

# Stormwater Management Plan

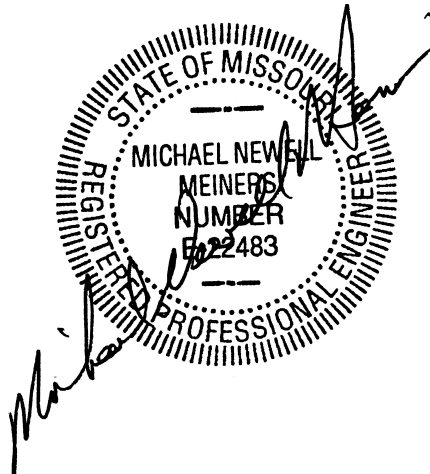
THE VILLAGES AT MONTRACHET WEST COMMERCIAL  
O'FALLON, MO

OCTOBER, 2024

Applicant:  
Reyering Properties LLC  
123 N Harrison  
St. Louis, MO 63122

Owner:  
Dickherber Farm Partnership LP  
4367 N Highway 94  
St. Charles, MO 63301

Reference Numbers:  
SCES: 2024020



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## **SITE INFORMATION AND PROPOSED DETENTION**

The Villages of Montrachet West Commercial is 5.15-acre site located on south side of the Highway 364 South Outer Road and on the west side of Montrachet Drive in the City of O'Fallon, Missouri. The Villages of Montrachet was approved in 2015 and is zoned Mixed Use Traditional Development District, MUTDD and the residential area is south of the 5.15-acres was developed. The 5.15-acres was not graded with only the east and south ends graded to construct Montrachet Drive on the east side and the residential lots on the south side. Twin Chimneys Lee Ridge residential development is to the west.

The site is less than 10 acres, so this report was prepared using the Rational Method of storm water analysis for storms that are a 20-minute duration. Travel time is a combination of sheet flowing over pavement then through storm sewer and 2-minute durations has been assigned for the maximum travel time to the detention basin.

As shown on the Existing Drainage Area Map 4.5 acres of the site drains off-site to the southwest toward the Twin Chimneys Lee Ridge residential lots to the storm sewer inlets and storm sewers within the residential lots to OUT 10. An additional 0.65 acres of the site drains to the southeast to Montrachet Drive to OUT 20. There currently is 0.9 acres of area that drains onto the site from Highway 364 South Outer Road.

As shown on the Proposed Drainage Area Map all of the site proposed pavement and buildings area of 3.91-acres estimated at 80% impervious will drain to the proposed detention basin located in the southwest corner of the site plus 0.08 acres estimated at 5% impervious drains from Highway 364 South Outer Road to the basin for a total area of 3.99-acres draining to the detention basin then to OUT 10. Also shown is 0.82 acres from the site that will by-pass the detention basin draining to southwest that will be 5% impervious and includes the wooded buffer along the west property line to OUT 10. Additionally shown is 0.33-acres from the site that will by-pass the detention basin and drain to the southeast to Montrachet Drive to OUT 20. The total detention basin by-pass is 1.15-acres at 5% impervious.

The allowable release from the detention basin was determined using the differential runoff for the predeveloped 5.15-acres with 4.5-acres draining to the southwest and 0.65 acres draining to the southeast.

The detention report was prepared using Hydraflow Hydrograph Extension for Autodesk Civil 3D software. The combined discharge of the basin routing and the basin by-pass is shown as the actual release from the site which are all below the allowable release.

The low flow openings blocked analysis for the 100-year storm assumes the lower opening on the Outfall Structure to be blocked and then routing the storm water through the basin to elevation 576.53. The top of the detention basin dam is 578.00 provides 1.47 foot of freeboard to the top of the detention basin dam.

An emergency spillway is proposed along the top of the dam that is 10 feet wide and 1 foot deep. The capacity of the spillway is  $Q = 3(10')^{1.5} = 30$  cfs which is greater than the 100-year discharge to the basin of 16.8 cfs.

Attached to this report are the Hydraflow Extension of AutoCAD reports and the supporting exhibits.

### **SEDIMENT LOSS**

The sediment loss into the basin over a two-year period was calculated using the Revised Universal Soil Loss Equation where:

$$Y = DA \times R \times K \times LS \times C = \text{Sediment Yield in Tons}$$

DA = Tributary Drainage Area in Acres

R = Erosivity Factor

K = Soil Erodibility Factor

LS = Topographic Factor

C = Cover-Management Factor

The building, pavement, and walks have a  $C = 0$  so those areas will not contribute to the sediment yield.

Total area to the basin is 3.75 acres. Lot B will have 0.86 acres of impervious surface to the basin and the initial phase of Lot A will have 0.75 acres of impervious surface. The result will be 2.14 acres of graded area that will be seeded and mulched.

For two years the total R would be 400.

The site soil is clay with sand and gravel,  $K = 0.25$

The land slope to the basin is 2 percent for 200 feet,  $LS = 0.37$

The graded area will be seeded and mulched for the ground cover,  $C = 0.10$

$$Y = 2.14 \times 400 \times 0.25 \times 0.37 \times 0.10 = 7.918 \text{ Tons} = 15,836 \text{ pounds}$$

Sandy Clay have a density of 85 pounds per cubic foot.

$$15,836 \text{ pounds} / 85 \text{ pounds per cubic foot} = 186.3 \text{ cubic feet.}$$

The area of the basin at elevation 572 is 1,886 square feet. The raise in the highwater with the sediment yield would be  $186.3 \text{ cubic feet} / 1,886 \text{ square feet} = 0.1 \text{ feet}$

The low flow blocked would then rise 0.1 feet to 576.56 providing 1.44 feet of freeboard to the top of dam shown to be 578.00

Every two years the detention basin should be inspected to determine if there are sediment deposits in the basin by inspecting the low flow opening and the flared end section draining into the basin. Excess sediment deposits should be removed out of the detention basin and hauled off to a landfill.

### **CURB INLET CATCH BASIN FILTERS**

To filter the storm water runoff all of the curb inlets catch basins include a catch basin inlet filter per the detail shown on the plans (or equal product).

Catch Basin Inlet Filters shall be serviced on a recurring basis to remove pollutant loading and interference from debris (leaves, vegetation, or trash). Each insert filter installation shall be serviced a minimum of three times per year with a change of filter medium pouches once per year. The timing of insert filter maintenance shall be March 1<sup>st</sup>, July 1<sup>st</sup>, and November 1<sup>st</sup> being prior to and just after the winter snow season and during the summer.

#### **Service Procedures:**

1. Remove catch basin top or grate and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities shall be notified as soon as practicable.
2. Using an individual vacuum, the collected materials shall be removed from the liner.
3. When all collected material have been removed, the filter medium pouches shall be removed per the manufacturer's recommendations. The filter liner, gaskets, frame, and mounting brackets shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Records. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.) shall be corrected and notation made in the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary, at least once per year.
5. The top or grate shall be replaced.
6. Used pouches and removed debris shall be disposed of in accordance with local, state, and federal requirements.

## DETENTION SUMMARY FOR THE SITE AREA OF 5.15 ACRES

### Pre-Development PIs, 5% Impervious, 20-Minute Storm

Pre-Developed 2-Year PI =	1.15 cfs/acres
Pre-Developed 15-Year PI =	1.7 cfs/acre
Pre-Developed 25-Year PI =	2.0 cfs/acre
Pre-Developed 100-Year PI =	2.29 cfs/acre

### Pre-Development 5.16 Acres Discharge, 5% Impervious, 20-Minute Storm

Pre-Developed 2-Year $5.16 \times 1.15 =$	5.93 cfs
Pre-Developed 15-Year $5.16 \times 1.7 =$	8.77 cfs
Pre-Developed 25-Year $5.16 \times 2.0 =$	10.32 cfs
Pre-Developed 100-Year $5.16 \times 2.29 =$	11.82 cfs

### Less OUT 20 By-Pass, 5% Impervious 0.65 Acres, 20-Minute Storm

		Difference
Post-Developed 2-Year $0.65 \times 1.15 =$	0.75 cfs	5.18 cfs
Post-Developed 15-Year $0.65 \times 1.7 =$	1.11 cfs	7.66 cfs
Post-Developed 25-Year $0.65 \times 2.0 =$	1.3 cfs	9.02 cfs
Post-Developed 100-Year $0.65 \times 2.29 =$	1.49 cfs	10.33 cfs

### Plus, Off-Site 0.09 Acres, 5% Impervious, 20 Min Storm Allowable Release

Pre-Developed 2-Year $0.09 \times 1.15 =$	0.10 cfs	5.28 cfs
Pre-Developed 15-Year $0.09 \times 1.7 =$	0.15 cfs	7.81 cfs
Pre-Developed 25-Year $0.09 \times 2.0 =$	0.18 cfs	9.20 cfs
Pre-Developed 100-Year $0.09 \times 2.29 =$	0.21 cfs	10.54 cfs

### Post-Development, 80% Impervious, 20- Minute Storm

Post-Developed 2-Year PI =	2.12 cfs/acre
Post-Developed 15-Year PI =	3.15 cfs/acre
Post-Developed 25-Year PI =	3.70 cfs/acre
Post-Developed 100-Year PI =	4.25 cfs/acre

### Discharge with 3.85 Acres of Site and 0.08 Off-site to Basin

Allowable 2-Year $3.85 \times 2.12 + 0.08 \times 1.15 =$	8.25 cfs
Allowable 15-Year $3.85 \times 3.15 + 0.08 \times 1.7 =$	12.26 cfs
Allowable 25-Year $3.85 \times 3.70 + 0.08 \times 2.0 =$	14.41 cfs
Allowable 100-Year $3.85 \times 4.25 + 0.08 \times 2.29 =$	16.55 cfs

### Actual Detention Basin Plus By-pass Release OUT 10

		High Water Elevation
Actual 2-Year, 20-Minute Release =	4.79 cfs	573.71
Actual 15-Year, 20-Minute Release =	5.84 cfs	574.83
Actual 25-Year, 20-Minute Release =	6.35 cfs	575.40
Actual 100-Year, 20-Minute Release =	6.85 cfs	575.96

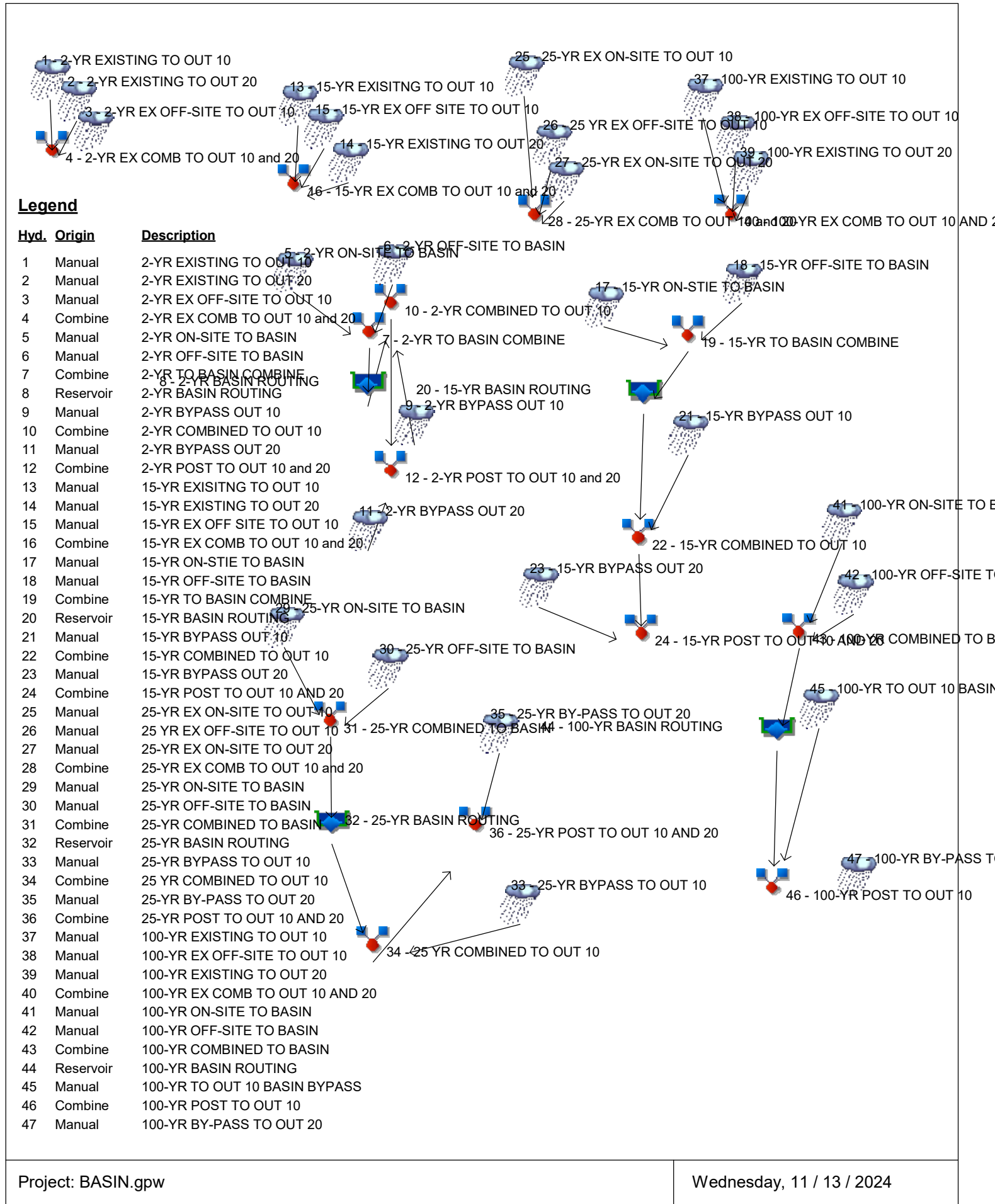
### 100-Year Low Flow Blocked

Post-Development 100-year low flows blocked Peak Elevation =	576.46
Top of Dam =	578.00
	1.47 Feet of Freeboard

# APPENDIX A

# Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020





# Hydrograph Return Period Recap

Hydroflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	Manual	----	----	5.180	----	----	----	----	----	----	2-YR EXISTING TO OUT 10
2	Manual	----	----	0.750	----	----	----	----	----	----	2-YR EXISTING TO OUT 20
3	Manual	----	----	0.090	----	----	----	----	----	----	2-YR EX OFF-SITE TO OUT 10
4	Combine	1, 2,	----	5.930	----	----	----	----	----	----	2-YR EX COMB TO OUT 10 and 20
5	Manual	----	----	8.250	----	----	----	----	----	----	2-YR ON-SITE TO BASIN
6	Manual	----	----	0.090	----	----	----	----	----	----	2-YR OFF-SITE TO BASIN
7	Combine	5, 6	----	8.340	----	----	----	----	----	----	2-YR TO BASIN COMBINE
8	Reservoir	7	----	3.882	----	----	----	----	----	----	2-YR BASIN ROUTING
9	Manual	----	----	0.940	----	----	----	----	----	----	2-YR BYPASS OUT 10
10	Combine	8, 9	----	4.790	----	----	----	----	----	----	2-YR COMBINED TO OUT 10
11	Manual	----	----	0.380	----	----	----	----	----	----	2-YR BYPASS OUT 20
12	Combine	10, 11	----	5.170	----	----	----	----	----	----	2-YR POST TO OUT 10 and 20
13	Manual	----	----	7.650	----	----	----	----	----	----	15-YR EXISTING TO OUT 10
14	Manual	----	----	1.100	----	----	----	----	----	----	15-YR EXISTING TO OUT 20
15	Manual	----	----	0.150	----	----	----	----	----	----	15-YR EX OFF SITE TO OUT 10
16	Combine	13, 14, 15	----	8.900	----	----	----	----	----	----	15-YR EX COMB TO OUT 10 and 20
17	Manual	----	----	12.26	----	----	----	----	----	----	15-YR ON-SITE TO BASIN
18	Manual	----	----	0.140	----	----	----	----	----	----	15-YR OFF-SITE TO BASIN
19	Combine	17, 18	----	12.40	----	----	----	----	----	----	15-YR TO BASIN COMBINE
20	Reservoir	19	----	4.485	----	----	----	----	----	----	15-YR BASIN ROUTING
21	Manual	----	----	1.390	----	----	----	----	----	----	15-YR BYPASS OUT 10
22	Combine	20, 21	----	5.839	----	----	----	----	----	----	15-YR COMBINED TO OUT 10
23	Manual	----	----	0.560	----	----	----	----	----	----	15-YR BYPASS OUT 20
24	Combine	22, 23	----	6.399	----	----	----	----	----	----	15-YR POST TO OUT 10 AND 20
25	Manual	----	----	9.000	----	----	----	----	----	----	25-YR EX ON-SITE TO OUT 10
26	Manual	----	----	0.180	----	----	----	----	----	----	25 YR EX OFF-SITE TO OUT 10
27	Manual	----	----	1.300	----	----	----	----	----	----	25-YR EX ON-SITE TO OUT 20
28	Combine	25, 26, 27	----	10.48	----	----	----	----	----	----	25-YR EX COMB TO OUT 10 and 20
29	Manual	----	----	14.41	----	----	----	----	----	----	25-YR ON-SITE TO BASIN
30	Manual	----	----	0.160	----	----	----	----	----	----	25-YR OFF-SITE TO BASIN
31	Combine	29, 30	----	14.57	----	----	----	----	----	----	25-YR COMBINED TO BASIN
32	Reservoir	31	----	4.757	----	----	----	----	----	----	25-YR BASIN ROUTING
33	Manual	----	----	1.640	----	----	----	----	----	----	25-YR BYPASS TO OUT 10
34	Combine	32, 33	----	6.354	----	----	----	----	----	----	25 YR COMBINED TO OUT 10
Proj. file: BASIN.gpw										Wednesday, 11 / 13 / 2024	

# Hydrograph Return Period Recap

Hydroflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	
35	Manual	-----	-----	0.660	-----	-----	-----	-----	-----	-----	25-YR BY-PASS TO OUT 20
36	Combine	34, 35	-----	7.014	-----	-----	-----	-----	-----	-----	25-YR POST TO OUT 10 AND 20
37	Manual	-----	-----	10.31	-----	-----	-----	-----	-----	-----	100-YR EXISTING TO OUT 10
38	Manual	-----	-----	0.210	-----	-----	-----	-----	-----	-----	100-YR EX OFF-SITE TO OUT 10
39	Manual	-----	-----	1.490	-----	-----	-----	-----	-----	-----	100-YR EXISTING TO OUT 20
40	Combine	37, 38, 39	-----	12.01	-----	-----	-----	-----	-----	-----	100-YR EX COMB TO OUT 10 AND
41	Manual	-----	-----	16.55	-----	-----	-----	-----	-----	-----	100-YR ON-SITE TO BASIN
42	Manual	-----	-----	0.180	-----	-----	-----	-----	-----	-----	100-YR OFF-SITE TO BASIN
43	Combine	41, 42	-----	16.73	-----	-----	-----	-----	-----	-----	100-YR COMBINED TO BASIN
44	Reservoir	43	-----	5.016	-----	-----	-----	-----	-----	-----	100-YR BASIN ROUTING
45	Manual	-----	-----	1.880	-----	-----	-----	-----	-----	-----	100-YR TO OUT 10 BASIN BYPASS
46	Combine	44, 45	-----	6.846	-----	-----	-----	-----	-----	-----	100-YR POST TO OUT 10
47	Manual	-----	-----	0.760	-----	-----	-----	-----	-----	-----	100-YR BY-PASS TO OUT 20
Proj. file: BASIN.gpw										Wednesday, 11 / 13 / 2024	

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	Manual	5.180	1	2	6,216	-----	-----	-----	2-YR EXISTING TO OUT 10
2	Manual	0.750	1	2	900	-----	-----	-----	2-YR EXISTING TO OUT 20
3	Manual	0.090	1	2	109	-----	-----	-----	2-YR EX OFF-SITE TO OUT 10
4	Combine	5.930	1	2	7,116	1, 2,	-----	-----	2-YR EX COMB TO OUT 10 and 20
5	Manual	8.250	1	2	9,900	-----	-----	-----	2-YR ON-SITE TO BASIN
6	Manual	0.090	1	2	109	-----	-----	-----	2-YR OFF-SITE TO BASIN
7	Combine	8.340	1	2	10,009	5, 6	-----	-----	2-YR TO BASIN COMBINE
8	Reservoir	3.882	1	21	10,007	7	573.71	6,332	2-YR BASIN ROUTING
9	Manual	0.940	1	2	1,128	-----	-----	-----	2-YR BYPASS OUT 10
10	Combine	4.790	1	20	11,135	8, 9	-----	-----	2-YR COMBINED TO OUT 10
11	Manual	0.380	1	2	456	-----	-----	-----	2-YR BYPASS OUT 20
12	Combine	5.170	1	20	11,591	10, 11	-----	-----	2-YR POST TO OUT 10 and 20
13	Manual	7.650	1	2	9,180	-----	-----	-----	15-YR EXISTING TO OUT 10
14	Manual	1.100	1	2	1,320	-----	-----	-----	15-YR EXISTING TO OUT 20
15	Manual	0.150	1	2	180	-----	-----	-----	15-YR EX OFF SITE TO OUT 10
16	Combine	8.900	1	2	10,680	13, 14, 15	-----	-----	15-YR EX COMB TO OUT 10 and 20
17	Manual	12.26	1	2	14,712	-----	-----	-----	15-YR ON-SITE TO BASIN
18	Manual	0.140	1	2	168	-----	-----	-----	15-YR OFF-SITE TO BASIN
19	Combine	12.40	1	2	14,880	17, 18	-----	-----	15-YR TO BASIN COMBINE
20	Reservoir	4.485	1	21	14,879	19	574.83	10,511	15-YR BASIN ROUTING
21	Manual	1.390	1	2	1,669	-----	-----	-----	15-YR BYPASS OUT 10
22	Combine	5.839	1	20	16,547	20, 21	-----	-----	15-YR COMBINED TO OUT 10
23	Manual	0.560	1	2	672	-----	-----	-----	15-YR BYPASS OUT 20
24	Combine	6.399	1	20	17,219	22, 23	-----	-----	15-YR POST TO OUT 10 AND 20
25	Manual	9.000	1	2	10,800	-----	-----	-----	25-YR EX ON-SITE TO OUT 10
26	Manual	0.180	1	2	216	-----	-----	-----	25 YR EX OFF-SITE TO OUT 10
27	Manual	1.300	1	2	1,559	-----	-----	-----	25-YR EX ON-SITE TO OUT 20
28	Combine	10.48	1	2	12,575	25, 26, 27	-----	-----	25-YR EX COMB TO OUT 10 and 20
29	Manual	14.41	1	2	17,292	-----	-----	-----	25-YR ON-SITE TO BASIN
30	Manual	0.160	1	2	192	-----	-----	-----	25-YR OFF-SITE TO BASIN
31	Combine	14.57	1	2	17,484	29, 30	-----	-----	25-YR COMBINED TO BASIN
32	Reservoir	4.757	1	21	17,483	31	575.40	12,825	25-YR BASIN ROUTING
33	Manual	1.640	1	2	1,968	-----	-----	-----	25-YR BYPASS TO OUT 10
34	Combine	6.354	1	20	19,451	32, 33	-----	-----	25 YR COMBINED TO OUT 10
BASIN.gpw					Return Period: 2 Year			Wednesday, 11 / 13 / 2024	

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

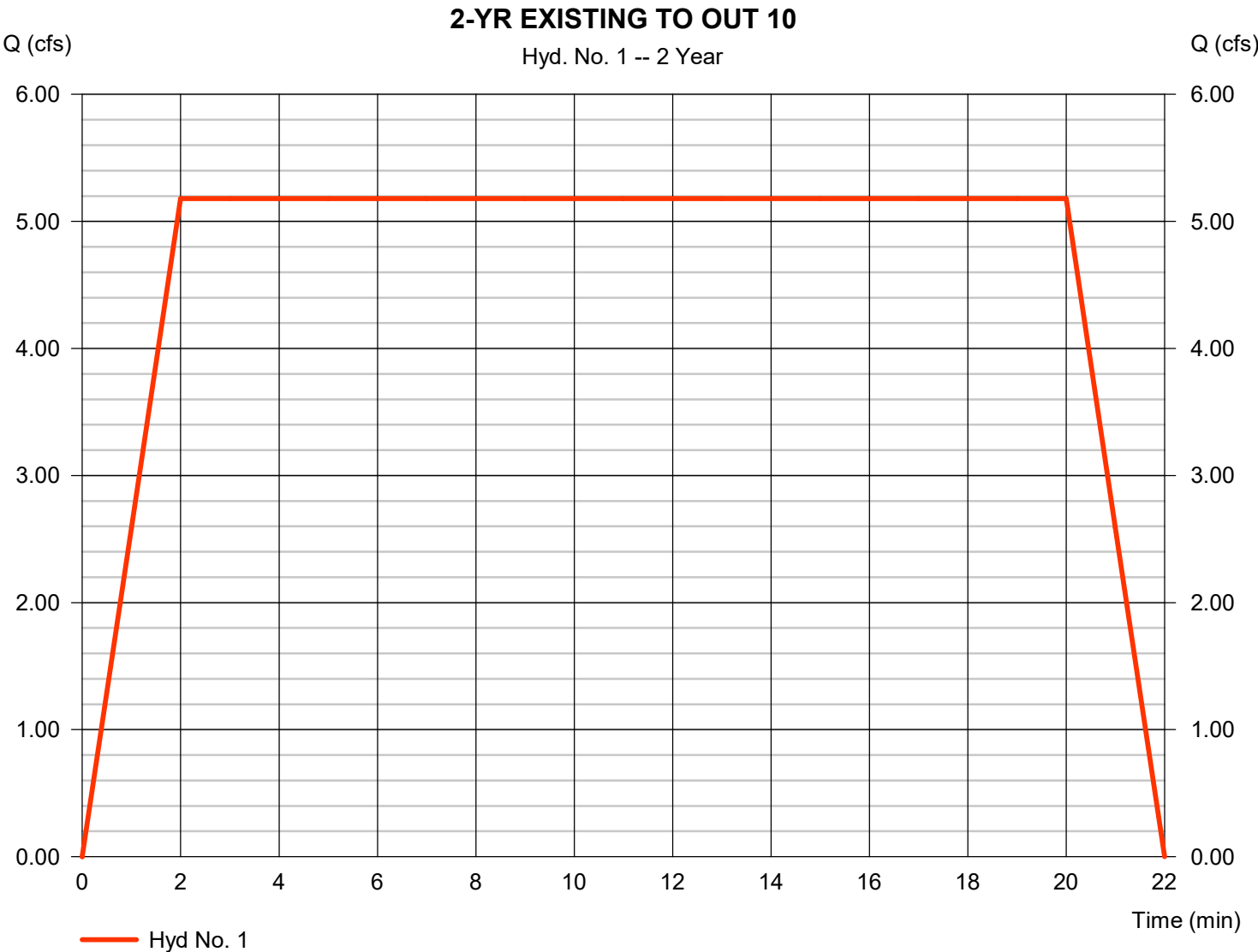
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
35	Manual	0.660	1	2	792	-----	-----	-----	25-YR BY-PASS TO OUT 20
36	Combine	7.014	1	20	20,243	34, 35	-----	-----	25-YR POST TO OUT 10 AND 20
37	Manual	10.31	1	2	12,371	-----	-----	-----	100-YR EXISTING TO OUT 10
38	Manual	0.210	1	2	252	-----	-----	-----	100-YR EX OFF-SITE TO OUT 10
39	Manual	1.490	1	2	1,788	-----	-----	-----	100-YR EXISTING TO OUT 20
40	Combine	12.01	1	2	14,411	37, 38, 39	-----	-----	100-YR EX COMB TO OUT 10 AND
41	Manual	16.55	1	2	19,860	-----	-----	-----	100-YR ON-SITE TO BASIN
42	Manual	0.180	1	2	216	-----	-----	-----	100-YR OFF-SITE TO BASIN
43	Combine	16.73	1	2	20,076	41, 42	-----	-----	100-YR COMBINED TO BASIN
44	Reservoir	5.016	1	21	20,075	43	575.96	15,151	100-YR BASIN ROUTING
45	Manual	1.880	1	2	2,256	-----	-----	-----	100-YR TO OUT 10 BASIN BYPASS
46	Combine	6.846	1	20	22,331	44, 45	-----	-----	100-YR POST TO OUT 10
47	Manual	0.760	1	2	912	-----	-----	-----	100-YR BY-PASS TO OUT 20
BASIN.gpw					Return Period: 2 Year			Wednesday, 11 / 13 / 2024	

# Hydrograph Report

## Hyd. No. 1

2-YR EXISTING TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 5.180 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 6,216 cuft



# Hydrograph Report

## Hyd. No. 2

2-YR EXISTING TO OUT 20

Hydrograph type	= Manual	Peak discharge	= 0.750 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 900 cuft

