JONES DAIRY STORAGE FACILITY
STORMWATER IMPACT ANALYSIS STATEMENT

APRIL 5, 2023

PREPARED BY:

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Section 1: Site Analysis and Narrative

Existing and Proposed Conditions

The existing site is vacant and heavily wooded, east of Jones Dairy Elementary School. The proposed storage facility and drive aisles will be added to the site for its new proposed use. The overall site is approximately 5.55 acres. The proposed increase in impervious area for the project site is 2.83 acres.

Pertinent Onsite and Offsite Drainage Conditions

The site entire site is undeveloped with vegetation and trees. The site and surrounding areas drain to a south-west ditch that runs below Jones Dairy Elementary and through the Neighborhood South.

Anticipated Stormwater Impacts & Design Criteria

The additional impervious will require a stormwater control measure to achieve removal of total suspended solids, volume and peak flow control. A wet pond is proposed as part of this development and Wake County Stormwater Tool has been included in our analysis.

Soils Series and Flood Hazard Areas

The site is located in the Neuse River Basin. Soils on the site are comprised of Wedowee-Saw complex and Helena sandy loam, hydrologic soil group B & D Respectively, based upon the Wake County Soils Survey. A review of Flood Hazard Areas based on the published maps and the NC Flood plain Mapping Information System indicate that there are no flood zones on site.

Proposed Stormwater Management Practices

There will be a proposed Wet pond which will accept flow from the storage development.

Calculation Method

The TR-55 Method was used to calculate pre and post development flows and preform routing. The rainfall frequency data was collected from NOAA Atlas 14. For nutrient accounting, the Wake County Stormwater tool was to determine required treatment.

Summary of Results

Pre/Post:

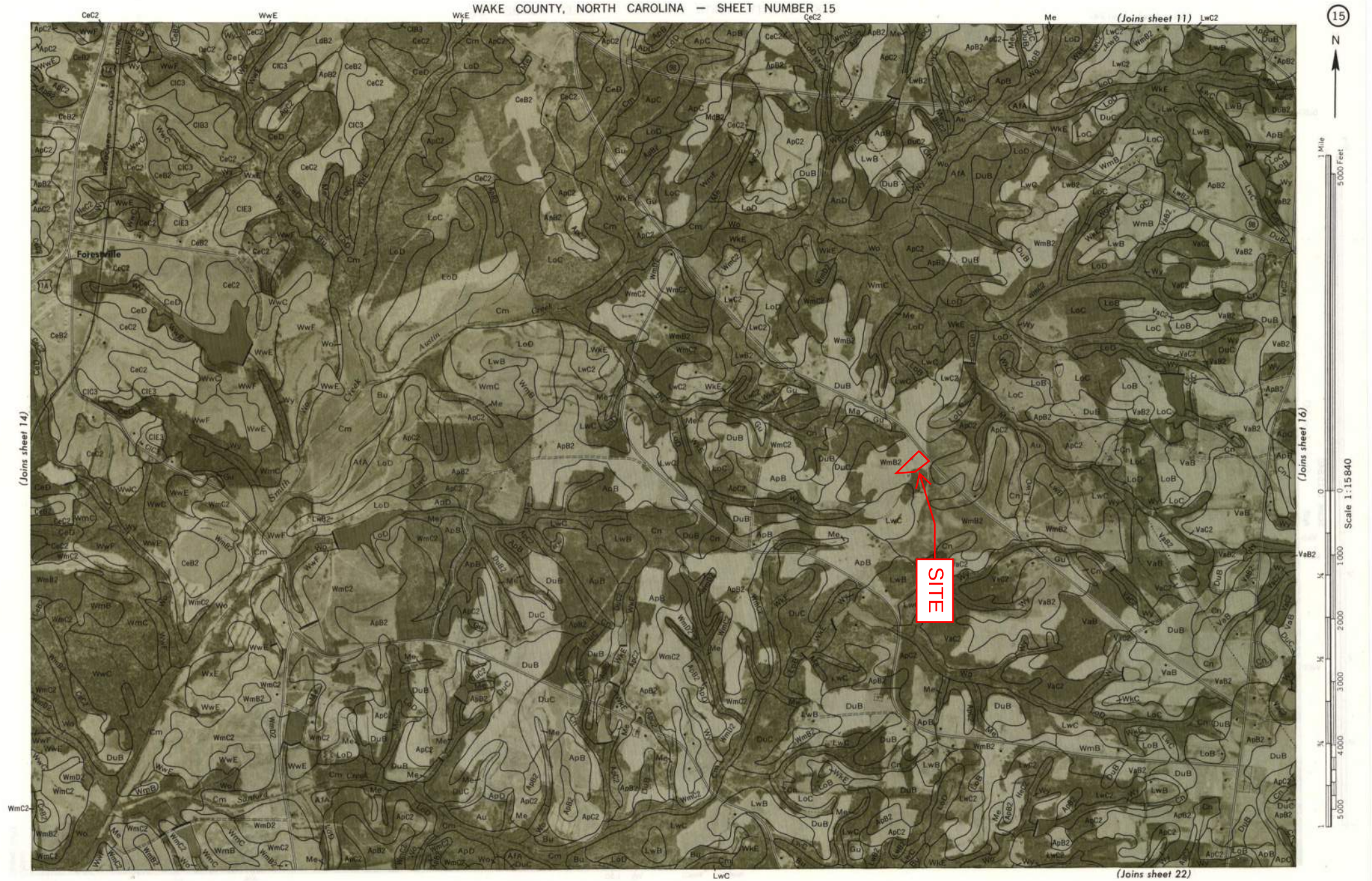
The wet pond will capture and treat approximately 3.39 acres, of which approximately 2.83 acres is impervious. The wet pond will reduce peak flow downstream which would otherwise be increased from the added impervious. There is one analysis point located on-site and downstream of where the proposed wet pond daylights. As modelled, the Wet Pond will reduce runoff to below pre-development levels for the 1, 2, and 10 year storm events. See the table below for pre-development and post-development conditions for analysis

Pre/Post Summary Tables

Site Analysis Point 1			
Site Condition	1 Year (cfs)	2 Year (cfs)	10 Year (cfs)
Pre-Development POA 1	0.88	1.76	4.94
Post-Development POA 1	0.88	1.44	4.80

Section 2: Environmental Maps

Soil Map


WAKE COUNTY, NORTH CAROLINA — SHEET NUMBER 15
15
N
(Joins sheet 11)
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 22)
Forestville
SITE
Scale 1:15840
1 Mile
5000 Feet

Section 2: Environmental Maps

FEMA Map

1DWLRQDO)ORRG+D]DUG/D\HU):,50HWWH

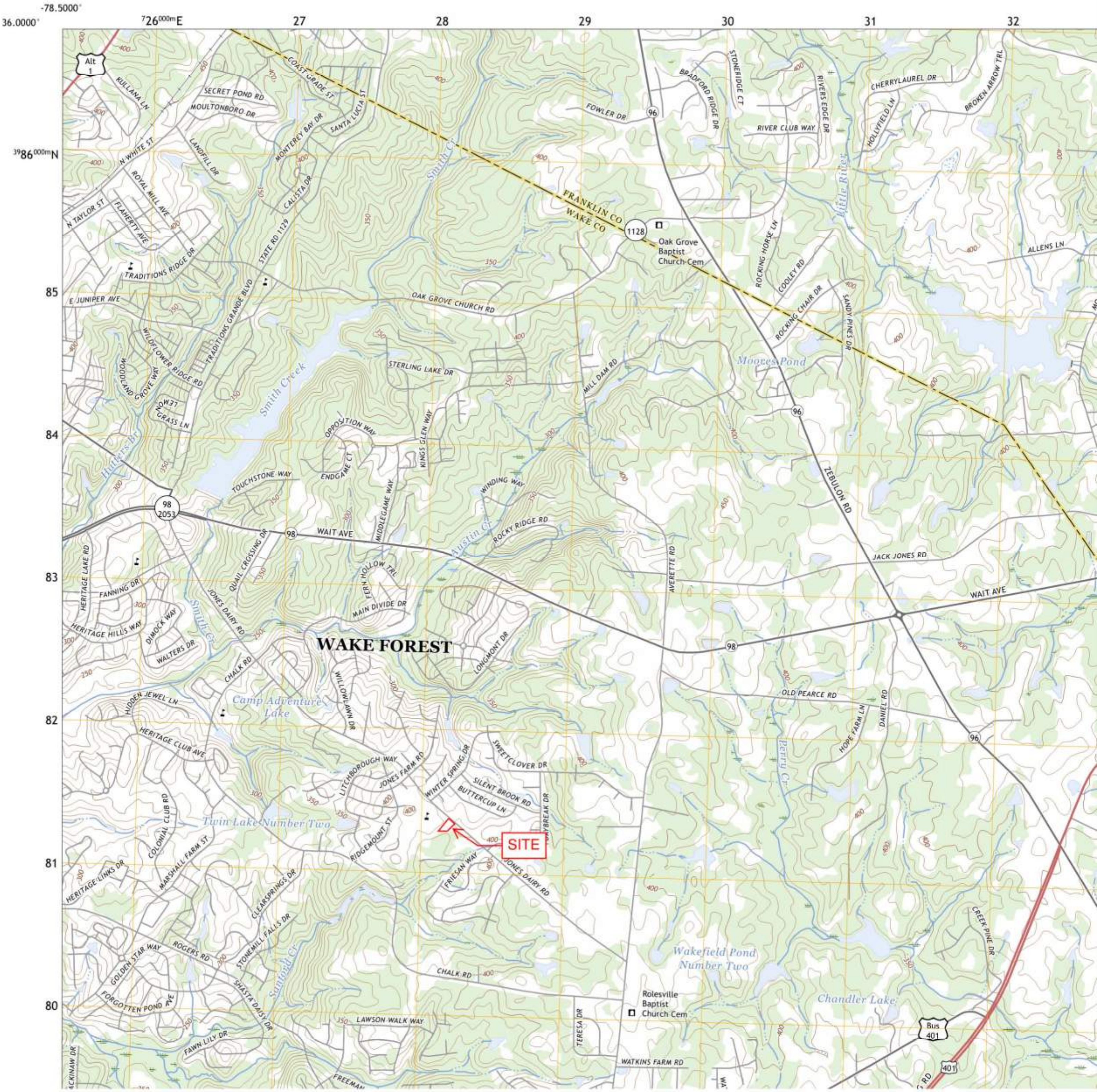
FEMA

%DVHPDS

Section 2: Environmental Maps

USGS Quad Map

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY



Section 3: Stormwater Calculations

Wet Pond Sizing Calculations

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Project: Rolesville Self Storage
Calculated By: GWF

Project No.: 54832
Date:

Wet Pond Design Calculations

SCM A

Pollutant / Nutrient Removal

Total Suspended Solids (TSS)	85%
Nitrogen	30%
Phosphorus	40%

Basin Characteristics

Post-Development Drainage Area

Area to Pond

Description	Acres
Impervious	2.83
Managed Pervious	0.56
Total to Pond	3.39
Pond Basin CN	85

Estimated Impervious

Lots

Description	Qty	Inc Area	Total Area
Subtotal			

Streets and SW

Description	Length	Imp/Ft	Total Area
Impervious			
Subtotal			

Other

Grand Total Impervious			

Surface Area to Drainage Area Ratio for Permanent Pool Sizing

Drainage Area to SCM

Impervious Area	Acres
Offsite Impervious Area	0.00
Onsite Impervious Area	2.83
Total Impervious Area	2.83
Total Drainage Area To SCM	3.39
Percent Impervious Area	83%

Required Surface Area of Permanent Pool

Average Depth (ft) =	3.5
SA/DA Ratio =	2.75
Required SA (ft2) =	4,873
SA as Shown (ft2) =	5,869

SA/DA Ratio from latest NCDENR BMP Manual

SA / DA Pond Volumes and Areas (Below Permanent / Normal Pool)

Elevation (ft)	Main Area (sf)	Forebay Area (sf)	Depth (ft)	Main Inc. Vol (cf)	Forebay Inc. Vol (cf)	Total Vol (cf)
				Bottom of Sediment Storage		
373.5	2,414		0.0	Top of Sediment Storage		
374.0	2,668		0.5	1,271	0	1,271
375.0	3,208	452	1.5	2,938	226	3,164
376.0	3,789	672	2.5	3,499	562	7,225
377.0	4,412	922	3.5	4,101	797	12,122
378.0	5,076	1,198	4.5	4,744	1,060	17,926
378.3	5,869		4.8	1,368	0	19,294
Total			4.8	17,920	2,645	20,565
Verify the Forebay Volume Is Approximately (15% - 20%) of the Permanent Pool Volume.						**15%**

Water Quality and Quantity Volumes (Above Permanent / Normal Pool)

Elevation (ft)	Main Area (sf)	Forebay Area (sf)	Depth (ft)	Inc Total Vol (cf)	Accum' Total Vol (cf)	
378.3	7,958		0.00	Permanent Pool Elevation		Notes
378.5	9,242	-	0.25	2,150	2,150	
379.5	10,596	-	1.25	9,919	12,069	TPE
380.5	12,010	-	2.25	11,303	23,372	
381.5	13,480	-	3.25	12,745	36,117	
		-				
		-				

Verify the Average Depth of Pool (D_{avg}) - Equation 3.

