APPENDIX A

Campus Drainage Mapping with CD

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DESCRIPTION	DATE	BY

STORM DRAINAGE MAPPING - INDEX PLAN

EASTERN CONNECTICUT STATE UNIVERSITY
FLOOD MANAGEMENT CERTIFICATE

83 WINDHAM STREET
WILLIMANTIC, CONNECTICUT

DESIGNED	BAM DRAWN	NEB CHECKED
SCALE	1"=150'	
DATE	JULY 2012	
PROJECT NO.	1266-27	
SHEET NO.	1 OF 7	

SHEET NAME

INDEX

STORM DRAINAGE MAPPING

EASTERN CONNECTICUT STATE UNIVERSITY
FLOOD MANAGEMENT CERTIFICATE

83 WINDHAM STREET
WILLIMANTIC, CONNECTICUT

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DESCRIPTION	DATE	BY

DESIGNED	DRAWN	CHECKED
---	BAM	NEB

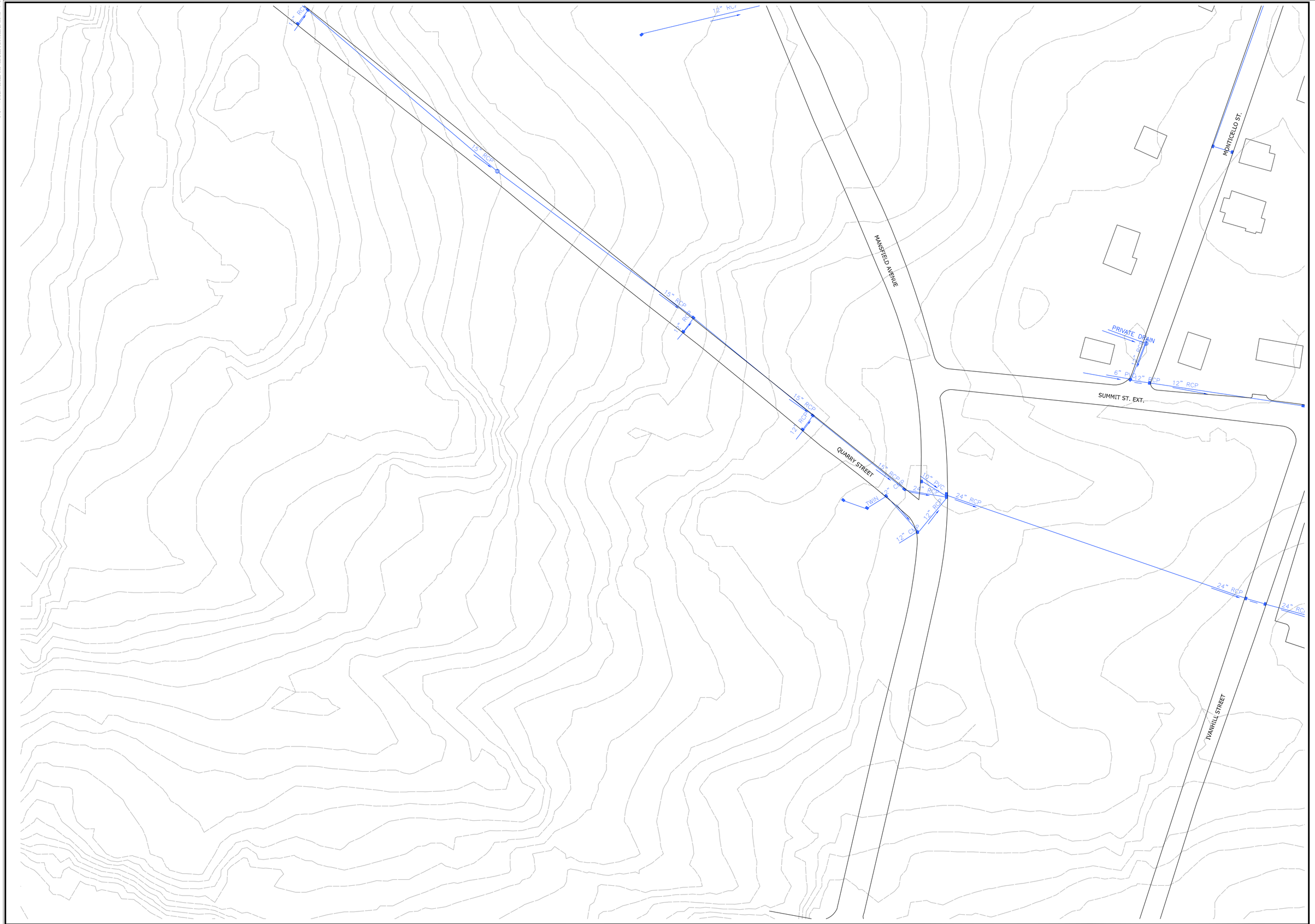
SCALE: 1"=50'

DATE: JULY 2012

PROJECT NO.: 1266-27

SHEET NO.: 2 OF 7

SHEET NAME: 2



N
W E
S

0 1/2" 1"
0' 25' 50'

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STORM DRAINAGE MAPPING

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83 WINDHAM STREET
WILLIMANTIC, CONNECTICUT

DESIGNED	DRAWN	CHECKED
---	BAM	NEB

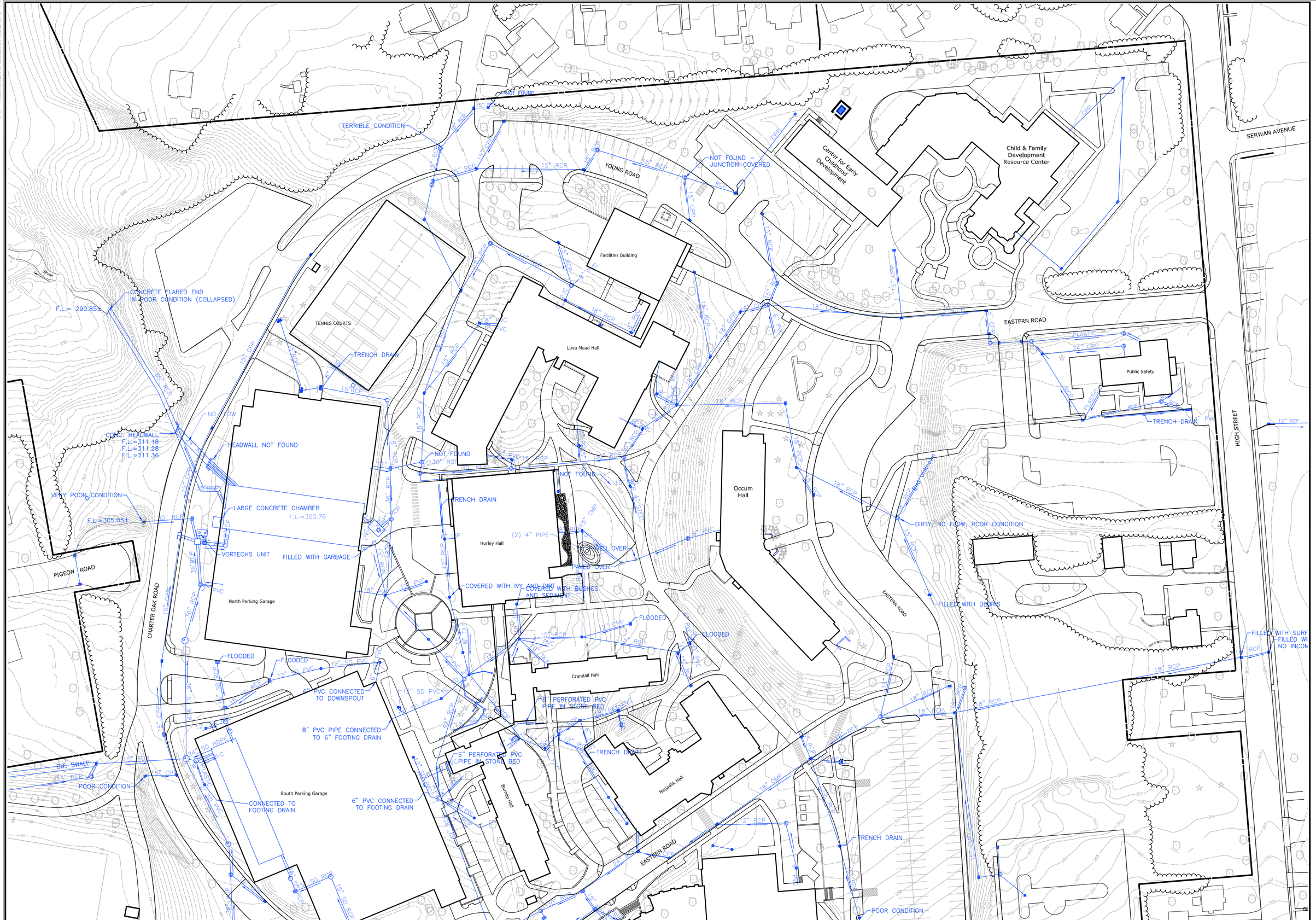
SCALE: 1"=50'

DATE: JULY 2012

PROJECT NO.: 1266-27

SHEET NO.: 3 OF 7

SHEET NAME: 2



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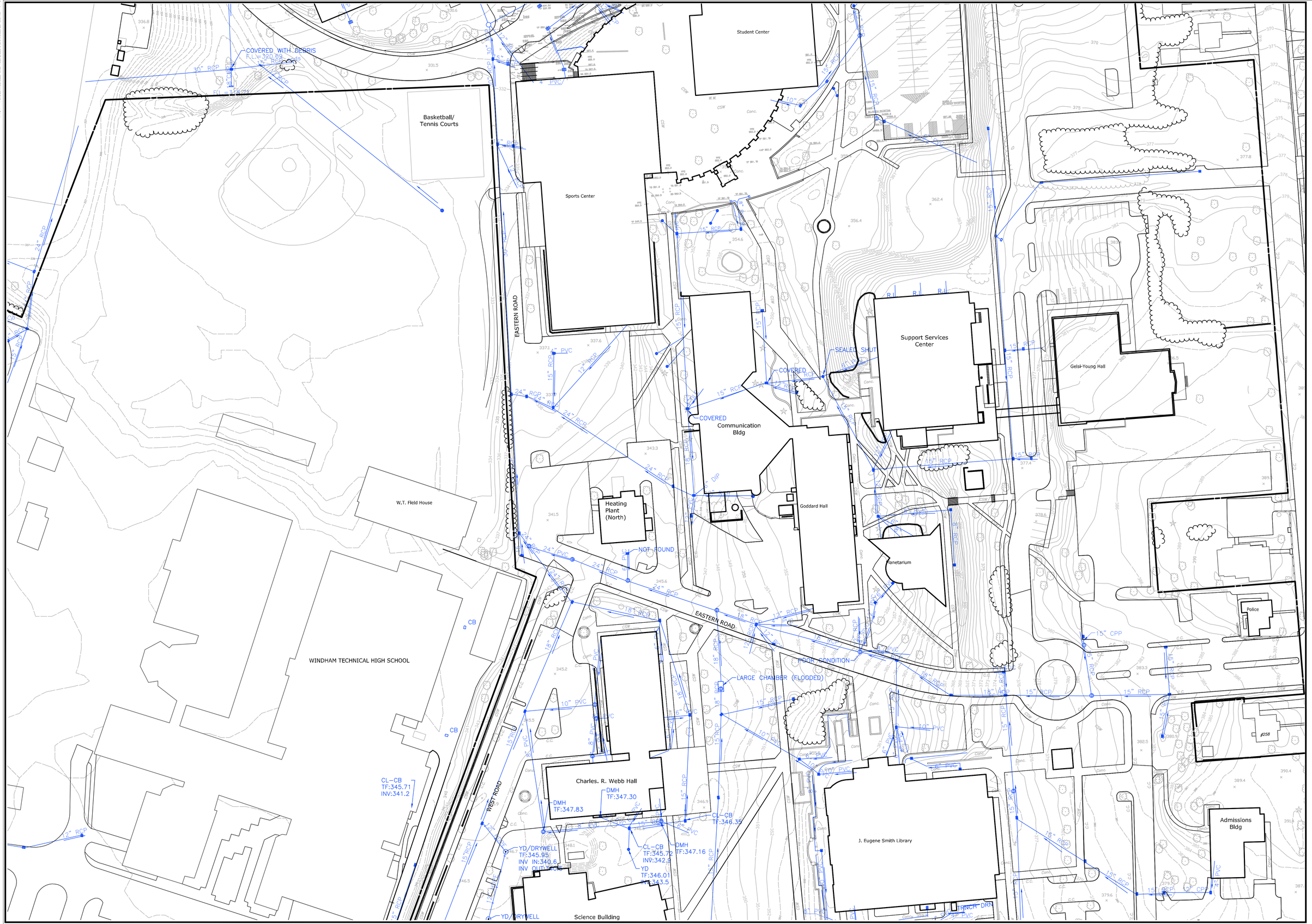
STORM DRAINAGE MAPPING

EASTERN CONNECTICUT STATE UNIVERSITY
FLOOD MANAGEMENT CERTIFICATE

83 WINDHAM STREET
WILLIMANTIC, CONNECTICUT

DESIGNED	DRAWN: BAM	CHECKED: NEB
SCALE	1"=50'	
DATE	JULY 2012	
PROJECT NO.	1266-27	
SHEET NO.	3 OF 7	
SHEET NAME	3	



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OVERALL CAMPUS WATERSHED MAP

EASTERN CONNECTICUT STATE UNIVERSITY
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83 WINDHAM STREET
WILLIMANTIC, CONNECTICUT

---	BAM	NEB
DESIGNED	DRAWN	CHECKED

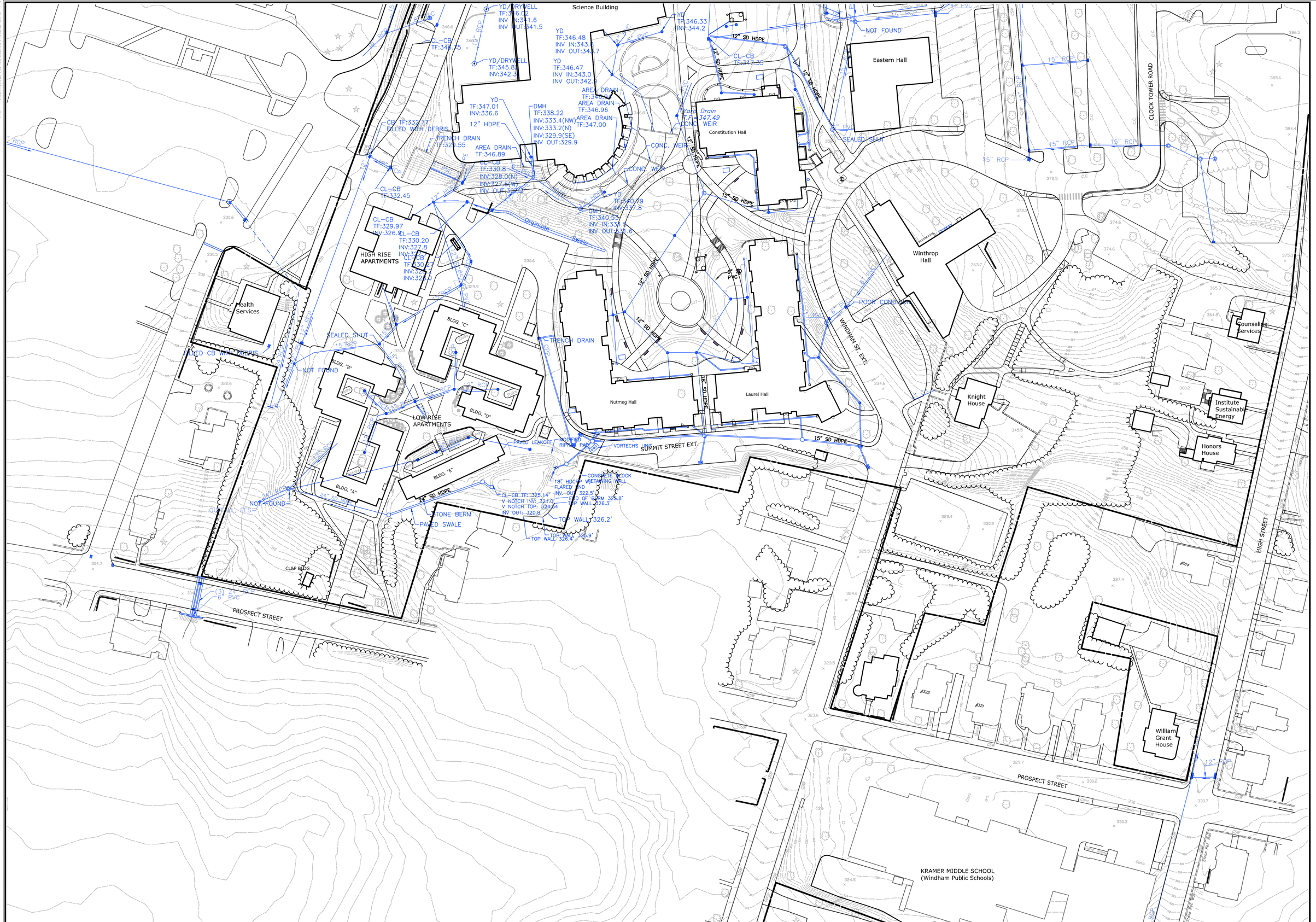
SCALE: 1"=50'

DATE: JULY 2012

PROJECT NO.: 1266-27

SHEET NO.: 5 OF 7

SHEET NAME: 4



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DESCRIPTION	DATE	BY

STORM DRAINAGE MAPPING

EASTERN CONNECTICUT STATE UNIVERSITY
FLOOD MANAGEMENT CERTIFICATE

83 WINDHAM STREET
WILLIMANTIC, CONNECTICUT

--- (DESIGNED)	BAM (DRAWN)	NEB (CHECKED)

SCALE: 1"=50'

DATE: JULY 2012

PROJECT NO.: 1266-27

SHEET NO.: 6 OF 7

SHEET NAME: 5

DESCRIPTION	DATE	BY

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STORM DRAINAGE MAPPING

EASTERN CONNECTICUT STATE UNIVERSITY
FLOOD MANAGEMENT CERTIFICATE

83 WINDHAM STREET
WILLIMANTIC, CONNECTICUT

DESIGNED	DRAWN	CHECKED
---	BAM	NEB

SCALE: 1"=50'

DATE: JULY 2012

PROJECT NO.: 1266-27

SHEET NO.: 7 OF 7

SHEET NAME: 6

APPENDIX B

Hydrologic Model Input and Output
Arboretum Brook Watershed
NRCS Rainfall

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Connecticut
Location	near Eastern Rd, Willimantic, CT 06226, USA
Longitude	72.218 degrees West
Latitude	41.722 degrees North
Elevation	371 feet
Date/Time	Fri, 8 Jun 2012 13:42:34 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.48	0.60	0.78	0.98	1.22	**1yr**	0.84	1.12	1.41	1.75	2.18	2.71	3.01	**1yr**	2.40	2.90	3.37	4.03	4.71	**1yr**
2yr	0.38	0.58	0.72	0.95	1.19	1.49	**2yr**	1.03	1.40	1.72	2.12	2.62	3.22	3.60	**2yr**	2.85	3.46	3.97	4.72	5.36	**2yr**
5yr	0.45	0.70	0.88	1.18	1.51	1.91	**5yr**	1.31	1.75	2.19	2.70	3.29	4.00	4.52	**5yr**	3.54	4.34	5.03	5.93	6.65	**5yr**
10yr	0.52	0.81	1.03	1.39	1.81	2.29	**10yr**	1.56	2.06	2.64	3.24	3.92	4.71	5.37	**10yr**	4.16	5.16	6.02	7.04	7.84	**10yr**
25yr	0.62	0.98	1.25	1.73	2.30	2.93	**25yr**	1.99	2.57	3.38	4.12	4.94	5.84	6.75	**25yr**	5.17	6.49	7.65	8.85	9.74	**25yr**
50yr	0.71	1.15	1.47	2.06	2.77	3.53	**50yr**	2.39	3.03	4.07	4.93	5.87	6.88	8.02	**50yr**	6.09	7.71	9.17	10.53	11.48	**50yr**
100yr	0.83	1.34	1.73	2.44	3.33	4.26	**100yr**	2.87	3.58	4.90	5.91	6.98	8.11	9.55	**100yr**	7.18	9.18	11.00	12.52	13.54	**100yr**
200yr	0.96	1.57	2.03	2.90	4.00	5.14	**200yr**	3.45	4.24	5.91	7.09	8.31	9.56	11.36	**200yr**	8.46	10.93	13.20	14.91	15.97	**200yr**
500yr	1.18	1.94	2.52	3.66	5.13	6.59	**500yr**	4.43	5.29	7.56	9.02	10.46	11.90	14.32	**500yr**	10.53	13.77	16.82	18.78	19.89	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.44	0.53	0.72	0.88	0.93	**1yr**	0.76	0.91	1.14	1.50	1.96	2.43	2.53	**1yr**	2.15	2.43	2.98	3.64	4.21	**1yr**
2yr	0.36	0.56	0.69	0.93	1.15	1.38	**2yr**	0.99	1.35	1.58	2.02	2.56	3.14	3.50	**2yr**	2.78	3.37	3.86	4.59	5.20	**2yr**
5yr	0.41	0.63	0.78	1.07	1.37	1.62	**5yr**	1.18	1.59	1.85	2.36	2.96	3.73	4.22	**5yr**	3.30	4.06	4.71	5.48	6.17	**5yr**
10yr	0.44	0.68	0.85	1.18	1.53	1.83	**10yr**	1.32	1.79	2.08	2.66	3.31	4.24	4.86	**10yr**	3.76	4.67	5.47	6.24	6.99	**10yr**
25yr	0.47	0.72	0.90	1.28	1.69	2.14	**25yr**	1.46	2.09	2.43	3.09	3.85	5.05	5.87	**25yr**	4.47	5.64	6.60	7.43	8.27	**25yr**
50yr	0.50	0.75	0.94	1.35	1.82	2.40	**50yr**	1.57	2.35	2.72	3.46	4.32	5.74	6.77	**50yr**	5.08	6.51	7.65	8.46	9.40	**50yr**
100yr	0.52	0.78	0.98	1.41	1.94	2.69	**100yr**	1.67	2.63	3.07	3.87	4.86	6.54	7.84	**100yr**	5.79	7.54	8.88	9.63	10.69	**100yr**
200yr	0.53	0.79	1.00	1.45	2.03	3.01	**200yr**	1.75	2.94	3.43	4.30	5.46	7.46	9.07	**200yr**	6.61	8.73	10.30	10.97	12.17	**200yr**
500yr	0.51	0.77	0.99	1.43	2.04	3.52	**500yr**	1.76	3.44	3.97	4.94	6.37	8.93	11.03	**500yr**	7.90	10.60	12.60	13.05	14.44	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.37	0.57	0.70	0.94	1.15	1.27	**1yr**	0.99	1.25	1.52	1.95	2.44	2.95	3.35	**1yr**	2.61	3.22	3.66	4.31	5.02	**1yr**
2yr	0.40	0.62	0.76	1.03	1.27	1.50	**2yr**	1.10	1.46	1.71	2.19	2.74	3.33	3.72	**2yr**	2.95	3.58	4.11	4.93	5.57	**2yr**
5yr	0.49	0.75	0.93	1.28	1.63	1.94	**5yr**	1.41	1.90	2.22	2.84	3.49	4.28	4.83	**5yr**	3.79	4.64	5.37	6.34	7.19	**5yr**
10yr	0.58	0.90	1.11	1.55	2.01	2.37	**10yr**	1.73	2.32	2.72	3.47	4.20	5.16	5.88	**10yr**	4.56	5.66	6.58	7.73	8.73	**10yr**
25yr	0.76	1.15	1.44	2.05	2.70	3.10	**25yr**	2.33	3.03	3.58	4.55	5.37	6.62	7.65	**25yr**	5.86	7.35	8.64	10.06	11.30	**25yr**
50yr	0.92	1.40	1.75	2.51	3.38	3.79	**50yr**	2.92	3.71	4.39	5.58	6.48	8.00	9.33	**50yr**	7.08	8.97	10.61	12.29	13.77	**50yr**
100yr	1.13	1.71	2.14	3.10	4.25	4.69	**100yr**	3.67	4.58	5.40	6.90	7.82	9.64	11.40	**100yr**	8.53	10.96	13.03	15.01	16.77	**100yr**
200yr	1.39	2.10	2.66	3.85	5.37	5.77	**200yr**	4.63	5.64	6.64	8.52	9.45	11.65	13.89	**200yr**	10.31	13.36	16.01	18.36	20.42	**200yr**
500yr	1.86	2.77	3.56	5.17	7.35	7.56	**500yr**	6.34	7.39	8.76	11.32	12.13	14.96	18.07	**500yr**	13.24	17.37	21.01	23.96	26.52	**500yr**

Powered by ACIS
Northeast Regional Climate Center

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ECSU -2012 Existing Conditions
Wilimantic, CT

Calculated By: BAM 06-2012
Checked By:_____
MMI#1266-27

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

(Derived from Worksheet 3, USDA 210-VI-TR55, Second Ed, June 1986)

Watershed ID: 10 | Existing Conditions X | Travel Time (Tt) _____
Subwatershed ID: _____ | Proposed Condntions _____ | Time of Conc. (Tc) X

Sheet Flow (Applicable to T_c Only)

	Segment ID		
1. Surface Description (Table 3-1)			
2. Manning's Roughness Coeff. for Sheet Flow, n (Table 3-1)			
3. Flow Length, L (Max. = 300 ft, CTDOT Recommends < 150 ft)			
4. Two-Year 24-hr rainfall, P_2 (in)			
5a. Change in Elevation, h (ft)			
5b. Land Slope, s (ft/ft)	0.000		
6. Travel Time, T_t (hr) $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		=	min.

Shallow Concentrated Flow (Assume Hyd. Radius = Depth of Flow)

	Segment ID					
7a. Surface Description						
7b. Paved or Unpaved						
7c. Manning's Roughness Coeff., n						
7d. Depth of Flow, d (ft) (d = 0.4 Unpaved, d = 0.2 Paved)						
8. Flow Length, L						
9a. Change in Elevation, h (ft)						
9b. Watercourse slope, s (ft/ft)						
10. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$						
11. Travel Time, T_t (hr) $T_t = \frac{L}{3600 * V}$		+	+	+	=	hr.
					=	min.

Channel Flow

	Segment ID					
12a. Channel/Conduit Description	A-B(15")					
12b. Cross sectional flow area, A (ft.$^{2)}$	PIPE					
13. Wetted perimeter, $P_{w\ (ft)}$	1.23					
14. Hydraulic Radius, R (ft) $R = \frac{A}{P_w}$	3.93					
15a. Change in Elevation, H (ft)	0.31					
15b. Channel Slope, S (ft/ft)	10.0					
16. Manning's Roughness Coeff., n	0.043					
17. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$	0.013					
18. Flow length, L (ft)	11.017					
19. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$	230					
	0.006	+	+	+	= 0.01	hr.
					= 0.3	min.

Lake or Reservoir Flow

	Segment ID					
20. Mean Depth of Lake or Reservoir, D (ft)						
21. Wave Velocity Ac, V_w (ft/sec) $V_w = (gD)^{0.5}$						
22. Flow Length, L (ft)						
25. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$		+	+	+	=	hr.
					=	min.

Total T_c (Sum T_t From Previous Steps) = 0 min.

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ECSU -2012 Existing Conditions
Wilimantic, CT

Calculated By: BAM 06-2012
Checked By:_____
MMI# 1266-27

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

(Derived from Worksheet 3, USDA 210-VI-TR55, Second Ed, June 1986)

Watershed ID: 20 | Existing Conditions X | Travel Time (Tt) _____
Subwatershed ID: _____ | Proposed Condntions _____ | Time of Conc. (Tc) X

Sheet Flow (Applicable to T_c Only)

	Segment ID	A-B			
1. Surface Description (Table 3-1)		GRASS			
2. Manning's Roughness Coeff. for Sheet Flow, n (Table 3-1)		0.240			
3. Flow Length, L (Max. = 300 ft, CTDOT Recommends < 150 ft)		300			
4. Two-Year 24-hr rainfall, P_2 (in)		3.3			
5a. Change in Elevation, h (ft)		16.0			
5b. Land Slope, s (ft/ft)		0.053			
6. Travel Time, T_t (hr) $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		0.381	=	22.9	min.

Shallow Concentrated Flow (Assume Hyd. Radius = Depth of Flow)

	Segment ID	B-C		C-D						
7a. Surface Description		GRASS		PAVED						
7b. Paved or Unpaved		UNPV		PAVE						
7c. Manning's Roughness Coeff., n		0.050		0.025						
7d. Depth of Flow, d (ft) (d = 0.4 Unpaved, d = 0.2 Paved)		0.4		0.2						
8. Flow Length, L		372		681						
9a. Change in Elevation, h (ft)		22.0		36.0						
9b. Watercourse slope, s (ft/ft)		0.059		0.053						
10. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$		3.934		4.686						
11. Travel Time, T_t (hr) $T_t = \frac{L}{3600 * V}$		0.026	+	0.040	+		+		=	0.07 hr.
									=	4.0 min.

Channel Flow

	Segment ID	D-E		D-E (36")						
12a. Channel/Conduit Description		CHANNEL		PIPE						
12b. Cross sectional flow area, A (ft.$^{2)}$		37.50		7.07						
13. Wetted perimeter, $P_{w\ (ft)}$		20.00		9.42						
14. Hydraulic Radius, R (ft) $R = \frac{A}{P_w}$		1.88		0.75						
15a. Change in Elevation, H (ft)		4.0		6.0						
15b. Channel Slope, S (ft/ft)		0.037		0.042						
16. Manning's Roughness Coeff., n		0.3		0.013						
17. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$		1.447		19.322						
18. Flow length, L (ft)		109		144						
19. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$		0.021	+	0.002	+		+		=	0.02 hr.
									=	1.4 min.

Lake or Reservoir Flow

	Segment ID									
20. Mean Depth of Lake or Reservoir, D (ft)										
21. Wave Velocity Ac, V_w (ft/sec) $V_w = (gD)^{0.5}$										
22. Flow Length, L (ft)										
25. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$										
			+		+		+		=	hr.
									=	min.

Total T_c (Sum T_t From Previous Steps) = 28 min.

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ECSU -2012 Existing Conditions
Wilimantic, CT

Calculated By: BAM 06-2012
Checked By:_____
MMI# 1266-27

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

(Derived from Worksheet 3, USDA 210-VI-TR55, Second Ed, June 1986)

Watershed ID: 30 | Existing Conditions X | Travel Time (Tt) _____
Subwatershed ID: _____ | Proposed Condntions _____ | Time of Conc. (Tc) X

Sheet Flow (Applicable to T_c Only)

	Segment ID	A-B			
1. Surface Description (Table 3-1)		GRASS			
2. Manning's Roughness Coeff. for Sheet Flow, n (Table 3-1)		0.240			
3. Flow Length, L (Max. = 300 ft, CTDOT Recommends < 150 ft)		300			
4. Two-Year 24-hr rainfall, P_2 (in)		3.3			
5a. Change in Elevation, h (ft)		8.0			
5b. Land Slope, s (ft/ft)		0.027			
6. Travel Time, T_t (hr) $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		0.503	=	30.2	min.

Shallow Concentrated Flow (Assume Hyd. Radius = Depth of Flow)

	Segment ID	B-C								
7a. Surface Description		GRASS								
7b. Paved or Unpaved		UNPV								
7c. Manning's Roughness Coeff., n		0.050								
7d. Depth of Flow, d (ft) (d = 0.4 Unpaved, d = 0.2 Paved)		0.4								
8. Flow Length, L		596								
9a. Change in Elevation, h (ft)		20.0								
9b. Watercourse slope, s (ft/ft)		0.034								
10. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$		2.964								
11. Travel Time, T_t (hr) $T_t = \frac{L}{3600 * V}$		0.056	+		+		+		=	0.06 hr.
									=	3.4 min.

Channel Flow

	Segment ID	C-D (15"_		D-E(36")						
12a. Channel/Conduit Description		PIPE		PIPE						
12b. Cross sectional flow area, A (ft.$^{2)}$		1.23		7.07						
13. Wetted perimeter, $P_{w\ (ft)}$		3.93		9.42						
14. Hydraulic Radius, R (ft) $R = \frac{A}{P_w}$		0.31		0.75						
15a. Change in Elevation, H (ft)		15.0		1.0						
15b. Channel Slope, S (ft/ft)		0.028		0.010						
16. Manning's Roughness Coeff., n		0.013		0.013						
17. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$		8.905		9.562						
18. Flow length, L (ft)		528		98						
19. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$		0.016	+	0.003	+		+		=	0.02 hr.
									=	1.2 min.

Lake or Reservoir Flow

	Segment ID									
20. Mean Depth of Lake or Reservoir, D (ft)										
21. Wave Velocity Ac, V_w (ft/sec) $V_w = (gD)^{0.5}$										
22. Flow Length, L (ft)										
25. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$										
			+		+		+		=	hr.
									=	min.

Total T_c (Sum T_t From Previous Steps) = 35 min.

Engineering, Landscape Architecture and Environmental Science
MILONE & MACBROOM®
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Cheshire, Connecticut 06410
(203 271-1773

ECSU -2012 Existing Conditions
Wilimantic, CT

Calculated By: BAM 06-2012
Checked By:_____
MMI# 1266-27

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

(Derived from Worksheet 3, USDA 210-VI-TR55, Second Ed, June 1986)

Watershed ID: 40 | Existing Conditions X | Travel Time (Tt) _____
Subwatershed ID: _____ | Proposed Condntions _____ | Time of Conc. (Tc) X

Sheet Flow (Applicable to T_c Only)

	Segment ID	A-B			
1. Surface Description (Table 3-1)		GRASS			
2. Manning's Roughness Coeff. for Sheet Flow, n (Table 3-1)		0.240			
3. Flow Length, L (Max. = 300 ft, CTDOT Recommends < 150 ft)		65			
4. Two-Year 24-hr rainfall, P_2 (in)		3.3			
5a. Change in Elevation, h (ft)		3.0			
5b. Land Slope, s (ft/ft)		0.046			
6. Travel Time, T_t (hr) $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		0.119	=	7.1	min.

Shallow Concentrated Flow (Assume Hyd. Radius = Depth of Flow)

	Segment ID	B-C								
7a. Surface Description		PAVED								
7b. Paved or Unpaved		PAVE								
7c. Manning's Roughness Coeff., n		0.025								
7d. Depth of Flow, d (ft) (d = 0.4 Unpaved, d = 0.2 Paved)		0.2								
8. Flow Length, L		690								
9a. Change in Elevation, h (ft)		9.0								
9b. Watercourse slope, s (ft/ft)		0.013								
10. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$		2.328								
11. Travel Time, T_t (hr) $T_t = \frac{L}{3600 * V}$		0.082	+		+		+		=	0.08 hr.
									=	4.9 min.

Channel Flow

	Segment ID	C-D (15")		D-E (42")_						
12a. Channel/Conduit Description		PIPE		PIPE						
12b. Cross sectional flow area, A (ft.^{2})		1.23		9.62						
13. Wetted perimeter, P_w (ft)		3.93		10.99						
14. Hydraulic Radius, R (ft) $R = \frac{A}{P_w}$		0.31		0.88						
15a. Change in Elevation, H (ft)		32.0		31.0						
15b. Channel Slope, S (ft/ft)		0.031		0.021						
16. Manning's Roughness Coeff., n		0.013		0.013						
17. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$		9.290		15.367						
18. Flow length, L (ft)		1035		1444						
19. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$		0.031	+	0.026	+		+		=	0.06 hr.
									=	3.4 min.

Lake or Reservoir Flow

	Segment ID									
20. Mean Depth of Lake or Reservoir, D (ft)										
21. Wave Velocity Ac, V_w (ft/sec) $V_w = (gD)^{0.5}$										
22. Flow Length, L (ft)										
25. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$			+		+		+		=	hr.
									=	min.

Total T_c (Sum T_t From Previous Steps) = 15 min.

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 10- 2017 Conditions
No Change from 2012 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG D	1/4 acre Residential District (off campus)	83			0.00	0.00
HSG C	Lawn / Open space - good (off campus)	74			0.00	0.00
N/A	Existing impervious / paved	98			1.67	163.66
HSG C	Lawn / Open space - good	74			0.34	25.16
				Totals =	2.01	188.82
					(0.0031	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{188.82}{2.01}$$

Use CN = **94**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 20- 2017 Conditions
No change from 2012 conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	1/4 acre Residential District	75			3.66	274.50
HSG C	1/4 acre Residential District	83			1.42	117.86
HSG C	1/4 acre Residential District	83			14.39	1194.37
N/A	Existing impervious / paved	98			1.37	134.26
HSG C	Lawn / Open space - good	74			7.50	555.00
HSG C	Lawn / Open space - good	74			0.14	10.36
HSG C	Lawn / Open space - good (off campus)	74			5.40	399.60
				Totals =	33.88	2685.95
					(0.0529	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{2685.95}{33.88}$$

Use CN = **79**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 30- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	1/4 acre Residential District (off campus)	75			1.51	113.25
HSG B	Lawn / Open space - good condition	61			3.36	204.96
HSG C	Lawn / Open space - good condition	74			2.85	210.90
N/A	Existing impervious / paved	98			6.91	677.18
					Totals =	14.63 / 1206.29
					(	0.0229 sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{1206.29}{14.63}$$

Use CN = **82**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 33- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	Lawn / Open space - good condition	61			3.11	189.71
HSG C	Lawn / Open space - good condition	74			14.20	1050.80
HSG C	Lawn / Open space - good (off-campus)	74			2.44	180.56
HSG B	Lawn / Open space - good (off-campus)	61			0.34	20.74
N/A	Existing impervious / paved (off-campus)	98			1.97	193.06
N/A	Existing impervious / paved (B)	98			3.53	345.94
N/A	Existing impervious / paved (D)	98			19.91	1951.18
				Totals =	45.50	3931.99
					(0.0711 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{3931.99}{45.50}$$

Use CN = **86**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: Pigeon Road Detention Basin

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG C	Lawn / Open space - good condition	74			9.88	731.12
N/A	Existing impervious / paved	98			0.00	0.00
HSG C	1/4 acre Residential District	83			21.92	1819.36
				Totals =	31.80	2550.48
					(0.0497 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{2550.48}{31.80}$$

Use CN = **80**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 30- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	1/4 acre Residential District (off campus)	75			1.51	113.25
HSG B	Lawn / Open space - good condition	61			3.36	204.96
HSG C	Lawn / Open space - good condition	74			2.85	210.90
N/A	Existing impervious / paved	98			6.54	640.92
N/A	Green Roof	88			0.37	32.56
				Totals =	14.63	1202.59
					(0.0229	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{1202.59}{14.63}$$

Use CN = **82**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 33- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	Lawn / Open space - good condition	61			3.11	189.71
HSG C	Lawn / Open space - good condition	74			14.20	1050.80
HSG C	Lawn / Open space - good (off-campus)	74			2.44	180.56
HSG B	Lawn / Open space - good (off-campus)	61			0.34	20.74
N/A	Existing impervious / paved (off-campus)	98			1.97	193.06
N/A	Existing impervious / paved (B)	98			3.53	345.94
N/A	Existing impervious / paved (D)	98			17.65	1729.70
N/A	Green Roof	88			2.26	198.88
				Totals =	45.50	3909.39
					(0.0711 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{3909.39}{45.50}$$

Use CN = **86**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 10- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG D	1/4 acre Residential District (off campus)	87			0.00	0.00
HSG D	Lawn / Open space - good (off campus)	80			0.00	0.00
N/A	Existing impervious / paved	98			1.67	163.66
HSG C	Lawn / Open space - good	74			0.34	25.16
				Totals =	2.01	188.82
					(0.0031	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{188.82}{2.01}$$

Use CN = **94**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 20- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	1/4 acre Residential District	75			3.66	274.50
HSG C	1/4 acre Residential District	83			15.81	1312.23
HSG D	1/4 acre Residential District	87				
N/A	Existing impervious / paved	98			1.37	134.26
HSG C	Lawn / Open space - good	74			7.64	565.36
HSG C	Lawn / Open space - good (off campus)	74			5.40	399.60
					Totals = 33.88	2685.95
					(0.0529 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{2685.95}{33.88}$$

Use CN = **79**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 30- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	1/4 acre Residential District (off campus)	75			1.51	113.25
HSG B	Lawn / Open space - good condition	61			2.90	176.90
HSG C	Lawn / Open space - good condition	74			3.05	225.70
N/A	Existing impervious / paved (B)	98			3.33	326.34
N/A	Existing impervious / paved (C)	98			3.84	376.32
				Totals =	14.63	1218.51
					(0.0229	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{1218.51}{14.63}$$

Use CN = **83**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 33- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	CN Value [1.] Figure 2-3	CN Value [1.] Figure 2-4	Area (Acres) Sq. Ft. %	Product of CN x Area
HSG B	Lawn / Open space - good condition	61			3.48	212.28
HSG C	Lawn / Open space - good condition	74			8.82	652.68
HSG C	Lawn / Open space - good (off-campus)	74			2.44	180.56
HSG B	Lawn / Open space - good (off-campus)	61			0.34	20.74
N/A	Existing impervious / paved (off-campus)	98			1.97	193.06
N/A	Existing impervious / paved	98			28.44	2787.12
				Totals =	45.49	4046.44
					(0.0711 sq mi)	

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{4046.44}{45.49}$ Use CN = **89**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 10- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG D	1/4 acre Residential District (off campus)	87				0.00
HSG D	Lawn / Open space - good (off campus)	80				0.00
N/A	Existing impervious / paved	98			0.07	6.86
HSG C	Lawn / Open space - good	74			1.94	143.56
				Totals =	2.01	150.42
					(0.0031	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{150.42}{2.01}$$

Use CN = 75

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 20- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	1/4 acre Residential District	75			3.66	274.50
HSG C	1/4 acre Residential District	83			1.42	117.86
HSG C	1/4 acre Residential District	83			14.39	1194.37
N/A	Existing impervious / paved	98			0.00	0.00
HSG C	Lawn / Open space - good	74			7.50	555.00
HSG C	Lawn / Open space - good	74			1.51	111.74
HSG C	Lawn / Open space - good (off campus)	74			5.40	399.60
				Totals =	33.88	2653.07
					(0.0529 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{2653.07}{33.88}$$

Use CN = **78**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 30- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	1/4 acre Residential District (off campus)	75			1.51	113.25
HSG B	Lawn / Open space - good condition	61			1.48	90.28
HSG C	Lawn / Open space - good condition	74			5.37	397.38
N/A	Existing impervious / paved (B)	98			0.91	89.18
N/A	Existing impervious / paved (D)	98			1.52	148.96
HSG B	Woods - good condition	55			3.84	211.20
				Totals =	14.63	1050.25
					(0.0229 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{1050.25}{14.63}$$

Use CN = 72

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 33- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	Lawn / Open space - good condition	61			1.36	82.96
HSG C	Lawn / Open space - good condition	74			21.34	1579.16
HSG C	Lawn / Open space - good (off-campus)	74			2.44	180.56
HSG B	Lawn / Open space - good (off-campus)	61			0.34	20.74
N/A	Existing impervious / paved (off-campus)	98			1.97	193.06
N/A	Existing impervious / paved (B)	98			0.90	88.20
N/A	Existing impervious / paved (D)	98			12.72	1246.56
HSG B	Woods - good condition	55			4.42	243.10
				Totals =	45.49	3634.34
					(0.0711 sq mi)	

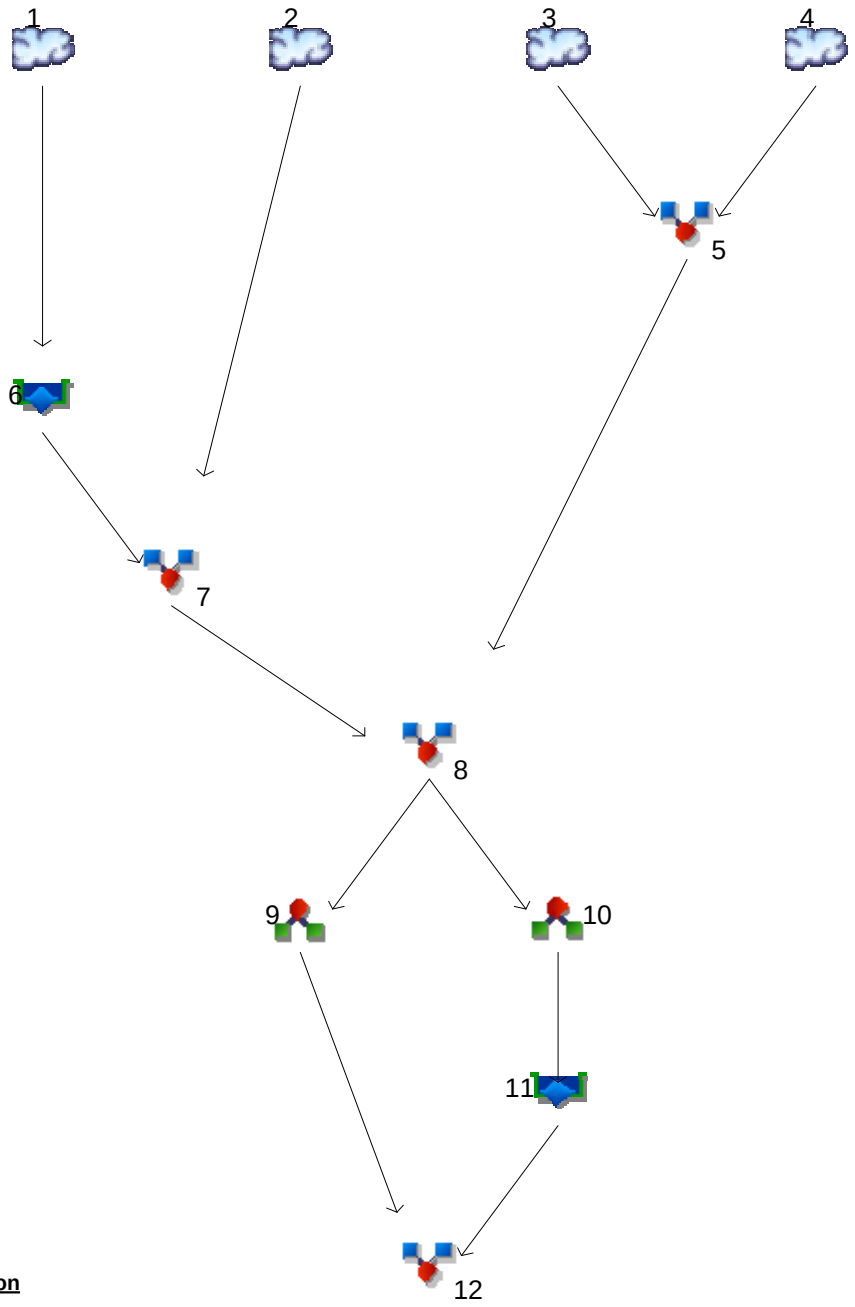
[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{3634.34}{45.49}$$

Use CN = **80**

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2017
2	SCS Runoff	WS20-2017
3	SCS Runoff	WS30-2017
4	SCS Runoff	WS33-2017
5	Combine	North Garage-East-2017
6	Reservoir	South Garage 2017
7	Combine	North Garage West 2017
8	Combine	North Garage Combined 2017
9	Diversion1	Test to make 25 yr run
10	Diversion2	Remaining to outfall
11	Reservoir	Arboretum Brook 2017
12	Combine	Outflow to Arboretum

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	-------	-------	-------	-------	-------	-------	13.62	WS10-2017
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	130.76	WS20-2017
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	55.80	WS30-2017
4	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	237.09	WS33-2017
5	Combine	3, 4	-------	-------	-------	-------	-------	-------	-------	281.92	North Garage-East-2017
6	Reservoir	1	-------	-------	-------	-------	-------	-------	-------	11.53	South Garage 2017
7	Combine	2, 6	-------	-------	-------	-------	-------	-------	-------	138.70	North Garage West 2017
8	Combine	5, 7	-------	-------	-------	-------	-------	-------	-------	414.70	North Garage Combined 2017
9	Diversion1	8	-------	-------	-------	-------	-------	-------	-------	111.00	Test to make 25 yr run
10	Diversion2	8	-------	-------	-------	-------	-------	-------	-------	303.70	Remaining to outfall
11	Reservoir	10	-------	-------	-------	-------	-------	-------	-------	243.56	Arboretum Brook 2017
12	Combine	9, 11	-------	-------	-------	-------	-------	-------	-------	354.56	Outflow to Arboretum

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	13.62	3	726	50,559	------	------	------	WS10-2017
2	SCS Runoff	130.76	3	738	689,994	------	------	------	WS20-2017
3	SCS Runoff	55.80	3	741	322,399	------	------	------	WS30-2017
4	SCS Runoff	237.09	3	732	1,096,331	------	------	------	WS33-2017
5	Combine	281.92	3	732	1,418,730	3, 4	------	------	North Garage-East-2017
6	Reservoir	11.53	3	729	50,552	1	309.98	6,155	South Garage 2017
7	Combine	138.70	3	738	740,545	2, 6	------	------	North Garage West 2017
8	Combine	414.70	3	735	2,159,275	5, 7	------	------	North Garage Combined 2017
9	Diversion1	111.00	3	711	1,595,845	8	------	------	Test to make 25 yr run
10	Diversion2	303.70	3	735	563,431	8	------	------	Remaining to outfall
11	Reservoir	243.56	3	744	563,429	10	315.99	160,481	Arboretum Brook 2017
12	Combine	354.56	3	744	2,159,273	9, 11	------	------	Outflow to Arboretum

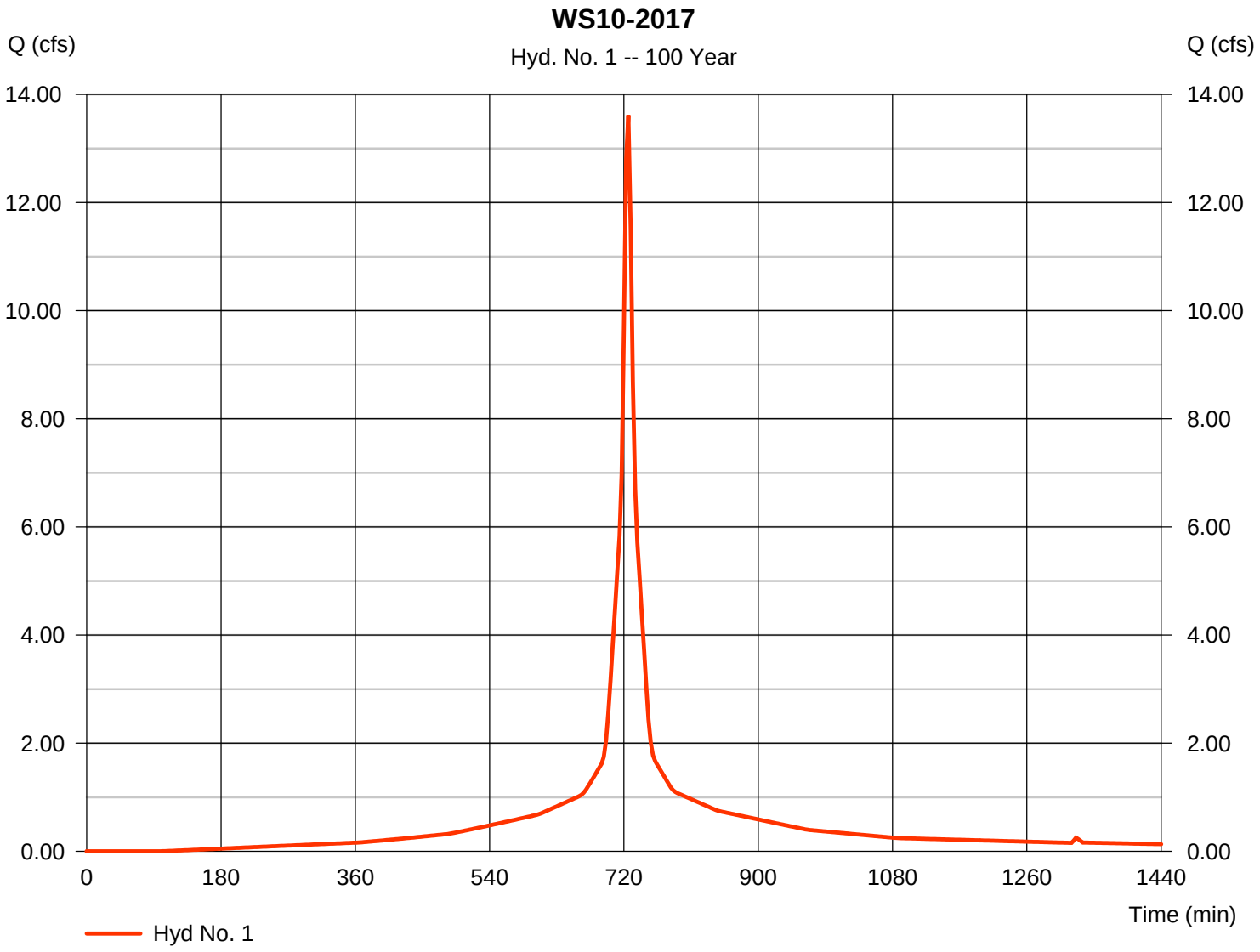
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

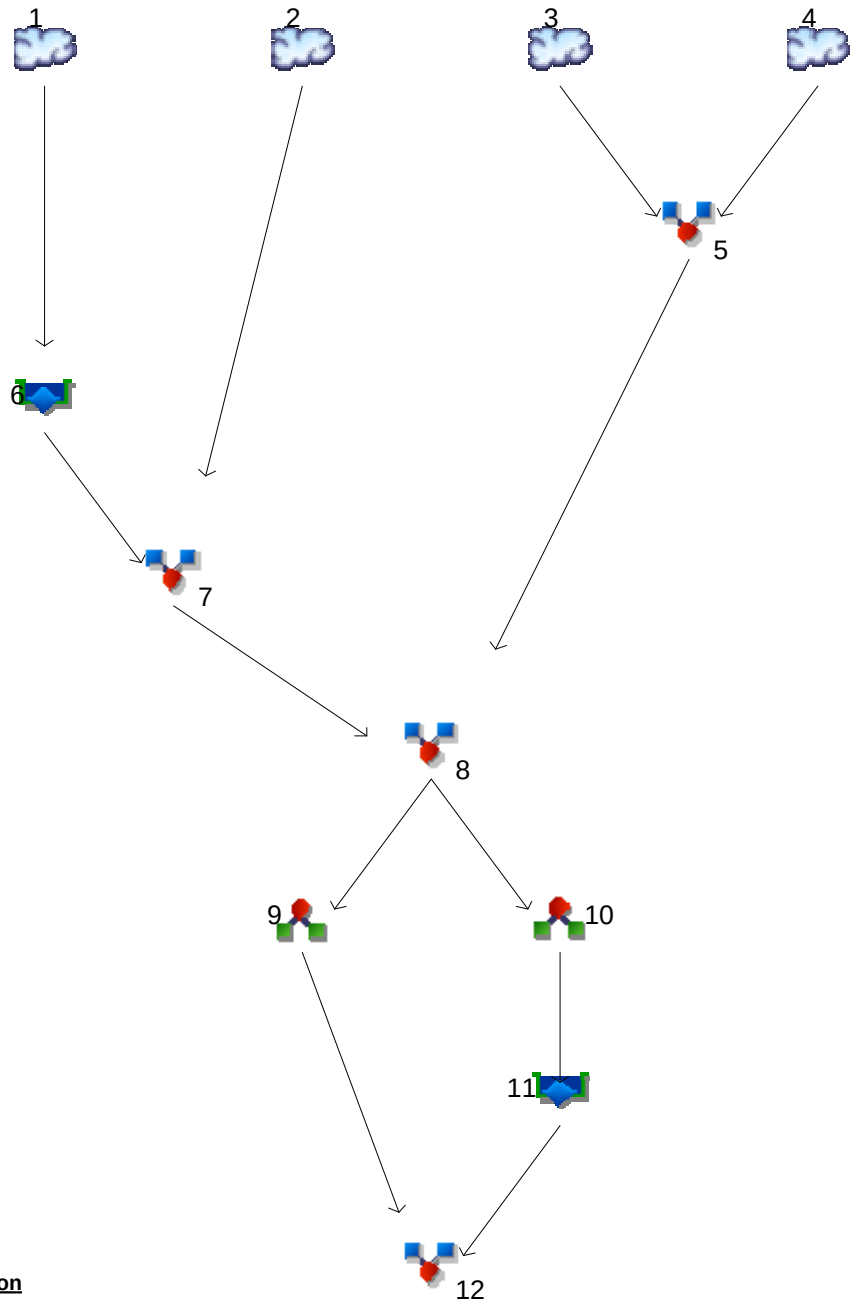
WS10-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 13.62 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 50,559 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2017
2	SCS Runoff	WS20-2017
3	SCS Runoff	WS30-2017
4	SCS Runoff	WS33-2017
5	Combine	North Garage-East-2017
6	Reservoir	South Garage 2017
7	Combine	North Garage West 2017
8	Combine	North Garage Combined 2017
9	Diversion1	Test to make 25 yr run
10	Diversion2	Remaining to outfall
11	Reservoir	Arboretum Brook 2017
12	Combine	Outflow to Arboretum

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	-------	-------	-------	-------	-------	11.48	-------	WS10-2017
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	104.78	-------	WS20-2017
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	45.24	-------	WS30-2017
4	SCS Runoff	------	-------	-------	-------	-------	-------	-------	195.23	-------	WS33-2017
5	Combine	3, 4	-------	-------	-------	-------	-------	-------	231.32	-------	North Garage-East-2017
6	Reservoir	1	-------	-------	-------	-------	-------	-------	9.572	-------	South Garage 2017
7	Combine	2, 6	-------	-------	-------	-------	-------	-------	111.55	-------	North Garage West 2017
8	Combine	5, 7	-------	-------	-------	-------	-------	-------	338.12	-------	North Garage Combined 2017
9	Diversion1	8	-------	-------	-------	-------	-------	-------	52.00	-------	Test to make 25 yr run
10	Diversion2	8	-------	-------	-------	-------	-------	-------	286.12	-------	Remaining to outfall
11	Reservoir	10	-------	-------	-------	-------	-------	-------	234.36	-------	Arboretum Brook 2017
12	Combine	9, 11	-------	-------	-------	-------	-------	-------	286.36	-------	Outflow to Arboretum

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	11.48	3	726	42,199	------	------	------	WS10-2017
2	SCS Runoff	104.78	3	738	550,316	------	------	------	WS20-2017
3	SCS Runoff	45.24	3	744	259,671	------	------	------	WS30-2017
4	SCS Runoff	195.23	3	732	894,083	------	------	------	WS33-2017
5	Combine	231.32	3	732	1,153,753	3, 4	------	------	North Garage-East-2017
6	Reservoir	9.572	3	729	42,192	1	309.82	5,575	South Garage 2017
7	Combine	111.55	3	738	592,508	2, 6	------	------	North Garage West 2017
8	Combine	338.12	3	735	1,746,262	5, 7	------	------	North Garage Combined 2017
9	Diversion1	52.00	3	699	1,116,011	8	------	------	Test to make 25 yr run
10	Diversion2	286.12	3	735	630,251	8	------	------	Remaining to outfall
11	Reservoir	234.36	3	744	630,250	10	315.60	156,257	Arboretum Brook 2017
12	Combine	286.36	3	744	1,746,261	9, 11	------	------	Outflow to Arboretum

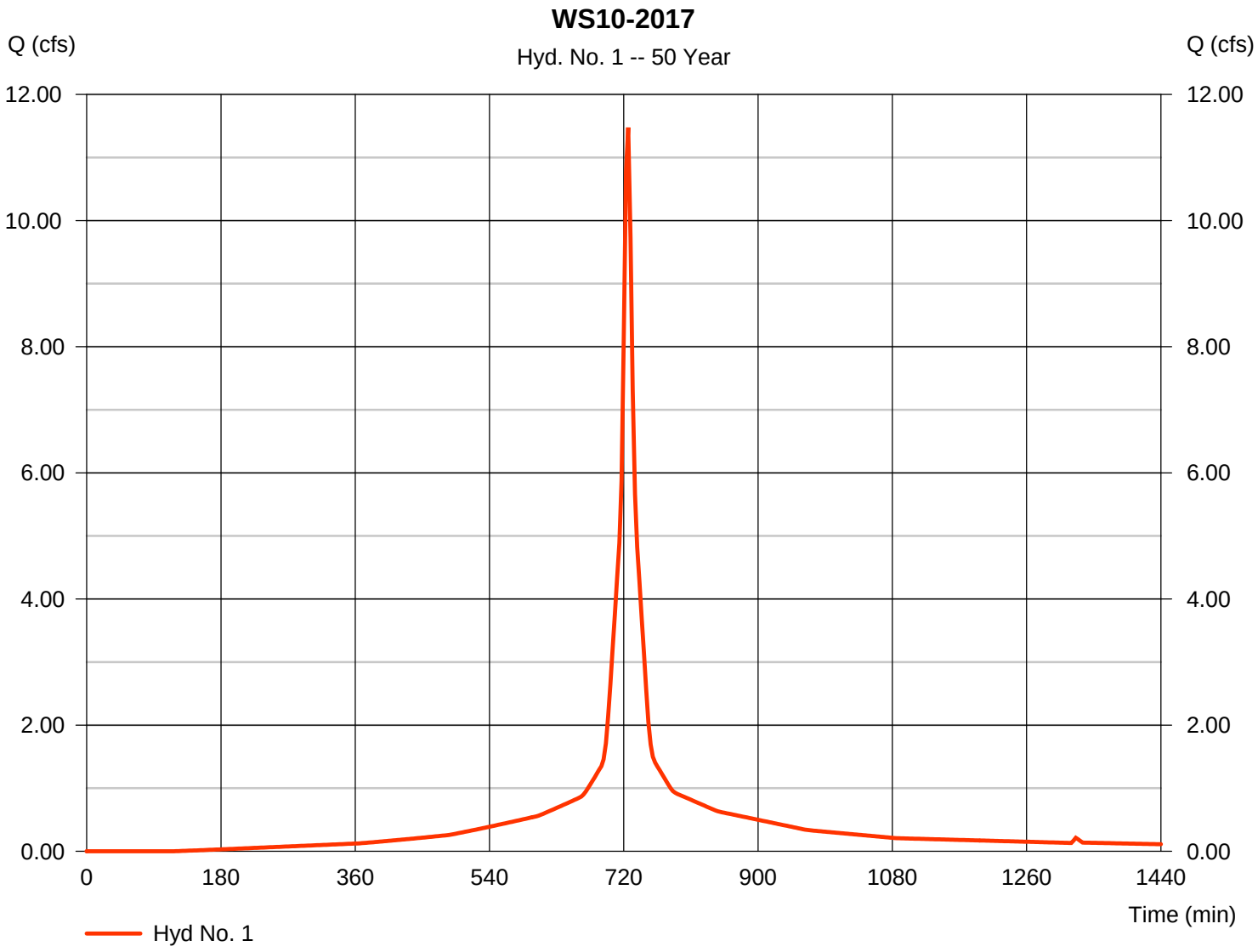
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 11.48 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 42,199 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



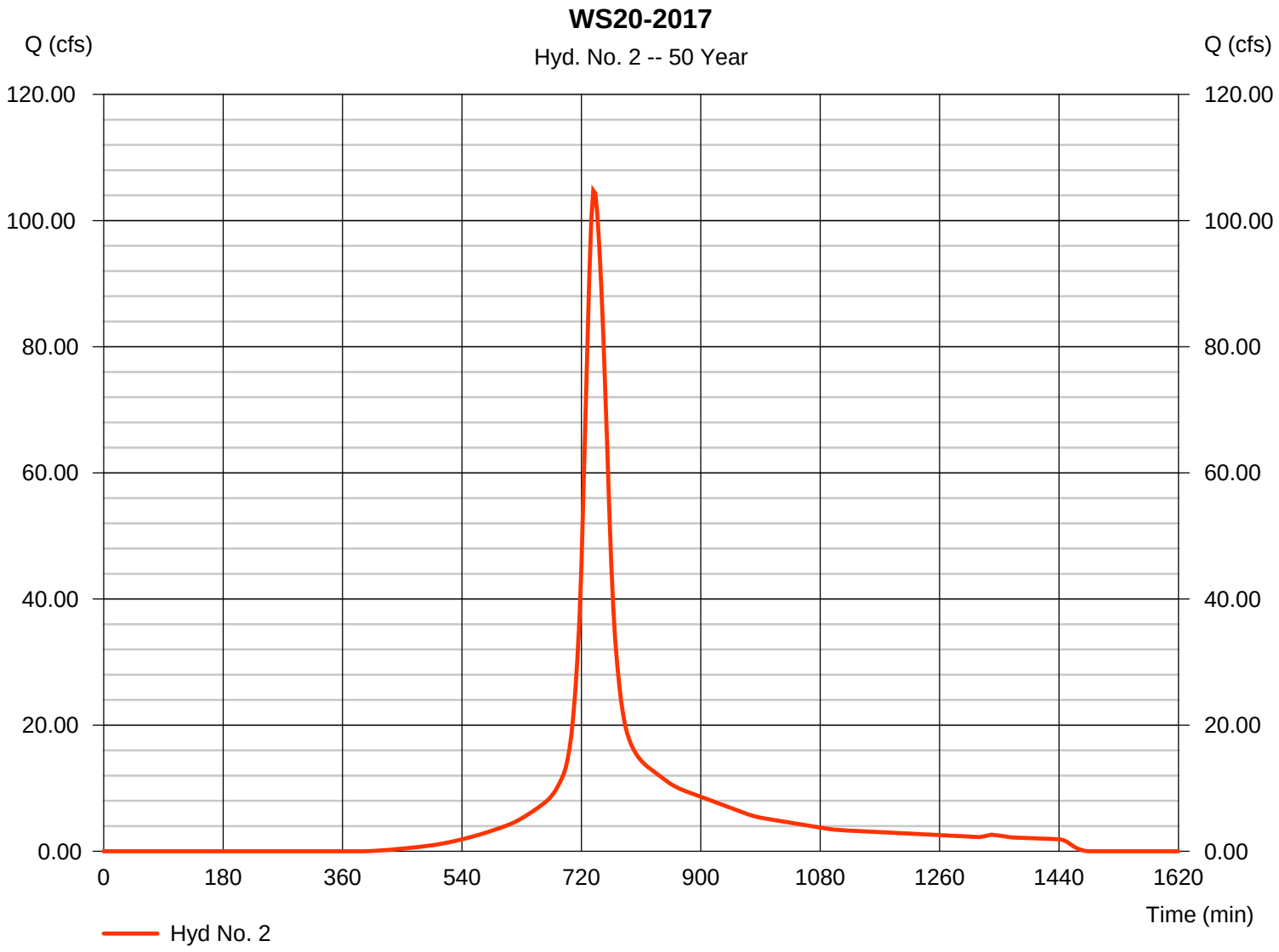
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS20-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 104.78 cfs
Storm frequency	= 50 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 550,316 cuft
Drainage area	= 33.880 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 28.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



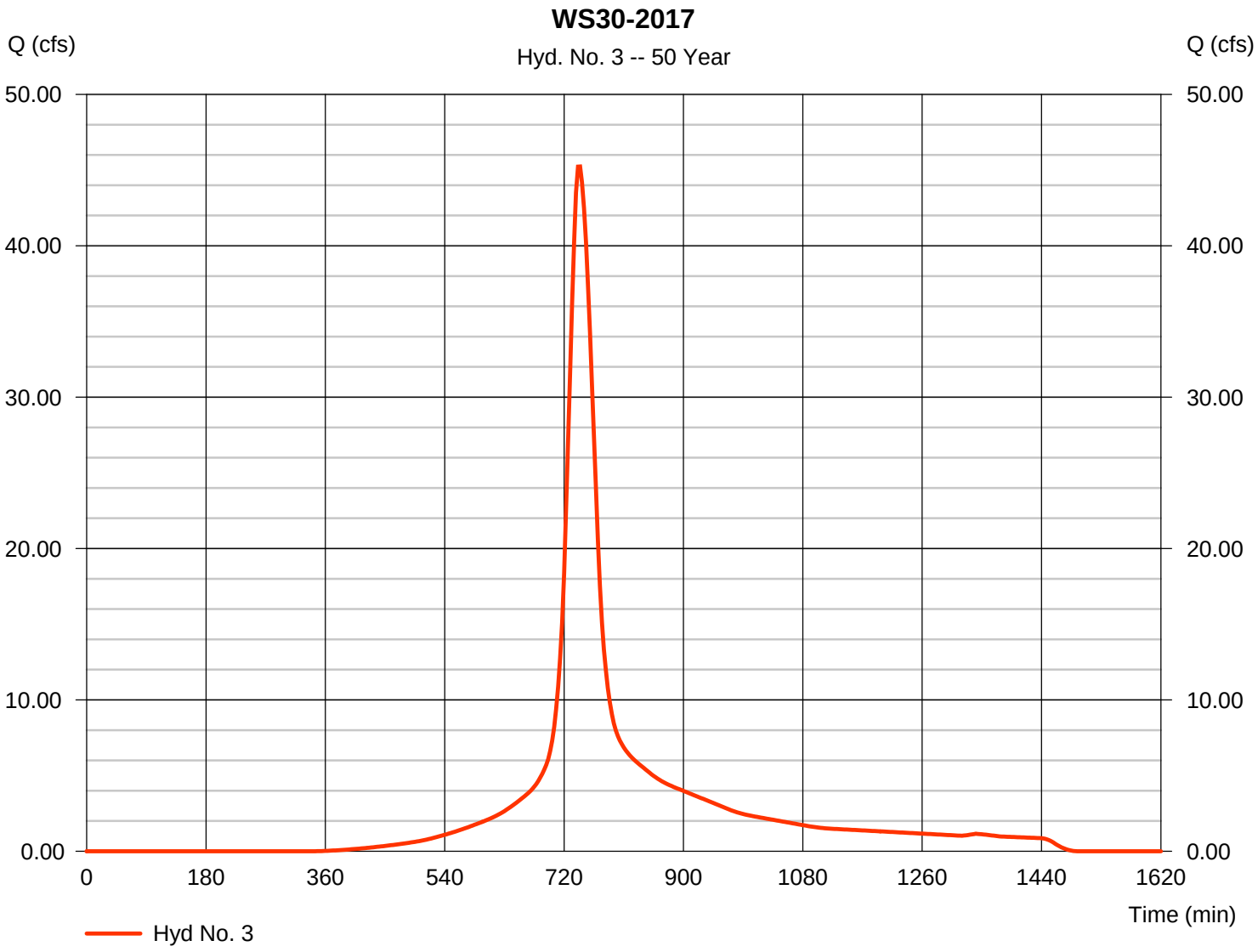
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS30-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 45.24 cfs
Storm frequency	= 50 yrs	Time to peak	= 744 min
Time interval	= 3 min	Hyd. volume	= 259,671 cuft
Drainage area	= 14.630 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 35.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



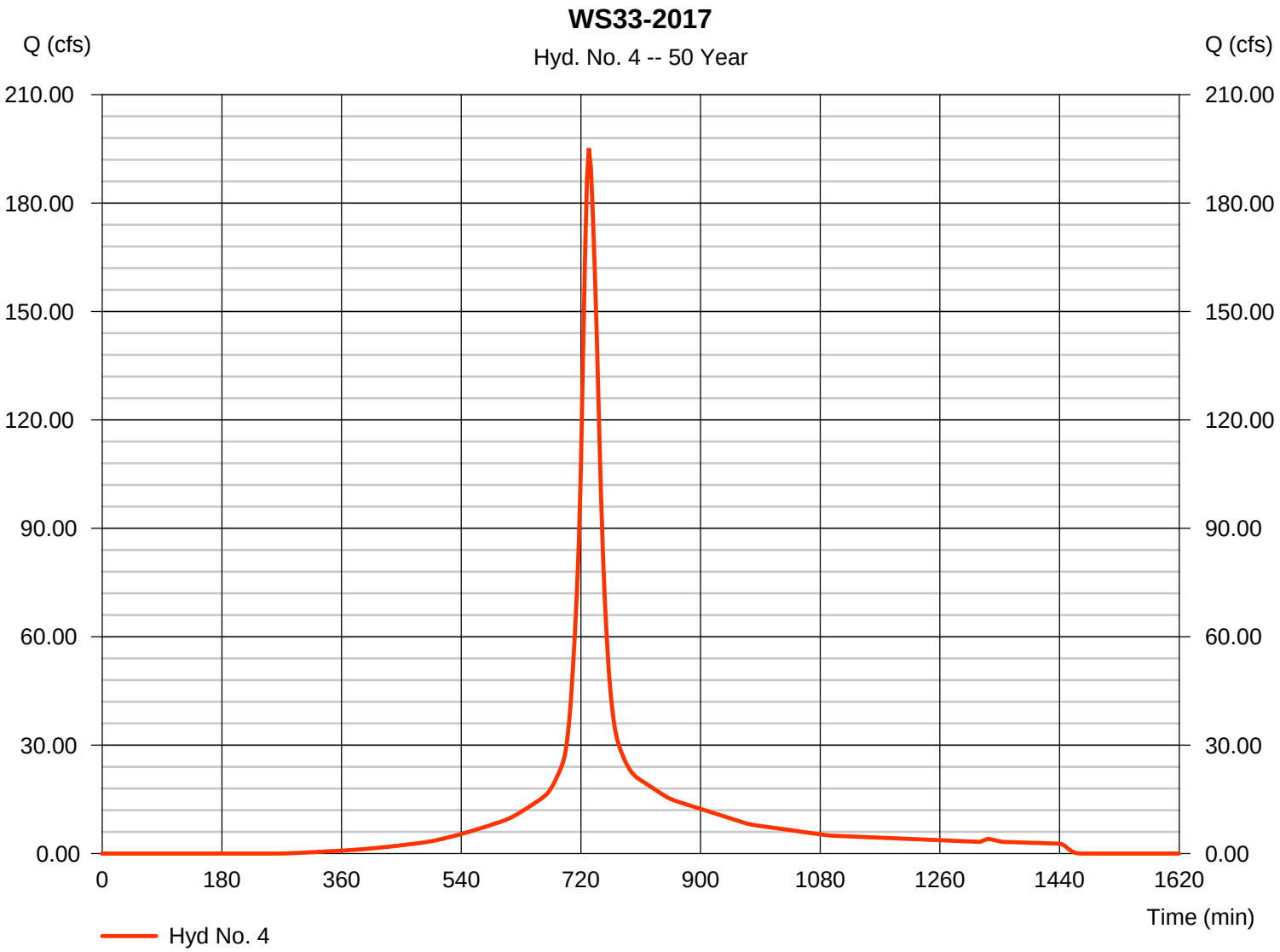
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS33-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 195.23 cfs
Storm frequency	= 50 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 894,083 cuft
Drainage area	= 45.490 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



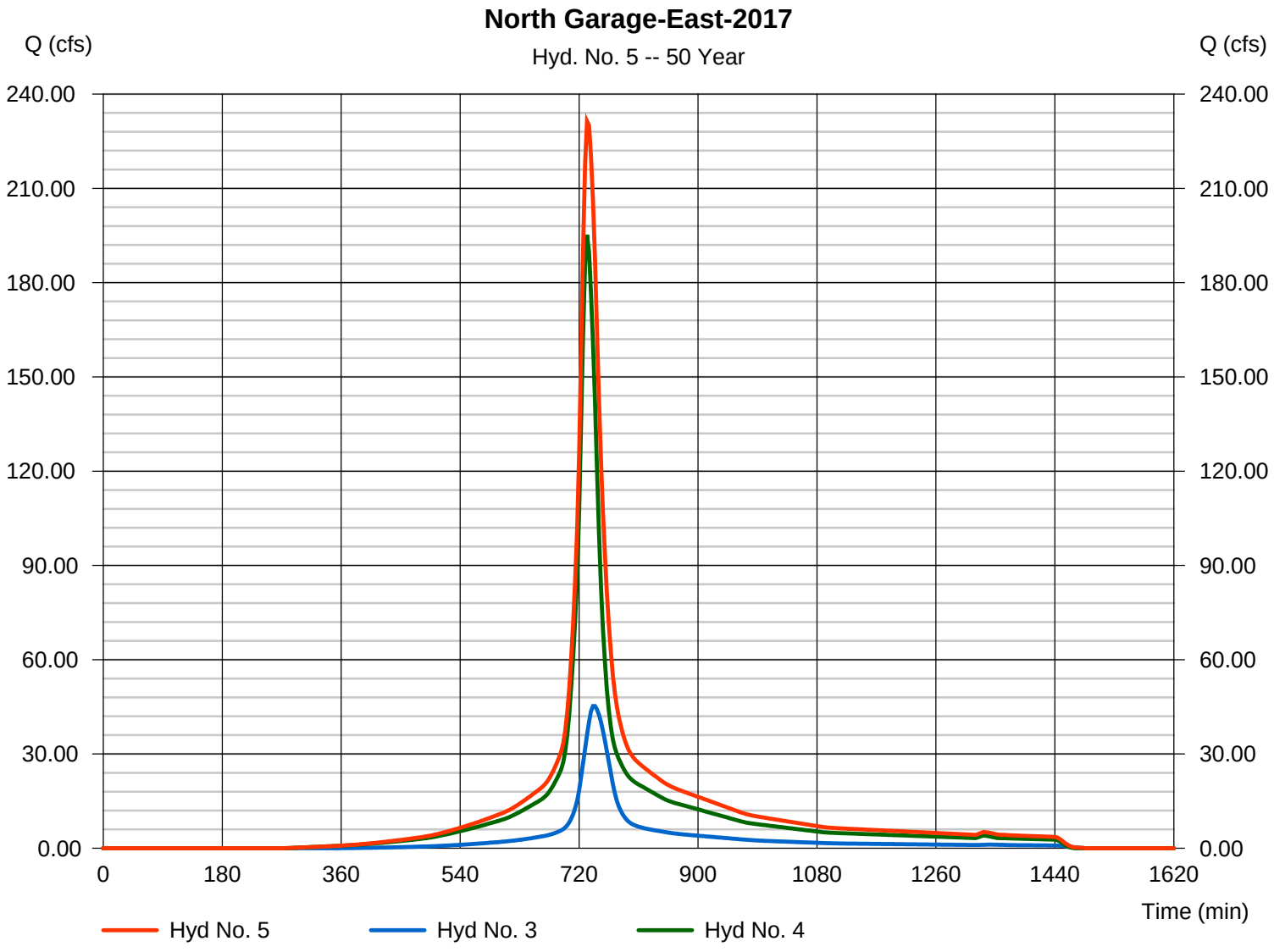
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

North Garage-East-2017

Hydrograph type	=	Combine	Peak discharge	=	231.32 cfs
Storm frequency	=	50 yrs	Time to peak	=	732 min
Time interval	=	3 min	Hyd. volume	=	1,153,753 cuft
Inflow hyds.	=	3, 4	Contrib. drain. area	=	60.120 ac



Hydrograph Report

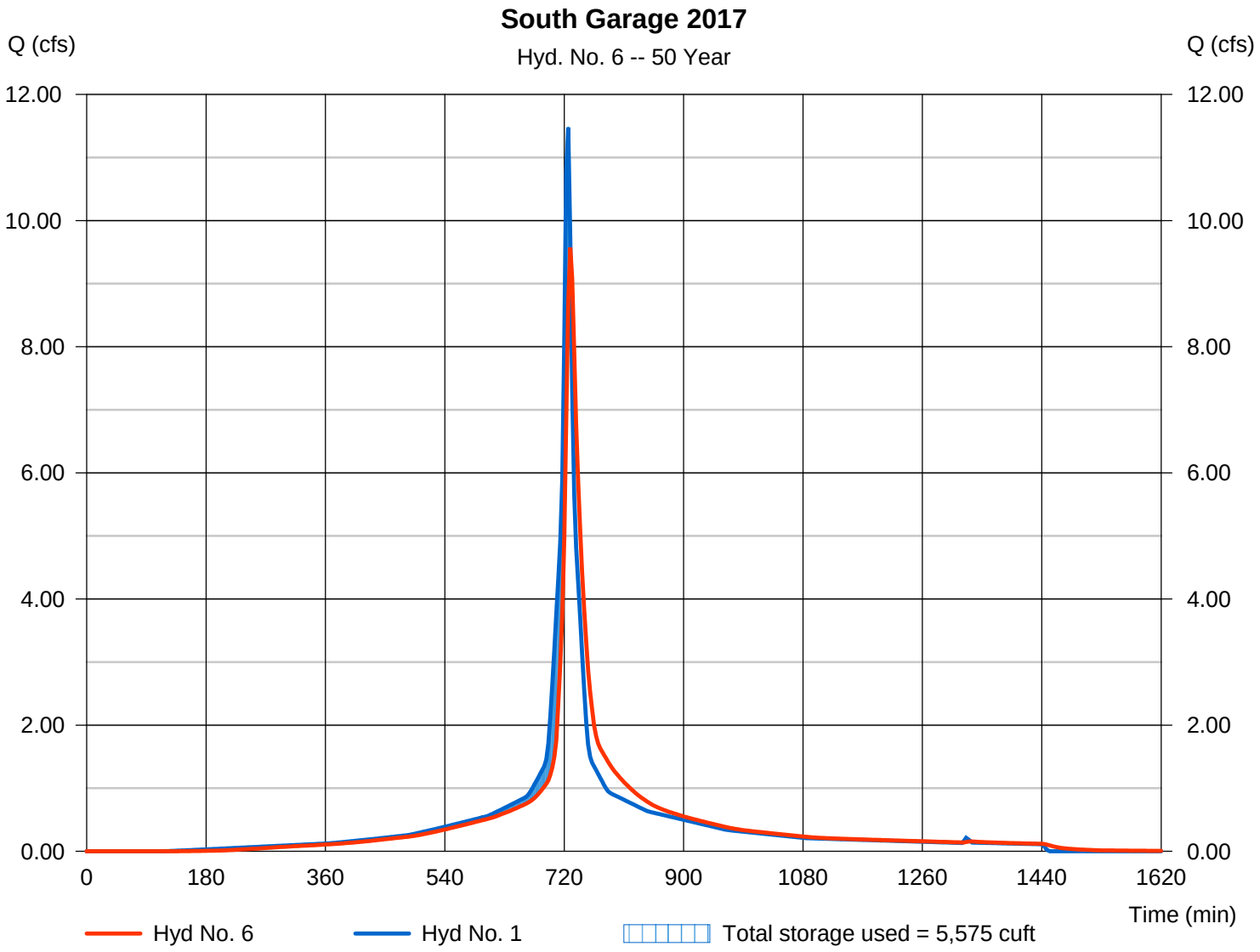
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

South Garage 2017

Hydrograph type	=	Reservoir	Peak discharge	=	9.572 cfs
Storm frequency	=	50 yrs	Time to peak	=	729 min
Time interval	=	3 min	Hyd. volume	=	42,192 cuft
Inflow hyd. No.	=	1 - WS10-2017	Max. Elevation	=	309.82 ft
Reservoir name	=	South Garage U/G Detention	Max. Storage	=	5,575 cuft

Storage Indication method used.



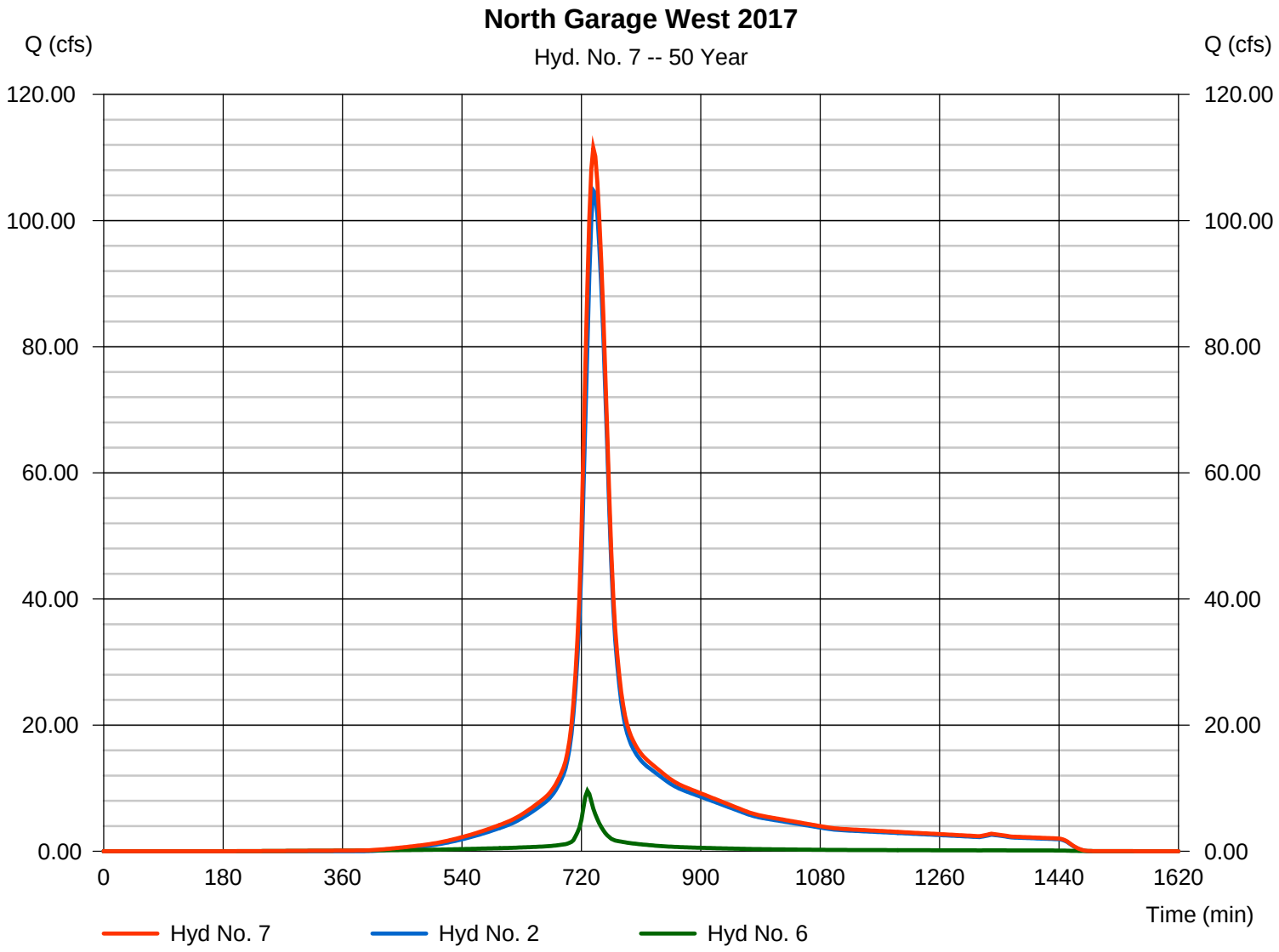
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 7

North Garage West 2017

Hydrograph type	= Combine	Peak discharge	= 111.55 cfs
Storm frequency	= 50 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 592,508 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 33.880 ac



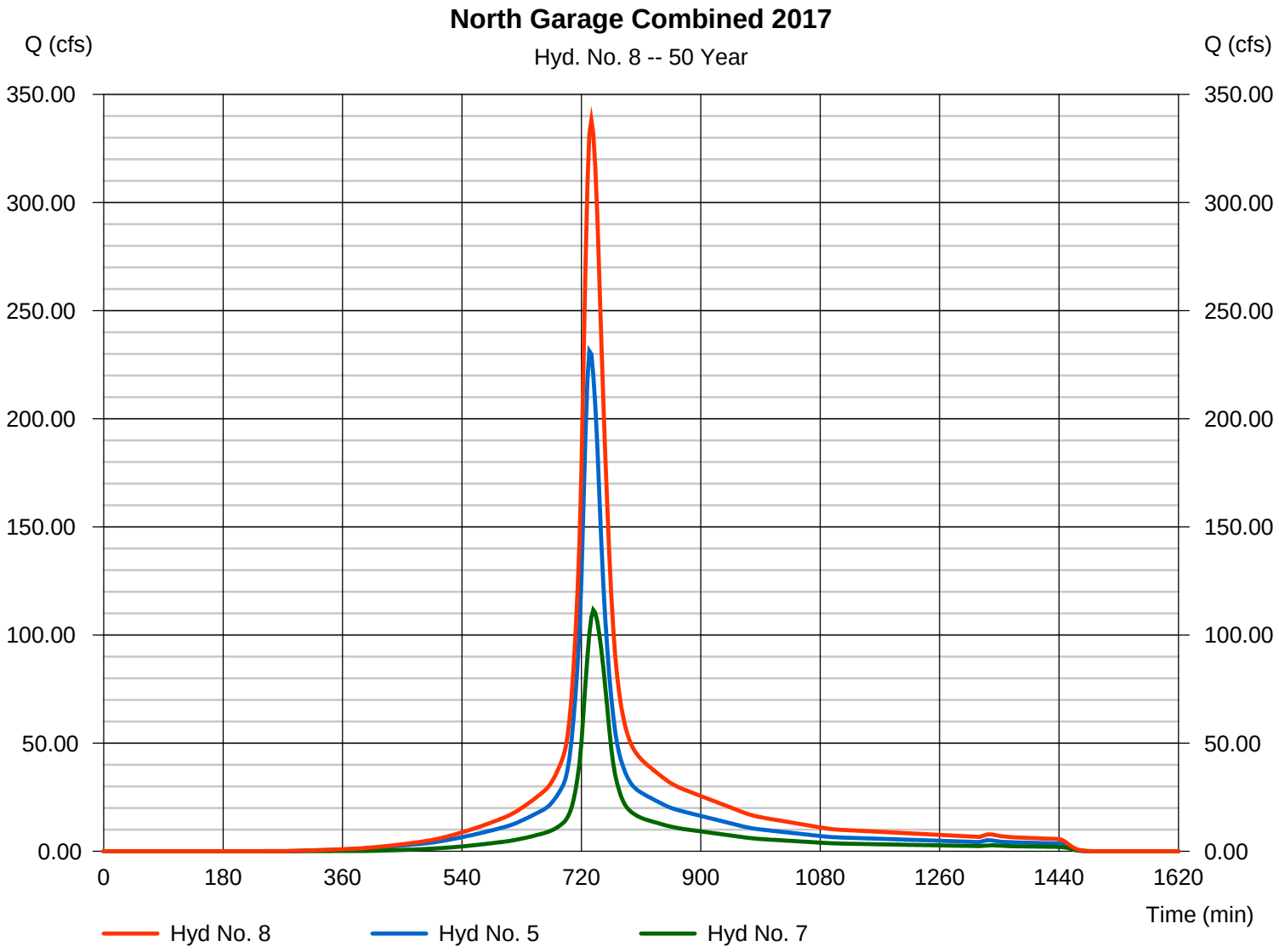
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 8

North Garage Combined 2017

Hydrograph type	=	Combine	Peak discharge	=	338.12 cfs
Storm frequency	=	50 yrs	Time to peak	=	735 min
Time interval	=	3 min	Hyd. volume	=	1,746,262 cuft
Inflow hyds.	=	5, 7	Contrib. drain. area	=	0.000 ac



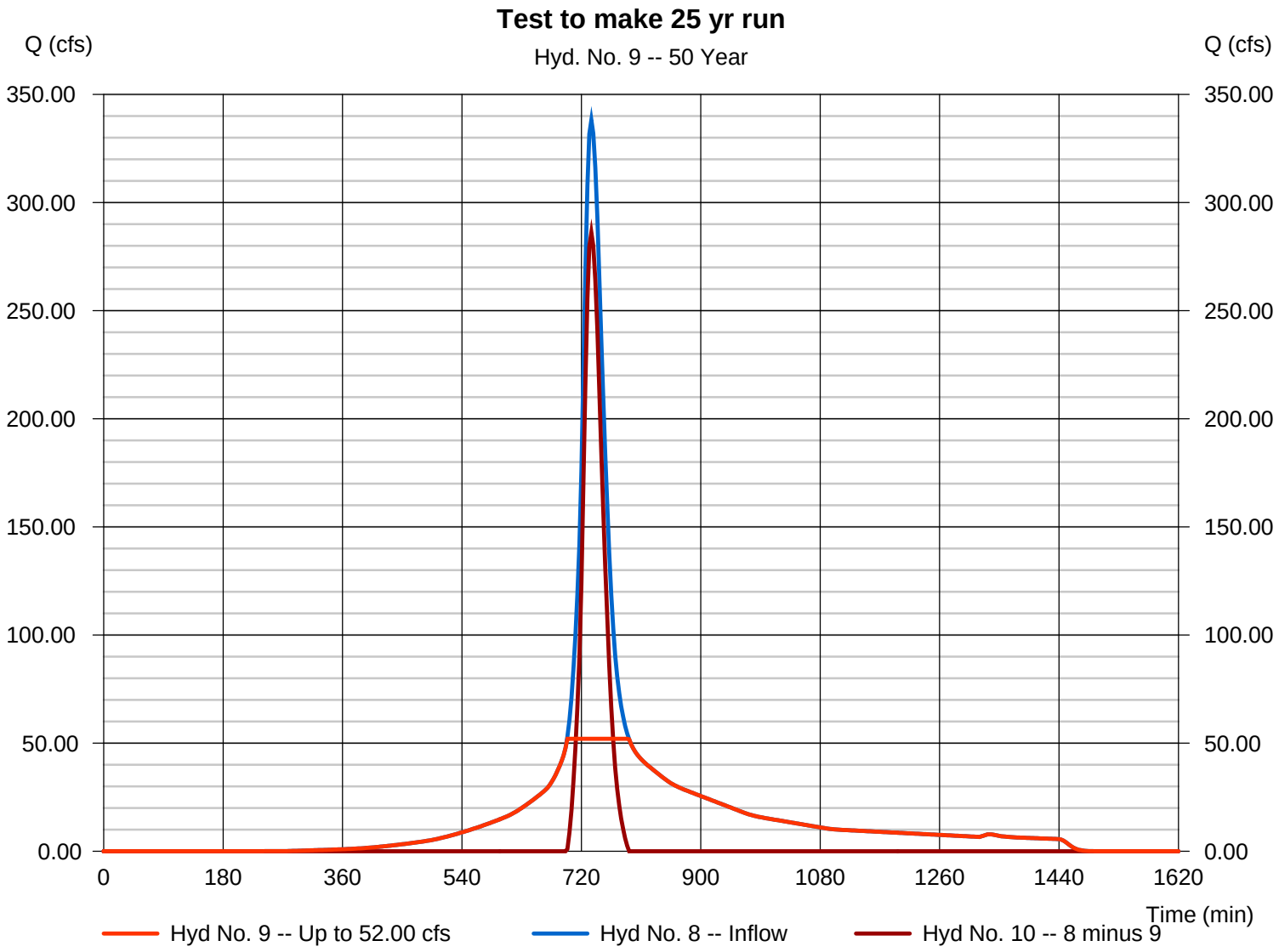
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 9

Test to make 25 yr run

Hydrograph type	= Diversion1	Peak discharge	= 52.00 cfs
Storm frequency	= 50 yrs	Time to peak	= 699 min
Time interval	= 3 min	Hyd. volume	= 1,116,011 cuft
Inflow hydrograph	= 8 - North Garage Combined 2017	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 52.00 cfs



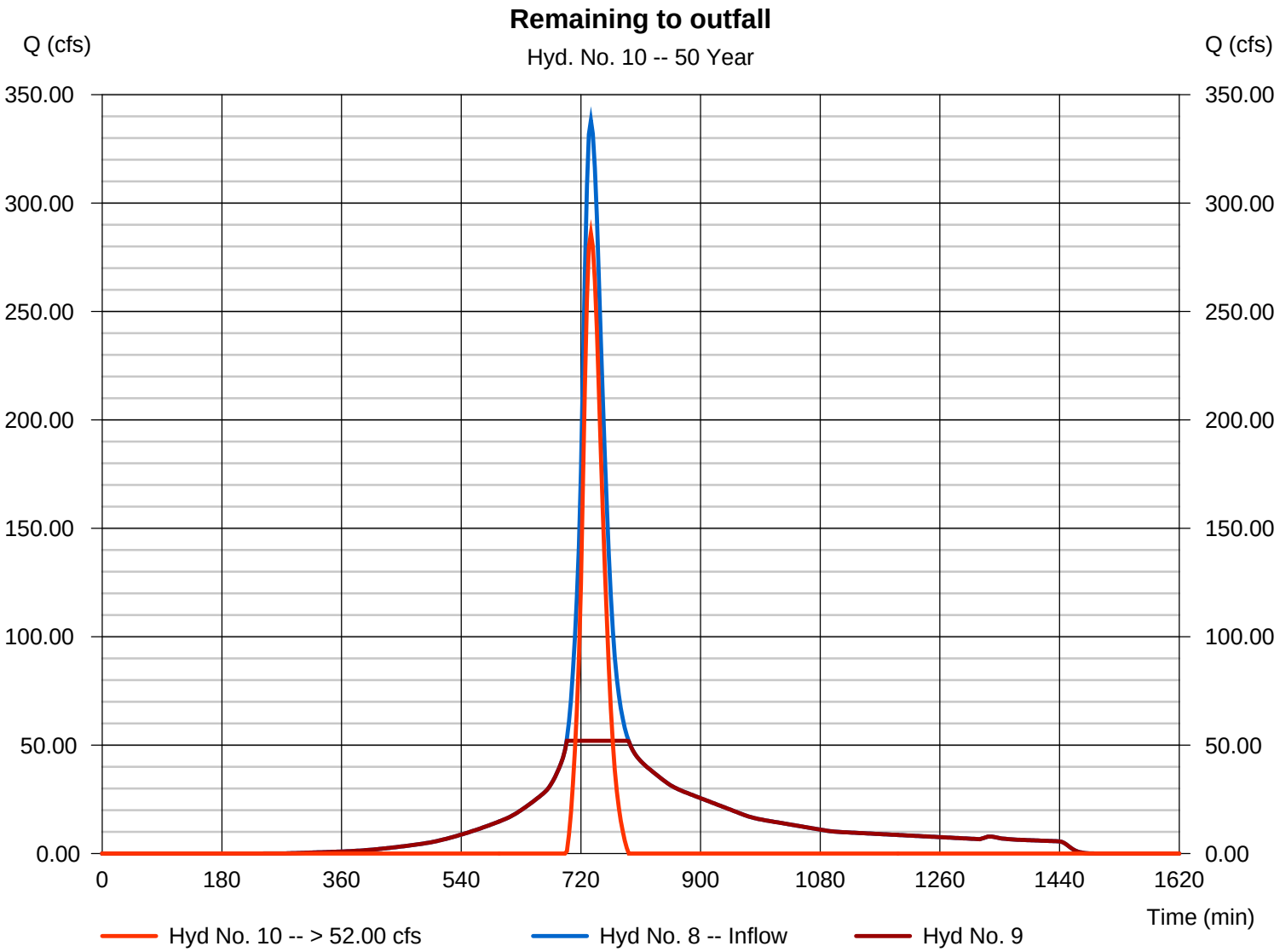
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 10

Remaining to outfall

Hydrograph type	= Diversion2	Peak discharge	= 286.12 cfs
Storm frequency	= 50 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 630,251 cuft
Inflow hydrograph	= 8 - North Garage Combined 2017	2nd diverted hyd.	= 9
Diversion method	= Constant Q	Constant Q	= 52.00 cfs



Hydrograph Report

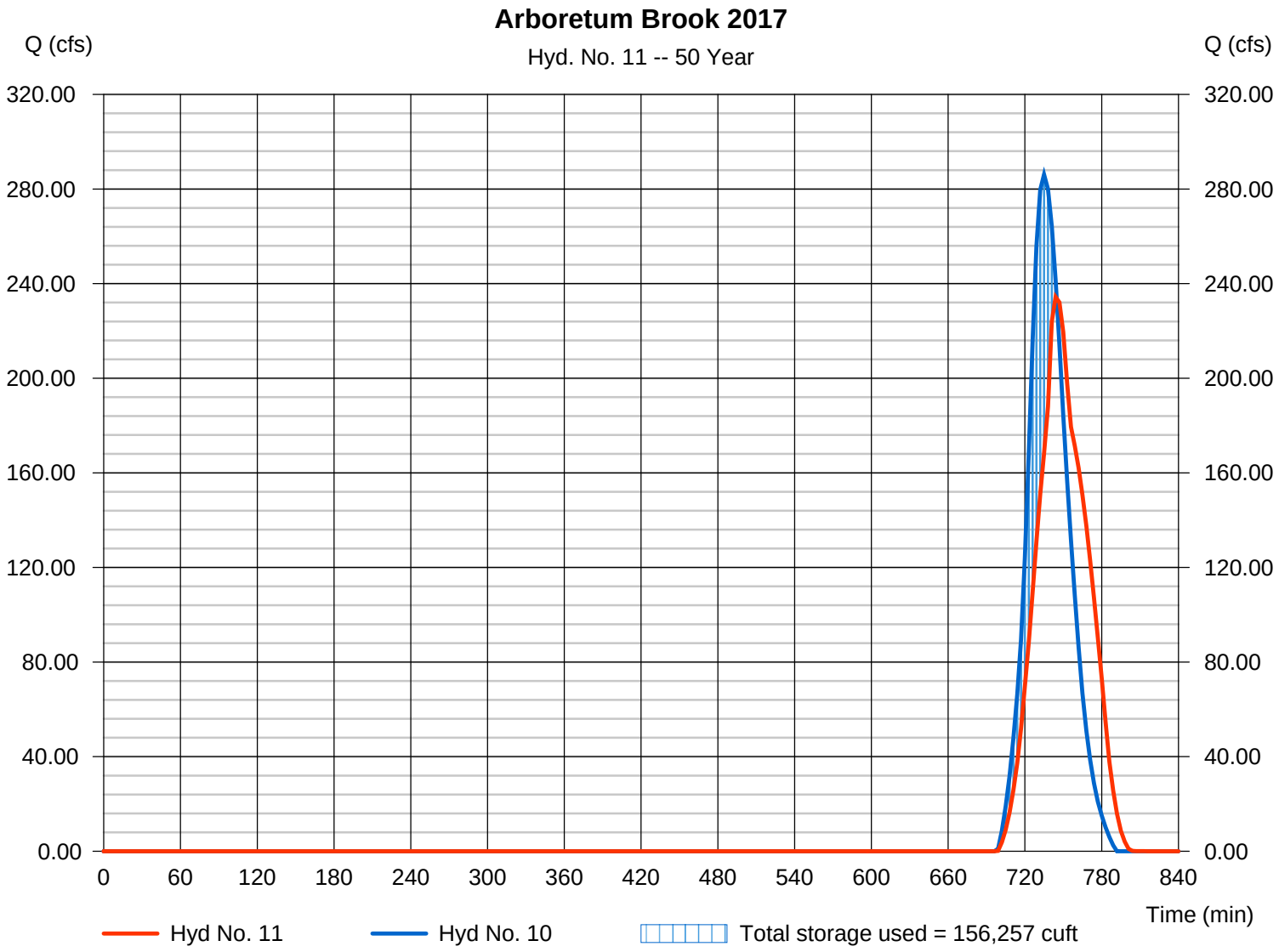
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 11

Arboretum Brook 2017

Hydrograph type	=	Reservoir	Peak discharge	=	234.36 cfs
Storm frequency	=	50 yrs	Time to peak	=	744 min
Time interval	=	3 min	Hyd. volume	=	630,250 cuft
Inflow hyd. No.	=	10 - Remaining to outfall	Max. Elevation	=	315.60 ft
Reservoir name	=	North Garage U/G Detention	Max. Storage	=	156,257 cuft

Storage Indication method used.



