

PICKETT/WHITAKER MINOR PLAT

Drainage Study

Commercial Development

Franklin, Johnson County, Indiana



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Pickett/Whitaker

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Professional Certification

Pickett/Whitaker

The following report and accompanying computations have been developed by me or under my direct supervision.



Venus Thorne
Professional Engineer
Registration Number: 11200278



Drainage Summary

Pickett/Whitaker

The proposed project is a commercial development located in the City of Franklin in Johnson County. The project site for the proposed development consists of 3.14 acres.

Analytical Methodology:

The site was designed per Section 6.19 General Drainage Standards of the City of Franklin Subdivision Control Ordinance.

Runoff Estimates - Runoff for the project were determined using the modified the huff rainfall distribution and corresponding quartile. The detention has been routed using Hydraflow hydrographs and the Huff 1st, 2nd and 3rd quartiles. The input criteria for the huff method includes determining the time-of-concentration, curve number and drainage area.

Times-of-Concentration – The existing and proposed times-of-concentration were determined using the TR-55 methodology. The flow paths are delineated on the enclosed existing and proposed site maps.

Curve Number –The curve numbers were determined using soil conditions and surface descriptions. Calculations for the existing and proposed runoff curve numbers are included within this report.

Allowable Release Rates – Per the ordinance, the storm water ponds have been designed to outlet storm water at a 2-year pre-development rainfall event rate for a 10-year post development storm and at a 10-year pre-development rainfall event rate for a 100-year post-development storm per the Ordinance..

Existing Site Conditions:

The existing site contains a vacant farm field. The site is split into two watersheds as shown on the enclosed maps. The site currently sheet drains.

Watershed A – Watershed A consists of 2.31 acres and outlets to the west of the site to an existing drainage pipe and detention.

Watershed B – Watershed B consist of 0.83 acres and outlets to the west of the site.

Proposed Site Conditions:

Watershed A

In developed conditions the entire proposed impervious areas for the site will flow to a proposed dry detention. Therefore Watershed A will consist of 2.81 acres. The improvements for the site consist of a concrete drive and gravel parking area. A summary of the runoff rates for Watershed A is shown below:

Watershed A	Runoff Rates (cfs)			
	2YR	10YR	25YR	100YR
Existing	0.17	0.59		
Proposed		0.17	0.34	0.68

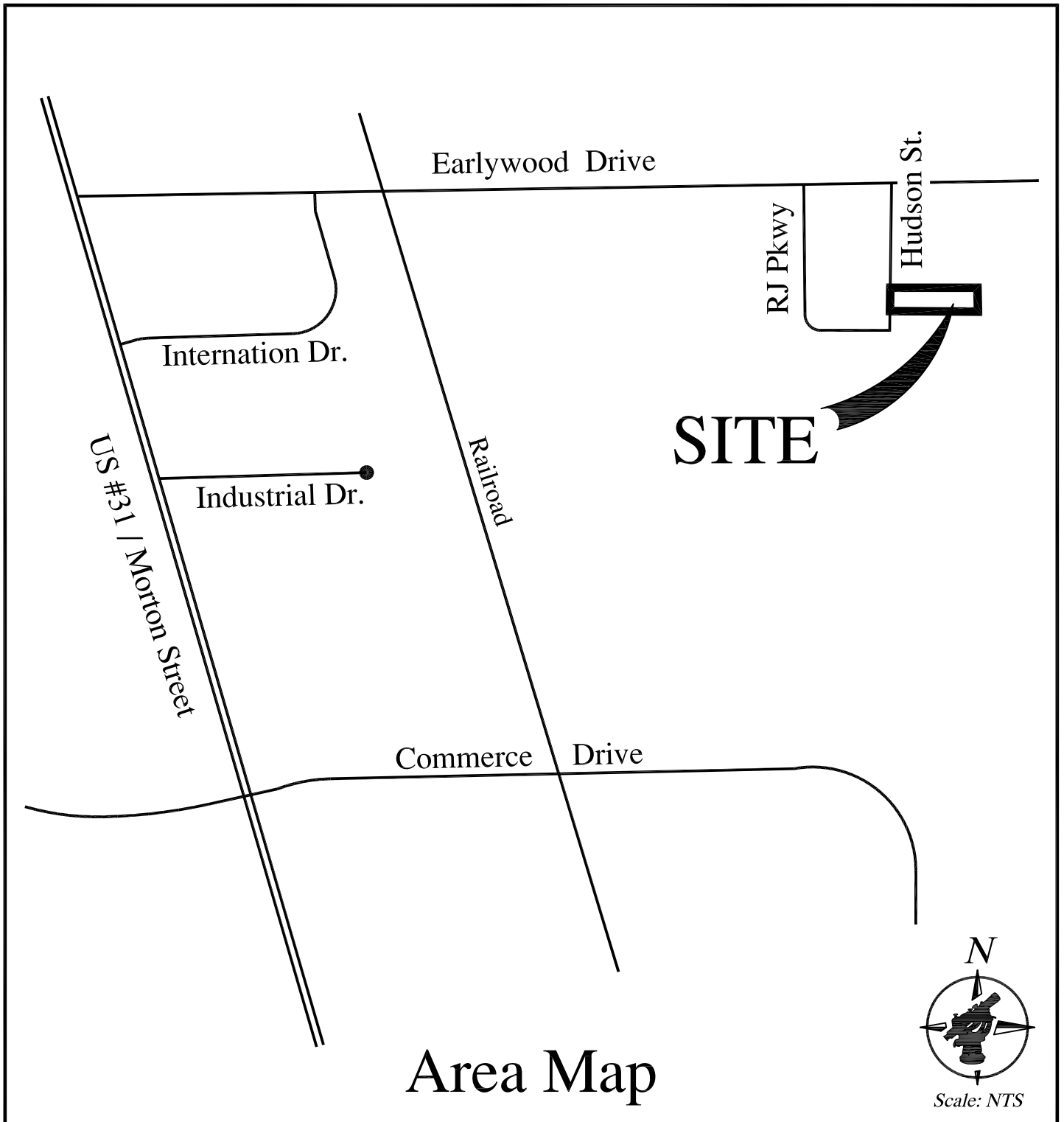
Watershed B

In developed conditions Watershed B will be reduced from 0.83 acres to 0.33 acres. No improvements are proposed for Watershed B in developed conditions. The watershed will continue to sheet flow to the west. The runoff for Watershed B is being decreased in developed conditions due to the decrease in area. A summary of the runoff rates for Watershed B is shown below

Watershed B	Runoff Rates (cfs)			
	2YR	10YR	25YR	100YR
Existing	0.11	0.42	0.65	1.10
Proposed	0.04	0.17	0.26	0.44

Water Quality:

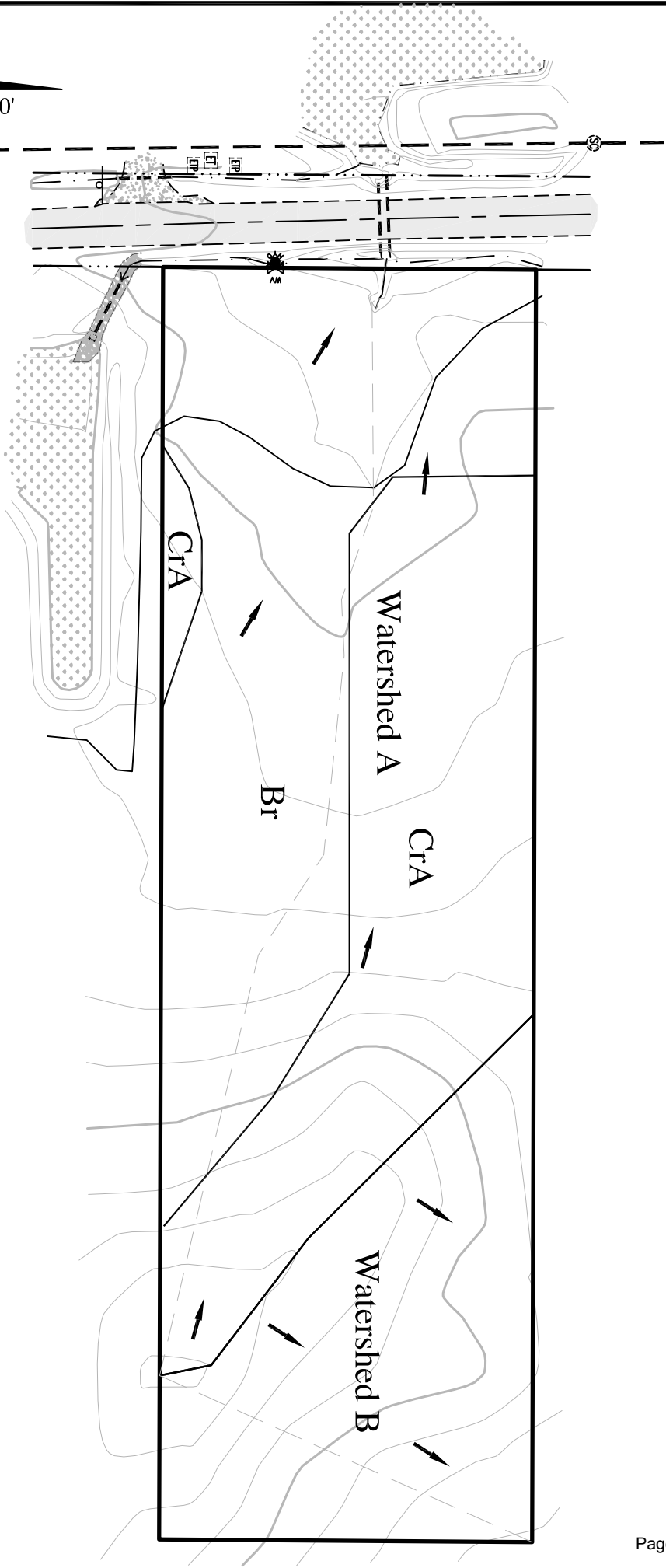
The proposed dry detention pond has been designed to address water quality for the site. A 2" orifice is proposed for the pond control structures for water quality purposes.



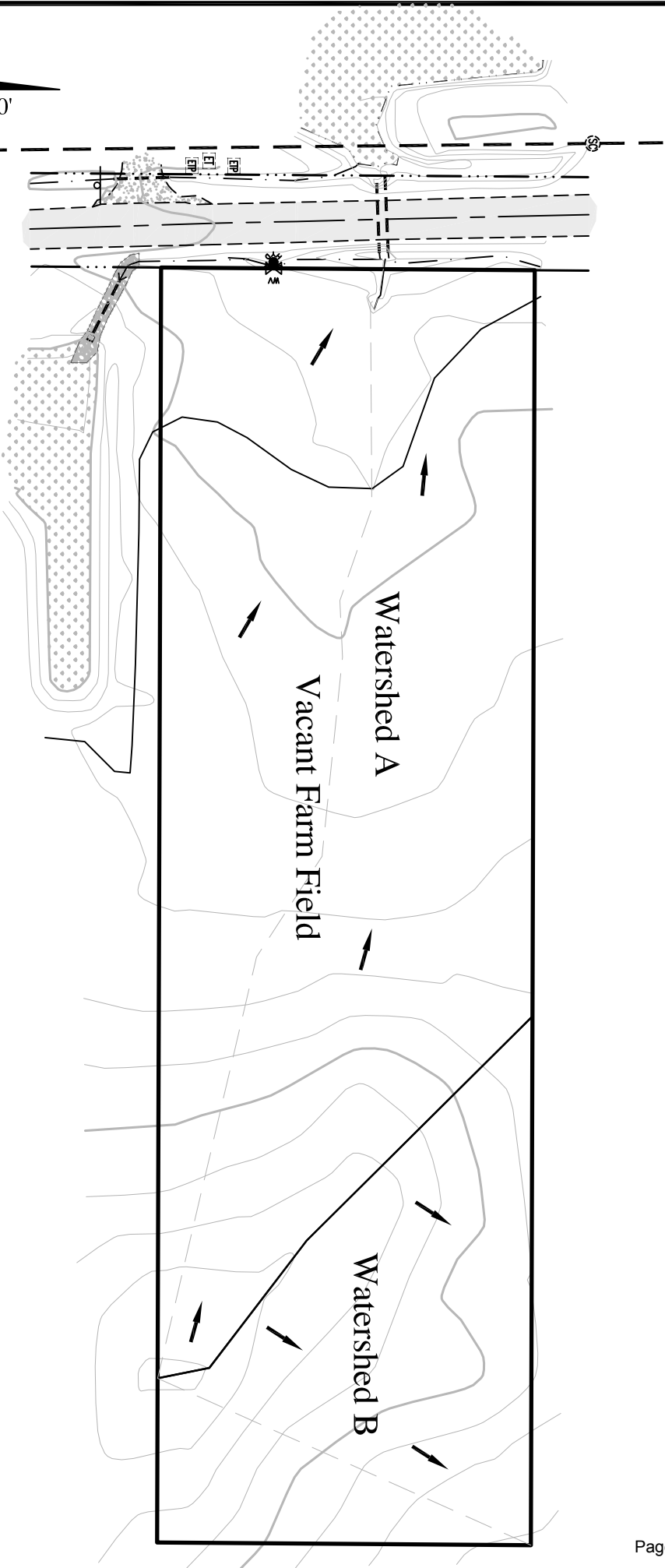
Soils Map

NORTH

Scale: 1"=80'



Existing Site Conditions



Runoff Curve Number

Project	Picket Minor Plat	By	VT	Date	12/5/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	12/5/2015
		<input checked="" type="checkbox"/>	Present	<input type="checkbox"/>	Developed
Basin A					
Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Pasture - Good	61	1.26	76.86
CrA	C	Pasture - Good	74	1.05	77.7
Totals =				2.31	154.56

CN = 66.9

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 2

A 2 HR

<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)	= 2.64	0.00	0.00	
Land slope (%)	= 1.00	0.00	0.00	
Travel Time (min)	= 14.23	+	0.00	+
			0.00	= 14.23
Shallow Concentrated Flow				
Flow length (ft)	= 515.00	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)	= 5.32	+	0.00	+
			0.00	= 5.32
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	0.0	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Total Travel Time, Tc				19.55 min

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.065	2	62	109	-----	-----	-----	A 1 HR
2	SCS Runoff	0.103	2	104	430	-----	-----	-----	A 2 HR
3	SCS Runoff	0.108	2	90	709	-----	-----	-----	A 3 HR
4	SCS Runoff	0.112	2	166	1,385	-----	-----	-----	A 6 HR
5	SCS Runoff	0.158	2	364	2,624	-----	-----	-----	A 12 HR
6	SCS Runoff	0.172	2	938	3,462	-----	-----	-----	A 24 HR
7	SCS Runoff	0.086	2	38	217	-----	-----	-----	B 1 HR
8	SCS Runoff	0.103	2	58	453	-----	-----	-----	B 2 HR
9	SCS Runoff	0.097	2	64	625	-----	-----	-----	B 3 HR
10	SCS Runoff	0.086	2	96	1,000	-----	-----	-----	B 6 HR
11	SCS Runoff	0.111	2	326	1,624	-----	-----	-----	B 12 HR
12	SCS Runoff	0.098	2	936	2,023	-----	-----	-----	B 24 HR
Existing Hydrographs.gpw					Return Period: 2 Year			Saturday, 12 / 5 / 2015 Page 15 of 84	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

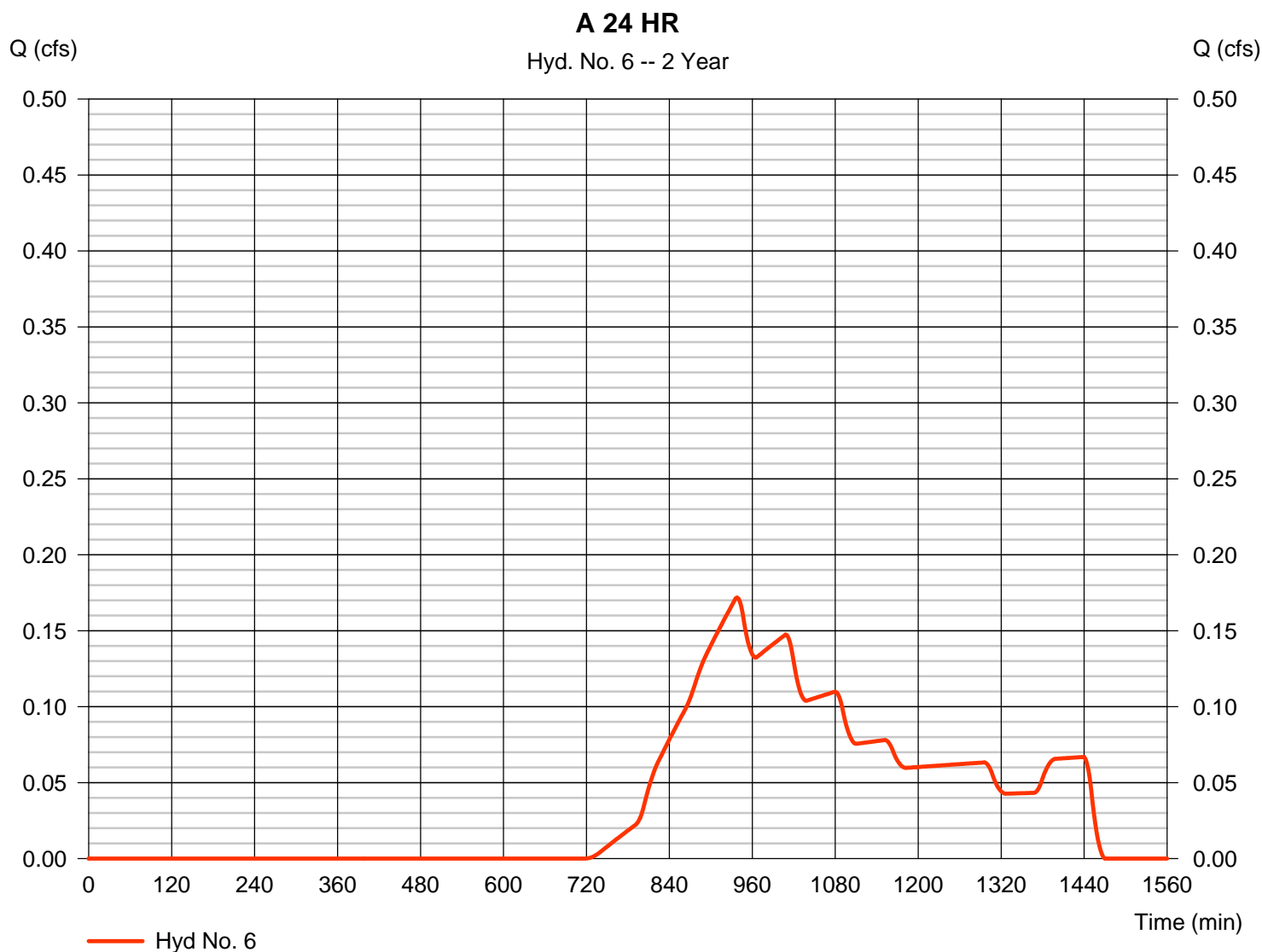
Saturday, 12 / 5 / 2015

Hyd. No. 6

A 24 HR

Hydrograph type = SCS Runoff
Storm frequency = 2 yrs
Time interval = 2 min
Drainage area = 2.310 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 2.64 in
Storm duration = 24.00 hrs

Peak discharge = 0.172 cfs
Time to peak = 938 min
Hyd. volume = 3,462 cuft
Curve number = 66.9
Hydraulic length = 0 ft
Time of conc. (Tc) = 19.60 min
Distribution = Huff-3rd
Shape factor = 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.511	2	40	1,333	-----	-----	-----	A 1 HR
2	SCS Runoff	0.595	2	54	2,621	-----	-----	-----	A 2 HR
3	SCS Runoff	0.554	2	64	3,462	-----	-----	-----	A 3 HR
4	SCS Runoff	0.475	2	96	5,376	-----	-----	-----	A 6 HR
5	SCS Runoff	0.510	2	328	7,560	-----	-----	-----	A 12 HR
6	SCS Runoff	0.470	2	936	9,963	-----	-----	-----	A 24 HR
7	SCS Runoff	0.421	2	30	971	-----	-----	-----	B 1 HR
8	SCS Runoff	0.406	2	40	1,622	-----	-----	-----	B 2 HR
9	SCS Runoff	0.359	2	52	2,022	-----	-----	-----	B 3 HR
10	SCS Runoff	0.275	2	92	2,894	-----	-----	-----	B 6 HR
11	SCS Runoff	0.264	2	326	3,846	-----	-----	-----	B 12 HR
12	SCS Runoff	0.218	2	936	4,862	-----	-----	-----	B 24 HR
Existing Hydrographs.gpw					Return Period: 10 Year			Saturday, 12 / 5 / 2015 Page 17 of 84	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

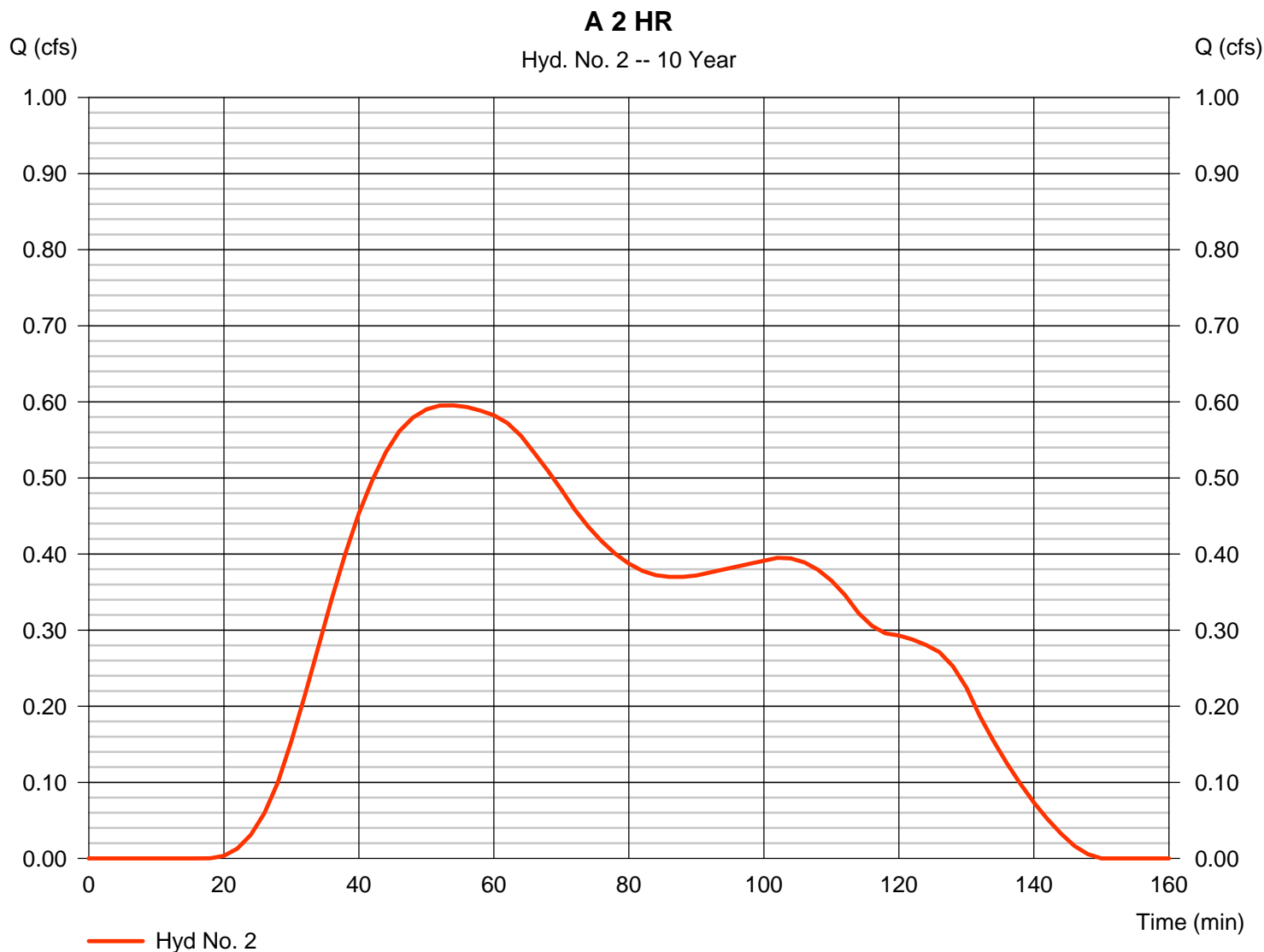
Saturday, 12 / 5 / 2015

Hyd. No. 2

A 2 HR

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 2.310 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 2.40 in
Storm duration = 2.00 hrs

Peak discharge = 0.595 cfs
Time to peak = 54 min
Hyd. volume = 2,621 cuft
Curve number = 66.9
Hydraulic length = 0 ft
Time of conc. (Tc) = 19.60 min
Distribution = Huff-1st
Shape factor = 484



Runoff Curve Number

Project	Picket Minor Plat	By	VT	Date	12/5/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	12/5/2015
		<input checked="" type="checkbox"/> X	Present	<input type="checkbox"/>	Developed
Basin B					
Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Pasture - Good	61		0
CrA	C	Pasture - Good	74	0.83	61.42
Totals =				0.83	61.42

CN = 74

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 7

B 1 HR

<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)	= 2.64	0.00	0.00	
Land slope (%)	= 1.00	0.00	0.00	
Travel Time (min)	= 14.23	+ 0.00	+ 0.00	= 14.23
Shallow Concentrated Flow				
Flow length (ft)	= 119.00	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)	= 1.23	+ 0.00	+ 0.00	= 1.23
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	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				15.46 min

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.065	2	62	109	-----	-----	-----	A 1 HR
2	SCS Runoff	0.103	2	104	430	-----	-----	-----	A 2 HR
3	SCS Runoff	0.108	2	90	709	-----	-----	-----	A 3 HR
4	SCS Runoff	0.112	2	166	1,385	-----	-----	-----	A 6 HR
5	SCS Runoff	0.158	2	364	2,624	-----	-----	-----	A 12 HR
6	SCS Runoff	0.172	2	938	3,462	-----	-----	-----	A 24 HR
7	SCS Runoff	0.086	2	38	217	-----	-----	-----	B 1 HR
8	SCS Runoff	0.103	2	58	453	-----	-----	-----	B 2 HR
9	SCS Runoff	0.097	2	64	625	-----	-----	-----	B 3 HR
10	SCS Runoff	0.086	2	96	1,000	-----	-----	-----	B 6 HR
11	SCS Runoff	0.111	2	326	1,624	-----	-----	-----	B 12 HR
12	SCS Runoff	0.098	2	936	2,023	-----	-----	-----	B 24 HR
Existing Hydrographs.gpw					Return Period: 2 Year			Saturday, 12 / 5 / 2015 Page 21 of 84	