$d_{avg} = [V_{perm\ pool} - [0.5 \times Depth_{max\ over\ shelf} \times Perimeter_{perm\ pool} \times Width_{submerged\ part\ of\ shelf}] / A_{bottom\ of\ shelf}$

V_{perm} =	17,920	C.F. (Main Pond)
$A_{bottom\ shelf}$ =	5,076	S.F. (Main Pond)
Depth of Water $_{over\ shelf}$ =	0.25	FT
Perimeter $_{perm\ pool}$ =	370	L.F. (Main Pond)
Width $_{submerged\ part\ of\ shelf}$ =	3.0	FT
D_{avg} =	3.50	FT
Depth for SA/DA =	**3.50**	**FT (Round D_{av} down to nearest 0.5 ft)**

1.0" Water Quality Runoff Volume Calculation

Using the runoff volume calculations in the "Simple Method" as described by Schueler (1987)

Where: Rv = Runoff Coefficient, in/in

I = Percent Impervious	I=	83.5%
Rv = 0.05 + 0.009(I)	Rv =	0.801
1.0 inch runoff volume (Required)		
Runoff volume, S=(Design rainfall) (Rv) (Drainage Area)		
Design Rainfall =	1.0	inch
Drainage Area =	3.39	acres
Storage Required =	**9,861**	**cu. ft.**

Volume Storage For 1.0" Runoff Above Permanent Pool (Provided)

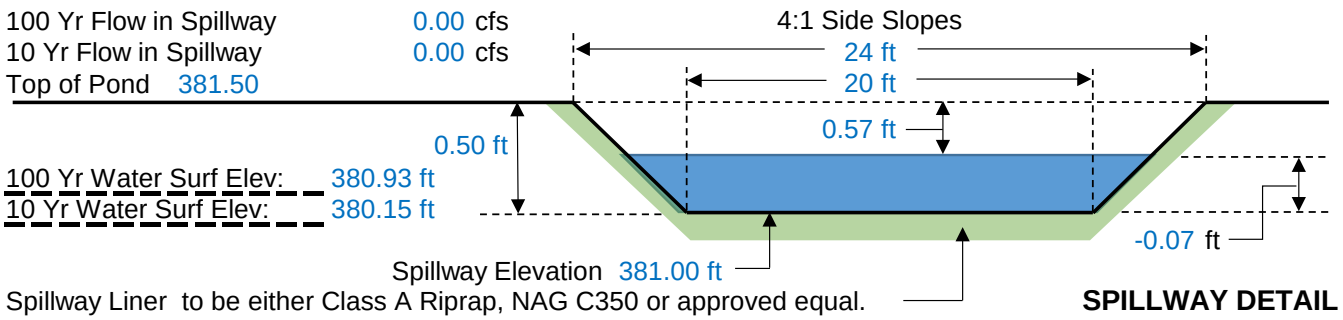
Depth	PPE SA (SF)	Top Temp Pool SA (SF)	Volume (CF)	Elevation
1.25	5,869	9,242	9,861	379.50

Size Water Quality Orifice for (2-5) Day Drawdown for 1" Runoff Volume

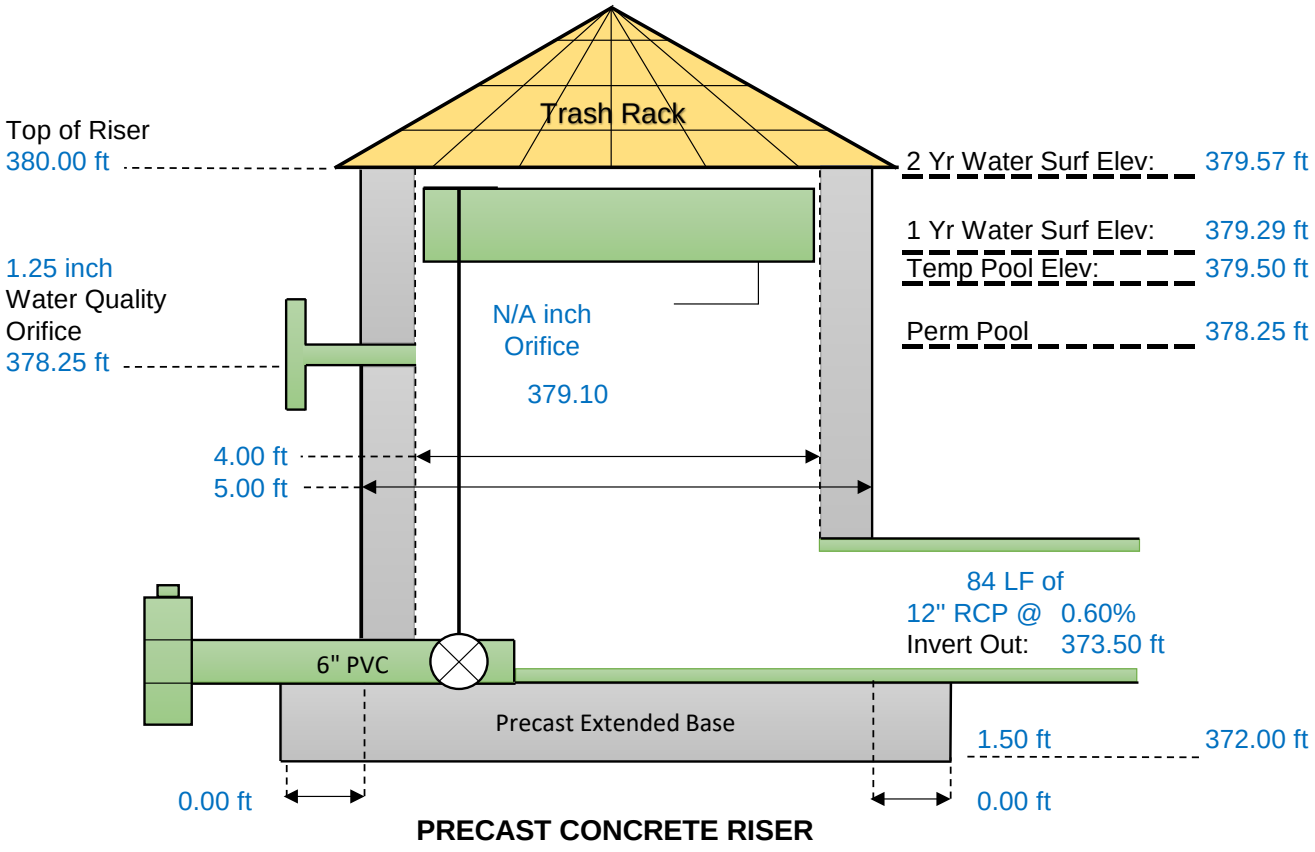
$Q_{1"} = CdA(2gh)^{1/2}$	(Orifice Equation; Cd=0.60)
1.25	Orifice Diameter (inches)
1.20	Driving Head to Centroid of Orifice (ft)
0.03	Q1.0" Drawdown Rate (cfs)
9,861	Water Quality Volume (V_{WQ})
V_{WQ}/(Q1" x 86,400)	Drawdown Time (days)
4.4	**Drawdown Time (days) (2 - 5 days)**

Pond / Riser Data & Elevations

Pond Type	Wet Pond			
TSS Removal	85%			
Top of Pond / Berm	381.50	ft		
Secondary Spillway Width	20.00	ft		
Bottom of Secondary Spillway	381.00	ft		
Top of Riser	380.00	ft	(at least 1' Above TPE)	
Riser Type / Size	4x4	ft		
Top of Water Quality / Temp Pool Elev	379.50	ft	(1" Runoff)	
Top of Veg. Shelf	378.50	ft		
Permanent Pool Elevation (Normal Pool)	378.25	ft		
Water Quality Orifice Elevation & Size	378.25	ft	1.25	in
Secondary Orifice Elevation & Size	379.10	ft	N/A	in
Bottom of Veg. Shelf	378.25	ft		
Top of Sediment Storage / Pond Bottom	373.50	ft		
Bottom of Sediment Storage	372.50	ft	(Min 1 ft)	
Invert Out of Riser	373.50	ft		
Outlet Pipe Size	12.00	in	Diameter RCP	
Outlet Pipe Length & Slope	84.00	ft	0.60	%
Downstream Outlet Elevation	373.00	ft		
1 Yr Water Surface Elev / Peak Flow (CFS)	379.29	ft	0.62	CFS
2 Yr Water Surface Elev Peak Flow (CFS)	379.57	ft	0.89	CFS
10 Yr Water Surface Elev Peak Flow (CFS)	380.15	ft	3.99	CFS
100 Yr Water Surface Elev Peak Flow (CFS)	380.93	ft	8.16	CFS



SPILLWAY DETAIL



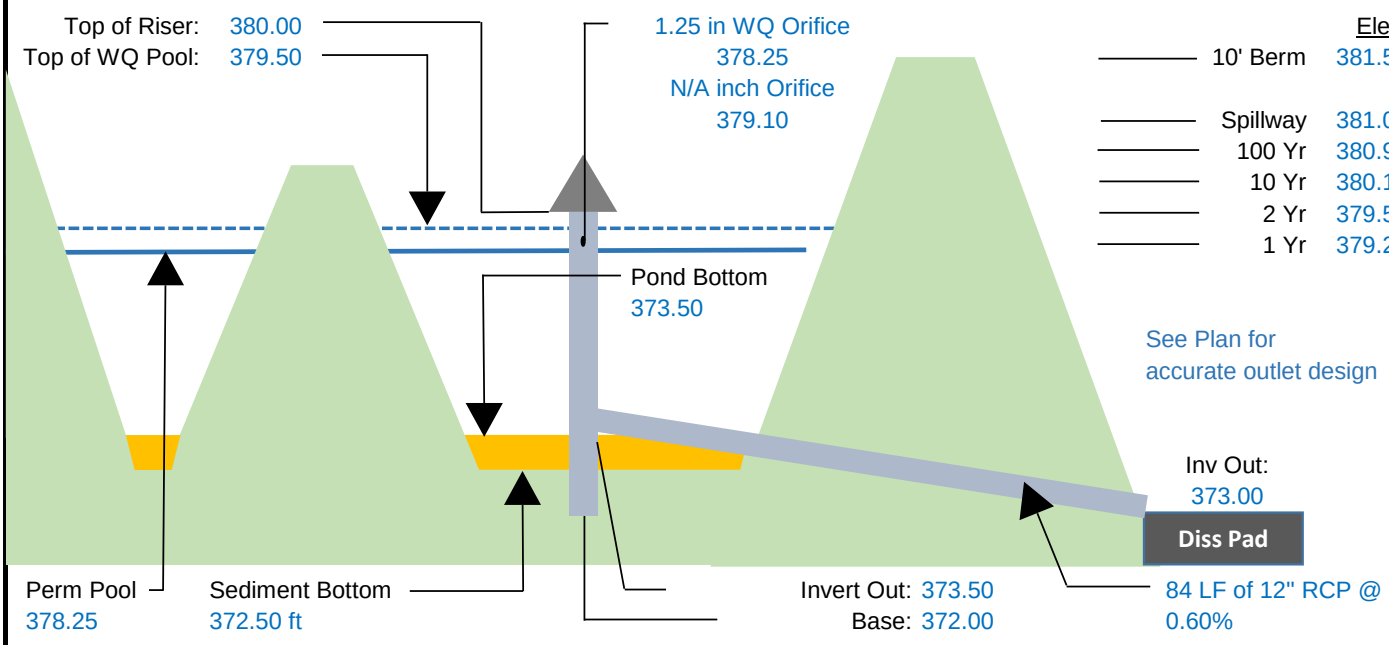
PRECAST CONCRETE RISER

4 ft x 4 ft x 6.5 ft Tall, With a 1.5 ft Thick Precast Extended Base

Section 3: Stormwater Calculations

Anti-Floatation Calculations

Pond Detail



Anti-Bouyancy Calculations for the Riser Structure

Riser Dimensions		Weight of Structure		Displaced Volume	
Outside Width	5.00 ft	Walls =	8,775 LBS	V = LxWx(HT) = C.F.	
Inside Width	4.00 ft	Base =	5,625 LBS		
Outside Length	5.00 ft			Displaced Water =	
Inside Length	4.00 ft			C.F. * 62.4 PCF = LBS	
Height	6.50 ft	Outlet Pipe =	59 LBS		
Base Thick' (ft)	1.50 ft	WQ Orifice =	1 LBS	Add 15% Factor of Safety	
Wall Thick' (ft)	0.50 ft				
Ext Base (ft)	0.00 ft	Weir #1 =	0 LBS	V =	163 C.F.
Areas removed from Riser		Weir #2 =	0 LBS	Disp. Water =	10,140 LBS
Outlet Pipe	0.79 ft	Weir #3 =	0 LBS	15% F.S. =	1,521 LBS
WQ Orifice	0.01 ft	Weir #4 =	0 LBS		
Orifice #1	0.00 ft	Other #1 =	0 LBS	Safety Factor	1.23
Orifice #2	0.00 ft				
Orifice #3	0.00 ft	**Weight =**	**14,340 LBS**	**Weight =**	**11,661 LBS**
Orifice #4	0.00 ft	**Precast Concrete Riser Structure to be 4 ft x 4 ft x 6.5 ft Tall, With a 1.5 ft Thick Precast Extended Base**			
Other	0.00 ft				

Planting Summary Requirements

	Dam / Berm			Non-Clumping Turf Grass		
6' Shelf Length	270	Area of Shelf =	1620 SF	(50 Plants per 200 SF of Area)		
Quantity	Type	Root	Common Name	Scientific Name	Planting Size	Notes
203	Herbaceous	Container	Quill Sedge	Cerex Tenera	4" Pot	24"-36" OC
101	Herbaceous	Container	Virginia Sweetspire	Itea Virginica	4" Pot	24"-36" OC
101	Herbaceous	Container	Joe Pye Weed	Eupat' Fistulosus	4" Pot	24"-36" OC

Section 3: Stormwater Calculations

Wake County Stormwater Tool

SITE DATA

Project Information	
Project Name:	**Jones Dairy Storage Facility**
Applicant:	Timmons Group For Rivercrest Realty
Applicant Contact Name:	Garrett Frank
Applicant Contact Number:	919.866.4503
Contact Email:	garrett.frank@timmons.com
Municipal Jurisdiction (Select from dropdown menu):	Rolesville
Last Updated:	Wednesday, April 5, 2023
Site Data:	
Total Site Area (Ac):	5.50
Existing Lake/Pond Area (Ac):	0.00
Proposed Disturbed Area (Ac):	4.71
Impervious Surface Area (acre):	2.83
Type of Development (Select from Dropdown menu):	Non-Residential
Percent Built Upon Area (BUA):	51%
Project Density:	High
Is the proposed project a site expansion?	No
Number of Drainage Areas on Site:	1
NOAA — **1-Year, 24-Hour Storm (inches) (See NOAA Website):**	2.86
NOAA — **2-Year, 24-Hour Storm (inches) (See NOAA Website):**	3.46
NOAA — **10-Year, 24-Hour Storm (inches) (See NOAA Website):**	5.03
Lot Data (if applicable):	
Total Acreage in Lots:	N/A
Number of Lots:	N/A
Average Lot Size (SF):	N/A
Total Impervious Surface Area on Lots (SF):	N/A
Average Impervious Surface Area Per Lot (SF):	N/A

Stormwater Narrative (limit to 1,200 characters - attach additional pages with submittal if necessary):

