

# **Attachment 2**

## **Bull Creek**

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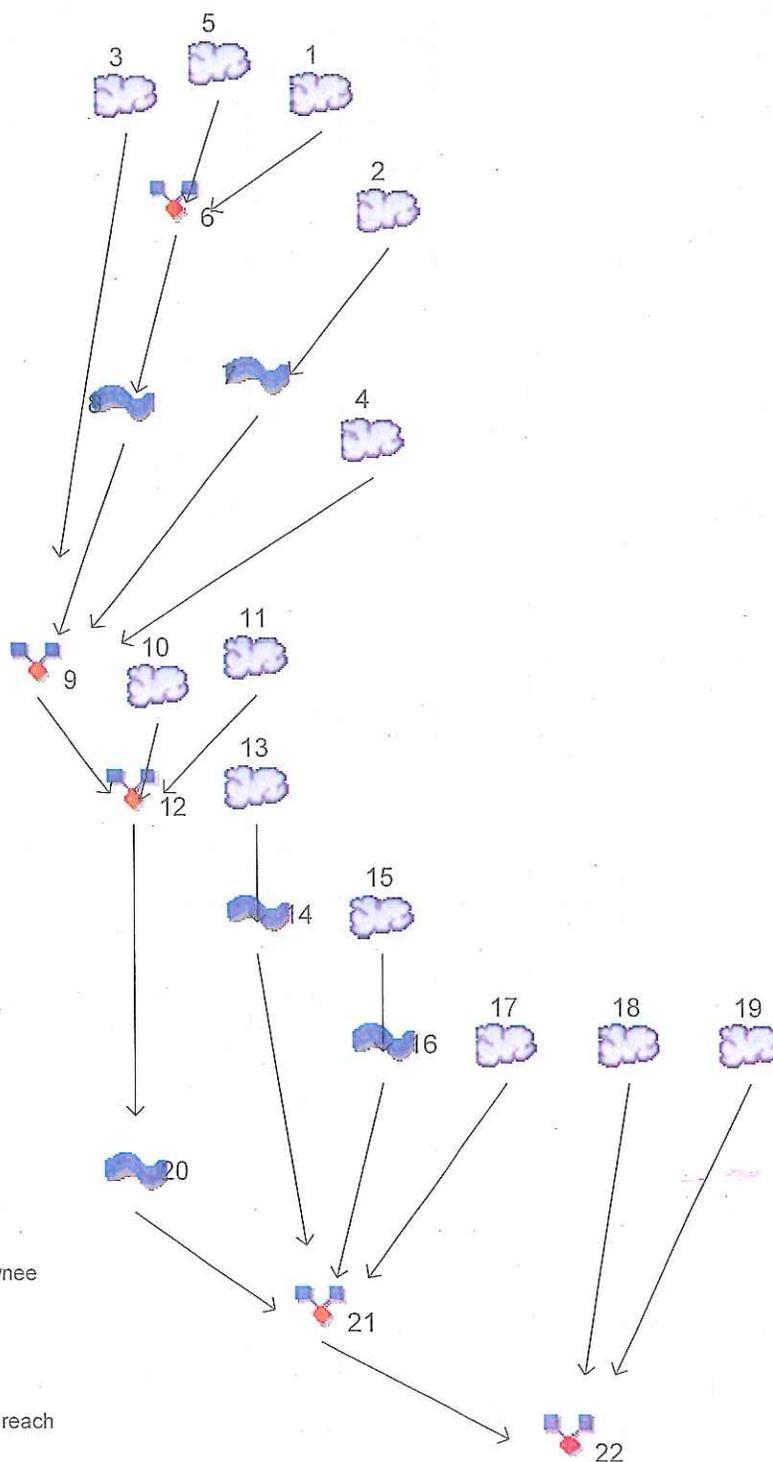
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# Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



## Legend

Hvd. Origin	Description
1	SCS Runoff BU-A1
2	SCS Runoff BU-A2
3	SCS Runoff BU-A3
4	SCS Runoff BU-A4
5	SCS Runoff BU-A5
6	Combine <no description>
7	Reach BU-A2
8	Reach BU-A1 A5 Reach
9	Combine Combined BUB Shawnee
10	SCS Runoff BU-A7/A5.1
11	SCS Runoff BU-A8
12	Combine Mapleton Shawnee
13	SCS Runoff BU-A6
14	Reach Shawneed /Loveland reach
15	SCS Runoff BU-A9
16	Reach BU-A9 Shawnee/ Loveland Reach
17	SCS Runoff BU-A10
18	SCS Runoff BU-A12 (Moyer Road)
19	SCS Runoff BU-A13 (Timberlink)
20	Reach BUB
21	Combine Shawnee Loveland (north)
22	Combine Total flow Shawnee/Loveland

# Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	-----	-----	-----	-----	-----	62.71	91.53	-----	154.80	BU-A1
2	SCS Runoff	-----	-----	-----	-----	-----	11.36	17.64	-----	31.59	BU-A2
3	SCS Runoff	-----	-----	-----	-----	-----	41.74	62.21	-----	106.81	BU-A3
4	SCS Runoff	-----	-----	-----	-----	-----	26.41	38.85	-----	65.69	BU-A4
5	SCS Runoff	-----	-----	-----	-----	-----	46.37	68.71	-----	118.13	BU-A5
6	Combine	1, 5	-----	-----	-----	-----	106.30	155.60	-----	263.35	<no description>
7	Reach	2	-----	-----	-----	-----	7.432	12.20	-----	23.40	BU-A2
8	Reach	6	-----	-----	-----	-----	105.85	155.02	-----	262.67	BU-A1 A5 Reach
9	Combine	3, 4, 7, 8	-----	-----	-----	-----	135.87	199.88	-----	340.42	Combined BUB Shawnee
10	SCS Runoff	-----	-----	-----	-----	-----	36.42	55.01	-----	95.86	BU-A7/A5.1
11	SCS Runoff	-----	-----	-----	-----	-----	45.37	65.60	-----	108.70	BU-A8
12	Combine	9, 10, 11	-----	-----	-----	-----	168.18	251.87	-----	439.51	Mapleton Shawnee
13	SCS Runoff	-----	-----	-----	-----	-----	29.29	44.25	-----	77.08	BU-A6
14	Reach	13	-----	-----	-----	-----	13.88	22.65	-----	42.84	Shawneed /Loveland reach
15	SCS Runoff	-----	-----	-----	-----	-----	28.55	41.39	-----	68.91	BU-A9
16	Reach	15	-----	-----	-----	-----	11.65	18.48	-----	34.71	BU-A9 Shawnee/ Loveland Reach
17	SCS Runoff	-----	-----	-----	-----	-----	137.17	200.28	-----	339.76	BU-A10
18	SCS Runoff	-----	-----	-----	-----	-----	4.432	6.541	-----	11.21	BU-A12 (Moyer Road)
19	SCS Runoff	-----	-----	-----	-----	-----	22.65	31.84	-----	51.23	BU-A13 (Timberlink)
20	Reach	12	-----	-----	-----	-----	138.21	209.42	-----	372.32	BUB
21	Combine	14, 16, 17, 20	-----	-----	-----	-----	265.03	381.20	-----	629.42	Shawnee Loveland (north)
22	Combine	18, 19, 21	-----	-----	-----	-----	274.10	393.73	-----	662.77	Total flow Shawnee/Loveland

# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	62.71	2	974	1,846,668	----	----	----	BU-A1
2	SCS Runoff	11.36	2	758	91,669	----	----	----	BU-A2
3	SCS Runoff	41.74	2	810	592,603	----	----	----	BU-A3
4	SCS Runoff	26.41	2	802	351,195	----	----	----	BU-A4
5	SCS Runoff	46.37	2	902	1,081,564	----	----	----	BU-A5
6	Combine	106.30	2	954	2,928,230	1, 5	----	----	<no description>
7	Reach	7.432	2	798	91,642	2	----	----	BU-A2
8	Reach	105.85	2	966	2,928,228	6	----	----	BU-A1 A5 Reach
9	Combine	135.87	2	894	3,963,667	3, 4, 7, 8	----	----	Combined BUB Shawnee
10	SCS Runoff	36.42	2	806	503,667	----	----	----	BU-A7/A5.1
11	SCS Runoff	45.37	2	752	319,371	----	----	----	BU-A8
12	Combine	168.18	2	848	4,786,707	9, 10, 11	----	----	Mapleton Shawnee
13	SCS Runoff	29.29	2	802	391,637	----	----	----	BU-A6
14	Reach	13.88	2	912	391,532	13	----	----	Shawneed /Loveland reach
15	SCS Runoff	28.55	2	782	304,420	----	----	----	BU-A9
16	Reach	11.65	2	872	304,316	15	----	----	BU-A9 Shawnee/ Loveland Reach
17	SCS Runoff	137.17	2	1190	6,334,771	----	----	----	BU-A10
18	SCS Runoff	4.432	2	964	127,470	----	----	----	BU-A12 (Moyer Road)
19	SCS Runoff	22.65	2	868	447,945	----	----	----	BU-A13 (Timberlink)
20	Reach	138.21	2	972	4,786,647	12	----	----	BUB
21	Combine	265.03	2	1132	11,817,260	14, 16, 17, 20	----	----	Shawnee Loveland (north)
22	Combine	274.10	2	1130	12,392,670	18, 19, 21	----	----	Total flow Shawnee/Loveland

Bull Creek tributary BUB.gpw

Return Period: 10 Year

Thursday, 01 / 28 / 2016

# Hydrograph Report

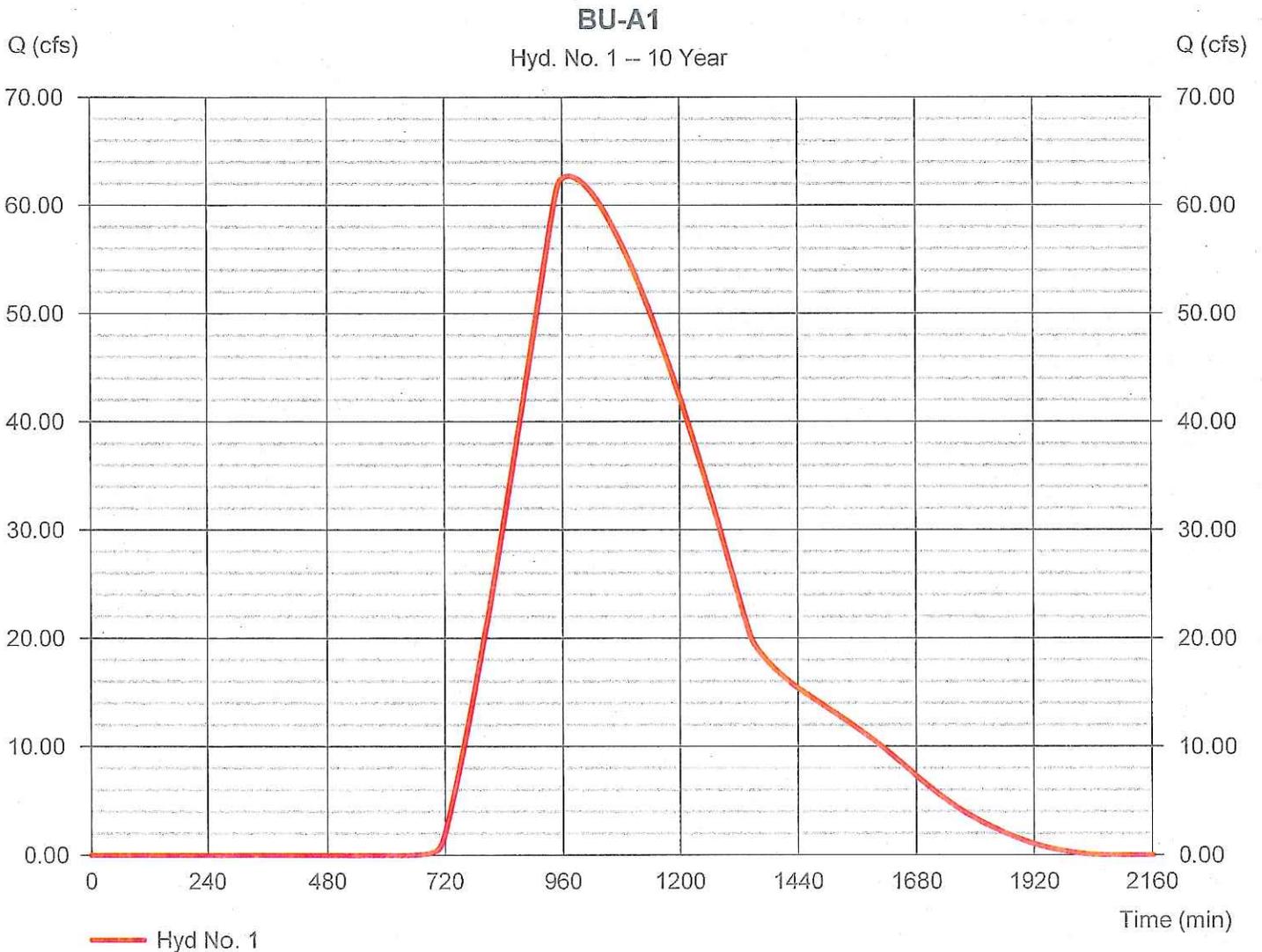
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Thursday, 01 / 28 / 2016

## Hyd. No. 1

BU-A1

Hydrograph type	= SCS Runoff	Peak discharge	= 62.71 cfs
Storm frequency	= 10 yrs	Time to peak	= 974 min
Time interval	= 2 min	Hyd. volume	= 1,846,668 cuft
Drainage area	= 454.000 ac	Curve number	= 78
Basin Slope	= 0.2 %	Hydraulic length	= 8600 ft
Tc method	= LAG	Time of conc. (Tc)	= 403.63 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

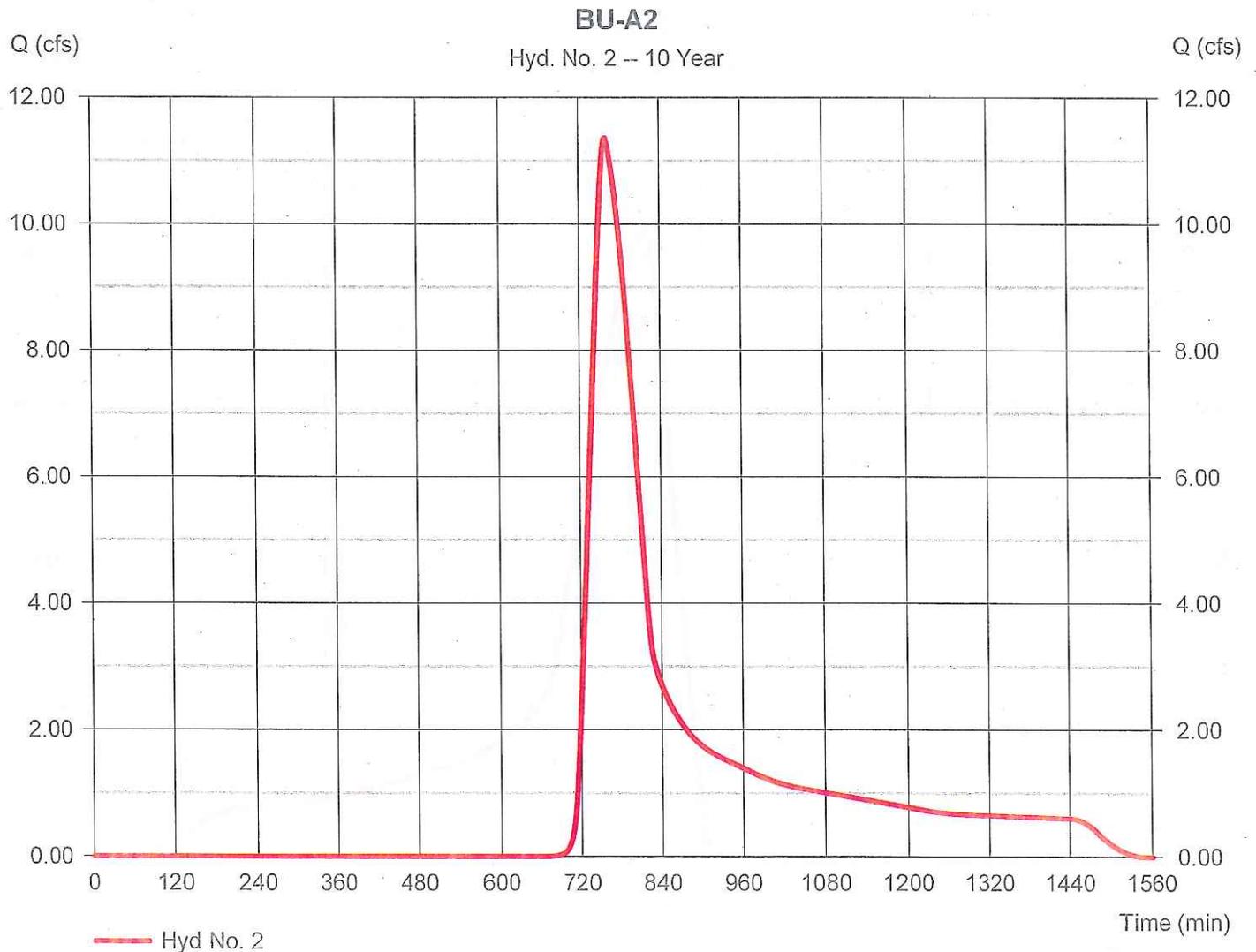
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## Hyd. No. 2

BU-A2

Hydrograph type	= SCS Runoff	Peak discharge	= 11.36 cfs
Storm frequency	= 10 yrs	Time to peak	= 758 min
Time interval	= 2 min	Hyd. volume	= 91,669 cuft
Drainage area	= 28.000 ac	Curve number	= 74
Basin Slope	= 0.8 %	Hydraulic length	= 1800 ft
Tc method	= LAG	Time of conc. (Tc)	= 68.07 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

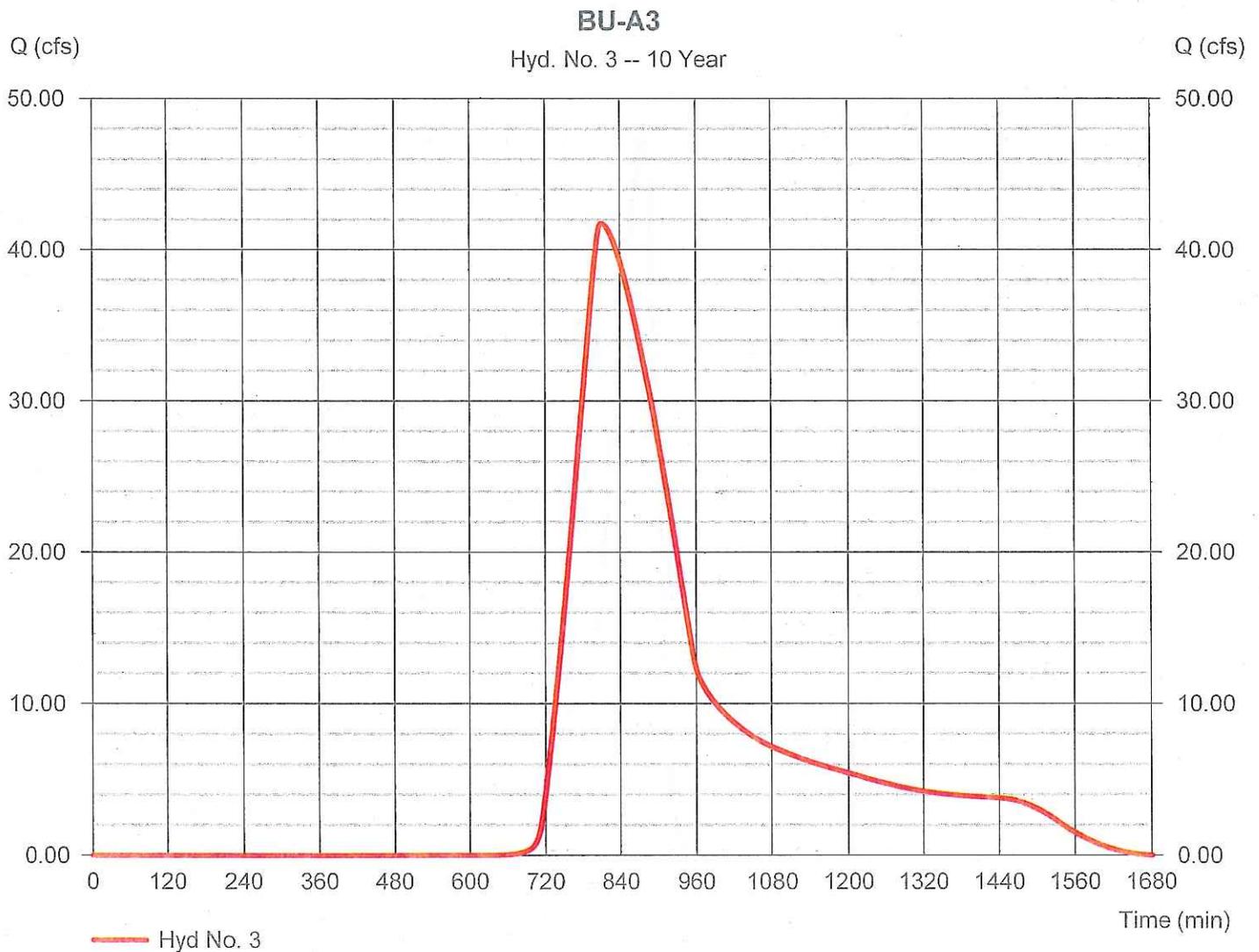
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## Hyd. No. 3

BU-A3

Hydrograph type	= SCS Runoff	Peak discharge	= 41.74 cfs
Storm frequency	= 10 yrs	Time to peak	= 810 min
Time interval	= 2 min	Hyd. volume	= 592,603 cuft
Drainage area	= 153.000 ac	Curve number	= 77
Basin Slope	= 0.5 %	Hydraulic length	= 4200 ft
Tc method	= LAG	Time of conc. (Tc)	= 155.48 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

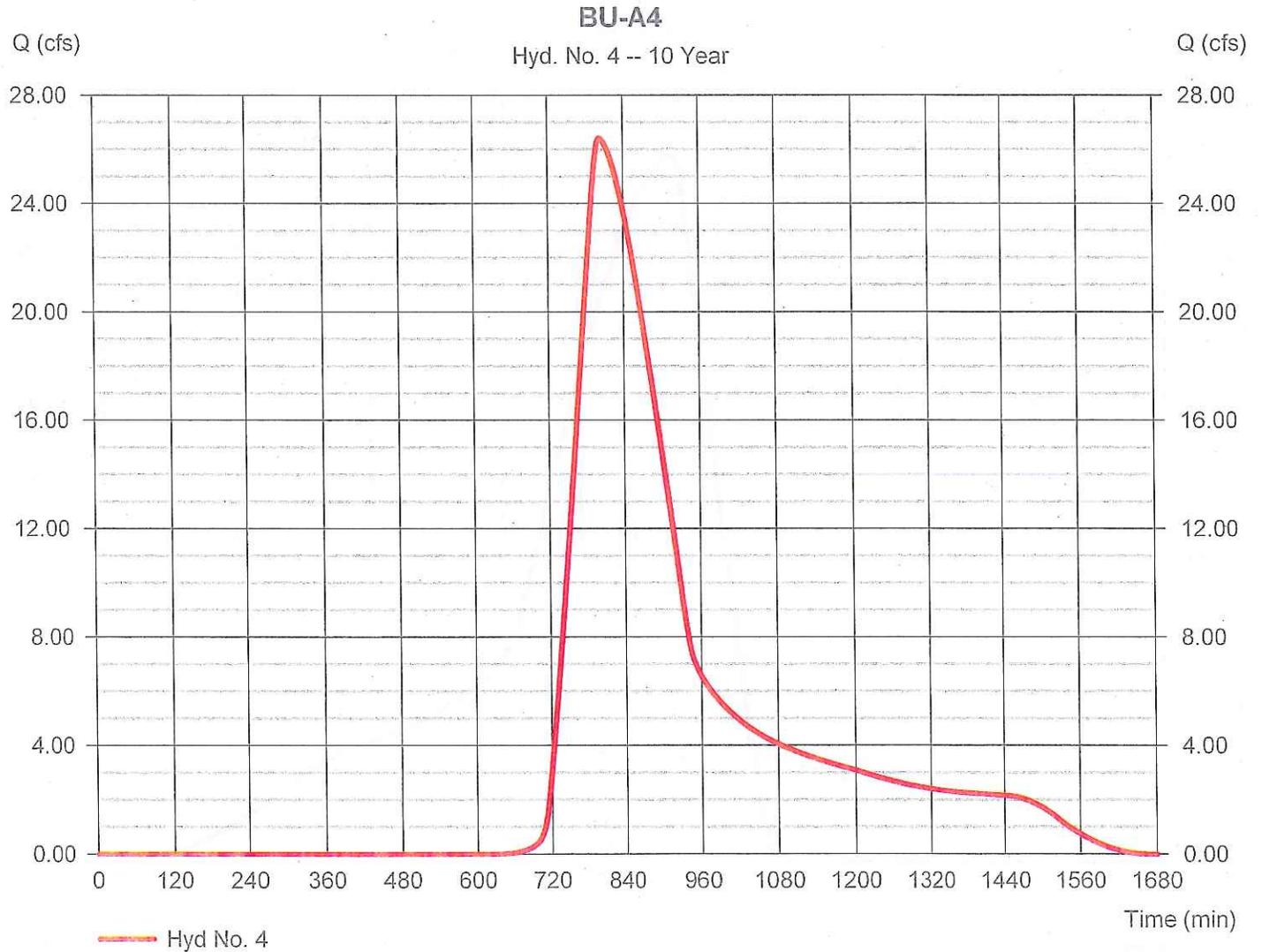
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## Hyd. No. 4

BU-A4

Hydrograph type	= SCS Runoff	Peak discharge	= 26.41 cfs
Storm frequency	= 10 yrs	Time to peak	= 802 min
Time interval	= 2 min	Hyd. volume	= 351,195 cuft
Drainage area	= 86.000 ac	Curve number	= 78
Basin Slope	= 0.4 %	Hydraulic length	= 3500 ft
Tc method	= LAG	Time of conc. (Tc)	= 145.82 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

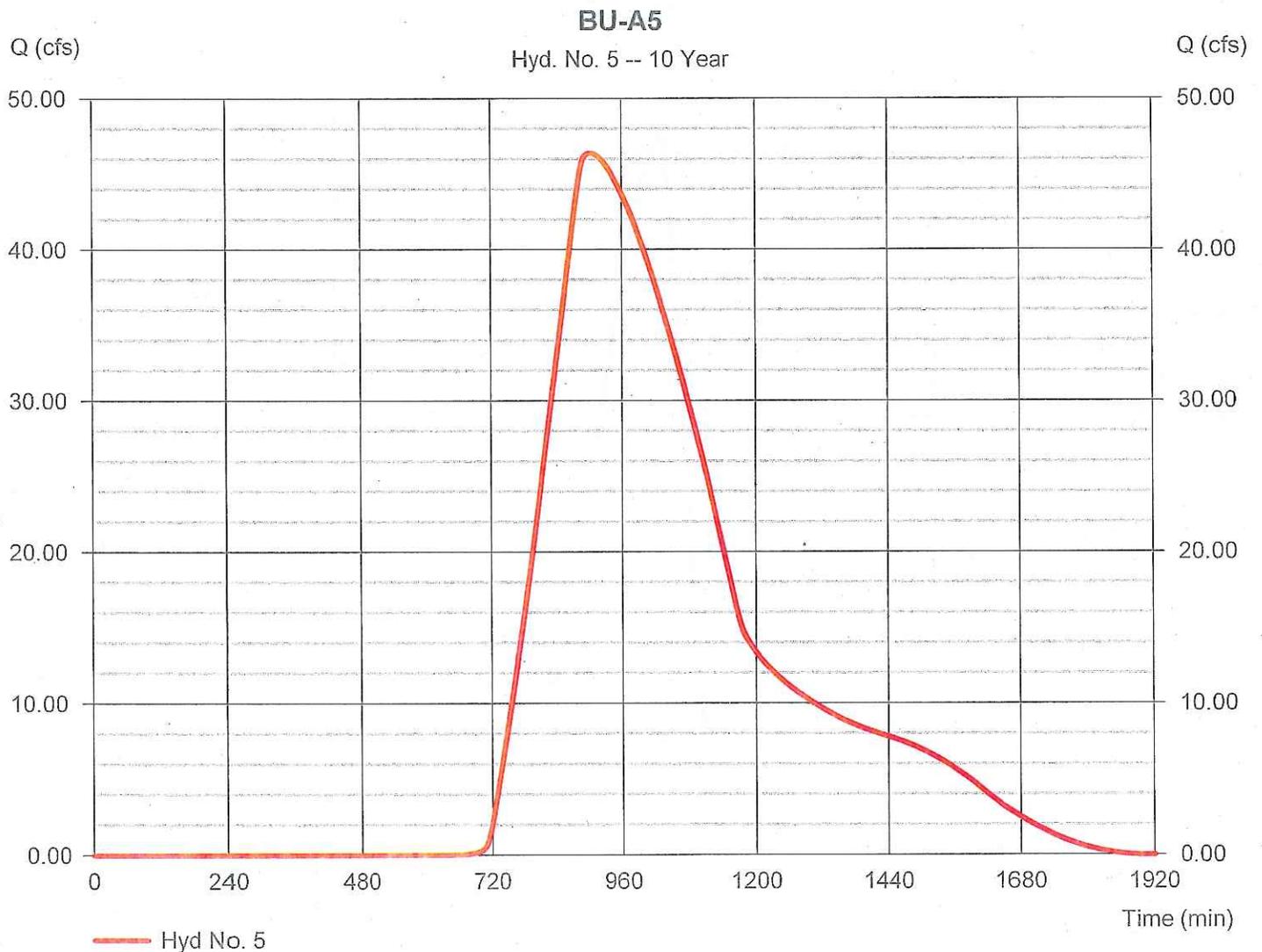
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## Hyd. No. 5

BU-A5

Hydrograph type	= SCS Runoff	Peak discharge	= 46.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 902 min
Time interval	= 2 min	Hyd. volume	= 1,081,564 cuft
Drainage area	= 280.000 ac	Curve number	= 77
Basin Slope	= 0.3 %	Hydraulic length	= 6800 ft
Tc method	= LAG	Time of conc. (Tc)	= 295.13 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



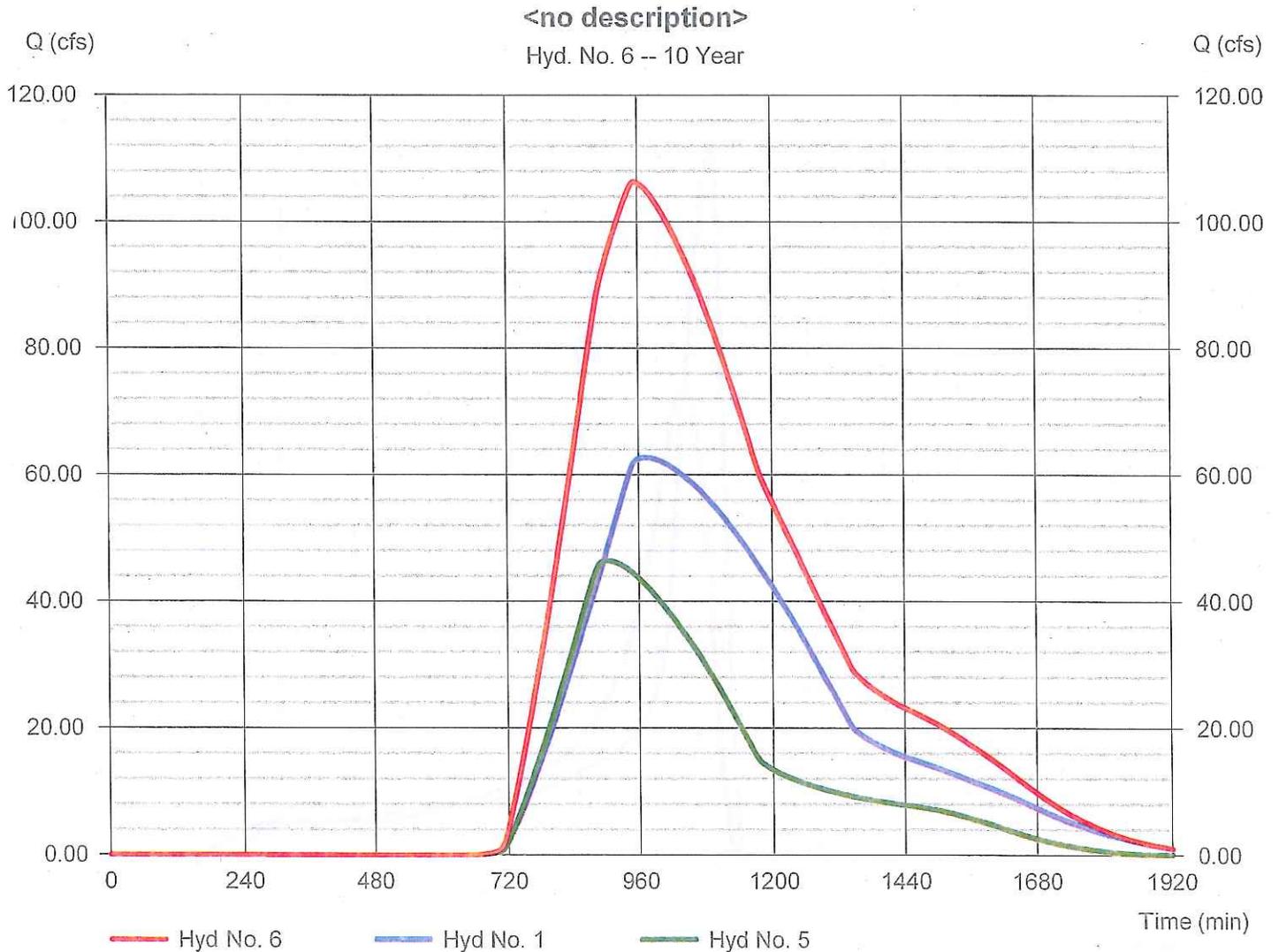
# Hydrograph Report

## Hyd. No. 6

<no description>

Hydrograph type = Combine  
Storm frequency = 10 yrs  
Time interval = 2 min  
Inflow hyds. = 1, 5

Peak discharge = 106.30 cfs  
Time to peak = 954 min  
Hyd. volume = 2,928,230 cuft  
Contrib. drain. area = 734.000 ac



# Hydrograph Report

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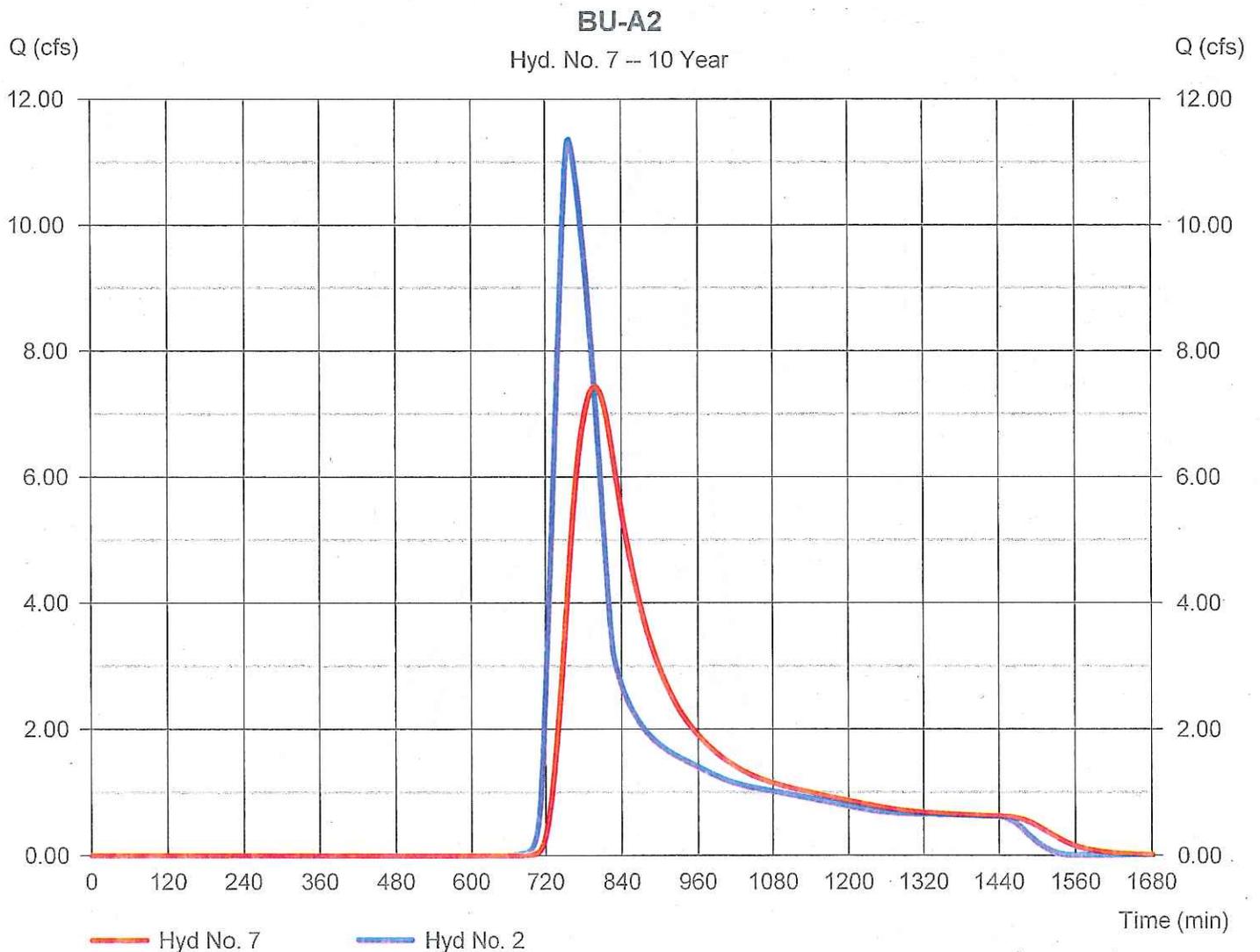
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## Hyd. No. 7

BU-A2

Hydrograph type	= Reach	Peak discharge	= 7.432 cfs
Storm frequency	= 10 yrs	Time to peak	= 798 min
Time interval	= 2 min	Hyd. volume	= 91,642 cuft
Inflow hyd. No.	= 2 - BU-A2	Section type	= Trapezoidal
Reach length	= 3500.0 ft	Channel slope	= 0.1 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 1.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.193	Rating curve m	= 1.553
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0430

Modified Att-Kin routing method used.



