STORMWATER MANAGEMENT REPORT

FOR

OFFICE AND RETAIL BUILDINGS AT 390 DAVIDSON AVENUE
(BLOCK 502.01, TAX LOT 57.01)
IN TOWNSHIP OF FRANKLIN,
SOMERSET COUNTY, NEW JERSEY

February 22nd 2024

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1.0 INTRODUCTION:

This report is prepared to support a Site Plan approval for two commercial buildings on land parcel known as lot 57.01 in block 502.01 in Township of Franklin, Somerset County. The site measures 2.456 acres and is located at the intersection of Davidson Avenue and New Brunswick Road. Figure 1 show the site mapped over a 2020 NJGIN aerial photograph. The following definitions are utilized for this report:

Where "MTD" means Mechanical Treatment Devices, which are certified to remove 80% of TSS from the parking lot stormwater runoff;
Where the "Rules" means Storm water Management Rules, which is known as N.J.A.C. 7:8;
Where "Site "means Land Parcel in Township of Franklin known as Lot 57.01 in Block 502.01;
Where "TSS" means Total Suspended Solids; and
Where "UG" means Underground Stormwater Storage System.

Figure 1: Site Mapped over a 2020 NJGIN Aerial Image

Figure 2 shows a Bound Brook USGS Quadrangle with site boundaries. Figure 3 shows the site mapped over a USDA Web Soil Survey along with the extent of the soil series. The site has three types of soil; Penn silt loam (PenB) with hydrologic soil group "C," The second one is Penn Channery silt loam (PeoC) with hydrologic soil group "C," and the third one is Rowland silt loam (RorAt) with hydrologic soil group "C." Appendix E shows the soil profiles and permeability results, which are used in determining infiltration rates and ground water mounding alalysis. Appendix F shows the Pre and Post development Drainage Area Map and locations of all the structures of proposed stormwater management system.

2.0 PRE DEVELOPMENT HYDROLOGY:

The site currently drains westerly to Raritan River Tributary. The rainfall amounts for 2, 10 and 100-year storm events are computed as:

2.1 Peak Stormwater Runoff is computed for the site based on following parameters:

2, 10, and 100 year storm event precipitation frequency is obtained from NOAA atlas 14-point precipitation frequency (a publication of Hydro meteorological design study center):

2 Year – 3.3 inches
10 year - 5.01 inches
100 year -8.35 inches

2.2 Factors for Somerset County under Table 5.5 of Stormwater Rules are described below:

2 Year 3.3 inches x 1.00 = 3.3 inches
10 year 5.01 inches x 1.03 = 5.16 inches
100 year 8.35 inches x 1.09 = 9.10 inches

2.3 Further as required under table 5.6 of the stormwater rules the precipitation amount is computed below:

2 Year 3.3 inches x 1.19 = 3.72 inches
10 year 5.16 inches x 1.24 = 6.40 inches
100 year 9.10 inches x 1.48 = 13.47 inches

Table 1 shows the pre development parameters that are used to compute peak flows:

TABLE 1: SUMMARY OF HYDROLOGIC PARAMETERS

Sub-Area	Area (Ac.)	Runoff Coeff. (C)	Tc (Min.)
Pre to North-West	1.35	74 (Hydrology Group C)	12 As computed

Appendix A shows the hydrographs for pre and post development land use for 2, 10 and 100-year storm events. Table 1A and 1B provide the compliances with the peak flow reductions in post development conditions.

3.0 POST-DEVELOPMENT HYDROLOGY:

Applicant is proposing two commercial buildings on the site and a parking lot. As the land use change is classified as major development under the rules peak flows are reduced by 50%, 25% and 20% for 2, 10 and 100-year storm events.

Proposed site improvements include construction of an Office and Retail Buildings with a parking lot. A quantitative hydrologic analysis for the disturbed areas of the site has been performed utilizing the same methodology as for the pre-development conditions. The hydrologic parameters were derived from the

same sources as the pre-development parameters. In post development conditions, the disturbed area of the site will continue to drain via the same general drainage areas as described in the pre-development hydrology.

To reduce peak flows from the site two underground (UG) storage systems are proposed. These systems include underground slotted ADS pipes and outlet structures. The outlet structures control the release of stormwater runoff to the stream. Appendix A shows the peak flow hydrographs for the post development conditions. It also shows the UG system routing and outflow volume for 2, 10 and 100-year storm event.

The pipe utilized to carry stormwater to the UG systems has capacity to handle 25-year storm event. Appendix B shows the pipe capacity computations for the all of the conveyance pipes used for the project. In addition Somerset Union County Soil Conservation District (SCD) requires the erosion protection at the stormwater discharge points. Appendix B shows the scour hole sizing computations for the anticipated stormwater runoff from the UG system.

4.0 GROUNDWATER RECHARGE AND GROUND WATER MOUNDING ANALYSIS:

In accordance with Chapter 6 of the BMP manual, compliance with one of the following two groundwater recharge standards is required:

1. "That 100% of the site's average annual pre-developed groundwater recharge volume be maintained after development;" or
2. "That 100% of the difference between the site's pre- and post-development 2-year runoff volumes be infiltrated."

The BMP areas of the site are the bottom areas of the UG systems. The Annual Groundwater Recharge Analysis (Based on GSR-32) computed the required BMP areas for the proposed development. The required BMP area is 2,155 sf while proposed BMP area for recharge is 3,795 sf. Attachment c shows the Recharge Analysis for the pre and post development conditions.

This appendix also shows the groundwater mounding analysis for proposed UG systems. Based on the results mounding due to infiltration is not negatively influencing neighboring sites. This analysis was conducted based on Hantush (1967) equation.

5. WATER QUALITY IMPROVEMENTS:

Subject project requires that the pavement area stormwater runoff is collected and filtered such that an 80% of TSS is removed prior to groundwater recharge and discharge to the stream. Two mechanical treatment devices that are certified by NJDEP are utilized to remove TSS. These device details and capacity computations are shown at appendix D. The stormwater runoff, which needs to be treated, is computed based on 1.25" rainfall in 2 hours with hydrograph distribution mentioned at the BMP manual.

6.0 NONSTRUCTURAL STRATEGIES

In addition, the stormwater management system complies with the New Jersey Stormwater Best Management Practices Manual (BMPM), dated April 2004. The site is designed in accordance with the nonstructural stormwater management strategies, to the maximum extent practical. More precisely, to achieve the required design and performance standards, the following nonstructural strategies are being applied to the design of the site:

6.1 Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.

The impervious surfaces on the site are disconnected by the provision of the proposed stormwater management basin that receives and treats the runoff from the site. The basin has been designed without a low flow channel and with a flat sand bottom to break up the flow of stormwater runoff over impervious surfaces prior to discharging to the existing drainage system within Tax Lot 57.01

6.2 Maximize the protection of natural drainage features and vegetation.
The site grading and stormwater management system have been designed to maintain the existing drainage patterns of the site. This manner of development protects the natural drainage features and vegetation.

6.3 Minimize the decrease in the time of concentration from pre- to post-construction.
To the maximum extent practical, the site was designed to minimize the decrease in pre-construction "time of concentration".

6.4 Minimize land disturbance including clearing and grading.
The site has been designed to utilize a majority of the cleared site, as well as minimize the fill material needed for construction, to reduce the amount of disturbance to the site.

6.5 Minimize soil compaction.
After rough grading of the site, heavy construction machinery on-site will be minimal.

6.6 Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides.
The site has been designed to utilize a majority of the cleared site to maintain the natural vegetation. In addition, a detailed landscape plan has been provided to supplement the existing vegetation.

6.7 Provide other source controls to prevent or minimize the release of pollutants into stormwater runoff.

The site is subject to and has been designed in accordance with the standards established under the Soil Erosion and Sediment Control Act.

7.0 CONCLUSIONS:

The proposed Stormwater management systems has been designed to meet the BMPM water quality, groundwater recharge standards, nonstructural Stormwater management strategy requirements, and reductions to the peak Stormwater flow rates from this development.

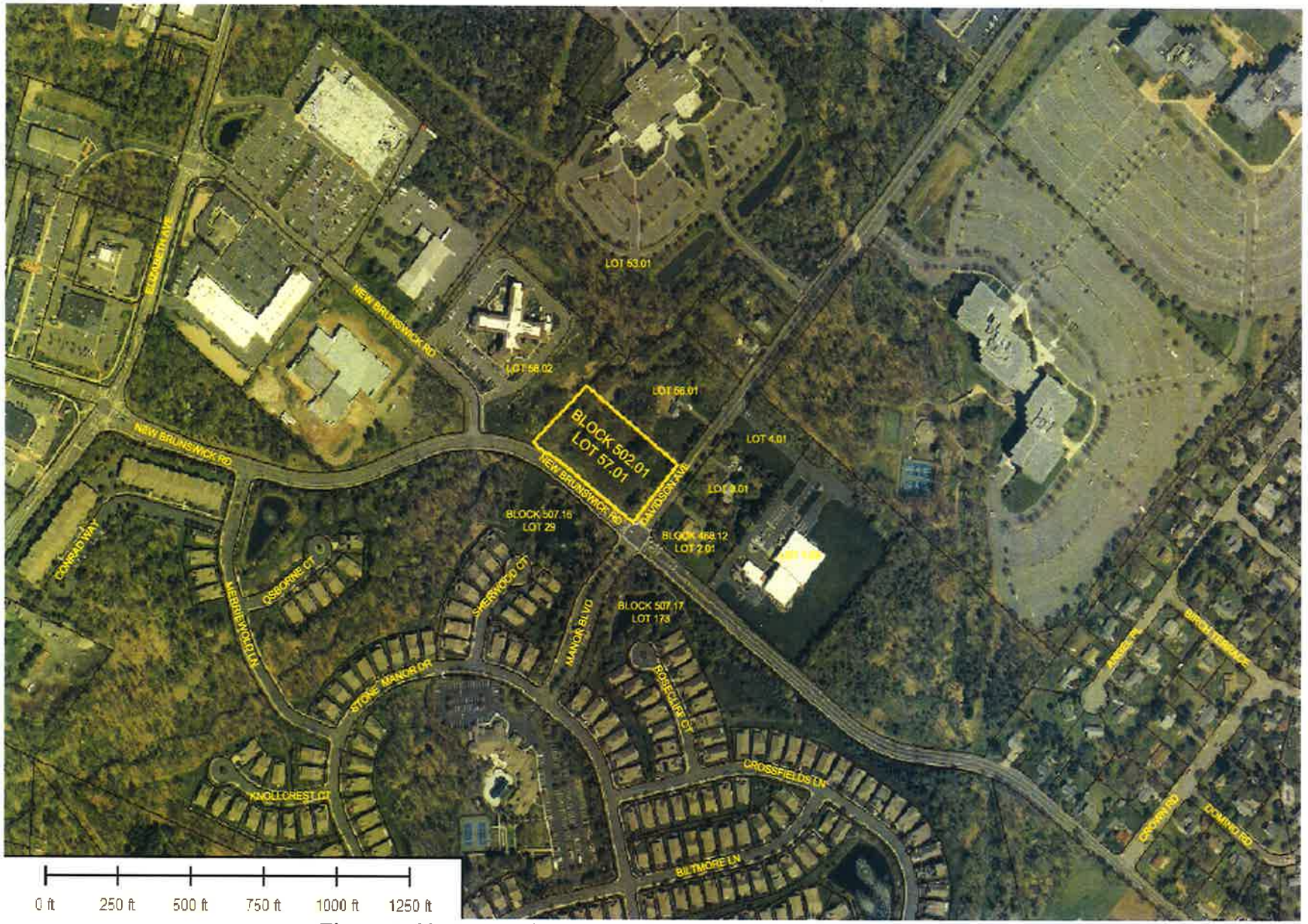


Figure 1: Site Mapped Over a 2020 Aerial Map Published By NJGIN

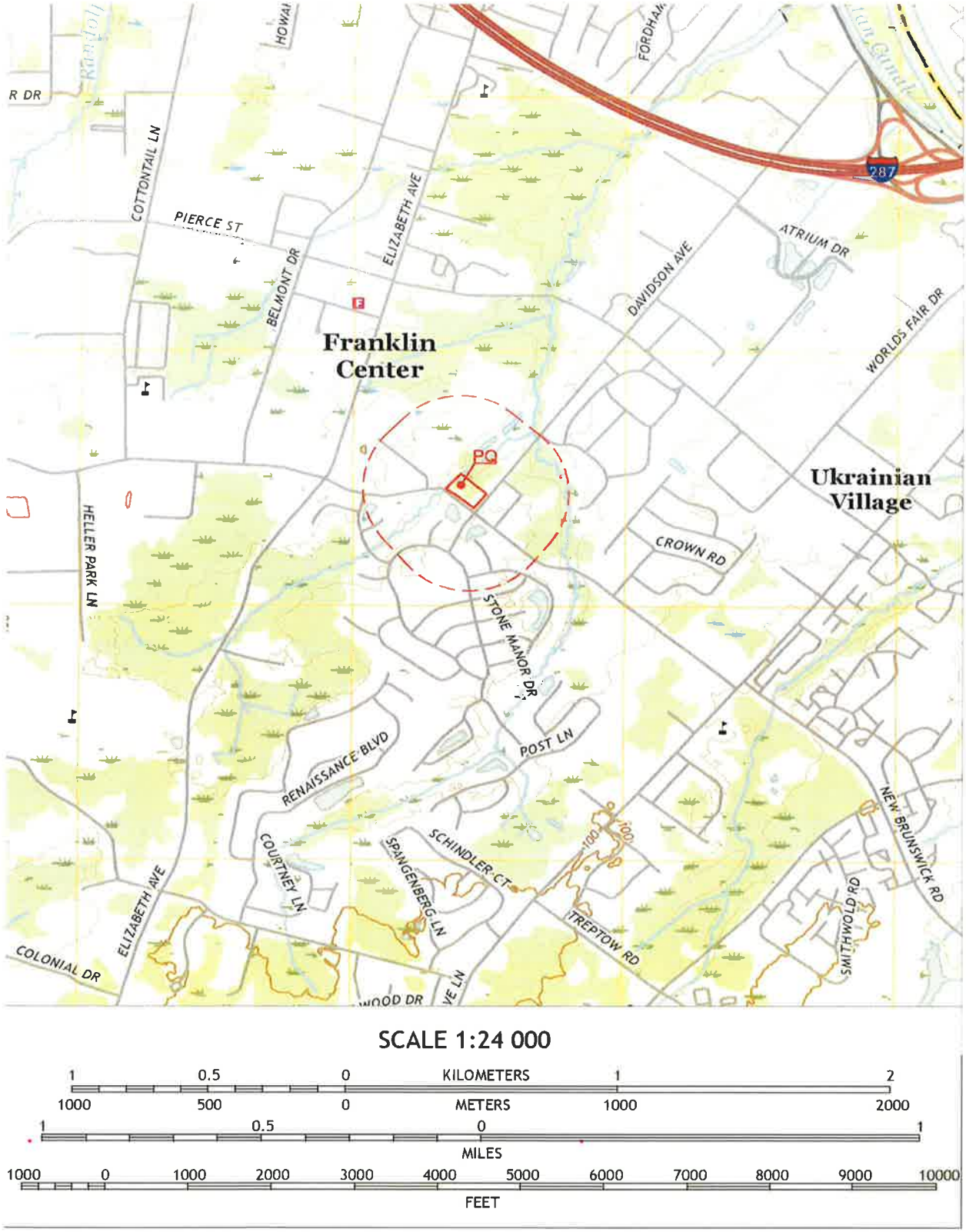


Figure 2: Site Mapped Over a Portion of the Bound Brook USGS Quadrangle - A USGS Publication

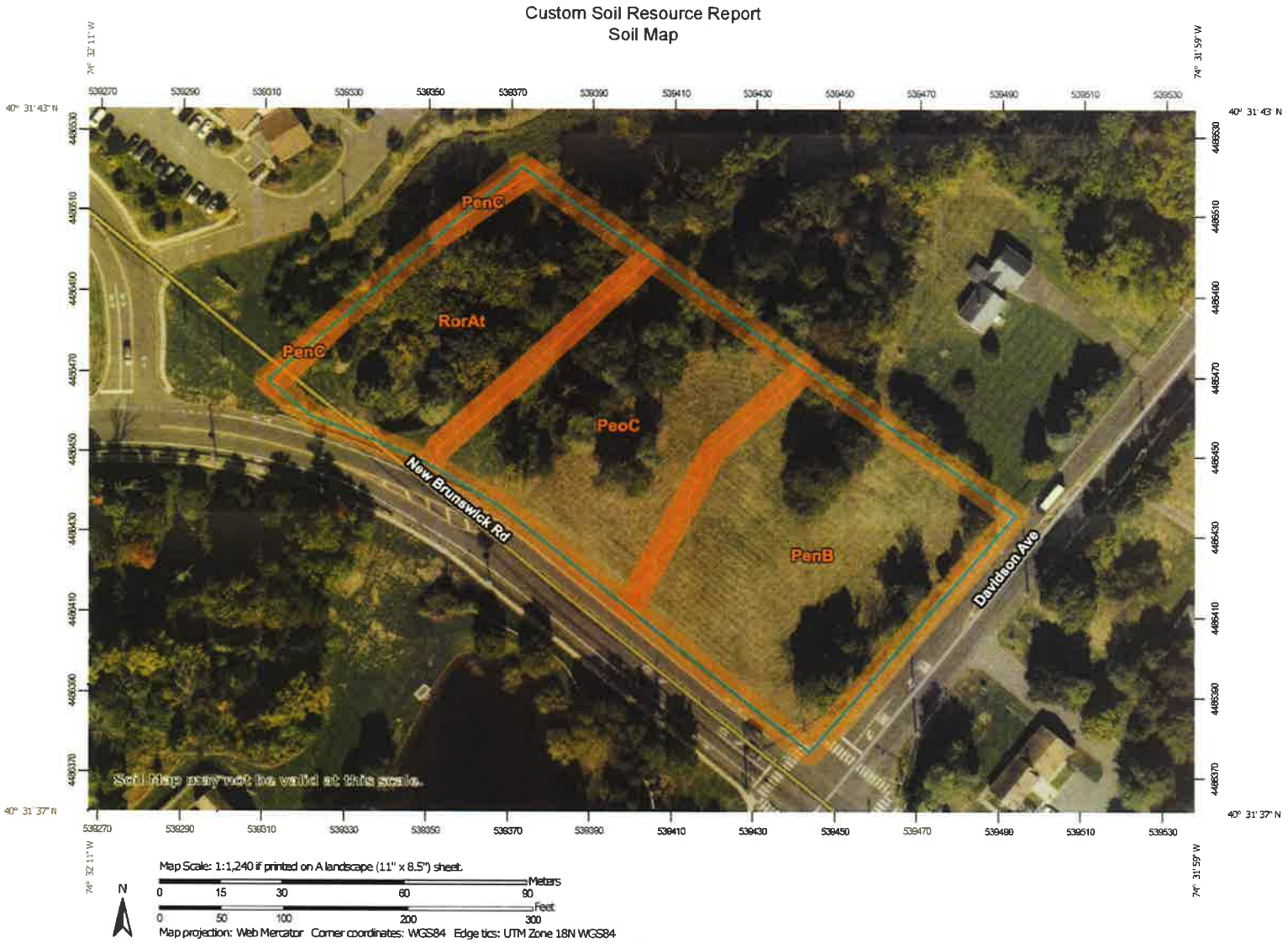


Figure 3: Site Mapped Over a Portion of Soil Survey Map (Obtained From USDA NRCS Web Site)

Table 1A- PRE DEVELOPMENT PEAK FLOW COMPUTATIONS AND DETERMINATION OF ALLOWED PEAK FLOW UPON NEW DEVELOPMENT ON THE SITE (WHERE CFS MEANS CUBIC FEET PER SECOND)					
Storm Frequency - Years	(B) Peak Flow (Pre Development) - CFS			% of Peak Flow Reduction For Rule Compliance	Maximum Peak Flow Allowed - CFS (B -C) + D
2	1.1			50.00%	0.6
10	2.8			75.00%	2.1
100	8			80.00%	6.4

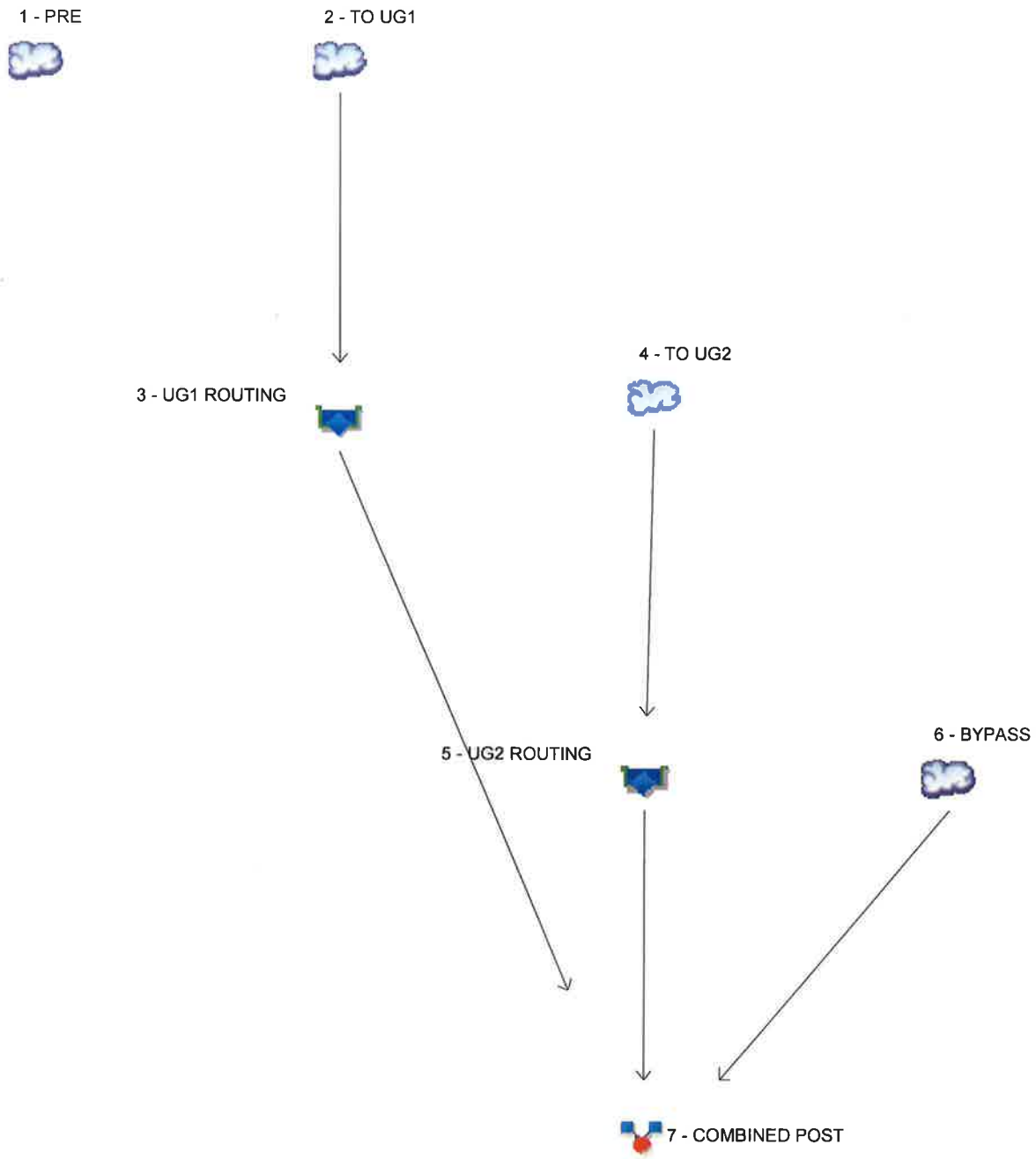
Table 1B -POST DEVELOPMENT PEAK FLOW COMPUTATIONS FROM THE DEVELOPMENT ON SITE (WHERE CFS MEANS CUBIC FEET PER SECOND)					
Storm Frequency - Years	Post Development Peak Flows - CFS	Maximum Peak Flow Allowed - CFS	Peak Flow Reduction Criteria Complied		
2	0.5	0.6	YES		
10	1.9	2.1	YES		
100	6.4	6.4	YES		

APPENDIX A:

PRE AND POST DEVELOPMENT RUNOFF CURVE NUMBER, TIME OF CONCENTRATION COMPUTATIONS AND STORM HYDROGRAPHS

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024



Legend

Hyd.	Origin	Description
1	SCS Runoff	PRE
2	SCS Runoff	TO UG1
3	Reservoir	UG1 ROUTING
4	SCS Runoff	TO UG2
5	Reservoir	UG2 ROUTING
6	SCS Runoff	BYPASS
7	Combine	COMBINED POST

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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	SCS Runoff	------	-------	1.076	-------	-------	2.835	2.687	-------	7.993	PRE
2	SCS Runoff	------	-------	1.247	-------	-------	2.228	2.151	-------	4.775	TO UG1
3	Reservoir	2	-------	0.184	-------	-------	1.185	1.123	-------	4.481	UG1 ROUTING
4	SCS Runoff	------	-------	0.806	-------	-------	1.409	1.362	-------	2.988	TO UG2
5	Reservoir	4	-------	0.146	-------	-------	0.208	0.204	-------	1.366	UG2 ROUTING
6	SCS Runoff	------	-------	0.273	-------	-------	0.659	0.628	-------	1.736	BYPASS
7	Combine	3, 5, 6	-------	0.533	-------	-------	1.878	1.781	-------	6.426	COMBINED POST

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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	1.076	6	738	6,788	------	------	------	PRE
2	SCS Runoff	1.247	6	732	7,853	------	------	------	TO UG1
3	Reservoir	0.184	6	774	1,557	2	68.86	2,380	UG1 ROUTING
4	SCS Runoff	0.806	6	732	5,232	------	------	------	TO UG2
5	Reservoir	0.146	6	768	1,027	4	65.39	1,023	UG2 ROUTING
6	SCS Runoff	0.273	6	738	1,683	------	------	------	BYPASS
7	Combine	0.533	6	744	4,268	3, 5, 6	------	------	COMBINED POST

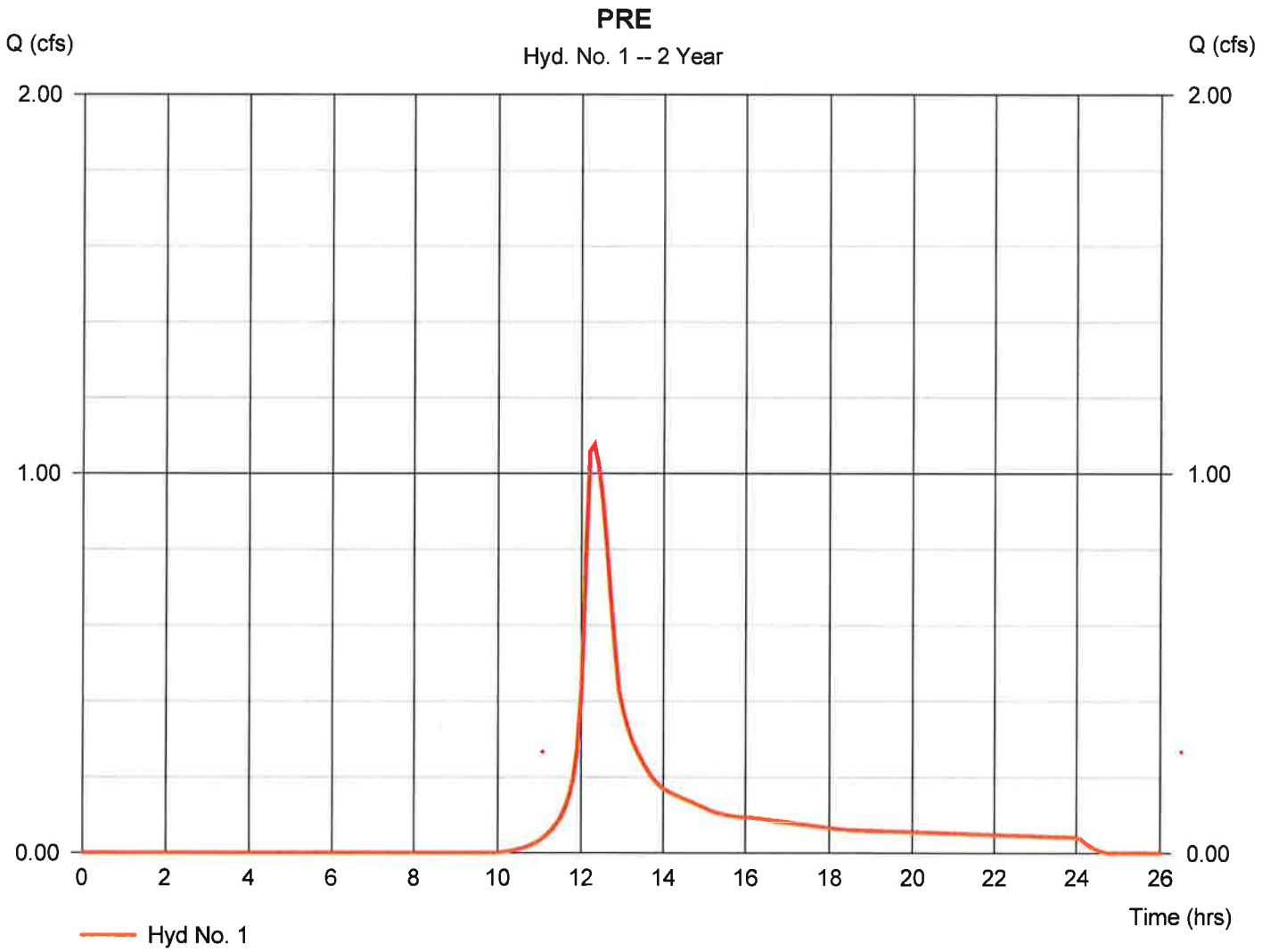
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 1

PRE

Hydrograph type	= SCS Runoff	Peak discharge	= 1.076 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.30 hrs
Time interval	= 6 min	Hyd. volume	= 6,788 cuft
Drainage area	= 1.350 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 3.72 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285



TR55 Tc Worksheet

Hyd. No. 1

PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.35		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 10.57**	**+**	**0.00**	**+**	**0.00**	**=**	**10.57**
Shallow Concentrated Flow							
Flow length (ft)	= 200.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.91**	**+**	**0.00**	**+**	**0.00**	**=**	**0.91**
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 ..... 11.50 min

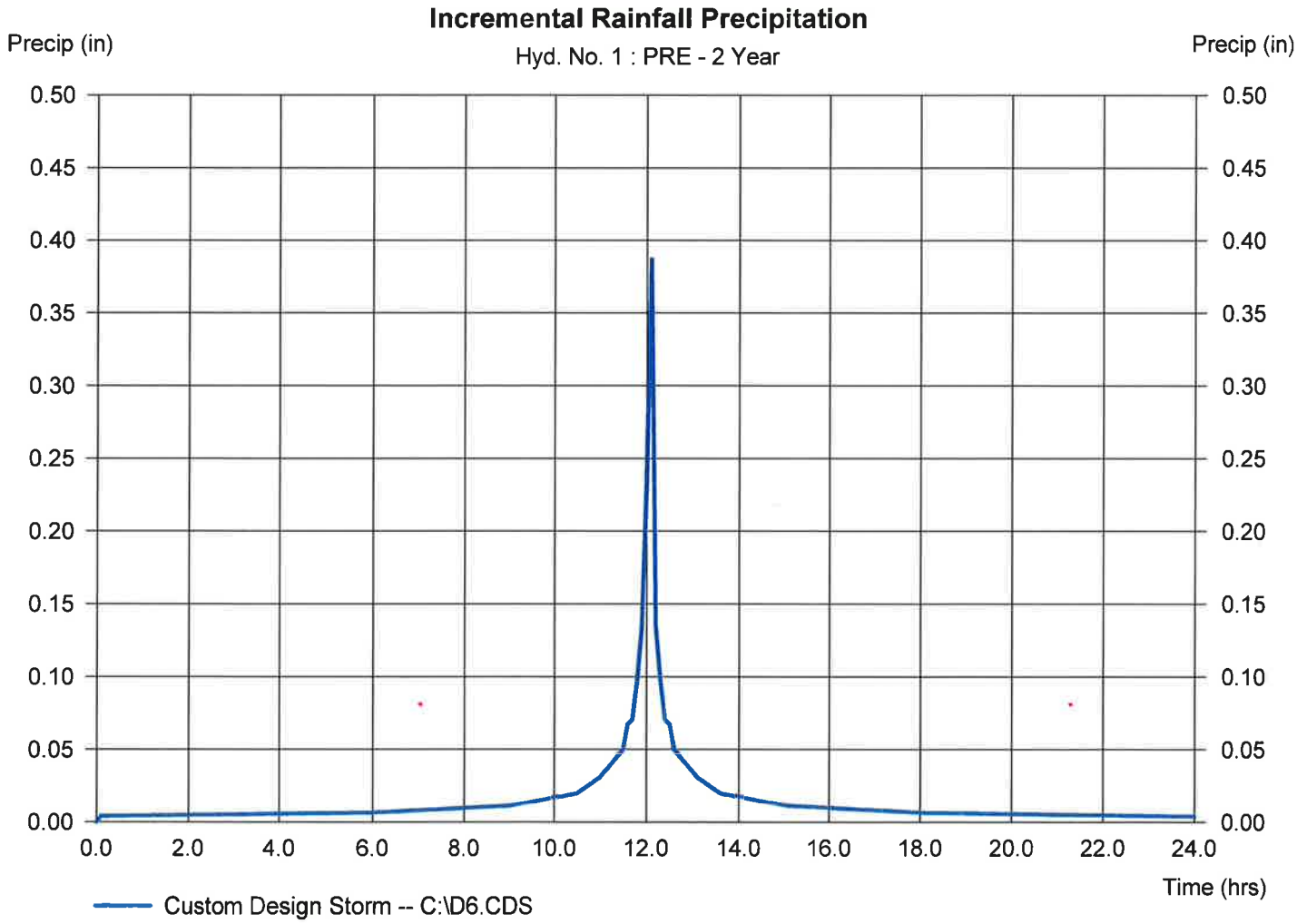
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 1

PRE

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.7200 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

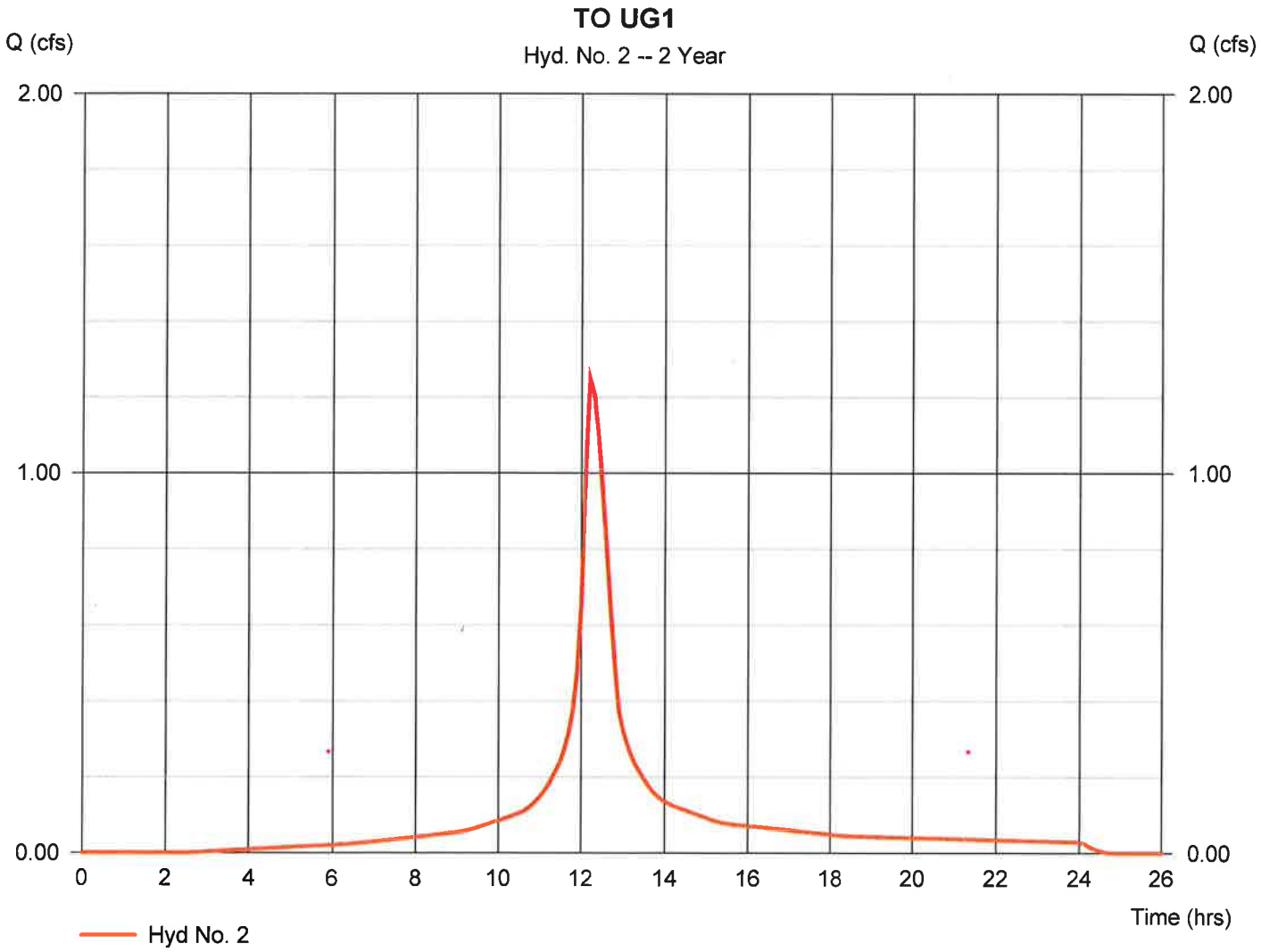
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 2

TO UG1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.247 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 7,853 cuft
Drainage area	= 0.690 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.72 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285

* Composite (Area/CN) = [(0.100 x 74) + (0.590 x 98)] / 0.690



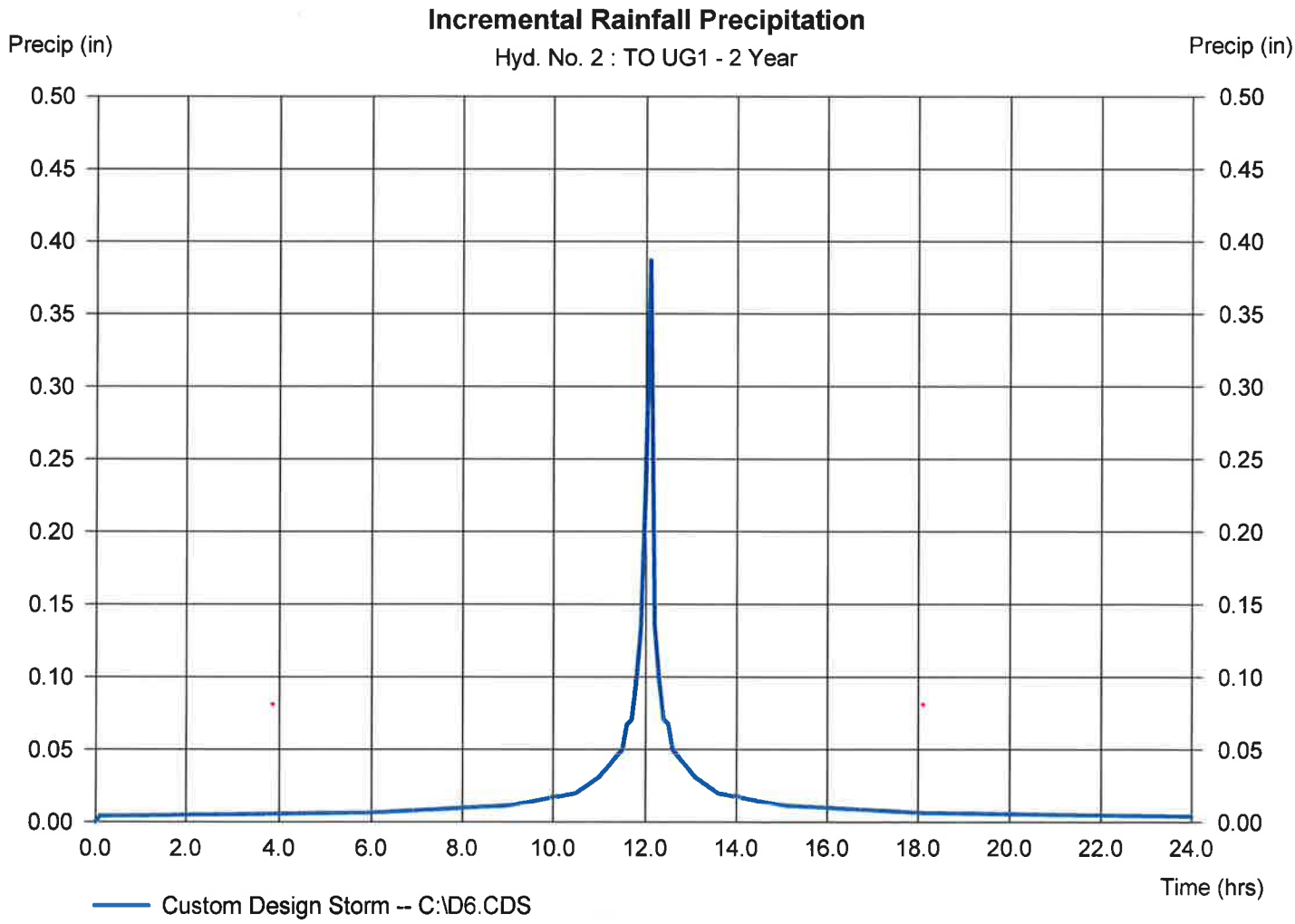
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 2

TO UG1

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.7200 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

