



Introduction

This storm water memorandum will study the re-development of a 0.44-acre site located at the Northwest corner of Maple Street and NE Douglas Street, Lee's Summit, Jackson County, Missouri. The site is located in the Cedar Creek watershed and drains southeasterly toward an existing public storm sewer system and northwesterly via overland flow. The development will NOT meet the City of Lee's Summit and APWA Section 5600 storm water detention requirements for Comprehensive Controls. The site will develop a parking lot and deck area and onsite storm water detention with extended 40-hour controls for the Water Quality storm event.

Purpose

This memorandum has been prepared to evaluate potential hydrologic and hydraulic issues related to the development of the proposed projects and recommend improvements if necessary to mitigate any anticipated negative downstream impacts. Exhibit A is the Proposed Drainage Area Map

Storm Study Methodology

Rational Method

Site Impervious Area

24.1% of Site (PRE) 45.2% of Site (POST)

Rational Coefficient

0.48 Pre / 0.65 Post

Hydrologic Soil Group

C

Additional Resources

Exhibit

C FEMA Firmette, 29095C0417G, dated January 20, 2017

None

D US Fish and Wildlife Wetland Inventory

None Identified

E Soil Map

APWA Section 5600.4.C.1 Comprehensive Control

- Ground Cover: Commercial
- Drainage Area: 0.44 acres
- Runoff Coefficient: Pre A (0.48) Pre B (0.37) Post A (0.65)
- Time of Concentration: Pre A (9.6) Pre B (9.1) Post A (7.2) minutes
- Allowable Discharge Rates
 - 2-YR: 0.22 cfs
 - 10-YR: 0.88 cfs
 - 100-YR: 1.32 cfs

Peak Discharge Summary and Allowable Detention Basin Discharge

Condition	Q (2-YR) cfs	Q (10-YR) cfs	Q (100-YR) cfs
Area A	0.89	1.32	1.99
Area B	0.22	0.33	0.49
Allowable Site Discharge	0.22	0.44	1.32
Design Detention Discharge	0.22	0.33	1.25

The proposed release rates will meet the APWA Section 5600 Allowable Release Rates



Hydraflow Report which includes both proposed hydrographs along with detention basin sizing and routing hydrographs may be found in Exhibit B.

Detention Design

Designation: Detention Basin

Type: Earthen Basin

Side Slopes: 3:1 Max.

Bottom Slope: 2% Min., Turf Lined

Basin Bottom Elevation: 1038.00

Basin Top Berm Elevation: 1043.50

Basin Volume: 2,118 cf @ 1043.50

Control Structure: Infiltration

Control Structure Effluent Pipe: 6" HDPE, FL (Out) = 1042.00'

Emergency Spillway: Earthen Broad Crested Weir, Crest Elevation=1042.50, Crest Length=50'

Top of Dam: 1043.50, Q=1.99, Depth=0.22', Velocity=2.13 fps

See Table below for a summary of detention basin data.

Detention Basin Data

	Peak Q In (cfs)	Tp In (min.)	Peak Q Out (cfs)	Tp Out (min)	Peak W.S.E.	Max. Storage Vol. (cf)
Detention Basin						
2-Year	1.11	10	0.22	0	1042.04	374
10-Year	1.64	10	0.33	0	1042.25	552
100-Year	1.48	10	0.76	12	1042.51	779

As shown in the above table, post detention peak discharge rates have been attenuated well below existing.

Conclusion

The development along with the proposed infiltration basin will meet all requirements of the City of Lee's Summit and APWA Section 5600 for storm water attenuation. There are no known Stream Buffer setback areas required due to the size of the upstream watershed. There are no known floodplain or wetlands onsite per the exhibits provided within this report from FEMA and National Wetland Mapper. Additionally, there are no required stream buffers due to the upstream watershed area being less than 40 acres.

Due to the reduction in existing peak flow rates from this site the development will not create a negative impact on the downstream system and will provide the required storm attenuation for the proposed development of the site.

Matt Schlicht, PE 2006019708



50 SE 30th Street Lee's Summit, MO 64082

P: (816) 623-9888 F: (816) 623-9849

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Storm Water Memorandum
January 24, 2025
100 NE Douglas St
Lee's Summit, MO

Exhibit A

Proposed Drainage Area Map



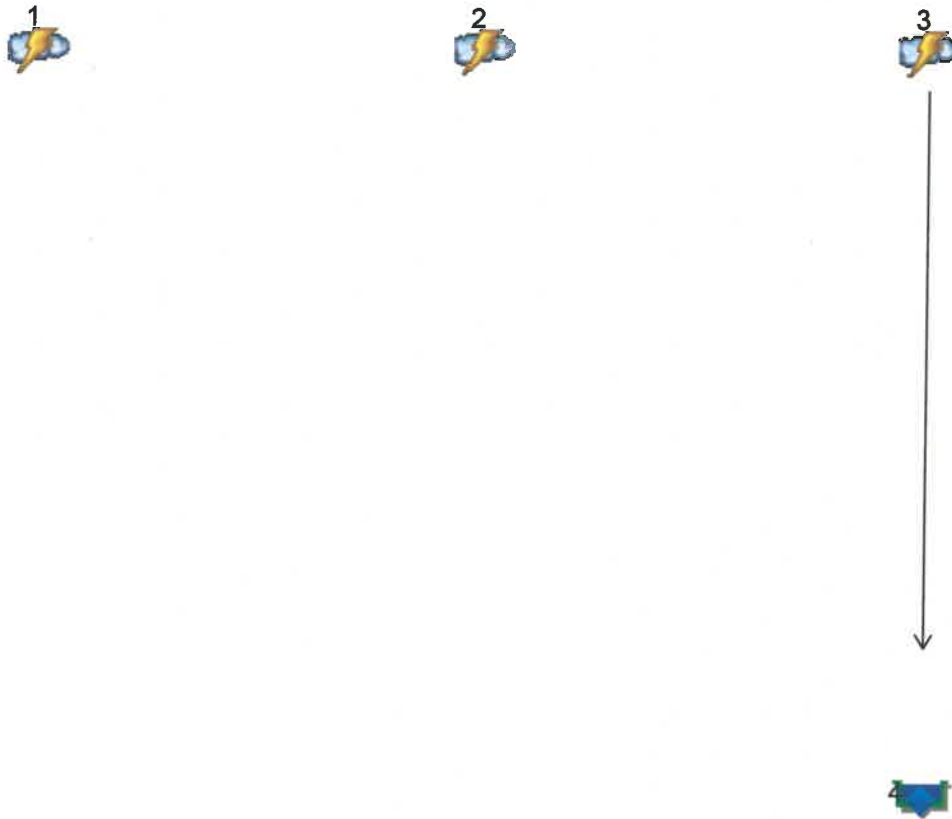
Storm Water Memorandum
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100 NE Douglas St
Lee's Summit, MO

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Watershed Model Schematic

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



Legend

<u>Hvd. Origin</u>	<u>Description</u>
1	Rational Pre A
2	Rational Pre B
3	Rational Post A
4	Reservoir Infiltration

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	Rational	-----	-----	0.595	-----	-----	0.877	-----	-----	1.327	Pre A
2	Rational	-----	-----	0.221	-----	-----	0.326	-----	-----	0.493	Pre B
3	Rational	-----	-----	0.891	-----	-----	1.315	-----	-----	1.989	Post A
4	Reservoir	3	-----	0.000	-----	-----	0.000	-----	-----	0.761	Infiltration

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	Rational	0.595	1	10	357	-----	-----	-----	Pre A
2	Rational	0.221	1	9	119	-----	-----	-----	Pre B
3	Rational	0.891	1	7	374	-----	-----	-----	Post A
4	Reservoir	0.000	1	n/a	0	3	1042.04	374	Infiltration