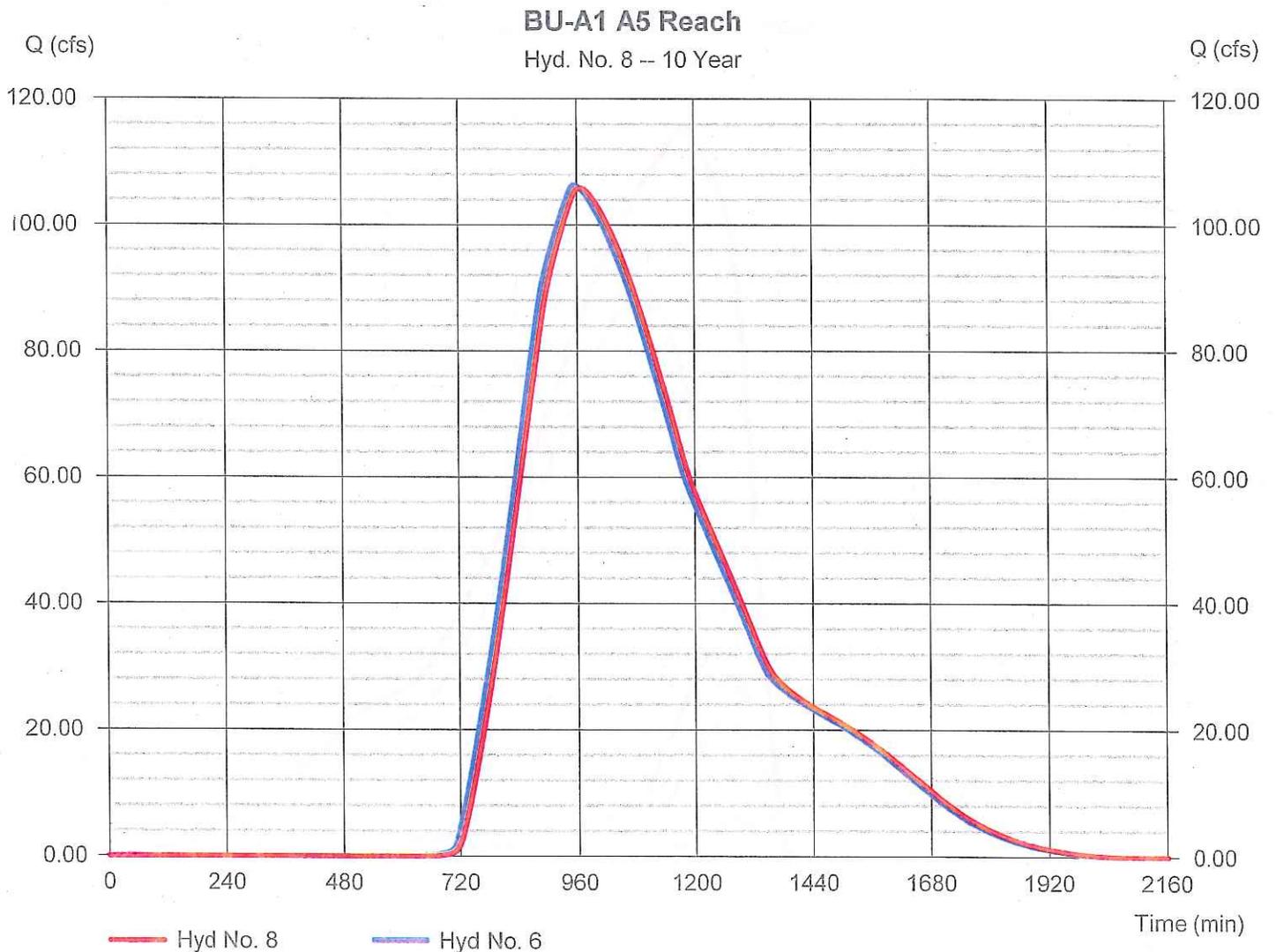
# Hydrograph Report

## Hyd. No. 8

### BU-A1 A5 Reach

Hydrograph type	= Reach	Peak discharge	= 105.85 cfs
Storm frequency	= 10 yrs	Time to peak	= 966 min
Time interval	= 2 min	Hyd. volume	= 2,928,228 cuft
Inflow hyd. No.	= 6 - <no description>	Section type	= Trapezoidal
Reach length	= 1800.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 1.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.274	Rating curve m	= 1.553
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.2116

Modified Att-Kin routing method used.



# Hydrograph Report

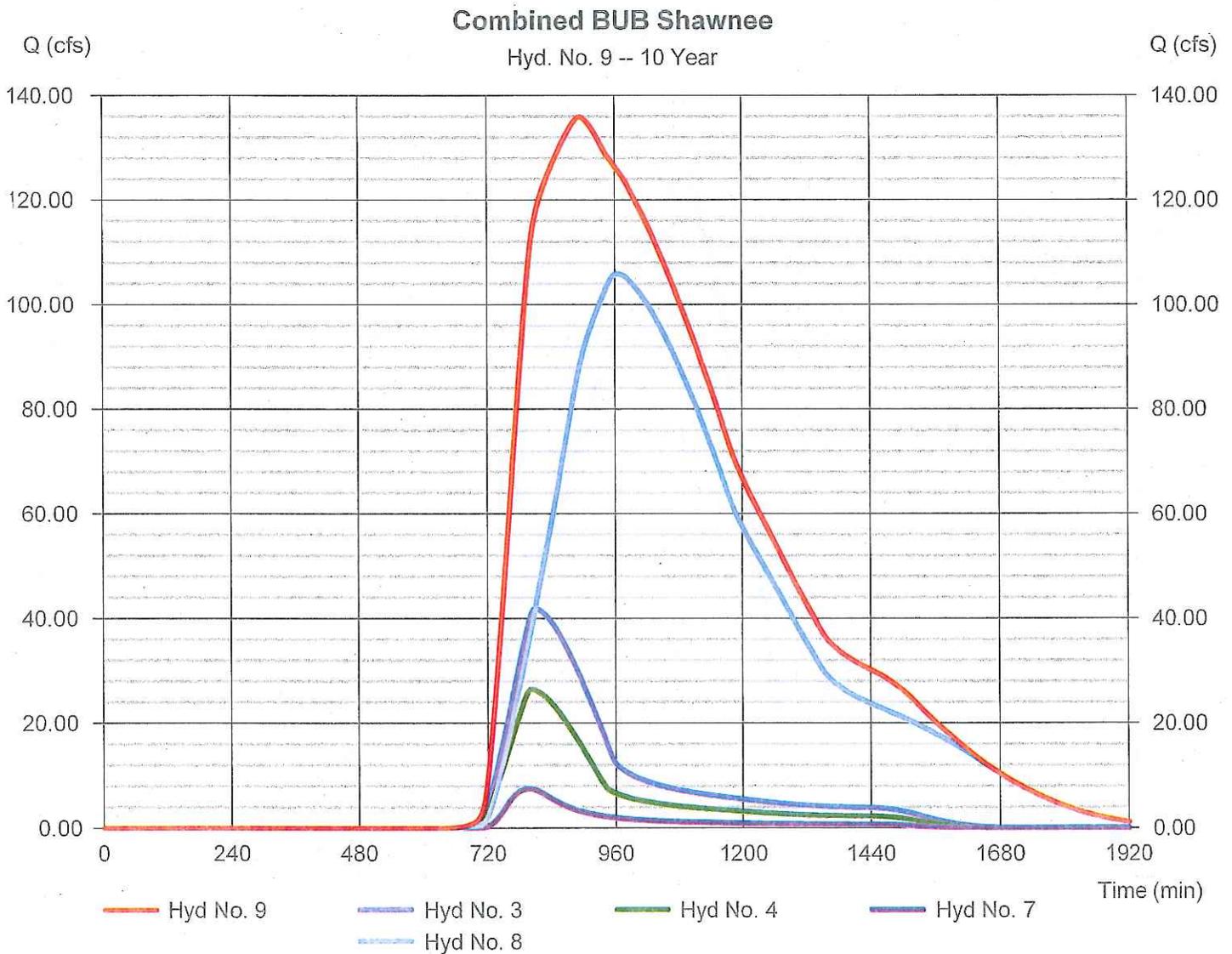
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## Hyd. No. 9

Combined BUB Shawnee

Hydrograph type	= Combine	Peak discharge	= 135.87 cfs
Storm frequency	= 10 yrs	Time to peak	= 894 min
Time interval	= 2 min	Hyd. volume	= 3,963,667 cuft
Inflow hyds.	= 3, 4, 7, 8	Contrib. drain. area	= 239.000 ac



# Hydrograph Report

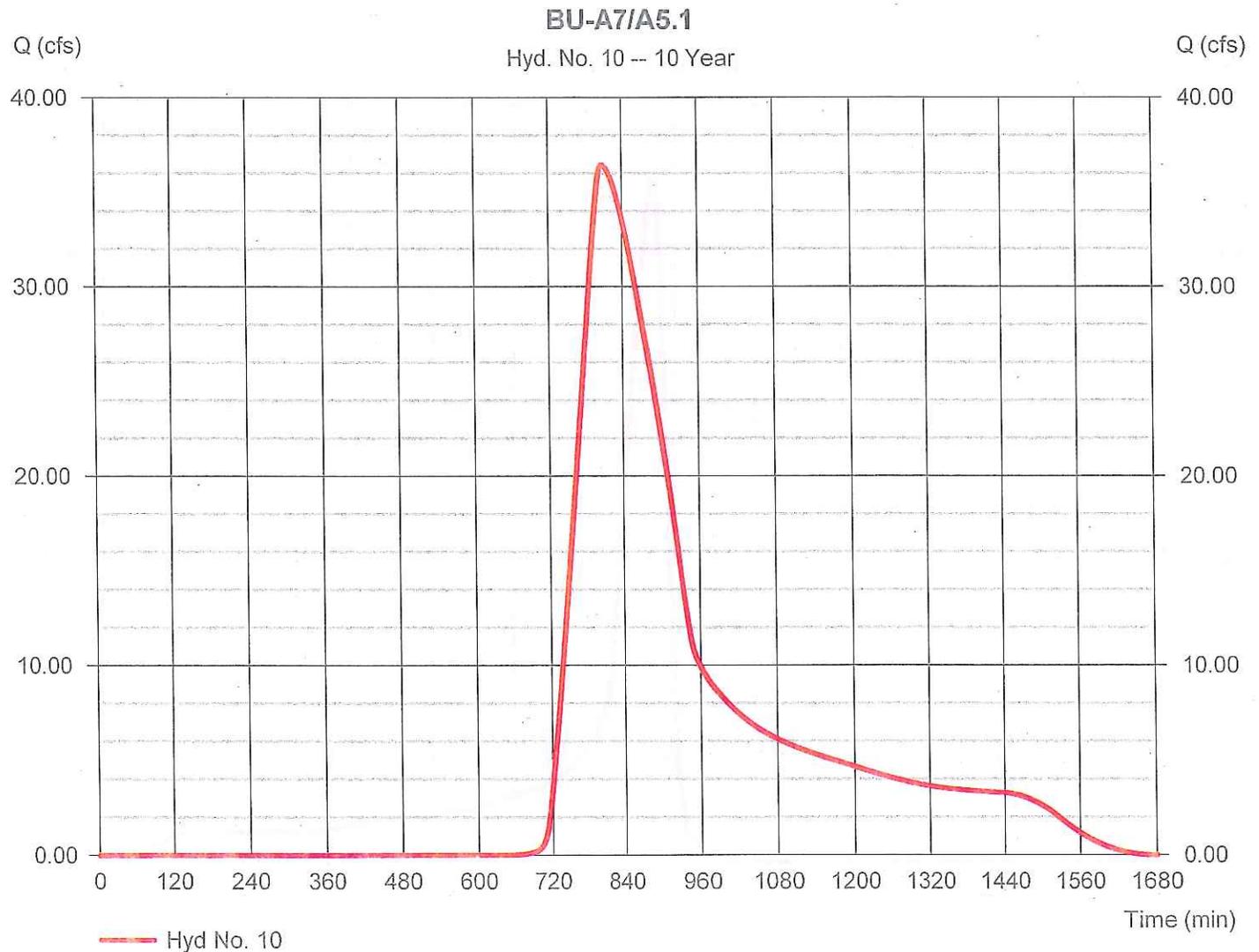
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## Hyd. No. 10

BU-A7/A5.1

Hydrograph type	= SCS Runoff	Peak discharge	= 36.42 cfs
Storm frequency	= 10 yrs	Time to peak	= 806 min
Time interval	= 2 min	Hyd. volume	= 503,667 cuft
Drainage area	= 138.000 ac	Curve number	= 76
Basin Slope	= 0.6 %	Hydraulic length	= 4250 ft
Tc method	= LAG	Time of conc. (Tc)	= 147.56 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

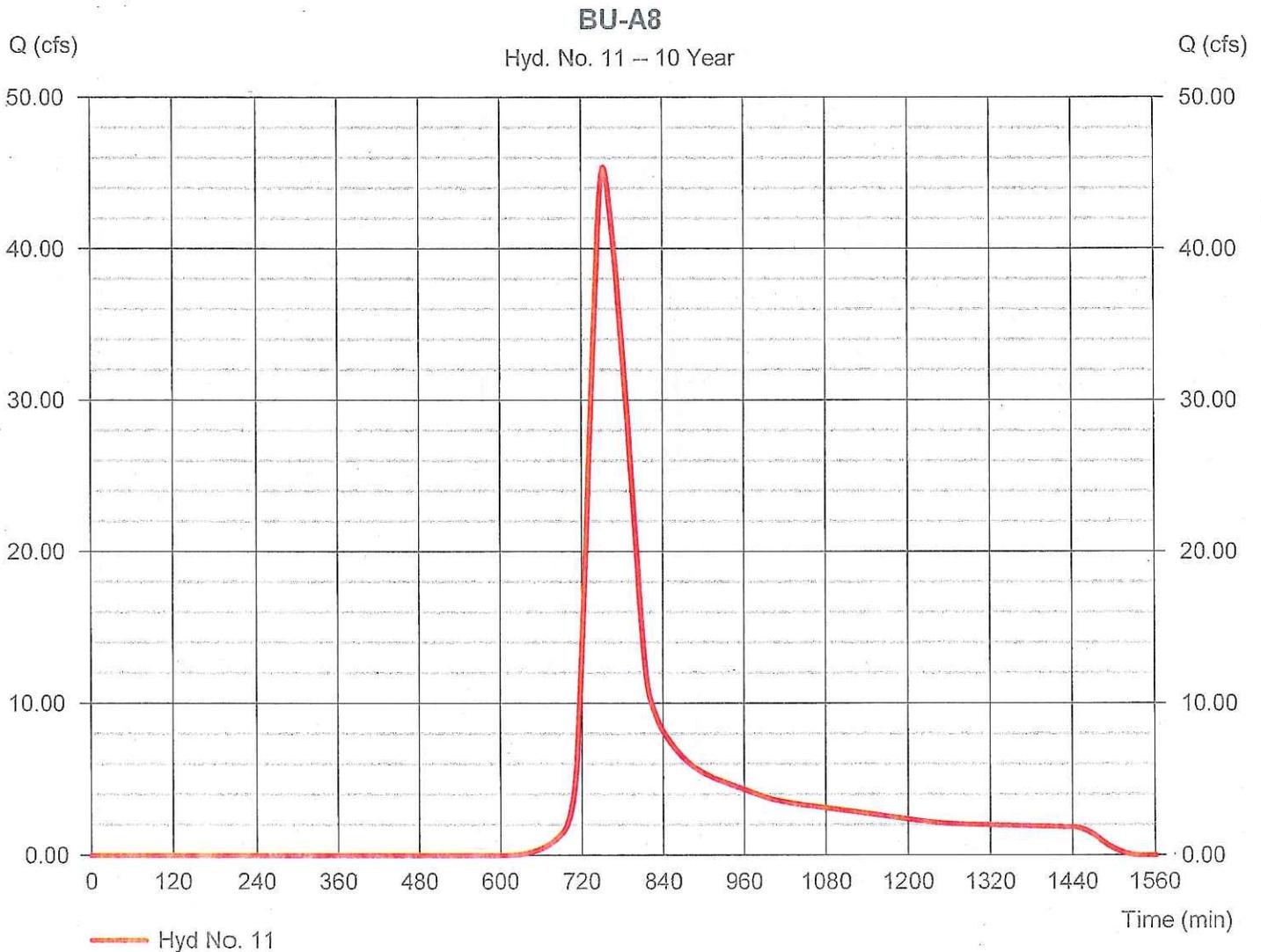
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## Hyd. No. 11

BU-A8

Hydrograph type	= SCS Runoff	Peak discharge	= 45.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 319,371 cuft
Drainage area	= 74.000 ac	Curve number	= 79
Basin Slope	= 0.9 %	Hydraulic length	= 2100 ft
Tc method	= LAG	Time of conc. (Tc)	= 62.67 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

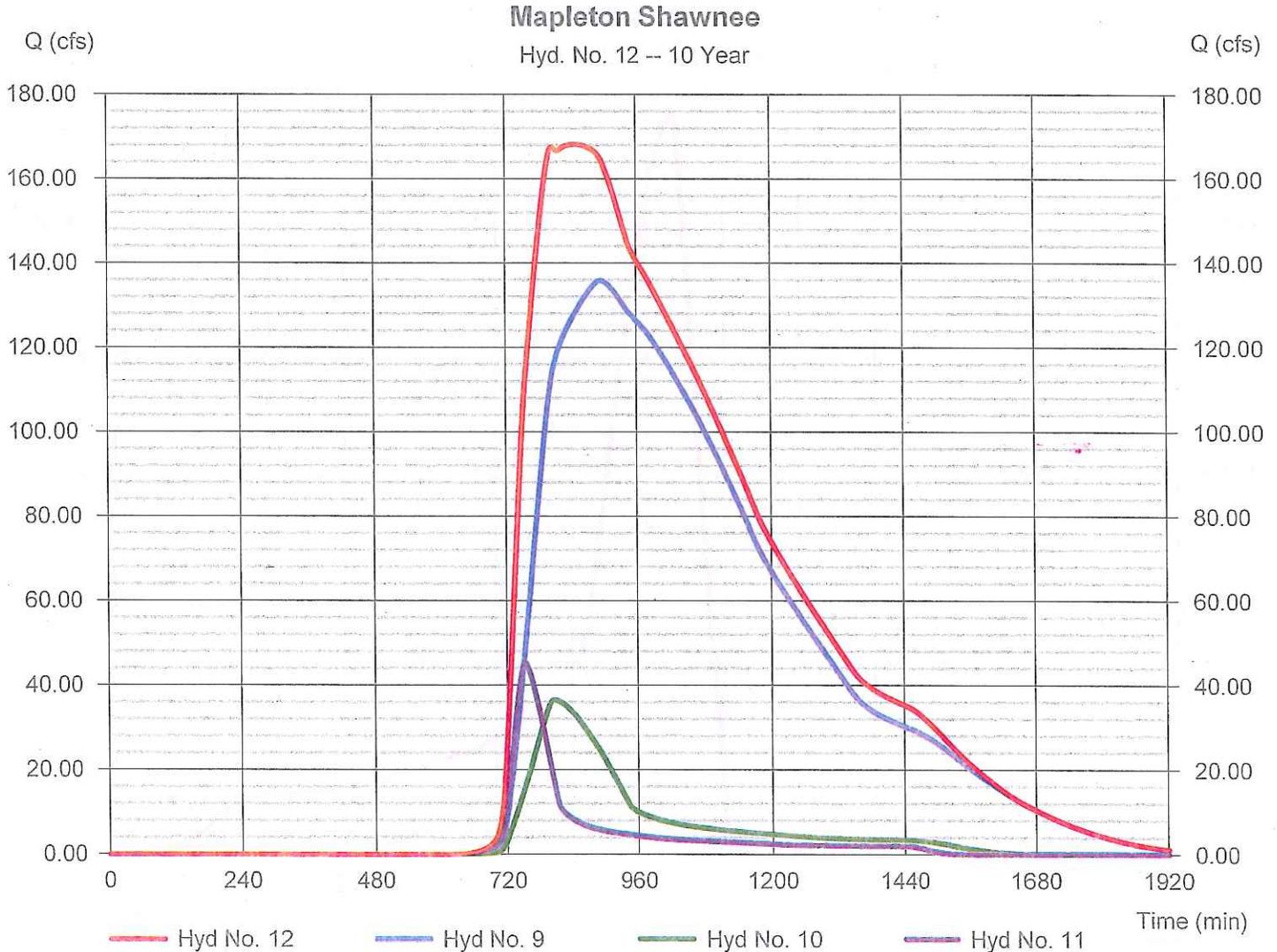
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## Hyd. No. 12

Mapleton Shawnee

Hydrograph type	= Combine	Peak discharge	= 168.18 cfs
Storm frequency	= 10 yrs	Time to peak	= 848 min
Time interval	= 2 min	Hyd. volume	= 4,786,707 cuft
Inflow hyds.	= 9, 10, 11	Contrib. drain. area	= 212.000 ac



# Hydrograph Report

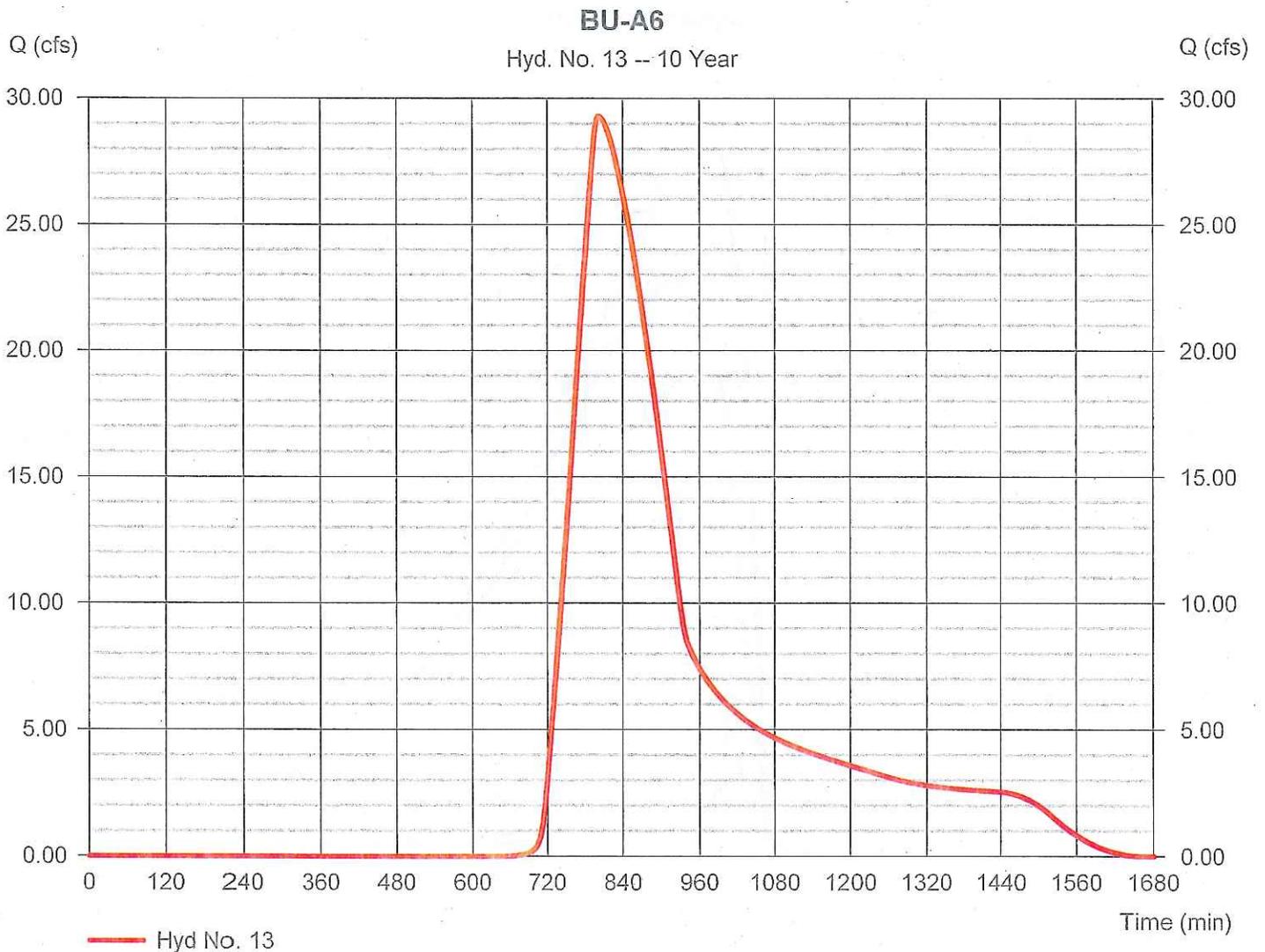
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## Hyd. No. 13

BU-A6

Hydrograph type	= SCS Runoff	Peak discharge	= 29.29 cfs
Storm frequency	= 10 yrs	Time to peak	= 802 min
Time interval	= 2 min	Hyd. volume	= 391,637 cuft
Drainage area	= 107.000 ac	Curve number	= 76
Basin Slope	= 0.4 %	Hydraulic length	= 3300 ft
Tc method	= LAG	Time of conc. (Tc)	= 139.17 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

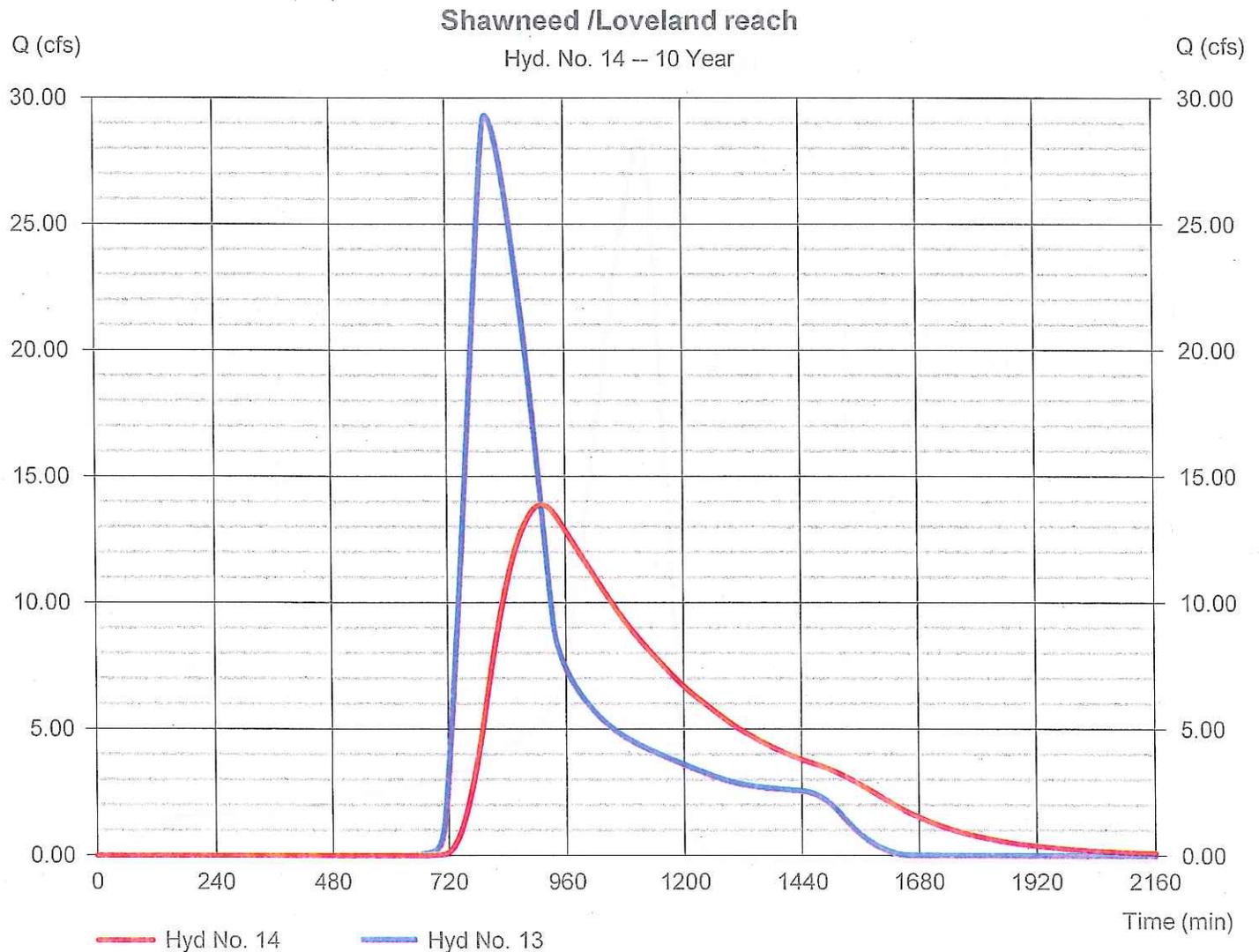
Thursday, 01 / 28 / 2016

## Hyd. No. 14

Shawneed /Loveland reach

Hydrograph type	= Reach	Peak discharge	= 13.88 cfs
Storm frequency	= 10 yrs	Time to peak	= 912 min
Time interval	= 2 min	Hyd. volume	= 391,532 cuft
Inflow hyd. No.	= 13 - BU-A6	Section type	= Trapezoidal
Reach length	= 16800.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.280	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0112

Modified Att-Kin routing method used.



