

DRAINAGE REPORT

PROPOSED DWELLING
8 STONE TOWER DRIVE
LOT 12, BLOCK 21
BOROUGH OF ALPINE
BERGEN COUNTY, NEW JERSEY
(FILE # 3972)

PREPARED ON:

February 7, 2022

PREPARED FOR:

OWNER

8 Stone Tower Drive Alpine, LLC
8 Stone Tower Drive, P.O. Box 751
Alpine, New Jersey 07020

APPLICANT

Rock Ridge Construction Management, LLC
64 North Summit Street, Suite 200
Tenafly, New Jersey 07670

MICHAEL J. HUBSCHMAN, P.C.
MICHAEL J. HUBSCHMAN, P.E., P.P.
PROFESSIONAL ENGINEER AND PLANNER
263A SOUTH WASHINGTON AVENUE
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NJPE No. 29497

NJPP No. 3200

[illegible]

INTRODUCTION:

This report has been developed to demonstrate compliance of the proposed drainage improvements on the project site with the Borough of Alpine Stormwater Control Ordinance and the Residential Site Improvement Standards (N.J.A.C. 5:21-7). The proposed net impervious increase is greater than 0.25 ac. Therefore; the project is considered a major project and must comply with the NJ Stormwater Management Regulations which are referenced in the RSIS requiring compliance with groundwater recharge, stormwater quality, and stormwater quantity requirements.

The project site is a residential property that is rectangular in shape and consists of an 87,120.64 square foot (2.00 acre) lot. It is located along the southerly side of Stone Tower Drive in the Borough of Alpine, Bergen County, New Jersey. The applicant proposes a dwelling that would include a cabana, covered patio, driveway, pool & spa, patios, BBQ, and associated ancillary improvements.

EVALUATION:

Stormwater runoff for the site was analyzed utilizing the Modified Rational Method. The property was evaluated for the 2, 10, 25 and 100-year design storm events in the present and developed conditions. Consistent with the Stormwater Regulations in the New Jersey Residential Site Improvement Standards (RSIS), peak flow reductions to 50%, 75%, and 80% were included in the SCS Method analysis for the 2, 10, and 100-year design storm events respectively.

CONCLUSIONS:

Three (3) 48" inch diameter, L=150 ft. pipes are required to meet the established design criteria for peak flow reduction. The outlet structure includes a 6.2 in diameter orifice at elevation 442.5 and a 9 in diameter orifice at 444.6 elevation. Site Plan includes requisite details about the detention system and outlet control structure. Cultec chambers (subsurface infiltration basins) are a Best Management Practice (BMP) that can be utilized for groundwater recharge.

Stormwater Management Summary

Storm	Existing Runoff	Allowable Runoff	Proposed Runoff	Storage Required	Storage Provided	DS No. 1 WSEL
	(CFS)	(CFS)	(CFS)	(CF)	(CF)	(FT)
2 Year	2.816	1.408	1.386	3,204	5,656	444.71
10 Year	3.741	2.806	2.669	4,217	5,656	445.30
25 Year	4.388	4.388	3.263	4,749	5,656	445.64
100 Year	5.295	4.236	4.230	5,566	5,656	446.39

STORMWATER QUALITY:

FloGard +Plus Inserts are proposed at each catch basin within the in the paved driveway area. The maximum peak water quality flow from the driveway to an inlet structure is to be 0,08 cfs which was calculated based on the NJDEP water quality storm of 1.25 inches. See section 3 of this report.

GROUNDWATER RECHARGE:

Annual Groundwater recharge Analysis was performed based on NJ BMP Manual Chapter 6. The calculations are performed utilizing GSR-32 spreadsheet. The target area for the groundwater recharge is 9,934 sf. The required BMP area for the recharge is 315.1 sf which was corresponds to the bottom area of cultec chambers. Based on the aforementioned, the site complies the NJ BMP Manual, Chapter 6, Requirement 1; that 100 percent of the site's average annual pre-developed groundwater recharge volume be maintained after development. See section 4 of this report.

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DRAINAGE REPORT

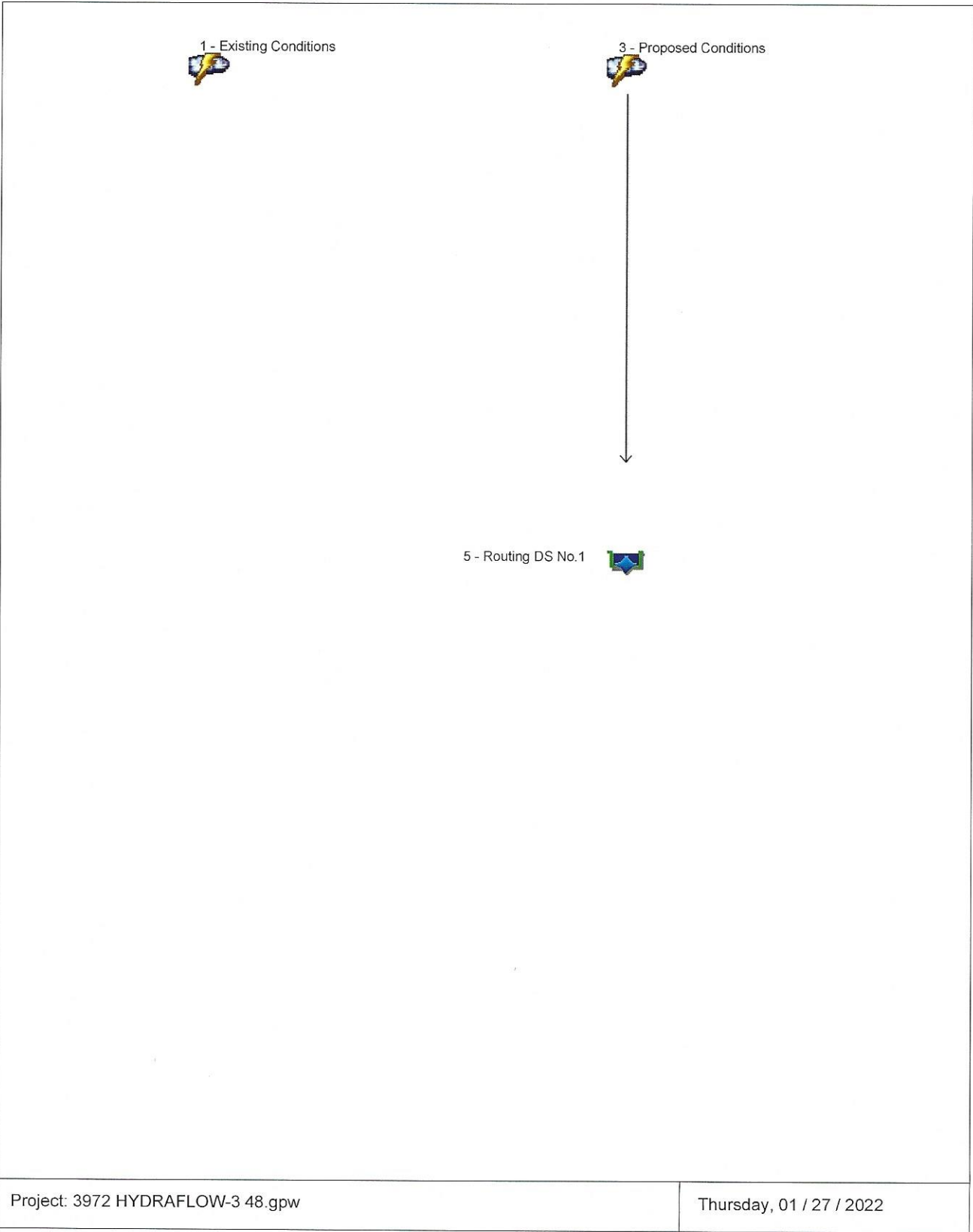
8 STONE TOWER DRIVE - LOT 12, BLOCK 21
BOROUGH OF ALPINE
BERGEN COUNTY, NEW JERSEY
FILE # 3972

SECTION 1

HYDRAFLOW REPORT FOR PRESENT CONDITIONS AND PROPOSED CONDITIONS

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



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	2.816	1	19	3,211	-----	-----	-----	Existing Conditions
3	Mod. Rational	2.180	1	10	6,279	-----	-----	-----	Proposed Conditions
5	Reservoir	1.386	1	52	6,274	3	444.71	3,204	Routing DS No.1
3972 HYDRAFLOW-3 48.gpw					Return Period: 2 Year			Thursday, 01 / 27 / 2022	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 01 / 27 / 2022

Hyd. No. 1

Existing Conditions

Hydrograph type	= Rational	Peak discharge	= 2.816 cfs
Storm frequency	= 2 yrs	Time to peak	= 19 min
Time interval	= 1 min	Hyd. volume	= 3,211 cuft
Drainage area	= 2.000 ac	Runoff coeff.	= 0.45
Intensity	= 3.129 in/hr	Tc by TR55	= 19.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No. 1

Existing Conditions

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>		
Sheet Flow						
Manning's n-value	= 0.240	0.011	0.011			
Flow length (ft)	= 150.0	0.0	0.0			
Two-year 24-hr precip. (in)	= 3.32	0.00	0.00			
Land slope (%)	= 2.60	0.00	0.00			
Travel Time (min)	= 17.45	+	0.00	+	0.00	= 17.45
Shallow Concentrated Flow						
Flow length (ft)	= 245.00	0.00	0.00			
Watercourse slope (%)	= 2.00	0.00	0.00			
Surface description	= Unpaved	Paved	Paved			
Average velocity (ft/s)	=2.28	0.00	0.00			
Travel Time (min)	= 1.79	+	0.00	+	0.00	= 1.79
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					19.00 min	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

