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STRONG RELATIONSHIPS • INFINITE POSSIBILITIES

PRELIMINARY DRAINAGE CALCULATIONS

Crater High School Parking Lot Improvements

655 N. 3rd Street, Central Point, OR 97502
Map 37S-02W-03-DB, Tax Lot 100

May 15, 2020
Type 2 Planning Application

Prepared For:
BBT Architects
Attn: Renee Alexander, AIA
1140 SW Simpson Ave., Suite 200
Bend, OR 97702

Prepared By:
Todd D. Powell, P.E.

NARRATIVE

The Applicant is seeking to improve the existing gravel parking lot located in the northern portion of the existing Crater High School Campus.

The proposed improvements include approximately 160,000 square feet of new paving for 421 parking spaces. Scope of work includes a new pavement section per geotechnical engineers recommendations (pending), curb and landscape islands as specified, new underground utilities for stormwater management and site lighting, replacement of existing utilities as required for construction, ADA pathways, sidewalks, and pedestrian connectivity, striping, biofiltration swales, planting and irrigation, demolition of the existing batting cages and tennis court, and erosion control.

Per City of Central Point and Rogue Valley Sewer Services (RVSS), a stormwater management report in compliance with the new stormwater manual adopted July 2018 is required to show that detention and water quality treatment will be provided for any re-developed areas. In this case, detention and treatment will be shown for the proposed new pervious and impervious areas associated with the development. Further discussion and design methodology are included as a part of this report.

Additionally, as a part of the RVSS permit requirements, an Operations and Maintenance Manual will be required for all the new and existing stormwater facilities located outside of the public right of way and public utility easements. This will include a Declaration of Covenants recorded to the property. This O&M Manual and Declaration of Covenants will be submitted to the City of Central Point in a separate document and is not a part of this report.

Hydraulic calculations were completed using Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2020 by Autodesk, Inc. v2020. Type 1A Santa Barbara Unit Hydrographs were utilized for runoff calculations with 1-yr, 10-yr, and 25-yr precipitation amounts of 1.00”, 3.00”, and 3.50” respectively.

This preliminary report is meant to show that the proposed new biofiltration swales and detention ponds are sized in accordance with the latest RVSS Manual. Following planning approval, and as a part of the project construction documents, a full Drainage Report with supporting calculations, basin maps, conveyance calcs, and additional narratives will be provided.

Preliminary calculations are shown on the following pages. A summary of the calculations is also shown on sheet C4.0 of the application documents.

Hydraflow Table of Contents

CPSD CHS DRN CALCS.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Thursday, 05 / 14 / 2020

Watershed Model Schematic 1

Hydrograph Return Period Recap 2

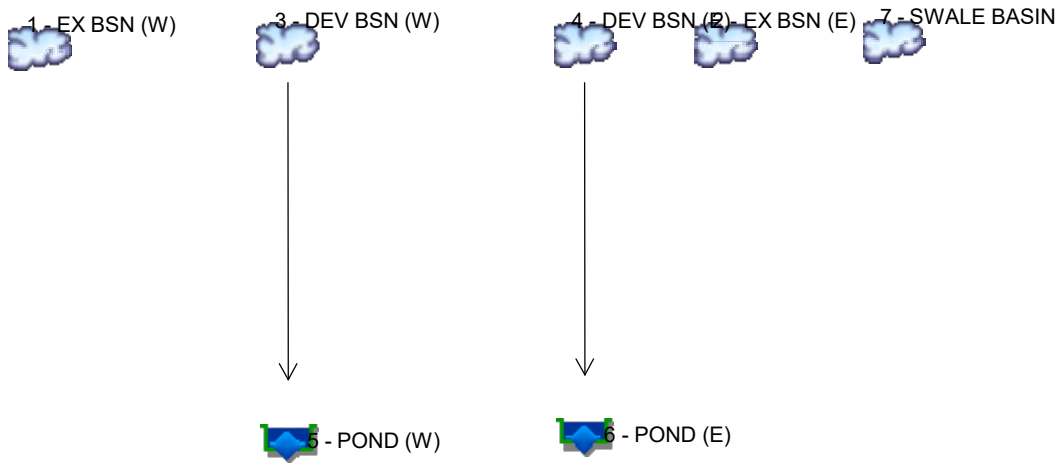
10 - Year

- **Summary Report** 3
- **Hydrograph Reports** 4
  - Hydrograph No. 1, SBUH Runoff, EX BSN (W) 4
    - TR-55 Tc Worksheet 5
  - Hydrograph No. 2, SBUH Runoff, EX BSN (E) 6
    - TR-55 Tc Worksheet 7
  - Hydrograph No. 3, SBUH Runoff, DEV BSN (W) 8
  - Hydrograph No. 4, SBUH Runoff, DEV BSN (E) 9
  - Hydrograph No. 5, Reservoir, POND (W) 10
    - Pond Report - POND (W) 11
  - Hydrograph No. 6, Reservoir, POND (E) 12
    - Pond Report - POND (E) 13

IDF Report 14

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020



Legend

Hyd.	Origin	Description
1	SBUH Runoff	EX BSN (W)
2	SBUH Runoff	EX BSN (E)
3	SBUH Runoff	DEV BSN (W)
4	SBUH Runoff	DEV BSN (E)
5	Reservoir	POND (W)
6	Reservoir	POND (E)
7	SBUH Runoff	SWALE BASIN