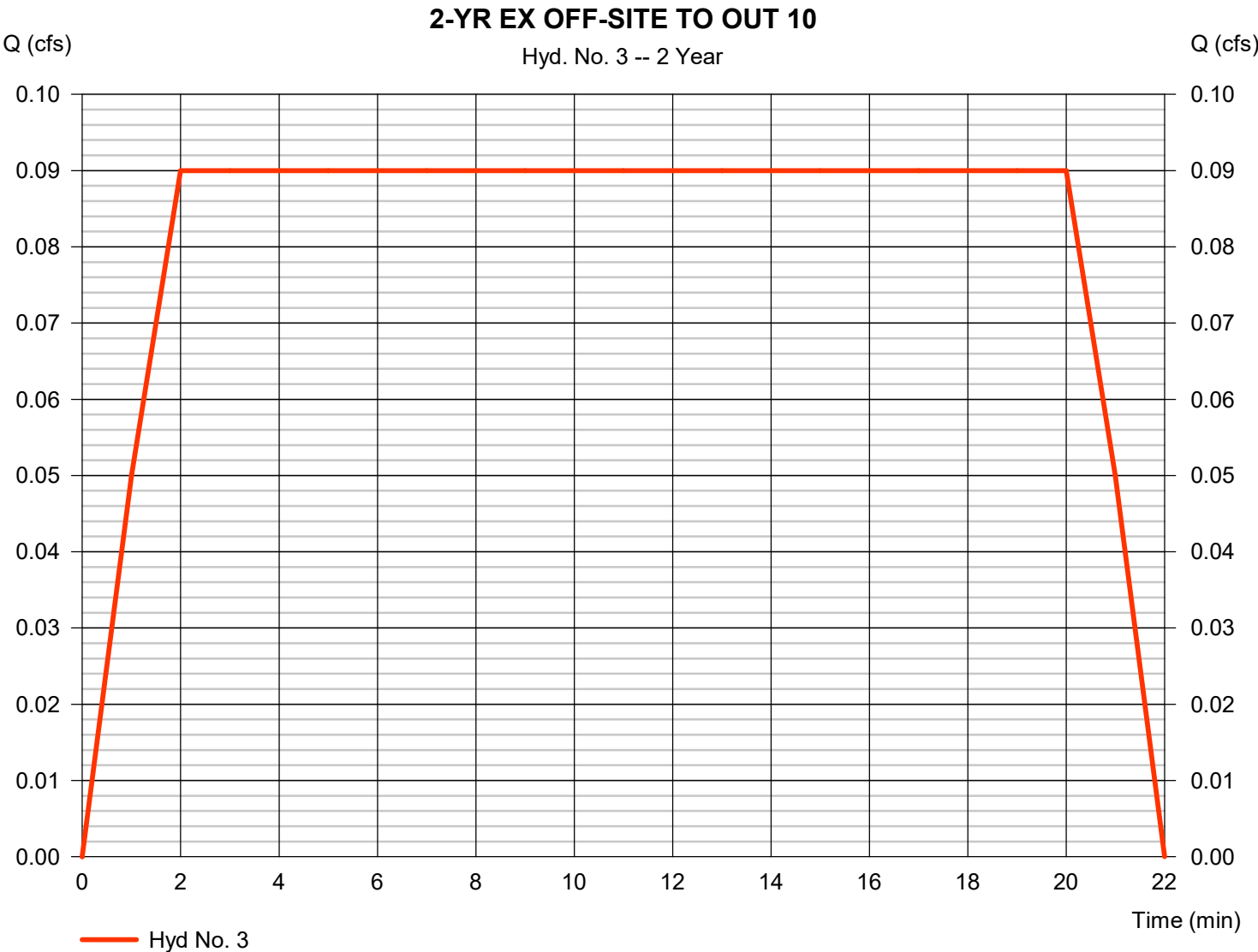


# Hydrograph Report

## Hyd. No. 3

2-YR EX OFF-SITE TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 0.090 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 109 cuft

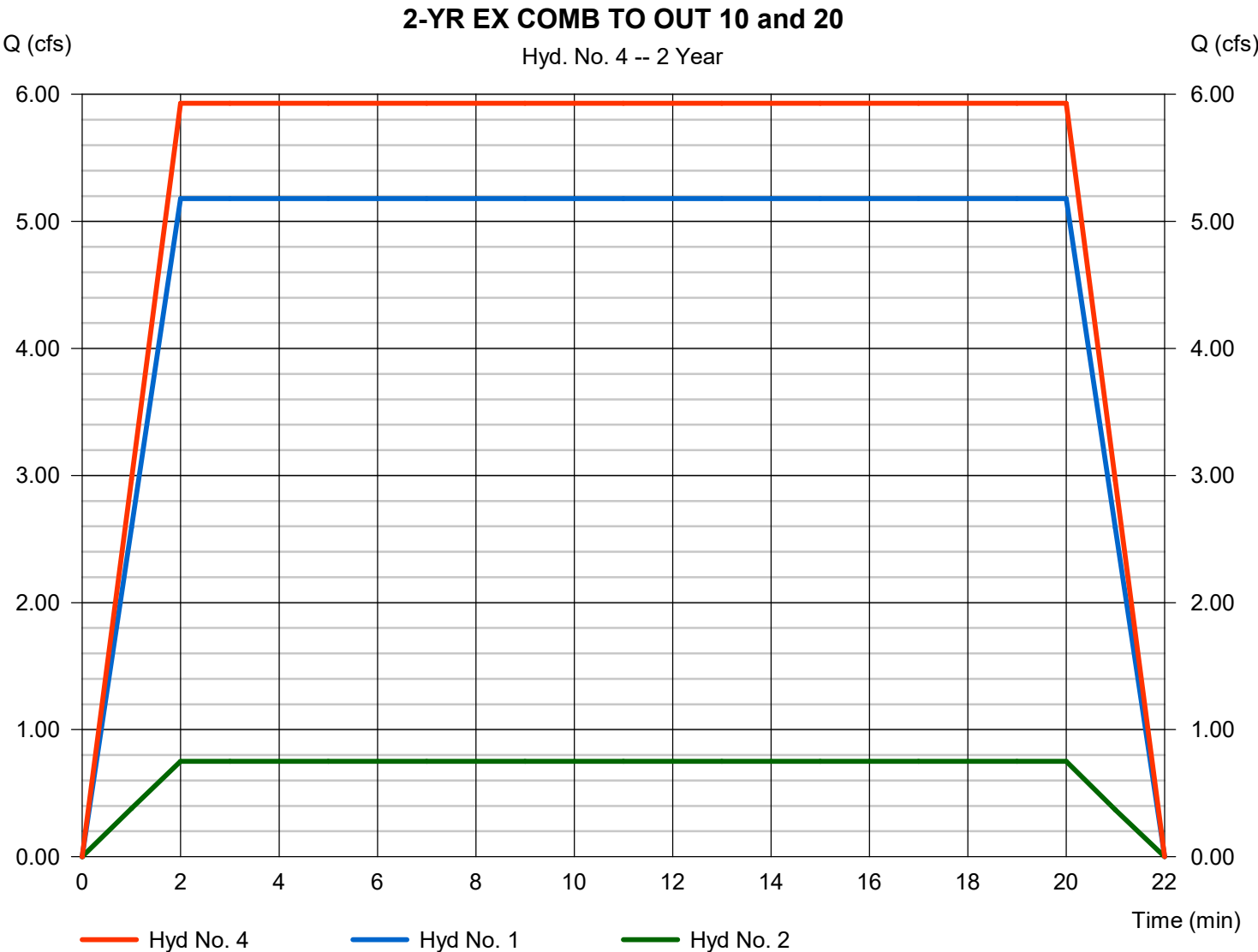


# Hydrograph Report

## Hyd. No. 4

2-YR EX COMB TO OUT 10 and 20

Hydrograph type	= Combine	Peak discharge	= 5.930 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 7,116 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 0.000 ac



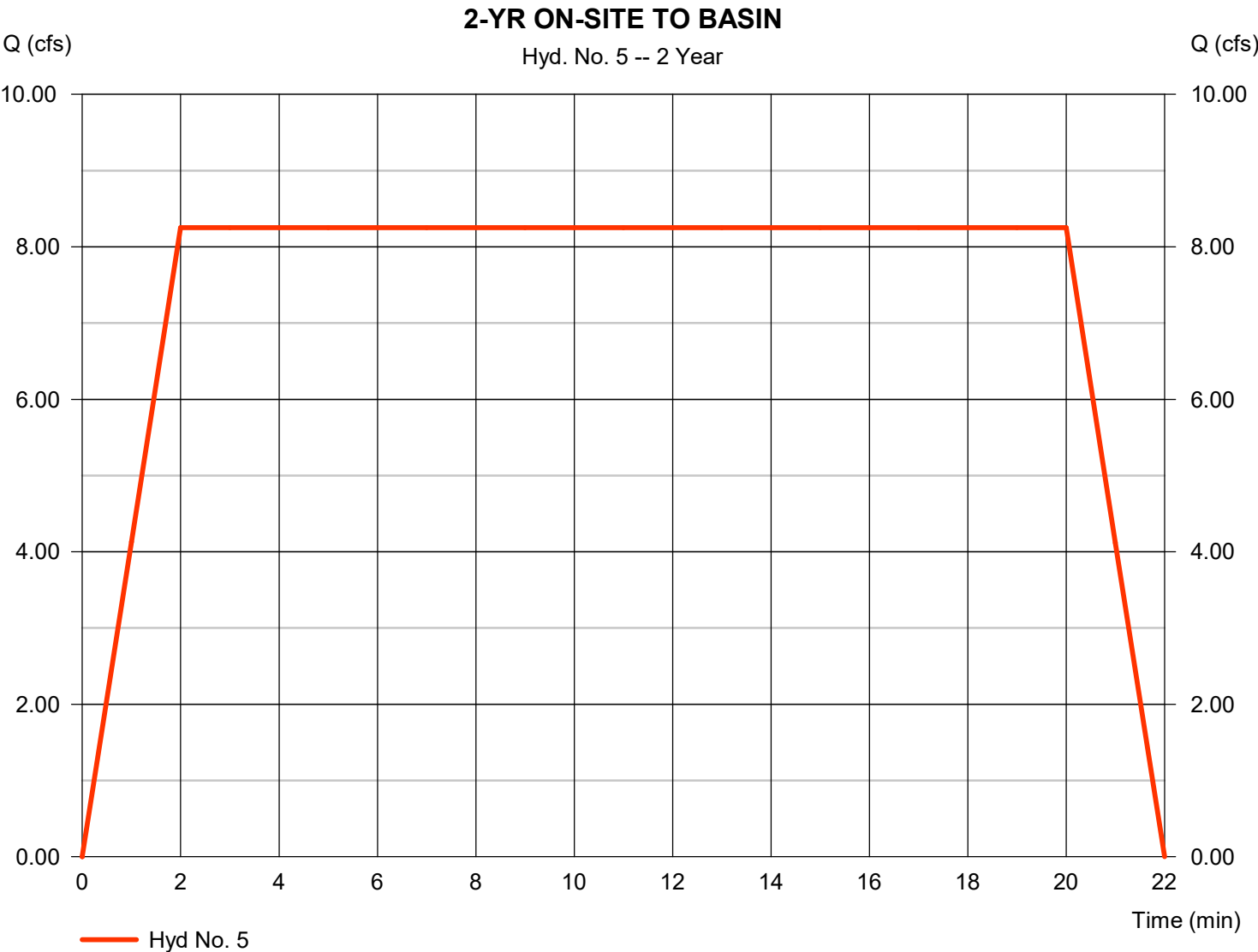


# Hydrograph Report

## Hyd. No. 5

### 2-YR ON-SITE TO BASIN

Hydrograph type	= Manual	Peak discharge	= 8.250 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 9,900 cuft

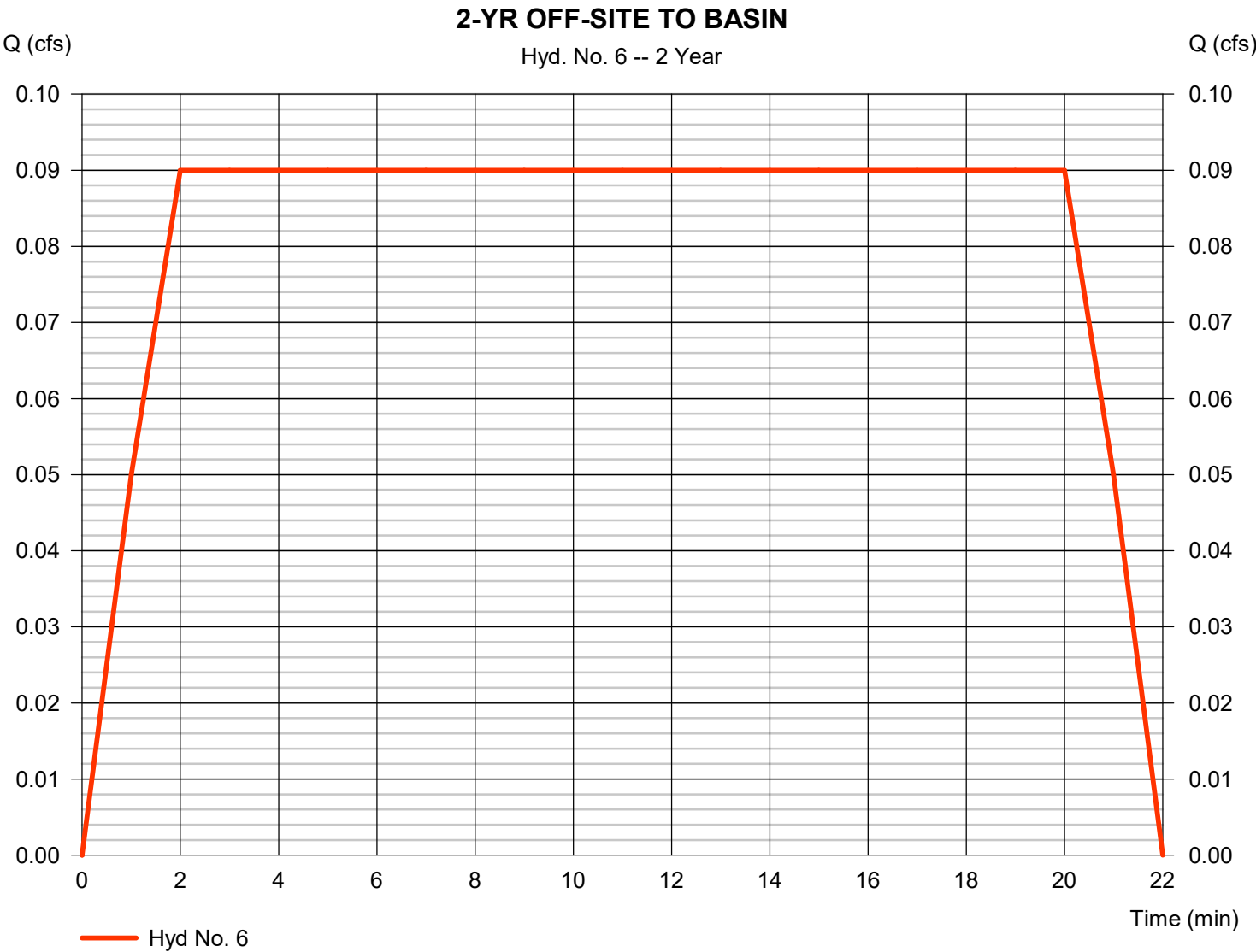


# Hydrograph Report

## Hyd. No. 6

### 2-YR OFF-SITE TO BASIN

Hydrograph type	= Manual	Peak discharge	= 0.090 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 109 cuft



# Hydrograph Report

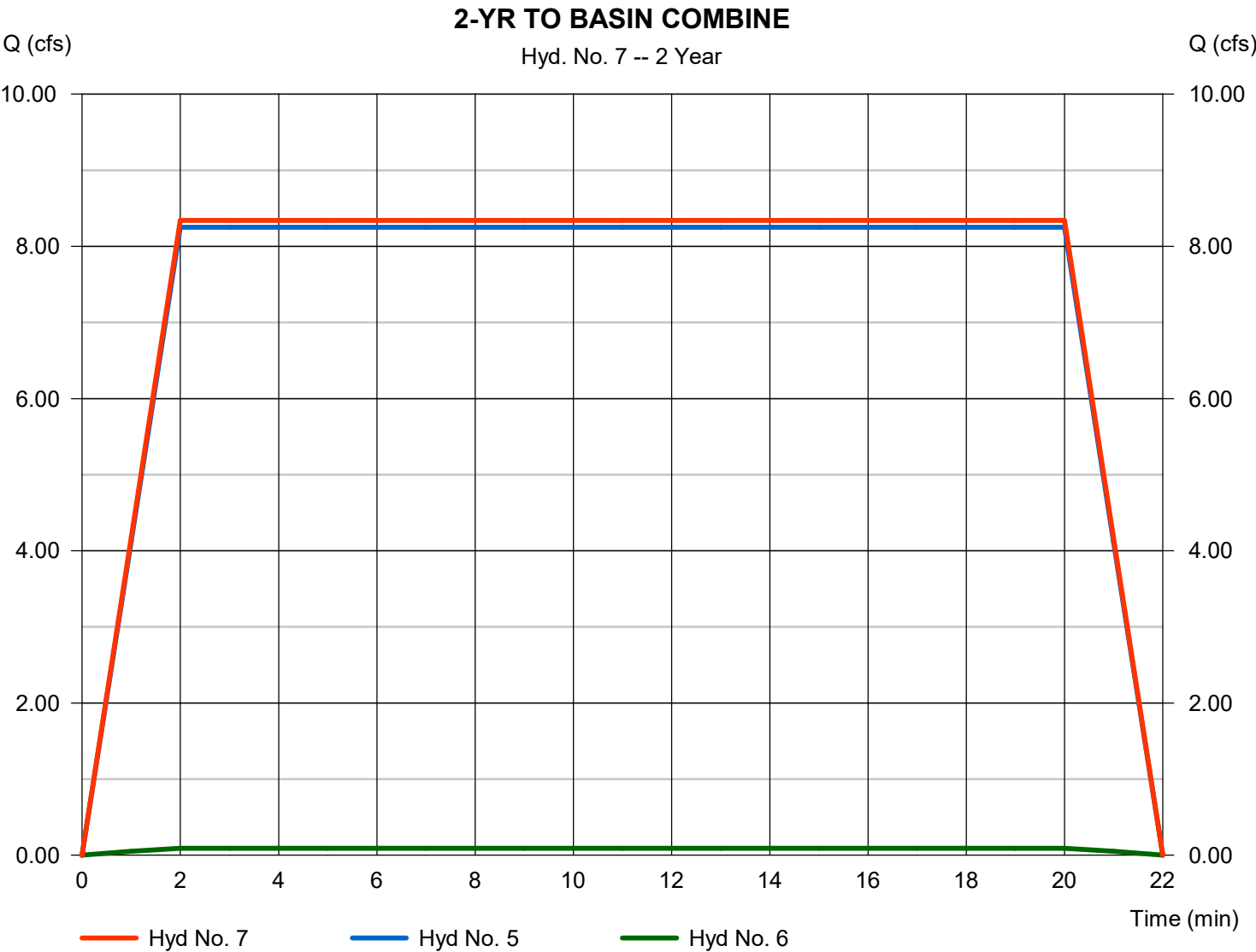
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 7

### 2-YR TO BASIN COMBINE

Hydrograph type	= Combine	Peak discharge	= 8.340 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 10,009 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 0.000 ac



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

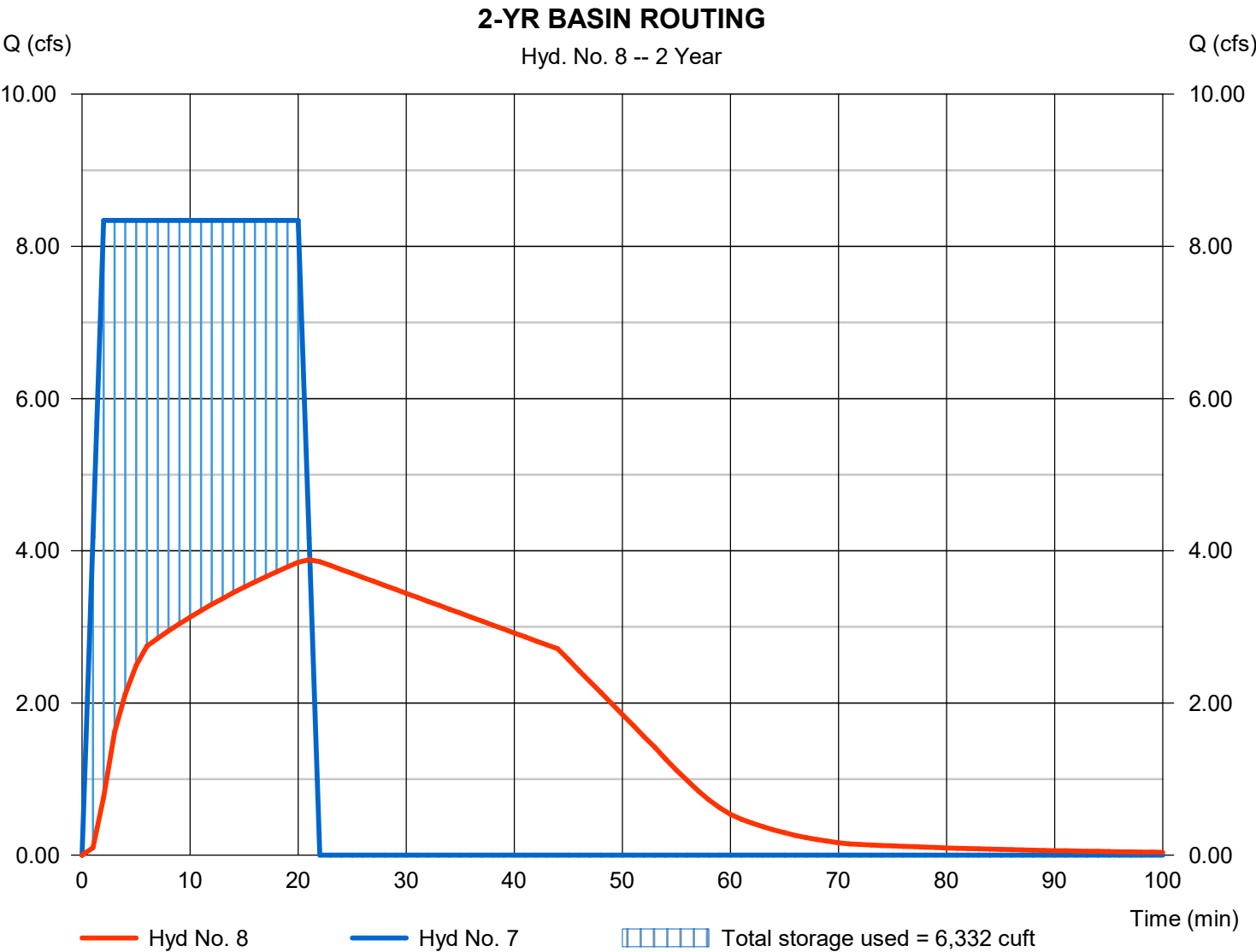
Wednesday, 11 / 13 / 2024

## Hyd. No. 8

### 2-YR BASIN ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 3.882 cfs
Storm frequency	= 2 yrs	Time to peak	= 21 min
Time interval	= 1 min	Hyd. volume	= 10,007 cuft
Inflow hyd. No.	= 7 - 2-YR TO BASIN COMBINEMax. Elevation	= 573.71 ft	
Reservoir name	= BASIN	Max. Storage	= 6,332 cuft

Storage Indication method used.



Pond No. 1 - BASIN

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 570.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	570.00	00	0	0
2.00	572.00	1,886	1,886	1,886
4.00	574.00	3,324	5,210	7,096
6.00	576.00	4,997	8,321	15,417
8.00	578.00	6,879	11,876	27,293

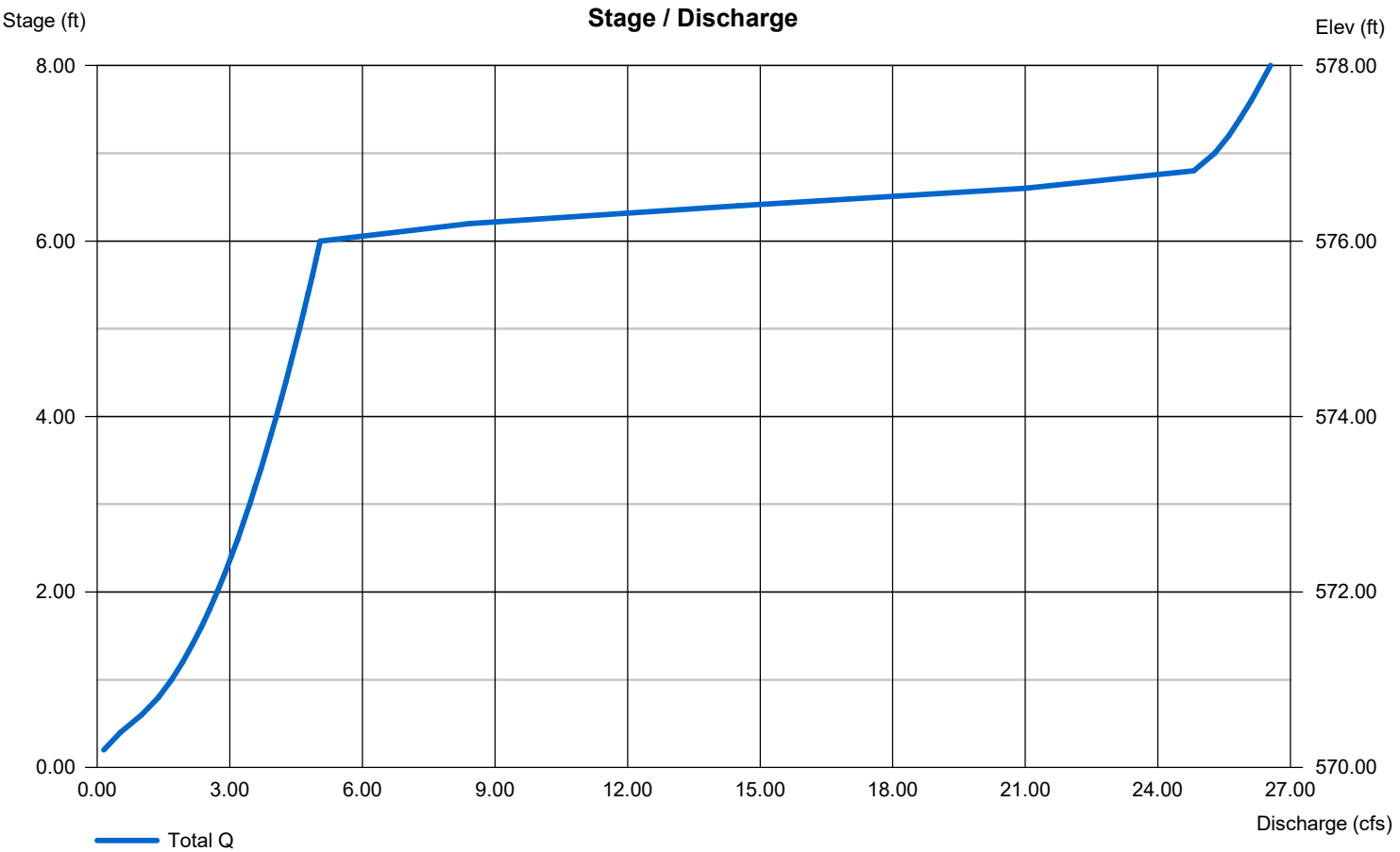
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	9.00	Inactive	0.00
Span (in)	= 18.00	9.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 566.00	570.00	0.00	0.00
Length (ft)	= 119.75	1.00	0.00	0.00
Slope (%)	= 2.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.00	0.00	0.00	0.00
Crest El. (ft)	= 576.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	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).