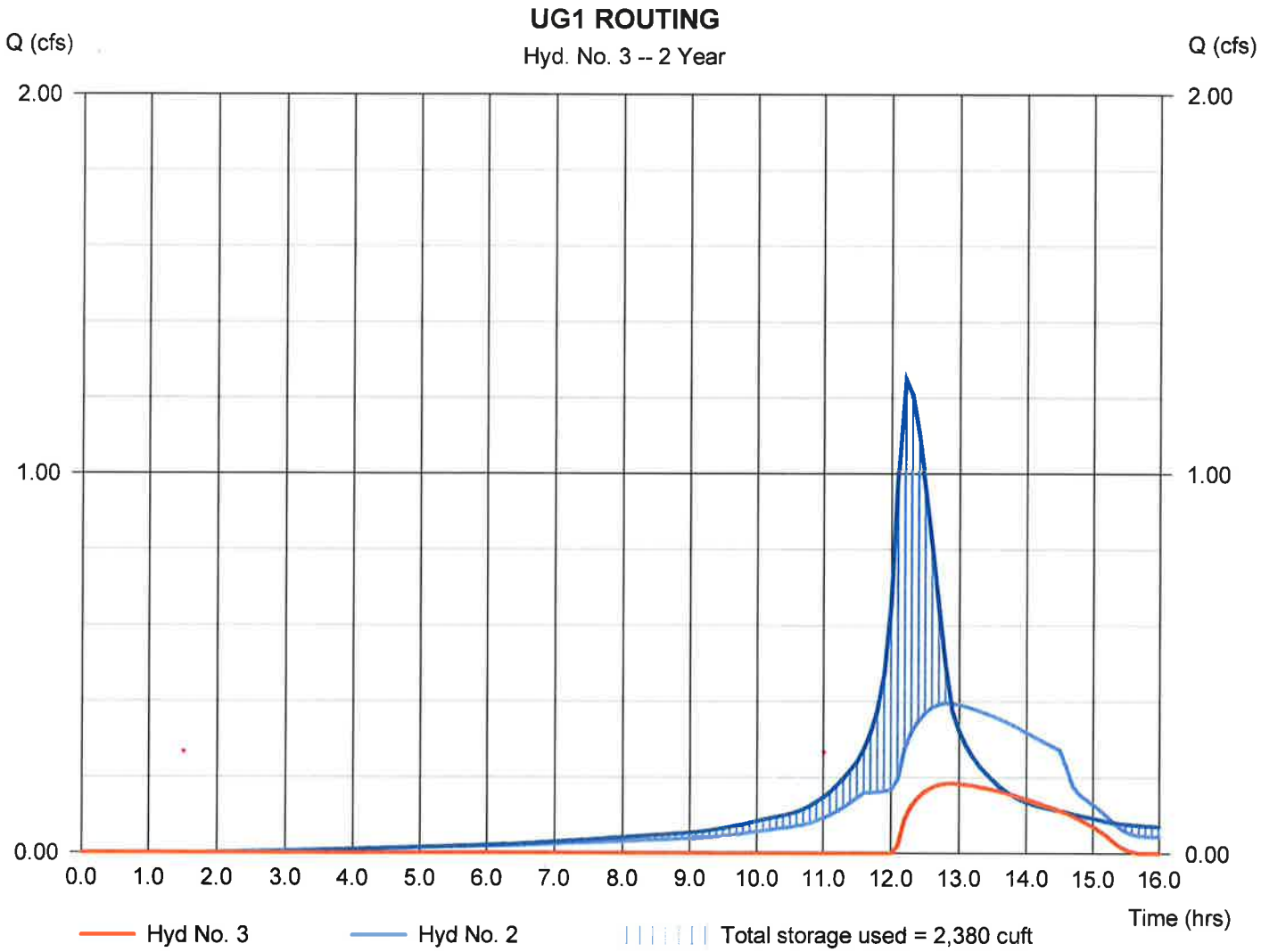
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 3

UG1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.184 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.90 hrs
Time interval	= 6 min	Hyd. volume	= 1,557 cuft
Inflow hyd. No.	= 2 - TO UG1	Max. Elevation	= 68.86 ft
Reservoir name	= UG1	Max. Storage	= 2,380 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Pond No. 1 - UG1

Pond Data

UG Chambers -Invert elev. = 67.50 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 80.00 ft, No. Barrels = 4, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 66.50 ft, Width = 5.00 ft, Height = 5.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	66.50	n/a	0	0
0.50	67.00	n/a	360	360
1.00	67.50	n/a	360	720
1.50	68.00	n/a	527	1,247
2.00	68.50	n/a	639	1,886
2.50	69.00	n/a	678	2,564
3.00	69.50	n/a	678	3,242
3.50	70.00	n/a	638	3,881
4.00	70.50	n/a	527	4,408
4.50	71.00	n/a	360	4,768
5.00	71.50	n/a	360	5,128

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 2.50	7.00	0.00	0.00
Span (in)	= 2.50	7.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 67.50	69.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.50	0.00	0.00	0.00
Crest El. (ft)	= 70.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 3.000 (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	66.50	0.00	0.00	---	---	0.00	---	---	---	0.000	---	0.000
0.50	360	67.00	0.00	0.00	---	---	0.00	---	---	---	0.142	---	0.142
1.00	720	67.50	0.00 ic	0.00	---	---	0.00	---	---	---	0.165	---	0.165
1.50	1,247	68.00	0.10 ic	0.00	---	---	0.00	---	---	---	0.189	---	0.292
2.00	1,886	68.50	0.16 ic	0.00	---	---	0.00	---	---	---	0.212	---	0.368
2.50	2,564	69.00	0.19 ic	0.00 ic	---	---	0.00	---	---	---	0.236	---	0.430
3.00	3,242	69.50	0.23 ic	0.59 ic	---	---	0.00	---	---	---	0.260	---	1.074
3.50	3,881	70.00	0.25 ic	1.08 ic	---	---	0.00	---	---	---	0.283	---	1.621
4.00	4,408	70.50	0.28 ic	1.41 ic	---	---	0.00	---	---	---	0.307	---	2.001
4.50	4,768	71.00	0.30 ic	1.68 ic	---	---	4.13	---	---	---	0.331	---	6.445
5.00	5,128	71.50	0.32 ic	1.91 ic	---	---	11.67	---	---	---	0.354	---	14.26

Hydrograph Report

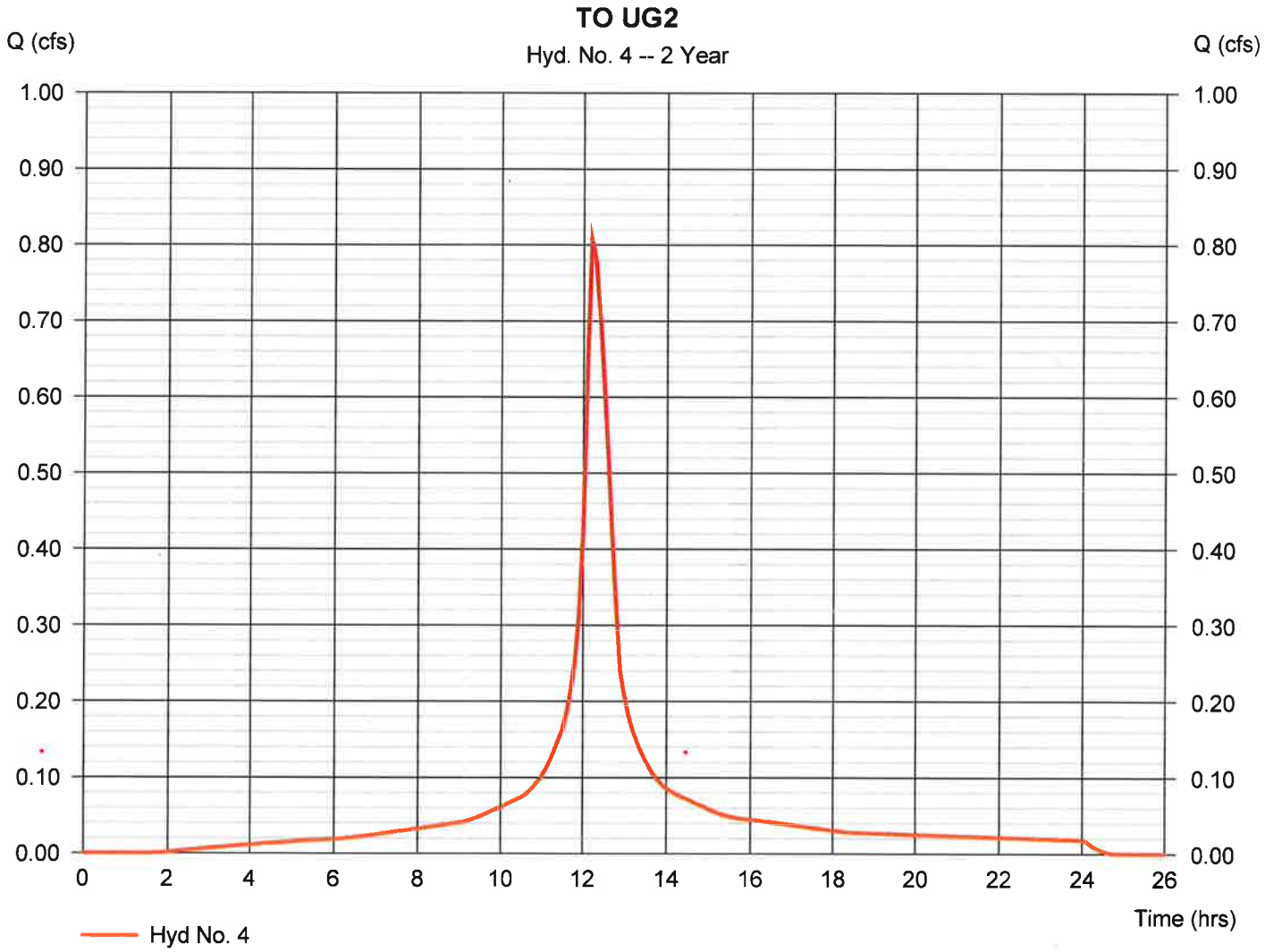
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 4

TO UG2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.806 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 5,232 cuft
Drainage area	= 0.430 ac	Curve number	= 97*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.72 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285

* Composite (Area/CN) = [(0.010 x 74) + (0.420 x 98)] / 0.430



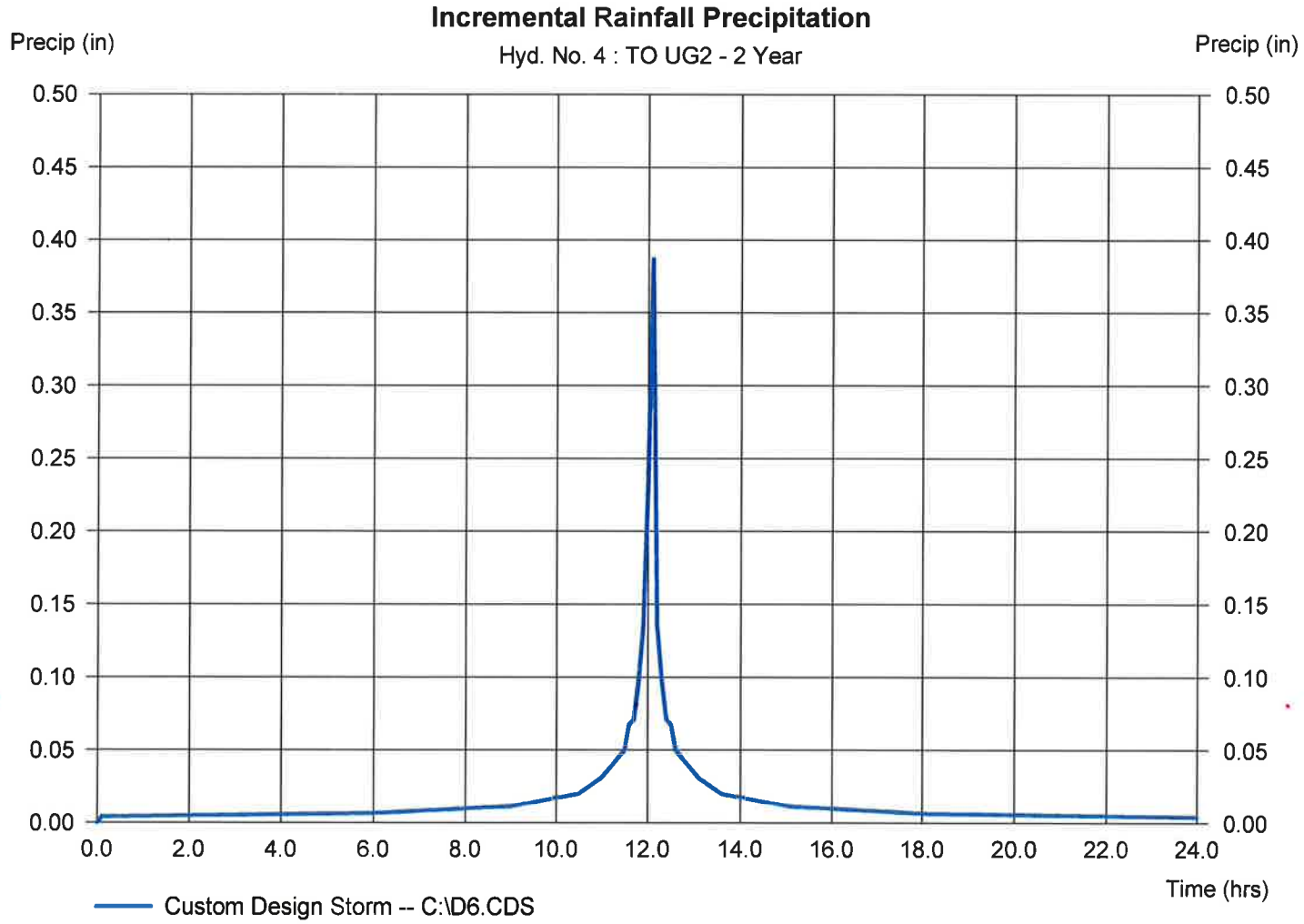
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 4

TO UG2

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.7200 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

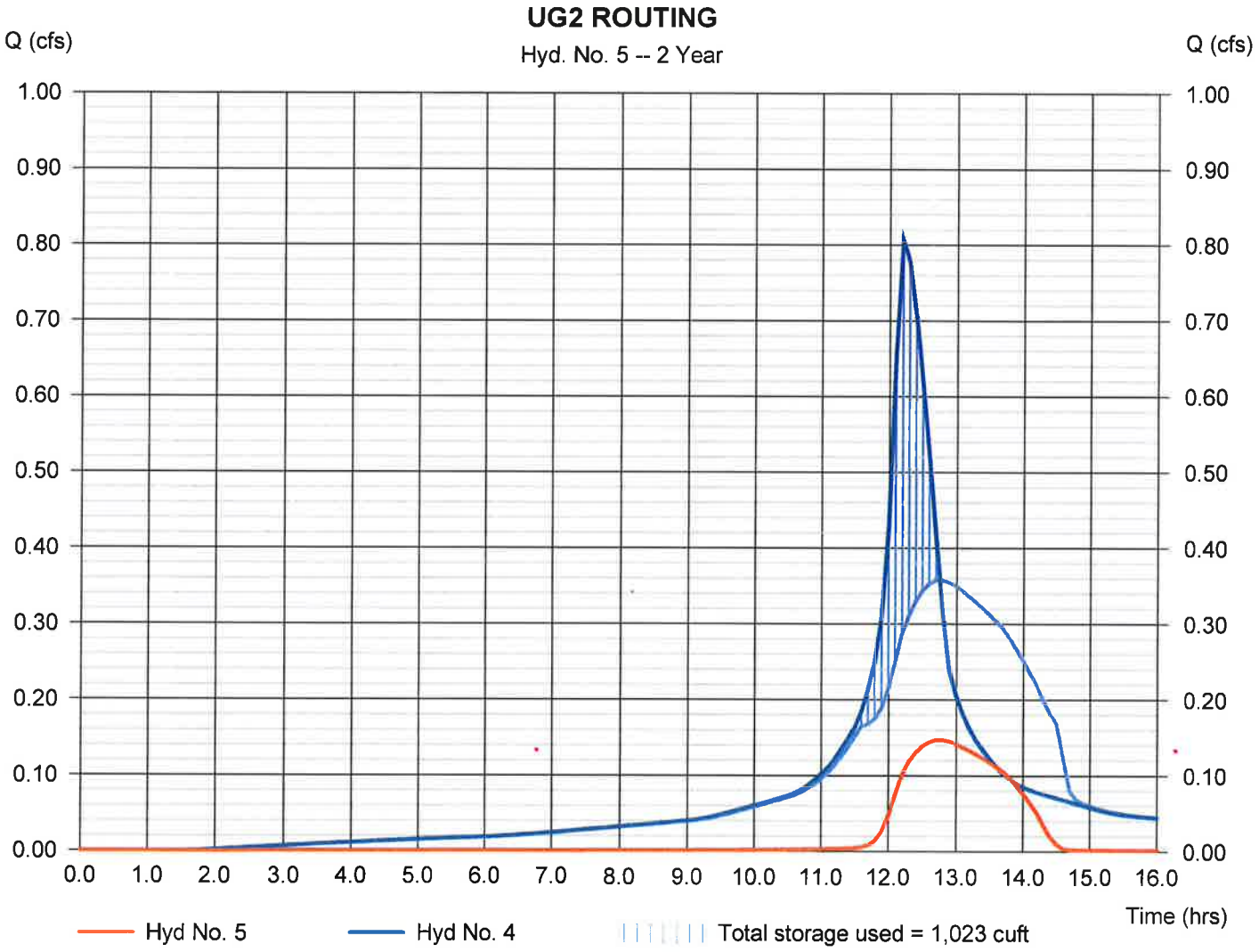
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 5

UG2 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.146 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.80 hrs
Time interval	= 6 min	Hyd. volume	= 1,027 cuft
Inflow hyd. No.	= 4 - TO UG2	Max. Elevation	= 65.39 ft
Reservoir name	= UG2	Max. Storage	= 1,023 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Pond No. 3 - UG2

Pond Data

UG Chambers -Invert elev. = 65.00 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 85.00 ft, No. Barrels = 5, Slope = 0.00%, Headers = Yes
Encasement -Invert elev. = 64.50 ft, Width = 5.00 ft, Height = 5.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	64.50	n/a	0	0
0.50	65.00	n/a	475	475
1.00	65.50	n/a	696	1,171
1.50	66.00	n/a	843	2,013
2.00	66.50	n/a	895	2,908
2.50	67.00	n/a	895	3,803
3.00	67.50	n/a	842	4,645
3.50	68.00	n/a	696	5,341
4.00	68.50	n/a	475	5,816
4.50	69.00	n/a	475	6,291
5.00	69.50	n/a	475	6,766

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 2.50	0.00	0.00	0.00
Span (in)	= 2.50	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 64.50	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.50	0.00	0.00	0.00
Crest El. (ft)	= 68.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 3.000 (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	64.50	0.00	---	---	---	0.00	---	---	---	0.000	---	0.000
0.50	475	65.00	0.10 ic	---	---	---	0.00	---	---	---	0.187	---	0.291
1.00	1,171	65.50	0.16 ic	---	---	---	0.00	---	---	---	0.219	---	0.374
1.50	2,013	66.00	0.19 ic	---	---	---	0.00	---	---	---	0.250	---	0.444
2.00	2,908	66.50	0.23 ic	---	---	---	0.00	---	---	---	0.281	---	0.507
2.50	3,803	67.00	0.25 ic	---	---	---	0.00	---	---	---	0.312	---	0.567
3.00	4,645	67.50	0.28 ic	---	---	---	0.00	---	---	---	0.344	---	0.623
3.50	5,341	68.00	0.30 ic	---	---	---	0.00	---	---	---	0.375	---	0.677
4.00	5,816	68.50	0.32 ic	---	---	---	0.00	---	---	---	0.406	---	0.730
4.50	6,291	69.00	0.34 ic	---	---	---	4.13	---	---	---	0.438	---	4.912
5.00	6,766	69.50	0.36 ic	---	---	---	11.67	---	---	---	0.469	---	12.50

Hydrograph Report

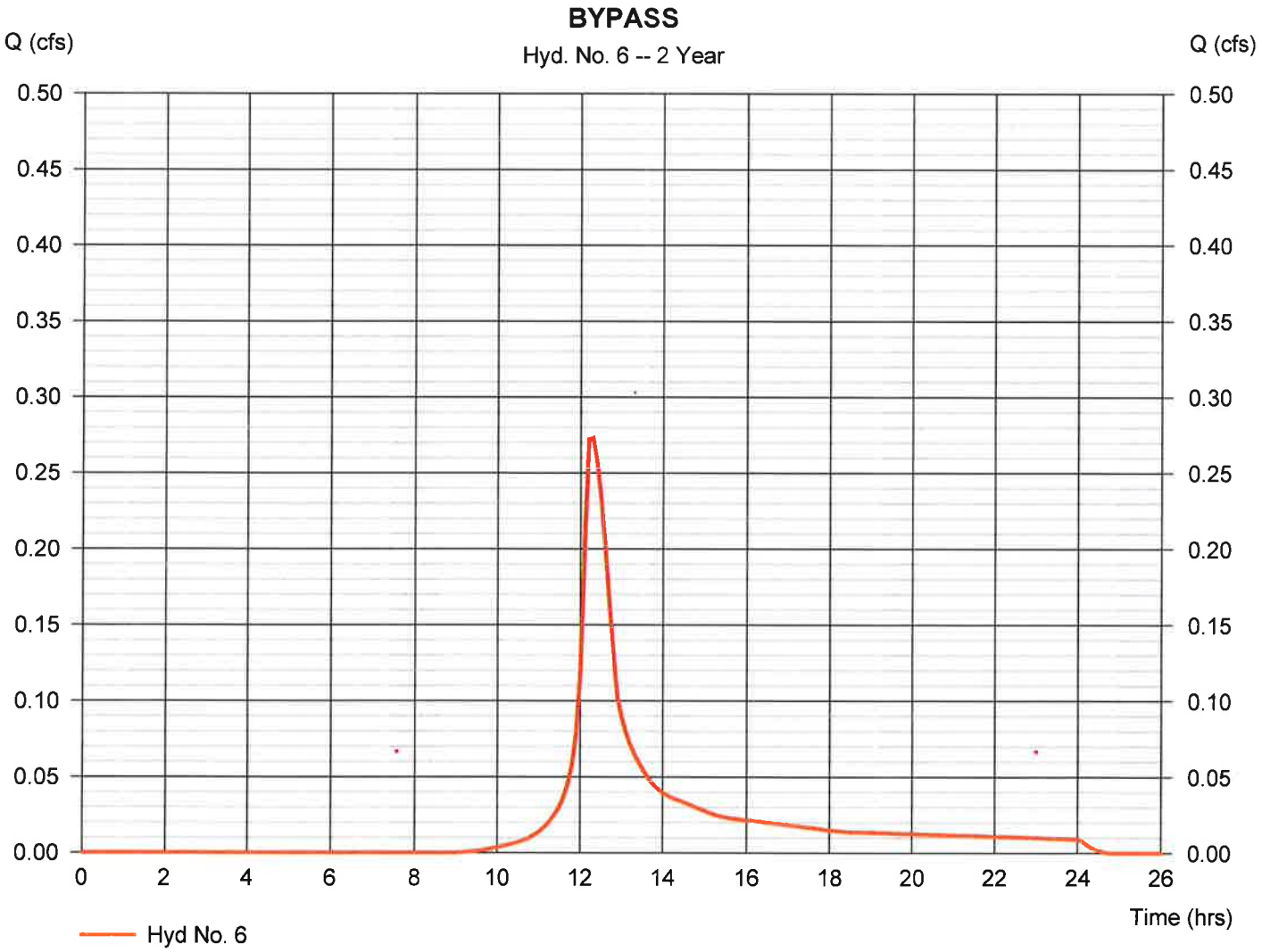
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 6

BYPASS

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.273 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.30 hrs
Time interval	=	6 min	Hyd. volume	=	1,683 cuft
Drainage area	=	0.280 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.72 in	Distribution	=	Custom
Storm duration	=	C:\D6.CDS	Shape factor	=	285

* Composite (Area/CN) = [(0.050 x 98) + (0.230 x 74)] / 0.280



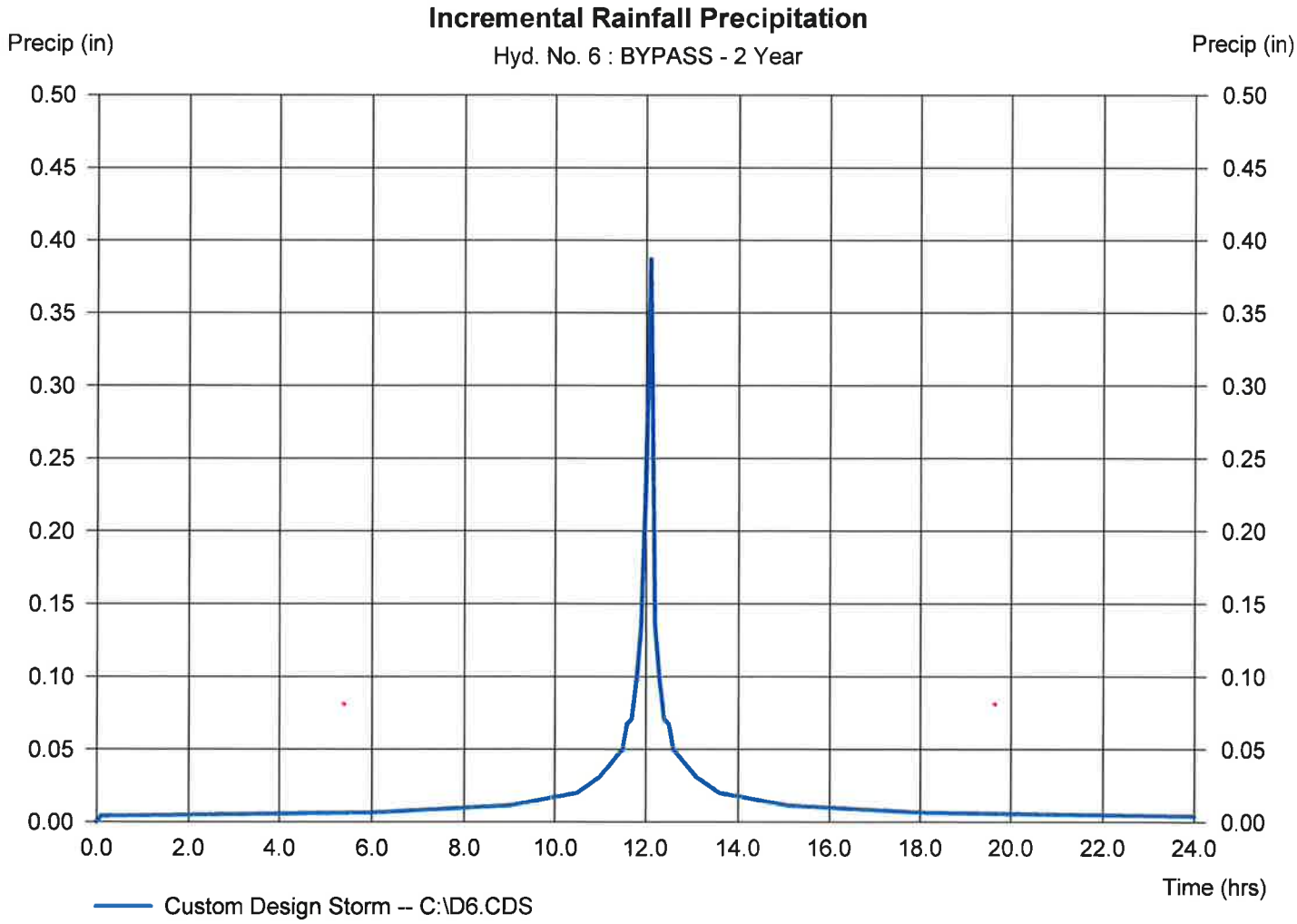
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 6

BYPASS

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.7200 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



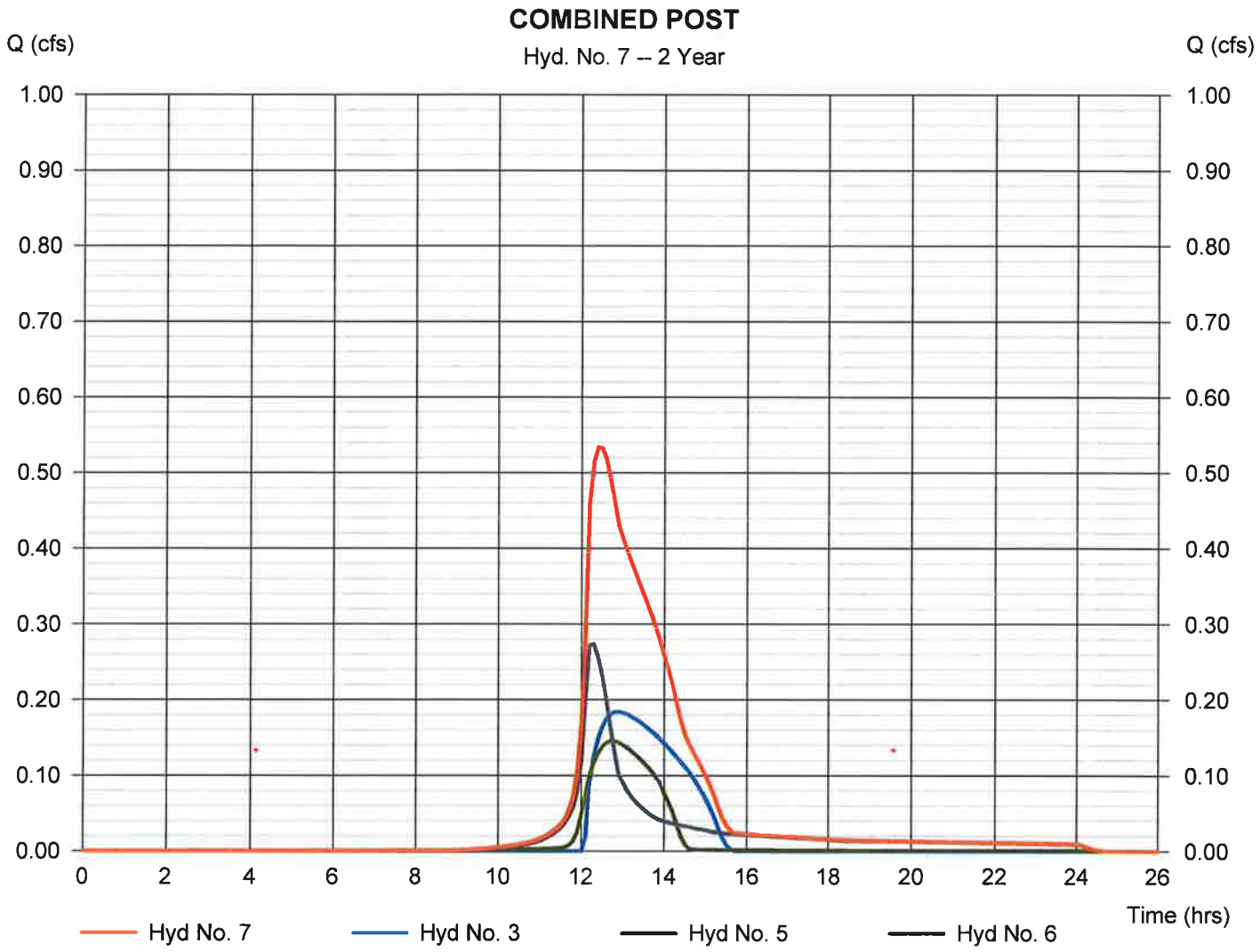
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 7

COMBINED POST

Hydrograph type	= Combine	Peak discharge	= 0.533 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.40 hrs
Time interval	= 6 min	Hyd. volume	= 4,268 cuft
Inflow hyds.	= 3, 5, 6	Contrib. drain. area	= 0.280 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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	2.835	6	732	17,160	------	------	------	PRE
2	SCS Runoff	2.228	6	732	14,458	------	------	------	TO UG1
3	Reservoir	1.185	6	756	5,236	2	69.83	3,658	UG1 ROUTING
4	SCS Runoff	1.409	6	732	9,373	------	------	------	TO UG2
5	Reservoir	0.208	6	774	2,416	4	66.21	2,396	UG2 ROUTING
6	SCS Runoff	0.659	6	732	3,974	------	------	------	BYPASS
7	Combine	1.878	6	750	11,626	3, 5, 6	------	------	COMBINED POST

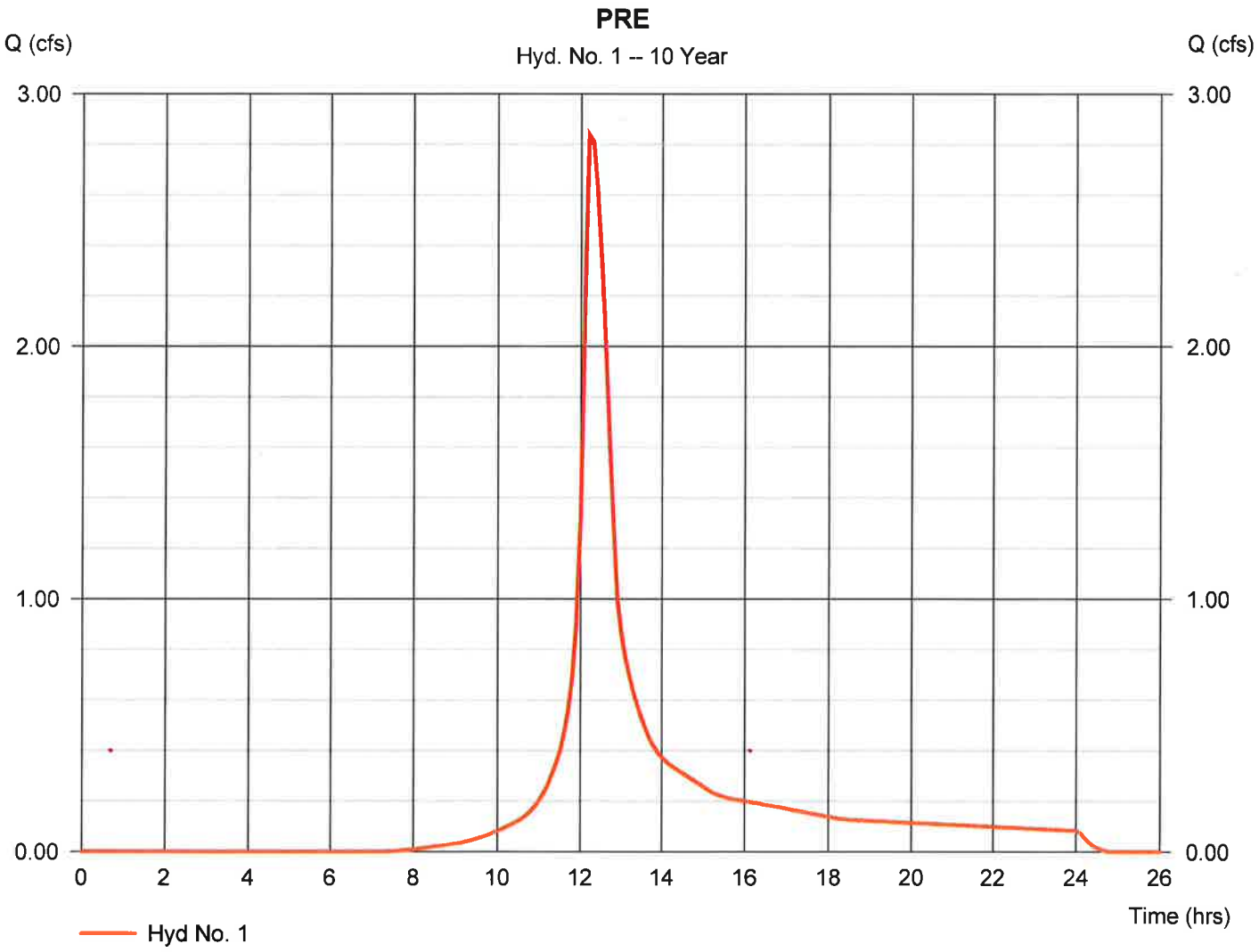
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 1

PRE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.835 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 17,160 cuft
Drainage area	= 1.350 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 6.40 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285



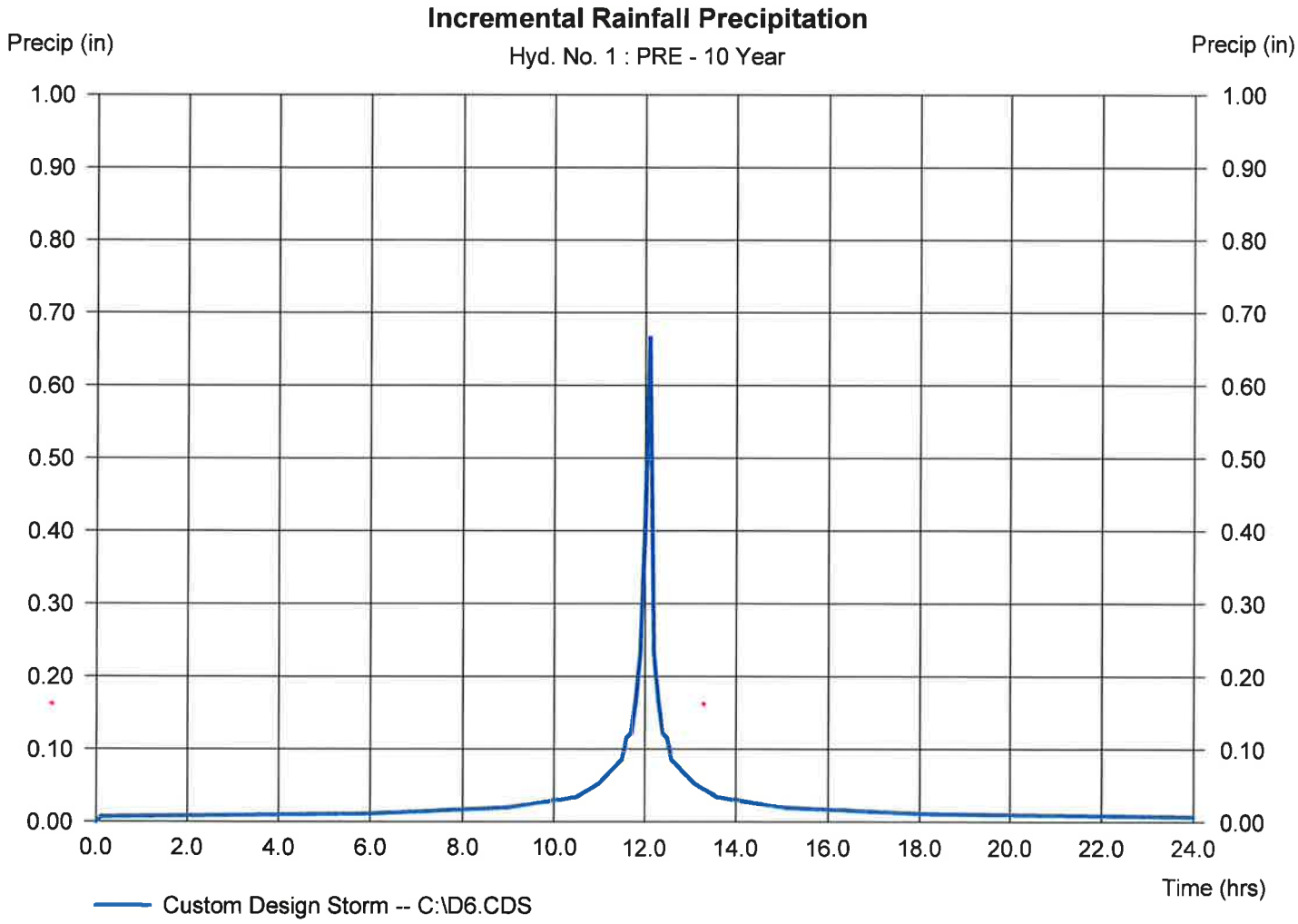
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 1

PRE

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 6.4000 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

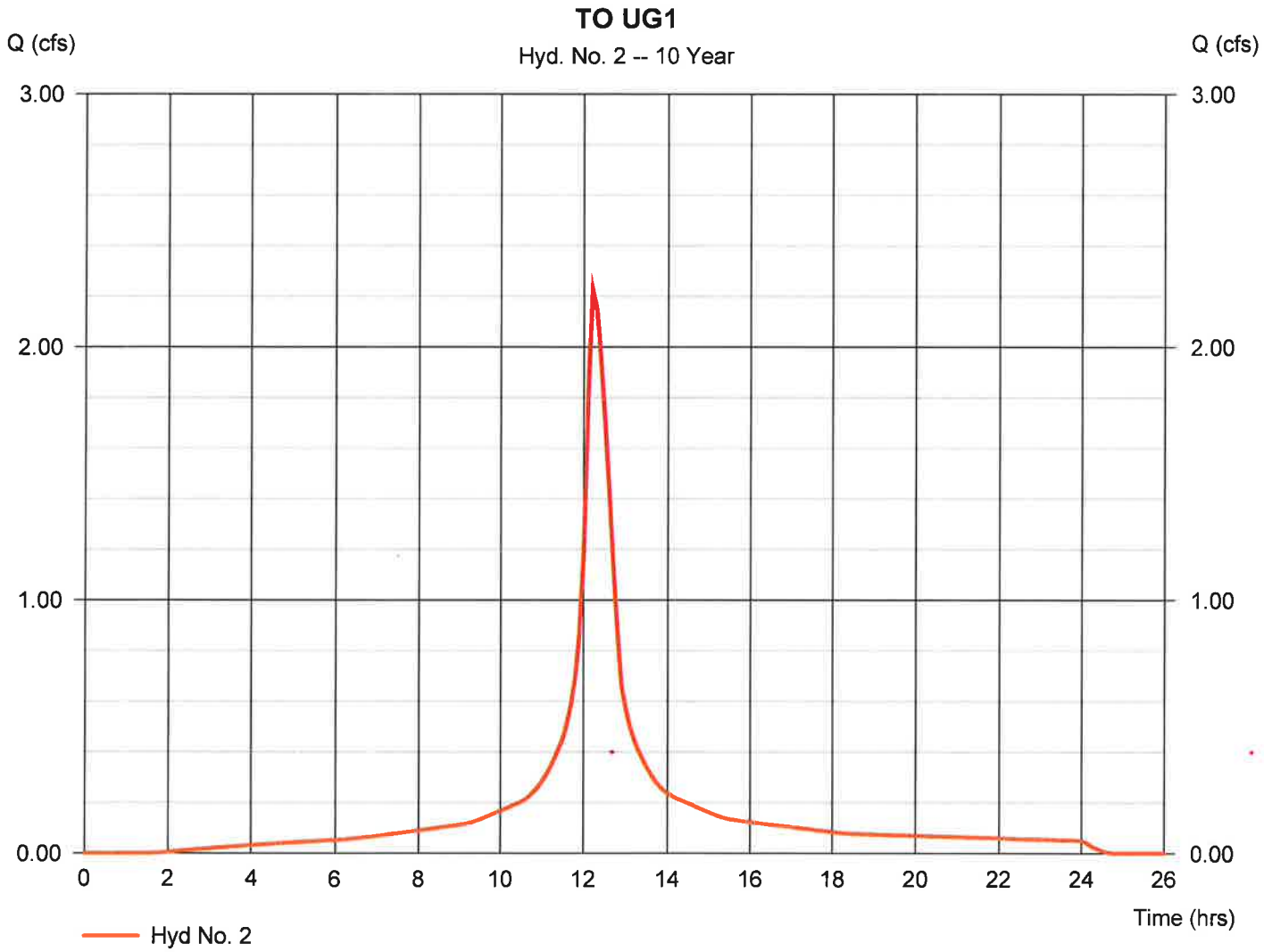
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 2