# Hydrograph Report

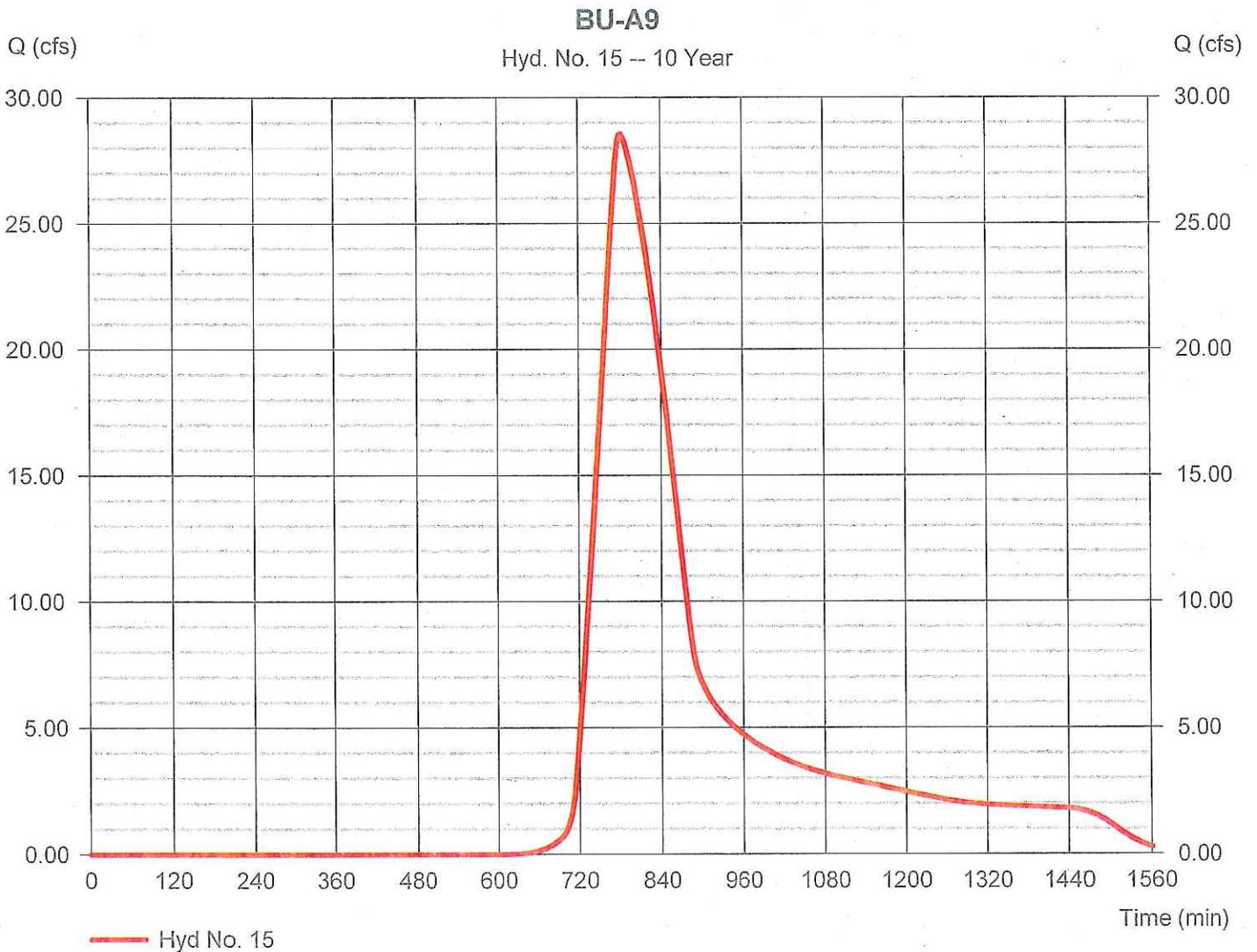
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Thursday, 01 / 28 / 2016

## Hyd. No. 15

BU-A9

Hydrograph type	= SCS Runoff	Peak discharge	= 28.55 cfs
Storm frequency	= 10 yrs	Time to peak	= 782 min
Time interval	= 2 min	Hyd. volume	= 304,420 cuft
Drainage area	= 71.000 ac	Curve number	= 79
Basin Slope	= 0.5 %	Hydraulic length	= 2800 ft
Tc method	= LAG	Time of conc. (Tc)	= 110.34 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

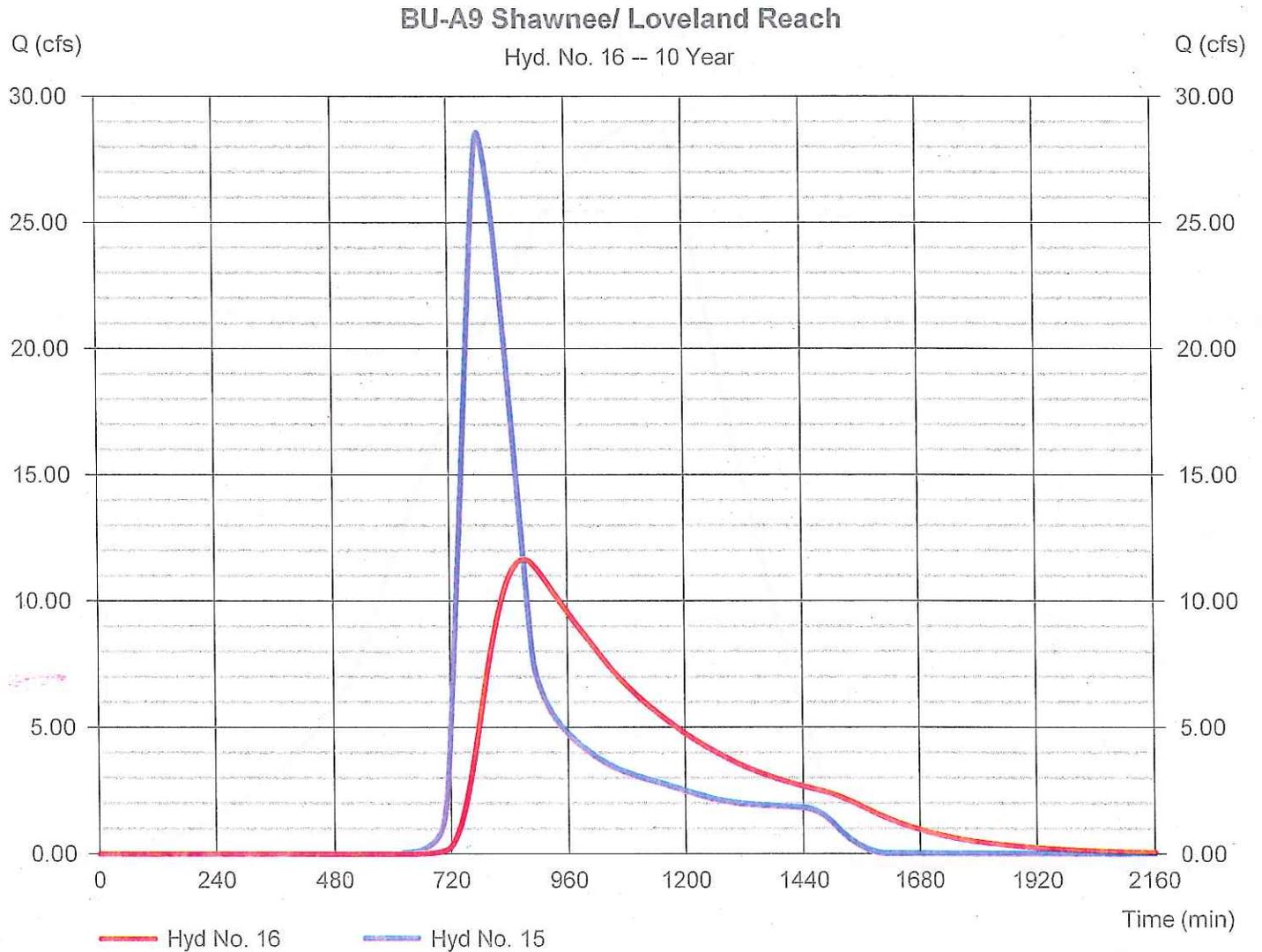
Thursday, 01 / 28 / 2016

## Hyd. No. 16

### BU-A9 Shawnee/ Loveland Reach

Hydrograph type	= Reach	Peak discharge	= 11.65 cfs
Storm frequency	= 10 yrs	Time to peak	= 872 min
Time interval	= 2 min	Hyd. volume	= 304,316 cuft
Inflow hyd. No.	= 15 - BU-A9	Section type	= Trapezoidal
Reach length	= 15500.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.280	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0113

Modified Att-Kin routing method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

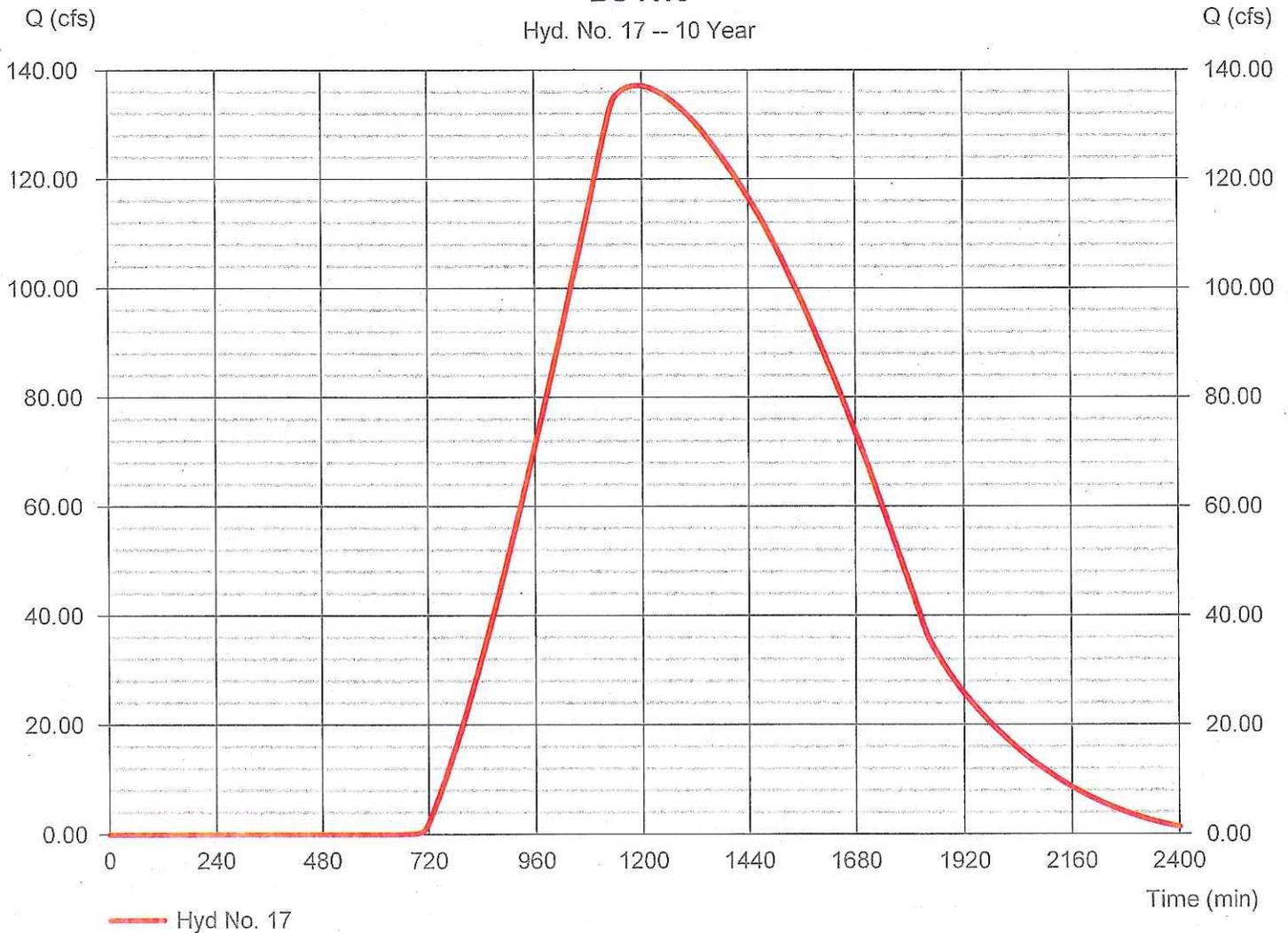
Thursday, 01 / 28 / 2016

## Hyd. No. 17

BU-A10

Hydrograph type	= SCS Runoff	Peak discharge	= 137.17 cfs
Storm frequency	= 10 yrs	Time to peak	= 1190 min
Time interval	= 2 min	Hyd. volume	= 6,334,771 cuft
Drainage area	= 1639.000 ac	Curve number	= 77
Basin Slope	= 0.2 %	Hydraulic length	= 16500 ft
Tc method	= LAG	Time of conc. (Tc)	= 716.88 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

**BU-A10**  
Hyd. No. 17 -- 10 Year



# Hydrograph Report

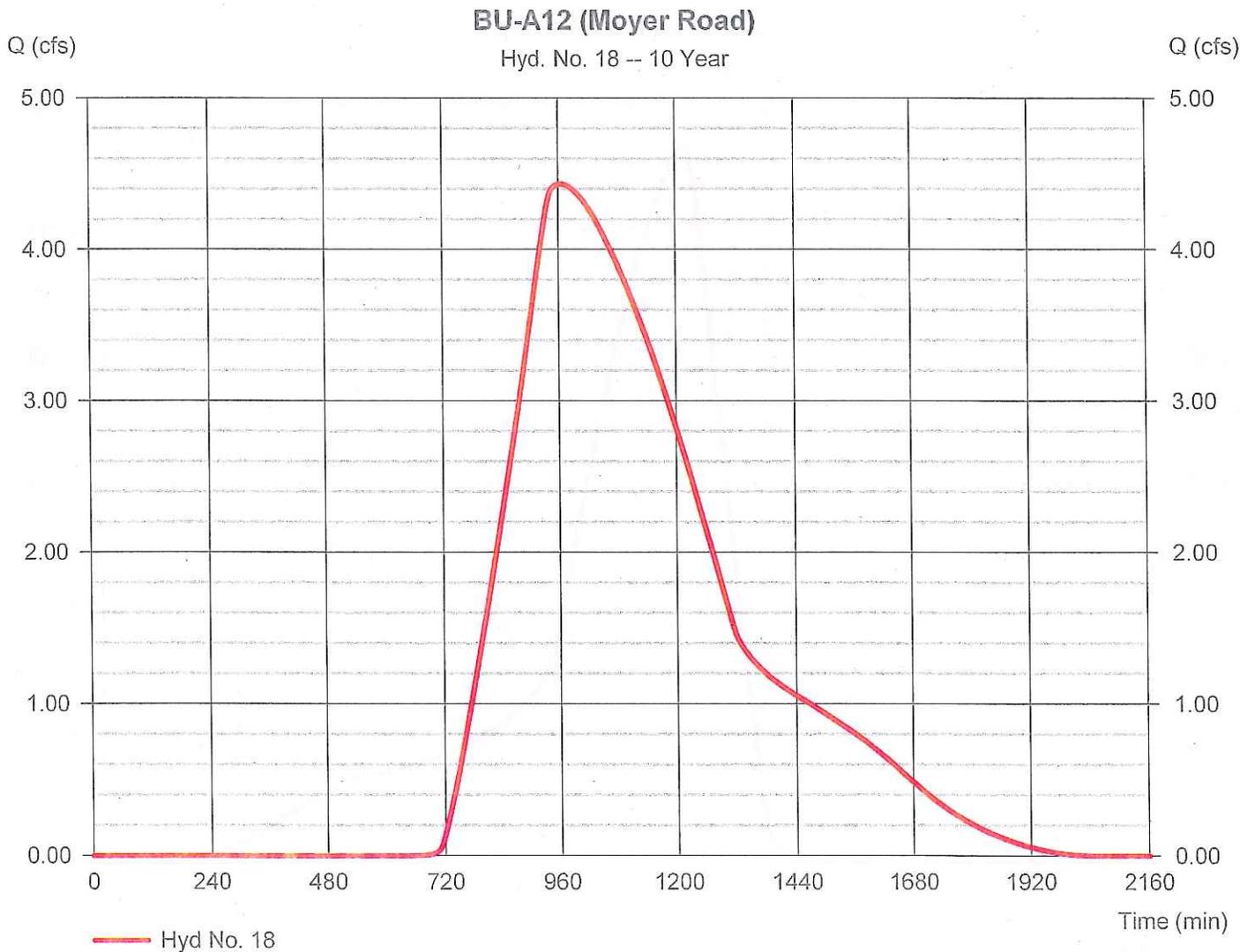
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 01 / 28 / 2016

## Hyd. No. 18

BU-A12 (Moyer Road)

Hydrograph type	= SCS Runoff	Peak discharge	= 4.432 cfs
Storm frequency	= 10 yrs	Time to peak	= 964 min
Time interval	= 2 min	Hyd. volume	= 127,470 cuft
Drainage area	= 33.000 ac	Curve number	= 77
Basin Slope	= 0.1 %	Hydraulic length	= 4000 ft
Tc method	= LAG	Time of conc. (Tc)	= 386.09 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

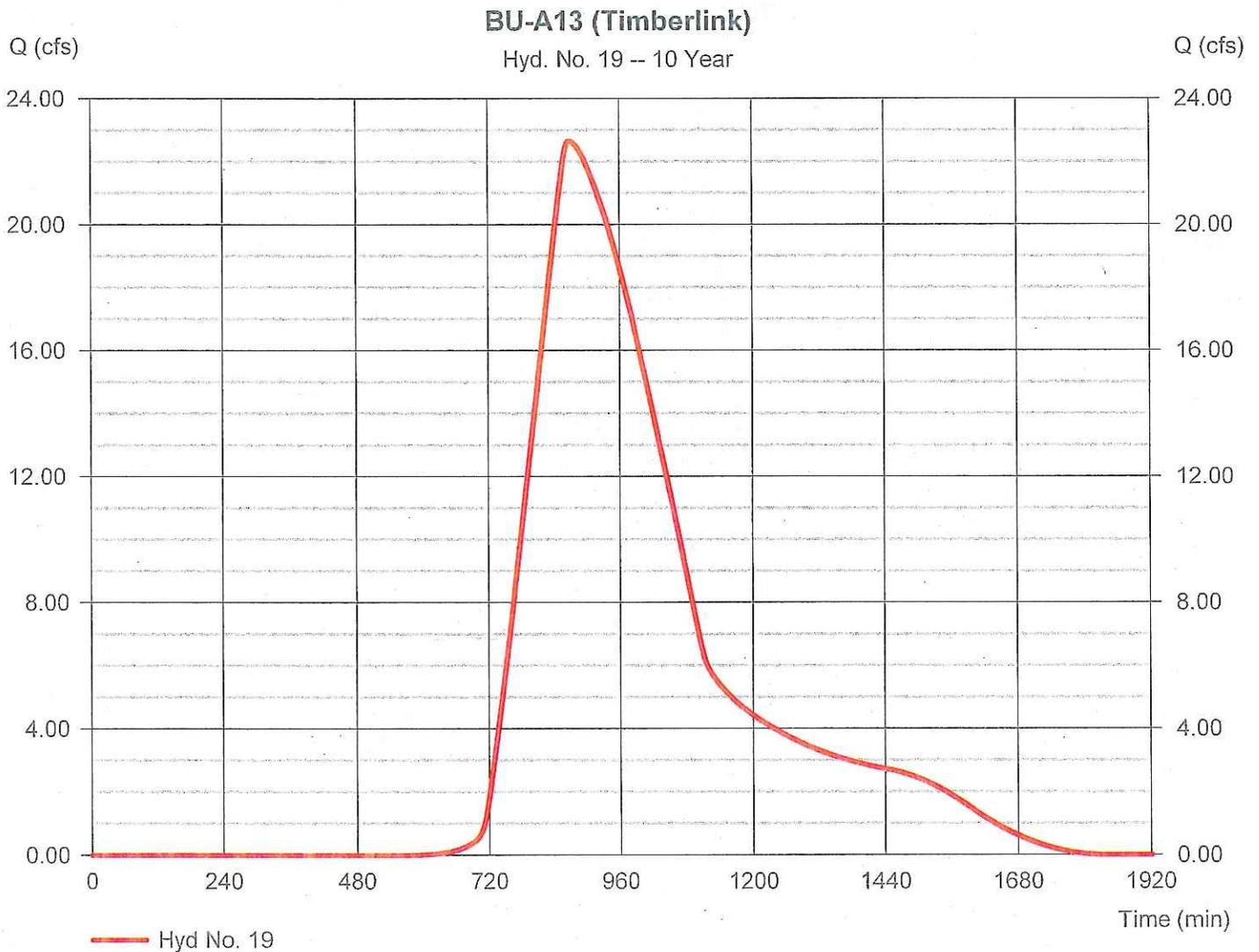
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## Hyd. No. 19

BU-A13 (Timberlink)

Hydrograph type	= SCS Runoff	Peak discharge	= 22.65 cfs
Storm frequency	= 10 yrs	Time to peak	= 868 min
Time interval	= 2 min	Hyd. volume	= 447,945 cuft
Drainage area	= 90.000 ac	Curve number	= 82
Basin Slope	= 0.1 %	Hydraulic length	= 3400 ft
Tc method	= LAG	Time of conc. (Tc)	= 251.44 min
Total precip.	= 2.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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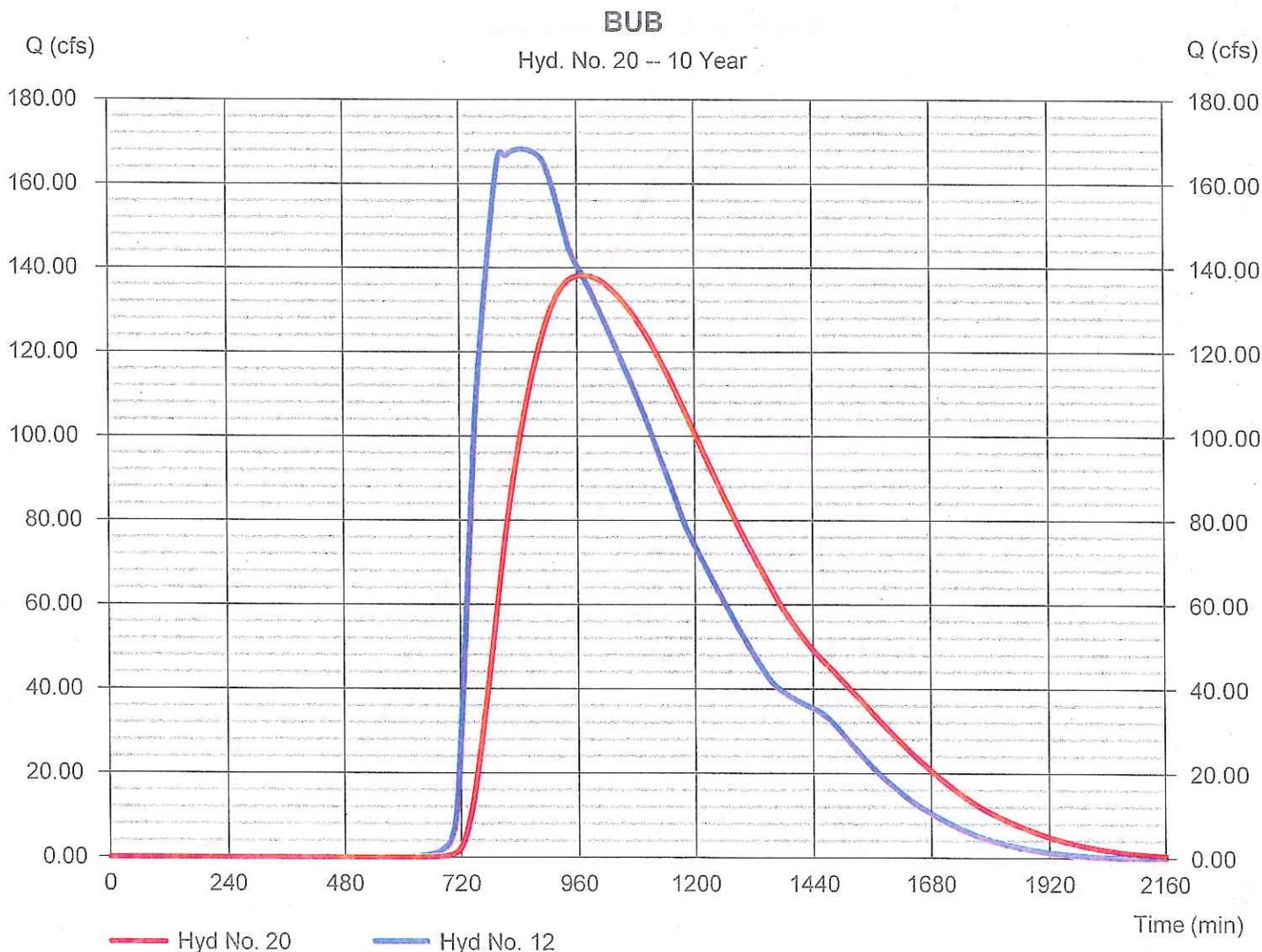
Thursday, 01 / 28 / 2016

## Hyd. No. 20

BUB

Hydrograph type	= Reach	Peak discharge	= 138.21 cfs
Storm frequency	= 10 yrs	Time to peak	= 972 min
Time interval	= 2 min	Hyd. volume	= 4,786,647 cuft
Inflow hyd. No.	= 12 - Mapleton Shawnee	Section type	= Trapezoidal
Reach length	= 17000.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.274	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0192

Modified Att-Kin routing method used.



# Hydrograph Report

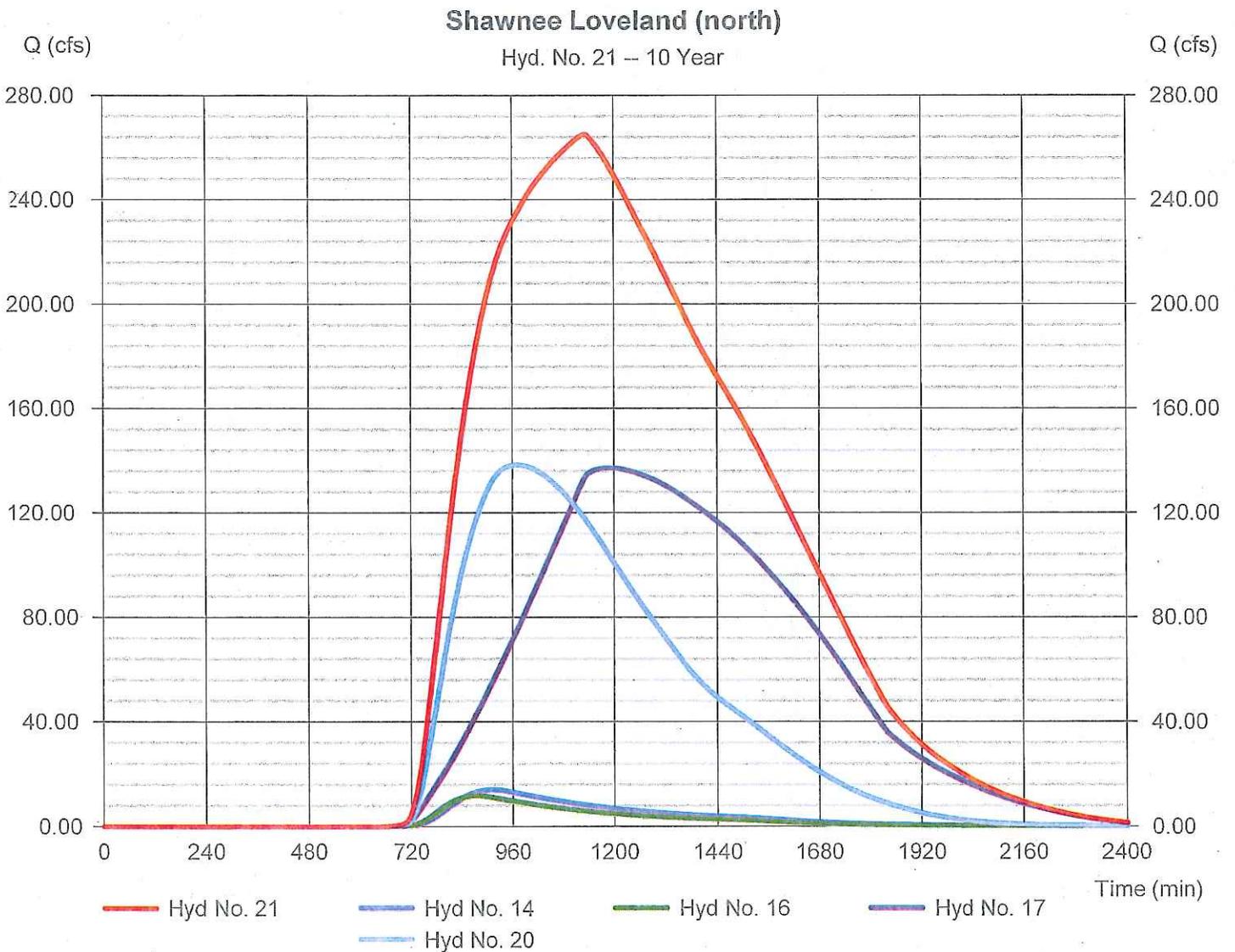
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 01 / 28 / 2016

## Hyd. No. 21

Shawnee Loveland (north)

Hydrograph type	= Combine	Peak discharge	= 265.03 cfs
Storm frequency	= 10 yrs	Time to peak	= 1132 min
Time interval	= 2 min	Hyd. volume	= 11,817,260 cuft
Inflow hyds.	= 14, 16, 17, 20	Contrib. drain. area	= 1639.000 ac



# Hydrograph Report

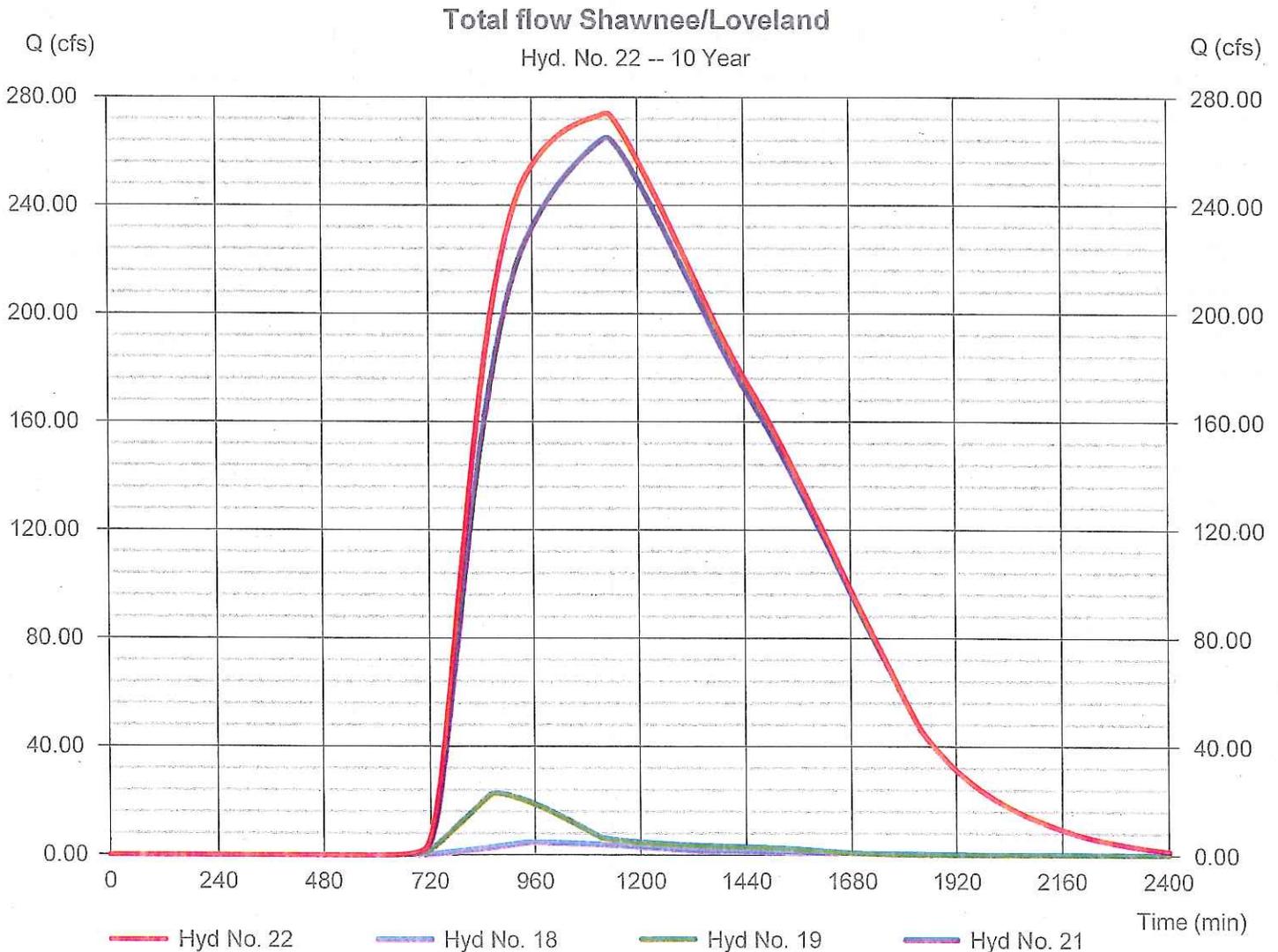
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## Hyd. No. 22

Total flow Shawnee/Loveland

Hydrograph type	= Combine	Peak discharge	= 274.10 cfs
Storm frequency	= 10 yrs	Time to peak	= 1130 min
Time interval	= 2 min	Hyd. volume	= 12,392,670 cuft
Inflow hyds.	= 18, 19, 21	Contrib. drain. area	= 123.000 ac



# Hydrograph Summary Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	91.53	2	966	2,628,883	----	----	----	BU-A1
2	SCS Runoff	17.64	2	756	135,225	----	----	----	BU-A2
3	SCS Runoff	62.21	2	808	850,819	----	----	----	BU-A3
4	SCS Runoff	38.85	2	802	499,955	----	----	----	BU-A4
5	SCS Runoff	68.71	2	896	1,552,835	----	----	----	BU-A5
6	Combine	155.60	2	952	4,181,718	1, 5	----	----	<no description>
7	Reach	12.20	2	792	135,201	2	----	----	BU-A2
8	Reach	155.02	2	960	4,181,716	6	----	----	BU-A1 A5 Reach
9	Combine	199.88	2	890	5,667,689	3, 4, 7, 8	----	----	Combined BUB Shawnee
10	SCS Runoff	55.01	2	804	729,481	----	----	----	BU-A7/A5.1
11	SCS Runoff	65.60	2	752	450,903	----	----	----	BU-A8
12	Combine	251.87	2	804	6,848,074	9, 10, 11	----	----	Mapleton Shawnee
13	SCS Runoff	44.25	2	800	567,223	----	----	----	BU-A6
14	Reach	22.65	2	900	567,134	13	----	----	Shawneed /Loveland reach
15	SCS Runoff	41.39	2	780	429,796	----	----	----	BU-A9
16	Reach	18.48	2	864	429,705	15	----	----	BU-A9 Shawnee/ Loveland Reach
17	SCS Runoff	200.28	2	1176	9,095,027	----	----	----	BU-A10
18	SCS Runoff	6.541	2	958	183,013	----	----	----	BU-A12 (Moyer Road)
19	SCS Runoff	31.84	2	866	617,621	----	----	----	BU-A13 (Timberlink)
20	Reach	209.42	2	944	6,848,015	12	----	----	BUB
21	Combine	381.20	2	1128	16,939,909	14, 16, 17, 20	----	----	Shawnee Loveland (north)
22	Combine	393.73	2	1122	17,740,530	18, 19, 21	----	----	Total flow Shawnee/Loveland

# Hydrograph Report

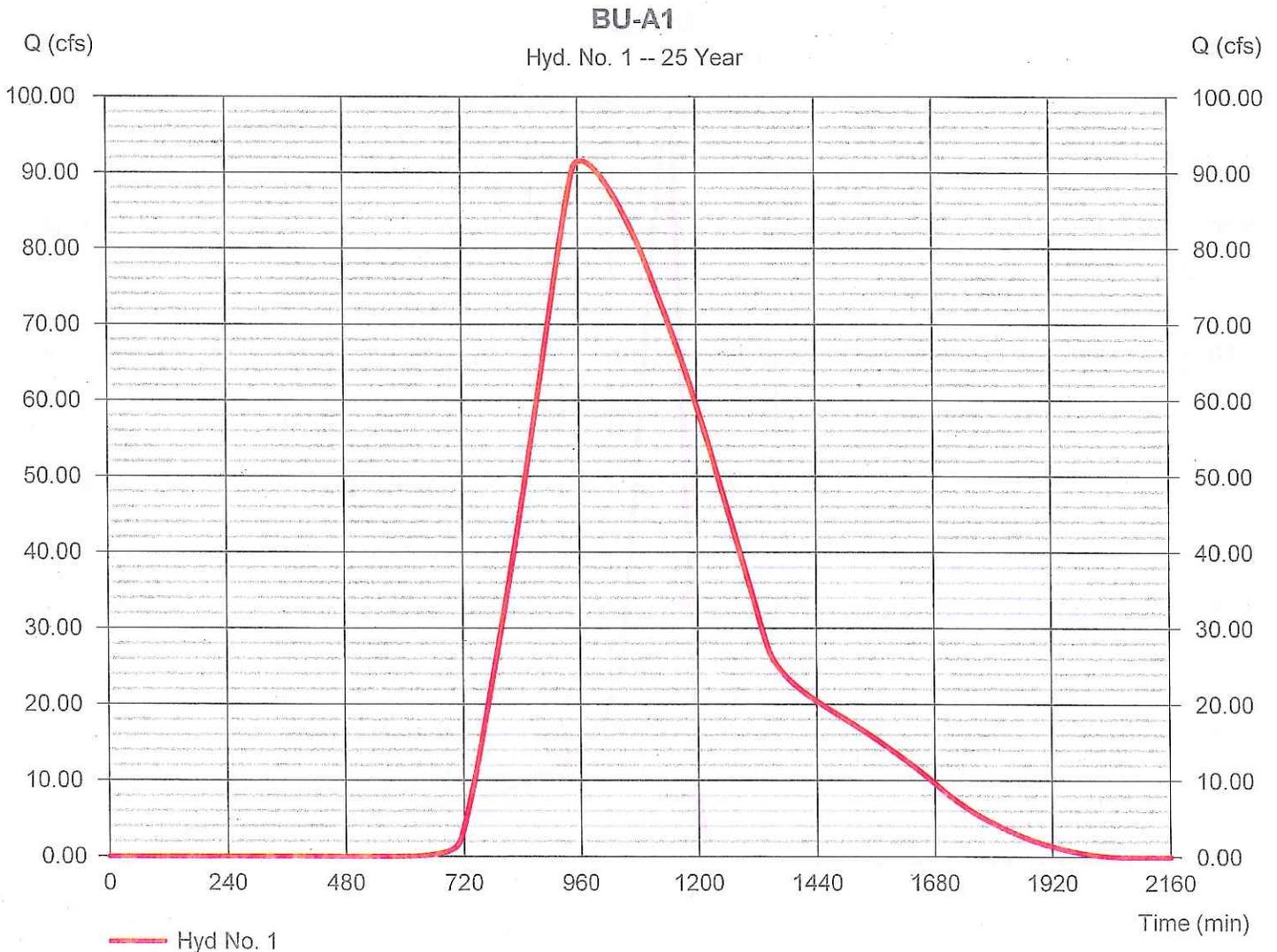
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Thursday, 01 / 28 / 2016

