STORM WATER MANAGEMENT

THE FOUNTAINS OF FAIRFIELD TOWNSHIP

Prepared: 7-18-08

Revised: 8-29-08

Detention Basin As-Built: 8-09-10

Amended for Popeyes Site 6-10-16

Amended to include AAA Storage Water Quality Modifcation to the Existing Lake 7/28/16

SUMMARY OF DATA

Black Font = original calculations

Method of Hydrograph Development: TR-55

Red Font = as-built calculations

Software: Hydraflow

Blue Font = Adjusted calcs for Popeyes

Design Criteria: Reduce the 50-year peak post-developed flow rate to less than or equal to the 10-year peak pre-developed flow rate. 7/28/16:This report was amended to include as-built information for the modification to the lake outlet structure proposed as part of the AAA Storage project. The modification was necessary to provide the required water quality volume for the project. Note the detention basin routing calculations assume the water quality zone of the pond is full of water. Therefore, the routing calculations begin at elevation 704.52. 6/10/16: The intent of this report is to adjust the as-built storm water management report prepared on 8/9/10 to show that the existing storm water system has the capacity to include the proposed development of the Popeyes parcel (located on the corner of Princeton and Gilmore Roads). The Popeyes parcel (approximately 2.1 acres) was removed as part of offsite drainage area #2 and added as part of the on-site drainage areas in both the pre & post-development scenarios. The results of the analysis indicate the existing storm water management system has the capacity to serve the Popeyes development. In addition, the existing water quality basin was designed to accommodate 38.0 acres of tributary area. The actual development area tributary to the basin, including the Popeyes parcel, will be 34.9 acres (see Water Quality Drainage Map). Therefore, the existing water quality basin has sufficient capacity to serve the Popeyes site.

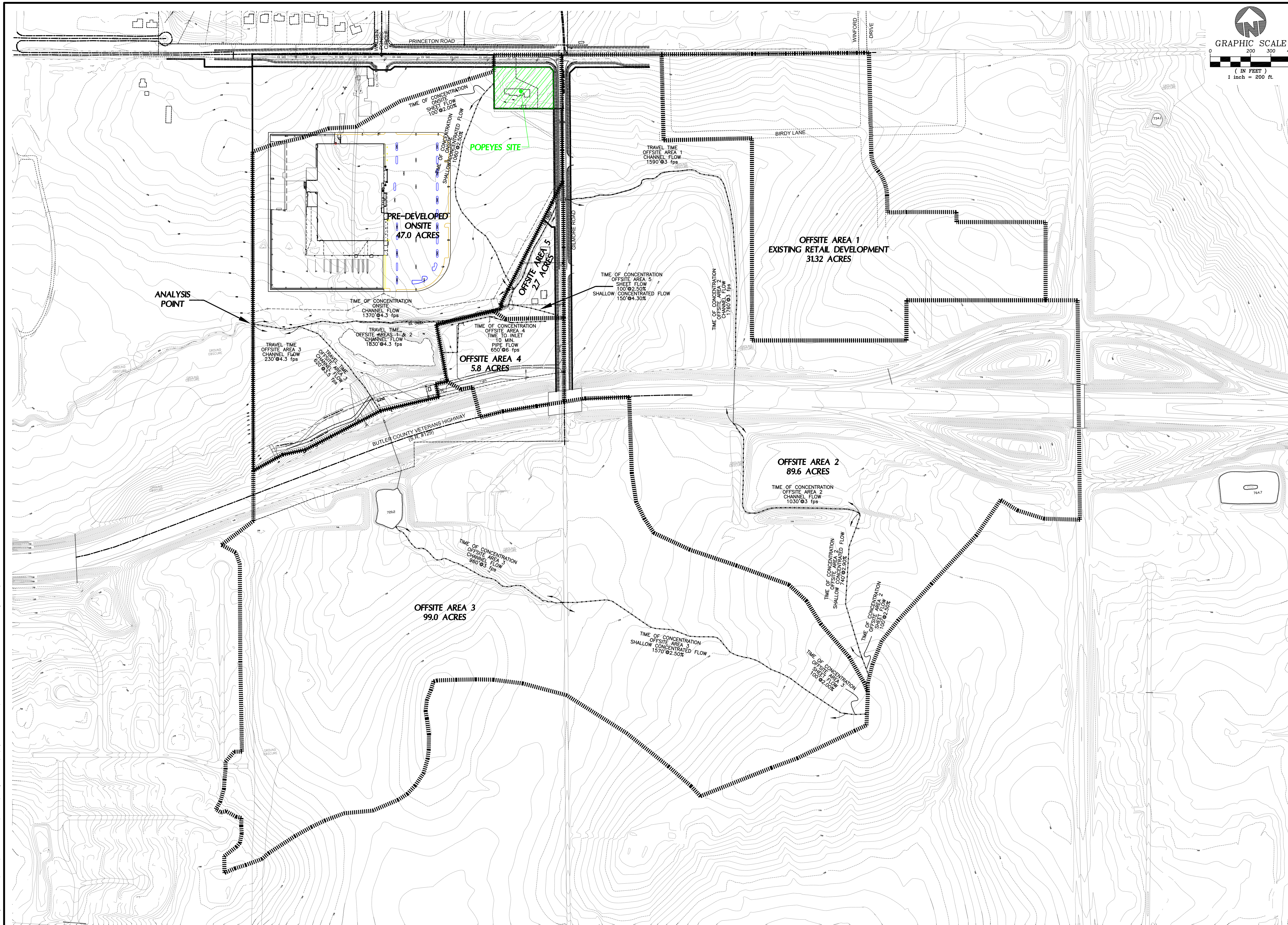
Drainage Area Descriptions	Drainage Area (Acres)	CN	Tc (Hours)
Pre-Developed Onsite Tributary to Analysis Point	47.0 ~~45.0~~	69.4	0.47
Offsite Area 1 Tributary to Analysis Point (Wal-Mart & Lowes Development)	31.32	-	-
Offsite Area 2 Tributary to Analysis Point	89.6 ~~91.7~~	62.3	0.56
Offsite Area 3 Tributary to Analysis Point	99.0	68.2	0.53
Offsite Area 4 Tributary to Analysis Point	5.8	92.6	0.20
Offsite Area 5 Tributary to Analysis Point	2.7	68.0	0.25
Post-developed Onsite Bypassing Detention Basin	50.7 ~~48.6~~	91.6	0.25
Post-developed Onsite Tributary to Detention Basin	4.2	79.5	0.21
Post-developed Onsite Tributary to Water Quality Basin	34.9 ~~38.0~~	93.0	0.25

Detention Basin T/Dike=710.50	Detention Basin Outlet: O.D.O.T. Type 2-4 Catch Basin, with (1) 1.5' Wide Windows @ ~~704.00~~ 704.52 and ~~(4)~~ 4' Wide Windows @ ~~708.80~~ 708.65				
Frequency	Inflow	Outflow (2)		Storage	Elevation
(yr)	(cfs)	(cfs)		(ft^3) (ac-ft)	(ft)
50	190.95	41.32 ~~43.50~~	419,047	~~407,852~~ ~~9.36~~ 9.62	~~708.80~~ 708.87
100	241.35	76.10 ~~119.68~~	511,830	~~463,914~~ ~~10.65~~ 11.75	~~709.40*~~ 709.74

*100 Year Elevation in the detention basin is 709.96. This has been calculated assuming that the outlet structure is completely clogged and all the water is flowing through the emergency spillway.

Release Rates at Analysis Point		
Storm Frequency	Pre-Developed Allowable Release Rate	Post-Developed Release Rate
(yr)	(cfs)	(cfs)
50	360.17 ~~360.54~~	~~339.21~~ ~~350.99~~ 358.00
100		~~406.52~~ ~~423.79~~ 430.93

Water Quality Basin T/Dike=720.5	Water Quality Basin Outlet: O.D.O.T. Type 2-5 Catch Basin with 5" Dia. Orifice @ 714.0 and (4) 5' Wide Windows @ 716.3	
Required Volume	Proposed Volume	Elevation
(cf)	(cf)	(ft)
62,073	63,379	716.30



Item	Revision Description	Date	Drawn:	Chk:
1	REVISED PER BCEO REVIEW COMMENTS	8-25-08	GJK	

THE FOUNTAINS OF FAIRFIELD TOWNSHIP

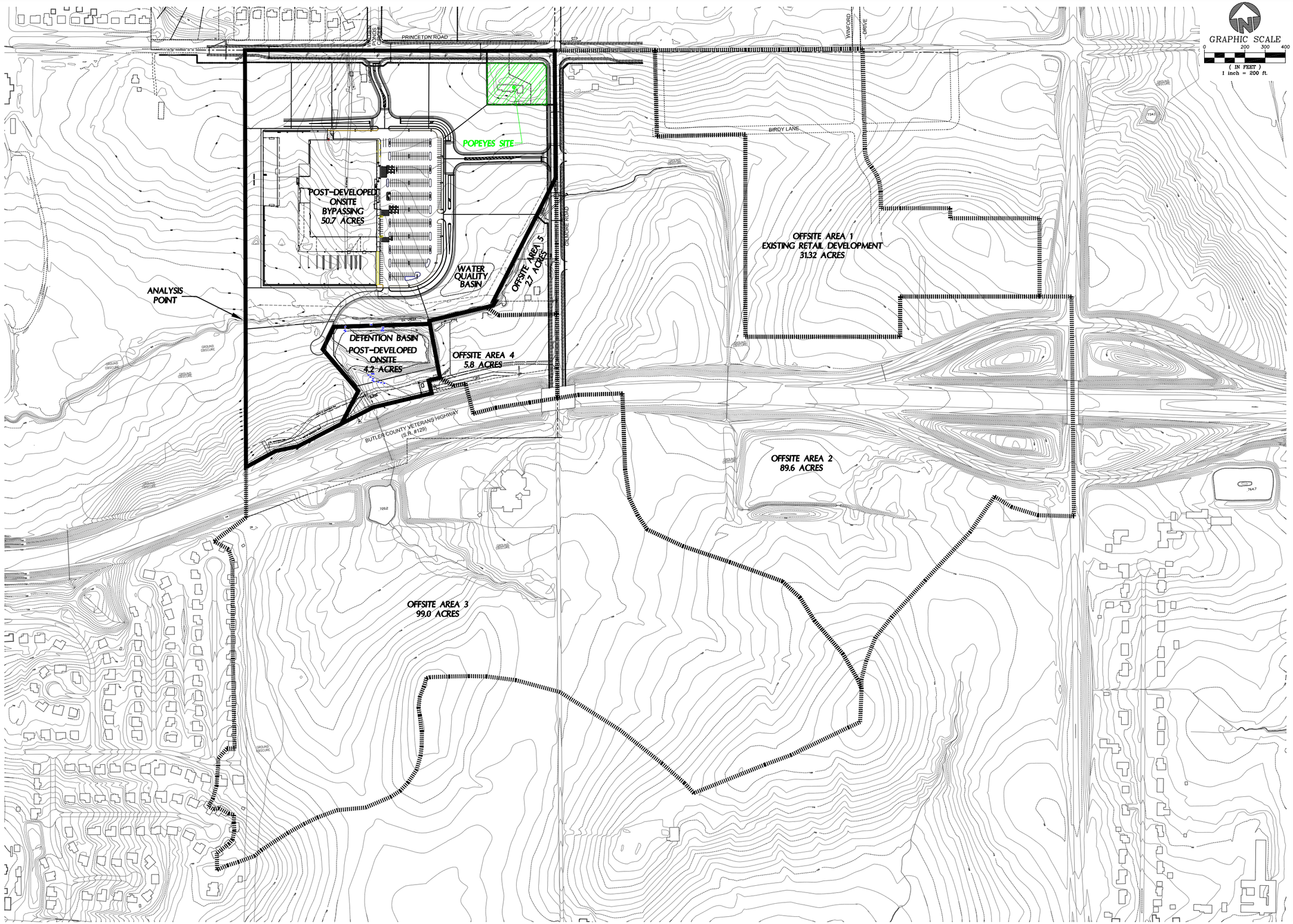
2865 PRINCETON ROAD
SECTION 25, TOWN 2, RANGE 3
FAIRFIELD TOWNSHIP, BUTLER COUNTY OHIO

PRE-DEVELOPED DETENTION MAP

bayer becker
www.bayerbecker.com
6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

Drawing: 07M097-000 GRADING 160610
Drawn by: GJK
Checked By:
Issue Date: 7-18-08
Sheet: 1

Plot time: Jun 10, 2016 – 12:54pm
Drawing name: J:\2007\07M097-000\Admin\Design Calcs\Popeyes Detention\07M097-000 GRADING 160610.dwg – Layout Tab: DRAINAGE MAPS



Item	Revision Description	Date	Drwn	Chk
1	REVISED PER BCEO REVIEW COMMENTS	8-25-08	GJK	

THE FOUNTAINS OF FAIRFIELD TOWNSHIP

2865 PRINCETON ROAD
SECTION 25, TOWN 2, RANGE 3
FAIRFIELD TOWNSHIP, BUTLER COUNTY OHIO

POST-DEVELOPED DETENTION MAP

bayer becker
www.bayerbecker.com
6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

Drawing: 7M097-000 GRADING 160610
Drawn by: GJK
Checked By:
Issue Date: 7-18-08
Sheet: 1

Plot time: Jun 10, 2016 - 12:57pm
Drawing name: J:\2007\07M097-000\Admin\Design Calcs\Popeye's Detention\07M097-000 GRADING 160610.dwg - Layout Tab: DRAINAGE MAPS

GRAPHIC SCALE
0 100 150 200
(IN FEET)
1 inch = 100 ft.

WALDEN PONDS CIRCLE

PRINCETON ROAD

POPEYES SITE

POST-DEVELOPED ONSITE TRIBUTARY TO WQ BASIN 34.9 ACRES

WATER QUALITY BASIN

GILMORE ROAD

EX. CREEK

GROUND OBSCURE

GROUND OBSCURE

GROUND OBSCURE

GROUND OBSCURE

Item	Revision Description	Date	Drwn	Chk
1	REVISED PER R-EO REVIEW COMMENTS	8-25-08	GJK	

THE FOUNTAINS OF FAIRFIELD TOWNSHIP

2865 PRINCETON ROAD
SECTION 25, TOWN 2, RANGE 3
FAIRFIELD TOWNSHIP, BUTLER COUNTY OHIO

WATER QUALITY MAP

bayer becker
www.bayerbecker.com
6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

Drawing: 7M0974-000 GRADING 160610
Drawn by: JSD
Checked By:
Issue Date: 6-10-16
Sheet: 1

Plot time: Jun 10, 2016 – 1:43pm
Drawing name: J:\2007\07M097-000\Admin\Design Calcs\Popeyes Detention\07M097-000 GRADING 160610.dwg – Layout Tab: DRAINAGE MAPS

Project: The Fountains of Fairfield Township

Drainage Area Description:

Pre-Developed Onsite Tributary to Analysis Point

Job #: 07M097.000
Initials: GJK
Date: 7/18/2008
Revised: 8/25/2008
Revised: 6/10/2016
JSD

Drainage Area = 47.0 Acres

Soil Types: 70 % Type B
30 % Type C

On-site area increased by 2.1 acres to account for Popeyes parcel as an on-site area (45.0 + 2.1 ~ 47.0 acres)

Land Use:

Brush (Poor)	94.00 %
Woods (Good)	6.00 %

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Brush (Poor)	**B**	67	70	94.00	44.09
Woods (Good)	**B**	55	70	6.00	2.31
Brush (Poor)	**C**	77	30	94.00	21.71
Woods (Good)	**C**	70	30	6.00	1.26

Composite CN = 69.4

Time of Concentration:

Tc

Sheet Flow:
Length = 100 Slope(ft/ft) = 0.0200 Manning's, n = 0.25 0.260 hr

Shallow Concentrated Flow:
Length = 1060 Slope(ft/ft) = 0.0250 Velocity (fps) = 2.4 0.123 hr

Channel Flow:
Length = 1370 Velocity (fps) = 4.3 0.089 hr

Tc = 0.47 hr
28.3 min

Project: **The Fountains of Fairfield Township**

Drainage Area Description:

Offsite Area 1 Tributary to Analysis Point (Wal-Mart & Lowes Development)

Job #: 07M097.000
Initials: GJK
Date: 7/18/2008
Revised: 8/25/2008

Description	Area (Ac)	CN	Tc (Min)
WM Store/Area Behind Store	10.18	89	10
Lowes Outlots	5.01	94	10
Lowes Parking Lot	6.31	98	10
Area Around Lowes	1.62	98	10
Lowes Store	3.10	98	10
Detention Area	5.10	80	10
Total	31.32		

NOTE: Information used in the routing of the Wal-Mart detention basin, was taken from a detention basin analysis performed by CESO, Inc., dated July 9, 2004. This report was forwarded to us for use in our detention basin analysis by Teresa Barnes, with the Butler County Engineer's Office.

Time of Travel:

Tt

Channel Flow:

Length = 1590 Velocity (fps) = 3 0.147 hr

Length = 1830 Velocity (fps) = 4.3 0.118 hr

Tt = 0.12 hr

7.1 min

Note: Travel time is very small, and therefore, not included in the routing of the detention basin.

Project: The Fountains of Fairfield Township

Drainage Area Description:

Offsite Area 2 Tributary to Analysis Point

Job #: 07M097.000
Initials: GJK
Date: 7/18/2008
Revised: 8/25/2008
Revised: 6/10/2016
JSD

Drainage Area = 89.6 Acres

Offsite area reduced by 2.1 acres to account for Popeyes parcel as an on-site area (91.7-2.1 = 89.6 acres)

Soil Types:
80 % Type B
20 % Type C

Land Use:
Straight Row Crops 20.00 %
Brush (Fair) 80.00 %

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Straight Row Crops	**B**	75	80	20.00	12.00
Brush (Fair)	**B**	56	80	80.00	35.84
Straight Row Crops	**C**	82	20	20.00	3.28
Brush (Fair)	**C**	70	20	80.00	11.20

Composite CN = 62.3

Time of Concentration:

Tc

Sheet Flow:
Length = 100 Slope(ft/ft) = 0.0250 Manning's, n = 0.25 0.238 hr

Shallow Concentrated Flow:
Length = 740 Slope(ft/ft) = 0.0290 Velocity (fps) = 3 0.069 hr

Channel Flow:
Length = 1030 Velocity (fps) = 3 0.095 hr
Length = 1760 Velocity (fps) = 3 0.163 hr

Tc = 0.56 hr
33.9 min

Time of Travel:

Tt

Channel Flow:
Length = 1830 Velocity (fps) = 4.3 0.118 hr

Tt = 0.12 hr
7.1 min

Note: Travel time is very small, and therefore, not included in the routing of the detention basin.

Project: **The Fountains of Fairfield Township**

Drainage Area Description:

Offsite Area 3 Tributary to Analysis Point

Job #: 07M097.000
Initials: GJK
Date: 7/18/2008
Revised: 8/25/2008

Drainage Area = 99.0 Acres

Soil Types:
70 % Type B
30 % Type C

Land Use:

Straight Row Crops	35.00 %
Woods (Good)	45.00
Church (Grass 50- 75%)	20.00 %

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Straight Row Crops	**B**	75	70	35.00	18.38
Woods (Good)	**B**	55	70	45.00	17.33
Church (Grass 50- 75%)	**B**	69	70	20.00	9.66
Straight Row Crops	**C**	82	30	35.00	8.61
Woods (Good)	**C**	70	30	45.00	9.45
Church (Grass 50- 75%)	**C**	79	30	20.00	4.74

Composite CN = 68.2

Time of Concentration:

Tc

Sheet Flow:
Length = 100 Slope(ft/ft) = 0.0200 Manning's, n = 0.25 0.260 hr

Shallow Concentrated Flow:
Length = 1570 Slope(ft/ft) = 0.0250 Velocity (fps) = 2.4 0.182 hr

Channel Flow:
Length = 960 Velocity (fps) = 3 0.089 hr

Tc = 0.53 hr
31.8 min

Time of Travel:

Tt

Channel Flow:
Length = 620 Velocity (fps) = 3.5 0.049 hr
Length = 230 Velocity (fps) = 4.3 0.015 hr

Tt = 0.06 hr
3.8 min

Note: Travel time is very small, and therefore, not included in the routing of the detention basin.

Project: **The Fountains of Fairfield Township**

Drainage Area Description:

Offsite Area 4 Tributary to Analysis Point

Job #: 07M097.000
Initials: GJK
Date: 7/18/2008
Revised: 8/25/2008

Drainage Area = 5.8 Acres

Soil Types:
70 % Type B
30 % Type C

Land Use: Commercial Development 100.00 %

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Commercial Development	**B**	92	70	100.00	64.40
Commercial Development	**C**	94	30	100.00	28.20

Composite CN = 92.6

Time of Concentration:

Tc

Time To Inlet 10 min. 0.167 hr

Pipe Flow
Length = 650 Velocity (fps) = 6 0.030 hr

Tc = 0.20 hr
11.8 min

Time of Travel:

Tt

Channel Flow:
Length = 330 Velocity (fps) = 3.5 0.026 hr

Tt = 0.03 hr
1.6 min

Note: Travel time is very small, and therefore, not included in the routing of the detention basin.

Project: **The Fountains of Fairfield Township**

Drainage Area Description:

Offsite Area 5 Tributary to Analysis Point

Job #: 07M097.000
Initials: GJK
Date: 7/18/2008
Revised: 8/25/2008

Drainage Area = 2.7 Acres

Soil Types:
100 % Type B
0 % Type C

Land Use: Residential (1 Acre Lots) 100.00 %

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Residential (1 Acre Lots)	**B**	68	100	100.00	68.00
Residential (1 Acre Lots)	**C**	79	0	100.00	0.00

Composite CN = 68.0

Time of Concentration:

Tc

Sheet Flow:
Length = 100 Slope(ft/ft) = 0.0250 Manning's, n = 0.25 0.238 hr

Shallow Concentrated Flow:
Length = 150 Slope(ft/ft) = 0.0350 Velocity (fps) = 4.7 0.009 hr

Channel Flow:
Length = Velocity (fps) = 0.000 hr

Tc = 0.25 hr
14.8 min

Time of Travel:

Tt

Channel Flow:
Length = 1290 Velocity (fps) = 4.3 0.083 hr

Tt = 0.08 hr
5.0 min

Note: Travel time is very small, and therefore, not included in the routing of the detention basin.

Project: The Fountains of Fairfield Township

Drainage Area Description:

Post-developed Onsite Bypassing Detention Basin

Job #: 07M097.000
Initials: GJK
Date: 7/18/2008
Revised: 8/25/2008
: 6/10/2016
JSD

Drainage Area = 50.7 Acres

On-site area increased by 2.1 acres to account for Popeyes parcel as an on-site area (48.6 + 2.1 = 50.7 acres)

Soil Types:

70 % Type B
30 % Type C

Land Use:

Retail (Impervious)	80.00 %	Total Retail: 41.3 Ac (85% Impervious)
Retail (Open Space)	14.00 %	
Woods	6.00 %	

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Retail (Impervious)	**B**	98	70	80.00	54.88
Retail (Open Space)	**B**	61	70	14.00	5.98
Woods	**B**	65	70	6.00	2.73
Retail (Impervious)	**C**	98	30	80.00	23.52
Retail (Open Space)	**C**	74	30	14.00	3.11
Woods	**C**	76	30	6.00	1.37

Composite CN = 91.6

Time of Concentration:

			Tc
Time to Inlet			0.167 hr
Pipe Flow			
Length = 1570	Velocity (fps) = 5.5		0.079 hr
		Tc =	**0.25 hr**
			14.8 min

Project: **The Fountains of Fairfield Township**

Drainage Area Description:

Post-developed Onsite Tributary to Detention Basin

Job #: 07M097.000
Initials: GJK
Date: 7/18/2008
Revised: 8/25/2008

Drainage Area = 4.2 Acres

Soil Types:
100 % Type B
0 % Type C

Land Use:

Lake	50.00 %
Open Space	50.00 %

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Lake	**B**	98	100	50.00	49.00
Open Space	**B**	61	100	50.00	30.50
Lake	**C**	98	0	50.00	0.00
Open Space	**C**	74	0	50.00	0.00

Composite CN = 79.5

Time of Concentration:

Tc

Sheet Flow:
Length = 100 Slope(ft/ft) = 0.0400 Manning's, n = 0.25 0.197 hr

Shallow Concentrated Flow:
Length = 200 Slope(ft/ft) = 0.0500 Velocity (fps) = 6.1 0.009 hr

Channel Flow:
Length = 200 Velocity (fps) = 3.5 0.016 hr

Tc = 0.21 hr
12.4 min

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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	57.70	2	720	155,443	------	------	------	WM Store/ Area Behind Loes
2	SCS Runoff	30.78	2	720	86,720	------	------	------	Lowes Outlots
3	SCS Runoff	40.20	2	720	120,059	------	------	------	Lowes Parking Lot
4	SCS Runoff	10.32	2	720	30,823	------	------	------	Area Around Lowes
5	SCS Runoff	19.75	2	720	58,983	------	------	------	Lowes Store
6	SCS Runoff	23.31	2	720	60,593	------	------	------	Detention Area
7	Combine	182.06	2	720	512,621	1, 2, 3, 4, 5, 6	------	------	Walmart Inflow to Basin = Area 1 (31.
8	Reservoir	17.30	2	754	512,472	7	744.09	256,711	WM Detention Outflow
9	SCS Runoff	108.90	2	736	534,486	------	------	------	Offsite Area 2
10	SCS Runoff	173.84	2	734	773,931	------	------	------	Offsite Area 3
11	SCS Runoff	34.95	2	720	97,013	------	------	------	Offsite Area 4
12	SCS Runoff	7.063	2	722	20,169	------	------	------	Offsite Area 5
13	Manual	51.31	2	732	219,250	------	------	------	Onsite 10-Year Allowable
14	Combine	360.17	2	734	2,157,316	8, 9, 10, 11, 12, 13	------	------	Allowable

Hydrographs 1 - 6 represent Area 1 = 31.32 acres.

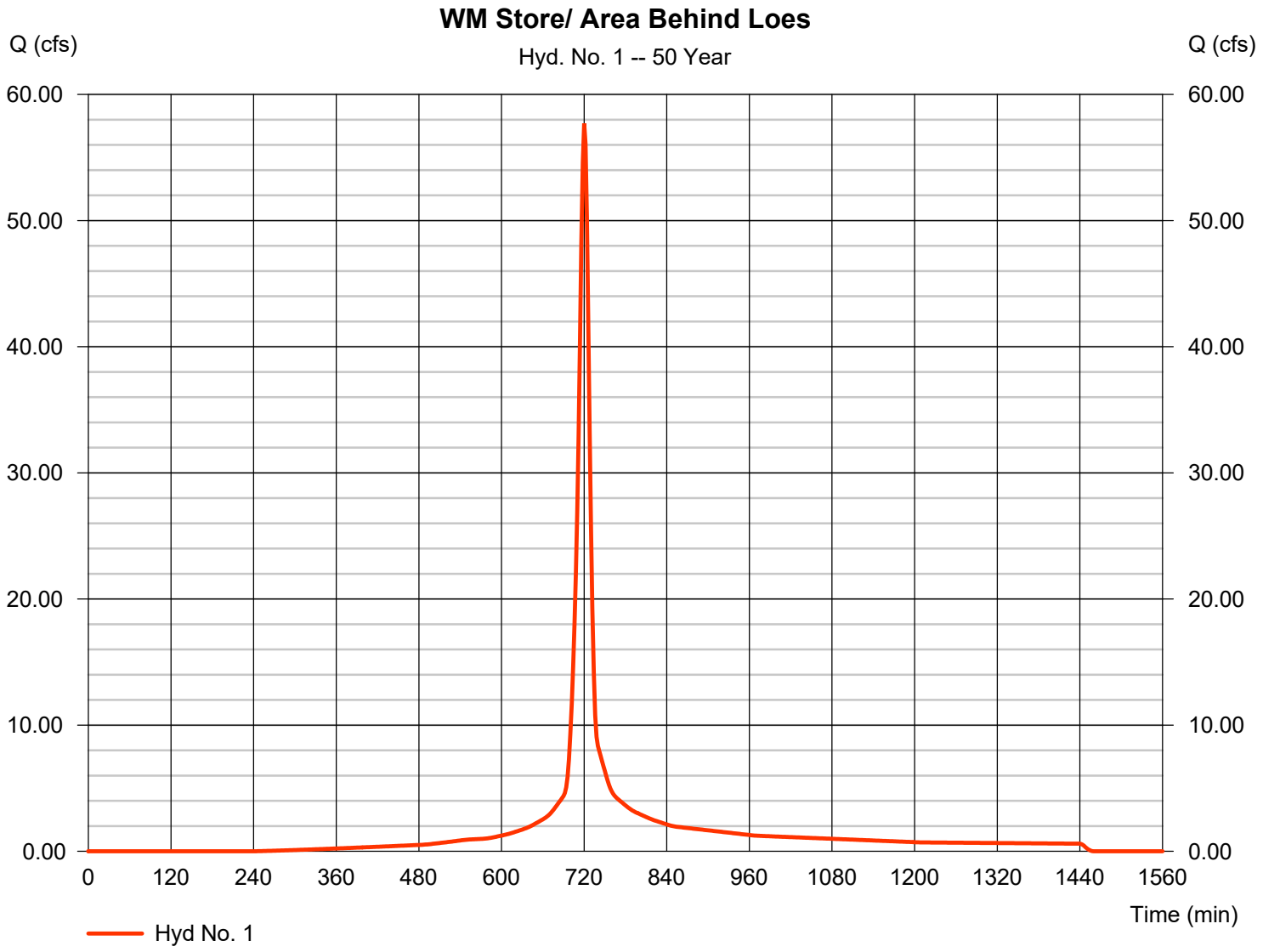
50 Year Allowable Release Rate

Hydrograph Report

Hyd. No. 1

WM Store/ Area Behind Loes

Hydrograph type	= SCS Runoff	Peak discharge	= 57.70 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 155,443 cuft
Drainage area	= 10.180 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

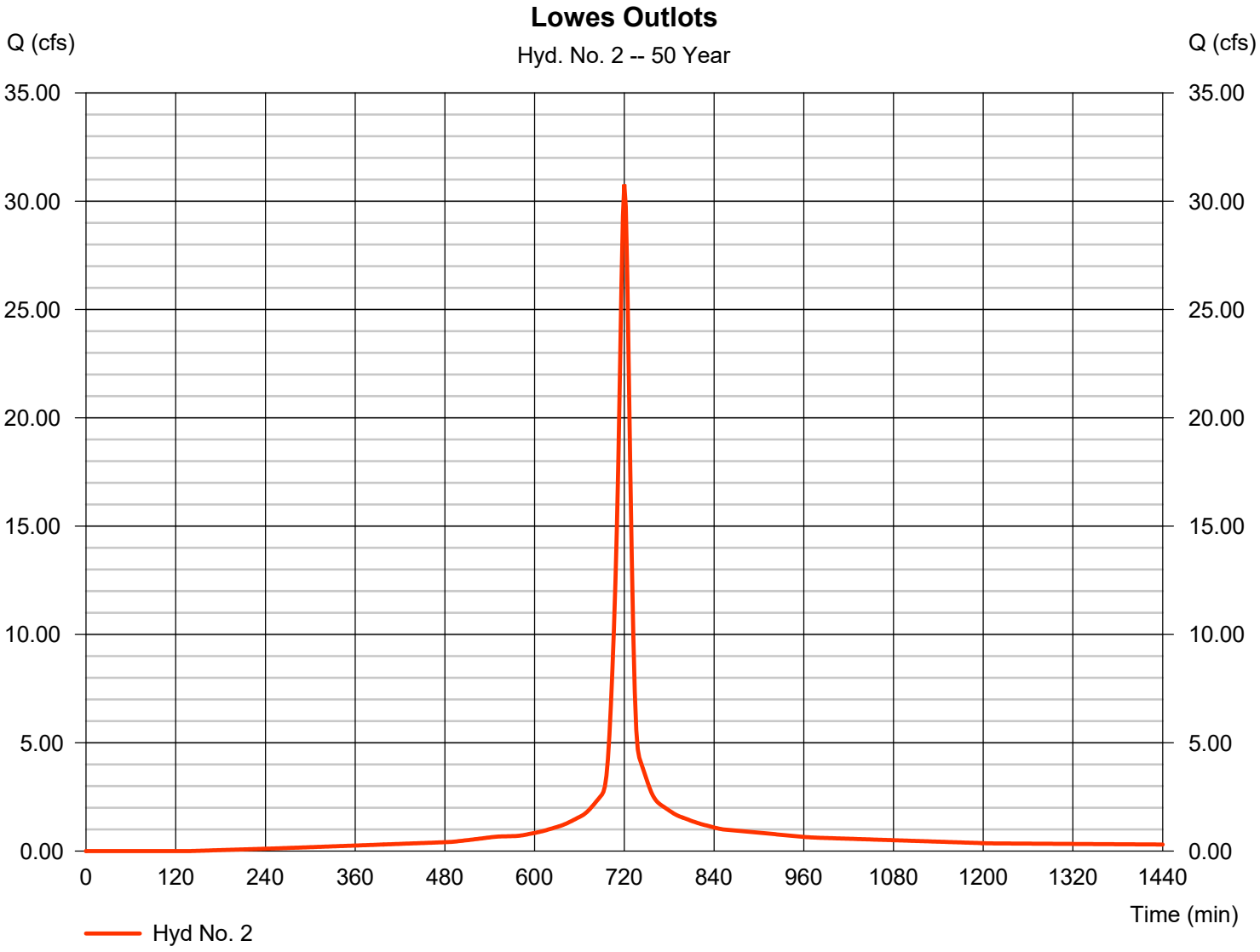


Hydrograph Report

Hyd. No. 2

Lowes Outlots

Hydrograph type	= SCS Runoff	Peak discharge	= 30.78 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 86,720 cuft
Drainage area	= 5.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

