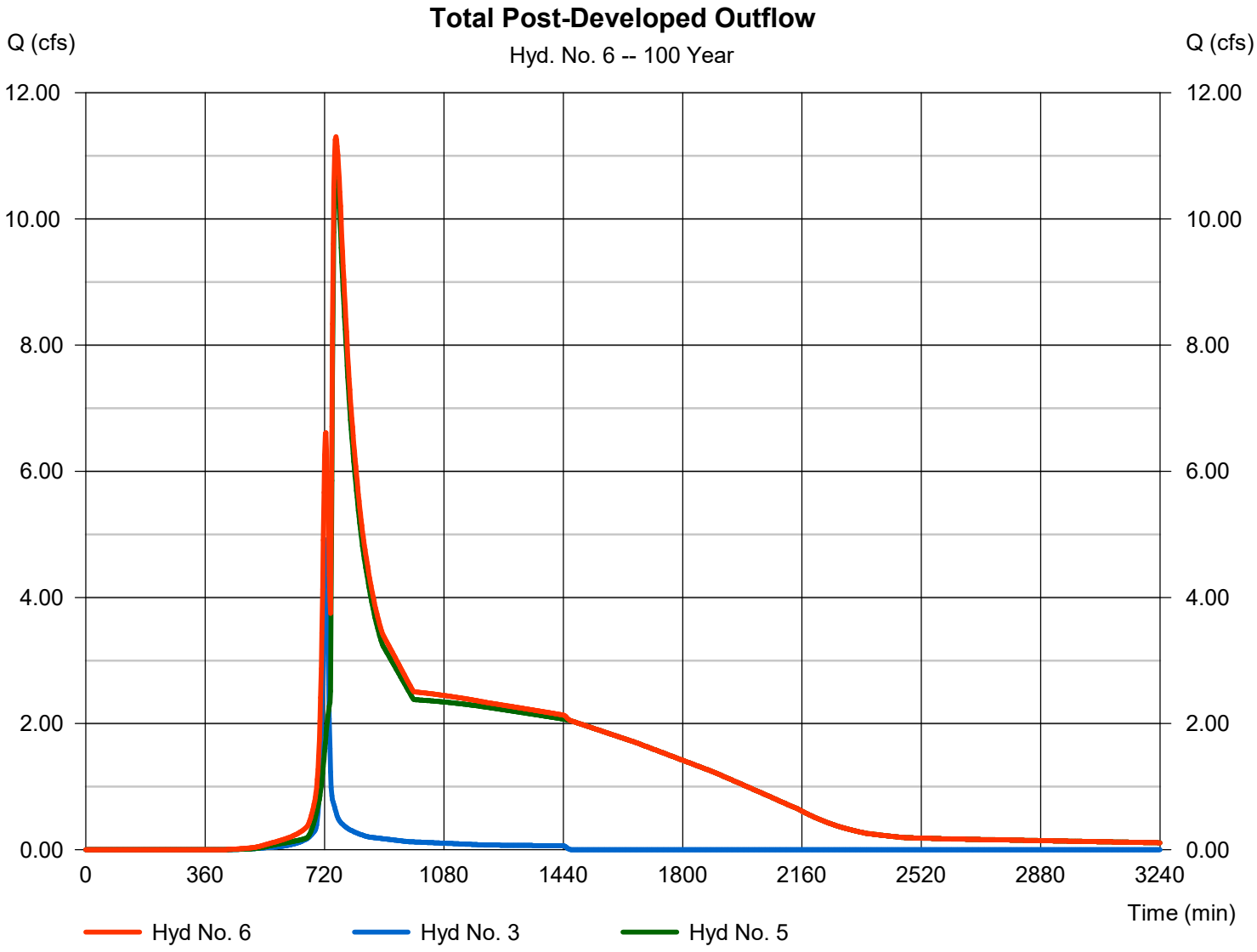


Hydrograph Report

Hyd. No. 6

Total Post-Developed Outflow

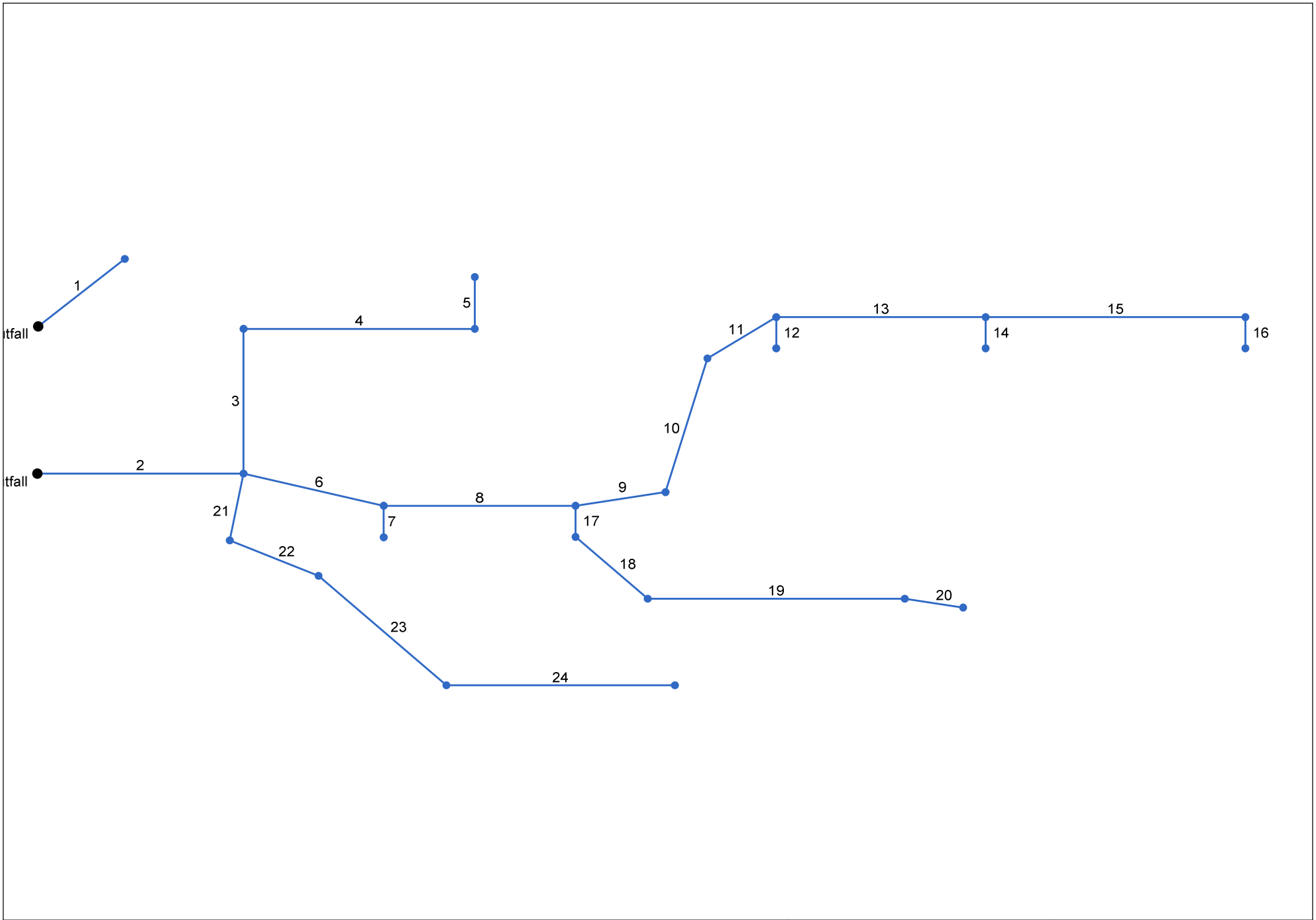
Hydrograph type	= Combine	Peak discharge	= 11.30 cfs
Storm frequency	= 100 yrs	Time to peak	= 754 min
Time interval	= 2 min	Hyd. volume	= 231,798 cuft
Inflow hyds.	= 3, 5	Contrib. drain. area	= 1.210 ac