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SBUH Runoff	------	0.015	-------	-------	-------	0.457	0.639	-------	-------	EX BSN (W)
2	SBUH Runoff	------	0.014	-------	-------	-------	0.436	0.608	-------	-------	EX BSN (E)
3	SBUH Runoff	------	0.264	-------	-------	-------	1.362	1.644	-------	-------	DEV BSN (W)
4	SBUH Runoff	------	0.243	-------	-------	-------	1.253	1.512	-------	-------	DEV BSN (E)
5	Reservoir	3	0.171	-------	-------	-------	0.450	0.531	-------	-------	POND (W)
6	Reservoir	4	0.152	-------	-------	-------	0.406	0.496	-------	-------	POND (E)
7	SBUH Runoff	------	0.063	-------	-------	-------	0.216	0.254	-------	-------	SWALE BASIN

10-YEAR STORM CALCULATIONS (FLOW CONTROL)

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

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	SBUH Runoff	0.457	2	482	10,164	------	------	------	EX BSN (W)
2	SBUH Runoff	0.436	2	482	9,347	------	------	------	EX BSN (E)
3	SBUH Runoff	1.362	2	474	19,109	------	------	------	DEV BSN (W)
4	SBUH Runoff	1.253	2	474	17,574	------	------	------	DEV BSN (E)
5	Reservoir	0.450	2	538	19,016	3	1254.58	3,258	POND (W)
6	Reservoir	0.406	2	540	17,473	4	1254.46	3,105	POND (E)
7	SBUH Runoff	0.216	2	474	3,115	------	------	------	SWALE BASIN

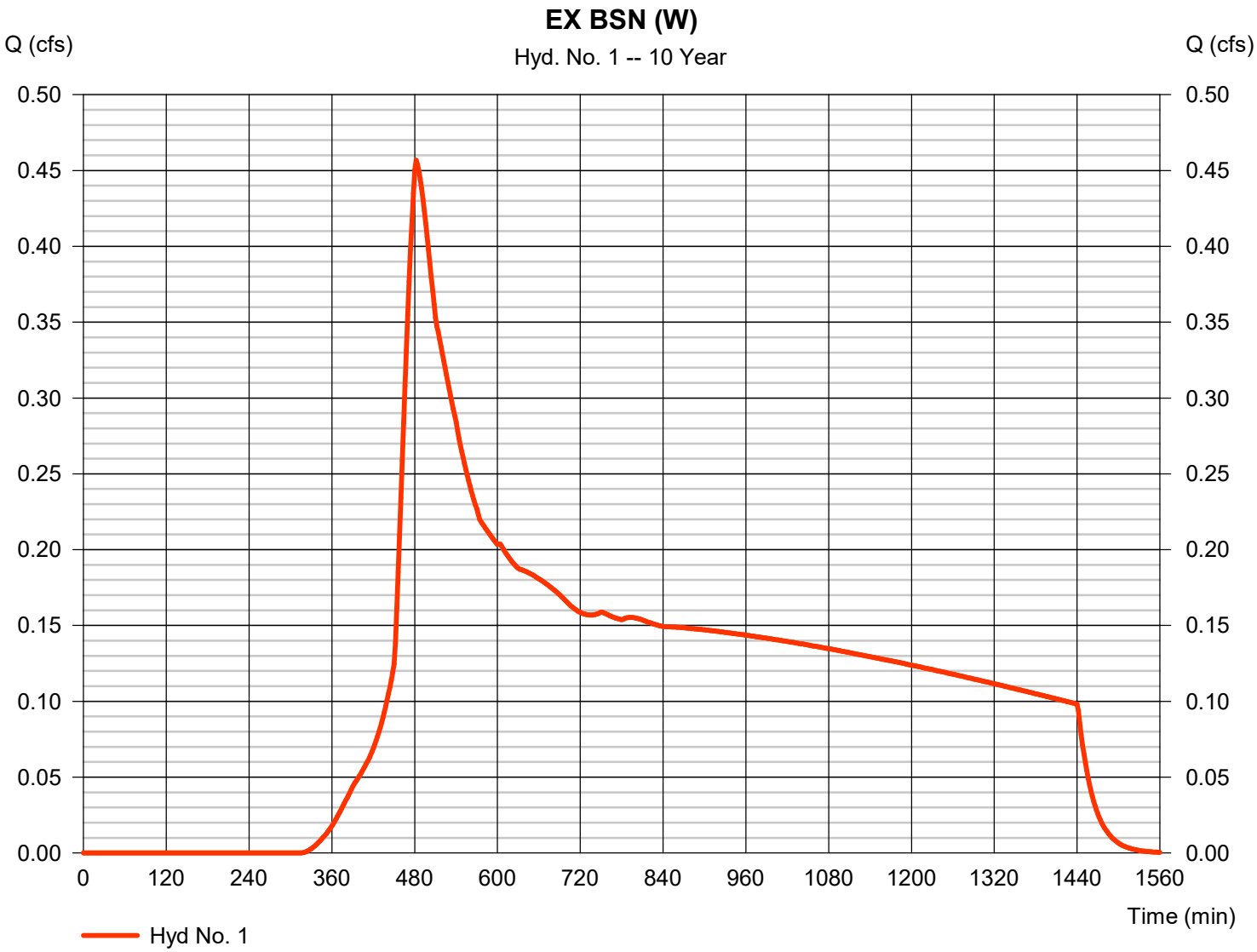
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 05 / 14 / 2020

Hyd. No. 1

EX BSN (W)

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.457 cfs
Storm frequency	= 10 yrs	Time to peak	= 482 min
Time interval	= 2 min	Hyd. volume	= 10,164 cuft
Drainage area	= 2.240 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.80 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 1