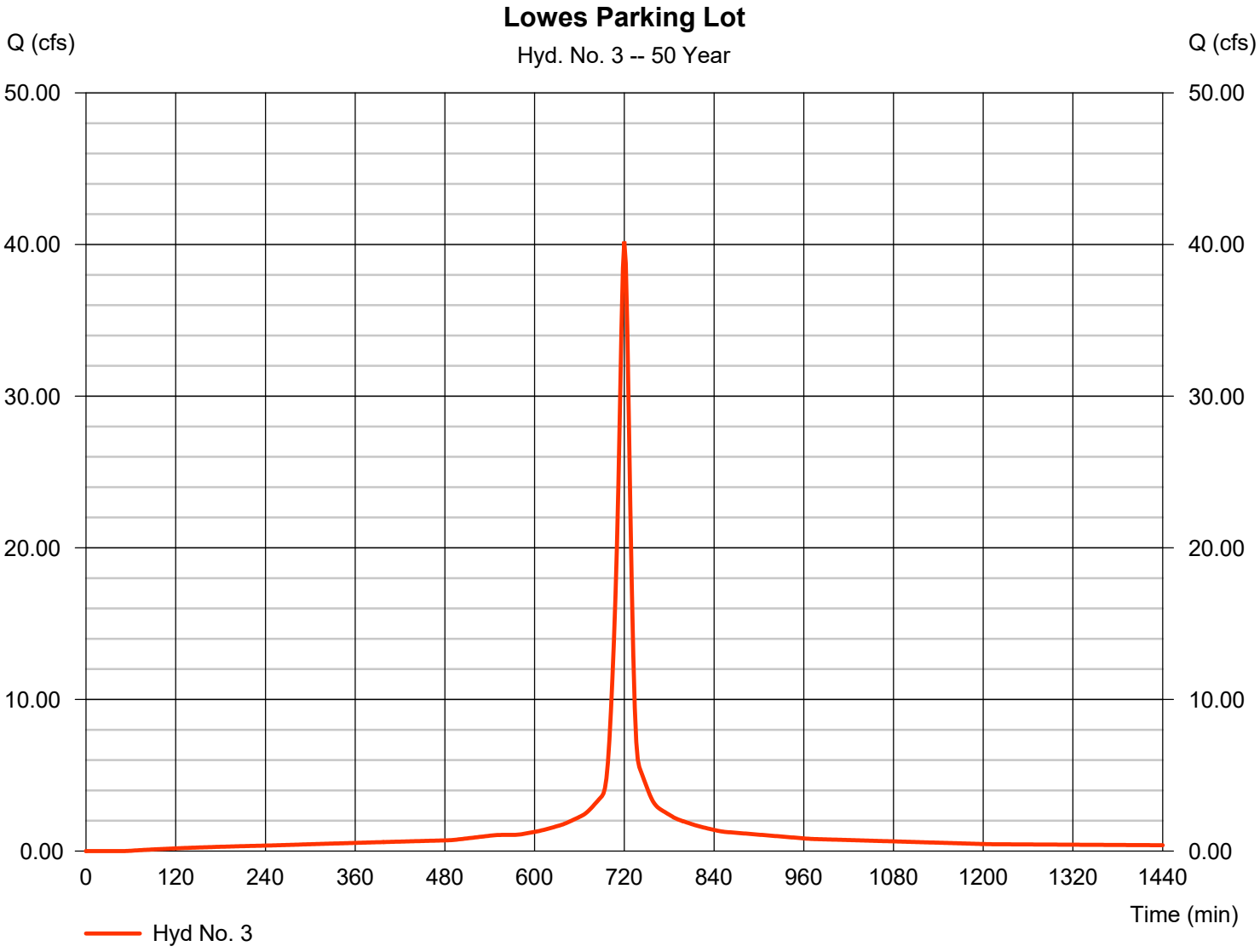


Hydrograph Report

Hyd. No. 3

Lowes Parking Lot

Hydrograph type	= SCS Runoff	Peak discharge	= 40.20 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 120,059 cuft
Drainage area	= 6.310 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

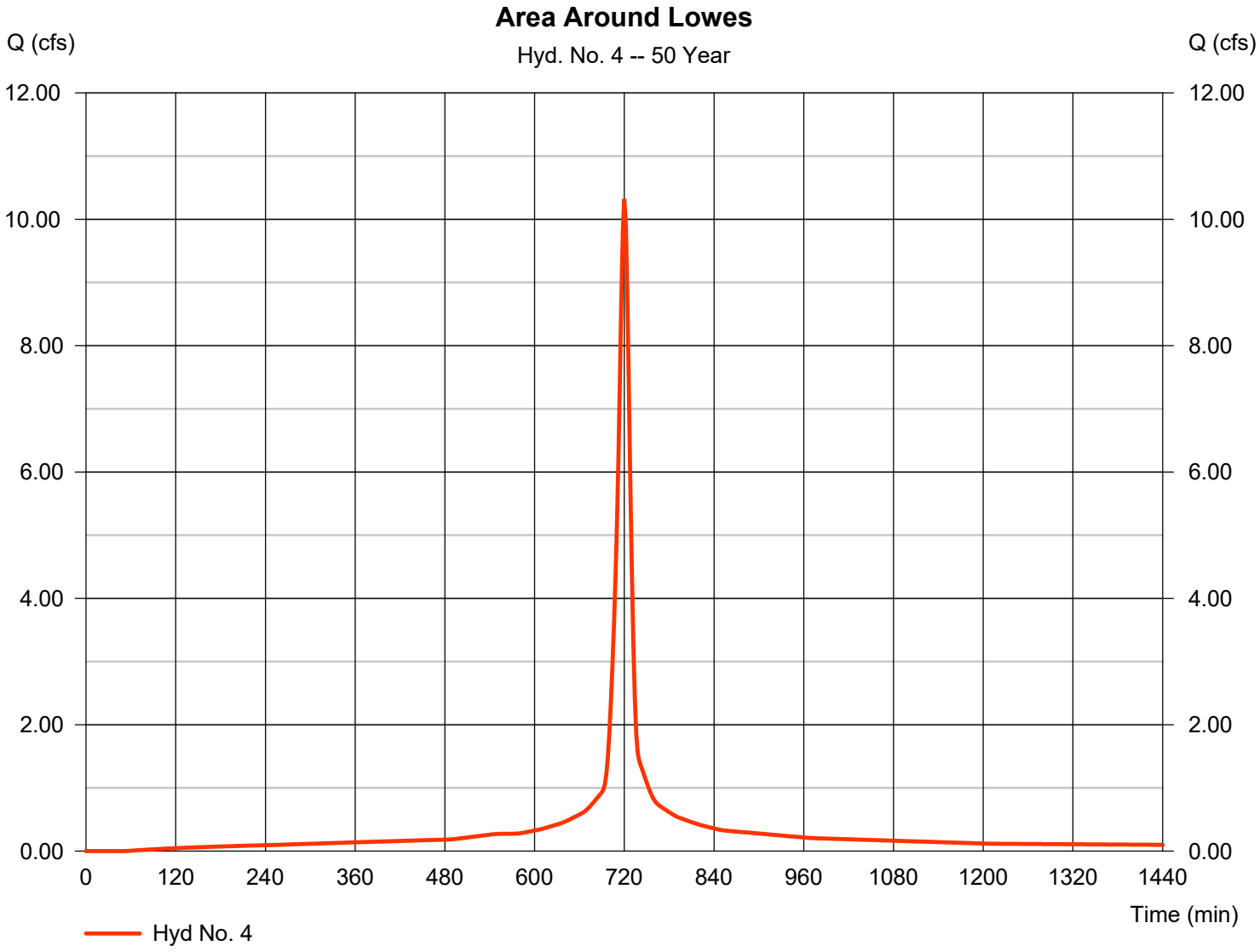


Hydrograph Report

Hyd. No. 4

Area Around Lowes

Hydrograph type	= SCS Runoff	Peak discharge	= 10.32 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 30,823 cuft
Drainage area	= 1.620 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

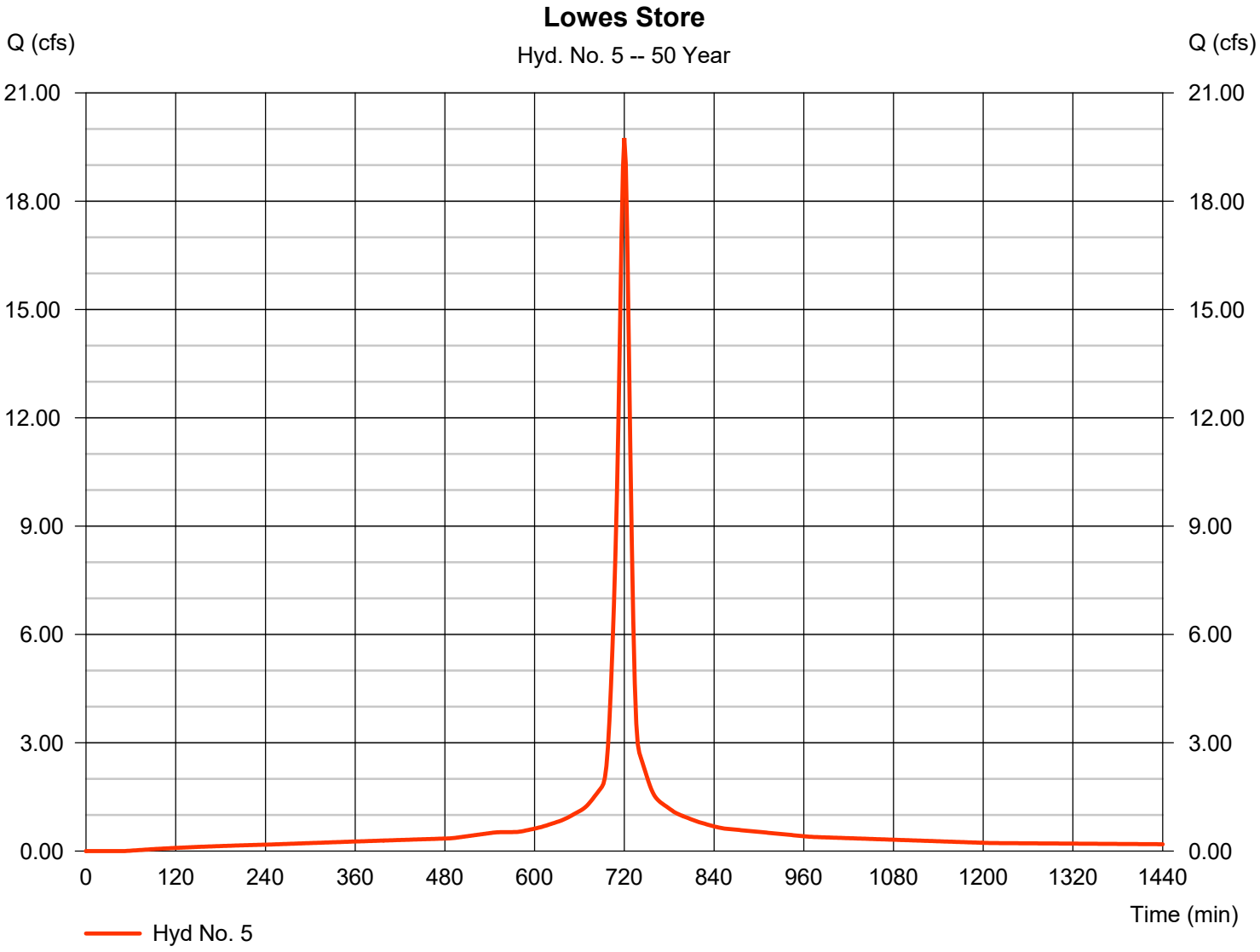


Hydrograph Report

Hyd. No. 5

Lowes Store

Hydrograph type	= SCS Runoff	Peak discharge	= 19.75 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 58,983 cuft
Drainage area	= 3.100 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

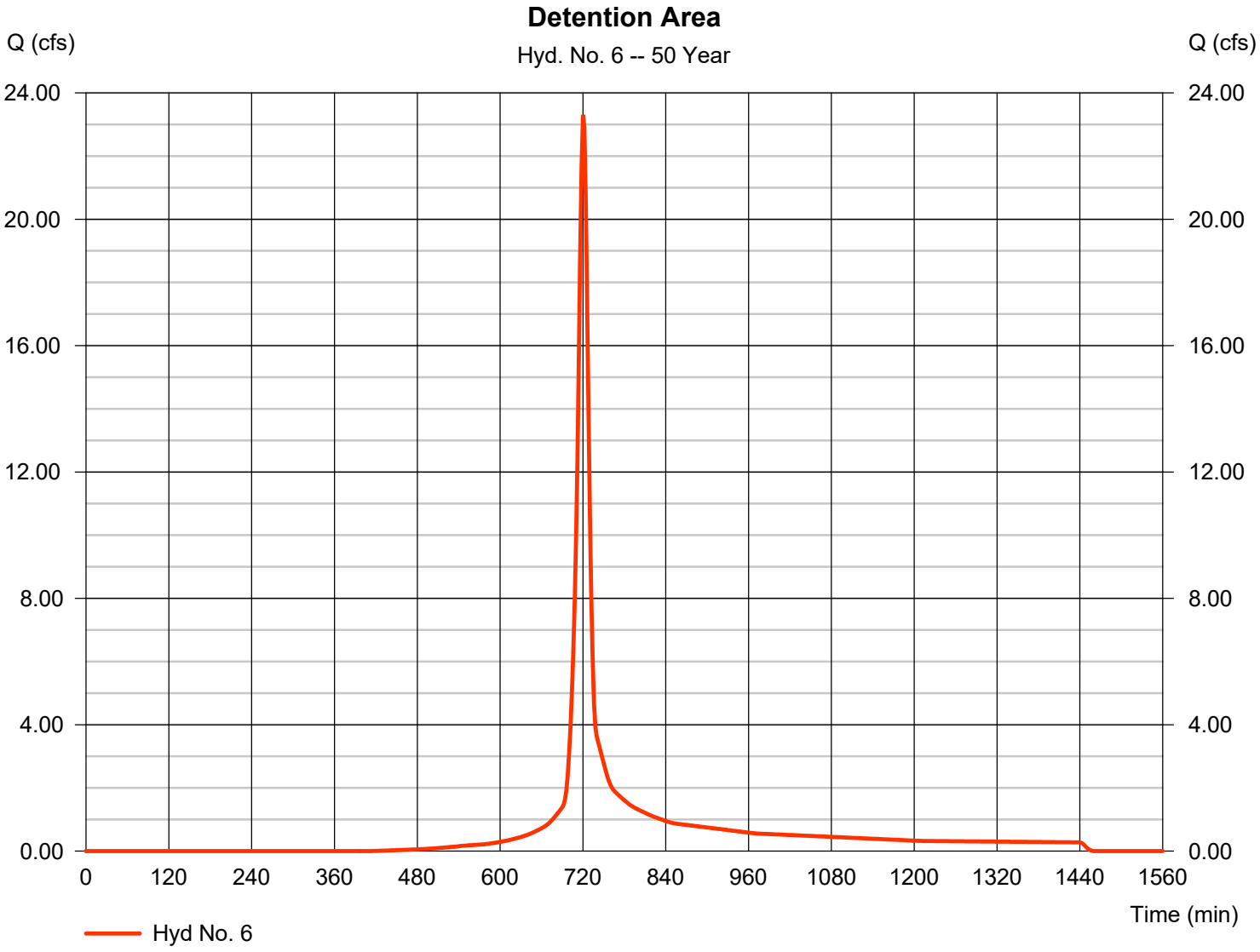


Hydrograph Report

Hyd. No. 6

Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 23.31 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 60,593 cuft
Drainage area	= 5.100 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

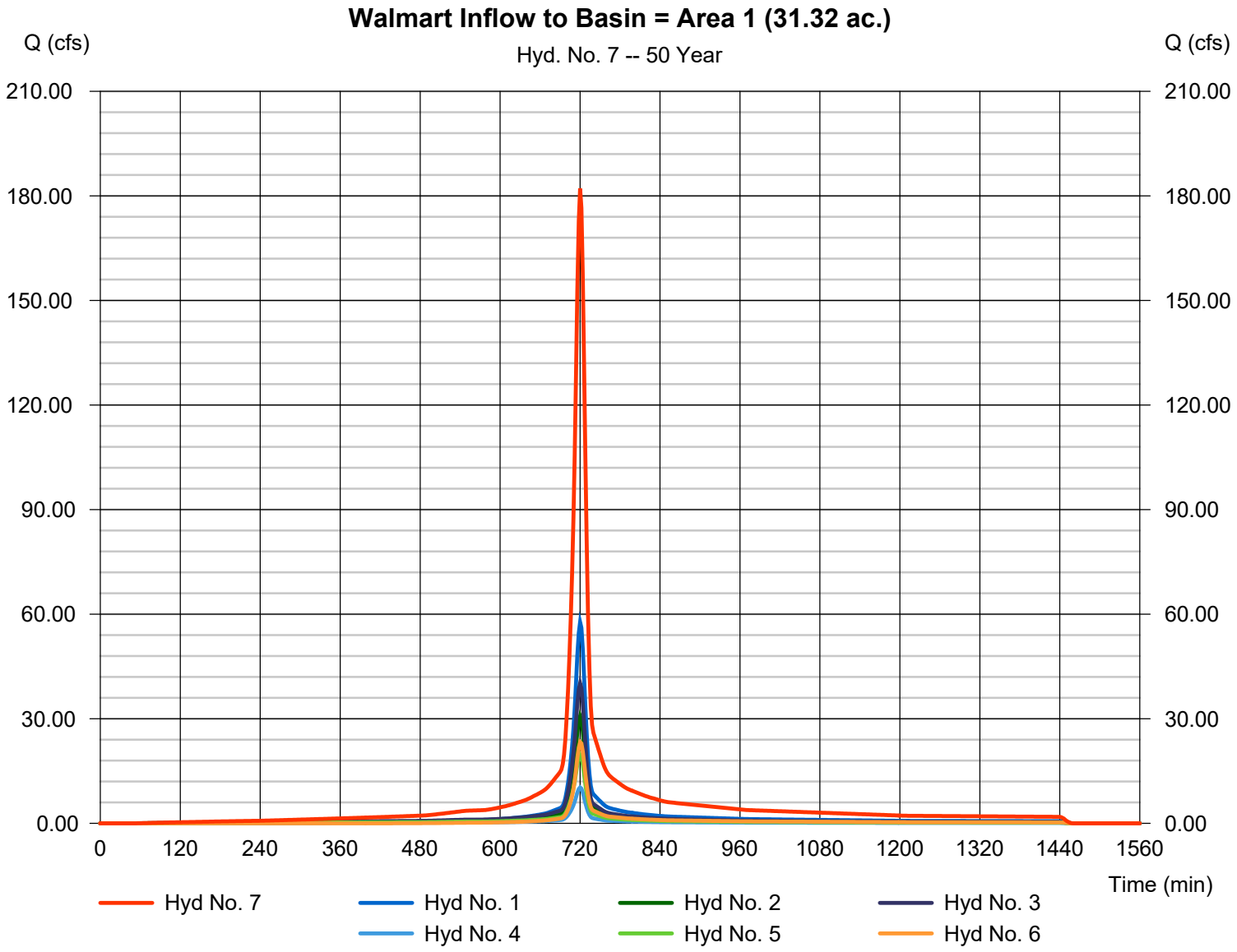


Hydrograph Report

Hyd. No. 7

Walmart Inflow to Basin = Area 1 (31.32 ac.)

Hydrograph type	= Combine	Peak discharge	= 182.06 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 512,621 cuft
Inflow hyds.	= 1, 2, 3, 4, 5, 6	Contrib. drain. area	= 31.320 ac



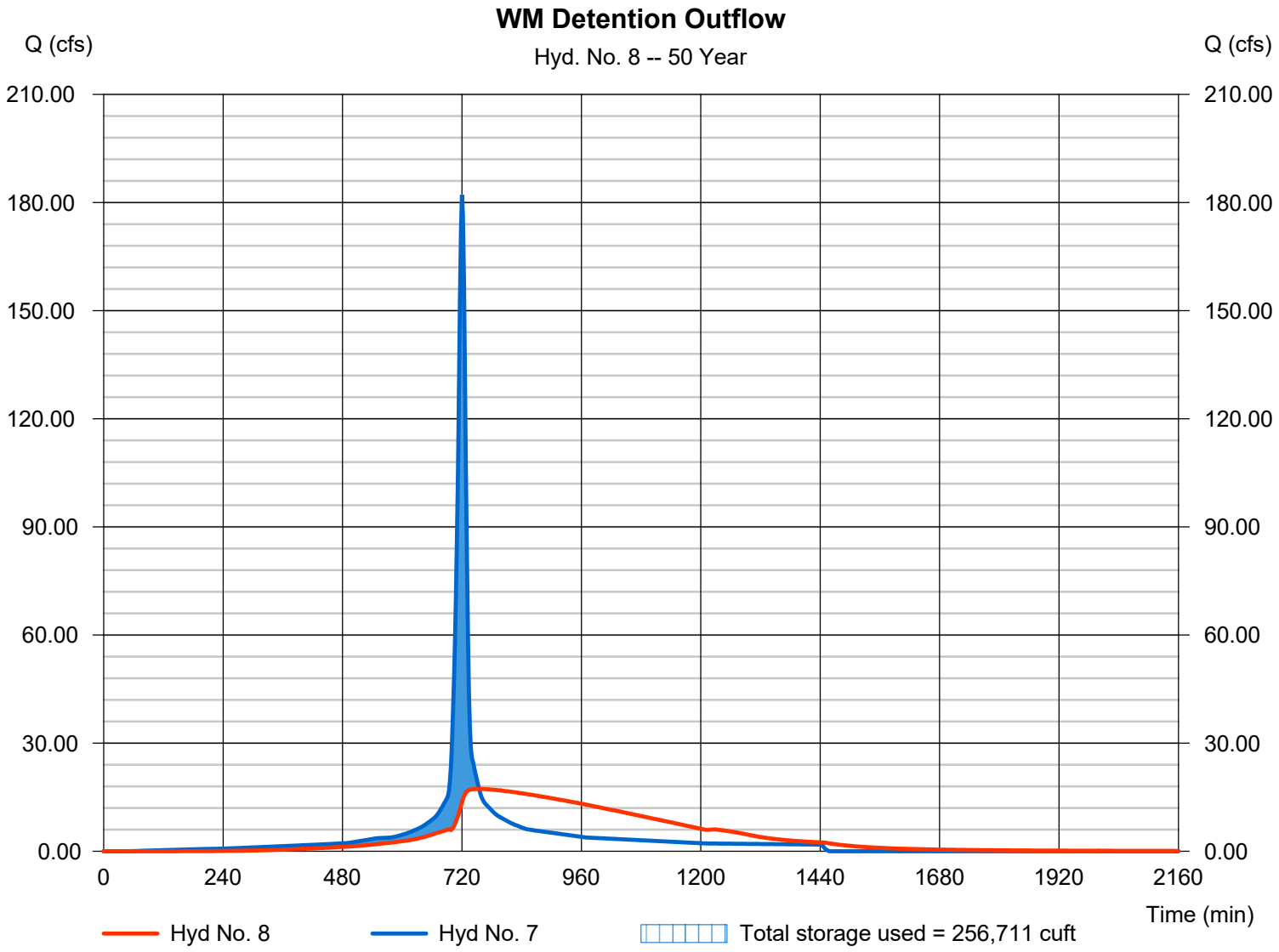
Hydrograph Report

Hyd. No. 8

WM Detention Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	17.30 cfs
Storm frequency	=	50 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	512,472 cuft
Inflow hyd. No.	=	7 - Walmart Inflow to Basin = Area 1 (81.32 ac.)	Max. Elevation	=	744.09 ft
Reservoir name	=	Existing Wal-Mart	Max. Storage	=	256,711 cuft

Storage Indication method used.



Pond No. 1 - Existing Wal-Mart

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 738.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	738.00	33,984	0	0
1.00	739.00	36,581	35,283	35,283
2.00	740.00	39,235	37,908	73,191
3.00	741.00	41,946	40,591	113,781
4.00	742.00	44,713	43,330	157,111
5.00	743.00	47,536	46,125	203,235
6.00	744.00	50,417	48,977	252,212
7.00	745.00	53,353	51,885	304,097

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 738.00	0.00	0.00	0.00
Length (ft)	= 110.00	0.00	0.00	0.00
Slope (%)	= 0.55	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)	= 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 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 / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	738.00	0.00	---	---	---	---	---	---	---	---	---	0.000
0.10	3,528	738.10	0.05 ic	---	---	---	---	---	---	---	---	---	0.055
0.20	7,057	738.20	0.21 ic	---	---	---	---	---	---	---	---	---	0.213
0.30	10,585	738.30	0.47 ic	---	---	---	---	---	---	---	---	---	0.471
0.40	14,113	738.40	0.81 ic	---	---	---	---	---	---	---	---	---	0.815
0.50	17,641	738.50	1.24 ic	---	---	---	---	---	---	---	---	---	1.243
0.60	21,170	738.60	1.74 ic	---	---	---	---	---	---	---	---	---	1.741
0.70	24,698	738.70	2.31 ic	---	---	---	---	---	---	---	---	---	2.306
0.80	28,226	738.80	2.92 ic	---	---	---	---	---	---	---	---	---	2.921
0.90	31,754	738.90	3.57 ic	---	---	---	---	---	---	---	---	---	3.574
1.00	35,283	739.00	4.26 ic	---	---	---	---	---	---	---	---	---	4.265
1.10	39,073	739.10	4.96 oc	---	---	---	---	---	---	---	---	---	4.962
1.20	42,864	739.20	5.44 oc	---	---	---	---	---	---	---	---	---	5.435
1.30	46,655	739.30	5.82 oc	---	---	---	---	---	---	---	---	---	5.820
1.40	50,446	739.40	6.06 oc	---	---	---	---	---	---	---	---	---	6.065
1.50	54,237	739.50	5.92 oc	---	---	---	---	---	---	---	---	---	5.919
1.60	58,027	739.60	6.37 oc	---	---	---	---	---	---	---	---	---	6.375
1.70	61,818	739.70	6.81 oc	---	---	---	---	---	---	---	---	---	6.812
1.80	65,609	739.80	7.22 oc	---	---	---	---	---	---	---	---	---	7.222
1.90	69,400	739.90	7.61 oc	---	---	---	---	---	---	---	---	---	7.611
2.00	73,191	740.00	7.98 oc	---	---	---	---	---	---	---	---	---	7.982
2.10	77,250	740.10	8.33 oc	---	---	---	---	---	---	---	---	---	8.335
2.20	81,309	740.20	8.67 oc	---	---	---	---	---	---	---	---	---	8.674
2.30	85,368	740.30	9.00 oc	---	---	---	---	---	---	---	---	---	9.000
2.40	89,427	740.40	9.31 oc	---	---	---	---	---	---	---	---	---	9.315
2.50	93,486	740.50	9.62 oc	---	---	---	---	---	---	---	---	---	9.619
2.60	97,545	740.60	9.91 oc	---	---	---	---	---	---	---	---	---	9.914
2.70	101,604	740.70	10.20 oc	---	---	---	---	---	---	---	---	---	10.20
2.80	105,663	740.80	10.48 oc	---	---	---	---	---	---	---	---	---	10.48
2.90	109,722	740.90	10.75 oc	---	---	---	---	---	---	---	---	---	10.75
3.00	113,781	741.00	11.02 oc	---	---	---	---	---	---	---	---	---	11.02
3.10	118,114	741.10	11.27 oc	---	---	---	---	---	---	---	---	---	11.27
3.20	122,447	741.20	11.53 oc	---	---	---	---	---	---	---	---	---	11.53
3.30	126,780	741.30	11.77 oc	---	---	---	---	---	---	---	---	---	11.77
3.40	131,113	741.40	12.02 oc	---	---	---	---	---	---	---	---	---	12.02

Continues on next page...

