

STORMWATER MANAGEMENT PLAN

Mathews Avenue Site Redevelopment

**301 Belle Isle Road, LLC
Syracuse, New York**

October 2010



O'BRIEN & GERE
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301 Belle Isle Road, LLC
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PETER E. GREVELDING, P.E., SENIOR VICE PRESIDENT
O'BRIEN & GERE ENGINEERS, INC.
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1. INTRODUCTION

This Stormwater Management Plan presents the stormwater management design approach for the Mathews Avenue Site Redevelopment in Solvay, NY (the Site), and a summary of the hydrologic and hydraulic analyses performed. This document also serves as a supplement to the Stormwater Pollution Prevention Plan (SWPPP) for this project. These analyses include comparison of pre- and post-development stormwater runoff conditions including the stormwater quantity and quality measures to be provided upon development. Also presented is a summary of the storm sewer system design. The Pre- and Post-Development Drainage Plans are attached as Figure 1 and Figure 2, and the Post-Development Catchment Plan as Figure 3. Also attached are stormwater quality calculations along with stormwater calculations for the design of the stormwater management areas (SWMAs).

As the project results in the disturbance of more than 1-acre of land a NYSDEC State Pollutant Discharge Elimination System (SPDES) Permit for Stormwater Discharges from Construction Activities must be obtained for the project. The SPDES Permit authorizes stormwater discharges to surface waters of the State from construction activities, and requires stormwater quantity and quality measures be provided in accordance with the NYS Stormwater Management Guidelines. The proposed stormwater measures have been designed in accordance with the *New York State Stormwater Management Design Manual* to provide stormwater quantity and quality mitigation, to the extent practicable for this site. The proposed design of the stormwater management facilities incorporates, and considers the protection of, the existing site characteristics (e.g., the Mathews Avenue Landfill, the existing wetlands and the former Erie Canal). A more detailed description of the Site is included in the SWPPP. The proposed stormwater management design for this project utilizes the remediated, former Erie Canal as a stormwater management area (SWMA) to mitigate runoff from the proposed redevelopment. Delineated wetland areas existing on-site are identified on the Existing Site Plan, which is included in the Contract Documents (bound separately).

1.1 BACKGROUND

The Mathews Avenue Site Redevelopment includes remediation (low-permeability covering of the landfill) and redevelopment of approximately 21-acres of the total 66-acre± property located in Solvay, NY. The Site is divided into Parcel A and Parcel B, which will be addressed separately as further described in the Remedial Action Work Plan for Parcel A. Parcel A (approximately 33 acres) includes the 20-acre former Mathews Ave. Landfill, the former section of the Erie Canal, and the Northern Drainage Swale which runs South of and parallel to the former Erie Canal. Parcel B (approximately 33 acres) includes the wetlands, uplands and other areas in the western portion of the Site. This Stormwater Management Plan has been prepared for Parcel A.

The Site was a former industrial landfill and contains variable soil cover (6-inches to 6-feet) over the landfill media. A portion of the former Erie Canal spans the Site from west to east across the northern limits of the Site. Eight delineated wetlands exist on the Site; two are located on the proposed redevelopment parcel (project area), five are located westerly of the project area, and one is located within the western limits of the former Erie Canal.

The Soils Map for the Site is included in Appendix D of the SWPPP for this project.

2. METHODOLOGY

Stormwater runoff was calculated using Hydraflow Hydrograph Extension for AutoCAD Civil 3D 2008 software which utilizes U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) TR-55 and TR-20 methodologies to perform the hydrologic analysis for pre-and post-development conditions including the design and modeling of the SWMAs. Hydraflow Storm Sewers Extension for AutoCAD Civil 3D 2008 software was utilized to calculate the stormwater runoff rates and design the storm sewer system. This software utilizes the energy-based Standard Step method to develop the hydraulic profile, and The Rational Method to estimate peak runoff rates for the design year storm events. The storm sewer system has been designed to convey runoff from a 5-year frequency storm event.

3. HYDROLOGIC ANALYSIS

3.1 PRE-DEVELOPMENT CONDITIONS

The 33±-acre site generally consists of an existing landfill covered with tall grass, brush, and light woods. The site has been delineated into nine drainage areas contributing to four general discharge points from the site. The discharge points are used for comparison of pre-development and post-development peak runoff rates and stormwater quality measures. In general the site is tributary to discharge points 1 and 2 (DP1 and DP2), as indicated on Figure 1. Runoff from DP3 and DP4 are eventually tributary to DP2. DP1 is located at an existing 18-inch culvert under Gere Lock Road in the north east corner of the site with a contributing area of 2.07-ac. DP2 is located within the Northern Drainage Swale on the south side of the former Erie Canal with a total contributing area of 16.61-ac. It is noted that Drainage Area 3B is tributary to an existing onsite wetland and discharges to DP2 during storm events greater than a 10-year frequency. The balance of the site consists of Drainage Area 3A which is approximately 3.36-ac and is tributary to an existing onsite wetland with no apparent discharge offsite. The drainage area boundaries and the associated times of concentration (T_c) for each are shown on Figure 1. The Watershed Model Schematic and Drainage Analysis for pre-development conditions are provided in Attachment 1. Table 1 below presents a summary of the peak runoff rates under pre-development conditions for each area:

Table 1 Summary of Pre-Development Drainage Area Run-off Rates (cfs)

Drainage Area	1-year	10-year	100-year
1 (Hyd 1)	1.9	5.1	8.0
2 (Hyd 2)	5.4	12.2	18.3
3A (Hyd 3)	4.3	10.6	16.6
3B (Hyd 4)	5.4	14.7	23.5
3C (Hyd 5)	1.7	5.0	8.2
4 (Hyd 6)	2.0	5.1	8.0
5 (Hyd 7)	1.5	3.8	5.9
6A (Hyd 8)	3.0	6.5	9.6
6B (Hyd 9)	1.5	3.4	5.0

Peak runoff rates are from Pre-Development Hydraflow output

Source: O'Brien & Gere

The following Table 2 is a summary of the peak runoff rates to DP1, DP2, and DP3 under pre-development conditions:

Table 2 Summary of Pre-Development Discharge Point Runoff Rates (cfs)

Drainage Area	1-year	10-year	100-year
DP1 (Hyd 1)	1.9	5.1	8.0
DP2 (Hyd 16)	5.2	13.7	33.3
DP3 (Hyd 13)	3.6	8.0	12.0
DP4 (Hyd 7)	1.5	3.8	5.9
Peak runoff rates are from Pre-Development Hydraflow output			
Source: O'Brien & Gere			

3.2 POST-DEVELOPMENT CONDITIONS

The proposed site remediation and redevelopment generally includes installation of an alternative cover on the existing landfill and development of an industrial recycling facility. The proposed site is to include asphalt pavement, concrete surfaces, lawn areas, and landscaping. Under post development conditions the site has been delineated into seven drainage areas and all except Drainage Areas 4B and 5 will be directed to SWMAs to provide stormwater quantity and quality control in accordance with NYSDEC requirements. Drainage Areas 4B and 5 will consist of gravel embankments located along the south and west sides of the site and have been included in the hydrologic analysis for the site. In accordance with the NYS Stormwater Management Design Manual stormwater quantity requirements include provision of the channel protection volume (CP_v) for extended detention of the post developed 1-year storm event, overbank flood protection to control discharge rates for the 10-year storm event and extreme flood protection to control discharge rates for the 100-year storm event. As the project is located within the Onondaga Lake Watershed, the water quality volumes (WQ_v) are calculated to meet the Enhanced Phosphorus Removal requirements. The drainage area boundaries along with the times of concentration (T_c) are provided on Figure 2. The Watershed Model Schematic and Drainage Analysis for post-development conditions are provided in Attachment 2. The following is a brief description of the areas tributary to the SWMAs:

- SWMA-1 is a proposed Pocket Pond tributary to the existing 18-inch diameter culvert under Gere Lock Road (DP1). SWMA-1 is to be lined with a low-permeability soil and 40mil LLDPE geo-membrane liner to prevent infiltration into the landfill media.
- SWMA-2 utilizes the former Erie Canal as a Wet Pond tributary to the existing Northern Drainage Swale (DP2) that discharges to Geddes Brook. As indicated on Figure 2, DP2 receives runoff contribution from DA2, via SWMA-2, from DA 4A and DA4B via SWMA 4. DP2 also receives runoff from DP3 and DP4.
- SWMA-3 is a proposed Pocket Pond that discharges to an existing drainage swale located on the south side of the site that is tributary to a 30-inchX42-inch culvert under the existing driveway for the Village of Solvay Landfill. Ultimately DP3 is tributary to the Northern Drainage Swale (DP2) that discharges to Geddes Brook.
- SWMA-4 is a proposed Pocket Pond located on the west side of the site that discharges to an existing wetland located west of the site that is tributary to the Northern Drainage Swale (DP2) that discharges to Geddes Brook.

The following Table 3 is a summary of the peak runoff rates for all drainage areas prior to stormwater management facilities under post-development conditions:

Table 3 Summary of Post-Development Drainage Area Runoff Rates (cfs)

Drainage Area	1-year	10-year	100-year
1 (Hyd 1)	7.1	13.4	18.9
2 (Hyd 2)	47.3	87.6	122.4
4A (Hyd 3)	1.5	3.6	5.5
4B (Hyd 4) ¹	1.5	4.1	6.7
5 (Hyd 5) ¹	1.1	3.0	4.9
6A (Hyd 6)	5.0	9.7	13.7
6B (Hyd 7)	1.5	3.3	5.0

Peak runoff rates are from Post-Development Hydraflow output

¹ These areas consist of gravel embankments w/o stormwater mitigation measures provided.

Source: O'Brien & Gere

The following Table 4 is a summary of the peak runoff rates to DP1, DP2, and DP3 prior to stormwater management facilities under post-development conditions:

Table 4 Summary of Post-Developed Discharge Point Runoff Rates (cfs)

Drainage Point	1-year	10-year (Overbank Flood)	100-year (Extreme Flood)
DP1 (Hyd 1)	7.1	13.4	18.9
DP2 (Hyd 2,3,4,12)	50.9	97.0	137.3
DP3 (Hyd 6,7)	5.3	10.3	14.7
DP4 (Hyd 5)	1.1	3.0	4.9

Peak runoff rates are from Post-Development Hydraflow output

Source: O'Brien & Gere

The following Table 5 is a comparison of the pre-developed vs post-developed peak runoff rates to DP1, DP2, and DP3 with stormwater management facilities under post-development conditions:

Table 5 Comparison of Pre-vs Post-Development Runoff Rates (cfs)

Discharge Point	1-year	10-year	100-year
DP1-PRE	1.9	5.1	8.0
POST	0.4	2.4	7.7
DP2-PRE	5.2	13.7	33.3
POST	2.6	7.4	12.5
DP3-PRE	3.6	8.0	12.0
POST	1.7	3.7	8.3
DP4-PRE	1.5	3.8	5.9
POST	1.1	3.0	4.9

Peak runoff rates are from Pre-Development and Post-Development Hydraflow output

The following Table 6 is a summary of the Channel Protection Volumes (CP_v) for each SWMA under post-development conditions:

Table 6 Summary of Channel Protection Volume (CP_v) for 1-yr Frequency Storm

SWMA	Required CP_v	Provided CP_v	Avg Release Rate	Elevation
1	0.31	0.31	0.33	401.8
2	1.61	1.61	0.33	396.9
3	0.13	0.13	0.33	408.4
4	0.07	0.07	0.33	404.3

CP_v values are from Stormwater Quality Calculations

Source: O'Brien & Gere

3.3 STORMWATER QUALITY

Stormwater quality measures in accordance with the requirements of the NYS Stormwater Management Design Manual are provided by the SWMAs. SWMAs 1, 3, and 4 have been designed as Pocket Ponds with pre-treatment forebays sized to provide a minimum of 10% of the WQ_v . SWMA-2 (former Erie Canal) has been designed as a Wet Pond with Advanced Drainage Systems Inc. (ADS) BaySeparator™ stormwater treatment systems at two (2) locations to provide pre-treatment stormwater quality measures. The BaySeparator™ units are proposed based on site constraints and to minimize disturbance within the former Erie Canal. These stormwater quality units will be online practices designed to treat the 1-year post development peak discharge from the closed storm sewer system prior to discharge to SWMA-2. Flows that exceed the 1-year peak flow rate will bypass the BaySeparator™ units and discharge directly to SWMA-2. The following is a summary of the water quality volumes required and the water quality volume provided for each SWMA. Calculations of the stormwater quality volume for each SWMA are provided in Attachment 4. Details of the design of the SWMAs are provided in the Contract Drawings developed for the project.

Table 7 Stormwater Quality Volume (WQ_v) Summary

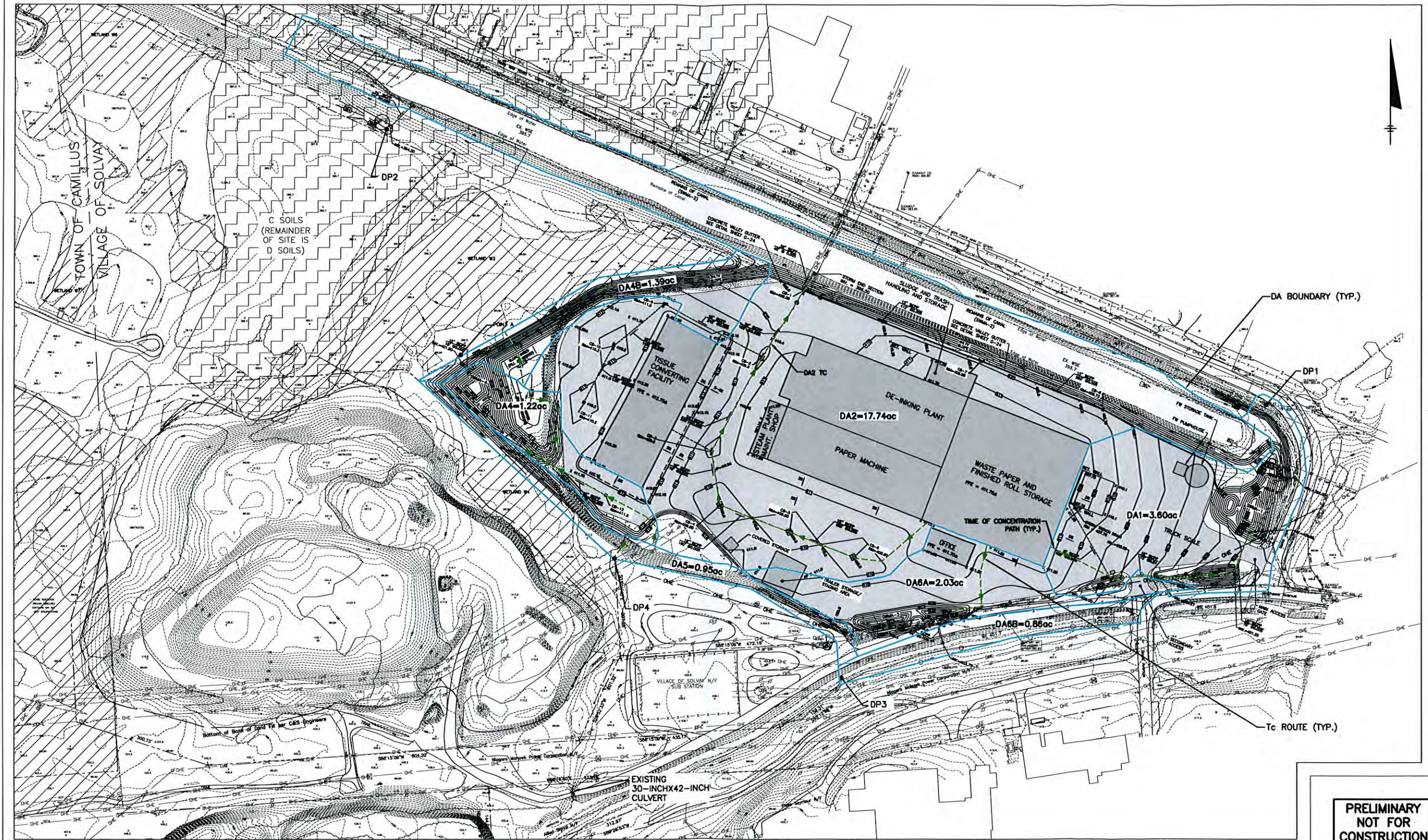
SWMA	SWMA 1	SWMA 2	SWMA 3	SWMA 4
WQ_v Required (ac-ft)	0.477	2.47	0.197	0.102
WQ_v Provided (ac-ft)	0.534	2.47	0.197	0.195

WQ_v values are from Stormwater Quality Calculations

Source: O'Brien & Gere

3.4 CONCLUSION

Through the use of the proposed stormwater management areas the peak runoff rates under post-development conditions will be less than pre-development rates from the site, mitigating the impacts from the site on downstream drainage facilities. In addition the stormwater management areas have been designed to provide stormwater quality measures in accordance with the NYS Stormwater Management Design Manual.



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MATHEWS AVENUE
SITE REDEVELOPMENT
VILLAGE OF SOLWAY, NEW YORK

GENERAL
**POST-DEVELOPMENT
DRAINAGE PLAN**

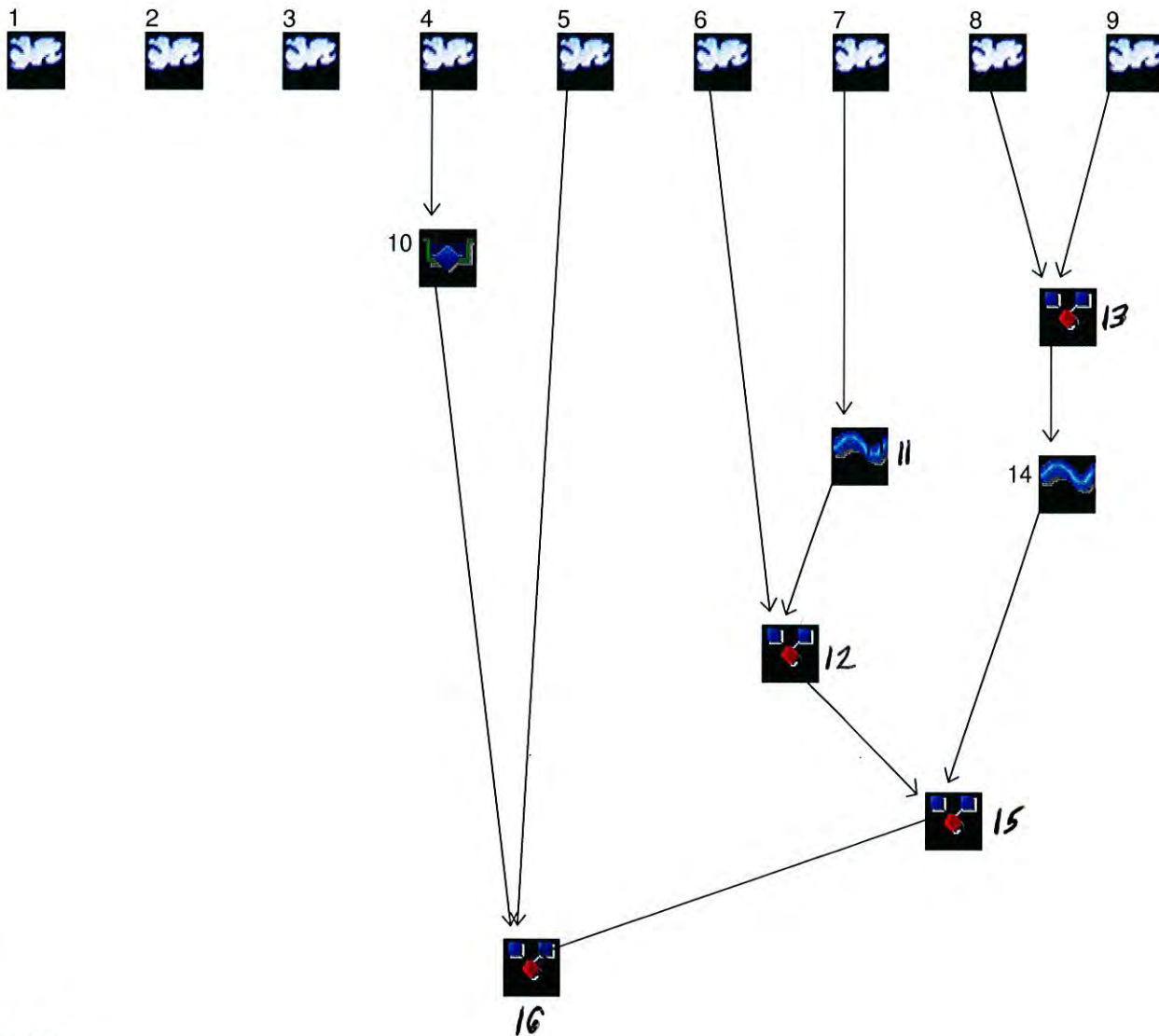
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*Pre-Development Conditions
Watershed Model*

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052



Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	SCS Runoff	DA 1 (TO DP1)
2	SCS Runoff	DA 2 (TO CANAL)
3	SCS Runoff	DA 3A
4	SCS Runoff	DA 3B
5	SCS Runoff	DA 3C
6	SCS Runoff	DA 4
7	SCS Runoff	DA 5
8	SCS Runoff	DA 6A
9	SCS Runoff	DA 6B
10	Reservoir	EX. ONSITE WETLAND
11	Reach	FROM POINT B TO POINT C
12	Combine	COMBINED DA4 AND DA5 TO POINT C
13	Combine	COMBINED DA6A AND DA6B
14	Reach	POINT A TO POINT C
15	Combine	COMBINED 4, 5, 6A, 6B AT POINT C
16	Combine	COMBINED 3B, 3C, 4, 5, 6A, 6B (TO DP2)

Hydrograph Return Period Recap

Hydrow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	-----	1.949	-----	-----	-----	5.079	-----	-----	8.026	DA 1 (TO DP1)
2	SCS Runoff	-----	5.404	-----	-----	-----	12.21	-----	-----	18.32	DA 2 (TO CANAL)
3	SCS Runoff	-----	4.261	-----	-----	-----	10.64	-----	-----	16.56	DA 3A
4	SCS Runoff	-----	5.420	-----	-----	-----	14.67	-----	-----	23.52	DA 3B
5	SCS Runoff	-----	1.731	-----	-----	-----	5.013	-----	-----	8.241	DA 3C
6	SCS Runoff	-----	2.014	-----	-----	-----	5.099	-----	-----	7.981	DA 4
7	SCS Runoff	-----	1.512	-----	-----	-----	3.794	-----	-----	5.910	DA 5
8	SCS Runoff	-----	2.953	-----	-----	-----	6.457	-----	-----	9.566	DA 6A
9	SCS Runoff	-----	1.489	-----	-----	-----	3.365	-----	-----	5.043	DA 6B
10	Reservoir	4	0.000	-----	-----	-----	4.288	-----	-----	16.16	EX. ONSITE WETLAND
11	Reach	7	0.718	-----	-----	-----	1.834	-----	-----	2.874	FROM POINT B TO POINT C
12	Combine	6, 11	2.651	-----	-----	-----	6.729	-----	-----	10.53	COMBINED DA4 AND DA5 TO POIN
13	Combine	8, 9,	3.576	-----	-----	-----	7.996	-----	-----	11.98	COMBINED DA6A AND DA6B
14	Reach	13	1.161	-----	-----	-----	2.609	-----	-----	3.907	POINT A TO POINT C
15	Combine	12, 14	3.526	-----	-----	-----	8.721	-----	-----	13.56	COMBINED 4, 5, 6A, 6B AT POINT C
16	Combine	5, 10, 15	5.225	-----	-----	-----	13.72	-----	-----	33.34	COMBINED 3B, 3C, 4, 5, 6A, 6B (TO
Proj. file: PRE DEV CONDITIONS.gpw										Wednesday, Aug 4, 2010	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	1.949	2	726	6,275	-----	-----	-----	DA 1 (TO DP1)
2	SCS Runoff	5.404	2	734	23,479	-----	-----	-----	DA 2 (TO CANAL)
3	SCS Runoff	4.261	2	722	11,177	-----	-----	-----	DA 3A
4	SCS Runoff	5.420	2	730	20,783	-----	-----	-----	DA 3B
5	SCS Runoff	1.731	2	728	6,381	-----	-----	-----	DA 3C
6	SCS Runoff	2.014	2	728	7,124	-----	-----	-----	DA 4
7	SCS Runoff	1.512	2	722	4,309	-----	-----	-----	DA 5
8	SCS Runoff	2.953	2	726	10,207	-----	-----	-----	DA 6A
9	SCS Runoff	1.489	2	716	3,007	-----	-----	-----	DA 6B
10	Reservoir	0.000	2	n/a	0	4	401.15	20,783	EX. ONSITE WETLAND
11	Reach	0.718	2	734	4,292	7	-----	-----	FROM POINT B TO POINT C
12	Combine	2.651	2	728	11,417	6, 11	-----	-----	COMBINED DA4 AND DA5 TO POIN
13	Combine	3.576	2	720	13,214	8, 9,	-----	-----	COMBINED DA6A AND DA6B
14	Reach	1.161	2	748	13,172	13	-----	-----	POINT A TO POINT C
15	Combine	3.526	2	730	24,589	12, 14	-----	-----	COMBINED 4, 5, 6A,6B AT POINT C
16	Combine	5.225	2	728	30,970	5, 10, 15	-----	-----	COMBINED 3B, 3C, 4, 5, 6A, 6B (TO
PRE DEV CONDITIONS.gpw					Return Period: 1 Year			Wednesday, Aug 4, 2010	

Hydrograph Report

4

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

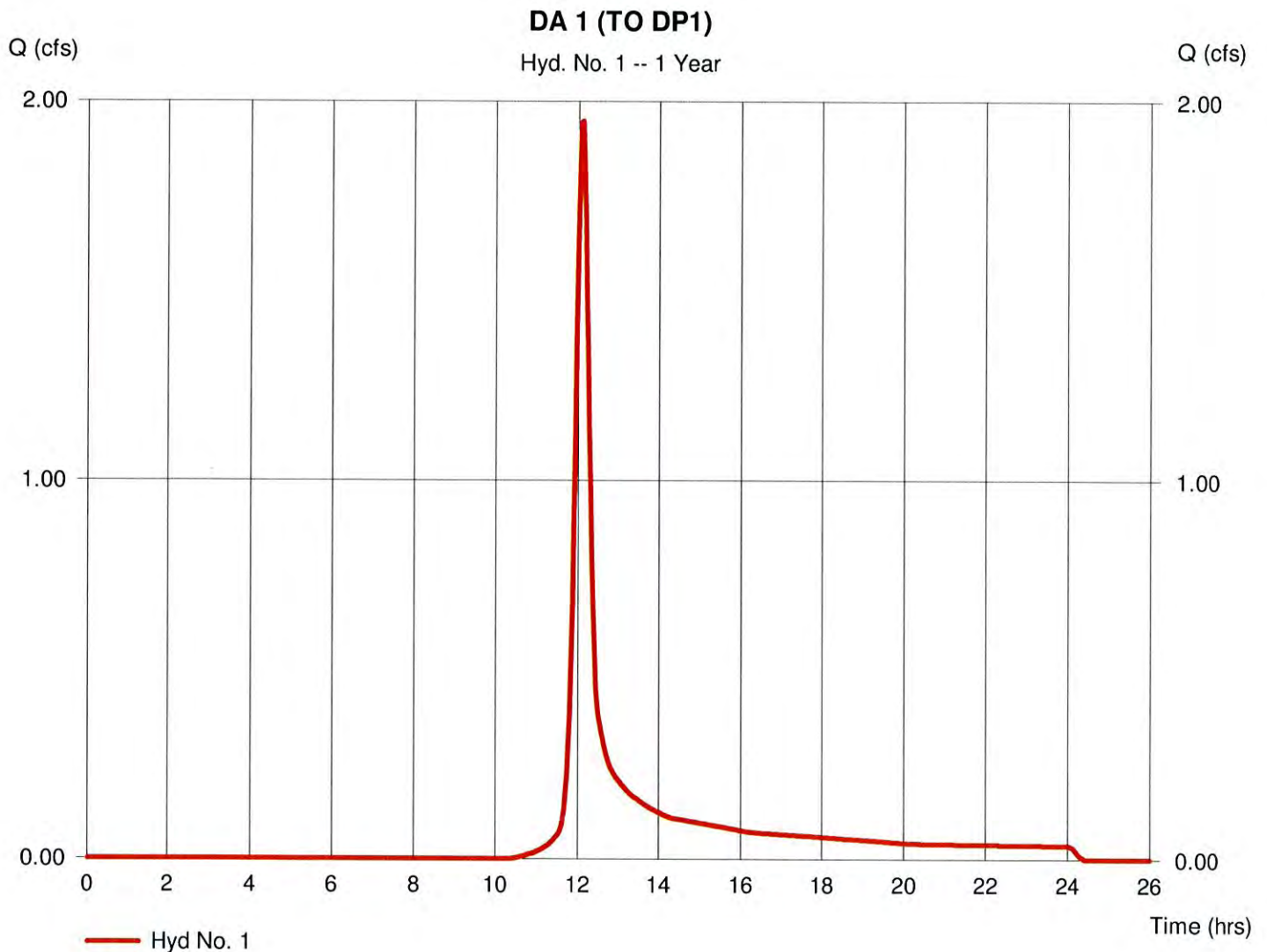
Wednesday, Aug 4, 2010

Hyd. No. 1

DA 1 (TO DP1)

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 2.070 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 1.949 cfs
Time to peak = 12.10 hrs
Hyd. volume = 6,275 cuft
Curve number = 83
Hydraulic length = 0 ft
Time of conc. (Tc) = 19.90 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

6

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

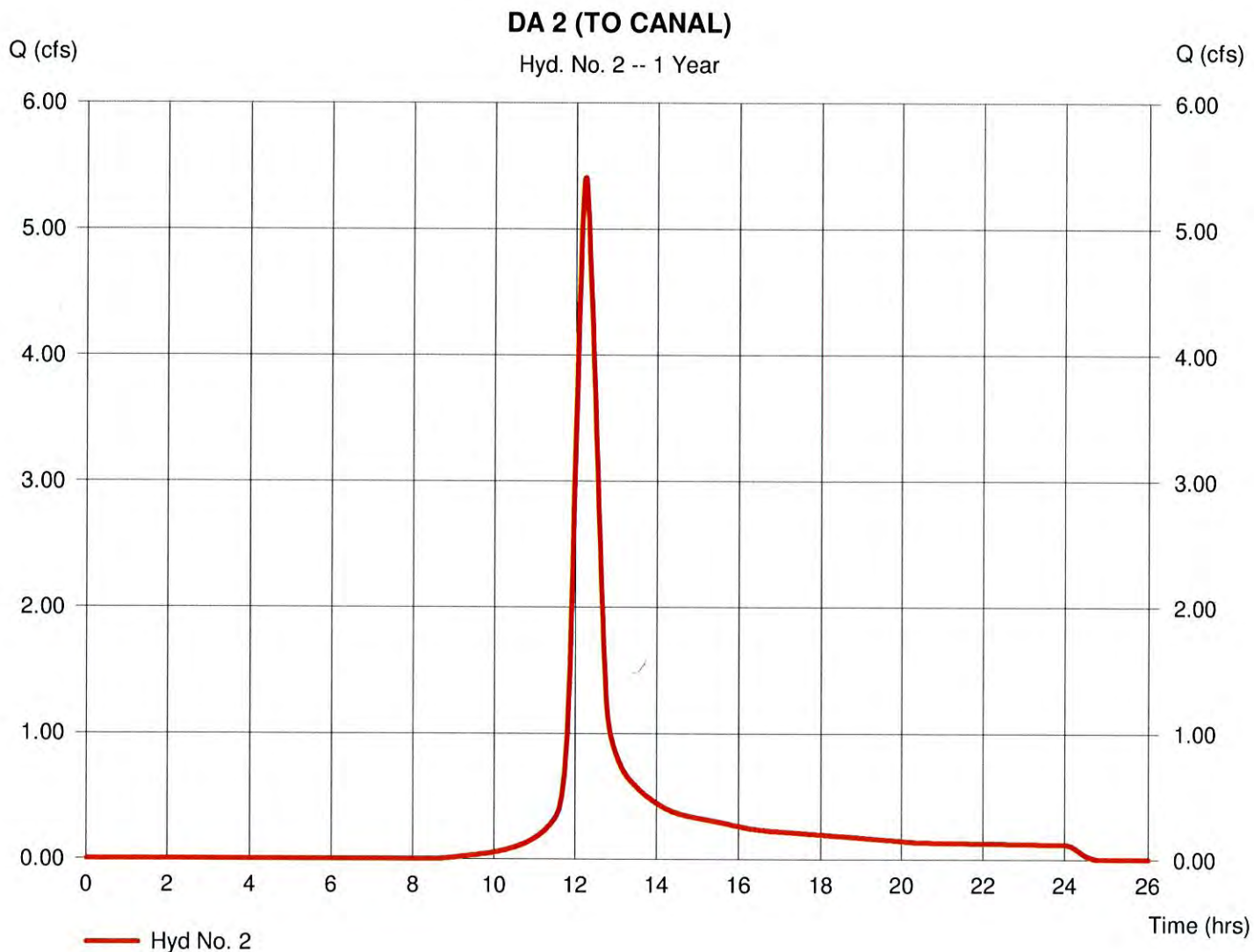
Wednesday, Aug 4, 2010

Hyd. No. 2

DA 2 (TO CANAL)

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 5.660 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 5.404 cfs
Time to peak = 12.23 hrs
Hyd. volume = 23,479 cuft
Curve number = 88
Hydraulic length = 0 ft
Time of conc. (Tc) = 33.20 min
Distribution = Type II
Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 2

DA 2 (TO CANAL)

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>		
Sheet Flow						
Manning's n-value	= 0.400	0.011	0.011			
Flow length (ft)	= 100.0	0.0	0.0			
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00			
Land slope (%)	= 1.00	0.00	0.00			
Travel Time (min)	= 32.72	+	0.00	+	0.00	= 32.72
Shallow Concentrated Flow						
Flow length (ft)	= 133.00	0.00	0.00			
Watercourse slope (%)	= 6.90	0.00	0.00			
Surface description	= Unpaved	Paved	Paved			
Average velocity (ft/s)	= 4.24	0.00	0.00			
Travel Time (min)	= 0.52	+	0.00	+	0.00	= 0.52
Channel Flow						
X sectional flow area (sqft)	= 0.00	0.00	0.00			
Wetted perimeter (ft)	= 0.00	0.00	0.00			
Channel slope (%)	= 0.00	0.00	0.00			
Manning's n-value	= 0.015	0.015	0.015			
Velocity (ft/s)	= 0.00	0.00	0.00			
Flow length (ft)	= 0.0	0.0	0.0			
Travel Time (min)	= 0.00	+	0.00	+	0.00	= 0.00
Total Travel Time, Tc					33.20 min	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

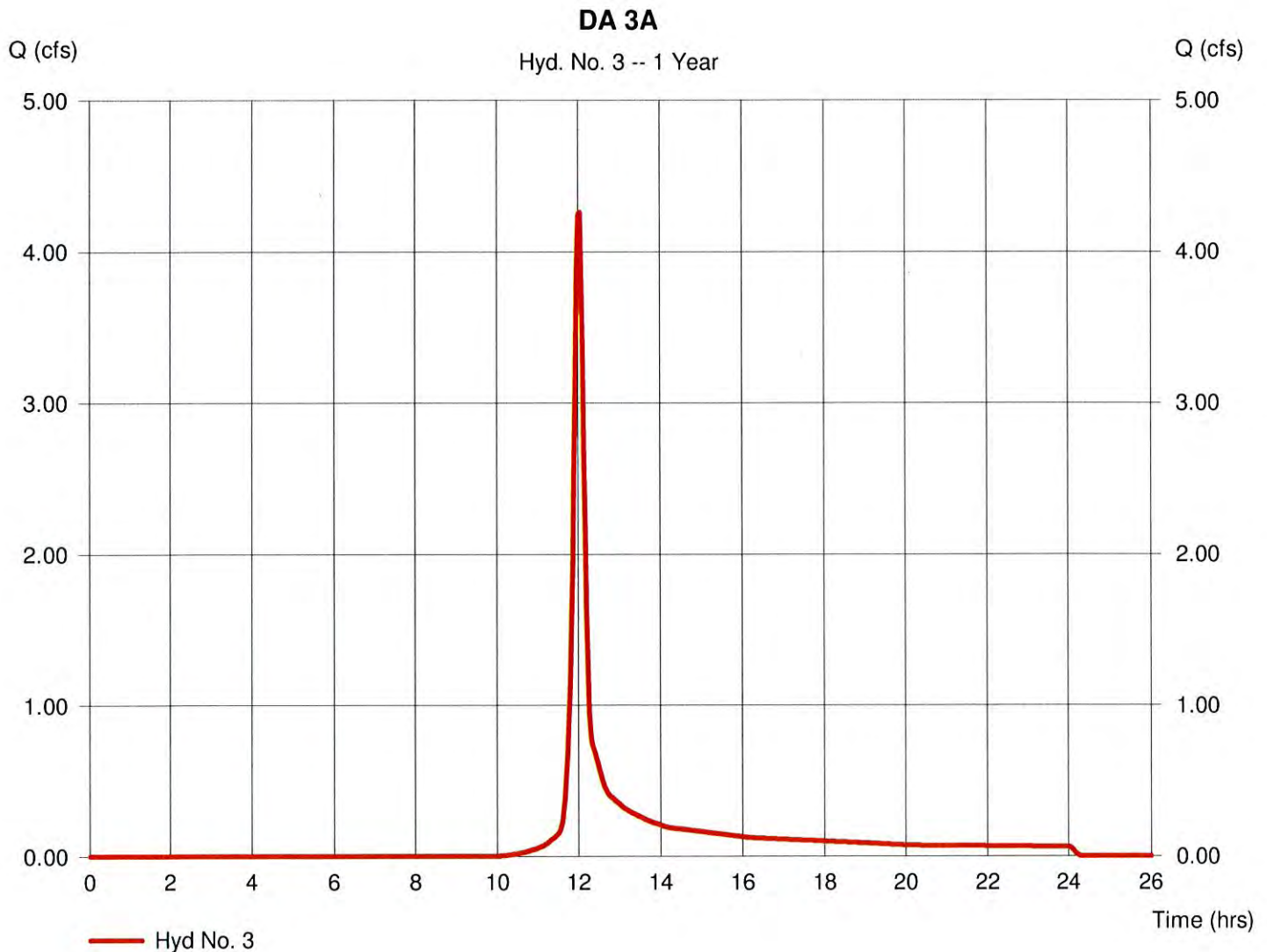
Wednesday, Aug 4, 2010

Hyd. No. 3

DA 3A

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 2 min
 Drainage area = 3.360 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 2.20 in
 Storm duration = 24 hrs

Peak discharge = 4.261 cfs
 Time to peak = 12.03 hrs
 Hyd. volume = 11,177 cuft
 Curve number = 84
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 13.10 min
 Distribution = Type II
 Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 3

DA 3A

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.150	0.011	0.011				
Flow length (ft)	= 100.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00				
Land slope (%)	= 3.00	0.00	0.00				
Travel Time (min)	= 9.62	+	0.00	+	0.00	=	9.62
Shallow Concentrated Flow							
Flow length (ft)	= 415.00	0.00	0.00				
Watercourse slope (%)	= 1.50	0.00	0.00				
Surface description	= Unpaved	Paved	Paved				
Average velocity (ft/s)	= 1.98	0.00	0.00				
Travel Time (min)	= 3.50	+	0.00	+	0.00	=	3.50
Channel Flow							
X sectional flow area (sqft)	= 0.00	0.00	0.00				
Wetted perimeter (ft)	= 0.00	0.00	0.00				
Channel slope (%)	= 0.00	0.00	0.00				
Manning's n-value	= 0.015	0.015	0.015				
Velocity (ft/s)	= 0.00	0.00	0.00				
Flow length (ft)	= 0.0	0.0	0.0				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Total Travel Time, Tc					13.10 min		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

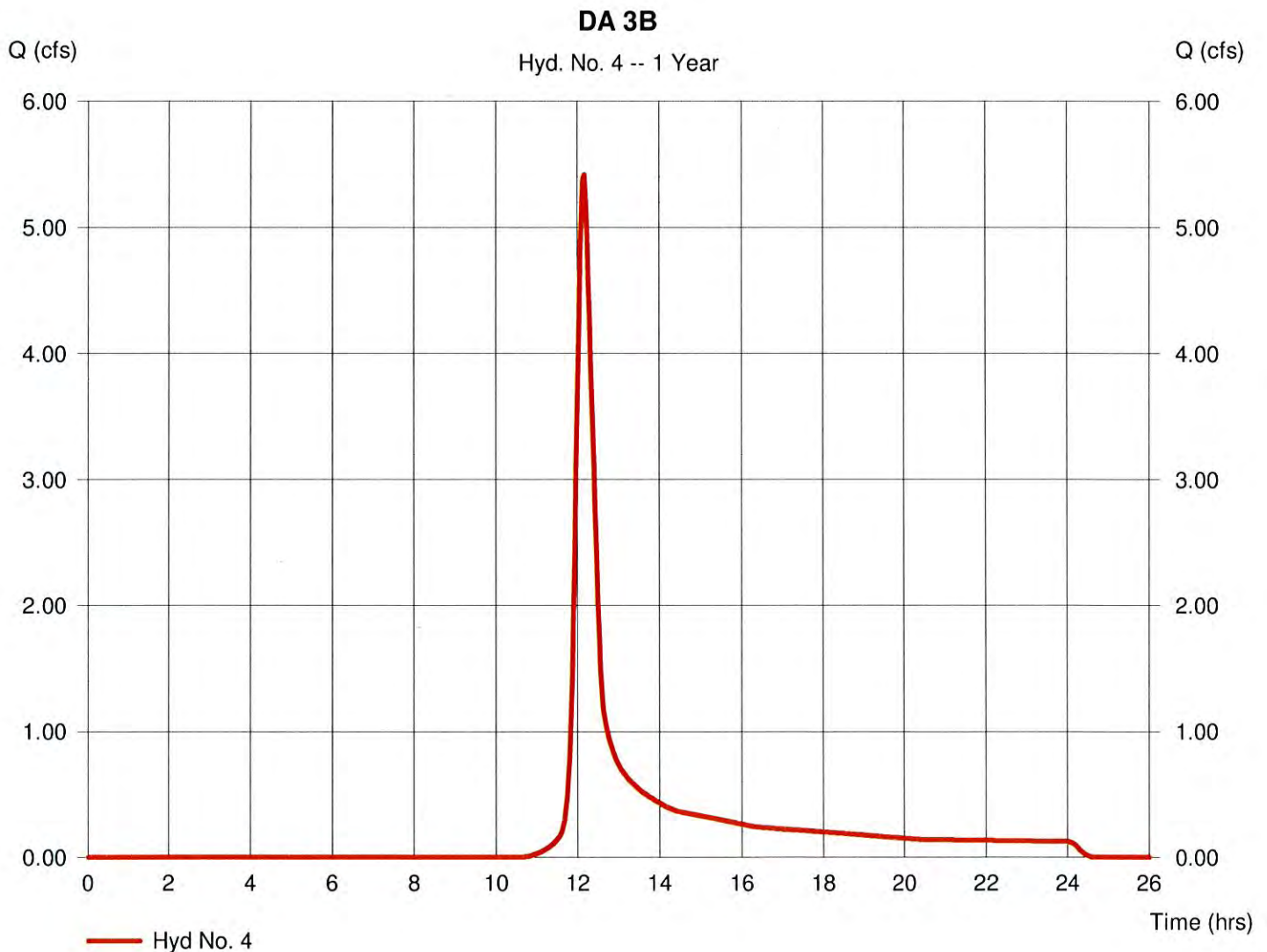
Wednesday, Aug 4, 2010

Hyd. No. 4

DA 3B

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 2 min
 Drainage area = 7.420 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 2.20 in
 Storm duration = 24 hrs

Peak discharge = 5.420 cfs
 Time to peak = 12.17 hrs
 Hyd. volume = 20,783 cuft
 Curve number = 82
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 23.50 min
 Distribution = Type II
 Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 4

DA 3B

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.400	0.011	0.011				
Flow length (ft)	= 100.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00				
Land slope (%)	= 3.30	0.00	0.00				
Travel Time (min)	= 20.29	+	0.00	+	0.00	=	20.29
Shallow Concentrated Flow							
Flow length (ft)	= 646.00	0.00	0.00				
Watercourse slope (%)	= 2.70	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	= 3.34	0.00	0.00				
Travel Time (min)	= 3.22	+	0.00	+	0.00	=	3.22
Channel Flow							
X sectional flow area (sqft)	= 0.00	0.00	0.00				
Wetted perimeter (ft)	= 0.00	0.00	0.00				
Channel slope (%)	= 0.00	0.00	0.00				
Manning's n-value	= 0.015	0.015	0.015				
Velocity (ft/s)	= 0.00	0.00	0.00				
Flow length (ft)	= 0.0	0.0	0.0				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Total Travel Time, Tc					23.50 min		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

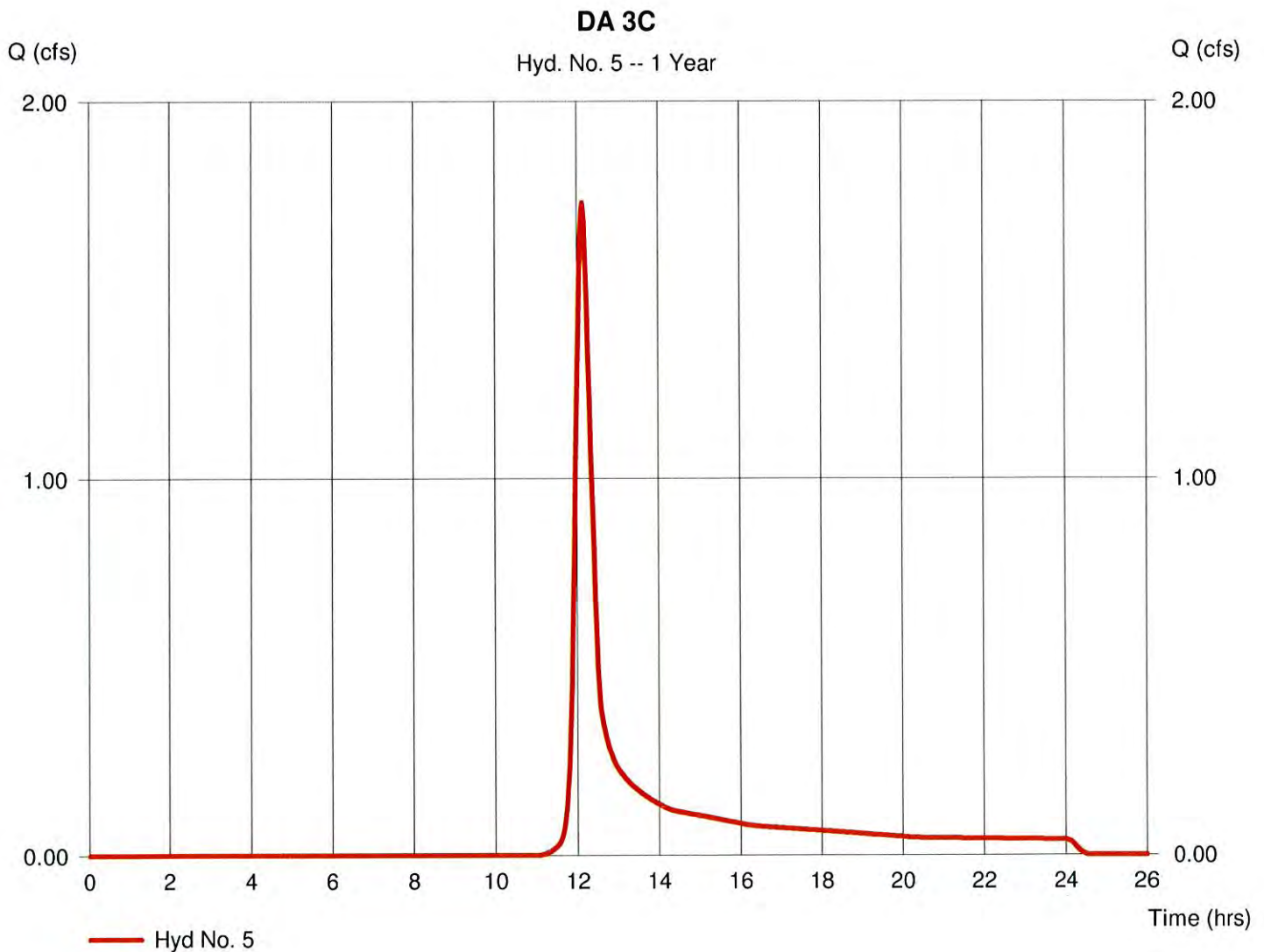
Wednesday, Aug 4, 2010

Hyd. No. 5

DA 3C

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 2 min
 Drainage area = 2.510 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 2.20 in
 Storm duration = 24 hrs

Peak discharge = 1.731 cfs
 Time to peak = 12.13 hrs
 Hyd. volume = 6,381 cuft
 Curve number = 80
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 22.90 min
 Distribution = Type II
 Shape factor = 484



TR55 Tc Worksheet

Hydrflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 5

DA 3C

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.400	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 2.80	0.00	0.00	
Travel Time (min)	= 21.67	+	0.00	+
			0.00	= 21.67
Shallow Concentrated Flow				
Flow length (ft)	= 275.00	0.00	0.00	
Watercourse slope (%)	= 5.20	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 3.68	0.00	0.00	
Travel Time (min)	= 1.25	+	0.00	+
			0.00	= 1.25
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Total Travel Time, Tc				22.90 min

Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

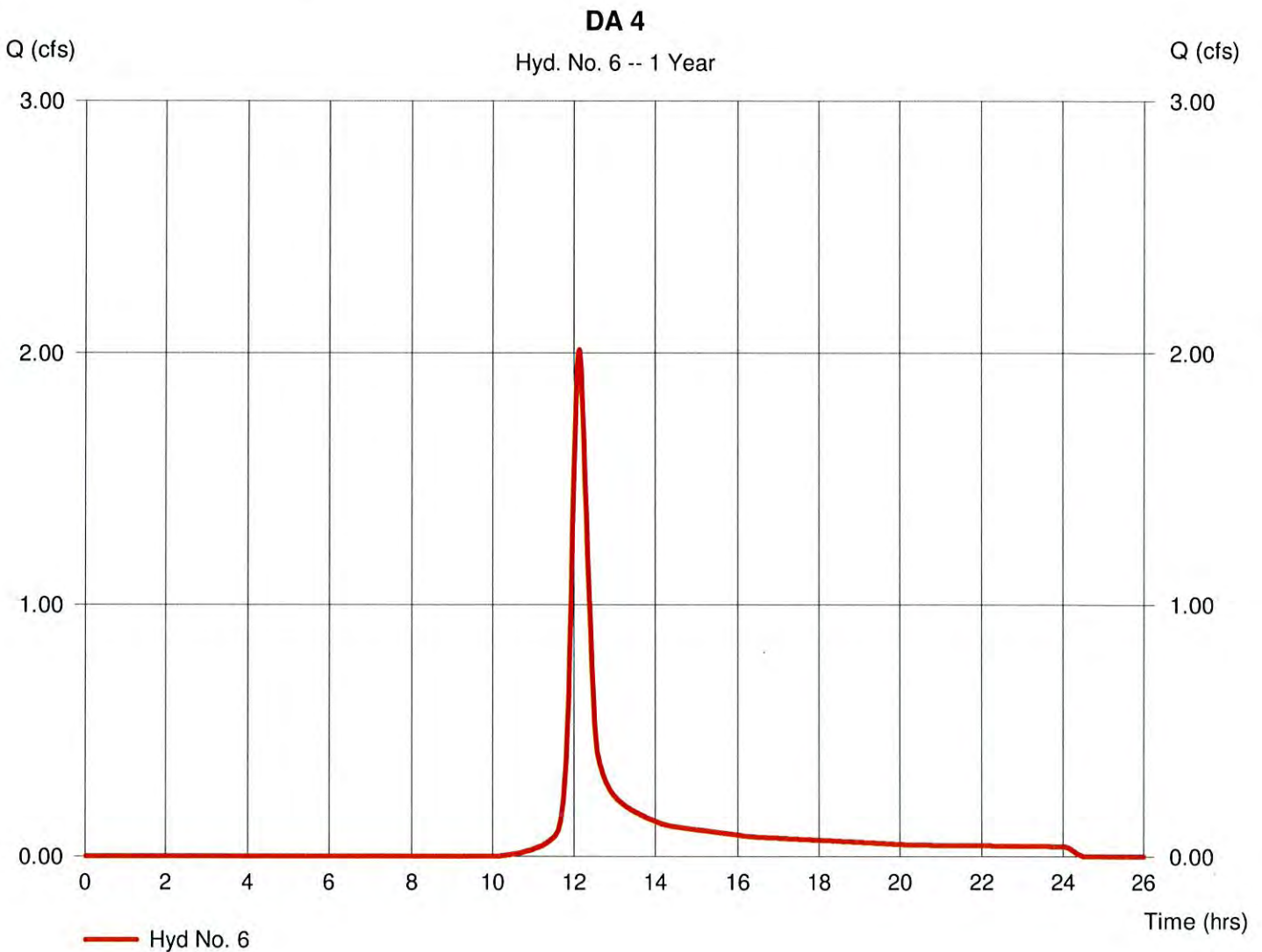
Wednesday, Aug 4, 2010

Hyd. No. 6

DA 4

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 2.170 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 2.014 cfs
Time to peak = 12.13 hrs
Hyd. volume = 7,124 cuft
Curve number = 84
Hydraulic length = 0 ft
Time of conc. (Tc) = 22.90 min
Distribution = Type II
Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 6

DA 4

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.400	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 2.80	0.00	0.00	
Travel Time (min)	= 21.67	+	0.00	+
			0.00	= 21.67
Shallow Concentrated Flow				
Flow length (ft)	= 275.00	0.00	0.00	
Watercourse slope (%)	= 5.20	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	= 3.68	0.00	0.00	
Travel Time (min)	= 1.25	+	0.00	+
			0.00	= 1.25
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	= 0.00	0.00	0.00	
Flow length (ft)	= 0.0	0.0	0.0	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Total Travel Time, Tc				22.90 min

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

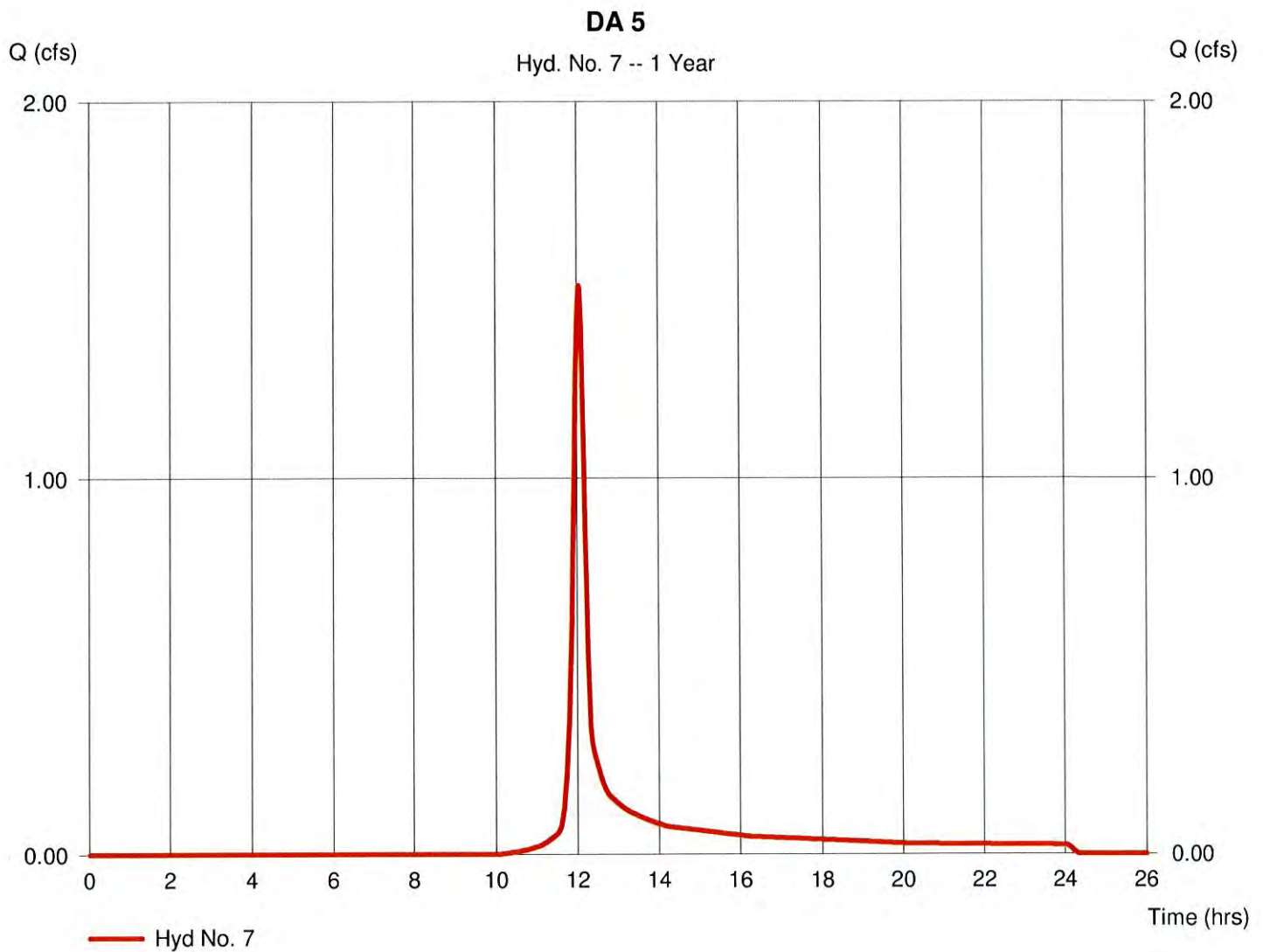
Wednesday, Aug 4, 2010

Hyd. No. 7

DA 5

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 2 min
 Drainage area = 1.370 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 2.20 in
 Storm duration = 24 hrs

Peak discharge = 1.512 cfs
 Time to peak = 12.03 hrs
 Hyd. volume = 4,309 cuft
 Curve number = 84
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 15.90 min
 Distribution = Type II
 Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 7

DA 5

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>		
Sheet Flow						
Manning's n-value	= 0.400	0.011	0.011			
Flow length (ft)	= 73.0	0.0	0.0			
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00			
Land slope (%)	= 3.40	0.00	0.00			
Travel Time (min)	= 15.59	+	0.00	+	0.00	= 15.59
Shallow Concentrated Flow						
Flow length (ft)	= 71.00	0.00	0.00			
Watercourse slope (%)	= 7.00	0.00	0.00			
Surface description	= Unpaved	Paved	Paved			
Average velocity (ft/s)	= 4.27	0.00	0.00			
Travel Time (min)	= 0.28	+	0.00	+	0.00	= 0.28
Channel Flow						
X sectional flow area (sqft)	= 0.00	0.00	0.00			
Wetted perimeter (ft)	= 0.00	0.00	0.00			
Channel slope (%)	= 0.00	0.00	0.00			
Manning's n-value	= 0.015	0.015	0.015			
Velocity (ft/s)	= 0.00	0.00	0.00			
Flow length (ft)	= 0.0	0.0	0.0			
Travel Time (min)	= 0.00	+	0.00	+	0.00	= 0.00
Total Travel Time, Tc					15.90 min	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

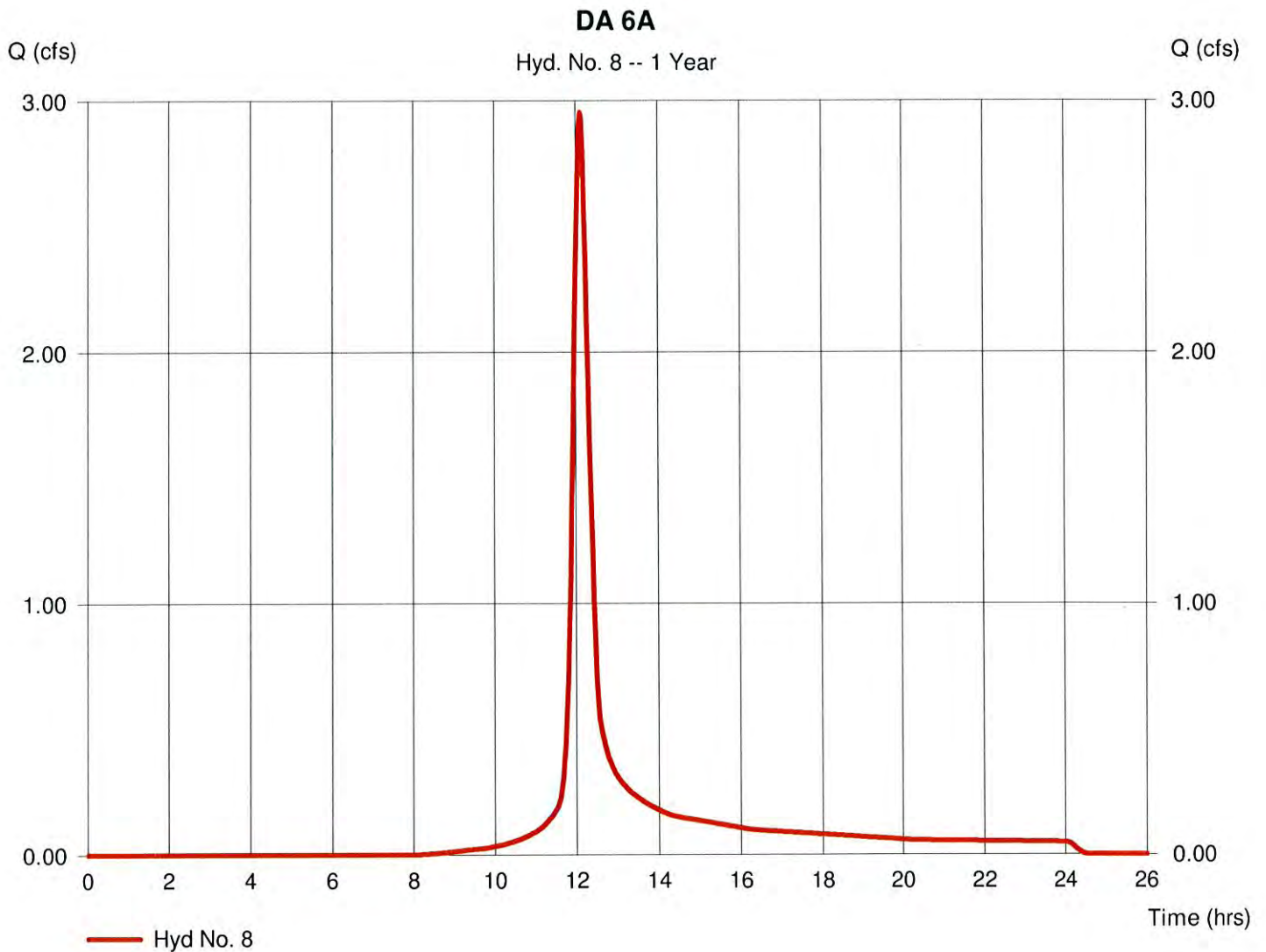
Wednesday, Aug 4, 2010

Hyd. No. 8

DA 6A

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 2 min
 Drainage area = 2.310 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 2.20 in
 Storm duration = 24 hrs

Peak discharge = 2.953 cfs
 Time to peak = 12.10 hrs
 Hyd. volume = 10,207 cuft
 Curve number = 89
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 22.10 min
 Distribution = Type II
 Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 8

DA 6A

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>		
Sheet Flow						
Manning's n-value	= 0.130	0.011	0.011			
Flow length (ft)	= 100.0	0.0	0.0			
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00			
Land slope (%)	= 0.40	0.00	0.00			
Travel Time (min)	= 19.21	+	0.00	+	0.00	= 19.21
Shallow Concentrated Flow						
Flow length (ft)	= 279.00	0.00	0.00			
Watercourse slope (%)	= 1.00	0.00	0.00			
Surface description	= Unpaved	Paved	Paved			
Average velocity (ft/s)	= 1.61	0.00	0.00			
Travel Time (min)	= 2.88	+	0.00	+	0.00	= 2.88
Channel Flow						
X sectional flow area (sqft)	= 0.00	0.00	0.00			
Wetted perimeter (ft)	= 0.00	0.00	0.00			
Channel slope (%)	= 0.00	0.00	0.00			
Manning's n-value	= 0.015	0.015	0.015			
Velocity (ft/s)	= 0.00	0.00	0.00			
Flow length (ft)	= 0.0	0.0	0.0			
Travel Time (min)	= 0.00	+	0.00	+	0.00	= 0.00
Total Travel Time, Tc					22.10 min	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

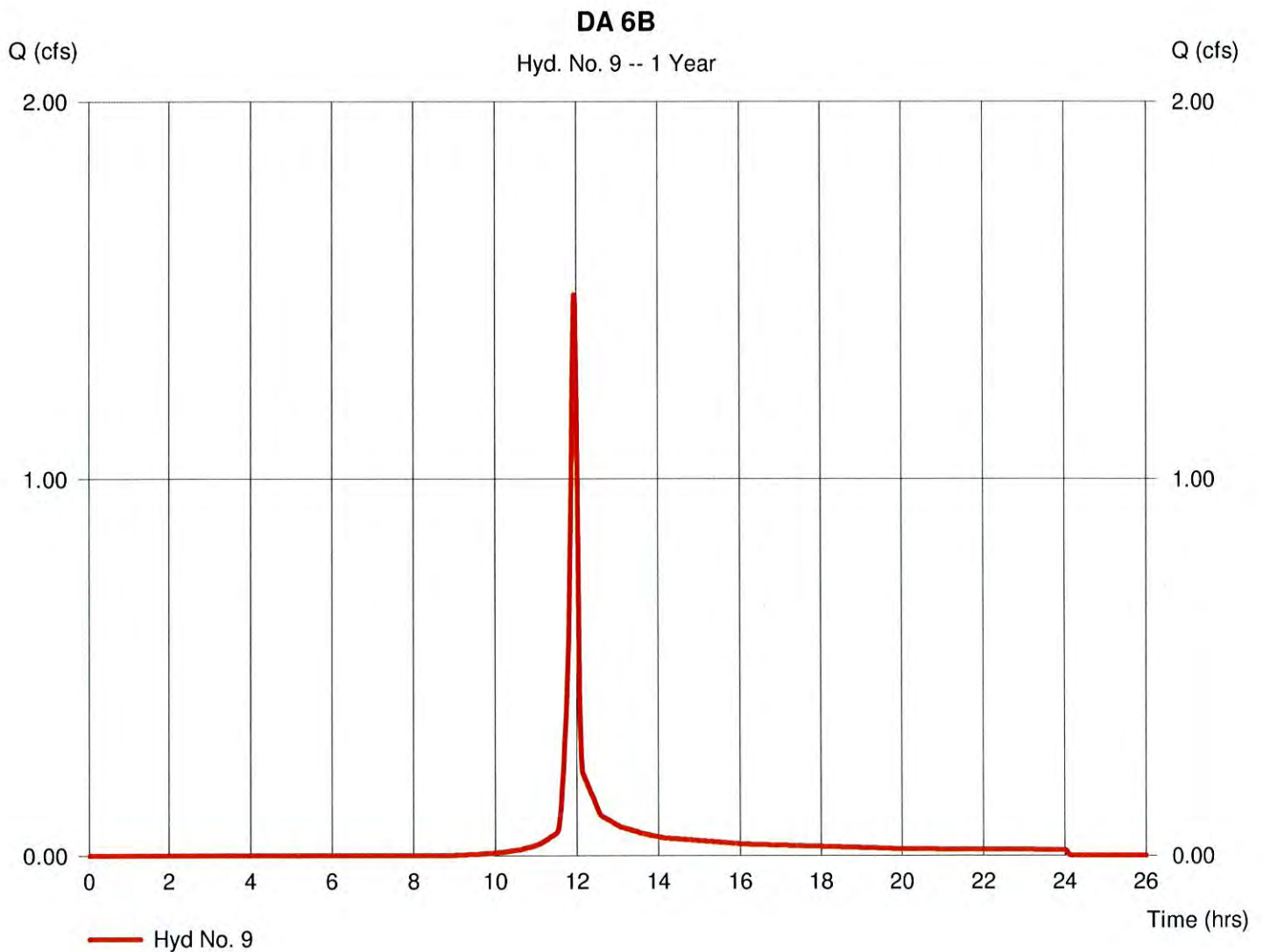
Wednesday, Aug 4, 2010

Hyd. No. 9

DA 6B

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 0.830 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 1.489 cfs
Time to peak = 11.93 hrs
Hyd. volume = 3,007 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.60 min
Distribution = Type II
Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 9

DA 6B

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.400	0.011	0.011	
Flow length (ft)	= 17.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00	
Land slope (%)	= 19.40	0.00	0.00	
Travel Time (min)	= 2.42	+	0.00	+
			0.00	= 2.42
Shallow Concentrated Flow				
Flow length (ft)	= 0.00	0.00	0.00	
Watercourse slope (%)	= 0.00	0.00	0.00	
Surface description	= Paved	Paved	Paved	
Average velocity (ft/s)	= 0.00	0.00	0.00	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Channel Flow				
X sectional flow area (sqft)	= 4.30	0.00	0.00	
Wetted perimeter (ft)	= 11.80	0.00	0.00	
Channel slope (%)	= 1.00	0.00	0.00	
Manning's n-value	= 0.025	0.015	0.015	
Velocity (ft/s)	= 3.03	0.00	0.00	
Flow length (ft)	= 580.0	0.0	0.0	
Travel Time (min)	= 3.19	+	0.00	+
			0.00	= 3.19
Total Travel Time, Tc				5.60 min

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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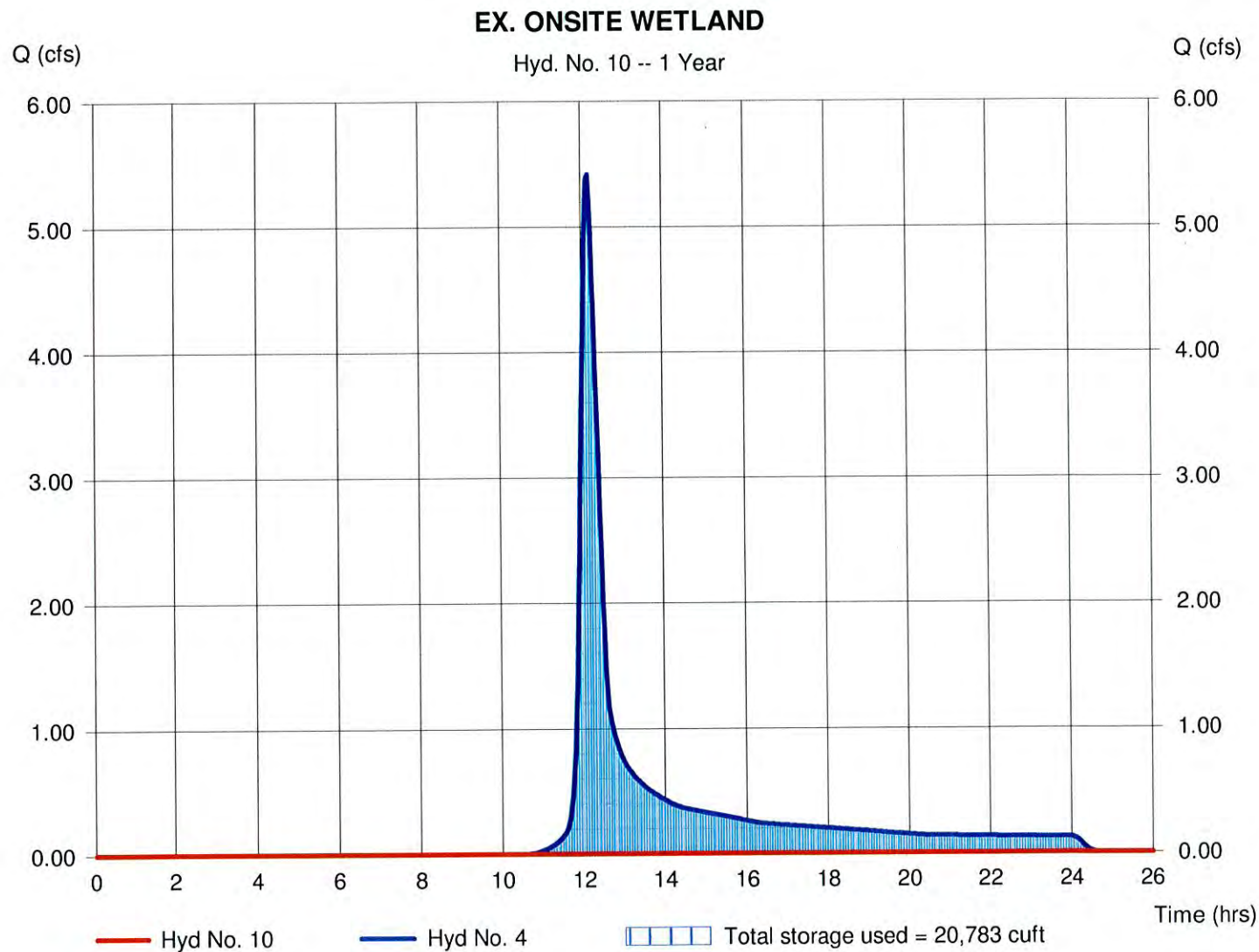
Hyd. No. 10

EX. ONSITE WETLAND

Hydrograph type = Reservoir
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyd. No. = 4 - DA 3B
Reservoir name = <New Pond>

Peak discharge = 0.000 cfs
Time to peak = n/a
Hyd. volume = 0 cuft
Max. Elevation = 401.15 ft
Max. Storage = 20,783 cuft

Storage Indication method used.