TO UG1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.228 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 14,458 cuft
Drainage area	= 0.690 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.40 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285

* Composite (Area/CN) = [(0.100 x 74) + (0.590 x 98)] / 0.690



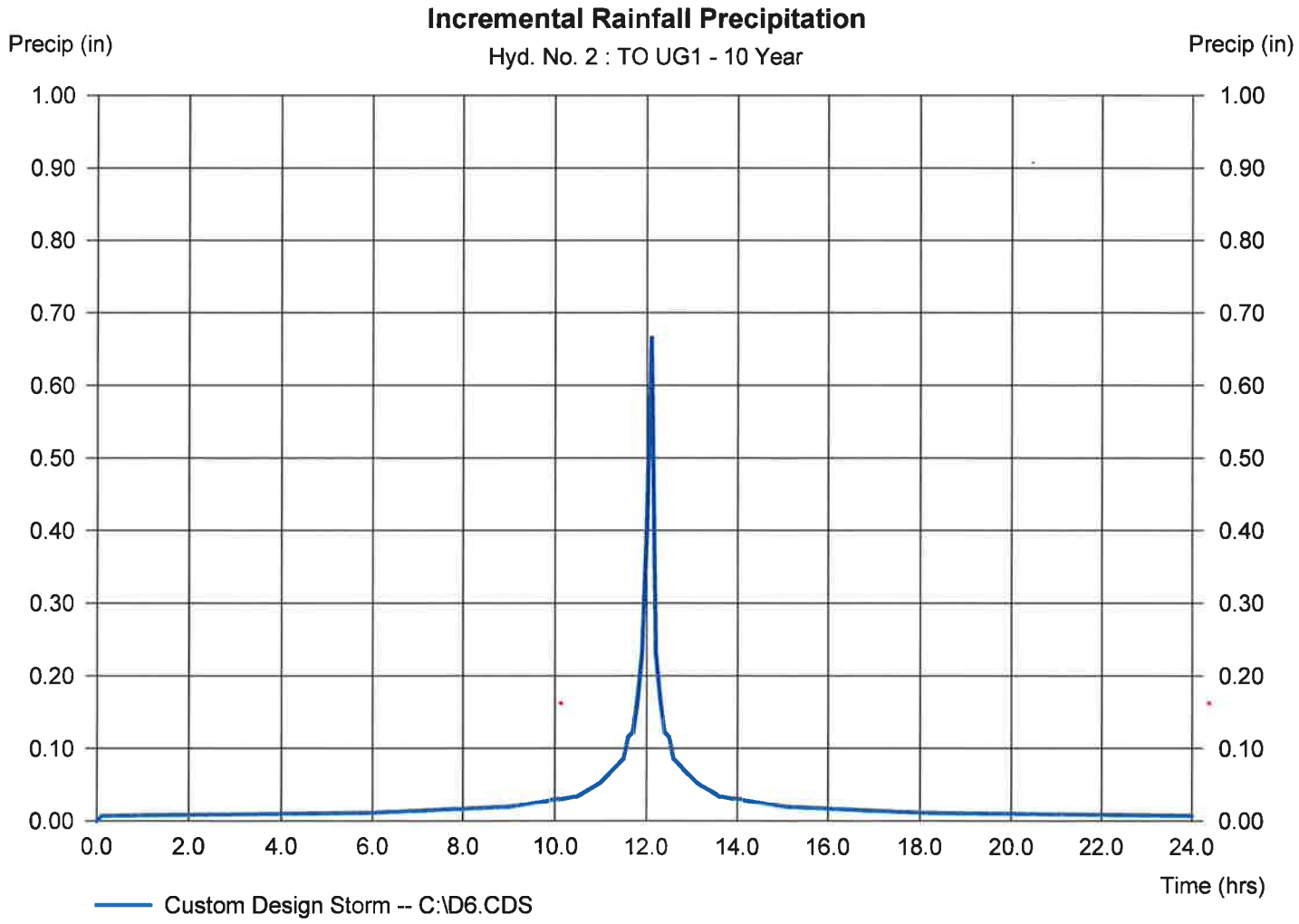
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 2

TO UG1

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 6.4000 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

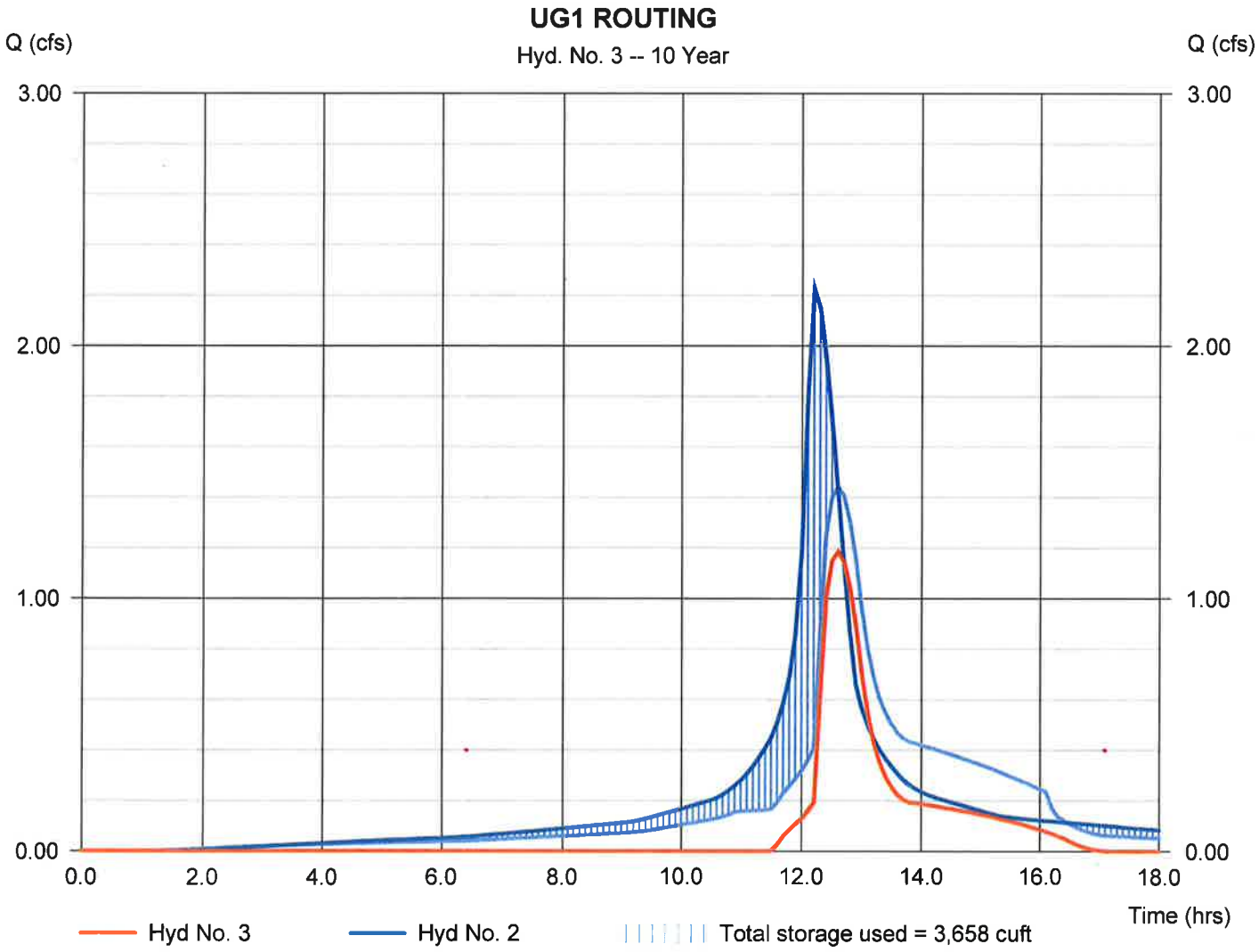
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 3

UG1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 1.185 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.60 hrs
Time interval	= 6 min	Hyd. volume	= 5,236 cuft
Inflow hyd. No.	= 2 - TO UG1	Max. Elevation	= 69.83 ft
Reservoir name	= UG1	Max. Storage	= 3,658 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

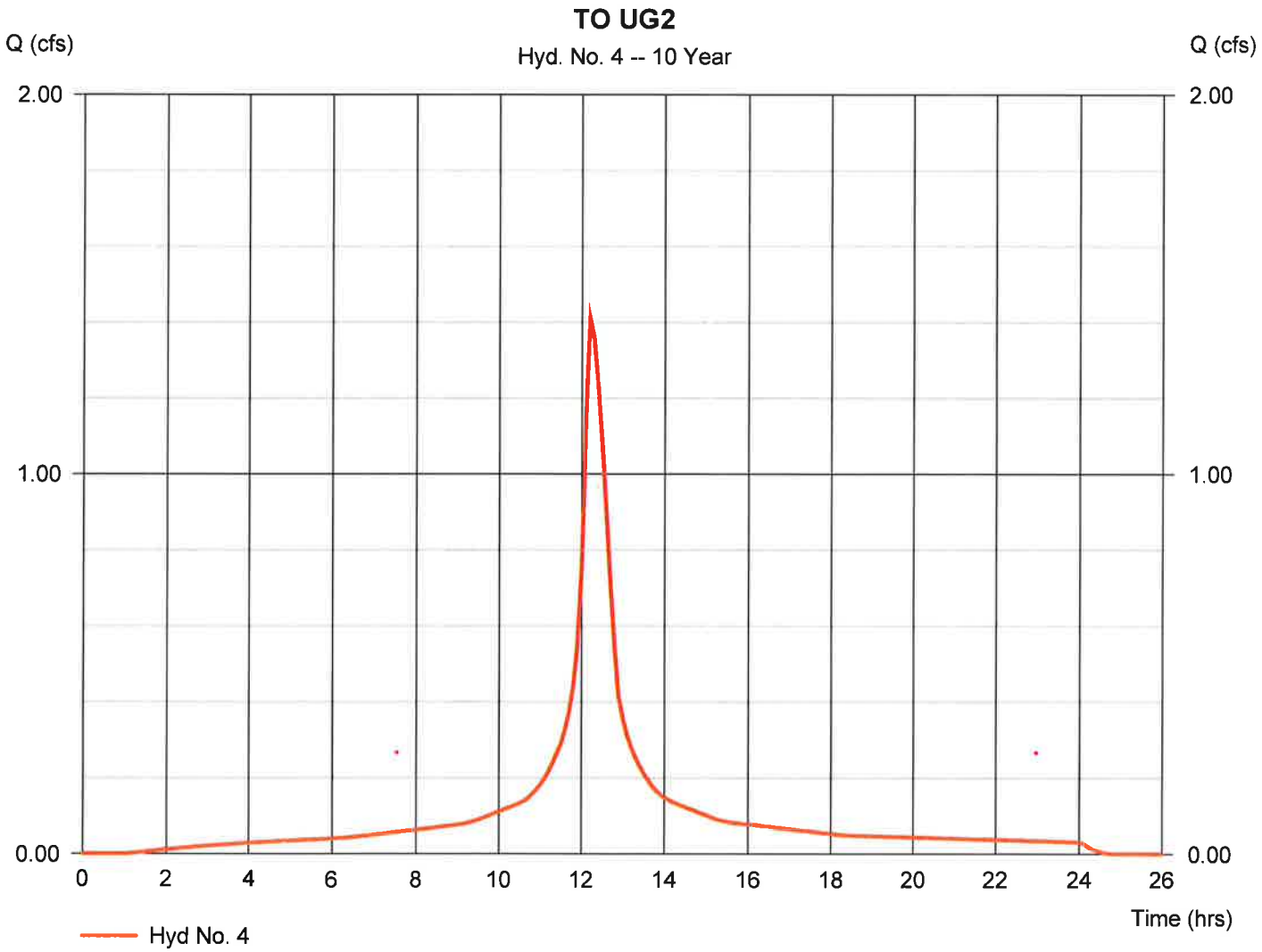
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 4

TO UG2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.409 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 9,373 cuft
Drainage area	= 0.430 ac	Curve number	= 97*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.40 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285

* Composite (Area/CN) = [(0.010 x 74) + (0.420 x 98)] / 0.430



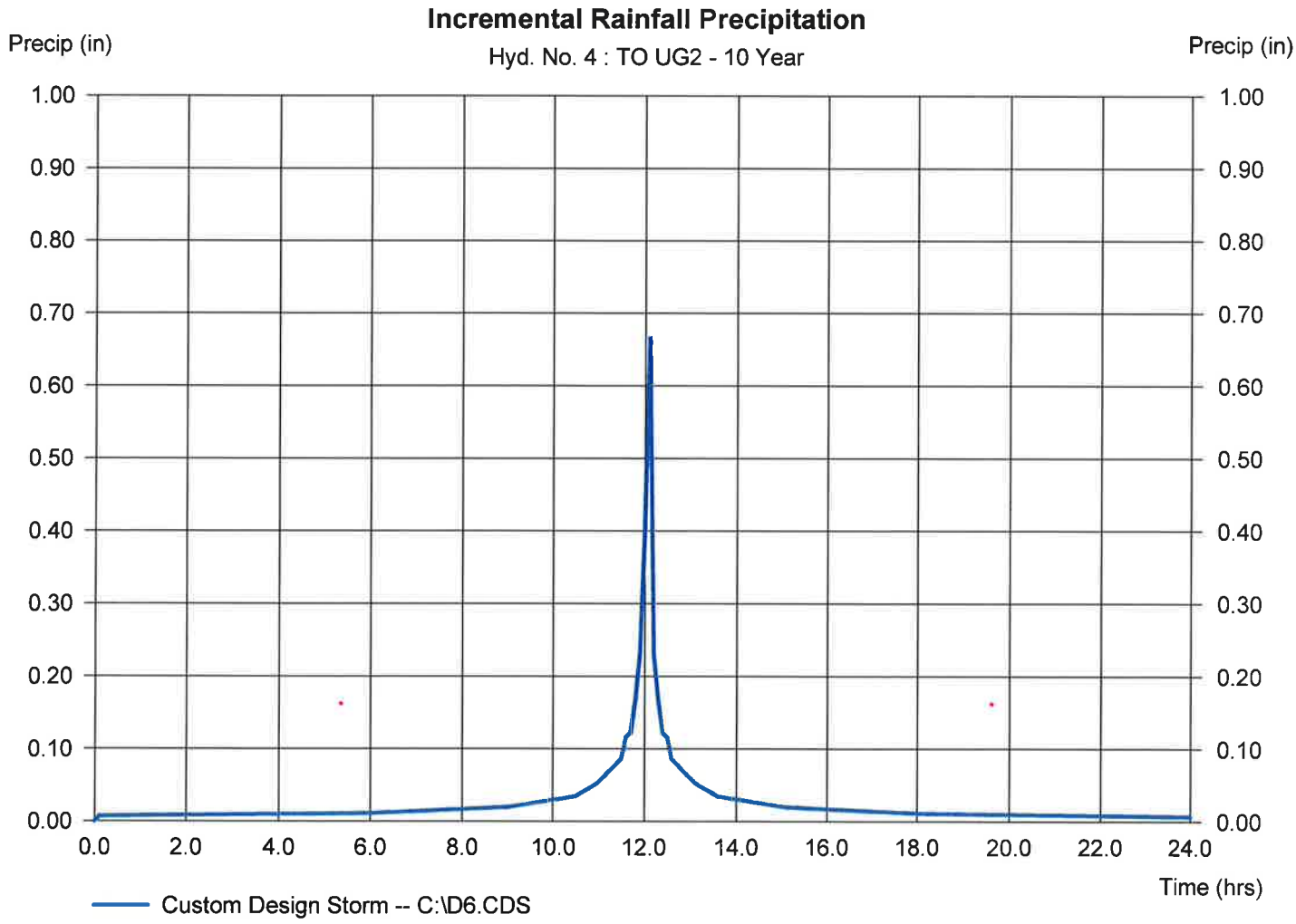
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 4

TO UG2

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 6.4000 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

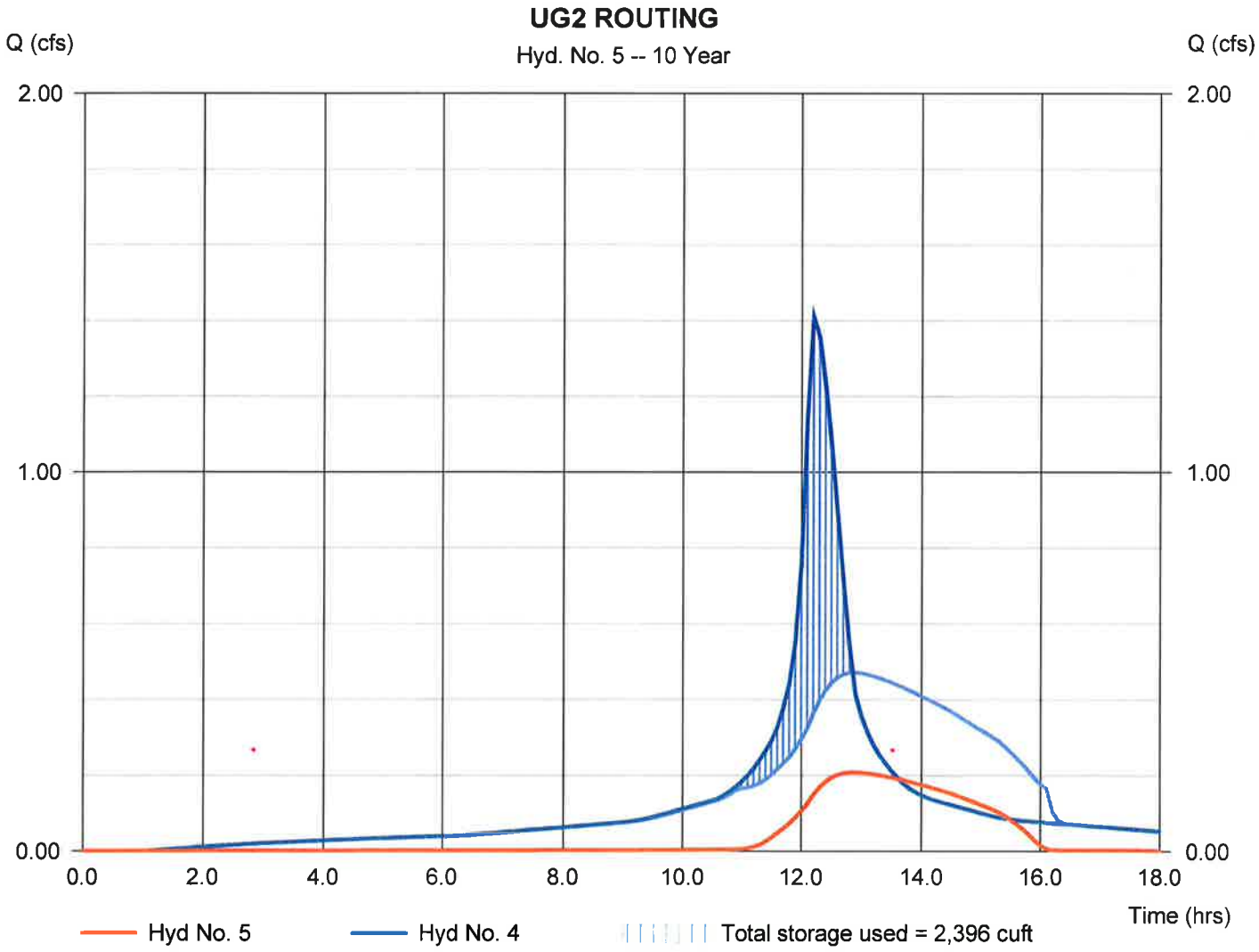
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 5

UG2 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 0.208 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.90 hrs
Time interval	= 6 min	Hyd. volume	= 2,416 cuft
Inflow hyd. No.	= 4 - TO UG2	Max. Elevation	= 66.21 ft
Reservoir name	= UG2	Max. Storage	= 2,396 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

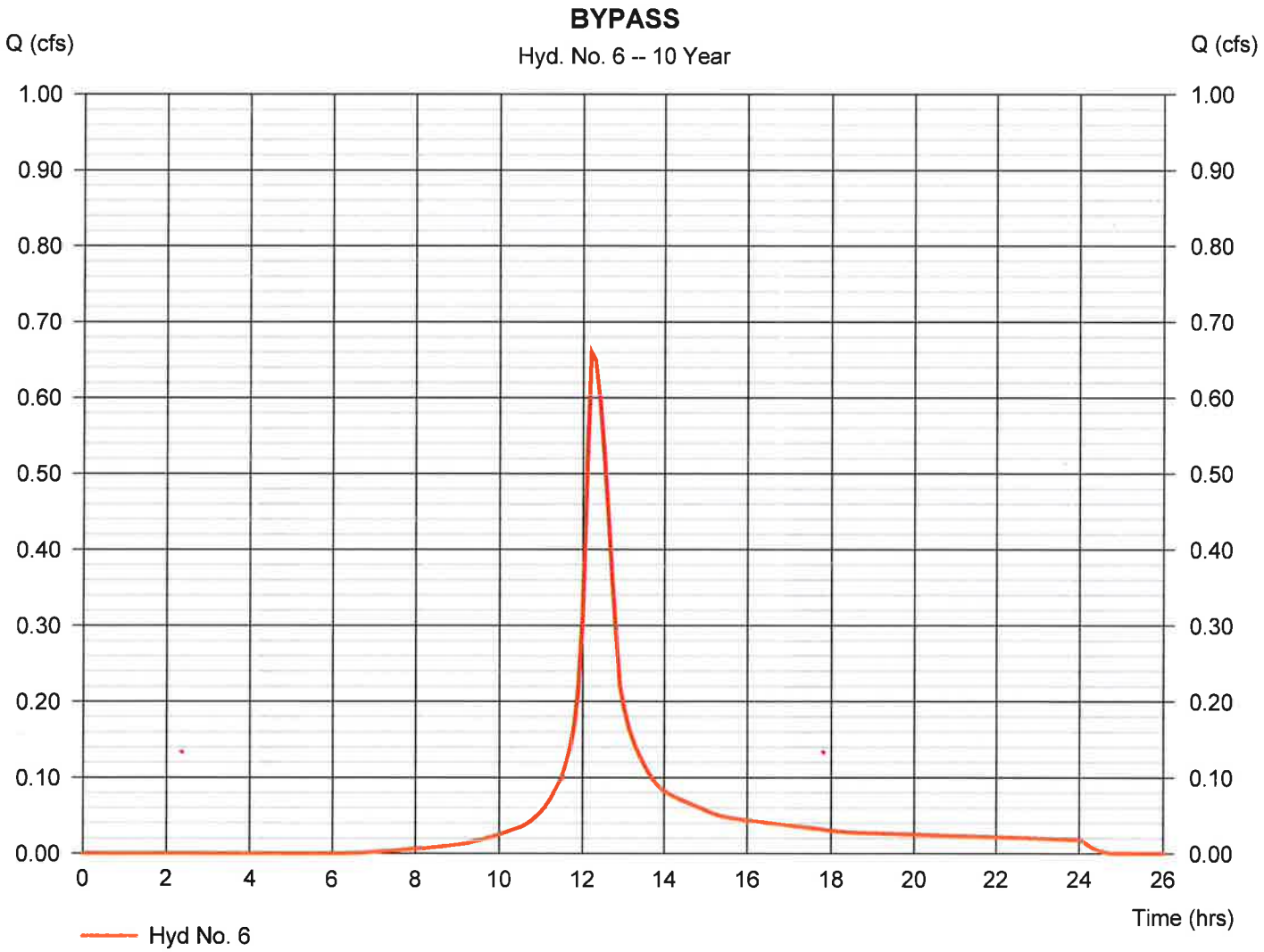
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 6

BYPASS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.659 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 3,974 cuft
Drainage area	= 0.280 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.40 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285

* Composite (Area/CN) = [(0.050 x 98) + (0.230 x 74)] / 0.280



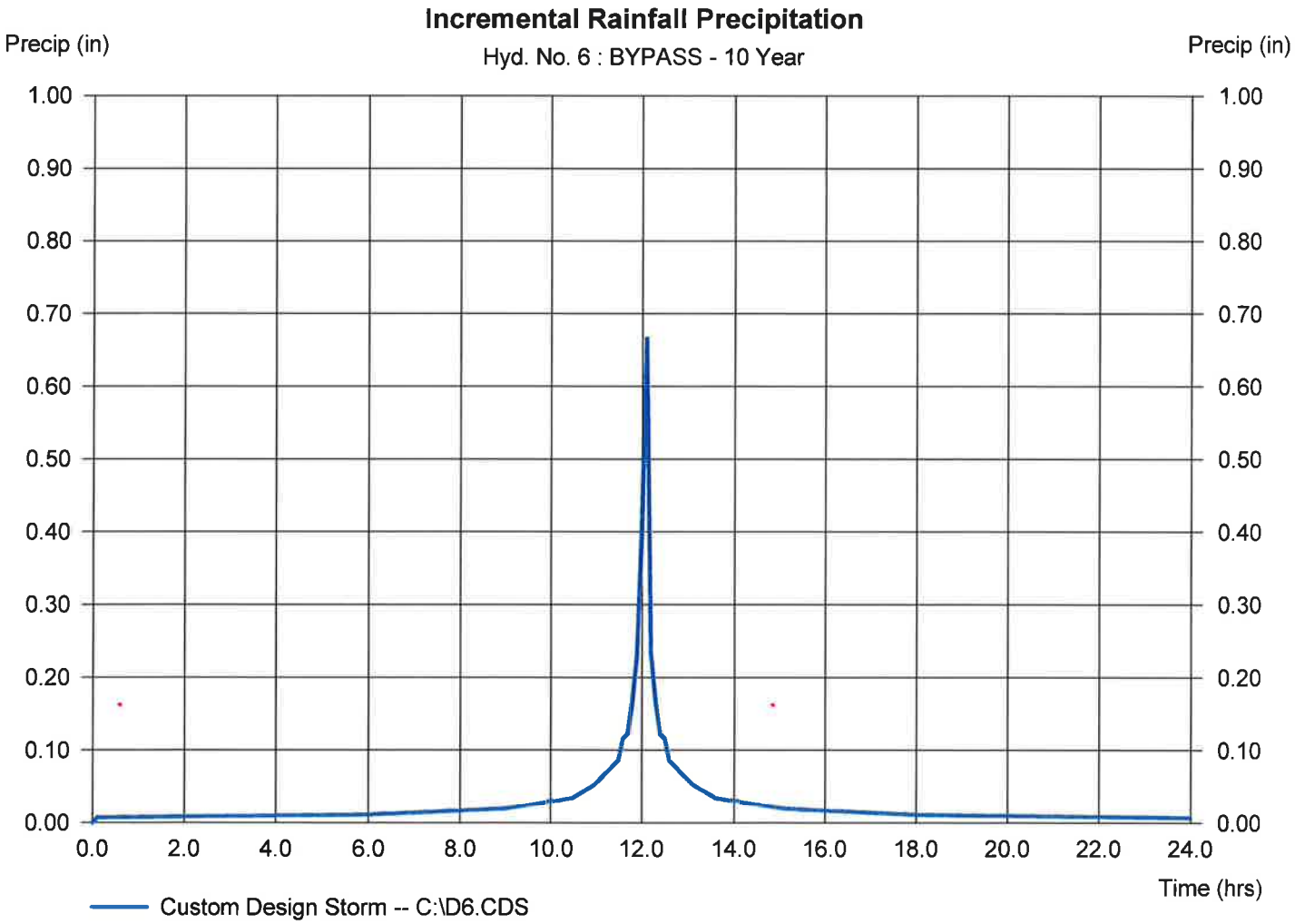
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 6

BYPASS

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 6.4000 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



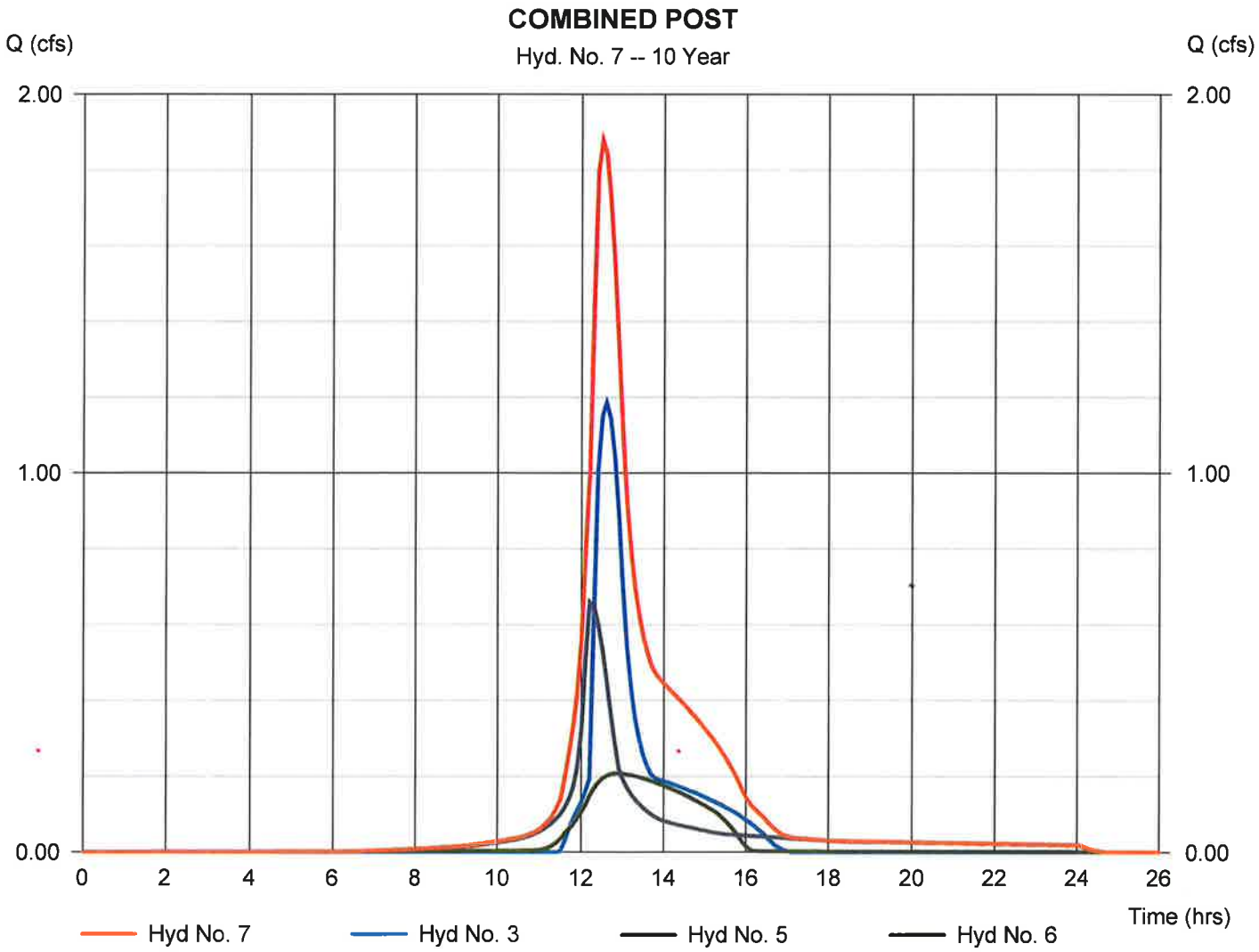
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 7

COMBINED POST

Hydrograph type	= Combine	Peak discharge	= 1.878 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.50 hrs
Time interval	= 6 min	Hyd. volume	= 11,626 cuft
Inflow hyds.	= 3, 5, 6	Contrib. drain. area	= 0.280 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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	7.993	6	732	48,753	------	------	------	PRE
2	SCS Runoff	4.775	6	732	32,003	------	------	------	TO UG1
3	Reservoir	4.481	6	738	17,665	2	70.86	4,670	UG1 ROUTING
4	SCS Runoff	2.988	6	732	20,327	------	------	------	TO UG2
5	Reservoir	1.366	6	762	7,095	4	68.70	6,004	UG2 ROUTING
6	SCS Runoff	1.736	6	732	10,697	------	------	------	BYPASS
7	Combine	6.426	6	738	35,457	3, 5, 6	------	------	COMBINED POST

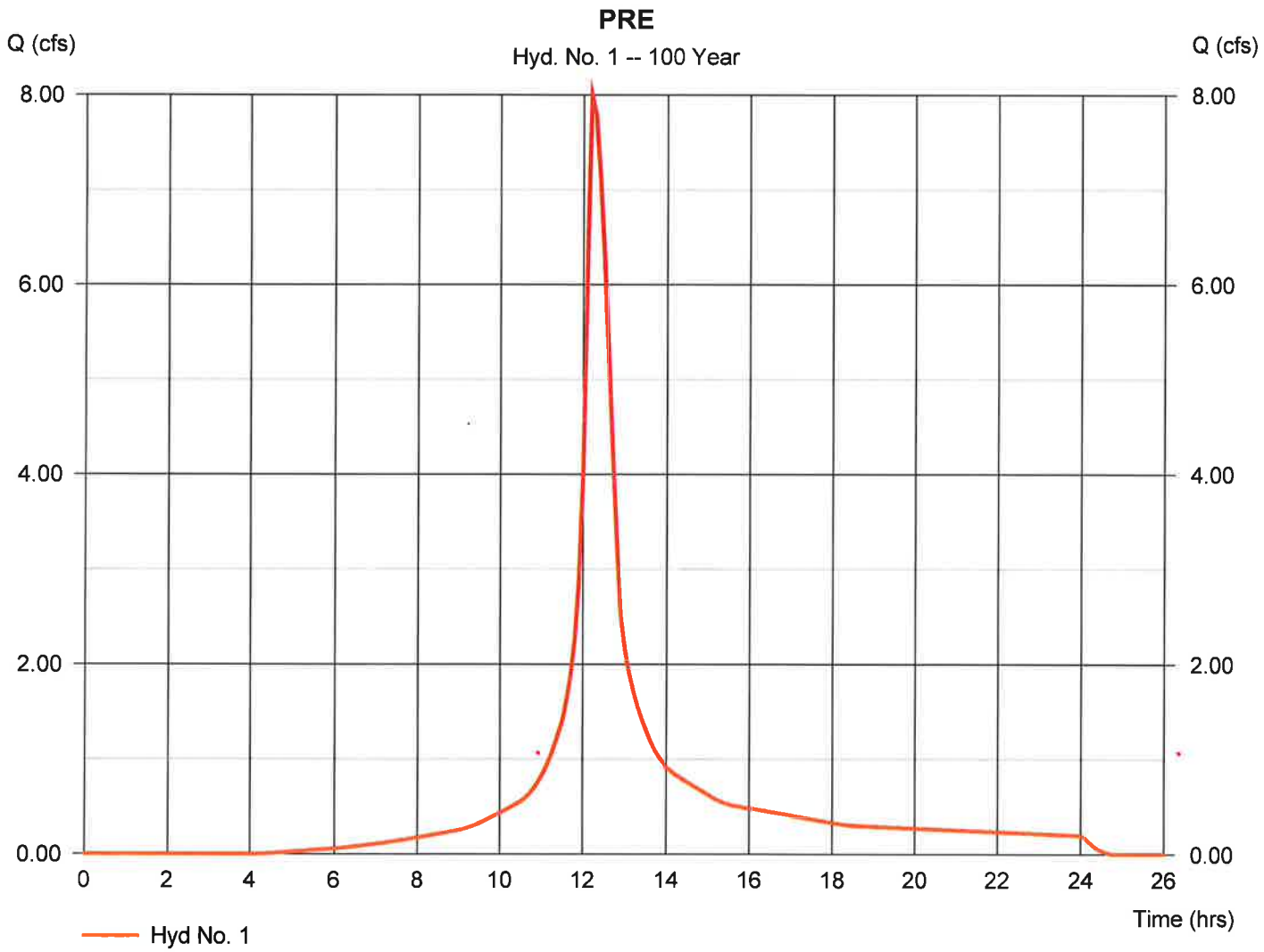
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 1

PRE

Hydrograph type	= SCS Runoff	Peak discharge	= 7.993 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 48,753 cuft
Drainage area	= 1.350 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 11.50 min
Total precip.	= 13.47 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285



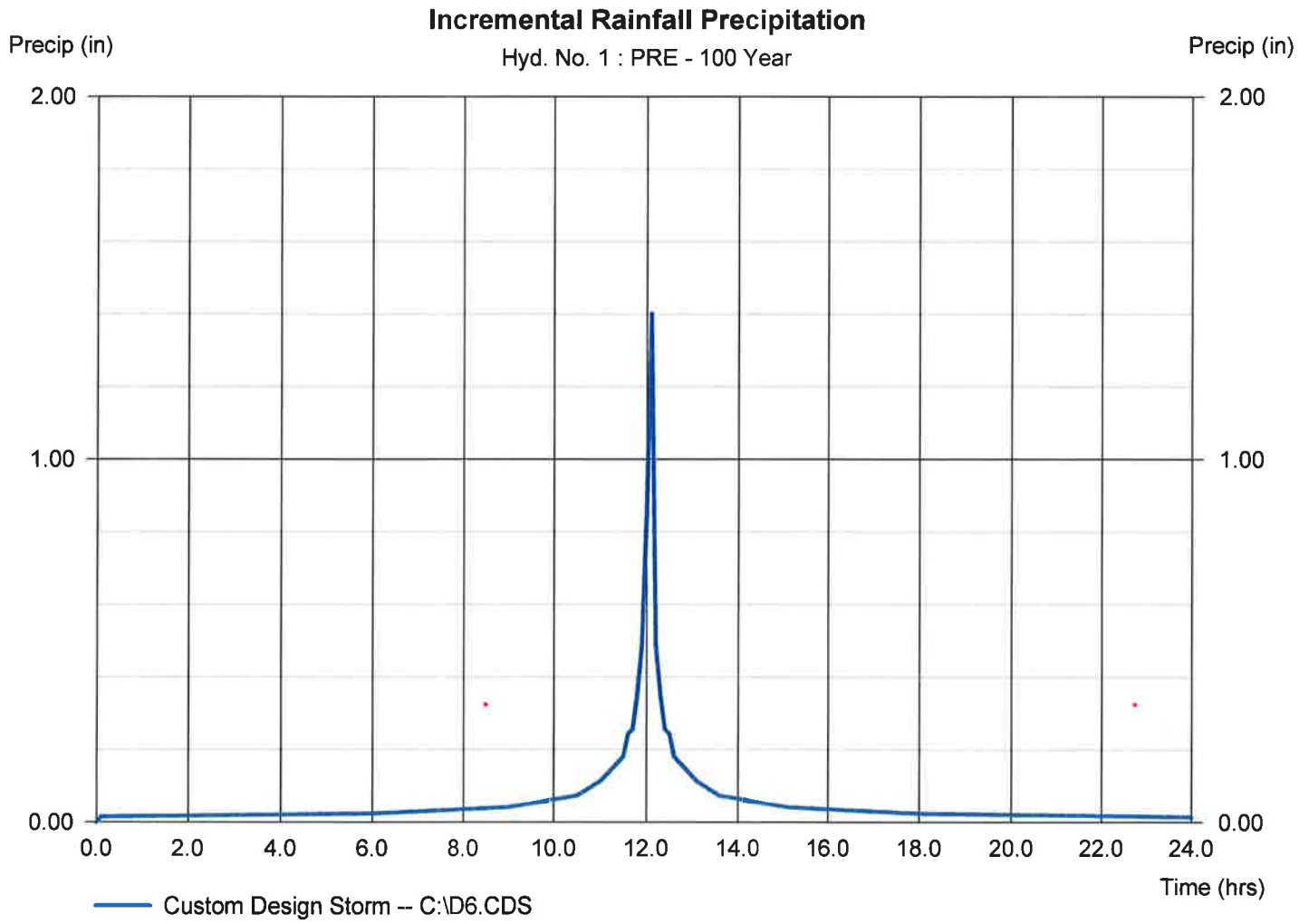
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 1

PRE

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 13.4700 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

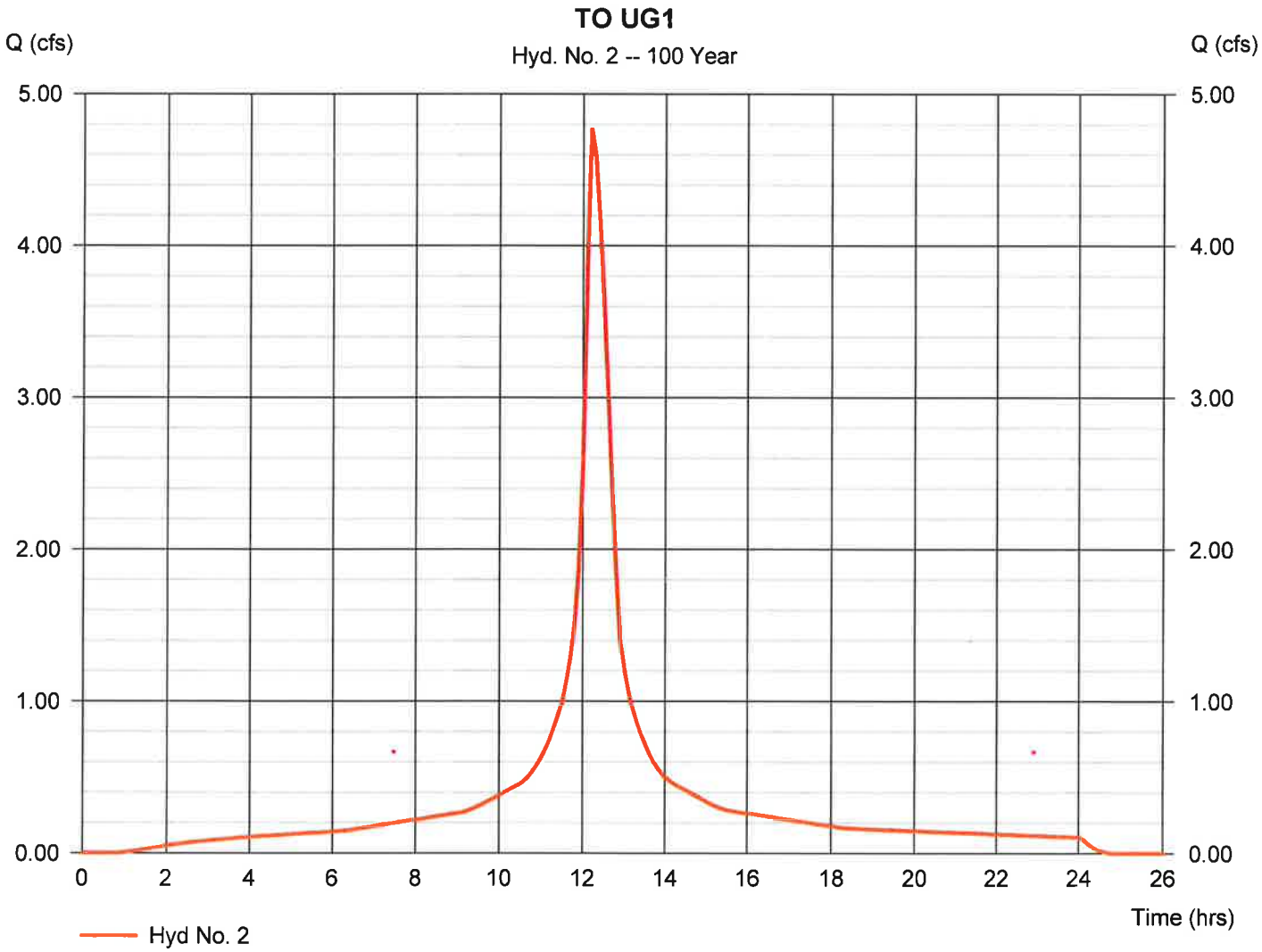
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 2