EX BSN (W)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.00		0.00		0.00		
Land slope (%)	= 1.50		0.00		0.00		
Travel Time (min)	**= 19.23**	**+**	**0.00**	**+**	**0.00**	**=**	**19.23**
Shallow Concentrated Flow							
Flow length (ft)	= 250.00		0.00		0.00		
Watercourse slope (%)	= 1.50		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.98		0.00		0.00		
Travel Time (min)	**= 2.11**	**+**	**0.00**	**+**	**0.00**	**=**	**2.11**
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 ..... 21.80 min

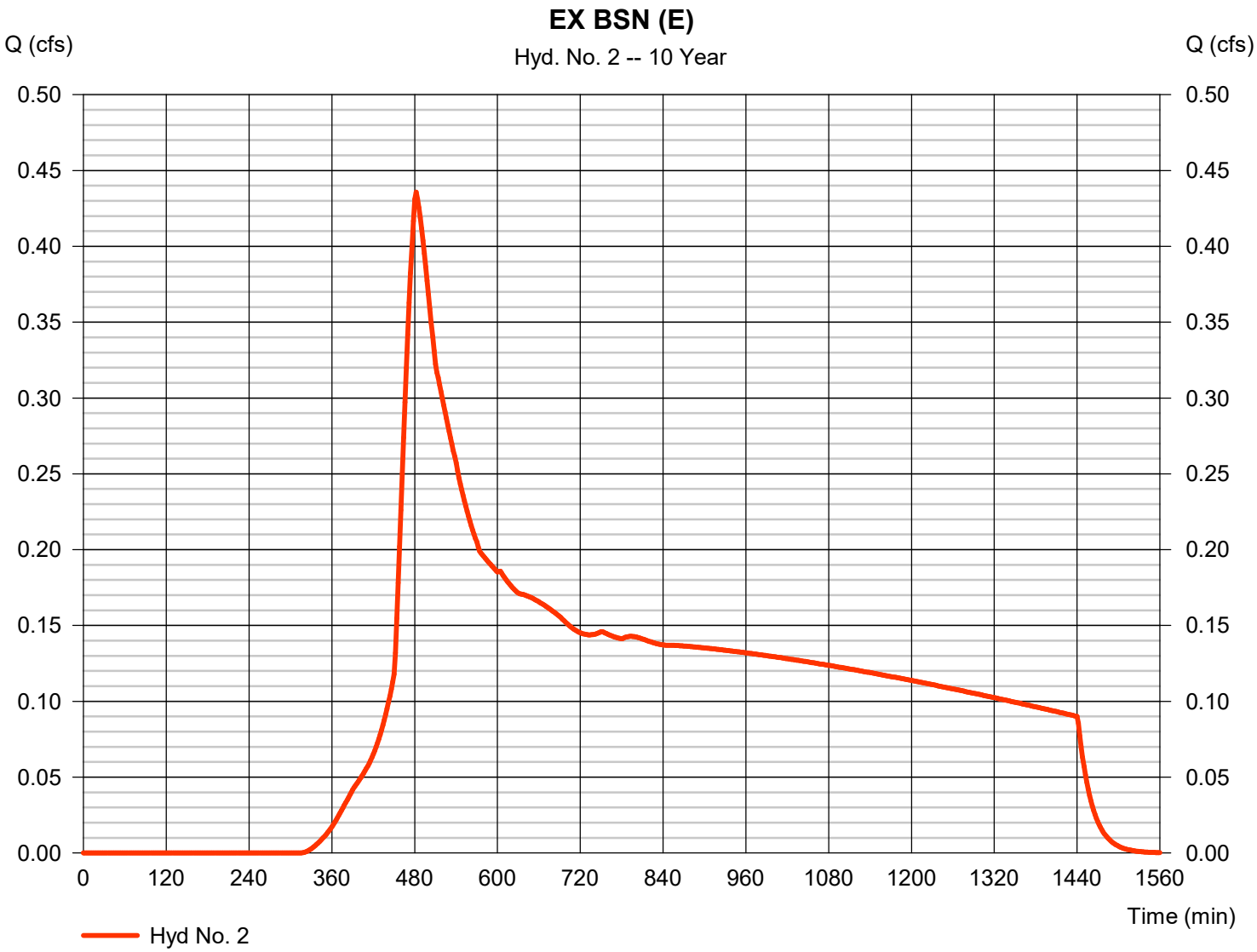
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 05 / 14 / 2020

Hyd. No. 2

EX BSN (E)

Hydrograph type	= SBUH Runoff	Peak discharge	= 0.436 cfs
Storm frequency	= 10 yrs	Time to peak	= 482 min
Time interval	= 2 min	Hyd. volume	= 9,347 cuft
Drainage area	= 2.060 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 19.70 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



TR55 Tc Worksheet

Hyd. No. 2

EX BSN (E)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.00		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 17.14**	**+**	**0.00**	**+**	**0.00**	**=**	**17.14**
Shallow Concentrated Flow							
Flow length (ft)	= 250.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
Travel Time (min)	**= 2.58**	**+**	**0.00**	**+**	**0.00**	**=**	**2.58**
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 ..... 19.70 min