## Hyd. No. 1

BU-A1

Hydrograph type	= SCS Runoff	Peak discharge	= 91.53 cfs
Storm frequency	= 25 yrs	Time to peak	= 966 min
Time interval	= 2 min	Hyd. volume	= 2,628,883 cuft
Drainage area	= 454.000 ac	Curve number	= 78
Basin Slope	= 0.2 %	Hydraulic length	= 8600 ft
Tc method	= LAG	Time of conc. (Tc)	= 403.63 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

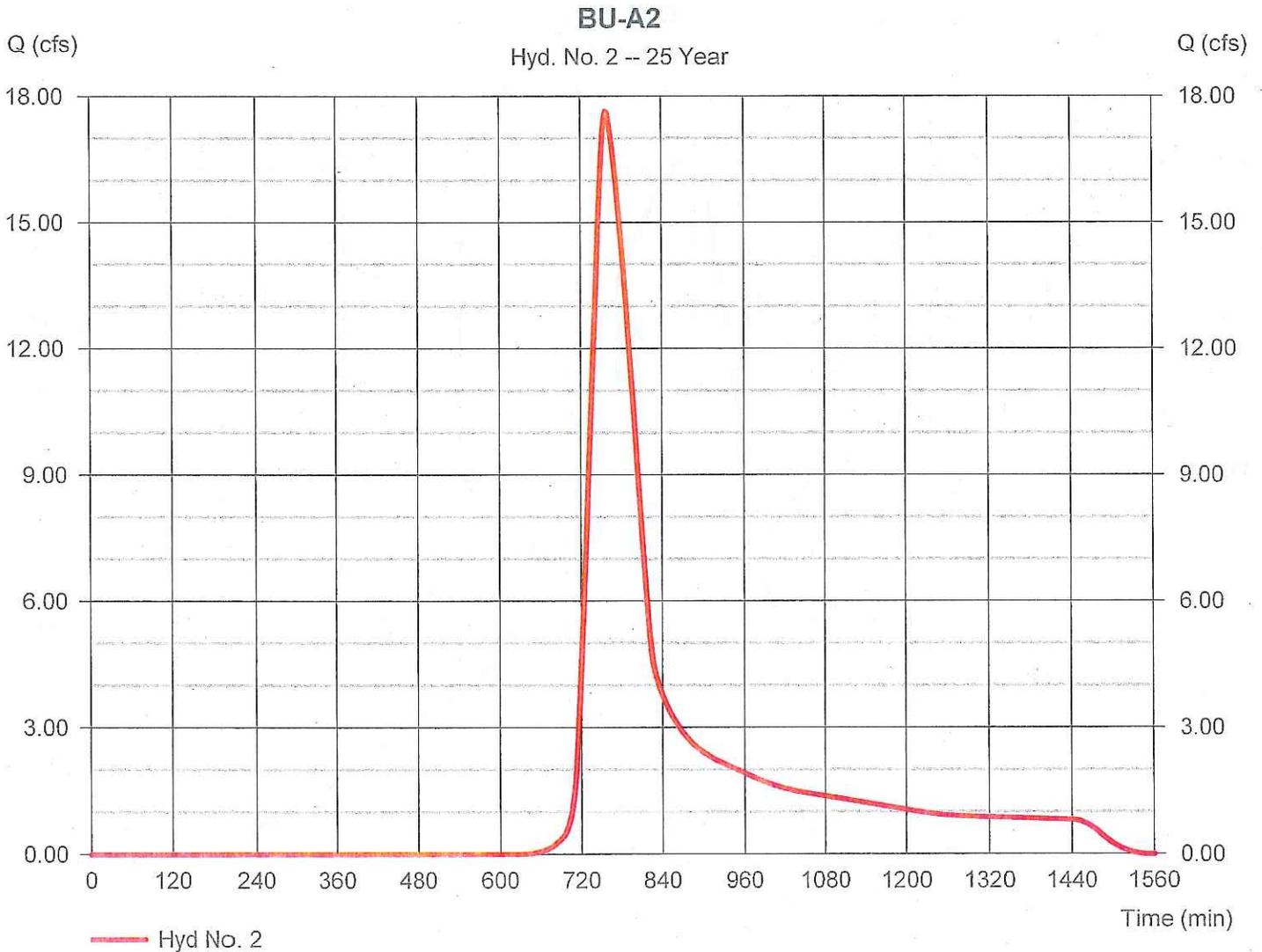
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## Hyd. No. 2

BU-A2

Hydrograph type	= SCS Runoff	Peak discharge	= 17.64 cfs
Storm frequency	= 25 yrs	Time to peak	= 756 min
Time interval	= 2 min	Hyd. volume	= 135,225 cuft
Drainage area	= 28.000 ac	Curve number	= 74
Basin Slope	= 0.8 %	Hydraulic length	= 1800 ft
Tc method	= LAG	Time of conc. (Tc)	= 68.07 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

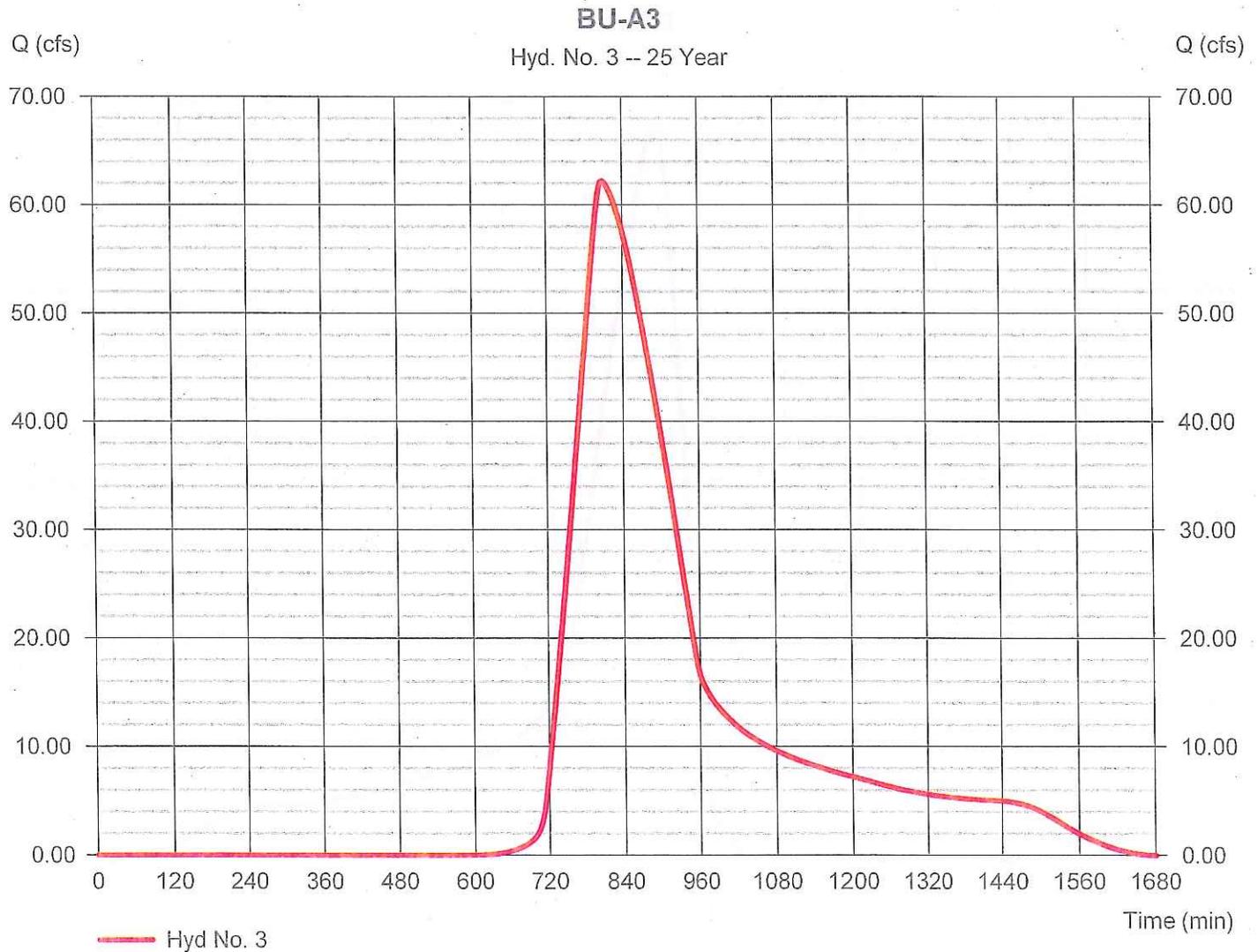
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## Hyd. No. 3

BU-A3

Hydrograph type	= SCS Runoff	Peak discharge	= 62.21 cfs
Storm frequency	= 25 yrs	Time to peak	= 808 min
Time interval	= 2 min	Hyd. volume	= 850,819 cuft
Drainage area	= 153.000 ac	Curve number	= 77
Basin Slope	= 0.5 %	Hydraulic length	= 4200 ft
Tc method	= LAG	Time of conc. (Tc)	= 155.48 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

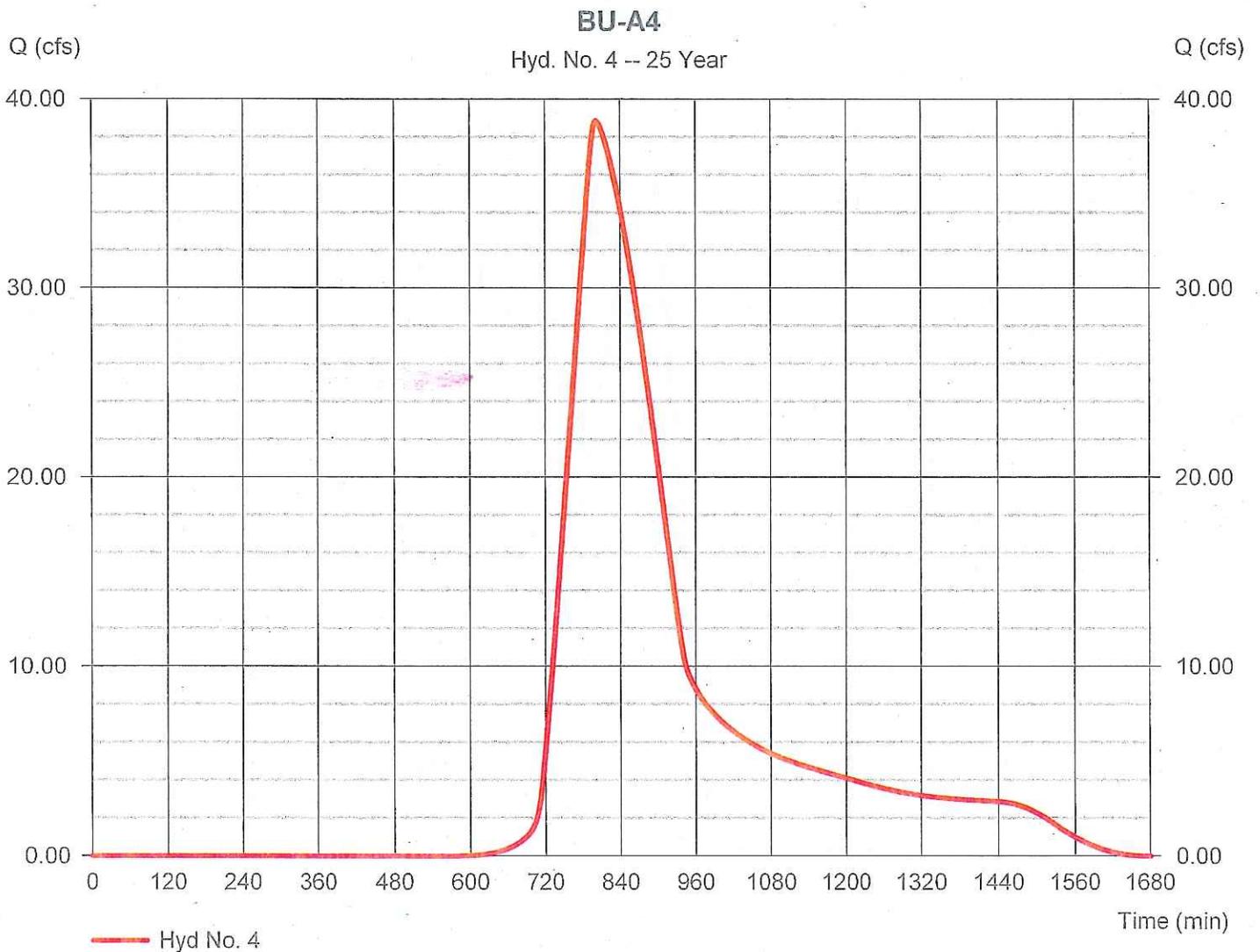
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## Hyd. No. 4

BU-A4

Hydrograph type	= SCS Runoff	Peak discharge	= 38.85 cfs
Storm frequency	= 25 yrs	Time to peak	= 802 min
Time interval	= 2 min	Hyd. volume	= 499,955 cuft
Drainage area	= 86.000 ac	Curve number	= 78
Basin Slope	= 0.4 %	Hydraulic length	= 3500 ft
Tc method	= LAG	Time of conc. (Tc)	= 145.82 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

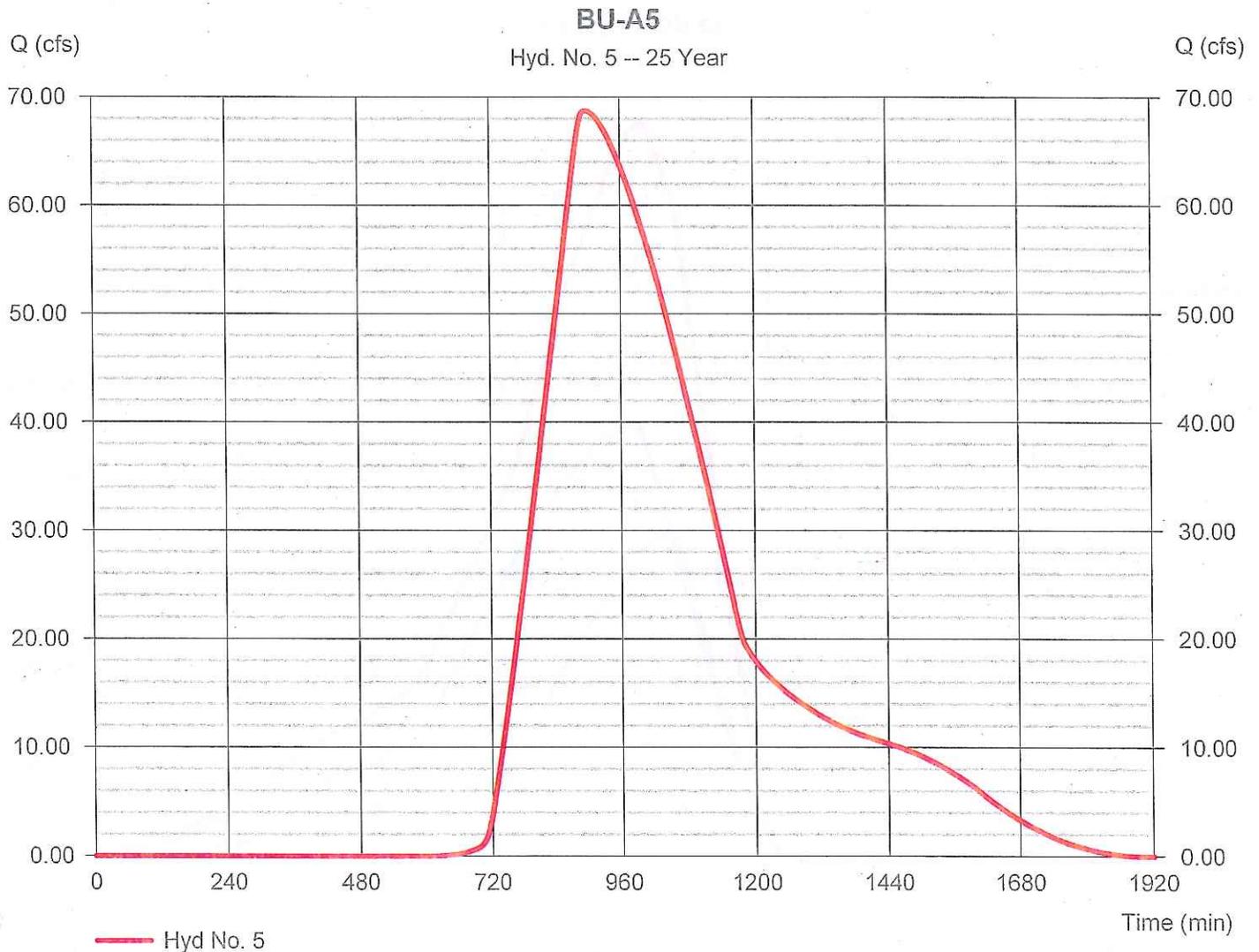
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## Hyd. No. 5

BU-A5

Hydrograph type	= SCS Runoff	Peak discharge	= 68.71 cfs
Storm frequency	= 25 yrs	Time to peak	= 896 min
Time interval	= 2 min	Hyd. volume	= 1,552,835 cuft
Drainage area	= 280.000 ac	Curve number	= 77
Basin Slope	= 0.3 %	Hydraulic length	= 6800 ft
Tc method	= LAG	Time of conc. (Tc)	= 295.13 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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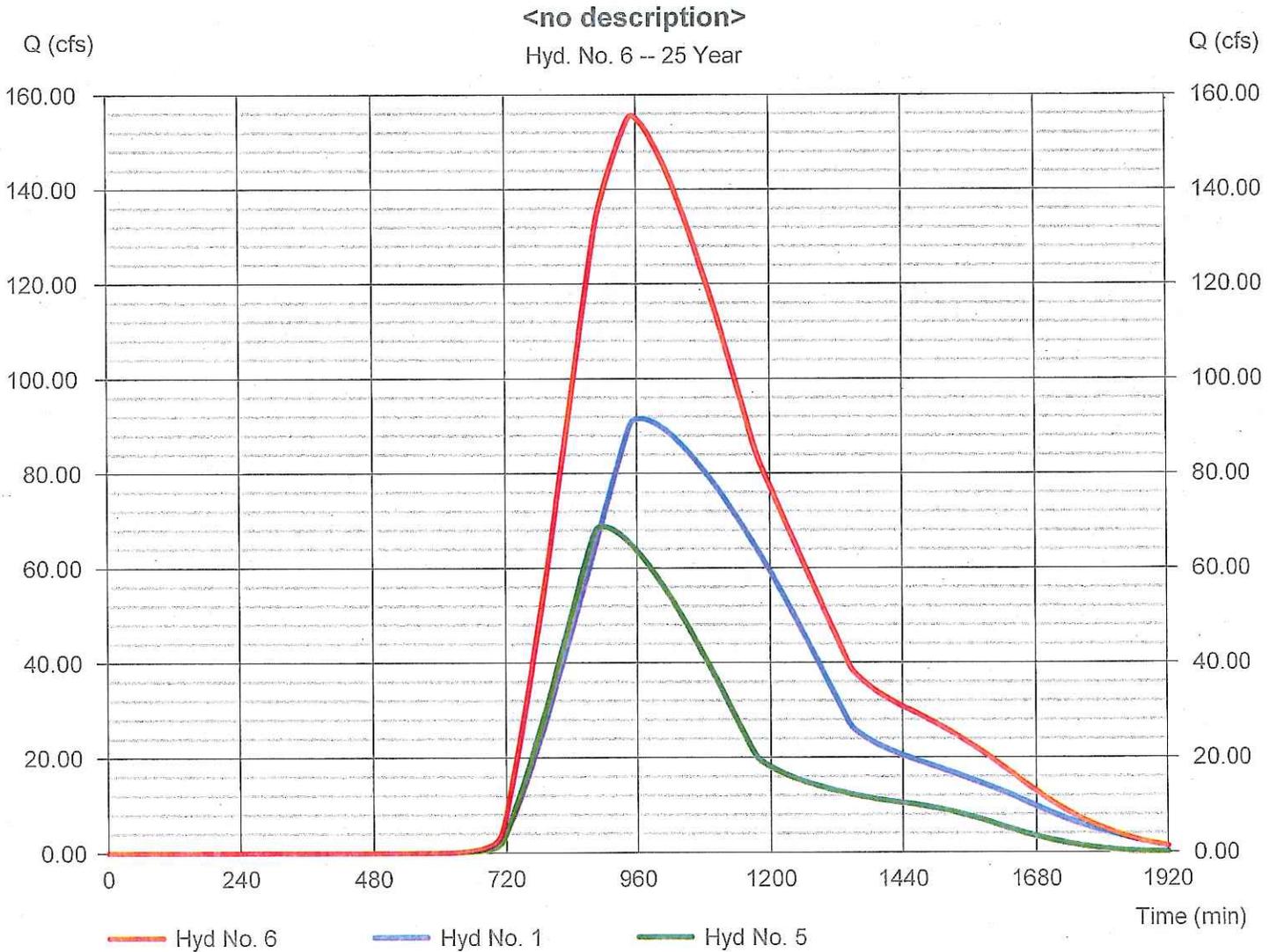
Thursday, 01 / 28 / 2016

## Hyd. No. 6

<no description>

Hydrograph type = Combine  
Storm frequency = 25 yrs  
Time interval = 2 min  
Inflow hyds. = 1, 5

Peak discharge = 155.60 cfs  
Time to peak = 952 min  
Hyd. volume = 4,181,718 cuft  
Contrib. drain. area = 734.000 ac



# Hydrograph Report

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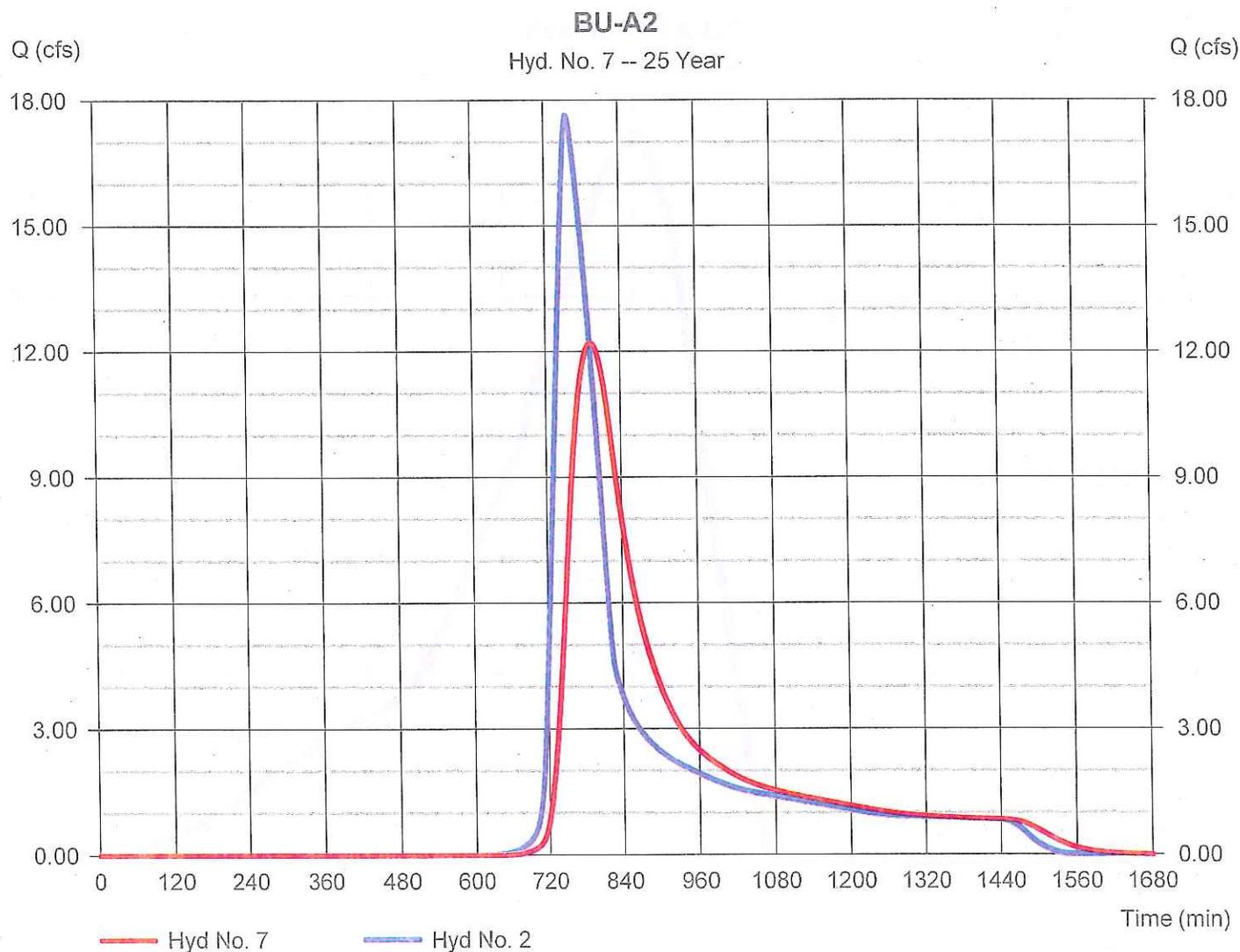
Thursday, 01 / 28 / 2016

## Hyd. No. 7

BU-A2

Hydrograph type	= Reach	Peak discharge	= 12.20 cfs
Storm frequency	= 25 yrs	Time to peak	= 792 min
Time interval	= 2 min	Hyd. volume	= 135,201 cuft
Inflow hyd. No.	= 2 - BU-A2	Section type	= Trapezoidal
Reach length	= 3500.0 ft	Channel slope	= 0.1 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 1.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.193	Rating curve m	= 1.553
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0501

Modified Att-Kin routing method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

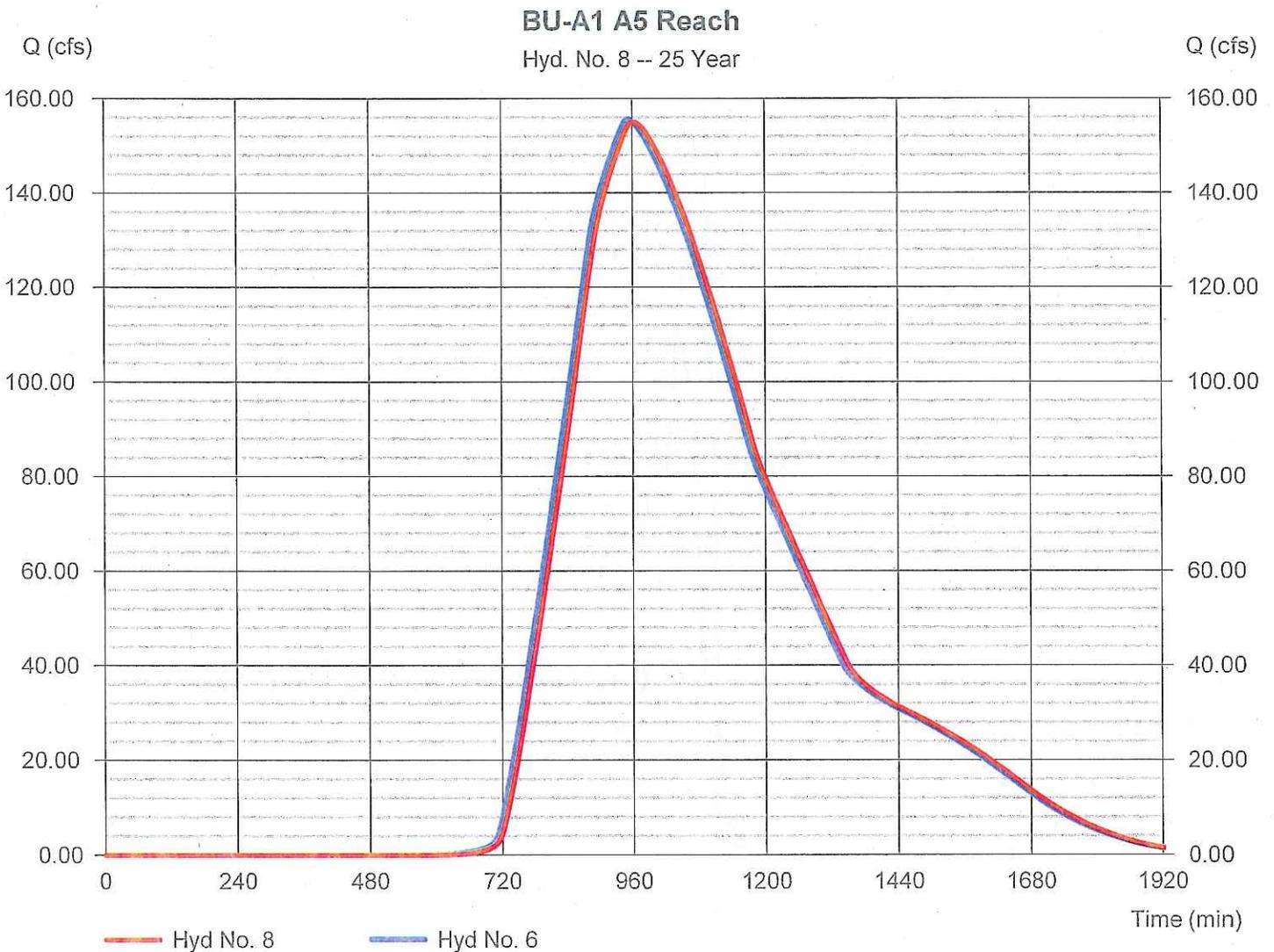
Thursday, 01 / 28 / 2016

## Hyd. No. 8

### BU-A1 A5 Reach

Hydrograph type	= Reach	Peak discharge	= 155.02 cfs
Storm frequency	= 25 yrs	Time to peak	= 960 min
Time interval	= 2 min	Hyd. volume	= 4,181,716 cuft
Inflow hyd. No.	= 6 - <no description>	Section type	= Trapezoidal
Reach length	= 1800.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 1.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.274	Rating curve m	= 1.553
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.2386

Modified Att-Kin routing method used.



# Hydrograph Report

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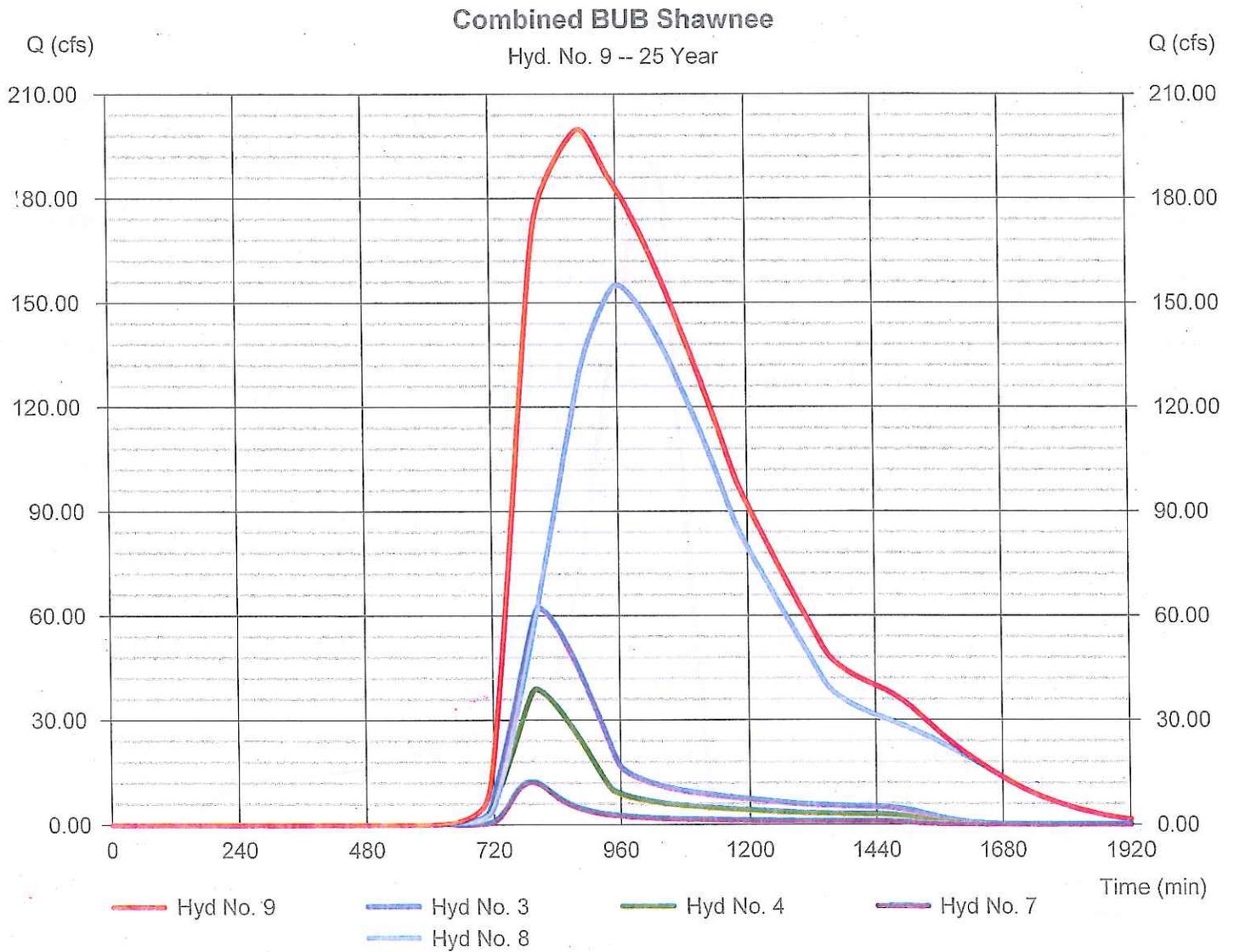
Thursday, 01 / 28 / 2016

## Hyd. No. 9

Combined BUB Shawnee

Hydrograph type = Combine  
 Storm frequency = 25 yrs  
 Time interval = 2 min  
 Inflow hyds. = 3, 4, 7, 8

Peak discharge = 199.88 cfs  
 Time to peak = 890 min  
 Hyd. volume = 5,667,689 cuft  
 Contrib. drain. area = 239.000 ac



# Hydrograph Report

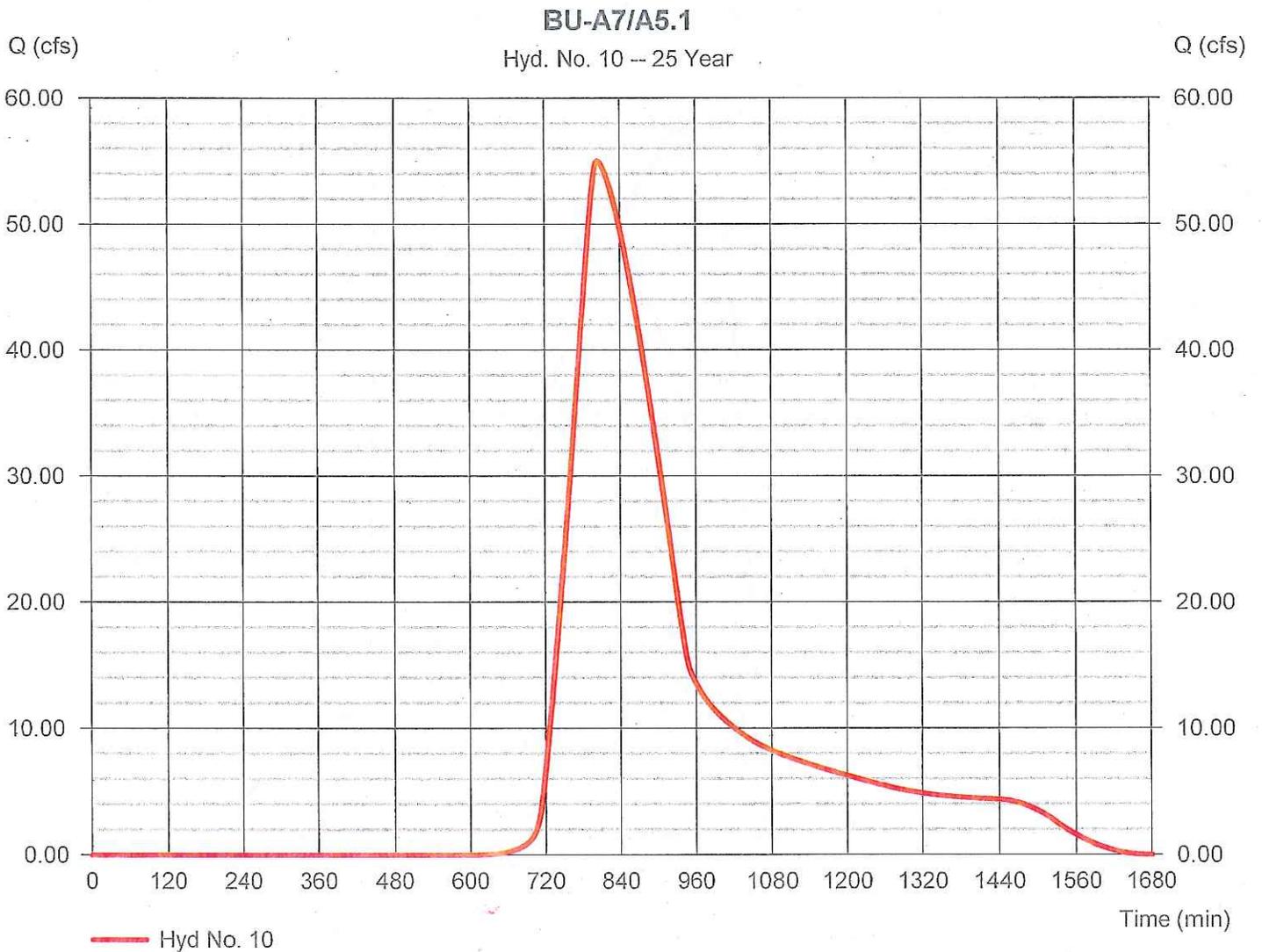
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## Hyd. No. 10