Existing Wal-Mart

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.50	135,446	741.50	12.25 oc	---	---	---	---	---	---	---	---	---	12.25
3.60	139,779	741.60	12.49 oc	---	---	---	---	---	---	---	---	---	12.49
3.70	144,112	741.70	12.72 oc	---	---	---	---	---	---	---	---	---	12.72
3.80	148,445	741.80	12.94 oc	---	---	---	---	---	---	---	---	---	12.94
3.90	152,778	741.90	13.16 oc	---	---	---	---	---	---	---	---	---	13.16
4.00	157,111	742.00	13.38 oc	---	---	---	---	---	---	---	---	---	13.38
4.10	161,723	742.10	13.59 oc	---	---	---	---	---	---	---	---	---	13.59
4.20	166,335	742.20	13.80 oc	---	---	---	---	---	---	---	---	---	13.80
4.30	170,948	742.30	14.01 oc	---	---	---	---	---	---	---	---	---	14.01
4.40	175,560	742.40	14.21 oc	---	---	---	---	---	---	---	---	---	14.21
4.50	180,173	742.50	14.42 oc	---	---	---	---	---	---	---	---	---	14.42
4.60	184,785	742.60	14.61 oc	---	---	---	---	---	---	---	---	---	14.61
4.70	189,398	742.70	14.81 oc	---	---	---	---	---	---	---	---	---	14.81
4.80	194,010	742.80	15.00 oc	---	---	---	---	---	---	---	---	---	15.00
4.90	198,623	742.90	15.19 oc	---	---	---	---	---	---	---	---	---	15.19
5.00	203,235	743.00	15.38 oc	---	---	---	---	---	---	---	---	---	15.38
5.10	208,133	743.10	15.57 oc	---	---	---	---	---	---	---	---	---	15.57
5.20	213,030	743.20	15.75 oc	---	---	---	---	---	---	---	---	---	15.75
5.30	217,928	743.30	15.94 oc	---	---	---	---	---	---	---	---	---	15.94
5.40	222,826	743.40	16.12 oc	---	---	---	---	---	---	---	---	---	16.12
5.50	227,723	743.50	16.29 oc	---	---	---	---	---	---	---	---	---	16.29
5.60	232,621	743.60	16.47 oc	---	---	---	---	---	---	---	---	---	16.47
5.70	237,519	743.70	16.64 oc	---	---	---	---	---	---	---	---	---	16.64
5.80	242,416	743.80	16.82 oc	---	---	---	---	---	---	---	---	---	16.82
5.90	247,314	743.90	16.99 oc	---	---	---	---	---	---	---	---	---	16.99
6.00	252,212	744.00	17.16 oc	---	---	---	---	---	---	---	---	---	17.16
6.10	257,400	744.10	17.32 oc	---	---	---	---	---	---	---	---	---	17.32
6.20	262,589	744.20	17.49 oc	---	---	---	---	---	---	---	---	---	17.49
6.30	267,777	744.30	17.65 oc	---	---	---	---	---	---	---	---	---	17.65
6.40	272,966	744.40	17.81 oc	---	---	---	---	---	---	---	---	---	17.81
6.50	278,154	744.50	17.98 oc	---	---	---	---	---	---	---	---	---	17.98
6.60	283,343	744.60	18.14 oc	---	---	---	---	---	---	---	---	---	18.14
6.70	288,531	744.70	18.29 oc	---	---	---	---	---	---	---	---	---	18.29
6.80	293,720	744.80	18.45 oc	---	---	---	---	---	---	---	---	---	18.45
6.90	298,908	744.90	18.61 oc	---	---	---	---	---	---	---	---	---	18.61
7.00	304,097	745.00	18.76 oc	---	---	---	---	---	---	---	---	---	18.76

...End

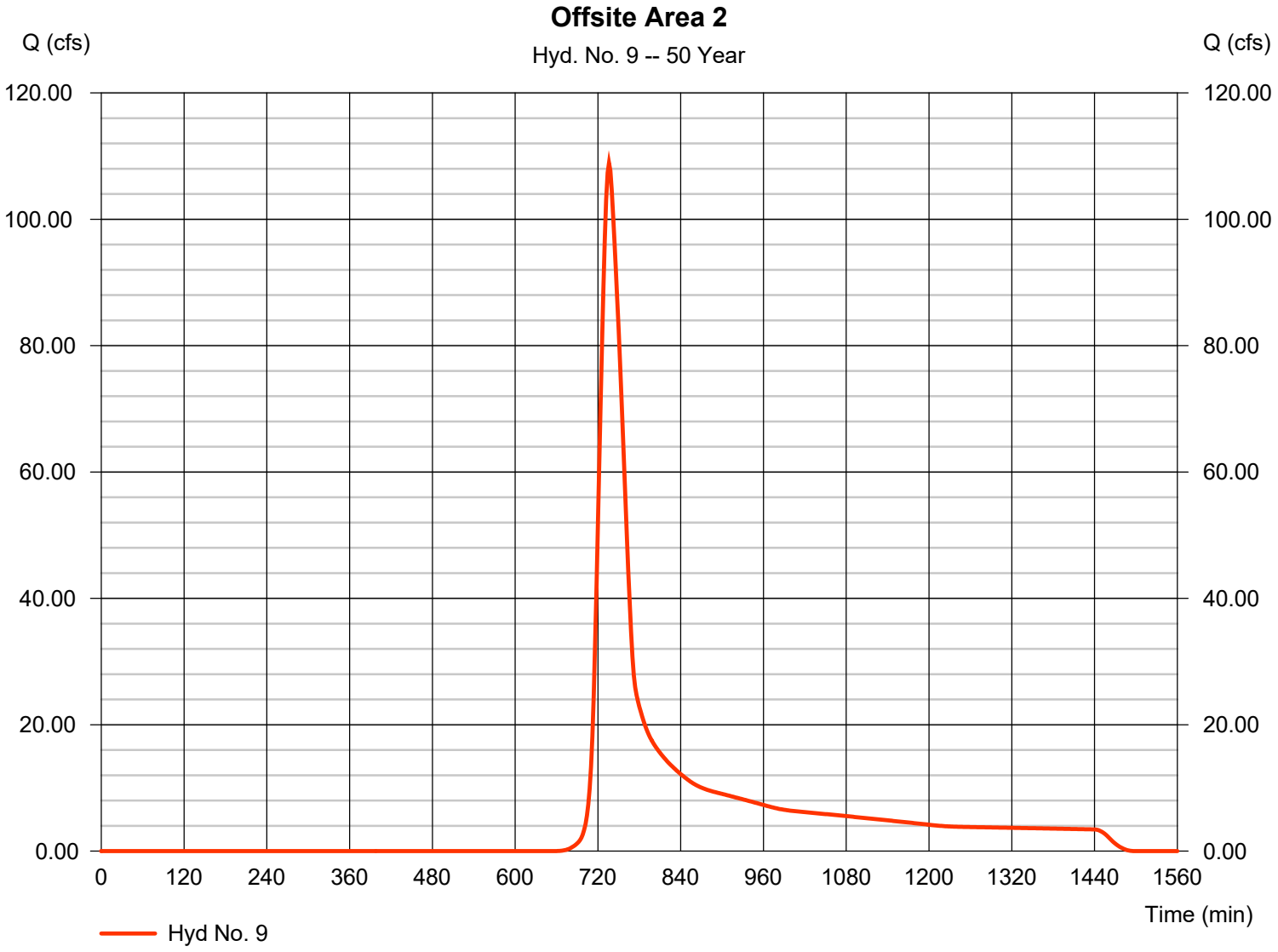
Hydrograph Report

Hyd. No. 9

Offsite Area 2

Offsite area reduced by 2.1 acres to account for Popeyes parcel as an on-site area (91.7-2.1 = 89.6 acres)

Hydrograph type	=	SCS Runoff	Peak discharge	=	108.90 cfs
Storm frequency	=	50 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	534,486 cuft
Drainage area	=	89.600 ac	Curve number	=	62.3
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	33.90 min
Total precip.	=	5.32 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

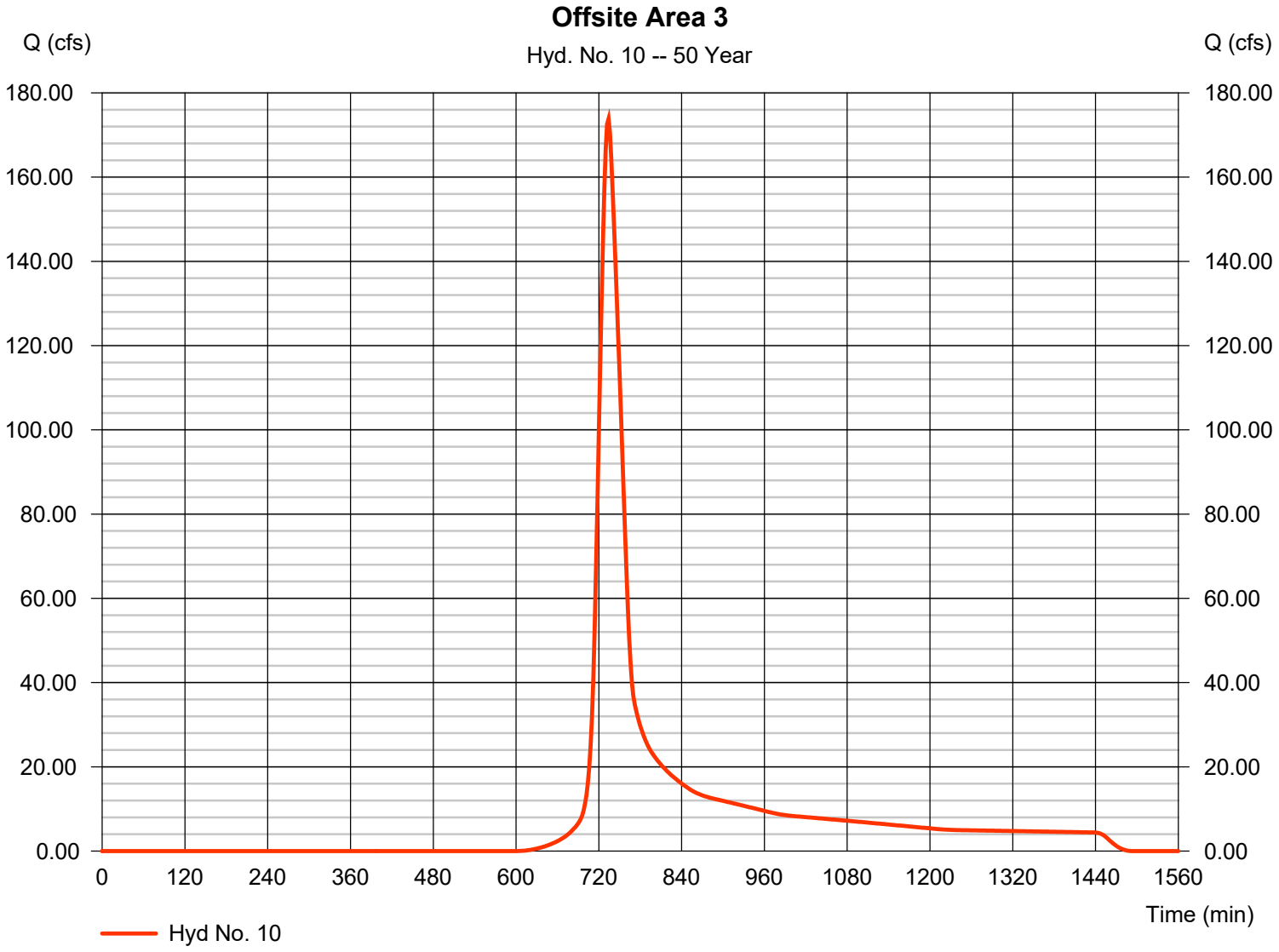


Hydrograph Report

Hyd. No. 10

Offsite Area 3

Hydrograph type	= SCS Runoff	Peak discharge	= 173.84 cfs
Storm frequency	= 50 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 773,931 cuft
Drainage area	= 99.000 ac	Curve number	= 68.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 31.80 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

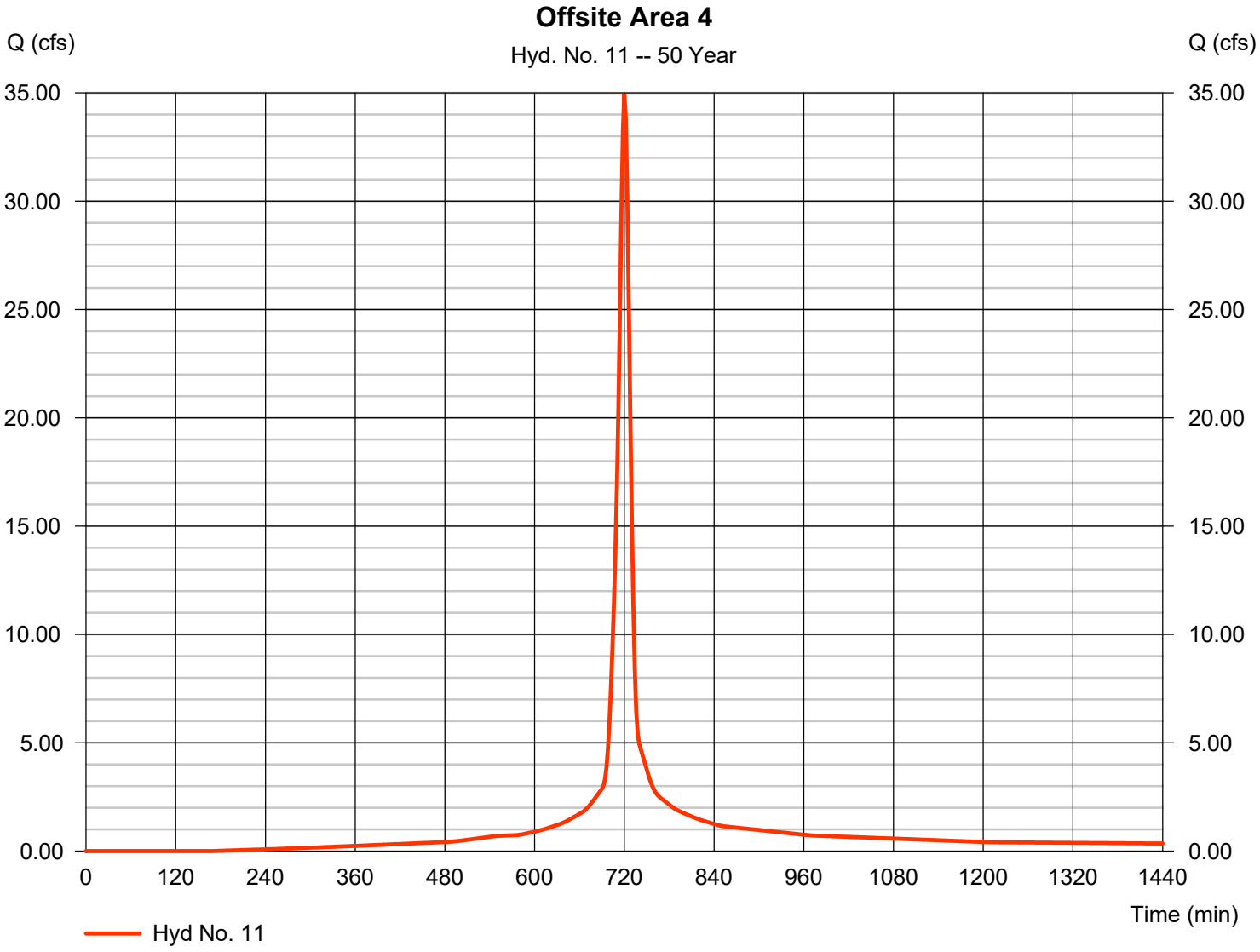


Hydrograph Report

Hyd. No. 11

Offsite Area 4

Hydrograph type	= SCS Runoff	Peak discharge	= 34.95 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 97,013 cuft
Drainage area	= 5.800 ac	Curve number	= 92.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 11.80 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

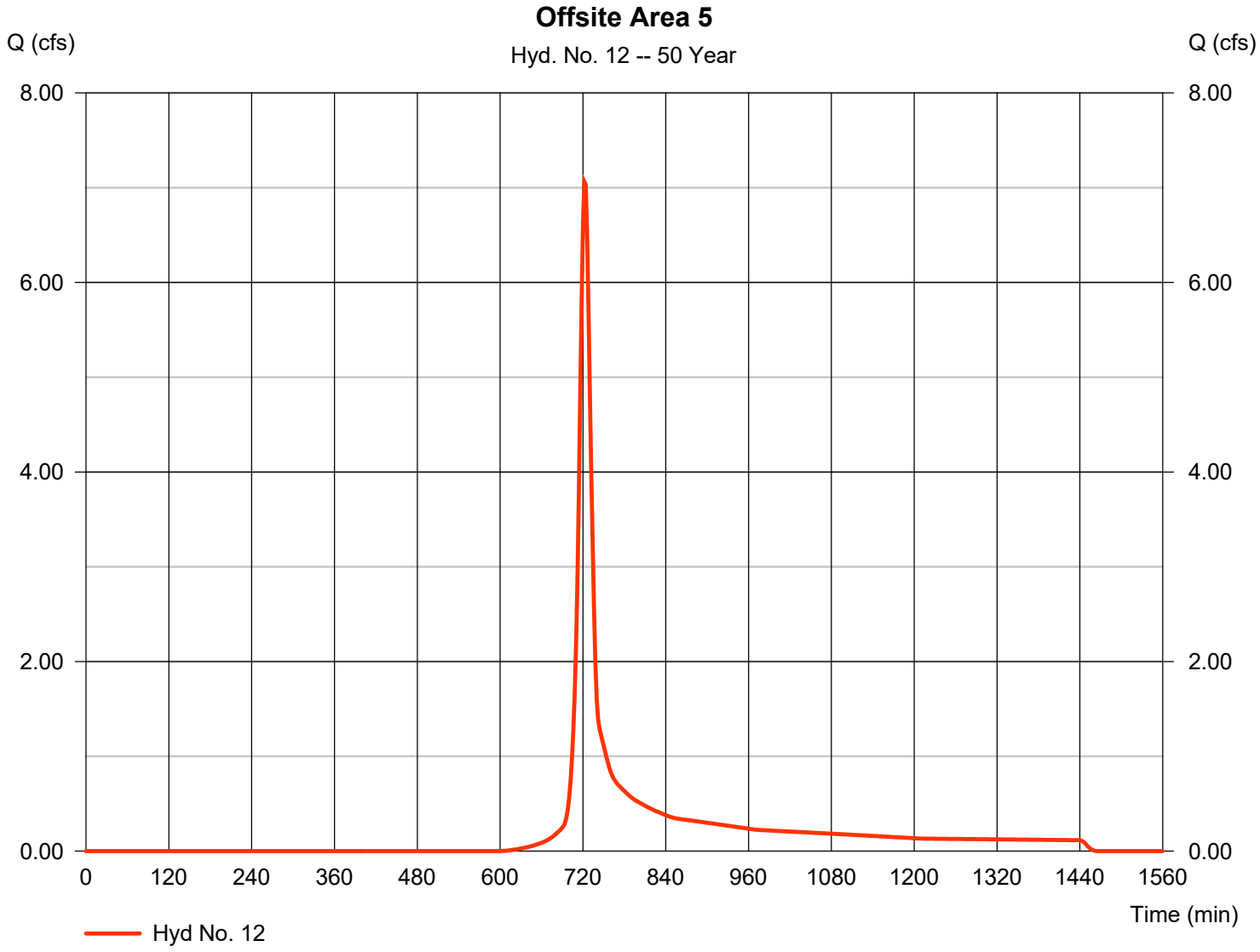


Hydrograph Report

Hyd. No. 12

Offsite Area 5

Hydrograph type	= SCS Runoff	Peak discharge	= 7.063 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 20,169 cuft
Drainage area	= 2.700 ac	Curve number	= 68
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 14.80 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

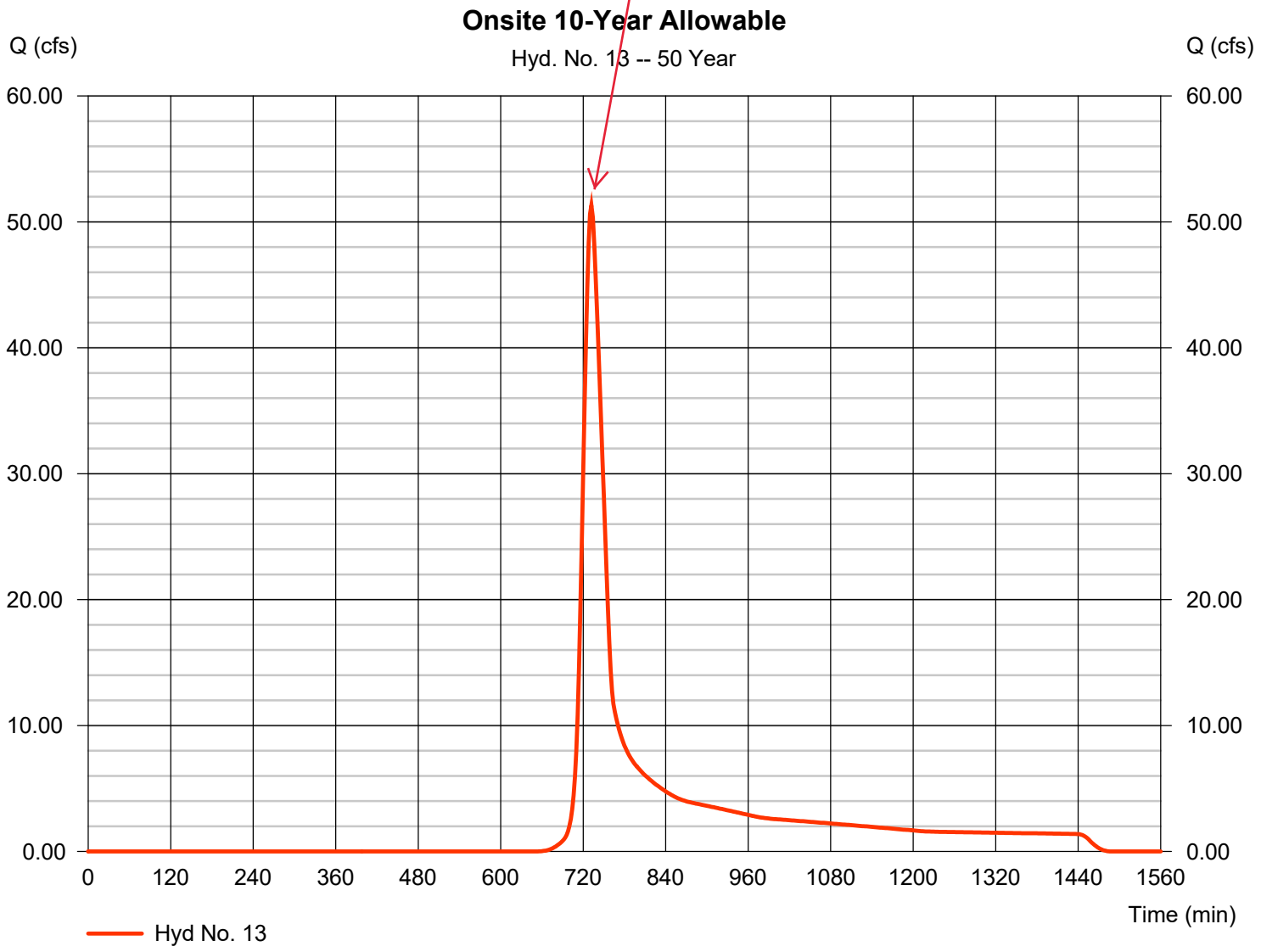
Hyd. No. 13

Onsite 10-Year Allowable

On-site area increased by 2.1 acres to account for Popeyes parcel as an on-site area (45.0 + 2.1 ~ 47.0 acres)

Hydrograph type	= Manual	Peak discharge	= 51.31 cfs
Storm frequency	= 50 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 219,250 cuft

On-site area computed as a 10 year storm for determining the allowable release rate.



Hydrograph Report

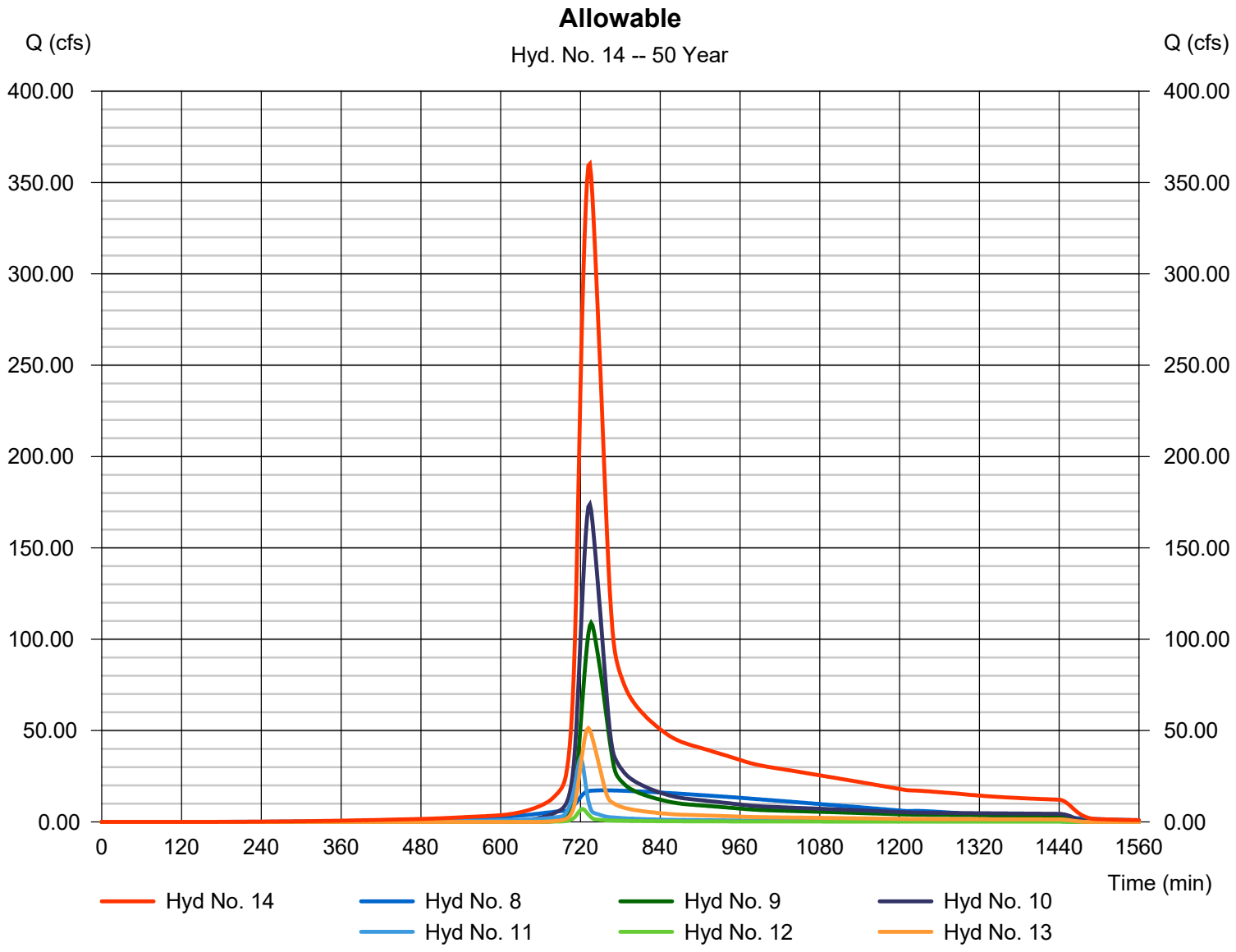
Hyd. No. 14

Allowable

50 Year Allowable Release Rate

Hydrograph type	= Combine	Peak discharge	= 360.17 cfs
Storm frequency	= 50 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 2,157,316 cuft
Inflow hyds.	= 8, 9, 10, 11, 12, 13	Contrib. drain. area	= 197.100 ac

Allowable release rate = 10 year on-site + 50 year off-site areas.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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	57.70	2	720	155,443	------	------	------	WM Store/ Area Behind Loes
2	SCS Runoff	30.78	2	720	86,720	------	------	------	Lowes Outlots
3	SCS Runoff	40.20	2	720	120,059	------	------	------	Lowes Parking Lot
4	SCS Runoff	10.32	2	720	30,823	------	------	------	Area Around Lowes
5	SCS Runoff	19.75	2	720	58,983	------	------	------	Lowes Store
6	SCS Runoff	23.31	2	720	60,593	------	------	------	Detention Area
7	Combine	182.06	2	720	512,621	1, 2, 3, 4, 5, 6	------	------	Walmart Inflow to Basin = Area 1 (31.
8	Reservoir	17.30	2	754	512,472	7	744.09	256,711	WM Detention Outflow
9	SCS Runoff	108.90	2	736	534,486	------	------	------	Offsite Area 2
10	SCS Runoff	173.84	2	734	773,931	------	------	------	Offsite Area 3
11	SCS Runoff	34.95	2	720	97,013	------	------	------	Offsite Area 4
12	SCS Runoff	7.063	2	722	20,169	------	------	------	Offsite Area 5
13	SCS Runoff	263.79	2	722	782,086	------	------	------	Onsite Bypassing Detention Basin
14	SCS Runoff	18.92	2	720	49,153	------	------	------	Onsite Tributary to Detention Basin
15	Combine	190.95	2	730	920,098	10, 11, 14	------	------	Proposed Basin Inflow
16	Reservoir	41.32	2	770	919,768	15	708.87	419,002	Proposed Basin Outflow
17	Combine	358.00	2	724	2,768,976	8, 9, 12, 13, 16	------	------	Post-Developed Flow at Analyis Point

Hydrographs 1 - 6 represent Area 1 = 31.32 acres.

50 Year release rate less than allowable release rate of 360.17 cfs

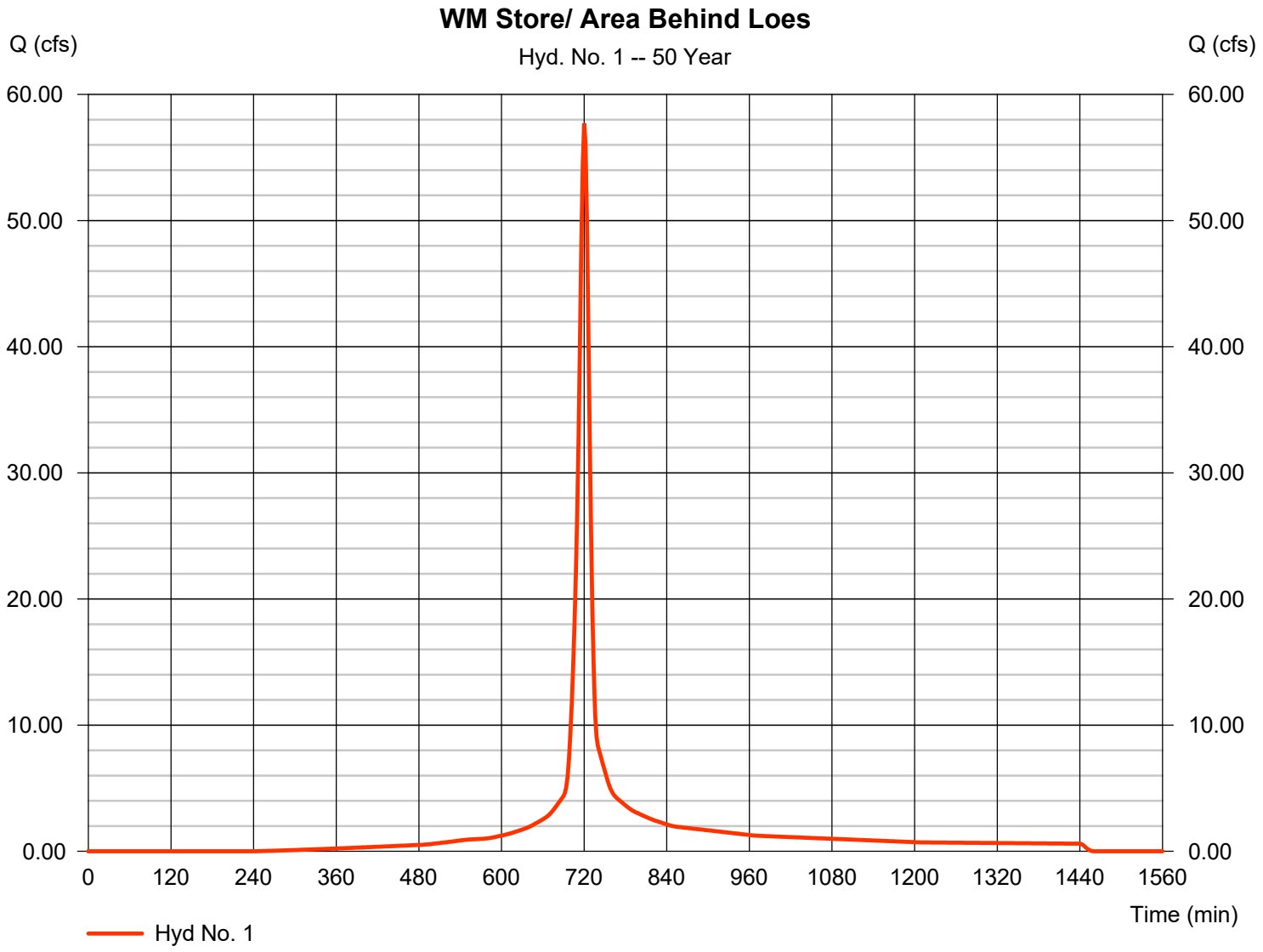
Elevation and volume matches 8-9-10 as-built calculations.

