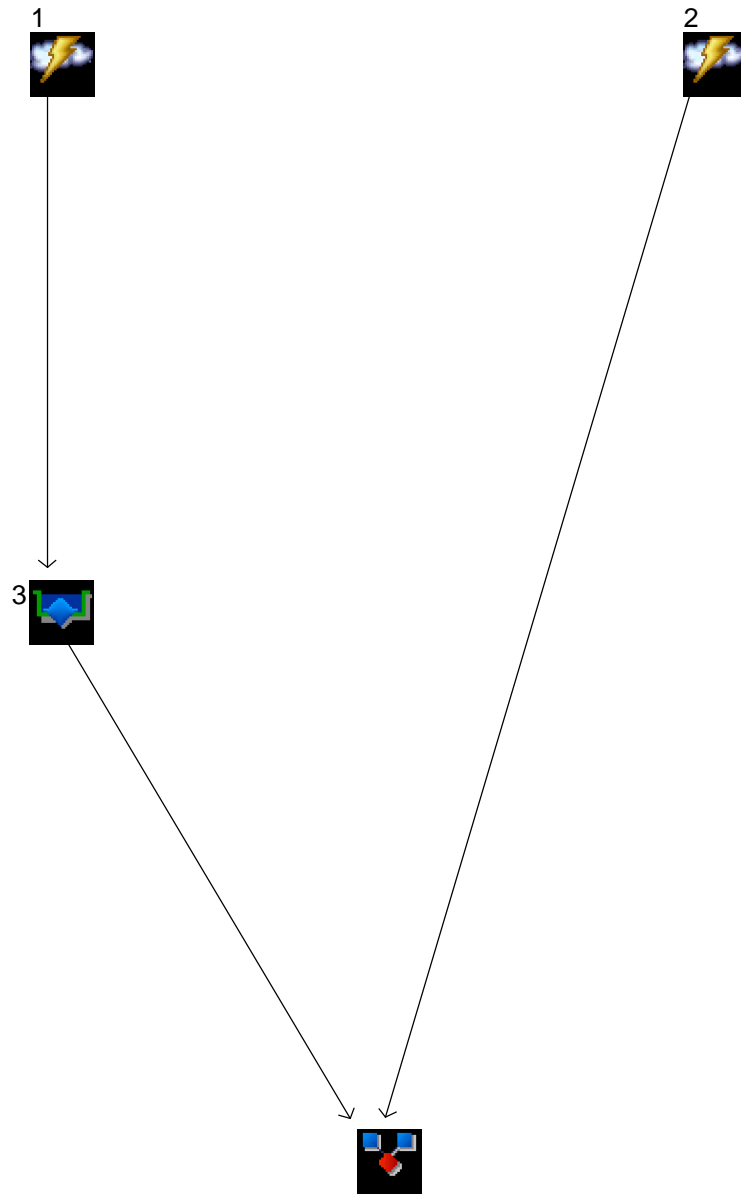


Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066



Legend

<u>Hyd. Origin</u>	<u>Description</u>
1	Rational South Basin (2)
2	Rational South Undeveloped
3	Reservoir South Detention
4	Combine Drainage to Southeast

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	Rational	15.42	1	28	25,902	-----	-----	-----	South Basin (2)
2	Rational	6.606	1	15	5,946	-----	-----	-----	South Undeveloped
3	Reservoir	6.245	1	45	25,891	1	1286.28	16,806	South Detention
4	Combine	7.374	1	15	31,837	2, 3	-----	-----	Drainage to Southeast
Sapulpa South 100.gpw					Return Period: 100 Year			Tuesday, Jul 21, 2009	

