

# Drainage Report:

300 Plaza

6088, 6084, 6080, and 6072 W. 300 N.  
Greenfield, Indiana 46140

# Drainage Report

Prepared:  
March 31, 2012

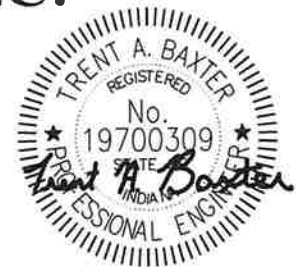
Revised:  
April 30, 2013

Prepared by:



**VERSATILE  
CONSTRUCTION  
GROUP, LLC.**

570 East Tracy Road, Suite 610  
New Whiteland, Indiana 46184  
Ph: 317.535.3579 Fax: 317.535.3581



CERTIFIED BY:

**Drainage Report**  
**300 Plaza**  
**6088, 6084, 6080, & 6072 W. 300 N.**  
**Greenfield, IN 46140**

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**Revised  
Drainage Report  
300 Plaza  
6088, 6084, 6080, 6072  
West 300 North  
Greenfield, Indiana  
Hancock County**

**Introduction**

The proposed project includes construction of a 10,297 s.f. four (4) unit building, approximately 57,781 +/- s.f. of concrete sidewalk, drives, and asphalt paving. The proposed project also includes the construction of a park area, and approximately 539 l.f. of a 10 ft. wide asphalt running path in the R-O-W. The proposed site is located on the northwest corner of the intersection of County Road West 300 North and County Road North 600 West. The site contains 2.063 acres. The proposed project will disturb approximately 2.563 acres. This report will analyze the existing and proposed peak flows from the proposed project, provide analysis for the proposed storm water conveyance system, and design the required stormwater detention and water quality BMP for the proposed site. The report will follow the guidelines established in the Hancock County, Indiana Stormwater Technical Standards Manual. A Summary of peak flows calculated in this report are included in Appendix A.

**Existing Site**

The existing site is a vacant grass/tree vegetated lot. The existing site contains two (2) drainage basins. Existing Basin 1 drains to the south off-site to an existing inlet located in the R-O-W of West 300 North. Basin 2 drains to the north off-site to the property to the north. There are no drainage structures on the current site. The Existing Basin Map and with area descriptions are included in Appendix C of this report.

**Soils and Floodway**

The soils on site are Brookston silty clay loam and Crosby silt loam. The soils are classified as group B. The site lies in Zone x of the FEMA FIRM Panel 18059C0108E dated March 17, 2014. A Soils Map with descriptions and a Floodway map is included in Appendix B of this report. Soils are classified as Group C (Group D will be used for proposed).

### **Existing Peak Flows**

Using the Hydraflow Hydrograph Extension for Autodesk Civil 3D version 2023 Program, the existing peak flows were calculated using the SCS Type II 24-hour storm. The existing peak runoff was analyzed for the 2-, 10-, and 100-year storm events. Time of concentration was developed from TR 55 for the existing Basins. The runoff “CN” curve numbers used in the calculations are as follows:

- 98 For all impervious areas.
- 74 For all grass areas (soils Group C).

The existing peak flows discharging from the existing basin are included in the Summary of this report (Appendix A).

The program results are included in Appendix E of this report.

### **Proposed Site**

The proposed site contains eighteen (18) drainage basins. Proposed Basins 1-14 drains through the proposed storm sewer system, underground chamber detention, and discharges out into the existing inlet located on the west side of CR N600W. Proposed Basin 15 sheet drains to the south into new Str. w (which is an extension of the existing inlet). Proposed Basin 16 sheet drains to the east into new Str. u (which is a new inlet placed on the outfall sewer). Proposed Basin 17 sheet drains to the north onto the adjacent property. Proposed Basin 18 sheet drains to the west onto the adjacent property. Drive. A copy of the Proposed Basin Map and Sub-Basin Map with area descriptions are included in Appendix D of this report.

### **Proposed Peak Flows**

Using the Hydraflow Hydrograph Extension for Autodesk Civil 3D version 2023 Program, the proposed peak flows were calculated using the SCS Type II 24-hour storm. The runoff was analyzed for the 2, 10, and 100 year storm events. Time of concentration for proposed Basins 1-14 was assumed at 15 minutes and assumed at 5 minutes for Basins 15-18. The runoff “CN” curve numbers used in the calculations are as follows:

- 98 For all impervious areas.
- 80 For all grass areas (Soils group D)

The proposed peak flows discharging from the proposed basins are included in the Summary of this report (Appendix A).

The program results are included in Appendix F of this report.

### **Stormwater Detention**

Using the Hydraflow Hydrograph Extension for Autodesk Civil 3D version 2023 Program, stormwater detention storage requirements were determined using the SCS Type II 24-hour storm. Detention requirements were based off the 100 yr. post developed runoff rate releasing at 0.3 c.f.s./acre based on the acres of contributing area (0.75 acres) resulting in an allowable 100 yr. release rate of 0.225 c.f.s. and the 10 yr. post developed runoff rate releasing at 0.1 c.f.s./acre resulting in an allowable 10 yr. release rate of 0.075 c.f.s. StormTech SC-740 underground chambers will be used for detention. Two different control structures were analyzed in this report, the calculated orifice and the minimum 4-inch diameter orifice as required by the Hancock County, Indiana Stormwater Technical Standards Manual.

The calculated orifice release rate control from the chambers will be provided by a 5.5-foot x 5-foot rectangular concrete structure (Str. t). The concrete structure will contain a 6-inch wide by a 5-foot-long weir wall. A 1.35-inch diameter hole will be provided at the bottom of the weir wall (853.14) to serve as the 10-yr outlet control. A 2.06-inch diameter hole will be provided at an elevation of 855.61 to serve as the 100-yr outlet control. An emergency overflow rectangular weir 5-foot long will be provided at the calculated 100-yr storage volume elevation (857.08) to pass 1.25 x Peak flow (13.154 c.f.s.).

The minimum 4-inch diameter orifice control structure will be provided by a 5.5-foot x 5-foot rectangular concrete structure (Str. t). The concrete structure will contain a 6-inch wide by a 5-foot-long weir wall. A 4-inch diameter hole will be provided at the bottom of the weir wall (853.14) to serve as the 10-yr and 100-yr outlet control. An emergency overflow rectangular weir 5-foot long will be provided at the calculated 100-yr storage volume elevation (855.66) to pass 1.25 x Peak flow (13.154 c.f.s.).

Results of the routing through the detention pond for the calculated orifice is provided in Appendix F of this report. Results of the routing through the detention pond for the minimum 4-inch diameter orifice is provided in Appendix G of this report.

### **Storm Sewer Sizing**

There are three different storm sewer systems that drain to the underground detention system. The north system drains Proposed Basins 1-5, the south system drains Proposed Basins 6-9, and the west system drains Proposed Basins 10-14. Using the 2019 Hydraflow Storm Sewer Program, the proposed storm sewers were sized to accommodate the peak run-off from a 10-yr. storm event without the hydraulic grade line exceeding the top of any inlet casting. The outfall pipe was sized to handle 1.25 times the peak 100 yr. storm (13.154 c.f.s.) without the upstream hydraulic grade line exceeding the top of weir wall (855.65<856.69).

Storm Sewer Sizing Calculations for are provided in Appendix H of this report.

### Storm Sewer Inlet Sizing

Storm sewer inlets were sized to accept the peak flow from the 10-yr. storm event with 50% of the inlet clogged. Storm sewer inlets were checked to also pass the 100-yr. storm. The Weir and Orifice equations were used in the calculations. 2.52 inches was the maximum depth over any inlet.

Inlet Sizing Calculations are provided in Appendix I of this Report.

### Water Quality

Water Quality will be provided by a combination of three (3) inline treatments. The first treatment consists of using a 24-inch-deep sump on the last inlets before the stormwater enters the underground detention system. These sumps are included on Str. c and Str. d in the west storm sewer system, Str. m in the south storm sewer system, and Str. r in the north storm sewer system. The second treatment consist of Isolator Rows in the underground detention system. The third treatment consists of a woven geotextile fabric wrapped 6-inch perforated underdrain. This underdrain is used to drain the bottom 6-inches of the entire detention bed. Using the SCS type 2 distribution with a 1-inch rain over 24 hours, the water quality flow thru peak flow was calculated for the three (3) storm sewer systems. The  $CN_{wq}$  numbers were calculated as follows:

$$CN_{wq} = 1000 / (10 + 5P + 10Qa - 10\text{Sqrt}(Qa^2 + 1.25QaP))$$

Where:  $CN_{wq}$ =curve number for water quality storm event

P= 1-inch rainfall

Qa= runoff volume = 1 x Rv

Rv= volumetric runoff coefficient = 0.05 + 0.009(I)

I= percent impervious cover

Therefore:

#### *North Storm System*

$$I = 21,775 \text{ s.f.} / 23,564 \text{ s.f.} \times 100 = 92.408$$

$$Rv = 0.05 + 0.009(92.408) = 0.8817$$

$$Qa = 0.8817$$

#### *South Storm System*

$$I = 17,898 \text{ s.f.} / 18,929 \text{ s.f.} \times 100 = 94.553$$

$$Rv = 0.05 + 0.009(94.533) = 0.9010$$

$$Qa = 0.9010$$

#### *West Storm System*

$$I = 27,010 \text{ s.f.} / 33,762 \text{ s.f.} \times 100 = 80.001$$

$$Rv = 0.05 + 0.009(80.001) = 0.7700$$

$$Qa = 0.8581$$

The  $CN_{wq}$  for each system is provided in the Proposed Basin Area Map description provided in Appendix D of this report.

Peak flow to be treated:

North storm system= 0.69 c.f.s.

South storm system=0.56 c.f.s.

West storm system=0.91 c.f.s.

The water quality flow thru peak flow will be directed to the isolator rows on all three storm sewer systems. The SCS-740 chambers are rated for each chamber of the Isolator rows to treat 0.15 c.f.s. of water quality flow.

Number of Isolator row chambers:

North storm system= 5 chambers required; 6 chambers used

South storm system= 4 chambers required; 6 chambers used

West storm system= 7 chambers required; 7 chambers used

The water quality peak flow will be directed to each isolator row using a weir wall. The weir wall height is determined by the depth of flow in the 24-inch pipe entering each Isolator Row.

Depth of flow of 24-inch pipe into Isolator Rows:

North storm system= 0.42 ft.

South storm system=0.38 ft.

West storm system=0.49 ft.

The Water Quality calculations for each storm sewer system are provided in Appendix J of this report.

Channel Reports that give the depth of flow in the 24-inch pipes for each storm sewer system are provided in Appendix K of this report.

## **Conclusion**

With the reduction of peak runoff from the entire site from the existing, the proposed project will not adversely affect the surrounding properties or any existing storm sewer system. This project meets the requirements of the Hancock County, Indiana Stormwater Technical Standards Manual.

# **Appendix A**

## Summary Table Of Calculations

# Summary Table

**Project: 300 Plaza**

Existing Peak Flows			
	2 Year Storm	10 Year Storm	100 Year storm
	(c.f.s.)	(c.f.s.)	(c.f.s.)
Basin 1 (drains to existing Inlet)	0.443	1.082	2.047
Basin 2 (drains to property to north)	1.019	2.442	4.611
Total Site	1.395	3.414	6.446

Proposed Peak Flows	Calculated Orifices			4-Inch Orifice		
	2 Year Storm	10 Year Storm	100 Year storm	2 Year Storm	10 Year Storm	100 Year storm
	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)	(c.f.s.)
Basins 1-14 (before detention)	4.663	7.220	10.520	4.663	7.220	10.520
Basins 1-14 (after detention)	0.057	0.074	0.226	0.399	0.502	0.635
Basin 15 (drains to Str. w)	0.203	0.401	0.681	0.203	0.401	0.681
Basin 16 (drains to Str. u)	0.248	0.453	0.728	0.248	0.453	0.728
Total to Street Storm Sewer	0.489	0.901	1.466	0.740	1.202	1.822
Basin 17 ( drains to property to the north)	0.104	0.207	0.353	0.104	0.207	0.353
Basin 18 ( drains to property to the west)	0.056	0.112	0.191	0.056	0.112	0.191
Total Site	0.650	1.220	2.011	0.900	1.520	2.366

Maximum Detention Elevation				
	2 Year Storm	10 Year Storm	100 Year storm	Overflow
Maximum Elevation Calculated Orifices	854.63	855.61	857.08	857.59
Maximum Elevation 4-inch Orifice	854.21	854.73	855.59	857.59





















# Appendix B

## Soils Map and Description And Floodway Map

Soil Map—Hancock County, Indiana  
(Soils Map)



## MAP LEGEND

	Area of Interest (AOI)		Spoil Area
	Area of Interest (AOI)		Stony Spot
	Soils		Very Stony Spot
	Soil Map Unit Polygons		Wet Spot
	Soil Map Unit Lines		Other
	Soil Map Unit Points		Special Line Features
<b>Special Point Features</b>			
	Blowout	<b>Water Features</b>	
	Borrow Pit		Streams and Canals
	Clay Spot	<b>Transportation</b>	
	Closed Depression		Rails
	Gravel Pit		Interstate Highways
	Gravelly Spot		US Routes
	Landfill		Major Roads
	Lava Flow		Local Roads
	Marsh or swamp	<b>Background</b>	
	Mine or Quarry		Aerial Photography
	Miscellaneous Water		
	Perennial Water		
	Rock Outcrop		
	Saline Spot		
	Sandy Spot		
	Severely Eroded Spot		
	Sinkhole		
	Slide or Slip		
	Sodic Spot		

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

**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: Hancock County, Indiana  
Survey Area Data: Version 24, Sep 7, 2021

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

Date(s) aerial images were photographed: Oct 17, 2019—Oct 20, 2019

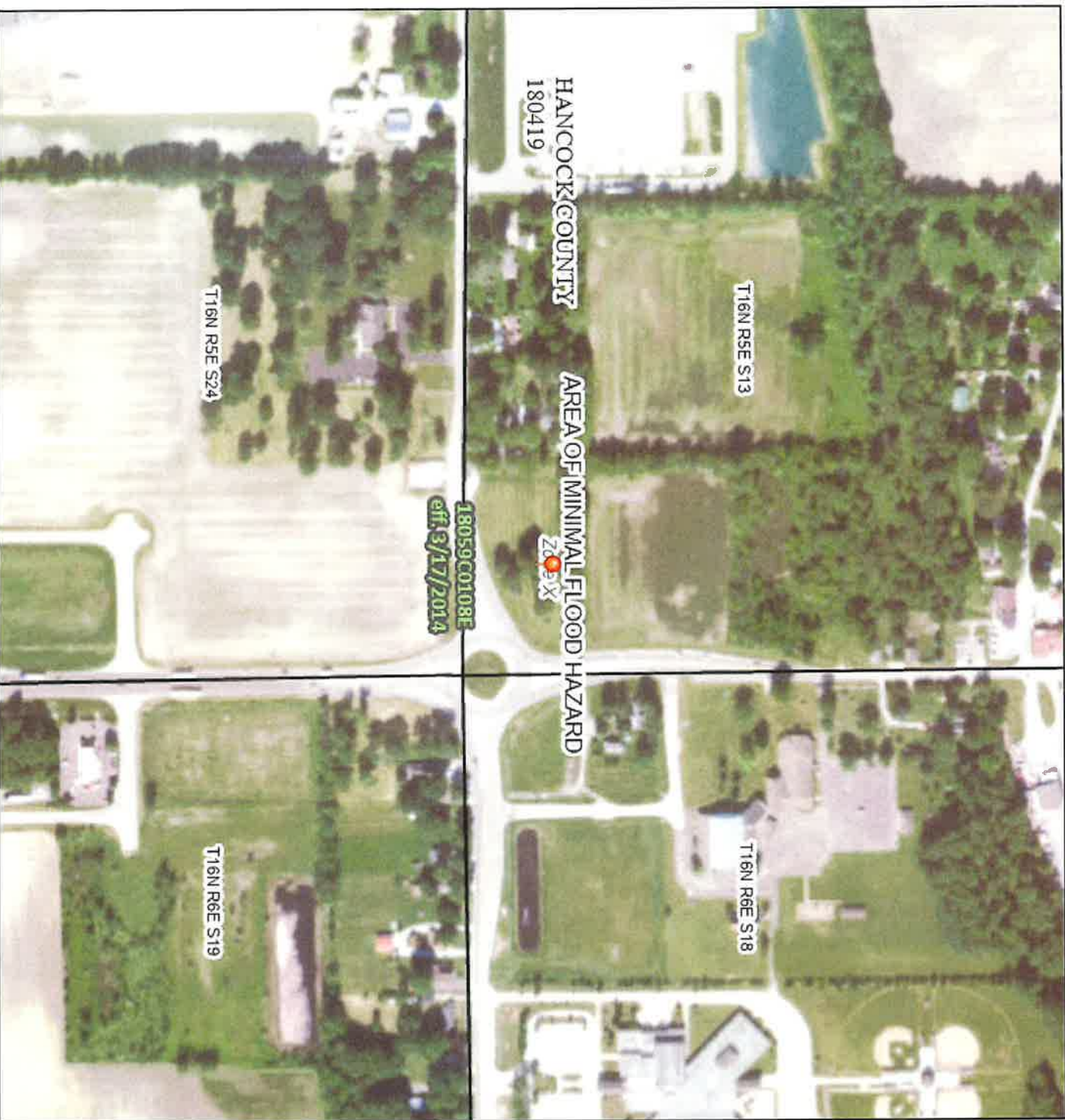
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Br	Brookston silty clay loam, 0 to 2 percent slopes	0.5	17.4%
CrA	Crosby silt loam, New Castle Till Plain, 0 to 2 percent slopes	2.2	82.6%
<b>Totals for Area of Interest</b>		<b>2.7</b>	<b>100.0%</b>

# National Flood Hazard Layer FIRMette

85°55'17"W, 39°49'53"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

**SPECIAL FLOOD HAZARD AREAS**

- Without Base Flood Elevation (BFE)  
Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, V, X, AP, AR
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**

- 0.2% Annual Chance Flood Hazard, Area of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee, See Notes, Zone X
- Area with Flood Risk due to Levee Zone X

**OTHER AREAS**

- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRS
- Area of Undetermined Flood Hazard Zone X

**GENERAL STRUCTURES**

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

**OTHER FEATURES**

- 20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
- 17.5 Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

**MAP PANELS**

- Digital Data Available
- No Digital Data Available
- Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards.

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/24/2022 at 1:51 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

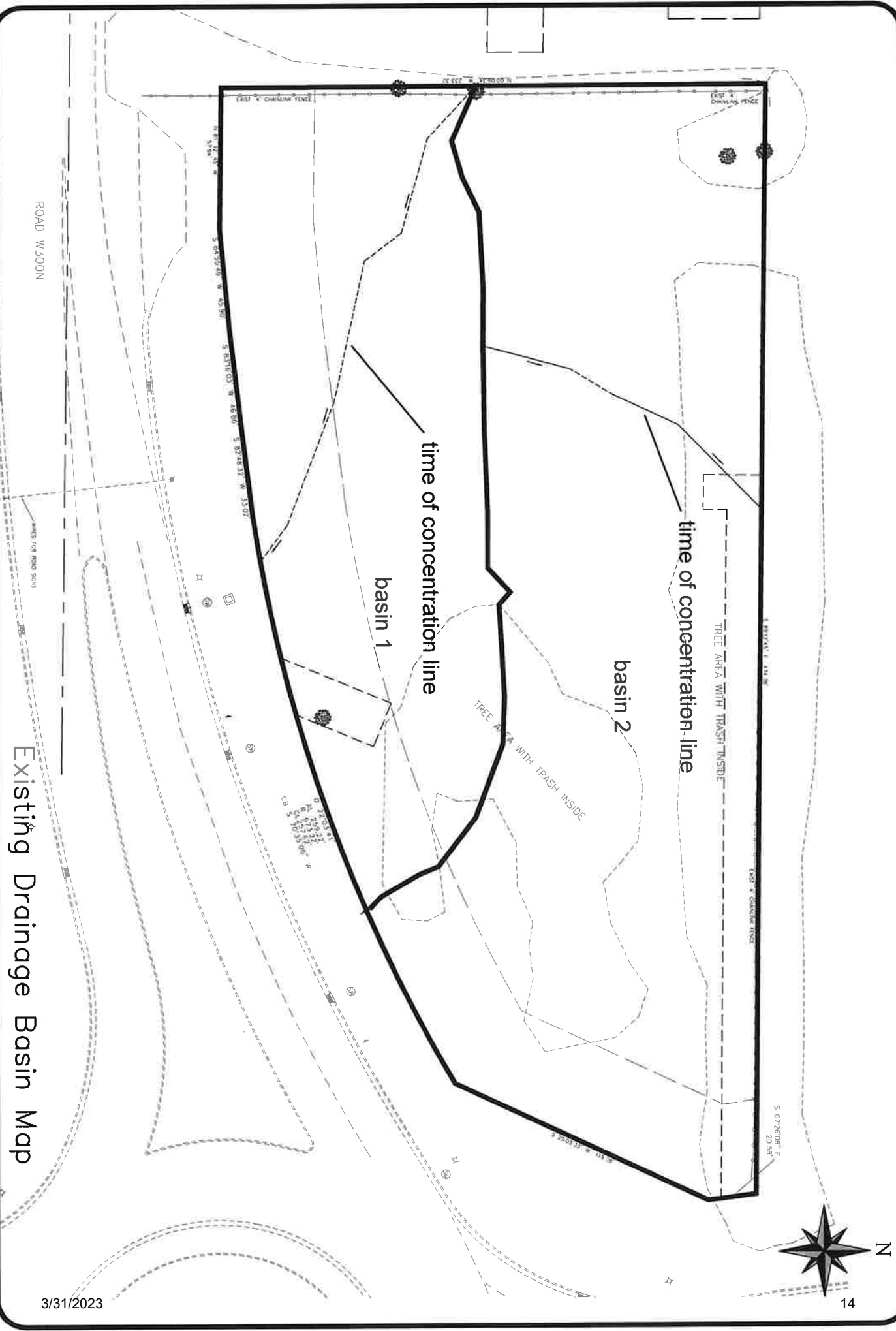
This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

0 250 500 1,000 1,500 2,000 Feet

85°55'17"W, 39°49'53"N

# Appendix C

## Existing Basin Map And Area Description



Existing Drainage Basin Map

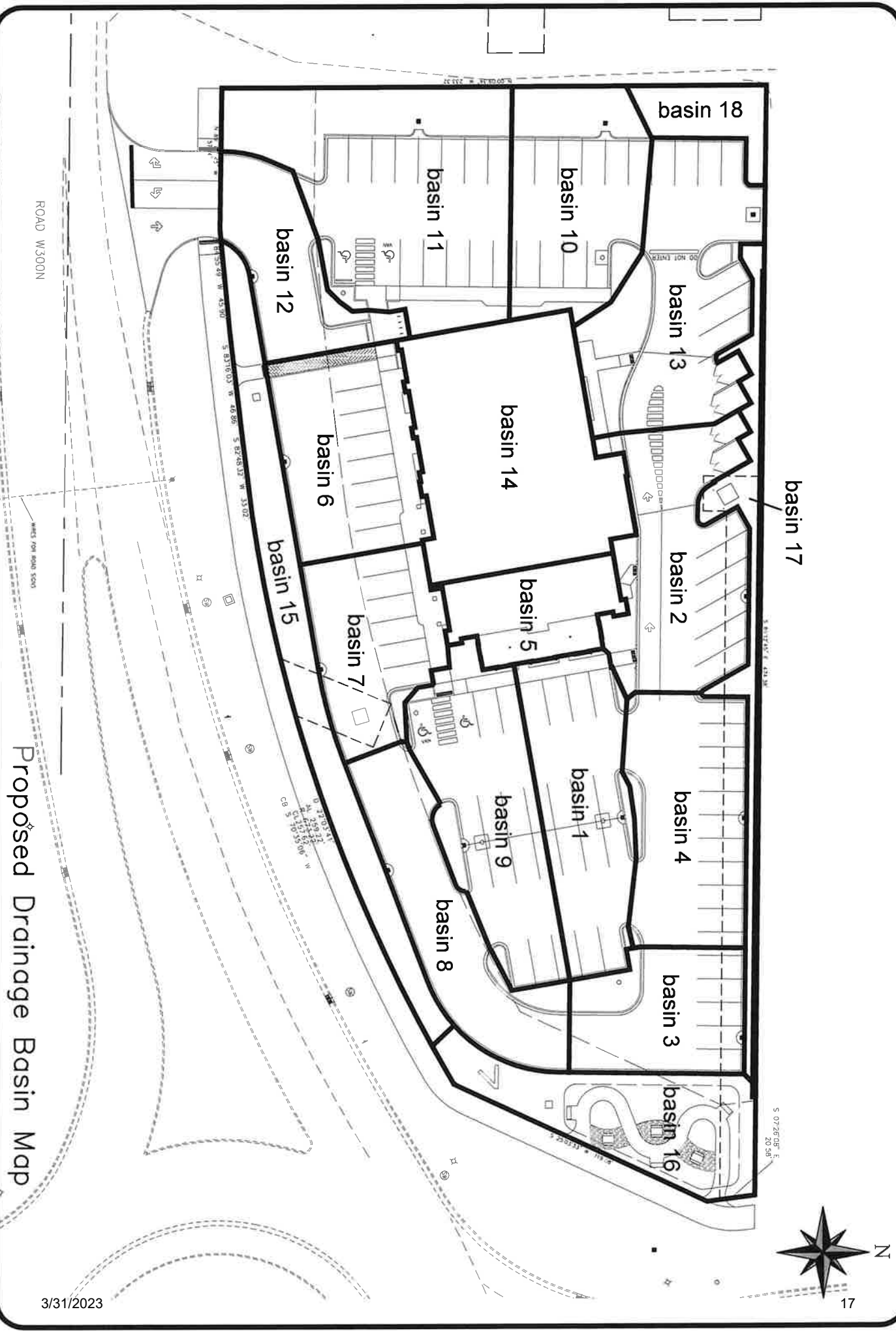
Project: 300 Plaza

Existing Basin Areas

Drains Off-Site Basin Number	Onsite (s.f.)			Total Acres			Total Basin	
	Roof/concrete	Asphalt	Grass	Roof	Asphalt	Grass	Acreage	" Cn"
Basin 1	-	-	32,459	-	-	0.745	0.75	74.00
Basin 2	-	-	57,422	-	-	1.318	1.32	74.00
Total Site	-	-	89,881	-	-	2.063	2.06	74.00

# Appendix D

## Proposed Basin Map And Area Description



Proposed Drainage Basin Map

# Project: 300 Plaza

## Proposed Basin Areas

Drains On-Site	Onsite (s.f.)			Total Acres			Total Basin				
	Basin Number	Roof/Concrete	Asphalt	Grass	Roof/concrete	Asphalt	Grass	Acreege	"C" <sup>1</sup>	"CN" <sup>1</sup>	"CN" <sup>wd</sup>
<b>North System</b>											
1	265	4,553	258	0.006	0.105	0.006	0.117	0.79	97.09	-	
2	1,699	3,577	660	0.039	0.082	0.015	0.136	0.76	96.00	-	
3	-	3,779	703	-	0.087	0.016	0.103	0.72	95.18	-	
4	-	5,238	168	-	0.120	0.004	0.124	0.80	97.44	-	
5	2,664	-	-	0.061	-	-	0.061	0.85	98.00	-	
<b>Total to North Sewer</b>	<b>4,628</b>	<b>17,147</b>	<b>1,789</b>	<b>0.106</b>	<b>0.394</b>	<b>0.041</b>	<b>0.541</b>	<b>0.78</b>	<b>96.63</b>	<b>98.94</b>	
<b>South System</b>											
6	836	4,127	95	0.019	0.095	0.002	0.116	0.81	97.66	-	
7	496	3,460	132	0.011	0.079	0.003	0.094	0.80	97.42	-	
8	-	3,867	113	-	0.089	0.003	0.091	0.80	97.49	-	
9	260	4,852	691	0.006	0.111	0.016	0.133	0.74	95.86	-	
<b>Total to South Sewer</b>	<b>1,592</b>	<b>16,306</b>	<b>1,031</b>	<b>0.037</b>	<b>0.374</b>	<b>0.024</b>	<b>0.435</b>	<b>0.79</b>	<b>97.02</b>	<b>99.12</b>	
<b>West System</b>											
10	287	3,497	1,562	0.007	0.080	0.036	0.123	0.63	92.74	-	
11	472	5,328	3,796	0.011	0.122	0.087	0.220	0.56	90.88	-	
12	203	2,933	237	0.005	0.067	0.005	0.077	0.78	96.74	-	
13	1,891	4,026	1,157	0.043	0.092	0.027	0.162	0.72	95.06	-	
14	8,373	-	-	0.192	-	-	0.192	0.85	98.00	-	
<b>Total to West Sewer</b>	<b>11,226</b>	<b>15,784</b>	<b>6,752</b>	<b>0.258</b>	<b>0.362</b>	<b>0.155</b>	<b>0.775</b>	<b>0.70</b>	<b>94.40</b>	<b>97.77</b>	
<b>Total to Detention System</b>											
		<b>17,446</b>	<b>49,237</b>	<b>9,572</b>	<b>0.401</b>	<b>1.130</b>	<b>0.220</b>	<b>1.751</b>	<b>0.74</b>	<b>95.74</b>	<b>-</b>
15	91	-	4,814	0.002	-	0.111	0.113	0.17	80.33	-	
16	404	900	3,424	0.009	0.021	0.079	0.109	0.34	84.96	-	
17	-	-	2,585	-	-	0.059	0.059	0.16	80.00	-	
18	-	-	1,408	-	-	0.032	0.032	0.16	80.00	-	
<b>Total to Off-Site</b>	<b>495</b>	<b>900</b>	<b>12,231</b>	<b>0.011</b>	<b>0.021</b>	<b>0.281</b>	<b>0.313</b>	<b>0.23</b>	<b>81.84</b>	<b>-</b>	
<b>Total Site</b>	<b>17,941</b>	<b>50,137</b>	<b>21,803</b>	<b>0.412</b>	<b>1.151</b>	<b>0.501</b>	<b>2.063</b>	<b>0.67</b>	<b>93.63</b>	<b>-</b>	

# Appendix E

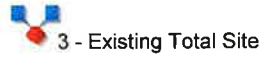
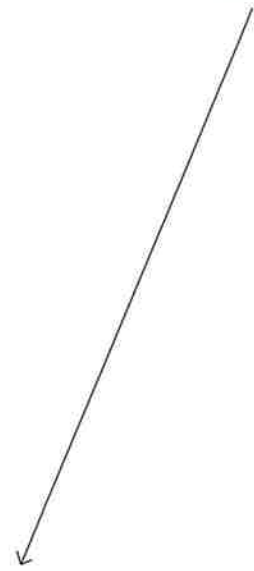
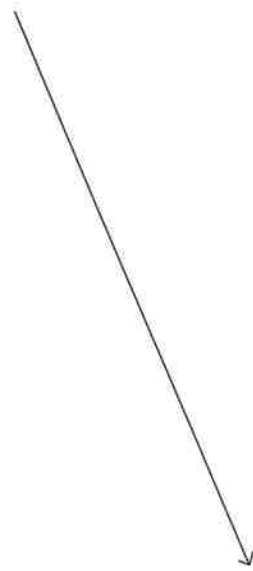
## Existing Peak Flows Calculations

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# Watershed Model Schematic

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



## Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	SCS Runoff Existing Basin 1
2	SCS Runoff Existing Basin 2
3	Combine Existing Total Site

# Hydrograph Return Period Recap

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

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	-----	-----	0.443	-----	-----	1.082	-----	-----	2.047	Existing Basin 1
2	SCS Runoff	-----	-----	1.019	-----	-----	2.442	-----	-----	4.611	Existing Basin 2
3	Combine	1, 2	-----	1.395	-----	-----	3.414	-----	-----	6.446	Existing Total Site

# 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	0.443	2	732	1,987	----	----	----	Existing Basin 1
2	SCS Runoff	1.019	2	726	3,492	----	----	----	Existing Basin 2
3	Combine	1.395	2	726	5,479	1, 2	----	----	Existing Total Site
Existing Peak Flows.gpw 3/31/2023					Return Period: 2 Year			Thursday, 03 / 30 / 2023	

# Hydrograph Report

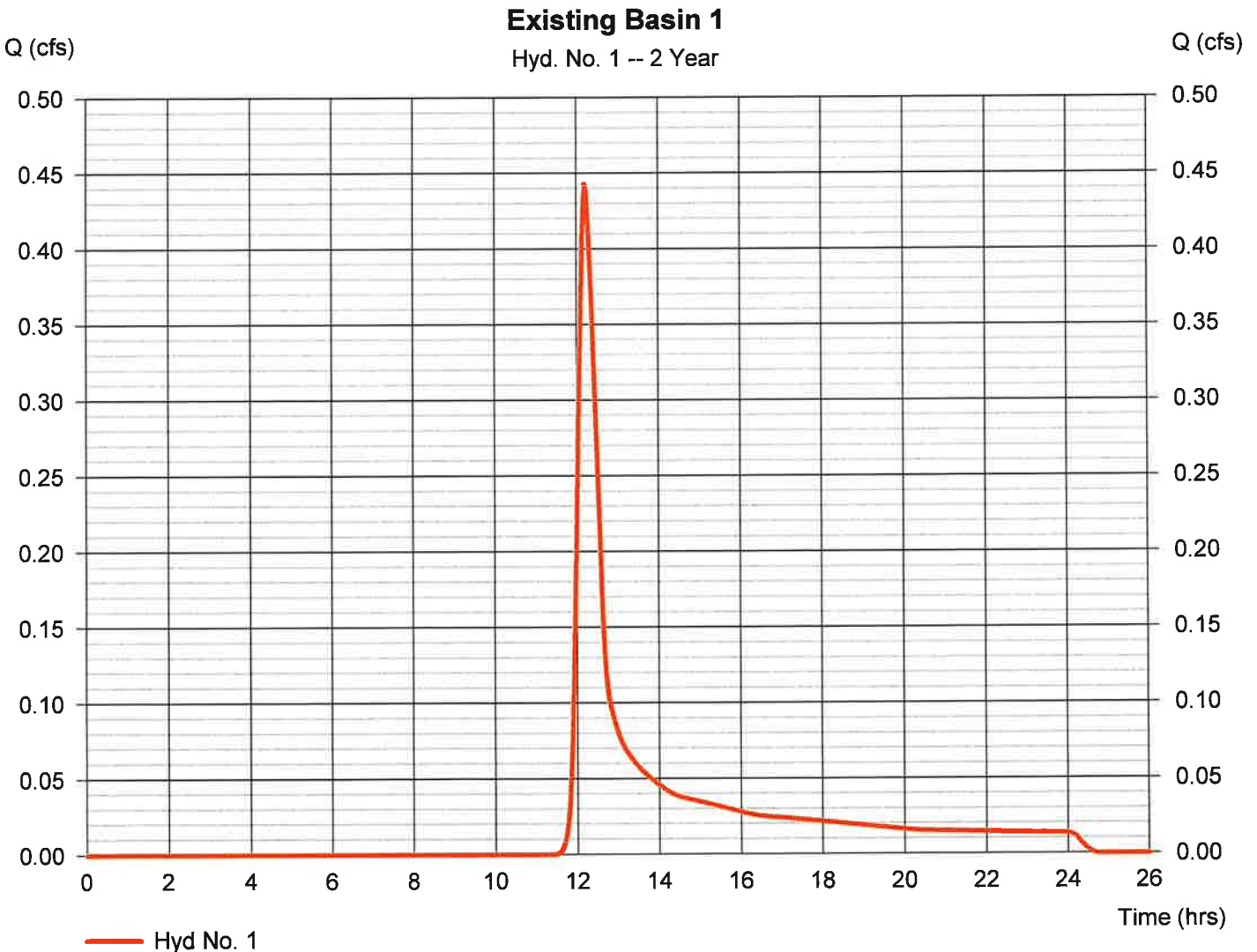
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 1

### Existing Basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.443 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 1,987 cuft
Drainage area	= 0.750 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 28.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 1

Existing Basin 1

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.71	0.00	0.00	
Land slope (%)	= 0.50	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 27.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 27.00</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 130.00	0.00	0.00	
Watercourse slope (%)	= 1.70	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=2.10	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 1.03</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 1.03</b>
<b>Channel Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+ 0.00</b>	<b>+ 0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>28.00 min</b>

# Hydrograph Report

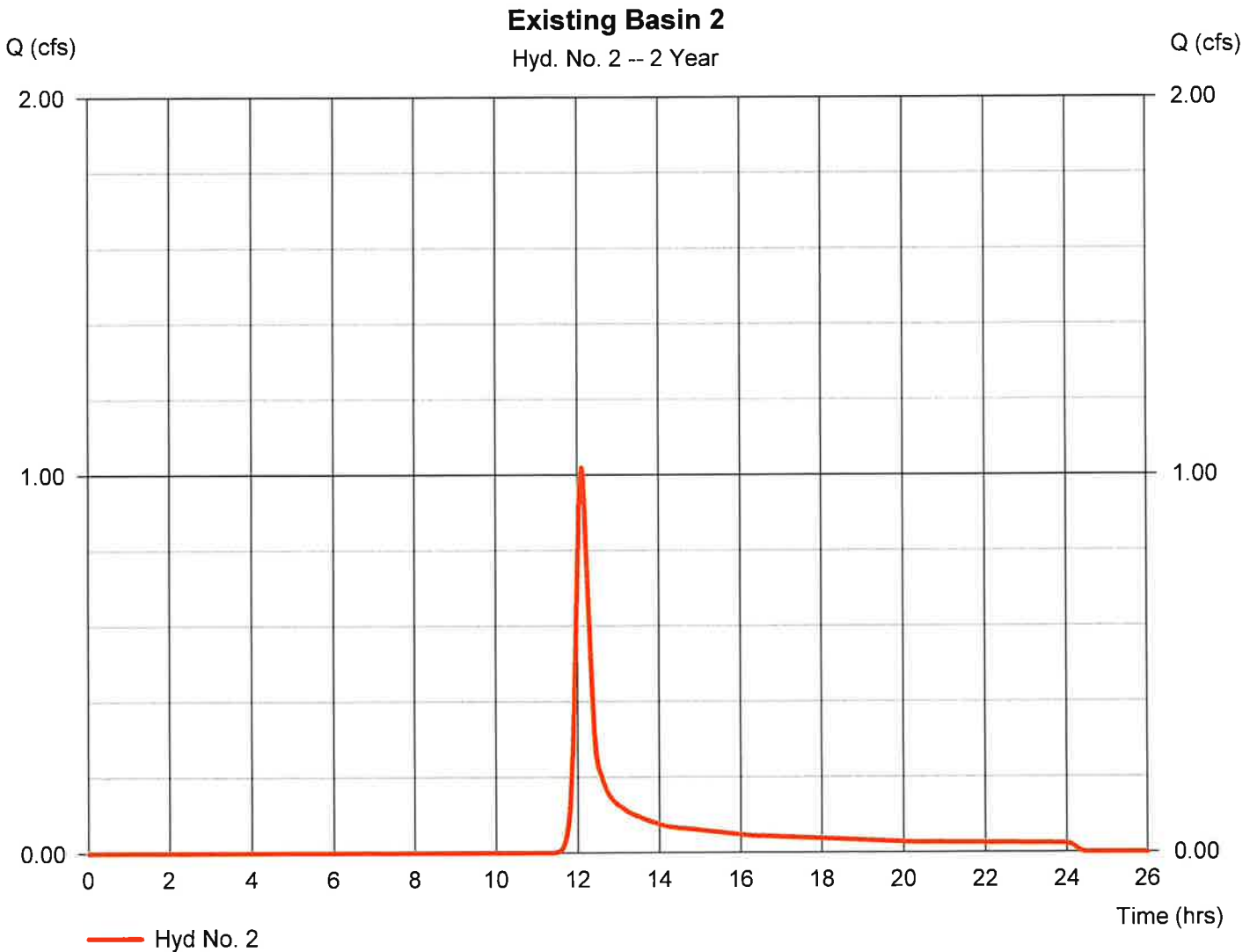
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 2

### Existing Basin 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.019 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,492 cuft
Drainage area	= 1.318 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.70 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# TR55 Tc Worksheet

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

## Hyd. No. 2

Existing Basin 2

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
<b>Sheet Flow</b>				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.71	0.00	0.00	
Land slope (%)	= 1.30	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 18.42</b>	<b>+</b> <b>0.00</b>	<b>+</b> <b>0.00</b>	<b>= 18.42</b>
<b>Shallow Concentrated Flow</b>				
Flow length (ft)	= 41.12	0.00	0.00	
Watercourse slope (%)	= 3.16	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=2.87	0.00	0.00	
<b>Travel Time (min)</b>	<b>= 0.24</b>	<b>+</b> <b>0.00</b>	<b>+</b> <b>0.00</b>	<b>= 0.24</b>
<b>Channel Flow</b>				
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	
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b> <b>0.00</b>	<b>+</b> <b>0.00</b>	<b>= 0.00</b>
<b>Total Travel Time, Tc .....</b>				<b>18.70 min</b>

# Hydrograph Report

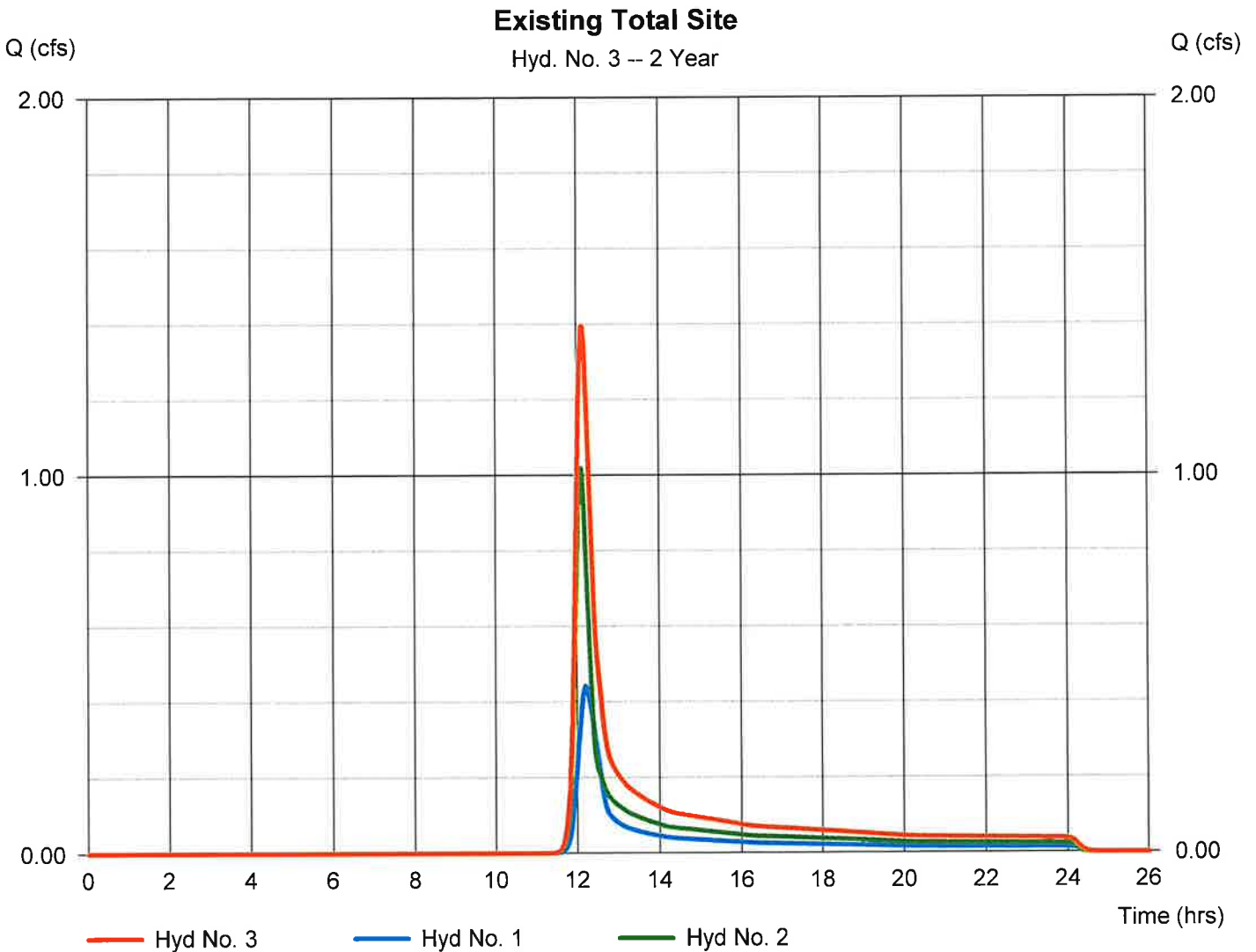
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 3

Existing Total Site

Hydrograph type	= Combine	Peak discharge	= 1.395 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 5,479 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 2.068 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	1.082	2	732	4,446	-----	-----	-----	Existing Basin 1	
2	SCS Runoff	2.442	2	724	7,813	-----	-----	-----	Existing Basin 2	
3	Combine	3.414	2	726	12,259	1, 2	-----	-----	Existing Total Site	
Existing Peak Flows.gpw					Return Period: 10 Year			Thursday, 03 / 30 / 2023		
3/31/2023					29					

# Hydrograph Report

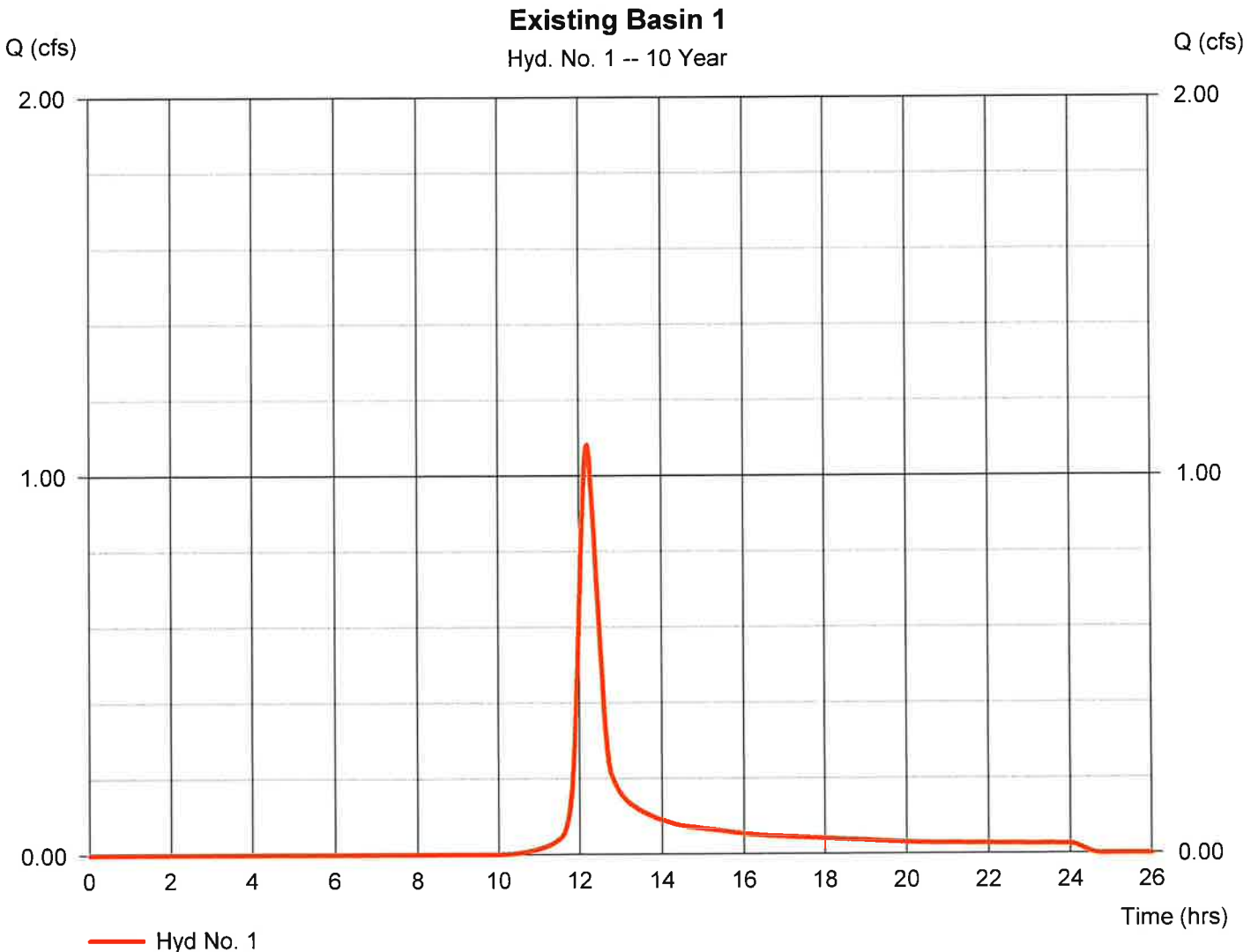
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 1