Hydrograph Report

Hyd. No. 1

WM Store/ Area Behind Loes

Hydrograph type	= SCS Runoff	Peak discharge	= 57.70 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 155,443 cuft
Drainage area	= 10.180 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



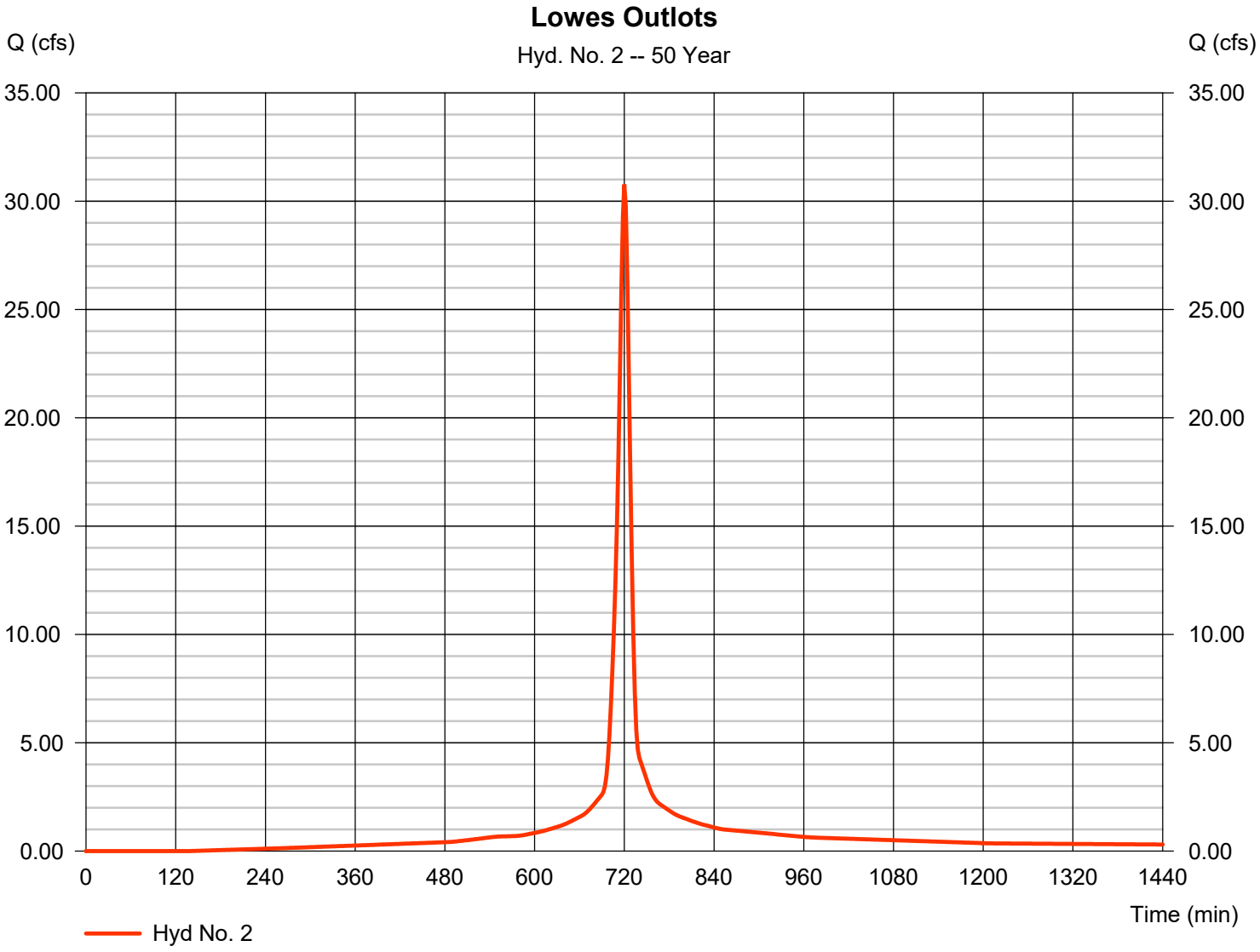
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 2

Lowes Outlots

Hydrograph type	= SCS Runoff	Peak discharge	= 30.78 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 86,720 cuft
Drainage area	= 5.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



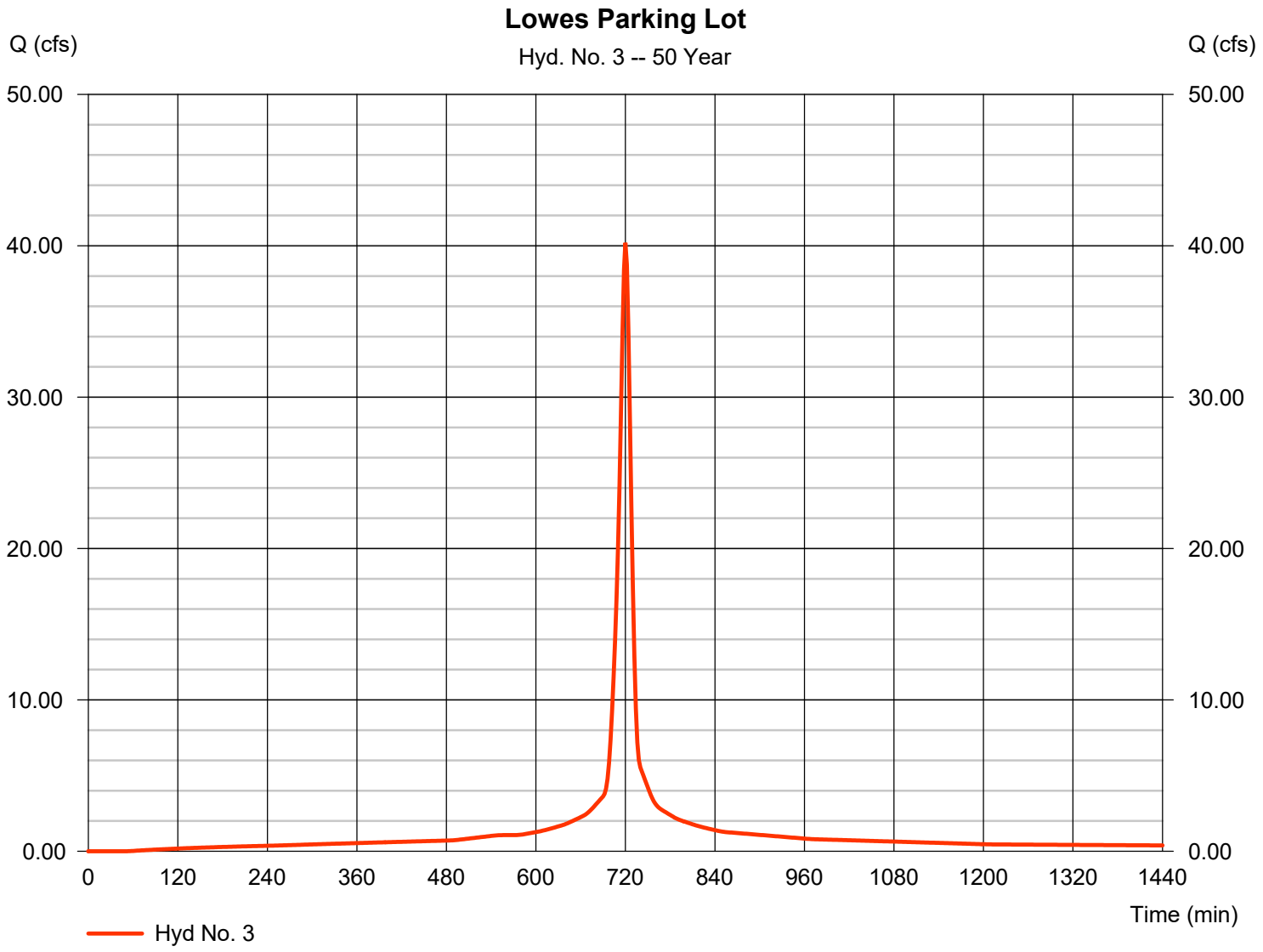
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 3

Lowes Parking Lot

Hydrograph type	= SCS Runoff	Peak discharge	= 40.20 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 120,059 cuft
Drainage area	= 6.310 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



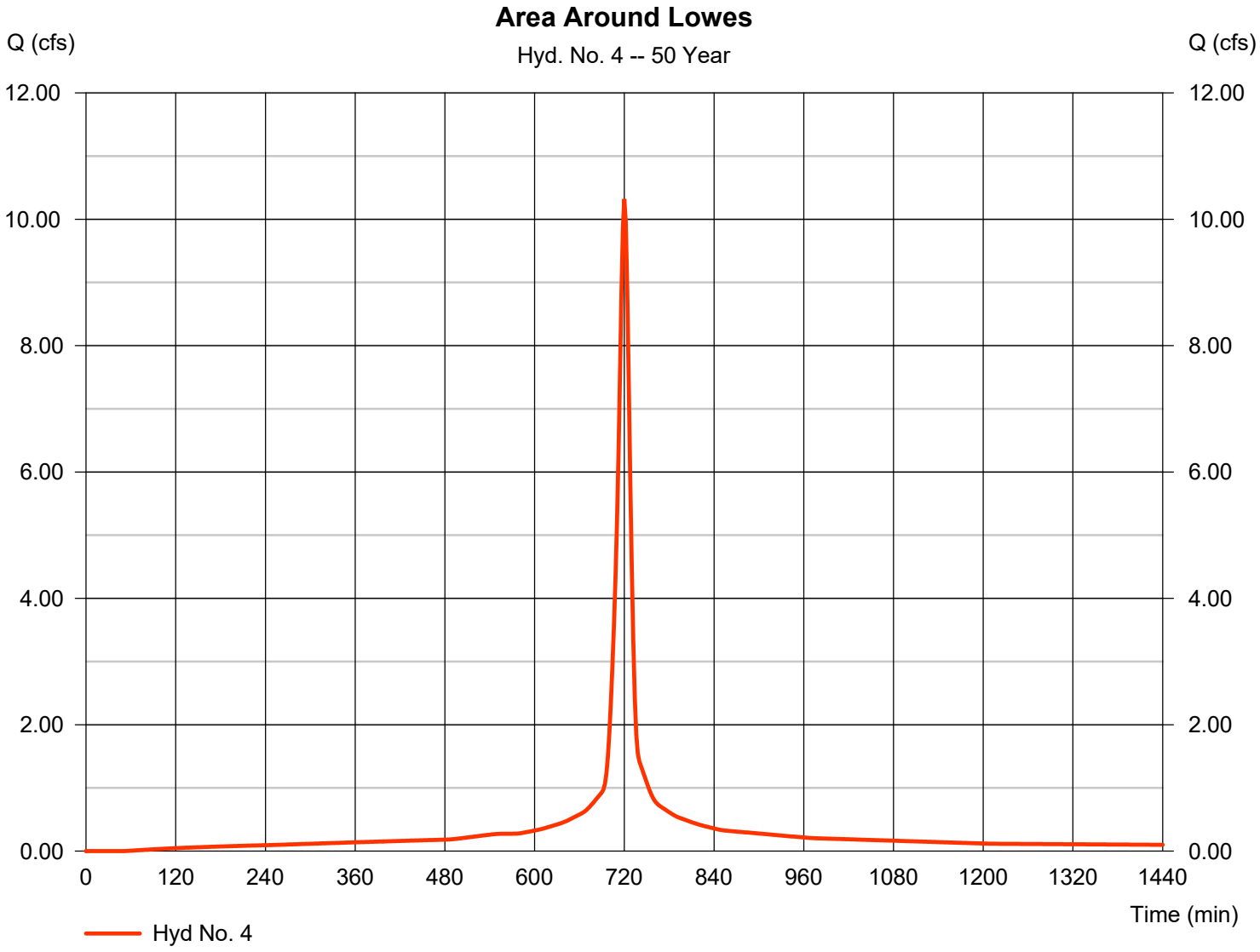
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 4

Area Around Lowes

Hydrograph type	= SCS Runoff	Peak discharge	= 10.32 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 30,823 cuft
Drainage area	= 1.620 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



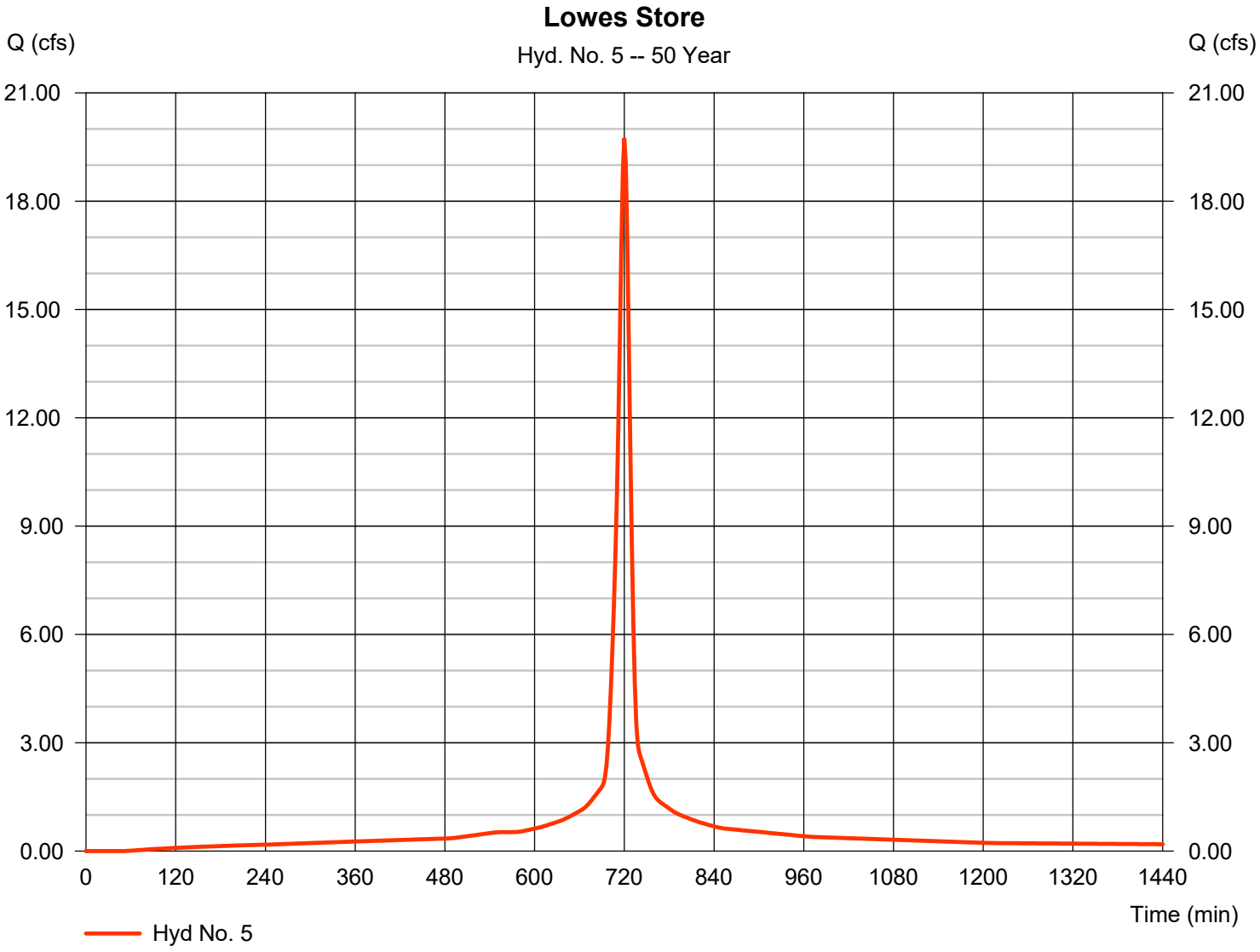
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 5

Lowes Store

Hydrograph type	= SCS Runoff	Peak discharge	= 19.75 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 58,983 cuft
Drainage area	= 3.100 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



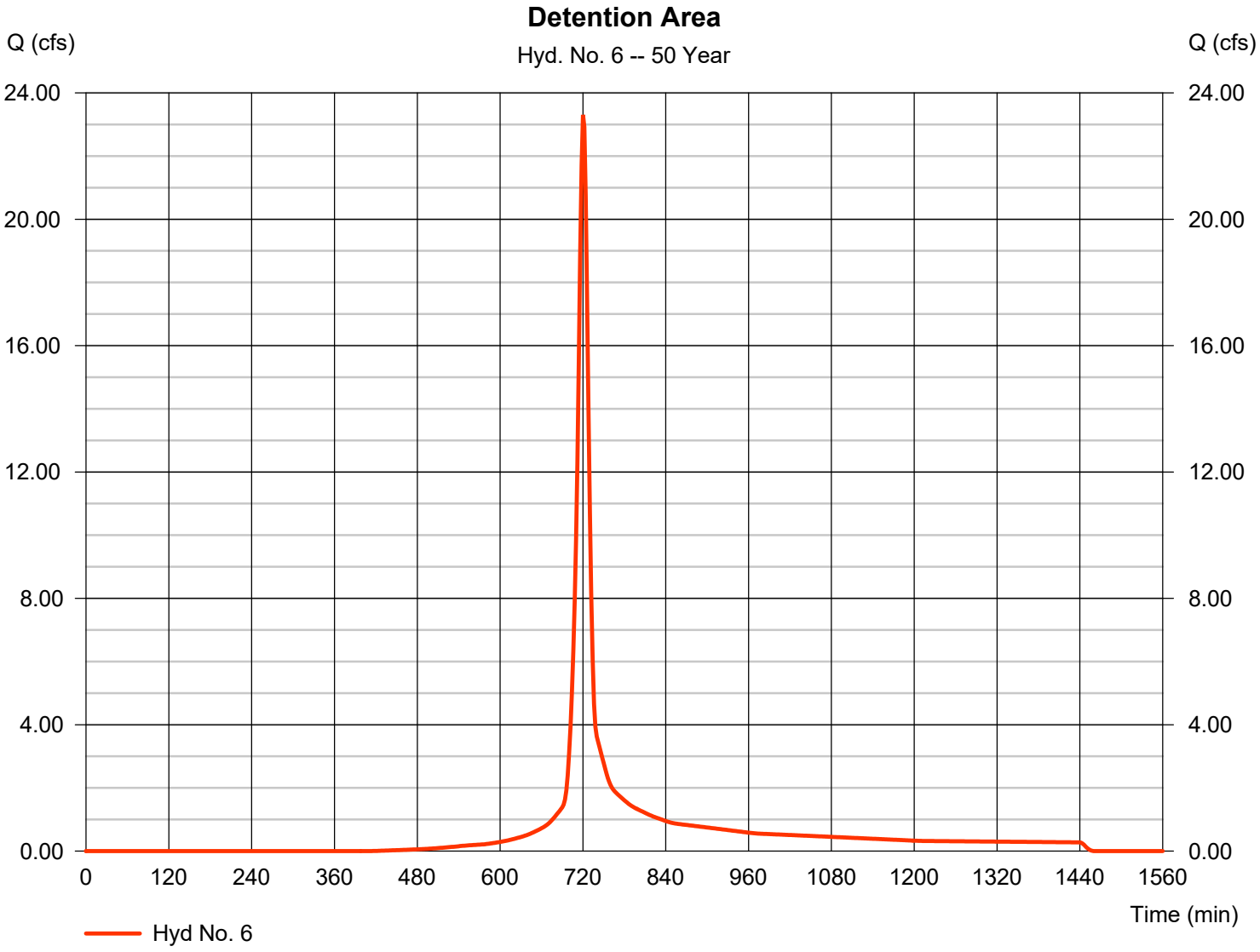
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 6

Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 23.31 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 60,593 cuft
Drainage area	= 5.100 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



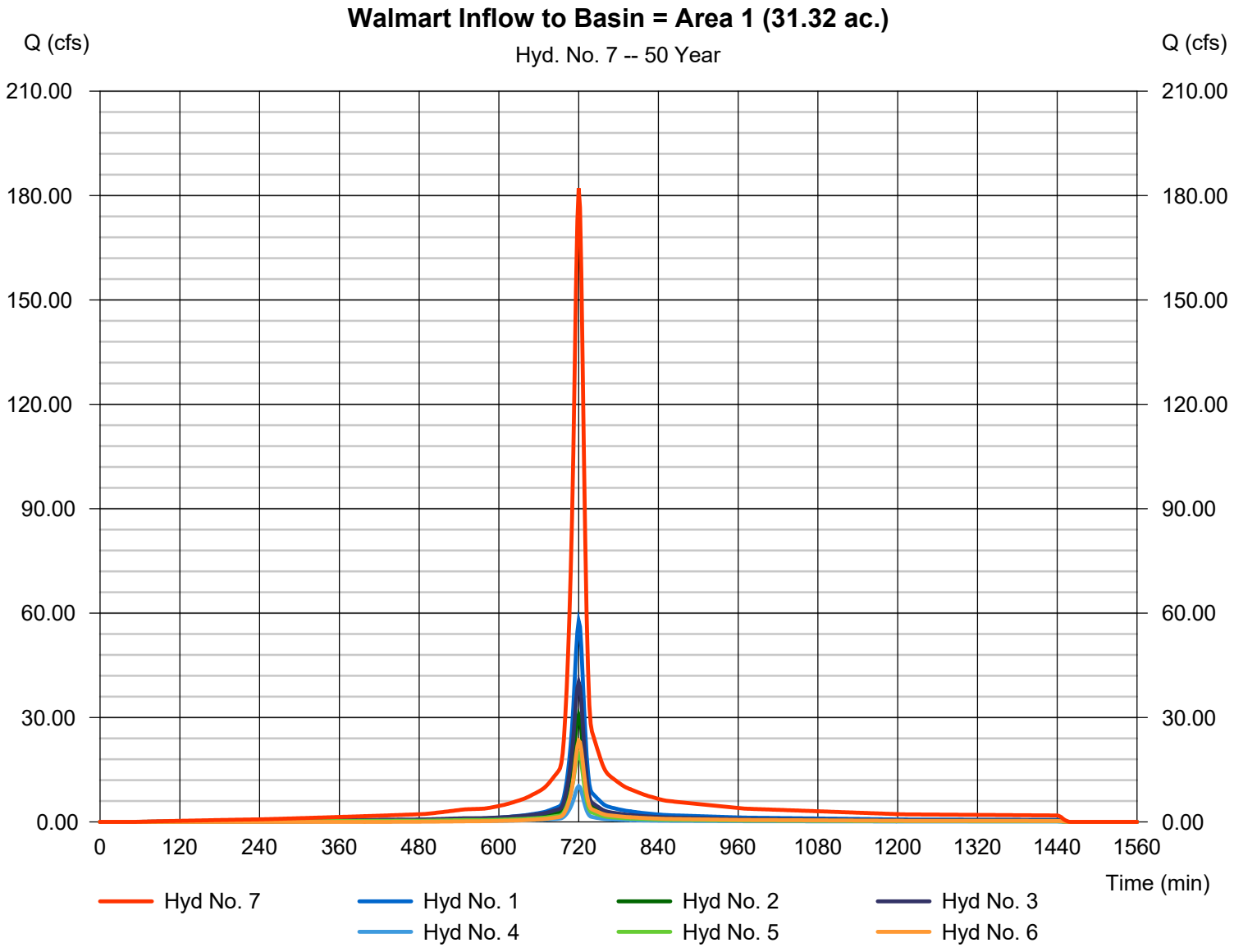
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 7

Walmart Inflow to Basin = Area 1 (31.32 ac.)

Hydrograph type	= Combine	Peak discharge	= 182.06 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 512,621 cuft
Inflow hyds.	= 1, 2, 3, 4, 5, 6	Contrib. drain. area	= 31.320 ac



Hydrograph Report

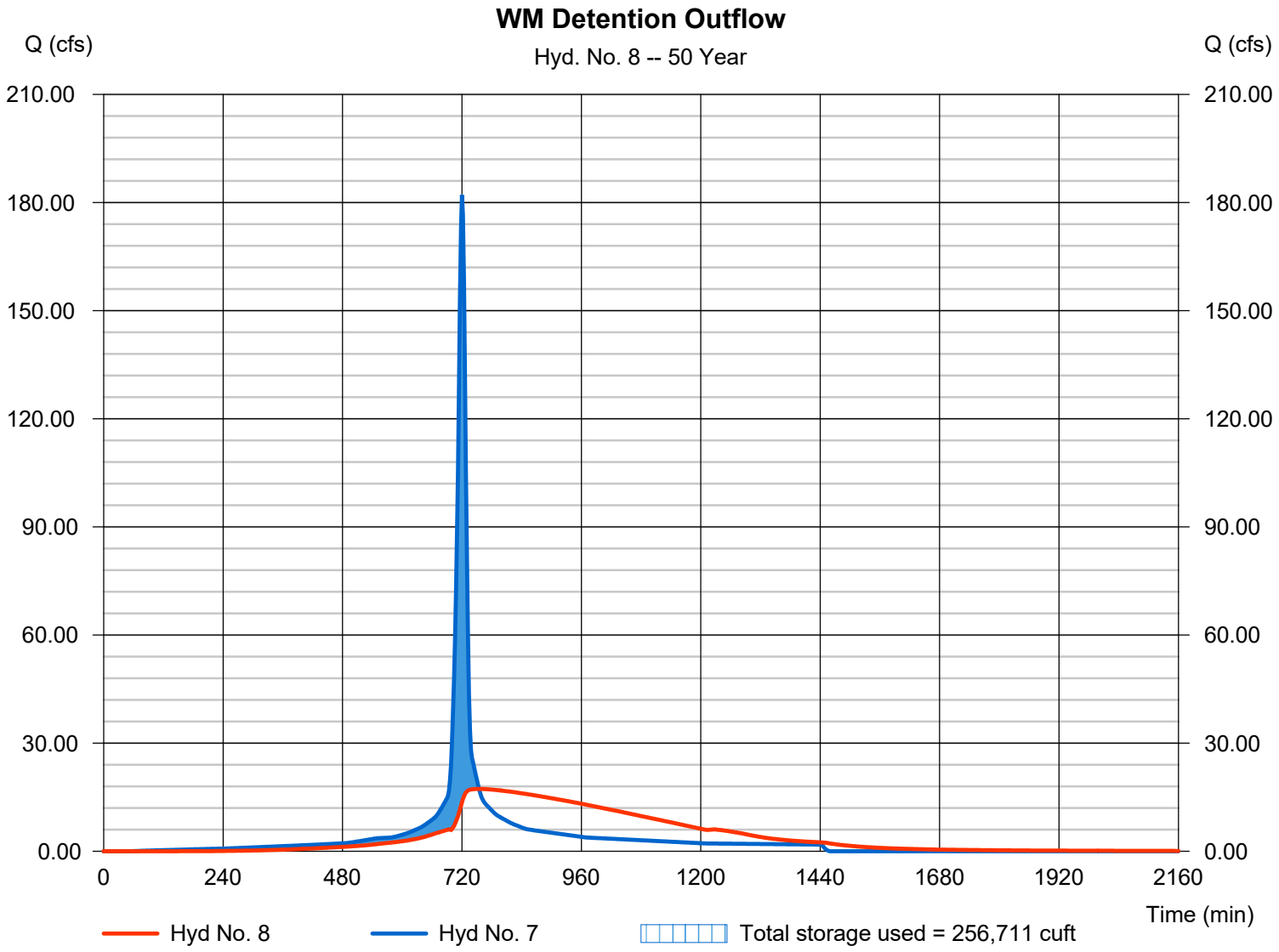
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 8

WM Detention Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	17.30 cfs
Storm frequency	=	50 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	512,472 cuft
Inflow hyd. No.	=	7 - Walmart Inflow to Basin = Area 1 (81.32 ac.)	Max. Elevation	=	744.09 ft
Reservoir name	=	Existing Wal-Mart	Max. Storage	=	256,711 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Existing Wal-Mart

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 738.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	738.00	33,984	0	0
1.00	739.00	36,581	35,283	35,283
2.00	740.00	39,235	37,908	73,191
3.00	741.00	41,946	40,591	113,781
4.00	742.00	44,713	43,330	157,111
5.00	743.00	47,536	46,125	203,235
6.00	744.00	50,417	48,977	252,212
7.00	745.00	53,353	51,885	304,097

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 738.00	0.00	0.00	0.00
Length (ft)	= 110.00	0.00	0.00	0.00
Slope (%)	= 0.55	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)	= 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 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 / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	738.00	0.00	---	---	---	---	---	---	---	---	---	0.000
0.10	3,528	738.10	0.05 ic	---	---	---	---	---	---	---	---	---	0.055
0.20	7,057	738.20	0.21 ic	---	---	---	---	---	---	---	---	---	0.213
0.30	10,585	738.30	0.47 ic	---	---	---	---	---	---	---	---	---	0.471
0.40	14,113	738.40	0.81 ic	---	---	---	---	---	---	---	---	---	0.815
0.50	17,641	738.50	1.24 ic	---	---	---	---	---	---	---	---	---	1.243
0.60	21,170	738.60	1.74 ic	---	---	---	---	---	---	---	---	---	1.741
0.70	24,698	738.70	2.31 ic	---	---	---	---	---	---	---	---	---	2.306
0.80	28,226	738.80	2.92 ic	---	---	---	---	---	---	---	---	---	2.921
0.90	31,754	738.90	3.57 ic	---	---	---	---	---	---	---	---	---	3.574
1.00	35,283	739.00	4.26 ic	---	---	---	---	---	---	---	---	---	4.265
1.10	39,073	739.10	4.96 oc	---	---	---	---	---	---	---	---	---	4.962
1.20	42,864	739.20	5.44 oc	---	---	---	---	---	---	---	---	---	5.435
1.30	46,655	739.30	5.82 oc	---	---	---	---	---	---	---	---	---	5.820
1.40	50,446	739.40	6.06 oc	---	---	---	---	---	---	---	---	---	6.065
1.50	54,237	739.50	5.92 oc	---	---	---	---	---	---	---	---	---	5.919
1.60	58,027	739.60	6.37 oc	---	---	---	---	---	---	---	---	---	6.375
1.70	61,818	739.70	6.81 oc	---	---	---	---	---	---	---	---	---	6.812
1.80	65,609	739.80	7.22 oc	---	---	---	---	---	---	---	---	---	7.222
1.90	69,400	739.90	7.61 oc	---	---	---	---	---	---	---	---	---	7.611
2.00	73,191	740.00	7.98 oc	---	---	---	---	---	---	---	---	---	7.982
2.10	77,250	740.10	8.33 oc	---	---	---	---	---	---	---	---	---	8.335
2.20	81,309	740.20	8.67 oc	---	---	---	---	---	---	---	---	---	8.674
2.30	85,368	740.30	9.00 oc	---	---	---	---	---	---	---	---	---	9.000
2.40	89,427	740.40	9.31 oc	---	---	---	---	---	---	---	---	---	9.315
2.50	93,486	740.50	9.62 oc	---	---	---	---	---	---	---	---	---	9.619
2.60	97,545	740.60	9.91 oc	---	---	---	---	---	---	---	---	---	9.914
2.70	101,604	740.70	10.20 oc	---	---	---	---	---	---	---	---	---	10.20
2.80	105,663	740.80	10.48 oc	---	---	---	---	---	---	---	---	---	10.48
2.90	109,722	740.90	10.75 oc	---	---	---	---	---	---	---	---	---	10.75
3.00	113,781	741.00	11.02 oc	---	---	---	---	---	---	---	---	---	11.02
3.10	118,114	741.10	11.27 oc	---	---	---	---	---	---	---	---	---	11.27
3.20	122,447	741.20	11.53 oc	---	---	---	---	---	---	---	---	---	11.53
3.30	126,780	741.30	11.77 oc	---	---	---	---	---	---	---	---	---	11.77
3.40	131,113	741.40	12.02 oc	---	---	---	---	---	---	---	---	---	12.02

Continues on next page...