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Wednesday, Aug 4, 2010

Pond No. 1 - <New Pond>

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 397.60 ft. Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	397.60	9,959	0	0
0.40	398.00	11,039	1,679	1,679
1.40	399.00	13,193	4,840	6,518
2.40	400.00	15,982	5,826	12,344
3.40	401.00	19,737	7,130	19,474
4.40	402.00	25,166	8,958	28,432
4.90	402.50	29,260	5,437	33,868

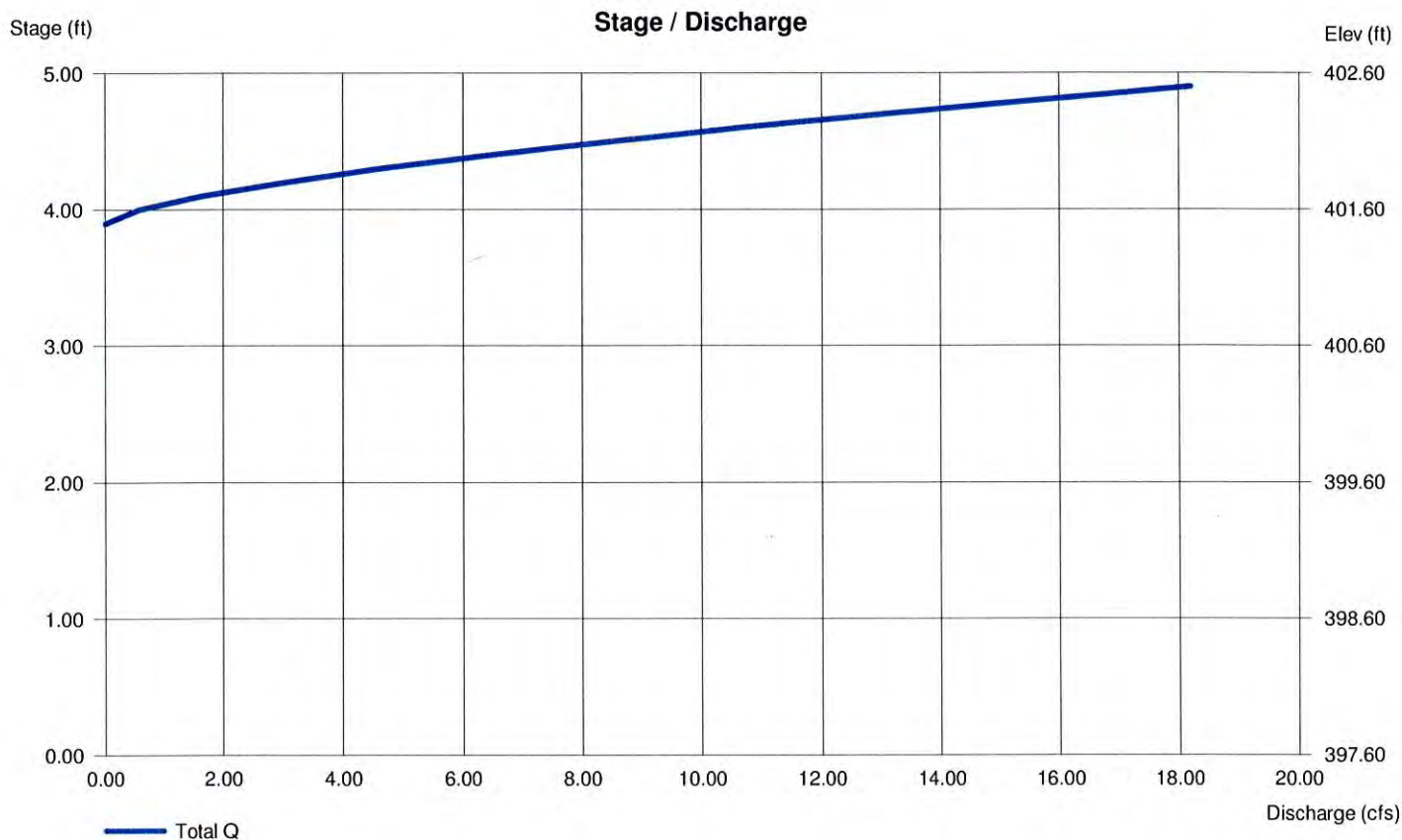
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 7.00	0.00	0.00	0.00
Crest El. (ft)	= 401.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

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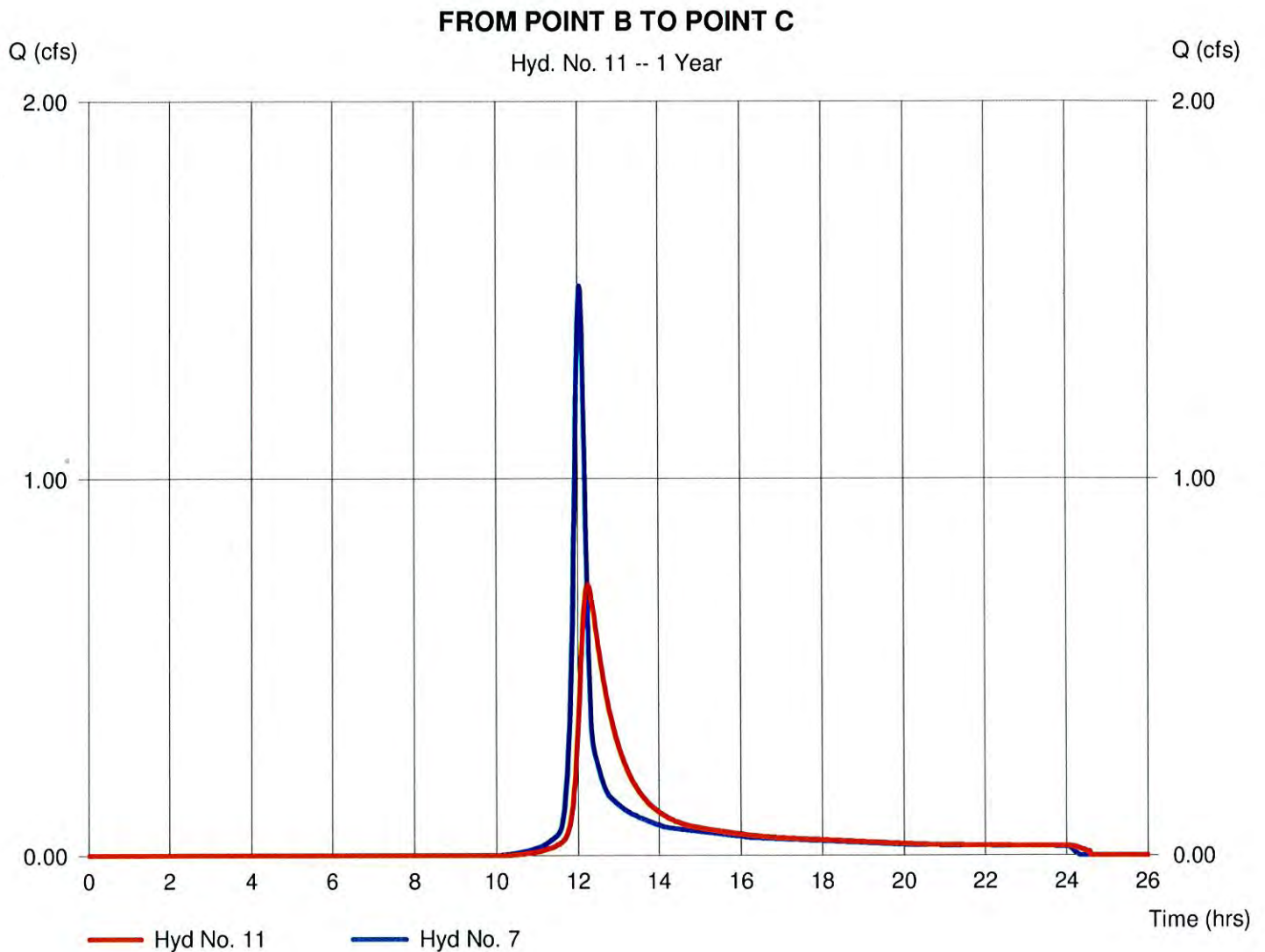
Hyd. No. 11

FROM POINT B TO POINT C

Hydrograph type = Reach
 Storm frequency = 1 yrs
 Time interval = 2 min
 Inflow hyd. No. = 7 - DA 5
 Reach length = 1150.0 ft
 Manning's n = 0.040
 Side slope = 20.0:1
 Rating curve x = 0.764
 Ave. velocity = 0.75 ft/s

Peak discharge = 0.718 cfs
 Time to peak = 12.23 hrs
 Hyd. volume = 4,292 cuft
 Section type = Trapezoidal
 Channel slope = 0.4 %
 Bottom width = 5.0 ft
 Max. depth = 1.0 ft
 Rating curve m = 0.976
 Routing coeff. = 0.0737

Modified Att-Kin routing method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

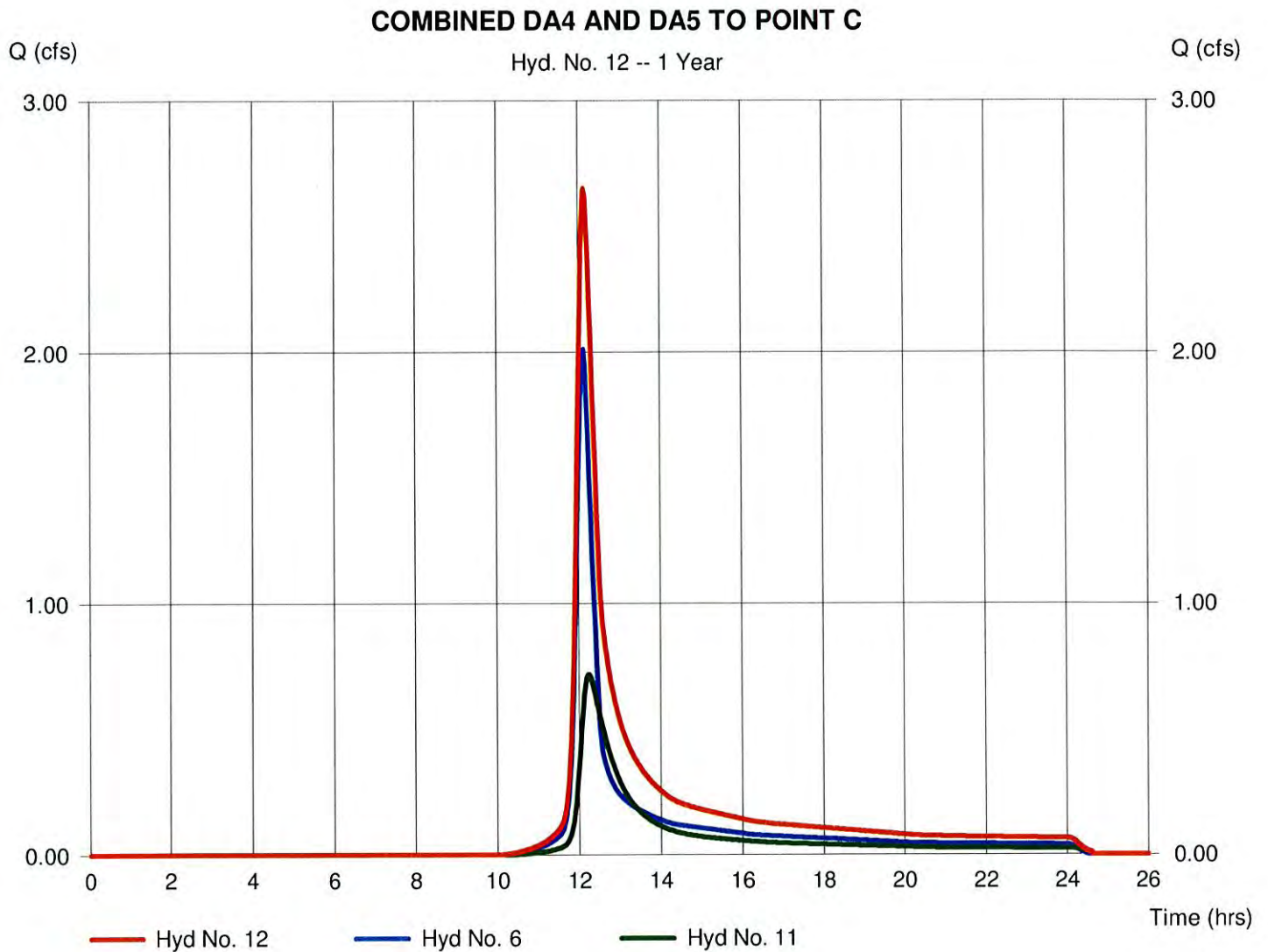
Wednesday, Aug 4, 2010

Hyd. No. 12

COMBINED DA4 AND DA5 TO POINT C

Hydrograph type = Combine
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyds. = 6, 11

Peak discharge = 2.651 cfs
Time to peak = 12.13 hrs
Hyd. volume = 11,417 cuft
Contrib. drain. area = 2.170 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

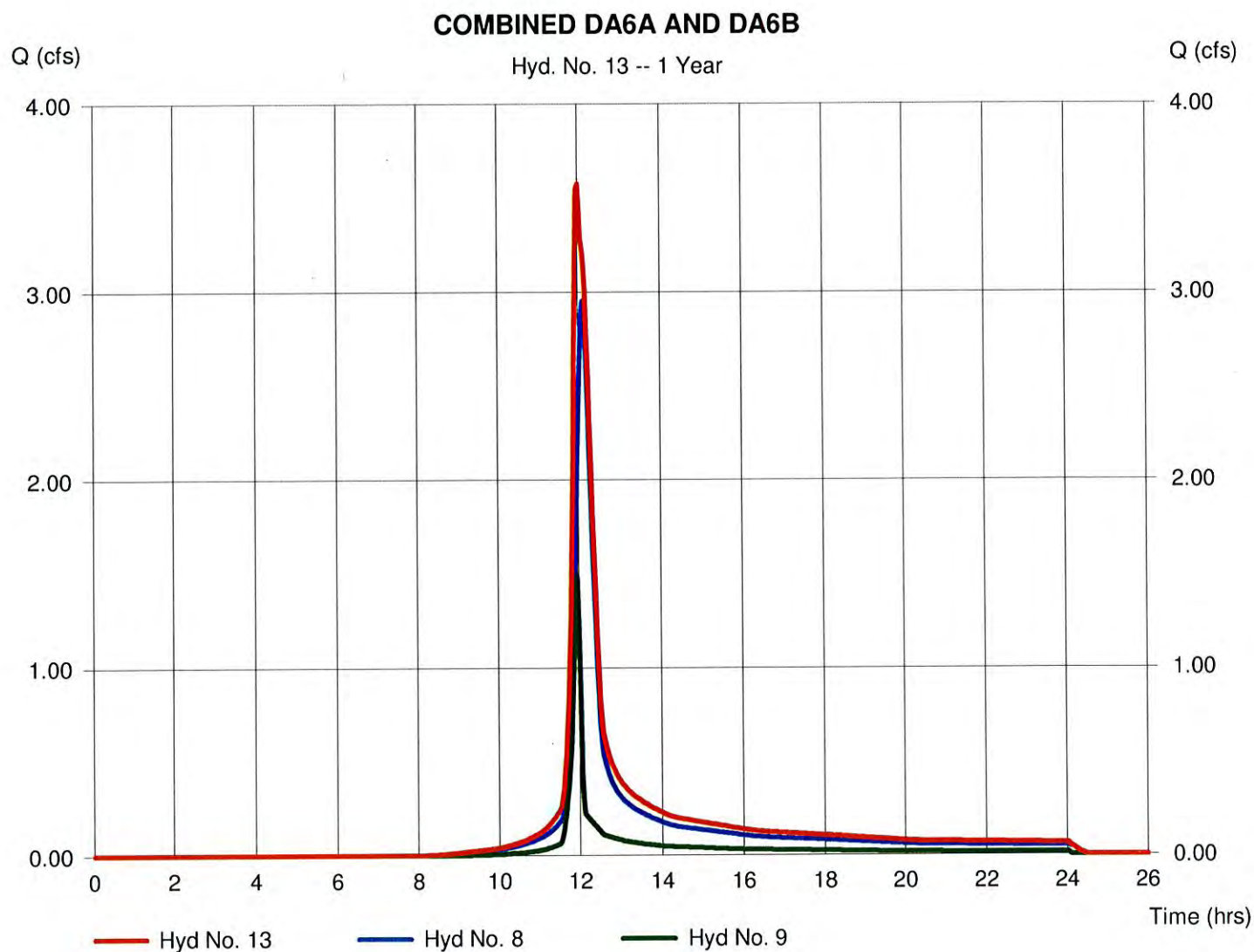
Wednesday, Aug 4, 2010

Hyd. No. 13

COMBINED DA6A AND DA6B

Hydrograph type = Combine
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyds. = 8, 9

Peak discharge = 3.576 cfs
Time to peak = 12.00 hrs
Hyd. volume = 13,214 cuft
Contrib. drain. area = 3.140 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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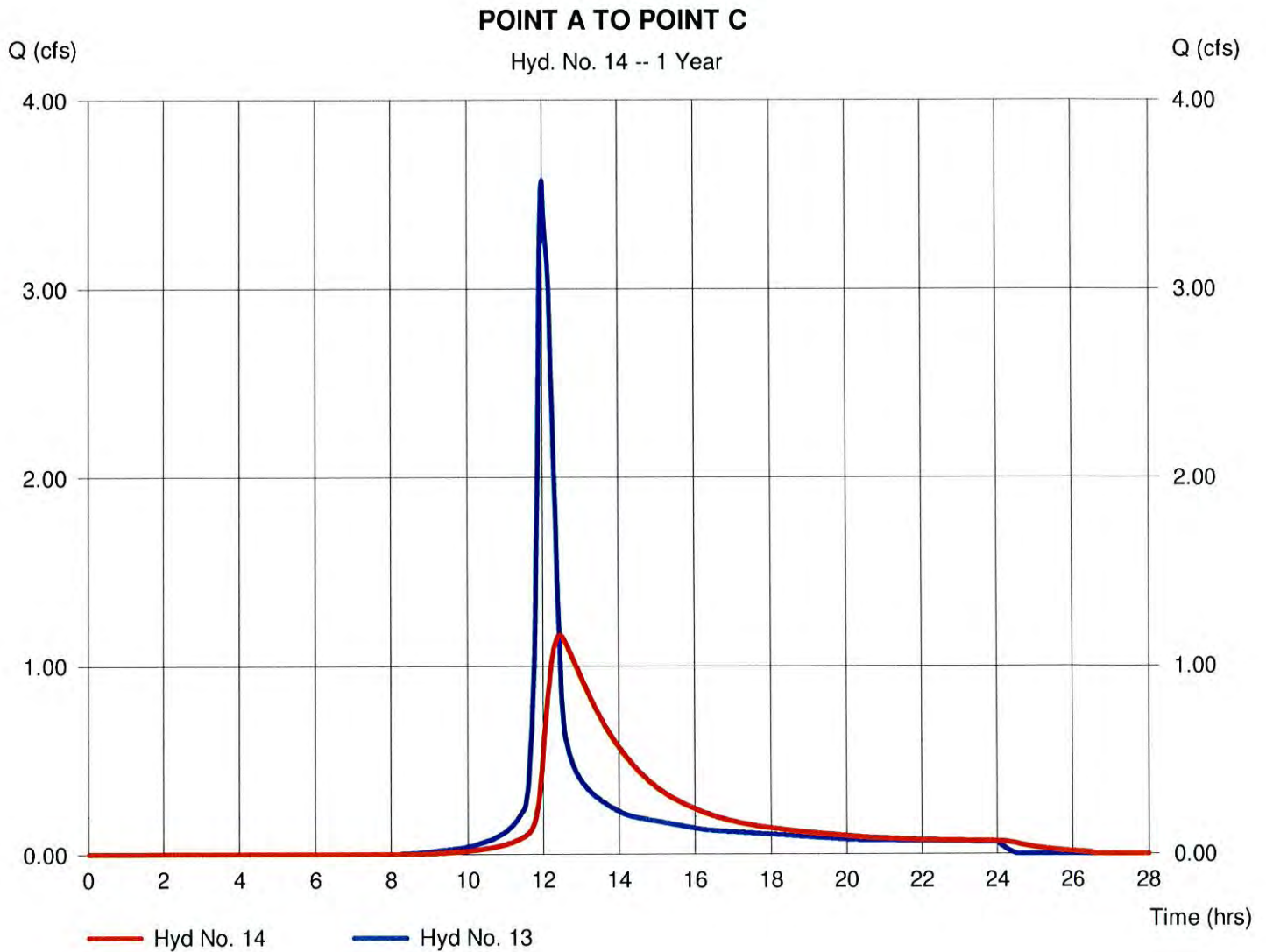
Hyd. No. 14

POINT A TO POINT C

Hydrograph type = Reach
 Storm frequency = 1 yrs
 Time interval = 2 min
 Inflow hyd. No. = 13 - COMBINED DA6A AND DA6B
 Reach length = 1815.0 ft
 Manning's n = 0.040
 Side slope = 20.0:1
 Rating curve x = 0.459
 Ave. velocity = 0.44 ft/s

Peak discharge = 1.161 cfs
 Time to peak = 12.47 hrs
 Hyd. volume = 13,172 cuft
 Section type = Trapezoidal
 Channel slope = 0.1 %
 Bottom width = 5.0 ft
 Max. depth = 1.0 ft
 Rating curve m = 0.976
 Routing coeff. = 0.0279

Modified Att-Kin routing method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

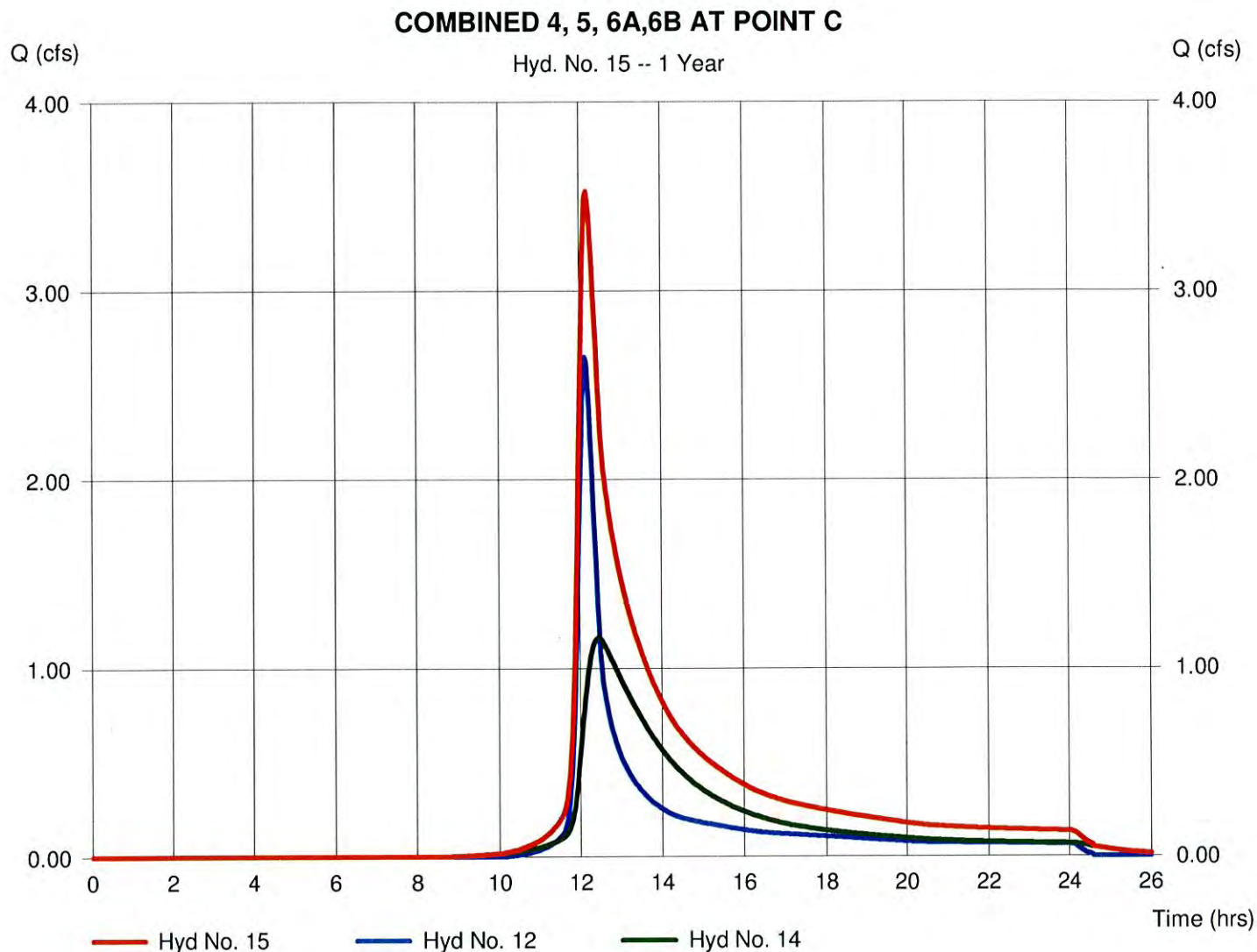
Wednesday, Aug 4, 2010

Hyd. No. 15

COMBINED 4, 5, 6A,6B AT POINT C

Hydrograph type = Combine
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyds. = 12, 14

Peak discharge = 3.526 cfs
Time to peak = 12.17 hrs
Hyd. volume = 24,589 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

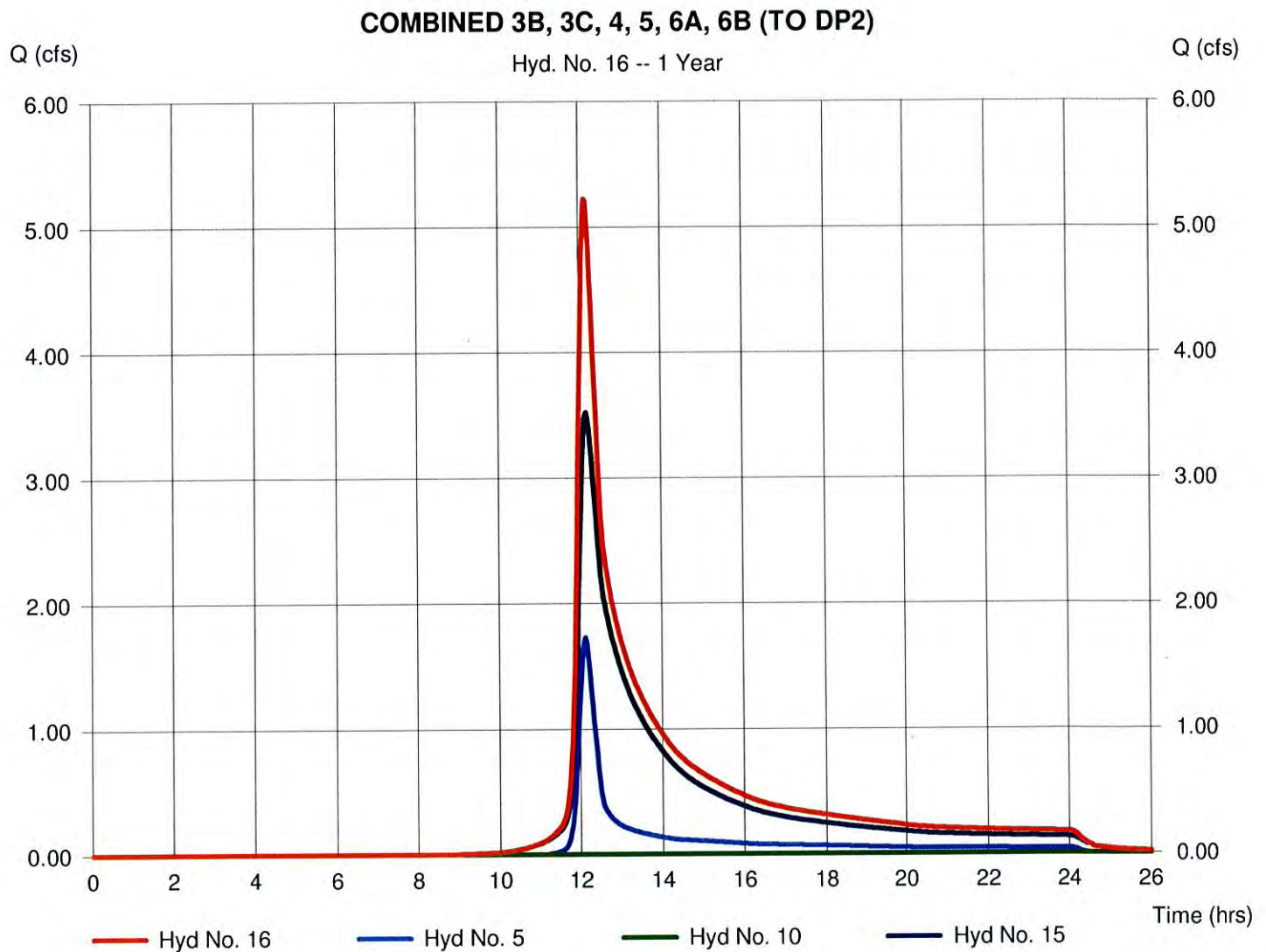
Wednesday, Aug 4, 2010

Hyd. No. 16

COMBINED 3B, 3C, 4, 5, 6A, 6B (TO DP2)

Hydrograph type = Combine
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyds. = 5, 10, 15

Peak discharge = 5.225 cfs
Time to peak = 12.13 hrs
Hyd. volume = 30,970 cuft
Contrib. drain. area = 2.510 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	5.079	2	724	15,881	-----	-----	-----	DA 1 (TO DP1)
2	SCS Runoff	12.21	2	732	52,918	-----	-----	-----	DA 2 (TO CANAL)
3	SCS Runoff	10.64	2	720	27,618	-----	-----	-----	DA 3A
4	SCS Runoff	14.67	2	728	53,905	-----	-----	-----	DA 3B
5	SCS Runoff	5.013	2	726	17,413	-----	-----	-----	DA 3C
6	SCS Runoff	5.099	2	726	17,605	-----	-----	-----	DA 4
7	SCS Runoff	3.794	2	722	10,647	-----	-----	-----	DA 5
8	SCS Runoff	6.457	2	726	22,497	-----	-----	-----	DA 6A
9	SCS Runoff	3.365	2	716	6,931	-----	-----	-----	DA 6B
10	Reservoir	4.288	2	752	29,951	4	401.88	27,360	EX. ONSITE WETLAND
11	Reach	1.834	2	734	10,630	7	-----	-----	FROM POINT B TO POINT C
12	Combine	6.729	2	728	28,236	6, 11	-----	-----	COMBINED DA4 AND DA5 TO POIN
13	Combine	7.996	2	718	29,428	8, 9,	-----	-----	COMBINED DA6A AND DA6B
14	Reach	2.609	2	746	29,385	13	-----	-----	POINT A TO POINT C
15	Combine	8.721	2	728	57,620	12, 14	-----	-----	COMBINED 4, 5, 6A,6B AT POINT C
16	Combine	13.72	2	728	104,984	5, 10, 15	-----	-----	COMBINED 3B, 3C, 4, 5, 6A, 6B (TO
PRE DEV CONDITIONS.gpw					Return Period: 10 Year			Wednesday, Aug 4, 2010	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

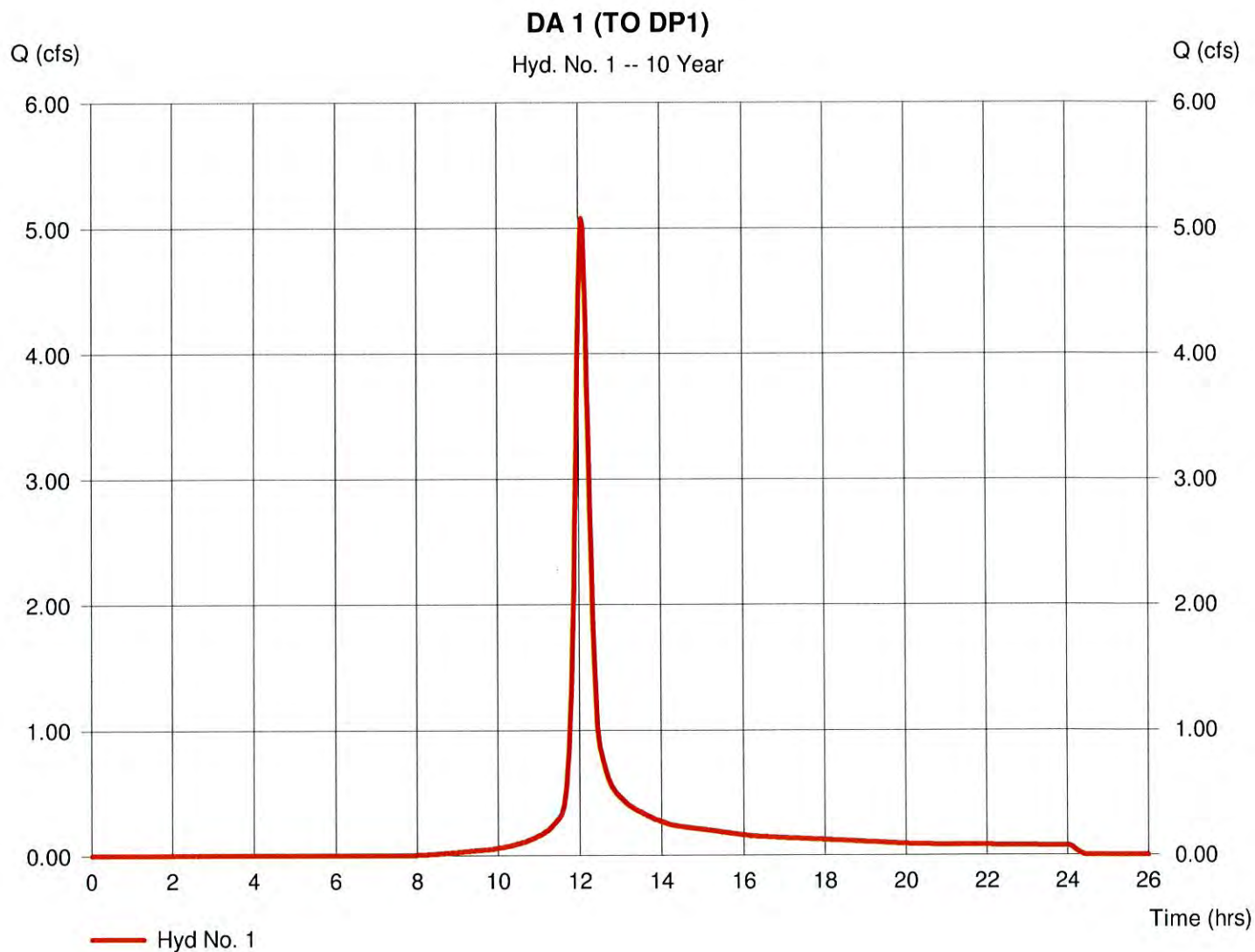
Wednesday, Aug 4, 2010

Hyd. No. 1

DA 1 (TO DP1)

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 2.070 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 3.80 in
 Storm duration = 24 hrs

Peak discharge = 5.079 cfs
 Time to peak = 12.07 hrs
 Hyd. volume = 15,881 cuft
 Curve number = 83
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 19.90 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

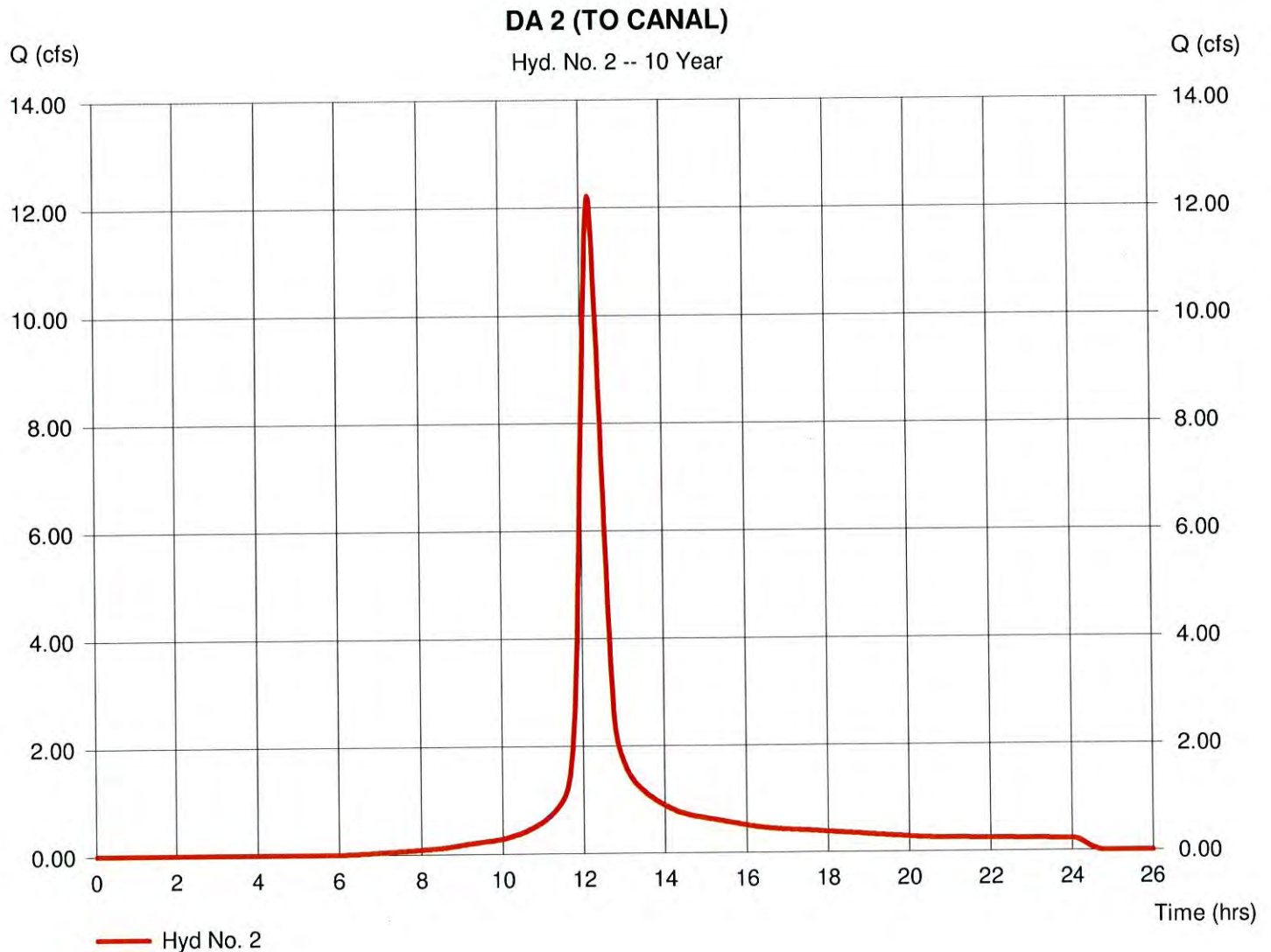
Wednesday, Aug 4, 2010

Hyd. No. 2

DA 2 (TO CANAL)

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 5.660 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 12.21 cfs
Time to peak = 12.20 hrs
Hyd. volume = 52,918 cuft
Curve number = 88
Hydraulic length = 0 ft
Time of conc. (Tc) = 33.20 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

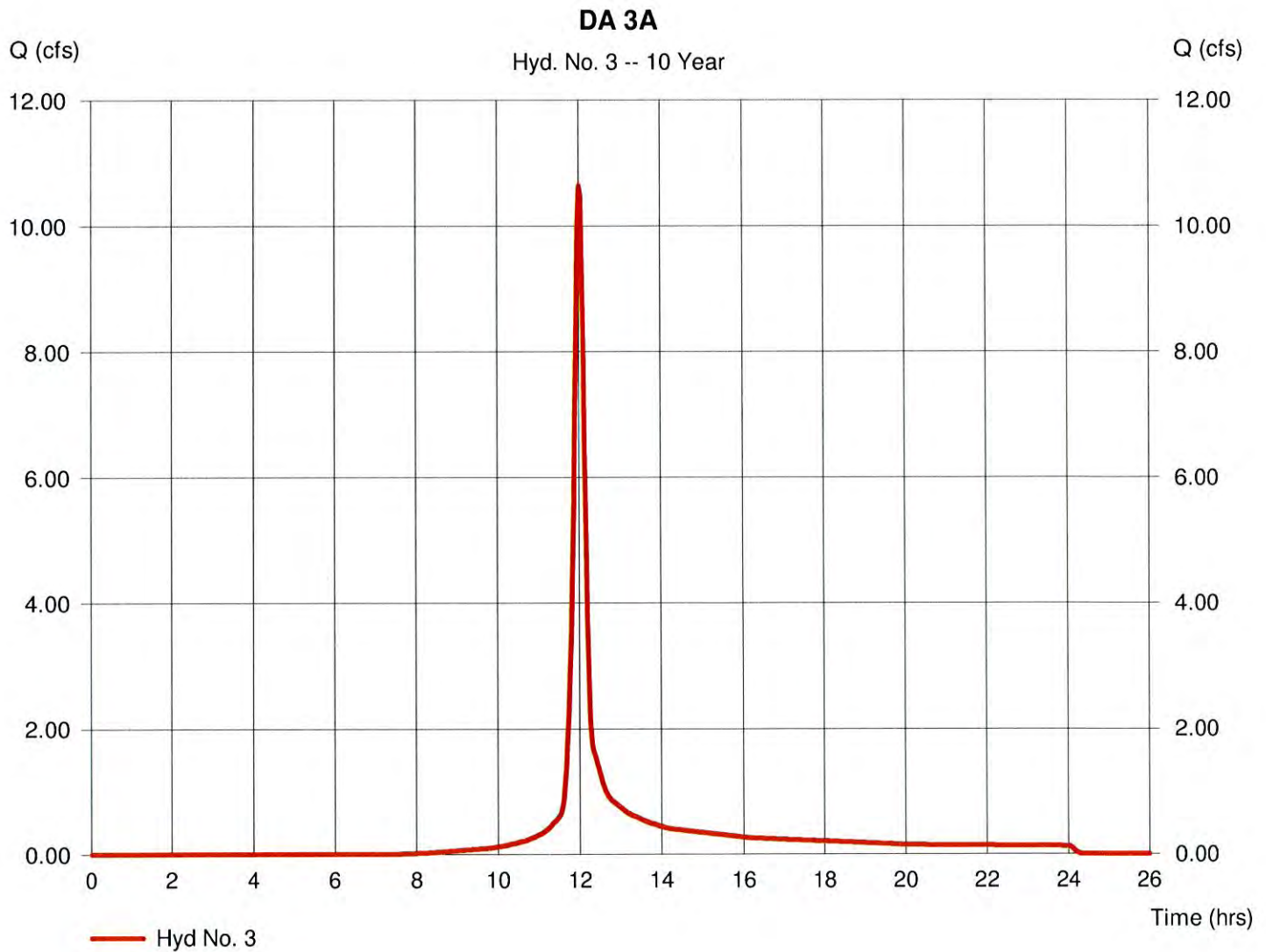
Wednesday, Aug 4, 2010

Hyd. No. 3

DA 3A

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 3.360 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 3.80 in
 Storm duration = 24 hrs

Peak discharge = 10.64 cfs
 Time to peak = 12.00 hrs
 Hyd. volume = 27,618 cuft
 Curve number = 84
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 13.10 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

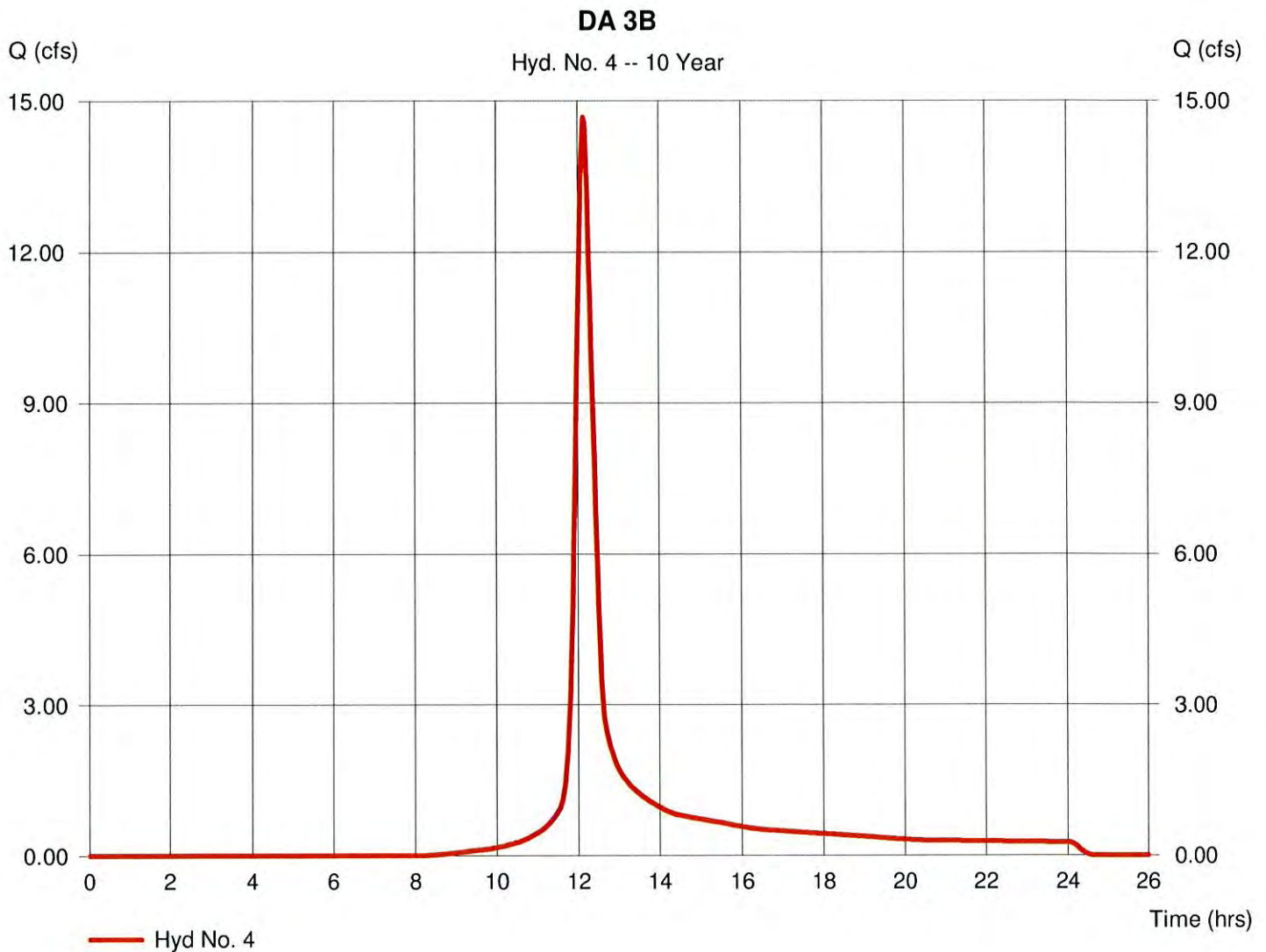
Wednesday, Aug 4, 2010

Hyd. No. 4

DA 3B

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 7.420 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 14.67 cfs
Time to peak = 12.13 hrs
Hyd. volume = 53,905 cuft
Curve number = 82
Hydraulic length = 0 ft
Time of conc. (Tc) = 23.50 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

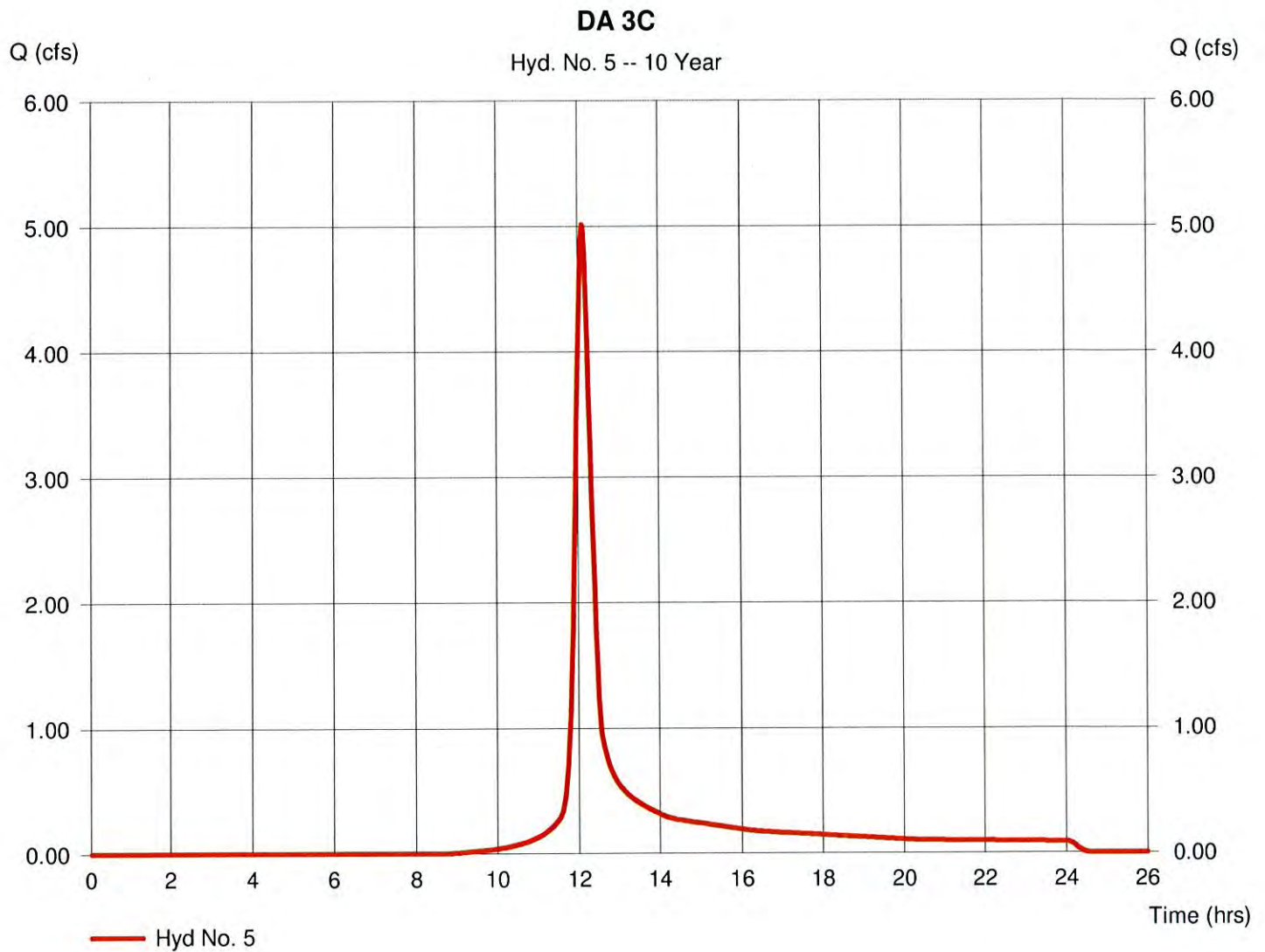
Wednesday, Aug 4, 2010

Hyd. No. 5

DA 3C

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 2.510 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 3.80 in
 Storm duration = 24 hrs

Peak discharge = 5.013 cfs
 Time to peak = 12.10 hrs
 Hyd. volume = 17,413 cuft
 Curve number = 80
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 22.90 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

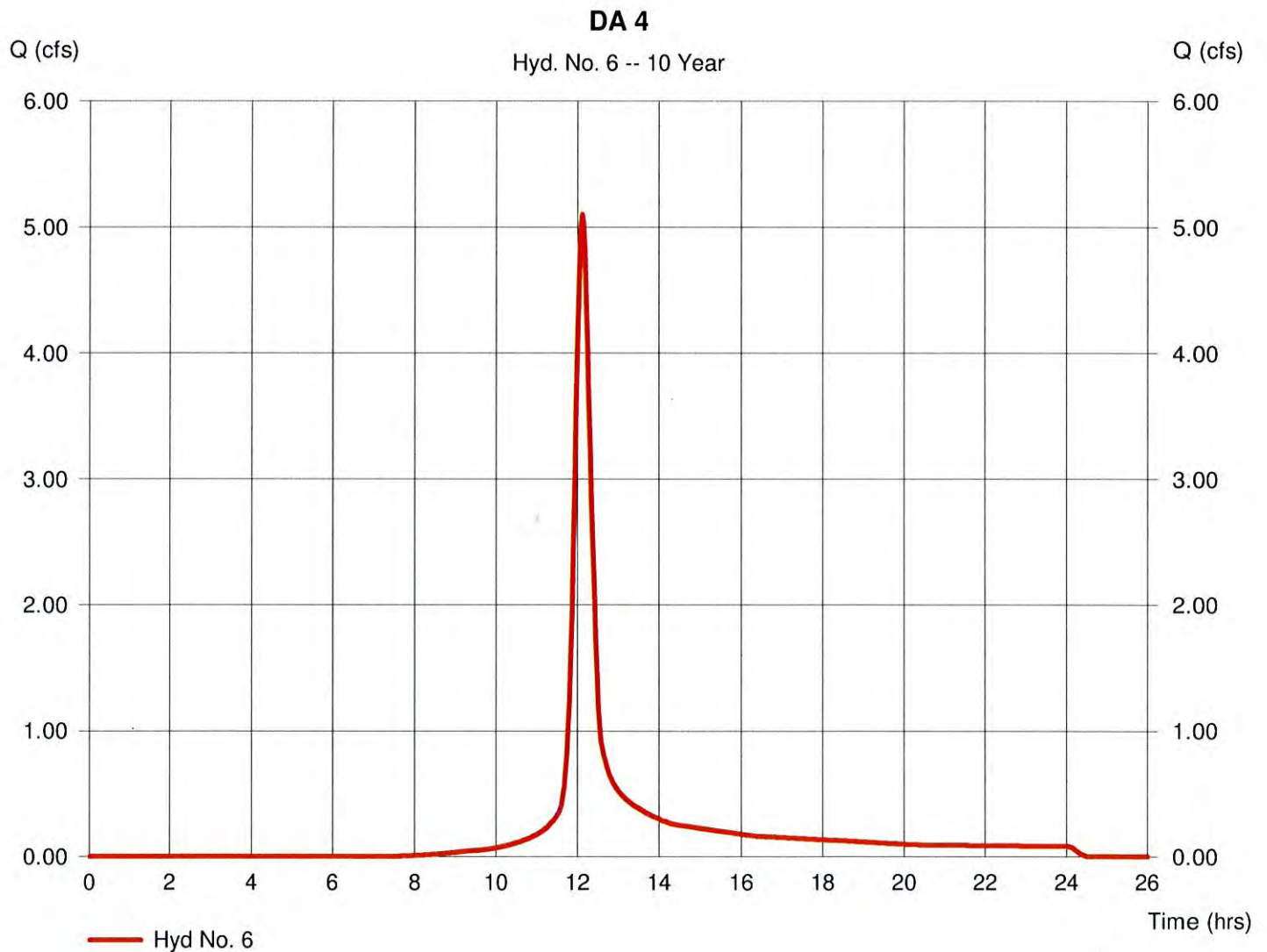
Wednesday, Aug 4, 2010

Hyd. No. 6

DA 4

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 2.170 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 5.099 cfs
Time to peak = 12.10 hrs
Hyd. volume = 17,605 cuft
Curve number = 84
Hydraulic length = 0 ft
Time of conc. (Tc) = 22.90 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