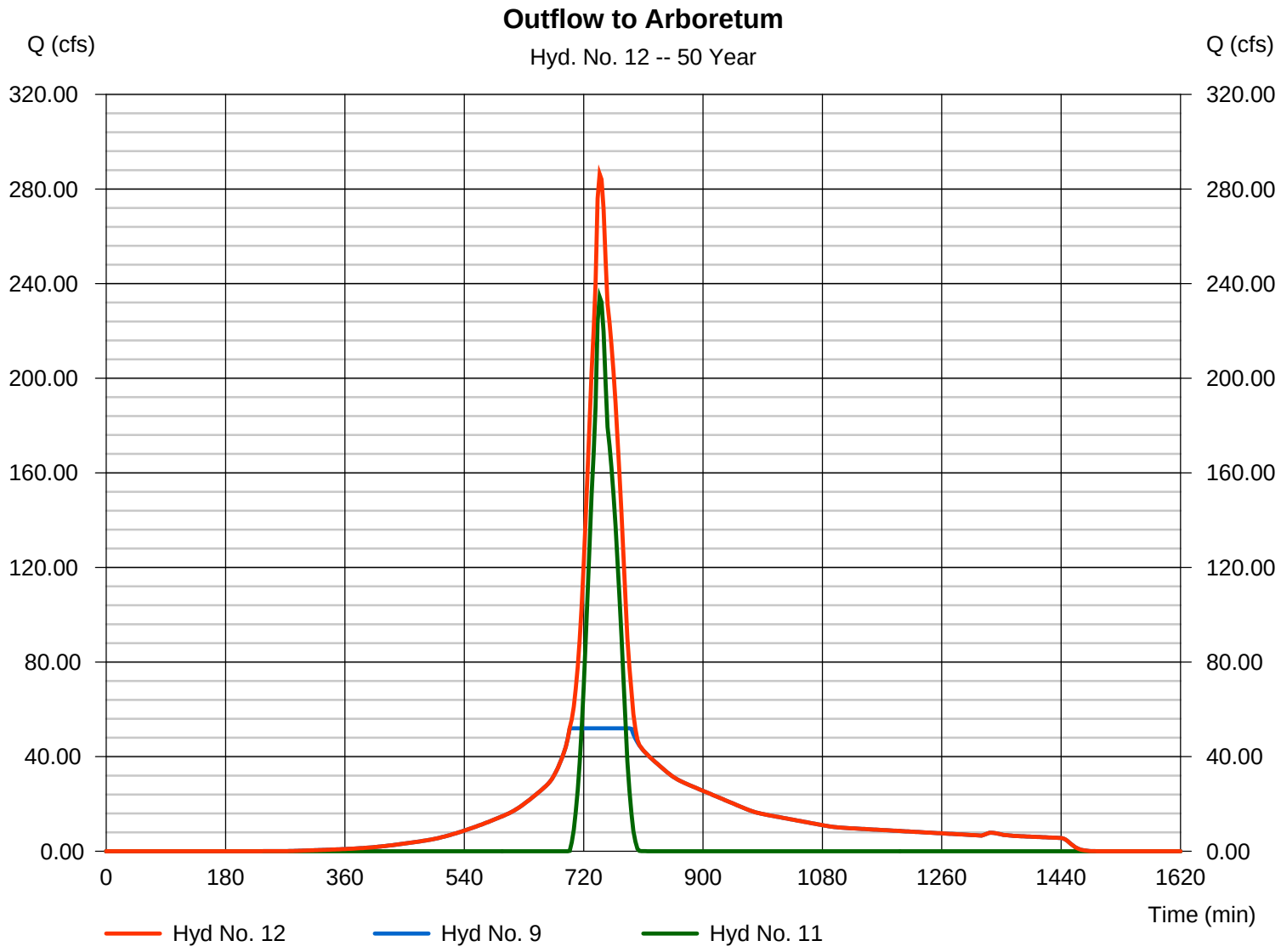
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 12

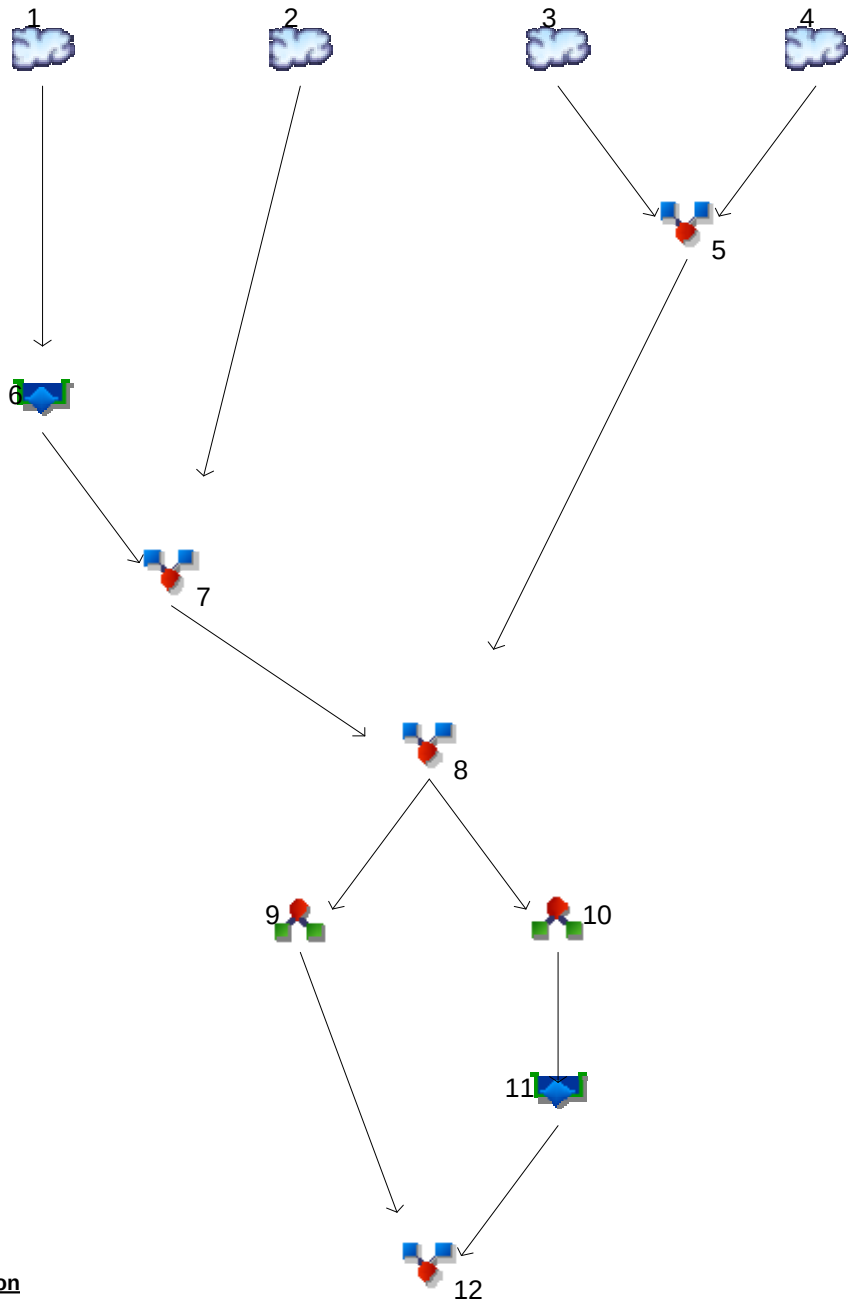
Outflow to Arboretum

Hydrograph type	=	Combine	Peak discharge	=	286.36 cfs
Storm frequency	=	50 yrs	Time to peak	=	744 min
Time interval	=	3 min	Hyd. volume	=	1,746,261 cuft
Inflow hyds.	=	9, 11	Contrib. drain. area	=	0.000 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2017
2	SCS Runoff	WS20-2017
3	SCS Runoff	WS30-2017
4	SCS Runoff	WS33-2017
5	Combine	North Garage-East-2017
6	Reservoir	South Garage 2017
7	Combine	North Garage West 2017
8	Combine	North Garage Combined 2017
9	Diversion1	Test to make 25 yr run
10	Diversion2	Remaining to outfall
11	Reservoir	Arboretum Brook 2017
12	Combine	Outflow to Arboretum

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	5.019	-------	-------	7.668	9.656	11.48	-------	WS10-2017
2	SCS Runoff	------	-------	31.28	-------	-------	59.96	83.00	104.78	-------	WS20-2017
3	SCS Runoff	------	-------	14.74	-------	-------	26.88	36.40	45.24	-------	WS30-2017
4	SCS Runoff	------	-------	70.62	-------	-------	121.04	159.69	195.23	-------	WS33-2017
5	Combine	3, 4	-------	82.04	-------	-------	141.94	188.44	231.32	-------	North Garage-East-2017
6	Reservoir	1	-------	3.255	-------	-------	5.914	7.835	9.572	-------	South Garage 2017
7	Combine	2, 6	-------	33.93	-------	-------	64.32	88.76	111.55	-------	North Garage West 2017
8	Combine	5, 7	-------	114.09	-------	-------	203.68	273.48	338.12	-------	North Garage Combined 2017
9	Diversion1	8	-------	44.00	-------	-------	44.00	44.00	44.00	-------	Test to make 25 yr run
10	Diversion2	8	-------	70.09	-------	-------	159.68	229.48	294.12	-------	Remaining to outfall
11	Reservoir	10	-------	61.19	-------	-------	126.00	170.12	243.62	-------	Arboretum Brook 2017
12	Combine	9, 11	-------	105.19	-------	-------	170.00	214.12	287.62	-------	Outflow to Arboretum

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	5.019	3	726	17,533	------	------	------	WS10-2017
2	SCS Runoff	31.28	3	741	166,244	------	------	------	WS20-2017
3	SCS Runoff	14.74	3	744	84,012	------	------	------	WS30-2017
4	SCS Runoff	70.62	3	732	315,462	------	------	------	WS33-2017
5	Combine	82.04	3	735	399,474	3, 4	------	------	North Garage-East-2017
6	Reservoir	3.255	3	732	17,527	1	309.12	3,371	South Garage 2017
7	Combine	33.93	3	741	183,771	2, 6	------	------	North Garage West 2017
8	Combine	114.09	3	735	583,245	5, 7	------	------	North Garage Combined 2017
9	Diversion1	44.00	3	720	471,527	8	------	------	Test to make 25 yr run
10	Diversion2	70.09	3	735	111,718	8	------	------	Remaining to outfall
11	Reservoir	61.19	3	744	111,716	10	302.50	22,071	Arboretum Brook 2017
12	Combine	105.19	3	744	583,244	9, 11	------	------	Outflow to Arboretum

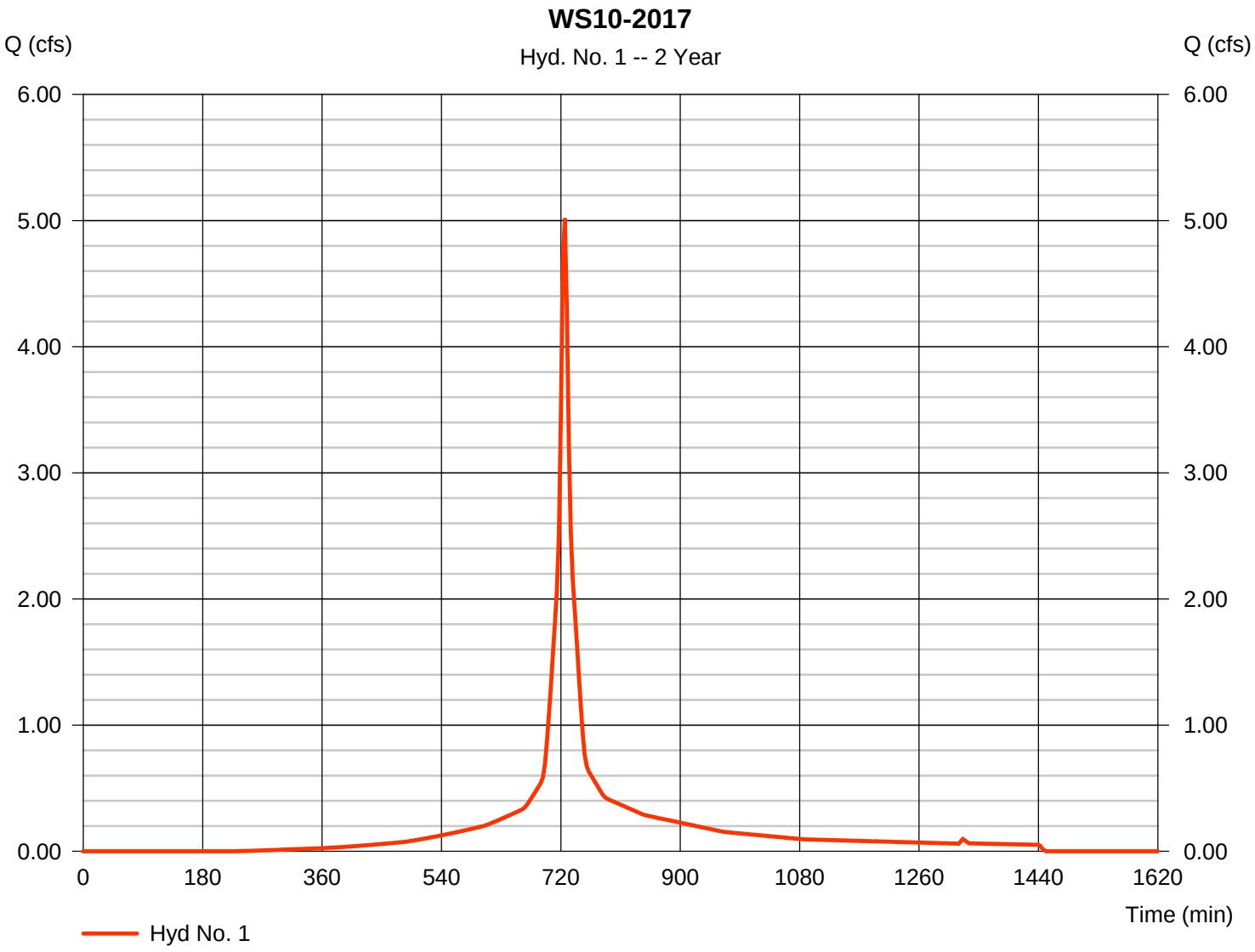
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 5.019 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 17,533 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.668	3	726	27,512	------	------	------	WS10-2017
2	SCS Runoff	59.96	3	741	314,066	------	------	------	WS20-2017
3	SCS Runoff	26.88	3	744	152,493	------	------	------	WS30-2017
4	SCS Runoff	121.04	3	732	544,462	------	------	------	WS33-2017
5	Combine	141.94	3	732	696,955	3, 4	------	------	North Garage-East-2017
6	Reservoir	5.914	3	729	27,505	1	309.48	4,389	South Garage 2017
7	Combine	64.32	3	738	341,572	2, 6	------	------	North Garage West 2017
8	Combine	203.68	3	735	1,038,527	5, 7	------	------	North Garage Combined 2017
9	Diversion1	44.00	3	708	720,917	8	------	------	Test to make 25 yr run
10	Diversion2	159.68	3	735	317,611	8	------	------	Remaining to outfall
11	Reservoir	126.00	3	747	317,609	10	307.31	71,091	Arboretum Brook 2017
12	Combine	170.00	3	747	1,038,526	9, 11	------	------	Outflow to Arboretum

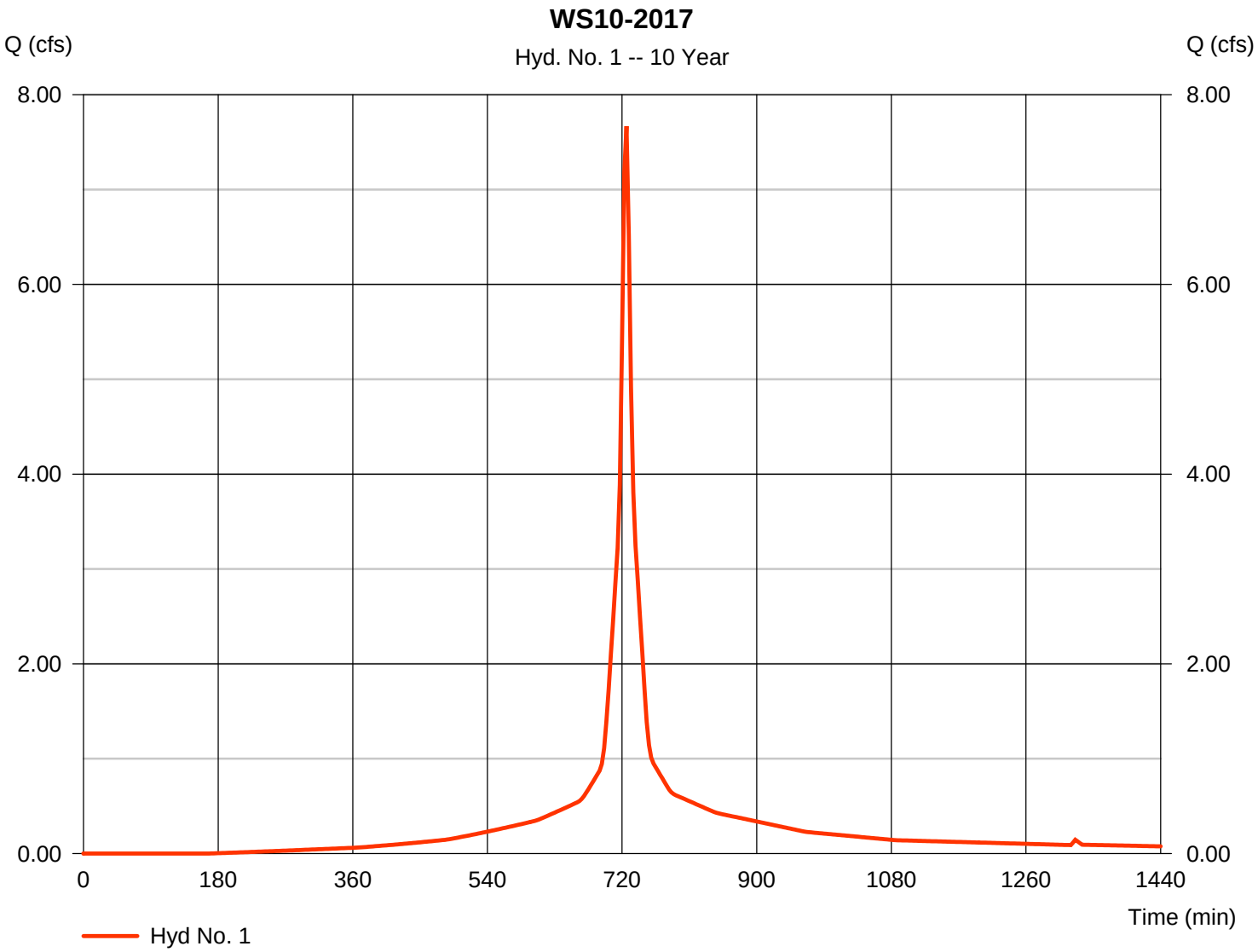
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-2017

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.668 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	27,512 cuft
Drainage area	=	2.010 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.71 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	9.656	3	726	35,147	------	------	------	WS10-2017
2	SCS Runoff	83.00	3	738	435,008	------	------	------	WS20-2017
3	SCS Runoff	36.40	3	744	207,583	------	------	------	WS30-2017
4	SCS Runoff	159.69	3	732	725,013	------	------	------	WS33-2017
5	Combine	188.44	3	732	932,597	3, 4	------	------	North Garage-East-2017
6	Reservoir	7.835	3	729	35,140	1	309.66	5,043	South Garage 2017
7	Combine	88.76	3	738	470,148	2, 6	------	------	North Garage West 2017
8	Combine	273.48	3	735	1,402,745	5, 7	------	------	North Garage Combined 2017
9	Diversion1	44.00	3	702	903,983	8	------	------	Test to make 25 yr run
10	Diversion2	229.48	3	735	498,761	8	------	------	Remaining to outfall
11	Reservoir	170.12	3	747	498,760	10	312.41	123,859	Arboretum Brook 2017
12	Combine	214.12	3	747	1,402,743	9, 11	------	------	Outflow to Arboretum

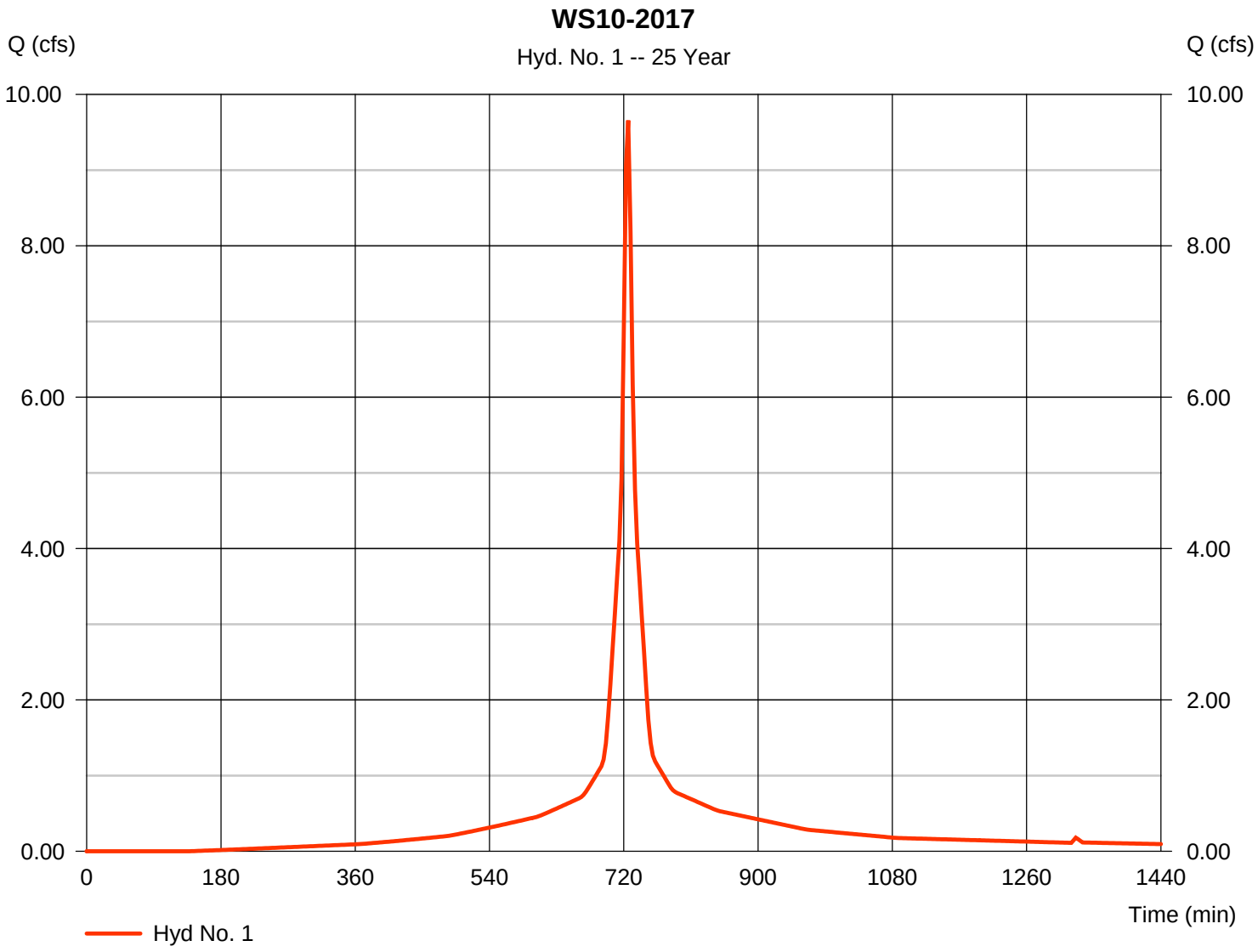
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 9.656 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 35,147 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	11.48	3	726	42,199	------	------	------	WS10-2017
2	SCS Runoff	104.78	3	738	550,316	------	------	------	WS20-2017
3	SCS Runoff	45.24	3	744	259,671	------	------	------	WS30-2017
4	SCS Runoff	195.23	3	732	894,083	------	------	------	WS33-2017
5	Combine	231.32	3	732	1,153,753	3, 4	------	------	North Garage-East-2017
6	Reservoir	9.572	3	729	42,192	1	309.82	5,575	South Garage 2017
7	Combine	111.55	3	738	592,508	2, 6	------	------	North Garage West 2017
8	Combine	338.12	3	735	1,746,262	5, 7	------	------	North Garage Combined 2017
9	Diversion1	44.00	3	693	1,067,133	8	------	------	Test to make 25 yr run
10	Diversion2	294.12	3	735	679,129	8	------	------	Remaining to outfall
11	Reservoir	243.62	3	744	679,128	10	315.96	160,513	Arboretum Brook 2017
12	Combine	287.62	3	744	1,746,261	9, 11	------	------	Outflow to Arboretum

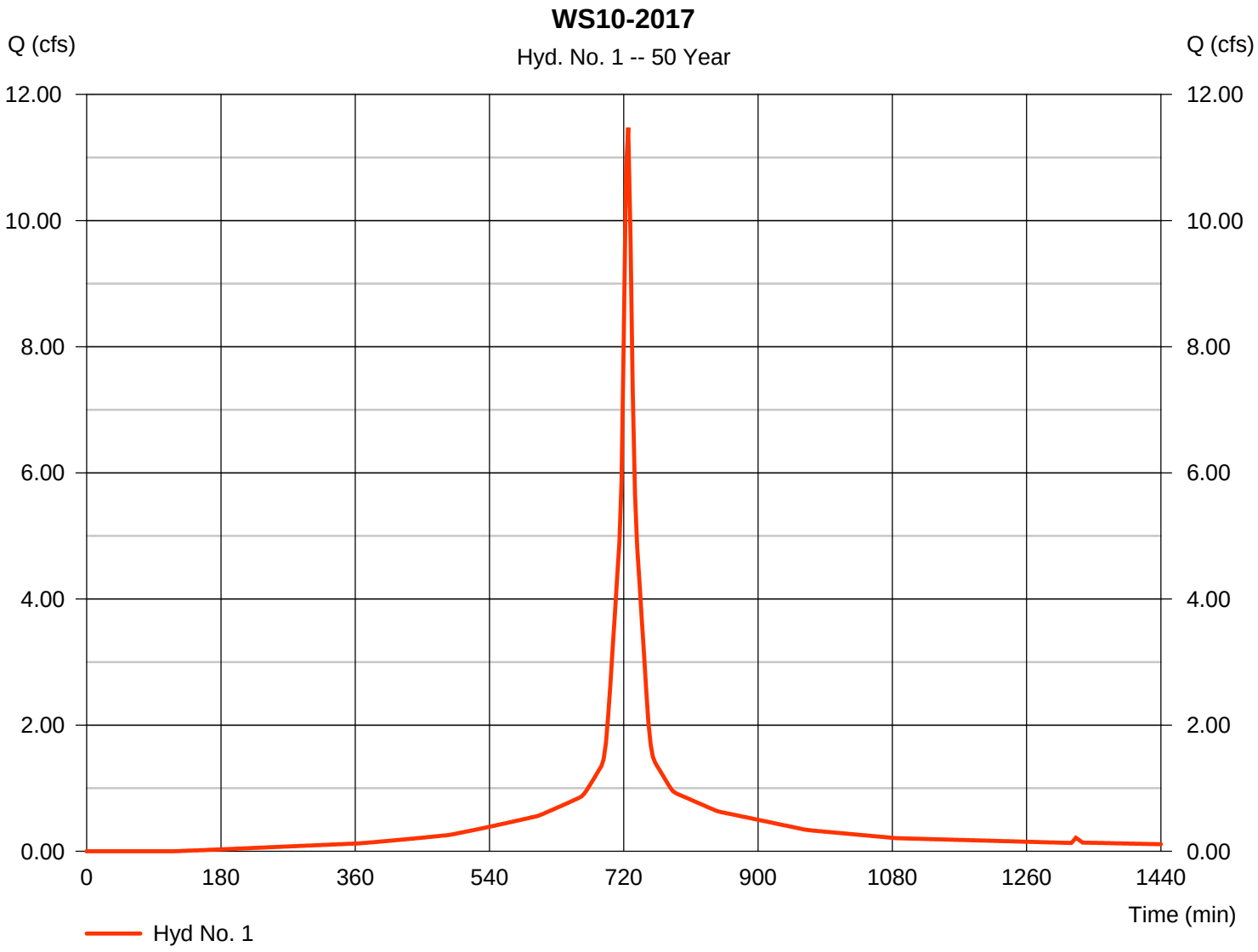
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

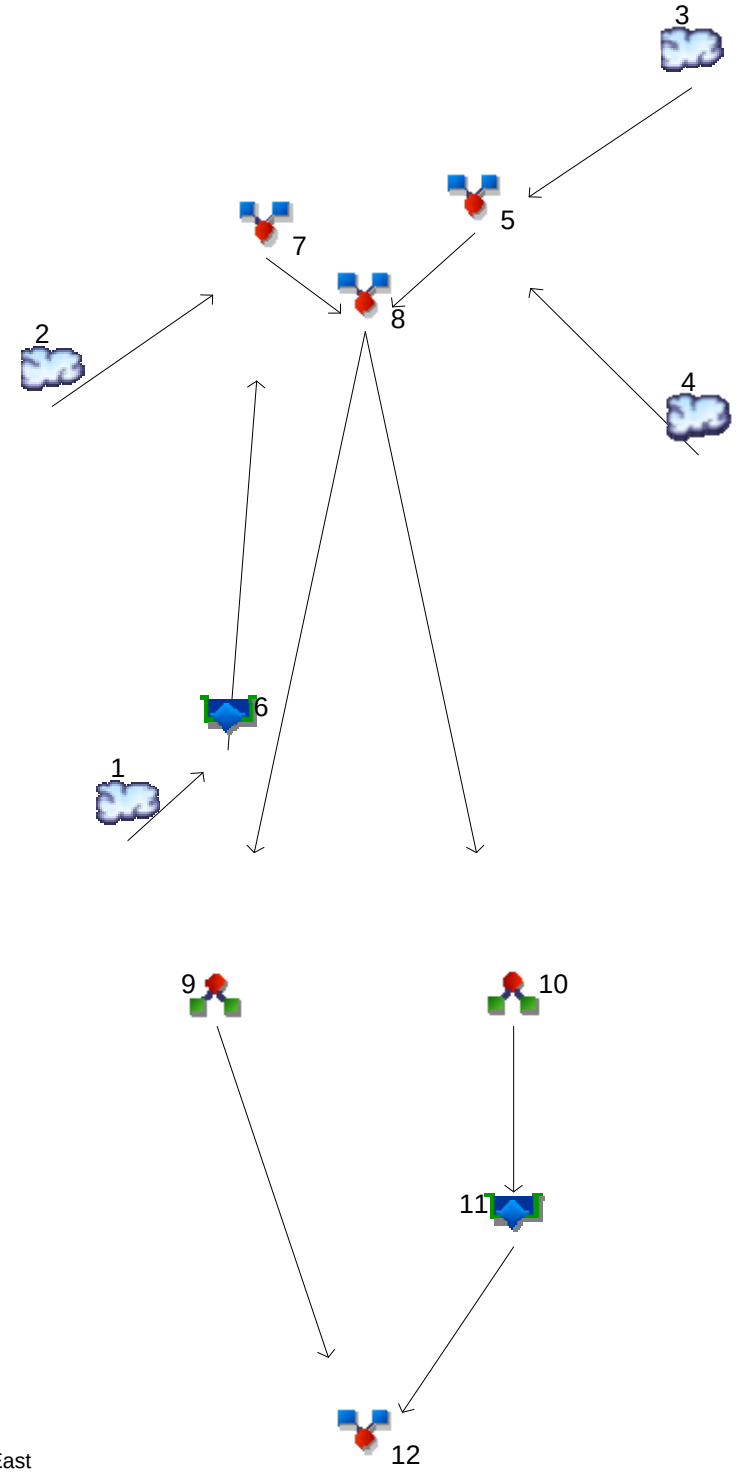
WS10-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 11.48 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 42,199 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2012
2	SCS Runoff	WS20-2012
3	SCS Runoff	WS30-2012
4	SCS Runoff	WS33-2012
5	Combine	North detention-East
6	Reservoir	South Garage Outflow
7	Combine	North detention-West
8	Combine	Inflow to North Garage
9	Diversion1	Test to make 50-100 yr run
10	Diversion2	Remaining to outfall
11	Reservoir	Arboretum Brook 2012
12	Combine	Discharge to Arboretum

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	-------	-------	-------	-------	-------	-------	13.62	WS10-2012
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	130.76	WS20-2012
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	56.72	WS30-2012
4	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	245.95	WS33-2012
5	Combine	3, 4	-------	-------	-------	-------	-------	-------	-------	291.64	North detention-East
6	Reservoir	1	-------	-------	-------	-------	-------	-------	-------	11.53	South Garage Outflow
7	Combine	2, 6	-------	-------	-------	-------	-------	-------	-------	138.70	North detention-West
8	Combine	5, 7	-------	-------	-------	-------	-------	-------	-------	423.67	Inflow to North Garage
9	Diversion1	8	-------	-------	-------	-------	-------	-------	-------	118.00	Test to make 50-100 yr run
10	Diversion2	8	-------	-------	-------	-------	-------	-------	-------	305.67	Remaining to outfall
11	Reservoir	10	-------	-------	-------	-------	-------	-------	-------	244.47	Arboretum Brook 2012
12	Combine	9, 11	-------	-------	-------	-------	-------	-------	-------	362.47	Discharge to Arboretum

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	13.62	3	726	50,559	------	------	------	WS10-2012
2	SCS Runoff	130.76	3	738	689,994	------	------	------	WS20-2012
3	SCS Runoff	56.72	3	741	328,791	------	------	------	WS30-2012
4	SCS Runoff	245.95	3	732	1,157,069	------	------	------	WS33-2012
5	Combine	291.64	3	732	1,485,859	3, 4	------	------	North detention-East
6	Reservoir	11.53	3	729	50,552	1	309.98	6,155	South Garage Outflow
7	Combine	138.70	3	738	740,545	2, 6	------	------	North detention-West
8	Combine	423.67	3	735	2,226,404	5, 7	------	------	Inflow to North Garage
9	Diversion1	118.00	3	711	1,667,750	8	------	------	Test to make 50-100 yr run
10	Diversion2	305.67	3	735	558,654	8	------	------	Remaining to outfall
11	Reservoir	244.47	3	744	558,653	10	316.00	160,917	Arboretum Brook 2012
12	Combine	362.47	3	744	2,226,403	9, 11	------	------	Discharge to Arboretum

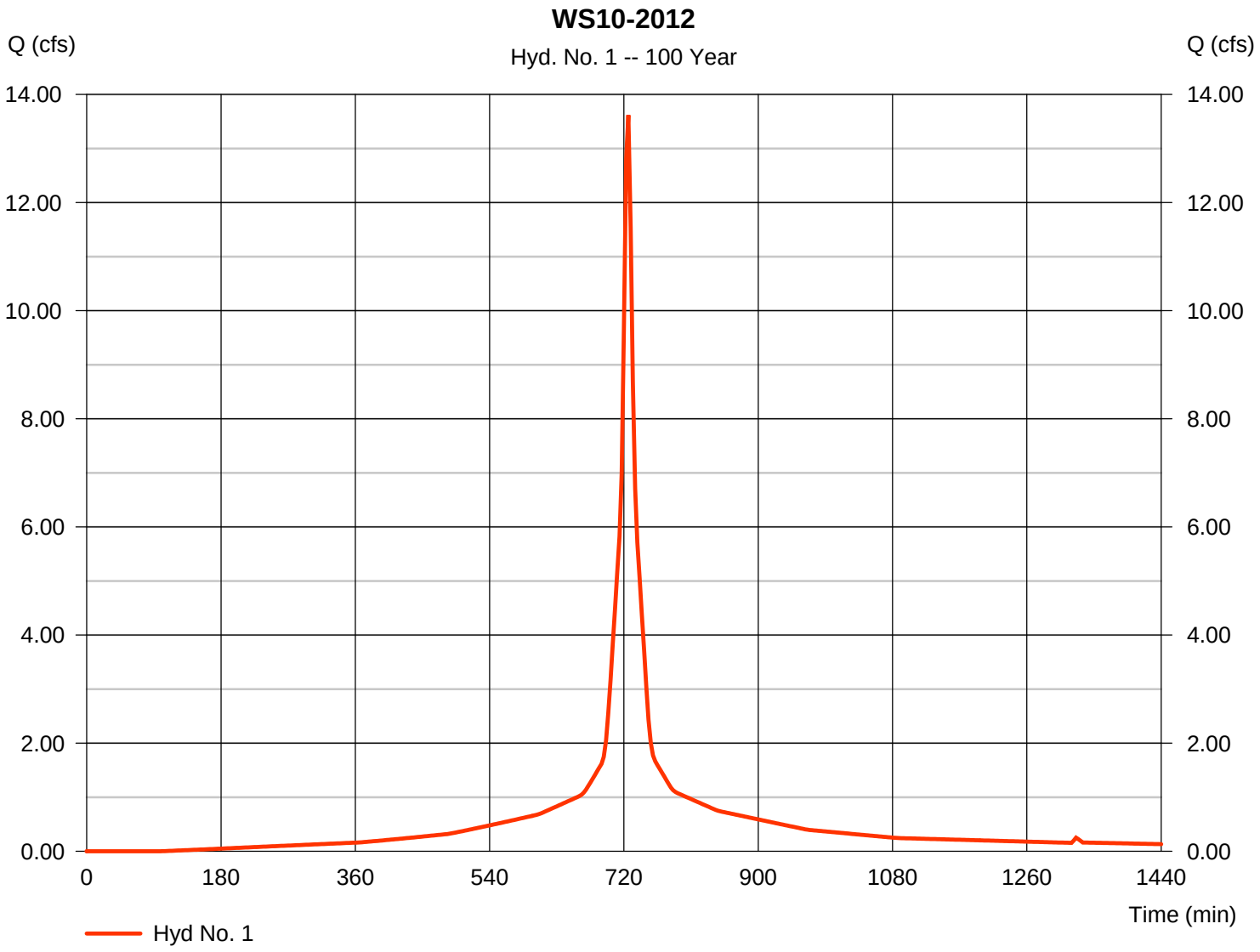
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

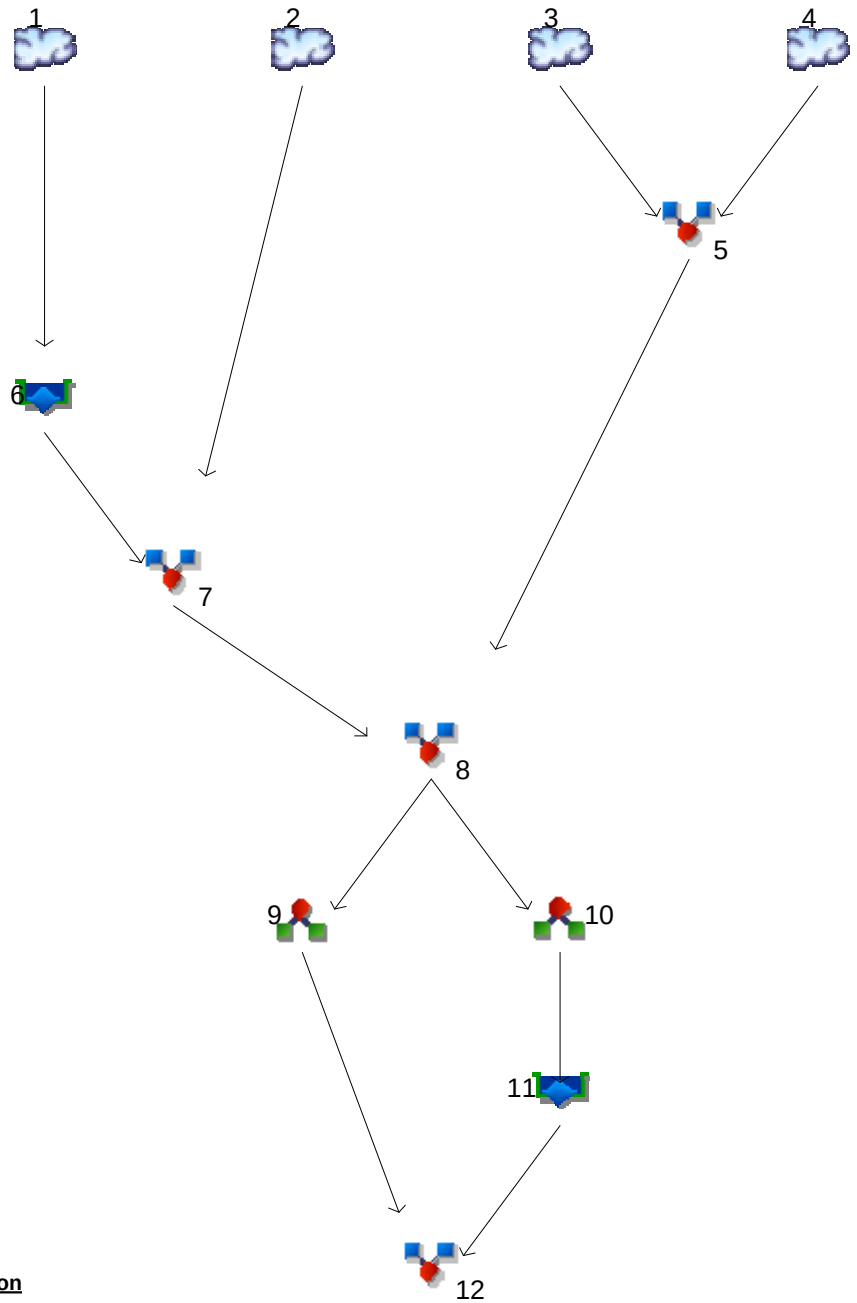
WS10-2012

Hydrograph type	= SCS Runoff	Peak discharge	= 13.62 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 50,559 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2017
2	SCS Runoff	WS20-2017
3	SCS Runoff	WS30-2017
4	SCS Runoff	WS33-2017
5	Combine	North Garage-East-2017
6	Reservoir	South Garage 2017
7	Combine	North Garage West 2017
8	Combine	North Garage Combined 2017
9	Diversion1	Test to make 25 yr run
10	Diversion2	Remaining to outfall
11	Reservoir	Arboretum Brook 2017
12	Combine	Outflow to Arboretum

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	-------	-------	-------	-------	-------	11.48	-------	WS10-2017
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	104.78	-------	WS20-2017
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	45.24	-------	WS30-2017
4	SCS Runoff	------	-------	-------	-------	-------	-------	-------	195.23	-------	WS33-2017
5	Combine	3, 4	-------	-------	-------	-------	-------	-------	231.32	-------	North Garage-East-2017
6	Reservoir	1	-------	-------	-------	-------	-------	-------	9.572	-------	South Garage 2017
7	Combine	2, 6	-------	-------	-------	-------	-------	-------	111.55	-------	North Garage West 2017
8	Combine	5, 7	-------	-------	-------	-------	-------	-------	338.12	-------	North Garage Combined 2017
9	Diversion1	8	-------	-------	-------	-------	-------	-------	52.00	-------	Test to make 25 yr run
10	Diversion2	8	-------	-------	-------	-------	-------	-------	286.12	-------	Remaining to outfall
11	Reservoir	10	-------	-------	-------	-------	-------	-------	234.36	-------	Arboretum Brook 2017
12	Combine	9, 11	-------	-------	-------	-------	-------	-------	286.36	-------	Outflow to Arboretum

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	11.48	3	726	42,199	------	------	------	WS10-2017
2	SCS Runoff	104.78	3	738	550,316	------	------	------	WS20-2017
3	SCS Runoff	45.24	3	744	259,671	------	------	------	WS30-2017
4	SCS Runoff	195.23	3	732	894,083	------	------	------	WS33-2017
5	Combine	231.32	3	732	1,153,753	3, 4	------	------	North Garage-East-2017
6	Reservoir	9.572	3	729	42,192	1	309.82	5,575	South Garage 2017
7	Combine	111.55	3	738	592,508	2, 6	------	------	North Garage West 2017
8	Combine	338.12	3	735	1,746,262	5, 7	------	------	North Garage Combined 2017
9	Diversion1	52.00	3	699	1,116,011	8	------	------	Test to make 25 yr run
10	Diversion2	286.12	3	735	630,251	8	------	------	Remaining to outfall
11	Reservoir	234.36	3	744	630,250	10	315.60	156,257	Arboretum Brook 2017
12	Combine	286.36	3	744	1,746,261	9, 11	------	------	Outflow to Arboretum

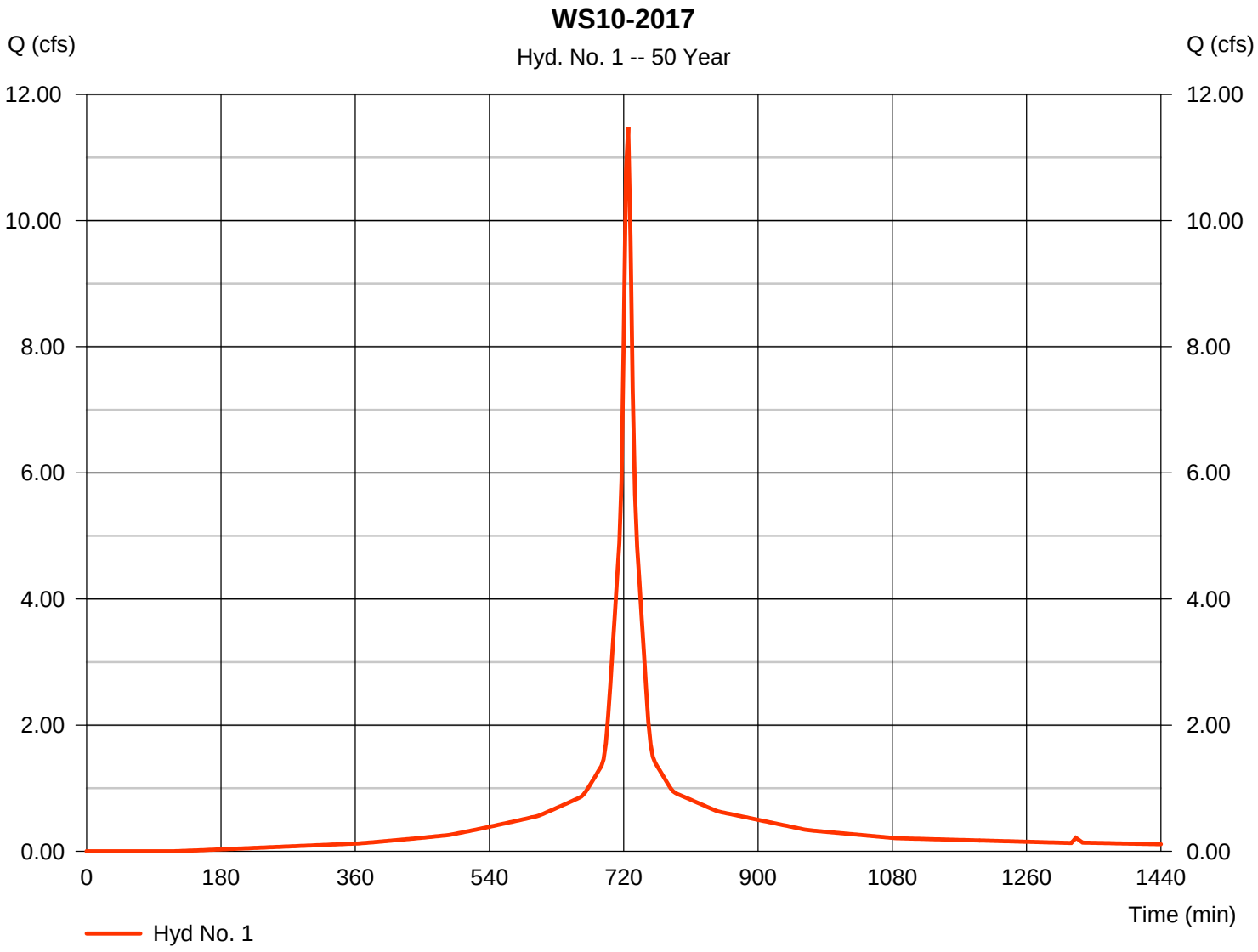
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 11.48 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 42,199 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



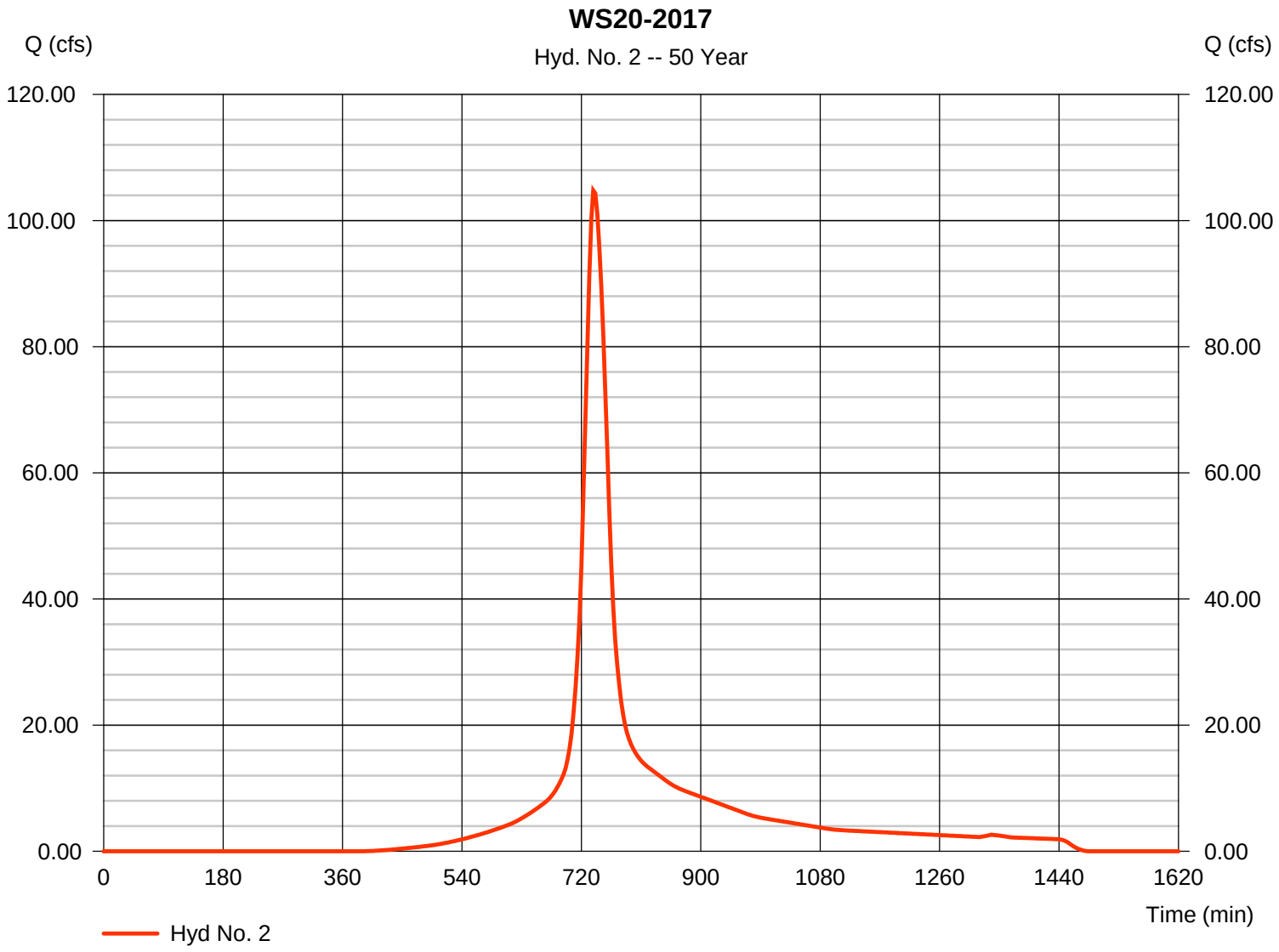
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS20-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 104.78 cfs
Storm frequency	= 50 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 550,316 cuft
Drainage area	= 33.880 ac	Curve number	= 79
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 28.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



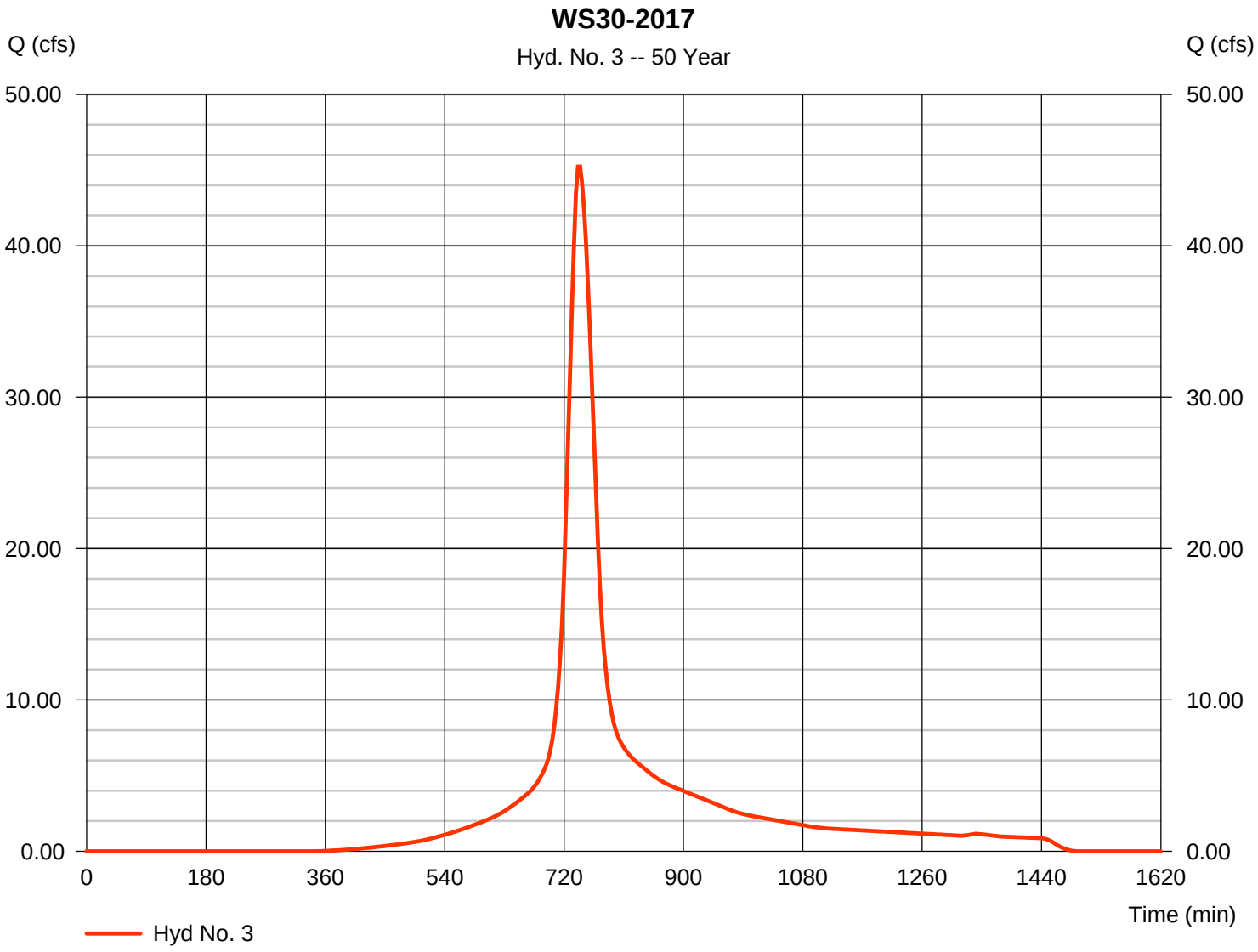
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS30-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 45.24 cfs
Storm frequency	= 50 yrs	Time to peak	= 744 min
Time interval	= 3 min	Hyd. volume	= 259,671 cuft
Drainage area	= 14.630 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 35.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



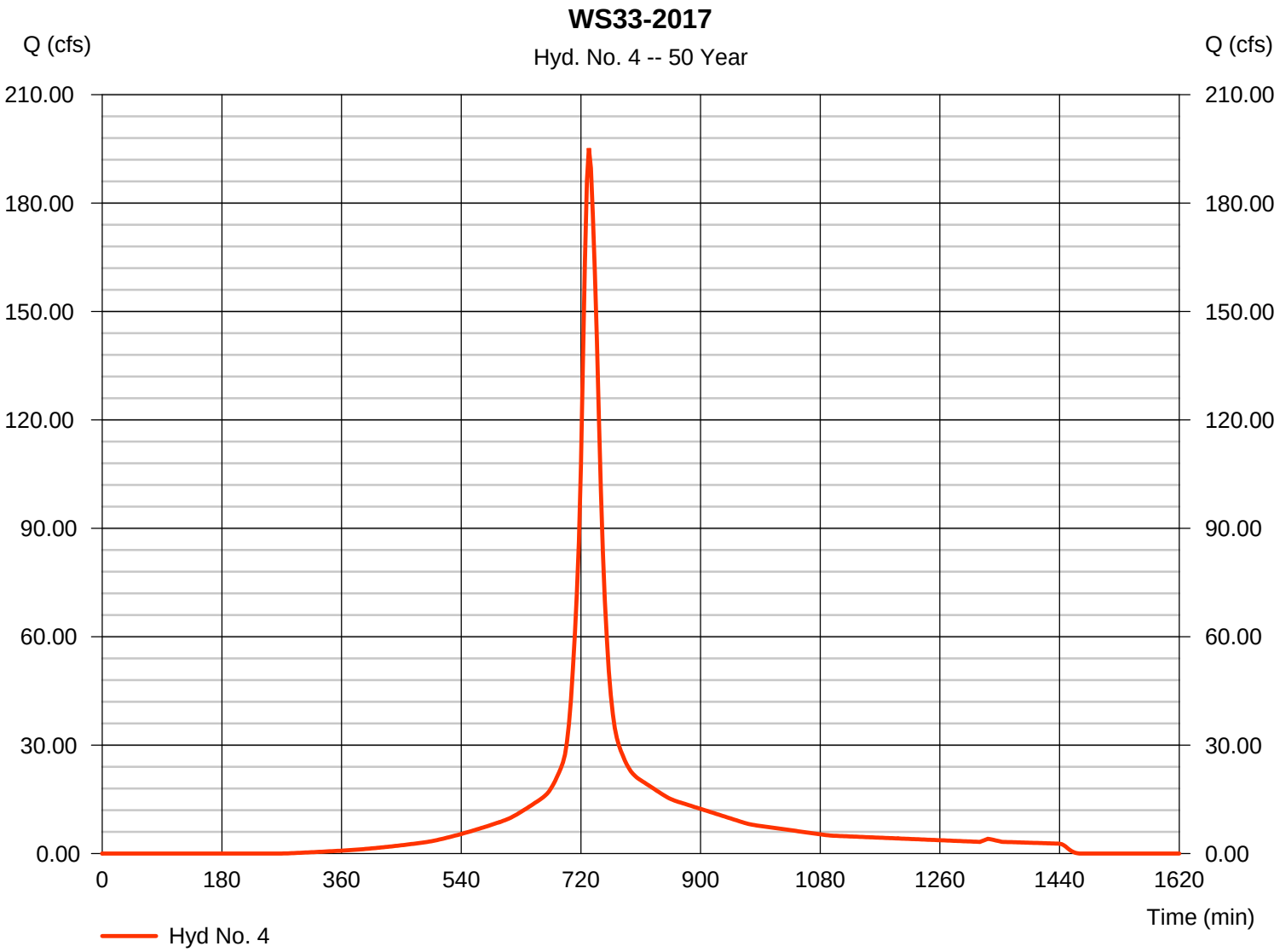
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS33-2017

Hydrograph type	= SCS Runoff	Peak discharge	= 195.23 cfs
Storm frequency	= 50 yrs	Time to peak	= 732 min
Time interval	= 3 min	Hyd. volume	= 894,083 cuft
Drainage area	= 45.490 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



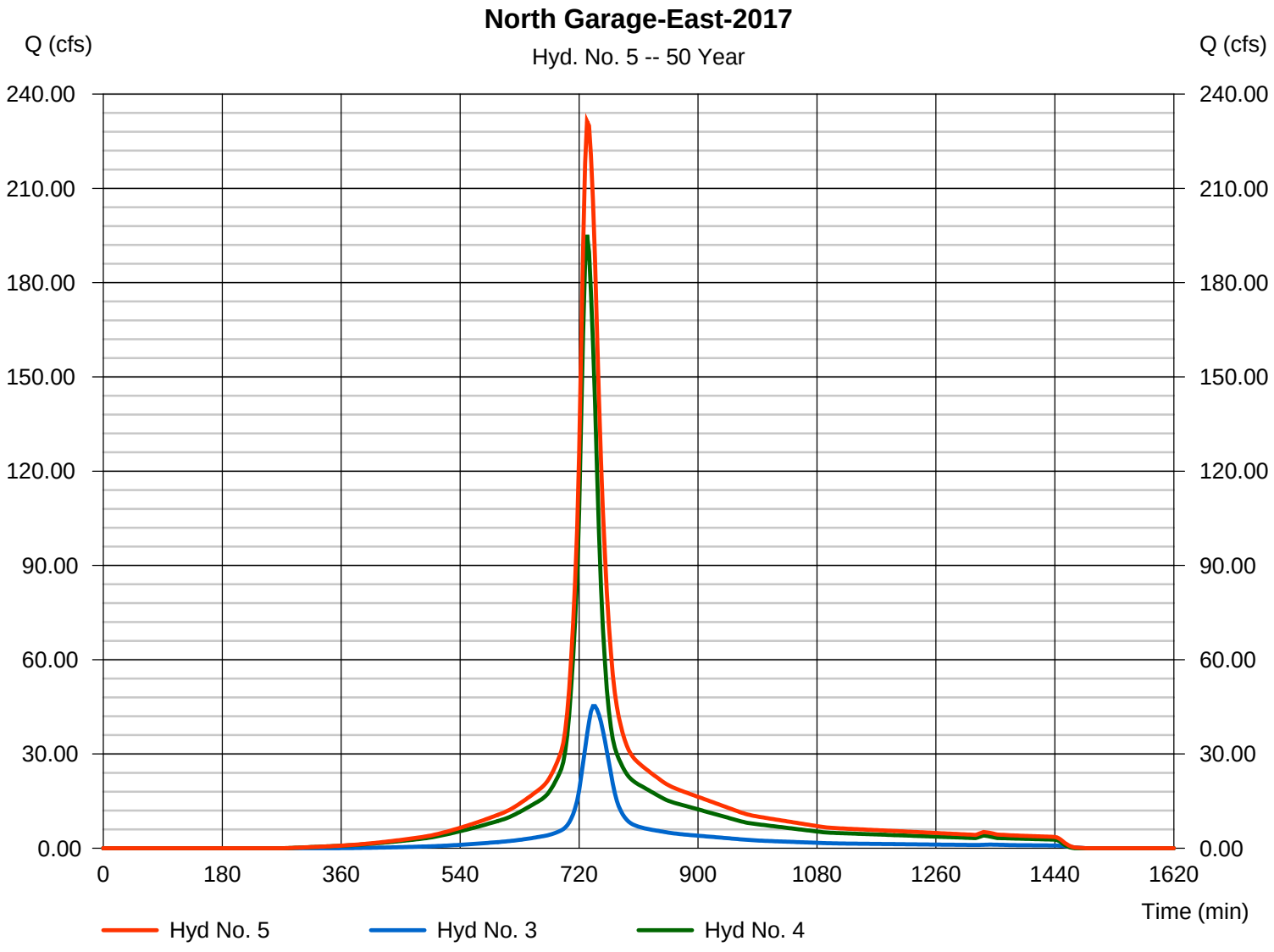
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

North Garage-East-2017

Hydrograph type	=	Combine	Peak discharge	=	231.32 cfs
Storm frequency	=	50 yrs	Time to peak	=	732 min
Time interval	=	3 min	Hyd. volume	=	1,153,753 cuft
Inflow hyds.	=	3, 4	Contrib. drain. area	=	60.120 ac



Hydrograph Report

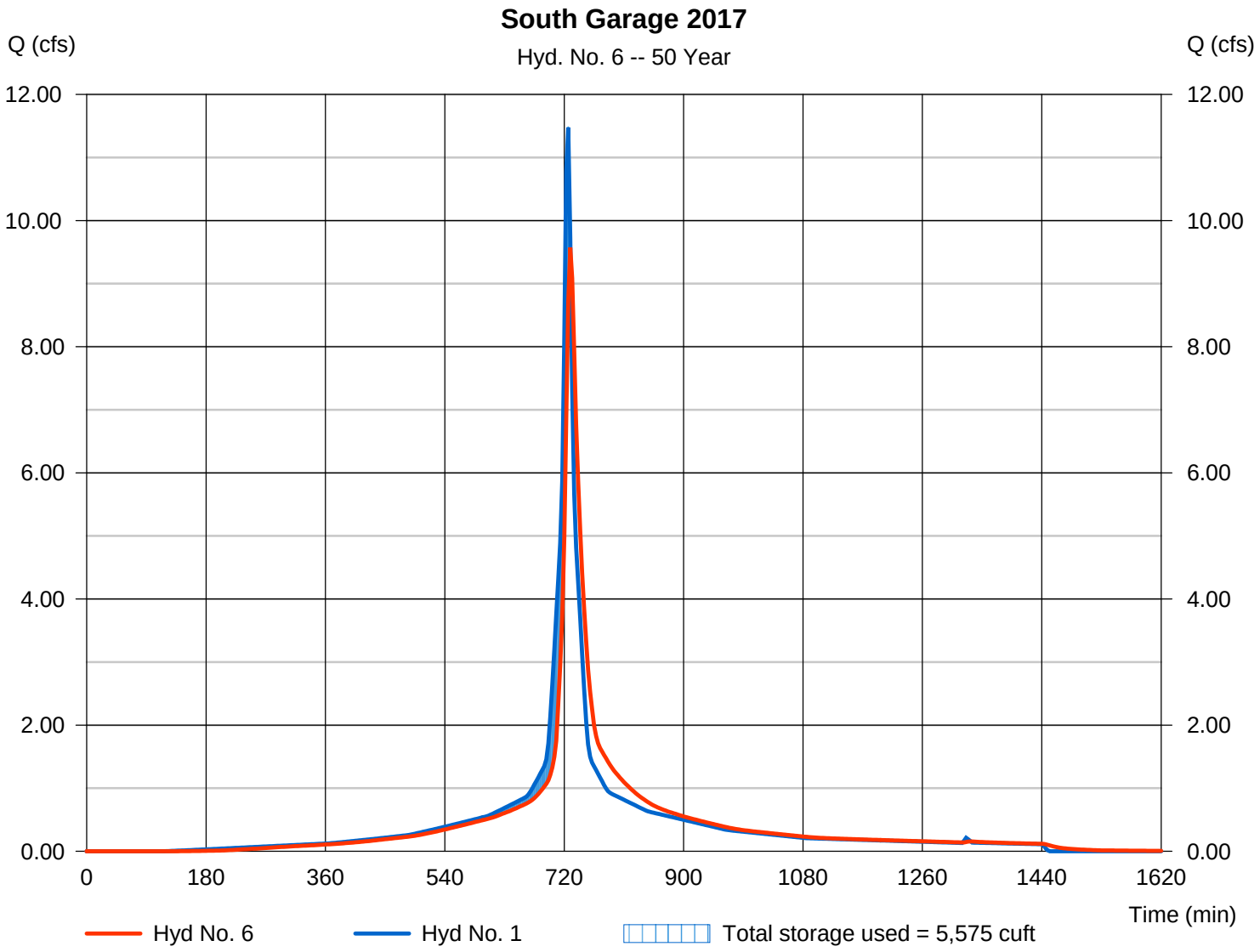
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

South Garage 2017

Hydrograph type	=	Reservoir	Peak discharge	=	9.572 cfs
Storm frequency	=	50 yrs	Time to peak	=	729 min
Time interval	=	3 min	Hyd. volume	=	42,192 cuft
Inflow hyd. No.	=	1 - WS10-2017	Max. Elevation	=	309.82 ft
Reservoir name	=	South Garage U/G Detention	Max. Storage	=	5,575 cuft

Storage Indication method used.



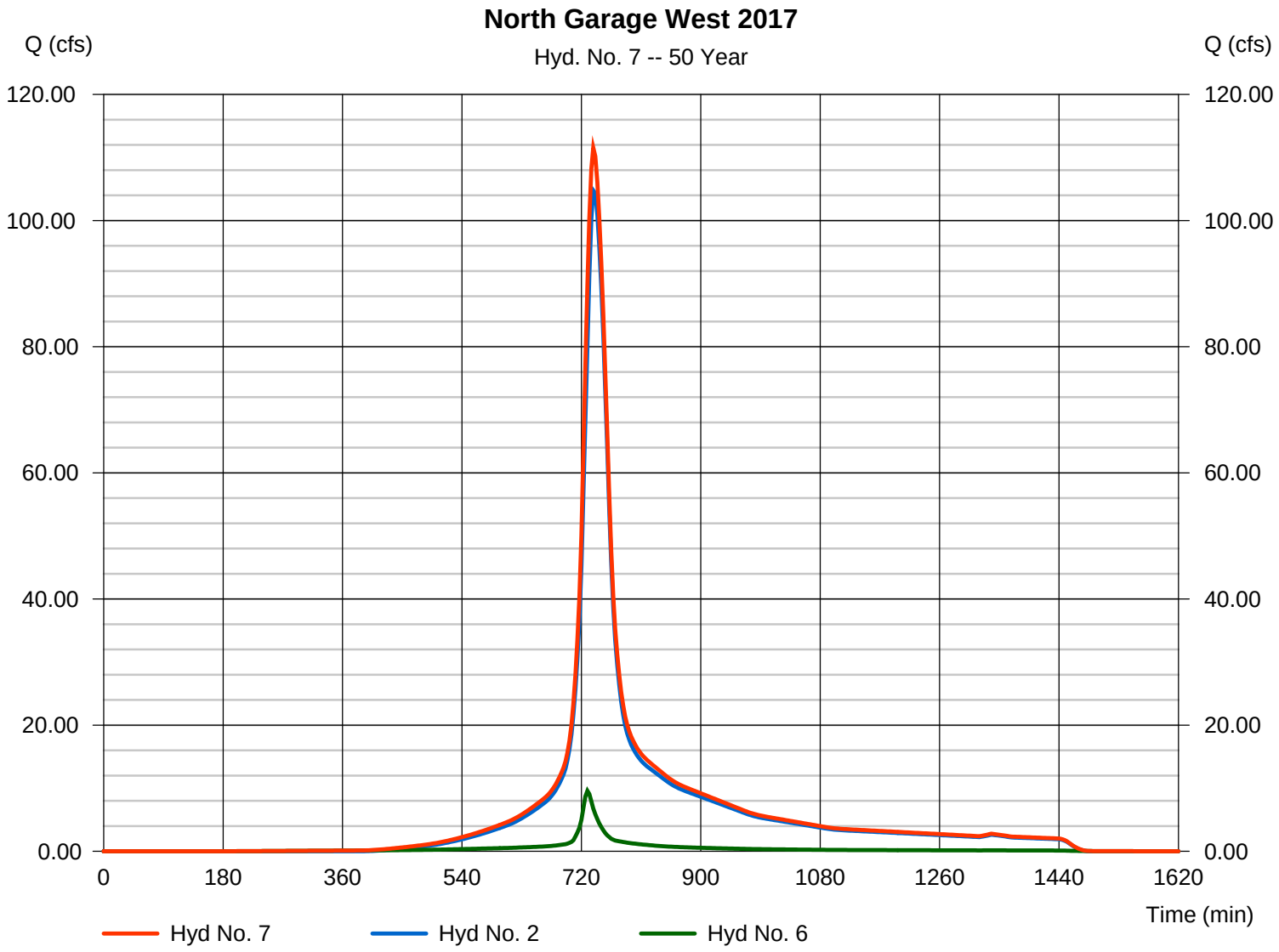
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 7

North Garage West 2017

Hydrograph type	= Combine	Peak discharge	= 111.55 cfs
Storm frequency	= 50 yrs	Time to peak	= 738 min
Time interval	= 3 min	Hyd. volume	= 592,508 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 33.880 ac



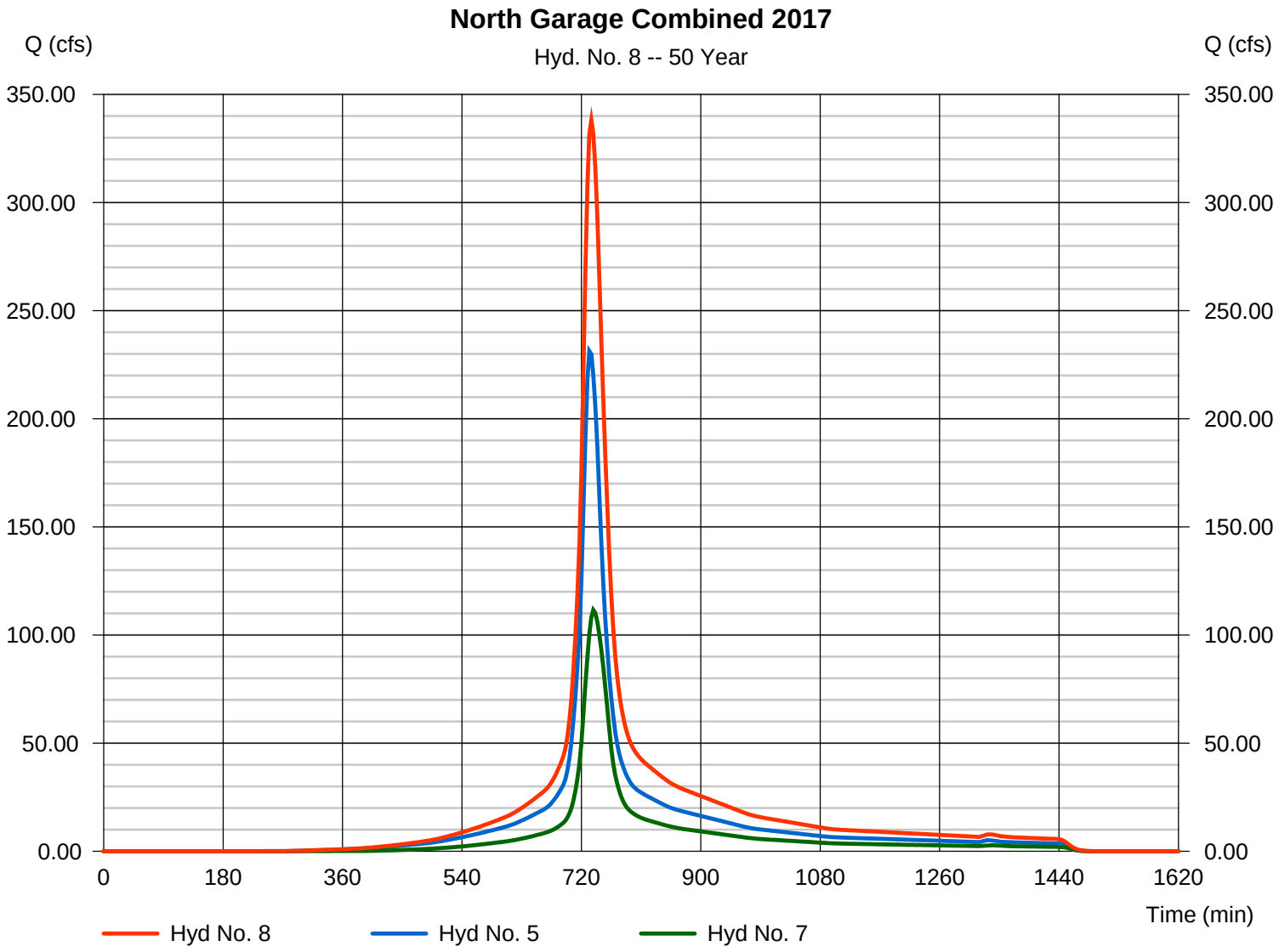
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 8

North Garage Combined 2017

Hydrograph type	=	Combine	Peak discharge	=	338.12 cfs
Storm frequency	=	50 yrs	Time to peak	=	735 min
Time interval	=	3 min	Hyd. volume	=	1,746,262 cuft
Inflow hyds.	=	5, 7	Contrib. drain. area	=	0.000 ac



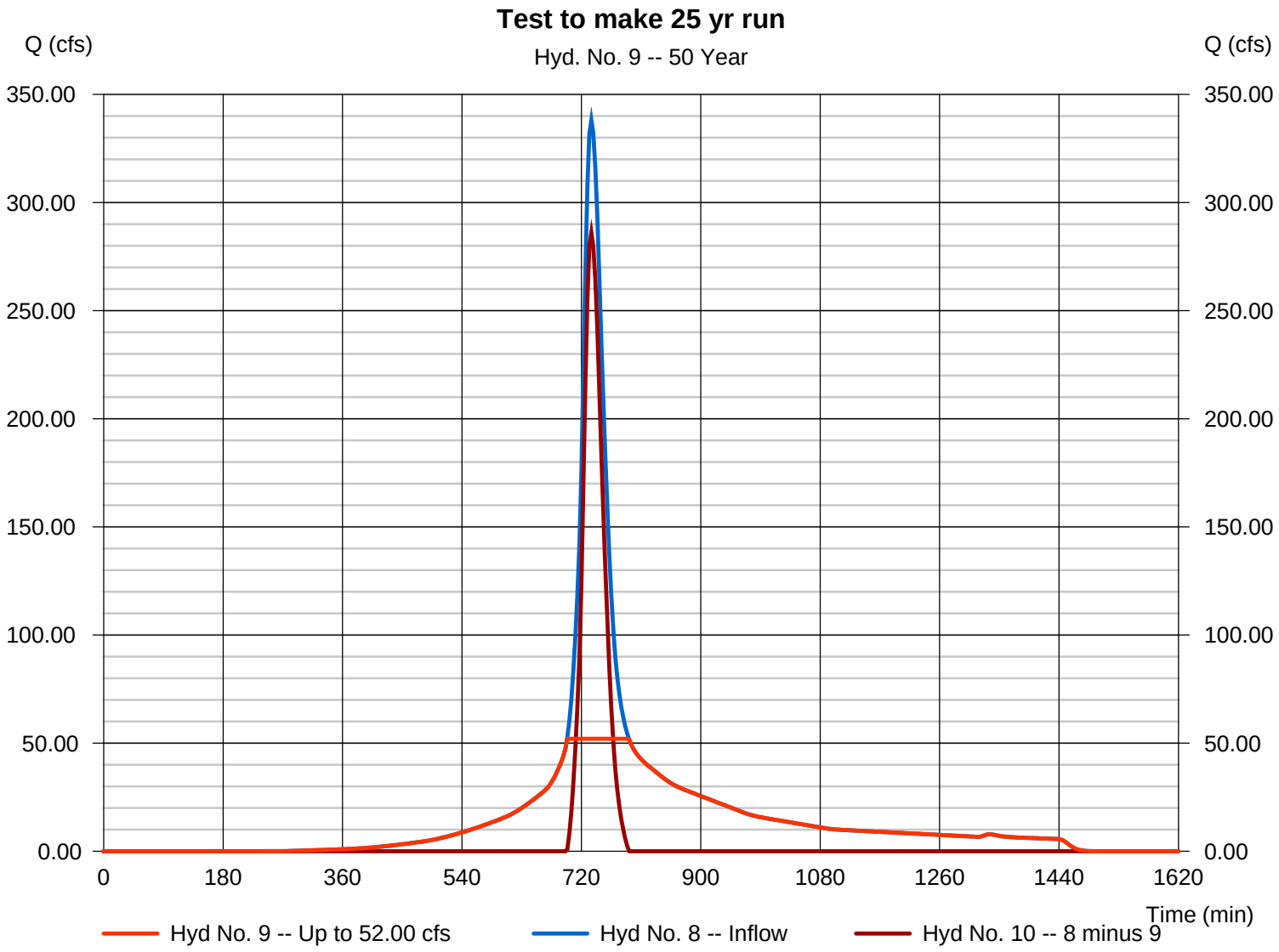
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 9

Test to make 25 yr run

Hydrograph type	= Diversion1	Peak discharge	= 52.00 cfs
Storm frequency	= 50 yrs	Time to peak	= 699 min
Time interval	= 3 min	Hyd. volume	= 1,116,011 cuft
Inflow hydrograph	= 8 - North Garage Combined 2017	2nd diverted hyd.	= 10
Diversion method	= Constant Q	Constant Q	= 52.00 cfs



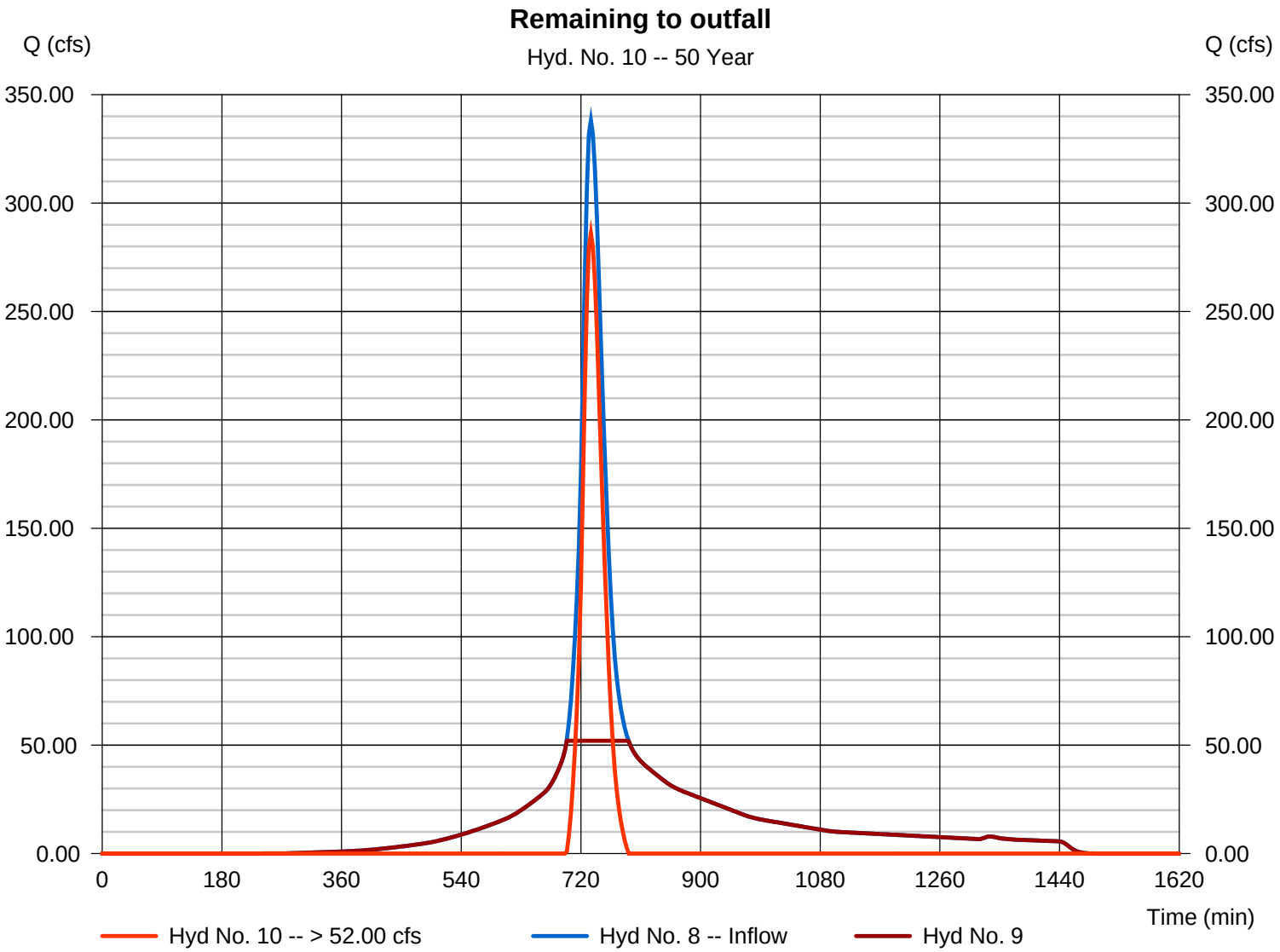
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 10

Remaining to outfall

Hydrograph type	= Diversion2	Peak discharge	= 286.12 cfs
Storm frequency	= 50 yrs	Time to peak	= 735 min
Time interval	= 3 min	Hyd. volume	= 630,251 cuft
Inflow hydrograph	= 8 - North Garage Combined 2017	2nd diverted hyd.	= 9
Diversion method	= Constant Q	Constant Q	= 52.00 cfs



Hydrograph Report

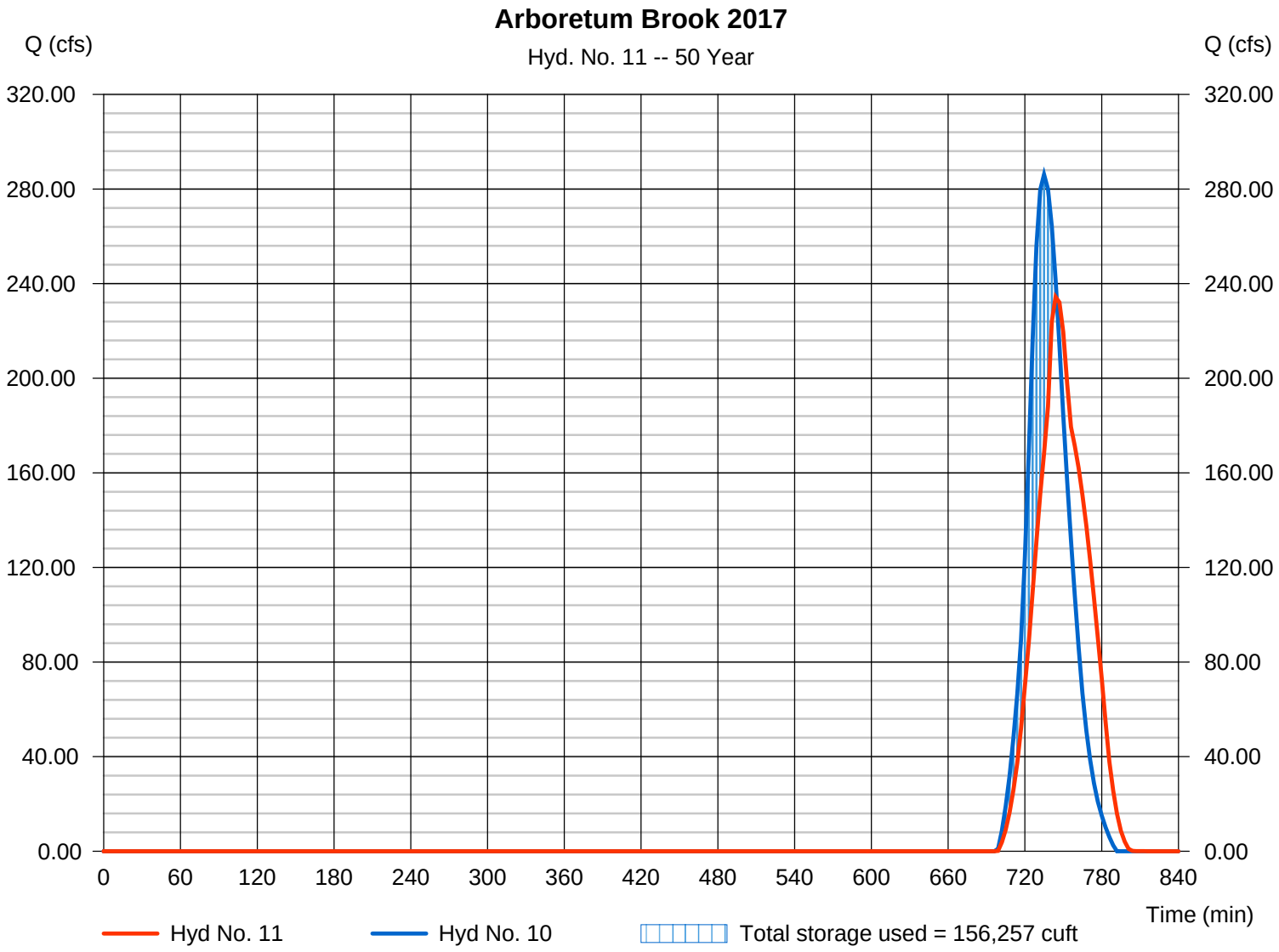
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 11

Arboretum Brook 2017

Hydrograph type	=	Reservoir	Peak discharge	=	234.36 cfs
Storm frequency	=	50 yrs	Time to peak	=	744 min
Time interval	=	3 min	Hyd. volume	=	630,250 cuft
Inflow hyd. No.	=	10 - Remaining to outfall	Max. Elevation	=	315.60 ft
Reservoir name	=	North Garage U/G Detention	Max. Storage	=	156,257 cuft

Storage Indication method used.



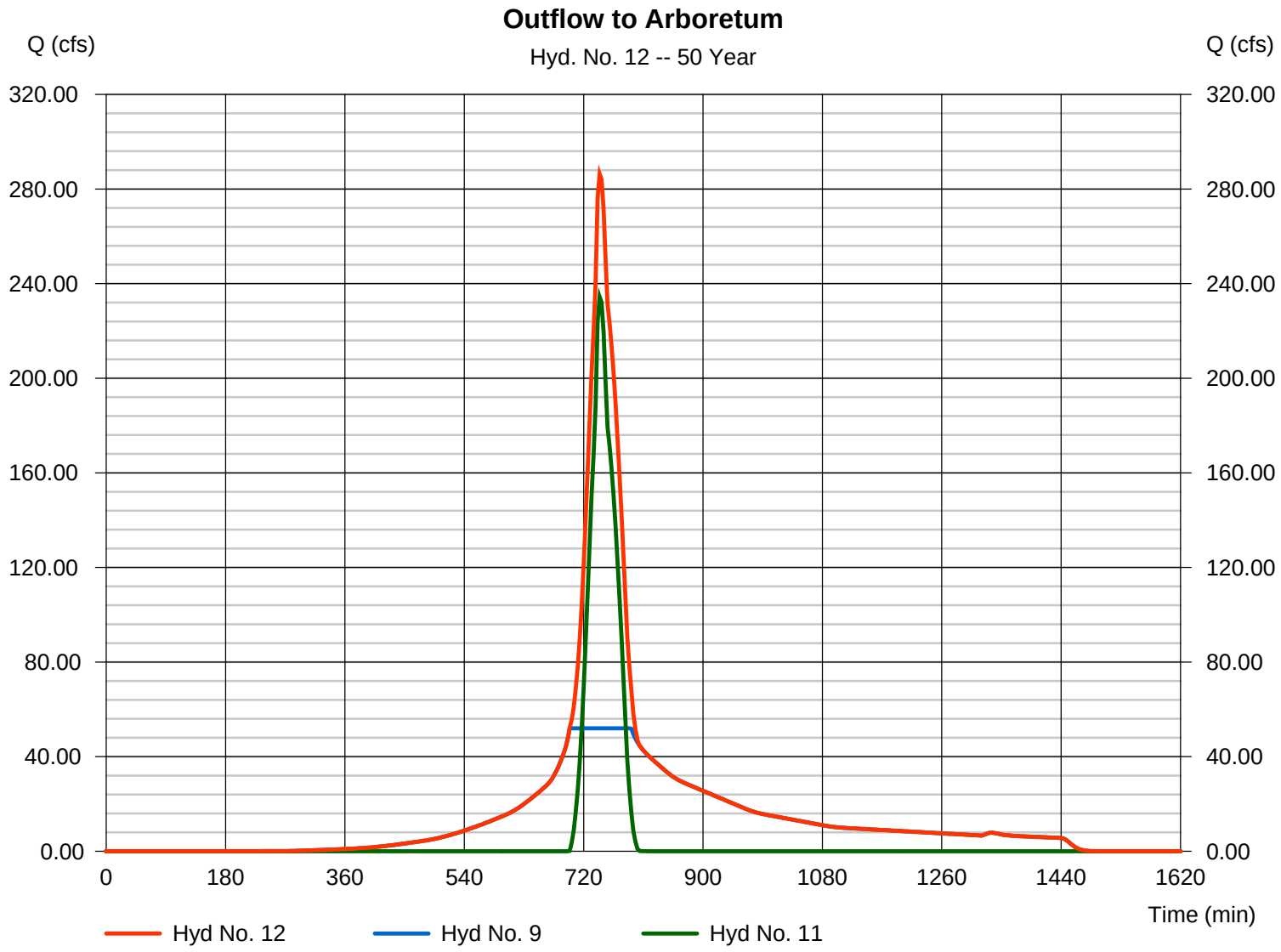
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 12

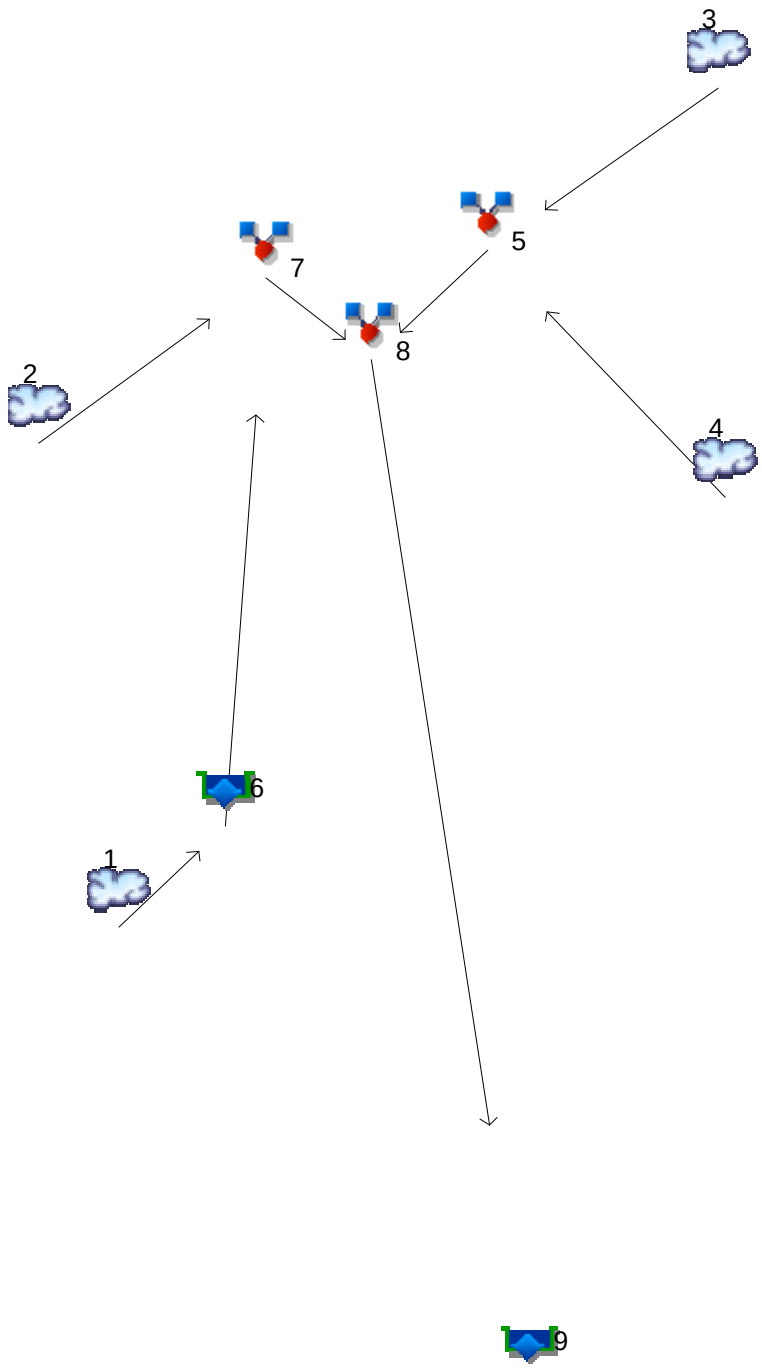
Outflow to Arboretum

Hydrograph type	=	Combine	Peak discharge	=	286.36 cfs
Storm frequency	=	50 yrs	Time to peak	=	744 min
Time interval	=	3 min	Hyd. volume	=	1,746,261 cuft
Inflow hyds.	=	9, 11	Contrib. drain. area	=	0.000 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2012
2	SCS Runoff	WS20-2012
3	SCS Runoff	WS30-2012
4	SCS Runoff	WS33-2012
5	Combine	North detention-East
6	Reservoir	South Garage Outflow
7	Combine	North detention-West
8	Combine	Inflow to North Garage
9	Reservoir	Arboretum Brook 2012

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	5.019	-------	-------	7.668	9.656	-------	-------	WS10-2012
2	SCS Runoff	------	-------	31.28	-------	-------	59.96	83.00	-------	-------	WS20-2012
3	SCS Runoff	------	-------	15.46	-------	-------	27.72	37.28	-------	-------	WS30-2012
4	SCS Runoff	------	-------	79.76	-------	-------	130.69	169.22	-------	-------	WS33-2012
5	Combine	3, 4	-------	91.42	-------	-------	152.36	198.80	-------	-------	North detention-East
6	Reservoir	1	-------	3.255	-------	-------	5.914	7.835	-------	-------	South Garage Outflow
7	Combine	2, 6	-------	33.93	-------	-------	64.32	88.76	-------	-------	North detention-West
8	Combine	5, 7	-------	123.30	-------	-------	213.41	283.10	-------	-------	Inflow to North Garage
9	Reservoir	8	-------	104.62	-------	-------	164.77	240.15	-------	-------	Arboretum Brook 2012

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	5.019	3	726	17,533	------	------	------	WS10-2012
2	SCS Runoff	31.28	3	741	166,244	------	------	------	WS20-2012
3	SCS Runoff	15.46	3	744	87,873	------	------	------	WS30-2012
4	SCS Runoff	79.76	3	732	357,574	------	------	------	WS33-2012
5	Combine	91.42	3	732	445,447	3, 4	------	------	North detention-East
6	Reservoir	3.255	3	732	17,527	1	309.12	3,371	South Garage Outflow
7	Combine	33.93	3	741	183,771	2, 6	------	------	North detention-West
8	Combine	123.30	3	735	629,217	5, 7	------	------	Inflow to North Garage
9	Reservoir	104.62	3	744	629,216	8	305.34	51,184	Arboretum Brook 2012

Hydrograph Report

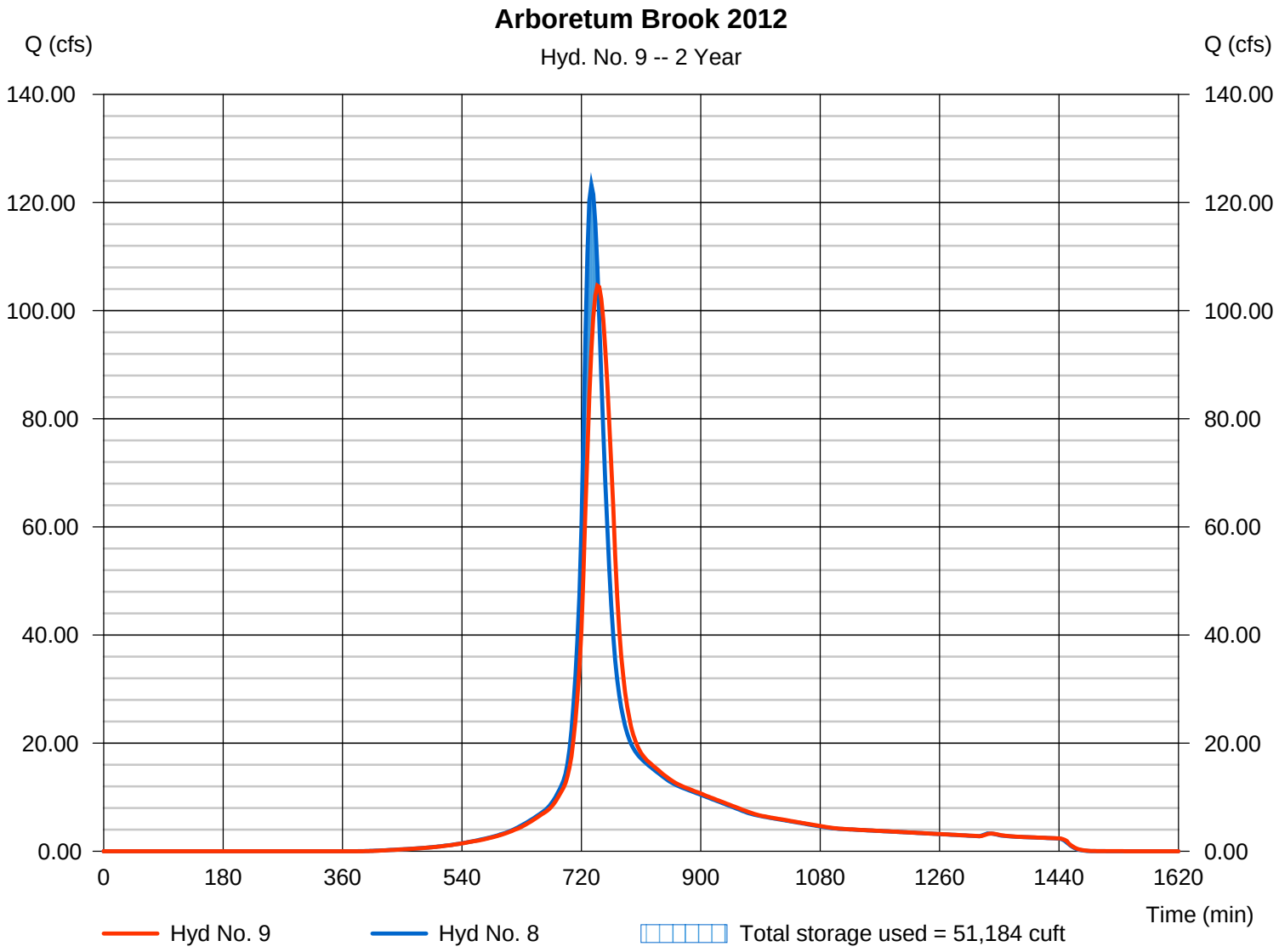
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 9

Arboretum Brook 2012

Hydrograph type	= Reservoir	Peak discharge	= 104.62 cfs
Storm frequency	= 2 yrs	Time to peak	= 744 min
Time interval	= 3 min	Hyd. volume	= 629,216 cuft
Inflow hyd. No.	= 8 - Inflow to North Garage	Max. Elevation	= 305.34 ft
Reservoir name	= North Garage U/G Detention	Max. Storage	= 51,184 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.668	3	726	27,512	------	------	------	WS10-2012
2	SCS Runoff	59.96	3	741	314,066	------	------	------	WS20-2012
3	SCS Runoff	27.72	3	744	157,461	------	------	------	WS30-2012
4	SCS Runoff	130.69	3	732	595,144	------	------	------	WS33-2012
5	Combine	152.36	3	732	752,605	3, 4	------	------	North detention-East
6	Reservoir	5.914	3	729	27,505	1	309.48	4,389	South Garage Outflow
7	Combine	64.32	3	738	341,572	2, 6	------	------	North detention-West
8	Combine	213.41	3	735	1,094,177	5, 7	------	------	Inflow to North Garage
9	Reservoir	164.77	3	747	1,094,176	8	311.71	116,630	Arboretum Brook 2012

Hydrograph Report

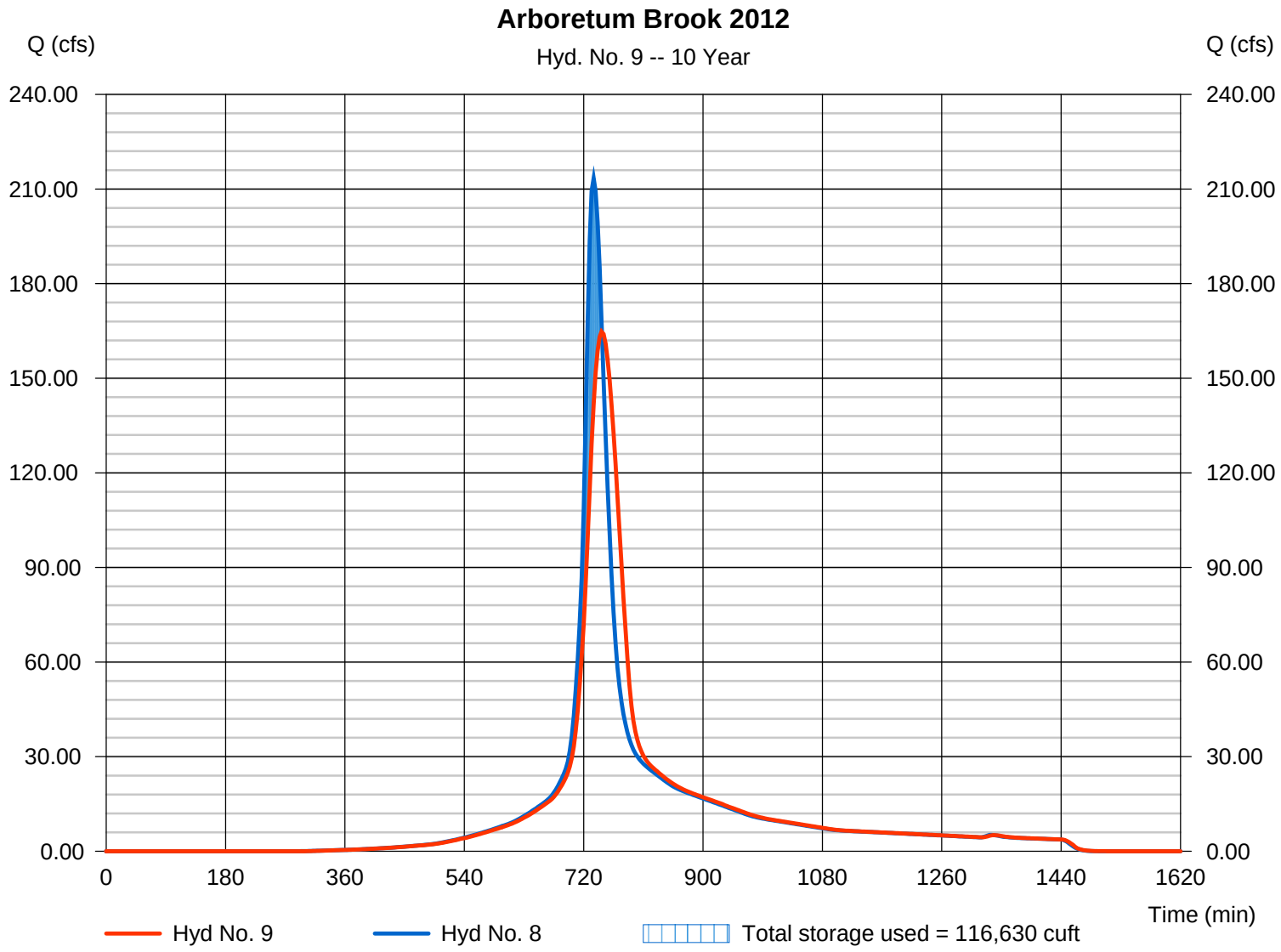
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 9

Arboretum Brook 2012

Hydrograph type	=	Reservoir	Peak discharge	=	164.77 cfs
Storm frequency	=	10 yrs	Time to peak	=	747 min
Time interval	=	3 min	Hyd. volume	=	1,094,176 cuft
Inflow hyd. No.	=	8 - Inflow to North Garage	Max. Elevation	=	311.71 ft
Reservoir name	=	North Garage U/G Detention	Max. Storage	=	116,630 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	9.656	3	726	35,147	------	------	------	WS10-2012
2	SCS Runoff	83.00	3	738	435,008	------	------	------	WS20-2012
3	SCS Runoff	37.28	3	744	213,146	------	------	------	WS30-2012
4	SCS Runoff	169.22	3	732	780,017	------	------	------	WS33-2012
5	Combine	198.80	3	732	993,164	3, 4	------	------	North detention-East
6	Reservoir	7.835	3	729	35,140	1	309.66	5,043	South Garage Outflow
7	Combine	88.76	3	738	470,148	2, 6	------	------	North detention-West
8	Combine	283.10	3	735	1,463,313	5, 7	------	------	Inflow to North Garage
9	Reservoir	240.15	3	744	1,463,310	8	315.83	158,856	Arboretum Brook 2012

Hydrograph Report

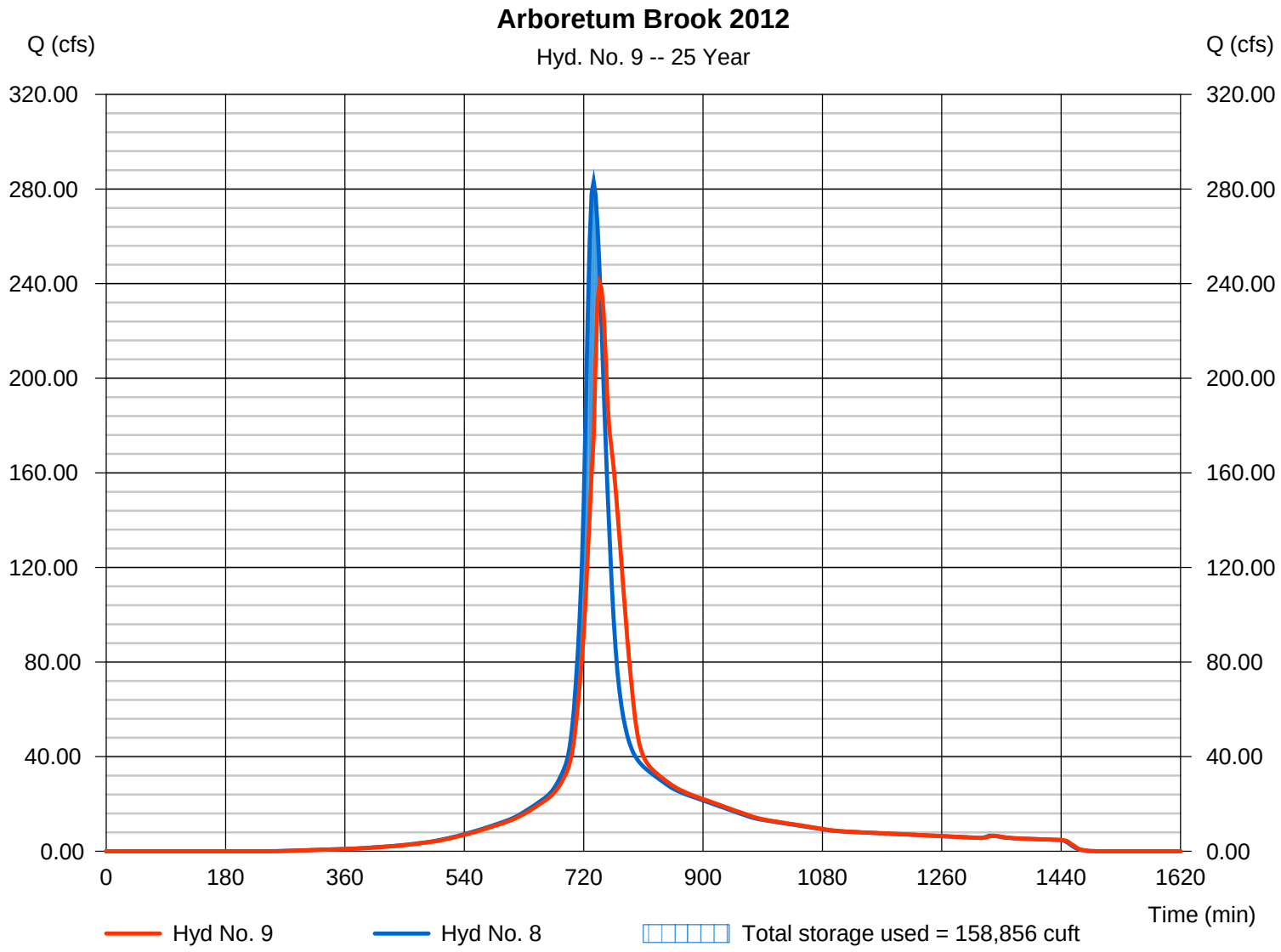
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 9

Arboretum Brook 2012

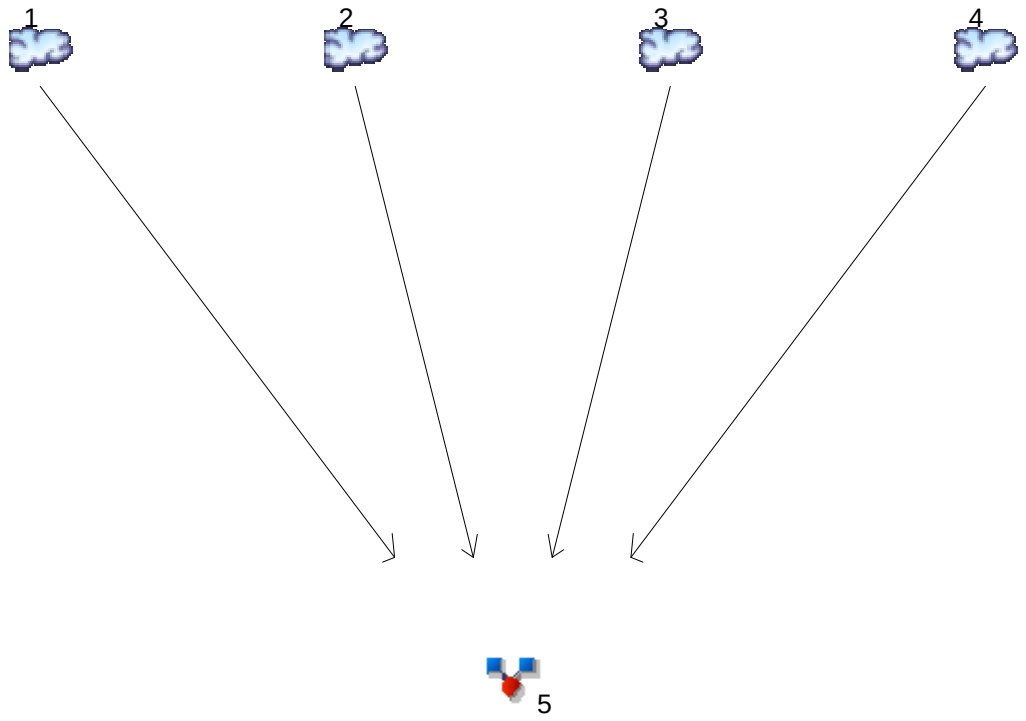
Hydrograph type	=	Reservoir	Peak discharge	=	240.15 cfs
Storm frequency	=	25 yrs	Time to peak	=	744 min
Time interval	=	3 min	Hyd. volume	=	1,463,310 cuft
Inflow hyd. No.	=	8 - Inflow to North Garage	Max. Elevation	=	315.83 ft
Reservoir name	=	North Garage U/G Detention	Max. Storage	=	158,856 cuft

Storage Indication method used.