Hydrograph Report

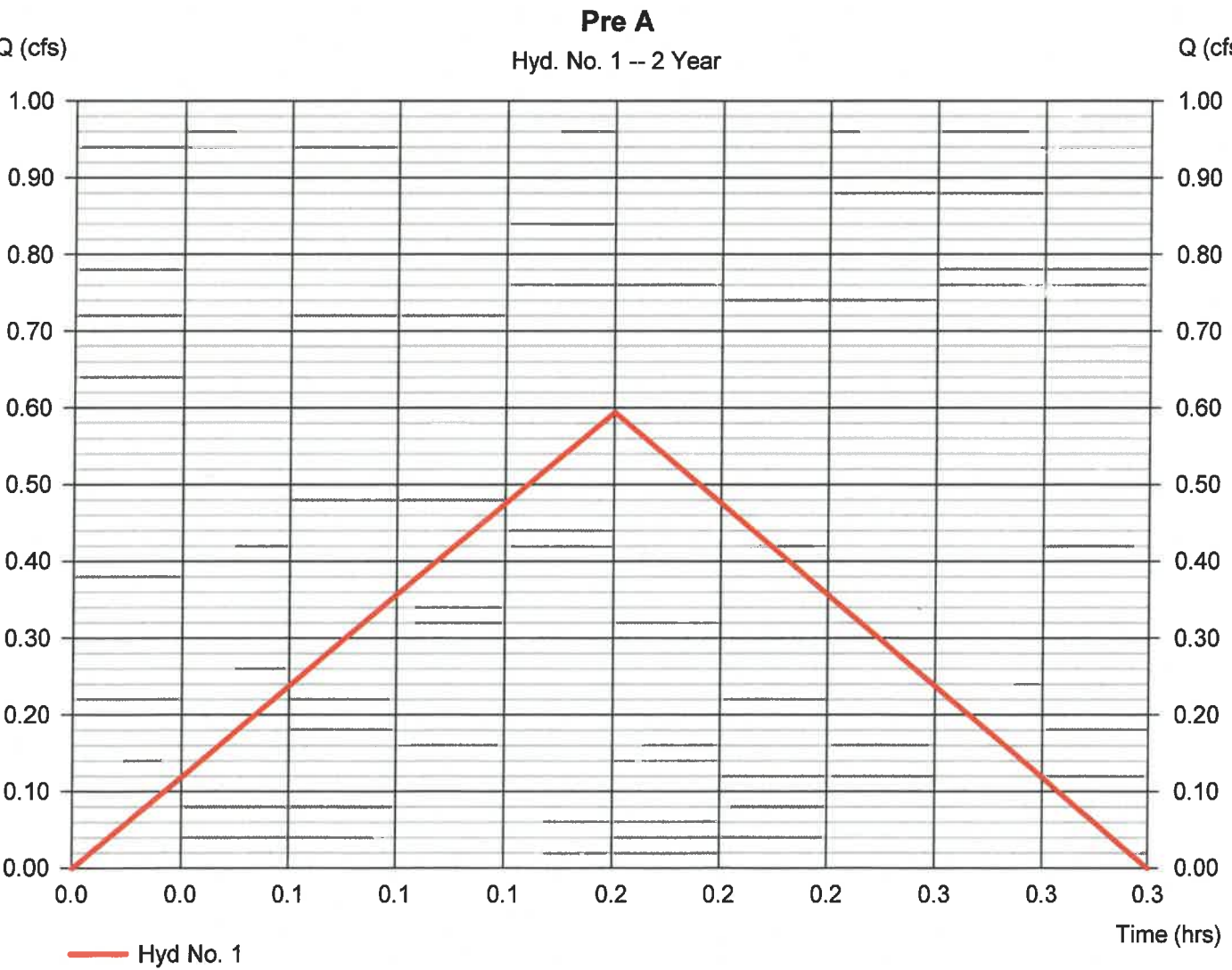
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Thursday, 01 / 23 / 2025

Hyd. No. 1

Pre A

Hydrograph type	= Rational	Peak discharge	= 0.595 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 357 cuft
Drainage area	= 0.300 ac	Runoff coeff.	= 0.48
Intensity	= 4.130 in/hr	Tc by User	= 10.00 min
IDF Curve	= KCMO.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

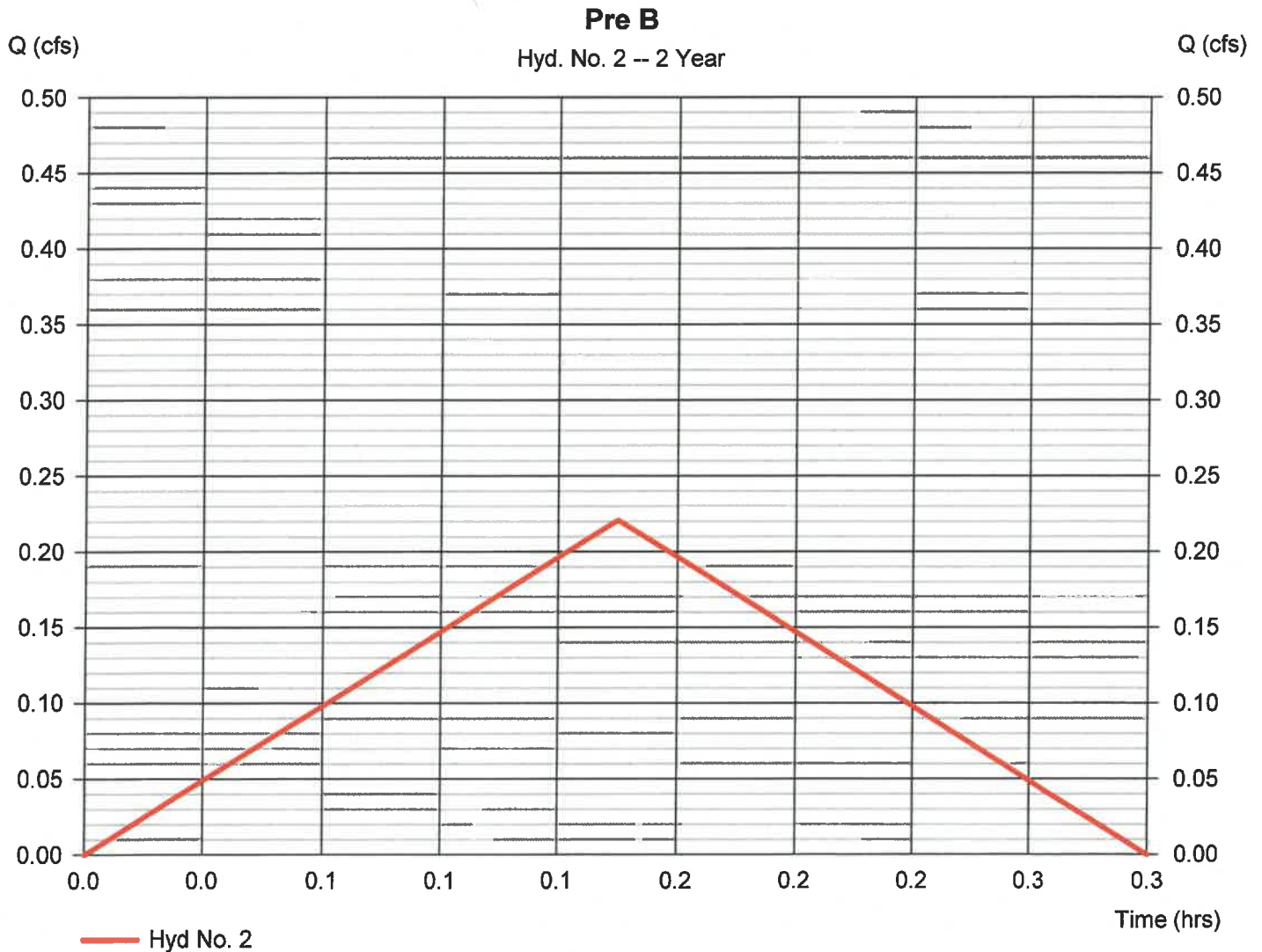
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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Hyd. No. 2

Pre B

Hydrograph type	= Rational	Peak discharge	= 0.221 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.15 hrs
Time interval	= 1 min	Hyd. volume	= 119 cuft
Drainage area	= 0.140 ac	Runoff coeff.	= 0.37
Intensity	= 4.266 in/hr	Tc by User	= 9.00 min
IDF Curve	= KCMO.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

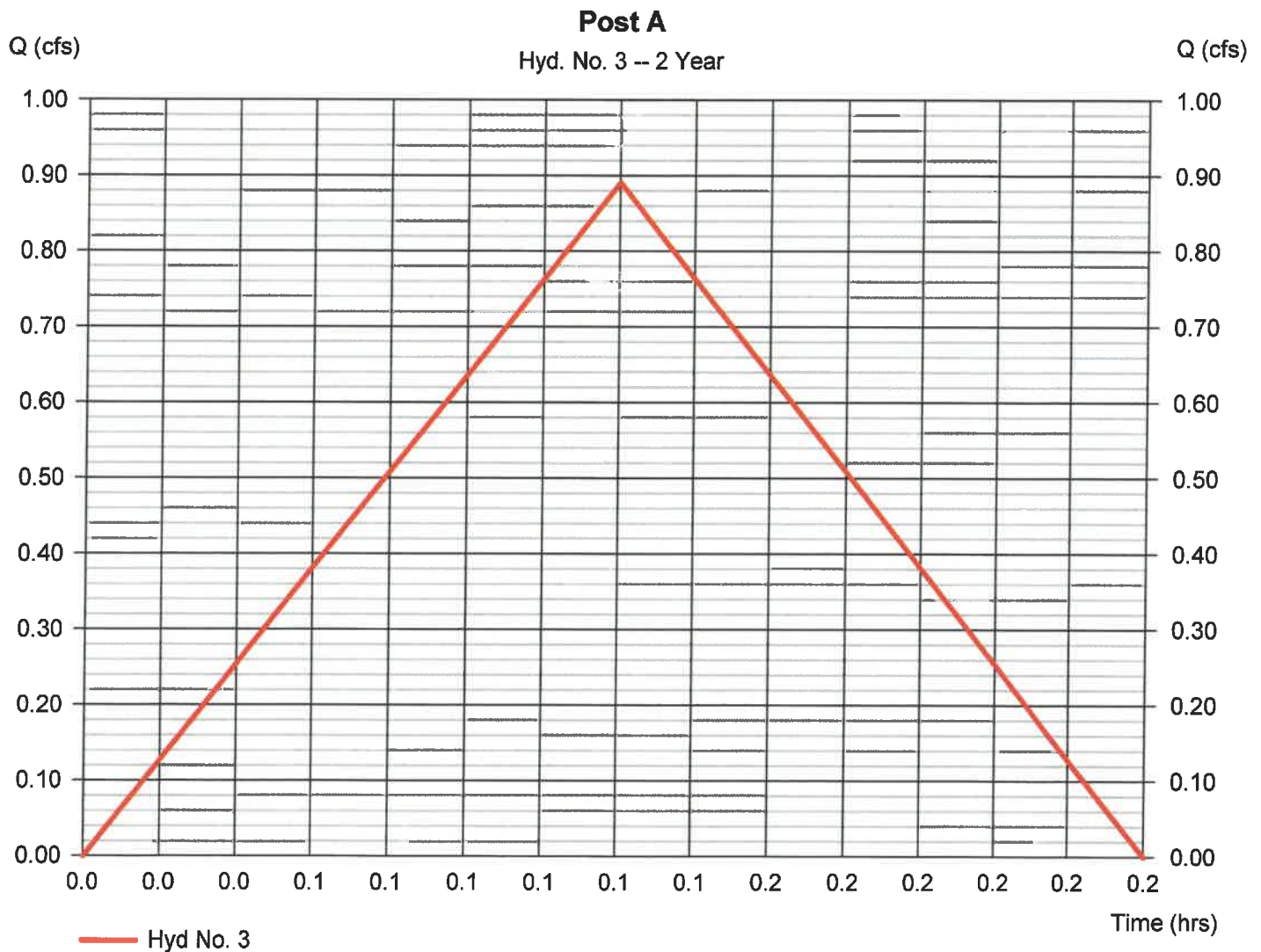
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Hyd. No. 3