# Hydrograph Report

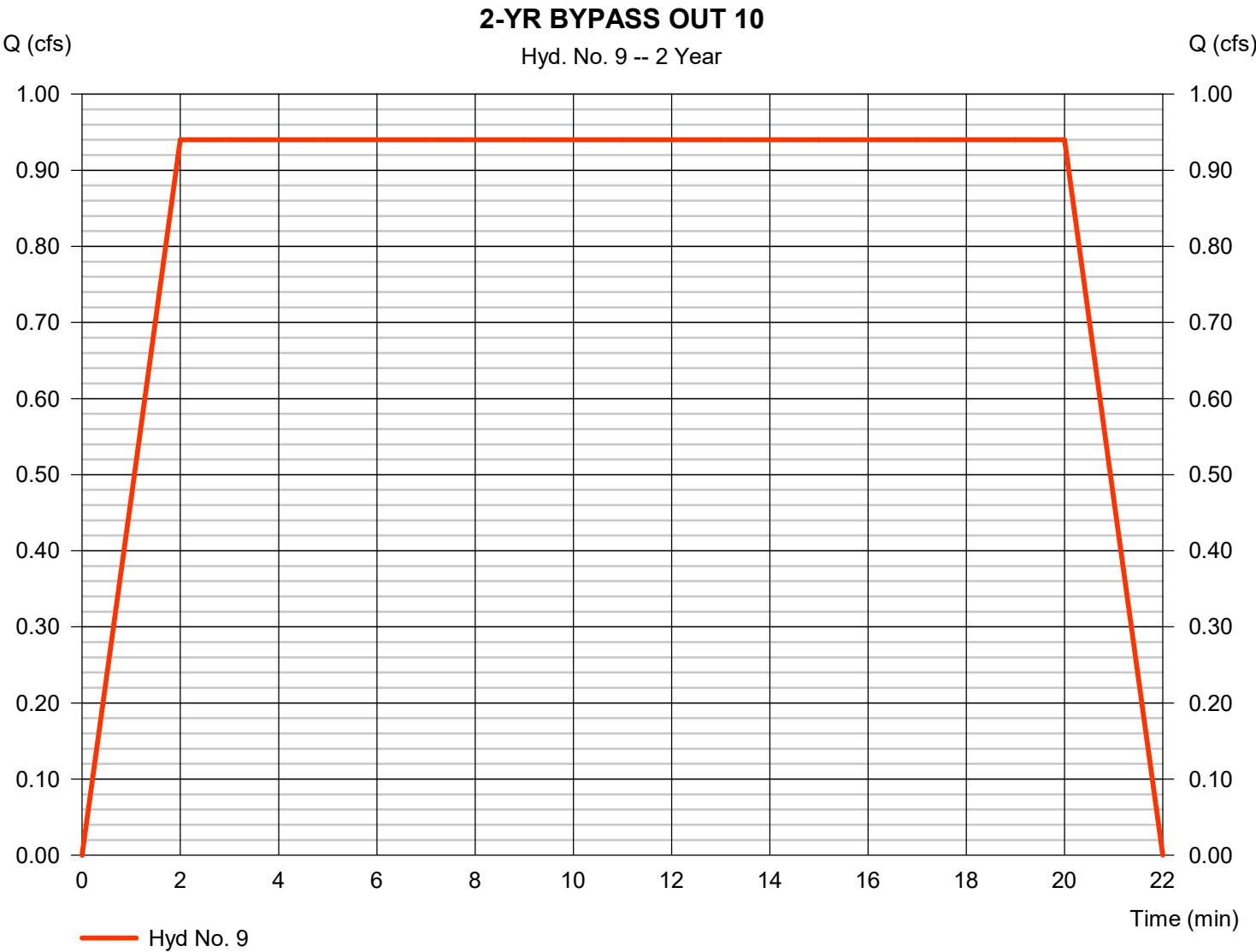
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 9

### 2-YR BYPASS OUT 10

Hydrograph type	= Manual	Peak discharge	= 0.940 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 1,128 cuft



# Hydrograph Report

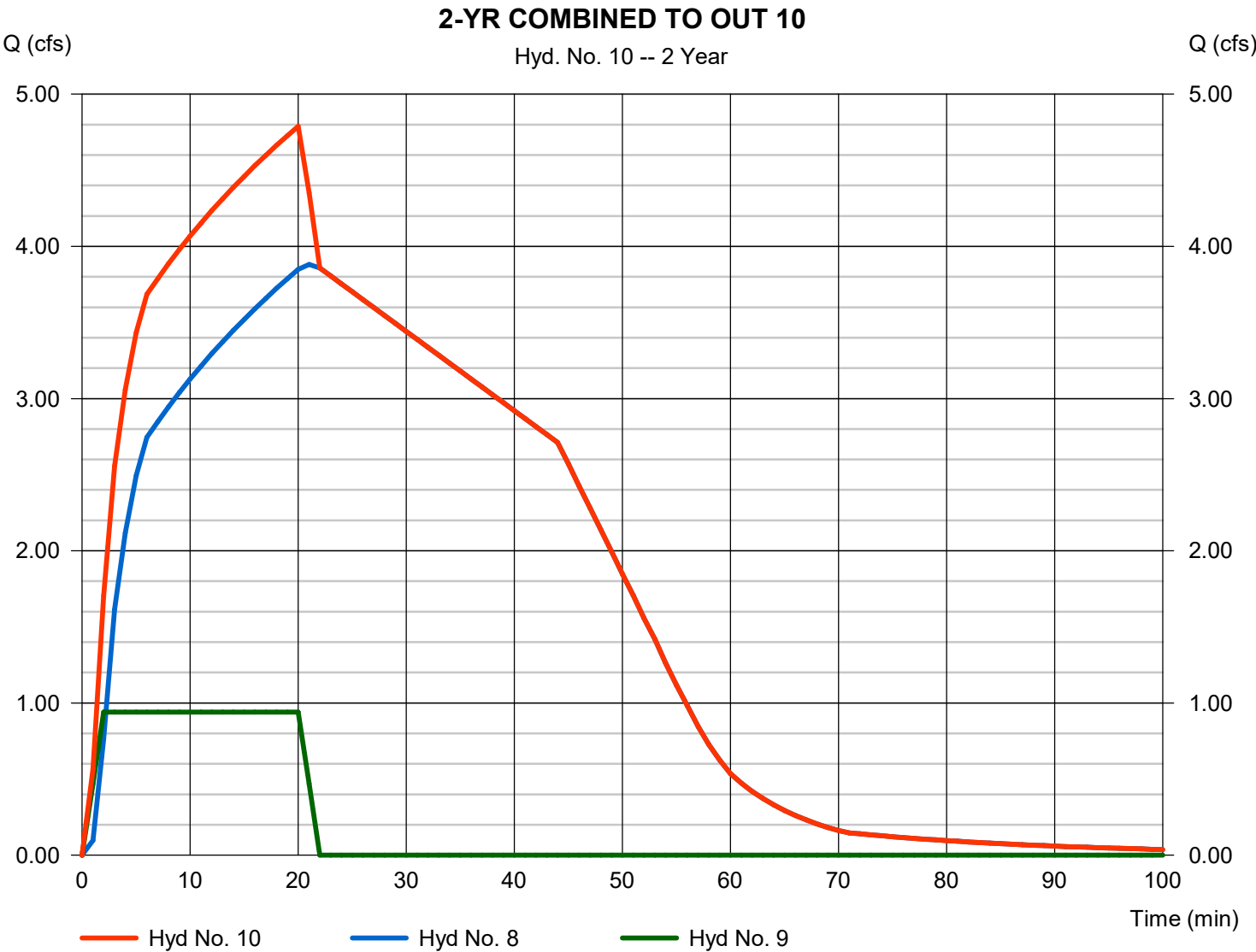
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 10

2-YR COMBINED TO OUT 10

Hydrograph type	= Combine	Peak discharge	= 4.790 cfs
Storm frequency	= 2 yrs	Time to peak	= 20 min
Time interval	= 1 min	Hyd. volume	= 11,135 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.000 ac

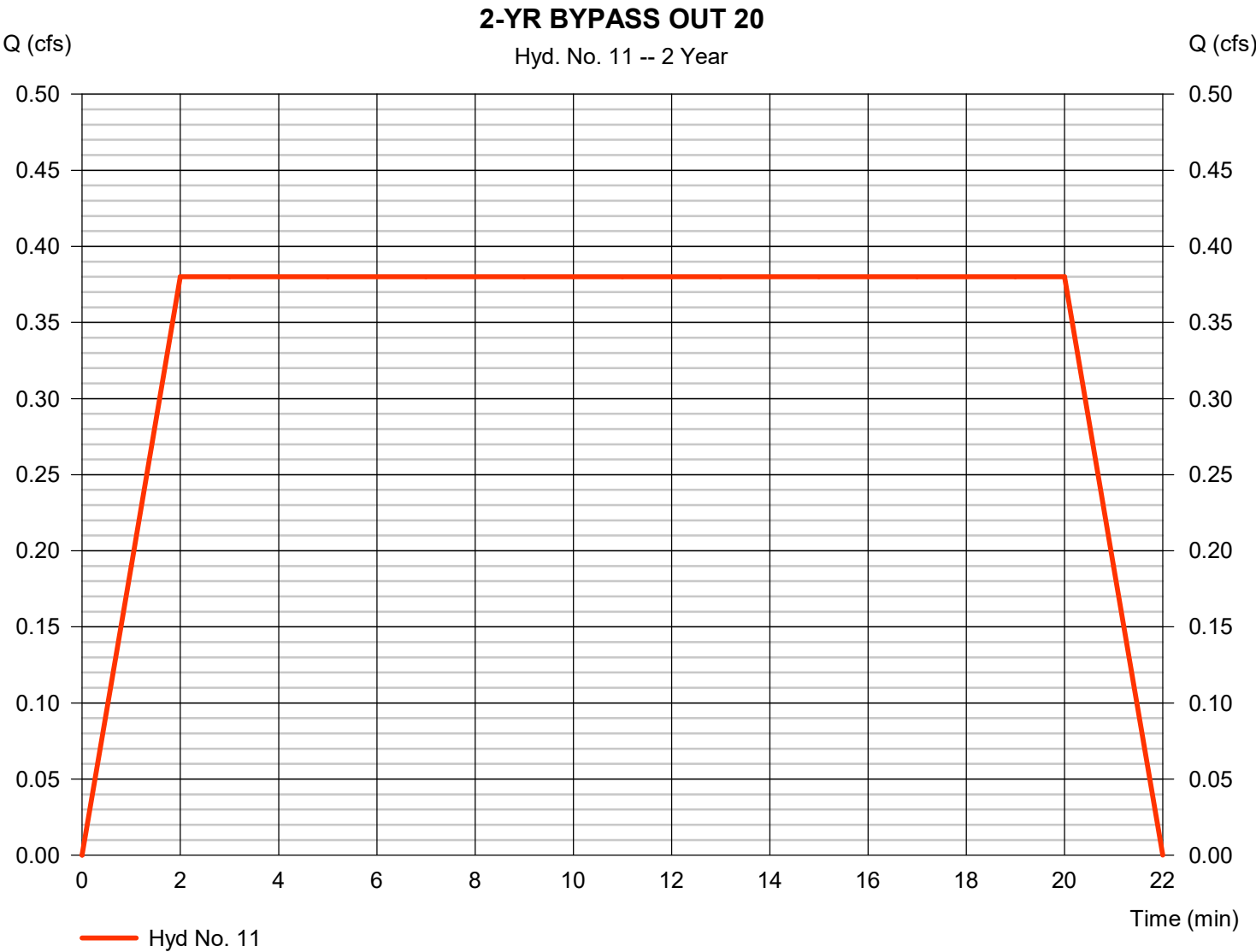


# Hydrograph Report

## Hyd. No. 11

2-YR BYPASS OUT 20

Hydrograph type	= Manual	Peak discharge	= 0.380 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 456 cuft





# Hydrograph Report

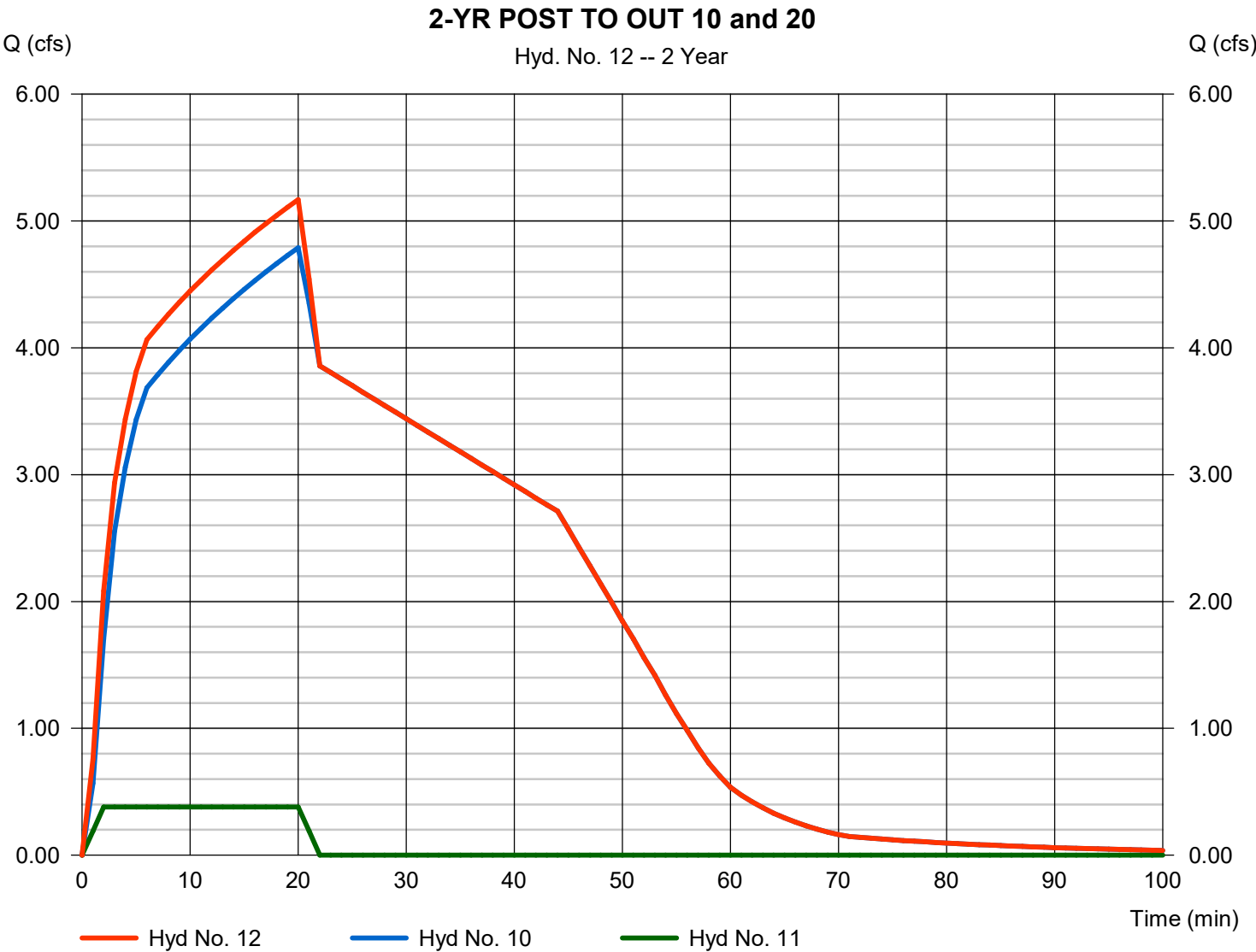
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 12

2-YR POST TO OUT 10 and 20

Hydrograph type	= Combine	Peak discharge	= 5.170 cfs
Storm frequency	= 2 yrs	Time to peak	= 20 min
Time interval	= 1 min	Hyd. volume	= 11,591 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 0.000 ac



# Hydrograph Report

## Hyd. No. 13

15-YR EXISITNG TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 7.650 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 9,180 cuft

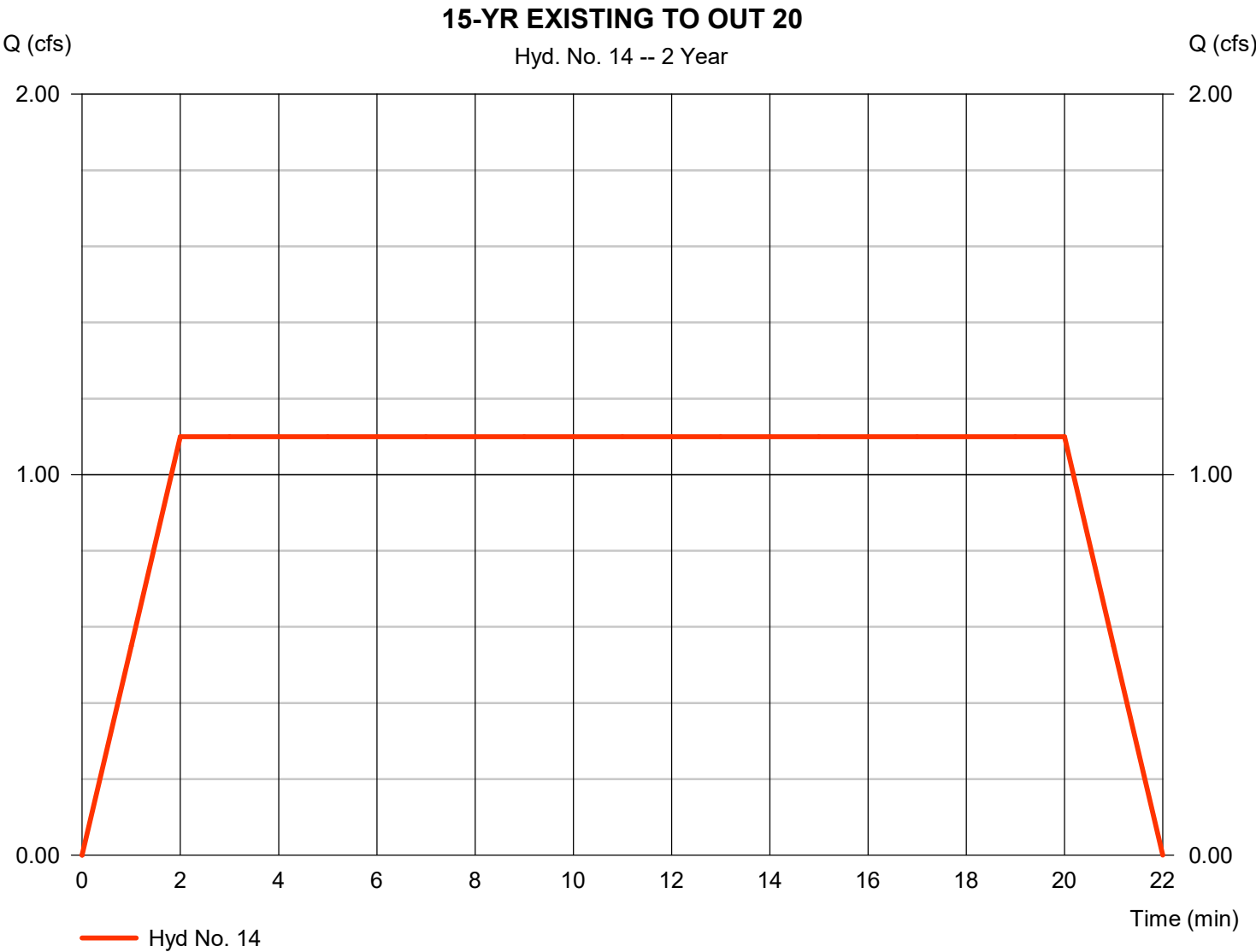


# Hydrograph Report

## Hyd. No. 14

15-YR EXISTING TO OUT 20

Hydrograph type	= Manual	Peak discharge	= 1.100 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 1,320 cuft

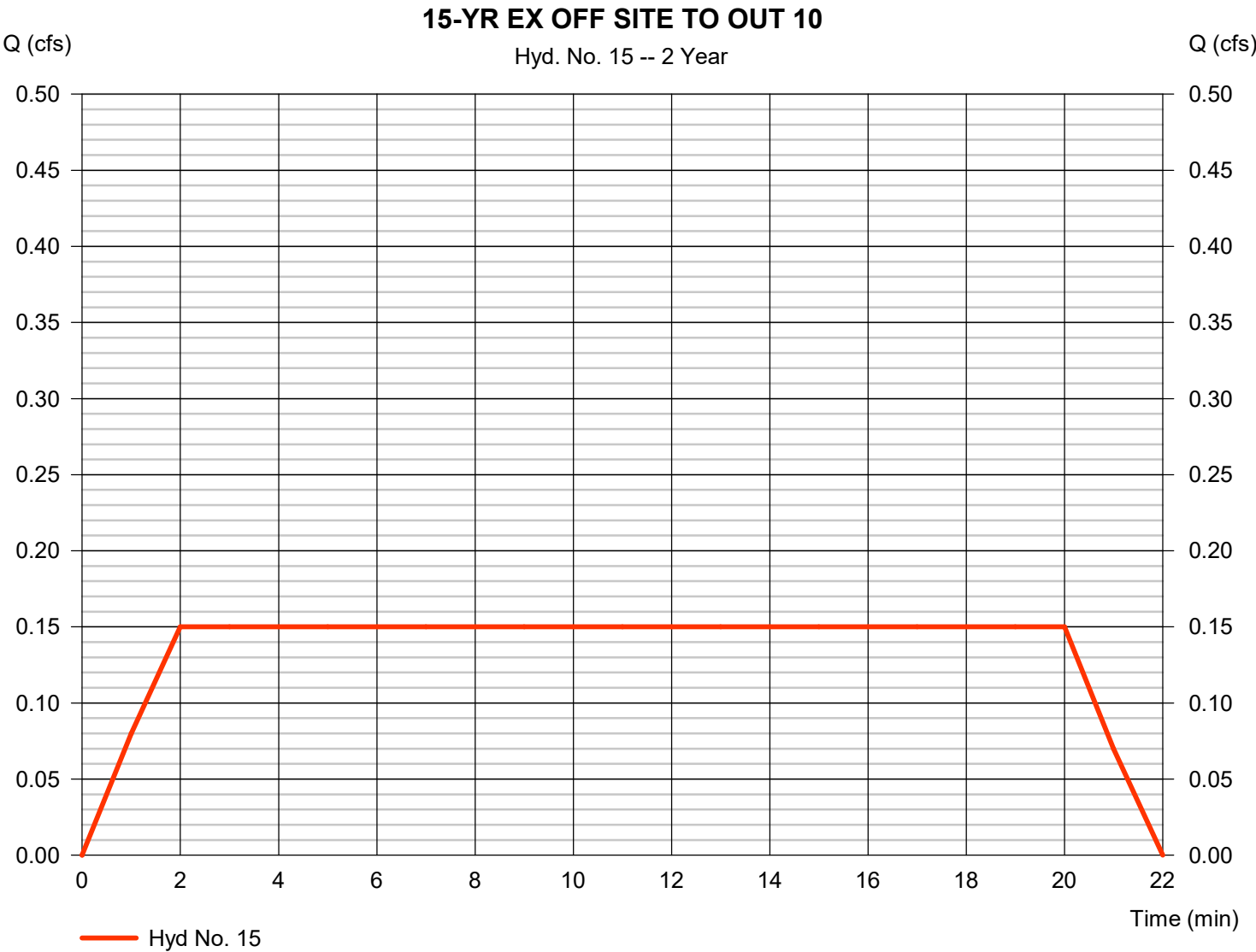


# Hydrograph Report

## Hyd. No. 15

15-YR EX OFF SITE TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 0.150 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 180 cuft



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

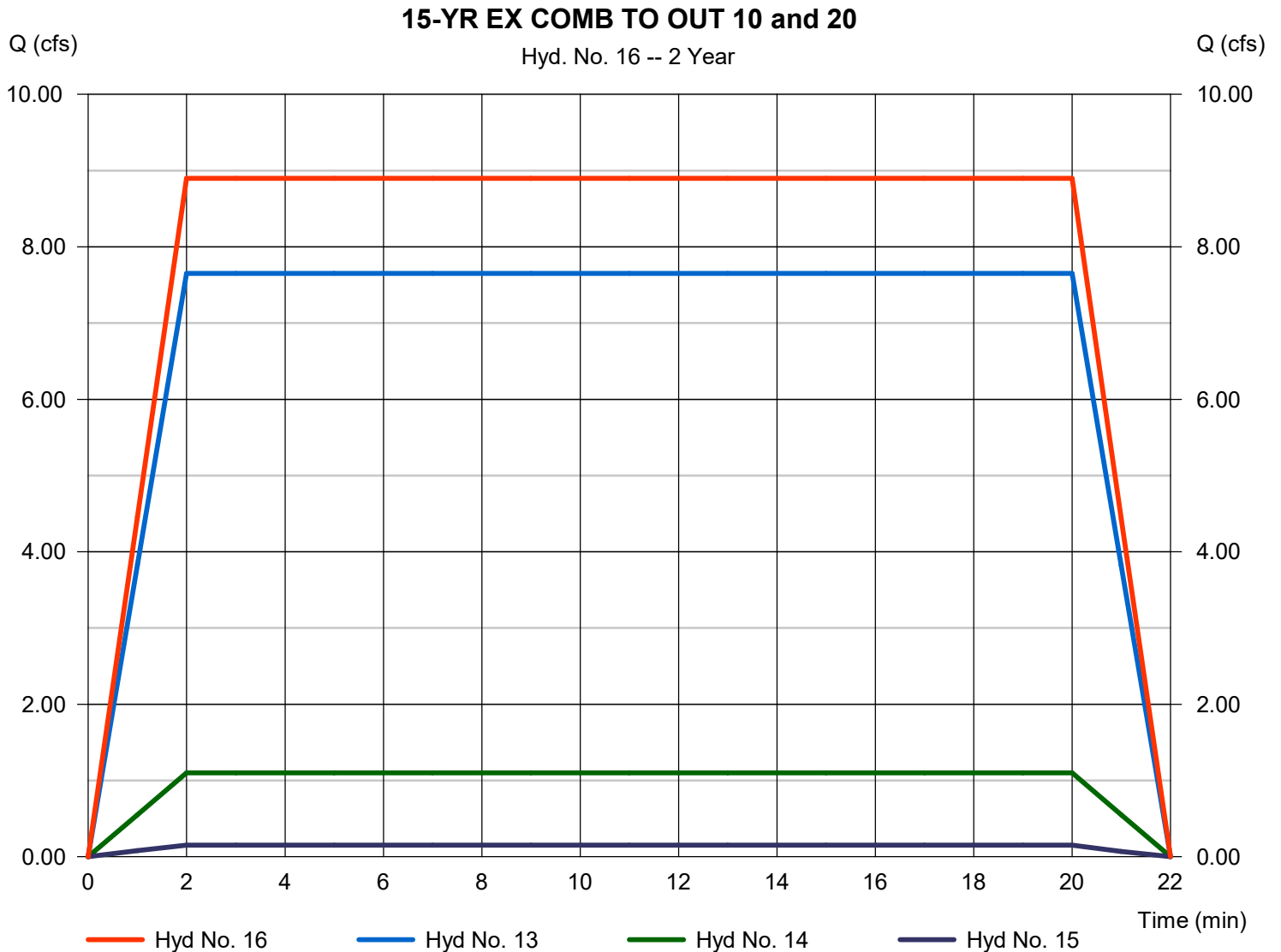
Wednesday, 11 / 13 / 2024

## Hyd. No. 16

15-YR EX COMB TO OUT 10 and 20

Hydrograph type = Combine  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Inflow hyds. = 13, 14, 15

Peak discharge = 8.900 cfs  
 Time to peak = 2 min  
 Hyd. volume = 10,680 cuft  
 Contrib. drain. area = 0.000 ac



# Hydrograph Report

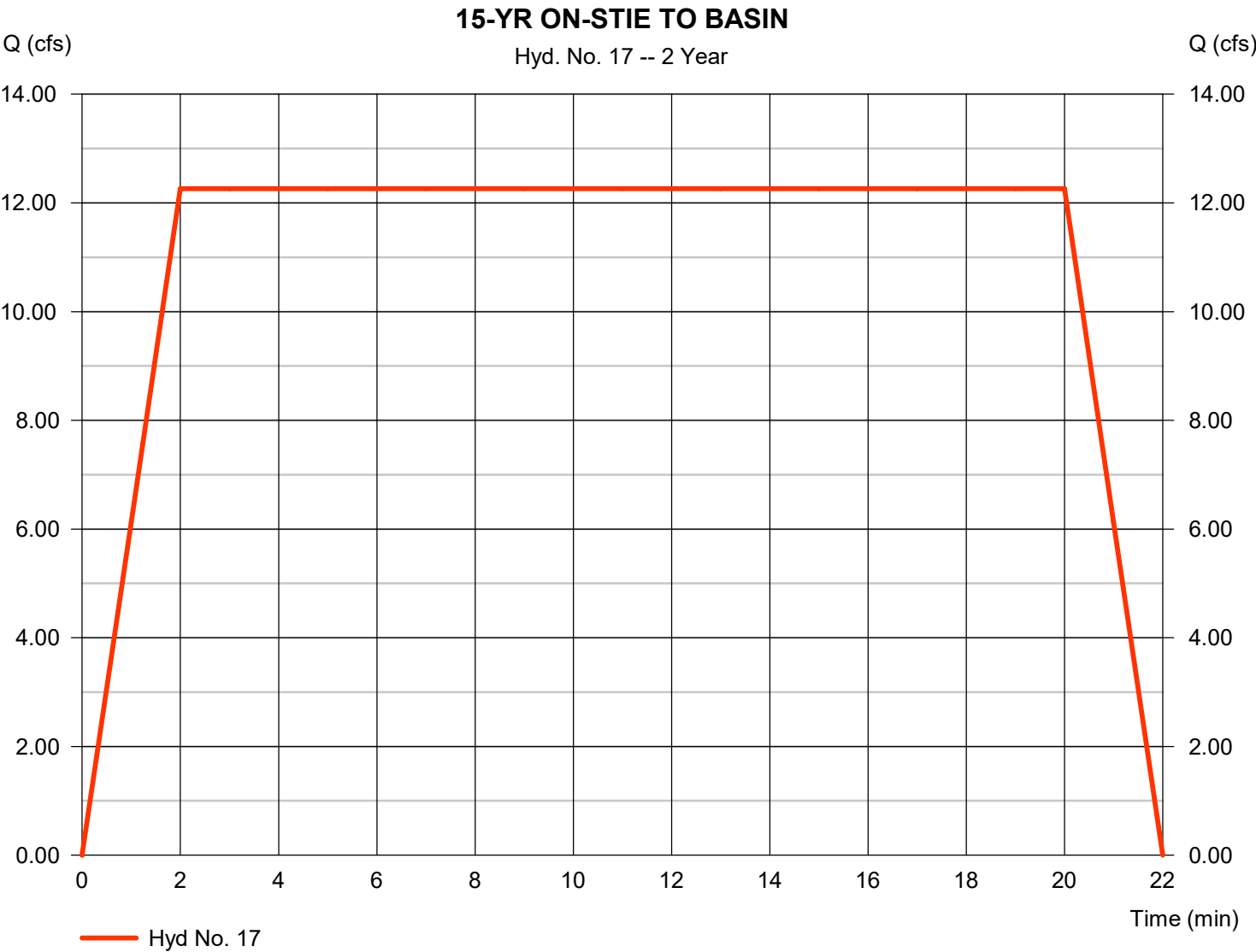
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 17