Existing Wal-Mart

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.50	135,446	741.50	12.25 oc	---	---	---	---	---	---	---	---	---	12.25
3.60	139,779	741.60	12.49 oc	---	---	---	---	---	---	---	---	---	12.49
3.70	144,112	741.70	12.72 oc	---	---	---	---	---	---	---	---	---	12.72
3.80	148,445	741.80	12.94 oc	---	---	---	---	---	---	---	---	---	12.94
3.90	152,778	741.90	13.16 oc	---	---	---	---	---	---	---	---	---	13.16
4.00	157,111	742.00	13.38 oc	---	---	---	---	---	---	---	---	---	13.38
4.10	161,723	742.10	13.59 oc	---	---	---	---	---	---	---	---	---	13.59
4.20	166,335	742.20	13.80 oc	---	---	---	---	---	---	---	---	---	13.80
4.30	170,948	742.30	14.01 oc	---	---	---	---	---	---	---	---	---	14.01
4.40	175,560	742.40	14.21 oc	---	---	---	---	---	---	---	---	---	14.21
4.50	180,173	742.50	14.42 oc	---	---	---	---	---	---	---	---	---	14.42
4.60	184,785	742.60	14.61 oc	---	---	---	---	---	---	---	---	---	14.61
4.70	189,398	742.70	14.81 oc	---	---	---	---	---	---	---	---	---	14.81
4.80	194,010	742.80	15.00 oc	---	---	---	---	---	---	---	---	---	15.00
4.90	198,623	742.90	15.19 oc	---	---	---	---	---	---	---	---	---	15.19
5.00	203,235	743.00	15.38 oc	---	---	---	---	---	---	---	---	---	15.38
5.10	208,133	743.10	15.57 oc	---	---	---	---	---	---	---	---	---	15.57
5.20	213,030	743.20	15.75 oc	---	---	---	---	---	---	---	---	---	15.75
5.30	217,928	743.30	15.94 oc	---	---	---	---	---	---	---	---	---	15.94
5.40	222,826	743.40	16.12 oc	---	---	---	---	---	---	---	---	---	16.12
5.50	227,723	743.50	16.29 oc	---	---	---	---	---	---	---	---	---	16.29
5.60	232,621	743.60	16.47 oc	---	---	---	---	---	---	---	---	---	16.47
5.70	237,519	743.70	16.64 oc	---	---	---	---	---	---	---	---	---	16.64
5.80	242,416	743.80	16.82 oc	---	---	---	---	---	---	---	---	---	16.82
5.90	247,314	743.90	16.99 oc	---	---	---	---	---	---	---	---	---	16.99
6.00	252,212	744.00	17.16 oc	---	---	---	---	---	---	---	---	---	17.16
6.10	257,400	744.10	17.32 oc	---	---	---	---	---	---	---	---	---	17.32
6.20	262,589	744.20	17.49 oc	---	---	---	---	---	---	---	---	---	17.49
6.30	267,777	744.30	17.65 oc	---	---	---	---	---	---	---	---	---	17.65
6.40	272,966	744.40	17.81 oc	---	---	---	---	---	---	---	---	---	17.81
6.50	278,154	744.50	17.98 oc	---	---	---	---	---	---	---	---	---	17.98
6.60	283,343	744.60	18.14 oc	---	---	---	---	---	---	---	---	---	18.14
6.70	288,531	744.70	18.29 oc	---	---	---	---	---	---	---	---	---	18.29
6.80	293,720	744.80	18.45 oc	---	---	---	---	---	---	---	---	---	18.45
6.90	298,908	744.90	18.61 oc	---	---	---	---	---	---	---	---	---	18.61
7.00	304,097	745.00	18.76 oc	---	---	---	---	---	---	---	---	---	18.76

...End

Hydrograph Report

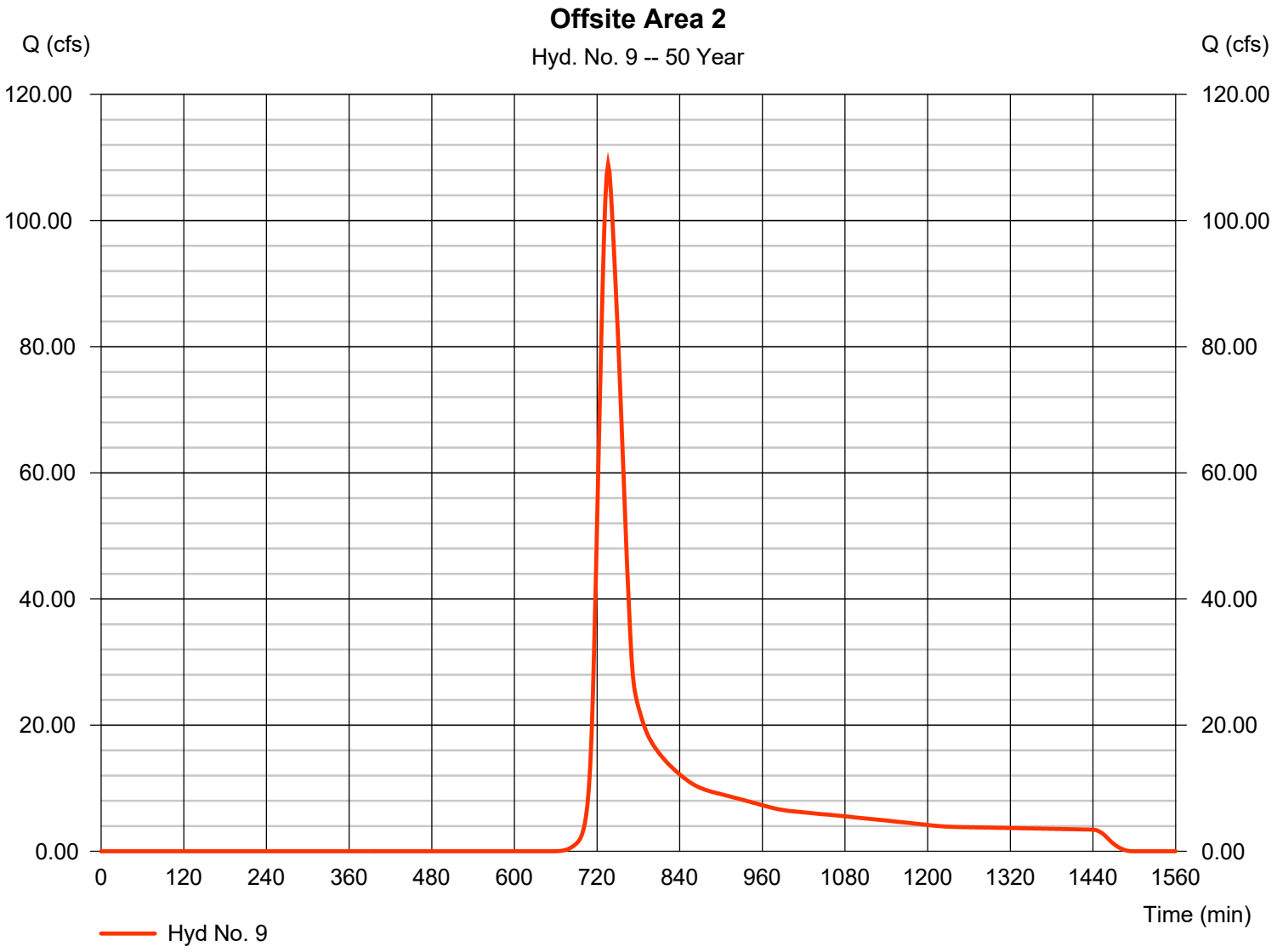
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 — Friday, 06 / 10 / 2016

Hyd. No. 9

Offsite Area 2

Offsite area reduced by 2.1 acres to account for Popeyes parcel as an on-site area (91.7-2.1 = 89.6 acres)

Hydrograph type	= SCS Runoff	Peak discharge	= 108.90 cfs
Storm frequency	= 50 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 534,486 cuft
Drainage area	= 89.600 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 33.90 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

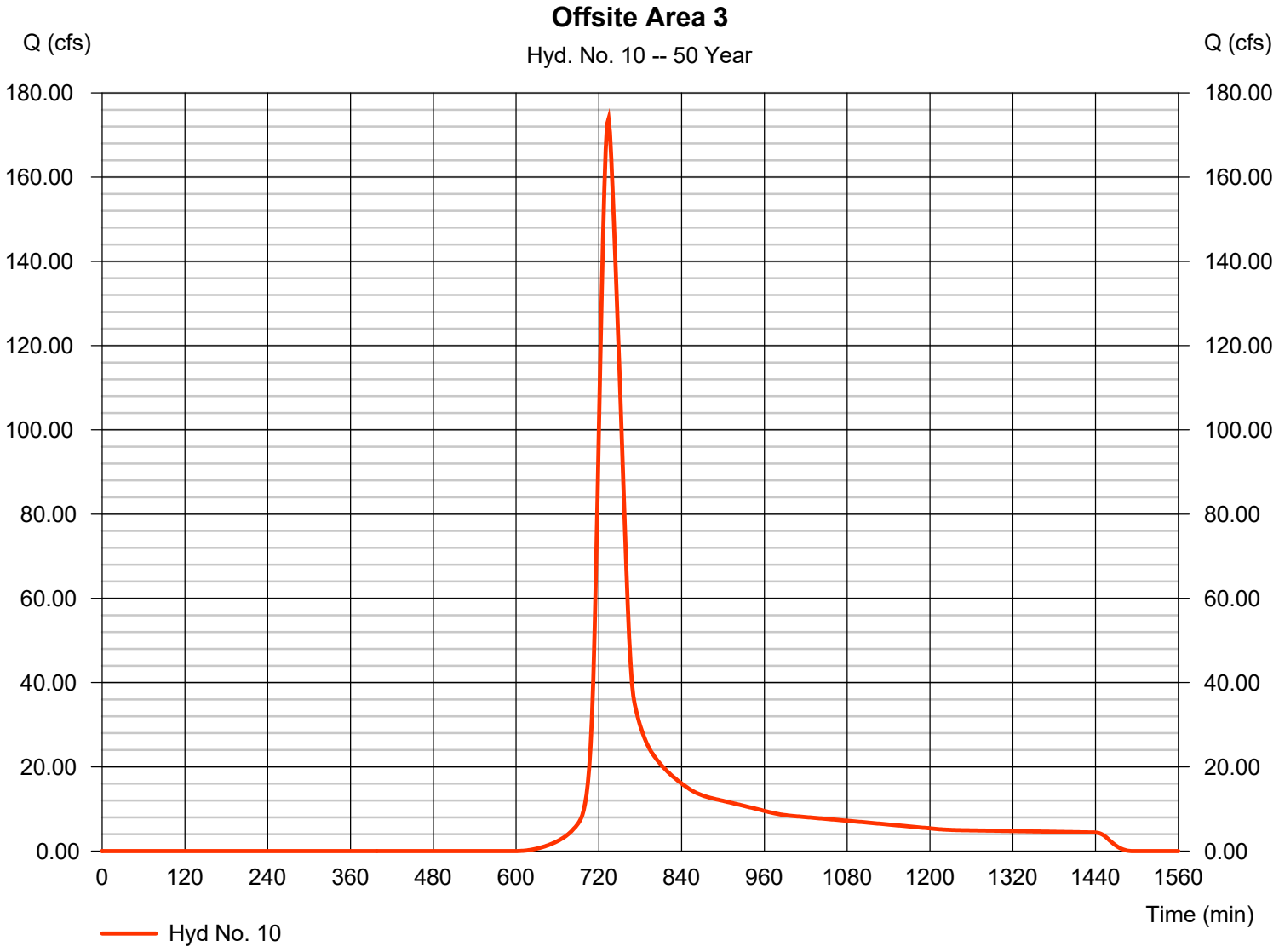


Hydrograph Report

Hyd. No. 10

Offsite Area 3

Hydrograph type	= SCS Runoff	Peak discharge	= 173.84 cfs
Storm frequency	= 50 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 773,931 cuft
Drainage area	= 99.000 ac	Curve number	= 68.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 31.80 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

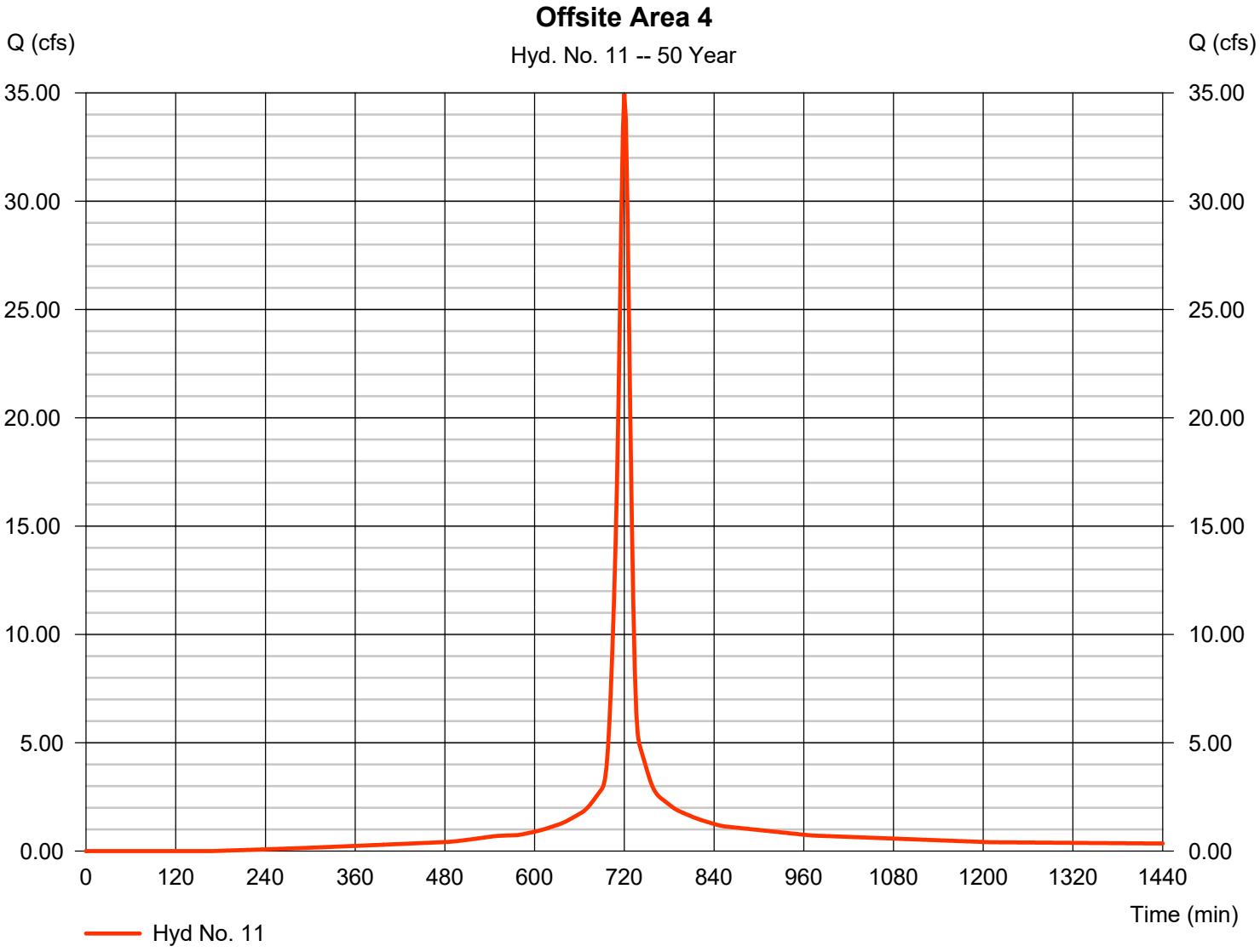


Hydrograph Report

Hyd. No. 11

Offsite Area 4

Hydrograph type	= SCS Runoff	Peak discharge	= 34.95 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 97,013 cuft
Drainage area	= 5.800 ac	Curve number	= 92.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 11.80 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

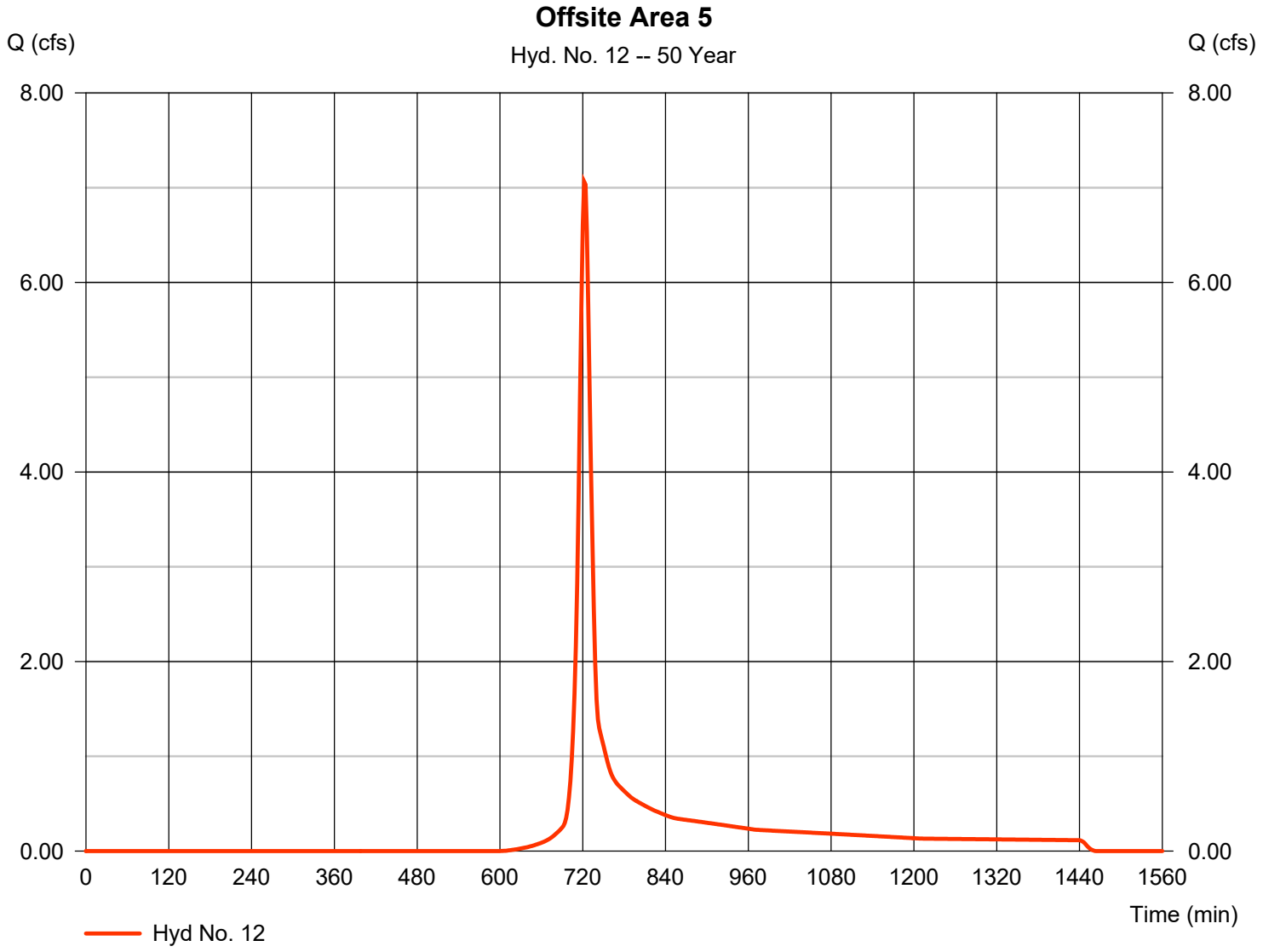


Hydrograph Report

Hyd. No. 12

Offsite Area 5

Hydrograph type	= SCS Runoff	Peak discharge	= 7.063 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 20,169 cuft
Drainage area	= 2.700 ac	Curve number	= 68
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 14.80 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

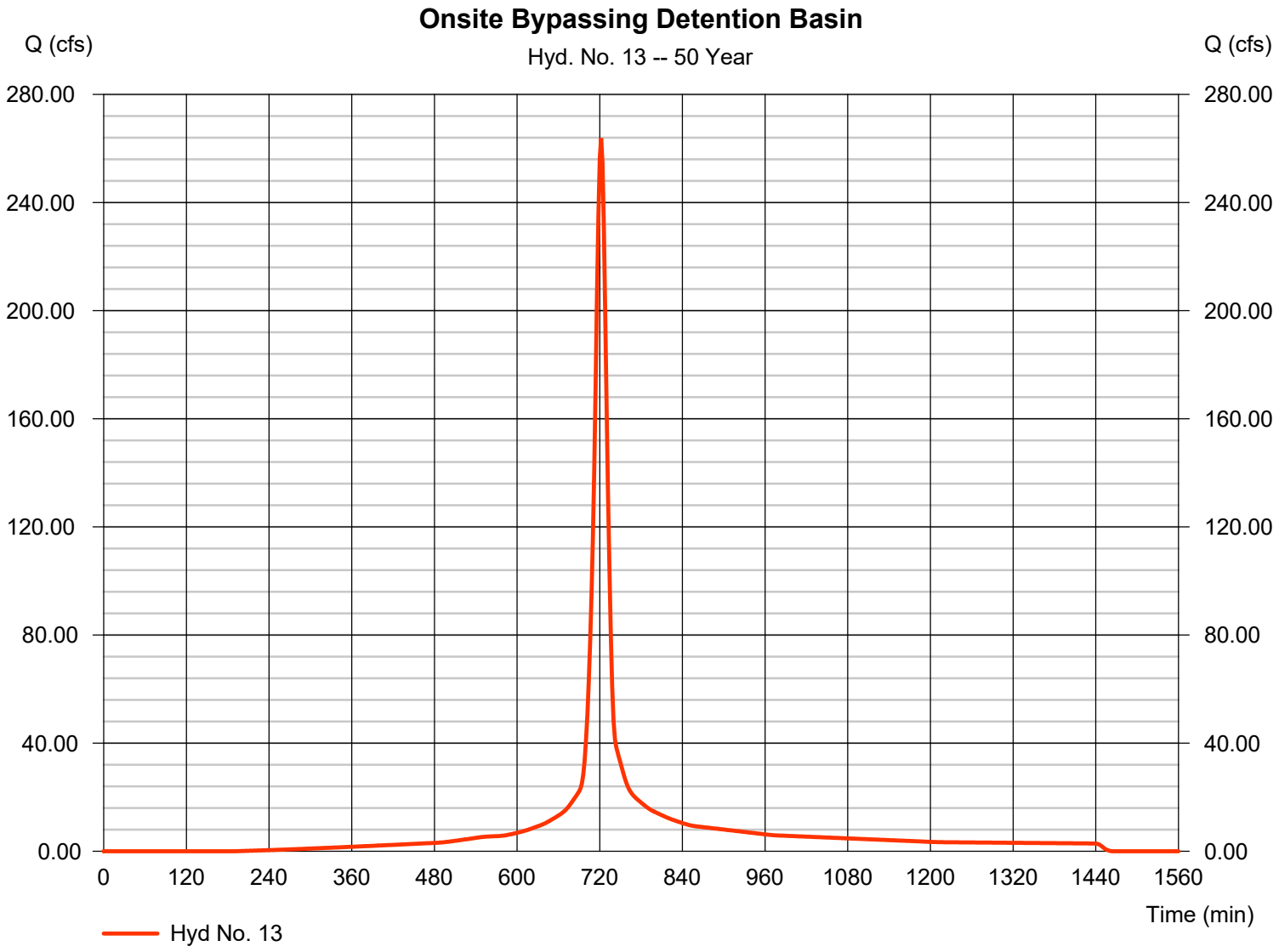
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 — Friday, 06 / 10 / 2016

Hyd. No. 13

Onsite Bypassing Detention Basin

On-site area increased by 2.1 acres to account for Popeyes parcel as an on-site area (48.6 + 2.1 = 50.7 acres)

Hydrograph type	= SCS Runoff	Peak discharge	= 263.79 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 782,086 cuft
Drainage area	= 50.700 ac	Curve number	= 91.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 14.80 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



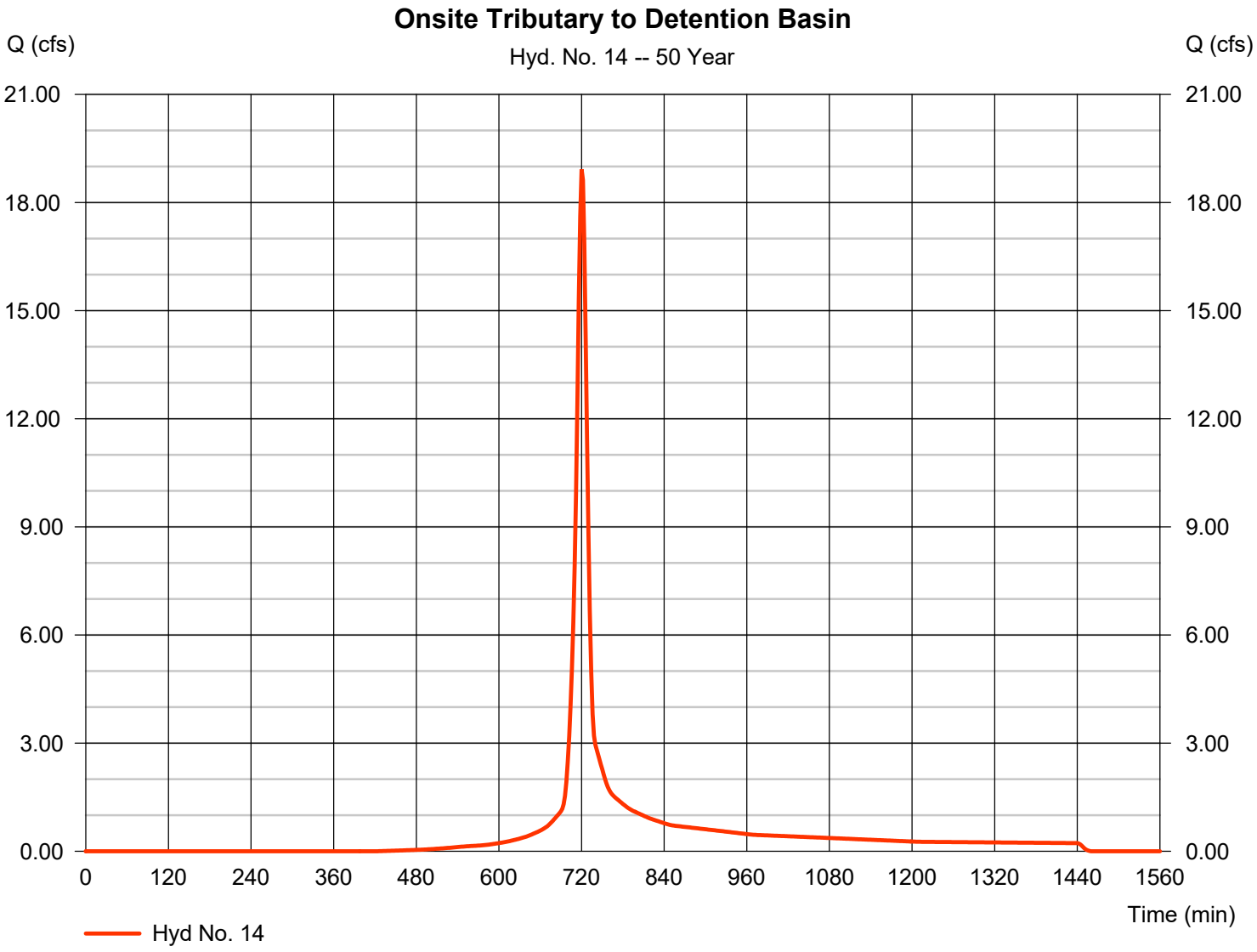
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 14

Onsite Tributary to Detention Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 18.92 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 49,153 cuft
Drainage area	= 4.200 ac	Curve number	= 79.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 12.40 min
Total precip.	= 5.32 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

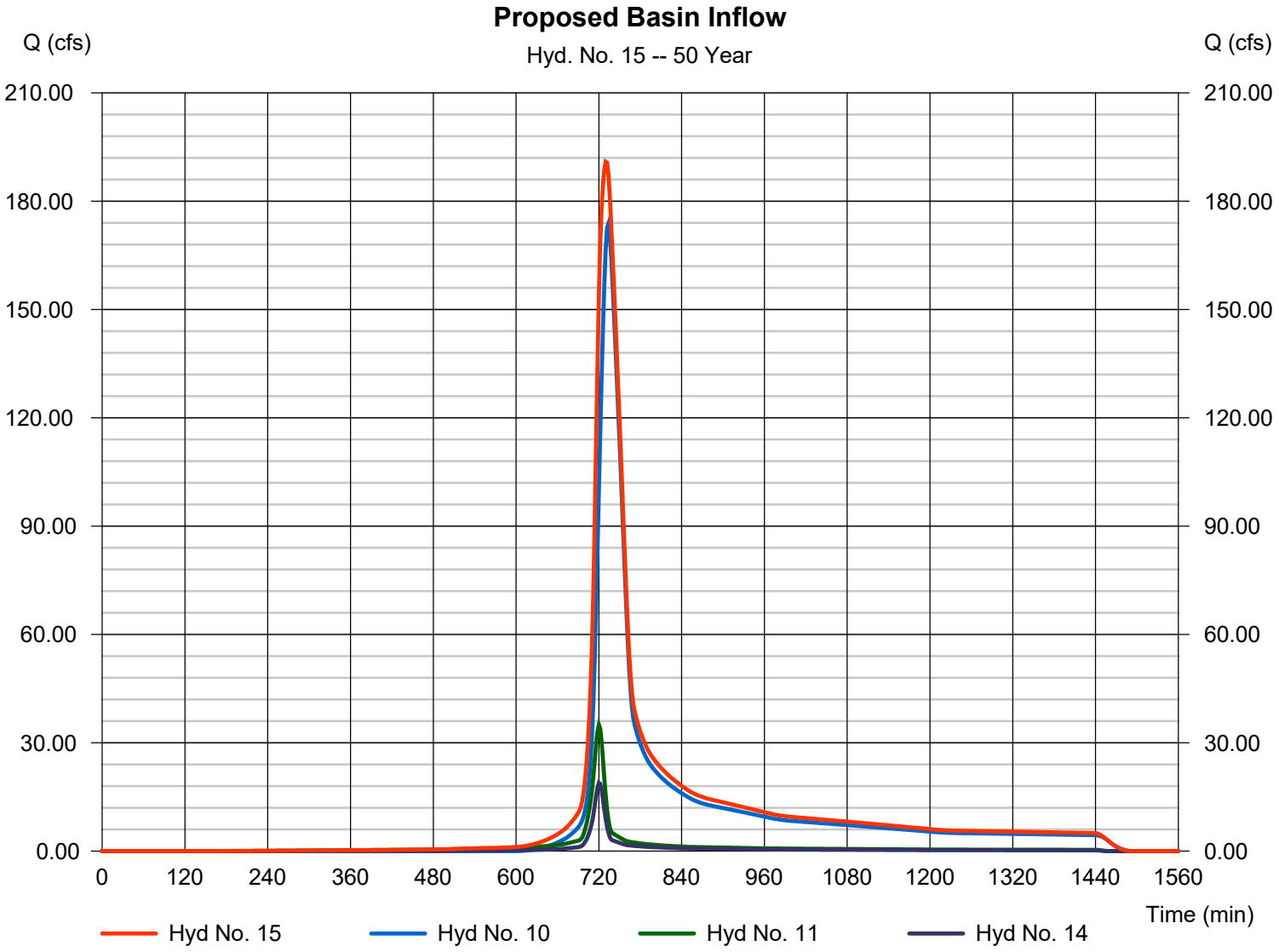


Hydrograph Report

Hyd. No. 15

Proposed Basin Inflow

Hydrograph type	= Combine	Peak discharge	= 190.95 cfs
Storm frequency	= 50 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 920,098 cuft
Inflow hyds.	= 10, 11, 14	Contrib. drain. area	= 109.000 ac