Post A

Hydrograph type	= Rational	Peak discharge	= 0.891 cfs
Storm frequency	= 2 yrs	Time to peak	= 0.12 hrs
Time interval	= 1 min	Hyd. volume	= 374 cuft
Drainage area	= 0.300 ac	Runoff coeff.	= 0.65
Intensity	= 4.569 in/hr	Tc by User	= 7.00 min
IDF Curve	= KCMO.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

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

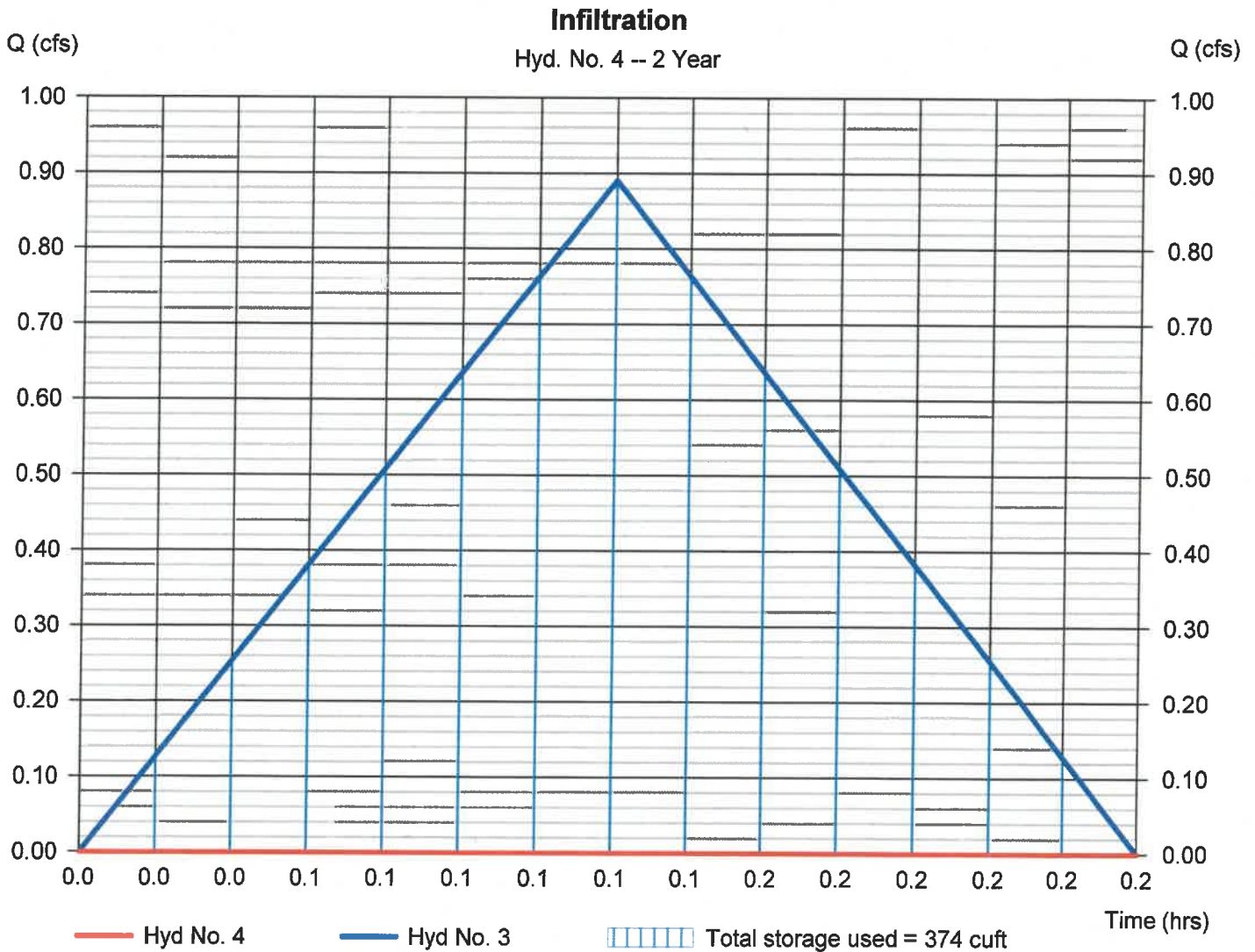
Thursday, 01 / 23 / 2025

Hyd. No. 4

Infiltration

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Post A	Max. Elevation	= 1042.04 ft
Reservoir name	= Infiltration	Max. Storage	= 374 cuft

Storage Indication method used.



Pond Report

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

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Pond No. 1 - Infiltration

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1038.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1038.00	73	0	0
1.00	1039.00	73	73	73
2.00	1040.00	73	73	146
3.00	1041.00	73	73	218
4.00	1042.00	182	123	342
5.00	1043.00	1,795	849	1,191
5.50	1043.50	1,914	927	2,118

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 8.00	0.00	0.00	0.00
Span (in)	= 8.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1042.50	0.00	0.00	0.00
Length (ft)	= 25.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	= 50.00	0.00	0.00	0.00
Crest El. (ft)	= 1042.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Cipiti	---	---	---
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	1038.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.10	7	1038.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.20	15	1038.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.30	22	1038.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.40	29	1038.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.50	36	1038.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.60	44	1038.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.70	51	1038.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.80	58	1038.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.90	66	1038.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.00	73	1039.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.10	80	1039.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.20	87	1039.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.30	95	1039.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.40	102	1039.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.50	109	1039.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.60	116	1039.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.70	124	1039.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.80	131	1039.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.90	138	1039.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.00	146	1040.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.10	153	1040.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.20	160	1040.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.30	167	1040.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.40	175	1040.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.50	182	1040.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.60	189	1040.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.70	197	1040.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.80	204	1040.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.90	211	1040.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.00	218	1041.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.10	231	1041.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.20	243	1041.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.30	255	1041.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000

Continues on next page...