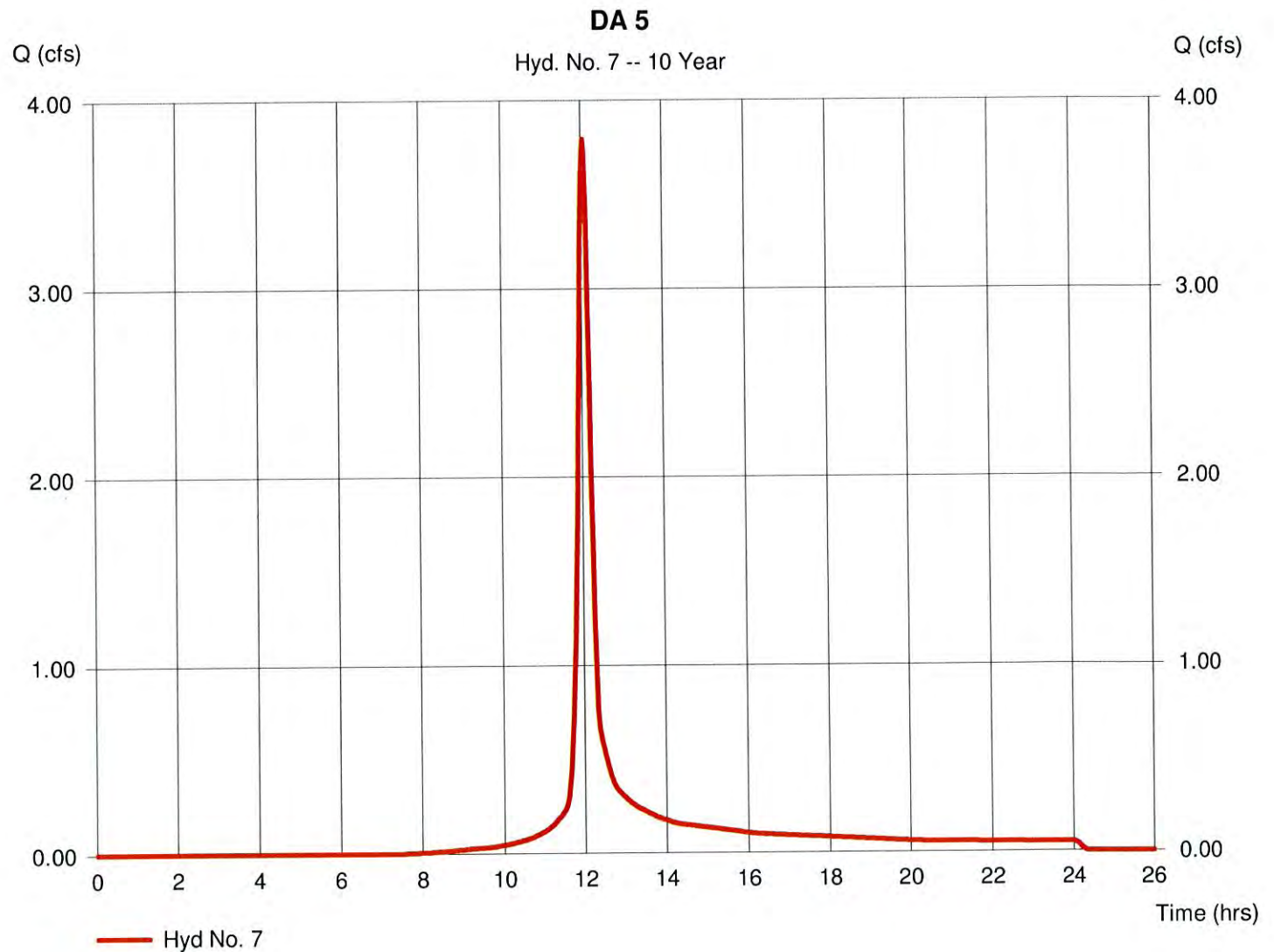
Wednesday, Aug 4, 2010

Hyd. No. 7

DA 5

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 1.370 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 3.80 in
 Storm duration = 24 hrs

Peak discharge = 3.794 cfs
 Time to peak = 12.03 hrs
 Hyd. volume = 10,647 cuft
 Curve number = 84
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 15.90 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

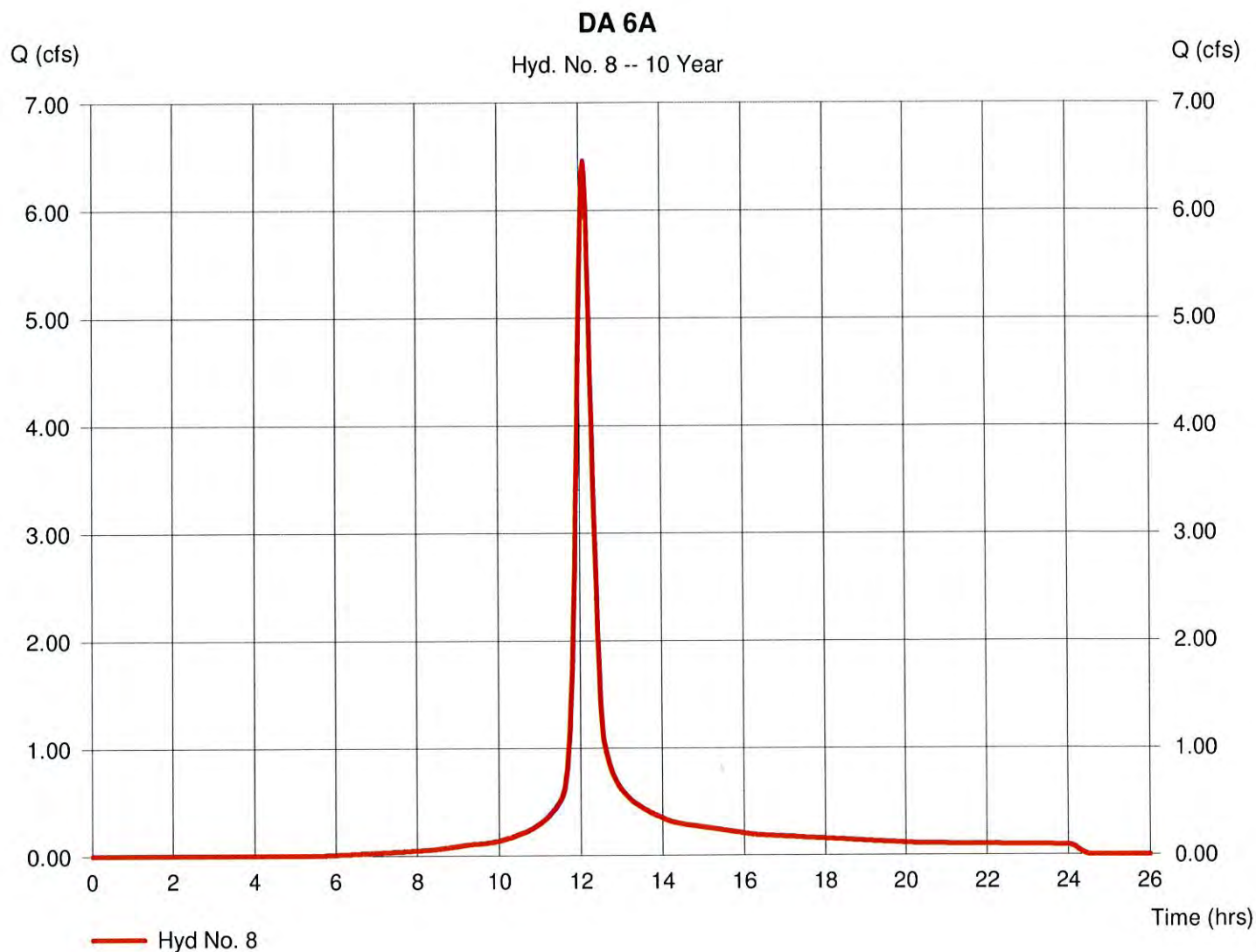
Wednesday, Aug 4, 2010

Hyd. No. 8

DA 6A

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 2.310 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 3.80 in
 Storm duration = 24 hrs

Peak discharge = 6.457 cfs
 Time to peak = 12.10 hrs
 Hyd. volume = 22,497 cuft
 Curve number = 89
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 22.10 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

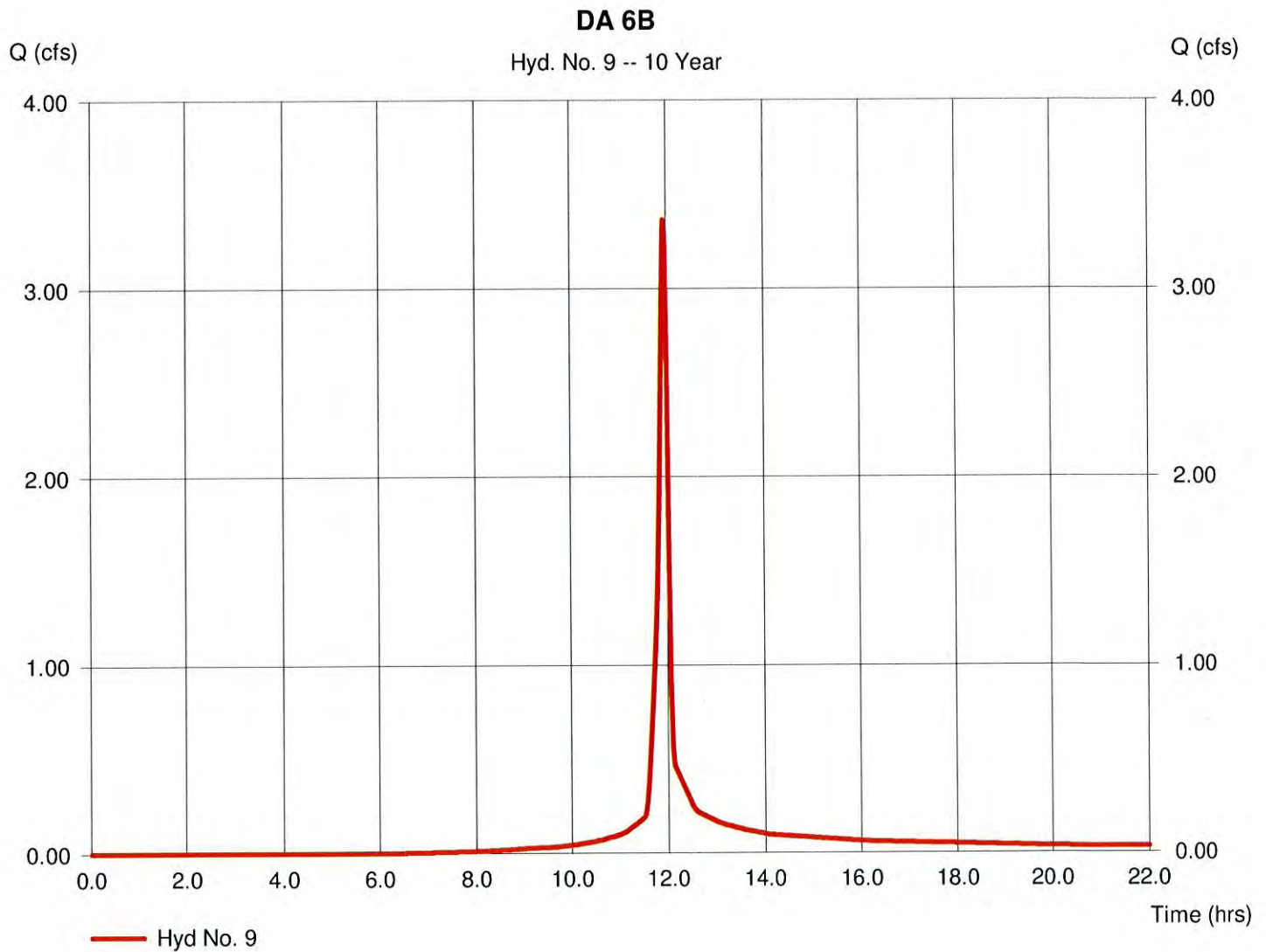
Wednesday, Aug 4, 2010

Hyd. No. 9

DA 6B

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 0.830 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 3.365 cfs
Time to peak = 11.93 hrs
Hyd. volume = 6,931 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.60 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Wednesday, Aug 4, 2010

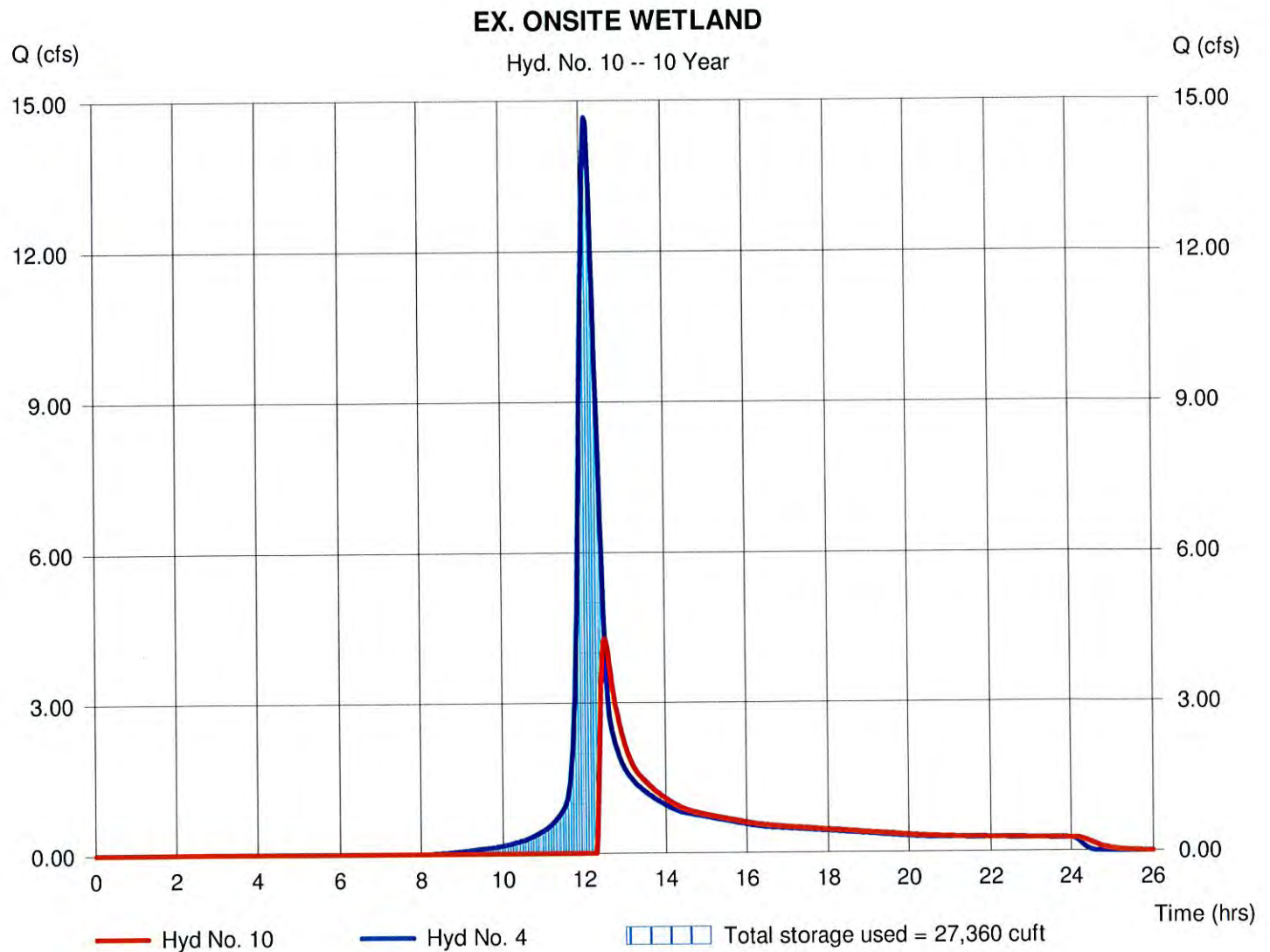
Hyd. No. 10

EX. ONSITE WETLAND

Hydrograph type = Reservoir
 Storm frequency = 10 yrs
 Time interval = 2 min
 Inflow hyd. No. = 4 - DA 3B
 Reservoir name = <New Pond>

Peak discharge = 4.288 cfs
 Time to peak = 12.53 hrs
 Hyd. volume = 29,951 cuft
 Max. Elevation = 401.88 ft
 Max. Storage = 27,360 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Wednesday, Aug 4, 2010

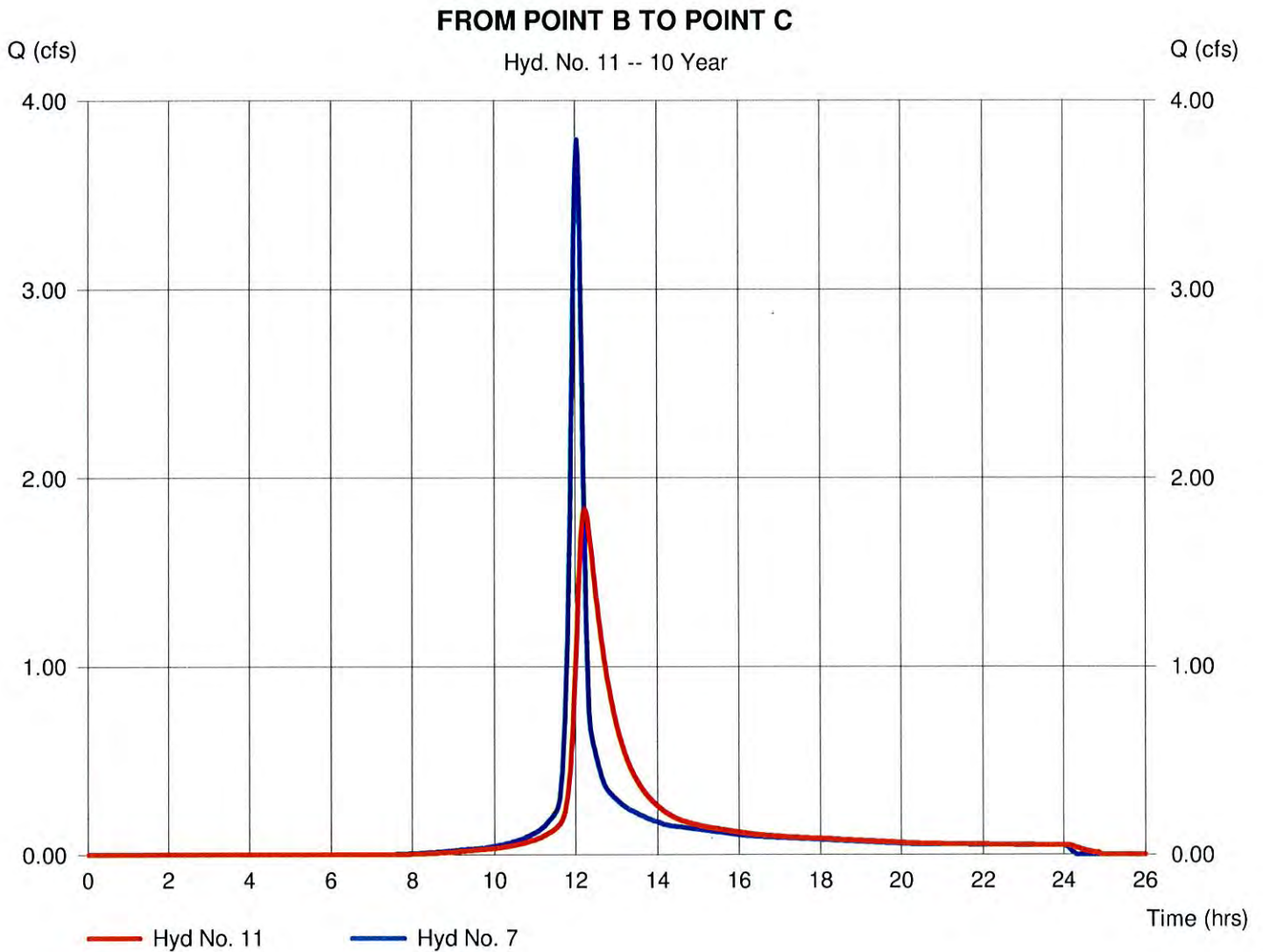
Hyd. No. 11

FROM POINT B TO POINT C

Hydrograph type = Reach
 Storm frequency = 10 yrs
 Time interval = 2 min
 Inflow hyd. No. = 7 - DA 5
 Reach length = 1150.0 ft
 Manning's n = 0.040
 Side slope = 20.0:1
 Rating curve x = 0.764
 Ave. velocity = 0.73 ft/s

Peak discharge = 1.834 cfs
 Time to peak = 12.23 hrs
 Hyd. volume = 10,630 cuft
 Section type = Trapezoidal
 Channel slope = 0.4 %
 Bottom width = 5.0 ft
 Max. depth = 1.0 ft
 Rating curve m = 0.976
 Routing coeff. = 0.0721

Modified Att-Kin routing method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

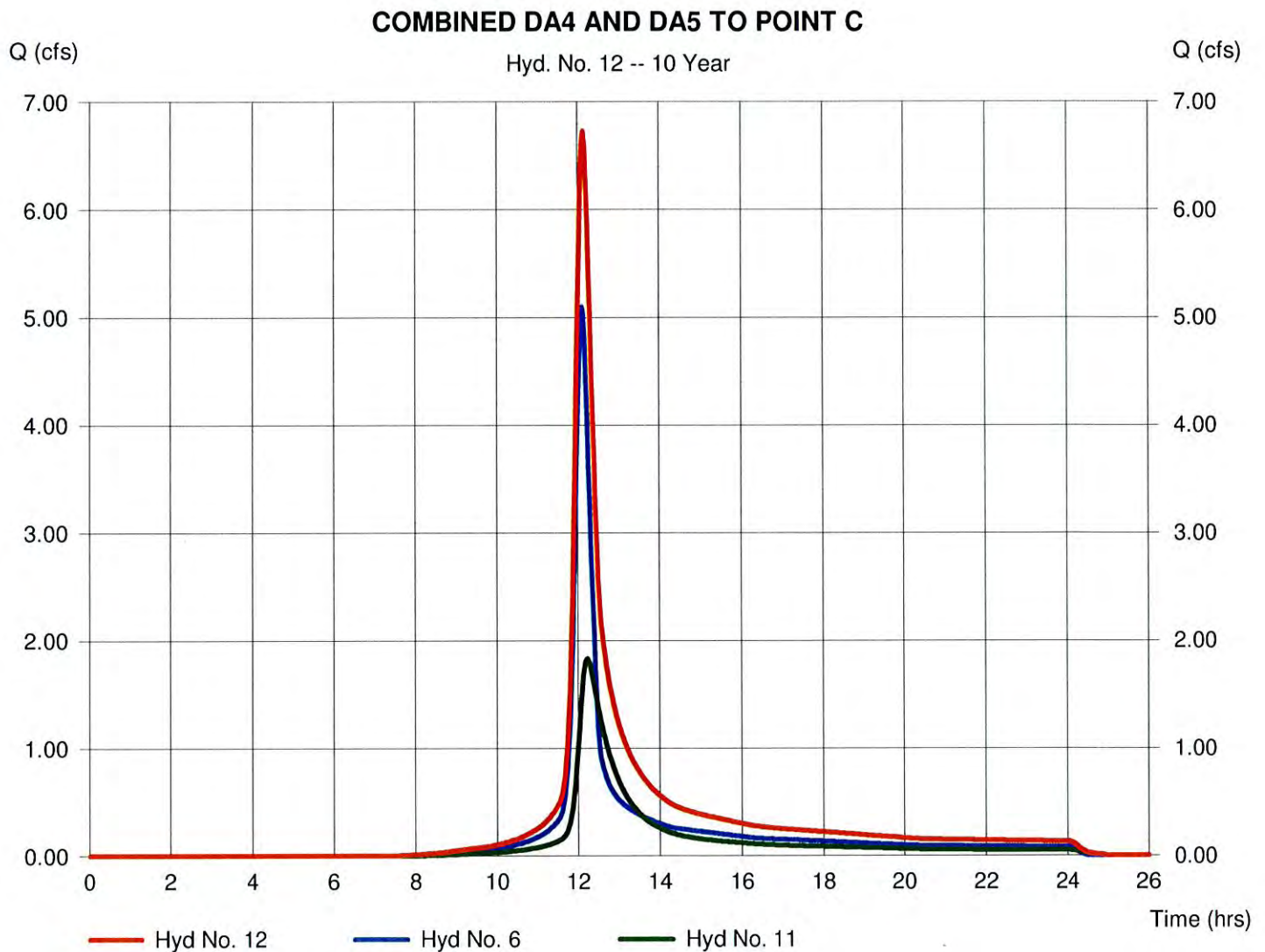
Wednesday, Aug 4, 2010

Hyd. No. 12

COMBINED DA4 AND DA5 TO POINT C

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 6, 11

Peak discharge = 6.729 cfs
Time to peak = 12.13 hrs
Hyd. volume = 28,236 cuft
Contrib. drain. area = 2.170 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

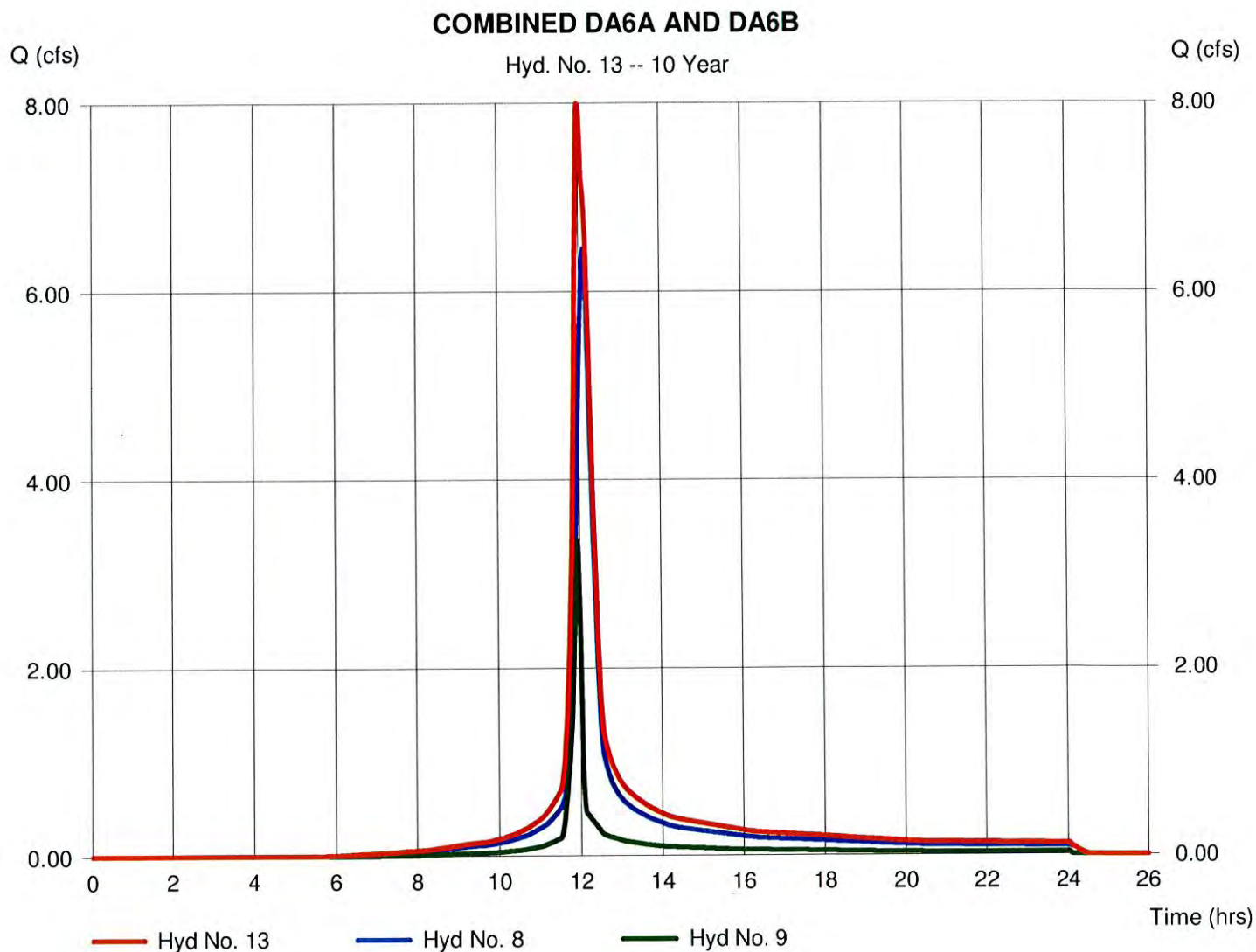
Wednesday, Aug 4, 2010

Hyd. No. 13

COMBINED DA6A AND DA6B

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 8, 9

Peak discharge = 7.996 cfs
Time to peak = 11.97 hrs
Hyd. volume = 29,428 cuft
Contrib. drain. area = 3.140 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Wednesday, Aug 4, 2010

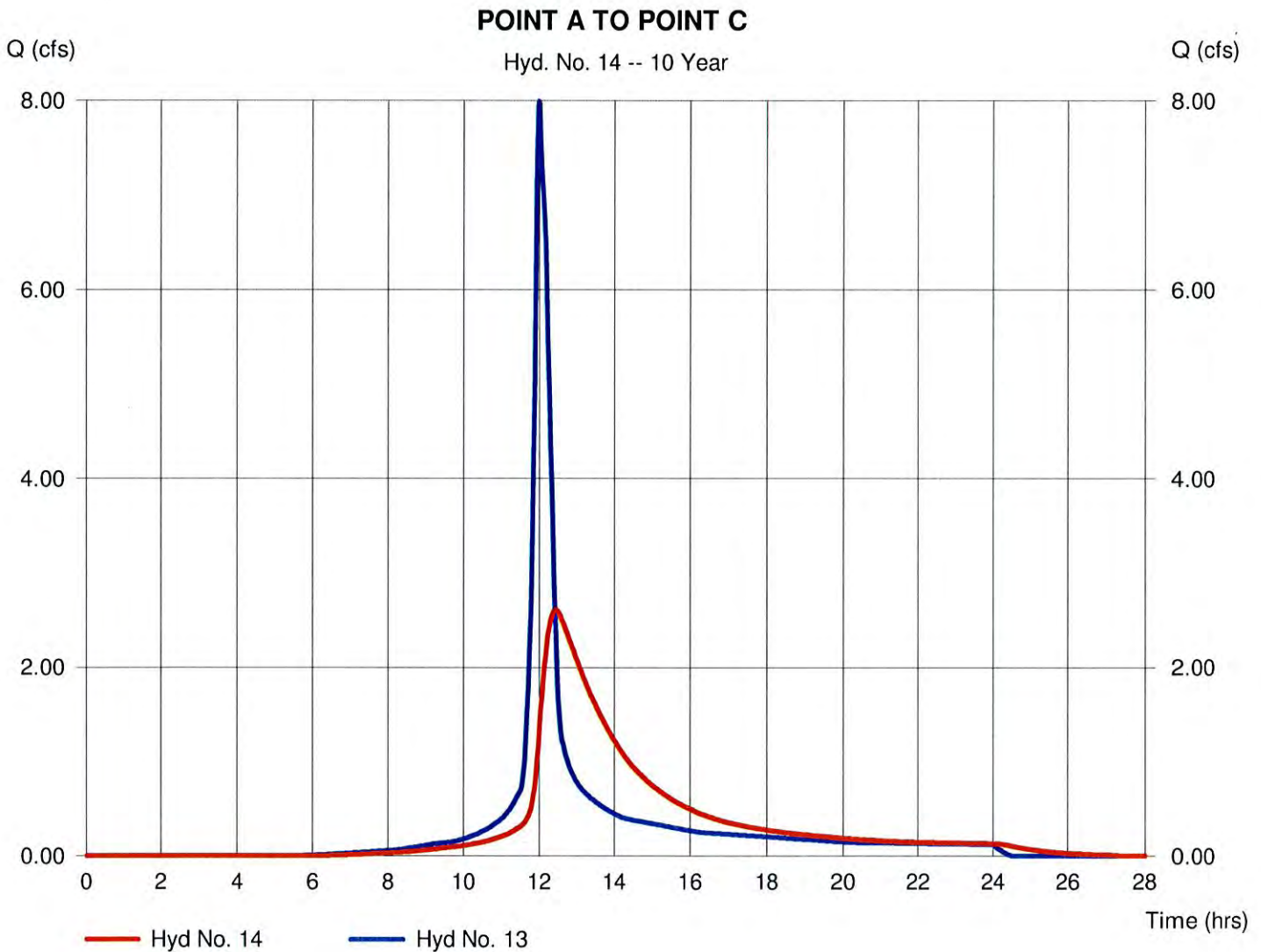
Hyd. No. 14

POINT A TO POINT C

Hydrograph type = Reach
 Storm frequency = 10 yrs
 Time interval = 2 min
 Inflow hyd. No. = 13 - COMBINED DA6A AND DA6B
 Reach length = 1815.0 ft
 Manning's n = 0.040
 Side slope = 20.0:1
 Rating curve x = 0.459
 Ave. velocity = 0.43 ft/s

Peak discharge = 2.609 cfs
 Time to peak = 12.43 hrs
 Hyd. volume = 29,385 cuft
 Section type = Trapezoidal
 Channel slope = 0.1 %
 Bottom width = 5.0 ft
 Max. depth = 1.0 ft
 Rating curve m = 0.976
 Routing coeff. = 0.0274

Modified Att-Kin routing method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

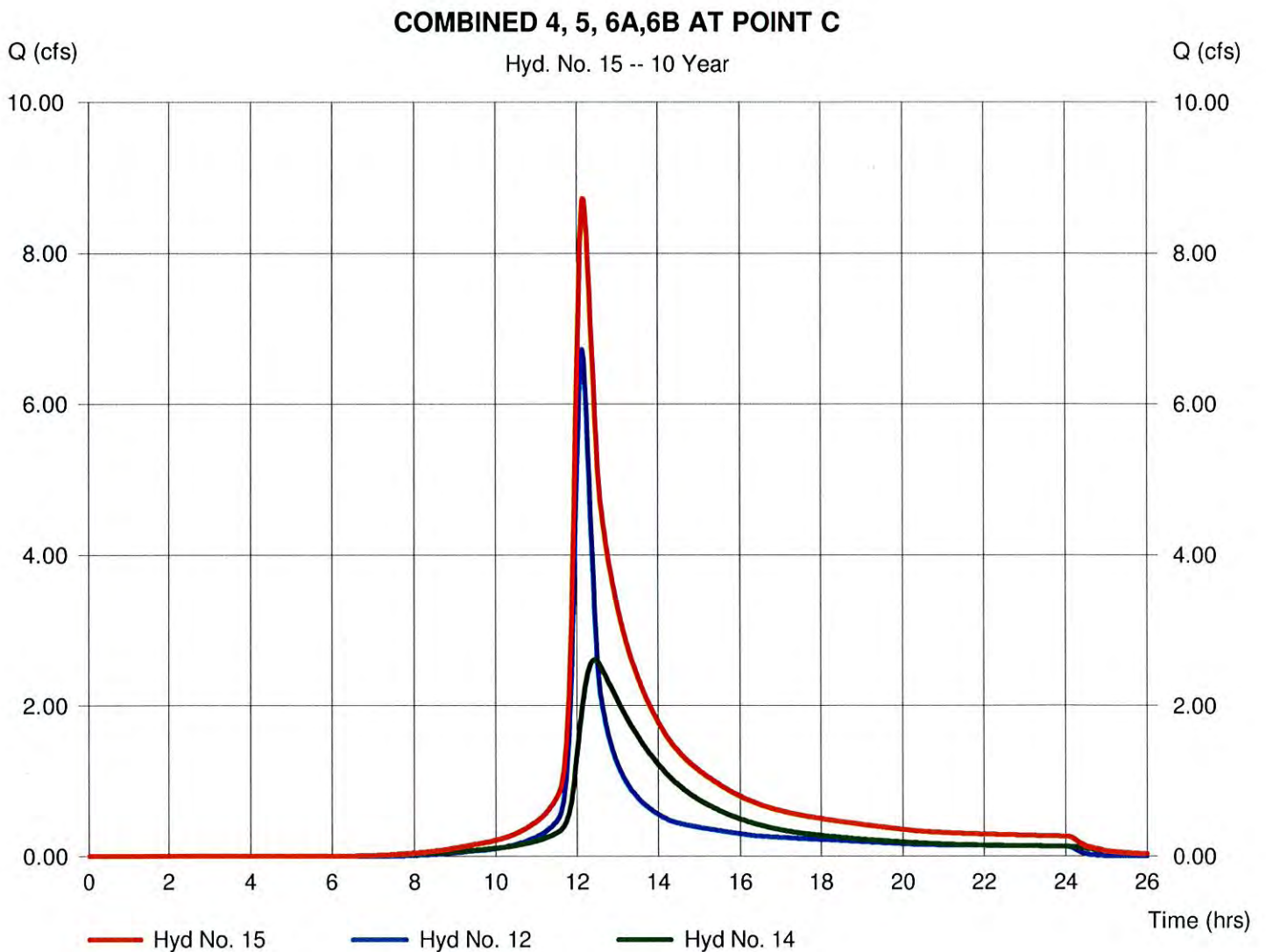
Wednesday, Aug 4, 2010

Hyd. No. 15

COMBINED 4, 5, 6A,6B AT POINT C

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 12, 14

Peak discharge = 8.721 cfs
Time to peak = 12.13 hrs
Hyd. volume = 57,620 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

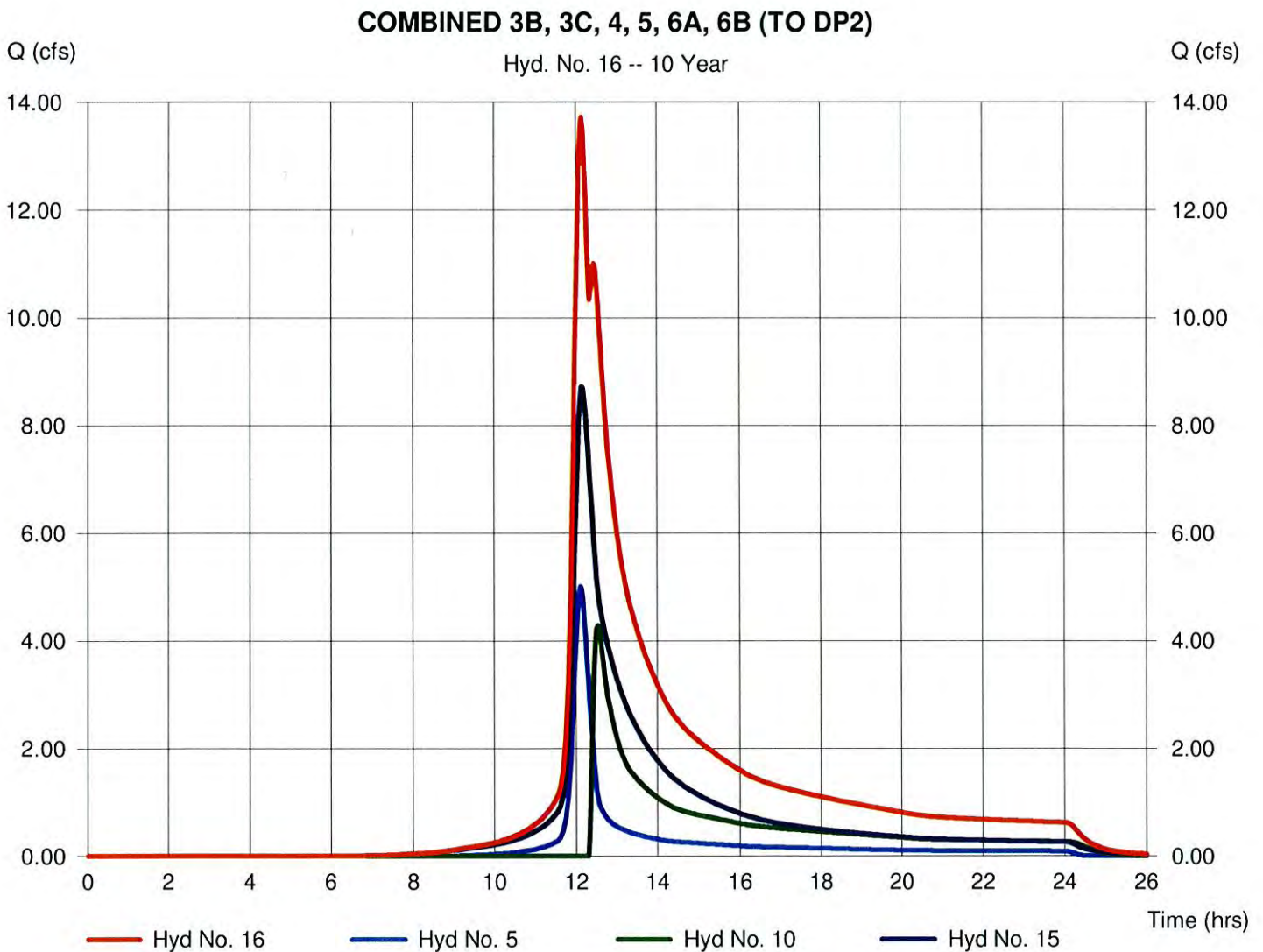
Wednesday, Aug 4, 2010

Hyd. No. 16

COMBINED 3B, 3C, 4, 5, 6A, 6B (TO DP2)

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 5, 10, 15

Peak discharge = 13.72 cfs
Time to peak = 12.13 hrs
Hyd. volume = 104,984 cuft
Contrib. drain. area = 2.510 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	8.026	2	724	25,214	-----	-----	-----	DA 1 (TO DP1)
2	SCS Runoff	18.32	2	732	80,282	-----	-----	-----	DA 2 (TO CANAL)
3	SCS Runoff	16.56	2	720	43,443	-----	-----	-----	DA 3A
4	SCS Runoff	23.52	2	728	86,397	-----	-----	-----	DA 3B
5	SCS Runoff	8.241	2	726	28,453	-----	-----	-----	DA 3C
6	SCS Runoff	7.981	2	726	27,692	-----	-----	-----	DA 4
7	SCS Runoff	5.910	2	722	16,747	-----	-----	-----	DA 5
8	SCS Runoff	9.566	2	726	33,830	-----	-----	-----	DA 6A
9	SCS Runoff	5.043	2	716	10,609	-----	-----	-----	DA 6B
10	Reservoir	16.16	2	740	62,443	4	402.43	33,038	EX. ONSITE WETLAND
11	Reach	2.874	2	734	16,730	7	-----	-----	FROM POINT B TO POINT C
12	Combine	10.53	2	728	44,423	6, 11	-----	-----	COMBINED DA4 AND DA5 TO POIN
13	Combine	11.98	2	718	44,439	8, 9,	-----	-----	COMBINED DA6A AND DA6B
14	Reach	3.907	2	746	44,396	13	-----	-----	POINT A TO POINT C
15	Combine	13.56	2	728	88,819	12, 14	-----	-----	COMBINED 4, 5, 6A,6B AT POINT C
16	Combine	33.34	2	736	179,714	5, 10, 15	-----	-----	COMBINED 3B, 3C, 4, 5, 6A, 6B (TO
PRE DEV CONDITIONS.gpw					Return Period: 100 Year			Wednesday, Aug 4, 2010	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

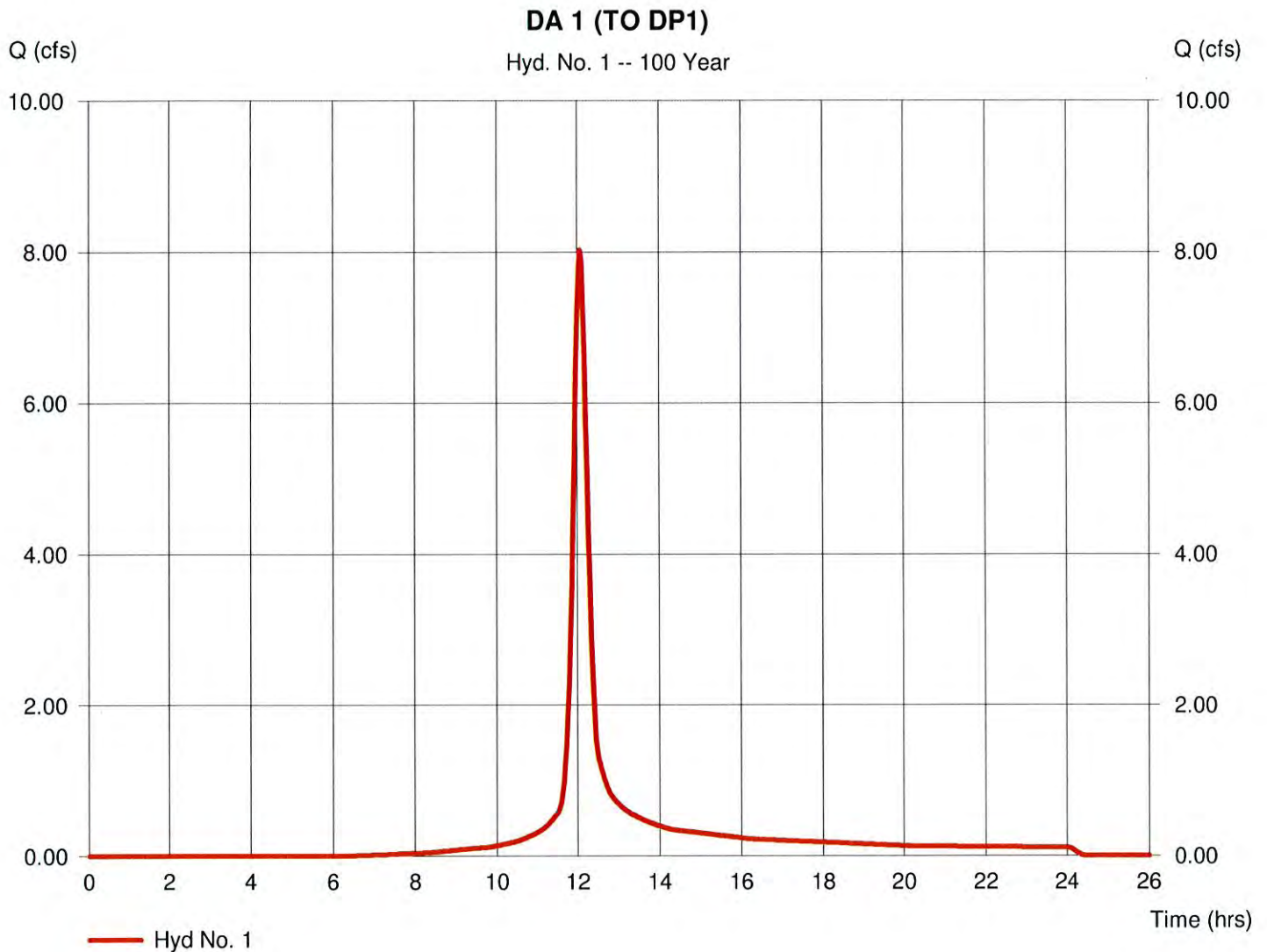
Wednesday, Aug 4, 2010

Hyd. No. 1

DA 1 (TO DP1)

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 2 min
 Drainage area = 2.070 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 5.20 in
 Storm duration = 24 hrs

Peak discharge = 8.026 cfs
 Time to peak = 12.07 hrs
 Hyd. volume = 25,214 cuft
 Curve number = 83
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 19.90 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

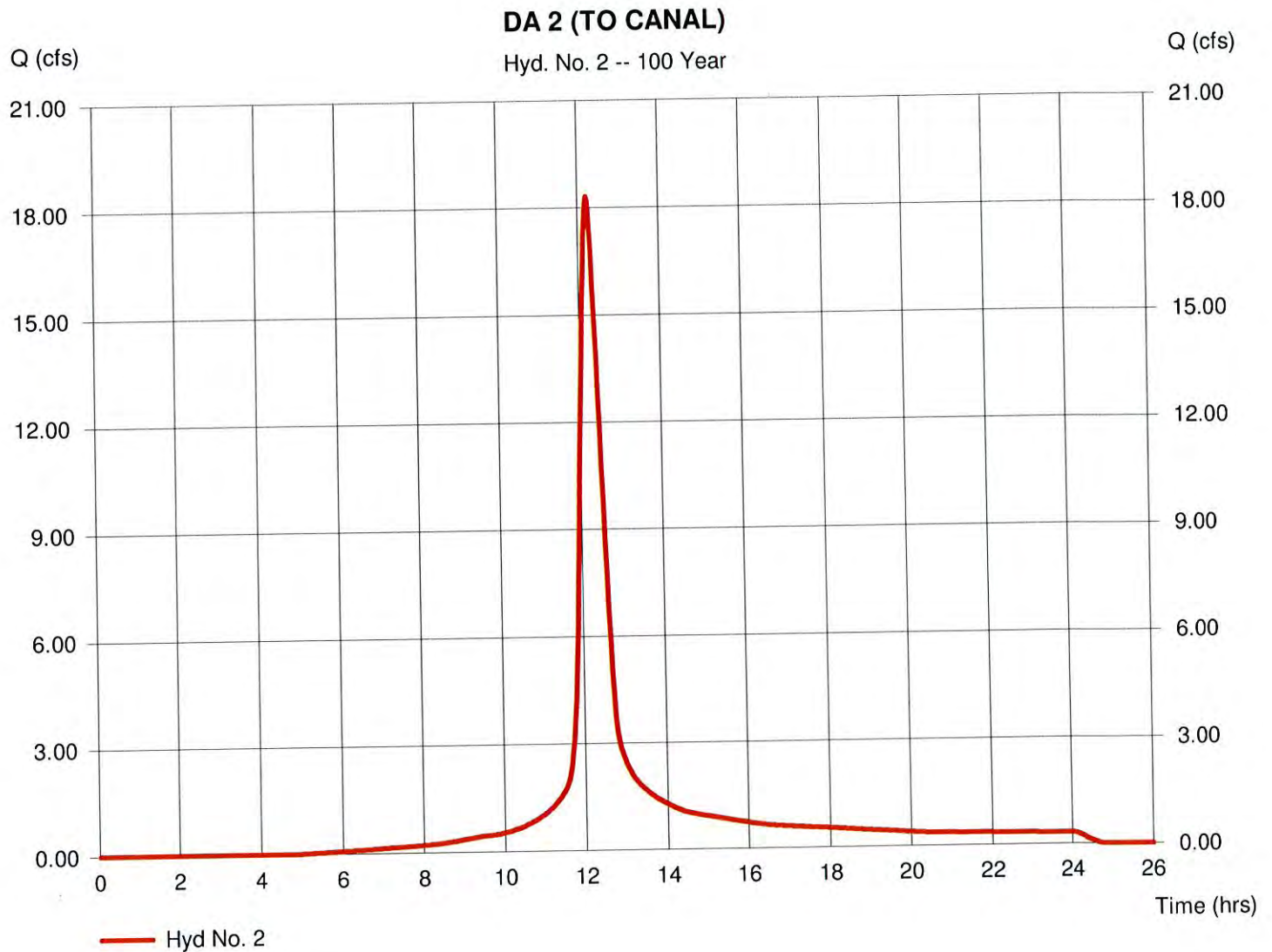
Wednesday, Aug 4, 2010

Hyd. No. 2

DA 2 (TO CANAL)

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 5.660 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 18.32 cfs
Time to peak = 12.20 hrs
Hyd. volume = 80,282 cuft
Curve number = 88
Hydraulic length = 0 ft
Time of conc. (Tc) = 33.20 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

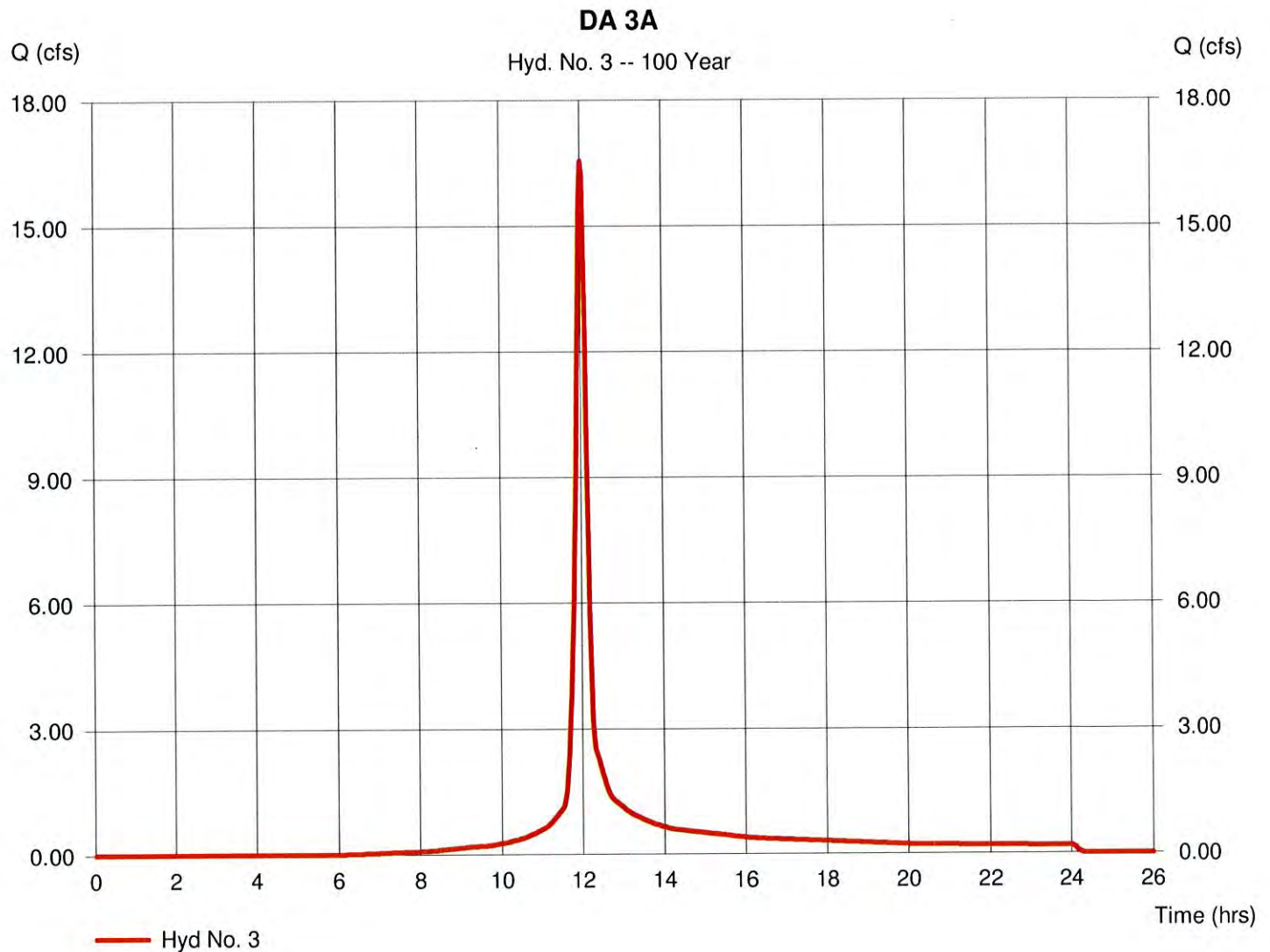
Wednesday, Aug 4, 2010

Hyd. No. 3

DA 3A

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 3.360 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 16.56 cfs
Time to peak = 12.00 hrs
Hyd. volume = 43,443 cuft
Curve number = 84
Hydraulic length = 0 ft
Time of conc. (Tc) = 13.10 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

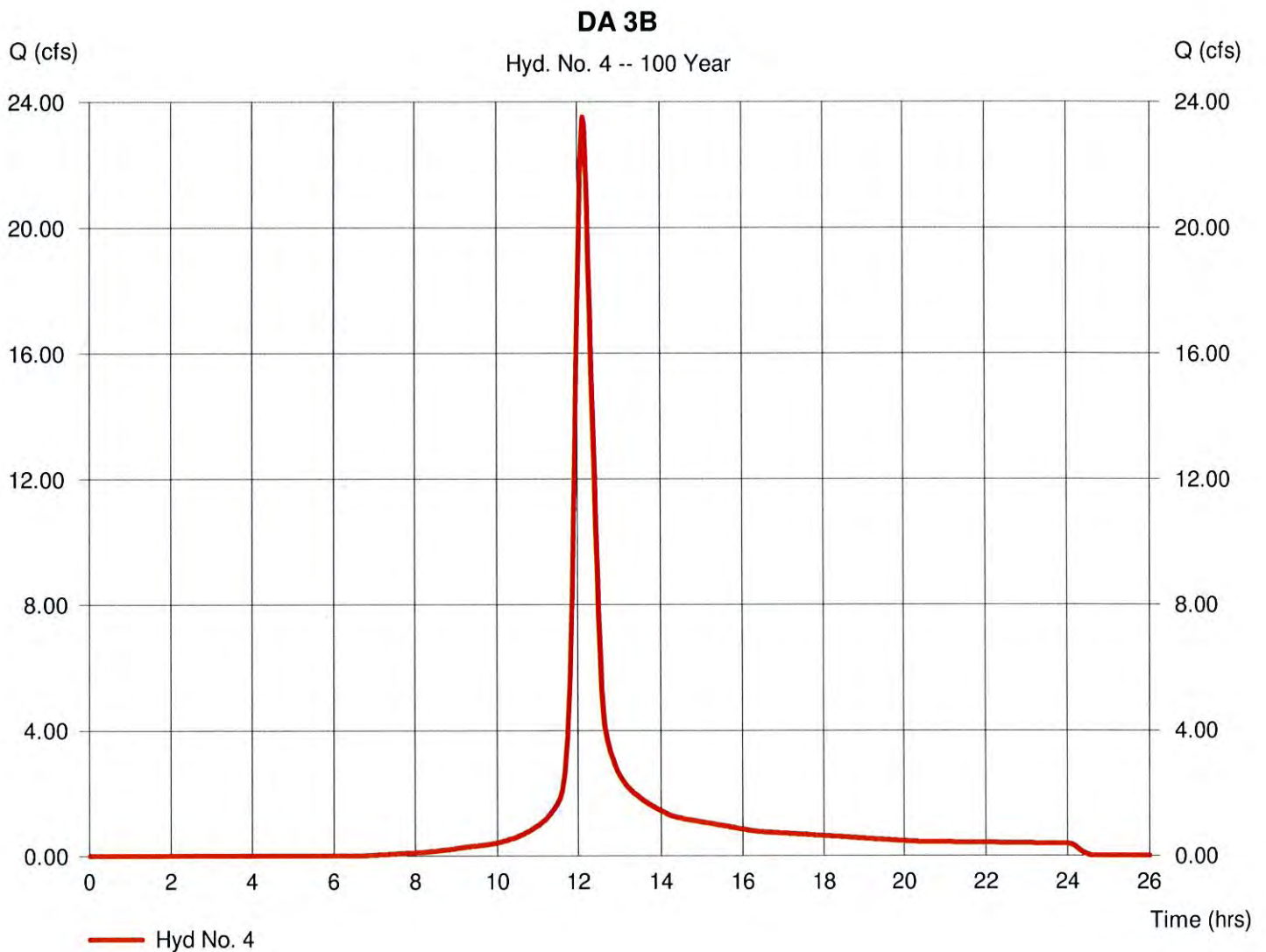
Wednesday, Aug 4, 2010

Hyd. No. 4

DA 3B

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 2 min
 Drainage area = 7.420 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 5.20 in
 Storm duration = 24 hrs

Peak discharge = 23.52 cfs
 Time to peak = 12.13 hrs
 Hyd. volume = 86,397 cuft
 Curve number = 82
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 23.50 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

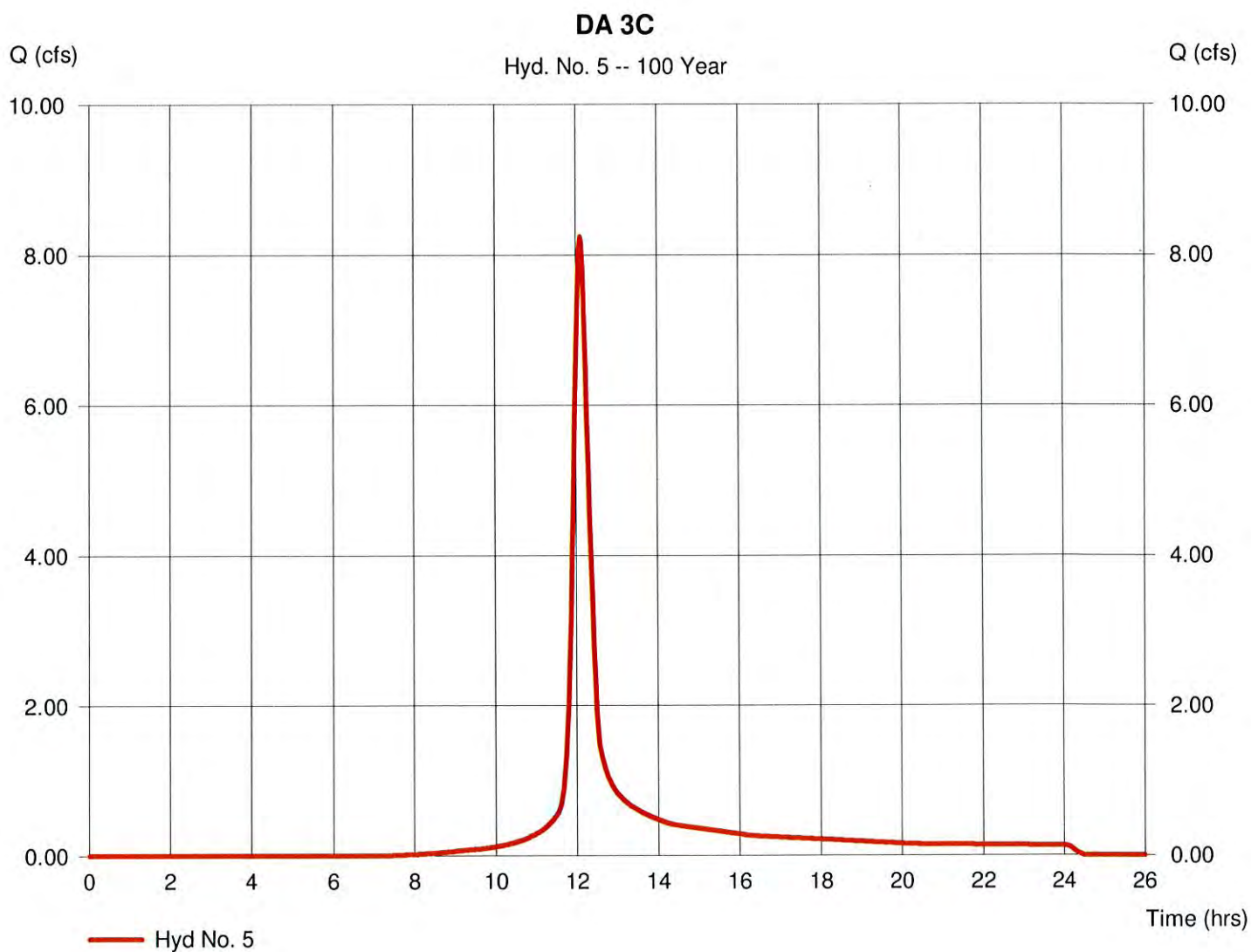
Wednesday, Aug 4, 2010

Hyd. No. 5

DA 3C

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 2.510 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 8.241 cfs
Time to peak = 12.10 hrs
Hyd. volume = 28,453 cuft
Curve number = 80
Hydraulic length = 0 ft
Time of conc. (Tc) = 22.90 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