Hydrograph Report

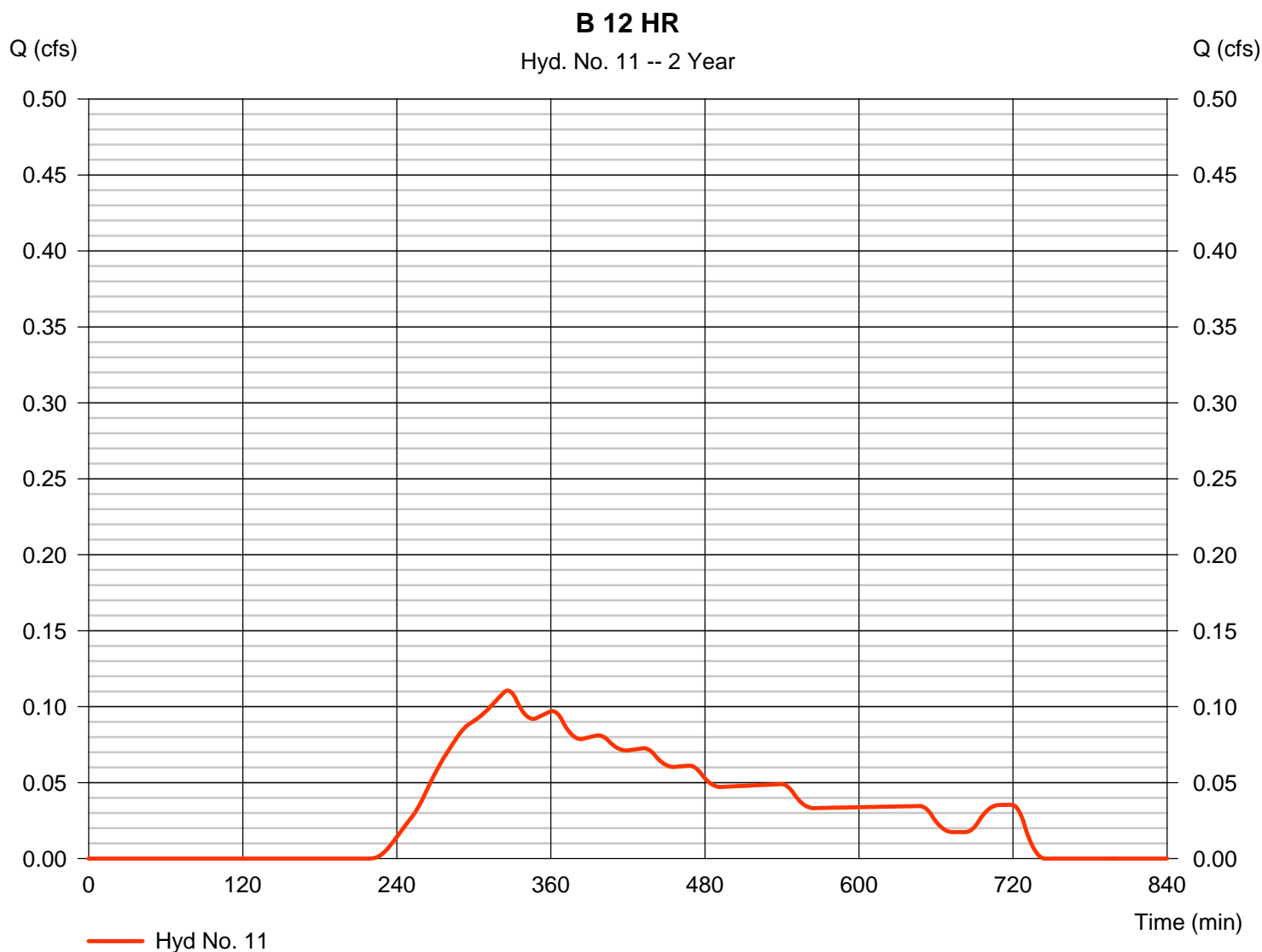
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Saturday, 12 / 5 / 2015

Hyd. No. 11

B 12 HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.111 cfs
Storm frequency	= 2 yrs	Time to peak	= 326 min
Time interval	= 2 min	Hyd. volume	= 1,624 cuft
Drainage area	= 0.830 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.50 min
Total precip.	= 2.40 in	Distribution	= Huff-2nd
Storm duration	= 12.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.511	2	40	1,333	-----	-----	-----	A 1 HR
2	SCS Runoff	0.595	2	54	2,621	-----	-----	-----	A 2 HR
3	SCS Runoff	0.554	2	64	3,462	-----	-----	-----	A 3 HR
4	SCS Runoff	0.475	2	96	5,376	-----	-----	-----	A 6 HR
5	SCS Runoff	0.510	2	328	7,560	-----	-----	-----	A 12 HR
6	SCS Runoff	0.470	2	936	9,963	-----	-----	-----	A 24 HR
7	SCS Runoff	0.421	2	30	971	-----	-----	-----	B 1 HR
8	SCS Runoff	0.406	2	40	1,622	-----	-----	-----	B 2 HR
9	SCS Runoff	0.359	2	52	2,022	-----	-----	-----	B 3 HR
10	SCS Runoff	0.275	2	92	2,894	-----	-----	-----	B 6 HR
11	SCS Runoff	0.264	2	326	3,846	-----	-----	-----	B 12 HR
12	SCS Runoff	0.218	2	936	4,862	-----	-----	-----	B 24 HR
Existing Hydrographs.gpw					Return Period: 10 Year			Saturday, 12 / 5 / 2015 Page 23 of 84	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

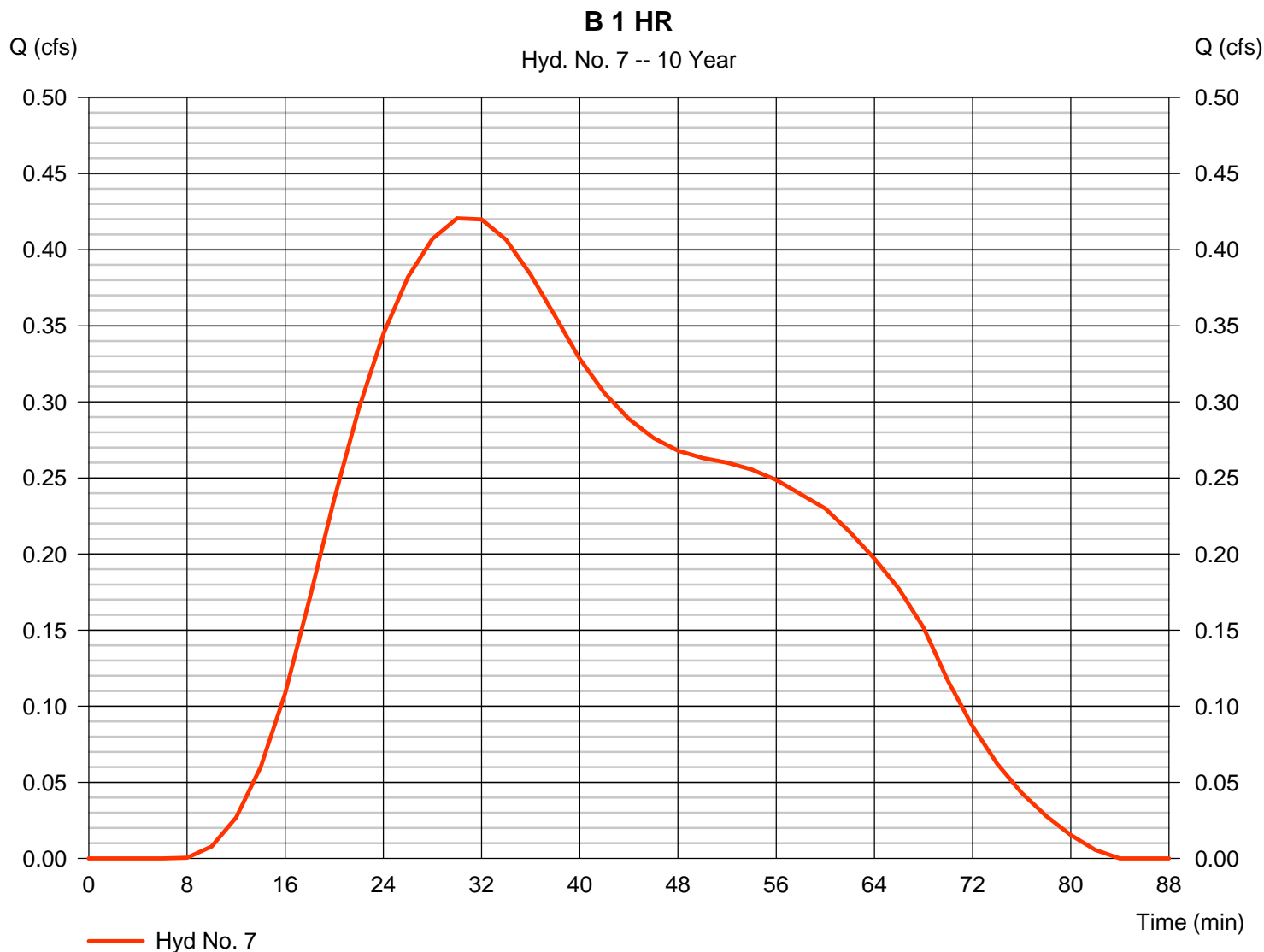
Saturday, 12 / 5 / 2015

Hyd. No. 7

B 1 HR

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 0.830 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.96 in
Storm duration = 1.00 hrs

Peak discharge = 0.421 cfs
Time to peak = 30 min
Hyd. volume = 971 cuft
Curve number = 74
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.50 min
Distribution = Huff-1st
Shape factor = 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.000	2	n/a	0	-----	-----	-----	A 1 HR
2	SCS Runoff	0.951	2	48	4,066	-----	-----	-----	A 2 HR
3	SCS Runoff	0.000	2	n/a	0	-----	-----	-----	A 3 HR
4	SCS Runoff	0.000	2	n/a	0	-----	-----	-----	A 6 HR
5	SCS Runoff	0.000	2	n/a	0	-----	-----	-----	A 12 HR
6	SCS Runoff	0.000	2	n/a	0	-----	-----	-----	A 24 HR
7	SCS Runoff	0.654	2	30	1,479	-----	-----	-----	B 1 HR
8	SCS Runoff	0.596	2	38	2,300	-----	-----	-----	B 2 HR
9	SCS Runoff	0.516	2	50	2,836	-----	-----	-----	B 3 HR
10	SCS Runoff	0.367	2	92	3,846	-----	-----	-----	B 6 HR
11	SCS Runoff	0.349	2	324	5,125	-----	-----	-----	B 12 HR
12	SCS Runoff	0.282	2	936	6,480	-----	-----	-----	B 24 HR
Existing Hydrographs.gpw					Return Period: 25 Year			Saturday, 12 / 5 / 2015 Page 25 of 84	

Hydrograph Report

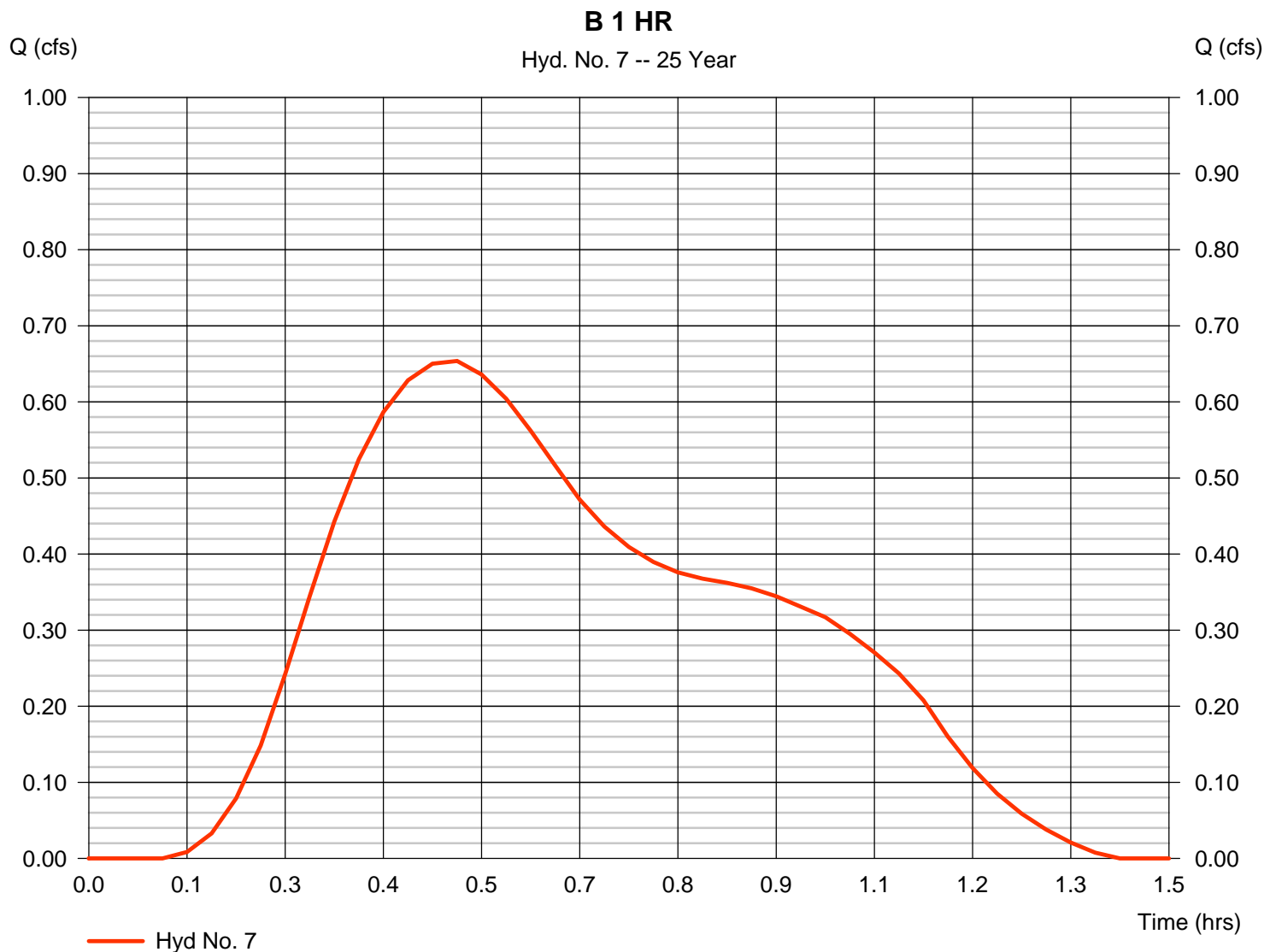
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Saturday, 12 / 5 / 2015

Hyd. No. 7

B 1 HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.654 cfs
Storm frequency	= 25 yrs	Time to peak	= 0.50 hrs
Time interval	= 2 min	Hyd. volume	= 1,479 cuft
Drainage area	= 0.830 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.50 min
Total precip.	= 2.31 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.000	2	n/a	0	-----	-----	-----	A 1 HR
2	SCS Runoff	1.737	2	44	7,084	-----	-----	-----	A 2 HR
3	SCS Runoff	0.000	2	n/a	0	-----	-----	-----	A 3 HR
4	SCS Runoff	0.000	2	n/a	0	-----	-----	-----	A 6 HR
5	SCS Runoff	0.000	2	n/a	0	-----	-----	-----	A 12 HR
6	SCS Runoff	0.000	2	n/a	0	-----	-----	-----	A 24 HR
7	SCS Runoff	1.103	2	28	2,442	-----	-----	-----	B 1 HR
8	SCS Runoff	0.972	2	36	3,640	-----	-----	-----	B 2 HR
9	SCS Runoff	0.821	2	48	4,411	-----	-----	-----	B 3 HR
10	SCS Runoff	0.554	2	90	5,794	-----	-----	-----	B 6 HR
11	SCS Runoff	0.492	2	324	7,322	-----	-----	-----	B 12 HR
12	SCS Runoff	0.393	2	936	9,356	-----	-----	-----	B 24 HR
Existing Hydrographs.gpw					Return Period: 100 Year			Saturday, 12 / 5 / 2015 Page 27 of 84	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

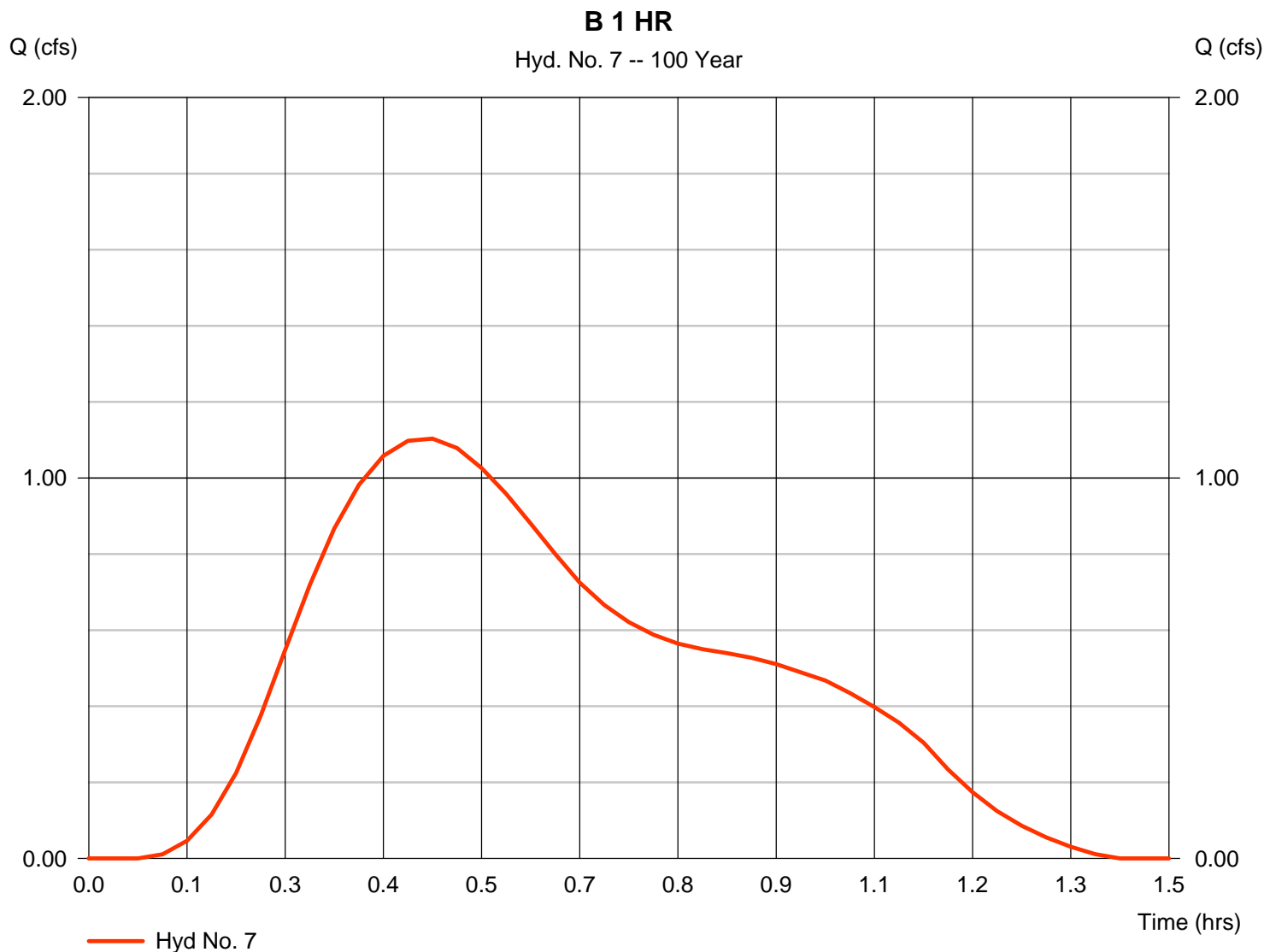
Saturday, 12 / 5 / 2015

Hyd. No. 7

B 1 HR

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 0.830 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 2.88 in
Storm duration = 1.00 hrs

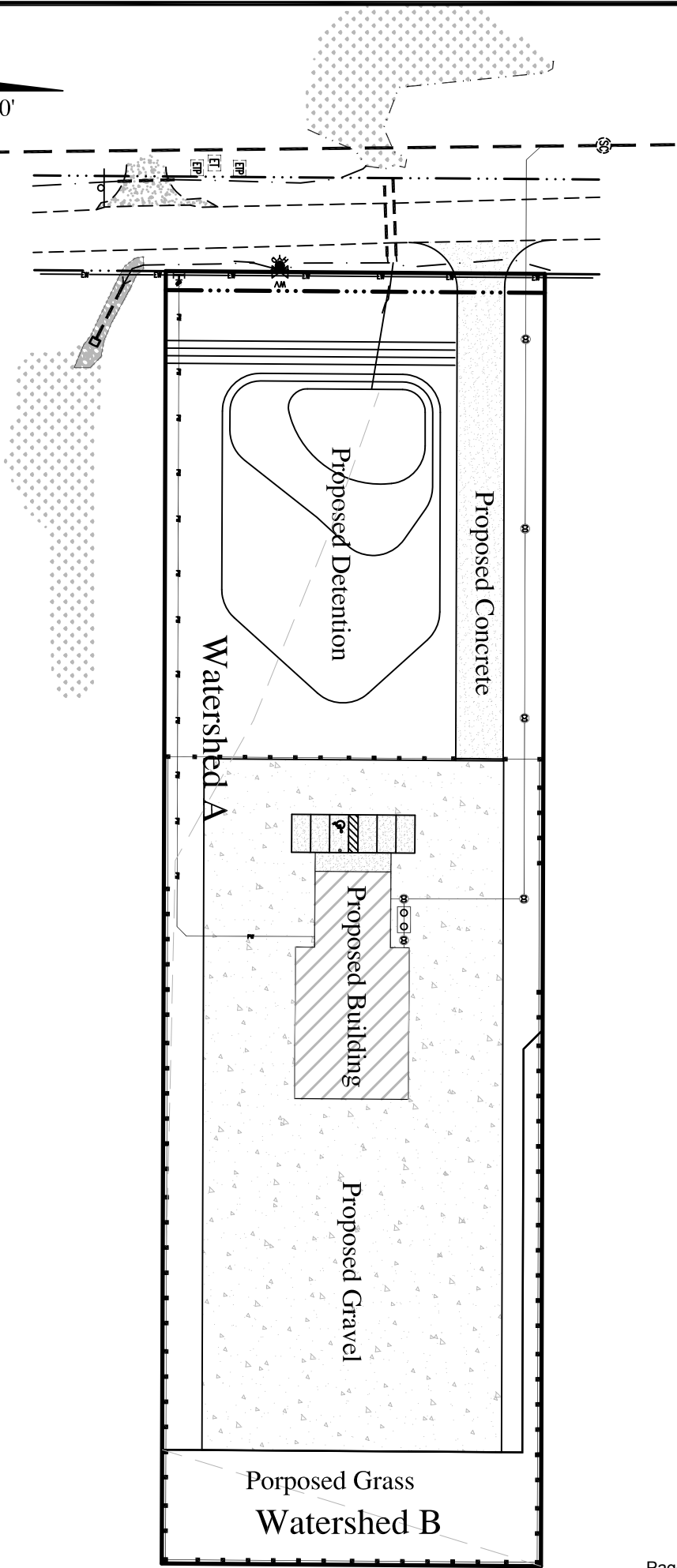
Peak discharge = 1.103 cfs
Time to peak = 0.47 hrs
Hyd. volume = 2,442 cuft
Curve number = 74
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.50 min
Distribution = Huff-1st
Shape factor = 484



Proposed Site Conditions

NORTH

Scale: 1"=80'



Runoff Curve Number

Project	Picket Minor Plat	By	VT	Date	2/24/2016
Location	Johnson County Franklin Township	Checked	DJS	Date	2/24/2016
		<input type="checkbox"/> Present	<input checked="" type="checkbox"/> Developed		
Basin 1					
Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Impervious	98	0.14	13.72
CrA	C	Impervious	98	0.19	18.62
Br	B	Stone	85	0.26	22.1
CrA	C	Stone	89	0.88	78.32
Br	B	Grass - Good	61	1.01	61.61
CrA	C	Grass - Good	74	0.33	24.42
Totals =				2.81	218.79

CN = 77.9

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 1

A 1 HR

<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)	= 2.64	0.00	0.00	
Land slope (%)	= 1.00	0.00	0.00	
Travel Time (min)	= 14.23	+	0.00	+
			0.00	= 14.23
Shallow Concentrated Flow				
Flow length (ft)	= 370.00	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)	= 3.82	+	0.00	+
			0.00	= 3.82
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	0.0	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Total Travel Time, Tc				18.06 min

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	1.939	2	32	4,655	-----	-----	-----	A 1 HR
2	SCS Runoff	1.854	2	40	7,328	-----	-----	-----	A 2 HR
3	SCS Runoff	1.606	2	52	8,925	-----	-----	-----	A 3 HR
4	SCS Runoff	1.175	2	92	12,331	-----	-----	-----	A 6 HR
5	SCS Runoff	1.076	2	326	15,982	-----	-----	-----	A 12 HR
6	SCS Runoff	0.853	2	936	19,821	-----	-----	-----	A 24 HR
7	Reservoir	0.127	2	82	4,588	1	763.44	4,228	A 1 HR
8	Reservoir	0.145	2	140	7,261	2	763.88	6,445	A 2 HR
9	Reservoir	0.151	2	198	8,858	3	764.04	7,572	A 3 HR
10	Reservoir	0.157	2	376	12,264	4	764.20	9,503	A 6 HR
11	Reservoir	0.162	2	732	15,915	5	764.36	11,431	A 12 HR
12	Reservoir	0.174	2	1448	19,754	6	764.44	12,291	A 24 HR
13	SCS Runoff	0.167	2	30	386	-----	-----	-----	B 1 HR
14	SCS Runoff	0.162	2	40	645	-----	-----	-----	B 2 HR
15	SCS Runoff	0.143	2	52	804	-----	-----	-----	B 3 HR
16	SCS Runoff	0.109	2	92	1,150	-----	-----	-----	B 6 HR
17	SCS Runoff	0.105	2	326	1,529	-----	-----	-----	B 12 HR
18	SCS Runoff	0.087	2	936	1,933	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 10 Year			Wednesday, 02 / 24 / 2016	

