DRESDNER ROBIN

STORMWATER MANAGEMENT AND ENGINEER'S REPORT

29 VAN REIPEN AVENUE

BLOCK 7904, LOTS 1 & 2

CITY OF JERSEY CITY, HUDSON COUNTY, NEW JERSEY

DRESDNER ROBIN PROJECT NO.: 10743-008

PREPARED FOR
29 VAN REIPEN, LLC
98 CUTTERMILL ROAD
SUITE 284 NORTH
GREAT NECK, NY 11021

PREPARED BY
DRESDNER ROBIN
1 EVERTRUST PLAZA, SUITE 901
JERSEY CITY, NJ 07302

DATE
DECEMBER 2020

JOSEPH MELE
PROFESSIONAL ENGINEER AND LAND SURVEYOR
NJ LICENSE NO. 24GB04323900

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1.0   INTRODUCTION

1.1   PURPOSE

This report has been prepared as required by Item 1.G of the *Engineering Completeness* section of the *Jersey City Land Development Ordinance Preliminary and Final Major Site Plan Checklist - Application Requirements, Development Procedures & Checklists*, to demonstrate how the proposed improvements meet the criteria of the following standards:

- New Jersey Residential Site Improvement Standards (N.J.A.C. 5:21) (published July 21, 2014).
- Stormwater Management Rules (N.J.A.C. 7:8) (amended April 19, 2010).
- Safe Drinking Water Act Rules (N.J.A.C. 7:10) (amended January 4, 2011).
- Pollutant Discharge Elimination System Rules (N.J.A.C. 7:14A) (amended January 5, 2009).
- Article VI "*Stormwater Control*" of Chapter 345 "*Zoning*" from the Code of the City of Jersey City.

1.2   PROJECT DESCRIPTION

The project site contains approximately 0.39 acres and is situated on the northeastern corner of Homestead Place along the southern side of Van Reipen Avenue. Zoning for the site is governed by the Journal Square 2060 Redevelopment Plan. The site is currently occupied by surface parking lot and a three-story brick building.

The applicant proposes to construct a 27-story mixed-use building. Mechanical rooms will be provided at grade.

2.0   STORMWATER MANAGEMENT

2.1   PURPOSE AND NEED

The proposed development will disturb more than 0.25 acres of land; therefore, the project is defined as a "major development" in accordance with Article VI "*Stormwater Control*" of Chapter 345 "*Zoning*" from the Code of the City of Jersey City. As a result, these regulations mandate the proposed development incorporate measures to address groundwater recharge, stormwater quality, and stormwater quantity.

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2.2   GROUNDWATER RECHARGE

The regulations cited above specify minimum design and performance standards for groundwater recharge; however, in accordance with N.J.A.C. 7:8-5.4(a)2.ii., the groundwater recharge requirement does not apply to previously disturbed project sites within the "Metropolitan Planning Area PA-1 Zone", which includes the project site; therefore, groundwater recharge is not provided for the project.

2.3   WATER QUALITY

The Jersey City Stormwater Control Ordinance requires "major developments" to include stormwater management measures to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality storm by 80% of the anticipated load from the development site. The requirement to reduce TSS does not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the New Jersey Pollutant Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A, or in a discharge specifically exempt under a NJPDES permit from this requirement. JCMUA combined sewer outfalls are currently permitted under the NJDPES program. Stormwater runoff from this project will discharge to a combined sewer; therefore, the water quality requirements do not apply. In addition, no vehicular surfaces are proposed which would require stormwater treatment per the NJDEP Stormwater Management Rules.

2.4   WATER QUANTITY

The Jersey City Stormwater Control Ordinance requires "major developments" to demonstrate through hydrologic and hydraulic analysis that the post-constructed stormwater runoff rates and volumes leaving the site meet specific criteria. The requirements state that proposed peak runoff rates shall be reduced to 50%, 75% and 80% of existing rates for the 2-year, 10-year and 100-year storm events respectively.

To satisfy said requirements, an underground detention basin system is proposed in the cellar of the building. Table 1 summarizes the existing and proposed stormwater analysis. Existing and proposed stormwater runoff calculations can be found in Appendix C.

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2.4.1   EXISTING CONDITIONS

At present, the site consists mostly of impervious cover in the form of asphalt pavement and buildings. The site runoff flows northwest to a street catch basin on Van Reipen Avenue.

2.4.2   PROPOSED CONDITIONS

The proposed conditions of the development project include facilities designed to manage stormwater runoff by detaining the runoff to reduce the peak runoff flow rates prior to discharge into the combined sewer. Runoff from approximately 80% of the site area will be collected via roof and surface drains and conveyed to a detention basin, which will be located beneath the first floor of the proposed building. The attenuated flow from the proposed detention basin will be controlled via an orifice control structure and discharge to the combined sewer in Homestead Place. The balance of the site, which consists of hardscape, will be undetained. The undetained flow and the detained flow are all contributory to the "Proposed Peak Runoff Rate" presented in Table 1 below.

STORM EVENT	EXISTING RUNOFF RATE (cfs)	REQUIRED RUNOFF RATE REDUCTION FACTOR*	ALLOWABLE RUNOFF RATE (cfs)	PROPOSED PEAK RUNOFF RATE (cfs)	MEETS REQUIREMENTS
2-yr	1.18	50%	0.59	0.37	YES
10-yr	1.89	25%	1.42	0.53	YES
100-yr	2.90	20%	2.32	0.72	YES

*Per N.J.A.C. 7:8-5.4.3.

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3.0 WATER AND SEWER DEMAND

3.1 SANITARY SEWER

Survey information indicates the presence of a 15" combined sewer in Homestead Place; however, record mapping from the JCMUA indicates the presence of an 18-inch diameter combined sewer. Coordination with the JCMUA will be necessary to confirm the characteristics of the existing sewer. The JCMUA also to upgrade this existing 15" clay combined sewer in Homestead Place to an 18" PVC combined sewer pipe. One 12-inch diameter sewer lateral connecting to the sewer in Homestead Place is proposed for the project. The projected sanitary flow can be found in Appendix A, which was computed in accordance with N.J.A.C. 7:14A-23.3.

The anticipated flow is greater than 8,000 gallons per day and therefore a Treatment Works Approval will be required from the New Jersey Department of Environmental Protection (NJDEP) prior to construction.

3.2 WATER SERVICE

Record mapping indicates the presence of a 6-inch diameter water main in Van Reipen Ave and a 12-inch diameter main in Pavonia Ave. A 6-inch combined service lateral is proposed for the project, which will connect to the 6" main in Van Reipen Avenue.

The estimated average-daily and peak water demand for the development can be found in Appendix B, which was calculated in accordance with Table 5.1 and 5.2 of the New Jersey Residential Site Improvements Standards (N.J.A.C. 5:21-5.1) and the Safe Drinking Water Act Rules (N.J.A.C. 7:10-12.6, Table 1: Average Daily Water Demand).

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APPENDIX A
SANITARY SEWER DEMAND
CALCULATIONS

DRESDNER ROBIN

<table>
<tr><td colspan="5">SANITARY SEWER CALCULATIONS

29 VAN REIPEN AVENUE
BLOCK 7904, LOTS 1 & 2
JERSEY CITY, NJ
DR PROJECT NO. 10743-008</td></tr>
<tr><th>Type of Establishment</th><th>Measurement</th><th># Units</th><th>GPD/Unit</th><th>GPD</th></tr>
<tr><td>Studio</td><td>Per Dwelling</td><td>372</td><td>150</td><td>55,800</td></tr>
<tr><td>1 Bedroom</td><td>Per Dwelling</td><td>228</td><td>150</td><td>34,200</td></tr>
<tr><td>3 Bedroom</td><td>Per Dwelling</td><td>12</td><td>300</td><td>3,600</td></tr>
<tr><td>Retail</td><td>Sq. Ft.</td><td>5,407</td><td>0.1</td><td>541</td></tr>
<tr><td>Office</td><td>Sq. Ft.</td><td>25,320</td><td>0.1</td><td>2,532</td></tr>
</table>

Projected Estimates per N.J.A.C. 7:14A-23.3

Flow Received	100%
Total Flow (GPD) ($Q_{projected}$)	96,673
Total Flow (CFS) ($Q_{projected}$)	0.150

Pipe Length (LF)	Diameter (in)	Material	Slope	n*
19	12	PVC	2.00%	0.013

* Per JCMUA Rules and Regulations, Section 5.01

Half Flow Pipe Capacity	
Depth of Flow, h (in)	6
h/D	0.500
Pipe Radius, r (ft)	0.500
Circ. Segment Height, h (ft)	0.500
Central Angle, θ (radians)	3.142
Cross-Sectional Area, A (ft^2)	0.393
Wetted Perimeter, P (ft)	1.571
Hydraulic Radius, R (ft)	0.250
Discharge, Q (cfs)	2.526
$Q_{projected}$ (x2) (cfs)	0.299
Pipe % Full [(A/A$_{full}$)*100%]	50.00%
Average Velocity, V (ft/sec)	6.433
$Q_{pipe} > 2xQ_{projected}$	TRUE
V ≥ 2.2 ft/sec	TRUE
Therefore, design is	**ADEQUATE**

Actual Pipe Velocity	
**Depth of Flow, h (in)	1.420
Pipe Radius, r (ft)	0.500
Circ. Segment Height, h (ft)	0.118
Central Angle, θ (radians)	1.405
Cross-Sectional Area, A (ft^2)	0.052
Wetted Perimeter, P (ft)	0.702
Hydraulic Radius, R (ft)	0.074
Pipe % Full [(A/A$_{full}$)*100%]	6.66%
Actual Velocity, V (ft/sec)	2.869

**Must have h < r

Compare	
Discharge, Q (cfs)	0.150
$Q_{projected}$, (cfs)	0.150

Equations used for calculations:

Manning's Formula:

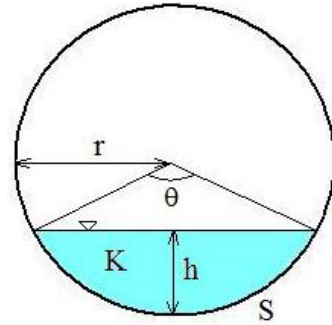$$Q = \left(\frac{1.49}{n}\right) AR^{2/3}\sqrt{S}$$

Q = Flow Rate, (ft^3/s)

n = Manning's Coefficient

A = Flow Area, (ft^2)

R = Hydraulic Radius, (ft)