BU-A7/A5.1

Hydrograph type	= SCS Runoff	Peak discharge	= 55.01 cfs
Storm frequency	= 25 yrs	Time to peak	= 804 min
Time interval	= 2 min	Hyd. volume	= 729,481 cuft
Drainage area	= 138.000 ac	Curve number	= 76
Basin Slope	= 0.6 %	Hydraulic length	= 4250 ft
Tc method	= LAG	Time of conc. (Tc)	= 147.56 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

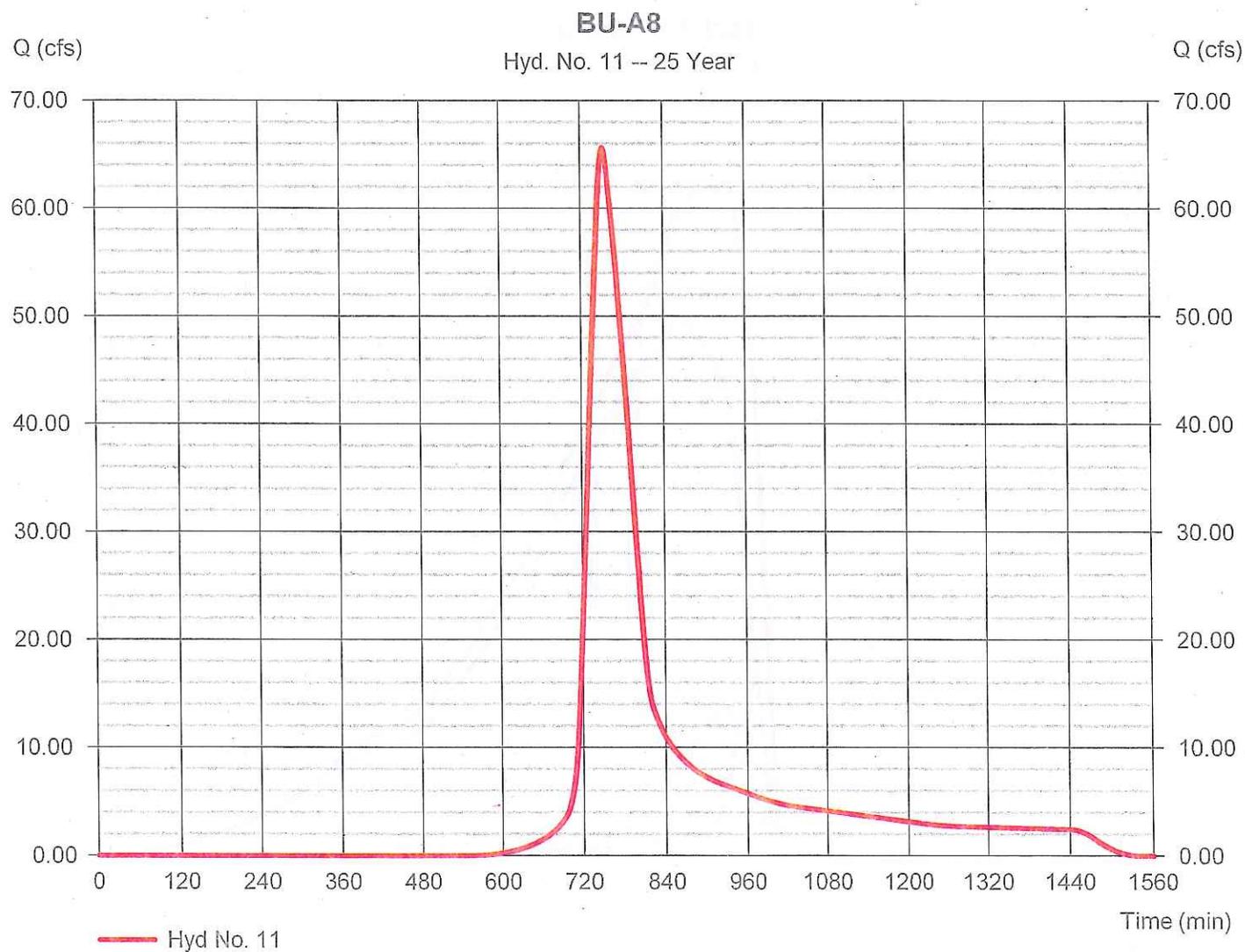
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## Hyd. No. 11

BU-A8

Hydrograph type	= SCS Runoff	Peak discharge	= 65.60 cfs
Storm frequency	= 25 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 450,903 cuft
Drainage area	= 74.000 ac	Curve number	= 79
Basin Slope	= 0.9 %	Hydraulic length	= 2100 ft
Tc method	= LAG	Time of conc. (Tc)	= 62.67 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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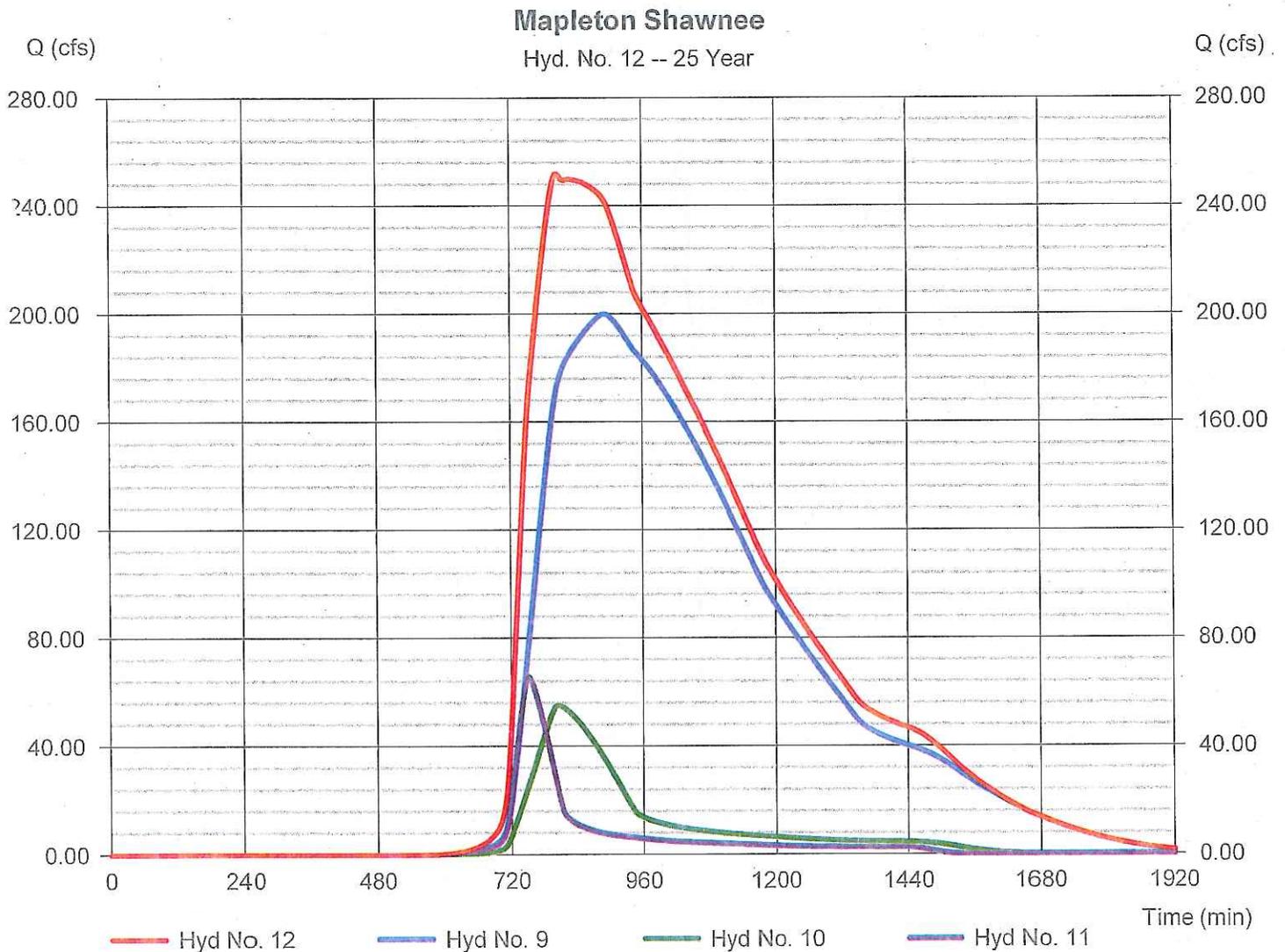
Thursday, 01 / 28 / 2016

## Hyd. No. 12

Mapleton Shawnee

Hydrograph type = Combine  
 Storm frequency = 25 yrs  
 Time interval = 2 min  
 Inflow hyds. = 9, 10, 11

Peak discharge = 251.87 cfs  
 Time to peak = 804 min  
 Hyd. volume = 6,848,074 cuft  
 Contrib. drain. area = 212.000 ac



# Hydrograph Report

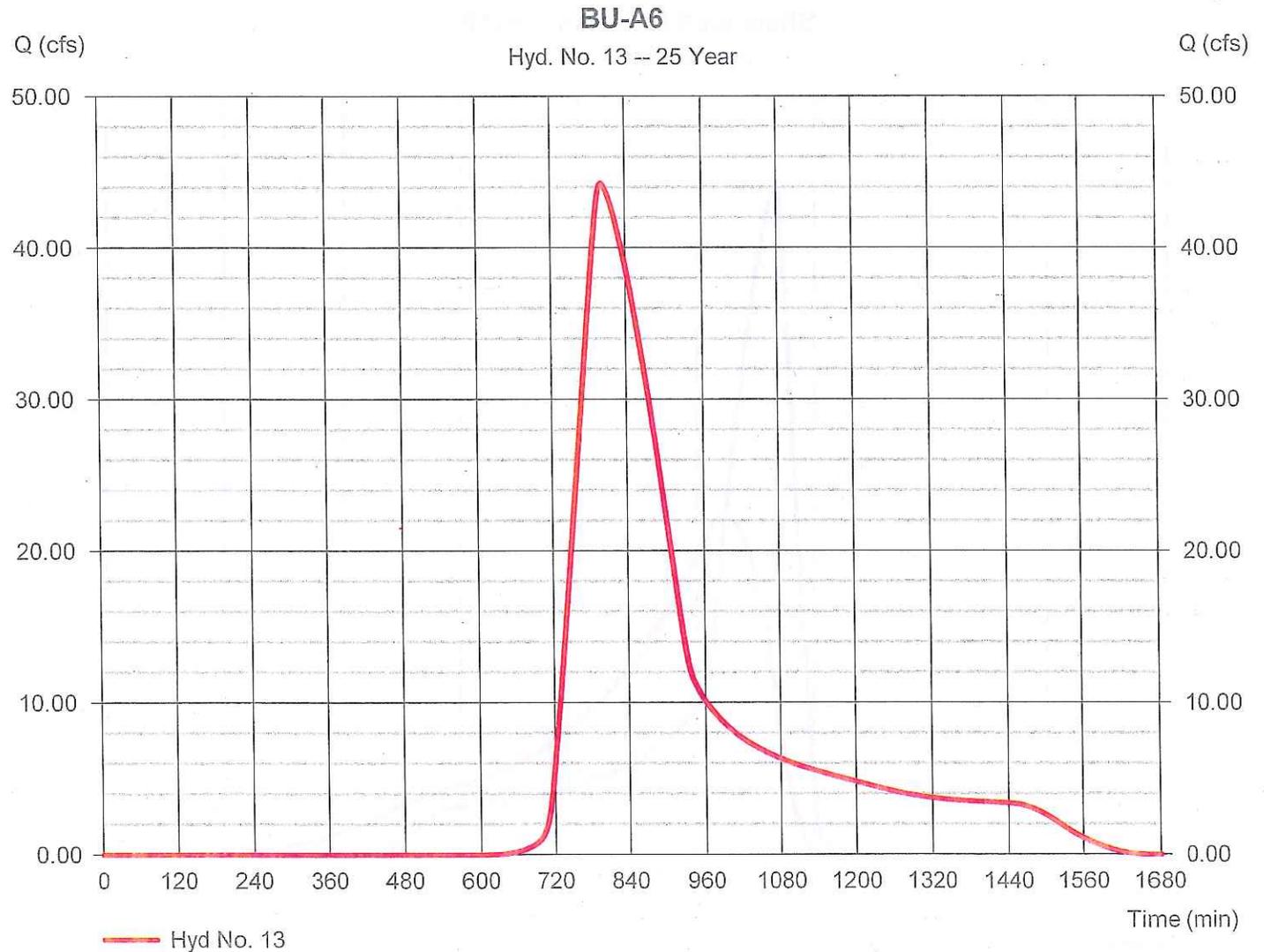
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Thursday, 01 / 28 / 2016

## Hyd. No. 13

BU-A6

Hydrograph type	= SCS Runoff	Peak discharge	= 44.25 cfs
Storm frequency	= 25 yrs	Time to peak	= 800 min
Time interval	= 2 min	Hyd. volume	= 567,223 cuft
Drainage area	= 107.000 ac	Curve number	= 76
Basin Slope	= 0.4 %	Hydraulic length	= 3300 ft
Tc method	= LAG	Time of conc. (Tc)	= 139.17 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

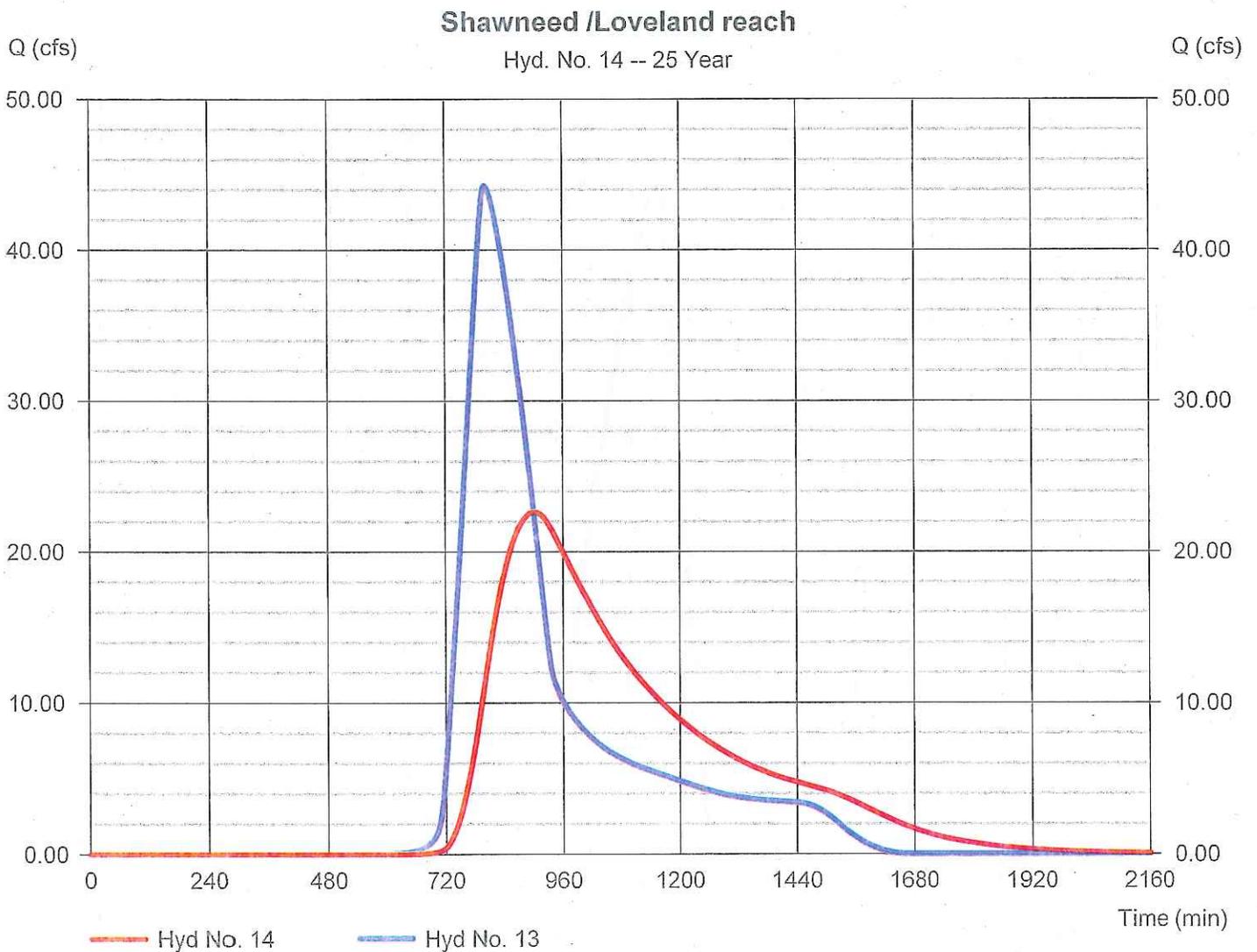
Thursday, 01 / 28 / 2016

## Hyd. No. 14

Shawneed /Loveland reach

Hydrograph type	= Reach	Peak discharge	= 22.65 cfs
Storm frequency	= 25 yrs	Time to peak	= 900 min
Time interval	= 2 min	Hyd. volume	= 567,134 cuft
Inflow hyd. No.	= 13 - BU-A6	Section type	= Trapezoidal
Reach length	= 16800.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.280	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0132

Modified Att-Kin routing method used.



# Hydrograph Report

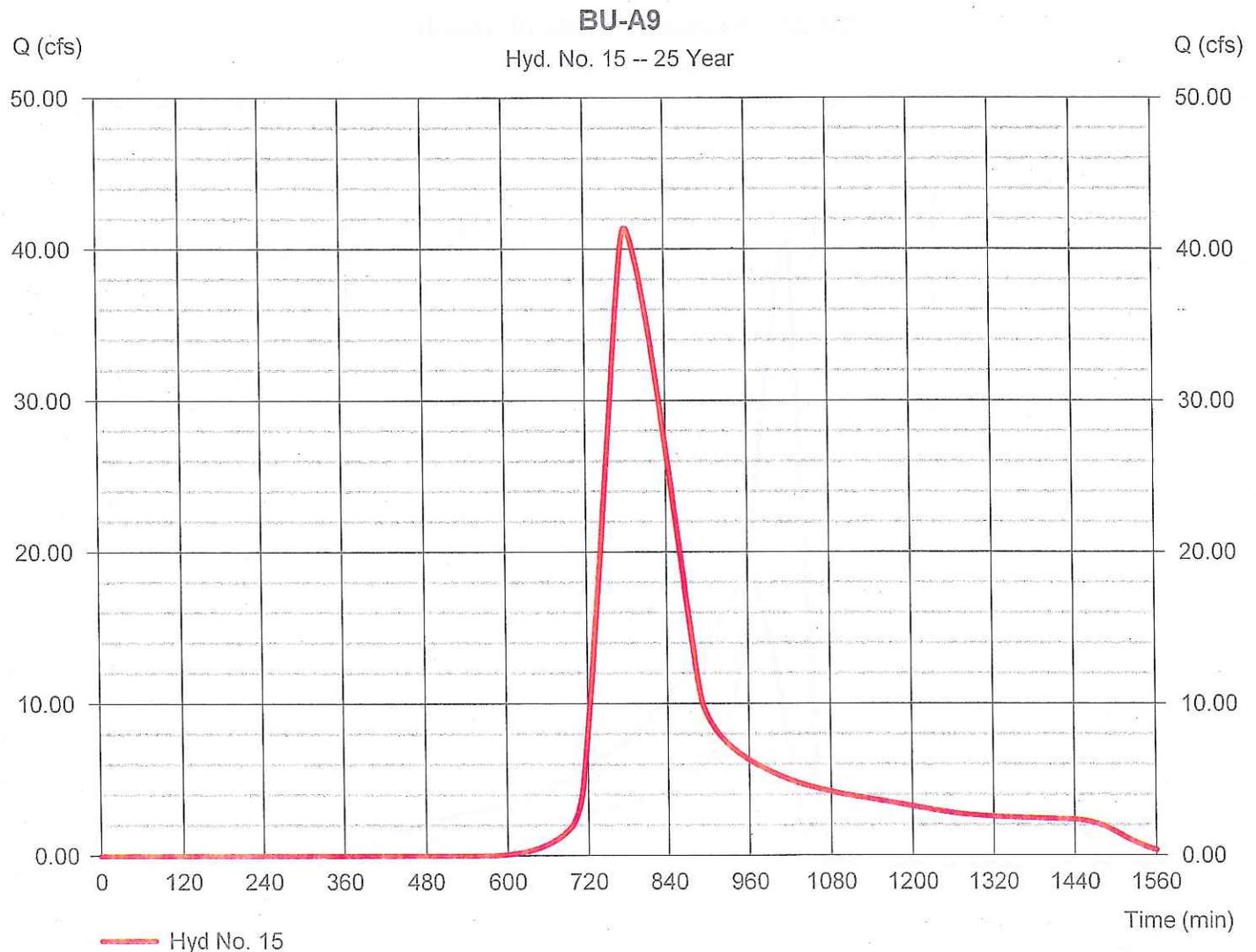
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 15

BU-A9

Hydrograph type	= SCS Runoff	Peak discharge	= 41.39 cfs
Storm frequency	= 25 yrs	Time to peak	= 780 min
Time interval	= 2 min	Hyd. volume	= 429,796 cuft
Drainage area	= 71.000 ac	Curve number	= 79
Basin Slope	= 0.5 %	Hydraulic length	= 2800 ft
Tc method	= LAG	Time of conc. (Tc)	= 110.34 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

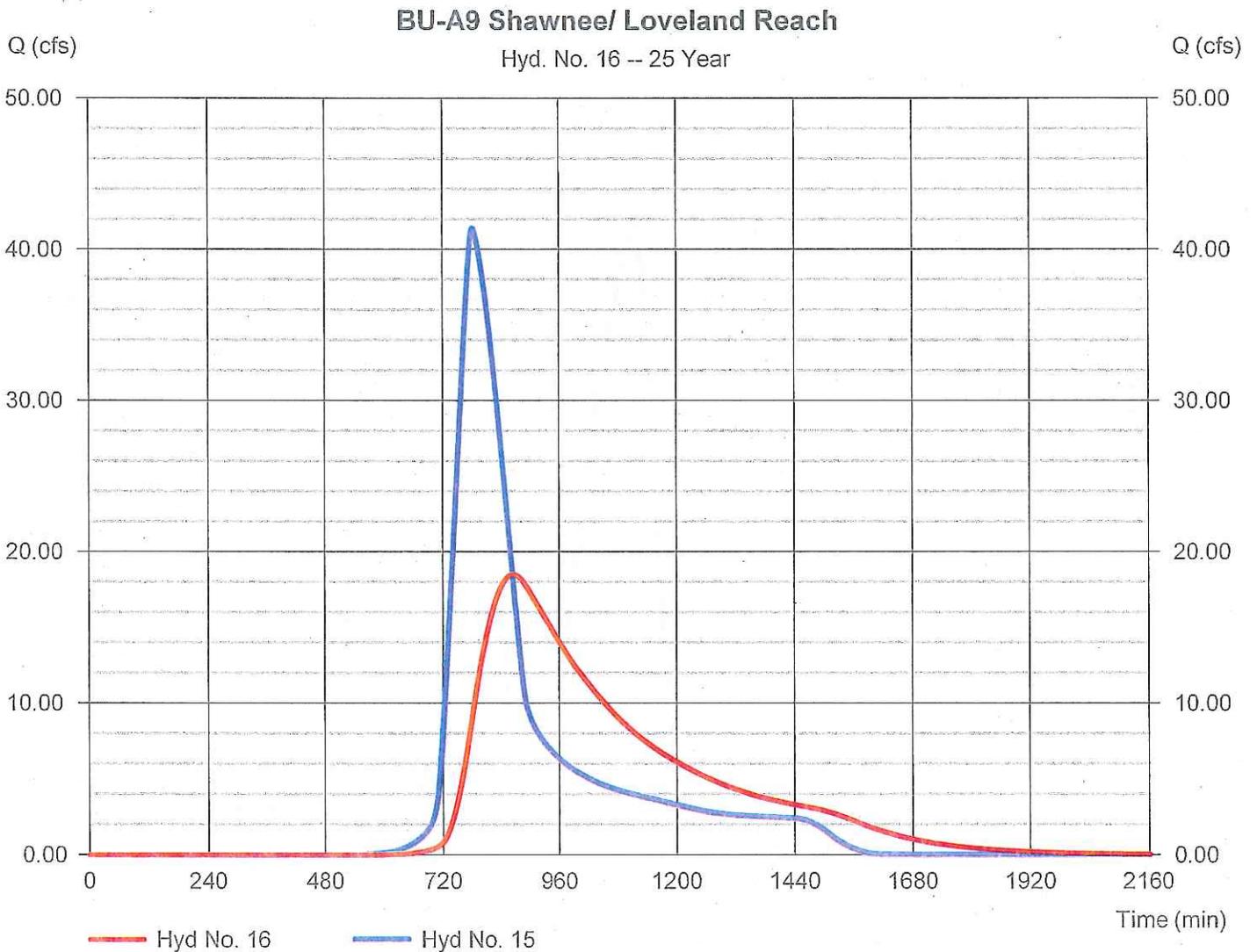
Thursday, 01 / 28 / 2016

## Hyd. No. 16

### BU-A9 Shawnee/ Loveland Reach

Hydrograph type	= Reach	Peak discharge	= 18.48 cfs
Storm frequency	= 25 yrs	Time to peak	= 864 min
Time interval	= 2 min	Hyd. volume	= 429,705 cuft
Inflow hyd. No.	= 15 - BU-A9	Section type	= Trapezoidal
Reach length	= 15500.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.280	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0131

Modified Att-Kin routing method used.



# Hydrograph Report

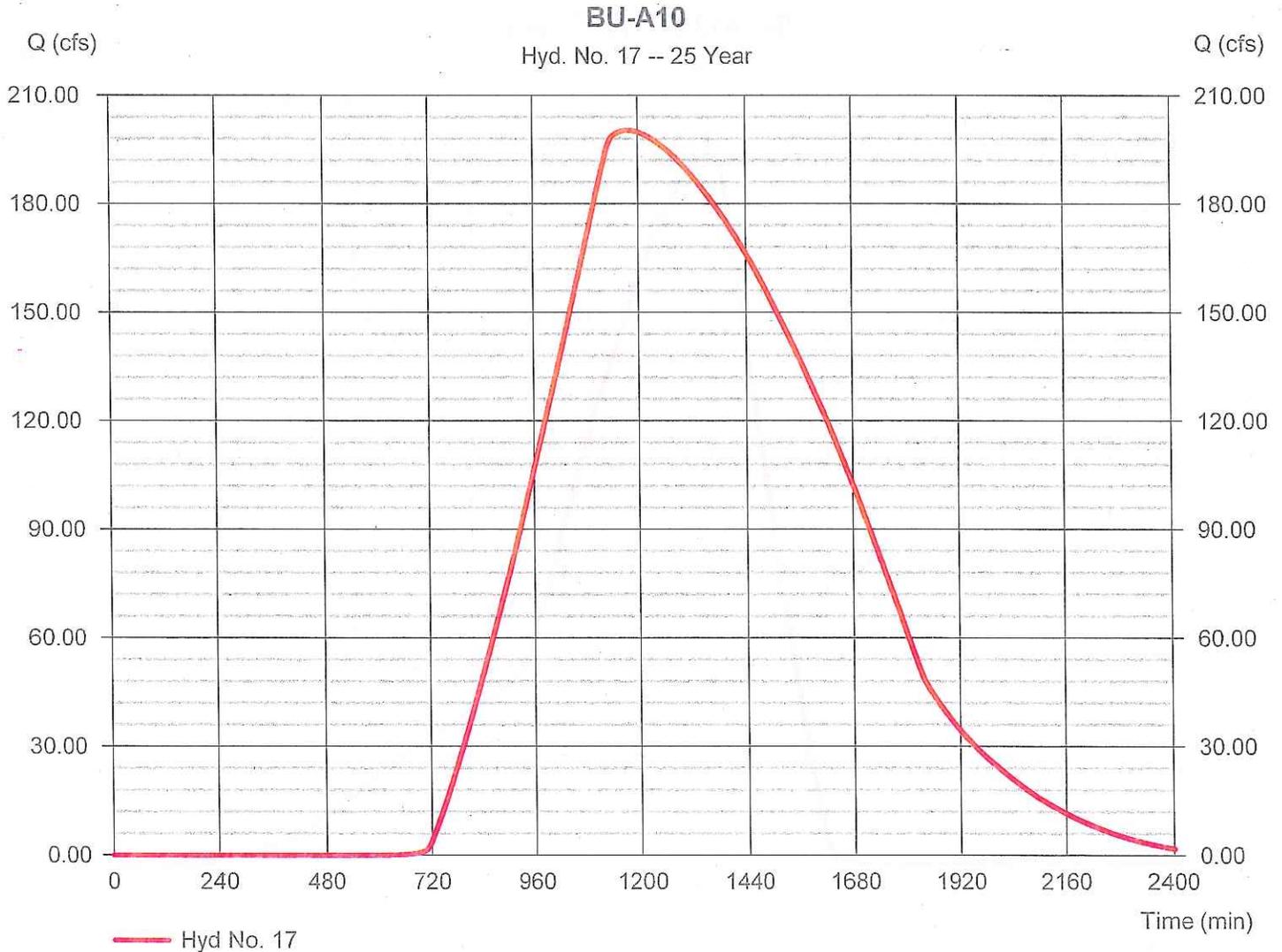
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Thursday, 01 / 28 / 2016

## Hyd. No. 17

BU-A10

Hydrograph type	= SCS Runoff	Peak discharge	= 200.28 cfs
Storm frequency	= 25 yrs	Time to peak	= 1176 min
Time interval	= 2 min	Hyd. volume	= 9,095,027 cuft
Drainage area	= 1639.000 ac	Curve number	= 77
Basin Slope	= 0.2 %	Hydraulic length	= 16500 ft
Tc method	= LAG	Time of conc. (Tc)	= 716.88 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

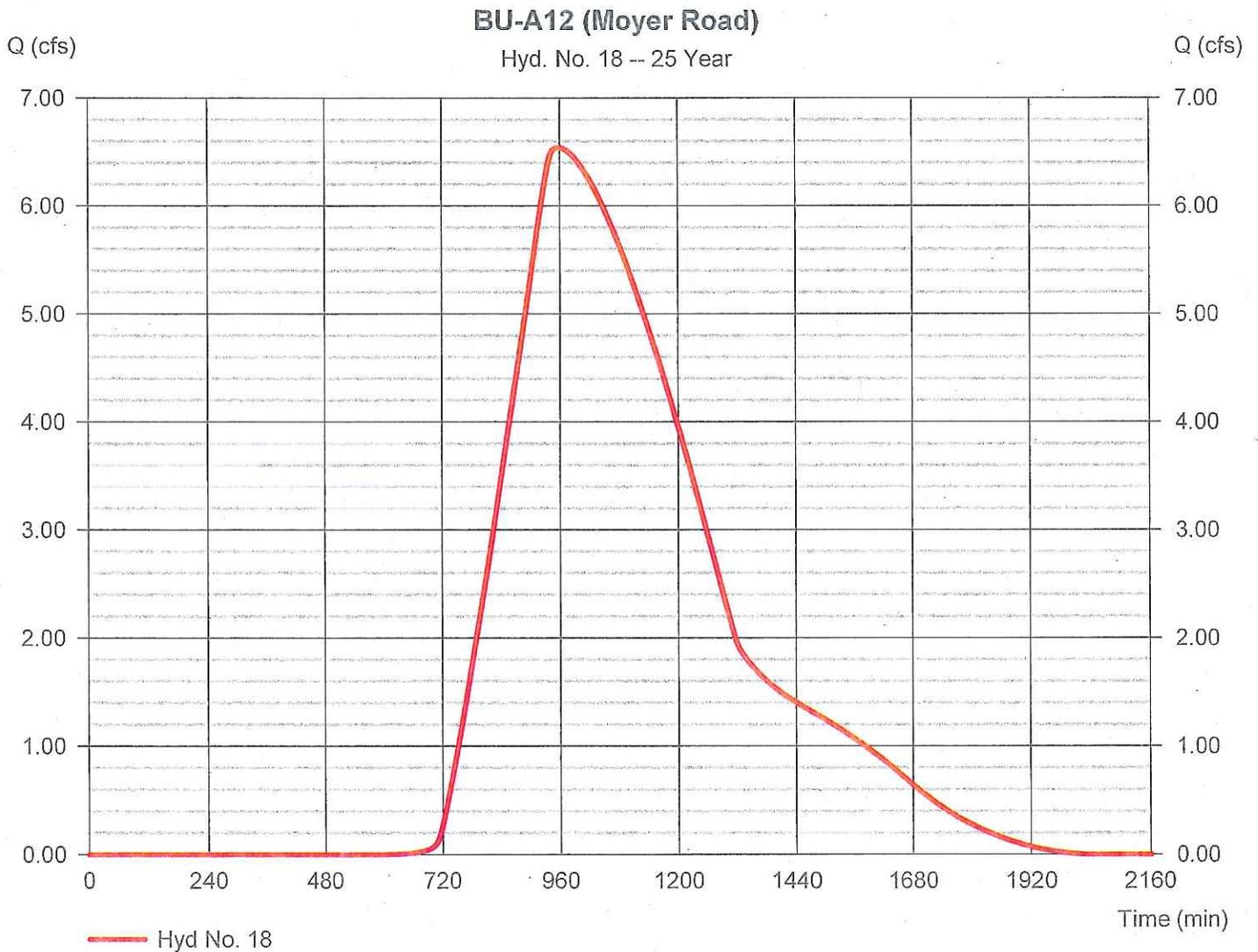
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## Hyd. No. 18

BU-A12 (Moyer Road)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.541 cfs
Storm frequency	= 25 yrs	Time to peak	= 958 min
Time interval	= 2 min	Hyd. volume	= 183,013 cuft
Drainage area	= 33.000 ac	Curve number	= 77
Basin Slope	= 0.1 %	Hydraulic length	= 4000 ft
Tc method	= LAG	Time of conc. (Tc)	= 386.09 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