Hydrograph Report

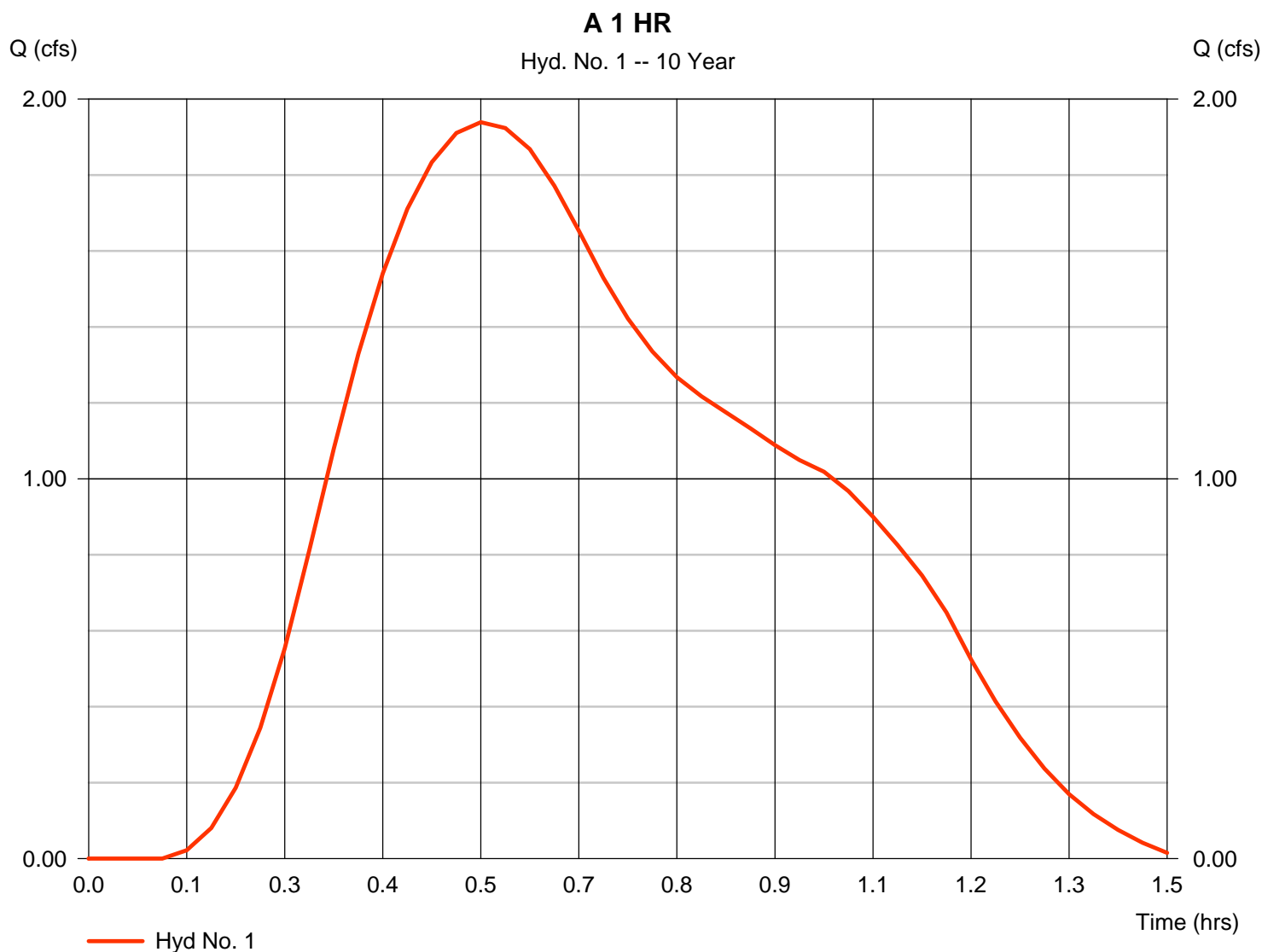
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Wednesday, 02 / 24 / 2016

Hyd. No. 1

A 1 HR

Hydrograph type	= SCS Runoff	Peak discharge	= 1.939 cfs
Storm frequency	= 10 yrs	Time to peak	= 0.53 hrs
Time interval	= 2 min	Hyd. volume	= 4,655 cuft
Drainage area	= 2.810 ac	Curve number	= 77.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.10 min
Total precip.	= 1.96 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.846	2	30	6,747	-----	-----	-----	A 1 HR
2	SCS Runoff	2.599	2	40	10,024	-----	-----	-----	A 2 HR
3	SCS Runoff	2.216	2	50	12,110	-----	-----	-----	A 3 HR
4	SCS Runoff	1.527	2	90	15,982	-----	-----	-----	A 6 HR
5	SCS Runoff	1.386	2	326	20,805	-----	-----	-----	A 12 HR
6	SCS Runoff	1.083	2	936	25,848	-----	-----	-----	A 24 HR
7	Reservoir	0.143	2	82	6,680	1	763.84	6,245	A 1 HR
8	Reservoir	0.155	2	142	9,957	2	764.17	9,026	A 2 HR
9	Reservoir	0.160	2	200	12,043	3	764.30	10,609	A 3 HR
10	Reservoir	0.190	2	376	15,915	4	764.48	12,849	A 6 HR
11	Reservoir	0.294	2	654	20,738	5	764.61	14,407	A 12 HR
12	Reservoir	0.337	2	1162	25,781	6	764.65	14,847	A 24 HR
13	SCS Runoff	0.260	2	30	588	-----	-----	-----	B 1 HR
14	SCS Runoff	0.237	2	38	914	-----	-----	-----	B 2 HR
15	SCS Runoff	0.206	2	50	1,134	-----	-----	-----	B 3 HR
16	SCS Runoff	0.146	2	92	1,529	-----	-----	-----	B 6 HR
17	SCS Runoff	0.139	2	324	2,038	-----	-----	-----	B 12 HR
18	SCS Runoff	0.112	2	936	2,576	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 25 Year			Wednesday, 02 / 24 / 2016	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

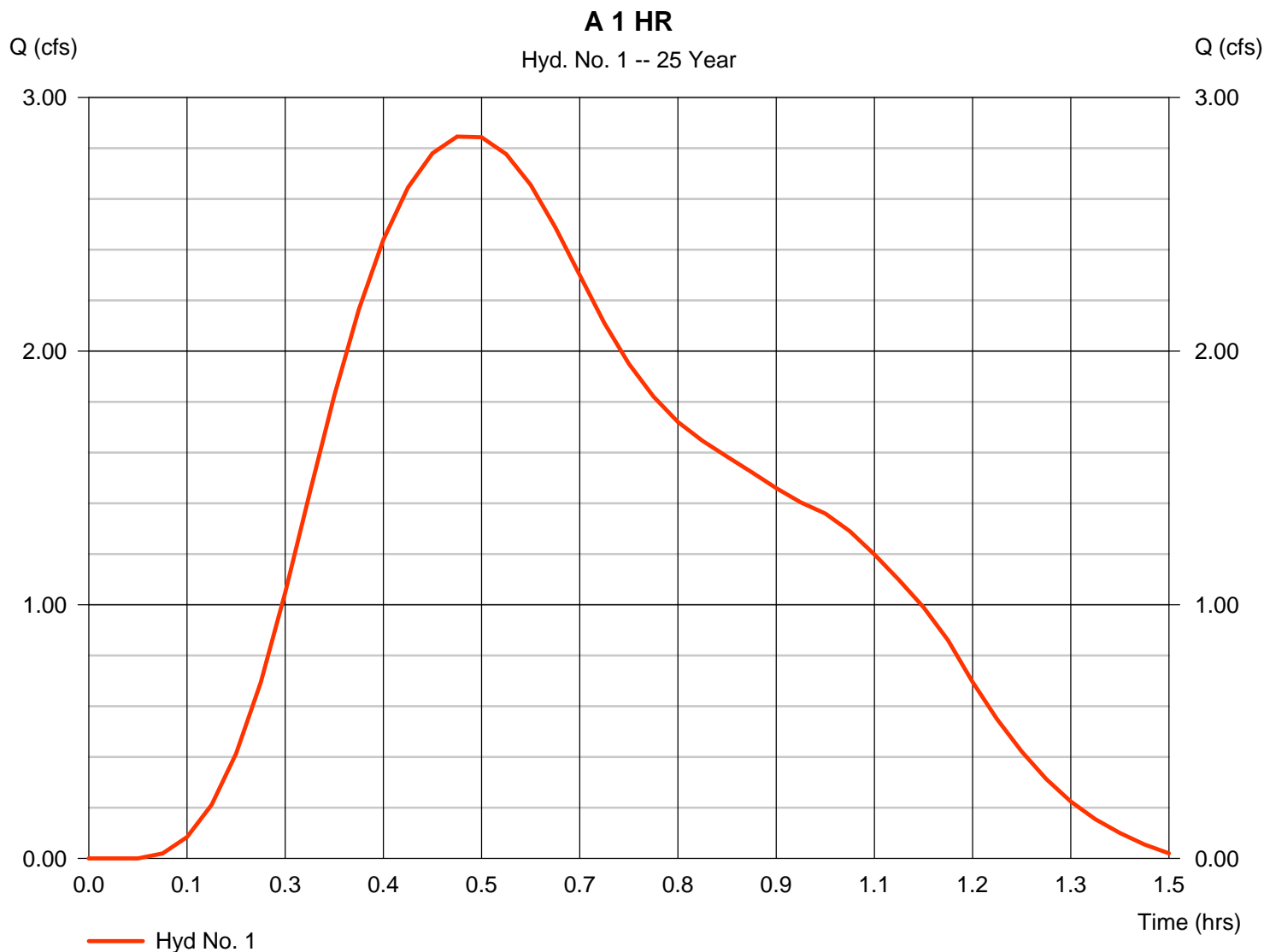
Wednesday, 02 / 24 / 2016

Hyd. No. 1

A 1 HR

Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 2 min
Drainage area = 2.810 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 2.31 in
Storm duration = 1.00 hrs

Peak discharge = 2.846 cfs
Time to peak = 0.50 hrs
Hyd. volume = 6,747 cuft
Curve number = 77.9
Hydraulic length = 0 ft
Time of conc. (Tc) = 18.10 min
Distribution = Huff-1st
Shape factor = 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.562	2	30	10,582	-----	-----	-----	A 1 HR
2	SCS Runoff	4.067	2	38	15,204	-----	-----	-----	A 2 HR
3	SCS Runoff	3.387	2	46	18,120	-----	-----	-----	A 3 HR
4	SCS Runoff	2.239	2	80	23,303	-----	-----	-----	A 6 HR
5	SCS Runoff	1.898	2	324	28,958	-----	-----	-----	A 12 HR
6	SCS Runoff	1.471	2	936	36,404	-----	-----	-----	A 24 HR
7	Reservoir	0.158	2	84	10,515	1	764.24	9,988	A 1 HR
8	Reservoir	0.258	2	140	15,137	2	764.57	13,943	A 2 HR
9	Reservoir	0.422	2	194	18,053	3	764.72	15,686	A 3 HR
10	Reservoir	0.530	2	318	23,236	4	764.80	16,654	A 6 HR
11	Reservoir	0.607	2	494	28,891	5	764.86	17,476	A 12 HR
12	Reservoir	0.684	2	1086	36,337	6	764.94	18,433	A 24 HR
13	SCS Runoff	0.439	2	28	971	-----	-----	-----	B 1 HR
14	SCS Runoff	0.386	2	36	1,447	-----	-----	-----	B 2 HR
15	SCS Runoff	0.327	2	48	1,754	-----	-----	-----	B 3 HR
16	SCS Runoff	0.220	2	90	2,304	-----	-----	-----	B 6 HR
17	SCS Runoff	0.196	2	324	2,911	-----	-----	-----	B 12 HR
18	SCS Runoff	0.156	2	936	3,720	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 100 Year			Wednesday, 02 / 24 / 2016	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

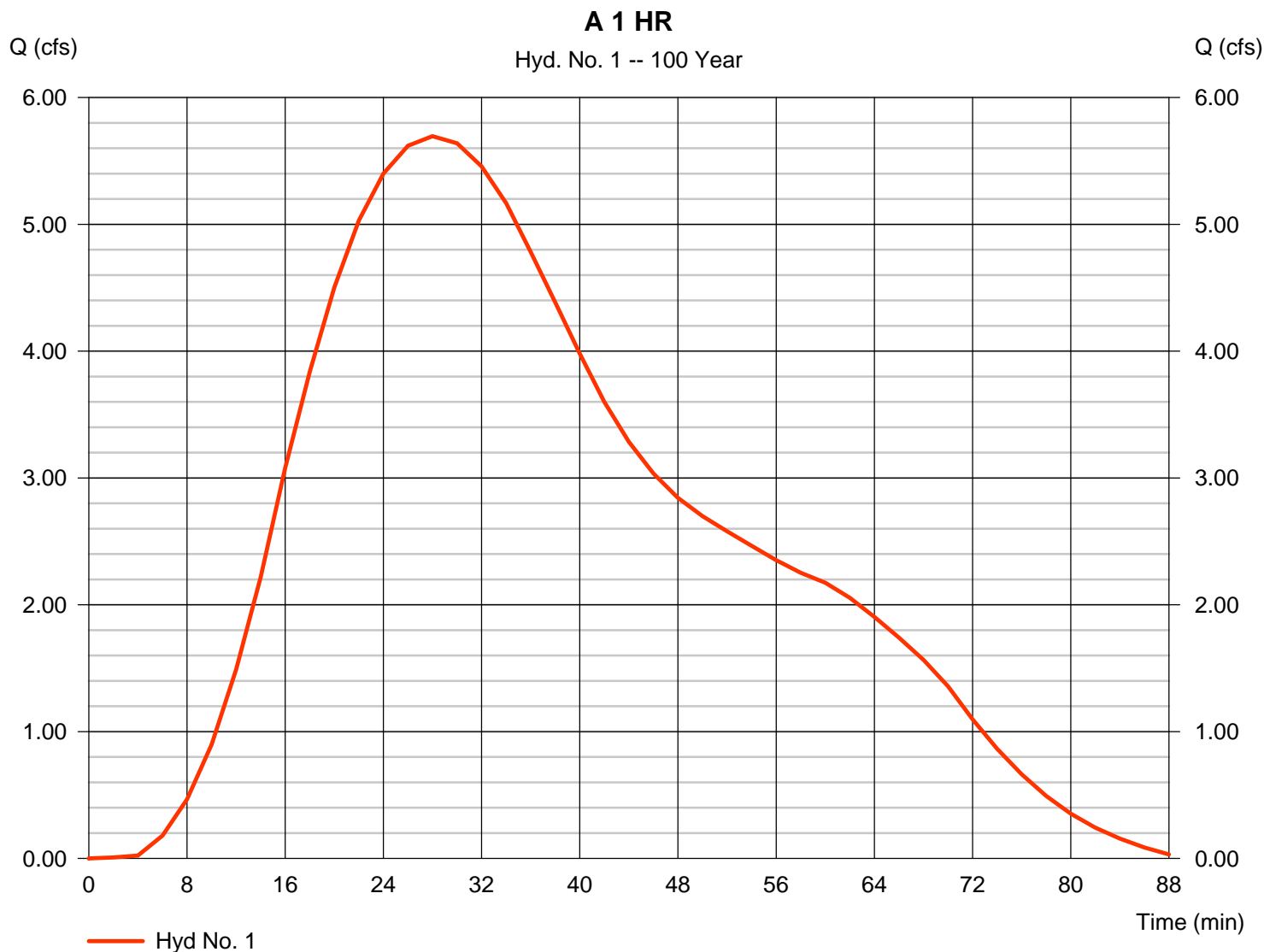
Saturday, 12 / 5 / 2015

Hyd. No. 1

A 1 HR

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Time interval = 2 min
Drainage area = 2.810 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 2.88 in
Storm duration = 1.00 hrs

Peak discharge = 5.694 cfs
Time to peak = 28 min
Hyd. volume = 12,929 cuft
Curve number = 81.8
Hydraulic length = 0 ft
Time of conc. (Tc) = 18.10 min
Distribution = Huff-1st
Shape factor = 484



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Wednesday, 02 / 24 / 2016

Pond No. 1 - Dry Detention

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 761.80 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	761.80	200	0	0
0.20	762.00	1,000	110	110
1.20	763.00	2,986	1,904	2,014
2.20	764.00	7,383	5,021	7,035
3.20	765.00	17,482	12,074	19,109

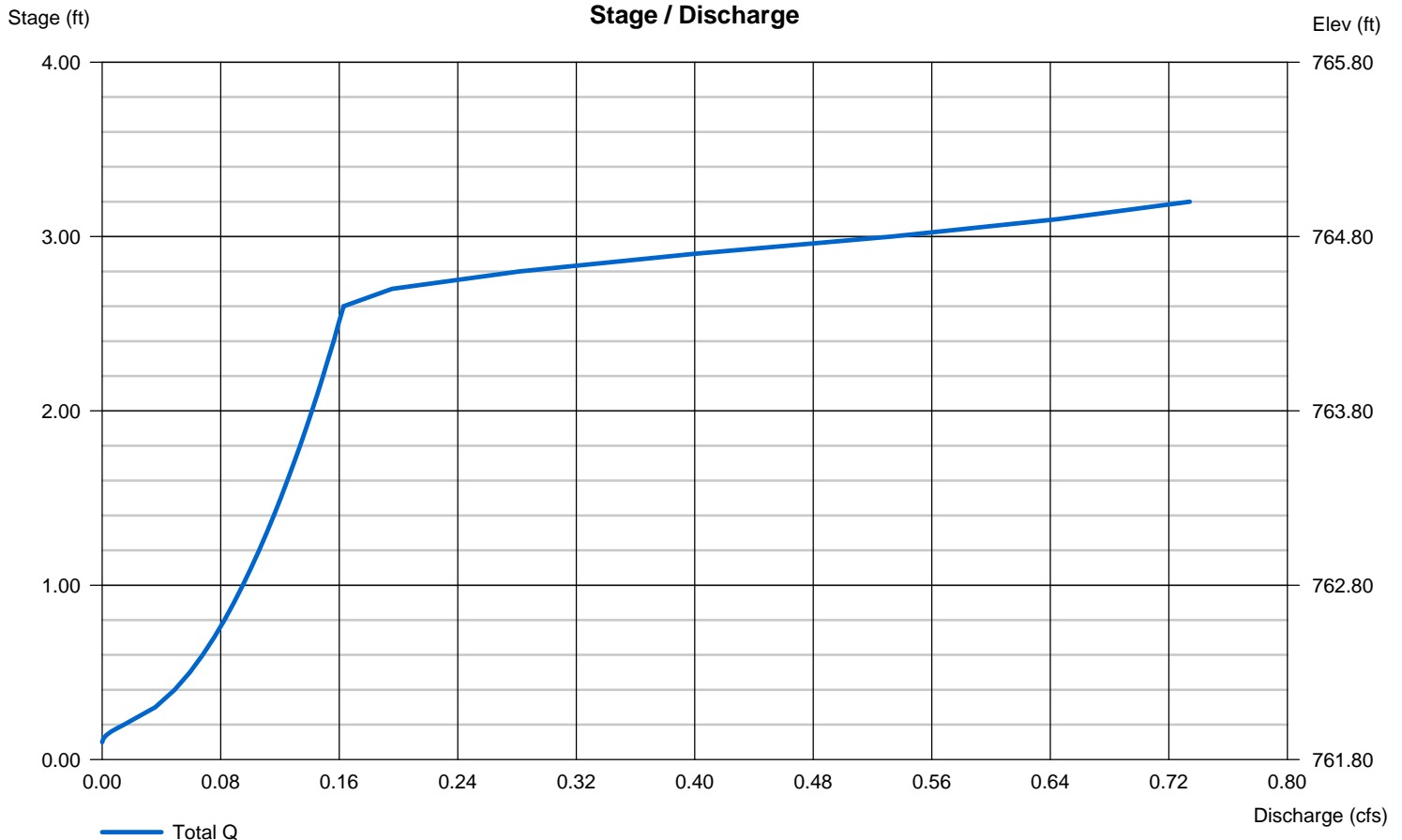
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 761.80	761.90	764.40	0.00
Length (ft)	= 56.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
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 Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.528	2	38	1,350	-----	-----	-----	A 1 HR
2	SCS Runoff	0.565	2	50	2,442	-----	-----	-----	A 2 HR
3	SCS Runoff	0.526	2	60	3,196	-----	-----	-----	A 3 HR
4	SCS Runoff	0.435	2	96	4,789	-----	-----	-----	A 6 HR
5	SCS Runoff	0.499	2	326	7,336	-----	-----	-----	A 12 HR
6	SCS Runoff	0.413	2	936	8,925	-----	-----	-----	A 24 HR
7	Reservoir	0.078	2	80	1,283	1	762.54	1,142	A 1 HR
8	Reservoir	0.103	2	136	2,375	2	762.95	1,922	A 2 HR
9	Reservoir	0.109	2	196	3,129	3	763.07	2,343	A 3 HR
10	Reservoir	0.115	2	372	4,722	4	763.18	2,894	A 6 HR
11	Reservoir	0.126	2	656	7,269	5	763.42	4,147	A 12 HR
12	Reservoir	0.126	2	1170	8,858	6	763.43	4,194	A 24 HR
13	SCS Runoff	0.034	2	38	86	-----	-----	-----	B 1 HR
14	SCS Runoff	0.041	2	58	180	-----	-----	-----	B 2 HR
15	SCS Runoff	0.039	2	64	248	-----	-----	-----	B 3 HR
16	SCS Runoff	0.034	2	96	398	-----	-----	-----	B 6 HR
17	SCS Runoff	0.044	2	326	646	-----	-----	-----	B 12 HR
18	SCS Runoff	0.039	2	936	804	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 2 Year			Wednesday, 02 / 24 / 2016	

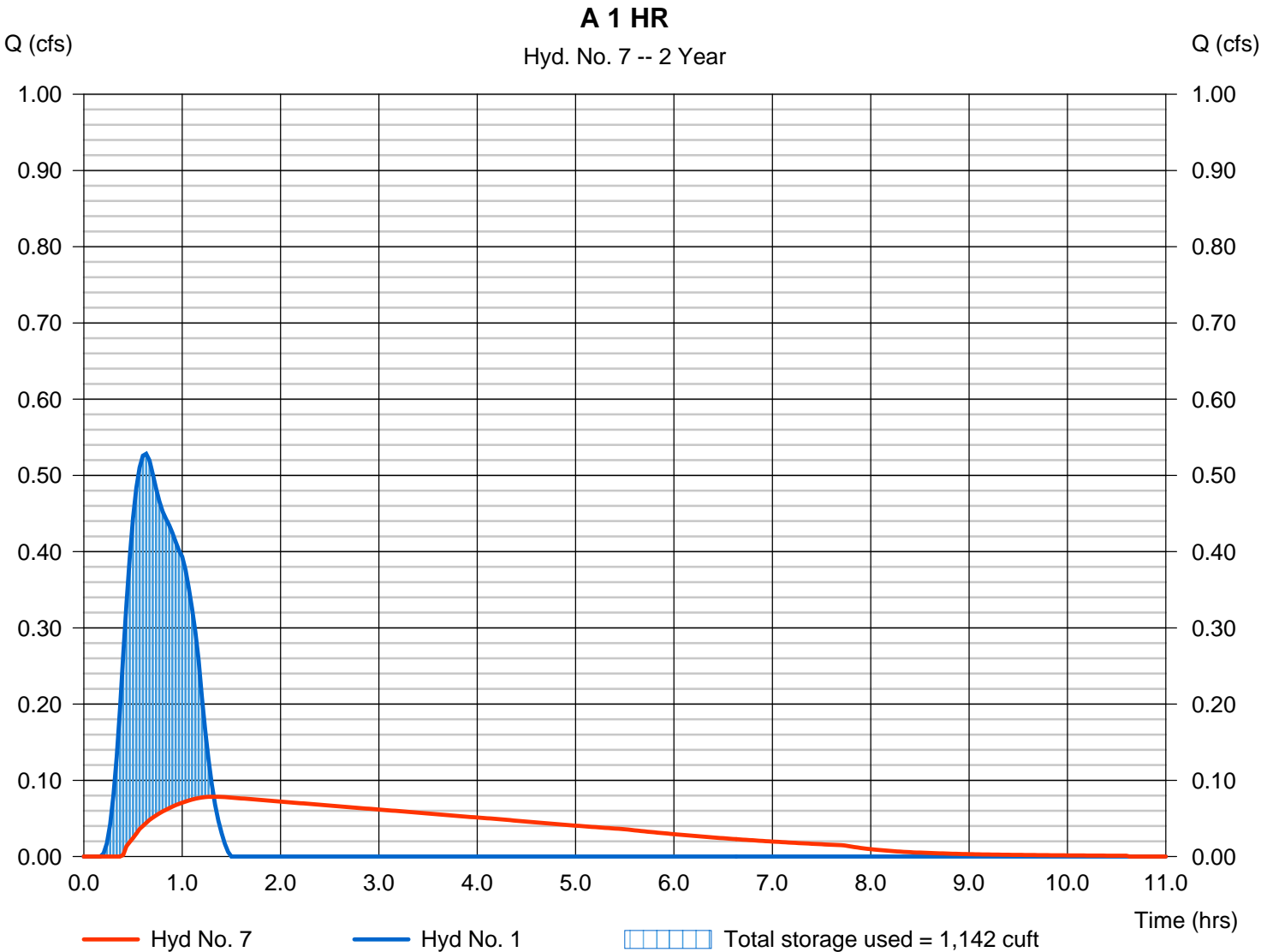
Hydrograph Report

Hyd. No. 7

A 1 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.078 cfs
Storm frequency	= 2 yrs	Time to peak	= 1.33 hrs
Time interval	= 2 min	Hyd. volume	= 1,283 cuft
Inflow hyd. No.	= 1 - A 1 HR	Max. Elevation	= 762.54 ft
Reservoir name	= Dry Detention	Max. Storage	= 1,142 cuft

Storage Indication method used.