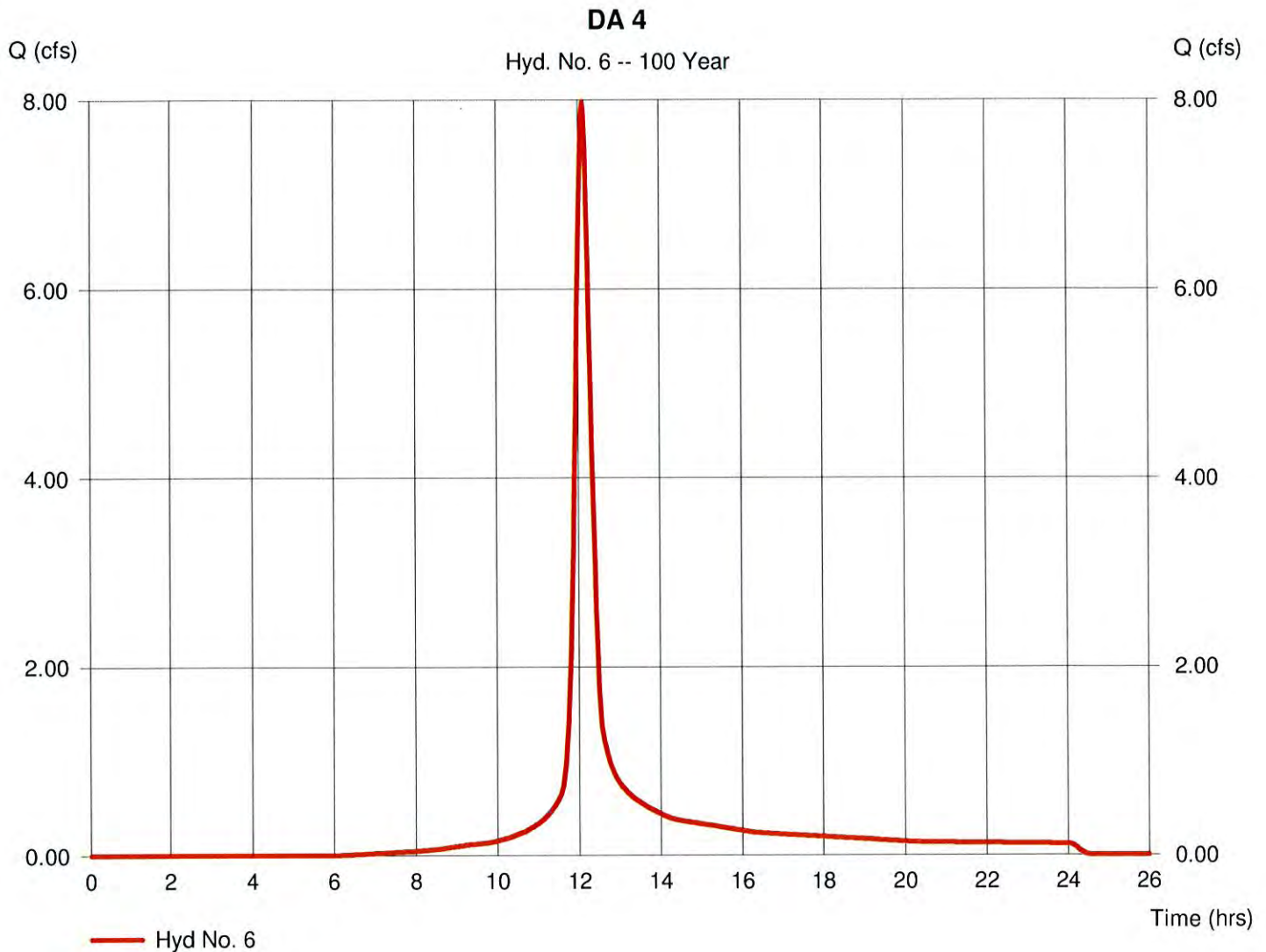
Wednesday, Aug 4, 2010

Hyd. No. 6

DA 4

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 2 min
 Drainage area = 2.170 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 5.20 in
 Storm duration = 24 hrs

Peak discharge = 7.981 cfs
 Time to peak = 12.10 hrs
 Hyd. volume = 27,692 cuft
 Curve number = 84
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 22.90 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

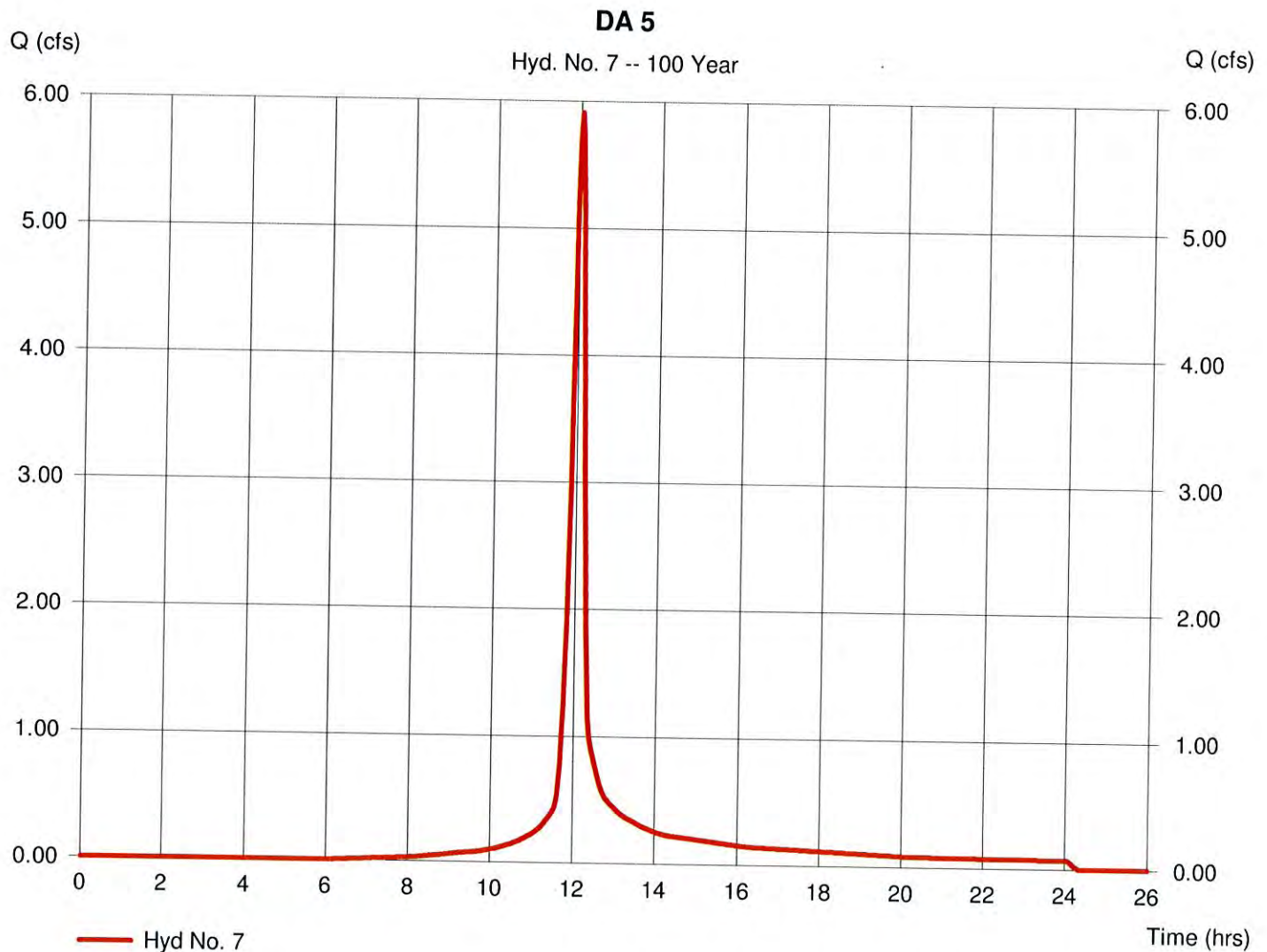
Wednesday, Aug 4, 2010

Hyd. No. 7

DA 5

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 1.370 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 5.910 cfs
Time to peak = 12.03 hrs
Hyd. volume = 16,747 cuft
Curve number = 84
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.90 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

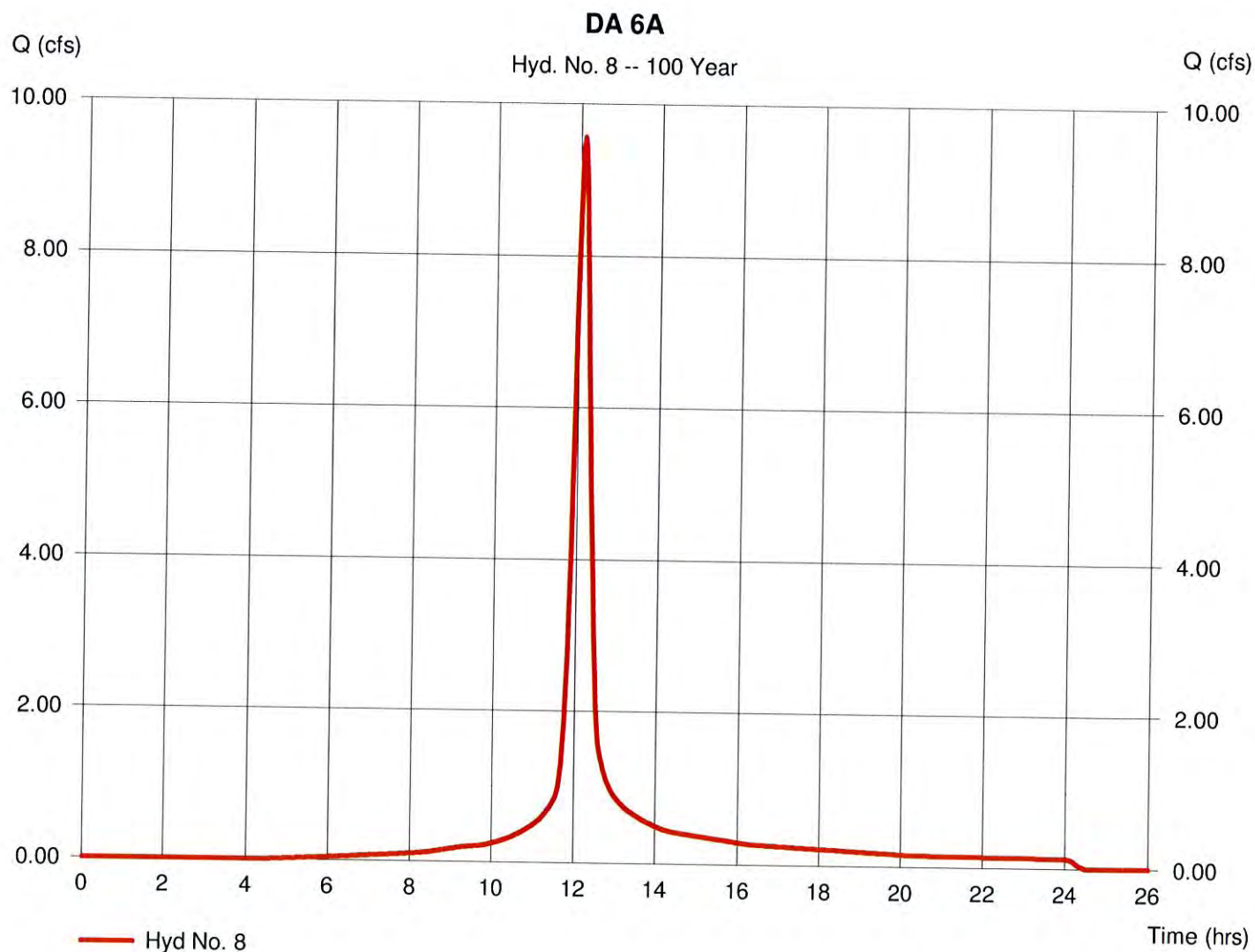
Wednesday, Aug 4, 2010

Hyd. No. 8

DA 6A

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 2.310 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 9.566 cfs
Time to peak = 12.10 hrs
Hyd. volume = 33,830 cuft
Curve number = 89
Hydraulic length = 0 ft
Time of conc. (Tc) = 22.10 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

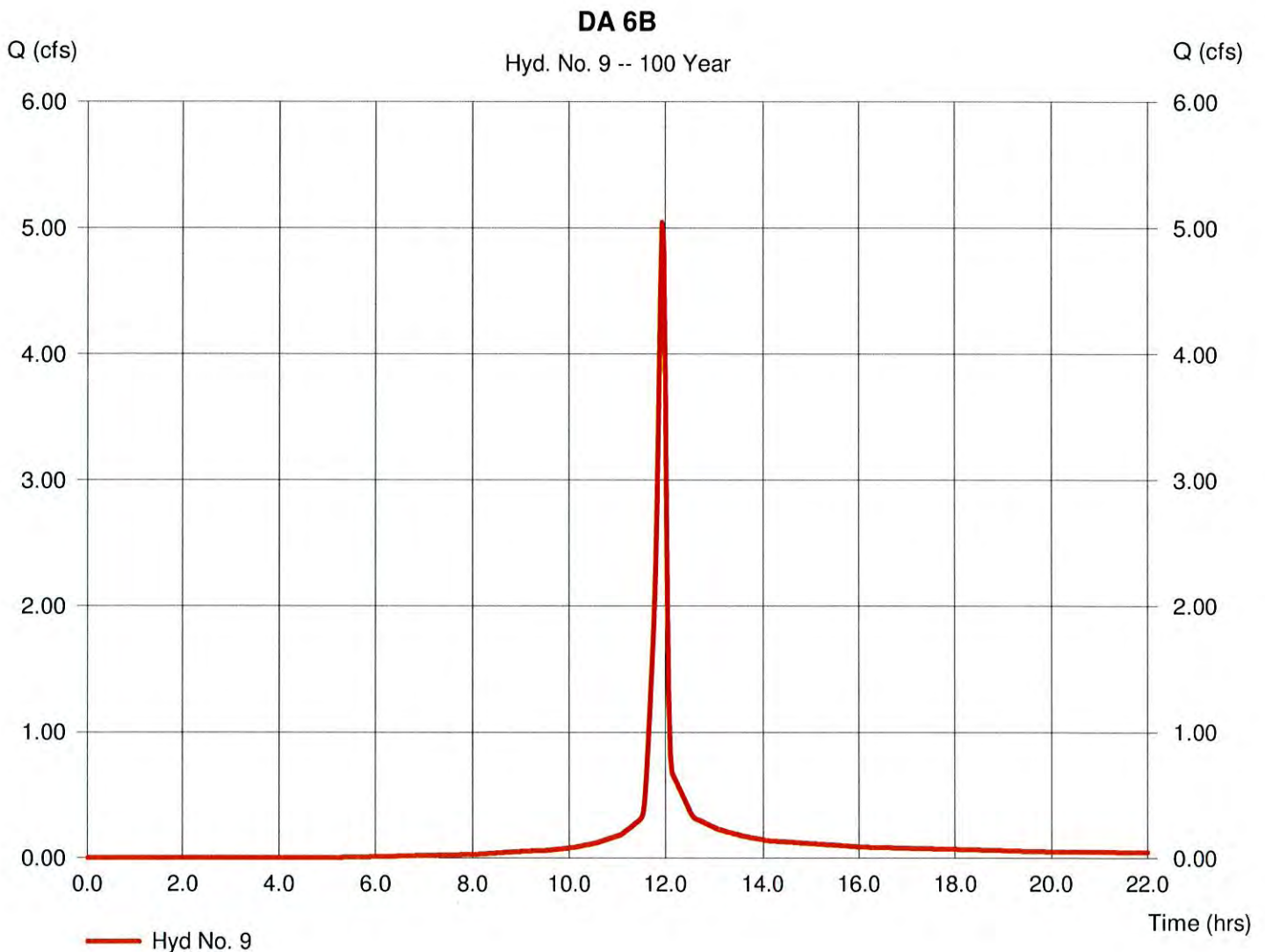
Wednesday, Aug 4, 2010

Hyd. No. 9

DA 6B

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 0.830 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 5.043 cfs
Time to peak = 11.93 hrs
Hyd. volume = 10,609 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.60 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Wednesday, Aug 4, 2010

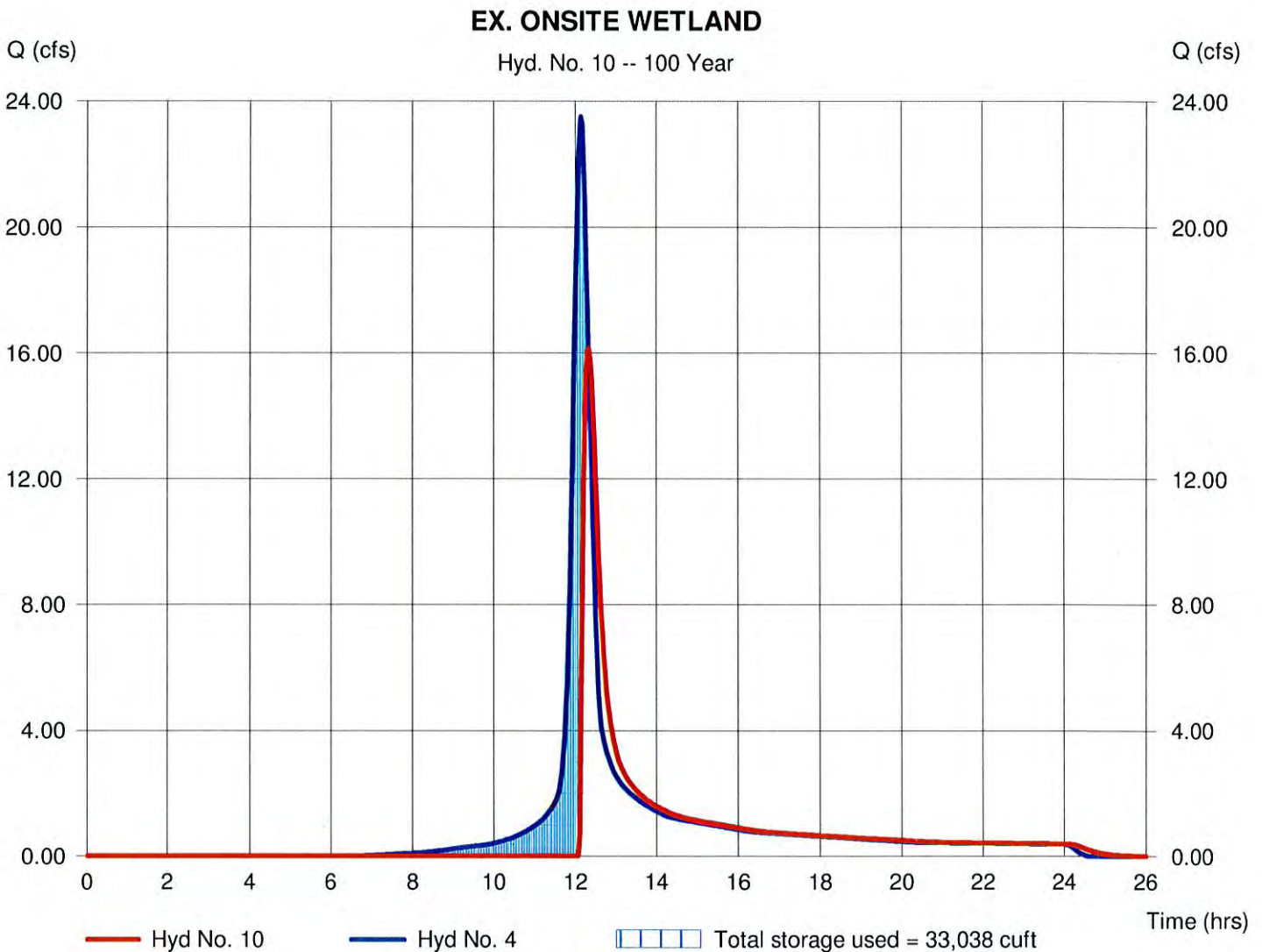
Hyd. No. 10

EX. ONSITE WETLAND

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 4 - DA 3B
Reservoir name = <New Pond>

Peak discharge = 16.16 cfs
Time to peak = 12.33 hrs
Hyd. volume = 62,443 cuft
Max. Elevation = 402.43 ft
Max. Storage = 33,038 cuft

Storage Indication method used.



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Wednesday, Aug 4, 2010

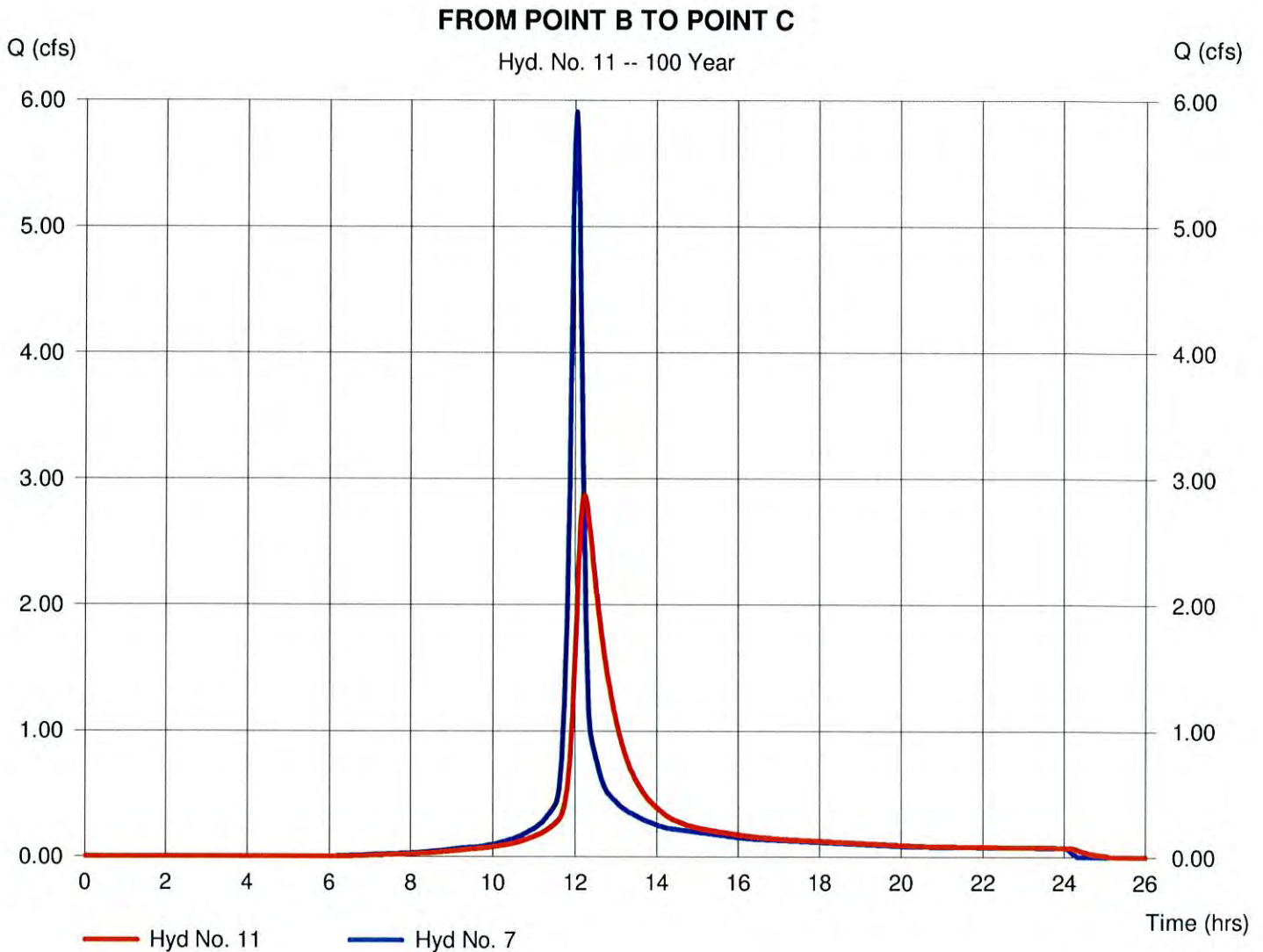
Hyd. No. 11

FROM POINT B TO POINT C

Hydrograph type = Reach
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 7 - DA 5
Reach length = 1150.0 ft
Manning's n = 0.040
Side slope = 20.0:1
Rating curve x = 0.764
Ave. velocity = 0.73 ft/s

Peak discharge = 2.874 cfs
Time to peak = 12.23 hrs
Hyd. volume = 16,730 cuft
Section type = Trapezoidal
Channel slope = 0.4 %
Bottom width = 5.0 ft
Max. depth = 1.0 ft
Rating curve m = 0.976
Routing coeff. = 0.0714

Modified Att-Kin routing method used.



Hydrograph Report

59

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

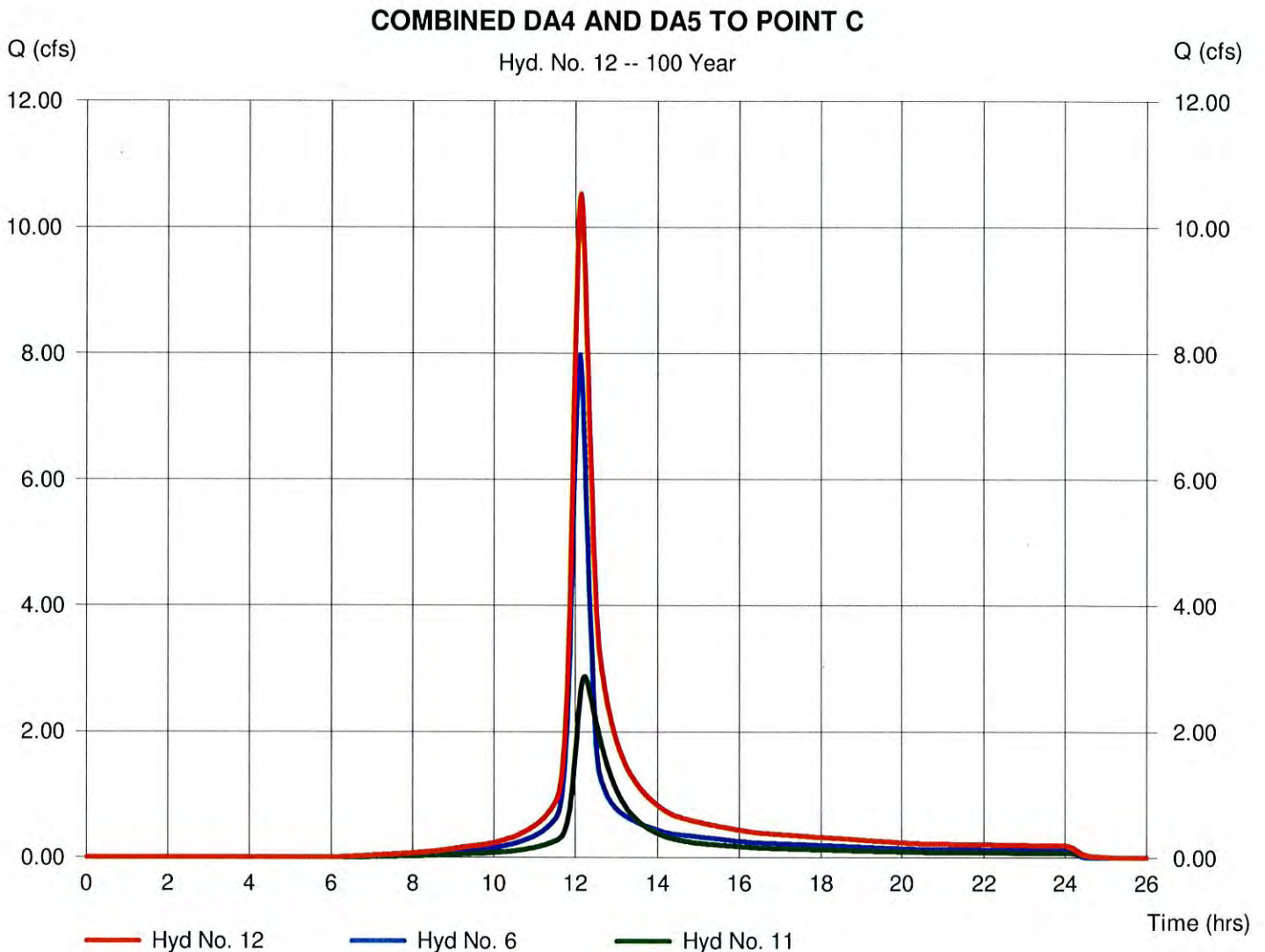
Wednesday, Aug 4, 2010

Hyd. No. 12

COMBINED DA4 AND DA5 TO POINT C

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 6, 11

Peak discharge = 10.53 cfs
Time to peak = 12.13 hrs
Hyd. volume = 44,423 cuft
Contrib. drain. area = 2.170 ac



Hydrograph Report

60

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

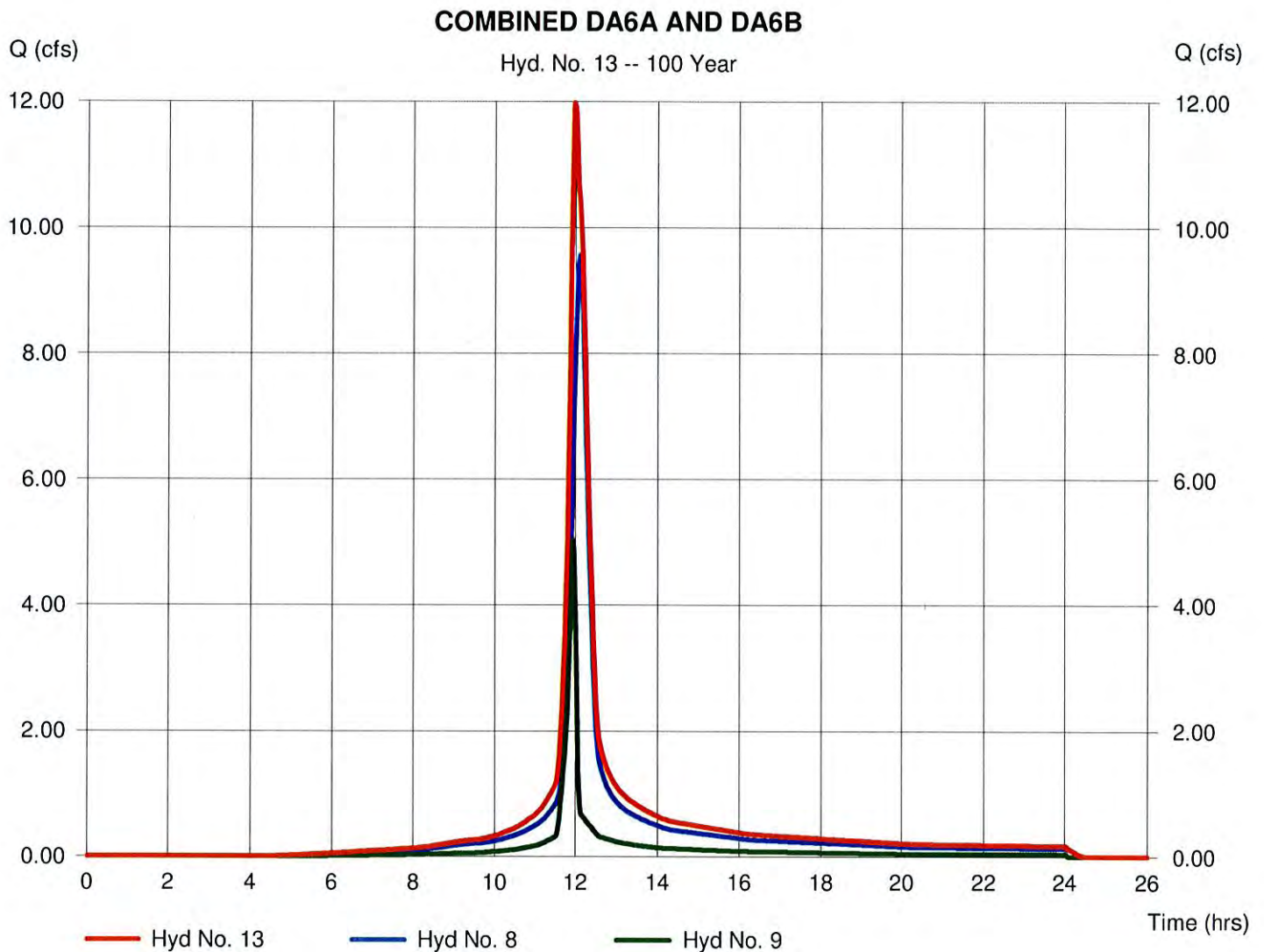
Wednesday, Aug 4, 2010

Hyd. No. 13

COMBINED DA6A AND DA6B

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 8, 9

Peak discharge = 11.98 cfs
Time to peak = 11.97 hrs
Hyd. volume = 44,439 cuft
Contrib. drain. area = 3.140 ac



Hydrograph Report

61

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Wednesday, Aug 4, 2010

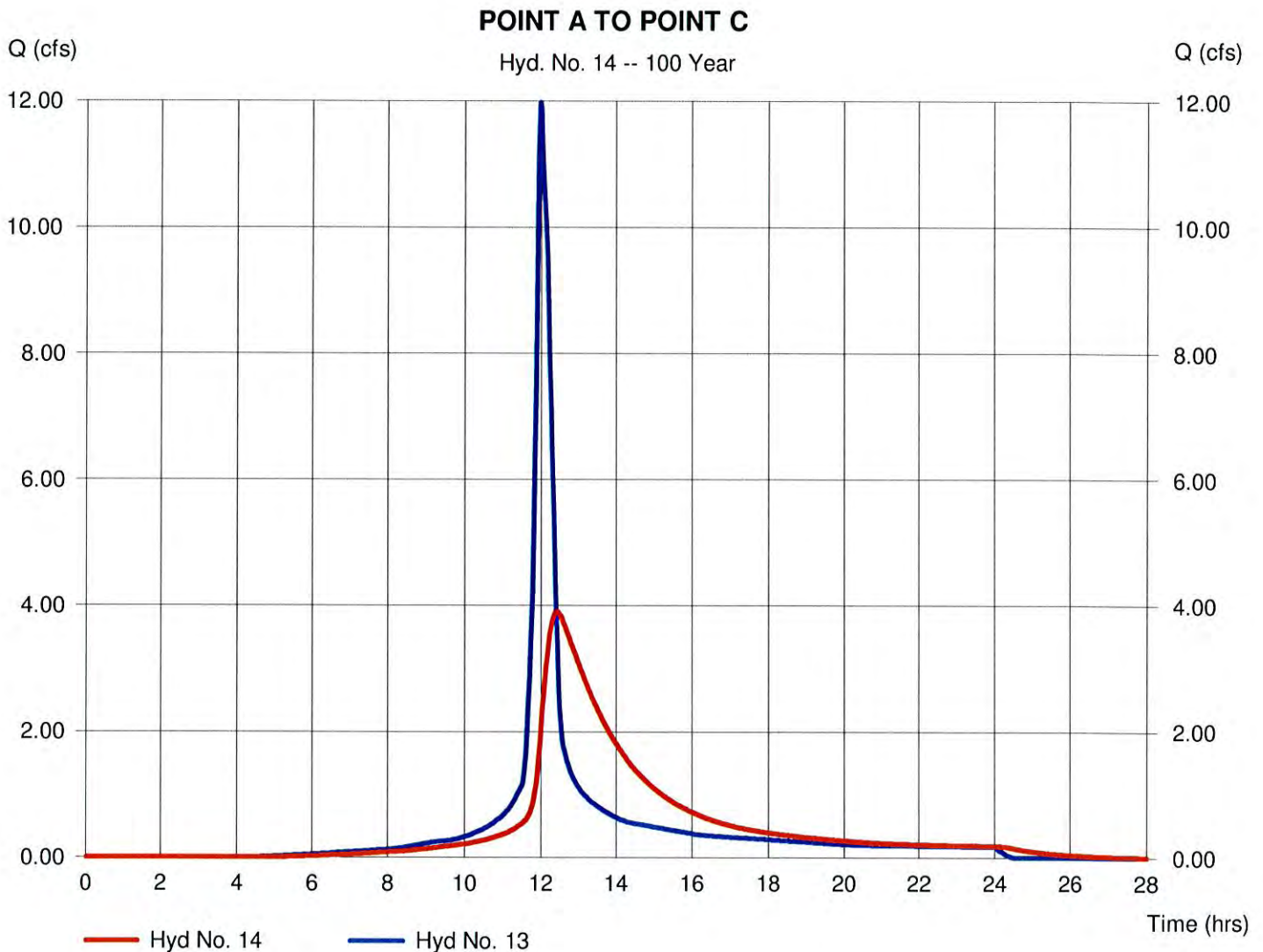
Hyd. No. 14

POINT A TO POINT C

Hydrograph type = Reach
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 13 - COMBINED DA6A AND DA6B
Reach length = 1815.0 ft
Manning's n = 0.040
Side slope = 20.0:1
Rating curve x = 0.459
Ave. velocity = 0.43 ft/s

Peak discharge = 3.907 cfs
Time to peak = 12.43 hrs
Hyd. volume = 44,396 cuft
Section type = Trapezoidal
Channel slope = 0.1 %
Bottom width = 5.0 ft
Max. depth = 1.0 ft
Rating curve m = 0.976
Routing coeff. = 0.0271

Modified Att-Kin routing method used.



Hydrograph Report

62

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

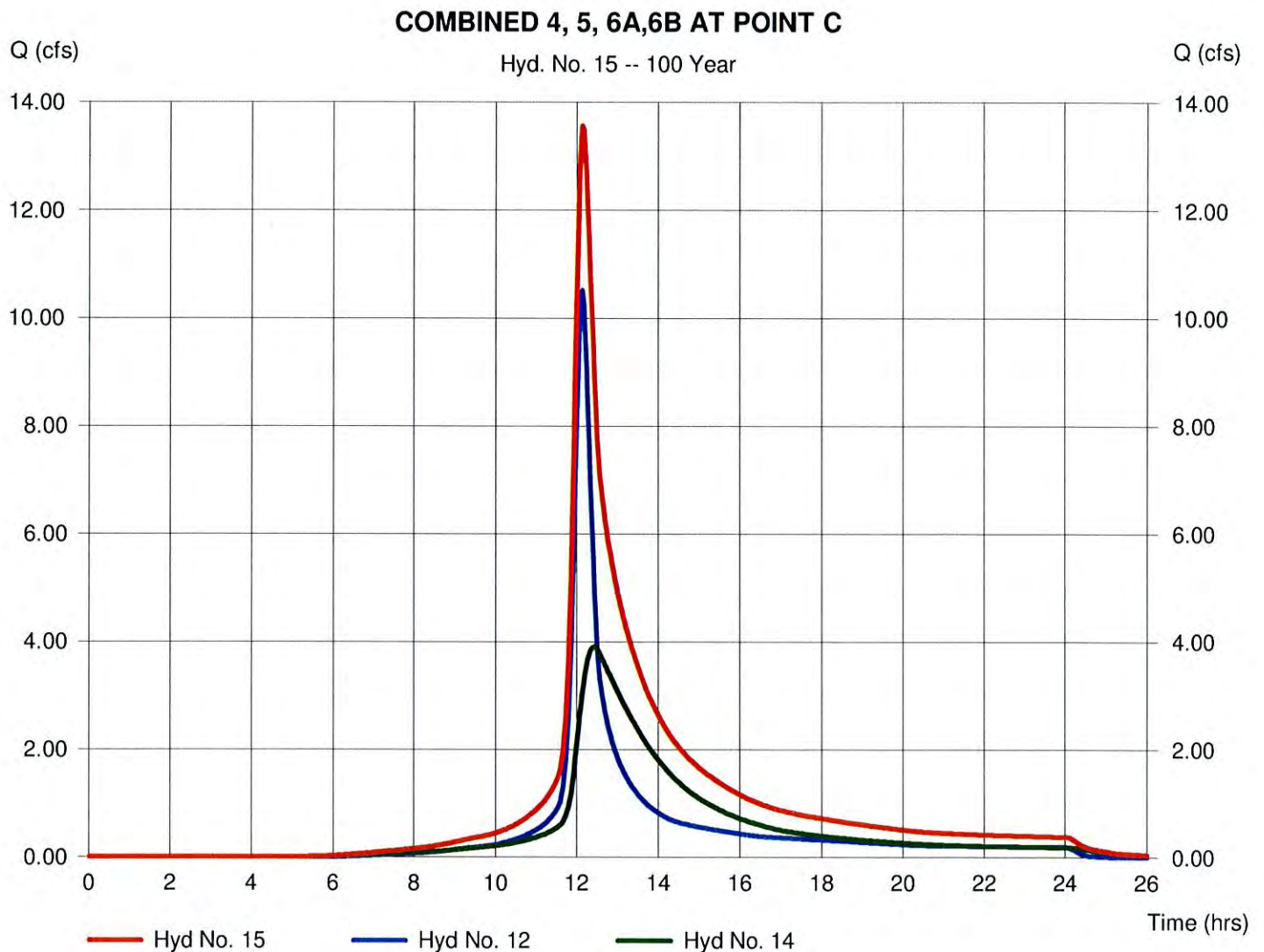
Wednesday, Aug 4, 2010

Hyd. No. 15

COMBINED 4, 5, 6A,6B AT POINT C

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 12, 14

Peak discharge = 13.56 cfs
Time to peak = 12.13 hrs
Hyd. volume = 88,819 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

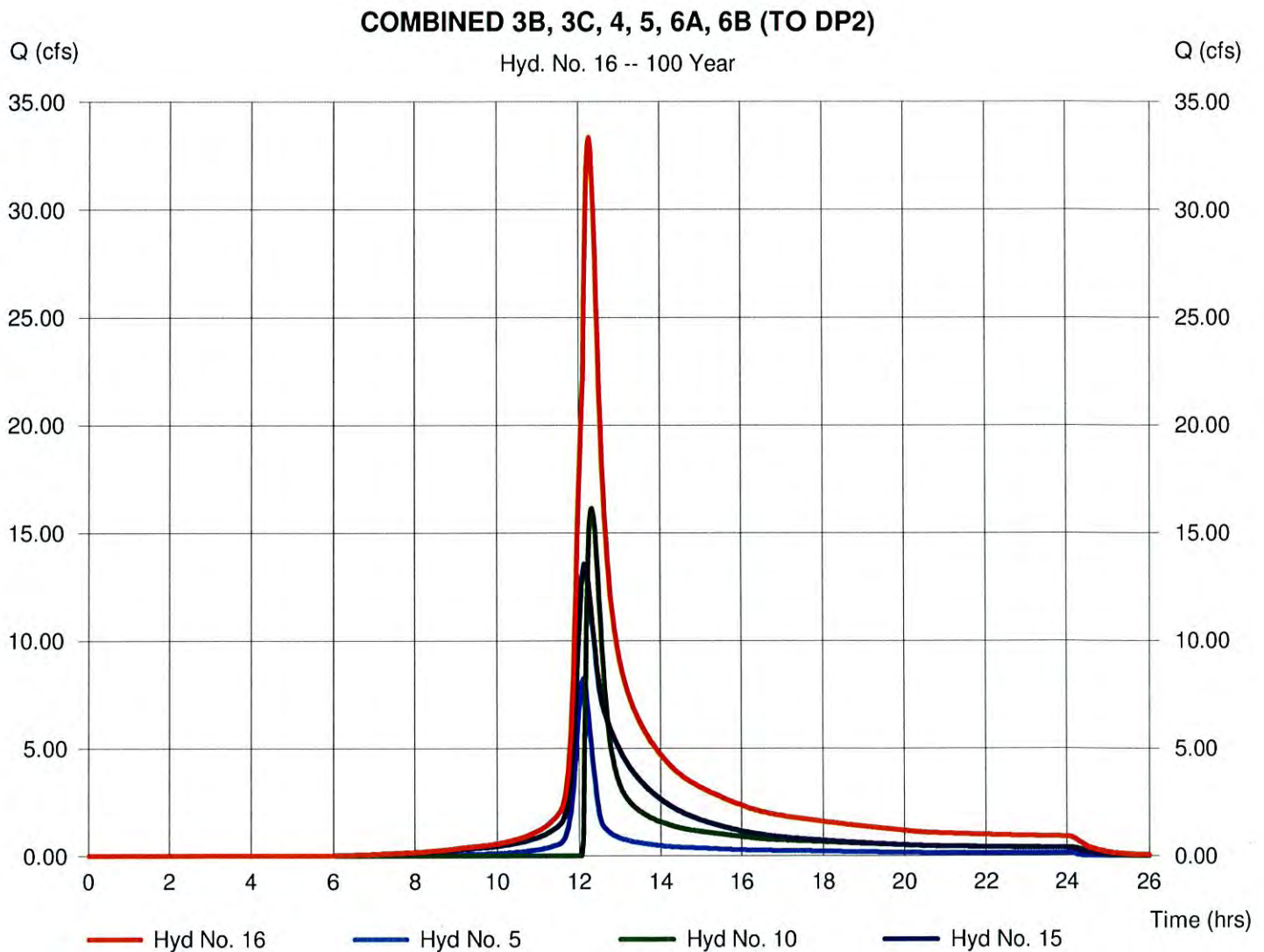
Wednesday, Aug 4, 2010

Hyd. No. 16

COMBINED 3B, 3C, 4, 5, 6A, 6B (TO DP2)

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 5, 10, 15

Peak discharge = 33.34 cfs
Time to peak = 12.27 hrs
Hyd. volume = 179,714 cuft
Contrib. drain. area = 2.510 ac



WinTR-55 Current Data Description

--- Identification Data ---

User: DJZ Date: 9/2/2010
 Project: Mathews Ave - ETC Units: English
 SubTitle: Pre-Development Site - April 2010 Areal Units: Acres
 State: New York
 County: Onondaga
 Filename: I:\Obg-Property.4152\39256.Brownfield-Red\120.001 - Empire Tissue\N&D\Stormwater_Design\Empire-TC_Pre-

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
DA1	DP-1 Culvert	Outlet	2.07	83	0.321
DA3B	On-site Wetland W2	Outlet	7.42	82	0.325
DA5	DP 4	Outlet	1.37	84	0.375
DA3A	Onsite Wetland W1	Outlet	3.36	84	0.212
DA3C	to DP-2	Outlet	2.51	80	0.397
DA4	SW to wetland W3	Outlet	2.05	84	0.368
DA2	to Canal	Outlet	5.66	88	0.533
DA6A	to south swale	Outlet	2.31	89	0.356
DA6B		Outlet	0.82	87	0.100

Total area: 27.57 (ac)

--- Storm Data ---

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.6	3.2	3.8	4.5	4.8	5.2	2.2

Storm Data Source: Onondaga County, NY (NRCS)
 Rainfall Distribution Type: Type II
 Dimensionless Unit Hydrograph: <standard>

Mathews Ave - ETC
Pre-Development Site - April 2010
Onondaga County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
DA1	Paved parking lots, roofs, driveways	D	.21	98
	Pasture, grassland or range (poor)	D	.54	89
	Pasture, grassland or range (good)	D	.4	80
	Brush - brush, weed, grass mix (poor)	D	.17	83
	Brush - brush, weed, grass mix (good)	D	.52	73
	Woods (fair)	D	.23	79
	Total Area / Weighted Curve Number		2.07 =====	83 ==
DA3B	Paved parking lots, roofs, driveways	D	.23	98
	Pasture, grassland or range (poor)	D	2.07	89
	Brush - brush, weed, grass mix (fair)	D	2.27	77
	Woods (fair)	D	2.85	79
	Total Area / Weighted Curve Number		7.42 =====	82 ==
DA5	Paved parking lots, roofs, driveways	D	.13	98
	Pasture, grassland or range (poor)	D	.4	89
	Brush - brush, weed, grass mix (poor)	D	.28	83
	Brush - brush, weed, grass mix (fair)	D	.36	77
	Woods (fair)	D	.2	79
	Total Area / Weighted Curve Number		1.37 =====	84 ==
DA3A	Paved parking lots, roofs, driveways	D	.09	98
	Pasture, grassland or range (poor)	D	1.77	89
	Brush - brush, weed, grass mix (fair)	D	.79	77
	Woods (fair)	D	.71	79
	Total Area / Weighted Curve Number		3.36 =====	84 ==
DA3C	Pasture, grassland or range (poor)	D	.52	89
	Brush - brush, weed, grass mix (fair)	D	1.25	77
	Woods (fair)	D	.74	79
	Total Area / Weighted Curve Number		2.51 =====	80 ==
DA4	Pasture, grassland or range (poor)	D	.2	89
	Brush - brush, weed, grass mix (poor)	D	1.85	83
	Total Area / Weighted Curve Number		2.05 =====	84 ==
DA2	Paved parking lots, roofs, driveways	D	2.96	98
	Brush - brush, weed, grass mix (fair)	C	.37	70
	Brush - brush, weed, grass mix (fair)	D	.69	77
	Woods (fair)	C	.4	73
	Woods (fair)	D	1.24	79
	Total Area / Weighted Curve Number		5.66 =====	88 ==
DA6A	Paved parking lots, roofs, driveways	D	.1	98
	Pasture, grassland or range (poor)	D	2.03	89
	Brush - brush, weed, grass mix (poor)	D	.11	83
	Brush - brush, weed, grass mix (fair)	D	.07	77
	Total Area / Weighted Curve Number		2.31 =====	89 ==

Mathews Ave - ETC
Pre-Development Site - April 2010
Onondaga County, New York

Sub-Area Land Use and Curve Number Details (continued)

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
DA6B	Paved parking lots, roofs, driveways	D	.24	98
	Pasture, grassland or range (fair)	D	.47	84
	Brush - brush, weed, grass mix (fair)	D	.11	77
	Total Area / Weighted Curve Number		.82	87
			===	==

Mathews Ave - ETC
Pre-Development Site - April 2010
Onondaga County, New York

Sub-Area Time of Concentration Details

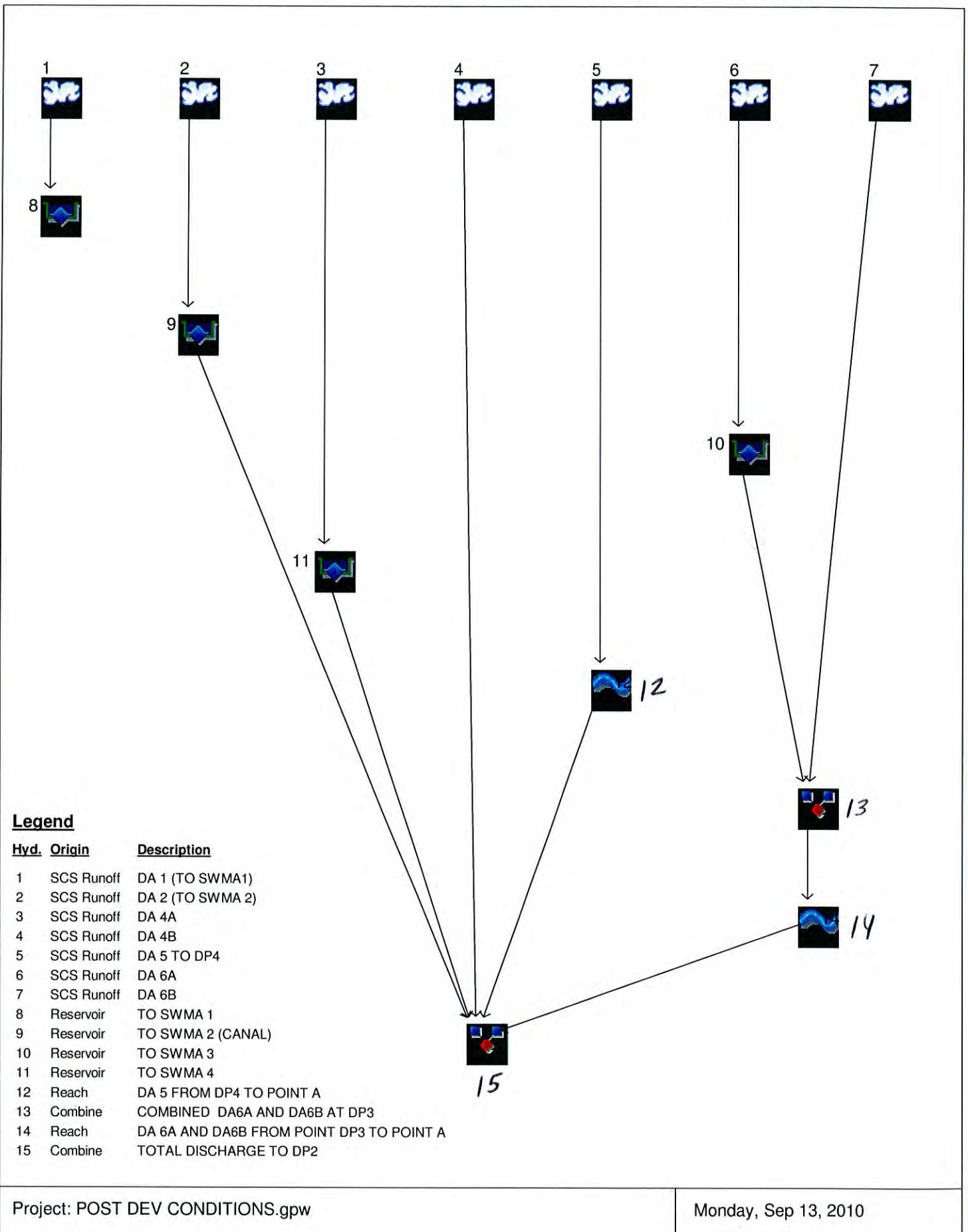
Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)

DA1							
SHEET	100	0.0400	0.400				0.301
SHALLOW	136	0.0600	0.050				0.010
CHANNEL	167	0.0330	0.035	9.00	18.00	4.639	0.010
Time of Concentration							0.321
							=====
DA3B							
SHEET	100	0.0330	0.400				0.325
SHALLOW	646	0.0270	0.050				
Time of Concentration							0.325
							=====
DA5							
SHEET	73	0.0340	0.400				0.250
SHALLOW	71	0.0700	0.050				0.005
CHANNEL	863					2.000	0.120
Time of Concentration							0.375
							=====
DA3A							
SHEET	100	0.0300	0.150				0.154
SHALLOW	415	0.0150	0.050				0.058
Time of Concentration							0.212
							=====
DA3C							
SHEET	100	0.0240	0.400				0.369
SHALLOW	346	0.0460	0.050				0.028
Time of Concentration							0.397
							=====
DA4							
SHEET	100	0.0280	0.400				0.347
SHALLOW	275	0.0520	0.050				0.021
Time of Concentration							0.368
							=====
DA2							
SHEET	100	0.0100	0.400				0.524
SHALLOW	133	0.0690	0.050				0.009
Time of Concentration							0.533
							=====
DA6A							
SHEET	100	0.0040	0.130				0.308
SHALLOW	279	0.0100	0.050				0.048
Time of Concentration							0.356
							=====
DA6B							
SHEET	17	0.1940	0.400				0.039
CHANNEL	580					3.000	0.054
Time of Concentration							0.100
							=====

*Post-Development
Conditions Watershed Model*

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052



Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	-----	7.078	-----	-----	-----	13.40	-----	-----	18.85	DA 1 (TO SWMA1)
2	SCS Runoff	-----	47.32	-----	-----	-----	87.62	-----	-----	122.37	DA 2 (TO SWMA 2)
3	SCS Runoff	-----	1.536	-----	-----	-----	3.627	-----	-----	5.525	DA 4A
4	SCS Runoff	-----	1.495	-----	-----	-----	4.140	-----	-----	6.732	DA 4B
5	SCS Runoff	-----	1.108	-----	-----	-----	3.006	-----	-----	4.867	DA 5 TO DP4
6	SCS Runoff	-----	4.983	-----	-----	-----	9.653	-----	-----	13.68	DA 6A
7	SCS Runoff	-----	1.471	-----	-----	-----	3.325	-----	-----	4.982	DA 6B
8	Reservoir	1	0.395	-----	-----	-----	1.755	-----	-----	7.661	TO SWMA 1
9	Reservoir	2	0.436	-----	-----	-----	1.723	-----	-----	3.450	TO SWMA 2 (CANAL)
10	Reservoir	6	0.350	-----	-----	-----	1.393	-----	-----	4.290	TO SWMA 3
11	Reservoir	3	0.198	-----	-----	-----	0.386	-----	-----	1.194	TO SWMA 4
12	Reach	5	0.400	-----	-----	-----	1.183	-----	-----	1.946	DA 5 FROM DP4 TO POINT A
13	Combine	7, 10,	1.759	-----	-----	-----	3.783	-----	-----	7.633	COMBINED DA6A AND DA6B AT D
14	Reach	13	0.403	-----	-----	-----	1.078	-----	-----	2.043	DA 6A AND DA6B FROM POINT DP3
15	Combine	4, 9, 11, 12, 14	2.624	-----	-----	-----	7.360	-----	-----	12.54	TOTAL DISCHARGE TO DP2

Proj. file: POST DEV CONDITIONS.gpw

Monday, Sep 13, 2010

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	7.078	2	716	14,881	-----	-----	-----	DA 1 (TO SWMA1)
2	SCS Runoff	47.32	2	716	100,954	-----	-----	-----	DA 2 (TO SWMA 2)
3	SCS Runoff	1.536	2	722	4,332	-----	-----	-----	DA 4A
4	SCS Runoff	1.495	2	720	3,472	-----	-----	-----	DA 4B
5	SCS Runoff	1.108	2	718	2,225	-----	-----	-----	DA 5 TO DP4
6	SCS Runoff	4.983	2	716	10,355	-----	-----	-----	DA 6A
7	SCS Runoff	1.471	2	716	2,971	-----	-----	-----	DA 6B
8	Reservoir	0.395	2	768	14,835	1	401.35	29,496	TO SWMA 1
9	Reservoir	0.436	2	1282	72,497	2	397.04	195,912	TO SWMA 2 (CANAL)
10	Reservoir	0.350	2	752	10,328	6	407.96	15,516	TO SWMA 3
11	Reservoir	0.198	2	756	4,310	3	403.39	9,614	TO SWMA 4
12	Reach	0.400	2	724	2,210	5	-----	-----	DA 5 FROM DP4 TO POINT A
13	Combine	1.759	2	718	13,299	7, 10,	-----	-----	COMBINED DA6A AND DA6B AT D
14	Reach	0.403	2	806	13,057	13	-----	-----	DA 6A AND DA6B FROM POINT DP3
15	Combine	2.624	2	720	94,441	4, 9, 11, 12, 14	-----	-----	TOTAL DISCHARGE TO DP2
POST DEV CONDITIONS.gpw					Return Period: 1 Year			Monday, Sep 13, 2010	

Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

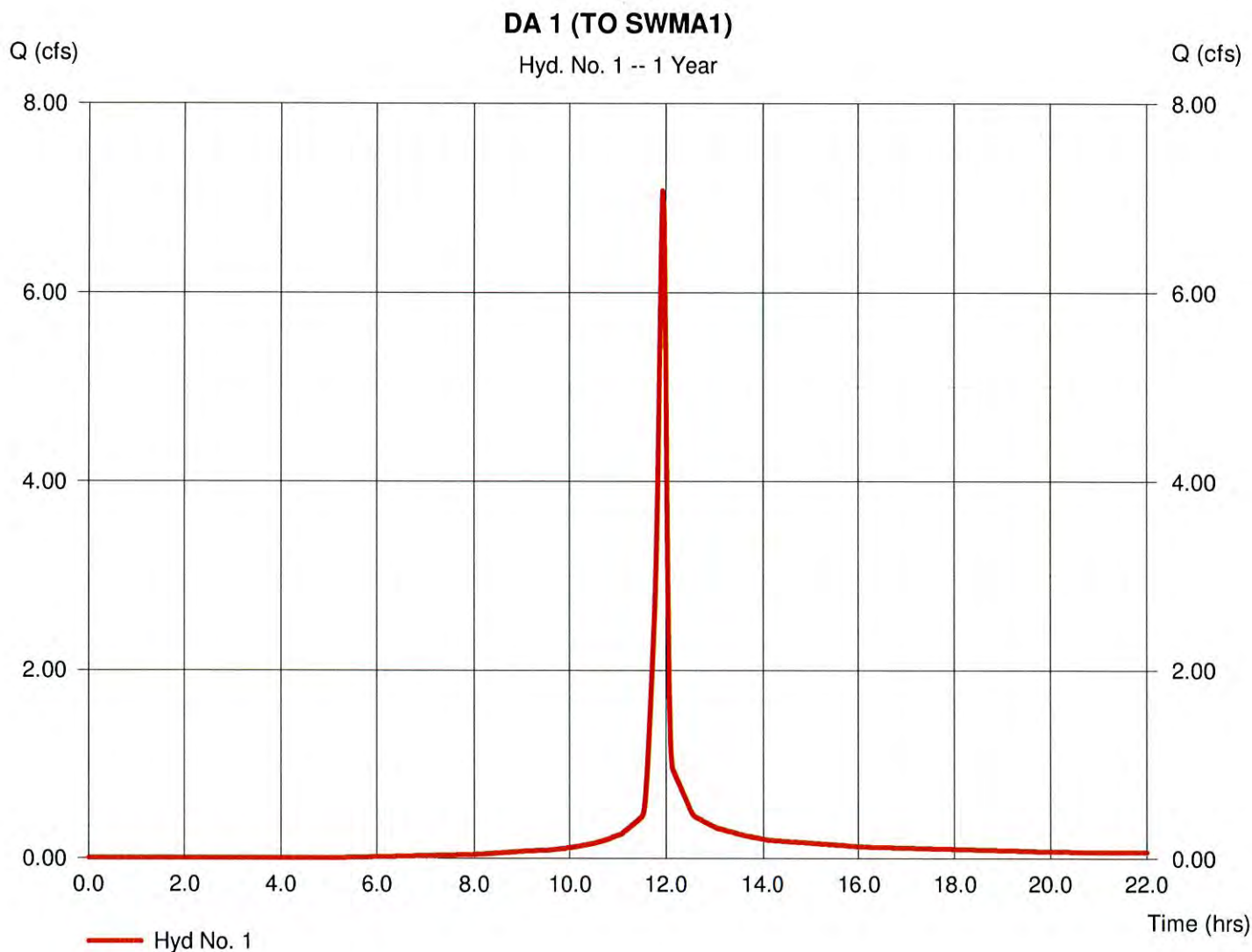
Monday, Sep 13, 2010

Hyd. No. 1

DA 1 (TO SWMA1)

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 2.760 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 7.078 cfs
Time to peak = 11.93 hrs
Hyd. volume = 14,881 cuft
Curve number = 94
Hydraulic length = 0 ft
Time of conc. (Tc) = 4.30 min
Distribution = Type II
Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 1

DA 1 (TO SWMA1)

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.011	0.011	0.011				
Flow length (ft)	= 150.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00				
Land slope (%)	= 3.00	0.00	0.00				
Travel Time (min)	= 1.65	+	0.00	+	0.00	=	1.65
Shallow Concentrated Flow							
Flow length (ft)	= 0.00	0.00	0.00				
Watercourse slope (%)	= 0.00	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	= 0.00	0.00	0.00				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow							
X sectional flow area (sqft)	= 3.25	0.00	0.00				
Wetted perimeter (ft)	= 8.16	0.00	0.00				
Channel slope (%)	= 1.45	0.00	0.00				
Manning's n-value	= 0.040	0.015	0.015				
Velocity (ft/s)	= 2.42	0.00	0.00				
Flow length (ft)	= 380.0	0.0	0.0				
Travel Time (min)	= 2.62	+	0.00	+	0.00	=	2.62
Total Travel Time, Tc				4.30 min			

Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

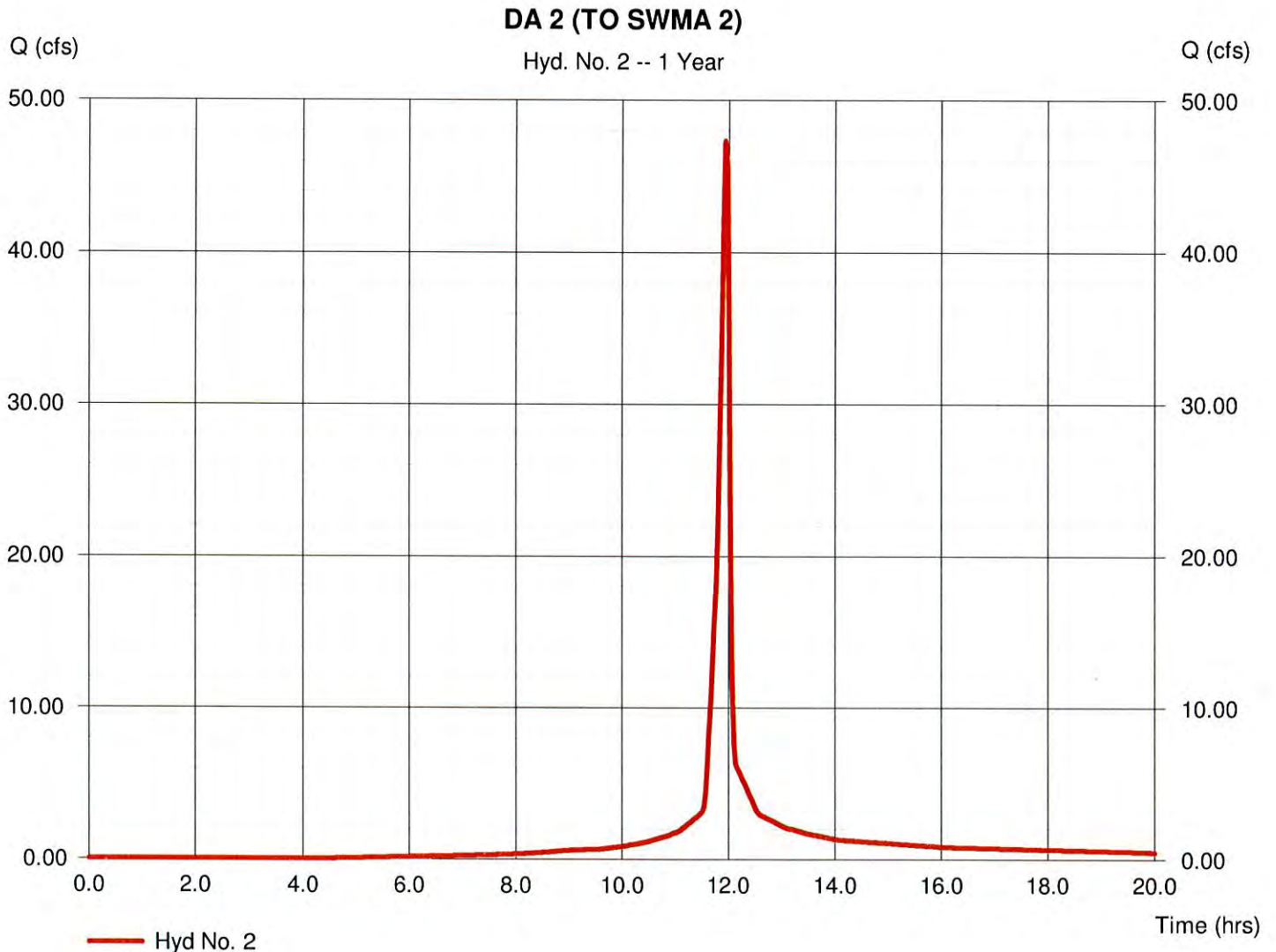
Monday, Sep 13, 2010

Hyd. No. 2

DA 2 (TO SWMA 2)