Infiltration

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.40	268	1041.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.50	280	1041.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.60	292	1041.60	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.70	305	1041.70	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.80	317	1041.80	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.90	329	1041.90	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.00	342	1042.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.10	427	1042.10	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.20	512	1042.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.30	596	1042.30	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.40	681	1042.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.50	766	1042.50	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.60	851	1042.60	0.04 ic	---	---	---	5.25	---	---	---	---	---	5.289
4.70	936	1042.70	0.13 ic	---	---	---	14.87	---	---	---	---	---	15.01
4.80	1,021	1042.80	0.28 ic	---	---	---	27.33	---	---	---	---	---	27.62
4.90	1,106	1042.90	0.47 ic	---	---	---	42.09	---	---	---	---	---	42.56
5.00	1,191	1043.00	0.68 ic	---	---	---	58.87	---	---	---	---	---	59.54
5.05	1,284	1043.05	0.78 ic	---	---	---	67.92	---	---	---	---	---	68.70
5.10	1,377	1043.10	0.83 oc	---	---	---	77.40	---	---	---	---	---	78.23
5.15	1,469	1043.15	0.85 oc	---	---	---	87.28	---	---	---	---	---	88.14
5.20	1,562	1043.20	0.89 oc	---	---	---	97.55	---	---	---	---	---	98.44
5.25	1,655	1043.25	0.96 oc	---	---	---	108.20	---	---	---	---	---	109.16
5.30	1,747	1043.30	1.03 oc	---	---	---	119.20	---	---	---	---	---	120.23
5.35	1,840	1043.35	1.10 oc	---	---	---	130.56	---	---	---	---	---	131.66
5.40	1,933	1043.40	1.16 oc	---	---	---	142.25	---	---	---	---	---	143.41
5.45	2,025	1043.45	1.22 oc	---	---	---	154.28	---	---	---	---	---	155.49
5.50	2,118	1043.50	1.27 oc	---	---	---	166.50	---	---	---	---	---	167.77

...End

Hydrograph Report

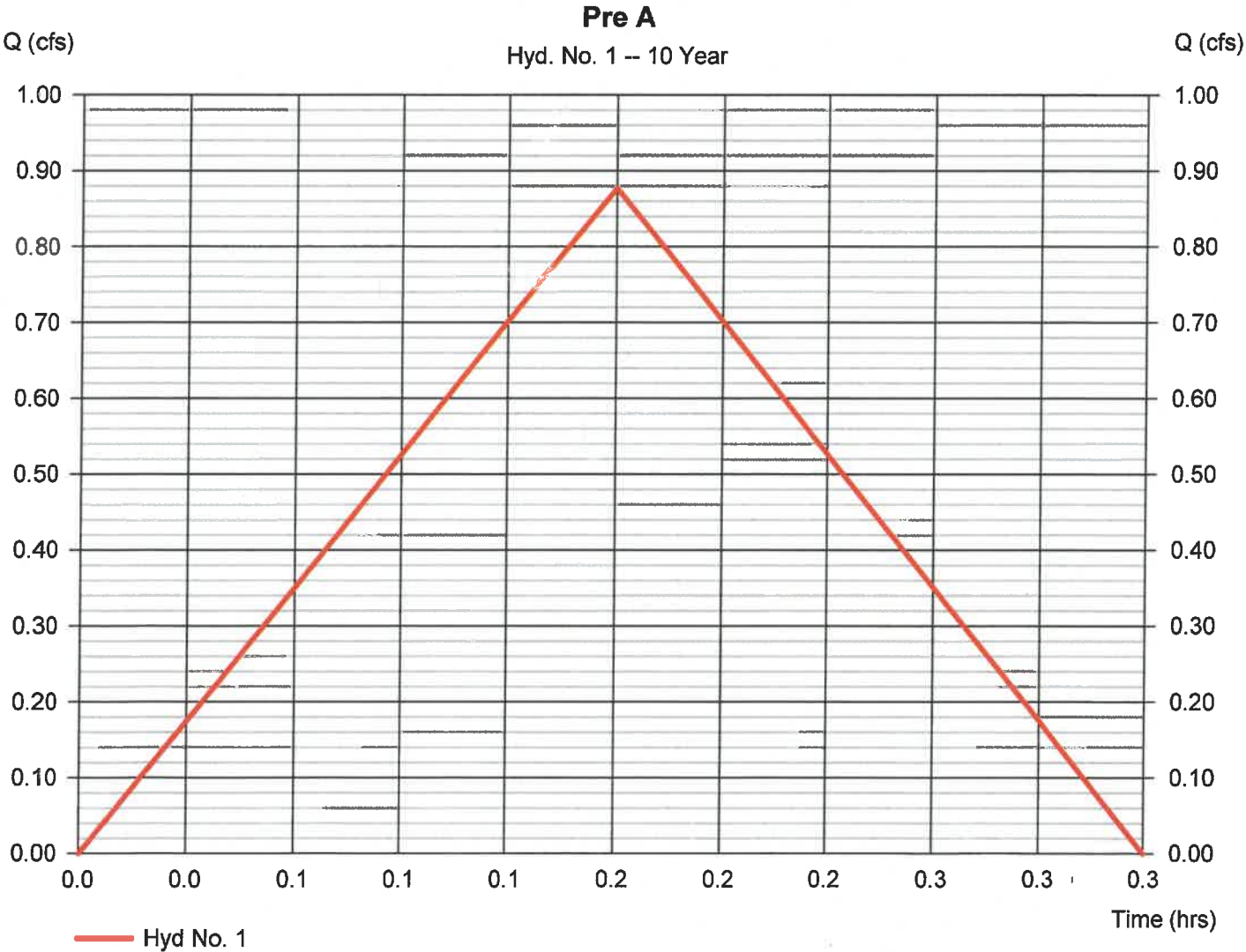
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Thursday, 01 / 23 / 2025

Hyd. No. 1

Pre A

Hydrograph type	= Rational	Peak discharge	= 0.877 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 526 cuft
Drainage area	= 0.300 ac	Runoff coeff.	= 0.48
Intensity	= 6.092 in/hr	Tc by User	= 10.00 min
IDF Curve	= KCMO.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

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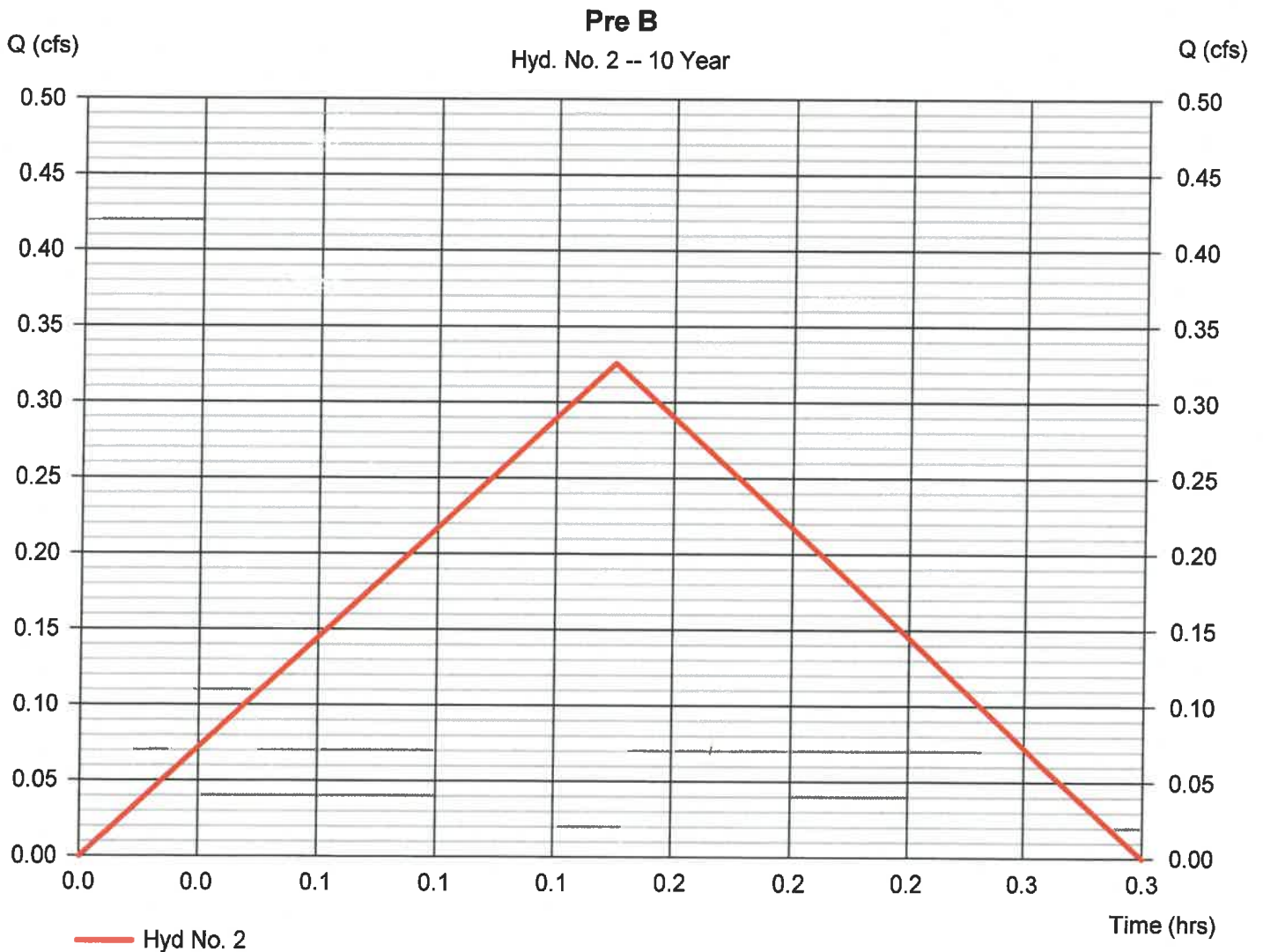
Thursday, 01 / 23 / 2025

Hyd. No. 2

Pre B

Hydrograph type = Rational
Storm frequency = 10 yrs
Time interval = 1 min
Drainage area = 0.140 ac
Intensity = 6.294 in/hr
IDF Curve = KCMO.IDF

Peak discharge = 0.326 cfs
Time to peak = 0.15 hrs
Hyd. volume = 176 cuft
Runoff coeff. = 0.37
Tc by User = 9.00 min
Asc/Rec limb fact = 1/1