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-1984
2	SCS Runoff	WS20-1984
3	SCS Runoff	WS30-1984
4	SCS Runoff	WS33-1984
5	Combine	Arboretum Brookt-1984

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	2.190	-------	-------	4.542	6.472	8.303	10.50	WS10-1984
2	SCS Runoff	------	-------	29.64	-------	-------	57.91	80.67	102.34	128.26	WS20-1984
3	SCS Runoff	------	-------	8.302	-------	-------	18.51	27.18	35.53	45.67	WS30-1984
4	SCS Runoff	------	-------	53.07	-------	-------	100.66	138.49	173.83	215.87	WS33-1984
5	Combine	1, 2, 3, 4	-------	88.20	-------	-------	171.79	239.32	302.84	378.77	Arboretum Brookt-1984

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.190	3	726	7,576	------	------	------	WS10-1984
2	SCS Runoff	29.64	3	741	158,408	------	------	------	WS20-1984
3	SCS Runoff	8.302	3	747	50,924	------	------	------	WS30-1984
4	SCS Runoff	53.07	3	732	241,354	------	------	------	WS33-1984
5	Combine	88.20	3	738	458,261	1, 2, 3, 4	------	------	Arboretum Brookt-1984

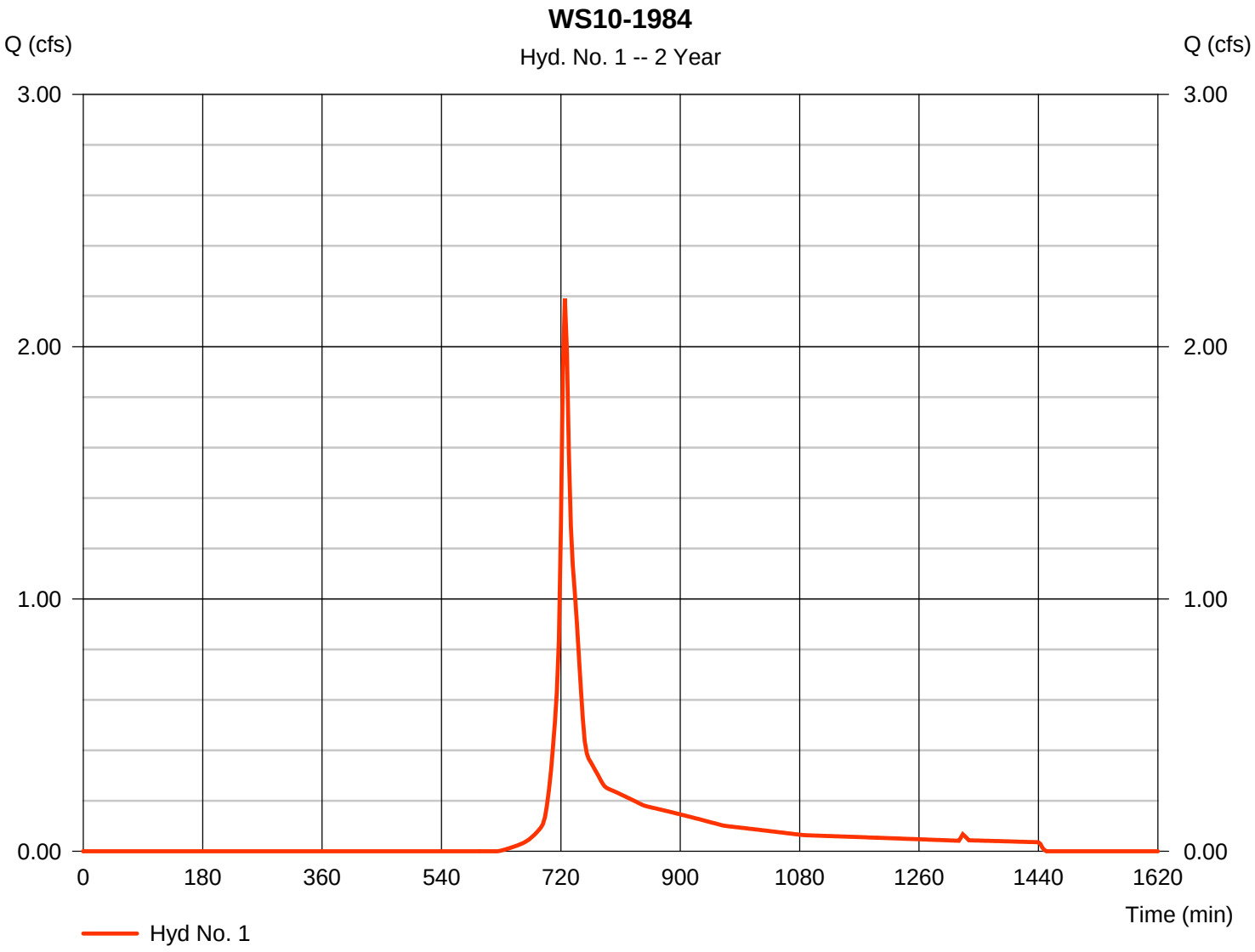
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-1984

Hydrograph type	= SCS Runoff	Peak discharge	= 2.190 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 7,576 cuft
Drainage area	= 2.010 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.542	3	726	15,160	------	------	------	WS10-1984
2	SCS Runoff	57.91	3	741	303,444	------	------	------	WS20-1984
3	SCS Runoff	18.51	3	744	106,867	------	------	------	WS30-1984
4	SCS Runoff	100.66	3	732	449,809	------	------	------	WS33-1984
5	Combine	171.79	3	735	875,279	1, 2, 3, 4	------	------	Arboretum Brookt-1984

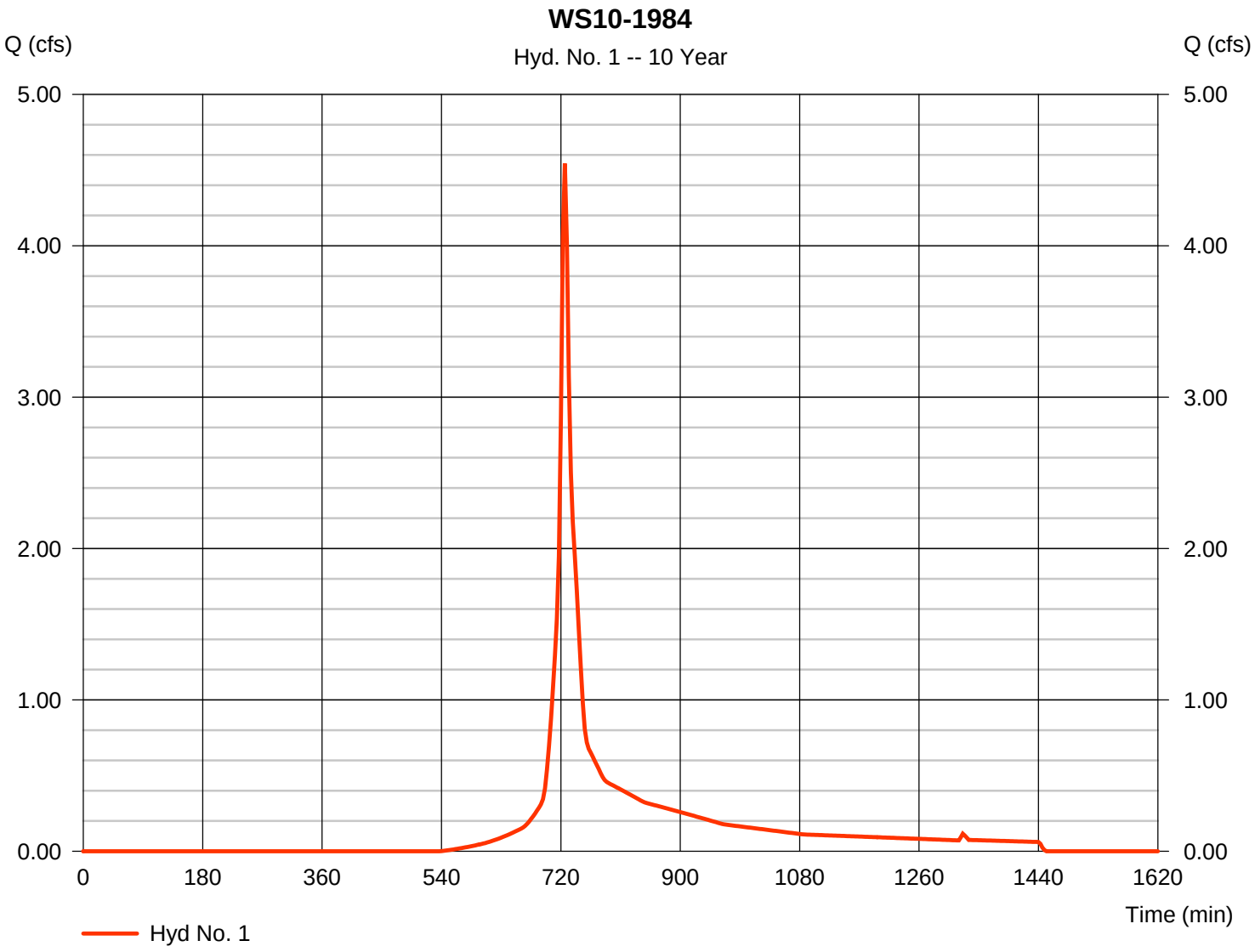
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-1984

Hydrograph type	= SCS Runoff	Peak discharge	= 4.542 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 15,160 cuft
Drainage area	= 2.010 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	6.472	3	726	21,521	------	------	------	WS10-1984
2	SCS Runoff	80.67	3	738	422,815	------	------	------	WS20-1984
3	SCS Runoff	27.18	3	744	154,754	------	------	------	WS30-1984
4	SCS Runoff	138.49	3	732	619,374	------	------	------	WS33-1984
5	Combine	239.32	3	735	1,218,464	1, 2, 3, 4	------	------	Arboretum Brookt-1984

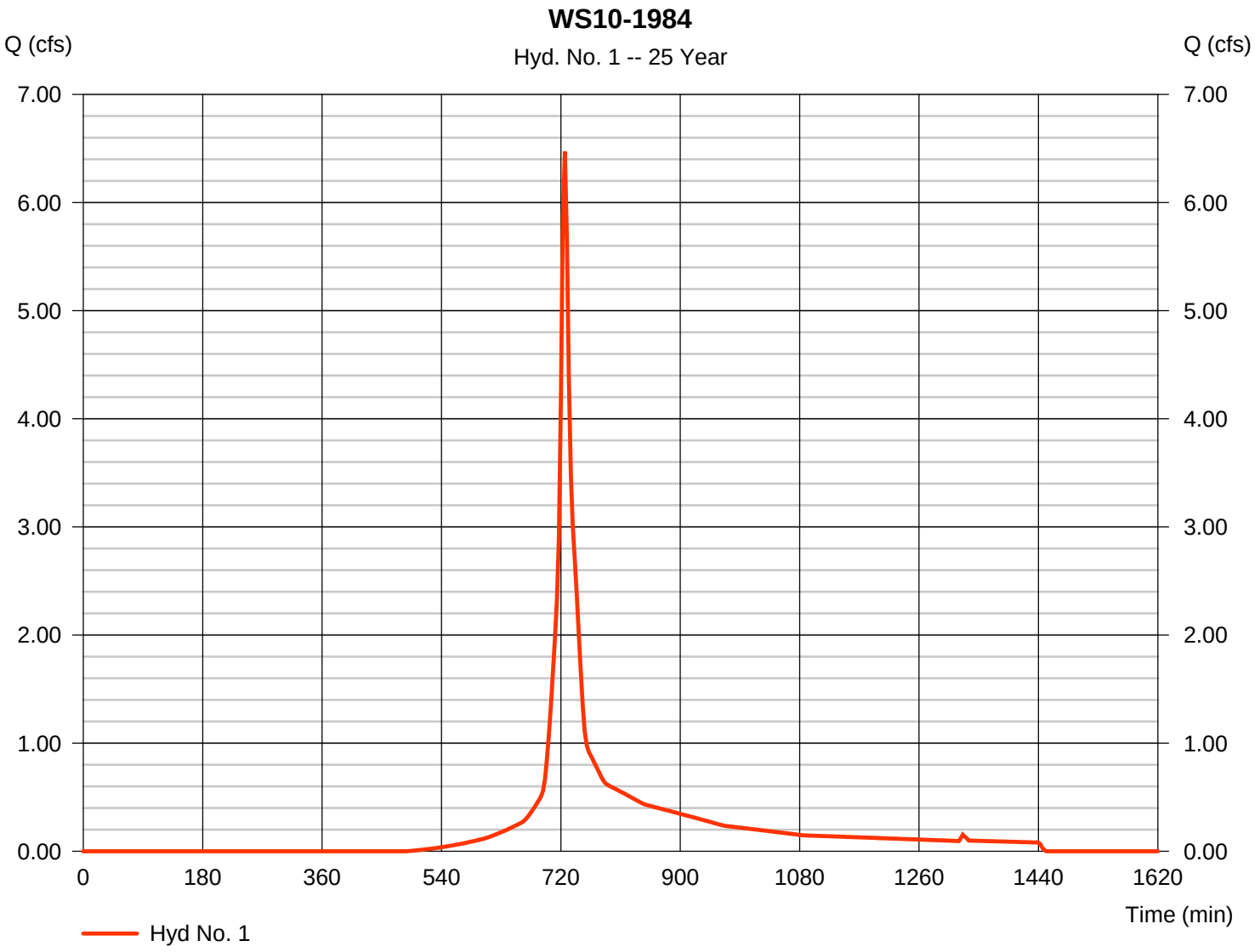
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-1984

Hydrograph type	= SCS Runoff	Peak discharge	= 6.472 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 21,521 cuft
Drainage area	= 2.010 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	8.303	3	726	27,661	------	------	------	WS10-1984
2	SCS Runoff	102.34	3	738	536,963	------	------	------	WS20-1984
3	SCS Runoff	35.53	3	744	201,465	------	------	------	WS30-1984
4	SCS Runoff	173.83	3	732	780,576	------	------	------	WS33-1984
5	Combine	302.84	3	735	1,546,664	1, 2, 3, 4	------	------	Arboretum Brookt-1984

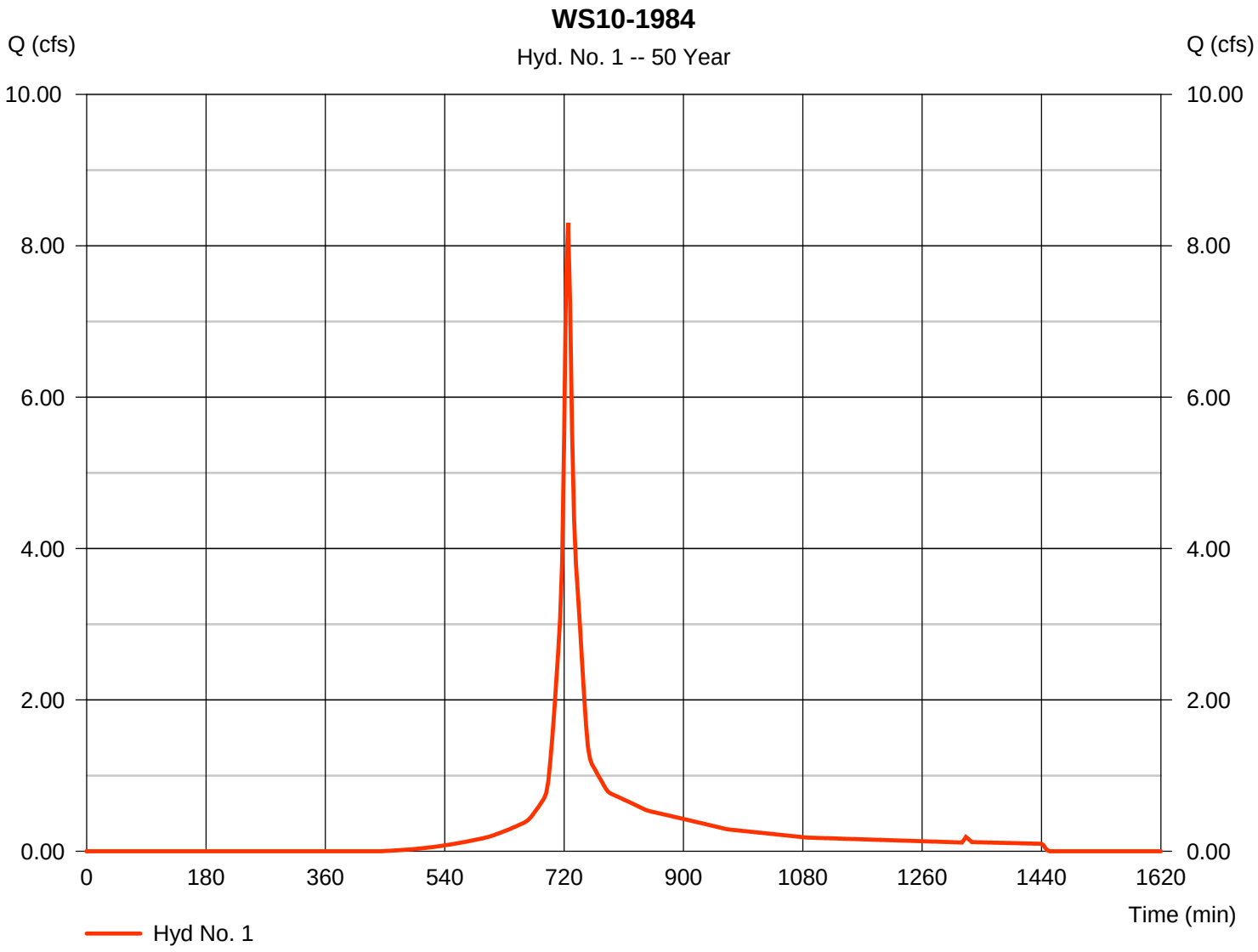
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-1984

Hydrograph type	= SCS Runoff	Peak discharge	= 8.303 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 27,661 cuft
Drainage area	= 2.010 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	10.50	3	726	35,166	------	------	------	WS10-1984
2	SCS Runoff	128.26	3	738	675,528	------	------	------	WS20-1984
3	SCS Runoff	45.67	3	744	258,984	------	------	------	WS30-1984
4	SCS Runoff	215.87	3	732	975,449	------	------	------	WS33-1984
5	Combine	378.77	3	735	1,945,127	1, 2, 3, 4	------	------	Arboretum Brookt-1984

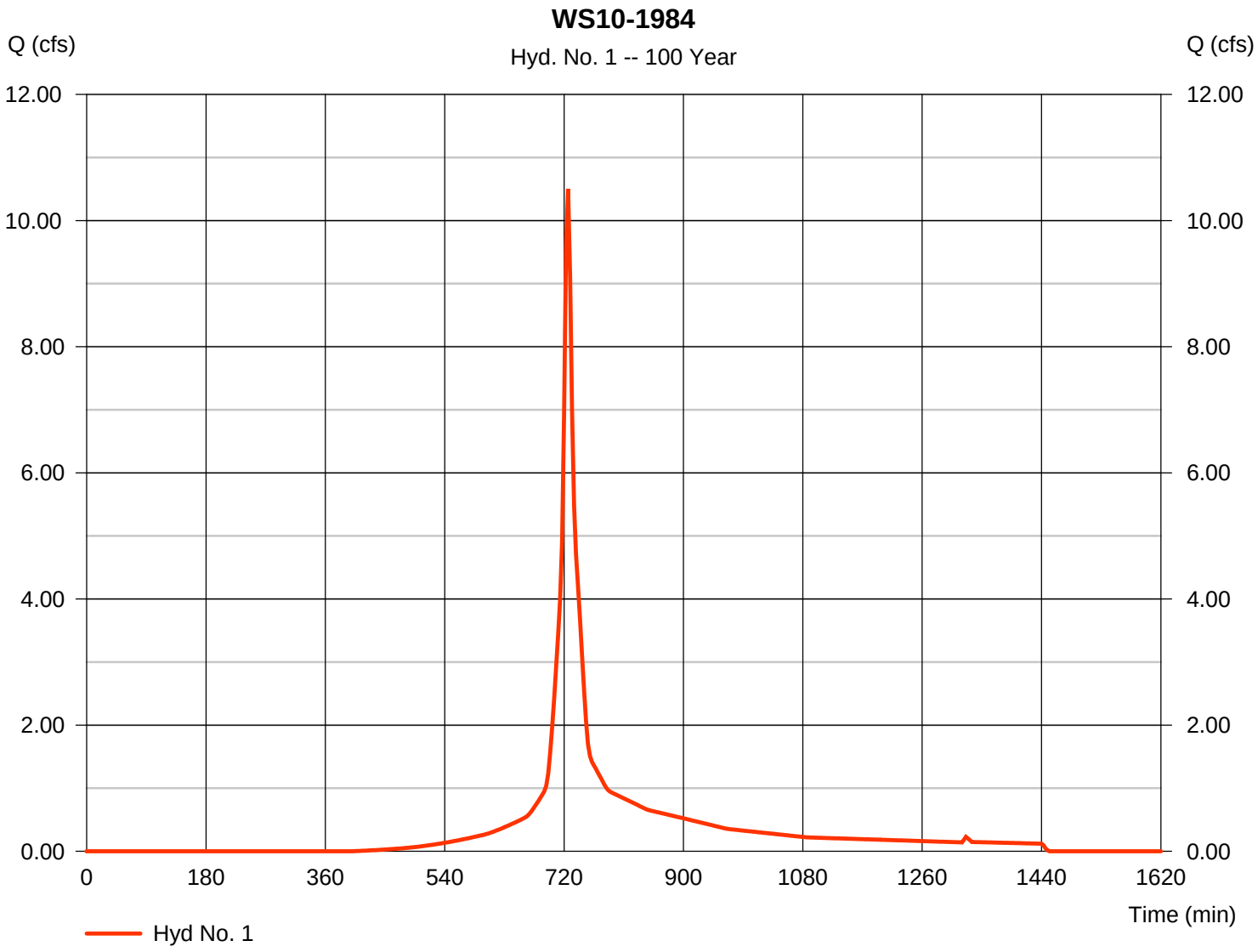
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-1984

Hydrograph type	= SCS Runoff	Peak discharge	= 10.50 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 35,166 cuft
Drainage area	= 2.010 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

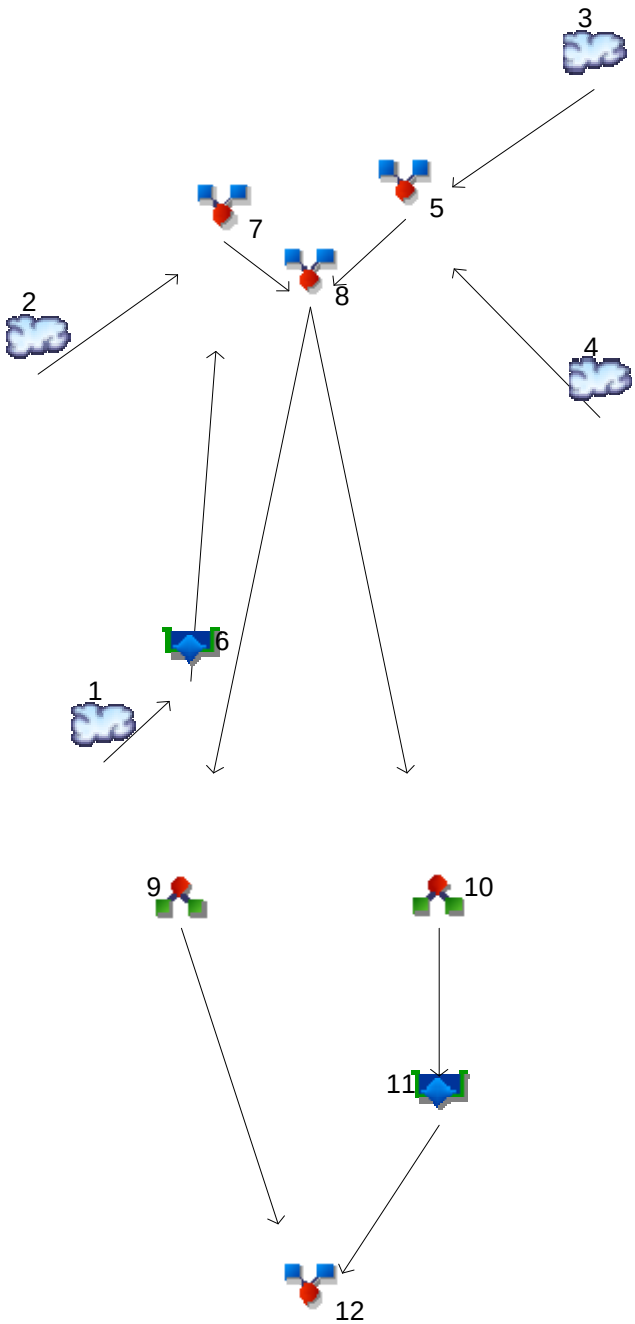


APPENDIX C

Hydrologic Model Input and Output
Arboretum Brook Watershed
TP-40 Rainfall

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2012
2	SCS Runoff	WS20-2012
3	SCS Runoff	WS30-2012
4	SCS Runoff	WS33-2012
5	Combine	North detention-East
6	Reservoir	South Garage Outflow
7	Combine	North detention-West
8	Combine	Inflow to North Garage
9	Diversion1	Test to make 50-100 yr run
10	Diversion2	Remaining to outfall
11	Reservoir	Arboretum Brook 2012
12	Combine	Discharge to Arboretum

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	-------	-------	-------	-------	-------	-------	11.51	WS10-2012
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	105.20	WS20-2012
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	46.33	WS30-2012
4	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	205.16	WS33-2012
5	Combine	3, 4	-------	-------	-------	-------	-------	-------	-------	242.25	North detention-East
6	Reservoir	1	-------	-------	-------	-------	-------	-------	-------	9.604	South Garage Outflow
7	Combine	2, 6	-------	-------	-------	-------	-------	-------	-------	111.99	North detention-West
8	Combine	5, 7	-------	-------	-------	-------	-------	-------	-------	348.73	Inflow to North Garage
9	Diversion1	8	-------	-------	-------	-------	-------	-------	-------	53.00	Test to make 50-100 yr run
10	Diversion2	8	-------	-------	-------	-------	-------	-------	-------	295.73	Remaining to outfall
11	Reservoir	10	-------	-------	-------	-------	-------	-------	-------	0.000	Arboretum Brook 2012
12	Combine	9, 11	-------	-------	-------	-------	-------	-------	-------	296.79	Discharge to Arboretum

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	11.51	3	726	42,335	------	------	------	WS10-2012
2	SCS Runoff	105.20	3	738	552,562	------	------	------	WS20-2012
3	SCS Runoff	46.33	3	741	266,680	------	------	------	WS30-2012
4	SCS Runoff	205.16	3	732	955,405	------	------	------	WS33-2012
5	Combine	242.25	3	732	1,222,086	3, 4	------	------	North detention-East
6	Reservoir	9.604	3	729	42,328	1	309.82	5,585	South Garage Outflow
7	Combine	111.99	3	738	594,890	2, 6	------	------	North detention-West
8	Combine	348.73	3	735	1,816,976	5, 7	------	------	Inflow to North Garage
9	Diversion1	53.00	3	699	1,163,805	8	------	------	Test to make 50-100 yr run
10	Diversion2	295.73	3	735	653,171	8	------	------	Remaining to outfall
11	Reservoir	0.000	3	n/a	0	10	0.00	0.000	Arboretum Brook 2012
12	Combine	296.79	3	744	1,816,975	9, 11	------	------	Discharge to Arboretum

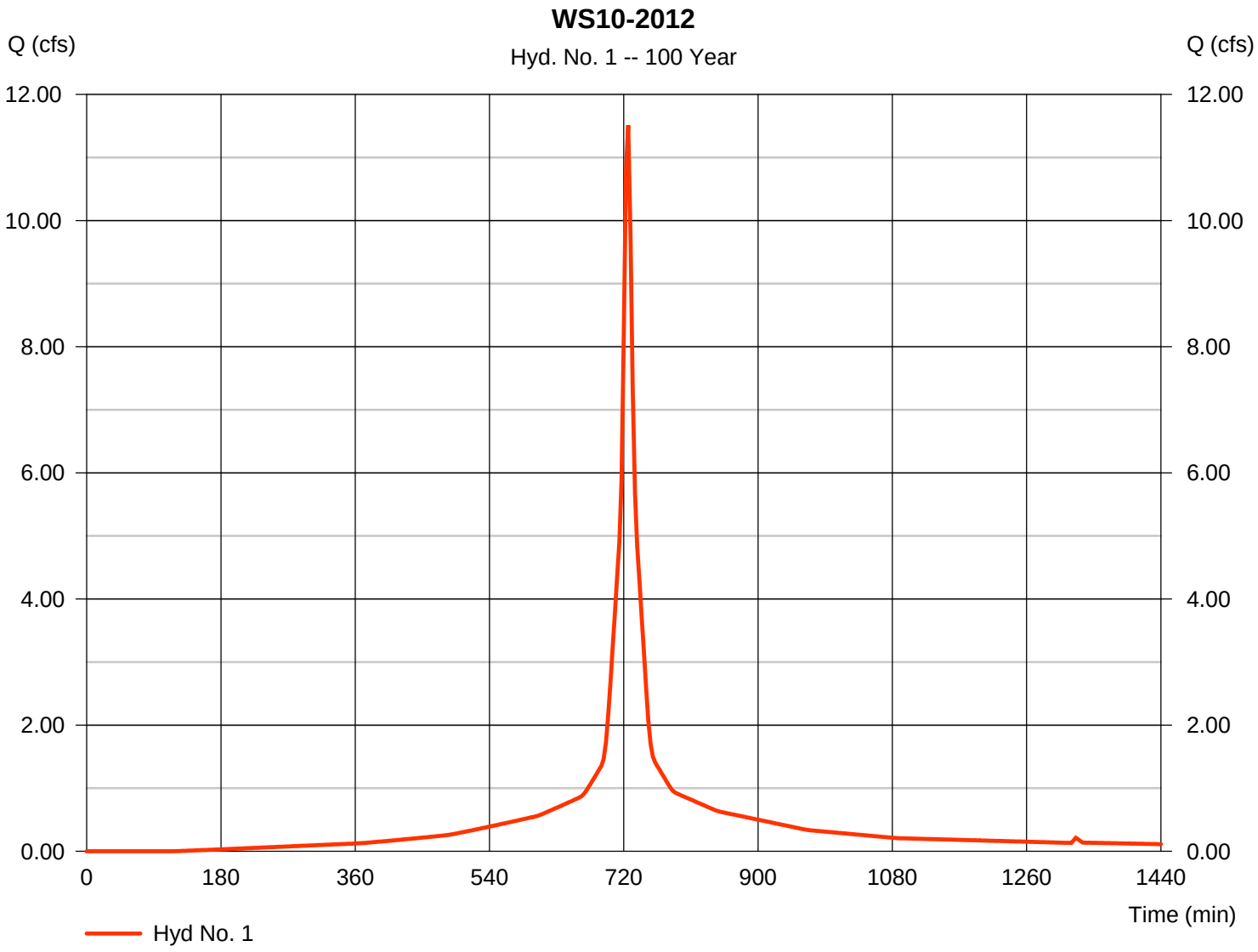
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

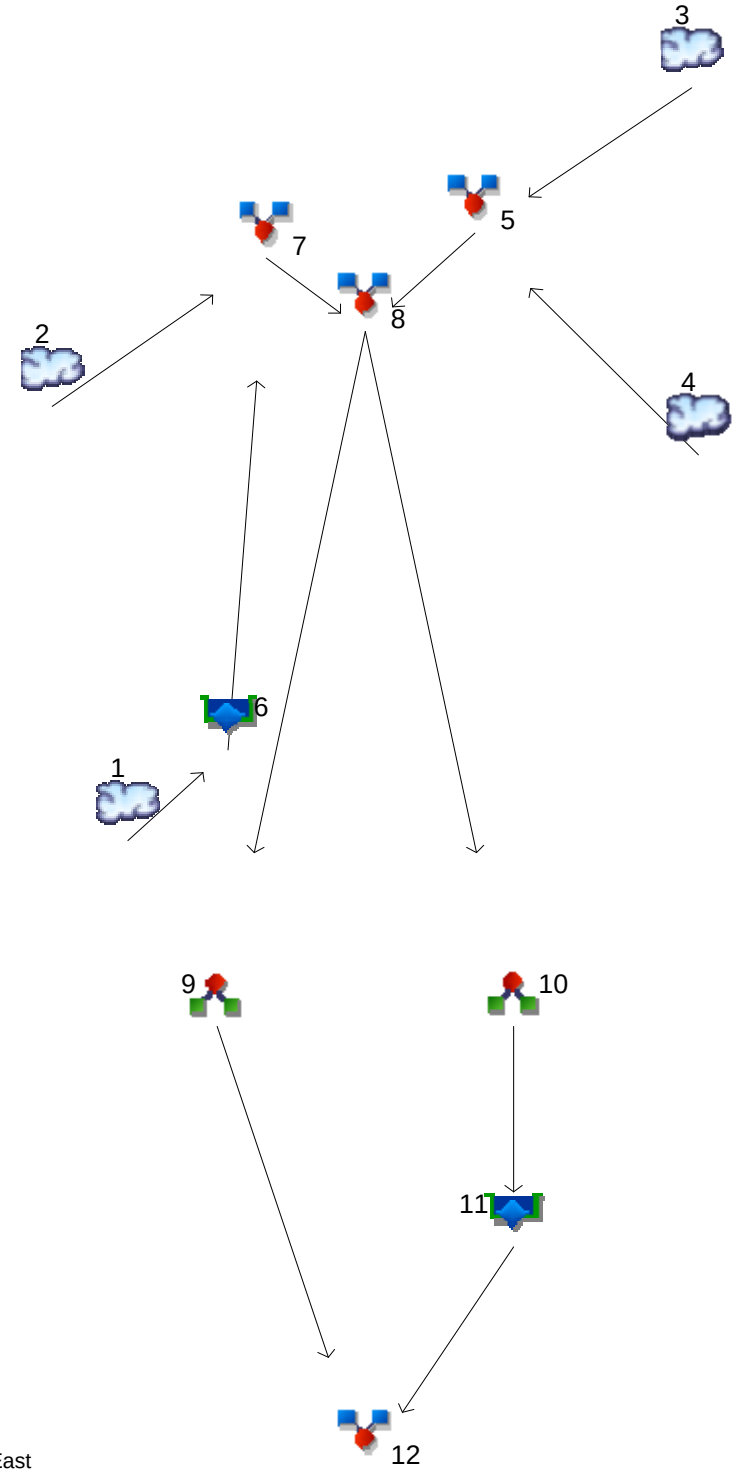
WS10-2012

Hydrograph type	= SCS Runoff	Peak discharge	= 11.51 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 42,335 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2012
2	SCS Runoff	WS20-2012
3	SCS Runoff	WS30-2012
4	SCS Runoff	WS33-2012
5	Combine	North detention-East
6	Reservoir	South Garage Outflow
7	Combine	North detention-West
8	Combine	Inflow to North Garage
9	Diversion1	Test to make 50-100 yr run
10	Diversion2	Remaining to outfall
11	Reservoir	Arboretum Brook 2012
12	Combine	Discharge to Arboretum

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	-------	-------	-------	-------	-------	10.29	-------	WS10-2012
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	90.50	-------	WS20-2012
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	40.34	-------	WS30-2012
4	SCS Runoff	------	-------	-------	-------	-------	-------	-------	181.45	-------	WS33-2012
5	Combine	3, 4	-------	-------	-------	-------	-------	-------	213.57	-------	North detention-East
6	Reservoir	1	-------	-------	-------	-------	-------	-------	8.438	-------	South Garage Outflow
7	Combine	2, 6	-------	-------	-------	-------	-------	-------	96.61	-------	North detention-West
8	Combine	5, 7	-------	-------	-------	-------	-------	-------	305.38	-------	Inflow to North Garage
9	Diversion1	8	-------	-------	-------	-------	-------	-------	16.00	-------	Test to make 50-100 yr run
10	Diversion2	8	-------	-------	-------	-------	-------	-------	289.38	-------	Remaining to outfall
11	Reservoir	10	-------	-------	-------	-------	-------	-------	243.48	-------	Arboretum Brook 2012
12	Combine	9, 11	-------	-------	-------	-------	-------	-------	259.48	-------	Discharge to Arboretum

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	10.29	3	726	37,586	------	------	------	WS10-2012
2	SCS Runoff	90.50	3	738	474,566	------	------	------	WS20-2012
3	SCS Runoff	40.34	3	744	231,213	------	------	------	WS30-2012
4	SCS Runoff	181.45	3	732	839,414	------	------	------	WS33-2012
5	Combine	213.57	3	732	1,070,627	3, 4	------	------	North detention-East
6	Reservoir	8.438	3	729	37,579	1	309.72	5,233	South Garage Outflow
7	Combine	96.61	3	738	512,146	2, 6	------	------	North detention-West
8	Combine	305.38	3	735	1,582,774	5, 7	------	------	Inflow to North Garage
9	Diversion1	16.00	3	618	678,671	8	------	------	Test to make 50-100 yr run
10	Diversion2	289.38	3	735	904,101	8	------	------	Remaining to outfall
11	Reservoir	243.48	3	744	904,100	10	315.99	160,444	Arboretum Brook 2012
12	Combine	259.48	3	744	1,582,772	9, 11	------	------	Discharge to Arboretum

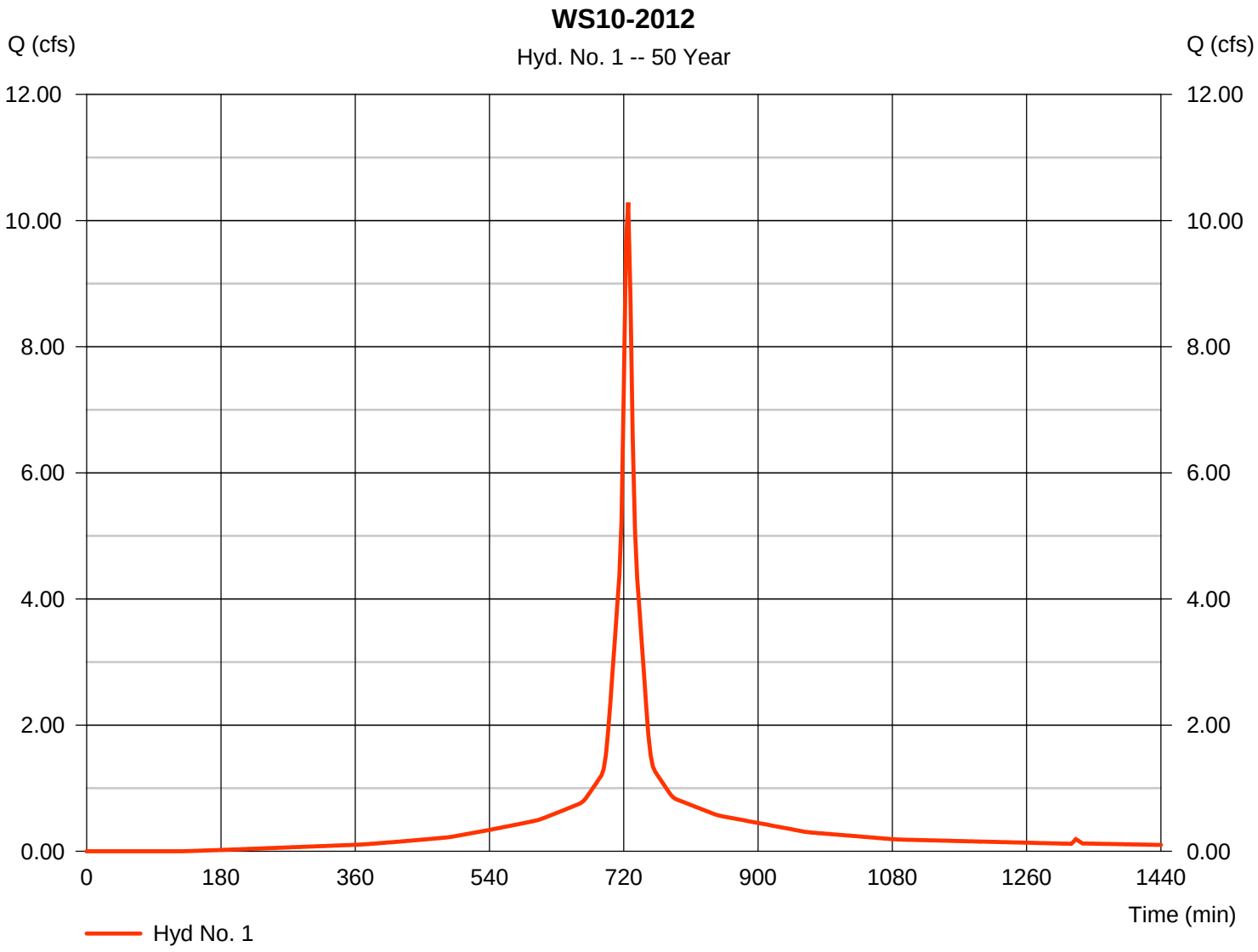
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

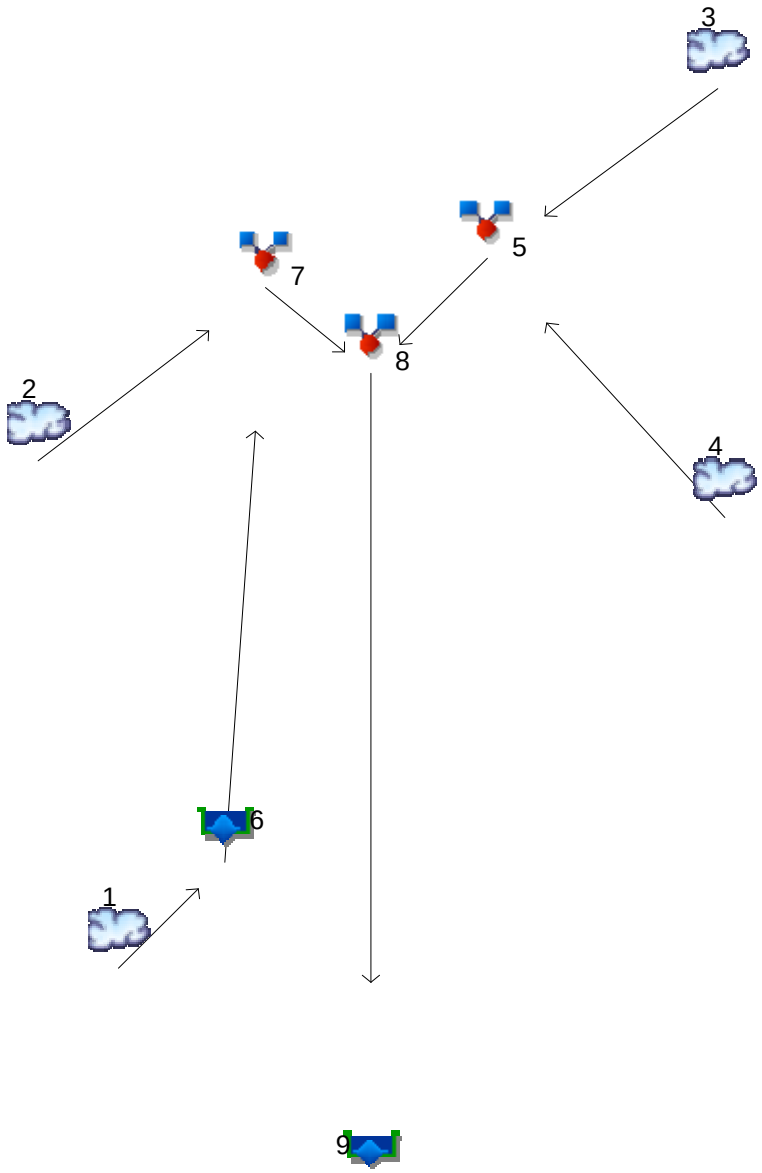
WS10-2012

Hydrograph type	= SCS Runoff	Peak discharge	= 10.29 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 37,586 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS10-2012
2	SCS Runoff	WS20-2012
3	SCS Runoff	WS30-2012
4	SCS Runoff	WS33-2012
5	Combine	North detention-East
6	Reservoir	South Garage Outflow
7	Combine	North detention-West
8	Combine	Inflow to North Garage
9	Reservoir	Arboretum Brook 2012

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	4.983	-------	-------	7.827	9.060	-------	-------	WS10-2012
2	SCS Runoff	------	-------	30.91	-------	-------	61.76	75.95	-------	-------	WS20-2012
3	SCS Runoff	------	-------	15.30	-------	-------	28.48	34.39	-------	-------	WS30-2012
4	SCS Runoff	------	-------	79.08	-------	-------	133.76	157.65	-------	-------	WS33-2012
5	Combine	3, 4	-------	90.61	-------	-------	156.06	184.83	-------	-------	North detention-East
6	Reservoir	1	-------	3.218	-------	-------	6.064	7.265	-------	-------	South Garage Outflow
7	Combine	2, 6	-------	33.54	-------	-------	66.24	81.35	-------	-------	North detention-West
8	Combine	5, 7	-------	122.12	-------	-------	218.95	262.09	-------	-------	Inflow to North Garage
9	Reservoir	8	-------	103.78	-------	-------	168.16	215.99	-------	-------	Arboretum Brook 2012

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.983	3	726	17,401	------	------	------	WS10-2012
2	SCS Runoff	30.91	3	741	164,395	------	------	------	WS20-2012
3	SCS Runoff	15.30	3	744	86,985	------	------	------	WS30-2012
4	SCS Runoff	79.08	3	732	354,463	------	------	------	WS33-2012
5	Combine	90.61	3	732	441,448	3, 4	------	------	North detention-East
6	Reservoir	3.218	3	732	17,394	1	309.11	3,353	South Garage Outflow
7	Combine	33.54	3	741	181,789	2, 6	------	------	North detention-West
8	Combine	122.12	3	735	623,237	5, 7	------	------	Inflow to North Garage
9	Reservoir	103.78	3	744	623,236	8	305.27	50,478	Arboretum Brook 2012

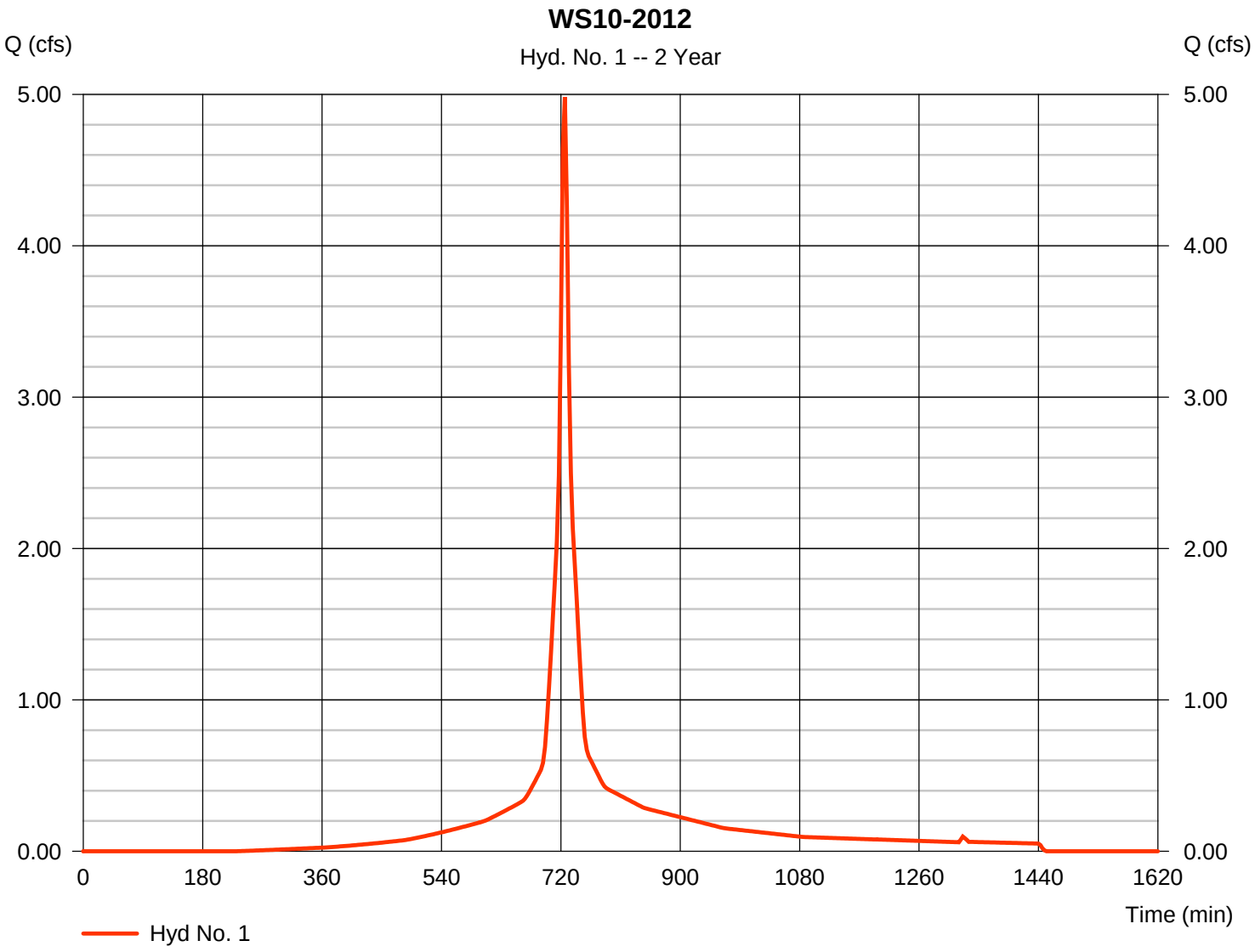
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-2012

Hydrograph type	= SCS Runoff	Peak discharge	= 4.983 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 17,401 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.827	3	726	28,119	------	------	------	WS10-2012
2	SCS Runoff	61.76	3	741	323,483	------	------	------	WS20-2012
3	SCS Runoff	28.48	3	744	161,827	------	------	------	WS30-2012
4	SCS Runoff	133.76	3	732	609,761	------	------	------	WS33-2012
5	Combine	156.06	3	732	771,587	3, 4	------	------	North detention-East
6	Reservoir	6.064	3	729	28,112	1	309.49	4,445	South Garage Outflow
7	Combine	66.24	3	738	351,595	2, 6	------	------	North detention-West
8	Combine	218.95	3	735	1,123,182	5, 7	------	------	Inflow to North Garage
9	Reservoir	168.16	3	747	1,123,181	8	312.16	121,189	Arboretum Brook 2012

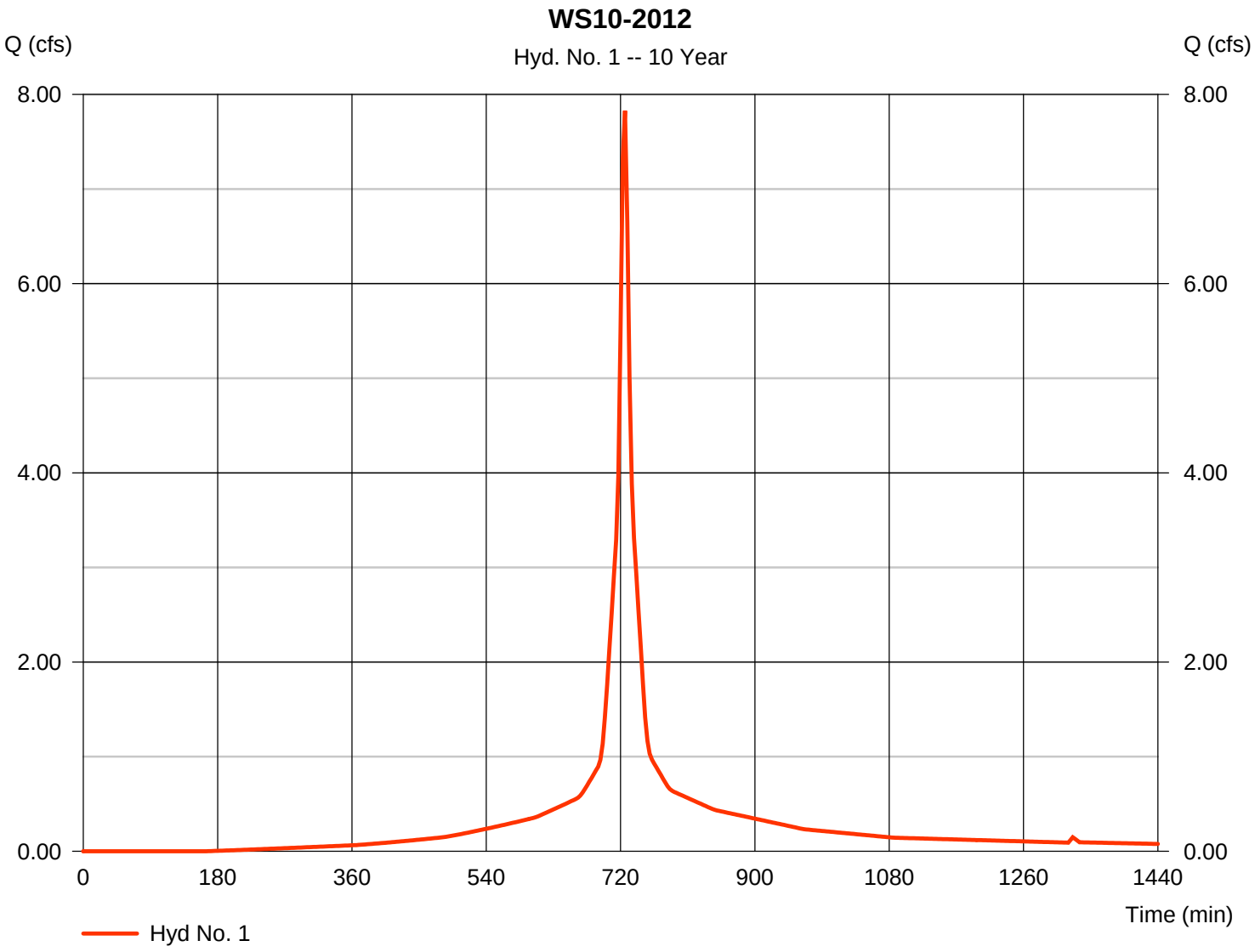
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-2012

Hydrograph type	= SCS Runoff	Peak discharge	= 7.827 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 28,119 cuft
Drainage area	= 2.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	9.060	3	726	32,846	------	------	------	WS10-2012
2	SCS Runoff	75.95	3	738	398,057	------	------	------	WS20-2012
3	SCS Runoff	34.39	3	744	196,212	------	------	------	WS30-2012
4	SCS Runoff	157.65	3	732	724,115	------	------	------	WS33-2012
5	Combine	184.83	3	732	920,327	3, 4	------	------	North detention-East
6	Reservoir	7.265	3	729	32,839	1	309.61	4,857	South Garage Outflow
7	Combine	81.35	3	738	430,896	2, 6	------	------	North detention-West
8	Combine	262.09	3	735	1,351,223	5, 7	------	------	Inflow to North Garage
9	Reservoir	215.99	3	747	1,351,222	8	314.96	149,372	Arboretum Brook 2012

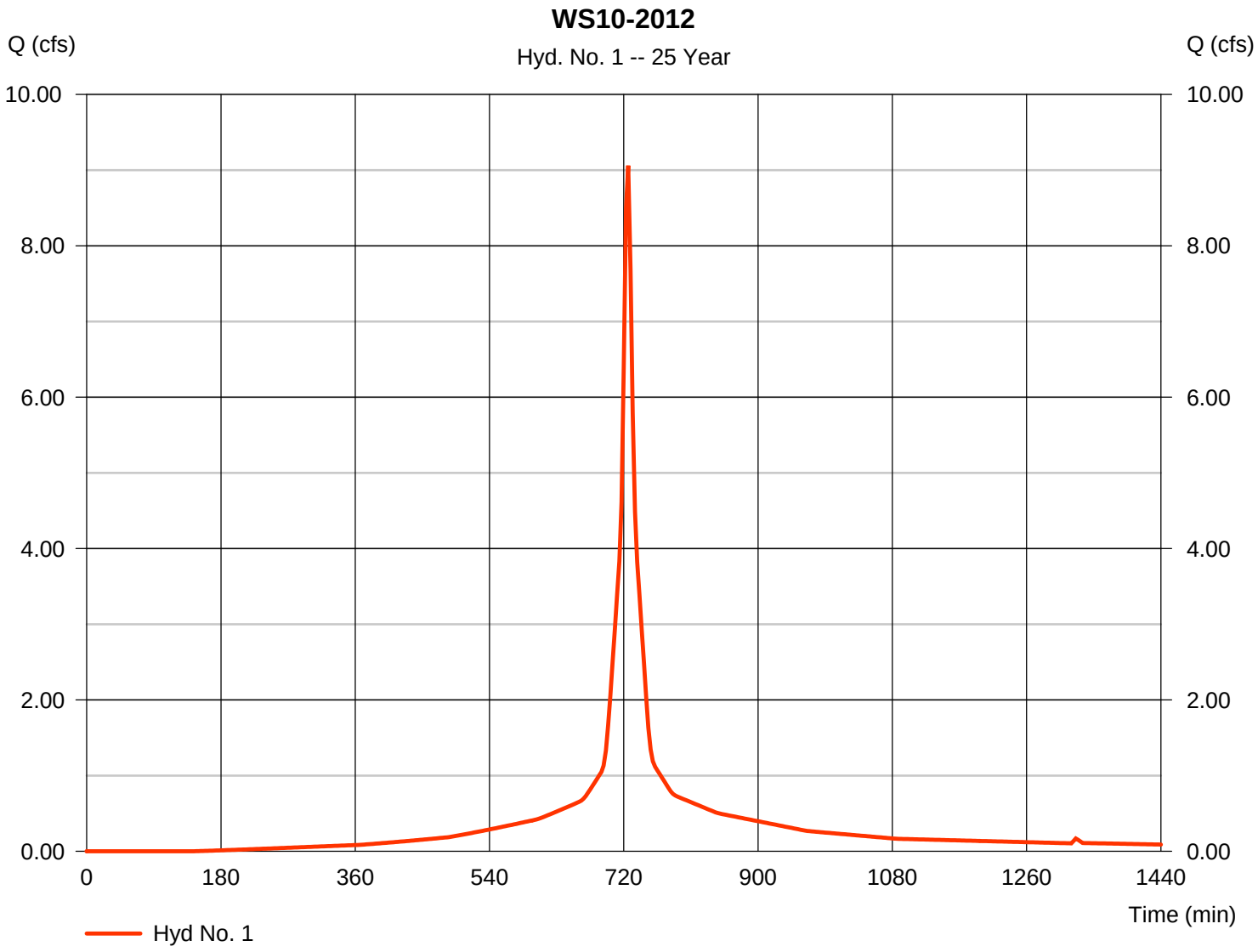
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS10-2012

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.060 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	32,846 cuft
Drainage area	=	2.010 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.50 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



APPENDIX D

Hydrologic Model Input and Output
Prospect Culvert Watershed
NRCS Rainfall

Engineering, Landscape Architecture and Environmental Science
MILONE & MACBROOM®
99 Realty Drive
Cheshire, Connecticut 06410
(203 271-1773

ECSU -2012 Existing Conditions
Wilimantic, CT

Calculated By: BAM 06-2012
Checked By:_____
MMI# 1266-27

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

(Derived from Worksheet 3, USDA 210-VI-TR55, Second Ed, June 1986)

Watershed ID: 50 | Existing Conditions X | Travel Time (Tt) _____
Subwatershed ID: _____ | Proposed Condntions _____ | Time of Conc. (Tc) X

Sheet Flow (Applicable to T_c Only)

	Segment ID	A-B			
1. Surface Description (Table 3-1)		GRASS			
2. Manning's Roughness Coeff. for Sheet Flow, n (Table 3-1)		0.240			
3. Flow Length, L (Max. = 300 ft, CTDOT Recommends < 150 ft)		300			
4. Two-Year 24-hr rainfall, P_2 (in)		3.3			
5a. Change in Elevation, h (ft)		5.0			
5b. Land Slope, s (ft/ft)		0.017			
6. Travel Time, T_t (hr) $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		0.607	=	36.4	min.

Shallow Concentrated Flow (Assume Hyd. Radius = Depth of Flow)

	Segment ID	B-C								
7a. Surface Description		GRASS								
7b. Paved or Unpaved		UNPV								
7c. Manning's Roughness Coeff., n		0.050								
7d. Depth of Flow, d (ft) (d = 0.4 Unpaved, d = 0.2 Paved)		0.4								
8. Flow Length, L		536								
9a. Change in Elevation, h (ft)		28.0								
9b. Watercourse slope, s (ft/ft)		0.052								
10. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$		3.698								
11. Travel Time, T_t (hr) $T_t = \frac{L}{3600 * V}$		0.040	+		+		+		=	0.04 hr.
									=	2.4 min.

Channel Flow

	Segment ID	C-D (24")								
12a. Channel/Conduit Description		PIPE								
12b. Cross sectional flow area, A (ft.$^{2)}$		3.14								
13. Wetted perimeter, $P_{w\ (ft)}$		6.28								
14. Hydraulic Radius, R (ft) $R = \frac{A}{P_w}$		0.50								
15a. Change in Elevation, H (ft)		59.0								
15b. Channel Slope, S (ft/ft)		0.029								
16. Manning's Roughness Coeff., n		0.013								
17. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$		12.303								
18. Flow length, L (ft)		2032								
19. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$		0.046	+		+		+		=	0.05 hr.
									=	2.8 min.

Lake or Reservoir Flow

	Segment ID									
20. Mean Depth of Lake or Reservoir, D (ft)										
21. Wave Velocity Ac, V_w (ft/sec) $V_w = (gD)^{0.5}$										
22. Flow Length, L (ft)										
25. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$			+		+		+		=	hr.
									=	min.

Total T_c (Sum T_t From Previous Steps) = 42 min.

Engineering, Landscape Architecture and Environmental Science
MILONE & MACBROOM®
99 Realty Drive
Cheshire, Connecticut 06410
(203 271-1773

ECSU -2012 Existing Conditions
Wilimantic, CT

Calculated By: BAM 06-2012
Checked By:_____
MMI# 1266-27

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

(Derived from Worksheet 3, USDA 210-VI-TR55, Second Ed, June 1986)

Watershed ID: 51 | Existing Conditions X | Travel Time (Tt) ____
Subwatershed ID: ____ | Proposed Condntions ____ | Time of Conc. (Tc) X

Sheet Flow (Applicable to T_c Only)

	Segment ID	A-B			
1. Surface Description (Table 3-1)		GRASS			
2. Manning's Roughness Coeff. for Sheet Flow, n (Table 3-1)		0.240			
3. Flow Length, L (Max. = 300 ft, CTDOT Recommends < 150 ft)		15			
4. Two-Year 24-hr rainfall, P_2 (in)		3.3			
5a. Change in Elevation, h (ft)		0.5			
5b. Land Slope, s (ft/ft)		0.033			
6. Travel Time, T_t (hr) $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		0.042	=	2.5	min.

Shallow Concentrated Flow (Assume Hyd. Radius = Depth of Flow)

	Segment ID	C-D								
7a. Surface Description		GRAVEL								
7b. Paved or Unpaved		UNPV								
7c. Manning's Roughness Coeff., n		0.050								
7d. Depth of Flow, d (ft) (d = 0.4 Unpaved, d = 0.2 Paved)		0.4								
8. Flow Length, L		100								
9a. Change in Elevation, h (ft)		2.4								
9b. Watercourse slope, s (ft/ft)		0.024								
10. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$		2.506								
11. Travel Time, T_t (hr) $T_t = \frac{L}{3600 * V}$		0.011	+		+		+		=	0.01 hr.
									=	0.7 min.

Channel Flow

	Segment ID	B-C (12")		D-E(15")						
12a. Channel/Conduit Description		PIPE		PIPE						
12b. Cross sectional flow area, A (ft.$^{2)}$		0.78		1.23						
13. Wetted perimeter, $P_{w\ (ft)}$		3.14		3.93						
14. Hydraulic Radius, R (ft) $R = \frac{A}{P_w}$		0.25		0.31						
15a. Change in Elevation, H (ft)		1.0		14.8						
15b. Channel Slope, S (ft/ft)		0.005		0.023						
16. Manning's Roughness Coeff., n		0.013		0.013						
17. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$		3.330		7.942						
18. Flow length, L (ft)		185		655						
19. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$		0.015	+	0.023	+		+		=	0.04 hr.
									=	2.3 min.

Lake or Reservoir Flow

	Segment ID									
20. Mean Depth of Lake or Reservoir, D (ft)										
21. Wave Velocity Ac, V_w (ft/sec) $V_w = (gD)^{0.5}$										
22. Flow Length, L (ft)										
25. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$			+		+		+		=	hr.
									=	min.

Total T_c (Sum T_t From Previous Steps) = 5 min.

Engineering, Landscape Architecture and Environmental Science
MILONE & MACBROOM®
99 Realty Drive
Cheshire, Connecticut 06410
(203 271-1773

ECSU -2012 Existing Conditions
Wilimantic, CT

Calculated By: BAM 06-2012
Checked By:_____
MMI# 1266-27

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

(Derived from Worksheet 3, USDA 210-VI-TR55, Second Ed, June 1986)

Watershed ID: 51 | Existing Conditions X | Travel Time (Tt) ____
Subwatershed ID: ____ | Proposed Condntions ____ | Time of Conc. (Tc) X

Sheet Flow (Applicable to T_c Only)

	Segment ID	A-B			
1. Surface Description (Table 3-1)		PAVED			
2. Manning's Roughness Coeff. for Sheet Flow, n (Table 3-1)		0.011			
3. Flow Length, L (Max. = 300 ft, CTDOT Recommends < 150 ft)		300			
4. Two-Year 24-hr rainfall, P_2 (in)		3.3			
5a. Change in Elevation, h (ft)		12.0			
5b. Land Slope, s (ft/ft)		0.040			
6. Travel Time, T_t (hr) $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		0.036	=	2.2	min.

Shallow Concentrated Flow (Assume Hyd. Radius = Depth of Flow)

	Segment ID	B-C								
7a. Surface Description		PAVED								
7b. Paved or Unpaved		PAVE								
7c. Manning's Roughness Coeff., n		0.025								
7d. Depth of Flow, d (ft) (d = 0.4 Unpaved, d = 0.2 Paved)		0.2								
8. Flow Length, L		215								
9a. Change in Elevation, h (ft)		22.0								
9b. Watercourse slope, s (ft/ft)		0.102								
10. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$		6.520								
11. Travel Time, T_t (hr) $T_t = \frac{L}{3600 * V}$		0.009	+		+		+		=	0.01 hr.
									=	0.5 min.

Channel Flow

	Segment ID	C-D (18")								
12a. Channel/Conduit Description		PIPE								
12b. Cross sectional flow area, A (ft.$^{2)}$		1.77								
13. Wetted perimeter, $P_{w\ (ft)}$		4.71								
14. Hydraulic Radius, R (ft) $R = \frac{A}{P_w}$		0.38								
15a. Change in Elevation, H (ft)		14.0								
15b. Channel Slope, S (ft/ft)		0.024								
16. Manning's Roughness Coeff., n		0.013								
17. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$		9.194								
18. Flow length, L (ft)		590								
19. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$		0.018	+		+		+		=	0.02 hr.
									=	1.1 min.

Lake or Reservoir Flow

	Segment ID									
20. Mean Depth of Lake or Reservoir, D (ft)										
21. Wave Velocity Ac, V_w (ft/sec) $V_w = (gD)^{0.5}$										
22. Flow Length, L (ft)										
25. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$			+		+		+		=	hr.
									=	min.

Total T_c (Sum T_t From Previous Steps) = 4 min.

Engineering, Landscape Architecture and Environmental Science
MILONE & MACBROOM®
99 Realty Drive
Cheshire, Connecticut 06410
(203 271-1773

ECSU -2012 Existing Conditions
Wilimantic, CT

Calculated By: BAM 06-2012
Checked By:_____
MMI# 1266-27

Time of Concentration (T_c) or Travel Time (T_t) Worksheet

(Derived from Worksheet 3, USDA 210-VI-TR55, Second Ed, June 1986)

Watershed ID: 60 | Existing Conditions X | Travel Time (Tt) ____
Subwatershed ID: ____ | Proposed Condntions ____ | Time of Conc. (Tc) X

Sheet Flow (Applicable to T_c Only)

	Segment ID		
1. Surface Description (Table 3-1)			
2. Manning's Roughness Coeff. for Sheet Flow, n (Table 3-1)			
3. Flow Length, L (Max. = 300 ft, CTDOT Recommends < 150 ft)			
4. Two-Year 24-hr rainfall, P_2 (in)			
5a. Change in Elevation, h (ft)			
5b. Land Slope, s (ft/ft)	0.000		
6. Travel Time, T_t (hr) $T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5}(s^{0.4})}$		=	min.

Shallow Concentrated Flow (Assume Hyd. Radius = Depth of Flow)

	Segment ID						
7a. Surface Description	A-B						
7b. Paved or Unpaved	PAVED						
7c. Manning's Roughness Coeff., n	PAVE						
7d. Depth of Flow, d (ft) (d = 0.4 Unpaved, d = 0.2 Paved)	0.025						
8. Flow Length, L	0.2						
9a. Change in Elevation, h (ft)	2360						
9b. Watercourse slope, s (ft/ft)	85.0						
10. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(d^{2/3})(s^{1/2})$	0.036						
11. Travel Time, T_t (hr) $T_t = \frac{L}{3600 * V}$	3.868						
	0.169	+	+	+	=	0.17	hr.
					=	10.2	min.

Channel Flow

	Segment ID						
12a. Channel/Conduit Description							
12b. Cross sectional flow area, A (ft.$^{2)}$							
13. Wetted perimeter, $P_{w\ (ft)}$							
14. Hydraulic Radius, R (ft) $R = \frac{A}{P_w}$							
15a. Change in Elevation, H (ft)							
15b. Channel Slope, S (ft/ft)							
16. Manning's Roughness Coeff., n							
17. Flow Velocity, V (ft/sec) $V = \frac{1.49}{n}(R^{2/3})(s^{1/2})$							
18. Flow length, L (ft)							
19. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$							
		+	+	+	=		hr.
					=		min.

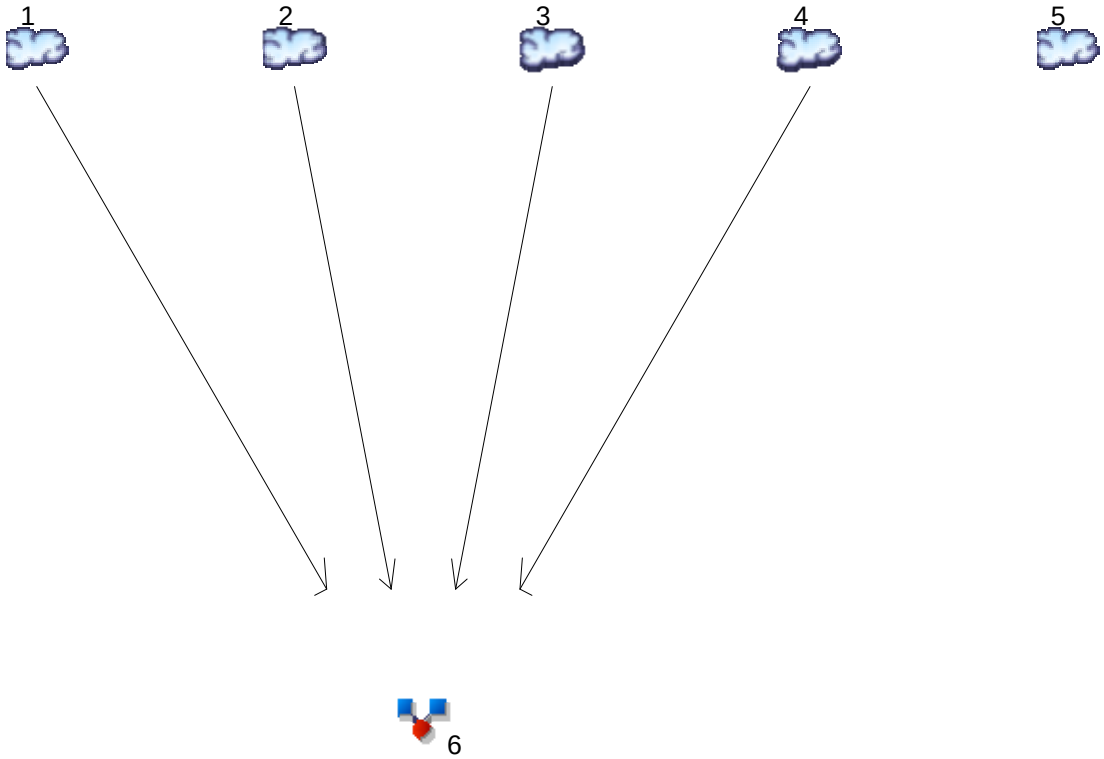
Lake or Reservoir Flow

	Segment ID						
20. Mean Depth of Lake or Reservoir, D (ft)							
21. Wave Velocity Ac, V_w (ft/sec) $V_w = (gD)^{0.5}$							
22. Flow Length, L (ft)							
25. Travel Time, T (hr) $T_t = \frac{L}{3600 * V}$							
		+	+	+	=		hr.
					=		min.

Total T_c (Sum T_t From Previous Steps) = 10 min.

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	2017 WS 50
2	SCS Runoff	2017 WS 51
3	SCS Runoff	2017 WS 52
4	SCS Runoff	2017 WS 55
5	SCS Runoff	2017 WS 60
6	Combine	2017 Inlet

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	41.95	-------	-------	75.37	101.45	125.61	154.20	2017 WS 50
2	SCS Runoff	------	-------	7.102	-------	-------	12.09	15.91	19.41	23.54	2017 WS 51
3	SCS Runoff	------	-------	8.362	-------	-------	14.03	18.34	22.29	26.94	2017 WS 52
4	SCS Runoff	------	-------	0.924	-------	-------	1.412	1.778	2.112	2.507	2017 WS 55
5	SCS Runoff	------	-------	16.22	-------	-------	29.58	40.04	49.74	61.23	2017 WS 60
6	Combine	1, 2, 3, 4,	-------	46.39	-------	-------	82.90	111.37	137.74	168.94	2017 Inlet

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	41.95	3	750	268,967	------	------	------	2017 WS 50
2	SCS Runoff	7.102	3	726	23,641	------	------	------	2017 WS 51
3	SCS Runoff	8.362	3	726	27,886	------	------	------	2017 WS 52
4	SCS Runoff	0.924	3	726	3,228	------	------	------	2017 WS 55
5	SCS Runoff	16.22	3	729	64,146	------	------	------	2017 WS 60
6	Combine	46.39	3	747	323,721	1, 2, 3, 4,	------	------	2017 Inlet

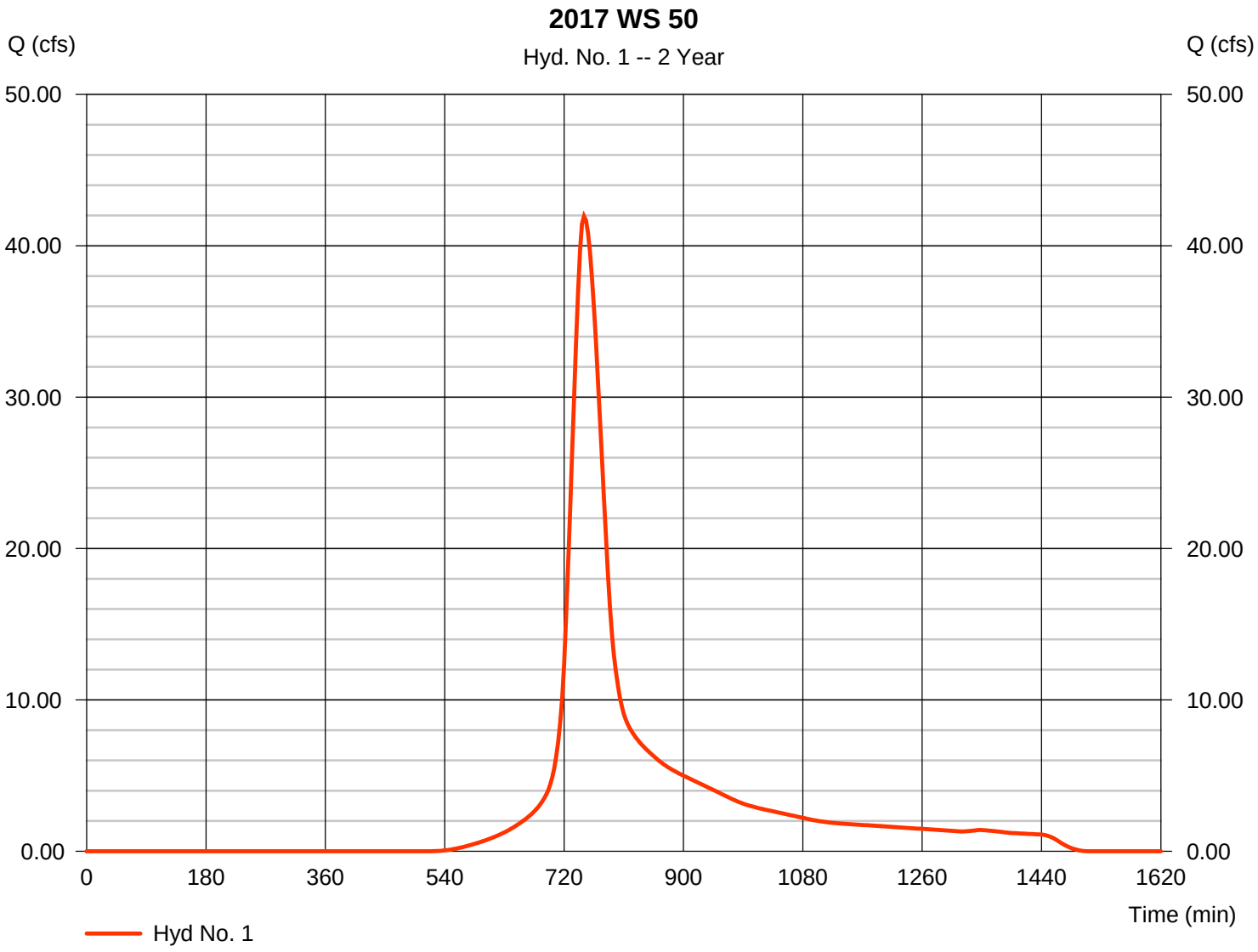
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 41.95 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 268,967 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



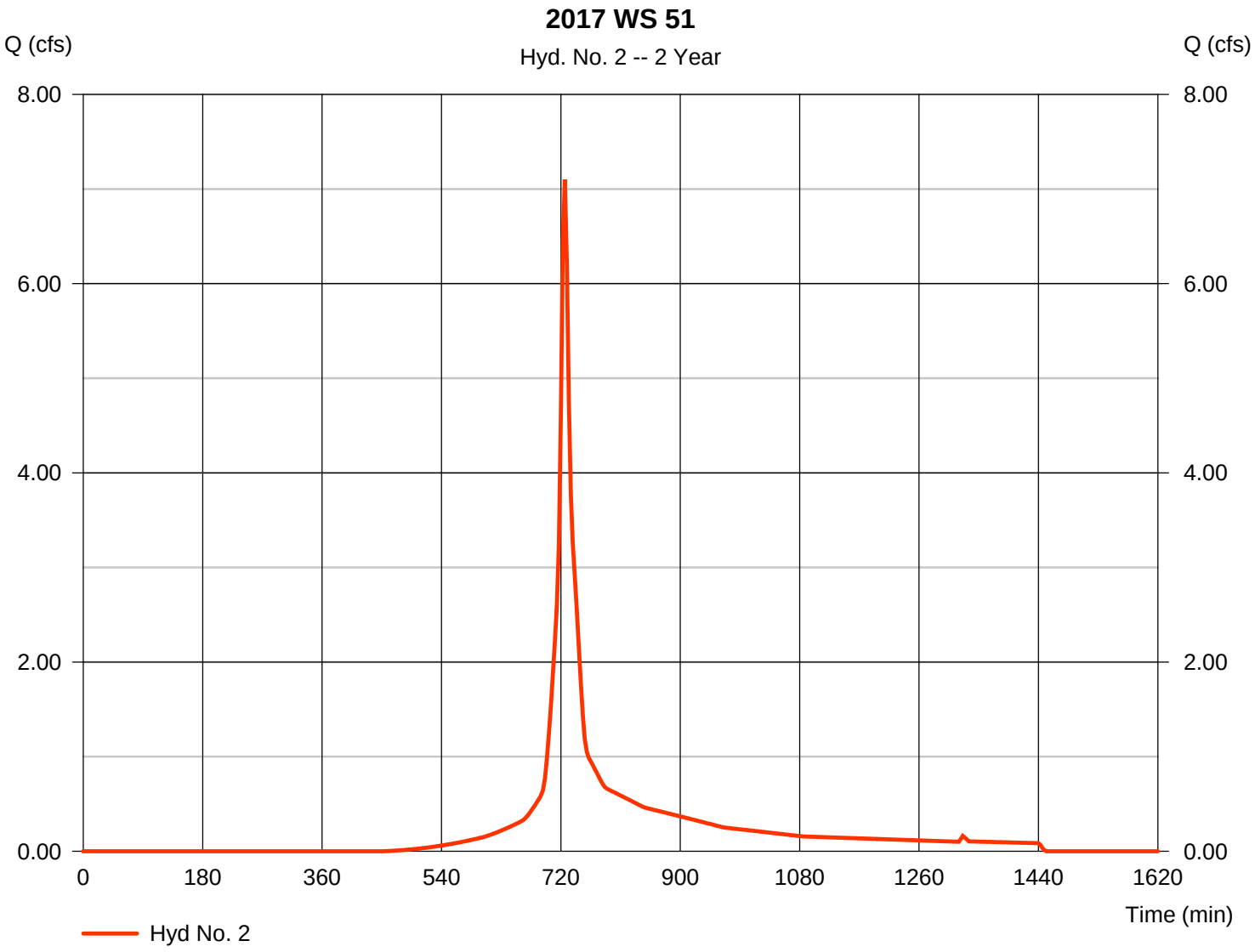
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.102 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	23,641 cuft
Drainage area	=	3.750 ac	Curve number	=	86
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.22 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



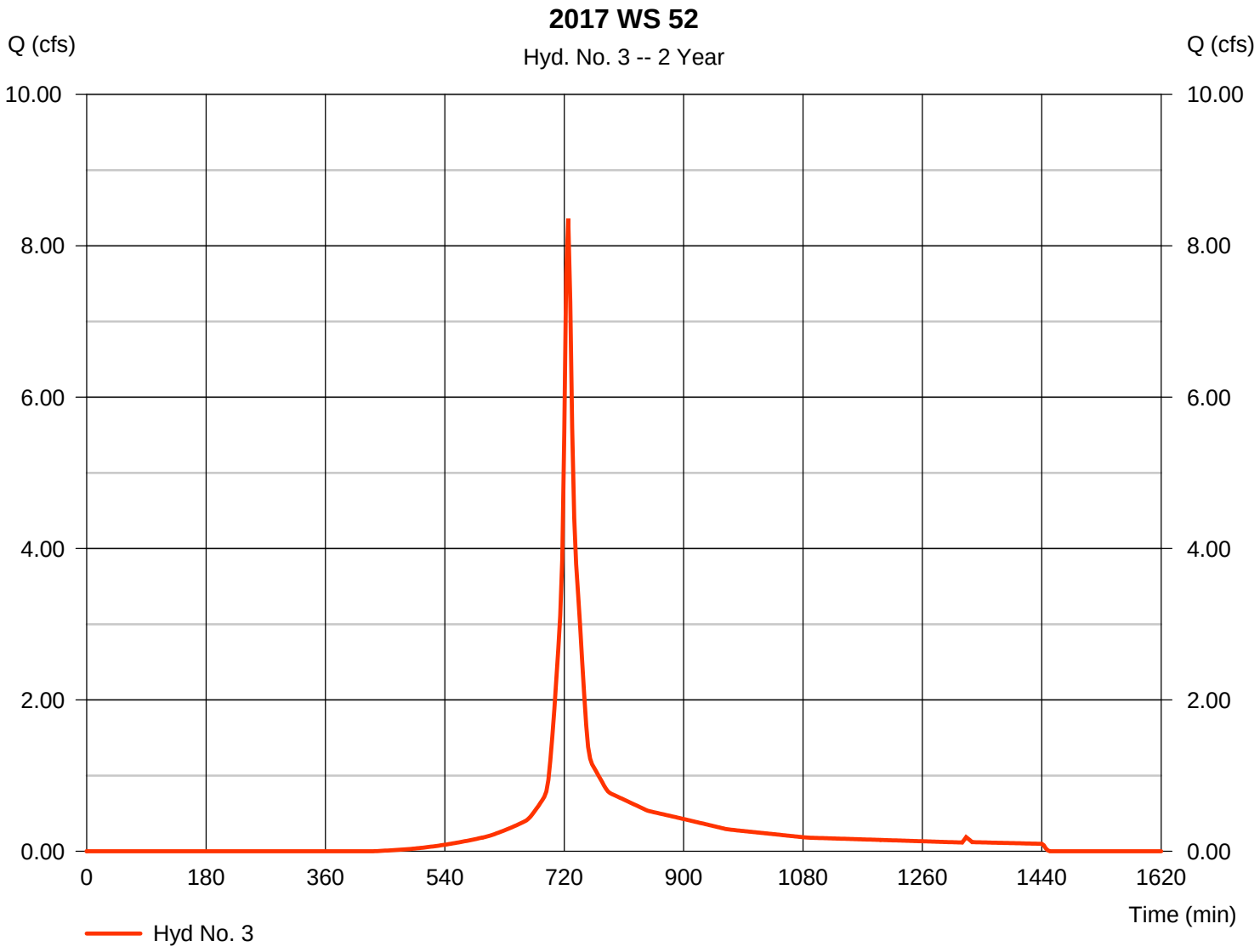
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.362 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	27,886 cuft
Drainage area	=	4.240 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.22 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



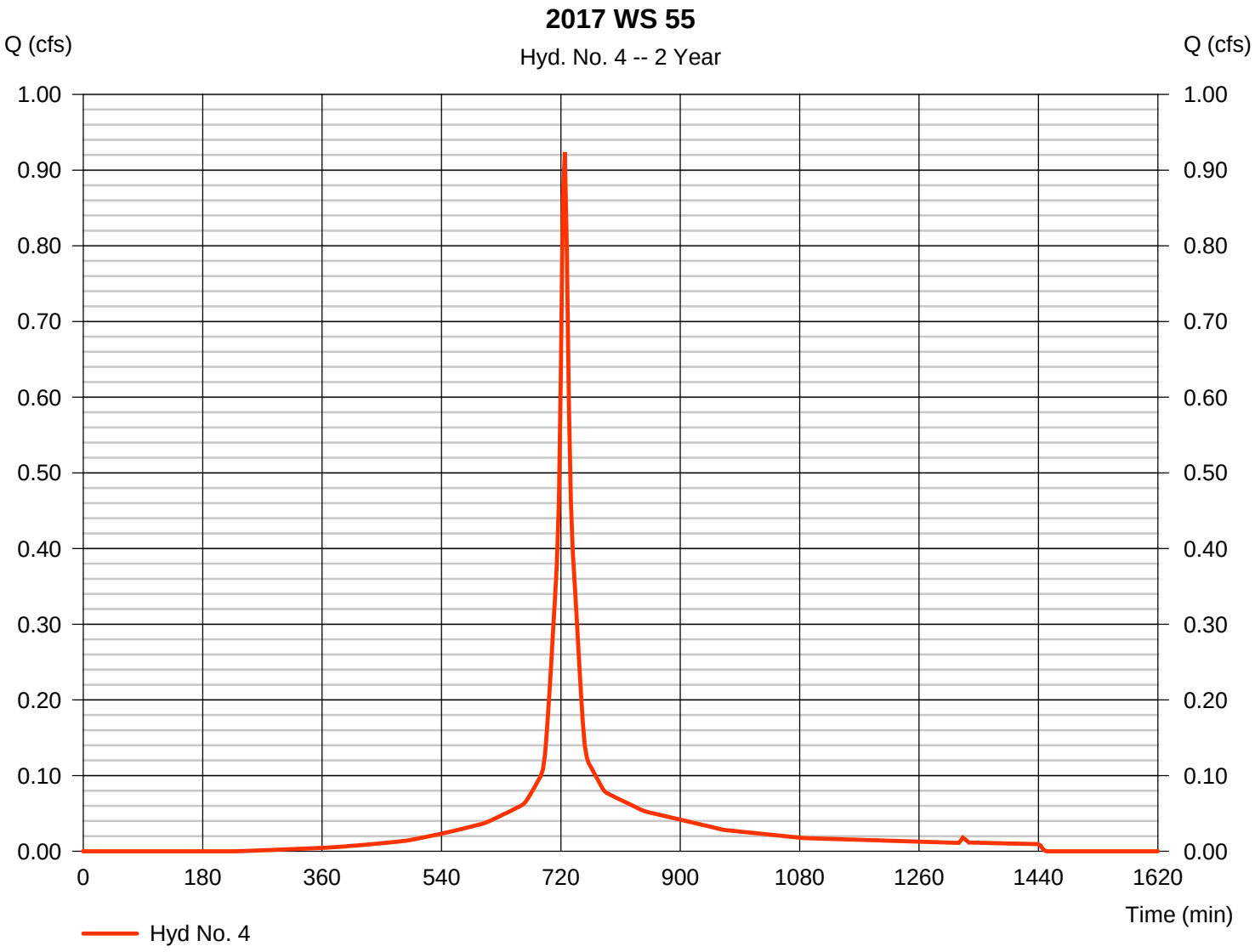
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 0.924 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 3,228 cuft
Drainage area	= 0.370 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



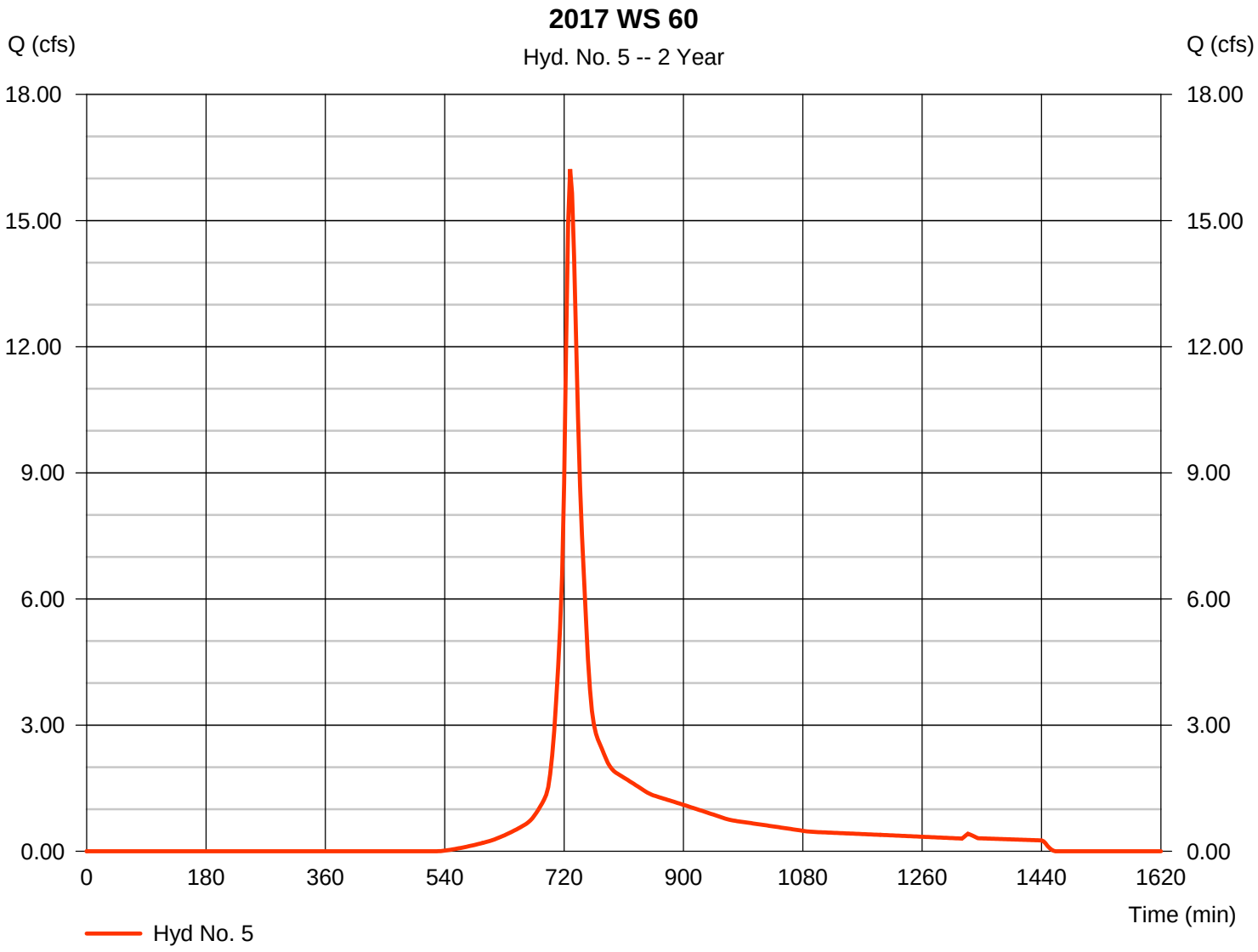
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 16.22 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 64,146 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



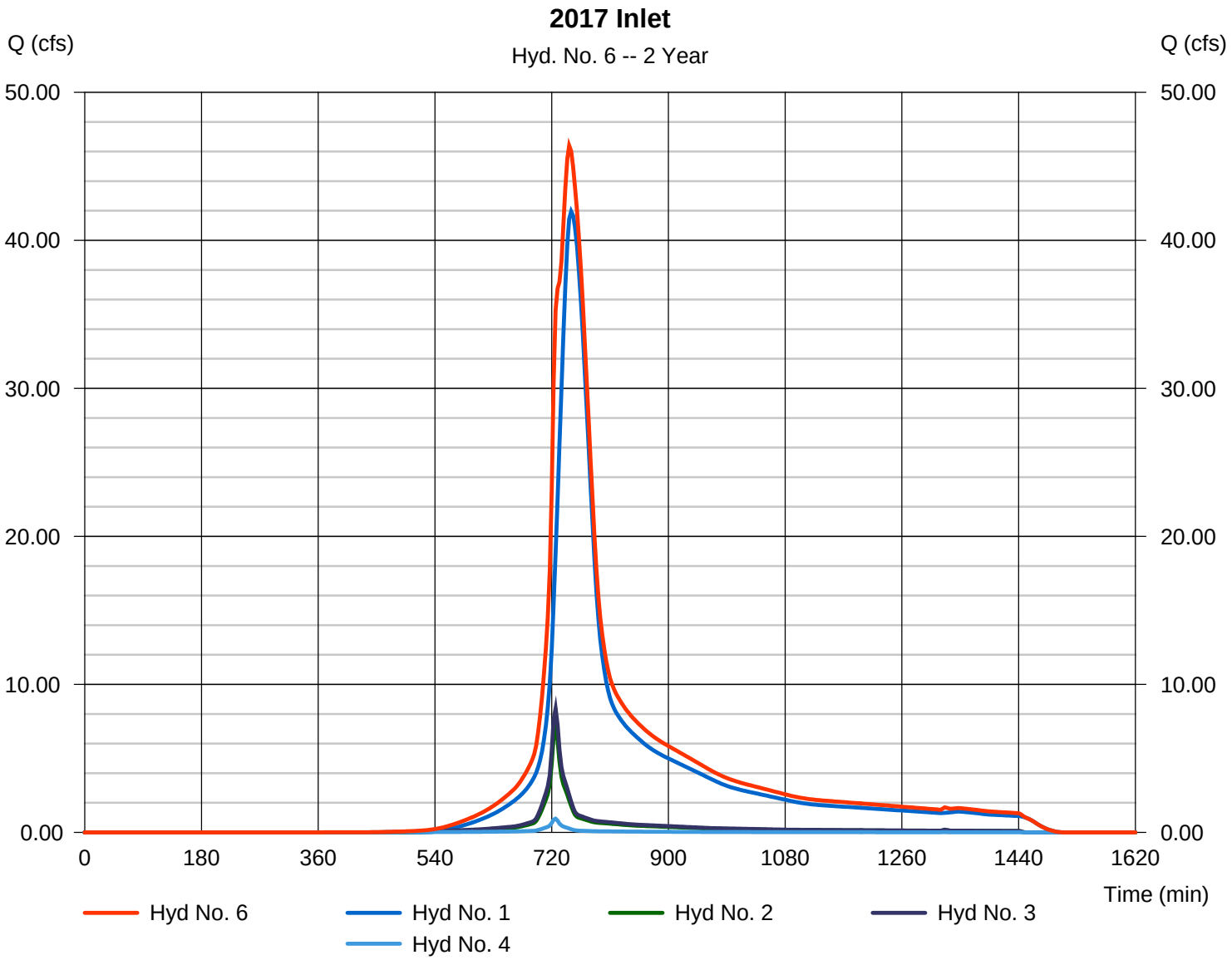
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 46.39 cfs
Storm frequency	= 2 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 323,721 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	75.37	3	750	481,965	------	------	------	2017 WS 50
2	SCS Runoff	12.09	3	726	40,803	------	------	------	2017 WS 51
3	SCS Runoff	14.03	3	726	47,544	------	------	------	2017 WS 52
4	SCS Runoff	1.412	3	726	5,064	------	------	------	2017 WS 55
5	SCS Runoff	29.58	3	729	116,434	------	------	------	2017 WS 60
6	Combine	82.90	3	747	575,377	1, 2, 3, 4,	------	------	2017 Inlet

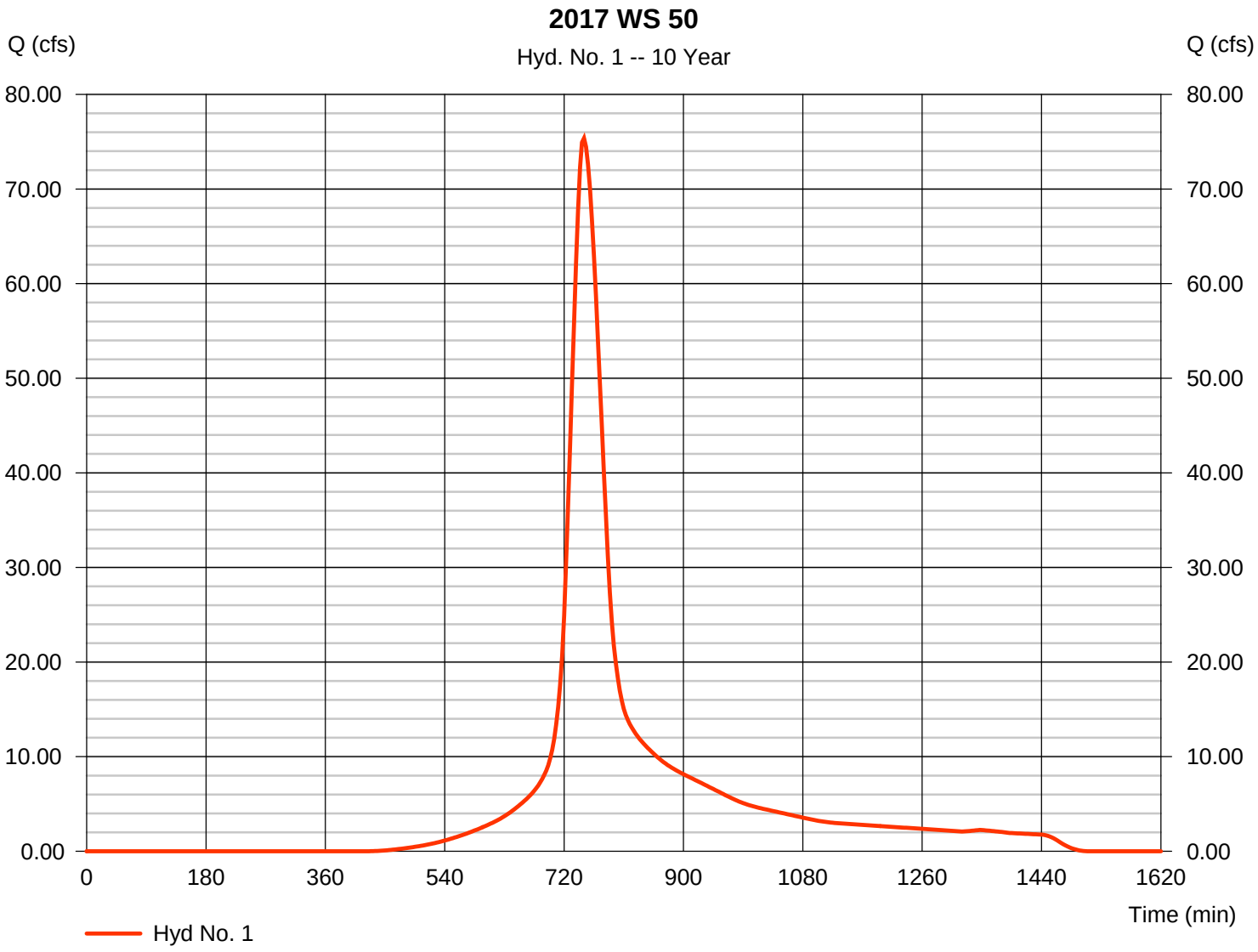
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 75.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 481,965 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



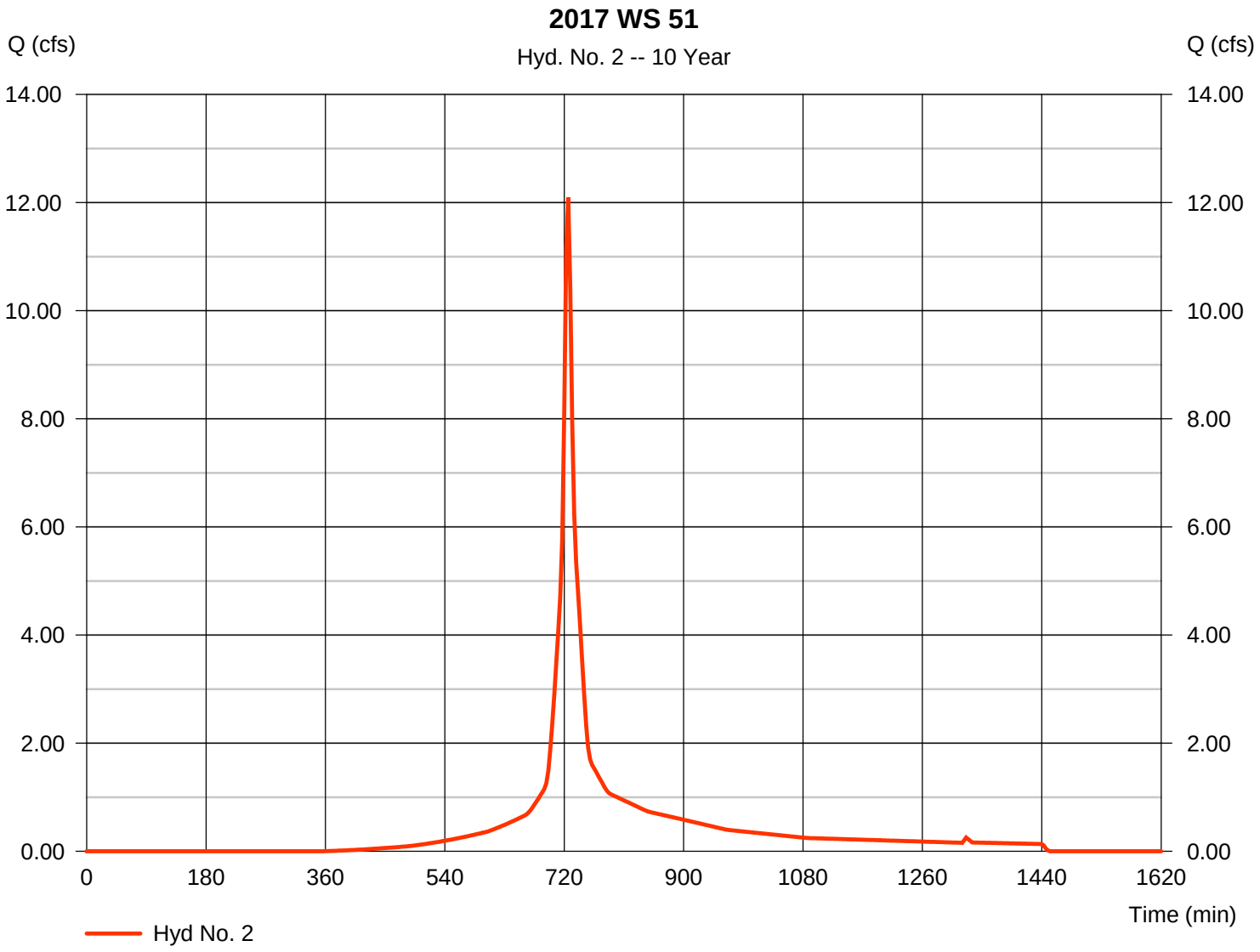
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 12.09 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 40,803 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



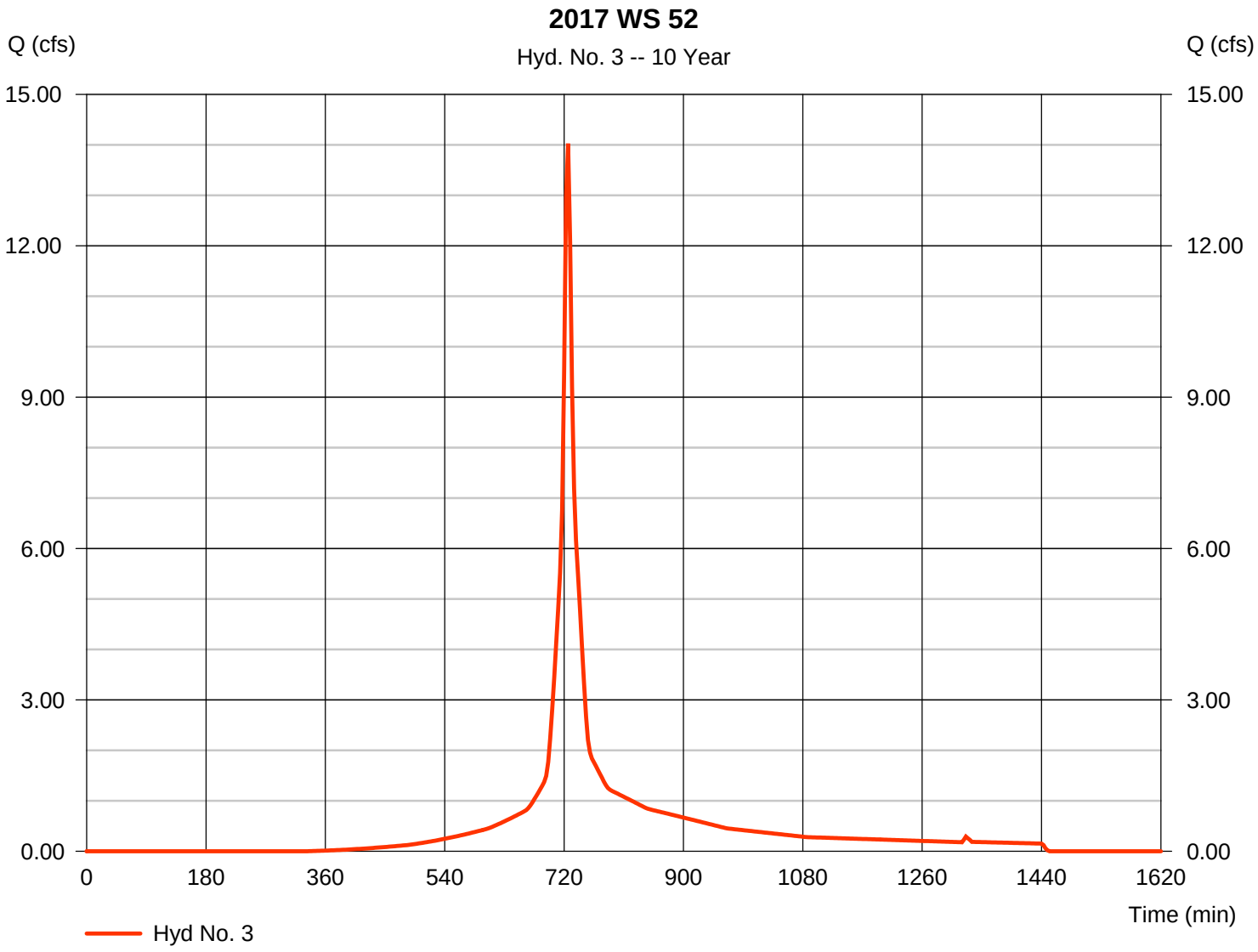
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 14.03 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 47,544 cuft
Drainage area	= 4.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



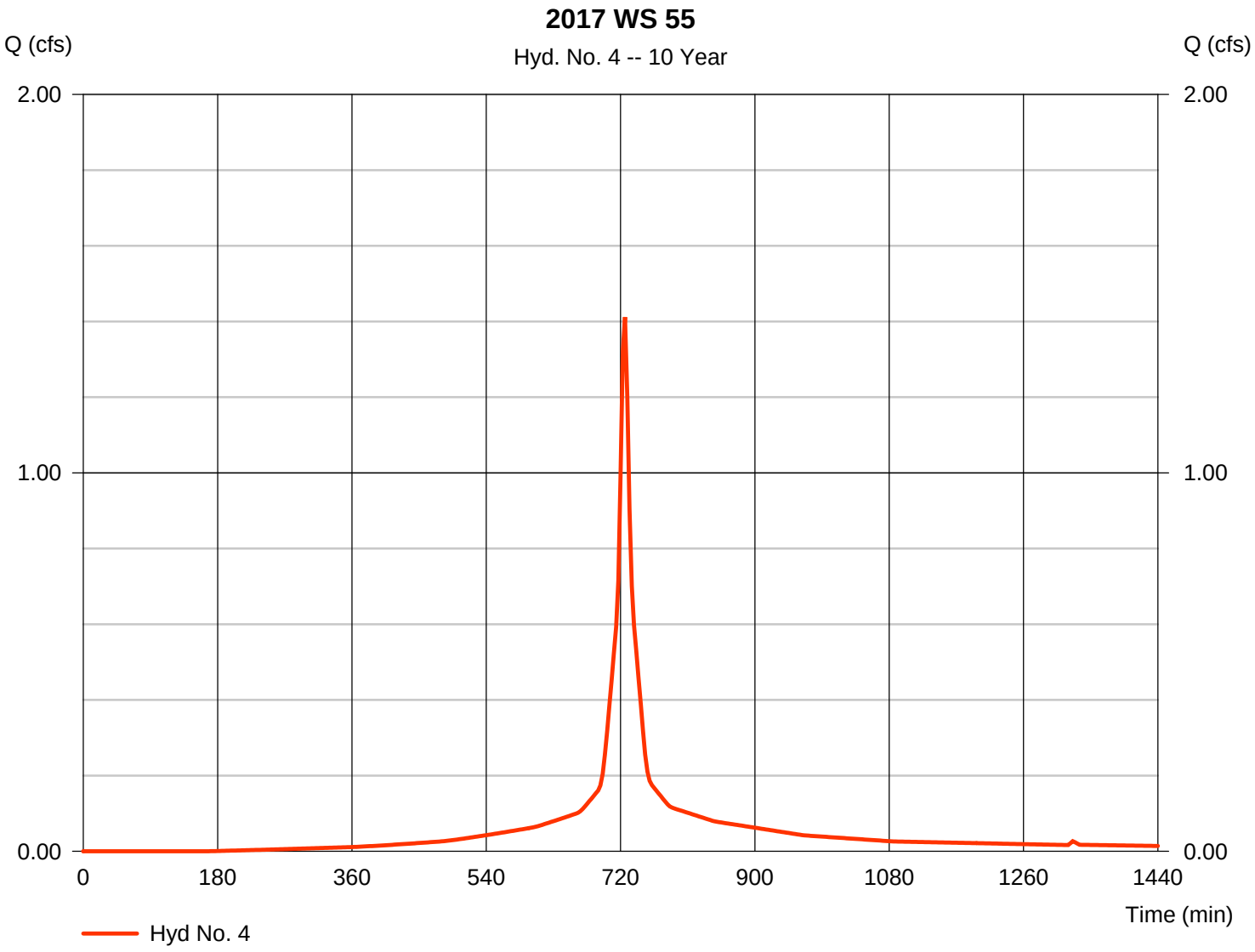
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.412 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	5,064 cuft
Drainage area	=	0.370 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.71 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