15-YR ON-STIE TO BASIN

Hydrograph type	= Manual	Peak discharge	= 12.26 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 14,712 cuft



# Hydrograph Report

## Hyd. No. 18

### 15-YR OFF-SITE TO BASIN

Hydrograph type	= Manual	Peak discharge	= 0.140 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 168 cuft



# Hydrograph Report

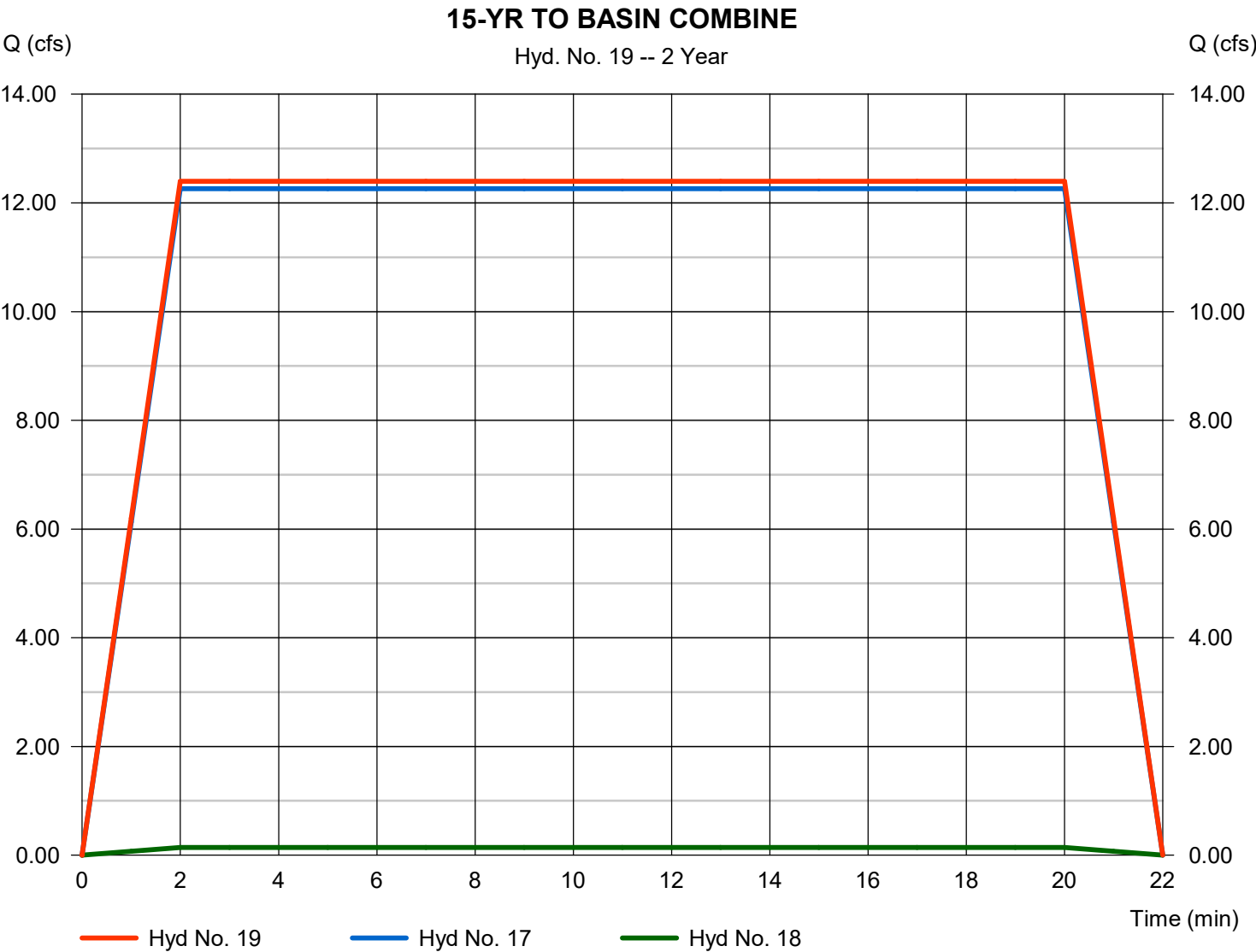
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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## Hyd. No. 19

15-YR TO BASIN COMBINE

Hydrograph type	= Combine	Peak discharge	= 12.40 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 14,880 cuft
Inflow hyds.	= 17, 18	Contrib. drain. area	= 0.000 ac





# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

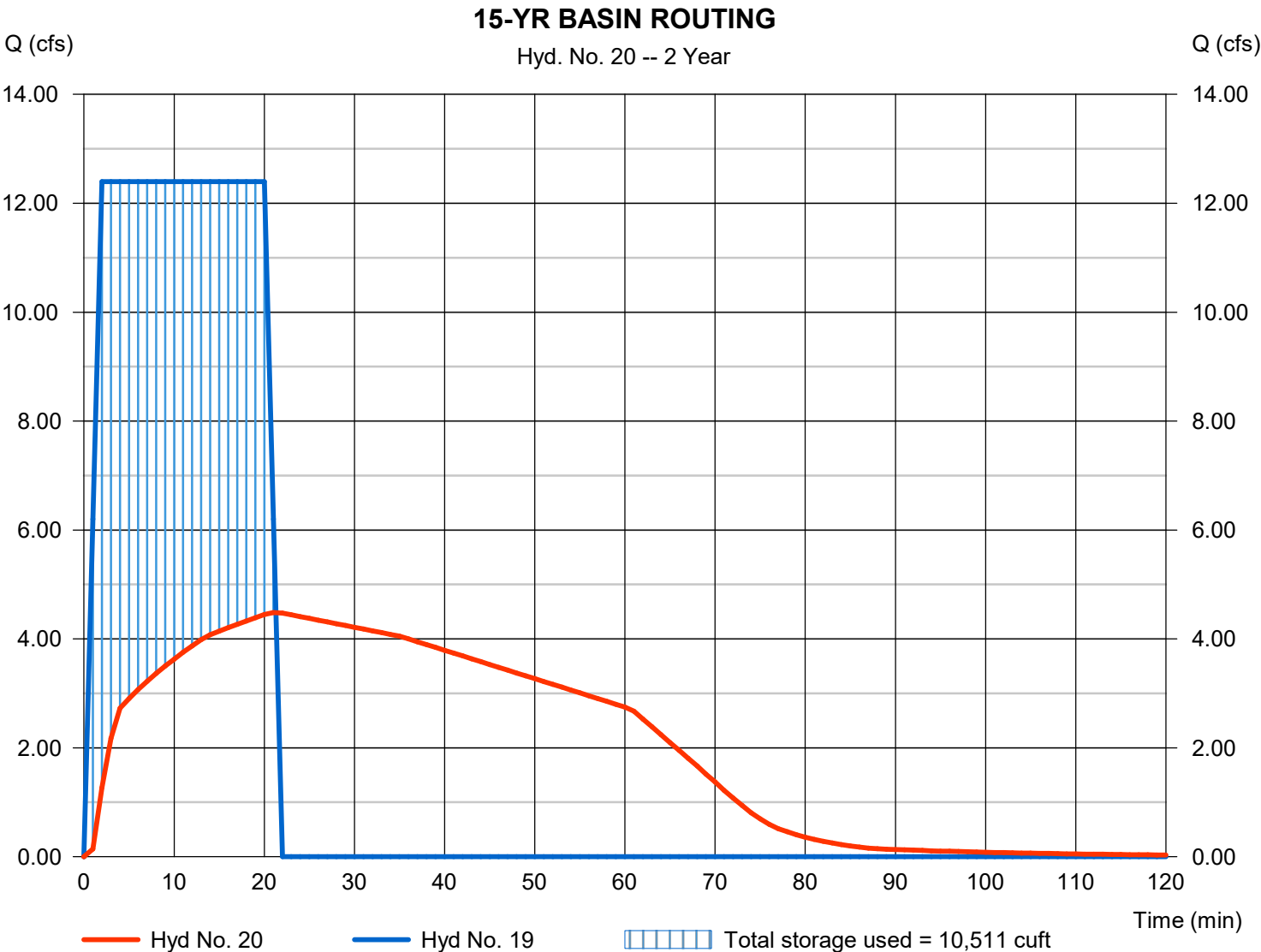
Wednesday, 11 / 13 / 2024

## Hyd. No. 20

### 15-YR BASIN ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 4.485 cfs
Storm frequency	= 2 yrs	Time to peak	= 21 min
Time interval	= 1 min	Hyd. volume	= 14,879 cuft
Inflow hyd. No.	= 19 - 15-YR TO BASIN COMBINED	Max. Elevation	= 574.83 ft
Reservoir name	= BASIN	Max. Storage	= 10,511 cuft

Storage Indication method used.



Pond No. 1 - BASIN

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 570.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	570.00	00	0	0
2.00	572.00	1,886	1,886	1,886
4.00	574.00	3,324	5,210	7,096
6.00	576.00	4,997	8,321	15,417
8.00	578.00	6,879	11,876	27,293

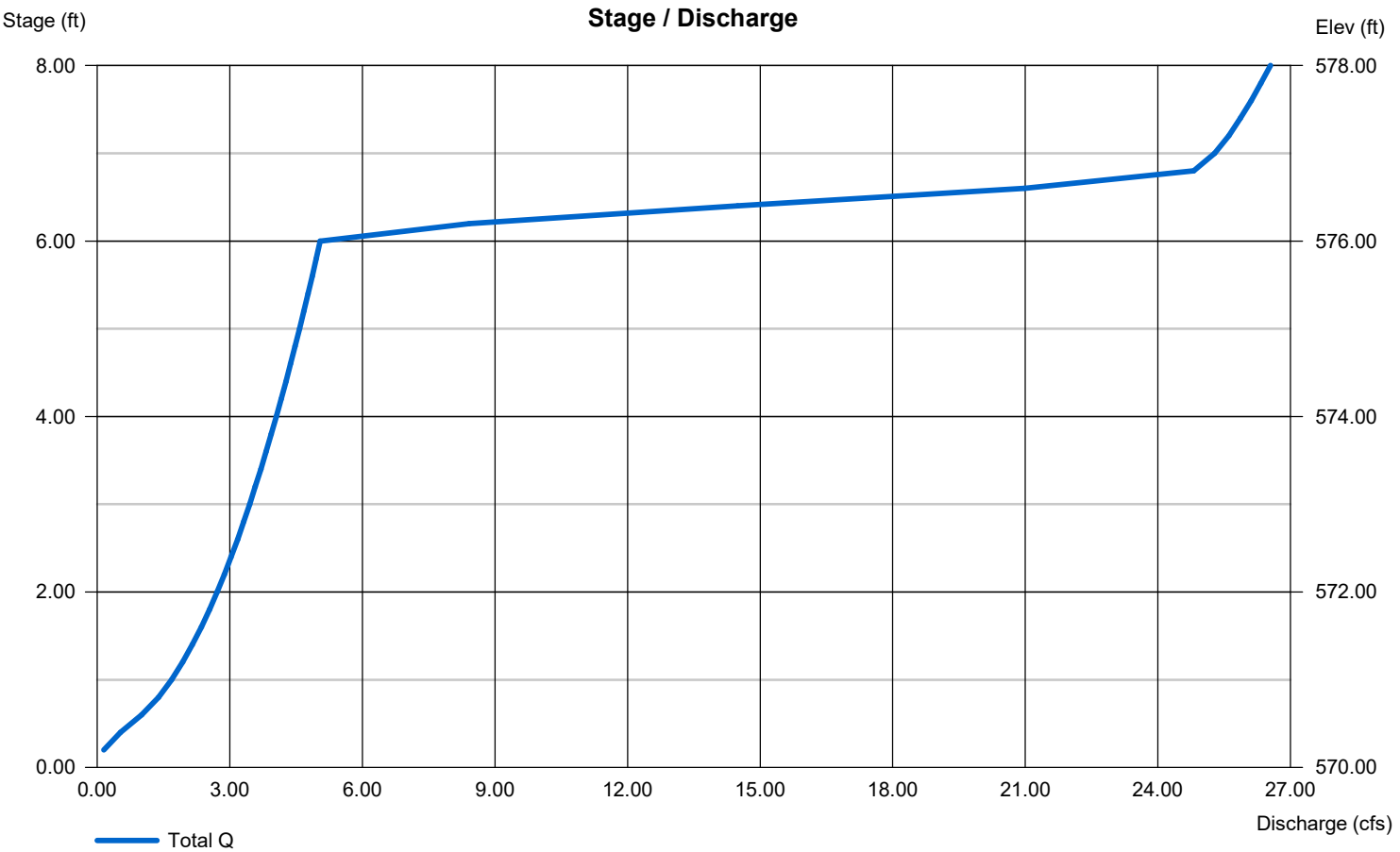
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	9.00	Inactive	0.00
Span (in)	= 18.00	9.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 566.00	570.00	0.00	0.00
Length (ft)	= 119.75	1.00	0.00	0.00
Slope (%)	= 2.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.00	0.00	0.00	0.00
Crest El. (ft)	= 576.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	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).



# Hydrograph Report

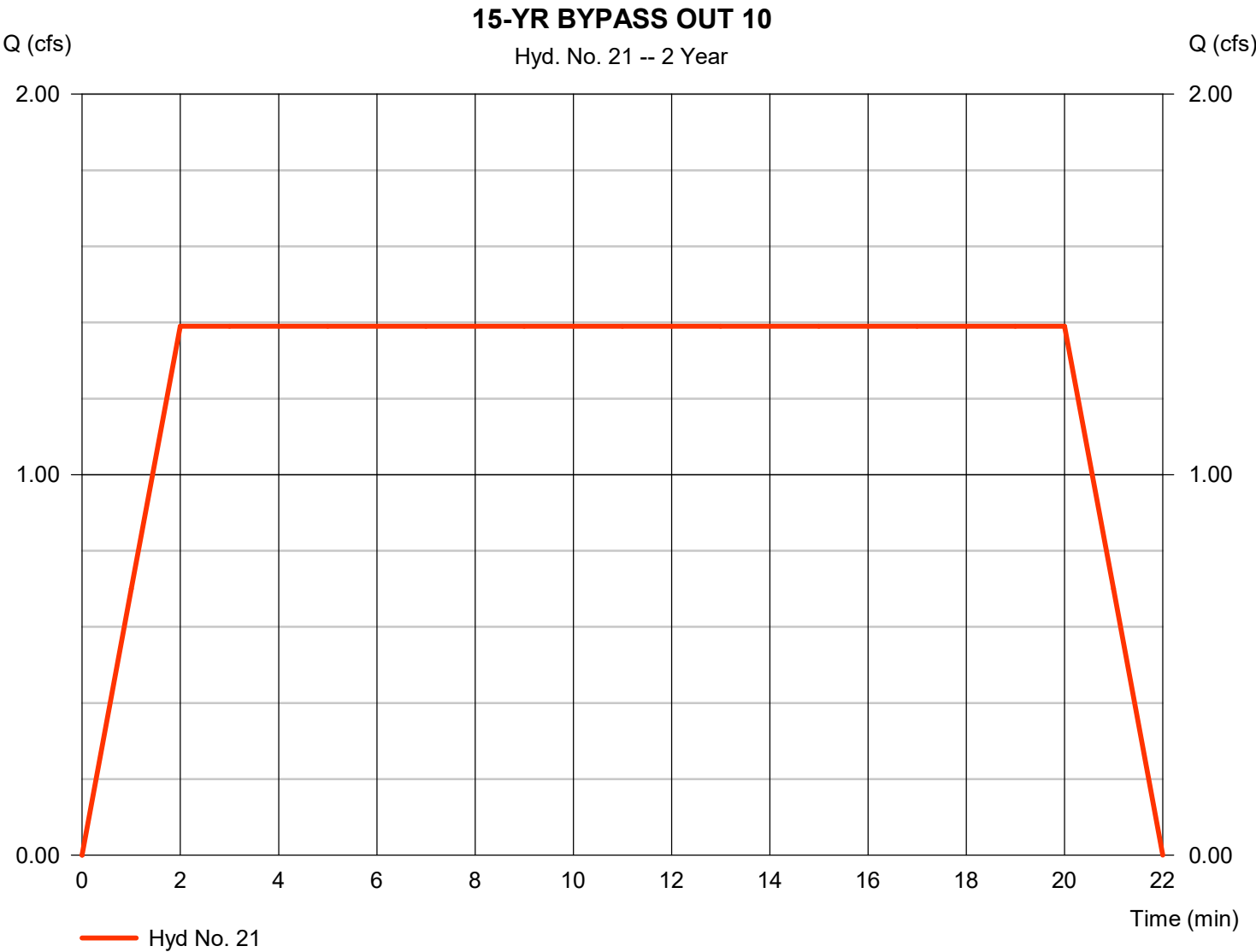
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 21

15-YR BYPASS OUT 10

Hydrograph type	= Manual	Peak discharge	= 1.390 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 1,669 cuft



# Hydrograph Report

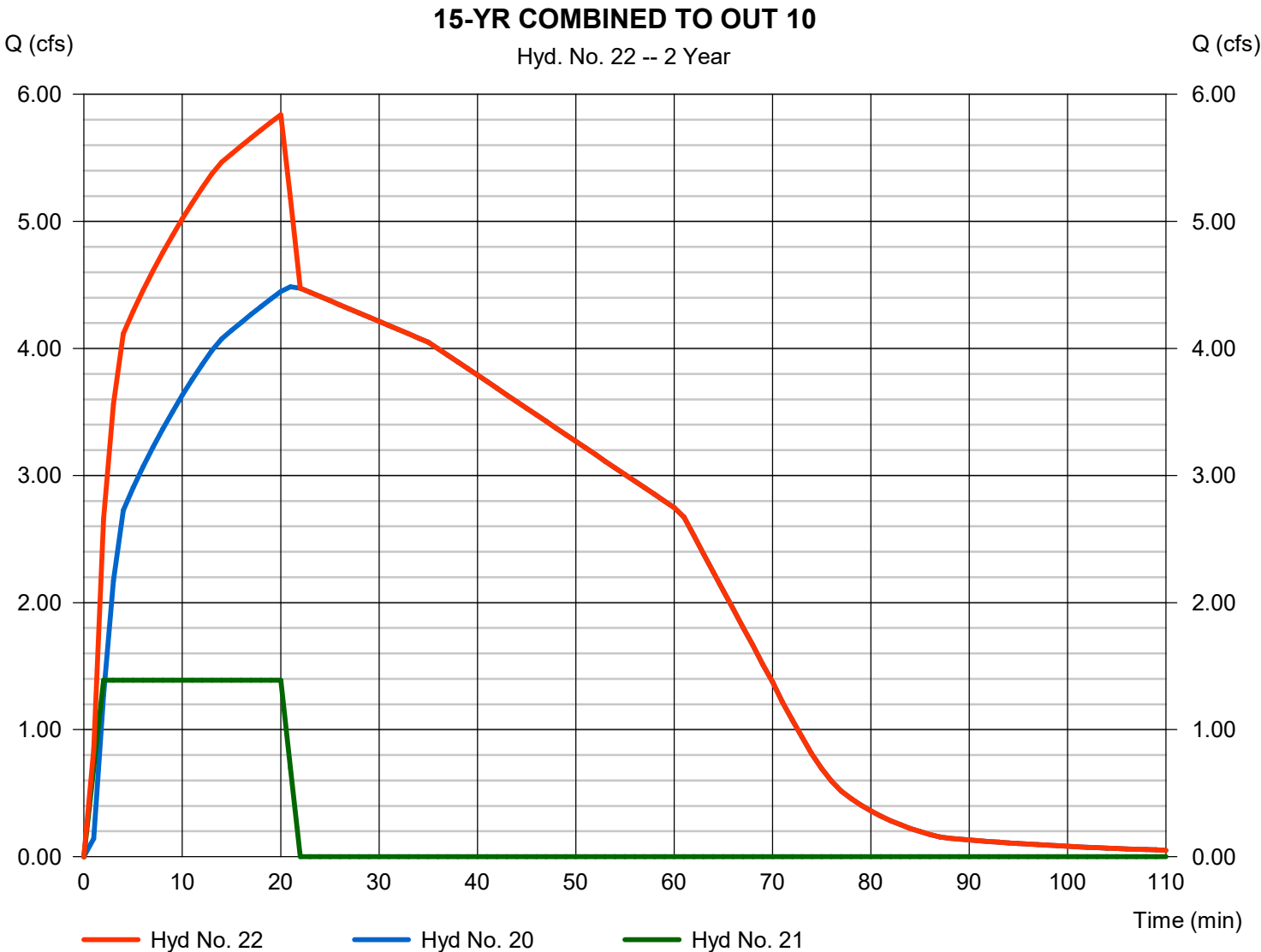
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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## Hyd. No. 22

15-YR COMBINED TO OUT 10

Hydrograph type	= Combine	Peak discharge	= 5.839 cfs
Storm frequency	= 2 yrs	Time to peak	= 20 min
Time interval	= 1 min	Hyd. volume	= 16,547 cuft
Inflow hyds.	= 20, 21	Contrib. drain. area	= 0.000 ac



# Hydrograph Report

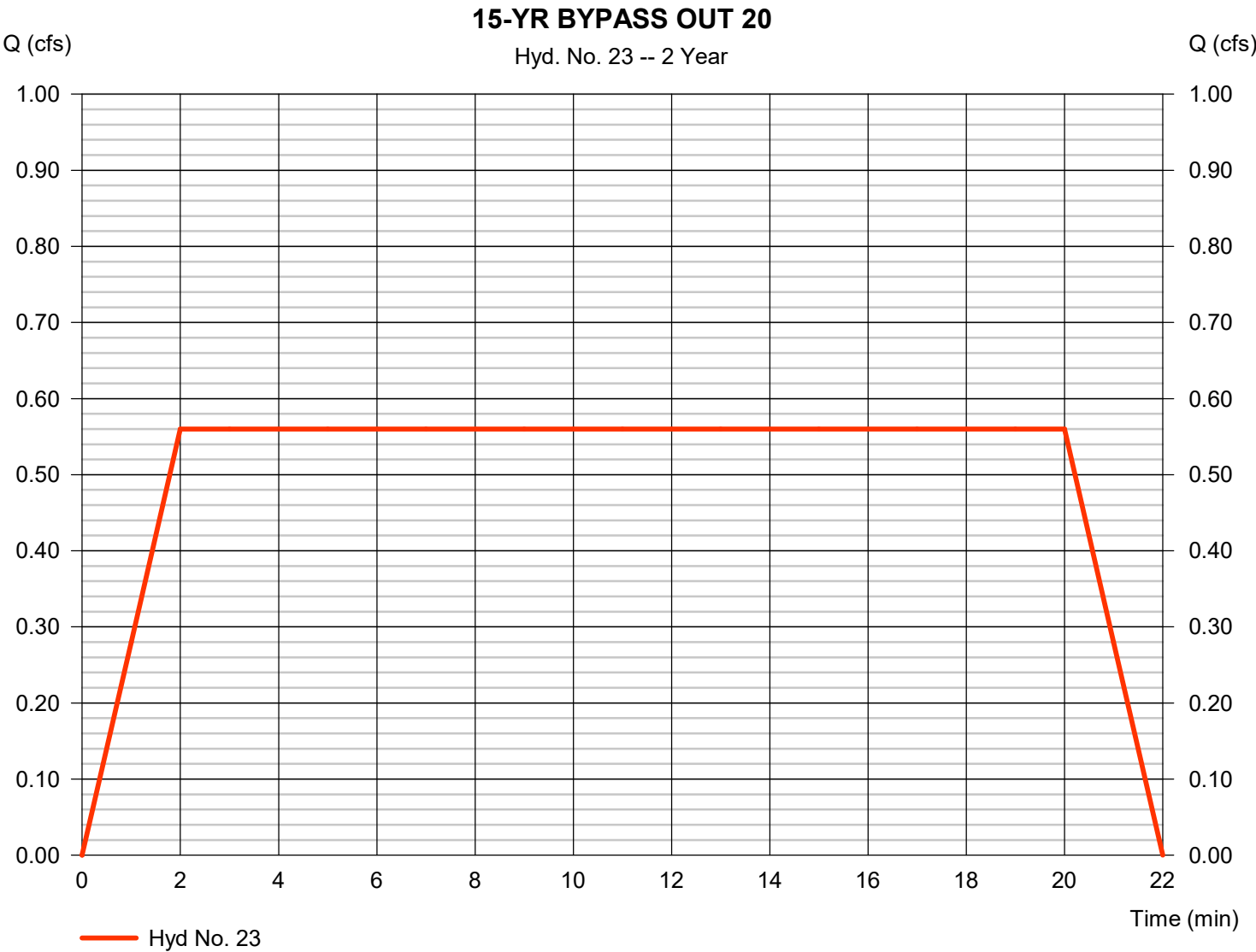
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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## Hyd. No. 23

15-YR BYPASS OUT 20

Hydrograph type	= Manual	Peak discharge	= 0.560 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 672 cuft



# Hydrograph Report

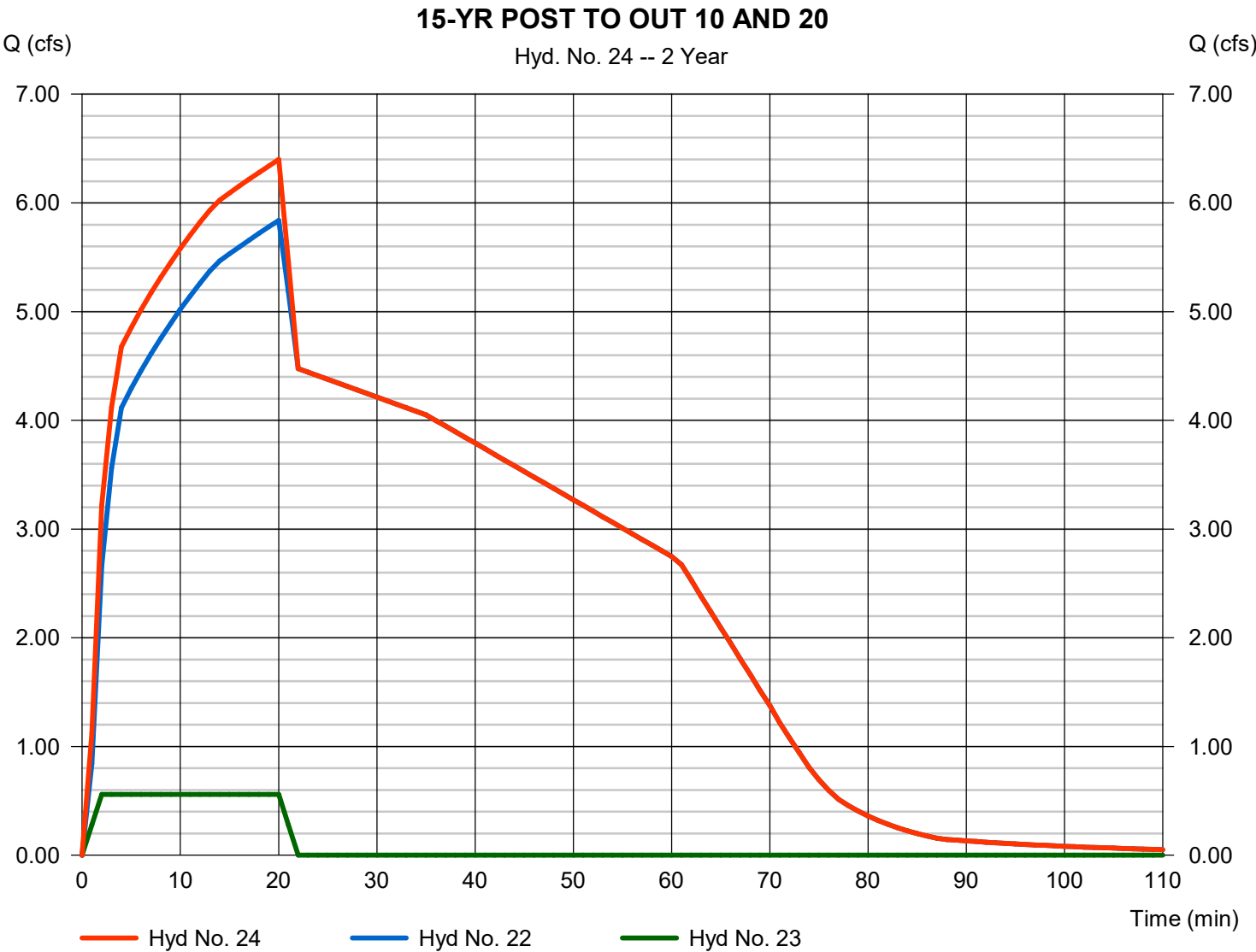
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 24