Appendix E

Storm Sewer Calculations

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



Project File: Preserve of Hudson.stm	Number of lines: 24	Date: 10/17/2024

Capacity

Line No.	Line ID	Inlet Time (min)	DnStm Ln No	Line Length (ft)	n-val Pipe	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Up (ft)	
1	CB#1	15.0	Outfall	77.220	0.015	0.19	0.19	0.47	0.09	0.09	15.0	15.0	4.11	0.37	2.36	3.70	12	1088.00	1088.45	1091.75	
2	CB#2	15.0	Outfall	135.940	0.015	0.15	7.96	0.77	0.12	4.95	15.0	20.6	3.48	17.22	19.28	5.32	30	1088.00	1088.40	1094.50	
3	CB#3	15.0	2	111.500	0.015	0.44	0.80	0.77	0.34	0.57	15.0	18.9	3.64	2.08	4.26	5.42	12	1088.40	1090.52	1094.60	
4	CB#4	15.0	3	152.500	0.015	0.21	0.36	0.77	0.16	0.23	15.0	16.8	3.88	0.90	2.36	3.00	12	1090.52	1091.41	1097.50	
5	CB#5	15.0	4	40.000	0.015	0.15	0.15	0.47	0.07	0.07	15.0	15.0	4.11	0.29	2.34	2.98	12	1091.24	1091.47	1095.50	
6	CB#6	15.0	2	95.710	0.015	0.24	6.24	0.77	0.18	3.67	15.0	20.2	3.51	12.90	13.88	4.42	24	1088.90	1089.38	1094.90	
7	CI#7	15.0	6	24.300	0.015	0.14	0.14	0.77	0.11	0.11	15.0	15.0	4.11	0.44	2.43	3.09	12	1090.38	1090.53	1094.90	
8	CI#8	15.0	6	126.500	0.015	0.36	5.86	0.77	0.28	3.38	15.0	19.7	3.57	12.04	12.57	4.00	24	1089.38	1089.90	1096.36	
9	MH#9	15.0	8	60.280	0.015	0.00	1.00	0.77	0.00	0.66	15.0	19.4	3.60	2.39	4.37	5.57	12	1090.90	1092.11	1097.42	
10	MH#10	15.0	9	106.640	0.015	0.00	1.00	0.77	0.00	0.66	15.0	18.8	3.65	2.43	4.36	5.55	12	1092.11	1094.24	1098.68	
11	CI#11	15.0	10	55.460	0.015	0.10	1.00	0.77	0.08	0.66	15.0	18.5	3.68	2.45	2.49	3.17	12	1094.24	1094.60	1099.03	
12	CI#12	15.0	11	24.000	0.015	0.22	0.22	0.60	0.13	0.13	15.0	15.0	4.11	0.54	2.44	3.11	12	1094.60	1094.75	1099.03	
13	CI#13	15.0	11	138.060	0.015	0.10	0.68	0.77	0.08	0.46	15.0	17.5	3.79	1.73	3.76	4.79	12	1094.60	1096.65	1100.40	
14	CI#14	15.0	13	24.000	0.015	0.17	0.17	0.60	0.10	0.10	15.0	15.0	4.11	0.42	2.44	3.11	12	1096.65	1096.80	1100.40	
15	CI#15	15.0	13	171.290	0.015	0.18	0.41	0.77	0.14	0.28	15.0	15.6	4.04	1.12	3.38	4.31	12	1096.65	1098.71	1103.00	
16	CI#16	15.0	15	24.000	0.015	0.23	0.23	0.60	0.14	0.14	15.0	15.0	4.11	0.57	2.36	3.00	12	1098.71	1098.85	1103.00	
17	CI#17	15.0	8	24.000	0.015	0.19	4.50	0.77	0.15	2.43	15.0	16.7	3.89	9.47	9.80	3.12	24	1089.90	1089.96	1096.36	
18	CB#18	15.0	17	67.360	0.015	0.22	4.31	0.60	0.13	2.29	15.0	16.3	3.94	9.01	9.25	2.94	24	1089.96	1090.11	1095.32	
19	CB#19	15.0	18	169.500	0.015	0.78	4.09	0.77	0.60	2.16	15.0	15.3	4.07	8.77	9.16	2.92	24	1090.11	1090.48	1096.56	
20	CB#20	15.0	19	39.100	0.015	3.31	3.31	0.47	1.56	1.56	15.0	15.0	4.11	6.40	9.40	2.99	24	1090.48	1090.57	1095.50	
21	CI#21	15.0	2	52.250	0.015	0.08	0.77	0.77	0.06	0.59	15.0	18.8	3.66	2.17	2.56	3.26	12	1089.90	1090.26	1093.50	
22	CI#22	15.0	21	64.580	0.015	0.11	0.69	0.77	0.08	0.53	15.0	18.4	3.70	1.97	2.43	3.09	12	1090.26	1090.66	1093.50	
23	CB#23	15.0	22	119.270	0.015	0.33	0.58	0.77	0.25	0.45	15.0	17.5	3.80	1.70	2.40	3.05	12	1090.66	1091.38	1094.14	

Project File: Preserve of Hudson.stm | Number of lines: 24 | Date: 10/17/2024

NOTES: Intensity = 51.43 / (Inlet time + 8.90) ^ 0.80 -- Return period = 10 Yrs. ; ** Critical depth ; System flows limited to full flow capacities.