TO UG1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.775 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 32,003 cuft
Drainage area	= 0.690 ac	Curve number	= 95*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 13.47 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285

* Composite (Area/CN) = [(0.100 x 74) + (0.590 x 98)] / 0.690



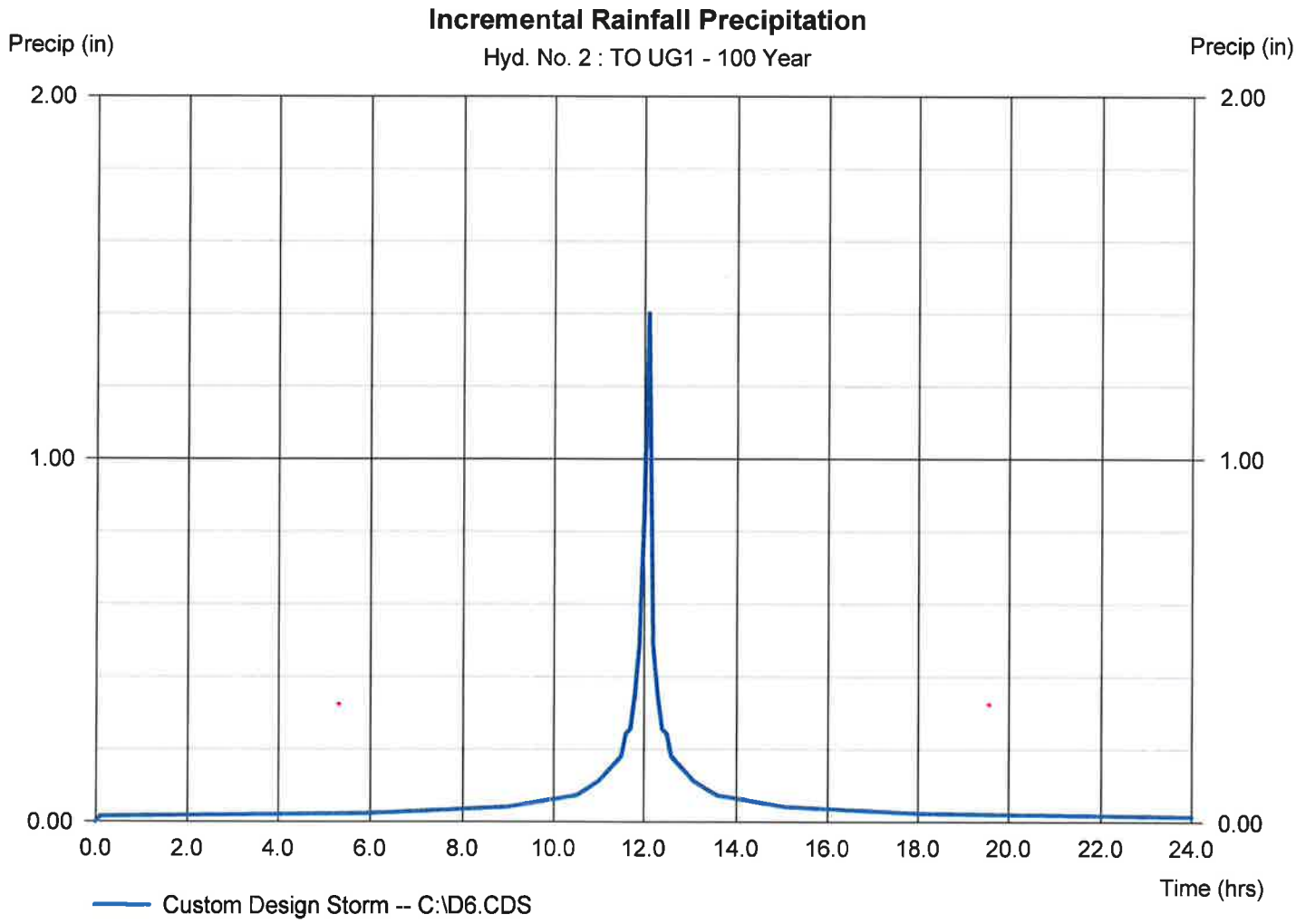
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 2

TO UG1

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 13.4700 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

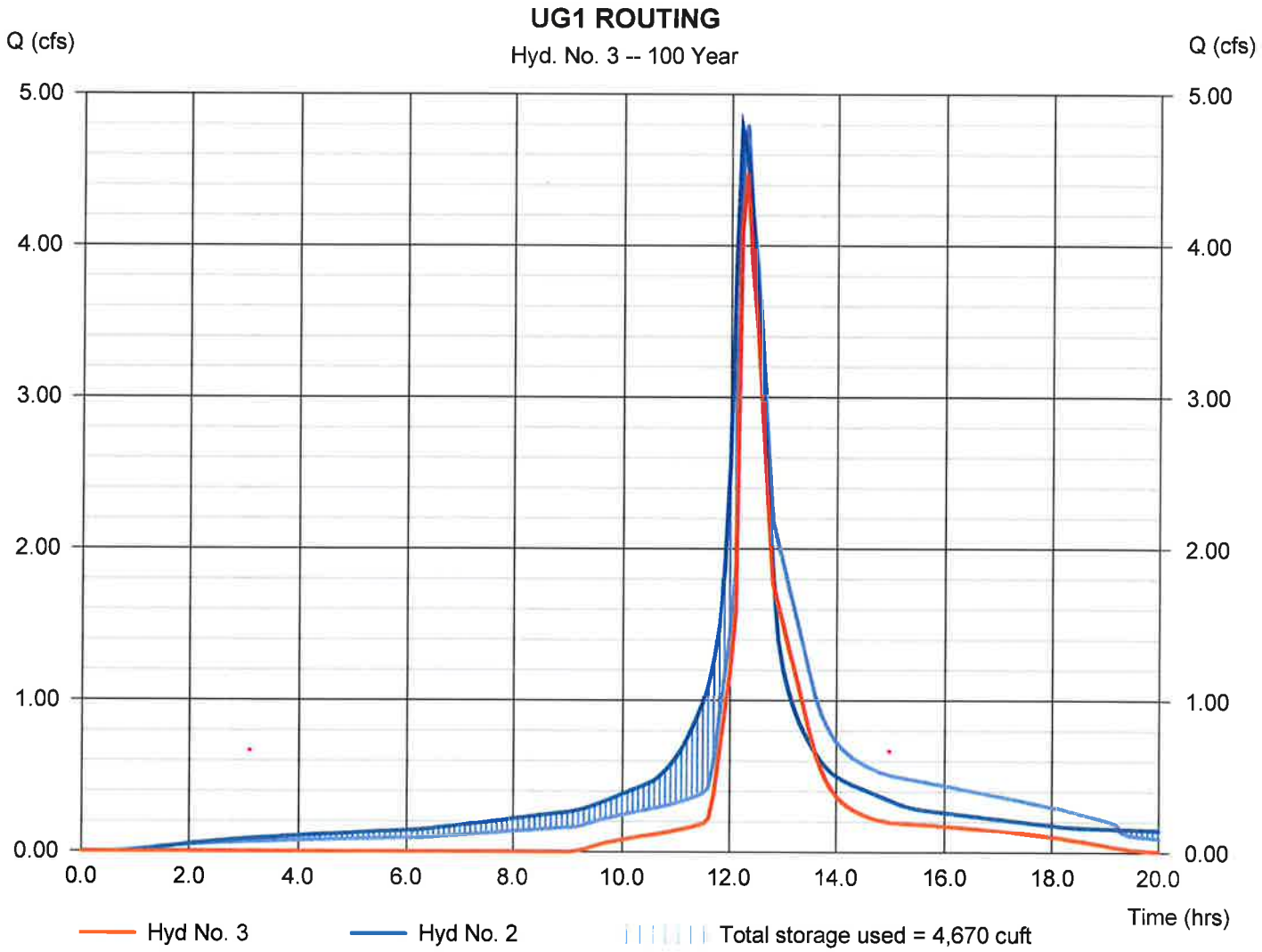
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 3

UG1 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 4.481 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.30 hrs
Time interval	= 6 min	Hyd. volume	= 17,665 cuft
Inflow hyd. No.	= 2 - TO UG1	Max. Elevation	= 70.86 ft
Reservoir name	= UG1	Max. Storage	= 4,670 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

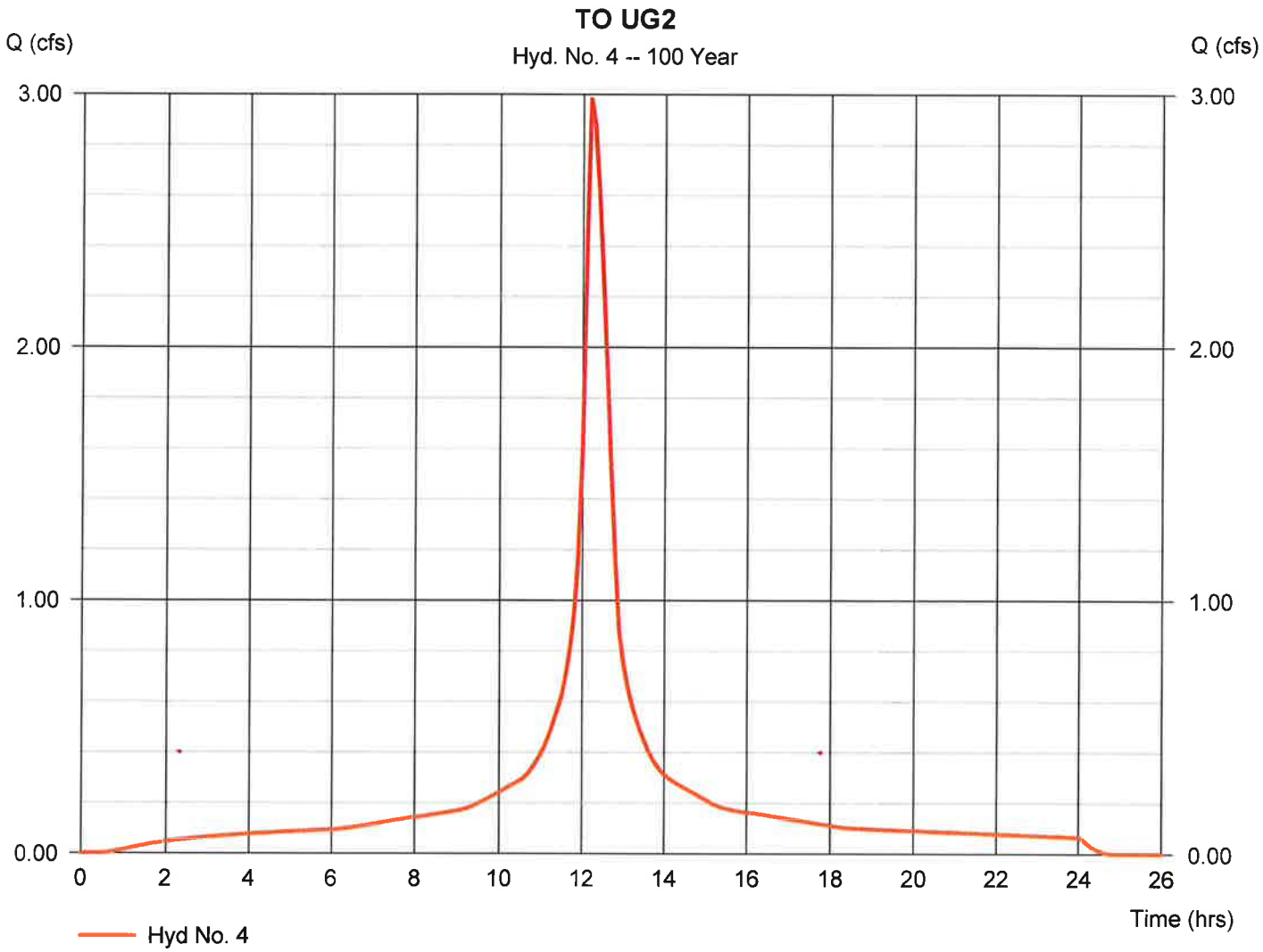
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 4

TO UG2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.988 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 20,327 cuft
Drainage area	= 0.430 ac	Curve number	= 97*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 13.47 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285

* Composite (Area/CN) = [(0.010 x 74) + (0.420 x 98)] / 0.430



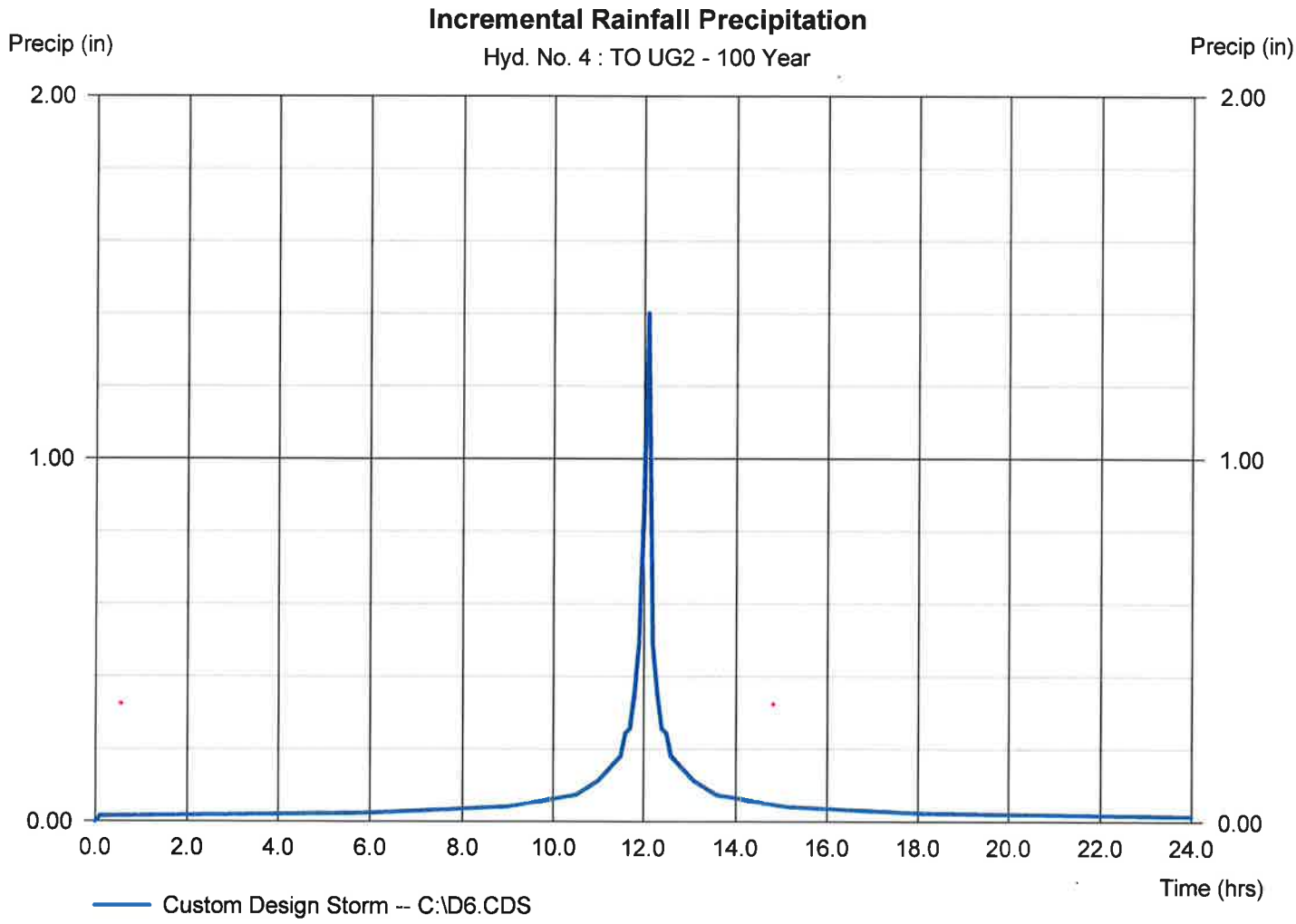
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 4

TO UG2

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 13.4700 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



Hydrograph Report

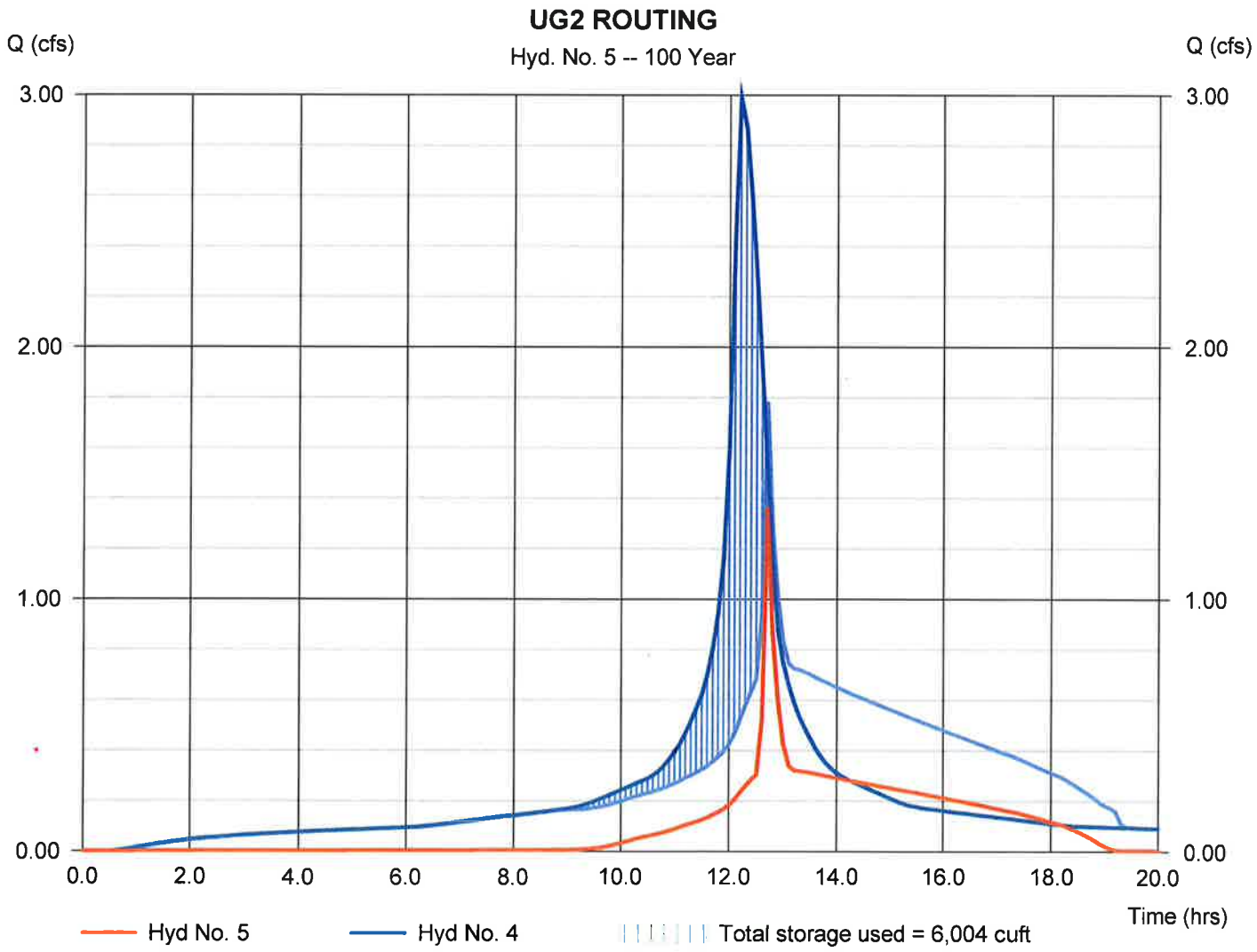
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 5

UG2 ROUTING

Hydrograph type	= Reservoir	Peak discharge	= 1.366 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.70 hrs
Time interval	= 6 min	Hyd. volume	= 7,095 cuft
Inflow hyd. No.	= 4 - TO UG2	Max. Elevation	= 68.70 ft
Reservoir name	= UG2	Max. Storage	= 6,004 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

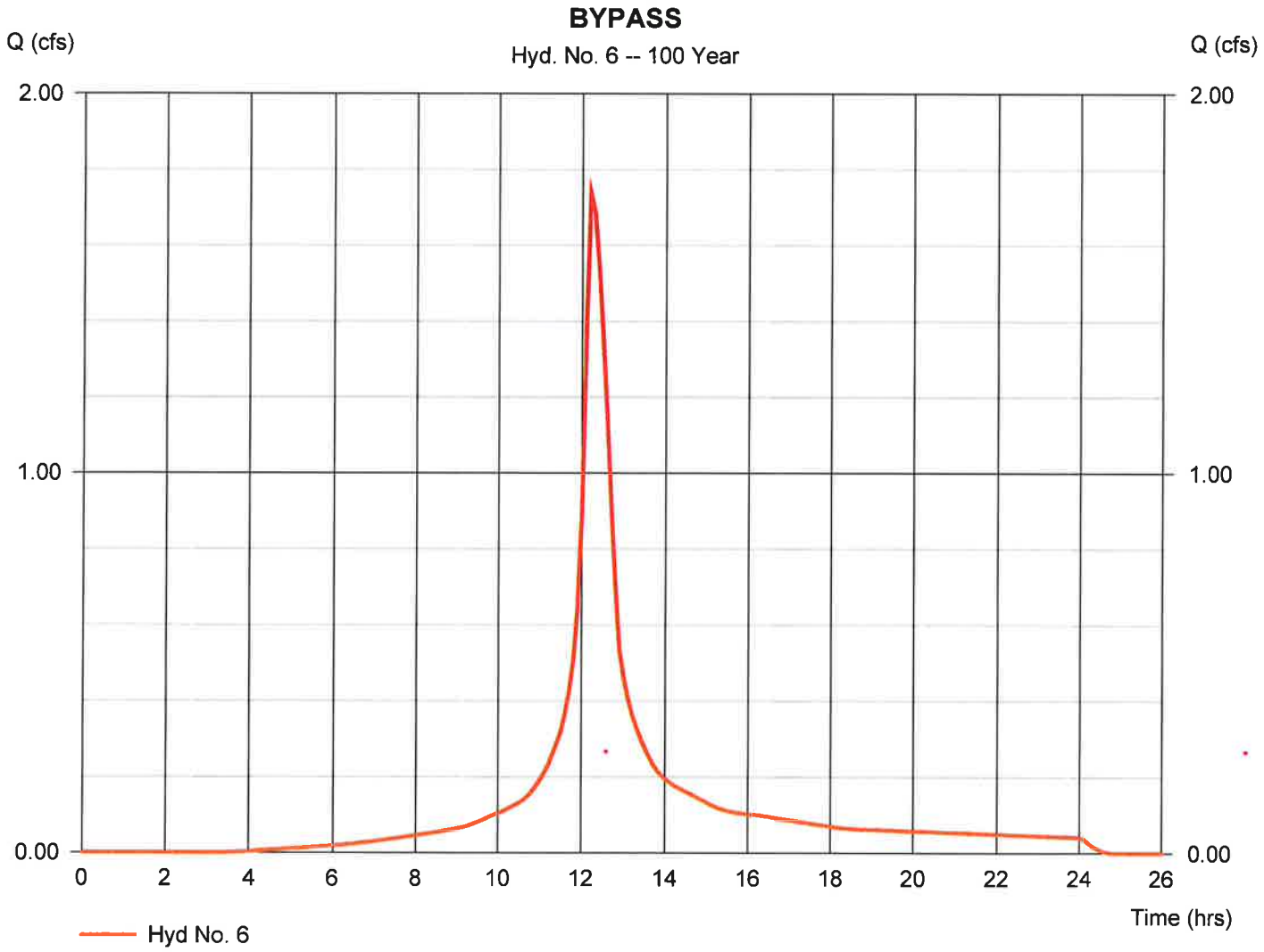
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 — Thursday, 02 / 22 / 2024

Hyd. No. 6

BYPASS

Hydrograph type	= SCS Runoff	Peak discharge	= 1.736 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 10,697 cuft
Drainage area	= 0.280 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 13.47 in	Distribution	= Custom
Storm duration	= C:\D6.CDS	Shape factor	= 285

* Composite (Area/CN) = [(0.050 x 98) + (0.230 x 74)] / 0.280



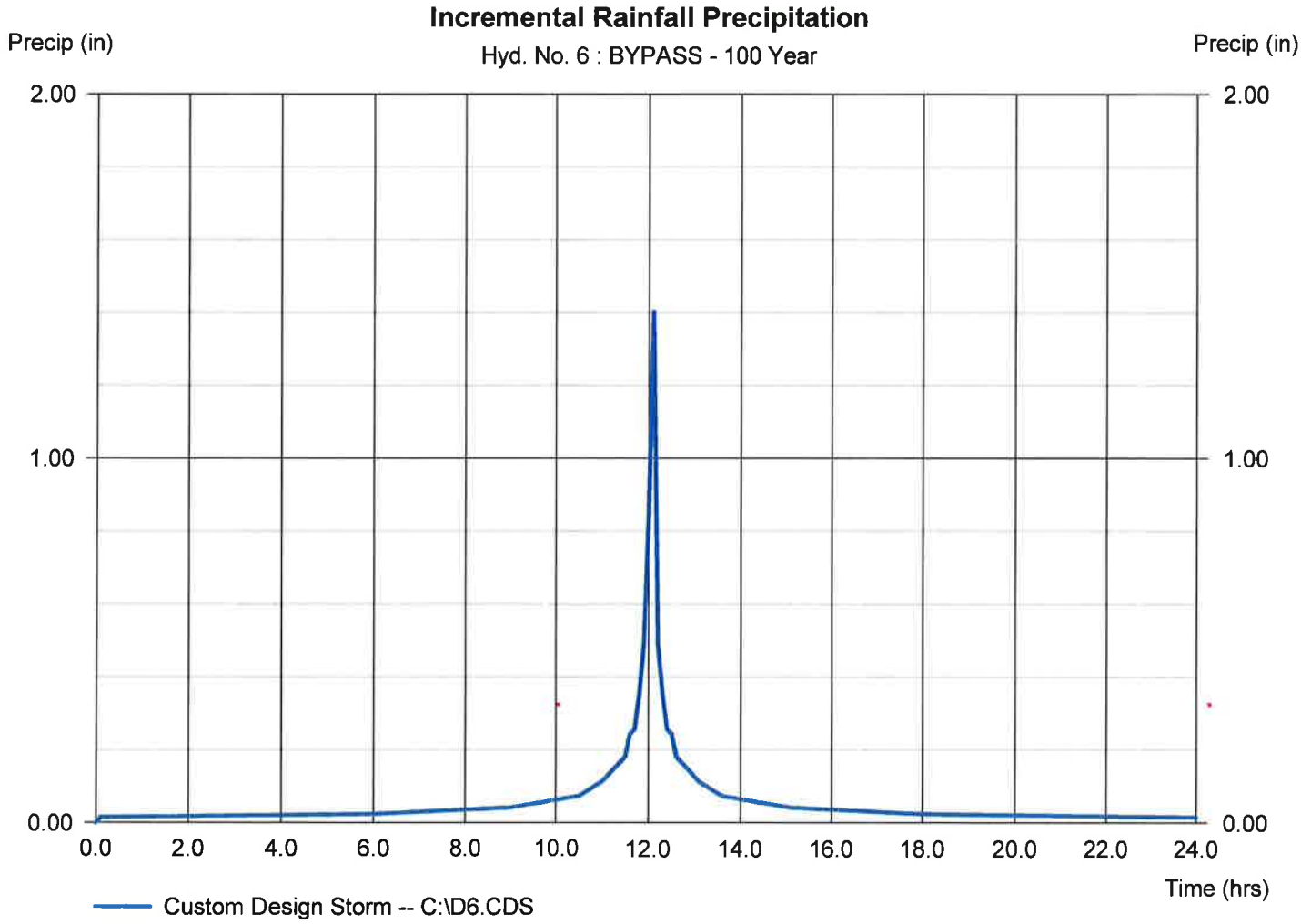
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 6

BYPASS

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 13.4700 in	Distribution	= Custom
Storm duration	= C:\D6.CDS		



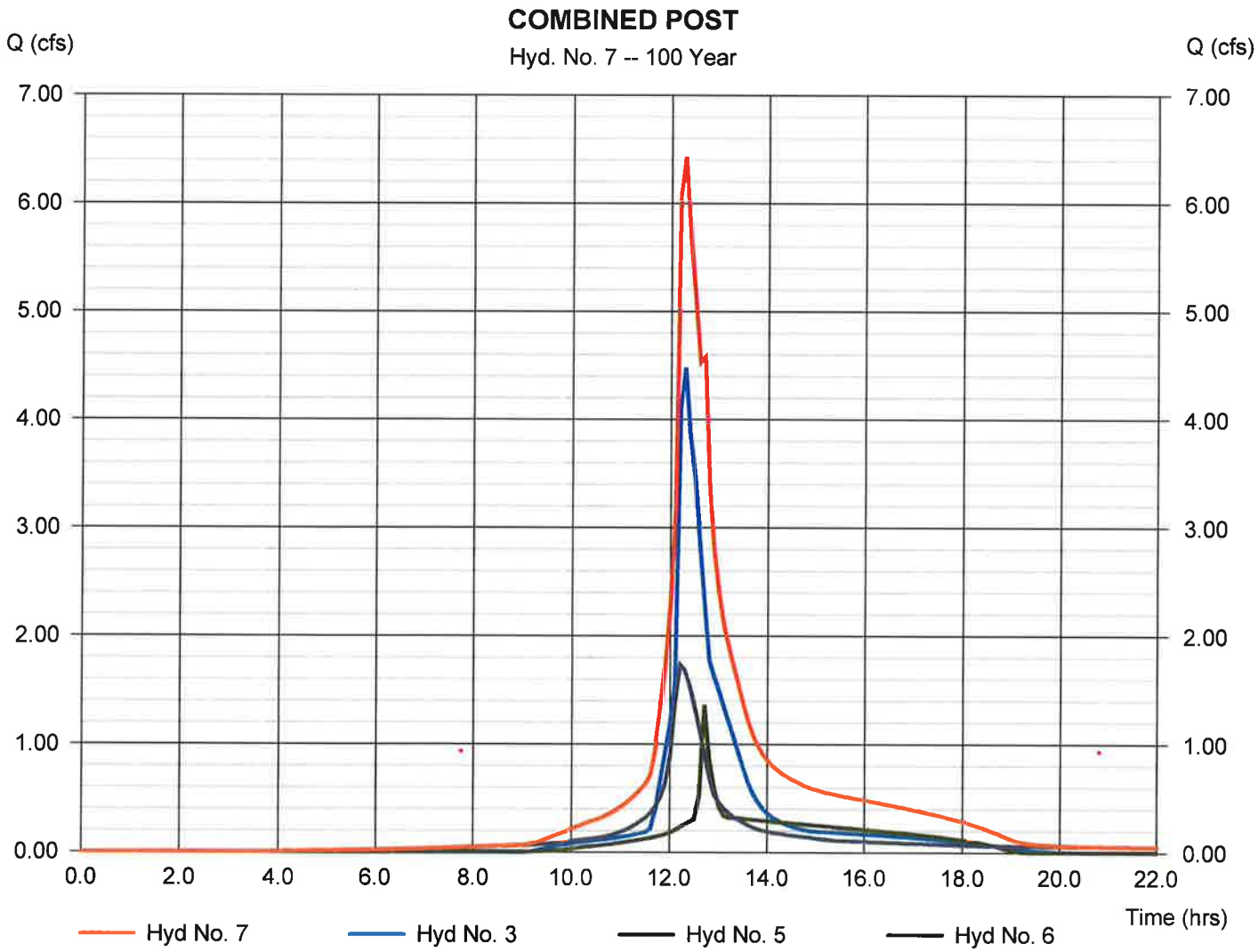
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Thursday, 02 / 22 / 2024

Hyd. No. 7

COMBINED POST

Hydrograph type	= Combine	Peak discharge	= 6.426 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.30 hrs
Time interval	= 6 min	Hyd. volume	= 35,457 cuft
Inflow hyds.	= 3, 5, 6	Contrib. drain. area	= 0.280 ac



APPENDIX B:

CONVEYANCE CAPACITY OF UNDERGROUND STORMWATER PIPES AND SCOUR HOLE SIZING COMPUTATIONS

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
11	End	5.000	0.00	0.00	0.00	0.00	0.00	10.0	10.0	0.0	2.20	2.89	3.59	15	0.20	67.49	67.50	68.08	68.16	0.00	0.00	OS-FES1
10	End	10.000	0.00	0.00	0.00	0.00	0.00	10.0	10.0	0.0	0.20	4.57	1.87	15	0.50	64.45	64.50	64.62	64.68	0.00	0.00	OS-FES2
9	8	57.000	0.15	0.15	0.86	0.13	0.13	10.0	10.0	6.9	0.90	4.61	2.28	15	0.51	70.25	70.54	70.82	70.91	0.00	0.00	1-2
8	6	73.000	0.09	0.24	0.94	0.08	0.21	10.0	11.3	6.7	1.43	4.60	2.51	15	0.51	69.88	70.25	70.64	70.74	0.00	0.00	2-MH
7	6	36.000	0.10	0.10	0.80	0.08	0.08	10.0	10.0	6.9	0.56	4.57	0.85	15	0.50	69.88	70.06	70.64	70.64	0.00	0.00	3-4
6	5	53.000	0.00	0.34	0.00	0.00	0.29	10.0	12.3	6.5	1.90	4.61	3.08	15	0.51	69.61	69.88	70.35	70.43	0.00	0.00	MH-4
5	4	35.000	0.07	0.41	0.99	0.07	0.36	10.0	12.9	6.4	2.32	4.63	3.78	15	0.51	69.43	69.61	70.06	70.23	0.00	0.00	4-5
4	End	86.000	0.16	0.57	0.96	0.15	0.52	10.0	13.2	6.3	3.27	7.79	4.41	15	1.45	67.50	68.75	68.23	69.48	0.00	0.00	5-UG1
3	2	63.000	0.08	0.08	0.99	0.08	0.08	10.0	10.0	6.9	0.55	4.60	2.16	15	0.51	68.49	68.81	68.87	69.10	0.00	0.00	6-MH
2	1	90.000	0.00	0.08	0.00	0.00	0.08	10.0	12.3	6.5	0.51	4.57	2.45	15	0.50	68.04	68.49	68.32	68.77	0.00	0.00	MH-7
1	End	7.000	0.35	0.43	0.98	0.34	0.42	10.0	15.7	5.9	2.50	4.88	4.00	15	0.57	64.50	64.54	65.13	65.18	0.00	0.00	7-UG2

Project File: PIPES.stm

Number of lines: 11

Run Date: 2/18/2024

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period =Yrs. 25 ; c = cir e = ellip b = box

SCOUR HOLE COMPUTATIONS AT POND 15" PIPE OUTFALL -

Variables:

Design Storm Flow for 25 Year, Q	2.20	cfs
Vertical Dimension of Outlet Pipe, D_o	15	in
Horizontal Dimension of Outlet Pipe, W_o	15	in
Tailwater Depth, TW[1]	0.25	ft
Scour Hole Depth, y (1/2 D_o or D_o)	11	in

Apron Dimension Calculations:

Minimum Bottom Width, $W_1 = 2W_o$	**W_1 = 2.50 ft**
Minimum Bottom Length, $L_1 = 3D_o$	**L_1 = 3.75 ft**
Minimum Top Width *(max side slope of 3:1)*, W_2	**W_2 = 8.00 ft**
Minimum Top Length *(max side slope of 3:1)*, L_2	**L_2 = 9.25 ft**

Rip Rap Stone Size Calculations:

Unit Dicharge, $q = Q/D_o$ = 1.76 cfs per foot

- **Case I:** $y = \frac{1}{2}D_o$

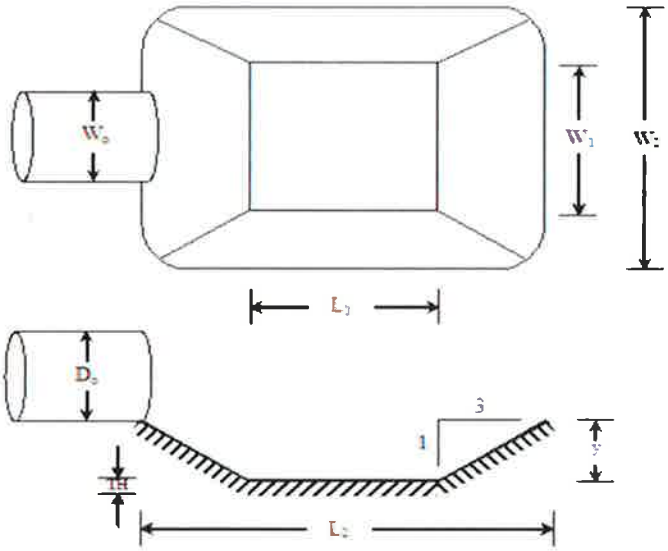
  Median Stone, $d_{50} = \frac{0.0125\,q^{1.33}}{TW}$ =

  Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric

- **Case II:** $y = D_o$

  Median Stone, $d_{50} = \frac{0.0082\,q^{1.33}}{TW}$ =

  Apron Thickness, $TH = 2 \times d_{50}$ with filter fabric



Notes:

1. The side slopes shall be 3:1 or flatter.
2. The bottom grade shall be 0.0% (level).
3. There shall be no overfall at the end of the apron or at the end of the culvert.
4. Fifty (50) percent by weight of the rip-rap mixture shall be smaller than the median size stone designated as d_{50}. The largest stone size in the mixture shall be 1.5 times the d_{50} size. The rip-rap shall be reasonably well graded.
5. The thickness of the rip-rap apron may be two (2) times the median stone diameter provided that the apron is constructed on a bedding of four (4) inches of 3/4 inch clean stone on approved filter fabric material.
6. Rip-rap and filter fabric shall meet the standards of the governing Soil Conservation District as well as the requirements of the local municipality.
7. Where the scour hole is to be placed within an existing or proposed waterway:
   a. The scour hole sidewalls should be eliminated to maintain a smooth hydraulic line along the waterway bottom to avoid inviting turbulent flow from a sudden depression in the waterway.
   b. If the flow in the waterway is greater than the flow from the proposed outlet, the rip-rap used to construct the scour hole should be sized based on the greater flow value according to the standard rip-rap.

Footnote:

1. Tailwater depth shall be the 2 year storm if discharging into a detention basin. For areas where tailwater cannot be computed, use $TW = 0.2D_o$.

APPENDIX C:

ANNUAL GROUND WATER RECHARGE ANALYSIS WORKSHEETS AND MOUNDING ANALYSIS

New Jersey Groundwater Recharge Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
SOMERSET CO., FRANKLIN TWP	45.7	1.48

Project Name:	390 DAVIDSON RD
Description:	MIXED USE BLDG +PARKING
Analysis Date:	02/18/24

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.35	Meadow, Pasture, Grassland or range	Penn	12.6	61,664
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
Total =	1.4			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				12.6	61,664

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.24	Impervious areas	Penn	0.0	-
2	0.11	Open space	Penn	12.3	4,914
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
Total =	1.4			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				1.0	4,914

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft) 54,014
Post-Development Annual Recharge Deficit=	*56,750*	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	3.80	(in)	DRWC= 0.00	(in)
ERWC =	0.99	(in)	EDRWC= 0.00	(in)

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.