### Existing Basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.082 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 4,446 cuft
Drainage area	= 0.750 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 28.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

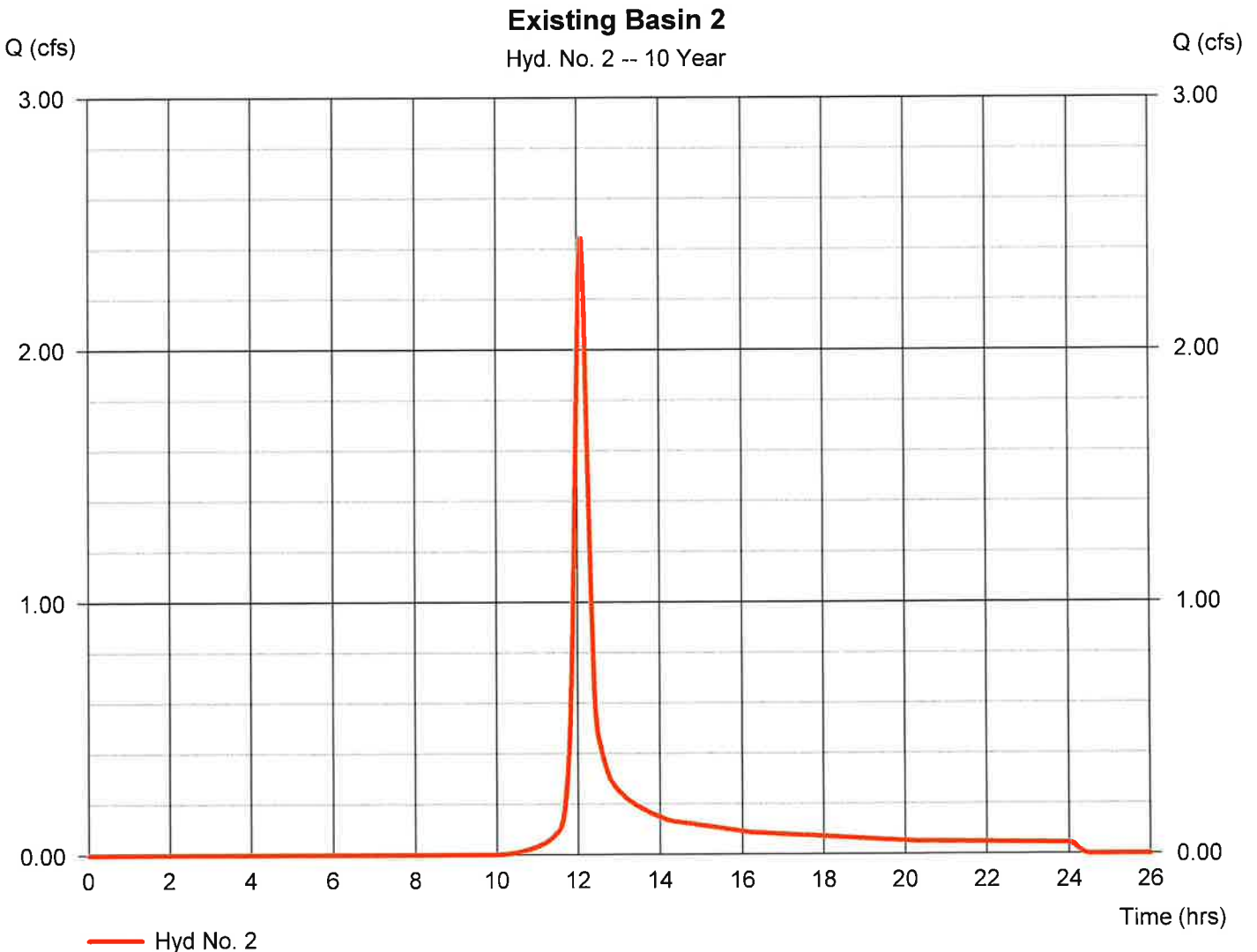
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 2

Existing Basin 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.442 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 7,813 cuft
Drainage area	= 1.318 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.70 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

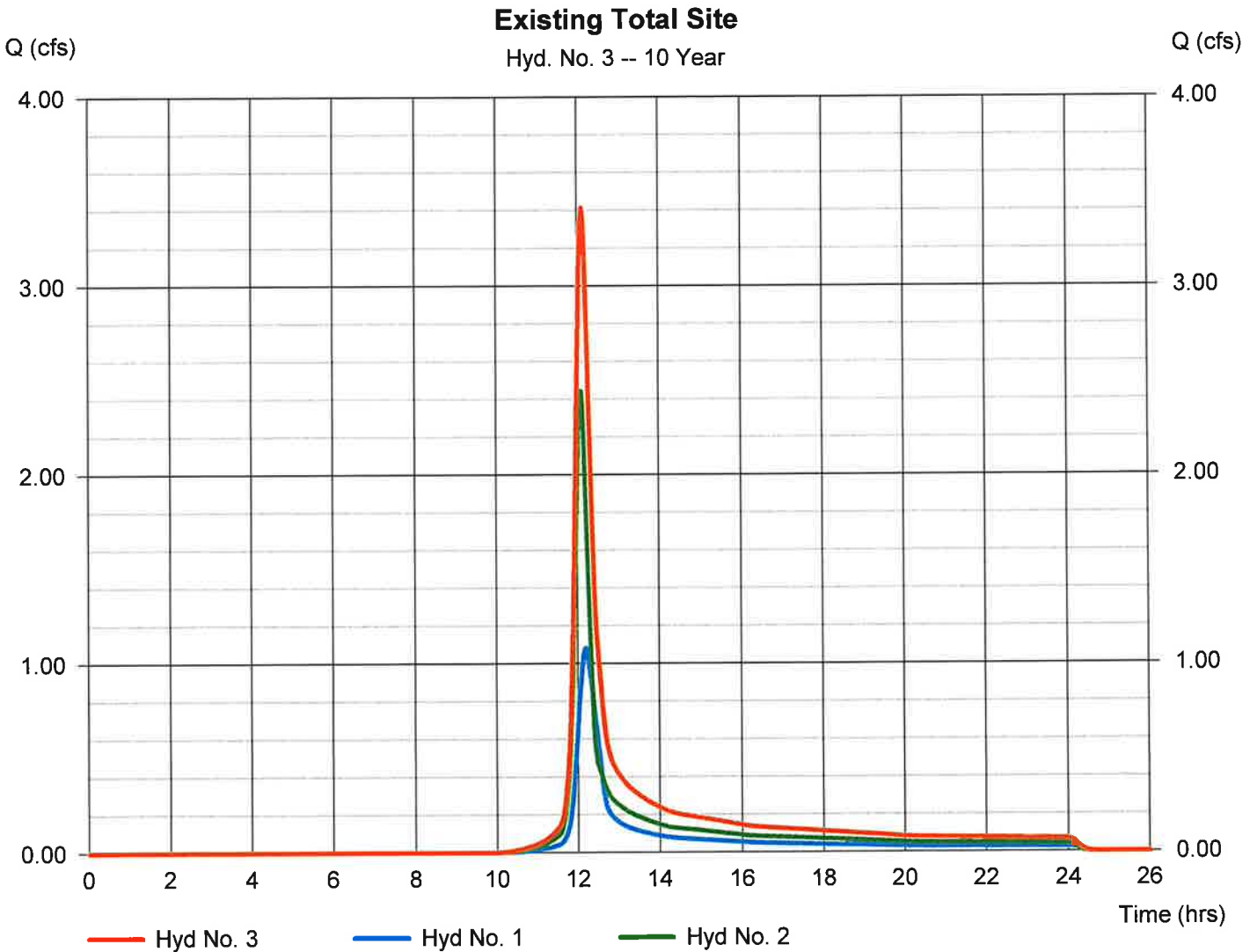
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 3

### Existing Total Site

Hydrograph type	= Combine	Peak discharge	= 3.414 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 12,259 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 2.068 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	2.047	2	730	8,215	----	----	----	Existing Basin 1
2	SCS Runoff	4.611	2	724	14,436	----	----	----	Existing Basin 2
3	Combine	6.446	2	726	22,651	1, 2	----	----	Existing Total Site
Existing Peak Flows.gpw					Return Period: 100 Year			Thursday, 03 / 30 / 2023	

# Hydrograph Report

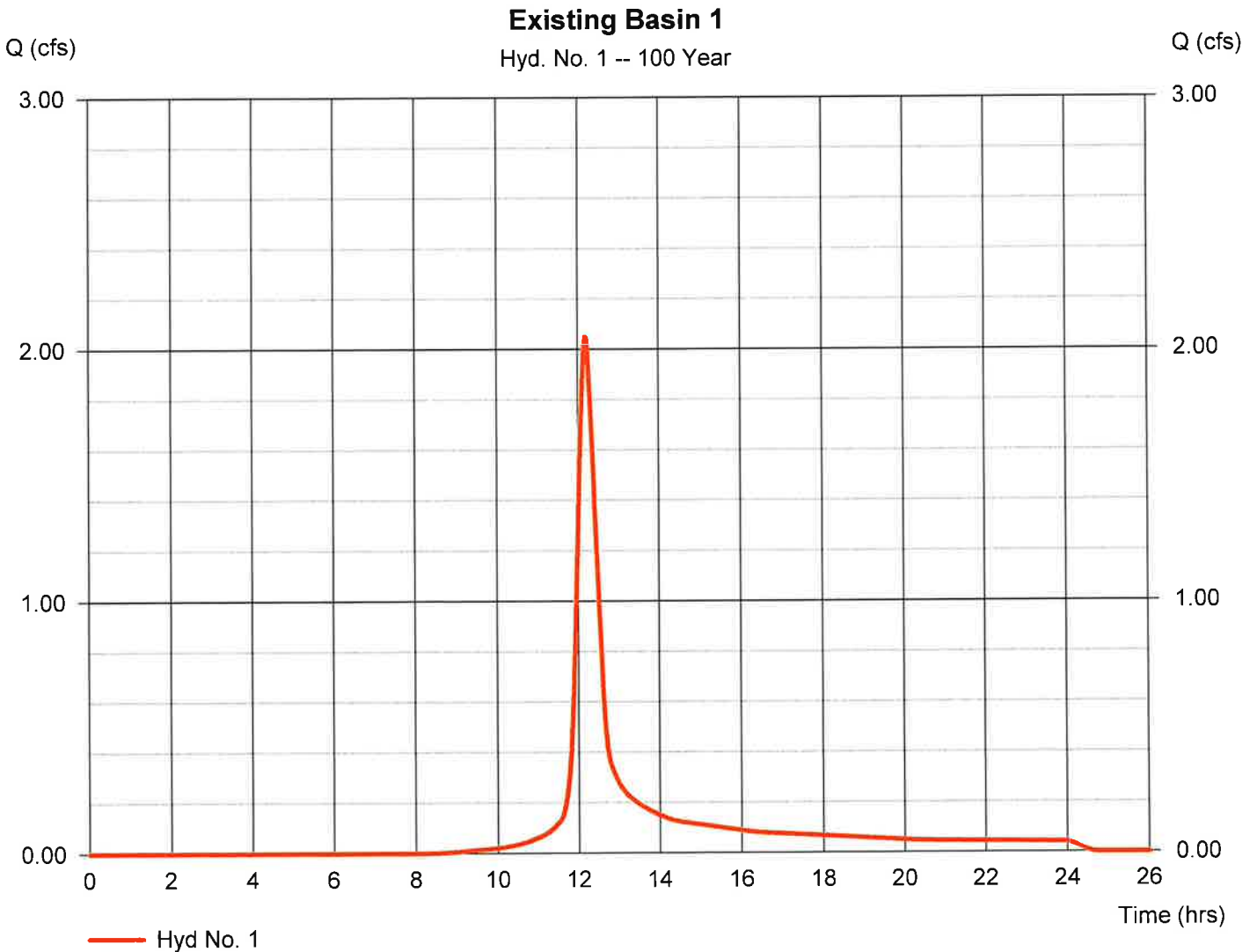
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 1

### Existing Basin 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.047 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 8,215 cuft
Drainage area	= 0.750 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 28.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

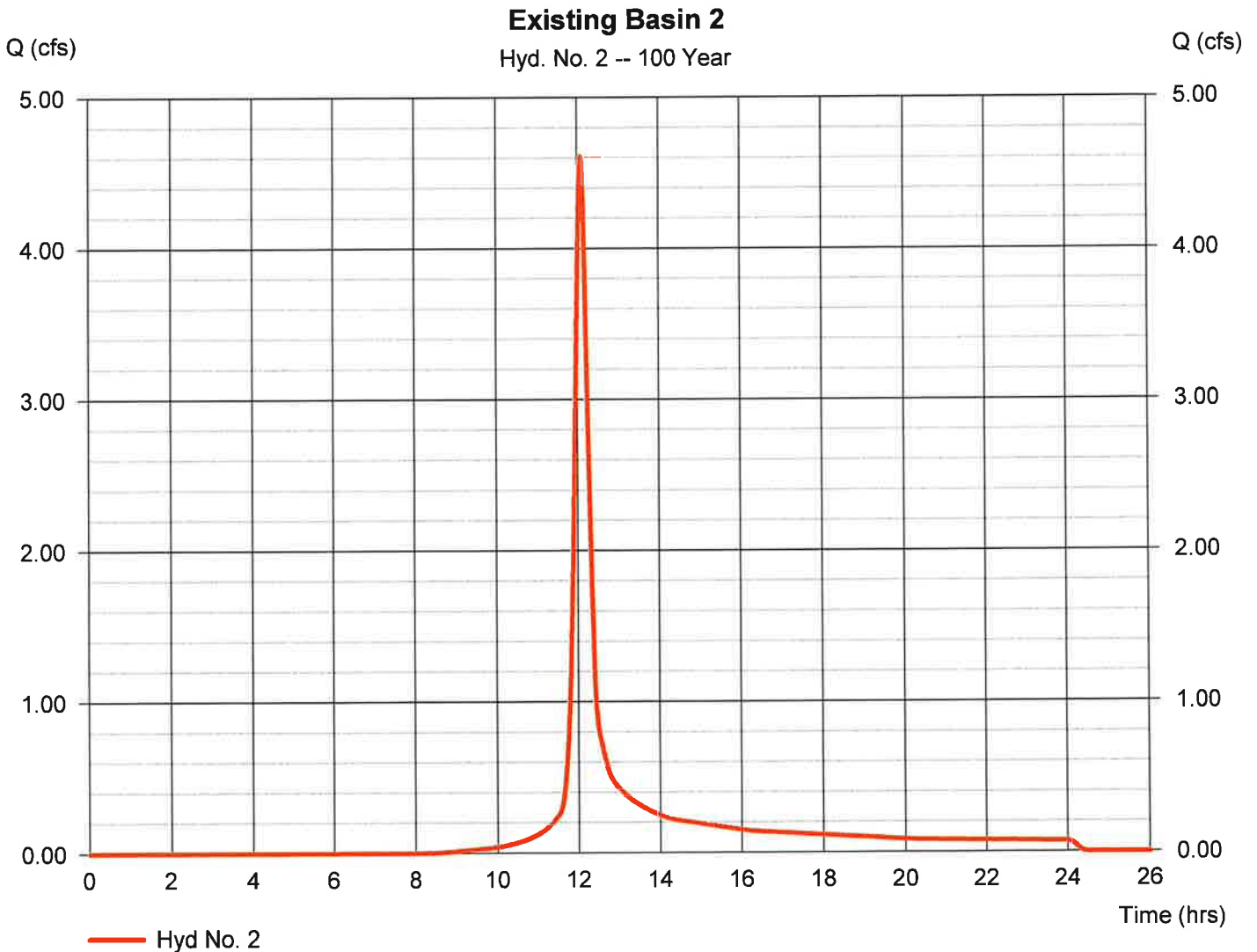
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 2

### Existing Basin 2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.611 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 14,436 cuft
Drainage area	= 1.318 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 18.70 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

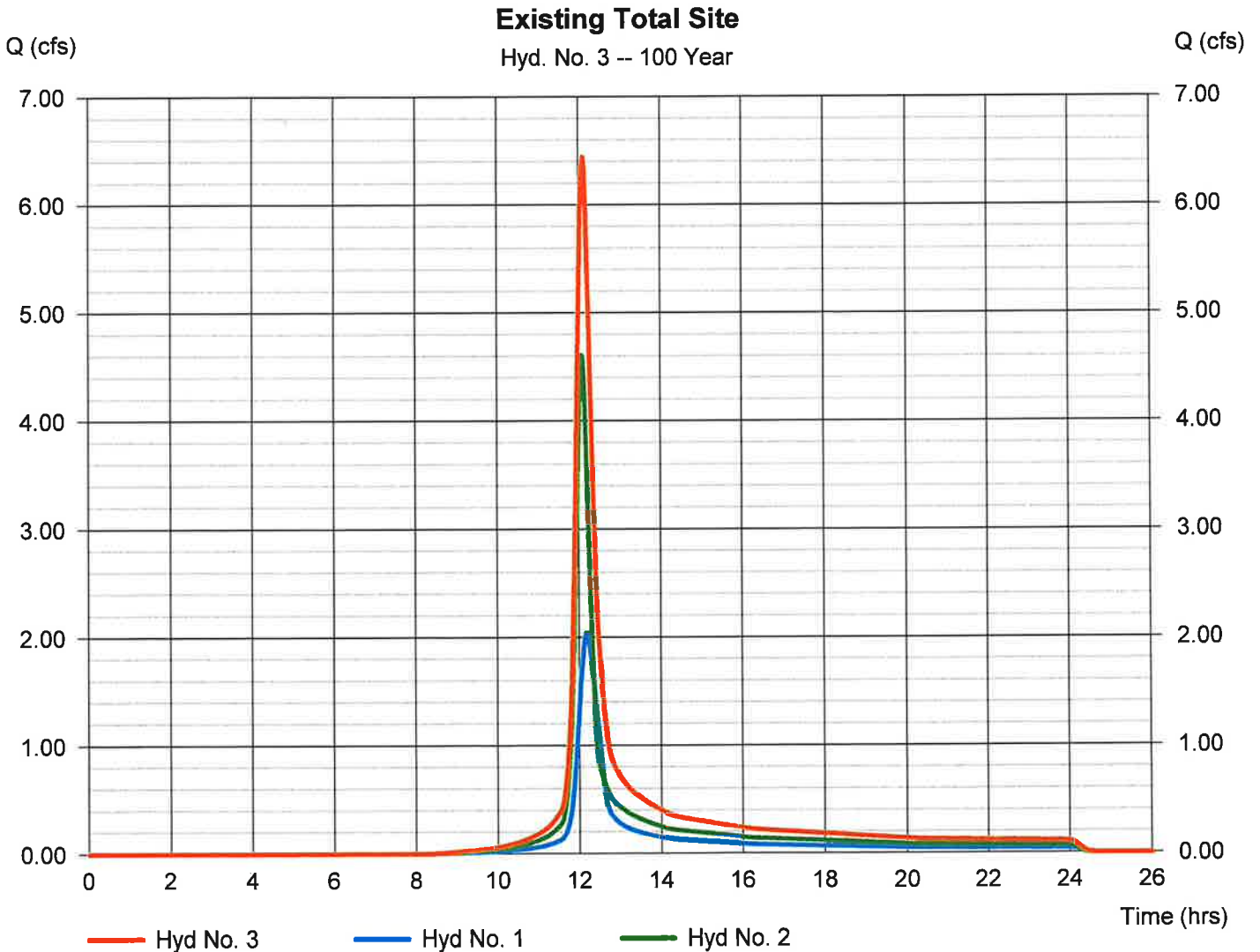


# Hydrograph Report

## Hyd. No. 3

### Existing Total Site

Hydrograph type	= Combine	Peak discharge	= 6.446 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 22,651 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 2.068 ac



# Hydraflow Rainfall Report

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

Thursday, 03 / 30 / 2023

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	55.7621	10.3000	0.8820	-----
3	0.0000	0.0000	0.0000	-----
5	57.1954	9.4000	0.8251	-----
10	57.6989	8.8000	0.7922	-----
25	54.1161	7.6000	0.7404	-----
50	50.2122	6.6000	0.6979	-----
100	46.8747	5.7000	0.6592 *	-----

File name: Hancock County.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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.03	3.92	3.23	2.75	2.41	2.14	1.93	1.76	1.62	1.50	1.40	1.31	1.31
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	0.00
5	6.33	4.95	4.10	3.51	3.09	2.76	2.50	2.29	2.11	1.97	1.84	1.73	1.73
10	7.21	5.65	4.68	4.03	3.55	3.18	2.89	2.65	2.45	2.29	2.14	2.02	2.02
25	8.29	6.47	5.38	4.64	4.10	3.69	3.36	3.10	2.88	2.69	2.53	2.39	2.39
50	9.08	7.07	5.88	5.09	4.51	4.07	3.72	3.44	3.20	3.00	2.83	2.68	2.68
100	9.83	7.63	6.36	5.51	4.90	4.44	4.07	3.77	3.52	3.31	3.13	2.97	2.97

Tc = time in minutes. Values may exceed 60.

Precip. file name: G:\PCP files\Hancock County\Hancock County.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	0.00	2.71	0.00	0.00	4.05	0.00	0.00	5.80
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	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00

3/31/2023

# Appendix F

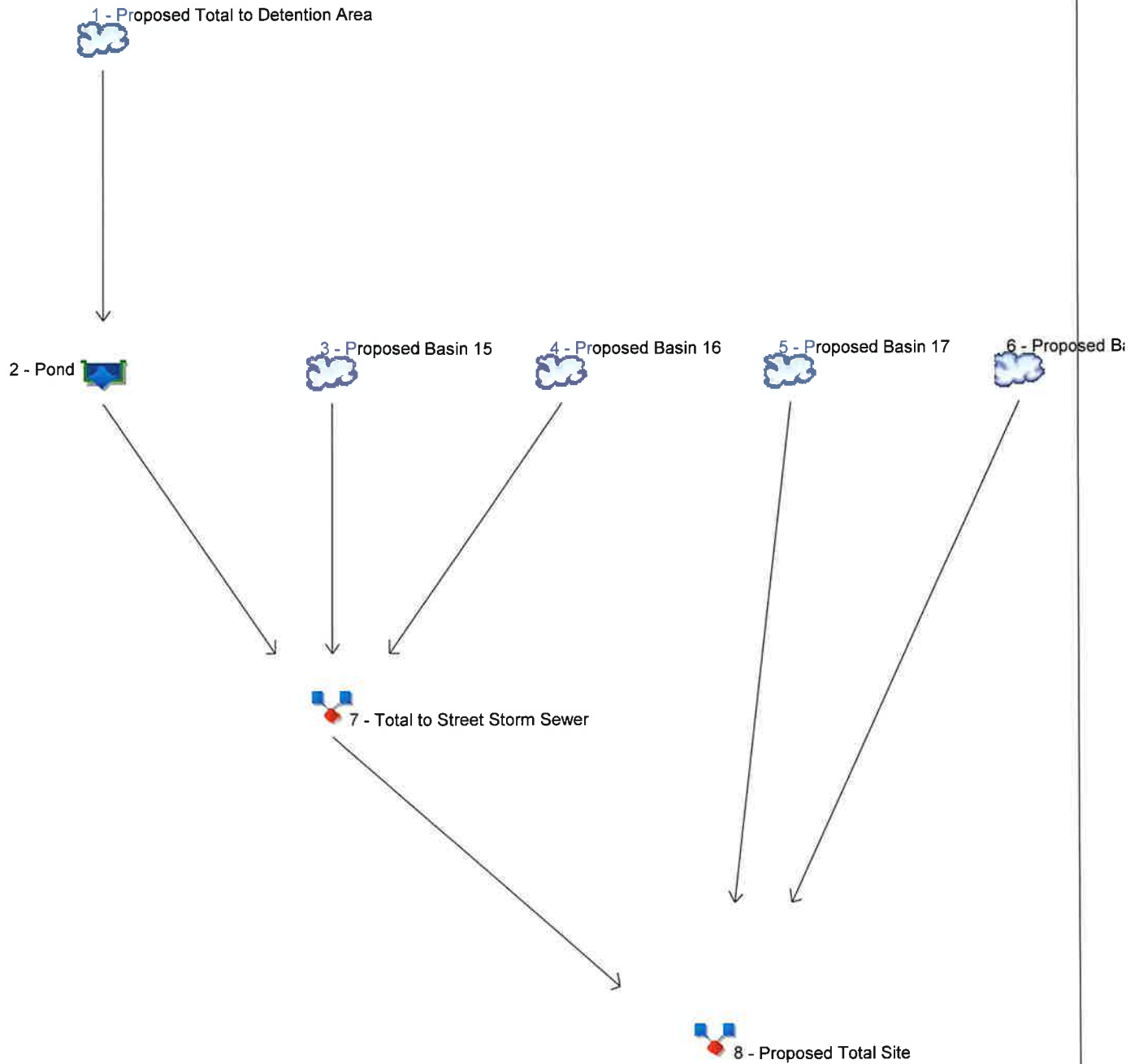
## Proposed Peak Flows Calculations with Routing for Calculated Orifices Sizes

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# Watershed Model Schematic

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



**Legend**

Hyd. Origin	Description
1	SCS Runoff Proposed Total to Detention Area
2	Reservoir Pond
3	SCS Runoff Proposed Basin 15
4	SCS Runoff Proposed Basin 16
5	SCS Runoff Proposed Basin 17
6	SCS Runoff Proposed Basin 18
7	Combine Total to Street Storm Sewer
8	Combine Proposed Total Site

# Hydrograph Return Period Recap

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

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	----	-----	4.663	-----	-----	7.220	-----	-----	10.52	Proposed Total to Detention Area
2	Reservoir	1	-----	0.057	-----	-----	0.074	-----	-----	0.226	Pond
3	SCS Runoff	----	-----	0.203	-----	-----	0.401	-----	-----	0.681	Proposed Basin 15
4	SCS Runoff	----	-----	0.248	-----	-----	0.453	-----	-----	0.728	Proposed Basin 16
5	SCS Runoff	----	-----	0.104	-----	-----	0.207	-----	-----	0.353	Proposed Basin 17
6	SCS Runoff	----	-----	0.056	-----	-----	0.112	-----	-----	0.191	Proposed Basin 18
7	Combine	2, 3, 4,	-----	0.489	-----	-----	0.901	-----	-----	1.466	Total to Street Storm Sewer
8	Combine	5, 6, 7	-----	0.650	-----	-----	1.220	-----	-----	2.011	Proposed Total Site

# 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	4.663	2	722	13,861	-----	-----	-----	Proposed Total to Detention Area
2	Reservoir	0.057	2	1260	13,117	1	854.63	11,105	Pond
3	SCS Runoff	0.203	2	718	405	-----	-----	-----	Proposed Basin 15
4	SCS Runoff	0.248	2	716	500	-----	-----	-----	Proposed Basin 16
5	SCS Runoff	0.104	2	718	208	-----	-----	-----	Proposed Basin 17
6	SCS Runoff	0.056	2	718	113	-----	-----	-----	Proposed Basin 18
7	Combine	0.489	2	718	14,022	2, 3, 4,	-----	-----	Total to Street Storm Sewer
8	Combine	0.650	2	718	14,344	5, 6, 7	-----	-----	Proposed Total Site
Proposed Peak Flows.gpw					Return Period: 2 Year			Thursday, 03 / 30 / 2023	
3/31/2023					42				

# Hydrograph Report

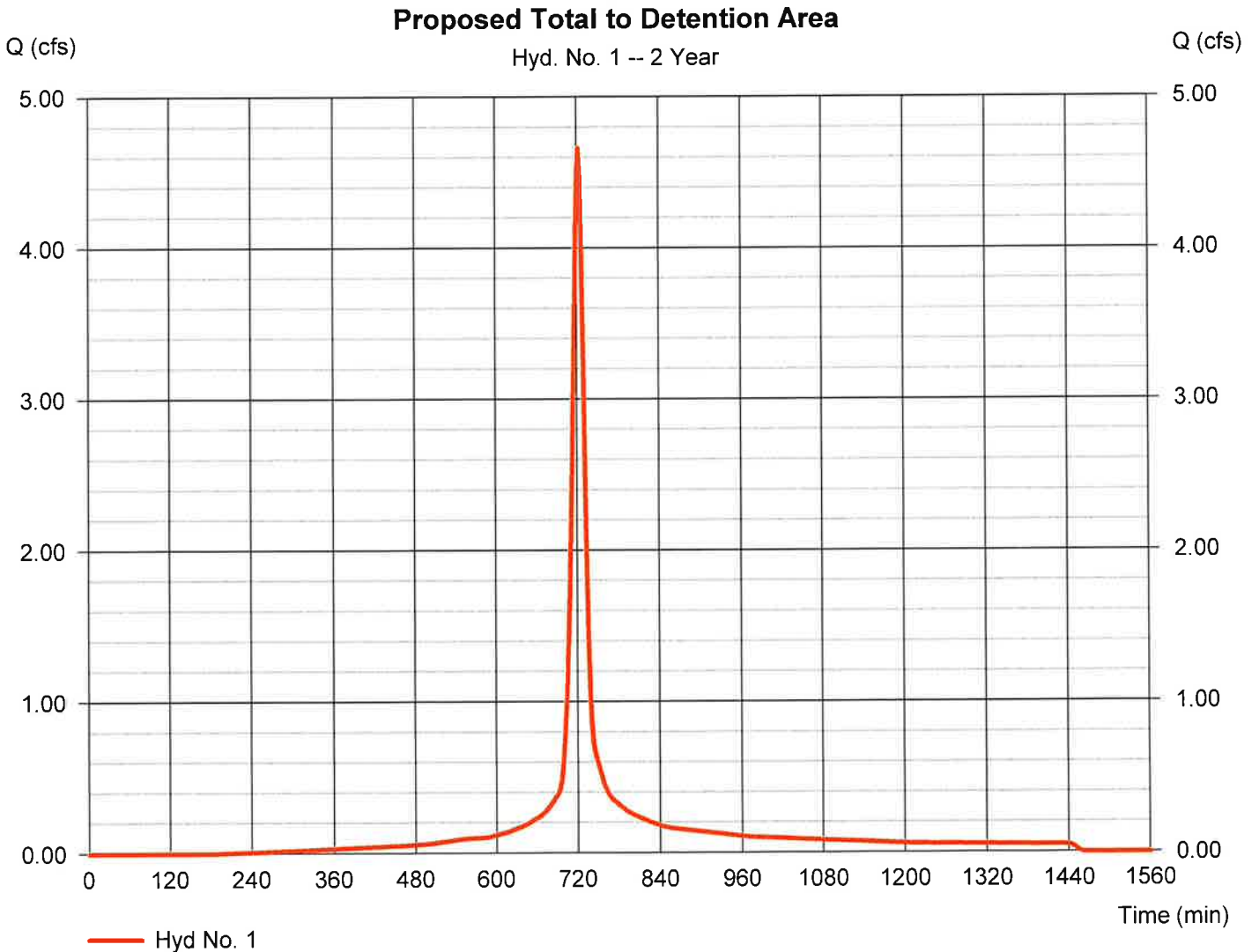
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 1

### Proposed Total to Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 4.663 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 13,861 cuft
Drainage area	= 1.751 ac	Curve number	= 95.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

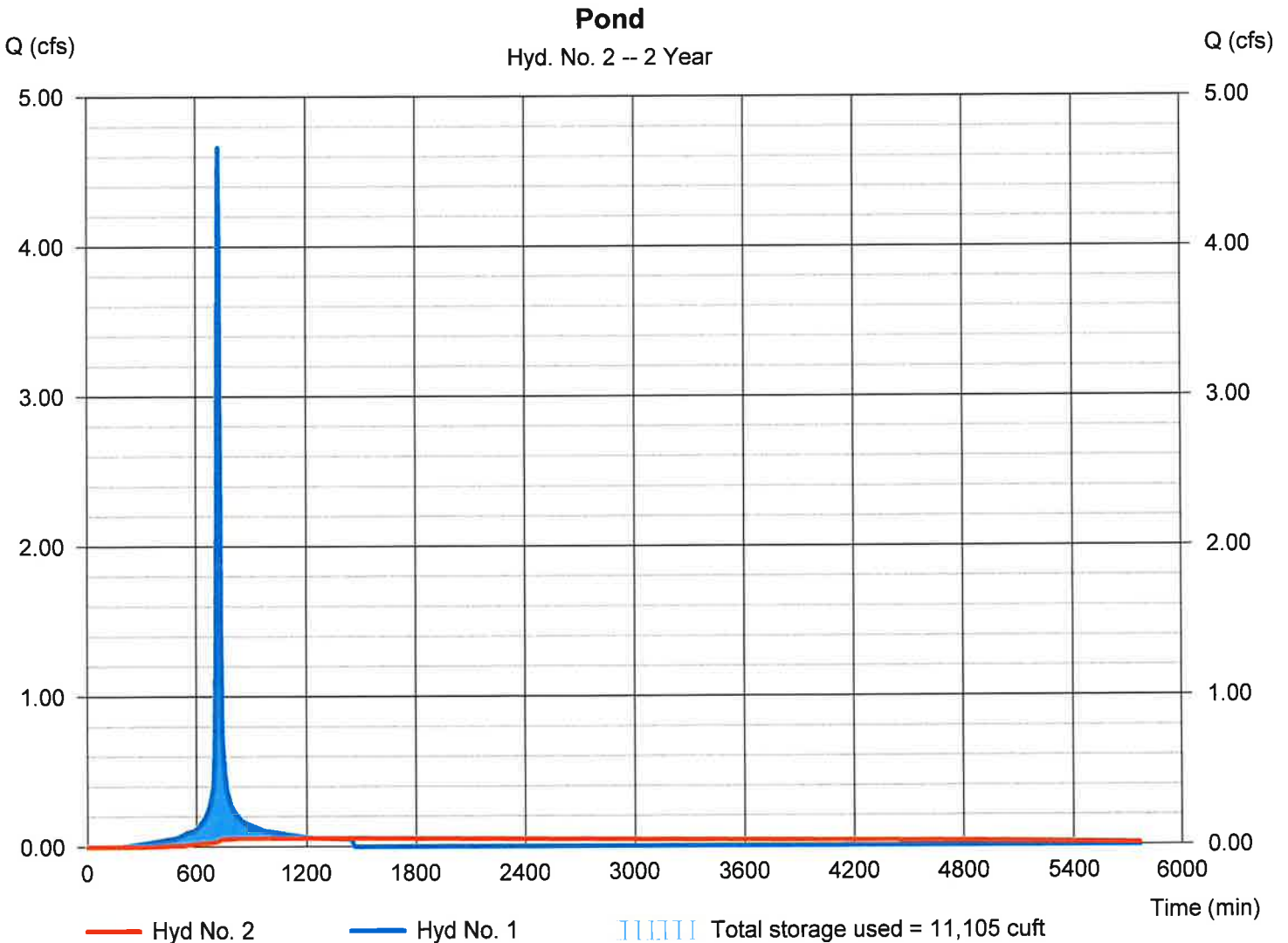
Thursday, 03 / 30 / 2023

## Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.057 cfs
Storm frequency	= 2 yrs	Time to peak	= 1260 min
Time interval	= 2 min	Hyd. volume	= 13,117 cuft
Inflow hyd. No.	= 1 - Proposed Total to Detention Area	Max. Elevation	= 854.63 ft
Reservoir name	= <New Pond>	Max. Storage	= 11,105 cuft

Storage Indication method used.



# Pond Report

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

Thursday, 03 / 30 / 2023

## Pond No. 1 - <New Pond>

### Pond Data

UG Chambers -Invert elev. = 853.64 ft, Rise x Span = 2.05 x 4.00 ft, Barrel Len = 7.12 ft, No. Barrels = 305, Slope = 0.00%, Headers = No  
 Encasement -Invert elev. = 853.14 ft, Width = 4.75 ft, Height = 4.50 ft, Voids = 40.00%

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	853.14	n/a	0	0
0.45	853.59	n/a	1,857	1,857
0.90	854.04	n/a	3,929	5,786
1.35	854.49	n/a	4,085	9,872
1.80	854.94	n/a	3,847	13,719
2.25	855.39	n/a	3,409	17,127
2.70	855.84	n/a	2,409	19,536
3.15	856.29	n/a	1,857	21,393
3.60	856.74	n/a	1,857	23,250
4.05	857.19	n/a	1,857	25,107
4.50	857.64	n/a	1,857	26,964

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 1.35	2.06	0.00	0.00
Span (in)	= 1.35	2.06	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 853.14	855.61	0.00	0.00
Length (ft)	= 0.50	0.50	0.00	0.00
Slope (%)	= 0.00	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	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 857.10	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
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	Civ A cfs	Civ B cfs	Civ 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	853.14	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.05	186	853.18	0.00 ic	0.00	---	---	0.00	---	---	---	---	---	0.003
0.09	371	853.23	0.01 ic	0.00	---	---	0.00	---	---	---	---	---	0.009
0.14	557	853.28	0.01 oc	0.00	---	---	0.00	---	---	---	---	---	0.009
0.18	743	853.32	0.02 oc	0.00	---	---	0.00	---	---	---	---	---	0.016
0.22	929	853.36	0.02 ic	0.00	---	---	0.00	---	---	---	---	---	0.020
0.27	1,114	853.41	0.02 ic	0.00	---	---	0.00	---	---	---	---	---	0.022
0.31	1,300	853.45	0.02 ic	0.00	---	---	0.00	---	---	---	---	---	0.024
0.36	1,486	853.50	0.03 ic	0.00	---	---	0.00	---	---	---	---	---	0.026
0.40	1,671	853.54	0.03 ic	0.00	---	---	0.00	---	---	---	---	---	0.028
0.45	1,857	853.59	0.03 ic	0.00	---	---	0.00	---	---	---	---	---	0.030
0.50	2,250	853.64	0.03 ic	0.00	---	---	0.00	---	---	---	---	---	0.032
0.54	2,643	853.68	0.03 ic	0.00	---	---	0.00	---	---	---	---	---	0.033
0.58	3,036	853.72	0.03 ic	0.00	---	---	0.00	---	---	---	---	---	0.035
0.63	3,429	853.77	0.04 ic	0.00	---	---	0.00	---	---	---	---	---	0.036
0.68	3,822	853.81	0.04 ic	0.00	---	---	0.00	---	---	---	---	---	0.038
0.72	4,215	853.86	0.04 ic	0.00	---	---	0.00	---	---	---	---	---	0.039
0.76	4,607	853.90	0.04 ic	0.00	---	---	0.00	---	---	---	---	---	0.040
0.81	5,000	853.95	0.04 ic	0.00	---	---	0.00	---	---	---	---	---	0.042
0.86	5,393	853.99	0.04 ic	0.00	---	---	0.00	---	---	---	---	---	0.043
0.90	5,786	854.04	0.04 ic	0.00	---	---	0.00	---	---	---	---	---	0.044
0.94	6,195	854.09	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.045
0.99	6,603	854.13	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.046
1.03	7,012	854.17	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.047
1.08	7,420	854.22	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.048
1.13	7,829	854.27	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.049
1.17	8,237	854.31	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.051
1.22	8,646	854.35	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.052
1.26	9,055	854.40	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.053

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&lt;New Pond&gt;

**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
1.30	9,463	854.44	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.053
1.35	9,872	854.49	0.05 ic	0.00	---	---	0.00	---	---	---	---	---	0.054
1.39	10,256	854.53	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.055
1.44	10,641	854.58	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.056
1.49	11,026	854.62	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.057
1.53	11,410	854.67	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.058
1.58	11,795	854.71	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.059
1.62	12,180	854.76	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.060
1.66	12,564	854.80	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.061
1.71	12,949	854.85	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.062
1.75	13,334	854.89	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.062
1.80	13,719	854.94	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.063
1.85	14,059	854.98	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.064
1.89	14,400	855.03	0.06 ic	0.00	---	---	0.00	---	---	---	---	---	0.065
1.93	14,741	855.08	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.066
1.98	15,082	855.12	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.066
2.03	15,423	855.16	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.067
2.07	15,764	855.21	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.068
2.12	16,104	855.25	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.069
2.16	16,445	855.30	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.069
2.20	16,786	855.34	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.070
2.25	17,127	855.39	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.071
2.30	17,368	855.43	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.072
2.34	17,609	855.48	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.072
2.38	17,850	855.53	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.073
2.43	18,090	855.57	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.074
2.47	18,331	855.61	0.07 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.074
2.52	18,572	855.66	0.08 ic	0.00 ic	---	---	0.00	---	---	---	---	---	0.079
2.57	18,813	855.70	0.08 ic	0.01 ic	---	---	0.00	---	---	---	---	---	0.090
2.61	19,054	855.75	0.08 ic	0.03 ic	---	---	0.00	---	---	---	---	---	0.102
2.66	19,295	855.79	0.08 ic	0.02 oc	---	---	0.00	---	---	---	---	---	0.094
2.70	19,536	855.84	0.08 ic	0.03 oc	---	---	0.00	---	---	---	---	---	0.113
2.74	19,721	855.89	0.08 ic	0.05 oc	---	---	0.00	---	---	---	---	---	0.125
2.79	19,907	855.93	0.08 ic	0.05 ic	---	---	0.00	---	---	---	---	---	0.133
2.84	20,093	855.97	0.08 ic	0.06 ic	---	---	0.00	---	---	---	---	---	0.139
2.88	20,278	856.02	0.08 ic	0.06 ic	---	---	0.00	---	---	---	---	---	0.144
2.92	20,464	856.06	0.08 ic	0.07 ic	---	---	0.00	---	---	---	---	---	0.149
2.97	20,650	856.11	0.08 ic	0.07 ic	---	---	0.00	---	---	---	---	---	0.153
3.02	20,836	856.15	0.08 ic	0.08 ic	---	---	0.00	---	---	---	---	---	0.158
3.06	21,021	856.20	0.08 ic	0.08 ic	---	---	0.00	---	---	---	---	---	0.162
3.11	21,207	856.24	0.08 ic	0.08 ic	---	---	0.00	---	---	---	---	---	0.166
3.15	21,393	856.29	0.08 ic	0.09 ic	---	---	0.00	---	---	---	---	---	0.170
3.19	21,578	856.34	0.08 ic	0.09 ic	---	---	0.00	---	---	---	---	---	0.174
3.24	21,764	856.38	0.09 ic	0.09 ic	---	---	0.00	---	---	---	---	---	0.178
3.29	21,950	856.42	0.09 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.181
3.33	22,136	856.47	0.09 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.185
3.38	22,321	856.52	0.09 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.188
3.42	22,507	856.56	0.09 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.191
3.47	22,693	856.60	0.09 ic	0.11 ic	---	---	0.00	---	---	---	---	---	0.195
3.51	22,878	856.65	0.09 ic	0.11 ic	---	---	0.00	---	---	---	---	---	0.198
3.56	23,064	856.69	0.09 ic	0.11 ic	---	---	0.00	---	---	---	---	---	0.201
3.60	23,250	856.74	0.09 ic	0.11 ic	---	---	0.00	---	---	---	---	---	0.204
3.64	23,436	856.78	0.09 ic	0.12 ic	---	---	0.00	---	---	---	---	---	0.207
3.69	23,621	856.83	0.09 ic	0.12 ic	---	---	0.00	---	---	---	---	---	0.210
3.73	23,807	856.87	0.09 ic	0.12 ic	---	---	0.00	---	---	---	---	---	0.213
3.78	23,993	856.92	0.09 ic	0.12 ic	---	---	0.00	---	---	---	---	---	0.216
3.83	24,178	856.96	0.09 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.218
3.87	24,364	857.01	0.09 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.221
3.92	24,550	857.05	0.09 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.224
3.96	24,735	857.10	0.09 ic	0.13 ic	---	---	0.00	---	---	---	---	---	0.227
4.01	24,921	857.14	0.10 ic	0.13 ic	---	---	0.16	---	---	---	---	---	0.387
4.05	25,107	857.19	0.10 ic	0.14 ic	---	---	0.45	---	---	---	---	---	0.682
4.09	25,293	857.23	0.10 ic	0.14 ic	---	---	0.83	---	---	---	---	---	1.060
4.14	25,478	857.28	0.10 ic	0.14 ic	---	---	1.27	---	---	---	---	---	1.509
4.18	25,664	857.33	0.10 ic	0.14 ic	---	---	1.78	---	---	---	---	---	2.017
4.23	25,850	857.37	0.10 ic	0.14 ic	---	---	2.33	---	---	---	---	---	2.577
4.28	26,035	857.41	0.10 ic	0.15 ic	---	---	2.94	---	---	---	---	---	3.187
4.32	26,221	857.46	0.10 ic	0.15 ic	---	---	3.60	---	---	---	---	---	3.842
4.37	26,407	857.50	0.10 ic	0.15 ic	---	---	4.29	---	---	---	---	---	4.539

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&lt;New Pond&gt;

**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
4.41	26,593	857.55	0.10 ic	0.15 ic	---	---	5.03	---	---	---	---	---	5.277
4.46	26,778	857.59	0.10 ic	0.15 ic	---	---	5.80	---	---	---	---	---	6.049
4.50	26,964	857.64	0.10 ic	0.16 ic	---	---	6.61	---	---	---	---	---	6.864