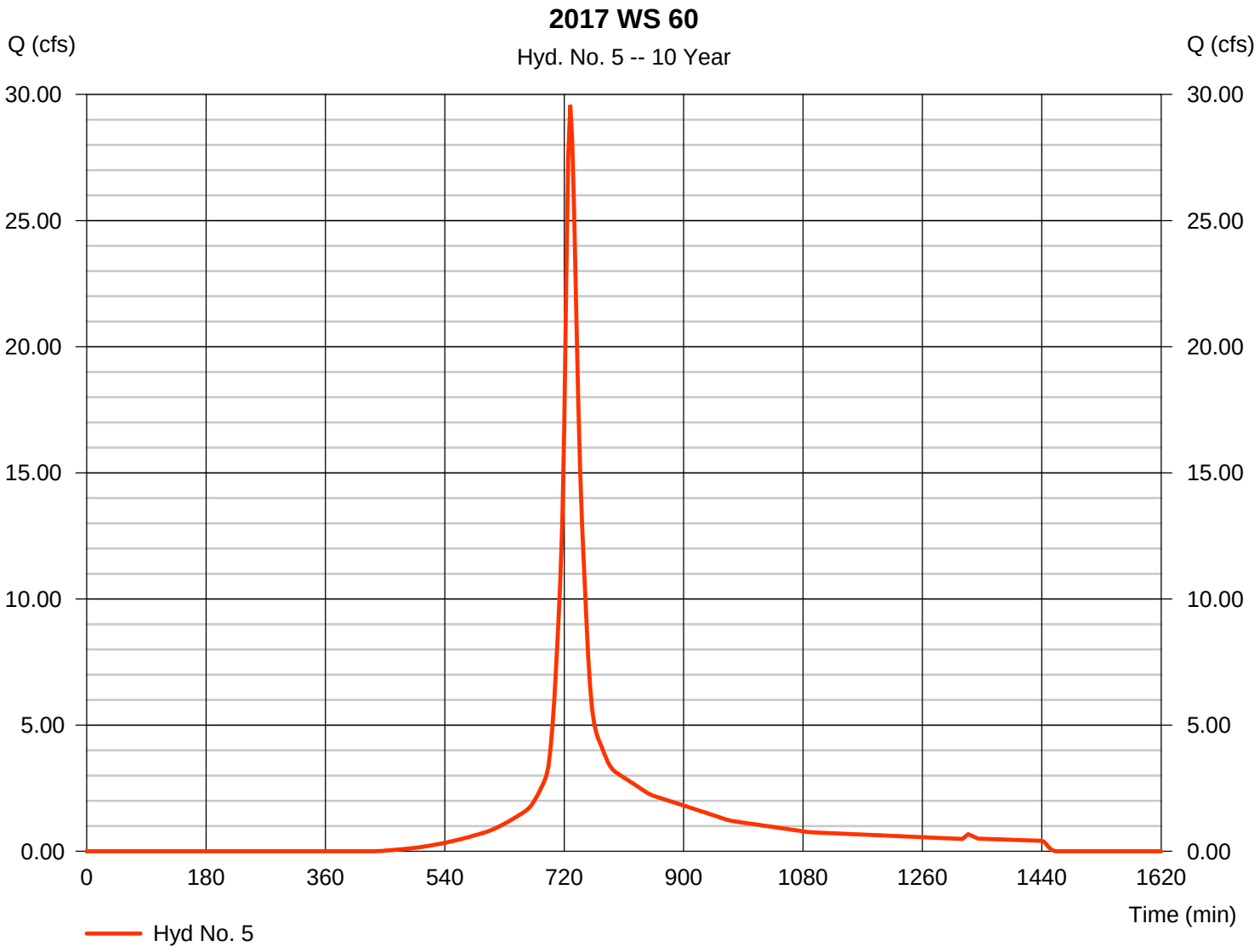
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 29.58 cfs
Storm frequency	= 10 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 116,434 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



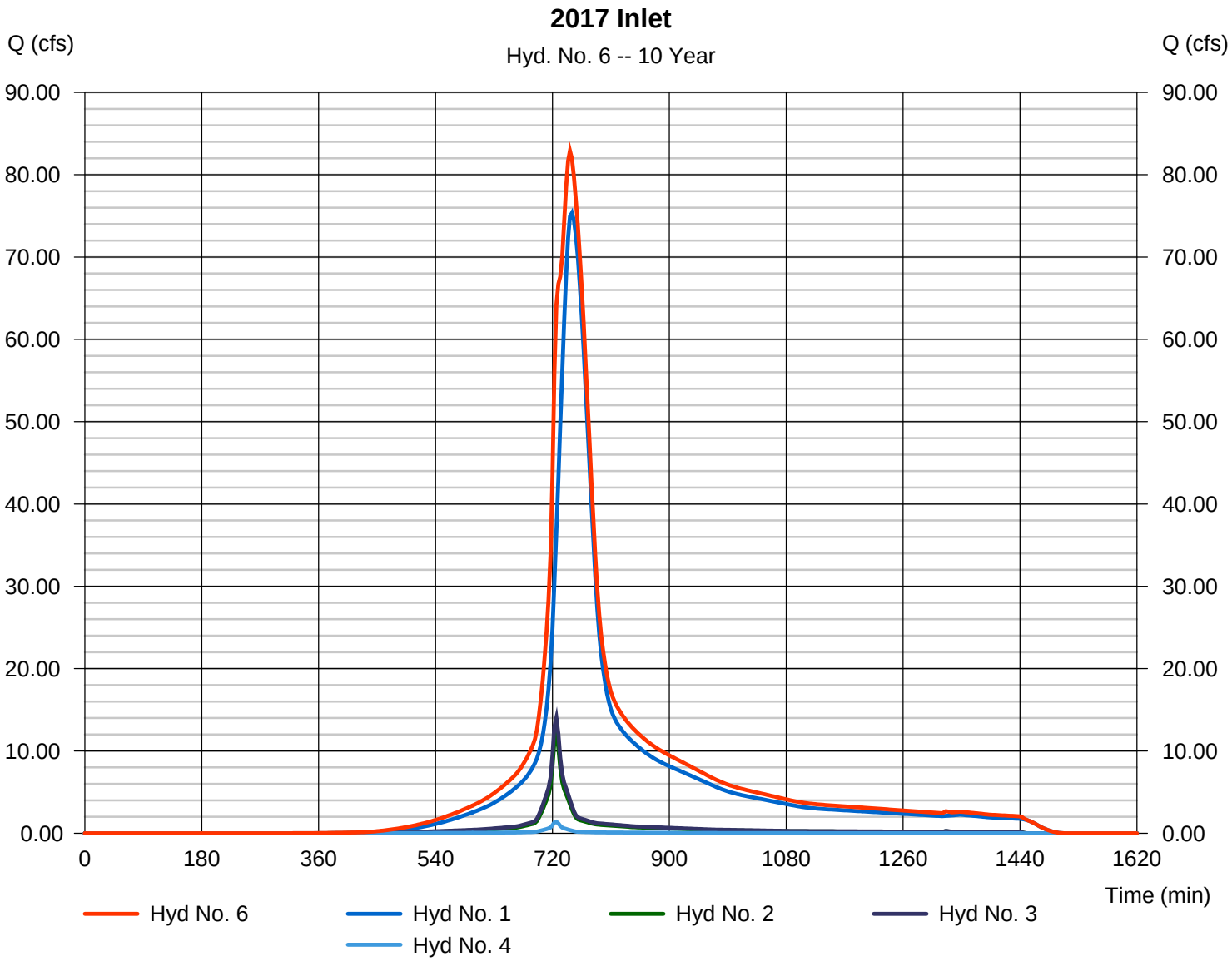
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 82.90 cfs
Storm frequency	= 10 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 575,377 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	101.45	3	750	652,410	------	------	------	2017 WS 50
2	SCS Runoff	15.91	3	726	54,334	------	------	------	2017 WS 51
3	SCS Runoff	18.34	3	726	62,973	------	------	------	2017 WS 52
4	SCS Runoff	1.778	3	726	6,470	------	------	------	2017 WS 55
5	SCS Runoff	40.04	3	729	158,497	------	------	------	2017 WS 60
6	Combine	111.37	3	747	776,186	1, 2, 3, 4,	------	------	2017 Inlet

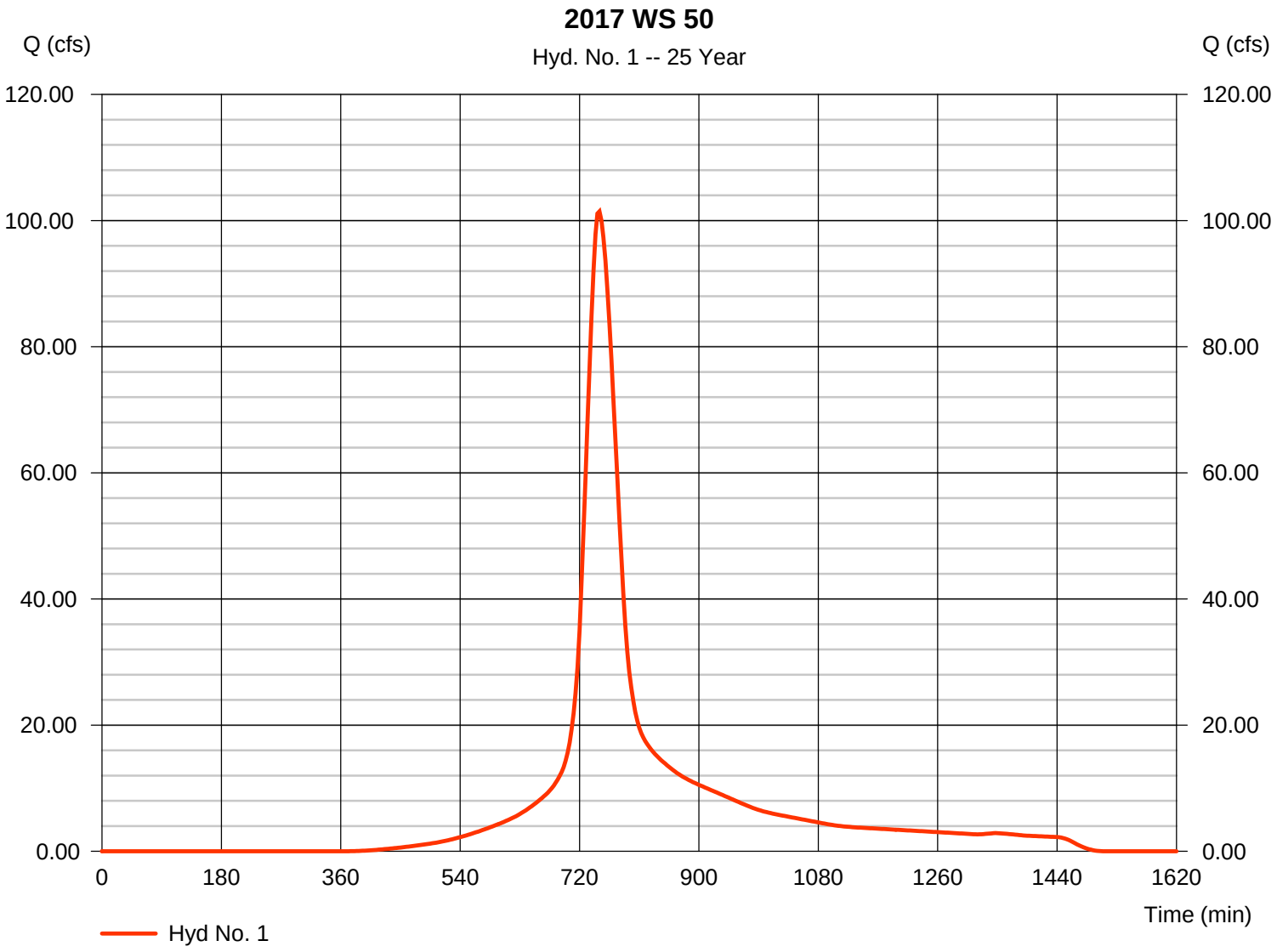
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 101.45 cfs
Storm frequency	= 25 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 652,410 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



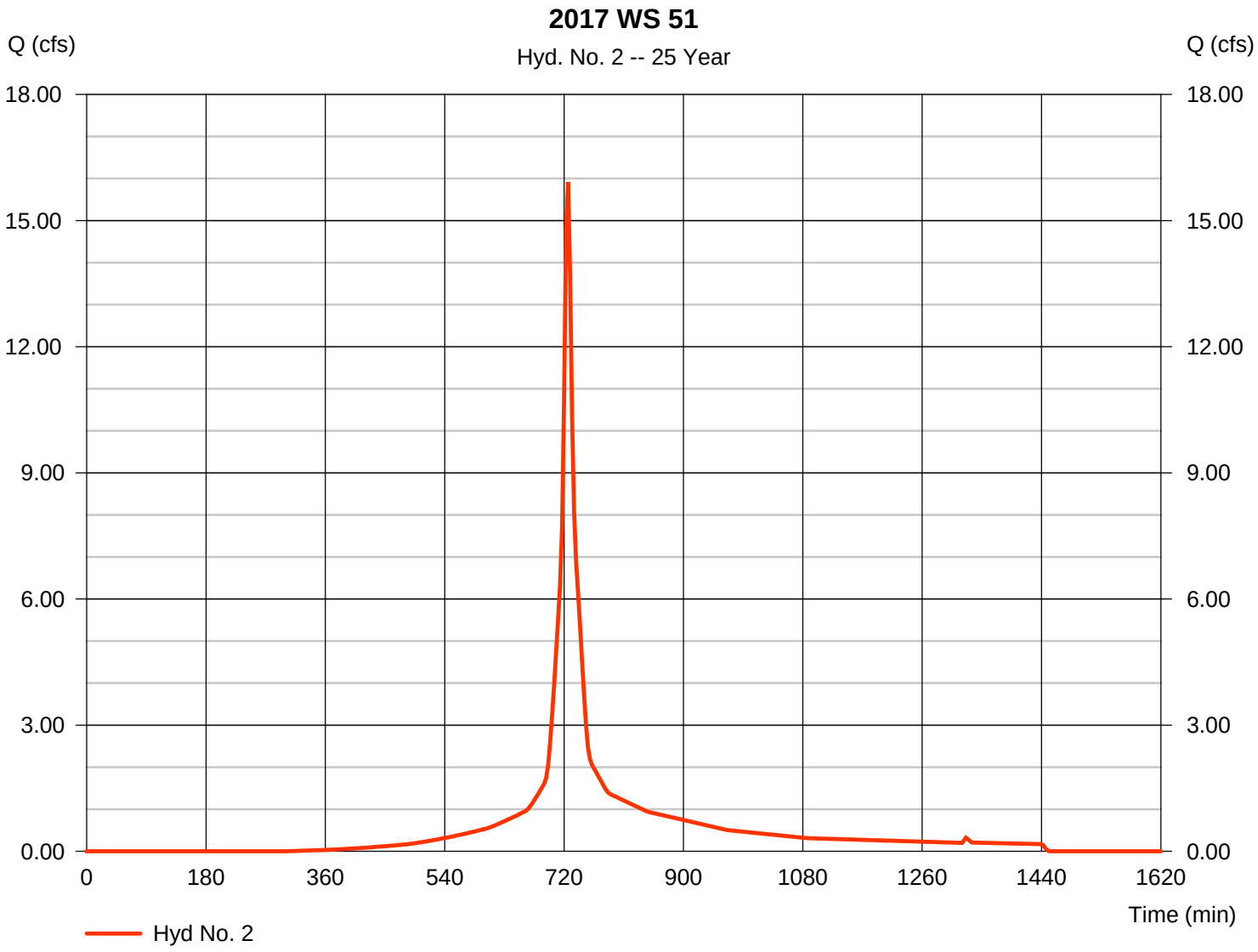
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 15.91 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 54,334 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



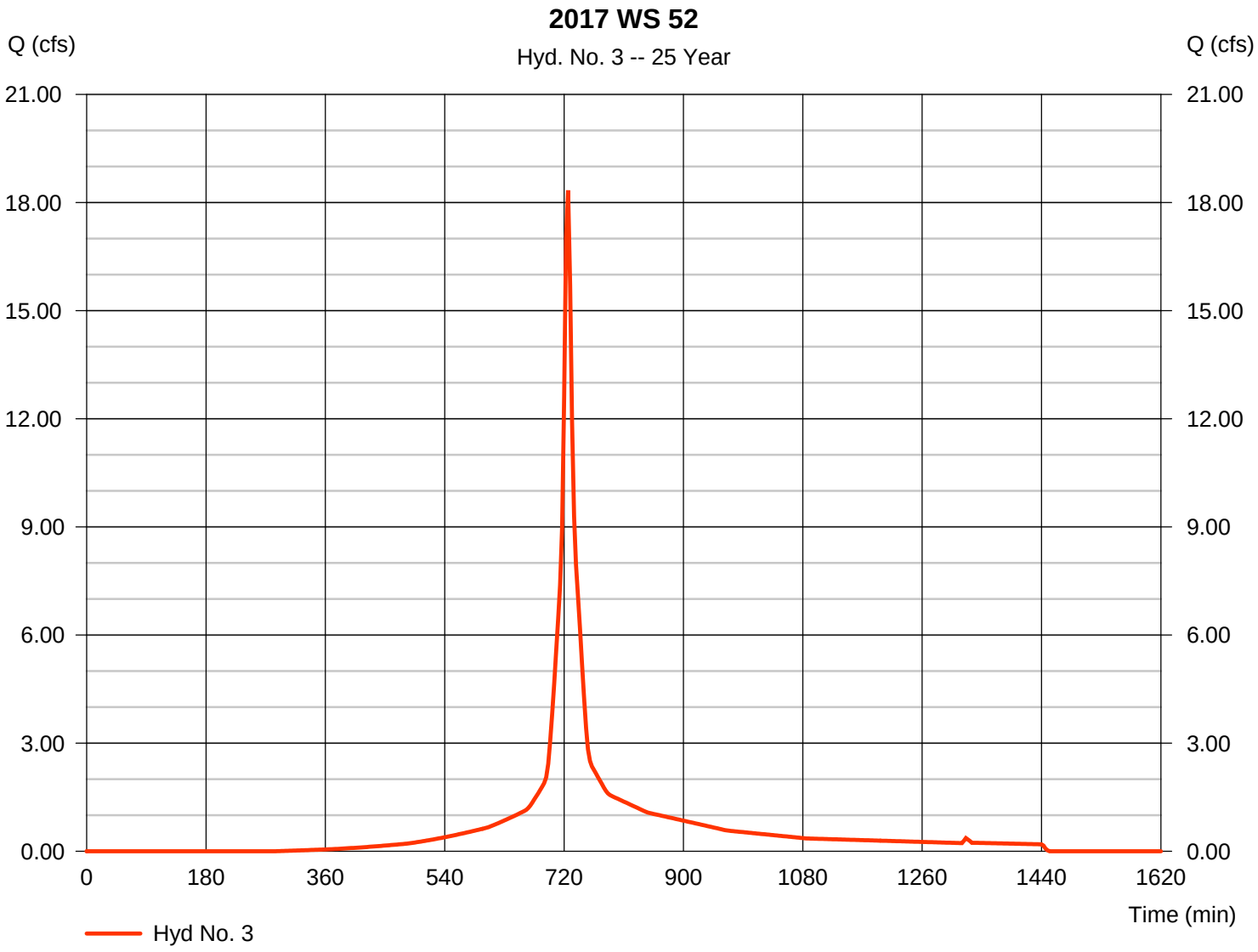
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 18.34 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 62,973 cuft
Drainage area	= 4.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



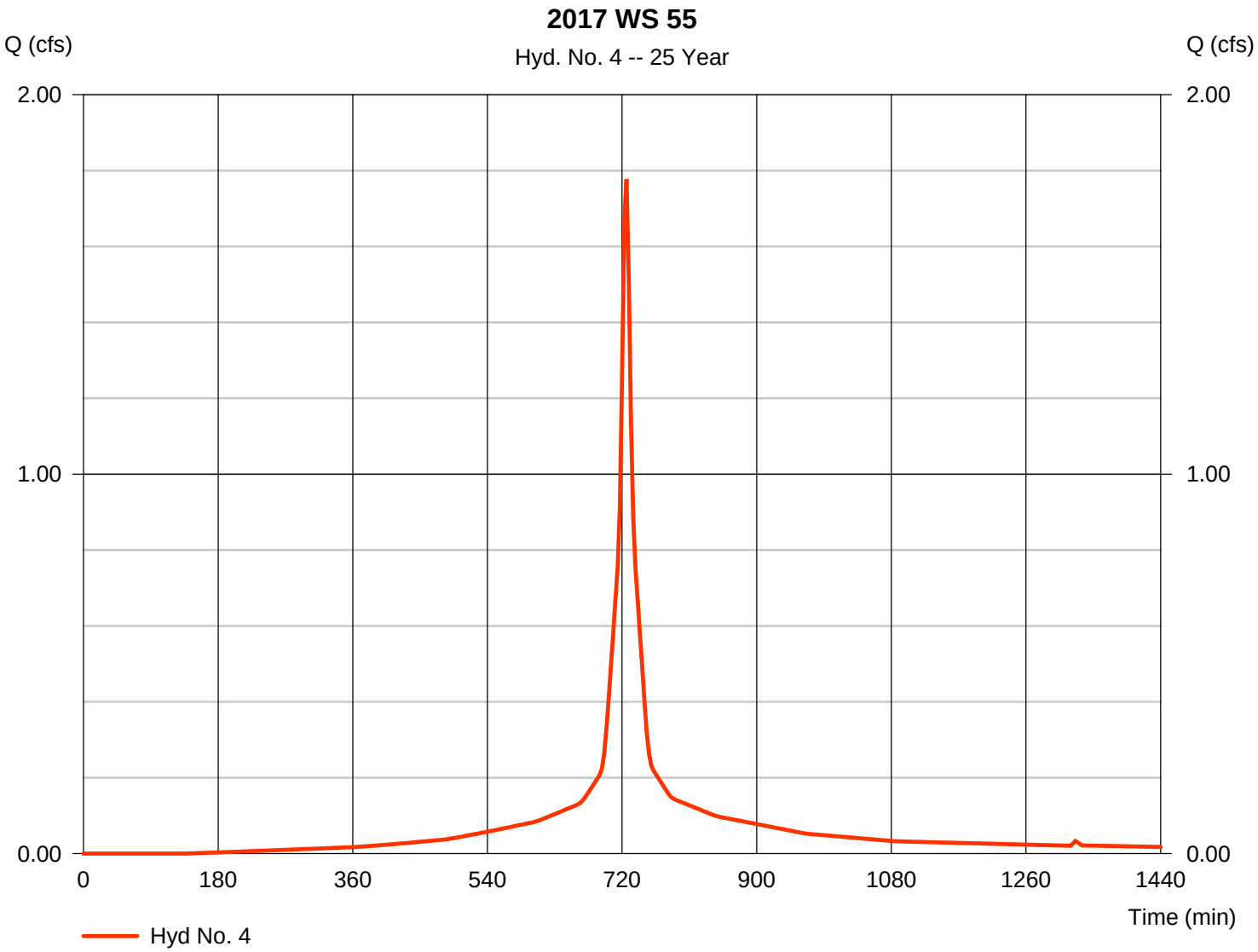
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.778 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	6,470 cuft
Drainage area	=	0.370 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.84 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



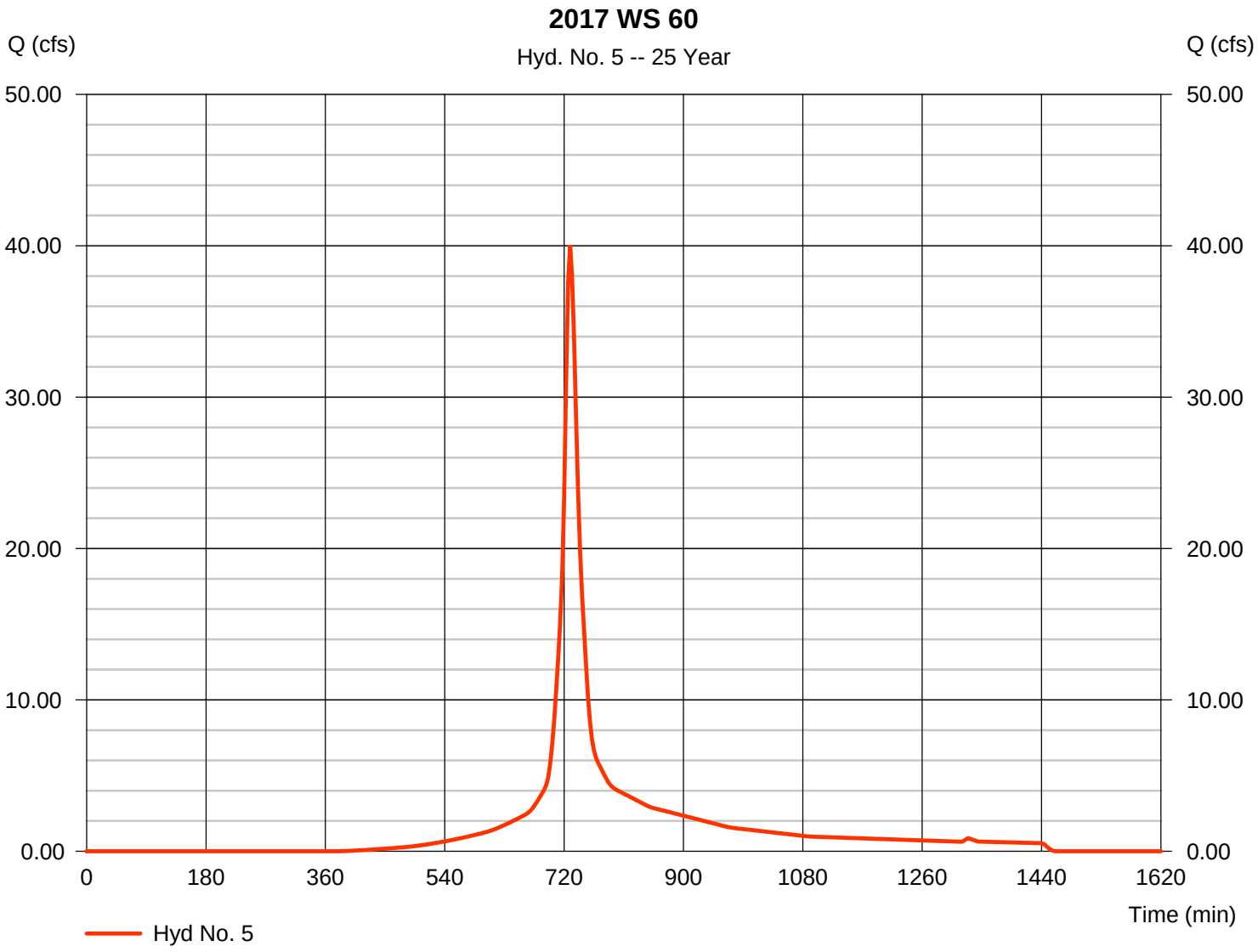
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 40.04 cfs
Storm frequency	= 25 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 158,497 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



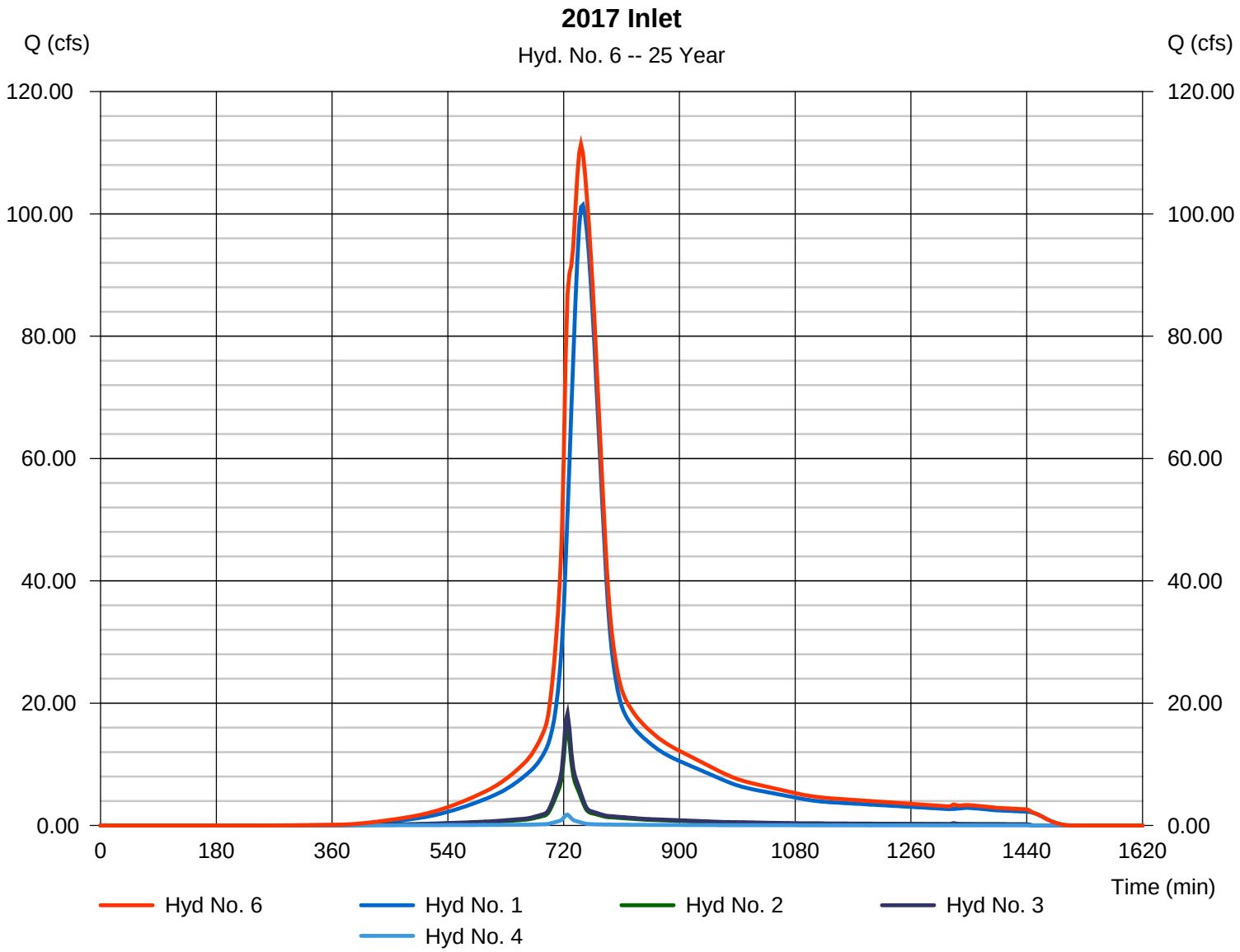
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 111.37 cfs
Storm frequency	= 25 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 776,186 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	125.61	3	750	813,152	------	------	------	2017 WS 50
2	SCS Runoff	19.41	3	726	67,004	------	------	------	2017 WS 51
3	SCS Runoff	22.29	3	726	77,390	------	------	------	2017 WS 52
4	SCS Runoff	2.112	3	726	7,768	------	------	------	2017 WS 55
5	SCS Runoff	49.74	3	729	198,268	------	------	------	2017 WS 60
6	Combine	137.74	3	747	965,314	1, 2, 3, 4,	------	------	2017 Inlet

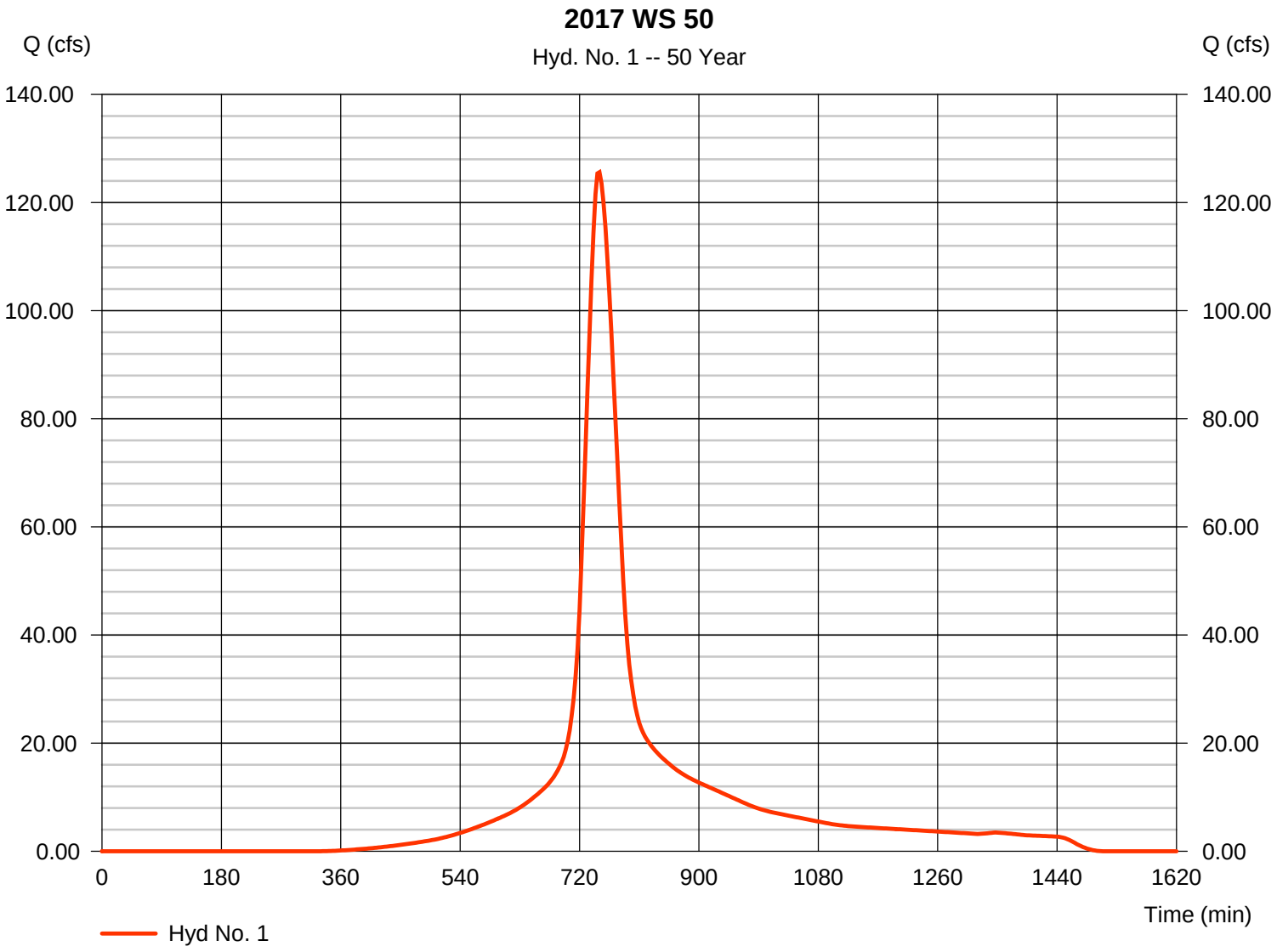
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 125.61 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 813,152 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



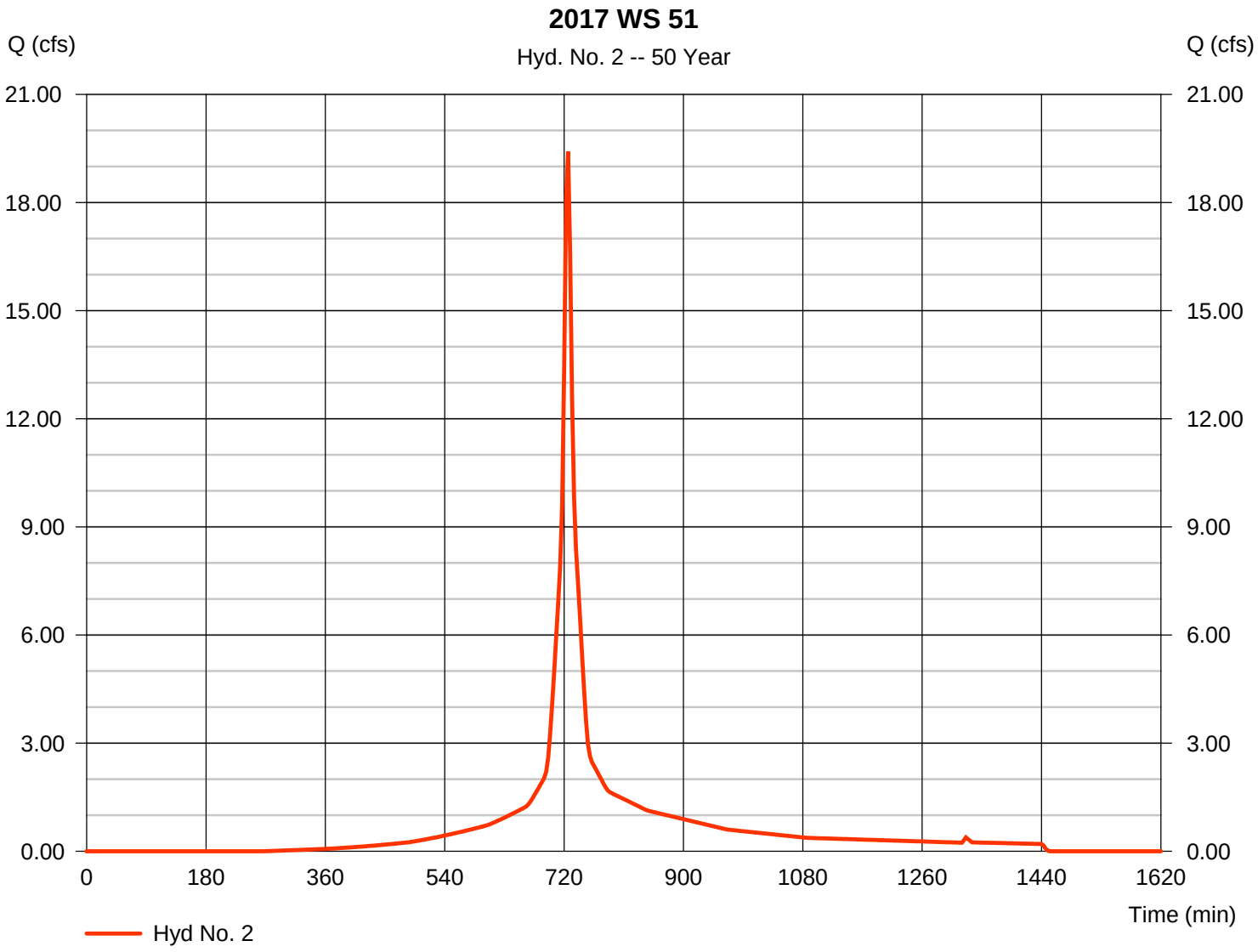
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 19.41 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 67,004 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



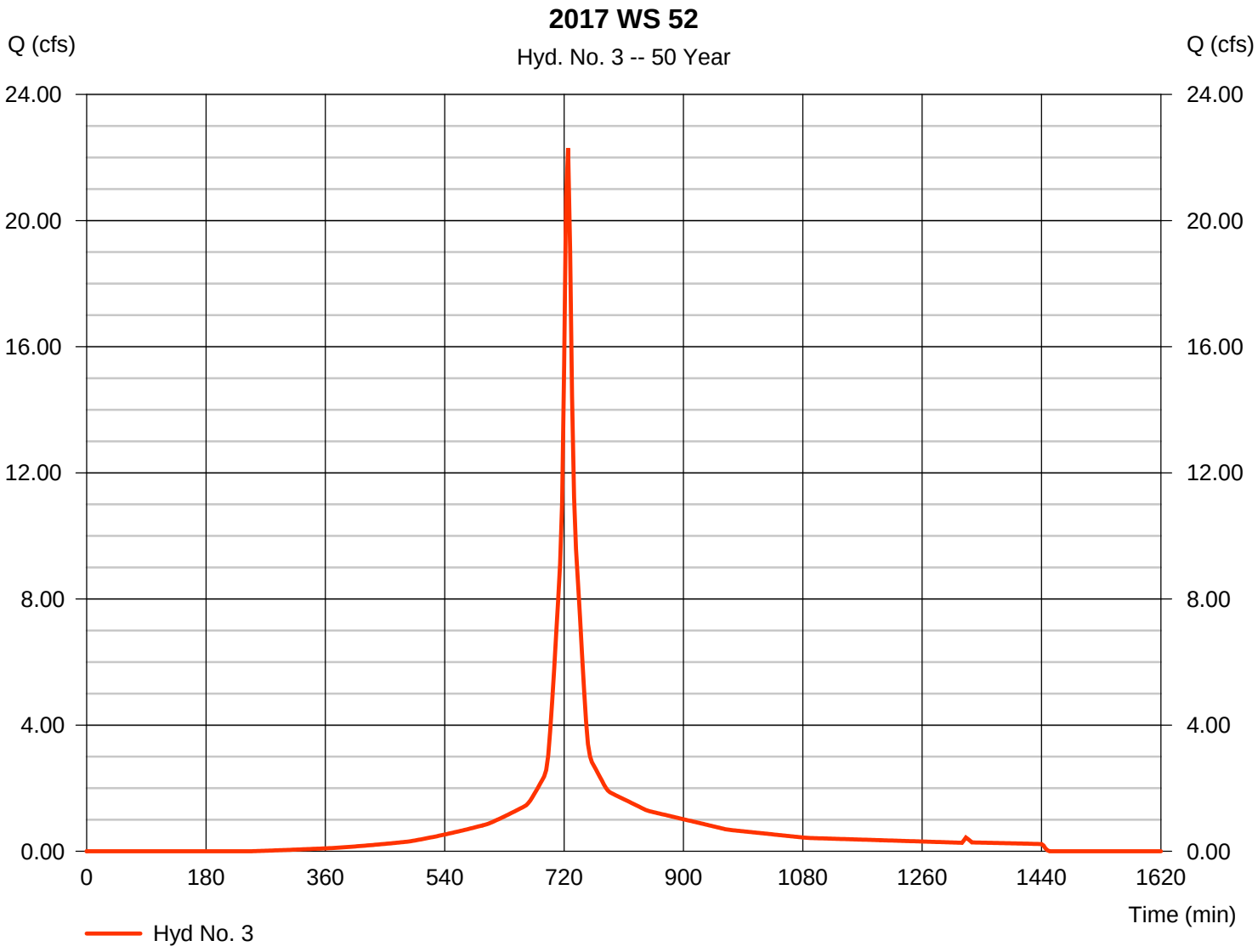
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 22.29 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 77,390 cuft
Drainage area	= 4.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



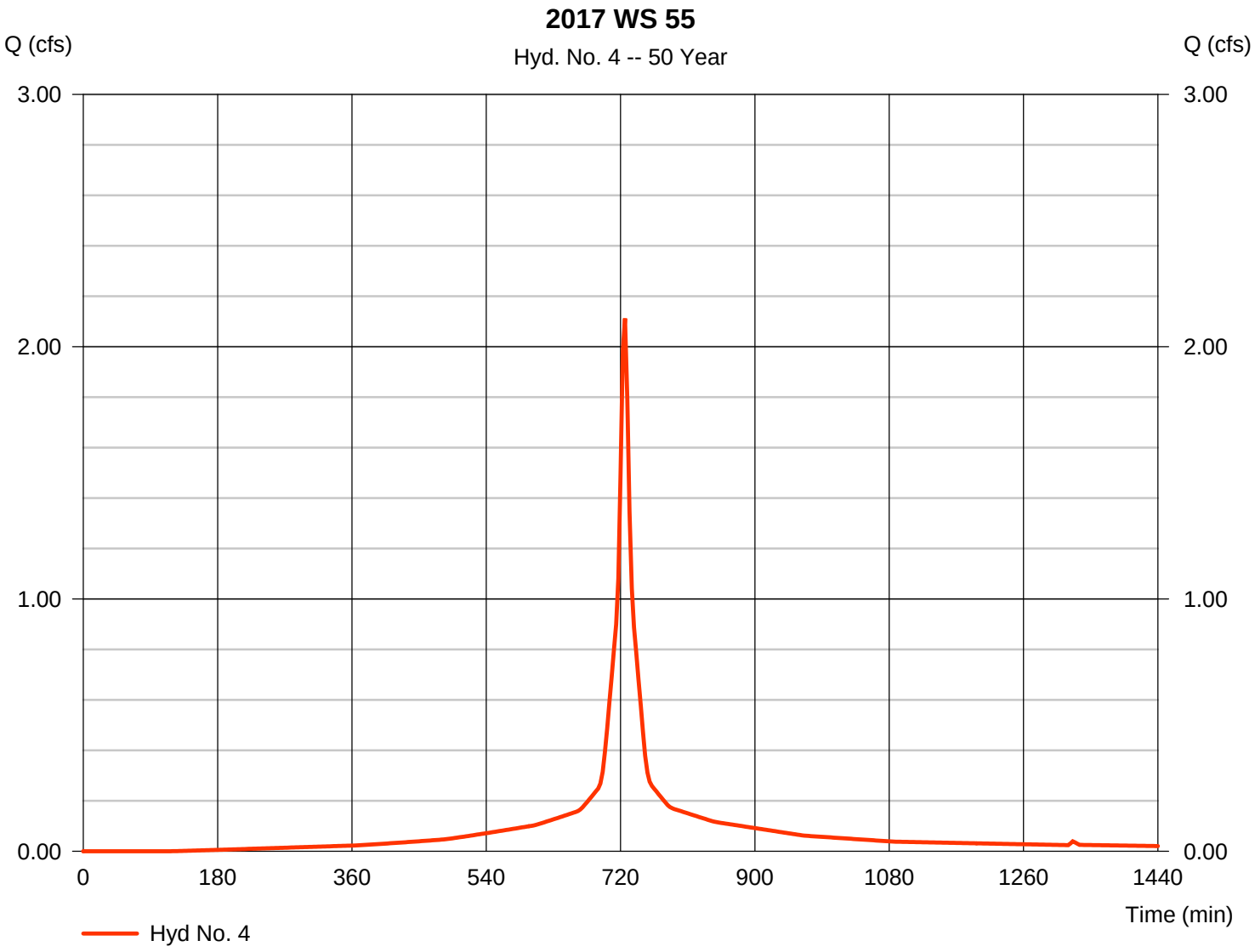
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 2.112 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 7,768 cuft
Drainage area	= 0.370 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



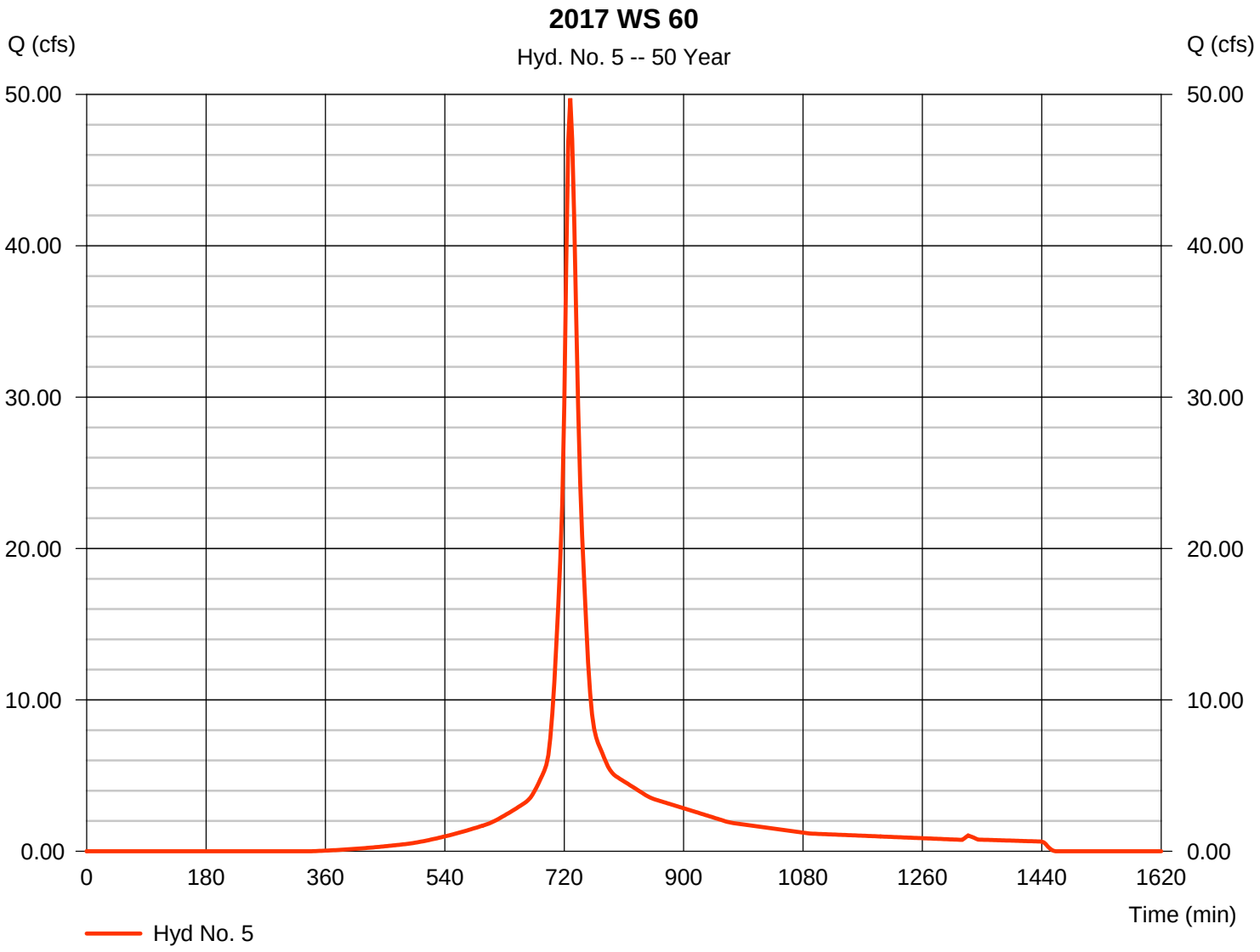
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 49.74 cfs
Storm frequency	= 50 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 198,268 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



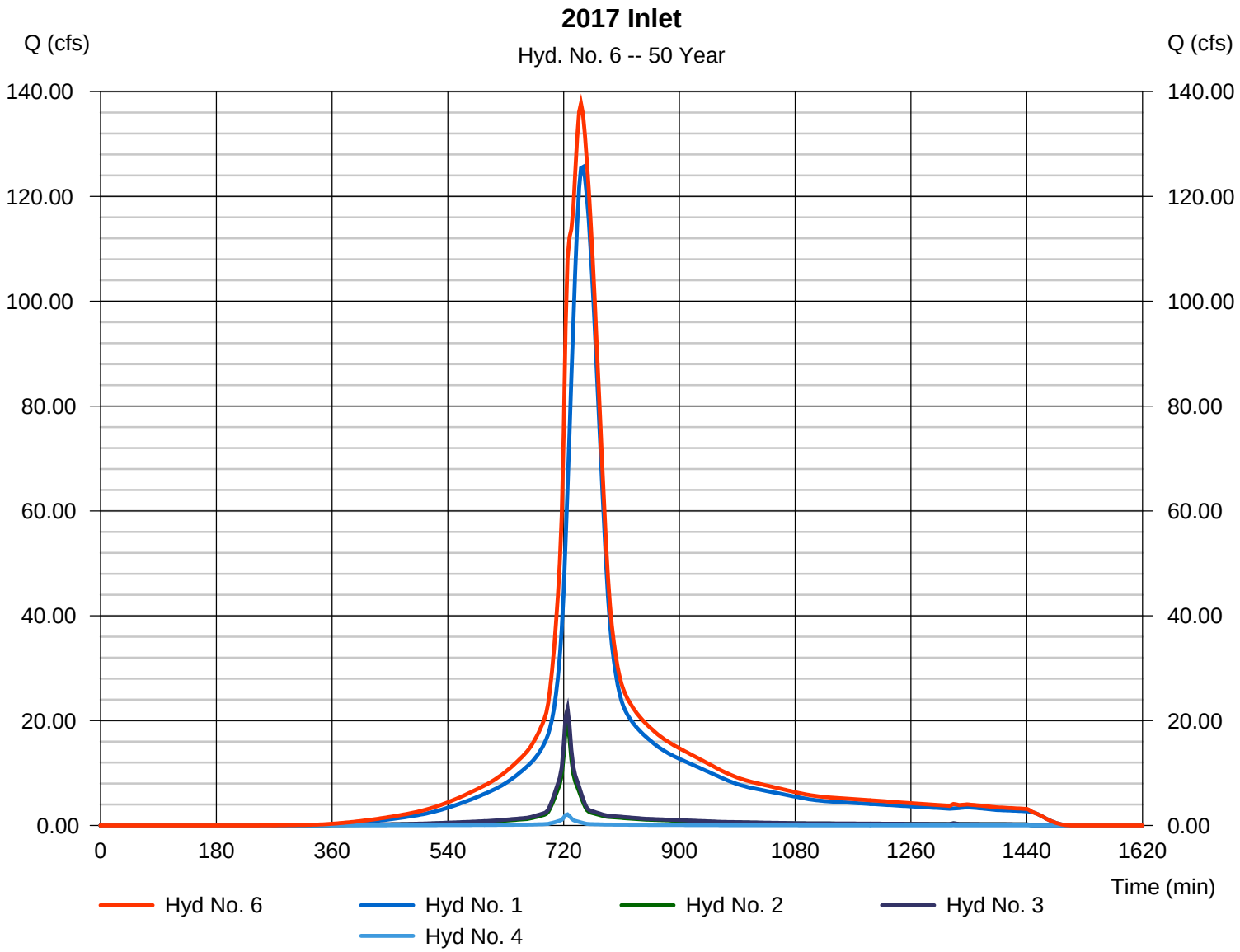
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 137.74 cfs
Storm frequency	= 50 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 965,314 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	154.20	3	750	1,006,382	------	------	------	2017 WS 50
2	SCS Runoff	23.54	3	726	82,161	------	------	------	2017 WS 51
3	SCS Runoff	26.94	3	726	94,610	------	------	------	2017 WS 52
4	SCS Runoff	2.507	3	726	9,307	------	------	------	2017 WS 55
5	SCS Runoff	61.23	3	729	246,163	------	------	------	2017 WS 60
6	Combine	168.94	3	747	1,192,460	1, 2, 3, 4,	------	------	2017 Inlet

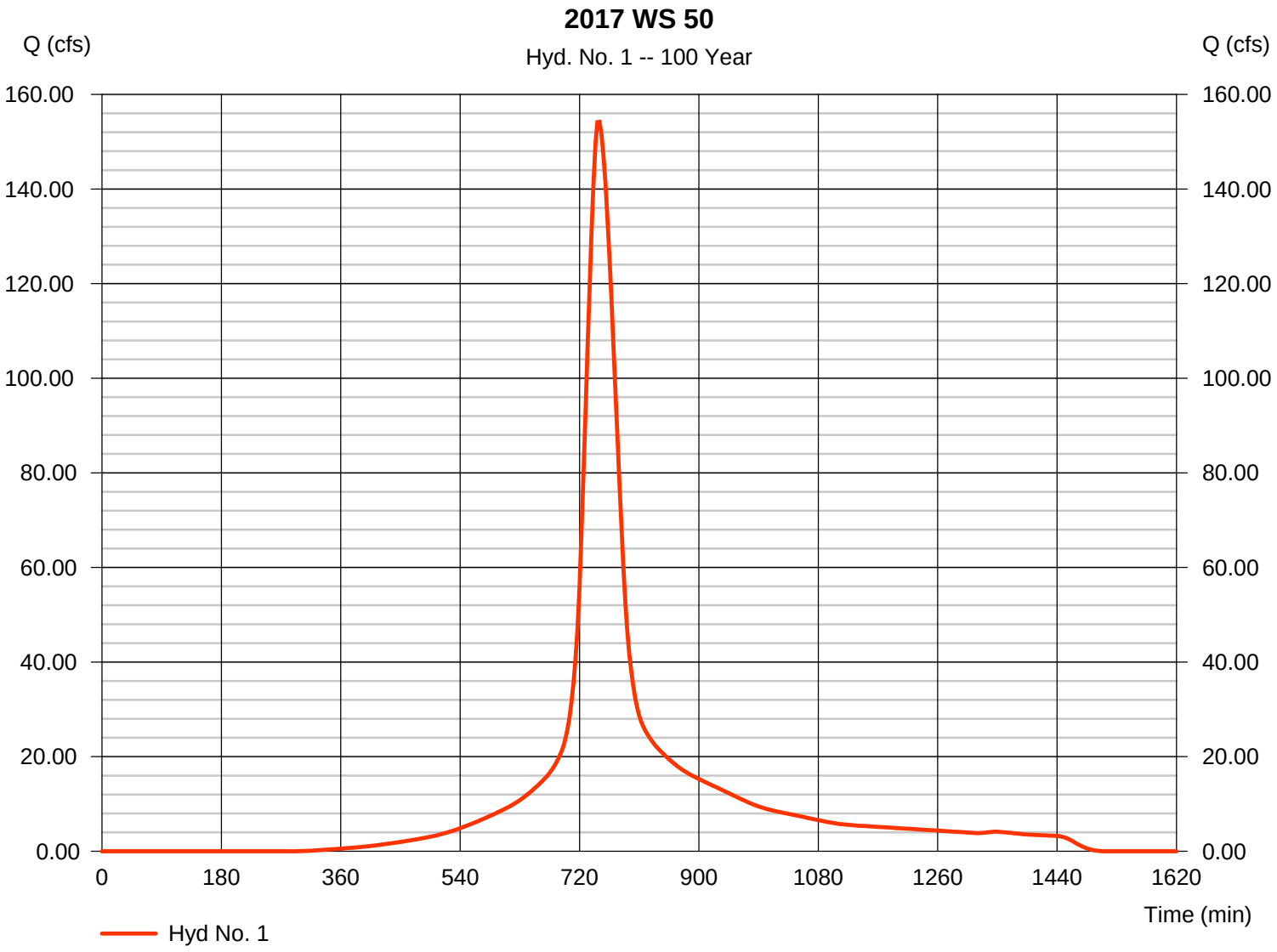
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 154.20 cfs
Storm frequency	= 100 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 1,006,382 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



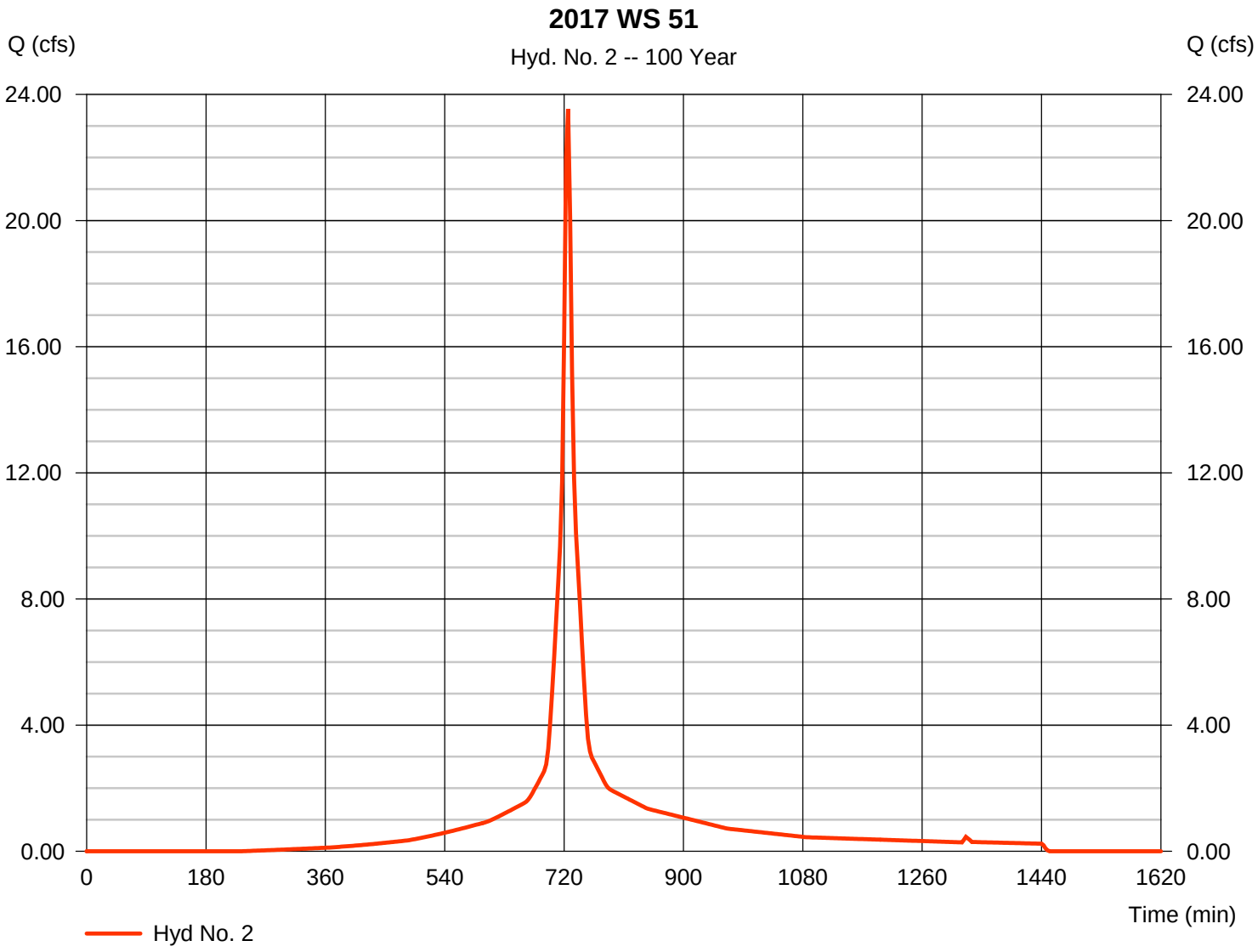
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 23.54 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 82,161 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



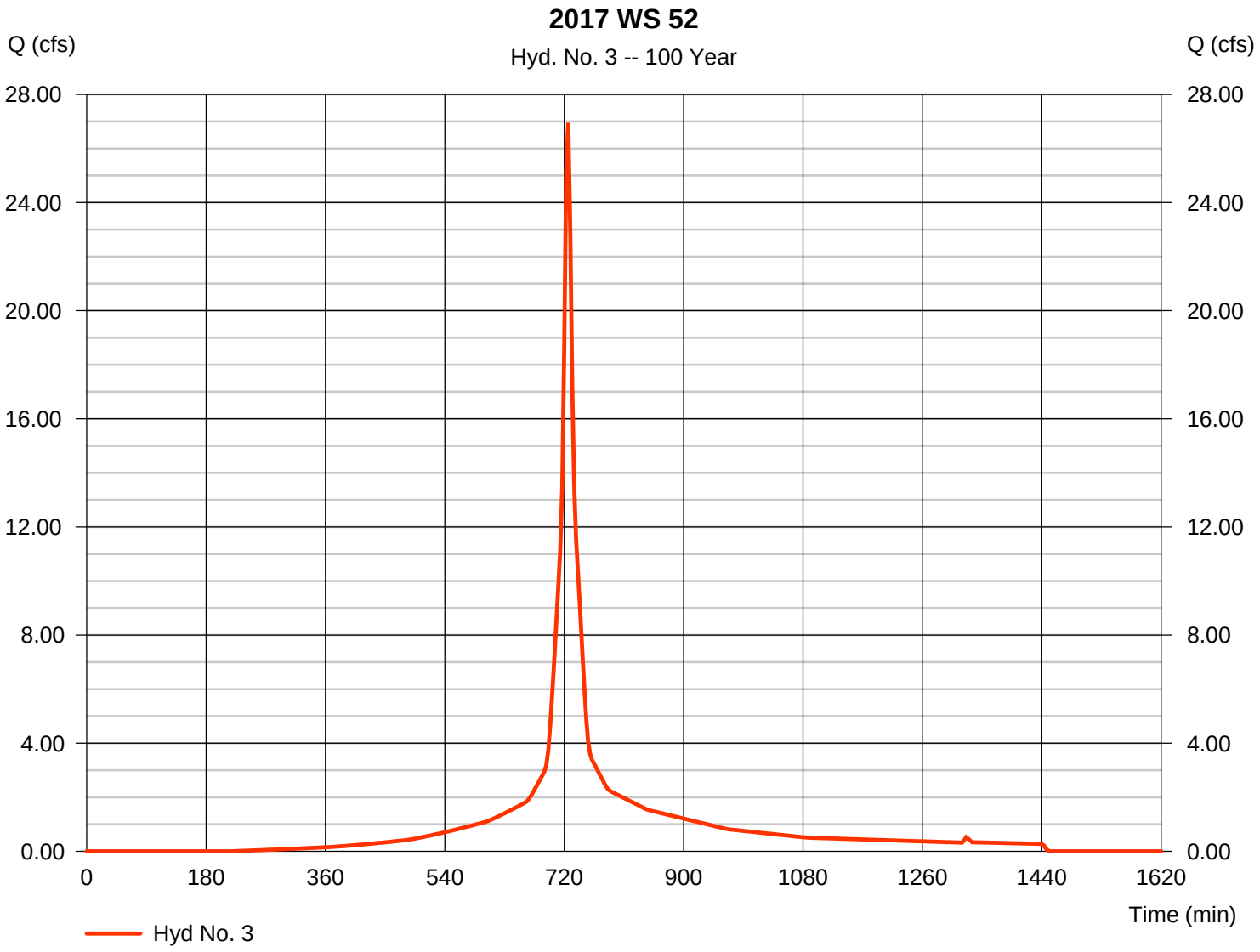
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 26.94 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 94,610 cuft
Drainage area	= 4.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



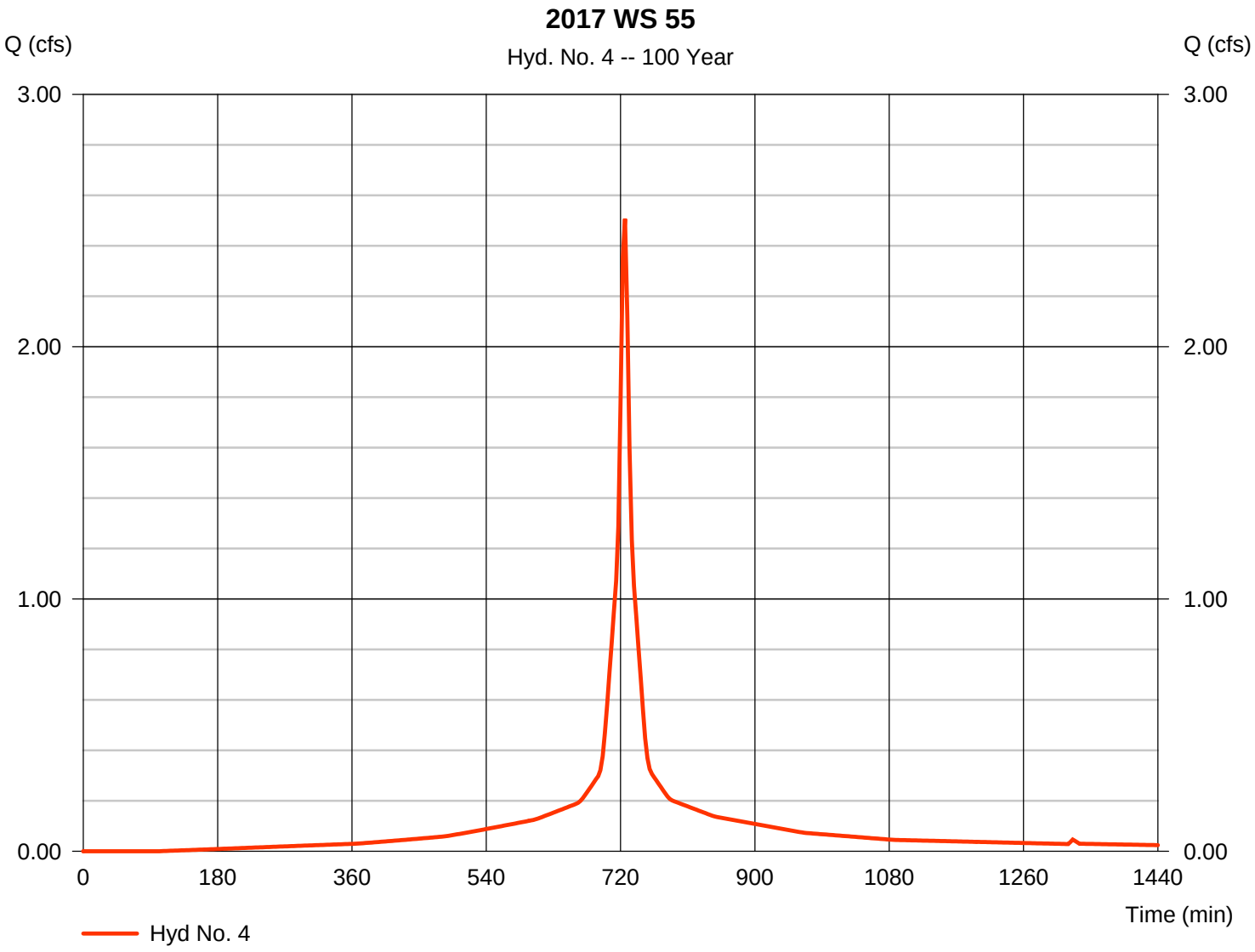
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.507 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	9,307 cuft
Drainage area	=	0.370 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	8.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



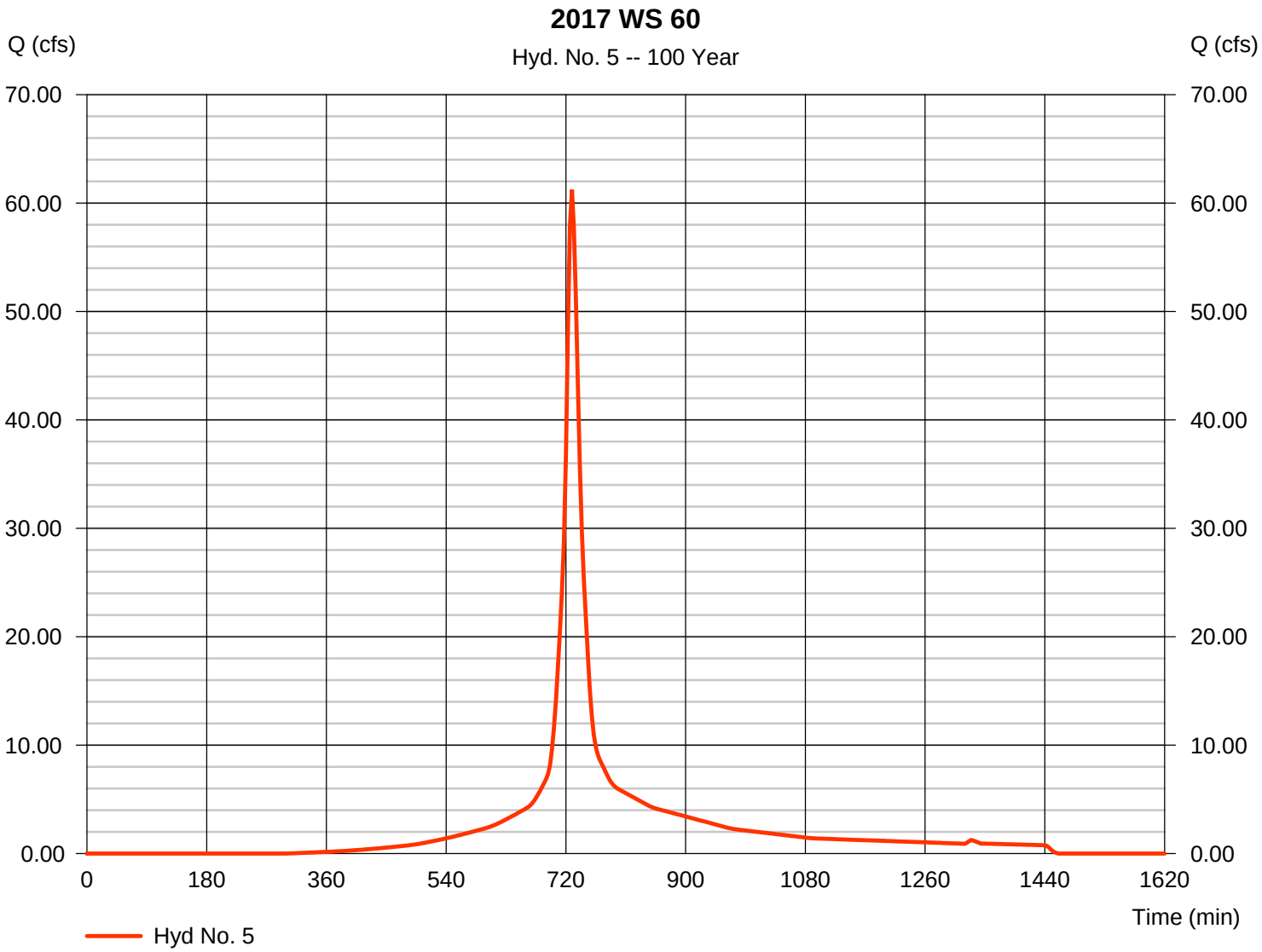
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 61.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 246,163 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



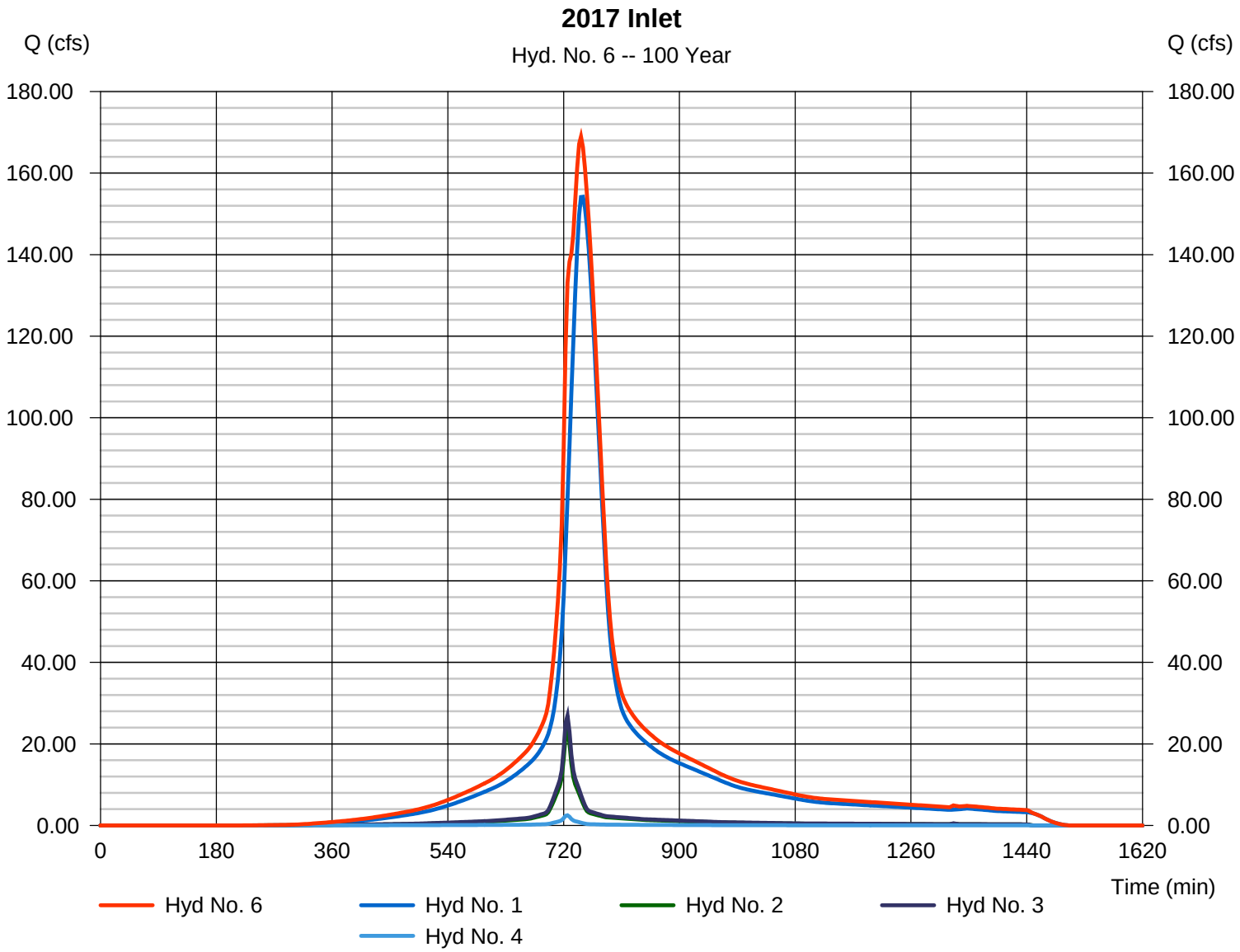
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

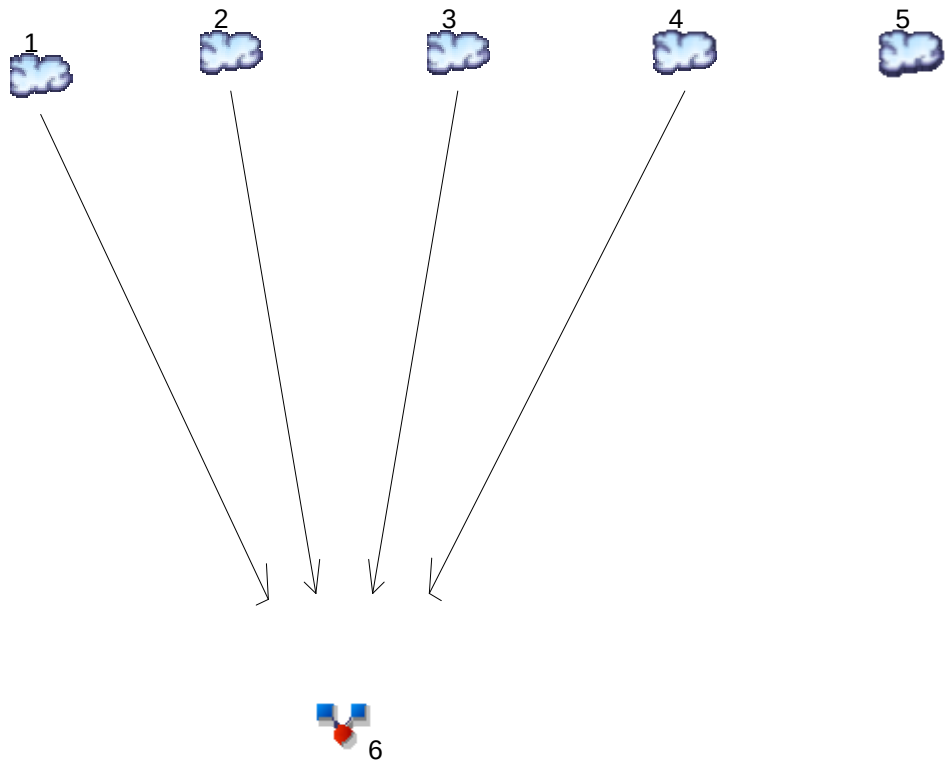
2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 168.94 cfs
Storm frequency	= 100 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 1,192,460 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS 50
2	SCS Runoff	WS 51
3	SCS Runoff	WS 52
4	SCS Runoff	WS 55
5	SCS Runoff	WS 60
6	Combine	2012 Inlet

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	41.95	-------	-------	75.37	101.45	125.61	154.20	WS 50
2	SCS Runoff	------	-------	7.982	-------	-------	13.01	16.81	20.28	24.37	WS 51
3	SCS Runoff	------	-------	9.025	-------	-------	14.71	19.00	22.93	27.55	WS 52
4	SCS Runoff	------	-------	0.816	-------	-------	1.312	1.686	2.027	2.428	WS 55
5	SCS Runoff	------	-------	16.22	-------	-------	29.58	40.04	49.74	61.23	WS 60
6	Combine	1, 2, 3, 4,	-------	46.70	-------	-------	83.20	111.65	138.00	169.19	2012 Inlet

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	41.95	3	750	268,967	------	------	------	WS 50
2	SCS Runoff	7.982	3	726	26,797	------	------	------	WS 51
3	SCS Runoff	9.025	3	726	30,299	------	------	------	WS 52
4	SCS Runoff	0.816	3	726	2,754	------	------	------	WS 55
5	SCS Runoff	16.22	3	729	64,146	------	------	------	WS 60
6	Combine	46.70	3	747	328,816	1, 2, 3, 4,	------	------	2012 Inlet

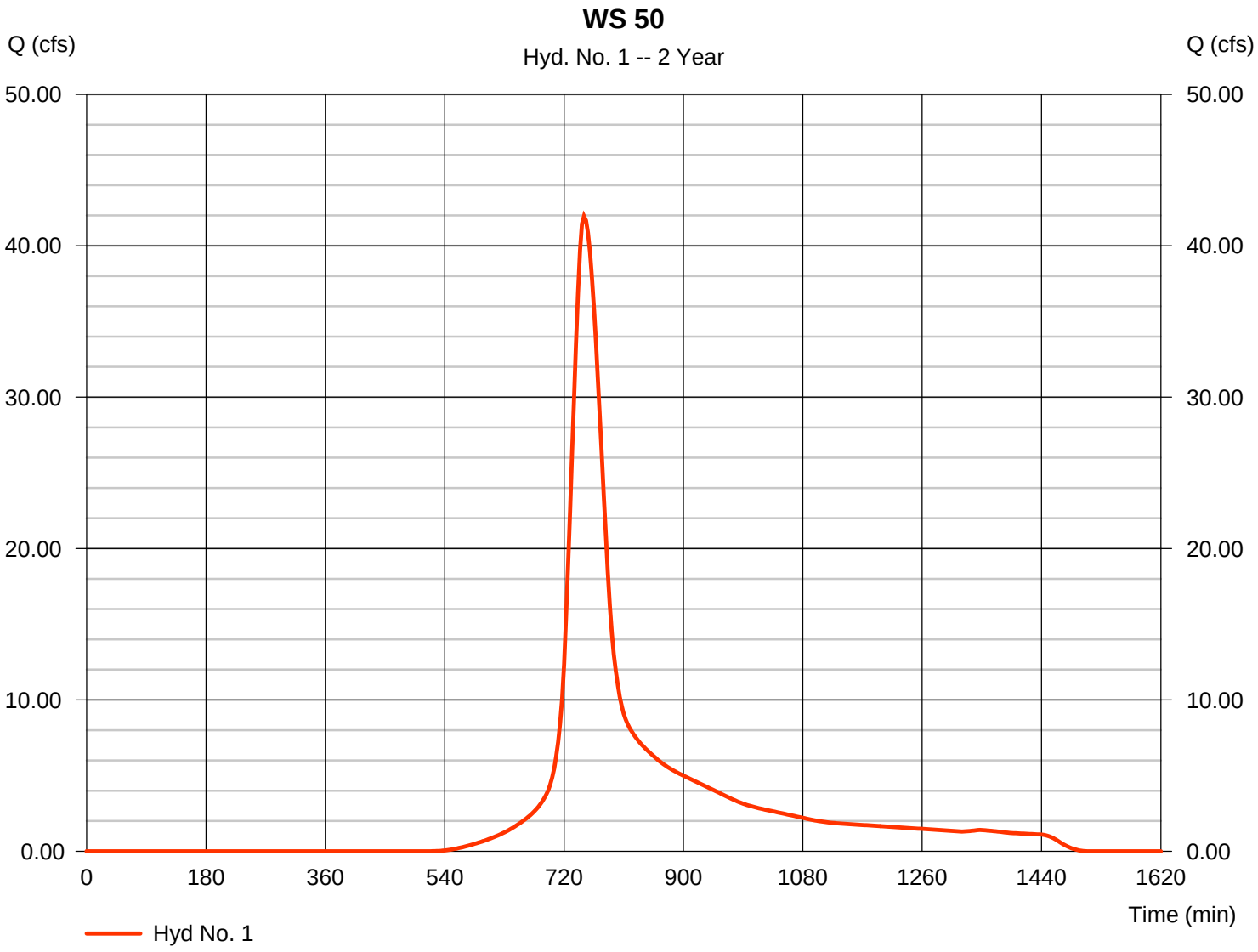
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 41.95 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 268,967 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



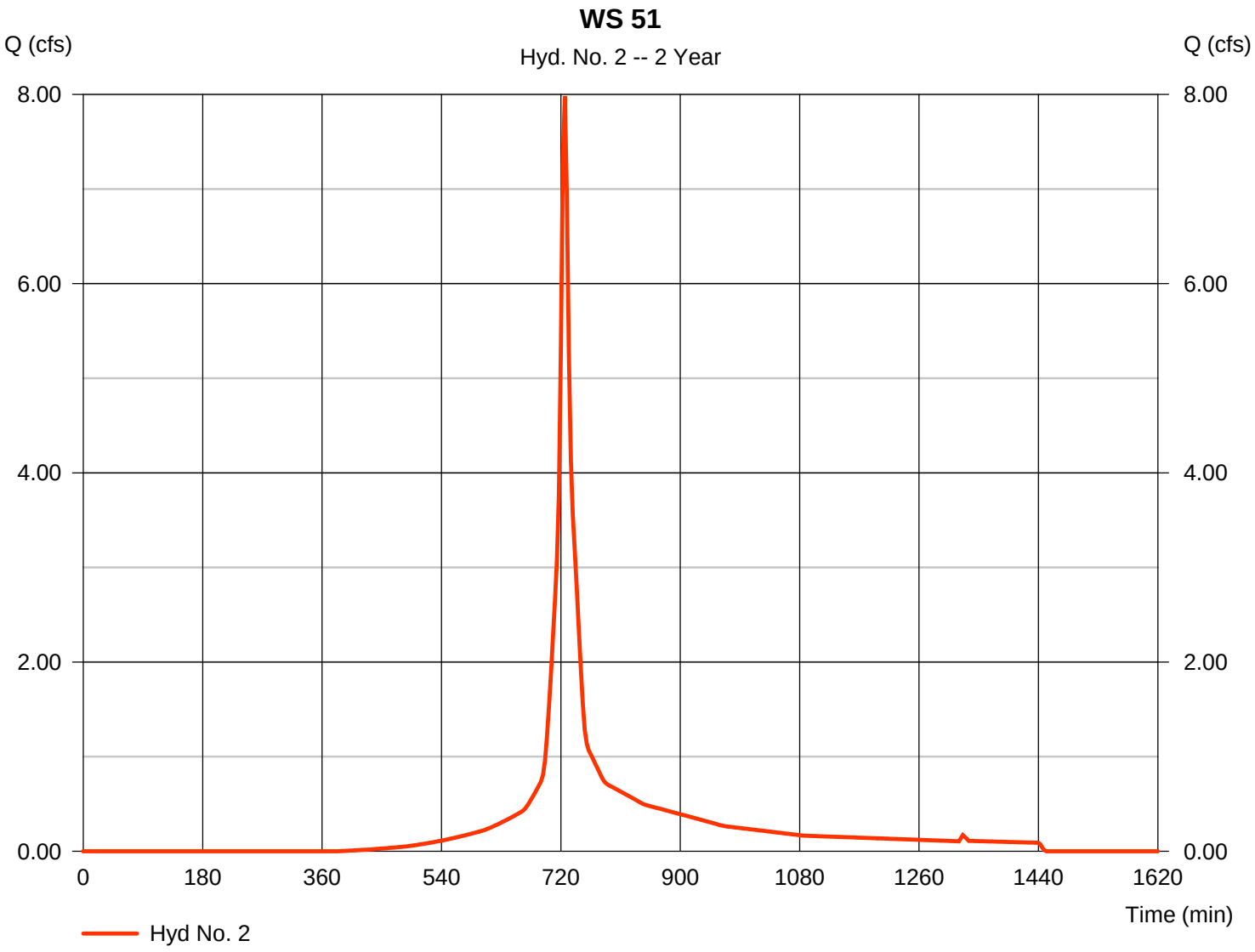
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 7.982 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 26,797 cuft
Drainage area	= 3.750 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



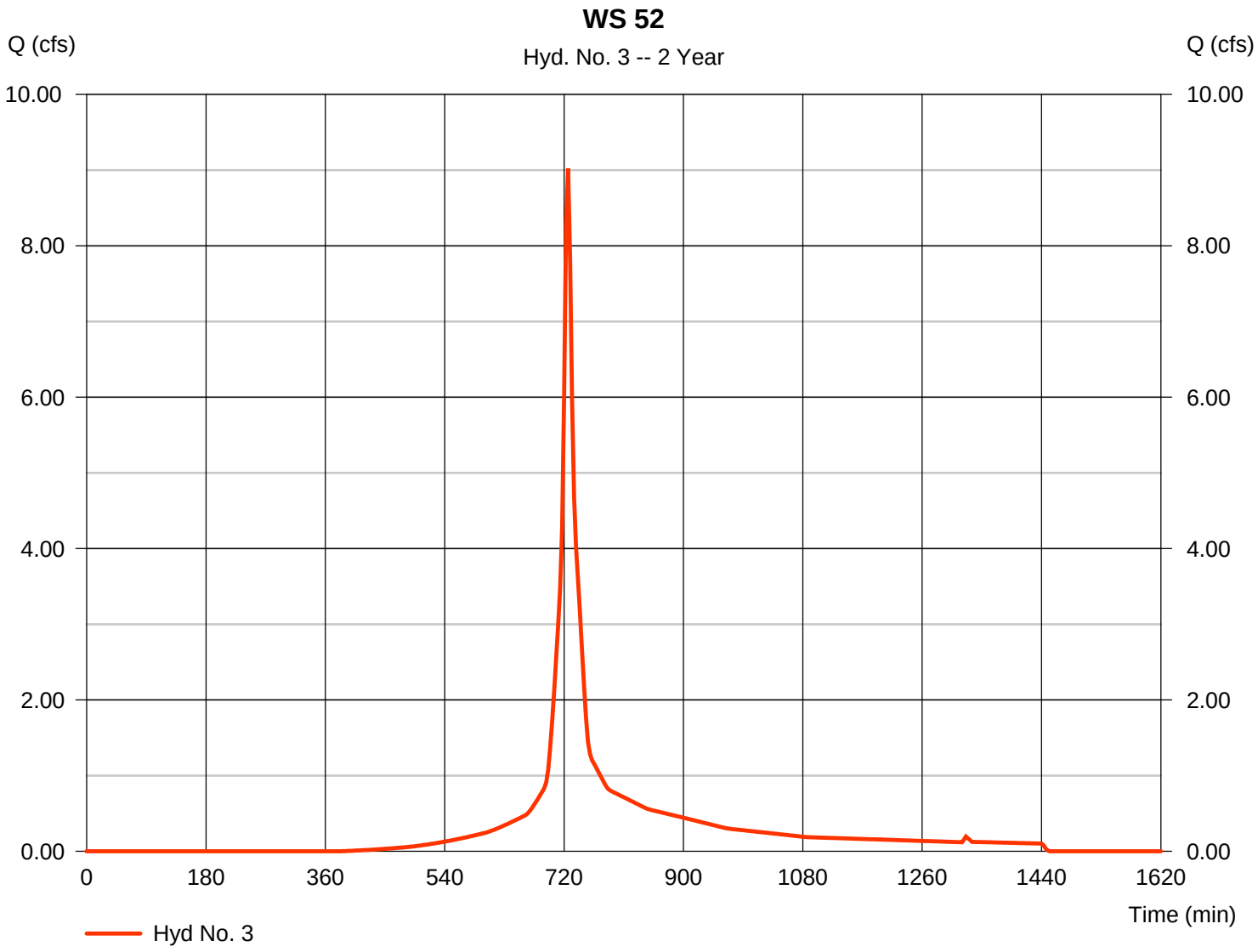
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 9.025 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 30,299 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



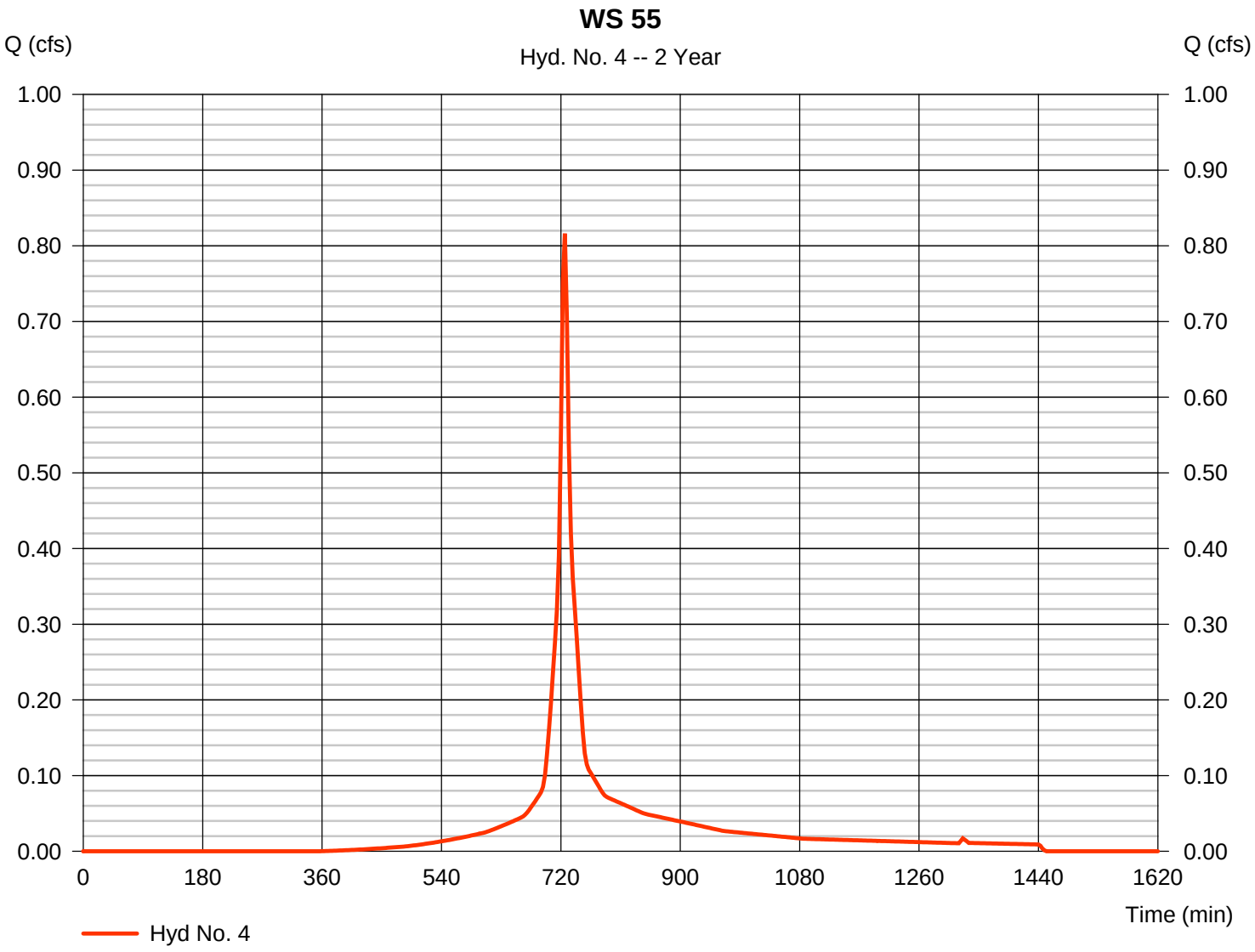
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 0.816 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 2,754 cuft
Drainage area	= 0.370 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



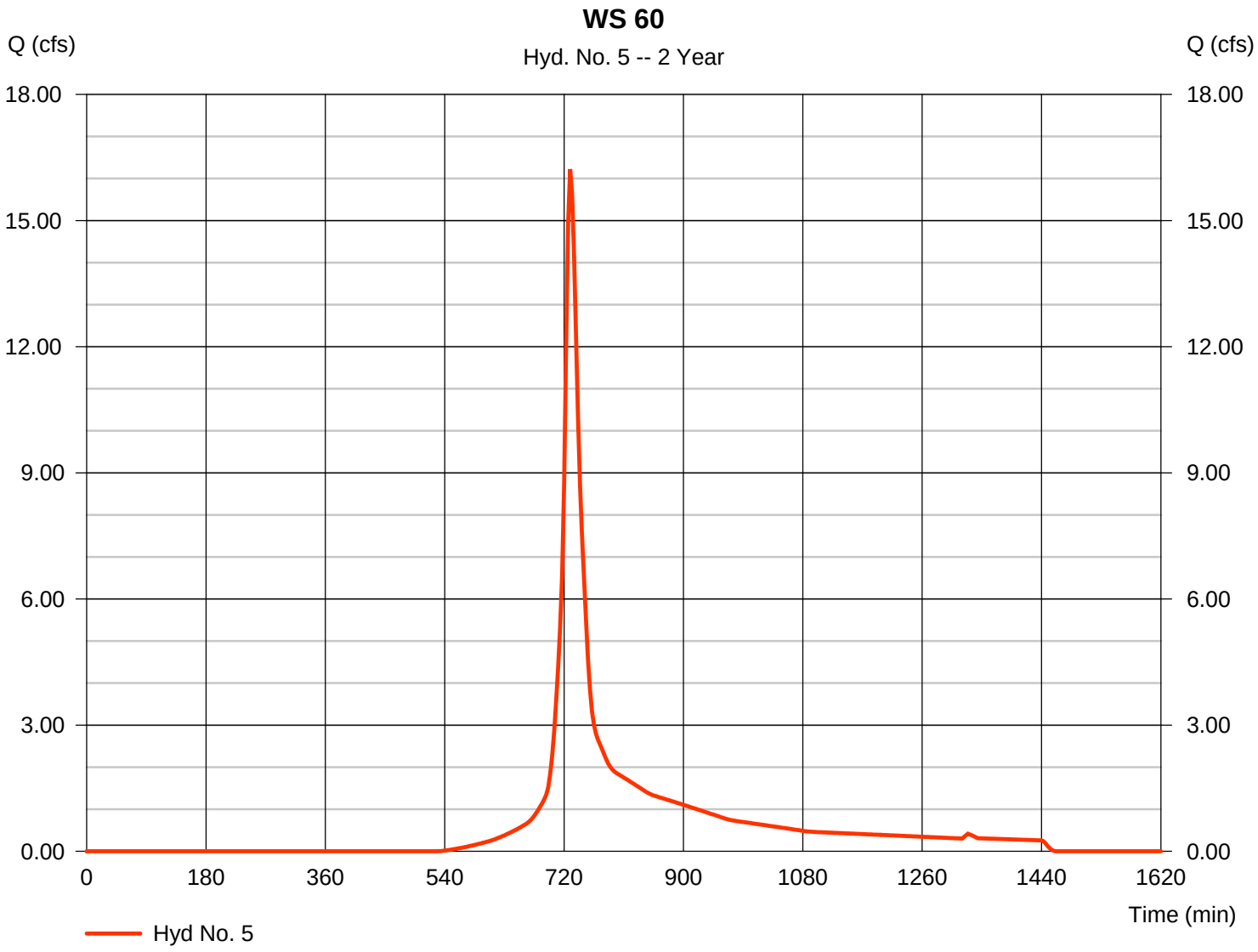
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 16.22 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 64,146 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



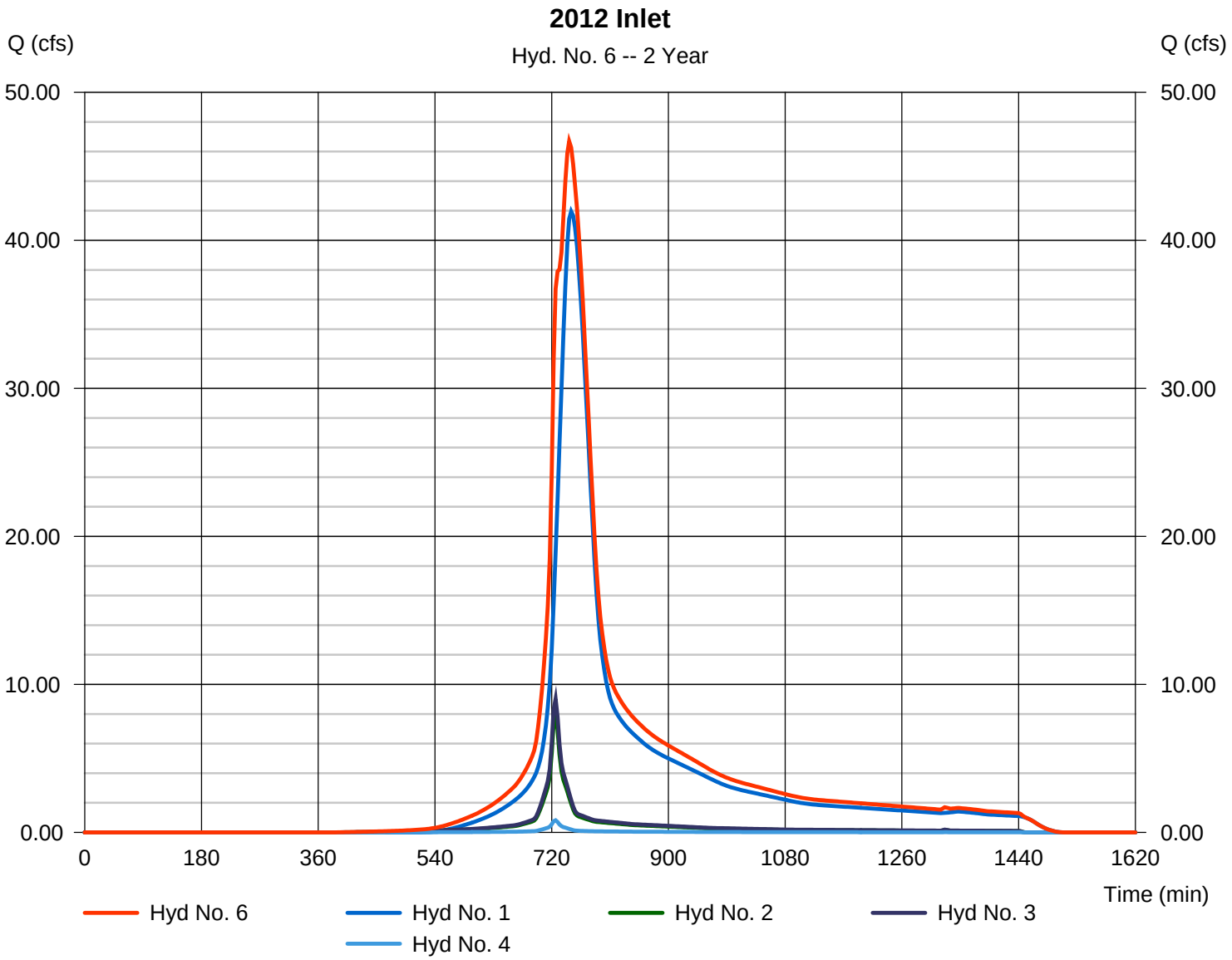
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 46.70 cfs
Storm frequency	= 2 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 328,816 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	75.37	3	750	481,965	------	------	------	WS 50
2	SCS Runoff	13.01	3	726	44,601	------	------	------	WS 51
3	SCS Runoff	14.71	3	726	50,429	------	------	------	WS 52
4	SCS Runoff	1.312	3	726	4,529	------	------	------	WS 55
5	SCS Runoff	29.58	3	729	116,434	------	------	------	WS 60
6	Combine	83.20	3	747	581,525	1, 2, 3, 4,	------	------	2012 Inlet

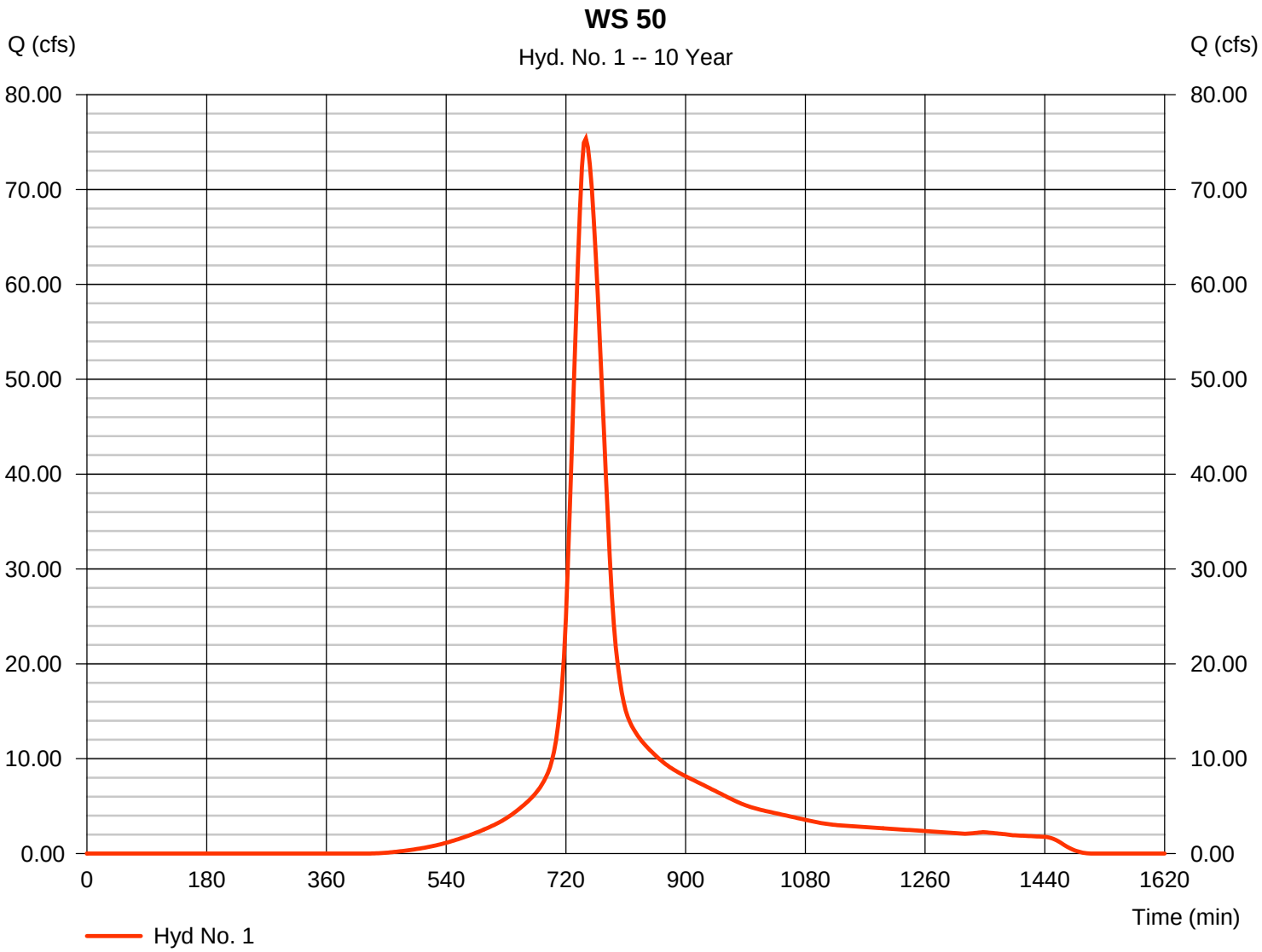
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 75.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 481,965 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