Project Name	Description	Analysis Date	BMP or LID Type
390 DAVIDSON RD	MIXED USE BLDG +PARKING	02/18/24	

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	2154.7	sq.ft
BMP Effective Depth, this is the design variable	dBMP	4.8	in
Upper level of the BMP surface (negative if above ground)	dBMPu	67.5	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	71.5	in
Post-development Land Segment Location of BMP Input Zero if Location is distributed or undetermined	SegBMP	8	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	1.49	in
ERWC Modified to consider dEXC	EDRWC	0.00	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.00	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.19	in
Inches of Rainfall to capture	Pdesign	0.27	in
Recharge Provided Avg. over Imp. Area		12.6	in
Runoff Captured Avg. over imp. Area		12.6	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.04	unitless
BMP Volume	VBMP	862	cu.ft

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	56,750	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	54,014	sq.ft
Root Zone Water Capacity	RWC	5.74	in
RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.48	no units
Average Annual P	Pavg	45.7	in
Recharge Requirement over Imp. Area	dr	12.6	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		56,750	cu.ft
Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.9%	%
%Runoff Infiltrated		35.4%	%
%Runoff Recharged		35.4%	%
%Rainfall Recharged		27.6%	%

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> dBMP must be<=dEXC-dBMPu, adjust parameters
dEXC Check---> OK

BMP Location---> Land Segment Number Selected for BMP is not Defined

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

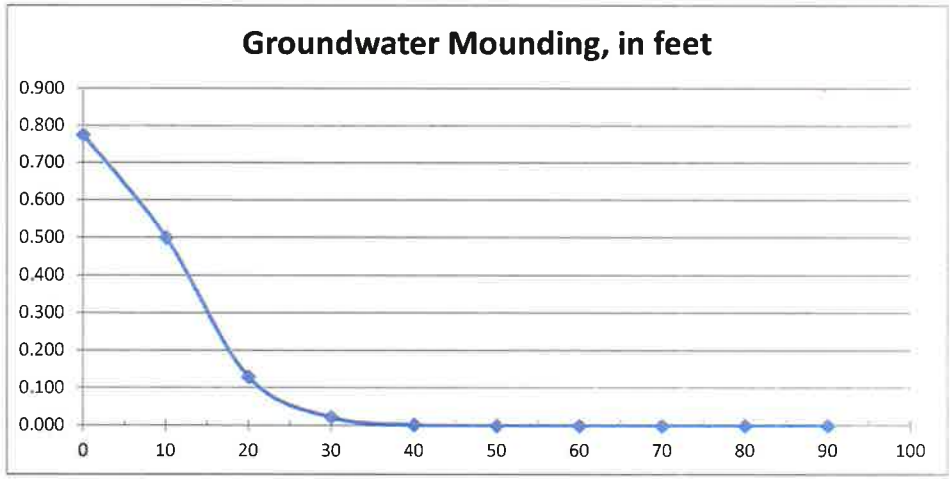
Input Values

3.00	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
25.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
10.000	x	1/2 length of basin (x direction, in feet)
40.000	y	1/2 width of basin (y direction, in feet)
0.63	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

10.776	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.776	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.776	0
0.501	10
0.131	20
0.023	30
0.003	40
0.001	50
0.000	60
0.000	70
0.000	80
0.000	90

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

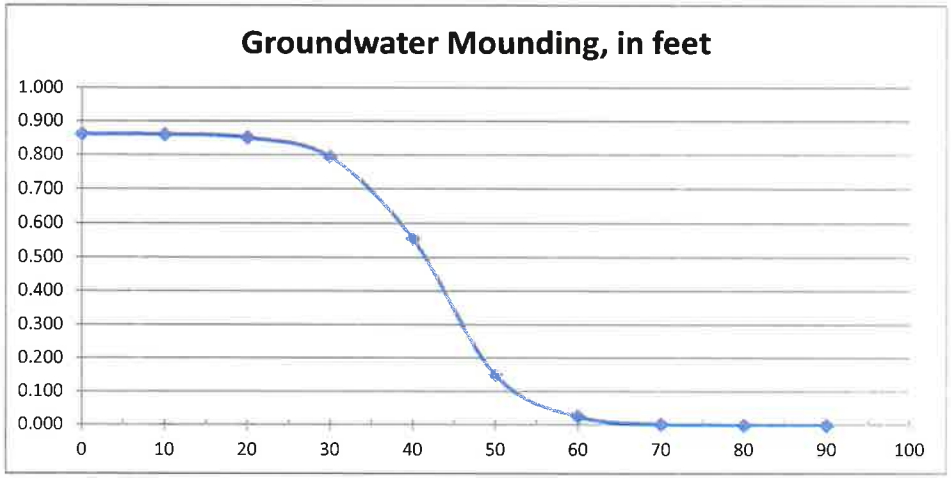
Input Values

3.00	*R*	Recharge rate (permeability rate) (in/hr)
		Specific yield, Sy (dimensionless)
0.150	Sy	default value is 0.15; max value is 0.2 provided that a lab test data is submitted
		Horizontal hydraulic conductivity (in/hr)
25.00	Kh	Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
42.500	x	1/2 length of basin (x direction, in feet)
12.500	y	1/2 width of basin (y direction, in feet)
0.63	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

10.863	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.863	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.863	0
0.862	10
0.853	20
0.795	30
0.555	40
0.152	50
0.028	60
0.004	70
0.001	80
0.000	90

Re-Calculate Now



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APPENDIX D:

WATER QUALITY STROM HYDROGRAPHS AND DETAILS OF MTD DEVICES TO REMOVED 80% TOTAL SUSPENDED SOLIDS

HC Kraken Filter Design Summary

Block 502.01, Lot 57.01 (MTD #1)
Franklin Twp, NJ
2/12/24

Information Provided by Engineer:

- Water quality flow rate = 0.97 cfs
- Impervious drainage area = 0.47 ac
- Pervious drainage area = 0.10 ac
- Presiding agency = NJDEP
- Required TSS removal rate = 80%

HC Kraken Filter Information and Cartridge Data:

The High-Capacity Kraken Filter Stormwater Treatment Device is a state-of-the-art stormwater filtration system utilizing pretreatment and advanced membrane filtration to ensure a high level of trash, TSS, metals, nutrients, and hydrocarbons removal. The HC Kraken Filter works by initially passing stormwater through a pretreatment chamber to capture trash, hydrocarbons, and sediments. Once runoff is pretreated, it is directed to the filter chamber where membrane filtration begins. When the water level reaches the top of the membrane filters, the treated water will then pass down the riser tube, collect in the underdrain manifold and flow to the discharge chamber. **The High-Capacity Kraken Filter has received final certification from the NJDEP for 80% TSS removal as a stand-alone treatment system.**

- HC Kraken Filter cartridge height = 10 inches (nominal)
- HC Kraken Filter cartridge surface area = 49 square feet
- HC Kraken Filter cartridge loading rate = 0.101 gallons/minute per square foot
- HC Kraken Filter cartridge treatment flow = 0.011 cfs
- **Hydraulic head required: 18.5"** (with 10-inch cartridge)

Design Summary:

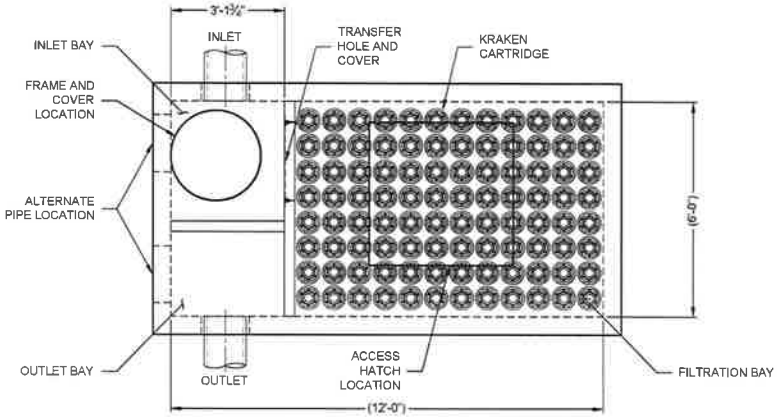
The High-Capacity Kraken Filter is sized based on the NJDEP certification, which lists an approved treatment flow rate and maximum impervious acreage limit per cartridge in Table 1. The number of cartridges required based on the impervious drainage area is compared with the number of cartridges required based on the treatment flow rate; the larger number of cartridges governs the sizing.

The HC Kraken Filter for this site was sized to provide **89 cartridges** in order to meet the hydraulic load requirement (calculations shown below). To house this number of cartridges, Contech Engineered Solutions recommends a 6' x 12' precast Shallow HC Kraken Filter.

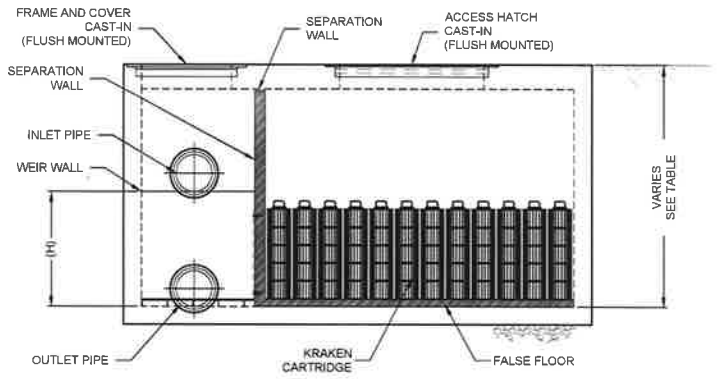
$$N_{cartridges\ hyd.load} = \frac{Q_{treat}}{Q_{cartridge}} = \frac{0.97\ cfs}{0.011\ {}^{cfs}/_{cartridge}} = 88.18 \Rightarrow (89)\ 10"\ Cartridges$$

$$N_{cartridges\ mass\ load} = \frac{Area_{site}}{Max\ Area_{cartridge}} = \frac{0.47\ acres}{0.009\ {}^{acres}/_{cartridge}} = 52.22 \Rightarrow (53)\ 10"\ Cartridges$$

7037 Ridge Road, Suite 350 | Hanover, MD 21076
Office: 443-457-1500 Fax: 410-740-8492



PLAN

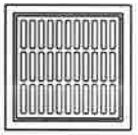


ELEVATION

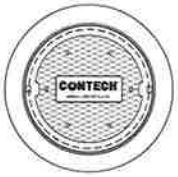
KRAKEN FILTER DESIGN NOTES

- KRAKEN FILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD
- A 6' x 12' PEAK DIVERSION STYLE STORMFILTER IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (96) AND IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR A RIGHT INLET CONFIGURATION
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS NOTED OTHERWISE

CARTRIDGE SIZE	30"	20"	10"
RECOMMENDED HYDRAULIC DROP (H)	36.5"	28.5"	18.5"
SPECIFIC FLOW RATE (gpm/sf)	0.10	0.10	0.10
CARTRIDGE FLOW RATE (gpm)	17	10.6	4.9



FRAME AND GRATE
(SIZE MAY VARY)
(NOT TO SCALE)



FRAME AND COVER
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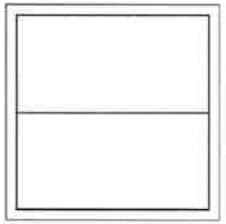
(NOT TO SCALE)



ACCESS HATCH
(48" SQUARE)
(NOT TO SCALE)

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs)	
PEAK FLOW RATE (cfs)	
RETURN PERIOD OF PEAK FLOW (yrs)	
CARTRIDGE FLOW RATE	
CARTRIDGE HEIGHT (SEE TABLE ABOVE)	
NUMBER OF CARTRIDGES REQUIRED	
INLET BAY RIM ELEVATION	
FILTER BAY RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES/SPECIAL REQUIREMENTS:

RIM TO SYSTEM INVERT

CARTRIDGE SIZE	MIN. HEIGHT	MAX. HEIGHT
10" & 20"	3'-6"	4'-10"
30"	4'-2"	4'-10"

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
4. KRAKEN FILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 10' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE KRAKEN FILTER STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
F. CONTRACTOR TO REMOVE THE TRANSFER OPENING COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

CONTECH®
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800-526-3999 513-645-7000 513-645-7993 FAX

KFPD0612 (6' x 12')
PEAK DIVERSION KRAKEN FILTER
SHALLOW
STANDARD DETAIL

HC Kraken Filter Design Summary

Maintenance:

Maintenance of Stormwater best management practices is required per the New Jersey Administrative Code 7:8-5.8. Recommendations for maintenance are included in chapters 8 & 9 of the New Jersey Stormwater Best Management Practices Manual. To comply with requirements, CONTECH offers a network of Preferred Service Providers that have the capability to perform all necessary inspections, compliance reporting and cleaning services. CONTECH recommends inspecting the system annually and maintaining the system at the recommendation of the annual inspection. Full maintenance is typically required every 24-36 months. Disposal of material should be handled in accordance with local regulations. Please contact CONTECH's Maintenance Department for all questions regarding maintenance at (503) 258-3157 or visit our website at www.conteches.com/maintenance.

Thank you for the opportunity to present this information to you and your client. If you have any questions, please call me at (443-457-1529).

Sincerely,

Taylor Murdock
Stormwater Design Engineer
Contech Engineered Solutions LLC

7037 Ridge Road, Suite 350 | Hanover, MD 21076
Office: 443-457-1500 Fax: 410-740-8492

Summary for Subcatchment 1S: Inlet #1 DA

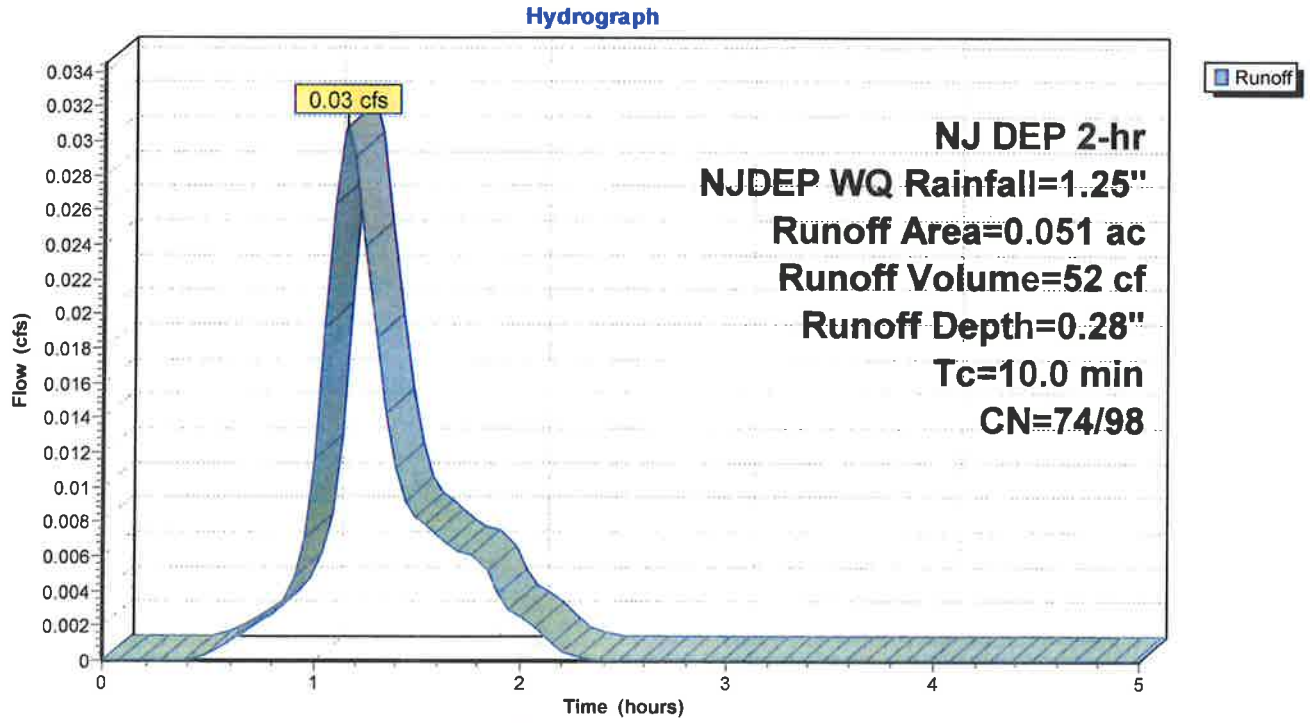
Runoff = 0.03 cfs @ 1.16 hrs, Volume= 52 cf, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.011	98	
*	0.040	74	
	0.051	79	Weighted Average
	0.040	74	78.43% Pervious Area
	0.011	98	21.57% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 1S: Inlet #1 DA



Summary for Subcatchment 2S: Inlet #2 DA

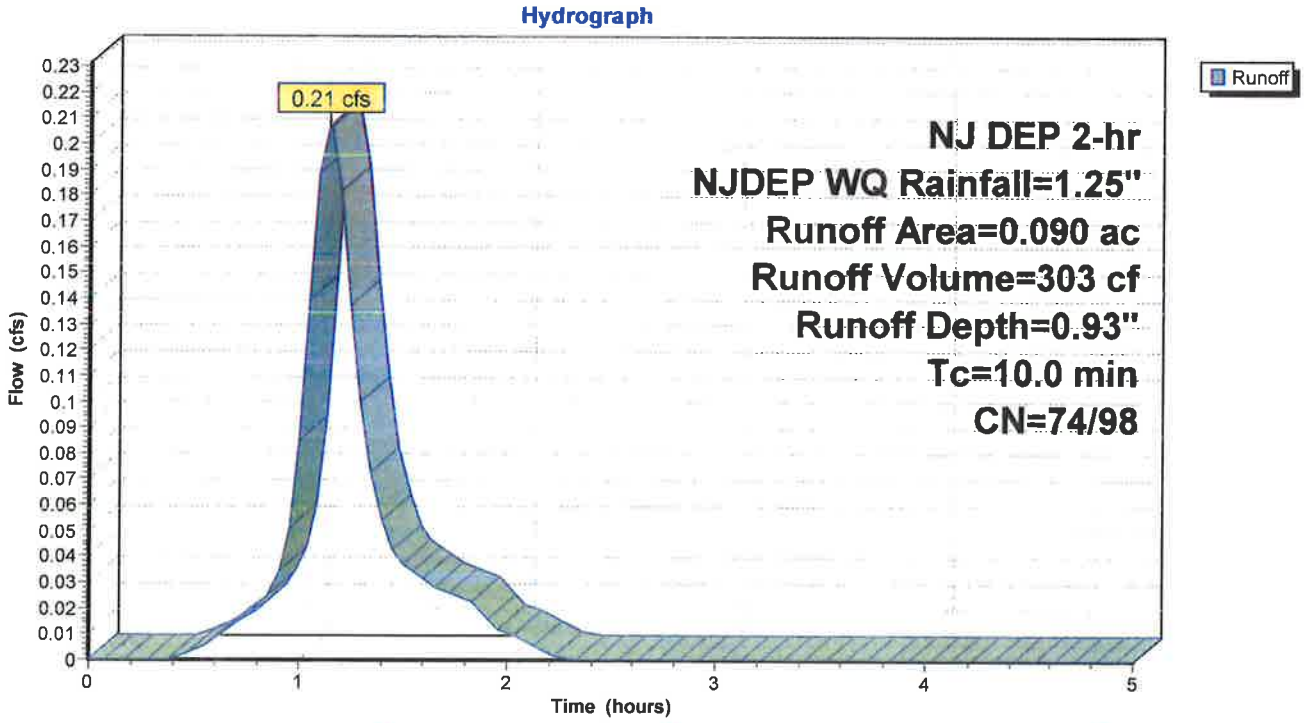
Runoff = 0.21 cfs @ 1.15 hrs, Volume= 303 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.080	98	
*	0.010	74	
	0.090	95	Weighted Average
	0.010	74	11.11% Pervious Area
	0.080	98	88.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 2S: Inlet #2 DA



Summary for Subcatchment 3S: Inlet #3 DA

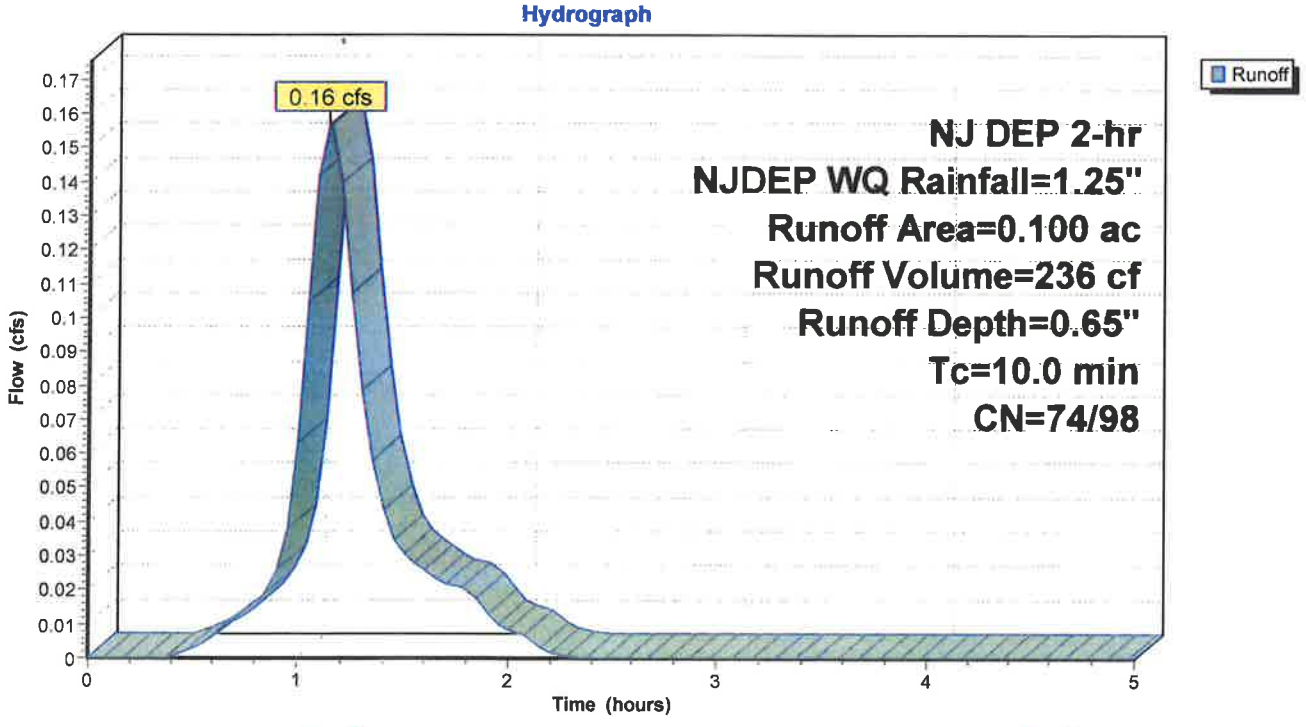
Runoff = 0.16 cfs @ 1.15 hrs, Volume= 236 cf, Depth= 0.65"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.060	98	
*	0.040	74	
	0.100	88	Weighted Average
	0.040	74	40.00% Pervious Area
	0.060	98	60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					Direct Entry,

Subcatchment 3S: Inlet #3 DA



Summary for Subcatchment 4S: Inlet #4 DA

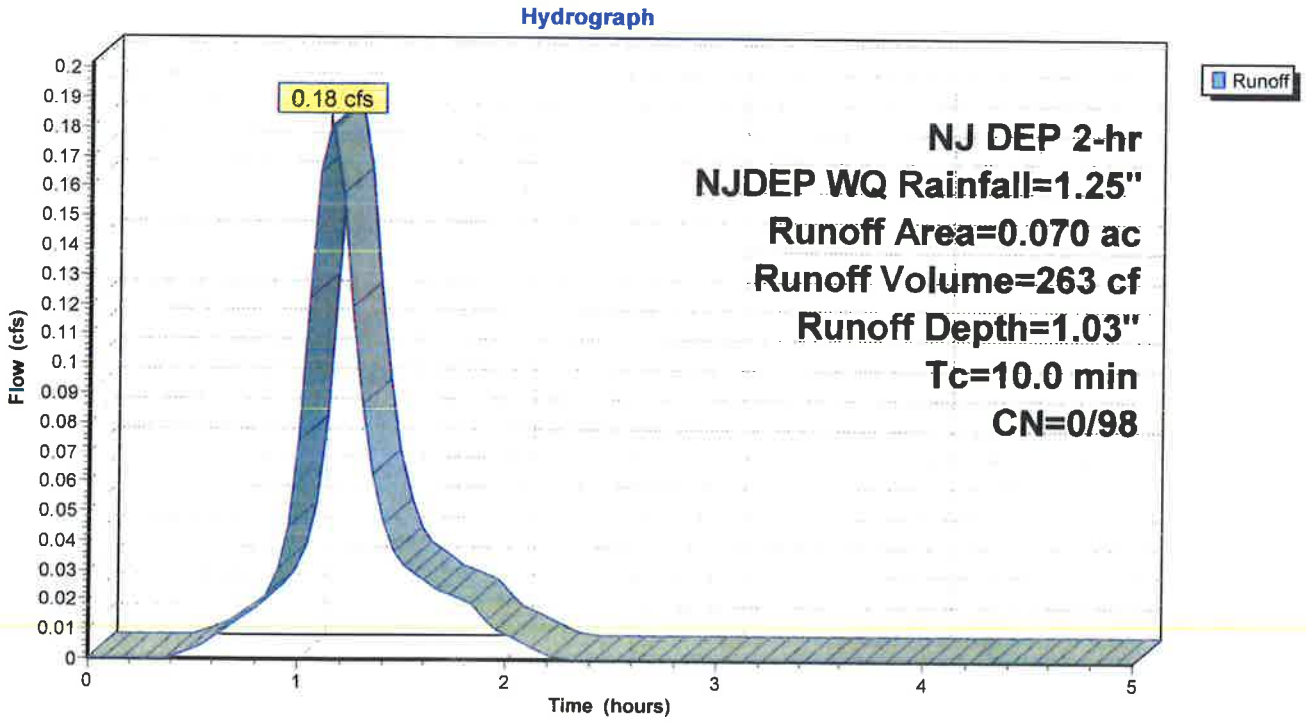
Runoff = 0.18 cfs @ 1.15 hrs, Volume= 263 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.070	98	
	0.070	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 4S: Inlet #4 DA



Summary for Subcatchment MTD1: MTD #1 Inlet DA

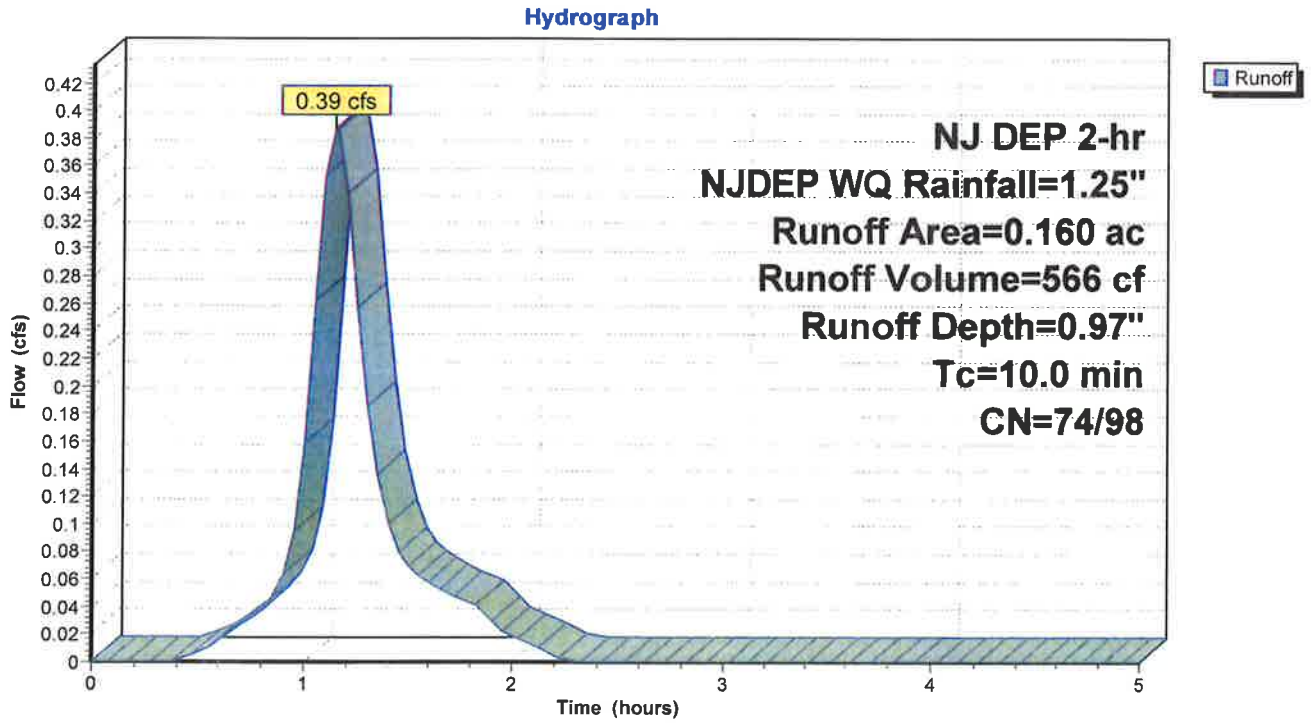
Runoff = 0.39 cfs @ 1.15 hrs, Volume= 566 cf, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.150	98	
*	0.010	74	
	0.160	97	Weighted Average
	0.010	74	6.25% Pervious Area
	0.150	98	93.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment MTD1: MTD #1 Inlet DA



State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATERSHED PROTECTION AND RESTORATION
BUREAU OF NJPDES STORMWATER PERMITTING & WATER QUALITY MANAGEMENT
P.O. Box 420 Mail Code 501-02A
Trenton, New Jersey 08625-0420
609-633-7021 / Fax: 609-777-0432
www.njstormwater.org

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

SHAWN M. LATOURETTE
Commissioner

November 18, 2022

Zachariha J. Kent
Vice President of Product Management
Bio Clean Environmental Services, Inc., a Quikrete Company
398 Via El Centro
Oceanside, CA 92058

Re: MTD Lab Certification
Bio Clean High Capacity Kraken Filter Stormwater Treatment Device
Online Installation

TSS Removal Rate 80%

Dear Mr. Kent:

The Stormwater Management rules under N.J.A.C. 7:8-5.2(f) and 5.2(j) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Bio Clean Environmental Services, Inc., a Quikrete company, has requested a Laboratory Certification for the Bio Clean High Capacity Kraken Filter Stormwater Treatment Device (High Capacity Kraken Filter).

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated October 2022) for this device is published online at http://www.njcat.org/uploads/newDocs/HCKrakenFilterNJCATFinalReport.pdf.

The NJDEP certifies the use of the High Capacity Kraken Filter by Bio Clean Environmental Services, Inc. at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-

5.5. The MTFR is calculated based on a verified loading rate of 0.101 gpm/ft^2 of effective membrane filter area.

2. The High Capacity Kraken Filter shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 6 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 11.3 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the High Capacity Kraken Filter. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.conteches.com/kraken for any changes to the maintenance requirements.

6. Sizing Requirement:

The example below demonstrates the sizing procedure for the High Capacity Kraken Filter:

Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using a High Capacity Kraken Filter. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

The selection of the appropriate model of a High Capacity Kraken Filter is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the High Capacity Kraken Filter in this example is 0.25 acres. Based upon the information in Table 1 below, the following number of cartridges are required in a High Capacity Kraken Filter to treat the impervious area without exceeding the maximum allowable drainage area:

a. Twenty-eight (28) 10" cartridges;
b. Thirteen (13) 20" cartridges; or
c. Eight (8) 30" cartridges.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:
time of concentration = 10 minutes
i = 3.2 in/hr (page 74, Fig. 5-16 of Chapter 5 of the NJ Stormwater BMP Manual)
c = 0.99 (runoff coefficient for impervious)
Q = ciA = 0.99 x 3.2 x 0.25 = 0.79 cfs (354.58 gpm)
(Note: 1 cfs = 448.83 gpm)

Given the site runoff is 0.79 cfs and based on Table 1 below, the following minimum numbers of cartridges are required in a High Capacity Kraken Filter without exceeding the MTFR of the individual model:

a. Seventy-two (72) 10" cartridges;
b. Thirty-three (33) 20" cartridges; or
c. Twenty-one (21) 30" cartridges.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the NJCAT Verification Report in the Verification Appendix under Table A-1.

Table 1. High Capacity Kraken Filter Cartridge MTFRs and Maximum Allowable Drainage Area

Cartridge Height (in)	Cartridge Maximum Treatment Flow Rate (MTFR) (cfs)	Maximum Allowable Drainage Area (acres)
30	0.038	0.032
20	0.024	0.020
10	0.011	0.009

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Changi Wu of my office at chang.i.wu@dep.nj.gov.

Sincerely,

Gabriel Mahon

Gabriel Mahon, Chief
Bureau of NJPDES Stormwater Permitting & Water Quality Management
Division of Watershed Protection and Restoration
New Jersey Department of Environmental Protection

Attachment: Maintenance Plan

cc: Richard Magee, NJCAT

HC Kraken Filter Design Summary

Block 502.01, Lot 57.01 (MTD #2)
Franklin Twp, NJ
2/12/24

Information Provided by Engineer:

- Water quality flow rate = 1.09 cfs
- Impervious drainage area = 0.42 ac
- Pervious drainage area = 0.01 ac
- Presiding agency = NJDEP
- Required TSS removal rate = 80%

HC Kraken Filter Information and Cartridge Data:

The High-Capacity Kraken Filter Stormwater Treatment Device is a state-of-the-art stormwater filtration system utilizing pretreatment and advanced membrane filtration to ensure a high level of trash, TSS, metals, nutrients, and hydrocarbons removal. The HC Kraken Filter works by initially passing stormwater through a pretreatment chamber to capture trash, hydrocarbons, and sediments. Once runoff is pretreated, it is directed to the filter chamber where membrane filtration begins. When the water level reaches the top of the membrane filters, the treated water will then pass down the riser tube, collect in the underdrain manifold and flow to the discharge chamber. **The High-Capacity Kraken Filter has received final certification from the NJDEP for 80% TSS removal as a stand-alone treatment system.**

- HC Kraken Filter cartridge height = 20 inches (nominal)
- HC Kraken Filter cartridge surface area = 104.5 square feet
- HC Kraken Filter cartridge loading rate = 0.101 gallons/minute per square foot
- HC Kraken Filter cartridge treatment flow = 0.024 cfs
- **Hydraulic head required = 28.5"** (with 20-inch cartridge)

Design Summary:

The High-Capacity Kraken Filter is sized based on the NJDEP certification, which lists an approved treatment flow rate and maximum impervious acreage limit per cartridge in Table 1. The number of cartridges required based on the impervious drainage area is compared with the number of cartridges required based on the treatment flow rate; the larger number of cartridges governs the sizing.

The HC Kraken Filter for this site was sized to provide **46 cartridges** in order to meet the hydraulic load requirement (calculations shown below). To house this number of cartridges, Contech Engineered Solutions recommends a 6' x 8' precast Shallow HC Kraken Filter.

$$N_{cartridges\ hyd.load} = \frac{Q_{treat}}{Q_{cartridge}} = \frac{1.09\ cfs}{0.024\ {}^{cfs}/_{cartridge}} = 45.42 \Rightarrow (46)\ 20"\ Cartridges$$

$$N_{cartridges\ mass\ load} = \frac{Area_{site}}{Max\ Area_{cartridge}} = \frac{0.42\ acres}{0.020\ {}^{acres}/_{cartridge}} = 21.00 \Rightarrow (21)\ 20"\ Cartridges$$

7037 Ridge Road, Suite 350 | Hanover, MD 21076
Office: 443-457-1500 Fax: 410-740-8492

HC Kraken Filter Design Summary

Maintenance:

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Thank you for the opportunity to present this information to you and your client. If you have any questions, please call me at (443-457-1529).

Sincerely,

Taylor Murdock
Stormwater Design Engineer
Contech Engineered Solutions LLC

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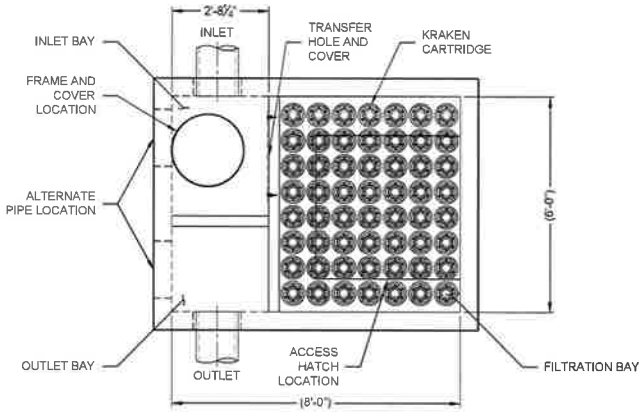
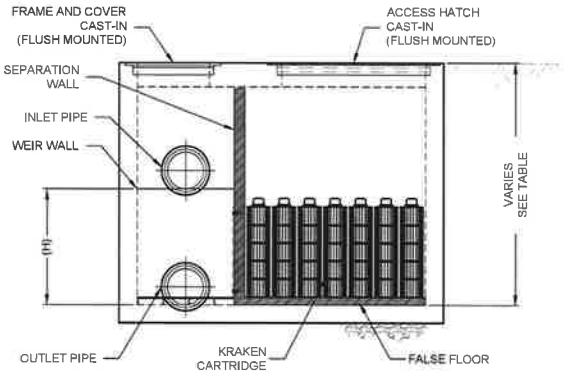
Office: 443-457-1500 Fax: 410-740-8492



PLAN

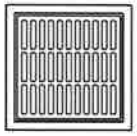


ELEVATION

KRAKEN FILTER DESIGN NOTES

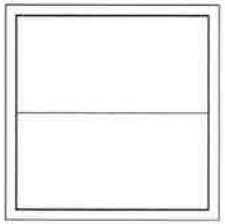
- KRAKEN FILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD
- A 6' x 8' PEAK DIVERSION STYLE KRAKEN FILTER IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (56) AND IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR A RIGHT INLET CONFIGURATION
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS NOTED OTHERWISE

CARTRIDGE HEIGHT	30"	20"	10"
RECOMMENDED HYDRAULIC DROP (H)	38.5"	28.5"	18.5"
SPECIFIC FLOW RATE (gpm/sf)	0.10	0.10	0.10
CARTRIDGE FLOW RATE (gpm)	17	10.6	4.9



FRAME AND GRATE
(SIZE MAY VARY)
(NOT TO SCALE)

FRAME AND COVER
(30" ROUND)
(NOT TO SCALE)



ACCESS HATCH
(48" SQUARE)
(NOT TO SCALE)

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs)	
PEAK FLOW RATE (cfs)	
RETURN PERIOD OF PEAK FLOW (yrs)	
CARTRIDGE FLOW RATE	
CARTRIDGE SIZE (30", 20", 10")	
NUMBER OF CARTRIDGES REQUIRED	
INLET BAY RIM ELEVATION	
FILTER BAY RIM ELEVATION	

PIPE DATA	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES/SPECIAL REQUIREMENTS:

RIM TO SYSTEM INVERT

CARTRIDGE SIZE	MIN. HEIGHT	MAX. HEIGHT
10" & 20"	3'-6"	4'-10"
30"	4'-2"	4'-10"

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE, www.ContechES.com
4. KRAKEN FILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 10' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE KRAKEN FILTER STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
F. CONTRACTOR TO REMOVE THE TRANSFER OPENING COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9100 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

KFPD0608 (6' x 8')
PEAK DIVERSION KRAKEN FILTER
SHALLOW
STANDARD DETAIL

Summary for Subcatchment 5S: Inlet #5 DA

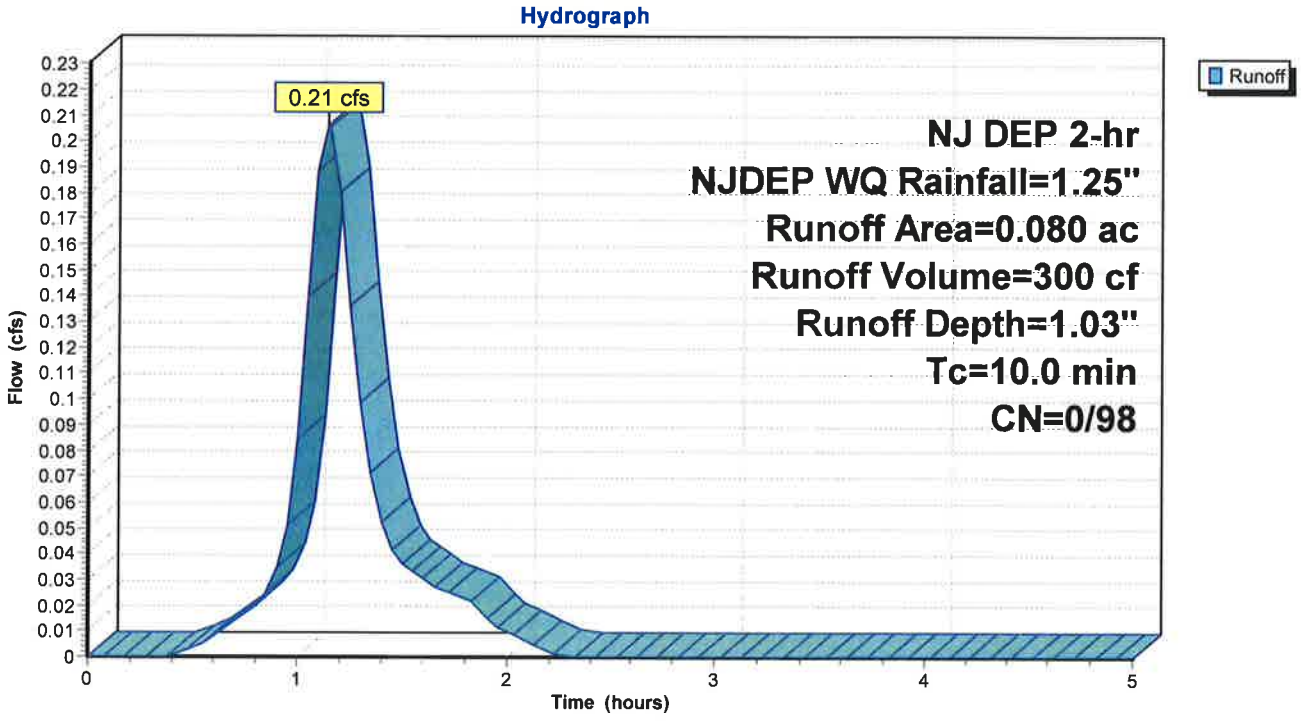
Runoff = 0.21 cfs @ 1.15 hrs, Volume= 300 cf, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.080	98	
	0.080	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 5S: Inlet #5 DA



Summary for Subcatchment MTD2: MTD #2 Inlet DA

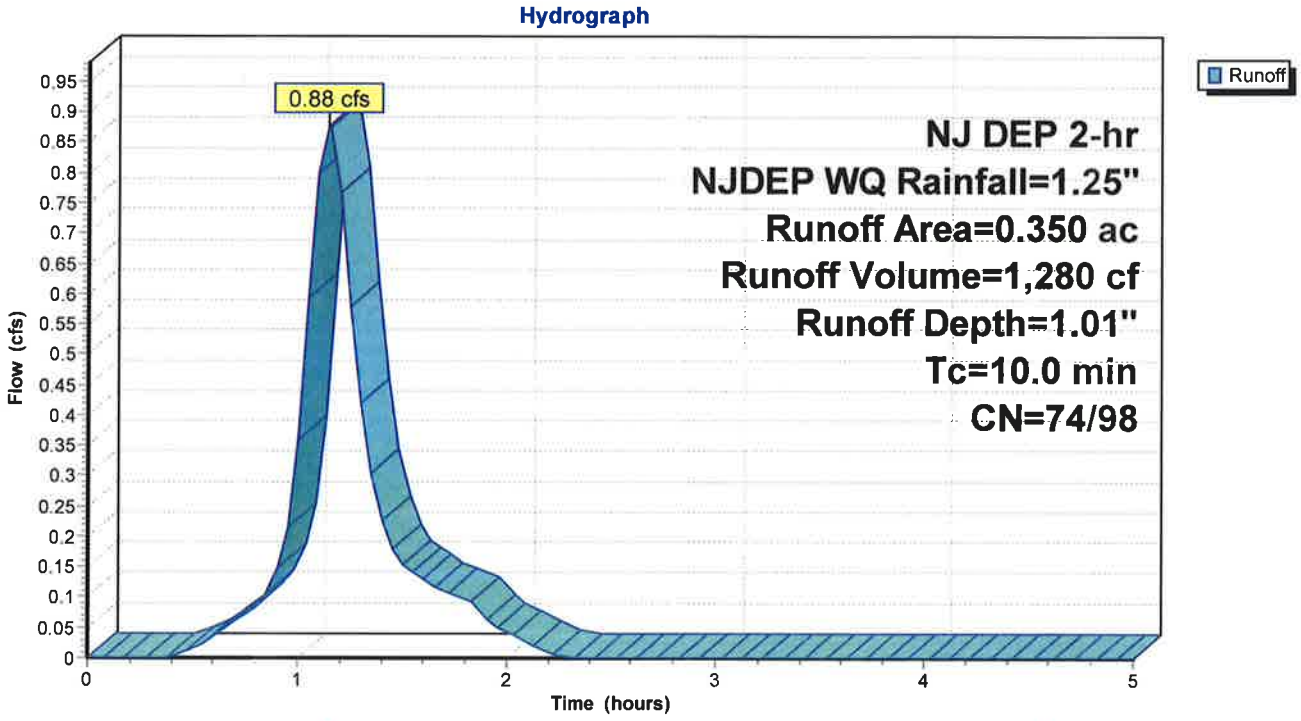
Runoff = 0.88 cfs @ 1.15 hrs, Volume= 1,280 cf, Depth= 1.01"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-5.00 hrs, dt= 0.05 hrs
NJ DEP 2-hr NJDEP WQ Rainfall=1.25"

	Area (ac)	CN	Description
*	0.340	98	
*	0.010	74	
	0.350	97	Weighted Average
	0.010	74	2.86% Pervious Area
	0.340	98	97.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment MTD2: MTD #2 Inlet DA



State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
PHILIP D. MURPHY
Governor
SHEILA Y. OLIVER
Lt. Governor
DIVISION OF WATERSHED PROTECTION AND RESTORATION
BUREAU OF NJPDES STORMWATER PERMITTING & WATER QUALITY MANAGEMENT
P.O. Box 420 Mail Code 501-02A
Trenton, New Jersey 08625-0420
609-633-7021 / Fax: 609-777-0432
www.njstormwater.org
SHAWN M. LATOURETTE
Commissioner

November 18, 2022

Zachariha J. Kent
Vice President of Product Management
Bio Clean Environmental Services, Inc., a Quikrete Company
398 Via El Centro
Oceanside, CA 92058

Re: MTD Lab Certification
Bio Clean High Capacity Kraken Filter Stormwater Treatment Device
Online Installation

TSS Removal Rate 80%

Dear Mr. Kent:

The Stormwater Management rules under N.J.A.C. 7:8-5.2(f) and 5.2(j) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Bio Clean Environmental Services, Inc., a Quikrete company, has requested a Laboratory Certification for the Bio Clean High Capacity Kraken Filter Stormwater Treatment Device (High Capacity Kraken Filter).