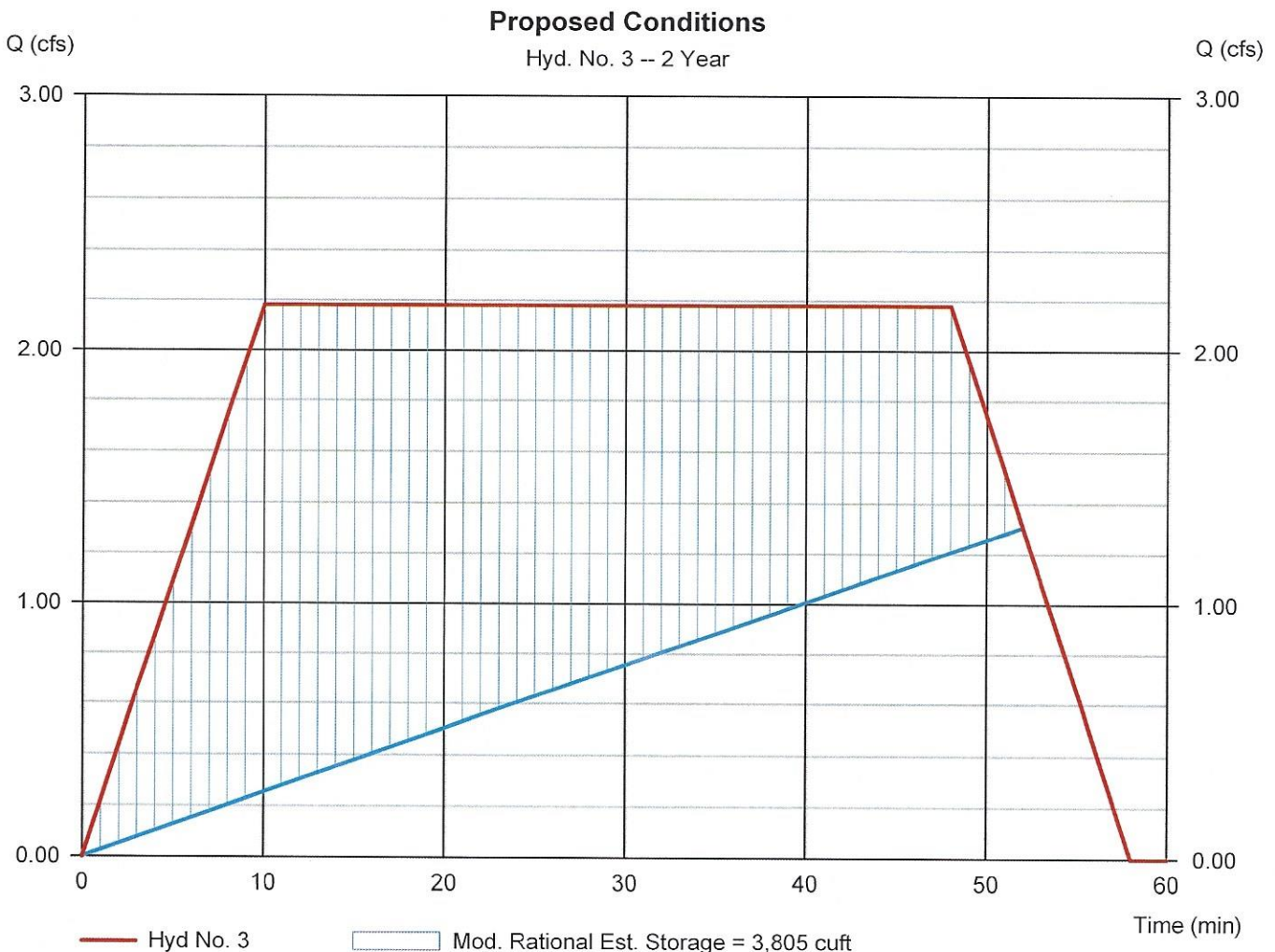
Thursday, 01 / 27 / 2022

Hyd. No. 3

Proposed Conditions

Hydrograph type	= Mod. Rational	Peak discharge	= 2.180 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 6,279 cuft
Drainage area	= 2.000 ac	Runoff coeff.	= 0.62*
Intensity	= 1.758 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Storm duration	= 4.8 x Tc
Target Q	=1.410 cfs	Est. Req'd Storage	=3,805 cuft

* Composite (Area/C) = $[(0.470 \times 0.99) + (1.530 \times 0.51)] / 2.000$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

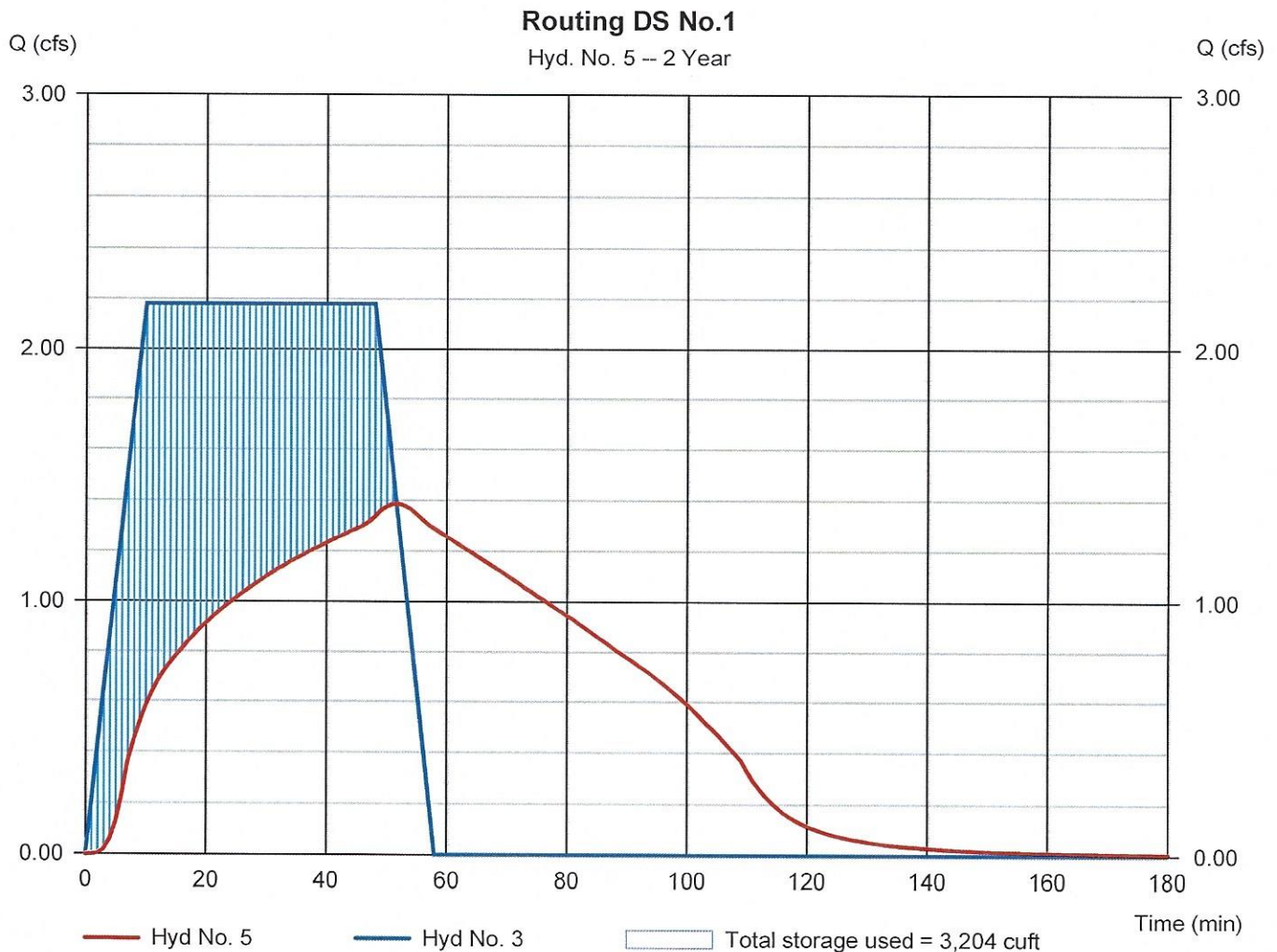
Thursday, 01 / 27 / 2022

Hyd. No. 5

Routing DS No.1

Hydrograph type	= Reservoir	Peak discharge	= 1.386 cfs
Storm frequency	= 2 yrs	Time to peak	= 52 min
Time interval	= 1 min	Hyd. volume	= 6,274 cuft
Inflow hyd. No.	= 3 - Proposed Conditions	Max. Elevation	= 444.71 ft
Reservoir name	= DS No.1	Max. Storage	= 3,204 cuft

Storage Indication method used.