Hydrograph Report

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

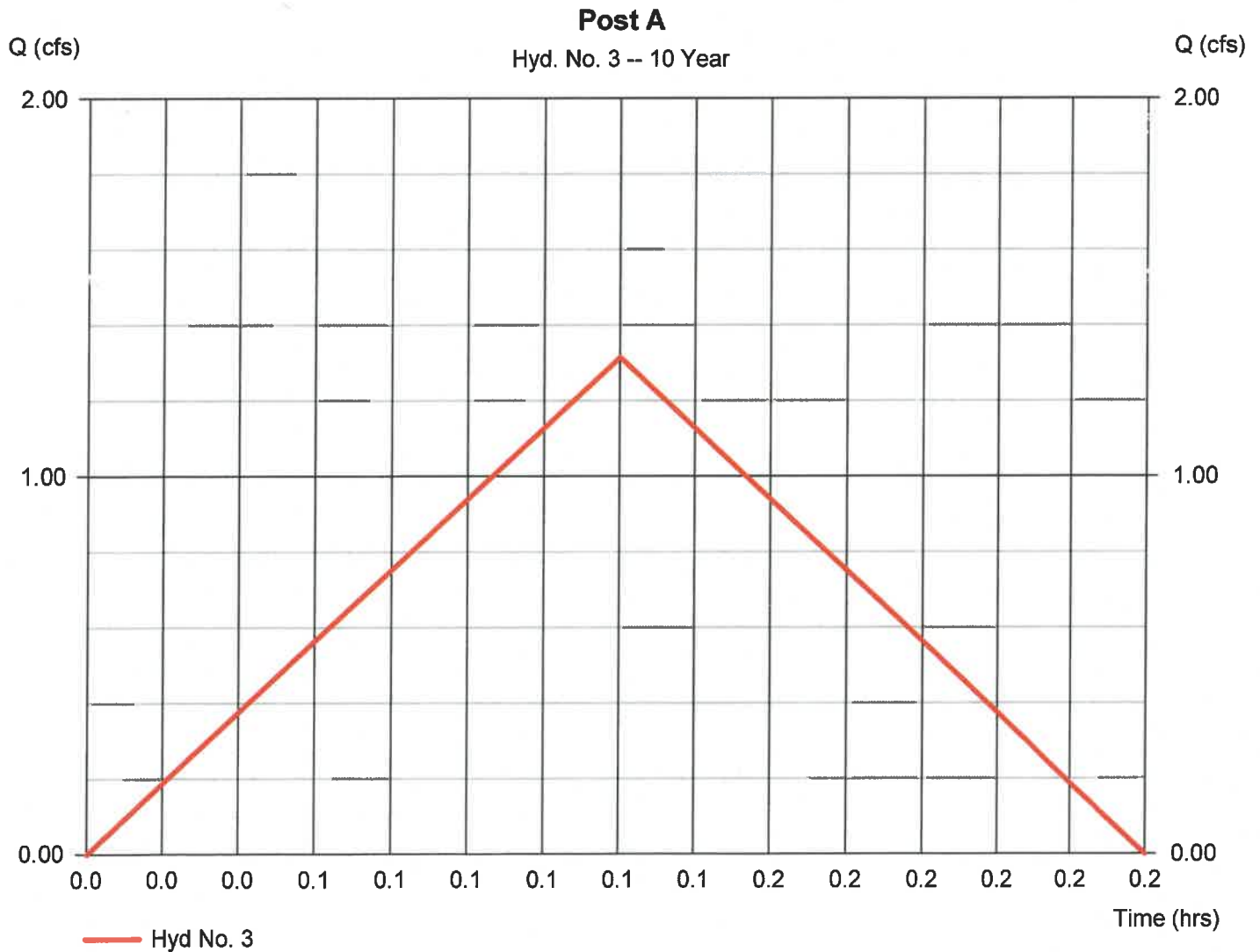
Thursday, 01 / 23 / 2025

Hyd. No. 3

Post A

Hydrograph type = Rational
 Storm frequency = 10 yrs
 Time interval = 1 min
 Drainage area = 0.300 ac
 Intensity = 6.745 in/hr
 IDF Curve = KCMO.IDF

Peak discharge = 1.315 cfs
 Time to peak = 0.12 hrs
 Hyd. volume = 552 cuft
 Runoff coeff. = 0.65
 Tc by User = 7.00 min
 Asc/Rec limb fact = 1/1



Hydrograph Report

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

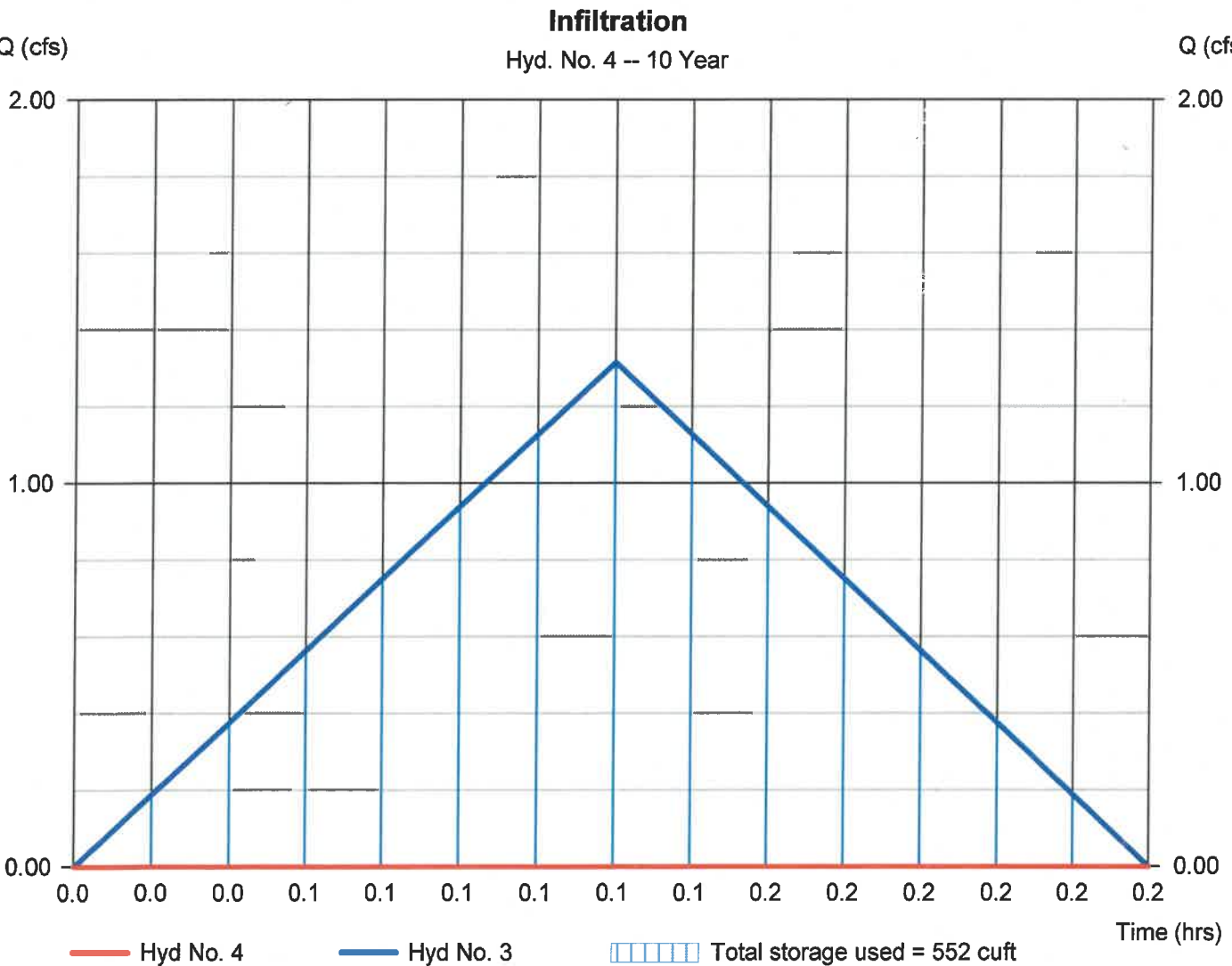
Thursday, 01 / 23 / 2025

Hyd. No. 4

Infiltration

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= n/a
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Post A	Max. Elevation	= 1042.25 ft
Reservoir name	= Infiltration	Max. Storage	= 552 cuft

Storage Indication method used.