Capacity

Line No.	Line ID	Inlet Time (min)	DnStm Ln No	Line Length (ft)	n-val Pipe	Drng Area (ac)	Total Area (ac)	Runoff Coeff (C)	Incr CxA	Total CxA	Inlet Time (min)	Tc (min)	i Sys (in/hr)	Total Runoff (cfs)	Capac Full (cfs)	Vel Ave (ft/s)	Line Size (in)	Invert Dn (ft)	Invert Up (ft)	Gnd/Rim El Up (ft)	
24	CB#24	15.0	23	150.710	0.015	0.25	0.25	0.77	0.19	0.19	15.0	15.0	4.11	0.79	2.40	3.05	12	1091.37	1092.28	1095.65	

Project File: Preserve of Hudson.stm | Number of lines: 24 | Date: 10/17/2024

NOTES: Intensity = 51.43 / (Inlet time + 8.90) ^ 0.80 -- Return period = 10 Yrs. ; ** Critical depth ; System flows limited to full flow capacities.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	77.220	0.19	0.19	0.47	0.09	0.09	15.0	15.0	4.7	0.42	2.36	1.35	12	0.58	1088.00	1088.45	1088.66	1088.77	1091.00	1091.75	CB#1
2	End	135.940	0.15	7.96	0.77	0.12	4.95	15.0	19.9	4.1	20.23	19.28	5.48	30	0.29	1088.00	1088.40	1089.54	1090.50	1092.00	1094.50	CB#2
3	2	111.500	0.44	0.80	0.77	0.34	0.57	15.0	18.4	4.3	2.43	4.26	3.09	12	1.90	1088.40	1090.52	1091.24	1091.93	1094.50	1094.60	CB#3
4	3	152.500	0.21	0.36	0.77	0.16	0.23	15.0	16.6	4.5	1.04	2.36	1.36	12	0.58	1090.52	1091.41	1092.16	1092.31	1094.60	1097.50	CB#4
5	4	40.000	0.15	0.15	0.47	0.07	0.07	15.0	15.0	4.7	0.33	2.34	0.44	12	0.57	1091.24	1091.47	1092.36	1092.36	1097.50	1095.50	CB#5
6	2	95.710	0.24	6.24	0.77	0.18	3.67	15.0	19.5	4.1	15.13	13.88	4.82	24	0.50	1088.90	1089.38	1091.24	1091.81	1094.50	1094.90	CB#6
7	6	24.300	0.14	0.14	0.77	0.11	0.11	15.0	15.0	4.7	0.51	2.43	0.65	12	0.62	1090.38	1090.53	1092.37	1092.38	1094.90	1094.90	CI#7
8	6	126.500	0.36	5.86	0.77	0.28	3.38	15.0	19.1	4.2	14.10	12.57	4.49	24	0.41	1089.38	1089.90	1092.37	1093.03	1094.90	1096.36	CI#8
9	8	60.280	0.00	1.00	0.77	0.00	0.66	15.0	18.8	4.2	2.80	4.37	3.56	12	2.01	1090.90	1092.11	1093.50	1093.99	1096.36	1097.42	MH#9
10	9	106.640	0.00	1.00	0.77	0.00	0.66	15.0	18.3	4.3	2.83	4.36	3.95	12	2.00	1092.11	1094.24	1094.17	1095.03	1097.42	1098.68	MH#10
11	10	55.460	0.10	1.00	0.77	0.08	0.66	15.0	18.1	4.3	2.85	2.49	3.64	12	0.65	1094.24	1094.60	1095.24	1095.72	1098.68	1099.03	CI#11
12	11	24.000	0.22	0.22	0.60	0.13	0.13	15.0	15.0	4.7	0.62	2.44	0.79	12	0.63	1094.60	1094.75	1096.15	1096.16	1099.03	1099.03	CI#12
13	11	138.060	0.10	0.68	0.77	0.08	0.46	15.0	17.2	4.4	2.01	3.76	3.30	12	1.48	1094.60	1096.65	1096.15	1097.25	1099.03	1100.40	CI#13
14	13	24.000	0.17	0.17	0.60	0.10	0.10	15.0	15.0	4.7	0.48	2.44	1.16	12	0.63	1096.65	1096.80	1097.25	1097.26	1100.40	1100.40	CI#14
15	13	171.290	0.18	0.41	0.77	0.14	0.28	15.0	15.5	4.6	1.29	3.38	3.03	12	1.20	1096.65	1098.71	1097.25	1099.19	1100.40	1103.00	CI#15
16	15	24.000	0.23	0.23	0.60	0.14	0.14	15.0	15.0	4.7	0.65	2.36	2.07	12	0.58	1098.71	1098.85	1099.19	1099.23	1103.00	1103.00	CI#16
17	8	24.000	0.19	4.50	0.77	0.15	2.43	15.0	16.5	4.5	10.96	9.80	3.49	24	0.25	1089.90	1089.96	1093.50	1093.57	1096.36	1096.36	CI#17
18	17	67.360	0.22	4.31	0.60	0.13	2.29	15.0	16.2	4.5	10.41	9.25	3.31	24	0.22	1089.96	1090.11	1093.78	1093.97	1096.36	1095.32	CB#18
19	18	169.500	0.78	4.09	0.77	0.60	2.16	15.0	15.3	4.7	10.09	9.16	3.21	24	0.22	1090.11	1090.48	1094.17	1094.62	1095.32	1096.56	CB#19
20	19	39.100	3.31	3.31	0.47	1.56	1.56	15.0	15.0	4.7	7.34	9.40	2.34	24	0.23	1090.48	1090.57	1094.70	1094.75	1096.56	1095.50	CB#20
21	2	52.250	0.08	0.77	0.77	0.06	0.59	15.0	18.3	4.3	2.53	2.56	3.22	12	0.69	1089.90	1090.26	1091.24	1091.59	1094.50	1093.50	CI#21
22	21	64.580	0.11	0.69	0.77	0.08	0.53	15.0	17.9	4.3	2.29	2.43	2.92	12	0.62	1090.26	1090.66	1091.83	1092.18	1093.50	1093.50	CI#22