S = Channel Slope, (ft/ft)

$$\theta = 2\arccos\left(\frac{r-h}{r}\right)$$

$$A = \frac{r^2(\theta - sin\theta)}{2}$$

$$P = r\theta$$

APPENDIX B

WATER SERVICE DEMAND CALCULATIONS

DRESDNER ROBIN

WATER DEMAND CALCULATIONS
29 VAN REIPEN AVENUE
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Residential Demand[1]

Type of Establishment	Measurement	# Units	GPD/Unit	Daily Demand (GPD)	Daily Demand (MGD)	Peaking Factor	Peak Daily Demand (GPD)	Peak Daily Demand (MGD)
Studio	Per Dwelling	372	80	29,760	0.030	3	89,280	0.089
1-Bedroom	Per Dwelling	228	120	27,360	0.027	3	82,080	0.082
3-Bedroom	Per Dwelling	12	270	3,240	0.003	3	9,720	0.010
Total Units		612						
Total Residential Demand				60,360	0.060		181,080	0.181

Non-Residential Demand[2]

Type of Establishment	Measurement	# Units	GPD/Unit	Daily Demand (GPD)	Daily Demand (MGD)	Peaking Factor	Peak Daily Demand (GPD)	Peak Daily Demand (MGD)
Office/Retail	SF	30,727	0.125	3,841	0.004	3	11,523	0.012
Total Non-Residential Demand				3,841	0.004		11,523	0.012

	Daily Demand (GPD)	Daily Demand (MGD)		Peak Daily Demand (GPD)	Peak Daily Demand (MGD)
Total Site Demand	64,201	0.064		192,603	0.193

Notes:

[1] *Residential demand as per N.J.A.C. 5:21-5.1*

[2] *Non-residential demand as per N.J.A.C. 7:10-12.6 (Table 1)*

APPENDIX C

STORMWATER RUNOFF

CALCULATIONS

Watershed Model Schematic

1 - Existing

2 - Proposed Detained

3 - Proposed Undetained

4 - Detention Routing

5 - Total Proposed Flow

Legend

Hyd.	Origin	Description
1	Rational	Existing
2	Mod. Rational	Proposed Detained
3	Rational	Proposed Undetained
4	Reservoir	Detention Routing
5	Combine	Total Proposed Flow

Hydrograph Return Period Recap

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	Rational	------	-------	1.184	-------	-------	1.889	-------	-------	2.901	Existing
2	Mod. Rational	------	-------	0.714	-------	-------	1.348	-------	-------	2.374	Proposed Detained
3	Rational	------	-------	0.139	-------	-------	0.221	-------	-------	0.340	Proposed Undetained
4	Reservoir	2	-------	0.319	-------	-------	0.489	-------	-------	0.655	Detention Routing
5	Combine	3, 4	-------	0.366	-------	-------	0.533	-------	-------	0.718	Total Proposed Flow

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	1.184	1	10	710	------	------	------	Existing
2	Mod. Rational	0.714	1	10	1,075	------	------	------	Proposed Detained
3	Rational	0.139	1	10	83	------	------	------	Proposed Undetained
4	Reservoir	0.319	1	92	2,732	2	85.74	74.2	Detention Routing
5	Combine	0.366	1	12	2,815	3, 4	------	------	Total Proposed Flow

Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 1.184 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 710 cuft
Drainage area	= 0.380 ac	Runoff coeff.	= 0.88*
Intensity	= 3.539 in/hr	Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.320 x 0.98) + (0.060 x 0.35)] / 0.380

Existing

Hyd. No. 1 -- 2 Year
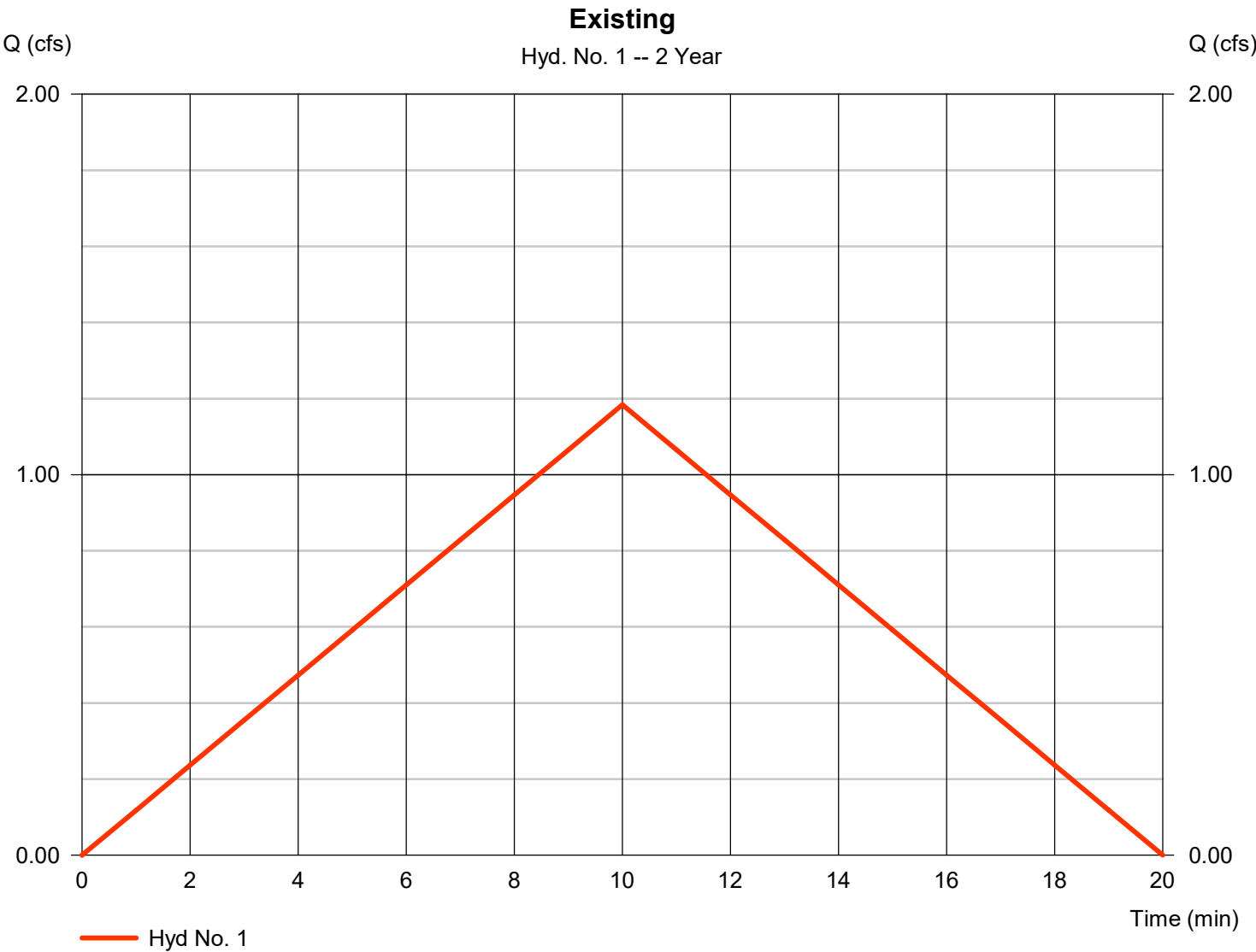
Hydrograph Report

Hyd. No. 2

Proposed Detained

Hydrograph type	= Mod. Rational	Peak discharge	= 0.714 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,075 cuft
Drainage area	= 0.350 ac	Runoff coeff.	= 0.98*
Intensity	= 2.081 in/hr	Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Storm duration	= 2.5 x Tc
Target Q	=0.530 cfs	Est. Req'd Storage	=506 cuft

* Composite (Area/C) = [(0.350 x 0.98)] / 0.350
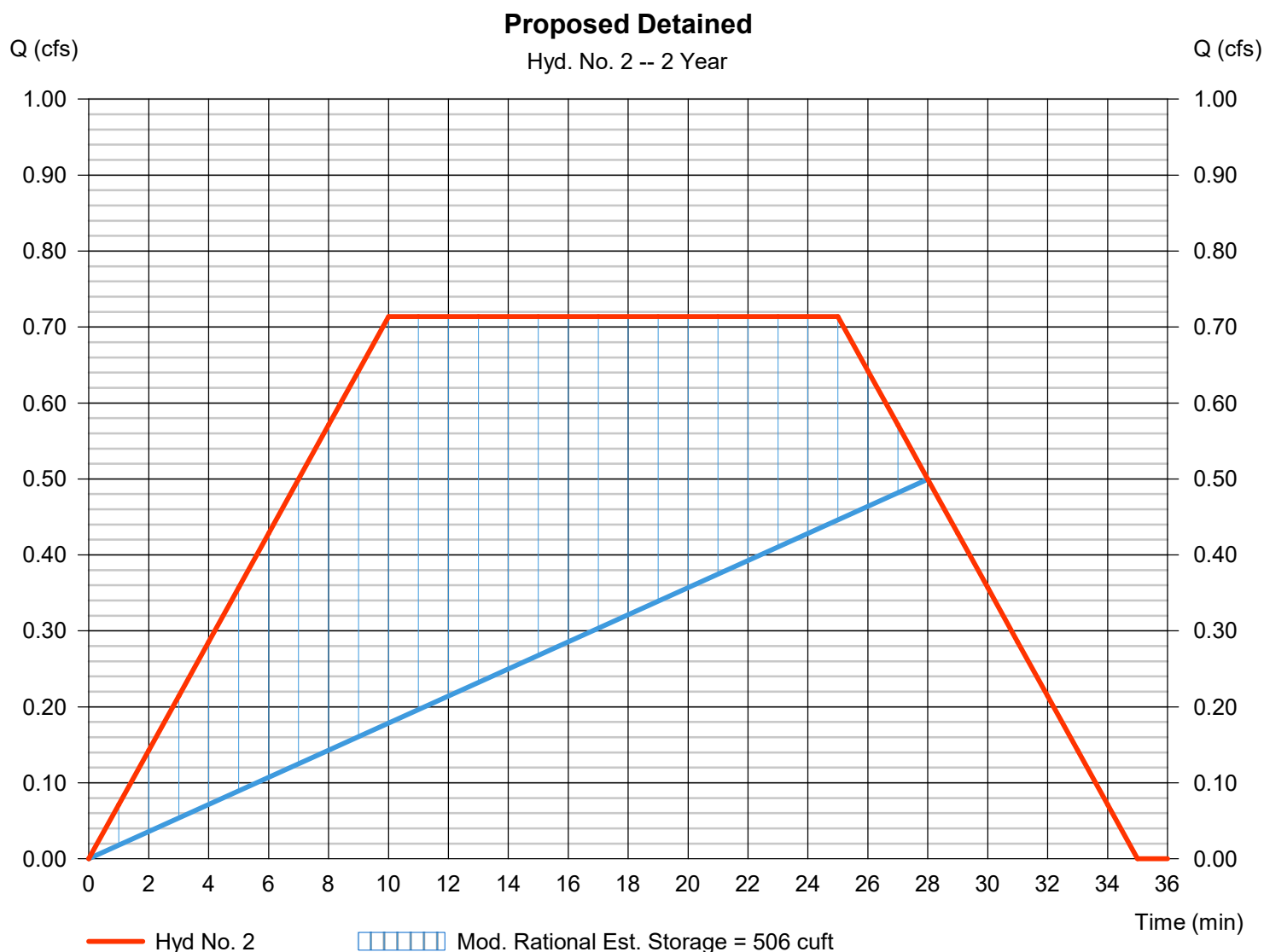
Proposed Detained