Hydrograph Report

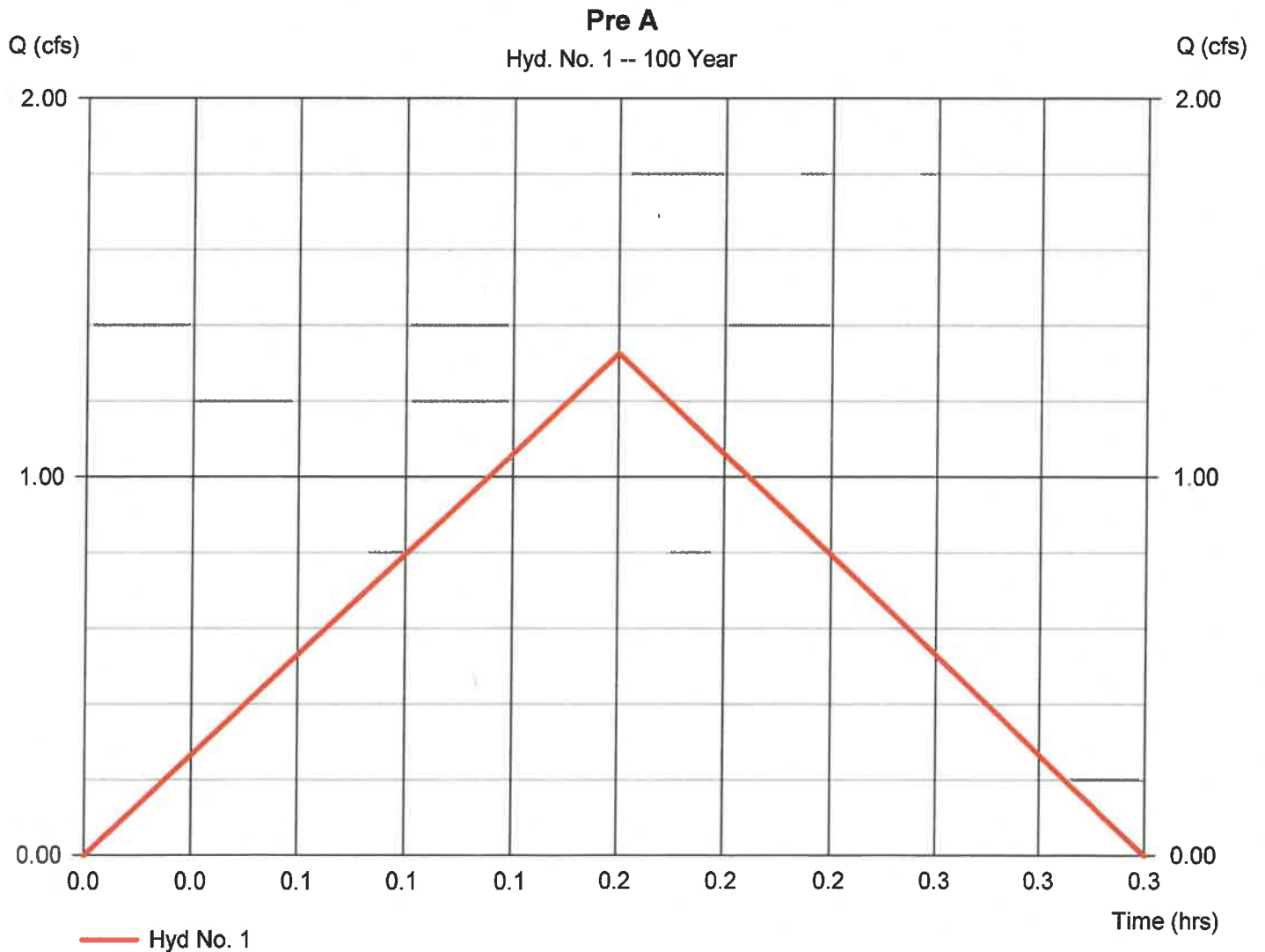
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 23 / 2025

Hyd. No. 1

Pre A

Hydrograph type	= Rational	Peak discharge	= 1.327 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.17 hrs
Time interval	= 1 min	Hyd. volume	= 796 cuft
Drainage area	= 0.300 ac	Runoff coeff.	= 0.48
Intensity	= 9.213 in/hr	Tc by User	= 10.00 min
IDF Curve	= KCMO.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

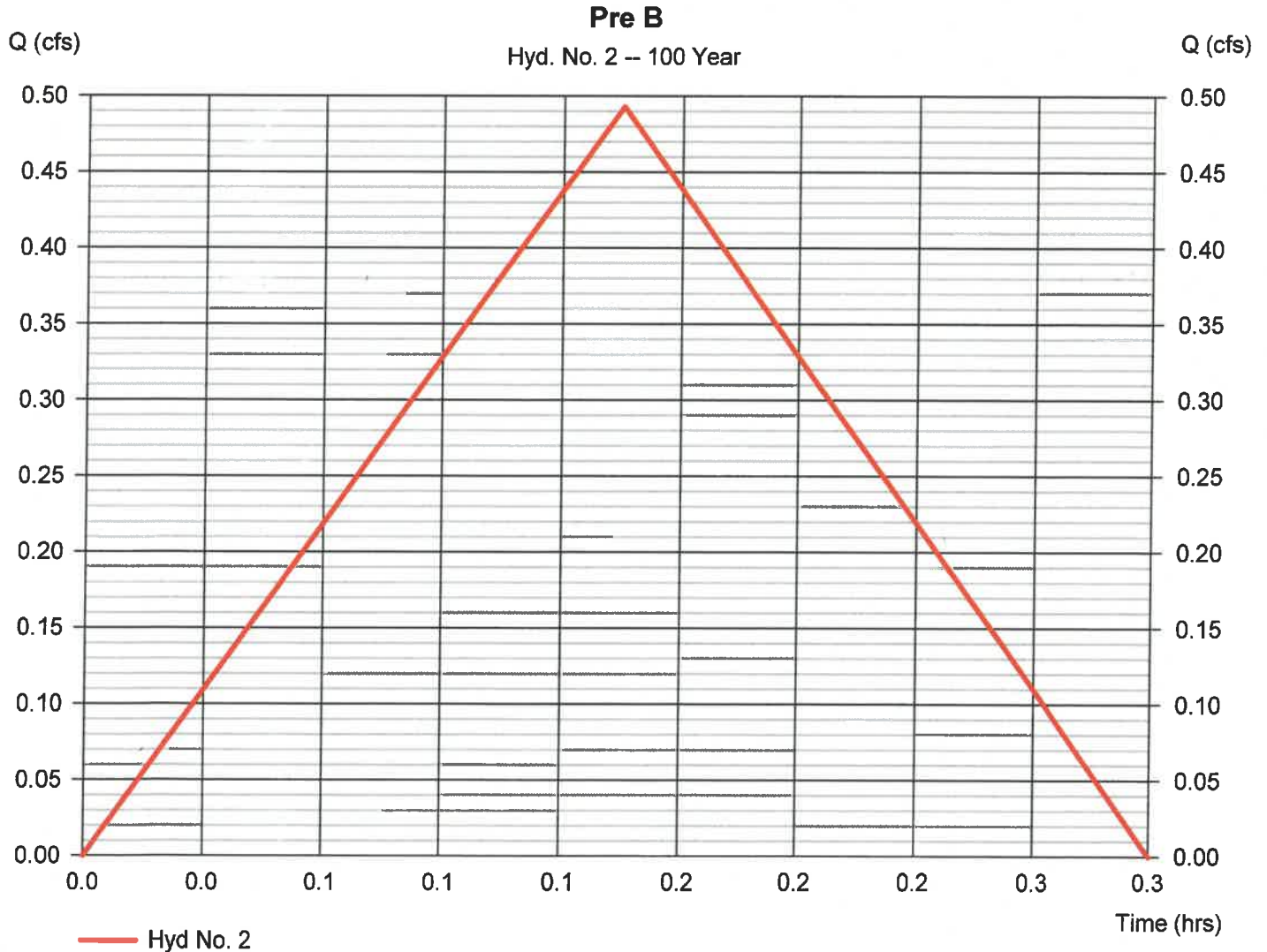
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Thursday, 01 / 23 / 2025

Hyd. No. 2

Pre B

Hydrograph type	= Rational	Peak discharge	= 0.493 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.15 hrs
Time interval	= 1 min	Hyd. volume	= 266 cuft
Drainage area	= 0.140 ac	Runoff coeff.	= 0.37
Intensity	= 9.519 in/hr	Tc by User	= 9.00 min
IDF Curve	= KCMO.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