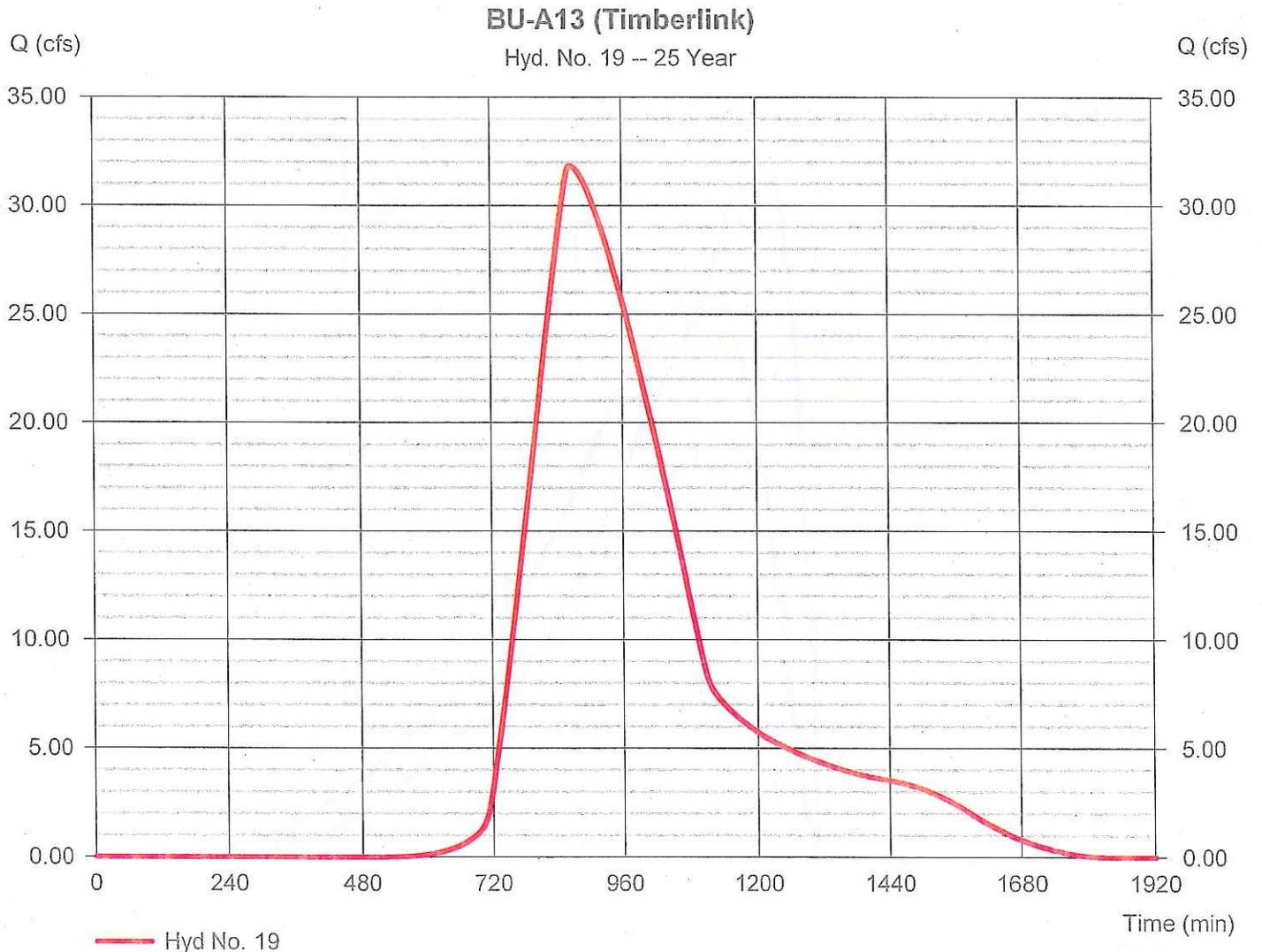
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 01 / 28 / 2016

## Hyd. No. 19

BU-A13 (Timberlink)

Hydrograph type	= SCS Runoff	Peak discharge	= 31.84 cfs
Storm frequency	= 25 yrs	Time to peak	= 866 min
Time interval	= 2 min	Hyd. volume	= 617,621 cuft
Drainage area	= 90.000 ac	Curve number	= 82
Basin Slope	= 0.1 %	Hydraulic length	= 3400 ft
Tc method	= LAG	Time of conc. (Tc)	= 251.44 min
Total precip.	= 3.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 20

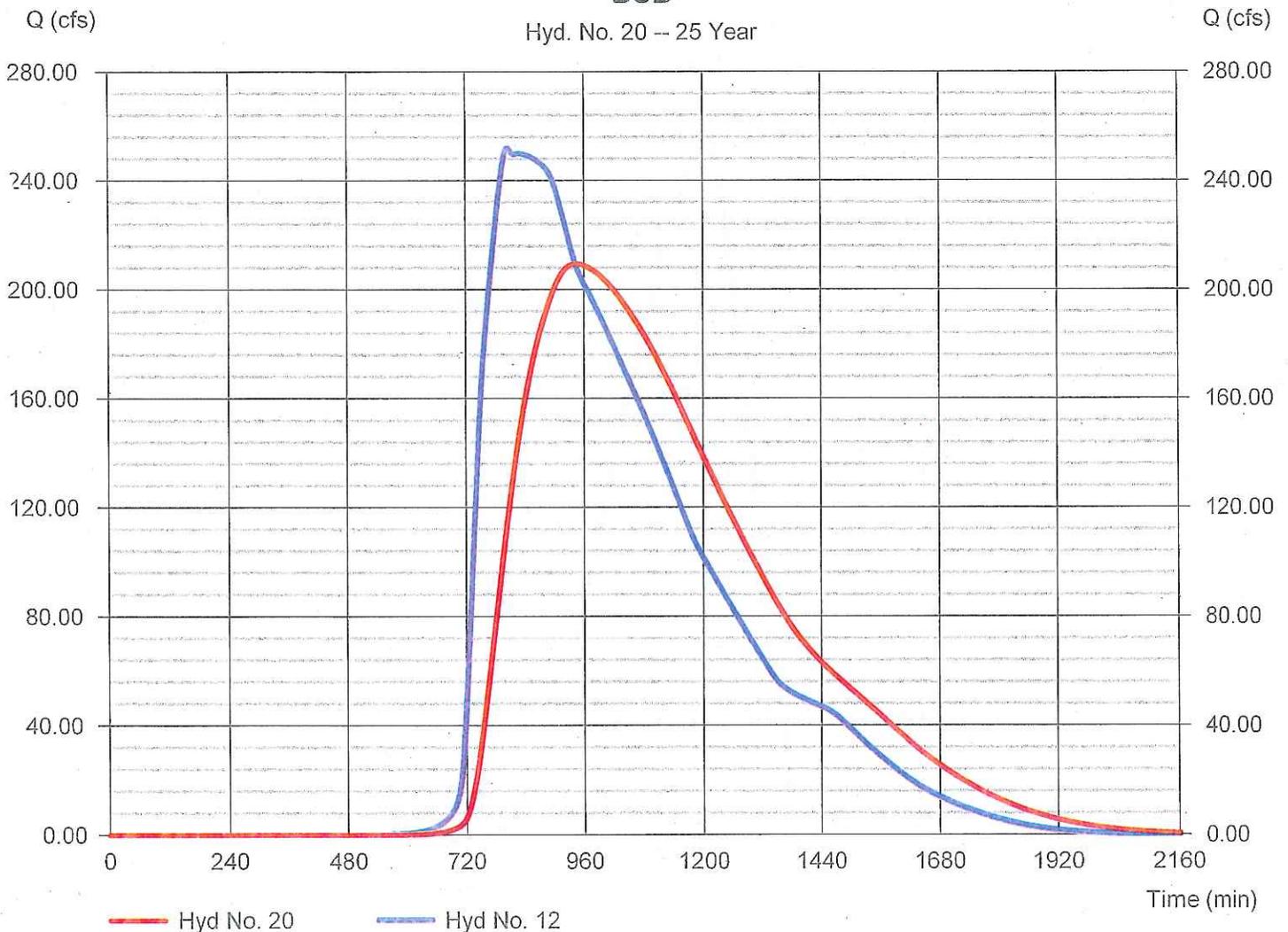
BUB

Hydrograph type	= Reach	Peak discharge	= 209.42 cfs
Storm frequency	= 25 yrs	Time to peak	= 944 min
Time interval	= 2 min	Hyd. volume	= 6,848,015 cuft
Inflow hyd. No.	= 12 - Mapleton Shawnee	Section type	= Trapezoidal
Reach length	= 17000.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.274	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0217

Modified Att-Kin routing method used.

### BUB

Hyd. No. 20 -- 25 Year



# Hydrograph Report

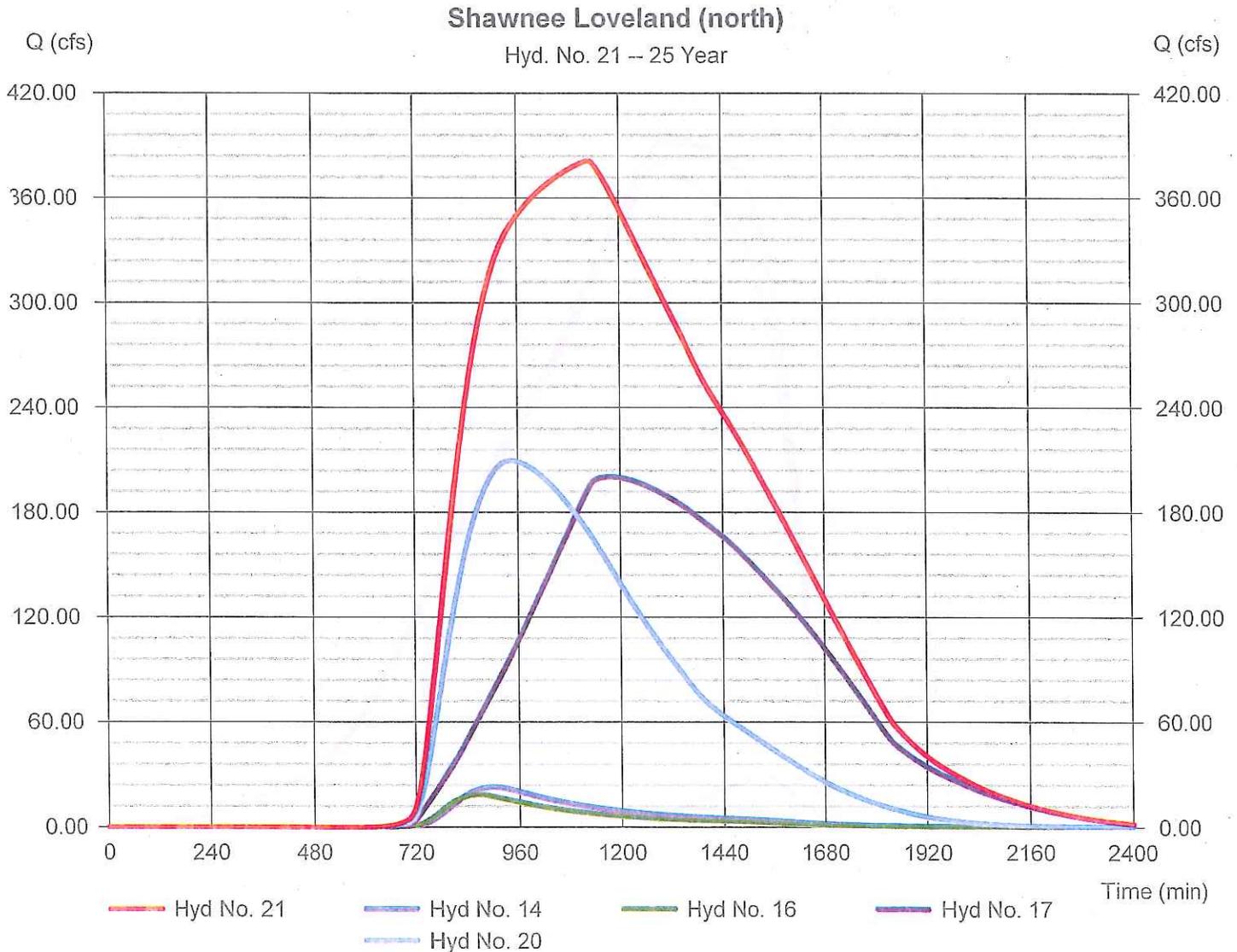
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 01 / 28 / 2016

## Hyd. No. 21

Shawnee Loveland (north)

Hydrograph type	= Combine	Peak discharge	= 381.20 cfs
Storm frequency	= 25 yrs	Time to peak	= 1128 min
Time interval	= 2 min	Hyd. volume	= 16,939,900 cuft
Inflow hyds.	= 14, 16, 17, 20	Contrib. drain. area	= 1639.000 ac



# Hydrograph Report

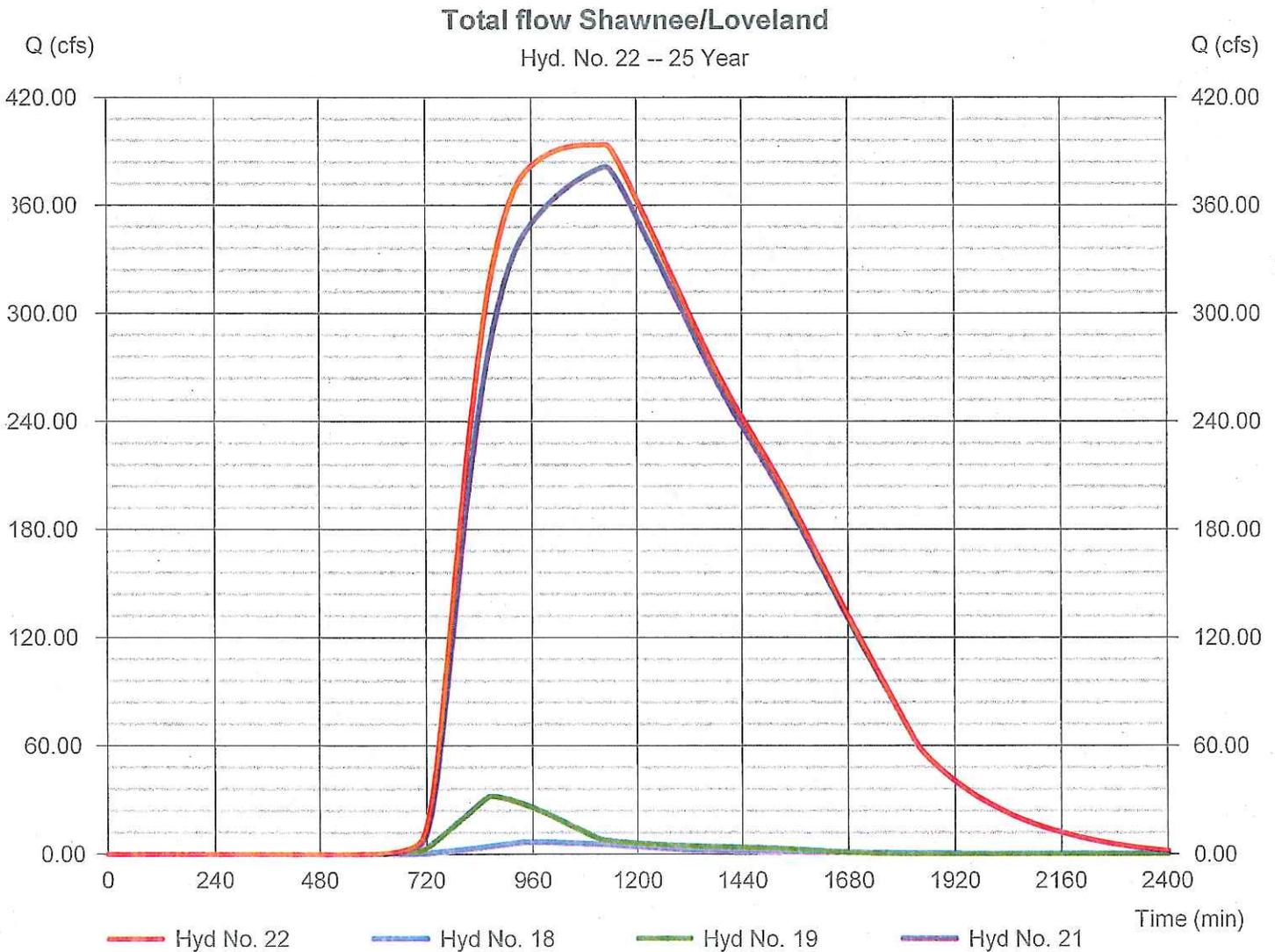
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 22

Total flow Shawnee/Loveland

Hydrograph type	= Combine	Peak discharge	= 393.73 cfs
Storm frequency	= 25 yrs	Time to peak	= 1122 min
Time interval	= 2 min	Hyd. volume	= 17,740,530 cuft
Inflow hyds.	= 18, 19, 21	Contrib. drain. area	= 123.000 ac



# Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	154.80	2	960	4,324,838	----	----	----	BU-A1
2	SCS Runoff	31.59	2	756	232,222	----	----	----	BU-A2
3	SCS Runoff	106.81	2	808	1,414,275	----	----	----	BU-A3
4	SCS Runoff	65.69	2	800	822,486	----	----	----	BU-A4
5	SCS Runoff	118.13	2	892	2,581,198	----	----	----	BU-A5
6	Combine	263.35	2	950	6,906,037	1, 5	----	----	<no description>
7	Reach	23.40	2	786	232,204	2	----	----	BU-A2
8	Reach	262.67	2	956	6,906,028	6	----	----	BU-A1 A5 Reach
9	Combine	340.42	2	888	9,374,986	3, 4, 7, 8	----	----	Combined BUB Shawnee
10	SCS Runoff	95.86	2	804	1,225,493	----	----	----	BU-A7/A5.1
11	SCS Runoff	108.70	2	752	734,307	----	----	----	BU-A8
12	Combine	439.51	2	802	11,334,780	9, 10, 11	----	----	Mapleton Shawnee
13	SCS Runoff	77.08	2	800	952,909	----	----	----	BU-A6
14	Reach	42.84	2	890	952,832	13	----	----	Shawneed /Loveland reach
15	SCS Runoff	68.91	2	780	699,933	----	----	----	BU-A9
16	Reach	34.71	2	854	699,860	15	----	----	BU-A9 Shawnee/ Loveland Reach
17	SCS Runoff	339.76	2	1162	15,118,200	----	----	----	BU-A10
18	SCS Runoff	11.21	2	950	304,213	----	----	----	BU-A12 (Moyer Road)
19	SCS Runoff	51.23	2	866	976,762	----	----	----	BU-A13 (Timberlink)
20	Reach	372.32	2	924	11,334,740	12	----	----	BUB
21	Combine	629.42	2	1116	28,105,630	14, 16, 17, 20	----	----	Shawnee Loveland (north)
22	Combine	662.77	2	978	29,386,620	18, 19, 21	----	----	Total flow Shawnee/Loveland

Bull Creek tributary BUB.gpw

Return Period: 100 Year

Thursday, 01 / 28 / 2016

# Hydrograph Report

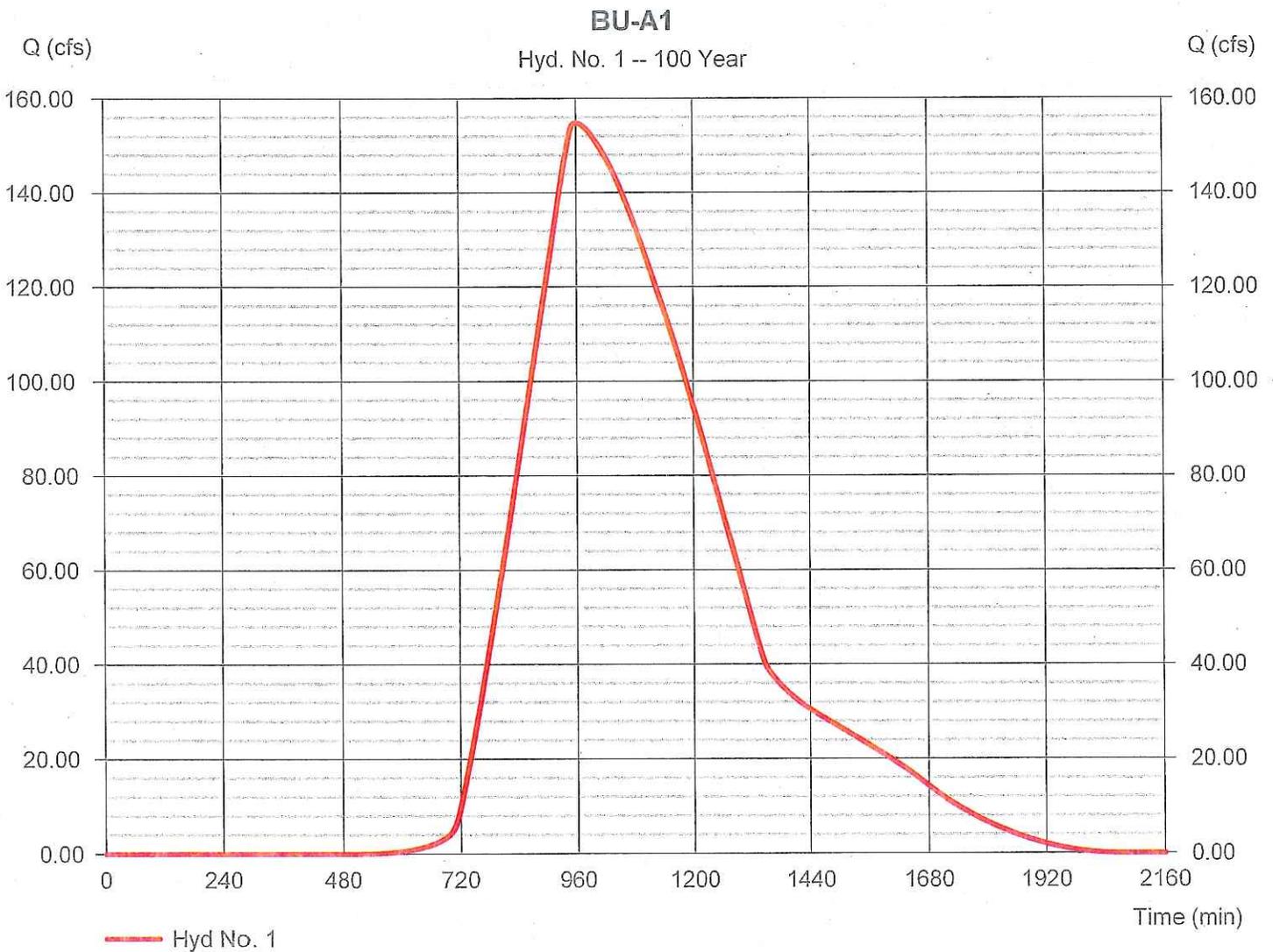
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Thursday, 01 / 28 / 2016

## Hyd. No. 1

BU-A1

Hydrograph type	= SCS Runoff	Peak discharge	= 154.80 cfs
Storm frequency	= 100 yrs	Time to peak	= 960 min
Time interval	= 2 min	Hyd. volume	= 4,324,838 cuft
Drainage area	= 454.000 ac	Curve number	= 78
Basin Slope	= 0.2 %	Hydraulic length	= 8600 ft
Tc method	= LAG	Time of conc. (Tc)	= 403.63 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

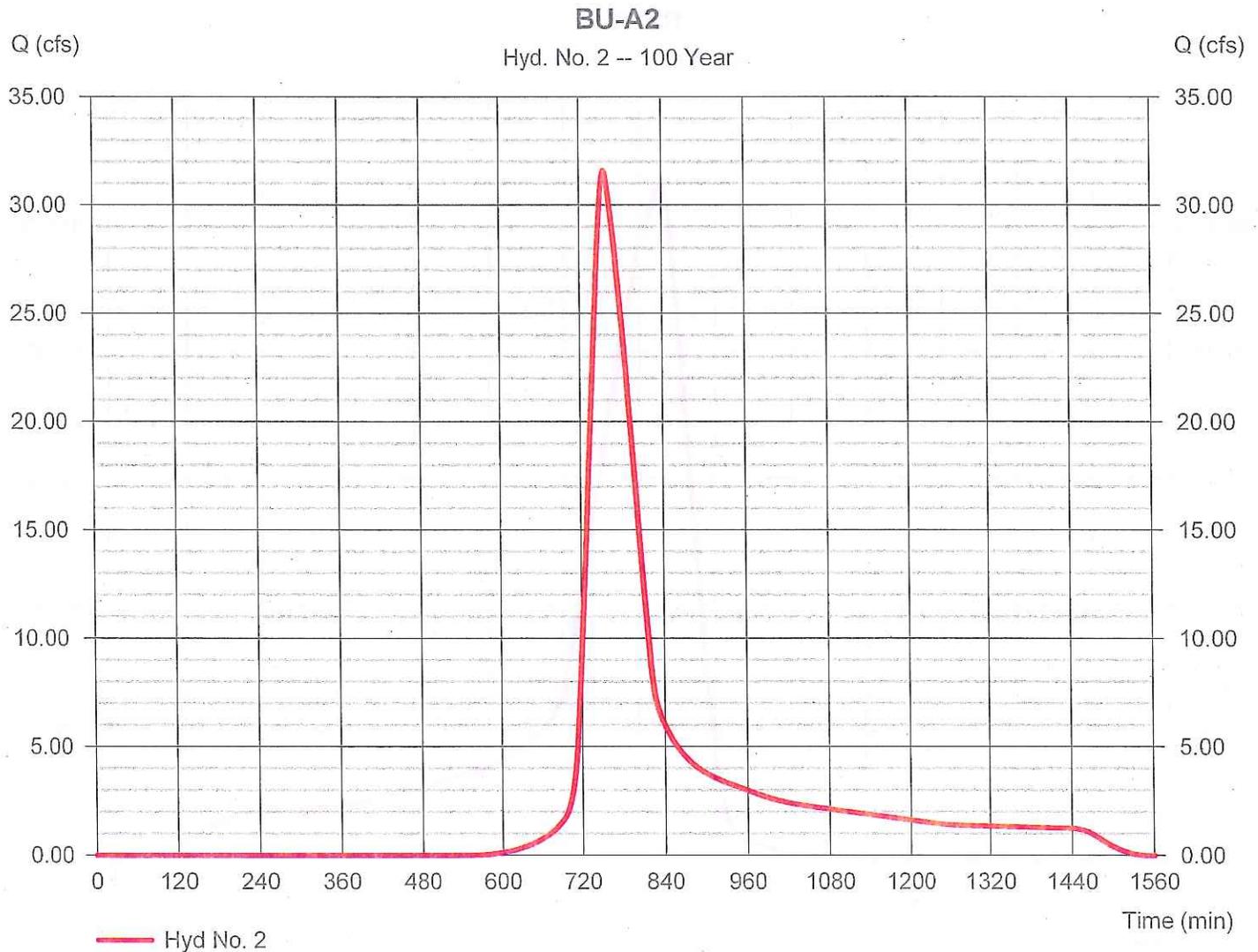
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## Hyd. No. 2

BU-A2

Hydrograph type	= SCS Runoff	Peak discharge	= 31.59 cfs
Storm frequency	= 100 yrs	Time to peak	= 756 min
Time interval	= 2 min	Hyd. volume	= 232,222 cuft
Drainage area	= 28.000 ac	Curve number	= 74
Basin Slope	= 0.8 %	Hydraulic length	= 1800 ft
Tc method	= LAG	Time of conc. (Tc)	= 68.07 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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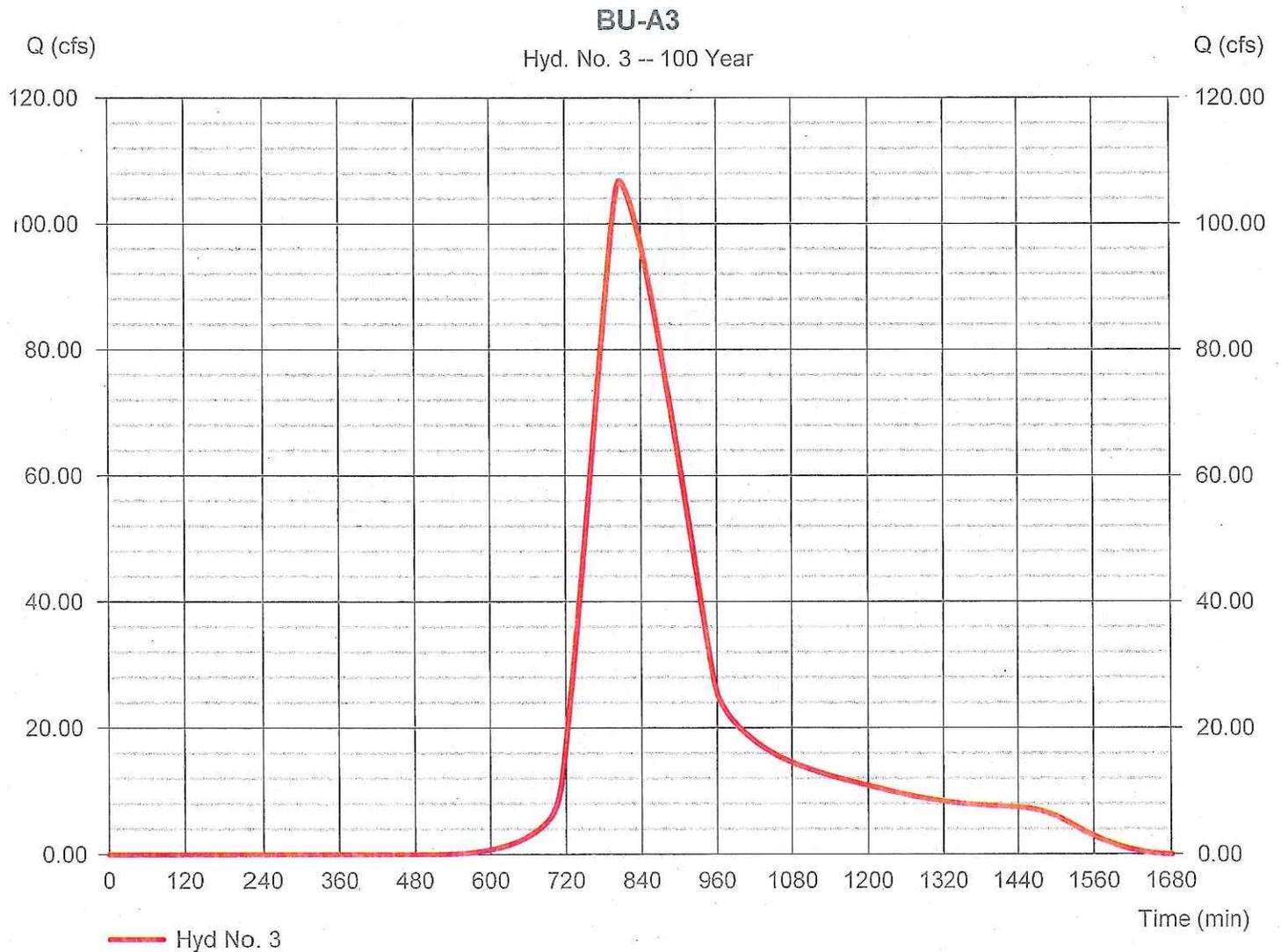
Thursday, 01 / 28 / 2016

## Hyd. No. 3

BU-A3

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 2 min  
Drainage area = 153.000 ac  
Basin Slope = 0.5 %  
Tc method = LAG  
Total precip. = 4.90 in  
Storm duration = 24 hrs

Peak discharge = 106.81 cfs  
Time to peak = 808 min  
Hyd. volume = 1,414,275 cuft  
Curve number = 77  
Hydraulic length = 4200 ft  
Time of conc. (Tc) = 155.48 min  
Distribution = Type II  
Shape factor = 484



# Hydrograph Report

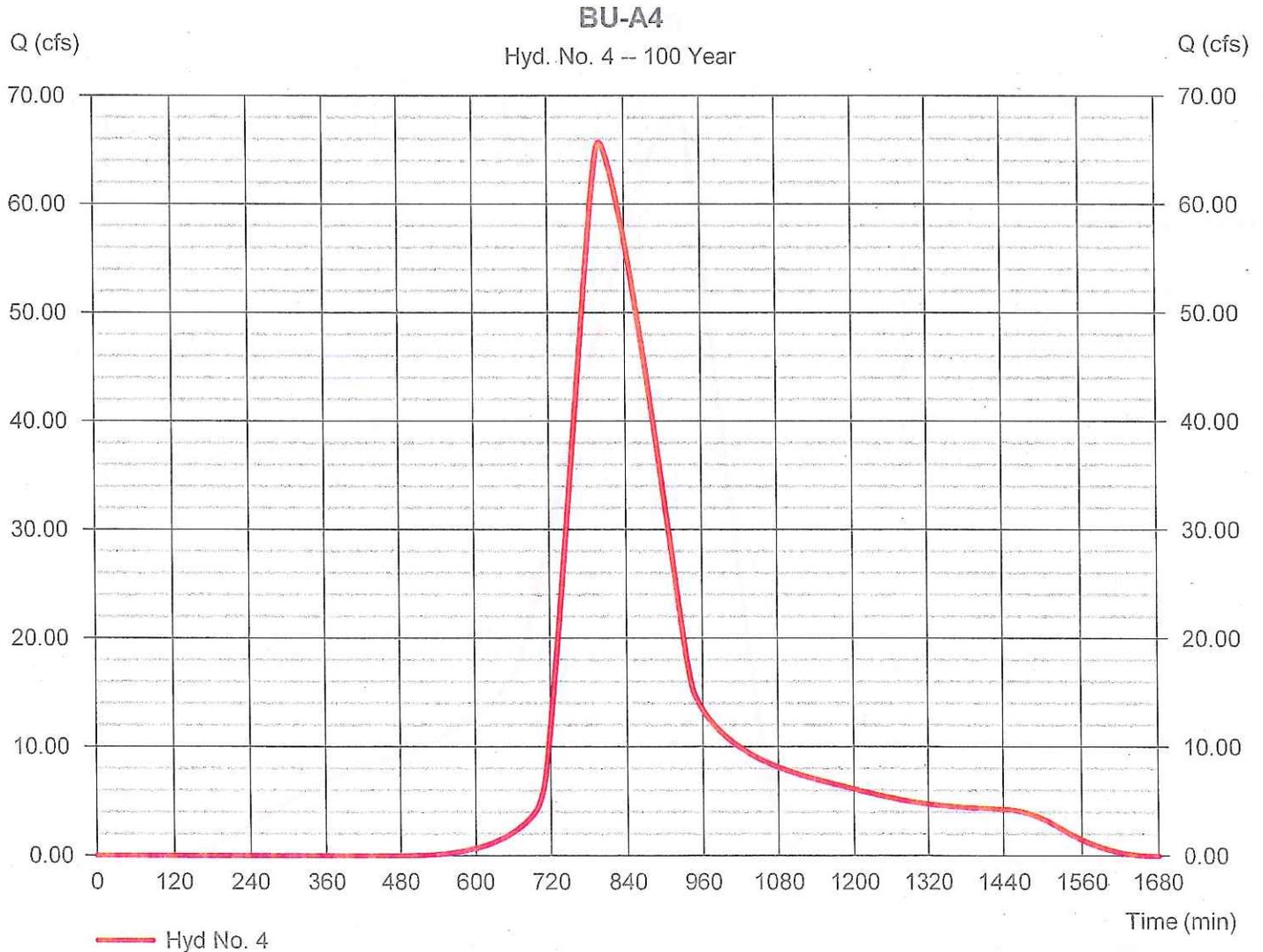
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 01 / 28 / 2016

## Hyd. No. 4

BU-A4

Hydrograph type	= SCS Runoff	Peak discharge	= 65.69 cfs
Storm frequency	= 100 yrs	Time to peak	= 800 min
Time interval	= 2 min	Hyd. volume	= 822,486 cuft
Drainage area	= 86.000 ac	Curve number	= 78
Basin Slope	= 0.4 %	Hydraulic length	= 3500 ft
Tc method	= LAG	Time of conc. (Tc)	= 145.82 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