...End

# Hydrograph Report

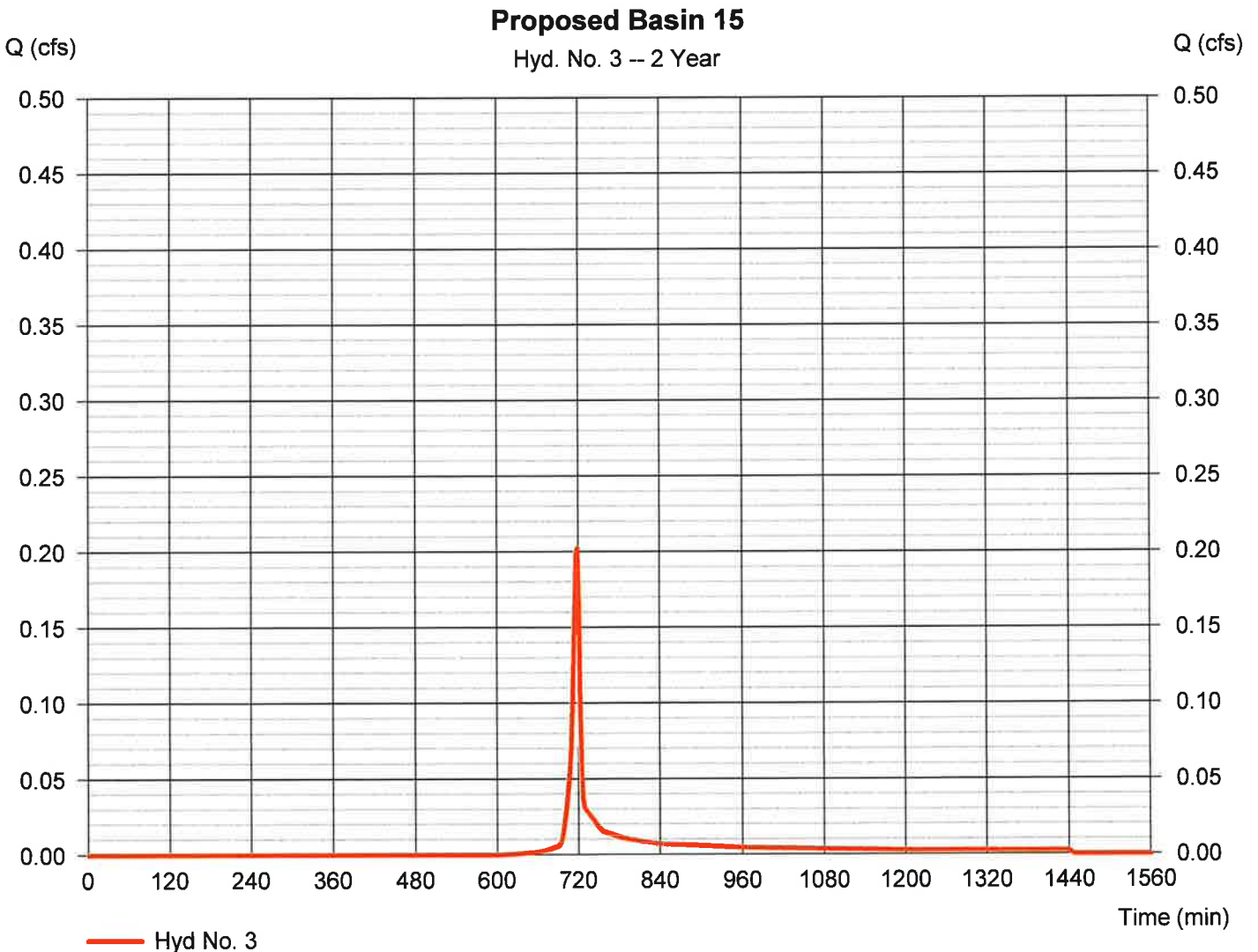
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## Hyd. No. 3

### Proposed Basin 15

Hydrograph type	= SCS Runoff	Peak discharge	= 0.203 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 405 cuft
Drainage area	= 0.113 ac	Curve number	= 80.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

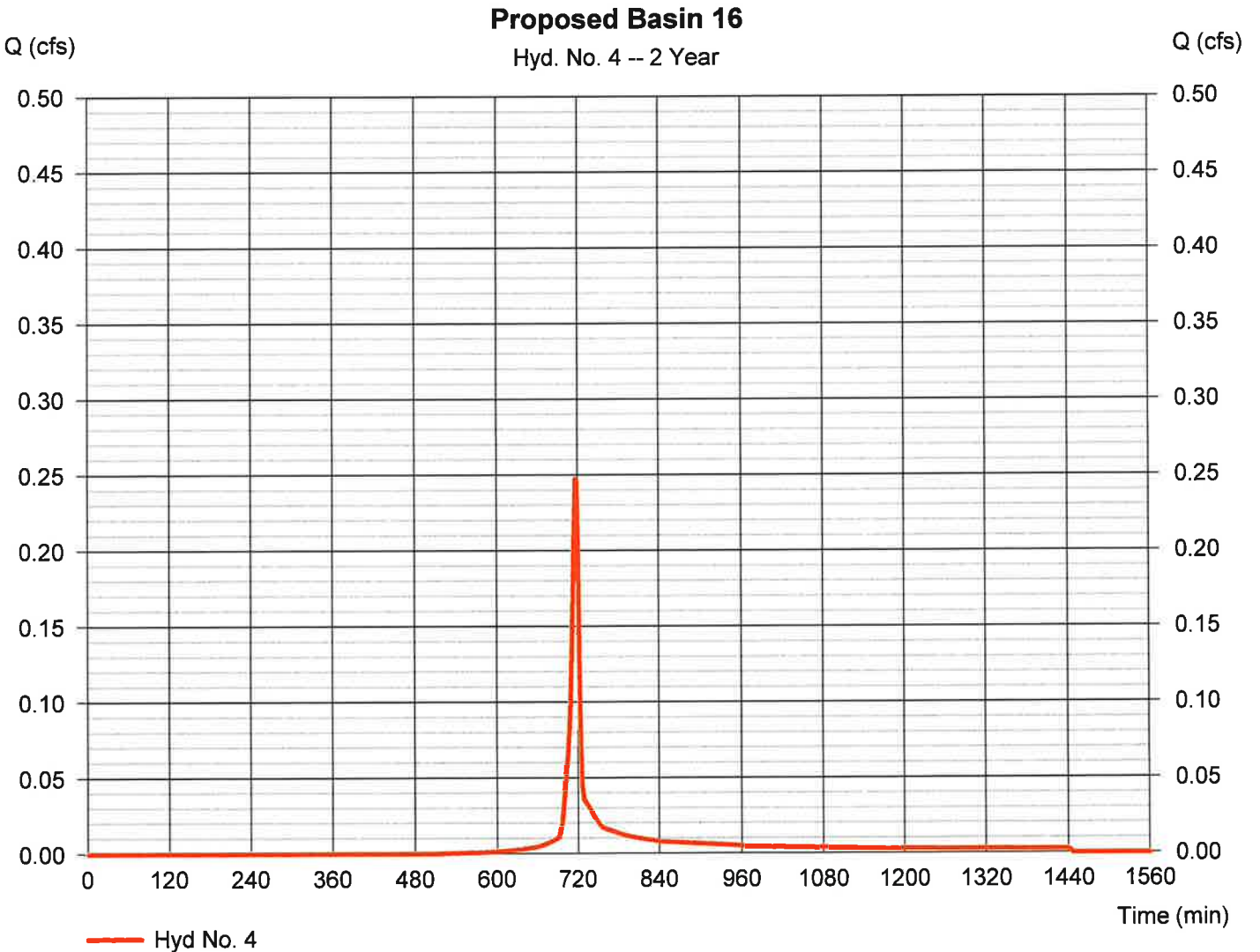
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## Hyd. No. 4

### Proposed Basin 16

Hydrograph type	= SCS Runoff	Peak discharge	= 0.248 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 500 cuft
Drainage area	= 0.109 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

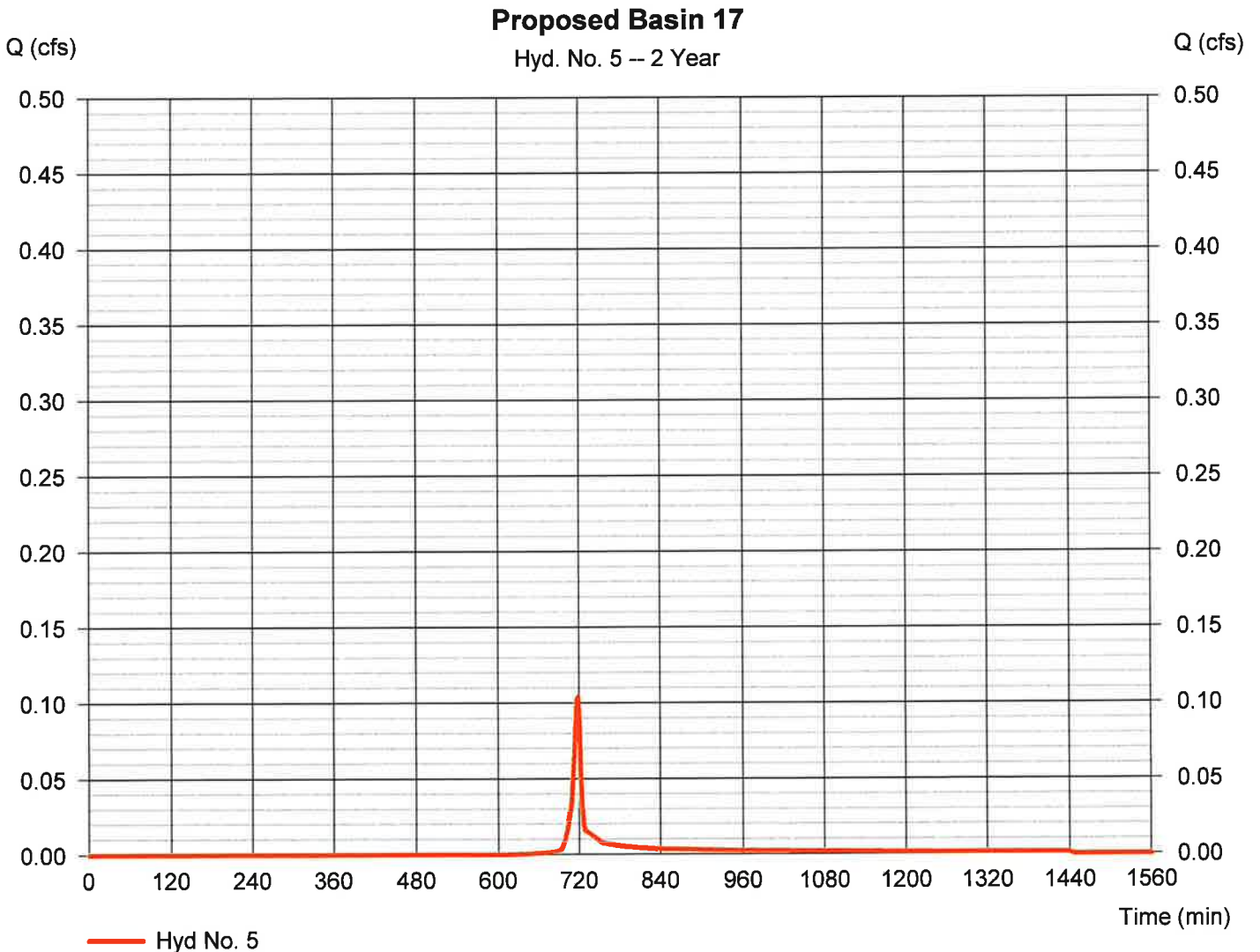
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## Hyd. No. 5

### Proposed Basin 17

Hydrograph type	= SCS Runoff	Peak discharge	= 0.104 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 208 cuft
Drainage area	= 0.059 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

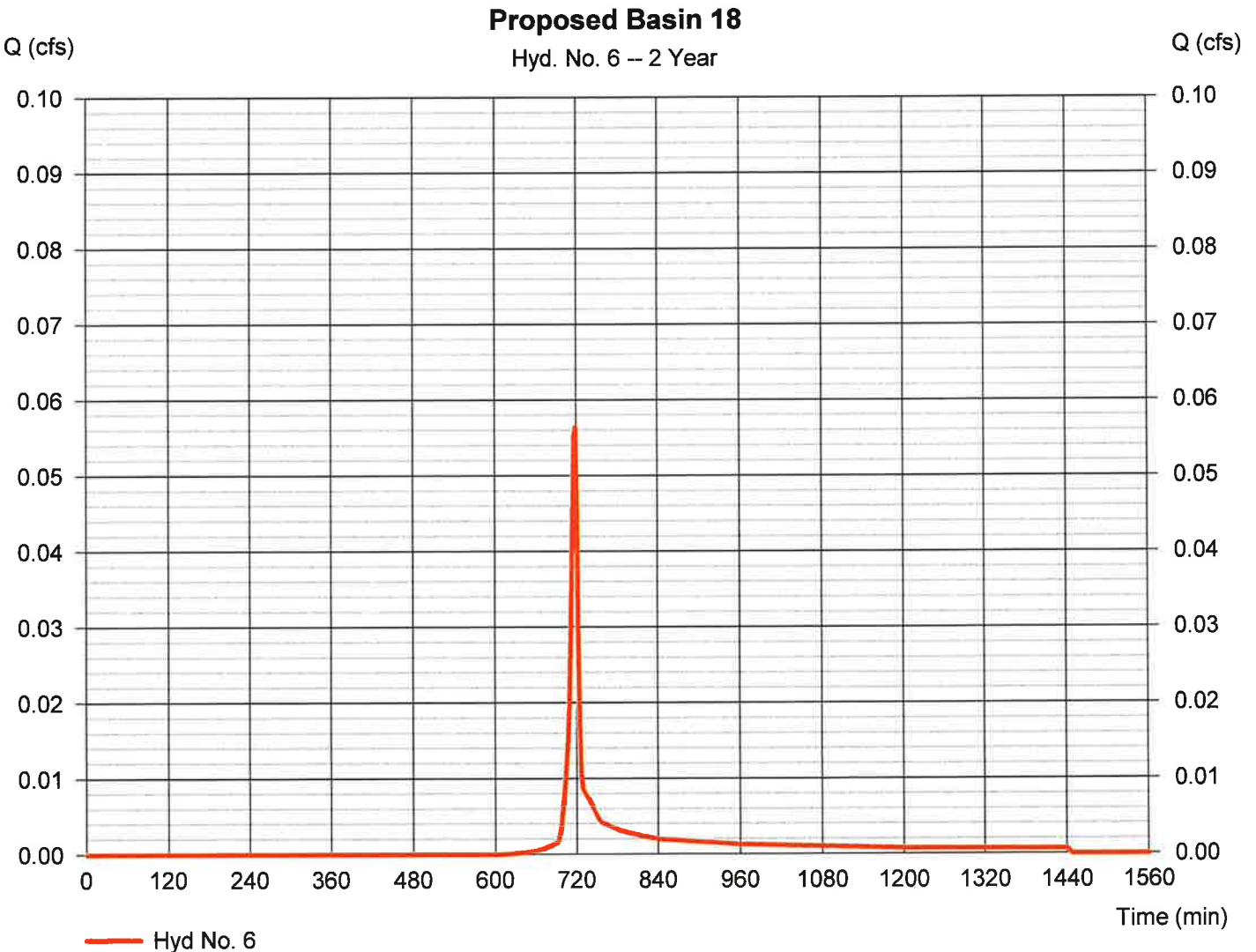
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## Hyd. No. 6

### Proposed Basin 18

Hydrograph type	= SCS Runoff	Peak discharge	= 0.056 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 113 cuft
Drainage area	= 0.032 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

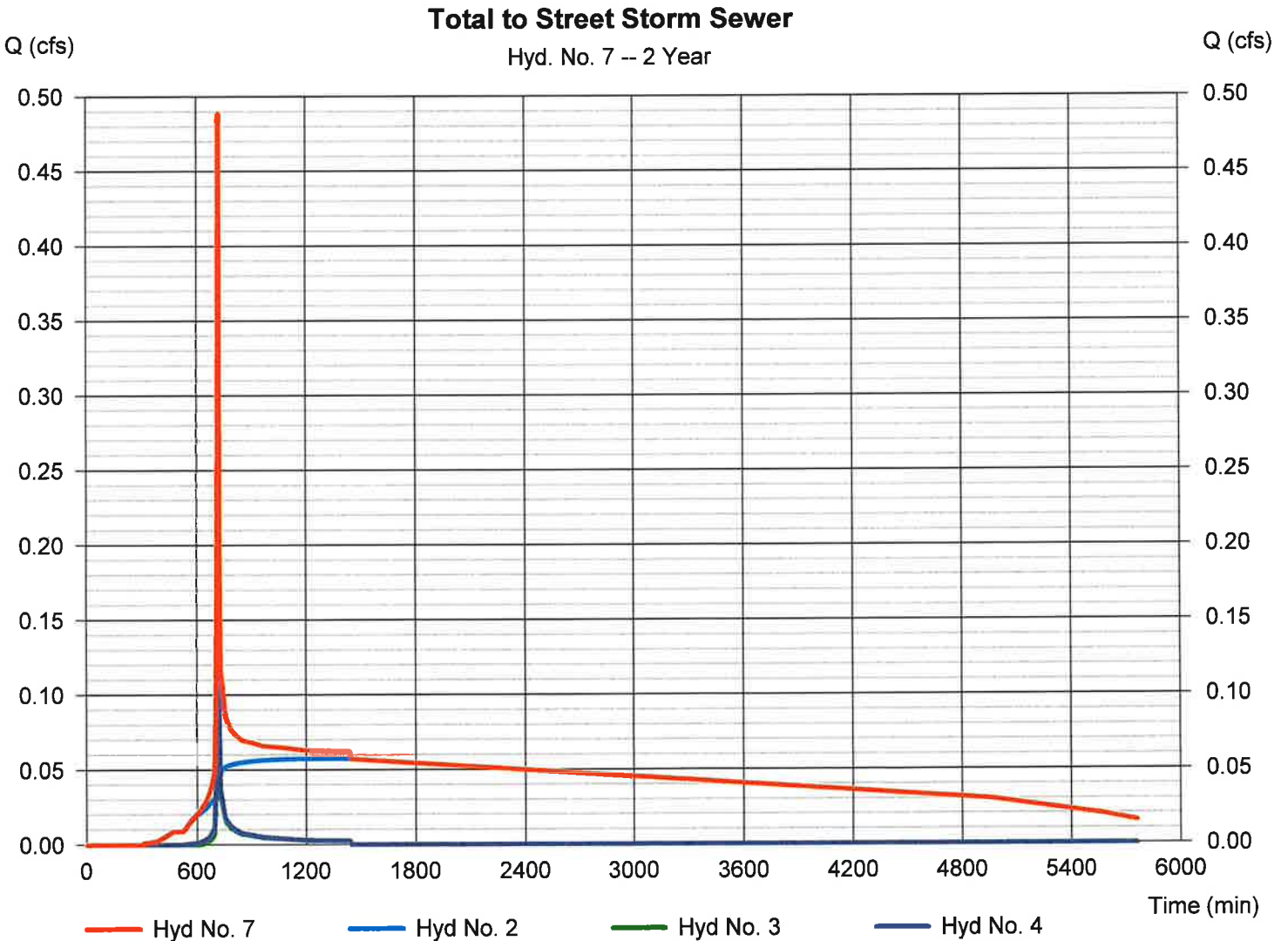
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Thursday, 03 / 30 / 2023

## Hyd. No. 7

Total to Street Storm Sewer

Hydrograph type	= Combine	Peak discharge	= 0.489 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 14,022 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 0.222 ac



# Hydrograph Report

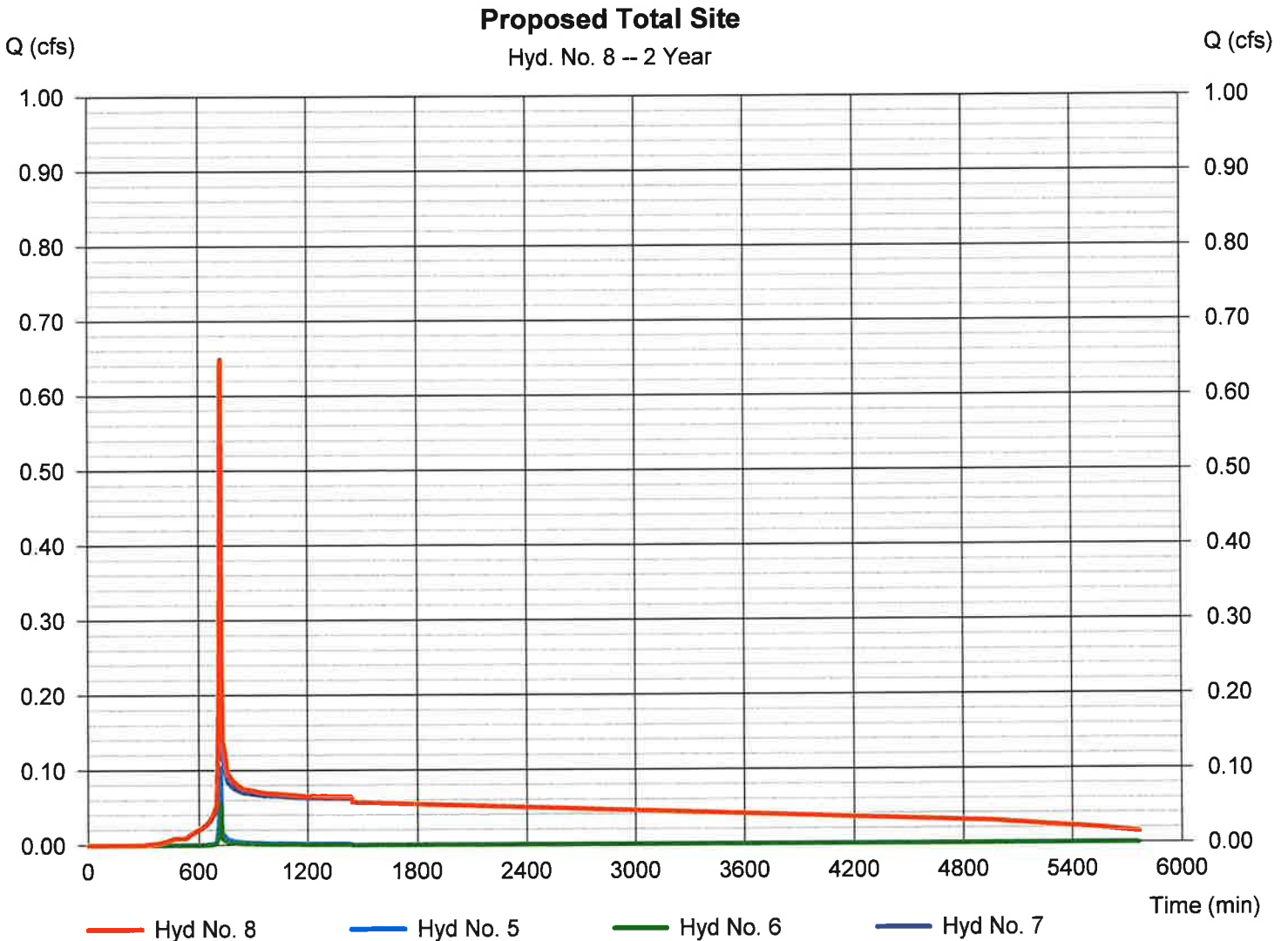
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## Hyd. No. 8

### Proposed Total Site

Hydrograph type	= Combine	Peak discharge	= 0.650 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 14,344 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 0.091 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	7.220	2	722	22,041	-----	-----	-----	Proposed Total to Detention Area	
2	Reservoir	0.074	2	1442	18,016	1	855.61	18,325	Pond	
3	SCS Runoff	0.401	2	716	810	-----	-----	-----	Proposed Basin 15	
4	SCS Runoff	0.453	2	716	928	-----	-----	-----	Proposed Basin 16	
5	SCS Runoff	0.207	2	716	418	-----	-----	-----	Proposed Basin 17	
6	SCS Runoff	0.112	2	716	227	-----	-----	-----	Proposed Basin 18	
7	Combine	0.901	2	716	19,754	2, 3, 4,	-----	-----	Total to Street Storm Sewer	
8	Combine	1.220	2	716	20,399	5, 6, 7	-----	-----	Proposed Total Site	
Proposed Peak Flows.gpw					Return Period: 10 Year			Thursday, 03 / 30 / 2023		

# Hydrograph Report

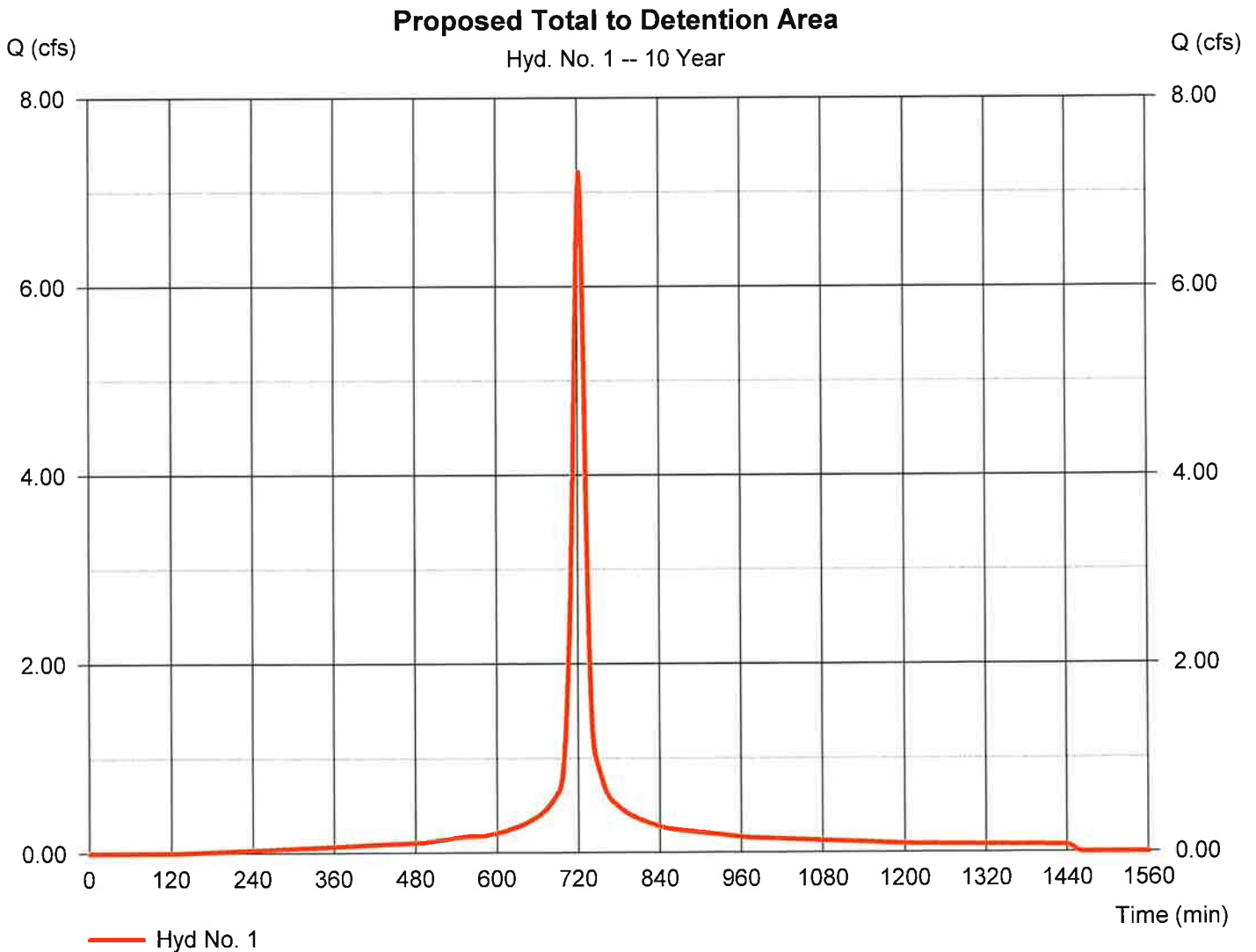
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Thursday, 03 / 30 / 2023

## Hyd. No. 1

### Proposed Total to Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 7.220 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 22,041 cuft
Drainage area	= 1.751 ac	Curve number	= 95.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

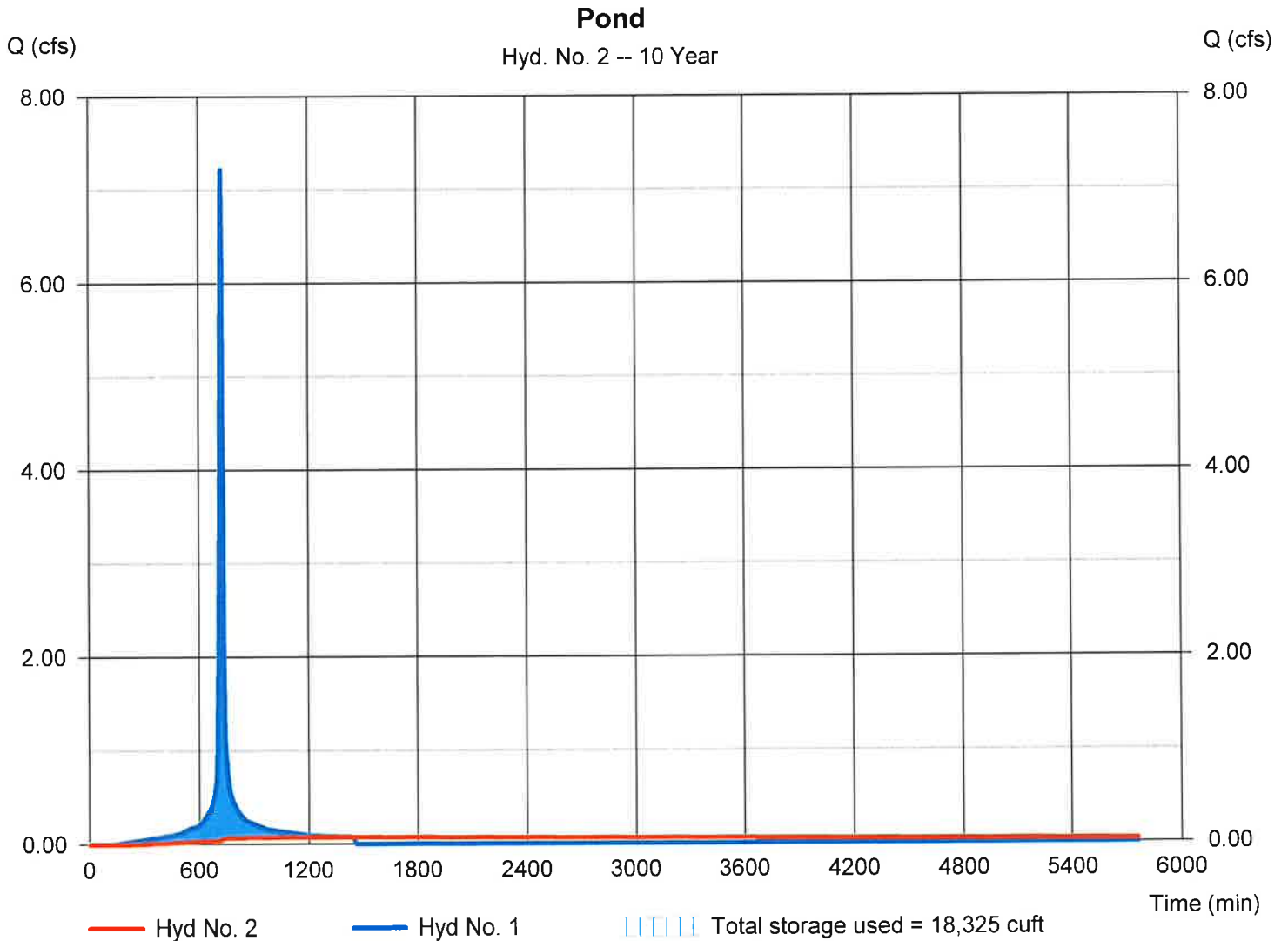
Thursday, 03 / 30 / 2023

## Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.074 cfs
Storm frequency	= 10 yrs	Time to peak	= 1442 min
Time interval	= 2 min	Hyd. volume	= 18,016 cuft
Inflow hyd. No.	= 1 - Proposed Total to Detention Area	Max. Elevation	= 855.61 ft
Reservoir name	= <New Pond>	Max. Storage	= 18,325 cuft

Storage Indication method used.



# Hydrograph Report

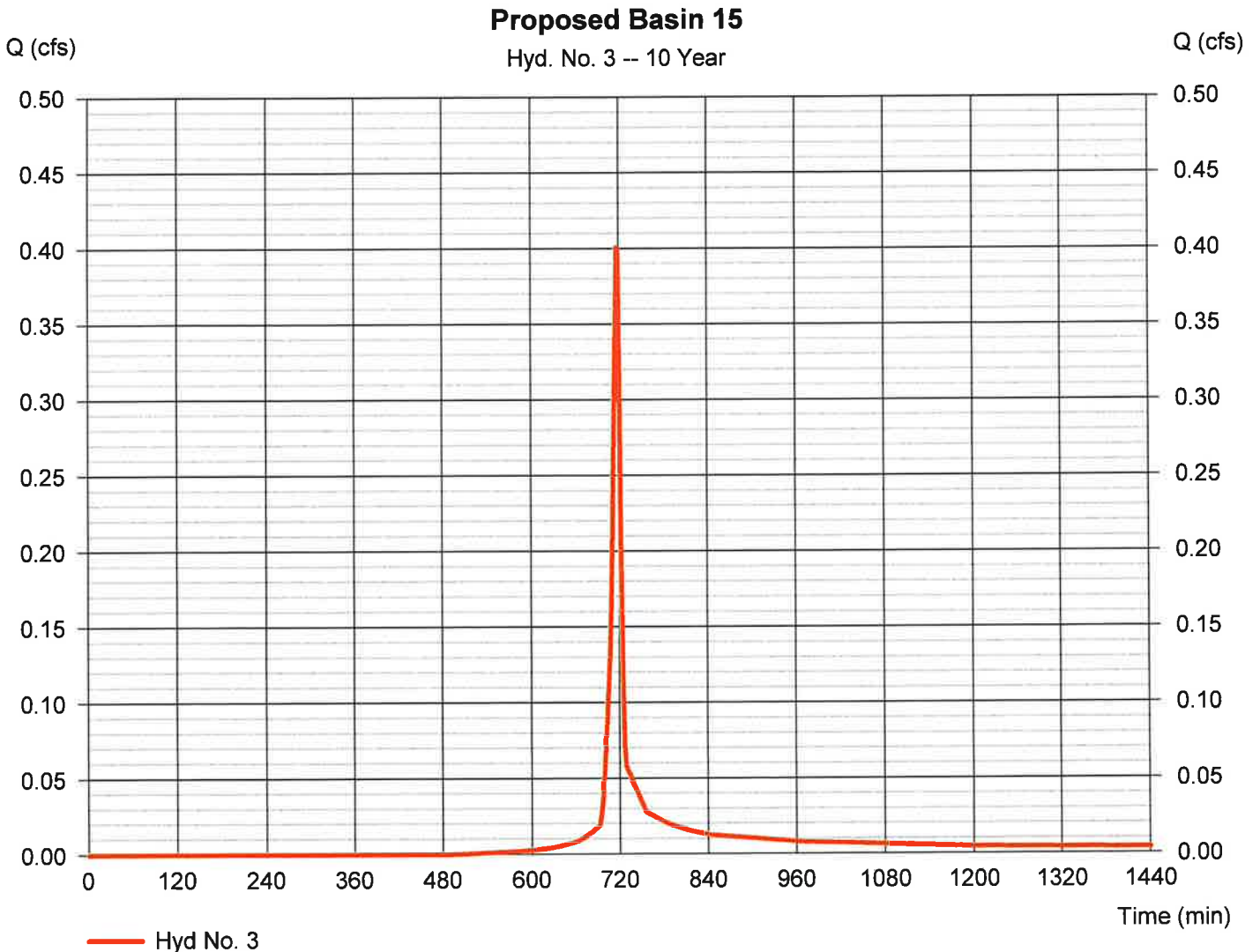
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 3

### Proposed Basin 15

Hydrograph type	= SCS Runoff	Peak discharge	= 0.401 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 810 cuft
Drainage area	= 0.113 ac	Curve number	= 80.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

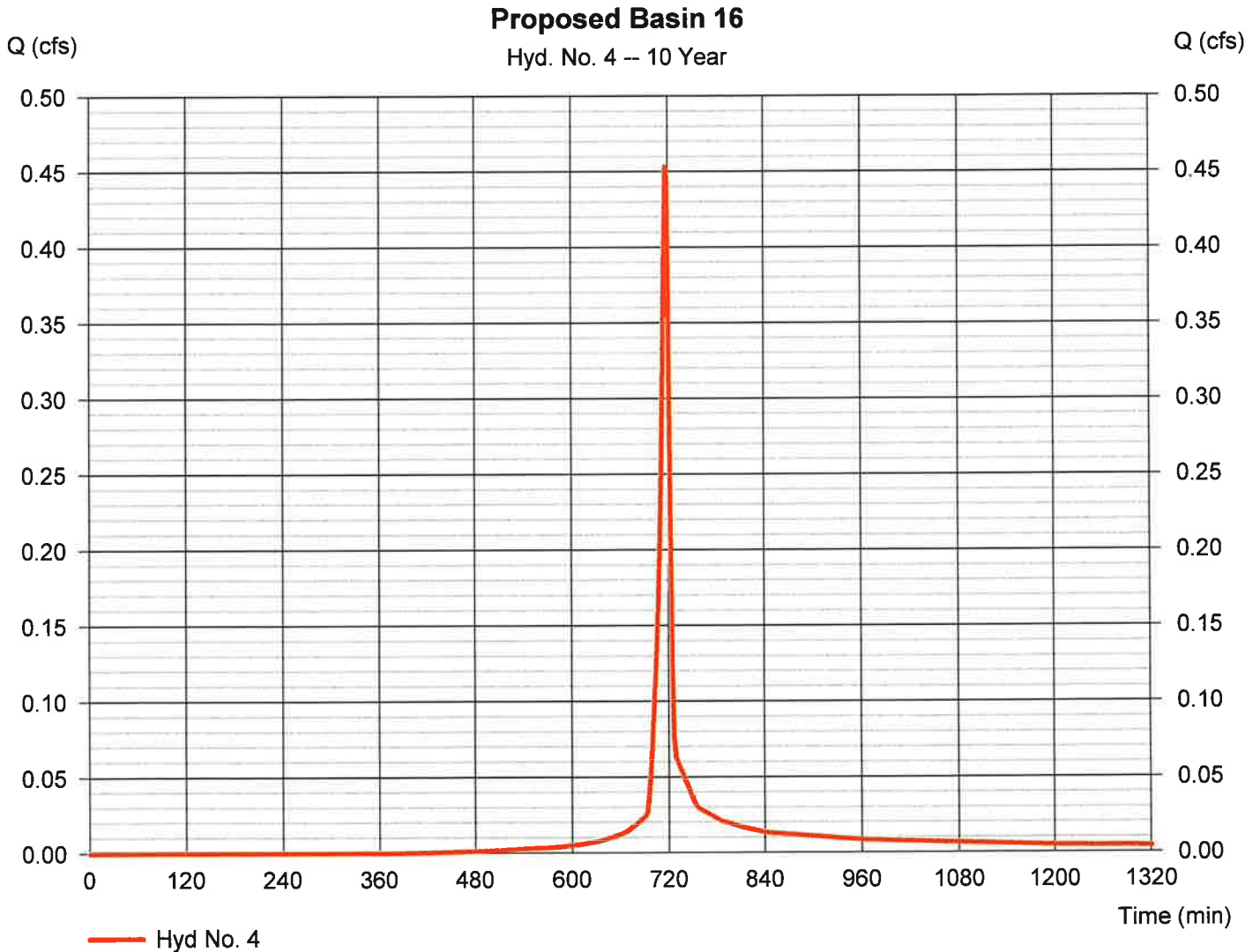


# Hydrograph Report

## Hyd. No. 4

### Proposed Basin 16

Hydrograph type	= SCS Runoff	Peak discharge	= 0.453 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 928 cuft
Drainage area	= 0.109 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

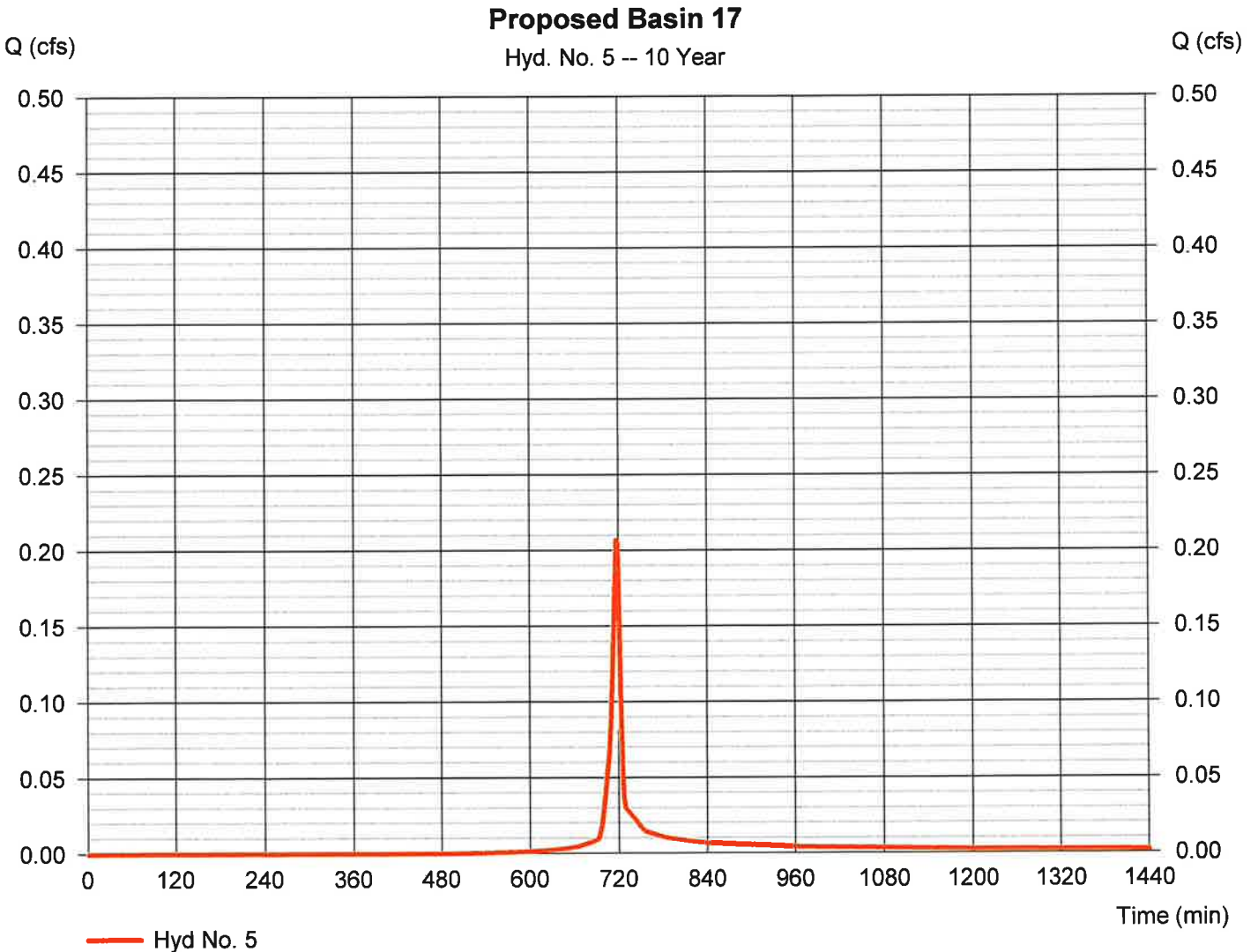
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 5

### Proposed Basin 17

Hydrograph type	= SCS Runoff	Peak discharge	= 0.207 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 418 cuft
Drainage area	= 0.059 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

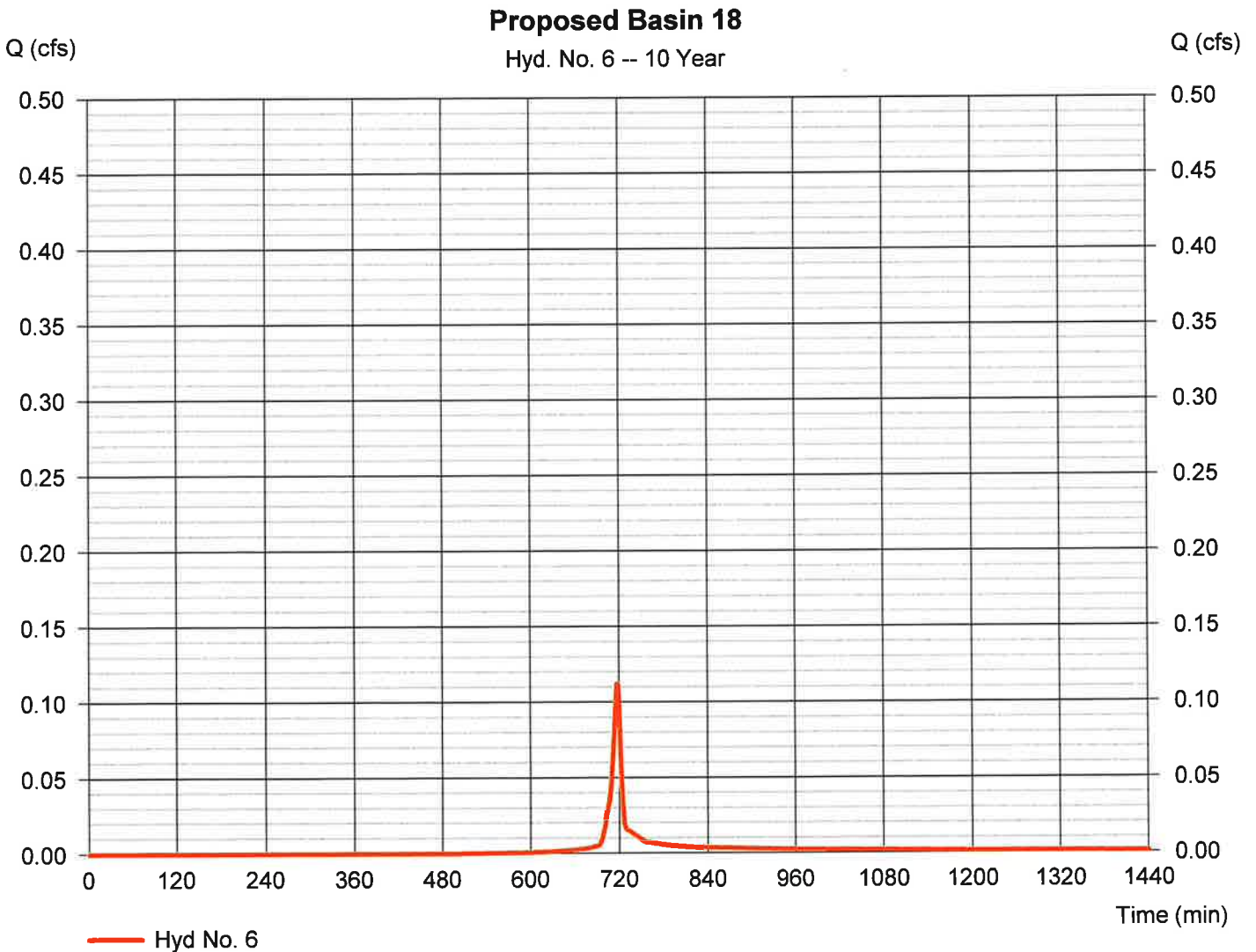
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 6

### Proposed Basin 18

Hydrograph type	= SCS Runoff	Peak discharge	= 0.112 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 227 cuft
Drainage area	= 0.032 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