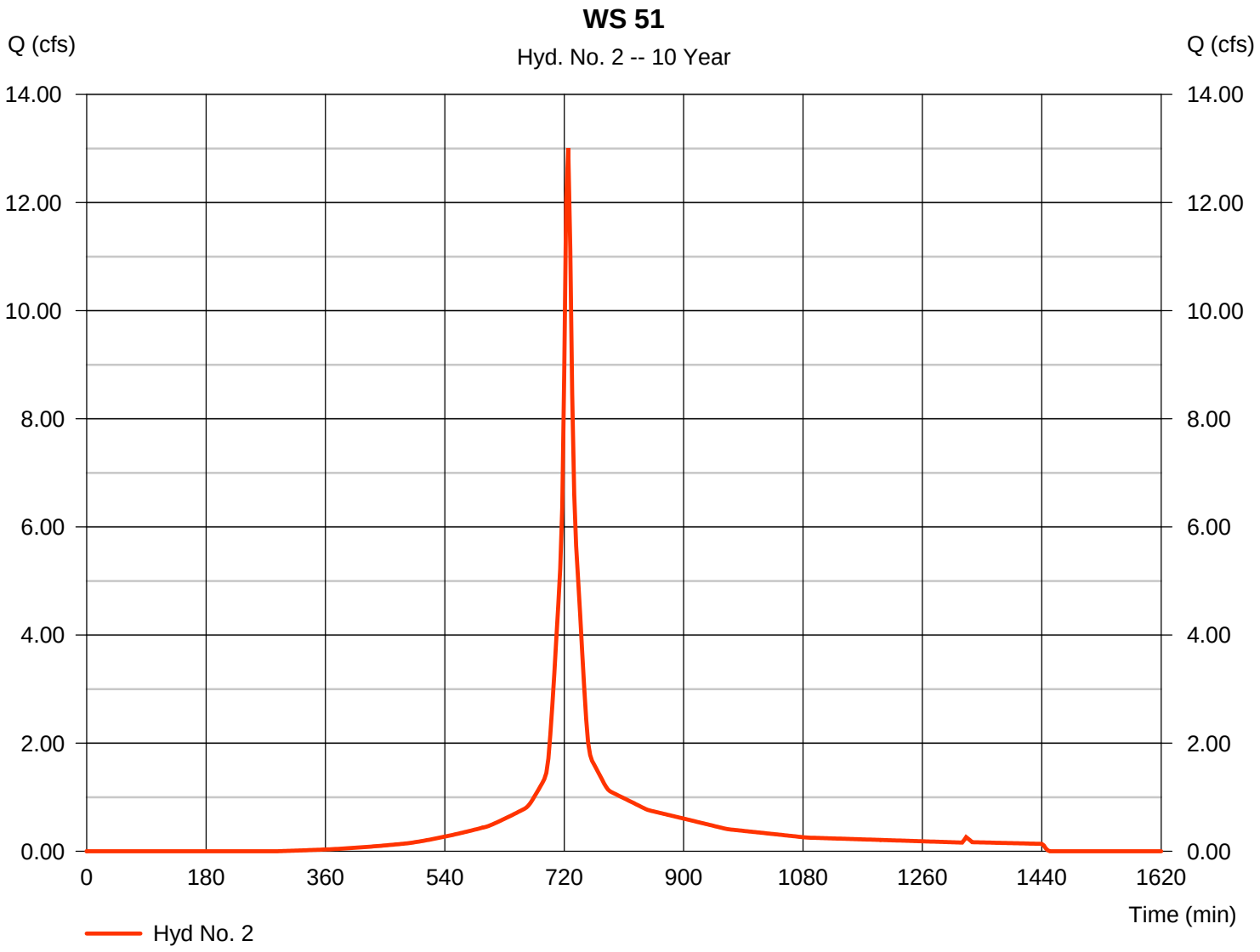
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 13.01 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 44,601 cuft
Drainage area	= 3.750 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



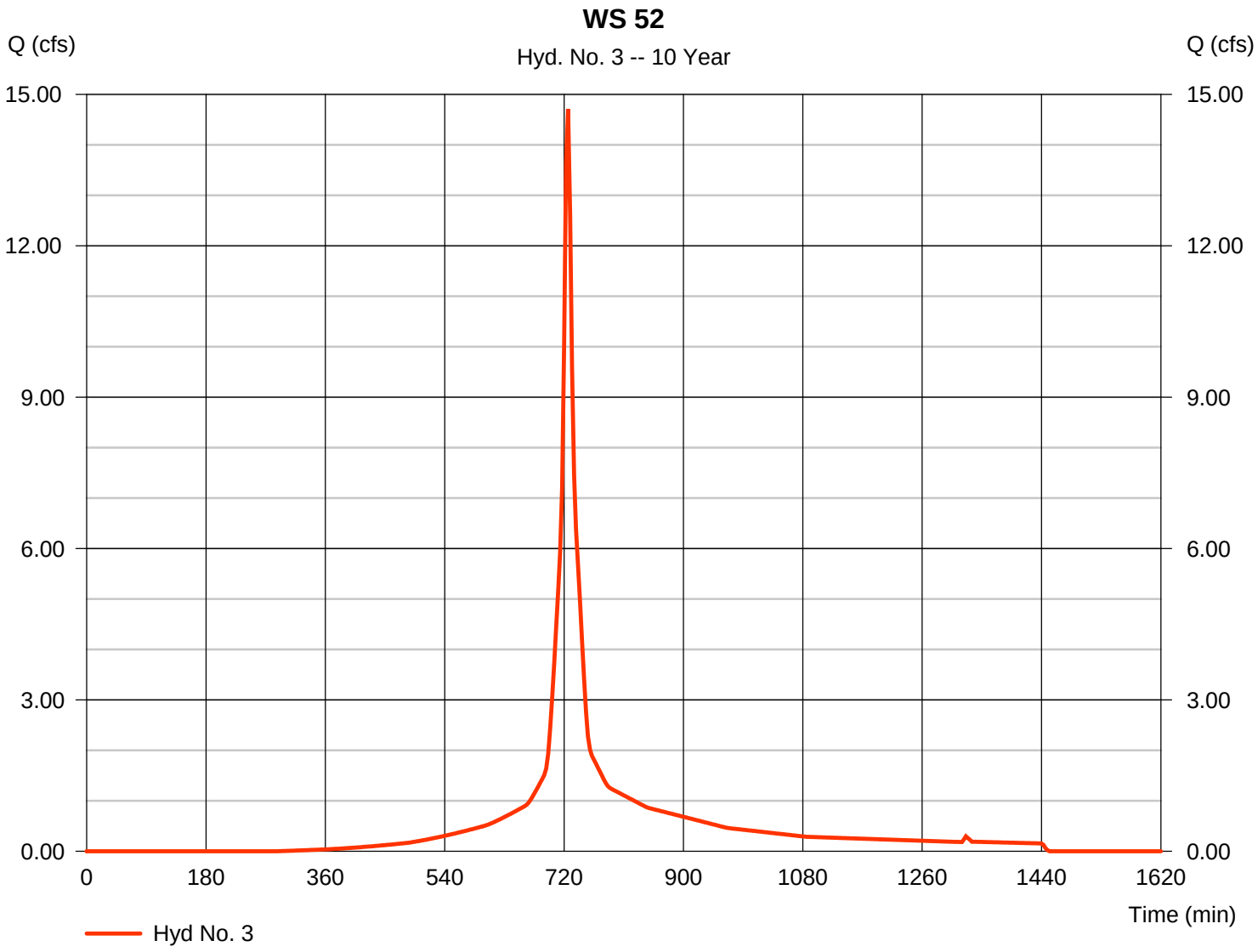
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 14.71 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 50,429 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



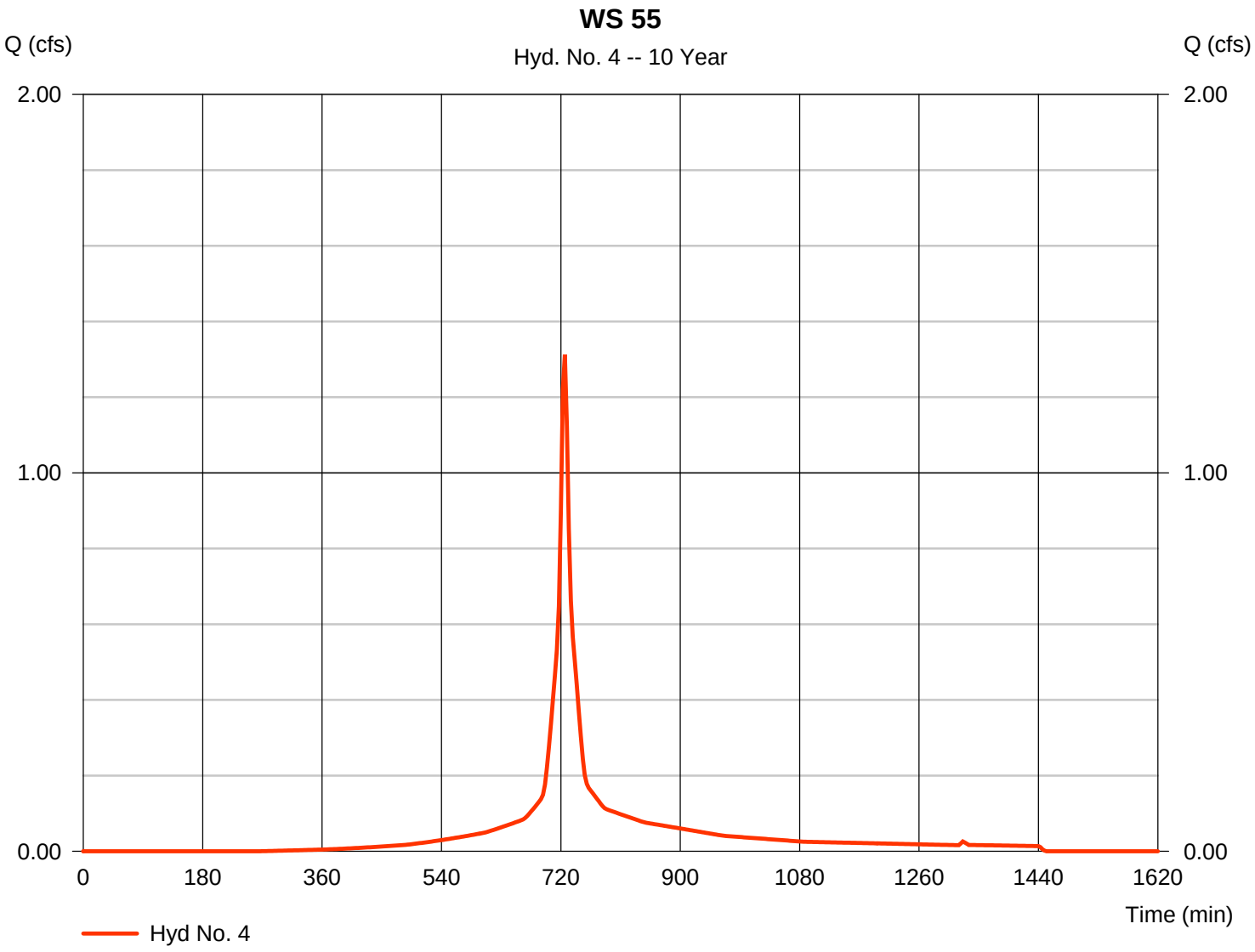
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.312 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	4,529 cuft
Drainage area	=	0.370 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.71 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



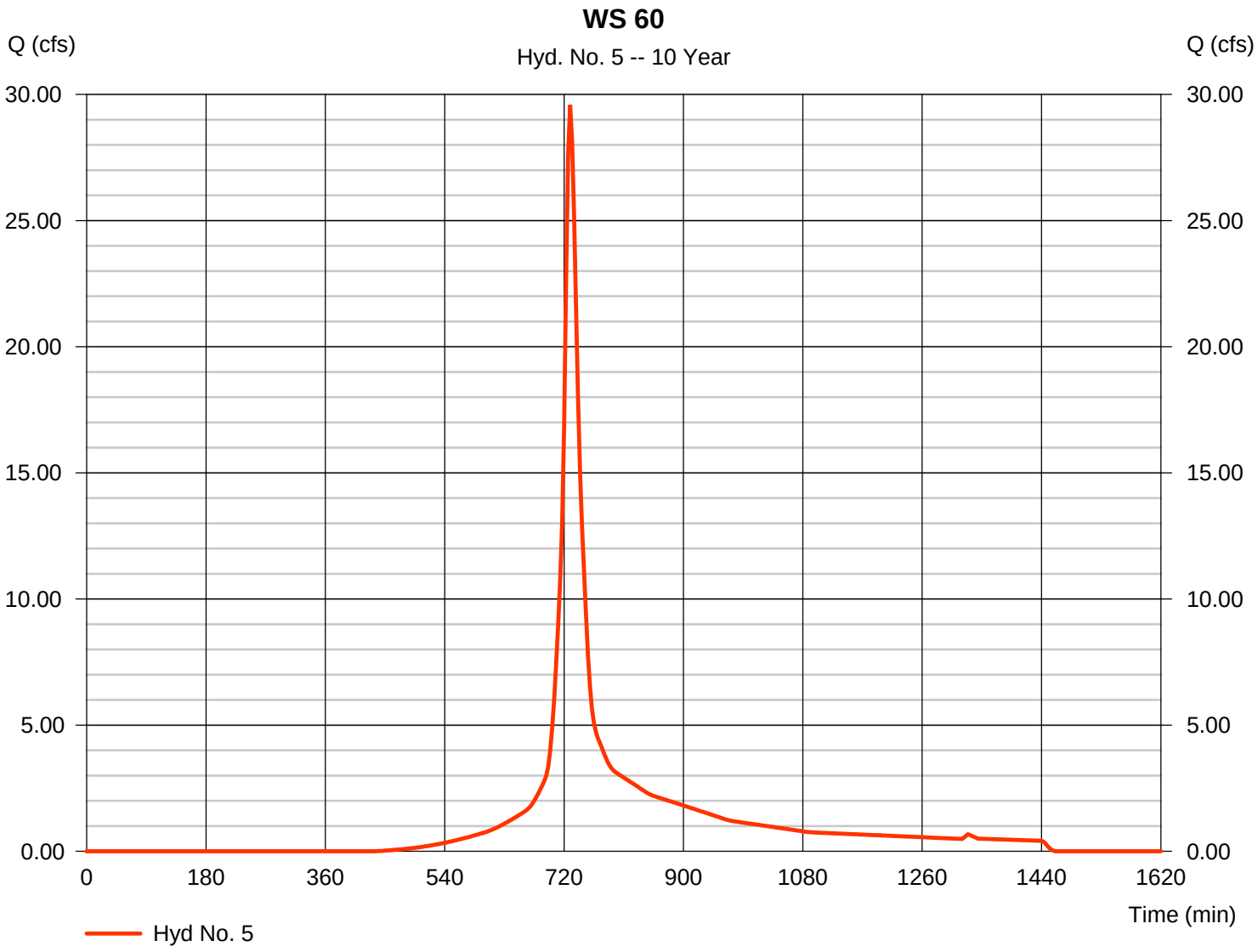
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 29.58 cfs
Storm frequency	= 10 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 116,434 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



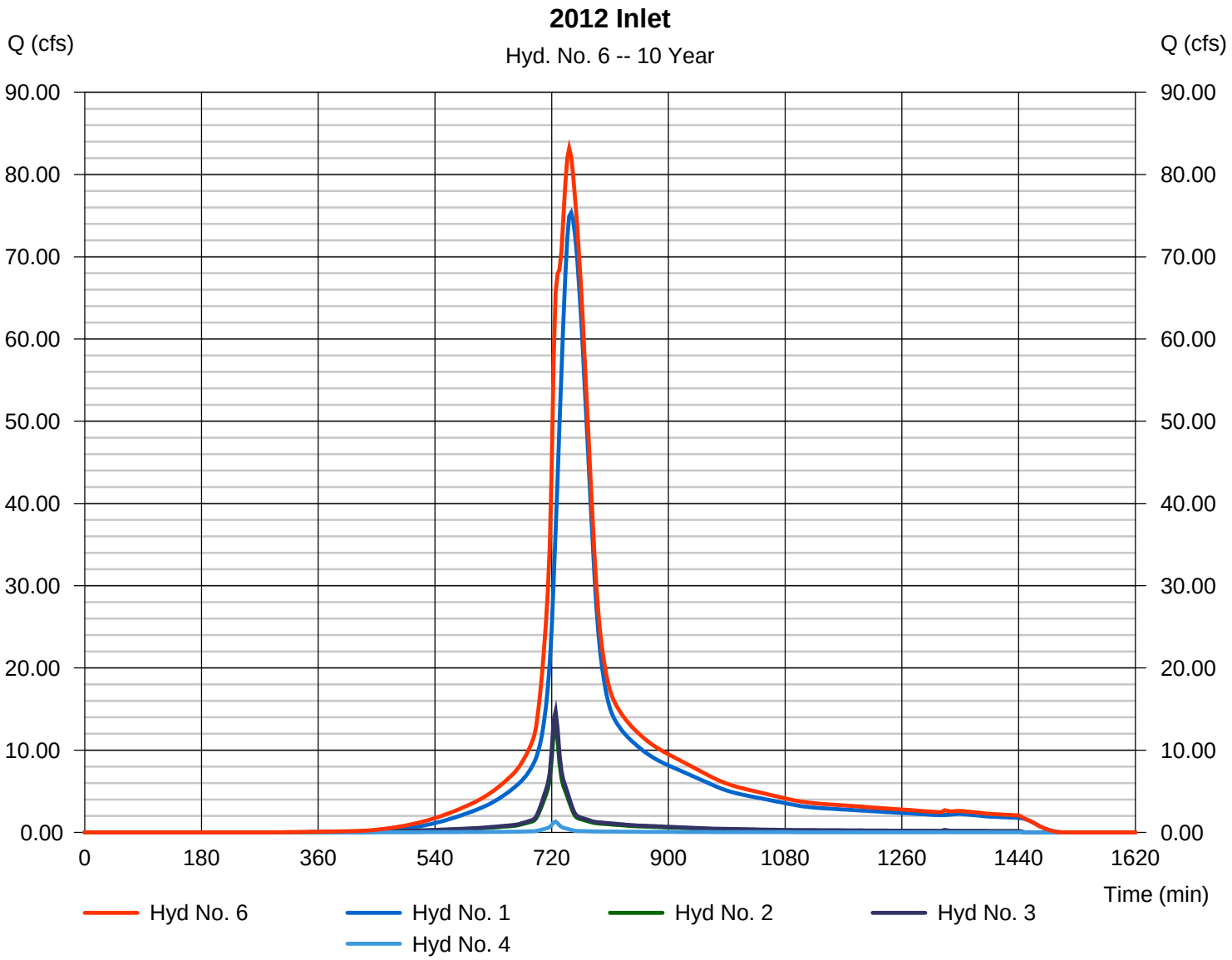
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 83.20 cfs
Storm frequency	= 10 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 581,525 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	101.45	3	750	652,410	------	------	------	WS 50
2	SCS Runoff	16.81	3	726	58,456	------	------	------	WS 51
3	SCS Runoff	19.00	3	726	66,094	------	------	------	WS 52
4	SCS Runoff	1.686	3	726	5,906	------	------	------	WS 55
5	SCS Runoff	40.04	3	729	158,497	------	------	------	WS 60
6	Combine	111.65	3	747	782,865	1, 2, 3, 4,	------	------	2012 Inlet

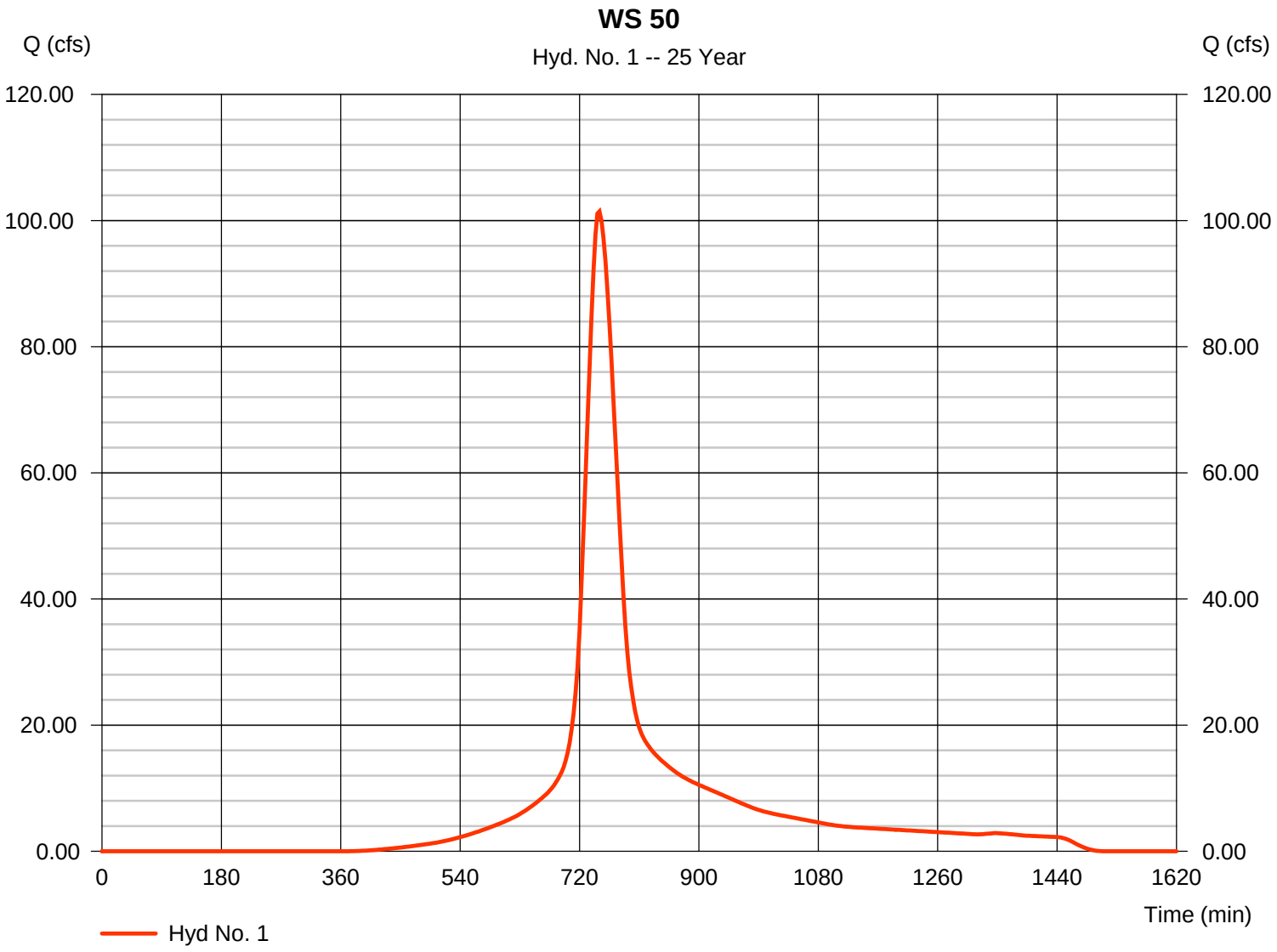
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 101.45 cfs
Storm frequency	= 25 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 652,410 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



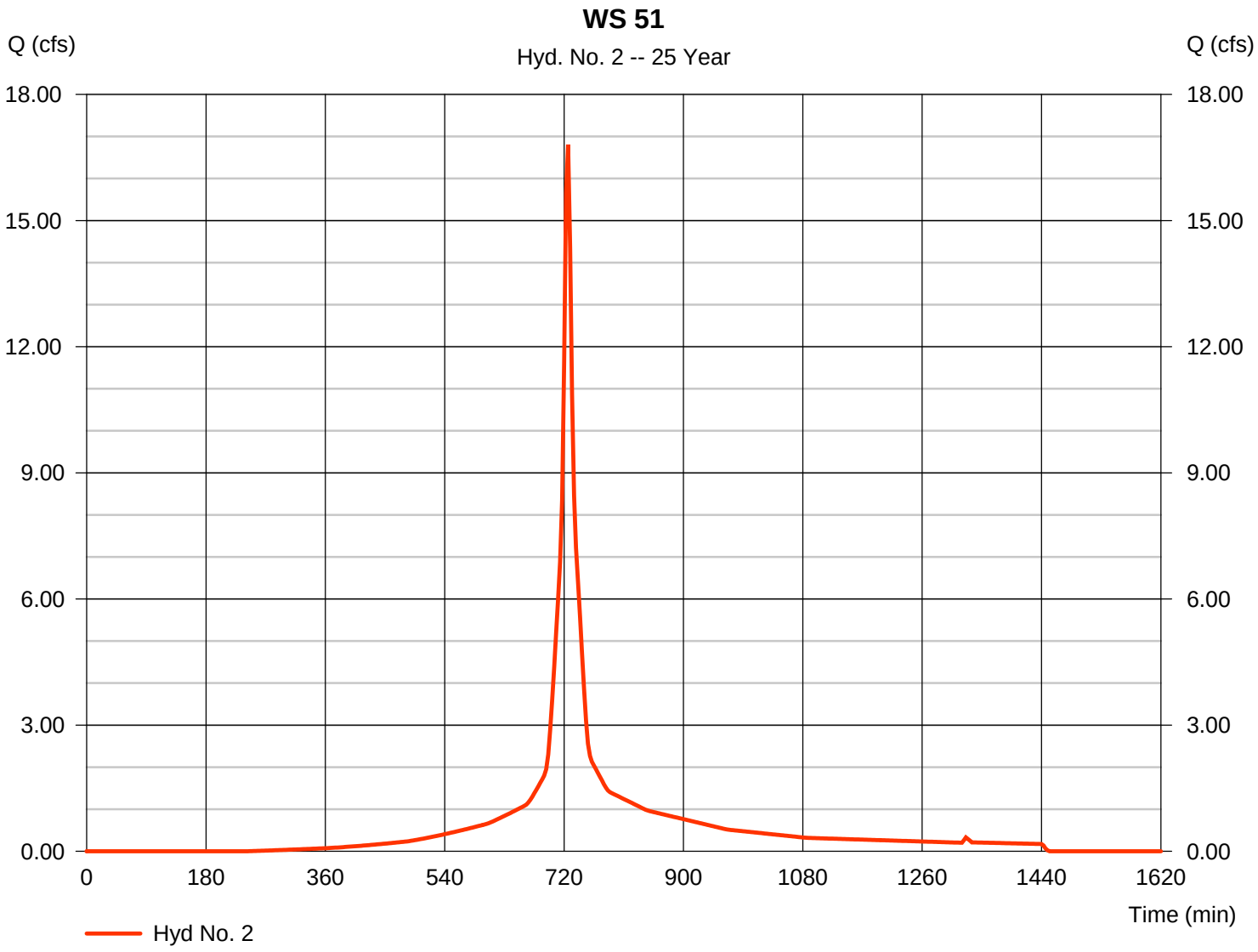
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 16.81 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 58,456 cuft
Drainage area	= 3.750 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



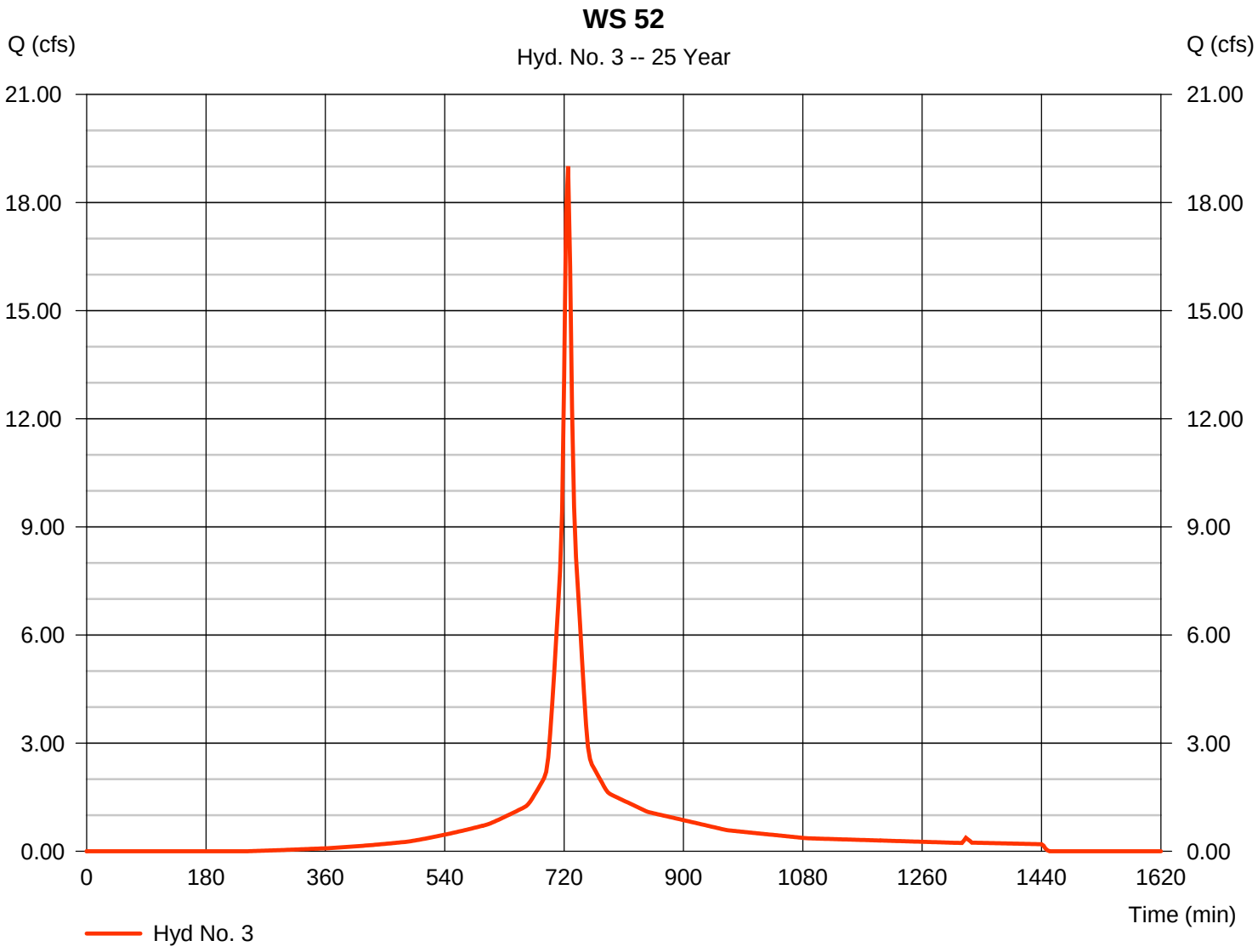
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 19.00 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 66,094 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



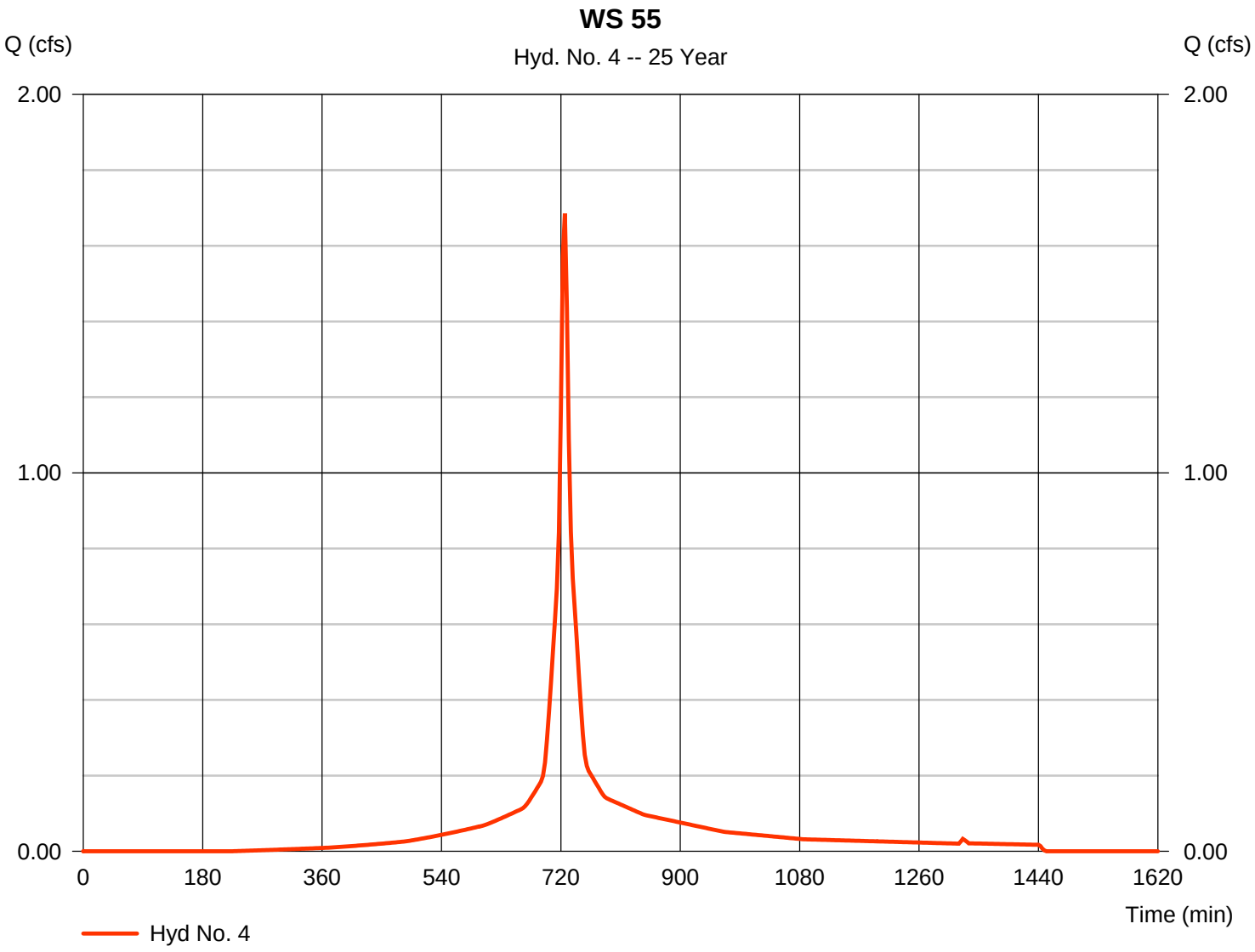
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 1.686 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 5,906 cuft
Drainage area	= 0.370 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



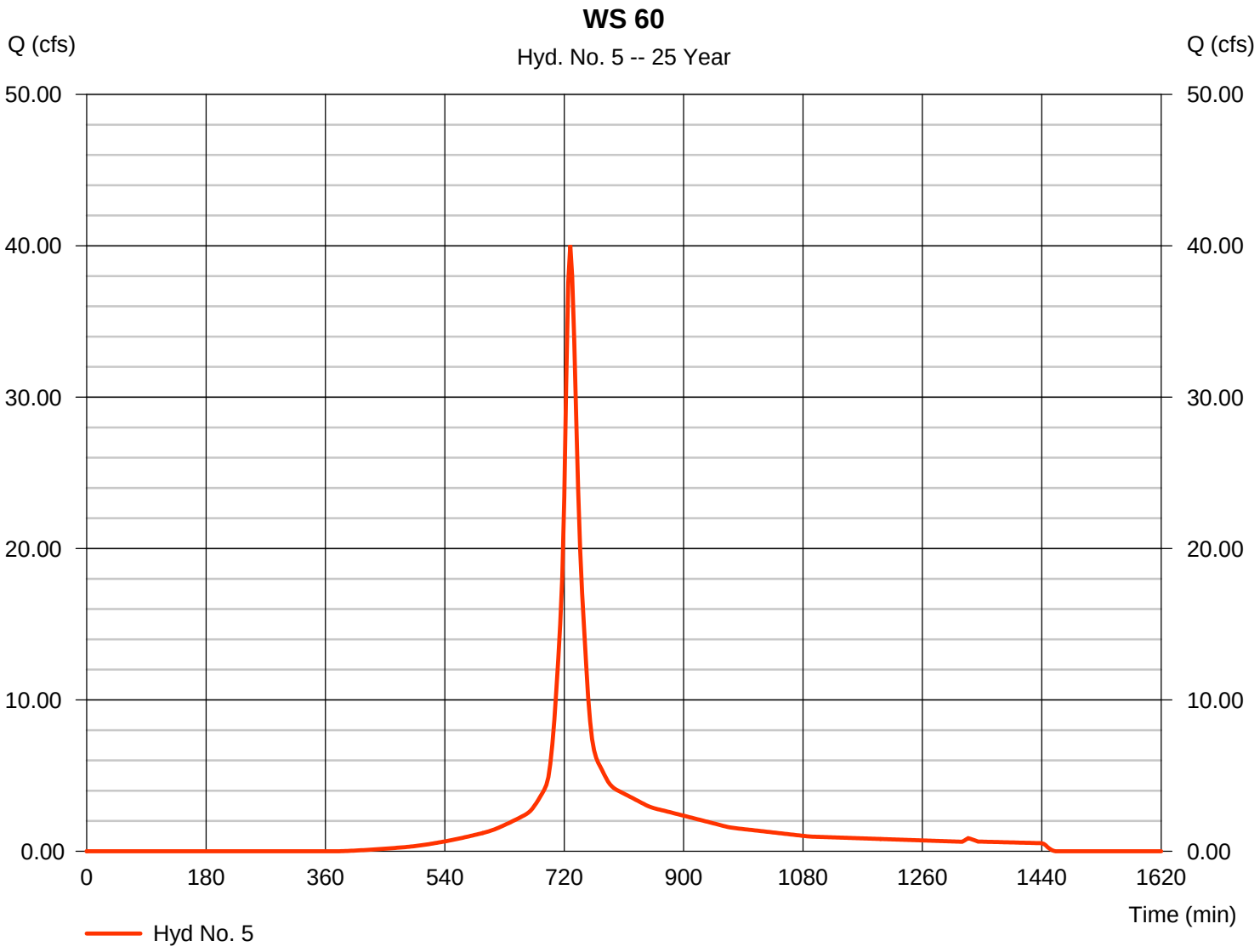
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 40.04 cfs
Storm frequency	= 25 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 158,497 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



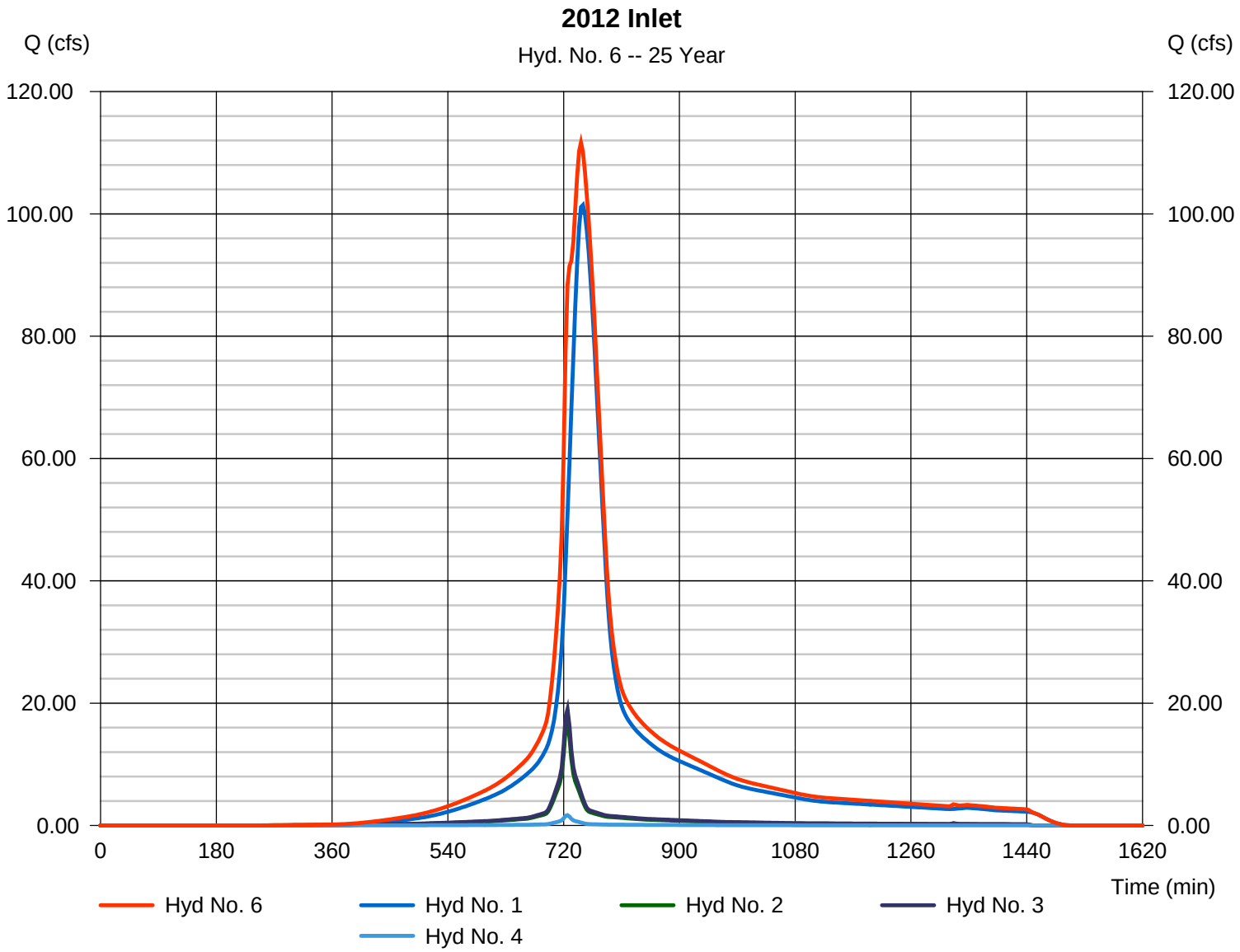
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 111.65 cfs
Storm frequency	= 25 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 782,865 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	125.61	3	750	813,152	------	------	------	WS 50
2	SCS Runoff	20.28	3	726	71,351	------	------	------	WS 51
3	SCS Runoff	22.93	3	726	80,674	------	------	------	WS 52
4	SCS Runoff	2.027	3	726	7,184	------	------	------	WS 55
5	SCS Runoff	49.74	3	729	198,268	------	------	------	WS 60
6	Combine	138.00	3	747	972,362	1, 2, 3, 4,	------	------	2012 Inlet

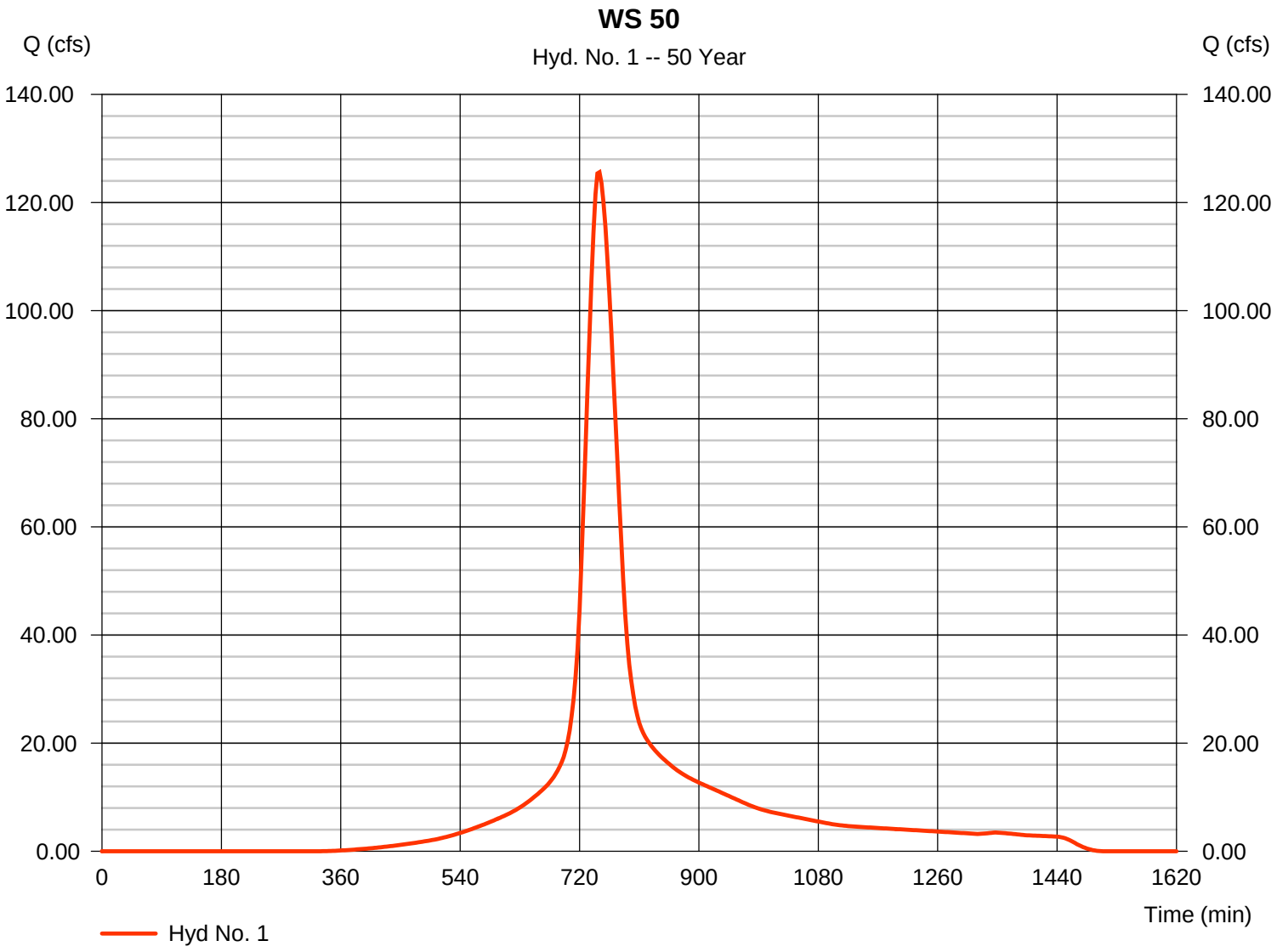
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 125.61 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 813,152 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



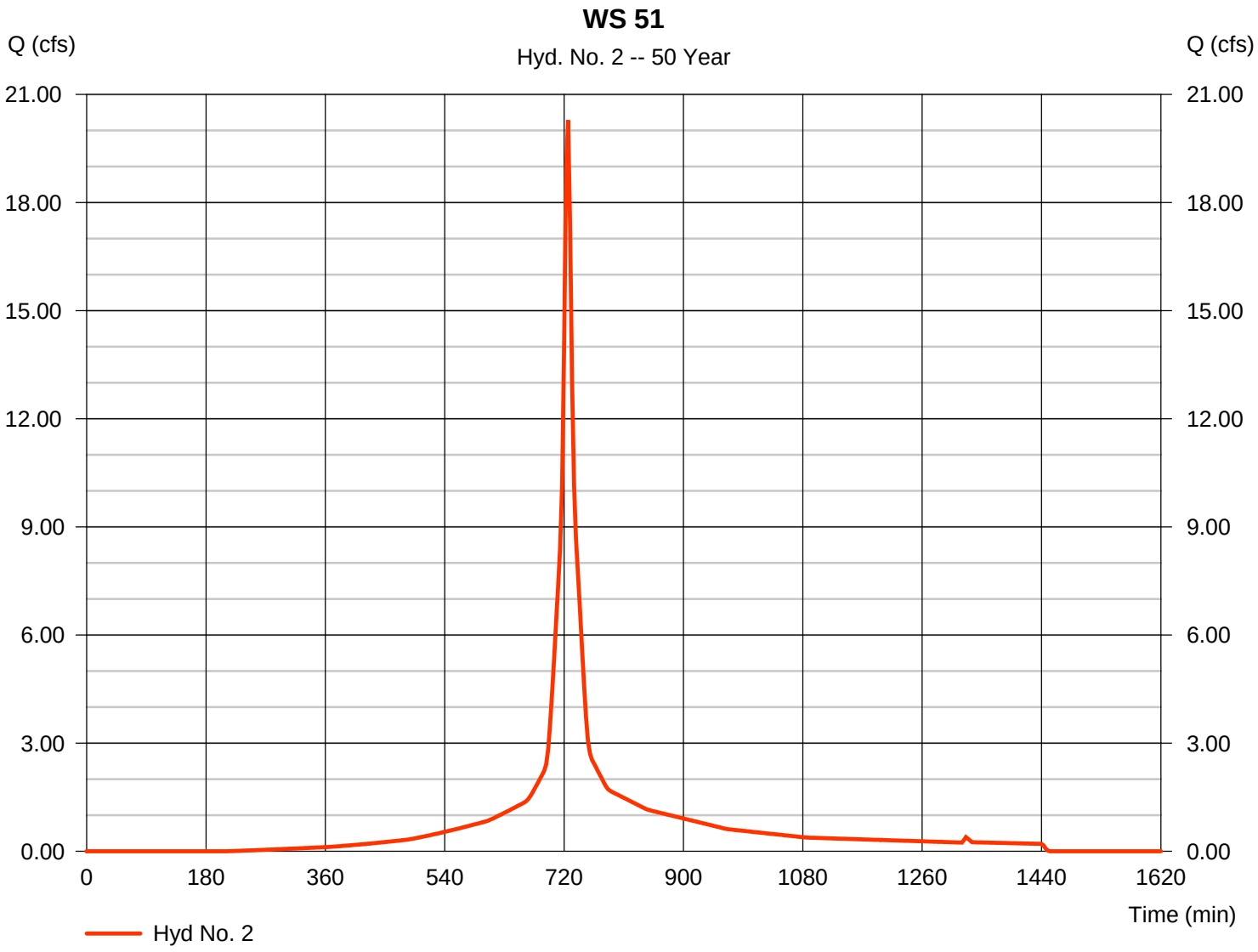
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 20.28 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 71,351 cuft
Drainage area	= 3.750 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



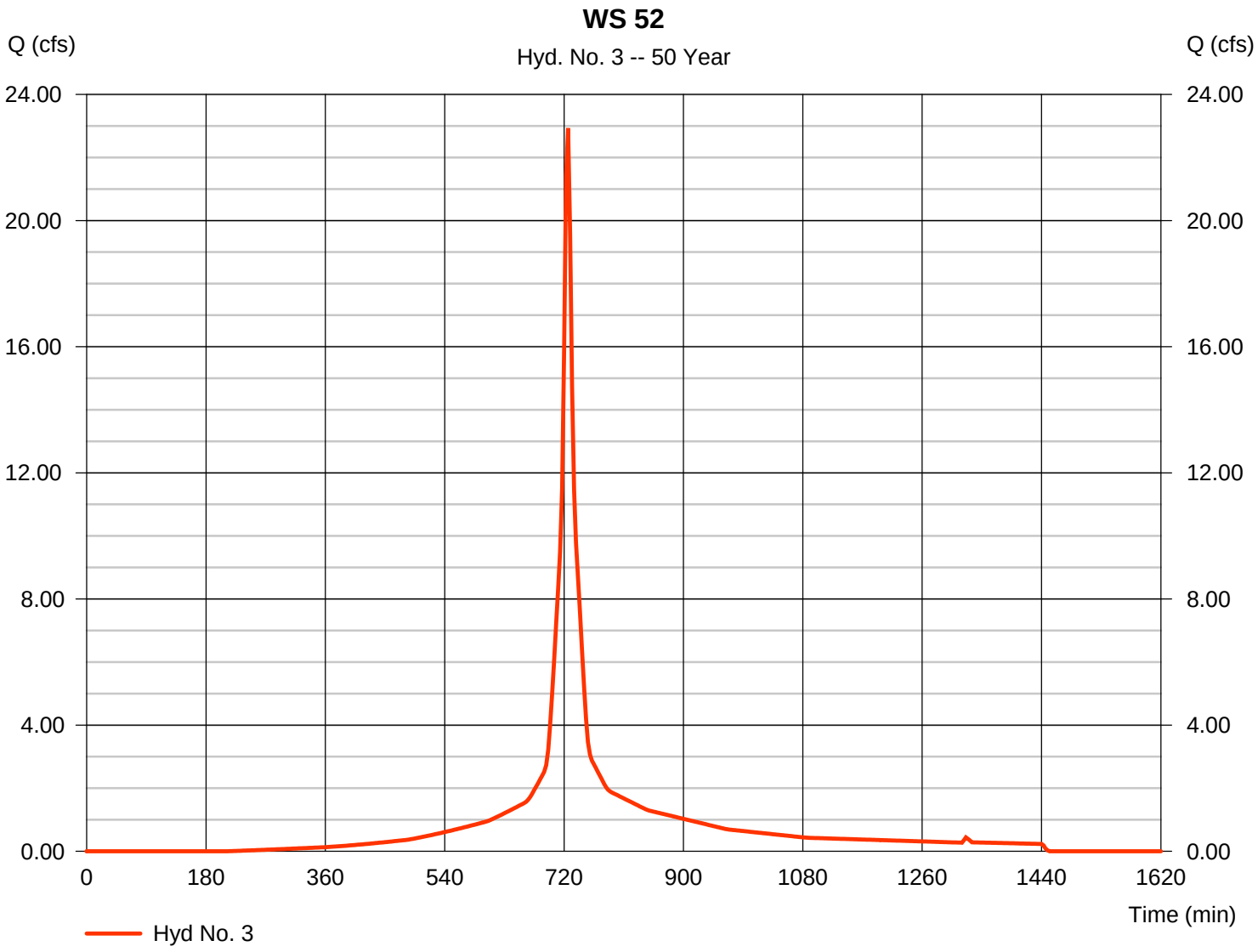
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 22.93 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 80,674 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



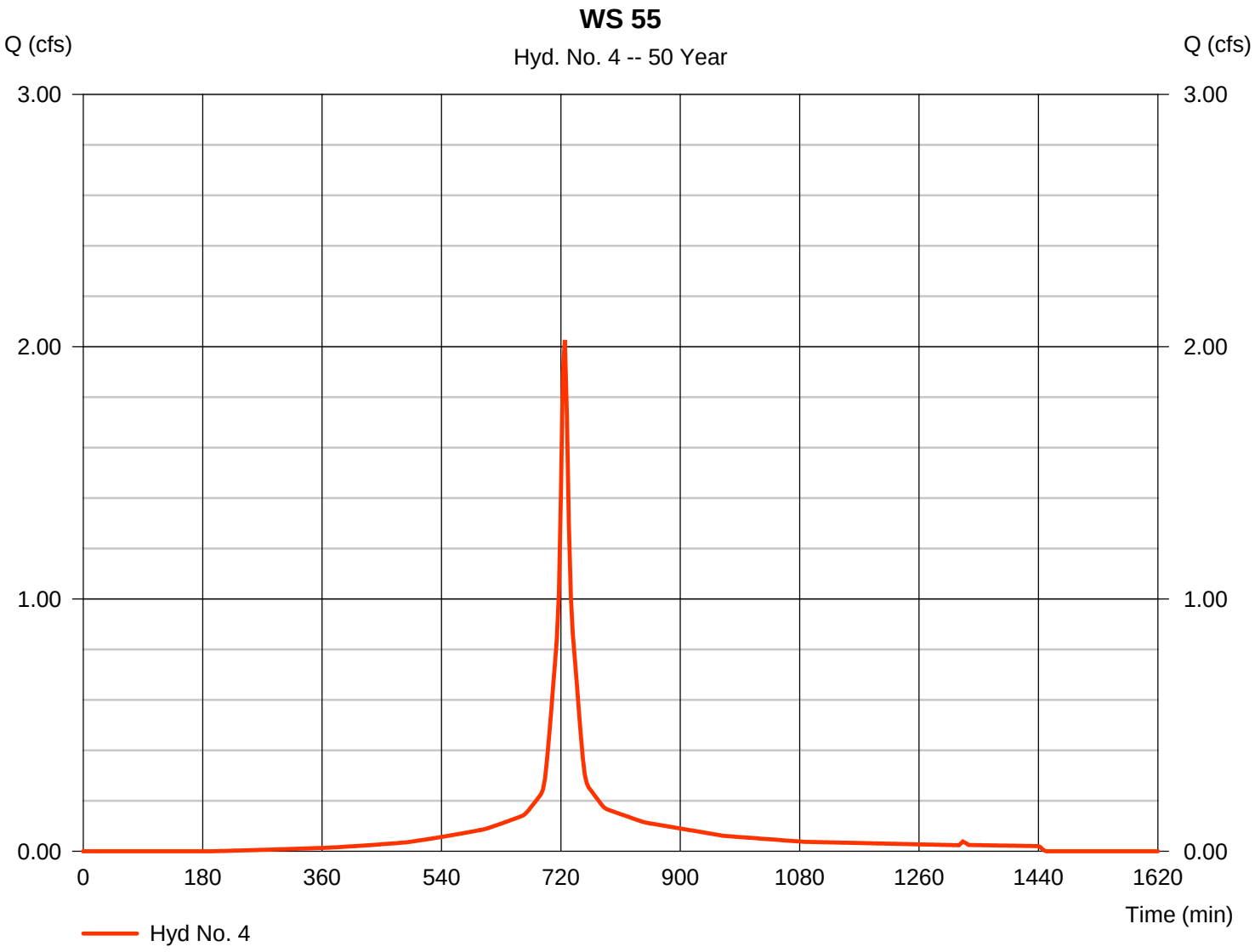
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 2.027 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 7,184 cuft
Drainage area	= 0.370 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



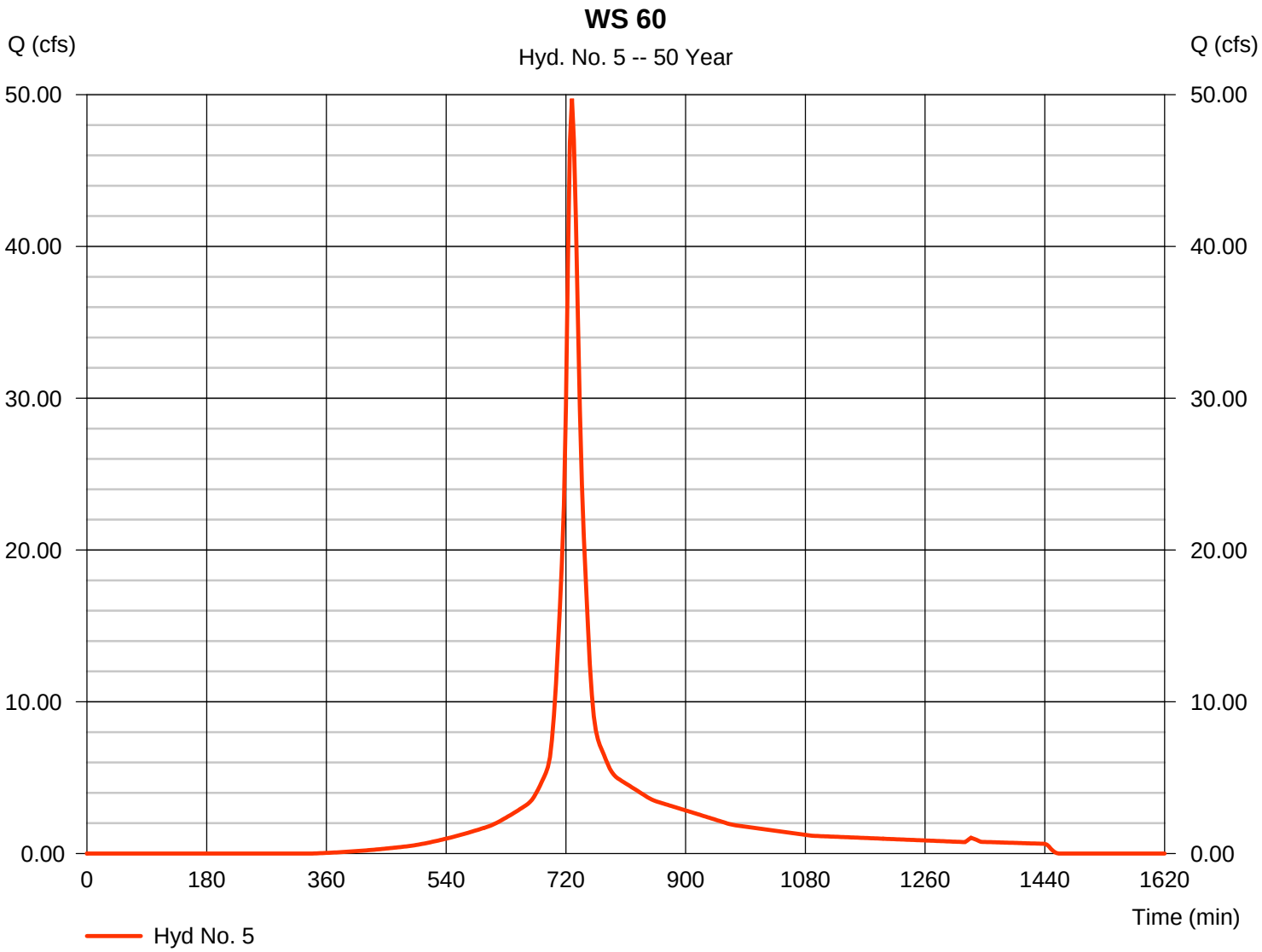
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 49.74 cfs
Storm frequency	= 50 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 198,268 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



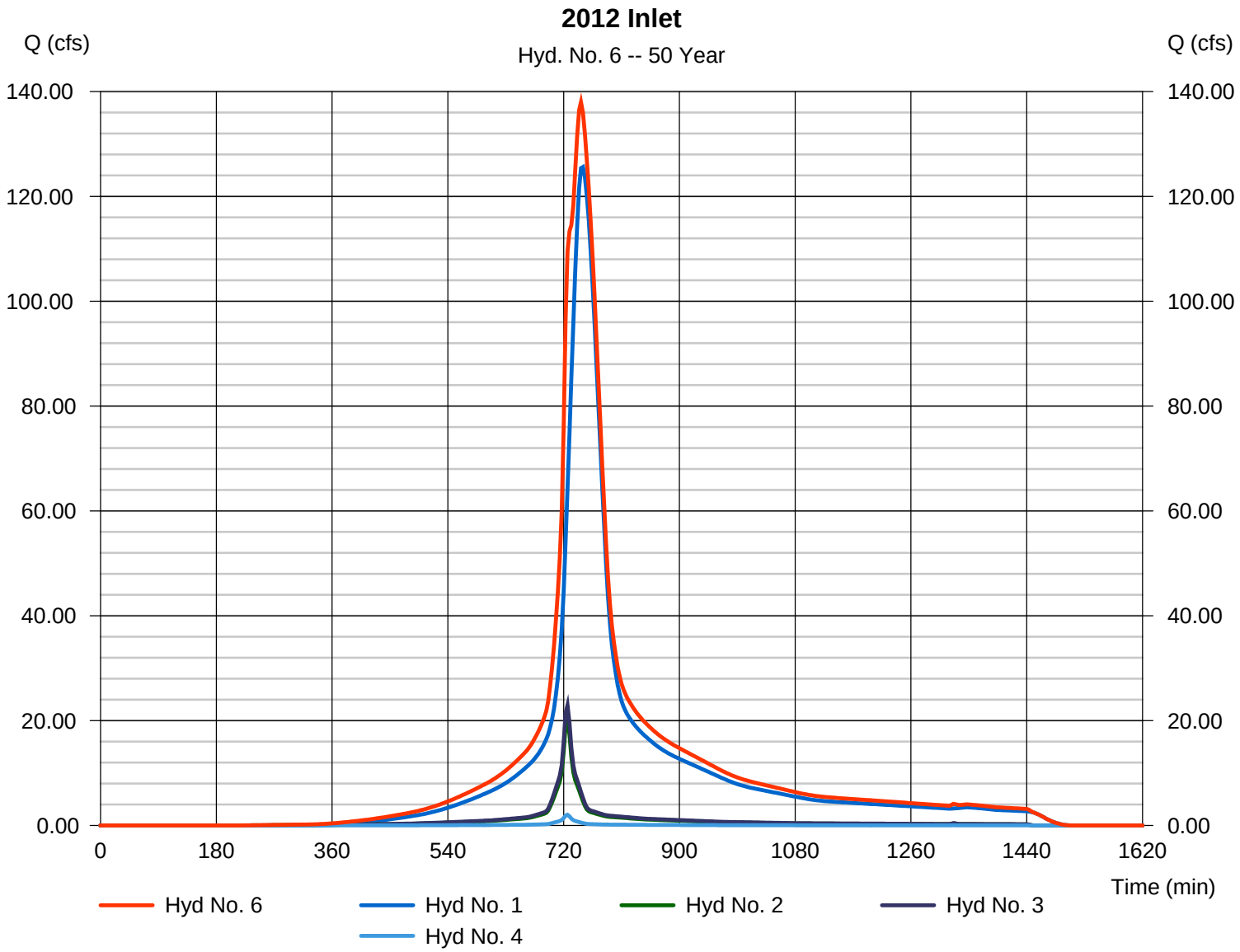
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 138.00 cfs
Storm frequency	= 50 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 972,362 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	154.20	3	750	1,006,382	------	------	------	WS 50
2	SCS Runoff	24.37	3	726	86,713	------	------	------	WS 51
3	SCS Runoff	27.55	3	726	98,043	------	------	------	WS 52
4	SCS Runoff	2.428	3	726	8,706	------	------	------	WS 55
5	SCS Runoff	61.23	3	729	246,163	------	------	------	WS 60
6	Combine	169.19	3	747	1,199,843	1, 2, 3, 4,	------	------	2012 Inlet

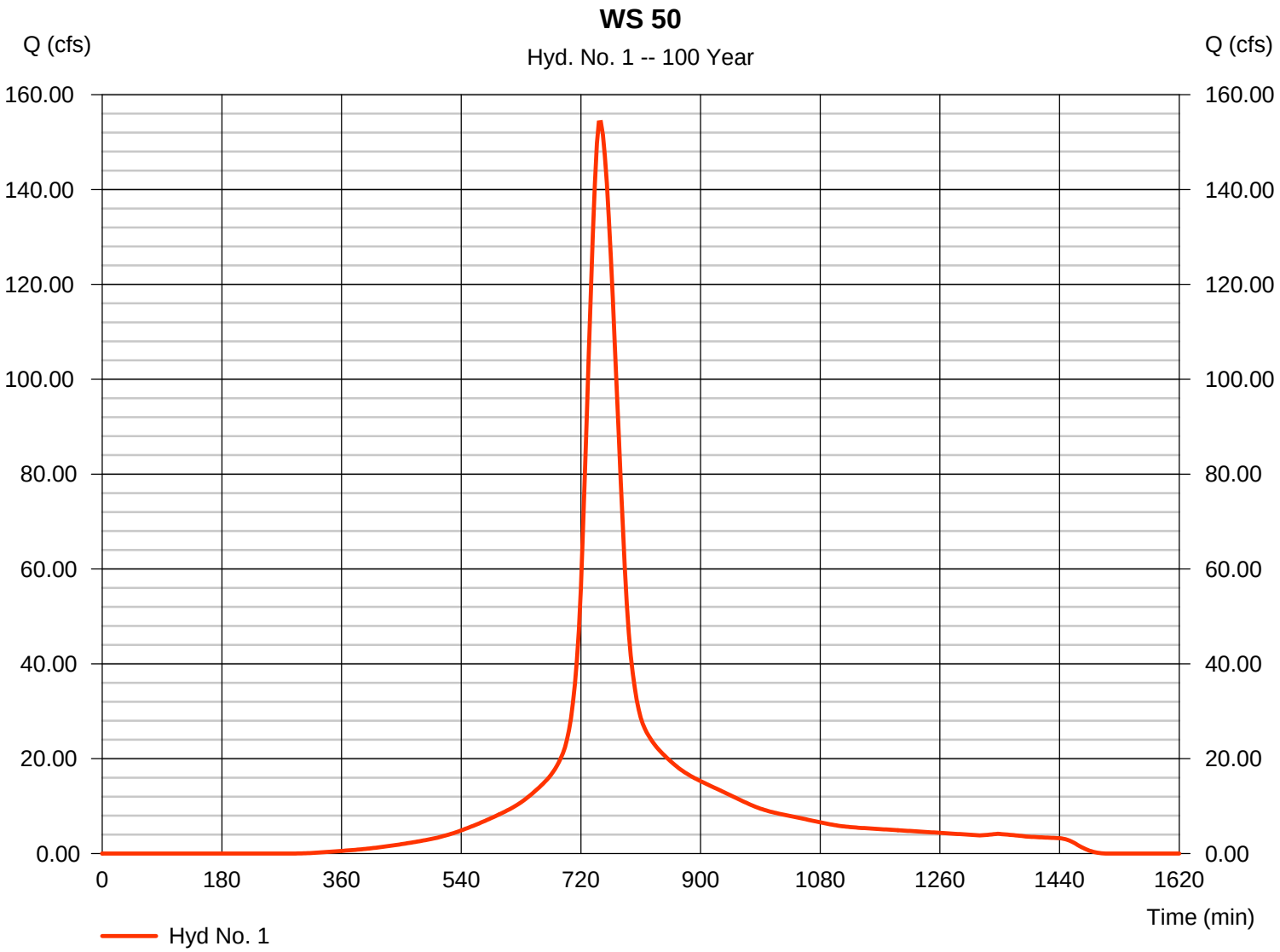
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 154.20 cfs
Storm frequency	= 100 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 1,006,382 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



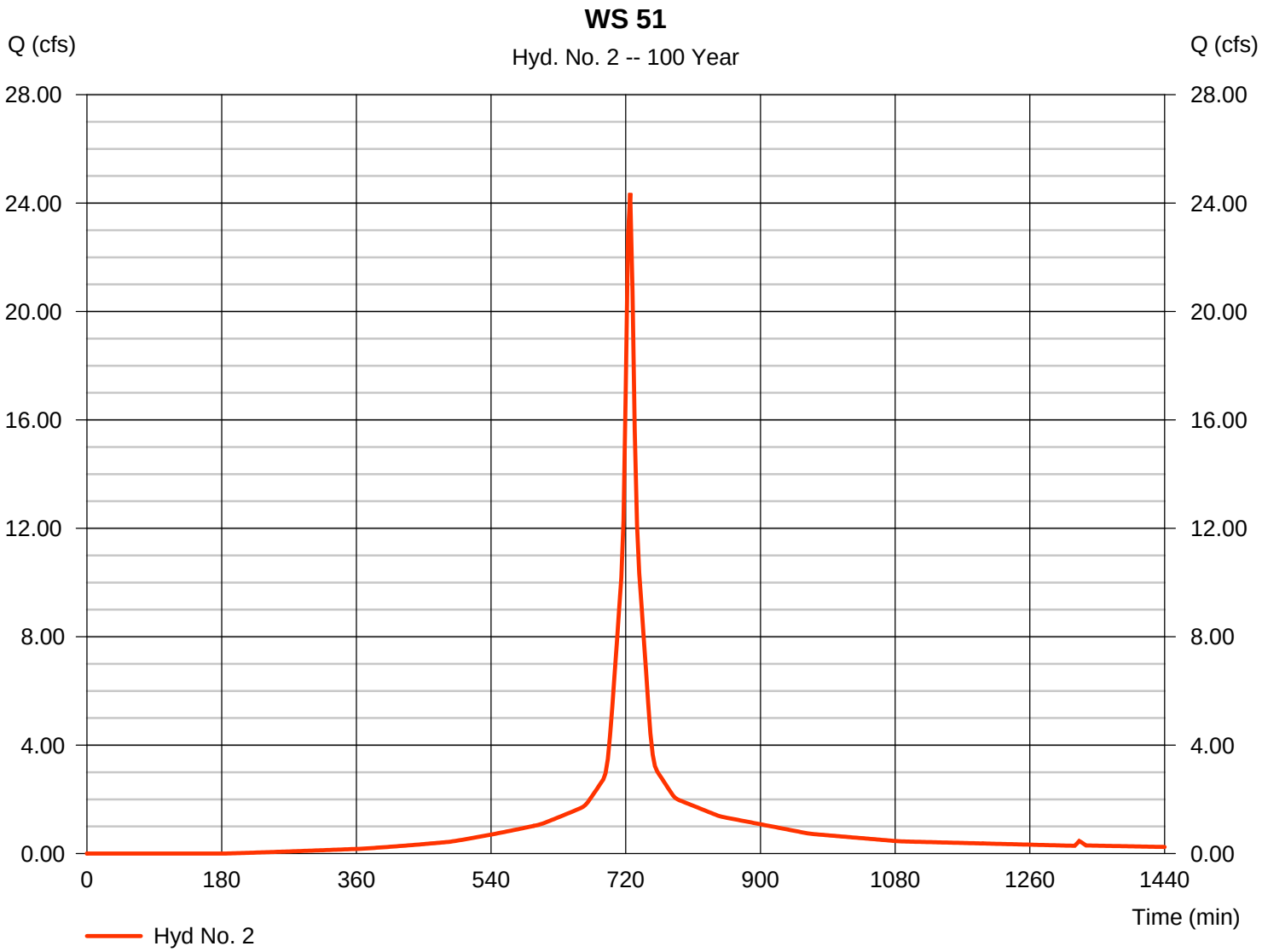
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	=	SCS Runoff	Peak discharge	=	24.37 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	86,713 cuft
Drainage area	=	3.750 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	8.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



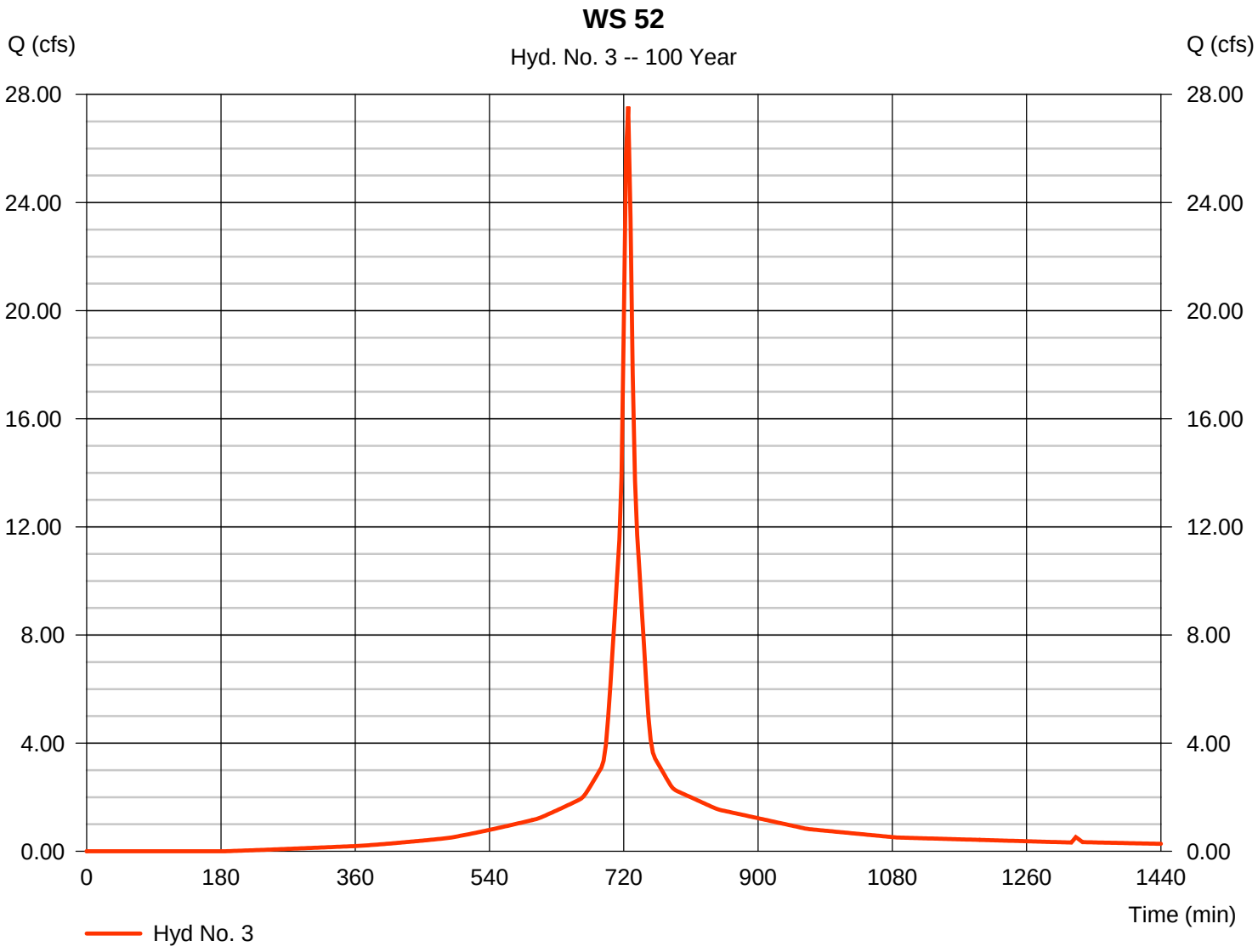
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 27.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 98,043 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



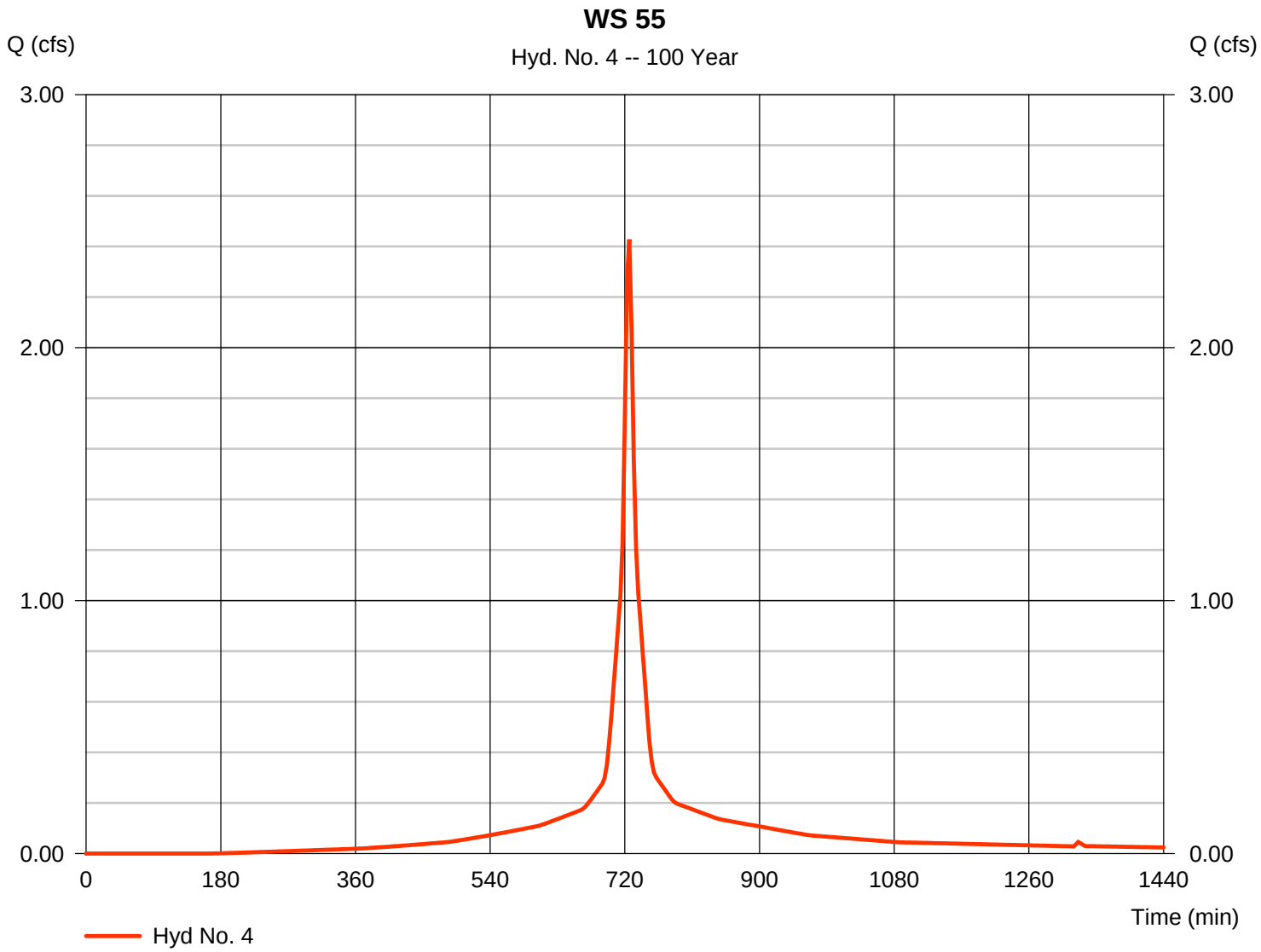
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.428 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	8,706 cuft
Drainage area	=	0.370 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	8.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



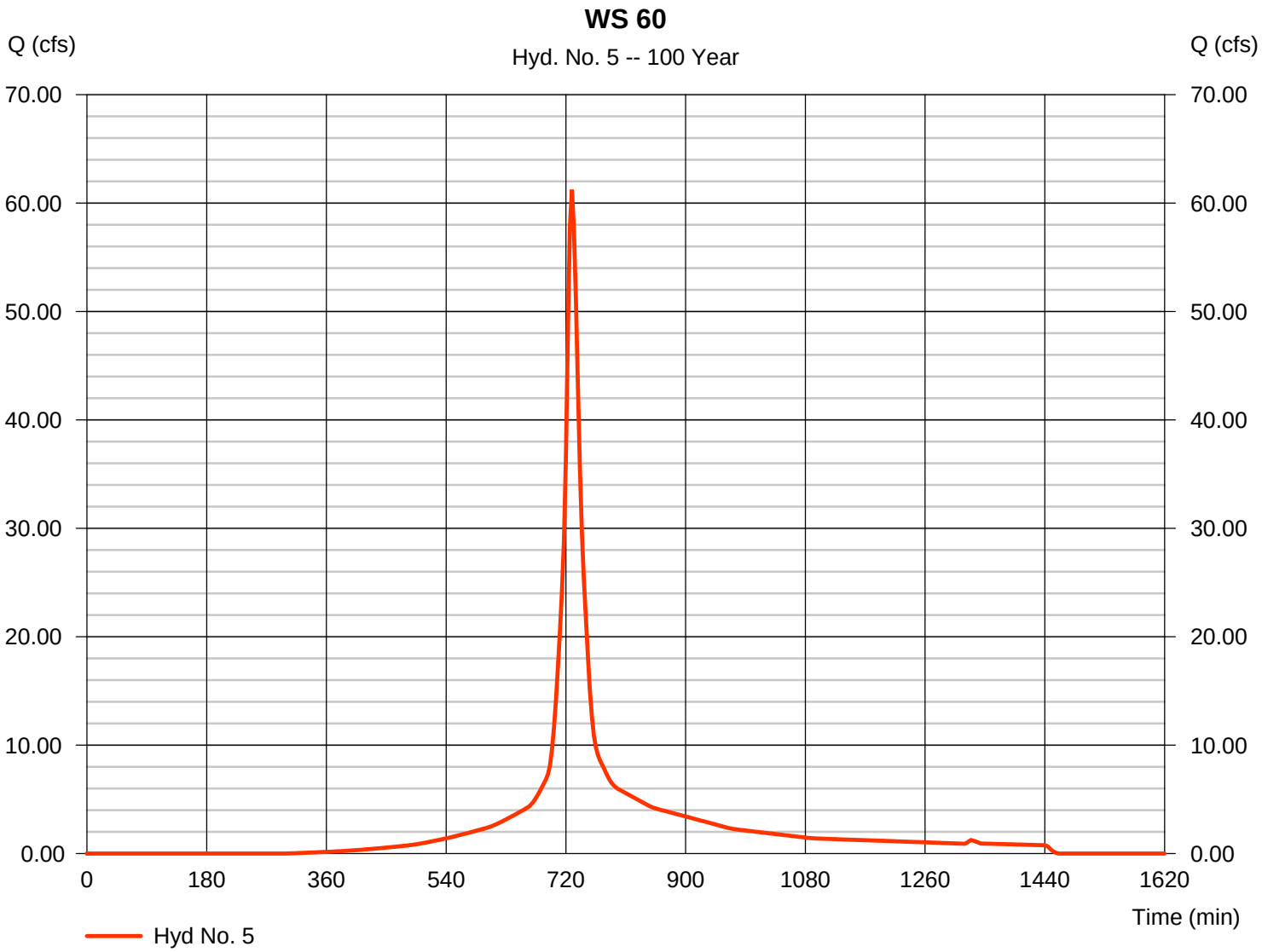
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 61.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 246,163 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.11 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



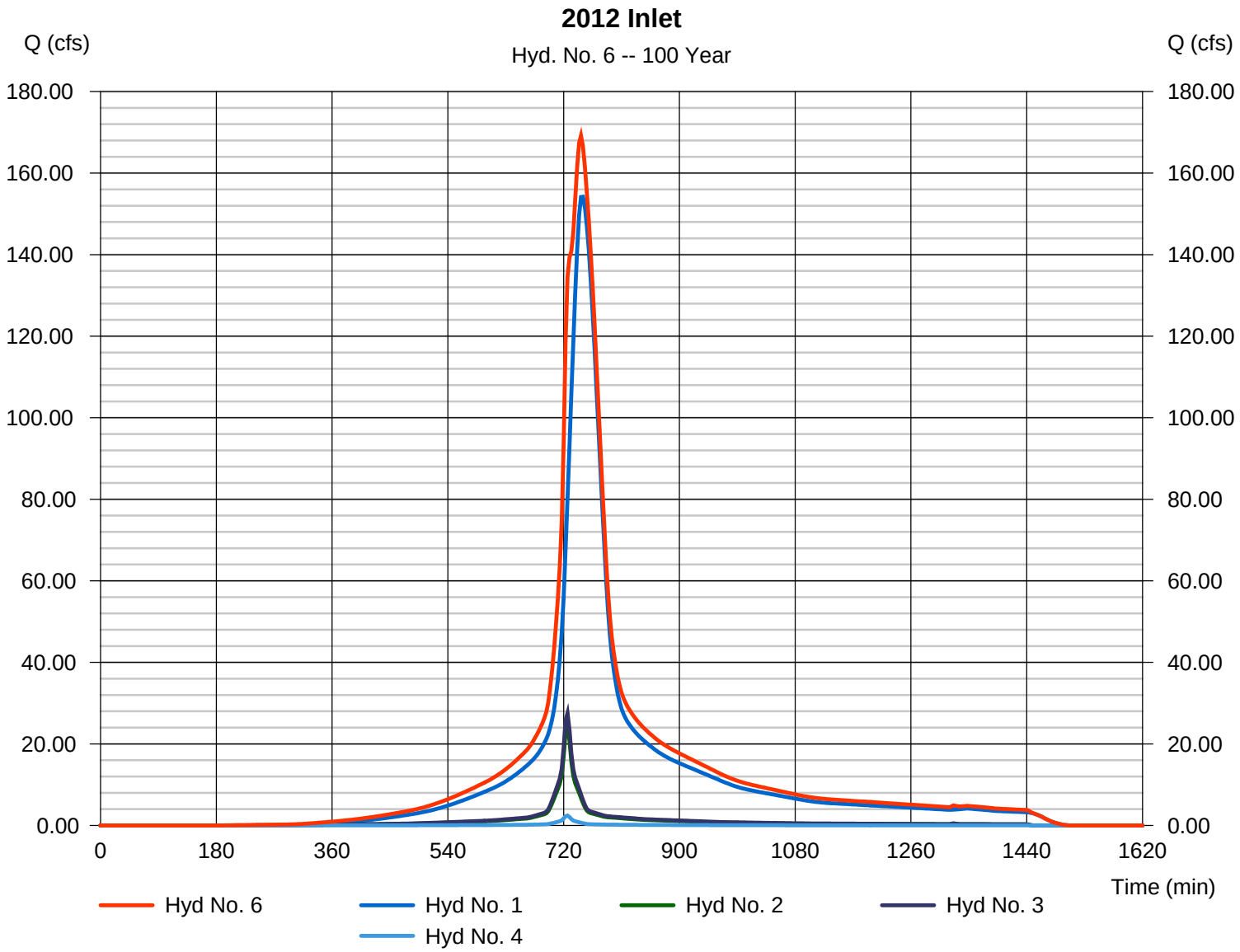
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

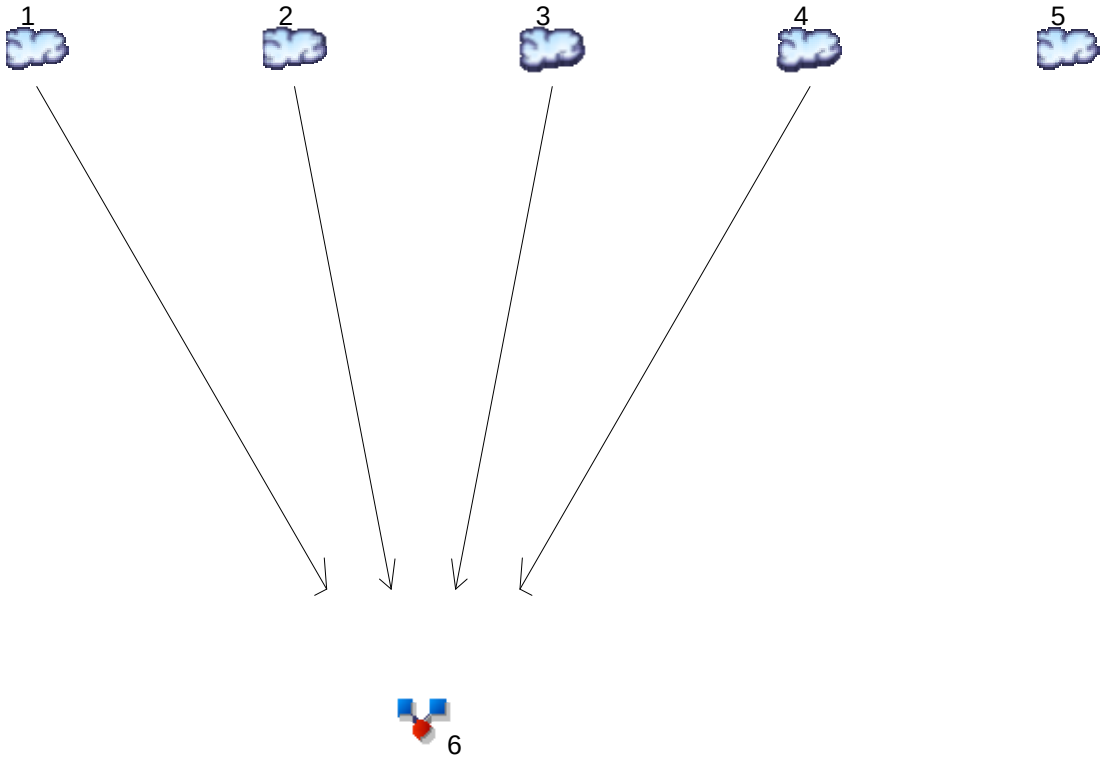
2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 169.19 cfs
Storm frequency	= 100 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 1,199,843 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	1984 WS 50
2	SCS Runoff	1984 WS 51
3	SCS Runoff	1984 WS 52
4	SCS Runoff	1984 WS 55
5	SCS Runoff	1984 WS 60
6	Combine	1984 Inlet

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	41.95	-------	-------	75.37	101.45	125.61	154.20	1984 WS 50
2	SCS Runoff	------	-------	5.124	-------	-------	9.801	13.53	17.01	21.16	1984 WS 51
3	SCS Runoff	------	-------	7.048	-------	-------	12.58	16.88	20.85	25.54	1984 WS 52
4	SCS Runoff	------	-------	0.816	-------	-------	1.312	1.686	2.027	2.428	1984 WS 55
5	SCS Runoff	------	-------	14.68	-------	-------	27.72	38.07	47.73	59.21	1984 WS 60
6	Combine	1, 2, 3, 4,	-------	45.63	-------	-------	82.10	110.58	136.97	168.21	1984 Inlet

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	41.95	3	750	268,967	------	------	------	1984 WS 50
2	SCS Runoff	5.124	3	726	17,251	------	------	------	1984 WS 51
3	SCS Runoff	7.048	3	726	23,456	------	------	------	1984 WS 52
4	SCS Runoff	0.816	3	726	2,754	------	------	------	1984 WS 55
5	SCS Runoff	14.68	3	729	58,497	------	------	------	1984 WS 60
6	Combine	45.63	3	747	312,427	1, 2, 3, 4,	------	------	1984 Inlet

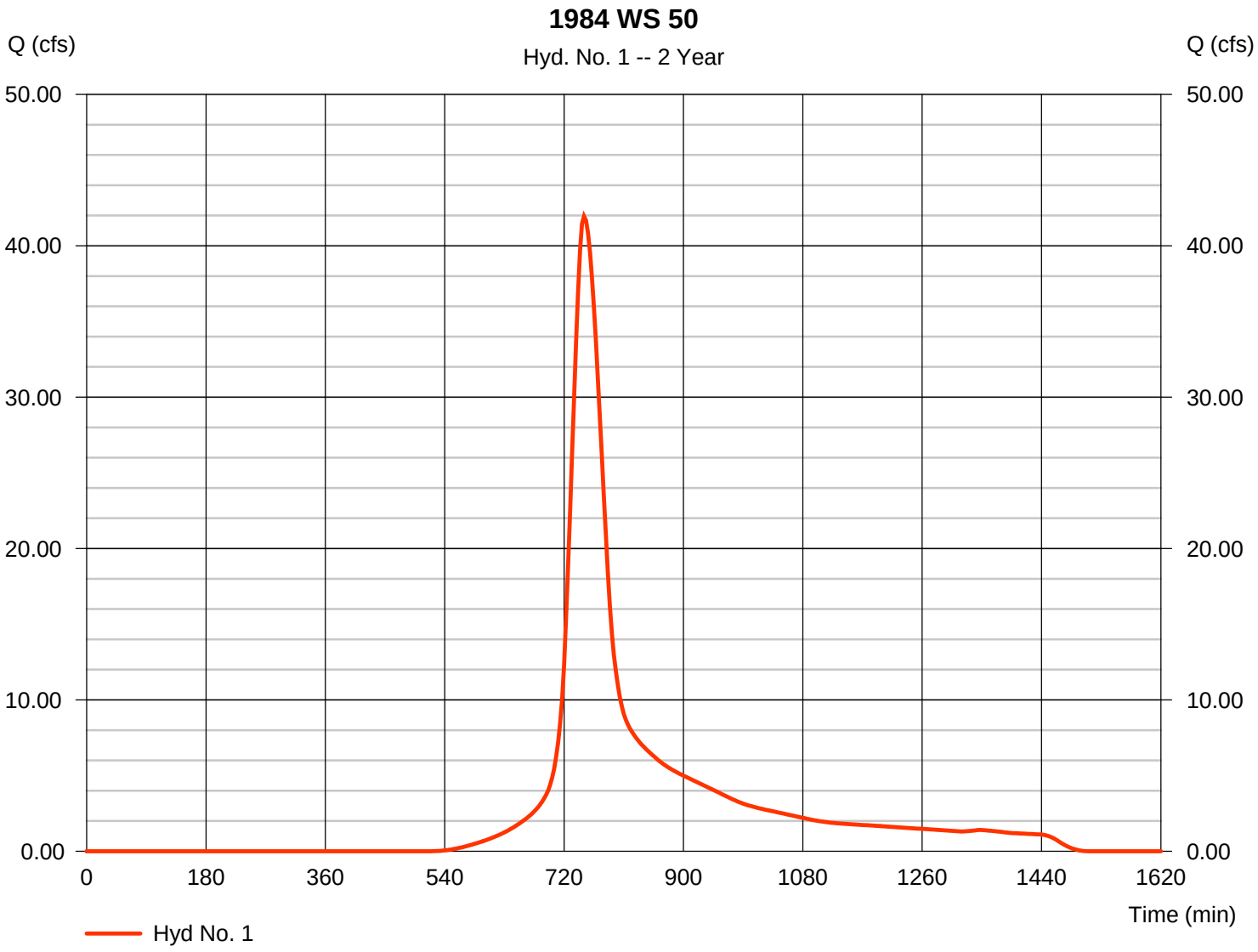
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 41.95 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 268,967 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	75.37	3	750	481,965	------	------	------	1984 WS 50
2	SCS Runoff	9.801	3	726	32,590	------	------	------	1984 WS 51
3	SCS Runoff	12.58	3	726	42,032	------	------	------	1984 WS 52
4	SCS Runoff	1.312	3	726	4,529	------	------	------	1984 WS 55
5	SCS Runoff	27.72	3	729	109,021	------	------	------	1984 WS 60
6	Combine	82.10	3	747	561,116	1, 2, 3, 4,	------	------	1984 Inlet

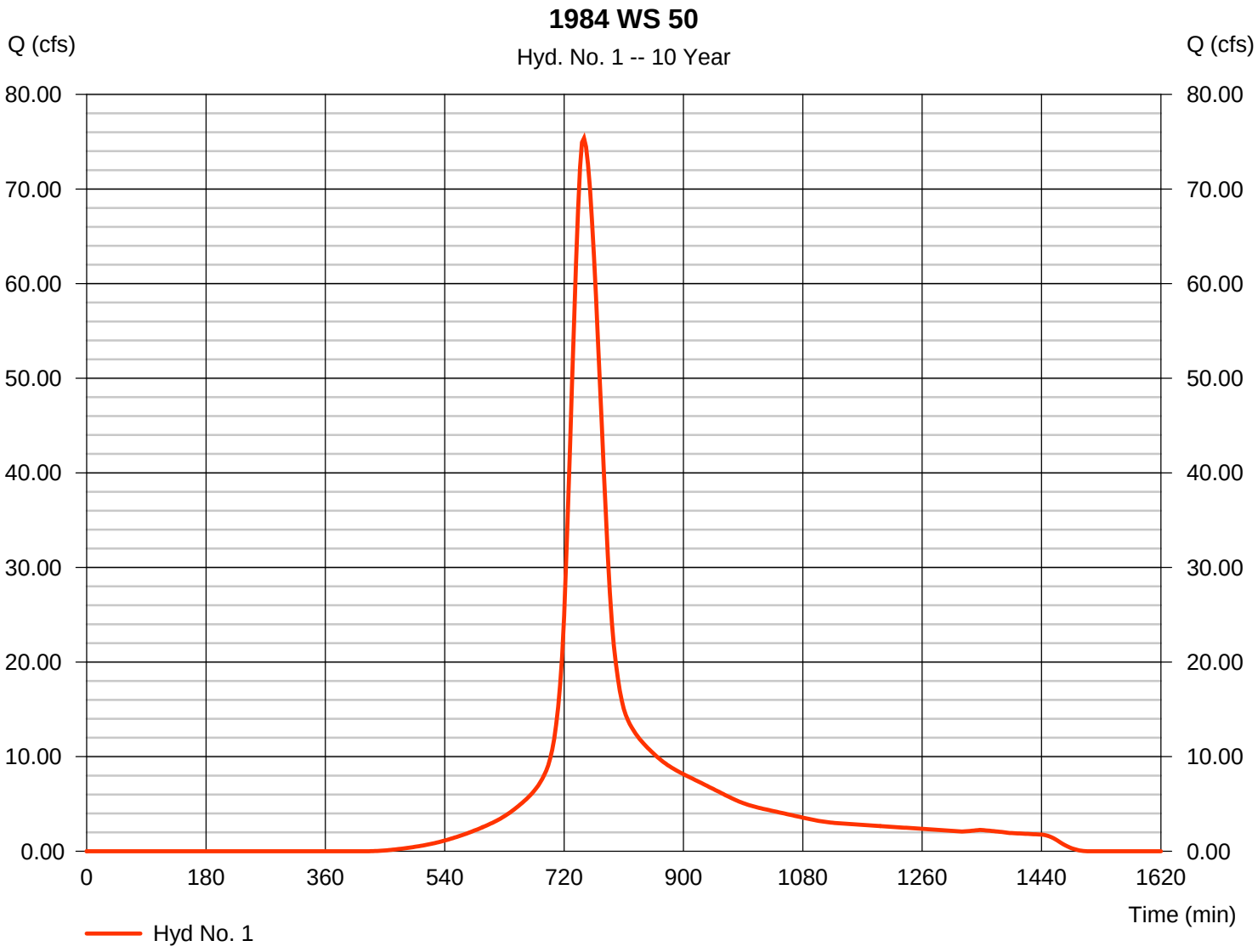
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 75.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 481,965 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 4.71 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	101.45	3	750	652,410	------	------	------	1984 WS 50
2	SCS Runoff	13.53	3	726	45,139	------	------	------	1984 WS 51
3	SCS Runoff	16.88	3	726	56,896	------	------	------	1984 WS 52
4	SCS Runoff	1.686	3	726	5,906	------	------	------	1984 WS 55
5	SCS Runoff	38.07	3	729	150,118	------	------	------	1984 WS 60
6	Combine	110.58	3	747	760,352	1, 2, 3, 4,	------	------	1984 Inlet

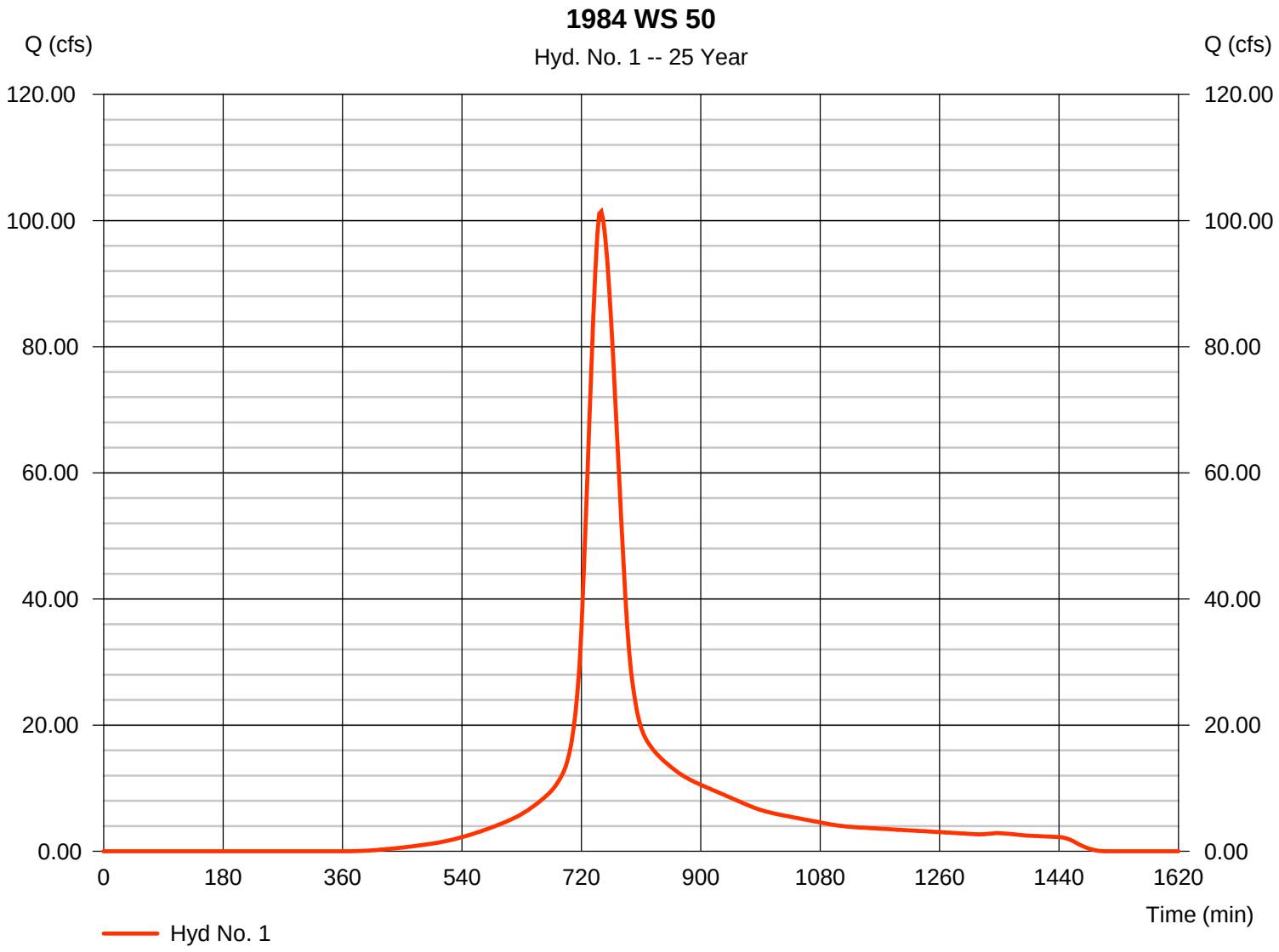
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 101.45 cfs
Storm frequency	= 25 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 652,410 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	125.61	3	750	813,152	------	------	------	1984 WS 50
2	SCS Runoff	17.01	3	726	57,105	------	------	------	1984 WS 51
3	SCS Runoff	20.85	3	726	70,914	------	------	------	1984 WS 52
4	SCS Runoff	2.027	3	726	7,184	------	------	------	1984 WS 55
5	SCS Runoff	47.73	3	729	189,189	------	------	------	1984 WS 60
6	Combine	136.97	3	747	948,356	1, 2, 3, 4,	------	------	1984 Inlet

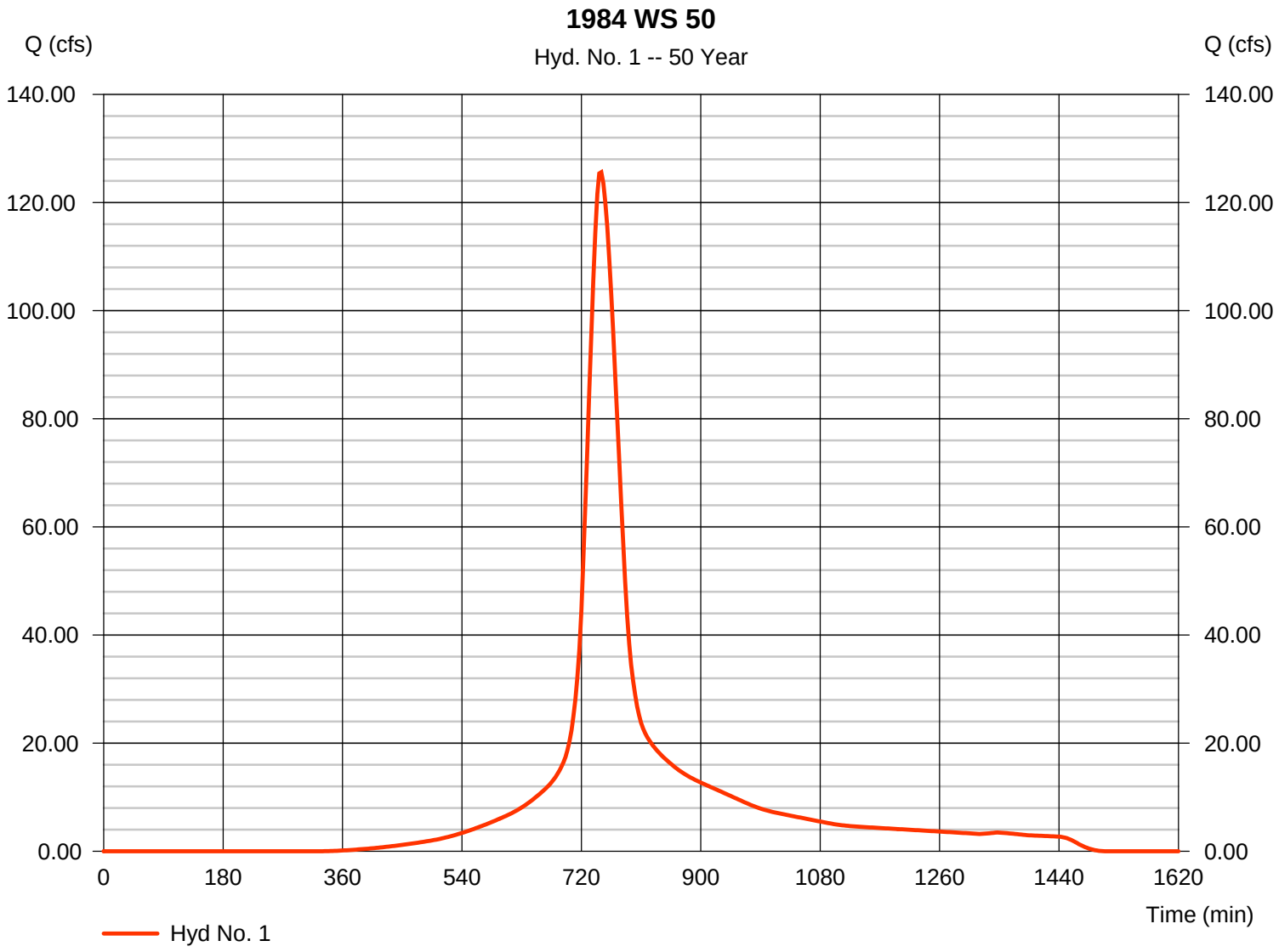
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 125.61 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 813,152 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	154.20	3	750	1,006,382	------	------	------	1984 WS 50
2	SCS Runoff	21.16	3	726	71,598	------	------	------	1984 WS 51
3	SCS Runoff	25.54	3	726	87,766	------	------	------	1984 WS 52
4	SCS Runoff	2.428	3	726	8,706	------	------	------	1984 WS 55
5	SCS Runoff	59.21	3	729	236,421	------	------	------	1984 WS 60
6	Combine	168.21	3	747	1,174,452	1, 2, 3, 4,	------	------	1984 Inlet

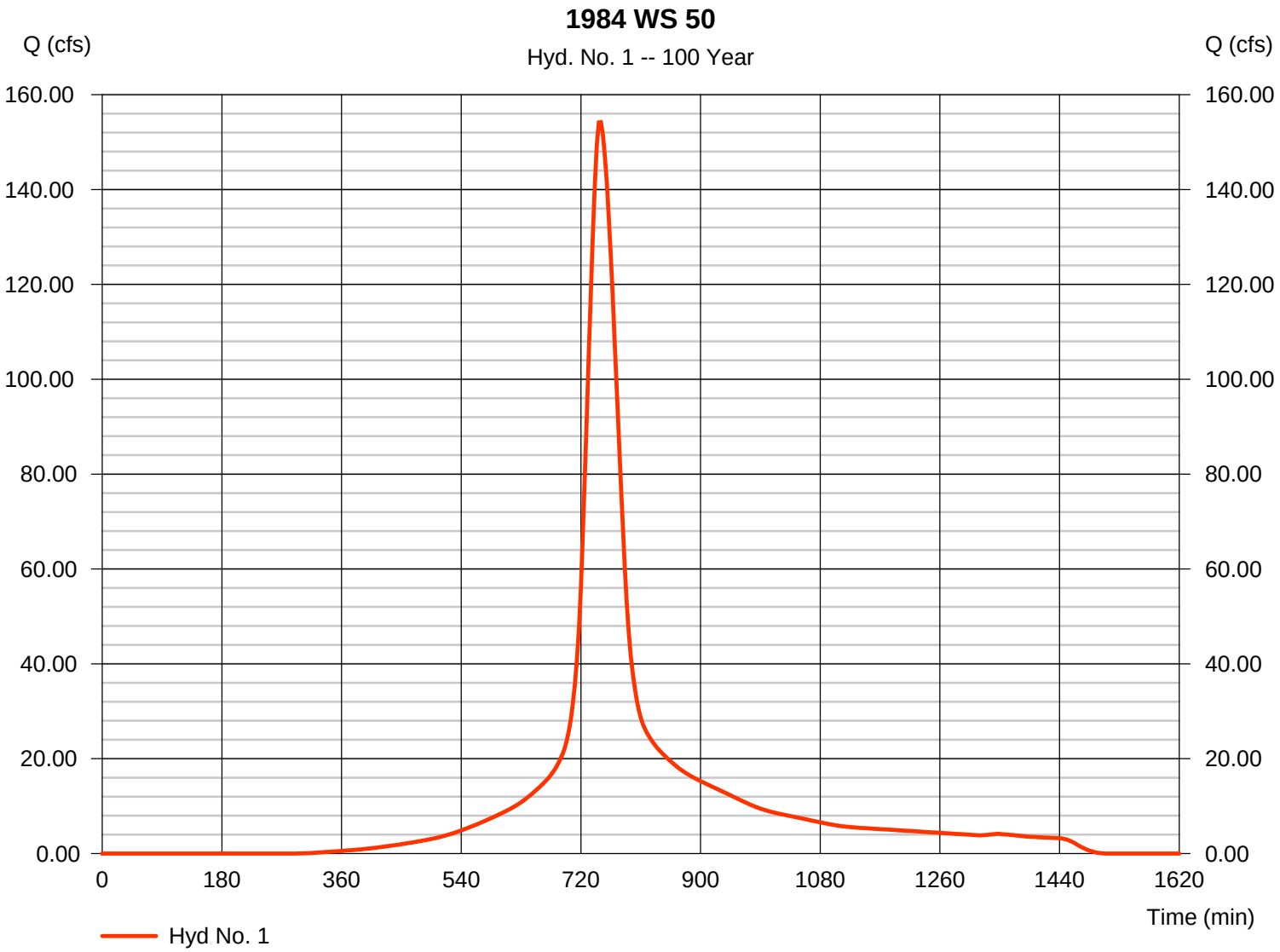
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	=	SCS Runoff	Peak discharge	=	154.20 cfs
Storm frequency	=	100 yrs	Time to peak	=	750 min
Time interval	=	3 min	Hyd. volume	=	1,006,382 cuft
Drainage area	=	45.580 ac	Curve number	=	83
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	42.00 min
Total precip.	=	8.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 50- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	Lawn / Open space - good (off campus)	61			1.50	91.50
HSG C	Lawn / Open space - good (off campus)	74			0.40	29.60
HSG B	Woods - good condition (off campus)	55			6.35	349.25
HSG C	Woods - good condition (off campus)	70			2.13	149.10
HSG C	1/4 acre Residential District (off campus)	83			0.69	57.27
HSG C	1/4 acre Residential District (off campus)	83			19.19	1592.77
N/A	Existing impervious / paved (off campus)	98			15.02	1471.96
N/A	Existing impervious / paved	98			0.15	14.70
HSG C	Lawn / Open space - good	74			0.15	11.10
				Totals =	45.58	3767.25
					(0.0712	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{3767.25}{45.58}$$

Use CN = **83**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 50- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved (off campus)	98			0.05	4.90
N/A	Existing impervious / paved	98			1.78	174.44
HSG C	Lawn / Open space - good	74			1.91	141.34
				Totals =	3.74	320.68
					(0.0058 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{320.68}{3.74}$$

Use CN = **86**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 50- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved	98			2.24	219.52
HSG C	Lawn / Open space - good	74			2.00	148.00
				Totals =	4.24	367.52
					(0.0066	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{367.52}{4.24}$$

Use CN = **87**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 50- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved	98			0.31	30.38
HSG C	Lawn / Open space - good	74			0.06	4.44
				Totals =	0.37	34.82
					(0.0006	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{34.82}{0.37}$$

Use CN = **94**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Watershed: WS 60- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres / Sq. Ft. / %)	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			3.84	284.16
N/A	Existing impervious / paved	98			1.63	159.74
HSG C	1/4 acre Residential District	83			5.90	489.70
				Totals =	11.37	933.60
					(0.0178	sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{933.60}{11.37}$ Use CN = **82**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 50- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	Lawn / Open space - good (off campus)	61			1.50	91.50
HSG C	Lawn / Open space - good (off campus)	74			0.40	29.60
HSG B	Woods - good condition (off campus)	55			6.35	349.25
HSG C	Woods - good condition (off campus)	70			2.13	149.10
HSG C	1/4 acre Residential District (off campus)	83			19.88	1650.04
HSG D	1/4 acre Residential District (off campus)	87				
N/A	Existing impervious / paved (off campus)	98			15.02	1471.96
N/A	Existing impervious / paved	98			0.15	14.70
HSG C	Lawn / Open space - good	74			0.15	11.10
				Totals =	45.58	3767.25
					(0.0712	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{3767.25}{45.58}$$

Use CN = **83**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 50- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved (off campus)	98			0.05	4.90
N/A	Existing impervious / paved	98			2.36	231.28
HSG C	Lawn / Open space - good	74			1.34	99.16
				Totals =	3.75	335.34
					(0.0059 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{335.34}{3.75}$$

Use CN = **89**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 50- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved	98			2.59	253.82
HSG C	Lawn / Open space - good	74			1.65	122.10
				Totals =	4.24	375.92
					(0.0066 sq mi)	

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{375.92}{4.24}$ Use CN = **89**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 50- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved	98			0.25	24.50
HSG C	Lawn / Open space - good	74			0.12	8.88
				Totals =	0.37	33.38
					(0.0006	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{33.38}{0.37}$$

Use CN = **90**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Watershed: WS 60- Existing Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1]			Area (Acres / Sq. Ft. / %)	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			3.84	284.16
N/A	Existing impervious / paved	98			1.63	159.74
HSG C	1/4 acre Residential District	83			5.90	489.70
				Totals =	11.37	933.60

(0.0178 sq mi)

[1] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{933.60}{11.37}$ Use CN = **82**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 50- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG B	Lawn / Open space - good (off campus)	61			1.50	91.50
HSG C	Lawn / Open space - good (off campus)	74			0.40	29.60
HSG B	Woods - good condition (off campus)	55			6.35	349.25
HSG C	Woods - good condition (off campus)	70			2.13	149.10
HSG C	1/4 acre Residential District (off campus)	83			0.69	57.27
HSG C	1/4 acre Residential District (off campus)	83			19.19	1592.77
N/A	Existing impervious / paved (off campus)	98			15.02	1471.96
N/A	Existing impervious / paved	98			0.00	0.00
HSG C	Lawn / Open space - good	74			0.30	22.20
				Totals =	45.58	3763.65
					(0.0712	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{3763.65}{45.58}$$

Use CN = **83**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 50- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved (off campus)	98			0.05	4.90
N/A	Existing impervious / paved	98			0.77	75.46
HSG C	Lawn / Open space - good	74			2.93	216.82
				Totals =	3.75	297.18
					(0.0059	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{297.18}{3.75}$$

Use CN = **79**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 50- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved	98			1.60	156.80
HSG C	Lawn / Open space - good	74			2.64	195.36
				Totals =	4.24	352.16
					(0.0066 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{352.16}{4.24}$$

Use CN = **83**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 50- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
N/A	Existing impervious / paved	98			0.24	23.52
HSG C	Lawn / Open space - good	74			0.13	9.62
				Totals =	0.37	33.14
					(0.0006	sq mi)

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{33.14}{0.37}$$

Use CN = **90**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 60- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres circled; Sq. Ft.; %)	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			4.62	341.88
N/A	Existing impervious / paved	98			0.85	83.30
HSG C	1/4 acre Residential District	83			5.90	489.70
				Totals =	11.37	914.88

[1.] Use only one CN value source per line.