Pond Report

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Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 01 / 27 / 2022

Pond No. 1 - DS No.1

Pond Data

UG Chambers -Invert elev. = 442.50 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 150.00 ft, No. Barrels = 3, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	442.50	n/a	0	0
0.40	442.90	n/a	292	292
0.80	443.30	n/a	511	803
1.20	443.70	n/a	622	1,425
1.60	444.10	n/a	688	2,113
2.00	444.50	n/a	716	2,829
2.40	444.90	n/a	717	3,546
2.81	445.31	n/a	687	4,232
3.21	445.71	n/a	622	4,854
3.61	446.11	n/a	511	5,365
4.01	446.51	n/a	291	5,656

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	6.20	9.00	0.00
Span (in)	= 15.00	6.20	9.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 442.40	442.50	444.60	0.00
Length (ft)	= 50.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	Inactive	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	= 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	442.50	0.00	0.00	0.00	---	---	---	---	---	---	---	0.000
0.40	292	442.90	0.39 ic	0.38 ic	0.00	---	---	---	---	---	---	---	0.379
0.80	803	443.30	0.73 ic	0.72 ic	0.00	---	---	---	---	---	---	---	0.718
1.20	1,425	443.70	0.94 ic	0.93 ic	0.00	---	---	---	---	---	---	---	0.931
1.60	2,113	444.10	1.12 ic	1.11 ic	0.00	---	---	---	---	---	---	---	1.108
2.00	2,829	444.50	1.29 ic	1.26 ic	0.00	---	---	---	---	---	---	---	1.263
2.40	3,546	444.90	1.70 ic	1.38 ic	0.32 ic	---	---	---	---	---	---	---	1.697
2.81	4,232	445.31	2.70 ic	1.45 ic	1.23 ic	---	---	---	---	---	---	---	2.689
3.21	4,854	445.71	3.37 ic	1.55 ic	1.82 ic	---	---	---	---	---	---	---	3.366
3.61	5,365	446.11	3.91 ic	1.64 ic	2.26 ic	---	---	---	---	---	---	---	3.905
4.01	5,656	446.51	4.36 oc	1.73 ic	2.63 ic	---	---	---	---	---	---	---	4.358

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	3.741	1	19	4,264	----	----	----	Existing Conditions
3	Mod. Rational	3.804	1	10	7,326	----	----	----	Proposed Conditions
5	Reservoir	2.669	1	35	7,298	3	445.30	4,217	Routing DS No.1
3972 HYDRAFLOW-3 48.gpw					Return Period: 10 Year			Thursday, 01 / 27 / 2022	

Hydrograph Report

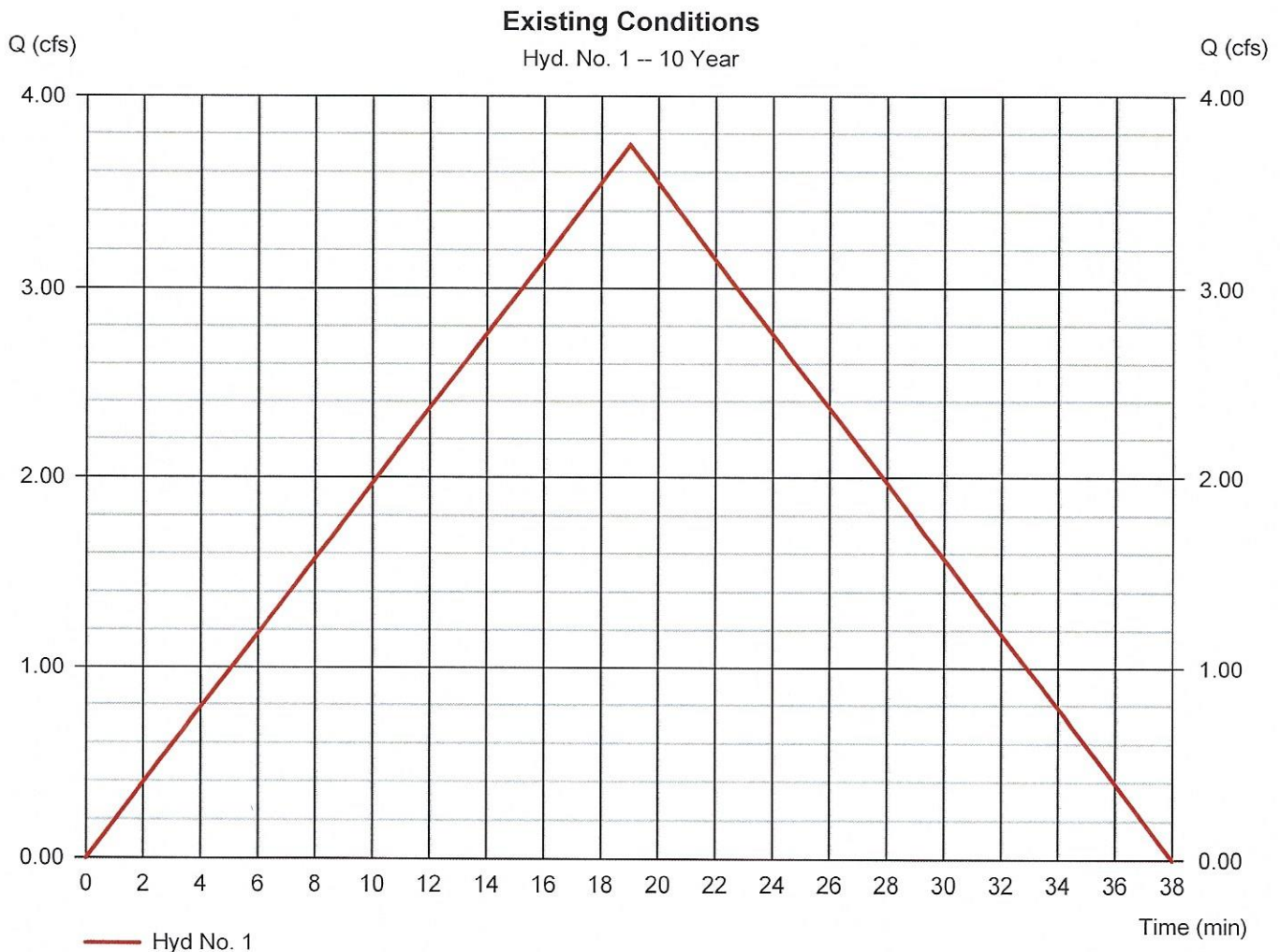
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 01 / 27 / 2022

Hyd. No. 1

Existing Conditions

Hydrograph type	= Rational	Peak discharge	= 3.741 cfs
Storm frequency	= 10 yrs	Time to peak	= 19 min
Time interval	= 1 min	Hyd. volume	= 4,264 cuft
Drainage area	= 2.000 ac	Runoff coeff.	= 0.45
Intensity	= 4.156 in/hr	Tc by TR55	= 19.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

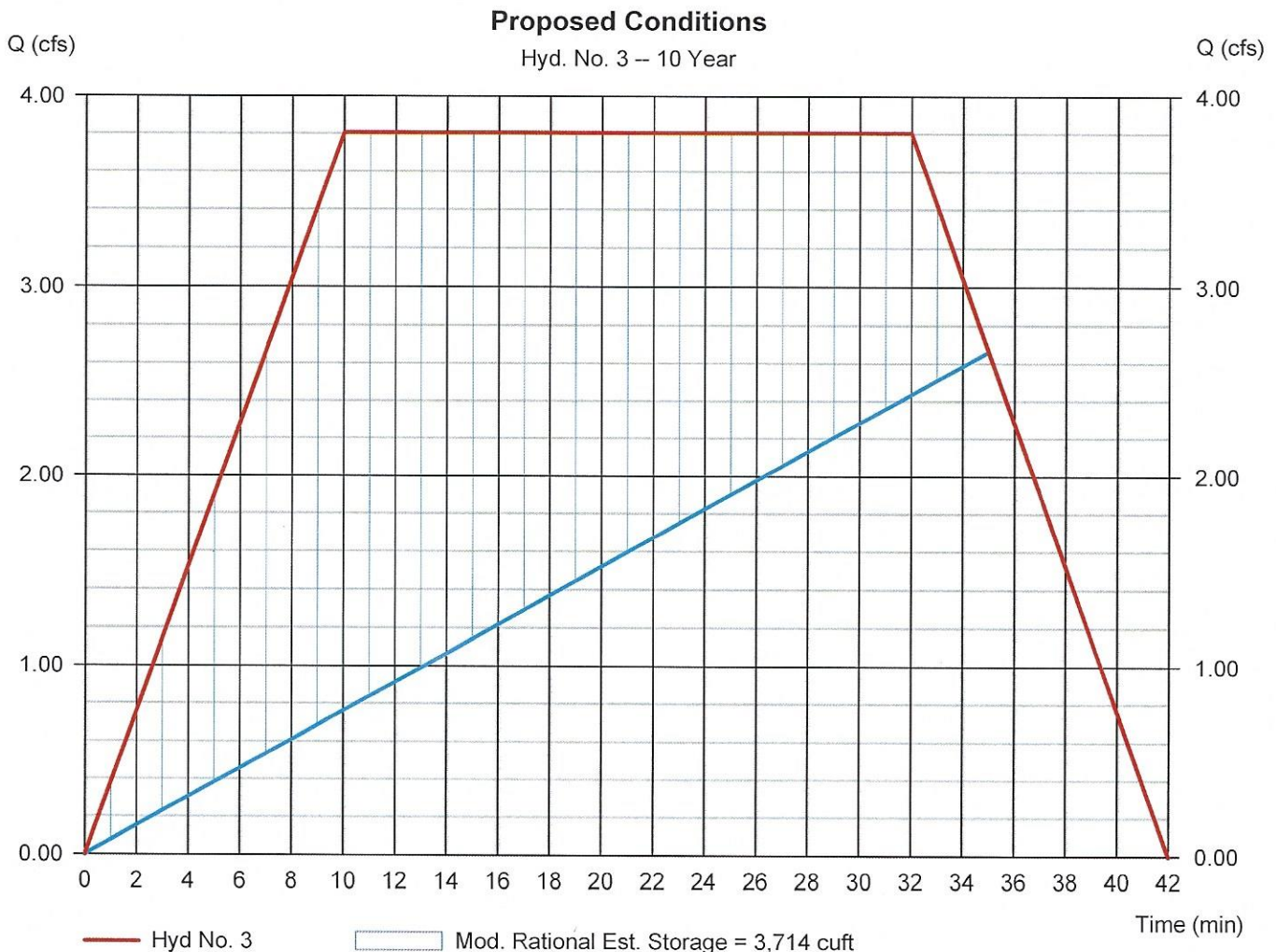
Thursday, 01 / 27 / 2022

Hyd. No. 3

Proposed Conditions

Hydrograph type	= Mod. Rational	Peak discharge	= 3.804 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 7,326 cuft
Drainage area	= 2.000 ac	Runoff coeff.	= 0.62*
Intensity	= 3.068 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Storm duration	= 3.2 x Tc
Target Q	=2.810 cfs	Est. Req'd Storage	=3,714 cuft