See Stormwater Impact Analysis

Project Name: Jones Dairy Storage Facility

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	7.48				7.48			
Site Acreage within Drainage=	5.47				5.47			
One-year, 24-hour rainfall (in)=	2.86							
Two-year, 24-hour rainfall (in)=	3.46							
Ten-year, 24-hour storm (in)=	5.03							
Total Lake/Pond Area (Acres)=	0.00				0.38			
Lake/Pond Area not in the Tc flow path (Acres)=	0.00				0.38			
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition		2.72		2.04		0.47		0.13
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition		0.55		0.16		1.22		0.82
Reforestation (in dedicated OS)								
Connected Impervious						1.60		1.23
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=	100.00				100.00			
Slope (ft/ft)=	0.045				0.110			
Surface Cover:	Woods				Grass			
n-value=	0.400				0.240			
T_t (hrs)=	0.274				0.127			
Shallow Flow								
Length (ft)=	815.00				100.00			
Slope (ft/ft)=	0.018				0.040			
Surface Cover:	Unpaved				Paved			
Average Velocity (ft/sec)=	2.16				4.07			
T_t (hrs)=	0.10				0.01			
Channel Flow 1								
Length (ft)=					511.00			
Slope (ft/ft)=					0.005			
Cross Sectional Flow Area (ft^2)=					7.07			
Wetted Perimeter (ft)=					9.42			
Channel Lining:					Concrete, unfinished			
n-value=					0.014			
Hydraulic Radius (ft)=					0.75			
Average Velocity (ft/sec)=					6.22			
T_t (hrs)=					0.02			

Project Name: Jones Dairy Storage Facility

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		310.00
Slope (ft/ft)=		0.010
Cross Sectional Flow Area (ft^2)=		15.00
Wetted Perimeter (ft)=		16.50
Channel Lining:		Weeds
n-value=		0.040
Hydraulic Radius (ft)=		0.91
Average Velocity (ft/sec)=		3.50
T_t (hrs)=		0.02
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.38	0.18
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	65	83
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**83**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	10,603	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.43	1.33
Volume of runoff (ft^3) =	8,488	26,319
Volume change (ft^3) =	17,831	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	2.020	9.256
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	0.71	1.81
Volume of runoff (ft^3) =	14,092	36,025
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	3.354	12.670
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	1.64	3.19
Volume of runoff (ft^3) =	32,556	63,298
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	7.749	22.261

Project Name: **Jones Dairy Storage Facility**

DA SITE SUMMARY
STORMWATER PRE-POST CALCULATIONS

SITE SUMMARY										
DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in) = $Q_{pre,1\text{-}year}$ =	0.43									
Peak Flow (cfs)=$Q_{1\text{-}year}$ =	2.020									
Post-Development (1-year, 24-hour storm)										
Proposed Impervious Surface (acre) =	2.83									
Runoff (in)=$Q_{1\text{-}year}$ =	1.33									
Peak Flow (cfs)=$Q_{1\text{-}year}$ =	9.256									
Increase in volume per DA (ft^3)_1-yr storm=	17,831									
Minimum Volume to be Managed for DA HIGH DENSITY REQUIREMENT = (ft^3) =	10,603									

TARGET CURVE NUMBER (TCN)

Site Data

SITE \SOIL COMPOSITION

HYDROLOGIC SOIL GROUP	Site Area	%	Target CN
A	0.00	0%	N/A
B	3.29	60%	N/A
C	0.00	0%	N/A
D	2.18	40%	N/A

Total Site Area (acres) =	5.47
Percent BUA (Includes Existing Lakes/Pond Areas) =	48%
Project Density =	High
Target Curve Number (TCN) =	N/A
$CN_{adjusted\ (1\text{-}year)}$=	83
Minimum Volume to be Managed (Total Site) Per TCN Requirement= ft^3 =	N/A

Site Nitrogen Loading Data

HSG	TN export coefficient (lbs/ac/yr)	Site Acreage	N Export
Pasture	1.2	0.00	0.00
Woods, Poor Condition	1.6	0.00	0.00
Woods, Fair Condition	1.2	0.00	0.00
Woods, Good Condition	0.8	0.60	0.48
Open Space, Poor Condition	1.0	0.00	0.00
Open Space, Fair Condition	0.8	0.00	0.00
Open Space, Good Condition	0.6	2.04	1.22
Reforestation (in dedicated OS)	0.6	0.00	0.00
Impervious	21.2	2.83	60.00
SITE NITROGEN LOADING RATE (lbs/ac/yr)=		11.28	
Nitrogen Load (lbs/yr)=		61.70	
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)_Wendell Only=		42.01	

Site Nitrogen Loading Data For Expansions Only

	Existing	New
Impervious(acres)=	NA	NA
"Expansion Area" (acres=)		
Nitrogen Load (lbs/yr)=	NA	NA
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	NA	NA
Total Site loading rate (lbs/ac/yr)		
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)=	NA	

Project Name: Jones Dairy Storage Facility

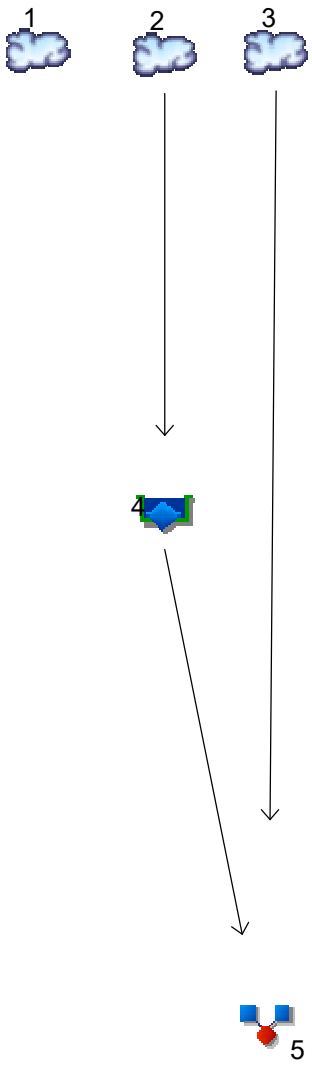
DA SITE SUMMARY
BMP CALCULATIONS

BMP SUMMARY										
DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in)=$Q^*_{1\text{-year}}$ =	0.43									
Peak Flow (cfs)=$Q_{1\text{-year}}$ =	2.020									
Post-Development (1-year, 24-hour storm)										
Target Curve Number (TCN) =	NA									
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.83									
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	0.875									
Post BMP $CN_{(1\text{-year})}$=	74									
Post-BMP Nitrogen Loading										
TOTAL SITE NITROGEN MITIGATED (lbs)=	15.08									
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	8.52									
TOTAL SITE NITROGEN LEFT TO MITIGATE_Wendell Only (lbs)=	**26.93**									

Section 3: Stormwater Calculations

Pre/Post Drainage Area Calculations

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	POA 1 - Pre
2	SCS Runoff	POA 1 - Post (Pond)
3	SCS Runoff	POA 1 - Post (Bypass)
4	Reservoir	Post to Wet Pond
5	Combine	POA 1 - Post (Combined)

Hydraflow Table of Contents

Hydrograph Return Period Recap

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	------	0.882	1.763	-------	-------	4.940	7.227	-------	11.21	POA 1 - Pre
2	SCS Runoff	------	10.80	13.53	-------	-------	20.61	24.85	-------	31.59	POA 1 - Post (Pond)
3	SCS Runoff	------	0.255	0.550	-------	-------	1.677	2.516	-------	3.994	POA 1 - Post (Bypass)
4	Reservoir	2	0.621	0.889	-------	-------	3.986	7.797	-------	8.156	Post to Wet Pond
5	Combine	3, 4	0.875	1.437	-------	-------	4.795	9.234	-------	11.89	POA 1 - Post (Combined)

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	0.882	2	750	8,228	------	------	------	POA 1 - Pre
2	SCS Runoff	10.80	2	716	22,875	------	------	------	POA 1 - Post (Pond)
3	SCS Runoff	0.255	2	754	2,655	------	------	------	POA 1 - Post (Bypass)
4	Reservoir	0.621	2	764	22,750	2	379.29	12,908	Post to Wet Pond
5	Combine	0.875	2	756	25,406	3, 4	------	------	POA 1 - Post (Combined)

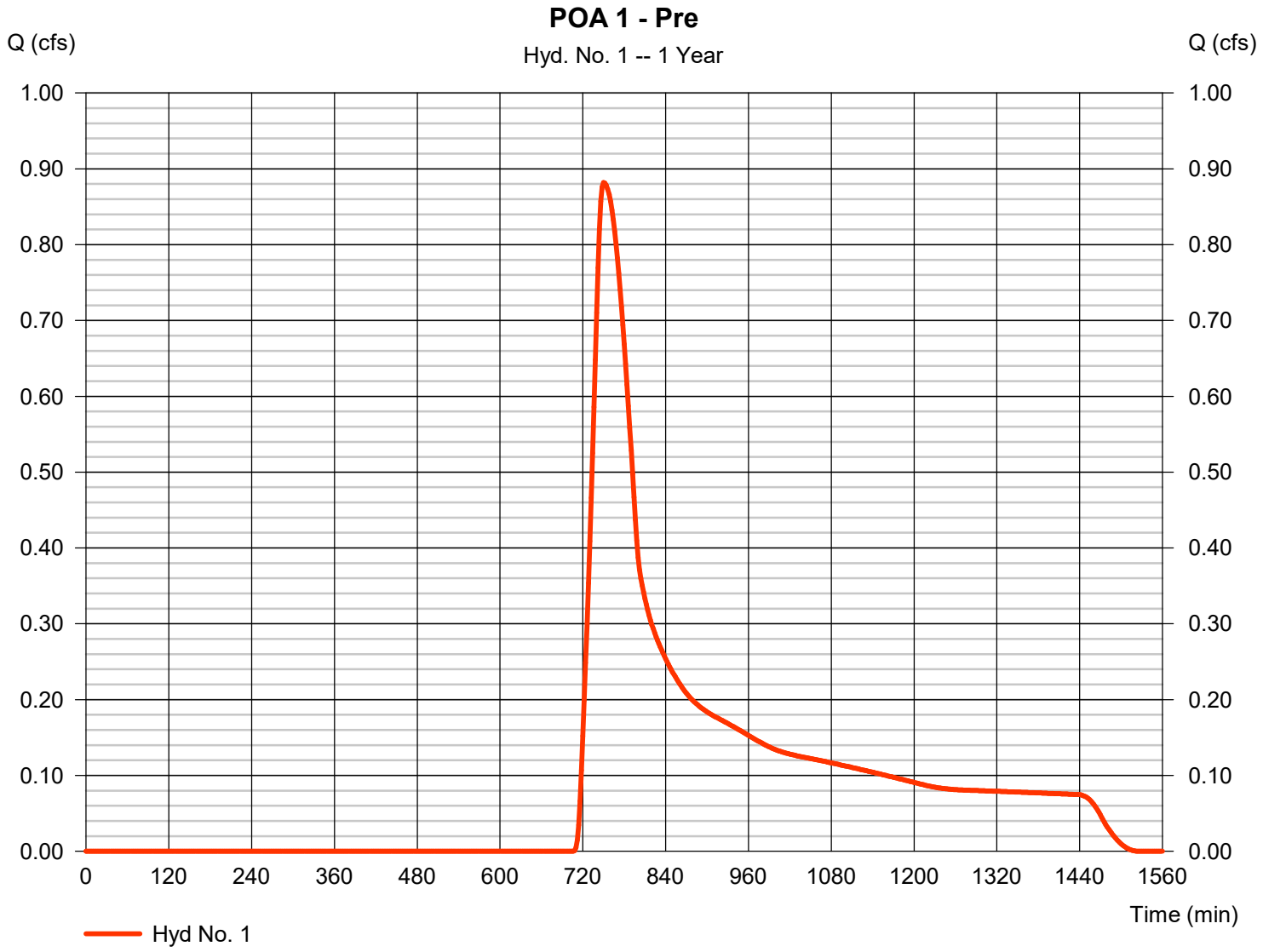
Hydrograph Report

Hyd. No. 1

POA 1 - Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 0.882 cfs
Storm frequency	= 1 yrs	Time to peak	= 750 min
Time interval	= 2 min	Hyd. volume	= 8,228 cuft
Drainage area	= 5.500 ac	Curve number	= 64*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 51.80 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.750 x 55) + (0.550 x 61) + (2.050 x 77) + (0.150 x 80)] / 5.500



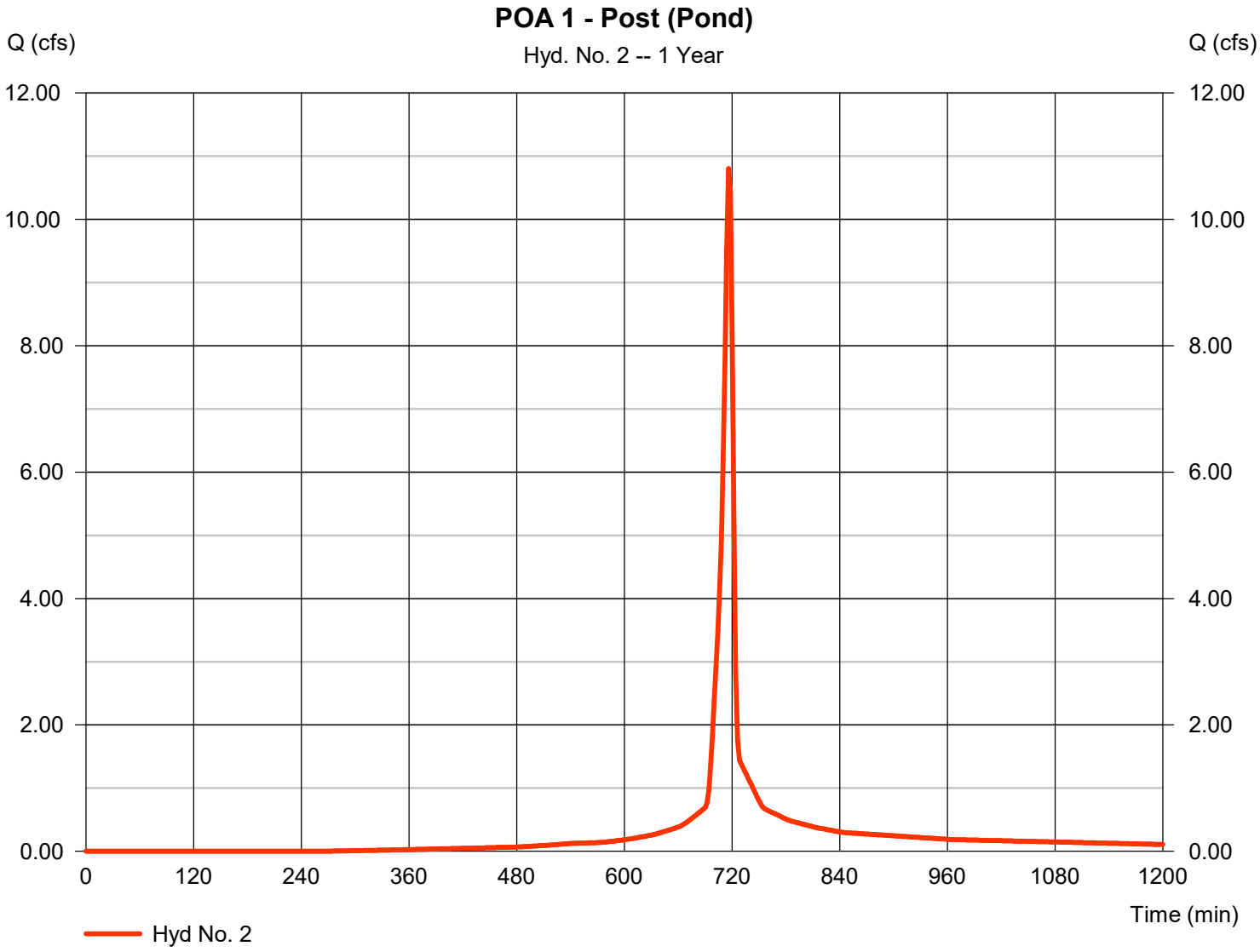
Hydrograph Report

Hyd. No. 2

POA 1 - Post (Pond)