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 17.720 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 47.32 cfs
Time to peak = 11.93 hrs
Hyd. volume = 100,954 cuft
Curve number = 95
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.30 min
Distribution = Type II
Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 2

DA 2 (TO SWMA 2)

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.011	0.011	0.011				
Flow length (ft)	= 130.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00				
Land slope (%)	= 2.00	0.00	0.00				
Travel Time (min)	= 1.73	+	0.00	+	0.00	=	1.73
Shallow Concentrated Flow							
Flow length (ft)	= 0.00	0.00	0.00				
Watercourse slope (%)	= 0.00	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	= 0.00	0.00	0.00				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow							
X sectional flow area (sqft)	= 1.77	0.00	0.00				
Wetted perimeter (ft)	= 4.71	0.00	0.00				
Channel slope (%)	= 0.50	0.00	0.00				
Manning's n-value	= 0.013	0.015	0.015				
Velocity (ft/s)	= 4.21	0.00	0.00				
Flow length (ft)	= 890.0	0.0	0.0				
Travel Time (min)	= 3.53	+	0.00	+	0.00	=	3.53
Total Travel Time, Tc					5.30 min		

Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

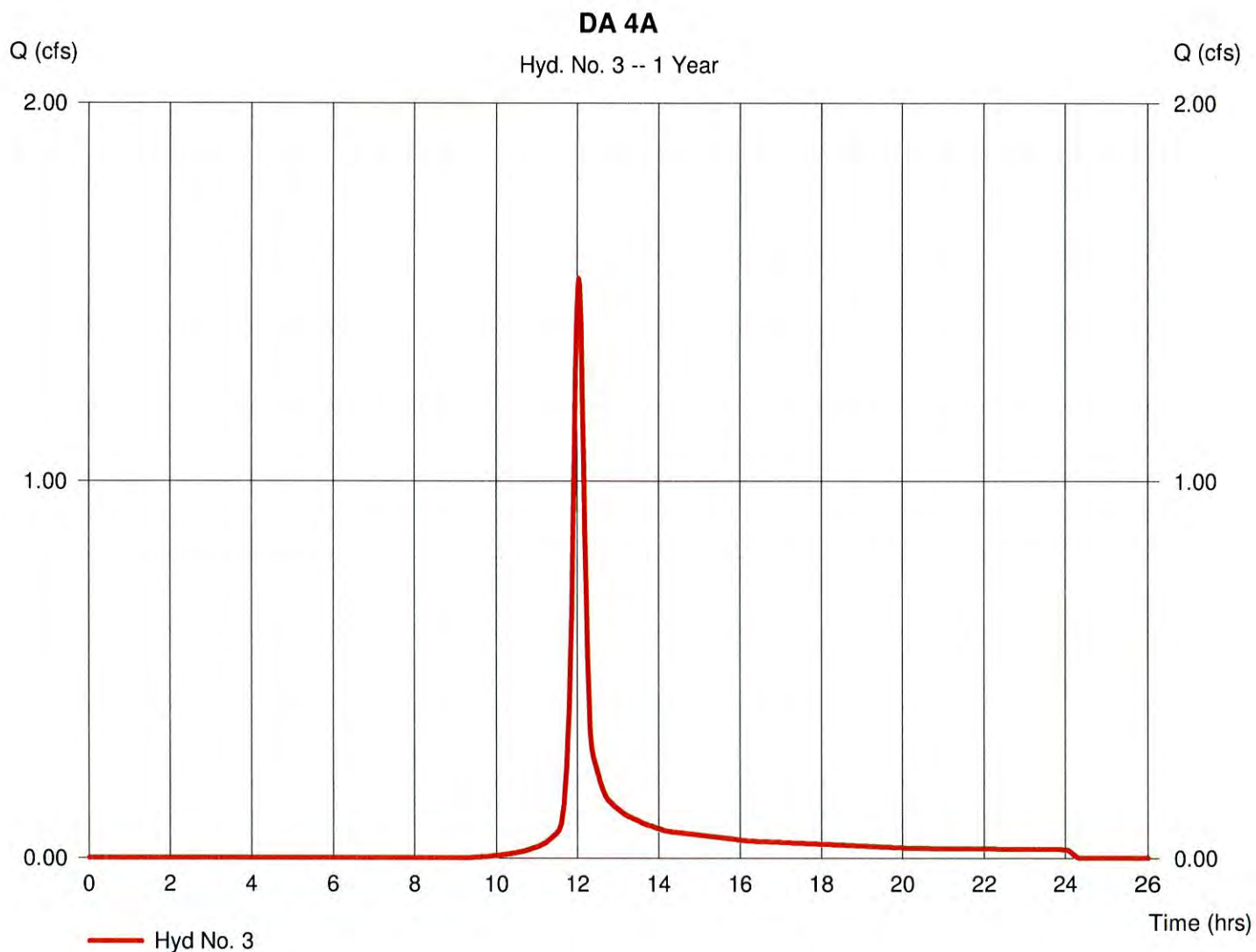
Monday, Sep 13, 2010

Hyd. No. 3

DA 4A

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 1.220 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 1.536 cfs
Time to peak = 12.03 hrs
Hyd. volume = 4,332 cuft
Curve number = 86
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.50 min
Distribution = Type II
Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 3

DA 4A

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.240	0.011	0.011				
Flow length (ft)	= 80.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00				
Land slope (%)	= 2.30	0.00	0.00				
Travel Time (min)	= 13.03	+	0.00	+	0.00	=	13.03
Shallow Concentrated Flow							
Flow length (ft)	= 0.00	0.00	0.00				
Watercourse slope (%)	= 0.00	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	= 0.00	0.00	0.00				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow							
X sectional flow area (sqft)	= 3.25	0.00	0.00				
Wetted perimeter (ft)	= 8.16	0.00	0.00				
Channel slope (%)	= 2.30	0.00	0.00				
Manning's n-value	= 0.040	0.015	0.015				
Velocity (ft/s)	= 3.05	0.00	0.00				
Flow length (ft)	= 450.0	0.0	0.0				
Travel Time (min)	= 2.46	+	0.00	+	0.00	=	2.46
Total Travel Time, Tc				15.50 min			

Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

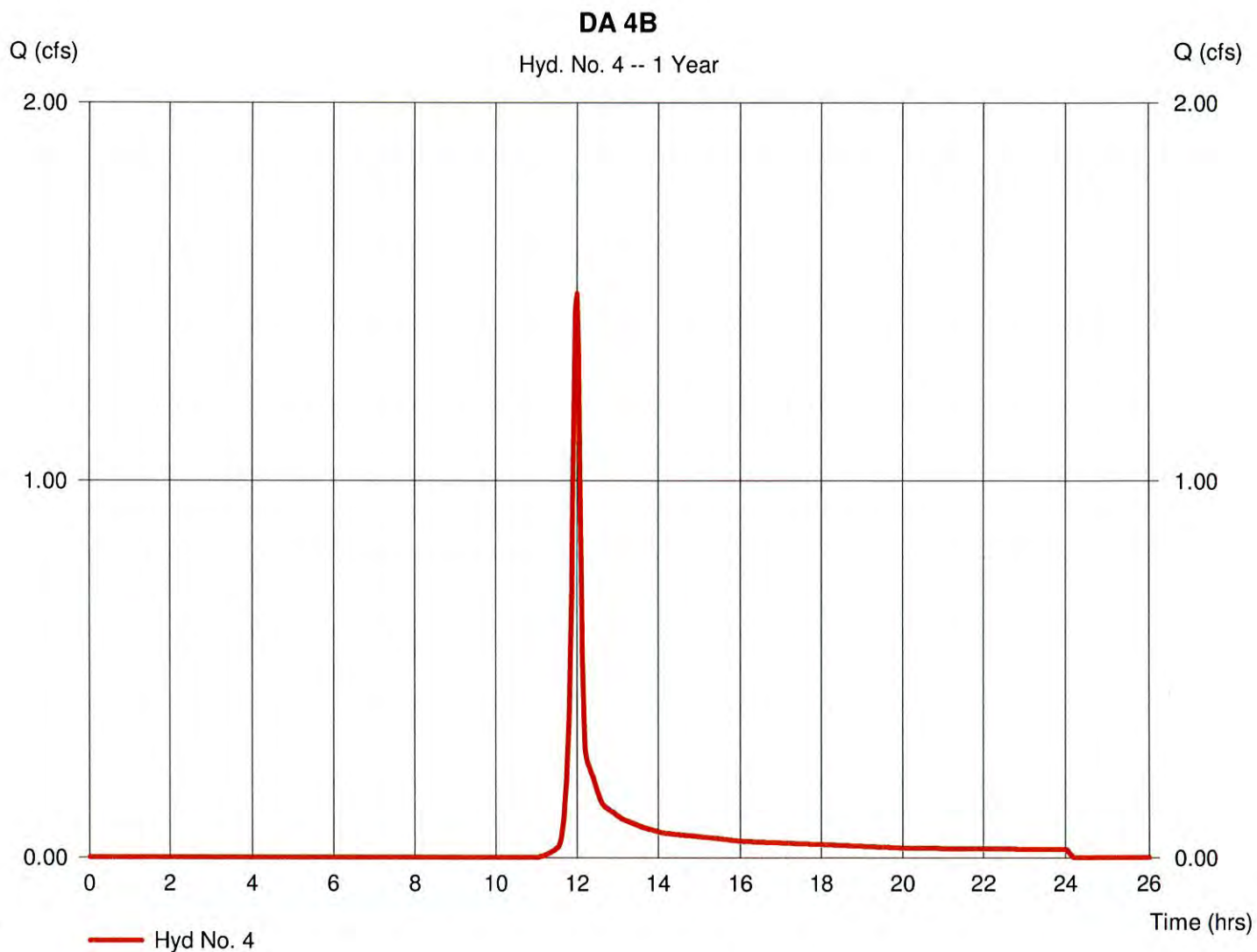
Monday, Sep 13, 2010

Hyd. No. 4

DA 4B

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 1.390 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 1.495 cfs
Time to peak = 12.00 hrs
Hyd. volume = 3,472 cuft
Curve number = 80
Hydraulic length = 0 ft
Time of conc. (Tc) = 9.20 min
Distribution = Type II
Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 4

DA 4B

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>		
Sheet Flow						
Manning's n-value	= 0.240	0.011	0.011			
Flow length (ft)	= 120.0	0.0	0.0			
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00			
Land slope (%)	= 12.50	0.00	0.00			
Travel Time (min)	= 9.16	+	0.00	+	0.00	= 9.16
Shallow Concentrated Flow						
Flow length (ft)	= 0.00	0.00	0.00			
Watercourse slope (%)	= 0.00	0.00	0.00			
Surface description	= Paved	Paved	Paved			
Average velocity (ft/s)	= 0.00	0.00	0.00			
Travel Time (min)	= 0.00	+	0.00	+	0.00	= 0.00
Channel Flow						
X sectional flow area (sqft)	= 0.00	0.00	0.00			
Wetted perimeter (ft)	= 0.00	0.00	0.00			
Channel slope (%)	= 0.00	0.00	0.00			
Manning's n-value	= 0.015	0.015	0.015			
Velocity (ft/s)	= 0.00	0.00	0.00			
Flow length (ft)	= 0.0	0.0	0.0			
Travel Time (min)	= 0.00	+	0.00	+	0.00	= 0.00
Total Travel Time, Tc				9.20 min		

Hydrograph Report

12

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

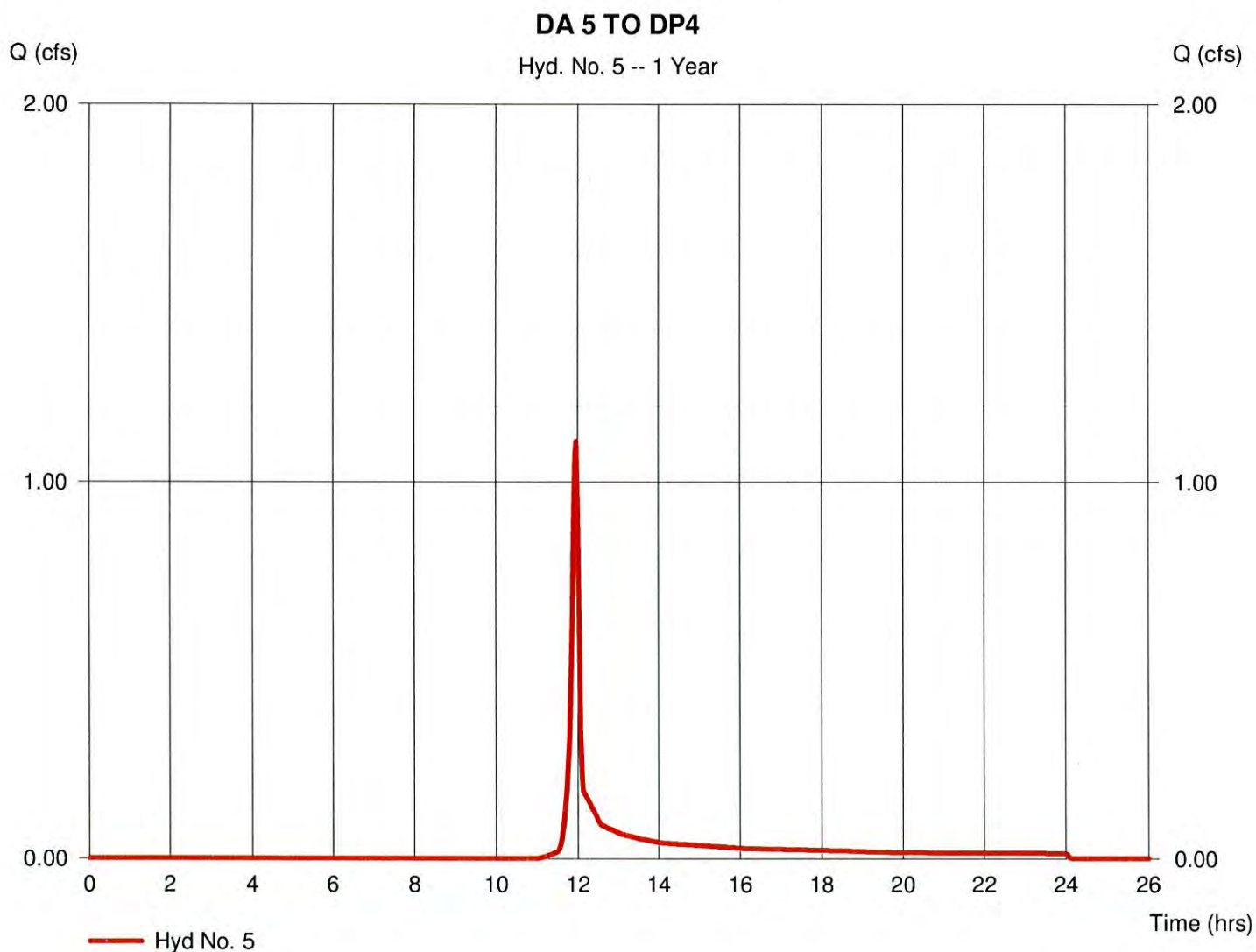
Monday, Sep 13, 2010

Hyd. No. 5

DA 5 TO DP4

Hydrograph type = SCS Runoff
Storm frequency = 1 yrs
Time interval = 2 min
Drainage area = 0.950 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 2.20 in
Storm duration = 24 hrs

Peak discharge = 1.108 cfs
Time to peak = 11.97 hrs
Hyd. volume = 2,225 cuft
Curve number = 80
Hydraulic length = 0 ft
Time of conc. (Tc) = 4.40 min
Distribution = Type II
Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 5

DA 5 TO DP4

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.240	0.011	0.011				
Flow length (ft)	= 60.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00				
Land slope (%)	= 20.00	0.00	0.00				
Travel Time (min)	= 4.36	+	0.00	+	0.00	=	4.36
Shallow Concentrated Flow							
Flow length (ft)	= 0.00	0.00	0.00				
Watercourse slope (%)	= 0.00	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	= 0.00	0.00	0.00				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow							
X sectional flow area (sqft)	= 0.00	0.00	0.00				
Wetted perimeter (ft)	= 0.00	0.00	0.00				
Channel slope (%)	= 0.00	0.00	0.00				
Manning's n-value	= 0.015	0.015	0.015				
Velocity (ft/s)	= 0.00	0.00	0.00				
Flow length (ft)	= 0.0	0.0	0.0				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Total Travel Time, Tc					4.40 min		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

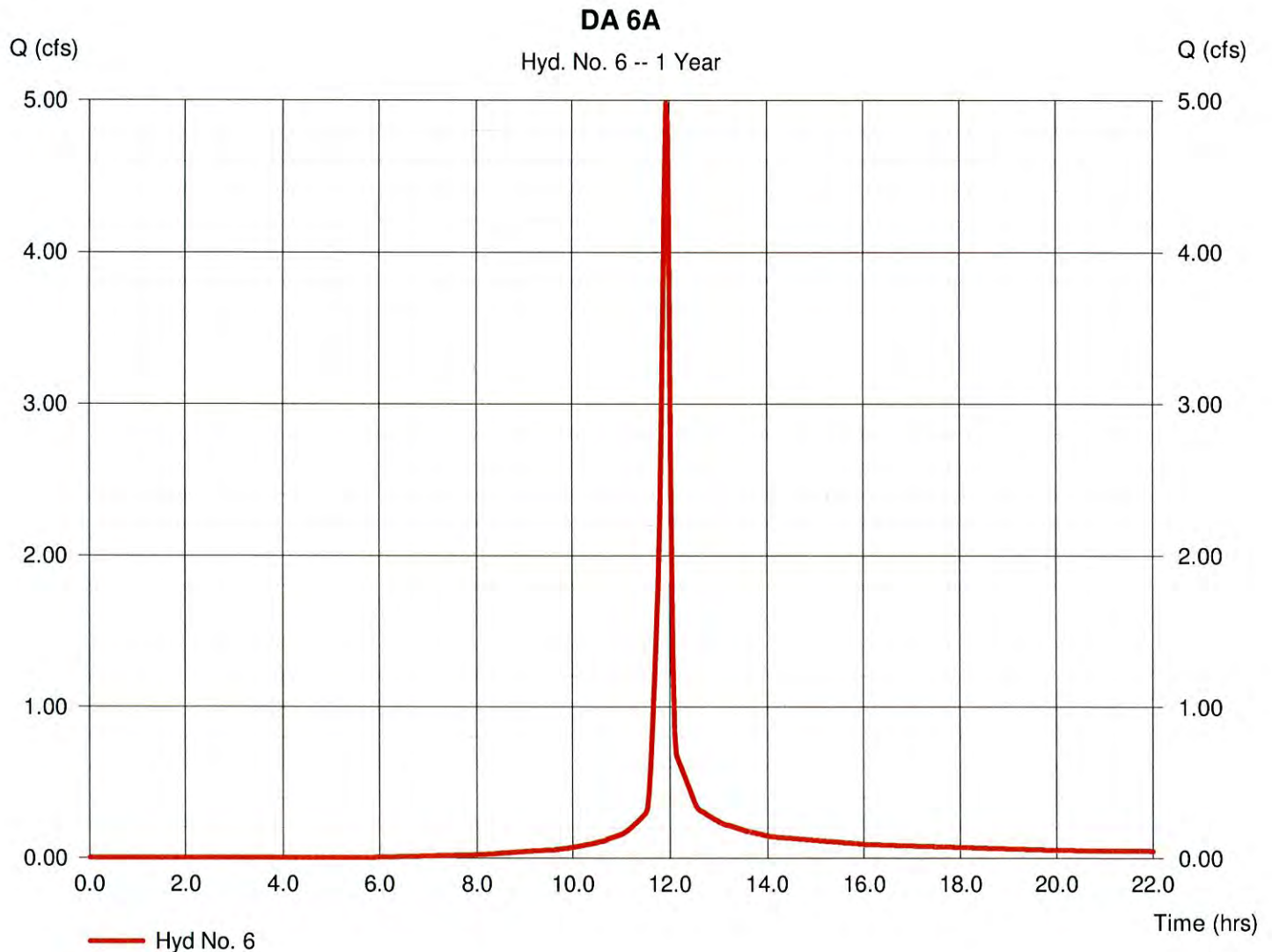
Monday, Sep 13, 2010

Hyd. No. 6

DA 6A

Hydrograph type = SCS Runoff
 Storm frequency = 1 yrs
 Time interval = 2 min
 Drainage area = 2.030 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 2.20 in
 Storm duration = 24 hrs

Peak discharge = 4.983 cfs
 Time to peak = 11.93 hrs
 Hyd. volume = 10,355 cuft
 Curve number = 93
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 3.80 min
 Distribution = Type II
 Shape factor = 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 6

DA 6A

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>		
Sheet Flow						
Manning's n-value	= 0.011	0.011	0.011			
Flow length (ft)	= 150.0	0.0	0.0			
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00			
Land slope (%)	= 2.00	0.00	0.00			
Travel Time (min)	= 1.94	+	0.00	+	0.00	= 1.94
Shallow Concentrated Flow						
Flow length (ft)	= 0.00	0.00	0.00			
Watercourse slope (%)	= 0.00	0.00	0.00			
Surface description	= Paved	Paved	Paved			
Average velocity (ft/s)	= 0.00	0.00	0.00			
Travel Time (min)	= 0.00	+	0.00	+	0.00	= 0.00
Channel Flow						
X sectional flow area (sqft)	= 3.25	0.00	0.00			
Wetted perimeter (ft)	= 8.16	0.00	0.00			
Channel slope (%)	= 1.00	0.00	0.00			
Manning's n-value	= 0.040	0.015	0.015			
Velocity (ft/s)	= 2.01	0.00	0.00			
Flow length (ft)	= 220.0	0.0	0.0			
Travel Time (min)	= 1.82	+	0.00	+	0.00	= 1.82
Total Travel Time, Tc				3.80 min		

Hydrograph Report

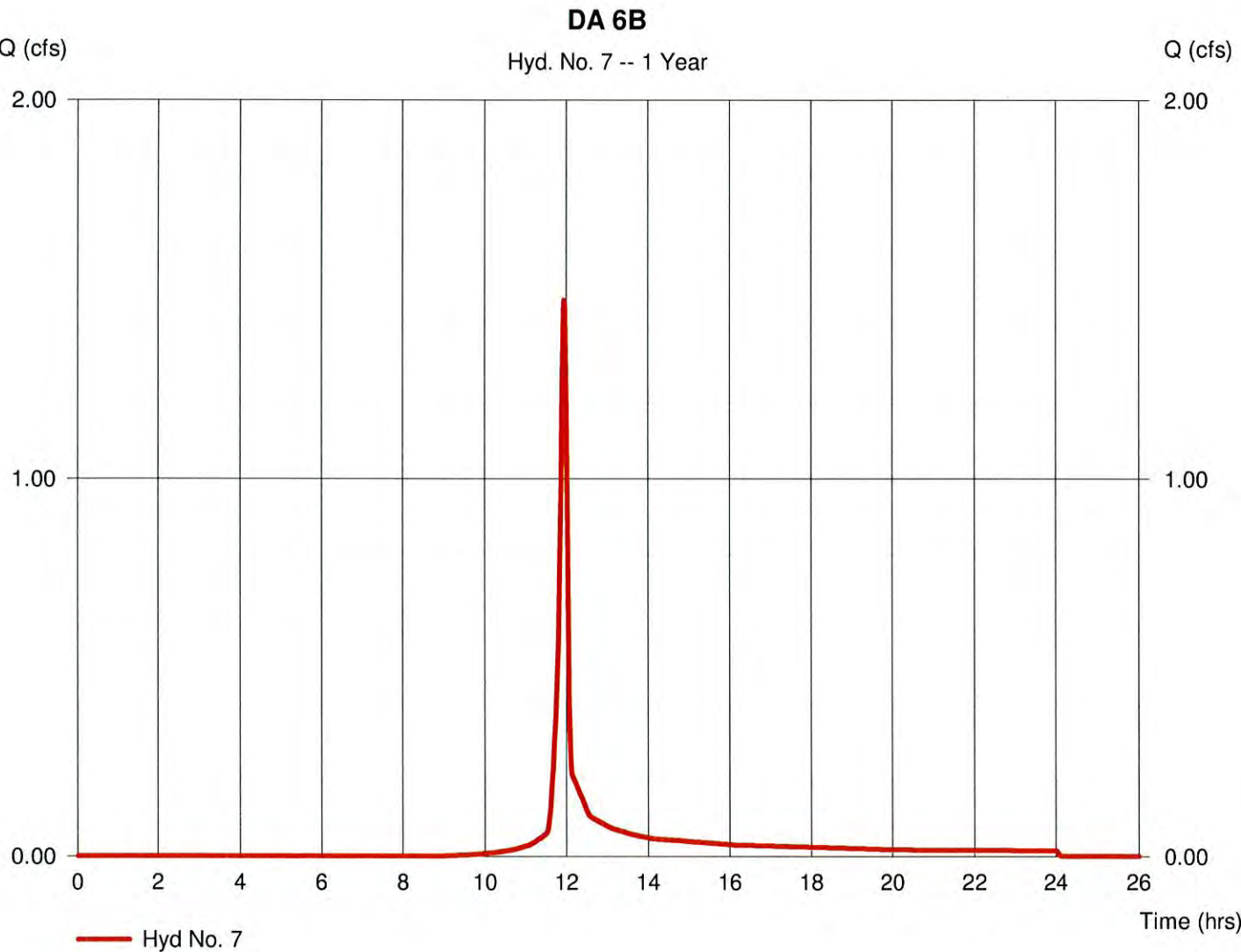
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

Hyd. No. 7

DA 6B

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.471 cfs
Storm frequency	=	1 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	2,971 cuft
Drainage area	=	0.820 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.60 min
Total precip.	=	2.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Hyd. No. 7

DA 6B

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.400	0.011	0.011				
Flow length (ft)	= 17.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 2.40	0.00	0.00				
Land slope (%)	= 19.40	0.00	0.00				
Travel Time (min)	= 2.42	+	0.00	+	0.00	=	2.42
Shallow Concentrated Flow							
Flow length (ft)	= 0.00	0.00	0.00				
Watercourse slope (%)	= 0.00	0.00	0.00				
Surface description	= Paved	Paved	Paved				
Average velocity (ft/s)	= 0.00	0.00	0.00				
Travel Time (min)	= 0.00	+	0.00	+	0.00	=	0.00
Channel Flow							
X sectional flow area (sqft)	= 4.30	0.00	0.00				
Wetted perimeter (ft)	= 11.80	0.00	0.00				
Channel slope (%)	= 1.00	0.00	0.00				
Manning's n-value	= 0.025	0.015	0.015				
Velocity (ft/s)	= 3.03	0.00	0.00				
Flow length (ft)	= 580.0	0.0	0.0				
Travel Time (min)	= 3.19	+	0.00	+	0.00	=	3.19
Total Travel Time, Tc				5.60 min			

Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

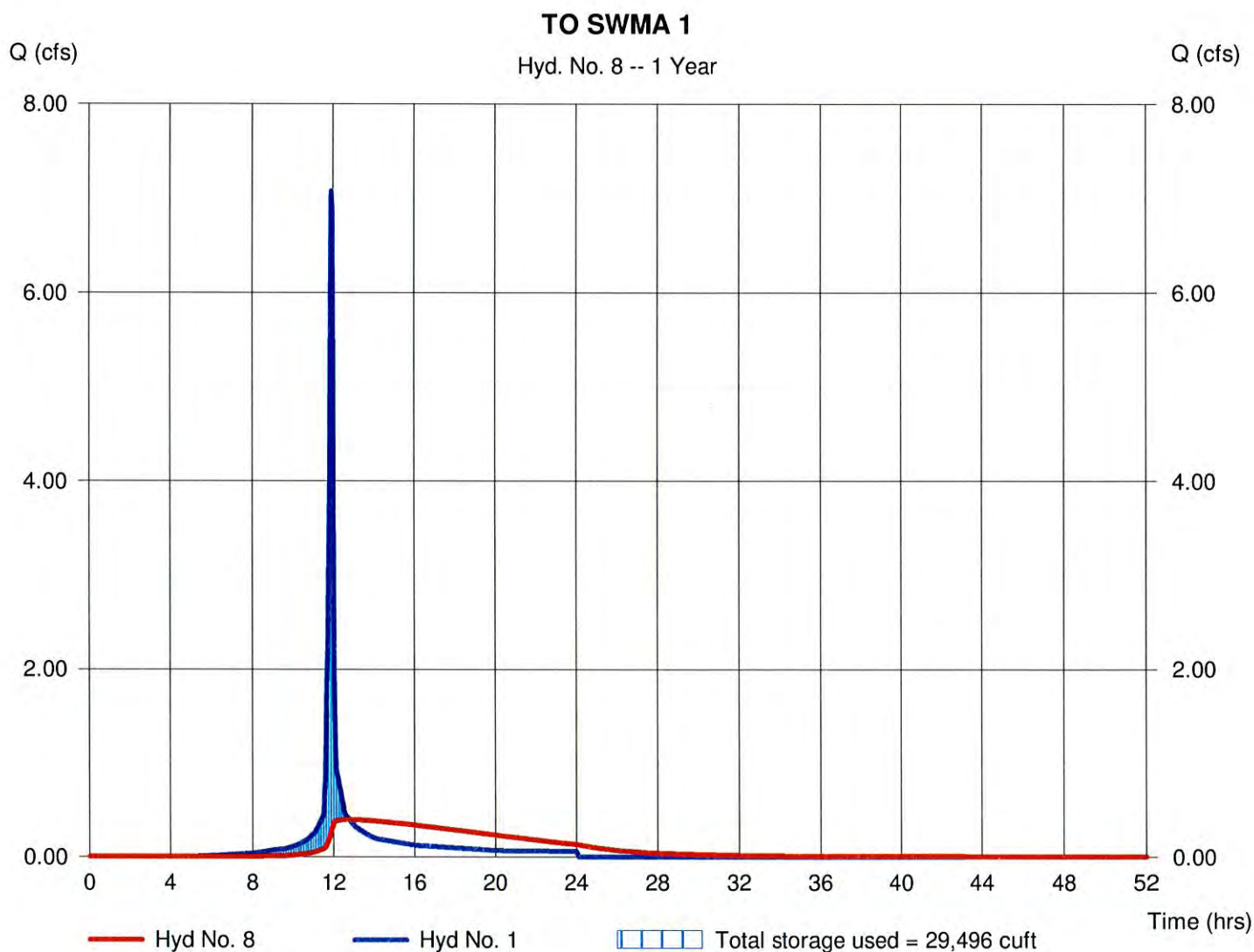
Hyd. No. 8

TO SWMA 1

Hydrograph type = Reservoir
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyd. No. = 1 - DA 1 (TO SWMA1)
Reservoir name = SWMA 1

Peak discharge = 0.395 cfs
Time to peak = 12.80 hrs
Hyd. volume = 14,835 cuft
Max. Elevation = 401.35 ft
Max. Storage = 29,496 cuft

Storage Indication method used. Wet pond routing start elevation = 400.30 ft.



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

Pond No. 1 - SWMA 1

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 393.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	393.00	00	0	0
1.00	394.00	1,002	334	334
2.00	395.00	1,514	1,249	1,583
3.00	396.00	2,114	1,805	3,389
4.00	397.00	2,891	2,492	5,881
5.00	398.00	3,800	3,335	9,216
6.00	399.00	4,812	4,296	13,511
7.00	400.00	5,907	5,350	18,861
7.30	400.30	9,070	2,229	21,090
8.00	401.00	7,059	5,630	26,720
9.00	402.00	8,796	7,911	34,631
10.00	403.00	10,710	9,736	44,367

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	4.00	0.00	0.00
Span (in)	= 18.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 396.20	400.30	0.00	0.00
Length (ft)	= 40.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.50	1.50	20.00	0.00
Crest El. (ft)	= 402.50	401.80	403.00	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= Riser	Rect	Broad	---
Multi-Stage	= Yes	Yes	Yes	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

Hyd. No. 9

TO SWMA 2 (CANAL)

Hydrograph type = Reservoir

Storm frequency = 1 yrs

Time interval = 2 min

Inflow hyd. No. = 2 - DA 2 (TO SWMA 2)

Reservoir name = SWMA 2

Peak discharge = 0.436 cfs

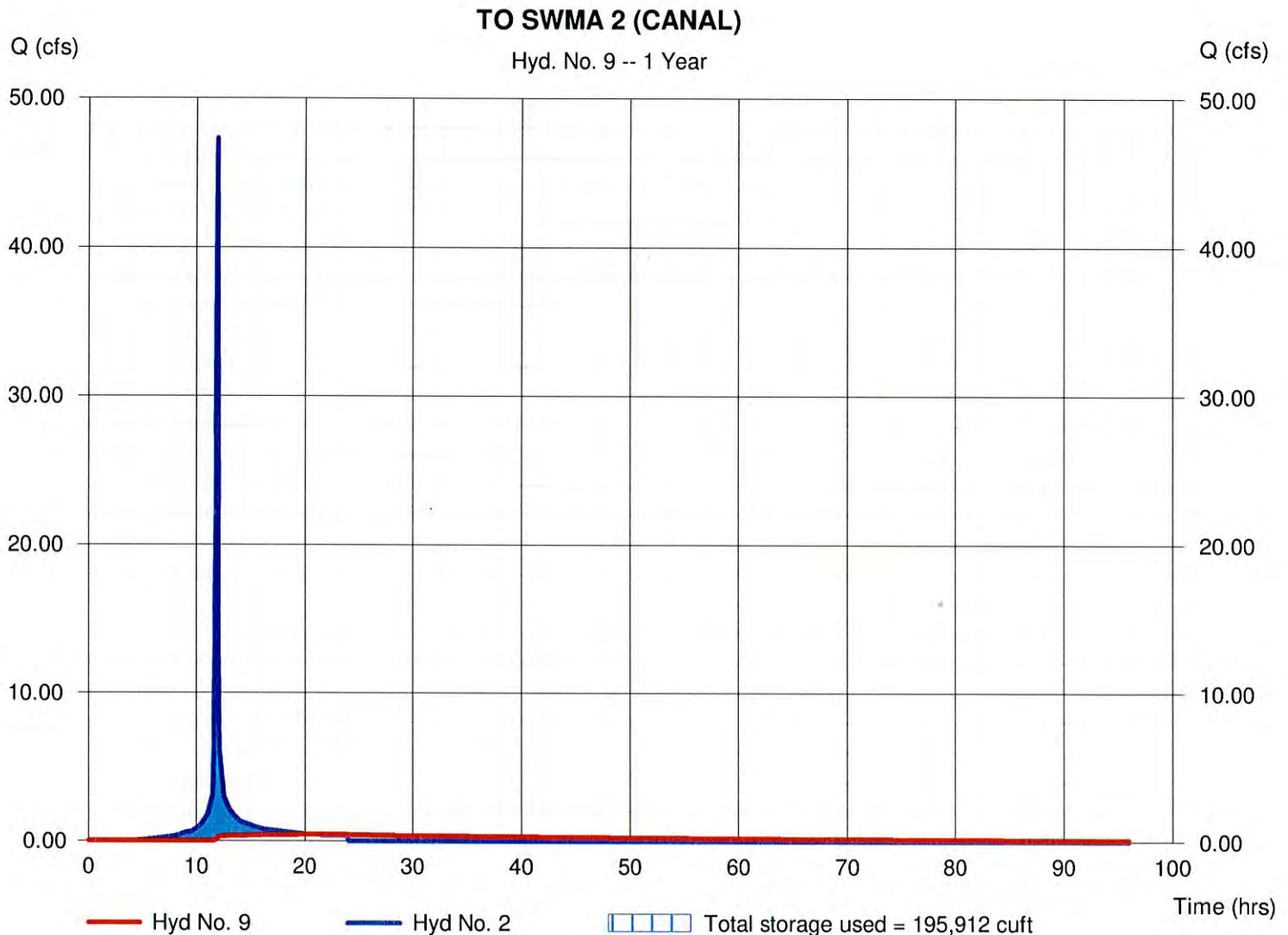
Time to peak = 21.37 hrs

Hyd. volume = 72,497 cuft

Max. Elevation = 397.04 ft

Max. Storage = 195,912 cuft

Storage Indication method used. Wet pond routing start elevation = 396.50 ft.



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

Pond No. 2 - SWMA 2

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 395.70 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	395.70	100,000	0	0
0.30	396.00	139,037	35,690	35,690
1.30	397.00	168,604	153,568	189,258
2.30	398.00	182,627	175,551	364,809
3.30	399.00	195,972	189,241	554,051
4.30	400.00	208,639	202,252	756,303

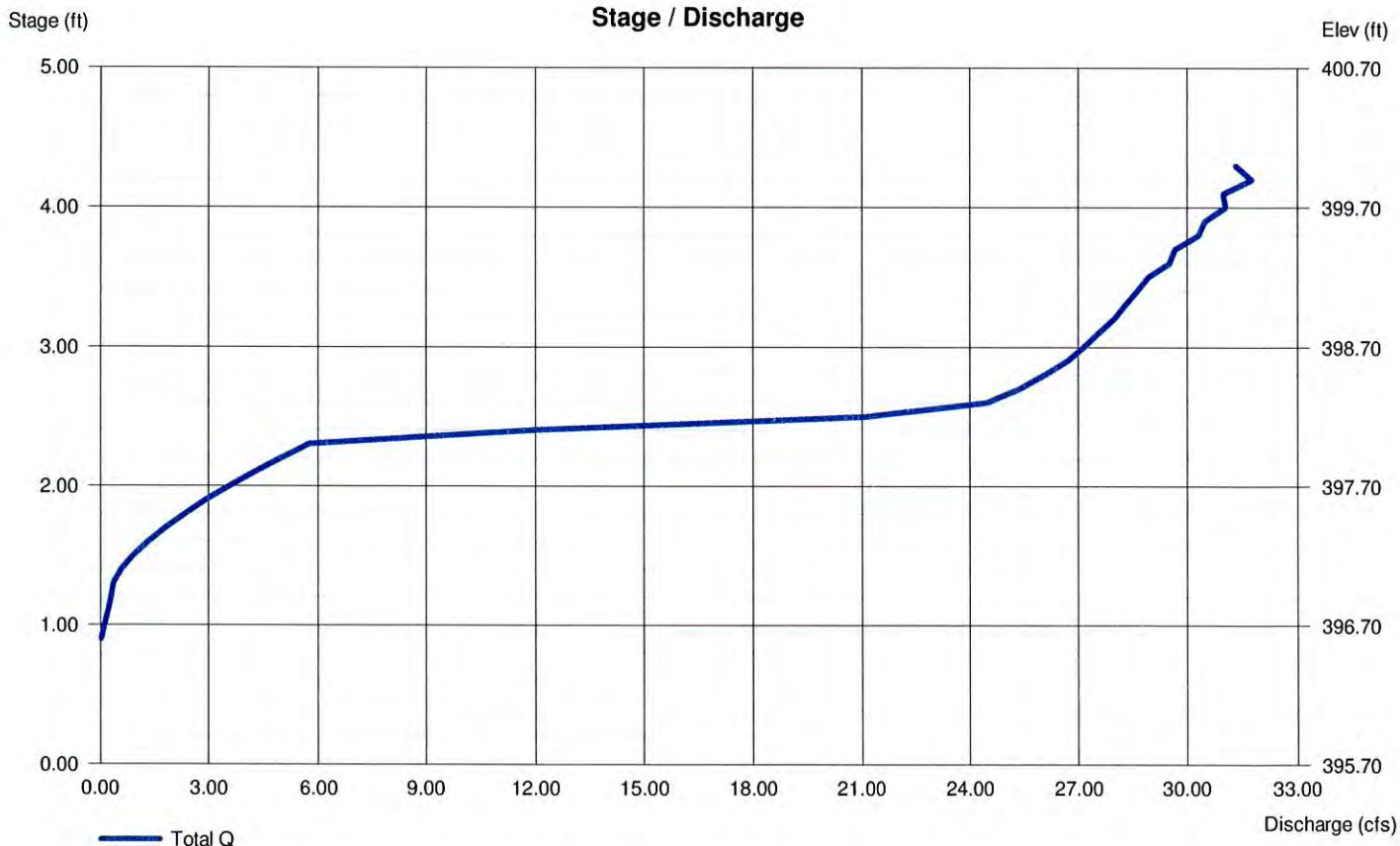
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	5.00	0.00	0.00
Span (in)	= 24.00	5.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 394.45	396.50	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.50	1.50	50.00	0.00
Crest El. (ft)	= 398.00	397.00	398.00	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= Riser	Rect	Broad	---
Multi-Stage	= Yes	Yes	Yes	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

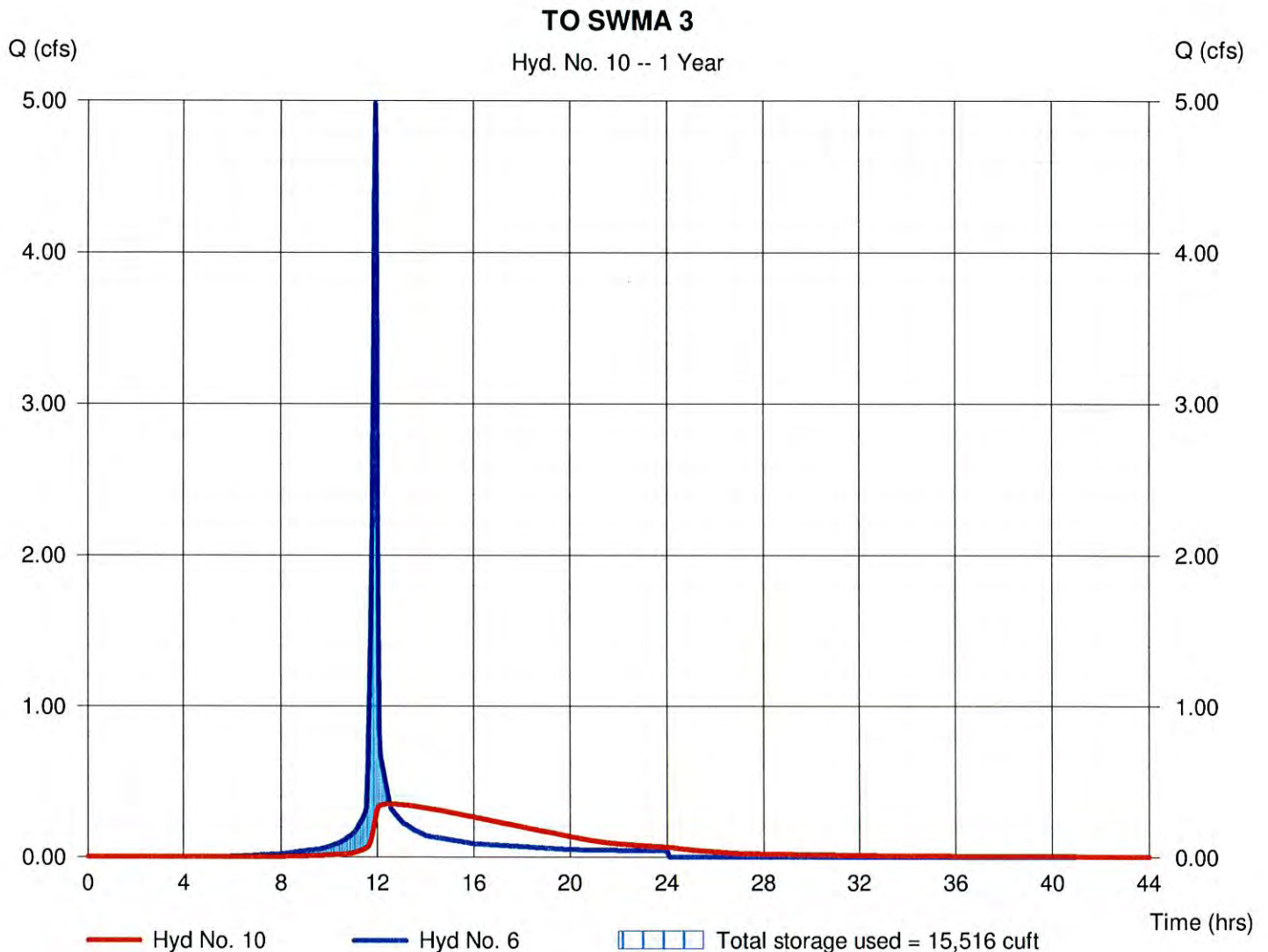
Hyd. No. 10

TO SWMA 3

Hydrograph type = Reservoir
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyd. No. = 6 - DA 6A
Reservoir name = SWMA 3

Peak discharge = 0.350 cfs
Time to peak = 12.53 hrs
Hyd. volume = 10,328 cuft
Max. Elevation = 407.96 ft
Max. Storage = 15,516 cuft

Storage Indication method used. Wet pond routing start elevation = 407.10 ft.



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

Pond No. 3 - SWMA 3

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 403.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	403.00	00	0	0
1.00	404.00	1,110	370	370
2.00	405.00	2,182	1,616	1,986
3.00	406.00	3,585	2,854	4,840
4.00	407.00	5,480	4,499	9,339
5.00	408.00	7,394	6,413	15,751
6.00	409.00	9,715	8,527	24,279
6.50	409.50	13,922	5,877	30,156

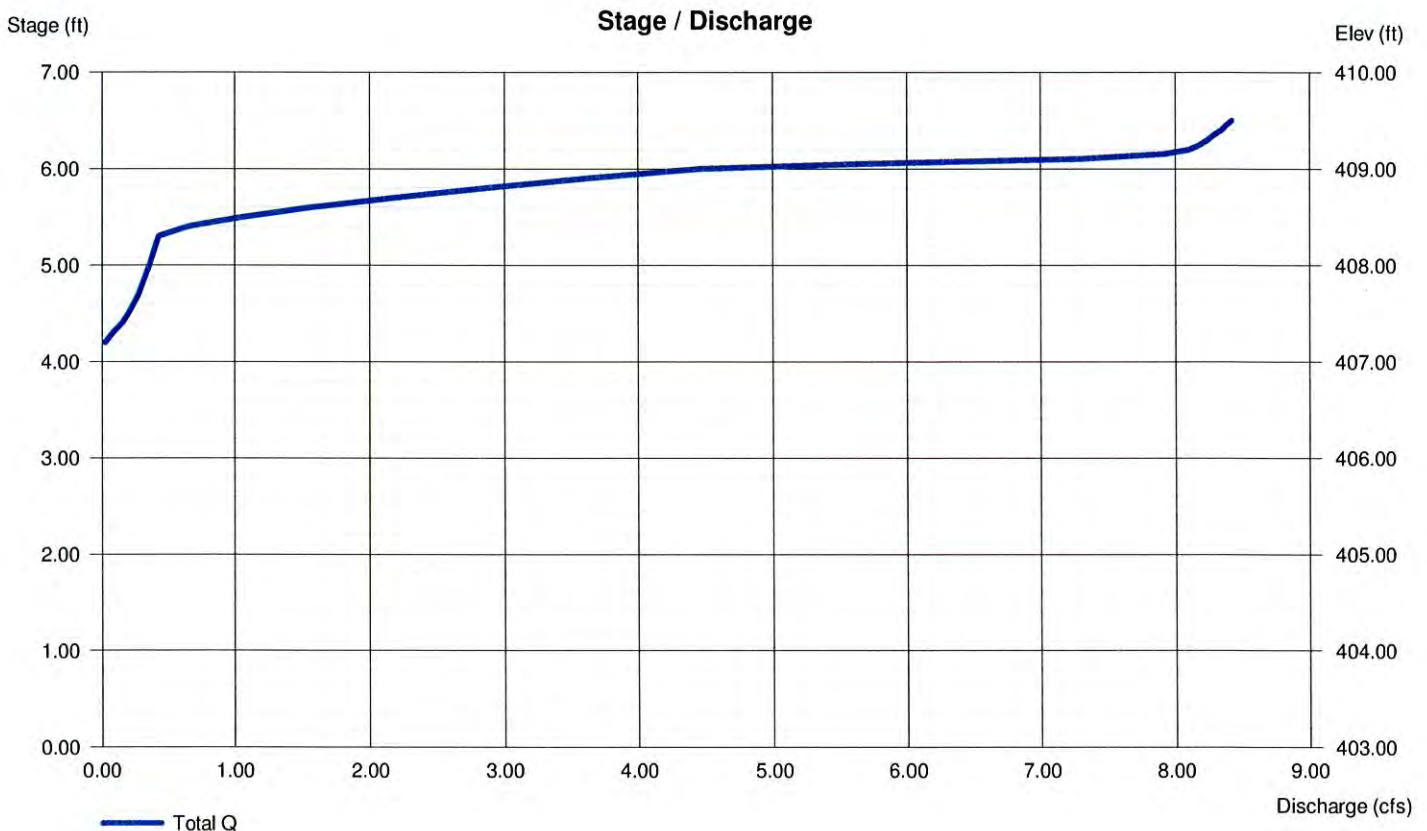
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	4.00	0.00	0.00
Span (in)	= 12.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 404.00	407.10	0.00	0.00
Length (ft)	= 30.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.50	2.00	10.00	0.00
Crest El. (ft)	= 409.00	408.30	409.00	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= Riser	Rect	Broad	---
Multi-Stage	= Yes	Yes	Yes	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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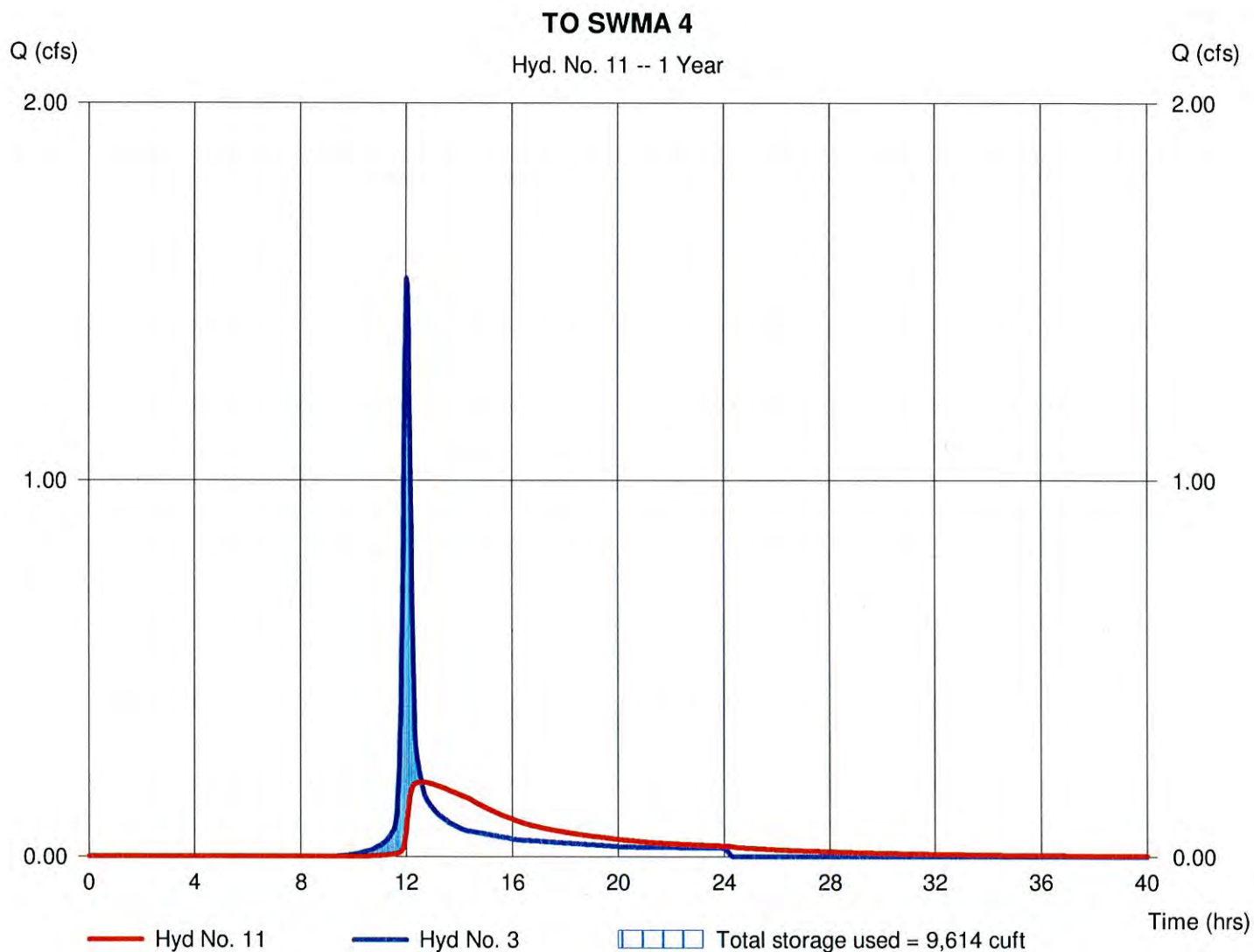
Hyd. No. 11

TO SWMA 4

Hydrograph type = Reservoir
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyd. No. = 3 - DA 4A
Reservoir name = SWMA 4

Peak discharge = 0.198 cfs
Time to peak = 12.60 hrs
Hyd. volume = 4,310 cuft
Max. Elevation = 403.39 ft
Max. Storage = 9,614 cuft

Storage Indication method used. Wet pond routing start elevation = 403.00 ft.



Pond Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

Pond No. 4 - SWMA 4

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 399.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	399.00	00	0	0
1.00	400.00	1,038	346	346
2.00	401.00	1,671	1,342	1,688
3.00	402.00	2,968	2,288	3,976
4.00	403.00	4,374	3,648	7,624
5.00	404.00	5,862	5,099	12,724
6.00	405.00	7,417	6,624	19,347

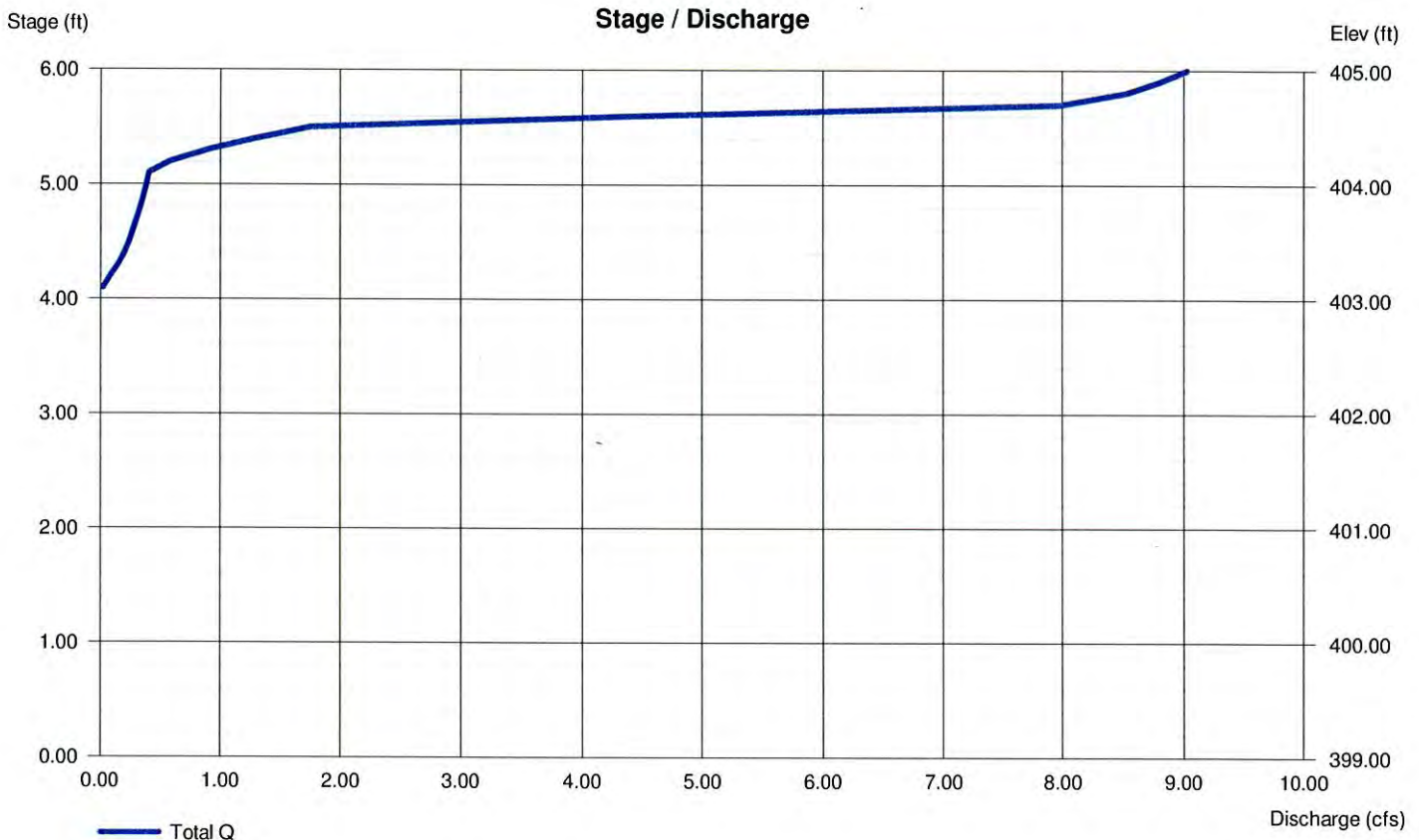
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	4.00	0.00	0.00
Span (in)	= 15.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 402.00	403.00	0.00	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.50	1.50	10.00	0.00
Crest El. (ft)	= 404.50	404.10	404.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= Riser	Rect	Broad	---
Multi-Stage	= Yes	Yes	Yes	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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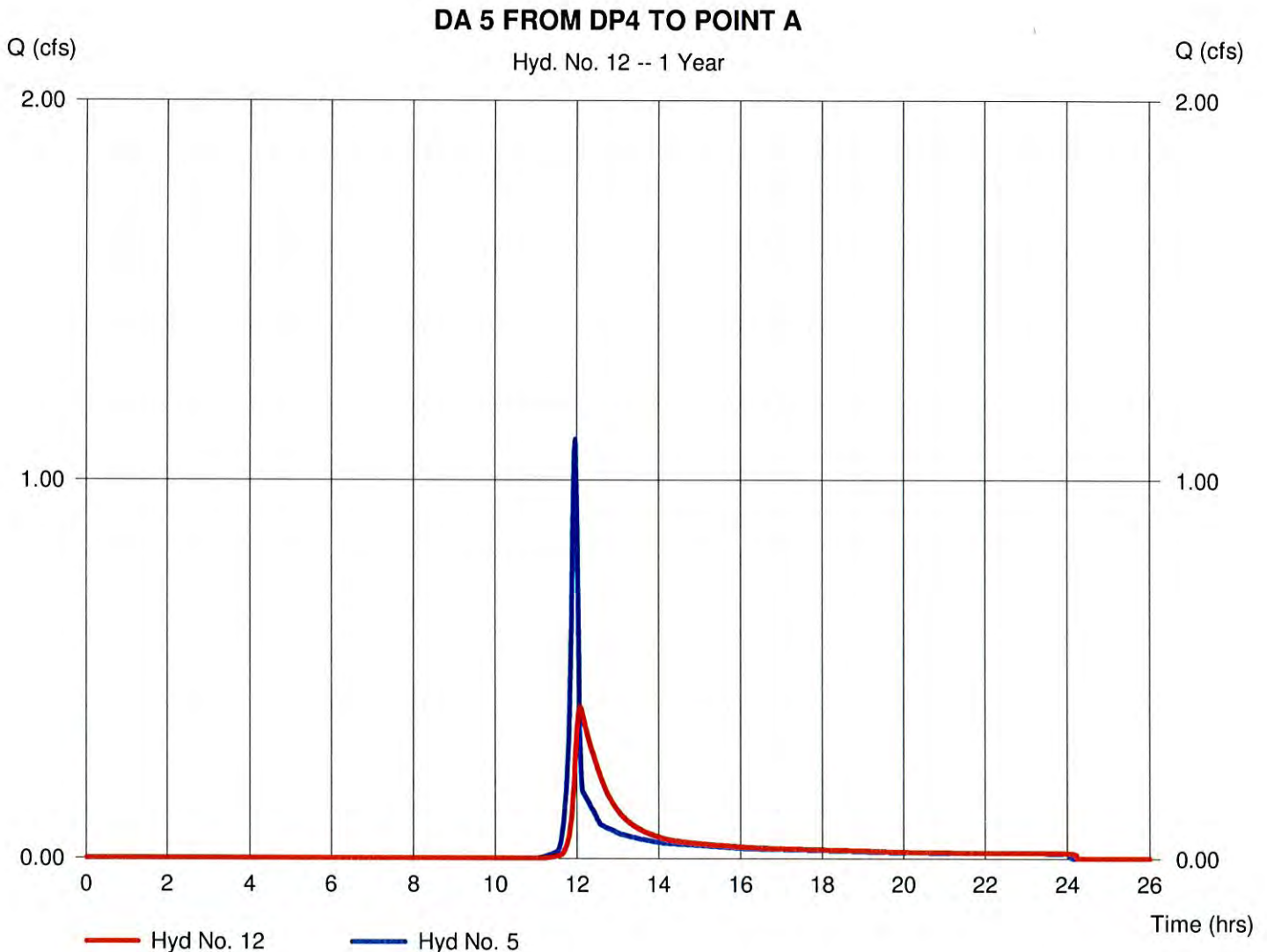
Hyd. No. 12

DA 5 FROM DP4 TO POINT A

Hydrograph type = Reach
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyd. No. = 5 - DA 5 TO DP4
Reach length = 1150.0 ft
Manning's n = 0.040
Side slope = 20.0:1
Rating curve x = 0.805
Ave. velocity = 0.80 ft/s

Peak discharge = 0.400 cfs
Time to peak = 12.07 hrs
Hyd. volume = 2,210 cuft
Section type = Trapezoidal
Channel slope = 0.4 %
Bottom width = 5.0 ft
Max. depth = 1.0 ft
Rating curve m = 0.976
Routing coeff. = 0.0782

Modified Att-Kin routing method used.