Project File: Preserve of Hudson.stm | Number of lines: 24 | Run Date: 10/17/2024

NOTES:Intensity = 47.31 / (Inlet time + 7.60) ^ 0.74; Return period =Yrs. 25 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	119.270	0.33	0.58	0.77	0.25	0.45	15.0	17.2	4.4	1.97	2.40	2.51	12	0.60	1090.66	1091.38	1092.26	1092.75	1093.50	1094.14	CB#23
24	23	150.710	0.25	0.25	0.77	0.19	0.19	15.0	15.0	4.7	0.91	2.40	1.33	12	0.60	1091.37	1092.28	1092.86	1093.00	1094.14	1095.65	CB#24

Project File: Preserve of Hudson.stm | Number of lines: 24 | Run Date: 10/17/2024

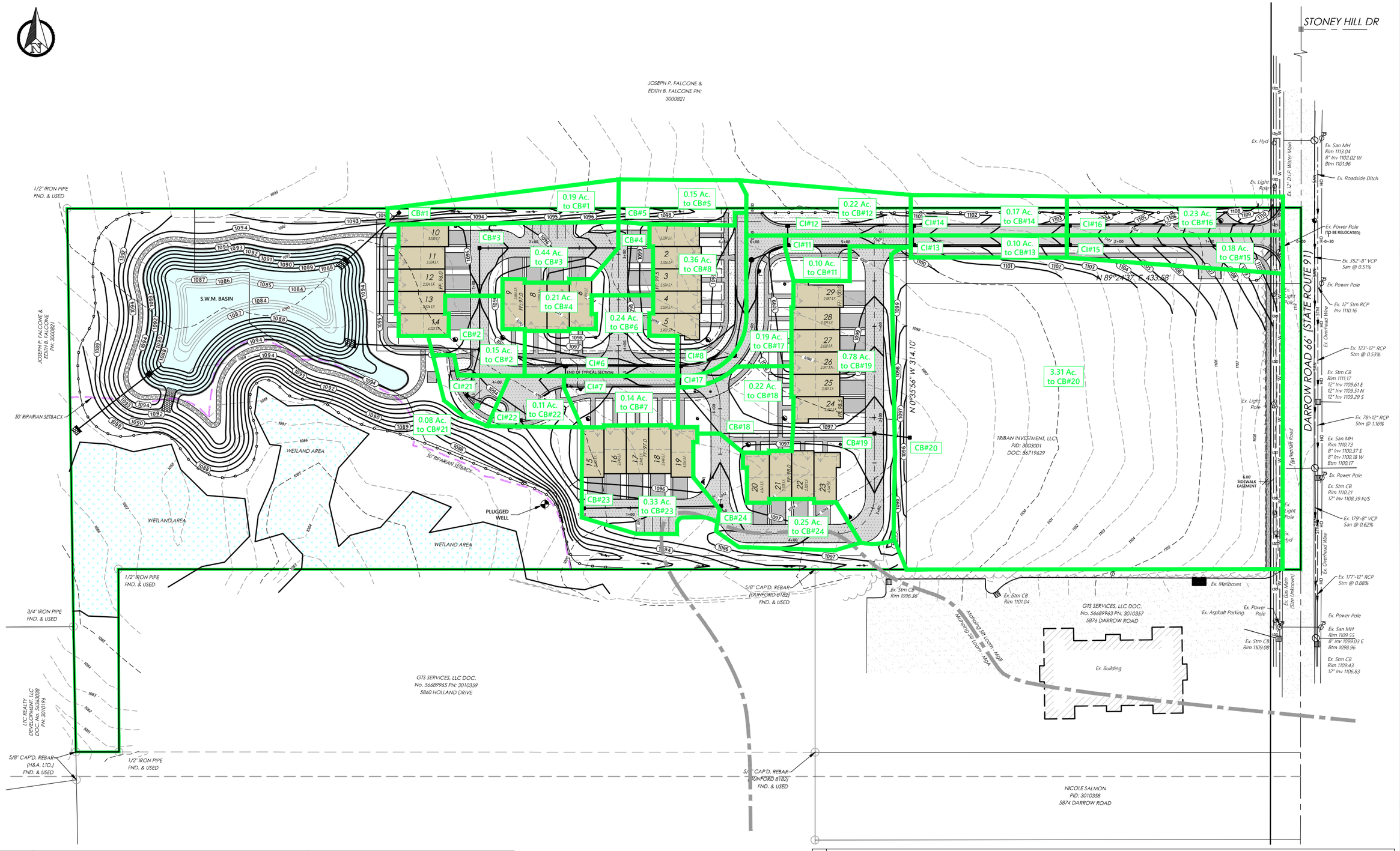
NOTES:Intensity = 47.31 / (Inlet time + 7.60) ^ 0.74; Return period =Yrs. 25 ; c = cir e = ellip b = box

PRESERVE OF HUDSON TOWNHOMES

CITY OF HUDSON - SUMMIT COUNTY - OHIO

POLARIS ENGINEERING & SURVEYING, INC.
34600 CHARDON ROAD - SUITE D
WILLOUGHBY HILLS, OHIO 44094
(440) 944-4433
www.polaris-es.com

STORM SEWER DRAINAGE MAP



REV. No.		DATE	BY

KEVIN M. HOFFMAN 24831 — STATE OF OHIO — PROFESSIONAL ENGINEER

DATE: 10/16/24 DRAWN: NMO
SCALE: HOR. 1"=50' VERT. 1"=00'