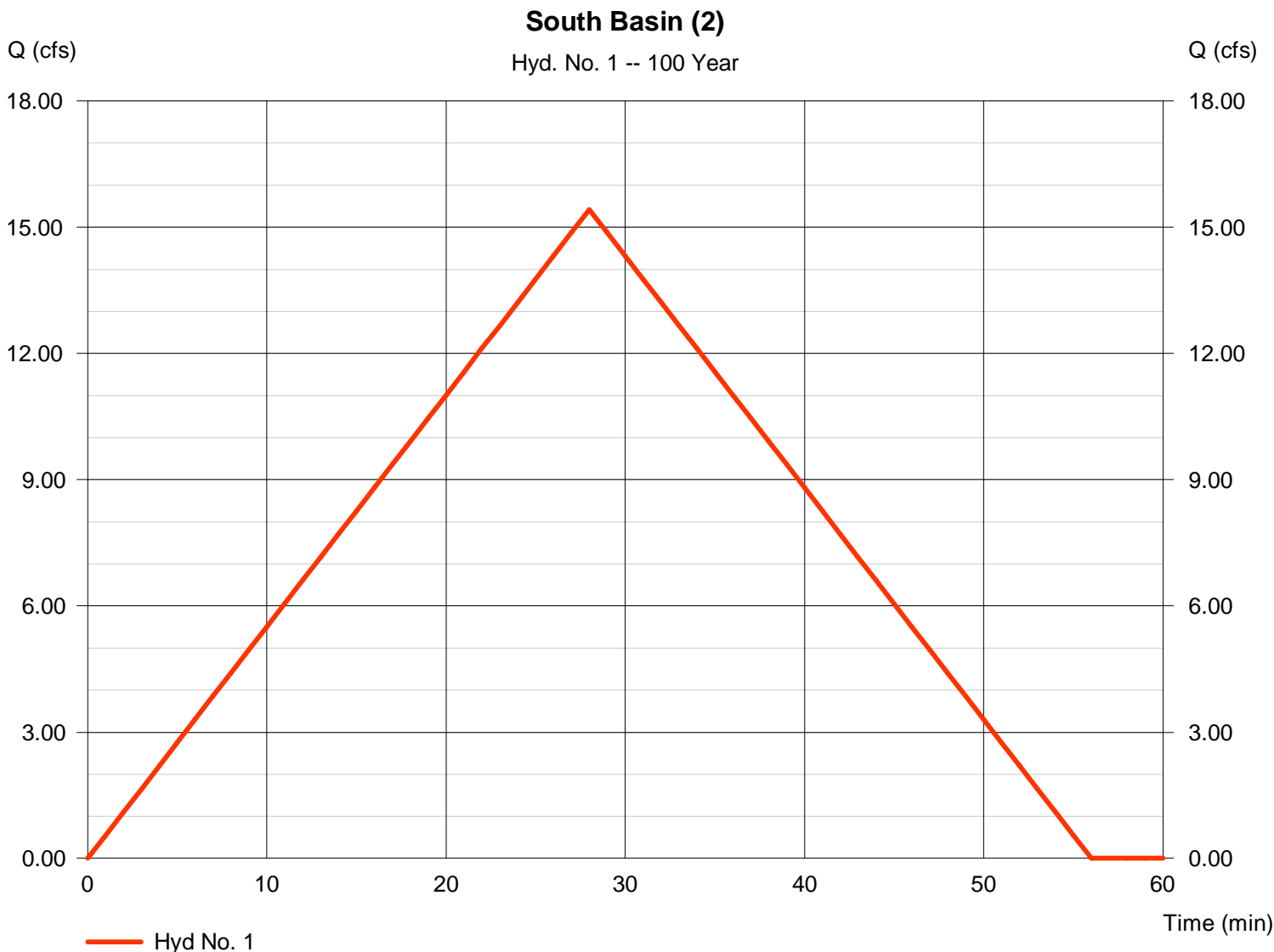
Hydrograph Report

Hyd. No. 1

South Basin (2)

Hydrograph type	= Rational	Peak discharge	= 15.42 cfs
Storm frequency	= 100 yrs	Time to peak	= 28 min
Time interval	= 1 min	Hyd. volume	= 25,902 cuft
Drainage area	= 3.450 ac	Runoff coeff.	= 0.8*
Intensity	= 5.586 in/hr	Tc by TR55	= 28.00 min
IDF Curve	= wichita.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.650 x 0.80) + (2.800 x 0.80)] / 3.450