Hyd. No. 2 -- 2 Year

Hyd No. 2   Mod. Rational Est. Storage = 506 cuft

Hydrograph Report
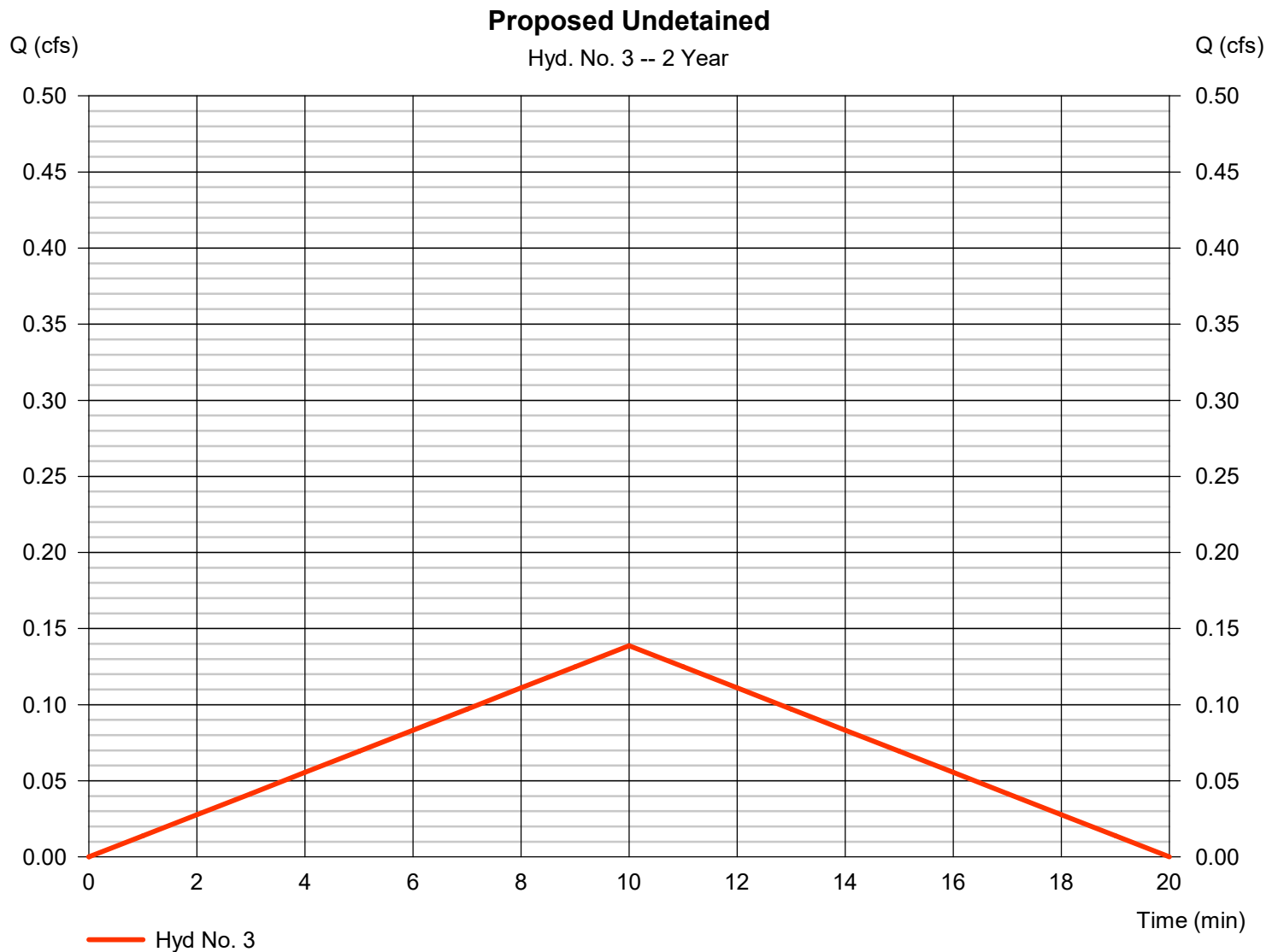
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020   Monday, 12 / 14 / 2020

Hyd. No. 3

Proposed Undetained

Hydrograph type	= Rational		Peak discharge	= 0.139 cfs
Storm frequency	= 2 yrs		Time to peak	= 10 min
Time interval	= 1 min		Hyd. volume	= 83 cuft
Drainage area	= 0.040 ac		Runoff coeff.	= 0.98*
Intensity	= 3.539 in/hr		Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.040 x 0.98)] / 0.040

Proposed Undetained

Hyd. No. 3 -- 2 Year

Hydrograph Report

Hyd. No. 4

Detention Routing

Hydrograph type	= Reservoir	Peak discharge	= 0.319 cfs
Storm frequency	= 2 yrs	Time to peak	= 92 min
Time interval	= 1 min	Hyd. volume	= 2,732 cuft
Inflow hyd. No.	= 2 - Proposed Detained	Max. Elevation	= 85.74 ft
Reservoir name	= Detention Pond	Max. Storage	= 74 cuft

Storage Indication method used.
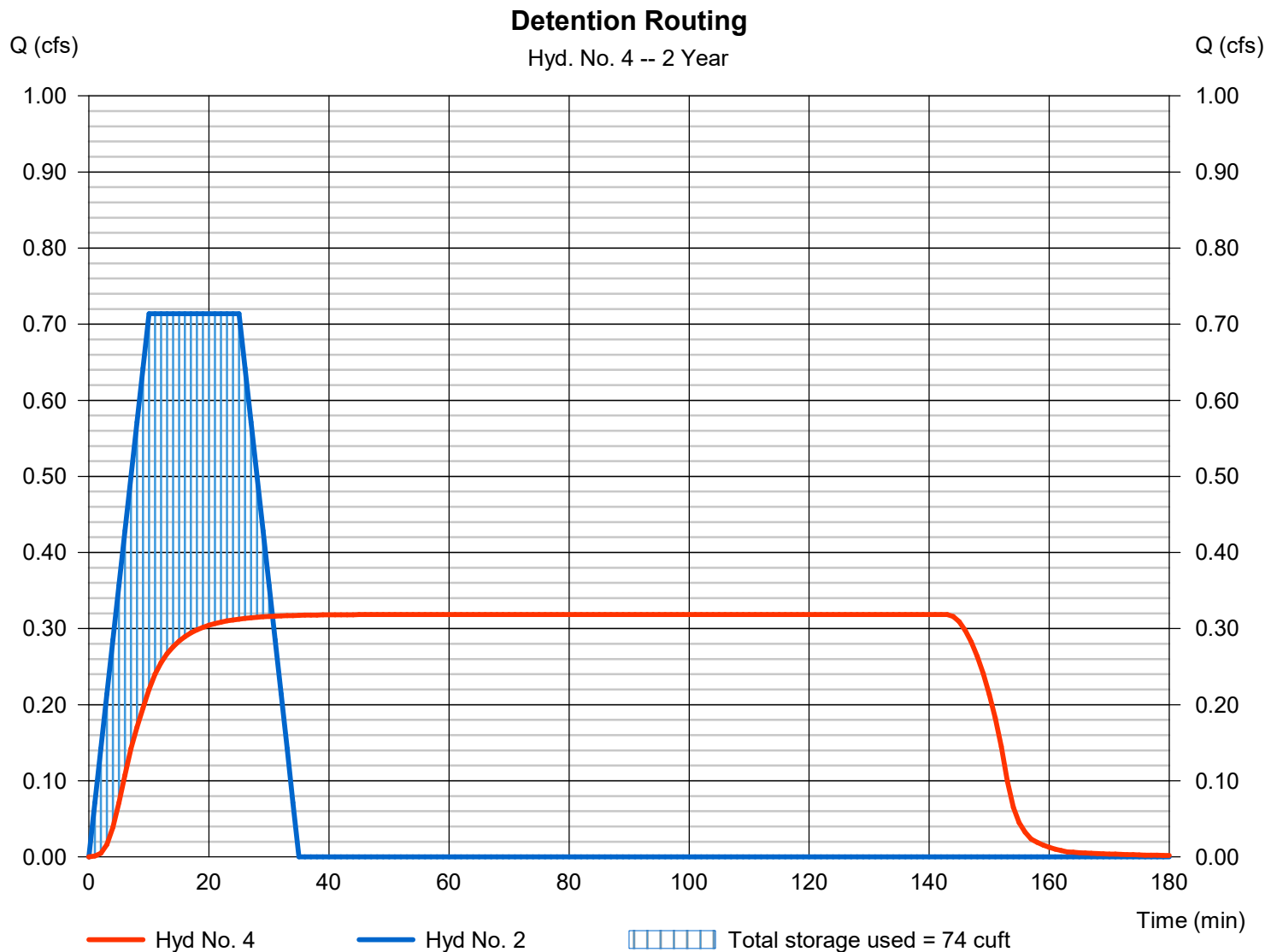
Detention Routing

Hyd. No. 4 -- 2 Year

Hyd No. 4   Hyd No. 2   Total storage used = 74 cuft

Pond Report

Pond No. 1 - Detention Pond
Pond Data
Trapezoid -Bottom L x W = 20.0 x 15.0 ft, Side slope = 0.00:1, Bottom elev. = 85.00 ft, Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	85.00	300	0	0
0.40	85.40	300	120	120
0.80	85.80	300	120	240
1.20	86.20	300	120	360
1.60	86.60	300	120	480
2.00	87.00	300	120	600
2.40	87.40	300	120	720
2.80	87.80	300	120	840
3.20	88.20	300	120	960
3.60	88.60	300	120	1,080
4.00	89.00	300	120	1,200

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.00	6.00	0.00
Span (in)	= 12.00	3.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 85.00	85.50	87.30	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.00	0.00	0.00	0.00
Crest El. (ft)	= 88.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
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).