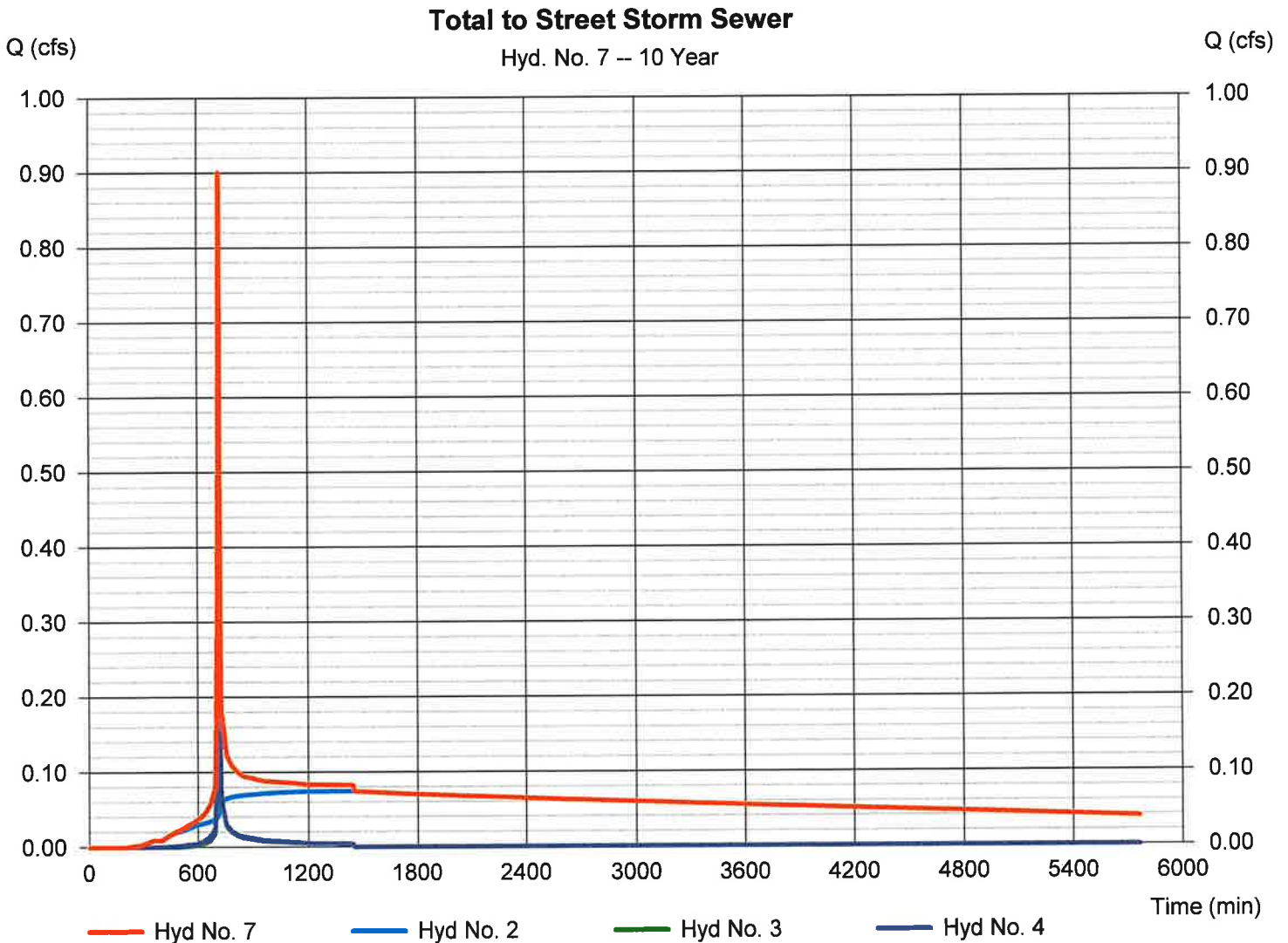
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 7

Total to Street Storm Sewer

Hydrograph type	= Combine	Peak discharge	= 0.901 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 19,754 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 0.222 ac



# Hydrograph Report

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

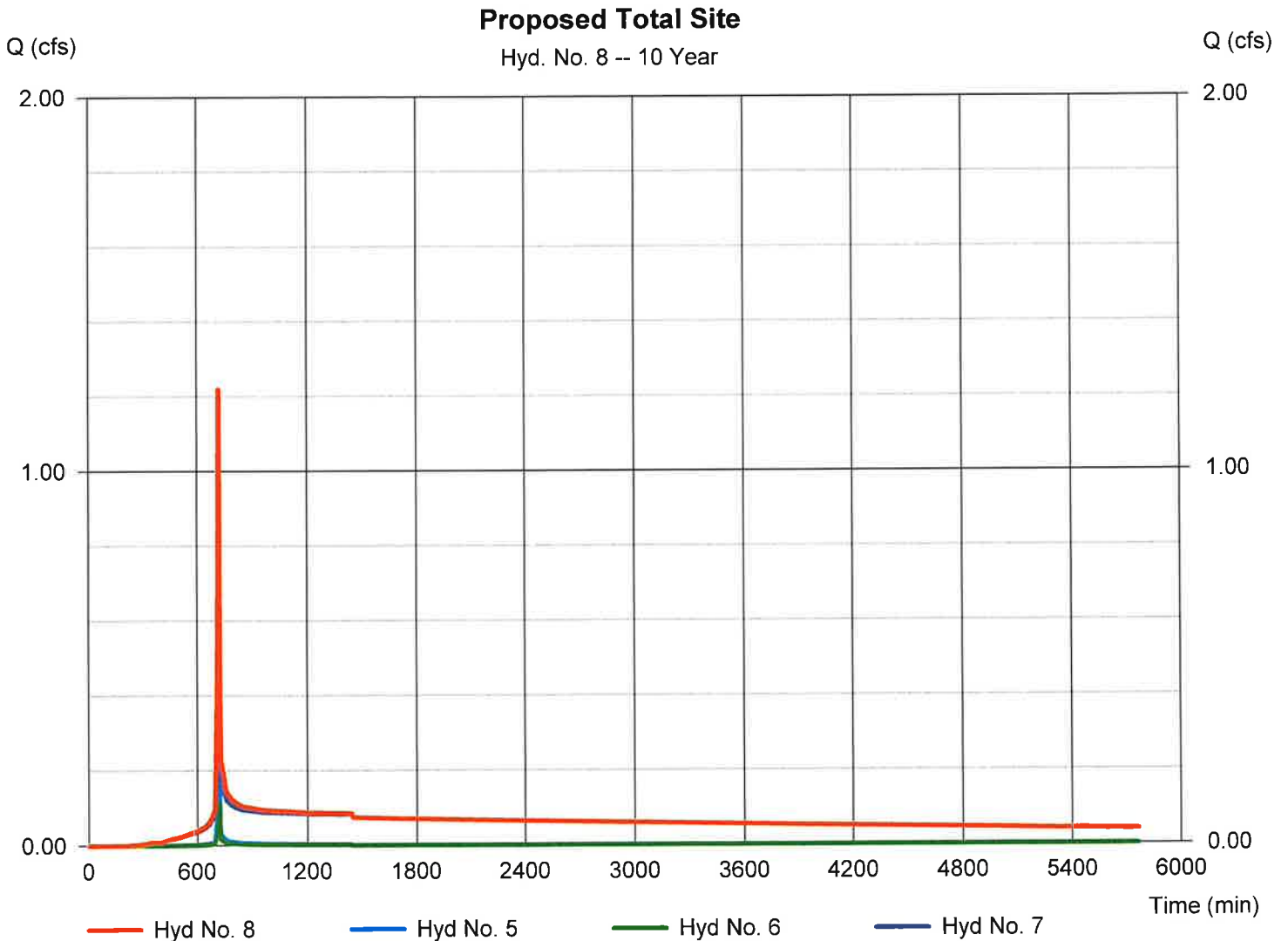
Thursday, 03 / 30 / 2023

## Hyd. No. 8

Proposed Total Site

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Time interval = 2 min  
Inflow hyds. = 5, 6, 7

Peak discharge = 1.220 cfs  
Time to peak = 716 min  
Hyd. volume = 20,399 cuft  
Contrib. drain. area = 0.091 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	10.52	2	722	32,806	-----	-----	-----	Proposed Total to Detention Area	
2	Reservoir	0.226	2	978	27,414	1	857.08	24,660	Pond	
3	SCS Runoff	0.681	2	716	1,396	-----	-----	-----	Proposed Basin 15	
4	SCS Runoff	0.728	2	716	1,526	-----	-----	-----	Proposed Basin 16	
5	SCS Runoff	0.353	2	716	723	-----	-----	-----	Proposed Basin 17	
6	SCS Runoff	0.191	2	716	392	-----	-----	-----	Proposed Basin 18	
7	Combine	1.466	2	716	30,336	2, 3, 4,	-----	-----	Total to Street Storm Sewer	
8	Combine	2.011	2	716	31,451	5, 6, 7	-----	-----	Proposed Total Site	
Proposed Peak Flows.gpw					Return Period: 100 Year		Thursday, 03 / 30 / 2023			
3/31/2023							63			

# Hydrograph Report

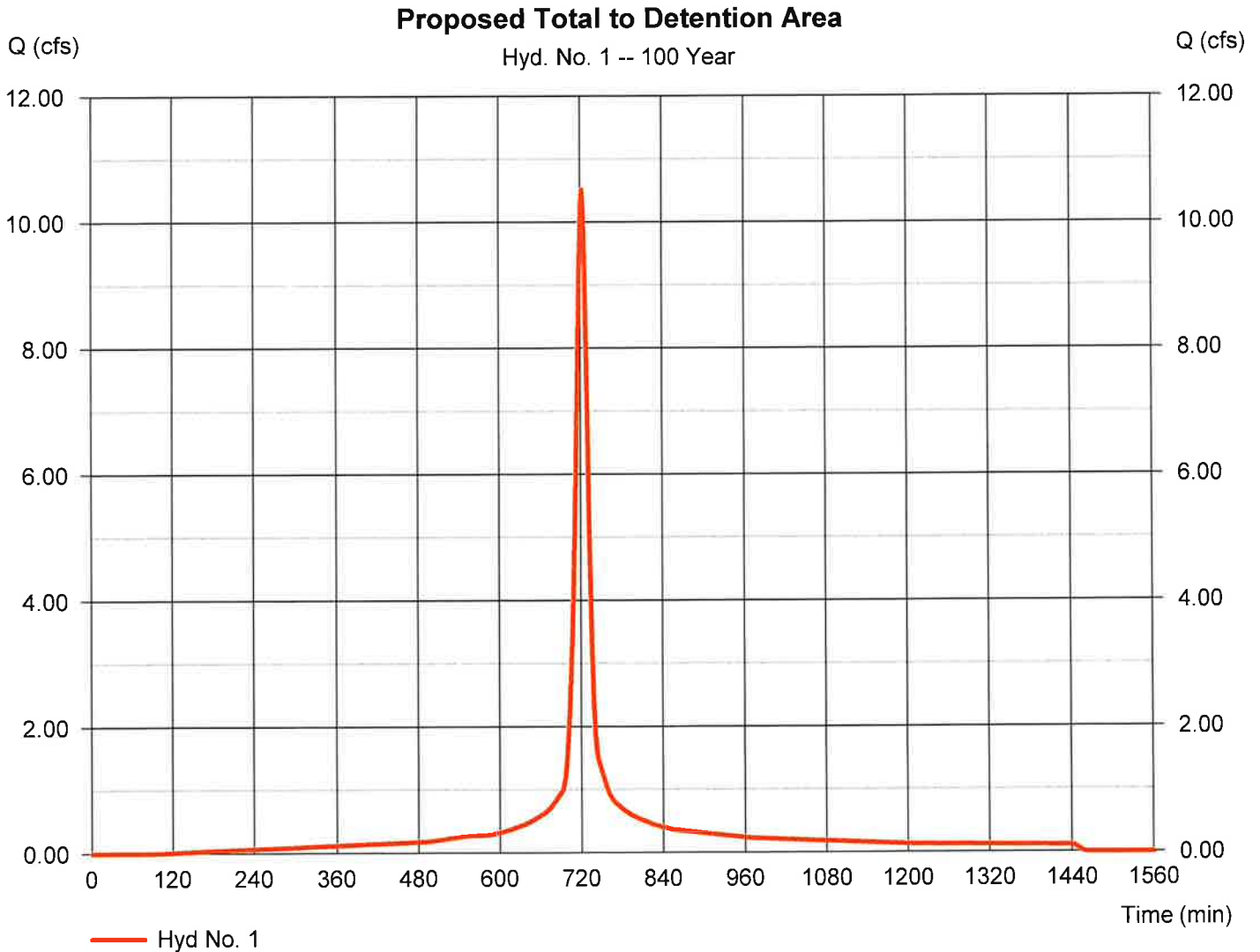
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 1

### Proposed Total to Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 10.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 32,806 cuft
Drainage area	= 1.751 ac	Curve number	= 95.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

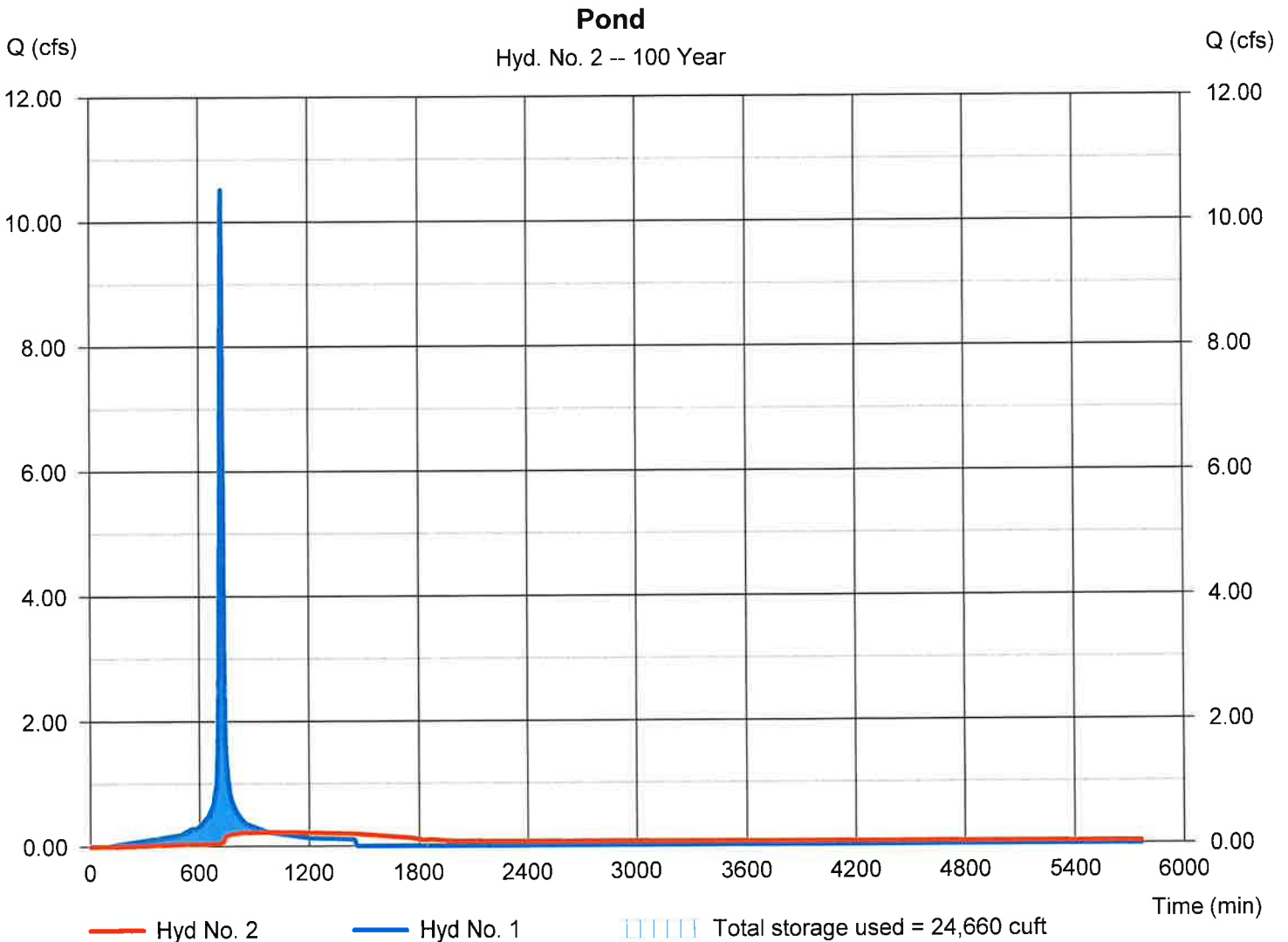
Thursday, 03 / 30 / 2023

## Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.226 cfs
Storm frequency	= 100 yrs	Time to peak	= 978 min
Time interval	= 2 min	Hyd. volume	= 27,414 cuft
Inflow hyd. No.	= 1 - Proposed Total to Detention Area	Max. Elevation	= 857.08 ft
Reservoir name	= <New Pond>	Max. Storage	= 24,660 cuft

Storage Indication method used.



# Hydrograph Report

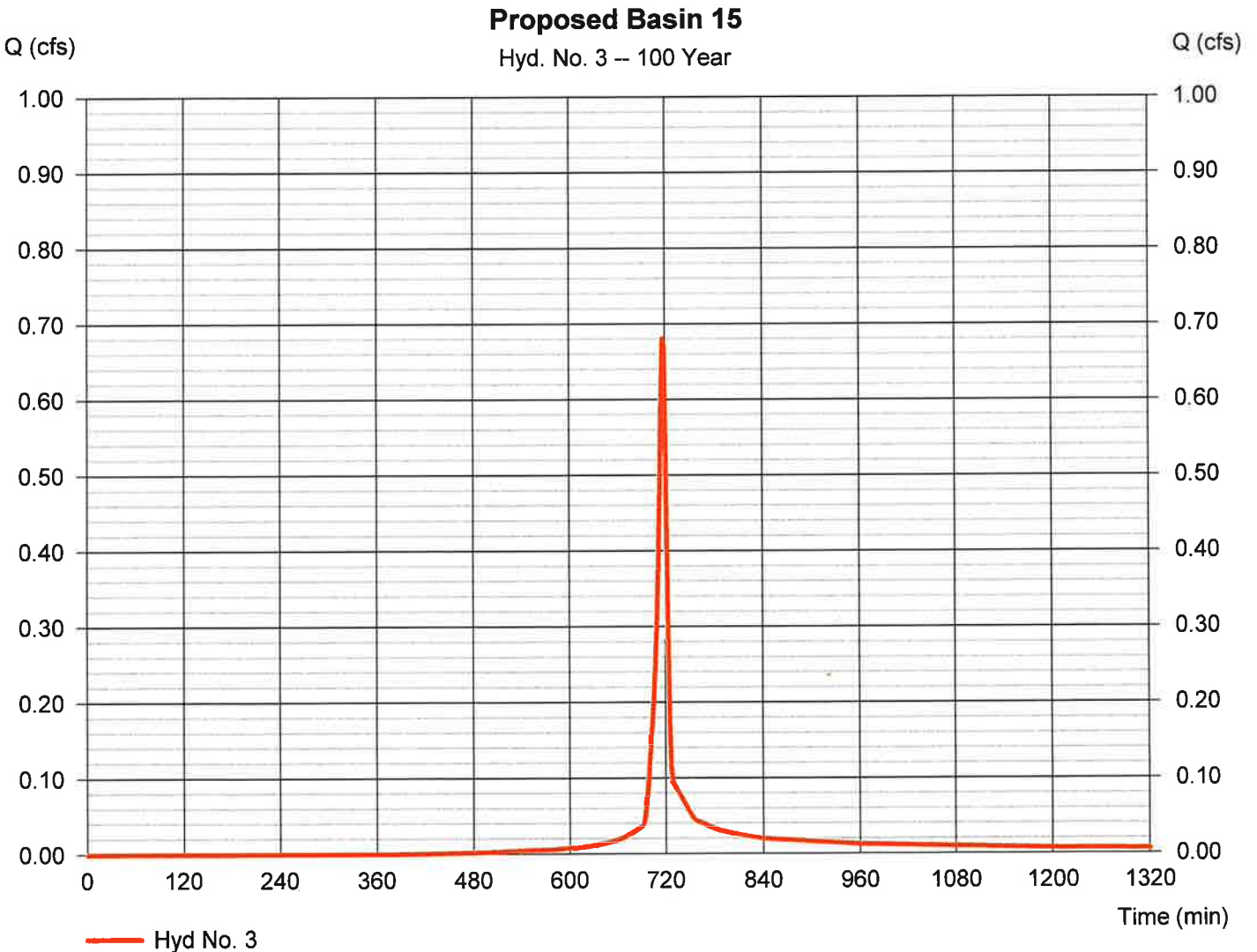
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 3

### Proposed Basin 15

Hydrograph type	= SCS Runoff	Peak discharge	= 0.681 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1,396 cuft
Drainage area	= 0.113 ac	Curve number	= 80.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

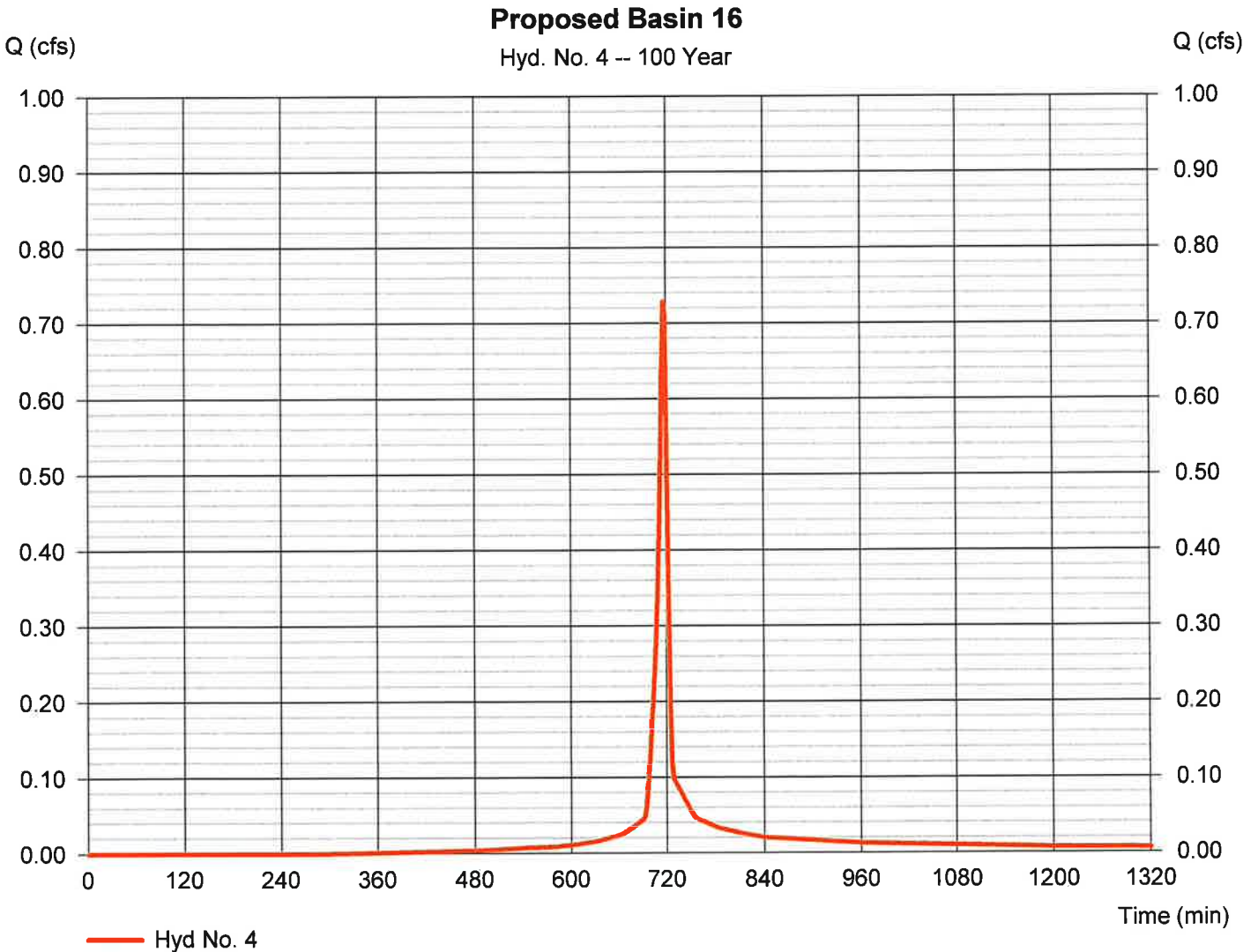
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 4

### Proposed Basin 16

Hydrograph type	= SCS Runoff	Peak discharge	= 0.728 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1,526 cuft
Drainage area	= 0.109 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

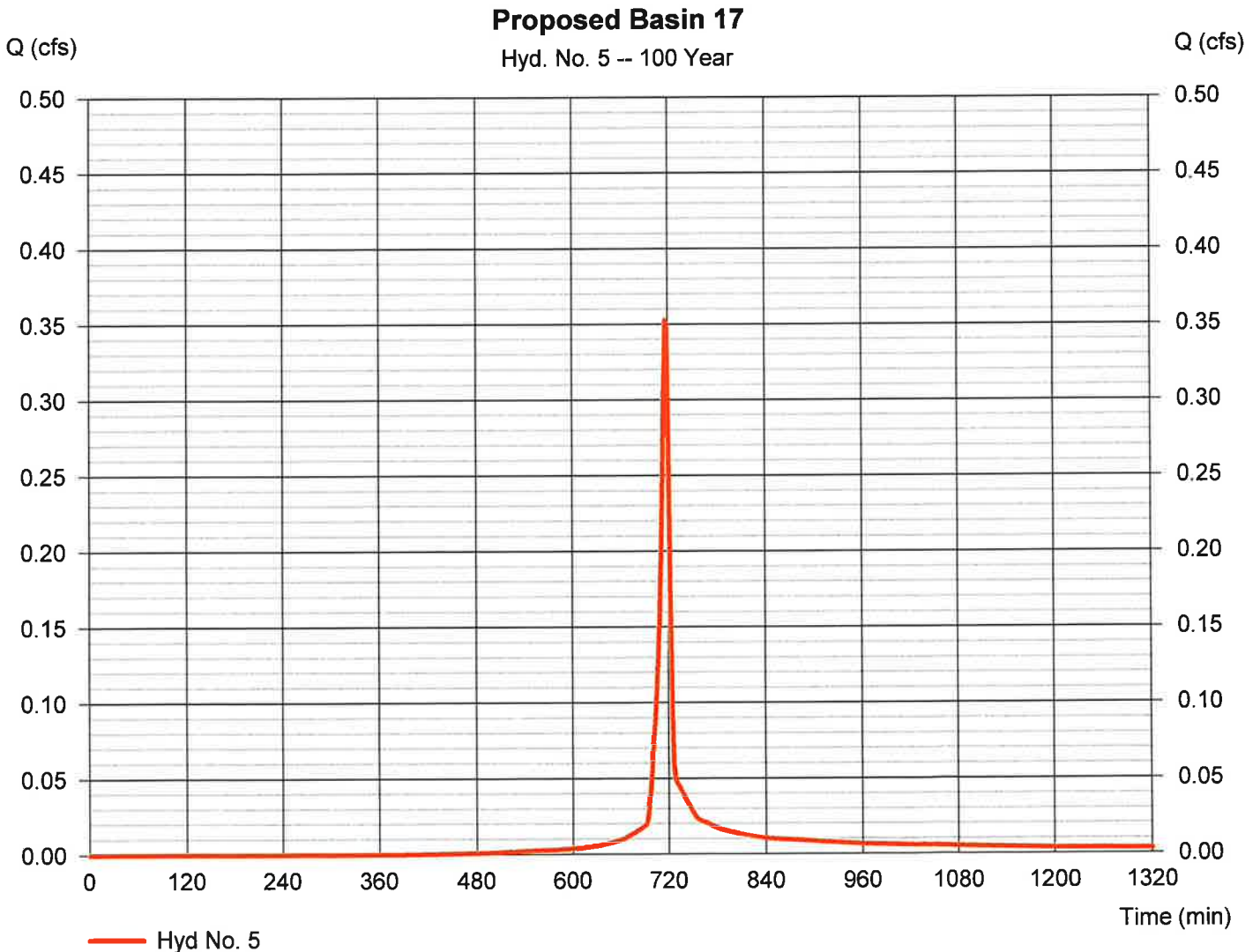
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Thursday, 03 / 30 / 2023

## Hyd. No. 5

### Proposed Basin 17

Hydrograph type	= SCS Runoff	Peak discharge	= 0.353 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 723 cuft
Drainage area	= 0.059 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

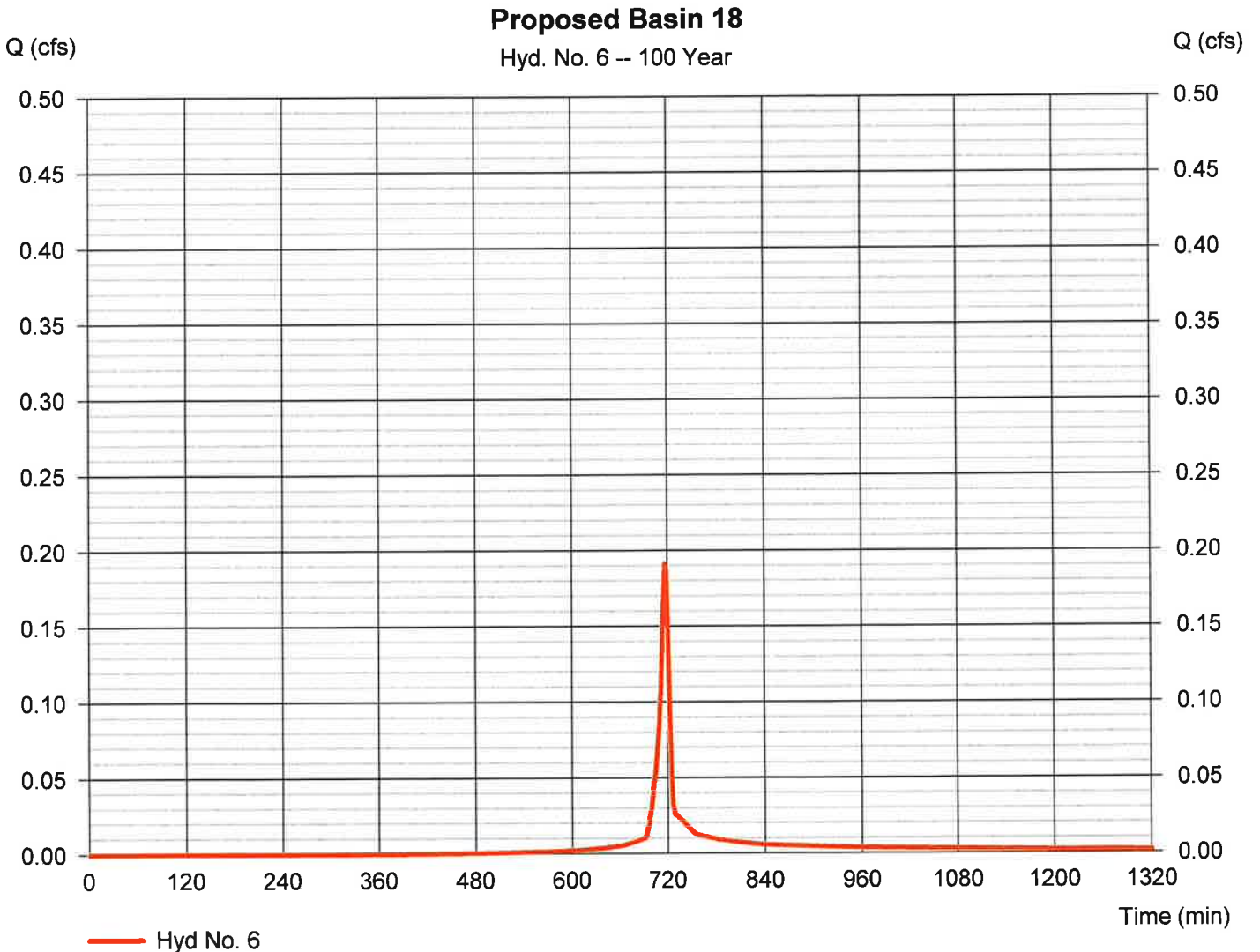
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 6

### Proposed Basin 18

Hydrograph type	= SCS Runoff	Peak discharge	= 0.191 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 392 cuft
Drainage area	= 0.032 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

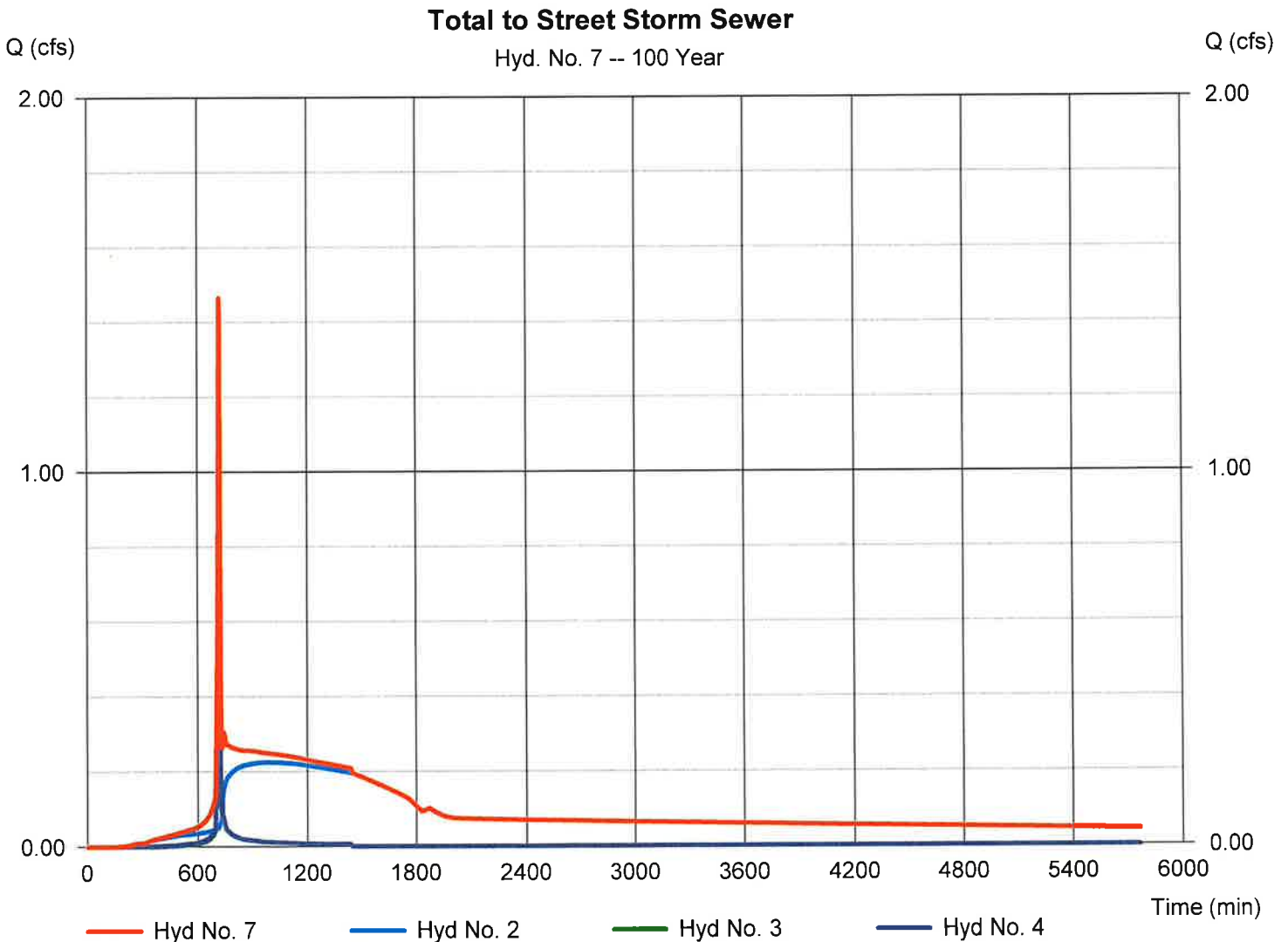
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 7

Total to Street Storm Sewer

Hydrograph type	= Combine	Peak discharge	= 1.466 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 30,336 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 0.222 ac



# Hydrograph Report

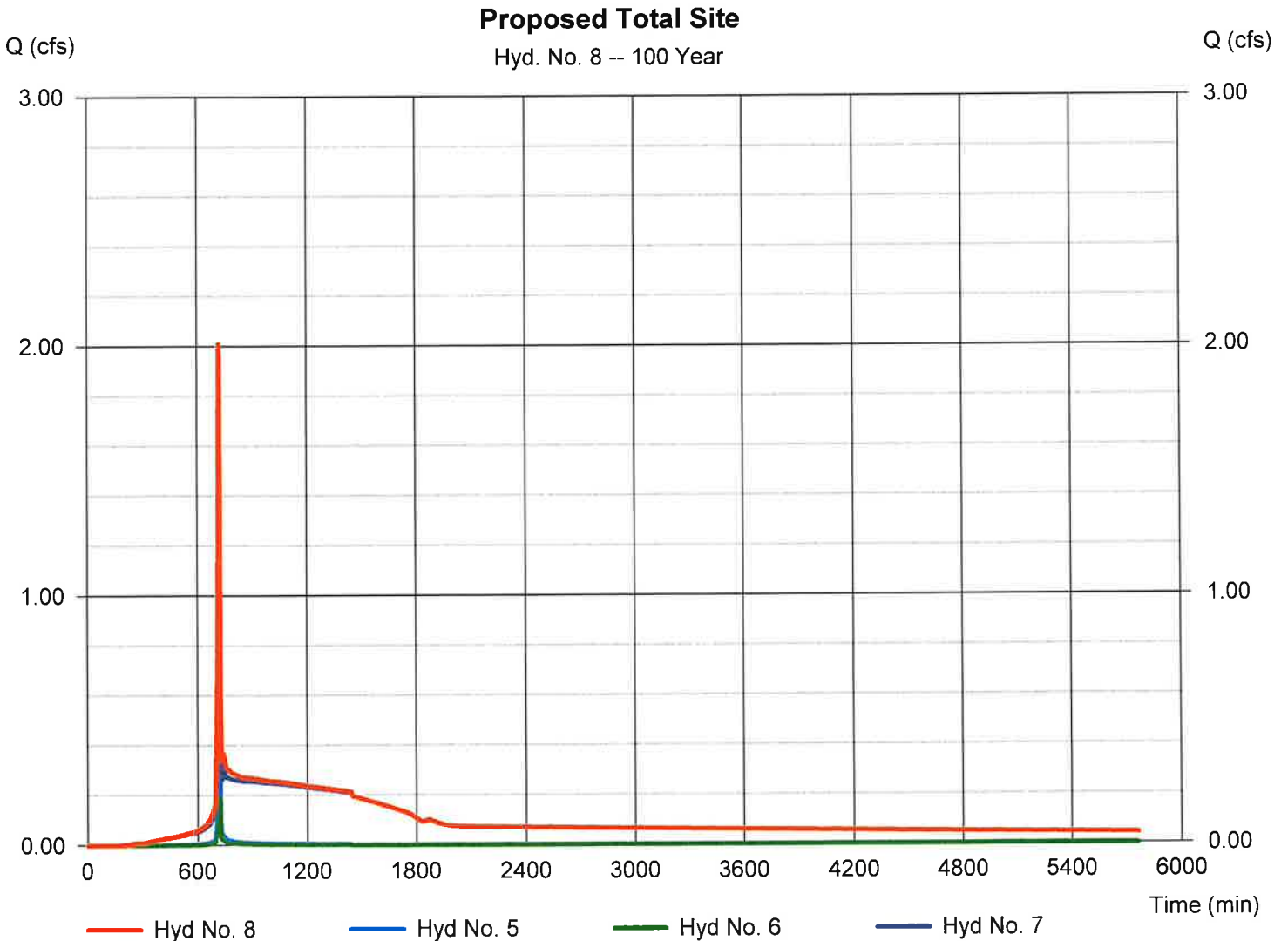
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 8

Proposed Total Site

Hydrograph type	= Combine	Peak discharge	= 2.011 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 31,451 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 0.091 ac



# Hydraflow Rainfall Report

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

Thursday, 03 / 30 / 2023

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	55.7621	10.3000	0.8820	-----
3	0.0000	0.0000	0.0000	-----
5	57.1954	9.4000	0.8251	-----
10	57.6989	8.8000	0.7922	-----
25	54.1161	7.6000	0.7404	-----
50	50.2122	6.6000	0.6979	-----
100	46.8747	5.7000	0.6592	-----

File name: Hancock County.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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.03	3.92	3.23	2.75	2.41	2.14	1.93	1.76	1.62	1.50	1.40	1.31
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	6.33	4.95	4.10	3.51	3.09	2.76	2.50	2.29	2.11	1.97	1.84	1.73
10	7.21	5.65	4.68	4.03	3.55	3.18	2.89	2.65	2.45	2.29	2.14	2.02
25	8.29	6.47	5.38	4.64	4.10	3.69	3.36	3.10	2.88	2.69	2.53	2.39
50	9.08	7.07	5.88	5.09	4.51	4.07	3.72	3.44	3.20	3.00	2.83	2.68
100	9.83	7.63	6.36	5.51	4.90	4.44	4.07	3.77	3.52	3.31	3.13	2.97

Tc = time in minutes. Values may exceed 60.

Precip. file name: G:\PCP files\Hancock County\Hancock County.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	0.00	2.71	0.00	0.00	4.05	0.00	0.00	5.80
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	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00

3/31/2023

# Appendix G

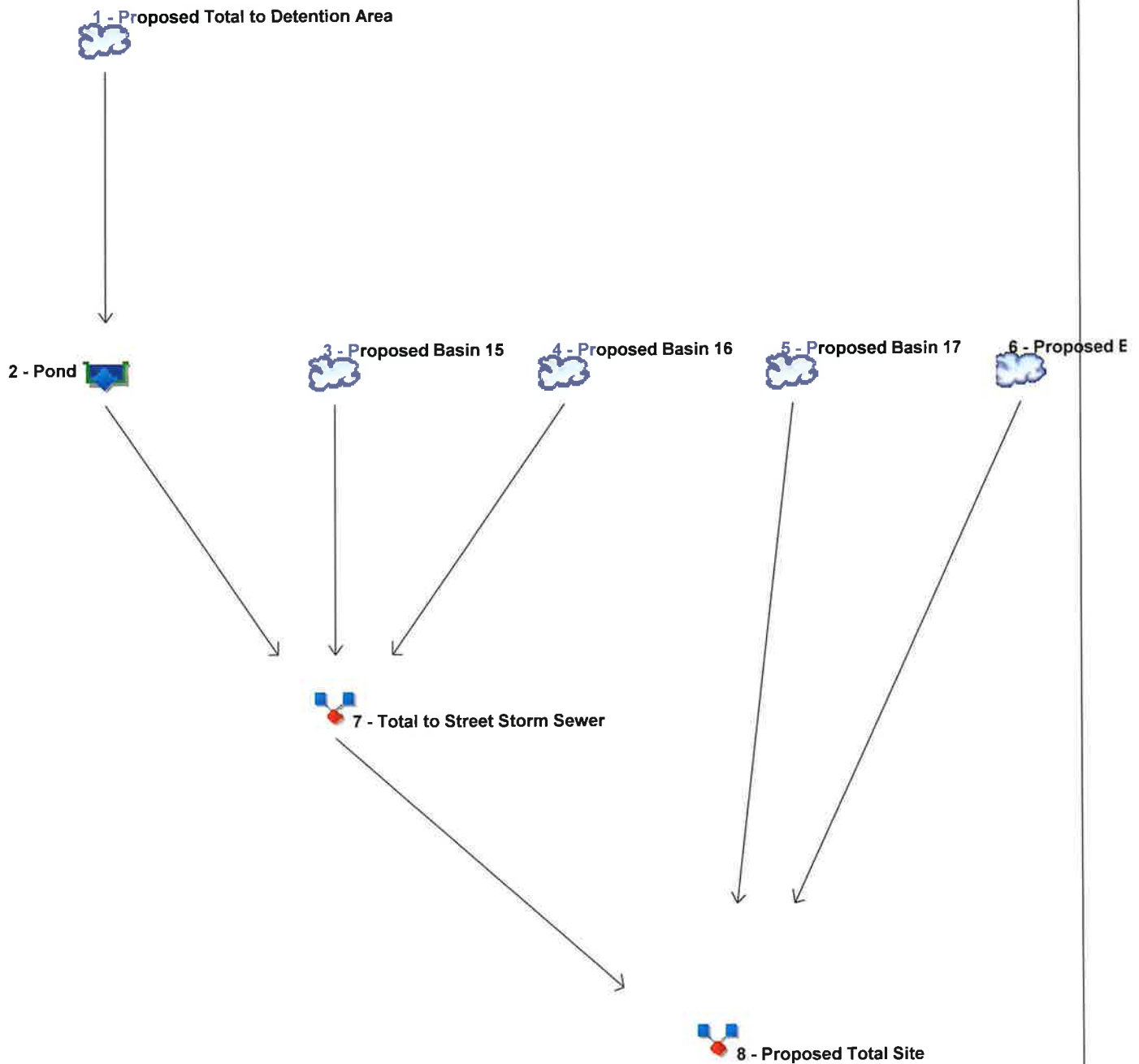
## Proposed Peak Flows Calculations with Routing for 4-Inch Orifice Size

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# Watershed Model Schematic

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



**Legend**

Hyd. Origin	Description
1	SCS Runoff Proposed Total to Detention Area
2	Reservoir Pond
3	SCS Runoff Proposed Basin 15
4	SCS Runoff Proposed Basin 16
5	SCS Runoff Proposed Basin 17
6	SCS Runoff Proposed Basin 18
7	Combine Total to Street Storm Sewer
8	Combine Proposed Total Site

# Hydrograph Return Period Recap

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

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	-----	-----	4.663	-----	-----	7.220	-----	-----	10.52	Proposed Total to Detention Area
2	Reservoir	1	-----	0.399	-----	-----	0.502	-----	-----	0.635	Pond
3	SCS Runoff	-----	-----	0.203	-----	-----	0.401	-----	-----	0.681	Proposed Basin 15
4	SCS Runoff	-----	-----	0.248	-----	-----	0.453	-----	-----	0.728	Proposed Basin 16
5	SCS Runoff	-----	-----	0.104	-----	-----	0.207	-----	-----	0.353	Proposed Basin 17
6	SCS Runoff	-----	-----	0.056	-----	-----	0.112	-----	-----	0.191	Proposed Basin 18
7	Combine	2, 3, 4,	-----	0.740	-----	-----	1.202	-----	-----	1.822	Total to Street Storm Sewer
8	Combine	5, 6, 7	-----	0.900	-----	-----	1.520	-----	-----	2.366	Proposed Total Site

# Hydrograph Summary Report

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

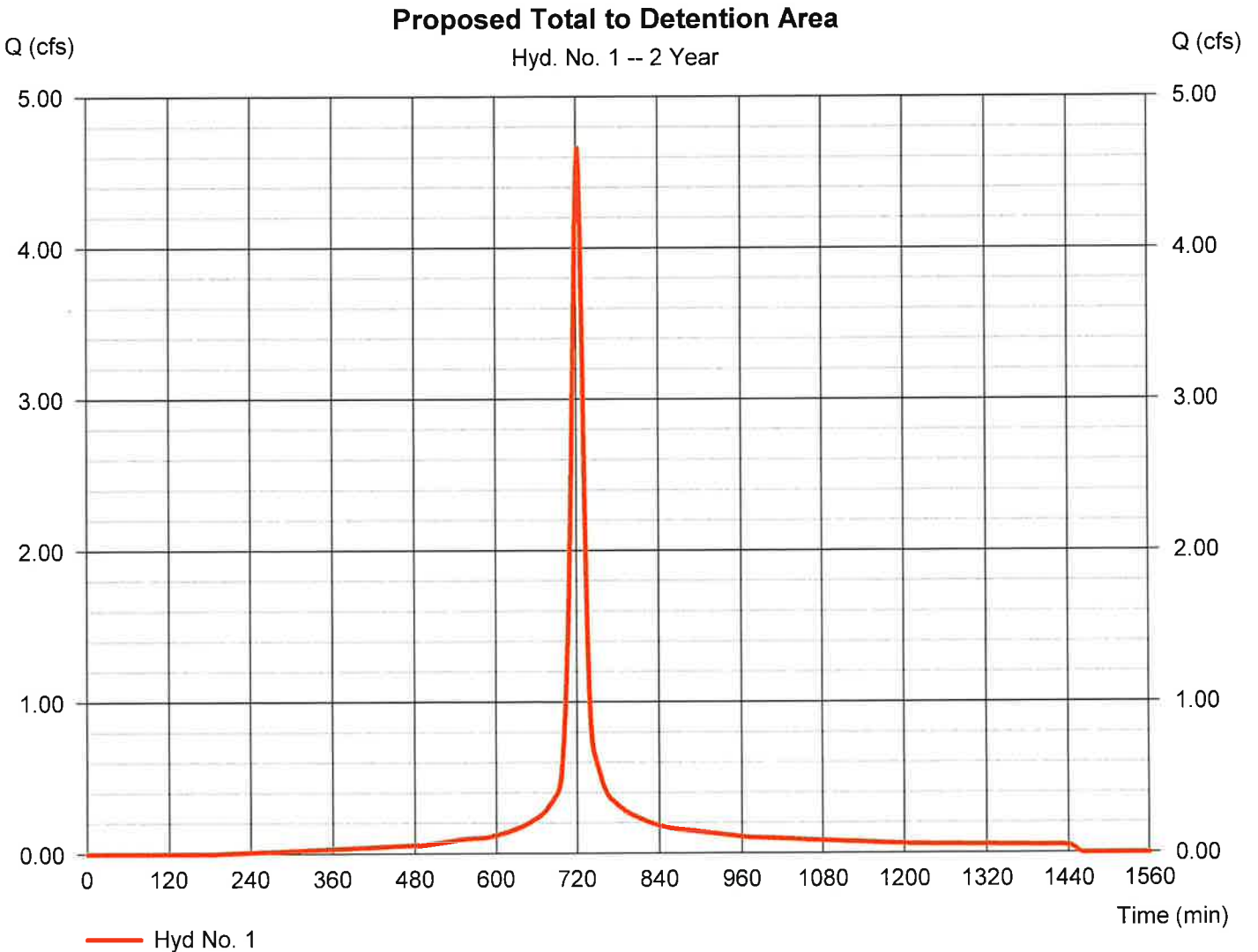
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description	
1	SCS Runoff	4.663	2	722	13,861	-----	-----	-----	Proposed Total to Detention Area	
2	Reservoir	0.399	2	764	13,824	1	854.21	7,317	Pond	
3	SCS Runoff	0.203	2	718	405	-----	-----	-----	Proposed Basin 15	
4	SCS Runoff	0.248	2	716	500	-----	-----	-----	Proposed Basin 16	
5	SCS Runoff	0.104	2	718	208	-----	-----	-----	Proposed Basin 17	
6	SCS Runoff	0.056	2	718	113	-----	-----	-----	Proposed Basin 18	
7	Combine	0.740	2	718	14,729	2, 3, 4,	-----	-----	Total to Street Storm Sewer	
8	Combine	0.900	2	718	15,051	5, 6, 7	-----	-----	Proposed Total Site	
Proposed Peak Flows 4-inch.gpw					Return Period: 2 Year			Thursday, 03 / 30 / 2023		

# Hydrograph Report

## Hyd. No. 1

### Proposed Total to Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 4.663 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 13,861 cuft
Drainage area	= 1.751 ac	Curve number	= 95.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

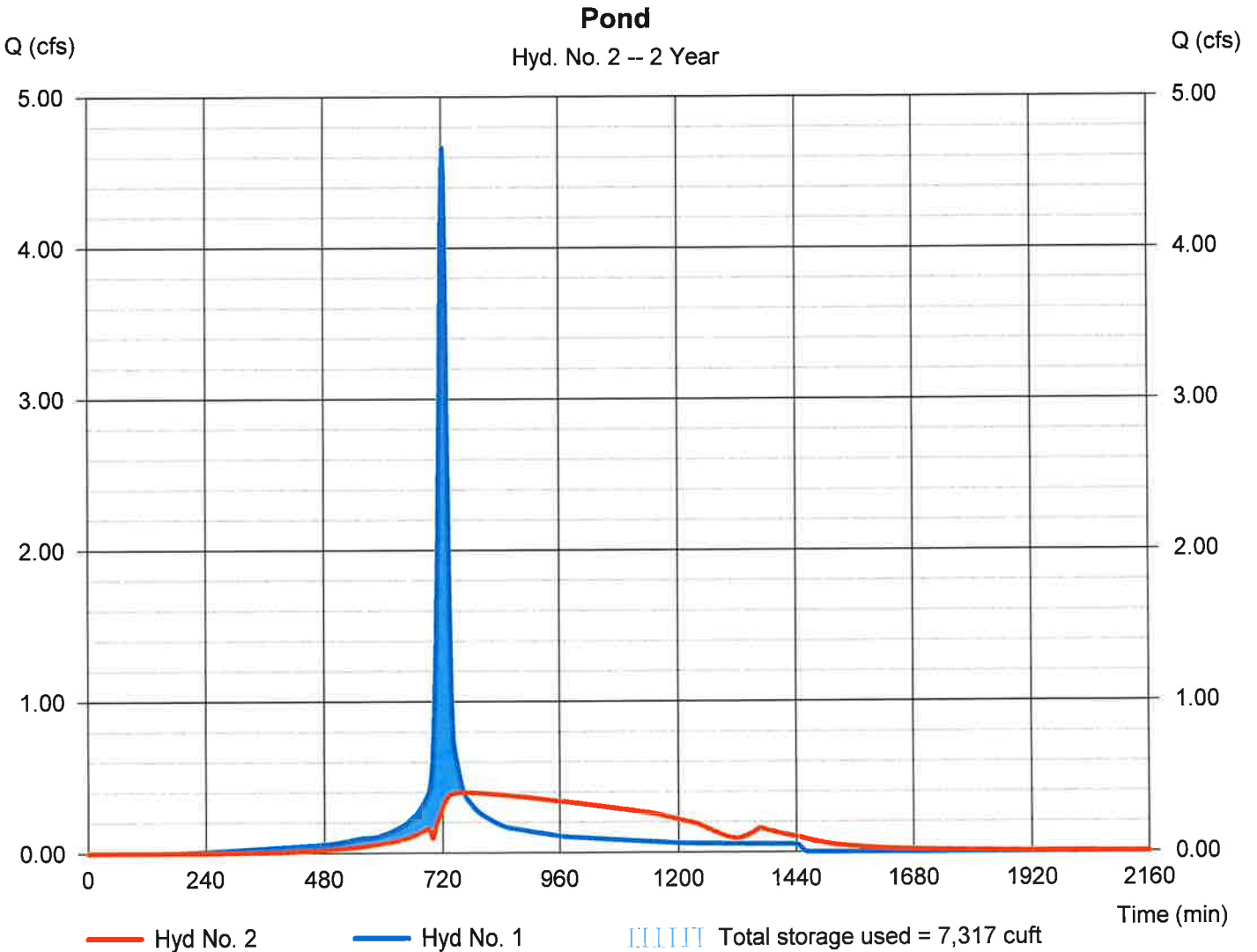
Thursday, 03 / 30 / 2023

## Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.399 cfs
Storm frequency	= 2 yrs	Time to peak	= 764 min
Time interval	= 2 min	Hyd. volume	= 13,824 cuft
Inflow hyd. No.	= 1 - Proposed Total to Detention Area	Max. Elevation	= 854.21 ft
Reservoir name	= <New Pond>	Max. Storage	= 7,317 cuft

Storage Indication method used.