* Composite (Area/C) = $[(0.470 \times 0.99) + (1.530 \times 0.51)] / 2.000$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

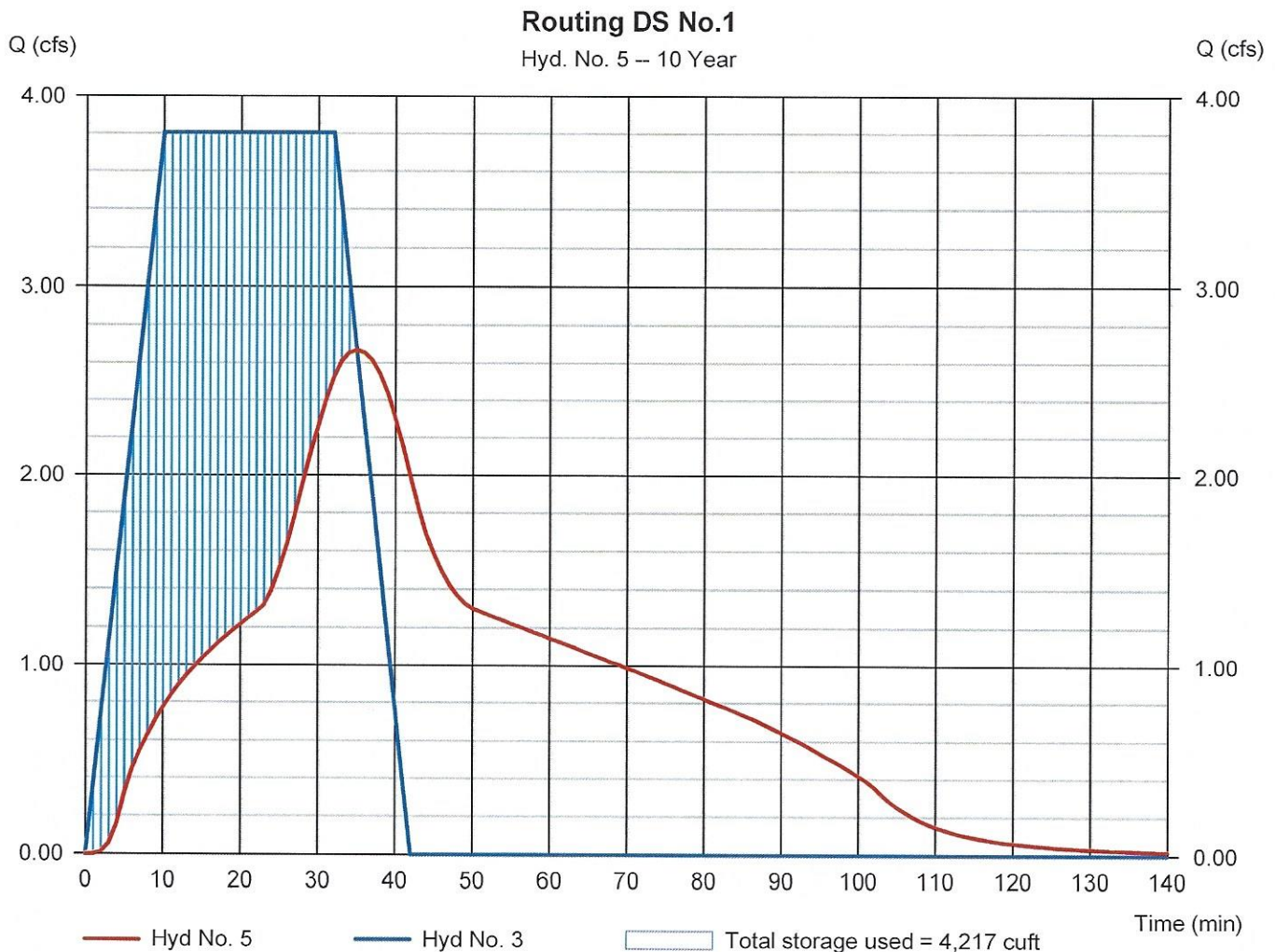
Thursday, 01 / 27 / 2022

Hyd. No. 5

Routing DS No.1

Hydrograph type	= Reservoir	Peak discharge	= 2.669 cfs
Storm frequency	= 10 yrs	Time to peak	= 35 min
Time interval	= 1 min	Hyd. volume	= 7,298 cuft
Inflow hyd. No.	= 3 - Proposed Conditions	Max. Elevation	= 445.30 ft
Reservoir name	= DS No.1	Max. Storage	= 4,217 cuft

Storage Indication method used.



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	4.388	1	19	5,002	----	----	----	Existing Conditions
3	Mod. Rational	5.222	1	10	7,864	----	----	----	Proposed Conditions
5	Reservoir	3.263	1	29	7,827	3	445.64	4,749	Routing DS No.1
3972 HYDRAFLOW-3 48.gpw					Return Period: 25 Year			Thursday, 01 / 27 / 2022	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 01 / 27 / 2022

Hyd. No. 1

Existing Conditions

Hydrograph type	= Rational	Peak discharge	= 4.388 cfs
Storm frequency	= 25 yrs	Time to peak	= 19 min
Time interval	= 1 min	Hyd. volume	= 5,002 cuft
Drainage area	= 2.000 ac	Runoff coeff.	= 0.45
Intensity	= 4.875 in/hr	Tc by TR55	= 19.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

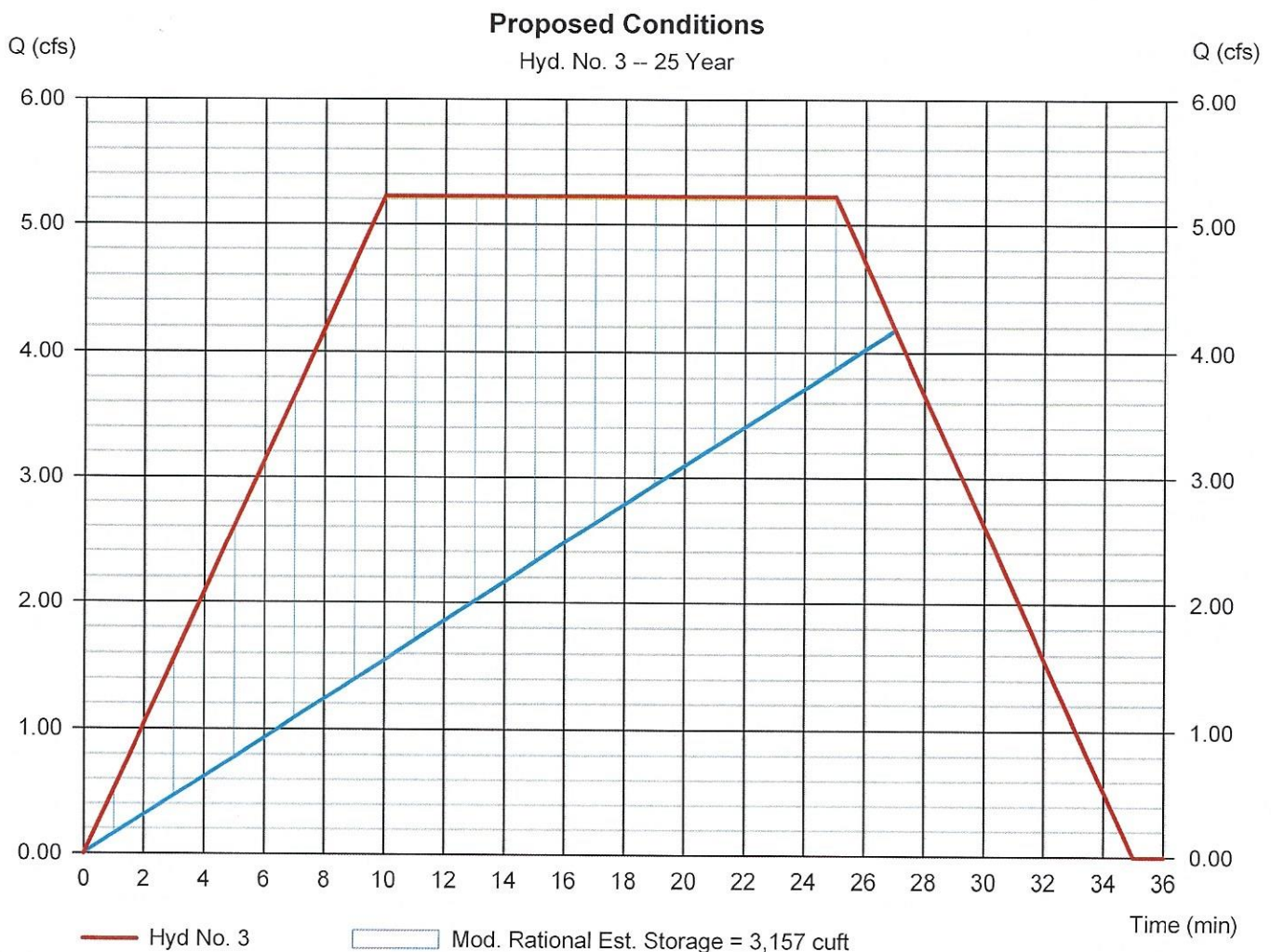
Thursday, 01 / 27 / 2022

Hyd. No. 3

Proposed Conditions

Hydrograph type	= Mod. Rational	Peak discharge	= 5.222 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 7,864 cuft
Drainage area	= 2.000 ac	Runoff coeff.	= 0.62*
Intensity	= 4.211 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Storm duration	= 2.5 x Tc
Target Q	=4.380 cfs	Est. Req'd Storage	=3,157 cuft