15-YR POST TO OUT 10 AND 20

Hydrograph type	= Combine	Peak discharge	= 6.399 cfs
Storm frequency	= 2 yrs	Time to peak	= 20 min
Time interval	= 1 min	Hyd. volume	= 17,219 cuft
Inflow hyds.	= 22, 23	Contrib. drain. area	= 0.000 ac



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 25

25-YR EX ON-SITE TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 9.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 10,800 cuft



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 26

25 YR EX OFF-SITE TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 0.180 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 216 cuft



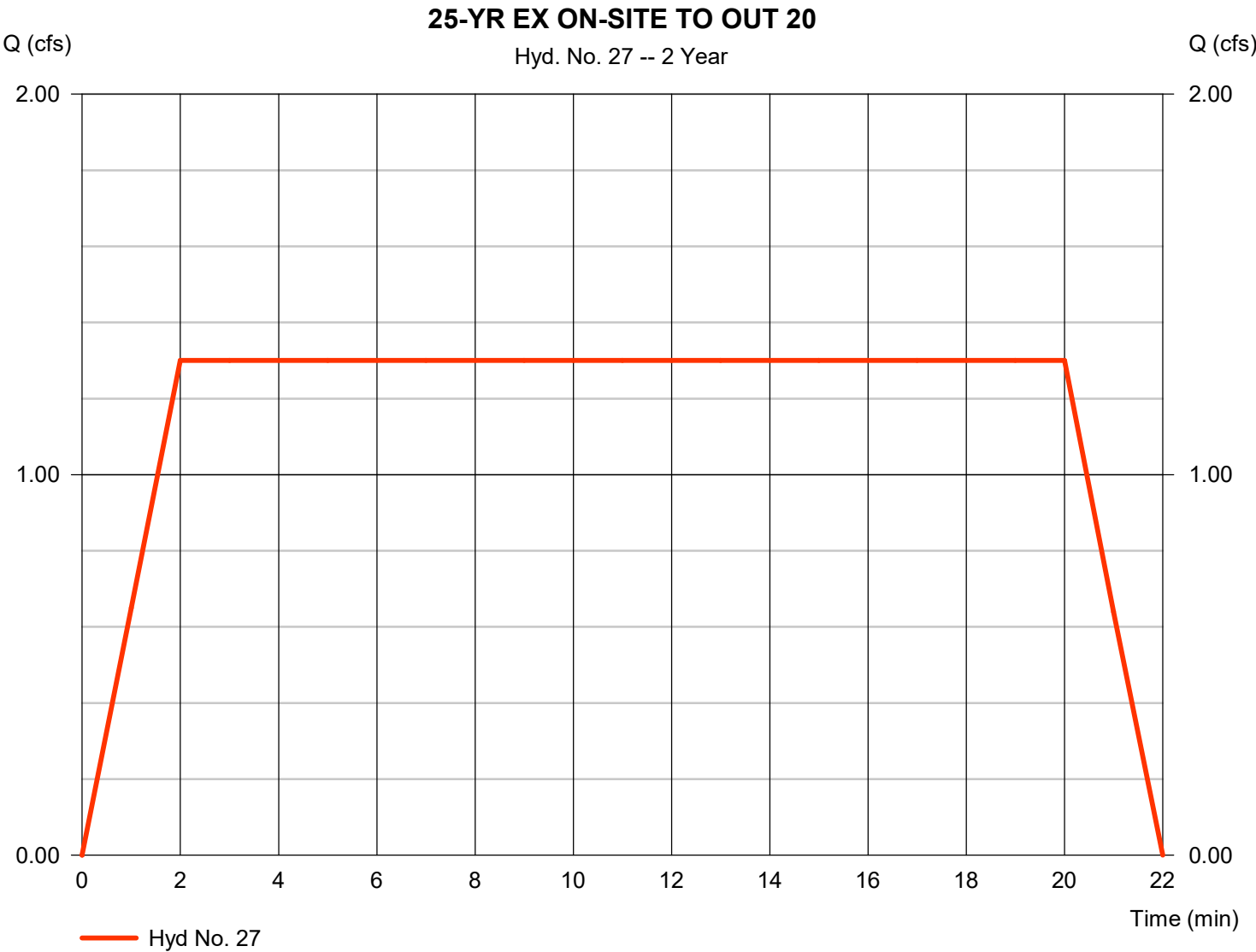


# Hydrograph Report

## Hyd. No. 27

25-YR EX ON-SITE TO OUT 20

Hydrograph type	= Manual	Peak discharge	= 1.300 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 1,559 cuft



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

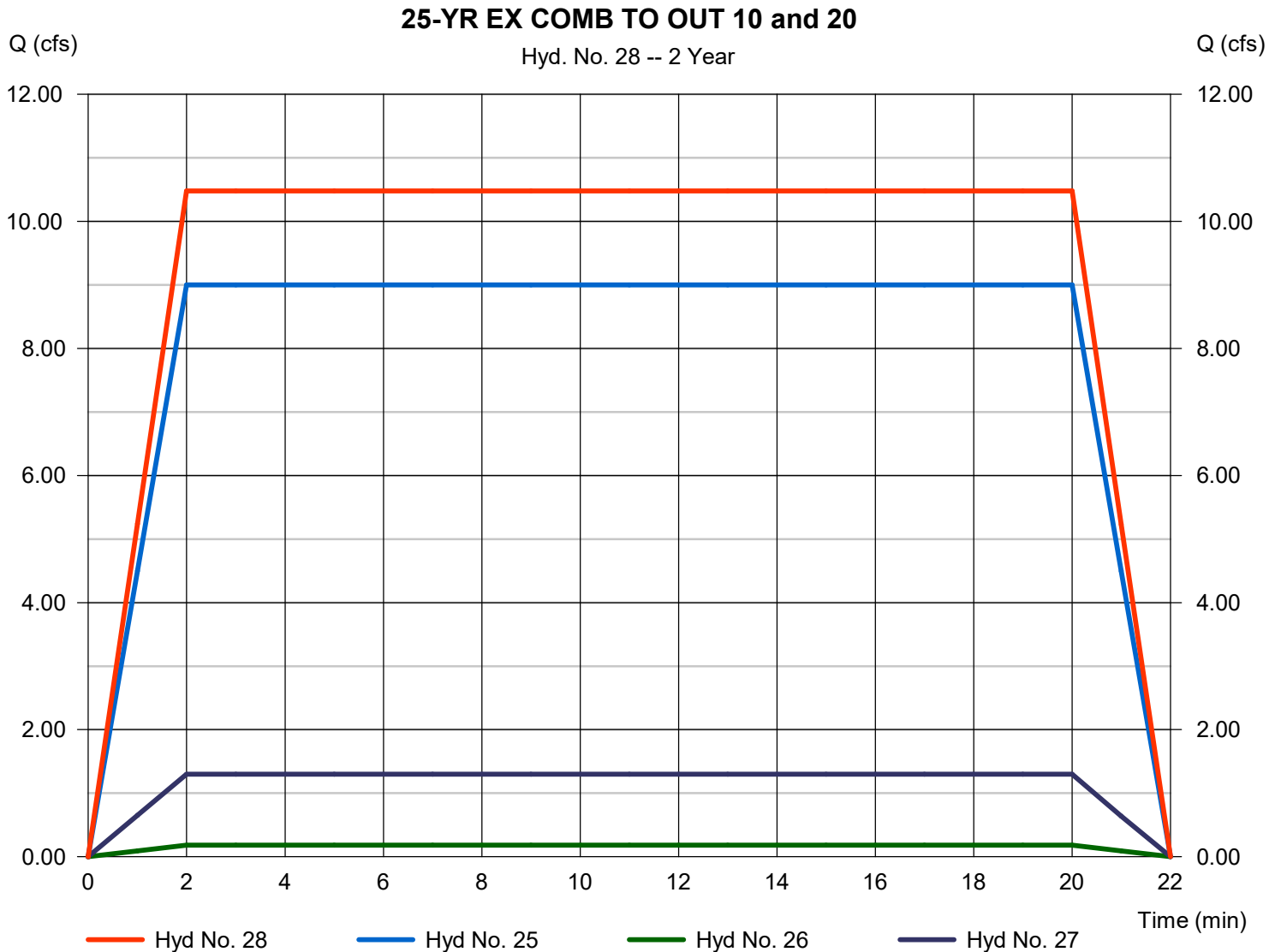
Wednesday, 11 / 13 / 2024

## Hyd. No. 28

25-YR EX COMB TO OUT 10 and 20

Hydrograph type = Combine  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Inflow hyds. = 25, 26, 27

Peak discharge = 10.48 cfs  
 Time to peak = 2 min  
 Hyd. volume = 12,575 cuft  
 Contrib. drain. area = 0.000 ac



# Hydrograph Report

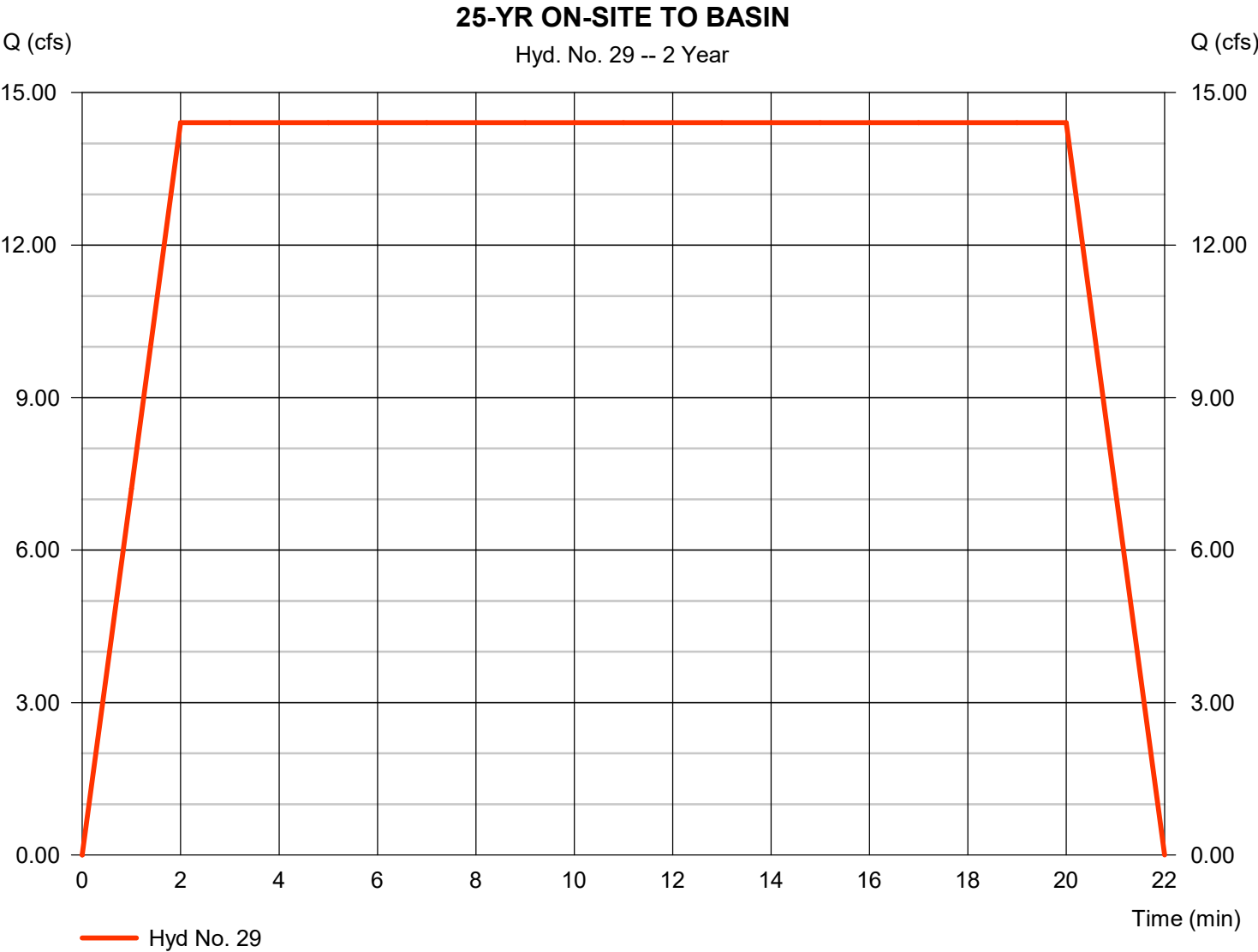
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 29

25-YR ON-SITE TO BASIN

Hydrograph type	= Manual	Peak discharge	= 14.41 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 17,292 cuft

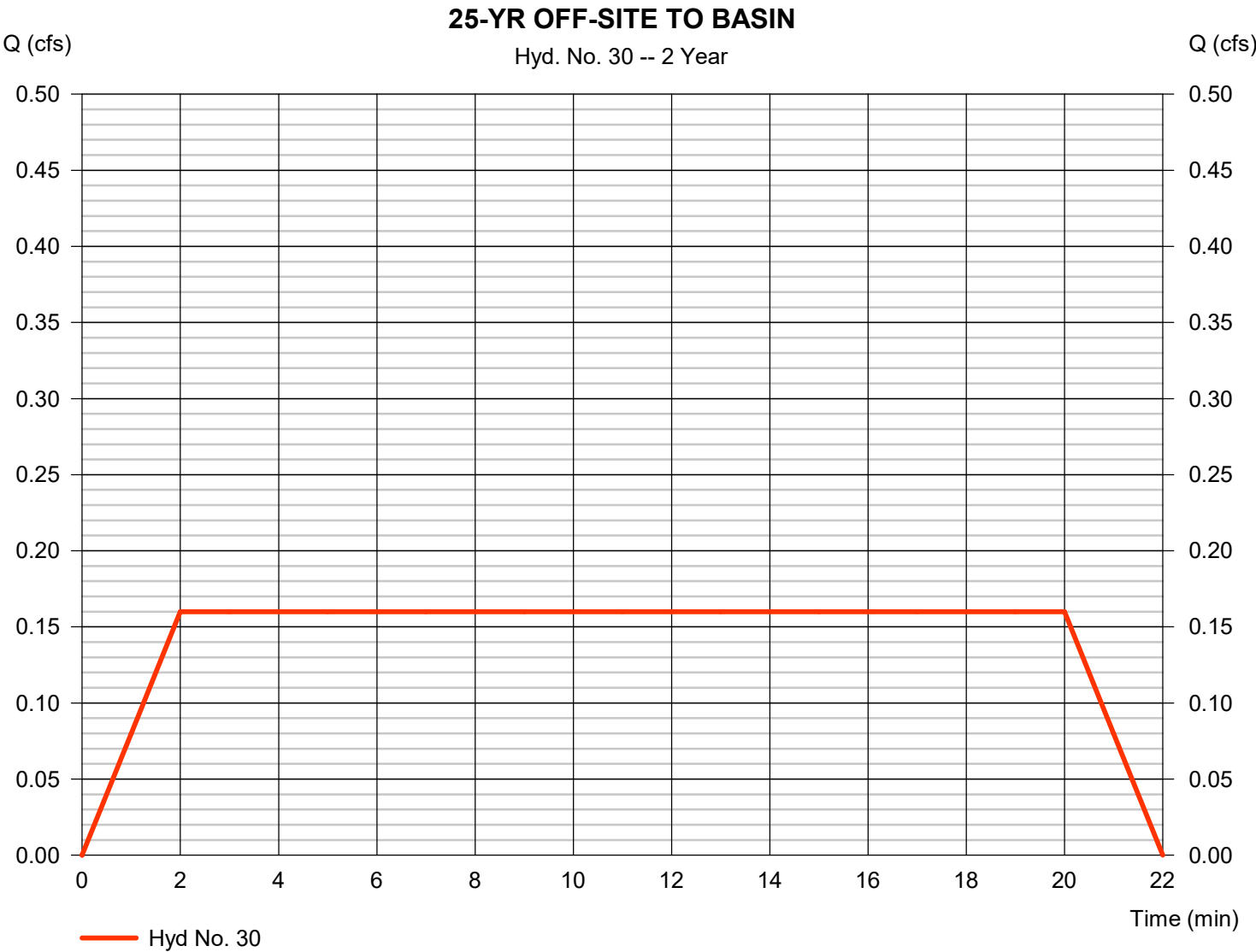


# Hydrograph Report

## Hyd. No. 30

### 25-YR OFF-SITE TO BASIN

Hydrograph type	= Manual	Peak discharge	= 0.160 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 192 cuft

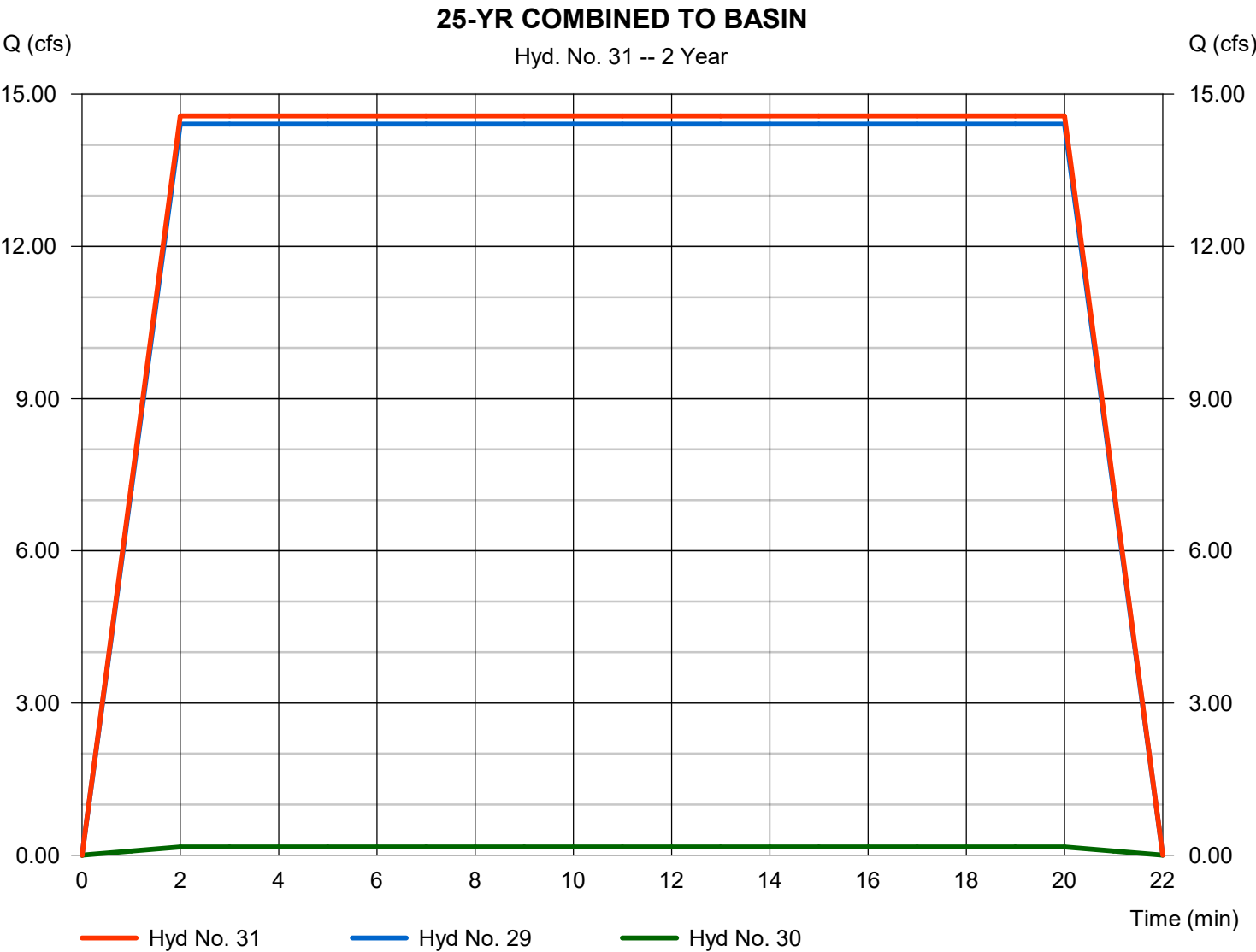


# Hydrograph Report

## Hyd. No. 31

### 25-YR COMBINED TO BASIN

Hydrograph type	= Combine	Peak discharge	= 14.57 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 17,484 cuft
Inflow hyds.	= 29, 30	Contrib. drain. area	= 0.000 ac



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

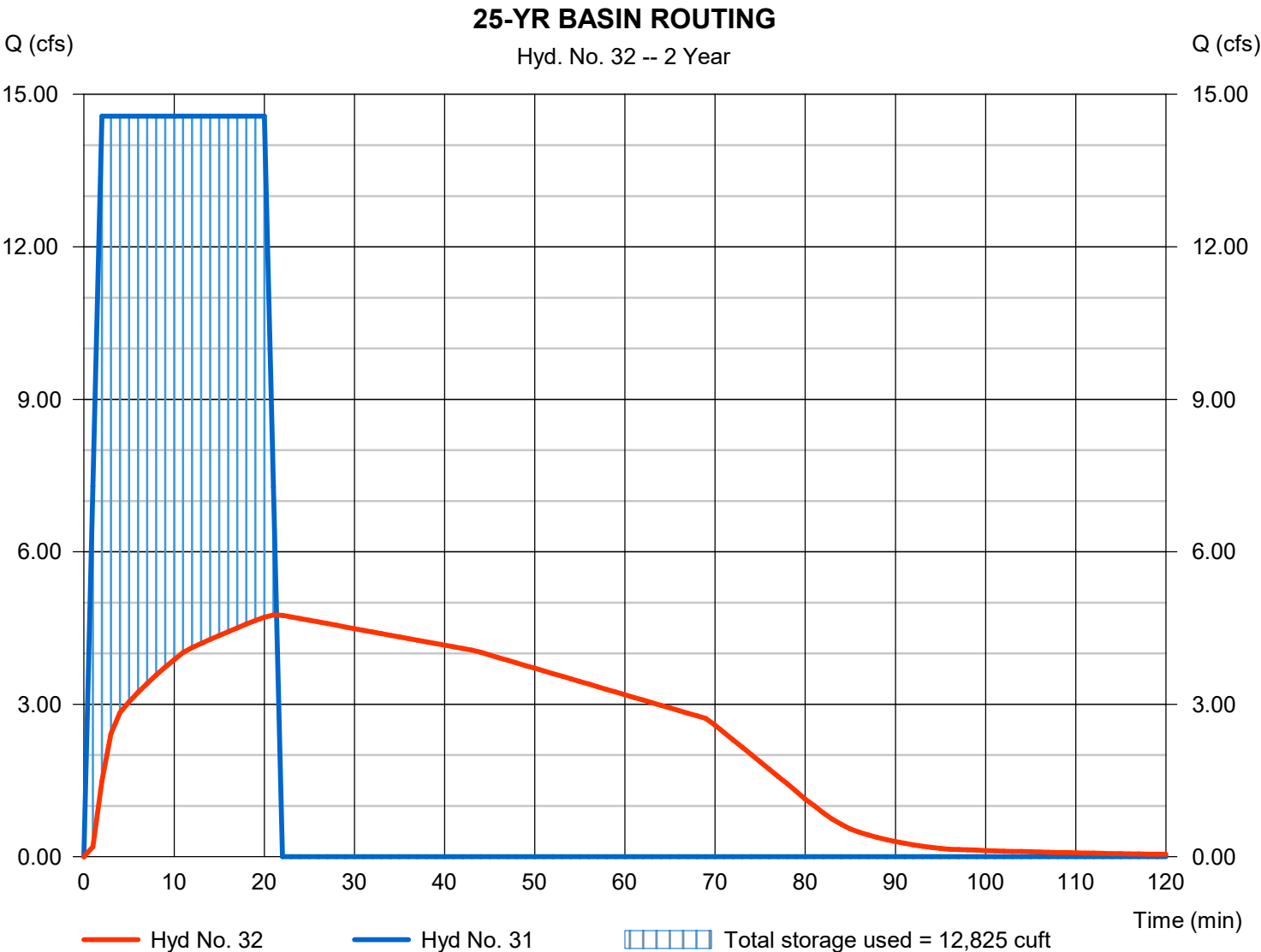
Wednesday, 11 / 13 / 2024

## Hyd. No. 32

### 25-YR BASIN ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 4.757 cfs
Storm frequency	= 2 yrs	Time to peak	= 21 min
Time interval	= 1 min	Hyd. volume	= 17,483 cuft
Inflow hyd. No.	= 31 - 25-YR COMBINED TO BASIN	Basin Elevation	= 575.40 ft
Reservoir name	= BASIN	Max. Storage	= 12,825 cuft

Storage Indication method used.



Pond No. 1 - BASIN

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 570.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	570.00	00	0	0
2.00	572.00	1,886	1,886	1,886
4.00	574.00	3,324	5,210	7,096
6.00	576.00	4,997	8,321	15,417
8.00	578.00	6,879	11,876	27,293

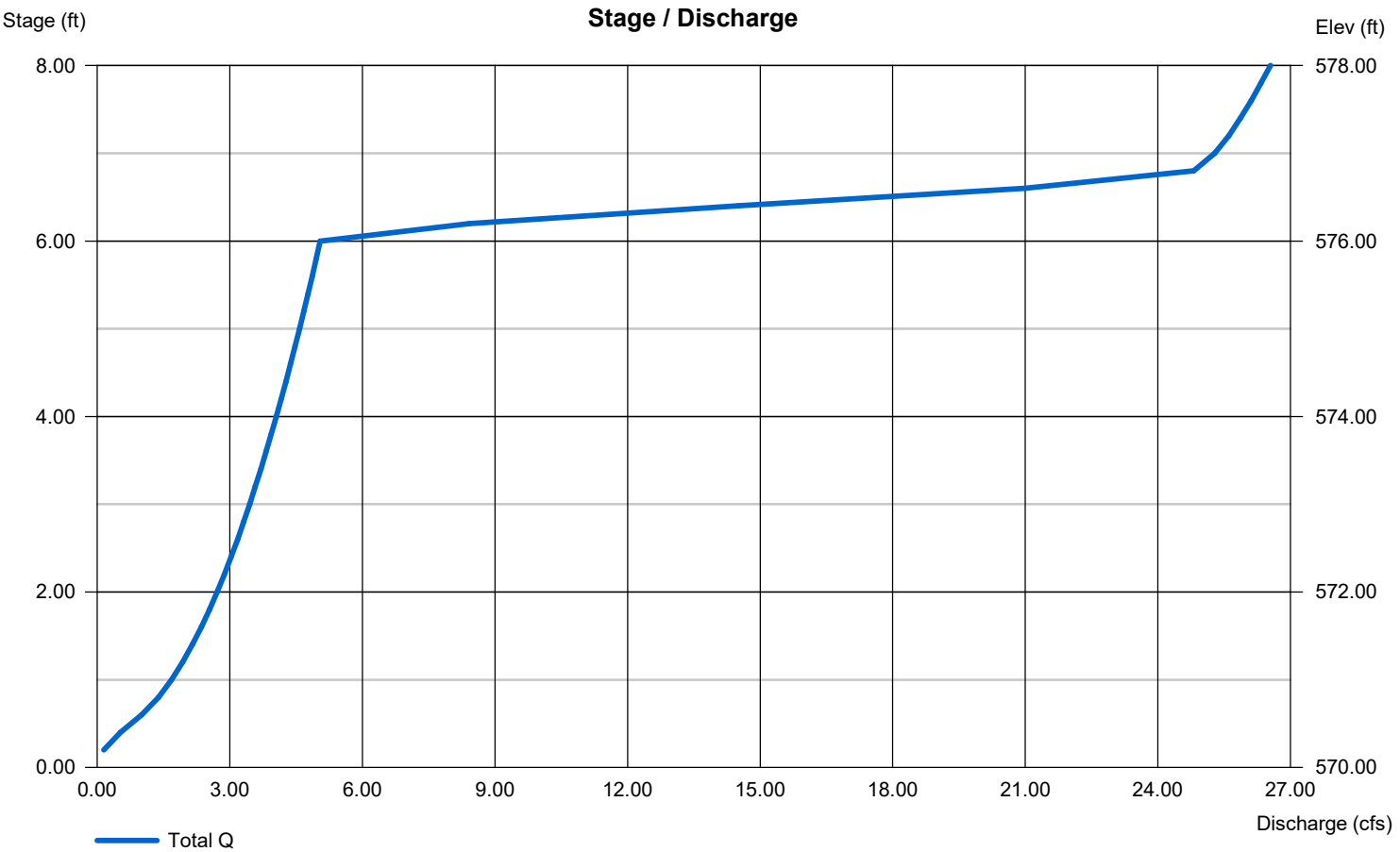
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	9.00	Inactive	0.00
Span (in)	= 18.00	9.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 566.00	570.00	0.00	0.00
Length (ft)	= 119.75	1.00	0.00	0.00
Slope (%)	= 2.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.00	0.00	0.00	0.00
Crest El. (ft)	= 576.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	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).