TR55 Tc Worksheet

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Hyd. No. 1

South Basin (2)

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>	
Sheet Flow								
Manning's n-value	= 0.035		0.011		0.011			
Flow length (ft)	= 100.0		0.0		0.0			
Two-year 24-hr precip. (in)	= 3.50		0.00		0.00			
Land slope (%)	= 0.26		0.00		0.00			
Travel Time (min)	= 6.61	+	0.00	+	0.00	=	6.61	
Shallow Concentrated Flow								
Flow length (ft)	= 1000.00		0.00		0.00			
Watercourse slope (%)	= 0.15		0.00		0.00			
Surface description	= Paved		Paved		Paved			
Average velocity (ft/s)	= 0.79		0.00		0.00			
Travel Time (min)	= 21.17	+	0.00	+	0.00	=	21.17	
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							=	28.00 min

Hydrograph Report

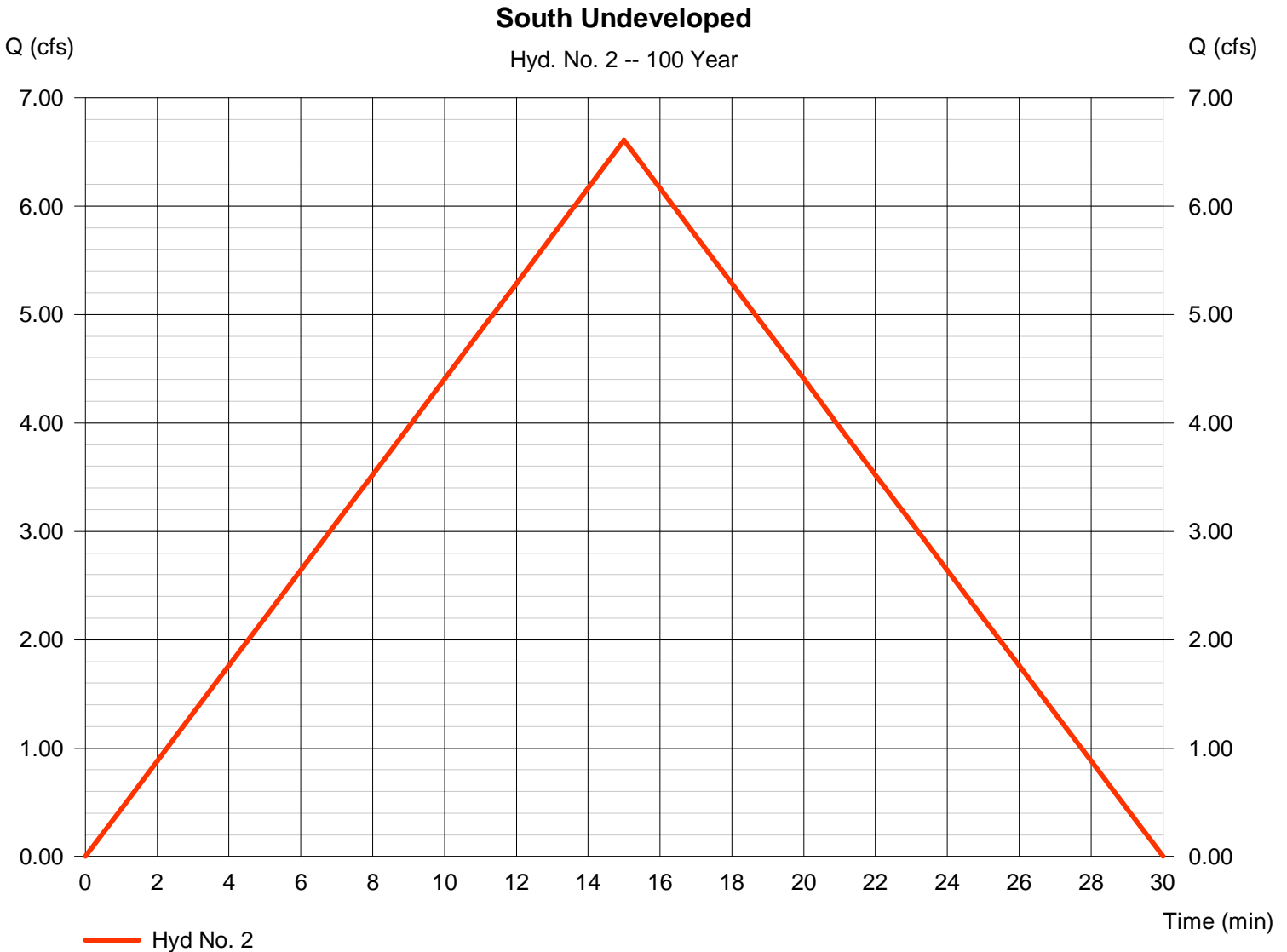
Hyd. No. 2

South Undeveloped

Hydrograph type = Rational
Storm frequency = 100 yrs
Time interval = 1 min
Drainage area = 1.950 ac
Intensity = 7.365 in/hr
IDF Curve = wichita.IDF

Peak discharge = 6.606 cfs
Time to peak = 15 min
Hyd. volume = 5,946 cuft
Runoff coeff. = 0.46*
Tc by User = 15.00 min
Asc/Rec limb fact = 1/1