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.80 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	22,875 cuft
Drainage area	=	3.170 ac	Curve number	=	93*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.86 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.580 x 98) + (0.210 x 61) + (0.380 x 80)] / 3.170



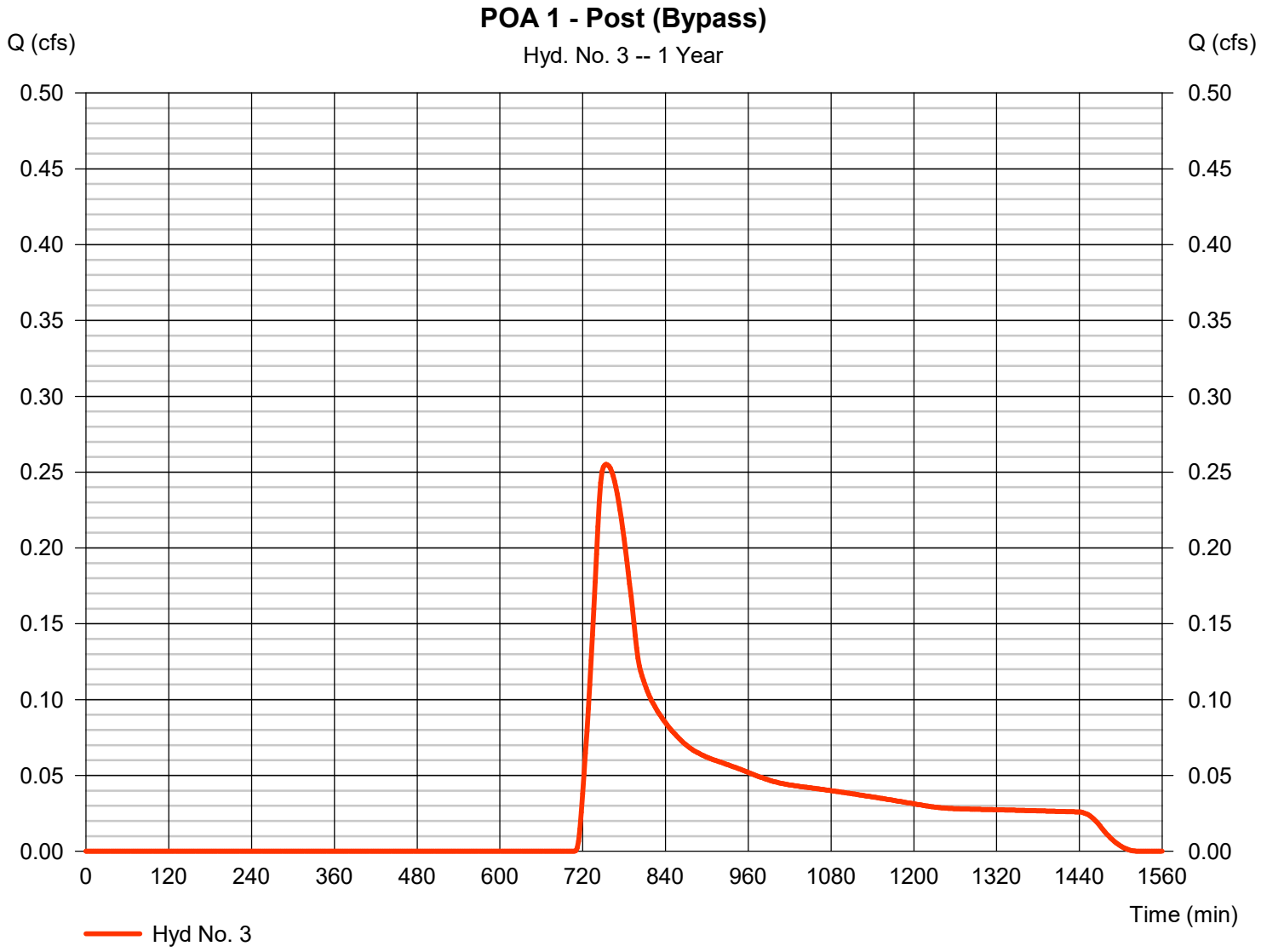
Hydrograph Report

Hyd. No. 3

POA 1 - Post (Bypass)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.255 cfs
Storm frequency	= 1 yrs	Time to peak	= 754 min
Time interval	= 2 min	Hyd. volume	= 2,655 cuft
Drainage area	= 2.110 ac	Curve number	= 62*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 54.00 min
Total precip.	= 2.86 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.190 x 61) + (0.170 x 80) + (0.610 x 55) + (0.140 x 77)] / 2.110



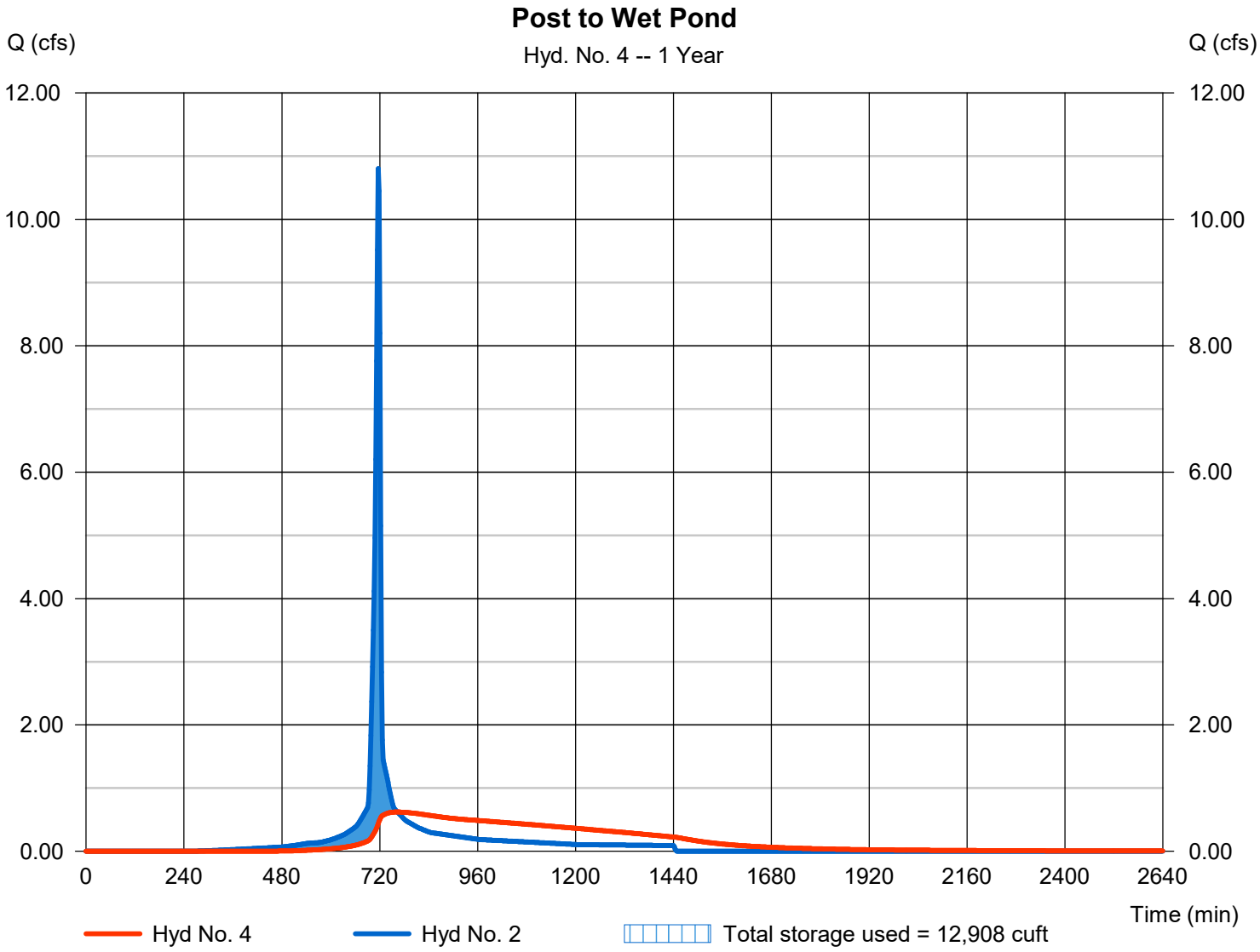
Hydrograph Report

Hyd. No. 4

Post to Wet Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.621 cfs
Storm frequency	=	1 yrs	Time to peak	=	764 min
Time interval	=	2 min	Hyd. volume	=	22,750 cuft
Inflow hyd. No.	=	2 - POA 1 - Post (Pond)	Max. Elevation	=	379.29 ft
Reservoir name	=	Wet Pond	Max. Storage	=	12,908 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Wet Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 378.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	378.00	7,546	0	0
0.50	378.50	10,192	4,435	4,435
1.10	379.10	11,051	6,373	10,807
1.50	379.50	11,637	4,538	15,345
2.50	380.50	13,142	12,390	27,735
3.50	381.50	14,703	13,923	41,657

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	1.50	3.50	Inactive
Span (in)	= 12.00	1.50	4.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 373.50	378.00	378.05	0.00
Length (ft)	= 84.19	0.00	0.00	0.00
Slope (%)	= 0.57	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

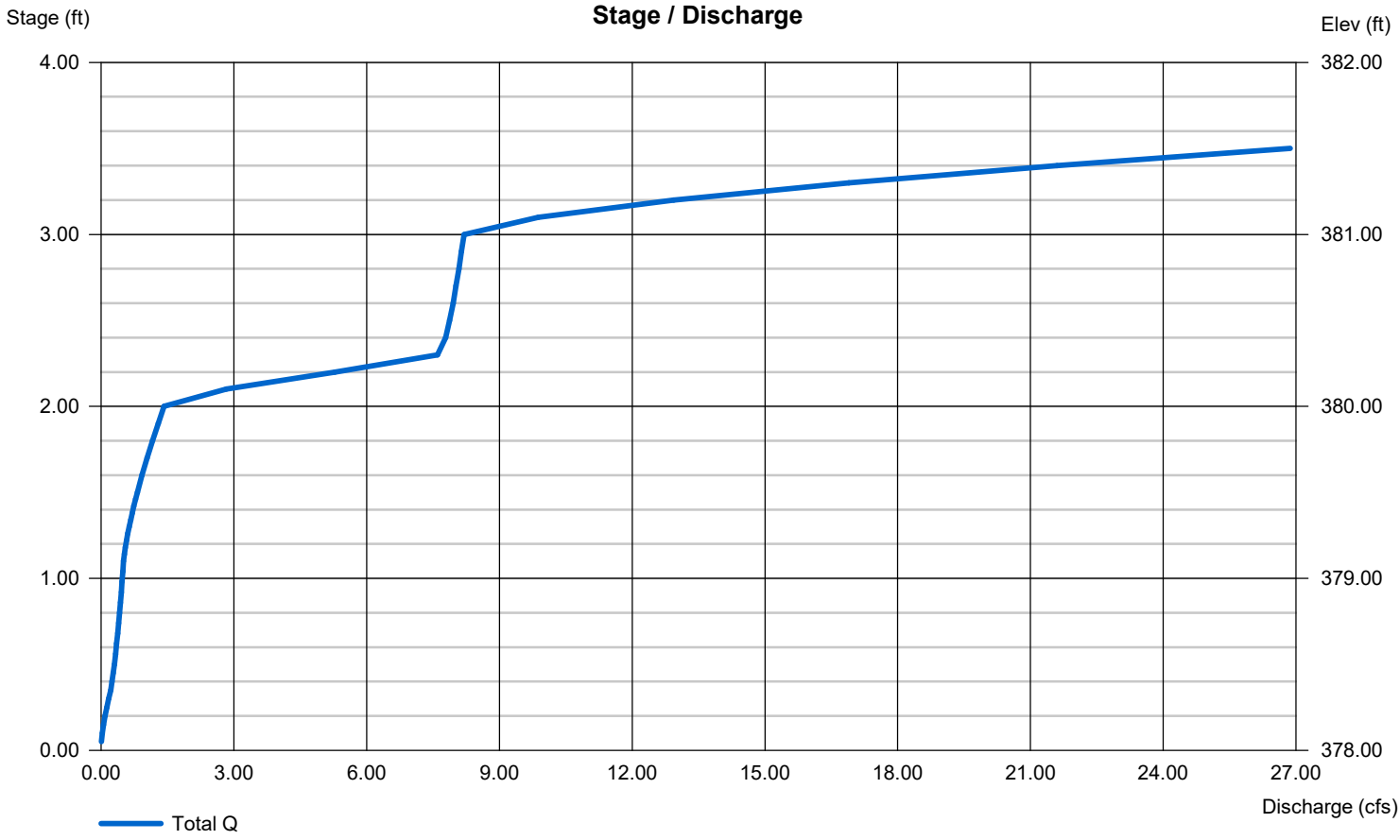
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	0.25	20.00	Inactive
Crest El. (ft)	= 380.00	379.10	381.00	379.75
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	Rect
Multi-Stage	= Yes	Yes	No	Yes

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).