# Pond Report

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

Thursday, 03 / 30 / 2023

## Pond No. 1 - <New Pond>

### Pond Data

UG Chambers -Invert elev. = 853.64 ft, Rise x Span = 2.05 x 4.00 ft, Barrel Len = 7.12 ft, No. Barrels = 305, Slope = 0.00%, Headers = No  
 Encasement -Invert elev. = 853.14 ft, Width = 4.75 ft, Height = 4.50 ft, Voids = 40.00%

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	853.14	n/a	0	0
0.45	853.59	n/a	1,857	1,857
0.90	854.04	n/a	3,929	5,786
1.35	854.49	n/a	4,085	9,872
1.80	854.94	n/a	3,847	13,719
2.25	855.39	n/a	3,409	17,127
2.70	855.84	n/a	2,409	19,536
3.15	856.29	n/a	1,857	21,393
3.60	856.74	n/a	1,857	23,250
4.05	857.19	n/a	1,857	25,107
4.50	857.64	n/a	1,857	26,964

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 4.00	Inactive	0.00	0.00
Span (in)	= 4.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 853.14	855.61	0.00	0.00
Length (ft)	= 0.50	0.00	0.00	0.00
Slope (%)	= 0.00	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	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 857.10	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
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	853.14	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.05	186	853.18	0.01 ic	---	---	---	0.00	---	---	---	---	---	0.005
0.09	371	853.23	0.02 ic	---	---	---	0.00	---	---	---	---	---	0.019
0.14	557	853.28	0.04 ic	---	---	---	0.00	---	---	---	---	---	0.042
0.18	743	853.32	0.07 ic	---	---	---	0.00	---	---	---	---	---	0.069
0.22	929	853.36	0.10 ic	---	---	---	0.00	---	---	---	---	---	0.101
0.27	1,114	853.41	0.13 ic	---	---	---	0.00	---	---	---	---	---	0.134
0.31	1,300	853.45	0.16 ic	---	---	---	0.00	---	---	---	---	---	0.163
0.36	1,486	853.50	0.09 oc	---	---	---	0.00	---	---	---	---	---	0.091
0.40	1,671	853.54	0.15 oc	---	---	---	0.00	---	---	---	---	---	0.150
0.45	1,857	853.59	0.19 oc	---	---	---	0.00	---	---	---	---	---	0.191
0.50	2,250	853.64	0.22 oc	---	---	---	0.00	---	---	---	---	---	0.225
0.54	2,643	853.68	0.25 oc	---	---	---	0.00	---	---	---	---	---	0.254
0.58	3,036	853.72	0.27 ic	---	---	---	0.00	---	---	---	---	---	0.272
0.63	3,429	853.77	0.29 ic	---	---	---	0.00	---	---	---	---	---	0.286
0.68	3,822	853.81	0.30 ic	---	---	---	0.00	---	---	---	---	---	0.300
0.72	4,215	853.86	0.31 ic	---	---	---	0.00	---	---	---	---	---	0.312
0.76	4,607	853.90	0.32 ic	---	---	---	0.00	---	---	---	---	---	0.325
0.81	5,000	853.95	0.34 ic	---	---	---	0.00	---	---	---	---	---	0.337
0.86	5,393	853.99	0.35 ic	---	---	---	0.00	---	---	---	---	---	0.349
0.90	5,786	854.04	0.36 ic	---	---	---	0.00	---	---	---	---	---	0.360
0.94	6,195	854.09	0.37 ic	---	---	---	0.00	---	---	---	---	---	0.371
0.99	6,603	854.13	0.38 ic	---	---	---	0.00	---	---	---	---	---	0.381
1.03	7,012	854.17	0.39 ic	---	---	---	0.00	---	---	---	---	---	0.391
1.08	7,420	854.22	0.40 ic	---	---	---	0.00	---	---	---	---	---	0.402
1.13	7,829	854.27	0.41 ic	---	---	---	0.00	---	---	---	---	---	0.411
1.17	8,237	854.31	0.42 ic	---	---	---	0.00	---	---	---	---	---	0.421
1.22	8,646	854.35	0.43 ic	---	---	---	0.00	---	---	---	---	---	0.430
1.26	9,055	854.40	0.44 ic	---	---	---	0.00	---	---	---	---	---	0.439

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<New Pond>

**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
1.30	9,463	854.44	0.45 ic	---	---	---	0.00	---	---	---	---	---	0.448
1.35	9,872	854.49	0.46 ic	---	---	---	0.00	---	---	---	---	---	0.457
1.39	10,256	854.53	0.47 ic	---	---	---	0.00	---	---	---	---	---	0.466
1.44	10,641	854.58	0.47 ic	---	---	---	0.00	---	---	---	---	---	0.474
1.49	11,026	854.62	0.48 ic	---	---	---	0.00	---	---	---	---	---	0.482
1.53	11,410	854.67	0.49 ic	---	---	---	0.00	---	---	---	---	---	0.491
1.58	11,795	854.71	0.50 ic	---	---	---	0.00	---	---	---	---	---	0.499
1.62	12,180	854.76	0.51 ic	---	---	---	0.00	---	---	---	---	---	0.506
1.66	12,564	854.80	0.51 ic	---	---	---	0.00	---	---	---	---	---	0.514
1.71	12,949	854.85	0.52 ic	---	---	---	0.00	---	---	---	---	---	0.522
1.75	13,334	854.89	0.53 ic	---	---	---	0.00	---	---	---	---	---	0.529
1.80	13,719	854.94	0.54 ic	---	---	---	0.00	---	---	---	---	---	0.537
1.85	14,059	854.98	0.54 ic	---	---	---	0.00	---	---	---	---	---	0.544
1.89	14,400	855.03	0.55 ic	---	---	---	0.00	---	---	---	---	---	0.552
1.93	14,741	855.08	0.56 ic	---	---	---	0.00	---	---	---	---	---	0.559
1.98	15,082	855.12	0.57 ic	---	---	---	0.00	---	---	---	---	---	0.566
2.03	15,423	855.16	0.57 ic	---	---	---	0.00	---	---	---	---	---	0.573
2.07	15,764	855.21	0.58 ic	---	---	---	0.00	---	---	---	---	---	0.580
2.12	16,104	855.25	0.59 ic	---	---	---	0.00	---	---	---	---	---	0.586
2.16	16,445	855.30	0.59 ic	---	---	---	0.00	---	---	---	---	---	0.593
2.20	16,786	855.34	0.60 ic	---	---	---	0.00	---	---	---	---	---	0.600
2.25	17,127	855.39	0.61 ic	---	---	---	0.00	---	---	---	---	---	0.606
2.30	17,368	855.43	0.61 ic	---	---	---	0.00	---	---	---	---	---	0.613
2.34	17,609	855.48	0.62 ic	---	---	---	0.00	---	---	---	---	---	0.619
2.38	17,850	855.53	0.63 ic	---	---	---	0.00	---	---	---	---	---	0.626
2.43	18,090	855.57	0.63 ic	---	---	---	0.00	---	---	---	---	---	0.632
2.47	18,331	855.61	0.64 ic	---	---	---	0.00	---	---	---	---	---	0.638
2.52	18,572	855.66	0.64 ic	---	---	---	0.00	---	---	---	---	---	0.644
2.57	18,813	855.70	0.65 ic	---	---	---	0.00	---	---	---	---	---	0.651
2.61	19,054	855.75	0.66 ic	---	---	---	0.00	---	---	---	---	---	0.657
2.66	19,295	855.79	0.66 ic	---	---	---	0.00	---	---	---	---	---	0.663
2.70	19,536	855.84	0.67 ic	---	---	---	0.00	---	---	---	---	---	0.669
2.74	19,721	855.89	0.67 ic	---	---	---	0.00	---	---	---	---	---	0.675
2.79	19,907	855.93	0.68 ic	---	---	---	0.00	---	---	---	---	---	0.680
2.84	20,093	855.97	0.69 ic	---	---	---	0.00	---	---	---	---	---	0.686
2.88	20,278	856.02	0.69 ic	---	---	---	0.00	---	---	---	---	---	0.692
2.92	20,464	856.06	0.70 ic	---	---	---	0.00	---	---	---	---	---	0.698
2.97	20,650	856.11	0.70 ic	---	---	---	0.00	---	---	---	---	---	0.703
3.02	20,836	856.15	0.71 ic	---	---	---	0.00	---	---	---	---	---	0.709
3.06	21,021	856.20	0.71 ic	---	---	---	0.00	---	---	---	---	---	0.715
3.11	21,207	856.24	0.72 ic	---	---	---	0.00	---	---	---	---	---	0.720
3.15	21,393	856.29	0.73 ic	---	---	---	0.00	---	---	---	---	---	0.726
3.19	21,578	856.34	0.73 ic	---	---	---	0.00	---	---	---	---	---	0.731
3.24	21,764	856.38	0.74 ic	---	---	---	0.00	---	---	---	---	---	0.737
3.29	21,950	856.42	0.74 ic	---	---	---	0.00	---	---	---	---	---	0.742
3.33	22,136	856.47	0.75 ic	---	---	---	0.00	---	---	---	---	---	0.747
3.38	22,321	856.52	0.75 ic	---	---	---	0.00	---	---	---	---	---	0.753
3.42	22,507	856.56	0.76 ic	---	---	---	0.00	---	---	---	---	---	0.758
3.47	22,693	856.60	0.76 ic	---	---	---	0.00	---	---	---	---	---	0.763
3.51	22,878	856.65	0.77 ic	---	---	---	0.00	---	---	---	---	---	0.768
3.56	23,064	856.69	0.77 ic	---	---	---	0.00	---	---	---	---	---	0.773
3.60	23,250	856.74	0.78 ic	---	---	---	0.00	---	---	---	---	---	0.778
3.64	23,436	856.78	0.78 ic	---	---	---	0.00	---	---	---	---	---	0.784
3.69	23,621	856.83	0.79 ic	---	---	---	0.00	---	---	---	---	---	0.789
3.73	23,807	856.87	0.79 ic	---	---	---	0.00	---	---	---	---	---	0.794
3.78	23,993	856.92	0.80 ic	---	---	---	0.00	---	---	---	---	---	0.799
3.83	24,178	856.96	0.80 ic	---	---	---	0.00	---	---	---	---	---	0.804
3.87	24,364	857.01	0.81 ic	---	---	---	0.00	---	---	---	---	---	0.808
3.92	24,550	857.05	0.81 ic	---	---	---	0.00	---	---	---	---	---	0.813
3.96	24,735	857.10	0.82 ic	---	---	---	0.00	---	---	---	---	---	0.818
4.01	24,921	857.14	0.82 ic	---	---	---	0.16	---	---	---	---	---	0.981
4.05	25,107	857.19	0.83 ic	---	---	---	0.45	---	---	---	---	---	1.278
4.09	25,293	857.23	0.83 ic	---	---	---	0.83	---	---	---	---	---	1.659
4.14	25,478	857.28	0.84 ic	---	---	---	1.27	---	---	---	---	---	2.110
4.18	25,664	857.33	0.84 ic	---	---	---	1.78	---	---	---	---	---	2.620
4.23	25,850	857.37	0.85 ic	---	---	---	2.33	---	---	---	---	---	3.181
4.28	26,035	857.41	0.85 ic	---	---	---	2.94	---	---	---	---	---	3.794
4.32	26,221	857.46	0.86 ic	---	---	---	3.60	---	---	---	---	---	4.451
4.37	26,407	857.50	0.86 ic	---	---	---	4.29	---	---	---	---	---	5.151

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&lt;New Pond&gt;

**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
4.41	26,593	857.55	0.87 ic	---	---	---	5.03	---	---	---	---	---	5.891
4.46	26,778	857.59	0.87 ic	---	---	---	5.80	---	---	---	---	---	6.665
4.50	26,964	857.64	0.87 ic	---	---	---	6.61	---	---	---	---	---	7.482

...End

# Hydrograph Report

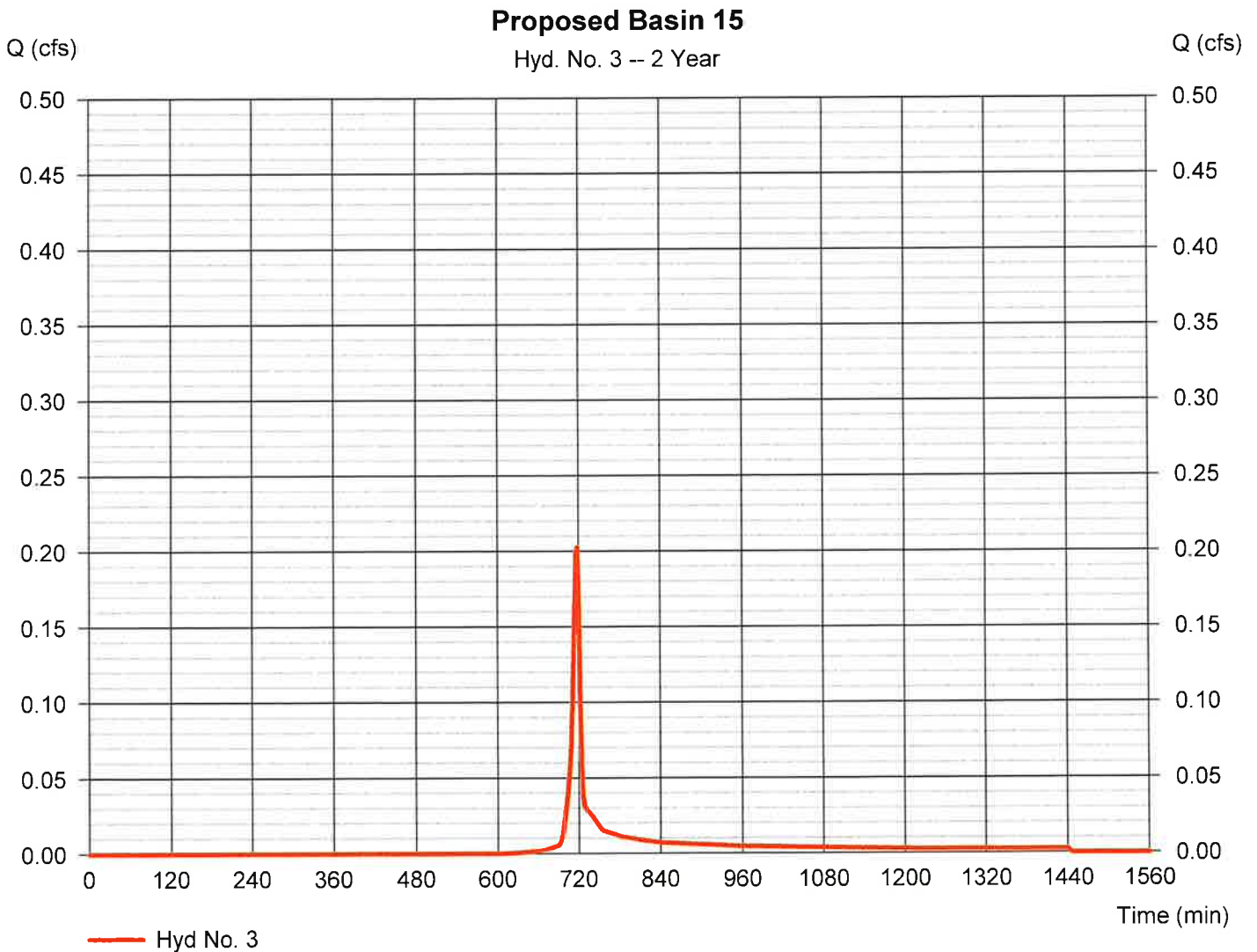
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 3

Proposed Basin 15

Hydrograph type	= SCS Runoff	Peak discharge	= 0.203 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 405 cuft
Drainage area	= 0.113 ac	Curve number	= 80.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

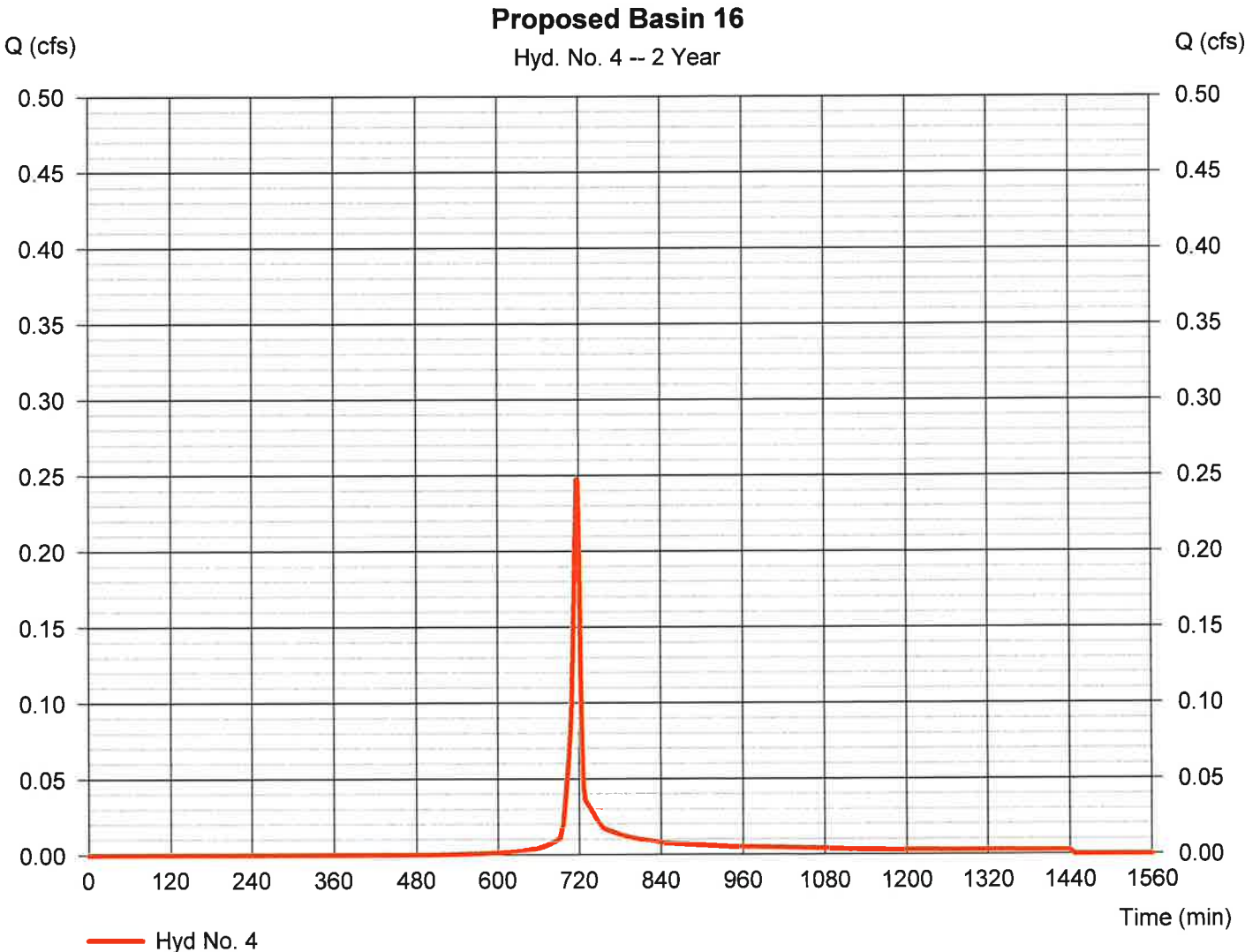
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 4

Proposed Basin 16

Hydrograph type	= SCS Runoff	Peak discharge	= 0.248 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 500 cuft
Drainage area	= 0.109 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

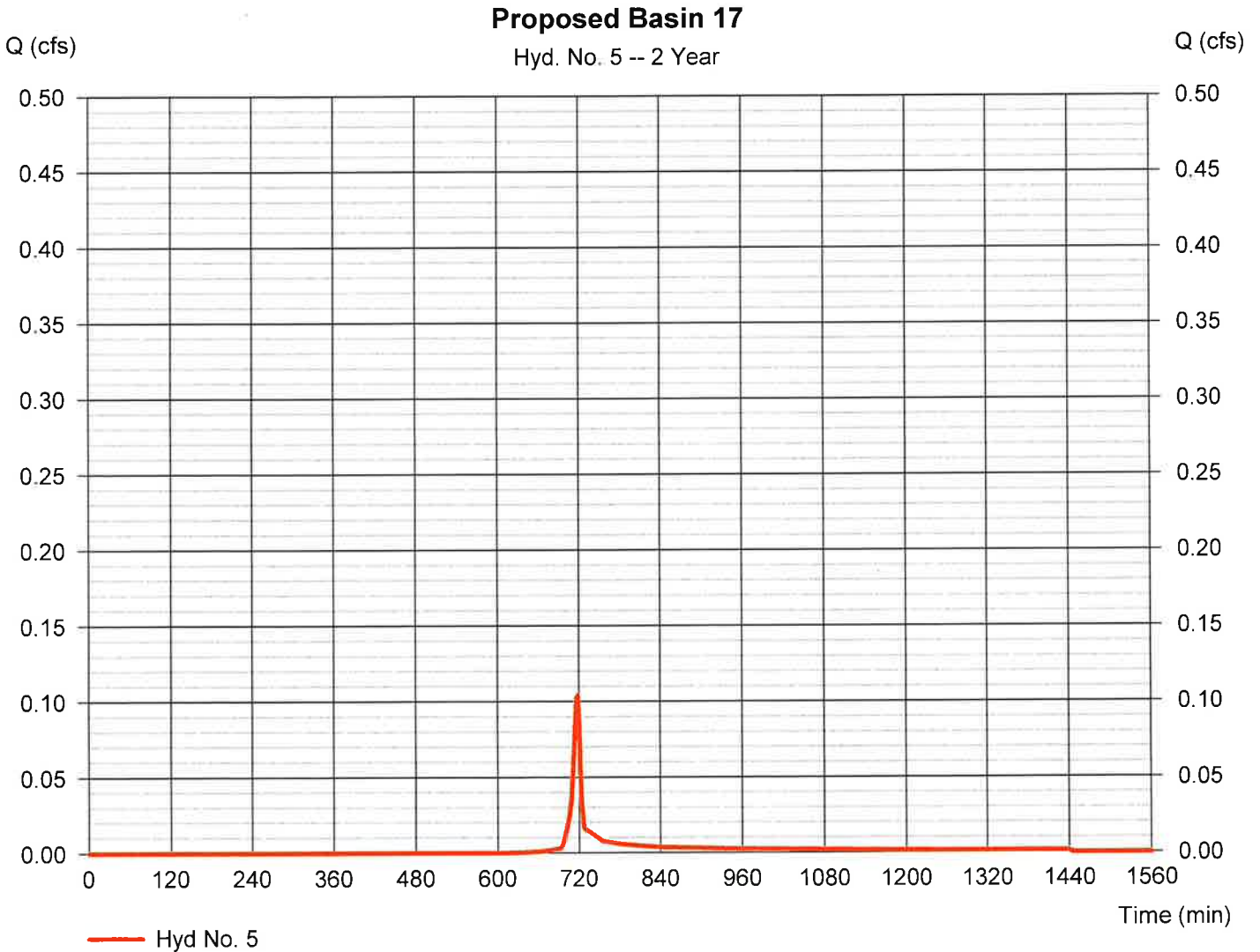
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 5

Proposed Basin 17

Hydrograph type	= SCS Runoff	Peak discharge	= 0.104 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 208 cuft
Drainage area	= 0.059 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

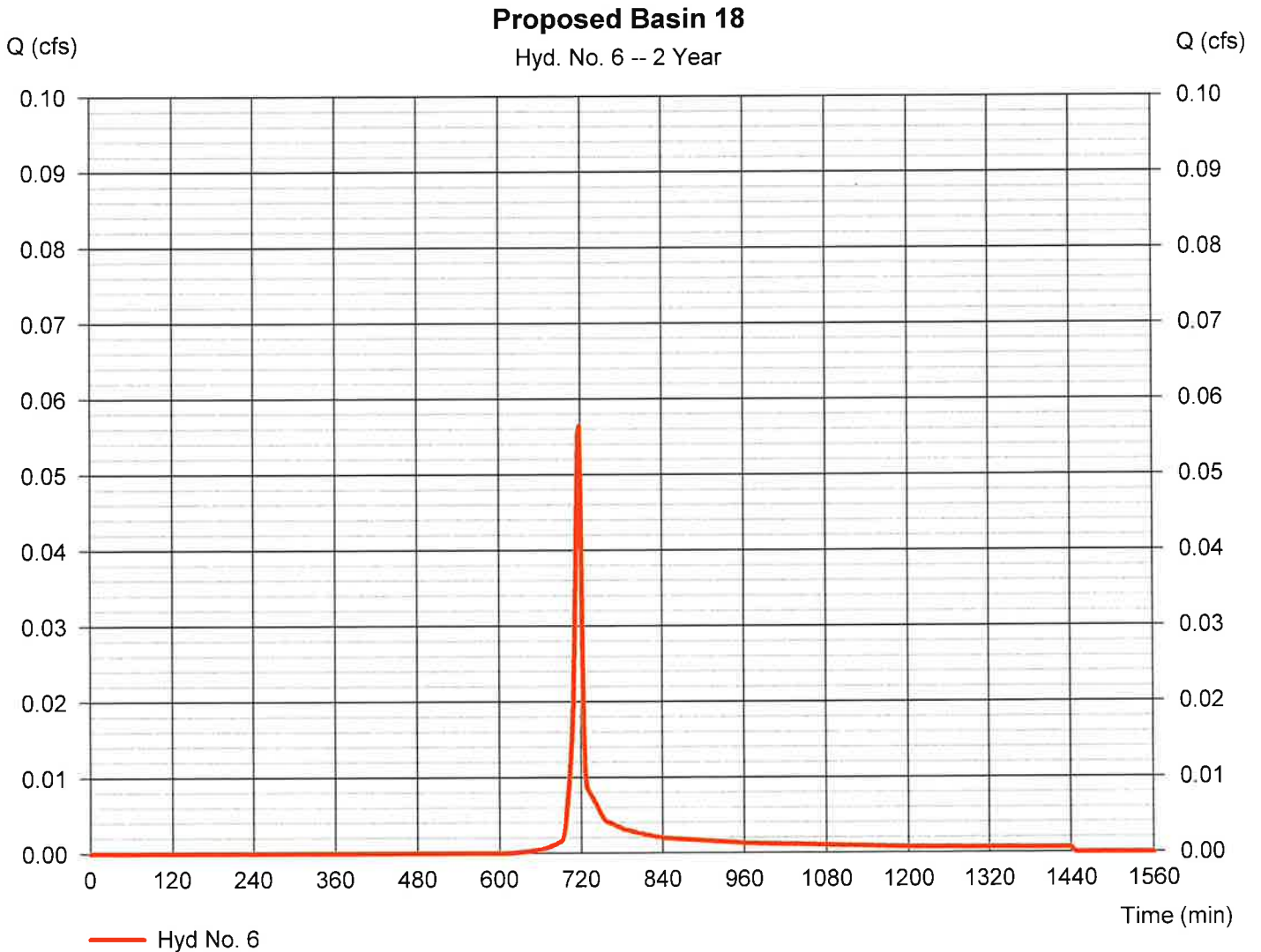
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 6

Proposed Basin 18

Hydrograph type	= SCS Runoff	Peak discharge	= 0.056 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 113 cuft
Drainage area	= 0.032 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

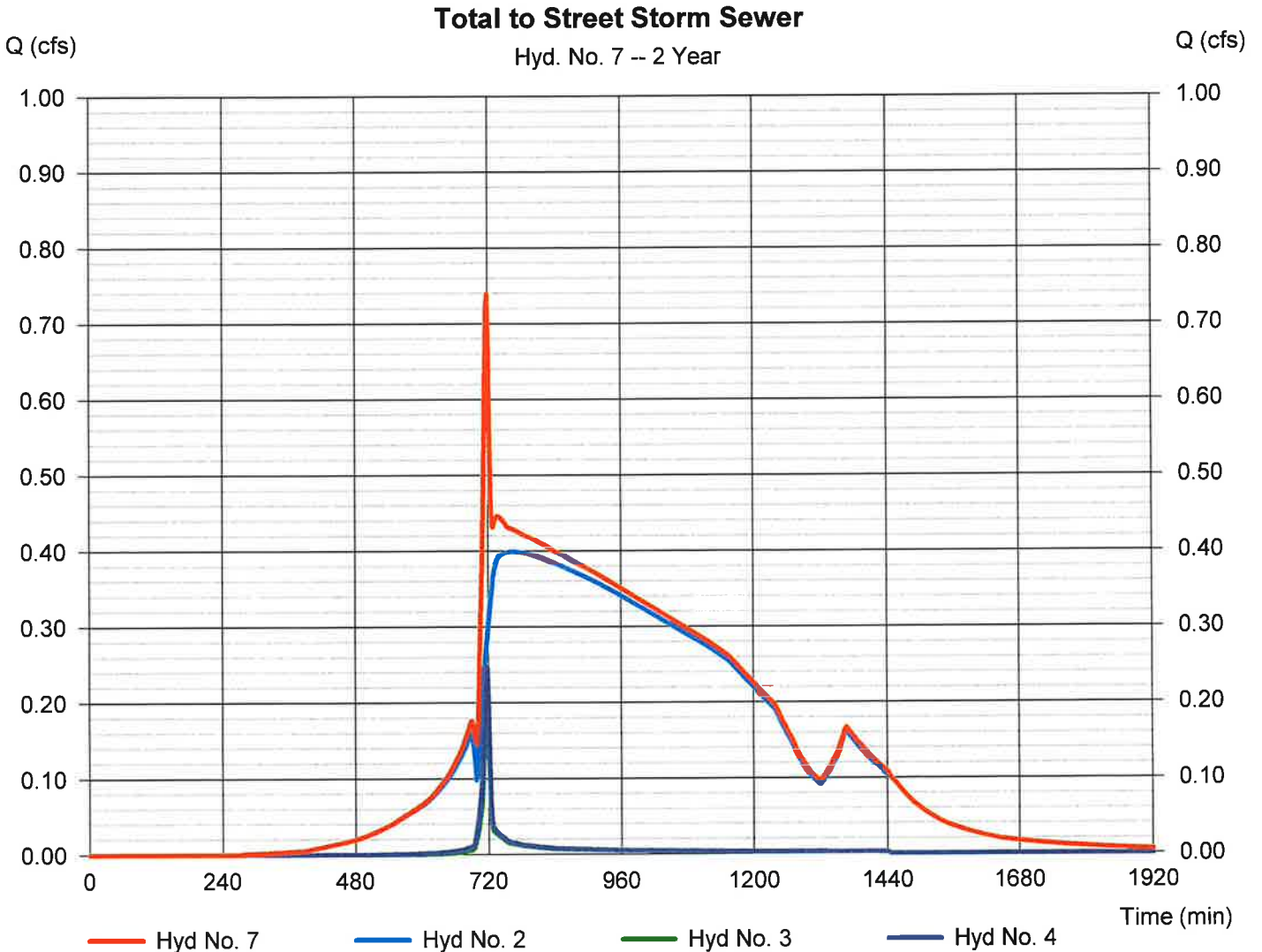
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 7

Total to Street Storm Sewer

Hydrograph type	= Combine	Peak discharge	= 0.740 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 14,729 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 0.222 ac



# Hydrograph Report

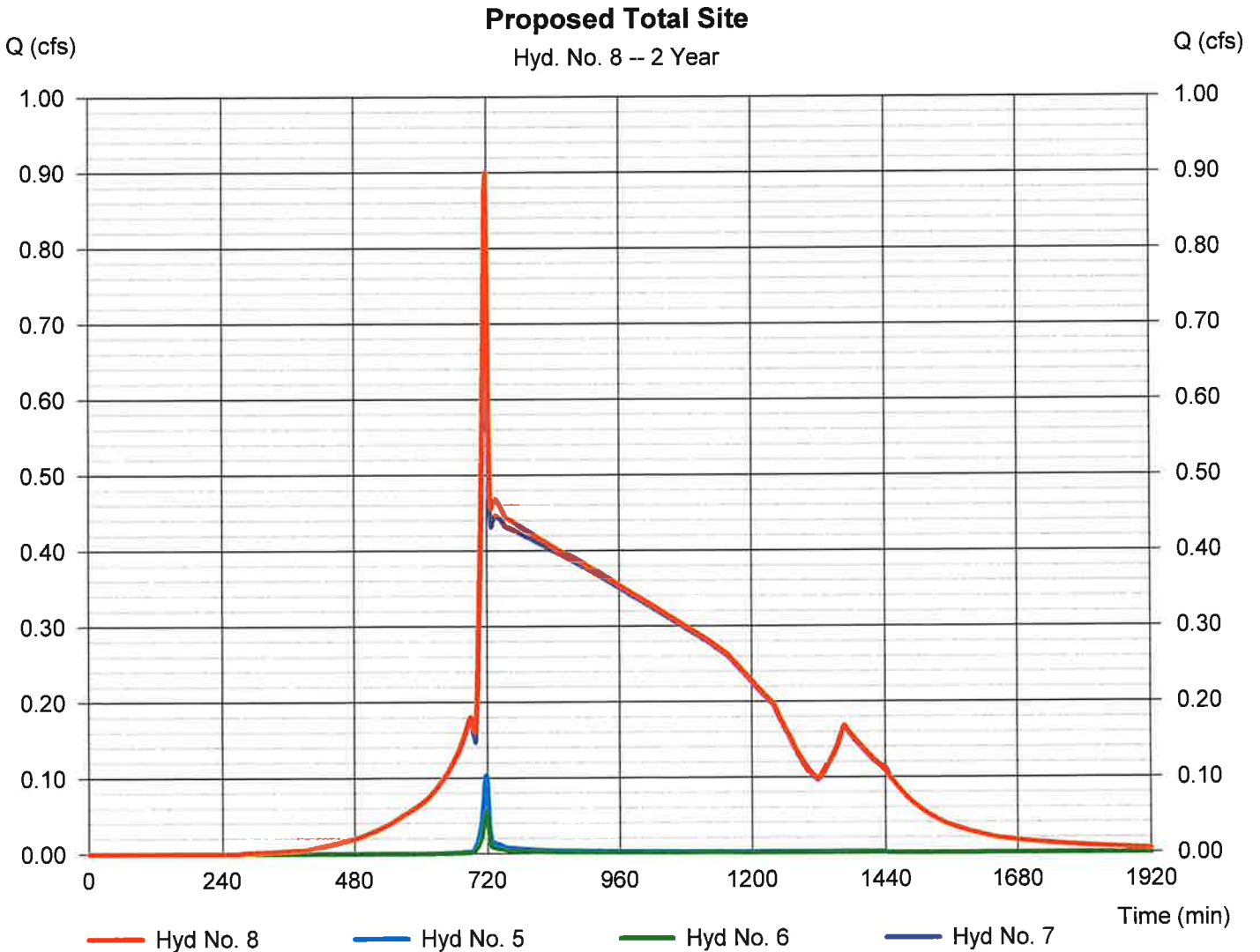
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 8

Proposed Total Site

Hydrograph type	= Combine	Peak discharge	= 0.900 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 15,051 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 0.091 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	7.220	2	722	22,041	-----	-----	-----	Proposed Total to Detention Area	
2	Reservoir	0.502	2	776	22,004	1	854.73	11,938	Pond	
3	SCS Runoff	0.401	2	716	810	-----	-----	-----	Proposed Basin 15	
4	SCS Runoff	0.453	2	716	928	-----	-----	-----	Proposed Basin 16	
5	SCS Runoff	0.207	2	716	418	-----	-----	-----	Proposed Basin 17	
6	SCS Runoff	0.112	2	716	227	-----	-----	-----	Proposed Basin 18	
7	Combine	1.202	2	718	23,743	2, 3, 4,	-----	-----	Total to Street Storm Sewer	
8	Combine	1.520	2	718	24,388	5, 6, 7	-----	-----	Proposed Total Site	
Proposed Peak Flows 4-inch.gpw					Return Period: 10 Year			Thursday, 03 / 30 / 2023		

# Hydrograph Report

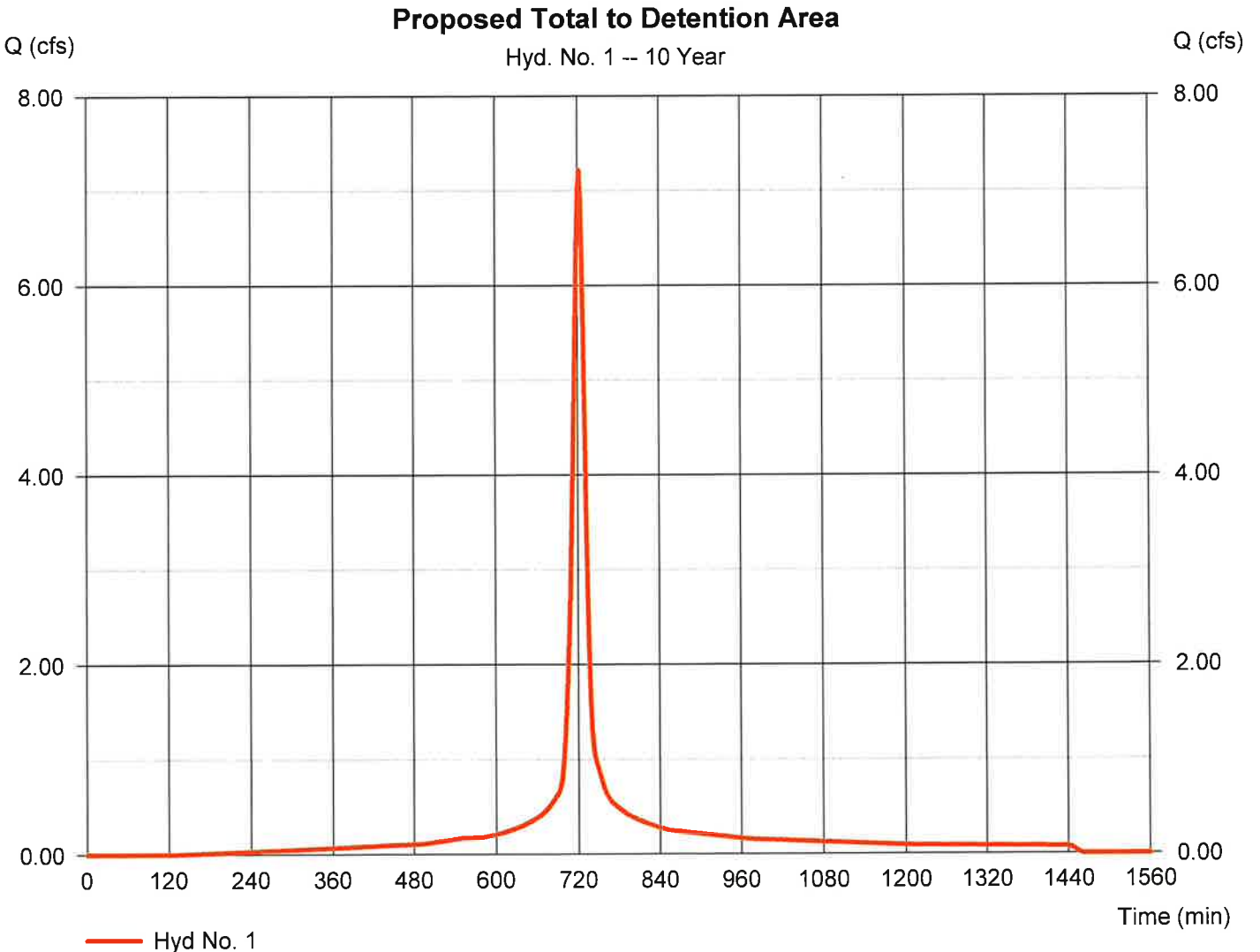
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 1

### Proposed Total to Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 7.220 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 22,041 cuft
Drainage area	= 1.751 ac	Curve number	= 95.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

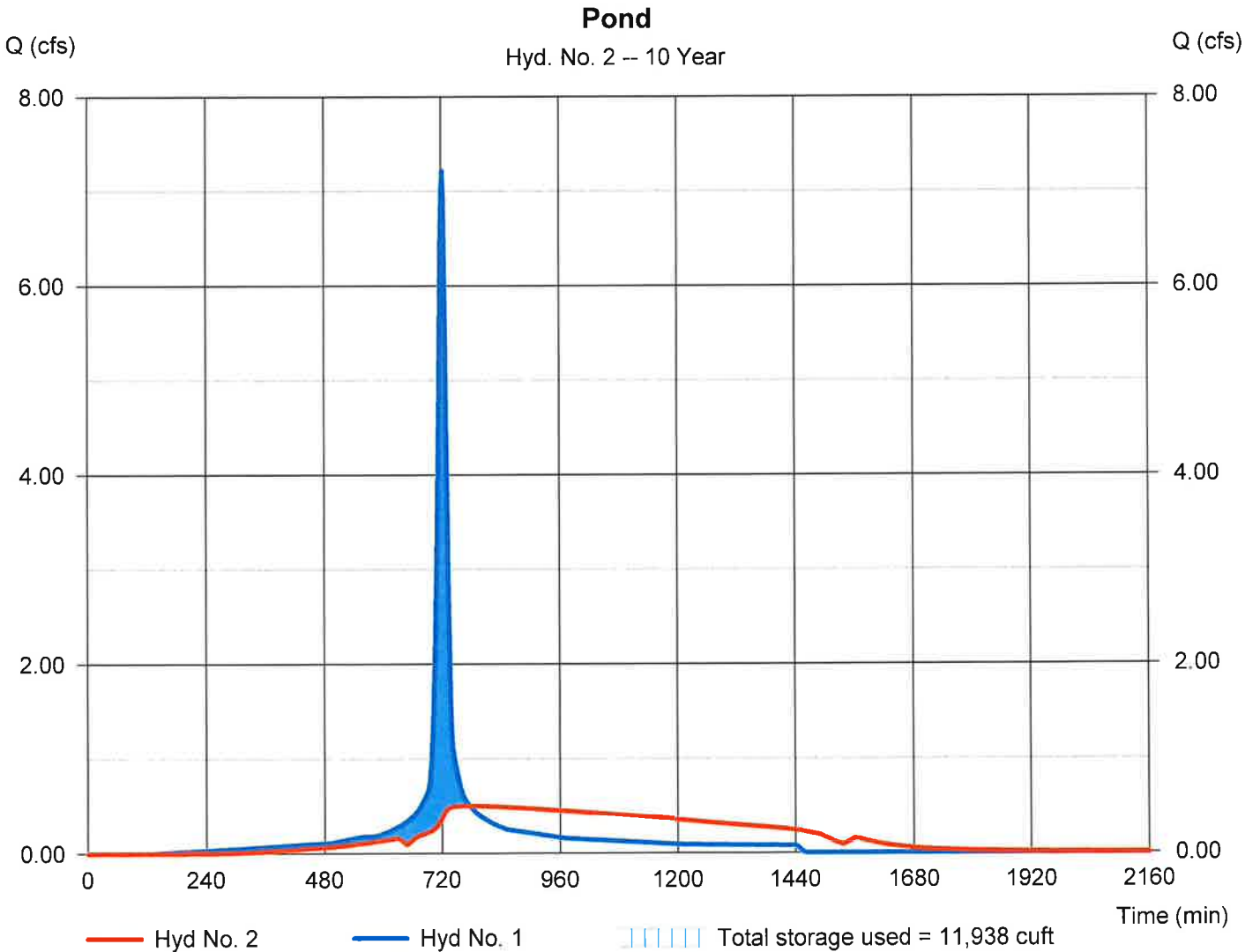
Thursday, 03 / 30 / 2023

## Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.502 cfs
Storm frequency	= 10 yrs	Time to peak	= 776 min
Time interval	= 2 min	Hyd. volume	= 22,004 cuft
Inflow hyd. No.	= 1 - Proposed Total to Detention Area	Max. Elevation	= 854.73 ft
Reservoir name	= <New Pond>	Max. Storage	= 11,938 cuft

Storage Indication method used.