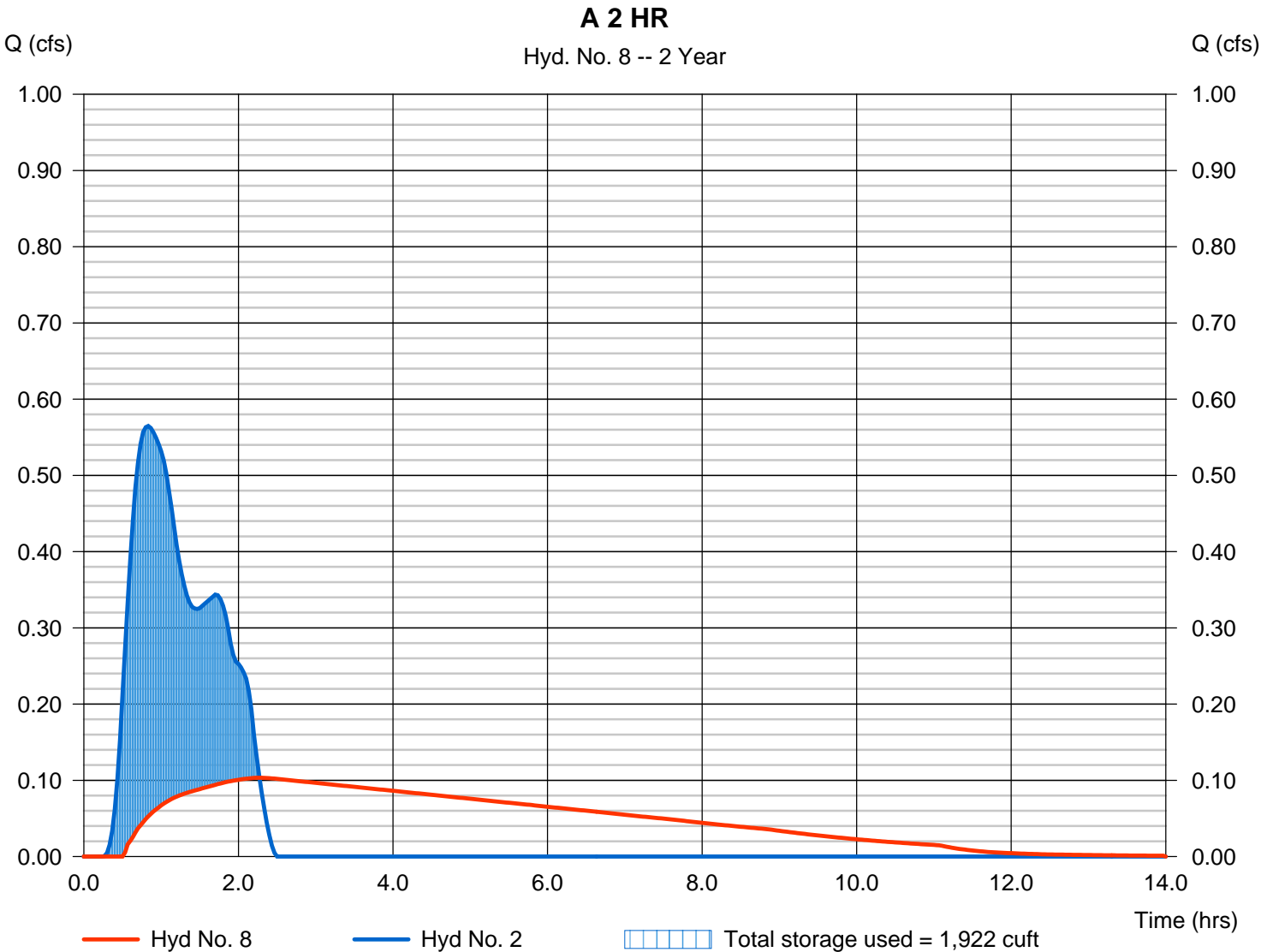
Hydrograph Report

Hyd. No. 8

A 2 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.103 cfs
Storm frequency	= 2 yrs	Time to peak	= 2.27 hrs
Time interval	= 2 min	Hyd. volume	= 2,375 cuft
Inflow hyd. No.	= 2 - A 2 HR	Max. Elevation	= 762.95 ft
Reservoir name	= Dry Detention	Max. Storage	= 1,922 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Wednesday, 02 / 24 / 2016

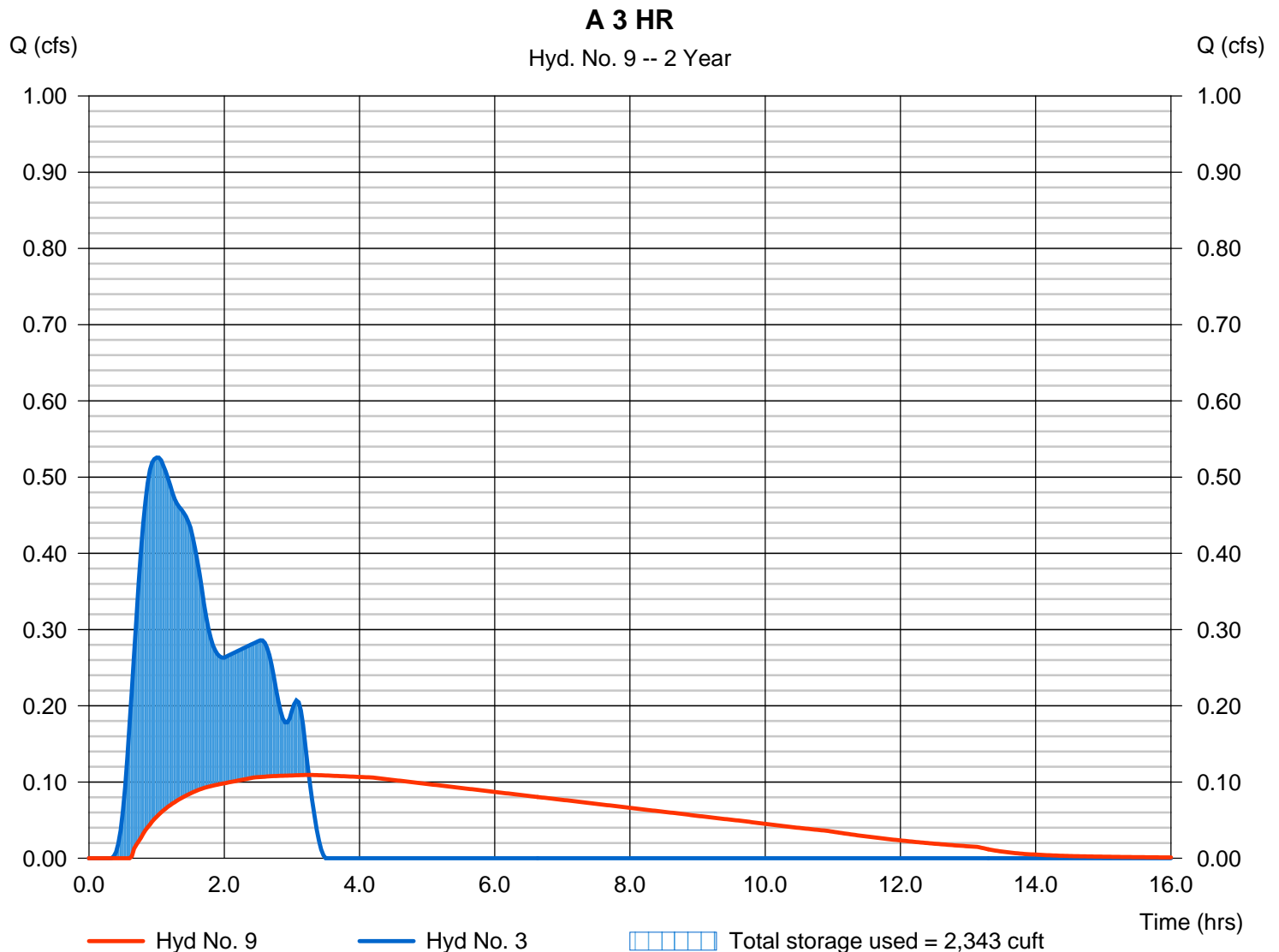
Hyd. No. 9

A 3 HR

Hydrograph type = Reservoir
Storm frequency = 2 yrs
Time interval = 2 min
Inflow hyd. No. = 3 - A 3 HR
Reservoir name = Dry Detention

Peak discharge = 0.109 cfs
Time to peak = 3.27 hrs
Hyd. volume = 3,129 cuft
Max. Elevation = 763.07 ft
Max. Storage = 2,343 cuft

Storage Indication method used.



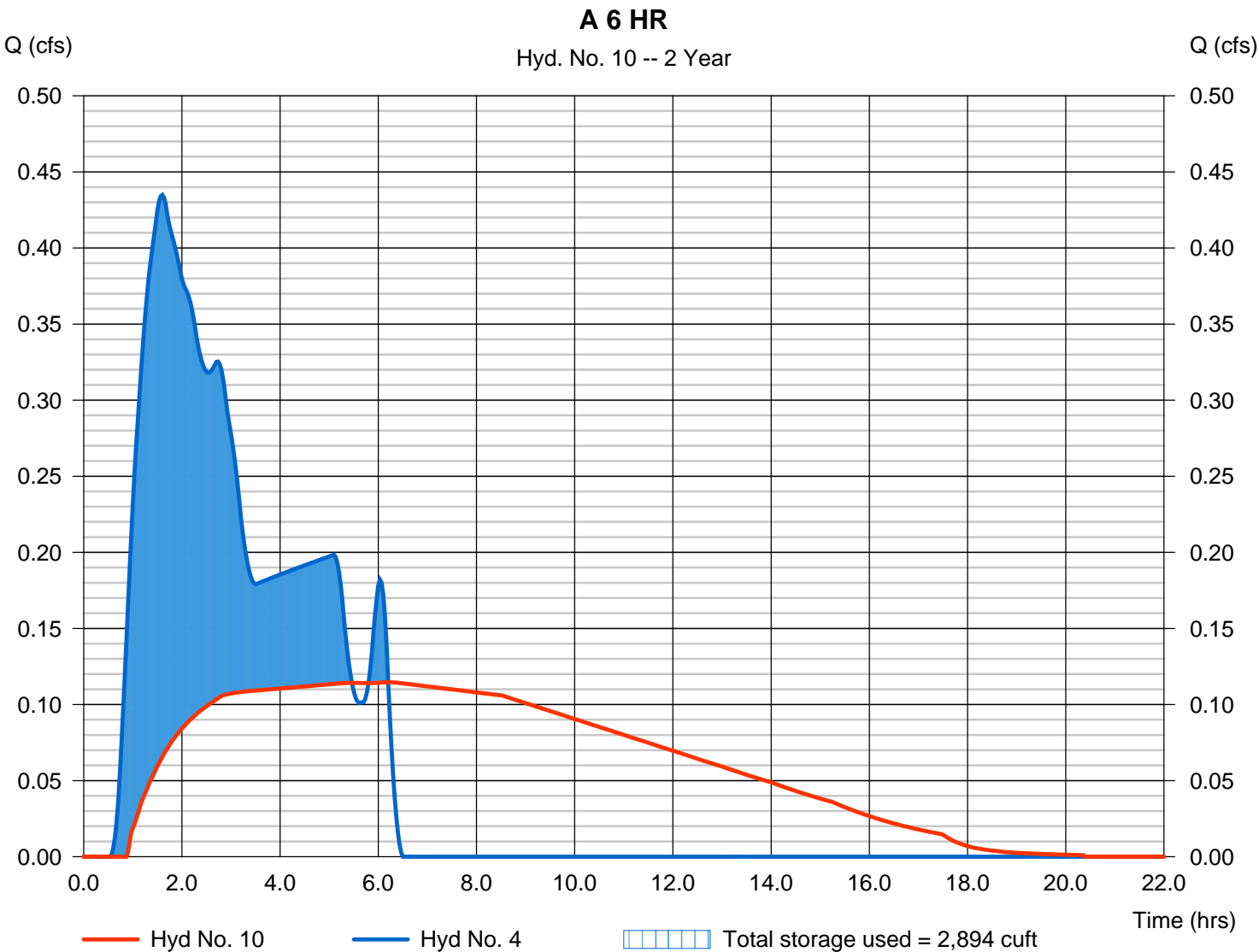
Hydrograph Report

Hyd. No. 10

A 6 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.115 cfs
Storm frequency	= 2 yrs	Time to peak	= 6.20 hrs
Time interval	= 2 min	Hyd. volume	= 4,722 cuft
Inflow hyd. No.	= 4 - A 6 HR	Max. Elevation	= 763.18 ft
Reservoir name	= Dry Detention	Max. Storage	= 2,894 cuft

Storage Indication method used.



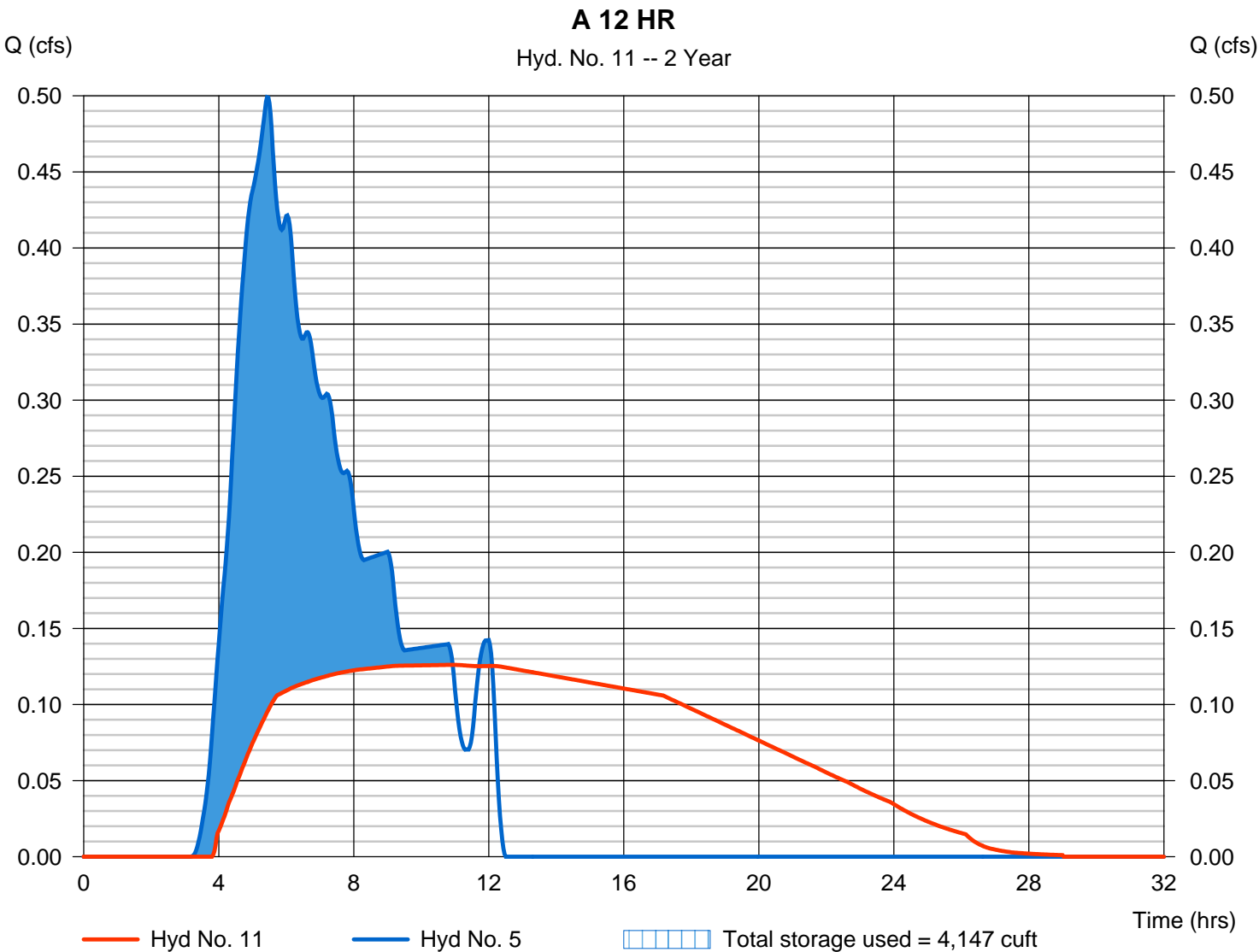
Hydrograph Report

Hyd. No. 11

A 12 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.126 cfs
Storm frequency	= 2 yrs	Time to peak	= 10.93 hrs
Time interval	= 2 min	Hyd. volume	= 7,269 cuft
Inflow hyd. No.	= 5 - A 12 HR	Max. Elevation	= 763.42 ft
Reservoir name	= Dry Detention	Max. Storage	= 4,147 cuft

Storage Indication method used.



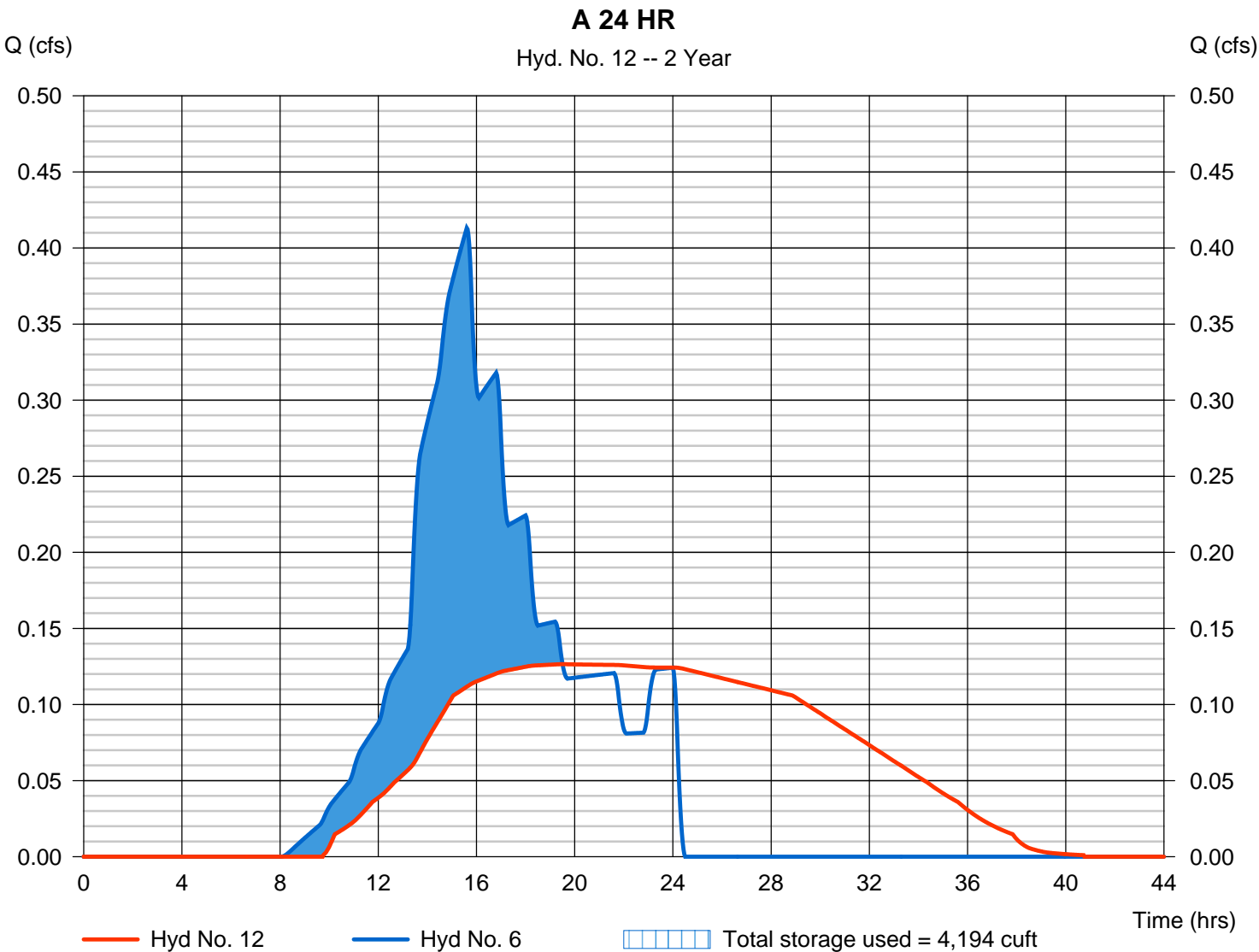
Hydrograph Report

Hyd. No. 12

A 24 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.126 cfs
Storm frequency	= 2 yrs	Time to peak	= 19.50 hrs
Time interval	= 2 min	Hyd. volume	= 8,858 cuft
Inflow hyd. No.	= 6 - A 24 HR	Max. Elevation	= 763.43 ft
Reservoir name	= Dry Detention	Max. Storage	= 4,194 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	1.939	2	32	4,655	-----	-----	-----	A 1 HR
2	SCS Runoff	1.854	2	40	7,328	-----	-----	-----	A 2 HR
3	SCS Runoff	1.606	2	52	8,925	-----	-----	-----	A 3 HR
4	SCS Runoff	1.175	2	92	12,331	-----	-----	-----	A 6 HR
5	SCS Runoff	1.076	2	326	15,982	-----	-----	-----	A 12 HR
6	SCS Runoff	0.853	2	936	19,821	-----	-----	-----	A 24 HR
7	Reservoir	0.127	2	82	4,588	1	763.44	4,228	A 1 HR
8	Reservoir	0.145	2	140	7,261	2	763.88	6,445	A 2 HR
9	Reservoir	0.151	2	198	8,858	3	764.04	7,572	A 3 HR
10	Reservoir	0.157	2	376	12,264	4	764.20	9,503	A 6 HR
11	Reservoir	0.162	2	732	15,915	5	764.36	11,431	A 12 HR
12	Reservoir	0.174	2	1448	19,754	6	764.44	12,291	A 24 HR
13	SCS Runoff	0.167	2	30	386	-----	-----	-----	B 1 HR
14	SCS Runoff	0.162	2	40	645	-----	-----	-----	B 2 HR
15	SCS Runoff	0.143	2	52	804	-----	-----	-----	B 3 HR
16	SCS Runoff	0.109	2	92	1,150	-----	-----	-----	B 6 HR
17	SCS Runoff	0.105	2	326	1,529	-----	-----	-----	B 12 HR
18	SCS Runoff	0.087	2	936	1,933	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 10 Year			Wednesday, 02 / 24 / 2016	

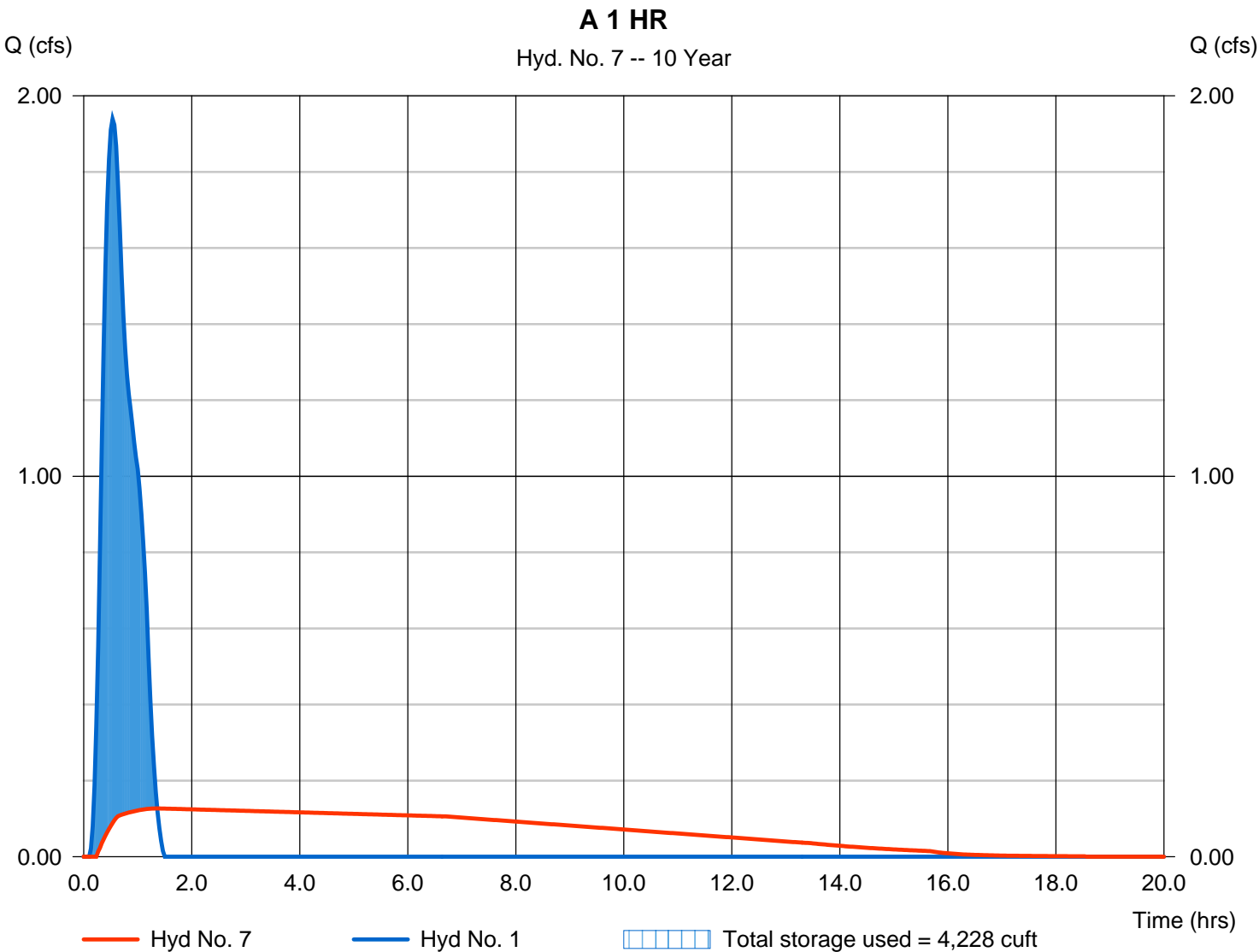
Hydrograph Report

Hyd. No. 7

A 1 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.127 cfs
Storm frequency	= 10 yrs	Time to peak	= 1.37 hrs
Time interval	= 2 min	Hyd. volume	= 4,588 cuft
Inflow hyd. No.	= 1 - A 1 HR	Max. Elevation	= 763.44 ft
Reservoir name	= Dry Detention	Max. Storage	= 4,228 cuft

Storage Indication method used.