(0.0178 sq mi)

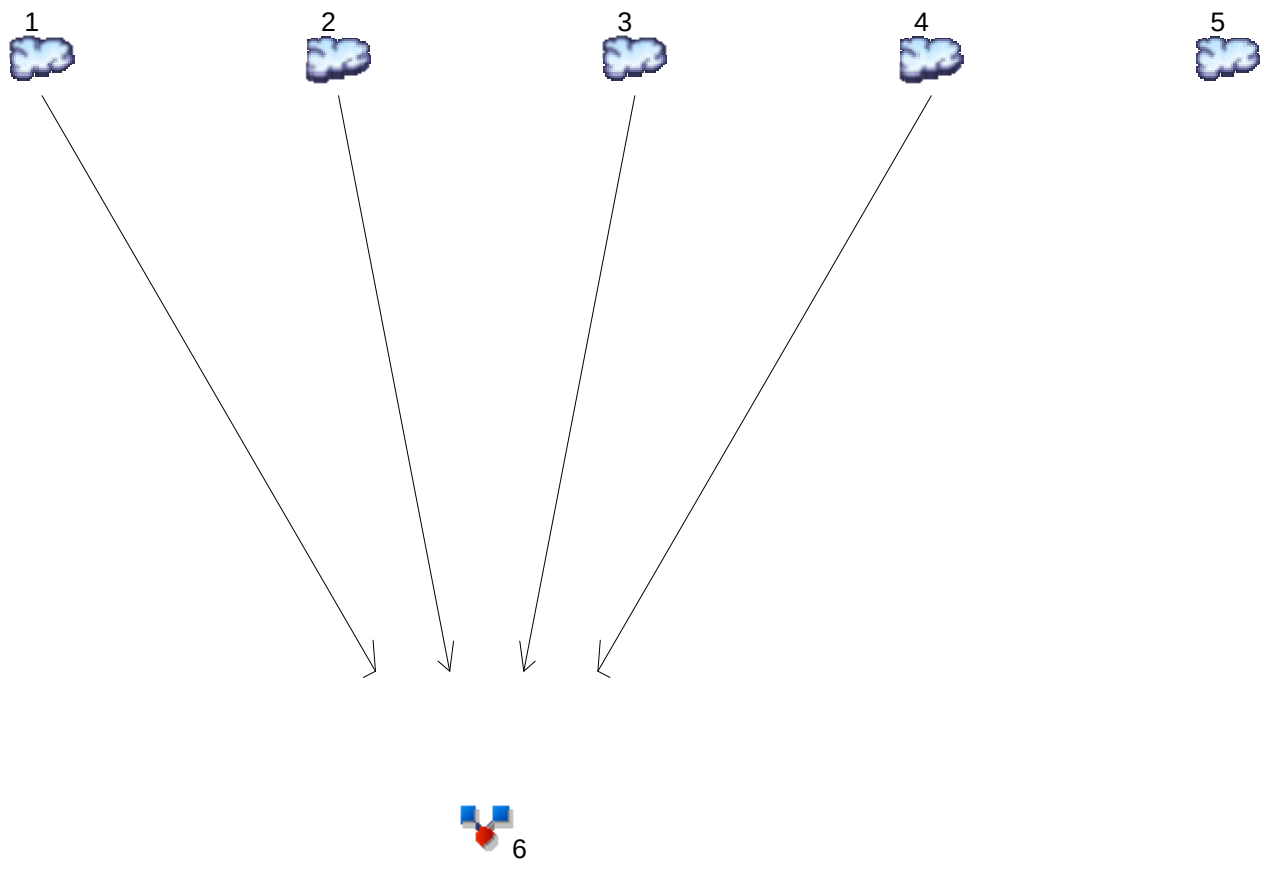
CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{914.88}{11.37}$ Use CN = **80**

APPENDIX E

Hydrologic Model Input and Output
Prospect Culvert Watershed
TP-40 Rainfall

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	2017 WS 50
2	SCS Runoff	2017 WS 51
3	SCS Runoff	2017 WS 52
4	SCS Runoff	2017 WS 55
5	SCS Runoff	2017 WS 60
6	Combine	2017 Inlet

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	41.51	-------	-------	77.44	93.57	109.80	126.07	2017 WS 50
2	SCS Runoff	------	-------	7.036	-------	-------	12.40	14.76	17.12	19.48	2017 WS 51
3	SCS Runoff	------	-------	8.287	-------	-------	14.37	17.04	19.71	22.37	2017 WS 52
4	SCS Runoff	------	-------	0.917	-------	-------	1.441	1.668	1.894	2.119	2017 WS 55
5	SCS Runoff	------	-------	16.05	-------	-------	30.41	36.88	43.39	49.93	2017 WS 60
6	Combine	1, 2, 3, 4,	-------	45.92	-------	-------	85.16	102.77	120.49	138.24	2017 Inlet

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	41.51	3	750	266,248	------	------	------	2017 WS 50
2	SCS Runoff	7.036	3	726	23,419	------	------	------	2017 WS 51
3	SCS Runoff	8.287	3	726	27,630	------	------	------	2017 WS 52
4	SCS Runoff	0.917	3	726	3,203	------	------	------	2017 WS 55
5	SCS Runoff	16.05	3	729	63,482	------	------	------	2017 WS 60
6	Combine	45.92	3	747	320,500	1, 2, 3, 4,	------	------	2017 Inlet

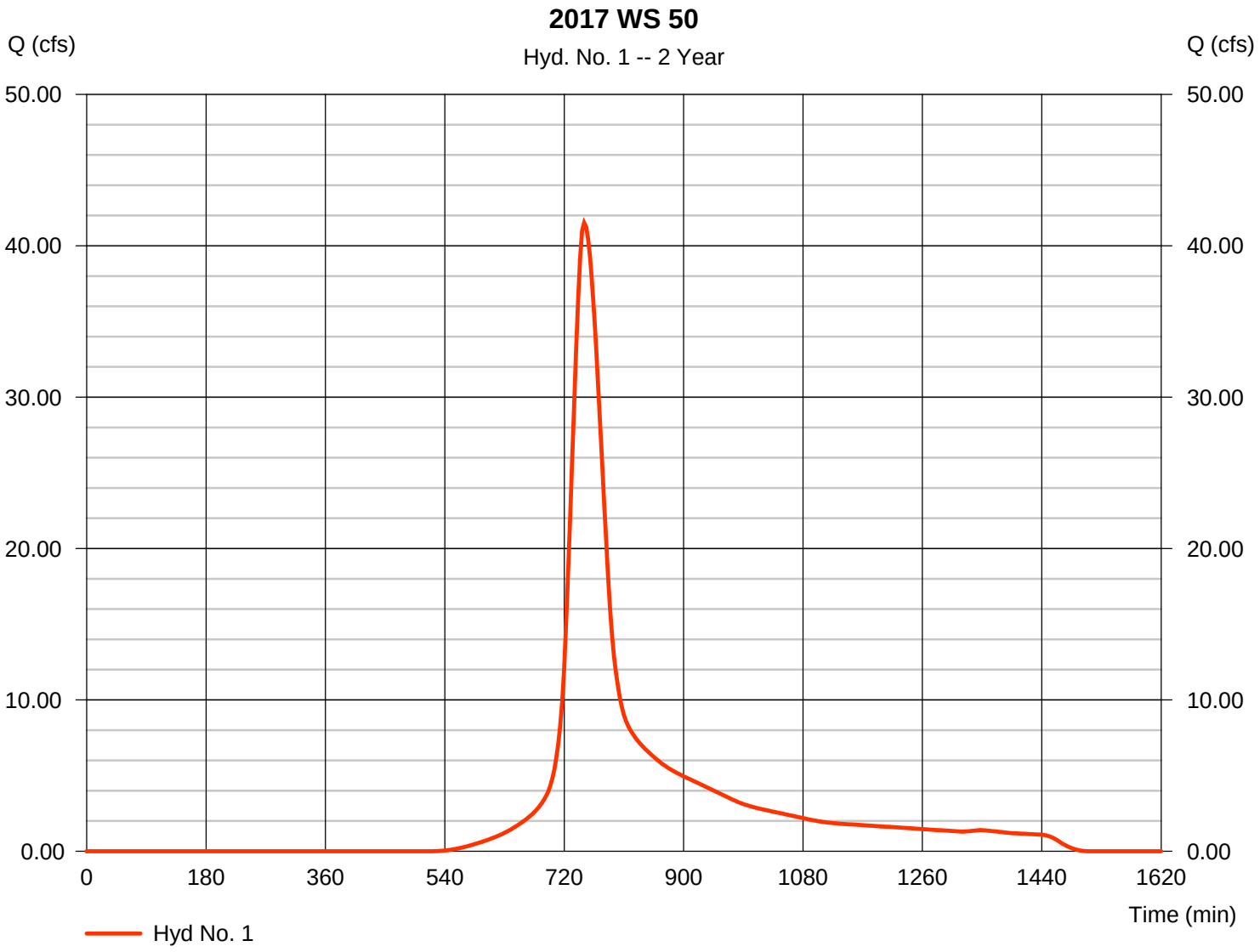
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 41.51 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 266,248 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



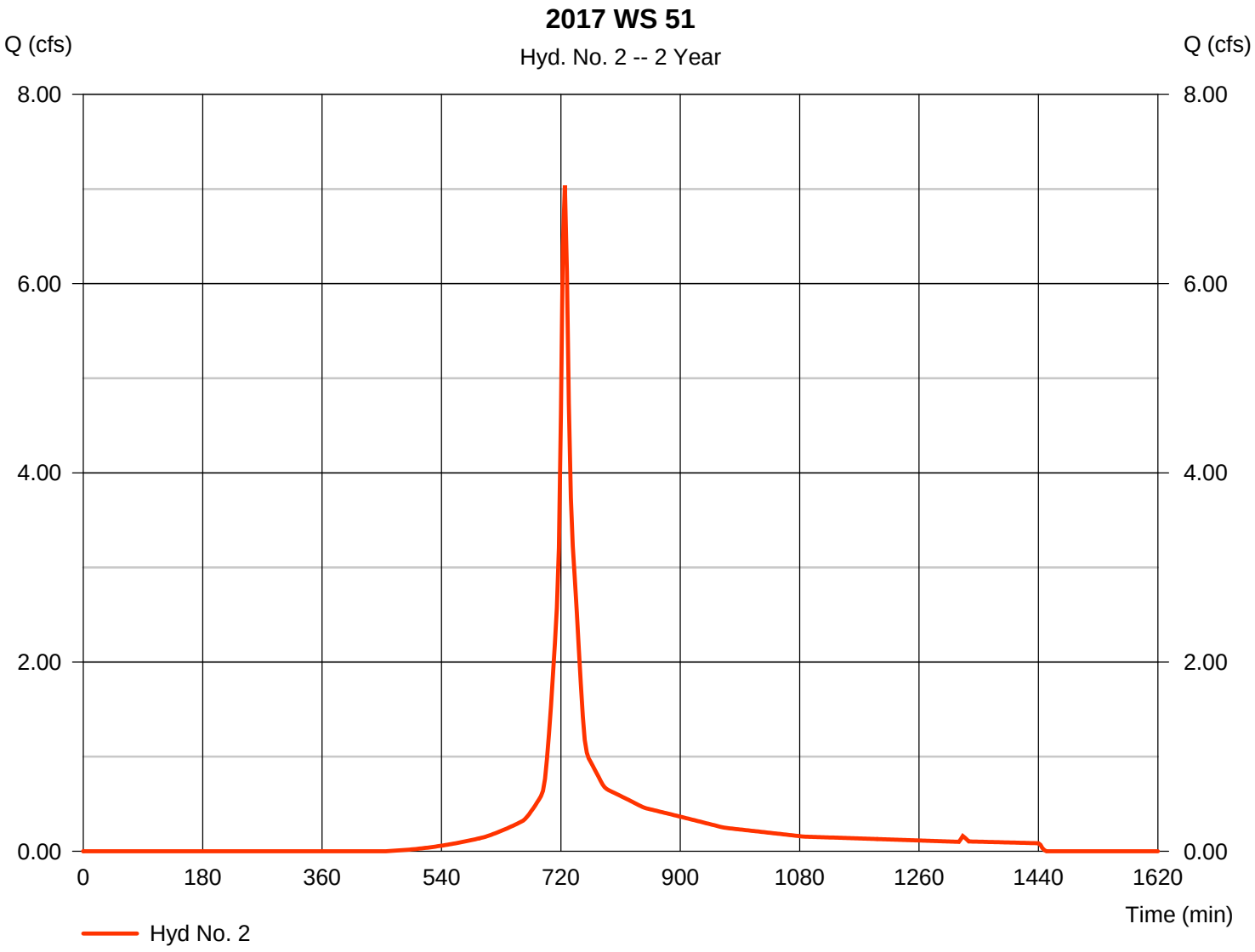
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 7.036 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 23,419 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



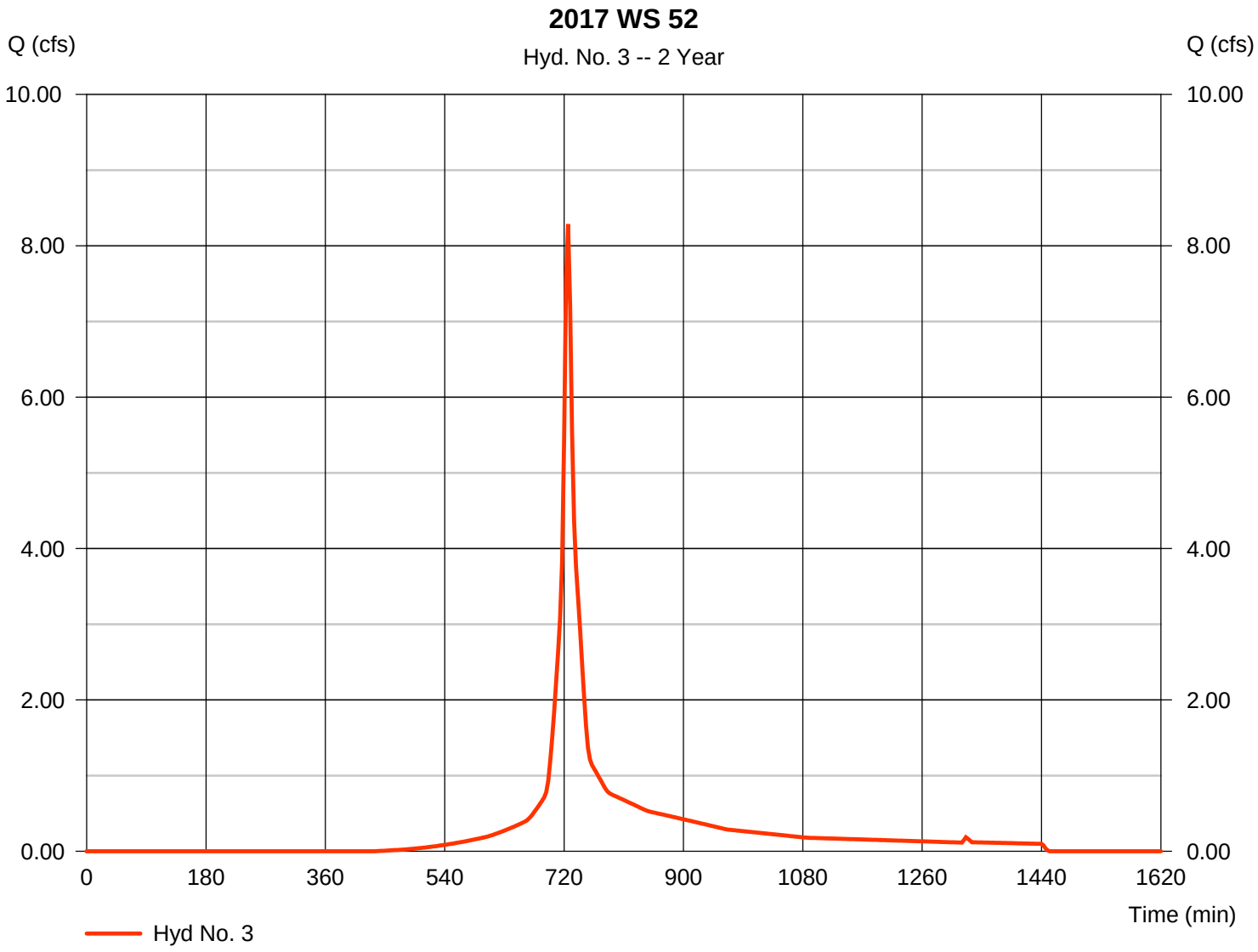
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.287 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	27,630 cuft
Drainage area	=	4.240 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.20 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



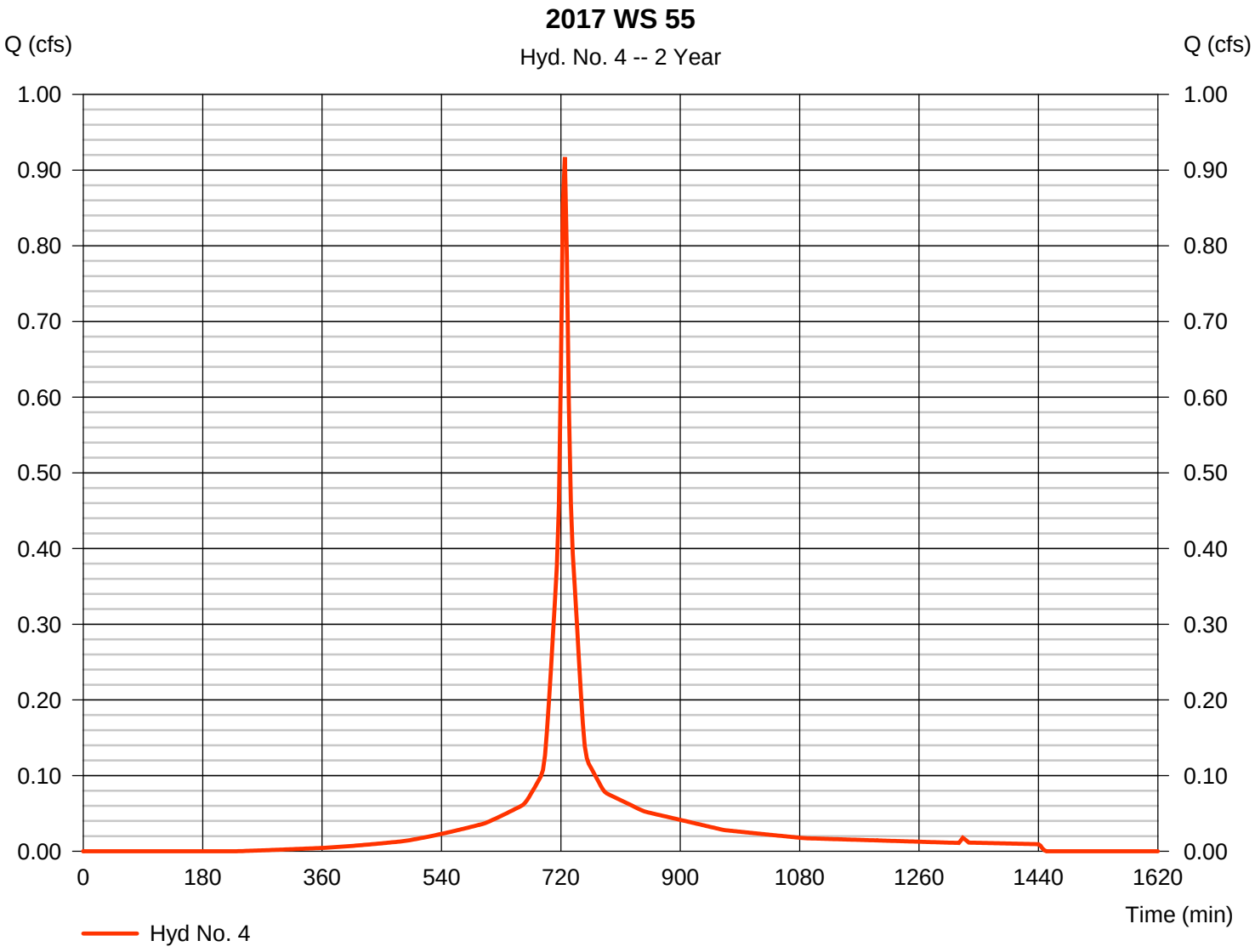
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 0.917 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 3,203 cuft
Drainage area	= 0.370 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



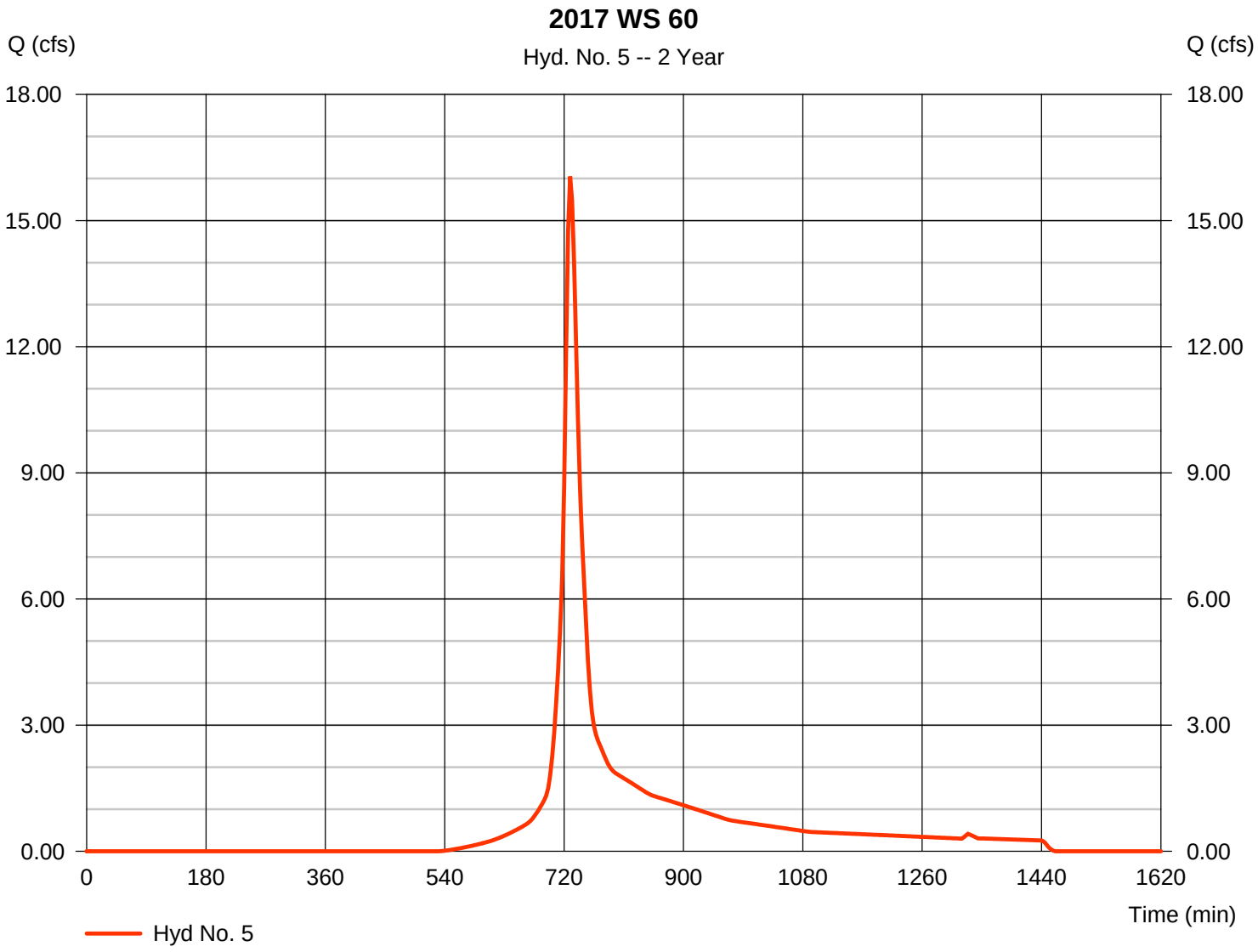
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 16.05 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 63,482 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



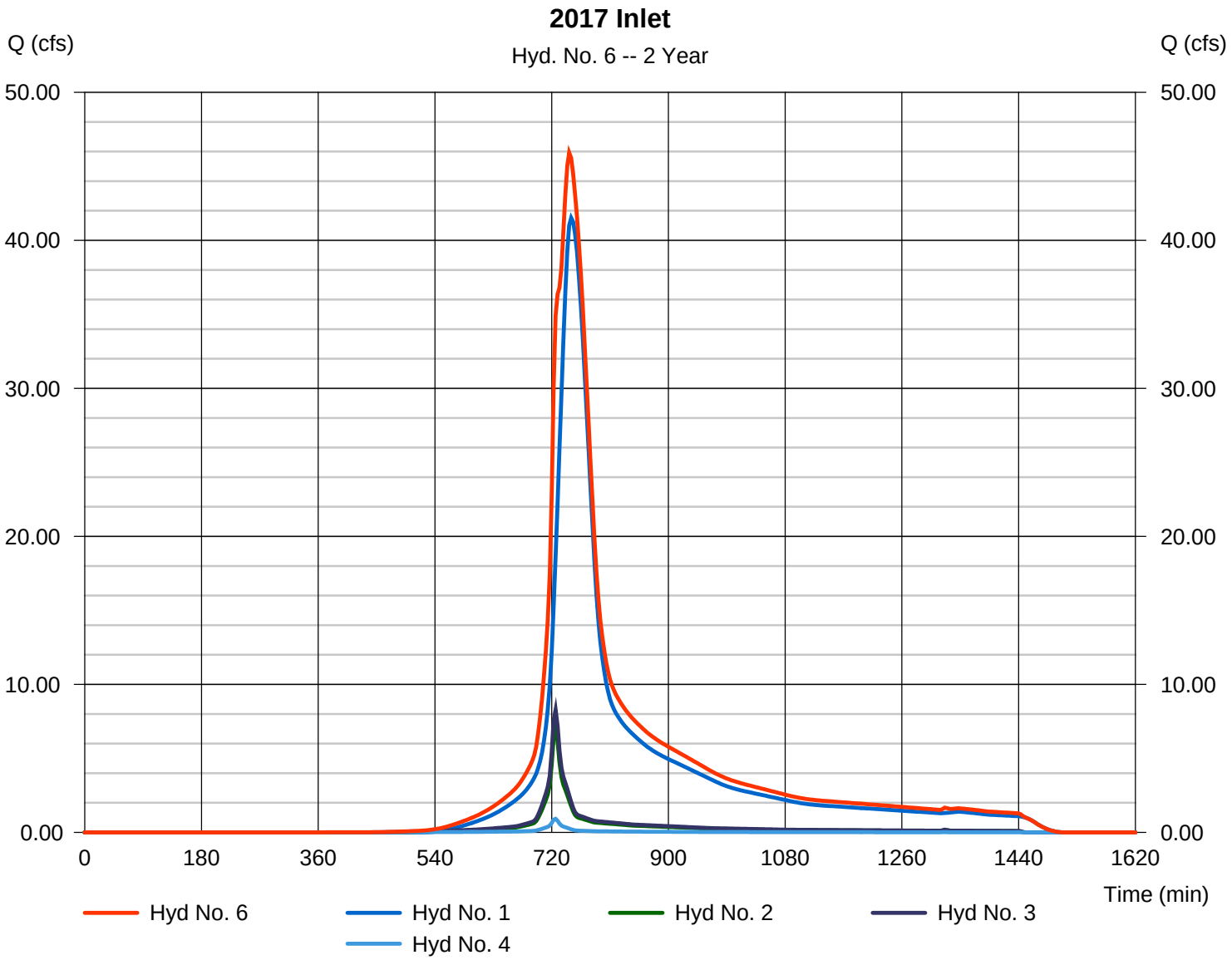
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 45.92 cfs
Storm frequency	= 2 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 320,500 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	77.44	3	750	495,328	------	------	------	2017 WS 50
2	SCS Runoff	12.40	3	726	41,868	------	------	------	2017 WS 51
3	SCS Runoff	14.37	3	726	48,761	------	------	------	2017 WS 52
4	SCS Runoff	1.441	3	726	5,176	------	------	------	2017 WS 55
5	SCS Runoff	30.41	3	729	119,726	------	------	------	2017 WS 60
6	Combine	85.16	3	747	591,134	1, 2, 3, 4,	------	------	2017 Inlet

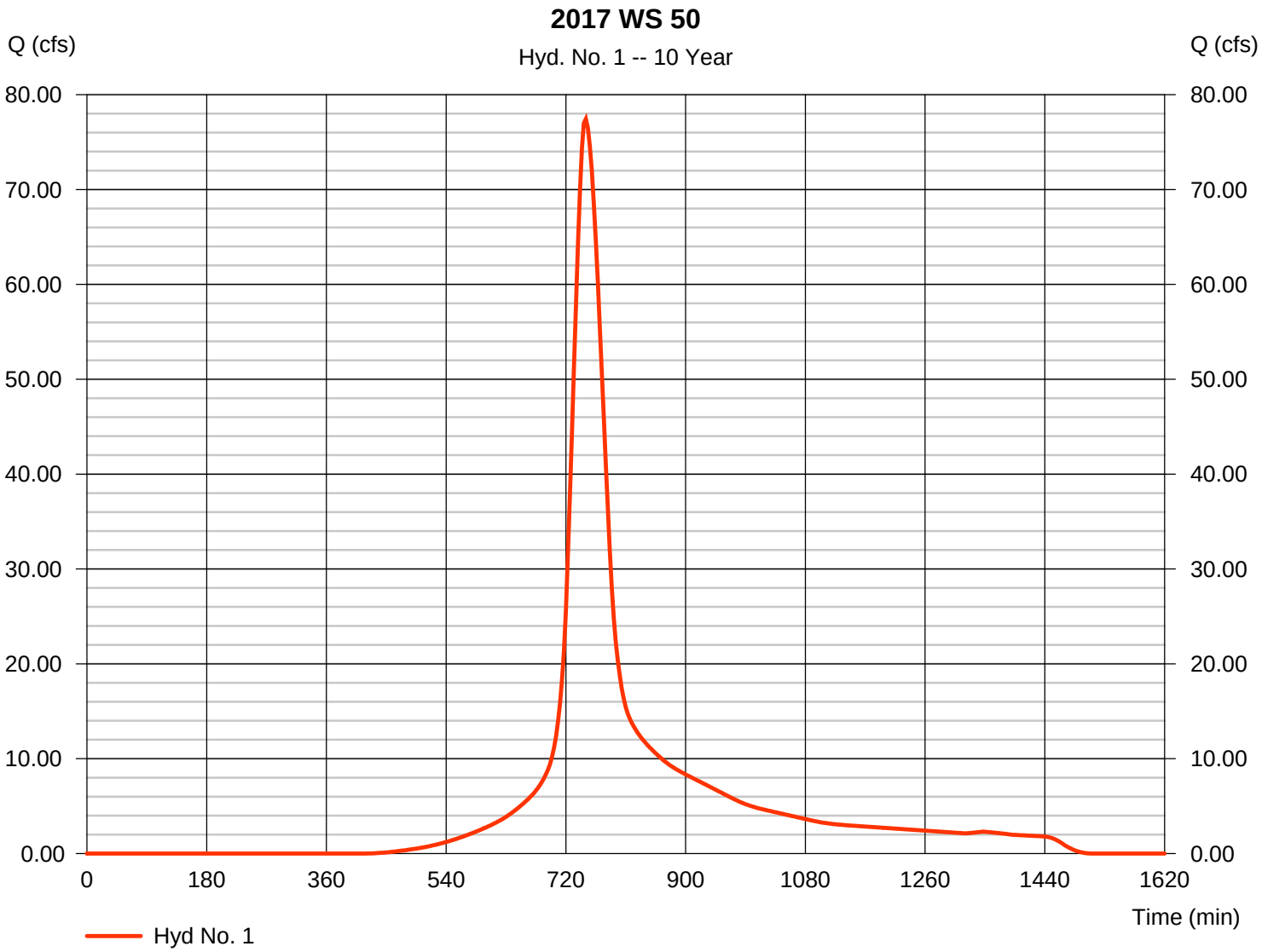
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 77.44 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 495,328 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



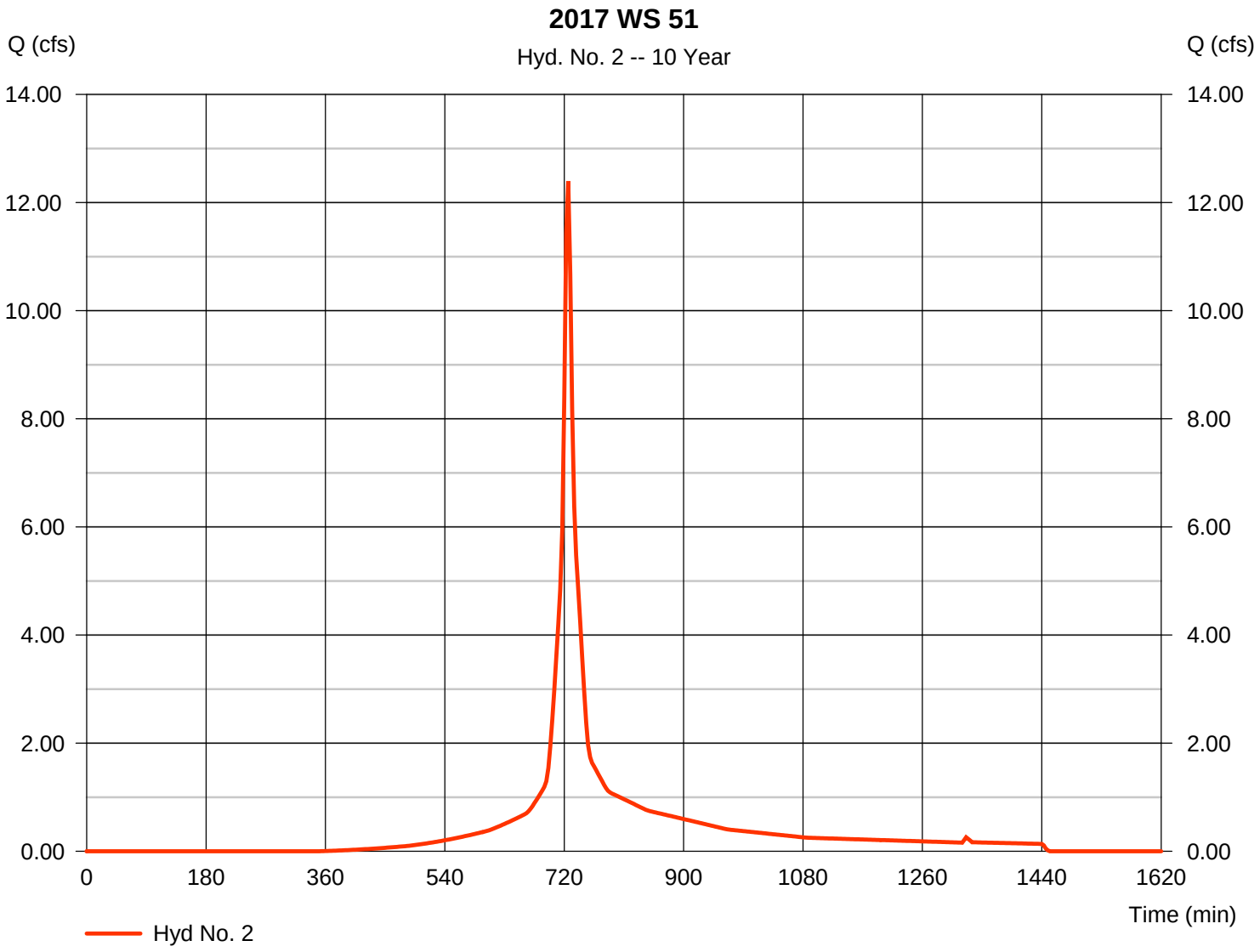
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 12.40 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 41,868 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



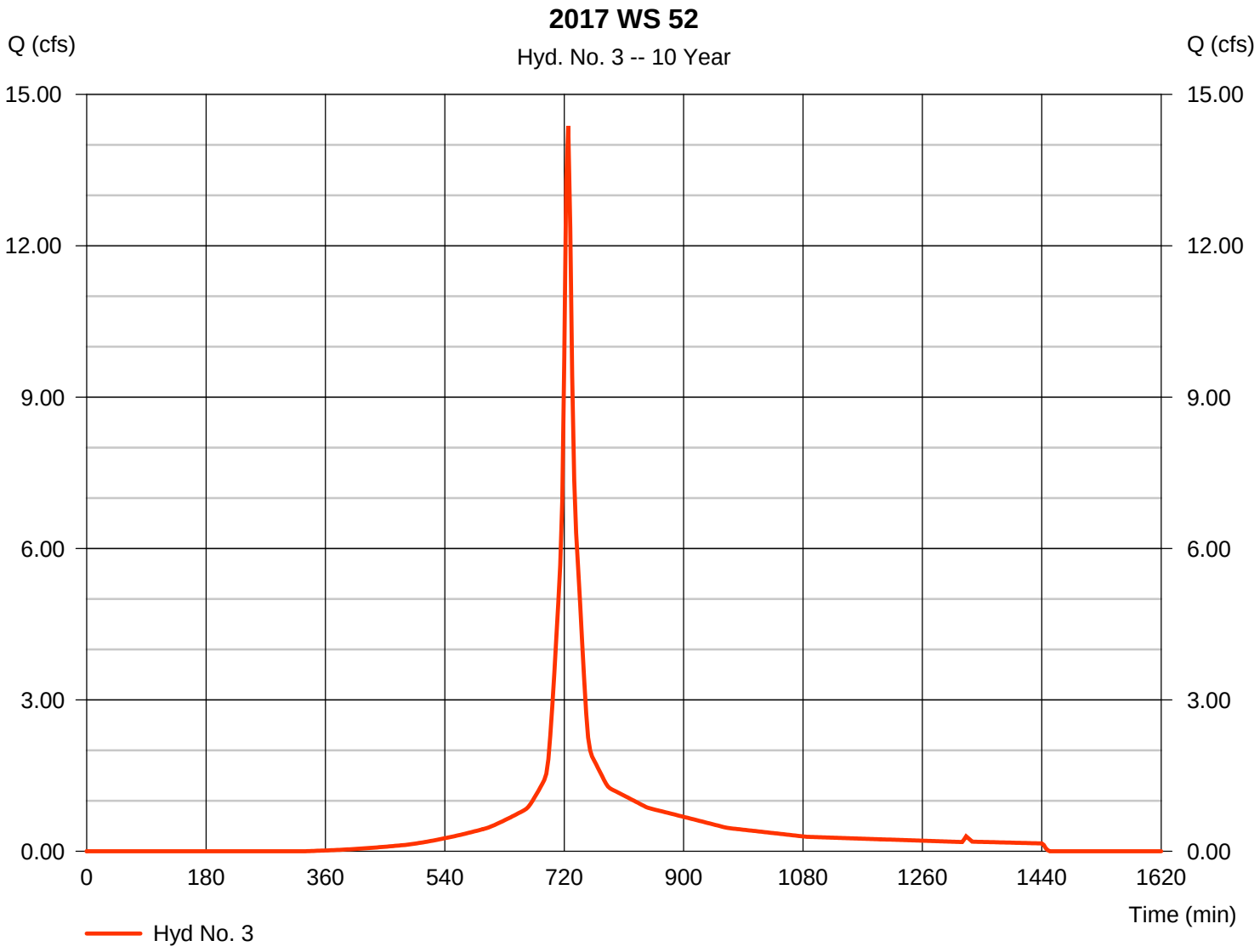
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 14.37 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 48,761 cuft
Drainage area	= 4.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



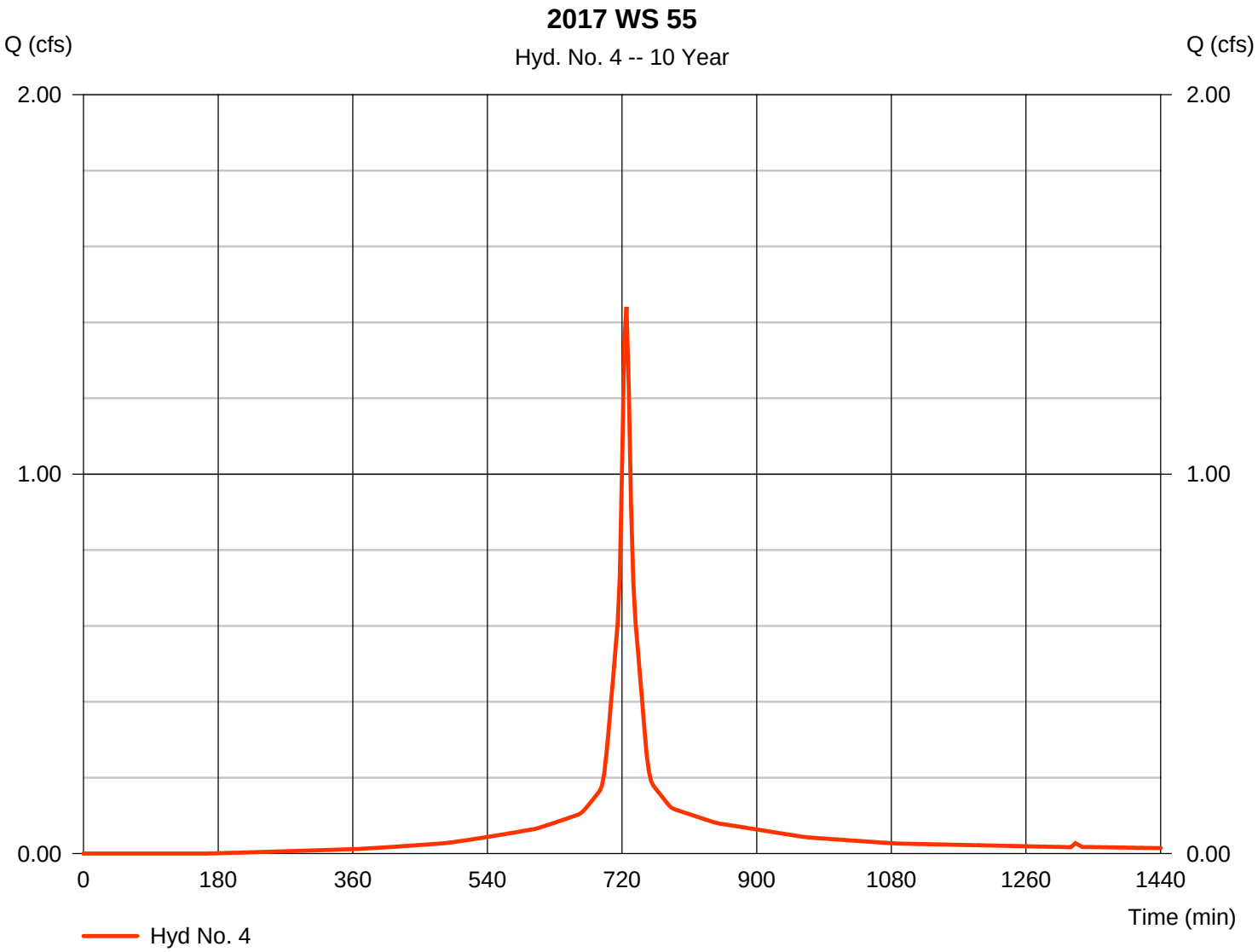
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.441 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	5,176 cuft
Drainage area	=	0.370 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.80 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



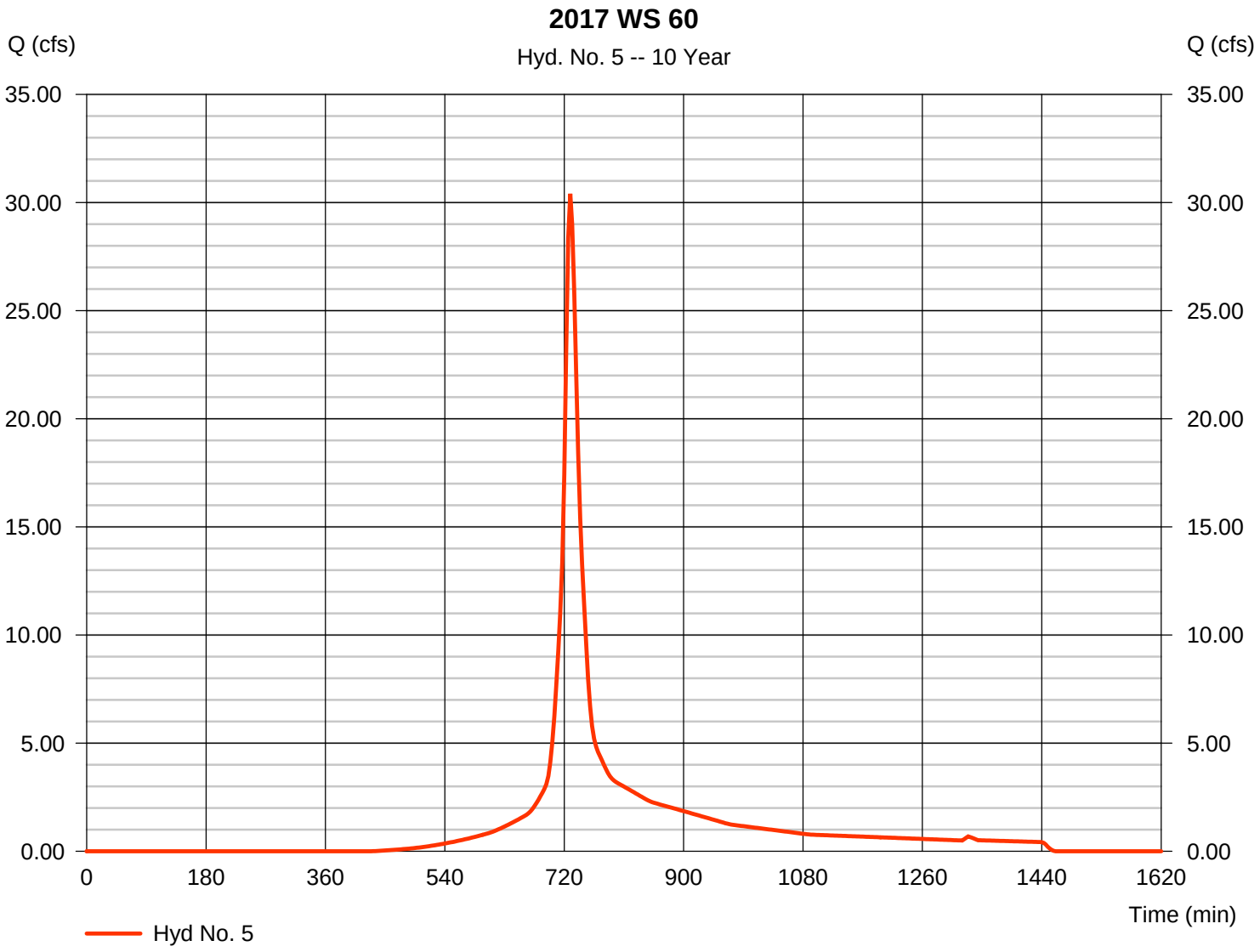
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 30.41 cfs
Storm frequency	= 10 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 119,726 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



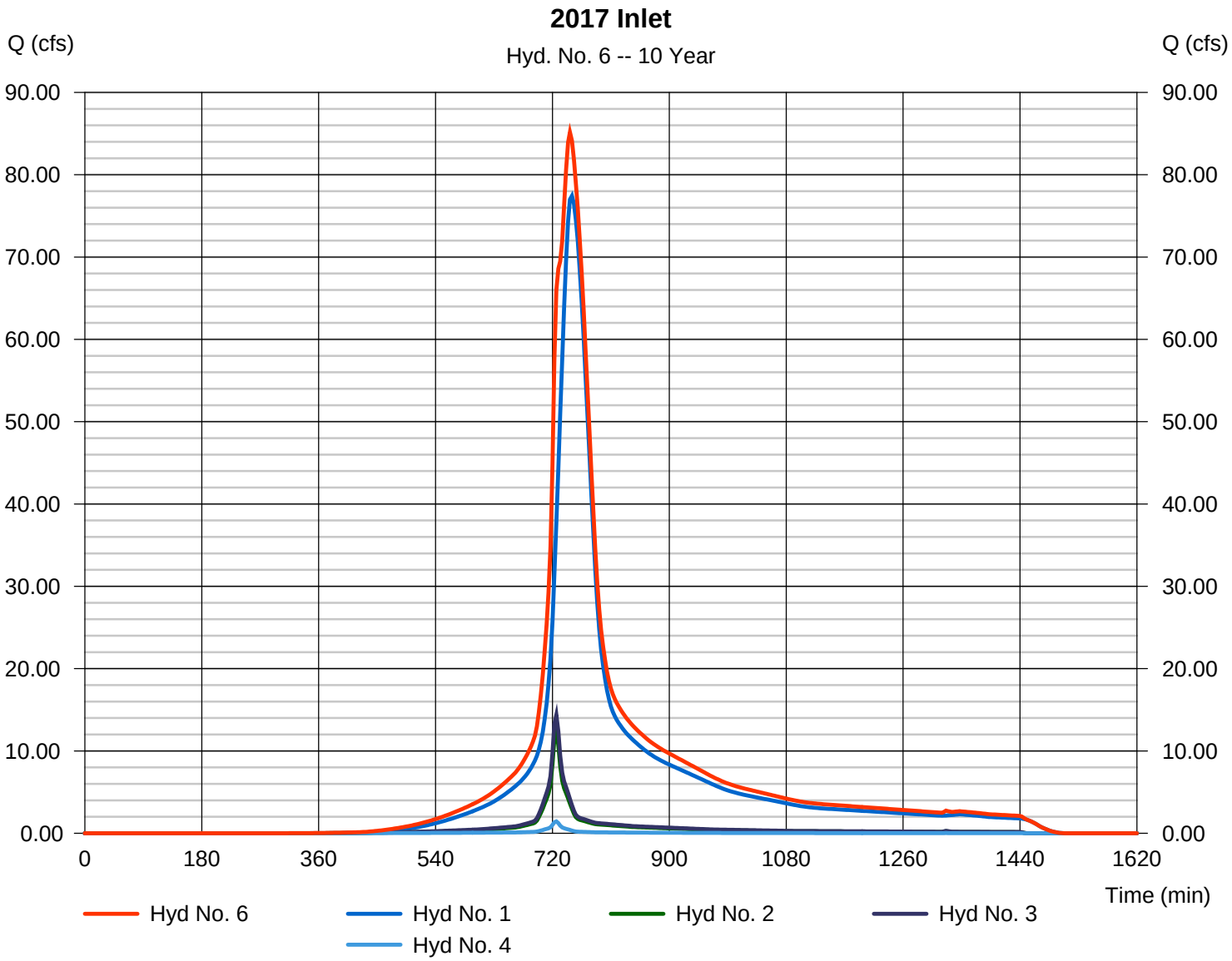
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 85.16 cfs
Storm frequency	= 10 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 591,134 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	93.57	3	750	600,576	------	------	------	2017 WS 50
2	SCS Runoff	14.76	3	726	50,231	------	------	------	2017 WS 51
3	SCS Runoff	17.04	3	726	58,300	------	------	------	2017 WS 52
4	SCS Runoff	1.668	3	726	6,046	------	------	------	2017 WS 55
5	SCS Runoff	36.88	3	729	145,691	------	------	------	2017 WS 60
6	Combine	102.77	3	747	715,154	1, 2, 3, 4,	------	------	2017 Inlet

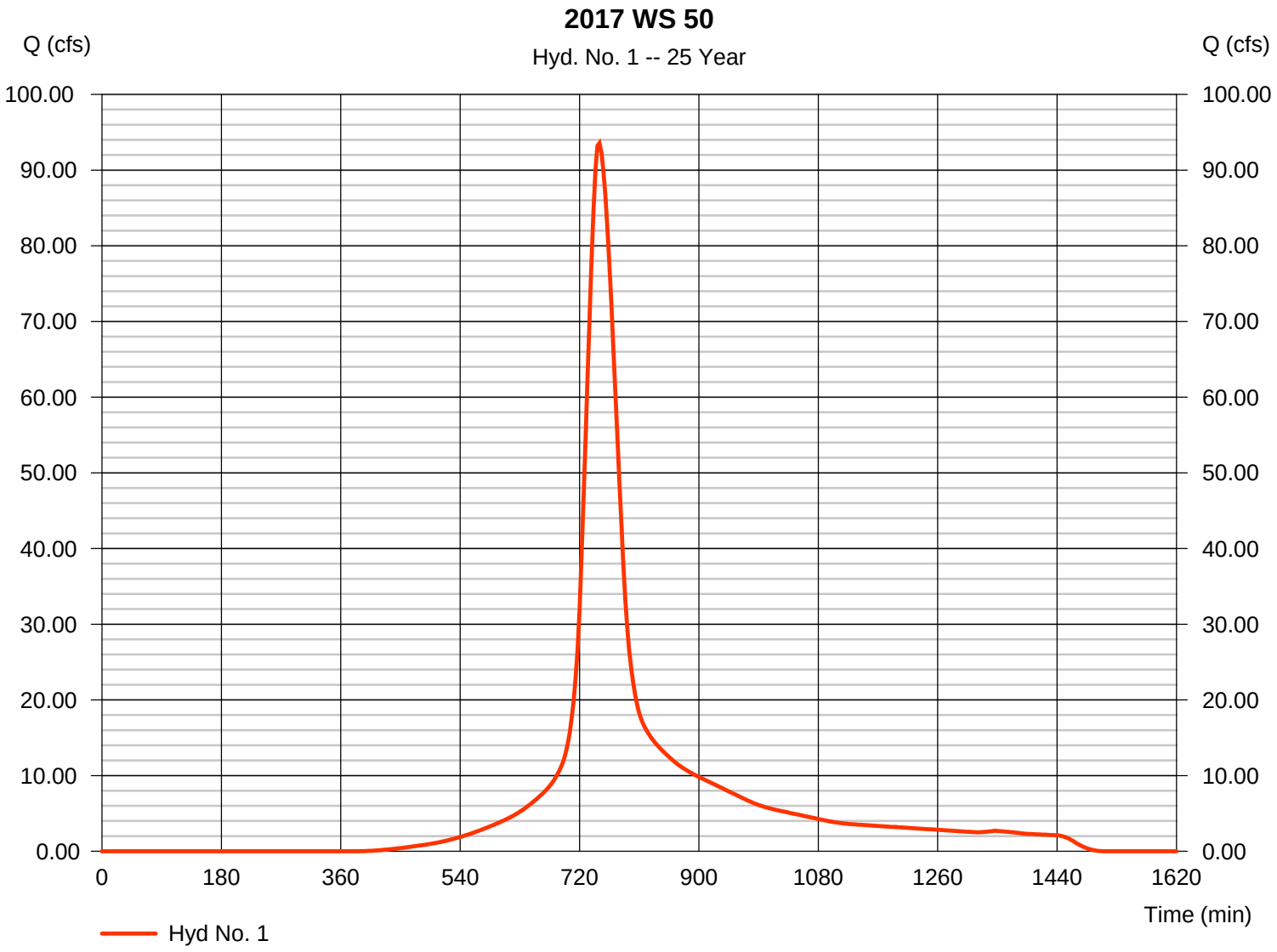
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 93.57 cfs
Storm frequency	= 25 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 600,576 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



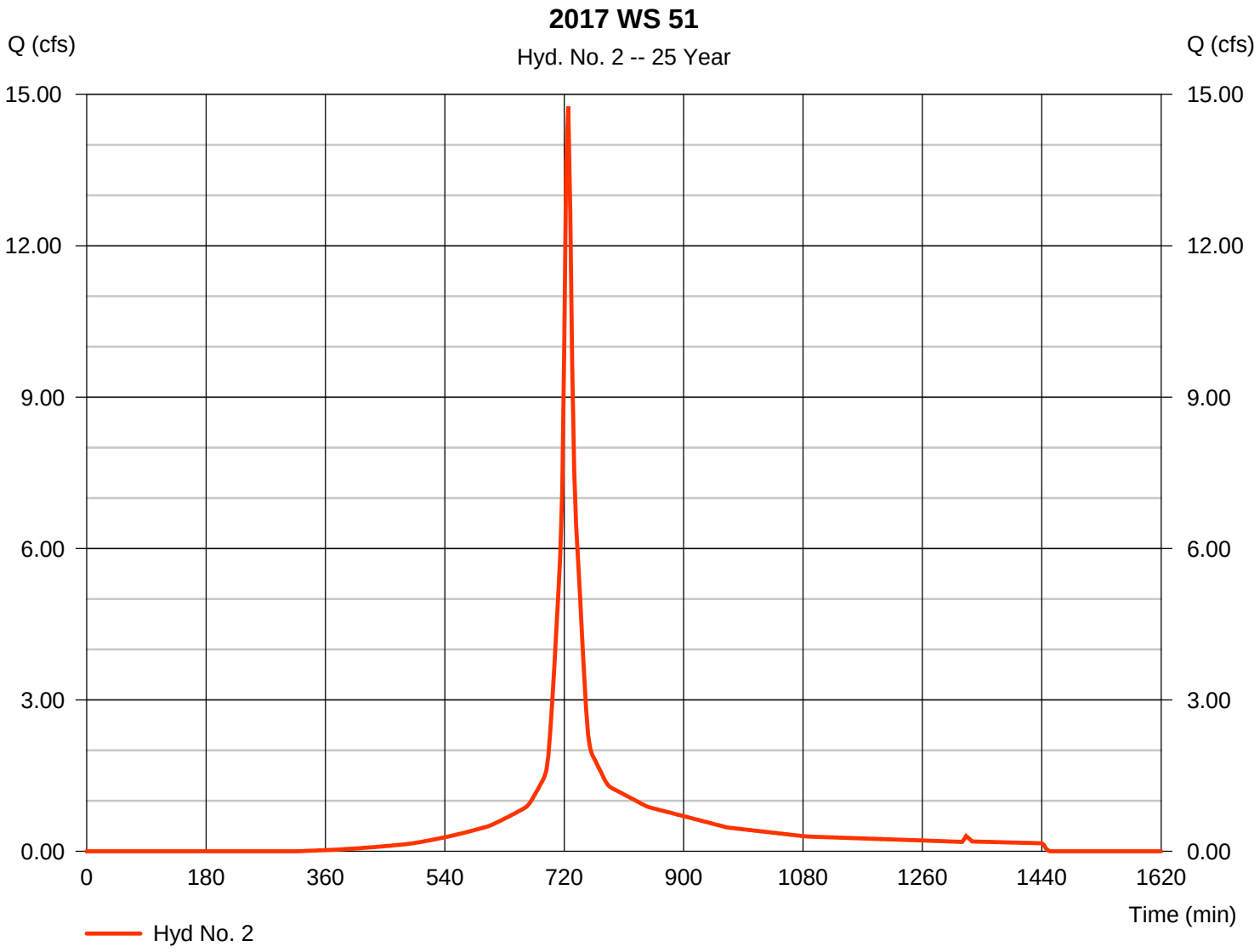
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 14.76 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 50,231 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



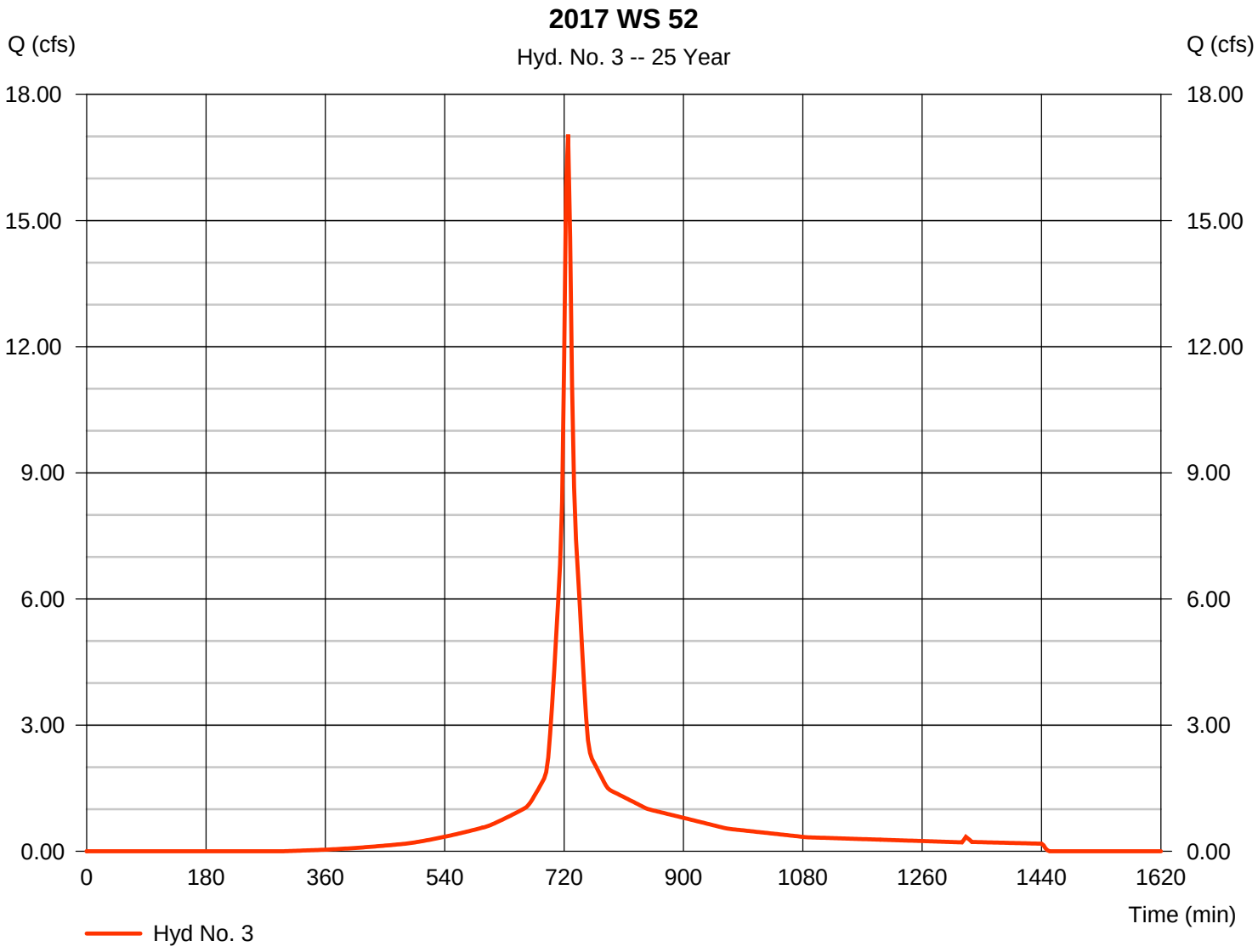
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 17.04 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 58,300 cuft
Drainage area	= 4.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



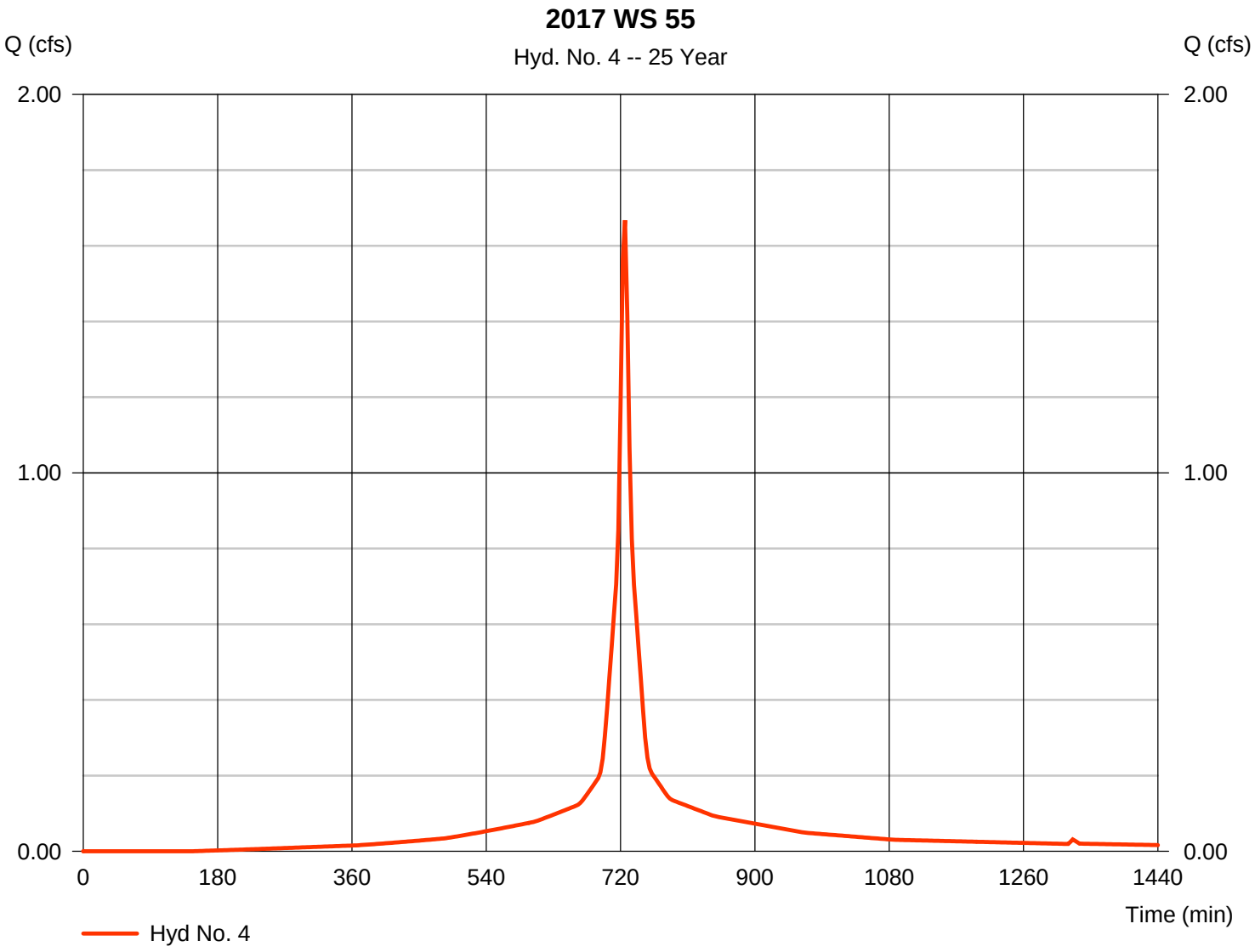
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.668 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	6,046 cuft
Drainage area	=	0.370 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.50 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



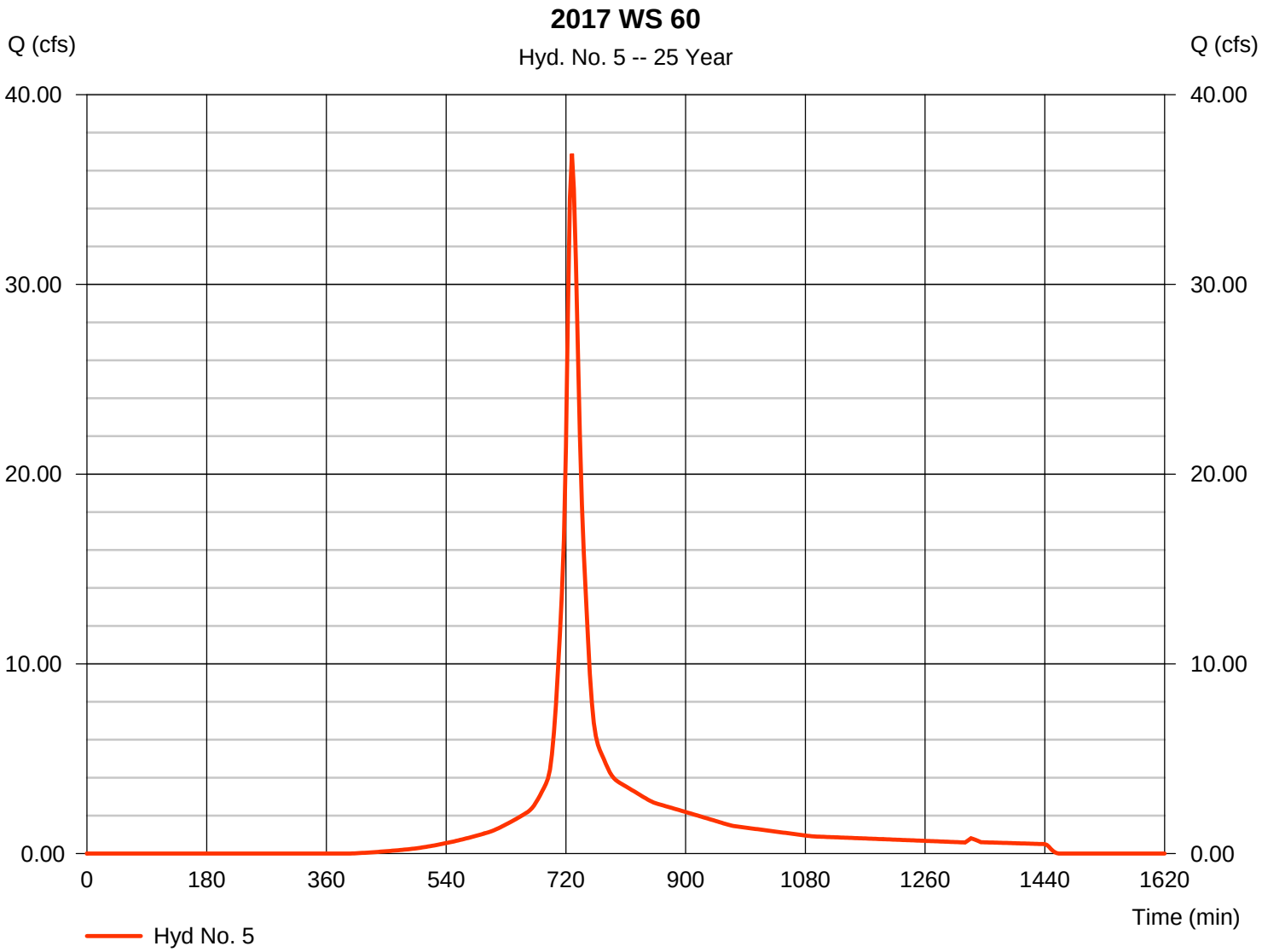
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 36.88 cfs
Storm frequency	= 25 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 145,691 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



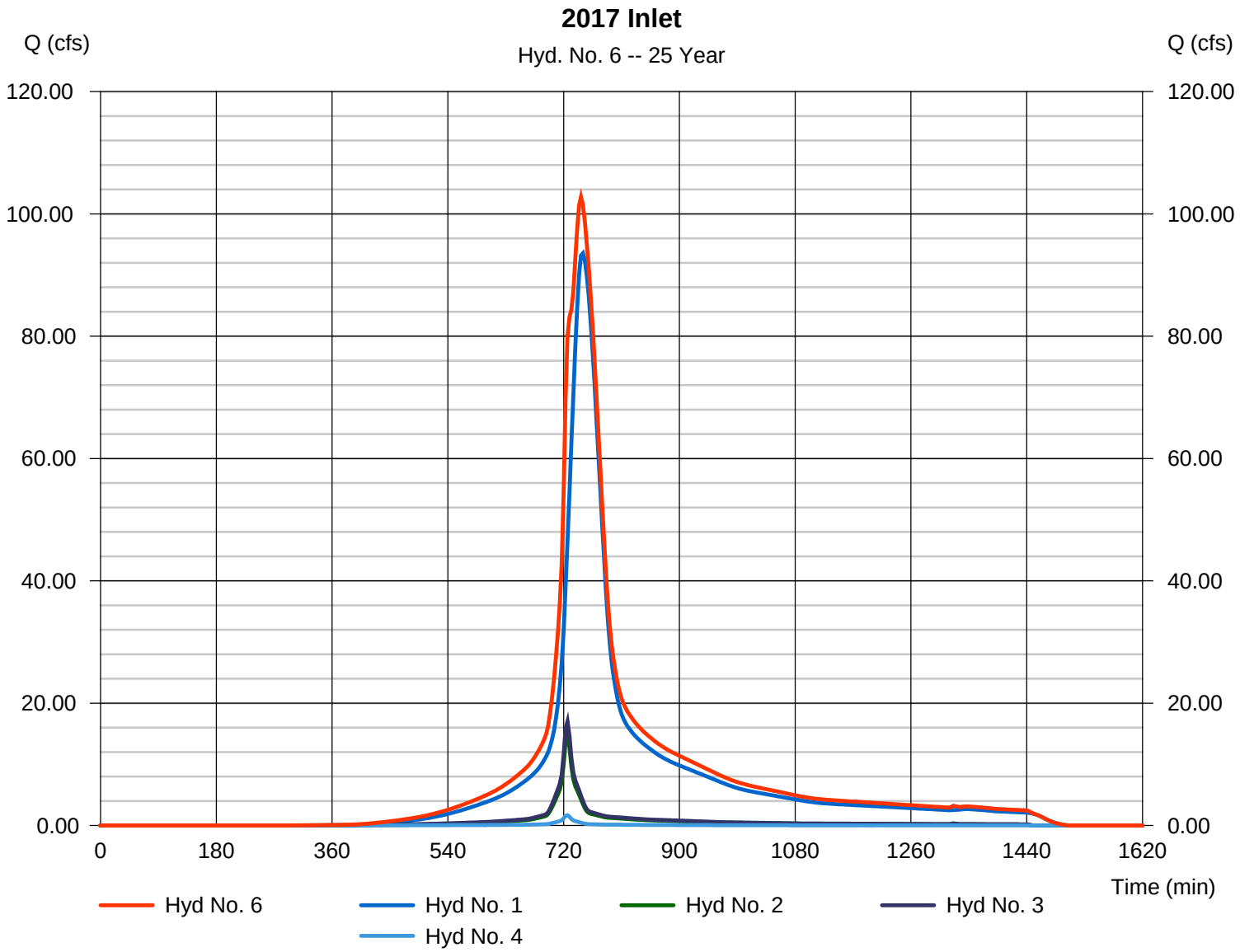
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 102.77 cfs
Storm frequency	= 25 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 715,154 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	109.80	3	750	707,711	------	------	------	2017 WS 50
2	SCS Runoff	17.12	3	726	58,701	------	------	------	2017 WS 51
3	SCS Runoff	19.71	3	726	67,945	------	------	------	2017 WS 52
4	SCS Runoff	1.894	3	726	6,919	------	------	------	2017 WS 55
5	SCS Runoff	43.39	3	729	172,171	------	------	------	2017 WS 60
6	Combine	120.49	3	747	841,275	1, 2, 3, 4,	------	------	2017 Inlet

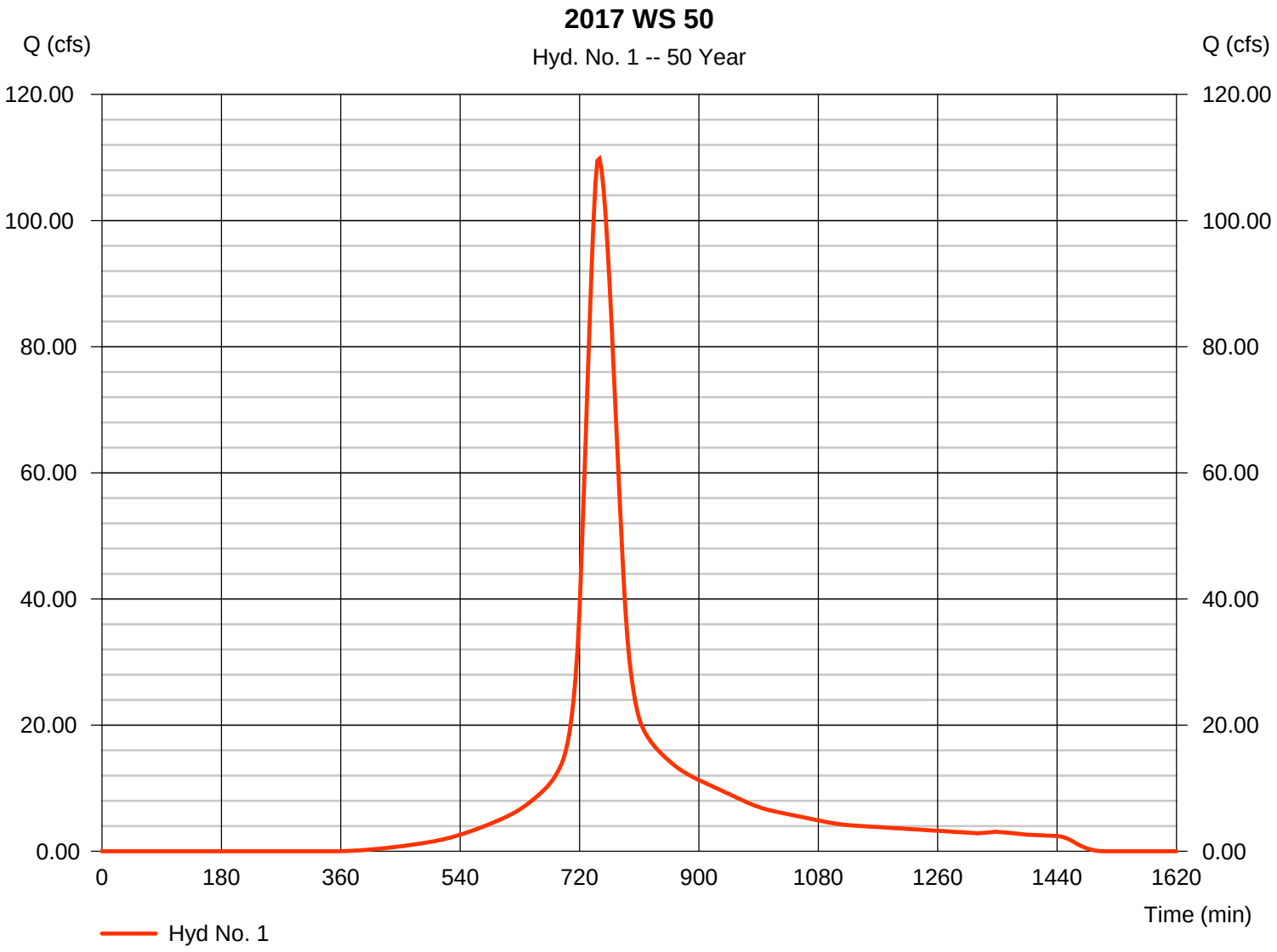
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 109.80 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 707,711 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



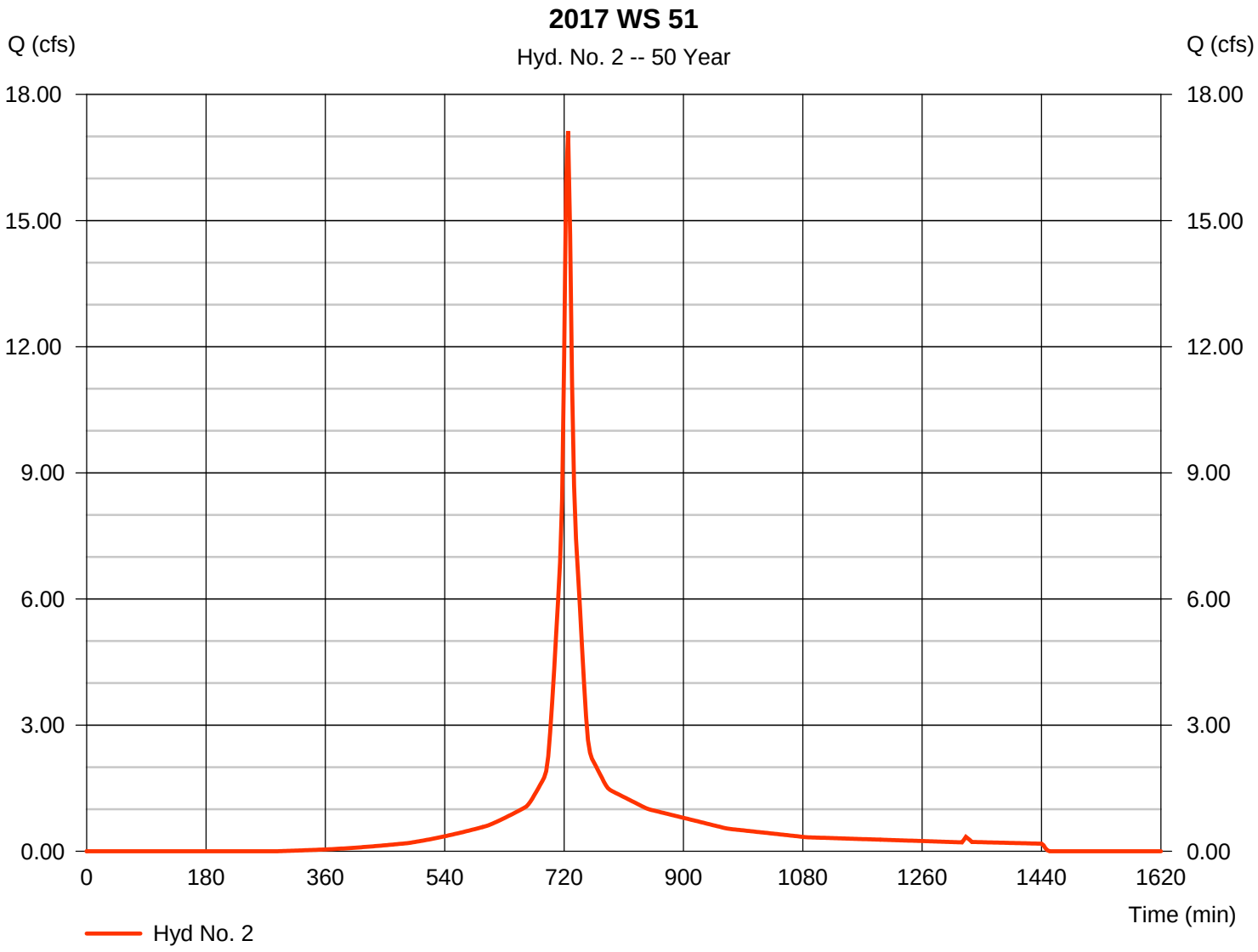
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 17.12 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 58,701 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



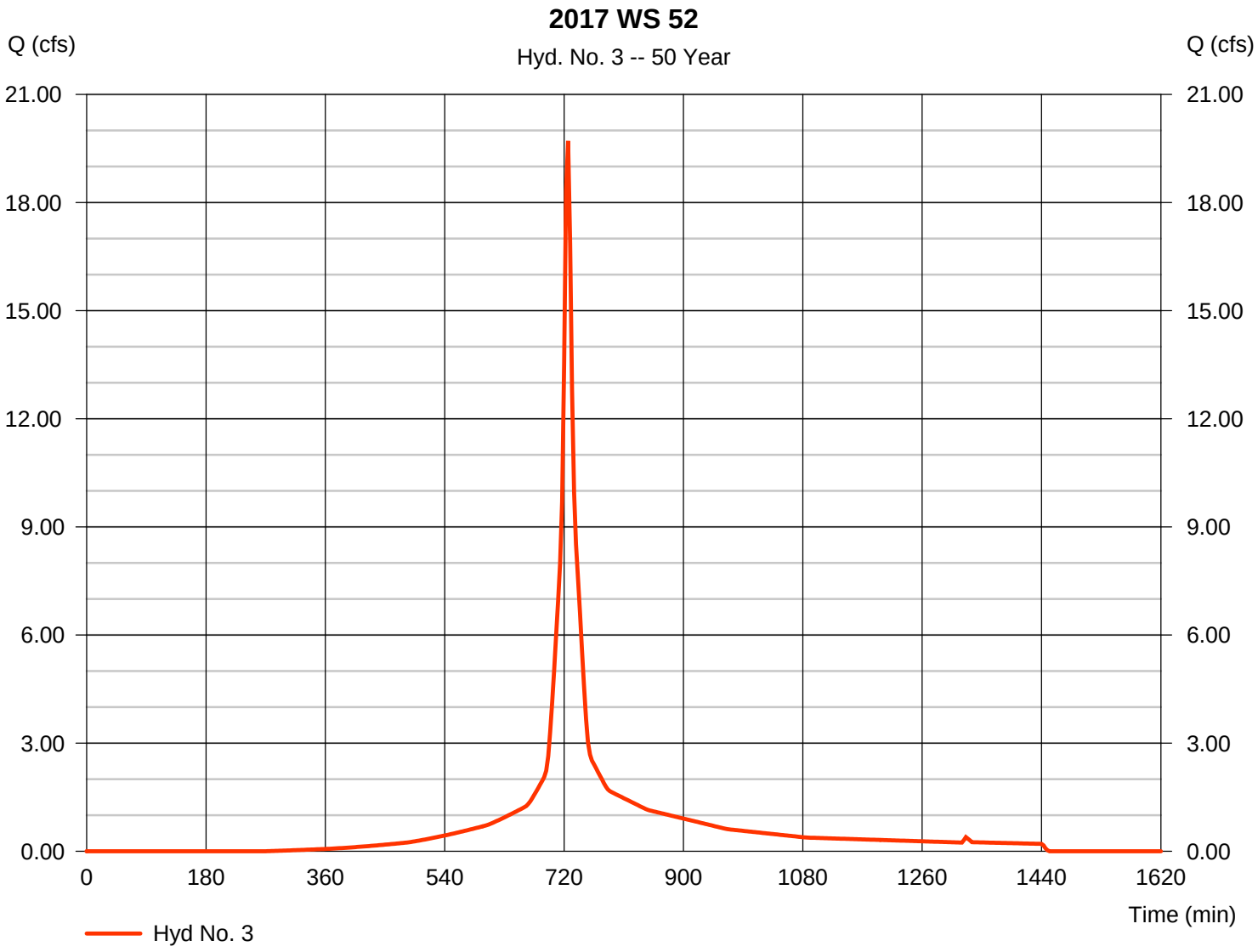
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 19.71 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 67,945 cuft
Drainage area	= 4.240 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



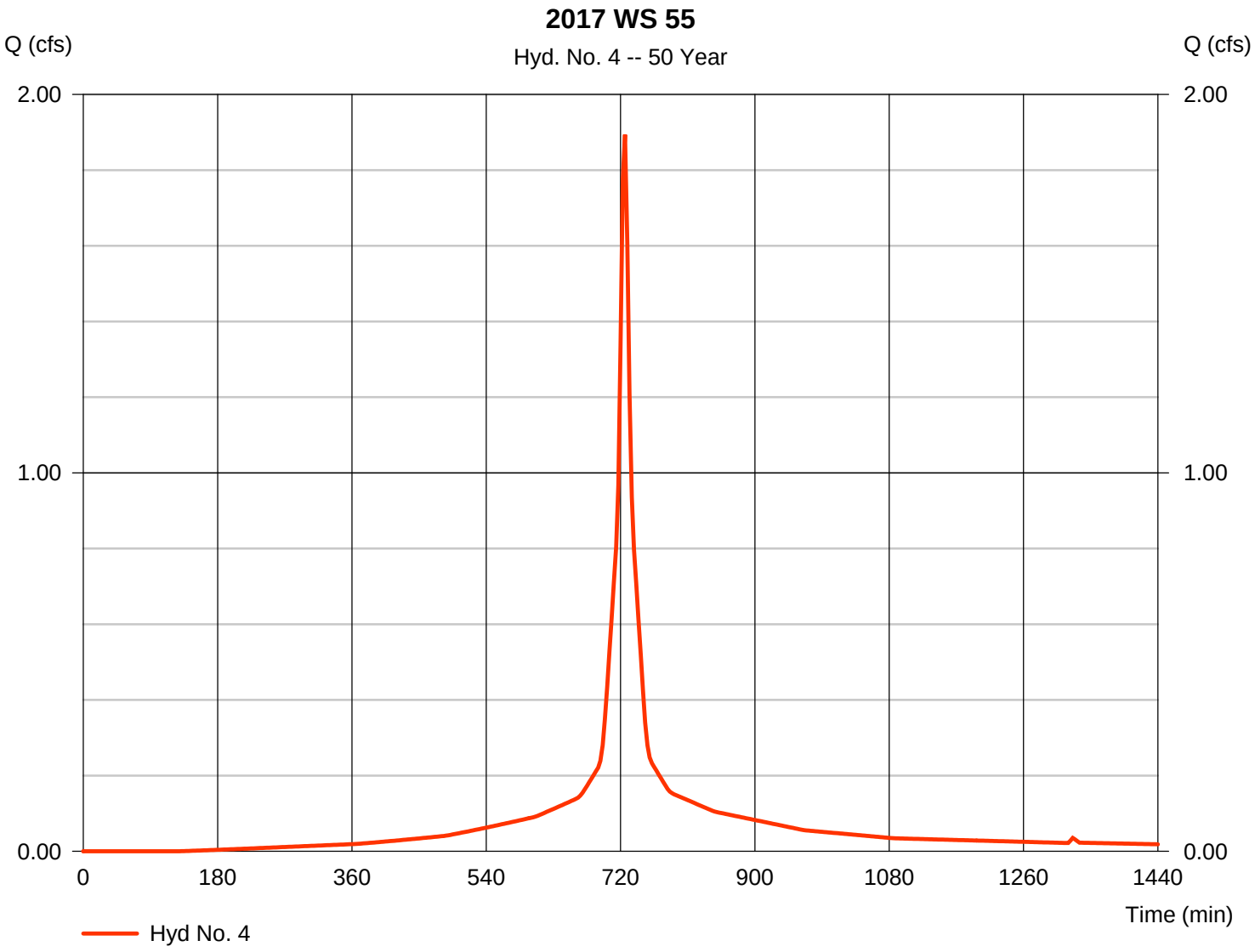
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.894 cfs
Storm frequency	=	50 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	6,919 cuft
Drainage area	=	0.370 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.20 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



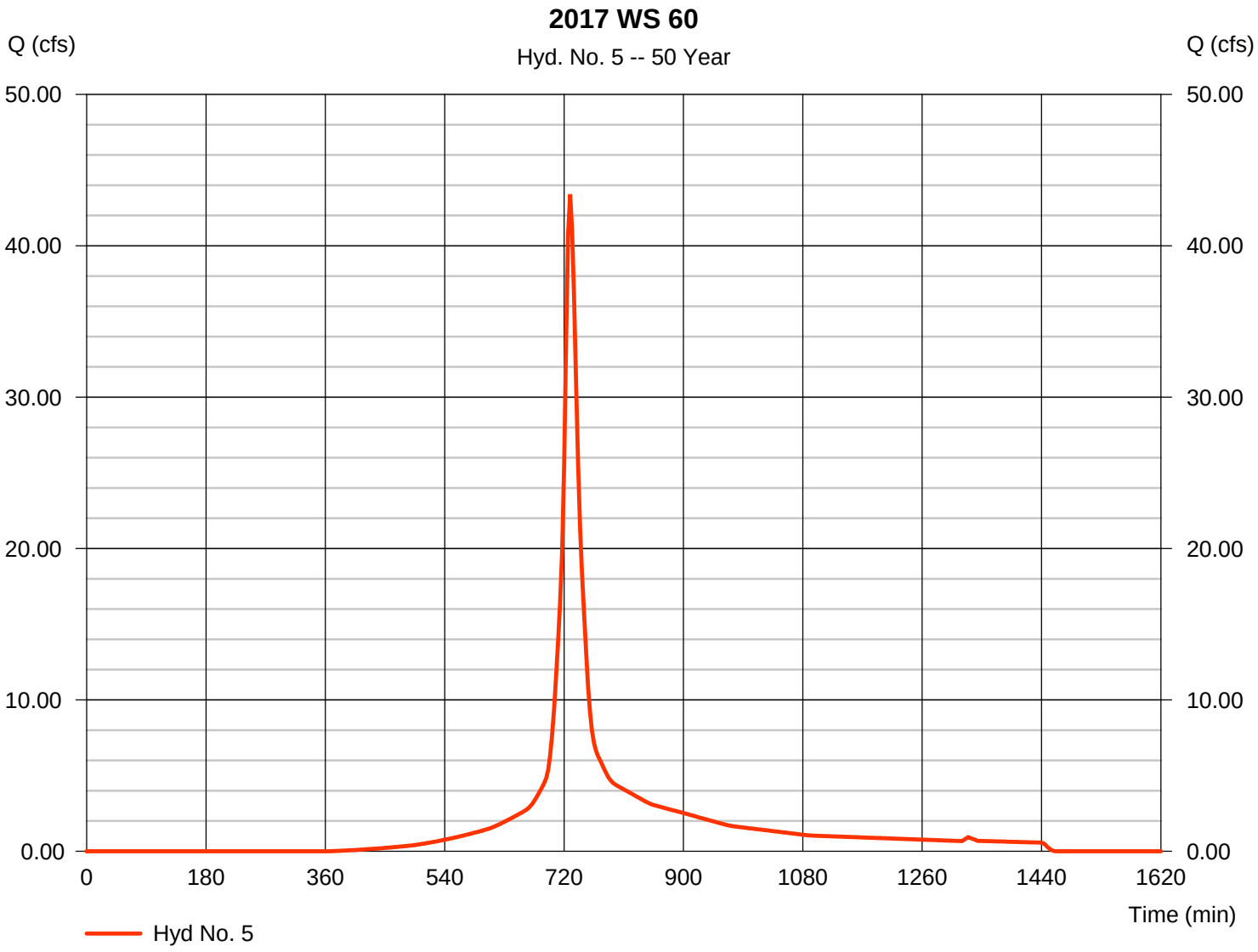
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 43.39 cfs
Storm frequency	= 50 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 172,171 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



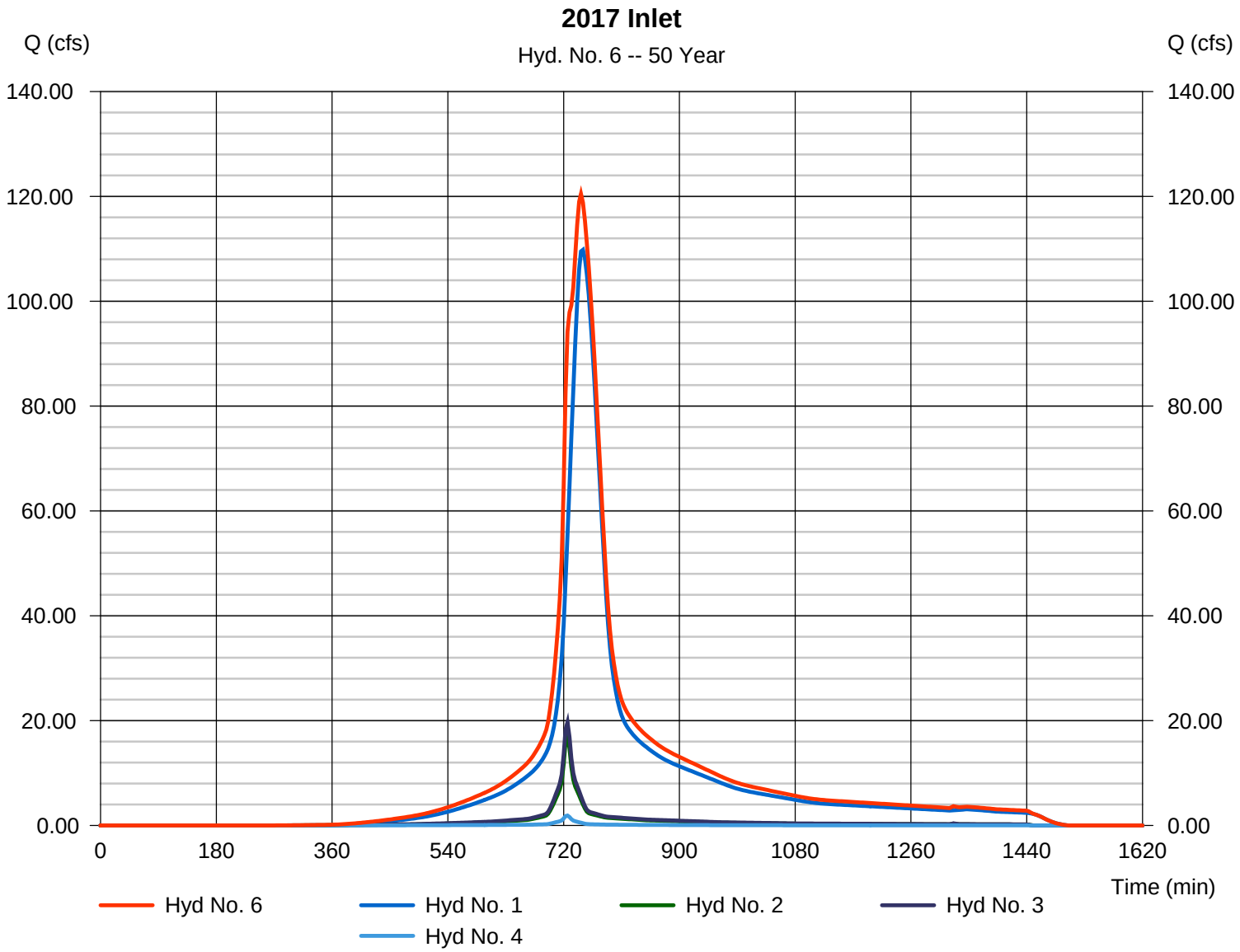
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 120.49 cfs
Storm frequency	= 50 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 841,275 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	126.07	3	750	816,271	------	------	------	2017 WS 50
2	SCS Runoff	19.48	3	726	67,249	------	------	------	2017 WS 51
3	SCS Runoff	22.37	3	726	77,668	------	------	------	2017 WS 52
4	SCS Runoff	2.119	3	726	7,793	------	------	------	2017 WS 55
5	SCS Runoff	49.93	3	729	199,040	------	------	------	2017 WS 60
6	Combine	138.24	3	747	968,981	1, 2, 3, 4,	------	------	2017 Inlet

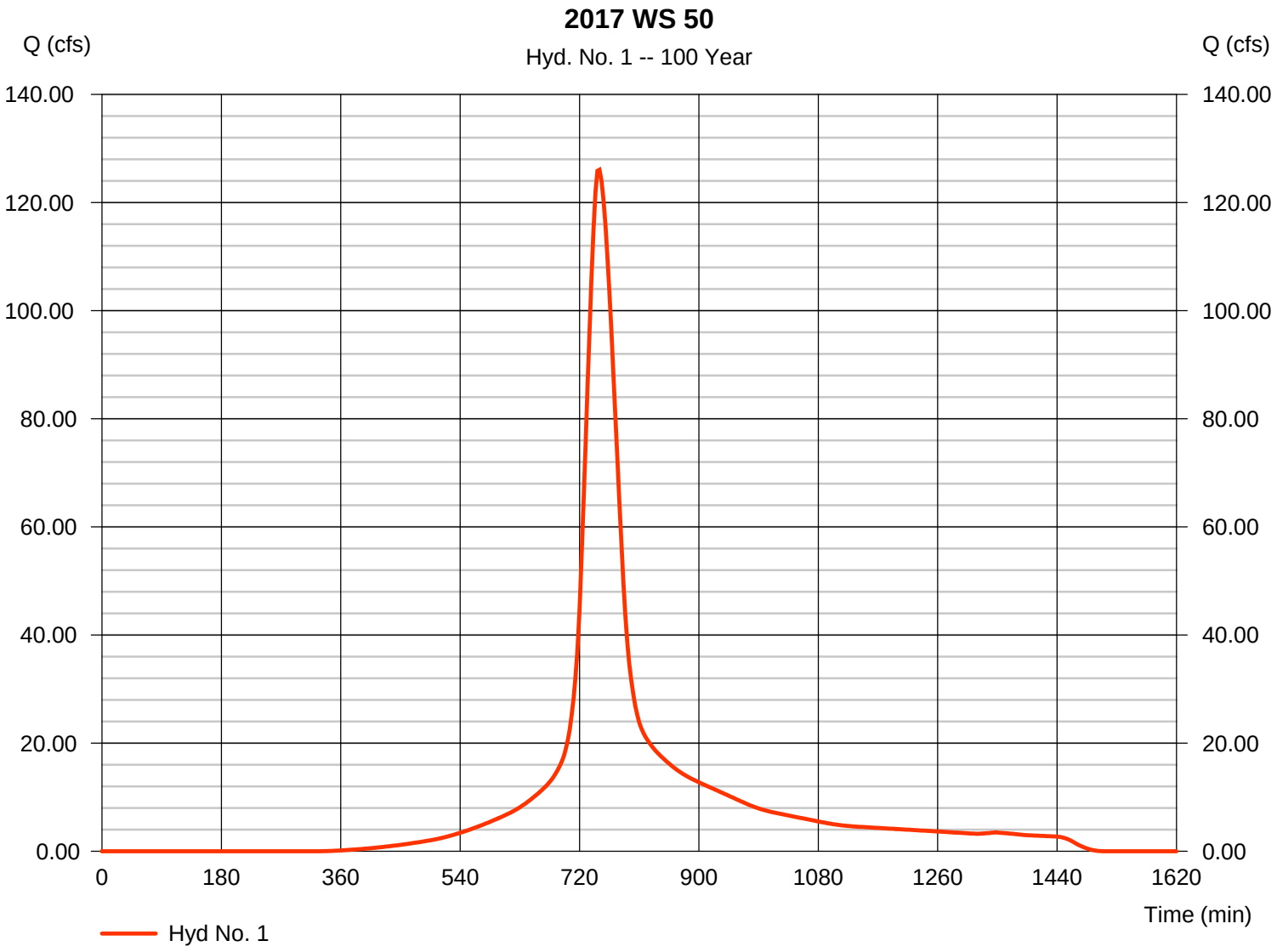
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

2017 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 126.07 cfs
Storm frequency	= 100 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 816,271 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