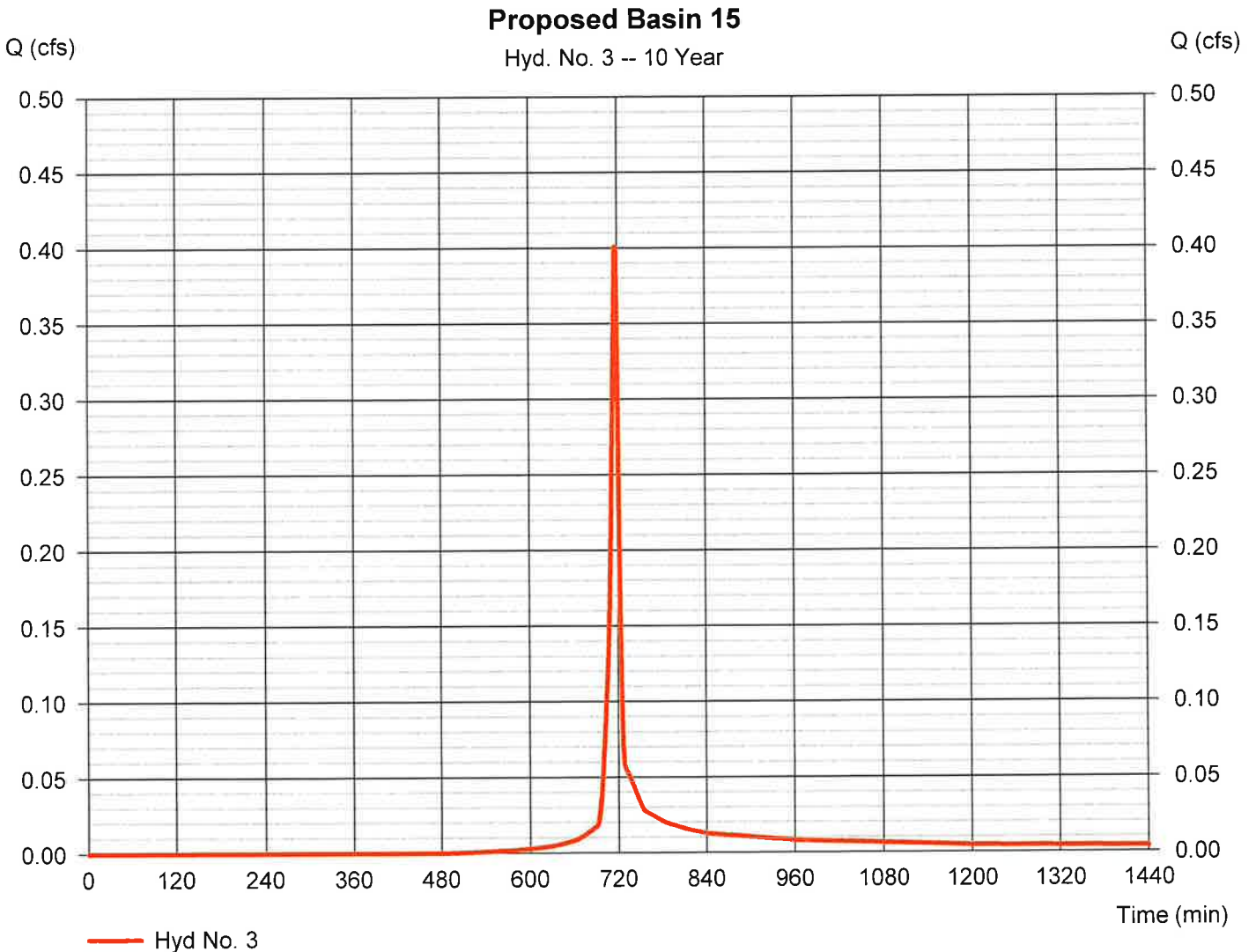


# Hydrograph Report

## Hyd. No. 3

### Proposed Basin 15

Hydrograph type	= SCS Runoff	Peak discharge	= 0.401 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 810 cuft
Drainage area	= 0.113 ac	Curve number	= 80.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

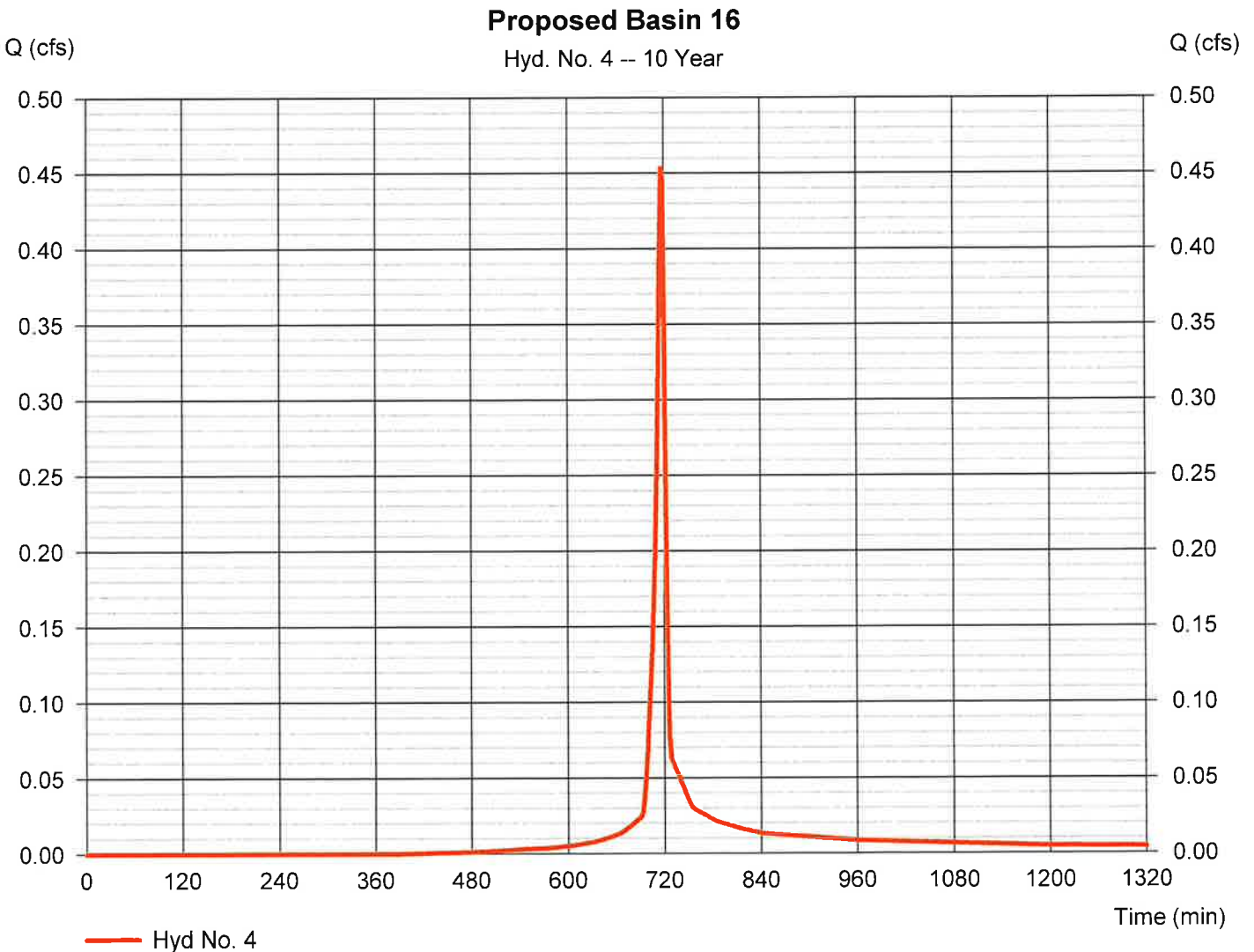
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 4

Proposed Basin 16

Hydrograph type	= SCS Runoff	Peak discharge	= 0.453 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 928 cuft
Drainage area	= 0.109 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

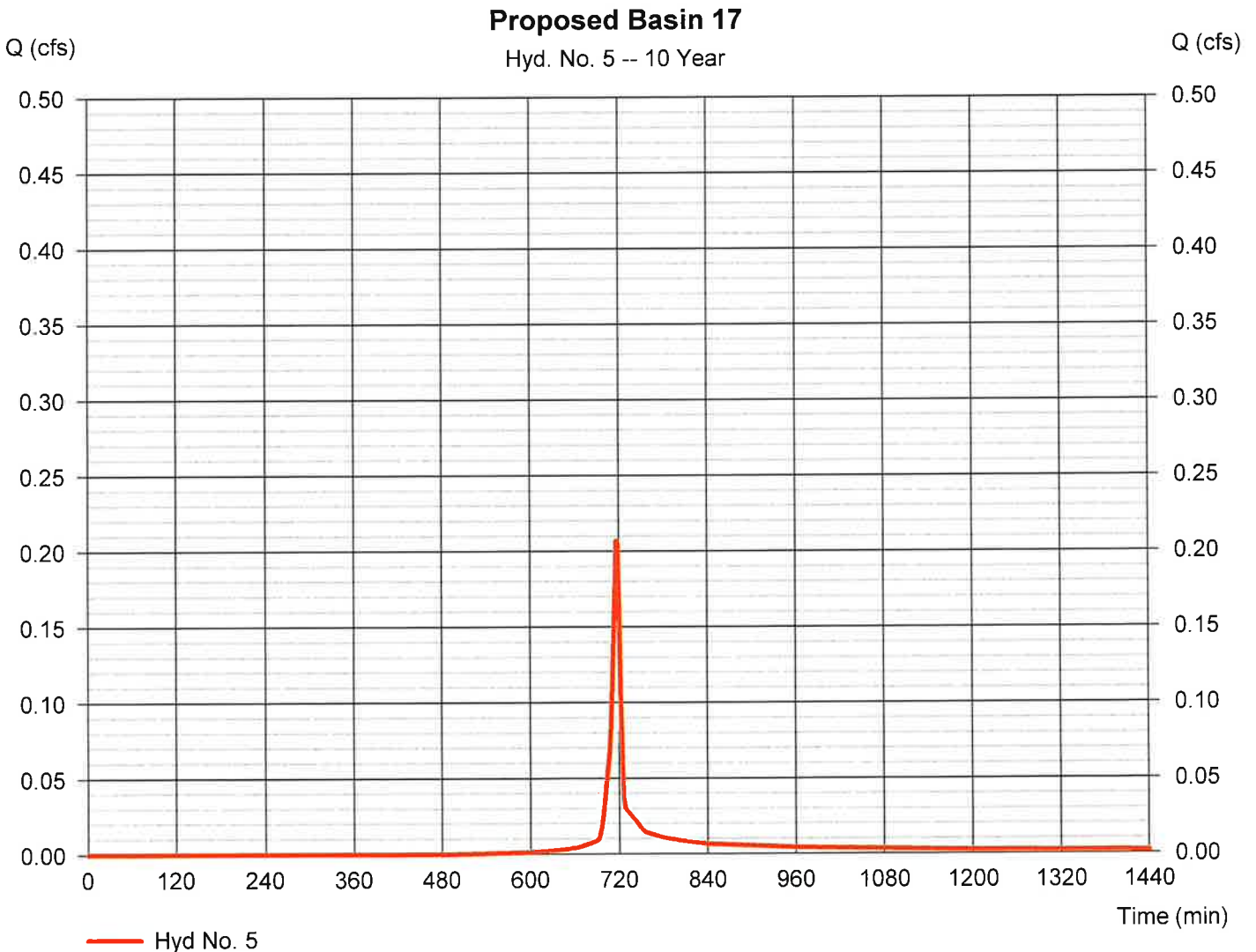
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 5

Proposed Basin 17

Hydrograph type	= SCS Runoff	Peak discharge	= 0.207 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 418 cuft
Drainage area	= 0.059 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

Thursday, 03 / 30 / 2023

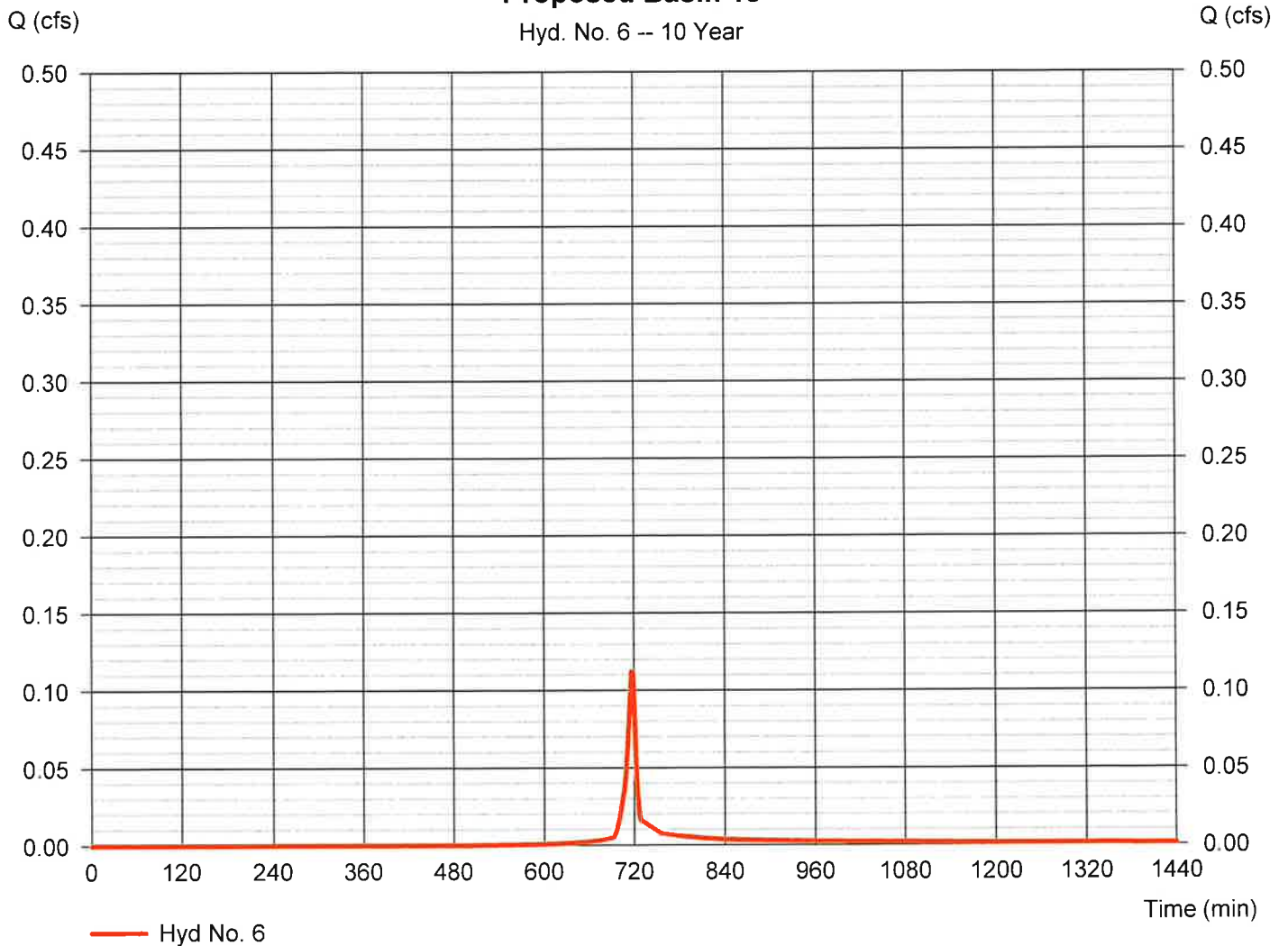
## Hyd. No. 6

Proposed Basin 18

Hydrograph type	= SCS Runoff	Peak discharge	= 0.112 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 227 cuft
Drainage area	= 0.032 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.05 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

### Proposed Basin 18

Hyd. No. 6 -- 10 Year



# Hydrograph Report

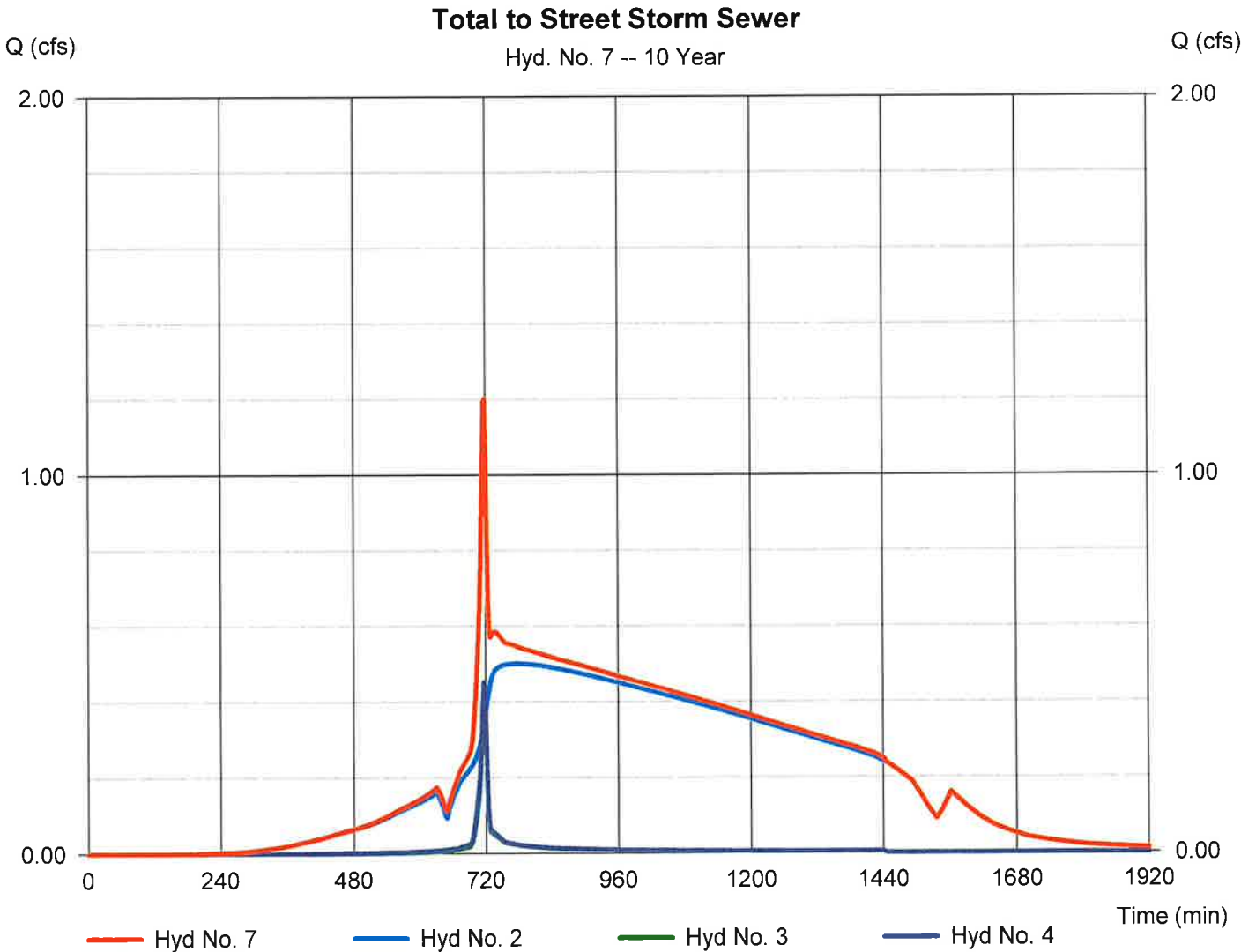
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 7

Total to Street Storm Sewer

Hydrograph type	= Combine	Peak discharge	= 1.202 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 23,743 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 0.222 ac



# Hydrograph Report

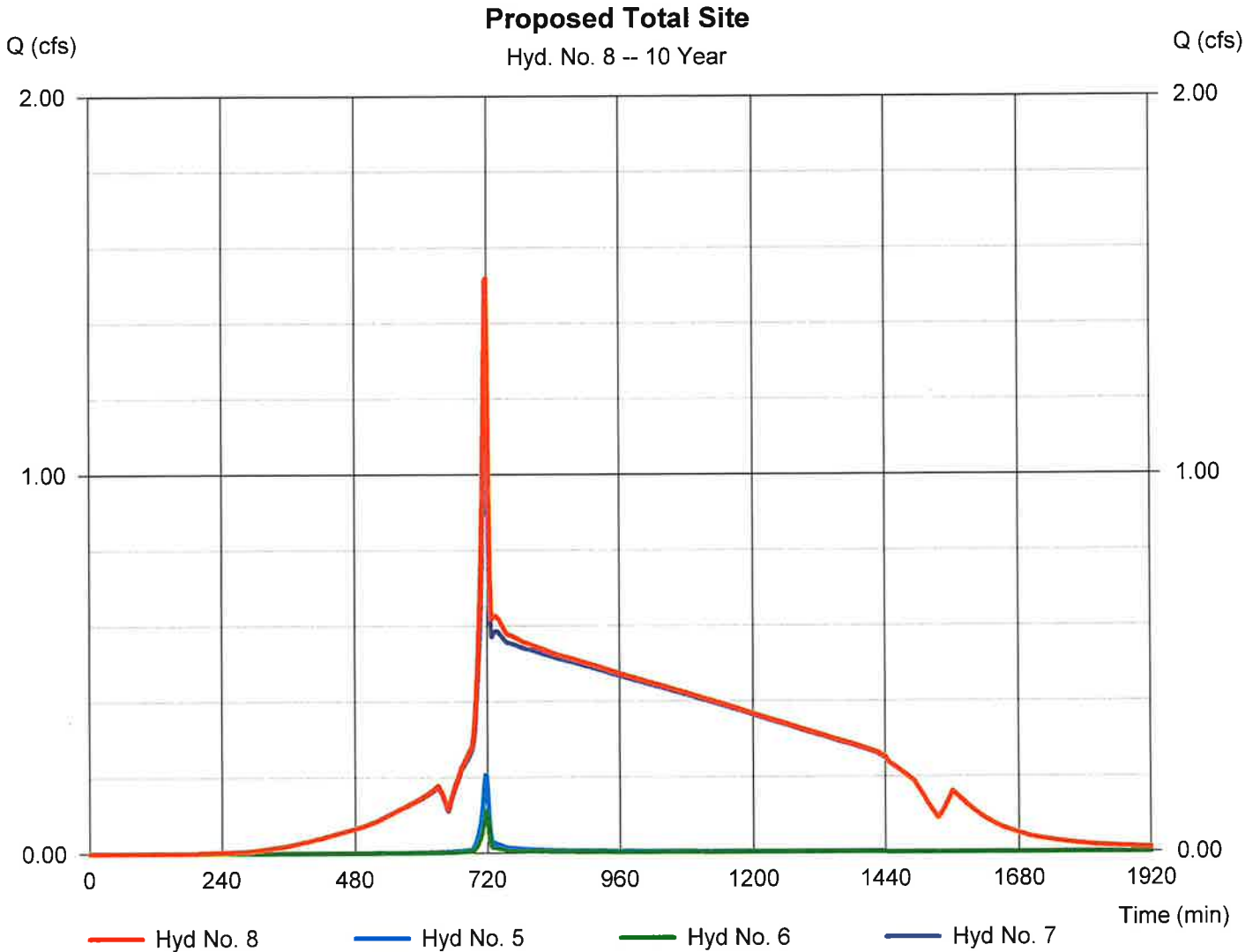
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 8

### Proposed Total Site

Hydrograph type	= Combine	Peak discharge	= 1.520 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 24,388 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 0.091 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	10.52	2	722	32,806	-----	-----	-----	Proposed Total to Detention Area	
2	Reservoir	0.635	2	788	32,769	1	855.59	18,195	Pond	
3	SCS Runoff	0.681	2	716	1,396	-----	-----	-----	Proposed Basin 15	
4	SCS Runoff	0.728	2	716	1,526	-----	-----	-----	Proposed Basin 16	
5	SCS Runoff	0.353	2	716	723	-----	-----	-----	Proposed Basin 17	
6	SCS Runoff	0.191	2	716	392	-----	-----	-----	Proposed Basin 18	
7	Combine	1.822	2	716	35,692	2, 3, 4,	-----	-----	Total to Street Storm Sewer	
8	Combine	2.366	2	716	36,807	5, 6, 7	-----	-----	Proposed Total Site	
Proposed Peak Flows 4-inch.gpw 3/31/2023					Return Period: 100 Year			Thursday, 03 / 30 / 2023		

# Hydrograph Report

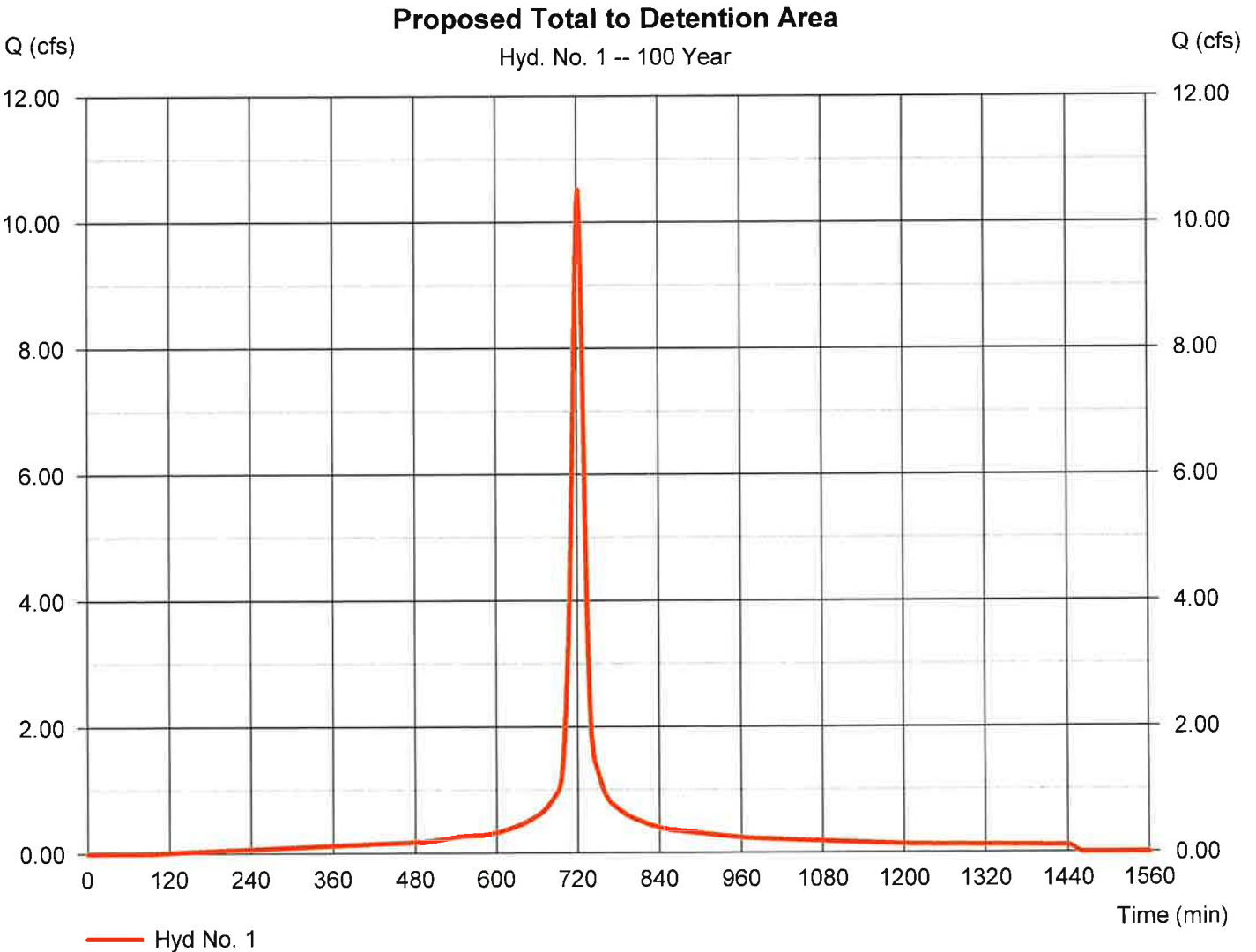
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 1

### Proposed Total to Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 10.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 32,806 cuft
Drainage area	= 1.751 ac	Curve number	= 95.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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

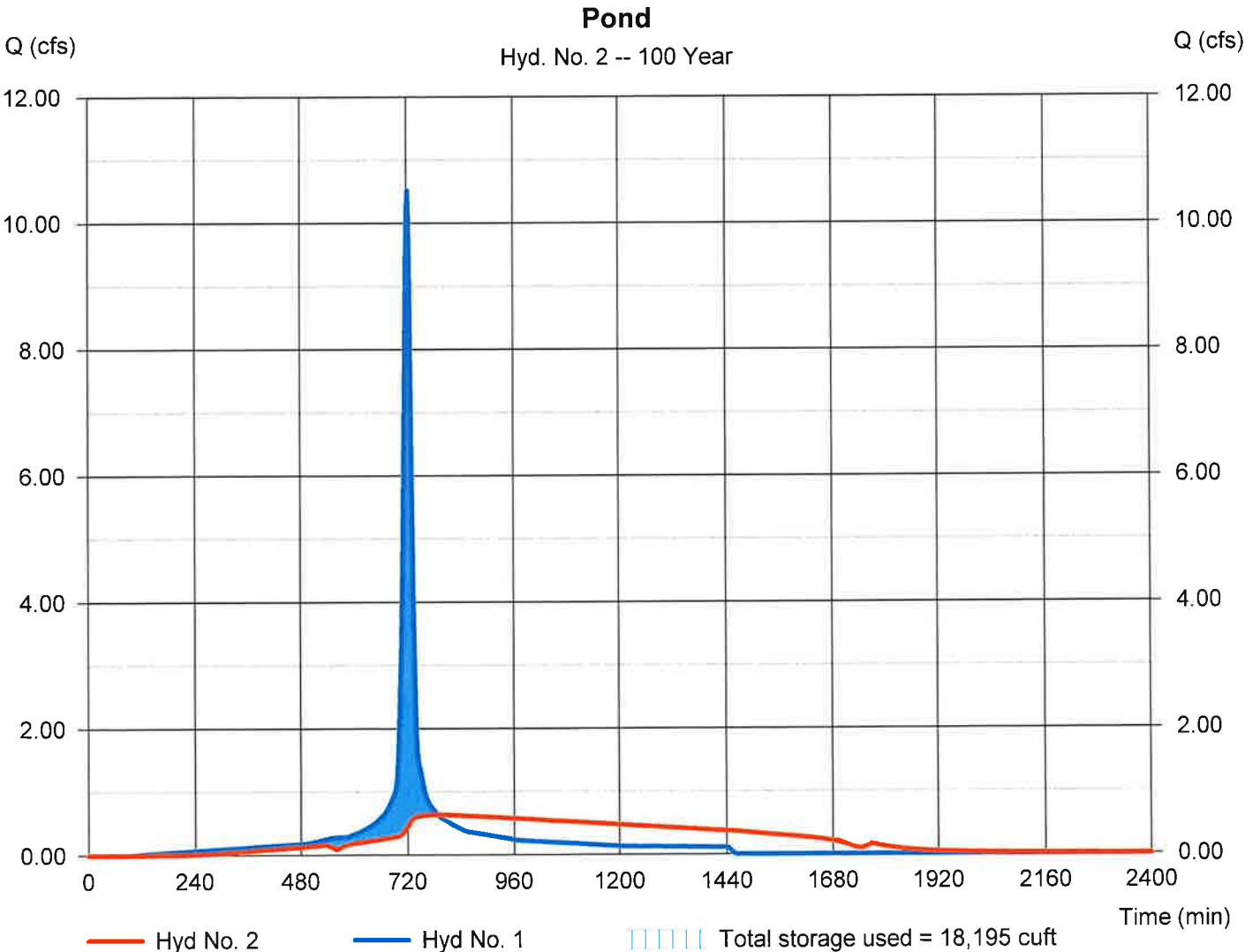
Thursday, 03 / 30 / 2023

## Hyd. No. 2

Pond

Hydrograph type	= Reservoir	Peak discharge	= 0.635 cfs
Storm frequency	= 100 yrs	Time to peak	= 788 min
Time interval	= 2 min	Hyd. volume	= 32,769 cuft
Inflow hyd. No.	= 1 - Proposed Total to Detention Area	Max. Elevation	= 855.59 ft
Reservoir name	= <New Pond>	Max. Storage	= 18,195 cuft

Storage Indication method used.



# Hydrograph Report

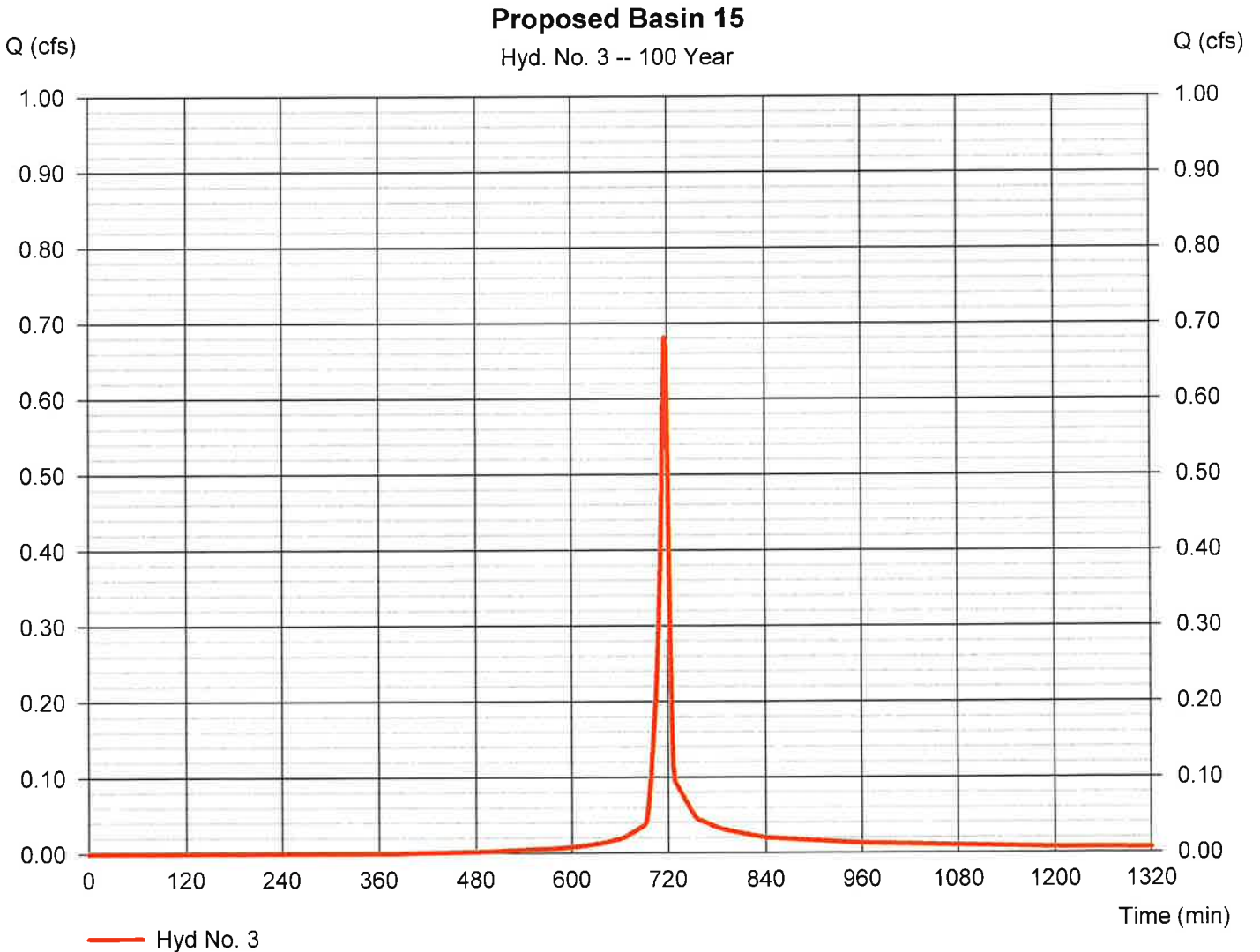
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 3

Proposed Basin 15

Hydrograph type	= SCS Runoff	Peak discharge	= 0.681 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1,396 cuft
Drainage area	= 0.113 ac	Curve number	= 80.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

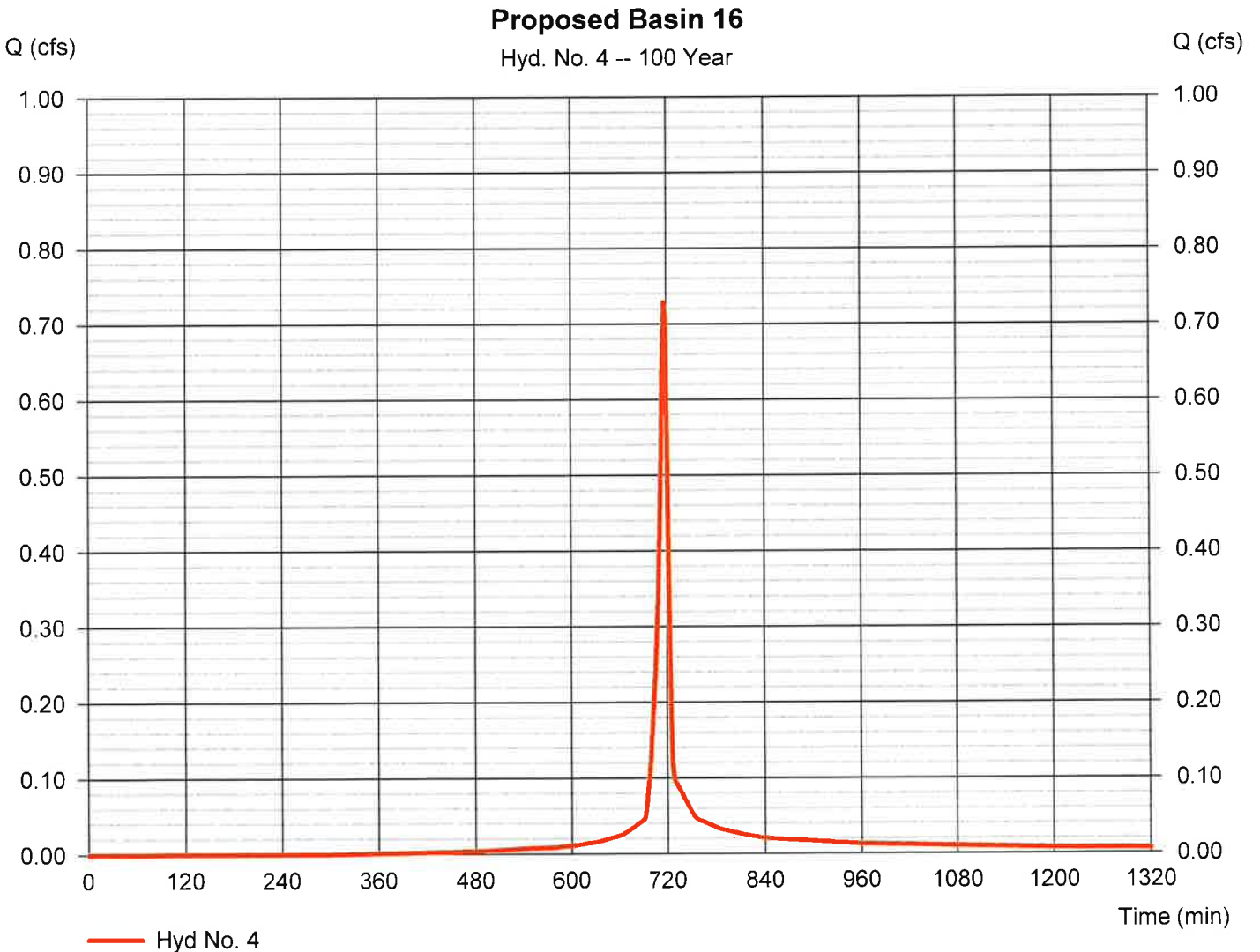
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 4

### Proposed Basin 16

Hydrograph type	= SCS Runoff	Peak discharge	= 0.728 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 1,526 cuft
Drainage area	= 0.109 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

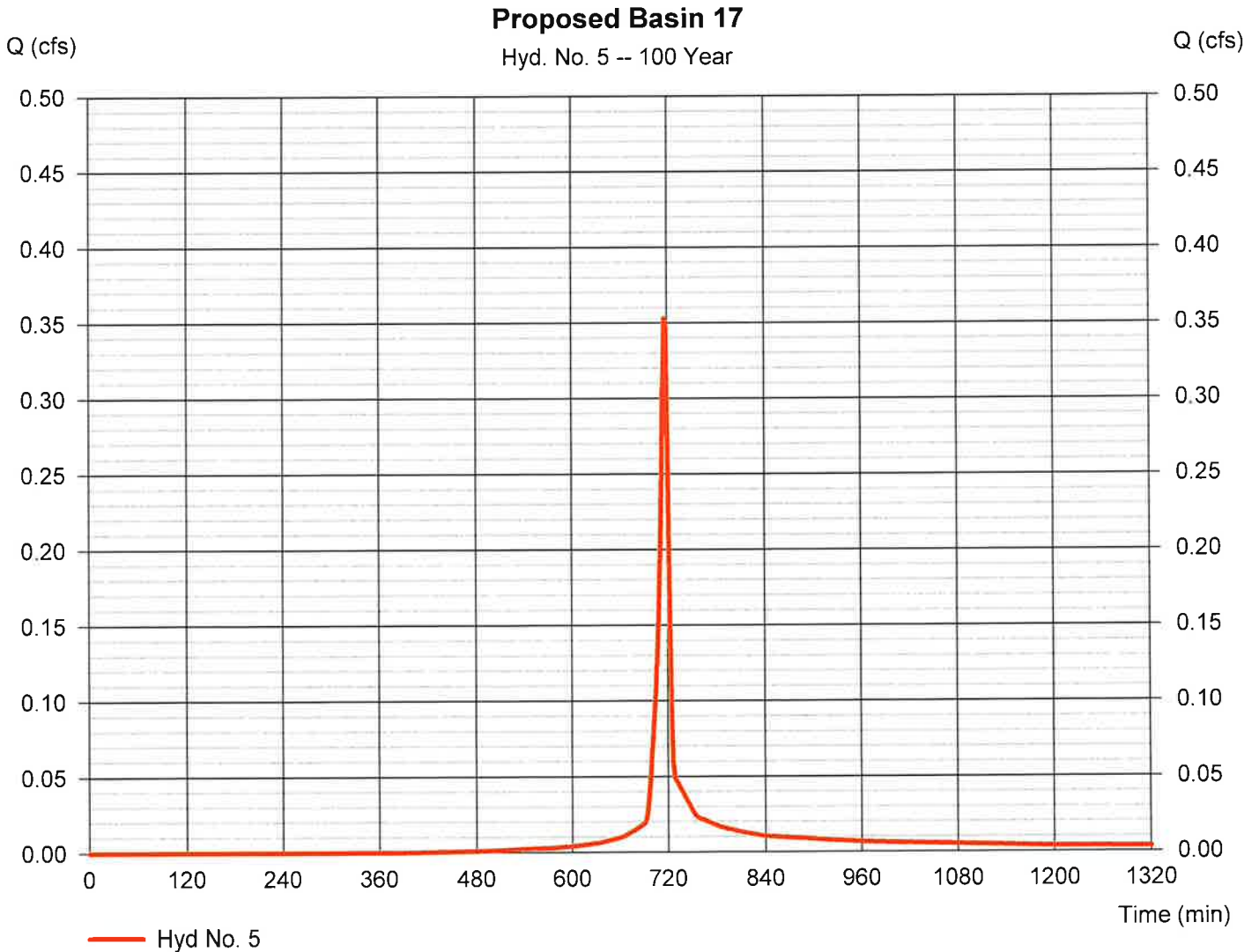
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 5

### Proposed Basin 17

Hydrograph type	= SCS Runoff	Peak discharge	= 0.353 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 723 cuft
Drainage area	= 0.059 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