* Composite (Area/C) = [(1.600 x 0.39) + (0.350 x 0.80)] / 1.950



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

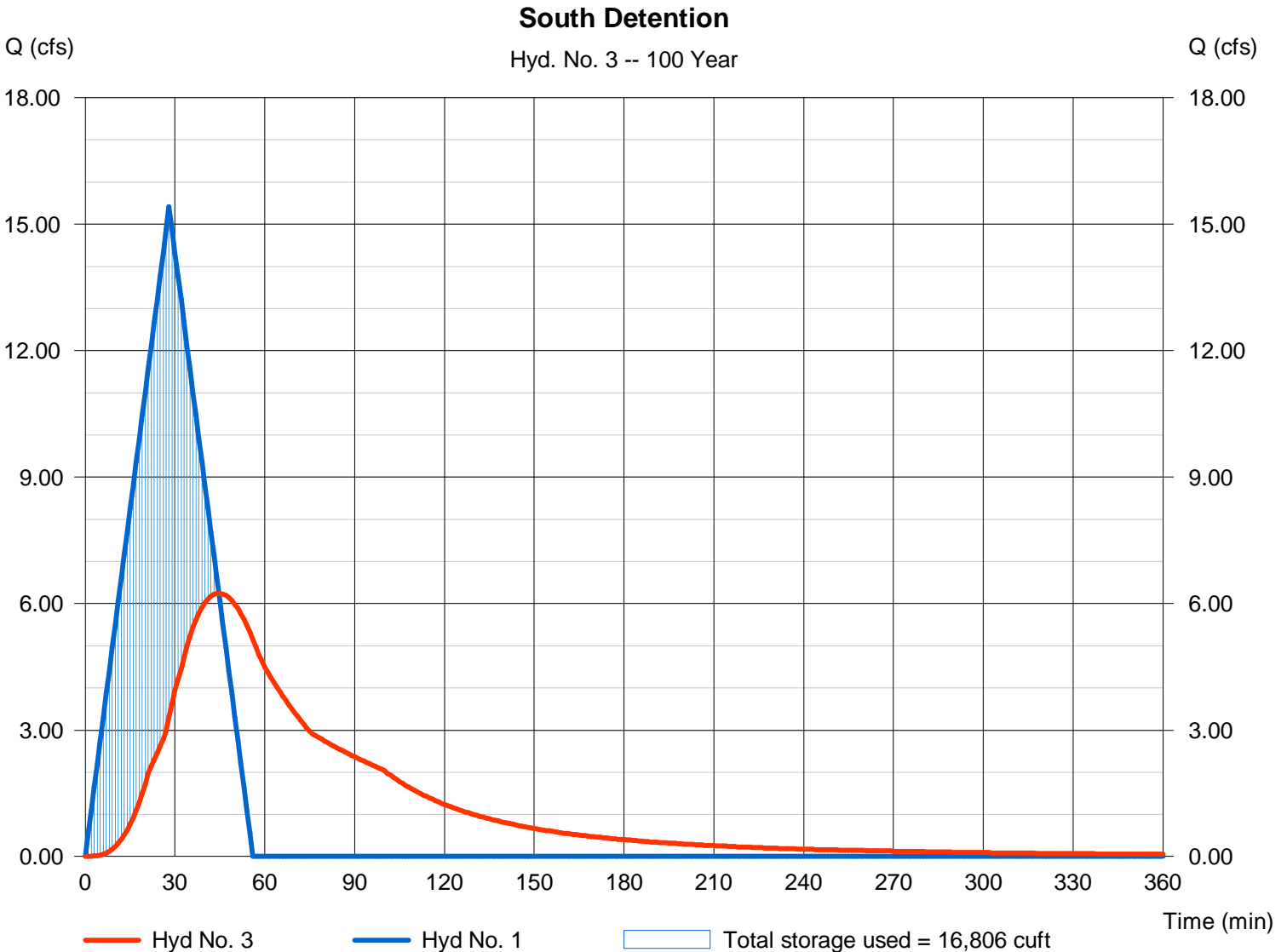
Tuesday, Jul 21, 2009

Hyd. No. 3

South Detention

Hydrograph type	= Reservoir	Peak discharge	= 6.245 cfs
Storm frequency	= 100 yrs	Time to peak	= 45 min
Time interval	= 1 min	Hyd. volume	= 25,891 cuft
Inflow hyd. No.	= 1 - South Basin (2)	Max. Elevation	= 1286.28 ft
Reservoir name	= South Detention Area	Max. Storage	= 16,806 cuft

Storage Indication method used.



Pond No. 1 - South Detention Area

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1285.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1285.50	12,500	0	0
0.50	1286.00	14,900	6,841	6,841
1.50	1287.00	61,650	35,616	42,456
2.50	1288.00	65,000	63,311	105,768