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	85.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.04	12	85.04	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.08	24	85.08	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.12	36	85.12	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.16	48	85.16	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.20	60	85.20	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.24	72	85.24	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.28	84	85.28	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.32	96	85.32	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.36	108	85.36	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.40	120	85.40	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.44	132	85.44	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.48	144	85.48	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.52	156	85.52	0.00 ic	0.00 ic	0.00	---	0.00	---	---	---	---	---	0.001
0.56	168	85.56	0.01 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.008
0.60	180	85.60	0.02 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.020
0.64	192	85.64	0.04 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.036
0.68	204	85.68	0.06 ic	0.06 ic	0.00	---	0.00	---	---	---	---	---	0.055
0.72	216	85.72	0.07 ic	0.07 ic	0.00	---	0.00	---	---	---	---	---	0.073
0.76	228	85.76	0.09 ic	0.09 ic	0.00	---	0.00	---	---	---	---	---	0.087
0.80	240	85.80	0.10 ic	0.10 ic	0.00	---	0.00	---	---	---	---	---	0.099
0.84	252	85.84	0.11 ic	0.11 ic	0.00	---	0.00	---	---	---	---	---	0.110
0.88	264	85.88	0.12 ic	0.12 ic	0.00	---	0.00	---	---	---	---	---	0.119
0.92	276	85.92	0.13 ic	0.13 ic	0.00	---	0.00	---	---	---	---	---	0.128
0.96	288	85.96	0.14 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.137
1.00	300	86.00	0.15 ic	0.14 ic	0.00	---	0.00	---	---	---	---	---	0.145
1.04	312	86.04	0.16 ic	0.15 ic	0.00	---	0.00	---	---	---	---	---	0.152
1.08	324	86.08	0.16 ic	0.16 ic	0.00	---	0.00	---	---	---	---	---	0.159
1.12	336	86.12	0.17 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.166
1.16	348	86.16	0.18 ic	0.17 ic	0.00	---	0.00	---	---	---	---	---	0.173
1.20	360	86.20	0.18 ic	0.18 ic	0.00	---	0.00	---	---	---	---	---	0.179
1.24	372	86.24	0.19 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.185

Continues on next page...

Detention Pond
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
1.28	384	86.28	0.19 ic	0.19 ic	0.00	---	0.00	---	---	---	---	---	0.191
1.32	396	86.32	0.20 ic	0.20 ic	0.00	---	0.00	---	---	---	---	---	0.197
1.36	408	86.36	0.20 ic	0.20 ic	0.00	---	0.00	---	---	---	---	---	0.203
1.40	420	86.40	0.21 ic	0.21 ic	0.00	---	0.00	---	---	---	---	---	0.208
1.44	432	86.44	0.21 ic	0.21 ic	0.00	---	0.00	---	---	---	---	---	0.213
1.48	444	86.48	0.22 ic	0.22 ic	0.00	---	0.00	---	---	---	---	---	0.219
1.52	456	86.52	0.22 ic	0.22 ic	0.00	---	0.00	---	---	---	---	---	0.224
1.56	468	86.56	0.24 ic	0.23 ic	0.00	---	0.00	---	---	---	---	---	0.229
1.60	480	86.60	0.24 ic	0.23 ic	0.00	---	0.00	---	---	---	---	---	0.233
1.64	492	86.64	0.24 ic	0.24 ic	0.00	---	0.00	---	---	---	---	---	0.238
1.68	504	86.68	0.25 ic	0.24 ic	0.00	---	0.00	---	---	---	---	---	0.243
1.72	516	86.72	0.25 ic	0.25 ic	0.00	---	0.00	---	---	---	---	---	0.247
1.76	528	86.76	0.25 ic	0.25 ic	0.00	---	0.00	---	---	---	---	---	0.252
1.80	540	86.80	0.26 ic	0.26 ic	0.00	---	0.00	---	---	---	---	---	0.256
1.84	552	86.84	0.26 ic	0.26 ic	0.00	---	0.00	---	---	---	---	---	0.260
1.88	564	86.88	0.26 ic	0.26 ic	0.00	---	0.00	---	---	---	---	---	0.265
1.92	576	86.92	0.28 ic	0.27 ic	0.00	---	0.00	---	---	---	---	---	0.269
1.96	588	86.96	0.28 ic	0.27 ic	0.00	---	0.00	---	---	---	---	---	0.273
2.00	600	87.00	0.28 ic	0.28 ic	0.00	---	0.00	---	---	---	---	---	0.277
2.04	612	87.04	0.29 ic	0.28 ic	0.00	---	0.00	---	---	---	---	---	0.281
2.08	624	87.08	0.29 ic	0.29 ic	0.00	---	0.00	---	---	---	---	---	0.285
2.12	636	87.12	0.29 ic	0.29 ic	0.00	---	0.00	---	---	---	---	---	0.289
2.16	648	87.16	0.29 ic	0.29 ic	0.00	---	0.00	---	---	---	---	---	0.293
2.20	660	87.20	0.31 ic	0.30 ic	0.00	---	0.00	---	---	---	---	---	0.297
2.24	672	87.24	0.31 ic	0.30 ic	0.00	---	0.00	---	---	---	---	---	0.300
2.28	684	87.28	0.31 ic	0.30 ic	0.00	---	0.00	---	---	---	---	---	0.304
2.32	696	87.32	0.31 ic	0.31 ic	0.00 ic	---	0.00	---	---	---	---	---	0.309
2.36	708	87.36	0.32 ic	0.31 ic	0.01 ic	---	0.00	---	---	---	---	---	0.323
2.40	720	87.40	0.35 ic	0.31 ic	0.03 ic	---	0.00	---	---	---	---	---	0.346
2.44	732	87.44	0.39 ic	0.32 ic	0.06 ic	---	0.00	---	---	---	---	---	0.376
2.48	744	87.48	0.42 ic	0.32 ic	0.09 ic	---	0.00	---	---	---	---	---	0.414
2.52	756	87.52	0.46 ic	0.33 ic	0.13 ic	---	0.00	---	---	---	---	---	0.460
2.56	768	87.56	0.52 ic	0.33 ic	0.18 ic	---	0.00	---	---	---	---	---	0.509
2.60	780	87.60	0.56 ic	0.33 ic	0.23 ic	---	0.00	---	---	---	---	---	0.562
2.64	792	87.64	0.62 ic	0.34 ic	0.28 ic	---	0.00	---	---	---	---	---	0.620
2.68	804	87.68	0.69 ic	0.34 ic	0.34 ic	---	0.00	---	---	---	---	---	0.675
2.72	816	87.72	0.74 ic	0.34 ic	0.39 ic	---	0.00	---	---	---	---	---	0.731
2.76	828	87.76	0.79 ic	0.35 ic	0.44 ic	---	0.00	---	---	---	---	---	0.782
2.80	840	87.80	0.84 ic	0.35 ic	0.47 ic	---	0.00	---	---	---	---	---	0.821
2.84	852	87.84	0.86 ic	0.35 ic	0.51 ic	---	0.00	---	---	---	---	---	0.861
2.88	864	87.88	0.91 ic	0.35 ic	0.54 ic	---	0.00	---	---	---	---	---	0.898
2.92	876	87.92	0.94 ic	0.36 ic	0.58 ic	---	0.00	---	---	---	---	---	0.933
2.96	888	87.96	0.97 ic	0.36 ic	0.61 ic	---	0.00	---	---	---	---	---	0.966
3.00	900	88.00	1.00 ic	0.36 ic	0.63 ic	---	0.00	---	---	---	---	---	0.998
3.04	912	88.04	1.04 ic	0.37 ic	0.66 ic	---	0.00	---	---	---	---	---	1.029
3.08	924	88.08	1.07 ic	0.37 ic	0.69 ic	---	0.00	---	---	---	---	---	1.058
3.12	936	88.12	1.10 ic	0.37 ic	0.71 ic	---	0.00	---	---	---	---	---	1.087
3.16	948	88.16	1.13 ic	0.38 ic	0.74 ic	---	0.00	---	---	---	---	---	1.115
3.20	960	88.20	1.15 ic	0.38 ic	0.76 ic	---	0.00	---	---	---	---	---	1.141
3.24	972	88.24	1.18 ic	0.38 ic	0.79 ic	---	0.00	---	---	---	---	---	1.167
3.28	984	88.28	1.21 ic	0.39 ic	0.81 ic	---	0.00	---	---	---	---	---	1.193
3.32	996	88.32	1.22 ic	0.39 ic	0.83 ic	---	0.00	---	---	---	---	---	1.217
3.36	1,008	88.36	1.24 ic	0.39 ic	0.85 ic	---	0.00	---	---	---	---	---	1.242
3.40	1,020	88.40	1.27 ic	0.39 ic	0.87 ic	---	0.00	---	---	---	---	---	1.265
3.44	1,032	88.44	1.29 ic	0.40 ic	0.89 ic	---	0.00	---	---	---	---	---	1.288
3.48	1,044	88.48	1.32 ic	0.40 ic	0.91 ic	---	0.00	---	---	---	---	---	1.311
3.52	1,056	88.52	1.35 ic	0.40 ic	0.93 ic	---	0.02	---	---	---	---	---	1.352
3.56	1,068	88.56	1.46 ic	0.40 ic	0.95 ic	---	0.10	---	---	---	---	---	1.452
3.60	1,080	88.60	1.58 ic	0.40 ic	0.97 ic	---	0.21	---	---	---	---	---	1.583
3.64	1,092	88.64	1.74 ic	0.40 ic	0.99 ic	---	0.35	---	---	---	---	---	1.740
3.68	1,104	88.68	1.92 ic	0.40 ic	1.00 ic	---	0.51	---	---	---	---	---	1.917
3.72	1,116	88.72	2.11 ic	0.40 ic	1.02 ic	---	0.69	---	---	---	---	---	2.113
3.76	1,128	88.76	2.33 ic	0.40 ic	1.04 ic	---	0.88	---	---	---	---	---	2.324
3.80	1,140	88.80	2.55 ic	0.40 ic	1.06 ic	---	1.09	---	---	---	---	---	2.550
3.84	1,152	88.84	2.79 ic	0.40 ic	1.07 ic	---	1.32	---	---	---	---	---	2.789
3.88	1,164	88.88	3.04 ic	0.39 ic	1.09 ic	---	1.56	---	---	---	---	---	3.041
3.92	1,176	88.92	3.30 ic	0.39 ic	1.11 ic	---	1.81	---	---	---	---	---	3.304
3.96	1,188	88.96	3.58 ic	0.38 ic	1.12 ic	---	2.08	---	---	---	---	---	3.579
4.00	1,200	89.00	3.86 ic	0.37 ic	1.14 ic	---	2.35	---	---	---	---	---	3.863