Hydrograph Report

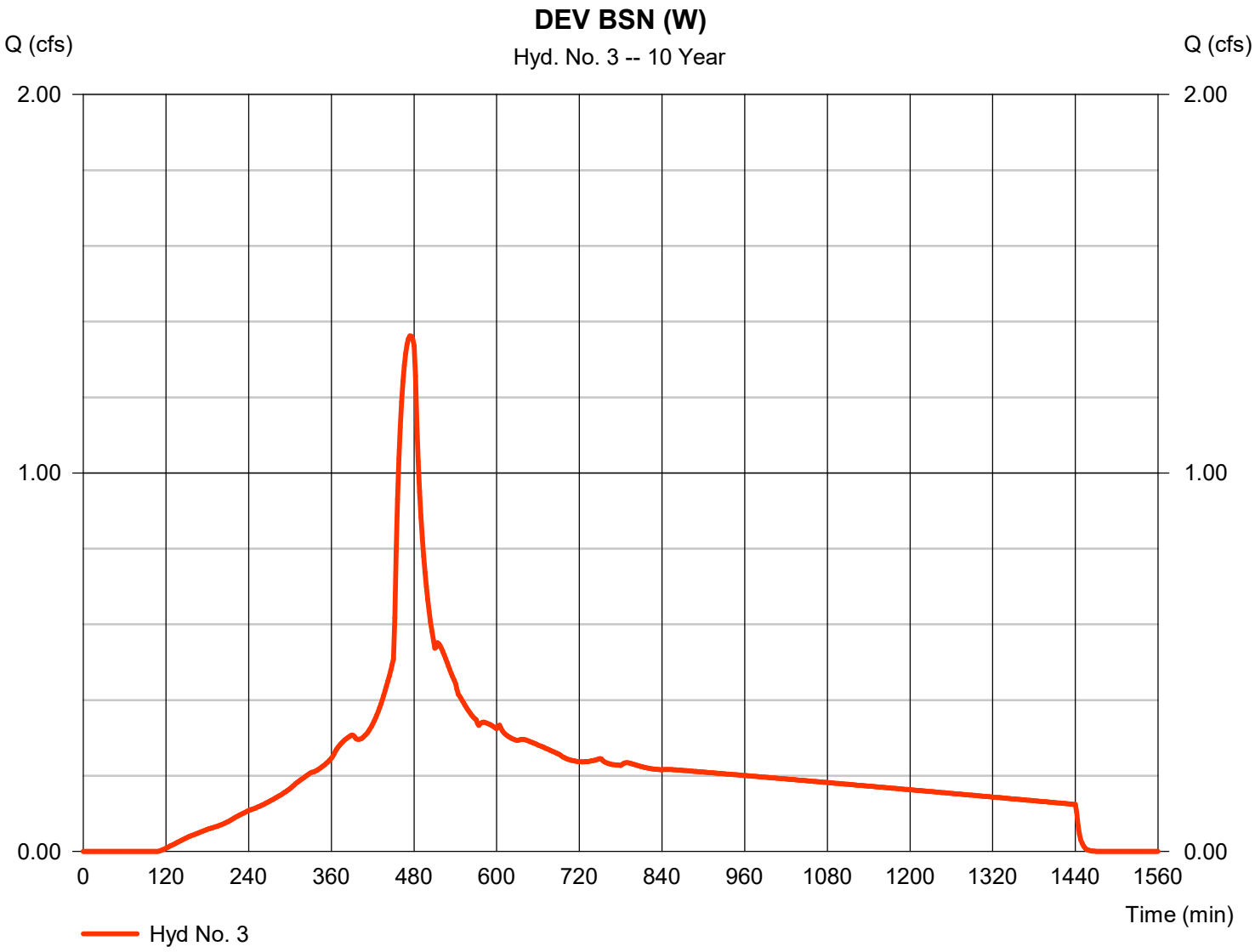
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 05 / 14 / 2020

Hyd. No. 3

DEV BSN (W)

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.362 cfs
Storm frequency	= 10 yrs	Time to peak	= 474 min
Time interval	= 2 min	Hyd. volume	= 19,109 cuft
Drainage area	= 2.240 ac	Curve number	= 94*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a

* Composite (Area/CN) = [(1.720 x 98) + (0.430 x 80)] / 2.240



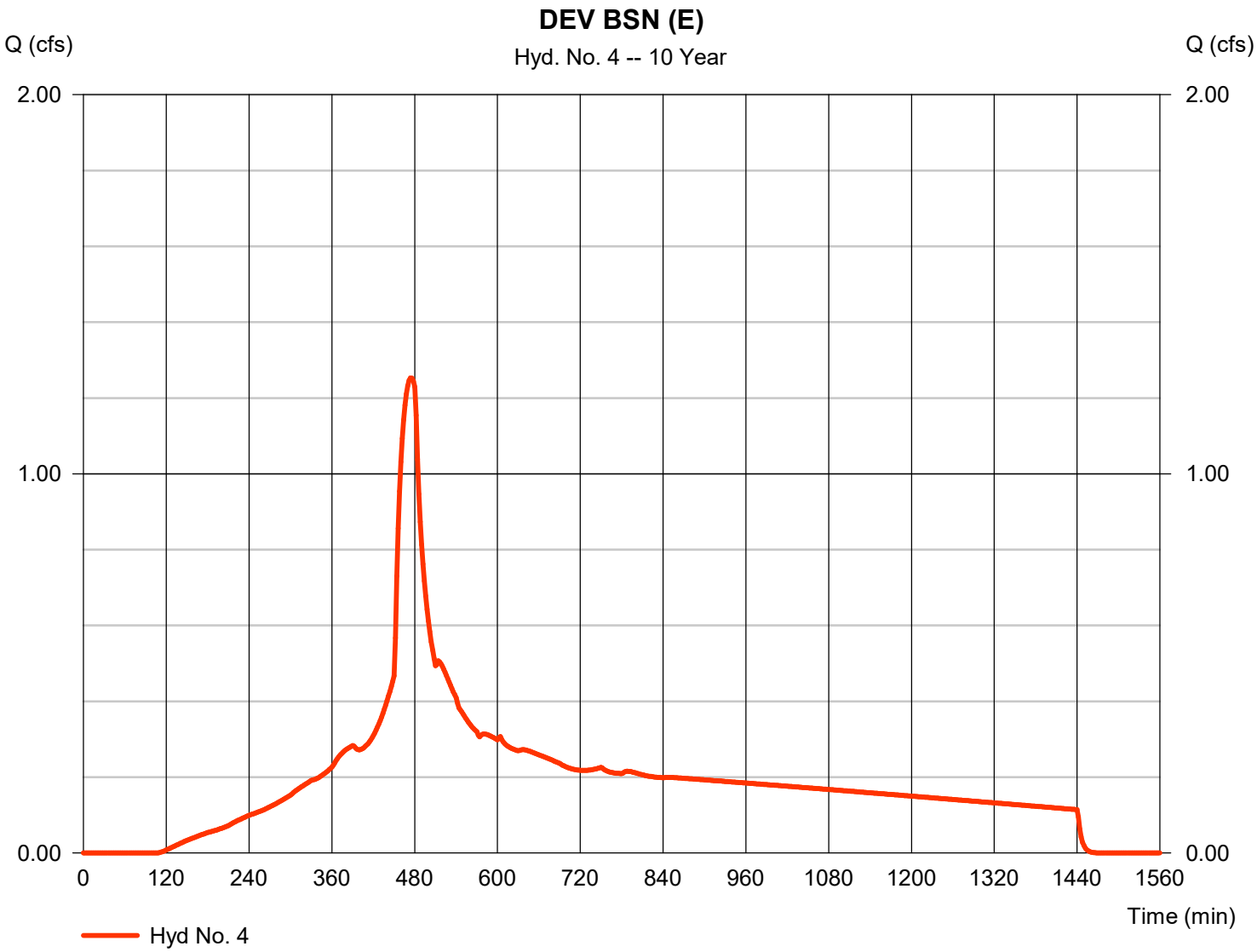
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 05 / 14 / 2020