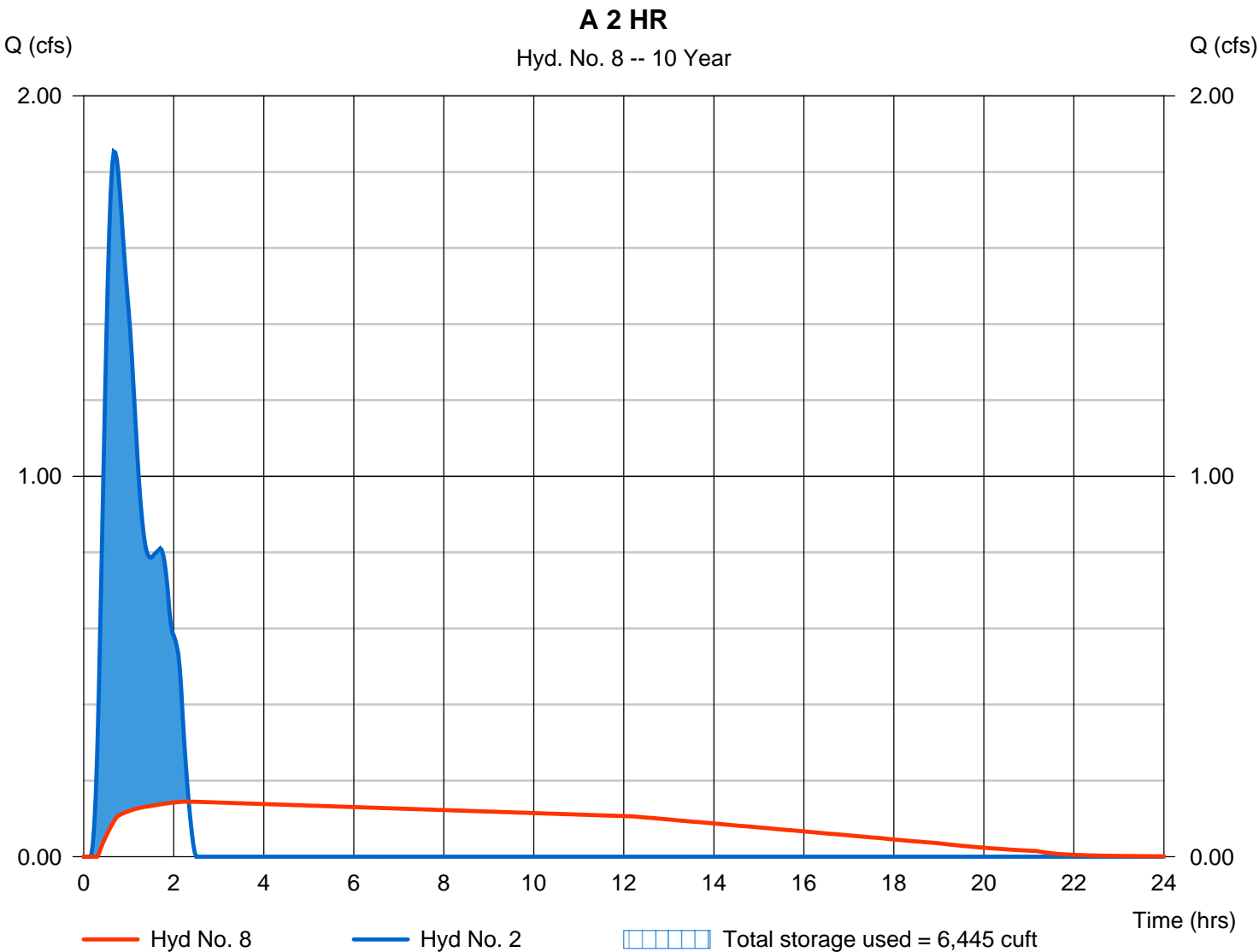
Hydrograph Report

Hyd. No. 8

A 2 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.145 cfs
Storm frequency	= 10 yrs	Time to peak	= 2.33 hrs
Time interval	= 2 min	Hyd. volume	= 7,261 cuft
Inflow hyd. No.	= 2 - A 2 HR	Max. Elevation	= 763.88 ft
Reservoir name	= Dry Detention	Max. Storage	= 6,445 cuft

Storage Indication method used.



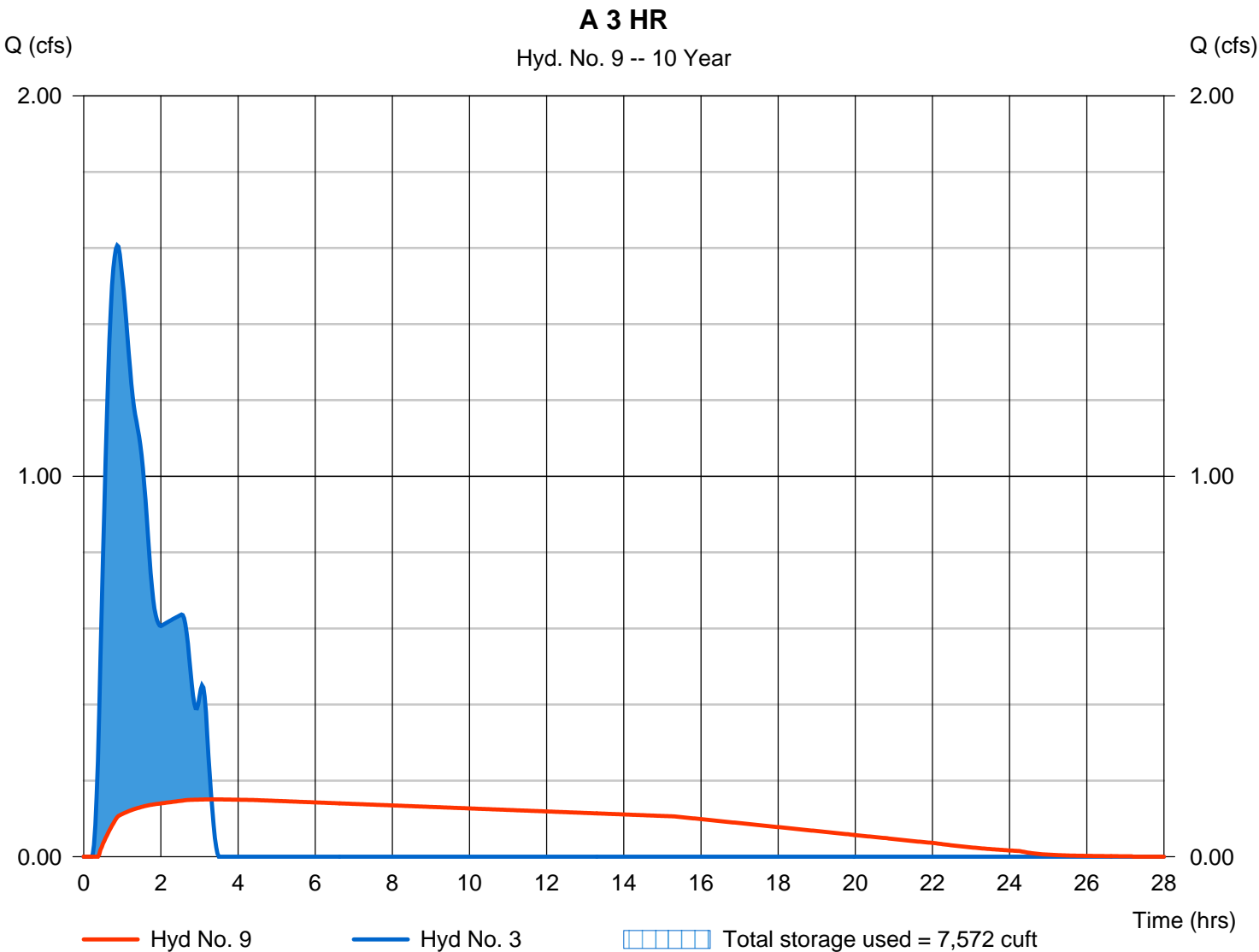
Hydrograph Report

Hyd. No. 9

A 3 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.151 cfs
Storm frequency	= 10 yrs	Time to peak	= 3.30 hrs
Time interval	= 2 min	Hyd. volume	= 8,858 cuft
Inflow hyd. No.	= 3 - A 3 HR	Max. Elevation	= 764.04 ft
Reservoir name	= Dry Detention	Max. Storage	= 7,572 cuft

Storage Indication method used.



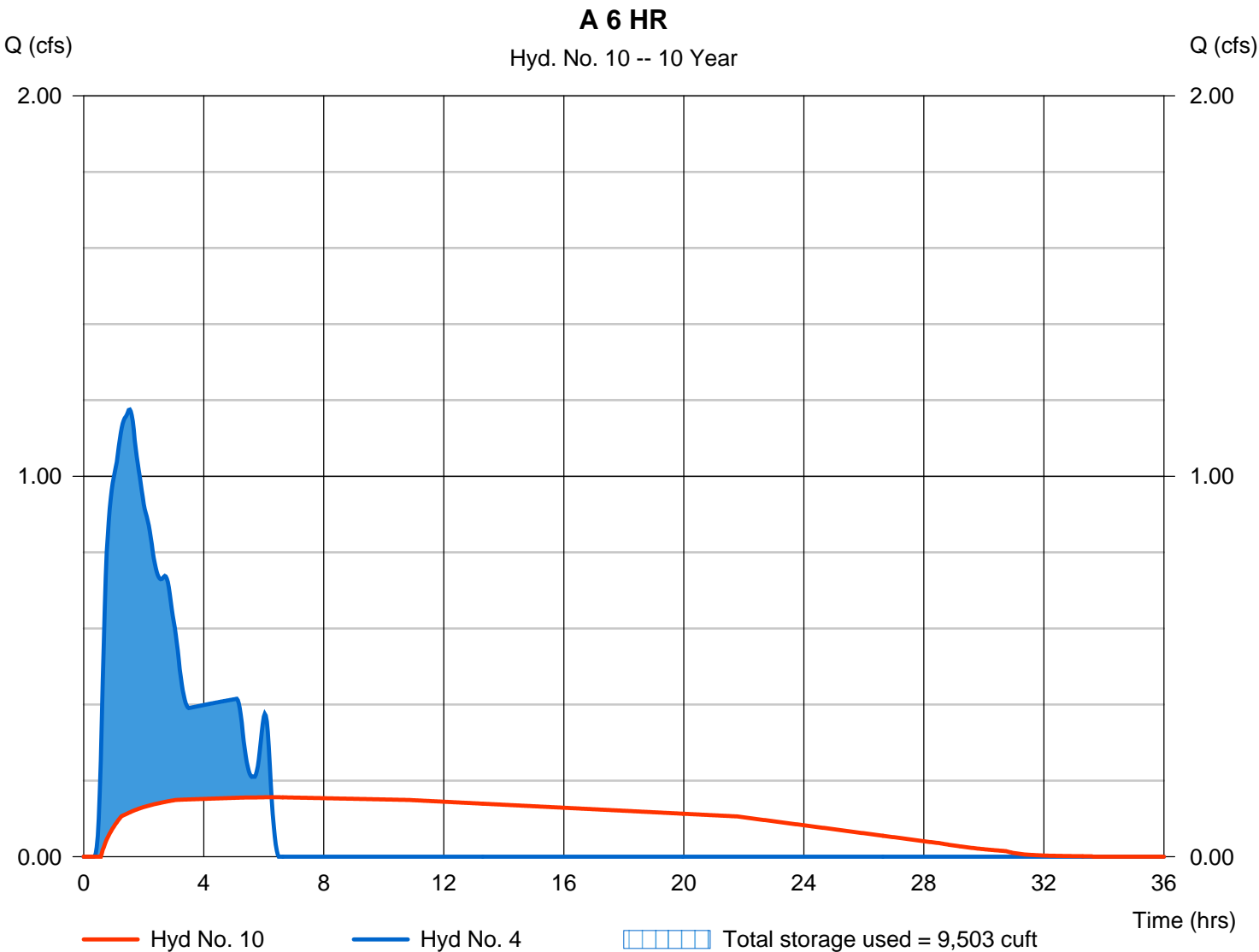
Hydrograph Report

Hyd. No. 10

A 6 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.157 cfs
Storm frequency	= 10 yrs	Time to peak	= 6.27 hrs
Time interval	= 2 min	Hyd. volume	= 12,264 cuft
Inflow hyd. No.	= 4 - A 6 HR	Max. Elevation	= 764.20 ft
Reservoir name	= Dry Detention	Max. Storage	= 9,503 cuft

Storage Indication method used.



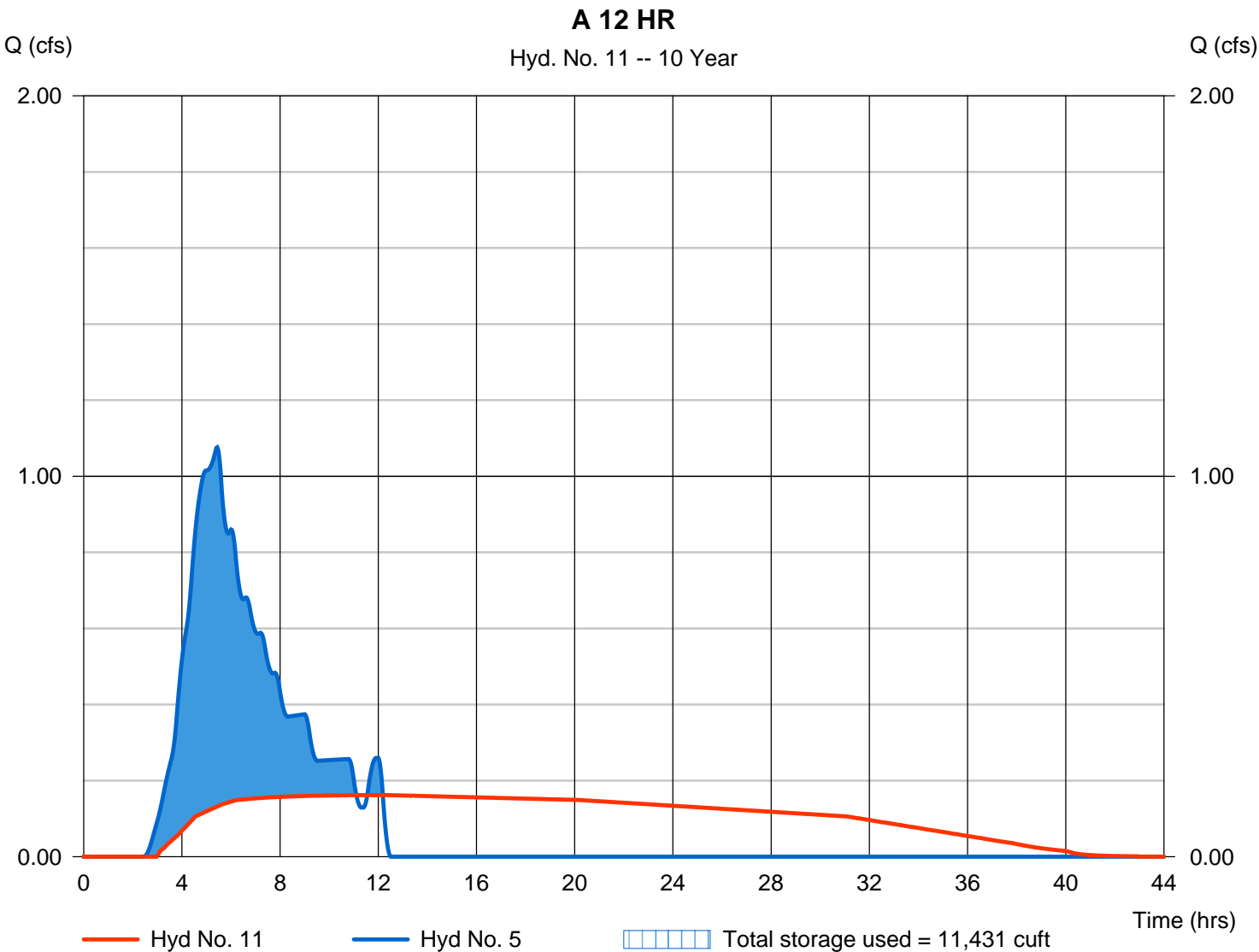
Hydrograph Report

Hyd. No. 11

A 12 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.162 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 15,915 cuft
Inflow hyd. No.	= 5 - A 12 HR	Max. Elevation	= 764.36 ft
Reservoir name	= Dry Detention	Max. Storage	= 11,431 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Wednesday, 02 / 24 / 2016

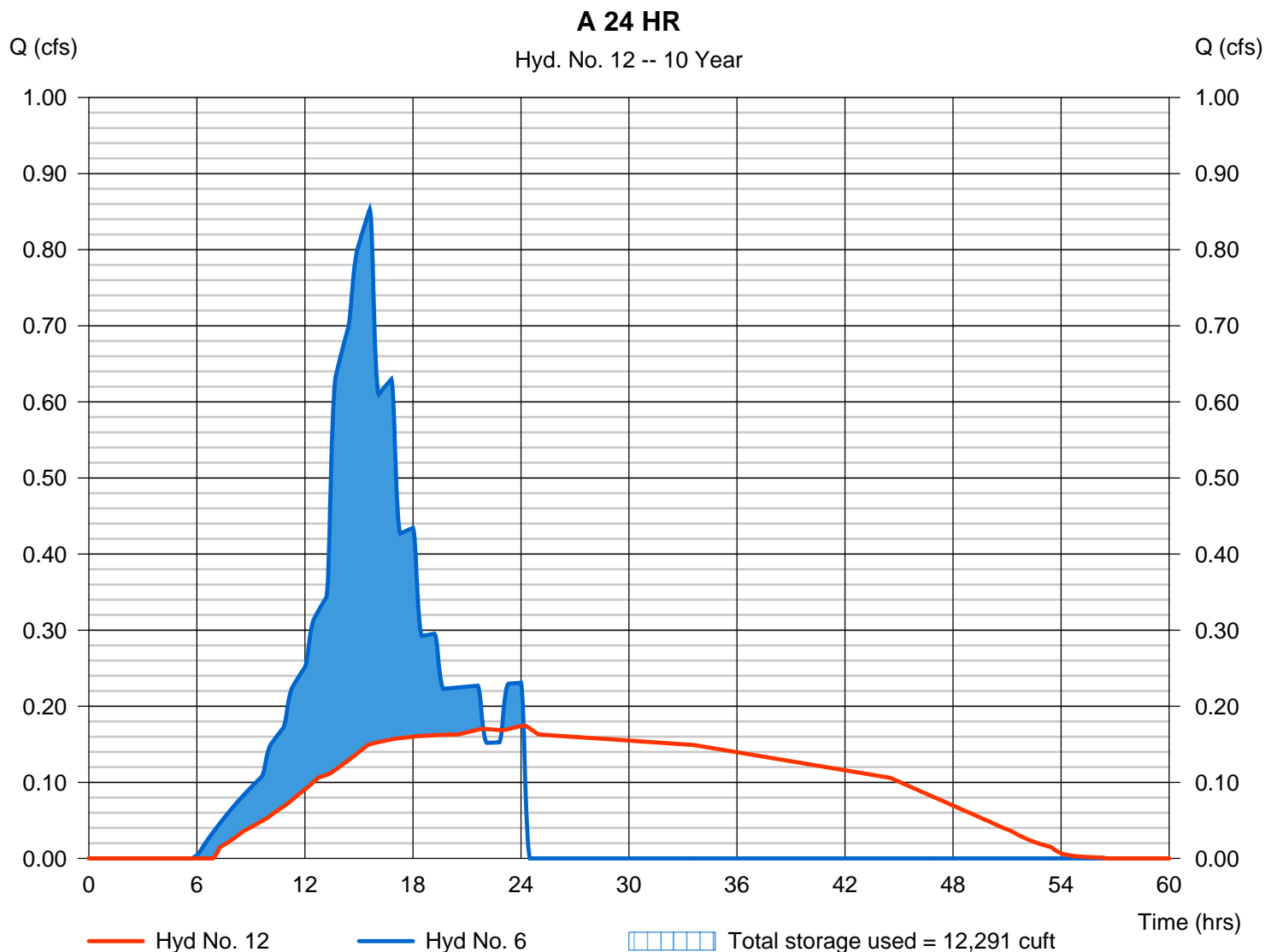
Hyd. No. 12

A 24 HR

Hydrograph type = Reservoir
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyd. No. = 6 - A 24 HR
Reservoir name = Dry Detention

Peak discharge = 0.174 cfs
Time to peak = 24.13 hrs
Hyd. volume = 19,754 cuft
Max. Elevation = 764.44 ft
Max. Storage = 12,291 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.846	2	30	6,747	-----	-----	-----	A 1 HR
2	SCS Runoff	2.599	2	40	10,024	-----	-----	-----	A 2 HR
3	SCS Runoff	2.216	2	50	12,110	-----	-----	-----	A 3 HR
4	SCS Runoff	1.527	2	90	15,982	-----	-----	-----	A 6 HR
5	SCS Runoff	1.386	2	326	20,805	-----	-----	-----	A 12 HR
6	SCS Runoff	1.083	2	936	25,848	-----	-----	-----	A 24 HR
7	Reservoir	0.143	2	82	6,680	1	763.84	6,245	A 1 HR
8	Reservoir	0.155	2	142	9,957	2	764.17	9,026	A 2 HR
9	Reservoir	0.160	2	200	12,043	3	764.30	10,609	A 3 HR
10	Reservoir	0.190	2	376	15,915	4	764.48	12,849	A 6 HR
11	Reservoir	0.294	2	654	20,738	5	764.61	14,407	A 12 HR
12	Reservoir	0.337	2	1162	25,781	6	764.65	14,847	A 24 HR
13	SCS Runoff	0.260	2	30	588	-----	-----	-----	B 1 HR
14	SCS Runoff	0.237	2	38	914	-----	-----	-----	B 2 HR
15	SCS Runoff	0.206	2	50	1,134	-----	-----	-----	B 3 HR
16	SCS Runoff	0.146	2	92	1,529	-----	-----	-----	B 6 HR
17	SCS Runoff	0.139	2	324	2,038	-----	-----	-----	B 12 HR
18	SCS Runoff	0.112	2	936	2,576	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 25 Year			Wednesday, 02 / 24 / 2016	

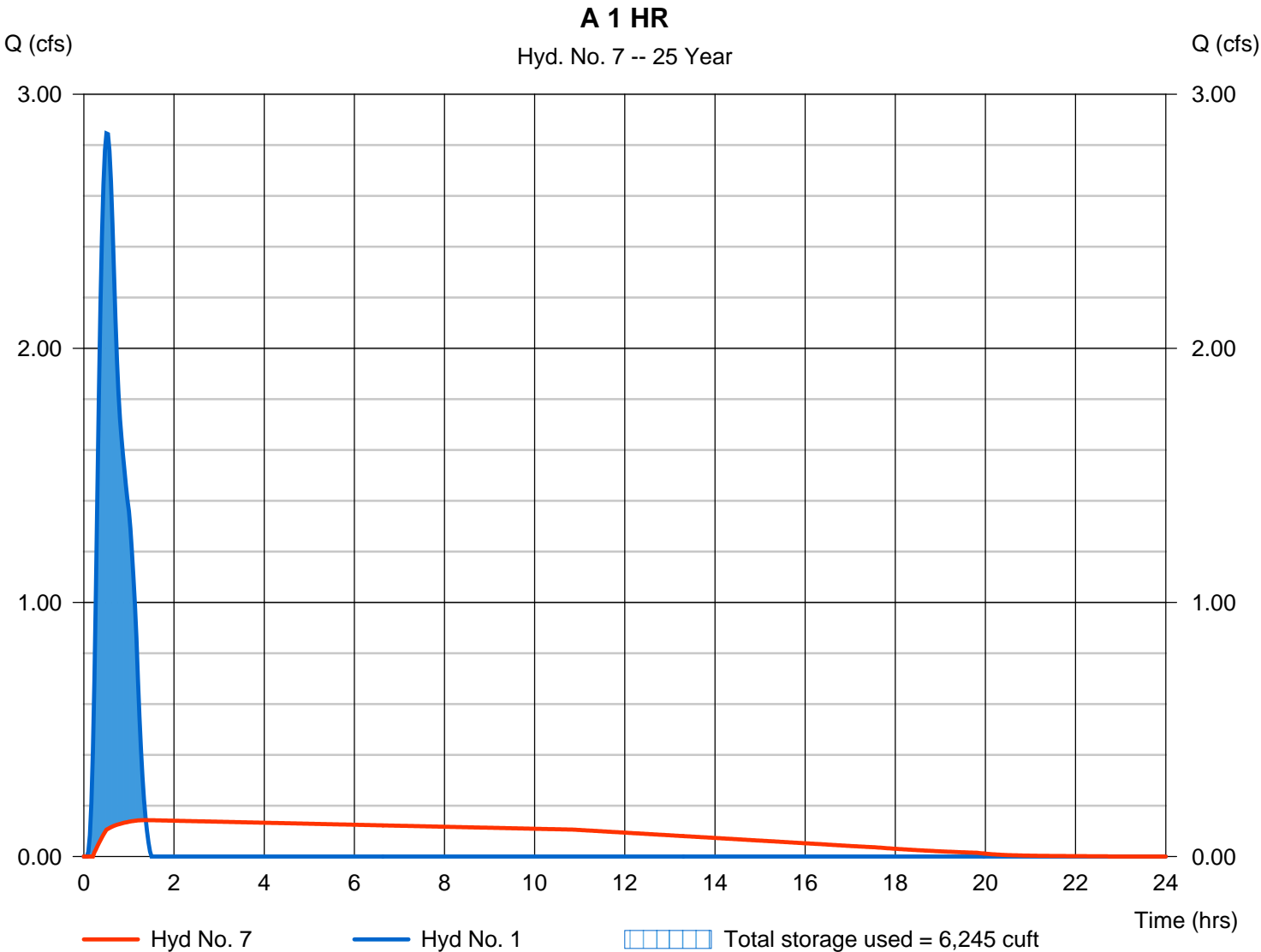
Hydrograph Report

Hyd. No. 7

A 1 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.143 cfs
Storm frequency	= 25 yrs	Time to peak	= 1.37 hrs
Time interval	= 2 min	Hyd. volume	= 6,680 cuft
Inflow hyd. No.	= 1 - A 1 HR	Max. Elevation	= 763.84 ft
Reservoir name	= Dry Detention	Max. Storage	= 6,245 cuft

Storage Indication method used.