...End

Hydrograph Report

Hyd. No. 5

Total Proposed Flow

Hydrograph type	= Combine	Peak discharge	= 0.366 cfs
Storm frequency	= 2 yrs	Time to peak	= 12 min
Time interval	= 1 min	Hyd. volume	= 2,815 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 0.040 ac

Total Proposed Flow

Hyd. No. 5 -- 2 Year
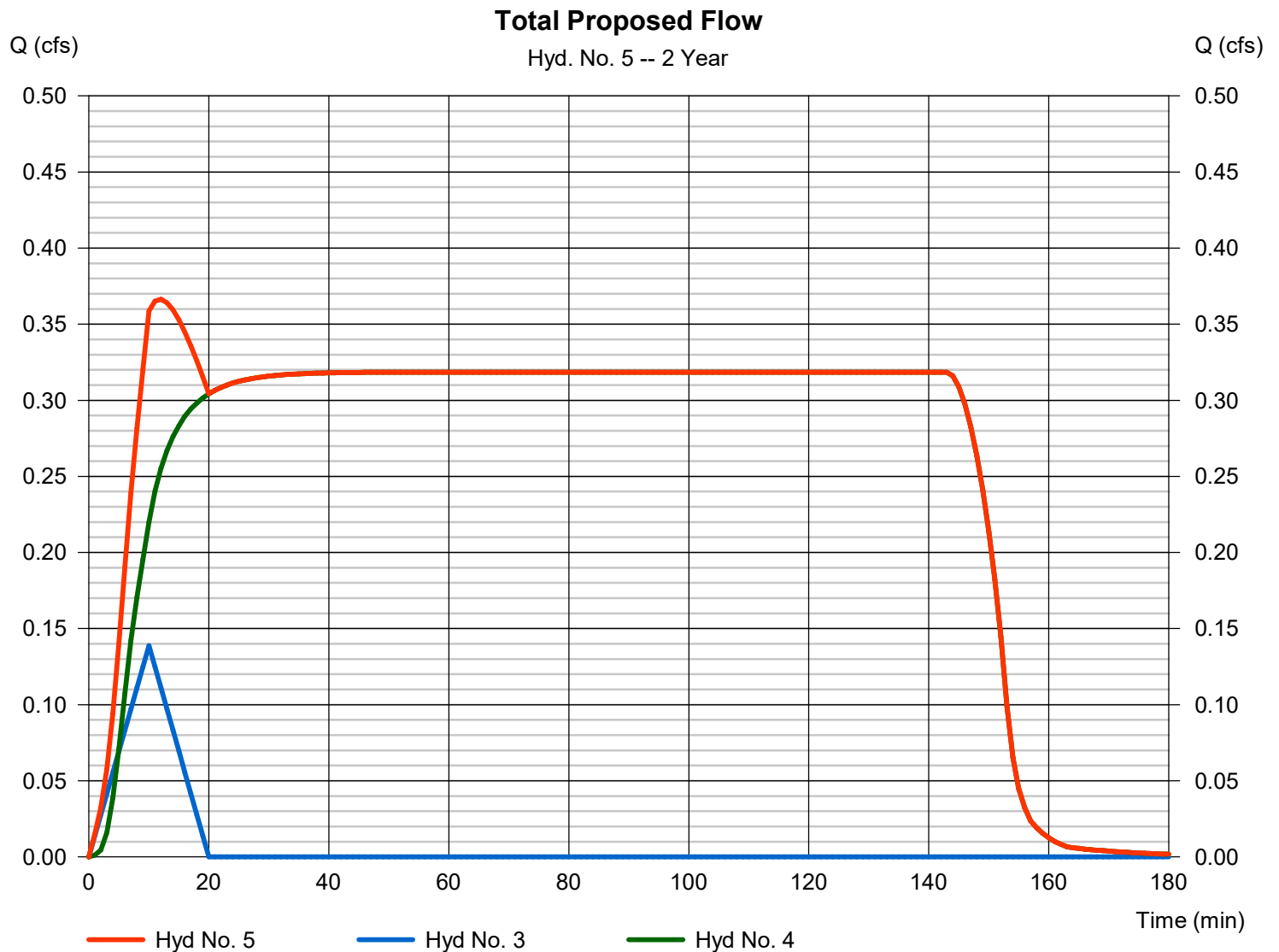
Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 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	Rational	1.889	1	10	1,134	------	------	------	Existing
2	Mod. Rational	1.348	1	10	1,544	------	------	------	Proposed Detained
3	Rational	0.221	1	10	133	------	------	------	Proposed Undetained
4	Reservoir	0.489	1	137	4,397	2	86.52	152	Detention Routing
5	Combine	0.533	1	12	4,530	3, 4	------	------	Total Proposed Flow

29 Van Reipen.gpw	Return Period: 10 Year	Monday, 12 / 14 / 2020

Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 1.889 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,134 cuft
Drainage area	= 0.380 ac	Runoff coeff.	= 0.88*
Intensity	= 5.650 in/hr	Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.320 x 0.98) + (0.060 x 0.35)] / 0.380

Existing

Hyd. No. 1 -- 10 Year

Q (cfs)   Q (cfs)

Time (min)
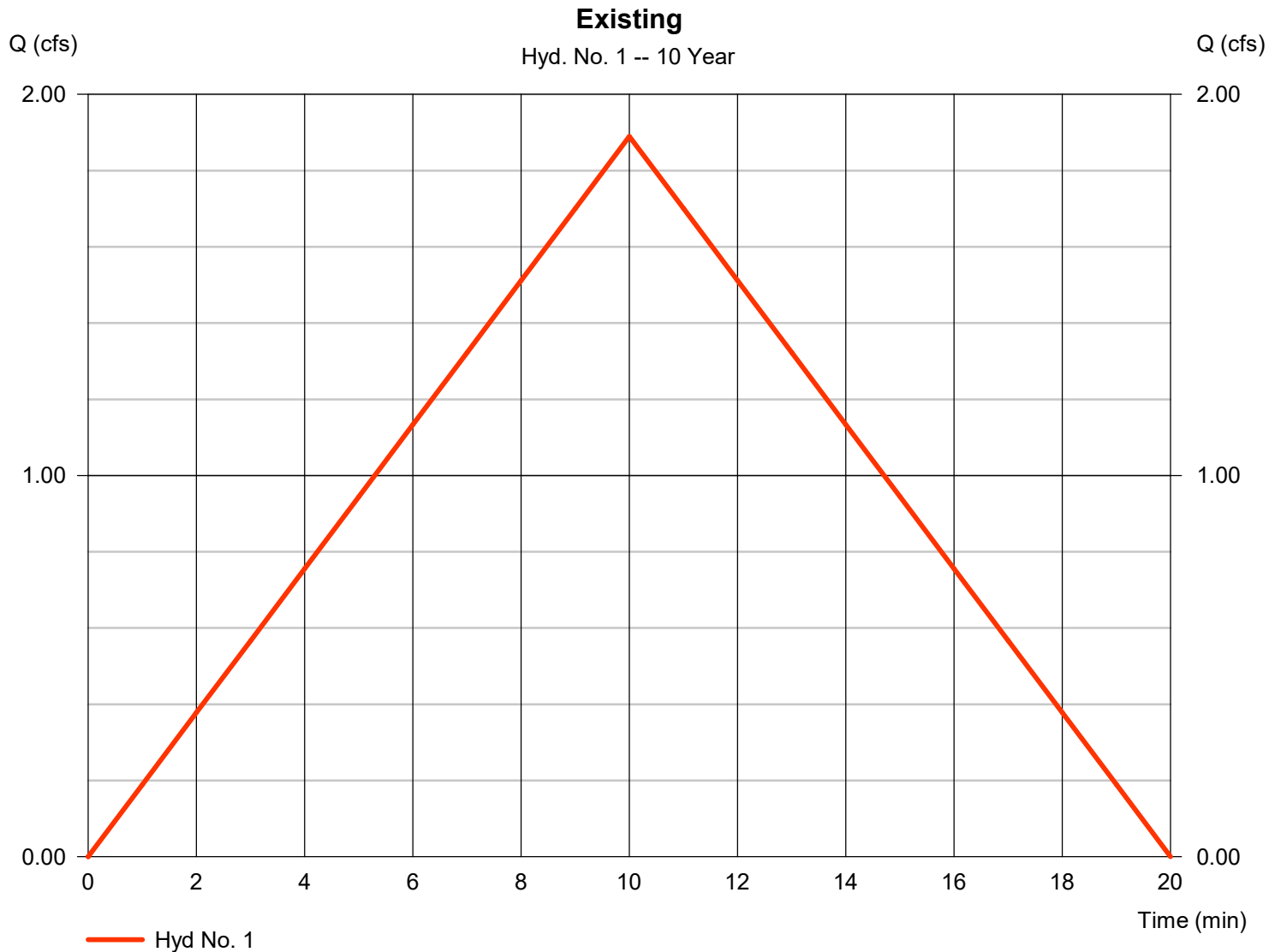
—— Hyd No. 1

Hydrograph Report

Hyd. No. 2

Proposed Detained

Hydrograph type	= Mod. Rational	Peak discharge	= 1.348 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,544 cuft
Drainage area	= 0.350 ac	Runoff coeff.	= 0.98*
Intensity	= 3.929 in/hr	Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Storm duration	= 1.9 x Tc
Target Q	=1.270 cfs	Est. Req'd Storage	=430 cuft