* Composite (Area/C) = $[(0.470 \times 0.99) + (1.530 \times 0.51)] / 2.000$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

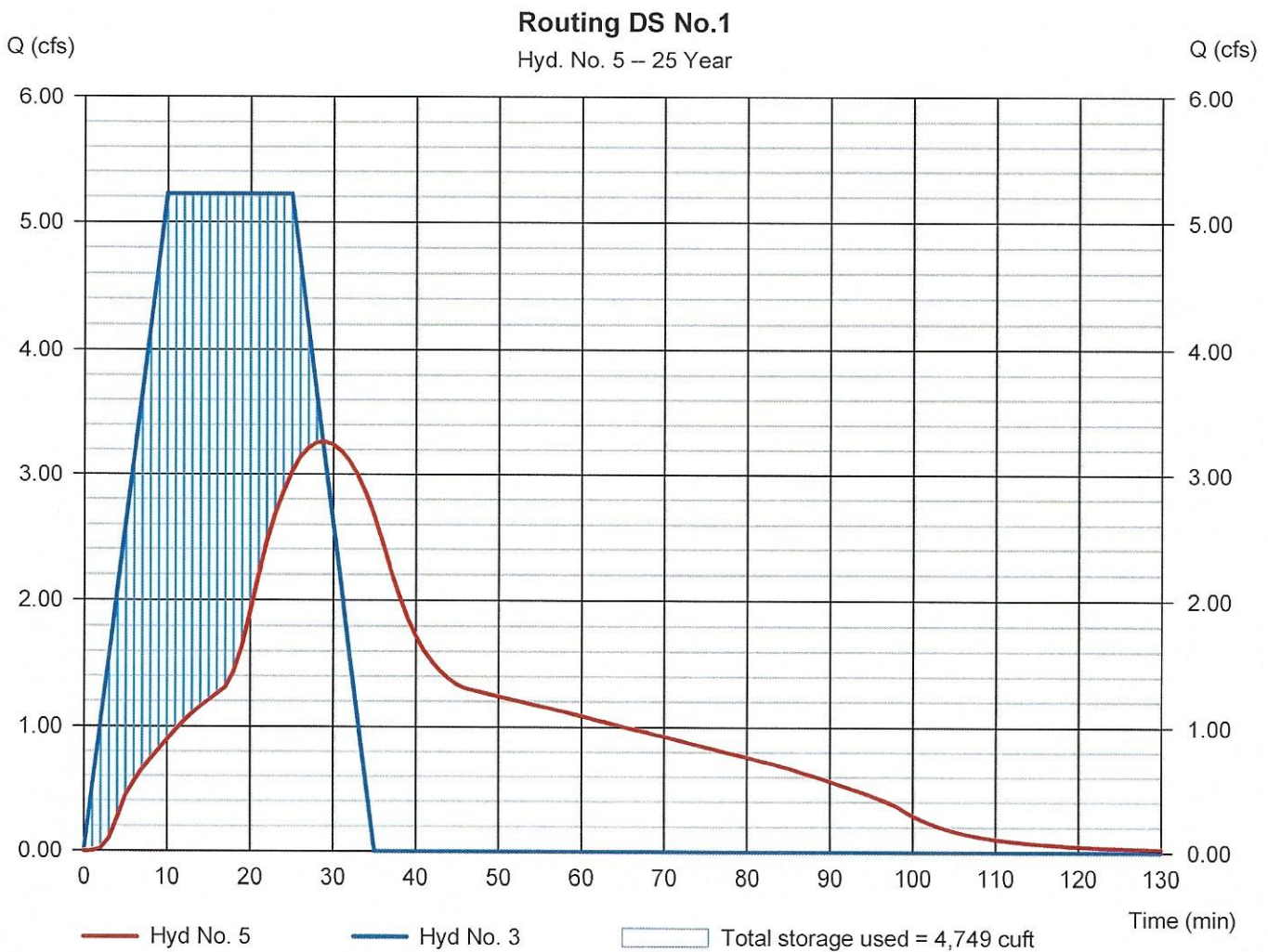
Thursday, 01 / 27 / 2022

Hyd. No. 5

Routing DS No.1

Hydrograph type	= Reservoir	Peak discharge	= 3.263 cfs
Storm frequency	= 25 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 7,827 cuft
Inflow hyd. No.	= 3 - Proposed Conditions	Max. Elevation	= 445.64 ft
Reservoir name	= DS No.1	Max. Storage	= 4,749 cuft

Storage Indication method used.



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	5.295	1	19	6,036	----	----	----	Existing Conditions
3	Mod. Rational	5.693	1	10	10,281	----	----	----	Proposed Conditions
5	Reservoir	4.230	1	33	10,241	3	446.39	5,566	Routing DS No.1
3972 HYDRAFLOW-3 48.gpw					Return Period: 100 Year			Thursday, 01 / 27 / 2022	

Hydrograph Report

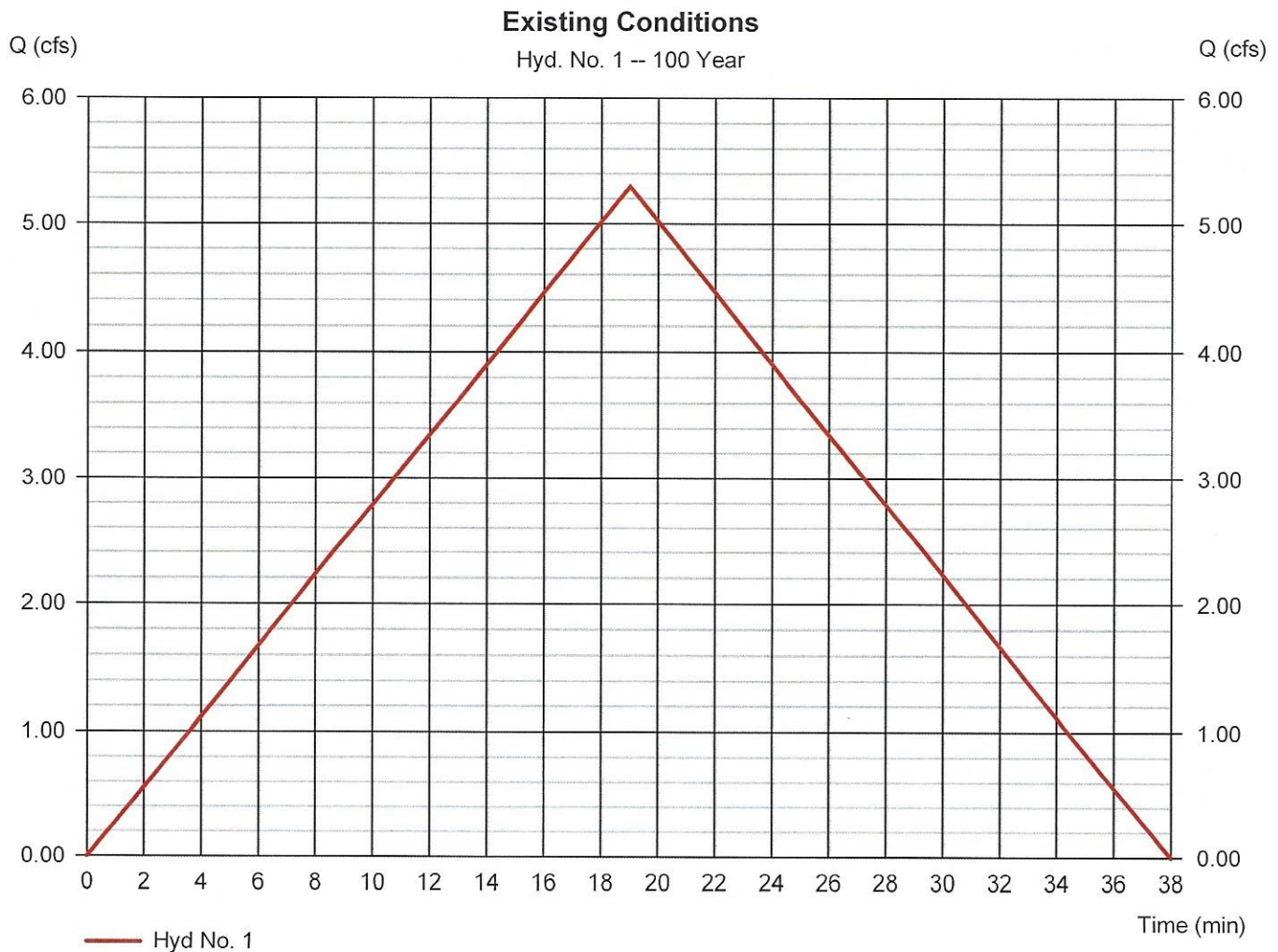
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 01 / 27 / 2022