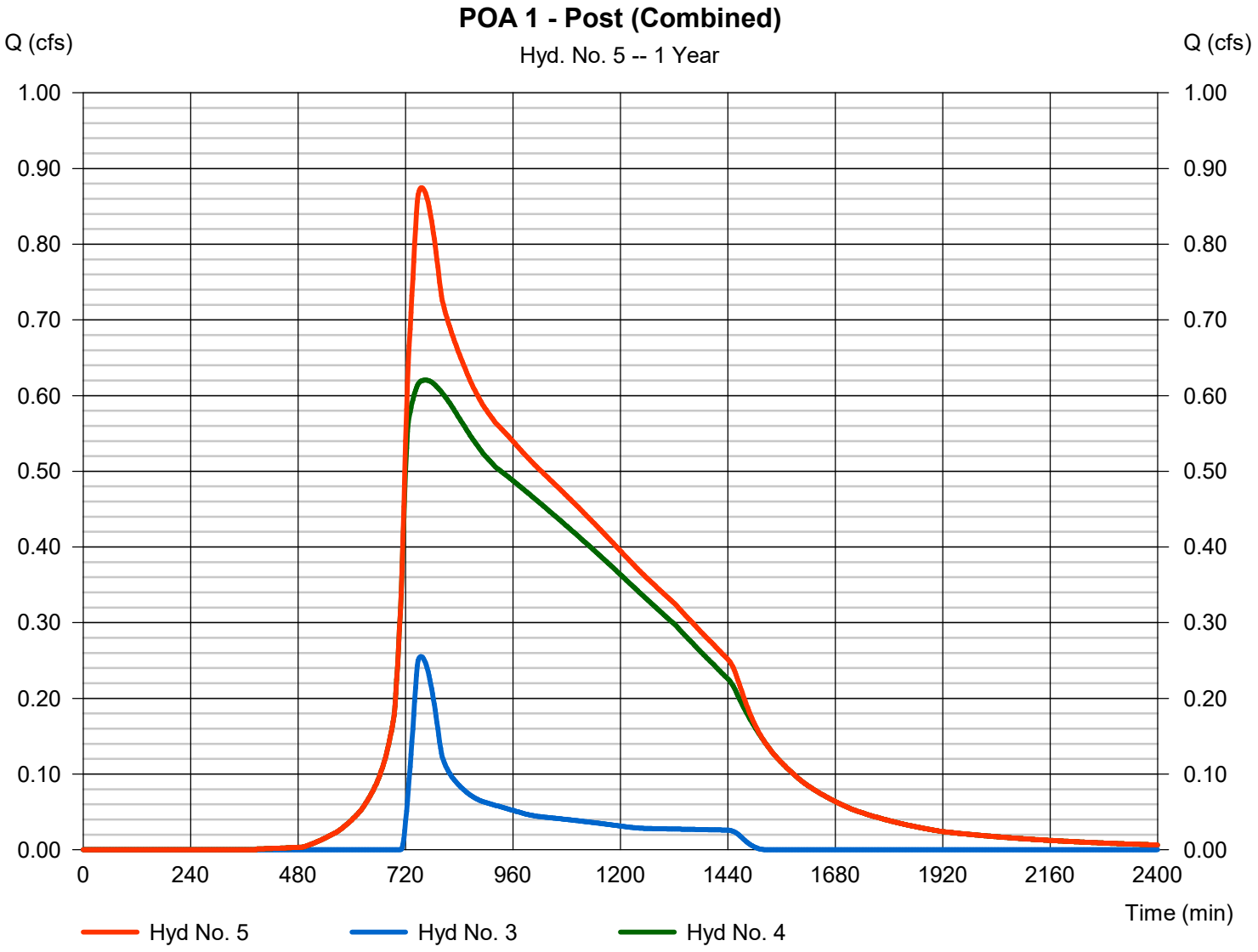


Hydrograph Report

Hyd. No. 5

POA 1 - Post (Combined)

Hydrograph type	= Combine	Peak discharge	= 0.875 cfs
Storm frequency	= 1 yrs	Time to peak	= 756 min
Time interval	= 2 min	Hyd. volume	= 25,406 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.110 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	1.763	2	748	13,781	------	------	------	POA 1 - Pre
2	SCS Runoff	13.53	2	716	29,087	------	------	------	POA 1 - Post (Pond)
3	SCS Runoff	0.550	2	750	4,607	------	------	------	POA 1 - Post (Bypass)
4	Reservoir	0.889	2	754	28,962	2	379.57	16,191	Post to Wet Pond
5	Combine	1.437	2	750	33,570	3, 4	------	------	POA 1 - Post (Combined)

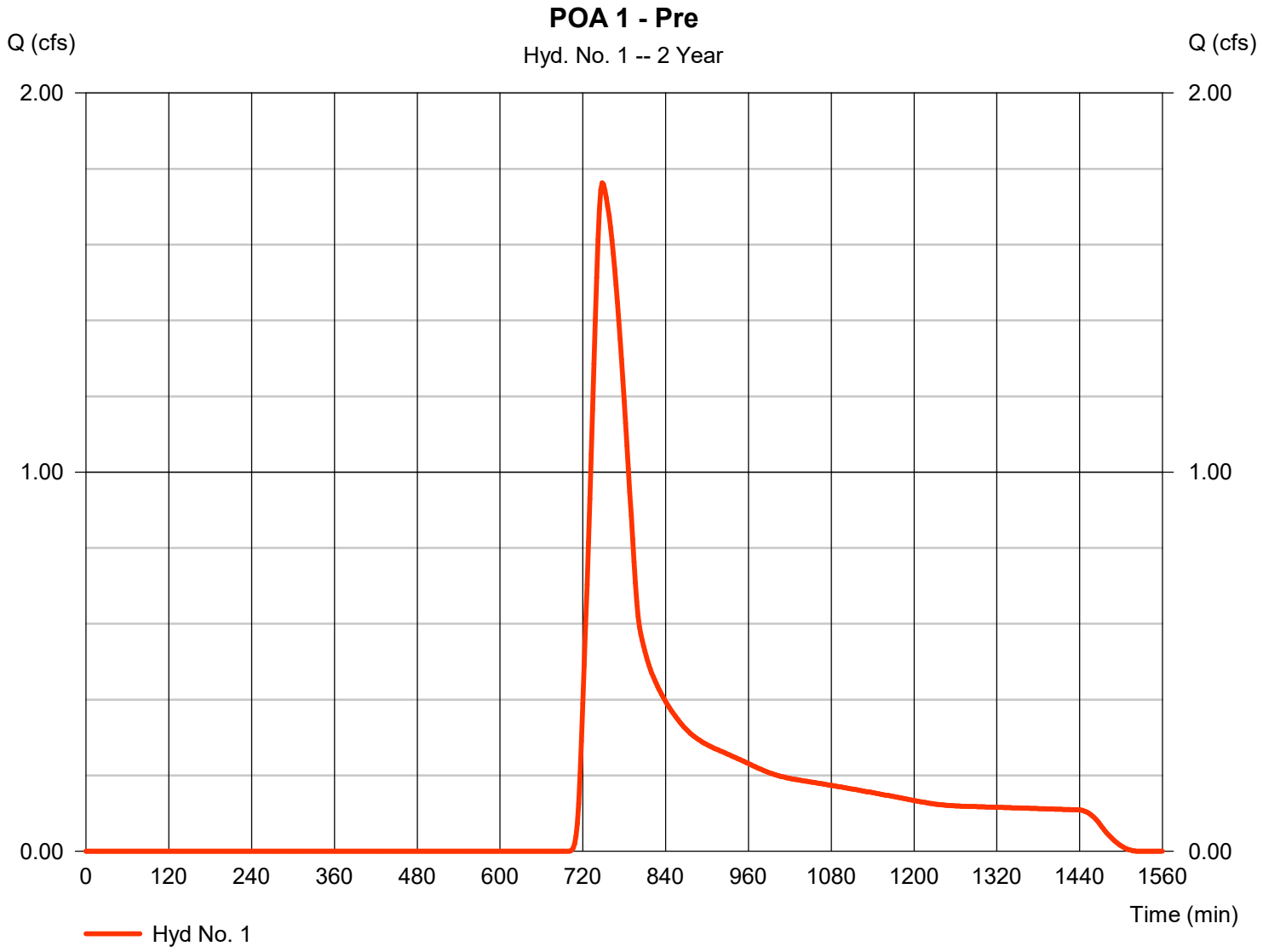
Hydrograph Report

Hyd. No. 1

POA 1 - Pre

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.763 cfs
Storm frequency	=	2 yrs	Time to peak	=	748 min
Time interval	=	2 min	Hyd. volume	=	13,781 cuft
Drainage area	=	5.500 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	51.80 min
Total precip.	=	3.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.750 x 55) + (0.550 x 61) + (2.050 x 77) + (0.150 x 80)] / 5.500



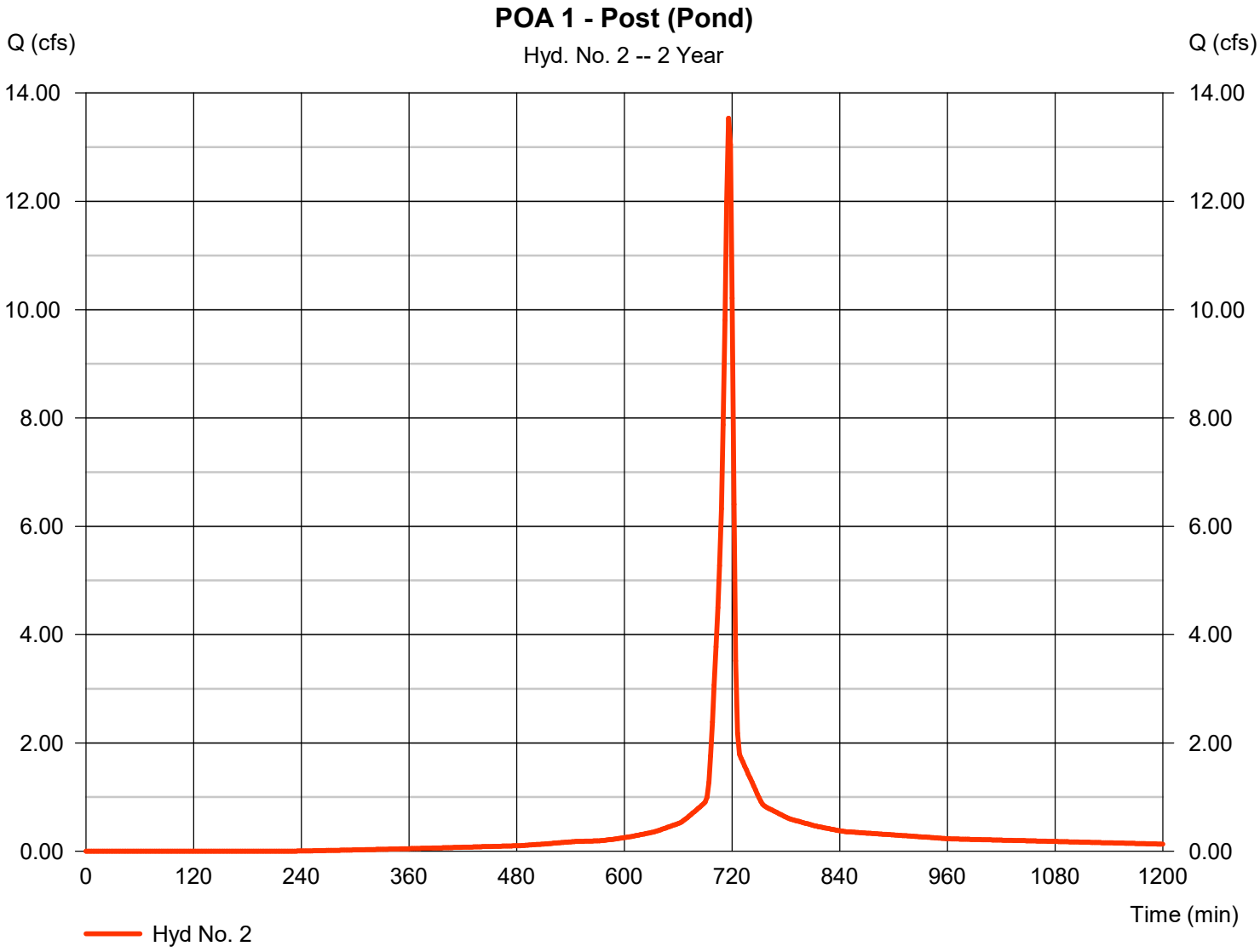
Hydrograph Report

Hyd. No. 2

POA 1 - Post (Pond)

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.53 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	29,087 cuft
Drainage area	=	3.170 ac	Curve number	=	93*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.580 x 98) + (0.210 x 61) + (0.380 x 80)] / 3.170