Culvert / Orifice Structures

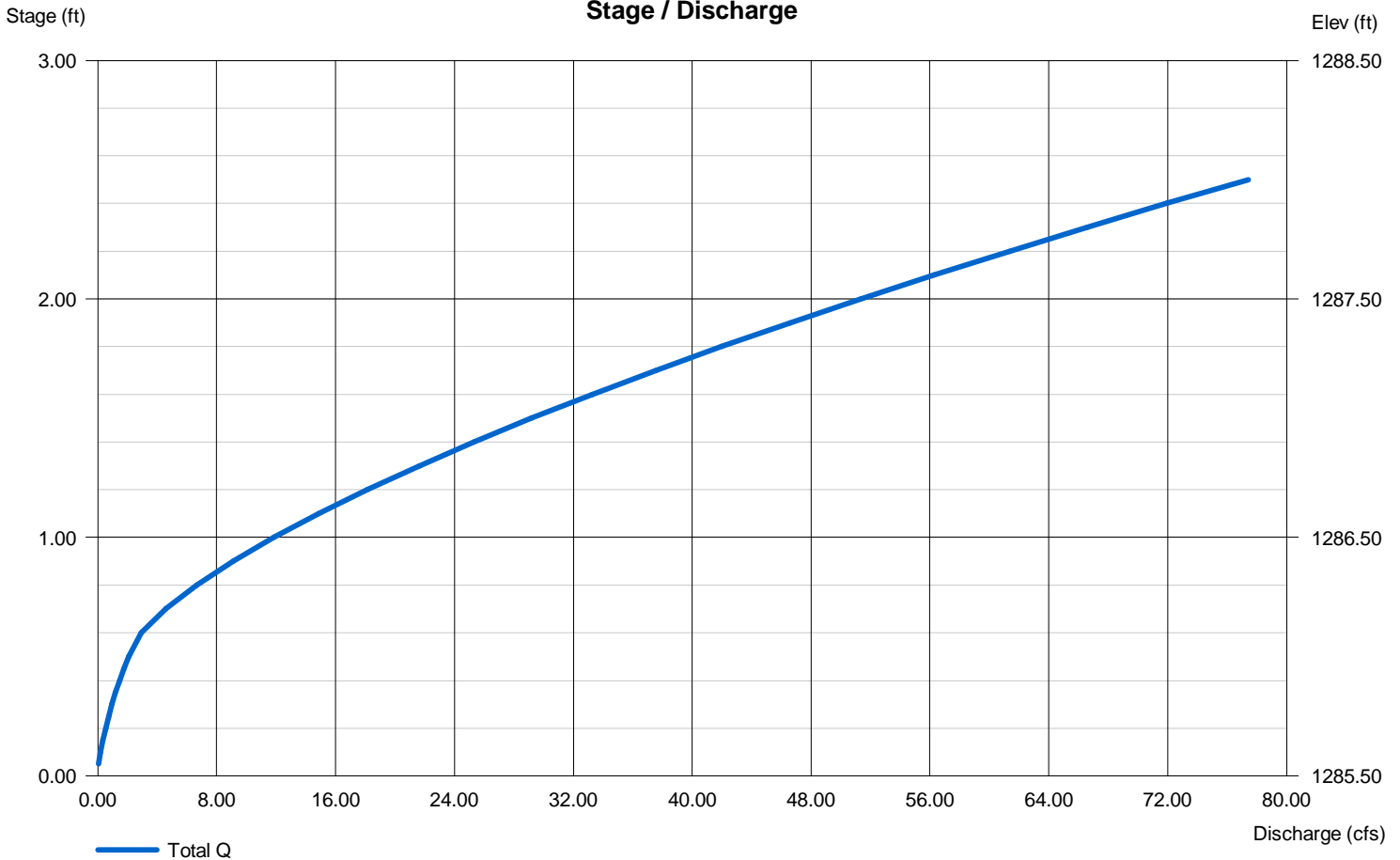
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	Inactive	Inactive	Inactive
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage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

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.75	6.00	Inactive	Inactive
Crest El. (ft)	= 1285.50	1286.05	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