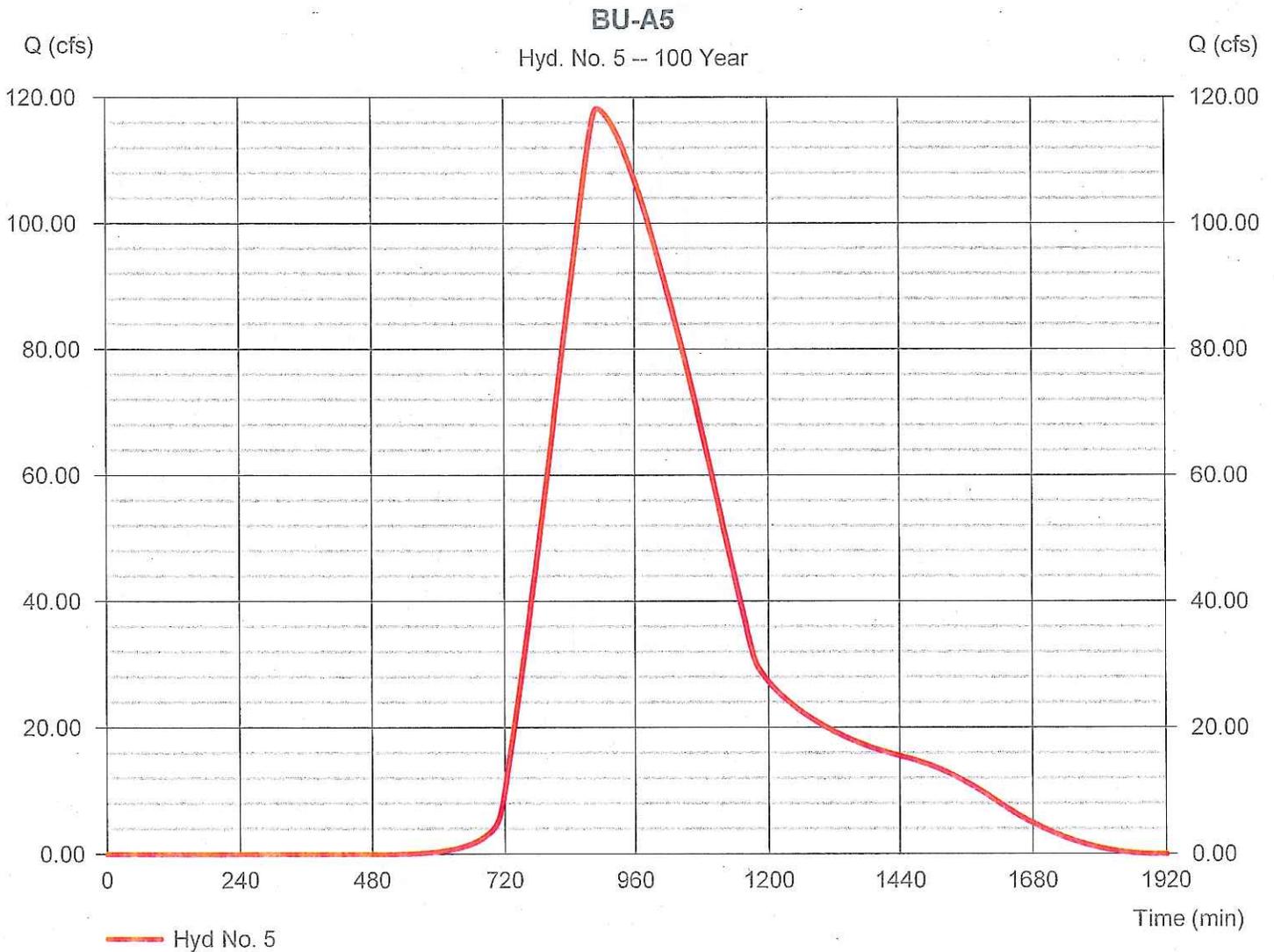
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## Hyd. No. 5

BU-A5

Hydrograph type	= SCS Runoff	Peak discharge	= 118.13 cfs
Storm frequency	= 100 yrs	Time to peak	= 892 min
Time interval	= 2 min	Hyd. volume	= 2,581,198 cuft
Drainage area	= 280.000 ac	Curve number	= 77
Basin Slope	= 0.3 %	Hydraulic length	= 6800 ft
Tc method	= LAG	Time of conc. (Tc)	= 295.13 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



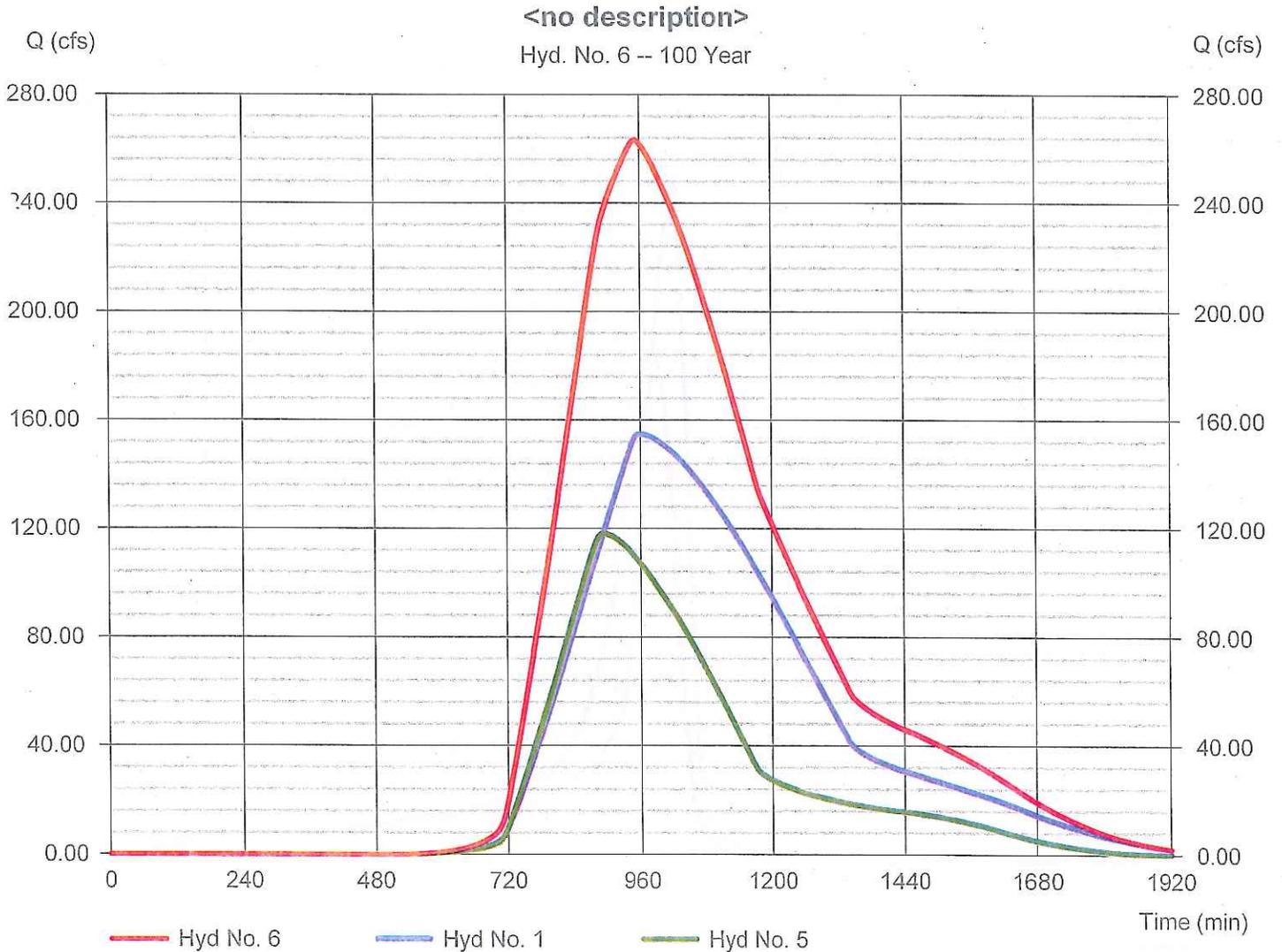
# Hydrograph Report

## Hyd. No. 6

<no description>

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 2 min  
Inflow hyds. = 1, 5

Peak discharge = 263.35 cfs  
Time to peak = 950 min  
Hyd. volume = 6,906,037 cuft  
Contrib. drain. area = 734.000 ac



# Hydrograph Report

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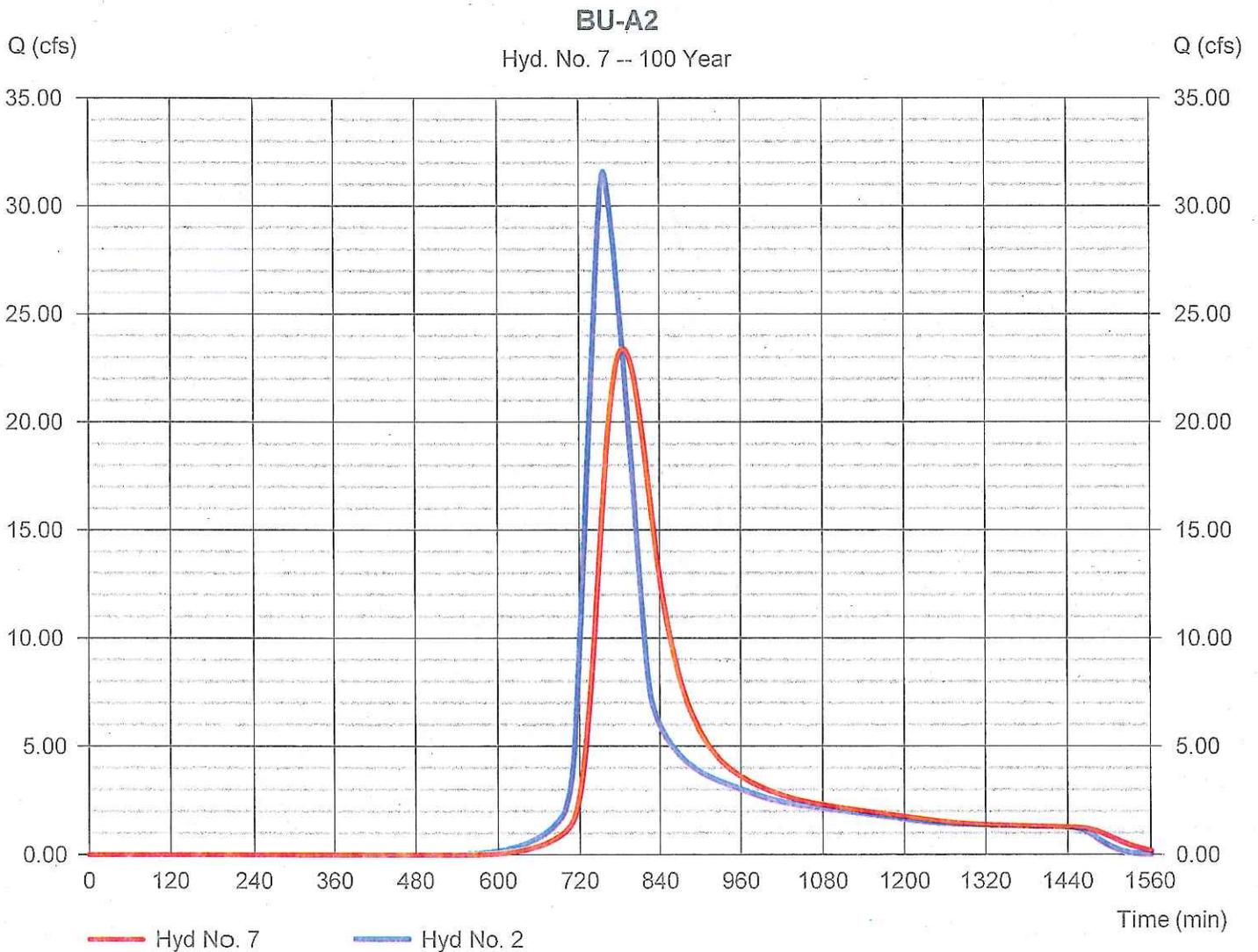
Thursday, 01 / 28 / 2016

## Hyd. No. 7

BU-A2

Hydrograph type	= Reach	Peak discharge	= 23.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 786 min
Time interval	= 2 min	Hyd. volume	= 232,204 cuft
Inflow hyd. No.	= 2 - BU-A2	Section type	= Trapezoidal
Reach length	= 3500.0 ft	Channel slope	= 0.1 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 1.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.193	Rating curve m	= 1.553
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0613

Modified Att-Kin routing method used.



# Hydrograph Report

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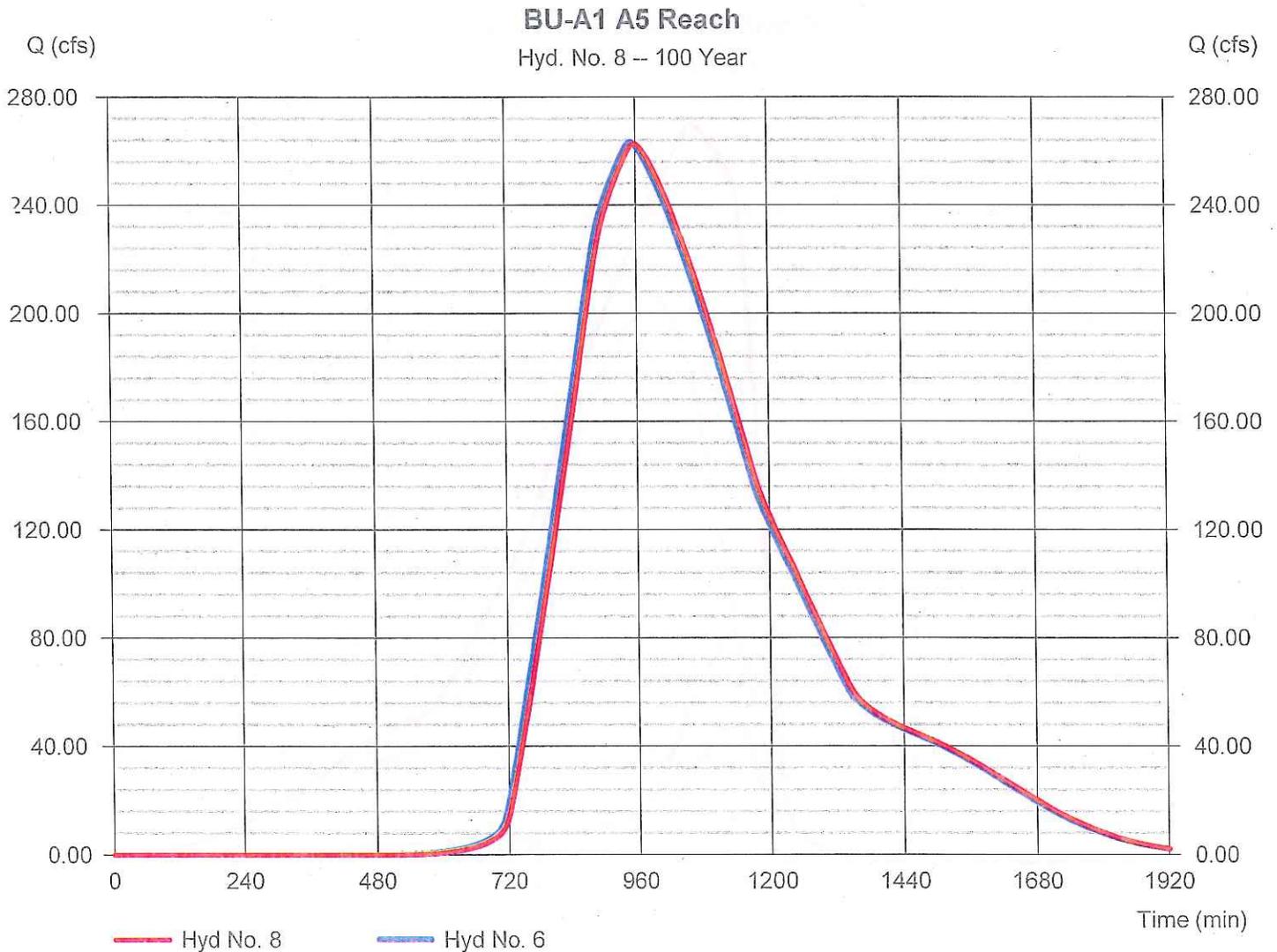
Thursday, 01 / 28 / 2016

## Hyd. No. 8

### BU-A1 A5 Reach

Hydrograph type	= Reach	Peak discharge	= 262.67 cfs
Storm frequency	= 100 yrs	Time to peak	= 956 min
Time interval	= 2 min	Hyd. volume	= 6,906,028 cuft
Inflow hyd. No.	= 6 - <no description>	Section type	= Trapezoidal
Reach length	= 1800.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 1.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.274	Rating curve m	= 1.553
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.2809

Modified Att-Kin routing method used.



# Hydrograph Report

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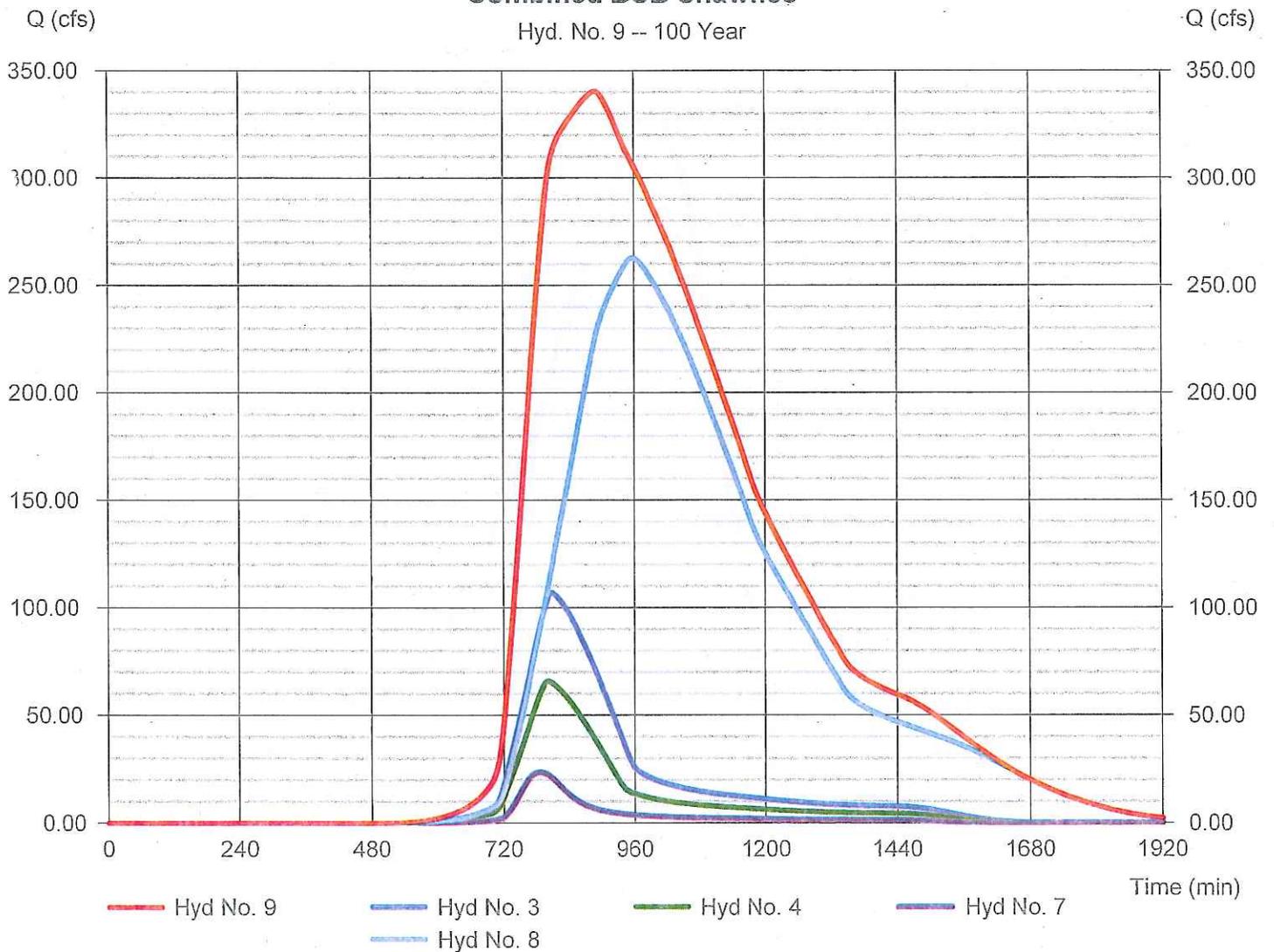
## Hyd. No. 9

Combined BUB Shawnee

Hydrograph type = Combine  
 Storm frequency = 100 yrs  
 Time interval = 2 min  
 Inflow hyds. = 3, 4, 7, 8

Peak discharge = 340.42 cfs  
 Time to peak = 888 min  
 Hyd. volume = 9,374,986 cuft  
 Contrib. drain. area = 239.000 ac

**Combined BUB Shawnee**  
 Hyd. No. 9 -- 100 Year



# Hydrograph Report

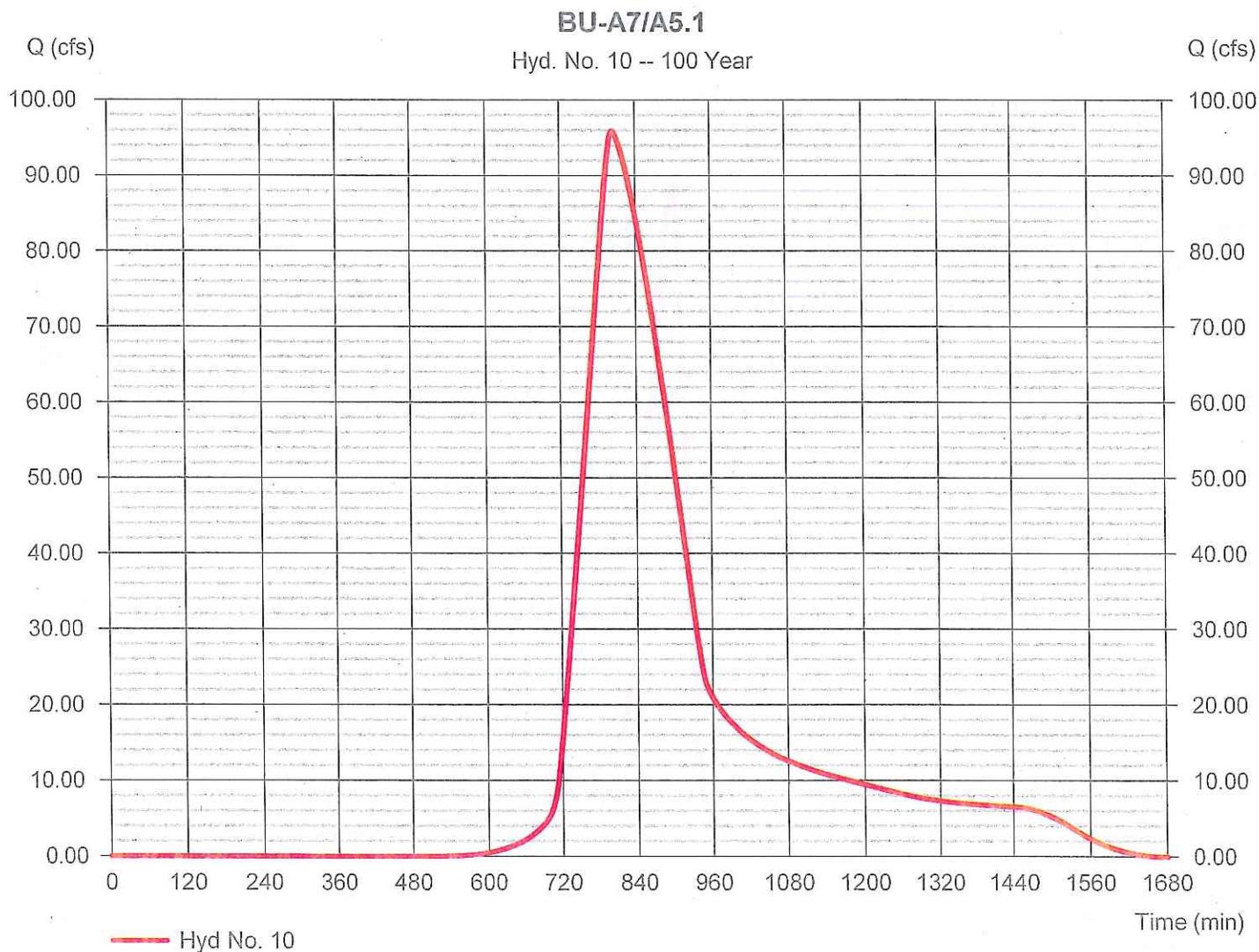
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 10

BU-A7/A5.1

Hydrograph type	= SCS Runoff	Peak discharge	= 95.86 cfs
Storm frequency	= 100 yrs	Time to peak	= 804 min
Time interval	= 2 min	Hyd. volume	= 1,225,493 cuft
Drainage area	= 138.000 ac	Curve number	= 76
Basin Slope	= 0.6 %	Hydraulic length	= 4250 ft
Tc method	= LAG	Time of conc. (Tc)	= 147.56 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

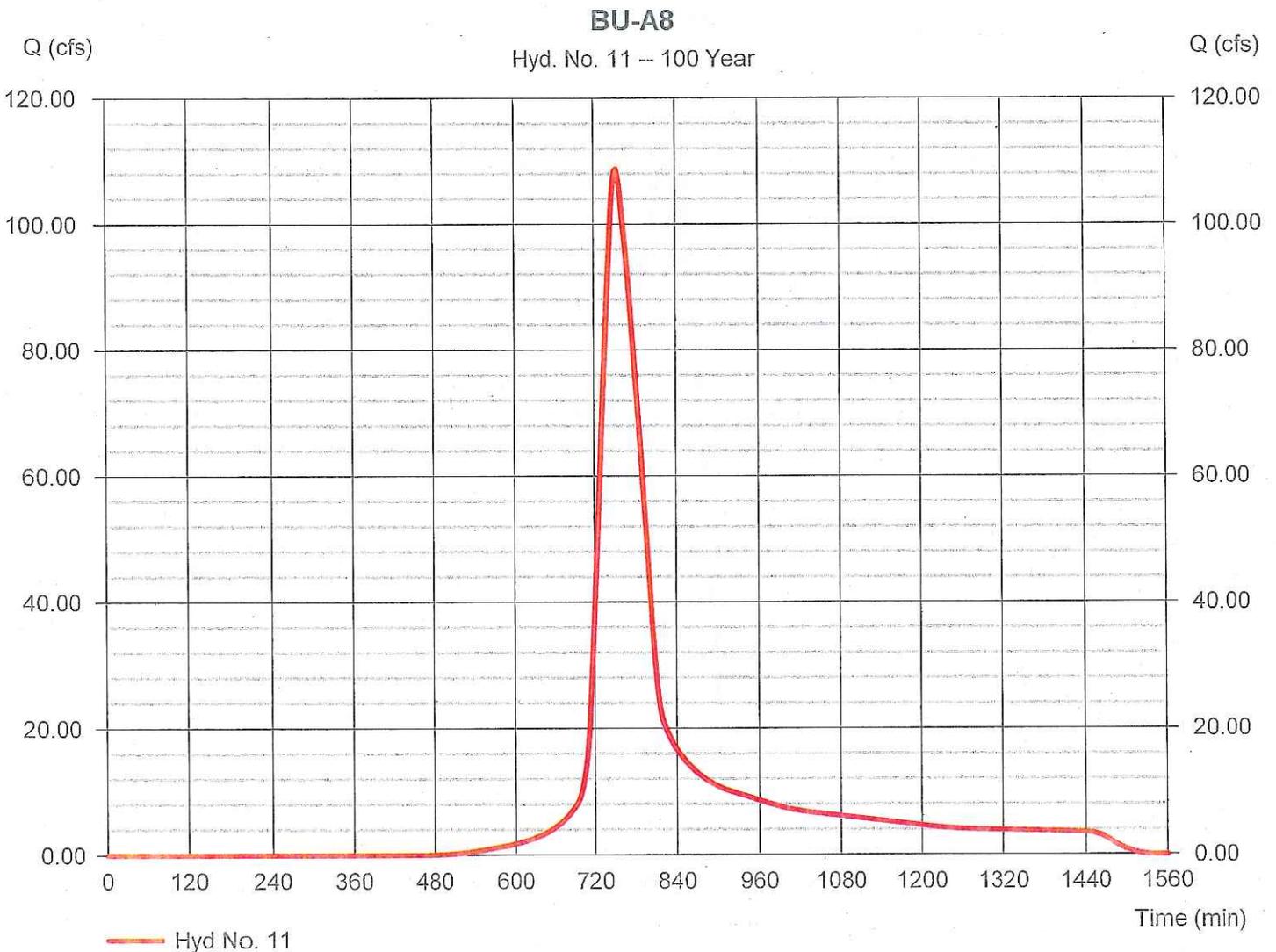
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 11

BU-A8

Hydrograph type	= SCS Runoff	Peak discharge	= 108.70 cfs
Storm frequency	= 100 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 734,307 cuft
Drainage area	= 74.000 ac	Curve number	= 79
Basin Slope	= 0.9 %	Hydraulic length	= 2100 ft
Tc method	= LAG	Time of conc. (Tc)	= 62.67 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

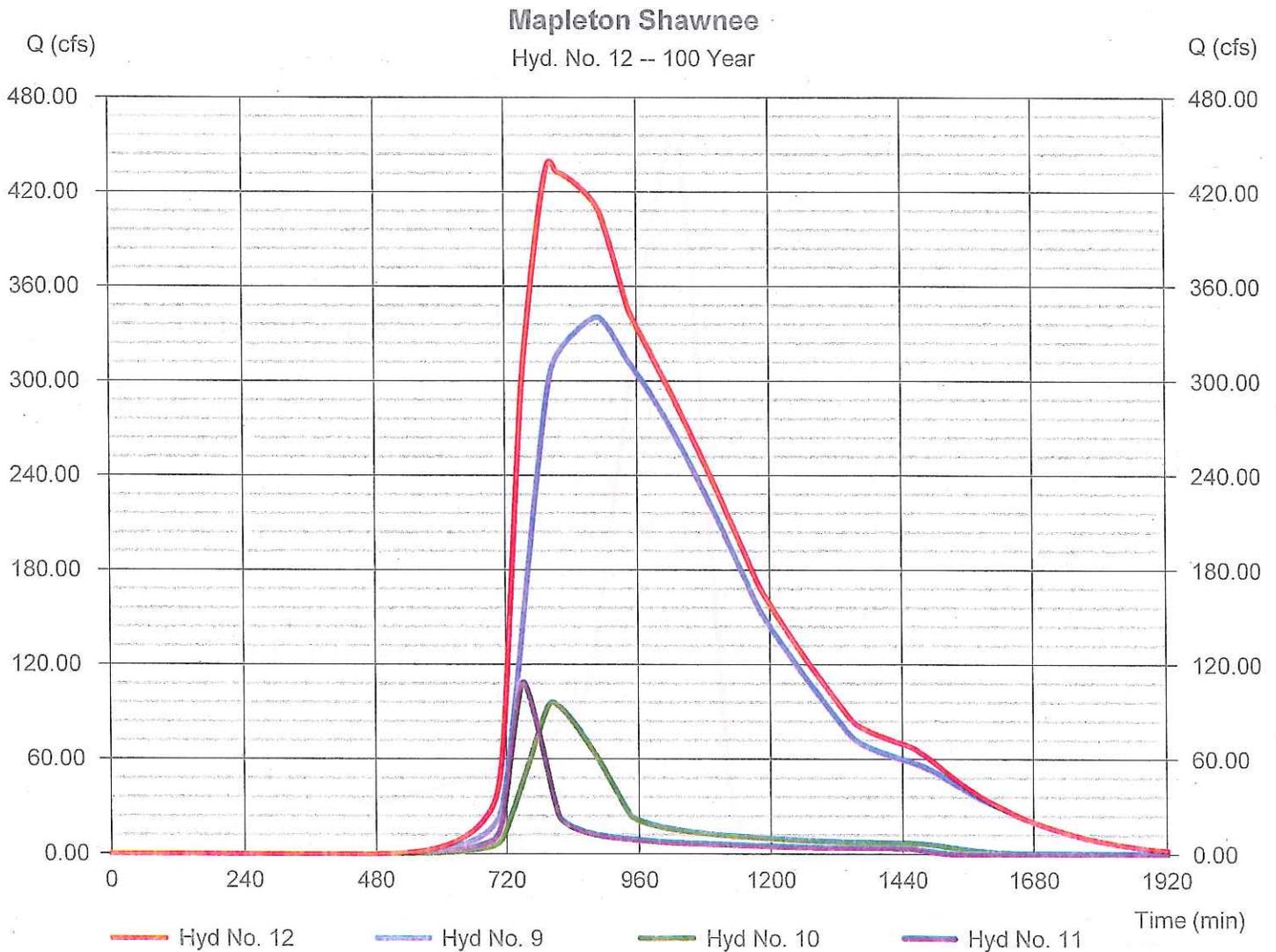
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 12

Mapleton Shawnee

Hydrograph type	= Combine	Peak discharge	= 439.51 cfs
Storm frequency	= 100 yrs	Time to peak	= 802 min
Time interval	= 2 min	Hyd. volume	= 11,334,780 cuft
Inflow hyds.	= 9, 10, 11	Contrib. drain. area	= 212.000 ac



# Hydrograph Report

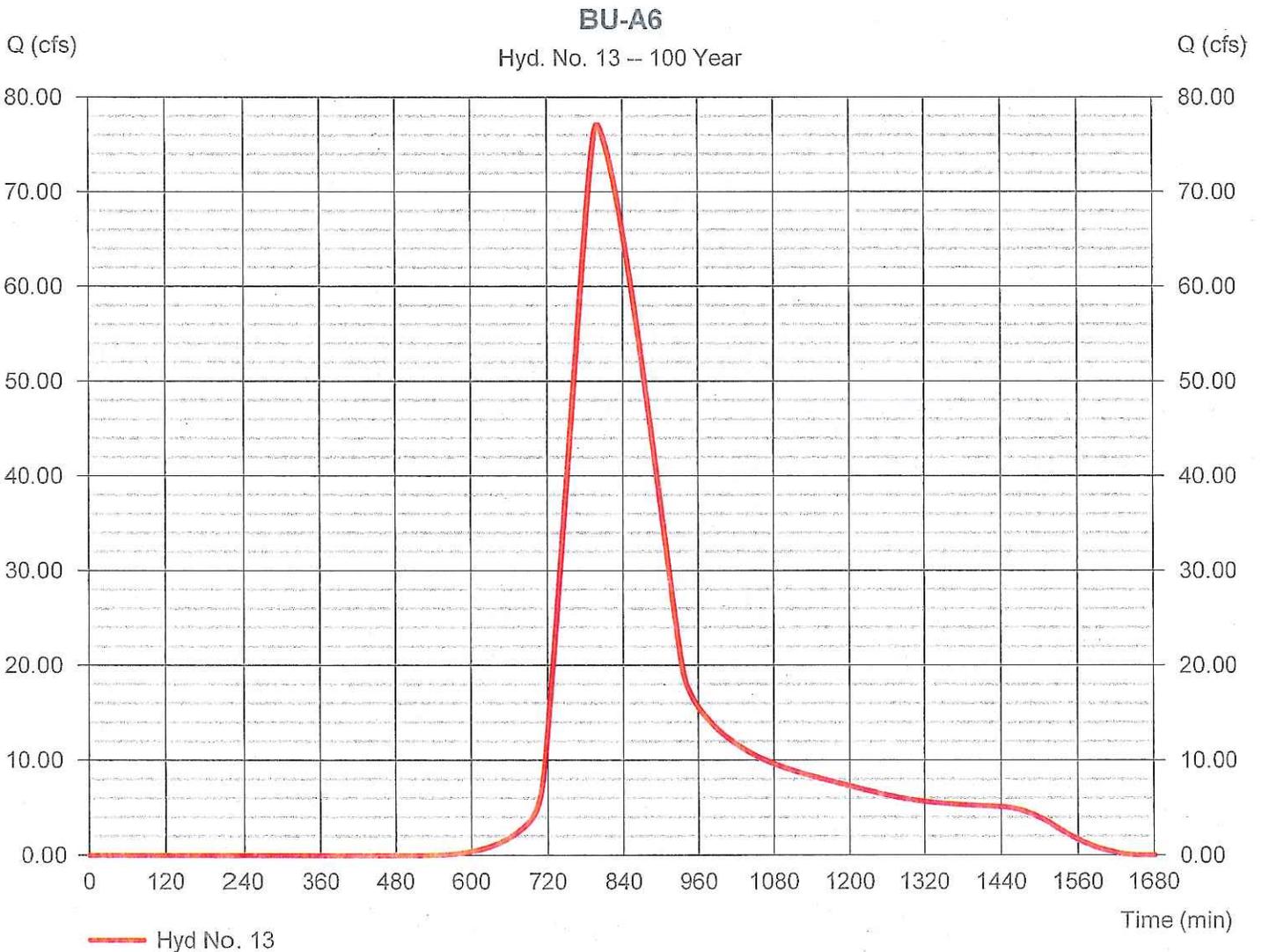
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## Hyd. No. 13