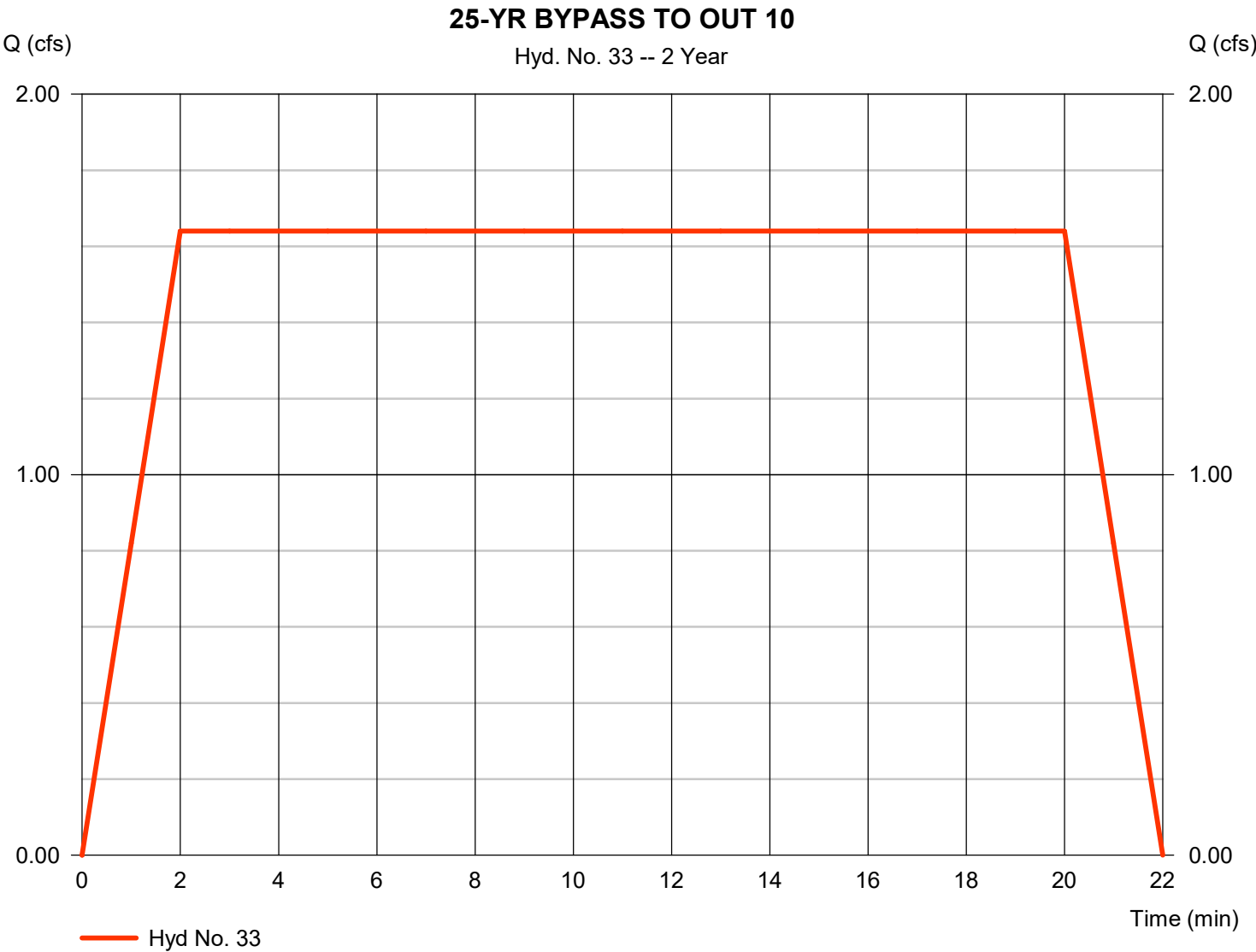


# Hydrograph Report

## Hyd. No. 33

25-YR BYPASS TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 1.640 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 1,968 cuft





# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

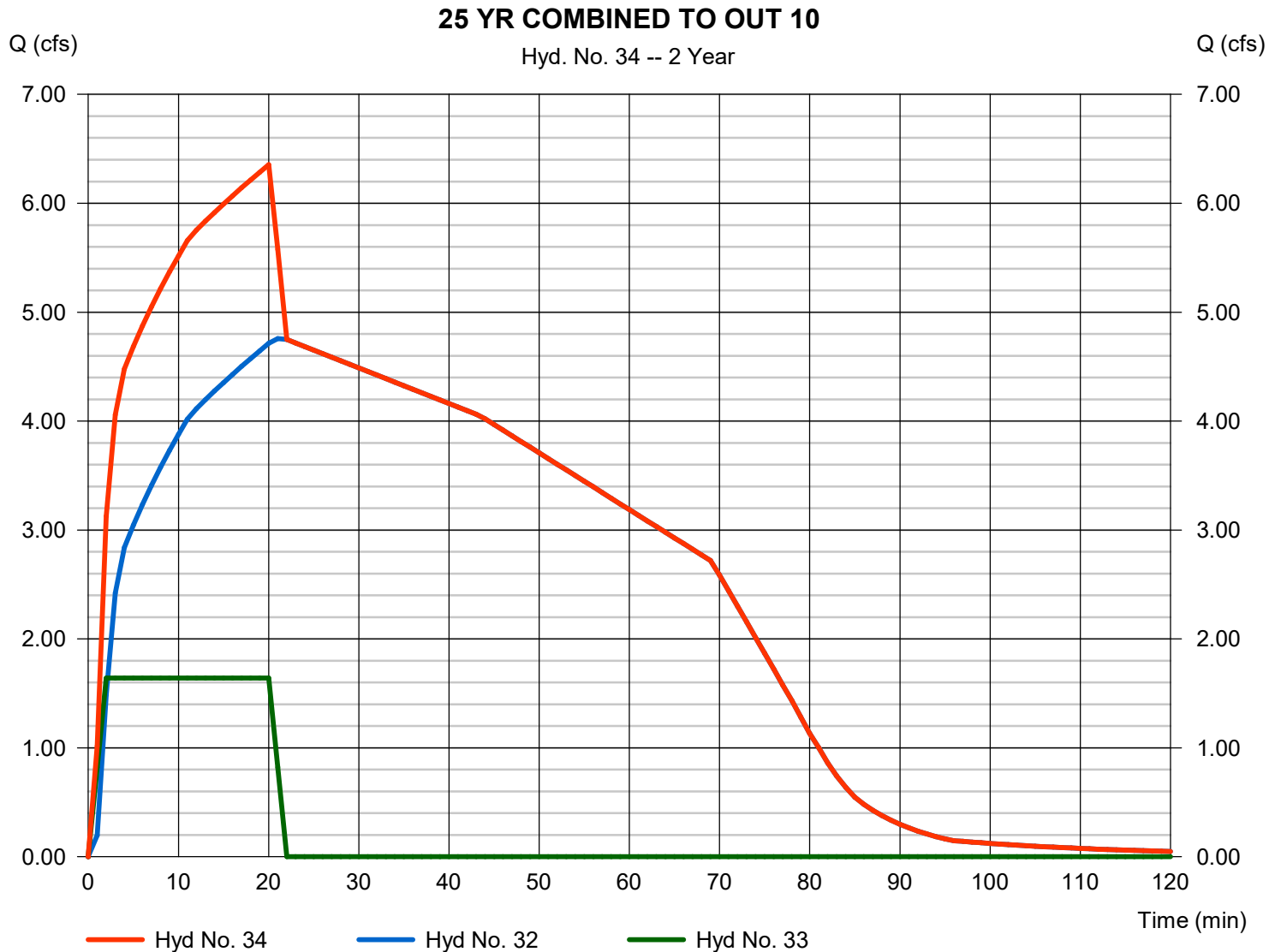
Wednesday, 11 / 13 / 2024

## Hyd. No. 34

25 YR COMBINED TO OUT 10

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 32, 33

Peak discharge = 6.354 cfs  
Time to peak = 20 min  
Hyd. volume = 19,451 cuft  
Contrib. drain. area = 0.000 ac

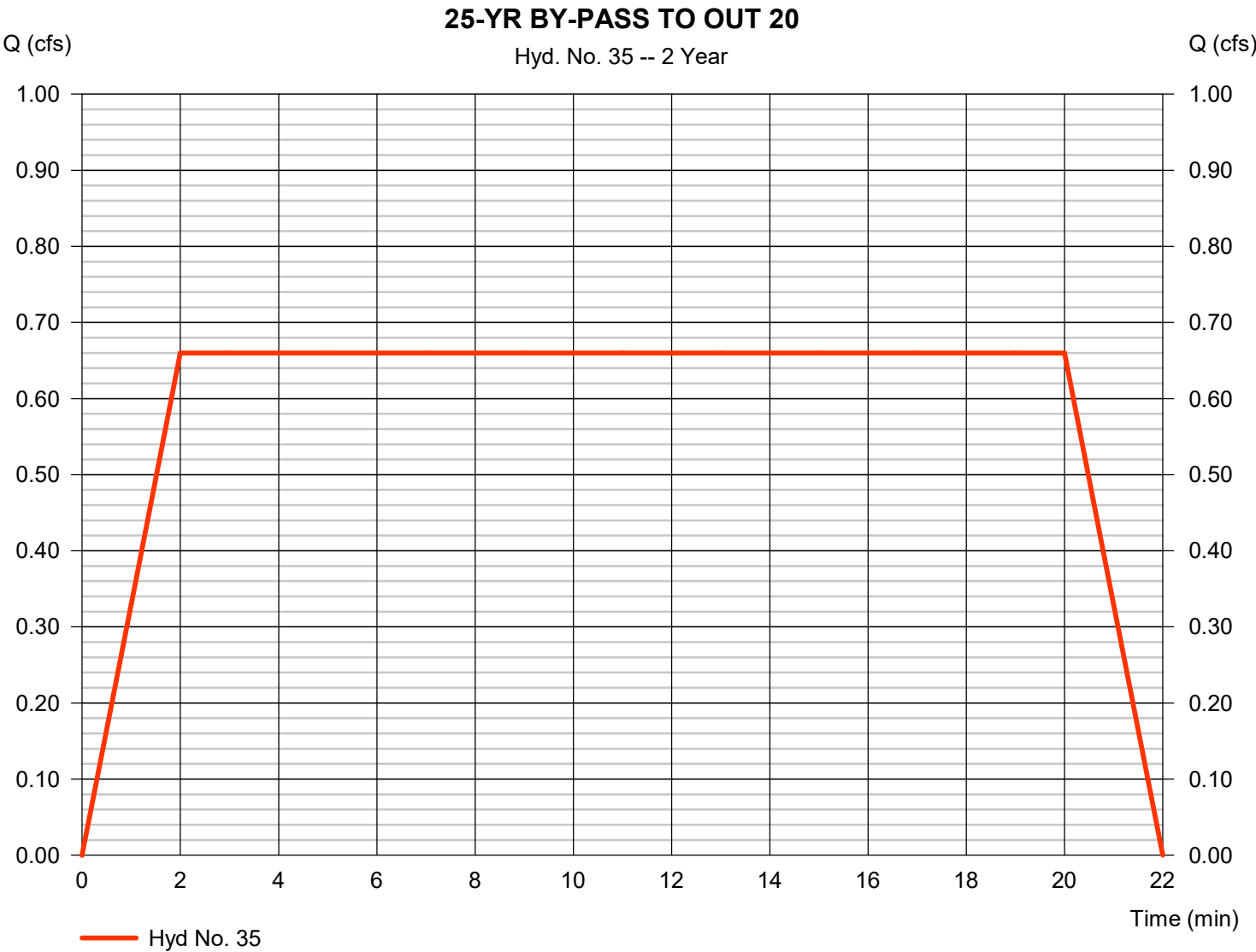


# Hydrograph Report

## Hyd. No. 35

25-YR BY-PASS TO OUT 20

Hydrograph type	= Manual	Peak discharge	= 0.660 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 792 cuft



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

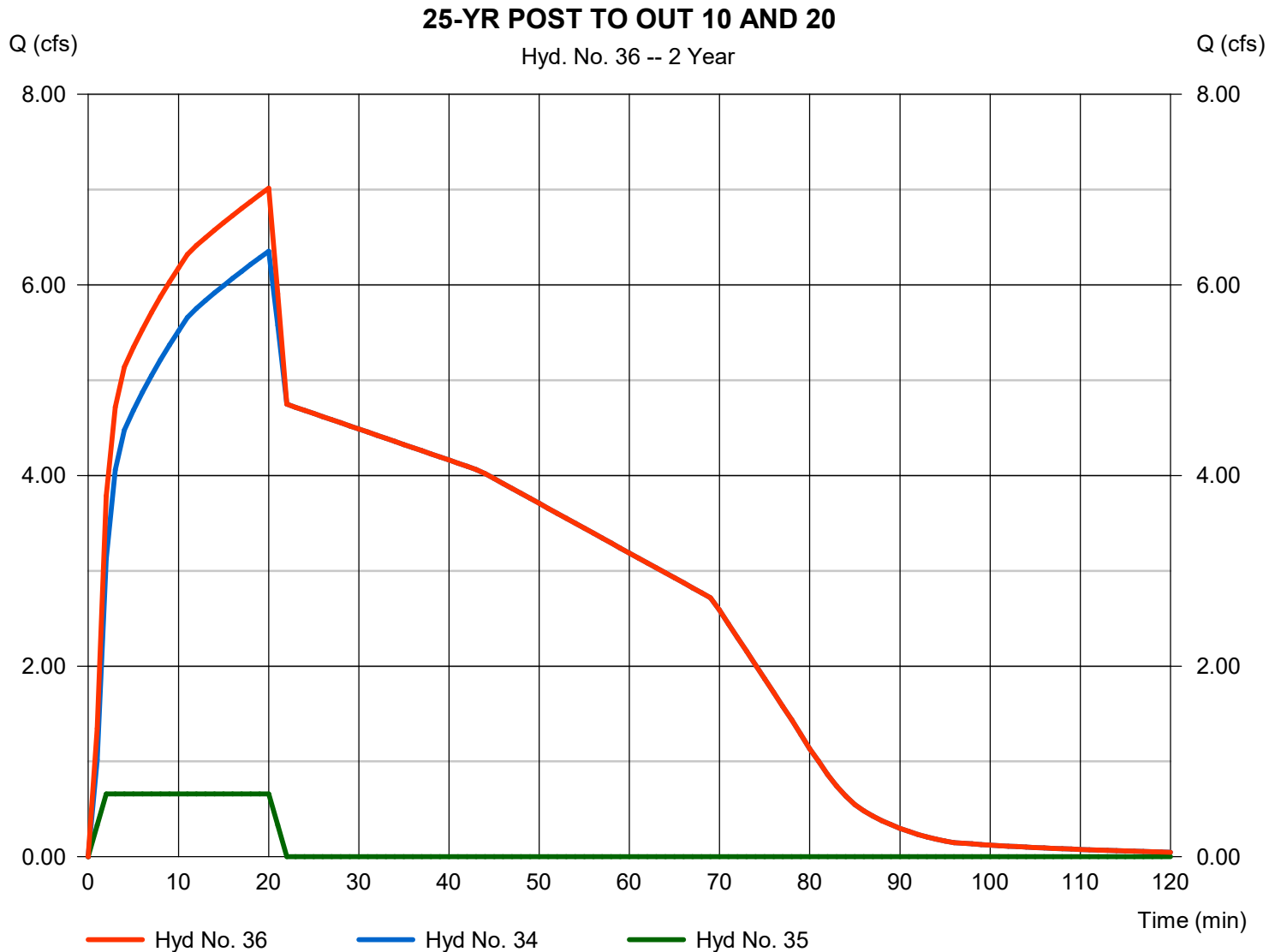
Wednesday, 11 / 13 / 2024

## Hyd. No. 36

25-YR POST TO OUT 10 AND 20

Hydrograph type = Combine  
 Storm frequency = 2 yrs  
 Time interval = 1 min  
 Inflow hyds. = 34, 35

Peak discharge = 7.014 cfs  
 Time to peak = 20 min  
 Hyd. volume = 20,243 cuft  
 Contrib. drain. area = 0.000 ac



# Hydrograph Report

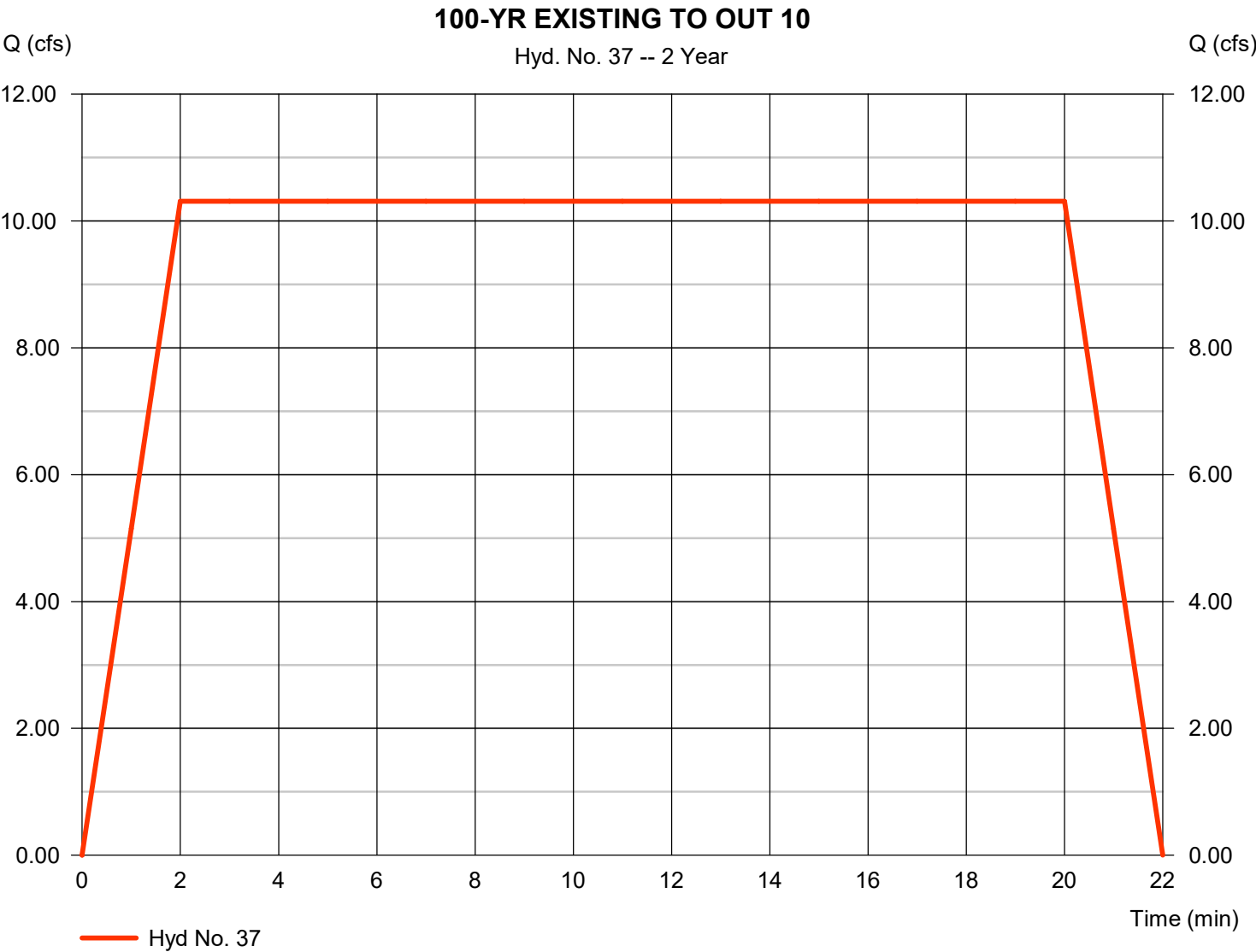
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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## Hyd. No. 37

100-YR EXISTING TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 10.31 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 12,371 cuft



# Hydrograph Report

## Hyd. No. 38

100-YR EX OFF-SITE TO OUT 10

Hydrograph type	= Manual	Peak discharge	= 0.210 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 252 cuft



# Hydrograph Report

## Hyd. No. 39

100-YR EXISTING TO OUT 20

Hydrograph type	= Manual	Peak discharge	= 1.490 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 1,788 cuft

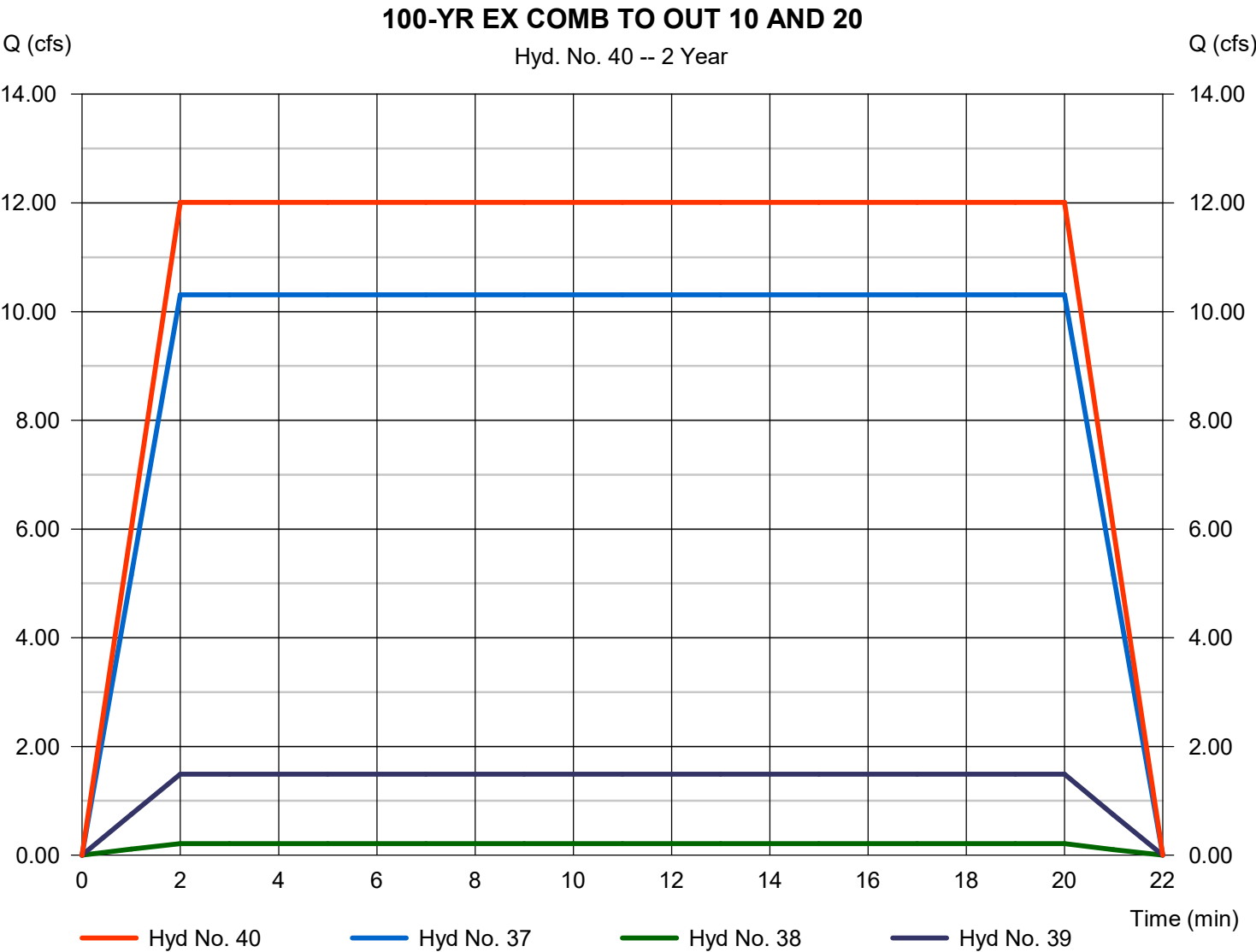


# Hydrograph Report

## Hyd. No. 40

100-YR EX COMB TO OUT 10 AND 20

Hydrograph type	= Combine	Peak discharge	= 12.01 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 14,411 cuft
Inflow hyds.	= 37, 38, 39	Contrib. drain. area	= 0.000 ac

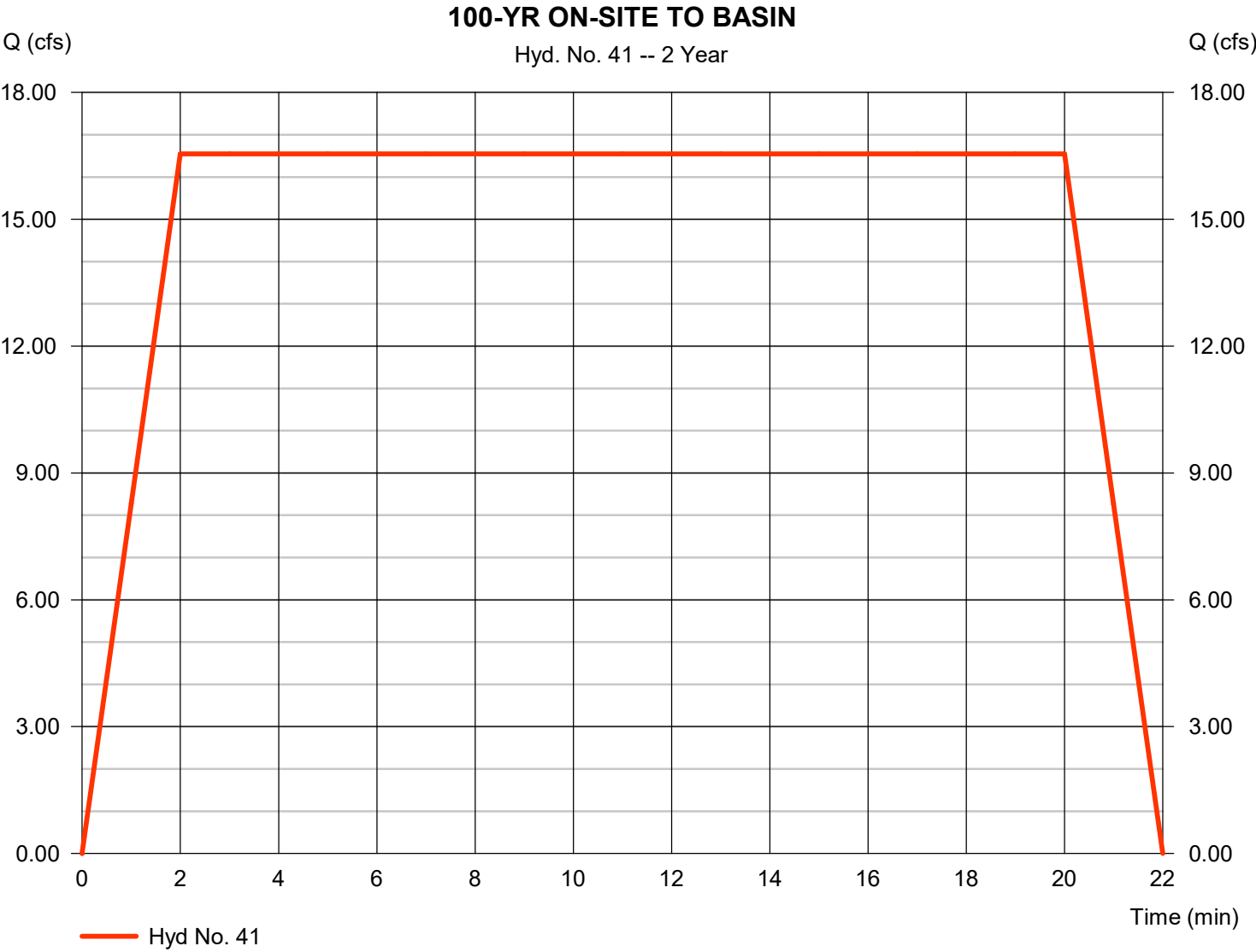


# Hydrograph Report

## Hyd. No. 41

### 100-YR ON-SITE TO BASIN

Hydrograph type	= Manual	Peak discharge	= 16.55 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 19,860 cuft