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

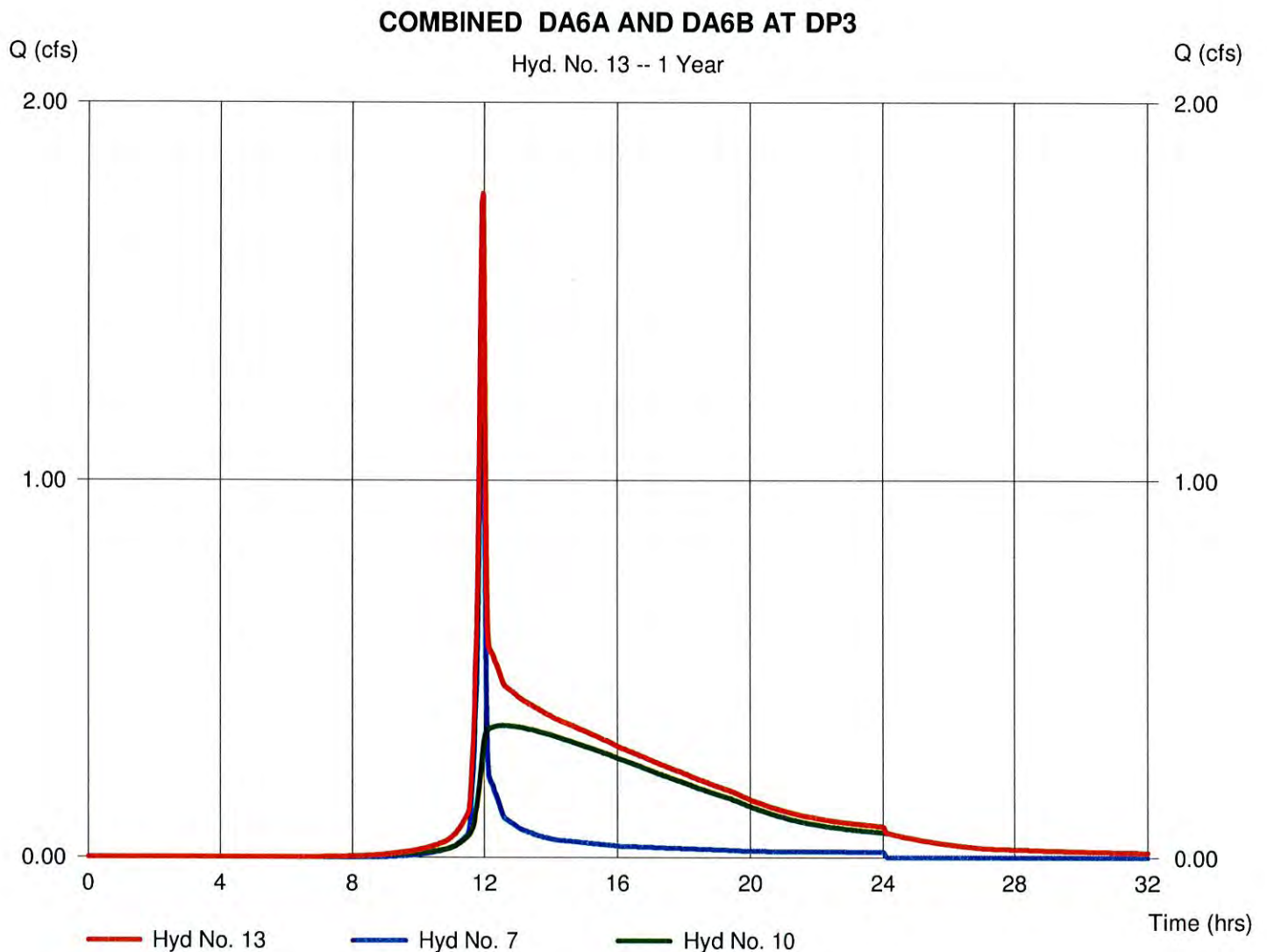
Monday, Sep 13, 2010

Hyd. No. 13

COMBINED DA6A AND DA6B AT DP3

Hydrograph type = Combine
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyds. = 7, 10

Peak discharge = 1.759 cfs
Time to peak = 11.97 hrs
Hyd. volume = 13,299 cuft
Contrib. drain. area = 0.820 ac



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

Hyd. No. 14

DA 6A AND DA6B FROM POINT DP3 TO POINT A

Hydrograph type = Reach

Storm frequency = 1 yrs

Time interval = 2 min

Inflow hyd. No. = 13 - COMBINED DA6A AND DA6B AT DP3

Reach length = 1815.0 ft

Manning's n = 0.040

Side slope = 20.0:1

Rating curve x = 0.403

Ave. velocity = 0.39 ft/s

Peak discharge = 0.403 cfs

Time to peak = 13.43 hrs

Hyd. volume = 13,057 cuft

Section type = Trapezoidal

Channel slope = 0.1 %

Bottom width = 5.0 ft

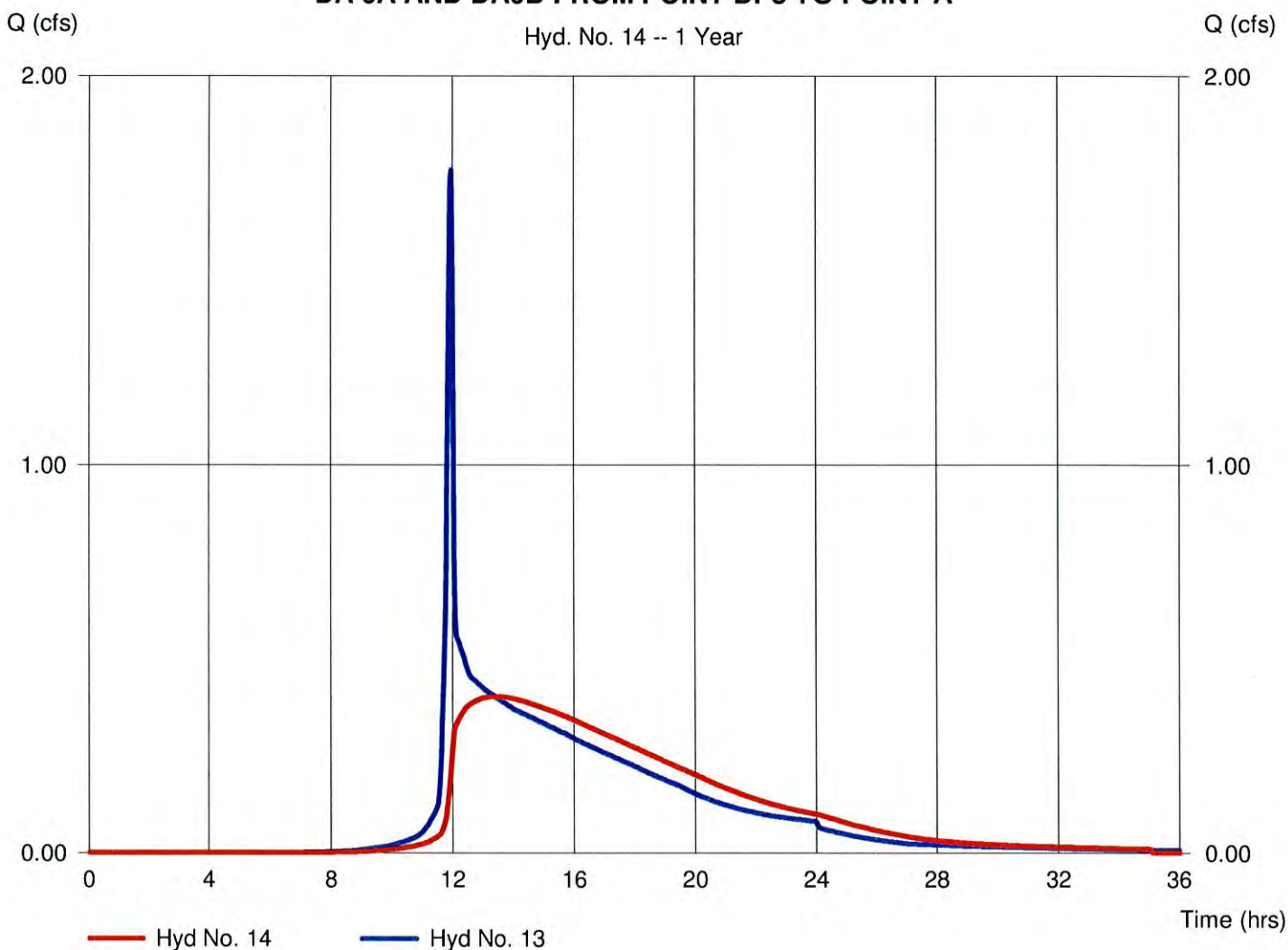
Max. depth = 1.0 ft

Rating curve m = 0.976

Routing coeff. = 0.0248

Modified Att-Kin routing method used.

DA 6A AND DA6B FROM POINT DP3 TO POINT A



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

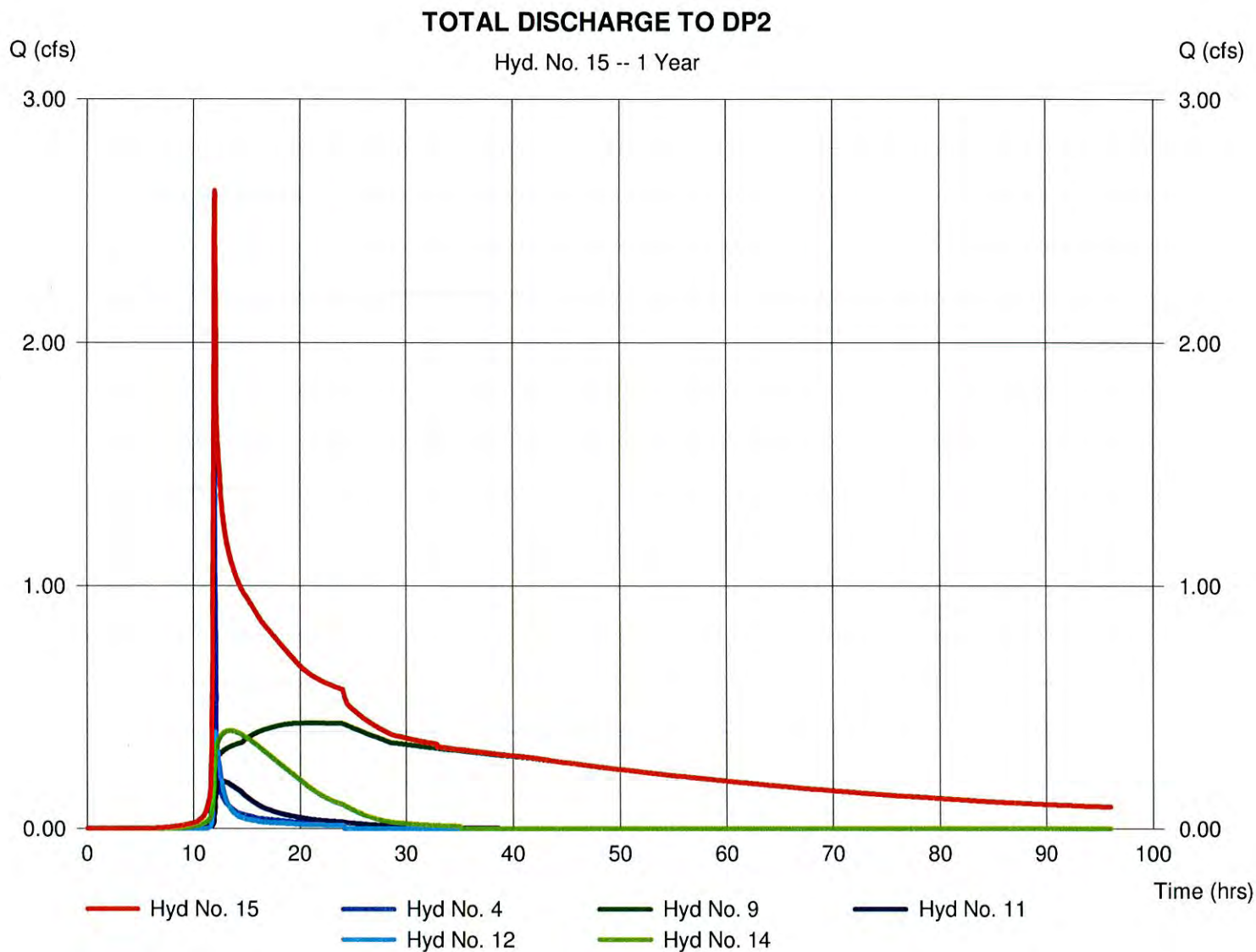
Monday, Sep 13, 2010

Hyd. No. 15

TOTAL DISCHARGE TO DP2

Hydrograph type = Combine
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyds. = 4, 9, 11, 12, 14

Peak discharge = 2.624 cfs
Time to peak = 12.00 hrs
Hyd. volume = 94,441 cuft
Contrib. drain. area = 1.390 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	13.40	2	716	29,385	-----	-----	-----	DA 1 (TO SWMA1)
2	SCS Runoff	87.62	2	716	195,024	-----	-----	-----	DA 2 (TO SWMA 2)
3	SCS Runoff	3.627	2	722	10,216	-----	-----	-----	DA 4A
4	SCS Runoff	4.140	2	718	9,474	-----	-----	-----	DA 4B
5	SCS Runoff	3.006	2	716	6,070	-----	-----	-----	DA 5 TO DP4
6	SCS Runoff	9.653	2	716	20,901	-----	-----	-----	DA 6A
7	SCS Runoff	3.325	2	716	6,848	-----	-----	-----	DA 6B
8	Reservoir	1.755	2	728	29,339	1	402.19	36,447	TO SWMA 1
9	Reservoir	1.723	2	924	160,179	2	397.38	256,333	TO SWMA 2 (CANAL)
10	Reservoir	1.393	2	728	20,874	6	408.56	20,560	TO SWMA 3
11	Reservoir	0.386	2	758	10,194	3	404.01	12,804	TO SWMA 4
12	Reach	1.183	2	724	6,055	5	-----	-----	DA 5 FROM DP4 TO POINT A
13	Combine	3.783	2	718	27,722	7, 10,	-----	-----	COMBINED DA6A AND DA6B AT D
14	Reach	1.078	2	770	27,480	13	-----	-----	DA 6A AND DA6B FROM POINT DP3
15	Combine	7.360	2	720	210,593	4, 9, 11, 12, 14	-----	-----	TOTAL DISCHARGE TO DP2
POST DEV CONDITIONS.gpw					Return Period: 10 Year			Monday, Sep 13, 2010	

Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

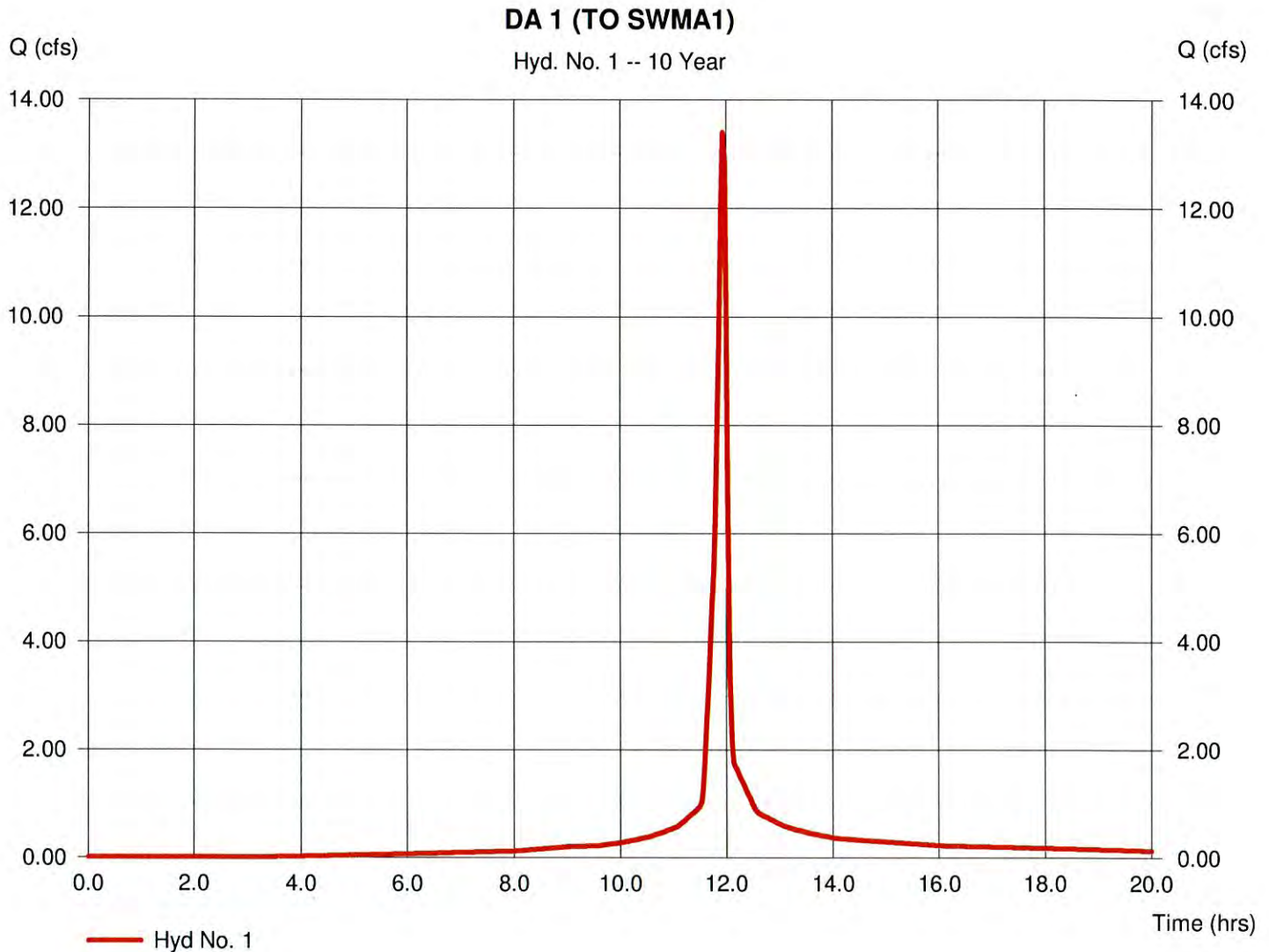
Monday, Sep 13, 2010

Hyd. No. 1

DA 1 (TO SWMA1)

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 2.760 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 13.40 cfs
Time to peak = 11.93 hrs
Hyd. volume = 29,385 cuft
Curve number = 94
Hydraulic length = 0 ft
Time of conc. (Tc) = 4.30 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

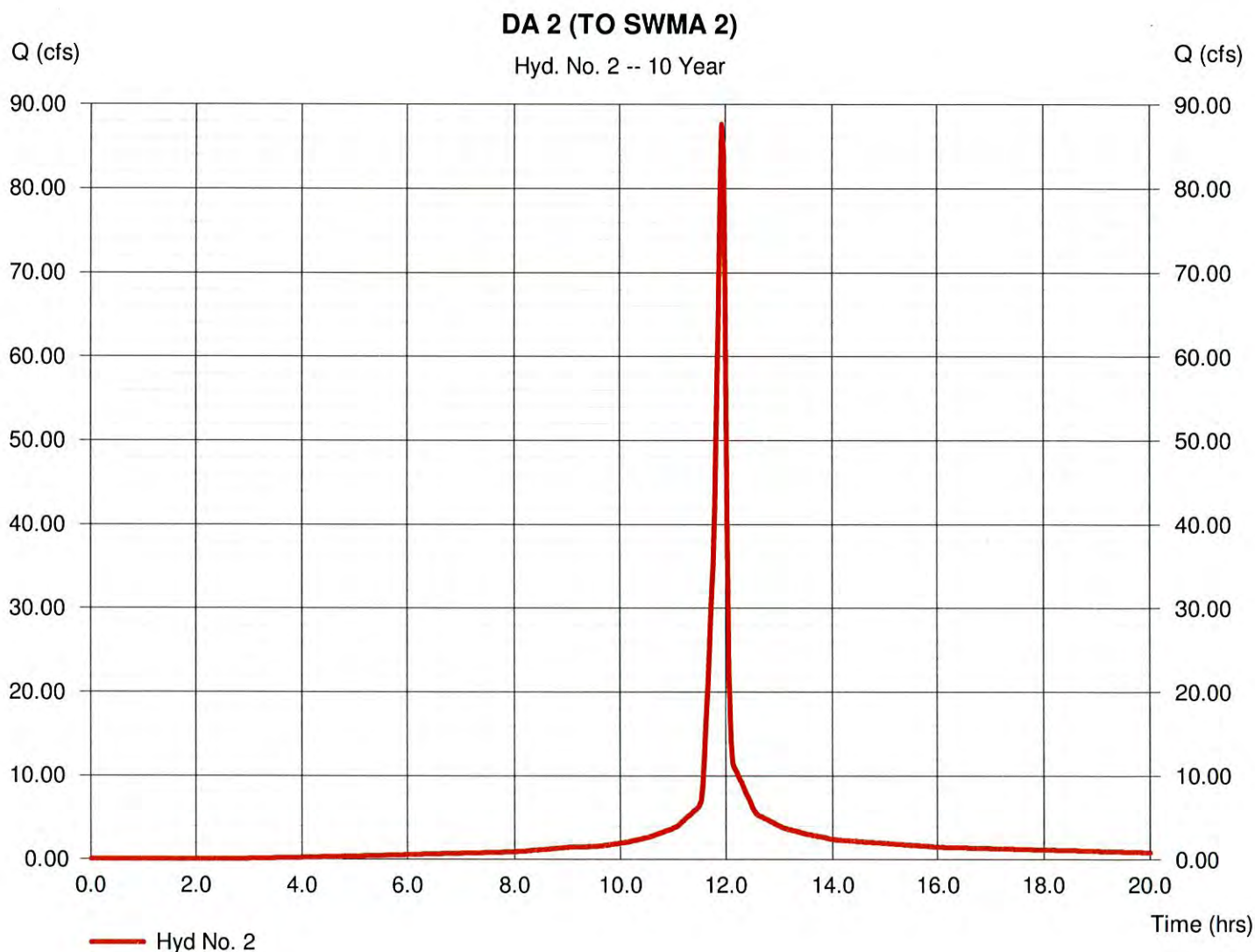
Monday, Sep 13, 2010

Hyd. No. 2

DA 2 (TO SWMA 2)

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 17.720 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 87.62 cfs
Time to peak = 11.93 hrs
Hyd. volume = 195,024 cuft
Curve number = 95
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.30 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

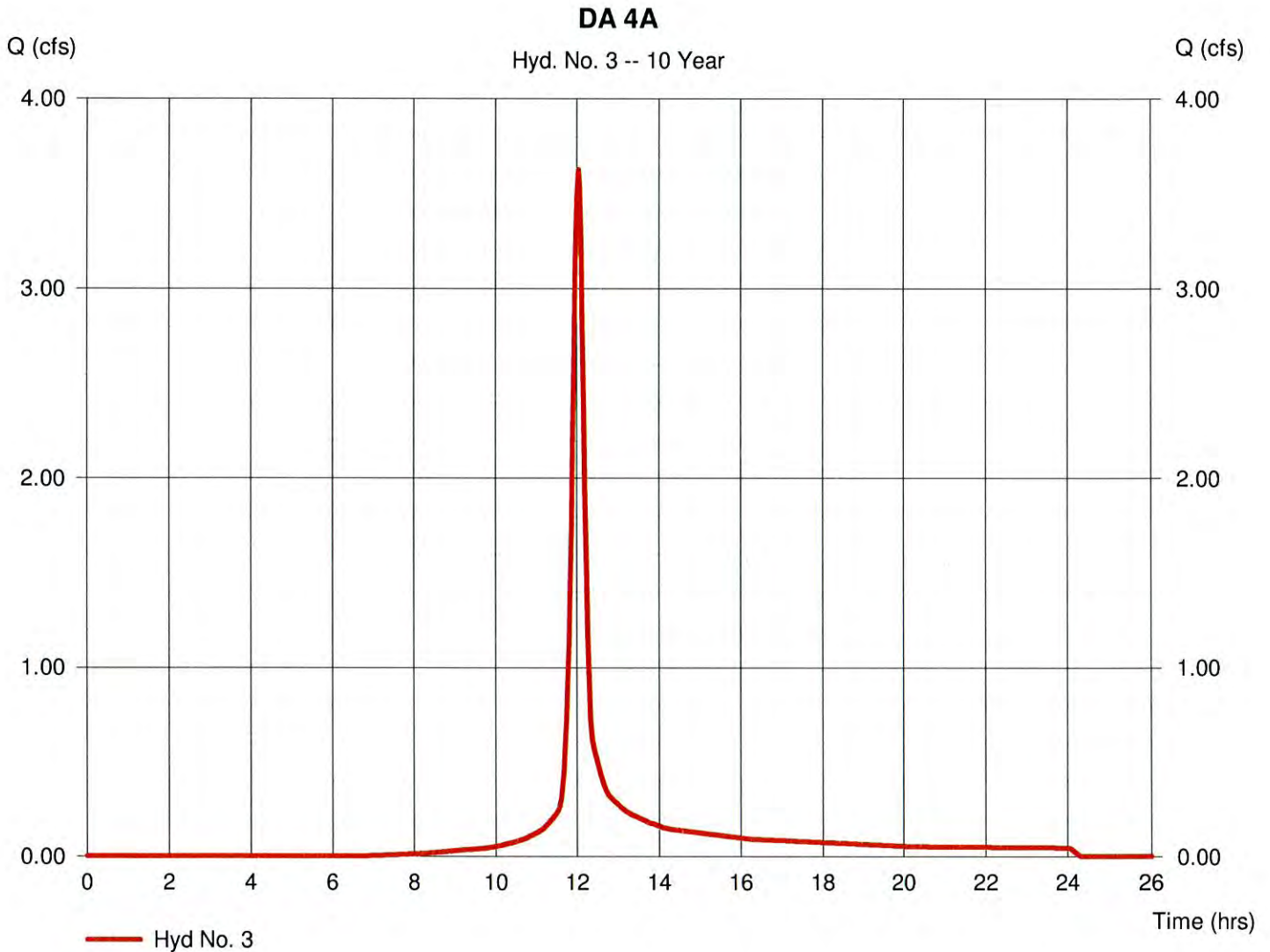
Monday, Sep 13, 2010

Hyd. No. 3

DA 4A

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 1.220 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 3.627 cfs
Time to peak = 12.03 hrs
Hyd. volume = 10,216 cuft
Curve number = 86
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.50 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

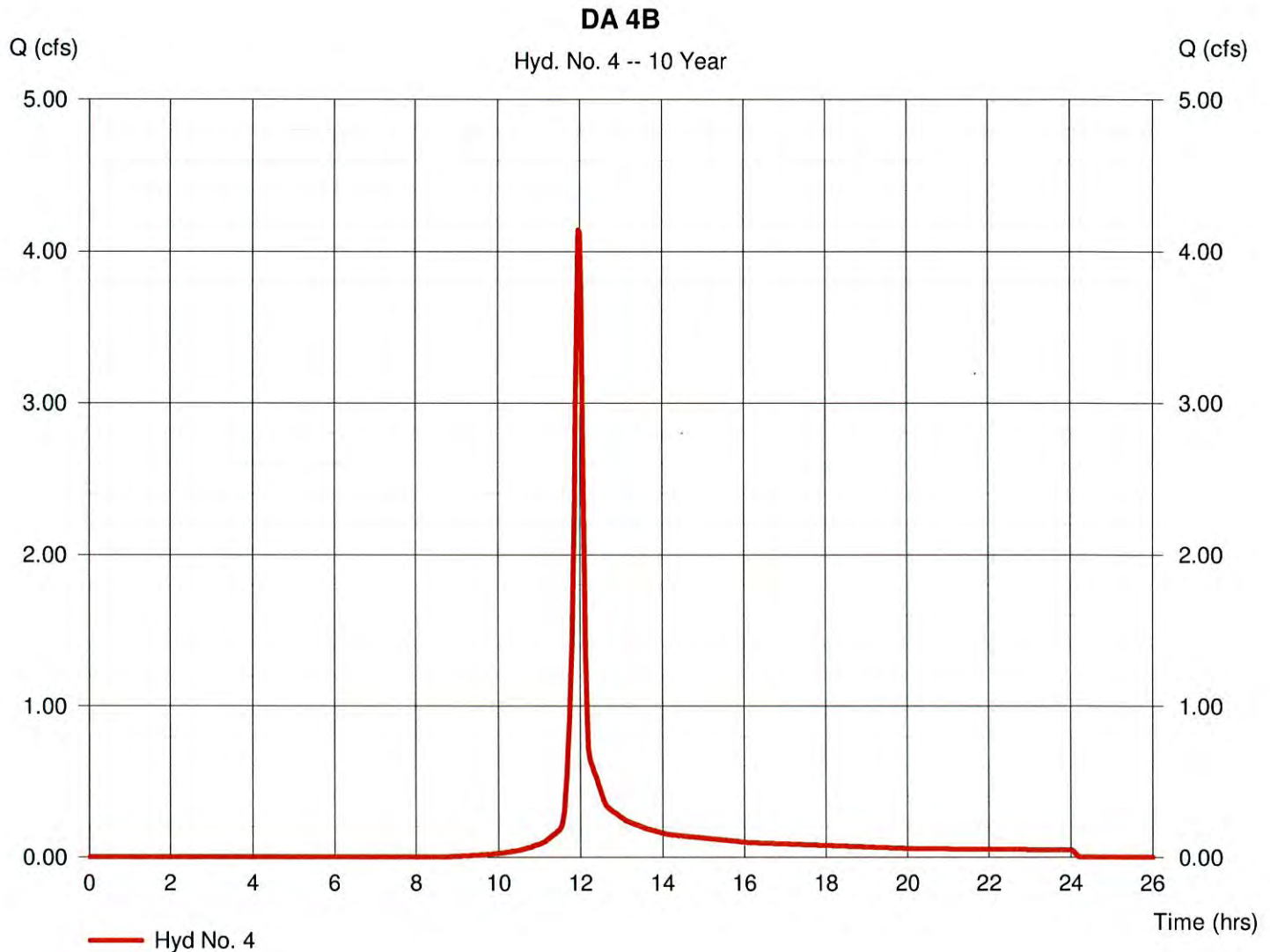
Monday, Sep 13, 2010

Hyd. No. 4

DA 4B

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 1.390 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 4.140 cfs
Time to peak = 11.97 hrs
Hyd. volume = 9,474 cuft
Curve number = 80
Hydraulic length = 0 ft
Time of conc. (Tc) = 9.20 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

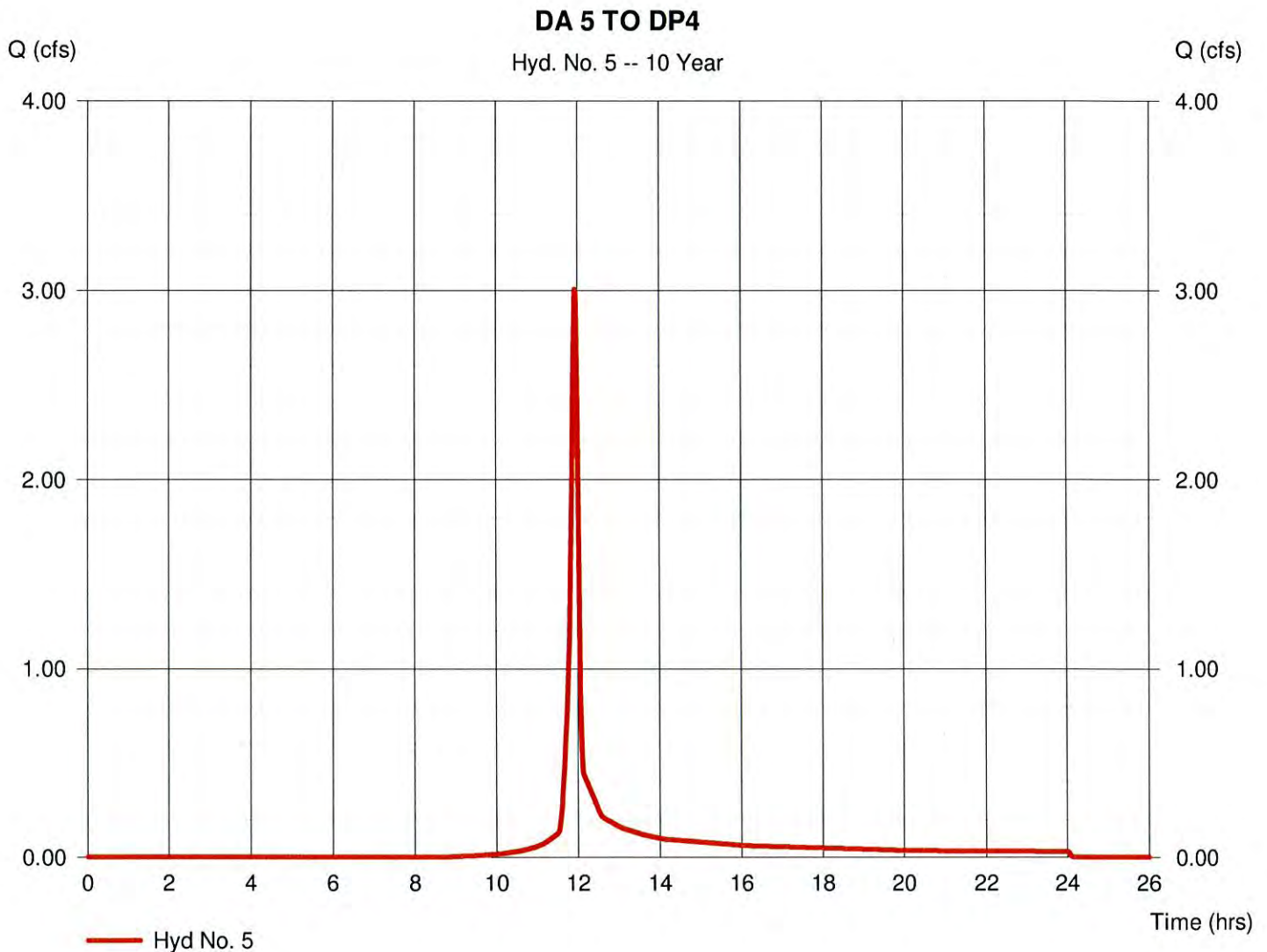
Monday, Sep 13, 2010

Hyd. No. 5

DA 5 TO DP4

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 0.950 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 3.006 cfs
Time to peak = 11.93 hrs
Hyd. volume = 6,070 cuft
Curve number = 80
Hydraulic length = 0 ft
Time of conc. (Tc) = 4.40 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

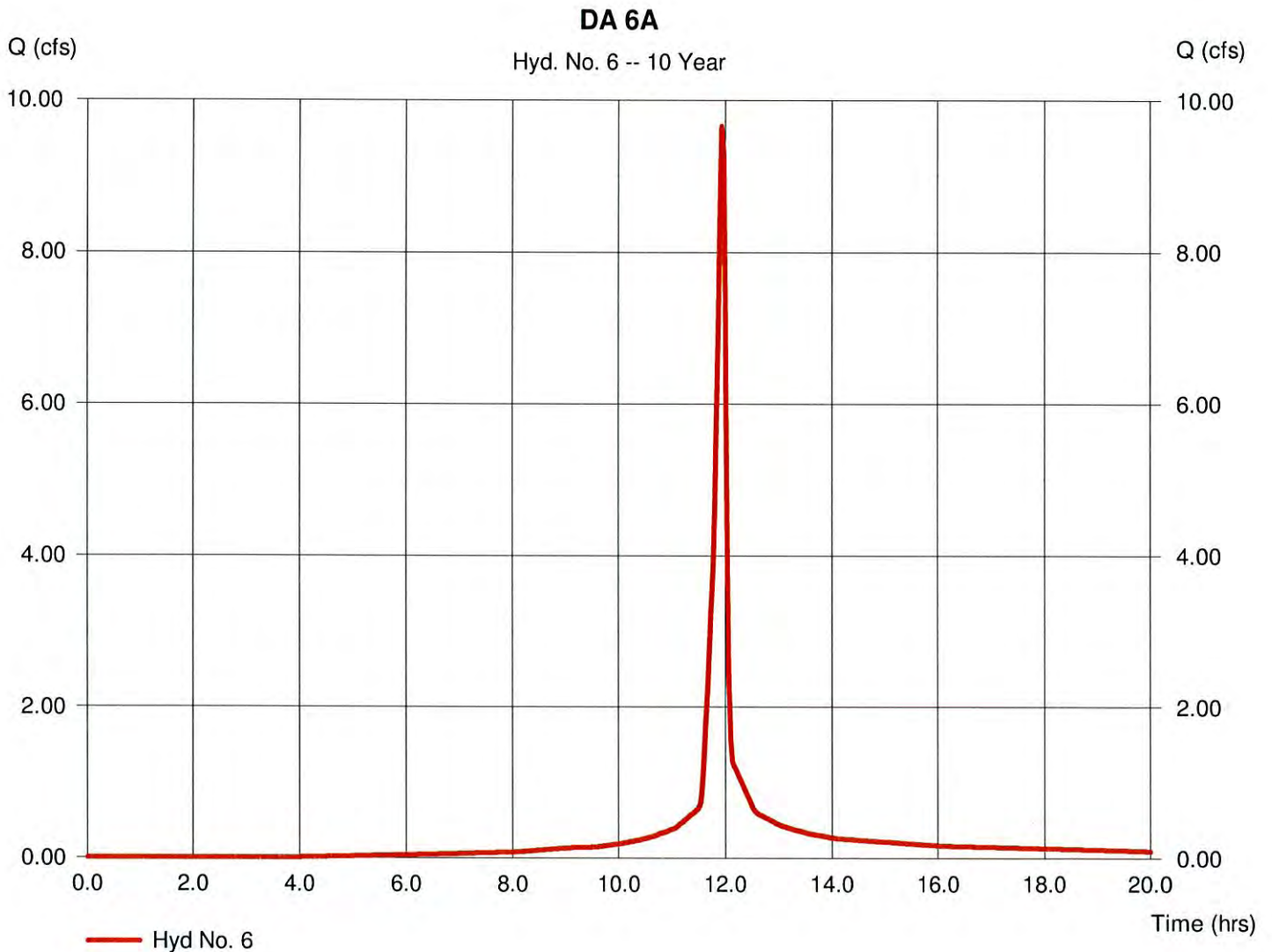
Monday, Sep 13, 2010

Hyd. No. 6

DA 6A

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 2.030 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 3.80 in
Storm duration = 24 hrs

Peak discharge = 9.653 cfs
Time to peak = 11.93 hrs
Hyd. volume = 20,901 cuft
Curve number = 93
Hydraulic length = 0 ft
Time of conc. (Tc) = 3.80 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

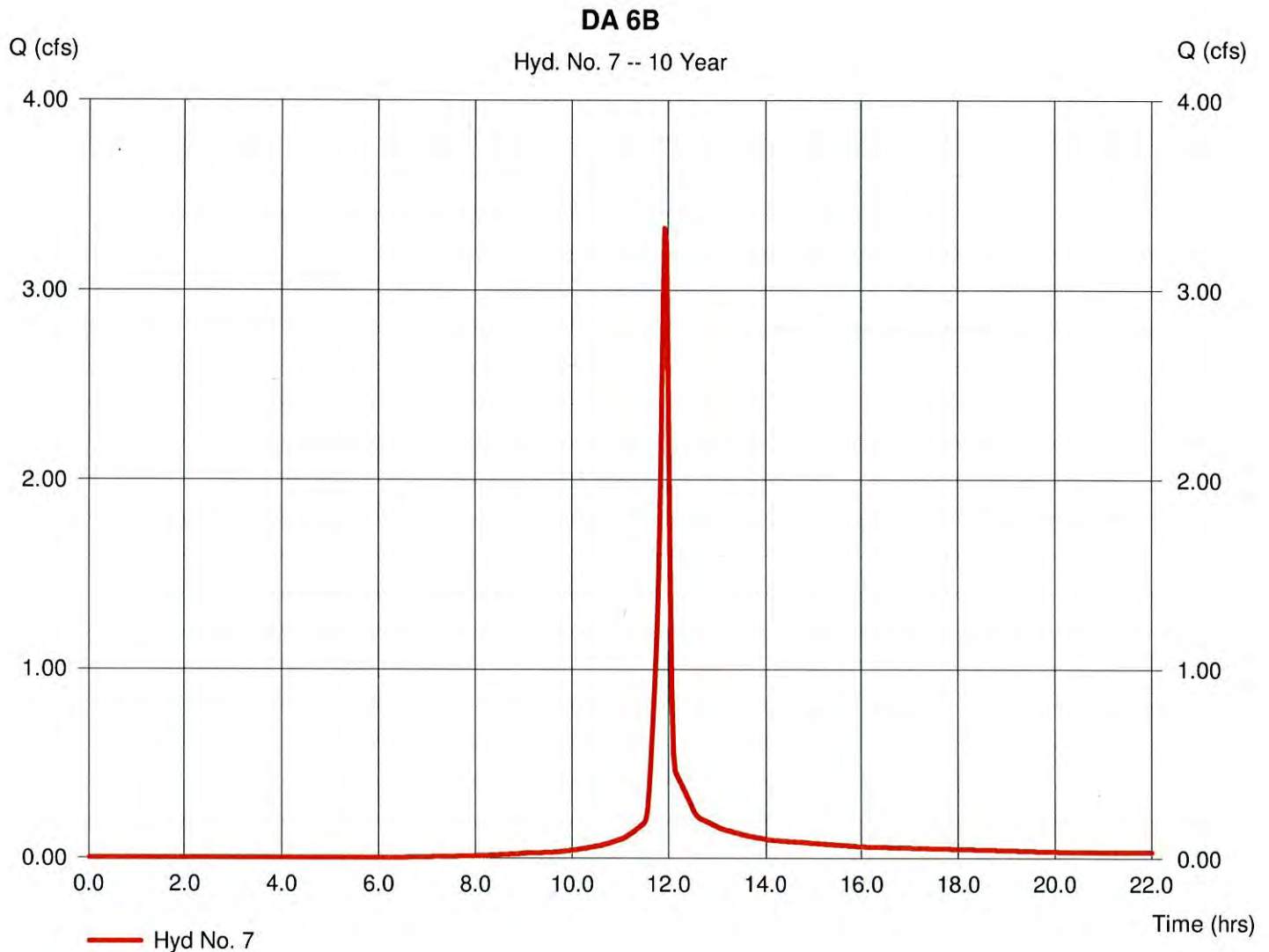
Monday, Sep 13, 2010

Hyd. No. 7

DA 6B

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 0.820 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 3.80 in
 Storm duration = 24 hrs

Peak discharge = 3.325 cfs
 Time to peak = 11.93 hrs
 Hyd. volume = 6,848 cuft
 Curve number = 87
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 5.60 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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Hyd. No. 8

TO SWMA 1

Hydrograph type = Reservoir

Storm frequency = 10 yrs

Time interval = 2 min

Inflow hyd. No. = 1 - DA 1 (TO SWMA1)

Reservoir name = SWMA 1

Peak discharge = 1.755 cfs

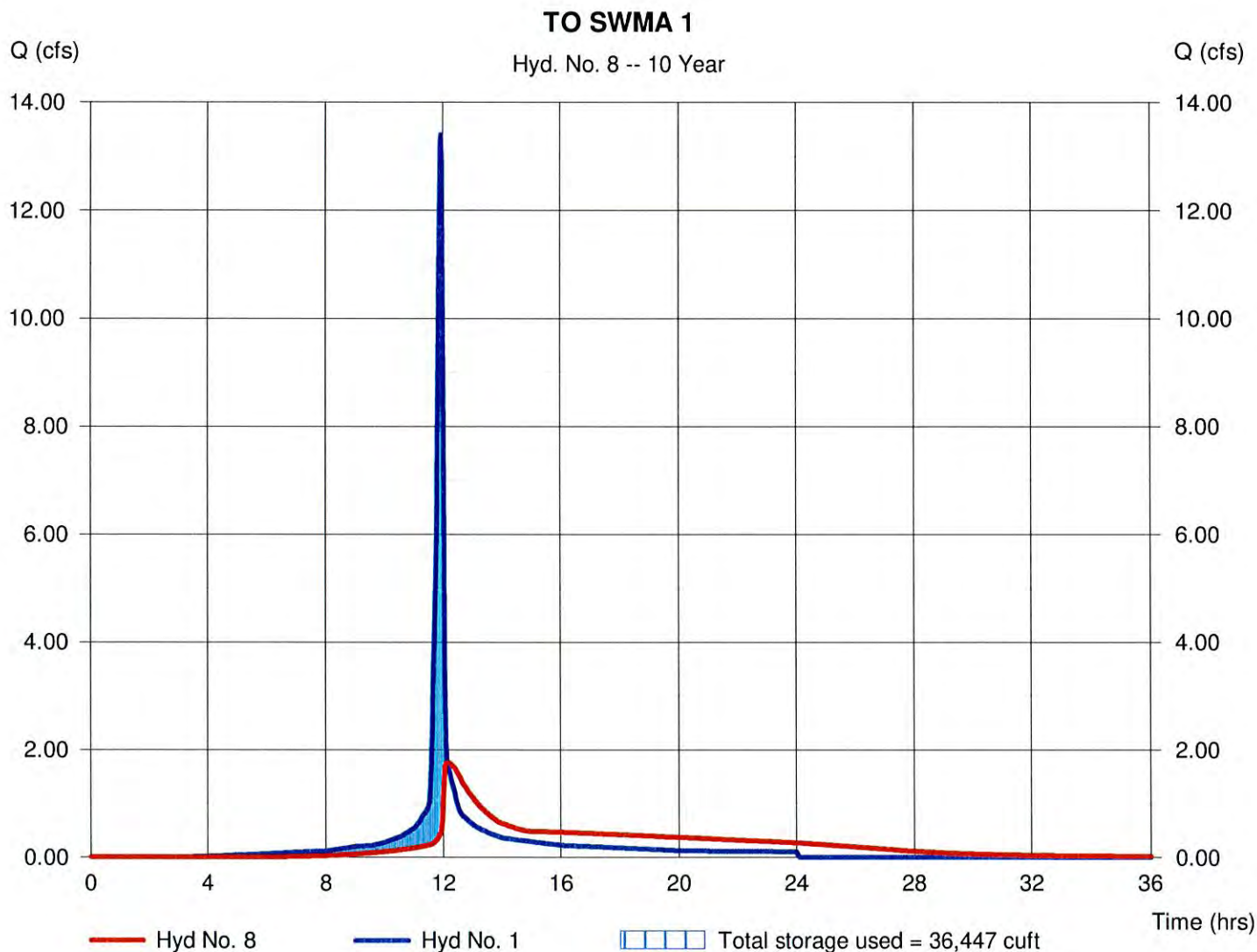
Time to peak = 12.13 hrs

Hyd. volume = 29,339 cuft

Max. Elevation = 402.19 ft

Max. Storage = 36,447 cuft

Storage Indication method used. Wet pond routing start elevation = 400.30 ft.



Hydrograph Report

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Hyd. No. 9

TO SWMA 2 (CANAL)

Hydrograph type = Reservoir

Storm frequency = 10 yrs

Time interval = 2 min

Inflow hyd. No. = 2 - DA 2 (TO SWMA 2)

Reservoir name = SWMA 2

Peak discharge = 1.723 cfs

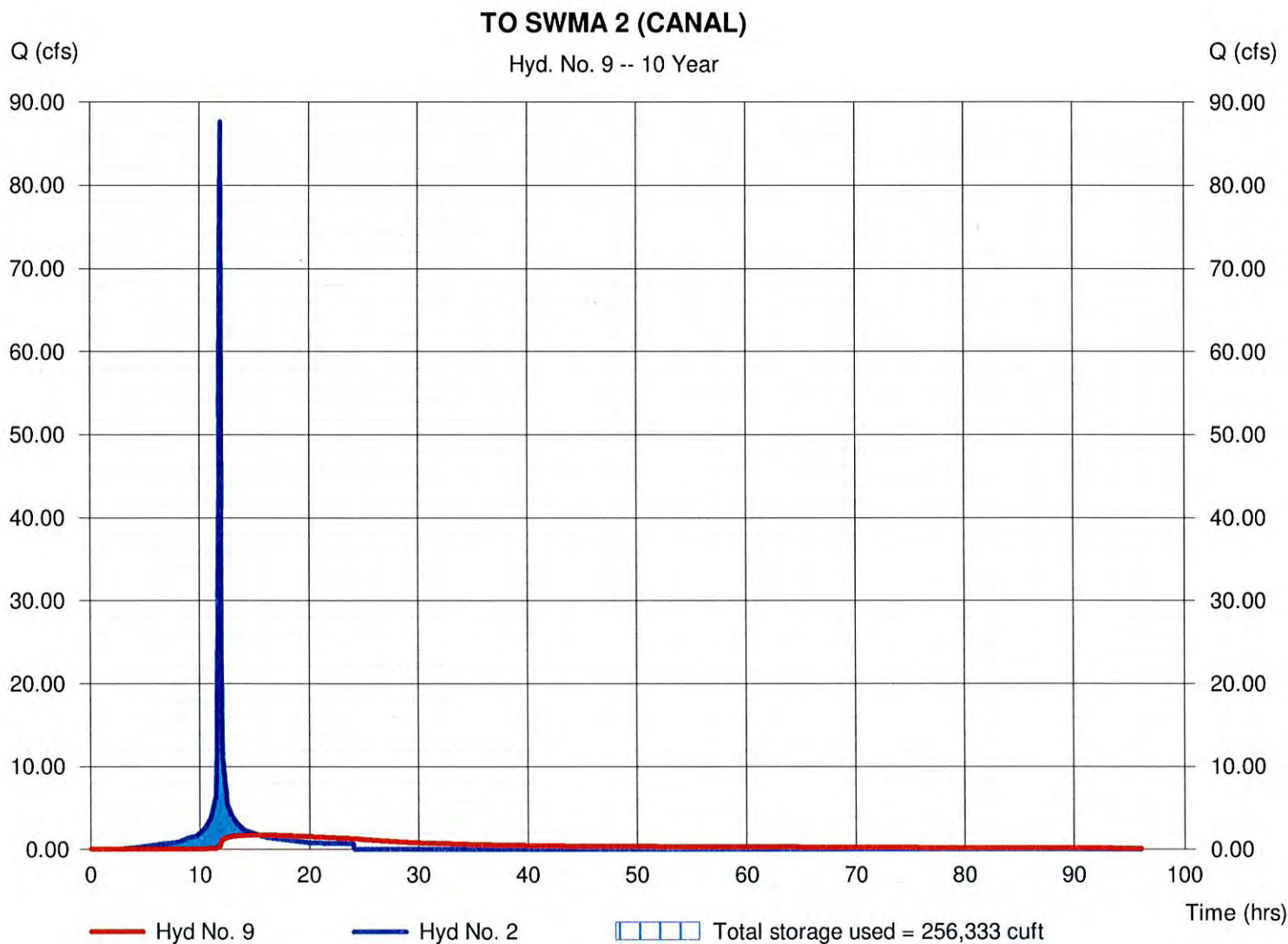
Time to peak = 15.40 hrs

Hyd. volume = 160,179 cuft

Max. Elevation = 397.38 ft

Max. Storage = 256,333 cuft

Storage Indication method used. Wet pond routing start elevation = 396.50 ft.



Hydrograph Report

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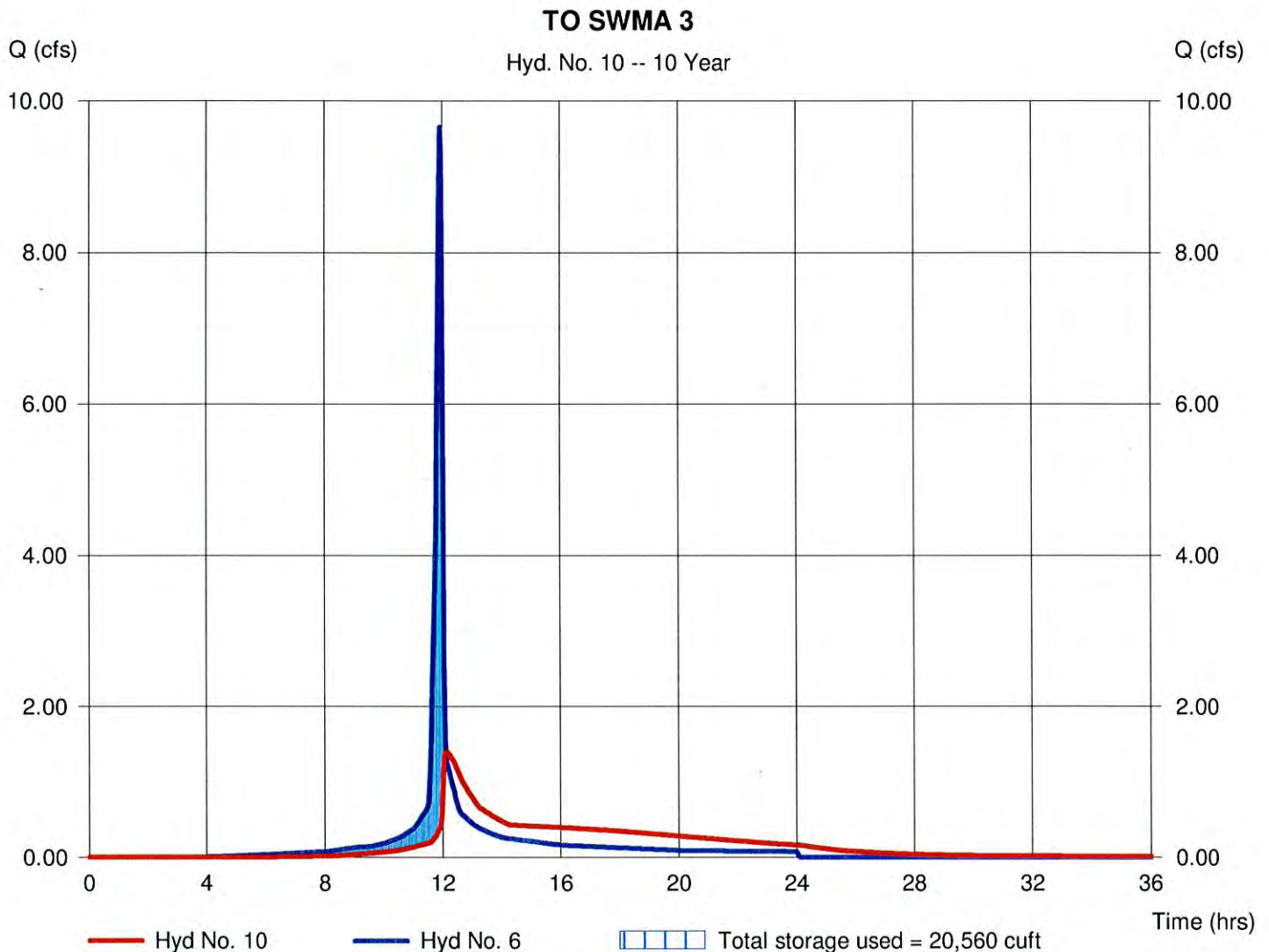
Hyd. No. 10

TO SWMA 3

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyd. No. = 6 - DA 6A
Reservoir name = SWMA 3

Peak discharge = 1.393 cfs
Time to peak = 12.13 hrs
Hyd. volume = 20,874 cuft
Max. Elevation = 408.56 ft
Max. Storage = 20,560 cuft

Storage Indication method used. Wet pond routing start elevation = 407.10 ft.



Hydrograph Report

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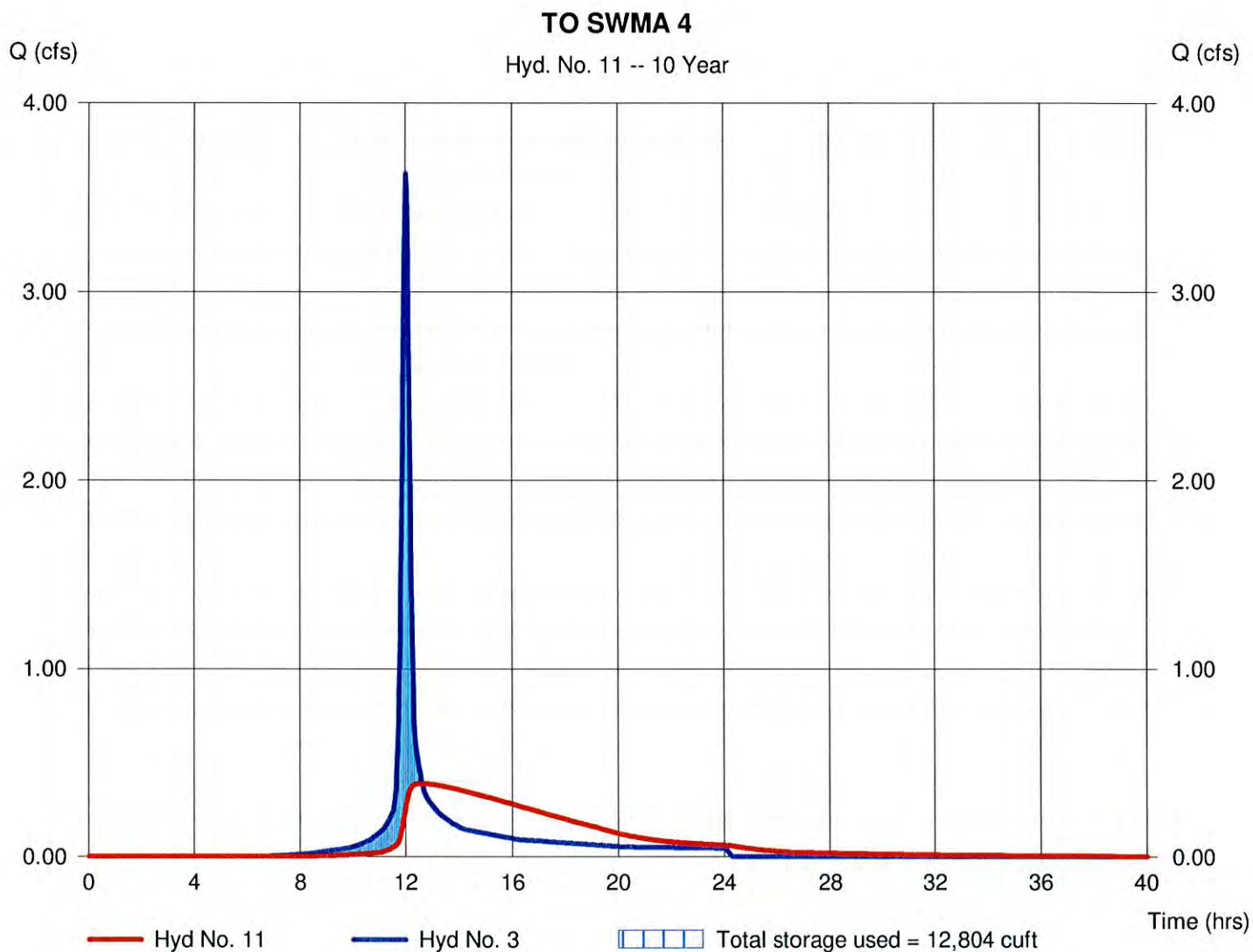
Hyd. No. 11

TO SWMA 4

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyd. No. = 3 - DA 4A
Reservoir name = SWMA 4

Peak discharge = 0.386 cfs
Time to peak = 12.63 hrs
Hyd. volume = 10,194 cuft
Max. Elevation = 404.01 ft
Max. Storage = 12,804 cuft

Storage Indication method used. Wet pond routing start elevation = 403.00 ft.



Hydrograph Report

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Monday, Sep 13, 2010

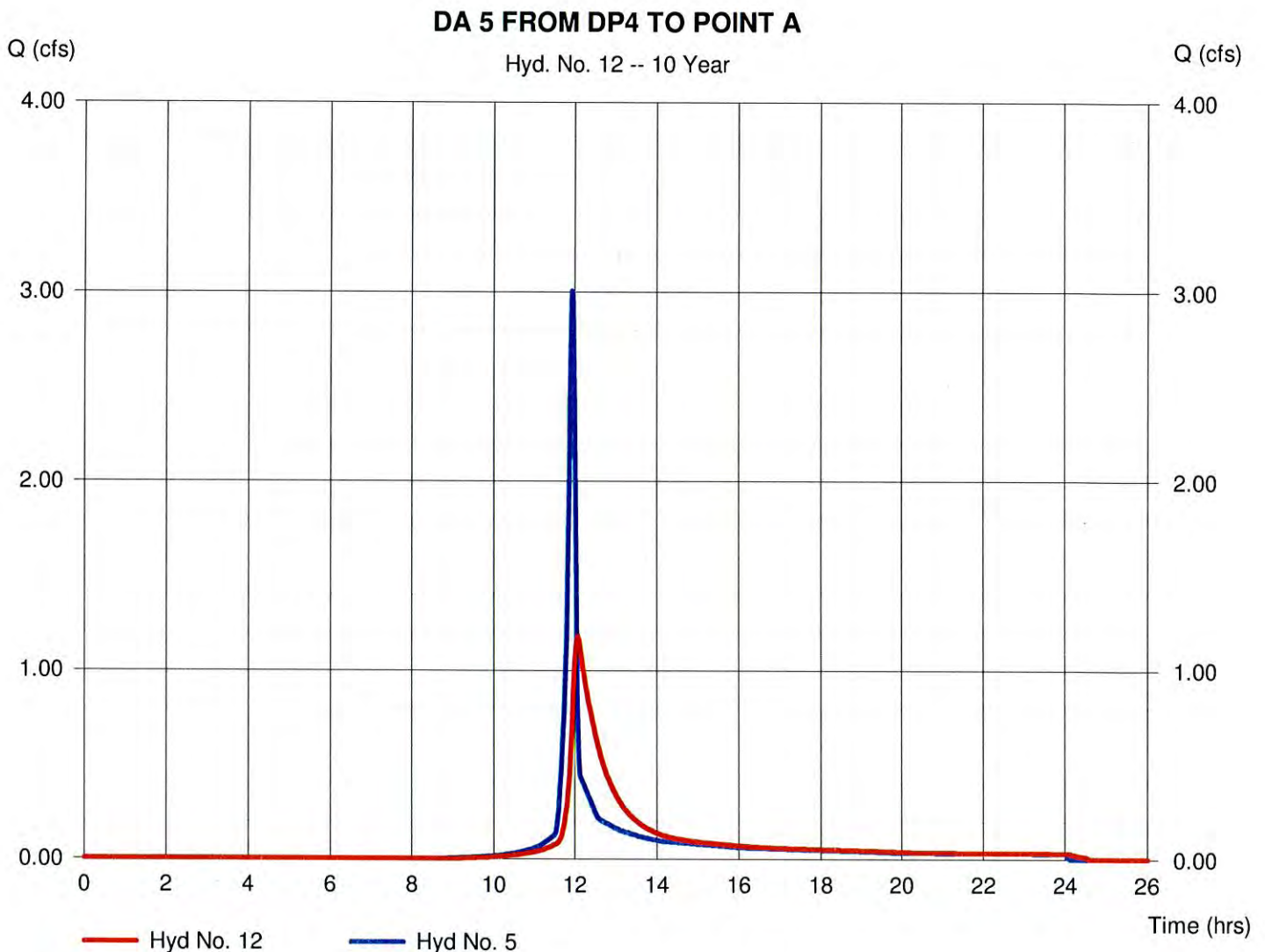
Hyd. No. 12

DA 5 FROM DP4 TO POINT A

Hydrograph type = Reach
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyd. No. = 5 - DA 5 TO DP4
Reach length = 1150.0 ft
Manning's n = 0.040
Side slope = 20.0:1
Rating curve x = 0.805
Ave. velocity = 0.78 ft/s

Peak discharge = 1.183 cfs
Time to peak = 12.07 hrs
Hyd. volume = 6,055 cuft
Section type = Trapezoidal
Channel slope = 0.4 %
Bottom width = 5.0 ft
Max. depth = 1.0 ft
Rating curve m = 0.976
Routing coeff. = 0.0764

Modified Att-Kin routing method used.