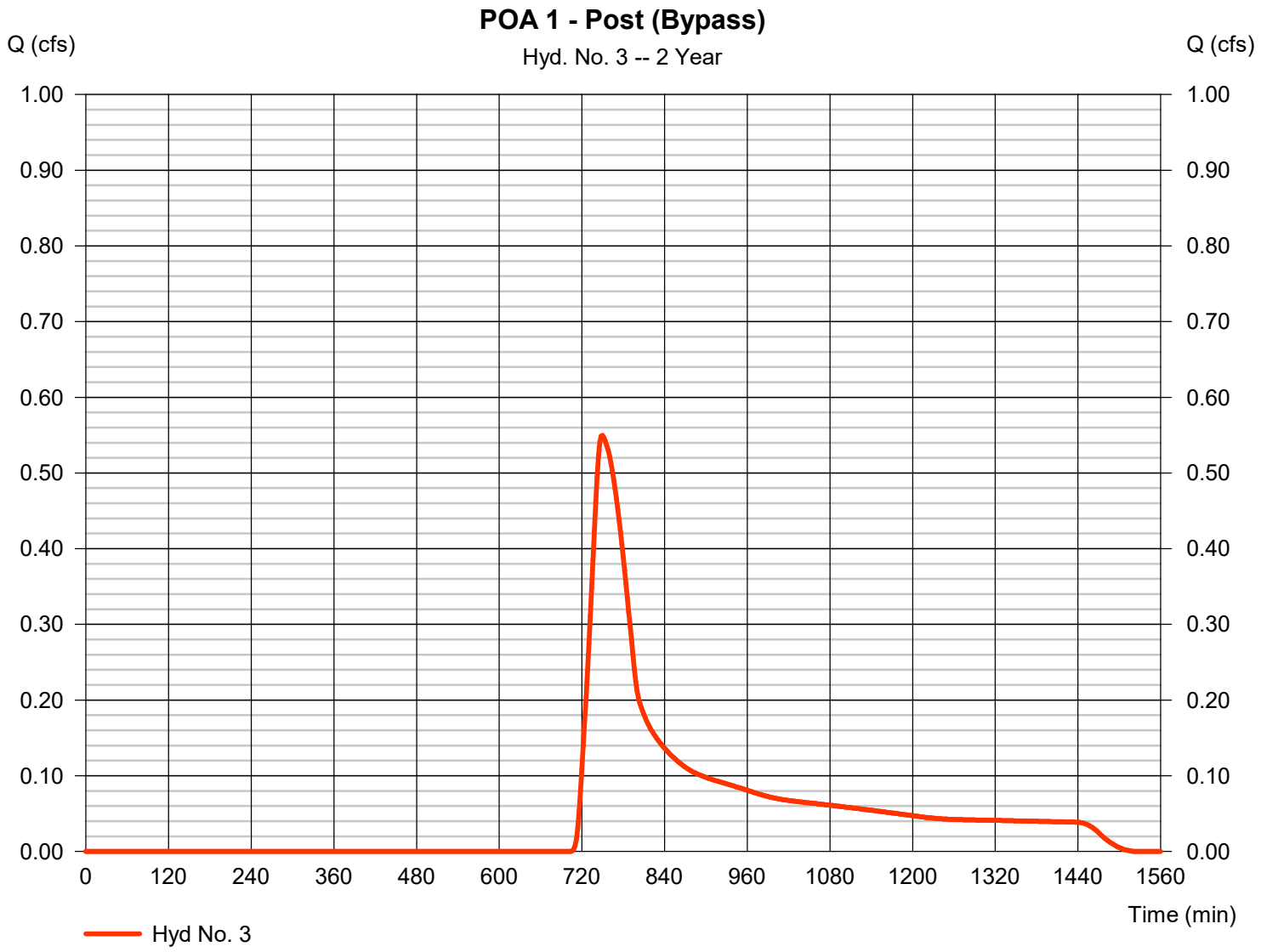
Hydrograph Report

Hyd. No. 3

POA 1 - Post (Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.550 cfs
Storm frequency	=	2 yrs	Time to peak	=	750 min
Time interval	=	2 min	Hyd. volume	=	4,607 cuft
Drainage area	=	2.110 ac	Curve number	=	62*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	54.00 min
Total precip.	=	3.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.190 x 61) + (0.170 x 80) + (0.610 x 55) + (0.140 x 77)] / 2.110



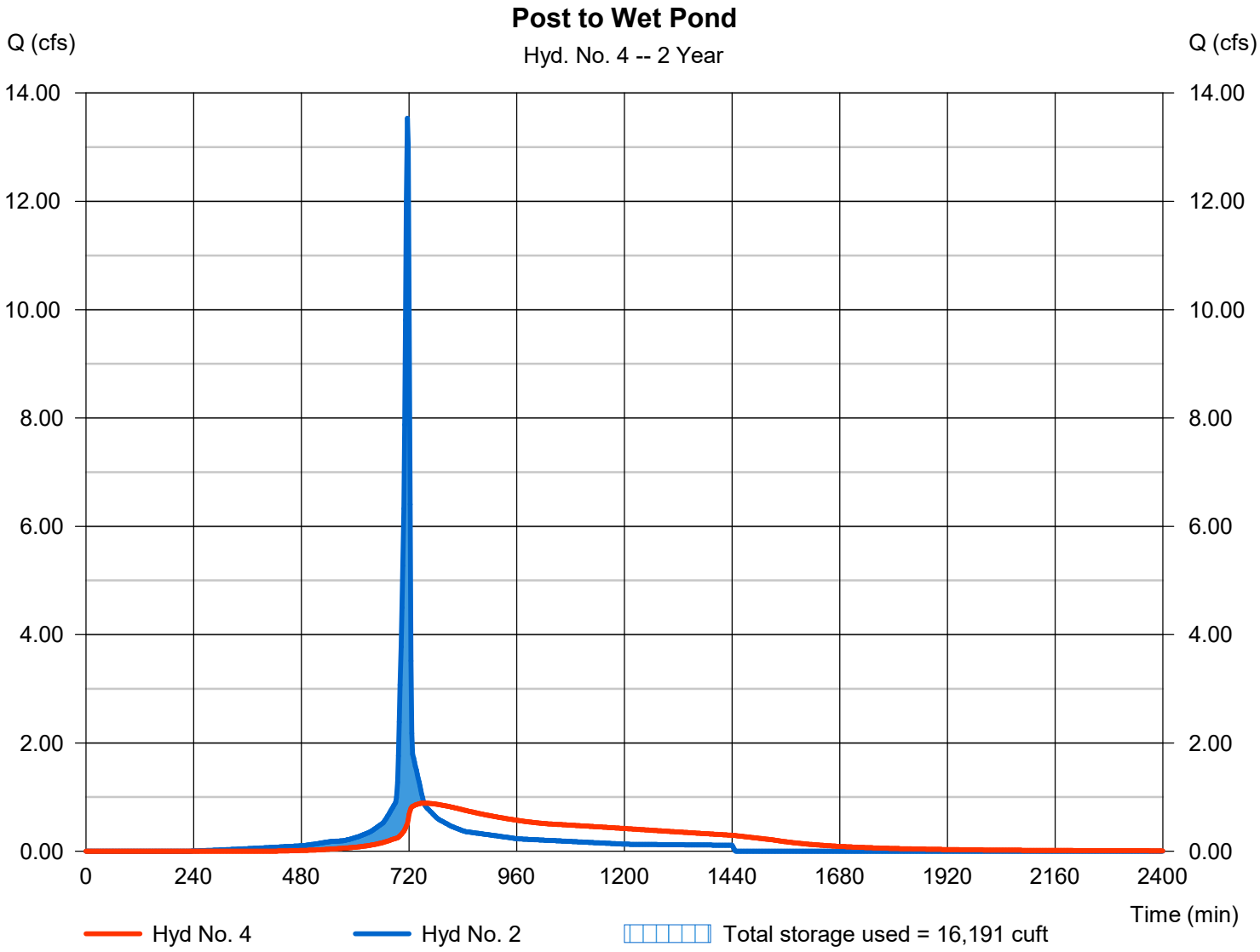
Hydrograph Report

Hyd. No. 4

Post to Wet Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.889 cfs
Storm frequency	=	2 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	28,962 cuft
Inflow hyd. No.	=	2 - POA 1 - Post (Pond)	Max. Elevation	=	379.57 ft
Reservoir name	=	Wet Pond	Max. Storage	=	16,191 cuft

Storage Indication method used.

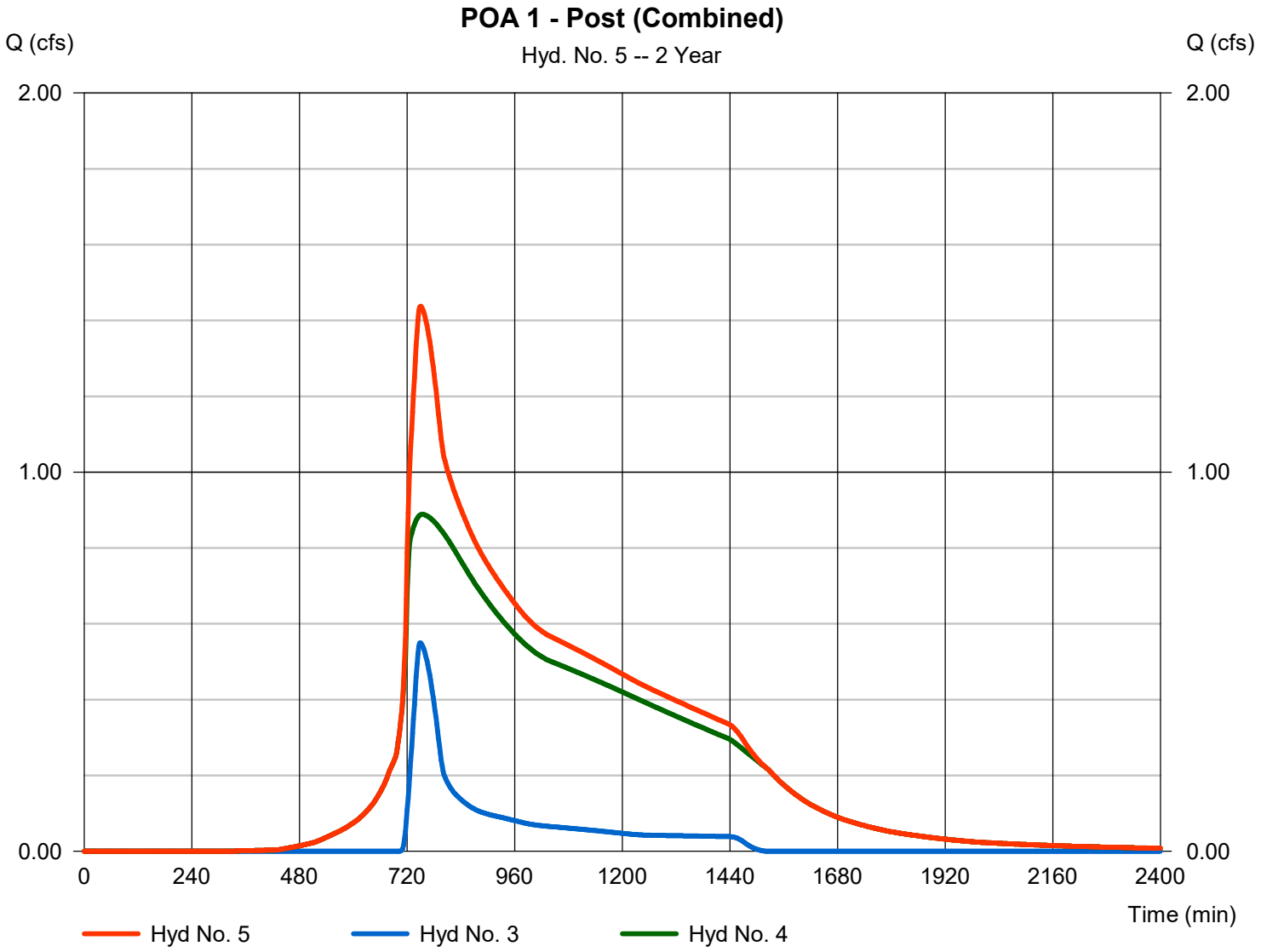


Hydrograph Report

Hyd. No. 5

POA 1 - Post (Combined)

Hydrograph type	=	Combine	Peak discharge	=	1.437 cfs
Storm frequency	=	2 yrs	Time to peak	=	750 min
Time interval	=	2 min	Hyd. volume	=	33,570 cuft
Inflow hyds.	=	3, 4	Contrib. drain. area	=	2.110 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	4.940	2	746	32,196	------	------	------	POA 1 - Pre
2	SCS Runoff	20.61	2	716	45,604	------	------	------	POA 1 - Post (Pond)
3	SCS Runoff	1.677	2	748	11,246	------	------	------	POA 1 - Post (Bypass)
4	Reservoir	3.986	2	726	45,480	2	380.15	23,363	Post to Wet Pond
5	Combine	4.795	2	726	56,726	3, 4	------	------	POA 1 - Post (Combined)

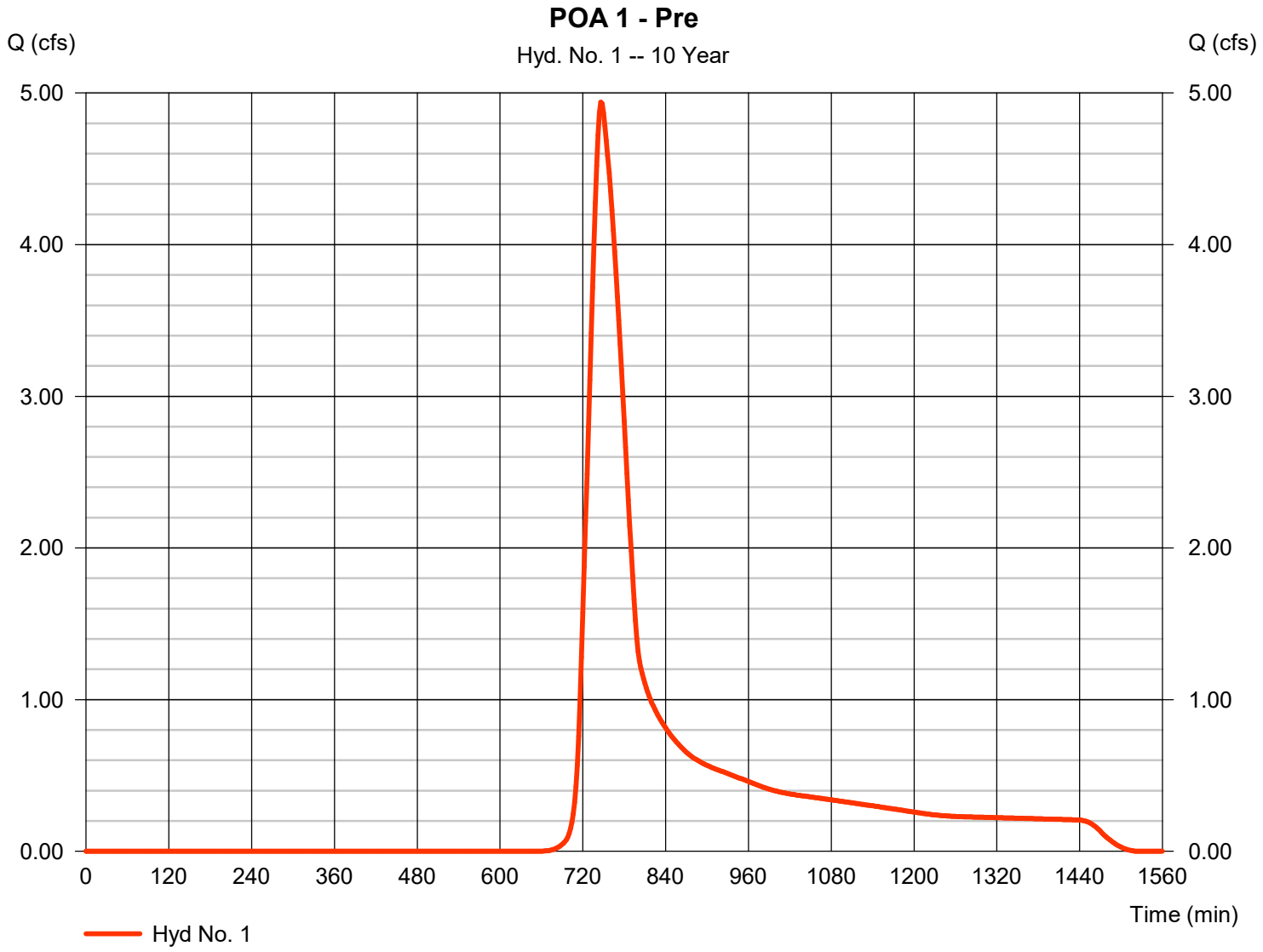
Hydrograph Report

Hyd. No. 1

POA 1 - Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 4.940 cfs
Storm frequency	= 10 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 32,196 cuft
Drainage area	= 5.500 ac	Curve number	= 64*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 51.80 min
Total precip.	= 5.03 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.750 x 55) + (0.550 x 61) + (2.050 x 77) + (0.150 x 80)] / 5.500