* Composite (Area/C) = [(0.350 x 0.98)] / 0.350
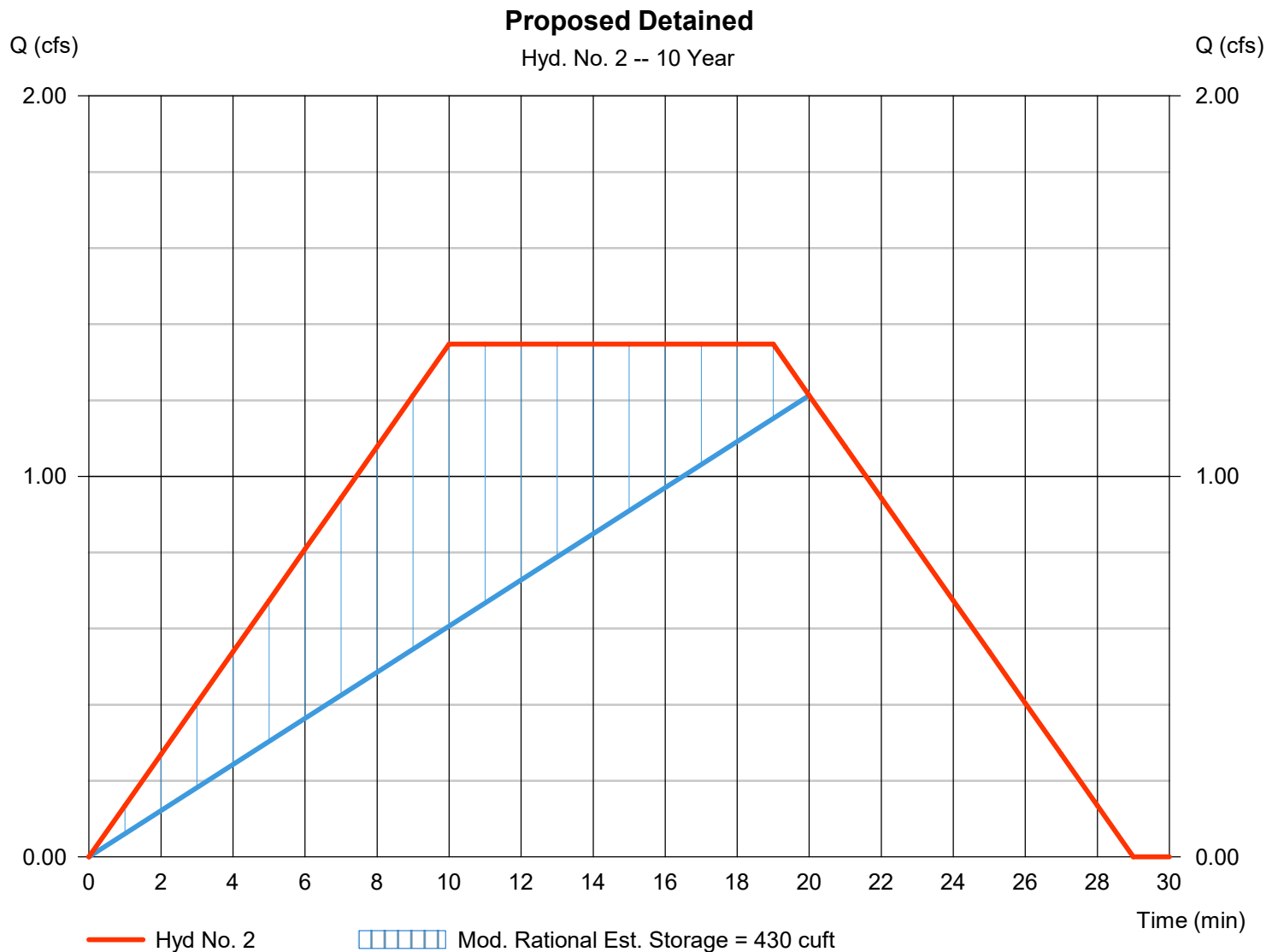
Proposed Detained

Hyd. No. 2 -- 10 Year

Hyd No. 2   Mod. Rational Est. Storage = 430 cuft

Hydrograph Report

Hyd. No. 3

Proposed Undetained

Hydrograph type	= Rational	Peak discharge	= 0.221 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 133 cuft
Drainage area	= 0.040 ac	Runoff coeff.	= 0.98*
Intensity	= 5.650 in/hr	Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.040 x 0.98)] / 0.040

Proposed Undetained

Hyd. No. 3 -- 10 Year
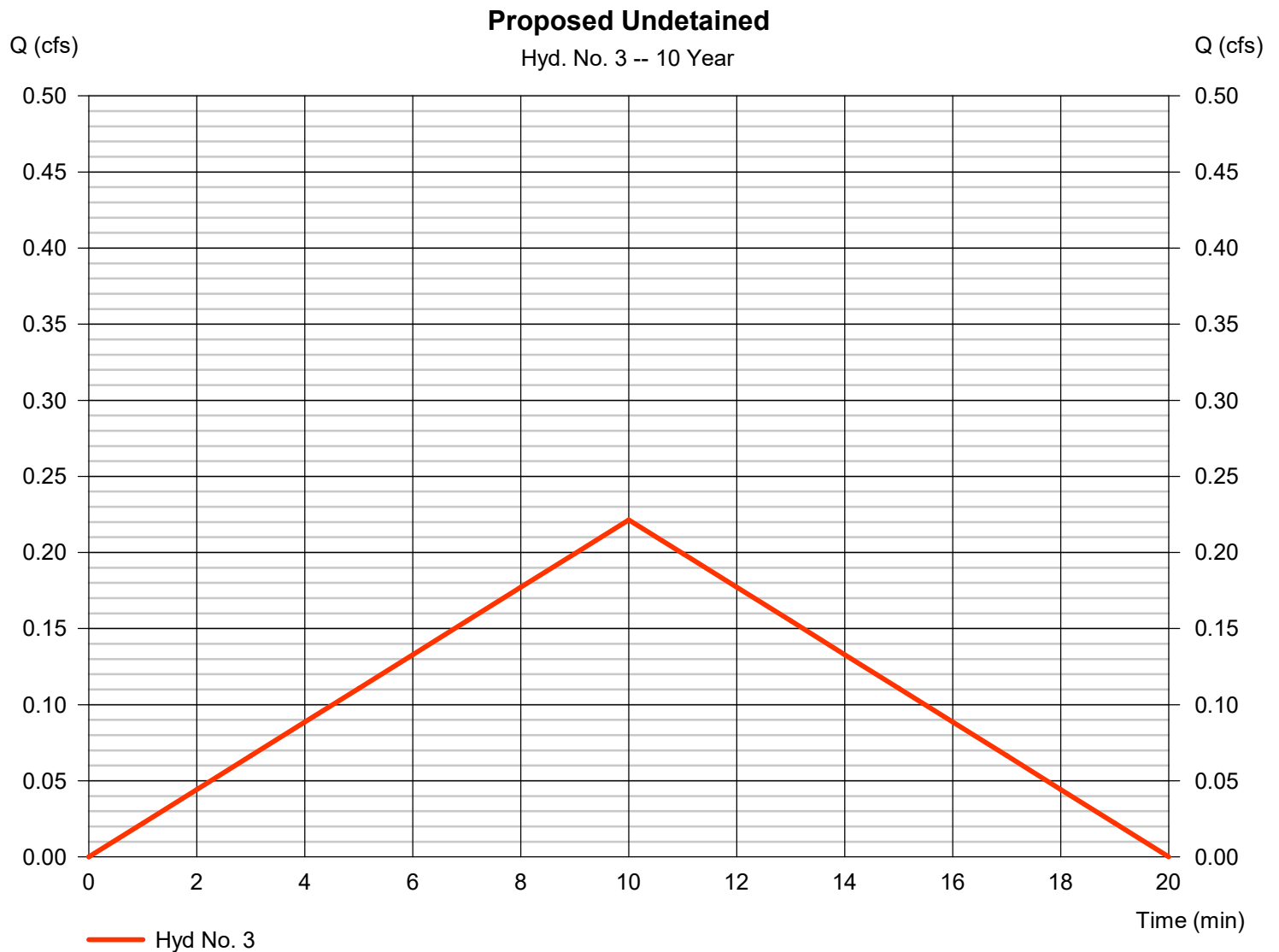
Hydrograph Report

Hyd. No. 4

Detention Routing

Hydrograph type	= Reservoir		Peak discharge	= 0.489 cfs
Storm frequency	= 10 yrs		Time to peak	= 137 min
Time interval	= 1 min		Hyd. volume	= 4,397 cuft
Inflow hyd. No.	= 2 - Proposed Detained		Max. Elevation	= 86.52 ft
Reservoir name	= Detention Pond		Max. Storage	= 152 cuft

Storage Indication method used.

Detention Routing
Hyd. No. 4 -- 10 Year

| | Hyd No. 4 | | Hyd No. 2 | | Total storage used = 152 cuft |

Hydrograph Report

Hyd. No. 5

Total Proposed Flow

Hydrograph type	= Combine	Peak discharge	= 0.533 cfs
Storm frequency	= 10 yrs	Time to peak	= 12 min
Time interval	= 1 min	Hyd. volume	= 4,530 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 0.040 ac

Total Proposed Flow

Hyd. No. 5 -- 10 Year

Q (cfs)

Time (min)

Hyd No. 5   Hyd No. 3   Hyd No. 4

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	2.901	1	10	1,740	------	------	------	Existing
2	Mod. Rational	2.374	1	10	2,151	------	------	------	Proposed Detained
3	Rational	0.340	1	10	204	------	------	------	Proposed Undetained
4	Reservoir	0.655	1	28	7,190	2	87.05	205	Detention Routing
5	Combine	0.718	1	11	7,394	3, 4	------	------	Total Proposed Flow

29 Van Reipen.gpw	Return Period: 100 Year	Monday, 12 / 14 / 2020

Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 2.901 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,740 cuft
Drainage area	= 0.380 ac	Runoff coeff.	= 0.88*
Intensity	= 8.675 in/hr	Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.320 x 0.98) + (0.060 x 0.35)] / 0.380