Hydrograph Report

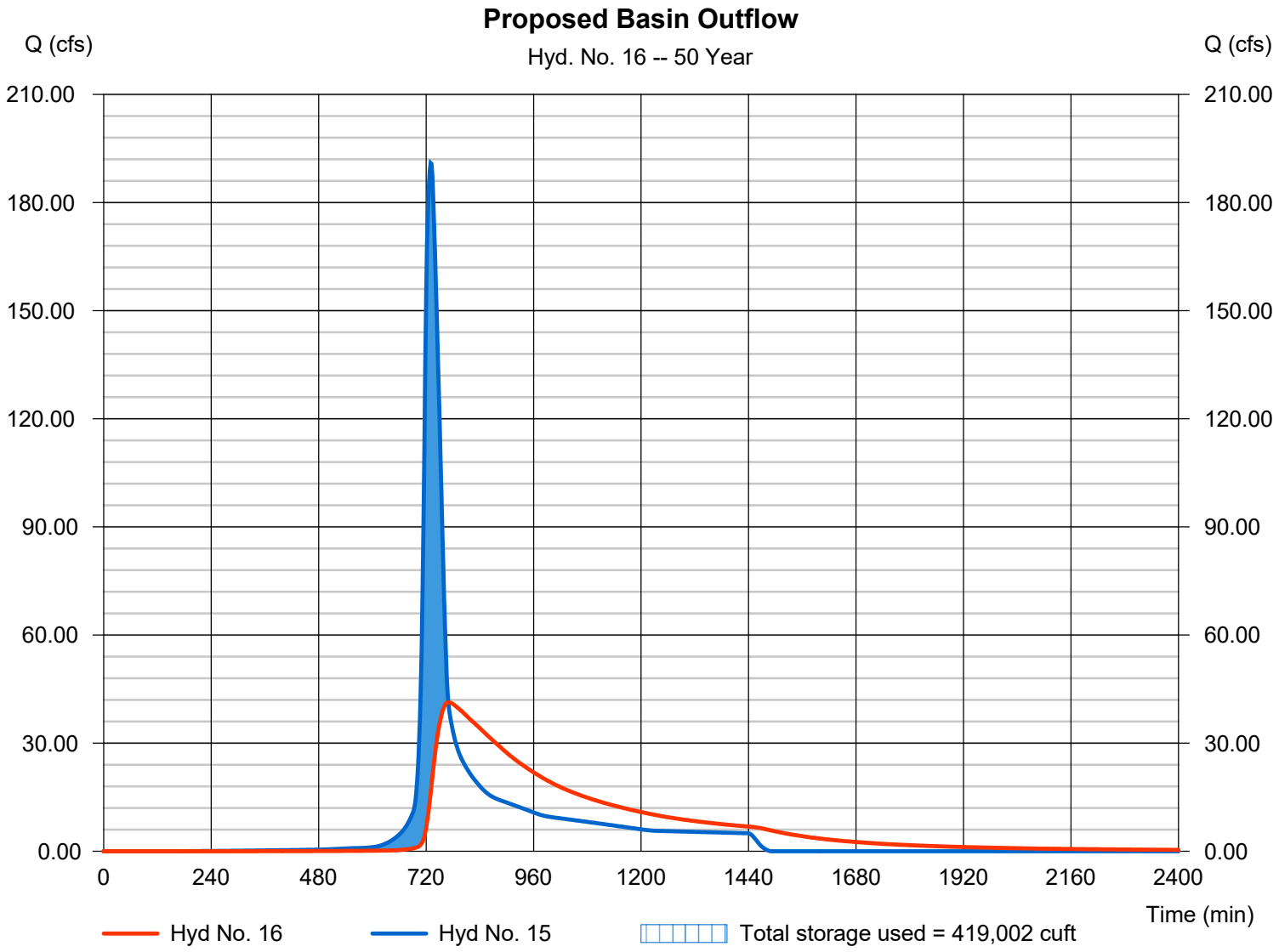
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

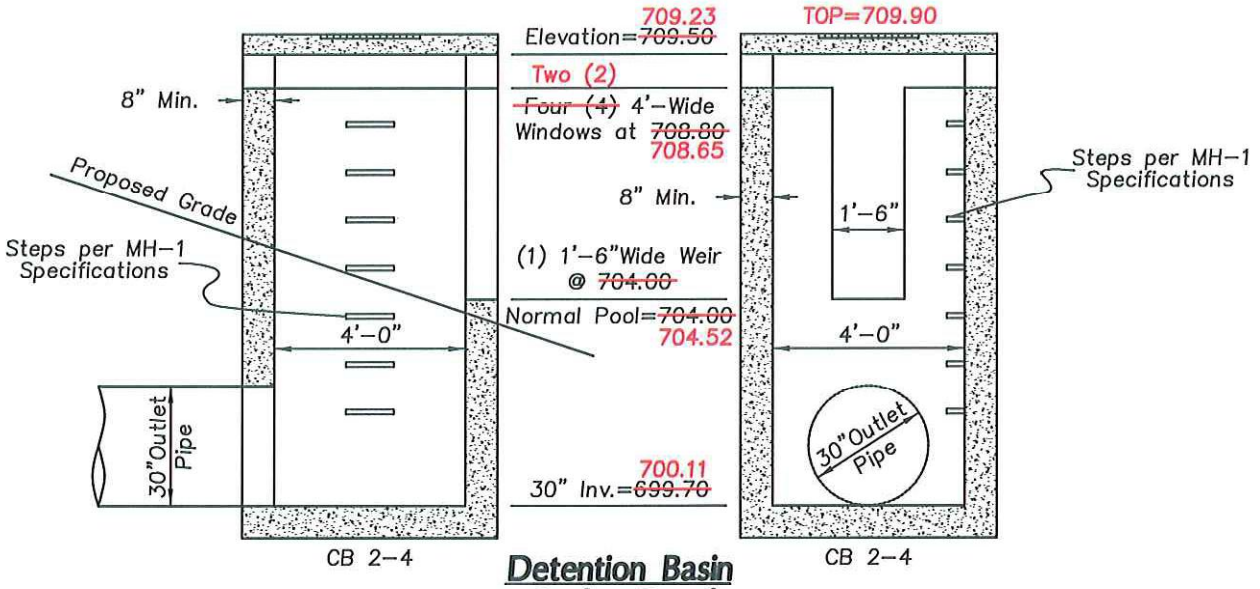
Hyd. No. 16

Proposed Basin Outflow

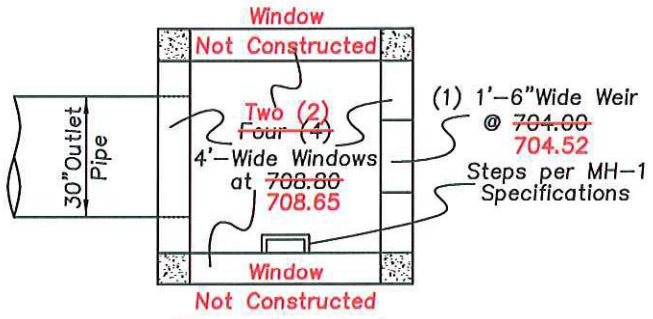
Hydrograph type	=	Reservoir	Peak discharge	=	41.32 cfs
Storm frequency	=	50 yrs	Time to peak	=	770 min
Time interval	=	2 min	Hyd. volume	=	919,768 cuft
Inflow hyd. No.	=	15 - Proposed Basin Inflow	Max. Elevation	=	708.87 ft
Reservoir name	=	As-Built Proposed Basin	Max. Storage	=	419,002 cuft

Storage Indication method used.

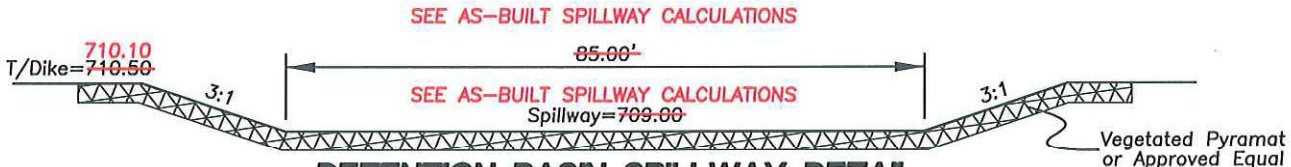




Detention Basin
Outlet Detail
Side Views



Detention Basin
Outlet Detail
Top View



DETENTION BASIN SPILLWAY DETAIL

07M097-000 OUTLET STRUCTURES

AS-BUILT 8/09/10

Drawing:	
Scale	nts
Drawn by:	GJK
Checked By:	
Issue Date:	8-25-08

THE FOUNTAINS OF FAIRFIELD TOWNSHIP

2865 PRINCETON ROAD
SECTION 25, TOWN 2, RANGE 3
FAIRFIELD TOWNSHIP, BUTLER COUNTY OHIO

DETENTION BASIN OUTLET DETAILS

bayer becker
6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Pond No. 2 - As-Built Proposed Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 704.52 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	704.52	86,157	0	0
1.48	706.00	92,665	132,284	132,284
3.48	708.00	101,212	193,795	326,079
5.48	710.00	112,584	213,674	539,753
5.98	710.50	115,415	56,993	596,745

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	0.00	0.00	0.00
Span (in)	= 30.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 700.11	0.00	0.00	0.00
Length (ft)	= 136.00	0.00	0.00	0.00
Slope (%)	= 0.67	0.00	0.00	n/a
N-Value	= .016	.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)	= 1.50	6.50	99.00	0.00
Crest El. (ft)	= 704.52	708.65	709.59	0.00
Weir Coeff.	= 3.00	3.00	3.00	3.33
Weir Type	= Rect	Rect	Rect	---
Multi-Stage	= Yes	Yes	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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	704.52	0.00	---	---	---	0.00	0.00	0.00	---	---	---	0.000
0.15	13,228	704.67	35.95 oc	---	---	---	0.26	0.00	0.00	---	---	---	0.256
0.30	26,457	704.82	35.95 oc	---	---	---	0.72	0.00	0.00	---	---	---	0.725
0.44	39,685	704.96	35.95 oc	---	---	---	1.33	0.00	0.00	---	---	---	1.332
0.59	52,914	705.11	35.95 oc	---	---	---	2.05	0.00	0.00	---	---	---	2.050
0.74	66,142	705.26	35.95 oc	---	---	---	2.86	0.00	0.00	---	---	---	2.865
0.89	79,370	705.41	35.95 oc	---	---	---	3.77	0.00	0.00	---	---	---	3.766
1.04	92,599	705.56	35.95 oc	---	---	---	4.75	0.00	0.00	---	---	---	4.746
1.18	105,827	705.70	35.95 oc	---	---	---	5.80	0.00	0.00	---	---	---	5.798
1.33	119,056	705.85	35.95 oc	---	---	---	6.92	0.00	0.00	---	---	---	6.919
1.48	132,284	706.00	35.95 oc	---	---	---	8.10	0.00	0.00	---	---	---	8.102
1.68	151,664	706.20	35.95 oc	---	---	---	9.80	0.00	0.00	---	---	---	9.799
1.88	171,043	706.40	35.95 oc	---	---	---	11.60	0.00	0.00	---	---	---	11.60
2.08	190,423	706.60	35.95 oc	---	---	---	13.50	0.00	0.00	---	---	---	13.50
2.28	209,802	706.80	35.95 oc	---	---	---	15.49	0.00	0.00	---	---	---	15.49
2.48	229,182	707.00	35.95 oc	---	---	---	17.58	0.00	0.00	---	---	---	17.58
2.68	248,561	707.20	35.95 oc	---	---	---	19.74	0.00	0.00	---	---	---	19.74
2.88	267,941	707.40	35.95 oc	---	---	---	21.99	0.00	0.00	---	---	---	21.99
3.08	287,320	707.60	35.95 oc	---	---	---	24.33	0.00	0.00	---	---	---	24.33
3.28	306,699	707.80	35.95 oc	---	---	---	26.73	0.00	0.00	---	---	---	26.73
3.48	326,079	708.00	35.95 oc	---	---	---	29.21	0.00	0.00	---	---	---	29.21
3.68	347,446	708.20	35.95 oc	---	---	---	31.77	0.00	0.00	---	---	---	31.77
3.88	368,814	708.40	35.95 oc	---	---	---	34.39	0.00	0.00	---	---	---	34.39
4.08	390,181	708.60	36.97 oc	---	---	---	36.97 s	0.00	0.00	---	---	---	36.97
4.28	411,548	708.80	40.00 oc	---	---	---	38.87 s	1.13	0.00	---	---	---	40.00
4.48	432,916	709.00	43.79 oc	---	---	---	39.75 s	4.04	0.00	---	---	---	43.79
4.68	454,283	709.20	47.57 oc	---	---	---	39.61 s	7.95	0.00	---	---	---	47.57
4.88	475,651	709.40	51.11 oc	---	---	---	38.44 s	12.67	0.00	---	---	---	51.11
5.08	497,018	709.60	54.28 oc	---	---	---	36.23 s	18.06	0.30	---	---	---	54.58
5.28	518,385	709.80	56.95 oc	---	---	---	33.25 s	23.70 s	28.60	---	---	---	85.55
5.48	539,753	710.00	58.66 oc	---	---	---	31.53 s	27.12 s	77.96	---	---	---	136.62
5.53	545,452	710.05	59.03 oc	---	---	---	31.19 s	27.84 s	92.65	---	---	---	151.68
5.58	551,151	710.10	59.38 oc	---	---	---	30.86 s	28.52 s	108.15	---	---	---	167.53
5.63	556,850	710.15	59.71 oc	---	---	---	30.55 s	29.16 s	124.46	---	---	---	184.17
5.68	562,550	710.20	60.04 oc	---	---	---	30.25 s	29.78 s	141.49	---	---	---	201.53
5.73	568,249	710.25	60.35 oc	---	---	---	29.97 s	30.37 s	159.19	---	---	---	219.54
5.78	573,948	710.30	60.65 oc	---	---	---	29.70 s	30.94 s	177.64	---	---	---	238.29
5.83	579,647	710.35	60.94 oc	---	---	---	29.44 s	31.49 s	196.73	---	---	---	257.67

Continues on next page...

As-Built Proposed Basin

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
5.88	585,347	710.40	61.22 oc	---	---	---	29.20 s	32.02 s	216.46	---	---	---	277.68
5.93	591,046	710.45	61.50 oc	---	---	---	28.96 s	32.53 s	236.81	---	---	---	298.30
5.98	596,745	710.50	61.77 oc	---	---	---	28.73 s	33.03 s	257.81	---	---	---	319.57

...End

Hydrograph Report

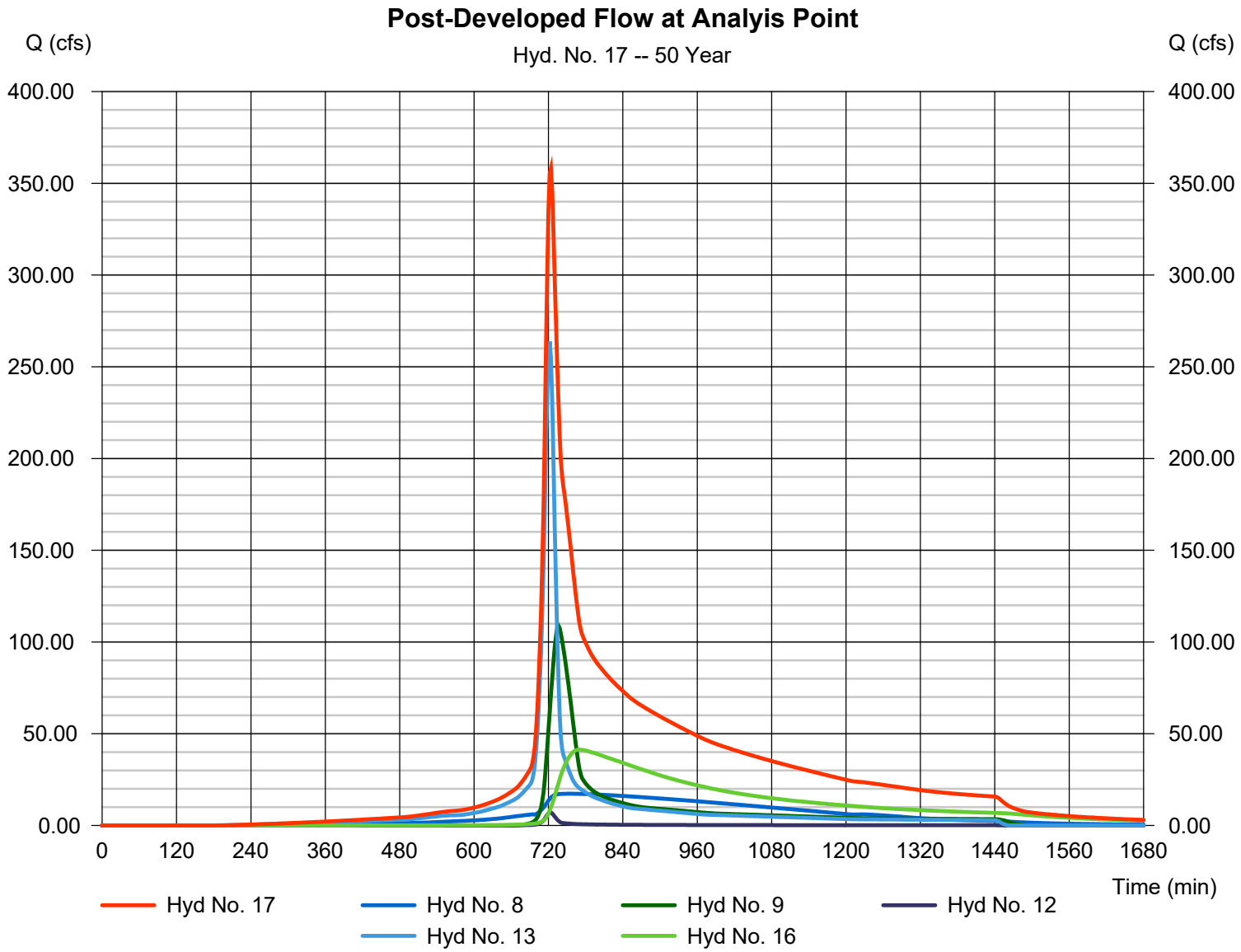
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 — Friday, 06 / 10 / 2016

Hyd. No. 17

Post-Developed Flow at Analyis Point

50 year post-development release rate which is less than the allowable rate of 360.17 cfs

Hydrograph type	=	Combine	Peak discharge	=	358.00 cfs
Storm frequency	=	50 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	2,768,976 cuft
Inflow hyds.	=	8, 9, 12, 13, 16	Contrib. drain. area	=	143.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

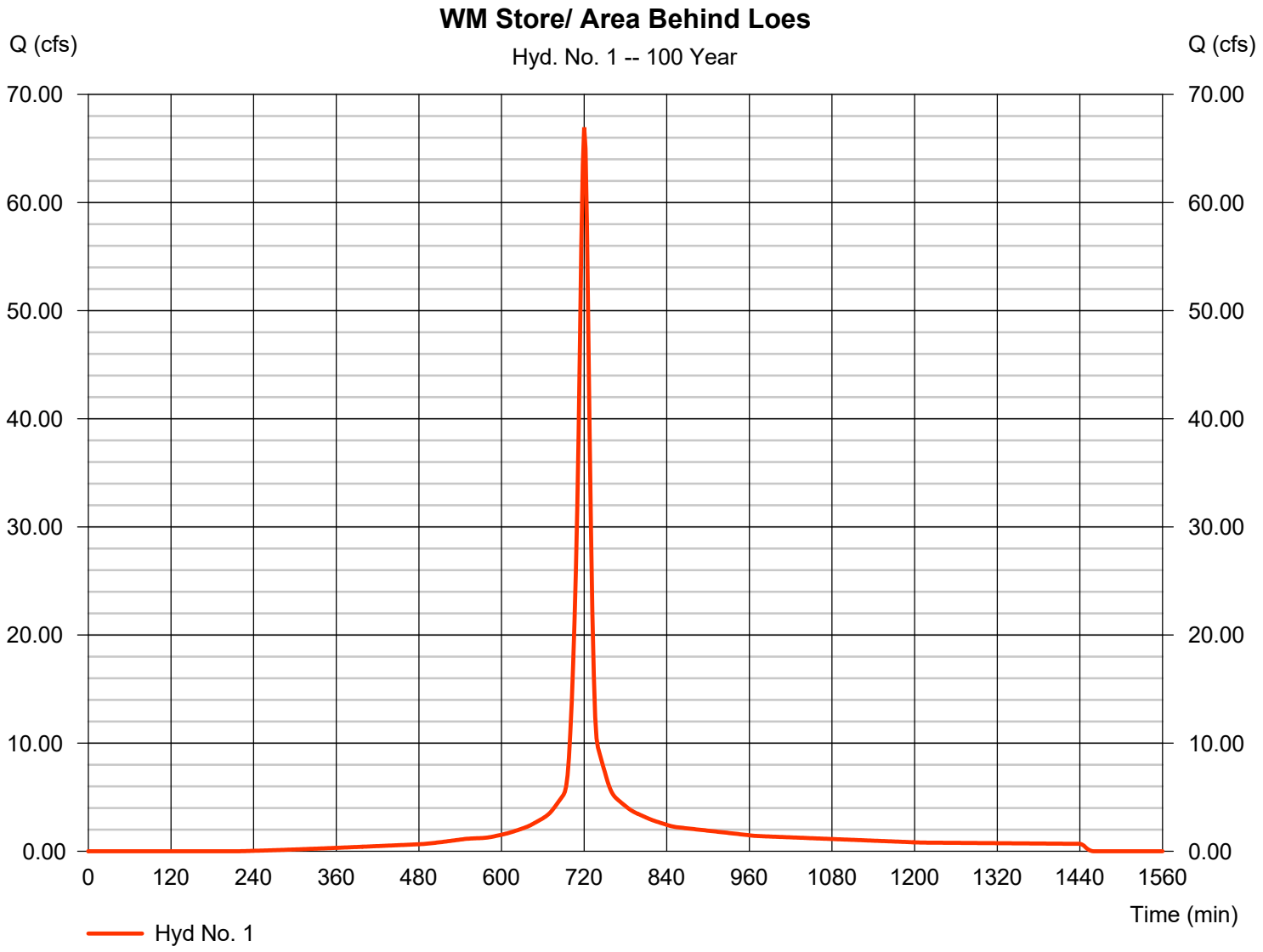
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	66.96	2	720	181,936	------	------	------	WM Store/ Area Behind Loes
2	SCS Runoff	35.23	2	720	100,079	------	------	------	Lowes Outlots
3	SCS Runoff	45.70	2	720	137,045	------	------	------	Lowes Parking Lot
4	SCS Runoff	11.73	2	720	35,184	------	------	------	Area Around Lowes
5	SCS Runoff	22.45	2	720	67,328	------	------	------	Lowes Store
6	SCS Runoff	27.92	2	720	72,879	------	------	------	Detention Area
7	Combine	209.99	2	720	594,452	1, 2, 3, 4, 5, 6	------	------	Walmart Inflow to Basin = Area 1 (31.
8	Reservoir	18.64	2	756	594,300	7	744.92	300,112	WM Detention Outflow
9	SCS Runoff	144.55	2	736	689,325	------	------	------	Offsite Area 2
10	SCS Runoff	220.98	2	734	971,496	------	------	------	Offsite Area 3
11	SCS Runoff	40.15	2	720	112,395	------	------	------	Offsite Area 4
12	SCS Runoff	8.963	2	722	25,338	------	------	------	Offsite Area 5
13	SCS Runoff	303.85	2	722	908,632	------	------	------	Onsite Bypassing Detention Basin
14	SCS Runoff	22.71	2	720	59,215	------	------	------	Onsite Tributary to Detention Basin
15	Combine	241.36	2	730	1,143,106	10, 11, 14	------	------	Proposed Basin Inflow
16	Reservoir	76.10	2	762	1,142,764	15	709.74	511,869	Proposed Basin Outflow
17	Combine	430.93	2	724	3,360,364	8, 9, 12, 13, 16	------	------	Post-Developed Flow at Analyis Point

Hydrograph Report

Hyd. No. 1

WM Store/ Area Behind Loes

Hydrograph type	= SCS Runoff	Peak discharge	= 66.96 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 181,936 cuft
Drainage area	= 10.180 ac	Curve number	= 89
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

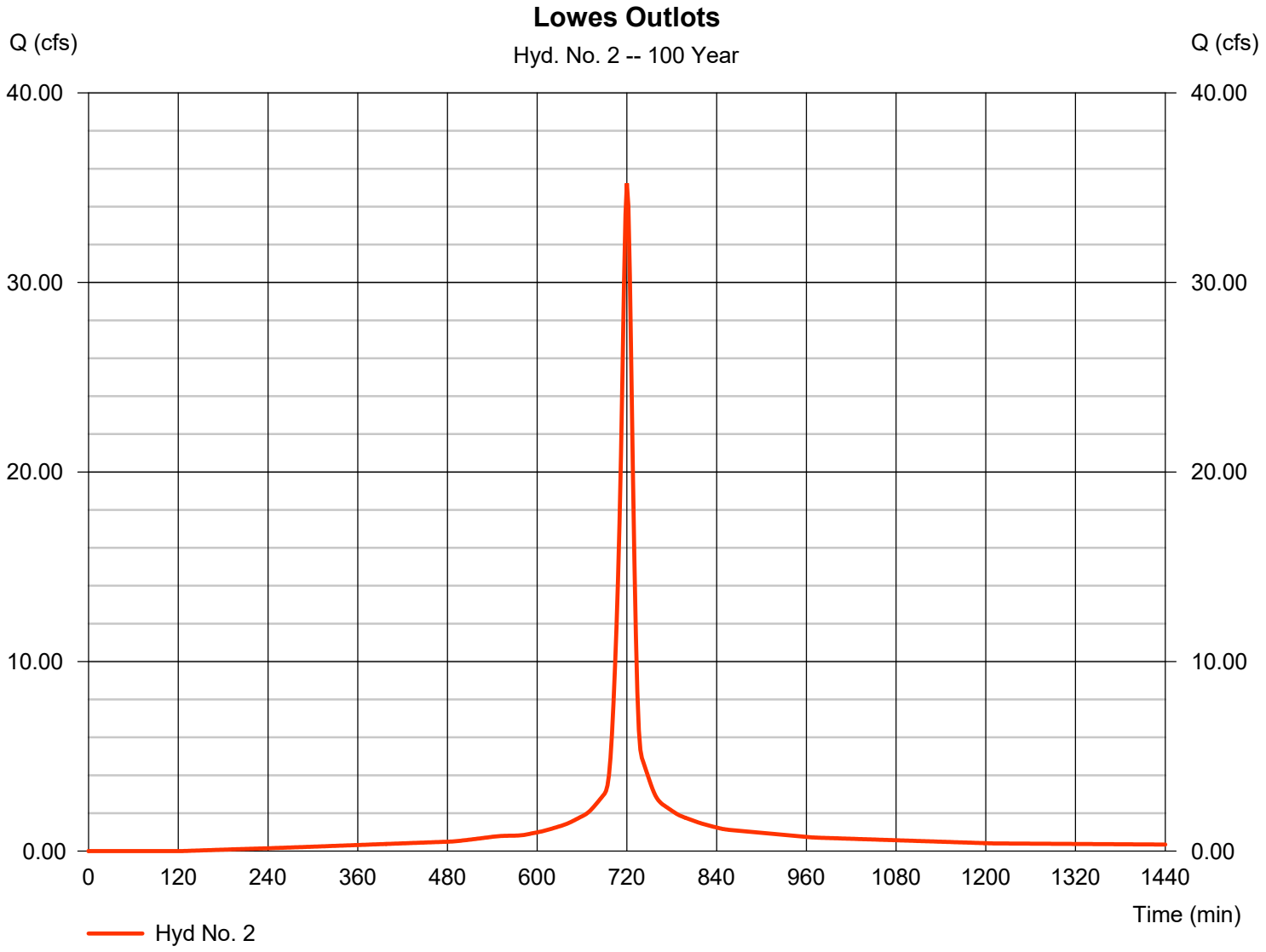


Hydrograph Report

Hyd. No. 2

Lowes Outlots

Hydrograph type	= SCS Runoff	Peak discharge	= 35.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 100,079 cuft
Drainage area	= 5.010 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



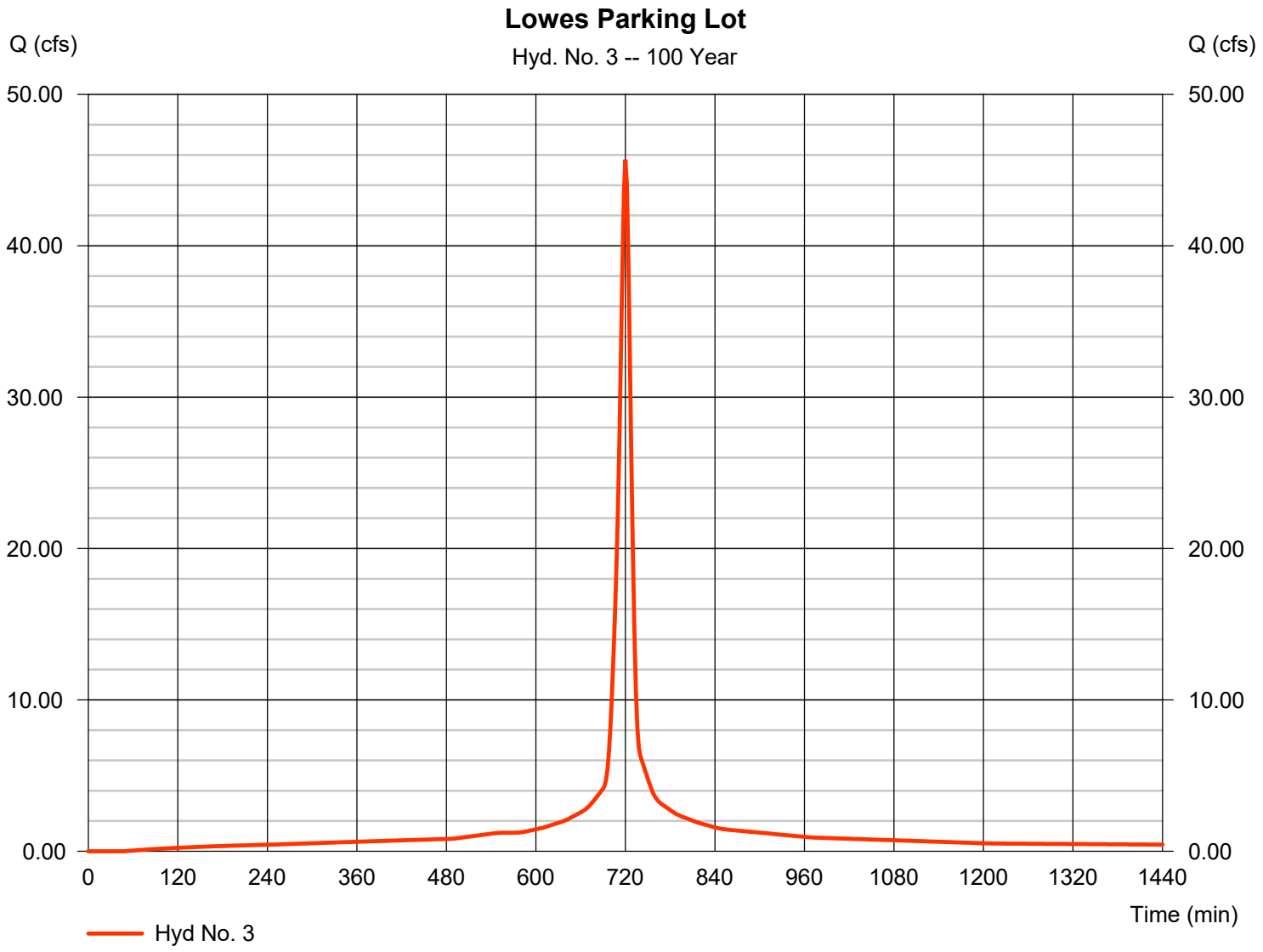
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 3

Lowes Parking Lot

Hydrograph type	= SCS Runoff	Peak discharge	= 45.70 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 137,045 cuft
Drainage area	= 6.310 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