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

Stage / Discharge



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

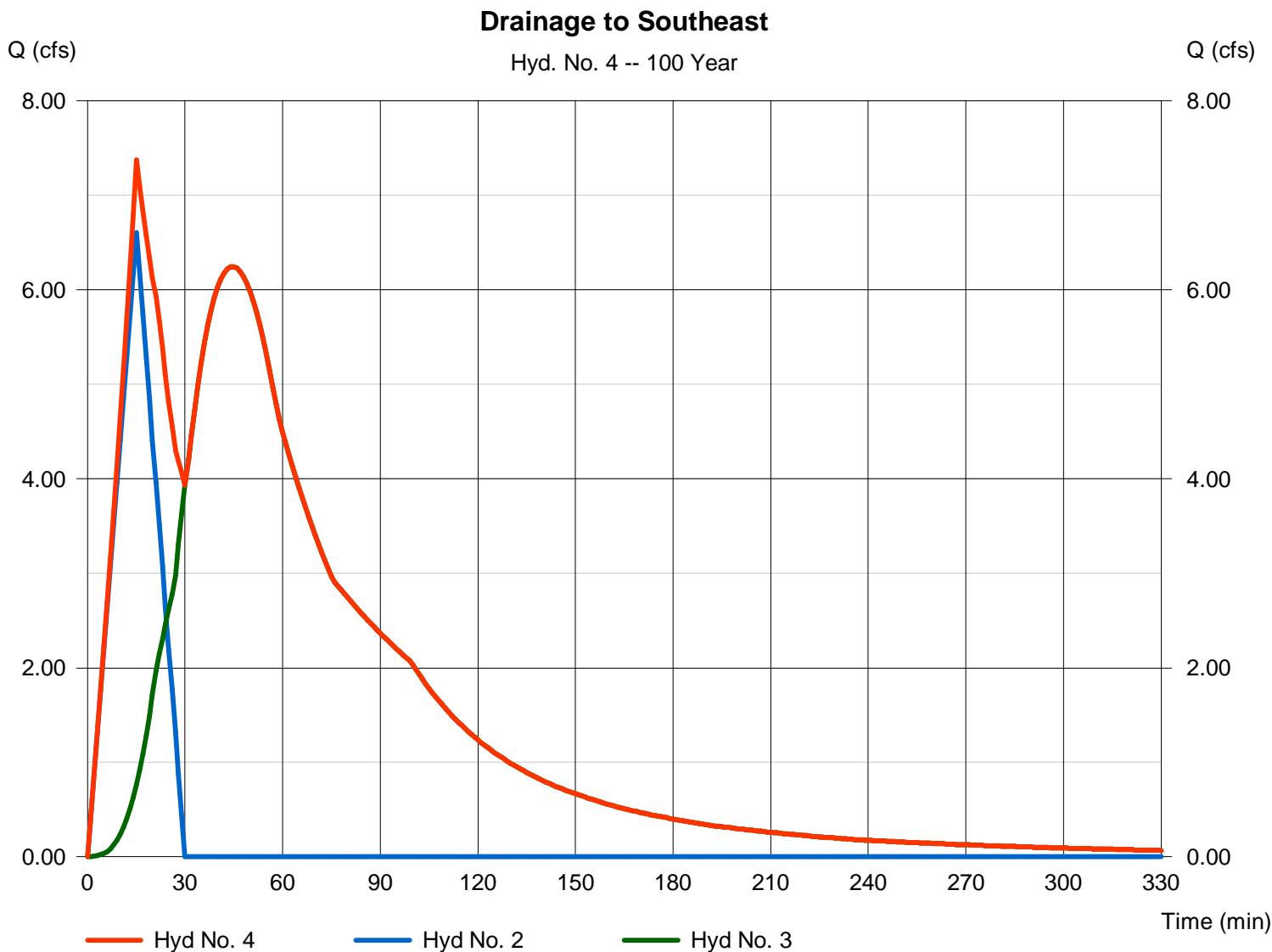
Tuesday, Jul 21, 2009

Hyd. No. 4

Drainage to Southeast

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 1 min
 Inflow hyds. = 2, 3

Peak discharge = 7.374 cfs
 Time to peak = 15 min
 Hyd. volume = 31,837 cuft
 Contrib. drain. area = 1.950 ac



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Tuesday, Jul 21, 2009

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	76.3137	14.3000	0.8844	-----
3	0.0000	0.0000	0.0000	-----
5	52.6224	11.2000	0.7497	-----
10	55.1841	11.1000	0.7229	-----
25	60.7012	11.1000	0.7068	-----
50	66.9222	11.3000	0.7004	-----
100	62.2794	10.1000	0.6624	-----

File name: wichita.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	5.57	4.54	3.85	3.35	2.97	2.67	2.43	2.23	2.06	1.92	1.80	1.69
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	6.52	5.33	4.55	3.99	3.57	3.24	2.97	2.75	2.57	2.41	2.27	2.15
10	7.40	6.09	5.22	4.60	4.13	3.76	3.46	3.21	3.00	2.82	2.67	2.53
25	8.51	7.03	6.05	5.35	4.81	4.39	4.05	3.76	3.52	3.32	3.14	2.98
50	9.47	7.86	6.78	6.00	5.41	4.94	4.56	4.24	3.98	3.75	3.55	3.37
100	10.31	8.53	7.37	6.53	5.90	5.40	5.00	4.66	4.37	4.13	3.92	3.73

Tc = time in minutes. Values may exceed 60.

Precip. file name: wich_24hr.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.50	0.00	4.50	5.30	6.10	6.80	7.90
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10