BU-A6

Hydrograph type	= SCS Runoff	Peak discharge	= 77.08 cfs
Storm frequency	= 100 yrs	Time to peak	= 800 min
Time interval	= 2 min	Hyd. volume	= 952,909 cuft
Drainage area	= 107.000 ac	Curve number	= 76
Basin Slope	= 0.4 %	Hydraulic length	= 3300 ft
Tc method	= LAG	Time of conc. (Tc)	= 139.17 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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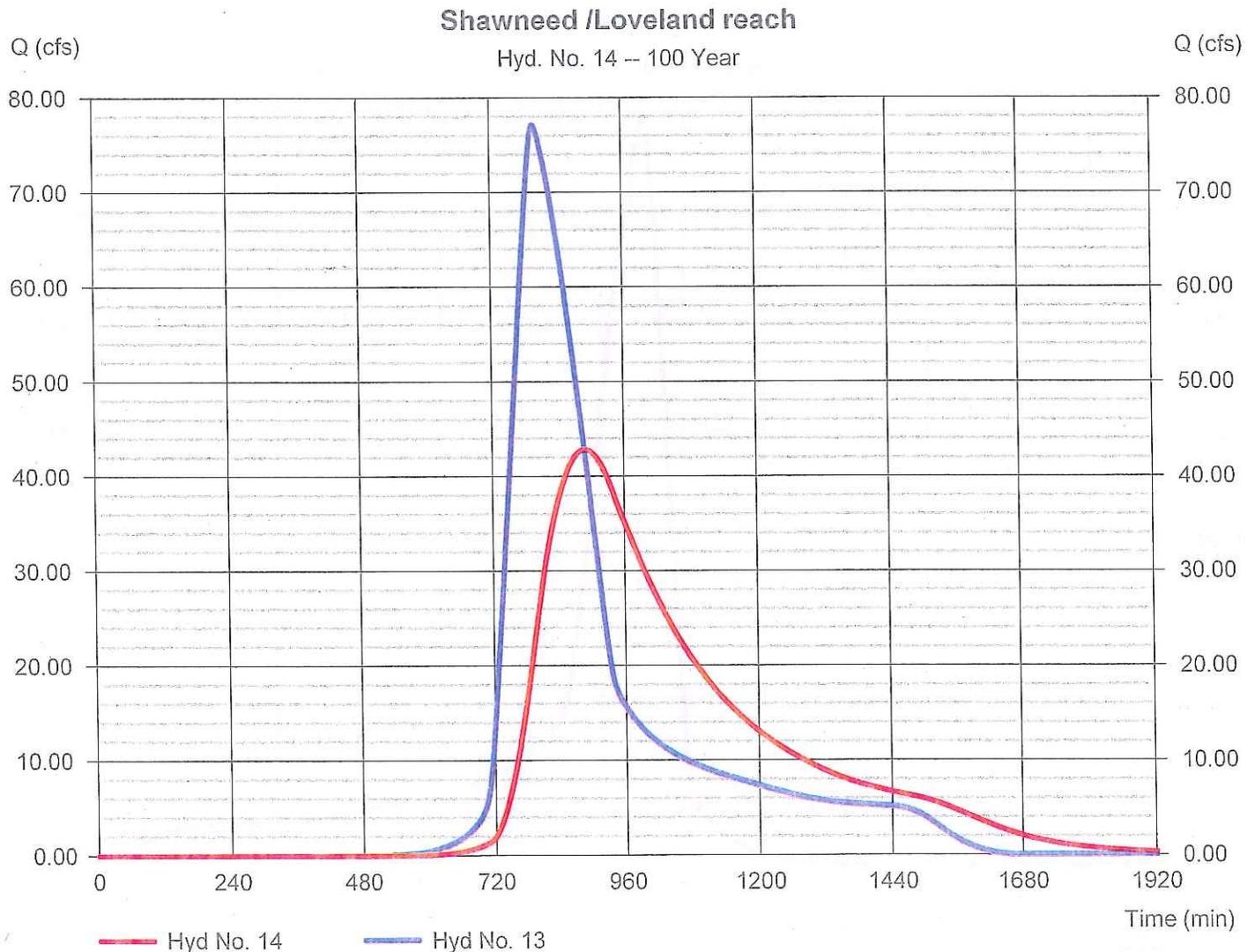
Thursday, 01 / 28 / 2016

## Hyd. No. 14

Shawneed /Loveland reach

Hydrograph type	= Reach	Peak discharge	= 42.84 cfs
Storm frequency	= 100 yrs	Time to peak	= 890 min
Time interval	= 2 min	Hyd. volume	= 952,832 cuft
Inflow hyd. No.	= 13 - BU-A6	Section type	= Trapezoidal
Reach length	= 16800.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.280	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0156

Modified Att-Kin routing method used.



# Hydrograph Report

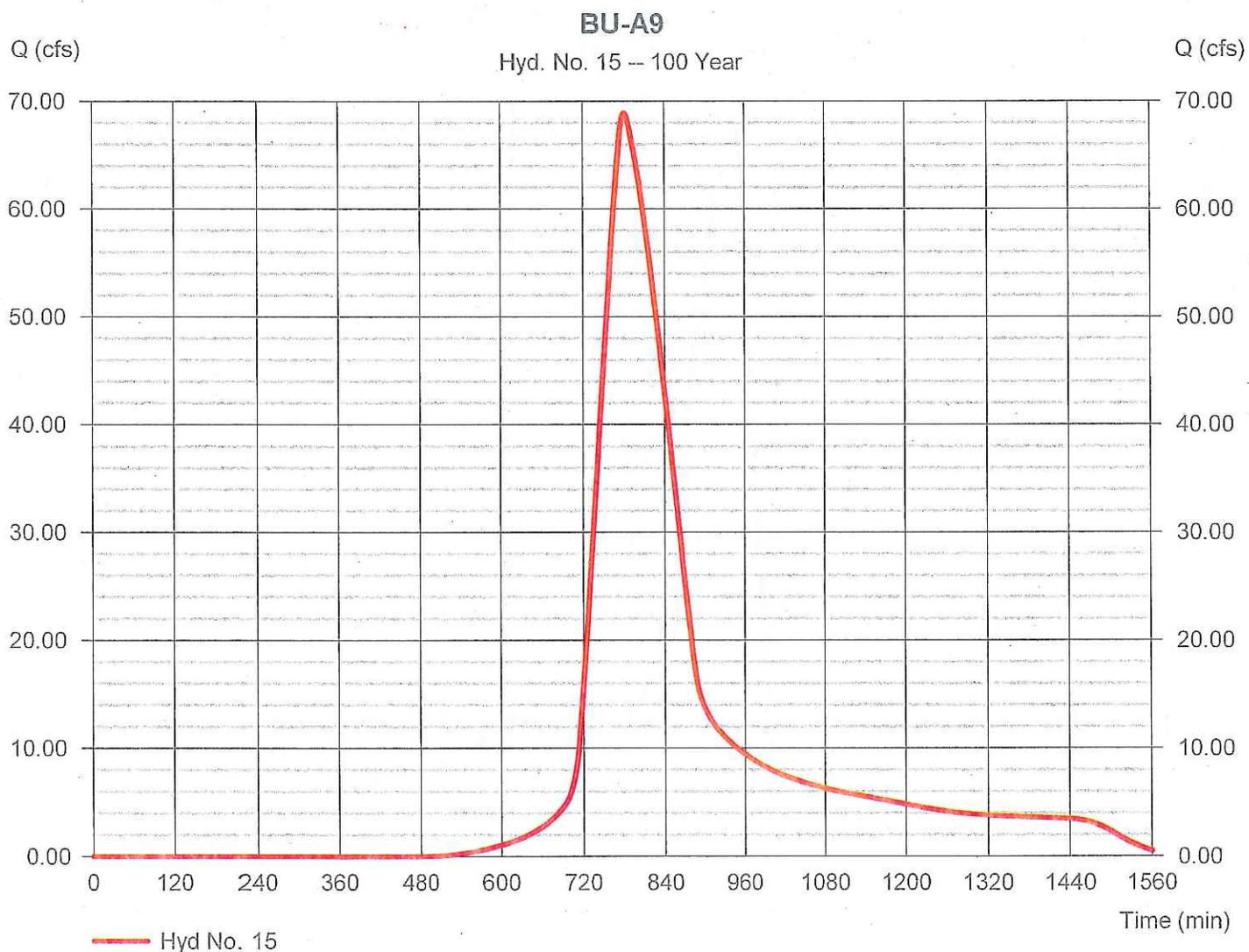
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 15

BU-A9

Hydrograph type	= SCS Runoff	Peak discharge	= 68.91 cfs
Storm frequency	= 100 yrs	Time to peak	= 780 min
Time interval	= 2 min	Hyd. volume	= 699,933 cuft
Drainage area	= 71.000 ac	Curve number	= 79
Basin Slope	= 0.5 %	Hydraulic length	= 2800 ft
Tc method	= LAG	Time of conc. (Tc)	= 110.34 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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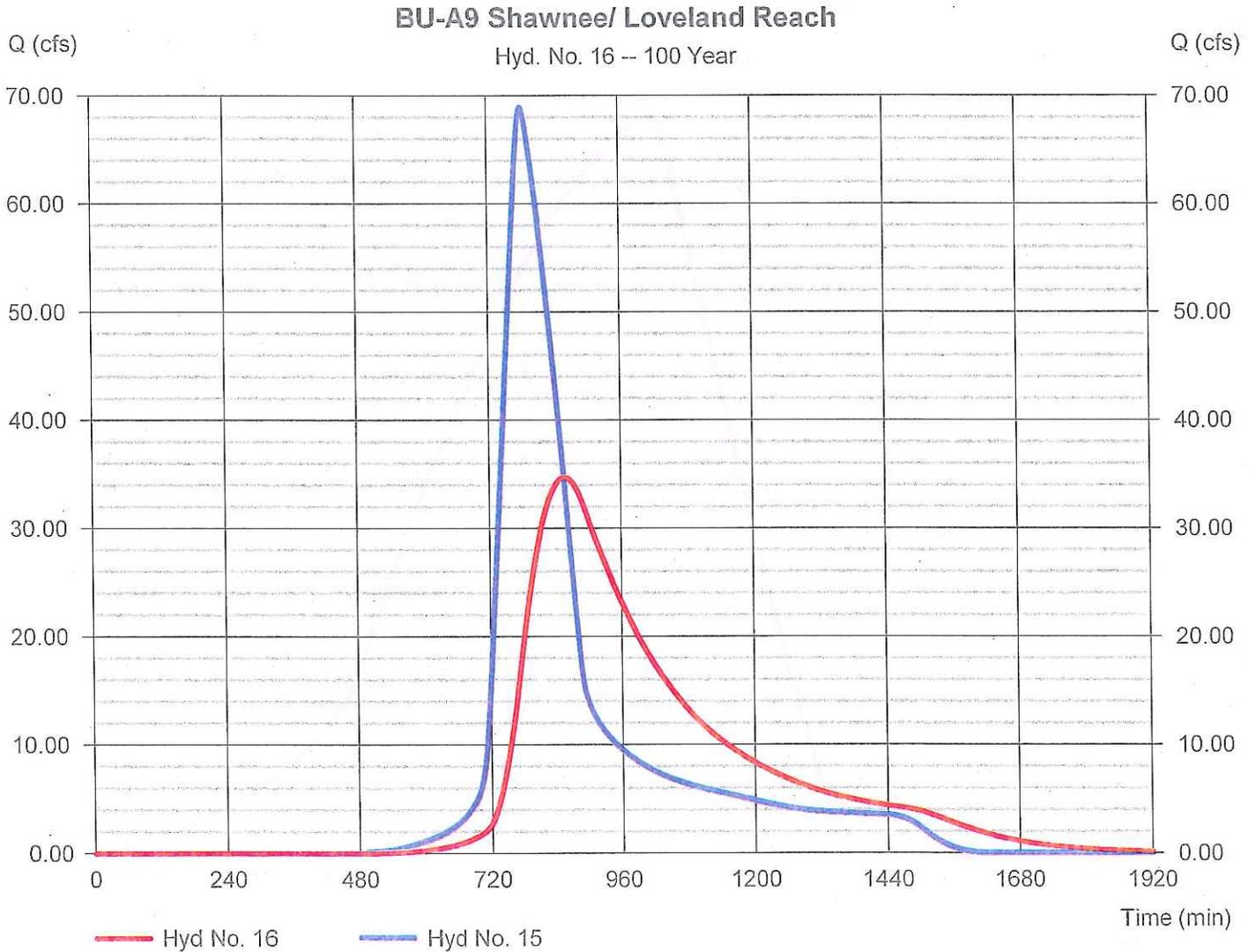
Thursday, 01 / 28 / 2016

## Hyd. No. 16

BU-A9 Shawnee/ Loveland Reach

Hydrograph type	= Reach	Peak discharge	= 34.71 cfs
Storm frequency	= 100 yrs	Time to peak	= 854 min
Time interval	= 2 min	Hyd. volume	= 699,860 cuft
Inflow hyd. No.	= 15 - BU-A9	Section type	= Trapezoidal
Reach length	= 15500.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.280	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0162

Modified Att-Kin routing method used.



# Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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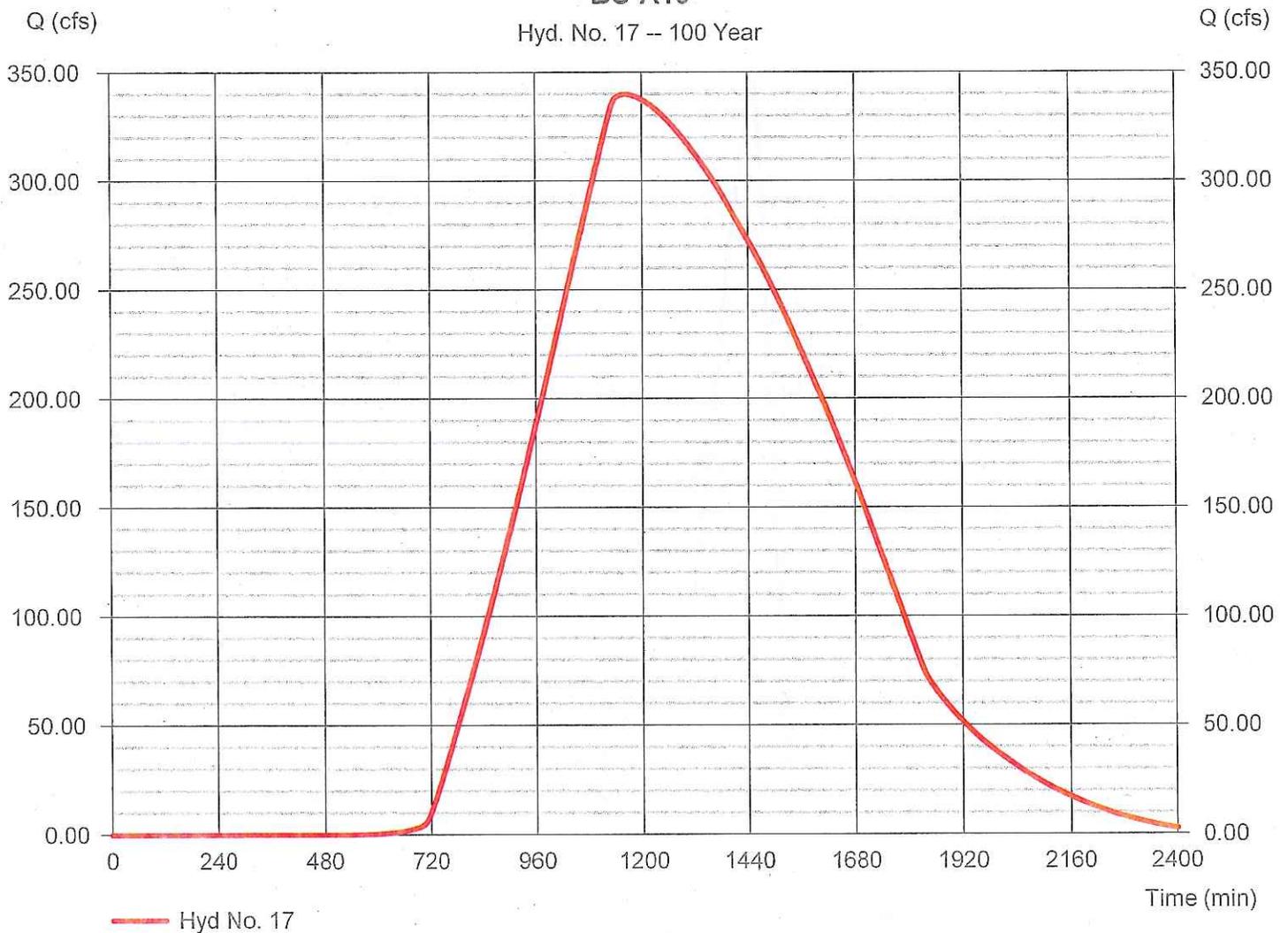
## Hyd. No. 17

BU-A10

Hydrograph type	= SCS Runoff	Peak discharge	= 339.76 cfs
Storm frequency	= 100 yrs	Time to peak	= 1162 min
Time interval	= 2 min	Hyd. volume	= 15,118,200 cuft
Drainage area	= 1639.000 ac	Curve number	= 77
Basin Slope	= 0.2 %	Hydraulic length	= 16500 ft
Tc method	= LAG	Time of conc. (Tc)	= 716.88 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

### BU-A10

Hyd. No. 17 -- 100 Year



# Hydrograph Report

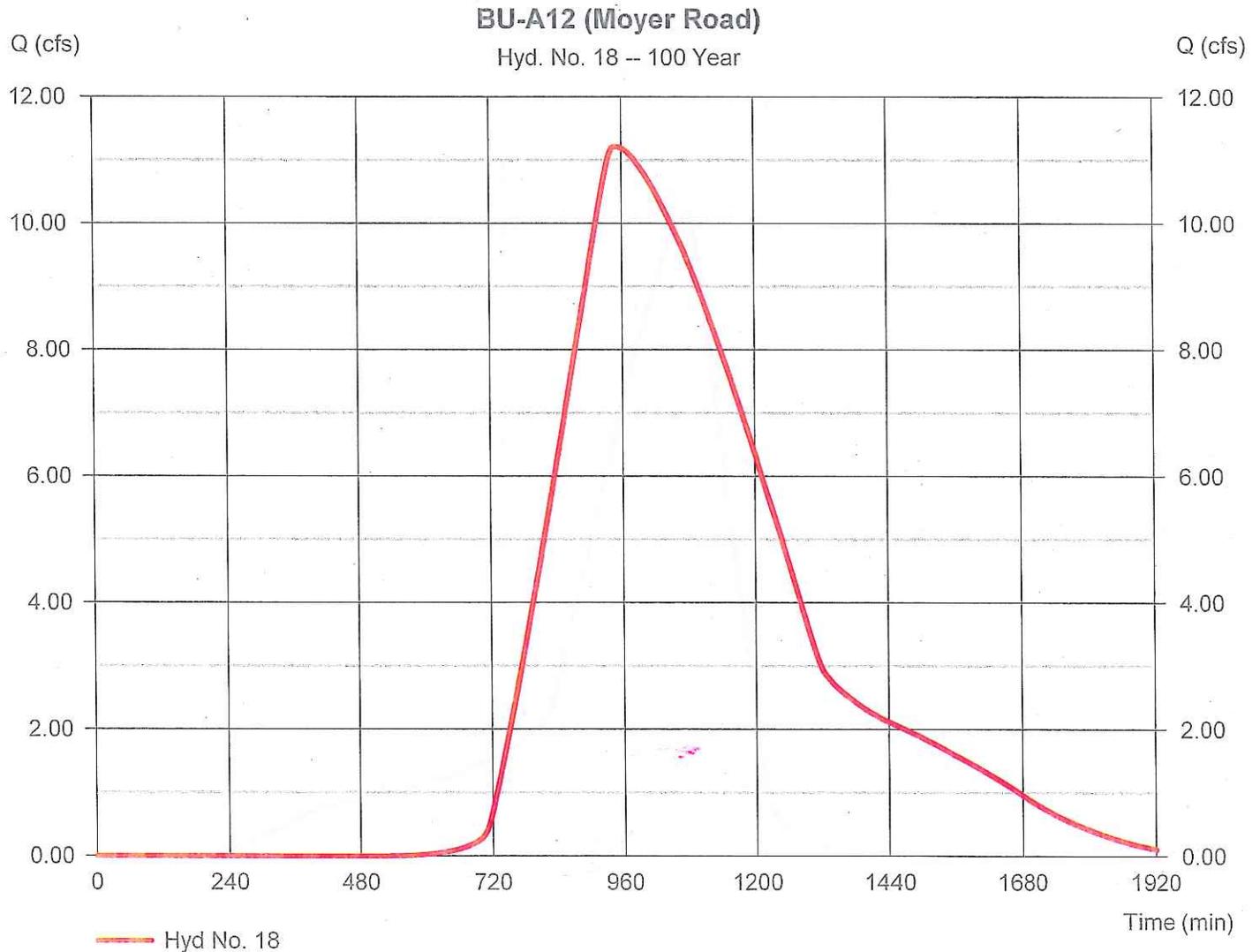
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## Hyd. No. 18

BU-A12 (Moyer Road)

Hydrograph type	= SCS Runoff	Peak discharge	= 11.21 cfs
Storm frequency	= 100 yrs	Time to peak	= 950 min
Time interval	= 2 min	Hyd. volume	= 304,213 cuft
Drainage area	= 33.000 ac	Curve number	= 77
Basin Slope	= 0.1 %	Hydraulic length	= 4000 ft
Tc method	= LAG	Time of conc. (Tc)	= 386.09 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

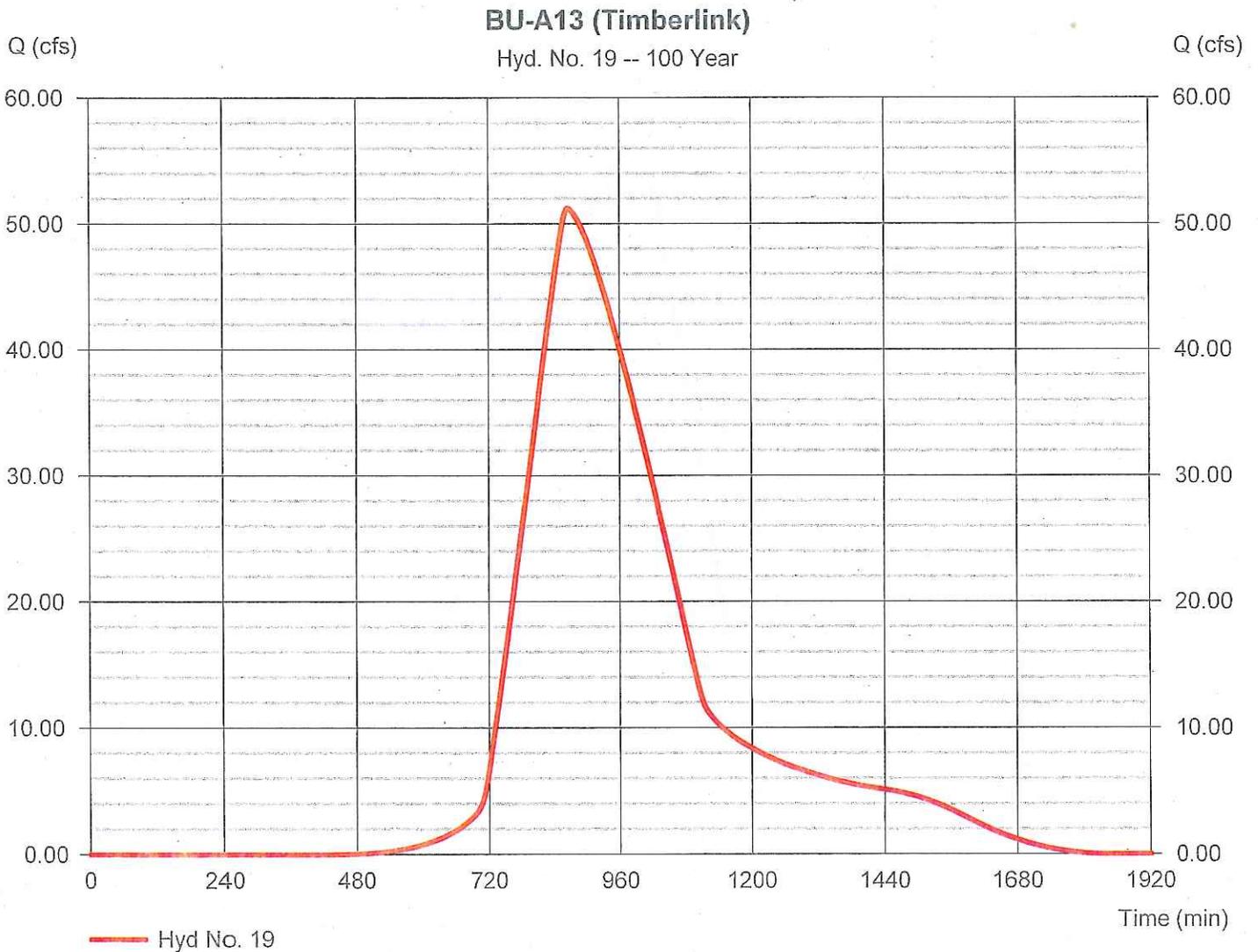
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 01 / 28 / 2016

## Hyd. No. 19

BU-A13 (Timberlink)

Hydrograph type	= SCS Runoff	Peak discharge	= 51.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 866 min
Time interval	= 2 min	Hyd. volume	= 976,762 cuft
Drainage area	= 90.000 ac	Curve number	= 82
Basin Slope	= 0.1 %	Hydraulic length	= 3400 ft
Tc method	= LAG	Time of conc. (Tc)	= 251.44 min
Total precip.	= 4.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



# Hydrograph Report

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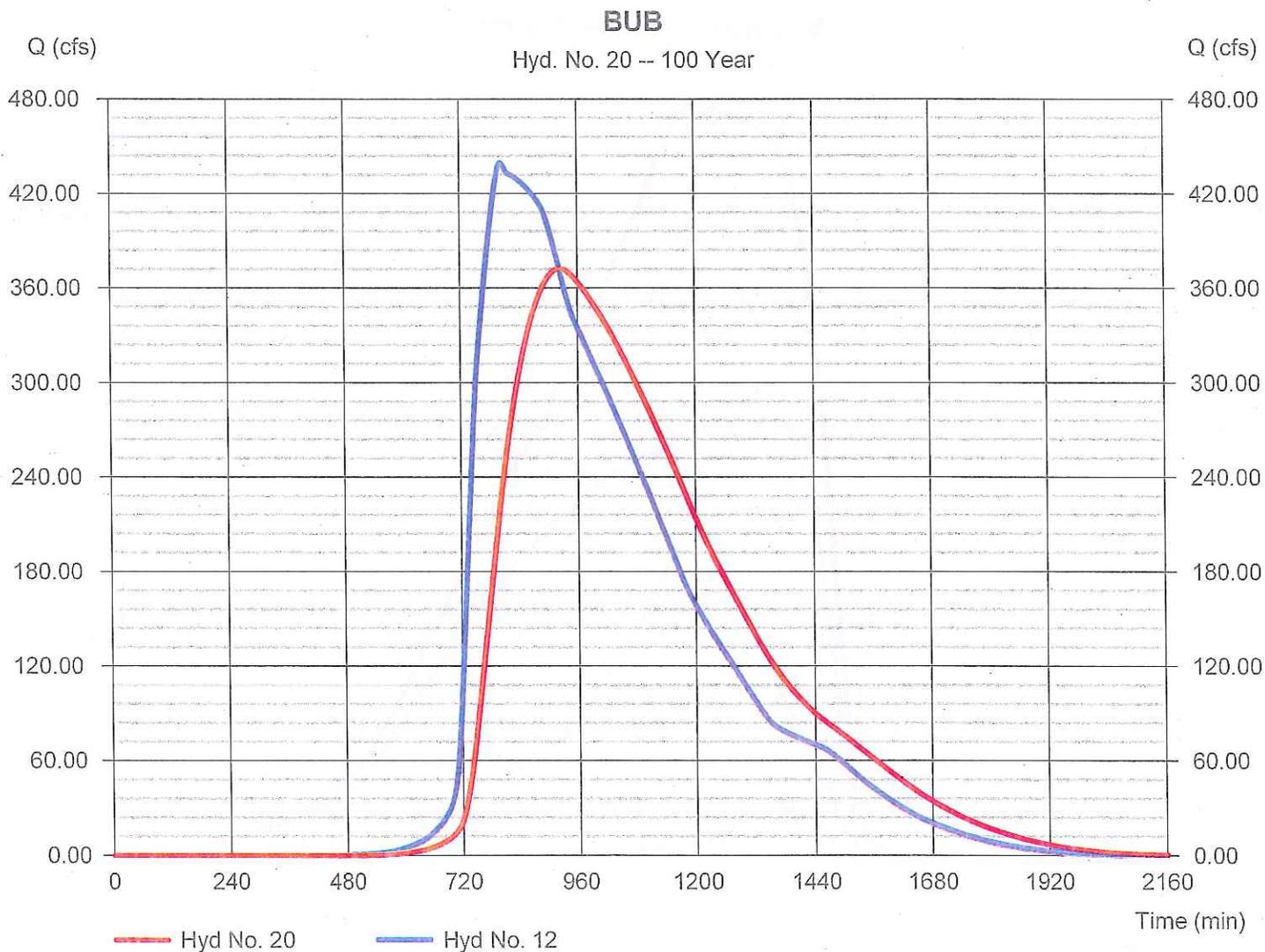
Thursday, 01 / 28 / 2016

## Hyd. No. 20

BUB

Hydrograph type	= Reach	Peak discharge	= 372.32 cfs
Storm frequency	= 100 yrs	Time to peak	= 924 min
Time interval	= 2 min	Hyd. volume	= 11,334,740 cuft
Inflow hyd. No.	= 12 - Mapleton Shawnee	Section type	= Trapezoidal
Reach length	= 17000.0 ft	Channel slope	= 0.2 %
Manning's n	= 0.040	Bottom width	= 15.0 ft
Side slope	= 3.0:1	Max. depth	= 3.0 ft
Rating curve x	= 0.274	Rating curve m	= 1.435
Ave. velocity	= 0.00 ft/s	Routing coeff.	= 0.0256

Modified Att-Kin routing method used.



# Hydrograph Report

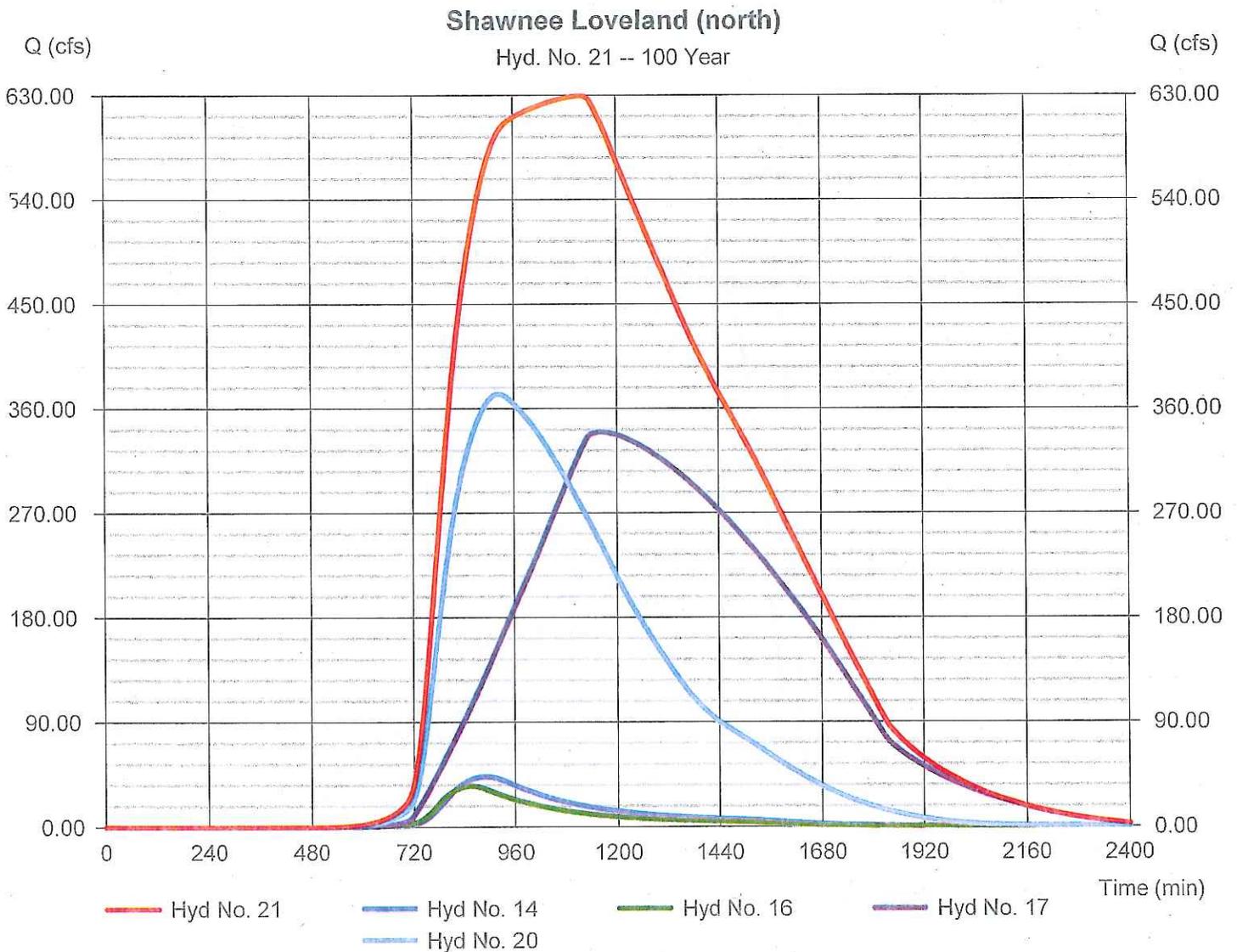
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 01 / 28 / 2016

## Hyd. No. 21

Shawnee Loveland (north)

Hydrograph type	= Combine	Peak discharge	= 629.42 cfs
Storm frequency	= 100 yrs	Time to peak	= 1116 min
Time interval	= 2 min	Hyd. volume	= 28,105,630 cuft
Inflow hyds.	= 14, 16, 17, 20	Contrib. drain. area	= 1639.000 ac



# Hydrograph Report

## Hyd. No. 22

Total flow Shawnee/Loveland

Hydrograph type	= Combine	Peak discharge	= 662.77 cfs
Storm frequency	= 100 yrs	Time to peak	= 978 min
Time interval	= 2 min	Hyd. volume	= 29,386,620 cuft
Inflow hyds.	= 18, 19, 21	Contrib. drain. area	= 123.000 ac