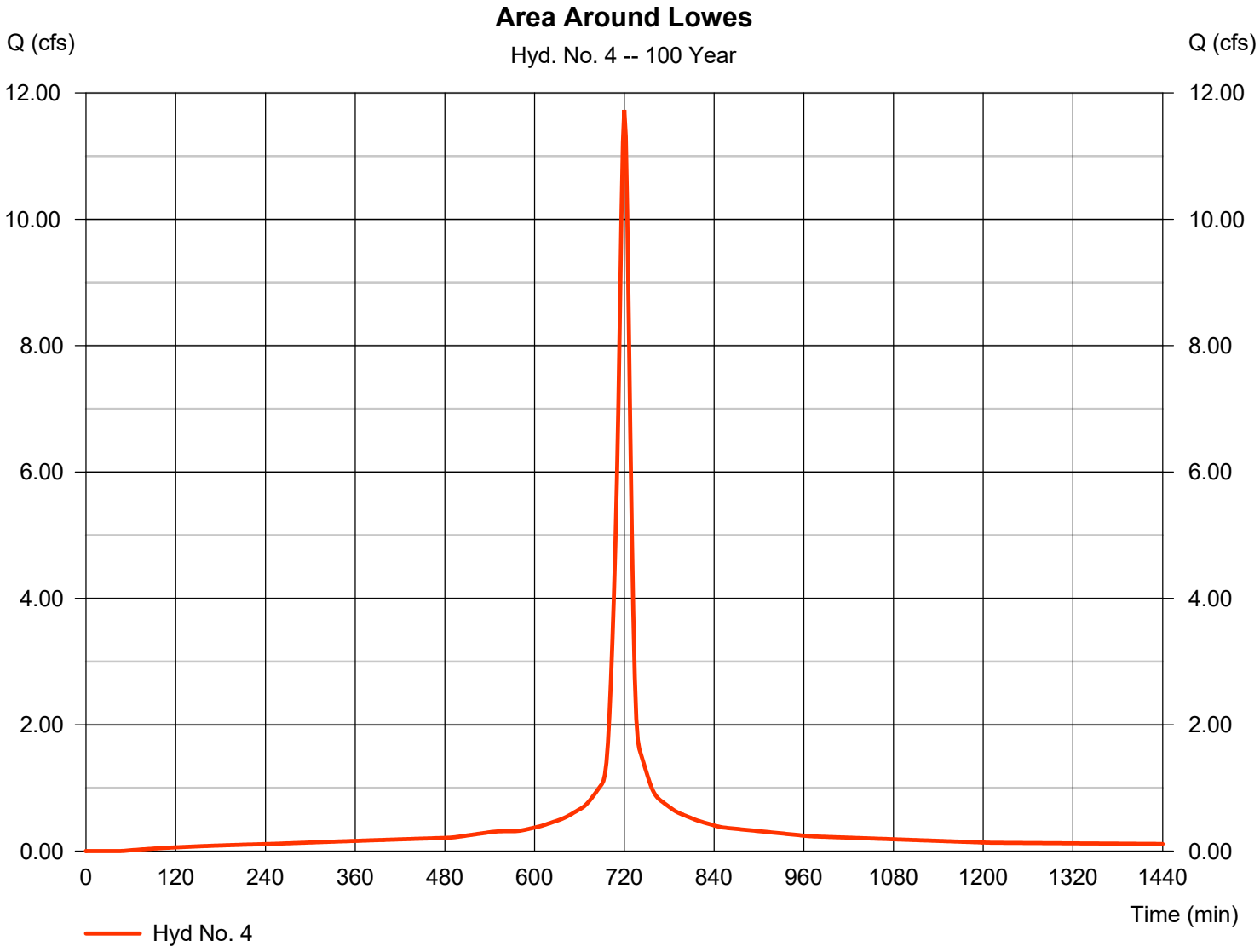
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 4

Area Around Lowes

Hydrograph type	= SCS Runoff	Peak discharge	= 11.73 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 35,184 cuft
Drainage area	= 1.620 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

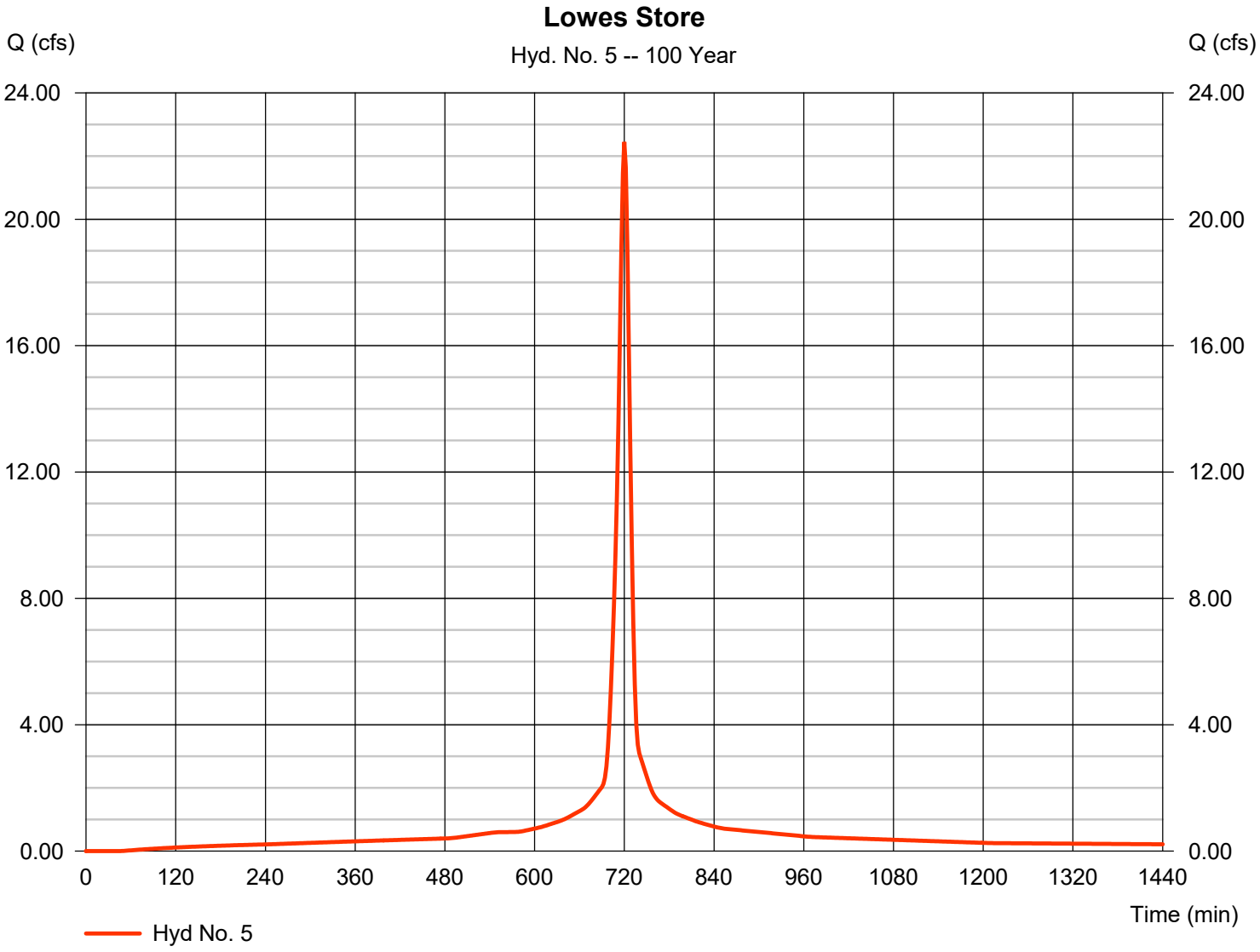


Hydrograph Report

Hyd. No. 5

Lowes Store

Hydrograph type	= SCS Runoff	Peak discharge	= 22.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 67,328 cuft
Drainage area	= 3.100 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



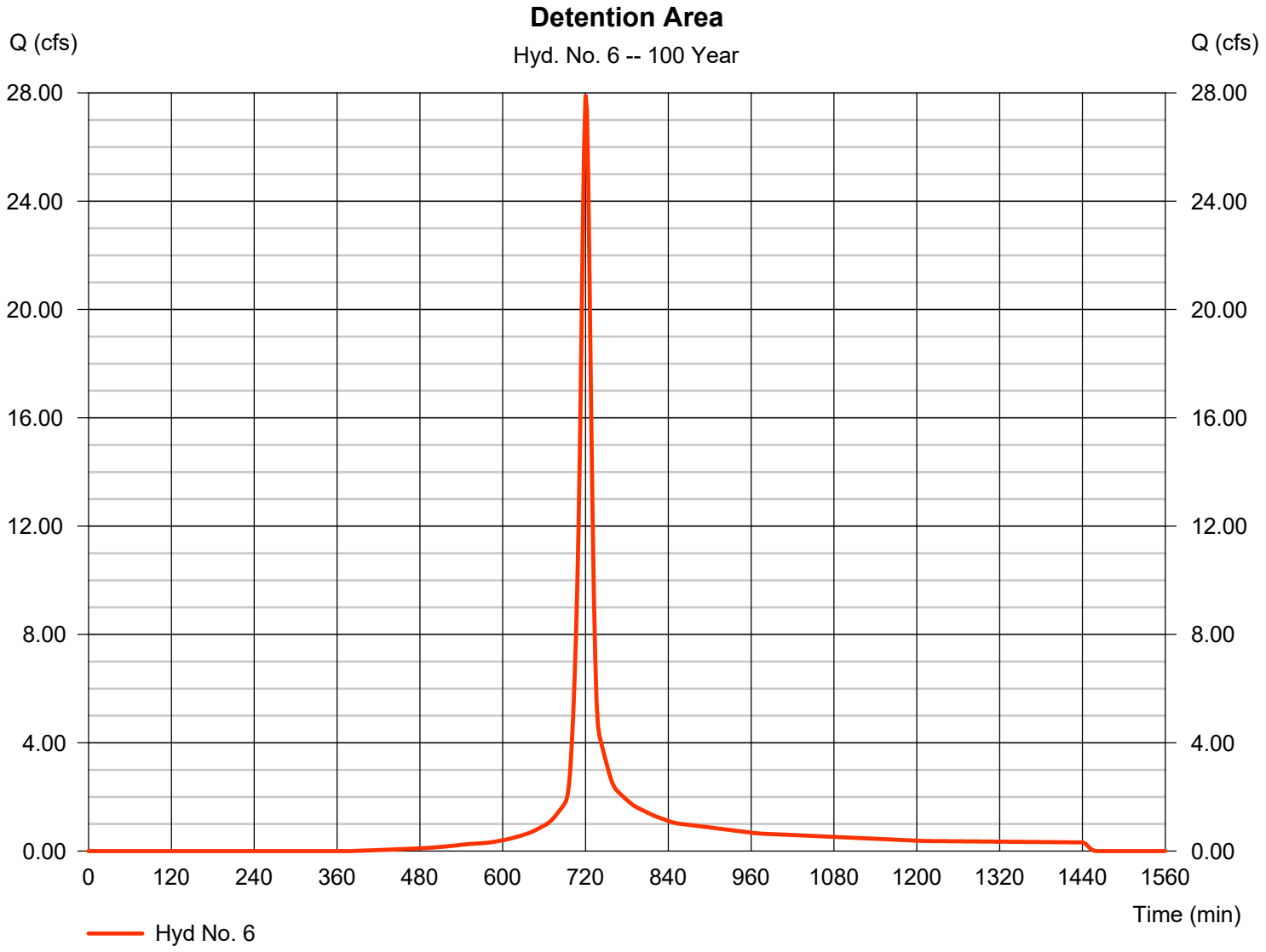
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 6

Detention Area

Hydrograph type	= SCS Runoff	Peak discharge	= 27.92 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 72,879 cuft
Drainage area	= 5.100 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



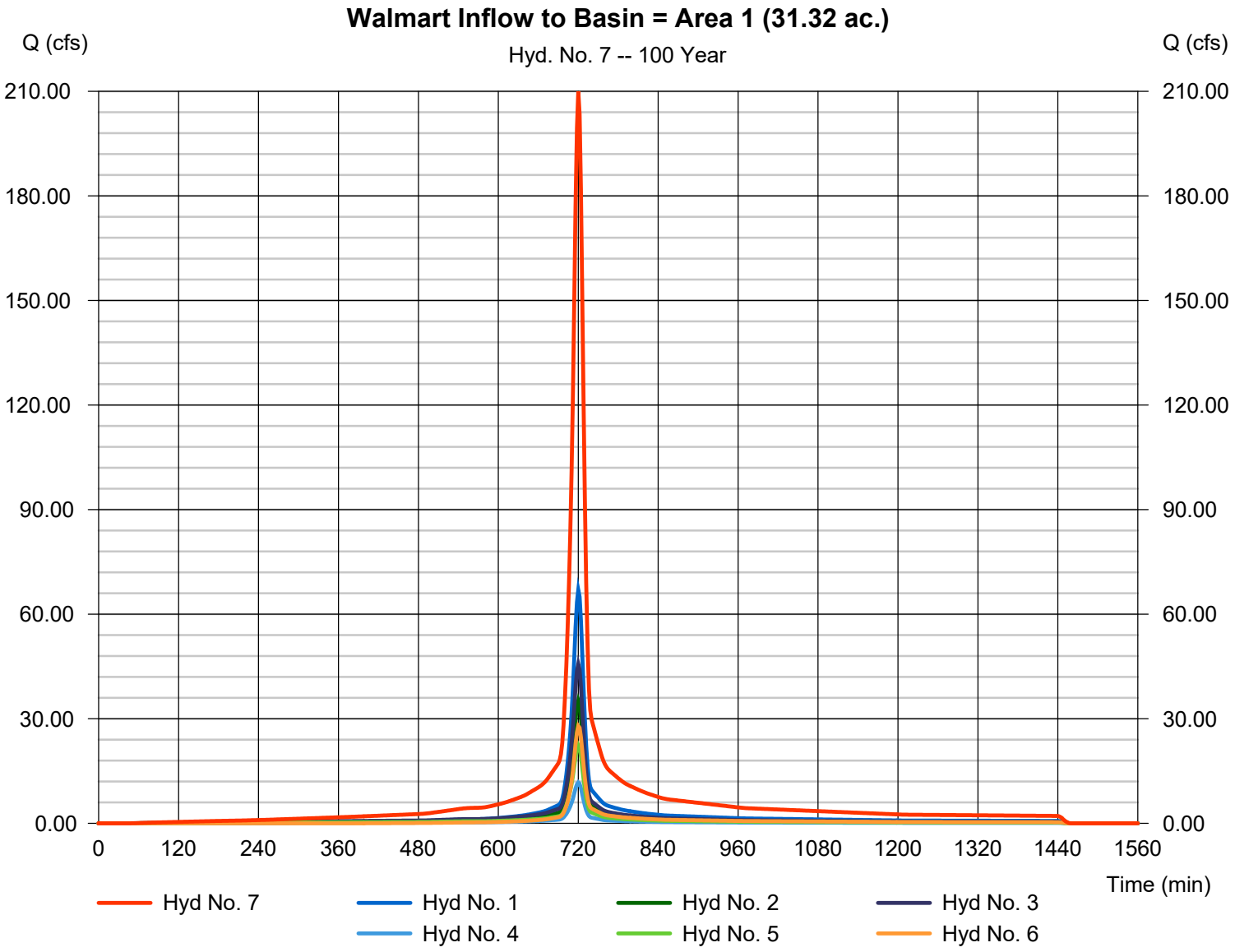
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 7

Walmart Inflow to Basin = Area 1 (31.32 ac.)

Hydrograph type	= Combine	Peak discharge	= 209.99 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 594,452 cuft
Inflow hyds.	= 1, 2, 3, 4, 5, 6	Contrib. drain. area	= 31.320 ac



Hydrograph Report

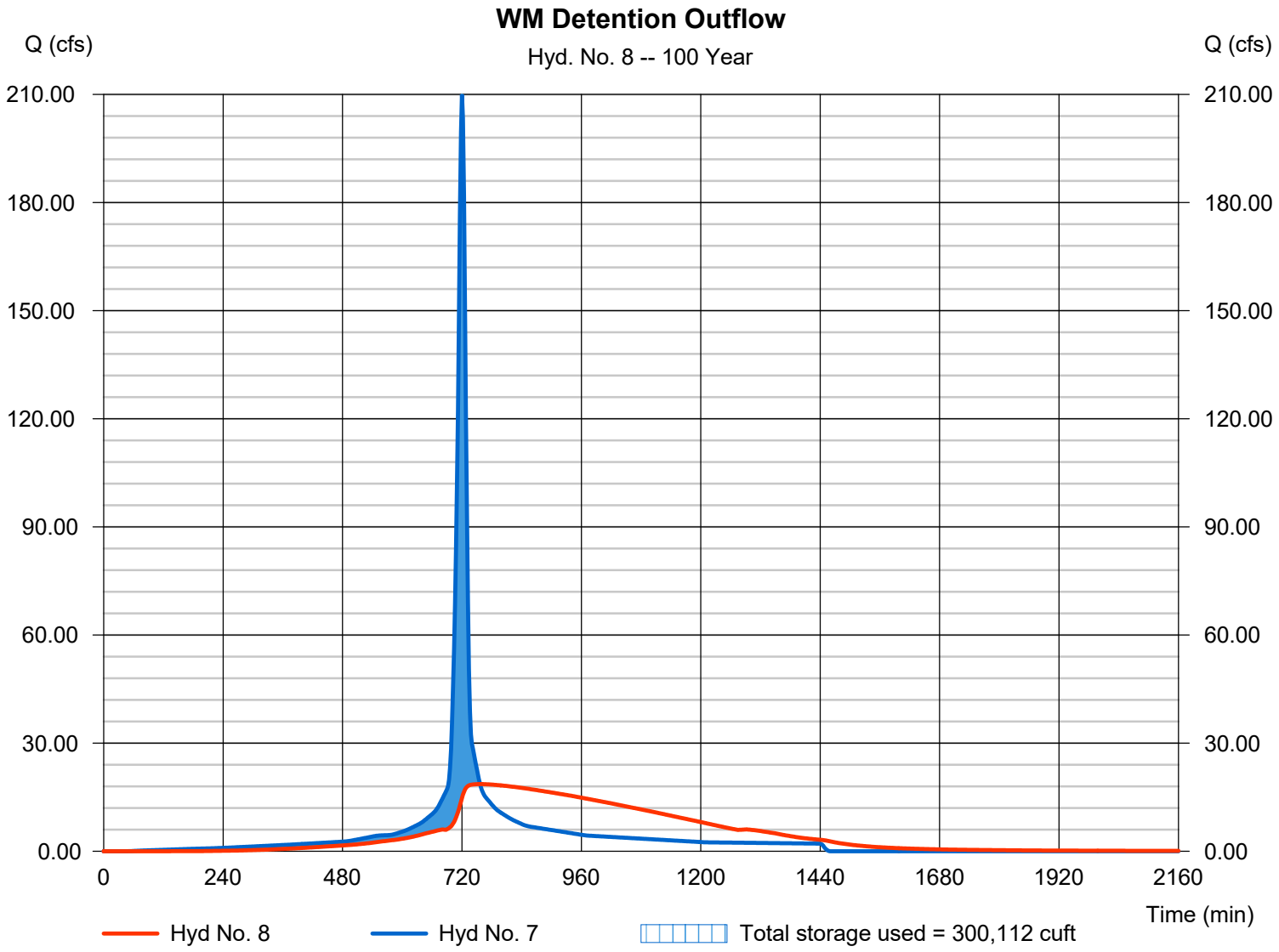
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 8

WM Detention Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	18.64 cfs
Storm frequency	=	100 yrs	Time to peak	=	756 min
Time interval	=	2 min	Hyd. volume	=	594,300 cuft
Inflow hyd. No.	=	7 - Walmart Inflow to Basin = Area (61.32 ac.)	Max. Elevation	=	744.92 ft
Reservoir name	=	Existing Wal-Mart	Max. Storage	=	300,112 cuft

Storage Indication method used.



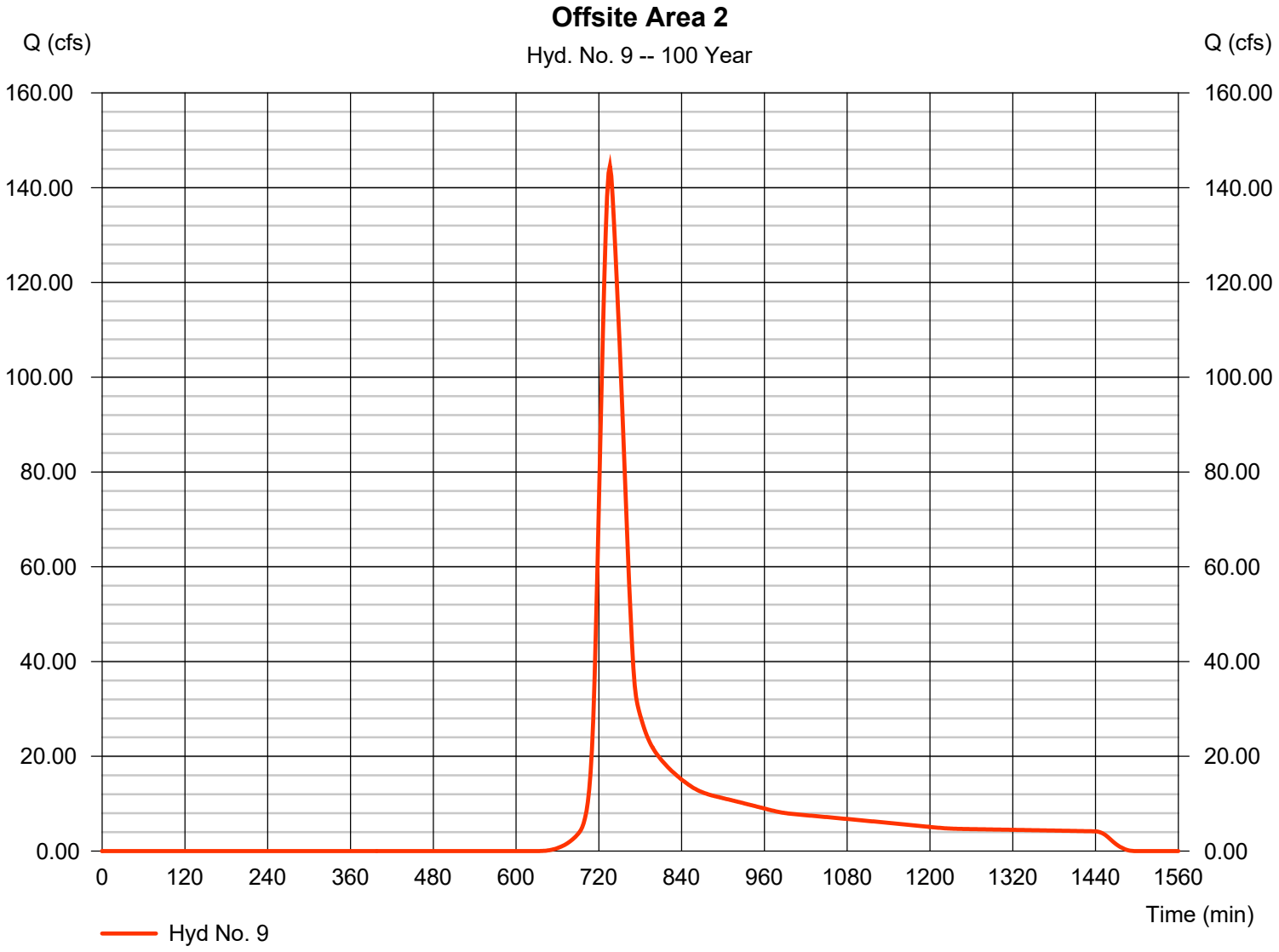
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 9

Offsite Area 2

Hydrograph type	= SCS Runoff	Peak discharge	= 144.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 689,325 cuft
Drainage area	= 89.600 ac	Curve number	= 62.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 33.90 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



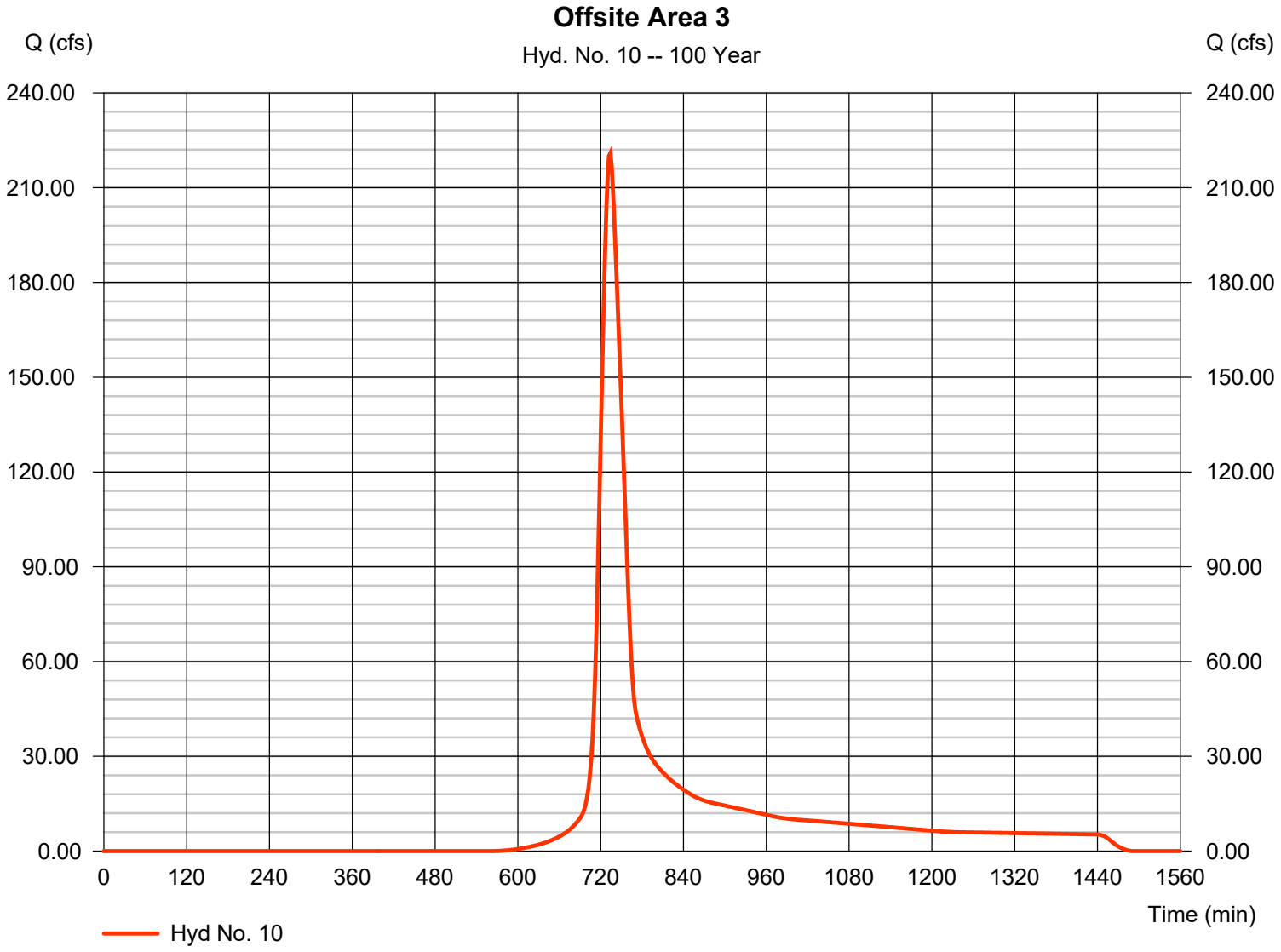
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 10

Offsite Area 3

Hydrograph type	= SCS Runoff	Peak discharge	= 220.98 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 971,496 cuft
Drainage area	= 99.000 ac	Curve number	= 68.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 31.80 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



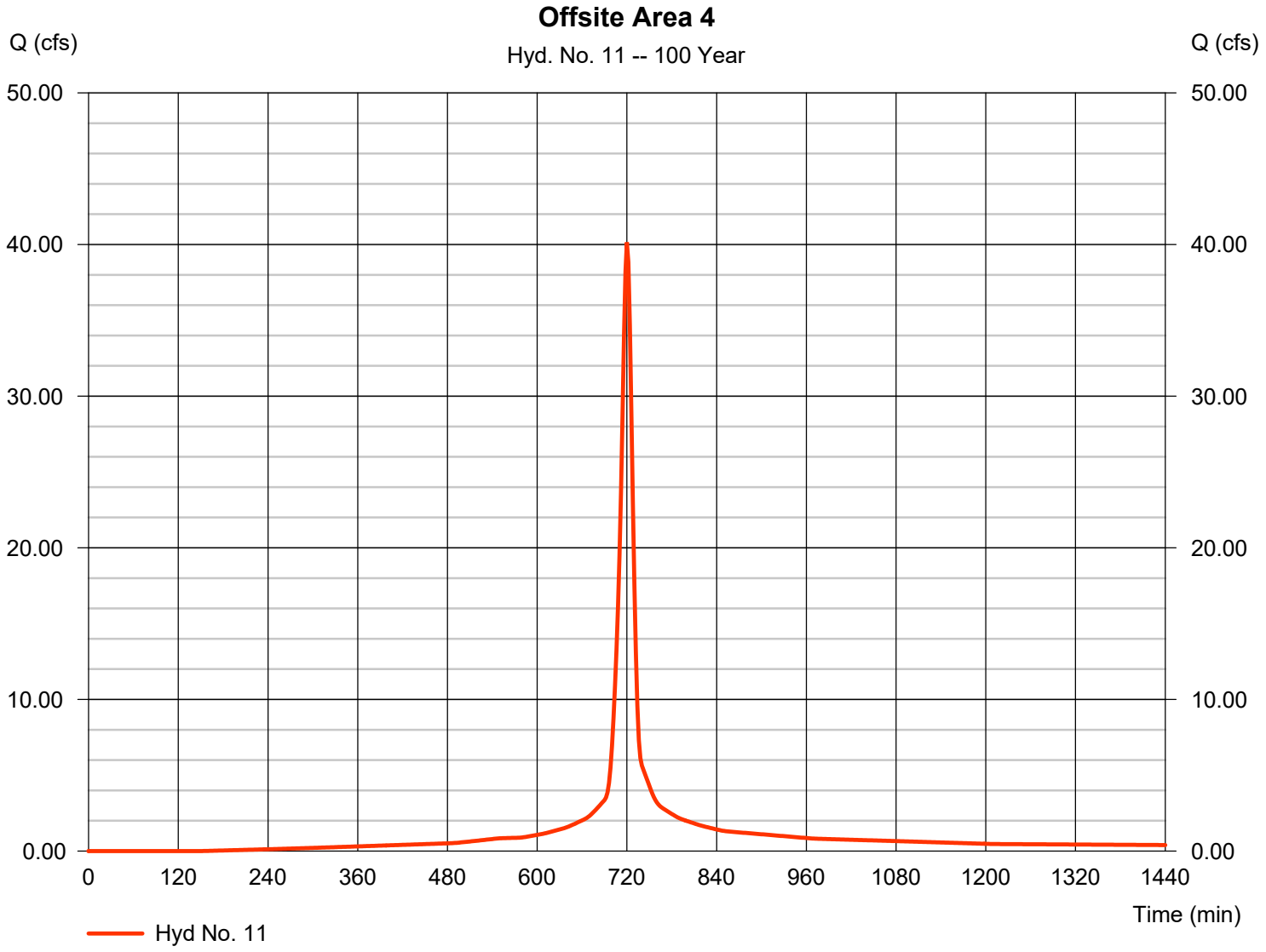
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 11

Offsite Area 4

Hydrograph type	= SCS Runoff	Peak discharge	= 40.15 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 112,395 cuft
Drainage area	= 5.800 ac	Curve number	= 92.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 11.80 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