Hyd. No. 1

Existing Conditions

Hydrograph type	= Rational	Peak discharge	= 5.295 cfs
Storm frequency	= 100 yrs	Time to peak	= 19 min
Time interval	= 1 min	Hyd. volume	= 6,036 cuft
Drainage area	= 2.000 ac	Runoff coeff.	= 0.45
Intensity	= 5.883 in/hr	Tc by TR55	= 19.00 min
IDF Curve	= NJ-RSIS.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

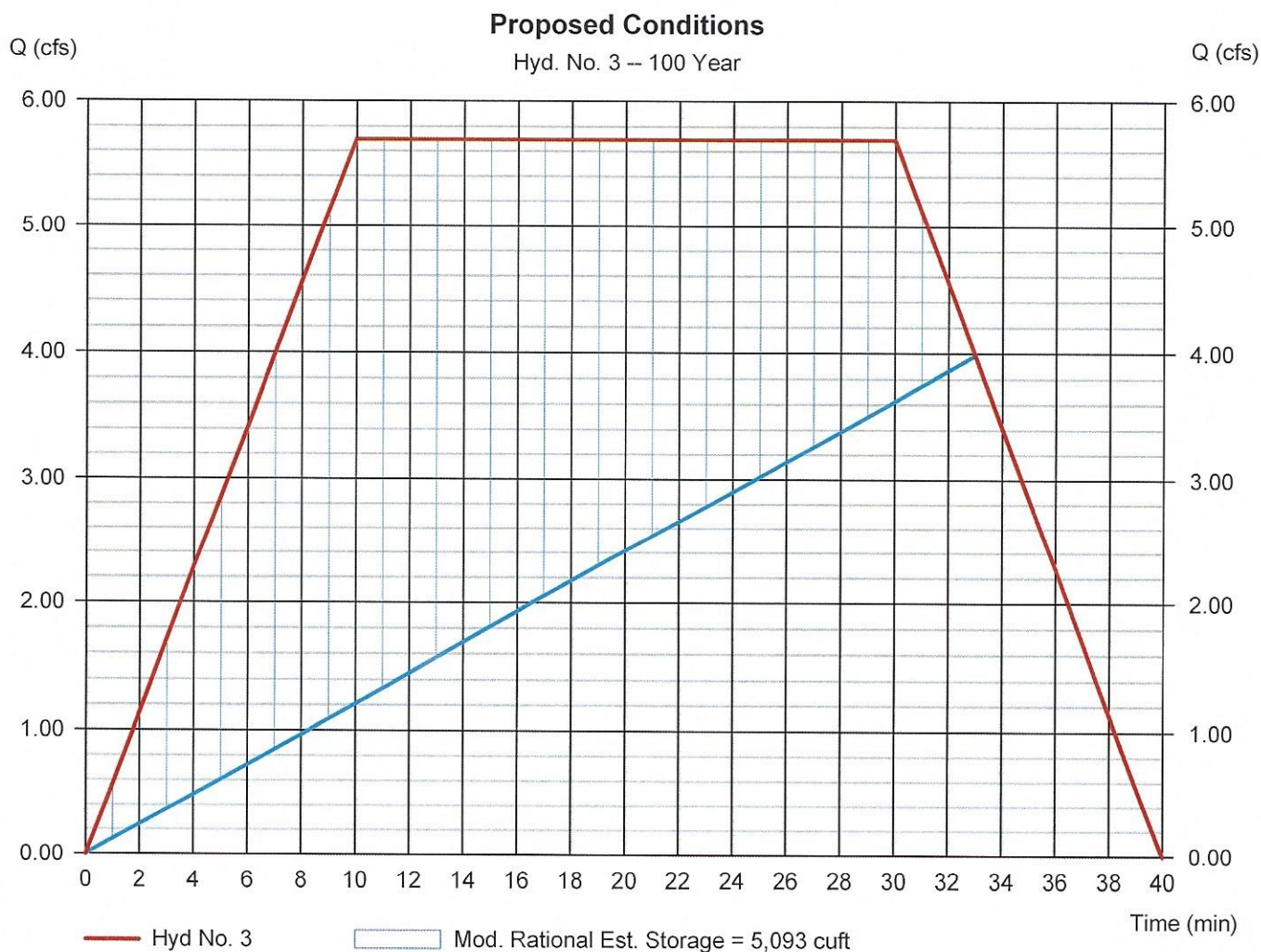
Thursday, 01 / 27 / 2022

Hyd. No. 3

Proposed Conditions

Hydrograph type	= Mod. Rational	Peak discharge	= 5.693 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 10,281 cuft
Drainage area	= 2.000 ac	Runoff coeff.	= 0.62*
Intensity	= 4.591 in/hr	Tc by User	= 10.00 min
IDF Curve	= NJ-RSIS.IDF	Storm duration	= 3.0 x Tc
Target Q	=4.240 cfs	Est. Req'd Storage	=5,093 cuft

* Composite (Area/C) = $[(0.470 \times 0.99) + (1.530 \times 0.51)] / 2.000$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

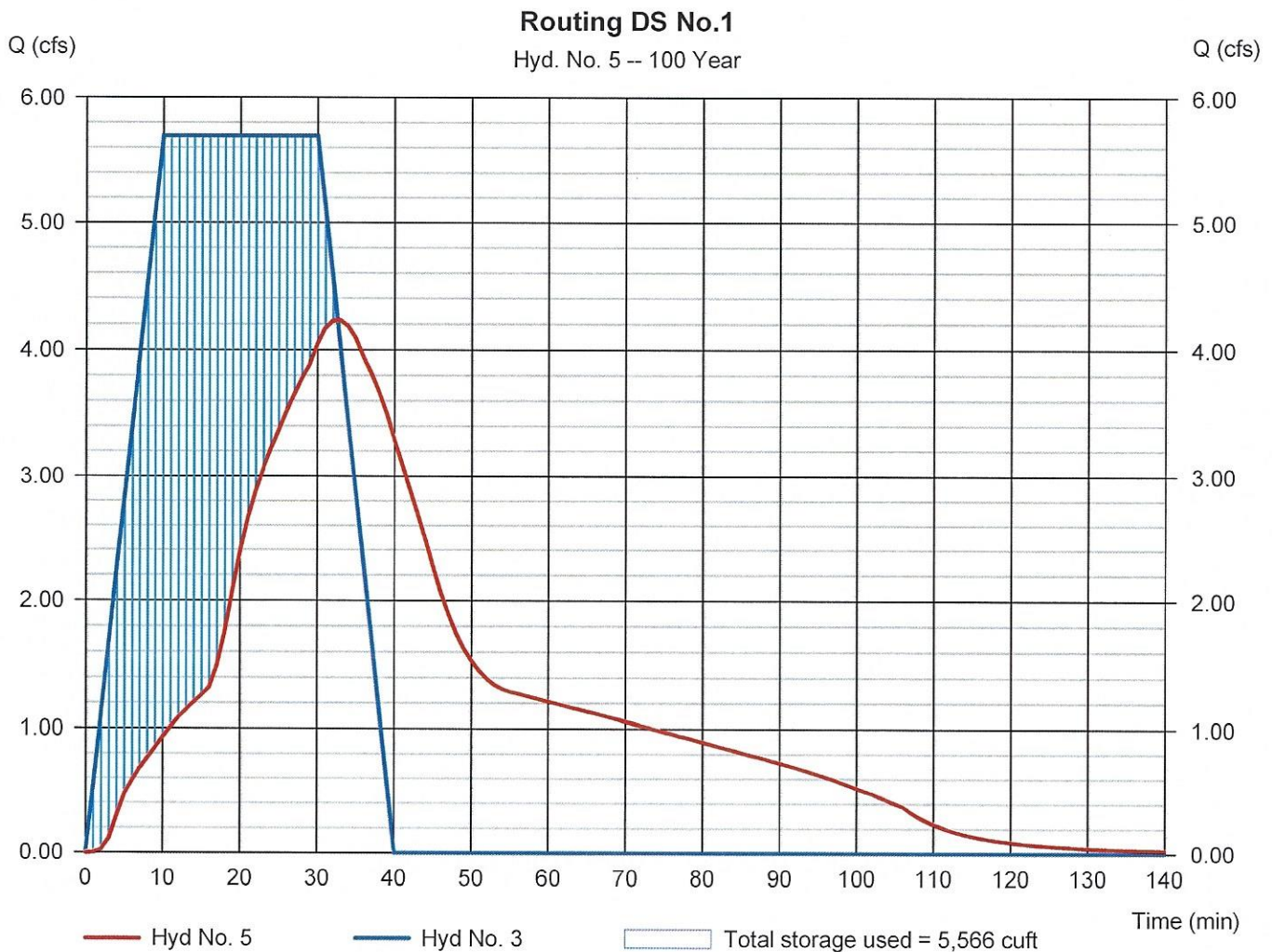
Thursday, 01 / 27 / 2022

Hyd. No. 5

Routing DS No.1

Hydrograph type	= Reservoir	Peak discharge	= 4.230 cfs
Storm frequency	= 100 yrs	Time to peak	= 33 min
Time interval	= 1 min	Hyd. volume	= 10,241 cuft
Inflow hyd. No.	= 3 - Proposed Conditions	Max. Elevation	= 446.39 ft
Reservoir name	= DS No.1	Max. Storage	= 5,566 cuft

Storage Indication method used.