Existing

Hyd. No. 1 -- 100 Year
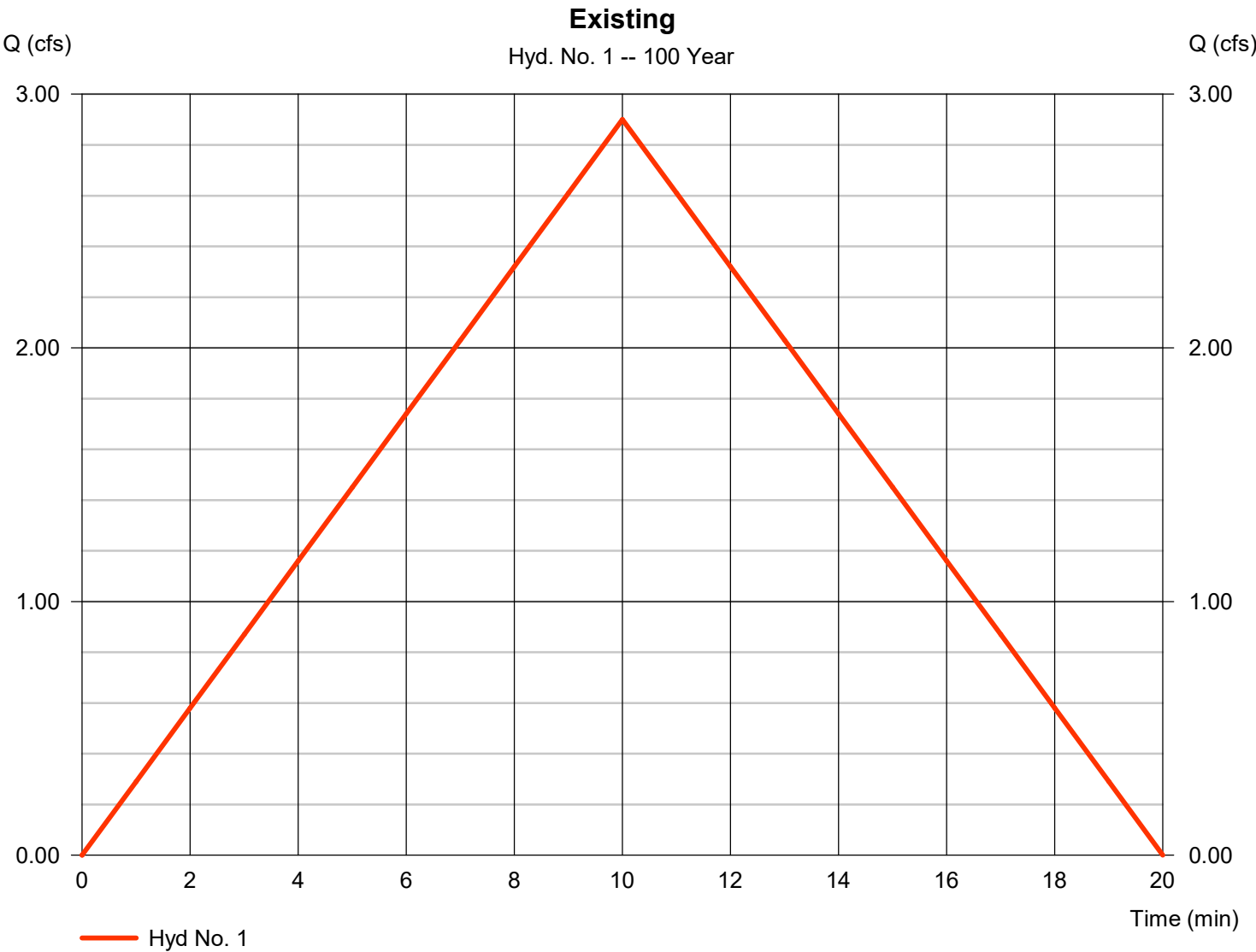
Hydrograph Report

Hyd. No. 2

Proposed Detained

Hydrograph type	= Mod. Rational	Peak discharge	= 2.374 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 2,151 cuft
Drainage area	= 0.350 ac	Runoff coeff.	= 0.98*
Intensity	= 6.921 in/hr	Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Storm duration	= 1.5 x Tc
Target Q	=2.000 cfs	Est. Req'd Storage	=622 cuft

* Composite (Area/C) = [(0.350 x 0.98)] / 0.350
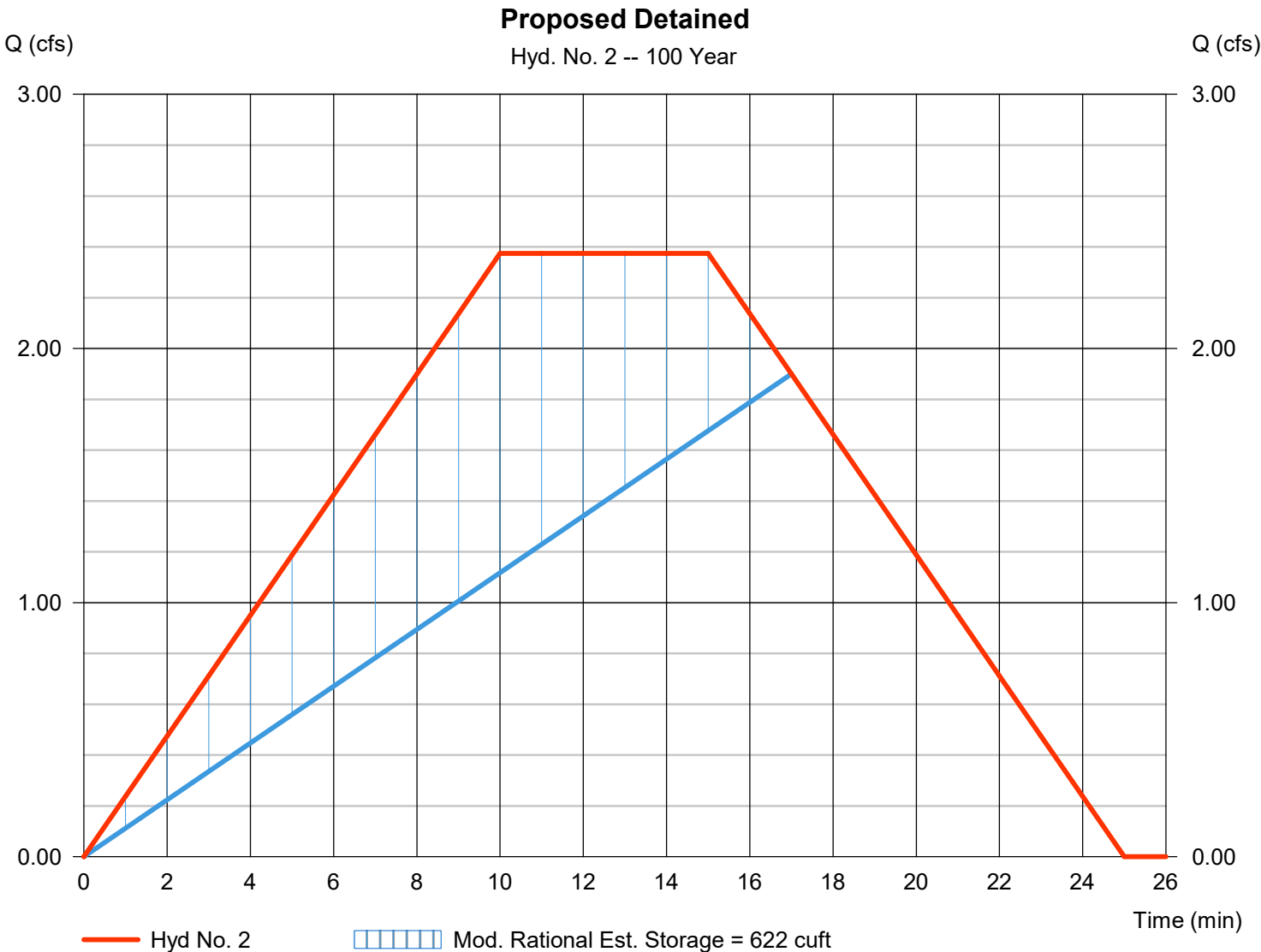
Proposed Detained

Hyd. No. 2 -- 100 Year

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020   Monday, 12 / 14 / 2020

Hyd. No. 3

Proposed Undetained

Hydrograph type	= Rational	Peak discharge	= 0.340 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 204 cuft
Drainage area	= 0.040 ac	Runoff coeff.	= 0.98*
Intensity	= 8.675 in/hr	Tc by User	= 10.00 min
IDF Curve	= JERSEY CITY IDF_2017.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.040 x 0.98)] / 0.040

Proposed Undetained

Hyd. No. 3 -- 100 Year
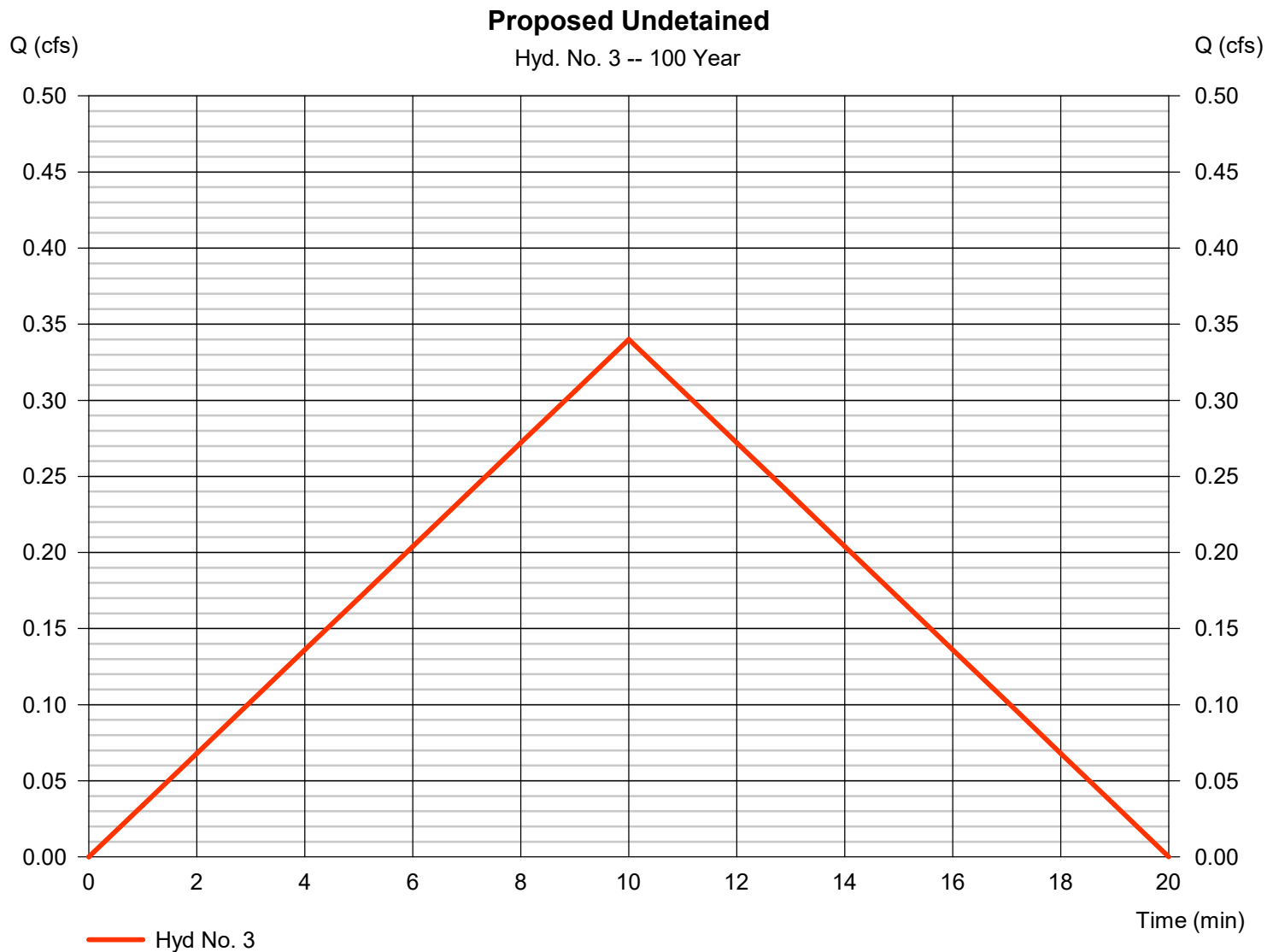
Hydrograph Report