Hyd. No. 4

DEV BSN (E)

Hydrograph type	= SBUH Runoff	Peak discharge	= 1.253 cfs
Storm frequency	= 10 yrs	Time to peak	= 474 min
Time interval	= 2 min	Hyd. volume	= 17,574 cuft
Drainage area	= 2.060 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.00 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= n/a



Hydrograph Report

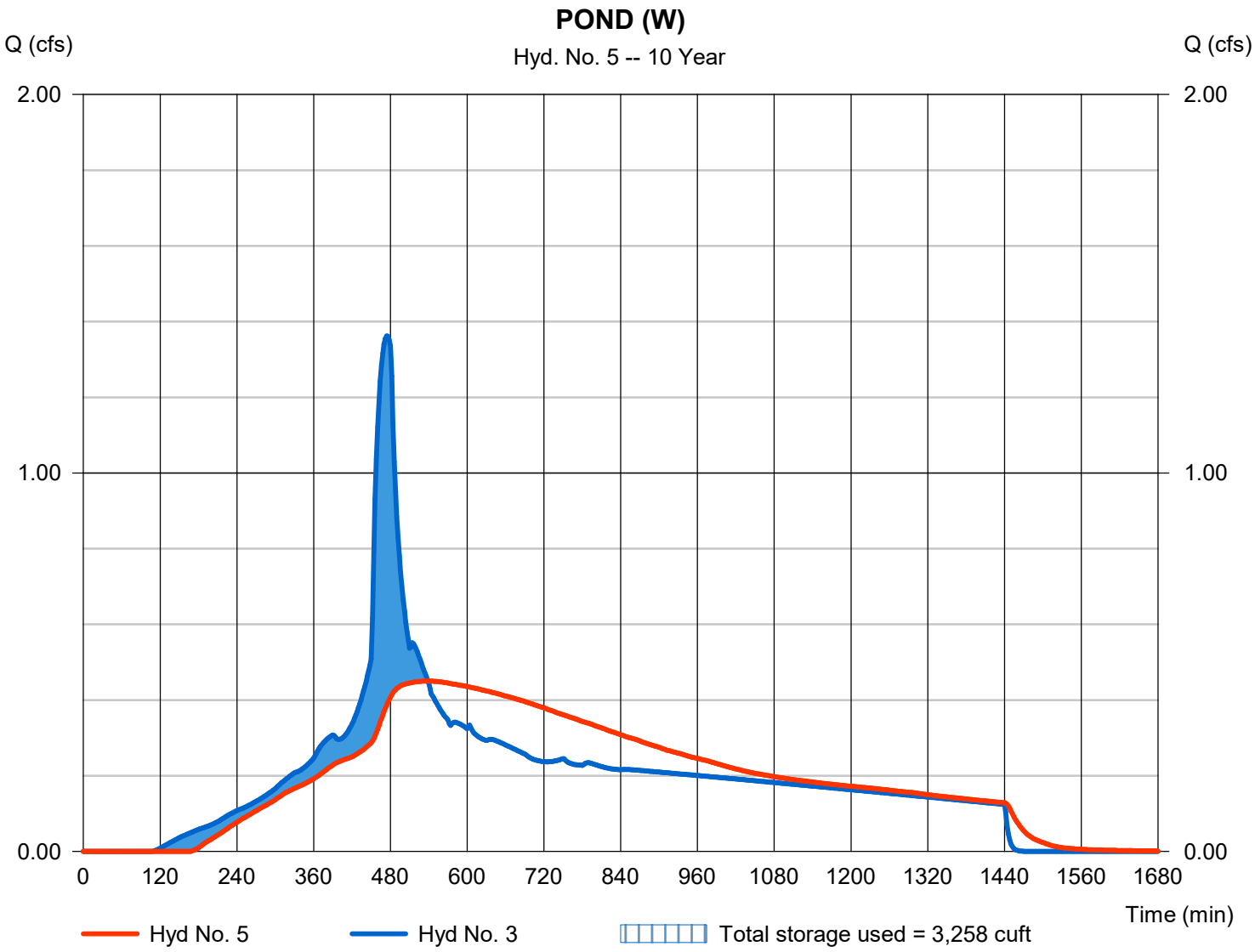
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 05 / 14 / 2020

Hyd. No. 5

POND (W)

Hydrograph type	= Reservoir	Peak discharge	= 0.450 cfs
Storm frequency	= 10 yrs	Time to peak	= 538 min
Time interval	= 2 min	Hyd. volume	= 19,016 cuft
Inflow hyd. No.	= 3 - DEV BSN (W)	Max. Elevation	= 1254.58 ft
Reservoir name	= POND (W)	Max. Storage	= 3,258 cuft

Storage Indication method used.