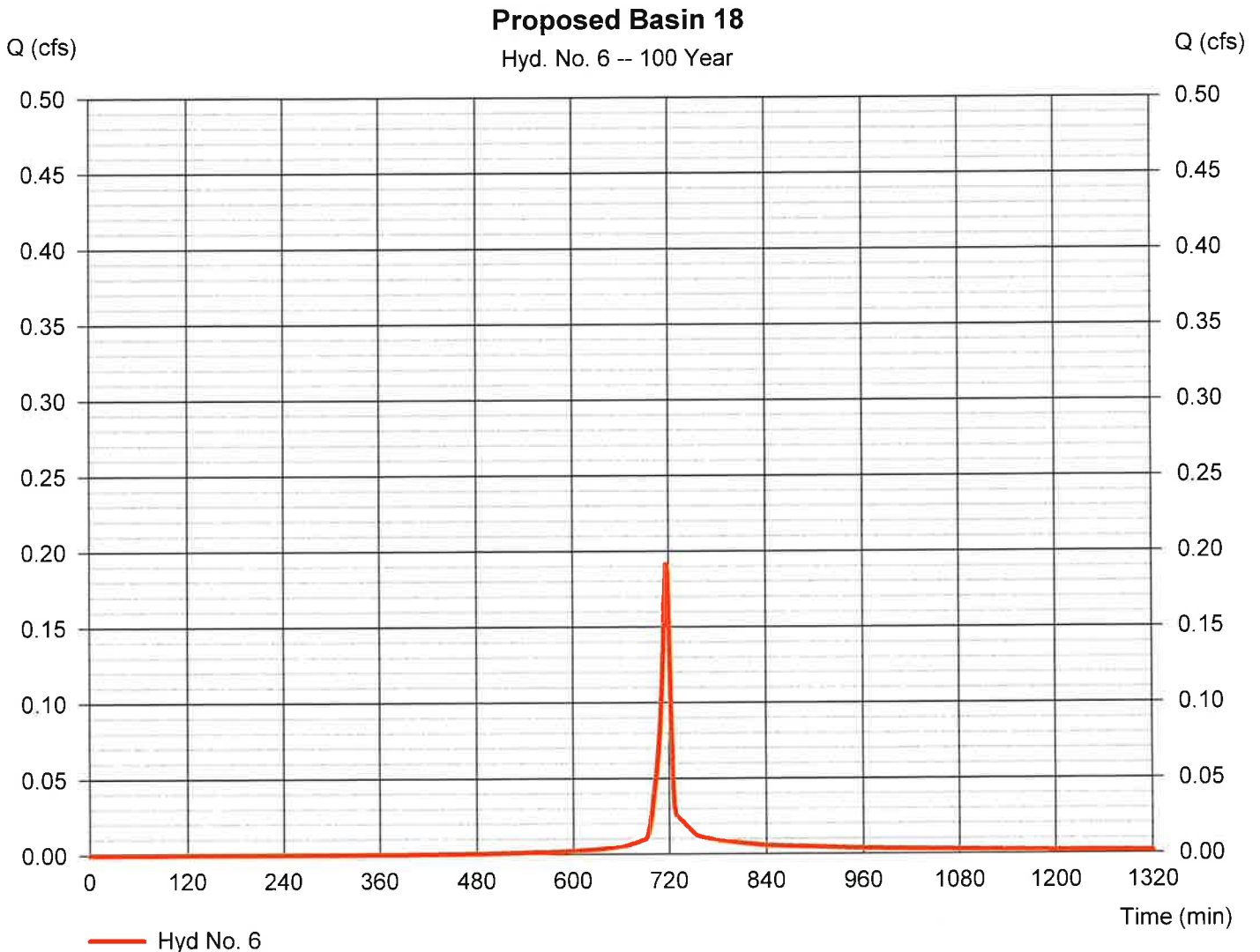
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 6

Proposed Basin 18

Hydrograph type	= SCS Runoff	Peak discharge	= 0.191 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 392 cuft
Drainage area	= 0.032 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

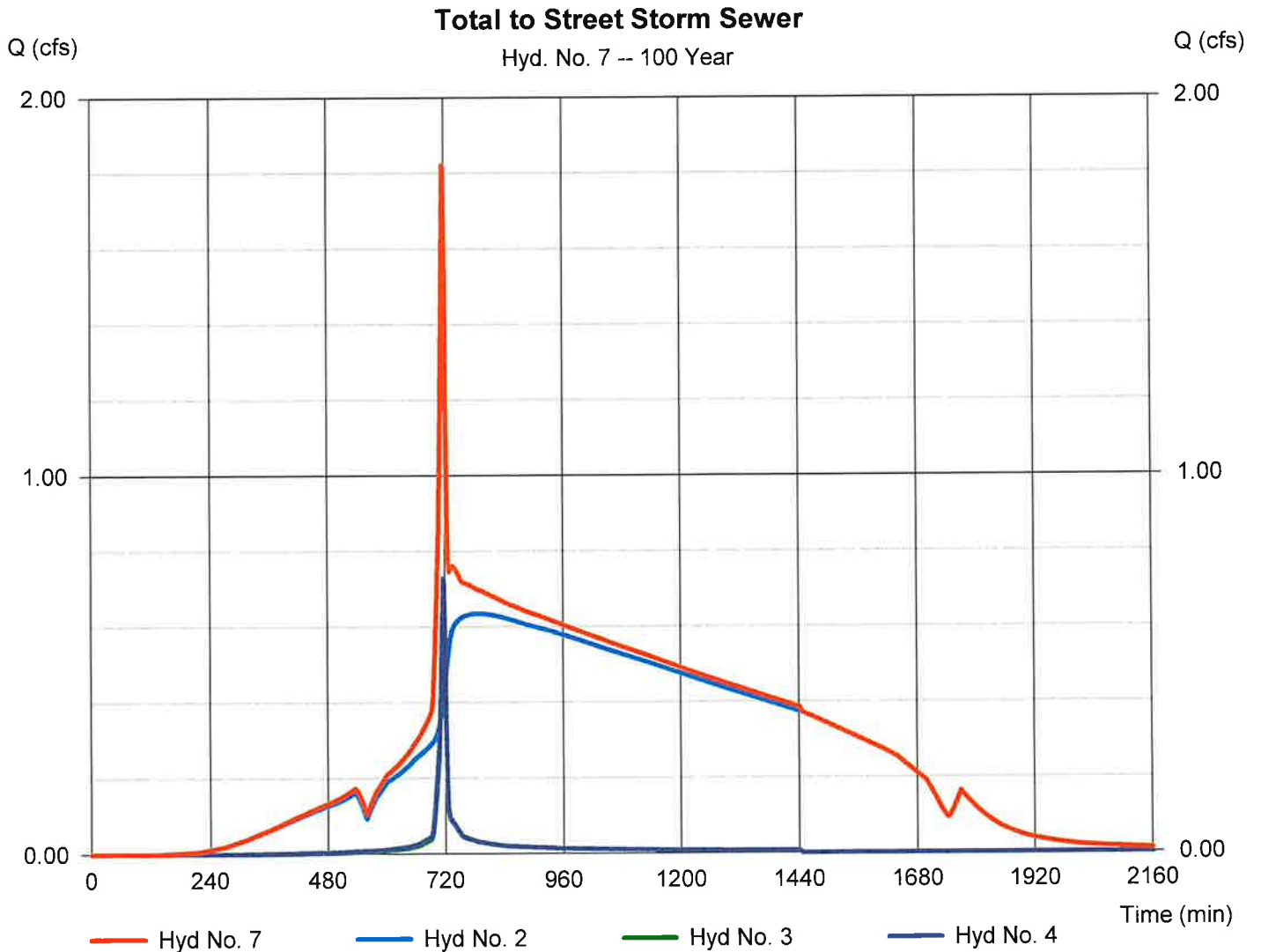
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 7

Total to Street Storm Sewer

Hydrograph type	= Combine	Peak discharge	= 1.822 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 35,692 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 0.222 ac



# Hydrograph Report

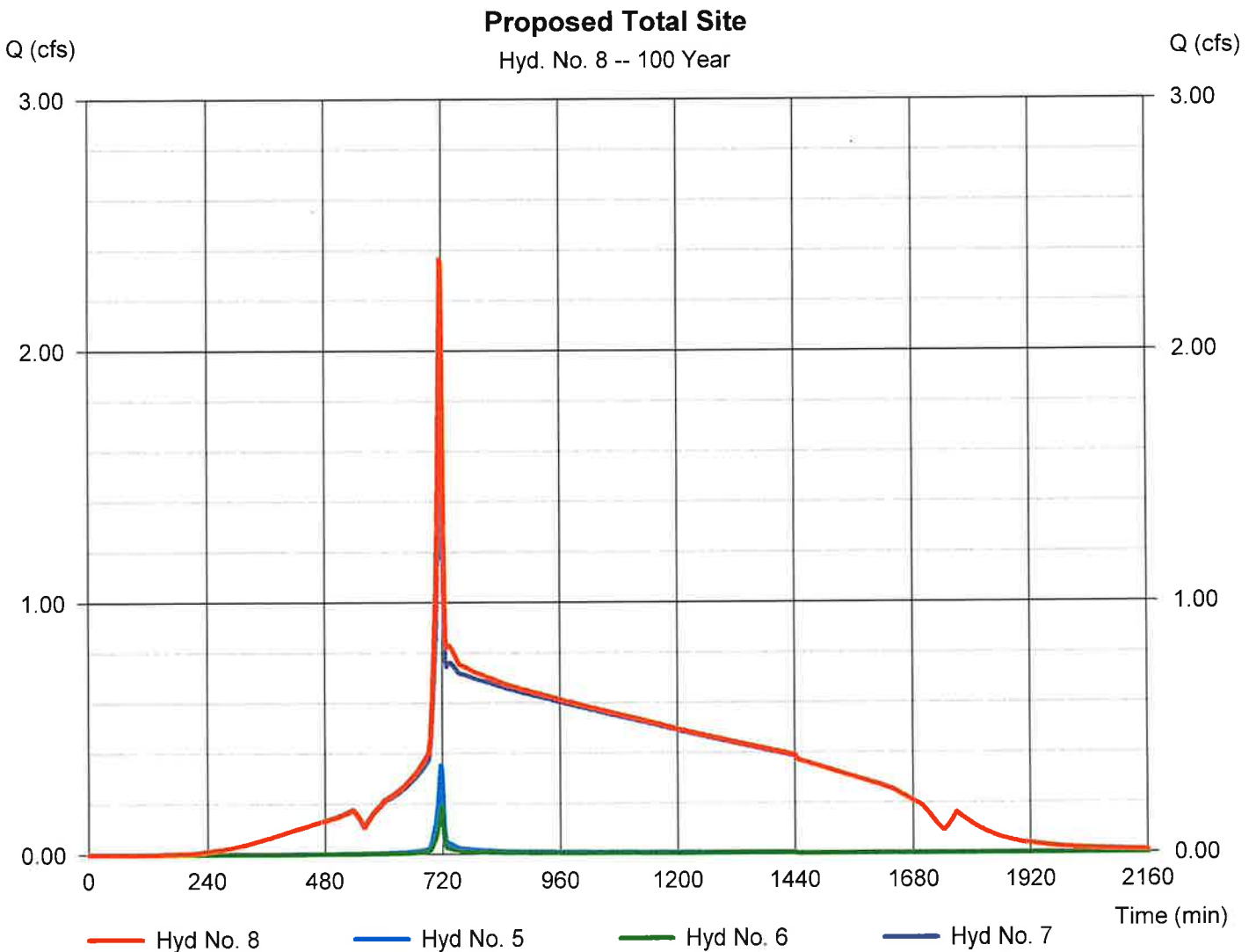
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 8

Proposed Total Site

Hydrograph type	= Combine	Peak discharge	= 2.366 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 36,807 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 0.091 ac



# Hydraflow Rainfall Report

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

Thursday, 03 / 30 / 2023

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	55.7621	10.3000	0.8820	-----
3	0.0000	0.0000	0.0000	-----
5	57.1954	9.4000	0.8251	-----
10	57.6989	8.8000	0.7922	-----
25	54.1161	7.6000	0.7404	-----
50	50.2122	6.6000	0.6979	-----
100	46.8747	5.7000	0.6592	-----

File name: Hancock County.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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.03	3.92	3.23	2.75	2.41	2.14	1.93	1.76	1.62	1.50	1.40	1.31	1.31
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	0.00
5	6.33	4.95	4.10	3.51	3.09	2.76	2.50	2.29	2.11	1.97	1.84	1.73	1.73
10	7.21	5.65	4.68	4.03	3.55	3.18	2.89	2.65	2.45	2.29	2.14	2.02	2.02
25	8.29	6.47	5.38	4.64	4.10	3.69	3.36	3.10	2.88	2.69	2.53	2.39	2.39
50	9.08	7.07	5.88	5.09	4.51	4.07	3.72	3.44	3.20	3.00	2.83	2.68	2.68
100	9.83	7.63	6.36	5.51	4.90	4.44	4.07	3.77	3.52	3.31	3.13	2.97	2.97

Tc = time in minutes. Values may exceed 60.

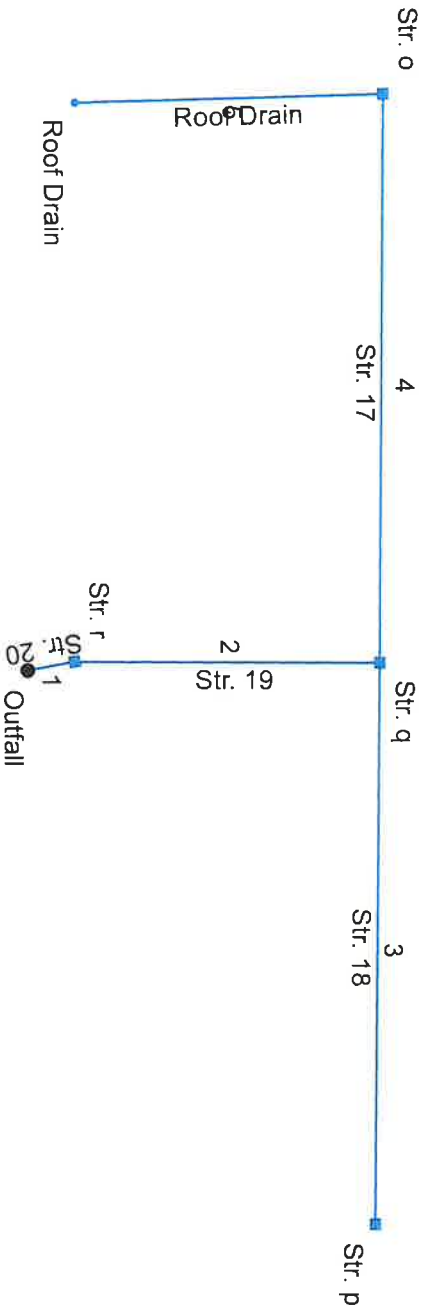
Precip. file name: G:\PCP files\Hancock County\Hancock County.pcp

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	0.00	2.71	0.00	0.00	4.05	0.00	0.00	5.80
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	0.00	0.00	0.00	0.00	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 3/31/2023	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# Appendix H

## Storm Sewer Sizing Calculations

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



Project File: North Storm.stm

Number of lines: 5

Date: 3/30/2023

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Str: 20	2.65	15	Cir	8,000	853.65	853.66	0.124	854.80	854.81	0.04	854.84	End	Combination
2	Str: 19	2.10	15	Cir	51,879	853.66	853.75	0.174	854.86	854.90	0.11	855.01	1	Combination
3	Str: 18	0.52	12	Cir	93,711	854.00	854.29	0.309	855.05	855.07	0.01	855.08	2	Combination
4	Str: 17	1.11	12	Cir	94,744	854.00	854.29	0.306	855.03	855.10	0.06	855.16	2	Combination
5	Roof Drain	0.37	8	Cir	52,384	854.62	855.22	1.145	855.18	855.50	n/a	855.64	4	Generic

Project File: North Storm.stm

Number of lines: 5

Run Date: 3/30/2023

NOTES: Return period = 10 Yrs. ; i - Inlet control.

# Storm Sewer Tabulation

Station	Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up	
Line To Line	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	8.000	0.12	0.54	0.79	0.09	5.0	7.6	6.3	2.65	2.47	2.25	15	0.12	853.65	853.66	854.80	854.81	858.89	858.75	Str. 20
2	1	51.879	0.12	0.42	0.80	0.10	5.0	7.1	6.4	2.10	2.91	1.75	15	0.17	853.66	853.75	854.86	854.90	858.75	858.00	Str. 19
3	2	93.711	0.10	0.10	0.72	0.07	5.0	5.0	7.2	0.52	2.15	0.73	12	0.31	854.00	854.29	855.05	855.07	858.00	858.25	Str. 18
4	2	94.744	0.14	0.20	0.76	0.11	5.0	5.5	7.0	1.11	2.13	1.52	12	0.31	854.00	854.29	855.03	855.10	858.00	858.40	Str. 17
5	4	52.384	0.06	0.06	0.85	0.05	5.0	5.0	7.2	0.37	1.40	1.89	8	1.15	854.62	855.22	855.18	855.50	858.40	858.50	Roof Drain
Project File: North Storm.stm															Number of lines: 5				Run Date: 3/30/2023		

NOTES: Intensity = 57.70 / (Inlet time + 8.80) ^ 0.79; Return period = Yrs. 10; c = cir e = ellip b = box

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter					Inlet		Byp Line No		
							Ht (in)	L (ft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)		Spread (ft)	Depr (in)
1	Str. r	0.68	0.00	0.68	0.00	Comb	4.0	1.83	1.83	1.50	Sag	2.00	0.050	0.020	0.000	0.17	5.61	0.19	5.61	0.2	Off
2	Str. q	0.69	0.00	0.69	0.00	Comb	4.0	1.83	1.83	1.50	Sag	2.00	0.050	0.020	0.000	0.17	5.67	0.19	5.67	0.2	Off
3	Str. p	0.52	0.00	0.52	0.00	Comb	4.0	183.00	183.00	1.50	Sag	2.00	0.050	0.020	0.000	0.00	0.33	0.02	0.33	0.2	Off
4	Str. o	0.77	0.00	0.77	0.00	Comb	4.0	1.83	1.83	1.50	Sag	2.00	0.050	0.020	0.000	0.18	6.14	0.20	6.14	0.2	Off
5	Roof Drain	0.37	0.00	0.37	0.00	Genr	0.0	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.000	0.30	12.00	0.30	12.00	0.0	Off

Project File: North Storm.stm

Number of lines: 5

Run Date: 3/30/2023

NOTES: Inlet N-Values = 0.016; Intensity = 57.70 / (Inlet time + 8.80) ^ 0.79; Return period = 10 Yrs.; \* Indicates Known Q added. All curb inlets are Horiz throat.

3/31/2023

# FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len (ft)	Drainage Area			Time of conc (min)	Time of Flow in sect (min)	Inten (l/hr)	Total CA	Add		Inlet elev (ft)	Elev of HGL			Rise	HGL	ADD	Cap	Date: 3/30/2023
					Incre-ment (ac)	Sub-Total (ac)	Sum CA					Total Flow	Q (cfs)		Elev of Crown	Up (ft)	Down (ft)					
1	End	Comb	0.012	8.000	0.00	0.00	0.00	7.58	0.06	6.30	0.42	0.00	2.65	858.75	854.81	854.80	0.01	15	0.12	2.25	2.65	Str. 20
					0.00	0.00	0.00								854.91	854.90		15	0.12	2.01	2.47	
					0.00	0.00	0.00								853.66	853.65	0.01	Cir				
2	1	Comb	0.012	51.879	0.00	0.00	0.00	7.09	0.49	6.45	0.33	0.00	2.10	858.00	854.90	854.86	0.04	15	0.07	1.75	2.10	Str. 19
					0.00	0.00	0.00								855.00	854.91		15	0.17	2.37	2.91	
					0.00	0.00	0.00								853.75	853.66	0.09	Cir				
3	2	Comb	0.012	93.711	0.00	0.00	0.00	5.00	2.09	7.21	0.07	0.00	0.52	858.25	855.07	855.05	0.02	12	0.02	0.73	0.52	Str. 18
					0.00	0.00	0.00								855.29	855.00		12	0.31	2.73	2.15	
					0.00	0.00	0.00								854.29	854.00	0.29	Cir				
4	2	Comb	0.012	94.744	0.00	0.00	0.00	5.45	1.01	7.03	0.16	0.00	1.11	858.40	855.10	855.03	0.07	12	0.07	1.52	1.11	Str. 17
					0.00	0.00	0.00								855.29	855.00		12	0.31	2.72	2.13	
					0.00	0.00	0.00								854.29	854.00	0.29	Cir				
5	4	Genr	0.012	52.384	0.00	0.00	0.00	5.00	0.45	7.21	0.05	0.00	0.37	858.50	855.50	855.18	0.32	8	0.61	1.89	0.37	Roof Drain
					0.00	0.00	0.00								855.89	855.29		8	1.15	4.01	1.40	
					0.00	0.00	0.00								855.22	854.62	0.60	Cir				

NOTES: Intensity = 57.70 / (inlet time + 8.80) ^ 0.79 (in/hr)

Project File: North Storm.stm

3/31/2023



# Hydraflow HGL Computation Procedure

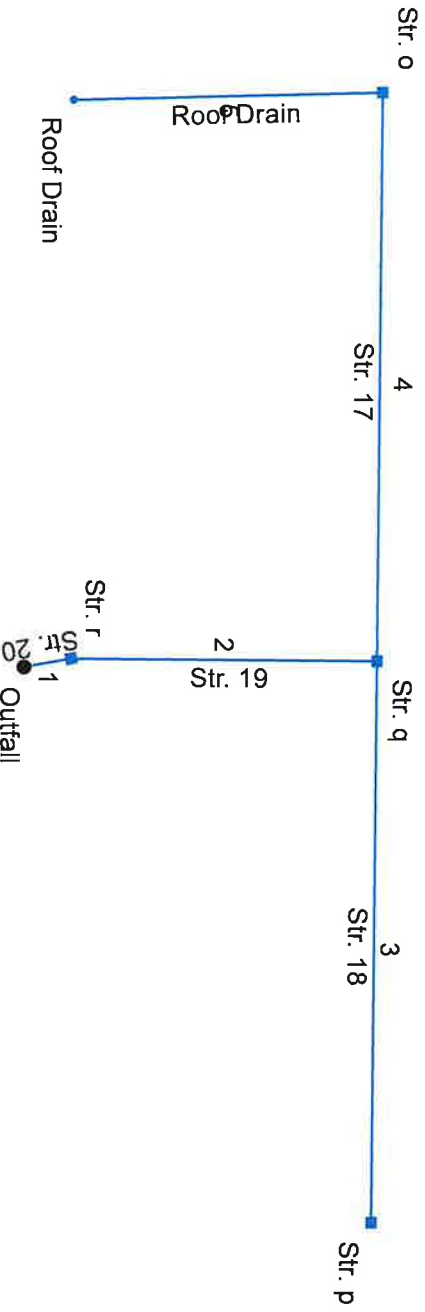
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## General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 7 Cross-sectional area of the flow at the downstream end.
- Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).
- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
- Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 16 Cross-sectional area of the flow at the upstream end.
- Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).
- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18).
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average  $Sf/100 \times \text{Line Length}$  (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

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



Project File: North Storm.stm

Number of lines: 5

Date: 3/30/2023

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL UP (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Str: 20	3.67	15	Cir	8,000	853.65	853.66	0.124	854.90	854.91	0.07	854.98	End	Combination
2	Str: 19	2.90	15	Cir	51,879	853.66	853.75	0.174	855.03*	855.12*	0.19	855.32	1	Combination
3	Str: 18	0.71	12	Cir	93,711	854.00	854.29	0.309	855.39*	855.42*	0.01	855.43	2	Combination
4	Str: 17	1.50	12	Cir	94,744	854.00	854.29	0.306	855.35*	855.49*	0.09	855.57	2	Combination
5	Roof Drain	0.50	8	Cir	52,384	854.62	855.22	1.145	855.60	855.67	0.06	855.73	4	Generic

Project File: North Storm.stm

Number of lines: 5

Run Date: 3/30/2023

NOTES: Return period = 100 Yrs. ; \*Surcharged (HGL above crown).

# Storm Sewer Tabulation

Station	Len	Drng Area		Rknff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID			
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Dn	Up	Dn	Up	Dn	Up		Dn	Up	
Line	To Line	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)			
1	End	8.000	0.12	0.54	0.79	0.09	0.42	5.0	7.1	8.7	3.67	2.47	2.99	15	0.12	853.65	853.66	854.90	854.91	858.89	858.75	Str. 20		
2	1	51.879	0.12	0.42	0.80	0.10	0.33	5.0	6.7	8.9	2.90	2.91	2.36	15	0.17	853.66	853.75	855.03	855.12	858.75	858.00	Str. 19		
3	2	93.711	0.10	0.10	0.72	0.07	0.07	5.0	5.0	9.8	0.71	2.15	0.90	12	0.31	854.00	854.29	855.39	855.42	858.00	858.25	Str. 18		
4	2	94.744	0.14	0.20	0.76	0.11	0.16	5.0	5.5	9.5	1.50	2.13	1.91	12	0.31	854.00	854.29	855.35	855.49	858.00	858.40	Str. 17		
5	4	52.384	0.06	0.06	0.85	0.05	0.05	5.0	5.0	9.8	0.50	1.40	1.72	8	1.15	854.62	855.22	855.60	855.67	858.40	858.50	Roof Drain		
Project File: North Storm.stm											Number of lines: 5											Run Date: 3/30/2023		

NOTES: Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66; Return period = Yrs. 100 ; c = cir e = ellip b = box

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter					Inlet		Byp Line No			
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)		Depth (ft)	Spread (ft)	Depr (in)
1	Str. r	0.93	0.00	0.93	0.00	Comb	4.0	1.83	2.75	1.83	1.50	Sag	2.00	0.050	0.020	0.000	0.20	7.11	0.22	7.11	0.2	Off
2	Str. q	0.94	0.00	0.94	0.00	Comb	4.0	1.83	2.75	1.83	1.50	Sag	2.00	0.050	0.020	0.000	0.20	7.18	0.22	7.18	0.2	Off
3	Str. p	0.71	0.00	0.71	0.00	Comb	4.0	183.00	3.10	183.00	1.50	Sag	2.00	0.050	0.020	0.000	0.01	0.41	0.02	0.41	0.2	Off
4	Str. o	1.05	0.00	1.05	0.00	Comb	4.0	1.83	2.75	1.83	1.50	Sag	2.00	0.050	0.020	0.000	0.22	7.75	0.23	7.75	0.2	Off
5	Roof Drain	0.50	0.00	0.50	0.00	Genr	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.000	0.30	12.00	0.30	12.00	0.0	Off

Project File: North Storm.stm

Number of lines: 5

Run Date: 3/30/2023

NOTES: Inlet N-Values = 0.016; Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66; Return period = 100 Yrs.; \* Indicates Known Q added. All curb inlets are Horiz throat.

3/31/2023

# FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len (ft)	Drainage Area			Time of conc (min)	Time of Flow in sect (min)	Inten (l/hr)	Total CA	Add Q		Inlet elev (ft)	Elev of HGL			Rise	HGL Pipe	ADD Full Flow	Cap (cfs)	Date: 3/30/2023
					Incre-ment (ac)	Sub-Total (ac)	Sum CA					Q	Total Flow		Up (ft)	Down (ft)	Fall (ft)					
1	End	Comb	0.012	8.000	0.00	0.00	0.00	7.10	0.04	8.73	0.42	0.00	3.67	858.75	854.91	854.90	0.01	15	0.12	2.99	3.67	Str: 20
					0.00	0.00	0.00								854.91	854.90		15	0.12	2.01	2.47	
					0.00	0.00	0.00								853.66	853.65	0.01	Cir				
2	1	Comb	0.012	51.879	0.00	0.00	0.00	6.73	0.37	8.90	0.33	0.00	2.90	858.00	855.12	855.03	0.09	15	0.17	2.36	2.90	Str: 19
					0.00	0.00	0.00								855.00	854.91	0.09	15	0.17	2.37	2.91	
					0.00	0.00	0.00								853.75	853.66	0.09	Cir				
3	2	Comb	0.012	93.711	0.00	0.00	0.00	5.00	1.73	9.83	0.07	0.00	0.71	858.25	855.42	855.39	0.03	12	0.03	0.90	0.71	Str: 18
					0.00	0.00	0.00								855.29	855.00	0.29	12	0.31	2.73	2.15	
					0.00	0.00	0.00								854.29	854.00	0.29	Cir				
4	2	Comb	0.012	94.744	0.00	0.00	0.00	5.51	0.83	9.53	0.16	0.00	1.50	858.40	855.49	855.35	0.14	12	0.15	1.91	1.50	Str: 17
					0.00	0.00	0.00								855.29	855.00	0.29	12	0.31	2.72	2.13	
					0.00	0.00	0.00								854.29	854.00	0.29	Cir				
5	4	Genr	0.012	52.384	0.00	0.00	0.00	5.00	0.51	9.83	0.05	0.00	0.50	858.50	855.67	855.60	0.07	8	0.13	1.72	0.50	Roof Drain
					0.00	0.00	0.00								855.89	855.29	0.60	8	1.15	4.01	1.40	
					0.00	0.00	0.00								855.22	854.62	0.60	Cir				

NOTES: Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66 (in/hr)

Project File: North Storm.stm

3/31/2023



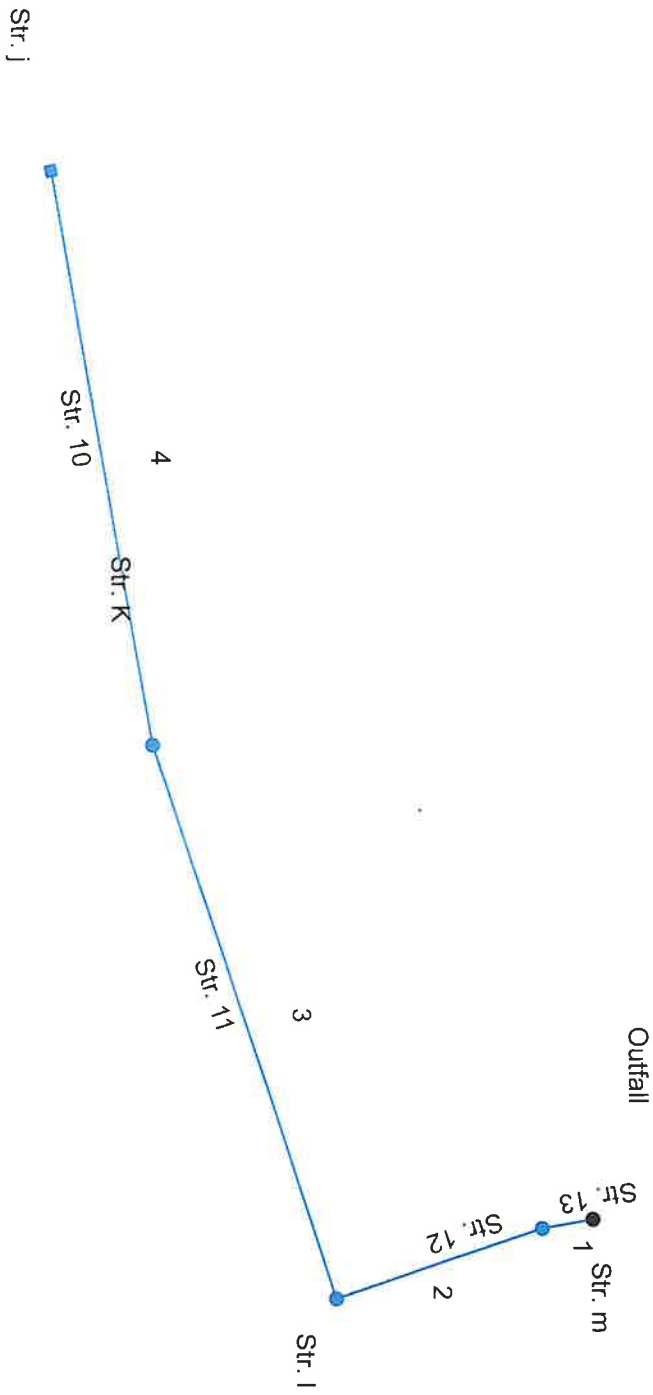
# Hydraflow HGL Computation Procedure

## General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 7 Cross-sectional area of the flow at the downstream end.
- Col. 8 The velocity of the flow at the downstream end. (Col. 3 / Col. 7).
- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
- Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 16 Cross-sectional area of the flow at the upstream end.
- Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).
- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18).
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average  $Sf/100 \times \text{Line Length}$  (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

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



Project File: South Storm.stm

Number of lines: 4

Date: 3/30/2023

Storm Sewers V2023.00

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Str. 13	2.08	15	Cir	8,000	853.65	853.66	0.124	857.19*	857.20*	0.02	857.22	End	Combination
2	Str. 12	1.51	12	Cir	34,307	853.66	853.77	0.321	857.22*	857.27*	0.09	857.36	1	Combination
3	Str. 11	1.11	12	Cir	90,555	853.87	854.15	0.309	857.38*	857.46*	0.02	857.47	2	Combination
4	Str. 10	0.70	12	Cir	90,180	854.25	854.53	0.311	857.49*	857.52*	0.01	857.54	3	Combination

Project File: South Storm.stm

Number of lines: 4

Run Date: 3/30/2023

NOTES: Return period = 10 Yrs. ; \*Surcharged (HGL above crown).

# Storm Sewer Tabulation

Station	Len	Drng Area		Rnofl coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
		Incr	Total		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	8.000	0.13	0.43	0.74	0.10	0.34	5.0	8.0	6.2	2.08	2.47	1.69	15	0.12	853.65	853.66	857.19	857.20	858.89	858.75	Str. 13
2	34.307	0.09	0.30	0.80	0.07	0.24	5.0	7.7	6.2	1.51	2.19	1.92	12	0.32	853.66	853.77	857.22	857.27	858.75	858.45	Str. 12
3	90.555	0.09	0.21	0.80	0.07	0.17	5.0	6.7	6.6	1.11	2.15	1.42	12	0.31	853.87	854.15	857.38	857.46	858.45	858.75	Str. 11
4	90.180	0.12	0.12	0.81	0.10	0.10	5.0	5.0	7.2	0.70	2.15	0.89	12	0.31	854.25	854.53	857.49	857.52	858.75	858.75	Str. 10

Project File: South Storm.stm

Number of lines: 4

Run Date: 3/30/2023

NOTES: Intensity = 57.70 / (Inlet time + 8.80) ^ 0.79; Return period = Yrs. 10 ; c = cir e = ellip b = box

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter					Inlet		Byp Line No			
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)		Depth (ft)	Spread (ft)	Depr (in)
1	Str. m	0.69	0.00	0.69	0.00	Comb	4.0	1.83	3.10	1.83	2.00	Sag	2.00	0.050	0.020	0.000	0.16	4.90	0.17	4.90	0.2	Off
2	Str. l	0.52	0.00	0.52	0.00	Comb	4.0	1.83	3.10	1.83	2.00	Sag	2.00	0.050	0.020	0.000	0.14	3.88	0.15	3.88	0.2	Off
3	Str. K	0.52	0.00	0.52	0.00	Comb	4.0	1.55	3.10	1.55	2.00	Sag	2.00	0.050	0.020	0.000	0.14	4.04	0.16	4.04	0.2	Off
4	Str. j	0.70	0.00	0.70	0.00	Comb	4.0	1.55	3.10	1.55	2.00	Sag	2.00	0.050	0.020	0.000	0.16	5.14	0.18	5.14	0.2	Off

Project File: South Storm.stm

Number of lines: 4

Run Date: 3/30/2023

NOTES: Inlet N-Values = 0.016; Intensity = 57.70 / (Inlet time + 8.80) ^ 0.79; Return period = 10 Yrs.; \* Indicates Known Q added. All curb inlets are Horiz throat.

3/31/2023

# FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len (ft)	Drainage Area			Time of conc (min)	Time of Flow in sect (min)	Inten (l/hr)	Total CA	Add		Inlet elev (ft)	Elev of HGL			Rise	HGL	ADD	Cap	Date: 3/30/2023
					Incr-ment (ac)	Sub-Total (ac)	Sum CA					Total Flow	Q (cts)		Elev of Crown	Elev of Invert	Fall (ft)					
1	End	Comb	0.012	8.000	0.00	0.00	0.00	8.04	0.08	6.16	0.34	0.00	2.08	858.75	857.20	857.19	0.01	15	0.09	1.69	2.08	Str. 13
					0.00	0.00	0.00								854.91	854.90		15	0.12	2.01	2.47	
					0.00	0.00	0.00								853.66	853.65	0.01	Cir				
2	1	Comb	0.012	34.307	0.00	0.00	0.00	7.75	0.30	6.25	0.24	0.00	1.51	858.45	857.27	857.22	0.05	12	0.15	1.92	1.51	Str. 12
					0.00	0.00	0.00								854.77	854.66		12	0.32	2.78	2.19	
					0.00	0.00	0.00								853.77	853.66	0.11	Cir				
3	2	Comb	0.012	90.555	0.00	0.00	0.00	6.68	1.06	6.58	0.17	0.00	1.11	858.75	857.46	857.38	0.08	12	0.08	1.42	1.11	Str. 11
					0.00	0.00	0.00								855.15	854.87		12	0.31	2.73	2.15	
					0.00	0.00	0.00								854.15	853.87	0.28	Cir				
4	3	Comb	0.012	90.180	0.00	0.00	0.00	5.00	1.68	7.21	0.10	0.00	0.70	858.75	857.52	857.49	0.03	12	0.03	0.89	0.70	Str. 10
					0.00	0.00	0.00								855.53	855.25		12	0.31	2.74	2.15	
					0.00	0.00	0.00								854.53	854.25	0.28	Cir				

NOTES: Intensity = 57.70 / (inlet time + 8.80) ^ 0.79 (in/hr)

Project File: South Storm.stm

3/31/2023



# Hydraflow HGL Computation Procedure

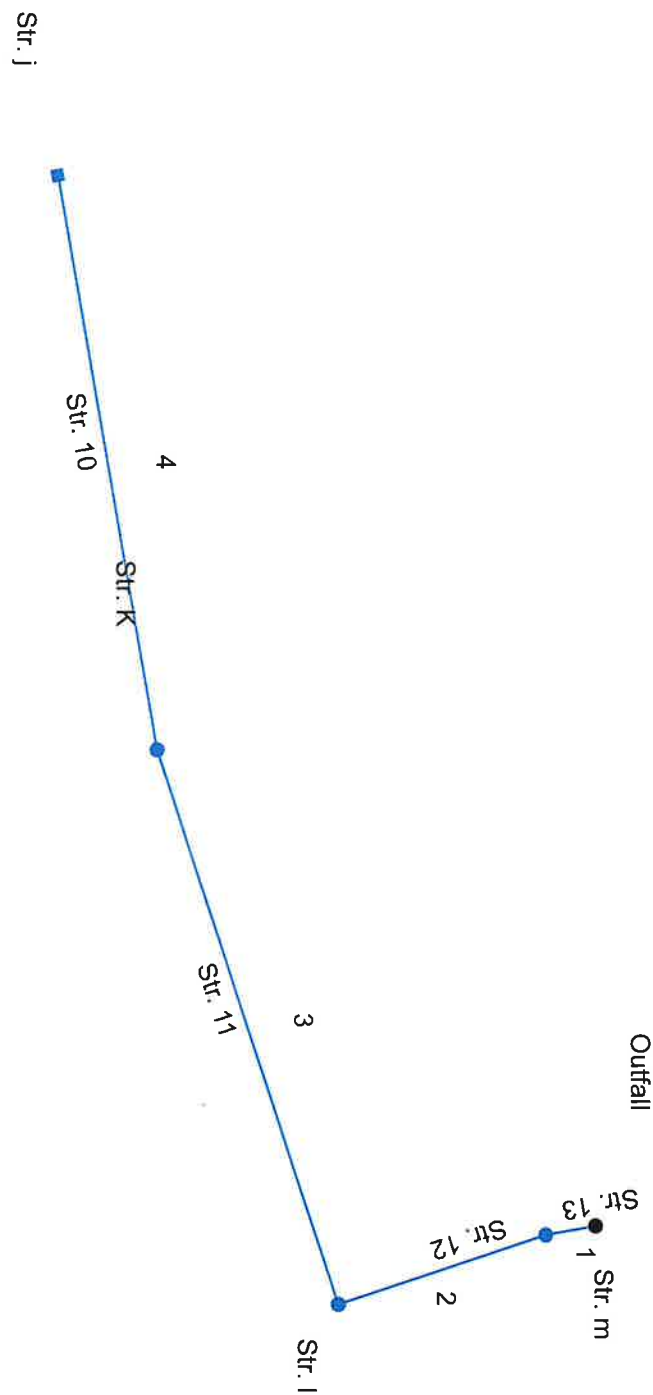
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## General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
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- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average  $Sf/100 \times \text{Line Length}$  (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

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



# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL UP (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Str. 13	2.93	15	Cir	8,000	853.65	853.66	0.124	857.19*	857.20*	0.04	857.25	End	Combination
2	Str. 12	2.12	12	Cir	34,307	853.66	853.77	0.321	857.25*	857.35*	0.17	857.52	1	Combination
3	Str. 11	1.55	12	Cir	90,555	853.87	854.15	0.309	857.57*	857.72*	0.03	857.75	2	Combination
4	Str. 10	0.96	12	Cir	90,180	854.25	854.53	0.311	857.79*	857.84*	0.02	857.86	3	Combination

Project File: South Storm.stm

Number of lines: 4

Run Date: 3/30/2023

NOTES: Return period = 100 Yrs. ; \*Surcharged (HGL above crown).

# Storm Sewer Tabulation

Station Line	To Line	Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Te		Rain (l)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
			Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	8.000	0.13	0.43	0.74	0.10	0.34	5.0	7.2	8.7	2.93	2.47	2.39	15	0.12	853.65	853.66	857.19	857.20	858.89	858.75	Str. 13
2	1	34.307	0.09	0.30	0.80	0.07	0.24	5.0	7.0	8.8	2.12	2.19	2.70	12	0.32	853.66	853.77	857.25	857.35	858.75	858.45	Str. 12
3	2	90.555	0.09	0.21	0.80	0.07	0.17	5.0	6.2	9.1	1.55	2.15	1.97	12	0.31	853.87	854.15	857.57	857.72	858.45	858.75	Str. 11
4	3	90.180	0.12	0.12	0.81	0.10	0.10	5.0	5.0	9.8	0.96	2.15	1.22	12	0.31	854.25	854.53	857.79	857.84	858.75	858.75	Str. 10

Project File: South Storm.stm

Number of lines: 4

Run Date: 3/30/2023

NOTES: Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66; Return period = Yrs. 100 ; c = cir e = ellip b = box

3/31/2023

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet			Grate Inlet			Gutter				Inlet		Byp Line No			
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)		Depth (ft)	Spread (ft)	Depr (in)
1	Str. m	0.95	0.00	0.95	0.00	Comb	4.0	1.83	3.10	1.83	2.00	Sag	2.00	0.050	0.020	0.000	0.18	6.23	0.20	6.23	0.2	Off
2	Str. l	0.71	0.00	0.71	0.00	Comb	4.0	1.83	3.10	1.83	2.00	Sag	2.00	0.050	0.020	0.000	0.16	4.98	0.18	4.98	0.2	Off
3	Str. K	0.71	0.00	0.71	0.00	Comb	4.0	1.55	3.10	1.55	2.00	Sag	2.00	0.050	0.020	0.000	0.16	5.17	0.18	5.17	0.2	Off
4	Str. j	0.96	0.00	0.96	0.00	Comb	4.0	1.55	3.10	1.55	2.00	Sag	2.00	0.050	0.020	0.000	0.19	6.52	0.21	6.52	0.2	Off

Project File: South Storm strn

Number of lines: 4

Run Date: 3/30/2023

3/31/2023

NOTES: Inlet N-Values = 0.016; Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66; Return period = 100 Yrs.; \* Indicates Known Q added. All curb inlets are Horiz throat.

# FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len (ft)	Drainage Area			Time of conc (min)	Time of Flow in sect (min)	Inten (l/hr)	Total CA	Add Q		Inlet elev (ft)	Elev of HGL			Rise Span	HGL Pipe	ADD Full Flow		Date: 3/30/2023 Frequency: 100 yrs Proj: South Storm.stm
					Incr-ment (ac)	Sub-Total (ac)	Sum CA					Total Flow (cfs)	Q (cfs)		Up (ft)	Down (ft)	Fall (ft)			Slope (%)	Vel (ft/s)	
1	End	Comb	0.012	8.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	7.21	0.06	8.68	0.34	0.00 2.93	858.75	857.20 854.91 853.66	857.19 854.90 853.65	0.01 0.01	15 15 Cir	0.18 0.12	2.39 2.01	2.93 2.47	Str: 13	
2	1	Comb	0.012	34.307	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	7.00	0.21	8.77	0.24	0.00 2.12	858.45	857.35 854.77 853.77	857.25 854.66 853.66	0.10 0.11	12 12 Cir	0.30 0.32	2.70 2.78	2.12 2.19	Str: 12	
3	2	Comb	0.012	90.555	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.24	0.77	9.14	0.17	0.00 1.55	858.75	857.72 855.15 854.15	857.57 854.87 853.87	0.15 0.28	12 12 Cir	0.16 0.31	1.97 2.73	1.55 2.15	Str: 11	
4	3	Comb	0.012	90.180	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	5.00	1.24	9.83	0.10	0.00 0.96	858.75	857.84 855.53 854.53	857.79 855.25 854.25	0.06 0.28	12 12 Cir	0.06 0.31	1.22 2.74	0.96 2.15	Str: 10	

NOTES: Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66 (in/hr)

Project File: South Storm.stm

3/31/2023



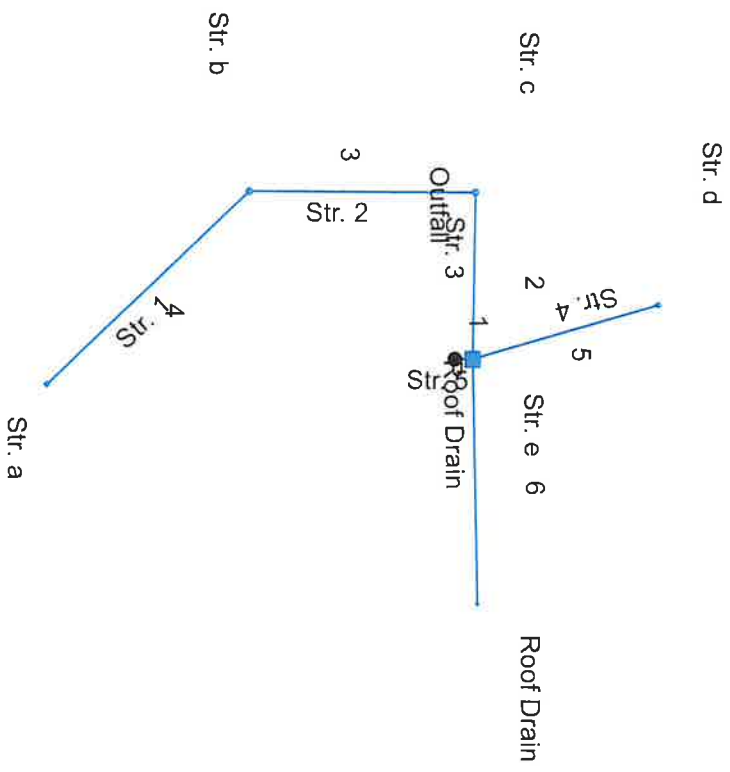
# Hydraflow HGL Computation Procedure

## General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 7 Cross-sectional area of the flow at the downstream end.
- Col. 8 The velocity of the flow at the downstream end. (Col. 3 / Col. 7).
- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
- Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 16 Cross-sectional area of the flow at the upstream end.
- Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).
- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18).
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average  $Sf/100 \times \text{Line Length}$  (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

# Hydratflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: West Storm.stm

Number of lines: 6

Date: 3/30/2023

Storm Sewers v2023 00

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Str. 5	3.41	18	Cir	6,516	853.65	853.66	0.153	854.35	854.45	n/a	854.59 i	End	Manhole
2	Str. 3	1.69	12	Cir	57,527	853.66	853.88	0.382	854.59	854.67	0.15	854.82	1	DropGrate
3	Str. 2	1.24	12	Cir	80,000	853.98	854.23	0.313	854.82	854.90	0.08	854.98	2	DropGrate
4	Str. 1	0.45	12	Cir	97,213	854.33	854.64	0.319	855.00	855.05	0.04	855.08	3	Combination
5	Str. 4	0.83	12	Cir	67,302	853.66	853.87	0.312	854.59	854.61	0.03	854.64	1	DropGrate
6	Roof Drain	1.16	10	Cir	84,700	853.66	856.00	2.763	854.59	856.48	n/a	856.76 i	1	Generic

Project File: West Storm.stm

Number of lines: 6

Run Date: 3/30/2023

NOTES: Return period = 10 Yrs. ; 1 - Inlet control.