# Hydrograph Report

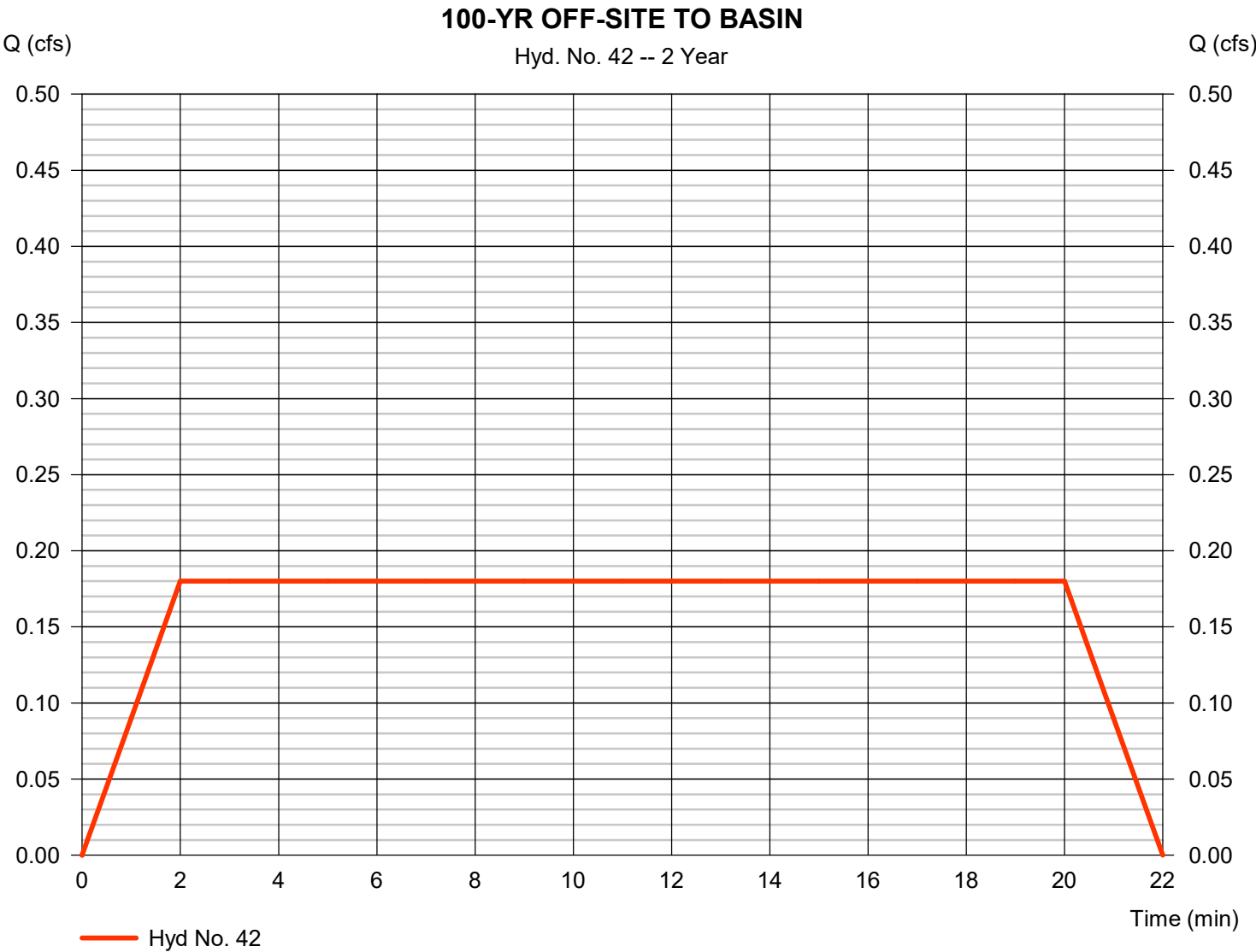
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 42

100-YR OFF-SITE TO BASIN

Hydrograph type	= Manual	Peak discharge	= 0.180 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 216 cuft



# Hydrograph Report

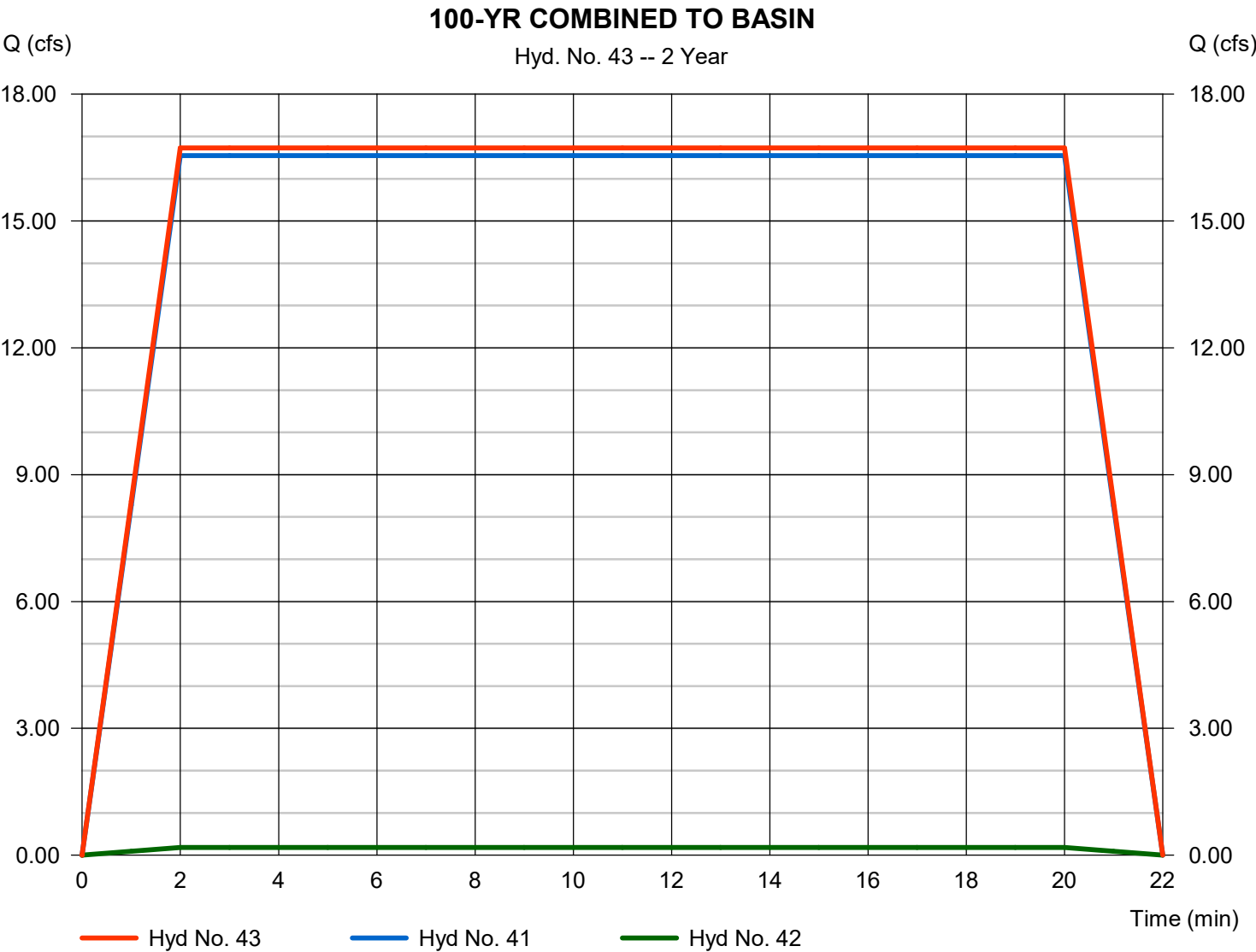
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Wednesday, 11 / 13 / 2024

## Hyd. No. 43

100-YR COMBINED TO BASIN

Hydrograph type	= Combine	Peak discharge	= 16.73 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 20,076 cuft
Inflow hyds.	= 41, 42	Contrib. drain. area	= 0.000 ac



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

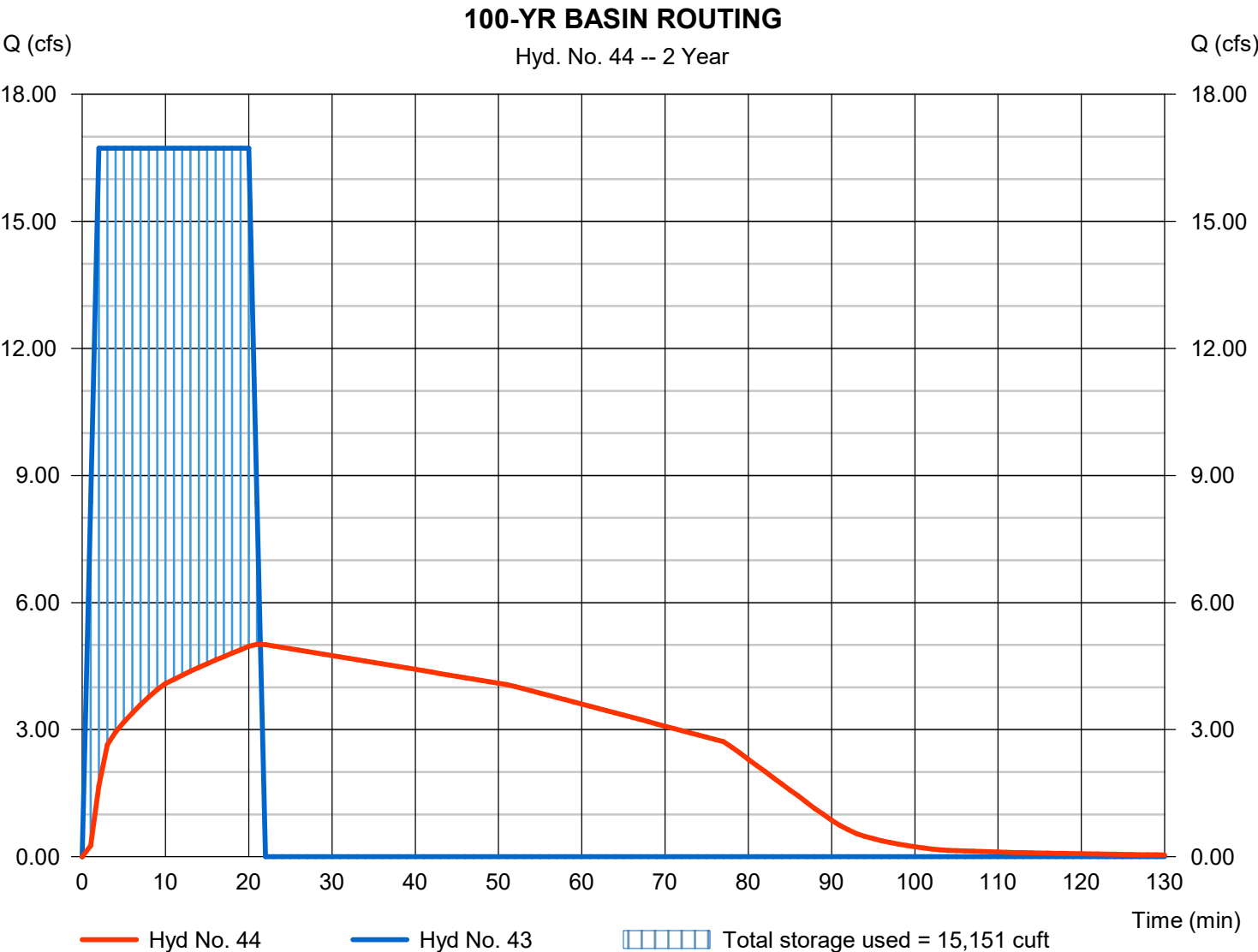
Wednesday, 11 / 13 / 2024

## Hyd. No. 44

### 100-YR BASIN ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 5.016 cfs
Storm frequency	= 2 yrs	Time to peak	= 21 min
Time interval	= 1 min	Hyd. volume	= 20,075 cuft
Inflow hyd. No.	= 43 - 100-YR COMBINED TO BASIN	Max. Elevation	= 575.96 ft
Reservoir name	= BASIN	Max. Storage	= 15,151 cuft

Storage Indication method used.



Pond No. 1 - BASIN

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 570.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	570.00	00	0	0
2.00	572.00	1,886	1,886	1,886
4.00	574.00	3,324	5,210	7,096
6.00	576.00	4,997	8,321	15,417
8.00	578.00	6,879	11,876	27,293

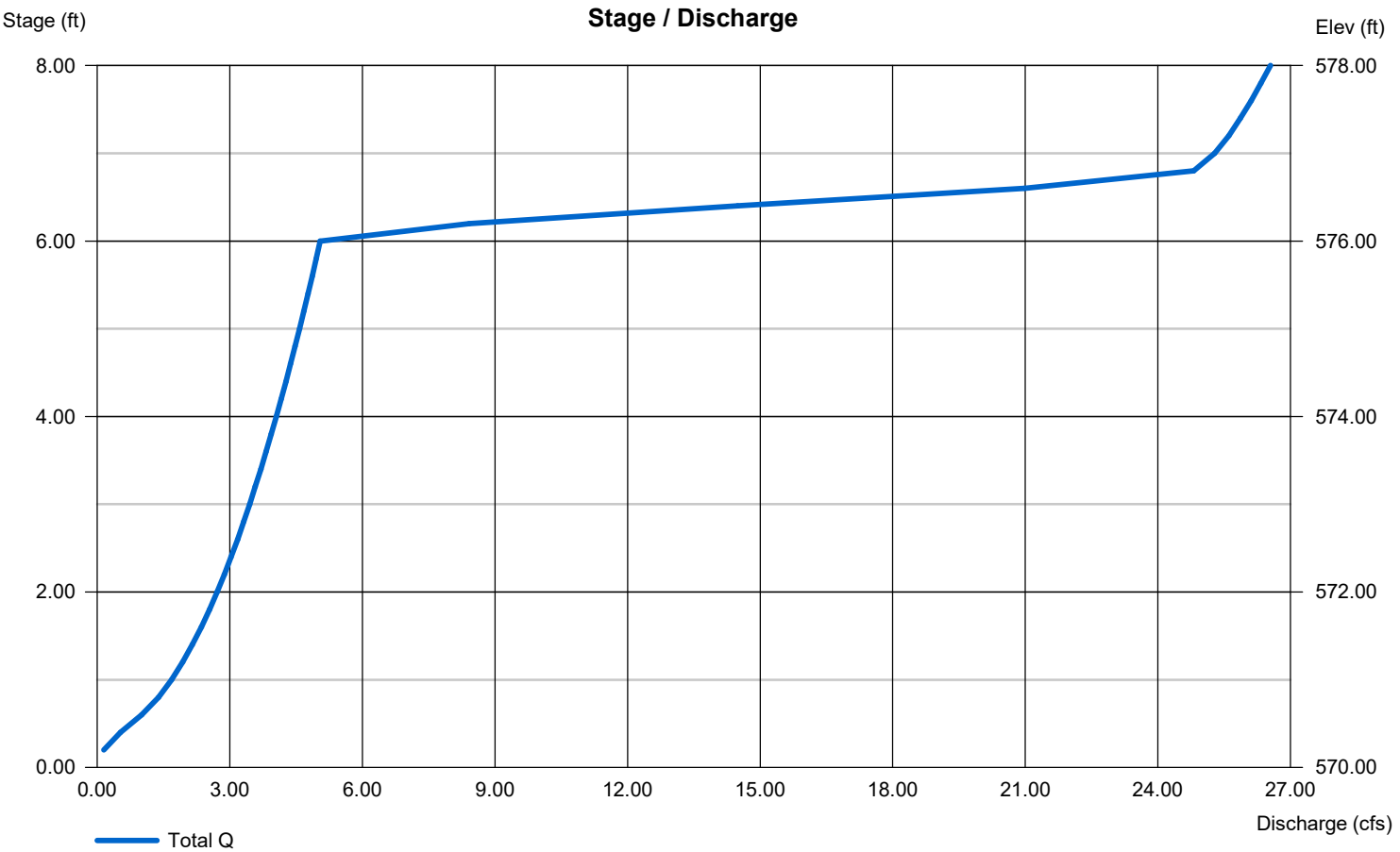
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	9.00	Inactive	0.00
Span (in)	= 18.00	9.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 566.00	570.00	0.00	0.00
Length (ft)	= 119.75	1.00	0.00	0.00
Slope (%)	= 2.00	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 11.00	0.00	0.00	0.00
Crest El. (ft)	= 576.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	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).



# Hydrograph Report

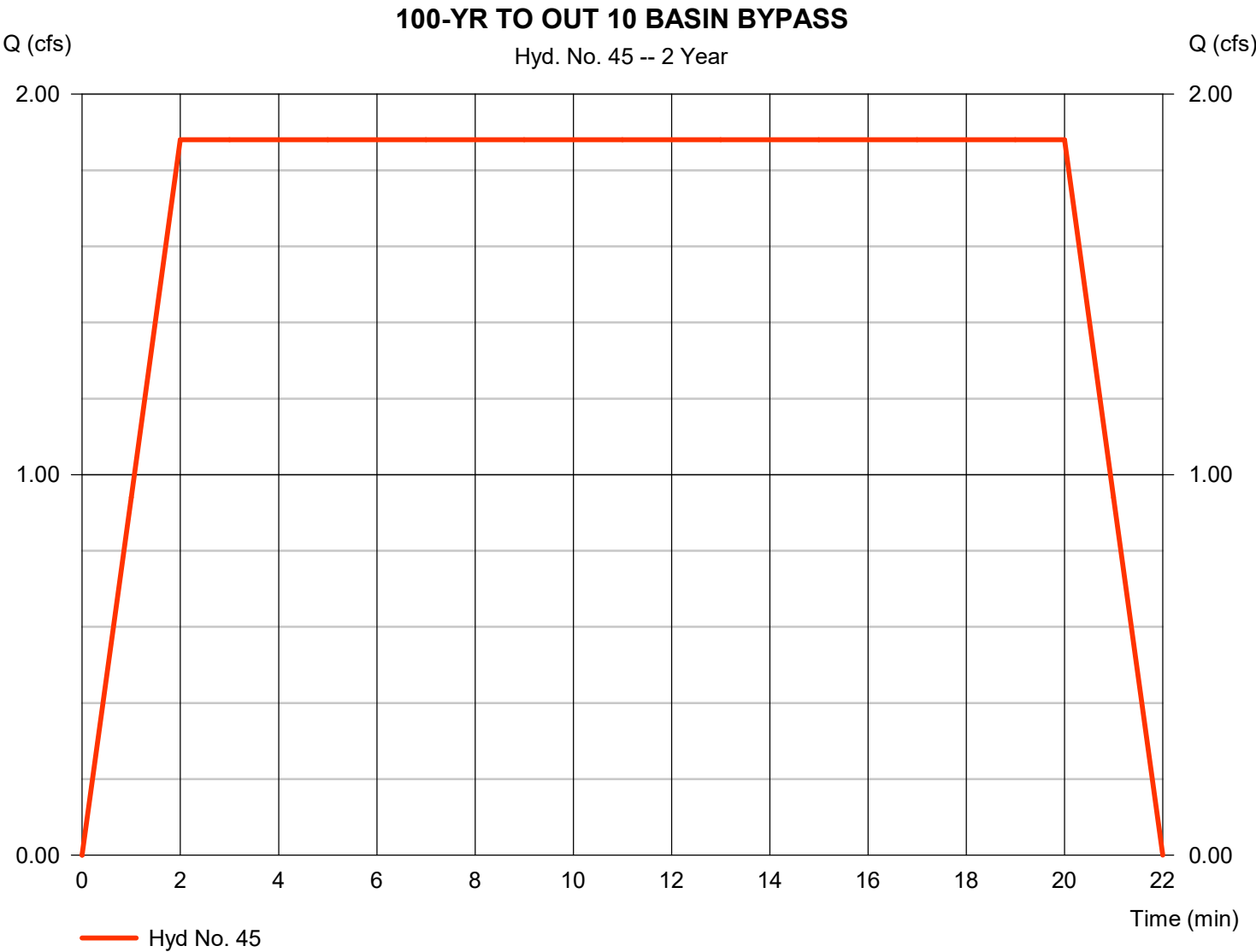
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Wednesday, 11 / 13 / 2024

## Hyd. No. 45

100-YR TO OUT 10 BASIN BYPASS

Hydrograph type	= Manual	Peak discharge	= 1.880 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 2,256 cuft



# Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

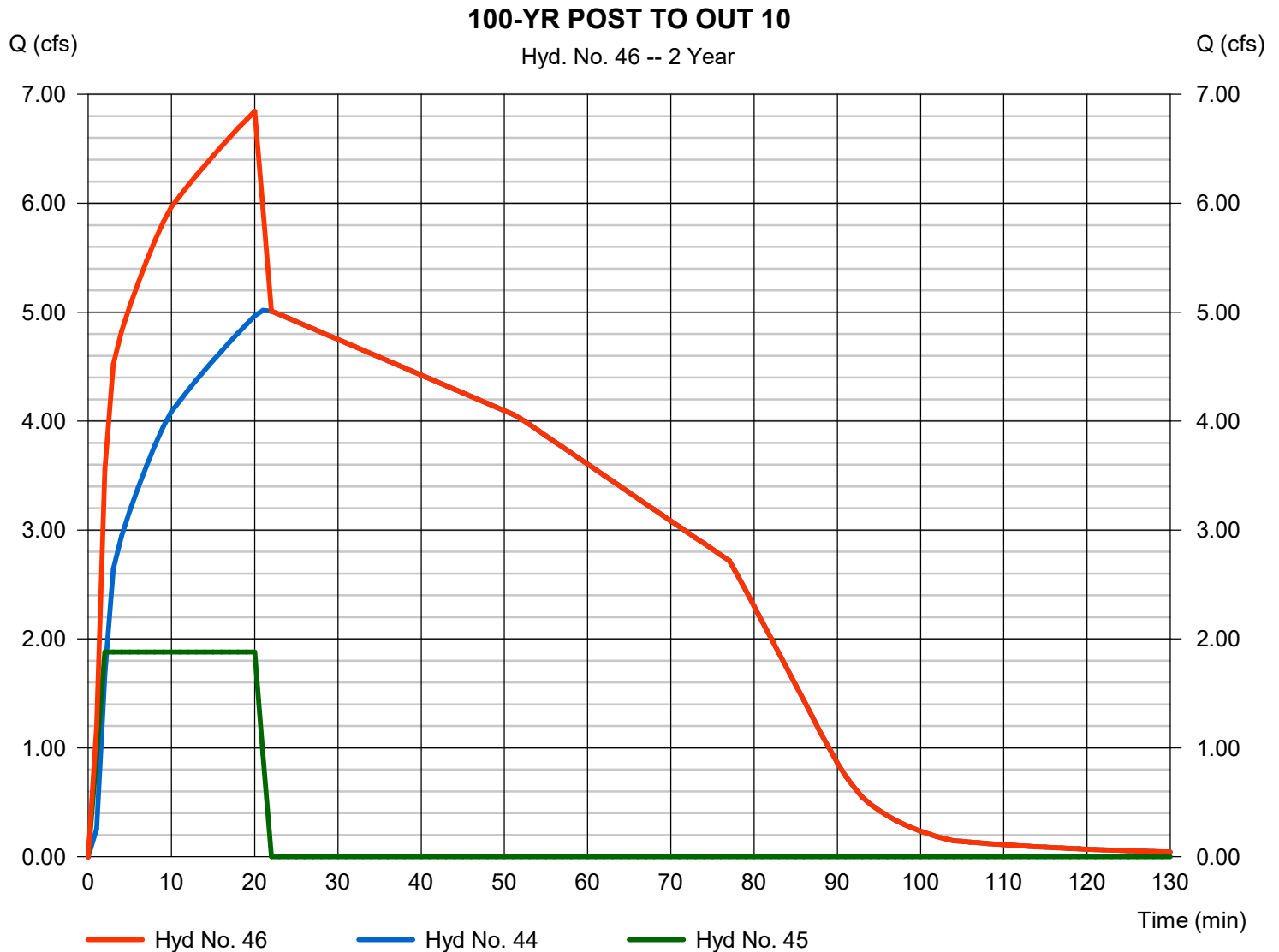
Wednesday, 11 / 13 / 2024

## Hyd. No. 46

100-YR POST TO OUT 10

Hydrograph type = Combine  
Storm frequency = 2 yrs  
Time interval = 1 min  
Inflow hyds. = 44, 45

Peak discharge = 6.846 cfs  
Time to peak = 20 min  
Hyd. volume = 22,331 cuft  
Contrib. drain. area = 0.000 ac



# Hydrograph Report

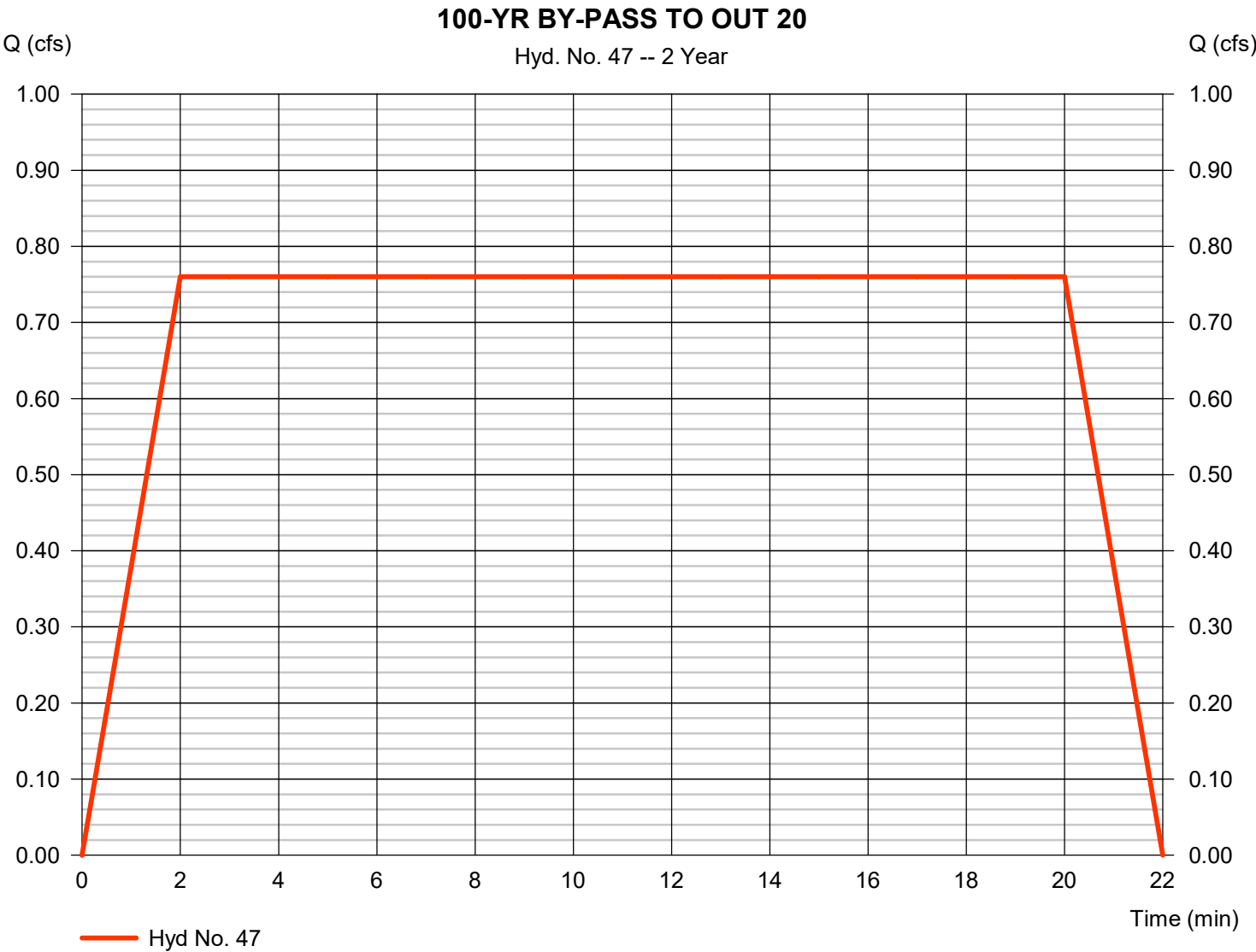
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Wednesday, 11 / 13 / 2024

## Hyd. No. 47

100-YR BY-PASS TO OUT 20

Hydrograph type	= Manual	Peak discharge	= 0.760 cfs
Storm frequency	= 2 yrs	Time to peak	= 2 min
Time interval	= 1 min	Hyd. volume	= 912 cuft



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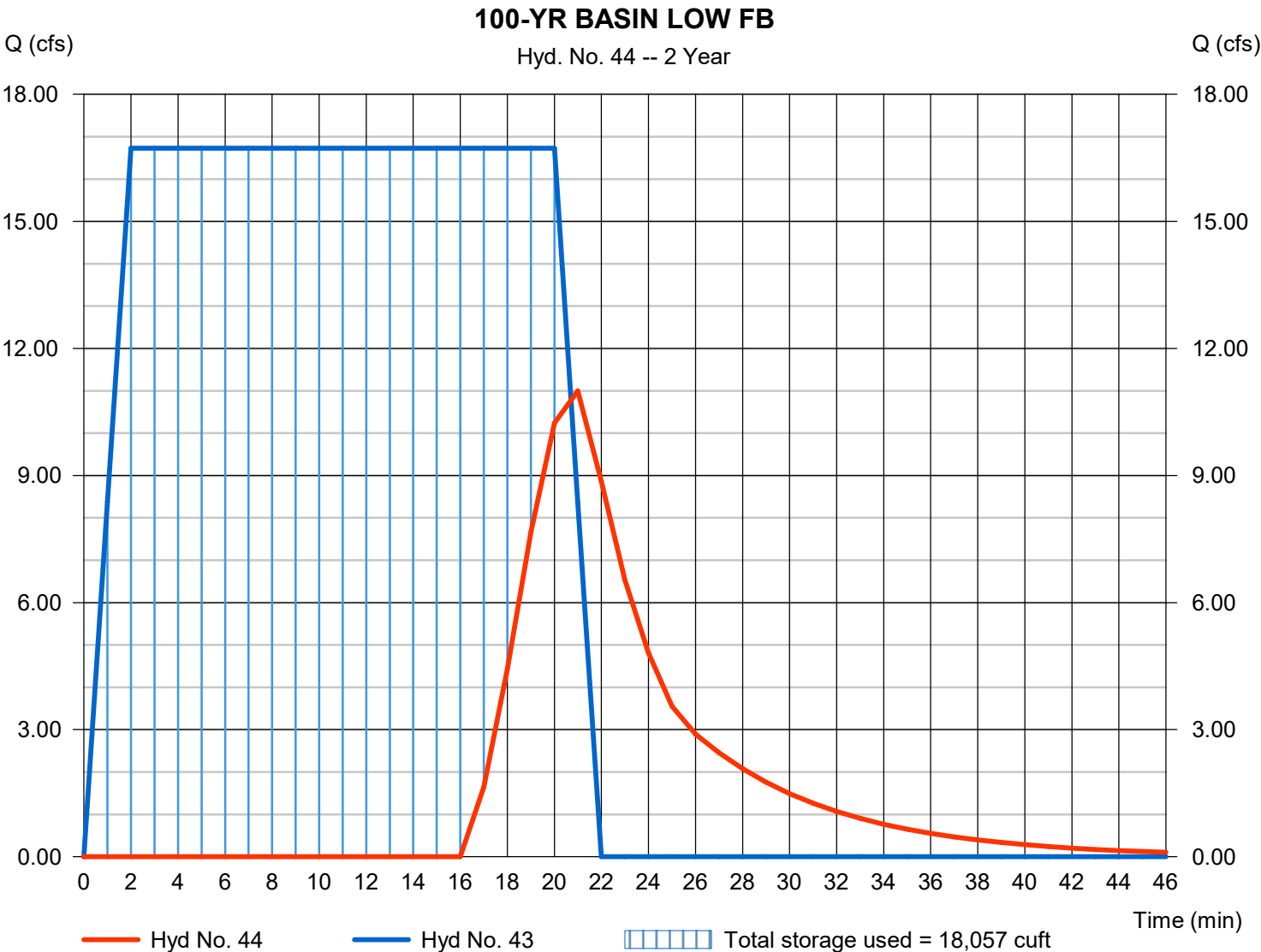
# Hydrograph Report

## Hyd. No. 44

100-YR BASIN LOW FB

Hydrograph type	= Reservoir	Peak discharge	= 11.00 cfs
Storm frequency	= 2 yrs	Time to peak	= 21 min
Time interval	= 1 min	Hyd. volume	= 4,659 cuft
Inflow hyd. No.	= 43 - 100-YR COMBINED TO BASIN	Max. Elevation	= 576.46 ft
Reservoir name	= BASIN	Max. Storage	= 18,057 cuft

Storage Indication method used.