Hydrograph Report

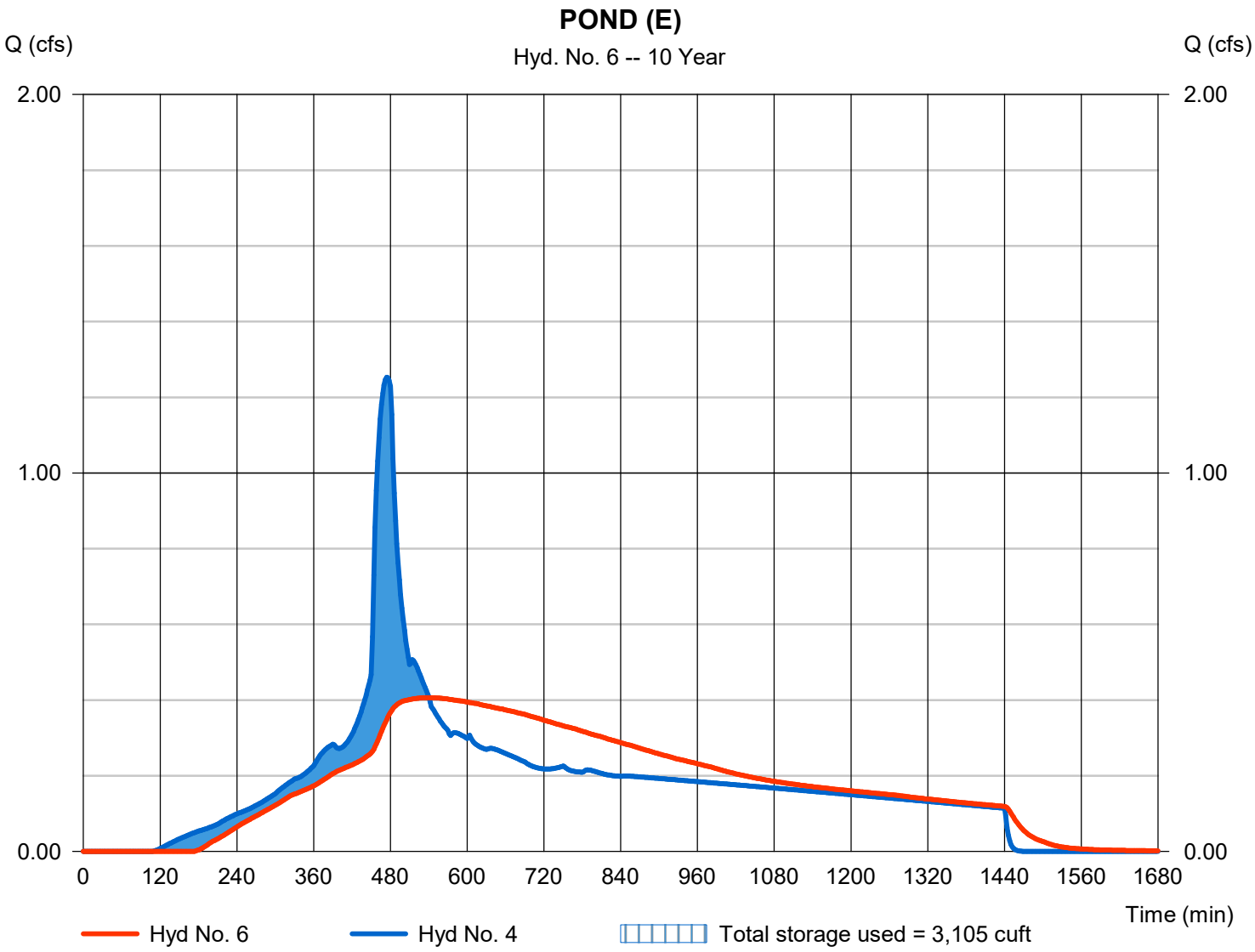
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 05 / 14 / 2020

Hyd. No. 6

POND (E)

Hydrograph type	= Reservoir	Peak discharge	= 0.406 cfs
Storm frequency	= 10 yrs	Time to peak	= 540 min
Time interval	= 2 min	Hyd. volume	= 17,473 cuft
Inflow hyd. No.	= 4 - DEV BSN (E)	Max. Elevation	= 1254.46 ft
Reservoir name	= POND (E)	Max. Storage	= 3,105 cuft

Storage Indication method used.