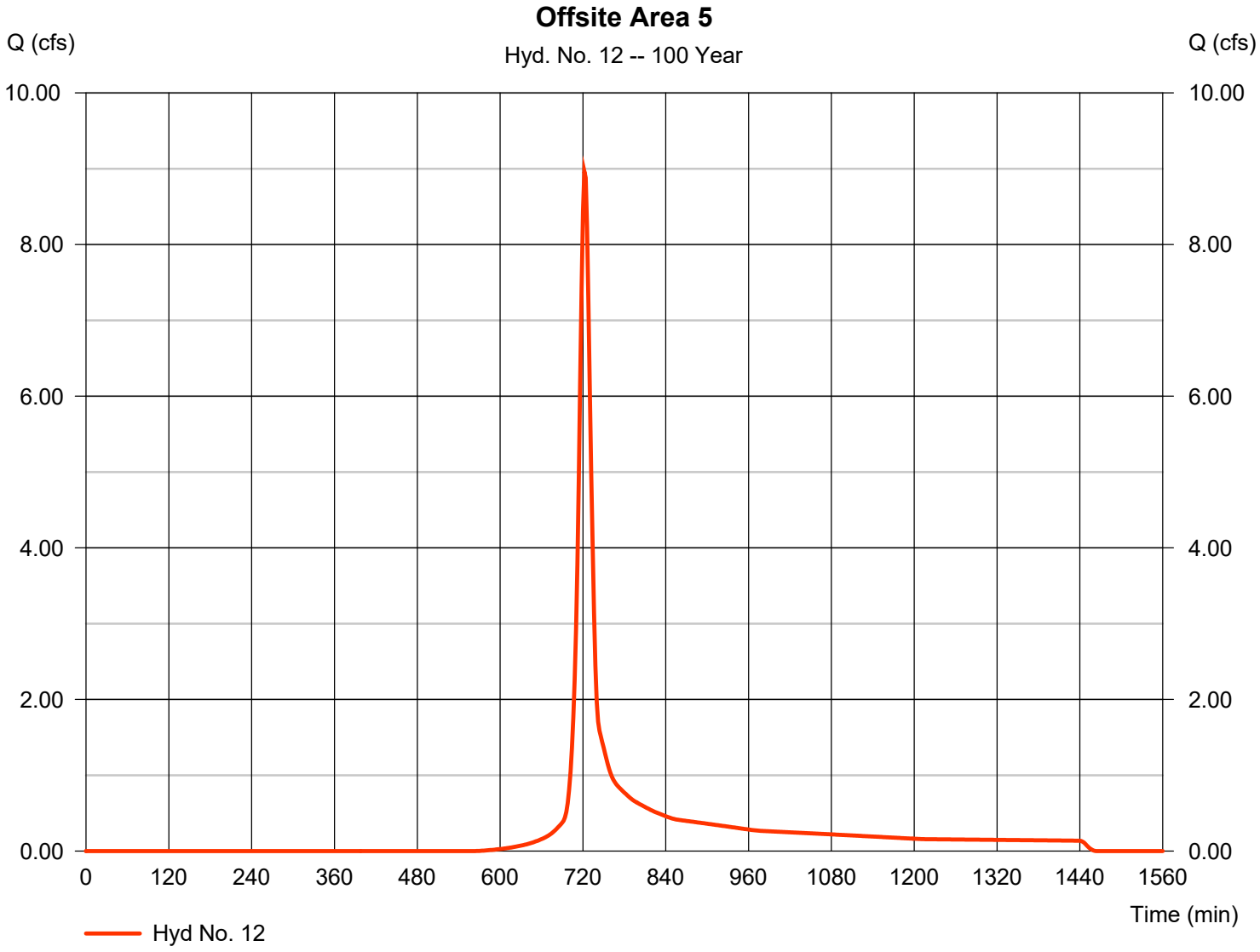


Hydrograph Report

Hyd. No. 12

Offsite Area 5

Hydrograph type	= SCS Runoff	Peak discharge	= 8.963 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 25,338 cuft
Drainage area	= 2.700 ac	Curve number	= 68
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 14.80 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



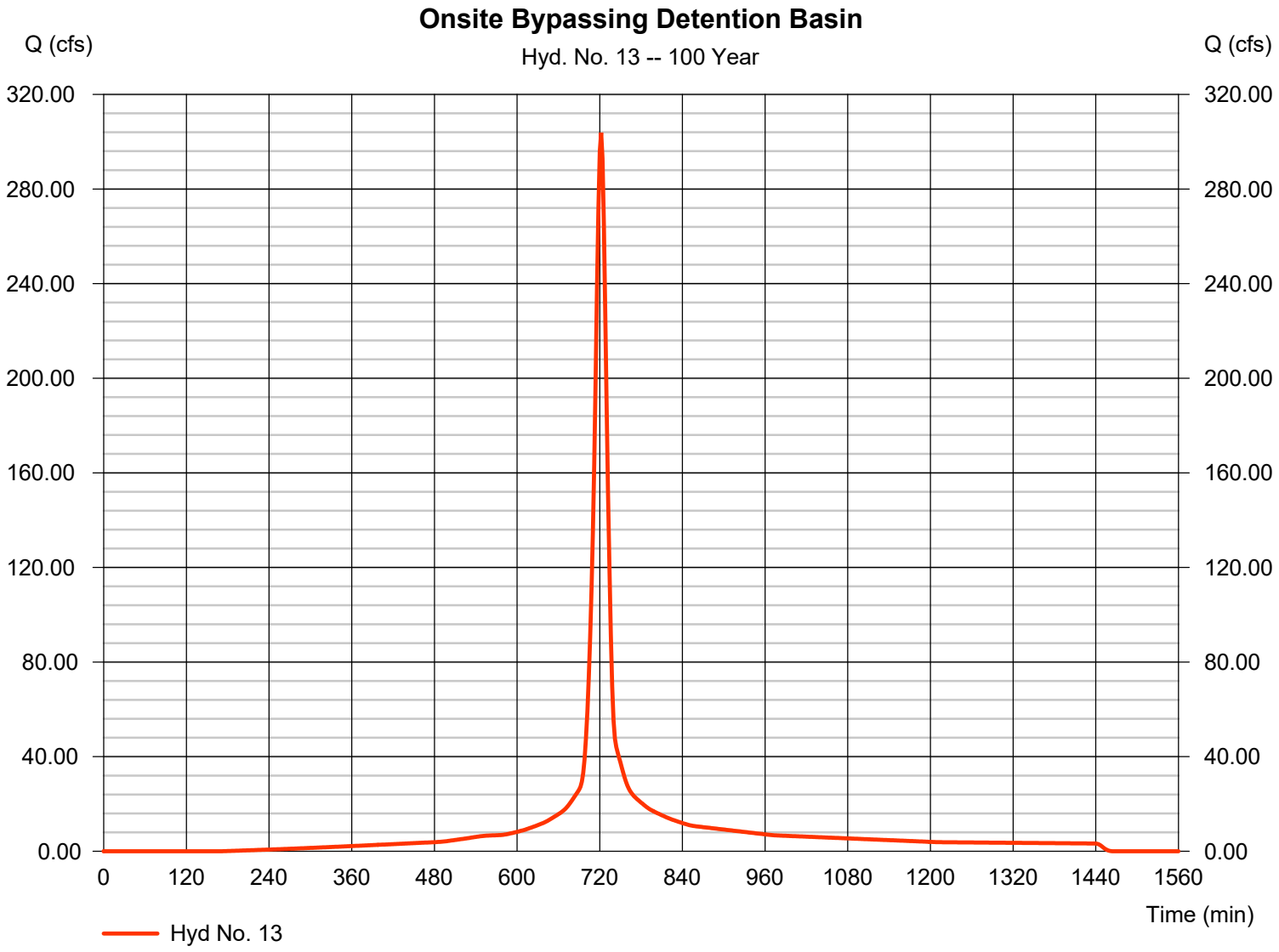
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 13

Onsite Bypassing Detention Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	303.85 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	908,632 cuft
Drainage area	=	50.700 ac	Curve number	=	91.6
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.80 min
Total precip.	=	6.04 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



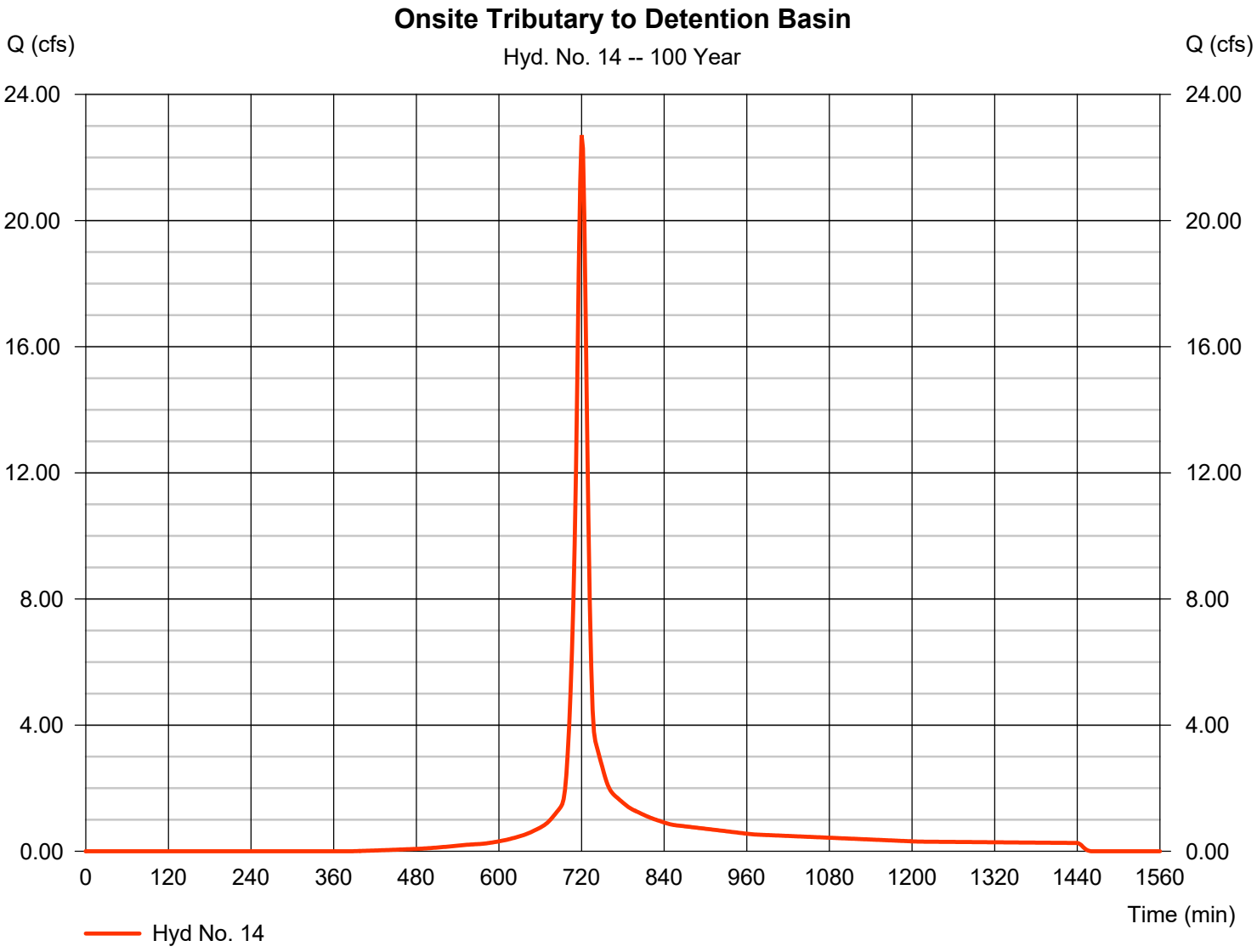
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 14

Onsite Tributary to Detention Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 22.71 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 59,215 cuft
Drainage area	= 4.200 ac	Curve number	= 79.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	=	Time of conc. (Tc)	= 12.40 min
Total precip.	= 6.04 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



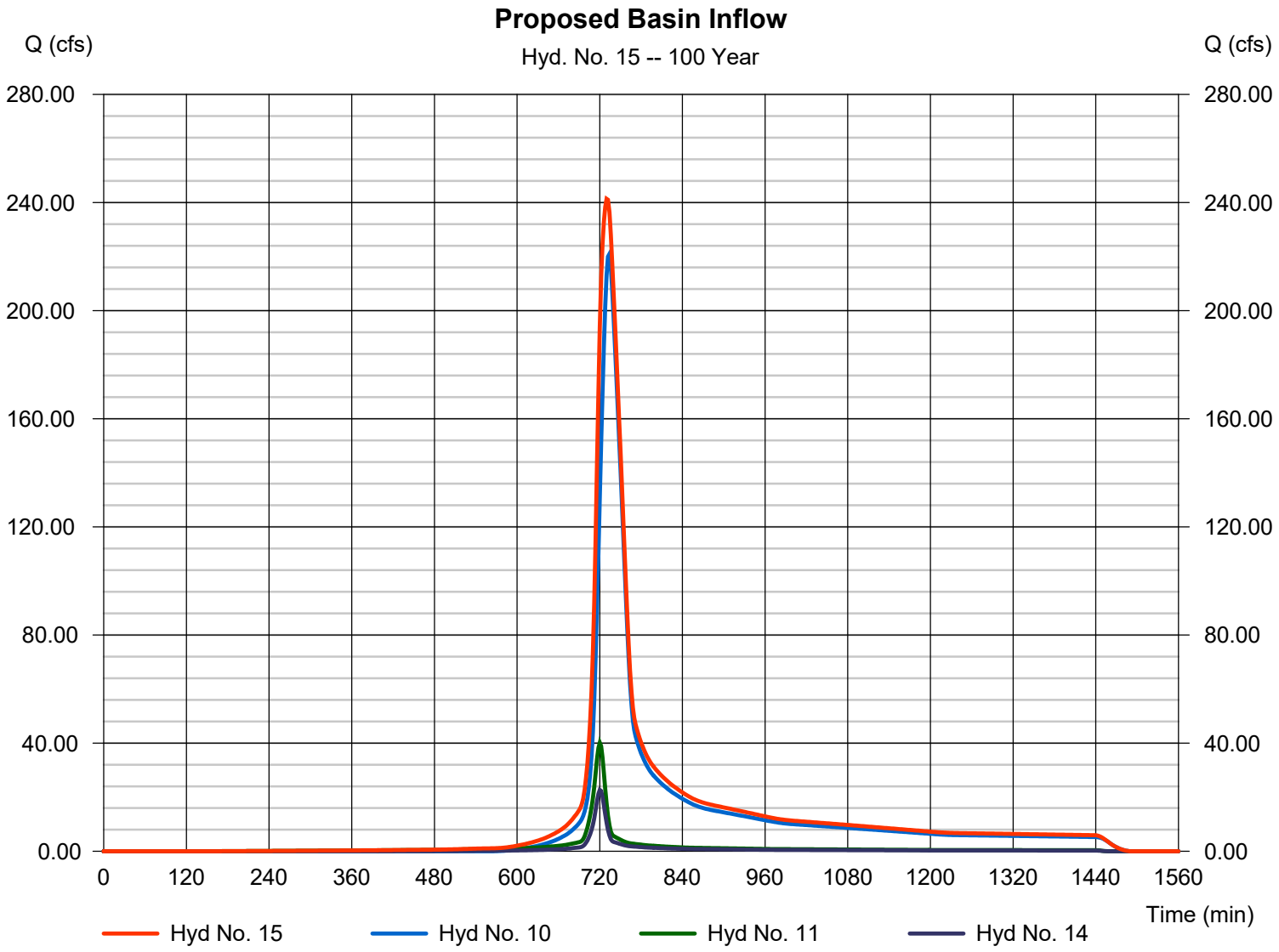
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 15

Proposed Basin Inflow

Hydrograph type	=	Combine	Peak discharge	=	241.36 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	1,143,106 cuft
Inflow hyds.	=	10, 11, 14	Contrib. drain. area	=	109.000 ac



Hydrograph Report

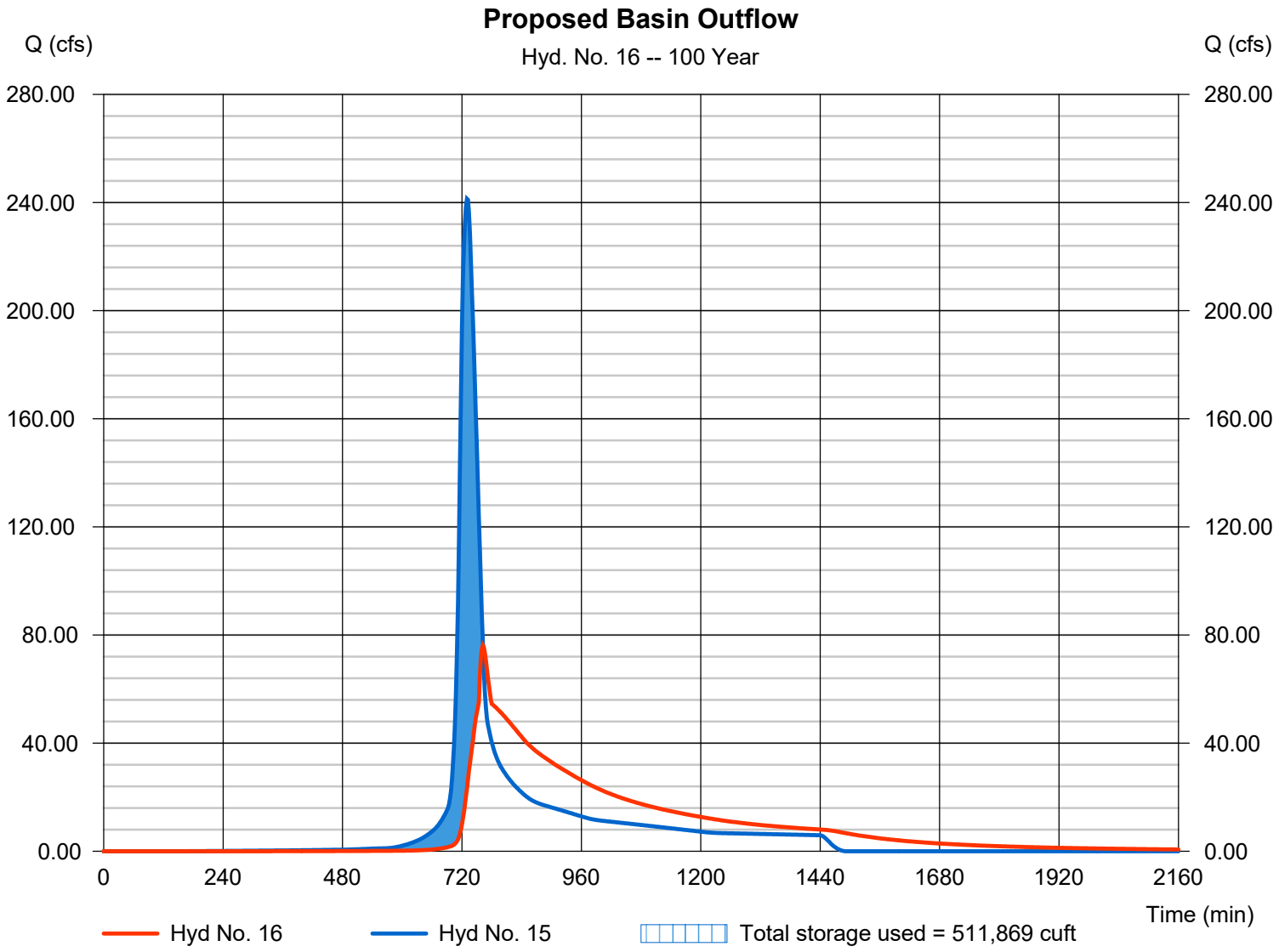
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 16

Proposed Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	76.10 cfs
Storm frequency	=	100 yrs	Time to peak	=	762 min
Time interval	=	2 min	Hyd. volume	=	1,142,764 cuft
Inflow hyd. No.	=	15 - Proposed Basin Inflow	Max. Elevation	=	709.74 ft
Reservoir name	=	As-Built Proposed Basin	Max. Storage	=	511,869 cuft

Storage Indication method used.



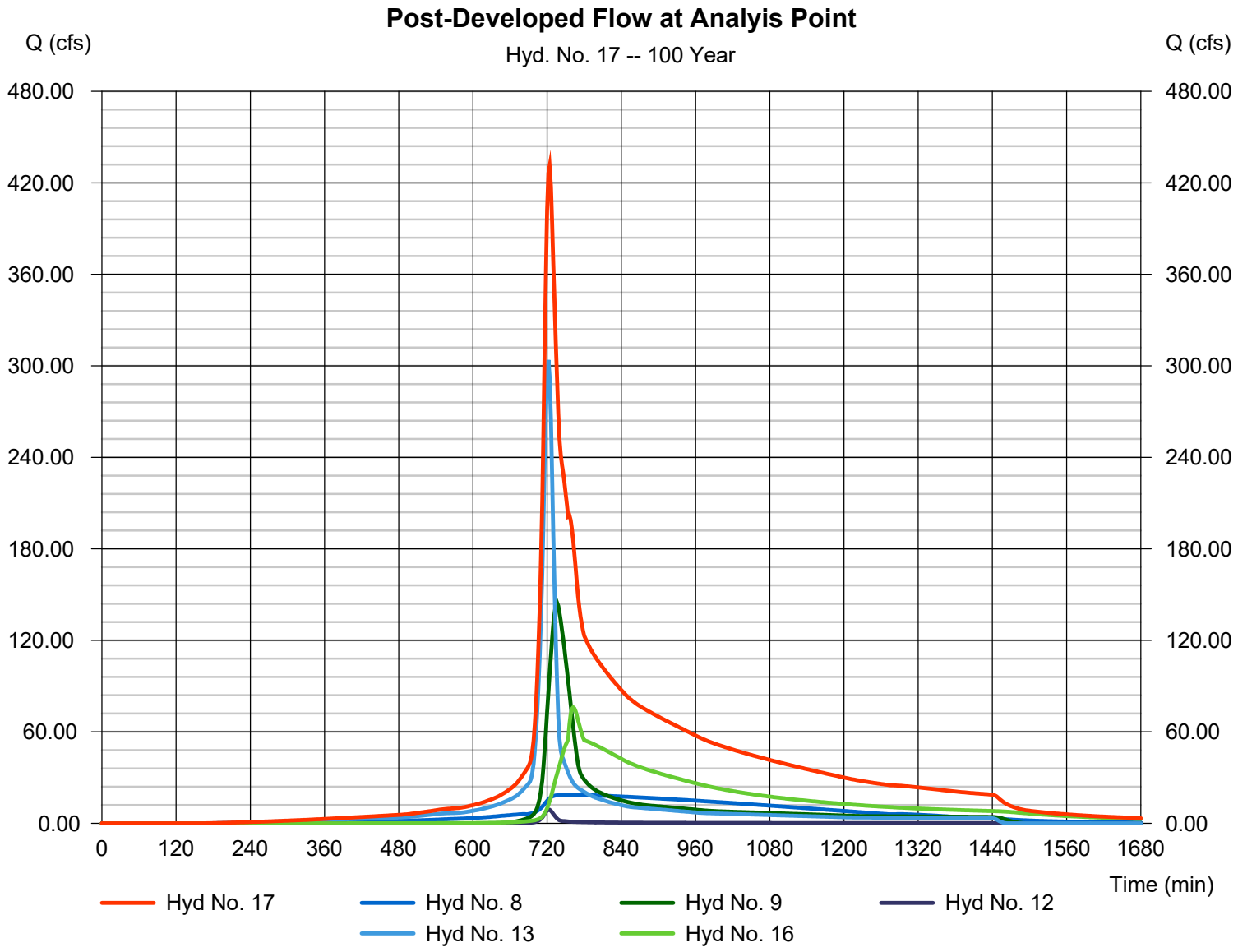
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5 Friday, 06 / 10 / 2016

Hyd. No. 17

Post-Developed Flow at Analyis Point

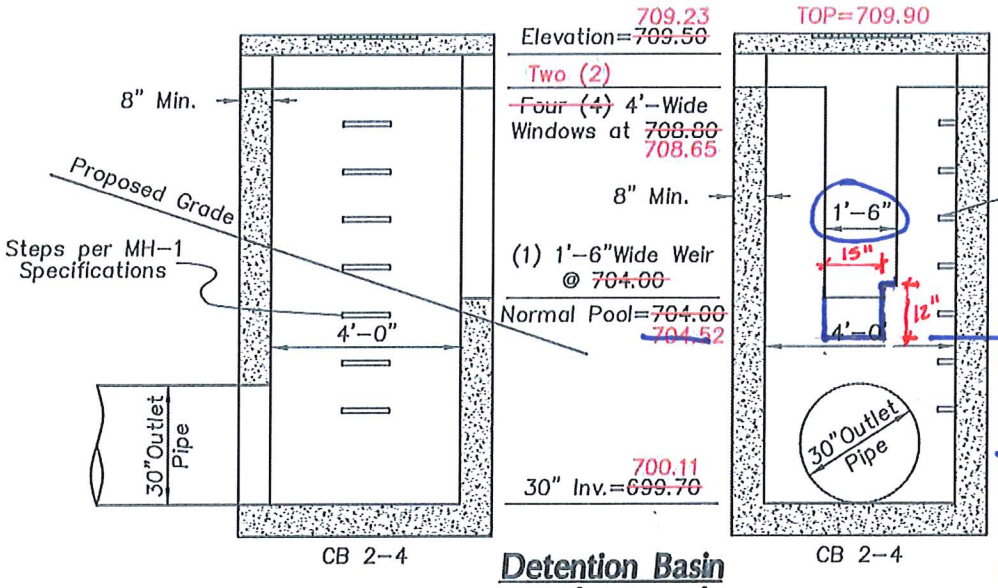
Hydrograph type	= Combine	Peak discharge	= 430.93 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 3,360,364 cuft
Inflow hyds.	= 8, 9, 12, 13, 16	Contrib. drain. area	= 143.000 ac



AAA SELF SERCURE STORAGE
WATER QUALITY
CALCULATIONS
PREPARED BY: BAYER BECKER
11/21/14

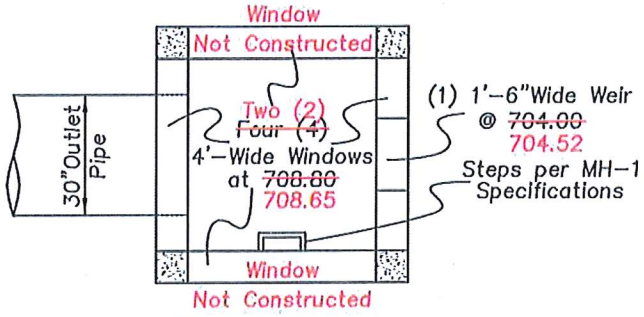
8/3/16: This section is modified to present as-built information for the modification to the lake outlet structure. The window was constructed to a width of 15" and at an elevation of 703.21 (see detail). The as-built window elevation is 0.29' lower than design resulting in an excess storage volume of 24,000 cubic feet (see amended calculations). The as-built width of the weir is consistent with the design documents providing a draw-down time of 25.1 hours.

11/21/14: The plan proposes to modify the existing lake to provide a water quality volume as required by the Ohio EPA. The proposal includes modifying the existing retention basin outlet by cutting a 15" weir into the side of the existing catch basin at elevation 703.50. This will lower the lake elevation by 1' and provide twice the required water quality storage volume. However, the weir is sized to draw down the water quality volume (first 6" of new storage provided) in 24 hours. The water quality volume was estimated using the entire drainage area tributary to the basin which includes 99.0 acres of land located on the south side of SR-129.

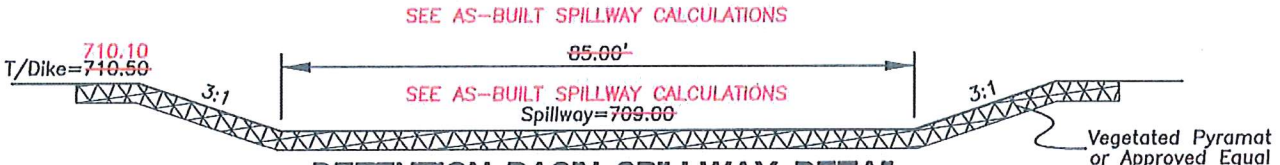


Detention Basin Outlet Detail
Side Views

NORMAL POOL = 703.21 (WINDOW LOWERED TO PROVIDE WQv FOR AAA STORAGE. THE DETENTION ROUTING CALCULATIONS ASSUME THE WQv AREA OF THE POND (703.21 to 704.52) IS FULL. THE ROUTING CALCULATIONS START AT ELEV. = 704.52.)



Detention Basin Outlet Detail
Top View



DETENTION BASIN SPILLWAY DETAIL

AS-BUILT 8/09/10

07M097-000 OUTLET STRUCTURES

Drawing:	
Scale	nts
Drawn by:	GJK
Checked By:	
Issue Date:	8-25-08

THE FOUNTAINS OF FAIRFIELD TOWNSHIP

2865 PRINCETON ROAD
SECTION 25, TOWN 2, RANGE 3
FAIRFIELD TOWNSHIP, BUTLER COUNTY OHIO

DETENTION BASIN OUTLET DETAILS

bayer becker
6900 Tylersville Road, Suite A
Mason, OH 45040 - 513.336.6600

Water Quality Volume

Project:	AAA Storage	Designed By:	DGB	Date:	10/16/14
Job No.:	14M055	Checked By:		Date:	
Basin ID:	Ex Lake Adjusted - As-built Calculation 8/3/16 (JSD)	Revised By:	JSD	Date:	11/21/14

Required Water Quality Volume

WQ_v = P C A/12
C = 0.858*i^3 - 0.78*i^2 + 0.774*I + 0.04
i = fraction of post-construction impervious surface

Site Drainage Area (A) =	108.10	acres		
Impervious Area (A) =	25.00	acres		
i =	0.23		WQ_v =	1.269 acre-ft.
Rainfall Depth (P) =	0.75	in.	Sediment Storage Allowance =	-25 %
			Sediment Storage Allowance =	-0.32 Ac-ft
Runoff Coefficient (C) =	0.19		**Total WQ_v =**	0.952 Ac-ft
			=	41,474 cu.ft.

Water Quality Release Rate

Q_{wqv} = Total WQ_v/RT

Required Retention Time (RT)	24	hours	Q_{wqv} =	0.480 cfs

Water Quality Outlet Orifice

Contour Areas

	Elevation ft	Area ft^2	Volume ft^3	Cum. Vol. ft^3	Elevation at V	Storage at Elev
Basin Inv. =	703.21	81,896	0.00	0.00		
Contour 1 =	704.50	86,157	108394.18	108394.18	703.70	41473.61
Contour 2 =						
Contour 3 =						
Contour 4 =						
Contour 4 =						
Contour 4 =						
Contour 4 =						

Weir Equation (Orifice will not be submerged)
Q = CLH^1.5

C =	3.00	
L =	15.00	ιννχη
H (avg) =	0.25	ft
Q =	**0.459748**	cfs

Provided Retention Time (PT) **25.06** hours

EX. RETENTION BASIN
3.3 ACRES

ONSITE AREA
5.8 ACRES

BUTLER COUNTY VETERANS HIGHWAY
(S.R. #129)

OFFSITE AREA 3
99.0 ACRES

EX. CREEK

720.2

GROUND OBSCURE

Item	Revision Description	Date	Drwn	Chk

AAA SELF SECURED STORAGE

LOT 8902
MENARDS CROSSING OF FAIRFIELD TOWNSHIP
SECTION 25, TOWN 2, RANGE 2
FAIRFIELD TOWNSHIP
BUTLER COUNY, OHIO

WQ DRAINAGE AREA MAP

bayer becker
www.bayerbecker.com
6903 Wilkinson Road, Suite A
Mason, OH 45040 - 513.336.6600

Drawing: 14M055-000 WQ DA
Drawn by: JSD
Checked By:
Issue Date: 09-12-14
Sheet: DRN

Plot time: Nov 21, 2014 - 5:46pm
Drawing name: J:\2014\14M055-000\CVI\DWG\14M055-000 WQ DA.dwg - Layout Tab: DRAINAGE MAPS