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

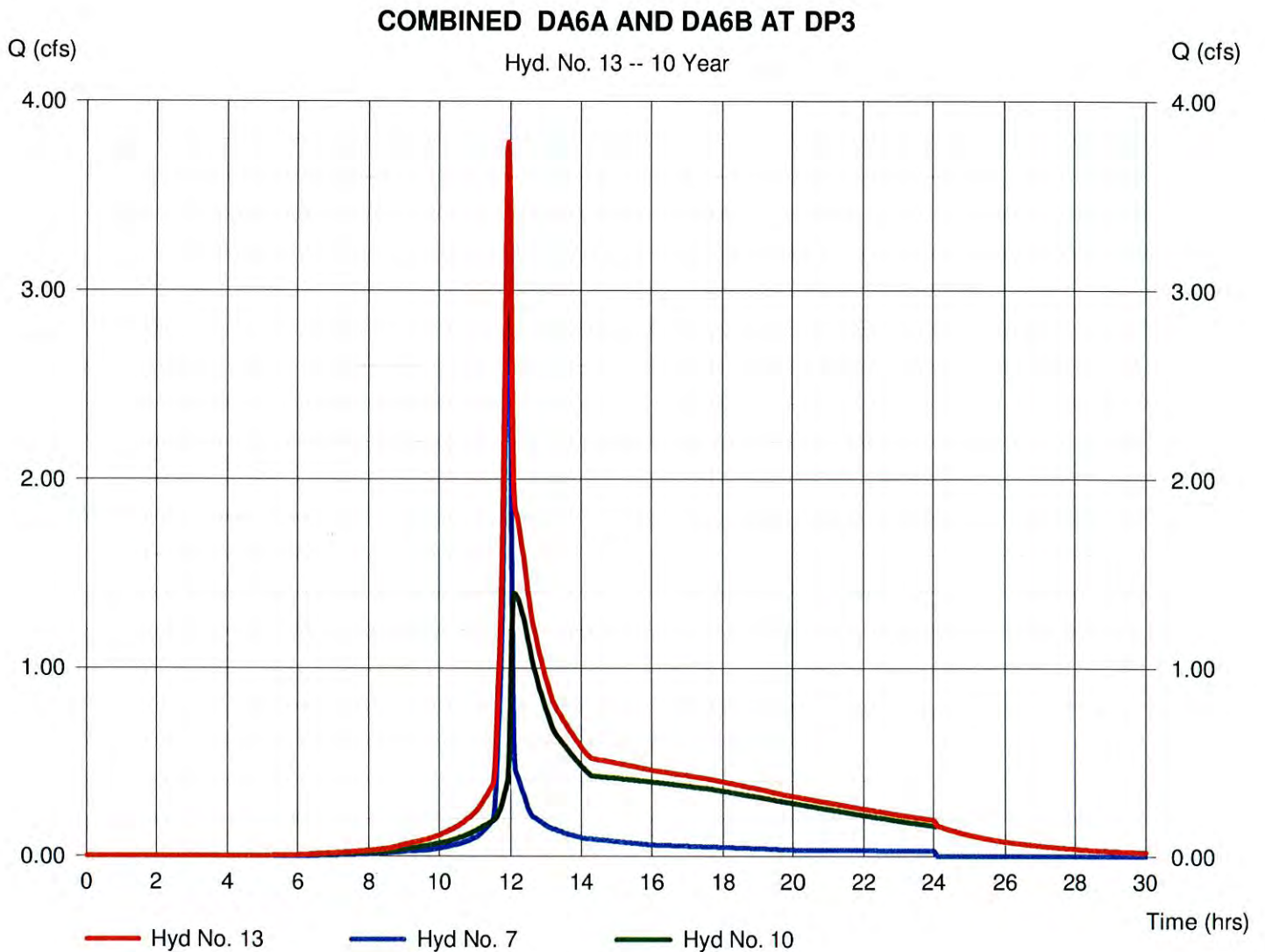
Monday, Sep 13, 2010

Hyd. No. 13

COMBINED DA6A AND DA6B AT DP3

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

Peak discharge = 3.783 cfs
Time to peak = 11.97 hrs
Hyd. volume = 27,722 cuft
Contrib. drain. area = 0.820 ac



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

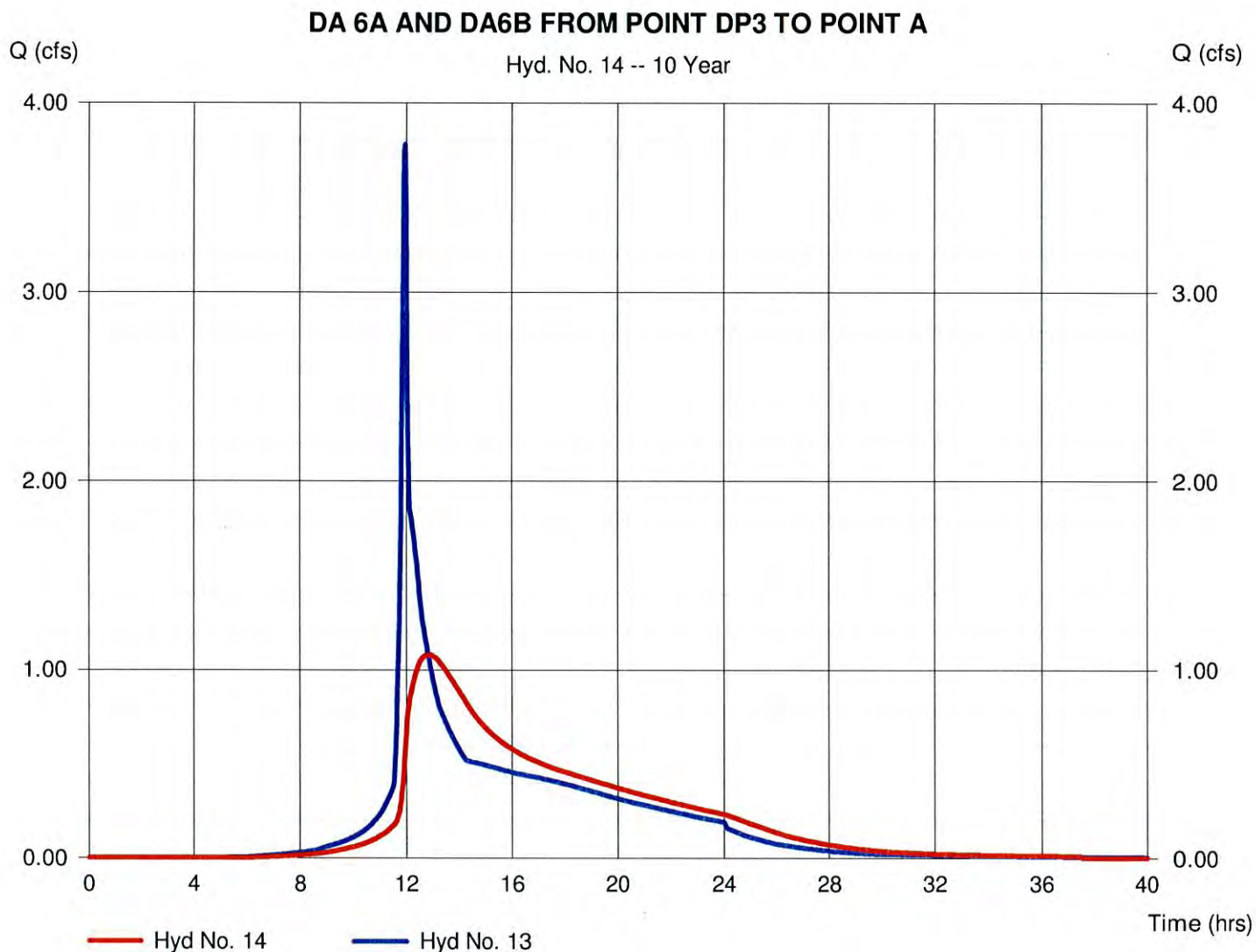
Monday, Sep 13, 2010

Hyd. No. 14

DA 6A AND DA6B FROM POINT DP3 TO POINT A

Hydrograph type	= Reach	Peak discharge	= 1.078 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.83 hrs
Time interval	= 2 min	Hyd. volume	= 27,480 cuft
Inflow hyd. No.	= 13 - COMBINED DA6A AND DA6B AT DP3	Section type	= Trapezoidal
Reach length	= 1815.0 ft	Channel slope	= 0.1 %
Manning's n	= 0.040	Bottom width	= 5.0 ft
Side slope	= 20.0:1	Max. depth	= 1.0 ft
Rating curve x	= 0.403	Rating curve m	= 0.976
Ave. velocity	= 0.38 ft/s	Routing coeff.	= 0.0243

Modified Att-Kin routing method used.



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

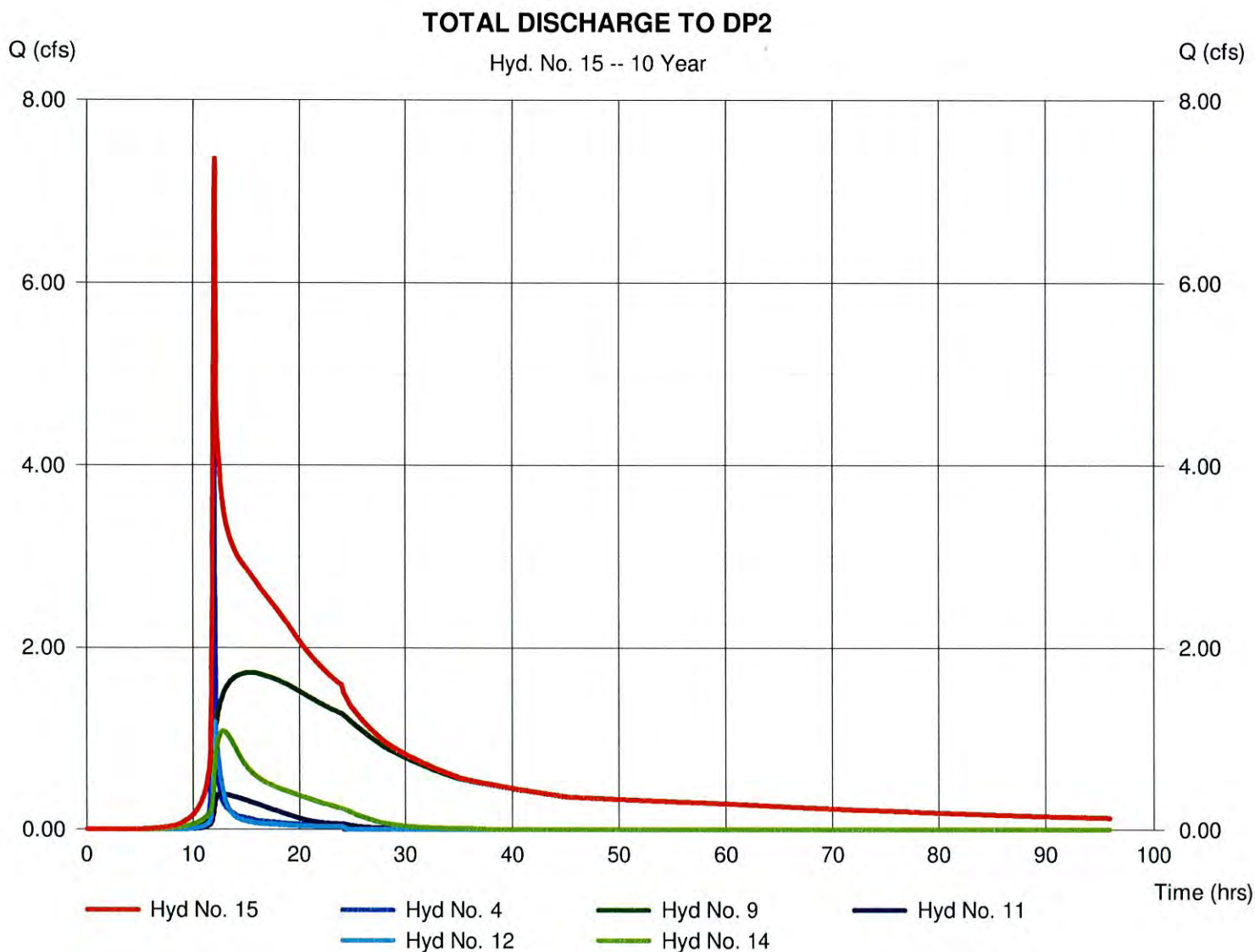
Monday, Sep 13, 2010

Hyd. No. 15

TOTAL DISCHARGE TO DP2

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 4, 9, 11, 12, 14

Peak discharge = 7.360 cfs
Time to peak = 12.00 hrs
Hyd. volume = 210,593 cuft
Contrib. drain. area = 1.390 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

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	18.85	2	716	42,317	-----	-----	-----	DA 1 (TO SWMA1)
2	SCS Runoff	122.37	2	716	278,463	-----	-----	-----	DA 2 (TO SWMA 2)
3	SCS Runoff	5.525	2	722	15,778	-----	-----	-----	DA 4A
4	SCS Runoff	6.732	2	718	15,480	-----	-----	-----	DA 4B
5	SCS Runoff	4.867	2	716	9,919	-----	-----	-----	DA 5 TO DP4
6	SCS Runoff	13.68	2	716	30,358	-----	-----	-----	DA 6A
7	SCS Runoff	4.982	2	716	10,481	-----	-----	-----	DA 6B
8	Reservoir	7.661	2	722	42,271	1	402.68	41,147	TO SWMA 1
9	Reservoir	3.450	2	834	241,446	2	397.68	308,583	TO SWMA 2 (CANAL)
10	Reservoir	4.290	2	724	30,331	6	408.99	24,108	TO SWMA 3
11	Reservoir	1.194	2	738	15,756	3	404.38	15,216	TO SWMA 4
12	Reach	1.946	2	724	9,903	5	-----	-----	DA 5 FROM DP4 TO POINT A
13	Combine	7.633	2	718	40,813	7, 10,	-----	-----	COMBINED DA6A AND DA6B AT D
14	Reach	2.043	2	760	40,572	13	-----	-----	DA 6A AND DA6B FROM POINT DP3
15	Combine	12.54	2	720	318,773	4, 9, 11, 12, 14	-----	-----	TOTAL DISCHARGE TO DP2
POST DEV CONDITIONS.gpw					Return Period: 100 Year			Monday, Sep 13, 2010	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

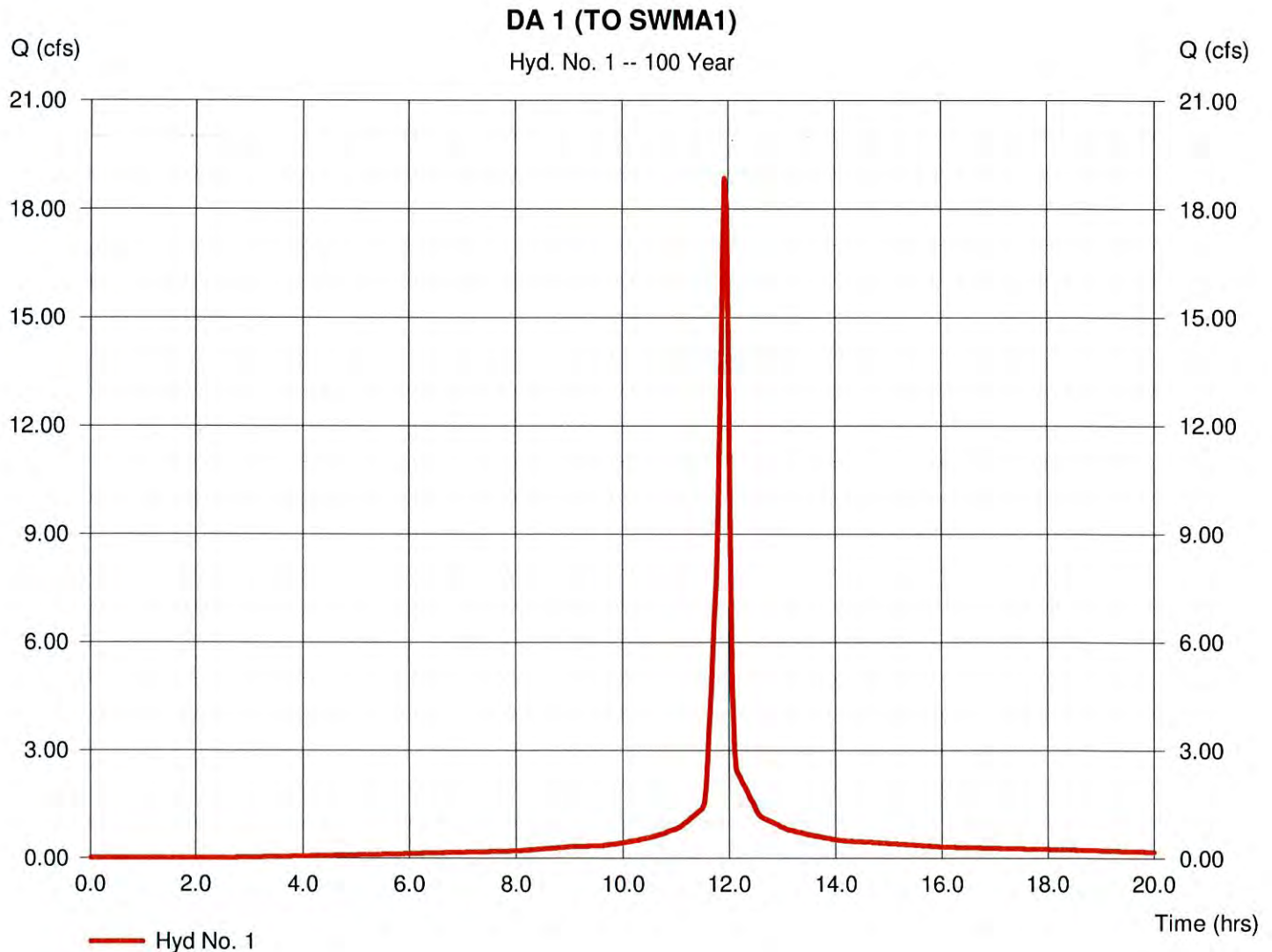
Monday, Sep 13, 2010

Hyd. No. 1

DA 1 (TO SWMA1)

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 2 min
 Drainage area = 2.760 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 5.20 in
 Storm duration = 24 hrs

Peak discharge = 18.85 cfs
 Time to peak = 11.93 hrs
 Hyd. volume = 42,317 cuft
 Curve number = 94
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 4.30 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

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Hyd. No. 2

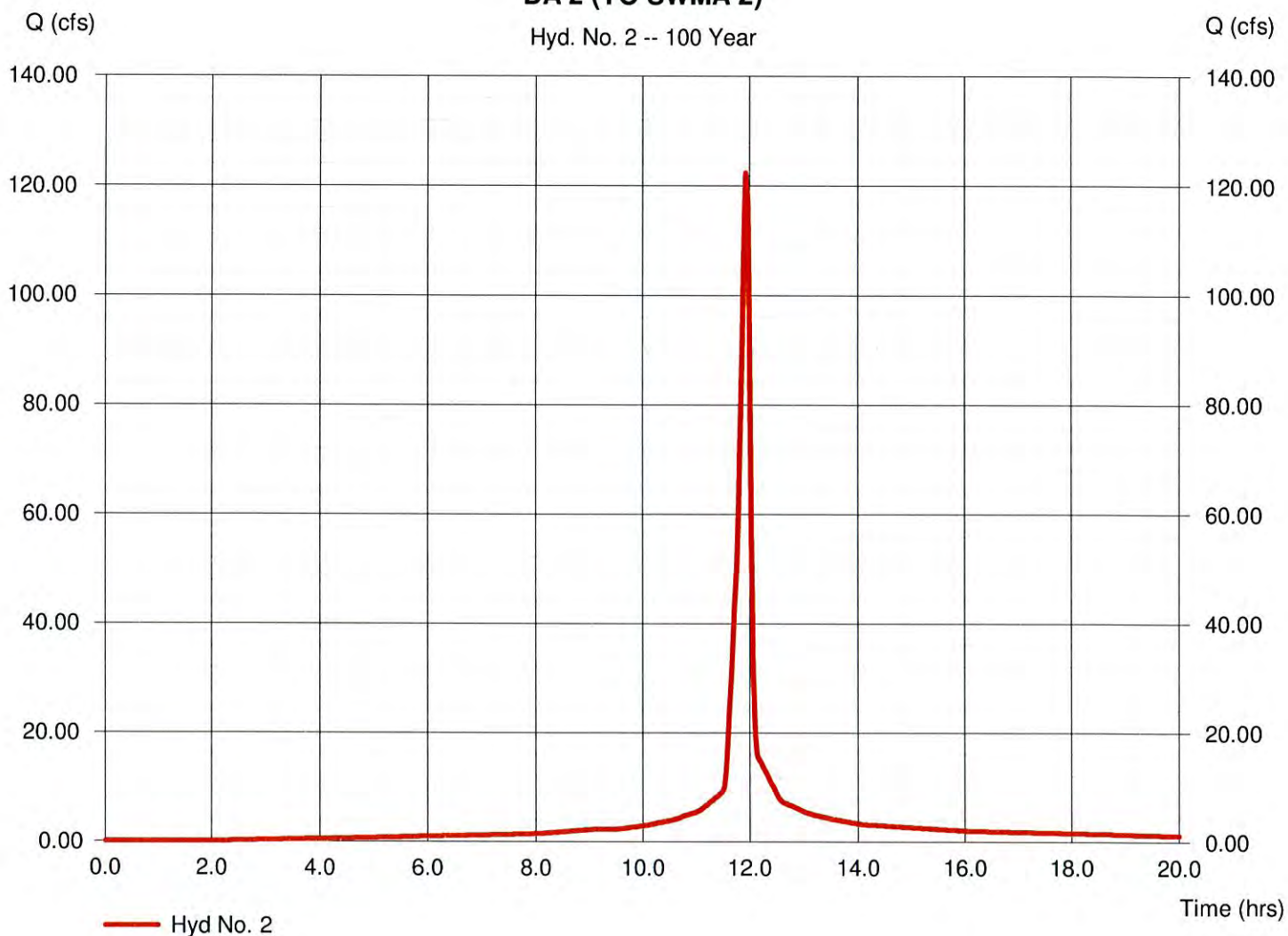
DA 2 (TO SWMA 2)

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 17.720 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 122.37 cfs
Time to peak = 11.93 hrs
Hyd. volume = 278,463 cuft
Curve number = 95
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.30 min
Distribution = Type II
Shape factor = 484

DA 2 (TO SWMA 2)

Hyd. No. 2 -- 100 Year



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

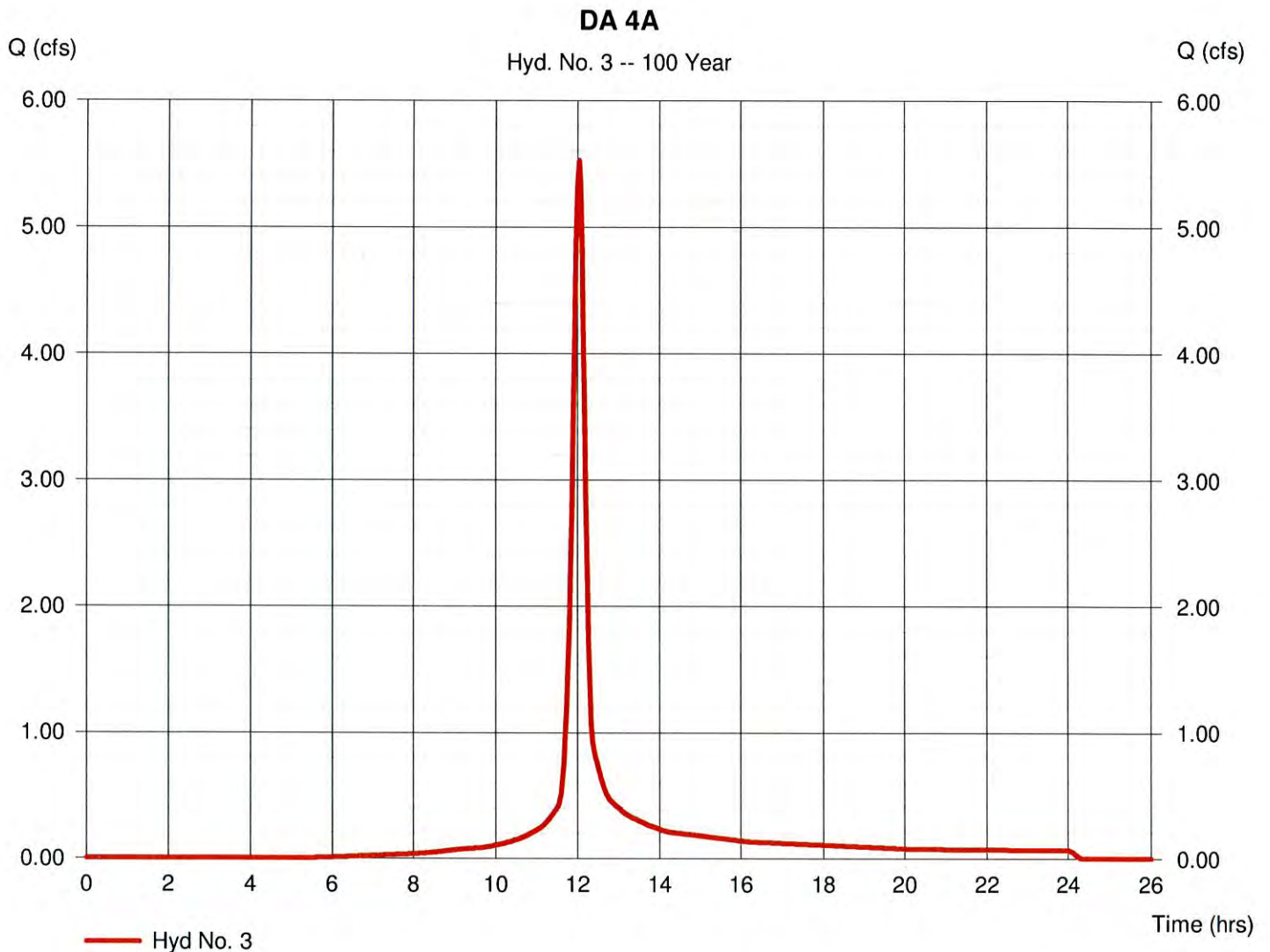
Monday, Sep 13, 2010

Hyd. No. 3

DA 4A

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 1.220 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 5.525 cfs
Time to peak = 12.03 hrs
Hyd. volume = 15,778 cuft
Curve number = 86
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.50 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

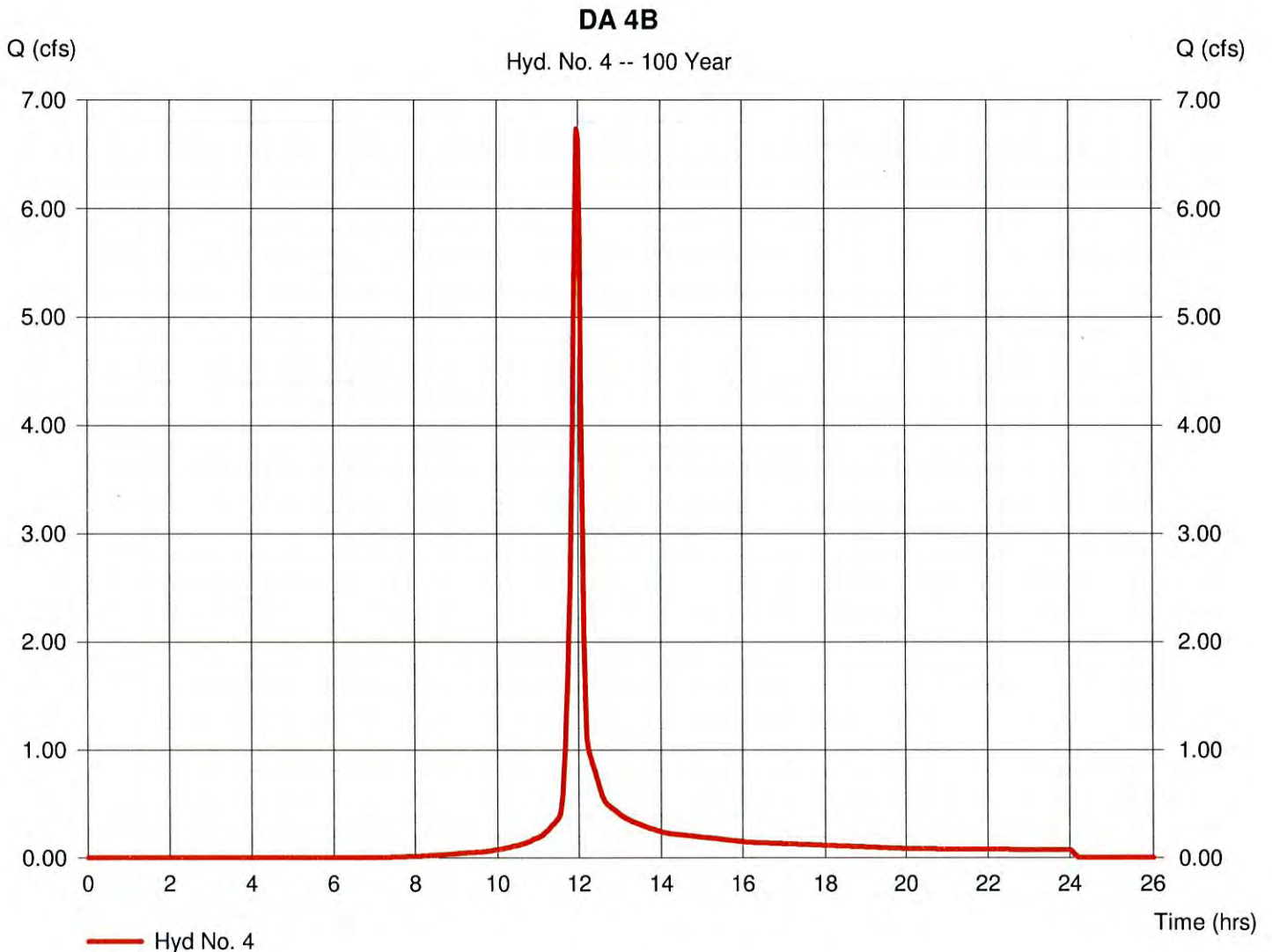
Monday, Sep 13, 2010

Hyd. No. 4

DA 4B

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 1.390 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 6.732 cfs
Time to peak = 11.97 hrs
Hyd. volume = 15,480 cuft
Curve number = 80
Hydraulic length = 0 ft
Time of conc. (Tc) = 9.20 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

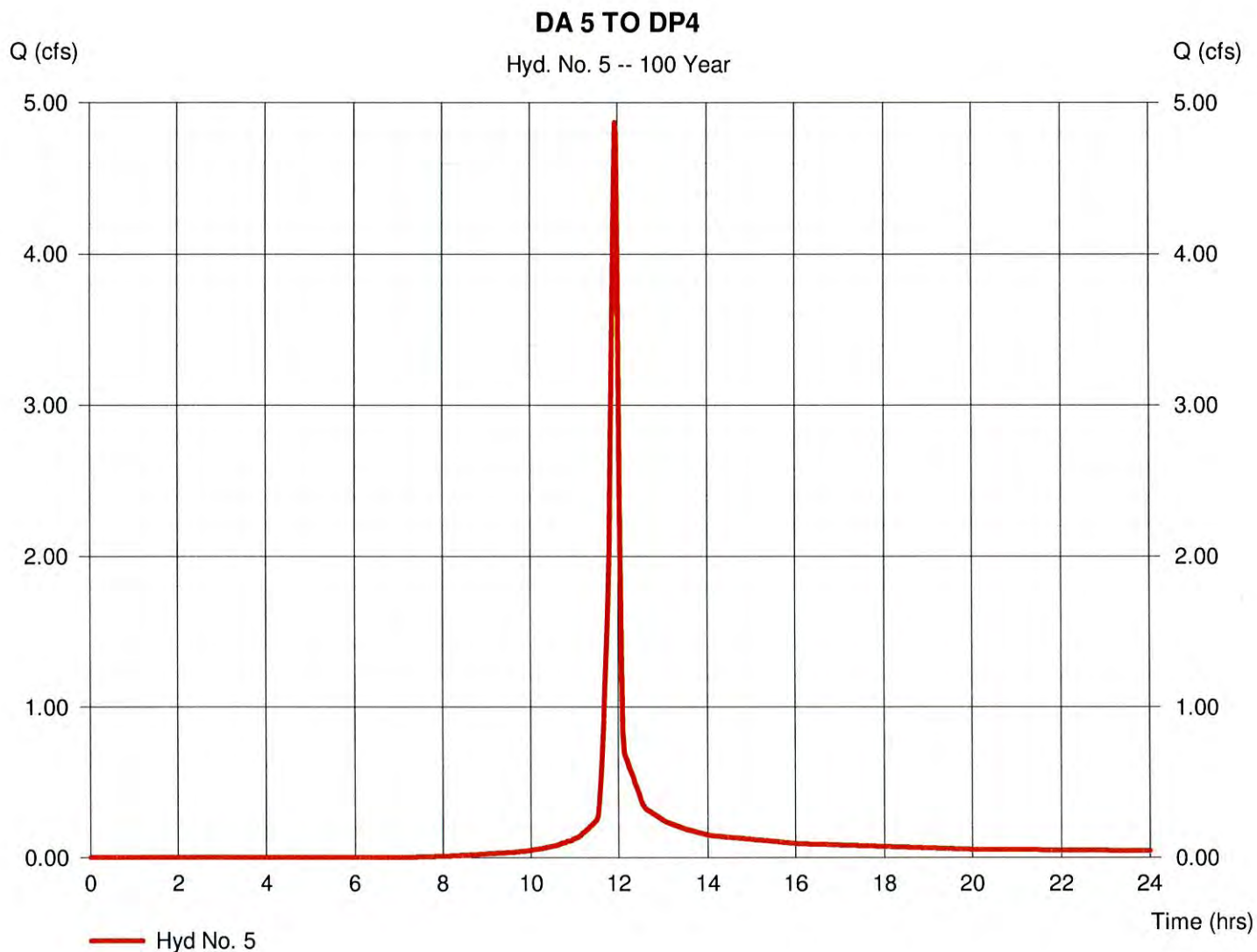
Monday, Sep 13, 2010

Hyd. No. 5

DA 5 TO DP4

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 0.950 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 4.867 cfs
Time to peak = 11.93 hrs
Hyd. volume = 9,919 cuft
Curve number = 80
Hydraulic length = 0 ft
Time of conc. (Tc) = 4.40 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

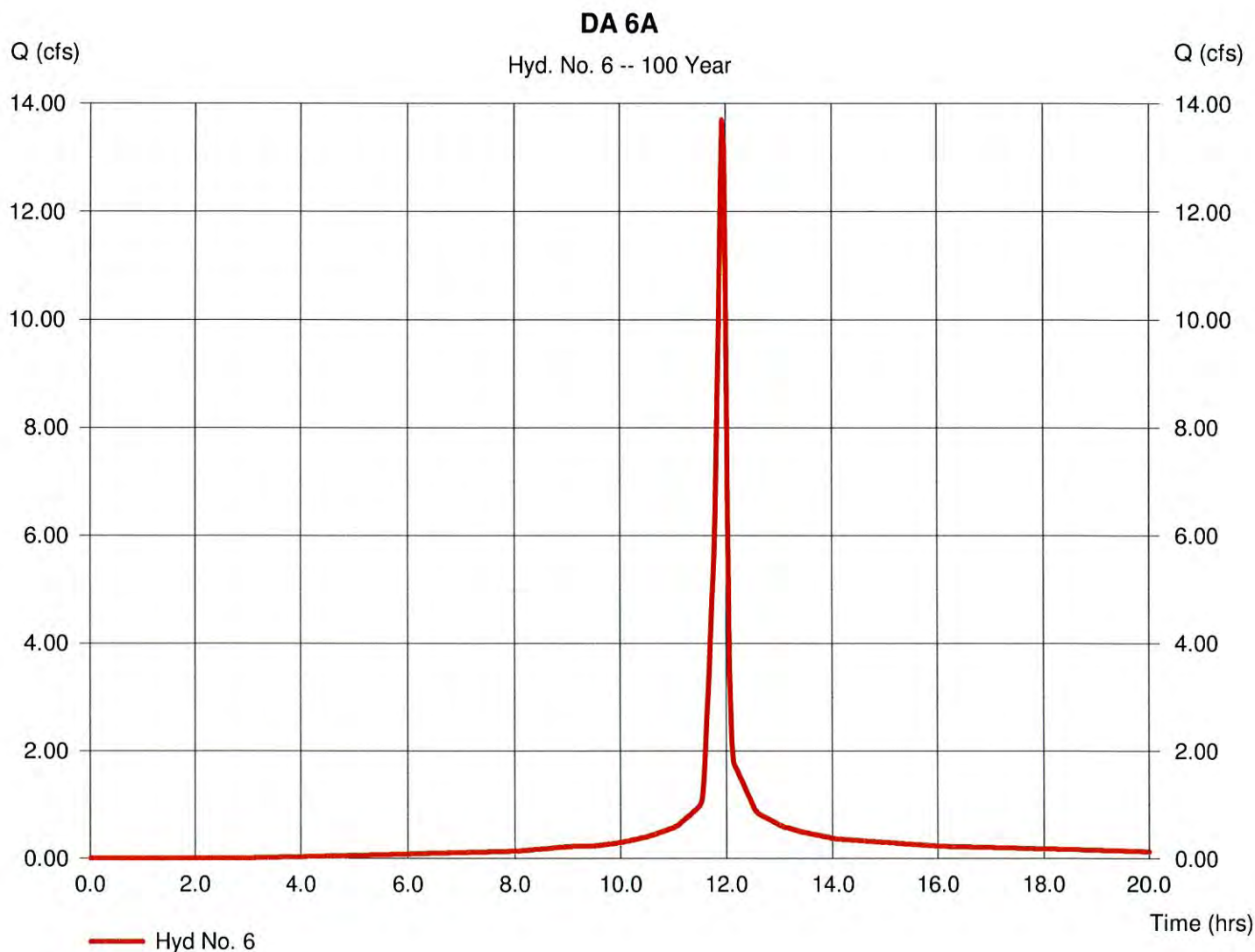
Monday, Sep 13, 2010

Hyd. No. 6

DA 6A

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 2.030 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 13.68 cfs
Time to peak = 11.93 hrs
Hyd. volume = 30,358 cuft
Curve number = 93
Hydraulic length = 0 ft
Time of conc. (Tc) = 3.80 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

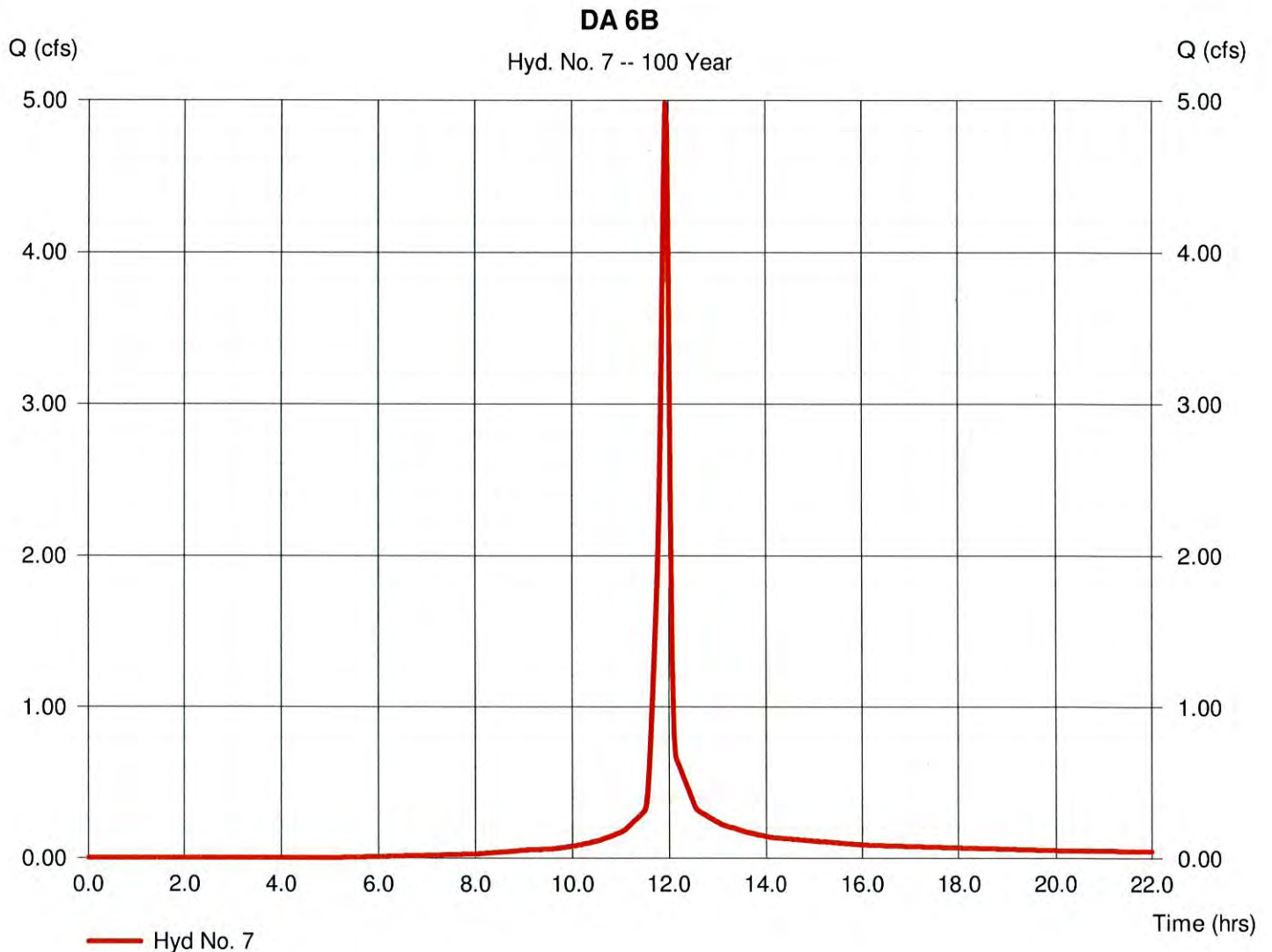
Monday, Sep 13, 2010

Hyd. No. 7

DA 6B

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 0.820 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 5.20 in
Storm duration = 24 hrs

Peak discharge = 4.982 cfs
Time to peak = 11.93 hrs
Hyd. volume = 10,481 cuft
Curve number = 87
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.60 min
Distribution = Type II
Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

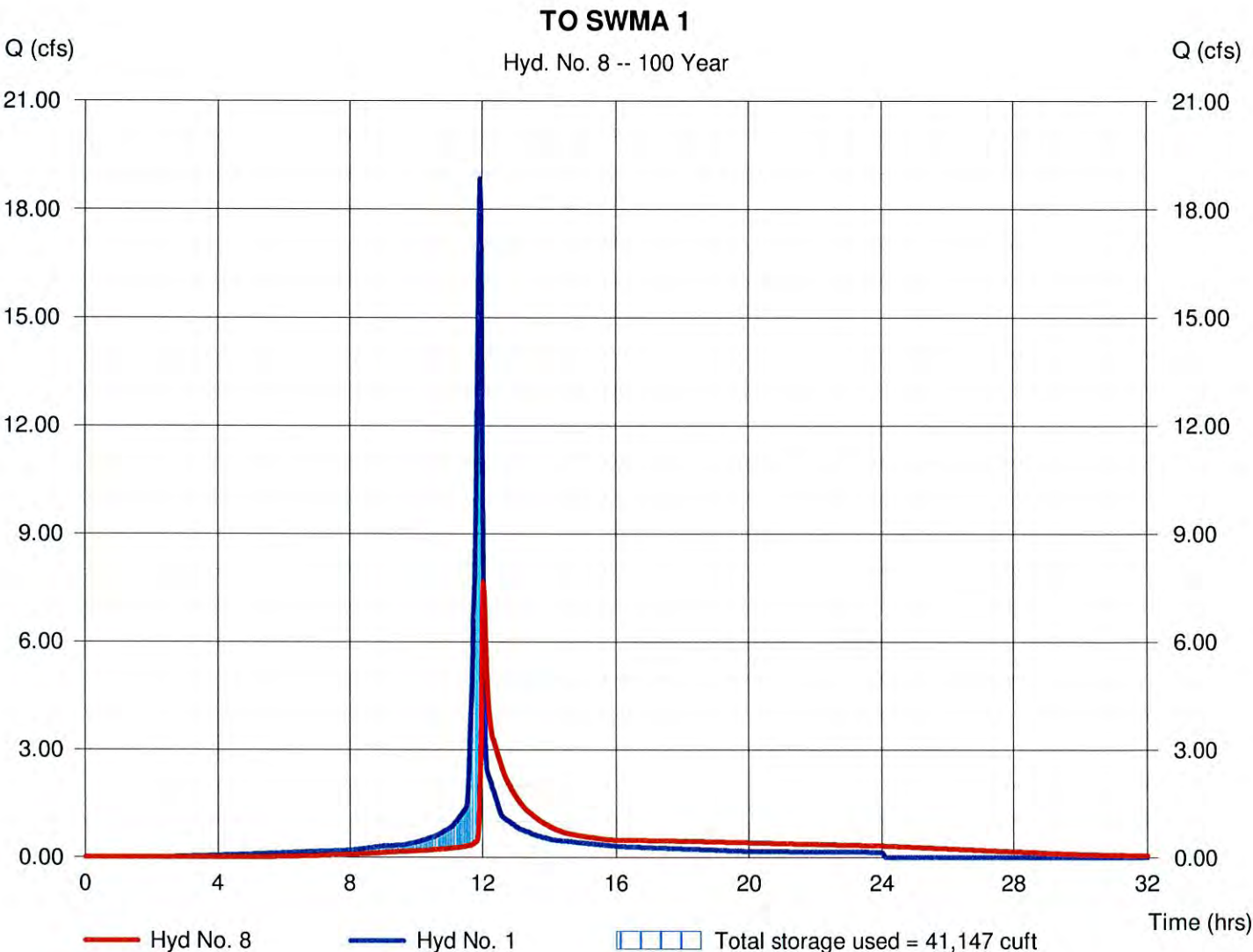
Monday, Sep 13, 2010

Hyd. No. 8

TO SWMA 1

Hydrograph type	= Reservoir	Peak discharge	= 7.661 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 42,271 cuft
Inflow hyd. No.	= 1 - DA 1 (TO SWMA1)	Max. Elevation	= 402.68 ft
Reservoir name	= SWMA 1	Max. Storage	= 41,147 cuft

Storage Indication method used. Wet pond routing start elevation = 400.30 ft.



Hydrograph Report

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Hyd. No. 9

TO SWMA 2 (CANAL)

Hydrograph type = Reservoir

Storm frequency = 100 yrs

Time interval = 2 min

Inflow hyd. No. = 2 - DA 2 (TO SWMA 2)

Reservoir name = SWMA 2

Peak discharge = 3.450 cfs

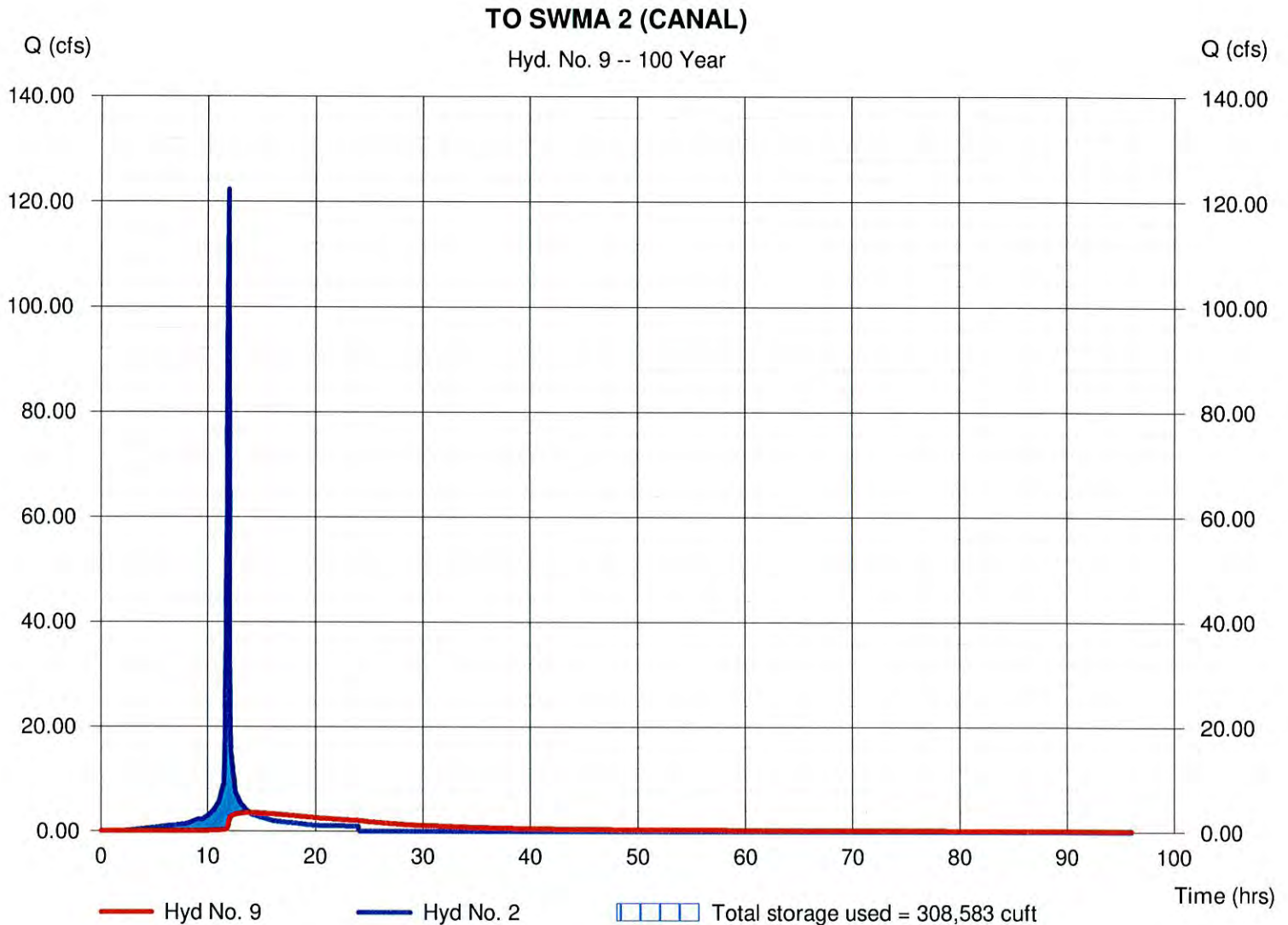
Time to peak = 13.90 hrs

Hyd. volume = 241,446 cuft

Max. Elevation = 397.68 ft

Max. Storage = 308,583 cuft

Storage Indication method used. Wet pond routing start elevation = 396.50 ft.



Hydrograph Report

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Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

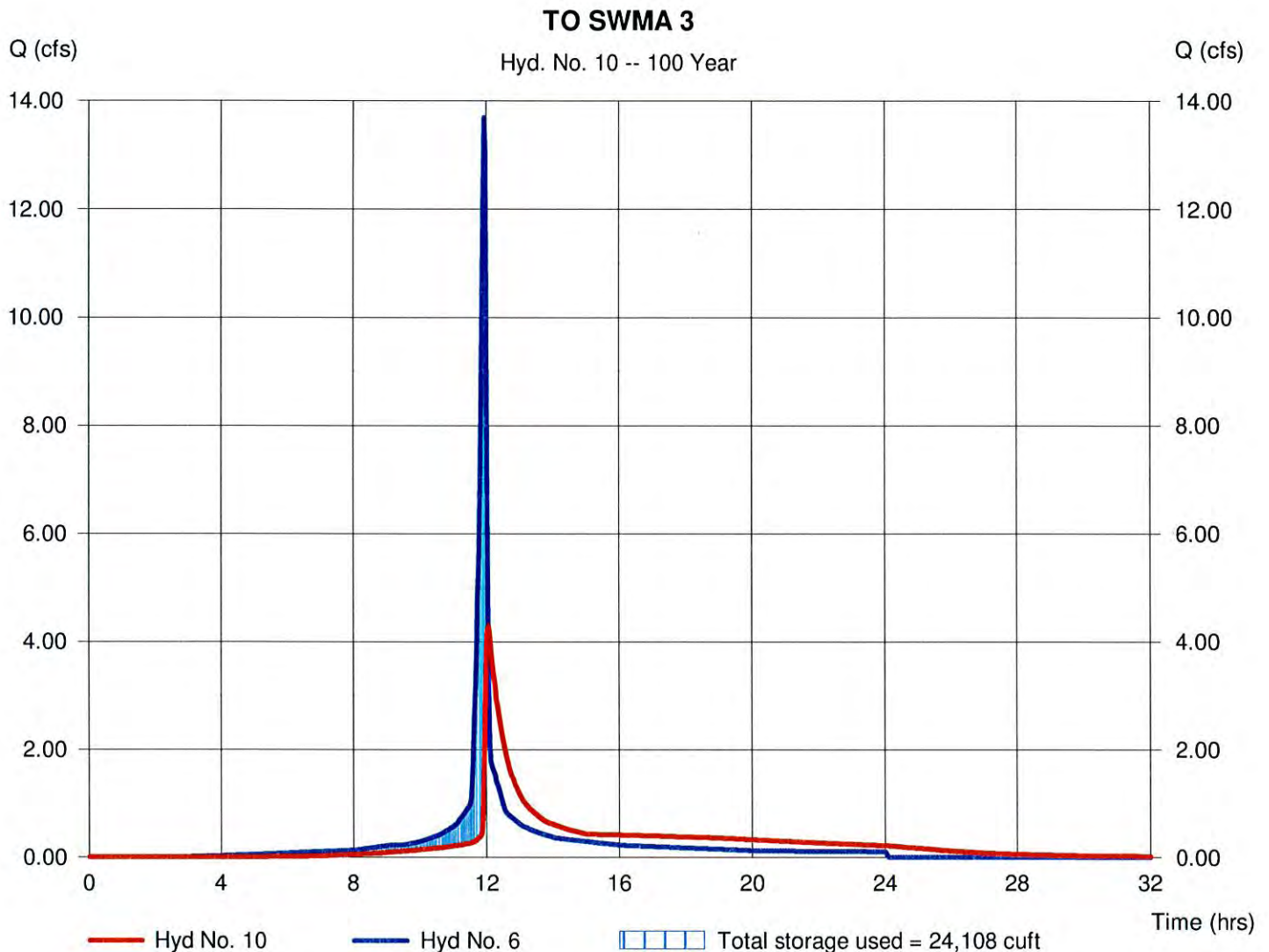
Hyd. No. 10

TO SWMA 3

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 6 - DA 6A
Reservoir name = SWMA 3

Peak discharge = 4.290 cfs
Time to peak = 12.07 hrs
Hyd. volume = 30,331 cuft
Max. Elevation = 408.99 ft
Max. Storage = 24,108 cuft

Storage Indication method used. Wet pond routing start elevation = 407.10 ft.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

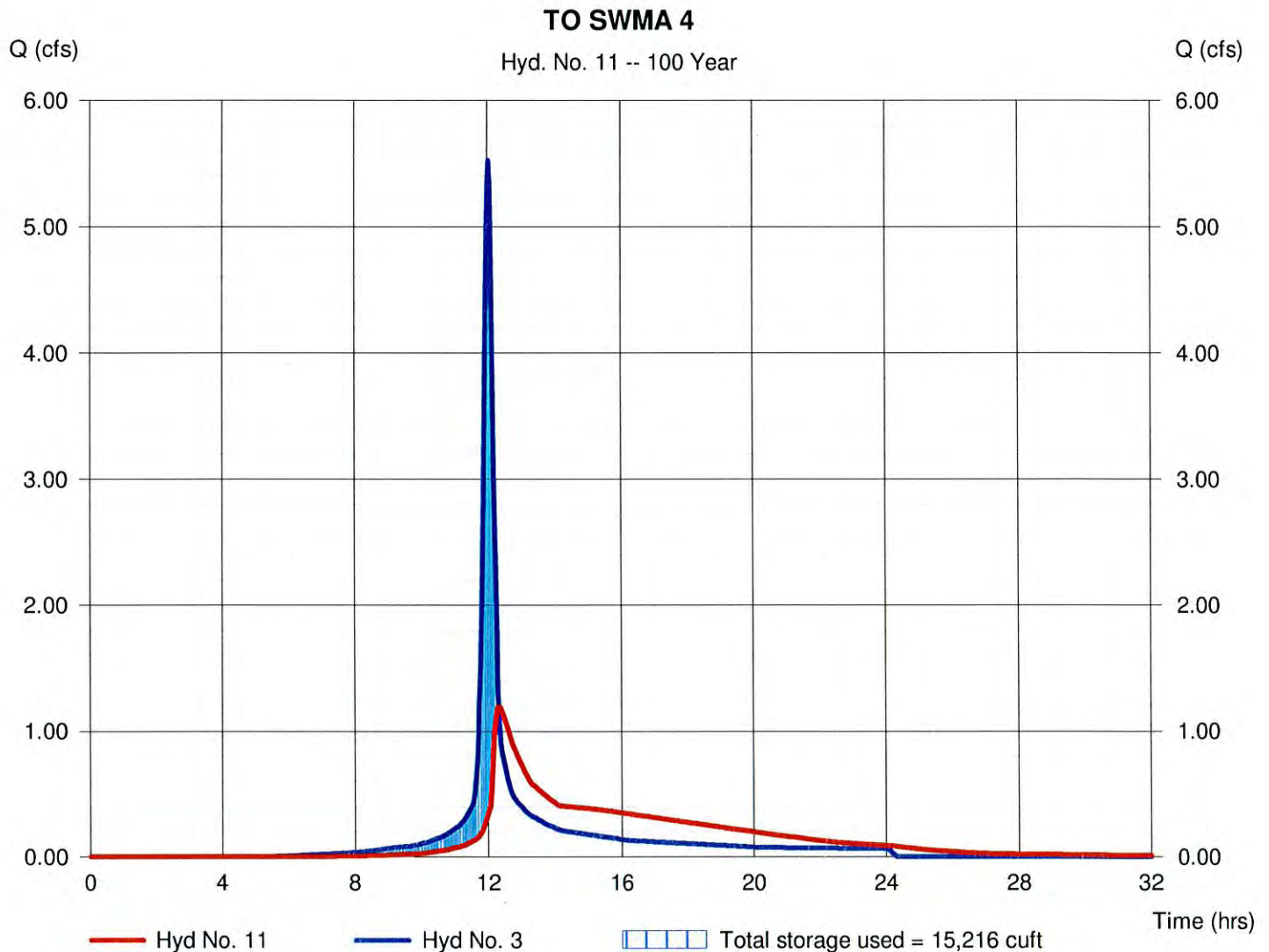
Hyd. No. 11

TO SWMA 4

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 3 - DA 4A
Reservoir name = SWMA 4

Peak discharge = 1.194 cfs
Time to peak = 12.30 hrs
Hyd. volume = 15,756 cuft
Max. Elevation = 404.38 ft
Max. Storage = 15,216 cuft

Storage Indication method used. Wet pond routing start elevation = 403.00 ft.



Hydrograph Report

58

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

Monday, Sep 13, 2010

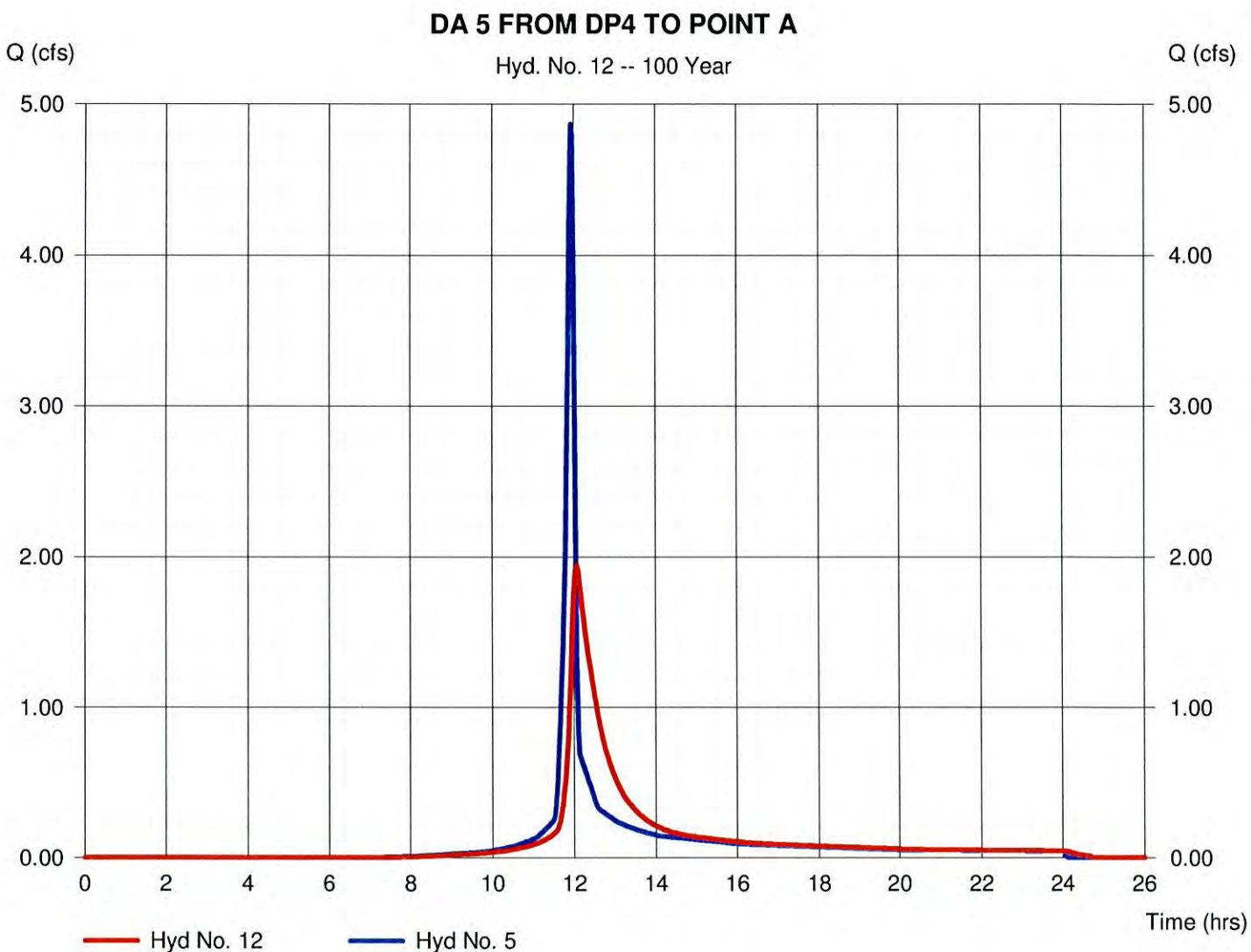
Hyd. No. 12

DA 5 FROM DP4 TO POINT A

Hydrograph type = Reach
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 5 - DA 5 TO DP4
Reach length = 1150.0 ft
Manning's n = 0.040
Side slope = 20.0:1
Rating curve x = 0.805
Ave. velocity = 0.77 ft/s

Peak discharge = 1.946 cfs
Time to peak = 12.07 hrs
Hyd. volume = 9,903 cuft
Section type = Trapezoidal
Channel slope = 0.4 %
Bottom width = 5.0 ft
Max. depth = 1.0 ft
Rating curve m = 0.976
Routing coeff. = 0.0756

Modified Att-Kin routing method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

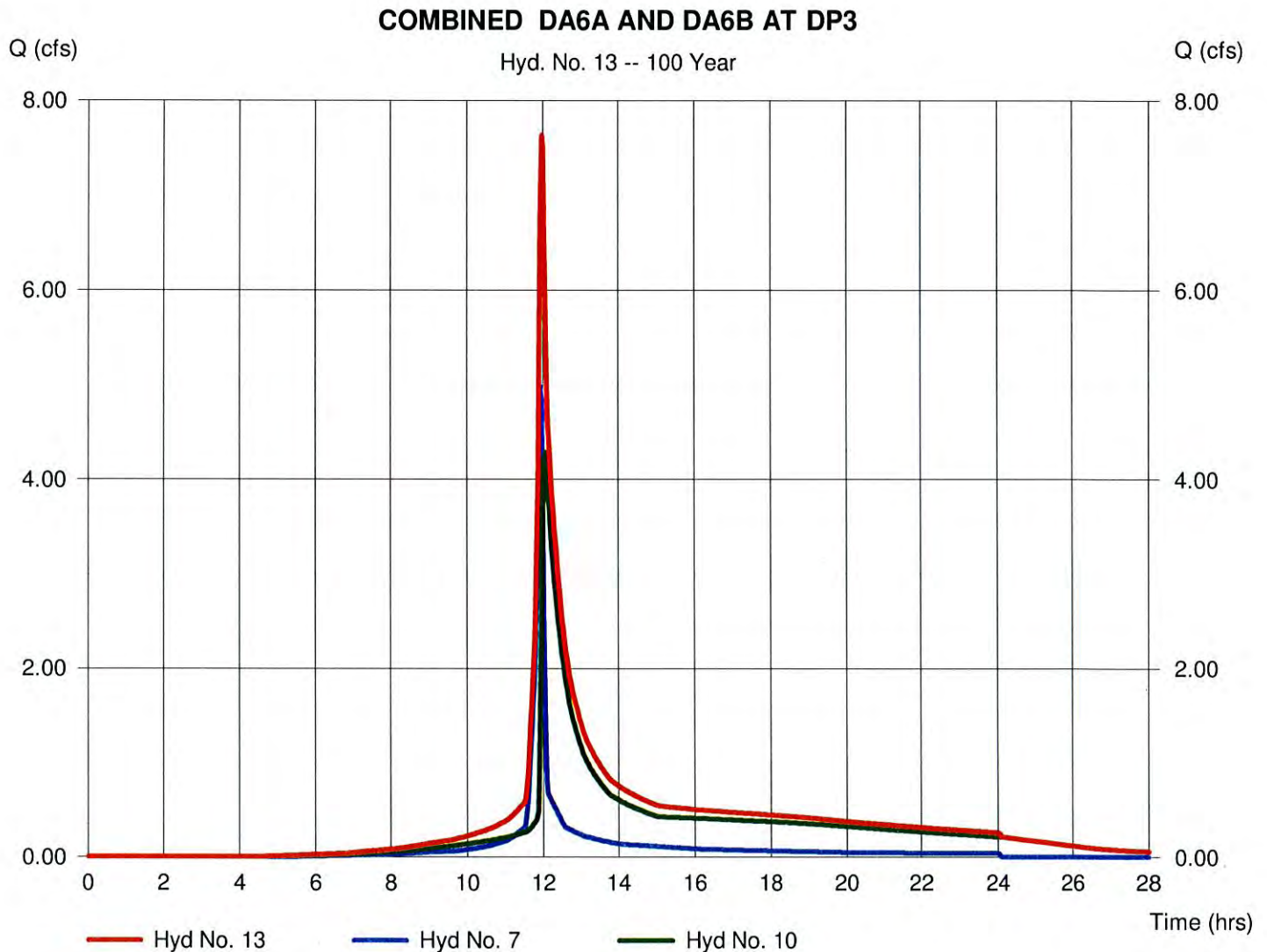
Monday, Sep 13, 2010

Hyd. No. 13

COMBINED DA6A AND DA6B AT DP3

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 7, 10

Peak discharge = 7.633 cfs
Time to peak = 11.97 hrs
Hyd. volume = 40,813 cuft
Contrib. drain. area = 0.820 ac



Hydrograph Report

60

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

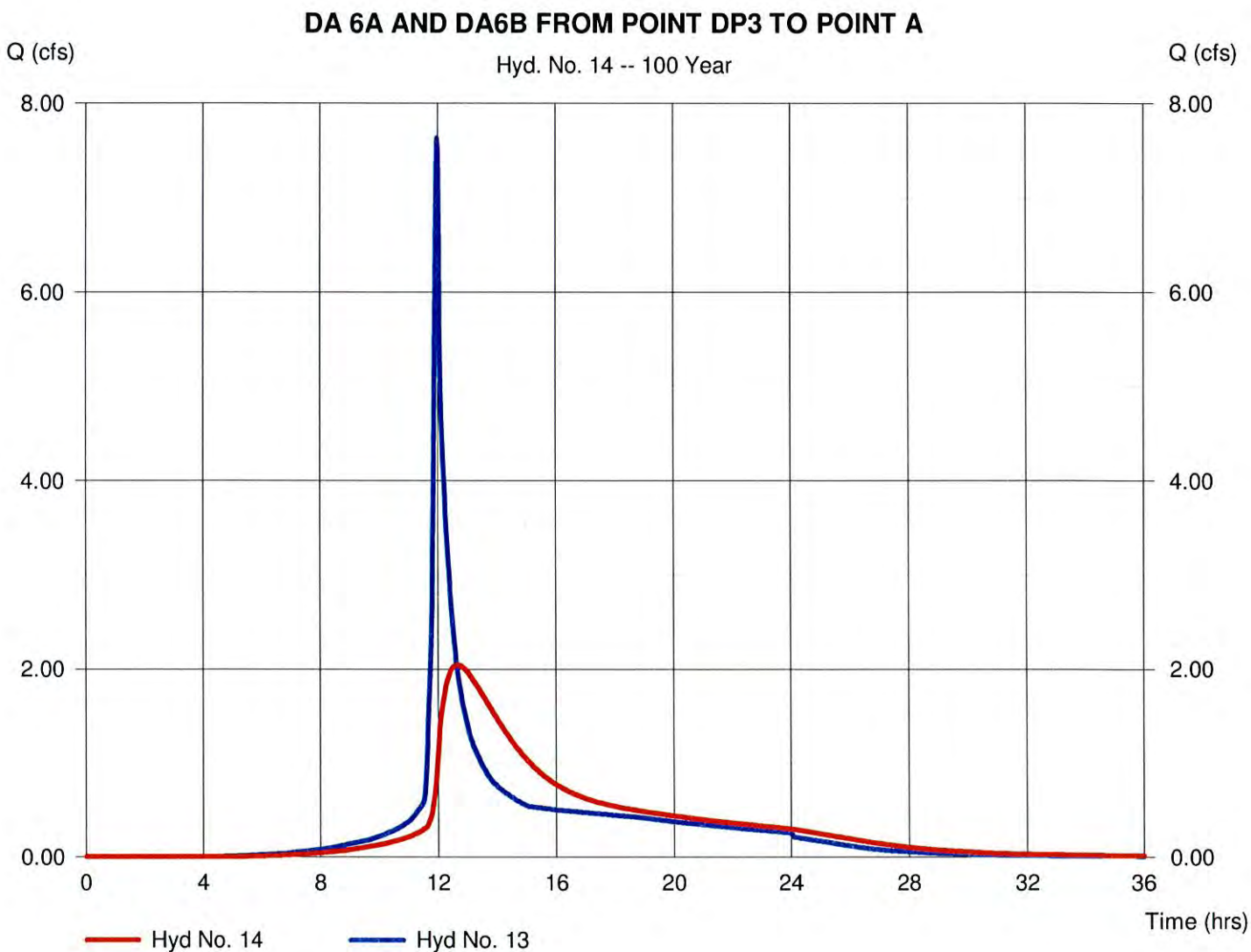
Monday, Sep 13, 2010

Hyd. No. 14

DA 6A AND DA6B FROM POINT DP3 TO POINT A

Hydrograph type	= Reach	Peak discharge	= 2.043 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.67 hrs
Time interval	= 2 min	Hyd. volume	= 40,572 cuft
Inflow hyd. No.	= 13 - COMBINED DA6A AND DA6B AT DP3	Section type	= Trapezoidal
Reach length	= 1815.0 ft	Channel slope	= 0.1 %
Manning's n	= 0.040	Bottom width	= 5.0 ft
Side slope	= 20.0:1	Max. depth	= 1.0 ft
Rating curve x	= 0.403	Rating curve m	= 0.976
Ave. velocity	= 0.37 ft/s	Routing coeff.	= 0.0239

Modified Att-Kin routing method used.