GRADING NOTES:

1. DEVELOPER MUST SUPPLY CITY CONSTRUCTION INSPECTORS WITH AN ENGINEER'S SOIL REPORTS PRIOR TO AND DURING SITE GRADING. THE SOIL REPORT WILL BE REQUIRED TO CONTAIN THE FOLLOWING INFORMATION ON SOIL TEST CURVES (PROCTOR REPORTS) FOR PROJECTS WITHIN THE CITY:
  - 1.1. MAXIMUM DRY DENSITY
  - 1.2. OPTIMUM MOISTURE CONTENT
  - 1.3. MAXIMUM AND MINIMUM ALLOWABLE MOISTURE CONTENT
  - 1.4. CURVE MUST BE PLOTTED TO SHOW DENSITY FROM A MINIMUM OF 80% COMPACTION AND ABOVE AS DETERMINED BY THE "MODIFIED AASHTO T-99 COMPACTION TEST" (A.S.T.M.-D-1557) OR FROM A MINIMUM OF 95% AS DETERMINED BY THE "STANDARD PROCTOR TEST AASHTO T-99, METHOD C" (A.S.T.M.-D-698). PROCTOR TYPE MUST BE DESIGNATED ON DOCUMENT.
  - 1.5. CURVE MUST HAVE AT LEAST 5 DENSITY POINTS WITH MOISTURE CONTENT AND SAMPLE LOCATIONS LISTED ON DOCUMENT
  - 1.6. SPECIFIC GRAVITY
  - 1.7. NATURAL MOISTURE CONTENT
  - 1.8. LIQUID LIMIT
  - 1.9. PLASTIC LIMITBE ADVISED THAT IF THIS INFORMATION IS NOT PROVIDED TO THE CITY'S CONSTRUCTION INSPECTOR THE CITY WILL NOT ALLOW GRADING OR CONSTRUCTION ACTIVITIES TO PROCEED ON ANY PROJECT SITE.
2. ALL FILL PLACED IN AREAS OTHER THAN PROPOSED STORM SEWERS, SANITARY SEWERS, PROPOSED ROADS, AND PAVED AREAS SHALL BE COMPACTED FROM THE BOTTOM OF THE FILL UP IN 8" LIFTS AND COMPACTED TO 90% MAXIMUM DENSITY AS DETERMINED BY MODIFIED AASHTO T-99 COMPACTION TEST OR 95% OF MAXIMUM DENSITY AS DETERMINED BY THE STANDARD PROCTOR TEST AASHTO T-99. ENSURE THE MOISTURE CONTENT OF THE SOIL IN FILL AREAS CORRESPONDS TO THE COMPACTIVE EFFORT AS DEFINED BY THE STANDARD OR MODIFIED PROCTOR TEST. OPTIMUM MOISTURE CONTENT SHALL BE DETERMINED USING THE SAME TEST THAT WAS USED FOR COMPACTION. SOIL COMPACTION CURVES SHALL BE SUBMITTED TO THE CITY OF OFALLON PRIOR TO THE PLACEMENT OF FILL.
3. THE SURFACE OF THE FILL SHALL BE FINISHED SO IT WILL NOT IMPOUND WATER. IF AT THE END OF A DAYS WORK IT WOULD APPEAR THAT THERE MAY BE RAIN PRIOR TO THE NEXT WORKING DAY, THE SURFACE SHALL BE FINISHED SMOOTH. IF THE SURFACE HAS BEEN FINISHED SMOOTH FOR ANY REASON, IT SHALL BE SCARIFIED BEFORE PROCEEDING WITH THE PLACEMENT OF SUCCEEDING LIFTS. FILL SHALL NOT BE PLACED ON FROZEN GROUND, NOR SHALL FILLING OPERATIONS CONTINUE WHEN THE TEMPERATURE IS SUCH AS TO PERMIT THE LAYER UNDER PLACEMENT TO FREEZE.
4. ALL SEDIMENT AND DETENTION BASINS ARE TO BE CONSTRUCTED DURING THE INITIAL PHASE OF THE GRADING OPERATION OR IN ACCORDANCE WITH THE APPROVED SWPPP.
5. WHEN GRADING OPERATIONS ARE COMPLETE OR SUSPENDED FOR MORE THAN 14 DAYS, PERMANENT GRASS MUST BE ESTABLISHED AT SUFFICIENT DENSITY TO PROVIDE EROSION CONTROL ON SITE. BETWEEN PERMANENT GRASS SEEDING PERIODS, TEMPORARY COVER SHALL BE PROVIDED ACCORDING TO MISSOURI DEPARTMENT OF NATURAL RESOURCES PROTECTING WATER QUALITY - A FIELD GUIDE TO EROSION, SEDIMENT AND STORMWATER BEST MANAGEMENT PRACTICES FOR DEVELOPMENT SITES IN MISSOURI AND KANSAS ALL FINISHED GRADES (AREAS NOT TO BE DISTURBED BY IMPROVEMENTS) IN EXCESS OF 20% SLOPES (5:1) SHALL BE MULCHED AND TACKED AT A RATE OF 100 POUNDS PER 1000 SQUARE FEET WHEN SEEDDED.
6. NO SLOPES SHALL EXCEED 3 (HORIZONTAL) : 1 (VERTICAL) UNLESS OTHERWISE APPROVED BY THE SOILS REPORT AND SPECIFICALLY LOCATED ON THE PLANS AND APPROVED BY THE CITY ENGINEER.
7. ALL LOW PLACES WHETHER ON SITE OR OFF SHALL BE GRADED TO PROVIDE DRAINAGE WITH TEMPORARY DITCHES.
8. ANY EXISTING WELLS AND/OR SPRINGS WHICH MAY EXIST ON THE PROPERTY MUST BE SEALED IN A MANNER ACCEPTABLE TO THE CITY OF OFALLON CONSTRUCTION INSPECTION DEPARTMENT AND FOLLOWING MISSOURI DEPARTMENT OF NATURAL RESOURCES STANDARDS AND SPECIFICATIONS.
9. (INTENTIONALLY OMITTED)
10. ALL TRENCH BACK FILLS UNDER PAVED AREAS SHALL BE GRANULAR BACK FILL, AND COMPACTED MECHANICALLY. ALL OTHER TRENCH BACK FILLS MAY BE EARTH MATERIAL (FREE OF LARGE CLOUDS, OR STONES) AND COMPACTED USING EITHER MECHANICAL TAMPING OR WATER JETTING. GRANULAR MATERIAL AND EARTH MATERIAL ASSOCIATED WITH NEW CONSTRUCTION OUTSIDE OF PAVEMENTS MAY BE JETTED, TAKING CARE TO AVOID DAMAGE TO NEWLY LAID SEWERS. THE JETTING SHALL BE PERFORMED WITH A PROBE ROUTE ON NOT GREATER THAN 7.5 FOOT CENTERS WITH THE JETTING PROBE CENTERED OVER AND PARALLEL WITH THE DIRECTION OF THE PIPE. TRENCH WIDTHS GREATER THAN 10 FEET WILL REQUIRE MULTIPLE PROBES EVERY 7.5 FOOT CENTERS.
  - 10.1. DEPTH: TRENCH BACK FILLS LESS THAN 8 FEET DEEP SHALL BE PROBED TO A DEPTH EXTENDING HALF THE DEPTH OF THE TRENCH BACK FILL, BUT NOT LESS THAN 3 FEET. TRENCH BACK FILL GREATER THAN 8 FEET IN DEPTH SHALL BE PROBED TO HALF THE DEPTH OF THE TRENCH BACK FILL BUT NOT GREATER THAN 8 FEET.
  - 10.2. EQUIPMENT: THE JETTING PROBE SHALL BE A METAL PIPE WITH AN INTERIOR DIAMETER OF 1.5 TO 2 INCHES.
  - 10.3. METHOD: JETTING SHALL BE PERFORMED FROM THE LOWEST SURFACE TOPOGRAPHIC POINT AND PROCEED TOWARD THE HIGHEST POINT, AND FROM THE BOTTOM OF THE TRENCH BACK FILL TOWARD THE SURFACE. THE FLOODING OF EACH JETTING PROBE SHALL BE STARTED SLOWLY ALLOWING SLOW SATURATION OF THE SOIL. WATER IS NOT ALLOWED TO FLOW AWAY FROM THE TRENCH WITHOUT FIRST SATURATING THE TRENCH.
  - 10.4. SURFACE BRIDGING: THE CONTRACTOR SHALL IDENTIFY THE LOCATIONS OF THE SURFACE BRIDGING THE TENDENCY FOR THE UPPER SURFACE TO CRUST AND ARCH OVER THE TRENCH RATHER THAN COLLAPSE AND CONSOLIDATE DURING THE JETTING PROCESS). THE CONTRACTOR SHALL BREAK DOWN THE BRIDGED AREAS USING AN APPROPRIATE METHOD SUCH AS WHEELS OR BUCKET OF A BACKHOE. WHEN SURFACE CRUST IS COLLAPSED, THE VOID SHALL BE BACK FILLED WITH THE SAME MATERIAL USED AS TRENCH BACK FILL AND RE-JETTED. COMPACTION OF THE MATERIALS WITHIN THE SUNKEN/JETTED AREA SHALL BE COMPACTED SUCH THAT NO FURTHER SURFACE SUBSIDENCE OCCURS.
11. SITE GRADING.
  - 11.1. WITHIN CITY RIGHT-OF-WAY: MATERIAL IS TO BE PLACED IN EIGHT (8) INCH TO TWELVE (12) INCH LOOSE LIFTS AND COMPACTED PER THE APPROVED COMPACTION REQUIREMENTS. ONE (1) COMPACTION TEST WILL BE PERFORMED EVERY TWO HUNDRED FIFTY (250) FEET ALONG THE CENTERLINE FOR EACH LIFT.
  - 11.2. OUTSIDE OF CITY RIGHT-OF-WAY: MATERIAL IS TO BE PLACED IN EIGHT (8) INCH TO TWELVE (12) INCH LOOSE LIFTS AND COMPACTED PER THE APPROVED COMPACTION REQUIREMENTS. ONE (1) COMPACTION TEST WILL BE PERFORMED AT TWO (2) FOOT VERTICAL INTERVALS AND APPROXIMATELY EVERY ONE THOUSAND (1,000) CUBIC YARDS.
12. ACCESS TO THE SITE FROM ANY OTHER LOCATION OTHER THAN THE PROPOSED CONSTRUCTION ENTRANCE IS STRICTLY PROHIBITED!

NOTES:

1. ALL SPOT ELEVATIONS ARE TO TOP OF PAVEMENT.

EARTHWORK QUANTITY ESTIMATE:

CUT TO FINISHED GRADE:	+15.006	CUBIC YARDS
FILL TO FINISHED GRADE:	-14.019	CUBIC YARDS (15% FILL FACTOR)
NET TO FINISHED GRADE:	+0.987	CUBIC YARDS (CUT)
PAVEMENT SUBGRADE:	33,546 SF x 11" / 27" =	+1,139 CY
CONCRETE S/W SUBGRADE:	5,042 SF x 7" / 27" =	+109 CY
BUILDING SUBGRADE:	5,700 SF x 8" / 27" =	+141 CY
NET TO SUBGRADE:		+1,389 CY
TOTAL: 987 + 1,389 = +2,376 CY (HEAVY)		

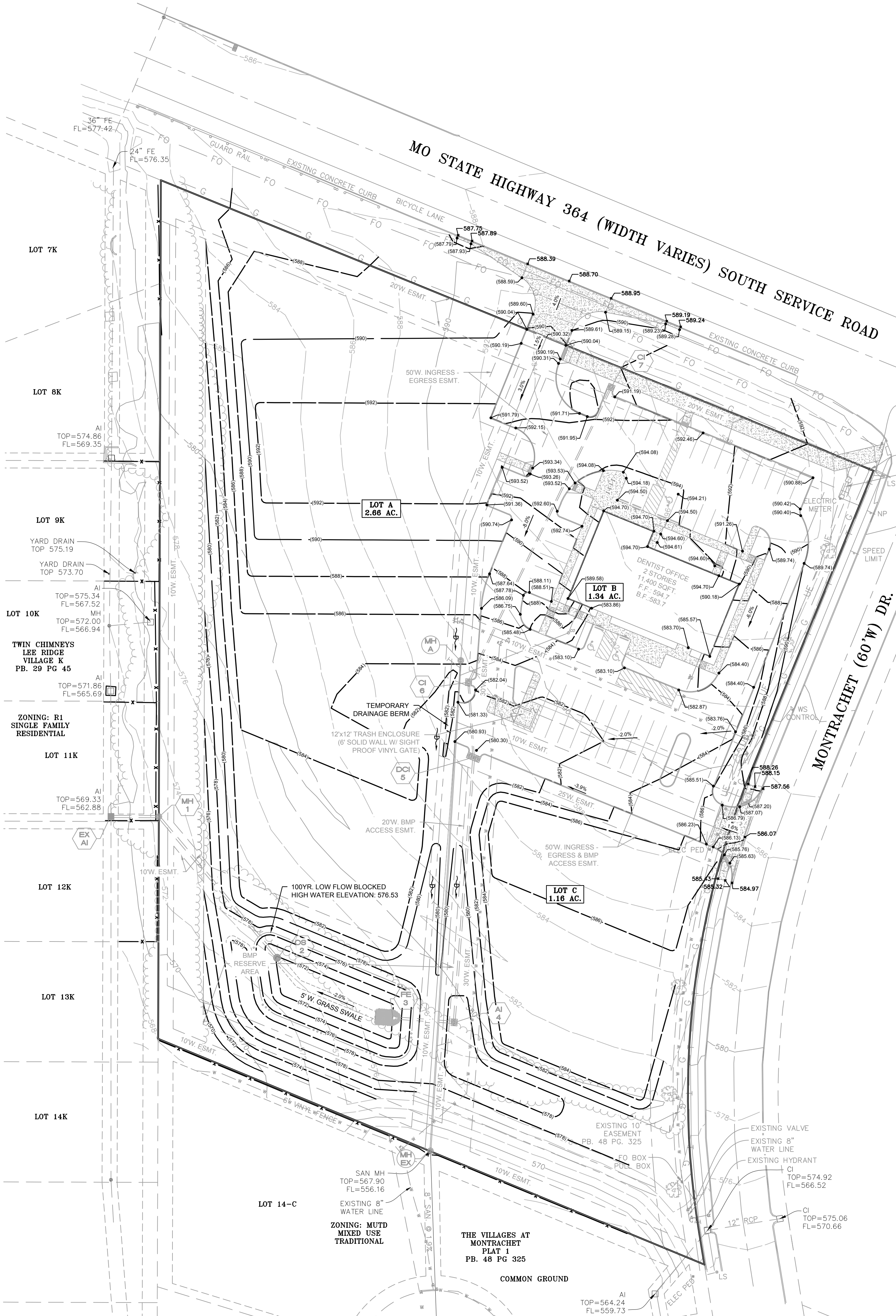
THE ABOVE CALCULATED QUANTITIES OF EARTHWORK ARE BE REGARDED AS AN ESTIMATE OF THE BULK MOVEMENT OR REDISTRIBUTION OF SOILS ON THE SITE AND SHOULD BE CONSIDERED AS SUCH. THESE QUANTITIES ARE INTENDED FOR GENERAL USE, AND THE ENGINEER ASSUMES NO LIABILITY FOR COST OVERRIDES DUE TO EXCESS EXCAVATED MATERIALS, SHORTAGES OF FILL, REMOVAL OF UNSUITABLE MATERIALS OFFSITE. IT IS THE GRADING CONTRACTOR'S RESPONSIBILITY TO PREPARE A QUANTITY TAKEOFF AND NOTE ANY DISCREPANCIES TO THE ENGINEER.

THE QUANTITIES ESTIMATED FOR EACH OF THE IMPROVEMENT ITEMS LISTED ABOVE ARE BASED UPON THE HORIZONTAL AND VERTICAL LOCATION OF THE IMPROVEMENTS AS PROPOSED ON THE SITE ENGINEERING PLANS PREPARED BY ST CHARLES ENGINEERING & SURVEYING, INC.

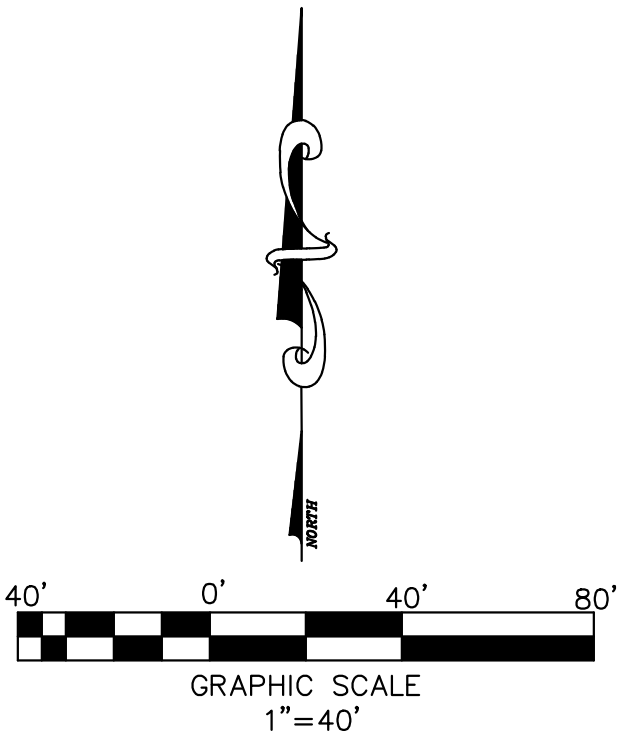
THE ENGINEER'S EARTHWORK ESTIMATE DOES NOT INCLUDE ANY OF THE FOLLOWING ITEMS REQUIRING EARTHWORK THAT MAY BE NECESSARY FOR COMPLETION OF THE PROJECT: MISCELLANEOUS UNDERGROUND CONDUITS, INCLUDING SEWER LINES AND WATER MAINS; SEWER STRUCTURES; PROCESS OR TRANSFER PIPING; ELECTRICAL OR TELEPHONE CONDUITS; BASES FOR LIGHT STANDARDS OR OTHER STRUCTURES; BUILDING FOOTINGS AND FOUNDATIONS; ETC.

THE ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACTUAL SIZE OF THE FIELD EXCAVATIONS MADE FOR THE INSTALLATION OF UNDERGROUND STRUCTURES, AND AS SUCH, THE ACTUAL QUANTITIES OF EARTHWORK FROM SUCH ITEMS MAY VARY FROM THE ESTIMATE SHOWN ABOVE.

EXCESS MATERIAL TO BE SPREAD "LOST" ON-SITE AND WILL NOT BE HAULED OFF OF THE SITE.



PROPERTY N/P  
DICKHERBER FARM  
PARTNERSHIP, LP  
6185/121  
ZONING: MUTD  
MIXED USE  
TRADITIONAL



UNDERGROUND UTILITIES HAVE BEEN PLOTTED FROM AVAILABLE INFORMATION AND THEREFORE THEIR LOCATIONS SHALL BE CONSIDERED APPROXIMATE ONLY. THE VERIFICATION OF THE LOCATION OF ALL UNDERGROUND UTILITIES, EITHER SHOWN OR NOT SHOWN ON THESE PLANS, SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND SHALL BE LOCATED PRIOR TO ANY GRADING AND/OR CONSTRUCTION OF IMPROVEMENTS.

Call BEFORE you DIG  
TOLL FREE  
1-800-344-7483  
MISSOURI ONE-CALL SYSTEM, INC.

ENGINEER'S AUTHENTICATION

THE RESPONSIBILITY FOR THE PROFESSIONAL ENGINEERING LIABILITY ON THIS PROJECT IS HEREBY LIMITED TO THE SET OF PLANS AUTHENTICATED BY THE SEAL, SIGNATURE AND DATE HEREUNDER ATTACHED. RESPONSIBILITY IS DISCLAIMED FOR ALL OTHER ENGINEERING PLANS INVOLVED IN THE PROJECT AND SPECIFICALLY EXCLUDES REVISIONS AFTER THIS DATE UNLESS REAUTHENTICATED.

IMPROVEMENT PLAN

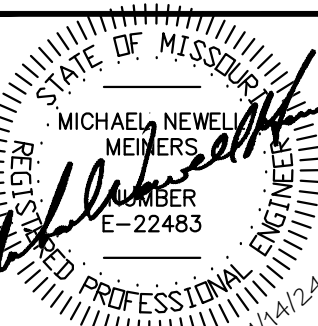
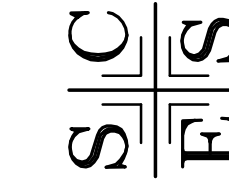
THE VILLAGES AT MONTRACHET  
WEST COMMERCIAL

GRADING PLAN

ST. CHARLES ENGINEERING & SURVEYING, INC.

801 S. FIFTH STREET, SUITE 202  
ST. CHARLES, MO 63301  
TEL: (636) 947-0607 FAX: (636) 947-2448

ST CHARLES ENGINEERING AND SURVEYING, INC.  
PROFESSIONAL ENGINEERING AND LAND SURVEYING CORPORATION  
MISSOURI STATE CERTIFICATES OF AUTHORITY - 001647 & 000379



ORDER NO.

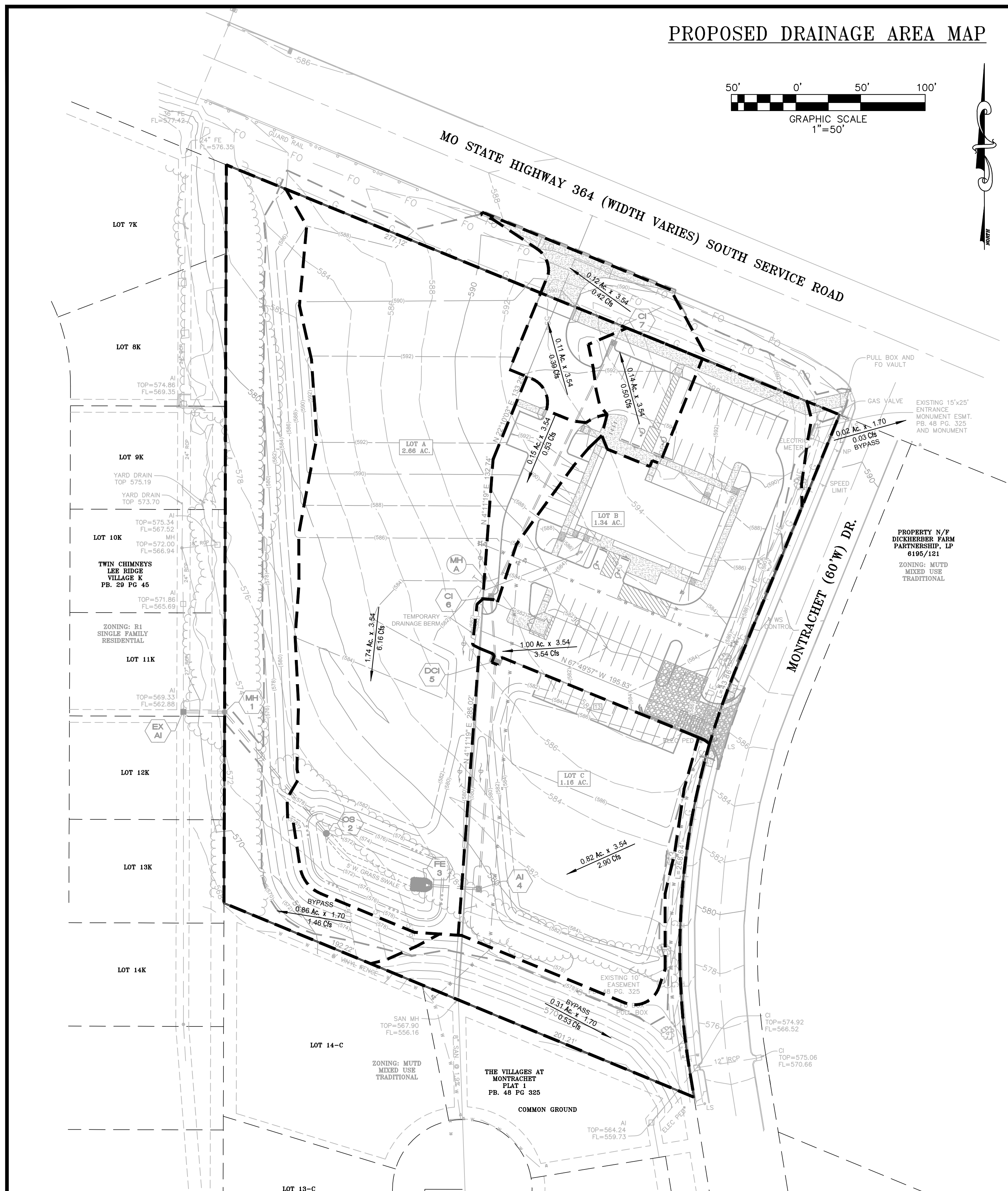
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