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Thursday, 01 / 27 / 2022

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	18.2280	0.1000	0.6968	-----
2	61.4708	11.8000	0.8688	-----
3	0.0000	0.0000	0.0000	-----
5	99.7061	14.8000	0.9304	-----
10	93.2845	13.4000	0.8945	-----
25	131.5029	16.5000	0.9231	-----
50	297.9532	23.2001	1.0724	-----
100	192.6755	18.7000	0.9612	-----

File name: NJ-RSIS.IDF

$$\text{Intensity} = B / (T_c + D)^E$$

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	5.86	3.64	2.75	2.25	1.93	1.70	1.53	1.39	1.28	1.19	1.12	1.05
2	5.30	4.23	3.53	3.04	2.68	2.40	2.18	1.99	1.84	1.71	1.60	1.50
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.20	5.03	4.24	3.67	3.24	2.90	2.63	2.40	2.22	2.06	1.92	1.80
10	6.89	5.56	4.68	4.04	3.57	3.20	2.90	2.66	2.45	2.28	2.13	2.00
25	7.74	6.39	5.44	4.75	4.22	3.80	3.46	3.17	2.94	2.73	2.55	2.40
50	8.30	6.96	5.99	5.25	4.67	4.20	3.81	3.49	3.22	2.98	2.78	2.60
100	9.19	7.65	6.55	5.74	5.10	4.60	4.19	3.84	3.55	3.30	3.09	2.90

T_c = time in minutes. Values may exceed 60.

01 DRAINAGE REPORT\JOE VINCE HYDROFLOW\Hydrographs 2004\Hydrographs 2004\Rain Files\Bergen-24hr.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.80	3.30	0.00	4.30	5.10	6.30	7.30	8.40
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

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DRAINAGE REPORT

8 STONE TOWER DRIVE - LOT 12, BLOCK 21
BOROUGH OF ALPINE
BERGEN COUNTY, NEW JERSEY
FILE # 3972

SECTION 2

RUNOFF STORAGE CALCULATIONS

RUNOFF STORAGE REQUIREMENTS (GROUNDWATER RECHARGE)

Project Information:		Calculations Performed By:	
Single Family Dwelling 8 Stone Tower Drive Alpine New Jersey USA		MJH/nm Hubschman Engineering, P.A. 263 A South Washington Ave Bergenfield New Jersey 07621 USA 201-384-5666	

Recharger 330XLHD Chamber Specifications	
Height	30.5 inches
Width	52.0 inches
Length	8.50 feet
Installed Length	7.00 feet
Bare Chamber Volume	52.21 cu. feet
Installed Chamber Volume	92.41 cu. feet

Breakdown of Storage Provided by Recharger 330XLHD Stormwater System	
Within Chambers	503.48 cu. feet
Within Feed Connectors	- cu. feet
Within Stone	492.57 cu. feet
Total Storage Provided	996.1 cu. feet
Total Storage Required	800.00 cu. feet



Recharger 330XLHD	
Total Number of Chambers Required	9
Starter Chambers	3 pieces
Intermediate Chambers	3 pieces
End Chambers	3 pieces
HVLV FC-24 Feed Connectors	4 pieces
CULTEC No. 410 Non-Woven Geotextile	161 sq. yards
CULTEC No. 4800 Woven Geotextile	33 feet
Stone	46 cu. yards

Based on 2 Internal Manifolds

Materials List	
Total Number of Chambers Required	9
Starter Chambers	3 pieces
Intermediate Chambers	3 pieces
End Chambers	3 pieces
HVLV FC-24 Feed Connectors	4 pieces
CULTEC No. 410 Non-Woven Geotextile	161 sq. yards
CULTEC No. 4800 Woven Geotextile	33 feet
Stone	46 cu. yards

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SECTION 3
**WATER QUALITY STORM FLOW
HYDROLOGY AND HYDRAULIC
ANALYSIS FOR PROJECT
WATER QUALITY STORM**

STORMWATER QUALITY

The NJDEP Stormwater Management Regulations require that stormwater quality be addressed over all impervious surfaces when quarter of an acre or more of new impervious surface coverage is proposed. This project requires a treatment level of 80% TSS removal in accordance with Section 4.2 of the New Jersey Stormwater Frequently Asked Questions (FAQ).

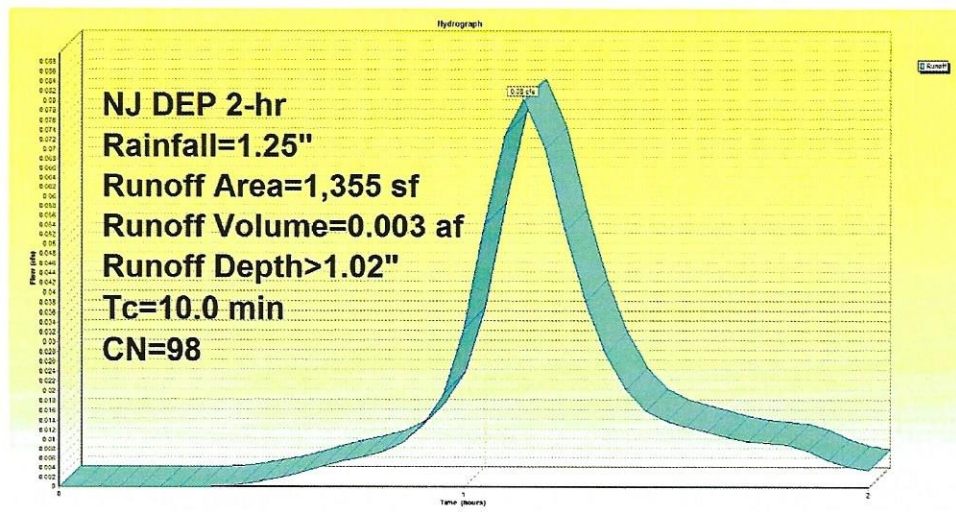
To comply with the above-mentioned requirements, FloGard +Plus inserts are proposed to treat the runoff from the driveway.

FloGard +Plus:

FloGard +PLUS® Catch Basin Insert Filter is an efficient inlet prefilter designed to remove suspended sediment and floatable trash and hydrocarbons from stormwater runoff in new or retrofit applications. The device features a unique dual bypass design for flows exceeding the water quality storm flow.

SUMMARY:

The driveway that is subject to the water quality treatment requirements is 5,988 sf. Peak water quality flow for the a tributary area to an inlet of the driveway is calculated to be 0.08 cfs which is calculated utilizing a HydroCAD computer software based on NJDEP IDF file for the Water Quality Storm.



See engineering drawings for requisite FloGard +Plus details.

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8 STONE TOWER DRIVE - LOT 12, BLOCK 21
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SECTION 4
GROUNDWATER RECHARGE
ANALYSIS

SUMMARY:

Annual Groundwater recharge Analysis was performed based on NJ BMP Manual Chapter 6. The calculations are performed utilizing GSR-32 spreadsheet. Annual groundwater recharge deficit associated with the project is calculated to be 25,214 cubic feet.

Nine (9) 330XLHD with a combined base area of 404.25 (sf.) of BMP are proposed for the groundwater recharge. Usable dBMP depth was calculated to be 29.6 inches. The target area to be utilized for the ground water recharge is the project area of the roof 9,934 (sf.). This area is comprised of rear rooftop and patio area.

Annual Groundwater Recharge Analysis and BMP Calculations are enclosed.

Annual Groundwater Recharge Analysis (based on GSR-32)									
Project Name:		8 Stone Tower Drive							
Description:		Single Family Dwelling							
Analysis Date:		01/26/22							
Post-Developed Conditions									
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)				
1	0.46535	Impervious areas	Boonton	0.0	-				
2	1.53367	Open space	Boonton	12.5	63,761				
3	0								
4	0								
5	0								
6	0								
7	0								
8	0								
9	0								
10	0								
11	0								
12	0								
13	0								
14	0								
15	0								
Total =	2.0								
Annual Recharge Requirements Calculation									
% of Pre-Developed Annual Recharge to Preserve =					100%				
Post-Development Annual Recharge Deficit =					25,214 (cubic feet)				
Recharge Efficiency Parameters Calculations (area averages)									
RWC = 3.60 (in)					DRWC = 0.00 (in)				
ERWC = 0.32 (in)					EDRW = 0.00 (in)				

Pre-Developed Conditions									
Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)				
1	2.00001	Woods	Boonton	13.1	94,975				
2	0								
3	0								
4	0								
5	0								
6	0								
7	0								
8	0								
9	0								
10	0								
11	0								
12	0								
13	0								
14	0								
15	0								
Total =	2.0			13.1	94,975				

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

4.3

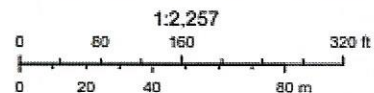
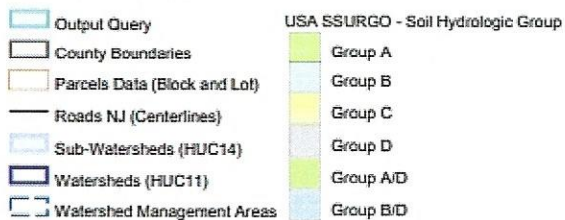
APPENDIX 1

- Site Location and Soil Type Map
- Typical Runoff Coefficients Table
- Time of Concentration (T_c) Nomograph
- IDF Curves and Tabulation

8 Stone Tower Drive



1/17/2022, 12:44:41 PM



Source: USDA NRCS, Esri, Esri Community Maps Contributors, County of Westchester, New Jersey Office of GIS, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/ASA, USGS, EPA, NPS, US Census Bureau, USDA

New Jersey Department of Environmental Protection
Esri Community Maps Contributors, County of Westchester, New Jersey Office of GIS, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/ASA, USGS, EPA, NPS

Soils (SSURGO)