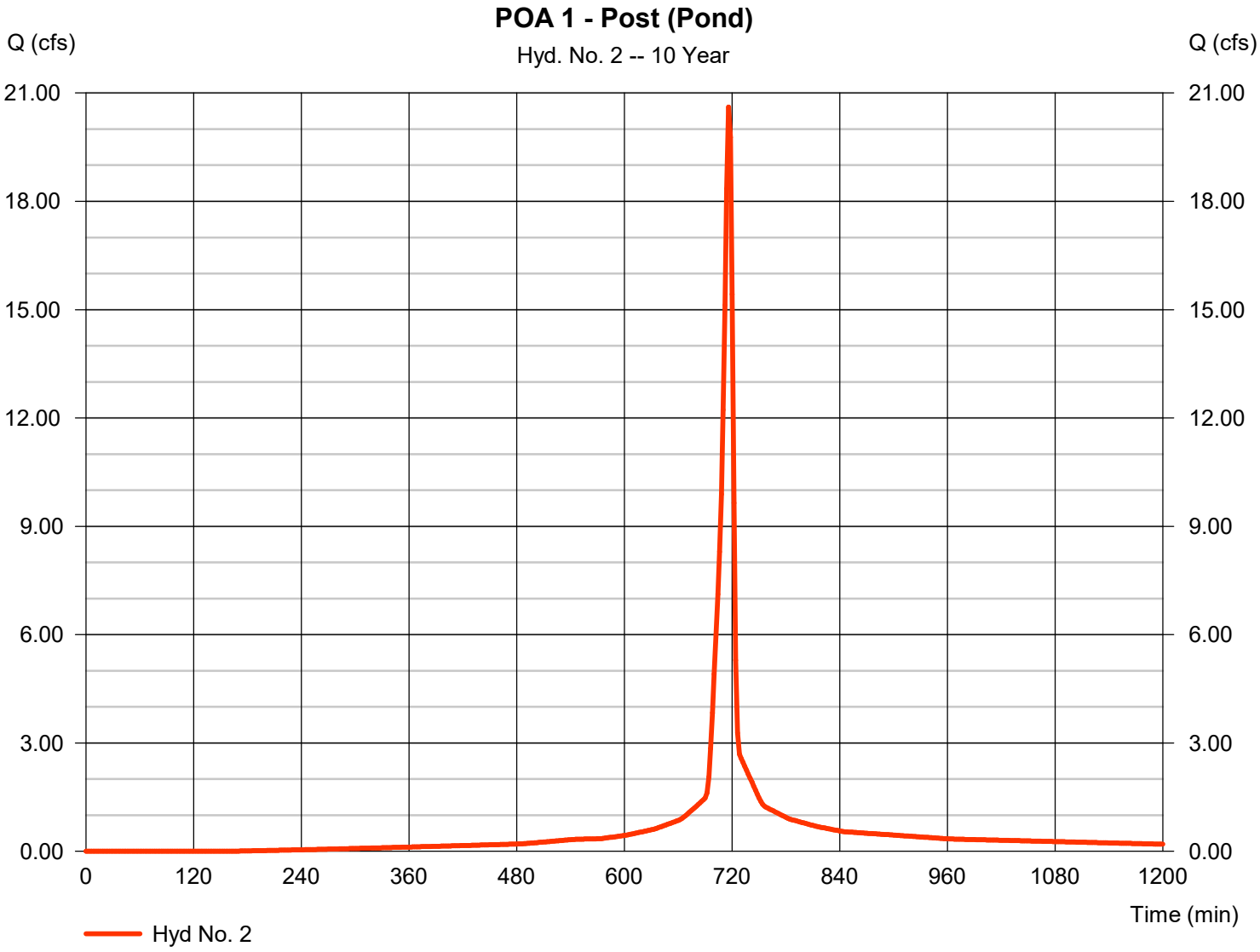
Hydrograph Report

Hyd. No. 2

POA 1 - Post (Pond)

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.61 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	45,604 cuft
Drainage area	=	3.170 ac	Curve number	=	93*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.03 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.580 x 98) + (0.210 x 61) + (0.380 x 80)] / 3.170



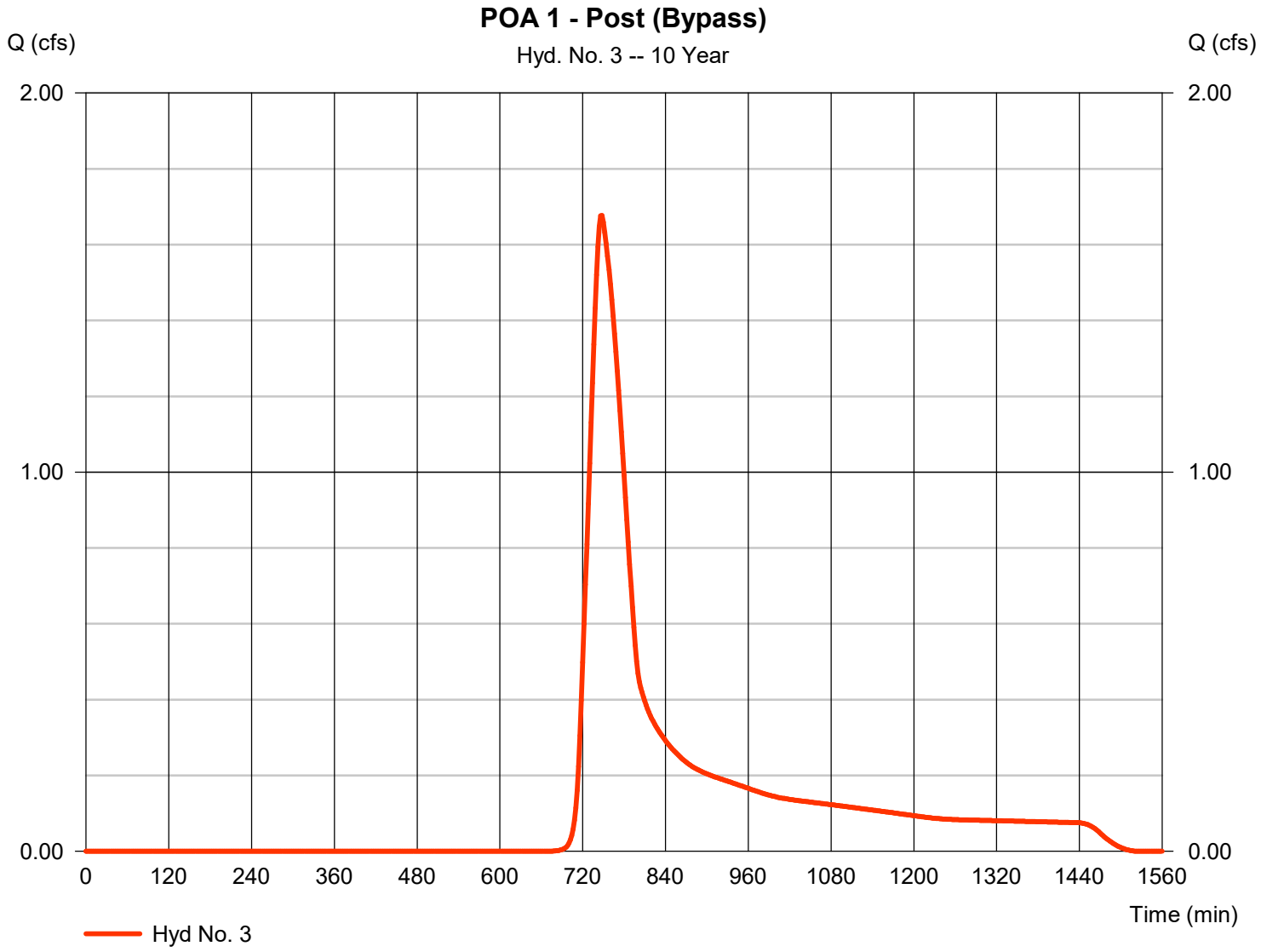
Hydrograph Report

Hyd. No. 3

POA 1 - Post (Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.677 cfs
Storm frequency	=	10 yrs	Time to peak	=	748 min
Time interval	=	2 min	Hyd. volume	=	11,246 cuft
Drainage area	=	2.110 ac	Curve number	=	62*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	54.00 min
Total precip.	=	5.03 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.190 x 61) + (0.170 x 80) + (0.610 x 55) + (0.140 x 77)] / 2.110



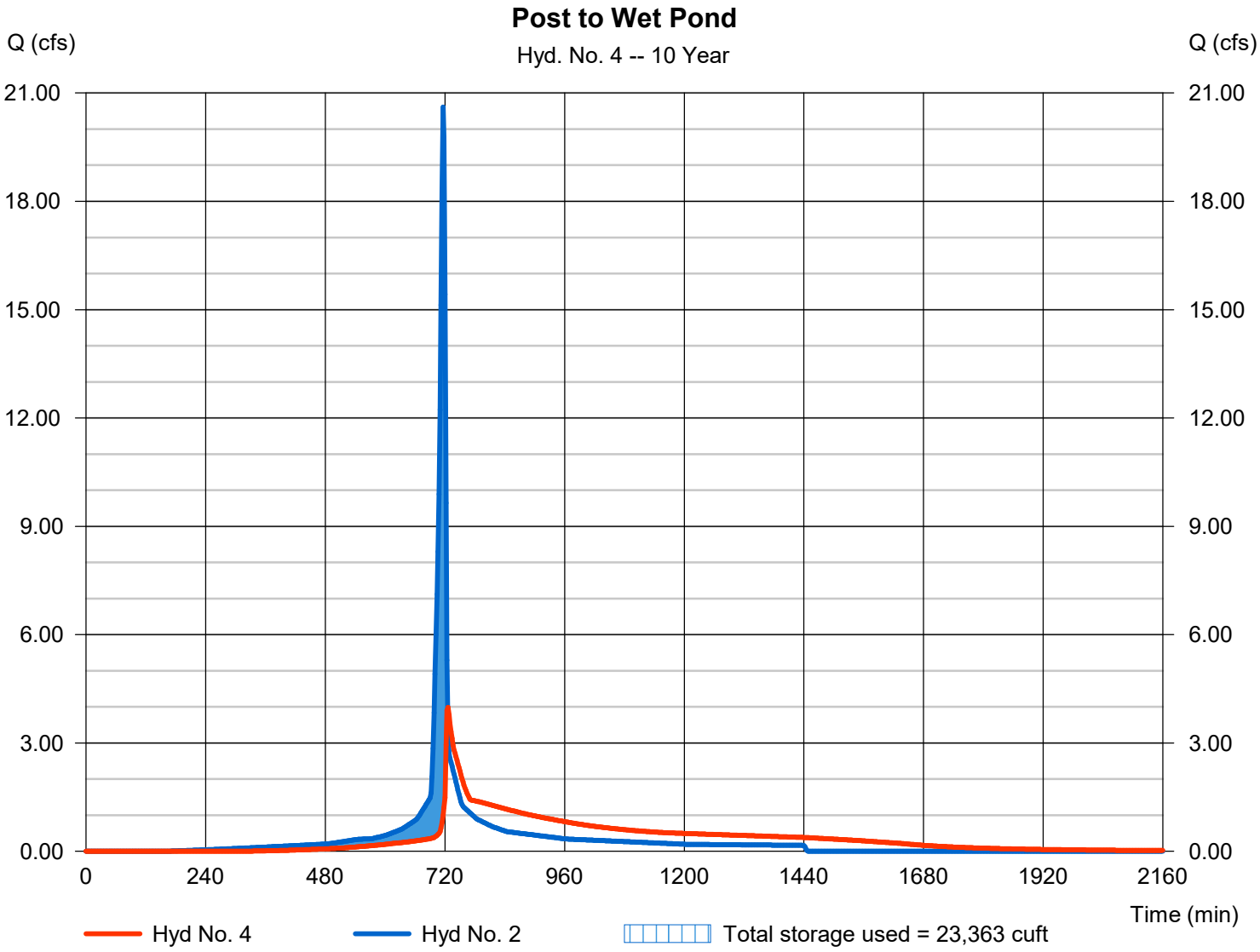
Hydrograph Report

Hyd. No. 4

Post to Wet Pond

Hydrograph type	=	Reservoir	Peak discharge	=	3.986 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	45,480 cuft
Inflow hyd. No.	=	2 - POA 1 - Post (Pond)	Max. Elevation	=	380.15 ft
Reservoir name	=	Wet Pond	Max. Storage	=	23,363 cuft

Storage Indication method used.