# Storm Sewer Tabulation

Station Line	To Line	Len (ft)	Drng Area		Rhoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
			Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	6.516	0.00	0.77	0.00	0.00	0.54	0.0	7.5	6.3	3.41	4.45	3.91	18	0.15	853.65	853.66	854.35	854.45	859.18	859.18	Str. 5
2	1	57.527	0.12	0.42	0.63	0.08	0.26	5.0	7.1	6.5	1.69	2.39	2.38	12	0.38	853.66	853.88	854.59	854.67	859.18	857.75	Str. 3
3	2	80.000	0.22	0.30	0.56	0.12	0.19	5.0	6.4	6.7	1.24	2.16	1.99	12	0.31	853.98	854.23	854.82	854.90	857.75	857.75	Str. 2
4	3	97.213	0.08	0.08	0.78	0.06	0.06	5.0	5.0	7.2	0.45	2.18	1.15	12	0.32	854.33	854.64	855.00	855.05	857.75	858.70	Str. 1
5	1	67.302	0.16	0.16	0.72	0.12	0.12	5.0	5.0	7.2	0.83	2.16	1.21	12	0.31	853.66	853.87	854.59	854.61	859.18	857.30	Str. 4
6	1	84.700	0.19	0.19	0.85	0.16	0.16	5.0	5.0	7.2	1.16	3.94	2.86	10	2.76	853.66	856.00	854.59	856.48	859.18	857.21	Roof Drain
Project File: West Storm.stm															Number of lines: 6				Run Date: 3/30/2023			

NOTES: Intensity = 57.70 / (Inlet time + 8.80) ^ 0.79; Return period = Yrs. 10 ; c = cir e = ellip b = box

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter						Inlet		Byp Line No			
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)		Spread (ft)	Depr (in)	
1	Str. e	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.00	0.000	0.000	0.000	0.00	0.00	0.0	Off		
2	Str. c	0.55	0.00	0.55	0.00	DtGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.000	0.000	0.07	9.38	0.07	9.38	0.0	Off
3	Str. b	0.89	0.00	0.89	0.00	DtGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.000	0.000	0.10	12.22	0.10	12.22	0.0	Off
4	Str. a	0.45	0.00	0.45	0.00	Comb	4.0	2.00	0.17	0.09	2.00	Sag	2.00	0.050	0.020	0.000	0.000	0.12	2.82	0.13	2.82	0.2	Off
5	Str. d	0.83	0.00	0.83	0.00	DtGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.000	0.000	0.10	11.77	0.10	11.77	0.0	Off
6	Roof Drain	1.16	0.00	1.16	0.00	Genr	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.000	0.000	0.30	12.00	0.30	12.00	0.0	Off

Project File: West Storm.stm

Number of lines: 6

Run Date: 3/30/2023

3/31/2023

NOTES: Inlet N-Values = 0.016; Intensity = 57.70 / (inlet time + 8.80) ^ 0.79; Return period = 10 Yrs.; \* Indicates Known Q added. All curb inlets are Horiz throat.

# FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len (ft)	Drainage Area			Time of conc (min)	Time of Flow in sect (min)	Inten (l/hr)	Total CA	Add Q		Inlet elev (ft)	Elev of HGL			Rise Span	HGL Pipe	ADD Full Flow	Cap (cfs)	Date: 3/30/2023
					C1 = 0.85	C2 = 0.82	C3 = 0.16					Q	Total Flow		Up (ft)	Down (ft)	Fail (ft)					
1	End	MH	0.012	6.516	0.00	0.00	0.00	7.46	0.03	6.33	0.54	0.00	3.41	859.18	854.45	854.35	0.09	18	1.42	3.91	3.41	Str. 5
					0.00	0.00	0.00							855.16	855.15		0.15	18	0.15	2.52	4.45	
					0.00	0.00	0.00							853.66	853.65	0.01		Cir				
2	1	D/Gt	0.012	57.527	0.00	0.00	0.00	7.05	0.41	6.46	0.26	0.00	1.69	857.75	854.67	854.59	0.08	12	0.14	2.38	1.69	Str. 3
					0.00	0.00	0.00							854.88	854.66		0.38	12	0.38	3.04	2.39	
					0.00	0.00	0.00							853.88	853.66	0.22		Cir				
3	2	D/Gt	0.012	80.000	0.00	0.00	0.00	6.38	0.67	6.69	0.19	0.00	1.24	857.75	854.90	854.82	0.08	12	0.10	1.99	1.24	Str. 2
					0.00	0.00	0.00							855.23	854.98		0.31	12	0.31	2.75	2.16	
					0.00	0.00	0.00							854.23	853.98	0.25		Cir				
4	3	Comb	0.012	97.213	0.00	0.00	0.00	5.00	1.38	7.21	0.06	0.00	0.45	858.70	855.05	855.00	0.04	12	0.04	1.15	0.45	Str. 1
					0.00	0.00	0.00							855.64	855.33		0.32	12	0.32	2.77	2.18	
					0.00	0.00	0.00							854.64	854.33	0.31		Cir				
5	1	D/Gt	0.012	67.302	0.00	0.00	0.00	5.00	0.93	7.21	0.12	0.00	0.83	857.30	854.61	854.59	0.02	12	0.04	1.21	0.83	Str. 4
					0.00	0.00	0.00							854.87	854.66		0.31	12	0.31	2.74	2.16	
					0.00	0.00	0.00							853.87	853.66	0.21		Cir				
6	1	Genr	0.012	84.700	0.00	0.00	0.00	5.00	0.49	7.21	0.16	0.00	1.16	857.21	856.48	854.59	1.89	10	2.24	2.86	1.16	Roof Drain
					0.00	0.00	0.00							856.83	854.49		2.76	10	2.76	7.23	3.94	
					0.00	0.00	0.00							856.00	853.66	2.34		Cir				

NOTES: Intensity = 57.70 / (inlet time + 8.80) ^ 0.79 (in/hr)

Project File: West Storm.stm

3/31/2023



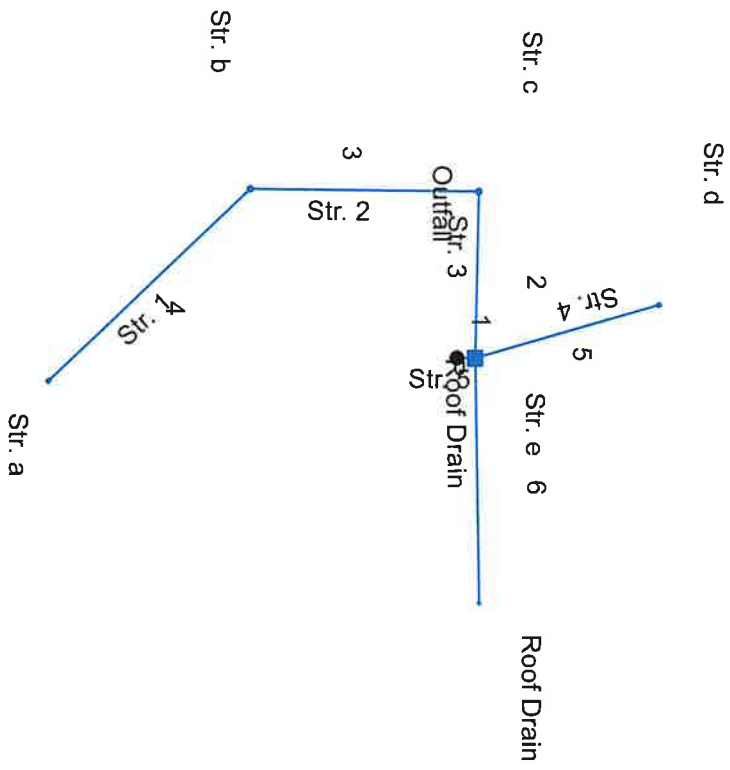
# Hydratflow HGL Computation Procedure

## General Procedure:

Hydratflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydratflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 7 Cross-sectional area of the flow at the downstream end.
- Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).
- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
- Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 16 Cross-sectional area of the flow at the upstream end.
- Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).
- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18).
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average  $Sf/100 \times \text{Line Length}$  (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

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



Project File: West Storm.stm

Number of lines: 6

Date: 3/30/2023

Storm Sewers V2023.00

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Str. 5	4.48	18	Cir	6,516	853.65	853.66	0.153	854.89	854.90	0.13	855.03	End	Manhole
2	Str. 3	2.21	12	Cir	57,527	853.66	853.88	0.382	855.03*	855.22*	0.18	855.41	1	DropGrate
3	Str. 2	1.62	12	Cir	80,000	853.98	854.23	0.313	855.46*	855.60*	0.07	855.68	2	DropGrate
4	Str. 1	0.61	12	Cir	97,213	854.33	854.64	0.319	855.73*	855.76*	0.01	855.77	3	Combination
5	Str. 4	1.13	12	Cir	67,302	853.66	853.87	0.312	855.12*	855.18*	0.03	855.21	1	DropGrate
6	Roof Drain	1.59	10	Cir	84,700	853.66	856.00	2.763	855.03	856.56	n/a	856.94	1	Generic

Project File: West Storm.stm

Number of lines: 6

Run Date: 3/30/2023

NOTES: Return period = 100 Yrs. ; \*Surcharged (HGL above crown). ; i - Inlet control.

# Storm Sewer Tabulation

Station	Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	6.516	0.00	0.77	0.00	0.54	0.0	8.1	8.3	4.48	4.45	2.87	18	0.15	853.65	853.66	854.89	854.90	859.18	859.18	Str. 5
2	1	57.527	0.12	0.42	0.63	0.26	5.0	7.7	8.5	2.21	2.39	2.81	12	0.38	853.66	853.88	855.03	855.22	859.18	857.75	Str. 3
3	2	80.000	0.22	0.30	0.56	0.19	5.0	7.1	8.7	1.62	2.16	2.07	12	0.31	853.98	854.23	855.46	855.60	857.75	857.75	Str. 2
4	3	97.213	0.08	0.08	0.78	0.06	5.0	5.0	9.8	0.61	2.18	0.78	12	0.32	854.33	854.64	855.73	855.76	857.75	858.70	Str. 1
5	1	67.302	0.16	0.16	0.72	0.12	5.0	5.0	9.8	1.13	2.16	1.44	12	0.31	853.66	853.87	855.12	855.18	859.18	857.30	Str. 4
6	1	84.700	0.19	0.19	0.85	0.16	5.0	5.0	9.8	1.59	3.94	3.47	10	2.76	853.66	856.00	855.03	856.56	859.18	857.21	Roof Drain
Project File: West Storm.stm															Number of lines: 6				Run Date: 3/30/2023		

NOTES: Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66; Return period = Yrs. 100 ; c = cir e = ellip b = box

# Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter					Inlet		Byp Line No			
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)		Depth (ft)	Spread (ft)	Depr (in)
1	Str. e	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.0	Off	
2	Str. c	0.74	0.00	0.74	0.00	D/Grt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.000	0.09	11.06	0.09	11.06	0.0	Off
3	Str. b	1.21	0.00	1.21	0.00	D/Grt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.000	0.13	14.55	0.13	14.55	0.0	Off
4	Str. a	0.61	0.00	0.61	0.00	Comb	4.0	2.00	0.17	0.09	2.00	Sag	2.00	0.050	0.020	0.000	0.12	3.24	0.14	3.24	0.2	Off
5	Str. d	1.13	0.00	1.13	0.00	D/Grt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.000	0.12	14.01	0.12	14.01	0.0	Off
6	Roof Drain	1.59	0.00	1.59	0.00	Genr	0.0	0.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.000	0.30	12.00	0.30	12.00	0.0	Off

Project File: West Storm.stm

Number of lines: 6

Run Date: 3/30/2023

3/31/2023

NOTES: Inlet N-Values = 0.016; Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66; Return period = 100 Yrs. ; \* Indicates Known Q added. All curb inlets are Horiz throat.

# FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len (ft)	Drainage Area			Time of conc (min)	Time of Flow in sect (min)	Inten (l/hr)	Total CA	Add Q		Inlet elev (ft)	Elev of HGL			Rise Span	HGL Pipe	ADD Full Flow	Cap (cfs)	Date: 3/30/2023
					Incre-ment (ac)	Sub-Total (ac)	Sum CA					Total Flow	Q (cfs)		Up (ft)	Down (ft)	Fall (ft)					
1	End	MH	0.012	6.516	0.00	0.00	0.00	8.06	0.04	8.32	0.54	0.00	859.18	854.90	854.89	0.01	18	0.16	2.87	4.48	Str. 5	
					0.00	0.00	0.00					4.48	855.16	855.15			0.15	2.52	4.45			
					0.00	0.00	0.00					2.21	853.66	853.65	0.01	12	0.38	3.04	2.39	Str. 3		
2	1	DrGt	0.012	57.527	0.00	0.00	0.00	7.72	0.34	8.46	0.26	0.00	857.75	855.22	855.03	0.19	12	0.33	2.81	2.21		
					0.00	0.00	0.00					2.21	854.88	854.66	0.22	12	0.38	3.04	2.39	Str. 3		
					0.00	0.00	0.00					1.62	853.88	853.66	0.22	12	0.38	3.04	2.39	Str. 3		
3	2	DrGt	0.012	80.000	0.00	0.00	0.00	7.08	0.65	8.74	0.19	0.00	857.75	855.60	855.46	0.14	12	0.18	2.07	1.62	Str. 2	
					0.00	0.00	0.00					1.62	855.23	854.98	0.25	12	0.31	2.75	2.16	Str. 2		
					0.00	0.00	0.00					0.61	854.23	853.98	0.25	12	0.31	2.75	2.16	Str. 2		
4	3	Comb	0.012	97.213	0.00	0.00	0.00	5.00	2.08	9.83	0.06	0.00	858.70	855.76	855.73	0.02	12	0.03	0.78	0.61	Str. 1	
					0.00	0.00	0.00					0.61	855.64	855.33	0.31	12	0.32	2.77	2.18	Str. 1		
					0.00	0.00	0.00					0.61	854.64	854.33	0.31	12	0.32	2.77	2.18	Str. 1		
5	1	DrGt	0.012	67.302	0.00	0.00	0.00	5.00	0.78	9.83	0.12	0.00	857.30	855.18	855.12	0.06	12	0.09	1.44	1.13	Str. 4	
					0.00	0.00	0.00					1.13	854.87	854.66	0.21	12	0.31	2.74	2.16	Str. 4		
					0.00	0.00	0.00					1.59	853.87	853.66	0.21	12	0.31	2.74	2.16	Str. 4		
6	1	Genr	0.012	84.700	0.00	0.00	0.00	5.00	0.41	9.83	0.16	0.00	857.21	856.56	855.03	1.54	10	1.81	3.47	1.59	Roof Drain	
					0.00	0.00	0.00					1.59	856.83	854.49	2.34	10	2.76	7.23	3.94	Roof Drain		
					0.00	0.00	0.00					1.59	856.00	853.66	2.34	10	2.76	7.23	3.94	Roof Drain		

NOTES: Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66 (in/hr)

Project File: West Storm.stm

3/31/2023



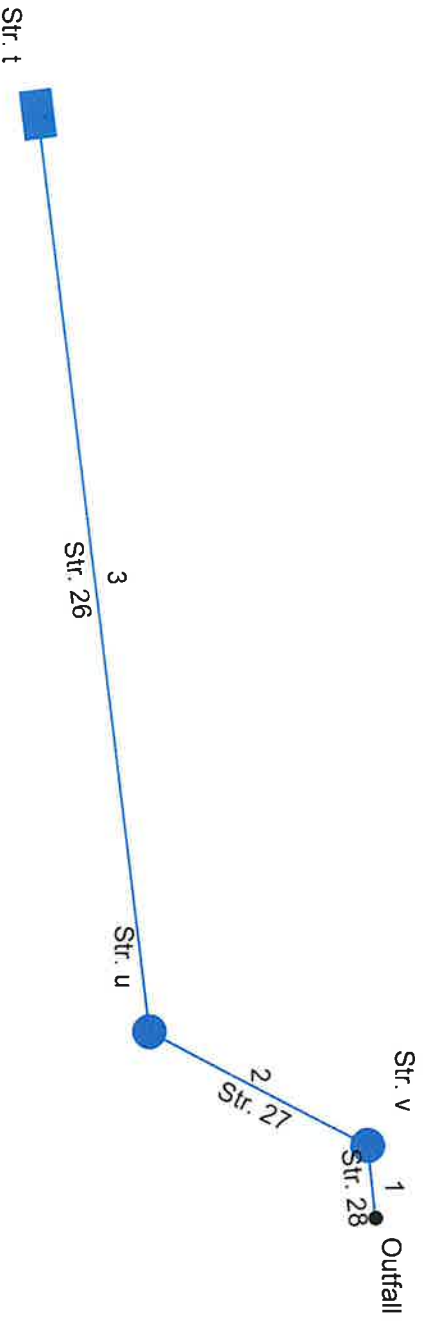
# Hydratflow HGL Computation Procedure

## General Procedure:

Hydratflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydratflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
- Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.
- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 7 Cross-sectional area of the flow at the downstream end.
- Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).
- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
- Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
- Col. 16 Cross-sectional area of the flow at the upstream end.
- Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).
- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18).
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average  $Sf/100 \times \text{Line Length}$  (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

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



Project File: outfall storm.stm

Number of lines: 3

Date: 3/30/2023

# Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Str. 28	13.54	24	Cir	8.850	852.66	852.68	0.226	854.07	854.16	n/a	854.61	End	Manhole
2	Str. 27	13.54	24	Cir	30.211	852.78	852.83	0.165	854.78*	854.89*	0.37	855.26	1	DropGrate
3	Str. 26	13.15	24	Cir	111.950	852.93	853.14	0.188	855.27*	855.65*	0.27	855.93	2	Manhole

Project File: outfall storm.stm  
 Number of lines: 3  
 Run Date: 3/30/2023

NOTES: Return period = 100 Yrs. ; \*Surcharged (HGL above crown) ; i - Inlet control.

# Storm Sewer Tabulation

Station	Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (l)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
		Incr	Total		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	8.850	0.00	0.12	0.00	0.00	0.04	0.0	5.1	9.8	13.54	10.76	5.57	24	0.23	852.66	852.68	854.07	854.16	858.00	858.60	Str. 28
2	30.211	0.12	0.12	0.33	0.04	0.04	5.0	5.0	9.8	13.54	9.20	4.31	24	0.17	852.78	852.83	854.78	854.89	858.60	856.50	Str. 27
3	111.950	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	13.15	9.80	4.19	24	0.19	852.93	853.14	855.27	855.65	856.50	856.50	Str. 26

Project File: outfall storm.stm

Number of lines: 3

Run Date: 3/30/2023

NOTES: Intensity = 46.87 / (inlet time + 5.70) ^ 0.66; Return period = Yrs. 100 ; c = cir e = ellip b = box



# FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len (ft)	Drainage Area			Time of conc (min)	Time of Flow in sect (min)	Inten (l) (in/hr)	Total CA	Add Q		Inlet elev (ft)	Elev of HGL			Rise Span	HGL Pipe	ADD Full Flow		Date: 3/30/2023
					Incr-ment (ac)	Sub-Total (ac)	Sum CA					Total Flow (cfs)	Q (cfs)		Up (ft)	Down (ft)	Fall (ft)			Slope (%)	Vel (ft/s)	
1	End	MH	0.013	8.850	0.00	0.00	0.00	5.12	0.03	9.76	0.04	0.00	13.54	858.60	854.16	854.07	0.09	24	1.05	5.57	13.54	Str: 28
					0.00	0.00	0.00							854.68	854.66	0.02	24	0.23	3.42	10.76		
					0.00	0.00	0.00							852.68	852.66		Cir					
2	1	D/Gt	0.013	30.211	0.00	0.00	0.00	5.00	0.12	9.83	0.04	0.00	13.54	856.50	854.89	854.78	0.11	24	0.36	4.31	13.54	Str: 27
					0.00	0.00	0.00							854.83	854.78	0.05	24	0.17	2.93	9.20		
					0.00	0.00	0.00							852.83	852.78		Cir					
3	2	MH	0.013	111.95	0.00	0.00	0.00	0.00	0.45	0.00	0.00	13.15	856.50	855.65	855.27	0.38	24	0.34	4.19	13.15	Str: 26	
					0.00	0.00	0.00							855.14	854.93	0.21	24	0.19	3.12	9.80		
					0.00	0.00	0.00							853.14	852.93		Cir					

NOTES: Intensity = 46.87 / (Inlet time + 5.70) ^ 0.66 (in/hr) Project File: outfall storm.stm



# Hydratflow HGL Computation Procedure

## General Procedure:

Hydratflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydratflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles. The computed HGL is checked against inlet control.

- Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.
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- Col. 3 Total flow rate in the line.
- Col. 4 The elevation of the downstream invert.
- Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.
- Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.
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- Col. 9 Velocity head (Velocity squared / 2g).
- Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head. (Col. 5 + Col. 9).
- Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation)
- Col. 12 The line length.
- Col. 13 The elevation of the upstream invert.
- Col. 14 Elevation of the hydraulic grade line at the upstream end.
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- Col. 18 Velocity head (Velocity squared / 2g).
- Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head. (Col. 14 + Col. 18).
- Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).
- Col. 21 The average of the downstream and upstream friction slopes.
- Col. 22 Energy loss. Average  $Sf/100 \times \text{Line Length}$  (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.
- Col. 23 The junction loss coefficient (K).
- Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

# Appendix I

## Inlet Sizing Calculations

### Inlet Capacity Calculation

Weir Flow:  $dw = [Q/3.0 P]^{0.67}$   
 Orifice Flow:  $do = [Q/4.89A]^{0.5}$

$dw$  = depth of flow (weir)  
 $do$  = depth of flow (orifice)  
 $A$  = area of opening  
 $Q$  = discharge to inlet  
 $P$  = perimeter of grate

Inlet #	Casting Type	Top of Casting (elev.)	Flow to Inlet Q (cfs) 10-yr	Flow to Inlet Q (cfs) 100-yr	Perimeter of Grate, P (ft.)	50% Clogged P (ft.)	Area of Gate, A (s.f.)	50% Clogged A (s.f.)	10 yr. Storm event				100 yr. Storm event			
									$dw$ (ft.)	$do$ (ft.)	Depth of water Stage (elev.)	Type of Flow	$dw$ (ft.)	$do$ (ft.)	Depth of water Stage (elev.)	Type of Flow
a	R-3234-B1	858.70	0.45	0.61	5.3	2.65	1.3	0.65	0.15	0.02	858.85	Weir	0.11	0.01	858.81	Weir
b	R-2560-E1	858.00	0.89	1.21	6.7	3.35	1.4	0.7	0.20	0.07	858.20	Weir	0.15	0.03	858.15	Weir
c	R-2560-E1	858.00	0.55	0.74	6.7	3.35	1.4	0.7	0.14	0.03	858.14	Weir	0.11	0.01	858.11	Weir
d	R-3433	858.15	0.83	1.13	8	4	1.5	0.75	0.17	0.05	858.32	Weir	0.13	0.02	858.28	Weir
j	R-3234-B1	858.75	0.7	0.96	5.3	2.65	1.3	0.65	0.20	0.05	858.95	Weir	0.15	0.02	858.90	Weir
k	R-3234-B1	858.75	0.52	0.71	5.3	2.65	1.3	0.65	0.16	0.03	858.91	Weir	0.12	0.01	858.87	Weir
l	R-3234-B1	858.45	0.52	0.71	5.3	2.65	1.3	0.65	0.16	0.03	858.61	Weir	0.12	0.01	858.57	Weir
m	R-3234-B1	858.75	0.69	0.95	5.3	2.65	1.3	0.65	0.19	0.05	858.94	Weir	0.15	0.02	858.90	Weir
n	R-3234-B1	858.40	0.77	1.05	5.3	2.65	1.3	0.65	0.21	0.06	858.61	Weir	0.16	0.03	858.56	Weir
o	R-3234-B1	858.25	0.52	0.71	5.3	2.65	1.3	0.65	0.16	0.03	858.41	Weir	0.12	0.01	858.37	Weir
p	R-3234-B1	858.00	0.69	0.94	5.3	2.65	1.3	0.65	0.19	0.05	858.19	Weir	0.15	0.02	858.15	Weir
q	R-3234-B1	858.00	0.68	0.93	5.3	2.65	1.3	0.65	0.19	0.05	858.94	Weir	0.15	0.02	858.90	Weir
r	R-3234-B1	858.75	0.68	0.93	5.3	2.65	1.3	0.65	0.19	0.05	858.94	Weir	0.15	0.02	858.90	Weir
u	R-2560-E1	856.50	0.453	0.728	6.7	3.35	1.4	0.7	0.13	0.02	856.63	Weir	0.11	0.01	856.61	Weir

# Appendix J

## Water Quality Calculations

# Hydraflow Table of Contents

<b>Watershed Model Schematic.....</b>	<b>1</b>
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# Watershed Model Schematic

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

1 - West Storm Water Quality



2 - South Storm Water Quality



3 - North Storm Water Quality



# Hydrograph Return Period Recap

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

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	----	-----	-----	-----	-----	-----	0.905	-----	-----	-----	West Storm Water Quality
2	SCS Runoff	----	-----	-----	-----	-----	-----	0.554	-----	-----	-----	South Storm Water Quality
3	SCS Runoff	----	-----	-----	-----	-----	-----	0.682	-----	-----	-----	North Storm Water Quality
Proj. file: Water Quality.gpw									Thursday, 03 / 30 / 2023			
3/31/2023												163

# 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	0.905	2	718	2,174	-----	-----	-----	West Storm Water Quality
2	SCS Runoff	0.554	2	718	1,419	-----	-----	-----	South Storm Water Quality
3	SCS Runoff	0.682	2	718	1,724	-----	-----	-----	North Storm Water Quality
Water Quality.gpw 3/31/2023					Return Period: 10 Year			Thursday, 03 / 30 / 2023	

# Hydrograph Report

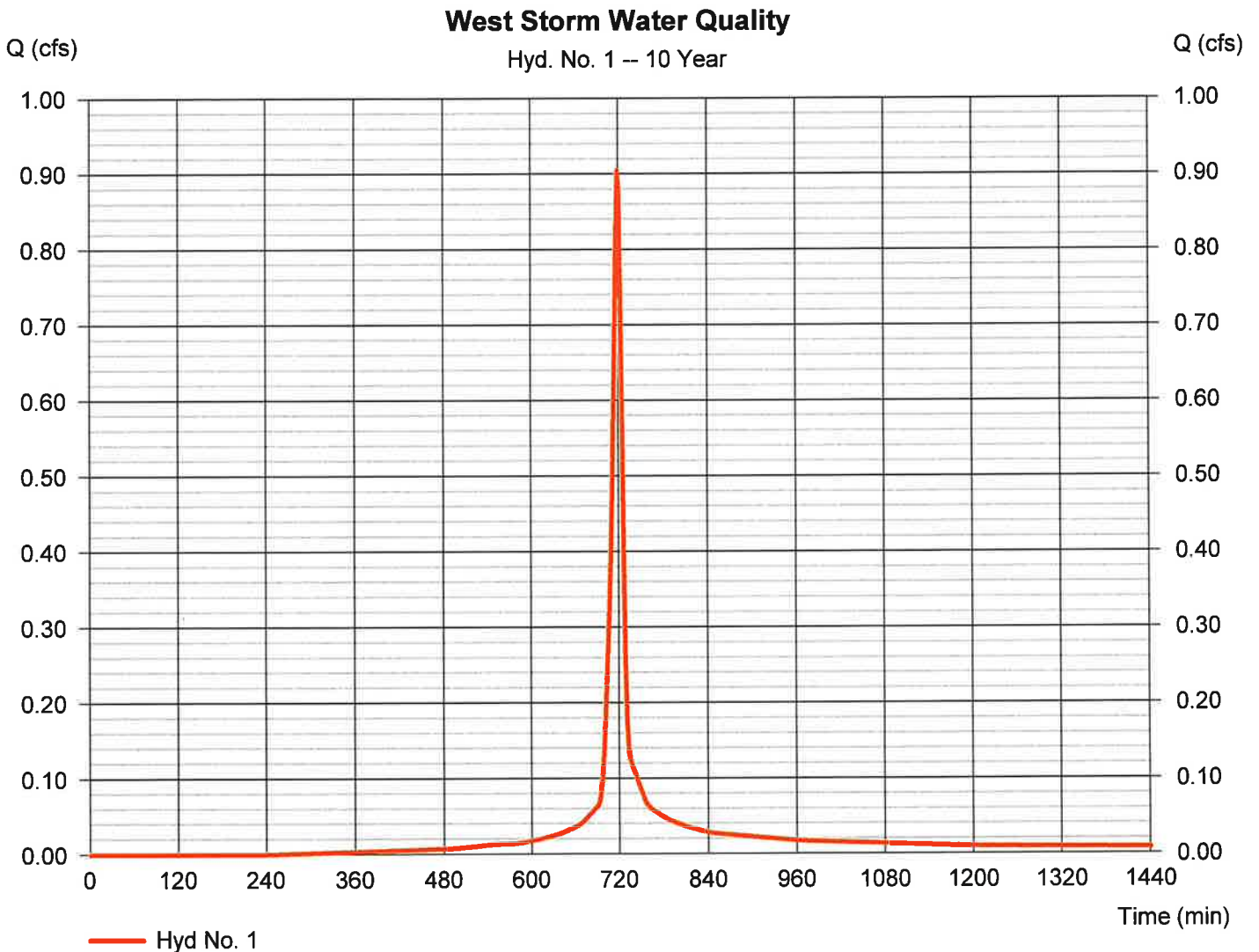
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 1

### West Storm Water Quality

Hydrograph type	= SCS Runoff	Peak discharge	= 0.905 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 2,174 cuft
Drainage area	= 0.775 ac	Curve number	= 97.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.50 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

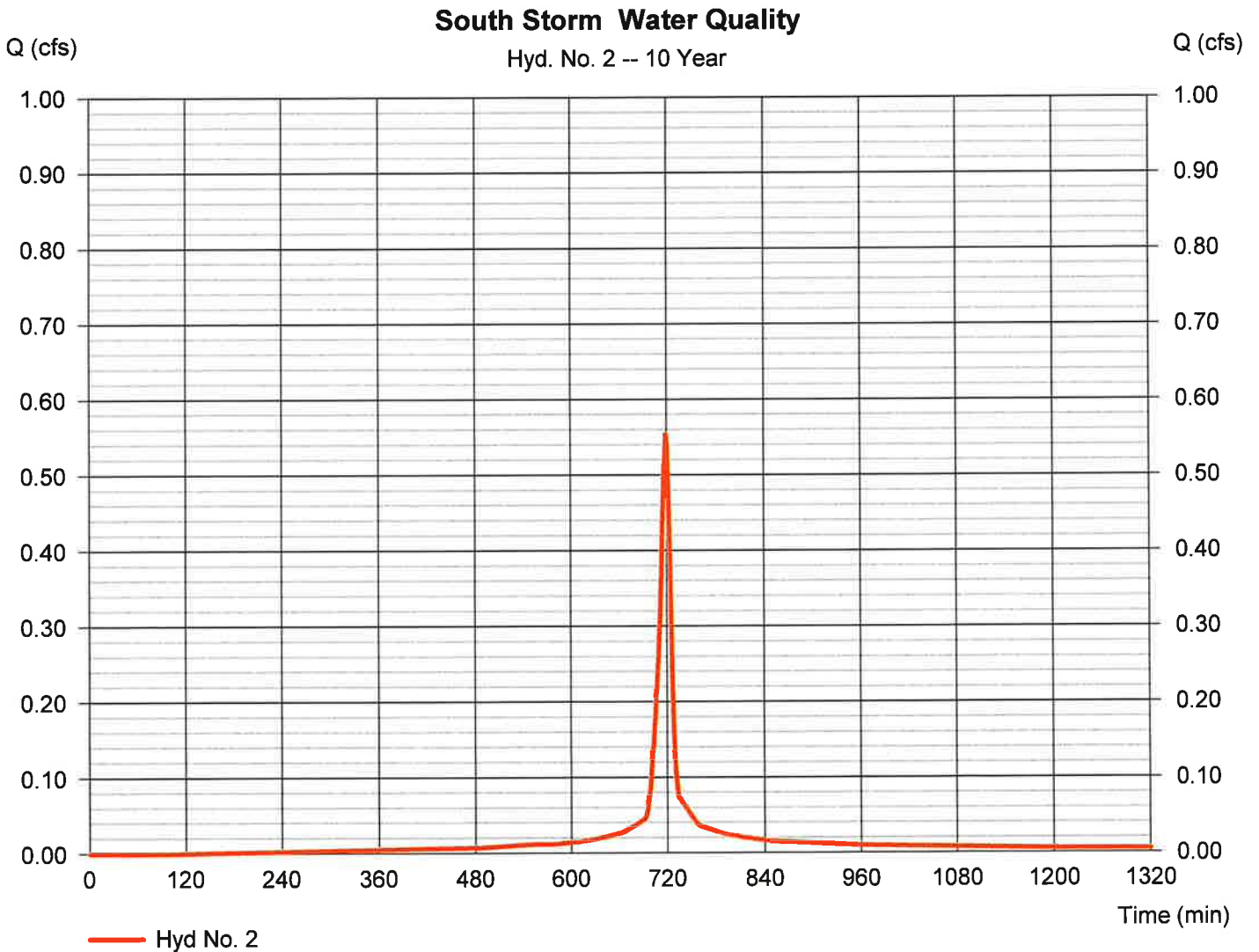
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 2

### South Storm Water Quality

Hydrograph type	= SCS Runoff	Peak discharge	= 0.554 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,419 cuft
Drainage area	= 0.435 ac	Curve number	= 99.1
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.00 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

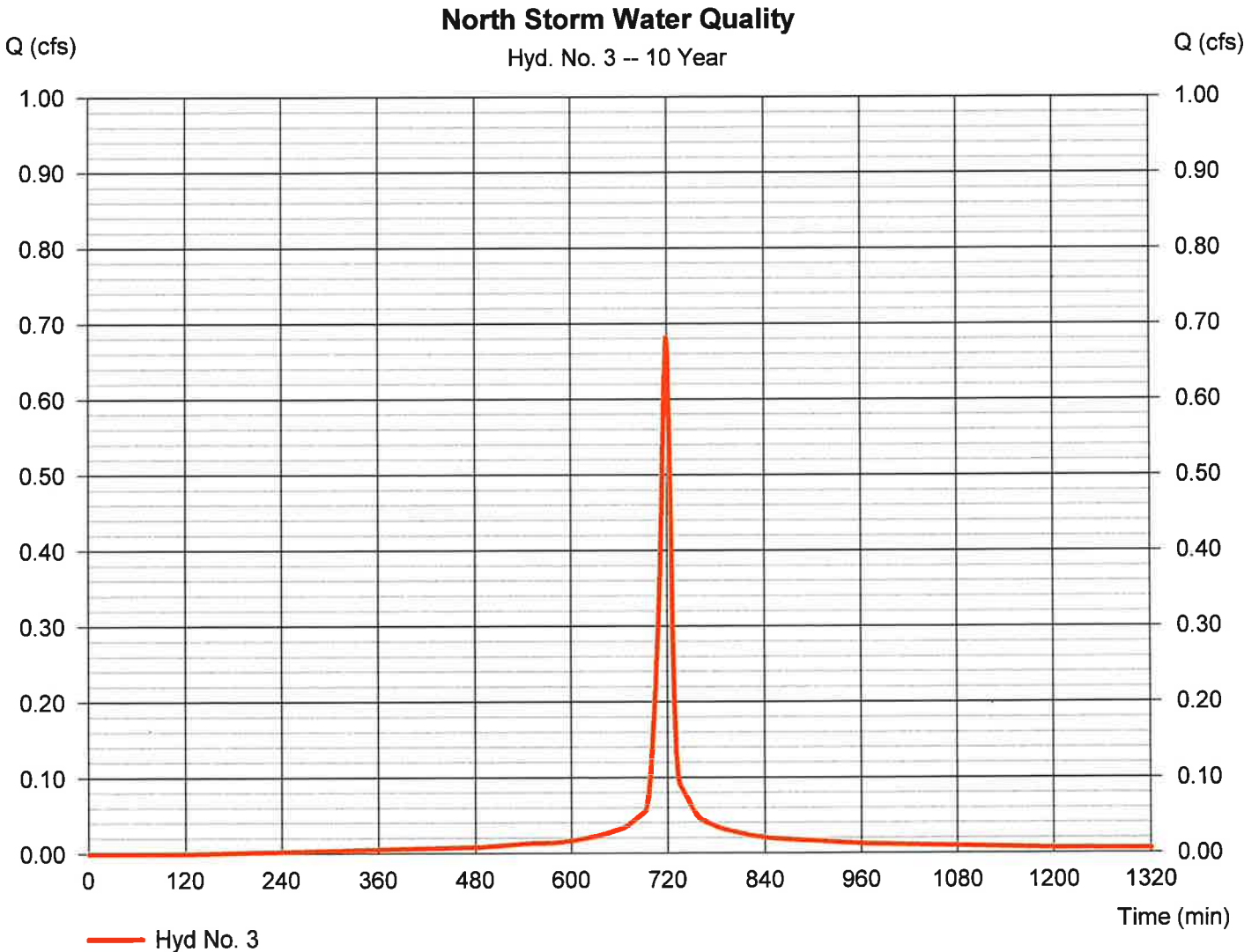
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 03 / 30 / 2023

## Hyd. No. 3

### North Storm Water Quality

Hydrograph type	= SCS Runoff	Peak discharge	= 0.682 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,724 cuft
Drainage area	= 0.541 ac	Curve number	= 98.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 7.90 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydraflow Rainfall Report

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

Thursday, 03 / 30 / 2023

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	55.7621	10.3000	0.8820	-----
3	0.0000	0.0000	0.0000	-----
5	57.1954	9.4000	0.8251	-----
10	57.6989	8.8000	0.7922	-----
25	54.1161	7.6000	0.7404	-----
50	50.2122	6.6000	0.6979	-----
100	46.8747	5.7000	0.6592	-----

File name: Hancock County.IDF

$$\text{Intensity} = B / (Tc + D)^E$$

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.03	3.92	3.23	2.75	2.41	2.14	1.93	1.76	1.62	1.50	1.40	1.31
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	6.33	4.95	4.10	3.51	3.09	2.76	2.50	2.29	2.11	1.97	1.84	1.73
10	7.21	5.65	4.68	4.03	3.55	3.18	2.89	2.65	2.45	2.29	2.14	2.02
25	8.29	6.47	5.38	4.64	4.10	3.69	3.36	3.10	2.88	2.69	2.53	2.39
50	9.08	7.07	5.88	5.09	4.51	4.07	3.72	3.44	3.20	3.00	2.83	2.68
100	9.83	7.63	6.36	5.51	4.90	4.44	4.07	3.77	3.52	3.31	3.13	2.97

Tc = time in minutes. Values may exceed 60.

Precip. file name: G:\PCP files\Hancock County\Water Quality.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	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00
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	0.00	0.00	0.00	0.00	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 3/31/2023	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

# Appendix K

## Channel Report Calculations

# Channel Report

## North Storm Pipe

### Circular

Diameter (ft) = 2.00

Invert Elev (ft) = 853.64

Slope (%) = 0.10

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.69

### Highlighted

Depth (ft) = 0.42

Q (cfs) = 0.690

Area (sqft) = 0.48

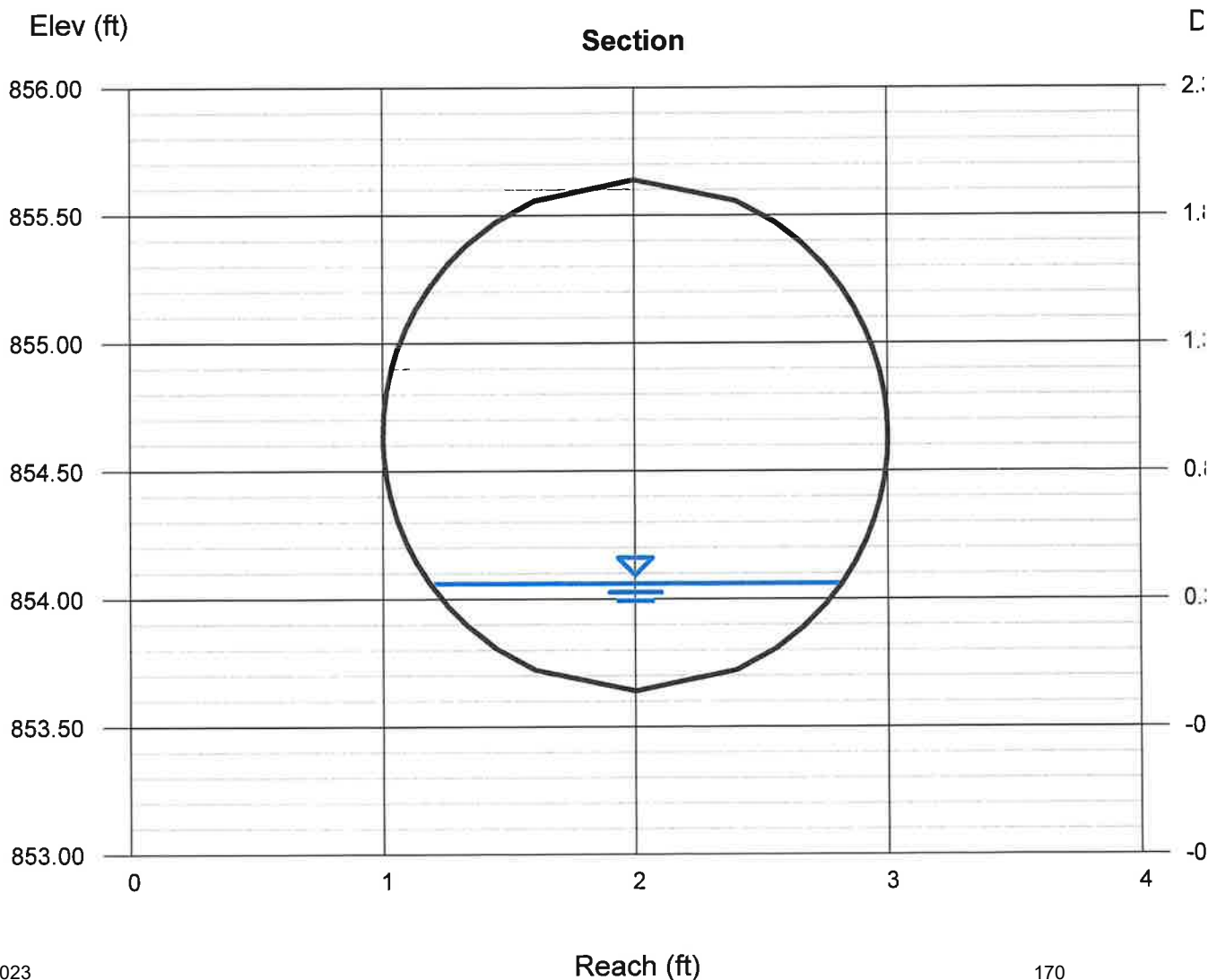
Velocity (ft/s) = 1.43

Wetted Perim (ft) = 1.91

Crit Depth, Yc (ft) = 0.29

Top Width (ft) = 1.63

EGL (ft) = 0.45



# Channel Report

## South Storm Pipe

### Circular

Diameter (ft) = 2.00

Invert Elev (ft) = 853.64

Slope (%) = 0.10

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.56

### Highlighted

Depth (ft) = 0.38

Q (cfs) = 0.560

Area (sqft) = 0.42

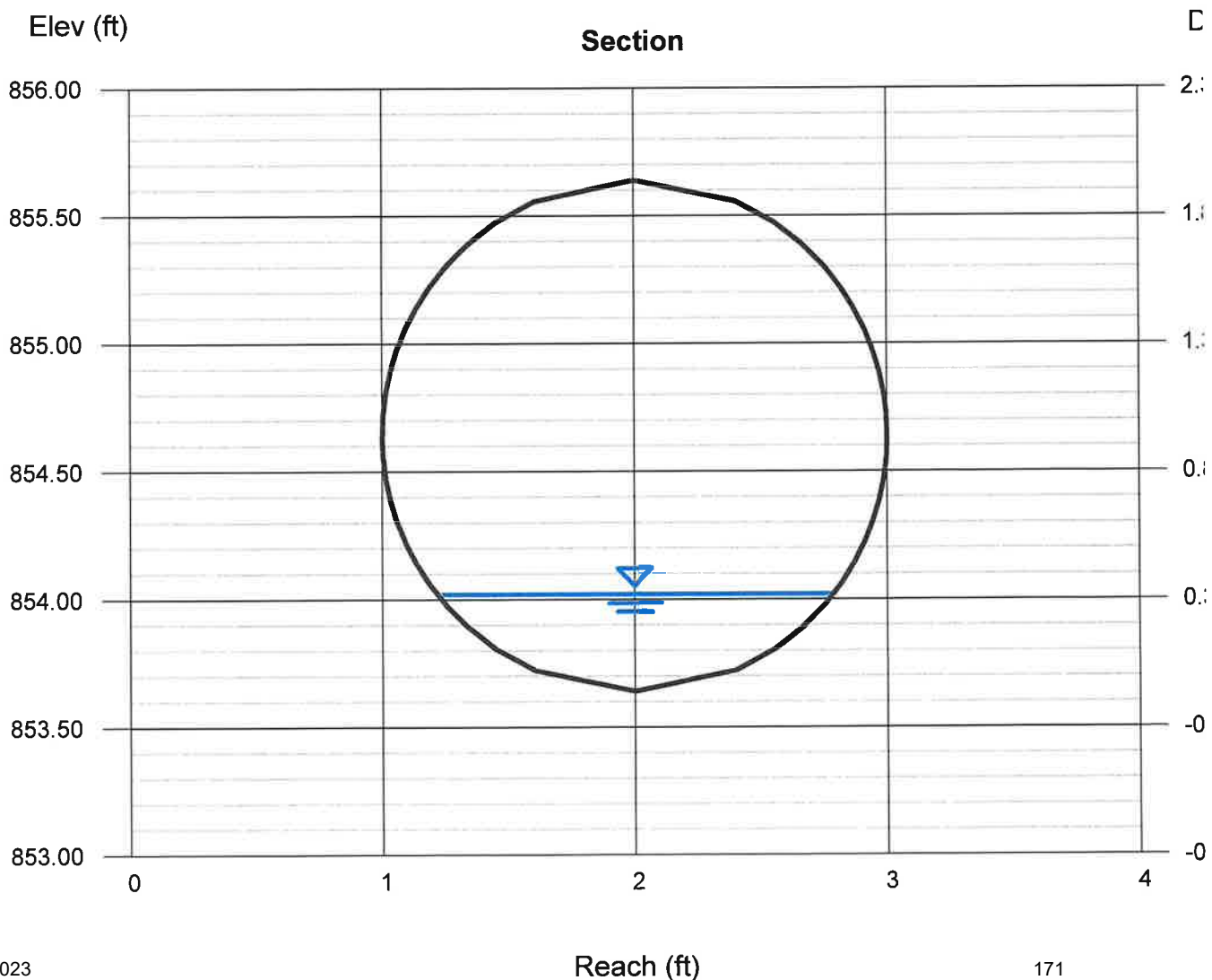
Velocity (ft/s) = 1.34

Wetted Perim (ft) = 1.81

Crit Depth, Yc (ft) = 0.26

Top Width (ft) = 1.57

EGL (ft) = 0.41



# Channel Report

## West Storm Pipe

### Circular

Diameter (ft) = 2.00

Invert Elev (ft) = 853.64

Slope (%) = 0.10

N-Value = 0.013

### Calculations

Compute by: Known Q

Known Q (cfs) = 0.91

### Highlighted

Depth (ft) = 0.49

Q (cfs) = 0.910

Area (sqft) = 0.60

Velocity (ft/s) = 1.51

Wetted Perim (ft) = 2.08

Crit Depth, Yc (ft) = 0.33

Top Width (ft) = 1.72

EGL (ft) = 0.53