FOLDER: DWG/Proj. Engineering
FILENAME: 24189 Drainage Maps
TAB: Storm Sewer Drainage Map
BNDY. BY: XXX
BASE. BY: XXX

GRAPHIC SCALE
50 0 25 50 100 200
(IN FEET)
1 INCH = 50 FEET

SYMBOL LEGEND

Ex. Clean Out	Ex. Sanitary Manhole	Ex. Gas Marker	Ex.Telphone Box	Ex. Yard Light	Ex. Tree	Ex. Monument Box
Ex. Catch Basin	Prop. Sanitary Manhole	Ex. Water Valve	Ex. Electrical Box	Ex. Guy Wire	Ex. Pine Tree	Irrigation Valve
Prop. Catch Basin	Prop. Curb Inlet	Ex. Water Meter	Ex. Power Transformer	Ex. Light Pole	Ex. Bush	Sprinkler Control Box
Ex. Yard Drain	Ex. Curb Inlet	Ex. Fire Hydrant	Cable TV Box	Prop. Light Pole	Ex. Stump	Sprinkler Head
Ex. Manhole	Ex. Storm Inlet MH	Prop. Hydrant	Ex. Power Pole	Traffic Signal Pole	Ex. Mailbox	Test Bore
Ex. Storm Manhole	Ex. Gas Meter	Prop. WL Valve	Ex. Light Power Pole	Traffic Signal Box	Ex. Sign	Guard Post
Prop. Storm Manhole	Ex. Gas Valve				Electrical Outlet	

PREPARED FOR:
KNEZ HOMES
7555 FREDLE DRIVE
PAINESVILLE, OH
PHONE: (440) 346-0098
CONTACT: HANNA COHAN PLESSNER

CONTRACT No.
24189

SHEET	OF
01	01