Rec	Map Unit Symbol	Map Unit Name
1	BorB	Boonton moderately well drained-Rock Outcrop Complex, 3-8% slopes
2	BorC	Boonton moderately well drained -Rock Outcrop Complex, 8-15% slopes

Recommended Coefficient of Runoff Values for Various Selected Land Uses

Land Use	Description	Hydrologic Soils Group			
		A	B	C	D
Cultivated Land	without conservation treatment	0.49	0.67	0.81	0.88
	with conservation treatment	0.27	0.43	0.67	0.67
Pasture or Range Land Meadow	poor condition	0.38	0.63	0.78	0.84
	good condition	---	0.25	0.51	0.65
	good condition	---	---	0.41	0.61
Wood or Forest Land	thin stand, poor cover, no mulch	---	0.34	0.59	0.70
	good cover	---	---	0.45	0.59
Open Spaces, Lawns, Parks, Golf Courses, Cemeteries					
	Good Condition	---	0.25	0.51	0.65
	Fair Condition	---	0.45	0.63	0.74
Commercial and Business Area	85% impervious	0.84	0.90	0.93	0.96
Industrial Districts	72% impervious	0.67	0.81	0.88	0.92
Residential	average % impervious				
Average Lot Size (acres)					
1/8	65	0.59	0.76	0.86	0.90
1/4	38	0.29	0.55	0.70	0.80
1/3	30	---	0.49	0.67	0.78
1/2	25	---	0.45	0.65	0.76
1	20	---	0.41	0.63	0.74
Paved Areas	parking lots, roofs, driveways, etc.	0.99	0.99	0.99	0.99
Streets and Roads	paved with curbs & storm sewers	0.99	0.99	0.99	0.99
	gravel	0.57	0.76	0.84	0.88
	dirt	0.49	0.69	0.80	0.84

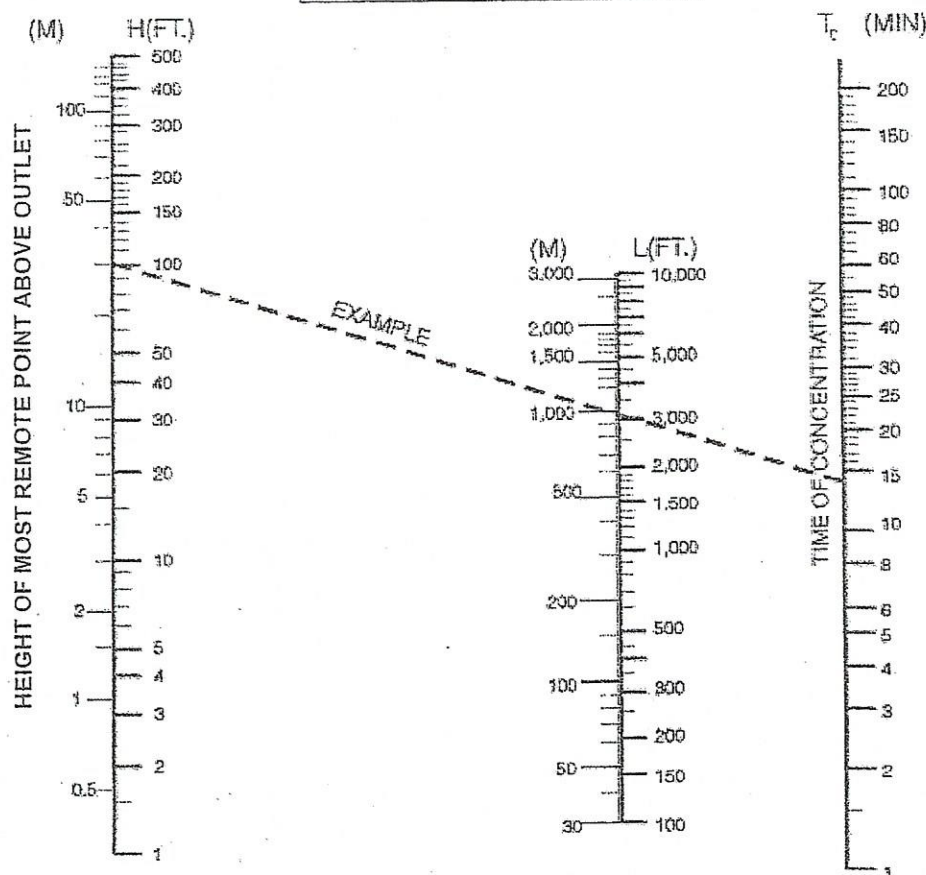
NOTE: Values are based on NRCS (formerly the SCS) definitions and are average values.

Source: Technical Manual for Land Use Regulation Program, Bureau of Inland and Coastal Regulations, Stream Encroachment Permits, New Jersey Department of Environmental Protection

Figure 7.1

TIME OF CONCENTRATION

Example
Height = 100 ft.
Length = 3000 ft.
Time of Concentration = 14 Min.



Notes:

Use Nomograph T_c for natural basins with well-defined channels, for overland or bare earth, and for mowed grass roadside channels.

For overland flow, grassed surfaces, multiply T_c by 2.

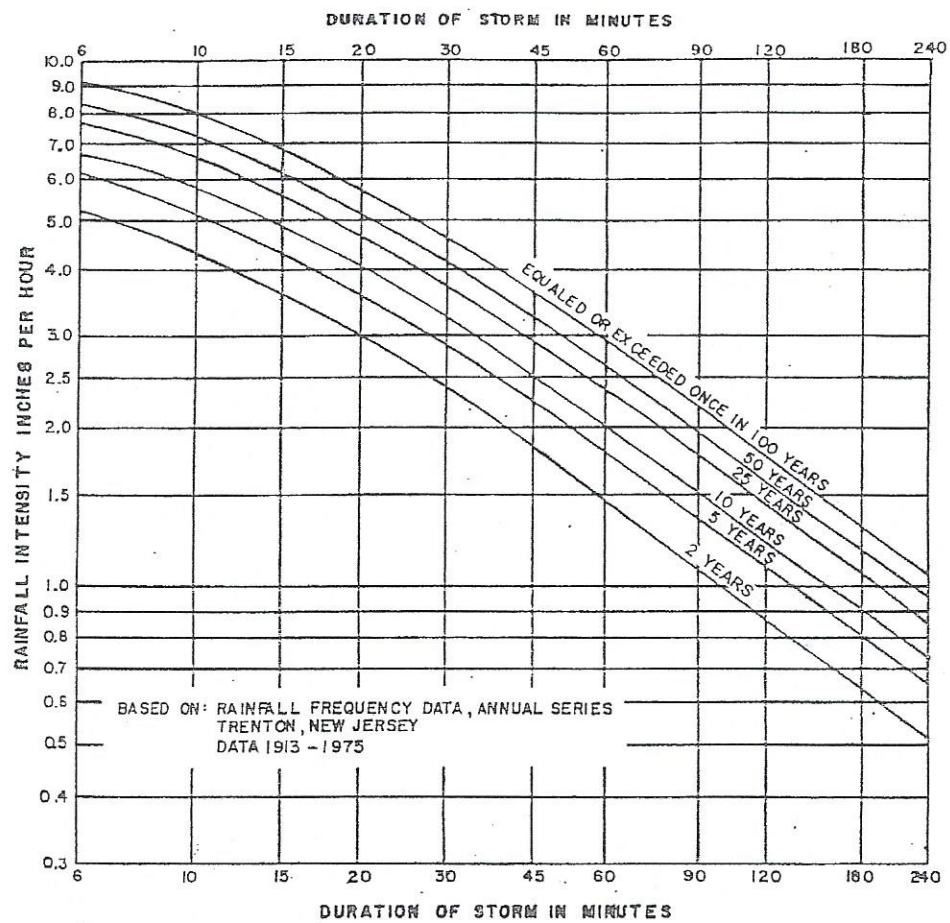
For overland flow, concrete or asphalt surfaces, multiply T_c by 0.4.

For concrete channels, multiply T_c by 0.2 overland flow.

Based on a study by P.Z. Kirpich, *Civil Engineering*, Vol.10, No.6, June 1940, p. 362.

N.J.A.C. 5:21-7.2

FIGURE 7.2 RAINFALL INTENSITY CURVES



Note: Adapted from Figure 2.1-2 in the NJDEP Technical Manual for Stream Encroachment Permits.

Northern New Jersey
 One Year Storm

Recurrence Frequency = 1

DURATION (Minutes)	INTENSITY (inches/hour)
6	3.7
10	3.59
15	2.95
20	2.13
30	1.98
45	1.42
60	1.22
90	0.79
120	0.76

NJDEP Curve
 2 Year Storm

Recurrence Frequency = 2

DURATION (Minutes)	INTENSITY (inches/hour)
6	5.2
10	4.3
15	3.55
20	3
30	2.4
45	1.8
60	1.49
90	1.1
120	0.92

NJDEP Curve
 10 Year Storm

Recurrence Frequency = 10

DURATION (Minutes)	INTENSITY (inches/hour)
6	6.8
10	5.71
15	4.74
20	4
30	3.35
45	2.5
60	2
90	1.5
120	1.34

NJDEP Curve
 25 Year Storm

Recurrence Frequency = 25

DURATION (Minutes)	INTENSITY (inches/hour)
6	7.7
10	6.47
15	5.38
20	4.6
30	3.88
45	3
60	2.54
90	1.8
120	1.6

NJDEP Curve
 100 Year Storm

Recurrence Frequency = 100

DURATION (Minutes)	INTENSITY (inches/hour)
6	9
10	7.6
15	6.33
20	5.8
30	4.68
45	3.8
60	3.17
90	2.3
120	2.02