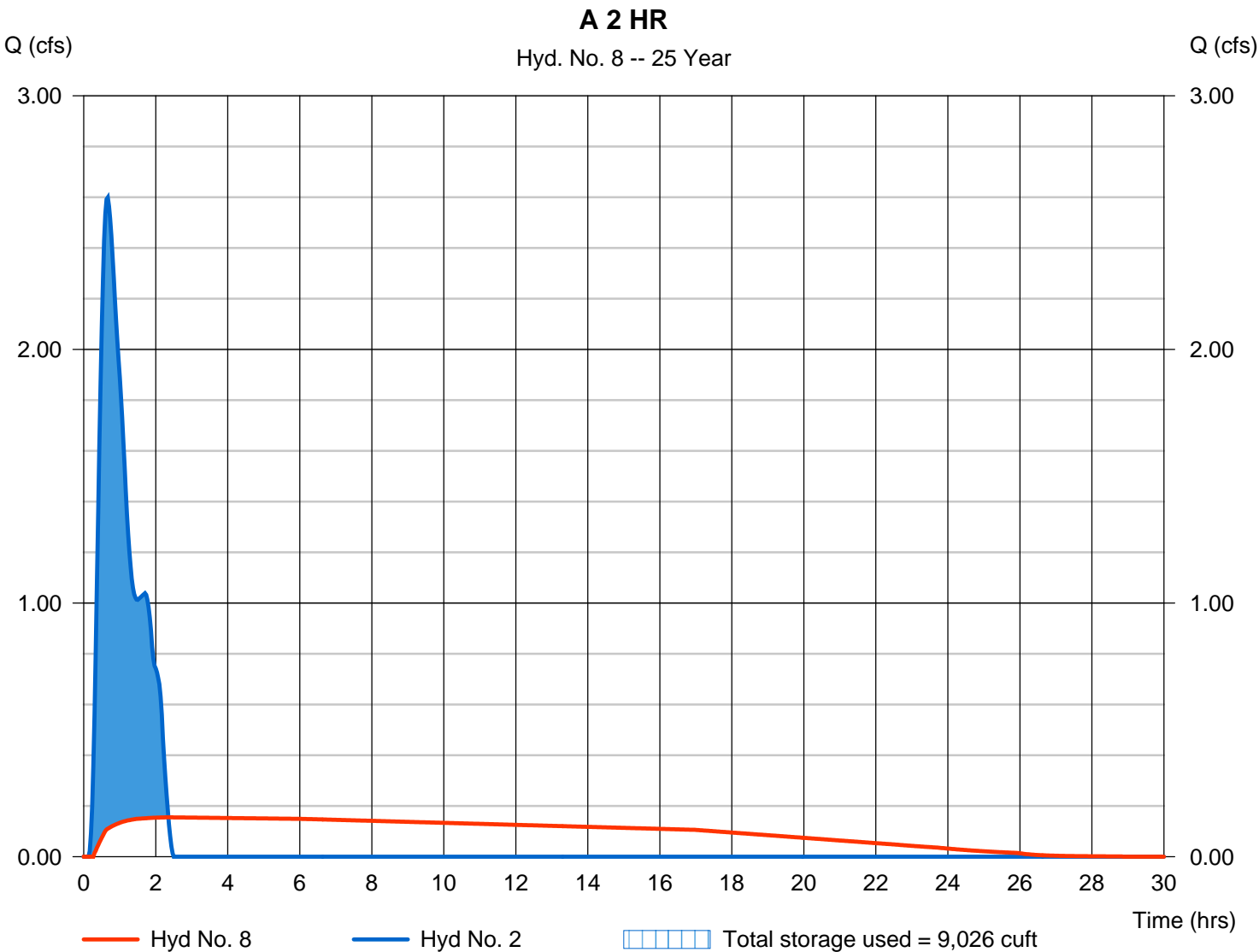
Hydrograph Report

Hyd. No. 8

A 2 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.155 cfs
Storm frequency	= 25 yrs	Time to peak	= 2.37 hrs
Time interval	= 2 min	Hyd. volume	= 9,957 cuft
Inflow hyd. No.	= 2 - A 2 HR	Max. Elevation	= 764.17 ft
Reservoir name	= Dry Detention	Max. Storage	= 9,026 cuft

Storage Indication method used.



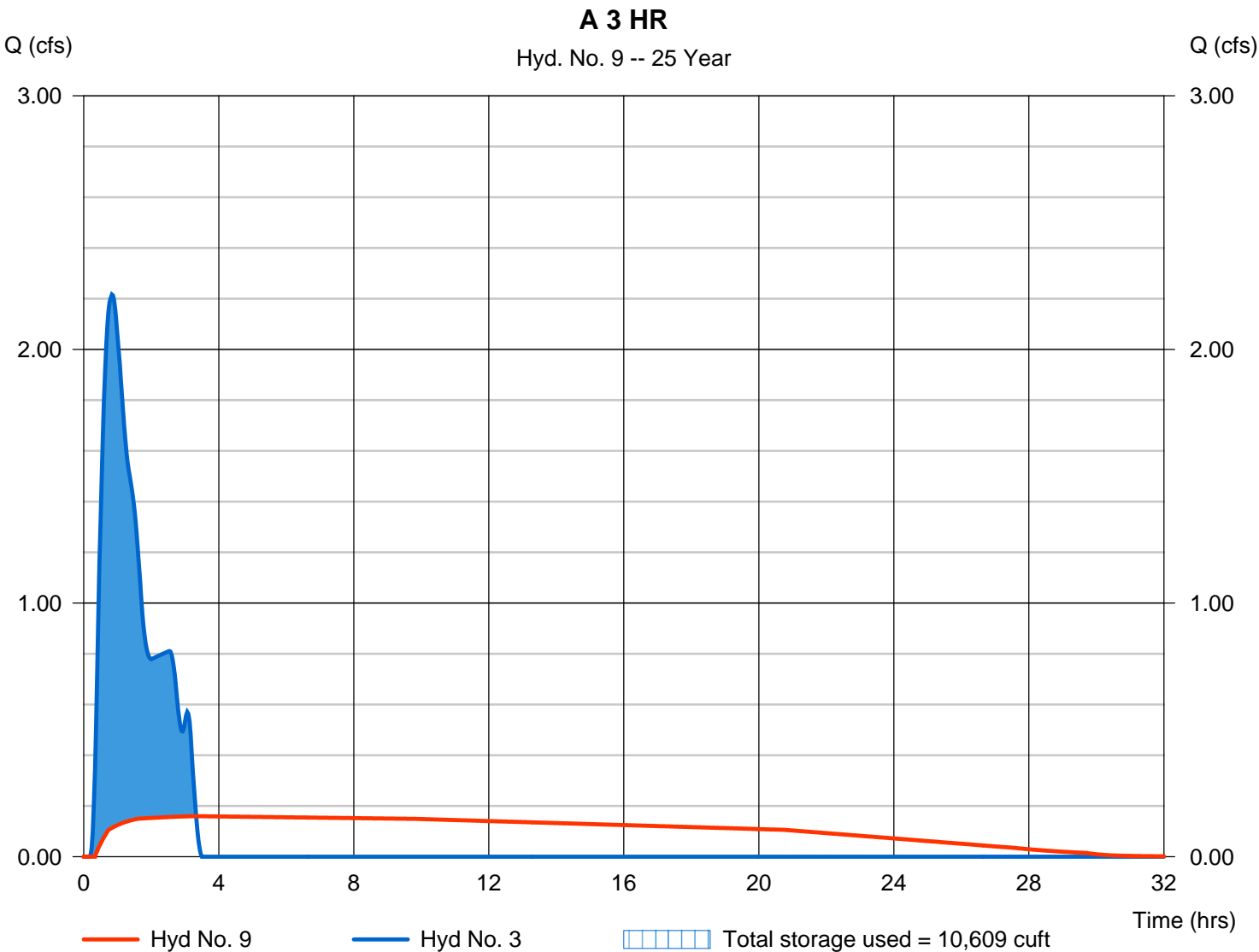
Hydrograph Report

Hyd. No. 9

A 3 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.160 cfs
Storm frequency	= 25 yrs	Time to peak	= 3.33 hrs
Time interval	= 2 min	Hyd. volume	= 12,043 cuft
Inflow hyd. No.	= 3 - A 3 HR	Max. Elevation	= 764.30 ft
Reservoir name	= Dry Detention	Max. Storage	= 10,609 cuft

Storage Indication method used.



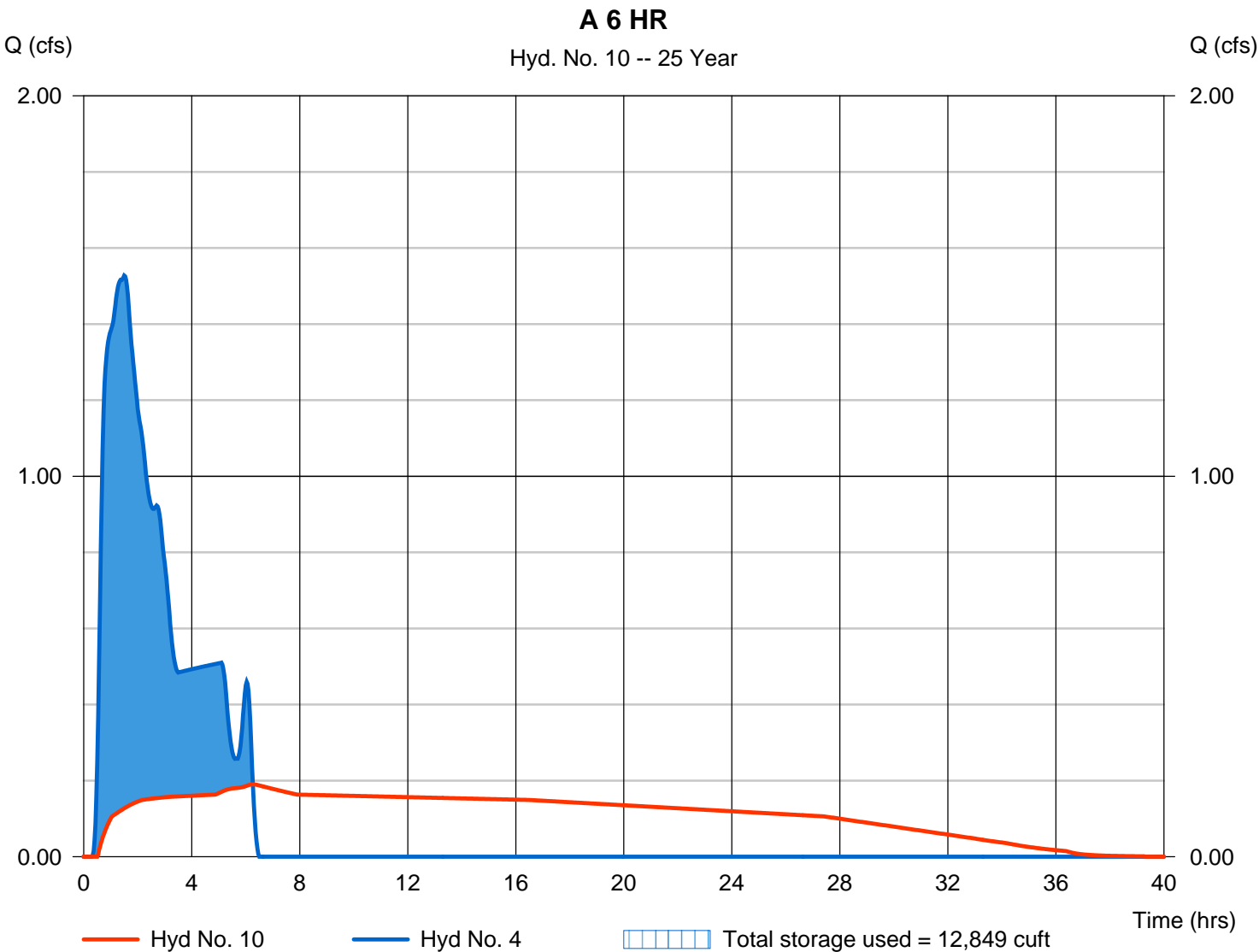
Hydrograph Report

Hyd. No. 10

A 6 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.190 cfs
Storm frequency	= 25 yrs	Time to peak	= 6.27 hrs
Time interval	= 2 min	Hyd. volume	= 15,915 cuft
Inflow hyd. No.	= 4 - A 6 HR	Max. Elevation	= 764.48 ft
Reservoir name	= Dry Detention	Max. Storage	= 12,849 cuft

Storage Indication method used.



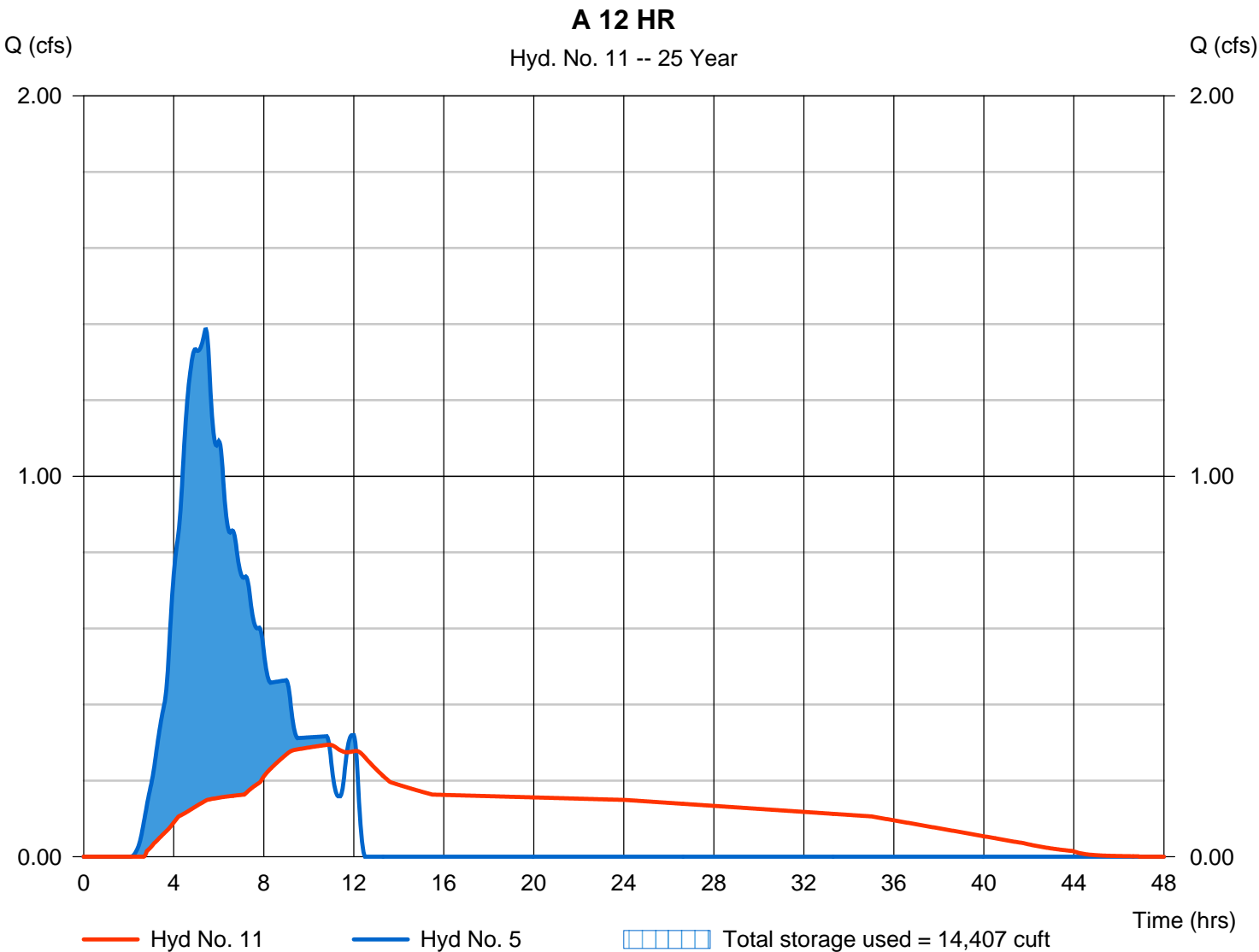
Hydrograph Report

Hyd. No. 11

A 12 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.294 cfs
Storm frequency	= 25 yrs	Time to peak	= 10.90 hrs
Time interval	= 2 min	Hyd. volume	= 20,738 cuft
Inflow hyd. No.	= 5 - A 12 HR	Max. Elevation	= 764.61 ft
Reservoir name	= Dry Detention	Max. Storage	= 14,407 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Wednesday, 02 / 24 / 2016

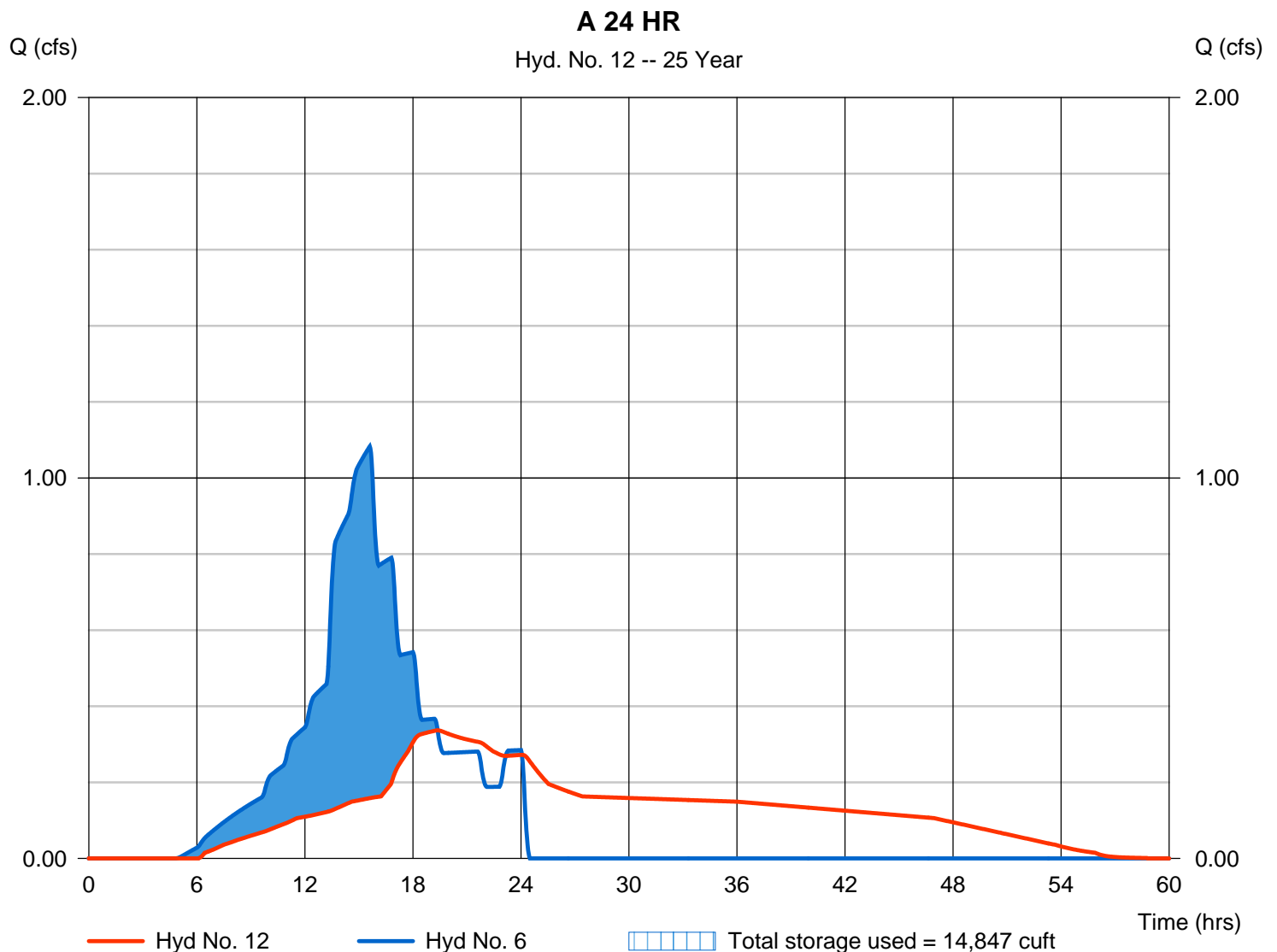
Hyd. No. 12

A 24 HR

Hydrograph type = Reservoir
Storm frequency = 25 yrs
Time interval = 2 min
Inflow hyd. No. = 6 - A 24 HR
Reservoir name = Dry Detention

Peak discharge = 0.337 cfs
Time to peak = 19.37 hrs
Hyd. volume = 25,781 cuft
Max. Elevation = 764.65 ft
Max. Storage = 14,847 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.562	2	30	10,582	-----	-----	-----	A 1 HR
2	SCS Runoff	4.067	2	38	15,204	-----	-----	-----	A 2 HR
3	SCS Runoff	3.387	2	46	18,120	-----	-----	-----	A 3 HR
4	SCS Runoff	2.239	2	80	23,303	-----	-----	-----	A 6 HR
5	SCS Runoff	1.898	2	324	28,958	-----	-----	-----	A 12 HR
6	SCS Runoff	1.471	2	936	36,404	-----	-----	-----	A 24 HR
7	Reservoir	0.158	2	84	10,515	1	764.24	9,988	A 1 HR
8	Reservoir	0.258	2	140	15,137	2	764.57	13,943	A 2 HR
9	Reservoir	0.422	2	194	18,053	3	764.72	15,686	A 3 HR
10	Reservoir	0.530	2	318	23,236	4	764.80	16,654	A 6 HR
11	Reservoir	0.607	2	494	28,891	5	764.86	17,476	A 12 HR
12	Reservoir	0.684	2	1086	36,337	6	764.94	18,433	A 24 HR
13	SCS Runoff	0.439	2	28	971	-----	-----	-----	B 1 HR
14	SCS Runoff	0.386	2	36	1,447	-----	-----	-----	B 2 HR
15	SCS Runoff	0.327	2	48	1,754	-----	-----	-----	B 3 HR
16	SCS Runoff	0.220	2	90	2,304	-----	-----	-----	B 6 HR
17	SCS Runoff	0.196	2	324	2,911	-----	-----	-----	B 12 HR
18	SCS Runoff	0.156	2	936	3,720	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 100 Year			Wednesday, 02 / 24 / 2016	

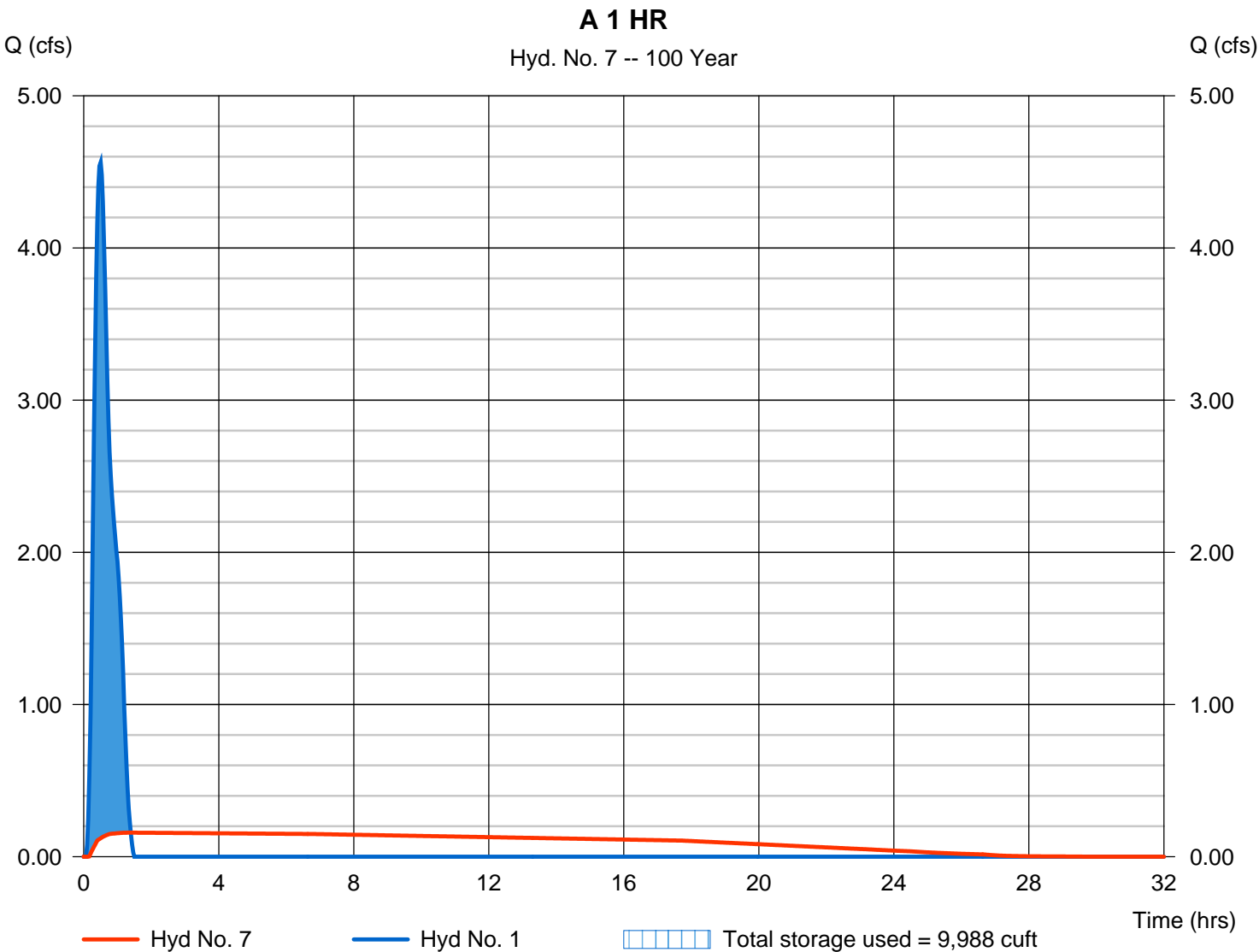
Hydrograph Report

Hyd. No. 7

A 1 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.158 cfs
Storm frequency	= 100 yrs	Time to peak	= 1.40 hrs
Time interval	= 2 min	Hyd. volume	= 10,515 cuft
Inflow hyd. No.	= 1 - A 1 HR	Max. Elevation	= 764.24 ft
Reservoir name	= Dry Detention	Max. Storage	= 9,988 cuft

Storage Indication method used.