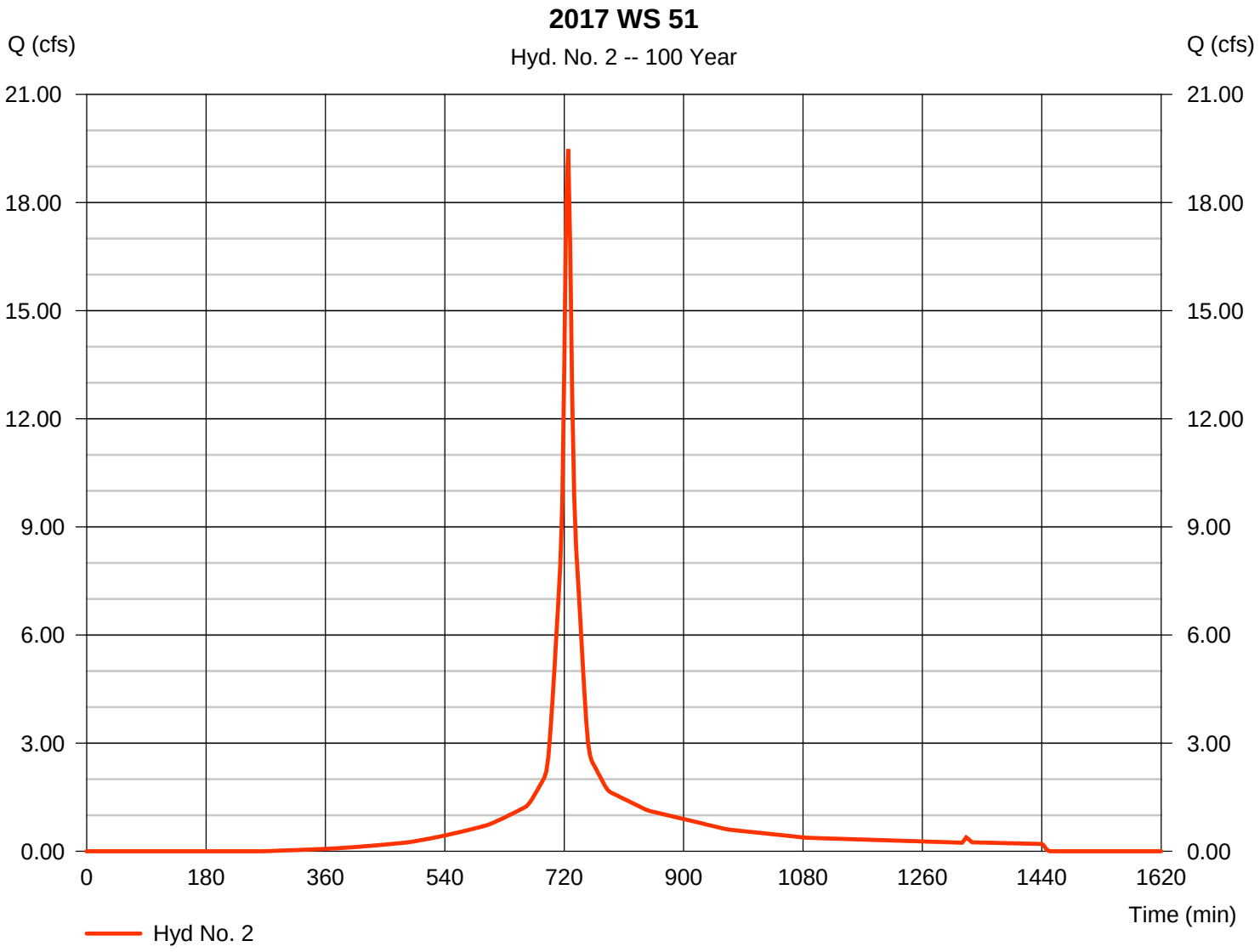
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

2017 WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 19.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 67,249 cuft
Drainage area	= 3.750 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



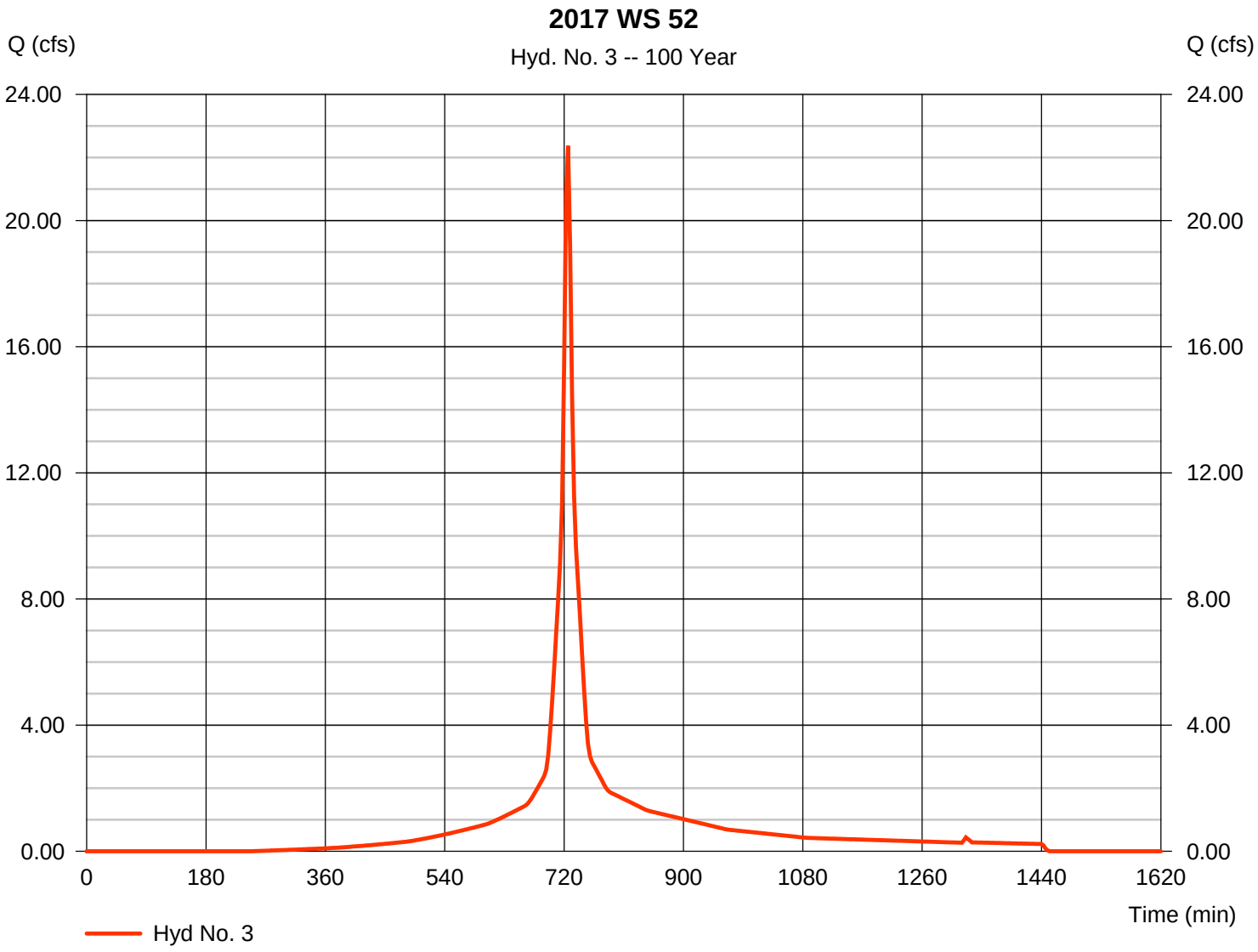
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

2017 WS 52

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.37 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	77,668 cuft
Drainage area	=	4.240 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.90 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



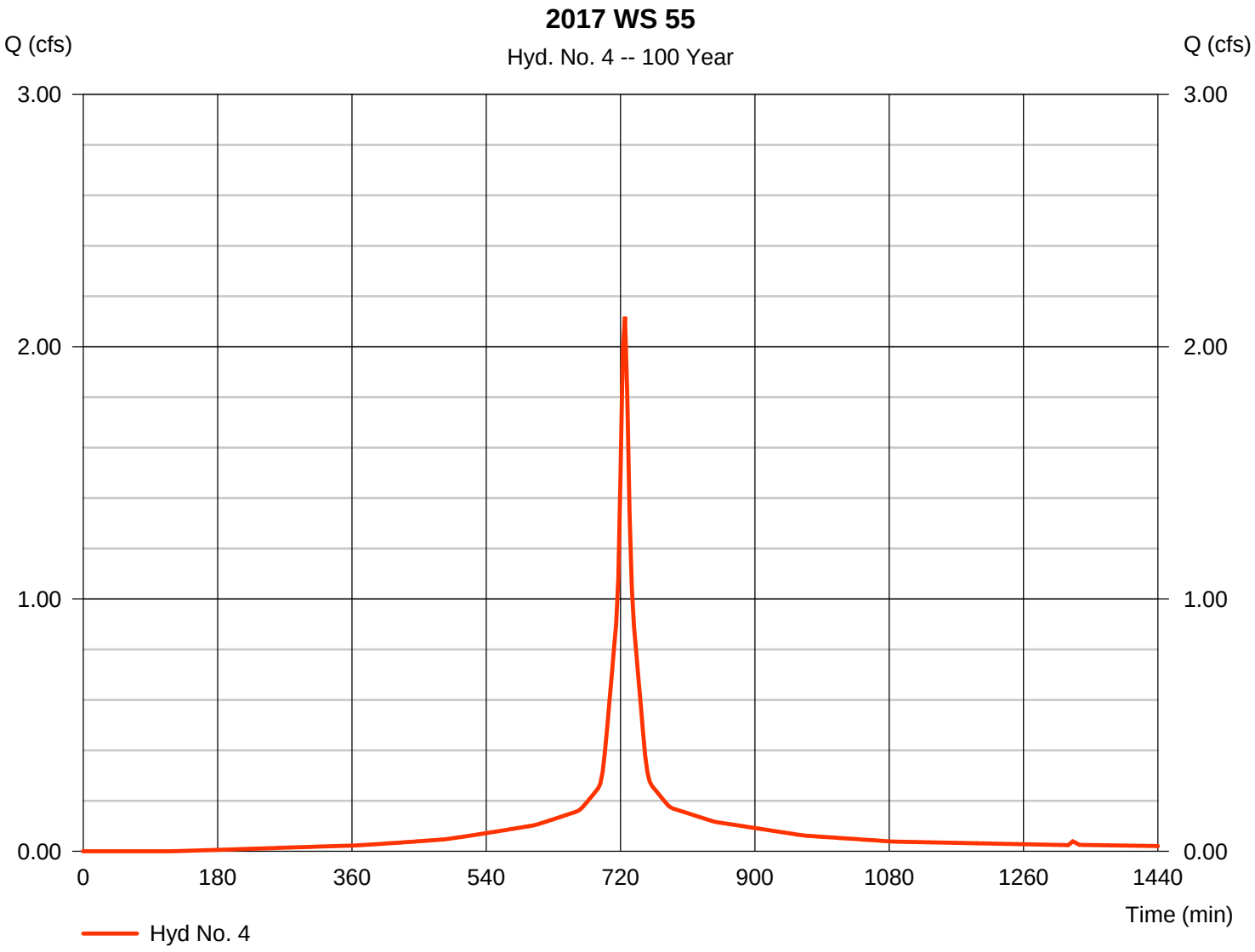
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

2017 WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.119 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	7,793 cuft
Drainage area	=	0.370 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.90 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



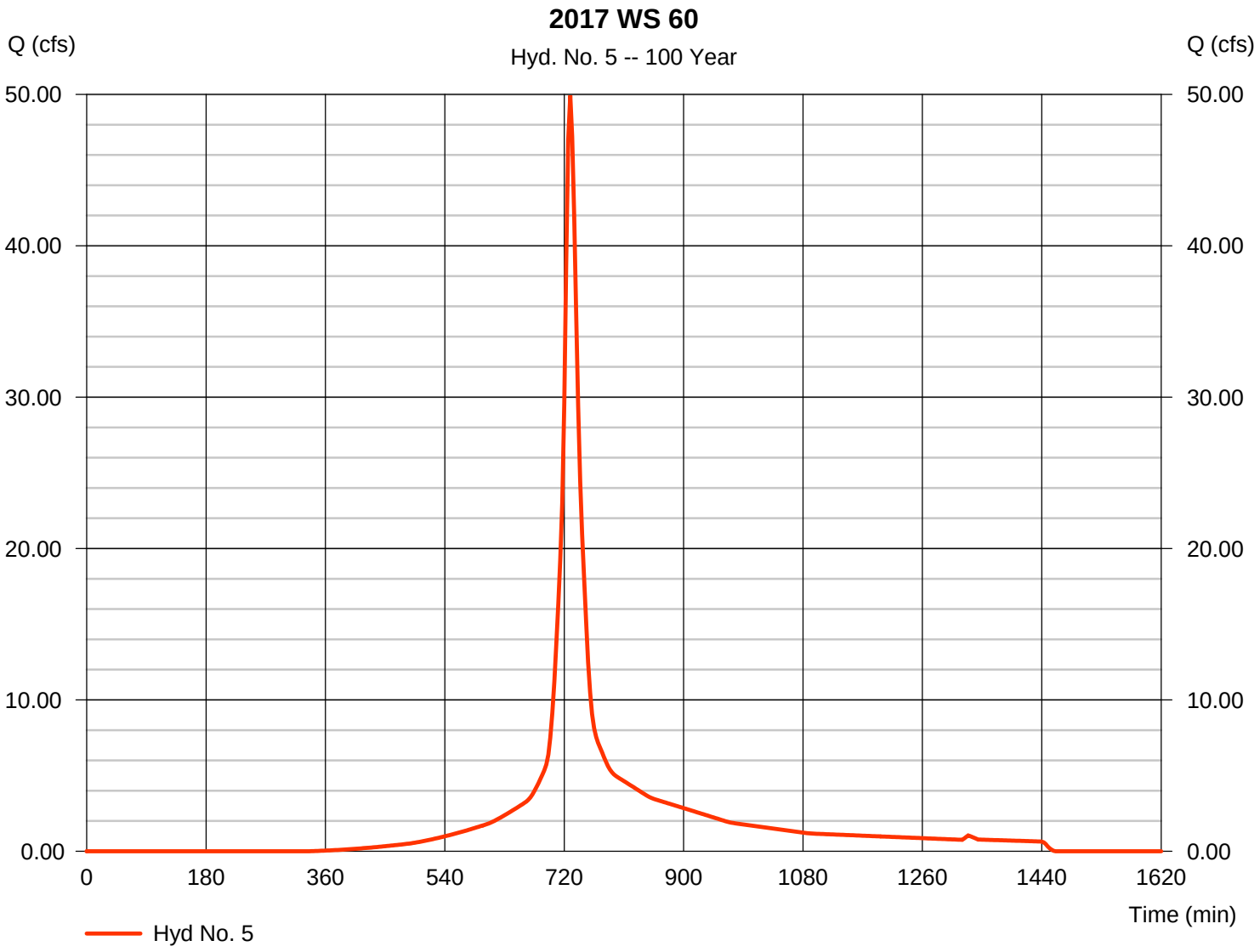
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

2017 WS 60

Hydrograph type	=	SCS Runoff	Peak discharge	=	49.93 cfs
Storm frequency	=	100 yrs	Time to peak	=	729 min
Time interval	=	3 min	Hyd. volume	=	199,040 cuft
Drainage area	=	11.370 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.90 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



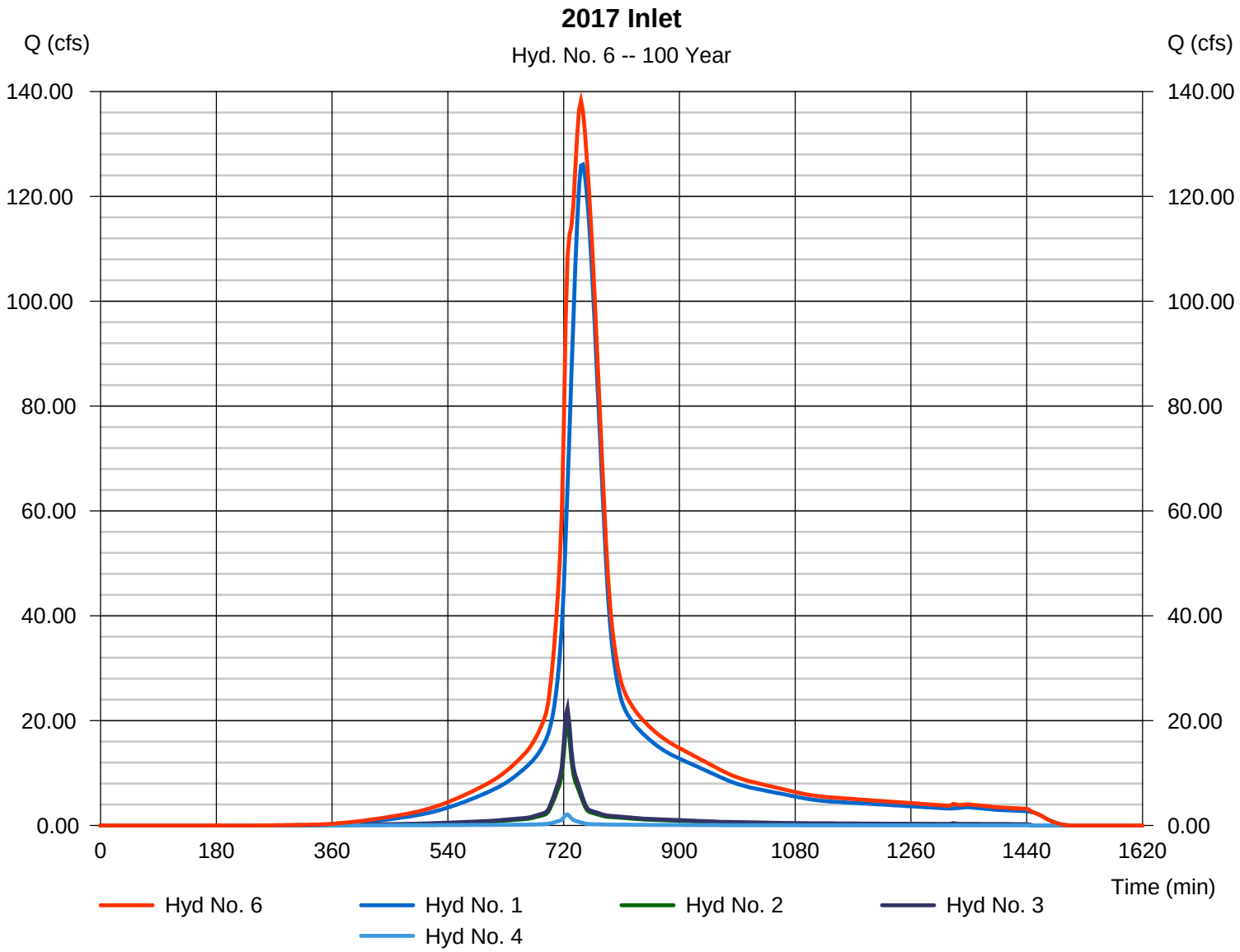
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

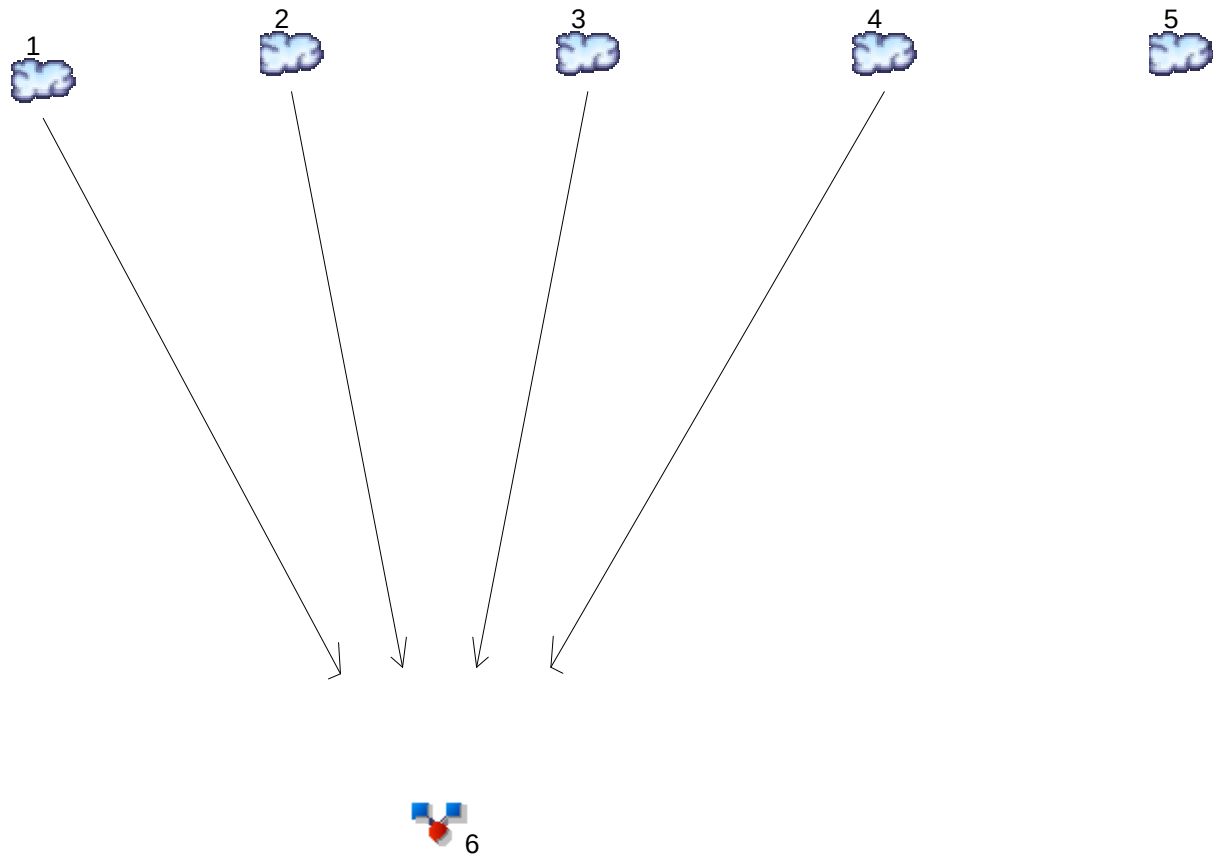
2017 Inlet

Hydrograph type	= Combine	Peak discharge	= 138.24 cfs
Storm frequency	= 100 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 968,981 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS 50
2	SCS Runoff	WS 51
3	SCS Runoff	WS 52
4	SCS Runoff	WS 55
5	SCS Runoff	WS 60
6	Combine	2012 Inlet

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	41.51	-------	-------	77.44	93.57	109.80	126.07	WS 50
2	SCS Runoff	------	-------	7.915	-------	-------	13.31	15.67	18.01	20.35	WS 51
3	SCS Runoff	------	-------	8.949	-------	-------	15.05	17.72	20.37	23.01	WS 52
4	SCS Runoff	------	-------	0.810	-------	-------	1.342	1.573	1.804	2.033	WS 55
5	SCS Runoff	------	-------	16.05	-------	-------	30.41	36.88	43.39	49.93	WS 60
6	Combine	1, 2, 3, 4,	-------	46.22	-------	-------	85.45	103.06	120.76	138.51	2012 Inlet

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	41.51	3	750	266,248	------	------	------	WS 50
2	SCS Runoff	7.915	3	726	26,564	------	------	------	WS 51
3	SCS Runoff	8.949	3	726	30,035	------	------	------	WS 52
4	SCS Runoff	0.810	3	726	2,731	------	------	------	WS 55
5	SCS Runoff	16.05	3	729	63,482	------	------	------	WS 60
6	Combine	46.22	3	747	325,578	1, 2, 3, 4,	------	------	2012 Inlet

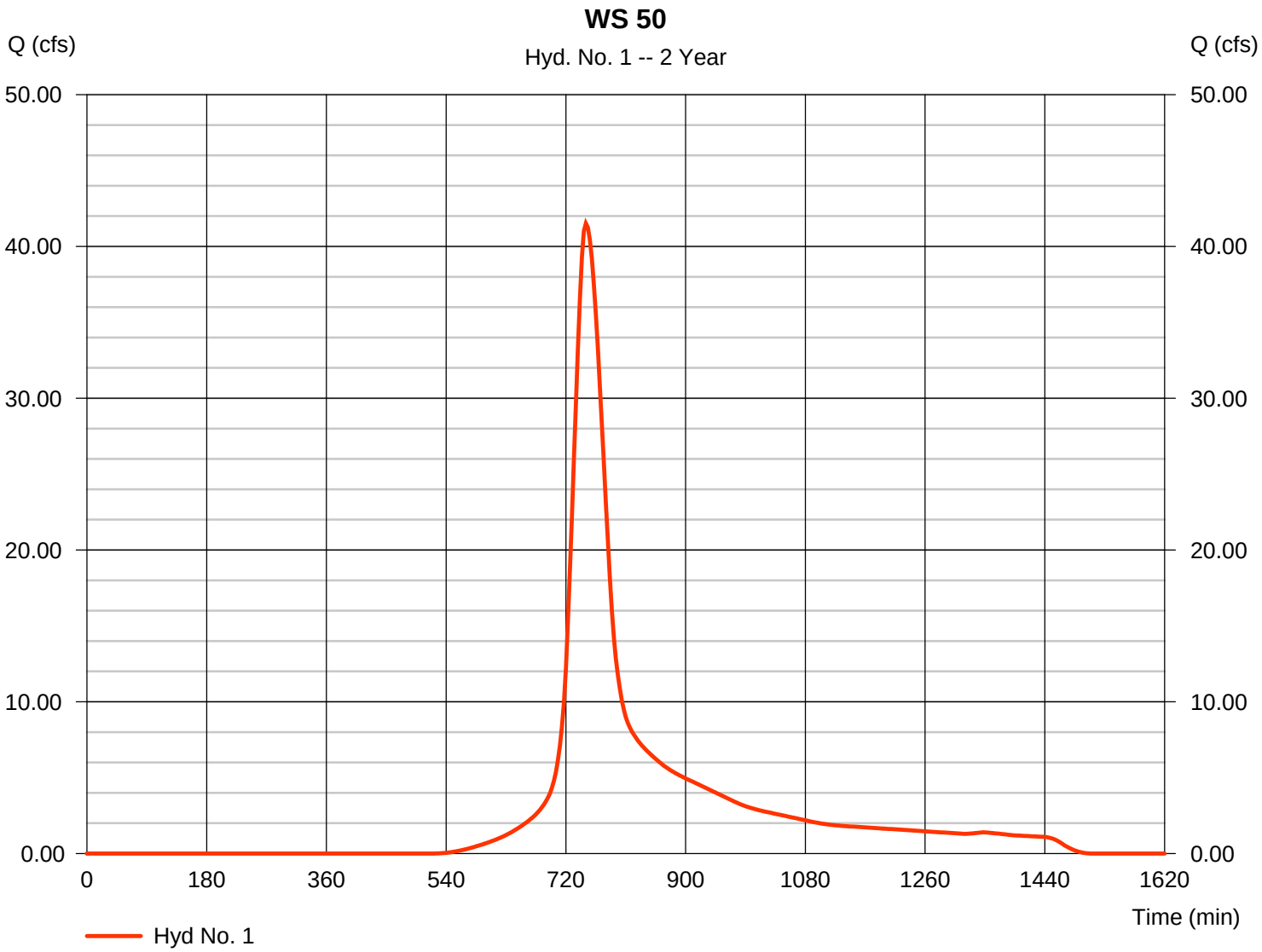
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 41.51 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 266,248 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



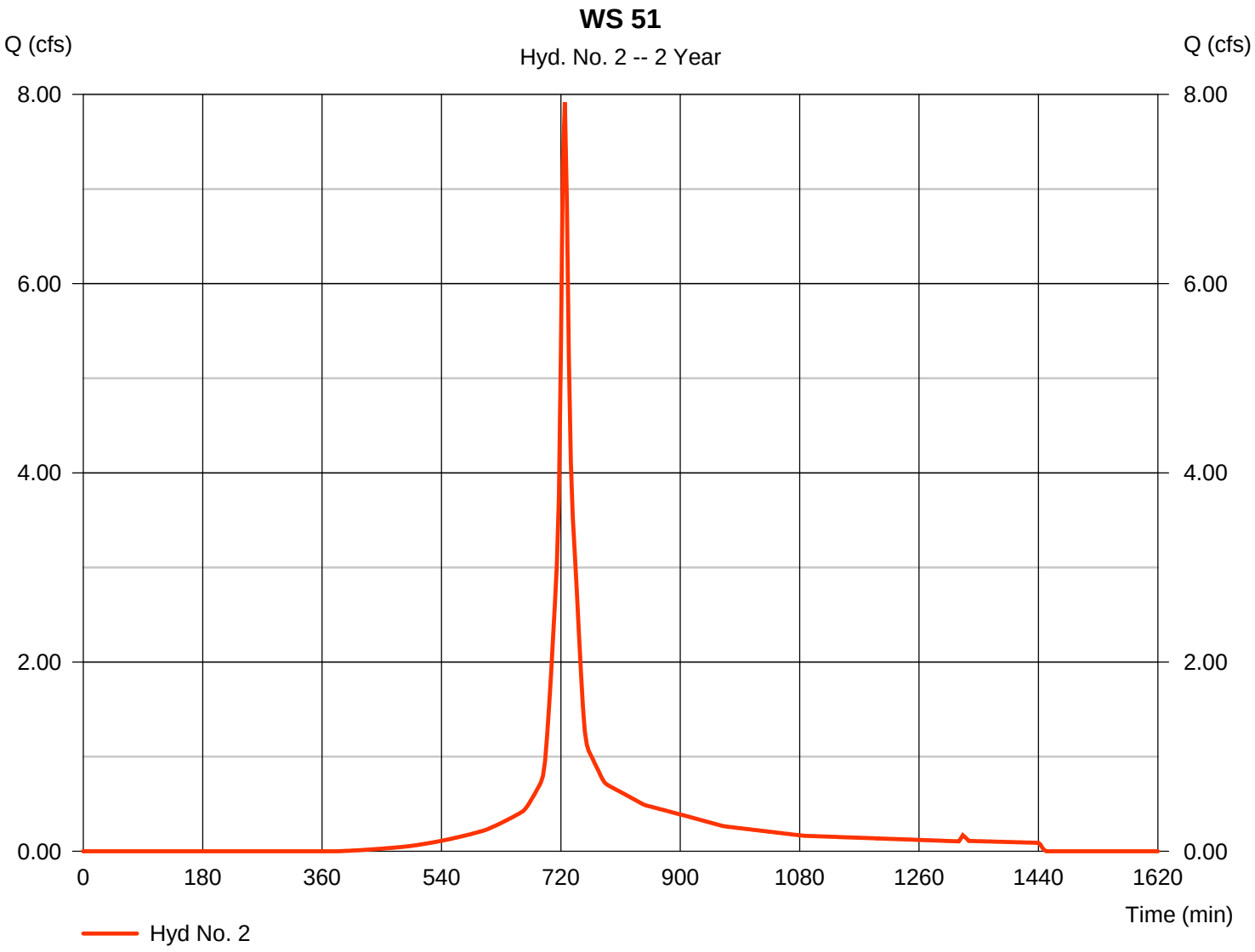
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.915 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	26,564 cuft
Drainage area	=	3.750 ac	Curve number	=	89
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.20 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



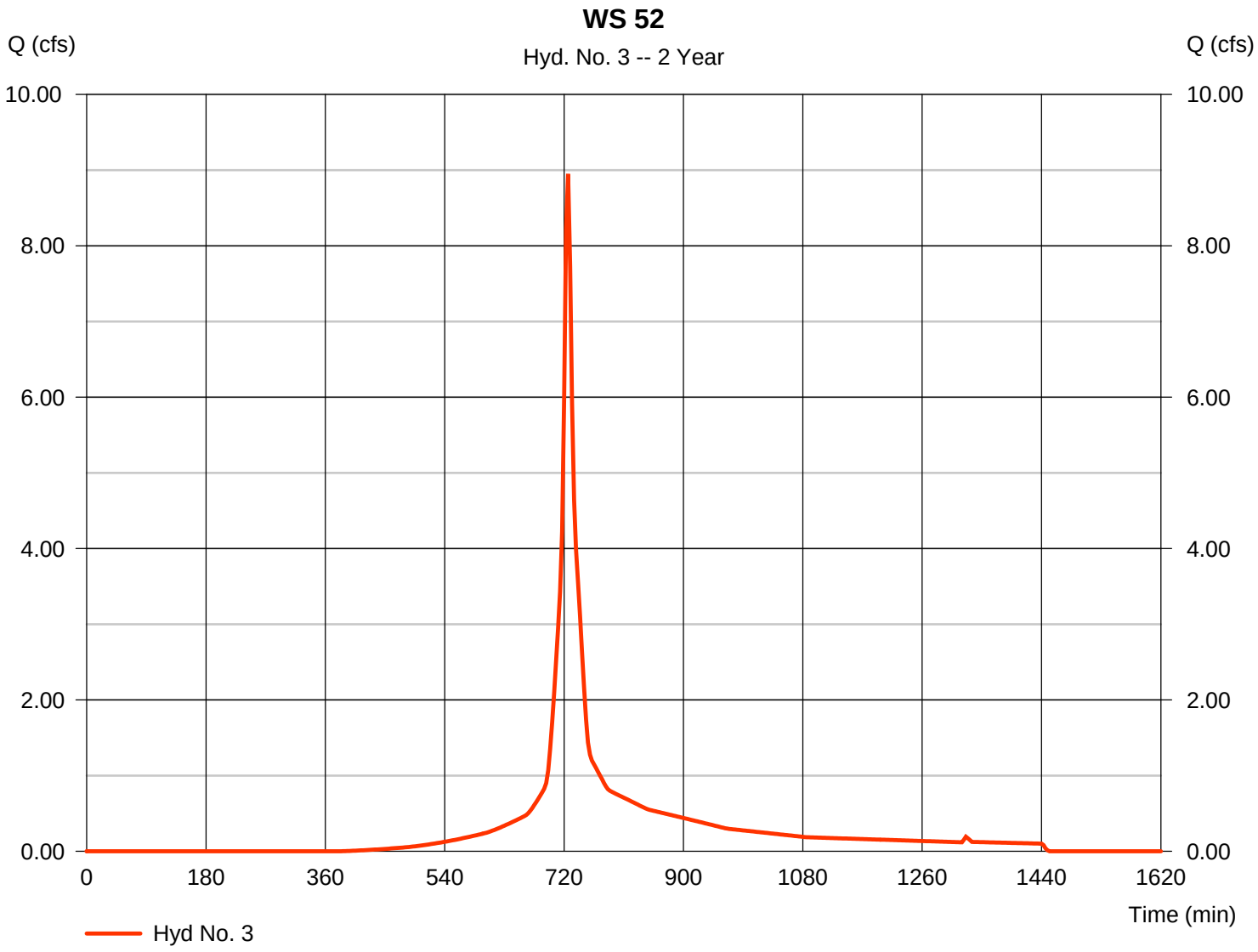
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 8.949 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 30,035 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



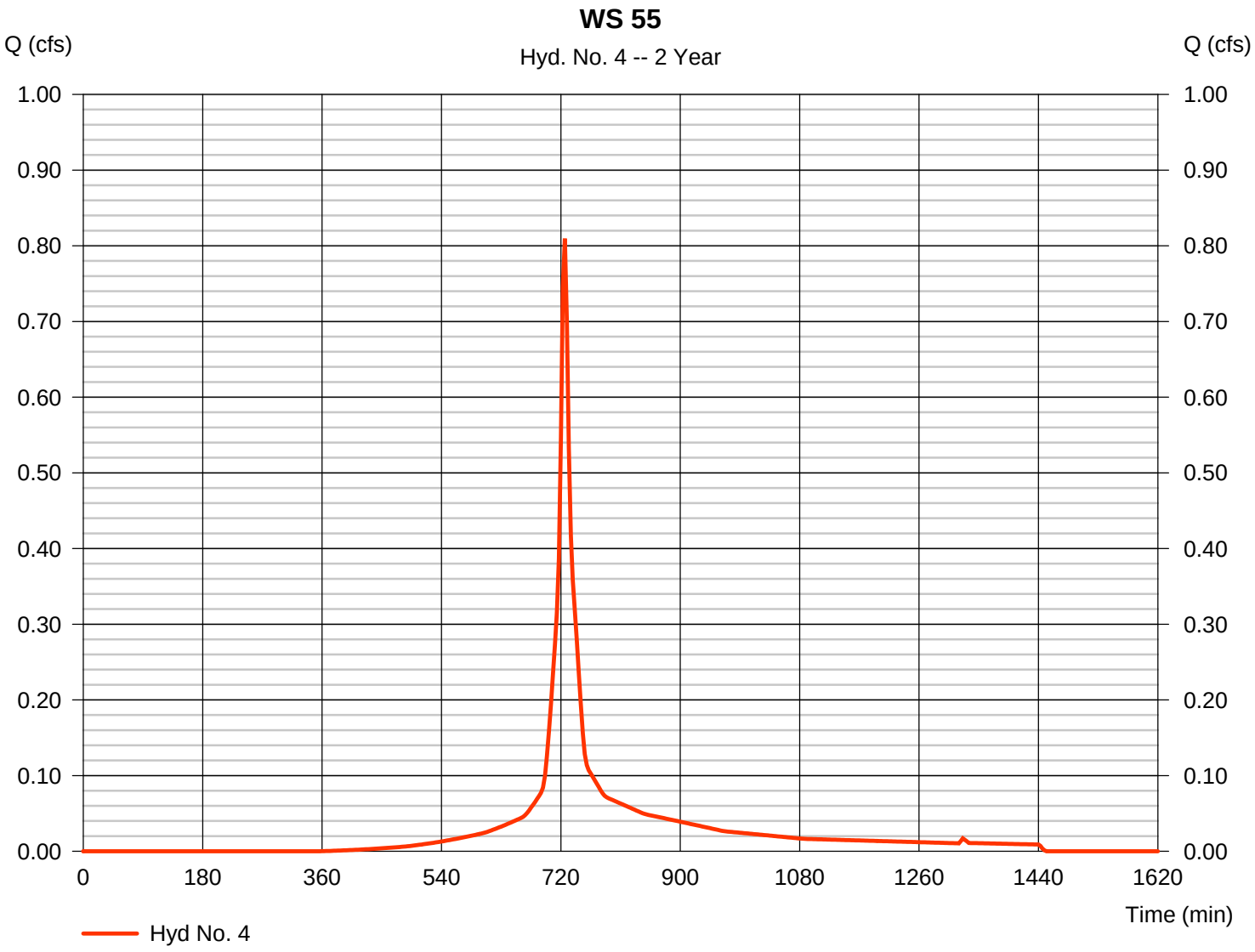
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 0.810 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 2,731 cuft
Drainage area	= 0.370 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



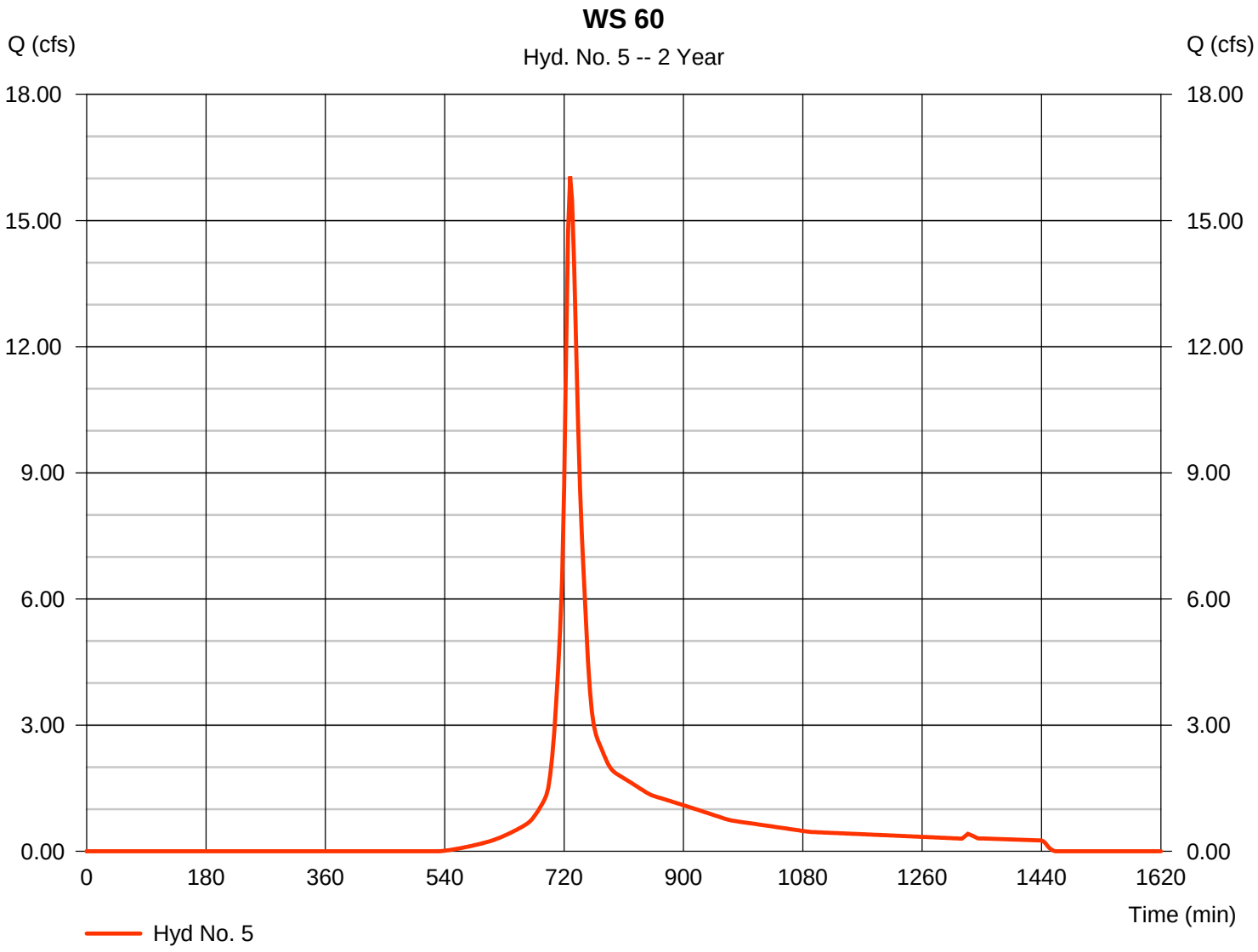
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 16.05 cfs
Storm frequency	= 2 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 63,482 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



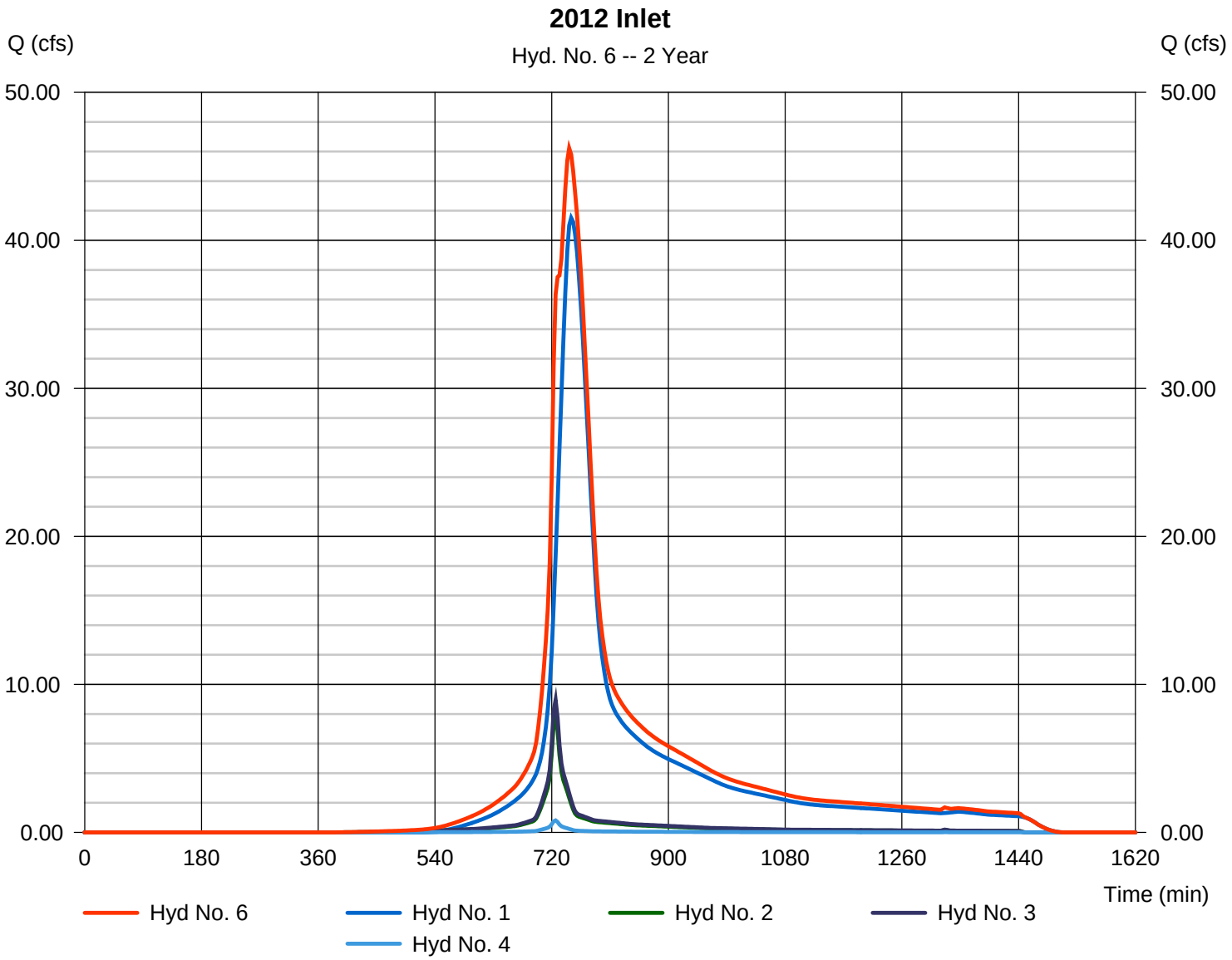
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 46.22 cfs
Storm frequency	= 2 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 325,578 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	77.44	3	750	495,328	------	------	------	WS 50
2	SCS Runoff	13.31	3	726	45,696	------	------	------	WS 51
3	SCS Runoff	15.05	3	726	51,667	------	------	------	WS 52
4	SCS Runoff	1.342	3	726	4,638	------	------	------	WS 55
5	SCS Runoff	30.41	3	729	119,726	------	------	------	WS 60
6	Combine	85.45	3	747	597,330	1, 2, 3, 4,	------	------	2012 Inlet

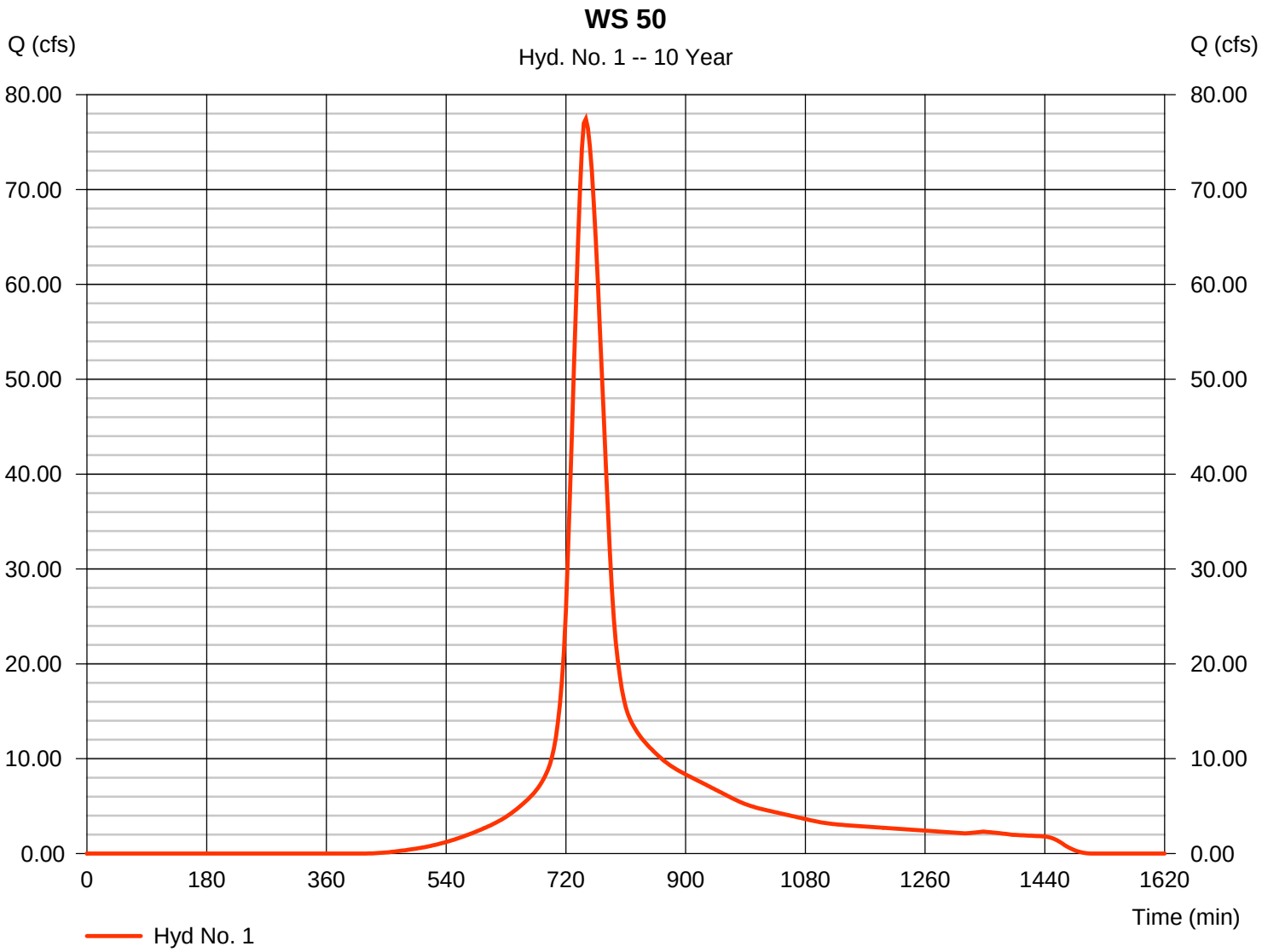
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 77.44 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 495,328 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



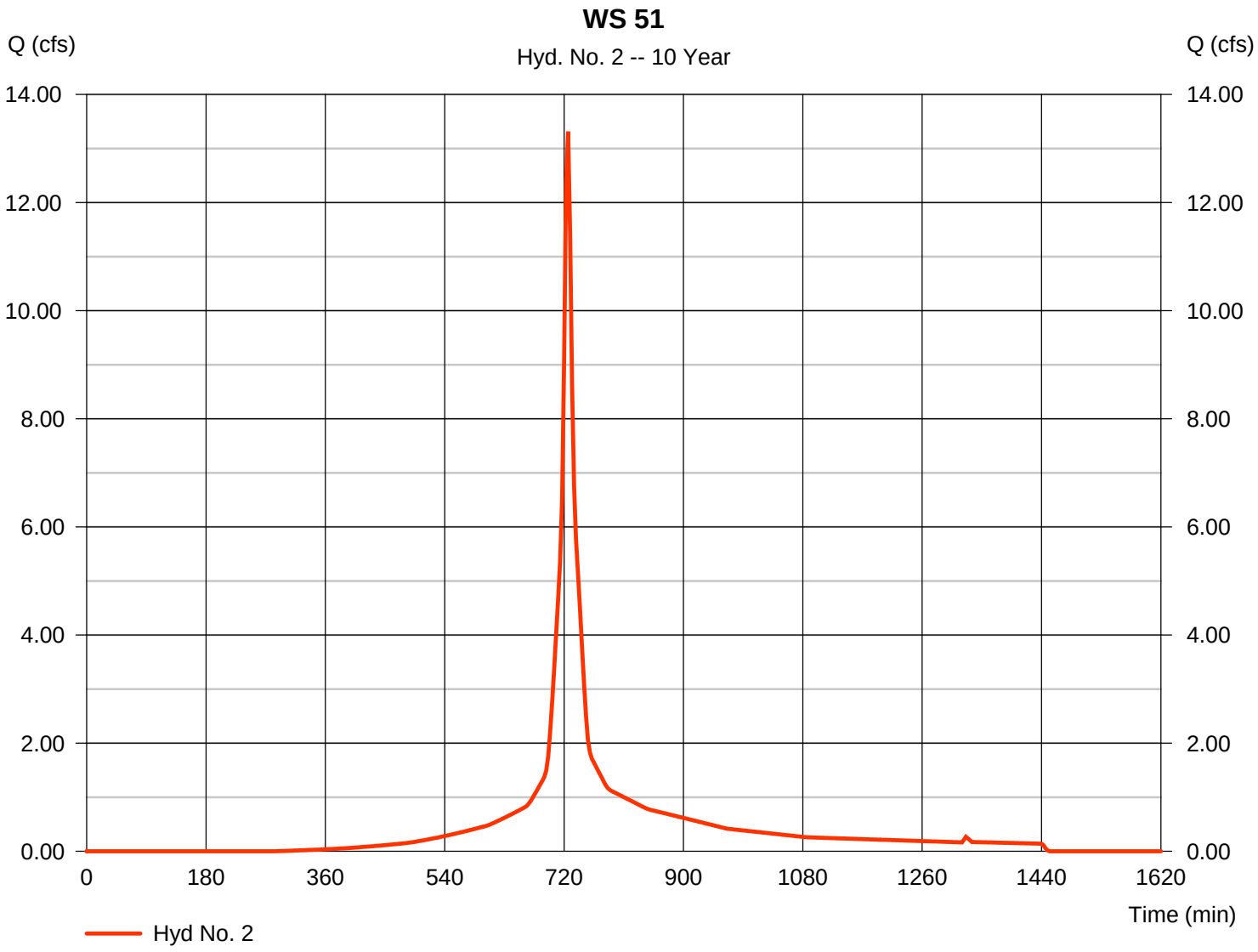
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 13.31 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 45,696 cuft
Drainage area	= 3.750 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



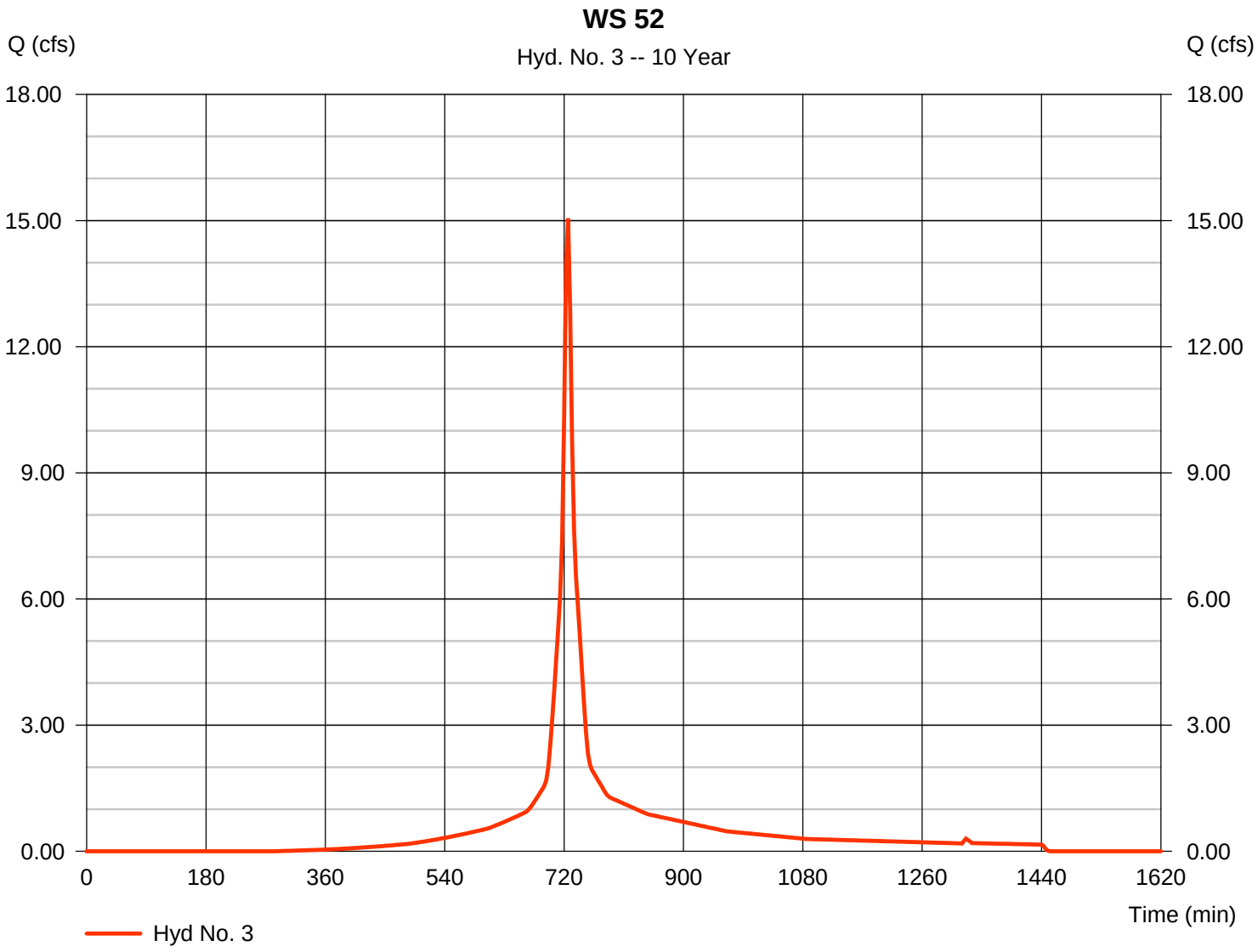
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 15.05 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 51,667 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



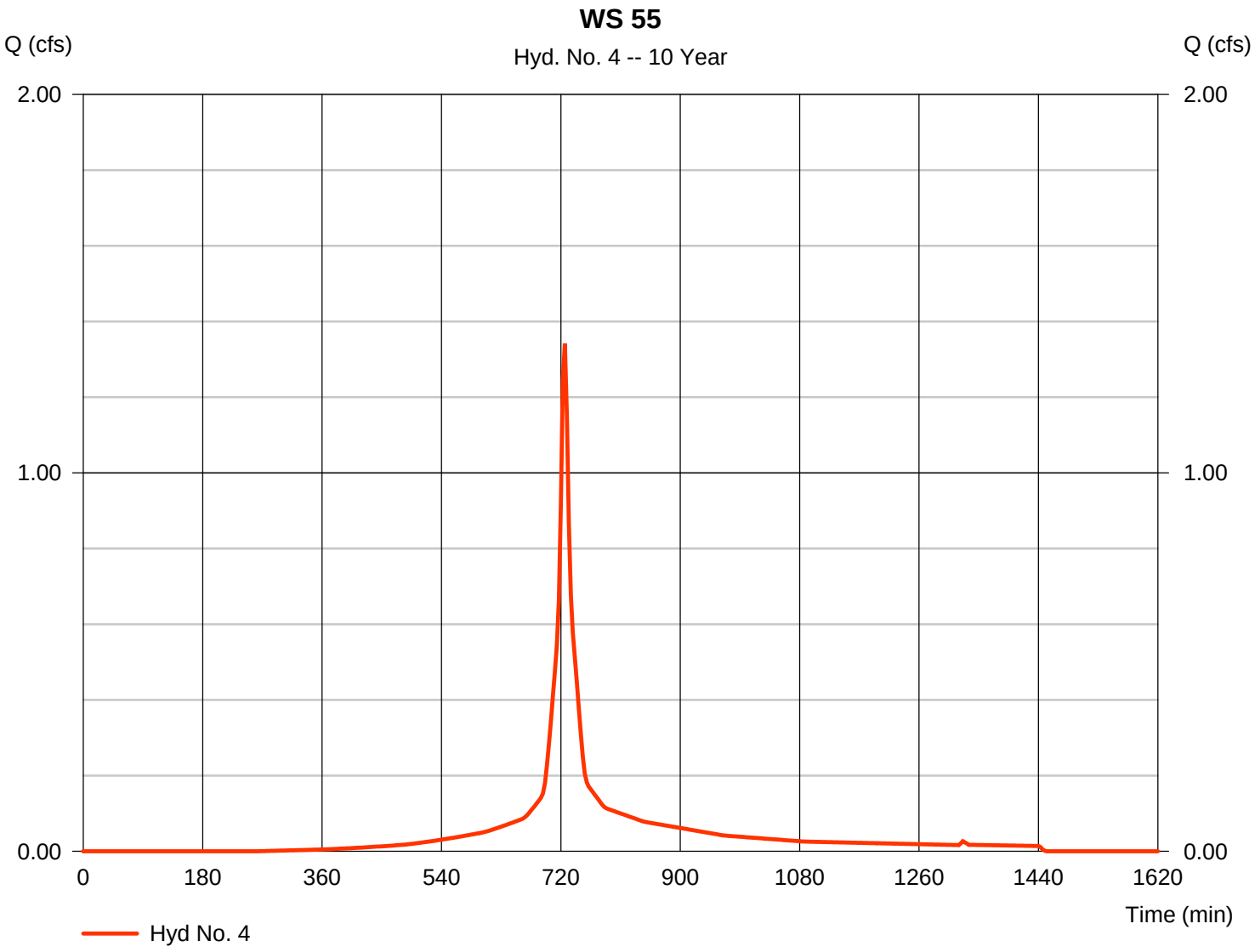
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 1.342 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 4,638 cuft
Drainage area	= 0.370 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



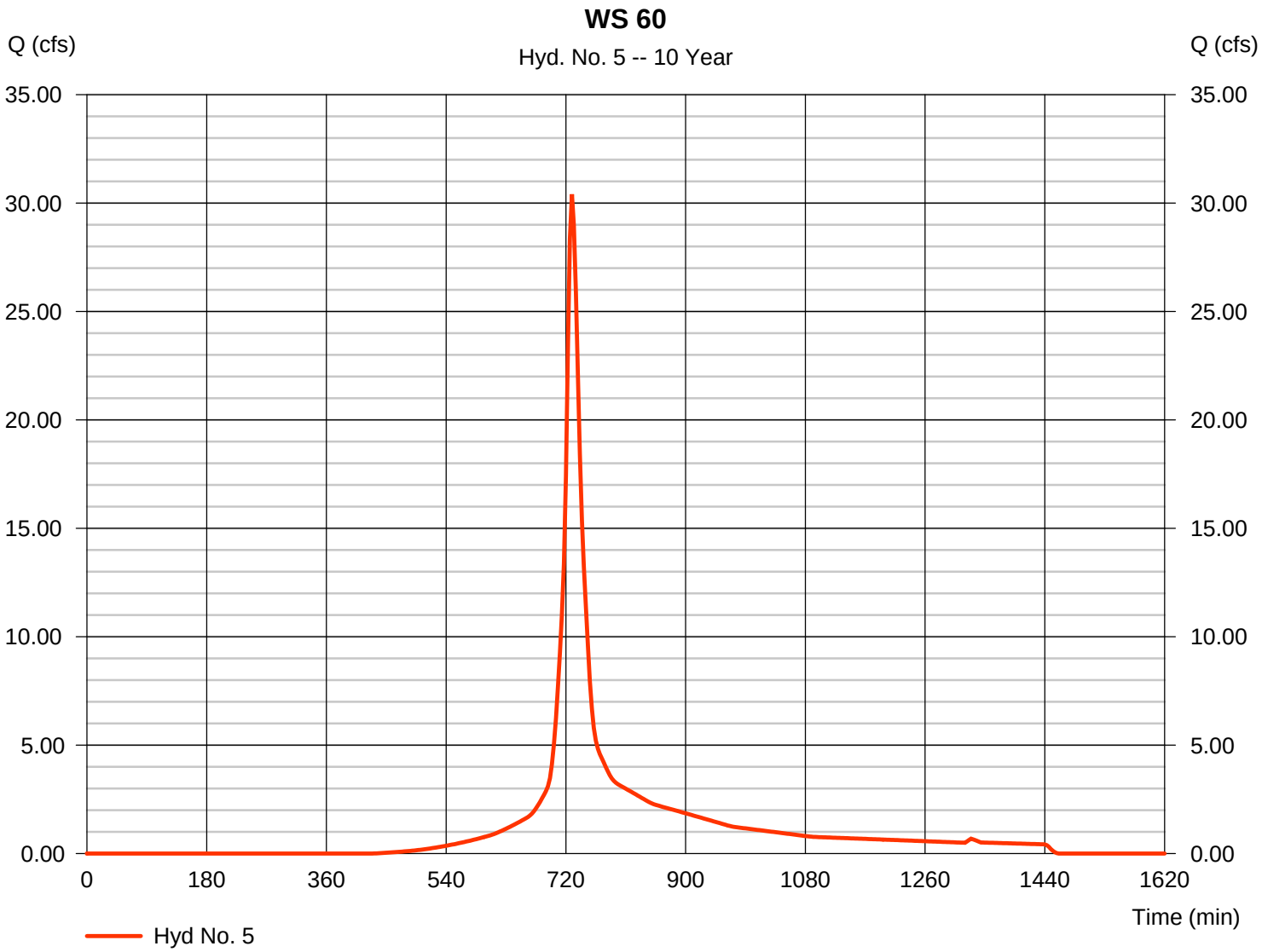
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 30.41 cfs
Storm frequency	= 10 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 119,726 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



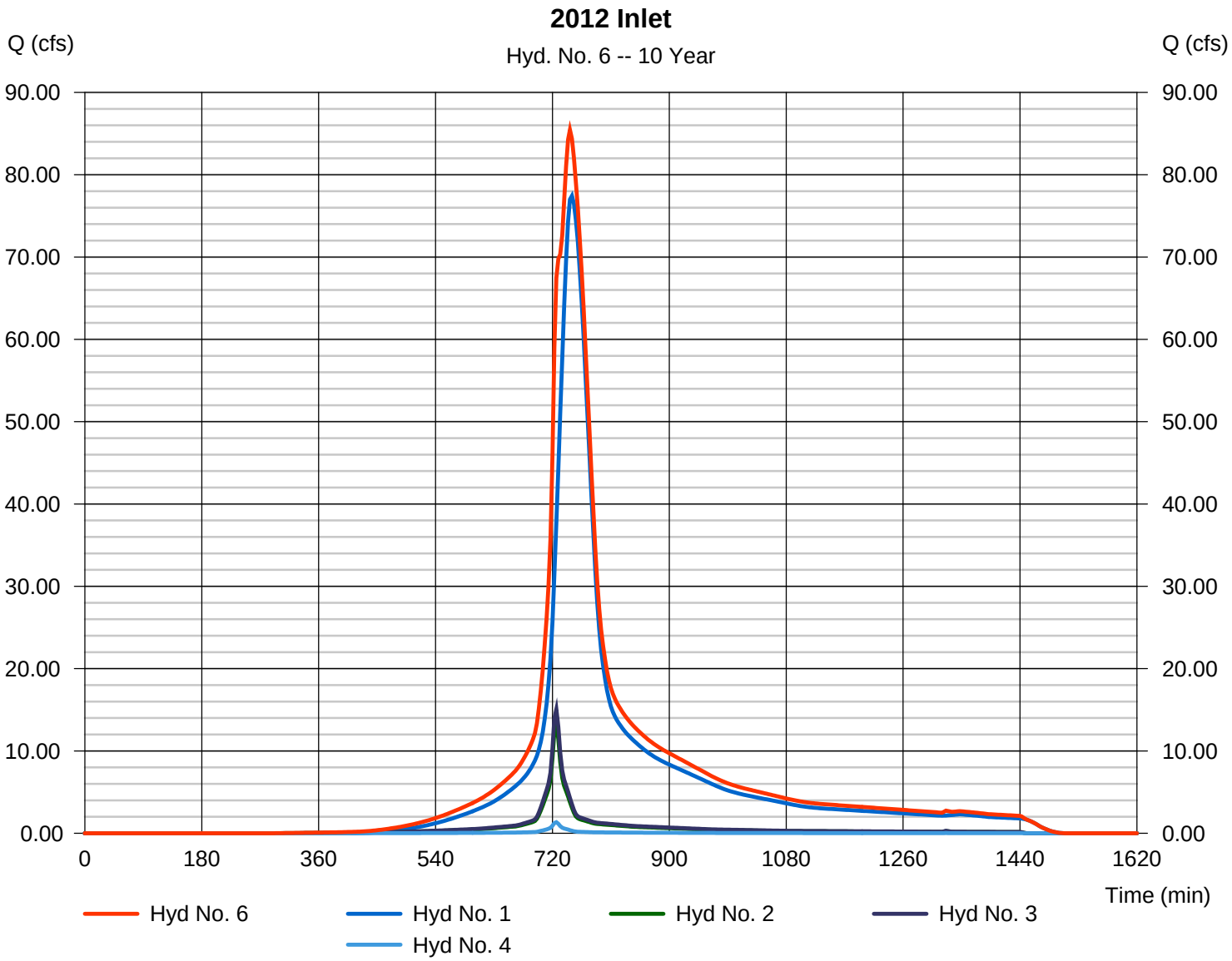
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 85.45 cfs
Storm frequency	= 10 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 597,330 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	93.57	3	750	600,576	------	------	------	WS 50
2	SCS Runoff	15.67	3	726	54,266	------	------	------	WS 51
3	SCS Runoff	17.72	3	726	61,357	------	------	------	WS 52
4	SCS Runoff	1.573	3	726	5,490	------	------	------	WS 55
5	SCS Runoff	36.88	3	729	145,691	------	------	------	WS 60
6	Combine	103.06	3	747	721,689	1, 2, 3, 4,	------	------	2012 Inlet

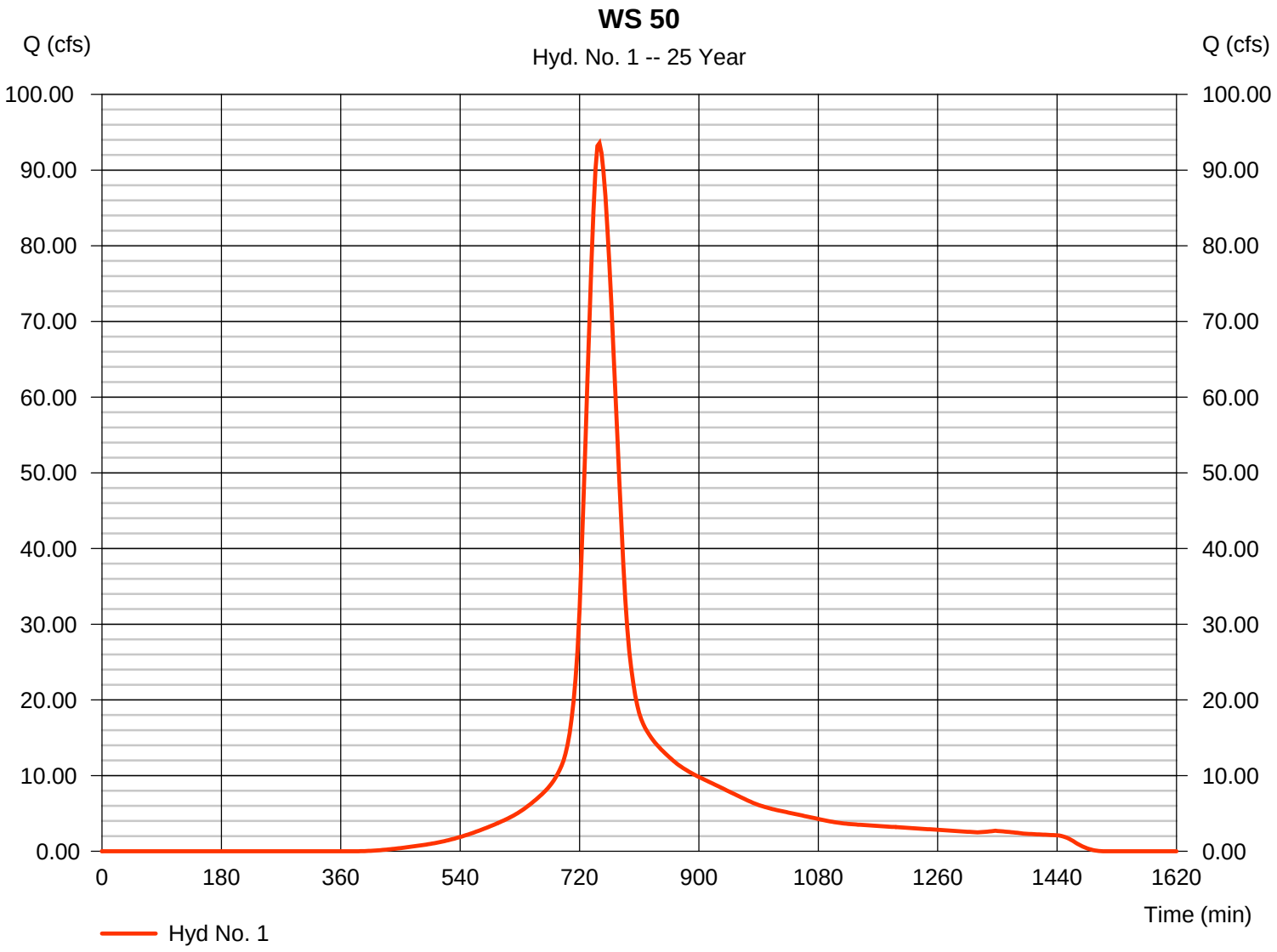
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 93.57 cfs
Storm frequency	= 25 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 600,576 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



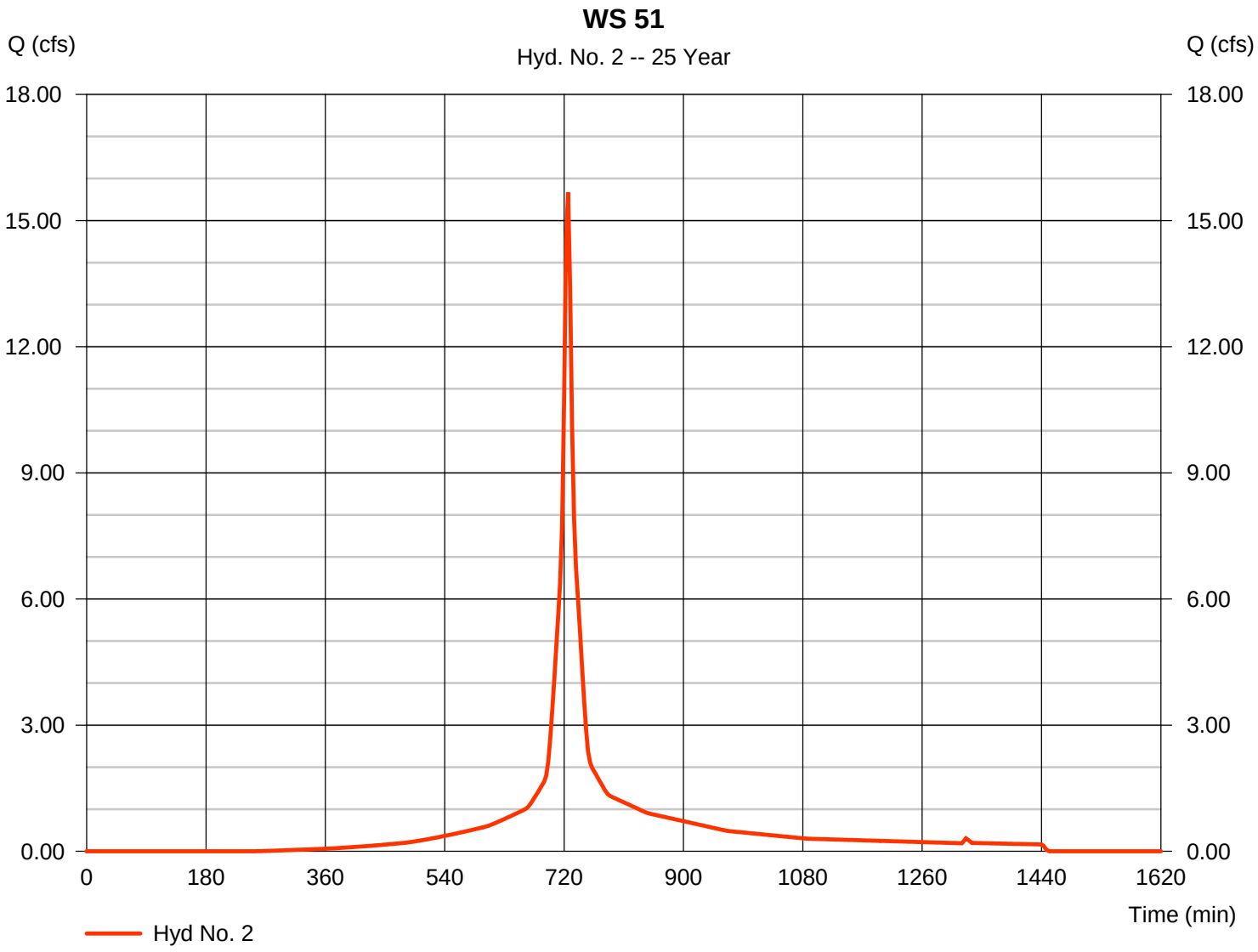
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 15.67 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 54,266 cuft
Drainage area	= 3.750 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



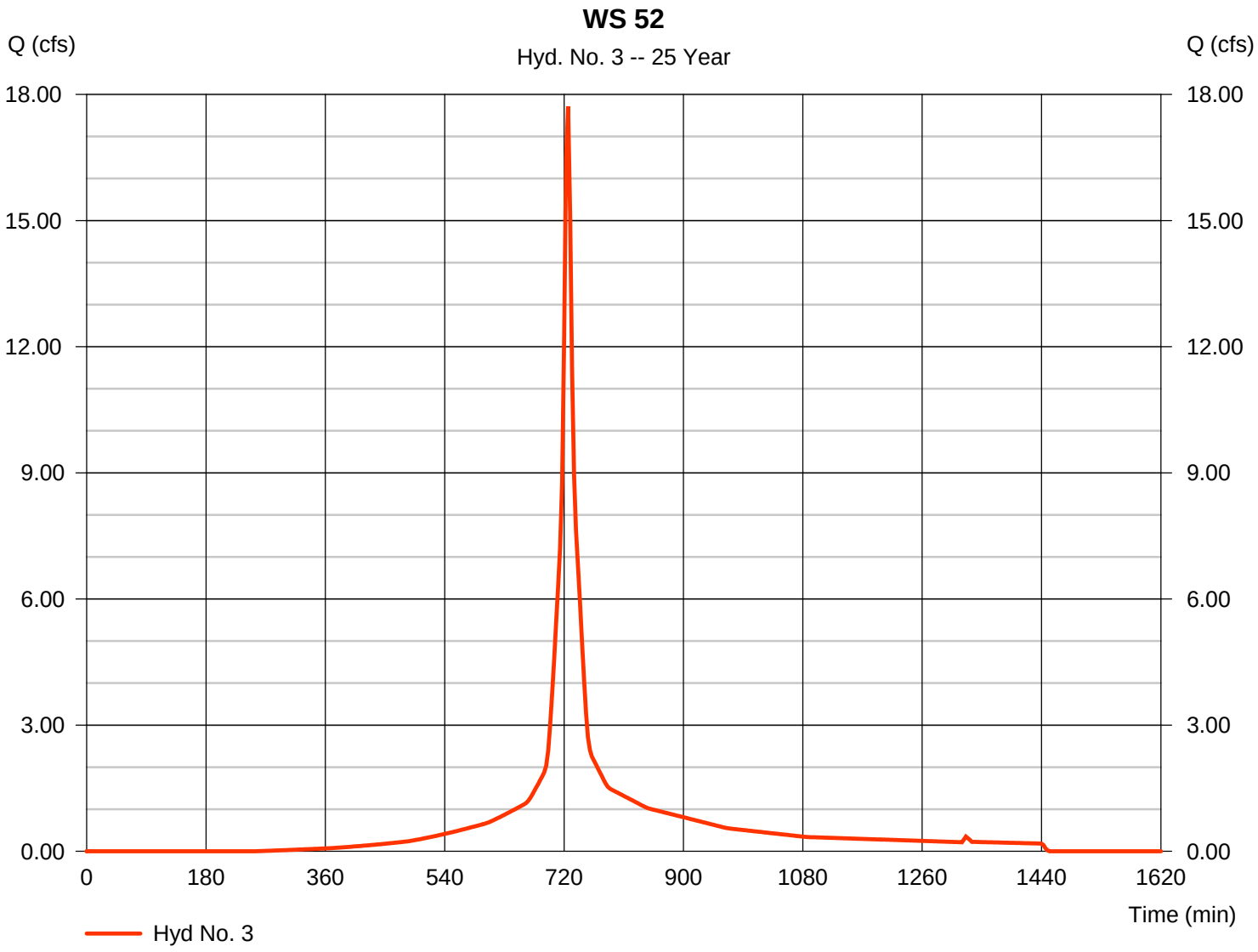
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 17.72 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 61,357 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



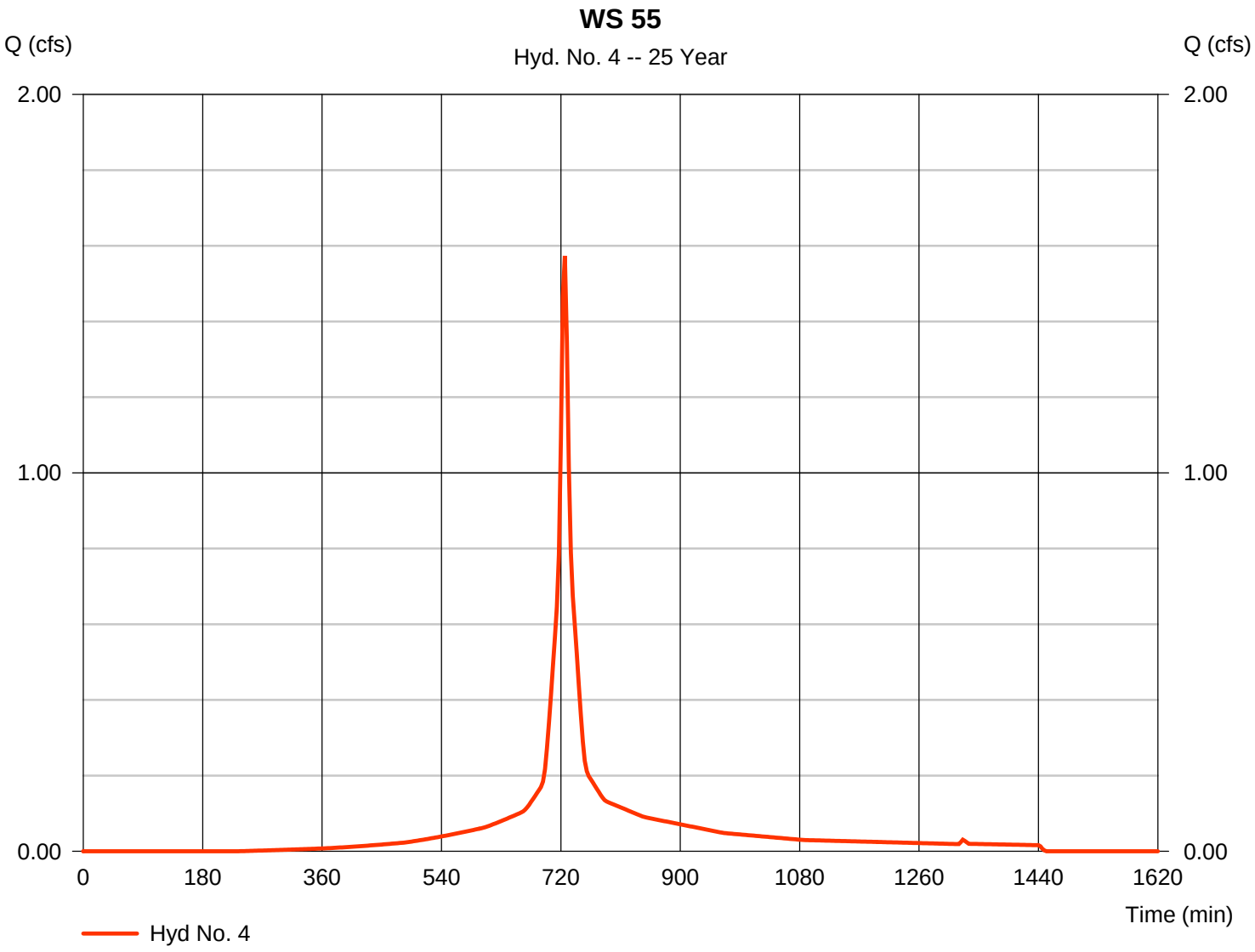
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 1.573 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 5,490 cuft
Drainage area	= 0.370 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



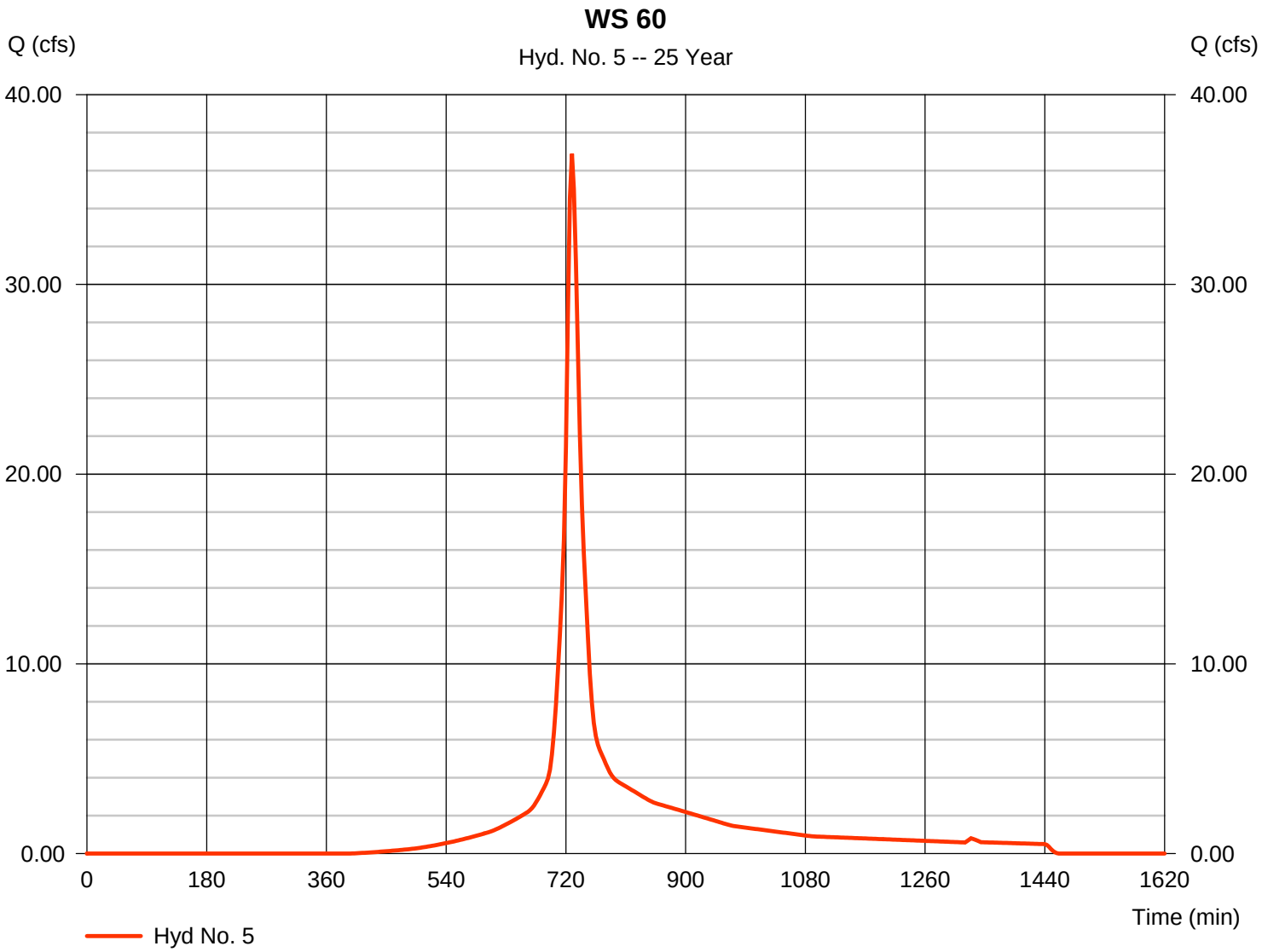
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 36.88 cfs
Storm frequency	= 25 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 145,691 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



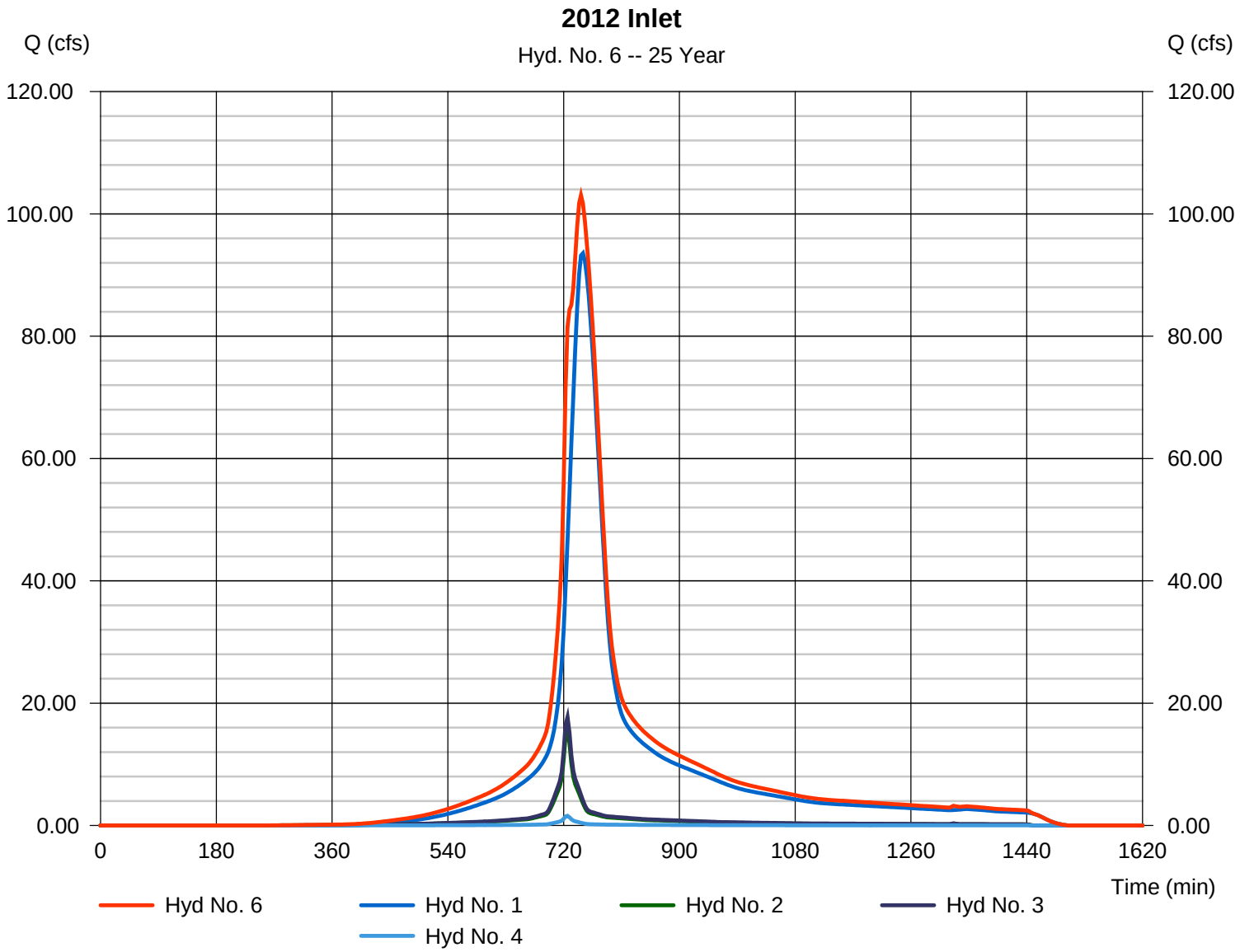
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 103.06 cfs
Storm frequency	= 25 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 721,689 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	109.80	3	750	707,711	------	------	------	WS 50
2	SCS Runoff	18.01	3	726	62,907	------	------	------	WS 51
3	SCS Runoff	20.37	3	726	71,127	------	------	------	WS 52
4	SCS Runoff	1.804	3	726	6,347	------	------	------	WS 55
5	SCS Runoff	43.39	3	729	172,171	------	------	------	WS 60
6	Combine	120.76	3	747	848,092	1, 2, 3, 4,	------	------	2012 Inlet

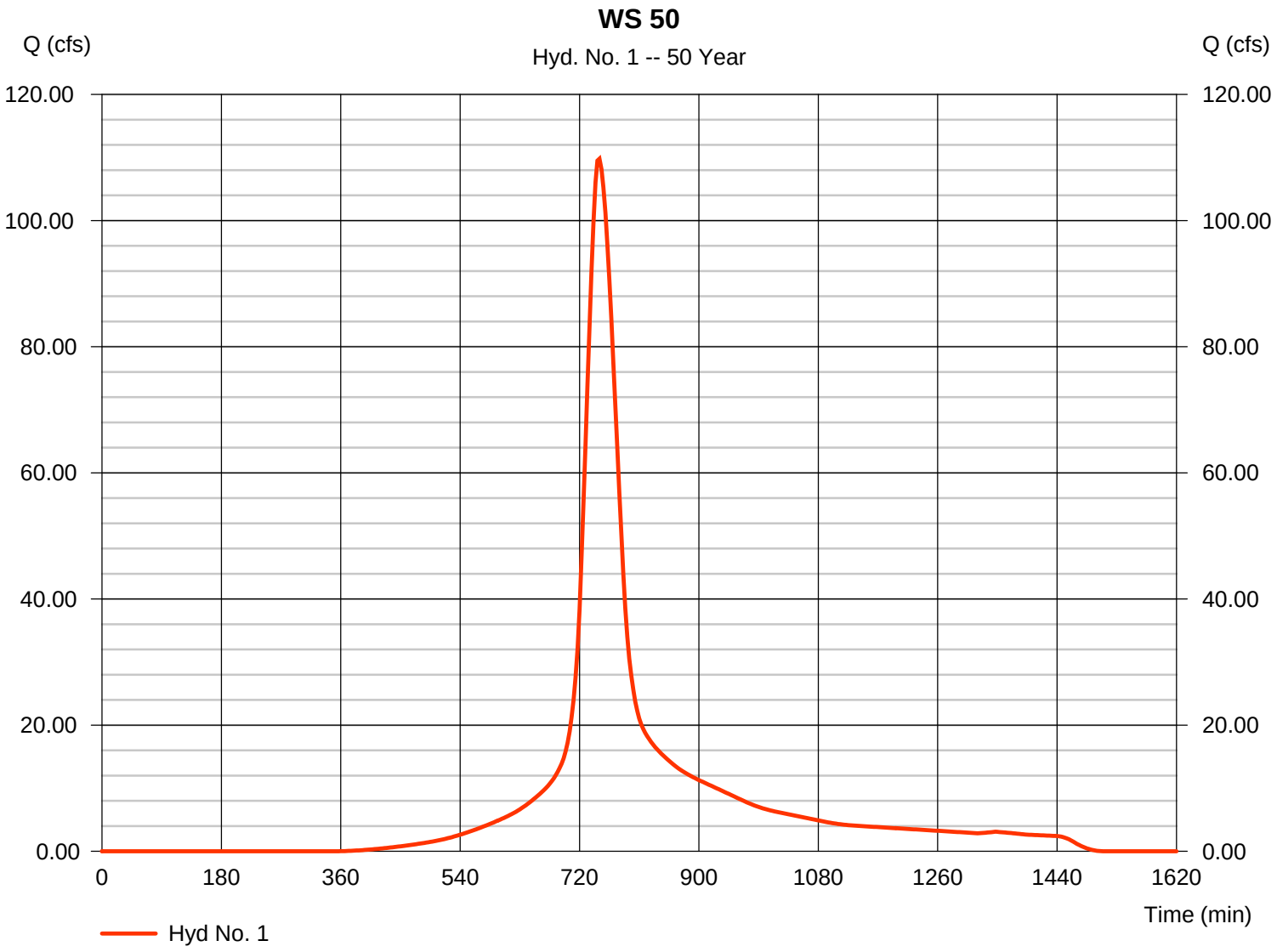
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 109.80 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 707,711 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



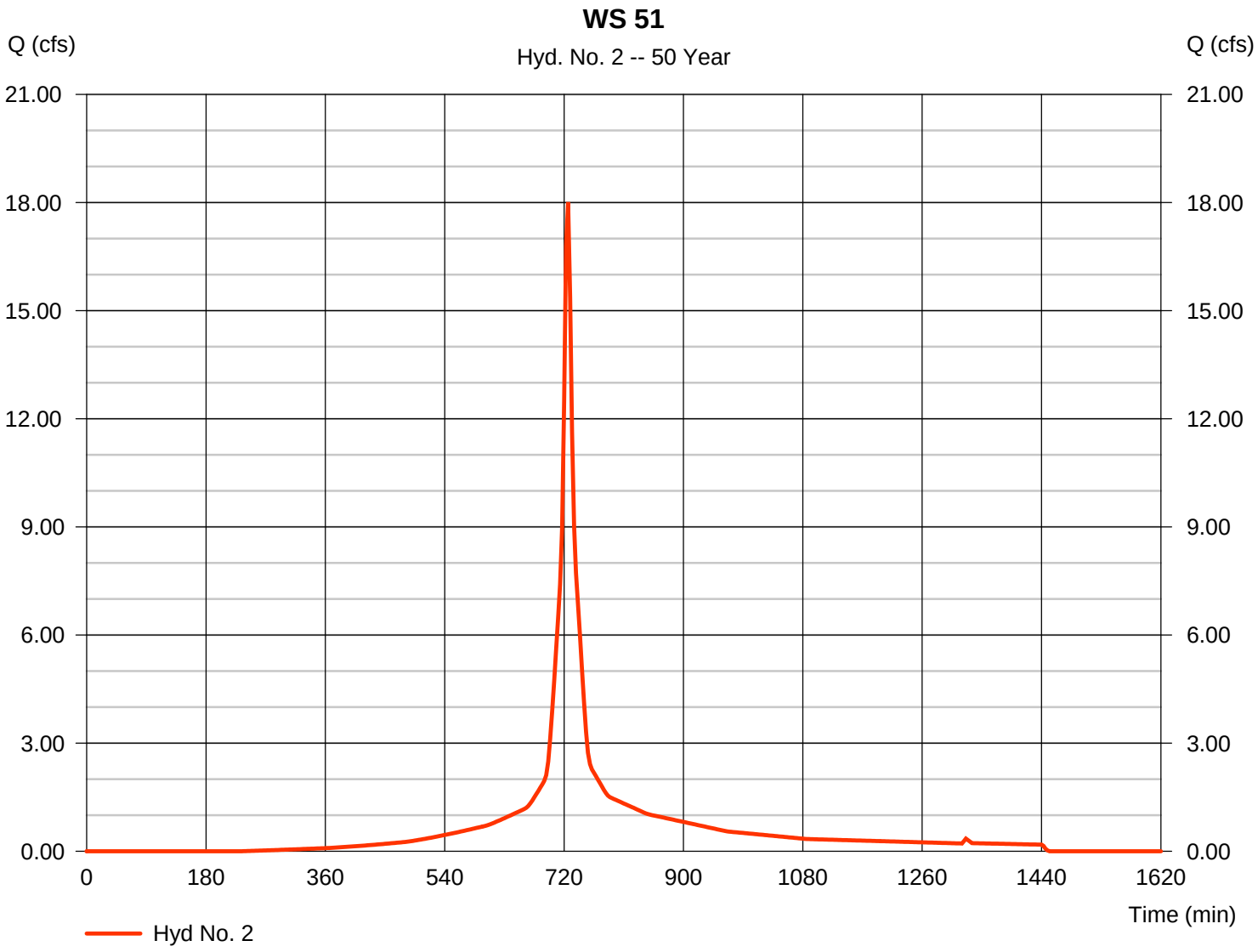
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 18.01 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 62,907 cuft
Drainage area	= 3.750 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



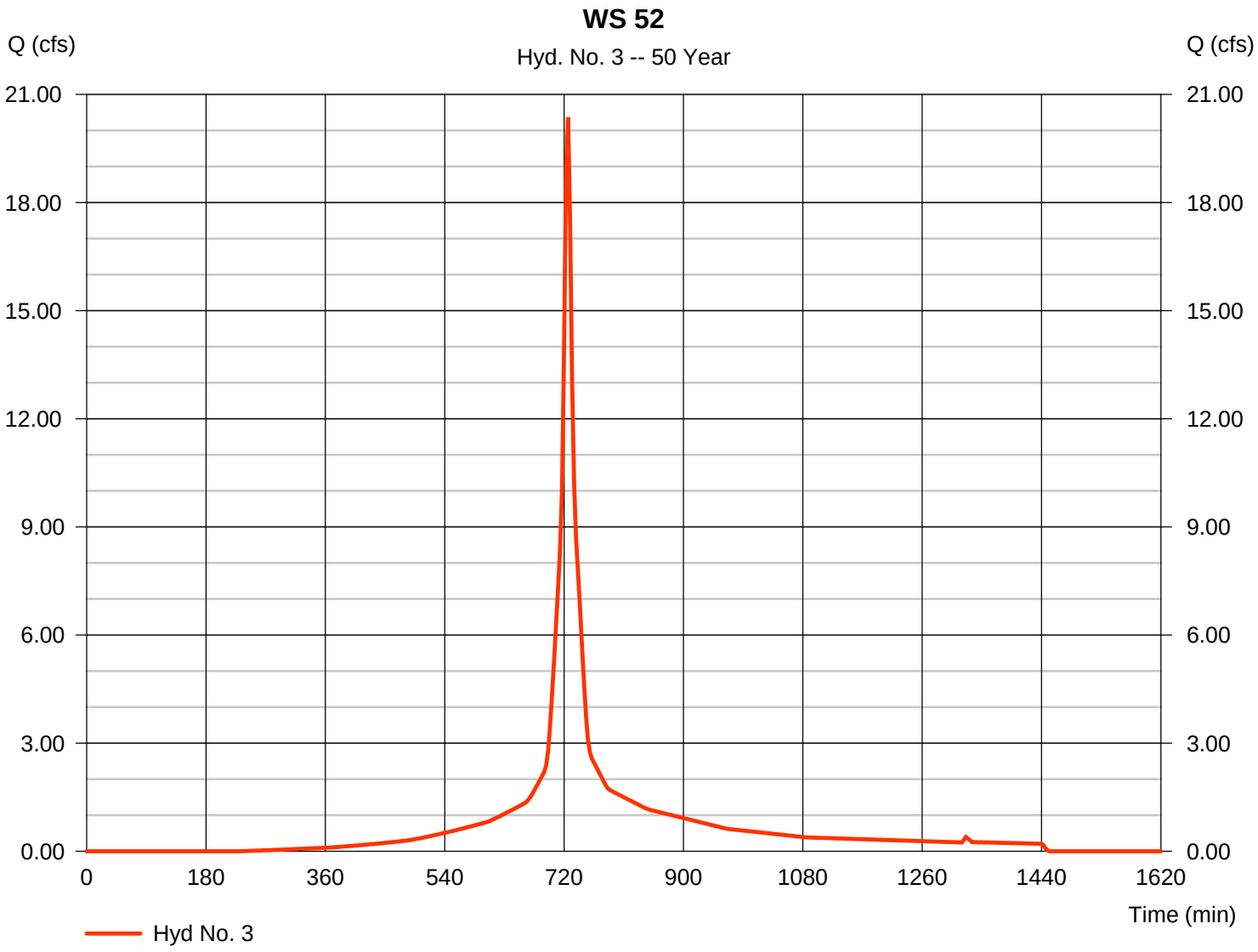
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 20.37 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 71,127 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



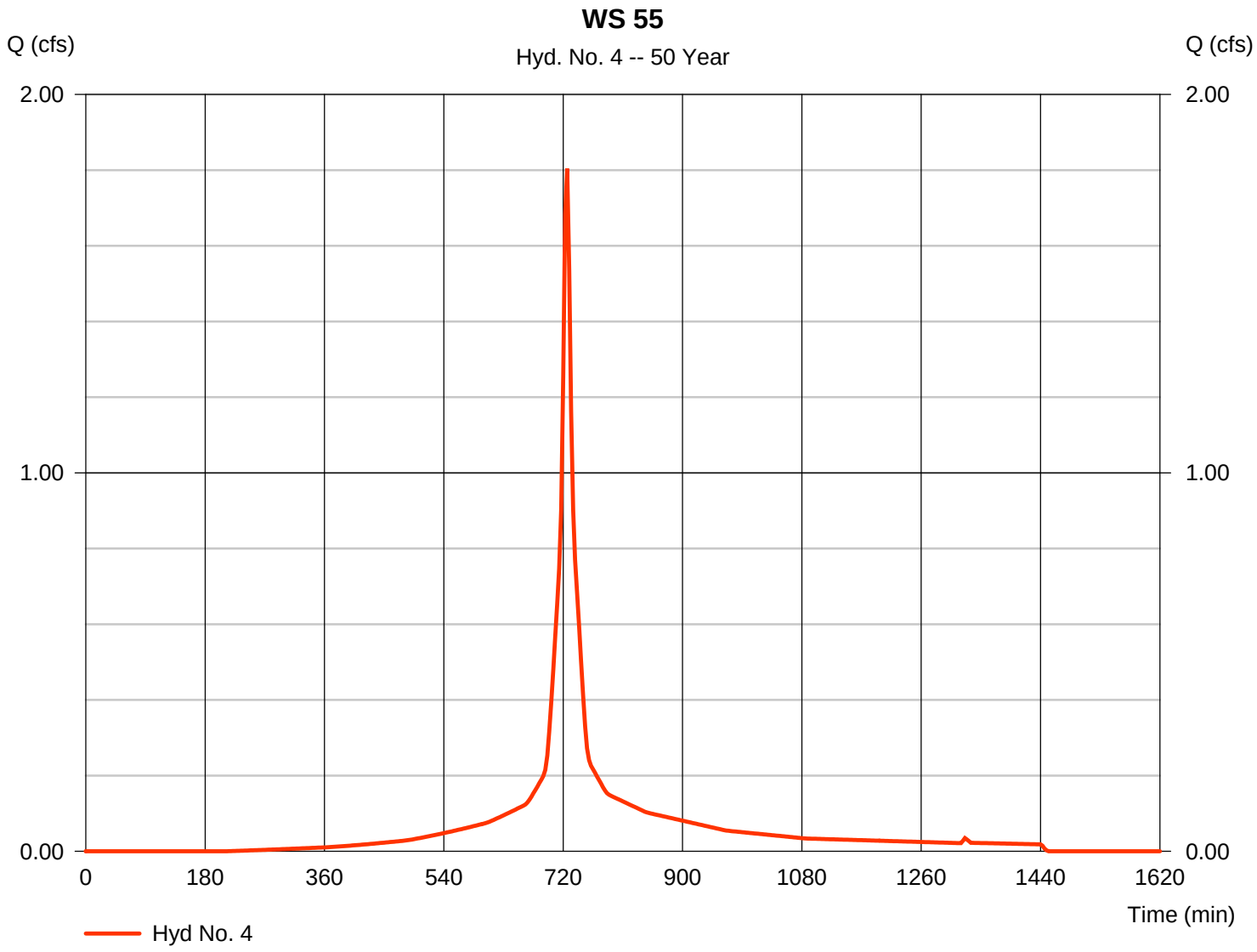
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	= SCS Runoff	Peak discharge	= 1.804 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 6,347 cuft
Drainage area	= 0.370 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



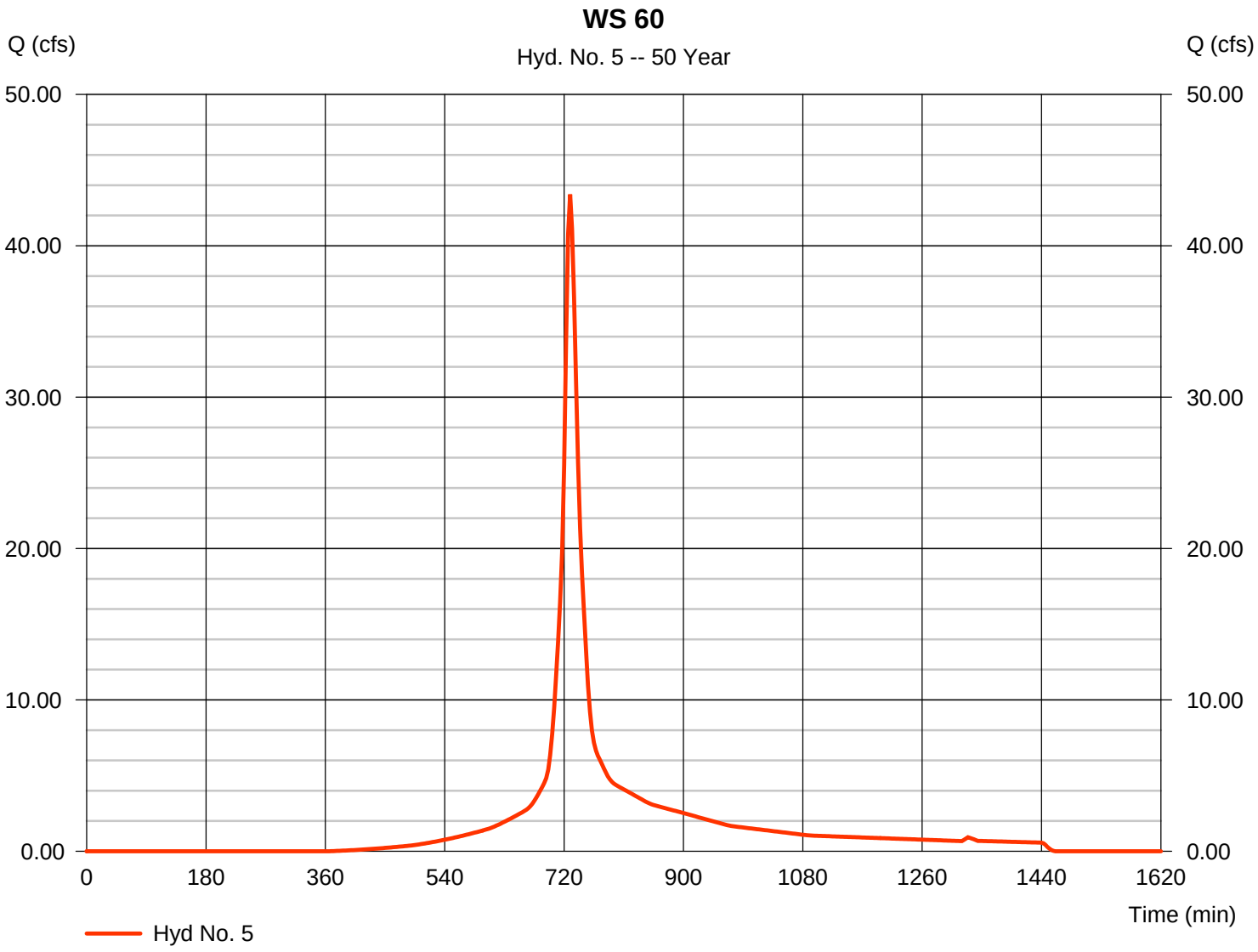
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	= SCS Runoff	Peak discharge	= 43.39 cfs
Storm frequency	= 50 yrs	Time to peak	= 729 min
Time interval	= 3 min	Hyd. volume	= 172,171 cuft
Drainage area	= 11.370 ac	Curve number	= 82
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