Hyd. No. 4

Detention Routing

Hydrograph type	= Reservoir		Peak discharge	= 0.655 cfs
Storm frequency	= 100 yrs		Time to peak	= 28 min
Time interval	= 1 min		Hyd. volume	= 7,190 cuft
Inflow hyd. No.	= 2 - Proposed Detained		Max. Elevation	= 87.05 ft
Reservoir name	= Detention Pond		Max. Storage	= 205 cuft

Storage Indication method used.
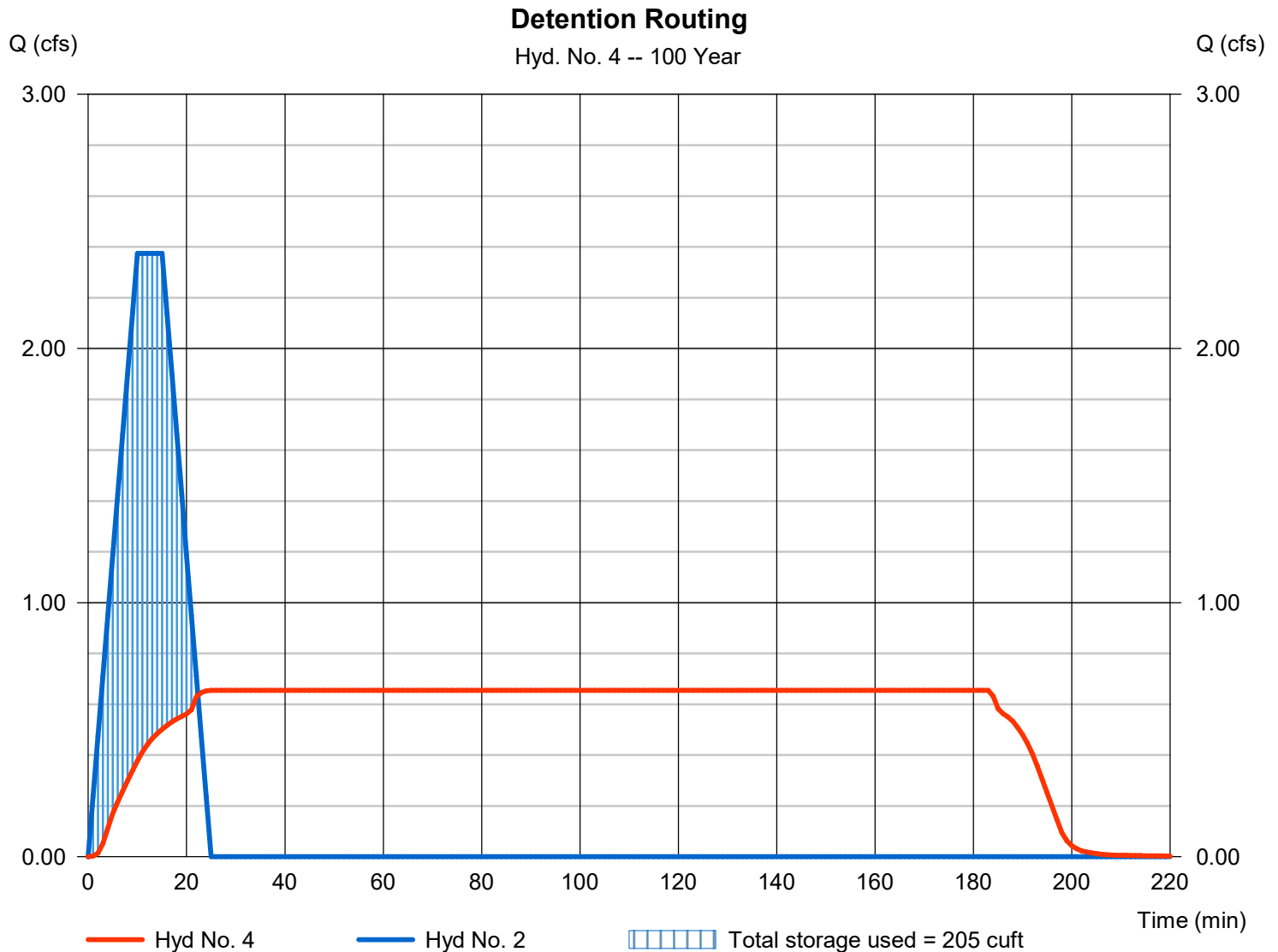
Detention Routing

Hyd. No. 4 -- 100 Year

Total storage used = 205 cuft

Hydrograph Report

Hyd. No. 5

Total Proposed Flow

Hydrograph type	= Combine		Peak discharge	= 0.718 cfs
Storm frequency	= 100 yrs		Time to peak	= 11 min
Time interval	= 1 min		Hyd. volume	= 7,394 cuft
Inflow hyds.	= 3, 4		Contrib. drain. area	= 0.040 ac

Total Proposed Flow

Hyd. No. 5 -- 100 Year

Hyd No. 5 ——— Hyd No. 3 ——— Hyd No. 4 ———

Hydraflow Rainfall Report

Monday, 12 / 14 / 2020
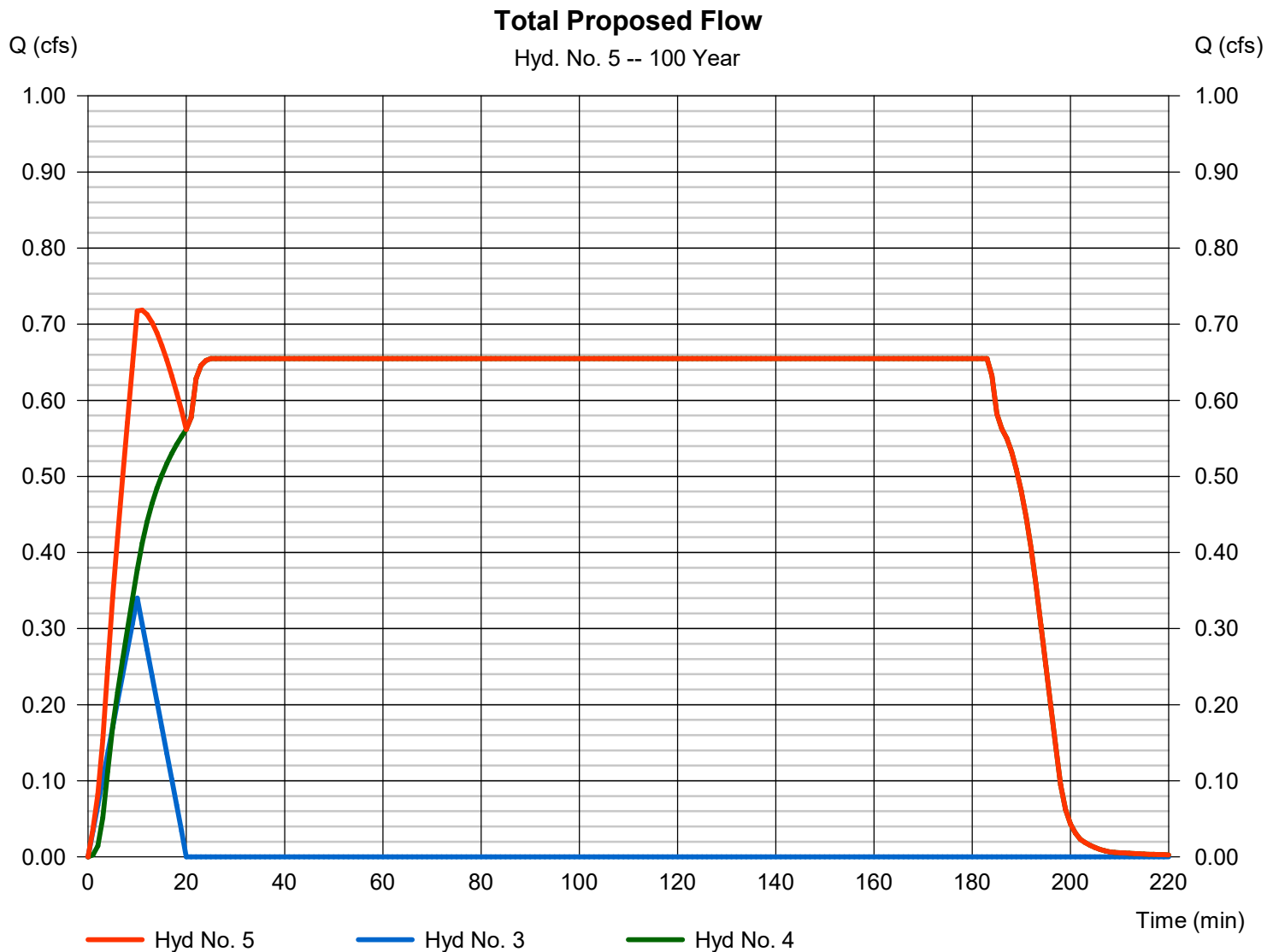
Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	**D**	**E**	**(N/A)**
1	0.0000	0.0000	0.0000	--------
2	22.9807	3.7000	0.7147	--------
3	0.0000	0.0000	0.0000	--------
5	0.0000	0.0000	0.0000	--------
10	37.7243	3.9000	0.7214	--------
25	0.0000	0.0000	0.0000	--------
50	0.0000	0.0000	0.0000	--------
100	57.0886	3.8000	0.7179	--------

File name: JERSEY CITY IDF_2017.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	4.90	3.54	2.83	2.39	2.09	1.86	1.68	1.54	1.43	1.33	1.25	1.18
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	7.79	5.65	4.53	3.82	3.33	2.97	2.69	2.46	2.28	2.13	1.99	1.88
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	11.98	8.67	6.95	5.87	5.12	4.56	4.13	3.79	3.50	3.27	3.06	2.89

Tc = time in minutes. Values may exceed 60.

Precip. file name: S:\Apps\Hydroflow Storm Data\NJ-Passaic.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	**2-yr**	**3-yr**	**5-yr**	**10-yr**	**25-yr**	**50-yr**	**100-yr**
SCS 24-hour	0.00	0.00	0.00	0.00	0.00	6.43	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00