POND AND BIOSWALE CALCULATIONS

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 05 / 14 / 2020

Pond No. 1 - POND (W)

Pond Data

Trapezoid -Bottom L x W = 300.0 x 2.0 ft, Side slope = 3.00:1, Bottom elev. = 1253.00 ft, Depth = 2.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1253.00	600	0	0
0.20	1253.20	964	156	156
0.40	1253.40	1,331	229	386
0.60	1253.60	1,700	303	689
0.80	1253.80	2,073	377	1,066
1.00	1254.00	2,448	452	1,518
1.20	1254.20	2,826	527	2,045
1.40	1254.40	3,207	603	2,649
1.60	1254.60	3,591	680	3,329
1.80	1254.80	3,978	757	4,085
2.00	1255.00	4,368	835	4,920

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 8.00	4.00	0.00	0.00
Span (in)	= 8.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 1253.00	1253.10	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .011	.011	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

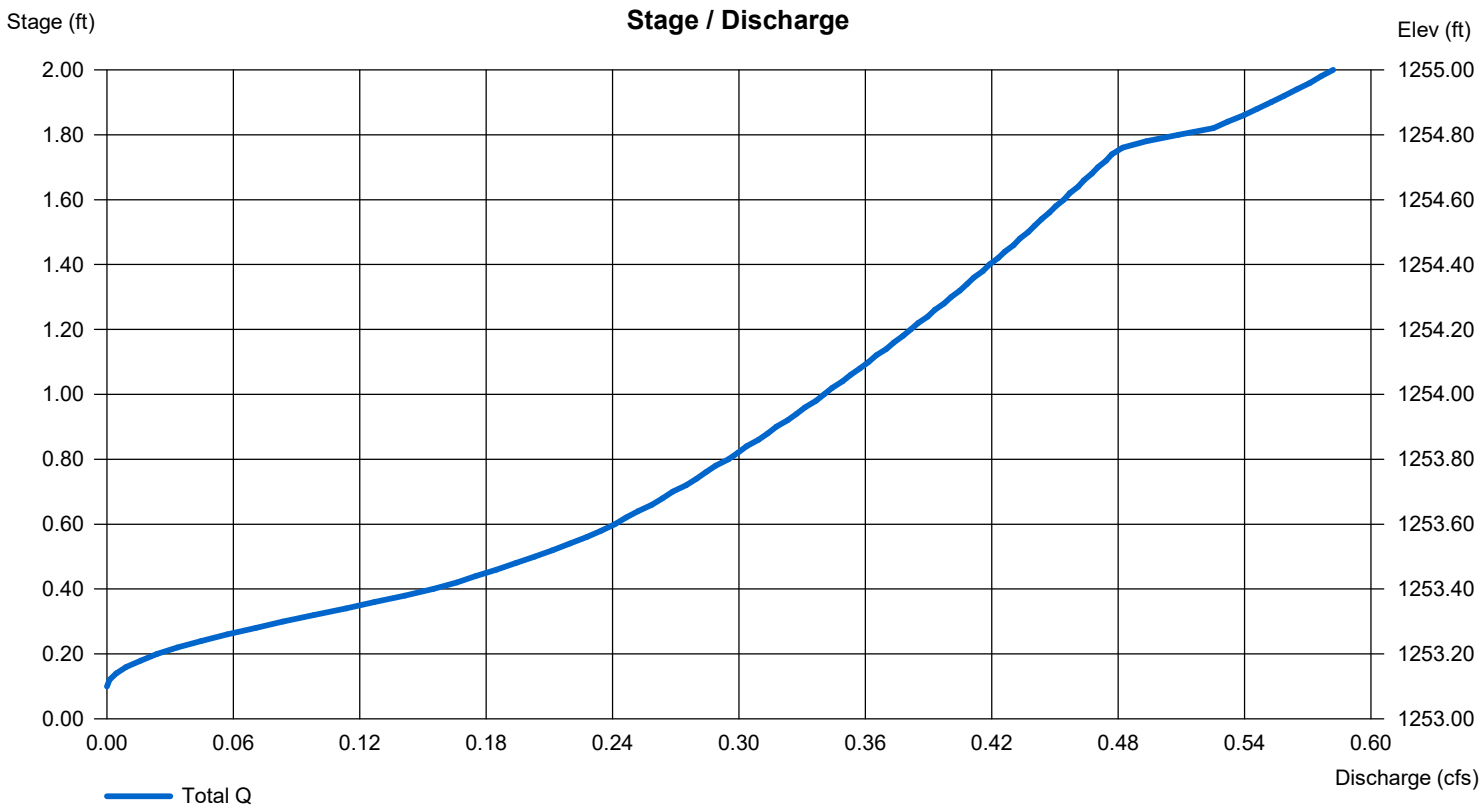
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.67	0.00	0.00	0.00
Crest El. (ft)	= 1254.75	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	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).



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 05 / 14 / 2020

Pond No. 2 - POND (E)

Pond Data

Trapezoid -Bottom L x W = 328.0 x 2.0 ft, Side slope = 3.00:1, Bottom elev. = 1253.00 ft, Depth = 2.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1253.00	656	0	0
0.20	1253.20	1,053	171	171
0.40	1253.40	1,454	251	422
0.60	1253.60	1,857	331	753
0.80	1253.80	2,263	412	1,165
1.00	1254.00	2,672	493	1,658
1.20	1254.20	3,084	576	2,234
1.40	1254.40	3,499	658	2,892
1.60	1254.60	3,916	741	3,633
1.80	1254.80	4,337	825	4,458
2.00	1255.00	4,760	910	5,368

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 8.00	3.88	0.00	0.00
Span (in)	= 8.00	3.88	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 1253.00	1253.10	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .011	.011	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