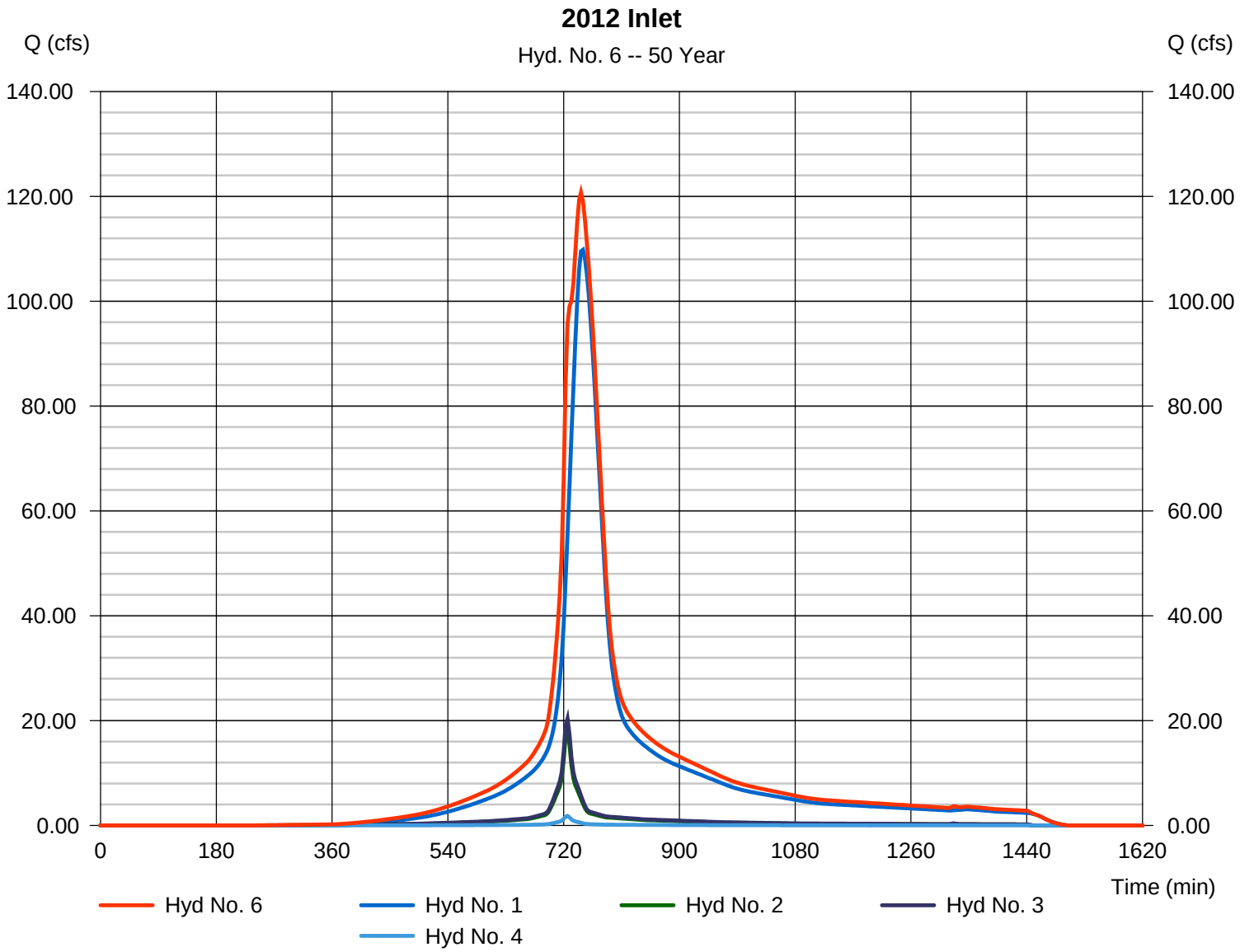
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 120.76 cfs
Storm frequency	= 50 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 848,092 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	126.07	3	750	816,271	------	------	------	WS 50
2	SCS Runoff	20.35	3	726	71,599	------	------	------	WS 51
3	SCS Runoff	23.01	3	726	80,955	------	------	------	WS 52
4	SCS Runoff	2.033	3	726	7,209	------	------	------	WS 55
5	SCS Runoff	49.93	3	729	199,040	------	------	------	WS 60
6	Combine	138.51	3	747	976,034	1, 2, 3, 4,	------	------	2012 Inlet

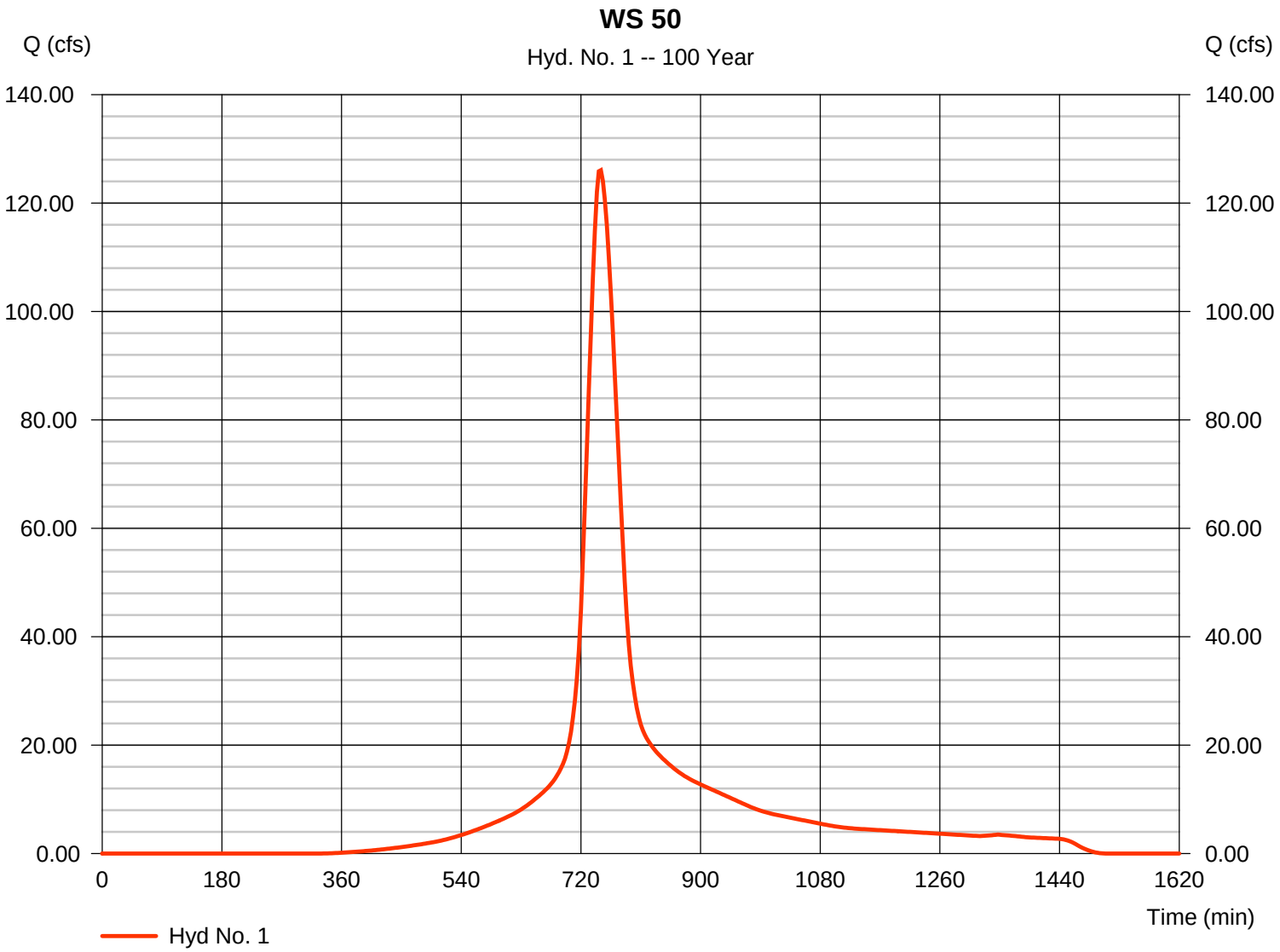
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 126.07 cfs
Storm frequency	= 100 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 816,271 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



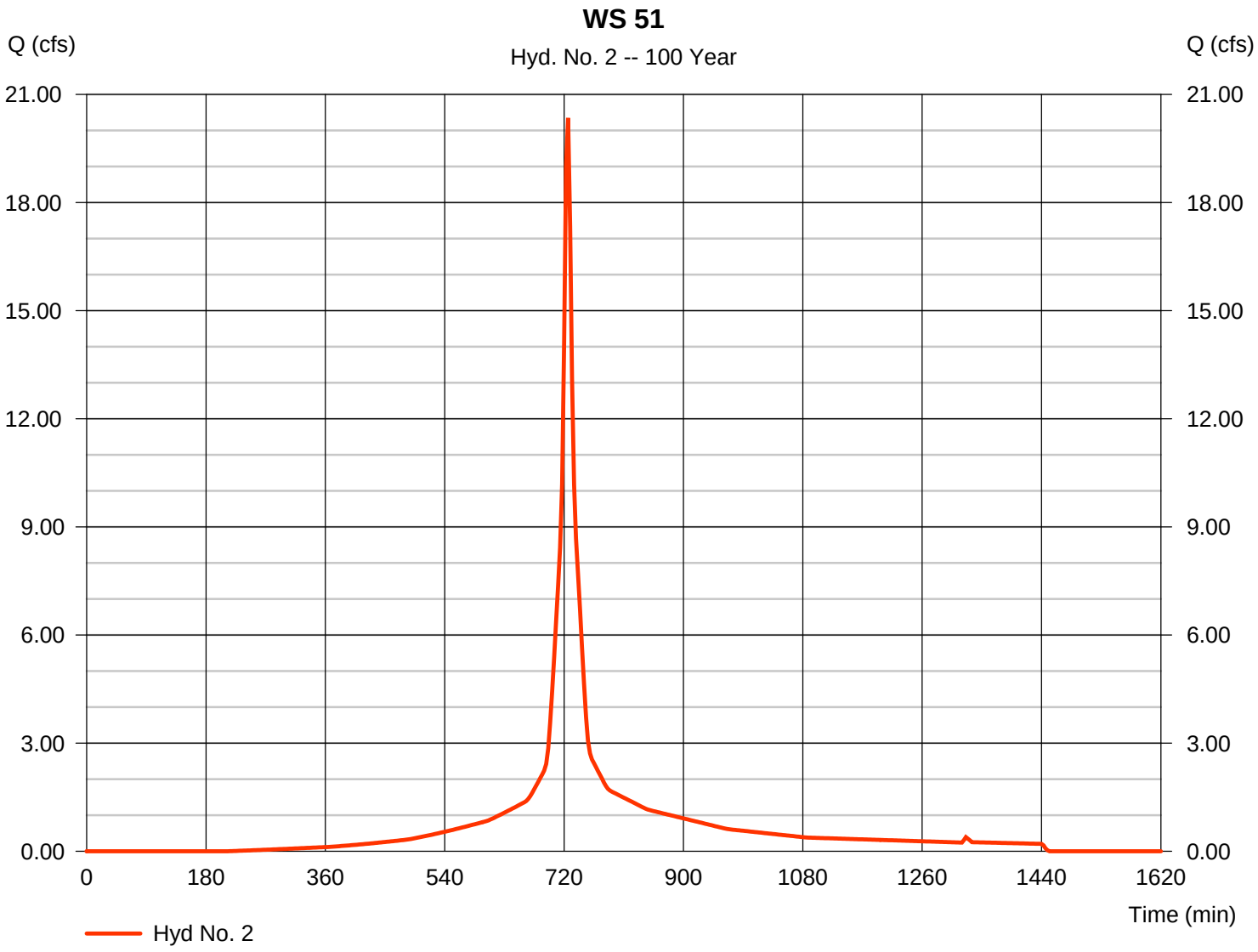
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 2

WS 51

Hydrograph type	= SCS Runoff	Peak discharge	= 20.35 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 71,599 cuft
Drainage area	= 3.750 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



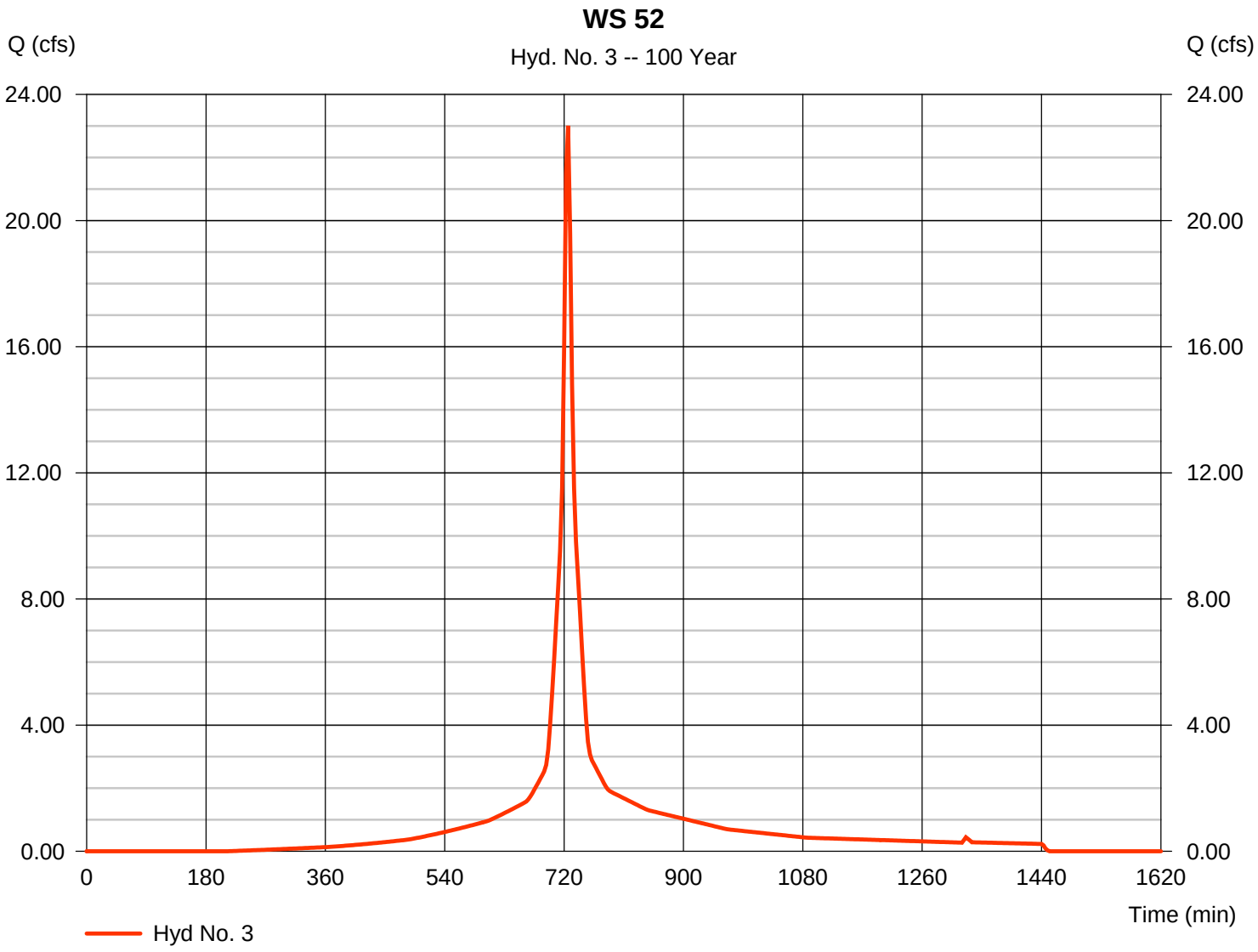
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 3

WS 52

Hydrograph type	= SCS Runoff	Peak discharge	= 23.01 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 80,955 cuft
Drainage area	= 4.240 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



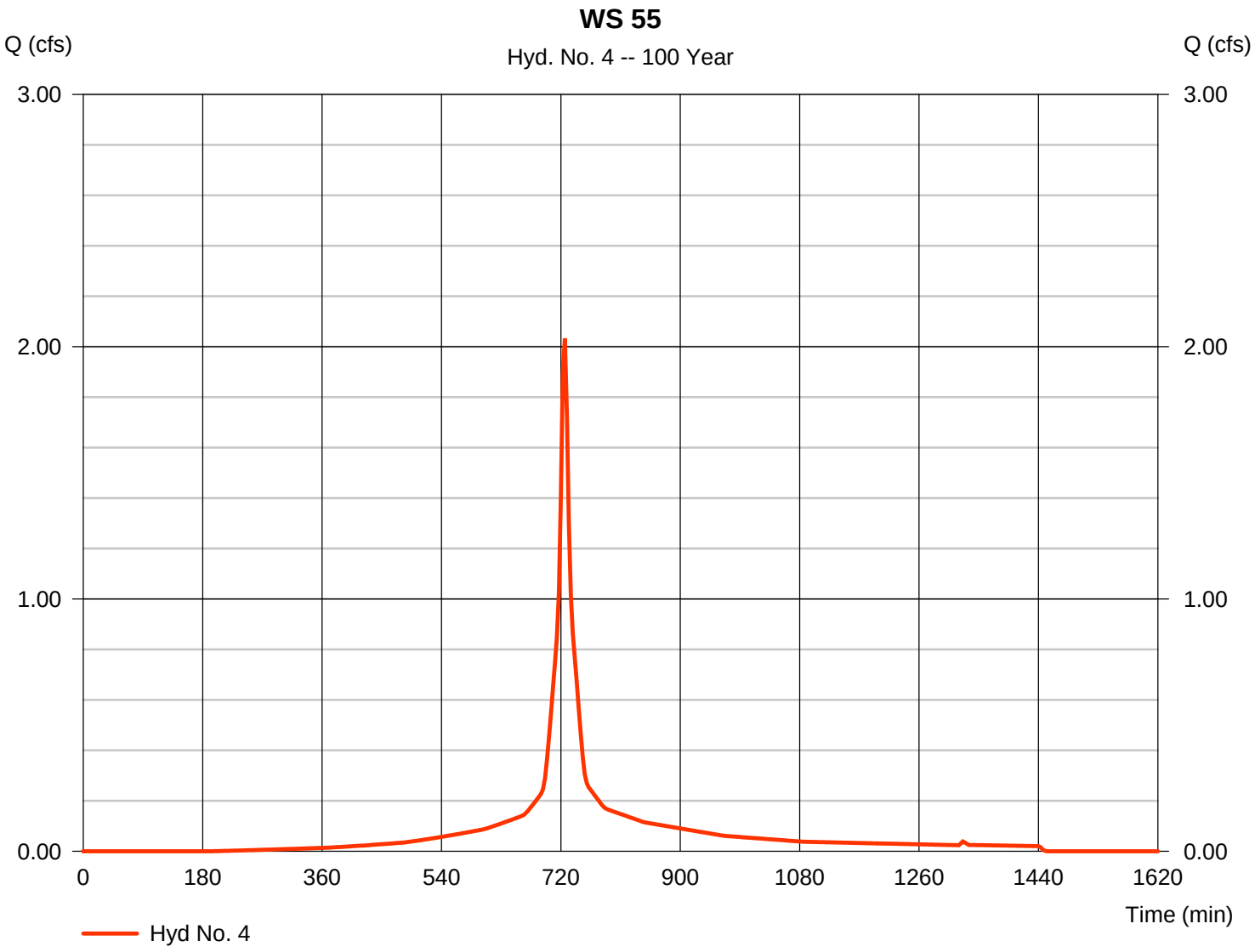
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 4

WS 55

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.033 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	7,209 cuft
Drainage area	=	0.370 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.90 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



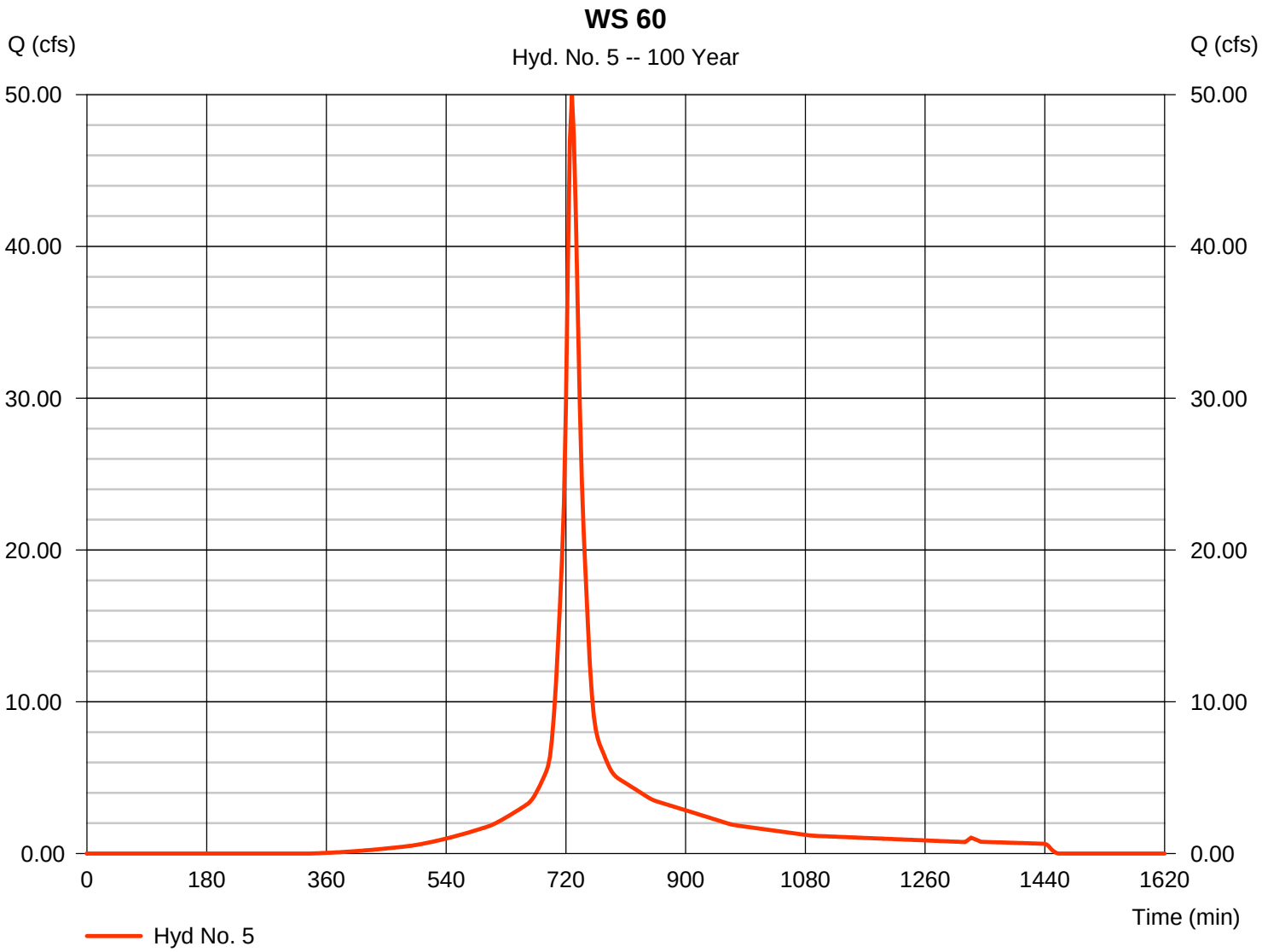
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 5

WS 60

Hydrograph type	=	SCS Runoff	Peak discharge	=	49.93 cfs
Storm frequency	=	100 yrs	Time to peak	=	729 min
Time interval	=	3 min	Hyd. volume	=	199,040 cuft
Drainage area	=	11.370 ac	Curve number	=	82
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.90 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



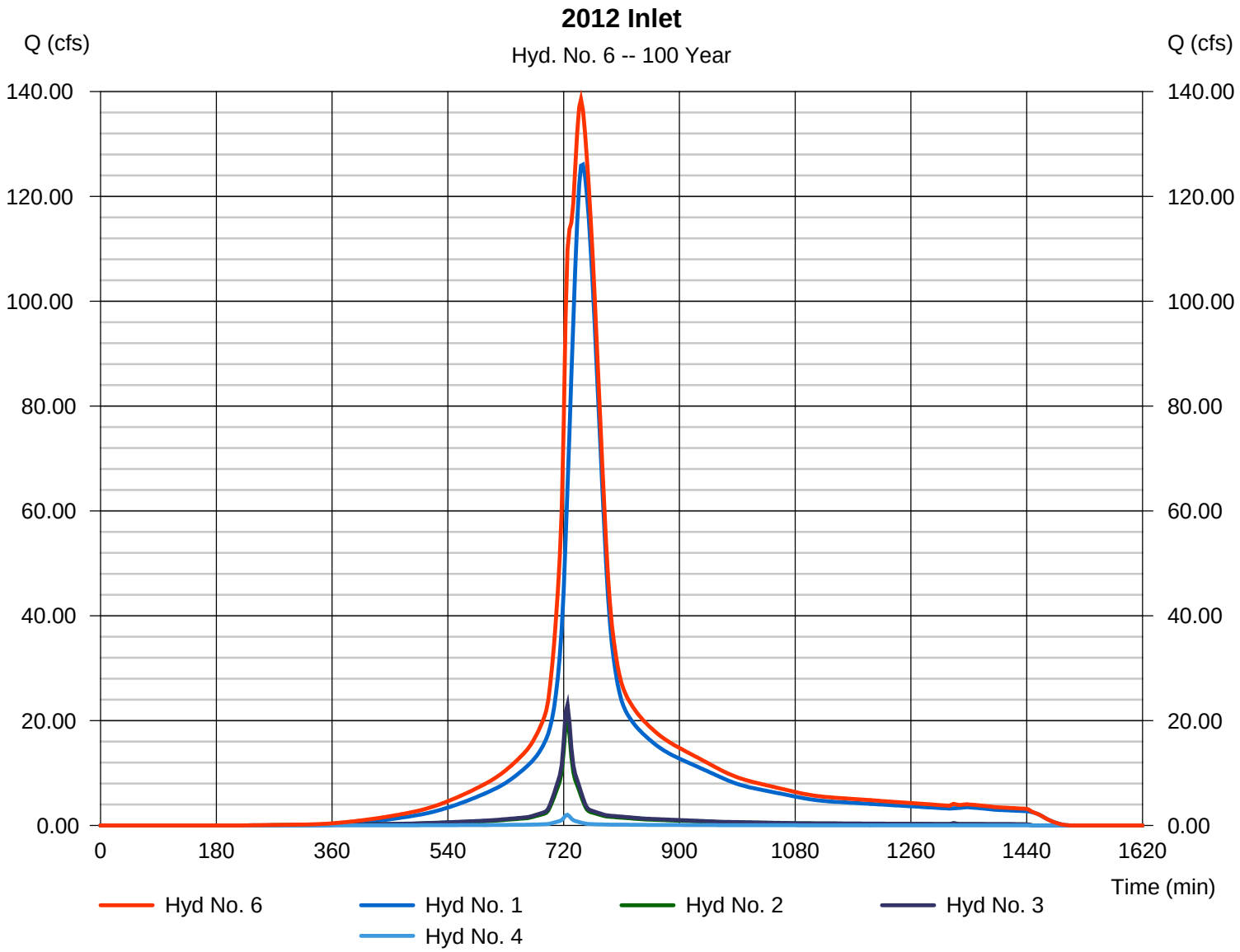
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 6

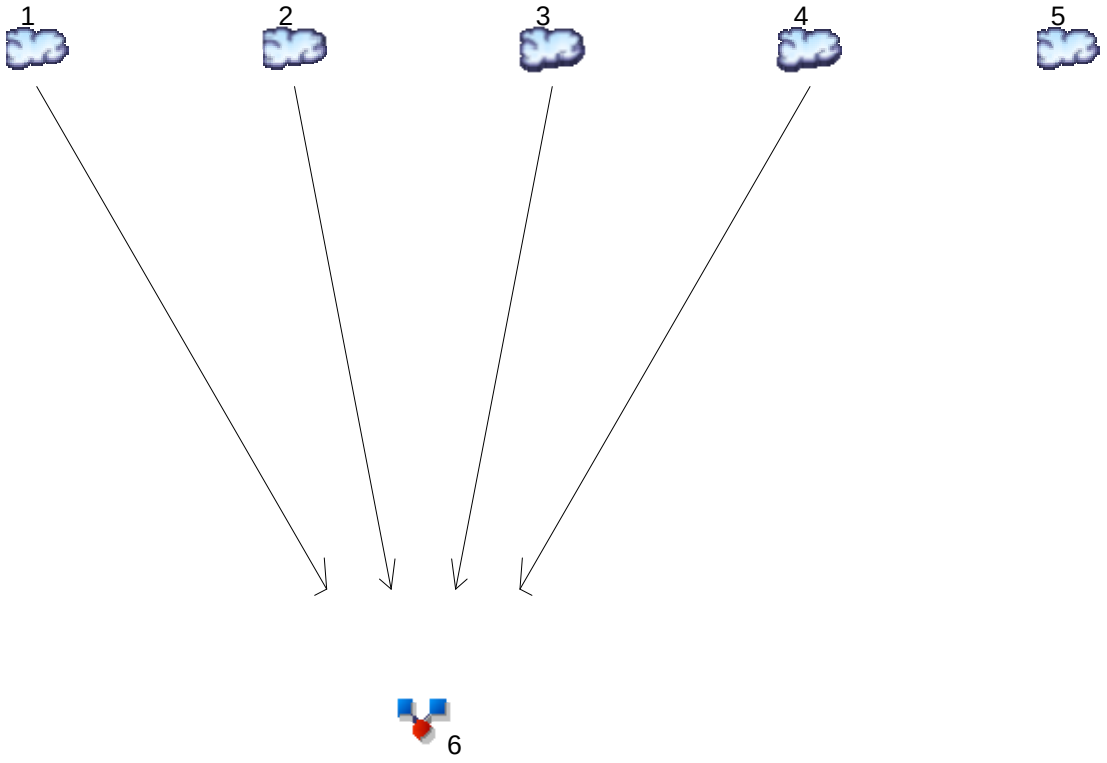
2012 Inlet

Hydrograph type	= Combine	Peak discharge	= 138.51 cfs
Storm frequency	= 100 yrs	Time to peak	= 747 min
Time interval	= 3 min	Hyd. volume	= 976,034 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 53.940 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9



Legend

Hyd.	Origin	Description
1	SCS Runoff	1984 WS 50
2	SCS Runoff	1984 WS 51
3	SCS Runoff	1984 WS 52
4	SCS Runoff	1984 WS 55
5	SCS Runoff	1984 WS 60
6	Combine	1984 Inlet

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	41.51	-------	-------	77.44	93.57	109.80	126.07	1984 WS 50
2	SCS Runoff	------	-------	5.065	-------	-------	10.09	12.40	14.73	17.08	1984 WS 51
3	SCS Runoff	------	-------	6.976	-------	-------	12.92	15.58	18.25	20.92	1984 WS 52
4	SCS Runoff	------	-------	0.810	-------	-------	1.342	1.573	1.804	2.033	1984 WS 55
5	SCS Runoff	------	-------	14.51	-------	-------	28.54	34.94	41.41	47.92	1984 WS 60
6	Combine	1, 2, 3, 4,	-------	45.16	-------	-------	84.36	101.98	119.71	137.48	1984 Inlet

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	41.51	3	750	266,248	------	------	------	1984 WS 50
2	SCS Runoff	5.065	3	726	17,059	------	------	------	1984 WS 51
3	SCS Runoff	6.976	3	726	23,219	------	------	------	1984 WS 52
4	SCS Runoff	0.810	3	726	2,731	------	------	------	1984 WS 55
5	SCS Runoff	14.51	3	729	57,862	------	------	------	1984 WS 60
6	Combine	45.16	3	747	309,256	1, 2, 3, 4,	------	------	1984 Inlet

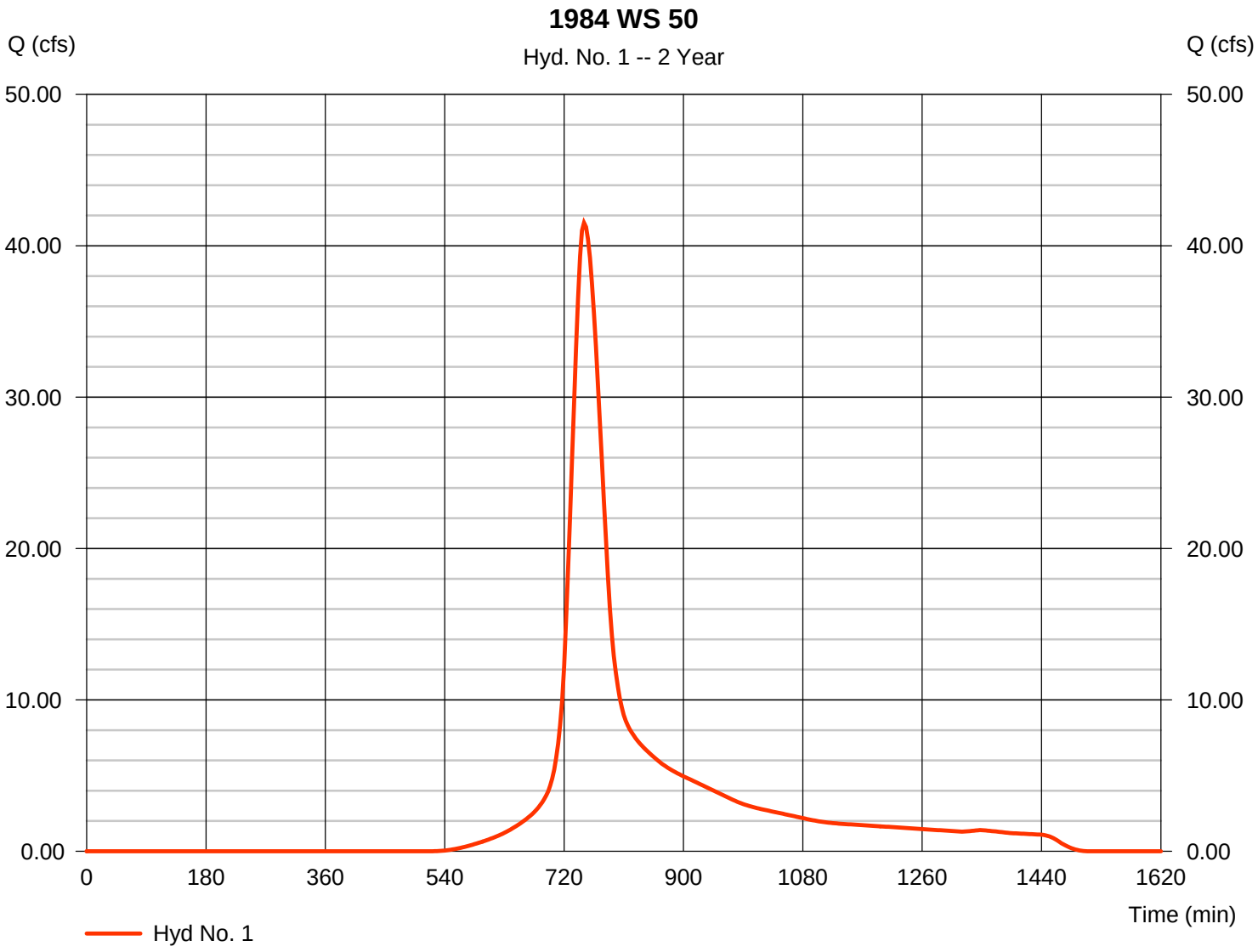
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 41.51 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 266,248 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	77.44	3	750	495,328	------	------	------	1984 WS 50
2	SCS Runoff	10.09	3	726	33,567	------	------	------	1984 WS 51
3	SCS Runoff	12.92	3	726	43,197	------	------	------	1984 WS 52
4	SCS Runoff	1.342	3	726	4,638	------	------	------	1984 WS 55
5	SCS Runoff	28.54	3	729	112,226	------	------	------	1984 WS 60
6	Combine	84.36	3	747	576,731	1, 2, 3, 4,	------	------	1984 Inlet

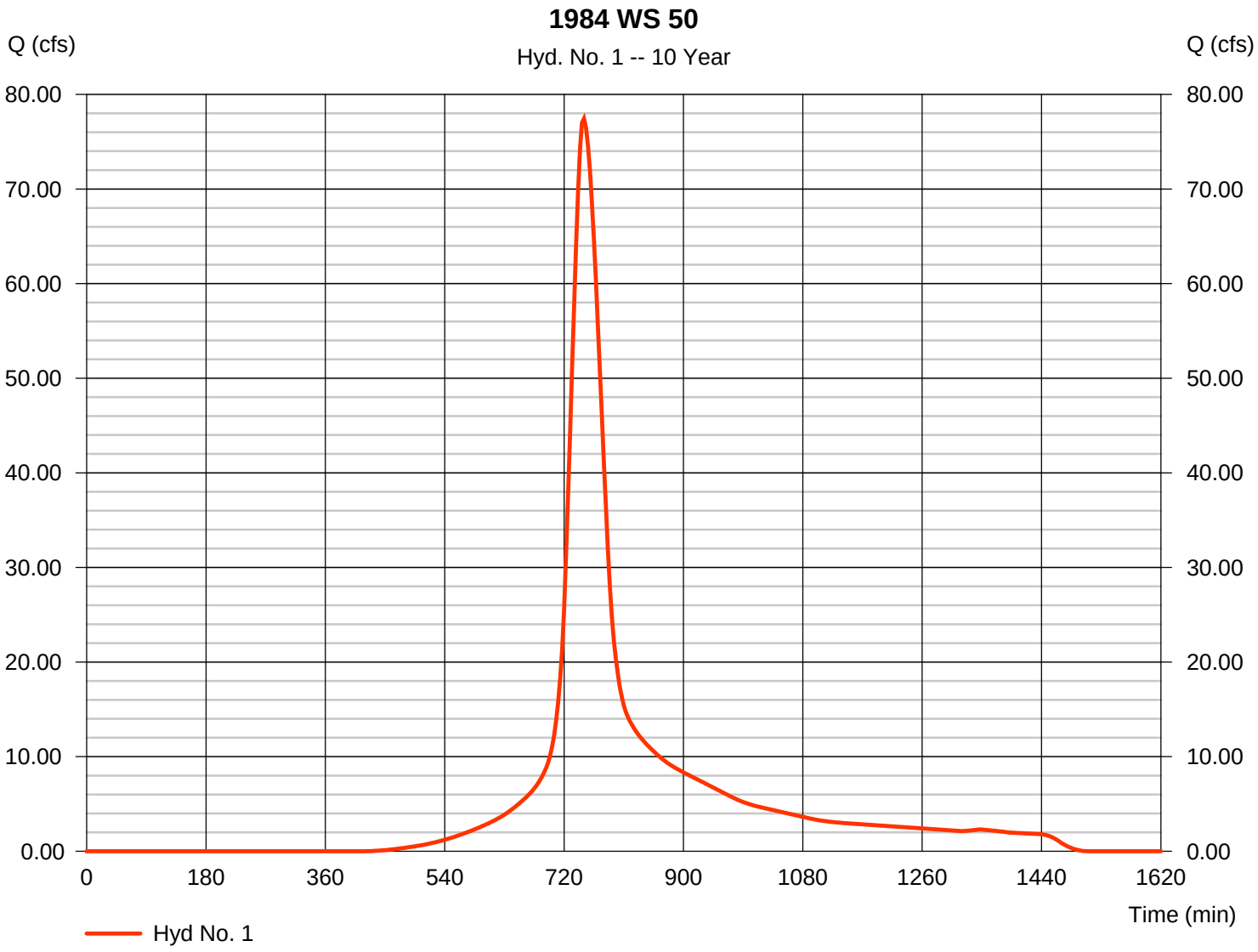
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 77.44 cfs
Storm frequency	= 10 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 495,328 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 4.80 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	93.57	3	750	600,576	------	------	------	1984 WS 50
2	SCS Runoff	12.40	3	726	41,305	------	------	------	1984 WS 51
3	SCS Runoff	15.58	3	726	52,376	------	------	------	1984 WS 52
4	SCS Runoff	1.573	3	726	5,490	------	------	------	1984 WS 55
5	SCS Runoff	34.94	3	729	137,577	------	------	------	1984 WS 60
6	Combine	101.98	3	747	699,746	1, 2, 3, 4,	------	------	1984 Inlet

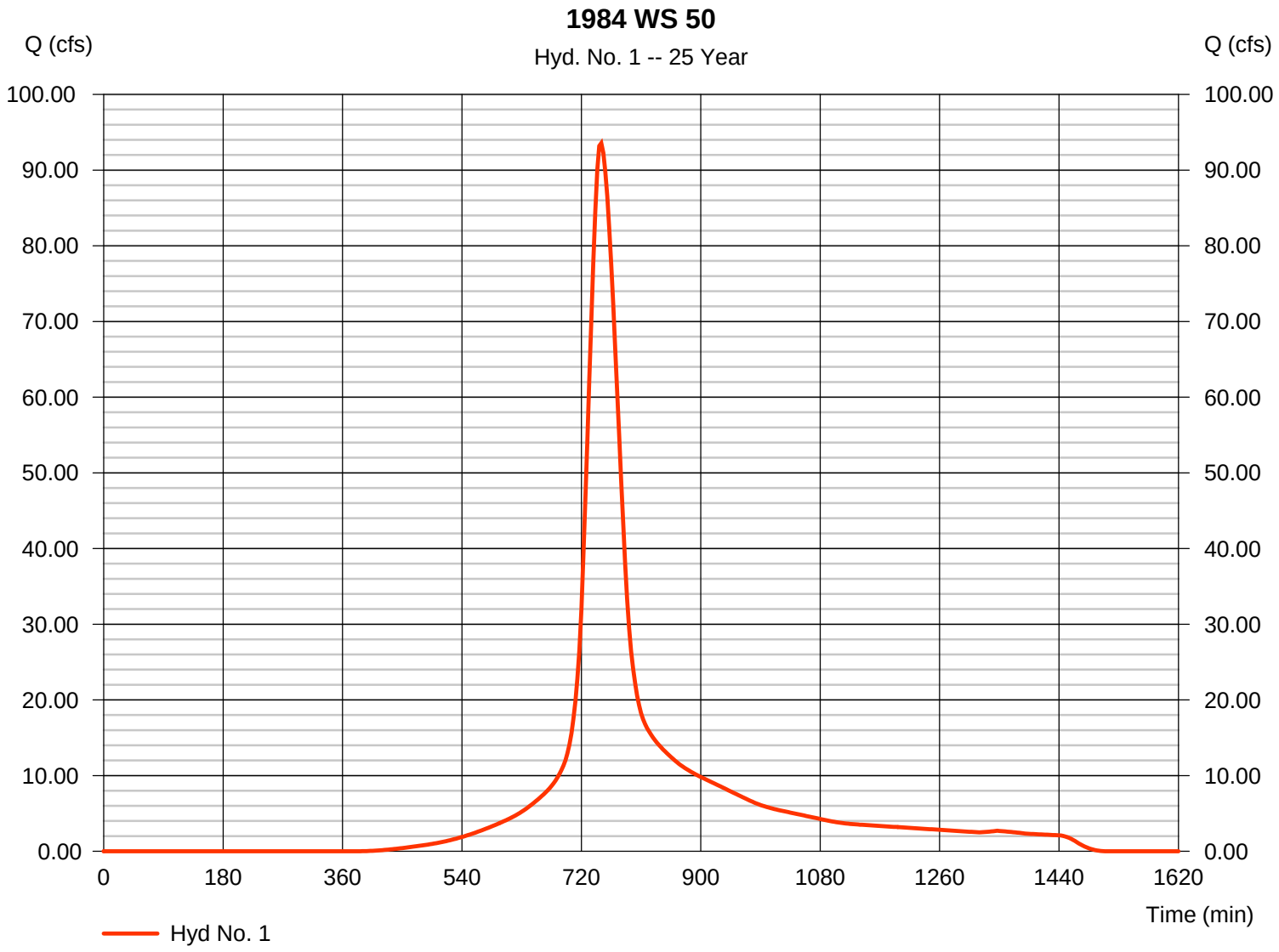
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 93.57 cfs
Storm frequency	= 25 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 600,576 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	109.80	3	750	707,711	------	------	------	1984 WS 50
2	SCS Runoff	14.73	3	726	49,244	------	------	------	1984 WS 51
3	SCS Runoff	18.25	3	726	61,719	------	------	------	1984 WS 52
4	SCS Runoff	1.804	3	726	6,347	------	------	------	1984 WS 55
5	SCS Runoff	41.41	3	729	163,532	------	------	------	1984 WS 60
6	Combine	119.71	3	747	825,022	1, 2, 3, 4,	------	------	1984 Inlet

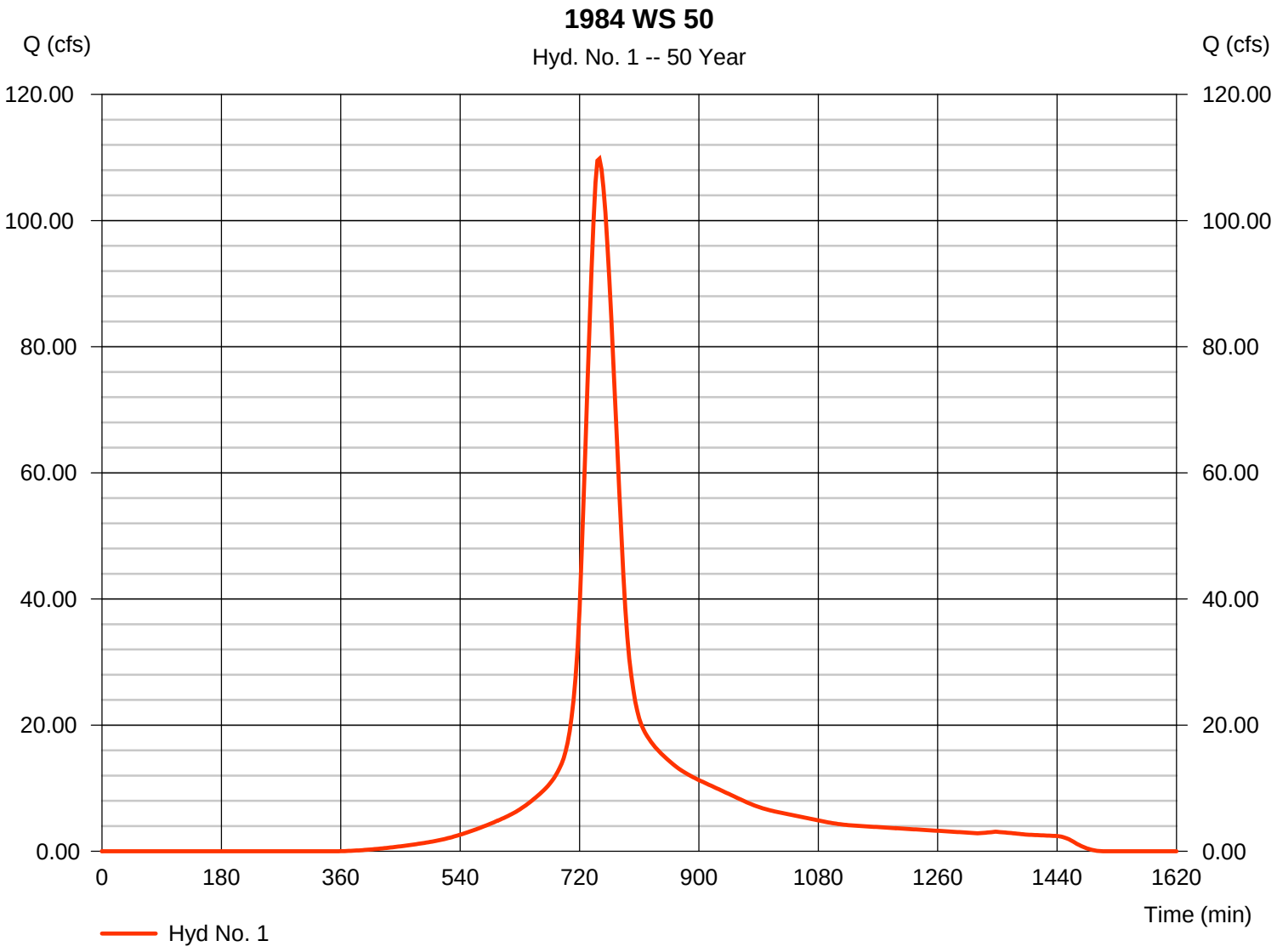
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 109.80 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 707,711 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	126.07	3	750	816,271	------	------	------	1984 WS 50
2	SCS Runoff	17.08	3	726	57,338	------	------	------	1984 WS 51
3	SCS Runoff	20.92	3	726	71,186	------	------	------	1984 WS 52
4	SCS Runoff	2.033	3	726	7,209	------	------	------	1984 WS 55
5	SCS Runoff	47.92	3	729	189,949	------	------	------	1984 WS 60
6	Combine	137.48	3	747	952,004	1, 2, 3, 4,	------	------	1984 Inlet

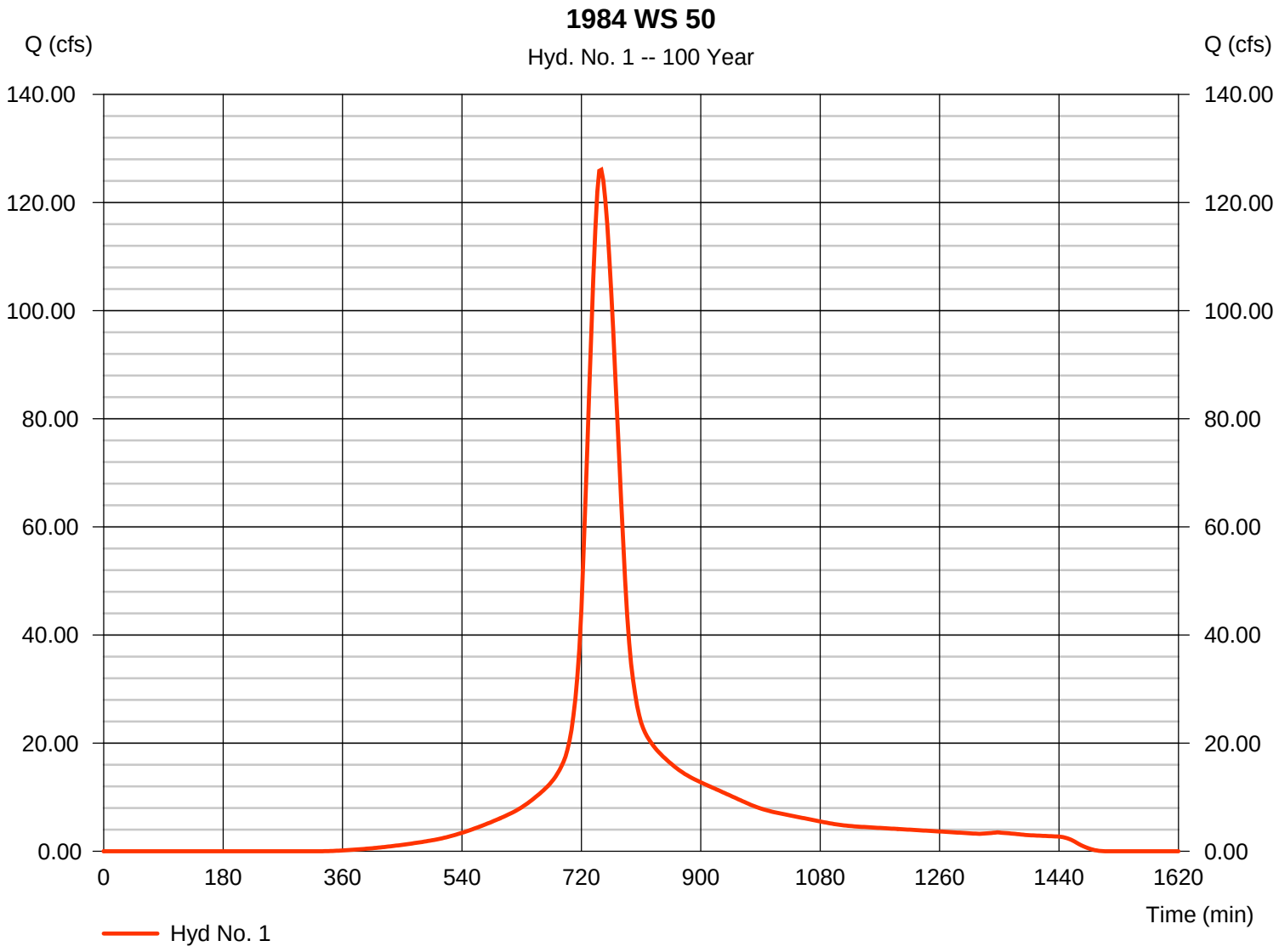
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

1984 WS 50

Hydrograph type	= SCS Runoff	Peak discharge	= 126.07 cfs
Storm frequency	= 100 yrs	Time to peak	= 750 min
Time interval	= 3 min	Hyd. volume	= 816,271 cuft
Drainage area	= 45.580 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 42.00 min
Total precip.	= 6.90 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



APPENDIX F

Hydrologic Model Input and Output
High Street and Windham Street Storm Sewers Watershed
NRCS Rainfall

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	5.293	-------	-------	8.088	10.18	12.10	14.36	WS 70
2	SCS Runoff	------	-------	3.574	-------	-------	5.745	7.380	8.875	10.63	WS 80
3	SCS Runoff	------	-------	3.711	-------	-------	6.136	7.974	9.656	11.63	WS 90
4	SCS Runoff	------	-------	5.351	-------	-------	8.087	10.14	12.02	14.24	WS 100
5	SCS Runoff	------	-------	0.603	-------	-------	1.094	1.478	1.833	2.254	WS 200
7	SCS Runoff	------	-------	5.148	-------	-------	7.960	10.07	12.00	14.27	2017 WS 70
8	SCS Runoff	------	-------	3.574	-------	-------	5.745	7.380	8.875	10.63	2017 WS 80
9	SCS Runoff	------	-------	3.711	-------	-------	6.136	7.974	9.656	11.63	2017 WS 90
10	SCS Runoff	------	-------	5.351	-------	-------	8.087	10.14	12.02	14.24	2017 WS 100
11	SCS Runoff	------	-------	0.603	-------	-------	1.094	1.478	1.833	2.254	2017 WS 200

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	5.293	3	726	18,493	------	------	------	WS 70
2	SCS Runoff	3.574	3	726	12,058	------	------	------	WS 80
3	SCS Runoff	3.711	3	726	12,412	------	------	------	WS 90
4	SCS Runoff	5.351	3	726	18,951	------	------	------	WS 100
5	SCS Runoff	0.603	3	726	2,010	------	------	------	WS 200
7	SCS Runoff	5.148	3	726	17,784	------	------	------	2017 WS 70
8	SCS Runoff	3.574	3	726	12,058	------	------	------	2017 WS 80
9	SCS Runoff	3.711	3	726	12,412	------	------	------	2017 WS 90
10	SCS Runoff	5.351	3	726	18,951	------	------	------	2017 WS 100
11	SCS Runoff	0.603	3	726	2,010	------	------	------	2017 WS 200

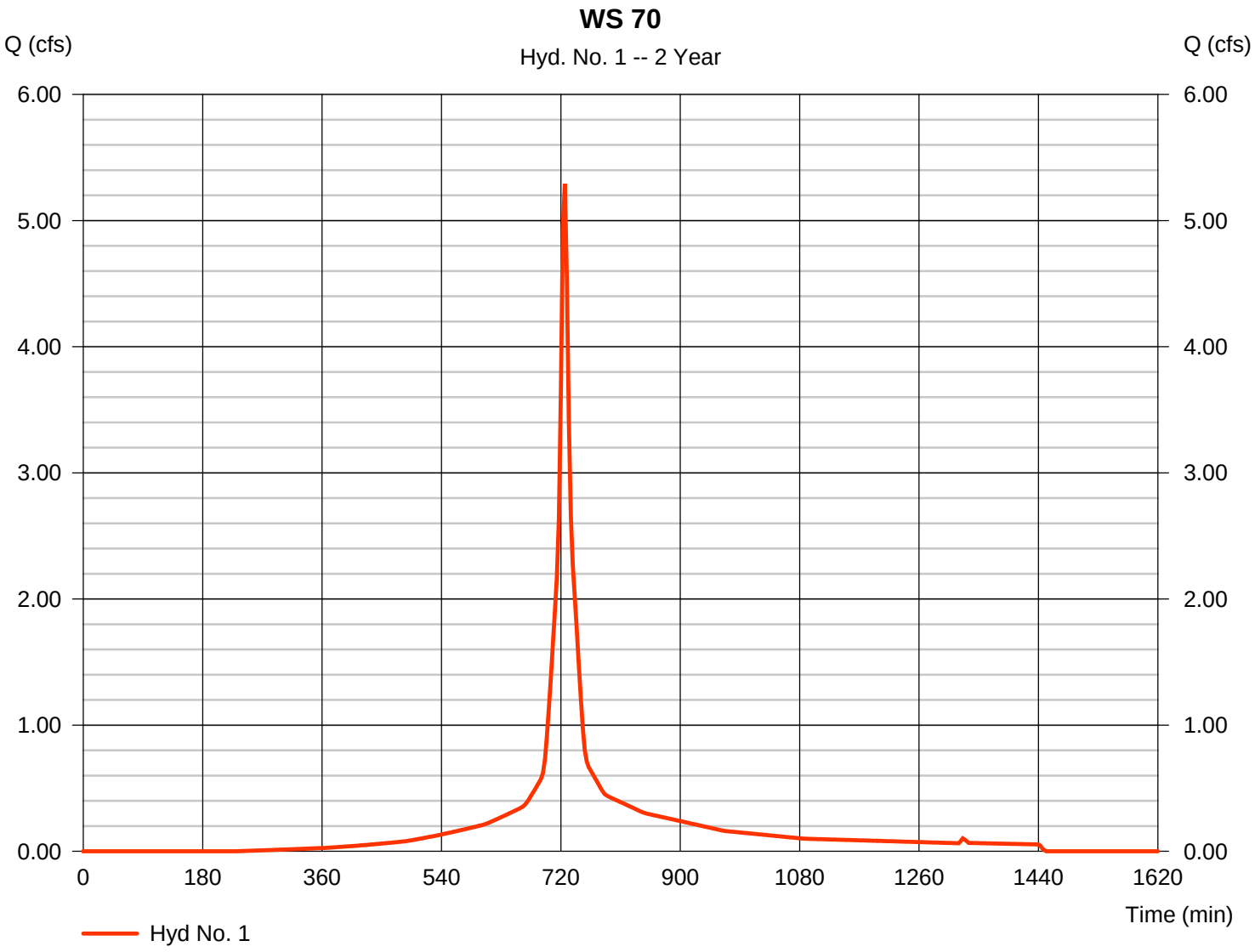
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	= SCS Runoff	Peak discharge	= 5.293 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 18,493 cuft
Drainage area	= 2.120 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.22 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	8.088	3	726	29,018	------	------	------	WS 70
2	SCS Runoff	5.745	3	726	19,831	------	------	------	WS 80
3	SCS Runoff	6.136	3	726	20,907	------	------	------	WS 90
4	SCS Runoff	8.087	3	726	29,392	------	------	------	WS 100
5	SCS Runoff	1.094	3	726	3,648	------	------	------	WS 200
7	SCS Runoff	7.960	3	726	28,234	------	------	------	2017 WS 70
8	SCS Runoff	5.745	3	726	19,831	------	------	------	2017 WS 80
9	SCS Runoff	6.136	3	726	20,907	------	------	------	2017 WS 90
10	SCS Runoff	8.087	3	726	29,392	------	------	------	2017 WS 100
11	SCS Runoff	1.094	3	726	3,648	------	------	------	2017 WS 200

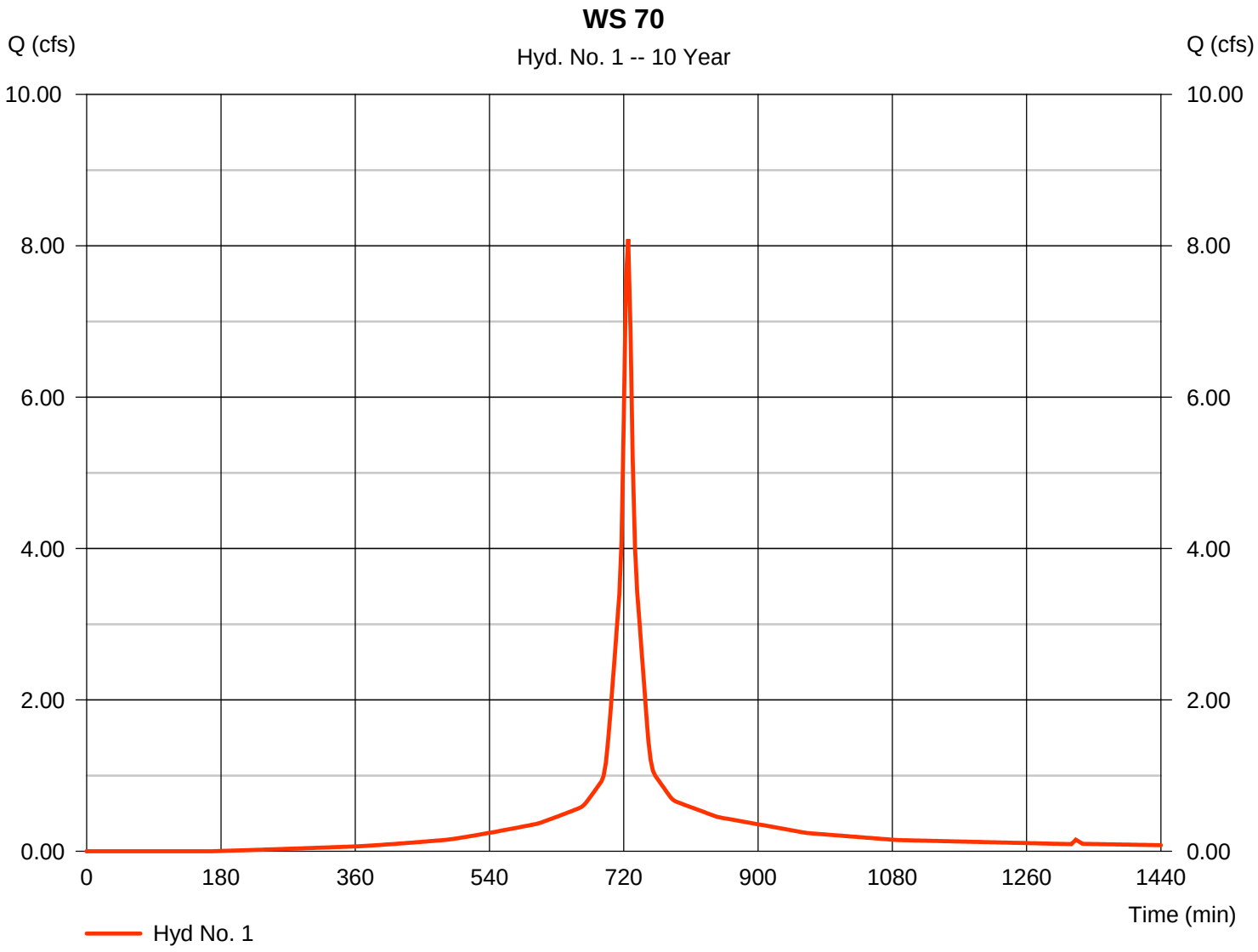
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.088 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	29,018 cuft
Drainage area	=	2.120 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.71 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	10.18	3	726	37,070	------	------	------	WS 70
2	SCS Runoff	7.380	3	726	25,857	------	------	------	WS 80
3	SCS Runoff	7.974	3	726	27,546	------	------	------	WS 90
4	SCS Runoff	10.14	3	726	37,360	------	------	------	WS 100
5	SCS Runoff	1.478	3	726	4,966	------	------	------	WS 200
7	SCS Runoff	10.07	3	726	36,251	------	------	------	2017 WS 70
8	SCS Runoff	7.380	3	726	25,857	------	------	------	2017 WS 80
9	SCS Runoff	7.974	3	726	27,546	------	------	------	2017 WS 90
10	SCS Runoff	10.14	3	726	37,360	------	------	------	2017 WS 100
11	SCS Runoff	1.478	3	726	4,966	------	------	------	2017 WS 200

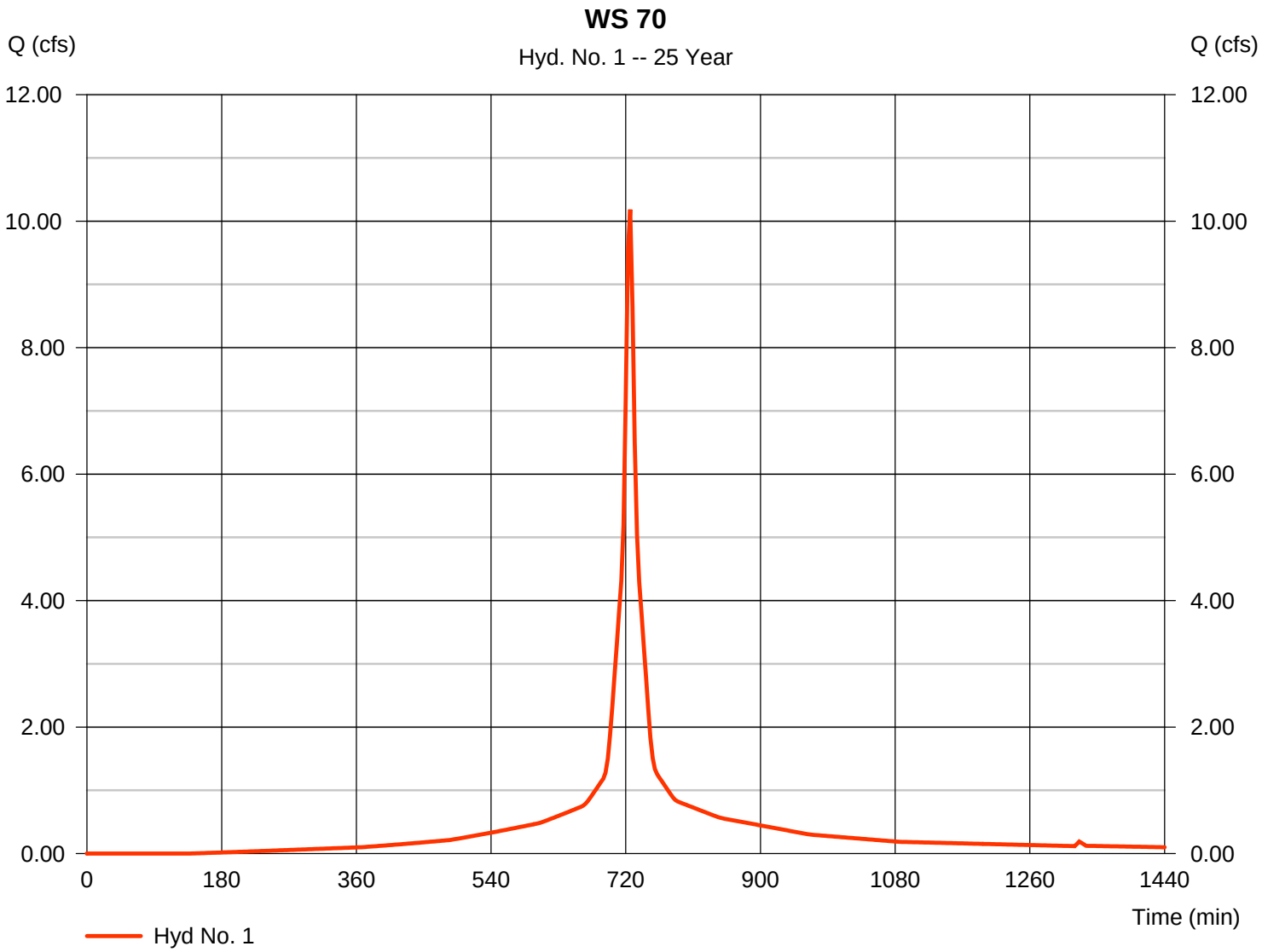
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	= SCS Runoff	Peak discharge	= 10.18 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 37,070 cuft
Drainage area	= 2.120 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.84 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	12.10	3	726	44,508	------	------	------	WS 70
2	SCS Runoff	8.875	3	726	31,455	------	------	------	WS 80
3	SCS Runoff	9.656	3	726	33,736	------	------	------	WS 90
4	SCS Runoff	12.02	3	726	44,712	------	------	------	WS 100
5	SCS Runoff	1.833	3	726	6,212	------	------	------	WS 200
7	SCS Runoff	12.00	3	726	43,666	------	------	------	2017 WS 70
8	SCS Runoff	8.875	3	726	31,455	------	------	------	2017 WS 80
9	SCS Runoff	9.656	3	726	33,736	------	------	------	2017 WS 90
10	SCS Runoff	12.02	3	726	44,712	------	------	------	2017 WS 100
11	SCS Runoff	1.833	3	726	6,212	------	------	------	2017 WS 200

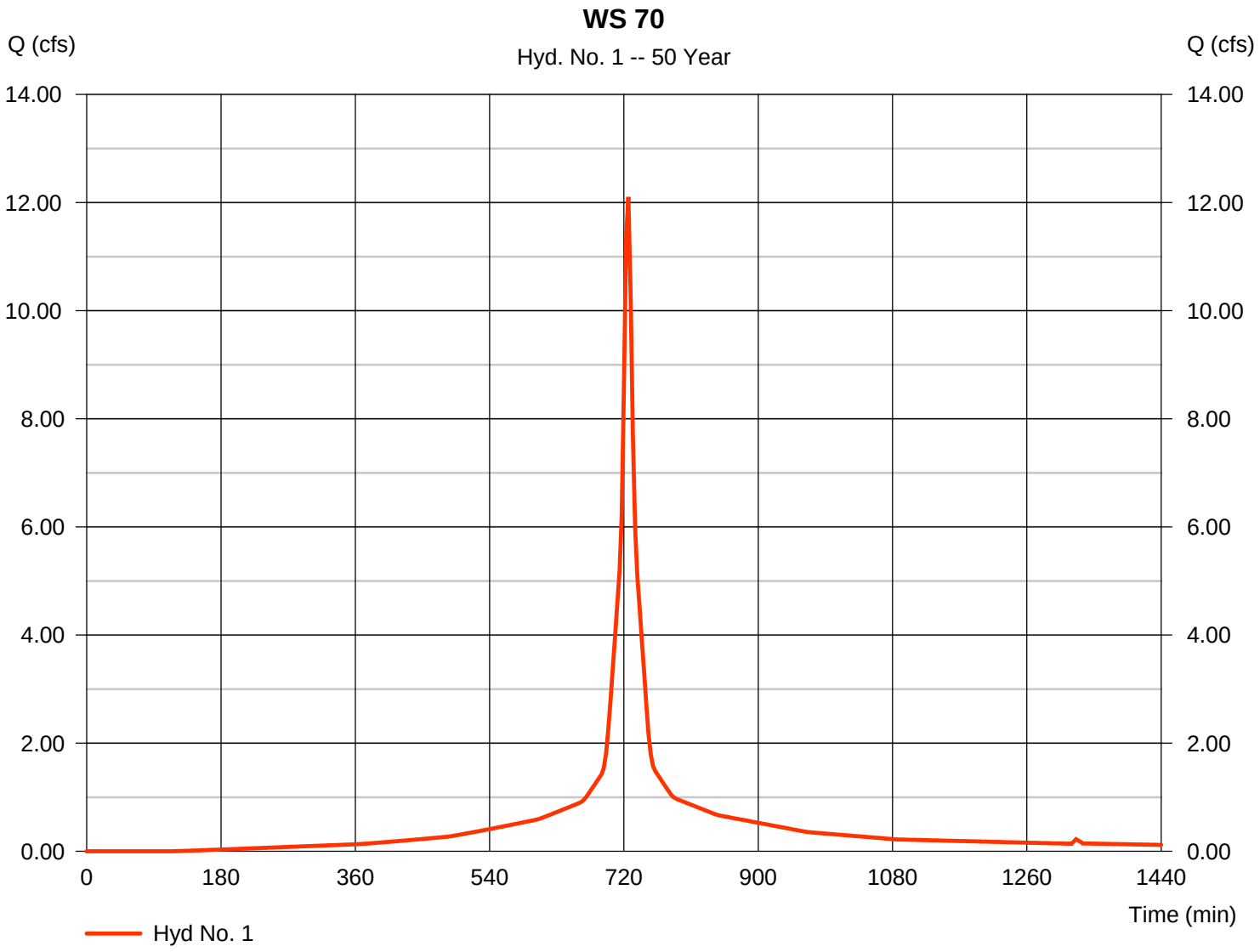
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	= SCS Runoff	Peak discharge	= 12.10 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 44,508 cuft
Drainage area	= 2.120 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.88 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	14.36	3	726	53,325	------	------	------	WS 70
2	SCS Runoff	10.63	3	726	38,117	------	------	------	WS 80
3	SCS Runoff	11.63	3	726	41,120	------	------	------	WS 90
4	SCS Runoff	14.24	3	726	53,421	------	------	------	WS 100
5	SCS Runoff	2.254	3	726	7,713	------	------	------	WS 200
7	SCS Runoff	14.27	3	726	52,463	------	------	------	2017 WS 70
8	SCS Runoff	10.63	3	726	38,117	------	------	------	2017 WS 80
9	SCS Runoff	11.63	3	726	41,120	------	------	------	2017 WS 90
10	SCS Runoff	14.24	3	726	53,421	------	------	------	2017 WS 100
11	SCS Runoff	2.254	3	726	7,713	------	------	------	2017 WS 200

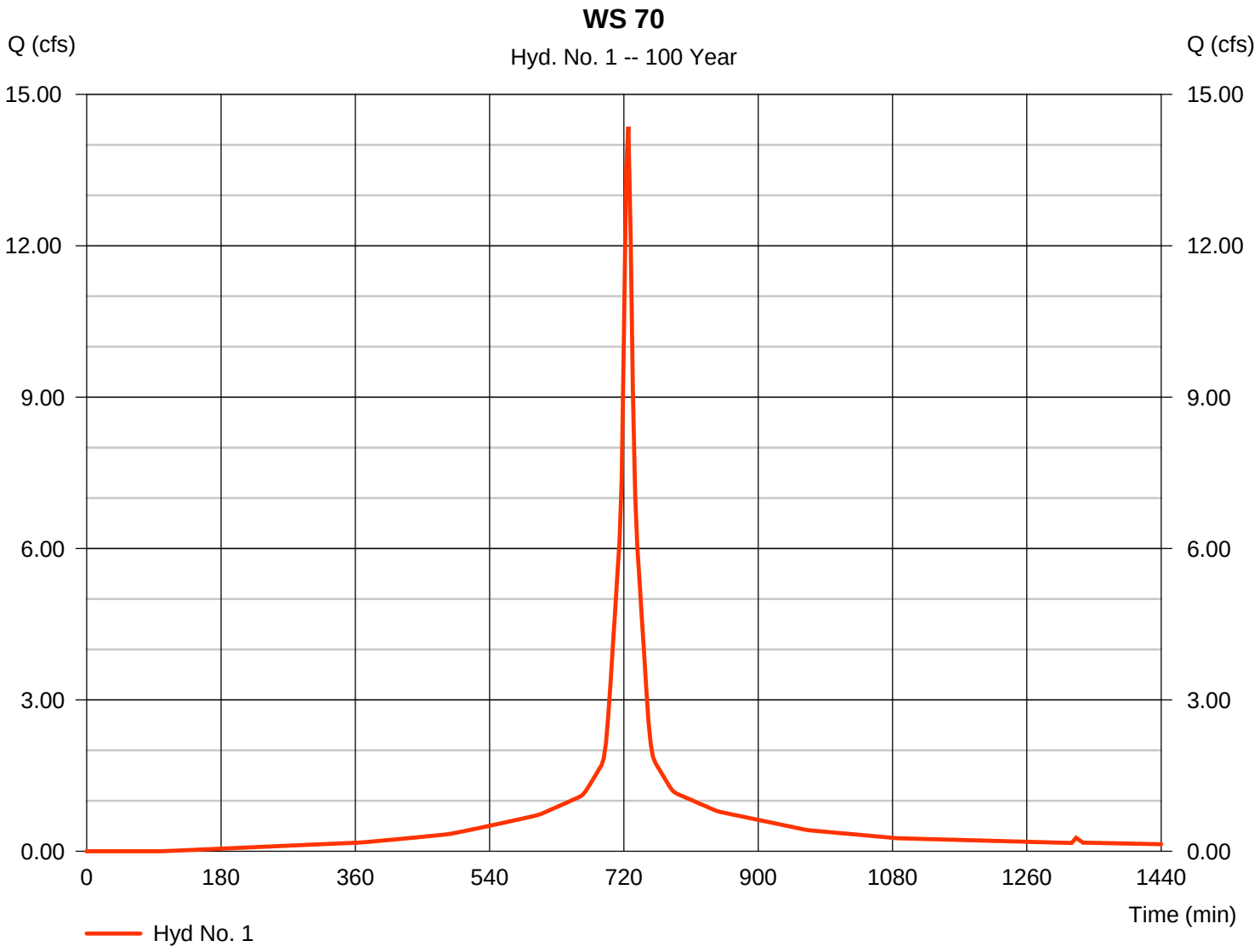
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.36 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	53,325 cuft
Drainage area	=	2.120 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	8.11 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12

Location: Willimantic, CT Checked: Date:

Circle one: Present ***Developed*** Historic Watershed: WS 70- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area (Acres) Sq. Ft. %	Product of CN x Area
HSG C	Lawn / Open space - good condition	74			0.48	35.52
N/A	Existing impervious / paved	98			1.60	156.80
N/A	Existing impervious / paved (off campus)	98			0.04	3.92
				Totals =	2.12	196.24

(0.0033 sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{196.24}{2.12}$ Use CN = **93**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12

Location: Willimantic, CT Checked: Date:

Circle one: Present ***Developed*** Historic Watershed: WS 80- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			0.51	37.74
N/A	Existing impervious / paved	98			1.00	98.00
N/A	Existing impervious / paved (off campus)	98			0.11	10.78
				Totals =	1.62	146.52
					(0.0025	sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{146.52}{1.62}$ Use CN = **90**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Historic Watershed: WS 90- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area (Acres) Sq. Ft. %	Product of CN x Area
HSG C	Lawn / Open space - good condition	74			0.75	55.50
N/A	Existing impervious / paved	98			0.40	39.20
N/A	Existing impervious / paved (off campus)	98			0.66	64.68
				Totals =	1.81	159.38

(0.0028 sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{159.38}{1.81}$ Use CN = **88**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Historic Watershed: WS 100- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area (Acres) Sq. Ft. %	Product of CN x Area
HSG C	Lawn / Open space - good condition	74			0.23	17.02
N/A	Existing impervious / paved	98			1.86	182.28
N/A	Existing impervious / paved (off campus)	98			0.00	0.00
				Totals =	2.09	199.30
					(0.0033	sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = total product / total area = 199.30 / 2.09 Use CN = **95**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present ***Developed*** Historic Watershed: WS 100- 2017 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.] Table 2-2	Figure 2-3	Figure 2-4	Area Acres Sq. Ft. %	Product of CN x Area
HSG C	Lawn / Open space - good condition	74			0.26	19.24
N/A	Existing impervious / paved	98			0.04	3.92
N/A	Existing impervious / paved (off campus)	98			0.08	7.84
				Totals =	0.38	31.00
					(0.0006 sq mi)	

[1.] Use only one CN value source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{31.00}{0.38}$$

Use CN = **82**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Historic Watershed: WS 70- 2012 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres / Sq. Ft. / %) — Acres circled	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			0.34	25.16
N/A	Existing impervious / paved	98			1.74	170.52
N/A	Existing impervious / paved (off campus)	98			0.04	3.92
				Totals =	2.12	199.60

[1.] Use only one CN value source per line.

(0.0033 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{199.60}{2.12}$ Use CN = **94**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Historic Watershed: WS 80- 2012 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	**Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area** (Acres circled / Sq. Ft. / %)	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**		
HSG C	Lawn / Open space - good condition	74			0.51	37.74
N/A	Existing impervious / paved	98			1.00	98.00
N/A	Existing impervious / paved (off campus)	98			0.11	10.78
				Totals =	1.62	146.52

[1.] Use only one CN value source per line.

(0.0025 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{146.52}{1.62}$ Use CN = **90**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Historic Watershed: WS 90- 2012 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	**Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)**	**CN Value [1.]**			**Area (Acres / Sq. Ft. / %)**	**Product of CN x Area**
		Table 2-2	**Figure 2-3**	**Figure 2-4**		
HSG C	Lawn / Open space - good condition	74			0.76	56.24
N/A	Existing impervious / paved	98			0.39	38.22
N/A	Existing impervious / paved (off campus)	98			0.66	64.68
				Totals =	1.81	159.14

(0.0028 sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{159.14}{1.81}$ Use CN = **88**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Historic Watershed: WS 100- 2012 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres / Sq. Ft. / %)	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			0.23	17.02
N/A	Existing impervious / paved	98			1.86	182.28
N/A	Existing impervious / paved (off campus)	98			0.00	0.00
				Totals =	2.09	199.30
					(0.0033 sq mi)	

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{199.30}{2.09}$ Use CN = 95

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: ***Present*** Developed Historic Watershed: WS 100- 2012 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			0.26	19.24
N/A	Existing impervious / paved	98			0.04	3.92
N/A	Existing impervious / paved (off campus)	98			0.08	7.84
				Totals =	0.38	31.00
					(0.0006	sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{31.00}{0.38}$ Use CN = **82**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 70- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			0.34	25.16
N/A	Existing impervious / paved	98			1.74	170.52
N/A	Existing impervious / paved (off campus)	98			0.04	3.92
				Totals =	2.12	199.60

[1.] Use only one CN value source per line.

(0.0033 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{199.60}{2.12}$$

Use CN = **94**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 80- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres / Sq. Ft. / %)	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			0.51	37.74
N/A	Existing impervious / paved	98			1.00	98.00
N/A	Existing impervious / paved (off campus)	98			0.11	10.78
				Totals =	1.62	146.52
					(0.0025	sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{146.52}{1.62}$ Use CN = 90

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 90- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres / Sq. Ft. / %)	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			0.76	56.24
N/A	Existing impervious / paved	98			0.39	38.22
N/A	Existing impervious / paved (off campus)	98			0.66	64.68
				Totals =	1.81	159.14

[1.] Use only one CN value source per line.

(0.0028 sq mi)

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{159.14}{1.81}$$

Use CN = **88**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 100- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4	Acres (circled) / Sq. Ft. / %	
HSG C	Lawn / Open space - good condition	74			0.23	17.02
N/A	Existing impervious / paved	98			1.86	182.28
N/A	Existing impervious / paved (off campus)	98			0.00	0.00
				Totals =	2.09	199.30
					(0.0033	sq mi)

[1.] Use only one CN value source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{199.30}{2.09}$ Use CN = **95**

Worksheet 2: Runoff curve number and runoff

Project: ECSU (#1266-27) By: BAM Date: 06/05/12
Location: Willimantic, CT Checked: Date:
Circle one: Present Developed ***Historic*** Watershed: WS 100- 1984 Conditions

1.) Runoff curve number (CN)

Hydrologic Soil Group (appendix A)	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Value [1.]			Area (Acres) Sq. Ft. %	Product of CN x Area
		Table 2-2	Figure 2-3	Figure 2-4		
HSG C	Lawn / Open space - good condition	74			0.26	19.24
N/A	Existing impervious / paved	98			0.04	3.92
N/A	Existing impervious / paved (off campus)	98			0.08	7.84
				Totals =	0.38	31.00

[1.] Use only one CN value source per line.

(0.0006 sq mi)

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{31.00}{0.38}$ Use CN = **82**

APPENDIX G

Hydrologic Model Input and Output
High Street and Windham Street Storm Sewers Watershed
TP-40 Rainfall

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	------	-------	5.255	-------	-------	8.255	9.555	10.85	12.14	WS 70
2	SCS Runoff	------	-------	3.544	-------	-------	5.875	6.889	7.898	8.903	WS 80
3	SCS Runoff	------	-------	3.679	-------	-------	6.283	7.422	8.557	9.689	WS 90
4	SCS Runoff	------	-------	5.314	-------	-------	8.251	9.525	10.79	12.06	WS 100
5	SCS Runoff	------	-------	0.597	-------	-------	1.124	1.362	1.601	1.840	WS 200
7	SCS Runoff	------	-------	5.110	-------	-------	8.129	9.436	10.74	12.03	2017 WS 70
8	SCS Runoff	------	-------	3.544	-------	-------	5.875	6.889	7.898	8.903	2017 WS 80
9	SCS Runoff	------	-------	3.679	-------	-------	6.283	7.422	8.557	9.689	2017 WS 90
10	SCS Runoff	------	-------	5.314	-------	-------	8.251	9.525	10.79	12.06	2017 WS 100
11	SCS Runoff	------	-------	0.597	-------	-------	1.124	1.362	1.601	1.840	2017 WS 200

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	5.255	3	726	18,353	------	------	------	WS 70
2	SCS Runoff	3.544	3	726	11,956	------	------	------	WS 80
3	SCS Runoff	3.679	3	726	12,301	------	------	------	WS 90
4	SCS Runoff	5.314	3	726	18,812	------	------	------	WS 100
5	SCS Runoff	0.597	3	726	1,989	------	------	------	WS 200
7	SCS Runoff	5.110	3	726	17,645	------	------	------	2017 WS 70
8	SCS Runoff	3.544	3	726	11,956	------	------	------	2017 WS 80
9	SCS Runoff	3.679	3	726	12,301	------	------	------	2017 WS 90
10	SCS Runoff	5.314	3	726	18,812	------	------	------	2017 WS 100
11	SCS Runoff	0.597	3	726	1,989	------	------	------	2017 WS 200

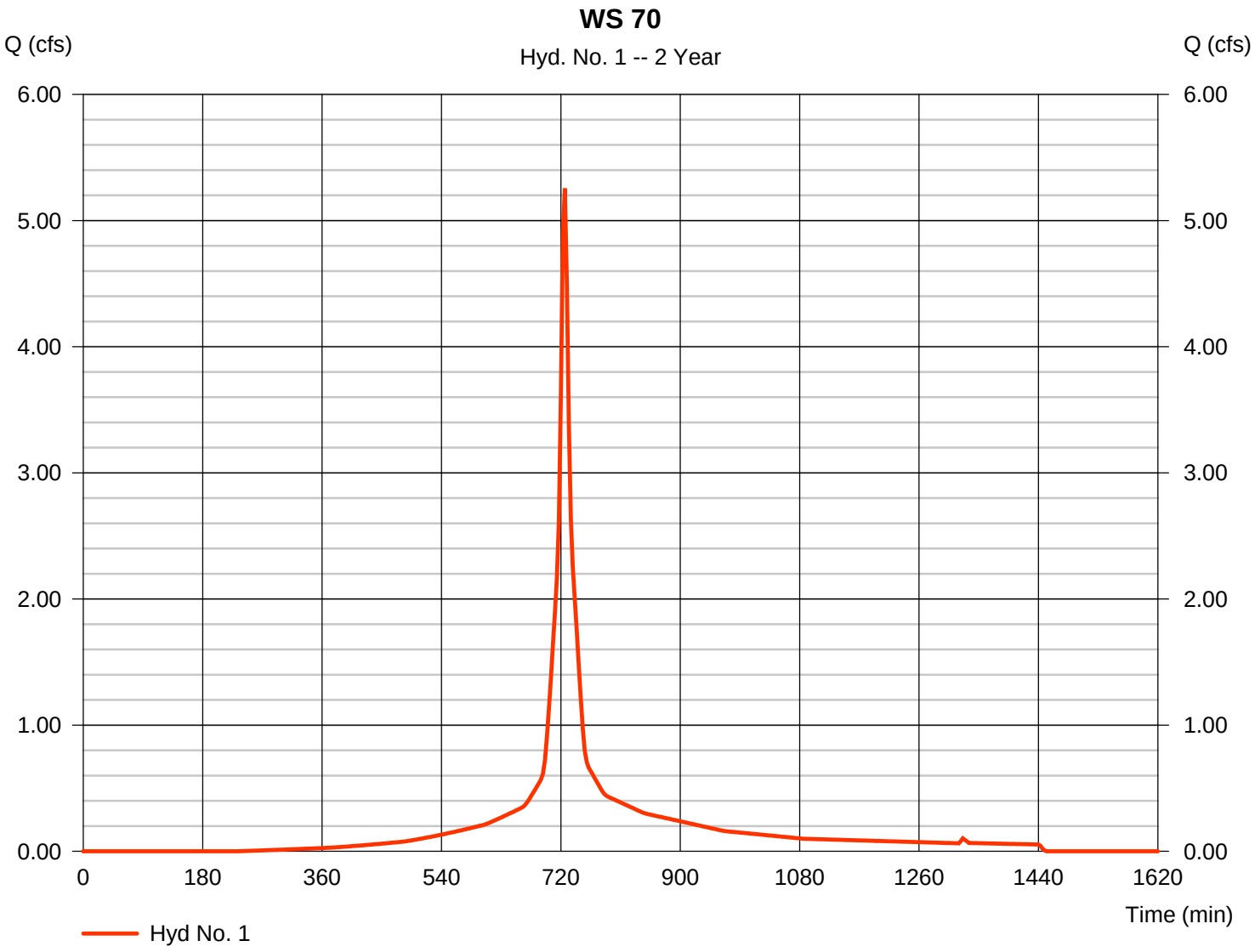
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	= SCS Runoff	Peak discharge	= 5.255 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 18,353 cuft
Drainage area	= 2.120 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	8.255	3	726	29,658	------	------	------	WS 70
2	SCS Runoff	5.875	3	726	20,308	------	------	------	WS 80
3	SCS Runoff	6.283	3	726	21,431	------	------	------	WS 90
4	SCS Runoff	8.251	3	726	30,025	------	------	------	WS 100
5	SCS Runoff	1.124	3	726	3,751	------	------	------	WS 200
7	SCS Runoff	8.129	3	726	28,870	------	------	------	2017 WS 70
8	SCS Runoff	5.875	3	726	20,308	------	------	------	2017 WS 80
9	SCS Runoff	6.283	3	726	21,431	------	------	------	2017 WS 90
10	SCS Runoff	8.251	3	726	30,025	------	------	------	2017 WS 100
11	SCS Runoff	1.124	3	726	3,751	------	------	------	2017 WS 200

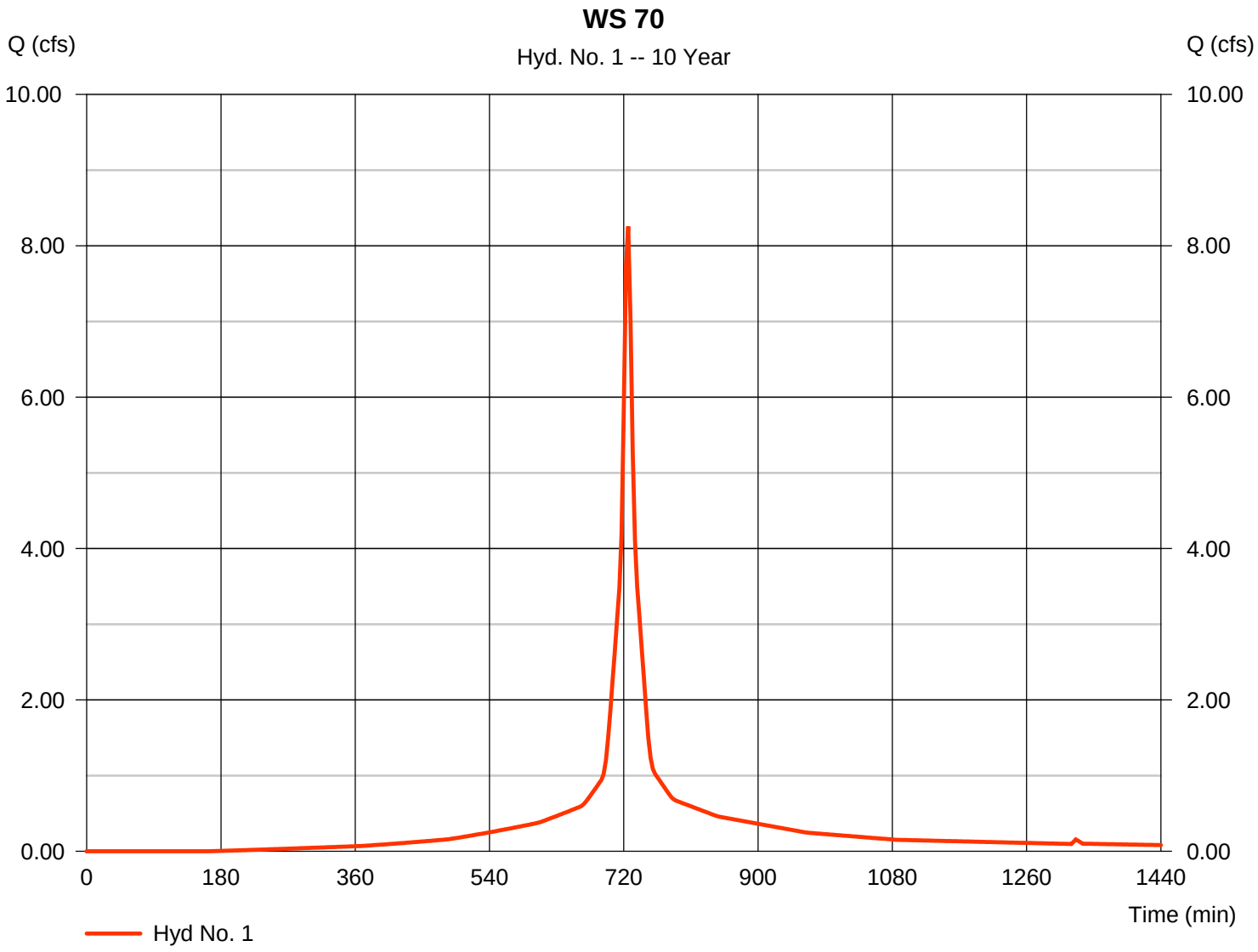
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.255 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	29,658 cuft
Drainage area	=	2.120 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	4.80 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	9.555	3	726	34,643	------	------	------	WS 70
2	SCS Runoff	6.889	3	726	24,036	------	------	------	WS 80
3	SCS Runoff	7.422	3	726	25,537	------	------	------	WS 90
4	SCS Runoff	9.525	3	726	34,960	------	------	------	WS 100
5	SCS Runoff	1.362	3	726	4,565	------	------	------	WS 200
7	SCS Runoff	9.436	3	726	33,834	------	------	------	2017 WS 70
8	SCS Runoff	6.889	3	726	24,036	------	------	------	2017 WS 80
9	SCS Runoff	7.422	3	726	25,537	------	------	------	2017 WS 90
10	SCS Runoff	9.525	3	726	34,960	------	------	------	2017 WS 100
11	SCS Runoff	1.362	3	726	4,565	------	------	------	2017 WS 200

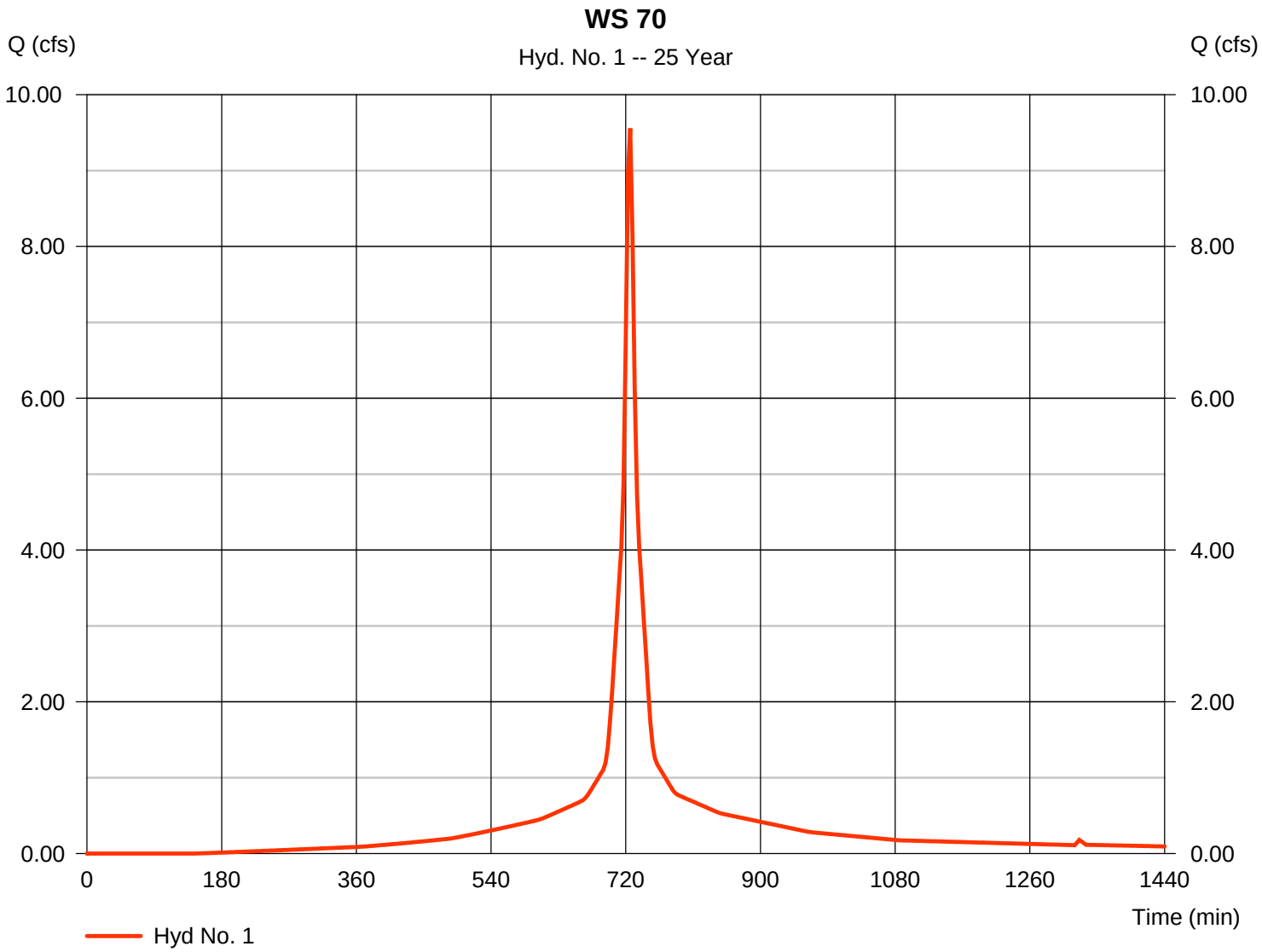
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.555 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	34,643 cuft
Drainage area	=	2.120 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.50 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	10.85	3	726	39,643	------	------	------	WS 70
2	SCS Runoff	7.898	3	726	27,790	------	------	------	WS 80
3	SCS Runoff	8.557	3	726	29,681	------	------	------	WS 90
4	SCS Runoff	10.79	3	726	39,903	------	------	------	WS 100
5	SCS Runoff	1.601	3	726	5,395	------	------	------	WS 200
7	SCS Runoff	10.74	3	726	38,815	------	------	------	2017 WS 70
8	SCS Runoff	7.898	3	726	27,790	------	------	------	2017 WS 80
9	SCS Runoff	8.557	3	726	29,681	------	------	------	2017 WS 90
10	SCS Runoff	10.79	3	726	39,903	------	------	------	2017 WS 100
11	SCS Runoff	1.601	3	726	5,395	------	------	------	2017 WS 200

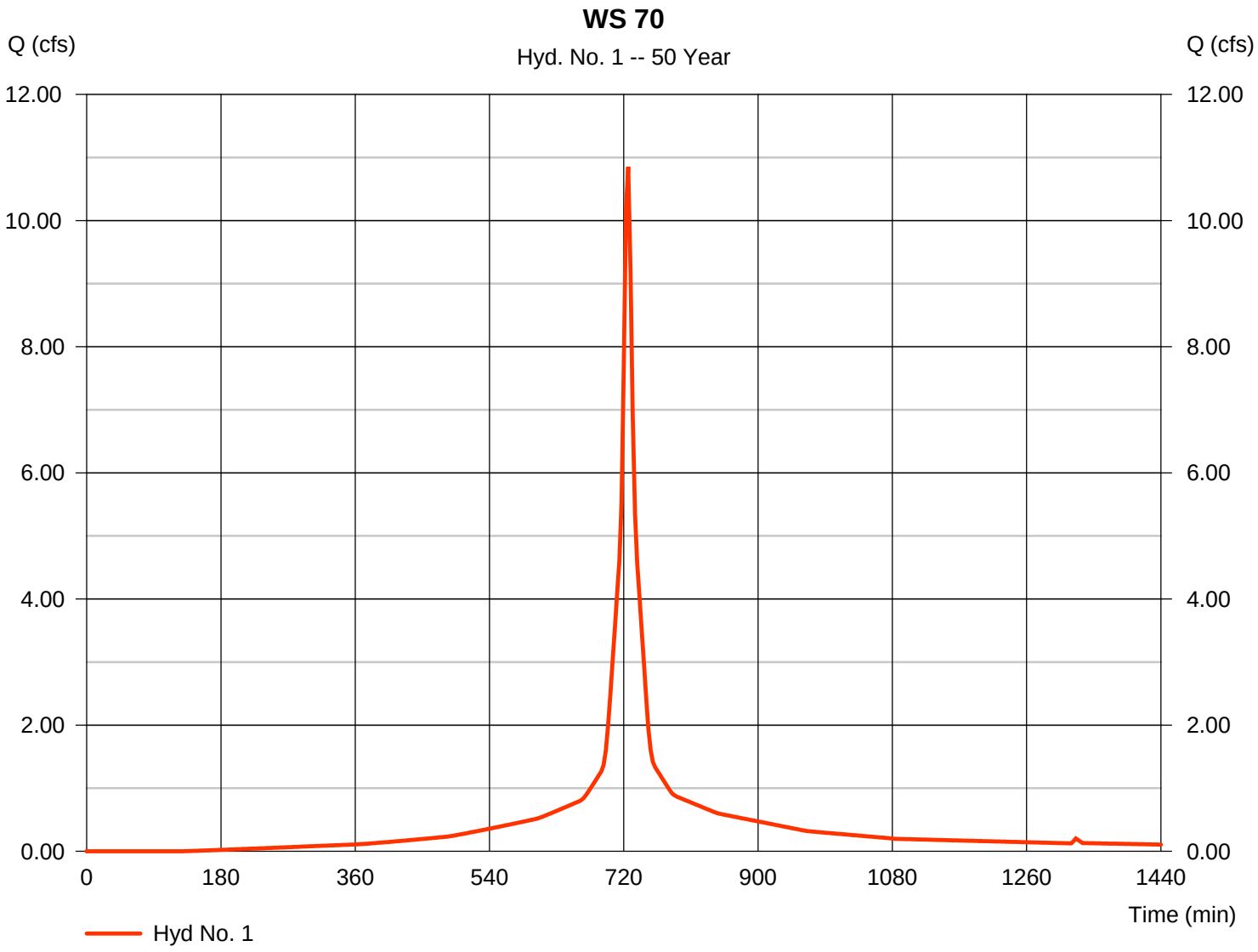
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	= SCS Runoff	Peak discharge	= 10.85 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 3 min	Hyd. volume	= 39,643 cuft
Drainage area	= 2.120 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.20 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

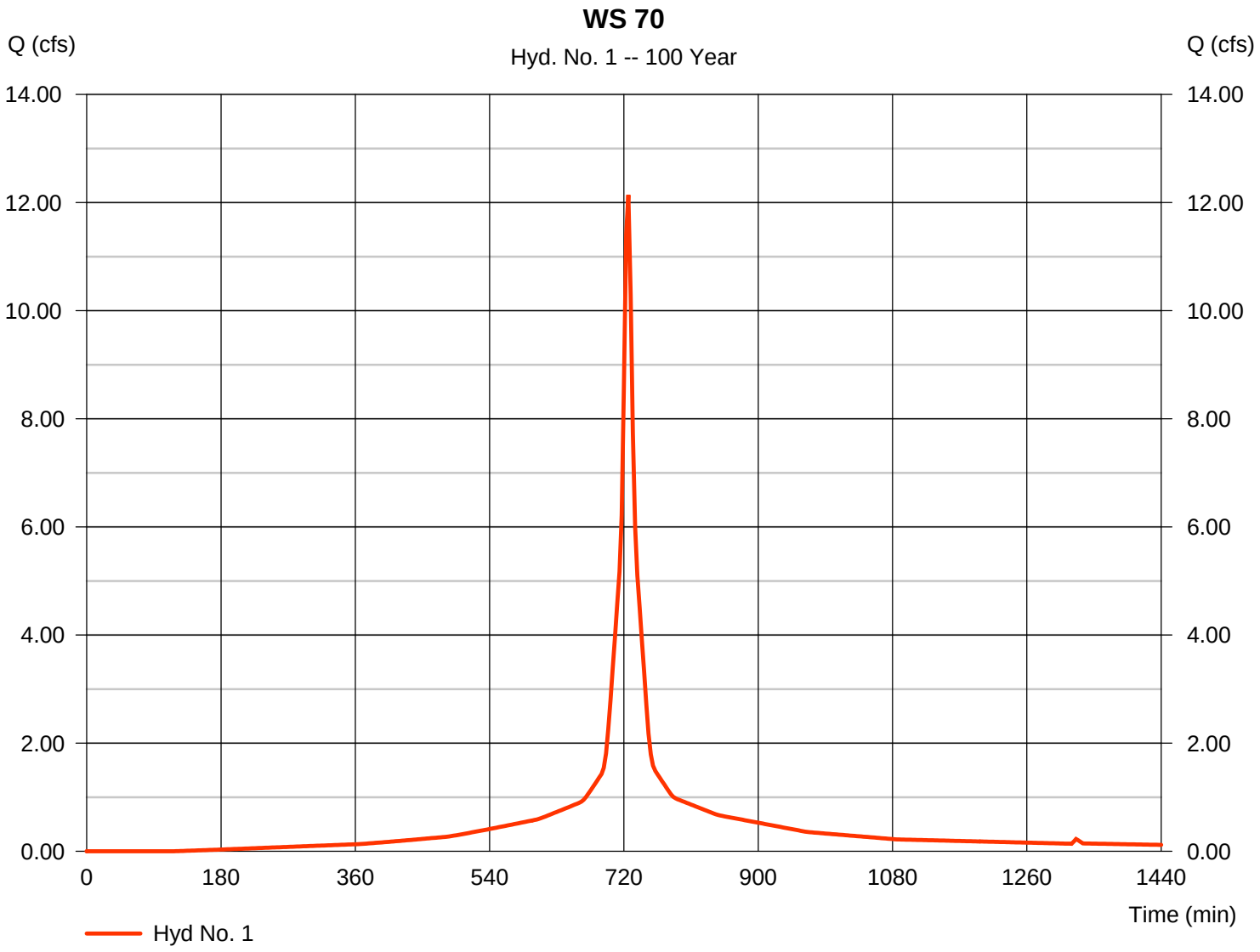
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9

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	12.14	3	726	44,651	------	------	------	WS 70
2	SCS Runoff	8.903	3	726	31,563	------	------	------	WS 80
3	SCS Runoff	9.689	3	726	33,856	------	------	------	WS 90
4	SCS Runoff	12.06	3	726	44,853	------	------	------	WS 100
5	SCS Runoff	1.840	3	726	6,236	------	------	------	WS 200
7	SCS Runoff	12.03	3	726	43,809	------	------	------	2017 WS 70
8	SCS Runoff	8.903	3	726	31,563	------	------	------	2017 WS 80
9	SCS Runoff	9.689	3	726	33,856	------	------	------	2017 WS 90
10	SCS Runoff	12.06	3	726	44,853	------	------	------	2017 WS 100
11	SCS Runoff	1.840	3	726	6,236	------	------	------	2017 WS 200

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2012 by Autodesk, Inc. v9 Thursday, 00 5, 2012

Hyd. No. 1

WS 70

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.14 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	3 min	Hyd. volume	=	44,651 cuft
Drainage area	=	2.120 ac	Curve number	=	94
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.90 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484