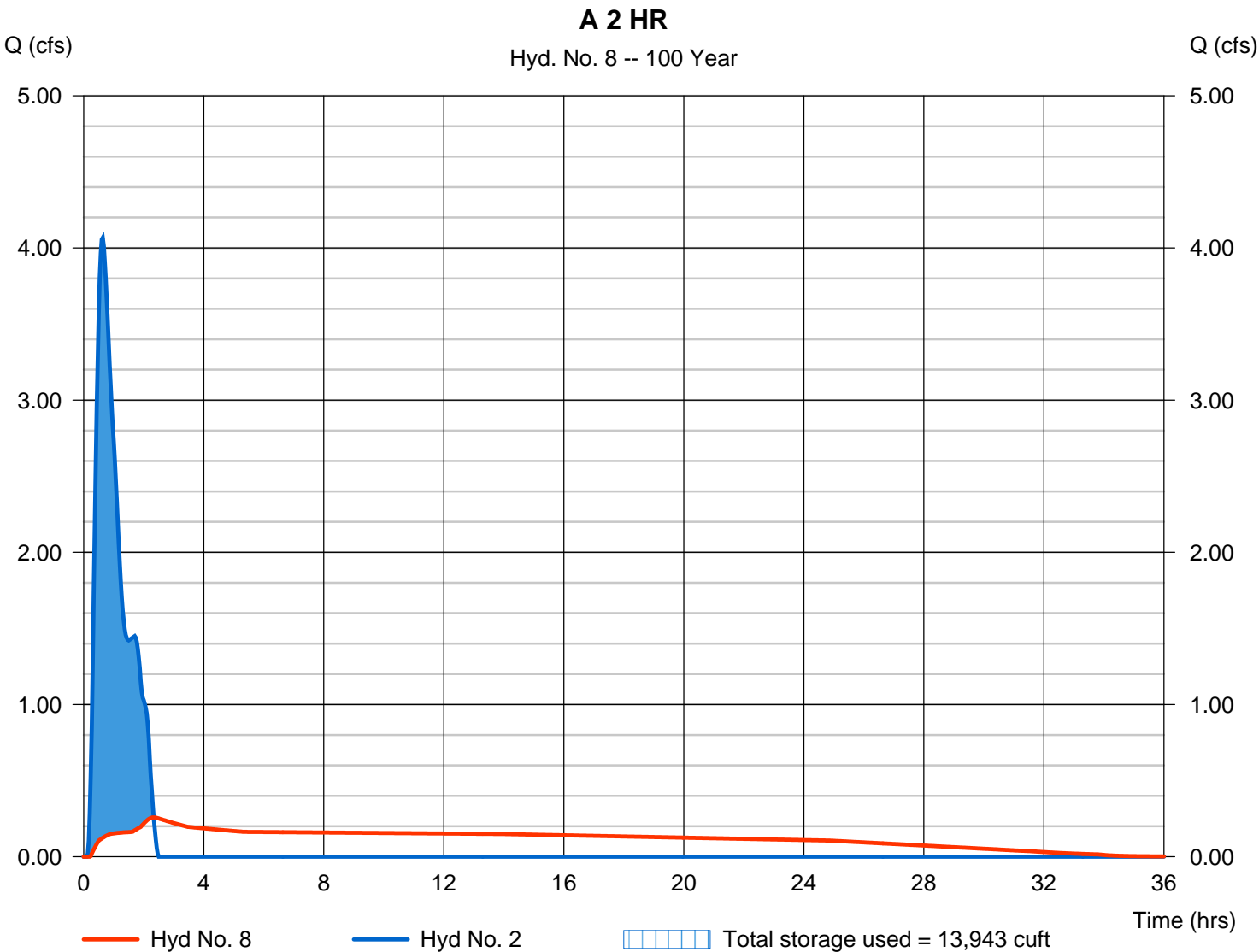
Hydrograph Report

Hyd. No. 8

A 2 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.258 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.33 hrs
Time interval	= 2 min	Hyd. volume	= 15,137 cuft
Inflow hyd. No.	= 2 - A 2 HR	Max. Elevation	= 764.57 ft
Reservoir name	= Dry Detention	Max. Storage	= 13,943 cuft

Storage Indication method used.



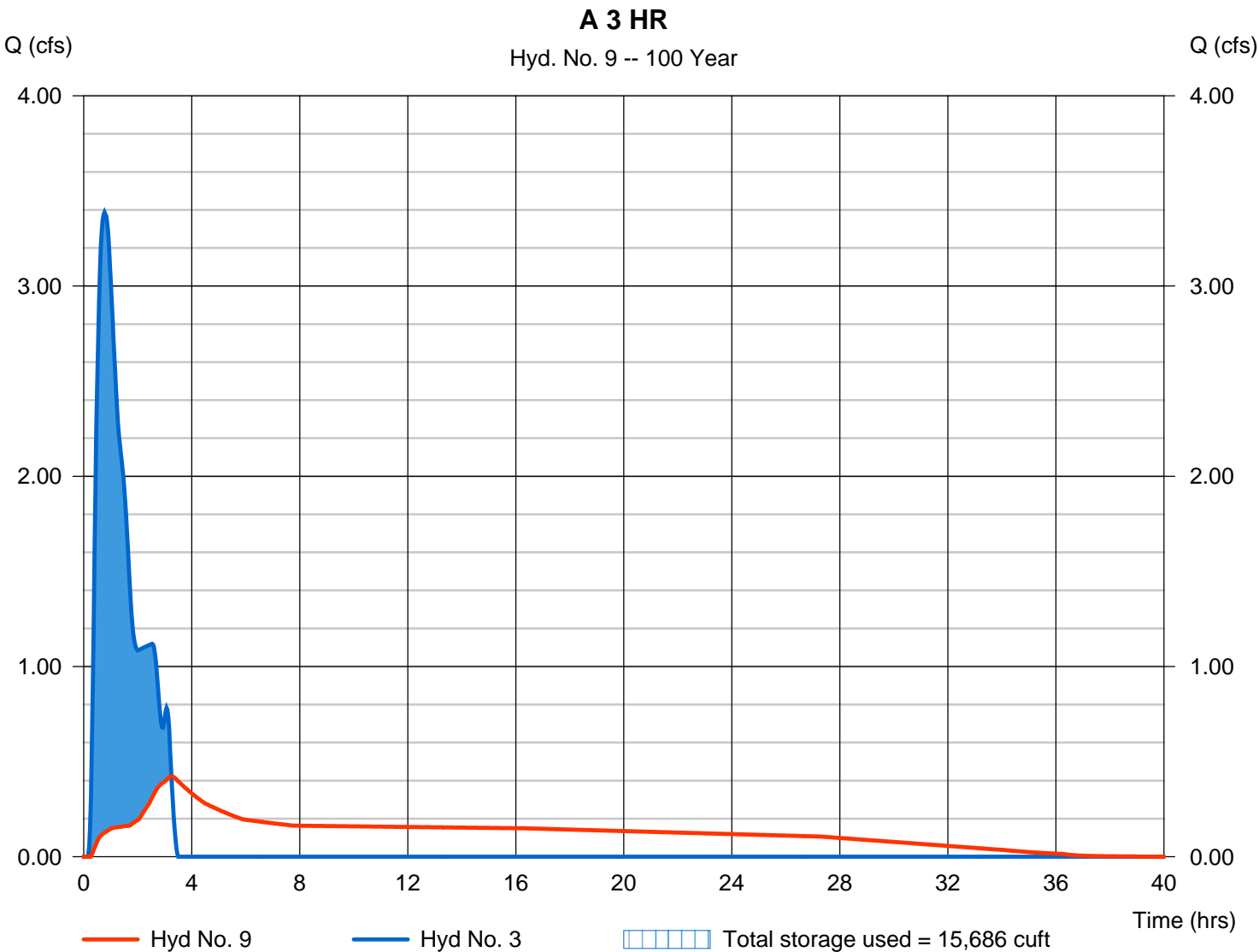
Hydrograph Report

Hyd. No. 9

A 3 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.422 cfs
Storm frequency	= 100 yrs	Time to peak	= 3.23 hrs
Time interval	= 2 min	Hyd. volume	= 18,053 cuft
Inflow hyd. No.	= 3 - A 3 HR	Max. Elevation	= 764.72 ft
Reservoir name	= Dry Detention	Max. Storage	= 15,686 cuft

Storage Indication method used.



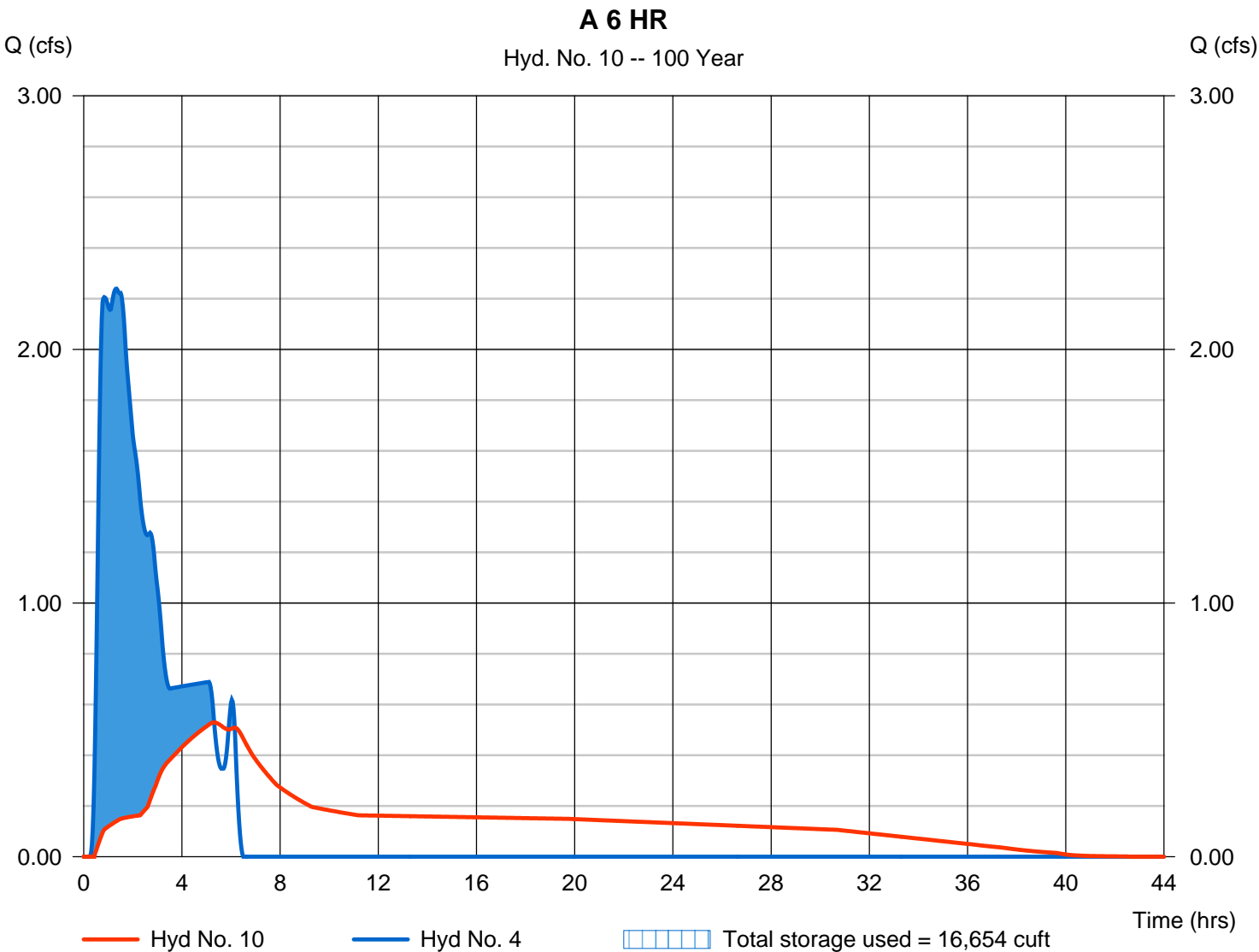
Hydrograph Report

Hyd. No. 10

A 6 HR

Hydrograph type	= Reservoir	Peak discharge	= 0.530 cfs
Storm frequency	= 100 yrs	Time to peak	= 5.30 hrs
Time interval	= 2 min	Hyd. volume	= 23,236 cuft
Inflow hyd. No.	= 4 - A 6 HR	Max. Elevation	= 764.80 ft
Reservoir name	= Dry Detention	Max. Storage	= 16,654 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Wednesday, 02 / 24 / 2016

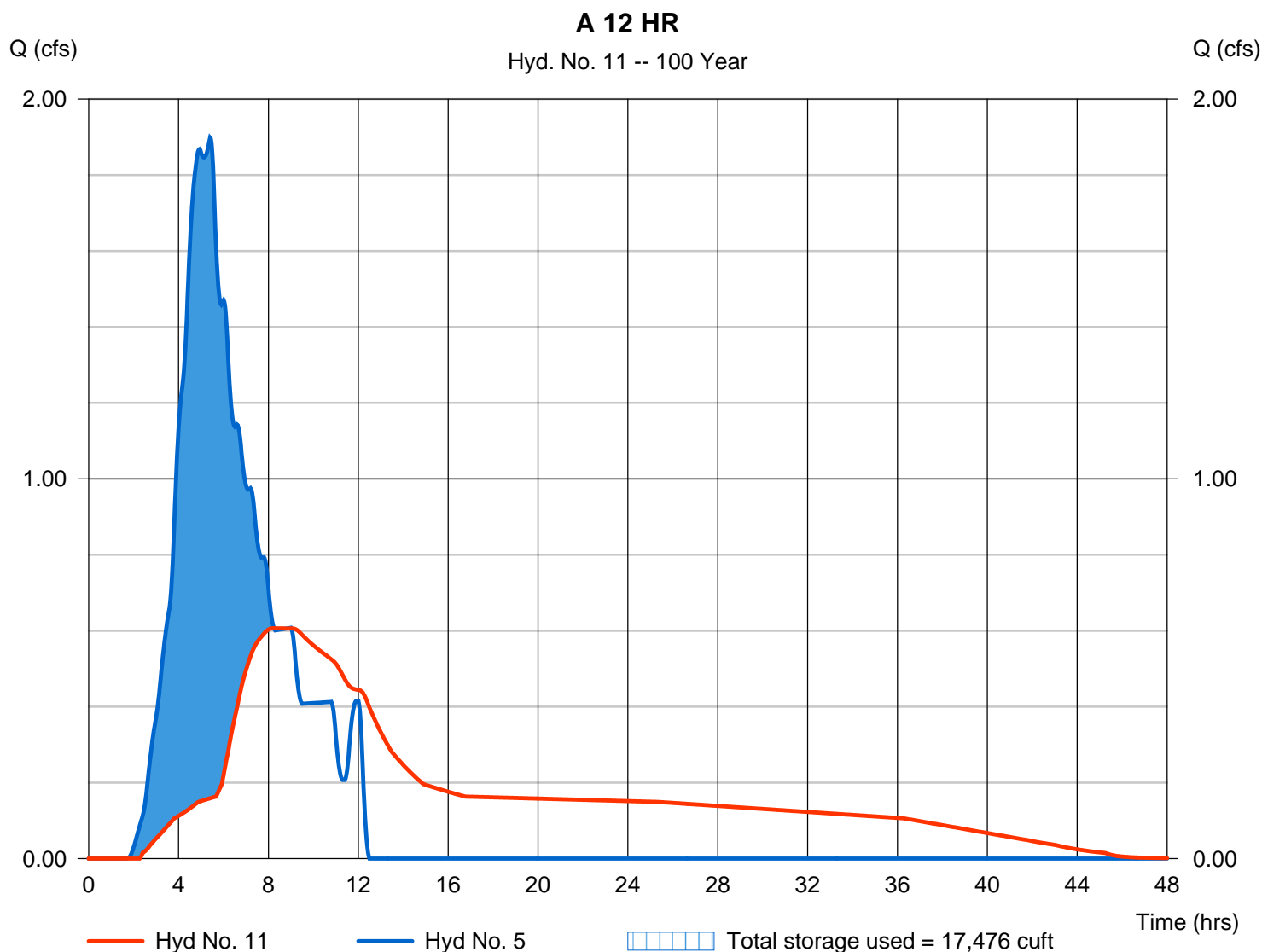
Hyd. No. 11

A 12 HR

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 5 - A 12 HR
Reservoir name = Dry Detention

Peak discharge = 0.607 cfs
Time to peak = 8.23 hrs
Hyd. volume = 28,891 cuft
Max. Elevation = 764.86 ft
Max. Storage = 17,476 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Wednesday, 02 / 24 / 2016

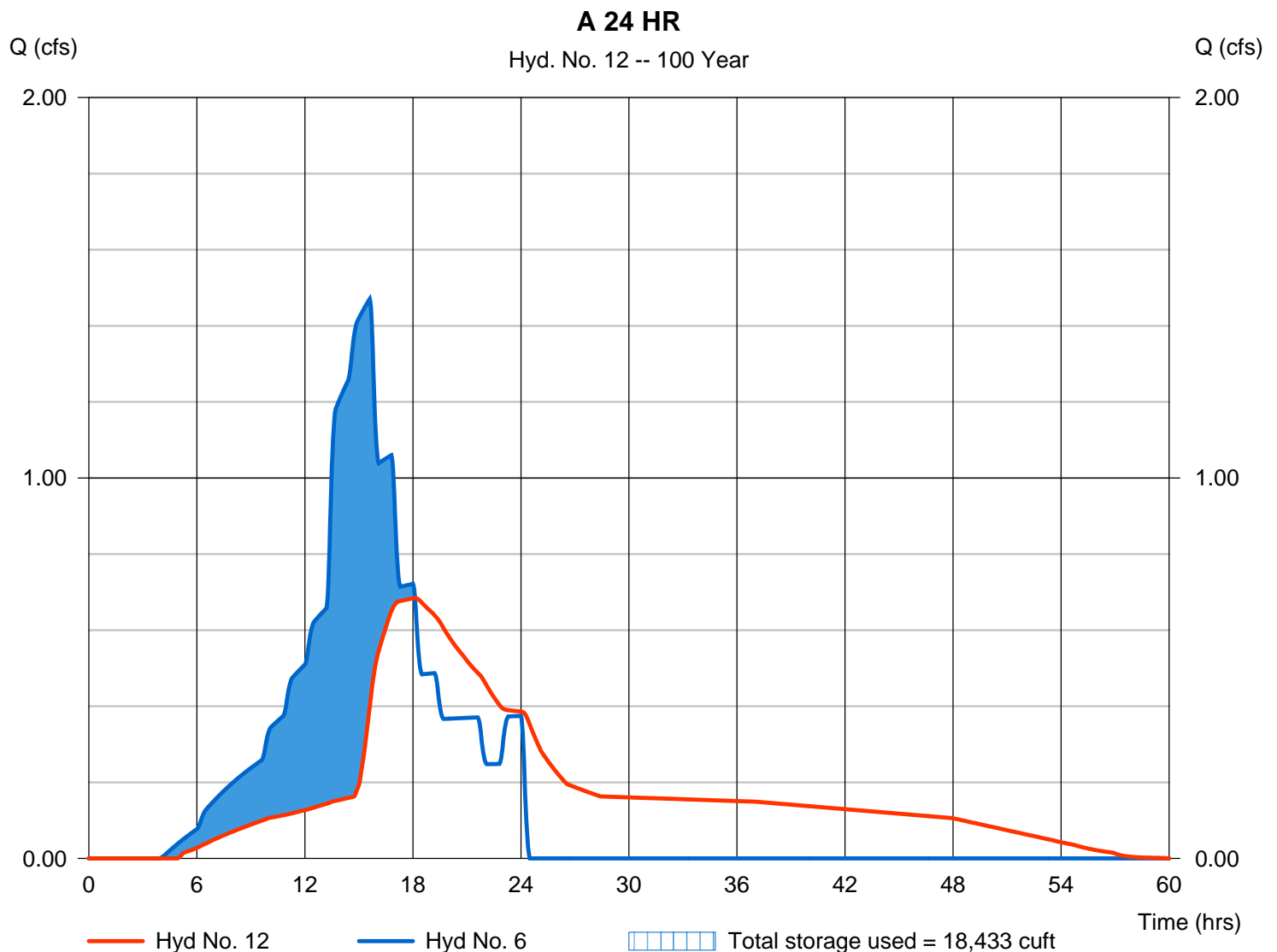
Hyd. No. 12

A 24 HR

Hydrograph type = Reservoir
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyd. No. = 6 - A 24 HR
Reservoir name = Dry Detention

Peak discharge = 0.684 cfs
Time to peak = 18.10 hrs
Hyd. volume = 36,337 cuft
Max. Elevation = 764.94 ft
Max. Storage = 18,433 cuft

Storage Indication method used.



Runoff Curve Number

Project	Picket Minor Plat	By	VT	Date	12/5/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	12/5/2015
		<input type="checkbox"/>	Present	<input checked="" type="checkbox"/>	Developed
Basin B					
Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Grass - Good	61		0
CrA	C	Grass - Good	74	0.33	24.42
Totals =				0.33	24.42

CN = 74

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 17

B 12 HR

Description	A	B	C	Totals
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)	= 2.64	0.00	0.00	
Land slope (%)	= 1.00	0.00	0.00	
Travel Time (min)	= 14.23	+	0.00	+
			0.00	= 14.23
Shallow Concentrated Flow				
Flow length (ft)	= 108.00	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)	= 1.12	+	0.00	+
			0.00	= 1.12
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	0.0	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Total Travel Time, Tc				15.35 min

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.884	2	34	2,177	-----	-----	-----	A 1 HR
2	SCS Runoff	0.103	2	58	453	-----	-----	-----	A 2 HR
3	SCS Runoff	0.097	2	64	625	-----	-----	-----	A 3 HR
4	SCS Runoff	0.086	2	96	1,000	-----	-----	-----	A 6 HR
5	SCS Runoff	0.111	2	326	1,624	-----	-----	-----	A 12 HR
6	SCS Runoff	0.098	2	936	2,023	-----	-----	-----	A 24 HR
7	Reservoir	0.107	2	80	2,160	1	762.92	1,856	A 1 HR
8	Reservoir	0.044	2	128	437	2	762.08	264	A 2 HR
9	Reservoir	0.048	2	164	608	3	762.10	296	A 3 HR
10	Reservoir	0.048	2	192	984	4	762.10	307	A 6 HR
11	Reservoir	0.058	2	474	1,608	5	762.19	480	A 12 HR
12	Reservoir	0.059	2	1022	2,006	6	762.20	485	A 24 HR
13	SCS Runoff	0.034	2	38	86	-----	-----	-----	B 1 HR
14	SCS Runoff	0.041	2	58	180	-----	-----	-----	B 2 HR
15	SCS Runoff	0.039	2	64	248	-----	-----	-----	B 3 HR
16	SCS Runoff	0.034	2	96	398	-----	-----	-----	B 6 HR
17	SCS Runoff	0.044	2	326	646	-----	-----	-----	B 12 HR
18	SCS Runoff	0.039	2	936	804	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 2 Year			Saturday, 12 / 5 / 2015 Page 71 of 84	

Hydrograph Report

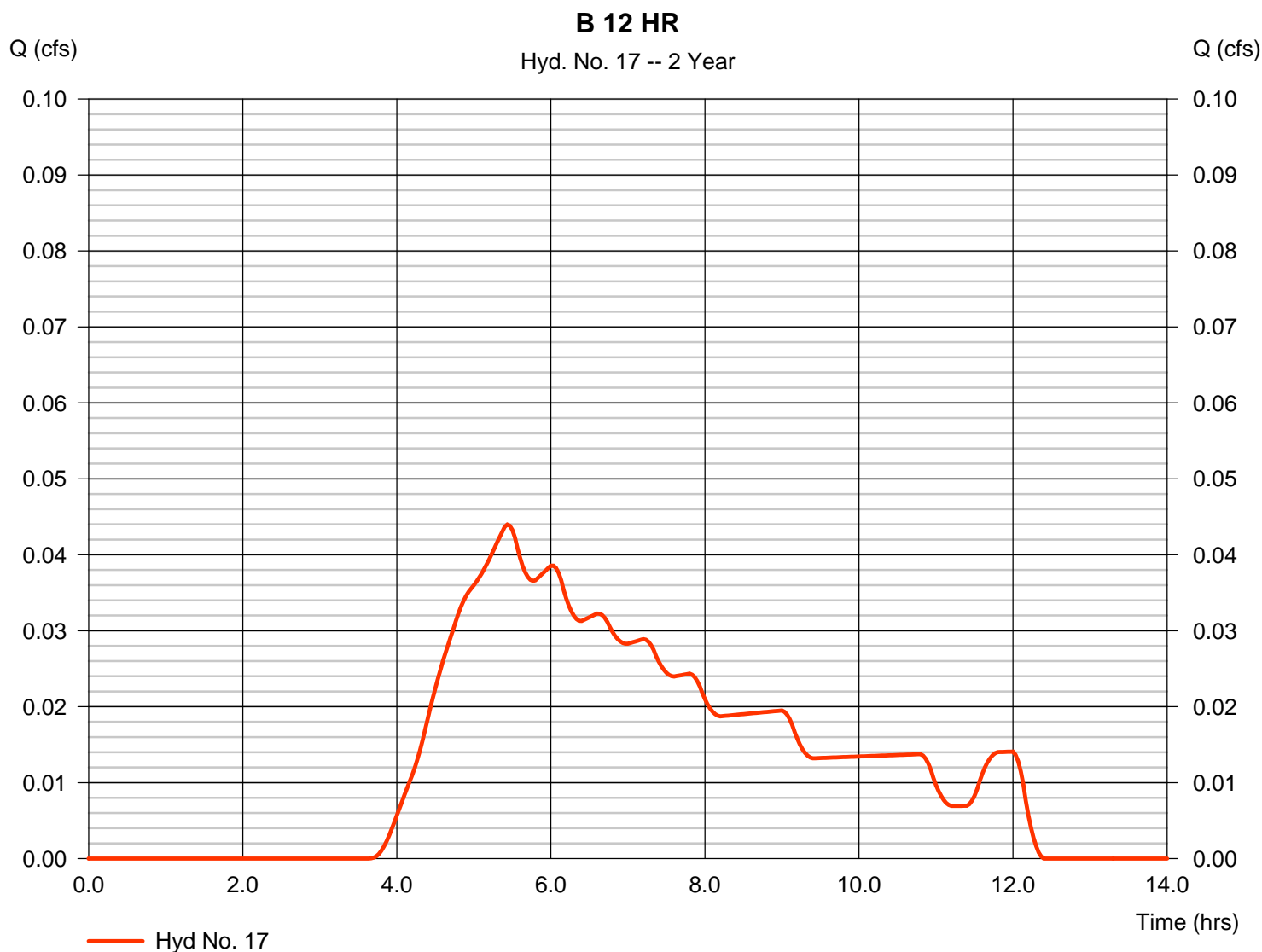
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Saturday, 12 / 5 / 2015