The project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated October 2022) for this device is published online at http://www.njcat.org/uploads/newDocs/HCKrakenFilterNJCATFinalReport.pdf.

The NJDEP certifies the use of the High Capacity Kraken Filter by Bio Clean Environmental Services, Inc. at a TSS removal rate of 80% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-

5.5. The MTFR is calculated based on a verified loading rate of 0.101 gpm/ft^2 of effective membrane filter area.

2. The High Capacity Kraken Filter shall be installed using the same configuration reviewed by NJCAT, and sized in accordance with the criteria specified in item 6 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 11.3 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual, which can be found online at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the High Capacity Kraken Filter. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at https://www.conteches.com/kraken for any changes to the maintenance requirements.

6. Sizing Requirement:

The example below demonstrates the sizing procedure for the High Capacity Kraken Filter:

Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using a High Capacity Kraken Filter. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

The selection of the appropriate model of a High Capacity Kraken Filter is based upon both the maximum inflow drainage area and the MTFR. It is necessary to calculate the required model using both methods and to use the largest model determined by the two methods.

Inflow Drainage Area Evaluation:

The drainage area to the High Capacity Kraken Filter in this example is 0.25 acres. Based upon the information in Table 1 below, the following number of cartridges are required in a High Capacity Kraken Filter to treat the impervious area without exceeding the maximum allowable drainage area:

a. Twenty-eight (28) 10" cartridges;
b. Thirteen (13) 20" cartridges; or
c. Eight (8) 30" cartridges.

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was based on the following:

time of concentration = 10 minutes
i = 3.2 in/hr (page 74, Fig. 5-16 of Chapter 5 of the NJ Stormwater BMP Manual)
c = 0.99 (runoff coefficient for impervious)
Q = ciA = 0.99 x 3.2 x 0.25 = 0.79 cfs (354.58 gpm)
(Note: 1 cfs = 448.83 gpm)

Given the site runoff is 0.79 cfs and based on Table 1 below, the following minimum numbers of cartridges are required in a High Capacity Kraken Filter without exceeding the MTFR of the individual model:

a. Seventy-two (72) 10" cartridges;
b. Thirty-three (33) 20" cartridges; or
c. Twenty-one (21) 30" cartridges.

The MTFR evaluation results will be used since that method results in the highest minimum configuration determined by the two methods.

The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the NJCAT Verification Report in the Verification Appendix under Table A-1.

Table 1. High Capacity Kraken Filter Cartridge MTFRs and Maximum Allowable Drainage Area

Cartridge Height (in)	Cartridge Maximum Treatment Flow Rate (MTFR) (cfs)	Maximum Allowable Drainage Area (acres)
30	0.038	0.032
20	0.024	0.020
10	0.011	0.009

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Changi Wu of my office at chang.i.wu@dep.nj.gov.

Sincerely,

Gabriel Mahon

Gabriel Mahon, Chief
Bureau of NJPDES Stormwater Permitting & Water Quality Management
Division of Watershed Protection and Restoration
New Jersey Department of Environmental Protection

Attachment: Maintenance Plan

cc: Richard Magee, NJCAT

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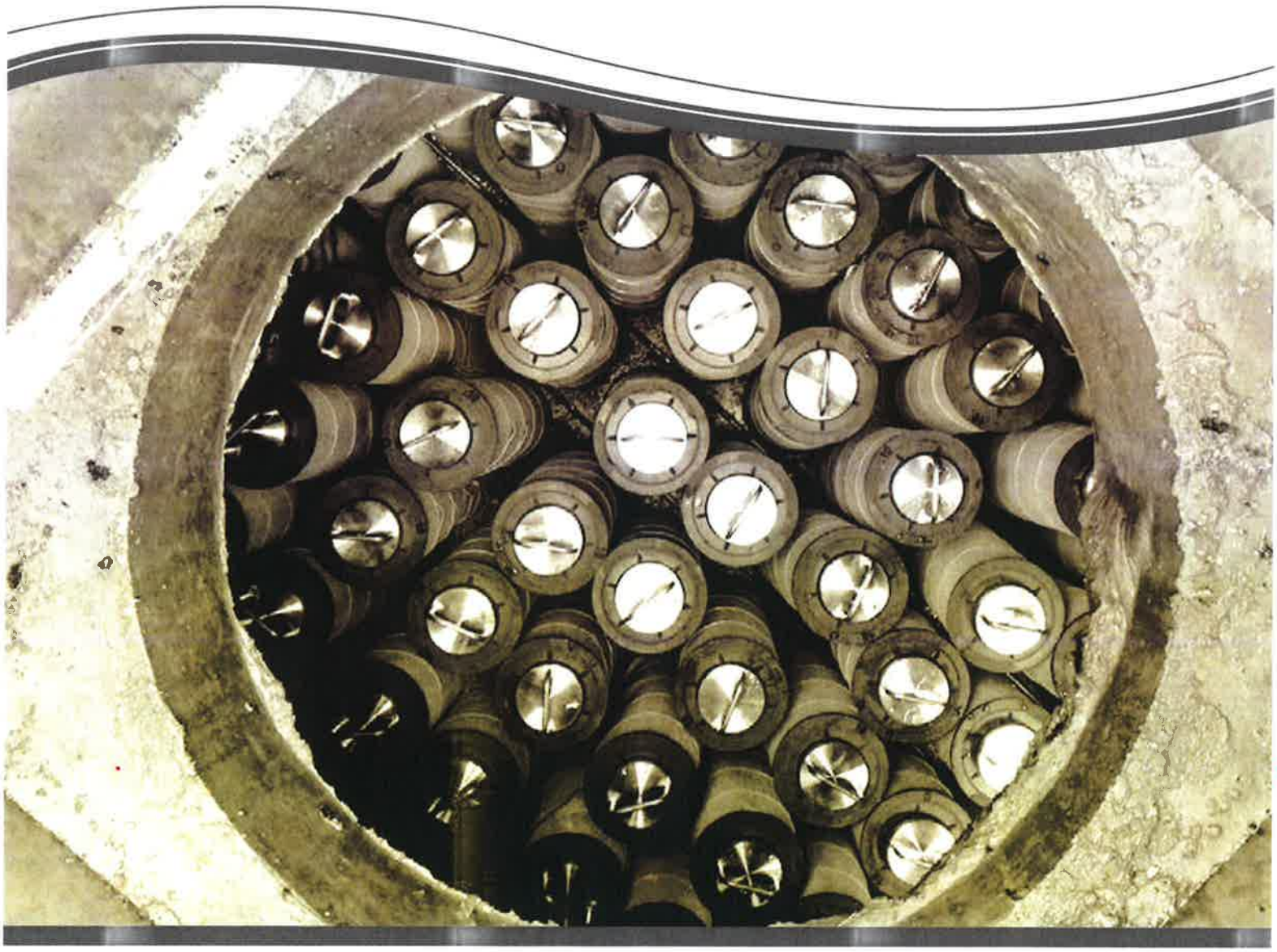
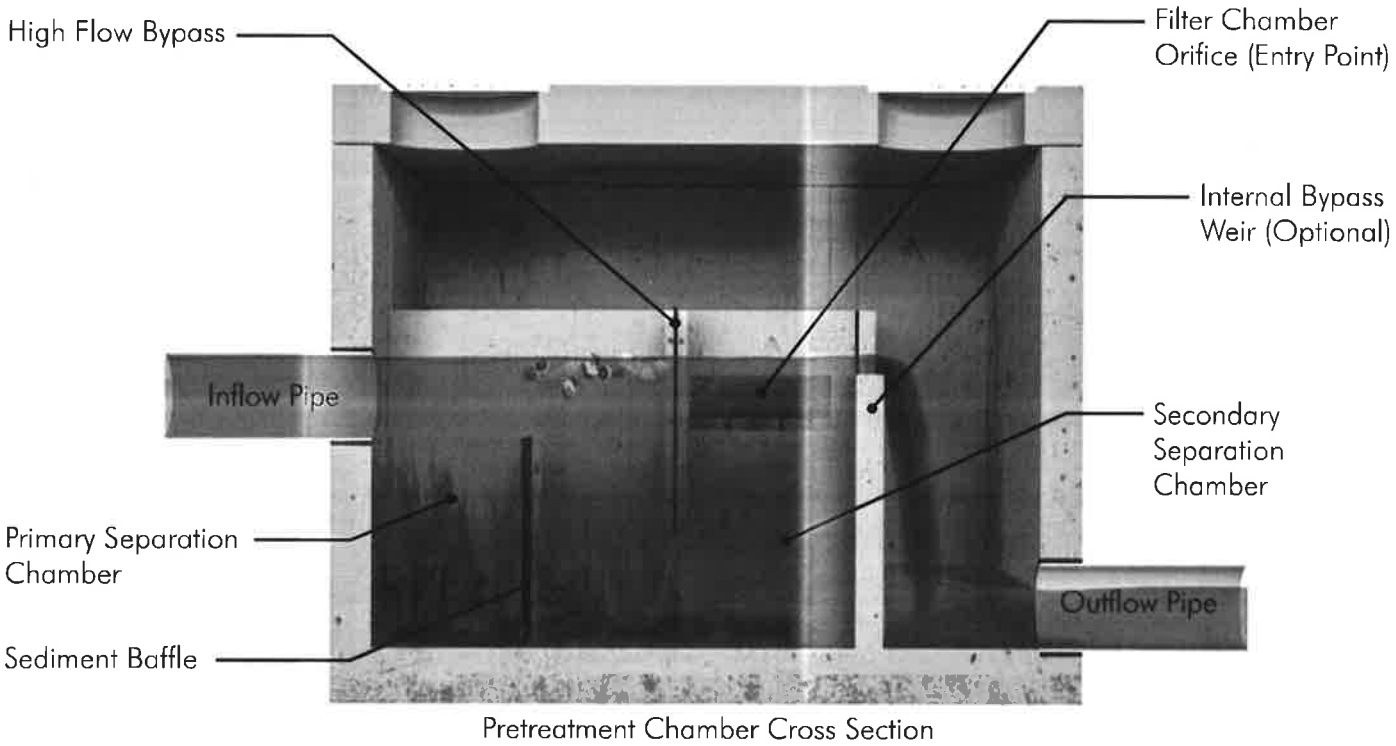
Kraken® Filter
Operation & Maintenance Manual



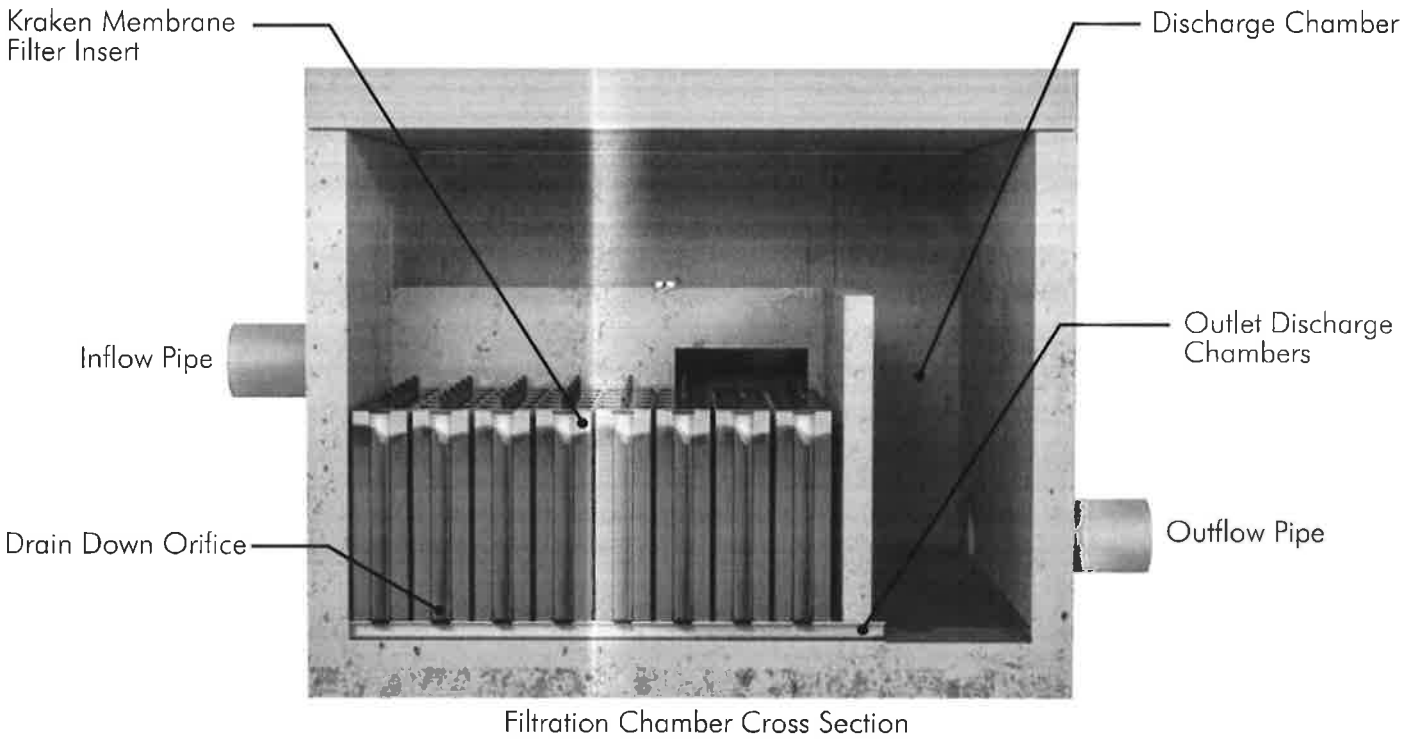
Operation & Maintenance

The Kraken® Filter is designed at a minimal loading rate of only 0.05 gpm/sq ft of media surface to maximize longevity and minimize maintenance requirements. Passive backwash and pretreatment also help to minimize system maintenance requirements. The Kraken® Filter is estimated to be able to handle up to at least 18 months sediment loading with no maintenance or loss of treatment capacity assuming 600 pounds of sediment per acre of impervious surface annually.

Yet, as with all stormwater BMPs, inspection and maintenance on the Kraken™ Filter is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and to provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess the site specific loading conditions. This is recommended because pollutant loading and pollutant characteristics can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding on roads, amount of daily traffic and land use can increase pollutant loading on the system. Observations made during the first year of inspections can be used to estimate inspection and maintenance intervals for subsequent years to ensure appropriate maintenance is provided. Without appropriate maintenance, a BMP will exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



Pre-Treatment Chamber Diagram



Filter Chamber Diagram

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Kraken® Filter:

- Contech Inspection Form
- Flashlight
- Manhole hook or appropriate tools to access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure
- Protective clothing and eye protection

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Kraken® Filter are quick and easy. As mentioned above, the first year should be seen as the maintenance interval establishment phase. During the first year, more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to plan future inspection and maintenance intervals.

The Kraken® Filter can be inspected through visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and near-by pedestrians from any dangers associated with an open access hatch or manhole. Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired, utilize a flashlight to see inside the system and all of its chambers.
- Look for any obstructions in the inflow pipe, pre-treatment chamber, filter chambers, discharge chamber or outflow pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs, estimate the amount of floatable debris accumulated in the pre-treatment chamber. Record this information on the inspection form. Next, utilizing a tape measure or measuring stick, estimate the amount of sediment accumulated in the primary and secondary sedimentation chambers. Record this depth on the inspection form. Through visual observation, inspect the condition of the filter cartridges. Look for excessive build-up of sediments on the surface and any build-up on the top of the cartridges. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components or cartridges
- Obstructions in the system or its inlet or outlet
- Accumulation of floatables in the pre-treatment chambers in which the length and width of the chamber behind oil/floatables skimmer is fully impacted
- Accumulation of sediment in the primary sedimentation chamber of more than 18" in depth
- Accumulation of sediment in the secondary sedimentation chamber of more than 6" in depth
- Accumulation of sediment in the filter chambers of more than 3" on average
- Substantial build-up of sediments on the filter membrane of the filter cartridges which will have a very dark appearance indicating the membrane may be fully saturated with sediment

The Kraken Filter vault is a robust system and is designed for treating and bypassing (when required) flow rates calculated by the Engineer of Record. Under the designed conditions with routine maintenance and inspections, the Kraken Filter should function for many years. The Kraken Filter can fail under certain conditions, such as: severe damage and cracking through the vault walls, internal weir and baffle walls falling out of place, blockages of the flow path such as inlet or outlet, filters not reset properly, excessive debris or sediment accumulation within the vault and on the filters. With proper maintenance these risks can be avoided. Contech representatives are also available for troubleshooting.

Maintenance Equipment

While maintenance can be done fully by hand, it is recommended that a vacuum truck be utilized to minimize time required to maintain the Kraken® Filter:

- Contech Maintenance Form
- Flashlight
- Manhole hook or appropriate tools to access hatches and covers
- Appropriate traffic control signage and procedures
- Measuring pole and/or tape measure
- Protective clothing and eye protection
- Vacuum truck
- Trash can
- Pressure washer

Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections of the system. Entry into the system will be required if it is determined the cartridge filters need washing/cleaning

Maintenance Procedures

It is recommended that maintenance occurs at least three days after the most recent rain event to allow for drain down of the system and any upstream detention systems designed to drain down over an extended period of time. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the pre-treatment chamber can be performed from finish surface without entry into the vault utilizing a vacuum truck. Once all safety measures have been set up, cleaning of the pre-treatment chamber can proceed as follows:

- Following rules for confined space entry, use a gas meter to detect the presence of any hazardous gases. If hazardous gases are present, do not enter the vault. Following appropriate confined space procedures, take steps, such as utilizing a venting system, to address the hazard. Once it is determined to be safe, enter utilizing appropriate entry equipment such as a ladder and tripod with harness.

- Once entry into the system has been established the maintenance technician should position themselves to stand in the pre-treatment chamber. From here, the removal of the cartridges can commence.

- Threaded couplings are used now, but old systems will have the pressure fitted coupling. Each cartridge that is pressure fitted in place will include a handle for easy removal. To remove a cartridge, simply grab the handle and pull straight up. It may be required to gently shift pressure from side to side while pulling up to break the pressure seal. Removal of the cartridge should be done by hand with minimal effort and requires no tools.

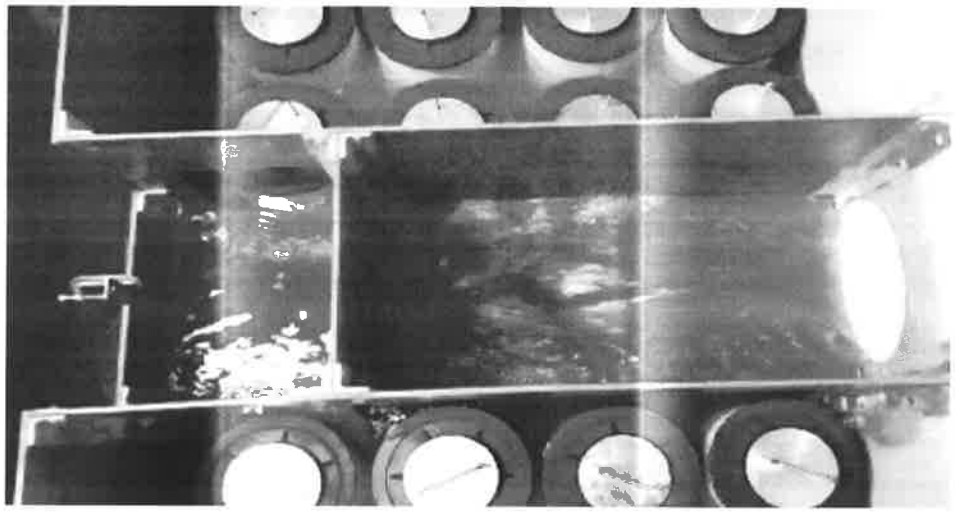
- Once the cartridges are removed, they should be lifted out from the vault and brought up to finish surface for cleaning. Using a large garbage can and a standard garden hose (low pressure nozzle), each cartridge should be rinsed off from the outside to remove accumulated sediments and debris. Once each cartridge is rinsed, it should be placed to the side for re-installation.

- Each filter chamber should be power washed and vacuumed clean before re-inserting the cleaned cartridges.
- After all cartridges have been washed, they can be replaced back into the vault. To replace each cartridge, simply slide cartridge over each pressure fitted coupler. Threaded couplings are used now, but old systems will have the pressure fitted coupling. Push down on the handle to ensure the cartridge has been fully seated and the bottom of the cartridge is making contact with the floor.
- The last step is to replace all access hatch lids and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.

Maintenance Sequence

1. Remove access hatches set up vacuum truck to clean the pretreatment chamber.

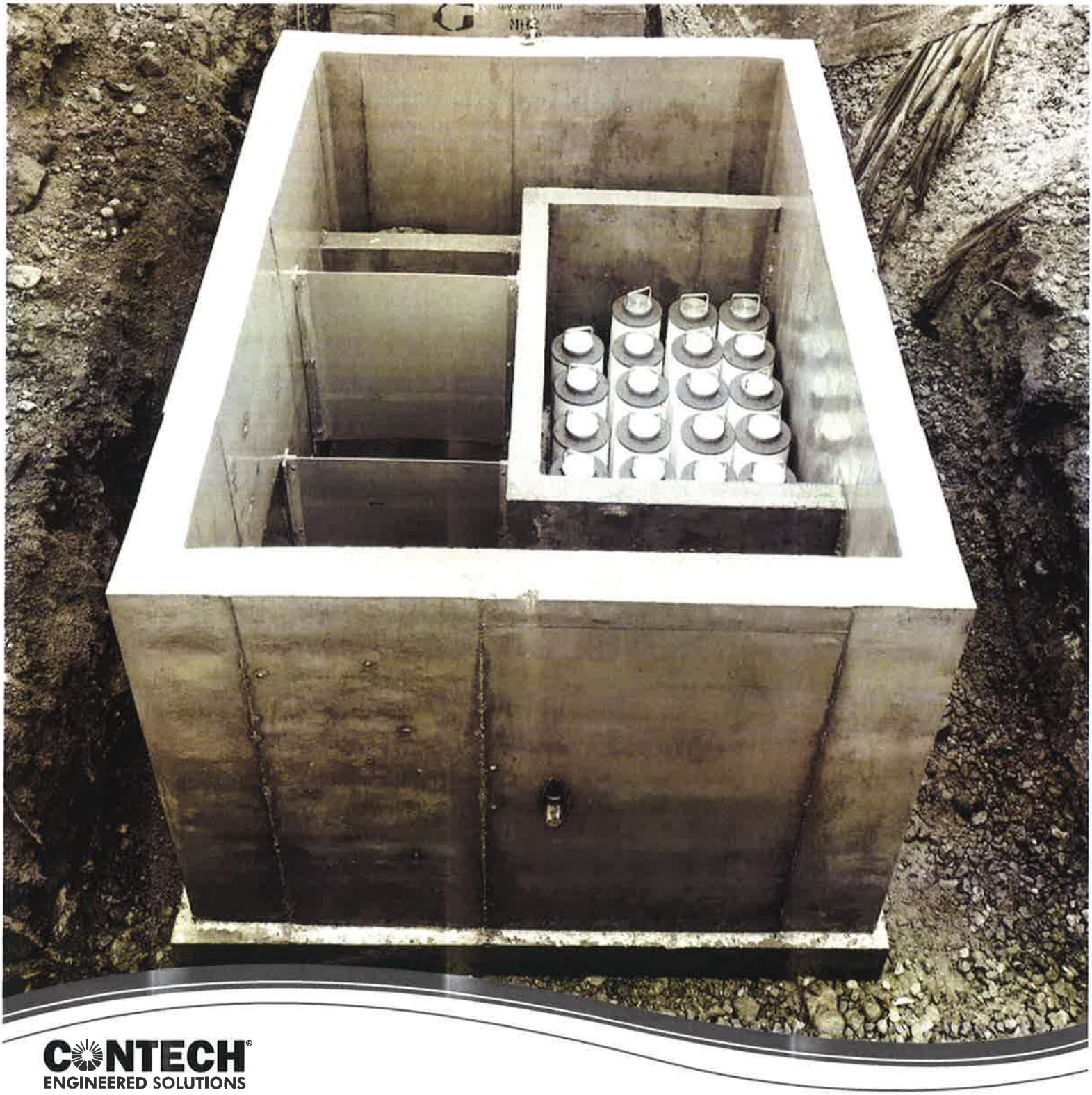
2. Insert vacuum hose in the sedimentation chamber and vacuum out all trash, sediment and standing water.



3. Assess the condition of the filter cartridges and determine if cleaning is required.

4. To wash cartridges, remove from vault. Place over trash can and use a garden hose to spray clean.

5. Once cleaned, install back into the vault. This completes maintenance. Ensure access lids are properly replaced.



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SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

APPENDIX D: PRE AND POST DEVELOPMENT DRAINAGE AREA MAP DATED 2/18/24

APPENDIX E:

SOIL PROFILES AND SOIL PERMEABILITY TEST DATA

Kashi Consulting Company, Inc.

Shrinath J Kotdawala, Ph.D., P.E. Gary Chiang, P.E.
983 Route 33, Unit D, Monroe Township, NJ - 08831, shri@kashiinc.com
54 Oakland Mills Rd, Manalapan, NJ – 07726, Phone: (848) 203 7460

SOIL INVESTIGATION CONDUCTED FOR DETERMINING WATER TABLE AND PERMEABILITY RATINGS

Date of Investigations: 12/16/2023
Method of Excavation: Large Track Hoe, Water Tank and Helpers
Excavator: Rey Wittmann, JW Landscape Contractors Inc., 39 Minnan Street Rahway, NJ – 07065
Weather: Sunny to Partially Sunny

Lot #1

Depth:	**Descriptions:**
0" – 8"	Top Soil (Dark Reddish Brown) – 2.5 YR (3/2), Sub Angular Blocky, Friable
8" – 34"	Silty Clay, Dark Reddish Brown, Firm to Friable - 5 YR (4/4)
34" – 120"	Fragmented Shale, Dark Reddish Brown (60" – 90" Depth – The shale layer is very hard)), 2.5 YR (3/6), Rippable, More than 80% non-soil shale fragments, 6" – 12" size plates with depth size increases, Water Table Observed at 7'.

Log #2

Depth:	**Descriptions:**
0" – 6"	Top Soil (Dark Reddish) - 2.5 YR (3/2)
6" – 42"	Clay Loam, Dark Reddish Brown, Blocky, Friable - 5 YR (4/4)
42" – 120"	Fragments Platy Shale, Dark Reddish Brown (60" – 90" Depth – The shale is very hard), More than 80% non-soil shale fragments A PERC test conducted at the depths of 72" (From 84" and deeper - very platy structure), Water Table Observed at 7'.

Log #4

0" – 12"	Top Soil (Dark Reddish), - 2.5 YR (3/2)
12" – 41"	Clay Loam, Dark Reddish Brown, Blocky, Friable, - 5 YR (4/4)
41" – 132"	Fragmented Platy Shale, Dark Reddish Brown (60" – 90" Depth – The shale is very hard), (24" – 48" Very Platy, 48" – 72" Very Hard Ripping, 72" – 120"), Very platy and Fragmented.

Log #5:

0" – 8"	Top Soil (Dark Reddish) – 2.5 YR (3/2)
8" – 38"	Clay Loam, Dark Reddish Brown, Blocky and Sub angular, Friable, 5 YR (4/4)
38" – 120"	Fragmented Platy Shale, Dark Reddish Brown, Alternative Very Firm to Rippable Shale layer, With depths the size of shale increases to 8" – 12" platy and in blocks. Water Table at 72")

* The fragmented shale layers showed seams, which were hard to rip. A machine with rippable teeth required for this investigations.

Date of Test:12/16/2023 –Basin Flood*

Location of Pit – Log #1

Size of Pit – 3' x 8'

Depth of Fractured Shale: 60" (Bottom of Test Elevation) – gallons poured - 375 per fill

Time Basin Flooded (1st Fill): 15:10
Time to Empty Basin: 15:45
Time Basin Flooded (2nd Fill): 15.55
Time to Empty Basin: 16:40

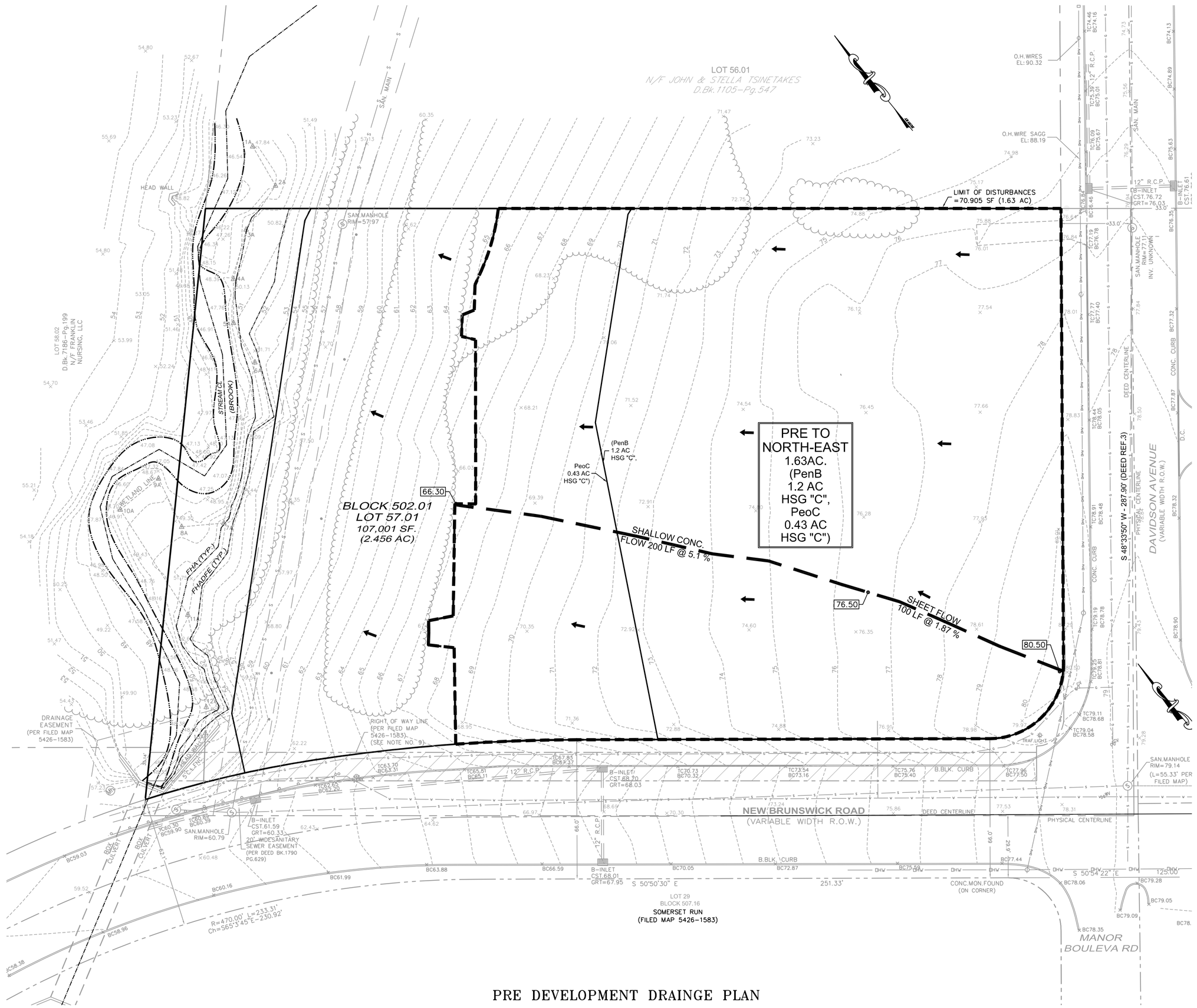
Location of Pit – Log #4

Size of Pit – 3' x 8'

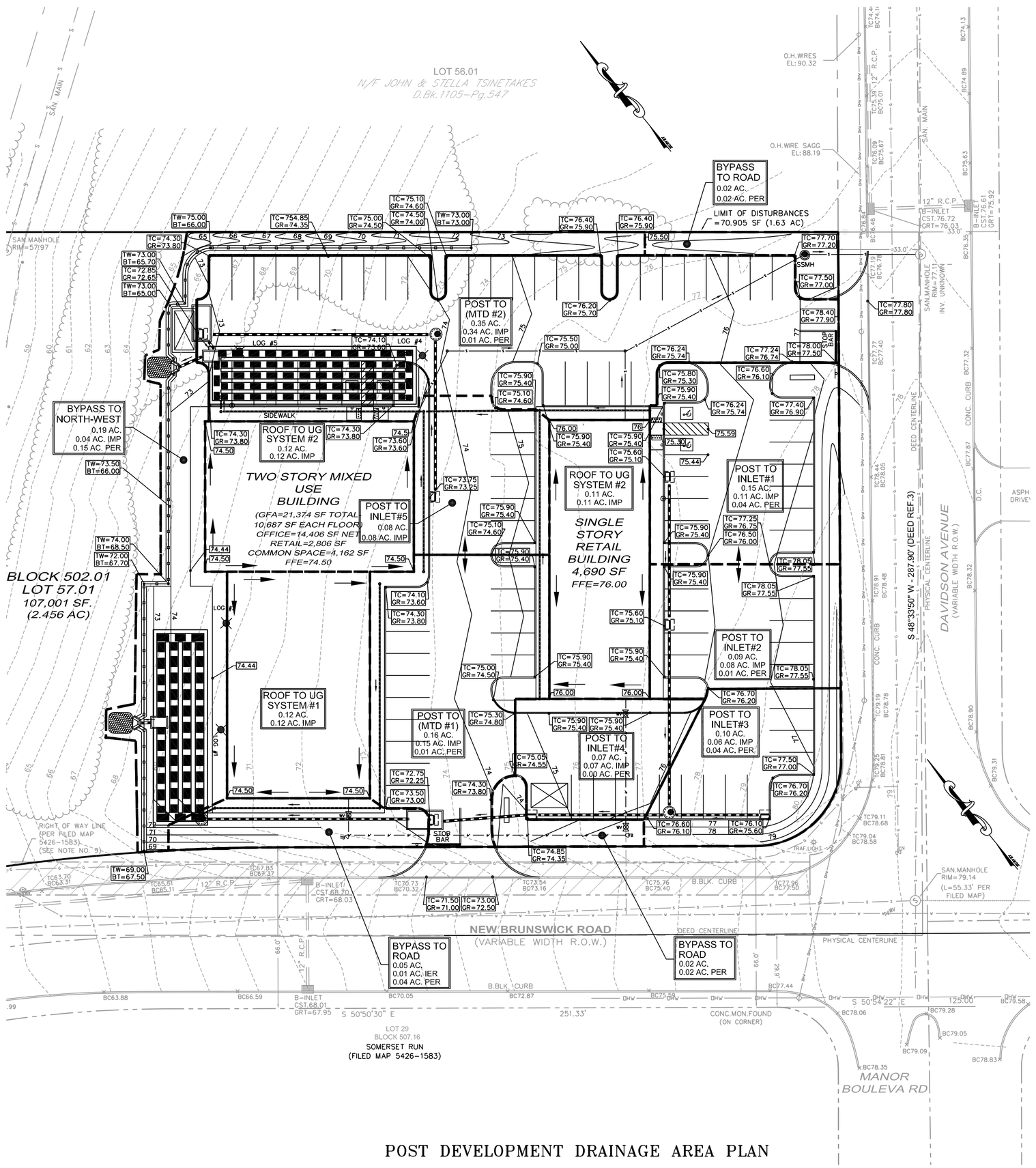
Depth of Fractured Shale: 78" (Bottom of Test Elevation) – gallons poured - 375 per fill

Time Basin Flooded (1st Fill): 14:07
Time to Empty Basin: 15:24
Time Basin Flooded (2nd Fill): 15.30
Time to Empty Basin: 16:20

* As all the profiles have variations in fracture sizes and depths – a field test shall be done when the entire excavation for the ground Stormwater System is excavated as per the BMP manual. Two permeability tests are conducted to assist in determining the PERC value of 6.316 inch / hour. The results are enclosed.



PRE DEVELOPMENT DRAINGE PLAN



POST DEVELOPMENT DRAINAGE AREA PLAN

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

SYMBOL	DESCRIPTION
	PLOT BOUNDARY
	SETBACK LINE
	NEW BUILDING
	NEW CURB
100	EXISTING CONTOURS
	UTILITY LAMP POLE
S	UTILITY SANITORY MANHOLE
	UTILITY STORM INLET
	WETLANDS FLAG
	SIGN
	UTILITY POLE
	CONCRETE
	TREE WOOD LINE
SD	UTILITY STORM MANHOLE
W	WATER LINE
S	SANITARY LINE
G	GAS LINE

PRE AND POST DEVELOPMENT DRAINAGE AREA MAP
BLOCK 502.01, LOT 57.01
TOWNSHIP OF FRANKLIN
SOMERSET COUNTY, NJ

SCALE: AS SHOWN

DRAWN BY: SJK

SHRINATH J KOTDAWALA, N.J.P.E.-LICENSE # 41204
KASHI CONSULTING COMPANY, INC. - 24GA2802000
54 OAKLAND MILLS RD, ENGLISHTOWN, NJ 07726
PHONE: (848) 203 7460 FAX: (732) 462 9666

CHECKED BY: SJK

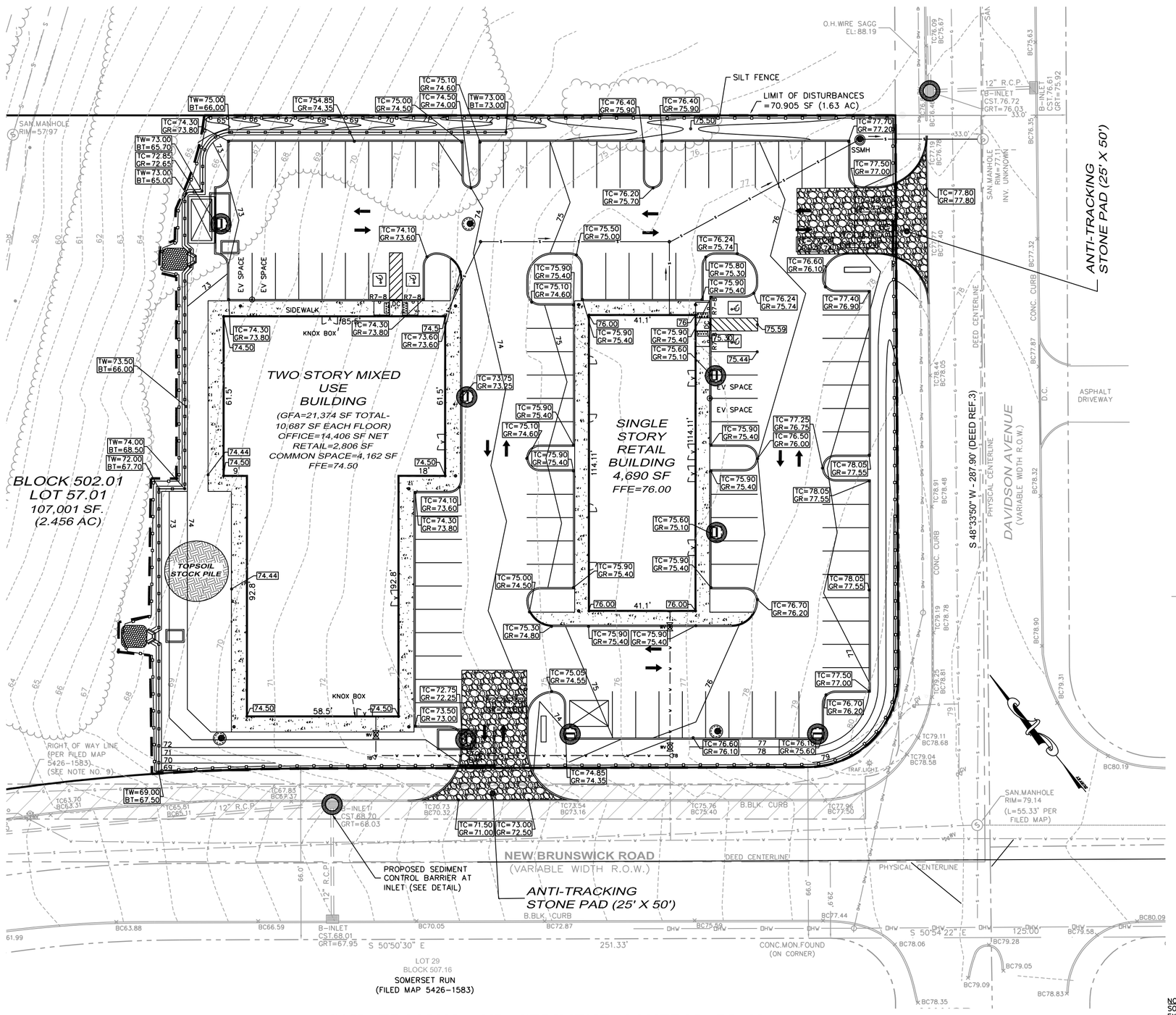
DATE: 02/01/2024

REVISIONS:

SHEET: 1
OF: 3

PROJECT: 390 DAVIDSON AVE.