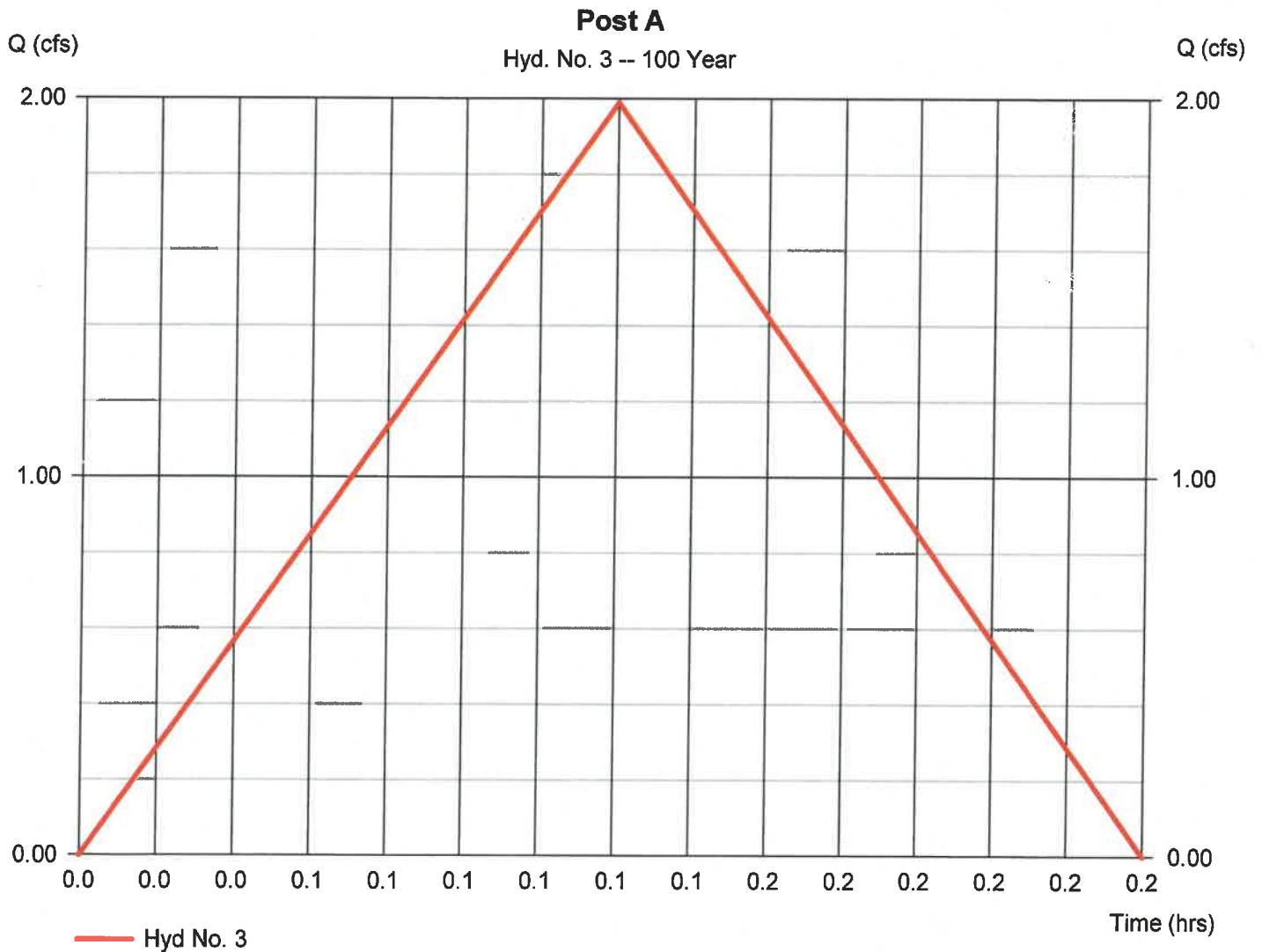
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Thursday, 01 / 23 / 2025

Hyd. No. 3

Post A

Hydrograph type	= Rational	Peak discharge	= 1.989 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.12 hrs
Time interval	= 1 min	Hyd. volume	= 836 cuft
Drainage area	= 0.300 ac	Runoff coeff.	= 0.65
Intensity	= 10.202 in/hr	Tc by User	= 7.00 min
IDF Curve	= KCMO.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

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

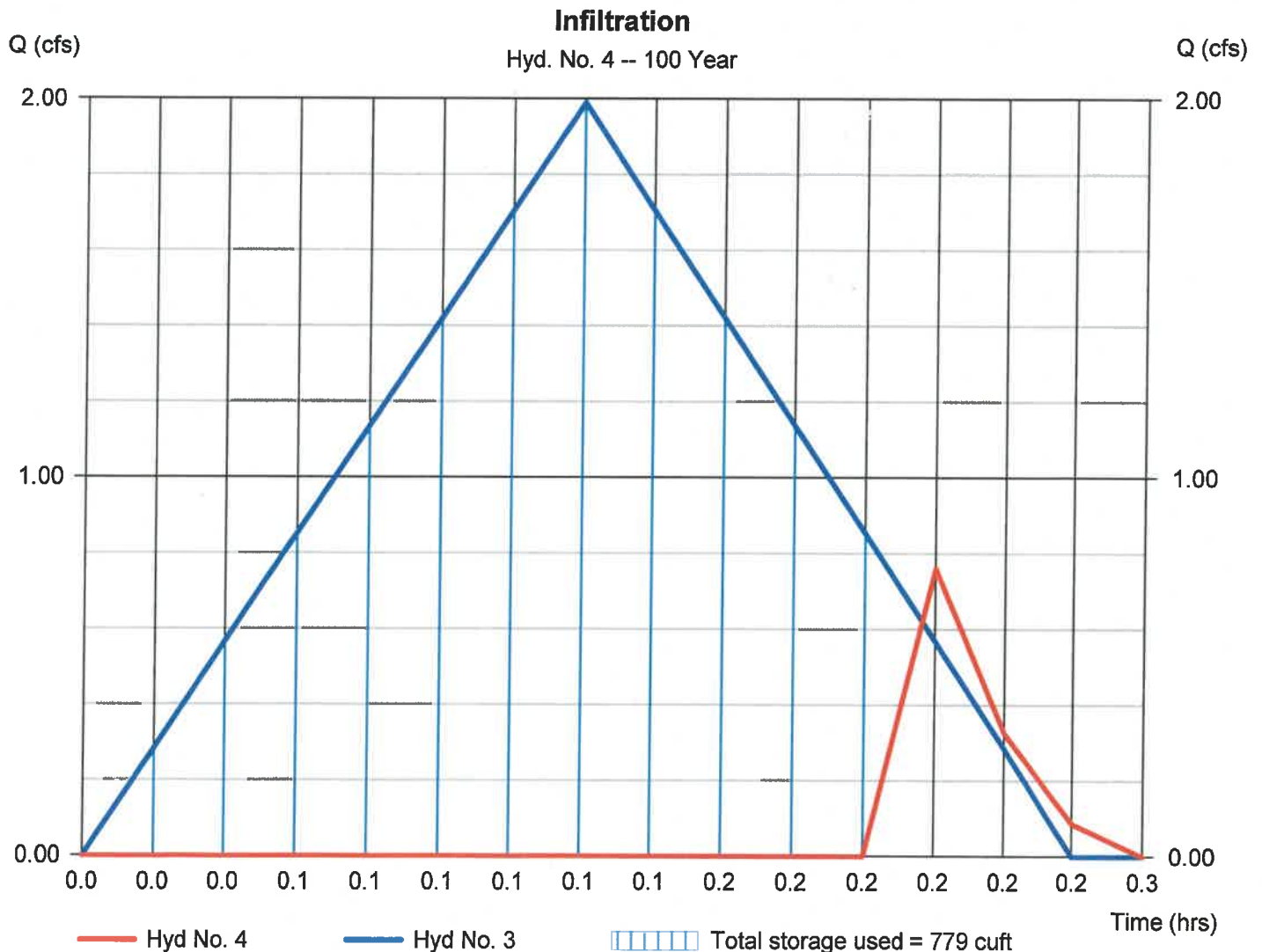
Thursday, 01 / 23 / 2025

Hyd. No. 4

Infiltration

Hydrograph type	= Reservoir	Peak discharge	= 0.761 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.20 hrs
Time interval	= 1 min	Hyd. volume	= 70 cuft
Inflow hyd. No.	= 3 - Post A	Max. Elevation	= 1042.51 ft
Reservoir name	= Infiltration	Max. Storage	= 779 cuft

Storage Indication method used.



Hydraflow Rainfall Report

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

Thursday, 01 / 23 / 2025

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	64.1474	17.7000	0.8922	-----
2	95.7859	19.2000	0.9317	-----
3	0.0000	0.0000	0.0000	-----
5	118.7799	19.1000	0.9266	-----
10	125.1300	18.2000	0.9051	-----
25	158.9867	18.7000	0.9180	-----
50	171.2459	18.3000	0.9078	-----
100	187.3624	18.1000	0.9031	-----

File name: KCMO.IDF

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

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.96	3.31	2.86	2.52	2.25	2.04	1.87	1.72	1.60	1.49	1.40	1.32
2	4.92	4.13	3.56	3.14	2.81	2.54	2.32	2.14	1.98	1.85	1.73	1.63
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.23	5.23	4.51	3.98	3.56	3.22	2.94	2.71	2.52	2.35	2.20	2.07
10	7.27	6.09	5.26	4.63	4.14	3.75	3.43	3.16	2.93	2.74	2.57	2.42
25	8.70	7.30	6.30	5.54	4.96	4.49	4.10	3.78	3.51	3.27	3.07	2.89
50	9.83	8.24	7.11	6.26	5.60	5.07	4.64	4.27	3.97	3.70	3.47	3.27
100	11.00	9.21	7.95	7.00	6.26	5.67	5.19	4.78	4.44	4.14	3.89	3.66

Tc = time in minutes. Values may exceed 60.