Hydrograph Report

61

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc. v6.052

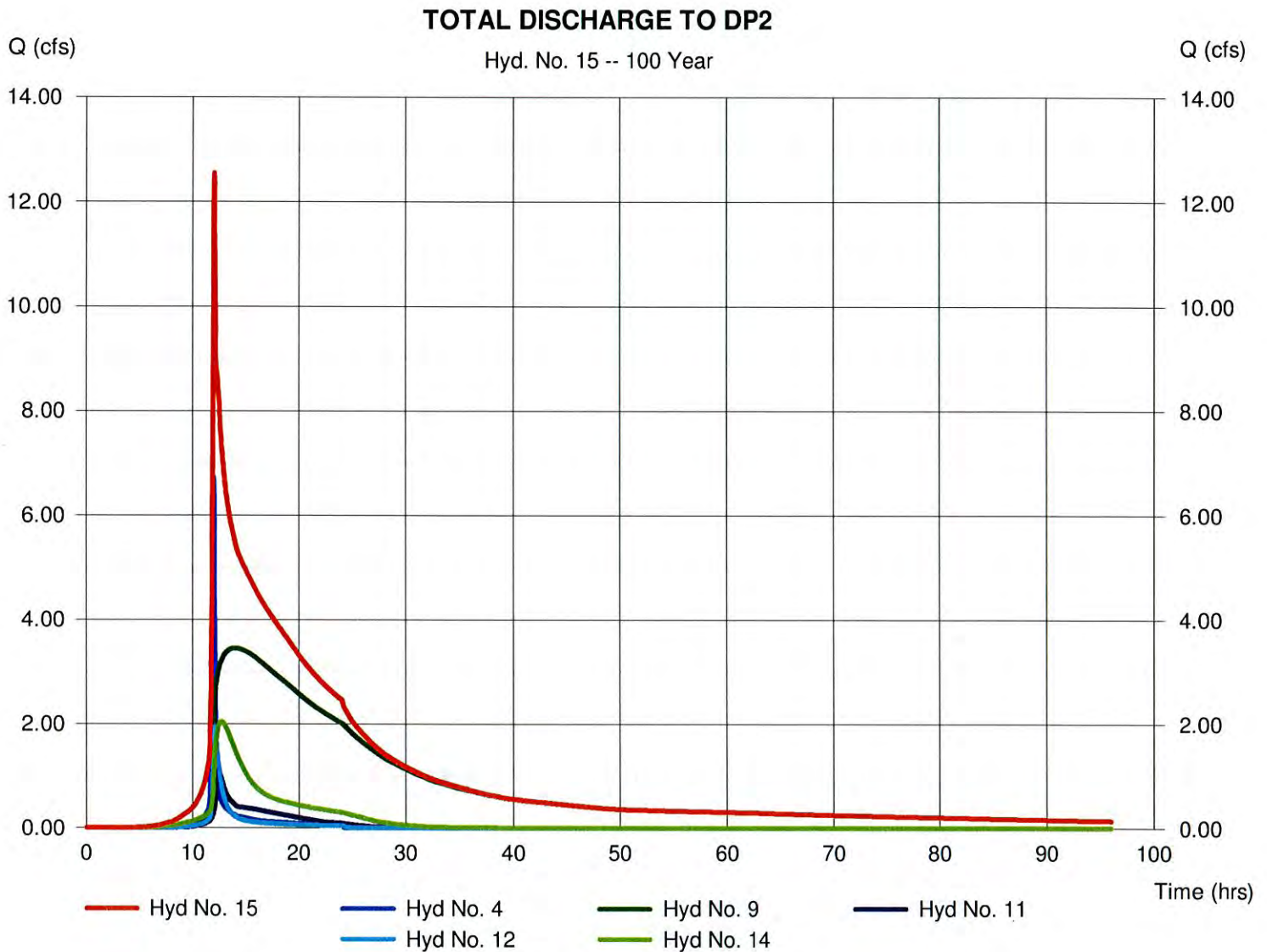
Monday, Sep 13, 2010

Hyd. No. 15

TOTAL DISCHARGE TO DP2

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 4, 9, 11, 12, 14

Peak discharge = 12.54 cfs
Time to peak = 12.00 hrs
Hyd. volume = 318,773 cuft
Contrib. drain. area = 1.390 ac



Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	67.0175	12.8000	0.8569	-----
3	0.0000	0.0000	0.0000	-----
5	76.3148	14.3000	0.8285	-----
10	87.9879	15.5000	0.8272	-----
25	104.7368	16.7000	0.8265	-----
50	117.3990	17.4000	0.8248	-----
100	133.7316	18.3000	0.8296	-----

File name: SampleFHA.idf

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

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.68	4.60	3.88	3.37	2.98	2.68	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.64	3.30	3.02	2.79	2.59	2.42	2.28	2.15
10	7.23	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.23	6.94	6.02	5.33	4.80	4.37	4.02	3.72	3.47	3.25	3.07	2.90
50	9.04	7.65	6.67	5.92	5.34	4.87	4.48	4.16	3.88	3.64	3.43	3.25
100	9.81	8.35	7.30	6.50	5.87	5.36	4.94	4.59	4.28	4.02	3.79	3.59

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

[illegible]

WinTR-55 Current Data Description

--- Identification Data ---

User: DJZ Date: 9/8/2010
 Project: Mathews Ave - ETC Units: English
 SubTitle: Post-Development Site Areal Units: Acres
 State: New York
 County: Onondaga
 Filename: I:\Obg-Property.4152\39256.Brownfield-Red\120.001 - Empire Tissue\N&D\Stormwater_Design\PO

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
DA1	to NE SWMA, to DP-1	Outlet	3.6	92	0.1
DA2	to Canal, to DP-2	Outlet	17.74	95	0.1
DA4	to SW SWMA, to DP-2	Outlet	1.22	85	0.111
DA5	to DP-4	Outlet	0.95	80	0.110
DA6A	to south SWMA	Outlet	2.03	93	0.100
DA6B	area arnd south swale	Outlet	0.86	85	0.100
DA4b	to DP-4	Outlet	1.39	84	0.100

Total area: 27.79 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr (in)
2.6	3.2	3.8	4.5	4.8	5.2	2.2

Storm Data Source: Onondaga County, NY (NRCS)
 Rainfall Distribution Type: Type II
 Dimensionless Unit Hydrograph: <standard>

Mathews Ave - ETC
Post-Development Site
Onondaga County, New York

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Velocity (ft/sec)	Travel Time (hr)

DA1							
SHEET	100	0.0200	0.011				0.022
SHALLOW	80	0.0200	0.025				0.008
CHANNEL	407					3.000	0.038
						Time of Concentration	0.1
							=====
DA2							
SHEET	100	0.0150	0.011				0.025
SHALLOW	89	0.0110	0.025				0.012
CHANNEL	863	0.0050	0.012	2.45	3.90	6.479	0.037
						Time of Concentration	0.1
							=====
DA4							
SHEET	70	0.0640	0.150				0.086
SHALLOW	67	0.0250	0.025				0.006
CHANNEL	222					5.000	0.012
CHANNEL	130					5.000	0.007
						Time of Concentration	0.111
							=====
DA5							
User-provided							0.110
						Time of Concentration	0.110
							=====
DA6A							
User-provided							0.100
						Time of Concentration	0.100
							=====
DA6B							
SHEET	20	0.1650	0.400				0.047
						Time of Concentration	0.100
							=====
DA4b							
User-provided							0.100
						Time of Concentration	0.100
							=====

Mathews Ave - ETC
Post-Development Site
Onondaga County, New York

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
DA1	Paved parking lots, roofs, driveways	D	2.43	98
	Pasture, grassland or range (good)	D	1.17	80
	Total Area / Weighted Curve Number		3.6	92
			===	==
DA2	Paved parking lots, roofs, driveways	D	14.92	98
	Pasture, grassland or range (good)	D	1.14	80
	Brush - brush, weed, grass mix (fair)	C	.36	70
	Woods (fair)	C	.4	73
	Woods (fair)	D	.92	79
	Total Area / Weighted Curve Number		17.74	95
			=====	==
DA4	Paved parking lots, roofs, driveways	D	.35	98
	Pasture, grassland or range (good)	D	.87	80
	Total Area / Weighted Curve Number		1.22	85
			=====	==
DA5	Pasture, grassland or range (good)	D	.9	80
	Brush - brush, weed, grass mix (poor)	D	.02	83
	Brush - brush, weed, grass mix (good)	D	.03	73
	Total Area / Weighted Curve Number		.95	80
			===	==
DA6A	Paved parking lots, roofs, driveways	D	1.51	98
	Pasture, grassland or range (good)	D	.52	80
	Total Area / Weighted Curve Number		2.03	93
			=====	==
DA6B	Paved parking lots, roofs, driveways	D	.28	98
	Pasture, grassland or range (good)	D	.48	80
	Brush - brush, weed, grass mix (good)	D	.1	73
	Total Area / Weighted Curve Number		.86	85
			===	==
DA4b	Paved parking lots, roofs, driveways	D	.32	98
	Pasture, grassland or range (good)	D	1.07	80
	Total Area / Weighted Curve Number		1.39	84
			=====	==

Stage Storage Tables

**PROPOSED STORMWATER MANAGEMENT AREA
SWMA-1
STAGE/STORAGE**

ELEVATION WATER	AREA (ft ²)	AREA (ac)	AVG. AREA (ft ²)	CHANGE IN ELEV. (ft)	VOLUME (ft ³)	RETENTION STORAGE (ac-ft)	DETENTION STORAGE (ac-ft)	TOTAL STORAGE (ac-ft)
400.30	0	0.000	0	400.30	0	0.00	-	0.000
401.00	10,609	0.244	5,305	0.70	3,713	0.09	-	0.085
402.00	12,573	0.289	11,591	1.00	11,591	0.35	-	0.351
403.00	14,698	0.337	13,636	1.00	13,636	0.66	-	0.664

**PROPOSED STORMWATER MANAGEMENT AREA
SWMA-2 (ERIE CANAL)
STAGE/STORAGE**

ELEVATION WATER	AREA (ft ²)	AREA (ac)	AVG. AREA (ft ²)	CHANGE IN ELEV. (ft)	VOLUME (ft ³)	RETENTION STORAGE (ac-ft)	DETENTION STORAGE (ac-ft)	TOTAL STORAGE (ac-ft)
396.50	0		0	0.00	0	0.00	-	0.00
397.00	168,604		168,604	0.50	84,302	1.94	-	1.94
398.00	182,627		175,616	1.00	175,616	5.97	-	5.97
398.20	185,296		183,962	0.20	36,792	6.81	-	6.81
399.00	195,972		190,634	0.80	152,507	10.31	-	10.31
400.00	208,639		202,306	1.00	202,306	14.96	-	14.96

PROPOSED STORMWATER MANAGEMENT AREA
SWMA-3
STAGE/STORAGE

ELEVATION WATER	AREA (ft ²)	AREA (ac)	AVG. AREA (ft ²)	CHANGE IN ELEV. (ft)	VOLUME (ft ³)	TOTAL STORAGE (ac-ft)
407.10	0	0.000	0	0.00	0	0.000
408.00	7,394	0.170	3,697	0.90	3,327	0.076
409.00	9,715	0.223	8,555	1.00	8,555	0.273
409.50	13,922	0.320	11,819	0.50	5,909	0.408

PROPOSED STORMWATER MANAGEMENT AREA
SWMA-4
STAGE/STORAGE

ELEVATION WATER	AREA (ft ²)	AREA (ac)	AVG. AREA (ft ²)	CHANGE IN ELEV. (ft)	VOLUME (ft ³)	TOTAL STORAGE (ac-ft)
403.00	0	0.000	0	0.00	0	-
404.00	5,862	0.135	2,931	1.00	2,931	0.067
405.00	7,417	0.170	6,640	1.00	6,640	0.220

*Stormwater Quality
Calculations*

PROJECT: Empire Tissue - Mathews Avenue
 PROJECT NO.: 39256-120
 DATE: 9/7/2010

STORMWATER QUALITY CALCULATIONS
SWMA # 1

Water Quality Volume Design - WQ_v

**Enhanced Phosphorus Removal Criteria Required*

WQ_v = Runoff Volume From 1-yr 24-hr Storm = Runoff Depth X Area

WQ_v - water quality volume, ac. ft.

P - 1-yr 24-hr Rainfall, inches

Q - Runoff Depth, inches $Q = \frac{(P-0.2S)^2}{P+0.8S}$
 A - site area, acres

P= 2.2 inches
 CN= 94
 A= 3.61 acres
 Q= 1.58 inches
 WQ_v= 0.477 acre-feet required or 20,762 cf
 0.534 acre-feet provided or 23,261 cf

Stream Channel Protection Volume Design - Cp_v

$V_s/V_r = 0.682 - (1.43(q_o/q_i)) + (1.64 (q_o/q_i)^2) - (0.804(q_o/q_i)^3)$

$V_s = [(V_s/V_r)(Q_d)(A)]/12$

V_s - required storage volume, ac. ft.

V_r - runoff volume, ac. ft.

q_u - unit peak discharge, csm/in

q_o - peak outflow discharge, cfs

q_i - peak inflow discharge, cfs

T - extended detention time, hours

Q_d - post-development runoff for design storm, inches

A - total drainage areas, acres

q_u= 1000 csm/in I_a= 0.128
 T= 24 hours I_a/P= 0.058
 q_o/q_i= 0.020 (From Appendix B Figure B.1) T_c= 0.072 hours
 q_i= 7.1 cfs
 q_o= 0.142 cfs
 V_s/V_r= 0.65
 Q_d= 1.58 inches
 A= 3.61 acres
 V_s= 0.31 ac. ft. Required CP_v Storage

From Stage/Storage/Discharge Table CP_v wsel = 401.8

Avg Release Rate = $(0.65 \text{ ac-ft} \times 43560 \text{ ft}^2/\text{ac}) / (24 \text{ hrs} \times 3,600 \text{ sec/hr}) = 0.33 \text{ cfs}$

Set Invert of orifice at 400.30

Avg. Head= 0.75 ft

$Q = C \cdot A \cdot ((2 \cdot g \cdot h)^{0.5})$

$A = Q / (C \cdot ((2 \cdot g \cdot h)^{0.5})) = 0.08 \text{ ft}^2$

$A = 3.14 d^2 / 4$

d= 0.317 feet = 3.8 inches so use 4-inch

PROJECT: Empire Tissue - Mathews Avenue
 PROJECT NO.: 39256-120
 DATE: 9/7/2010

STORMWATER QUALITY CALCULATIONS
SWMA # 2 (CANAL)

Water Quality Volume Design - WQ_v

**Enhanced Phosphorus Removal Criteria Required*

WQ_v = Runoff Volume From 1-yr 24-hr Storm = Runoff Depth X Area

WQ_v - water quality volume, ac. ft.

P - 1-yr 24-hr Rainfall, inches

Q - Runoff Depth, inches $Q = \frac{(P-0.2S)^2}{P+0.8S}$
 A - site area, acres

P= 2.2	inches		
CN= 95			
A= 17.72	acres		
Q= 1.67	inches		
WQ _v = 2.47	acre-feet required or	107,685	cf
2.47	acre-feet provided or	107,685	cf

Stream Channel Protection Volume Design - Cp_v

$V_s/V_r = 0.682 - (1.43(q_o/q_i)) + (1.64 (q_o/q_i)^2) - (0.804(q_o/q_i)^3)$

$V_s = [(V_s/V_r)(Q_d)(A)]/12$

V_s - required storage volume, ac. ft.

V_r - runoff volume, ac. ft.

q_u - unit peak discharge, csm/in

q_o - peak outflow discharge, cfs

q_i - peak inflow discharge, cfs

T - extended detention time, hours

Q_d - post-development runoff for design storm, inches

A - total drainage areas, acres

q _u =	1000 csm/in	la=	0.105
T=	24 hours	la/P=	0.048
q _o /q _i =	0.020 (From Appendix B Figure B.1)	Tc=	0.088 hours
q _i =	49.6 cfs		
q _o =	0.992 cfs		
V _s /V _r =	0.65		
Q _d =	1.67 inches		
A=	17.72 acres		
V _s =	1.61 ac. ft.	Required CP _v Storage	

From Stage/Storage/Discharge Table CP_v wsel = 396.90

Avg Release Rate = $(0.65 \text{ ac-ft} \times 43560 \text{ ft}^2/\text{ac}) / (24 \text{ hrs} \times 3,600 \text{ sec/hr}) = 0.33 \text{ cfs}$

Set Invert of orifice at 396.50

Avg. Head= 0.2 ft

$$Q = C \cdot A \cdot ((2 \cdot g \cdot h)^{0.5})$$

$$A = Q / (C \cdot ((2 \cdot g \cdot h)^{0.5})) = 0.15 \text{ ft}^2$$

$$A = 3.14 d^2 / 4$$

$$d = 0.442 \text{ feet} = 5 \text{ inches}$$

PROJECT: Empire Tissue - Mathews Avenue
 PROJECT NO.: 39256-120
 DATE: 9/7/2010

STORMWATER QUALITY CALCULATIONS **SWMA # 3**

Water Quality Volume Design - WQ_v

**Enhanced Phosphorus Removal Criteria Required*

WQ_v = Runoff Volume From 1-yr 24-hr Storm = Runoff Depth X Area

WQ_v - water quality volume, ac. ft.

P - 1-yr 24-hr Rainfall, inches

Q - Runoff Depth, inches $Q = \frac{(P-0.2S)^2}{P+0.8S}$
 A - site area, acres

P= 2.2	inches		
CN= 95			
A= 2.03	acres		
Q= 1.50	inches		
WQ_v= 0.254	acre-feet required or	11,046	cf
0.254	acre-feet provided or	11,046	cf

Stream Channel Protection Volume Design - C_p

$V_s/V_r = 0.682 - (1.43(q_o/q_i)) + (1.64 (q_o/q_i)^2) - (0.804(q_o/q_i)^3)$

$V_s = [(V_s/V_r)(Q_d)(A)]/12$

V_s - required storage volume, ac. ft.

V_r - runoff volume, ac. ft.

q_u - unit peak discharge, csm/in

q_o - peak outflow discharge, cfs

q_i - peak inflow discharge, cfs

T - extended detention time, hours

Q_d - post-development runoff for design storm, inches

A - total drainage areas, acres

q_u=	1000 csm/in	la=	0.105
T=	24 hours	la/P=	0.048
q_o/q_i=	0.020 (From Appendix B Figure B.1)	Tc=	0.063 hours
q_i=	3.8 cfs		
q_o=	0.076 cfs		
V_s/V_r=	0.65		
Q_d=	1.50 inches		
A=	1.41 acres		
V_s=	0.12 ac. ft.	Required C_{Pv} Storage	

From Stage/Storage/Discharge Table C_{Pv} wsel = 408.3

Avg Release Rate = $(0.65 \text{ ac-ft} \times 43560 \text{ ft}^2/\text{ac}) / (24 \text{ hrs} \times 3,600 \text{ sec/hr}) = 0.33 \text{ cfs}$

Set Invert of orifice at 407.10

Avg. Head= 0.6 ft

$Q = C \cdot A \cdot ((2 \cdot g \cdot h)^{0.5})$

$A = Q / (C \cdot ((2gh)^{0.5})) = 0.09 \text{ ft}^2$

$A = 3.14d^2/4$

d= 0.336 feet = 4 inches

PROJECT: Empire Tissue - Mathews Avenue
 PROJECT NO.: 39256-120
 DATE: 9/7/2010

STORMWATER QUALITY CALCULATIONS SWMA # 4

Water Quality Volume Design - WQ_v

**Enhanced Phosphorus Removal Criteria Required*

WQ_v = Runoff Volume From 1-yr 24-hr Storm = Runoff Depth X Area

WQ_v - water quality volume, ac. ft.

P - 1-yr 24-hr Rainfall, inches

Q - Runoff Depth, inches $Q = \frac{(P-0.2S)^2}{P+0.8S}$

A - site area, acres

P= 2.2	inches		
CN= 86			
A= 1.22	acres		
Q= 1.00	inches		
WQ _v = 0.102	acre-feet required or	4,429	cf
0.195	acre-feet provided	8,494	cf

Stream Channel Protection Volume Design - C_p

$V_s/V_r = 0.682 - (1.43(q_o/q_i)) + (1.64 (q_o/q_i)^2) - (0.804(q_o/q_i)^3)$

$V_s = [(V_s/V_r)(Q_d)(A)]/12$

V_s - required storage volume, ac. ft.

V_r - runoff volume, ac. ft.

q_u - unit peak discharge, csm/in

q_o - peak outflow discharge, cfs

q_i - peak inflow discharge, cfs

T - extended detention time, hours

Q_d - post-development runoff for design storm, inches

A - total drainage areas, acres

q _u =	700	csm/in	la=	0.326
T=	24	hours	la/P=	0.148
q _o /q _i =	0.025	(From Appendix B Figure B.1)	Tc=	0.258 hours
q _i =	1.5	cfs		
q _o =	0.038	cfs		
V _s /V _r =	0.65			
Q _d =	1.00	inches		
A=	1.22	acres		
V _s =	0.07	ac. ft.	Required C _P _v Storage	

From Stage/Storage/Discharge Table C_P_v wsel = 404.3

Avg Release Rate = $(0.65 \text{ ac-ft} \times 43560 \text{ ft}^2/\text{ac}) / (24 \text{ hrs} \times 3,600 \text{ sec/hr}) = 0.33 \text{ cfs}$

Set Invert of orifice at 403.00

Avg. Head= 0.65 ft

$Q = C \cdot A \cdot ((2 \cdot g \cdot h)^{0.5})$

$A = Q / (C \cdot ((2 \cdot g \cdot h)^{0.5})) = 0.08 \text{ ft}^2$

$A = 3.14 d^2 / 4$

d= 0.327 feet = 4 inches

*Emergency Spillway Weir
Reports*

Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc.

Wednesday, Sep 1 2010

Emergency Spillway for SWMA 1

Trapezoidal Weir

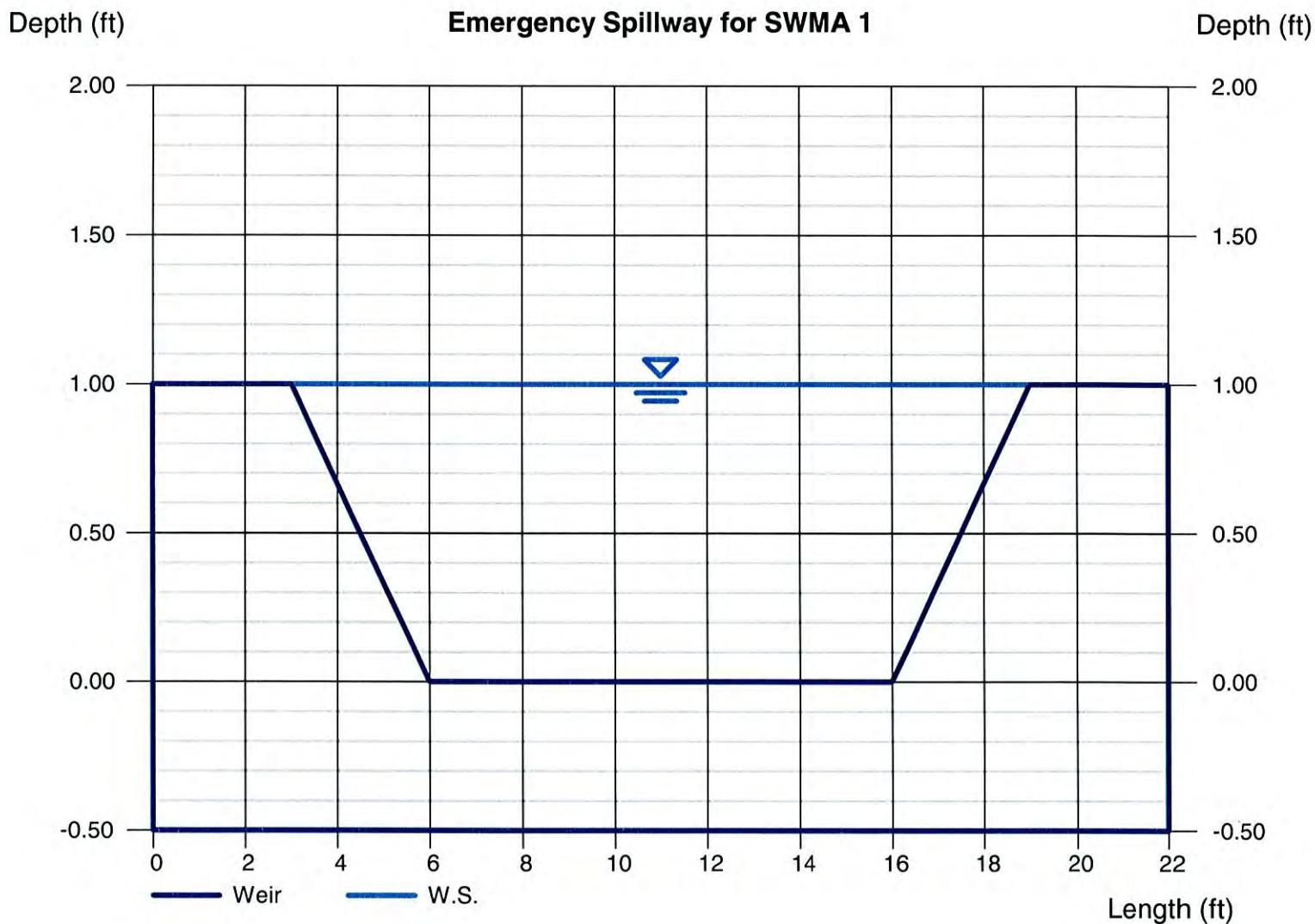
Crest = Sharp
Bottom Length (ft) = 10.00
Total Depth (ft) = 1.00
Side Slope (z:1) = 3.00

Highlighted

Depth (ft) = 1.00
Q (cfs) = 38.44
Area (sqft) = 13.00
Velocity (ft/s) = 2.96
Top Width (ft) = 16.00

Calculations

Weir Coeff. Cw = 3.10
Compute by: Q vs Depth
No. Increments = 10



Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc.

Wednesday, Sep 1 2010

Emergency Spillway for SWMA 2

Trapezoidal Weir

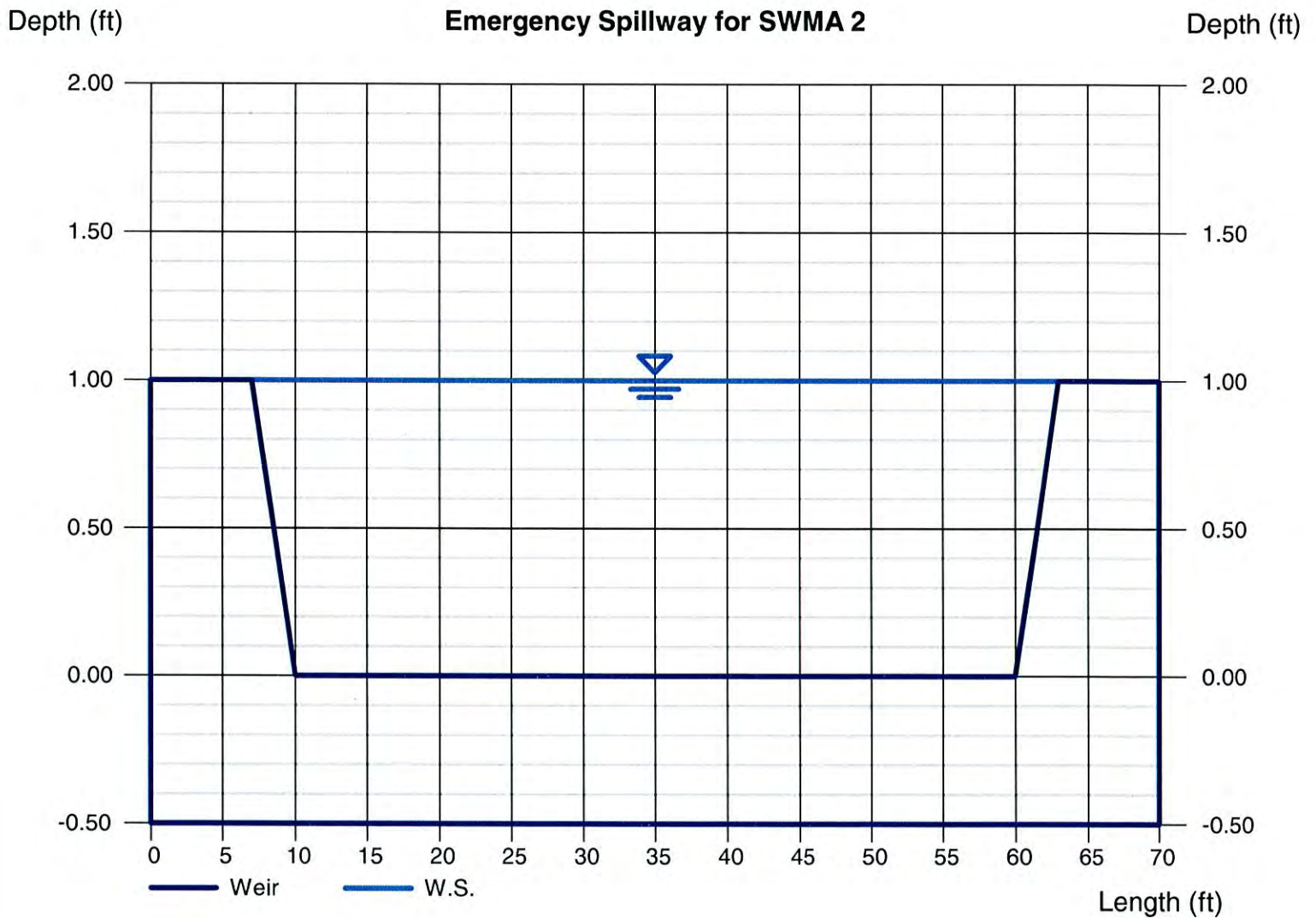
Crest = Sharp
Bottom Length (ft) = 50.00
Total Depth (ft) = 1.00
Side Slope (z:1) = 3.00

Highlighted

Depth (ft) = 1.00
Q (cfs) = 162.44
Area (sqft) = 53.00
Velocity (ft/s) = 3.06
Top Width (ft) = 56.00

Calculations

Weir Coeff. Cw = 3.10
Compute by: Q vs Depth
No. Increments = 10



Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc.

Wednesday, Sep 1 2010

Emergency Spillway for SWMA 3

Trapezoidal Weir

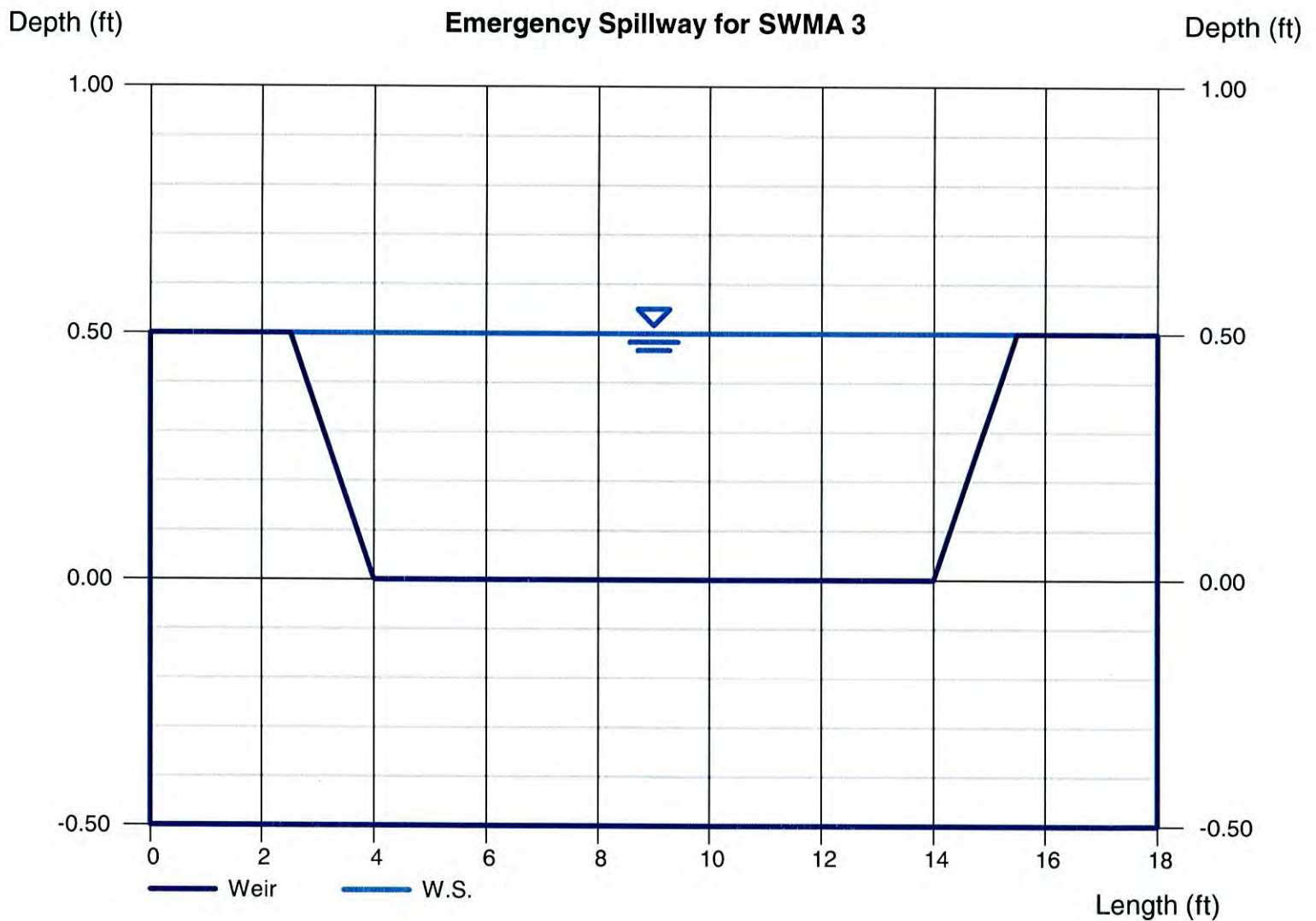
Crest = Sharp
Bottom Length (ft) = 10.00
Total Depth (ft) = 0.50
Side Slope (z:1) = 3.00

Highlighted

Depth (ft) = 0.50
Q (cfs) = 12.28
Area (sqft) = 5.75
Velocity (ft/s) = 2.13
Top Width (ft) = 13.00

Calculations

Weir Coeff. Cw = 3.10
Compute by: Q vs Depth
No. Increments = 10



Weir Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2008 by Autodesk, Inc.

Wednesday, Sep 1 2010

Emergency Spillway for SWMA 4

Trapezoidal Weir

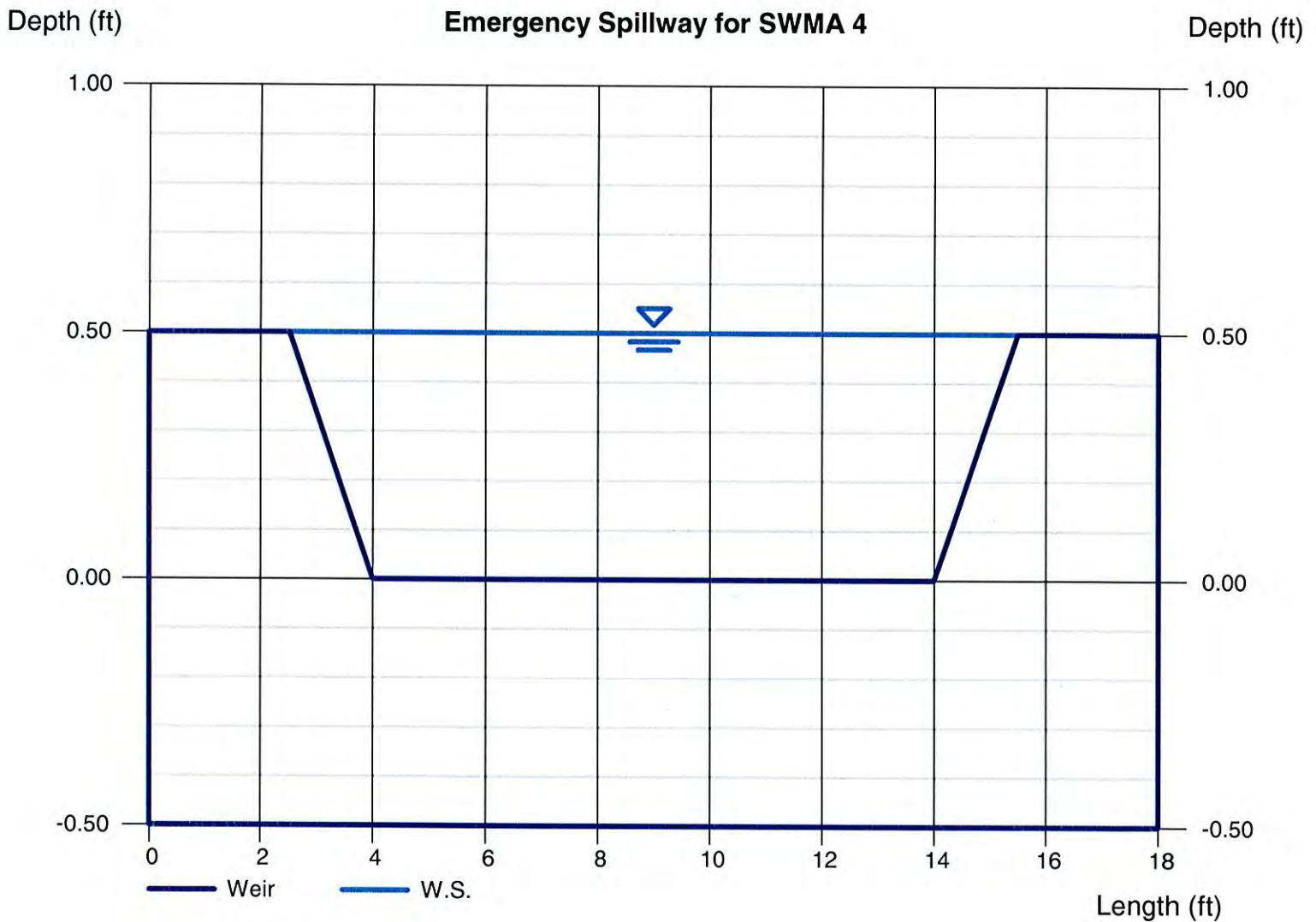
Crest = Sharp
Bottom Length (ft) = 10.00
Total Depth (ft) = 0.50
Side Slope (z:1) = 3.00

Highlighted

Depth (ft) = 0.50
Q (cfs) = 12.28
Area (sqft) = 5.75
Velocity (ft/s) = 2.13
Top Width (ft) = 13.00

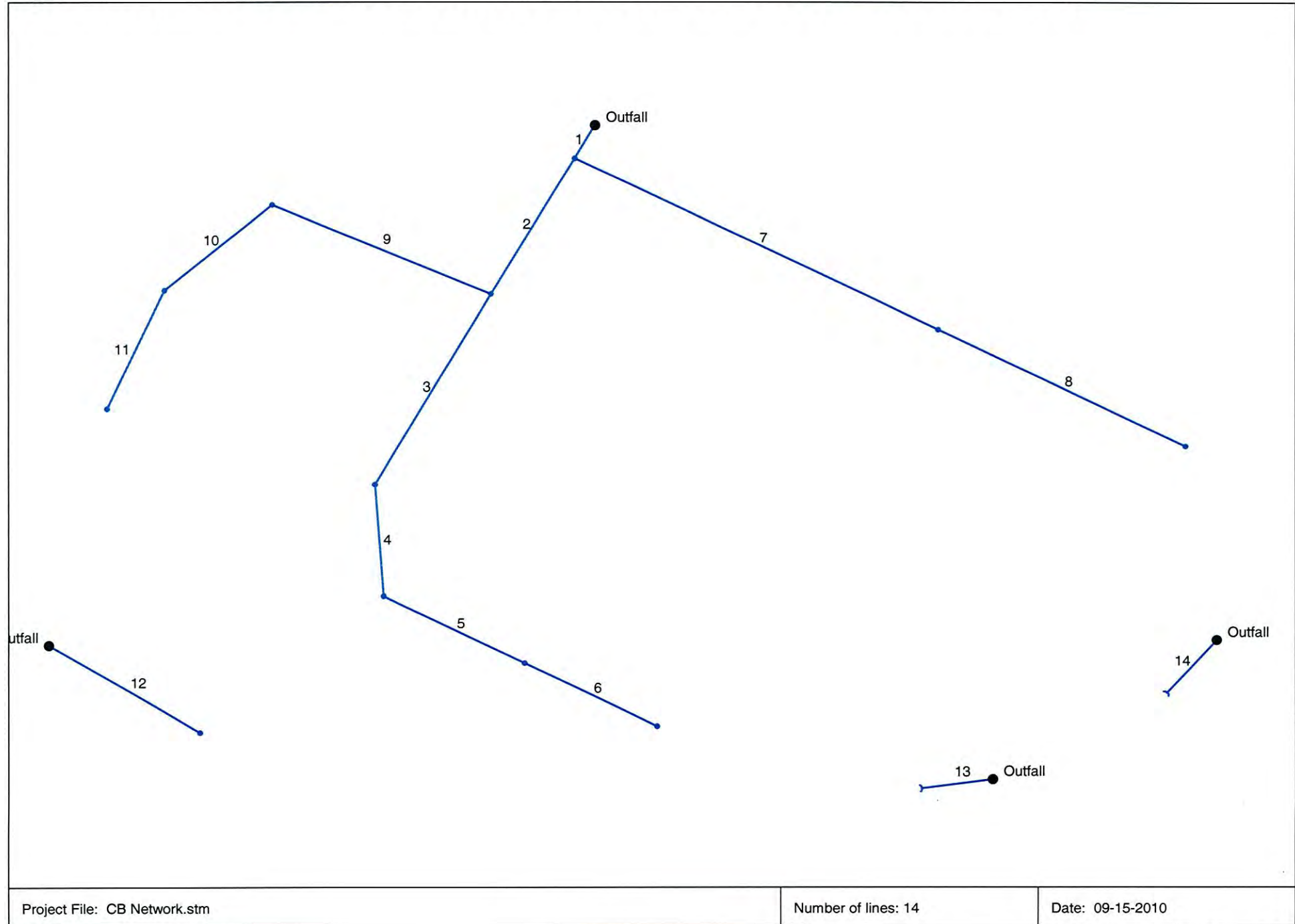
Calculations

Weir Coeff. Cw = 3.10
Compute by: Q vs Depth
No. Increments = 10



*Storm Sewer System Design
Summary*

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2008 Plan



MyReport

Line No.	Inlet ID	Line ID	Runoff Coeff	Tc	Drng Area	Flow Rate	Capac Full	n-val Pipe	Line Size	Line Slope	Vel Dn	Vel Up	Invert Dn	Invert Up	Line Length	Gnd/Rim El Dn	
			(C)	(min)	(ac)	(cfs)	(cfs)		(in)	(%)	(ft/s)	(ft/s)	(ft)	(ft)	(ft)	(ft)	
1			0.90	9.5	1.78	41.86	76.64	0.012	36	1.13	5.92	5.92	396.50	396.95	40.000	399.00	
2			0.90	8.9	0.76	28.02	31.42	0.012	30	0.50	5.71	5.71	399.99	400.82	166.000	408.50	
3			0.90	8.0	1.45	20.08	31.42	0.012	30	0.50	4.09	4.09	400.82	401.97	230.000	409.60	
4			0.71	7.6	1.07	14.72	17.27	0.012	24	0.50	4.69	4.69	402.47	403.05	116.700	409.60	
5			0.89	6.9	0.79	11.84	17.33	0.012	24	0.50	3.77	3.77	403.15	403.95	160.000	409.15	
6			0.90	6.0	2.00	9.08	17.33	0.012	24	0.50	2.89	2.89	404.05	404.80	150.000	409.15	
7			0.90	7.5	1.40	9.09	8.05	0.012	18	0.50	5.14	5.14	401.99	404.05	411.000	408.50	
8			0.90	6.0	0.83	3.77	4.94	0.012	15	0.50	3.07	3.07	404.45	405.85	280.200	408.50	
9			0.00	7.1	0.00	6.93	8.04	0.012	18	0.50	3.92	4.22	404.35	405.56	242.000	409.60	
10			0.87	6.5	0.95	7.22	8.05	0.012	18	0.50	4.09	4.09	405.56	406.27	141.700	411.60	
11			0.80	6.0	0.83	3.35	2.73	0.012	12	0.50	4.26	4.26	406.52	407.20	136.000	410.20	
12			0.78	6.0	0.44	1.73	2.74	0.012	12	0.50	2.95	3.84	407.00	407.90	179.000	407.00	
13			0.78	6.0	0.56	2.20	3.86	0.012	12	1.00	2.94	4.23	404.27	405.00	73.000	0.00	
14			0.75	6.0	1.57	5.94	7.99	0.012	18	0.49	4.36	5.13	400.63	401.00	75.000	0.00	
Project File: CB Network.stm									Number of lines: 14				Date: 09-15-2010				
NOTES: ** Critical depth																	

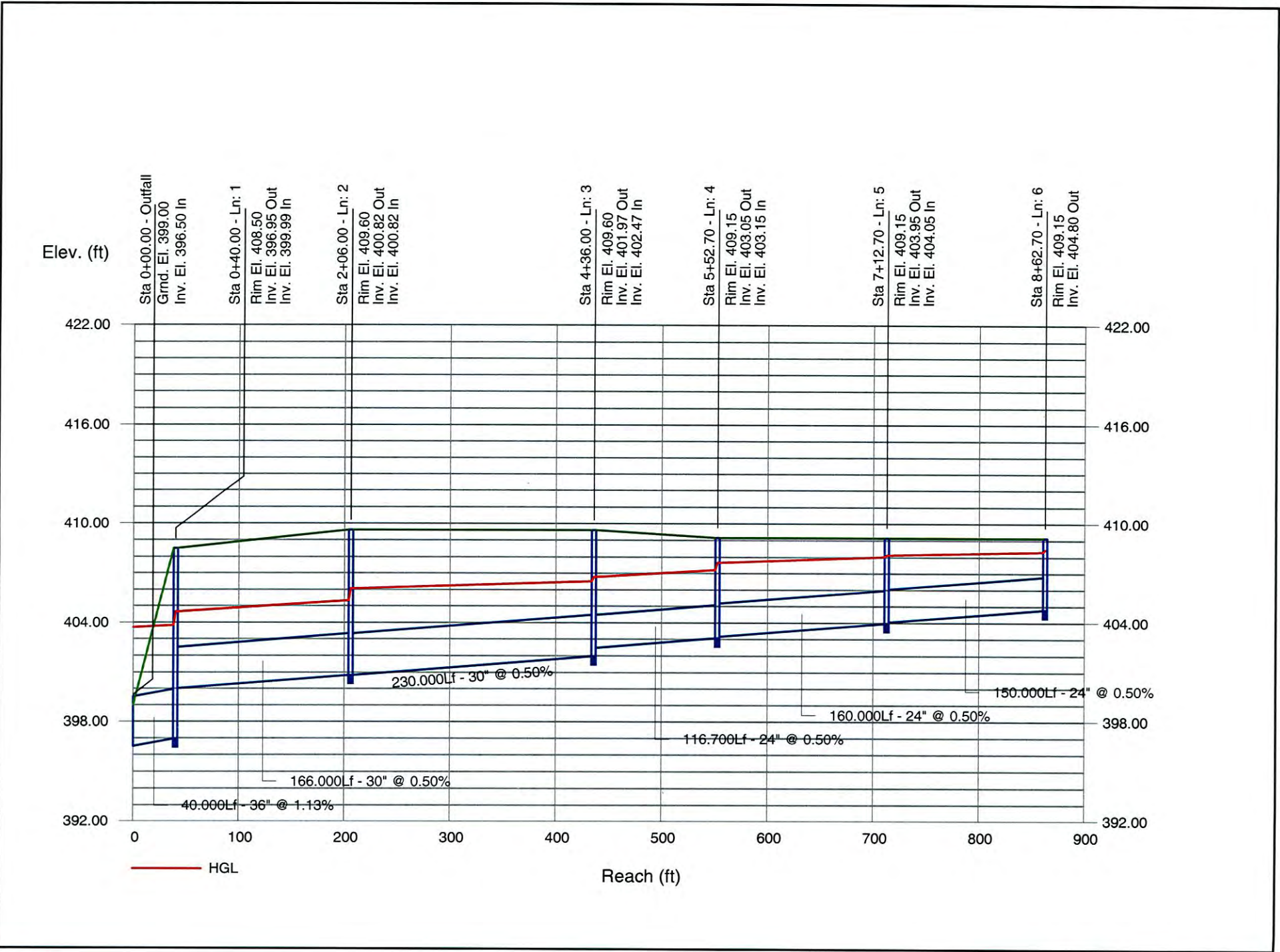
MyReport

Gnd/Rim EI Up
(ft)
408.50
409.60
409.60
409.15
409.15
409.15
408.50
409.10
411.60
410.20
410.20
411.60
0.00
0.00

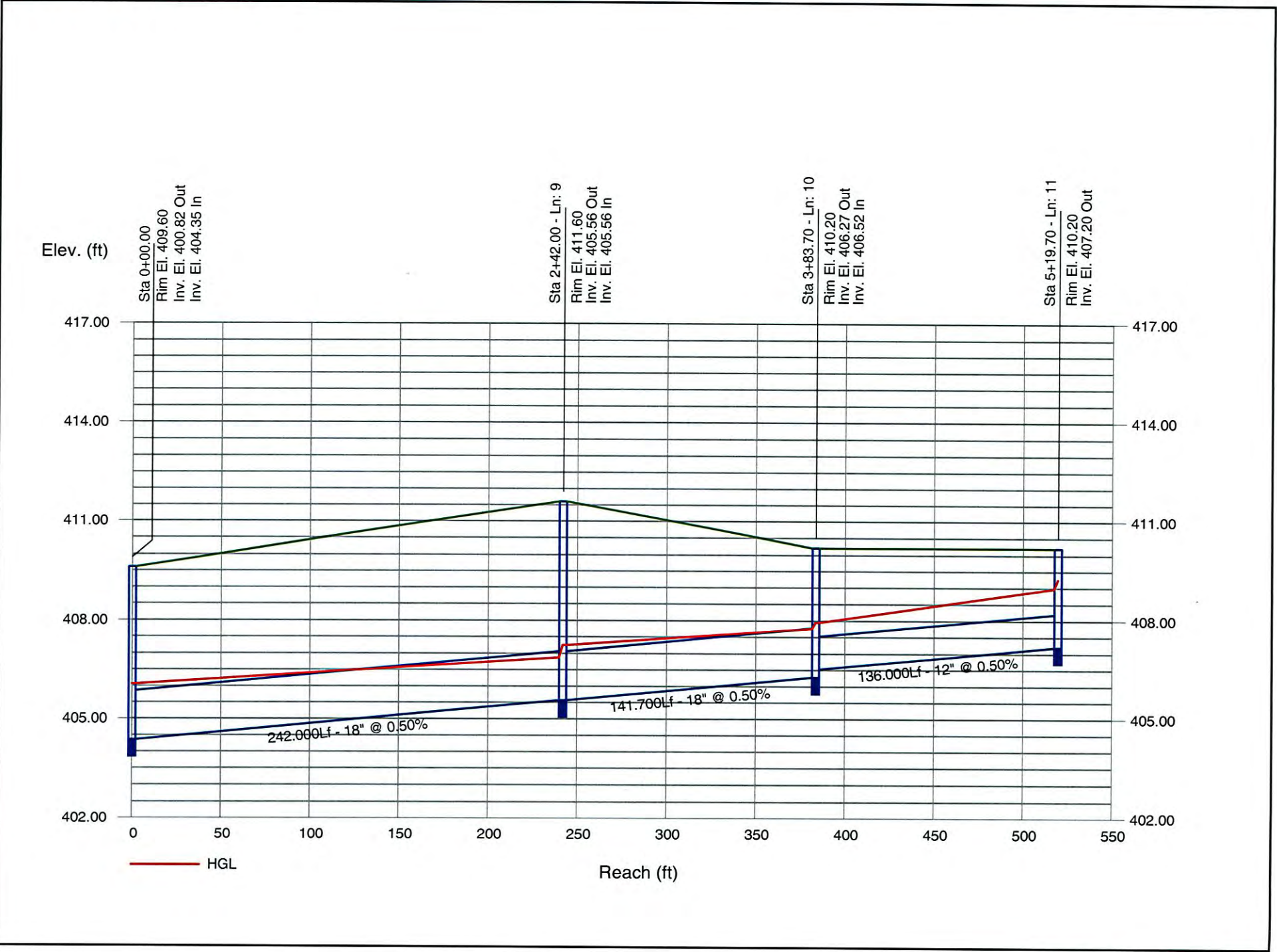
Project File: CB Network.stm	Number of lines: 14	Date: 09-15-2010
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NOTES: ** Critical depth

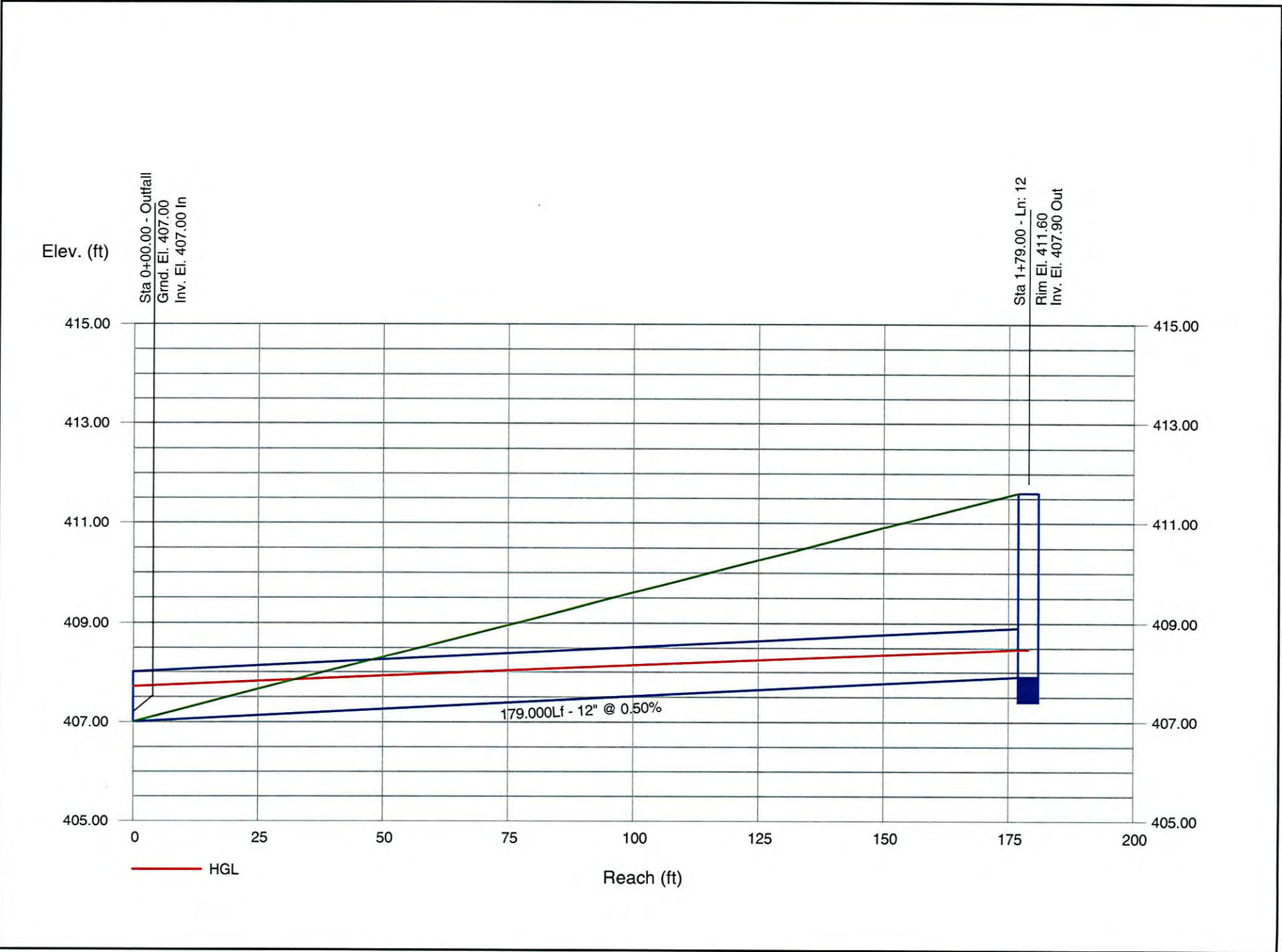
Storm Sewer Profile



Storm Sewer Profile

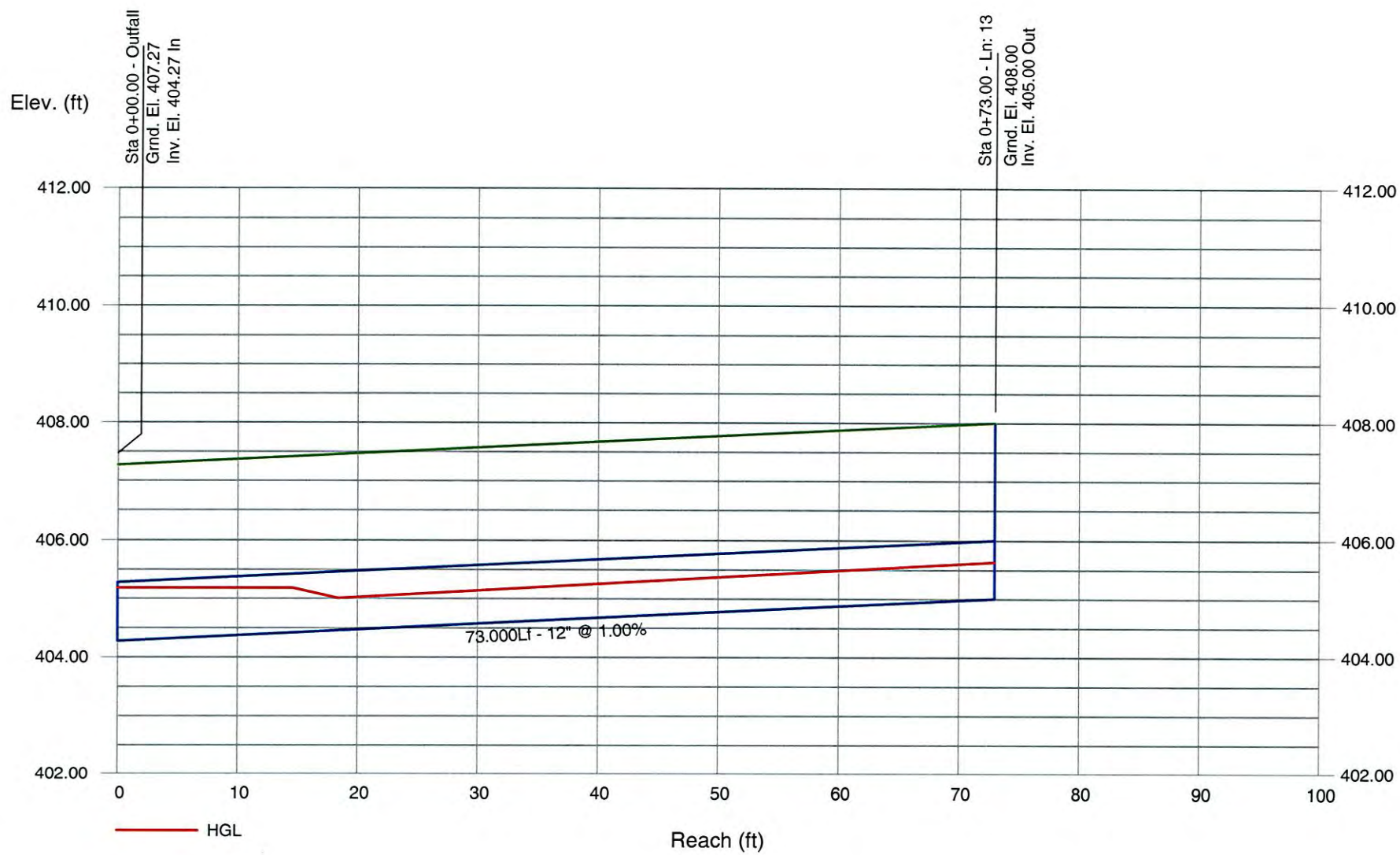


Storm Sewer Profile



Storm Sewer Profile

Proj. file: CB Network.stm



Storm Sewer Profile