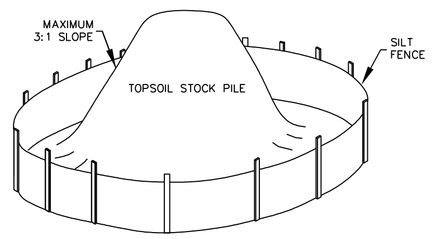
SHRINATH J KOTDAWALA
PROFESSIONAL ENGINEER N.J. LIC. No. 41204



SOIL EROSION AND SEDIMENT CONTROL PLAN

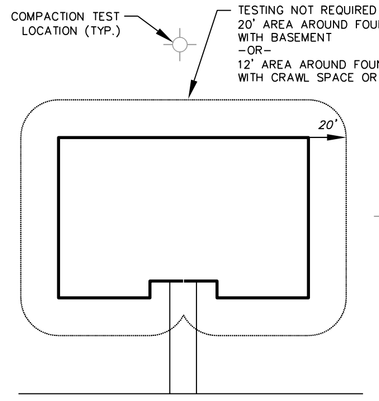
NOTES:

1. THE PROPERTY OWNER SHALL BE RESPONSIBLE FOR MAINTENANCE OF SOIL EROSION CONTROL MEASURES DURING CONSTRUCTION.



TOPSOIL STOCK PILE DETAIL

NO SCALE



MULTIFAMILY HOUSING OR OTHER NON-RESIDENTIAL BUILDING/STRUCTURE

NOTE:
SOIL COMPACTION TESTING LOCATIONS IDENTIFIED ARE RECOMMENDED LOCATIONS FOR GRADED/DISTURBED AREAS WITHIN THE VICINITY OF BUILDINGS AND STRUCTURES OR ON INDIVIDUAL LOTS. FOR GRADED/DISTURBED AREAS WITHIN OPEN OR COMMON SPACES, SOIL COMPACTION TESTING SHALL BE PERFORMED IN ACCORDANCE WITH THE FREQUENCY LISTED IN THE LEGEND (THIS SHEET).

TYPICAL SOIL COMPACTION TESTING LOCATIONS

NO SCALE

SITE MAPPED OVER A 2020 AERIAL IMAGE OBTAINED FROM NJGIN

SOIL DE-COMPACTION AND TESTING REQUIREMENTS:

A. SOIL COMPACTION TESTING REQUIREMENTS

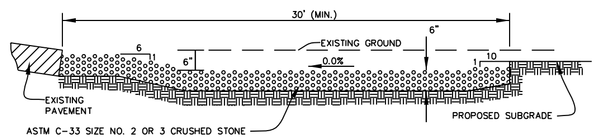
1. SUBGRADE SOILS PRIOR TO THE APPLICATION OF TOPSOIL (SEE PERMANENT SEEDING AND STABILIZATION NOTES FOR TOPSOIL REQUIREMENTS) SHALL BE FREE OF EXCESSIVE COMPACTION TO A DEPTH OF 6.0 INCHES TO ENHANCE THE ESTABLISHMENT OF PERMANENT VEGETATIVE COVER.
2. AREAS OF THE SITE WHICH ARE SUBJECT TO COMPACTION TESTING AND/OR MITIGATION ARE GRAPHICALLY DENOTED ON THE CERTIFIED SOIL EROSION CONTROL PLAN.
3. COMPACTION TESTING LOCATIONS ARE DENOTED ON THE PLAN. A COPY OF THE PLAN OR PORTION OF THE PLAN SHALL BE USED TO MARK LOCATIONS OF TESTS, AND ATTACHED TO THE COMPACTION REMEDIATION FORM, AVAILABLE FROM THE LOCAL SOIL CONSERVATION DISTRICT. THIS FORM MUST BE FILLED OUT AND SUBMITTED PRIOR TO RECEIVING A CERTIFICATE OF COMPLIANCE FROM THE DISTRICT.
4. IN THE EVENT THAT TESTING INDICATES COMPACTION IN EXCESS OF THE MAXIMUM THRESHOLDS INDICATED FOR THE SIMPLIFIED TESTING METHODS (SEE DETAILS BELOW), THE CONTRACTOR/OWNER SHALL HAVE THE OPTION TO PERFORM EITHER (1) COMPACTION MITIGATION OVER THE ENTIRE MITIGATION AREA DENOTED ON THE PLAN (EXCLUDING EXEMPTED AREAS), OR (2) PERFORM ADDITIONAL, MORE DETAILED TESTING TO ESTABLISH THE LIMITS OF EXCESSIVE COMPACTION WHEREUPON ONLY THE EXCESSIVELY COMPACTED AREAS WOULD REQUIRED COMPACTION MITIGATION. ADDITIONAL DETAILED TESTING SHALL BE PERFORMED BY A TRAINED, LICENSED PROFESSIONAL.

B. COMPACTION TESTING METHODS

1. PROBING WIRE TEST (SEE DETAIL)
2. HAND-HELD PENETROMETER TEST (SEE DETAIL)
3. TUBE BULK DENSITY TEST (LICENSED PROFESSIONAL ENGINEER REQUIRED)
4. NUCLEAR DENSITY TEST (LICENSED PROFESSIONAL ENGINEER REQUIRED)
5. ADDITIONAL TESTING METHODS WHICH CONFORM TO ASTM STANDARDS AND SPECIFICATIONS, AND WHICH PRODUCE A DRY WEIGHT, SOIL BULK DENSITY MEASUREMENT MAY BE ALLOWED SUBJECT TO DISTRICT APPROVAL.
6. DETAILED REQUIREMENTS FOR EACH COMPACTION TESTING METHOD CAN BE FOUND IN SECTION 19 "STANDARD FOR LAND GRADING" OF THE NJ STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL, LATEST EDITION.
7. SOIL COMPACTION TESTING IS NOT REQUIRED IF/WHEN SUBSOIL COMPACTION REMEDIATION (SCARIFICATION/TILLAGE (6" MINIMUM DEPTH OR SIMILAR) IS PROPOSED AS PART OF THE SEQUENCE OF CONSTRUCTION.

C. PROCEDURES FOR SOIL COMPACTION MITIGATION

1. PROCEDURES SHALL BE USED TO MITIGATE EXCESSIVE SOIL COMPACTION PRIOR TO PLACEMENT OF TOPSOIL AND ESTABLISHMENT OF PERMANENT VEGETATIVE COVER.
2. RESTORATION OF COMPACTED SOILS SHALL BE THROUGH DEEP SCARIFICATION/TILLAGE (6" MINIMUM DEPTH) WHERE THERE IS NO DANGER TO UNDERGROUND UTILITIES (CABLES, IRRIGATION SYSTEM, ETC.). IN THE ALTERNATIVE, ANOTHER METHOD AS SPECIFIED BY A NEW JERSEY LICENSED PROFESSIONAL ENGINEER MAYBE SUBSTITUTED, SUBJECT TO DISTRICT APPROVAL.



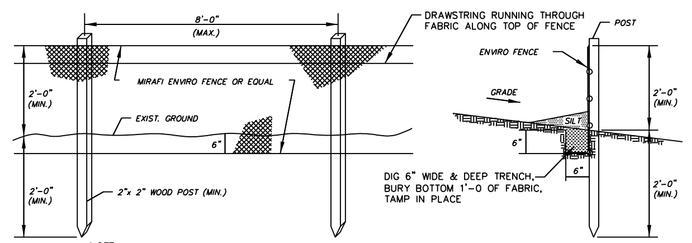
NOTE: AT POORLY DRAINED LOCATIONS, GEOTEXTILE FILTER FABRIC SHALL BE INSTALLED UNDERNEATH THE CRUSHED STONE.

PERCENT SLOPE OF ROADWAY	LENGTH OF STONE REQUIRED	
	COARSE GRAINED SOILS	FINE GRAINED SOILS
0 to 2%	50 ft.	100 ft.
2 to 5%	100 ft.	200 ft.
>5%	ENTIRE SURFACE STABILIZED WITH FABC BASE COURSE (1)	

(1) AS PRESCRIBED BY LOCAL ORDINANCE OR OTHER GOVERNING AUTHORITY.

TRANSVERSE SECTION
ANTI-TRACKING STONE AT DRIVE

NO SCALE

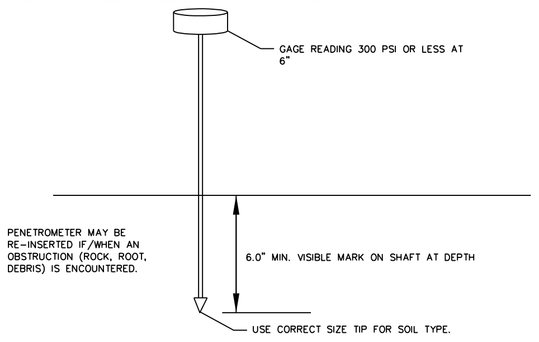


NOTE:
THE FABRIC MUST BE SECURELY FASTENED TO THE POSTS USING A SYSTEM CONSISTING OF METAL FASTENERS (NAILS OR STAPLES) AND A HIGH STRENGTH REINFORCEMENT MATERIAL (NYLON WEBBING, GROMMETS, WASHERS, ETC.) PLACED BETWEEN THE FASTENER AND THE GEOTEXTILE FABRIC. THE FASTENING SYSTEM SHALL RESIST TEARING AWAY FROM THE POST. THE FABRIC SHALL INCORPORATE A DRAWSTRING IN THE TOP PORTION OF THE FENCE FOR ADDED STRENGTH.

SILT FENCE DETAIL

NO SCALE

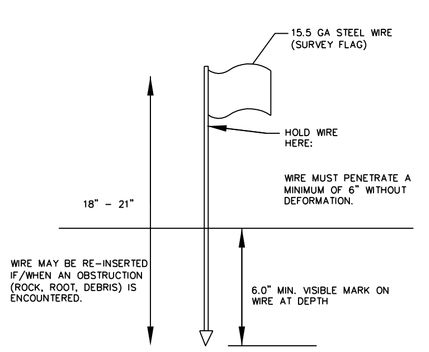
NOTE:
SOIL SHOULD BE MOIST BUT NOT SATURATED. DO NOT TEST WHEN SOIL IS EXCESSIVELY DRY OR SUBJECT TO FREEZING TEMPERATURES. SLOW, STEADY DOWNWARD PRESSURE USED TO ADVANCE THE PROBE. PROBE MUST PENETRATE AT LEAST 6" WITH LESS THAN 300 PSI READING ON THE GAGE.



HANDHELD SOIL PENETROMETER TEST

NO SCALE

NOTE:
SOIL SHOULD BE MOIST BUT NOT SATURATED. DO NOT TEST WHEN SOIL IS EXCESSIVELY DRY OR SUBJECT TO FREEZING TEMPERATURES. SLOW, STEADY DOWNWARD PRESSURE USED TO ADVANCE THE WIRE.



PROBING WIRE TEST DETAIL

NO SCALE

DESCRIPTION

= SOIL COMPACTION TESTING AREAS

-RECOMMENDED SOIL COMPACTION TESTING LOCATION (APPROX. 1 PER/0.5 ACRES)

CONSTRUCTION SEQUENCE

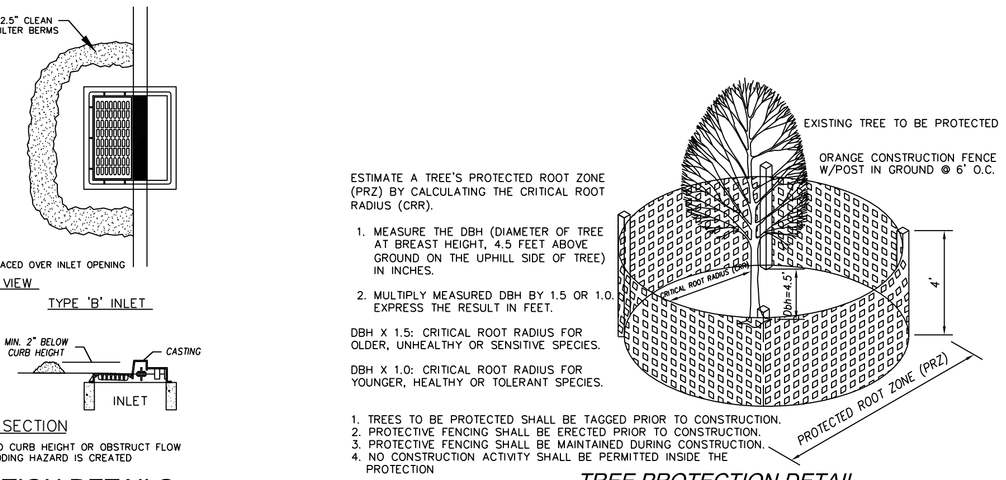
1. INSTALL SILT FENCE, ANTI-TRACKING STONE PAD & TREE PROTECTION FENCING. (1 DAY)
2. INSTALL INLET PROTECTION. (1 DAY)
3. ROUGH GRADE SITE & CONSTRUCT RETAINING WALL. (2 WEEKS)
4. BUILDING CONSTRUCTION. (12 MONTHS)
5. INSTALL DRAINAGE FACILITY. (1 WEEK)
6. INSTALL UTILITIES, CURBING AND PAVEMENT. (2 WEEKS)
7. FINISH GRADE DISTURBED AREAS. (3 DAYS)
8. REMOVE TREE PROTECTION FENCING. (1 DAY)
9. STABILIZE, MULCH, FERTILIZE & SEED ALL DISTURBED AREAS IN ACCORDANCE WITH S.C.D. SPECIFICATIONS. (1 DAYS)
10. REMOVE ALL SOIL EROSION CONTROL DEVICES. (1 DAY)

NOTES:
1. THE PROPERTY OWNER SHALL BE RESPONSIBLE FOR MAINTENANCE OF SOIL EROSION CONTROL MEASURES DURING CONSTRUCTION.

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.



CROSS SECTION

STONE PILES NOT TO EXCEED CURB HEIGHT OR OBSTRUCT FLOW TO AN EXTENT THAT A FLOODING HAZARD IS CREATED

INLET PROTECTION DETAILS

NO SCALE

ESTIMATE A TREE'S PROTECTED ROOT ZONE (PRZ) BY CALCULATING THE CRITICAL ROOT RADIUS (CRR).

1. MEASURE THE DBH (DIAMETER OF TREE AT BREAST HEIGHT, 4.5 FEET ABOVE GROUND ON THE UPHILL SIDE OF TREE) IN INCHES.
2. MULTIPLY MEASURED DBH BY 1.5 OR 1.0, EXPRESS THE RESULT IN FEET.

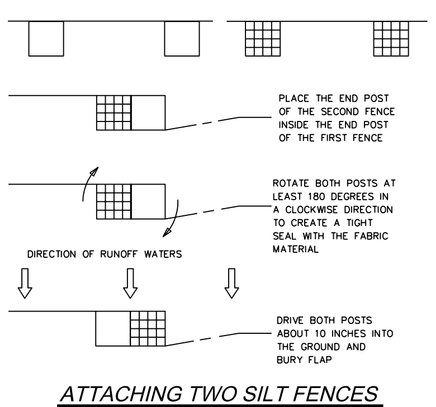
DBH X 1.5: CRITICAL ROOT RADIUS FOR OLDER, UNHEALTHY OR SENSITIVE SPECIES.

DBH X 1.0: CRITICAL ROOT RADIUS FOR YOUNGER, HEALTHY OR TOLERANT SPECIES.

1. TREES TO BE PROTECTED SHALL BE TAGGED PRIOR TO CONSTRUCTION.
2. PROTECTIVE FENCING SHALL BE ERECTED PRIOR TO CONSTRUCTION.
3. PROTECTIVE FENCING SHALL BE MAINTAINED DURING CONSTRUCTION.
4. NO CONSTRUCTION ACTIVITY SHALL BE PERMITTED INSIDE THE PROTECTION

TREE PROTECTION DETAIL

NO SCALE



ATTACHING TWO SILT FENCES

NO SCALE

SYMBOL	DESCRIPTION
	PLOT BOUNDARY
	NEW BUILDING
	NEW CURB
100	EXISTING CONTOURS
	UTILITY LAMP POLE
S	UTILITY SANITORY MANHOLE
	UTILITY STORM INLET
	WETLANDS FLAG
	SIGN
	UTILITY POLE
	CONCRETE
	TREE WOOD LINE
SD	UTILITY STORM MANHOLE
	WATER LINE
	SANITARY LINE
	GAS LINE

THIS DRAWING IS TO BE USED FOR SOIL EROSION AND SEDIMENT CONTROL PURPOSES ONLY.

SOIL EROSION AND SEDIMENT CONTROL PLAN
BLOCK 502.01, LOT 57.01
TOWNSHIP OF FRANKLIN
SOMERSET COUNTY, NJ

SCALE: AS SHOWN

DRAWN BY: SJK

SHRINATH J KOTDAWALA, N.J.P.E.-LICENSE # 41204
KASHI CONSULTING COMPANY, INC. - 24GA2802000
54 OAKLAND MILLS RD, ENGLISHTOWN, NJ 07726
PHONE: (848) 203 7460 FAX: (732) 462 9666

CHECKED BY: SJK

DATE: 07-28-2023

REVISIONS:

SHEET: 2 OF: 3

SHRINATH J KOTDAWALA
PROFESSIONAL ENGINEER N.J. LIC. No. 41204

PROJECT: 390 DAVIDSON AVE.

PERMANENT VEGETATIVE COVER FOR SOIL STABILIZATION:

1. SITE PREPARATION

A. GRADE AS NEEDED AND FEASIBLE TO PERMIT THE USE OF CONVENTIONAL EQUIPMENT FOR SEEDBED PREPARATION, SEEDING, MULCH APPLICATION, AND MULCH ANCHORING. ALL GRADING SHOULD BE DONE IN ACCORDANCE WITH STANDARD FOR LAND GRADING.

B. IMMEDIATELY PRIOR TO SEEDING AND TOPSOIL APPLICATION, THE SUBSOIL SHALL BE EVALUATED FOR COMPACTION IN ACCORDANCE WITH THE STANDARD FOR LAND GRADING.

C. TOPSOIL SHOULD BE HANDLED ONLY WHEN IT IS DRY ENOUGH TO WORK WITHOUT DAMAGING THE SOIL STRUCTURE. A UNIFORM APPLICATION TO A DEPTH OF 5 INCHES (UNSETTLED) IS REQUIRED ON ALL SITES. TOPSOIL SHALL BE AMENDED WITH ORGANIC MATTER, AS NEEDED, IN ACCORDANCE WITH THE STANDARD FOR TOPSOILING.

D. INSTALL NEEDED EROSION CONTROL PRACTICES OR FACILITIES SUCH AS DIVERSIONS, GRADE STABILIZATION STRUCTURES, CHANNEL STABILIZATION MEASURES, SEDIMENT BASINS, AND WATERWAYS.

2. SEEDBED PREPARATION

A. UNIFORMLY APPLY GROUND LIMESTONE AND FERTILIZER TO TOPSOIL WHICH HAS BEEN SPREAD AND FIRMED, ACCORDING TO SOIL TEST RECOMMENDATIONS SUCH AS OFFERED BY RUTGERS CO-OPERATIVE EXTENSION. SOIL SAMPLE MAILERS ARE AVAILABLE FROM THE LOCAL RUTGERS COOPERATIVE EXTENSION OFFICES (<HTTP://NJACS.RUTGERS.EDU/COUNTY/>). FERTILIZER SHALL BE APPLIED AT THE RATE OF 500 POUNDS PER ACRE OR 11 POUNDS PER 1,000 SQUARE FEET OF 10-10-10 OR EQUIVALENT WITH 50% WATER INSOLUBLE NITROGEN UNLESS A SOIL TEST INDICATES OTHERWISE AND INCORPORATED INTO THE SURFACE 4 INCHES. IF FERTILIZER IS NOT INCORPORATED, APPLY ONE HALF THE RATE DESCRIBED ABOVE DURING SEEDBED PREPARATION AND REPEAT ANOTHER ONE HALF RATE APPLICATION OF THE SAME FERTILIZER WITHIN 3 TO 5 WEEKS AFTER SEEDING.

B. WORK LIME AND FERTILIZER INTO THE TOPSOIL AS NEARLY AS PRACTICAL TO A DEPTH OF 4 INCHES WITH A DISC, SPRINGTOOTH HARROW, OR OTHER SUITABLE EQUIPMENT. THE FINAL HARROWING OR DISKING OPERATION SHOULD BE ON THE GENERAL CONTOUR. CONTINUE TILLAGE UNTIL A REASONABLE UNIFORM SEEDBED IS PREPARED.

C. HIGH ACID PRODUCING SOIL. SOILS HAVING A PH OF 4 OR LESS OR CONTAINING IRON SULFIDE SHALL BE COVERED WITH A MINIMUM OF 12 INCHES OF SOIL HAVING A PH OF 5 OR MORE BEFORE INITIATING SEEDBED PREPARATION. SEE STANDARD FOR MANAGEMENT OF HIGH ACID PRODUCING SOILS FOR SPECIFIC REQUIREMENTS.

3. SEEDING

A. SELECT A MIXTURE FROM TABLE 4-3 OR USE MIXTURE RECOMMENDED BY RUTGERS COOPERATIVE EXTENSION OR NATURAL RESOURCES CONSERVATION SERVICE WHICH IS APPROVED BY THE SOIL CONSERVATION DISTRICT. SEED GERMINATION SHALL HAVE BEEN TESTED WITHIN 12 MONTHS OF THE PLANTING DATE. NO SEED SHALL BE ACCEPTED WITH A GERMINATION TEST DATE MORE THAN 12 MONTHS OLD UNLESS RETESTED.

1. SEEDING RATES SPECIFIED ARE REQUIRED WHEN A REPORT OF COMPLIANCE IS REQUESTED PRIOR TO ACTUAL ESTABLISHMENT OF PERMANENT VEGETATION. UP TO 50% REDUCTION IN RATES MAY BE USED WHEN PERMANENT VEGETATION IS ESTABLISHED PRIOR TO A REPORT OF COMPLIANCE INSPECTION. THESE RATES APPLY TO ALL METHODS OF SEEDING. ESTABLISHING PERMANENT VEGETATION MEANS 80% VEGETATIVE COVERAGE WITH THE SPECIFIED SEED MIXTURE FOR THE SEEDED AREA AND MOWED ONCE.

2. WARM SEASON MIXTURES ARE GRASSES AND LEGUMES WHICH MAXIMIZE GROWTH AT HIGH TEMPERATURES, GENERALLY 850 F AND ABOVE. SEE TABLE 4-3 MIXTURES 1 TO 7. PLANTING RATES FOR WARM SEASON GRASSES SHALL BE THE AMOUNT OF PURE LIVE SEED (PLS) AS DETERMINED BY GERMINATION TESTING RESULTS.

3. COOL SEASON MIXTURES ARE GRASSES AND LEGUMES WHICH MAXIMIZE GROWTH AT TEMPERATURES BELOW 850 F. MANY GRASSES BECOME ACTIVE AT 650 F. SEE TABLE 4-3, MIXTURES 8-20. ADJUSTMENT OF PLANTING RATES TO COMPENSATE FOR THE AMOUNT OF PURE LIVE SEED IS NOT REQUIRED FOR COOL SEASON GRASSES.

B. CONVENTIONAL SEEDING IS PERFORMED BY APPLYING SEED UNIFORMLY BY HAND, CYCLONE (CENTRIFUGAL) SEEDER, DROP SEEDER, DRILL OR CULTIPACKER SEEDER. EXCEPT FOR DRILLED, HYDROSEEDED OR CULTIPACKED SEEDINGS, SEED SHALL BE INCORPORATED INTO THE SOIL WITHIN 24 HOURS OF SEEDBED PREPARATION TO A DEPTH OF 1/4 TO 1/2 INCH, BY RAKING OR DRAGGING. DEPTH OF SEED PLACEMENT MAY BE 1/4 INCH DEEPER ON COARSE TEXTURED SOIL.

C. AFTER SEEDING, FIRMING THE SOIL WITH A CORRUGATED ROLLER WILL ASSURE GOOD SEED-TO-SOIL CONTACT, RESTORE CAPILLARITY, AND IMPROVE SEEDLING EMERGENCE. THIS IS THE PREFERRED METHOD. WHEN PERFORMED ON THE CONTOUR, SHEET EROSION WILL BE MINIMIZED AND WATER CONSERVATION ON SITE WILL BE MAXIMIZED.

D. HYDROSEEDING IS A BROADCAST SEEDING METHOD USUALLY INVOLVING A TRUCK OR TRAILER MOUNTED TANK, WITH AN AGITATION SYSTEM AND HYDRAULIC PUMP FOR MIXING SEED, WATER AND FERTILIZER AND SPRAYING THE MIX ONTO THE PREPARED SEEDBED. MULCH SHALL NOT BE INCLUDED IN THE TANK WITH SEED. SHORT FIBERED MULCH MAY BE APPLIED WITH A HYDROSEEDER FOLLOWING SEEDING. (ALSO SEE SECTION 4-MULCHING BELOW). HYDROSEEDING IS NOT A PREFERRED SEEDING METHOD BECAUSE SEED AND FERTILIZER ARE APPLIED TO THE SURFACE AND NOT INCORPORATED INTO THE SOIL. WHEN POOR SEED TO SOIL CONTACT OCCURS, THERE IS A REDUCED SEED GERMINATION AND GROWTH.

4. MULCHING

MULCHING IS REQUIRED ON ALL SEEDING. MULCH WILL INSURE AGAINST EROSION BEFORE GRASS IS ESTABLISHED AND WILL PROMOTE FASTER AND EARLIER ESTABLISHMENT. THE EXISTENCE OF VEGETATION SUFFICIENT TO CONTROL SOIL EROSION SHALL BE DEEMED COMPLIANCE WITH THIS MULCHING REQUIREMENT.

A. STRAW OR HAY. UNROTTED SMALL GRAIN STRAW, HAY FREE OF SEEDS, TO BE APPLIED AT THE RATE OF 1-1/2 TO 2 TONS PER ACRE (70 TO 90 POUNDS PER 1,000 SQUARE FEET), EXCEPT THAT WHERE A CRIMPER IS USED INSTEAD OF A LIQUID MULCH-BINDER (TACKIFYING OR ADHESIVE AGENT), THE RATE OF APPLICATION IS 3 TONS PER ACRE. MULCH CHOPPER-BLOWERS MUST NOT GRIND THE MULCH. HAY MULCH IS NOT RECOMMENDED FOR ESTABLISHING FINE TURF OR LAWNS DUE TO THE PRESENCE OF WEED SEED.

APPLICATION - SPREAD MULCH UNIFORMLY BY HAND OR MECHANICALLY SO THAT AT LEAST 85% OF THE SOIL SURFACE IS COVERED. FOR UNIFORM DISTRIBUTION OF HAND-SPREAD MULCH, DIVIDE AREA INTO APPROXIMATELY 1,000 SQUARE FEET SECTIONS AND DISTRIBUTE 70 TO 90 POUNDS WITHIN EACH SECTION.

ANCHORING SHALL BE ACCOMPLISHED IMMEDIATELY AFTER PLACEMENT TO MINIMIZE LOSS BY WIND OR WATER. THIS MAY BE DONE BY ONE OF THE FOLLOWING METHODS, DEPENDING UPON THE SIZE OF THE AREA, STEEPNESS OF SLOPES, AND COSTS.

1. PEG AND TWINE. DRIVE 8 TO 10 INCH WOODEN PEGS TO WITHIN 2 TO 3 INCHES OF THE SOIL SURFACE EVERY 4 FEET IN ALL DIRECTIONS. STAKES MAY BE DRIVEN BEFORE OR AFTER APPLYING MULCH. SECURE MULCH TO SOIL SURFACE BY STRETCHING TWINE BETWEEN PEGS IN A CRISS-CROSS AND A SQUARE PATTERN. SECURE TWINE AROUND EACH PEG WITH TWO OR MORE ROUND TURNS.

2. MULCH NETTINGS - STAPLE PAPER, JUTE, COTTON, OR PLASTIC NETTINGS TO THE SOIL SURFACE. USE A DEGRADABLE NETTING IN AREAS TO BE MOWED.

3. CRIMPER (MULCH ANCHORING COULTER TOOL) - A TRACTOR-DRAWN IMPLEMENT, SOMEWHAT LIKE A DISC HARROW, ESPECIALLY DESIGNED TO PUSH OR CUT SOME OF THE BROADCAST LONG FIBER MULCH 3 TO 4 INCHES INTO THE SOIL SO AS TO ANCHOR IT AND LEAVE PART STANDING UPRIGHT. THIS TECHNIQUE IS LIMITED TO AREAS TRAVERSABLE BY A TRACTOR, WHICH MUST OPERATE ON THE CONTOUR OF SLOPES. STRAW MULCH RATE MUST BE 3 TONS PER ACRE. NO TACKIFYING OR ADHESIVE AGENT IS REQUIRED.

4. LIQUID MULCH-BINDERS - MAY BE USED TO ANCHOR SALT HAY, HAY OR STRAW MULCH.

(A) APPLICATIONS SHOULD BE HEAVIER AT EDGES WHERE WIND MAY CATCH THE MULCH, IN VALLEYS, AND AT CRESTS OF BANKS. THE REMAINDER OF THE AREA SHOULD BE UNIFORM IN APPEARANCE.

(B) USE ONE OF THE FOLLOWING:

(1) ORGANIC AND VEGETABLE BASED BINDERS - NATURALLY OCCURRING, POWDER BASED, HYDROPHILIC MATERIALS WHEN MIXED WITH WATER FORMULATES A GEL AND WHEN APPLIED TO MULCH UNDER SATISFACTORY CURING CONDITIONS WILL FORM MEMBRANED NETWORKS OF INSOLUBLE POLYMERS. THE VEGETABLE GEL SHALL BE PHYSIOLOGICALLY HARMLESS AND NOT RESULT IN A PHYTOTOXIC EFFECT OR IMPEDE GROWTH OF TURF GRASS. USE AT RATES AND WEATHER CONDITIONS AS RECOMMENDED BY THE MANUFACTURER TO ANCHOR MULCH MATERIALS. MANY NEW PRODUCTS ARE AVAILABLE, SOME OF WHICH MAY NEED FURTHER EVALUATION FOR USE IN THIS STATE.

(2) SYNTHETIC BINDERS - HIGH POLYMER SYNTHETIC EMULSION, MISCIBLE WITH WATER WHEN DILUTED AND FOLLOWING APPLICATION TO MULCH, DRYING AND CURING SHALL NO LONGER BE SOLUBLE OR DISPERSIBLE IN WATER. IT SHALL BE APPLIED AT RATES RECOMMENDED BY THE MANUFACTURER AND REMAIN TACKY UNTIL GERMINATION OF GRASS.

NOTE: ALL NAMES GIVEN ABOVE ARE REGISTERED TRADE NAMES. THIS DOES NOT CONSTITUTE A RECOMMENDATION OF THESE PRODUCTS TO THE EXCLUSION OF OTHER PRODUCTS.

B. WOOD-FIBER OR PAPER-FIBER MULCH - SHALL BE MADE FROM WOOD, PLANT FIBERS OR PAPER CONTAINING NO GROWTH OR GERMINATION INHIBITING MATERIALS, USED AT THE RATE OF 1,500 POUNDS PER ACRE (OR AS RECOMMENDED BY THE PRODUCT MANUFACTURER) AND MAY BE APPLIED BY A HYDROSEEDER. MULCH SHALL NOT BE MIXED IN THE TANK WITH SEED. USE IS LIMITED TO FLATTER SLOPES AND DURING OPTIMUM SEEDING PERIODS IN SPRING AND FALL.

C. PELLETIZED MULCH - COMPRESSED AND EXTRUDED PAPER AND/OR WOOD FIBER PRODUCT, WHICH MAY CONTAIN CO-POLYMERS, TACKIFIERS, FERTILIZERS AND COLORING AGENTS. THE DRY PELLETS, WHEN APPLIED TO A SEEDED AREA AND WATERED, FORM A MULCH MAT. PELLETIZED MULCH SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. MULCH MAY BE APPLIED BY HAND OR MECHANICAL SPREADER AT THE RATE OF 60-75 LBS/1,000 SQUARE FEET AND ACTIVATED WITH 0.2 TO 0.4 INCHES OF WATER. THIS MATERIAL HAS BEEN FOUND TO BE BENEFICIAL FOR USE ON SMALL LAWN OR RENOVATION AREAS, SEEDED AREAS WHERE WEED-SEED FREE MULCH IS DESIRED OR ON SITES WHERE STRAW MULCH AND TACKIFIER AGENT ARE NOT PRACTICAL OR DESIRABLE. APPLYING THE FULL 0.2 TO 0.4 INCHES OF WATER AFTER SPREADING PELLETIZED MULCH ON THE SEED BED IS EXTREMELY IMPORTANT FOR SUFFICIENT ACTIVATION AND EXPANSION OF THE MULCH TO PROVIDE SOIL COVERAGE.

5. IRRIGATION (WHERE FEASIBLE)

IF SOIL MOISTURE IS DEFICIENT, AND MULCH IS NOT USED, SUPPLY NEW SEEDING WITH ADEQUATE WATER (A MINIMUM OF 1/4 INCH APPLIED UP TO TWICE A DAY UNTIL VEGETATION IS WELL ESTABLISHED). THIS IS ESPECIALLY TRUE WHEN SEEDINGS ARE MADE IN ABNORMALLY DRY OR HOT WEATHER OR ON DROUGHTY SITES.

6. TOPDRESSING

SINCE SOIL ORGANIC MATTER CONTENT AND SLOW RELEASE NITROGEN FERTILIZER (WATER INSOLUBLE) ARE PRESCRIBED IN SECTION 2A - SEEDBED PREPARATION IN THIS STANDARD, NO FOLLOW-UP OF TOPDRESSING IS MANDATORY. AN EXCEPTION MAY BE MADE WHERE GROSS NITROGEN DEFICIENCY EXISTS IN THE SOIL TO THE EXTENT THAT TURF FAILURE MAY DEVELOP. IN THAT INSTANCE, TOPDRESS WITH 10-10-10 OR EQUIVALENT AT 300 POUNDS PER ACRE OR 7 POUNDS PER 1,000 SQUARE FEET EVERY 3 TO 5 WEEKS UNTIL THE GROSS NITROGEN DEFICIENCY IN THE TURF IS AMELIORATED.

7. ESTABLISHING PERMANENT VEGETATIVE STABILIZATION

THE QUALITY OF PERMANENT VEGETATION RESTS WITH THE CONTRACTOR. THE TIMING OF SEEDING, PREPARING THE SEEDBED, APPLYING NUTRIENTS, MULCH AND OTHER MANAGEMENT ARE ESSENTIAL. THE SEED APPLICATION RATES IN TABLE 4-3 ARE REQUIRED WHEN A REPORT OF COMPLIANCE IS REQUESTED PRIOR TO ACTUAL ESTABLISHMENT OF PERMANENT VEGETATION. UP TO 50% REDUCTION IN APPLICATION RATES MAY BE USED WHEN PERMANENT VEGETATION IS ESTABLISHED PRIOR TO REQUESTING A REPORT OF COMPLIANCE FROM THE DISTRICT. THESE RATES APPLY TO ALL METHODS OF SEEDING. ESTABLISHING PERMANENT VEGETATION MEANS 80% VEGETATIVE COVER (OF THE SEEDED SPECIES) AND MOWED ONCE. NOTE THIS DESIGNATION OF MOWED ONCE DOES NOT GUARANTEE THE PERMANENCY OF THE TURF SHOULD OTHER MAINTENANCE FACTORS BE NEGLECTED OR OTHERWISE MISMANAGED.

Table 4-2
Permanent Stabilization Mixtures for Various Uses

APPLICATION	PLANTING MIXTURES BY SOIL DRAINAGE CLASS (1) (SEE TABLE 4-3)		
	EXCESSIVELY DRAINED	WELL TO MODERATELY WELL DRAINED	SOMEWHAT POORLY TO POORLY DRAINED
RESIDENTIAL/COMMERCIAL LOTS	10, 12, 15	6, 10, 12, 13, 14, 15	16
POND AND CHANNEL BANKS, DIKES, BERMS AND DAMS	2, 5, 6, 10	5, 6, 7, 8, 9, 15	2, 8, 16, 17
DRAINAGE DITCHES, SWALES, DETENTION BASINS	2, 9, 11	2, 7, 9, 11, 12, 17	2, 9, 16, 17
FILTER STRIPS	12	11, 12	11, 12
GRASSES WATERWAY, SPILLWAYS	2, 3, 9, 10, 12	6, 7, 9, 10, 11, 12	2, 9, 11, 12
RECREATION AREAS, ATHLETIC FIELDS	5, 12, 15, 18	12, 13, 14, 15, 18	16
SPECIAL PROBLEM SITES,STEEP SLOPES AND BANKS, ROADSIDES, BORROW AREAS	2, 3, 4, 6	2, 3, 5, 7, 8, 9, 10, 15, 18	2, 9, 10, 11, 12
SAND AND GRAVEL PITS, SANITARY LANDFILLS	1, 2, 3, 4, 6, 20	1, 2, 3, 4, 5, 6, 8, 15, 20	2, 8
DREDGED MATERIAL, SPOILBANKS, BORROW AREAS	2, 3, 6, 20	2, 3, 6, 11	2, 8
STREAMBANKS & SHORELINES (2)	2, 8, 20, 21a	2, 8, 19b, 20, 21a, 21b	2, 8, 19a, 21a, b, c, d
UTILITY RIGHTS-OF-WAY	3, 7, 18	3, 7	8, 9, 17

1. REFER TO SOIL SURVEYS FOR DRAINAGE CLASS DESCRIPTIONS.
2. REFER TO SOIL BIOENGINEERING STANDARD FOR ADDITIONAL SEED MIXTURES.
3. SPILLWAYS ONLY.
4. SEE APPENDIX E FOR DESCRIPTION OF TURF GRASSES AND CULTIVARS.

TEMPORARY VEGETATIVE COVER FOR SOIL STABILIZATION:

1. SITE PREPARATION

A. GRADE AS NEEDED AND FEASIBLE TO PERMIT THE USE OF CONVENTIONAL EQUIPMENT FOR SEEDBED PREPARATION, SEEDING, MULCH APPLICATION, AND MULCH ANCHORING. ALL GRADING SHOULD BE DONE IN ACCORDANCE WITH THE STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY (STANDARDS) FOR LAND GRADING, PG 19-1.

B. INSTALL NEEDED EROSION CONTROL PRACTICES OR FACILITIES SUCH AS DIVERSIONS, GRADE STABILIZATION STRUCTURES, CHANNEL STABILIZATION MEASURES, SEDIMENT BASINS, AND WATERWAYS. SEE STANDARDS 11 THROUGH 42.

C. IMMEDIATELY PRIOR TO SEEDING, THE SURFACE SHOULD BE SCARIFIED 6" TO 12" WHERE THERE HAS BEEN SOIL COMPACTION. THIS PRACTICE IS PERMISSIBLE ONLY WHERE THERE IS NO DANGER TO UNDERGROUND UTILITIES (CABLES, IRRIGATION SYSTEMS, ETC.).

2. SEEDBED PREPARATION

A. APPLY GROUND LIMESTONE AND FERTILIZER ACCORDING TO SOIL TEST RECOMMENDATIONS SUCH AS OFFERED BY RUTGERS CO-OPERATIVE EXTENSION. SOIL SAMPLE MAILERS ARE AVAILABLE FROM THE LOCAL RUTGERS COOPERATIVE EXTENSION OFFICES. FERTILIZER SHALL BE APPLIED AT THE RATE OF 500 POUNDS PER ACRE OR 11 POUNDS PER 1,000 SQUARE FEET OF 10-20-10 OR EQUIVALENT WITH 50% WATER INSOLUBLE NITROGEN UNLESS A SOIL TEST INDICATES OTHERWISE. LIMING RATES SHALL BE ESTABLISHED VIA SOIL TESTING. CALCIUM CARBONATE IS THE EQUIVALENT AND STANDARD FOR MEASURING THE ABILITY OF LIMING MATERIALS TO NEUTRALIZE SOIL ACIDITY AND SUPPLY CALCIUM AND MAGNESIUM TO GRASSES AND LEGUMES.

B. WORK LIME AND FERTILIZER INTO THE SOIL AS NEARLY AS PRACTICAL TO A DEPTH OF 4 INCHES WITH A DISC, SPRINGTOOTH HARROW, OR OTHER SUITABLE EQUIPMENT. THE FINAL HARROWING OR DISKING OPERATION SHOULD BE ON THE GENERAL CONTOUR. CONTINUE TILLAGE UNTIL A REASONABLE UNIFORM SEEDBED IS PREPARED.

C. INSPECT SEEDBED JUST BEFORE SEEDING. IF TRAFFIC HAS LEFT THE SOIL COMPACTED, THE AREA MUST BE RETILLED IN ACCORDANCE WITH THE ABOVE.