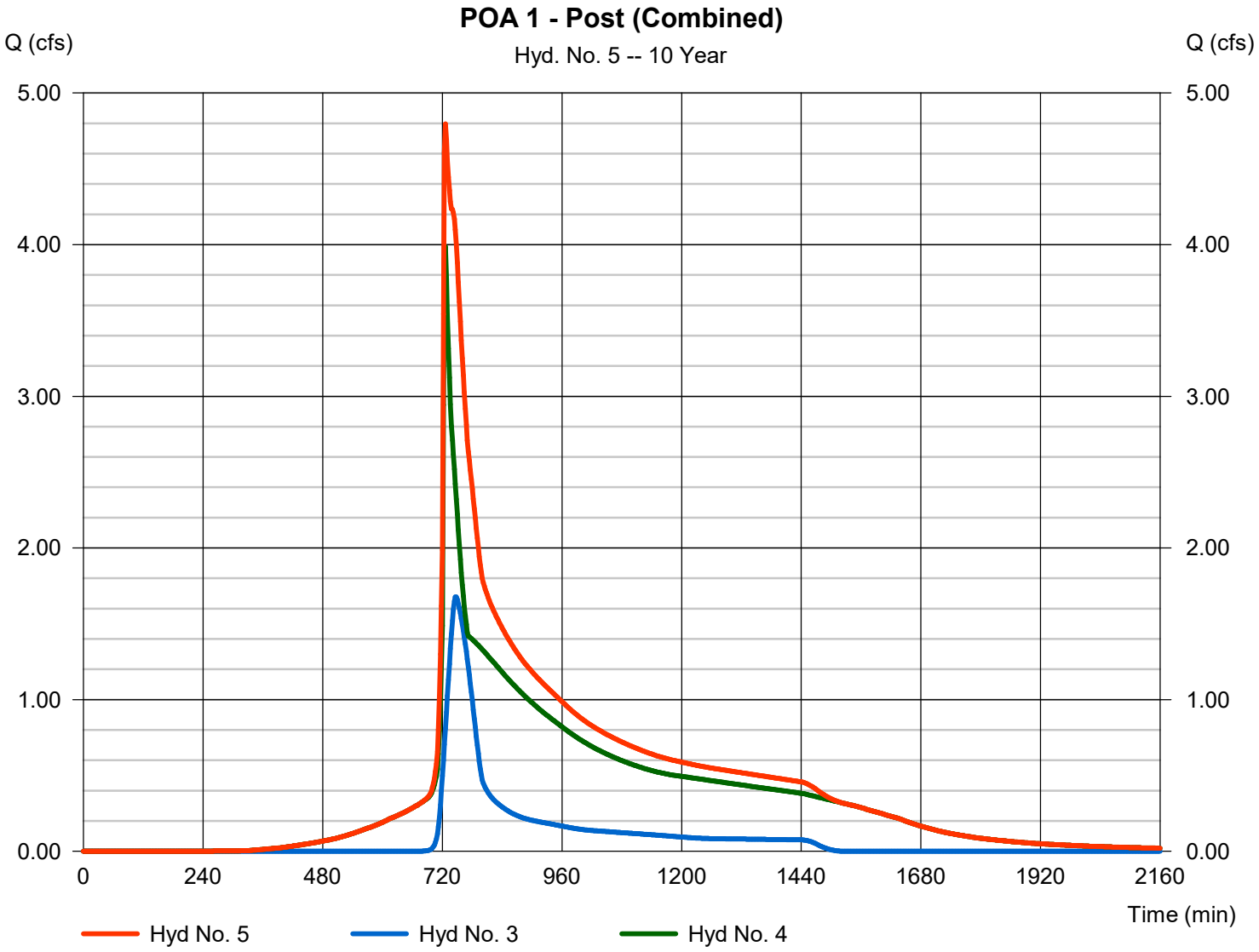


Hydrograph Report

Hyd. No. 5

POA 1 - Post (Combined)

Hydrograph type	= Combine	Peak discharge	= 4.795 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 56,726 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.110 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	59.7930	12.4000	0.8801	--------
2	71.2172	12.9000	0.8806	--------
3	0.0000	0.0000	0.0000	--------
5	0.0000	0.0000	0.0000	--------
10	67.8359	12.0000	0.7923	--------
25	62.7327	11.1000	0.7421	--------
50	0.0000	0.0000	0.0000	--------
100	51.7573	9.1000	0.6550	--------

File name: Town of Rolesville.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.84	3.88	3.25	2.80	2.47	2.21	2.00	1.83	1.69	1.57	1.47	1.38
2	5.61	4.52	3.80	3.28	2.90	2.60	2.36	2.16	2.00	1.86	1.74	1.63
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	7.19	5.86	4.98	4.35	3.88	3.51	3.21	2.96	2.76	2.58	2.42	2.29
25	7.98	6.53	5.57	4.89	4.38	3.98	3.65	3.39	3.16	2.97	2.80	2.65
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	9.15	7.50	6.44	5.69	5.13	4.69	4.33	4.04	3.79	3.58	3.39	3.23

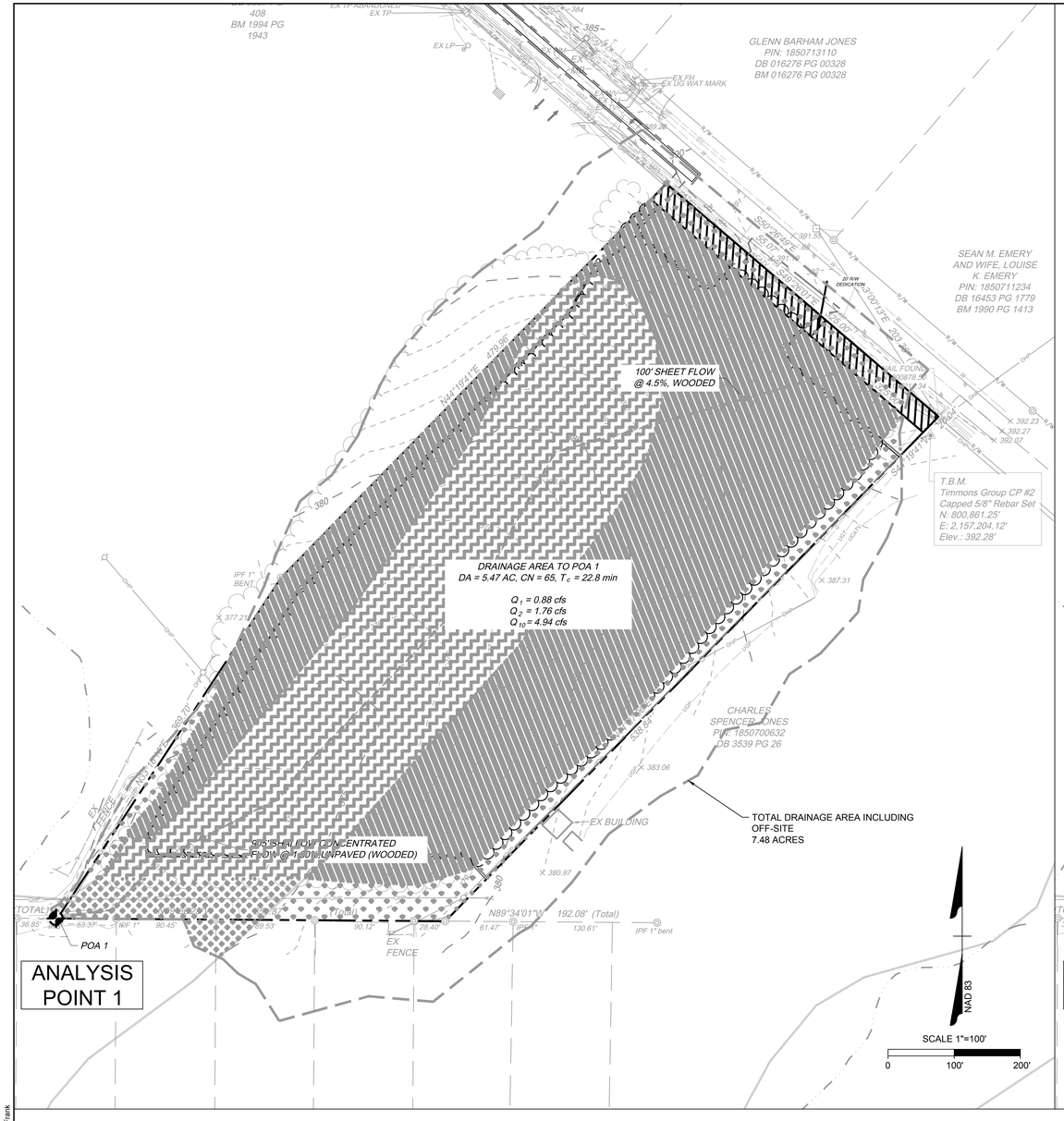
Tc = time in minutes. Values may exceed 60.

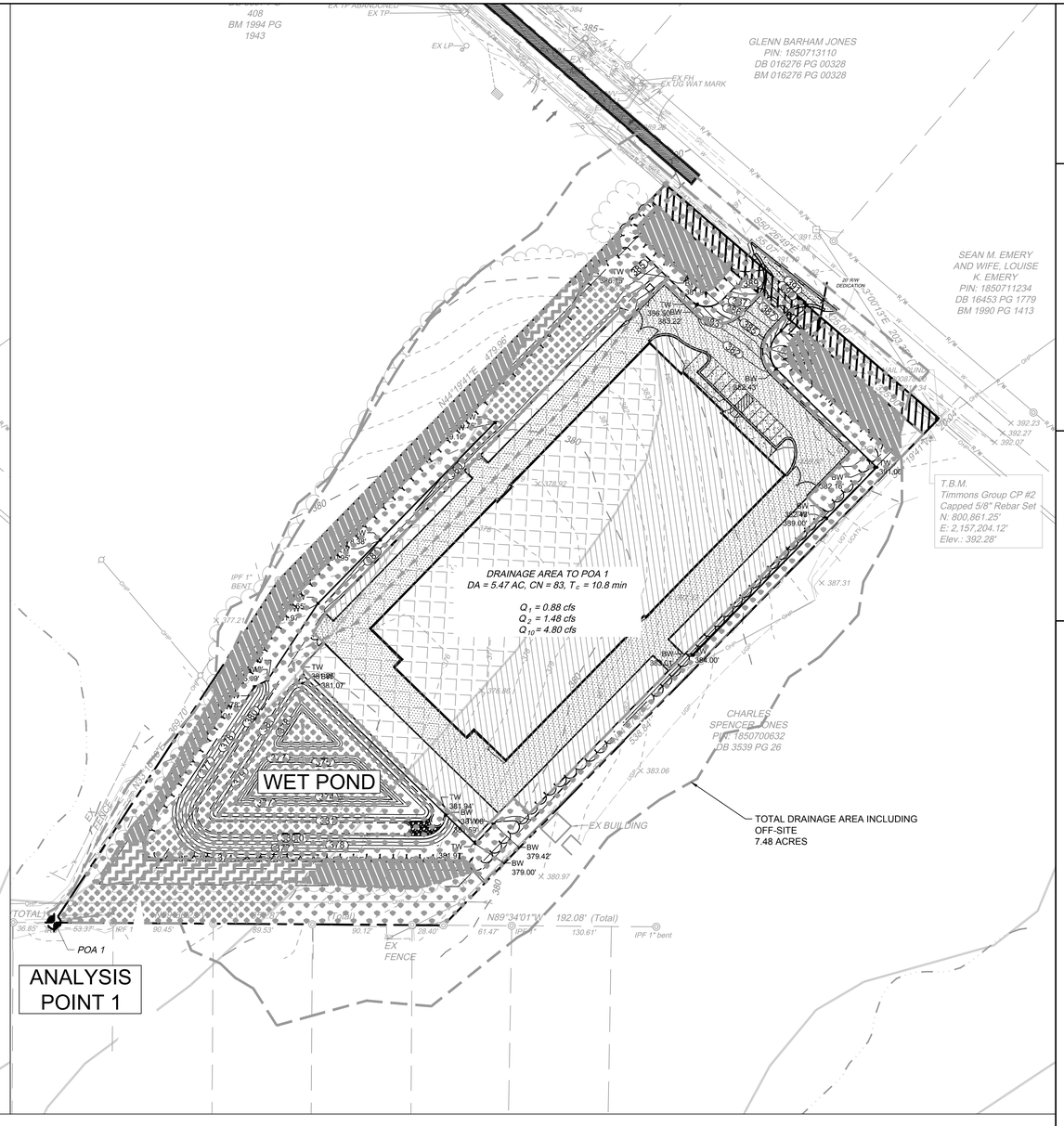
Precip. file name: S:\333\42811-Hoover_Road\Calc\Stm\precip.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.86	3.46	0.00	3.30	5.03	5.98	6.80	7.50
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	2.75	0.00	0.00	6.50	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	2.80	0.00	0.00	6.00	0.00

Section 4: Stormwater Compliance

Pre/Post Stormwater Maps





PRE-DEVELOPED SITE

STORM WATER QUANTITY CALCULATIONS						
ANALYSIS POINT	DRAINAGE AREA (ac)	IMPERVIOUS AREA (ac)	COMPOSITE CN	Q1	Q2	Q10
1	5.47	0.00	65	0.88	1.76	4.94

LANDUSE SUMMARY			
LEGEND	LANDUSE	EXISTING AREA (AC)	PROPOSED AREA (AC)
	IMPERVIOUS	0	2.83
	LAWN B SOIL	0.55	1.22
	LAWN D SOIL	0.16	0.82
	WOODS B SOIL	2.72	0.47
	WOODS D SOIL	2.04	0.13
	DRAINAGE AREA BOUNDARY	5.47	5.47

POST-DEVELOPED SITE

STORM WATER QUANTITY CALCULATIONS								
BASIN	SUB-BASIN	DRAINAGE AREA (ac)	IMPERVIOUS AREA	FLOW TYPE	COMPOSITE CN	Q1	Q2	Q10
1	DA 1 - BYPASS	2.30	0.0	BYPASS	62	0.26	0.55	1.68
	DA 1 - SCM	3.17	2.83	MANAGED	93	0.62	0.89	3.99
	DA 1 - TOTAL	5.47	2.83	TOTAL	74	0.88	1.44	4.80

OVERALL SUMMARY						
ANALYSIS POINT	Q1 (PRE)	Q1 (POST)	Q2 (PRE)	Q2 (POST)	Q10 (PRE)	Q10 (POST)
1	0.88	0.88	1.76	1.44	4.94	4.80

PRELIMINARY PLANS
FOR REVIEW ONLY

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 055780 GARRETT W. FRANK 5-17-23

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REVISION DESCRIPTION	DATE

DATE
04/05/2023

DRAWN BY
J. HAYES

DESIGNED BY
G. FRANK

CHECKED BY
G. FRANK

SCALE
AS SHOWN

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NORTH CAROLINA LICENSE NO. C-1652

JONES DAIRY STORAGE FACILITY

TOWN OF ROLESVILLE - WAKE COUNTY - NORTH CAROLINA

JOB NO.
54832

SHEET NO.