Hyd. No. 17

B 12 HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.044 cfs
Storm frequency	= 2 yrs	Time to peak	= 5.43 hrs
Time interval	= 2 min	Hyd. volume	= 646 cuft
Drainage area	= 0.330 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.30 min
Total precip.	= 2.40 in	Distribution	= Huff-2nd
Storm duration	= 12.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.663	2	30	6,258	-----	-----	-----	A 1 HR
2	SCS Runoff	0.406	2	40	1,622	-----	-----	-----	A 2 HR
3	SCS Runoff	0.359	2	52	2,022	-----	-----	-----	A 3 HR
4	SCS Runoff	0.275	2	92	2,894	-----	-----	-----	A 6 HR
5	SCS Runoff	0.264	2	326	3,846	-----	-----	-----	A 12 HR
6	SCS Runoff	0.218	2	936	4,862	-----	-----	-----	A 24 HR
7	Reservoir	0.143	2	82	6,242	1	763.74	5,745	A 1 HR
8	Reservoir	0.086	2	130	1,606	2	762.55	1,160	A 2 HR
9	Reservoir	0.090	2	190	2,005	3	762.62	1,287	A 3 HR
10	Reservoir	0.092	2	314	2,877	4	762.66	1,366	A 6 HR
11	Reservoir	0.100	2	484	3,830	5	762.79	1,618	A 12 HR
12	Reservoir	0.101	2	1088	4,846	6	762.81	1,644	A 24 HR
13	SCS Runoff	0.167	2	30	386	-----	-----	-----	B 1 HR
14	SCS Runoff	0.162	2	40	645	-----	-----	-----	B 2 HR
15	SCS Runoff	0.143	2	52	804	-----	-----	-----	B 3 HR
16	SCS Runoff	0.109	2	92	1,150	-----	-----	-----	B 6 HR
17	SCS Runoff	0.105	2	326	1,529	-----	-----	-----	B 12 HR
18	SCS Runoff	0.087	2	936	1,933	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 10 Year			Saturday, 12 / 5 / 2015 Page 73 of 84	

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

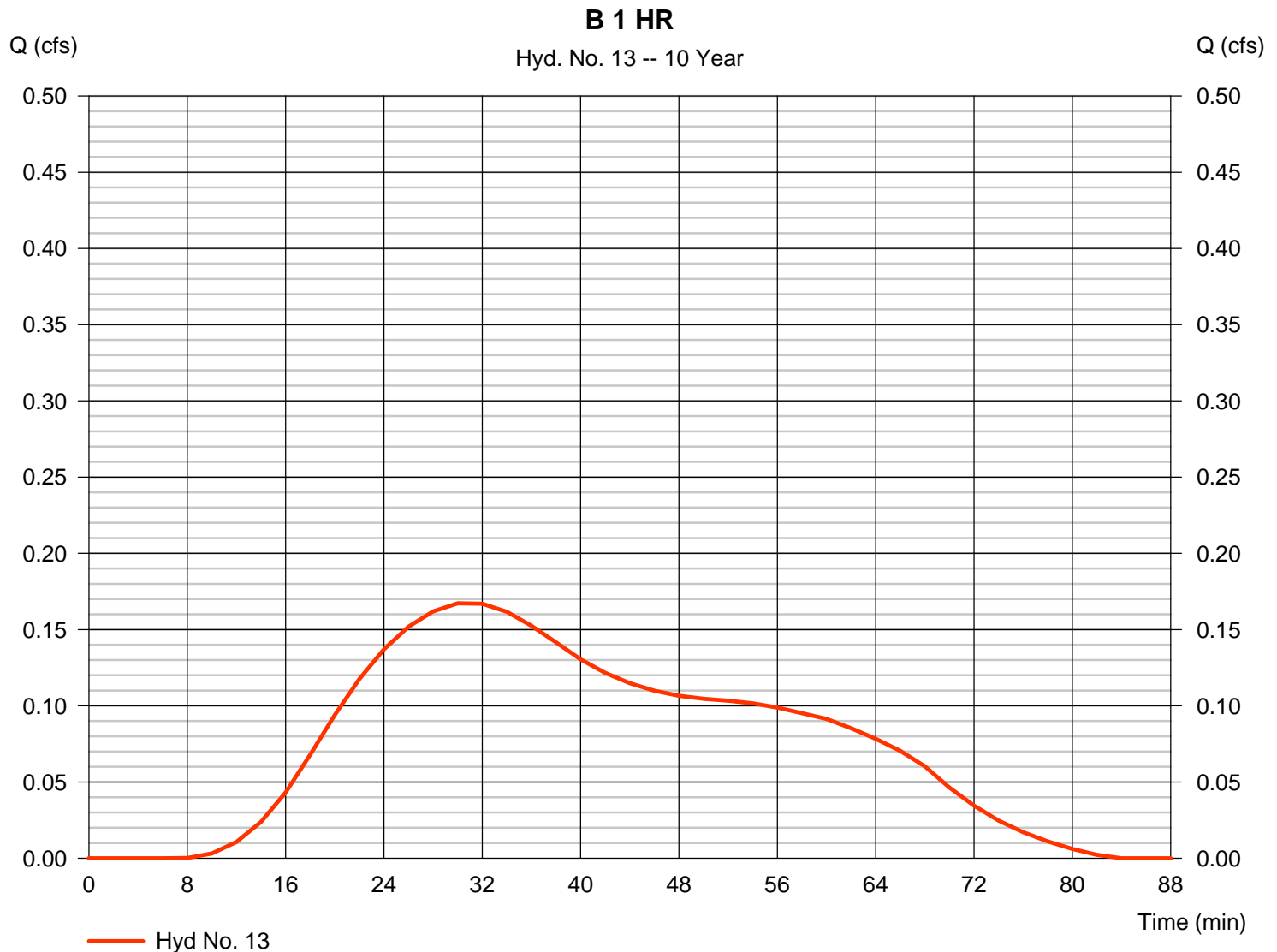
Saturday, 12 / 5 / 2015

Hyd. No. 13

B 1 HR

Hydrograph type = SCS Runoff
Storm frequency = 10 yrs
Time interval = 2 min
Drainage area = 0.330 ac
Basin Slope = 0.0 %
Tc method = User
Total precip. = 1.96 in
Storm duration = 1.00 hrs

Peak discharge = 0.167 cfs
Time to peak = 30 min
Hyd. volume = 386 cuft
Curve number = 74
Hydraulic length = 0 ft
Time of conc. (Tc) = 15.30 min
Distribution = Huff-1st
Shape factor = 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	3.740	2	30	8,661	-----	-----	-----	A 1 HR
2	SCS Runoff	0.596	2	38	2,300	-----	-----	-----	A 2 HR
3	SCS Runoff	0.516	2	50	2,836	-----	-----	-----	A 3 HR
4	SCS Runoff	0.367	2	92	3,846	-----	-----	-----	A 6 HR
5	SCS Runoff	0.349	2	324	5,125	-----	-----	-----	A 12 HR
6	SCS Runoff	0.282	2	936	6,480	-----	-----	-----	A 24 HR
7	Reservoir	0.156	2	82	8,645	1	764.09	8,079	A 1 HR
8	Reservoir	0.103	2	132	2,283	2	762.85	1,729	A 2 HR
9	Reservoir	0.109	2	190	2,820	3	762.96	1,930	A 3 HR
10	Reservoir	0.110	2	314	3,830	4	762.99	1,994	A 6 HR
11	Reservoir	0.115	2	546	5,109	5	763.08	2,394	A 12 HR
12	Reservoir	0.115	2	1092	6,463	6	763.08	2,435	A 24 HR
13	SCS Runoff	0.260	2	30	588	-----	-----	-----	B 1 HR
14	SCS Runoff	0.237	2	38	914	-----	-----	-----	B 2 HR
15	SCS Runoff	0.206	2	50	1,134	-----	-----	-----	B 3 HR
16	SCS Runoff	0.146	2	92	1,529	-----	-----	-----	B 6 HR
17	SCS Runoff	0.139	2	324	2,038	-----	-----	-----	B 12 HR
18	SCS Runoff	0.112	2	936	2,576	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 25 Year			Saturday, 12 / 5 / 2015 Page 75 of 84	

Hydrograph Report

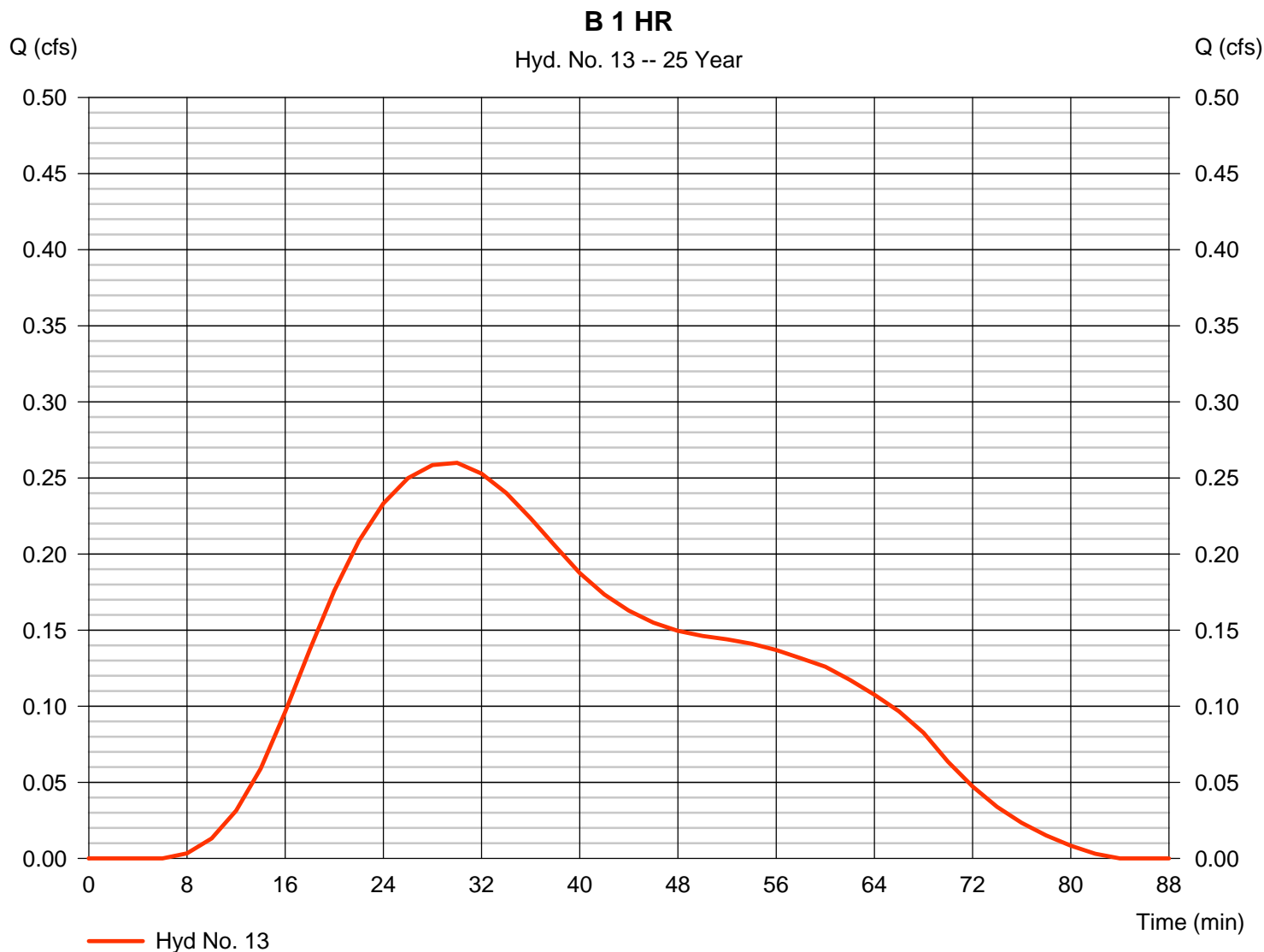
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Saturday, 12 / 5 / 2015

Hyd. No. 13

B 1 HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.260 cfs
Storm frequency	= 25 yrs	Time to peak	= 30 min
Time interval	= 2 min	Hyd. volume	= 588 cuft
Drainage area	= 0.330 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.30 min
Total precip.	= 2.31 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	5.694	2	28	12,929	-----	-----	-----	A 1 HR
2	SCS Runoff	0.972	2	36	3,640	-----	-----	-----	A 2 HR
3	SCS Runoff	0.821	2	48	4,411	-----	-----	-----	A 3 HR
4	SCS Runoff	0.554	2	90	5,794	-----	-----	-----	A 6 HR
5	SCS Runoff	0.492	2	324	7,322	-----	-----	-----	A 12 HR
6	SCS Runoff	0.393	2	936	9,356	-----	-----	-----	A 24 HR
7	Reservoir	0.168	2	84	12,913	1	764.43	12,271	A 1 HR
8	Reservoir	0.120	2	132	3,623	2	763.18	2,918	A 2 HR
9	Reservoir	0.123	2	192	4,395	3	763.26	3,304	A 3 HR
10	Reservoir	0.125	2	318	5,777	4	763.30	3,526	A 6 HR
11	Reservoir	0.129	2	552	7,306	5	763.39	3,962	A 12 HR
12	Reservoir	0.130	2	1156	9,339	6	763.41	4,077	A 24 HR
13	SCS Runoff	0.439	2	28	971	-----	-----	-----	B 1 HR
14	SCS Runoff	0.386	2	36	1,447	-----	-----	-----	B 2 HR
15	SCS Runoff	0.327	2	48	1,754	-----	-----	-----	B 3 HR
16	SCS Runoff	0.220	2	90	2,304	-----	-----	-----	B 6 HR
17	SCS Runoff	0.196	2	324	2,911	-----	-----	-----	B 12 HR
18	SCS Runoff	0.156	2	936	3,720	-----	-----	-----	B 24 HR
Proposed Hydrographs.gpw					Return Period: 100 Year			Saturday, 12 / 5 / 2015 Page 77 of 84	

Hydrograph Report

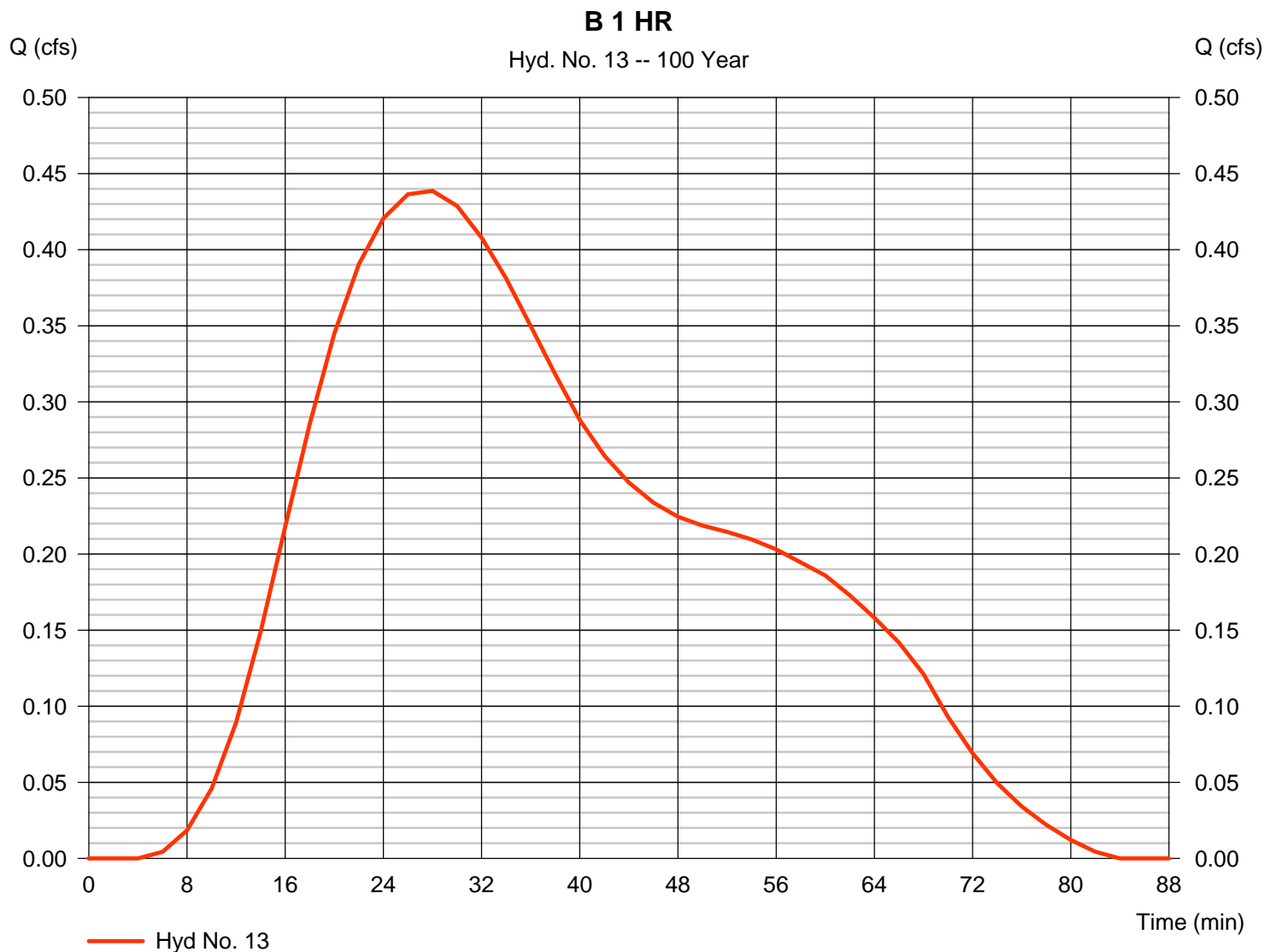
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Saturday, 12 / 5 / 2015

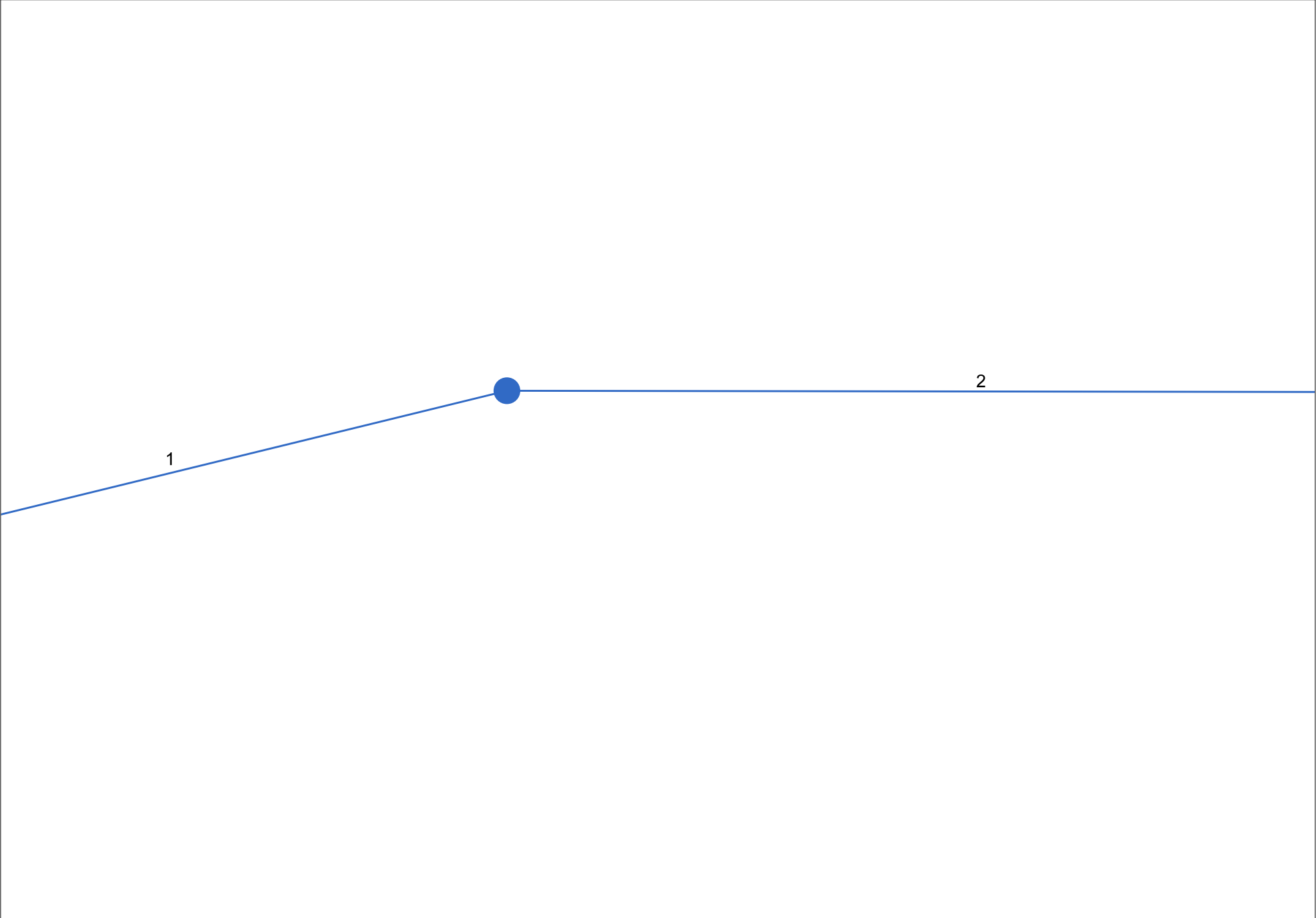
Hyd. No. 13

B 1 HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.439 cfs
Storm frequency	= 100 yrs	Time to peak	= 28 min
Time interval	= 2 min	Hyd. volume	= 971 cuft
Drainage area	= 0.330 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.30 min
Total precip.	= 2.88 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	102 - 103	3.98	15	Cir	112.000	764.50	765.00	0.446	765.32	766.02	0.11	766.13	End	DropGrate
2	103 - 104	2.61	15	Cir	151.000	765.00	765.45	0.298	766.13	766.36	0.12	766.47	1	DropGrate

Project File: Line 102-104.stm

Number of lines: 2

Run Date: 3/3/2016

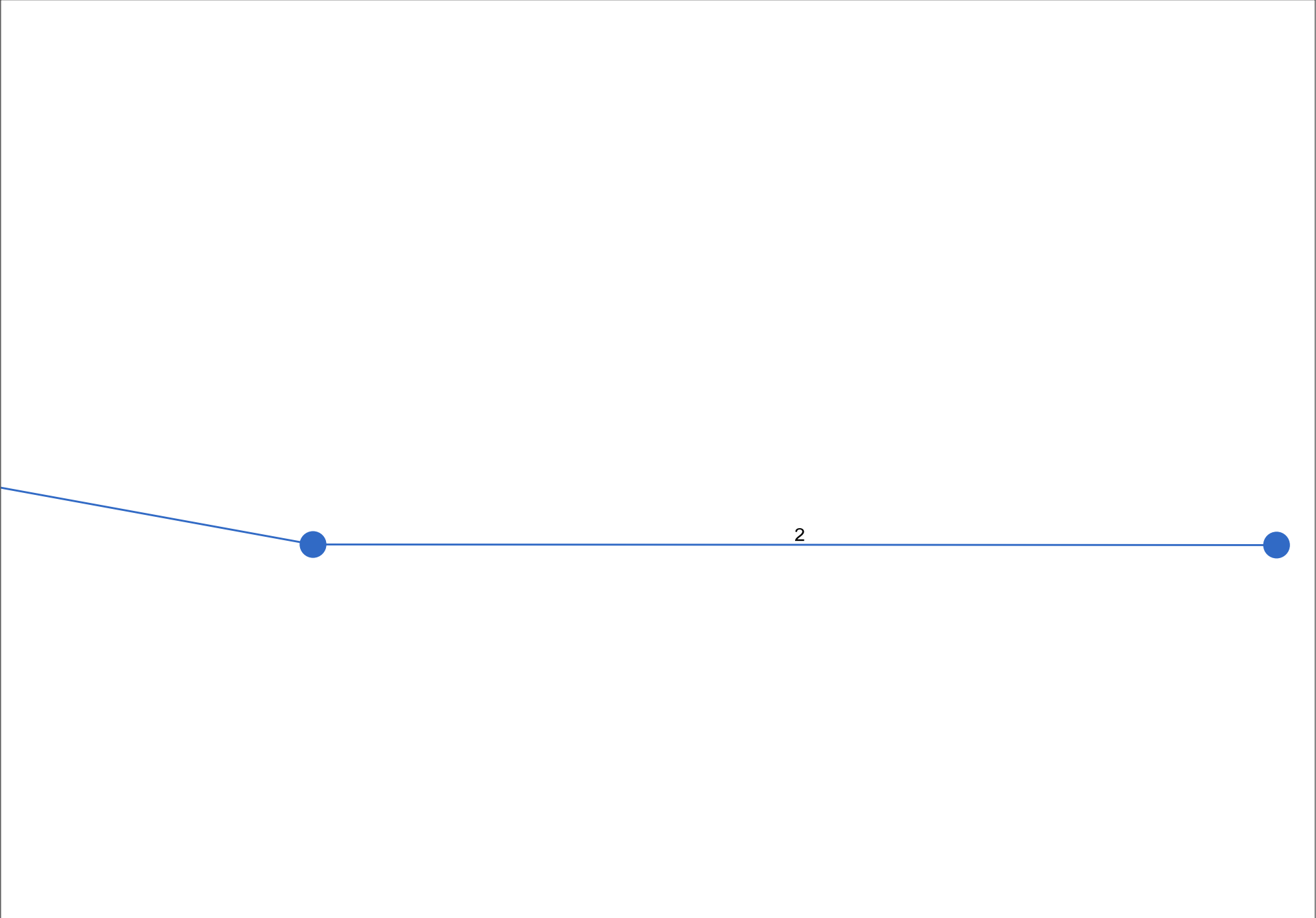
NOTES: Return period = 10 Yrs.

03/03/16

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (I) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID				
Line	To Line		Incr (ac)	Total (ac)		Incr (min)	Total (min)	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)					
1	End	112.000	0.23	0.67	0.85	0.20	0.57	5.0	6.2	6.5	3.98	4.31	4.18	15	0.45	764.50	765.00	765.32	766.02	0.00	767.50	102 - 103				
2	1	151.000	0.44	0.44	0.85	0.37	0.37	5.0	5.0	7.0	2.61	3.53	2.49	15	0.30	765.00	765.45	766.13	766.36	767.50	767.50	103 - 104				

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	105 - 106	3.92	15	Cir	122.000	764.50	765.11	0.500	765.29	766.09	0.11	766.20	End	DropGrate
2	106 - 107	2.55	15	Cir	155.000	765.11	765.58	0.303	766.20	766.44	0.12	766.57	1	DropGrate

Project File: Line 105-107.stm

Number of lines: 2

Run Date: 3/3/2016

NOTES: Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (I) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID				
Line	To Line		Incr (ac)	Total (ac)		Incr (min)	Total (min)	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)					
1	End	122.000	0.23	0.66	0.85	0.20	0.56	5.0	6.2	6.5	3.92	4.57	4.28	15	0.50	764.50	765.11	765.29	766.09	0.00	767.50	105 - 106				
2	1	155.000	0.43	0.43	0.85	0.37	0.37	5.0	5.0	7.0	2.55	3.56	2.53	15	0.30	765.11	765.58	766.20	766.44	767.50	767.50	106 - 107				