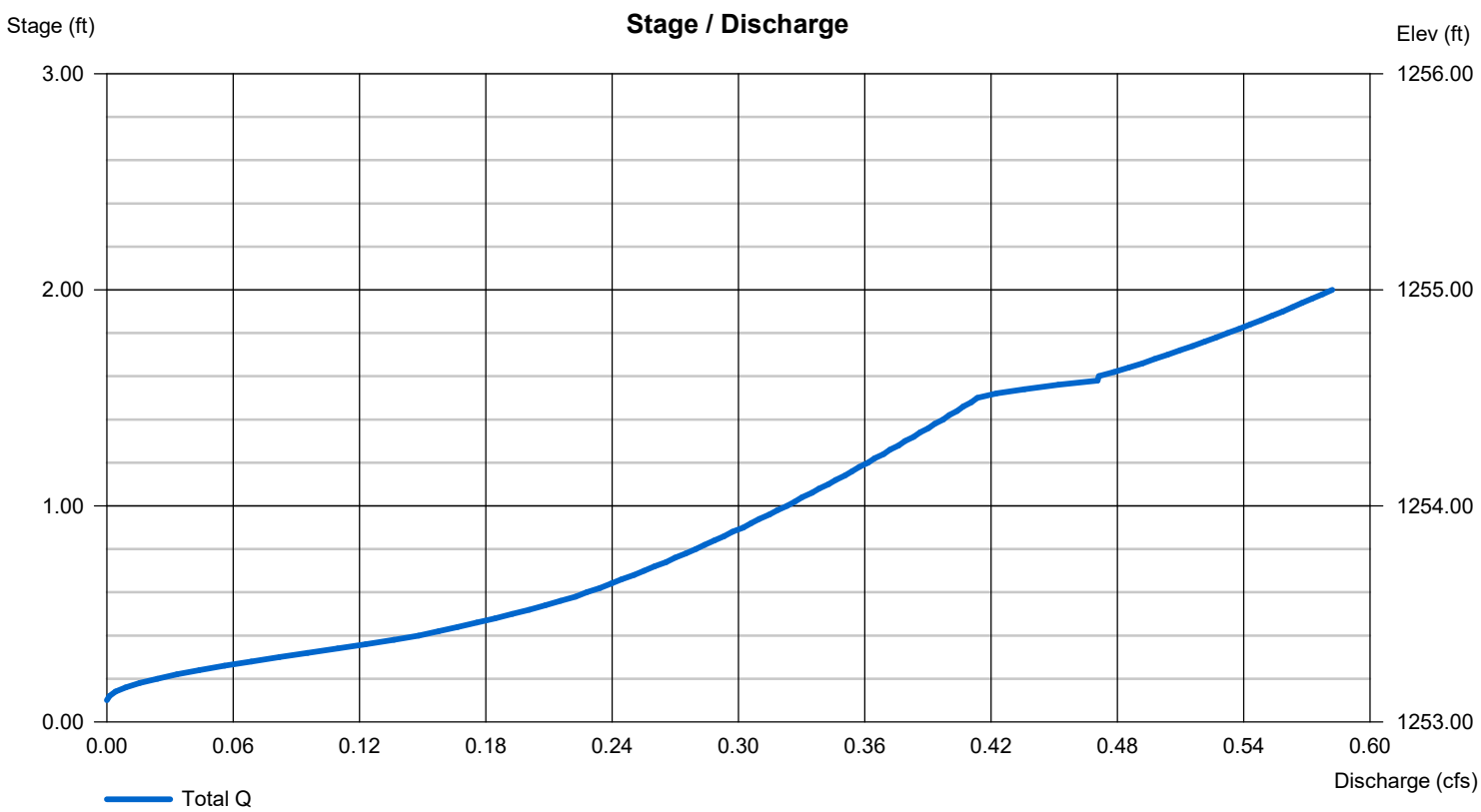
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.67	0.00	0.00	0.00
Crest El. (ft)	= 1254.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
Multi-Stage	= Yes	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).



PROJECT: Crater High School Parking Lot

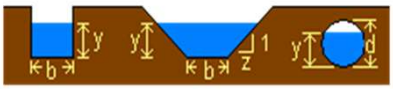
CLIENT: BBT Architecture

SUBJECT: Bioswale Calculations

BIOFILTRATION SWALE CALCULATIONS

Flow Element	Trapezoidal Channel
Method	Manning's Formula

Bottom Width	"b"	=	2.00	feet
Depth of Water	"y"	=	0.19	feet
Left Side Slope	"z"	=	3	to 1
Right Side Slope	"z"	=	3	to 1
Diameter	"d"	=	0.00	feet
Slope	"s"	=	0.0050	feet per foot
Manning's	"n"	=	0.240	



Rectangle Trapezoid Circle

Section	Area (sq. ft.)	Wetted Perimeter (feet)	Hydraulic Radius (feet)	Channel Conveyance (cfs)	Velocity (ft/sec)
Rectangle	0.39	2.3880	0.1625	0.05	0.130
Trapezoid	**0.50**	**3.2270**	**0.1552**	**0.063**	**0.126**
Circle	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

WQ Flow
0.063

Summary		
Required Residence Time, Tr (min.):	9.00	
Proposed Residence Time, Tp:(min.):	**9.22**	**OK**
Tp = L/V		
Length of Biofiltration Swale, L (feet):	70.00	
Velocity, V(fps):	0.126	
Velocity, V(fpm):	7.588	

RAINFALL DATA

Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	0.0000	0.0000	0.0000	--------
3	0.0000	0.0000	0.0000	--------
5	0.0000	0.0000	0.0000	--------
10	112.7739	13.8000	1.1447	--------
25	0.0000	0.0000	0.0000	--------
50	0.0000	0.0000	0.0000	--------
100	0.0000	0.0000	0.0000	--------

File name: Medford IDF table 10 year only.idf

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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	3.92	3.00	2.41	2.00	1.71	1.49	1.32	1.18	1.06	0.97	0.89	0.82
25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.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	1.00	0.00	0.00	0.00	3.00	3.50	0.00	0.00
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	1.00	0.00	0.00	0.00	3.00	3.50	0.00	0.00