D. SOILS HIGH IN SULFIDES OR HAVING A PH OF 4 OR LESS REFER TO STANDARD FOR MANAGEMENT OF HIGH ACID PRODUCING SOILS.

3. SEEDING

A. SELECT SEED FROM RECOMMENDATIONS IN TABLE 7-2 BELOW.

TABLE 7-2

TEMPORARY VEGETATIVE STABILIZATION GRASSES, SEEDING RATES, DATES AND DEPTH

SEED SELECTIONS	SEEDING RATE (1) (pounds)		OPTIMUM SEEDING DATE (2) Based on Plant Hardiness Zone (3)			OPTIMUM SEED DEPTH (4) (inches)
	Per Acre	Per 1000 Sq. Ft.	ZONE 5b, 6s	ZONE 6b	ZONE 7a, b	
COOL SEASON GRASSES						
1. Perennial ryegrass	100	1.0	3/15-6/1 8/1-9/15	3/1-5/15 8/15-10/1	2/15-5/1 8/15-10/15	0.5
2. Spring oats	86	2.0	3/15-6/1 8/1-9/15	3/1-5/15 8/15-10/1	2/15-5/1 8/15-10/15	1.0
3. Winter Barley	96	2.2	8/1-9/15	8/15-10/1	8/15-10/15	1.0
4. Annual ryegrass	100	1.0	3/15-6/1 8/1-9/15	3/15-6/1 8/1-9/15	2/15-5/1 8/15-10/15	0.5
5. Winter Cereal Rye	112	2.8	8/1 - 11/1	8/1 - 11/15	8/1 - 12/15	1.0
WARM SEASON GRASSES						
6. Pearl millet	20	0.5	6/1-8/1	5/15-8/15	5/1-9/1	1.0
7. Millet (German or Hungarian)	30	0.7	6/1-8/1	5/15-8/15	5/1-9/1	1.0

1 SEEDING RATE FOR WARM SEASON GRASS, SELECTIONS 5 - 7 SHALL BE ADJUSTED TO REFLECT THE AMOUNT OF PURE LIVE SEED (PLS) AS DETERMINED BY A GERMINATION TEST RESULT. NO ADJUSTMENT IS REQUIRED FOR COOL SEASON GRASSES.
2 MAY BE PLANTED THROUGHOUT SUMMER IF SOIL MOISTURE IS ADEQUATE OR SEEDED AREA CAN BE IRRIGATED.
3 PLANT HARDINESS ZONE
4 TWICE THE DEPTH FOR SANDY SOILS

B. CONVENTIONAL SEEDING. APPLY SEED UNIFORMLY BY HAND, CYCLONE (CENTRIFUGAL) SEEDER, DROP SEEDER, DRILL OR CULTIPACKER SEEDER. EXCEPT FOR DRILLED, HYDROSEEDED OR CULTIPACKED SEEDINGS, SEED SHALL BE INCORPORATED INTO THE SOIL, TO A DEPTH OF 1/4 TO 1/2 INCH, BY RAKING OR DRAGGING. DEPTH OF SEED PLACEMENT MAY BE 1/4 INCH DEEPER ON COARSE TEXTURED SOIL.

C. HYDROSEEDING IS A BROADCAST SEEDING METHOD USUALLY INVOLVING A TRUCK OR TRAILER MOUNTED TANK, WITH AN AGITATION SYSTEM AND HYDRAULIC PUMP FOR MIXING SEED, WATER AND FERTILIZER AND SPRAYING THE MIX ONTO THE PREPARED SEEDBED. MULCH SHALL NOT BE INCLUDED IN THE TANK WITH SEED. SHORT FIBERED MULCH MAY BE APPLIED WITH A HYDROSEEDER FOLLOWING SEEDING. (ALSO SEE SECTION4-MULCHING). HYDROSEEDING IS NOT A PREFERRED SEEDING METHOD BECAUSE SEED AND FERTILIZER ARE APPLIED TO THE SURFACE AND NOT INCORPORATED INTO THE SOIL BECAUSE POOR SEED TO SOIL CONTACT REDUCES SEED GERMINATION AND GROWTH.

D. AFTER SEEDING, FIRMING THE SOIL WITH A CORRUGATED ROLLER WILL ASSURE GOOD SEED-TO-SOIL CONTACT, RESTORE CAPILLARITY, AND IMPROVE SEEDLING EMERGENCE. THIS IS THE PREFERRED METHOD. WHEN PERFORMED ON THE CONTOUR, SHEET EROSION WILL BE MINIMIZED AND WATER CONSERVATION ON SITE WILL BE MAXIMIZED.

4. MULCHING

MULCHING IS REQUIRED ON ALL SEEDING. MULCH WILL INSURE AGAINST EROSION BEFORE GRASS IS ESTABLISHED AND WILL PROMOTE FASTER AND EARLIER ESTABLISHMENT. THE EXISTENCE OF VEGETATION SUFFICIENT TO CONTROL SOIL EROSION SHALL BE DEEMED COMPLIANCE WITH THIS MULCHING REQUIREMENT.

A. STRAW OR HAY. UNROTTED SMALL GRAIN STRAW, HAY FREE OF SEEDS, APPLIED AT THE RATE OF 1-1/2 TO 2 TONS PER ACRE (70 TO 90 POUNDS PER 1,000 SQUARE FEET), EXCEPT THAT WHERE A CRIMPER IS USED INSTEAD OF A LIQUID MULCH-BINDER (TACKIFYING OR ADHESIVE AGENT), THE RATE OF APPLICATION IS 3 TONS PER ACRE. MULCH CHOPPER-BLOWERS MUST NOT GRIND THE MULCH. HAY MULCH IS NOT RECOMMENDED FOR ESTABLISHING FINE TURF OR LAWNS DUE TO THE PRESENCE OF WEED SEED.

APPLICATION: SPREAD MULCH UNIFORMLY BY HAND OR MECHANICALLY SO THAT APPROXIMATELY 95% OF THE SOIL SURFACE WILL BE COVERED. FOR UNIFORM DISTRIBUTION OF HAND-SPREAD MULCH, DIVIDE AREA INTO APPROXIMATELY 1,000 SQUARE FEET SECTIONS AND DISTRIBUTE 70 TO 90 POUNDS WITHIN EACH SECTION.

ANCHORING SHALL BE ACCOMPLISHED IMMEDIATELY AFTER PLACEMENT TO MINIMIZE LOSS BY WIND OR WATER. THIS MAY BE DONE BY ONE OF THE FOLLOWING METHODS, DEPENDING UPON THE SIZE OF THE AREA, STEEPNESS OF SLOPES, AND COSTS.

(1) PEG AND TWINE. DRIVE 8 TO 10 INCH WOODEN PEGS TO WITHIN 2 TO 3 INCHES OF THE SOIL SURFACE EVERY 4 FEET IN ALL DIRECTIONS. STAKES MAY BE DRIVEN BEFORE OR AFTER APPLYING MULCH. SECURE MULCH TO SOIL SURFACE BY STRETCHING TWINE BETWEEN PEGS IN A CRIS-CROSS AND A SQUARE PATTERN. SECURE TWINE AROUND EACH PEG WITH TWO OR MORE ROUND TURNS.

(2) MULCH NETTINGS. STAPLE PAPER, JUTE, COTTON, OR PLASTIC NETTINGS TO THE SOIL SURFACE. USE DEGRADABLE NETTING IN AREAS TO BE MOWED.

(3) CRIMPER (MULCH ANCHORING COULTER TOOL). A TRACTOR-DRAWN IMPLEMENT, SOMEWHAT LIKE A DISC HARROW, ESPECIALLY DESIGNED TO PUSH OR CUT SOME OF THE BROADCAST LONG FIBER MULCH 3 TO 4 INCHES INTO THE SOIL SO AS TO ANCHOR IT AND LEAVE PART STANDING UPRIGHT. THIS TECHNIQUE IS LIMITED TO AREAS TRAVERSABLE BY A TRACTOR, WHICH MUST OPERATE ON THE CONTOUR OF SLOPES. STRAW MULCH RATE MUST BE 3 TONS PER ACRE. NO TACKIFYING OR ADHESIVE AGENT IS REQUIRED.

(4) LIQUID MULCH-BINDERS - MAY BE USED TO ANCHOR HAY OR STRAW MULCH.

(A) APPLICATIONS SHOULD BE HEAVIER AT EDGES WHERE WIND MAY CATCH THE MULCH, IN VALLEYS, AND AT CRESTS OF BANKS. THE REMAINDER OF THE AREA SHOULD BE UNIFORM IN APPEARANCE.

(B) USE ONE OF THE FOLLOWING:

(1) ORGANIC AND VEGETABLE BASED BINDERS - NATURALLY OCCURRING, POWDER BASED, HYDROPHILIC MATERIALS WHEN MIXED WITH WATER FORMULATES A GEL AND WHEN APPLIED TO MULCH UNDER SATISFACTORY CURING CONDITIONS WILL FORM MEMBRANED NETWORKS OF INSOLUBLE POLYMERS. THE VEGETABLE GEL SHALL BE PHYSIOLOGICALLY HARMLESS AND NOT RESULT IN A PHYTOTOXIC EFFECT OR IMPEDE GROWTH OF TURFGRASS. USE AT RATES AND WEATHER CONDITIONS AS RECOMMENDED BY THE MANUFACTURER TO ANCHOR MULCH MATERIALS. MANY NEW PRODUCTS ARE AVAILABLE, SOME OF WHICH MAY NEED FURTHER EVALUATION FOR USE IN THIS STATE.

(2) SYNTHETIC BINDERS - HIGH POLYMER SYNTHETIC EMULSION, MISCIBLE WITH WATER WHEN DILUTED AND FOLLOWING APPLICATION TO MULCH, DRYING AND CURING SHALL NO LONGER BE SOLUBLE OR DISPERSIBLE IN WATER. IT SHALL BE APPLIED AT RATES RECOMMENDED BY THE MANUFACTURER AND REMAIN TACKY UNTIL GERMINATION OF GRASS.

NOTE: ALL NAMES GIVEN ABOVE ARE REGISTERED TRADE NAMES. THIS DOES NOT CONSTITUTE A COMMENDATIONS OF THESE PRODUCTS TO THE EXCLUSION OF OTHER PRODUCTS.

B. WOOD-FIBER OR PAPER-FIBER MULCH. SHALL BE MADE FROM WOOD, PLANT FIBERS OR PAPER CONTAINING NO GROWTH OR GERMINATION INHIBITING MATERIALS, USED AT THE RATE OF 1,500 POUNDS PER ACRE (OR AS RECOMMENDED BY THE PRODUCT MANUFACTURER) AND MAY BE APPLIED BY A HYDROSEEDER. THIS MULCH SHALL NOT BE MIXED IN THE TANK WITH SEED. USE IS LIMITED TO FLATTER SLOPES AND DURING OPTIMUM SEEDING PERIODS IN SPRING AND FALL.

C. PELLETIZED MULCH. COMPRESSED AND EXTRUDED PAPER AND/OR WOOD FIBER PRODUCT, WHICH MAY CONTAIN CO-POLYMERS, TACKIFIERS, FERTILIZERS AND COLORING AGENTS. THE DRY PELLETS, WHEN APPLIED TO A SEEDED AREA AND WATERED, FORM A MULCH MAT. PELLETIZED MULCH SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. MULCH MAY BE APPLIED BY HAND OR MECHANICAL SPREADER AT THE RATE OF 60-75 LBS/1,000 SQUARE FEET AND ACTIVATED WITH 0.2 TO 0.4 INCHES OF WATER. THIS MATERIAL HAS BEEN FOUND TO BE BENEFICIAL FOR USE ON SMALL LAWN OR RENOVATION AREAS, SEEDED AREAS WHERE WEED-SEED FREE MULCH IS DESIRED OR ON SITES WHERE STRAW MULCH AND TACKIFIER AGENT ARE NOT PRACTICAL OR DESIRABLE.

APPLYING THE FULL 0.2 TO 0.4 INCHES OF WATER AFTER SPREADING PELLETIZED MULCH ON THE SEED BED IS EXTREMELY IMPORTANT FOR SUFFICIENT ACTIVATION AND EXPANSION OF THE MULCH TO PROVIDE SOIL COVERAGE.

Table 4-3
PERMANENT VEGETATIVE MIXTURES, PLANTINGS RATES AND PLANTINGS DATES (1)

SEED MIXTURE (2)	PLANTING RATE (3)		PLANTING DATES: O=Optimal Planting period A=Acceptable Planting period — PLANT HARDINESS ZONES									MAINTENANCE LEVEL(4)	REMARKS
			Zone 5b, 6a			Zone 6b			Zone 7a, 7b				
	lbs/acre	lbs/1000 sq. ft.	3/15-5/31	6/1-7/31	8/1-10/1	3/1-4/30	5/1-8/14	8/15-10/15	2/1-4/30	5/1-8/14	8/15-10/30		
COOL SEASON SEED MIXTURES													
Hard fescue and/or Chewing fescue and/or Strong creeping red fescue / Perennial ryegrass / Ky. bluegrass (blend)	175 / 45 / 45	4.0 / 1.0 / 1.0	A	A	O 5	A	A	O	A 5	A 5	O	A-C	General lawn/recreation.

STANDARD NOTES FOR TOPSOILING:

1. DEFINITION:

TOPSOILING ENTAILS THE DISTRIBUTION OF SUITABLE QUALITY SOIL ON AREAS TO BE VEGETATED.

2. PURPOSE:

TO IMPROVE THE SOIL MEDIUM FOR PLANT ESTABLISHMENT AND MAINTENANCE.

3. WATER QUALITY ENHANCEMENT:

GROWTH AND ESTABLISHMENT OF A VIGOROUS VEGETATIVE COVER IS FACILITATED BY TOPSOIL, PREVENTING SOIL LOSS BY WIND AND RAIN OFFSITE AND INTO STREAMS AND OTHER STORMWATER CONVEYANCES.

4. WHERE APPLICABLE

TOPSOIL SHALL BE USED WHERE SOILS ARE TO BE DISTURBED AND WILL BE REVEGETATED.

5. METHODS AND MATERIALS

1. MATERIALS

A. TOPSOIL SHOULD BE FRIABLE1, LOAMY2, FREE OF DEBRIS, OBJECTIONABLE WEEDS AND STONES, AND CONTAIN NO TOXIC SUBSTANCE OR ADVERSE CHEMICAL OR PHYSICAL CONDITION THAT MAY BE HARMFUL TO PLANT GROWTH. SOLUBLE SALTS SHOULD NOT BE EXCESSIVE (CONDUCTIVITY LESS THAN 0.5 MILLIMHOS PER CENTIMETER. MORE THAN 0.5 MILLIMHOS MAY DESICCATE SEEDLINGS AND ADVERSELY IMPACT GROWTH). IMPORTED TOPSOIL SHALL HAVE A MINIMUM ORGANIC MATTER CONTENT OF 2.75 PERCENT. ORGANIC MATTER CONTENT MAY BE RAISED BY ADDITIVES.

B. TOPSOIL SUBSTITUTE IS A SOIL MATERIAL WHICH MAY HAVE BEEN AMENDED WITH SAND, SILT, CLAY, ORGANIC MATTER, FERTILIZER OR LIME AND HAS THE APPEARANCE OF TOPSOIL. TOPSOIL SUBSTITUTES MAY BE UTILIZED ON SITES WITH INSUFFICIENT TOPSOIL FOR ESTABLISHING PERMANENT VEGETATION. ALL TOPSOIL SUBSTITUTE MATERIALS SHALL MEET THE REQUIREMENTS OF TOPSOIL NOTED ABOVE. SOIL TESTS SHALL BE PERFORMED TO DETERMINE THE COMPONENTS OF SAND, SILT, CLAY, ORGANIC MATTER, SOLUBLE SALTS AND PH LEVEL.

2. STRIPPING AND STOCKPILING

A. FIELD EXPLORATION SHOULD BE MADE TO DETERMINE WHETHER QUANTITY AND OR QUALITY OF SURFACE SOIL JUSTIFIES STRIPPING.

B. STRIPPING SHALL BE CONFINED TO THE IMMEDIATE CONSTRUCTION AREA.

C. WHERE FEASIBLE, LIME MAY BE APPLIED BEFORE STRIPPING AT A RATE DETERMINED BY SOIL TESTS TO BRING THE SOIL PH TO APPROXIMATELY 6.5.

D. A 4-6 INCH STRIPPING DEPTH IS COMMON, BUT MAY VARY DEPENDING ON THE PARTICULAR SOIL.

E. STOCKPILES OF TOPSOIL SHOULD BE SITUATED SO AS NOT TO OBSTRUCT NATURAL DRAINAGE OR CAUSE OFF-SITE ENVIRONMENTAL DAMAGE.

F. STOCKPILES SHOULD BE VEGETATED IN ACCORDANCE WITH STANDARDS PREVIOUSLY DESCRIBED HEREIN; SEE STANDARDS FOR PERMANENT (PG. 4-1) OR TEMPORARY (PG.7-1) VEGETATIVE COVER FOR SOIL STABILIZATION. WEEDS SHOULD NOT BE ALLOWED TO GROW ON STOCKPILES.

3. SITE PREPARATION

A. GRADE AT THE ONSET OF THE OPTIMAL SEEDING PERIOD SO AS TO MINIMIZE THE DURATION AND AREA OF EXPOSURE OF DISTURBED SOIL TO EROSION. IMMEDIATELY PROCEED TO ESTABLISH VEGETATIVE COVER IN ACCORDANCE WITH THE SPECIFIED SEED MIXTURE. TIME IS OF THE ESSENCE

B. GRADE AS NEEDED AND FEASIBLE TO PERMIT THE USE OF CONVENTIONAL EQUIPMENT FOR SEEDBED PREPARATION, SEEDING, MULCH APPLICATION AND ANCHORING, AND MAINTENANCE. SEE THE STANDARD FOR LAND GRADING, PG. 19-1.

C. AS GUIDANCE FOR IDEAL CONDITIONS, SUBSOIL SHOULD BE TESTED FOR LIME REQUIREMENT. LIMESTONE, IF NEEDED, SHOULD BE APPLIED TO BRING SOIL TO A PH OF APPROXIMATELY 6.5 AND INCORPORATED INTO THE SOIL AS NEARLY AS PRACTICAL TO A DEPTH OF 4 INCHES.

D. PRIOR TO TOPSOILING, THE SUBSOIL SHALL BE IN COMPLIANCE WITH THE STANDARD FOR LAND GRADING, PG. 19-1.

E. EMPLOY NEEDED EROSION CONTROL PRACTICES SUCH AS DIVERSIONS, GRADE STABILIZATION STRUCTURES, CHANNEL STABILIZATION MEASURES, SEDIMENTATION BASINS, AND WATERWAYS. SEE STANDARDS 11 THROUGH 42.

4. APPLYING TOPSOIL

A. TOPSOIL SHOULD BE HANDLED ONLY WHEN IT IS DRY ENOUGH TO WORK WITHOUT DAMAGING SOIL STRUCTURE; I.E., LESS THAN FIELD CAPACITY (SEE GLOSSARY).

B. A UNIFORM APPLICATION TO AN AVERAGE DEPTH OF 5.0 INCHES, MINIMUM OF 4 INCHES, FIRMED IN PLACE IS REQUIRED. ALTERNATIVE DEPTHS MAY BE CONSIDERED WHERE SPECIAL REGULATORY AND/OR INDUSTRY DESIGN STANDARDS ARE APPROPRIATE SUCH AS ON GOLF COURSES, SPORTS FIELDS, LANDFILL CAPPING, ETC.. SOILS WITH A PH OF 4.0 OR LESS OR CONTAINING IRON SULFIDE SHALL BE COVERED WITH A MINIMUM DEPTH OF 12 INCHES OF SOIL HAVING A PH OF 5.0 OR MORE, IN ACCORDANCE WITH THE STANDARD FOR MANAGEMENT OF HIGH ACID PRODUCING SOIL (PG. 1-1).

C. PURSUANT TO THE REQUIREMENTS IN SECTION 7 OF THE STANDARD FOR PERMANENT VEGETATIVE STABILIZATION, THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT PERMANENT VEGETATIVE COVER BECOMES ESTABLISHED ON AT LEAST 80% OF THE SOILS TO BE STABILIZED WITH VEGETATION. FAILURE TO ACHIEVE THE MINIMUM COVERAGE MAY REQUIRE ADDITIONAL WORK TO BE PERFORMED BY THE CONTRACTOR TO INCLUDE SOME OR ALL OF THE FOLLOWING: SUPPLEMENTAL SEEDING, RE-APPLICATION OF LIME AND FERTILIZERS, AND/OR THE ADDITION OF ORGANIC MATTER (I.E. COMPOST) AS A TOP DRESSING. SUCH ADDITIONAL MEASURES SHALL BE BASED ON SOIL TESTS SUCH AS THOSE OFFERED BY RUTGERS COOPERATIVE EXTENSION SERVICE OR OTHER APPROVED LABORATORY FACILITIES QUALIFIED TO TEST SOIL SAMPLES FOR AGRONOMIC PROPERTIES.

FOOTNOTES:

1. SEE APPENDIX B OF THE STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY FOR DESCRIPTIONS OF TURF GRASS MIXTURES AND CULIVARS. THE ACTUAL AMOUNT OF WARM SEASON GRASS MIXTURE USED IN TABLE 3 (SEED MIX 1-7) SHALL BE ADJUSTED TO REFLECT THE AMOUNT OF PURE LIVE SEED (PLS) AS DETERMINED BY GERMINATION TESTING RESULTS. NO ADJUSTMENT IS REQUIRED FOR COOL SEASON GRASSES (SEED MIXTURES 8-20).

2. SEEDING MIXTURES AND/OR RATES NOT LISTED ABOVE MAY BE USED IF RECOMMENDED BY THE LOCAL SOIL CONSERVATION DISTRICT, NATURAL RESOURCES CONSERVATION SERVICE; RECOMMENDATIONS OF RUTGERS COOPERATIVE EXTENSION MAY BE USED IF APPROVED BY THE SOIL CONSERVATION DISTRICT. LEGUMES (WHITE CLOVER, FLATPEA, LESPEDEZA) SHOULD BE MIXED WITH PROPER INNOCULANT PRIOR TO PLANTING.

3. SEEDING RATES SPECIFIED ARE REQUIRED WHEN A REPORT OF COMPLIANCE IS REQUESTED PRIOR TO ACTUAL ESTABLISHMENT OF PERMANENT VEGETATION. UP TO 50% REDUCTION IN RATES MAY BE USED WHEN PERMANENT VEGETATION IS ESTABLISHED PRIOR TO A REPORT OF COMPLIANCE INSPECTION. THESE RATES APPLY TO ALL METHODS OF SEEDING. ESTABLISHING PERMANENT VEGETATION MEANS 80 % VEGETATIVE COVERAGE OF THE SEEDED AREA AND MOWED ONCE. GRASS SEED MIXTURE CHECKED BY THE STATE SEED ANALYST, NEW JERSEY DEPARTMENT OF AGRICULTURE, TRENTON, NEW JERSEY, WILL ASSURE THE PURCHASER THAT THE MIXTURE OBTAINED IS THE MIXTURE ORDERED, PURSUANT TO THE N.J. STATE SEED LAW, N.J.S.A. 4:8-17.13 ET. SEQ.

O = OPTIMAL PLANTING PERIOD A = ACCEPTABLE PLANTING PERIOD

4. MAINTENANCE LEVEL:

A: INTENSIVE MOWING, (2-4 DAYS), FERTILIZATION, LIME, PEST CONTROL AND IRRIGATION (EXAMPLES - HIGH MAINTENANCE LAWNS, COMMERCIAL AND RECREATION AREAS, PUBLIC FACILITIES).

B: FREQUENT MOWING, (4-7 DAYS), OCCASIONAL FERTILIZATION, LIME AND WEED CONTROL (EXAMPLES - HOME LAWNS, COMMERCIAL SITES, SCHOOL SITES).

C: PERIODIC MOWING (7-14 DAYS), OCCASIONAL FERTILIZATION AND LIME (EXAMPLES - HOME LAWNS, PARKS).

D: INFREQUENT OR NO MOWING, FERTILIZATION AND LIME THE FIRST YEAR OF ESTABLISHMENT (EXAMPLES - ROADSIDES, RECREATION AREAS, PUBLIC OPEN SPACES).

5. SUMMER SEEDINGS SHOULD ONLY BE CONDUCTED WHEN SITE IS IRRIGATED. MIXES INCLUDING WHITE CLOVER REQUIRE THAT AT LEAST SIX WEEKS OF GROWING SEASON REMAIN AFTER SEEDING TO ENSURE ESTABLISHMENT BEFORE FREEZING CONDITIONS.

6. PLANT HARDINESS ZONE - PROPERTY IN QUESTION IS WITHIN ZONE 6B.

SOMERSET COUNTY SOIL EROSION AND SEDIMENT CONTROL NOTES:

1. ALL SOIL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE INSTALLED PRIOR TO ANY MAJOR SOIL DISTURBANCES, OR IN THEIR PROPER SEQUENCE AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.
2. ANY DISTURBED AREAS THAT WILL BE LEFT EXPOSED MORE THAN 30 DAYS AND NOT SUBJECT TO CONSTRUCTION TRAFFIC, WILL IMMEDIATELY RECEIVE A TEMPORARY SEEDING. IF THE SEASON PREVENTS THE ESTABLISHMENT OF A TEMPORARY COVER, THE DISTURBED AREAS WILL BE MULCHED WITH STRAW, OR EQUIVALENT MATERIAL, AT A RATE OF TWO (2) TONS PER ACRE, ACCORDING TO NJ STATE STANDARDS
3. PERMANENT VEGETATION SHALL BE SEEDED OR SODDED ON ALL EXPOSED AREAS WITHIN TEN (10) DAYS AFTER FINAL GRADING. MULCH WILL BE USED FOR PROTECTION UNTIL SEEDING IS ESTABLISHED
4. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE NJ STATE STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY, 7TH EDITION LAST REVISED JANUARY 2014
5. A SUB-BASE COURSE WILL BE APPLIED IMMEDIATELY FOLLOWING ROUGH GRADING AND INSTALLATION OF IMPROVEMENTS IN ORDER TO STABILIZE STREETS, ROADS, DRIVEWAYS AND PARKING AREAS. IN AREAS WHERE NO UTILITIES ARE PRESENT, THE SUB-BASE SHALL BE INSTALLED WITHIN 15 DAYS OR PRELIMINARY GRADING.
6. IMMEDIATELY FOLLOWING INITIAL DISTURBANCE OR ROUGH GRADING ALL CRITICAL AREAS SUBJECT TO EROSION (I.E.: STEEP SLOPES, ROADWAY EMBANKMENTS) WILL RECEIVE A TEMPORARY SEEDING IN COMBINATION WITH STRAW MULCH OR A SUITABLE EQUIVALENT, AT A RATE OF TWO (2) TONS PER ACRE, ACCORDING TO THE NJ STATE STANDARDS.
7. ANY STEEP SLOPES RECEIVING PIPELINE INSTALLATION WILL BE BACKFILLED AND STABILIZED DAILY, AS THE INSTALLATION PROCEEDS (I.E.: SLOPES GREATER THAT 3:1)
8. TRAFFIC CONTROL STANDARDS REQUIRE THE INSTALLATION OF A 50'X30'X6'PAD OF 1 1/2" OR 2" STONE, AT ALL CONSTRUCTION DRIVEWAYS, IMMEDIATELY AFTER INITIAL SITE DISTURBANCE.
9. THE SOMERSET-UNION SOIL CONSERVATION DISTRICT SHALL BE NOTIFIED IN WRITING 48 HOURS IN ADVANCE OF ANY LAND DISTURBING ACTIVITY.
10. AT THE TIME WHEN THE SITE PREPARATION FOR PERMANENT VEGETATIVE STABILIZATION IS GOING TO BE ACCOMPLISHED, ANY SOIL THAT WILL NOT PROVIDE A SUITABLE ENVIRONMENT TO SUPPORT ADEQUATE VEGETATIVE GROUND COVER, SHALL BE REMOVED OR TREATED IN SUCH A WAY THAT WILL PERMANENTLY ADJUST THE SOIL CONDITIONS AND RENDER IT SUITABLE FOR VEGETATIVE GROUND COVER. IF THE REMOVAL OR TREATMENT OF THE SOIL WILL NOT PROVIDE SUITABLE CONDITIONS, NON-VEGETATIVE MEANS OF PERMANENT GROUND STABILIZATION WILL HAVE TO BE EMPLOYED. TOPSOIL SHOULD BE HANDLED ONLY WHEN IT IS DRY ENOUGH TO WORK WITHOUT DAMAGING THE SOIL STRUCTURE. A UNIFORM APPLICATION TO A DEPTH OF 5 INCHES (UNSETTLED) IS REQUIRED ON ALL SITES.
11. IN THAT NJSA 4:24-39 ET SEQ., REQUIRES THAT NO CERTIFICATE OF OCCUPANCY BE ISSUED BEFORE THE PROVISIONS OF THE CERTIFIED PLAN FOR SOIL EROSION AND SEDIMENT CONTROL HAVE BEEN COMPLIED WITH FOR PERMANENT MEASURES, ALL SITE WORK FOR SITE PLANS AND ALL WORK AROUND INDIVIDUAL LOTS IN SUBDIVISIONS, WILL HAVE TO BE COMPLETED PRIOR TO THE DISTRICT ISSUING A REPORT OF COMPLIANCE FOR THE ISSUANCE OF A CERTIFICATE OF OCCUPANCY BY THE MUNICIPALITY.
12. CONDUIT OUTLET PROTECTION MUST BE INSTALLED AT ALL REQUIRED OUTFALLS PRIOR TO THE DRAINAGE SYSTEM BECOMING OPERATIONAL.
13. ANY CHANGES TO THE CERTIFIED SOIL EROSION AND SEDIMENT CONTROL PLAN WILL REQUIRE THE SUBMISSION OF REVISED SOIL EROSION AND SEDIMENT CONTROL PLANS TO THE DISTRICT FOR RE-CERTIFICATION. THE REVISED PLANS MUST MEET ALL CURRENT NJ STATE SOIL EROSION& SEDIMENT CONTROL STANDARDS.
14. THE SOMERSET-UNION SOIL CONSERVATION DISTRICT SHALL BE NOTIFIED OF ANY CHANGES IN OWNERSHIP.
15. MULCHING TO THE NJ STANDARDS IS REQUIRED FOR OBTAINING A CONDITIONAL REPORT OF COMPLIANCE. CONDITIONALS ARE ONLY ISSUED WHEN THE SEASON PROHIBITS SEEDING.
16. CONTRACTOR IS RESPONSIBLE FOR KEEPING ALL ADJACENT ROADS CLEAN DURING LIFE OF CONSTRUCTION PROJECT.
17. THE DEVELOPER SHALL BE RESPONSIBLE FOR REMEDIATING ANY EROSION OR SEDIMENT PROBLEMS THAT ARISE AS A RESULT OF ONGOING CONSTRUCTION AT THE REQUEST OF THE SOMERSET-UNION SOIL CONSERVATION DISTRICT.
18. HYDRO SEEDING IS A TWO- STEP PROCESS. THE FIRST STEP INCLUDES SEED, FERTILIZER, LIME, ETC., ALONG WITH MINIMAL AMOUNTS OF MULCH TO PROMOTE CONSISTENCY, GOOD SEED TO SOIL CONTACT, AND GIVE A VISUAL INDICATION OF COVERAGE. UPON COMPLETION OF SEEDING OPERATION, HYDRO-MULCH SHOULD BE APPLIED AT A RATE OF 1500 LBS. PER ACRE IN SECOND STEP. THE USE OF HYDRO-MULCH, AS OPPOSED TO STRAW, IS LIMITED TO OPTIMUM SEEDING DATES AS LISTED IN THE NJ STANDARDS

STABILIZATION WITH MULCH ONLY:

1. SITE PREPARATION

A. GRADE AS NEEDED AND FEASIBLE TO PERMIT THE USE OF CONVENTIONAL EQUIPMENT FOR SEEDBED PREPARATION, SEEDING, MULCH APPLICATION, AND MULCH ANCHORING. ALL GRADING SHOULD BE DONE IN ACCORDANCE WITH THE STANDARDS FOR SOIL EROSION & SEDIMENT CONTROL FOR LAND GRADING.

B. INSTALL NEEDED EROSION CONTROL PRACTICES OR FACILITIES SUCH AS DIVERSIONS, GRADE STABILIZATION STRUCTURES, CHANNEL STABILIZATION MEASURES, SEDIMENT BASINS, AND WATERWAYS. SEE STANDARDS 11 THROUGH 42 OF STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY.

2. PROTECTIVE MATERIALS

A. UNROTTED SMALL-GRAIN STRAW AT 2.0 TO 2.5 TONS PER ACRE IS SPREAD UNIFORMLY AT 90 TO 115 POUNDS PER 1,000 SQUARE FEET AND ANCHORED WITH A MULCH ANCHORING TOOL, LIQUID MULCH BINDERS, OR NETTING TIE DOWN. OTHER SUITABLE MATERIALS MAY BE USED IF APPROVED BY THE SOIL CONSERVATION DISTRICT. THE APPROVED RATES ABOVE HAVE BEEN MET WHEN THE MULCH COVERS THE GROUND COMPLETELY UPON VISUAL INSPECTION, I.E. THE SOIL CANNOT BE SEEN BELOW THE MULCH.

B. ASPHALT EMULSION IS RECOMMENDED AT THE RATE OF 600 TO 1,200 GALLONS PER ACRE. THIS IS SUITABLE FOR A LIMITED PERIOD OF TIME WHERE TRAVEL BY PEOPLE, ANIMALS, OR MACHINES IS NOT A PROBLEM.

C. SYNTHETIC OR ORGANIC SOIL STABILIZERS MAY BE USED UNDER SUITABLE CONDITIONS AND IN QUANTITIES AS RECOMMENDED BY THE MANUFACTURER.

D. WOOD-FIBER OR PAPER-FIBER MULCH AT THE RATE OF 1,500 POUNDS PER ACRE (OR ACCORDING TO THE MANUFACTURER'S REQUIREMENTS) MAY BE APPLIED BY A HYDROSEEDER.

E. MULCH NETTING, SUCH AS PAPER JUTE, EXCELSIOR, COTTON, OR PLASTIC, MAY BE USED.

F. WOOD CHIPS APPLIED UNIFORMLY TO A MINIMUM DEPTH OF 2 INCHES MAY BE USED. WOOD CHIPS WILL NOT BE USED ON AREAS WHERE FLOWING WATER COULD WASH THEM INTO AN INLET AND PLUG IT.

G. GRAVEL, CRUSHED STONE, OR SLAG AT THE RATE OF 9 CUBIC YARDS PER 1,000 SQ. FT. APPLIED UNIFORMLY TO A MINIMUM DEPTH OF 3 INCHES MAY BE USED. SIZE 2 OR 3 (ASTM C-33) IS RECOMMENDED.

3. MULCH ANCHORING - SHOULD BE ACCOMPLISHED IMMEDIATELY AFTER PLACEMENT OF HAY OR STRAW MULCH TO MINIMIZE LOSS BY WIND OR WATER. THIS MAY BE DONE BY ONE OF THE FOLLOWING METHODS, DEPENDING UPON THE SIZE OF THE AREA AND STEEPNESS OF SLOPES.

A. PEG AND TWINE - DRIVE 8 TO 10 INCH WOODEN PEGS TO WITHIN 2 TO 3 INCHES OF THE SOIL SURFACE EVERY 4 FEET IN ALL DIRECTIONS. STAKES MAY BE DRIVEN BEFORE OR AFTER APPLYING MULCH. SECURE MULCH TO SOIL SURFACE BY STRETCHING TWINE BETWEEN PEGS IN A CRIS-CROSS AND A SQUARE PATTERN. SECURE TWINE AROUND EACH PEG WITH TWO OR MORE ROUND TURNS.

B. MULCH NETTINGS - STAPLE PAPER, COTTON, OR PLASTIC NETTINGS OVER MULCH. USE A DEGRADABLE NETTING IN AREA TO BE MOWED. NETTING IS USUALLY AVAILABLE IN ROLLS 4 FEET WIDE AND UP TO 300 FEET LONG.

C. CRIMPER MULCH ANCHORING COULTER TOOL - A TRACTOR-DRAWN IMPLEMENT ESPECIALLY DESIGNED TO PUNCH AND ANCHOR MULCH INTO THE SOIL SURFACE. THIS PRACTICE AFFORDS MAXIMUM EROSION CONTROL, BUT ITS USE IS LIMITED TO THOSE SLOPES UPON WHICH THE TRACTOR CAN OPERATE SAFELY. SOIL PENETRATION SHOULD BE ABOUT 3 TO 4 INCHES. ON SLOPING LAND, THE OPERATION SHOULD BE ON THE CONTOUR.

D. LIQUID MULCH-BINDERS

1. APPLICATIONS SHOULD BE HEAVIER AT EDGES WHERE WIND CATCHES THE MULCH, IN VALLEYS, AND AT CRESTS OF BANKS. REMAINDER OF AREA SHOULD BE UNIFORM IN APPEARANCE.

2. USE ONE OF THE FOLLOWING:

A. ORGANIC AND VEGETABLE BASED BINDERS - NATURALLY OCCURRING, POWDER BASED, HYDROPHILIC MATERIALS THAT MIXED WITH WATER FORMULATES A GEL AND WHEN APPLIED TO MULCH UNDER SATISFACTORY CURING CONDITIONS WILL FORM MEMBRANED NETWORKS OF INSOLUBLE POLYMERS. THE VEGETABLE GEL SHALL BE PHYSIOLOGICALLY HARMLESS AND NOT RESULT IN A PHYTOTOXIC EFFECT OR IMPEDE GROWTH OF TURFGRASS. VEGETABLE BASED GELS SHALL BE APPLIED AT RATES AND WEATHER CONDITIONS RECOMMENDED BY THE MANUFACTURER.

B. SYNTHETIC BINDERS - HIGH POLYMER SYNTHETIC EMULSION, MISCIBLE WITH WATER WHEN DILUTED AND FOLLOWING APPLICATION TO MULCH, DRYING AND CURING SHALL NO LONGER BE SOLUBLE OR DISPERSIBLE IN WATER. IT SHALL BE APPLIED AT RATES AND WEATHER CONDITIONS RECOMMENDED BY THE MANUFACTURER AND REMAIN TACKY UNTIL GERMINATION OF GRASS.

STANDARDS FOR MANAGEMENT OF HIGH ACID PRODUCING SOILS:

1. LIMIT THE EXCAVATION AREA AND EXPOSURE TIME WHEN HIGH ACID-PRODUCING SOILS ARE ENCOUNTERED.

2. TOPSOIL STRIPPED FROM THE SITE SHALL BE STORED SEPARATELY FROM TEMPORARILY STOCKPILED HIGH ACID-PRODUCING SOILS.

3. STOCKPILES OF HIGH ACID-PRODUCING SOIL SHOULD BE LOCATED ON LEVEL LAND TO MINIMIZE ITS MOVEMENT, ESPECIALLY WHEN THIS MATERIAL HAS A HIGH CLAY CONTENT.

4. TEMPORARILY STOCKPILED HIGH ACID-PRODUCING SOIL MATERIAL TO BE STORED MORE THAN 48 HOURS SHOULD BE COVERED WITH PROPERLY ANCHORED, HEAVY GRADE SHEETS OF POLYETHYLENE WHERE POSSIBLE. IF NOT POSSIBLE, STOCKPILES SHALL BE COVERED WITH A MINIMUM OF 3 TO 6 INCHES OF WOOD CHIPS TO MINIMIZE EROSION OF THE STOCKPILE. SILT FENCE SHALL BE INSTALLED AT THE TOE OF THE SLOPE TO CONTAIN MOVEMENT OF THE STOCKPILED MATERIAL. TOPSOIL SHALL NOT BE APPLIED TO THE STOCKPILES TO PREVENT TOPSOIL CONTAMINATION WITH HIGH ACID-PRODUCING SOIL.

5. HIGH ACID-PRODUCING SOILS WITH A PH OF 4.0 OR LESS OR CONTAINING IRON SULFIDE (INCLUDING BORROW FROM CUTS OR DREDGED SEDIMENT) SHALL BE ULTIMATELY PLACED OR BURIED WITH LIMESTONE APPLIED AT THE RATE OF 10 TONS PER ACRE (OR 450 POUNDS PER 1,000 SQUARE FEET OF SURFACE AREA) AND COVERED WITH A MINIMUM OF 12 INCHES OF SETTLED SOIL WITH A PH OF 5.0 OR MORE EXCEPT AS FOLLOWS:
   a. AREAS WHERE TREES OR SHRUBS ARE TO BE PLANTED SHALL BE COVERED WITH A MINIMUM OF 24 INCHES OF SOIL WITH A PH OR 5 OR MORE.
   b. DISPOSAL AREAS SHALL NOT BE LOCATED WITHIN 24 INCHES OF ANY SURFACE OF A SLOPE OR BANK, SUCH AS BERMS, STREAM BANKS, DITCHES, AND OTHERS, TO PREVENT POTENTIAL LATERAL LEACHING DAMAGES.

6. EQUIPMENT USED FOR MOVEMENT OF HIGH ACID-PRODUCING SOILS SHOULD BE CLEANED AT THE END OF EACH DAY TO PREVENT SPREADING OF HIGH ACID-PRODUCING SOIL MATERIALS TO OTHER PARTS OF THE SITE, INTO STREAMS OR STORMWATER CONVEYANCES, AND TO PROTECT MACHINERY FROM ACCELERATED RUSTING.

7. NON-VEGETATIVE EROSION CONTROL PRACTICES (STONE TRACKING PADS, STRATEGICALLY PLACED LIMESTONE CHECK DAM, SEDIMENT BARRIER, WOOD CHIPS) SHOULD BE INSTALLED TO LIMIT THE MOVEMENT OF HIGH ACID-PRODUCING SOILS FROM, AROUND, OR OFF THE SITE.

8. FOLLOWING BURIAL OR REMOVAL OF HIGH ACID-PRODUCING SOIL, TOPSOILING AND SEEDING OF THE SITE (SEE TEMPORARY VEGETATIVE COVER FOR SOIL STABILIZATION, PERMANENT VEGETATIVE COVER FOR SOIL STABILIZATION, AND TOPSOILING), MONITORING MUST CONTINUE FOR A MINIMUM OF 6 MONTHS TO ENSURE THERE IS ADEQUATE STABILIZATION AND THAT NO HIGH ACID-PRODUCING SOIL PROBLEMS EMERGE. IF PROBLEMS STILL EXIST, THE AFFECTED AREA MUST BE TREATED AS INDICATED ABOVE TO CORRECT THE PROBLEM.

SOIL EROSION AND SEDIMENT CONTROL NOTES BLOCK 502.01, LOT 57.01 TOWNSHIP OF FRANKLIN SOMERSET COUNTY, NJ	SCALE: AS SHOWN DRAWN BY: SJK
SHRINATH J KOTDAWALA, N.J.P.E.-LICENSE # 41204 KASHI CONSULTING COMPANY, INC. - 24GA2802000 54 OAKLAND MILLS RD, ENGLISHTOWN, NJ 07726 PHONE: (848) 203 7460 FAX: (732) 462 9666	CHECKED BY: SJK DATE: 07-28-2023
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