Precip. file name: Z:\acad\KCMO.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	1.37	3.71	0.00	3.30	5.68	6.00	6.80	9.26
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	2.49	3.10	0.00	4.01	4.64	5.52	6.21	6.90
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	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10



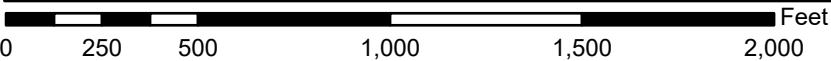
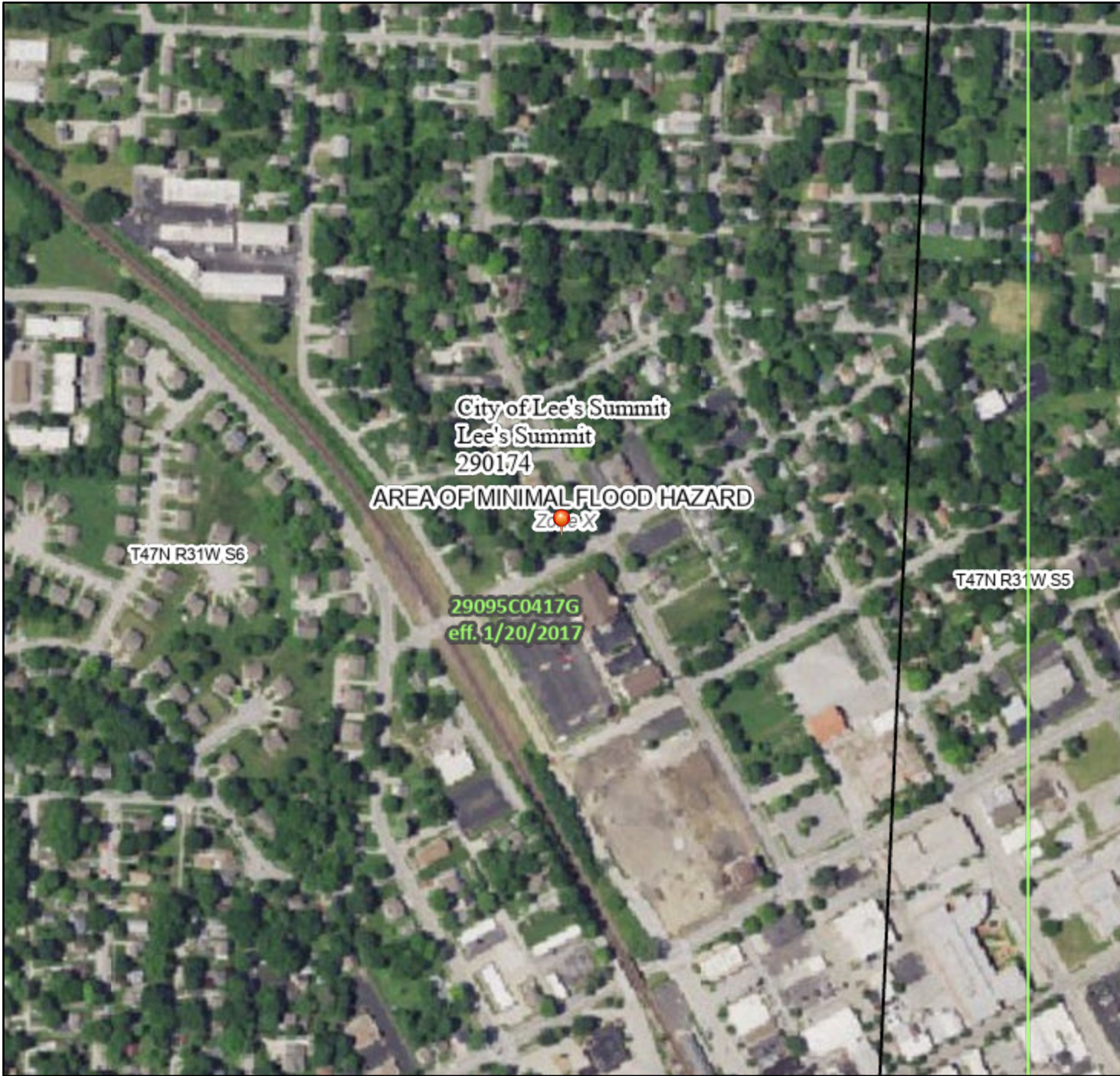
Storm Water Memorandum
January 24, 2025
100 NE Douglas St
Lee's Summit, MO

Exhibit C FEMA FIRMeTte

National Flood Hazard Layer FIRMette



94°23'4"W 38°55'13"N



1:6,000

94°22'27"W 38°54'45"N

Basemap Imagery Source: USGS National Map 2023

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, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas 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 D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
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 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
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 **1/23/2025 at 9:13 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.



Storm Water Memorandum
January 24, 2025
100 NE Douglas St
Lee's Summit, MO

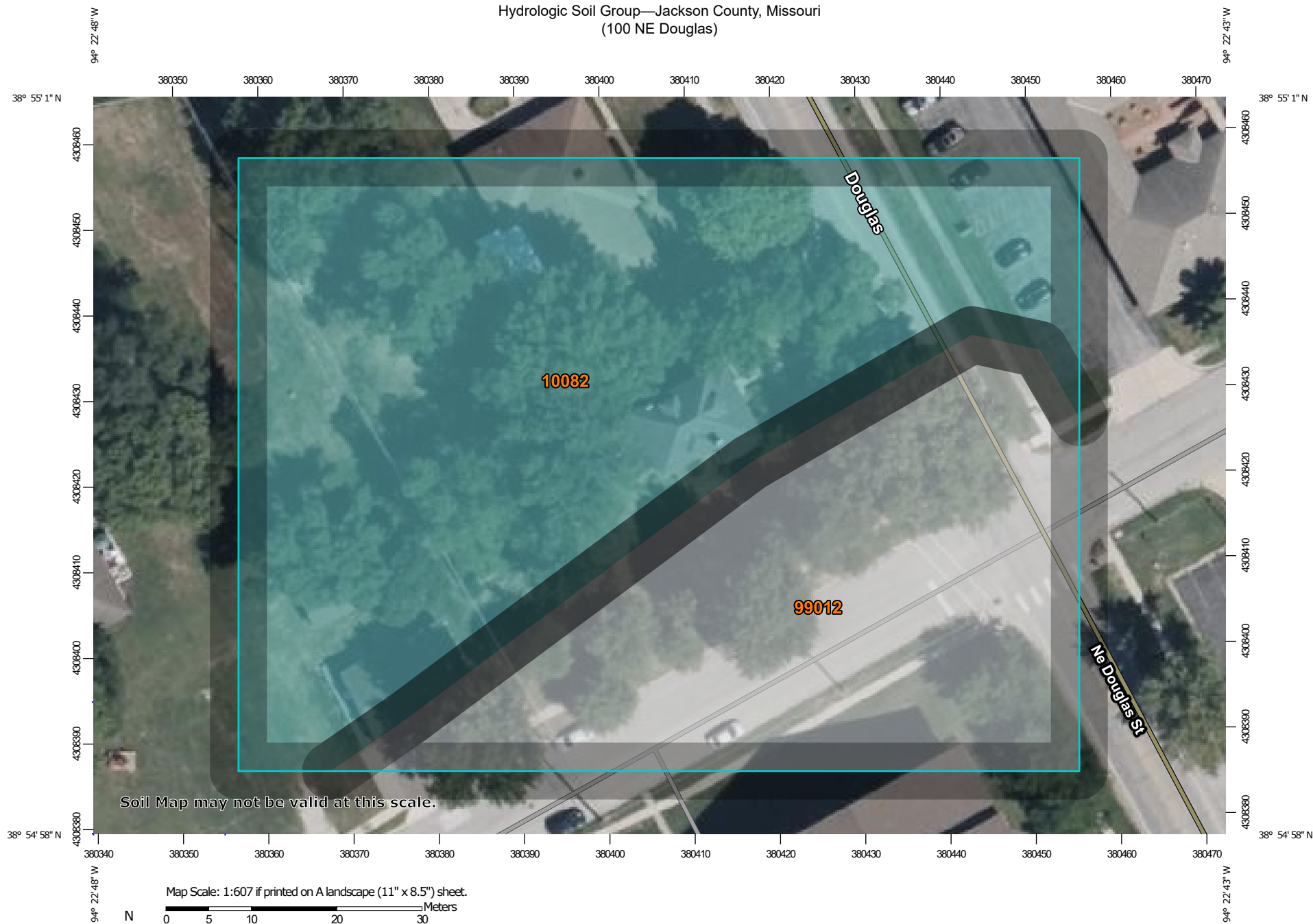
Exhibit D Wetland Inventory Map



Storm Water Memorandum
January 24, 2025
100 NE Douglas St
Lee's Summit, MO

Exhibit E Soil Map

Hydrologic Soil Group—Jackson County, Missouri (100 NE Douglas)



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 27, Aug 27, 2024

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

Date(s) aerial images were photographed: Aug 30, 2022—Sep 8, 2022

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	1.1	63.0%
99012	Urban land, upland, 5 to 9 percent slopes		0.6	37.0%
Totals for Area of Interest			1.8	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher