CIVIL ENGINEERING
ENVIRONMENTAL
SURVEYING
LANDSCAPE ARCHITECTURE
GEOTECHNICAL

STORMWATER MANAGEMENT REPORT

Puleo International, Inc.
Block 18, Lot 5
13 Moebus Place
Town of Clinton,
Hunterdon County, NJ

Prepared For:
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October 19, 2020
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1. PROJECT DESCRIPTION

1.1 Existing Conditions

The subject property, where the proposed stormwater management facilities will be located, is currently known as Block 18, Lot 5 on the Town of Clinton tax maps and is within the OB-4 Office Research District Zone. Access to the site is via an existing driveway opening along Route 31 North. The property is mostly a vacant lot, but contains a Town utility building in the northwest corner.

1.2 Proposed Conditions

The project consists of the construction of a warehouse structure with office area and associated parking and loading docks. Stormwater management improvements will be constructed to meet state and local ordinance requirements. General site improvements in accordance with all state and local ordinance requirements will be implemented in the construction of the proposed development.

In accordance with the requirements set by N.J.A.C. 7:8, the project is considered a "Major Development". The proposed disturbance exceeds 1 acre and the increase in impervious coverage is greater than 0.25 acre; therefore, the project is required to meet the stormwater management requirements for water quantity, water quality and groundwater recharge set by N.J.A.C 7:8.

1.3 Soil Conditions

Per the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey, generally two soils are present on the site. The Southern portion of the site predominantly consists of Duffield Silt Loam (DufB, DugCg), which typically has depth to bedrock between 56-80 inches below the surface and a depth to the water table greater than 80 inches. Duffield Silt Loam is classified as hydrologic soil group (HSG) B. The Northern portion of the site contains Gladstone Gravelly Loam (GkaoC2). Gladstone Gravelly Loam typically has a depth to bedrock between 42 to 80 inches and groundwater greater than 80 inches and is classified as HSG B. A USDA NRCS Web Soil Survey map is included in Appendix A.

2. METHODOLOGY

2.1 Stormwater Runoff Calculation Methodology

The stormwater quantity runoff analysis has been performed utilizing the Soil Conservation Service (SCS) Technical Release 55 (TR-55) "Urban Hydrology for Small Watersheds," revised June 1986. The site runoff has been calculated for the 2-, 10-, and 100-year storm frequencies in accordance with NJDEP's storm water regulations for water quantity control (N.J.A.C. 7:8-5.4).

The analysis utilized the New Jersey 24-hour rainfall frequency data per NOAA precipitation frequency estimates with New Jersey region C rainfall distribution. The time of concentration (Tc) calculations were calculated based on the velocity method per Chapter 15 of the National Engineering Handbook. Several potential Tc flow paths were analyzed in order to determine the most appropriate flow path. CN values were calculated for each drainage area. The summary of results and supporting calculations for the existing and proposed stormwater quantity runoff analysis can be found in Appendices B-F of this report.

2.2 Stormwater Runoff Quality

The storm water runoff quality analysis has been performed in accordance with NJDEP's Storm Water Management Regulations (N.J.A.C. 7:8-5.5). This storm water management plan serves to reduce the post-construction load of Total Suspended Solids (TSS) generated from the water quality design storm by 80 percent, as an annual average. This reduction has been applied to all areas of new development on the site. The water quality design storm consists of 1.25 inches of rain falling in 2 hours with the NJDEP distribution as illustrated in N.J.A.C. 7:8-5.5 "Table 1 - Water Quality Design Storm Distribution".

2.3 Groundwater Recharge

A groundwater recharge analysis has been performed in accordance with NJDEP's Stormwater Management Rules (N.J.A.C. 7:8-5.4). The New Jersey Groundwater Recharge Spreadsheet (NJGRS) Version 2.0 (Updated November 2003) was utilized to determine the groundwater recharge associated with the site. Computations of the pre-development and post-development annual groundwater recharge rates and the annual recharge deficit was prepared based on the New Jersey Geological Survey Report GSR-32" A Method for Evaluating Ground-Water Recharge Areas in New Jersey", which is incorporated into the NJGSR spreadsheet (Refer to Appendix I of this report).

2.4 Non-Structural Stormwater Management Strategies

As per N.J.A.C. 7:8-5.3 requirements non-structural stormwater strategies have been incorporated into the design to the maximum extent practicable:

1. The proposed impervious surfaces are minimized on the project site and the runoff over the proposed impervious surfaces flow into the proposed stormwater management systems;

2. Natural drainage features and vegetation are maintained and maximized where possible;

3. Land disturbance is being minimized to the extent possible and there is minimal clearing required for the project;

4. Soil compaction will be minimized and any areas of over compaction will be mediated in accordance with the local soil conservation district standards;

5. Low maintenance trees and native grasses are proposed to encourage retention of all plantings in areas not proposed as maintained lawn;

6. The stormwater control system was designed to prevent trash and debris from exiting the stormwater management facility. This is accomplished through the use of inlet filters, trash racks, and grates. The stormwater system will be cleaned and trash/debris will be removed according the Stormwater Management Maintenance Plan, this will be performed by the Owner/Operator and all documents will be provided to the Township Stormwater Coordinator.

2.5 Stormwater Conveyance

The storm sewer hydraulics is based upon the Manning Equation as defined in the "Handbook of Hydraulics," by Brater and King, Sixth Edition. Storm sewer capacity is based on full depth gravity flow. The project is designed to convey water via closed pipe systems to the stormwater management system. Refer to Appendix J for calculations.

3. STORMWATER ANALYSIS

3.1 Existing Conditions Stormwater Runoff Quantity

The Pre-Development Drainage Area Map (Appendix C) illustrates the existing drainage area on site. The site has been analyzed as one drainage area.

EXDA-A is defined by the proposed limit of disturbance due to the proposed development. The drainage area is modeled with one distinct land cover as follows: 9.96 acres of woods. EXDA-A generally flows from the southern site boundary to the northern site boundary. No existing stormwater management system is present on-site.

The curve numbers (*CN*) and time of concentrations (T_c) for the existing drainage area have been calculated utilizing the TR-55 method and velocity method respectively for the existing drainage area. A runoff hydrograph has been calculated for the 2-, 10-, and 100-year storms. The peak runoff (*Q cfs*) has been obtained from the runoff hydrograph for the existing drainage area.

The pre-development runoff from the existing drainage area is listed in the following table:

Drainage Area	2-year Storm Peak Outflow (cfs)	10-year Storm Peak Outflow (cfs)	100-year Storm Peak Outflow (cfs)
EXDA-A	1.342	7.176	23.84

Refer to Appendices D through F for a summary of the composite curve numbers (CN), pre-development peak discharge rates for the 2-, 10-, and 100-year storms, and the associated runoff hydrographs.

3.2 Proposed Conditions Stormwater Runoff Quantity

The Post-Development Drainage Area Map (Appendix C), illustrates the proposed drainage areas for the post-development condition.

To accommodate the proposed site development, the existing drainage area has been subdivided into two distinct proposed drainage areas, PRDA-A To Basin and PRDA-A Bypass.

PRDA-A To Basin is comprised of the all the new impervious cover and lawn area that is directed to the proposed bioretention basin. PRDA-A To Basin is modeled as 6.49 acres of impervious coverage and 3.16 acres of open space. PRDA-A To Basin discharges along the northern property line. Please note that the impervious area to the building has been designed to include additional impervious coverage for future building expansion of approximately 20,000 square feet.

PRDA-A Bypass is comprised of the new lawn area on the subject property that will bypass the proposed bioretention basin. PRDA-A Bypass is modeled as 0.31 acres of open space and 0.093 acres of open space. PRDA-A Bypass discharges along the northern site boundary.

To manage the stormwater runoff, a bioretention basin has been designed.

The performance of the stormwater management system, and the bypass area are summarized in the tables below:

Drainage Area	2-year Storm Peak Outflow (cfs)	10-year Storm Peak Outflow (cfs)	100-year Storm Peak Outflow (cfs)
PRDA-A (Impervious)	24.25	36.12	58.13
PRDA-A (Pervious)	3.692	8.602	19.15
PRDA-A To Basin	27.93	44.72	77.28
Basin Discharge	0.495	1.858	18.41
PRDA-A Bypass	0.362	0.844	1.879
Prop. Site Run-off	0.650	1.903	18.89

The proposed Stormwater Management Systems provide the necessary detention time and storage to achieve the reduction factors required by N.J.A.C.7:8. A summary table has been provided below documenting the overall performance of the system:

Runoff Comparison Table Comparing Existing Site Run-off to Proposed Site Run-off				
Storm	Ex. Site Run-off (cfs)	Reduction Required	Target Runoff (cfs)	Prop. Site Run-off (cfs)
2-year	1.342	50%	0.671	0.650
10-year	7.176	75%	5.382	1.903
100-year	23.84	80%	19.072	18.89

3.3 Stormwater Runoff Quality

The proposed runoff quality has achieved the required TSS removal, in accordance with NJDEP standards. Quality treatment has been provided for the proposed development through the use of a Bioretention Basin designed in accordance with the NJDEP BMP Manual for a water quality storm TSS removal rate of 80%.

3.4 Groundwater Recharge

The existing site has an annual total of groundwater recharge of approximately 560,249 C.F. The proposed development creates an annual total groundwater recharge deficit of approximately 401,829 C.F. The proposed bioretention basin has been design to infiltrate the groundwater recharge deficit. An annual recharge volume of approximately 403,452 C.F. is observed in the post development conditions. The analysis has been performed based upon the approved NJDEP Recharge Spreadsheet and can be found in Appendix I. Bioretention basin has been designed to not infiltrate water into the subsurface.

3.5 Soil Erosion and Sediment Control

Soil Erosion and Sediment Control measures have been designed for the stormwater management system to ensure that water quality is maintained and

that the system can safely and adequately control runoff from the property. Design calculations for the conduit outlet protection can be found in Appendix K of this report.

4. CONCLUSIONS

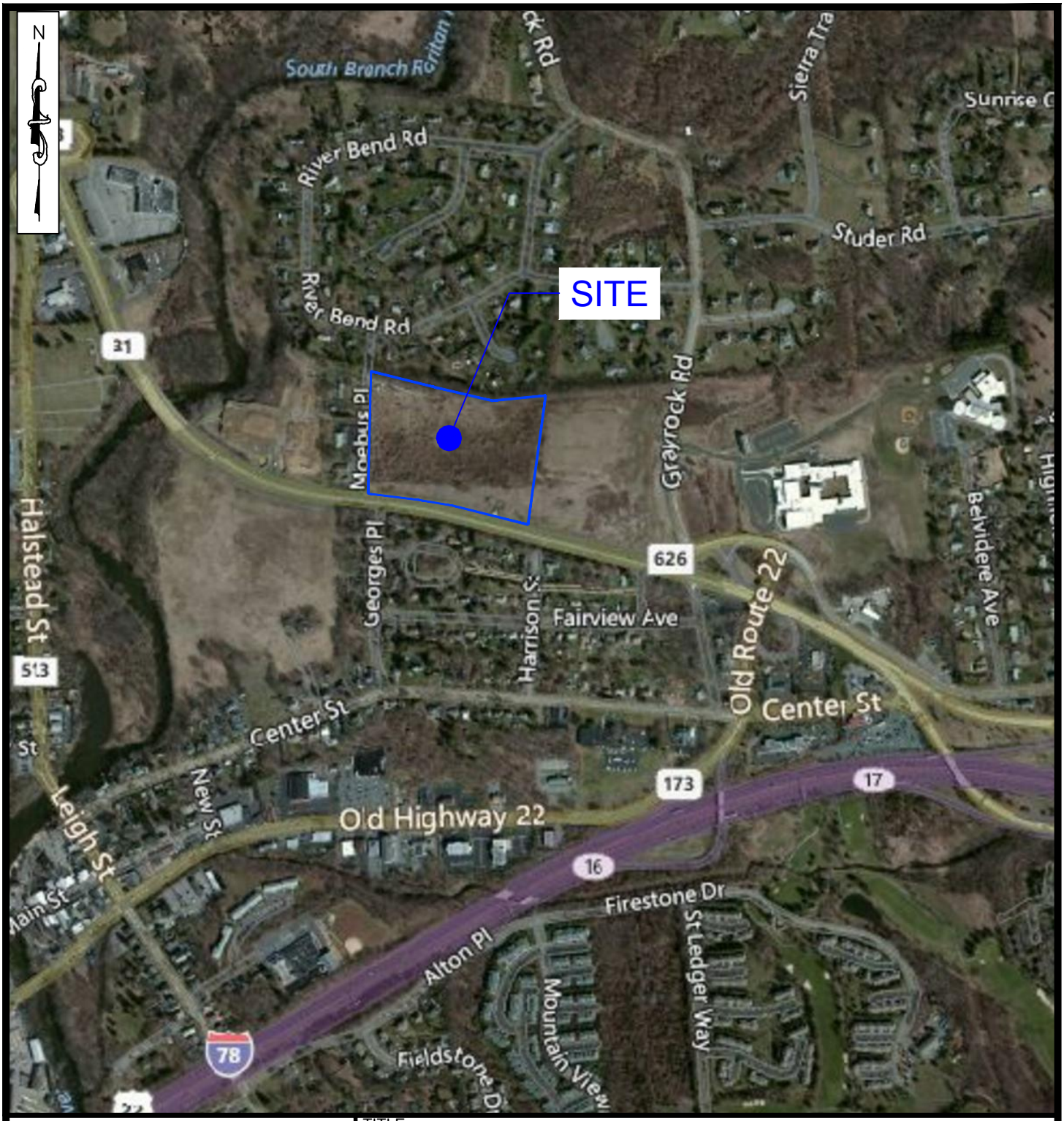
The proposed development will reduce peak flow from the site for the 2-, 10-, and 100-year storm events by factors greater than 50%, 75%, and 80%, respectively (NJDEP Standard) under the proposed conditions.

For the proposed condition, the peak runoff rates for the 2-, 10-, and 100-year storm events are reduced while existing drainage patterns are generally maintained.

All on-site storm conveyance systems were designed to accommodate the proposed site improvements under the 25-year storm event.

In conclusion, the proposed design includes a proposed stormwater management system for the property that meets all of the quantity, quality and recharge requirements outlined in the Stormwater Management Rules of N.J.A.C. 7:8.

APPENDIX A



800 0 800

SCALE 1" = 800 FT

TITLE:

AERIAL MAP

E&LP

140 WEST MAIN STREET HIGH BRIDGE, NJ 08829

(908) 238-0544 FAX: (908)238-9572

C.O.A. #: 24GA28021500

A PROFESSIONAL ASSOCIATION

LOCATION:

PULEO INTERNATIONAL INC
13 MOEBUS PLACE (RT 31)
BLOCK 18, LOT 5
TOWN OF CLINTON
HUNTERDON COUNTY, NJ

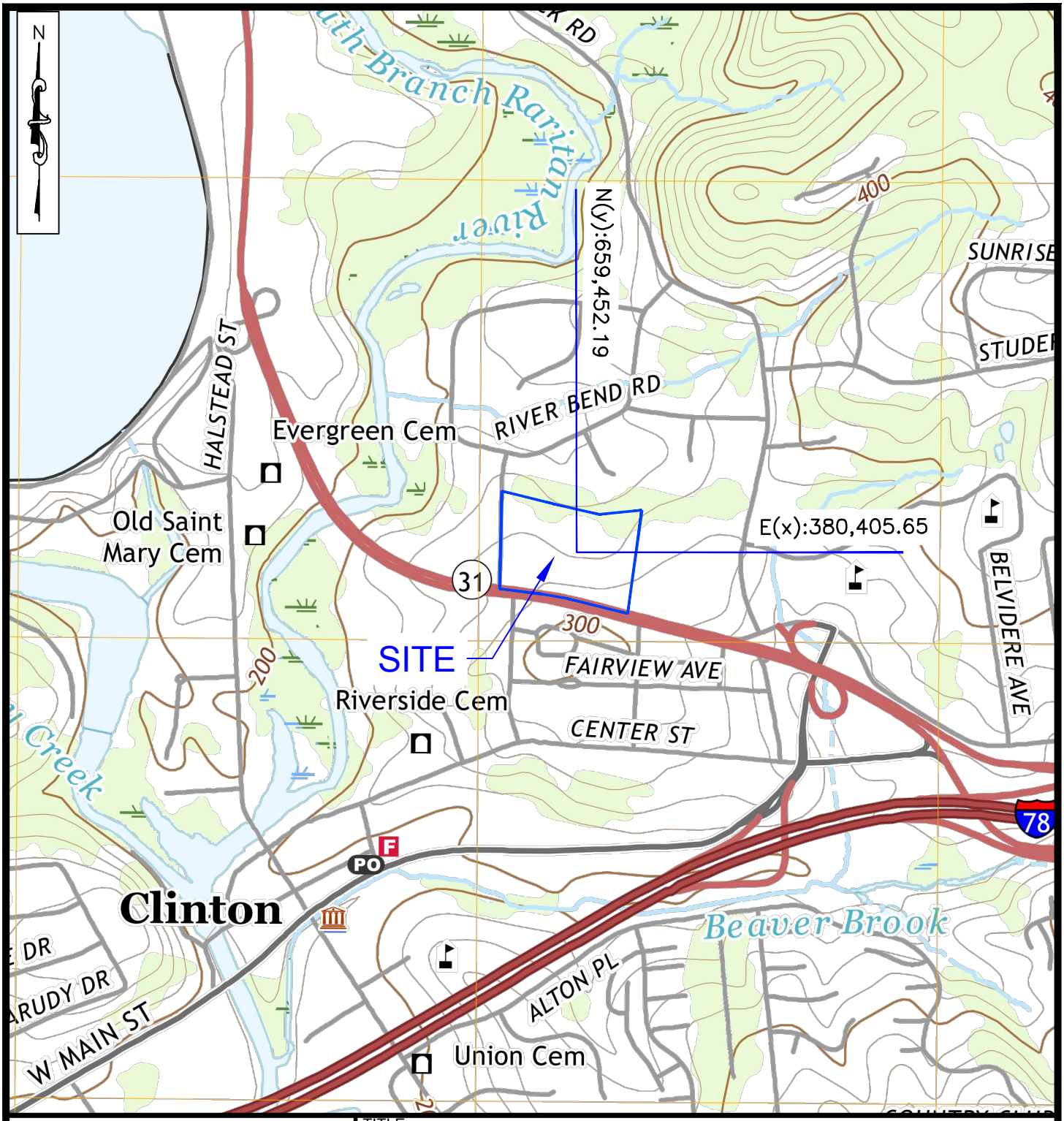
DATE: 07/24/2020

PROJECT NO.: 0120176

FILENAME: AERIAL.DWG

FIGURE No.

1



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SCALE 1" = 1000 FT

TITLE: USGS MAP

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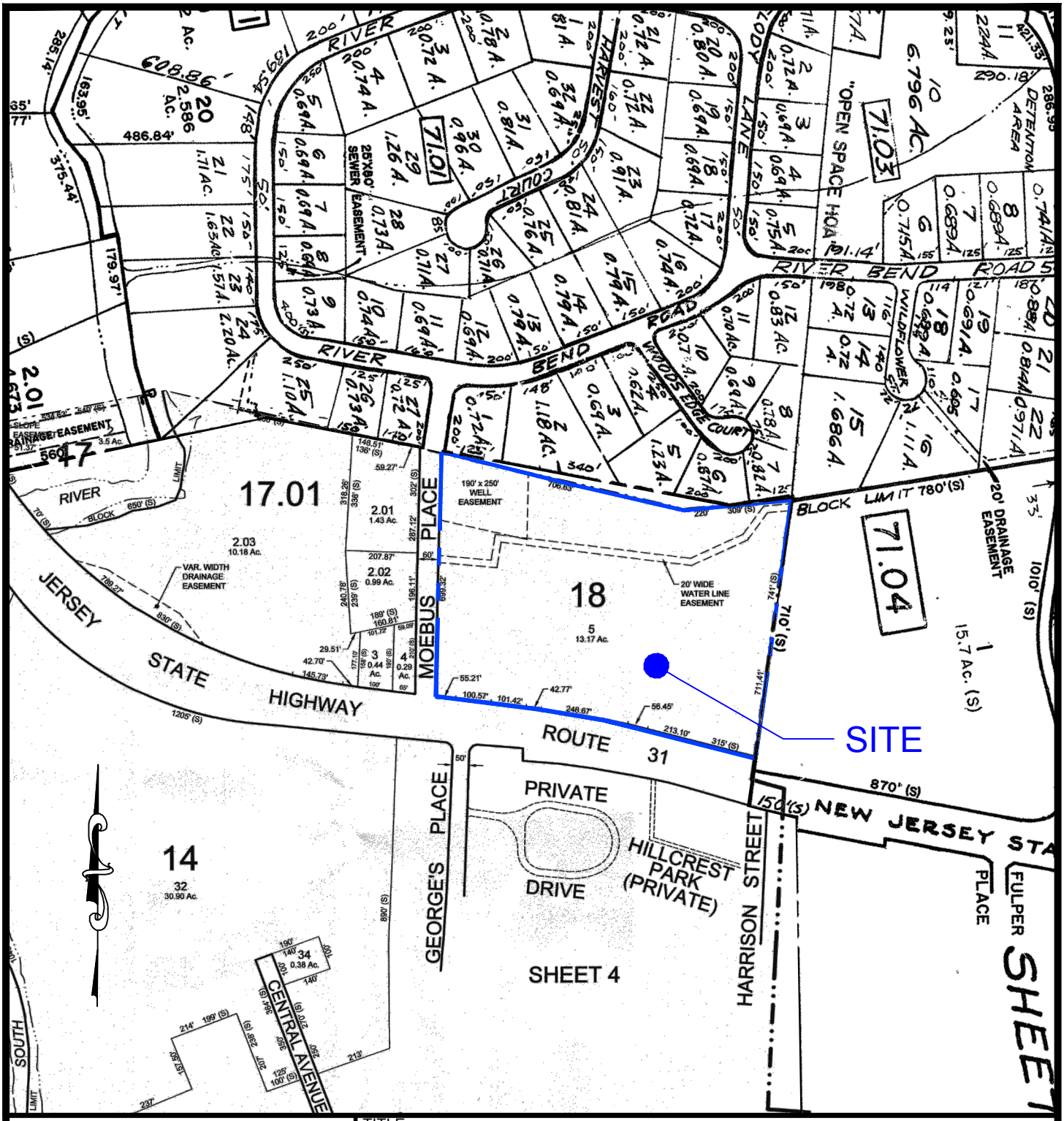
PROJECT NO.: 0120176

FILENAME: USGS.DWG

FIGURE No. 2

REFERENCES:
USGS HIGH BIRDGE QUADRANGLE 2019



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SCALE 1" = 400 FT

REFERENCES:
- TOWN OF CLINTON TAX MAP SHEET 5
- CLINTON TOWNSHIP TAX MAP SHEET 13

TITLE:

TAX MAP

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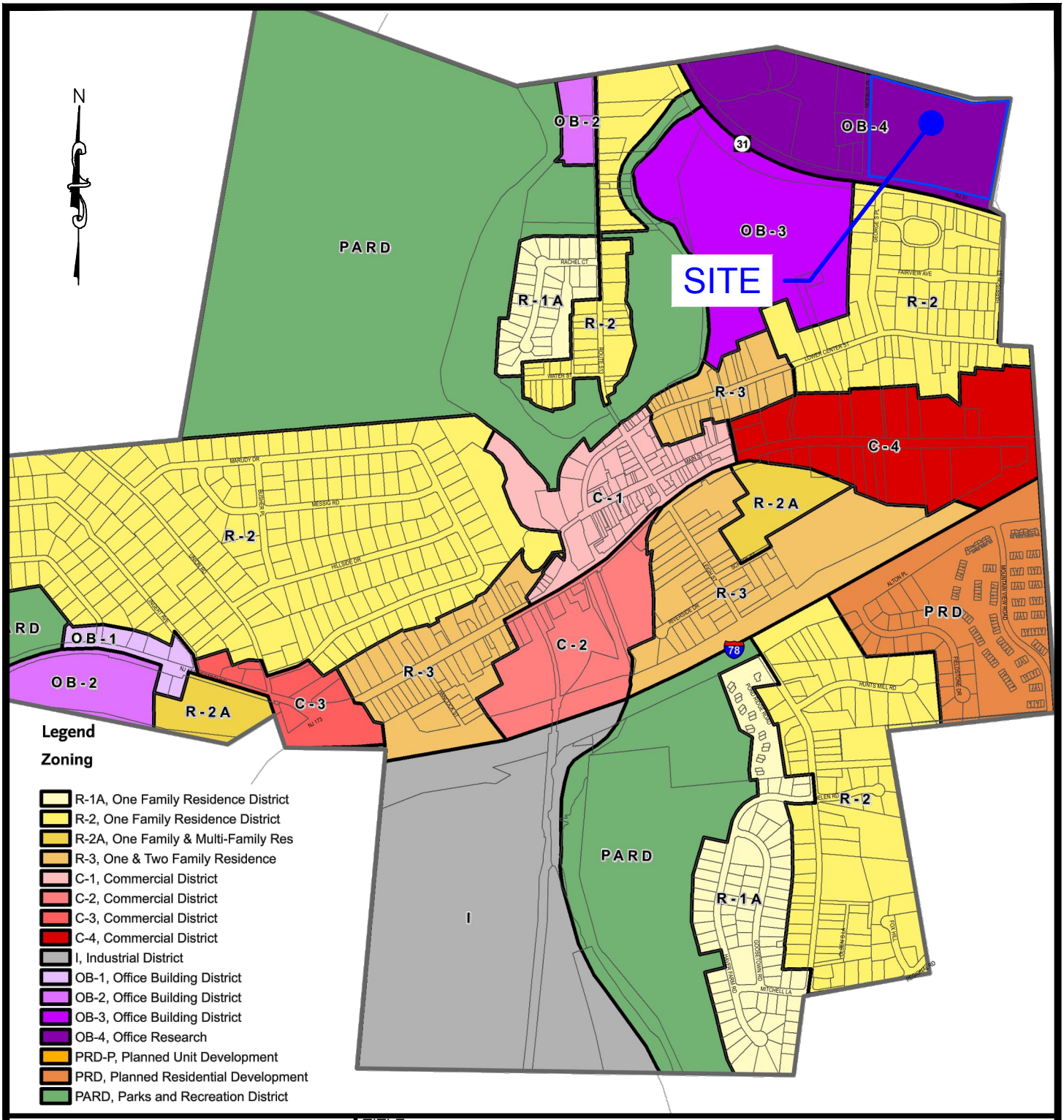
PROJECT NO.: 0120176

FILENAME: TAX.DWG

FIGURE No.

3



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SCALE 1" = 1000 FT

REFERENCES: TOWN OF CLINTON ZONING MAP

TITLE:

ZONING MAP

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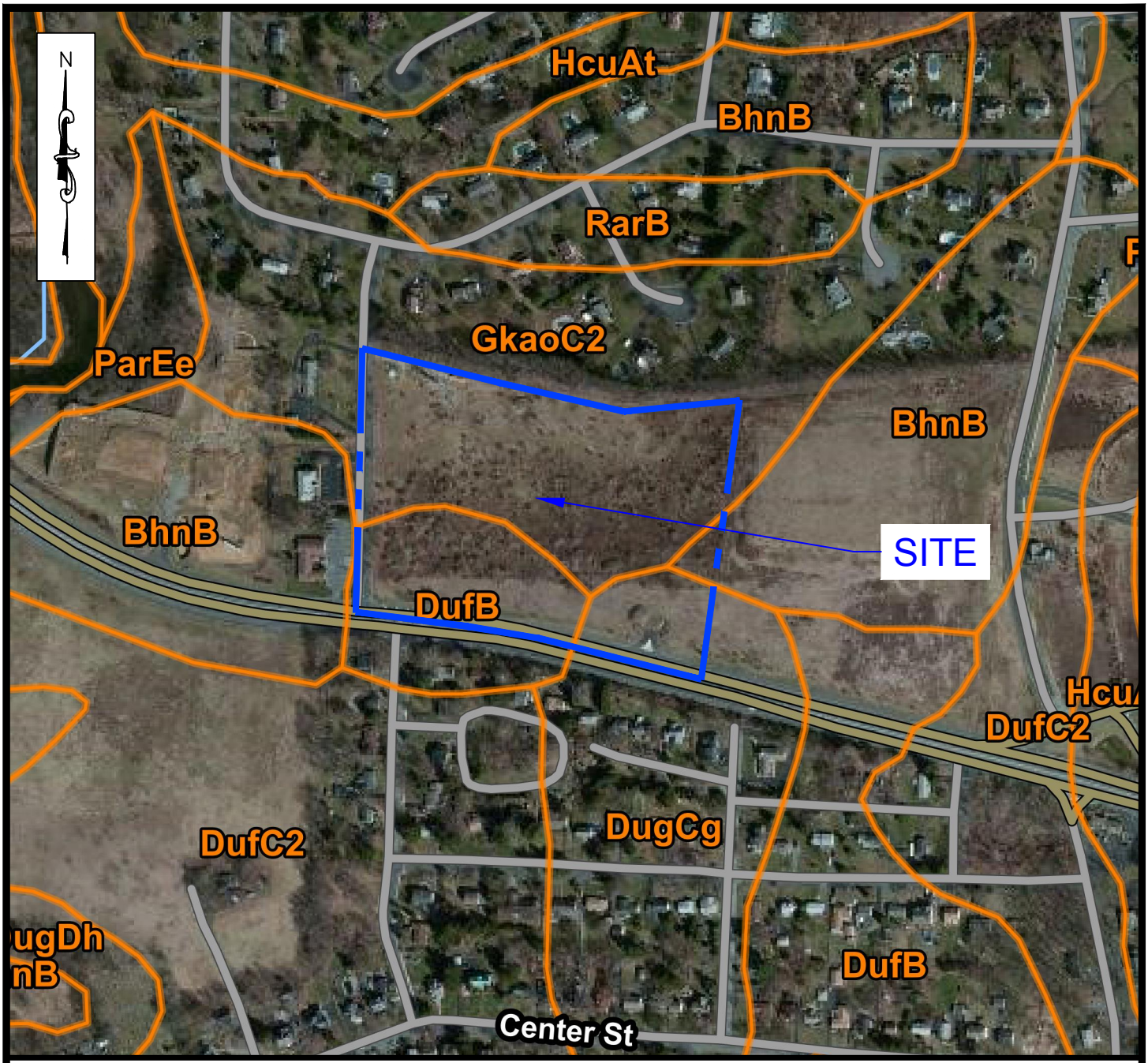
PROJECT NO.: 0120176

FILENAME: ZONING MAP.DWG

FIGURE No.

4



SOILS

GkcoC2: Gladstone Gravelly Loam, 8 t0 15 percent slopes, eroded;

DufB: Duffield Silt Loam, 2 to 6 percent slopes;

DugCg: Duffield Silt Loam, 0 to 12 percent slopes, rocky;

BhnB: Birdsboro Silt Loam, 2 to 6 percent slopes;

SOURCE:
NATURAL RESOURCES CONSERVATION SERVICE

400 0 400

Scale 1" = 400 ft

TITLE:

USDA SOIL MAP

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HUNTERDON COUNTY, NJ

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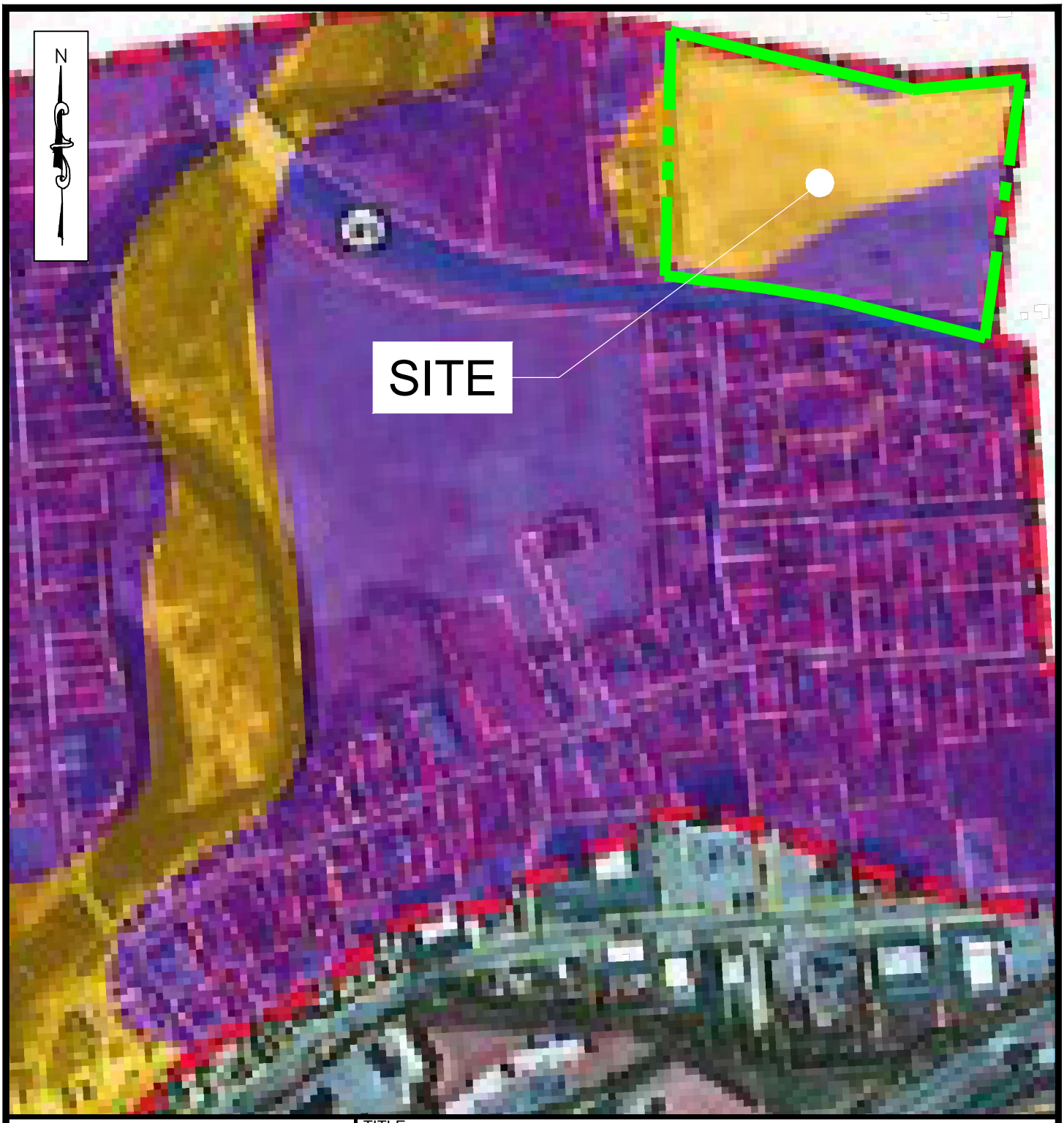
PROJECT NO.: 0120176

FILENAME:SOIL MAP.dwg

FIGURE No.

10



LEGEND:

CARBONATE DISTRICT

CRD- CARBONATE ROCK DISTRICT

CDA- CARBONATE DRAINAGE AREA

400 0 400

Scale 1" = 400 ft

REFERENCES:
TOWN OF CLINTON CODE CHAPTER 88
LAND USE

TITLE:
MUNICIPAL CARBONATE AREA DISTRICT MAP

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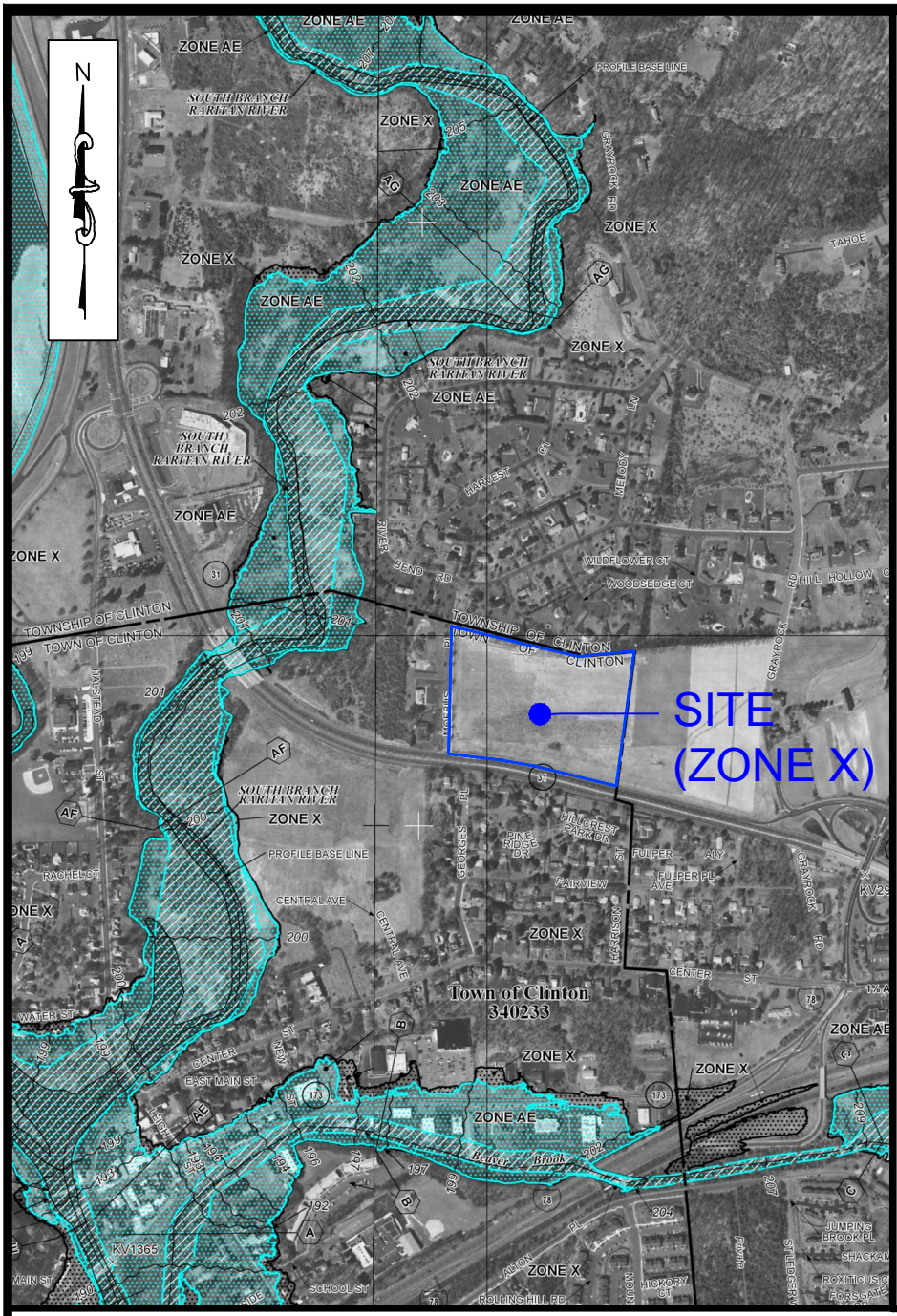
FILENAME: CARBONATE ROCK.dwg

FIGURE No.

6



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A–A — Cross section line
- 23–23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 18
- 6000000 FT — 5000-foot grid values: New Jersey State Plane coordinate system (FIPSZONE = 2900), Transverse Mercator projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
SEPTEMBER 25, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

1000 0 1000

Scale 1" = 1000 ft

SOURCE:
FEMA FLOOD MAP SERVICE CENTER

TITLE: FEMA FLOOD MAP

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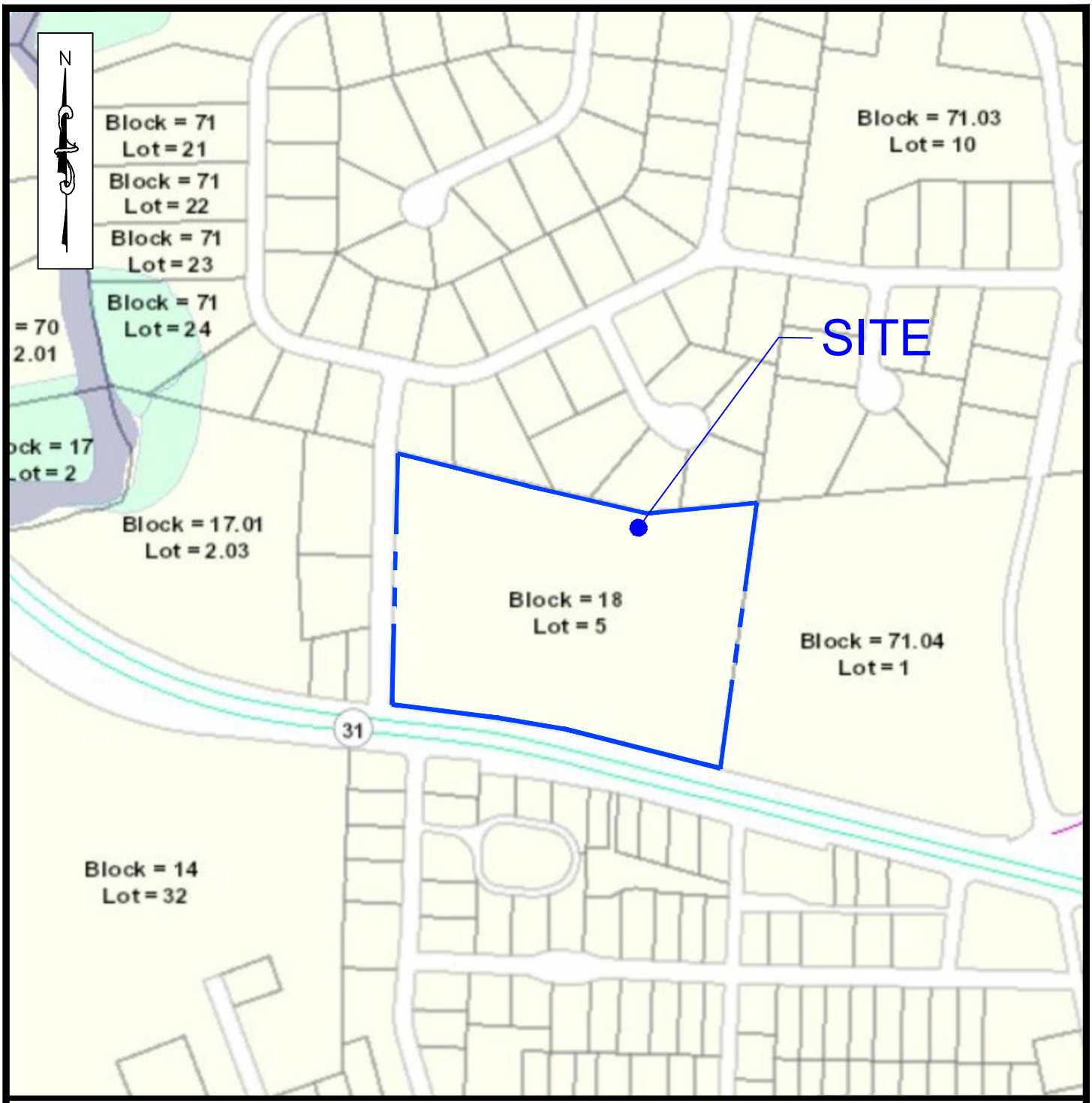
FILENAME: FEMA.dwg

FIGURE No. 7



NOT TO SCALE

FRESHWATER WETLANDS

SOURCE: NJ GEOWEB

TITLE: FRESHWATER WETLANDS INVENTORY MAP

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FILENAME: FWWI.dwg

FIGURE No.
8

APPENDIX B

NOAA Atlas 14, Volume 2, Version 3
Location name: Clinton, New Jersey, USA*
Latitude: 40.6437°, Longitude: -74.903°
Elevation: 246.94 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.333 (0.299-0.372)	0.397 (0.357-0.443)	0.469 (0.420-0.522)	0.522 (0.466-0.581)	0.587 (0.523-0.651)	0.635 (0.562-0.704)	0.682 (0.600-0.757)	0.726 (0.635-0.806)	0.783 (0.681-0.872)	0.826 (0.713-0.923)
10-min	0.532 (0.477-0.593)	0.635 (0.571-0.708)	0.751 (0.673-0.836)	0.835 (0.746-0.929)	0.936 (0.833-1.04)	1.01 (0.895-1.12)	1.08 (0.954-1.20)	1.15 (1.01-1.28)	1.24 (1.08-1.38)	1.30 (1.12-1.45)
15-min	0.665 (0.596-0.742)	0.798 (0.717-0.890)	0.950 (0.851-1.06)	1.06 (0.943-1.17)	1.19 (1.06-1.32)	1.28 (1.13-1.42)	1.37 (1.21-1.52)	1.45 (1.27-1.61)	1.56 (1.36-1.74)	1.63 (1.41-1.83)
30-min	0.912 (0.817-1.02)	1.10 (0.991-1.23)	1.35 (1.21-1.50)	1.53 (1.37-1.70)	1.76 (1.56-1.95)	1.93 (1.71-2.14)	2.10 (1.85-2.33)	2.26 (1.98-2.51)	2.48 (2.16-2.76)	2.65 (2.28-2.96)
60-min	1.14 (1.02-1.27)	1.38 (1.24-1.54)	1.73 (1.55-1.93)	1.99 (1.78-2.22)	2.34 (2.08-2.60)	2.61 (2.31-2.90)	2.89 (2.54-3.21)	3.17 (2.77-3.52)	3.56 (3.10-3.96)	3.86 (3.33-4.31)
2-hr	1.40 (1.25-1.55)	1.70 (1.53-1.89)	2.15 (1.93-2.38)	2.49 (2.23-2.75)	2.97 (2.64-3.28)	3.36 (2.98-3.70)	3.77 (3.32-4.16)	4.20 (3.67-4.64)	4.82 (4.16-5.33)	5.32 (4.54-5.90)
3-hr	1.57 (1.41-1.75)	1.91 (1.71-2.13)	2.40 (2.15-2.68)	2.78 (2.49-3.09)	3.32 (2.96-3.68)	3.76 (3.33-4.16)	4.21 (3.71-4.67)	4.70 (4.10-5.21)	5.38 (4.64-5.99)	5.95 (5.07-6.63)
6-hr	2.02 (1.82-2.26)	2.45 (2.21-2.74)	3.07 (2.77-3.42)	3.57 (3.21-3.98)	4.30 (3.83-4.78)	4.91 (4.34-5.46)	5.57 (4.88-6.19)	6.29 (5.45-6.97)	7.34 (6.26-8.15)	8.22 (6.92-9.16)
12-hr	2.50 (2.26-2.80)	3.03 (2.74-3.39)	3.83 (3.45-4.27)	4.50 (4.03-5.00)	5.48 (4.86-6.08)	6.33 (5.57-7.01)	7.27 (6.32-8.03)	8.31 (7.14-9.18)	9.87 (8.32-10.9)	11.2 (9.31-12.4)
24-hr	2.84 (2.61-3.11)	3.43 (3.15-3.76)	4.33 (3.97-4.73)	5.08 (4.64-5.55)	6.19 (5.62-6.74)	7.13 (6.43-7.75)	8.15 (7.29-8.86)	9.27 (8.21-10.1)	10.9 (9.53-11.9)	12.3 (10.6-13.4)
2-day	3.33 (3.06-3.67)	4.03 (3.70-4.44)	5.09 (4.66-5.61)	5.97 (5.44-6.55)	7.21 (6.54-7.91)	8.25 (7.44-9.03)	9.37 (8.39-10.2)	10.6 (9.37-11.6)	12.3 (10.8-13.5)	13.8 (11.9-15.1)
3-day	3.52 (3.25-3.83)	4.24 (3.92-4.63)	5.34 (4.92-5.82)	6.23 (5.72-6.78)	7.50 (6.86-8.15)	8.56 (7.78-9.29)	9.68 (8.75-10.5)	10.9 (9.76-11.8)	12.6 (11.2-13.7)	14.1 (12.3-15.3)
4-day	3.70 (3.44-4.00)	4.46 (4.14-4.82)	5.58 (5.17-6.03)	6.49 (6.01-7.01)	7.79 (7.17-8.39)	8.86 (8.13-9.55)	10.00 (9.12-10.8)	11.2 (10.2-12.1)	12.9 (11.6-14.0)	14.4 (12.8-15.6)
7-day	4.35 (4.05-4.68)	5.22 (4.86-5.61)	6.45 (6.00-6.93)	7.46 (6.93-8.01)	8.91 (8.23-9.56)	10.1 (9.30-10.8)	11.4 (10.4-12.2)	12.7 (11.6-13.7)	14.7 (13.2-15.8)	16.2 (14.5-17.5)
10-day	5.00 (4.68-5.35)	5.97 (5.59-6.39)	7.28 (6.81-7.78)	8.33 (7.77-8.91)	9.81 (9.12-10.5)	11.0 (10.2-11.7)	12.2 (11.3-13.1)	13.5 (12.4-14.5)	15.3 (13.9-16.4)	16.8 (15.1-18.1)
20-day	6.73 (6.35-7.15)	7.99 (7.53-8.48)	9.53 (8.98-10.1)	10.7 (10.1-11.4)	12.4 (11.6-13.1)	13.6 (12.8-14.5)	14.9 (13.9-15.8)	16.2 (15.0-17.2)	17.9 (16.5-19.1)	19.3 (17.7-20.6)
30-day	8.39 (7.96-8.85)	9.89 (9.38-10.4)	11.5 (10.9-12.2)	12.8 (12.1-13.5)	14.5 (13.7-15.2)	15.7 (14.8-16.6)	17.0 (15.9-17.9)	18.2 (17.0-19.2)	19.8 (18.4-20.9)	20.9 (19.4-22.2)
45-day	10.7 (10.2-11.2)	12.5 (11.9-13.2)	14.4 (13.7-15.1)	15.8 (15.1-16.6)	17.6 (16.7-18.5)	18.9 (18.0-19.9)	20.2 (19.1-21.3)	21.4 (20.2-22.5)	22.9 (21.6-24.1)	24.0 (22.5-25.3)
60-day	12.8 (12.2-13.4)	15.0 (14.3-15.7)	17.1 (16.3-17.9)	18.7 (17.8-19.6)	20.6 (19.6-21.7)	22.1 (21.0-23.2)	23.4 (22.2-24.6)	24.6 (23.4-25.9)	26.1 (24.7-27.5)	27.2 (25.7-28.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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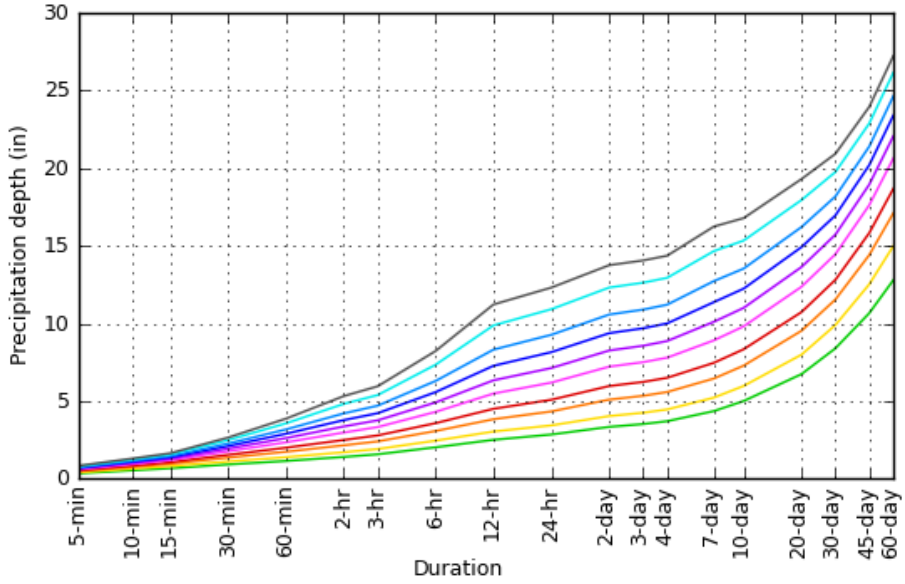
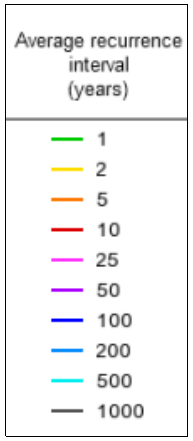
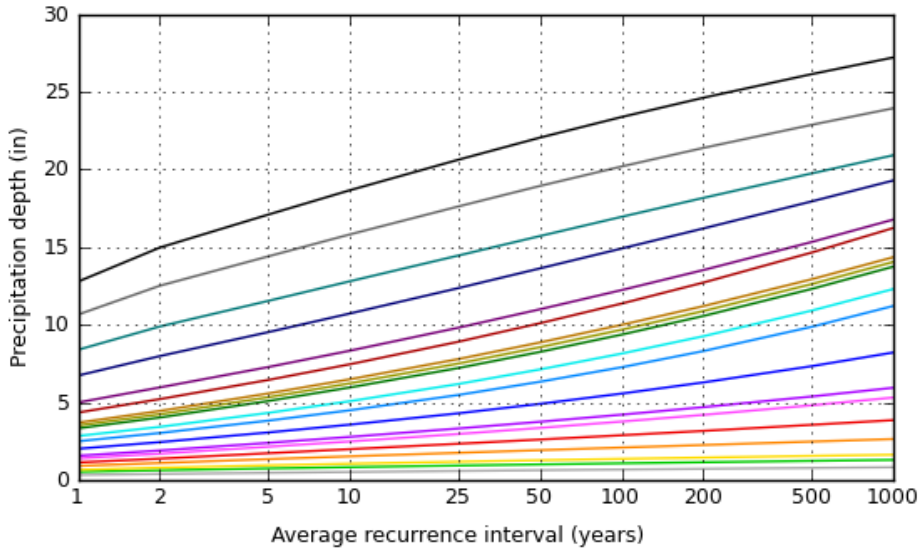
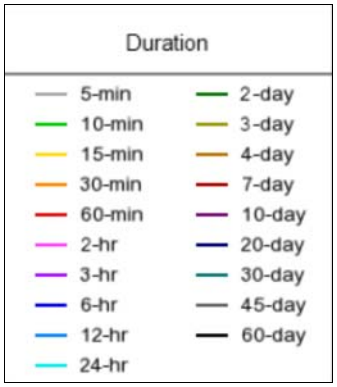
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 40.6437°, Longitude: -74.9030°









NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Thu Oct 15 17:55:23 2020

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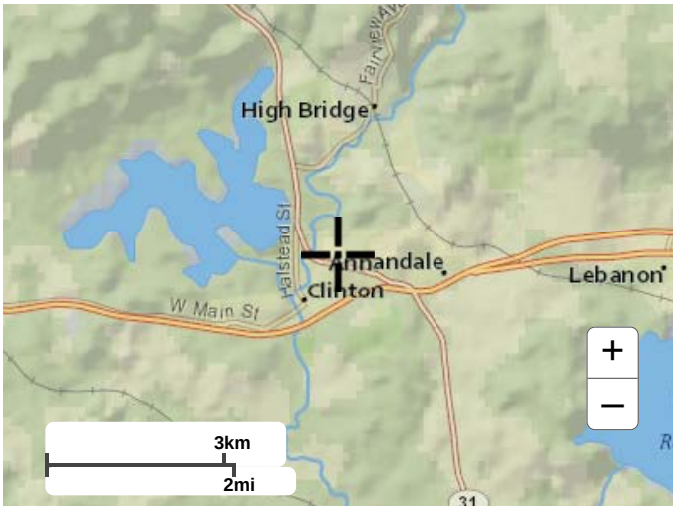
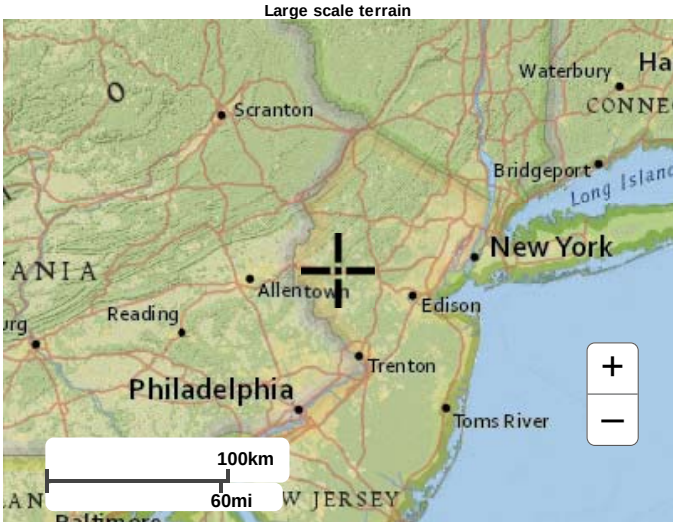
Maps & aerials

Small scale terrain



Large scale terrain



Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

APPENDIX C

EXDA-A
AREA: 9.96 AC.
CN:55
TC:20.97 MIN.

0 40 80 Feet
SCALE:1"=40'

E&LP
140 WEST MAIN STREET HIGH BRIDGE, NJ 08829
PH. 908-238-0544 FAX. 908-238-9572
A PROFESSIONAL ASSOCIATION
CERTIFICATE OF AUTHORIZATION NO.: 24GA28021500 EXP. 8/31/2022

NO.	REVISION	BY	DATE

DATE

WAYNE J. INGRAM
PROFESSIONAL ENGINEER
N.J. P.E. NO. 24GB04258200

PROJECT:

PULEO INTERNATIONAL, LLC
13 MOEBUS PLACE
BLOCK 18 LOT 5
TOWN OF CLINTON

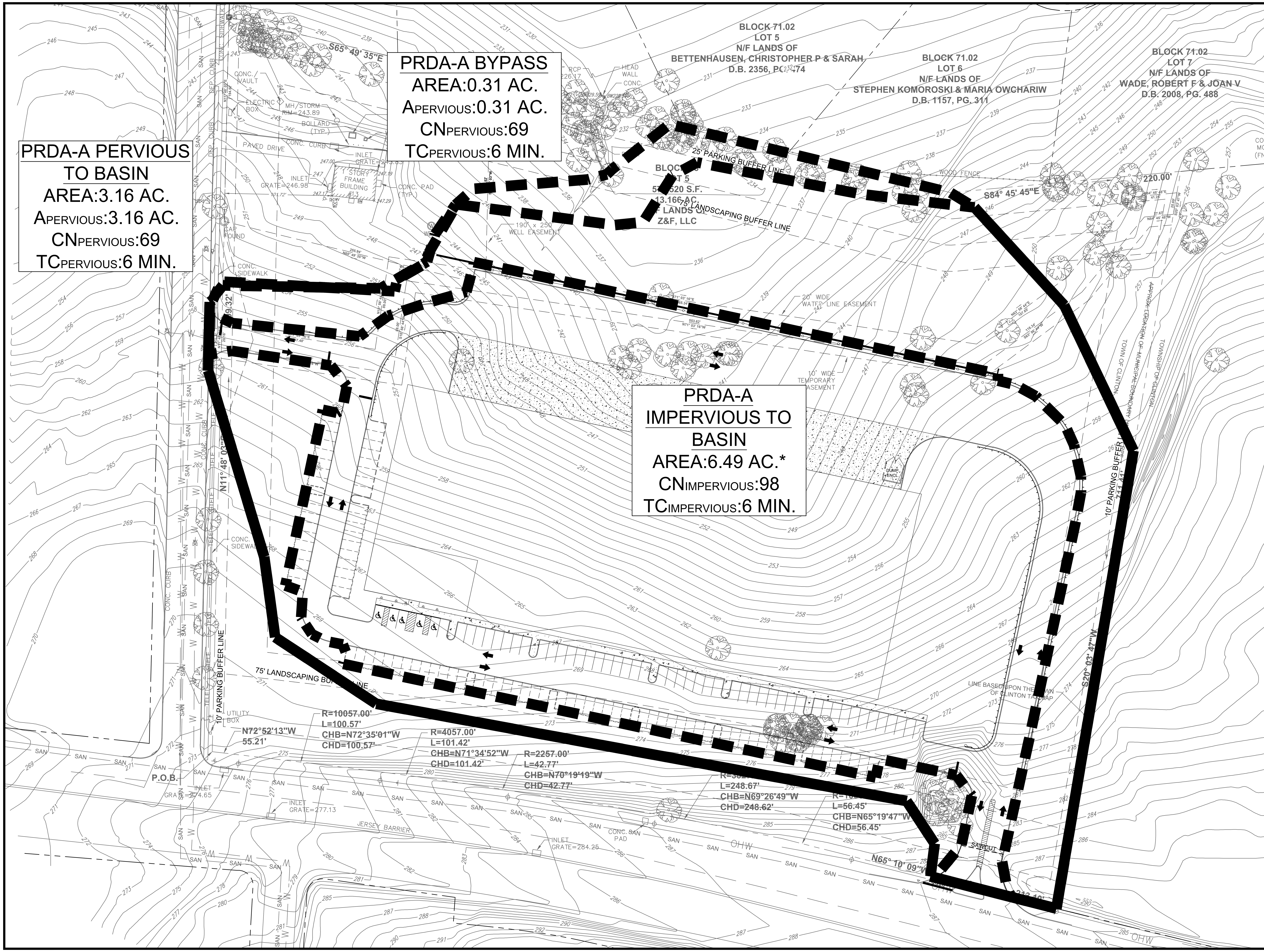
HUNTERDON COUNTY NEW JERSEY

TITLE:

EXISTING DRAINAGE AREA MAP

JOB NO.:	0120176
SCALE:	1"=40'
DESIGNED:	EAJ
CHECKED:	KFO
FILENAME:	PRDA.DWG
DATE:	9 / 25 / 2020

DRAWING NO.: 1 / 2


PRDA-A BYPASS
AREA:0.31 AC.
APERVIOUS:0.31 AC.
CNPERVIOUS:69
TCPERVIOUS:6 MIN.
PRDA-A PERVIOUS TO BASIN
AREA:3.16 AC.
APERVIOUS:3.16 AC.
CNPERVIOUS:69
TCPERVIOUS:6 MIN.
PRDA-A IMPERVIOUS TO BASIN
AREA:6.49 AC.*
CNIMPERVIOUS:98
TCIMPERVIOUS:6 MIN.
BLOCK 71.02
LOT 5
N/F LANDS OF
BETTENHAUSEN, CHRISTOPHER P & SARAH
BLOCK 71.02
LOT 6
N/F LANDS OF
STEPHEN KOMOROSKI & MARIA OWCHARIW
D.B. 1157, PG. 311
BLOCK 71.02
LOT 7
N/F LANDS OF
WADE, ROBERT F & JOAN V
D.B. 2008, PG. 488
S65° 49' 35"E
S84° 45' 45"E
220.00'
25' PARKING BUFFER LINE
75' LANDSCAPING BUFFER LINE
190' x 250' WELL EASEMENT
20' WIDE WATER LINE EASEMENT
10' WIDE TEMPORARY EASEMENT
10' PARKING BUFFER LINE
75' LANDSCAPING BUFFER LINE
S20° 03' 47"W
N11° 48' 02"
N72°52'13"W
55.21'
R=10057.00'
L=100.57'
CHB=N72°35'01"W
CHD=100.57'
R=4057.00'
L=101.42'
CHB=N71°34'52"W
CHD=101.42'
R=2257.00'
L=42.77'
CHB=N70°19'19"W
CHD=42.77'
L=248.67'
CHB=N69°26'49"W
CHD=248.62'
L=56.45'
CHB=N65°19'47"W
CHD=56.45'
N65° 10' 09"W
P.O.B.
INLET GRATE=277.13
INLET GRATE=284.25
JERSEY BARRIER
CONC. SAN PAD
LINE BASED UPON THE TOWN OF CLINTON TAX MAP
TOWN OF CLINTON
TOWNSHIP OF CLINTON
APPROX. LOCATION OF MUNICIPAL BOUNDARY
SCALE:1"=40'

E&LP
140 WEST MAIN STREET HIGH BRIDGE, NJ 08829
PH. 908-238-0544 FAX. 908-238-9572
A PROFESSIONAL ASSOCIATION
CERTIFICATE OF AUTHORIZATION NO.: 24GA28021500 EXP. 8/31/2022

NO.	REVISION	BY	DATE

DATE

WAYNE J. INGRAM
PROFESSIONAL ENGINEER
N.J. P.E. NO. 24GB04258200

PROJECT:

PULEO INTERNATIONAL, LLC
13 MOEBUS PLACE
BLOCK 18 LOT 5
TOWN OF CLINTON

HUNTERDON COUNTY NEW JERSEY

TITLE:

PROPOSED DRAINAGE AREA MAP

JOB NO.:	0120176
SCALE:	1"=40'
DESIGNED:	EAJ
CHECKED:	KFO
FILENAME:	PRDA.DWG
DATE:	9 / 25 / 2020

DRAWING NO.: 2 / 2

APPENDIX D

Project: _____ By: _____
Location: _____ Date: _____
_____ Chk'd: _____
Revised: _____

Watershed: **EXDA A - Pre-Developed**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (sf)	Area (acres)	Product of CN x Area
B	Wood	55	433,744	9.96	547.66

Totals =	9.96	547.66

Composite Cn = $\frac{547.66}{9.96}$ = 55.00

USE Cn = 55

Project: _____ By: _____
Location: _____ Date: _____
_____ Chk'd: _____
Revised: _____

Watershed: **PRDA A - Pervious to Basin-Post Developed**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (sf)	Area (acres)	Product of CN x Area
B	Lawn	69	137,738	3.16	218.18

Totals = 3.16 218.18

Composite Cn = $\frac{218.18}{3.16}$ = 69.00

USE Cn = 69

Project: _____ By: _____
Location: _____ Date: _____
_____ Chk'd: _____
Revised: _____

Watershed: **PRDA A - Pervious-Post Developed**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (sf)	Area (acres)	Product of CN x Area
B	Impervious	98	282,497	6.49	635.55

Totals =	6.49	635.55

Composite Cn = $\frac{635.55}{6.49}$ = 98.00

USE Cn = 98

Project: _____ By: _____
Location: _____ Date: _____
_____ Chk'd: _____
Revised: _____

Watershed: **PRDA A - Pervious Bypass Area-Post Developed**

RUNOFF CURVE NUMBER CALCULATIONS:

(S.C.S. TR-55 method)

Soil name and hydrologic group	Cover Description	Cn	Area (sf)	Area (acres)	Product of CN x Area
B	Lawn	69	13,509	0.31	21.40

Totals =	0.31	21.40

Composite Cn = $\frac{21.40}{0.31}$ = 69.00

USE Cn = 69

APPENDIX E

Project: **Puleo International, Inc**
Location: **13 Moebus Place, Town of Clinton, NJ**

By: JZ
Date: 25-Feb-20
Chk'd: CN
Revised:

Drainage Area: **EXDA-A**

TIME OF CONCENTRATION

(National Engineering Handbook Chapter 15 - Velocity Method)

Sheet Flow

	Segment ID	A	B	C
Surface Description (Table 15-1)		Woods		
Manning's Roughness Coefficient, n (Table 15-1)		0.4		
Sheet Flow Length, L = (100)(sqrt(s))/n	ft.	100		
Two Year 24 Hour Rainfall, P2	in.	3.43		
Land Slope, s	ft/ft	0.0720		
Tt = $\frac{0.007(nL)^{0.8}}{(P2^{0.5})(s^{0.4})}$	hr	0.2071	0.0000	0.0000
Sheet flow Subtotal Tt =	**hr**			**0.2071**

Shallow Concentrated Flow

	Segment ID	A	B	C
Surface Description (Figure 15-4)		Woodland	Pavement	Short Grass
Flow Length, L	ft	641		
Watercourse Slope, s	ft/ft	0.0700		
Average Velocity, V (Figure 15-4)	fps	1.25		
Tt = $\frac{L}{(3600 \times V)}$	hr	0.1424	0.0000	0.0000
Shallow concentrated flow Subtotal Tt =	**hr**			**0.1424**

Open Channel Flow

	Segment ID			
Cross Sectional Flow Area, a	sq ft			
Wetted Perimeter, Pw	ft			
Hydraulic Radius, r = a/Pw	ft			
Channel Slope, s	ft/ft			
Manning's Roughness Coefficient, n				
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Flow length, L	ft			
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0000		
Channel flow Subtotal Tt =	**hr**			**0.0000**

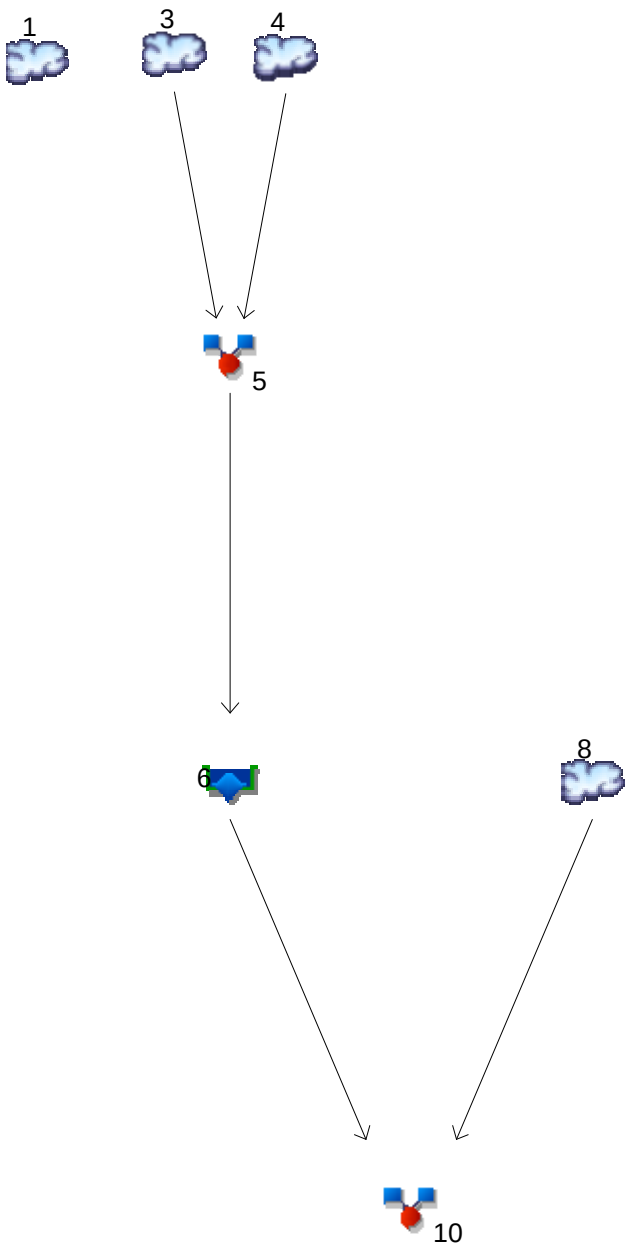
Pipe Flow

	Segment ID			
Structure 'From' - 'To'				
Flow Length, L	ft			
Pipe Diameter, D	in			
Manning's Roughness Coefficient, n				
Pipe Slope, s	ft/ft			
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0000		
Pipe flow Subtotal Tt =	**hr**			**0.0000**

Total Tt = 0.3495 hours
= 20.97 minutes

APPENDIX F

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	EXDA-A
3	SCS Runoff	PRDA-A-PERVIOUS
4	SCS Runoff	PRDA-A-IMPERVIOUS
5	Combine	PRDA-A To Basin
6	Reservoir	SWM-1
8	SCS Runoff	PRDA A Bypass
10	Combine	PRDA Total

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)							Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	1.342	-------	-------	7.176	-------	-------	23.84	EXDA-A
3	SCS Runoff	------	-------	3.692	-------	-------	8.602	-------	-------	19.15	PRDA-A-PERVIOUS
4	SCS Runoff	------	-------	24.25	-------	-------	36.12	-------	-------	58.13	PRDA-A-IMPERVIOUS
5	Combine	3, 4	-------	27.93	-------	-------	44.72	-------	-------	77.28	PRDA-A To Basin
6	Reservoir	5	-------	0.495	-------	-------	1.858	-------	-------	18.41	SWM-1
8	SCS Runoff	------	-------	0.362	-------	-------	0.844	-------	-------	1.879	PRDA A Bypass
10	Combine	6, 8,	-------	0.650	-------	-------	1.903	-------	-------	18.89	PRDA Total

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.342	1	748	11,772	------	------	------	EXDA-A
3	SCS Runoff	3.692	1	728	10,792	------	------	------	PRDA-A-PERVIOUS
4	SCS Runoff	24.25	1	727	77,663	------	------	------	PRDA-A-IMPERVIOUS
5	Combine	27.93	1	727	88,455	3, 4	------	------	PRDA-A To Basin
6	Reservoir	0.495	1	1081	51,681	5	238.46	69,810	SWM-1
8	SCS Runoff	0.362	1	728	1,059	------	------	------	PRDA A Bypass
10	Combine	0.650	1	728	52,739	6, 8,	------	------	PRDA Total

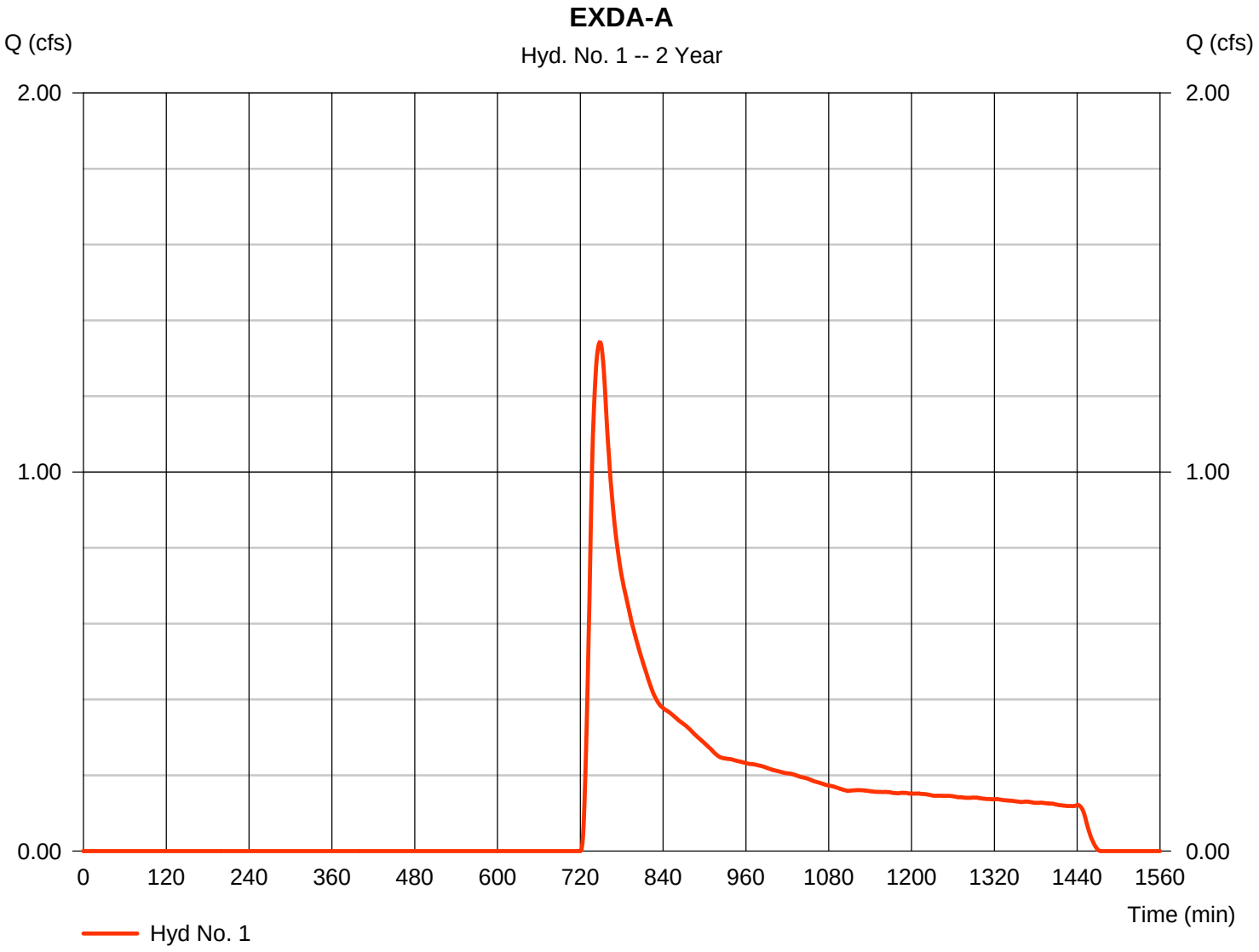
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.342 cfs
Storm frequency	=	2 yrs	Time to peak	=	748 min
Time interval	=	1 min	Hyd. volume	=	11,772 cuft
Drainage area	=	9.960 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	3.43 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Reg Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



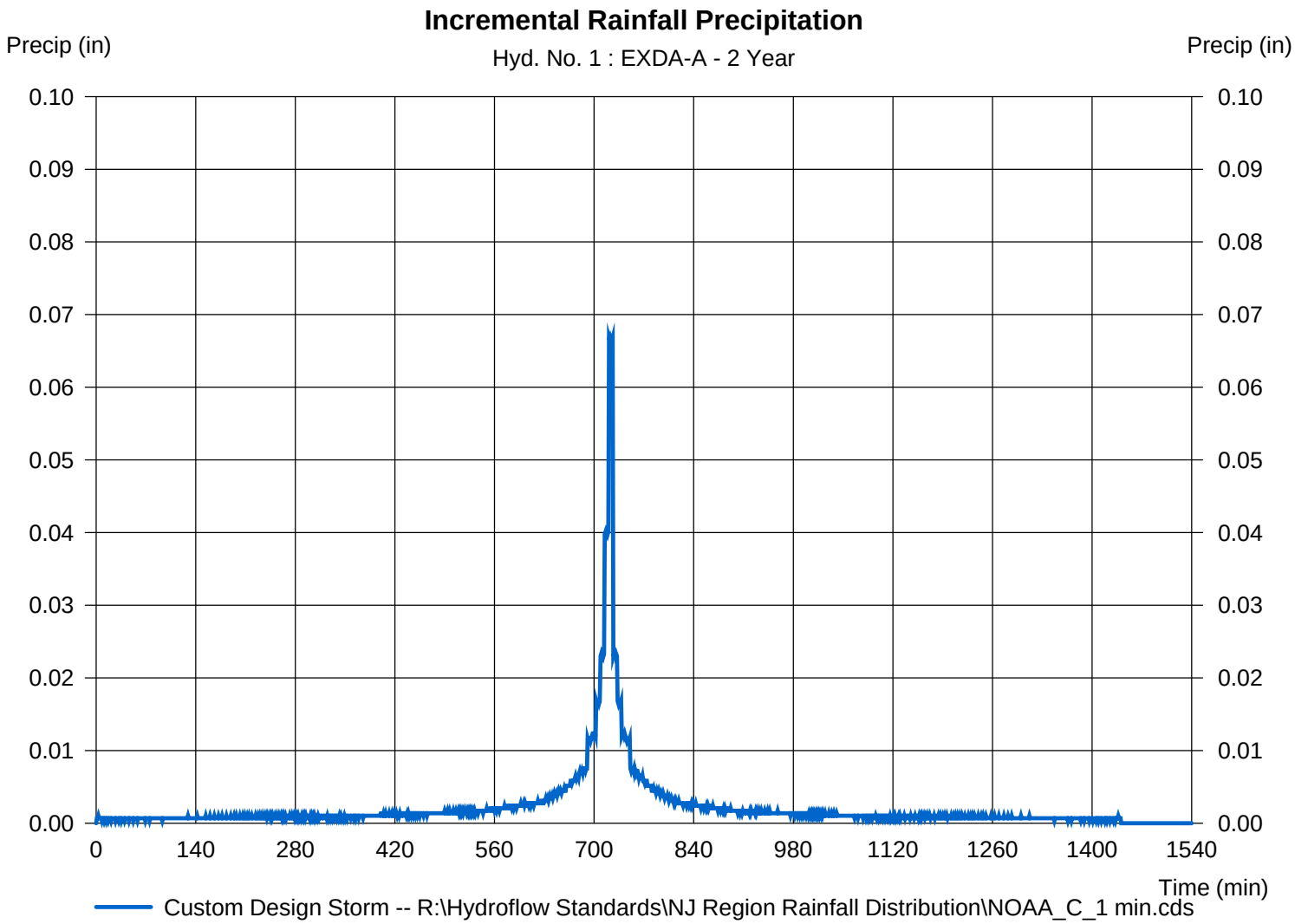
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Storm Frequency	= 2 yrs	Time interval	= 1 min
Total precip.	= 3.4300 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



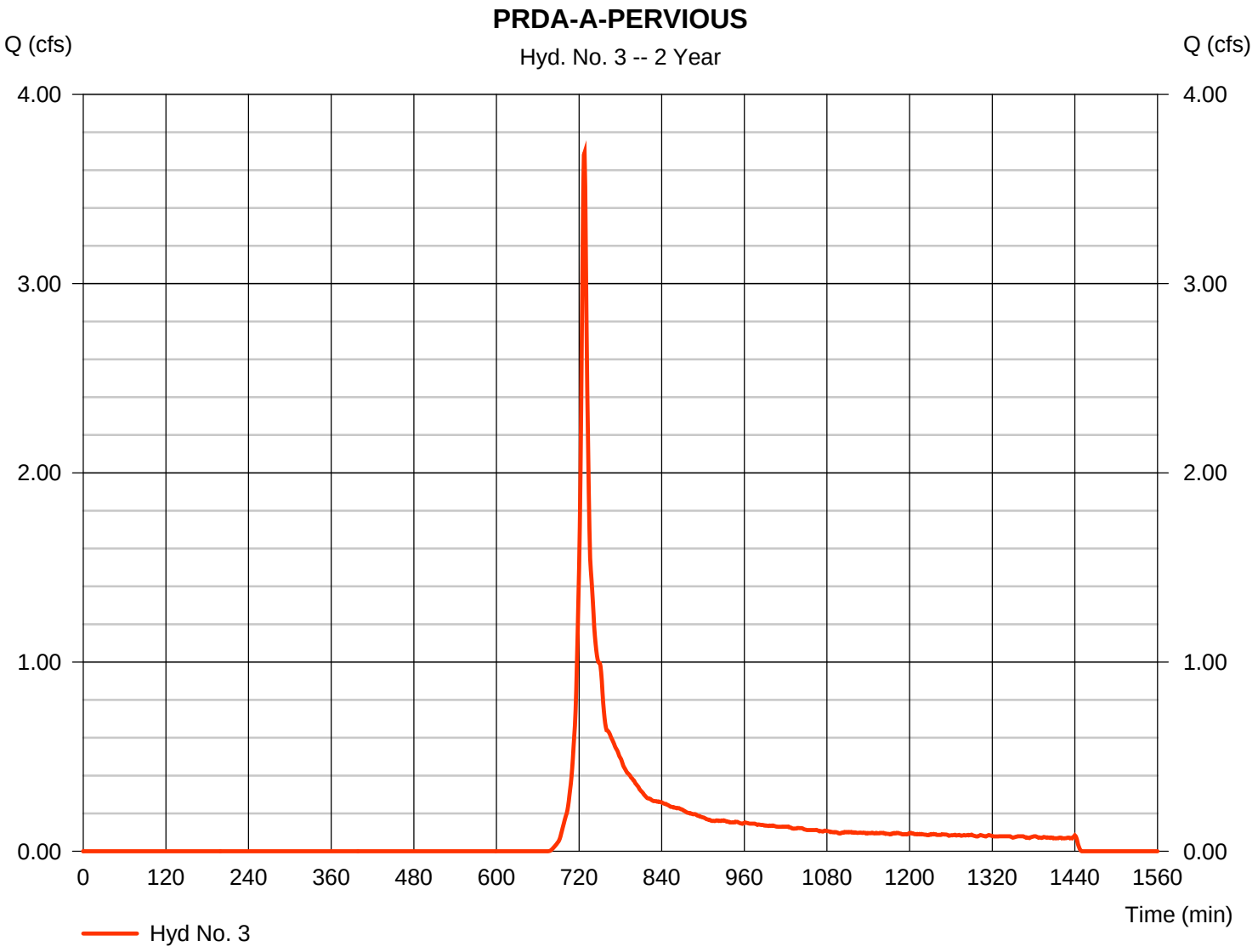
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 3

PRDA-A-PERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.692 cfs
Storm frequency	=	2 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	10,792 cuft
Drainage area	=	3.160 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.43 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rea Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484

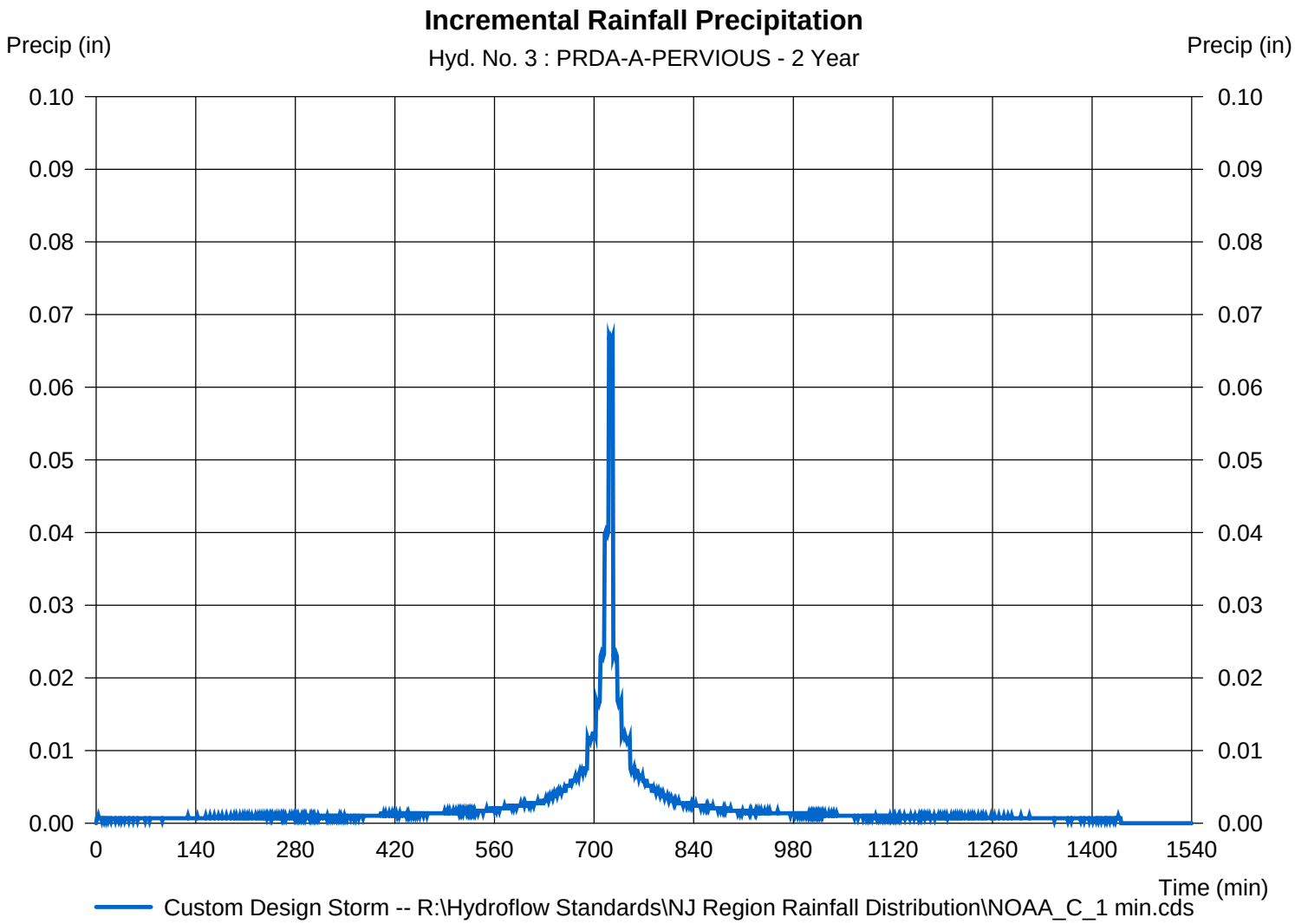


Precipitation Report

Hyd. No. 3

PRDA-A-PERVIOUS

Storm Frequency	= 2 yrs	Time interval	= 1 min
Total precip.	= 3.4300 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



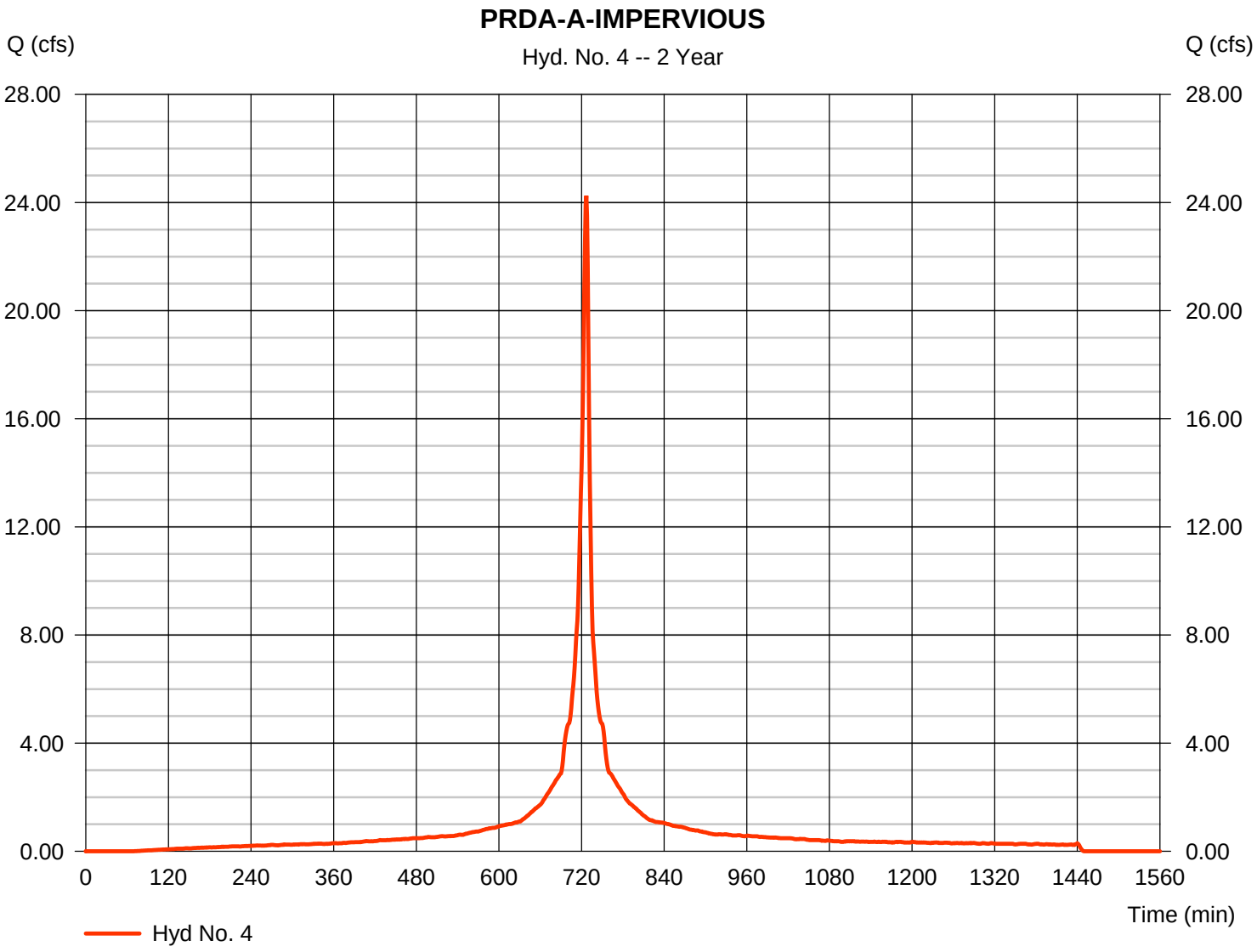
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	24.25 cfs
Storm frequency	=	2 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	77,663 cuft
Drainage area	=	6.490 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.43 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Region 3 Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



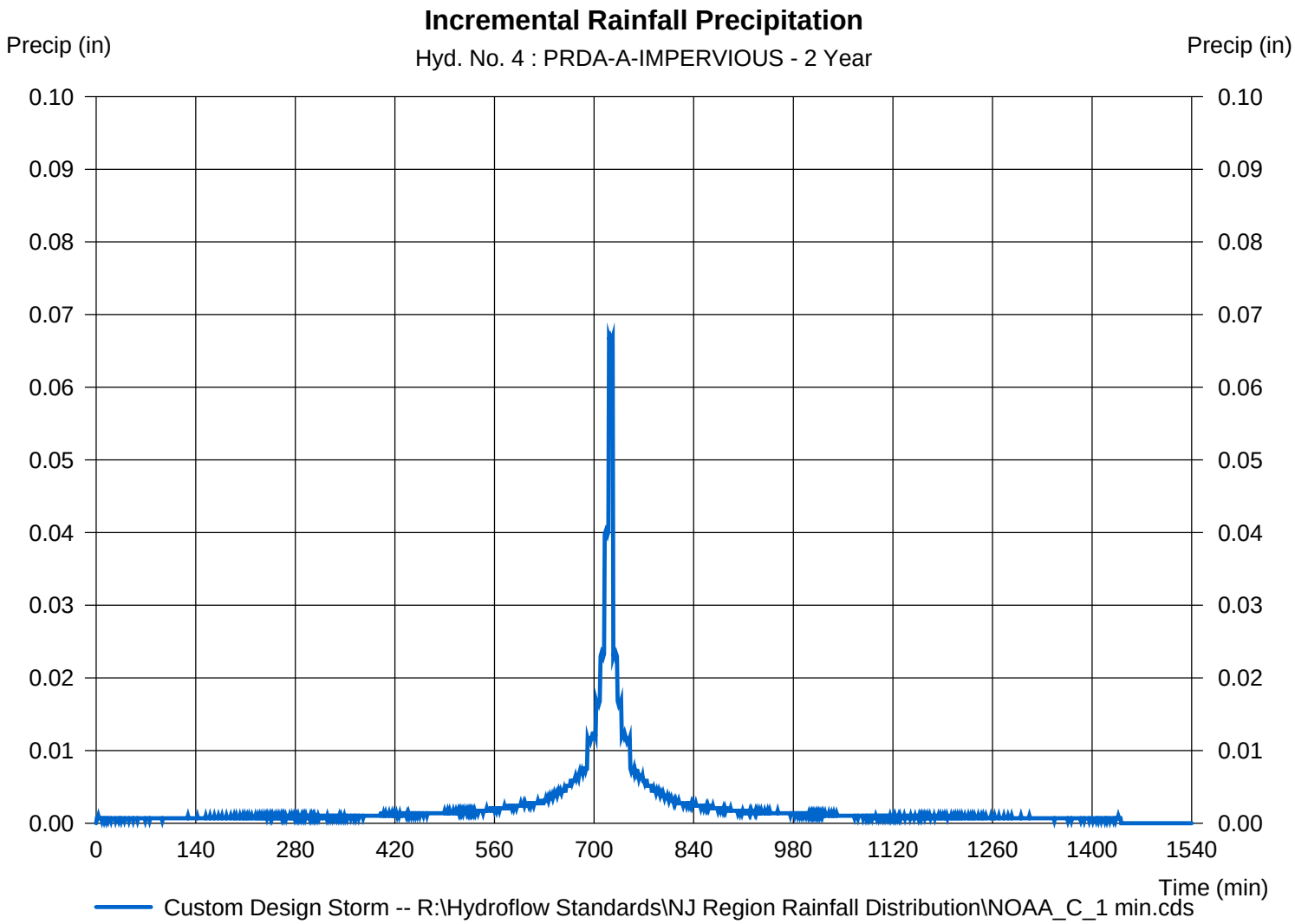
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Storm Frequency	= 2 yrs	Time interval	= 1 min
Total precip.	= 3.4300 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



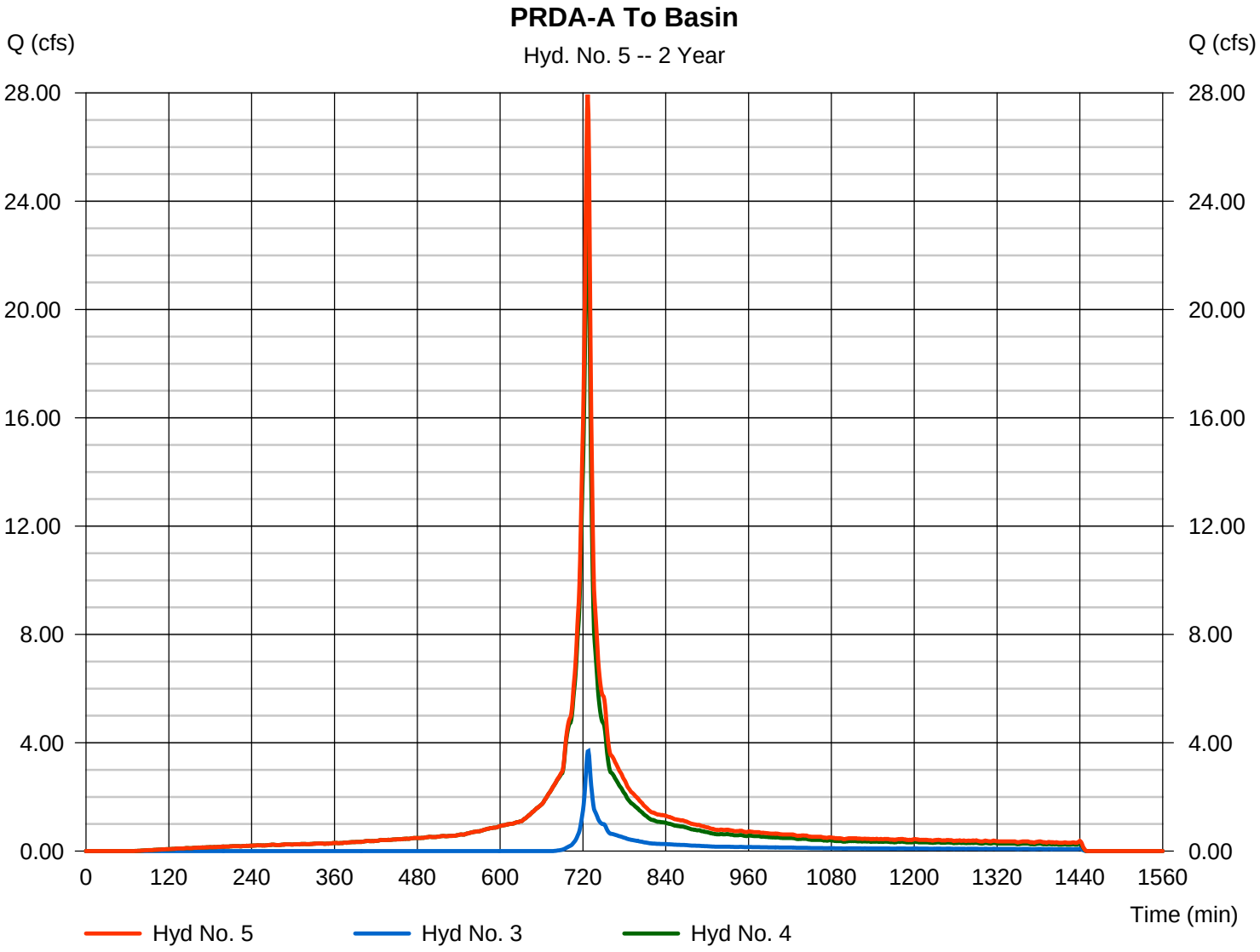
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 5

PRDA-A To Basin

Hydrograph type	= Combine	Peak discharge	= 27.93 cfs
Storm frequency	= 2 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 88,455 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 9.650 ac



Hydrograph Report

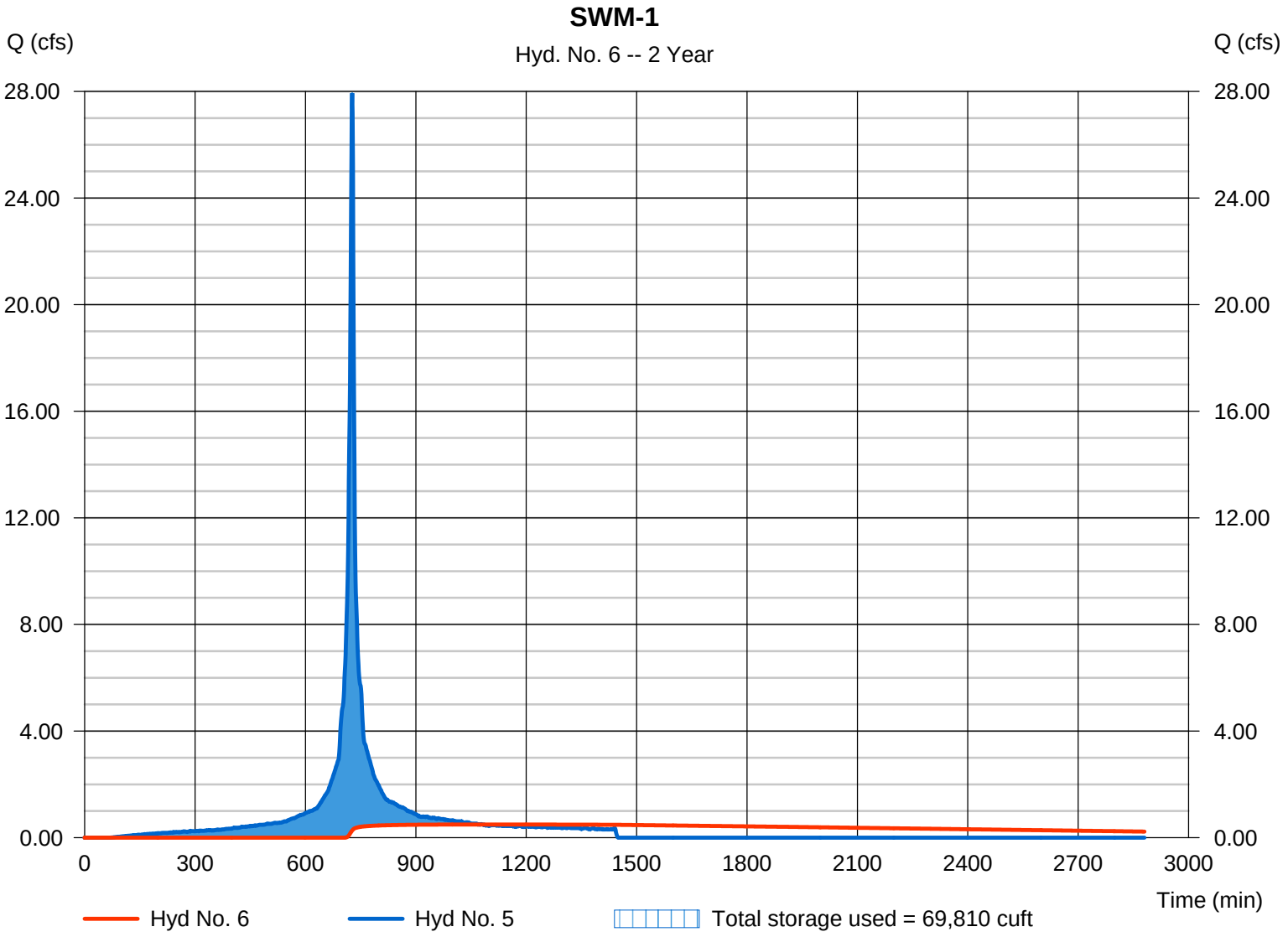
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 6

SWM-1

Hydrograph type	=	Reservoir	Peak discharge	=	0.495 cfs
Storm frequency	=	2 yrs	Time to peak	=	1081 min
Time interval	=	1 min	Hyd. volume	=	51,681 cuft
Inflow hyd. No.	=	5 - PRDA-A To Basin	Max. Elevation	=	238.46 ft
Reservoir name	=	BIORETENTION BASIN	Max. Storage	=	69,810 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Pond No. 1 - BIORETENTION BASIN

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 236.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	236.00	24,863	0	0
1.00	237.00	27,631	26,232	26,232
2.00	238.00	30,462	29,032	55,264
3.00	239.00	33,357	31,895	87,160
4.00	240.00	36,316	34,823	121,982
5.00	241.00	39,338	37,813	159,795

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	4.00	0.00	0.00
Span (in)	= 18.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 231.00	236.90	0.00	0.00
Length (ft)	= 1.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

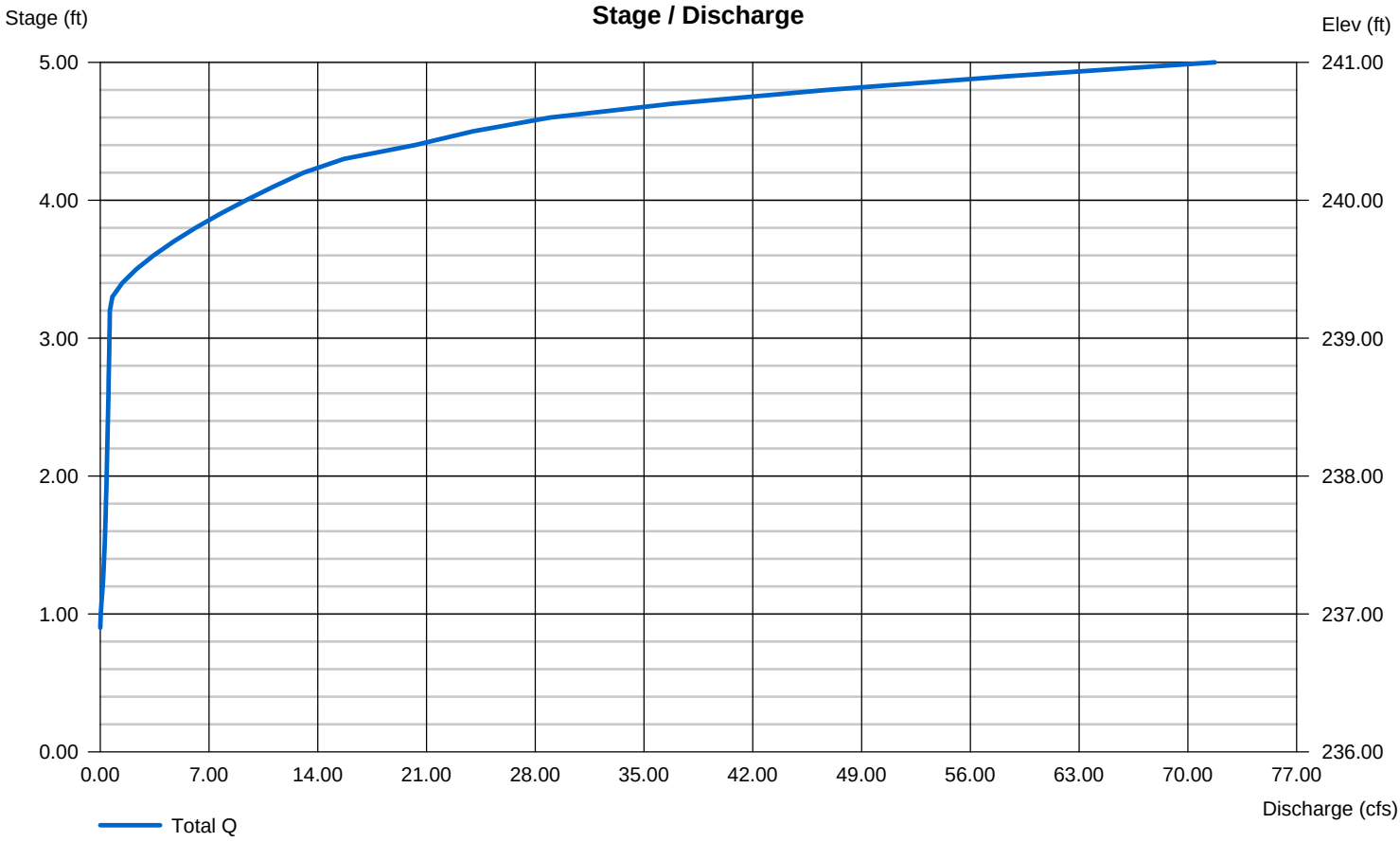
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	4.00	50.00	0.00
Crest El. (ft)	= 240.25	239.25	240.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



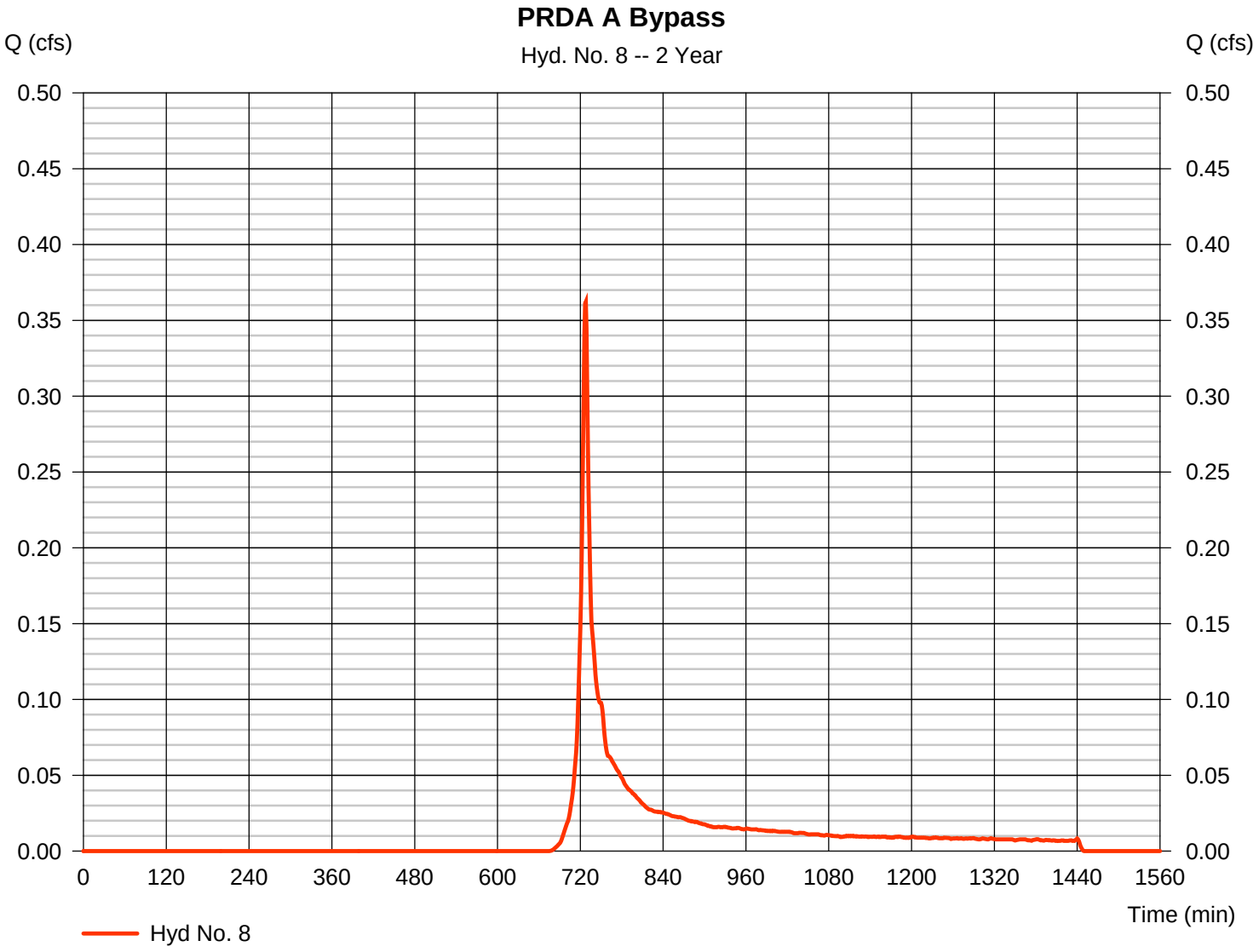
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 8

PRDA A Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.362 cfs
Storm frequency	=	2 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	1,059 cuft
Drainage area	=	0.310 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.43 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Reg Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



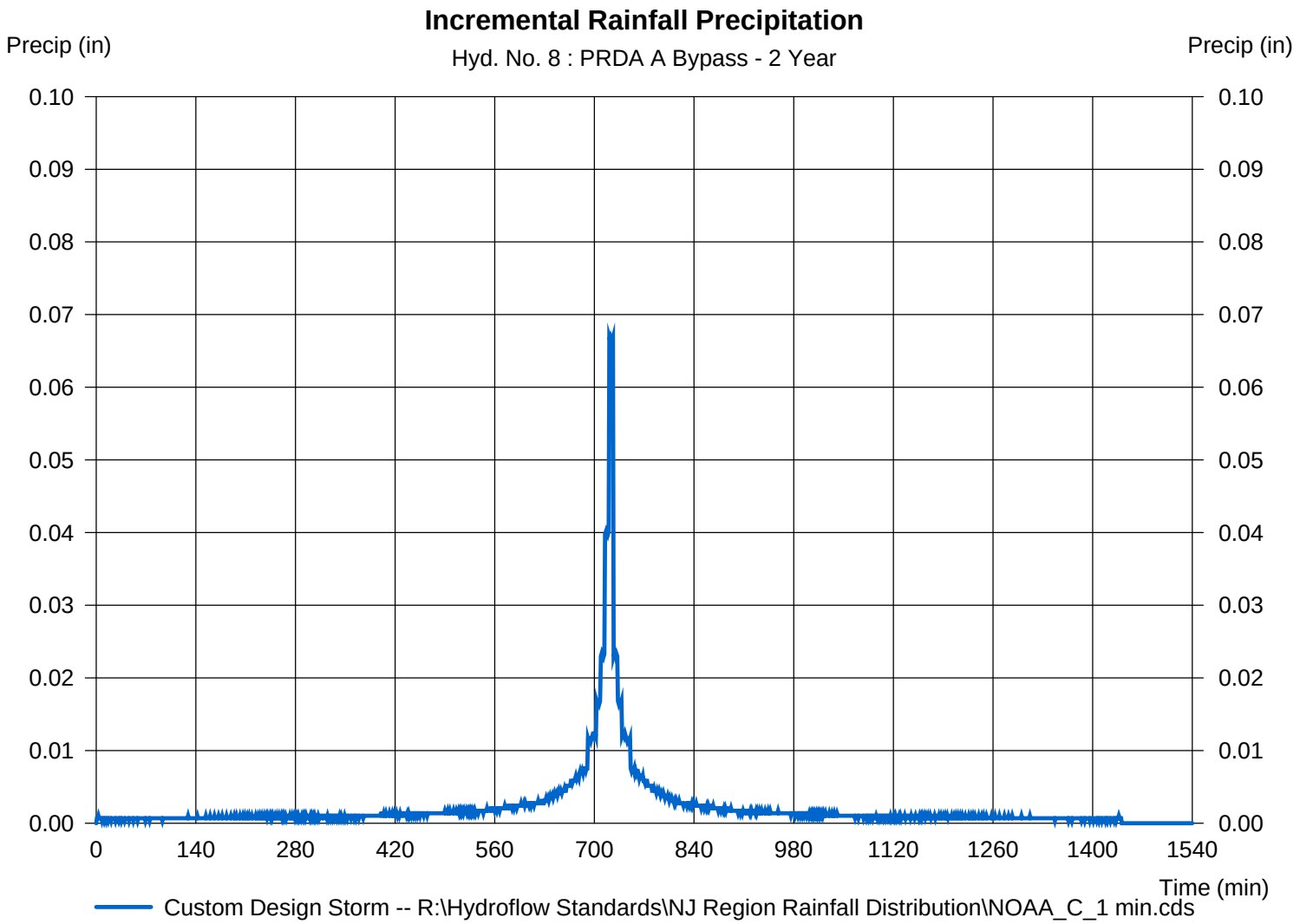
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 8

PRDA A Bypass

Storm Frequency	= 2 yrs	Time interval	= 1 min
Total precip.	= 3.4300 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



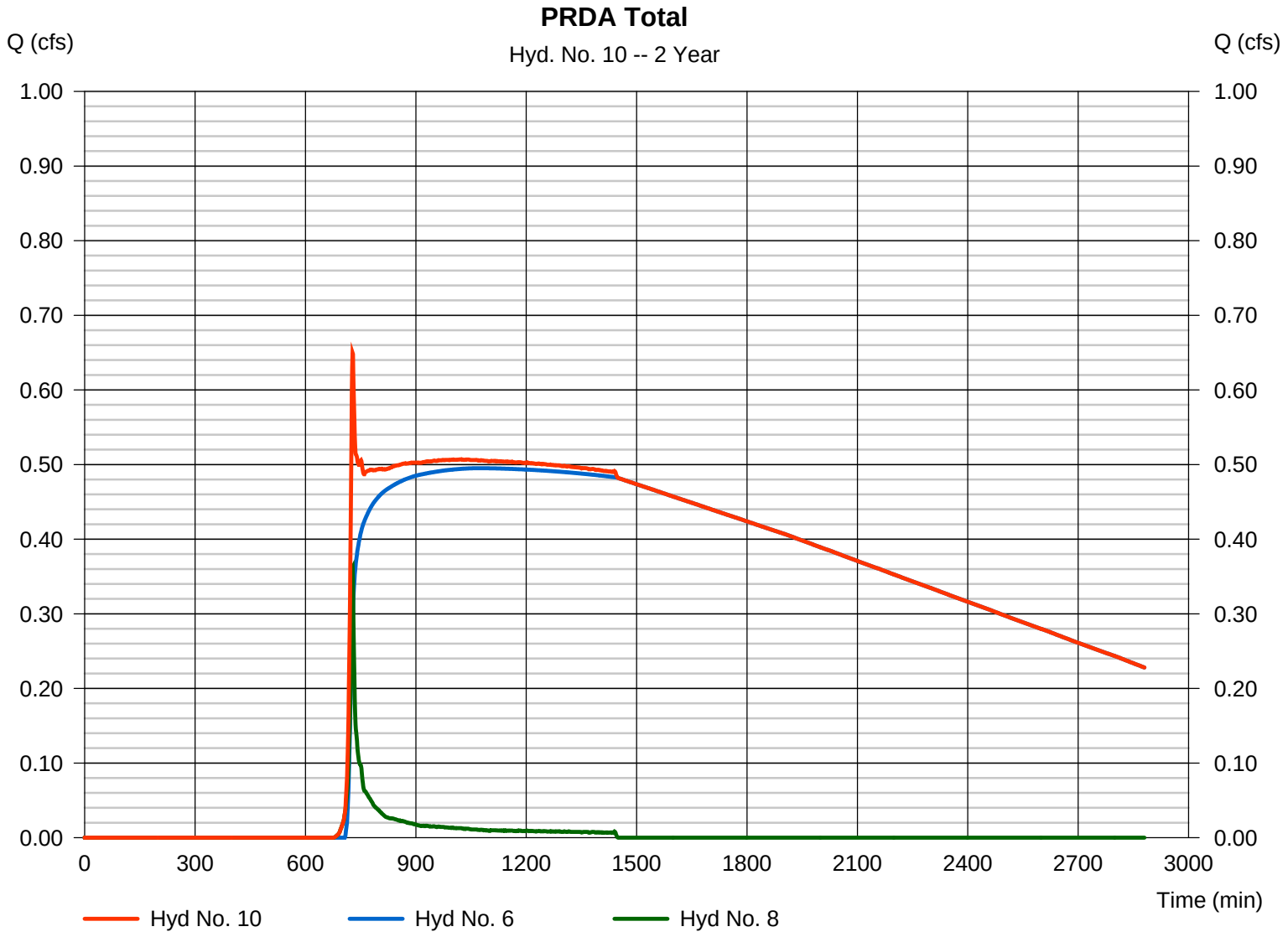
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 10

PRDA Total

Hydrograph type	= Combine	Peak discharge	= 0.650 cfs
Storm frequency	= 2 yrs	Time to peak	= 728 min
Time interval	= 1 min	Hyd. volume	= 52,739 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.310 ac



Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.176	1	738	37,235	------	------	------	EXDA-A
3	SCS Runoff	8.602	1	727	23,844	------	------	------	PRDA-A-PERVIOUS
4	SCS Runoff	36.12	1	727	117,661	------	------	------	PRDA-A-IMPERVIOUS
5	Combine	44.72	1	727	141,506	3, 4	------	------	PRDA-A To Basin
6	Reservoir	1.858	1	853	89,479	5	239.45	102,791	SWM-1
8	SCS Runoff	0.844	1	727	2,339	------	------	------	PRDA A Bypass
10	Combine	1.903	1	851	91,818	6, 8,	------	------	PRDA Total

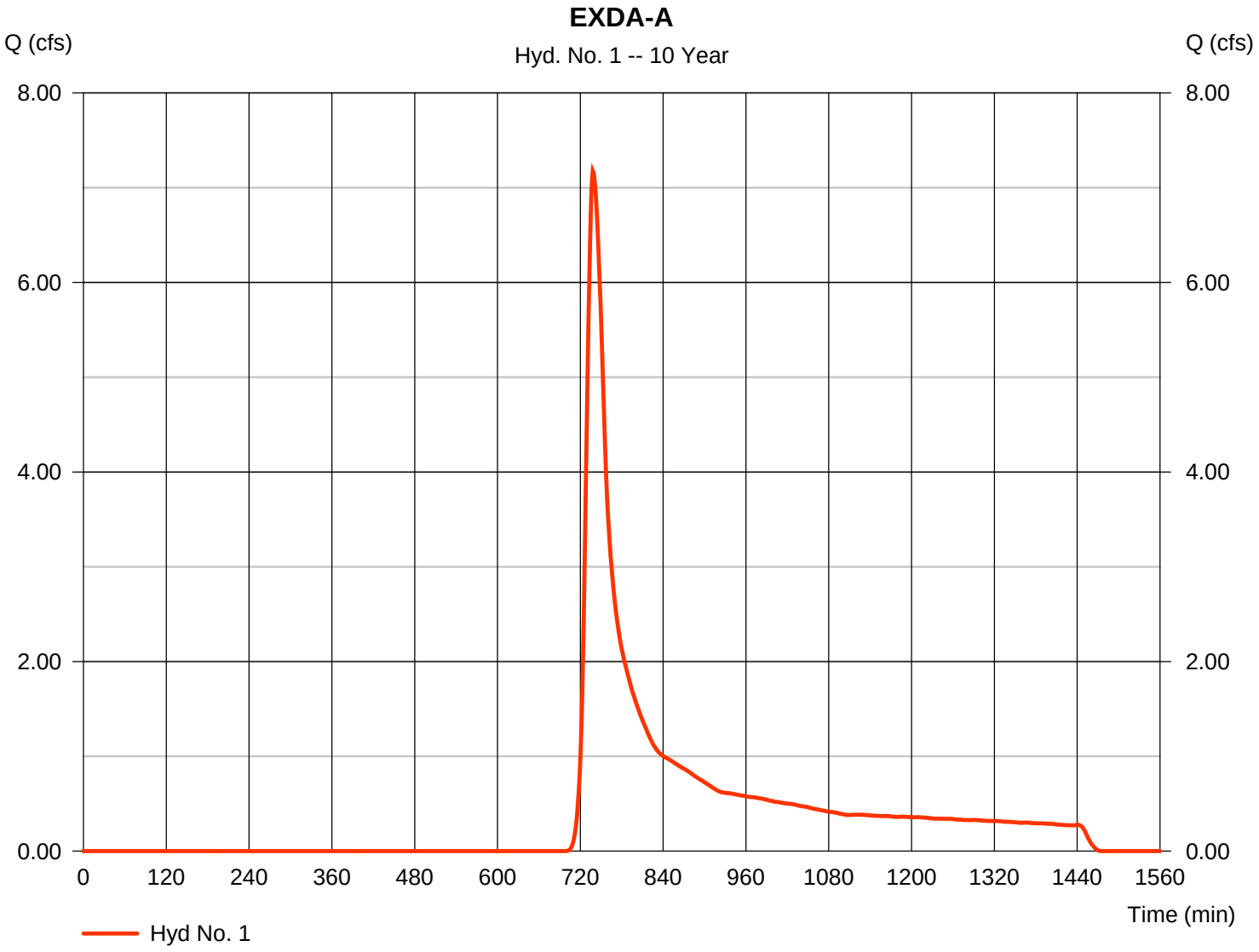
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.176 cfs
Storm frequency	=	10 yrs	Time to peak	=	738 min
Time interval	=	1 min	Hyd. volume	=	37,235 cuft
Drainage area	=	9.960 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	5.08 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Reg Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



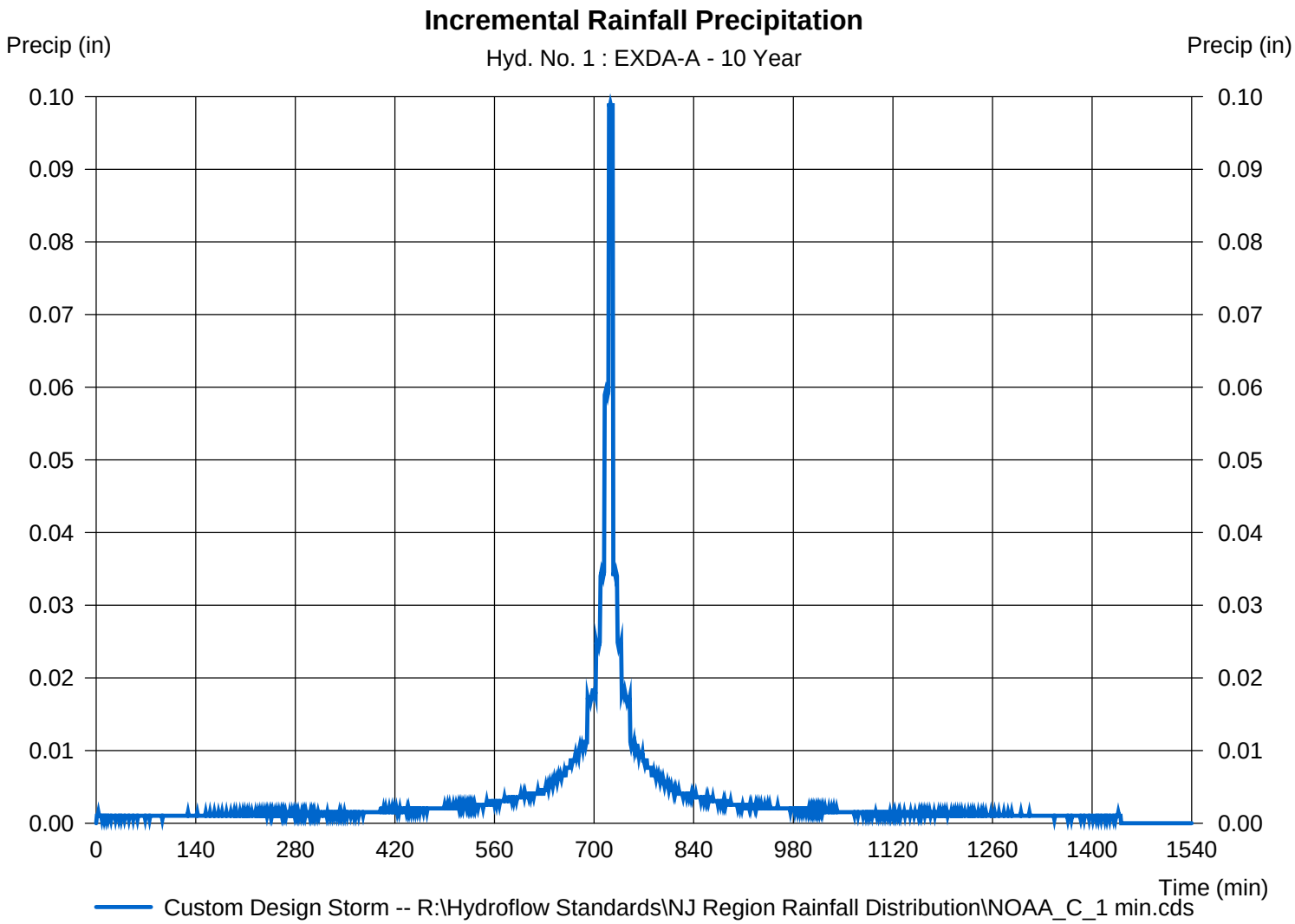
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 5.0800 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



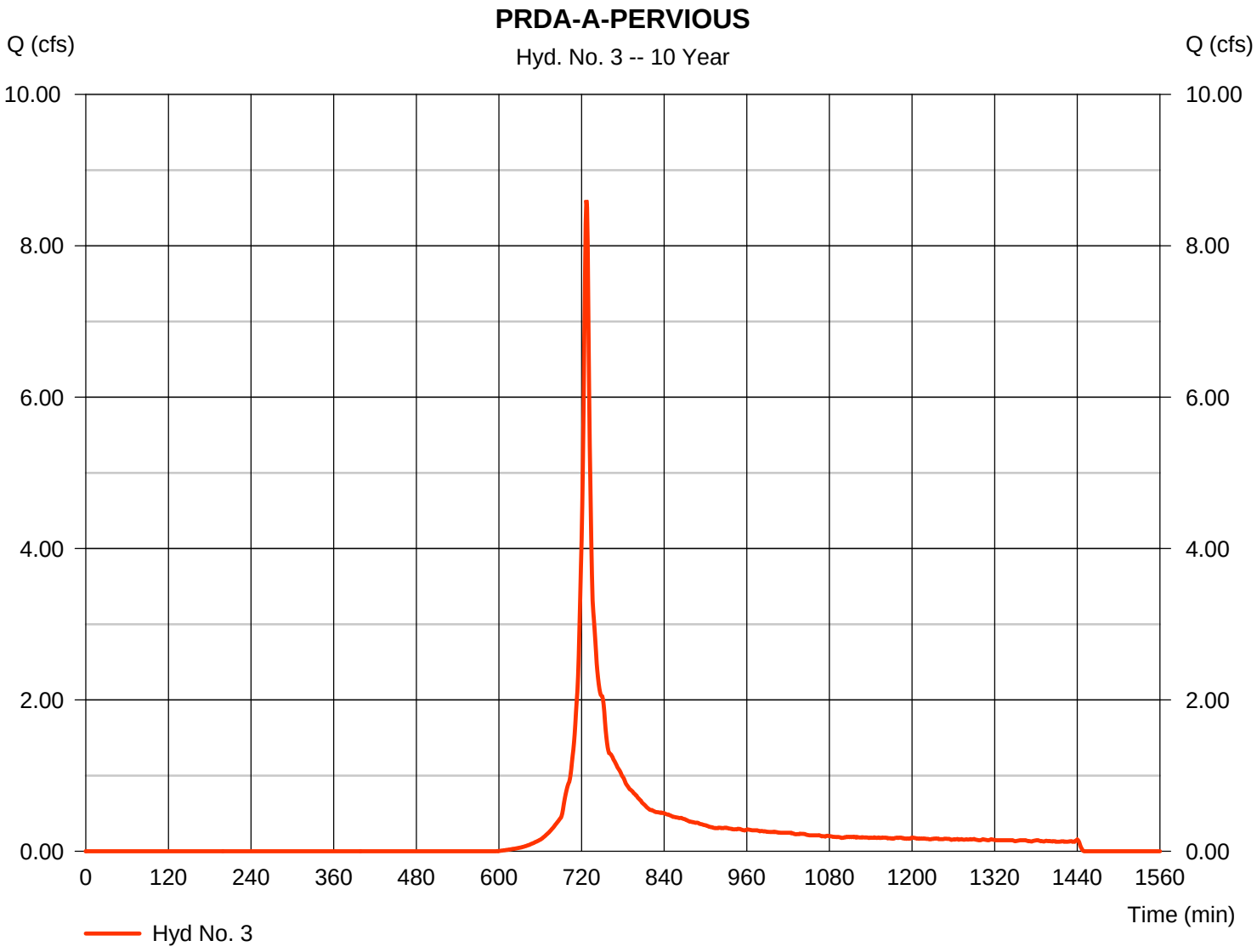
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 3

PRDA-A-PERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.602 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	23,844 cuft
Drainage area	=	3.160 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.08 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rest of State Rainfall Distribution\484A_C_1 min.cds	Shape factor	=	484

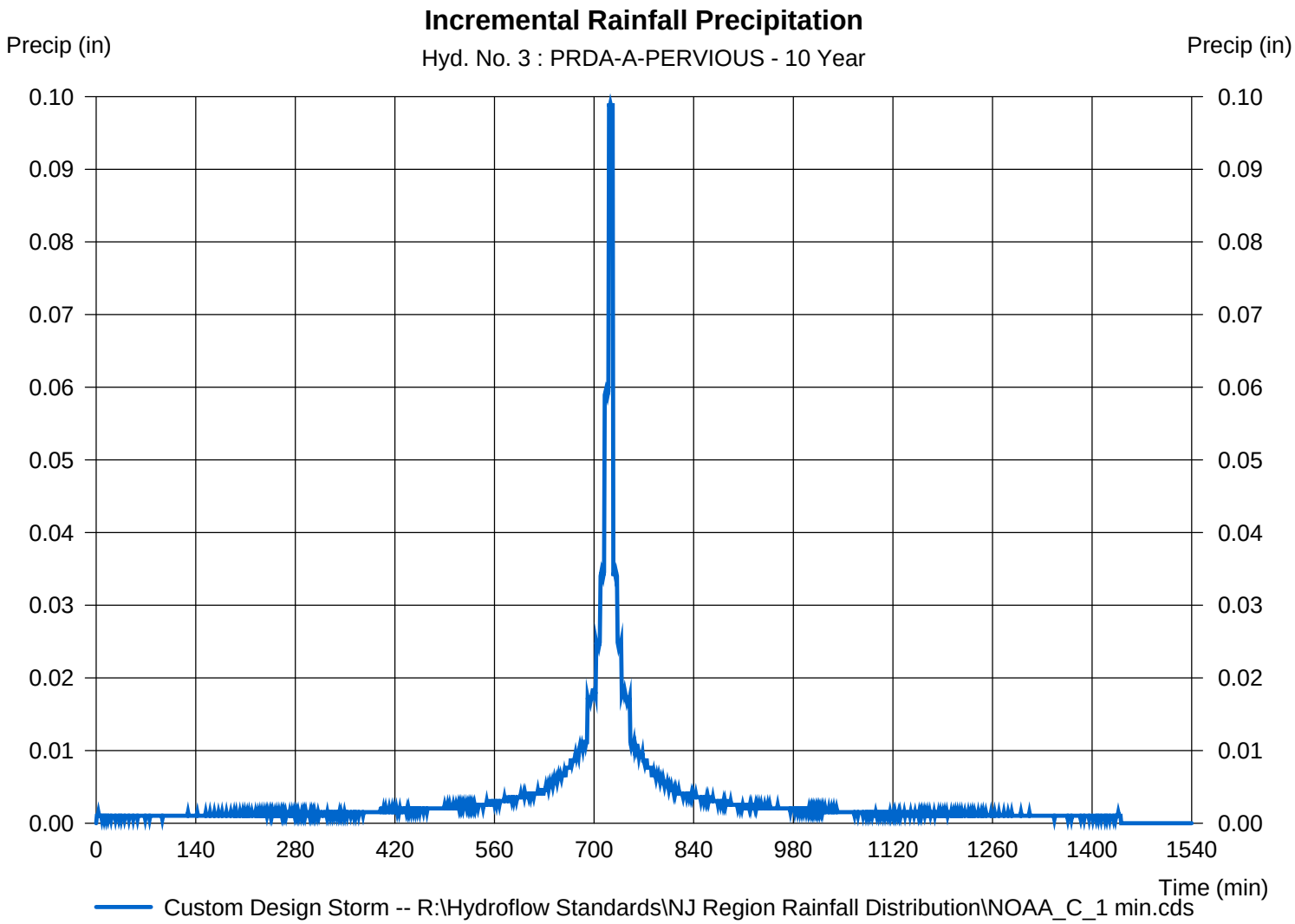


Precipitation Report

Hyd. No. 3

PRDA-A-PERVIOUS

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 5.0800 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



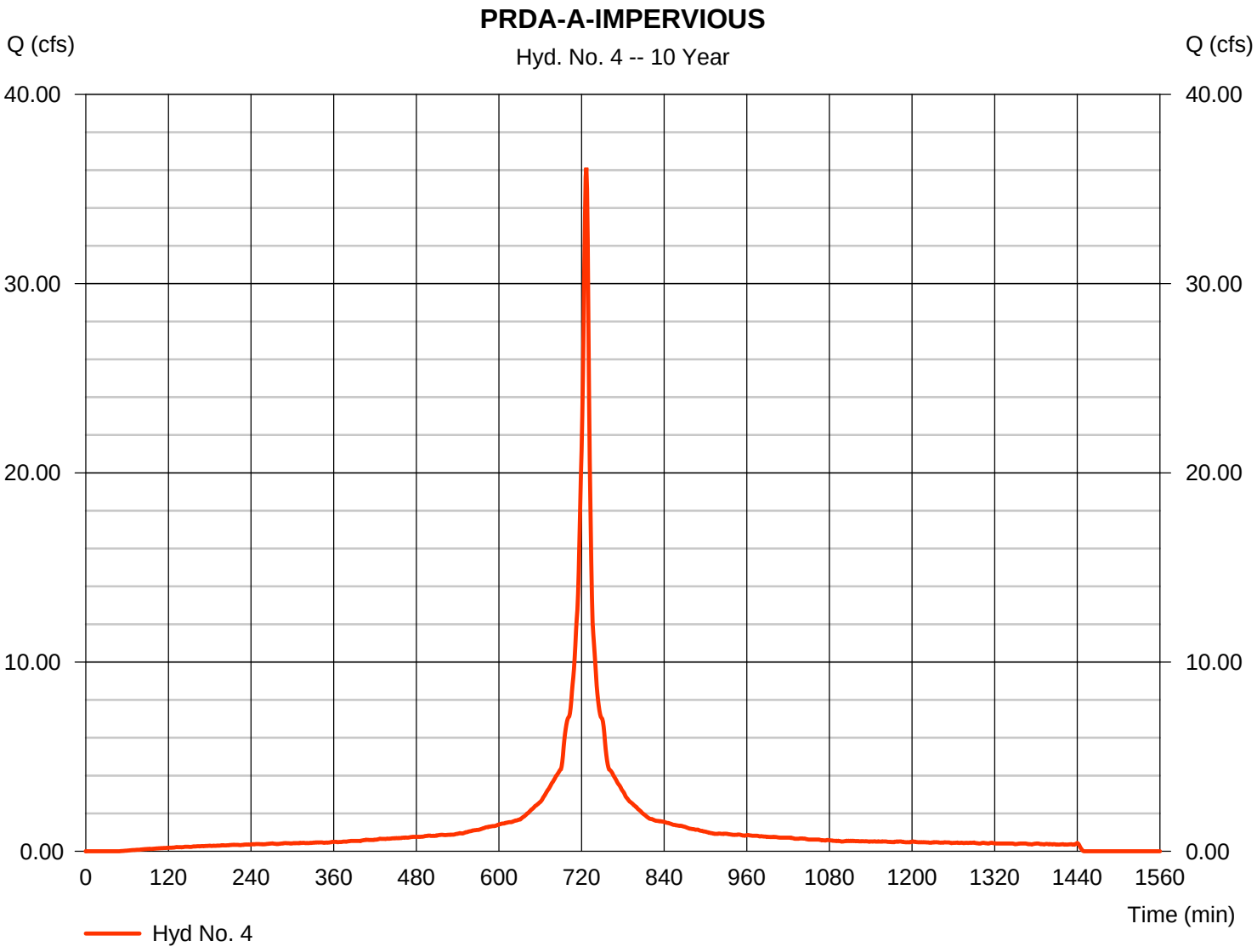
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	36.12 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	117,661 cuft
Drainage area	=	6.490 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.08 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rea Storm Rainfall Distribution\484AA_C_1 min.cds			



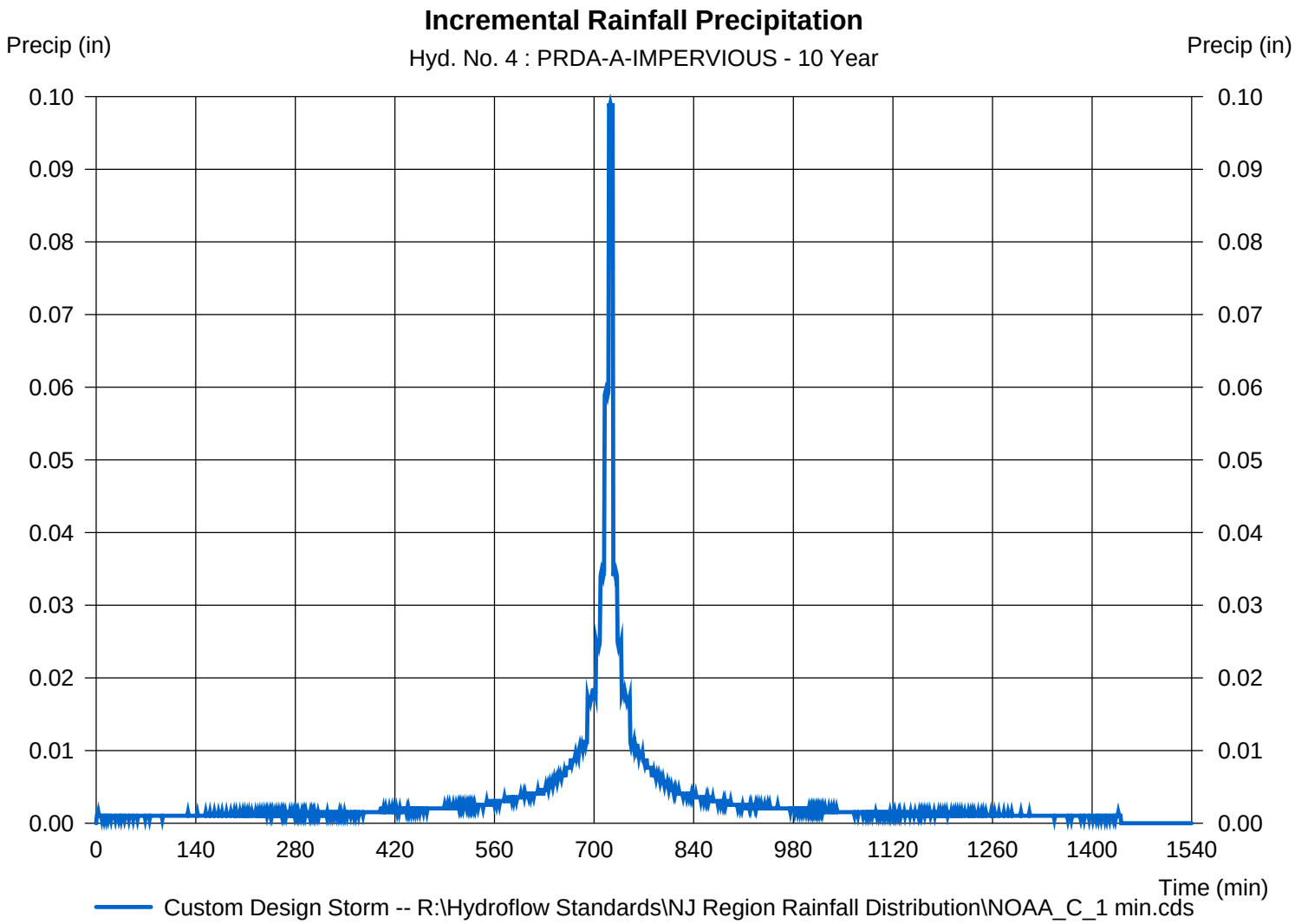
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 5.0800 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



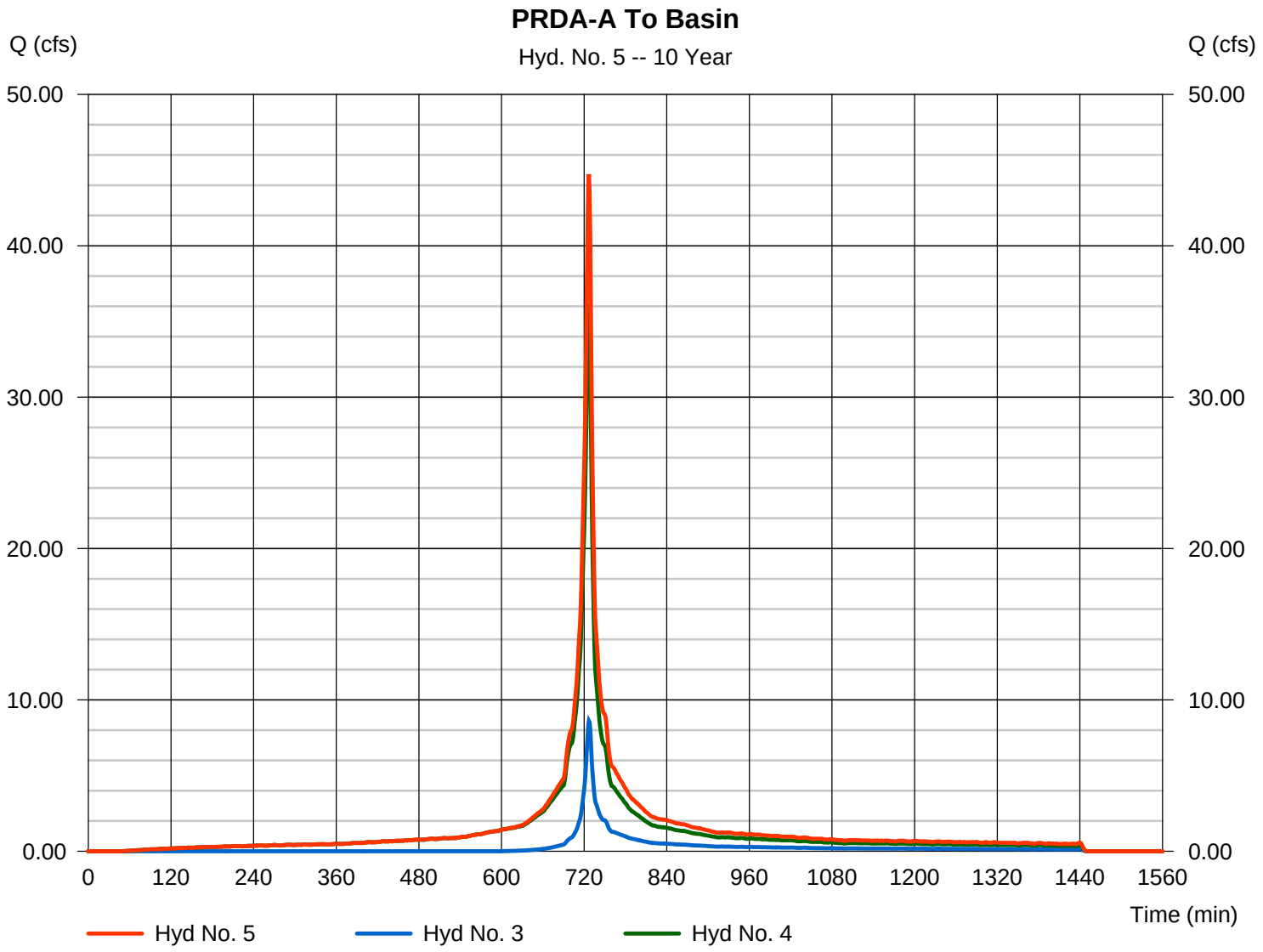
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 5

PRDA-A To Basin

Hydrograph type	=	Combine	Peak discharge	=	44.72 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	141,506 cuft
Inflow hyds.	=	3, 4	Contrib. drain. area	=	9.650 ac



Hydrograph Report

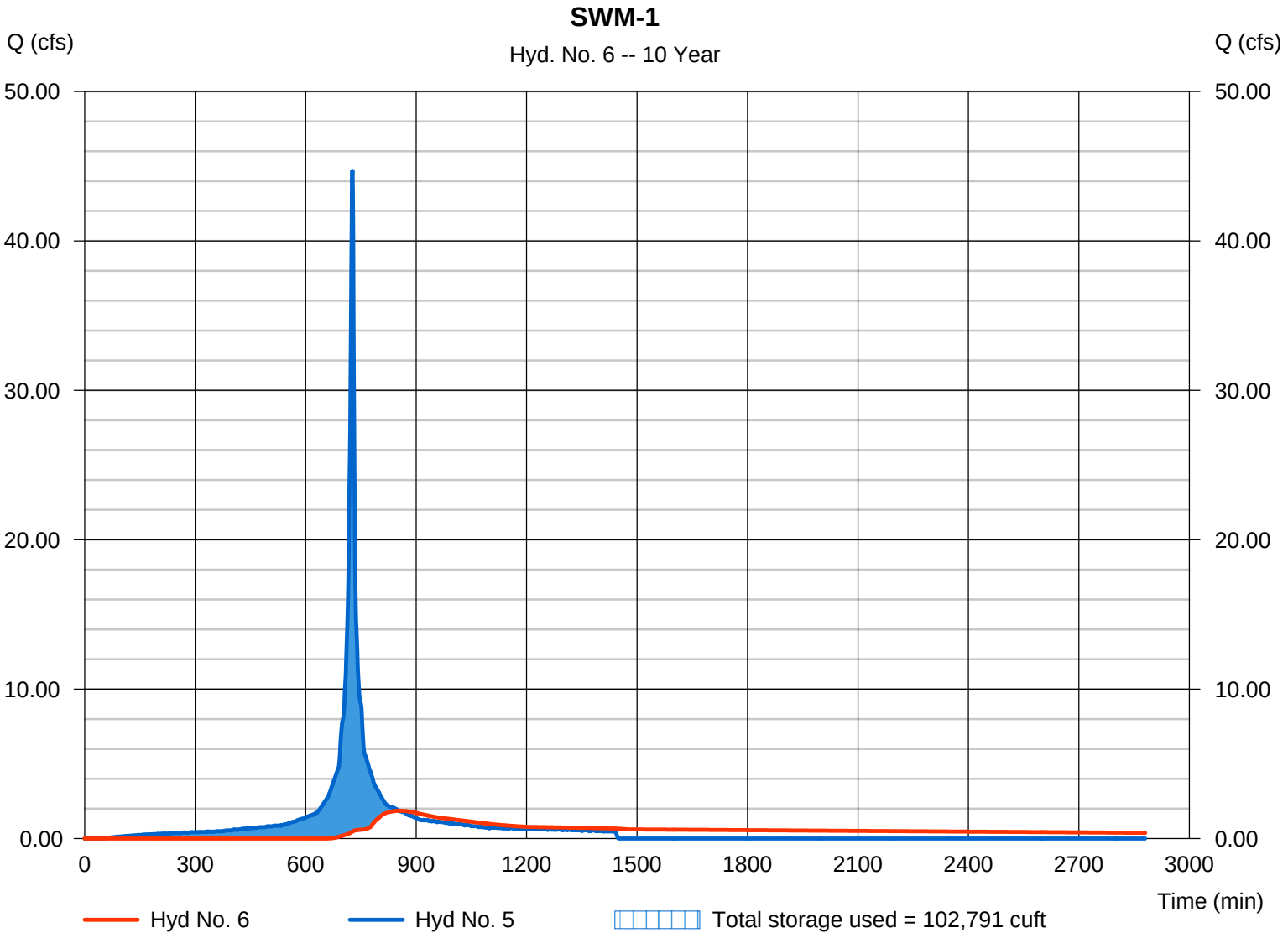
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 6

SWM-1

Hydrograph type	=	Reservoir	Peak discharge	=	1.858 cfs
Storm frequency	=	10 yrs	Time to peak	=	853 min
Time interval	=	1 min	Hyd. volume	=	89,479 cuft
Inflow hyd. No.	=	5 - PRDA-A To Basin	Max. Elevation	=	239.45 ft
Reservoir name	=	BIORETENTION BASIN	Max. Storage	=	102,791 cuft

Storage Indication method used.



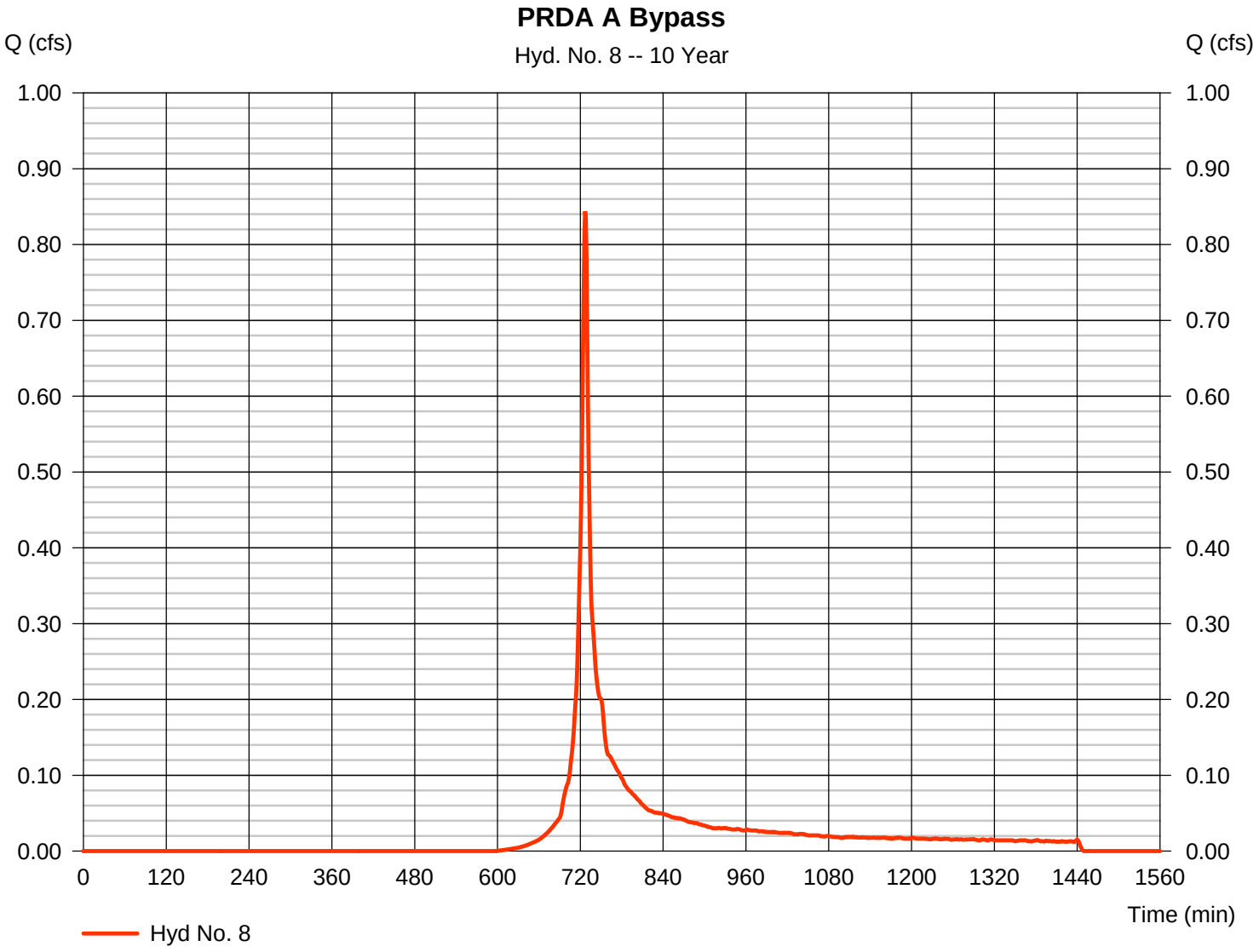
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 8

PRDA A Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.844 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	2,339 cuft
Drainage area	=	0.310 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.08 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Reg Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484

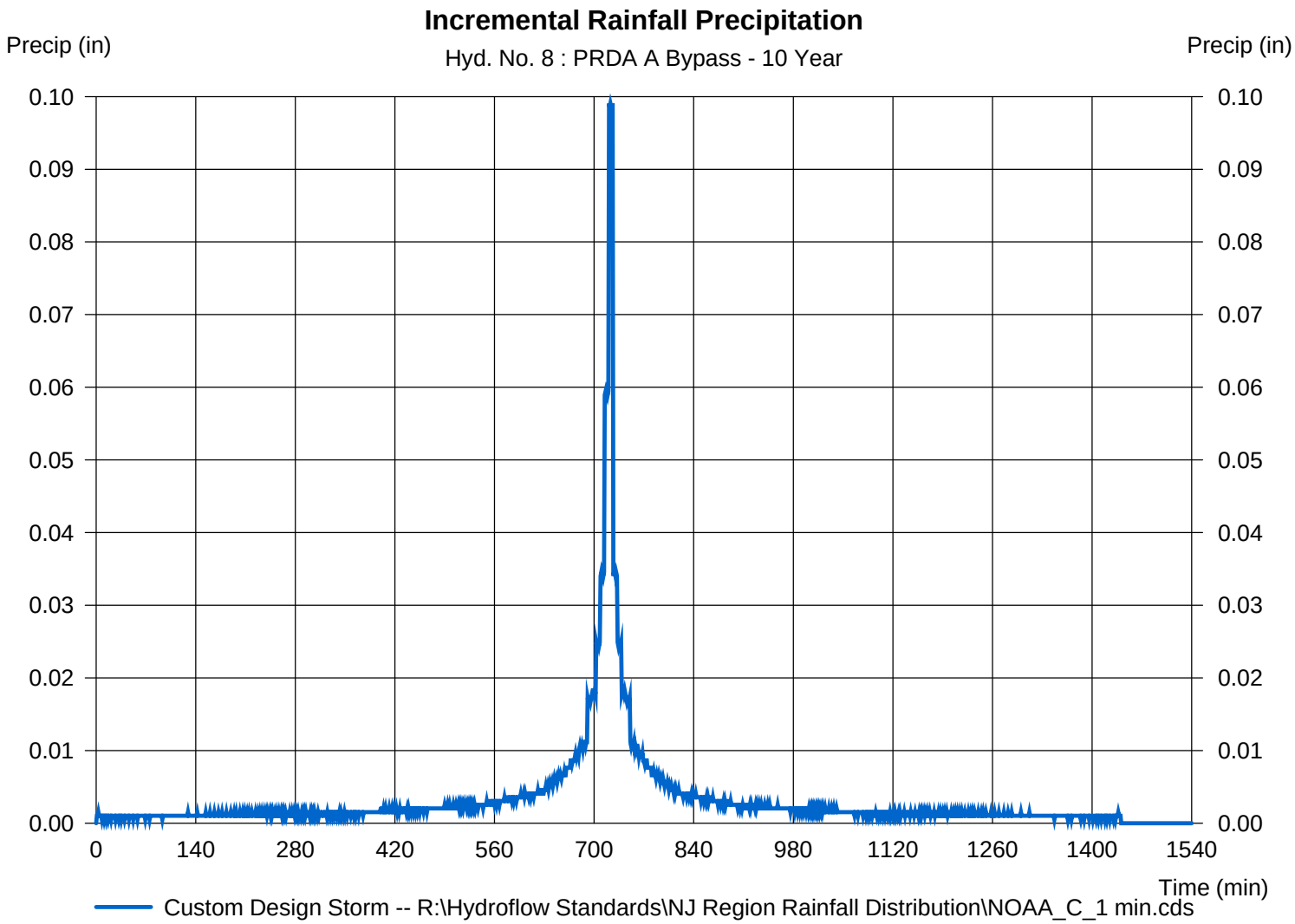


Precipitation Report

Hyd. No. 8

PRDA A Bypass

Storm Frequency	= 10 yrs	Time interval	= 1 min
Total precip.	= 5.0800 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



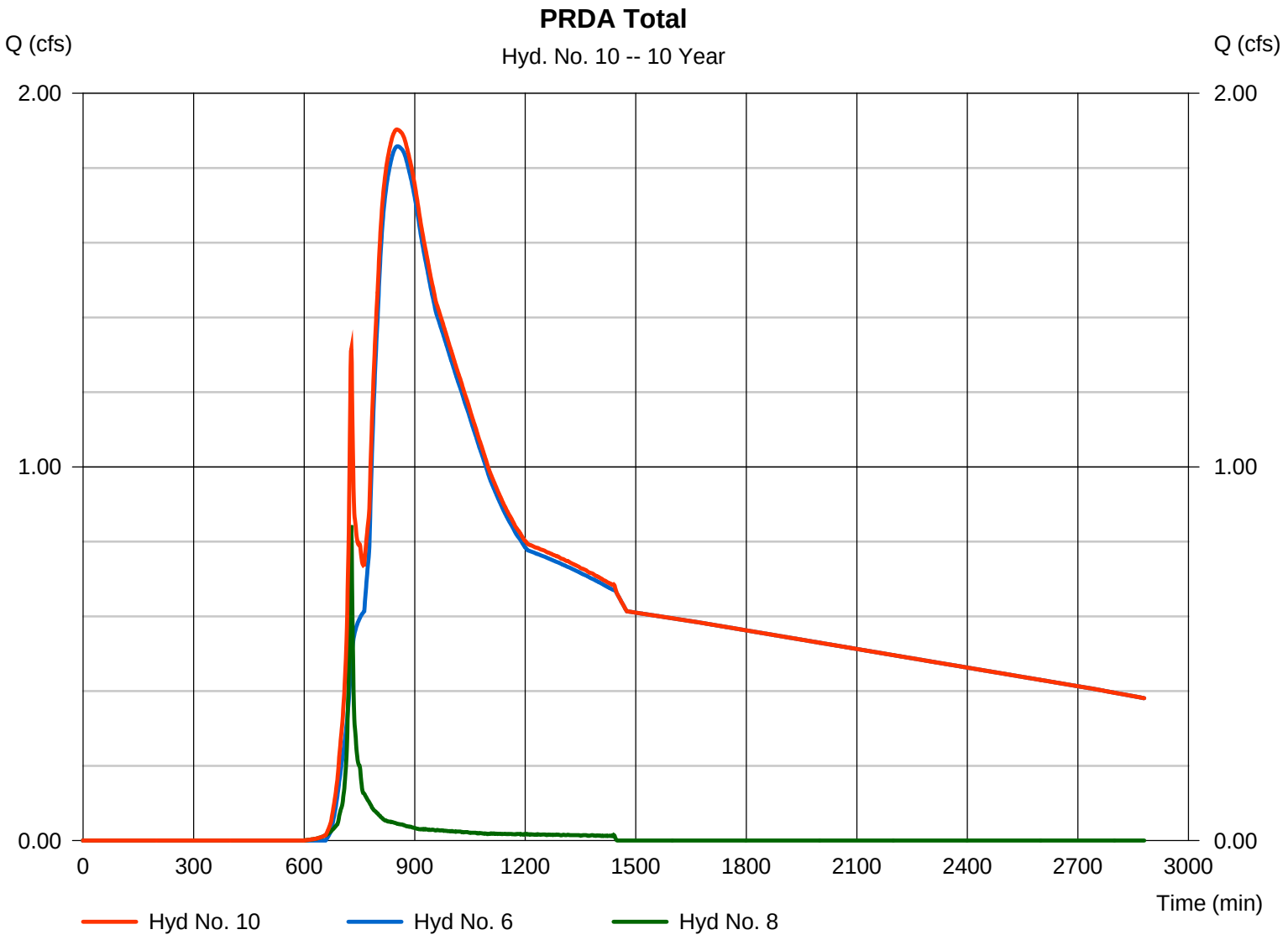
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 10

PRDA Total

Hydrograph type	= Combine	Peak discharge	= 1.903 cfs
Storm frequency	= 10 yrs	Time to peak	= 851 min
Time interval	= 1 min	Hyd. volume	= 91,818 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.310 ac



Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	23.84	1	737	105,387	------	------	------	EXDA-A
3	SCS Runoff	19.15	1	727	52,964	------	------	------	PRDA-A-PERVIOUS
4	SCS Runoff	58.13	1	727	192,175	------	------	------	PRDA-A-IMPERVIOUS
5	Combine	77.28	1	727	245,140	3, 4	------	------	PRDA-A To Basin
6	Reservoir	18.41	1	743	191,517	5	240.36	135,583	SWM-1
8	SCS Runoff	1.879	1	727	5,196	------	------	------	PRDA A Bypass
10	Combine	18.89	1	743	196,713	6, 8,	------	------	PRDA Total

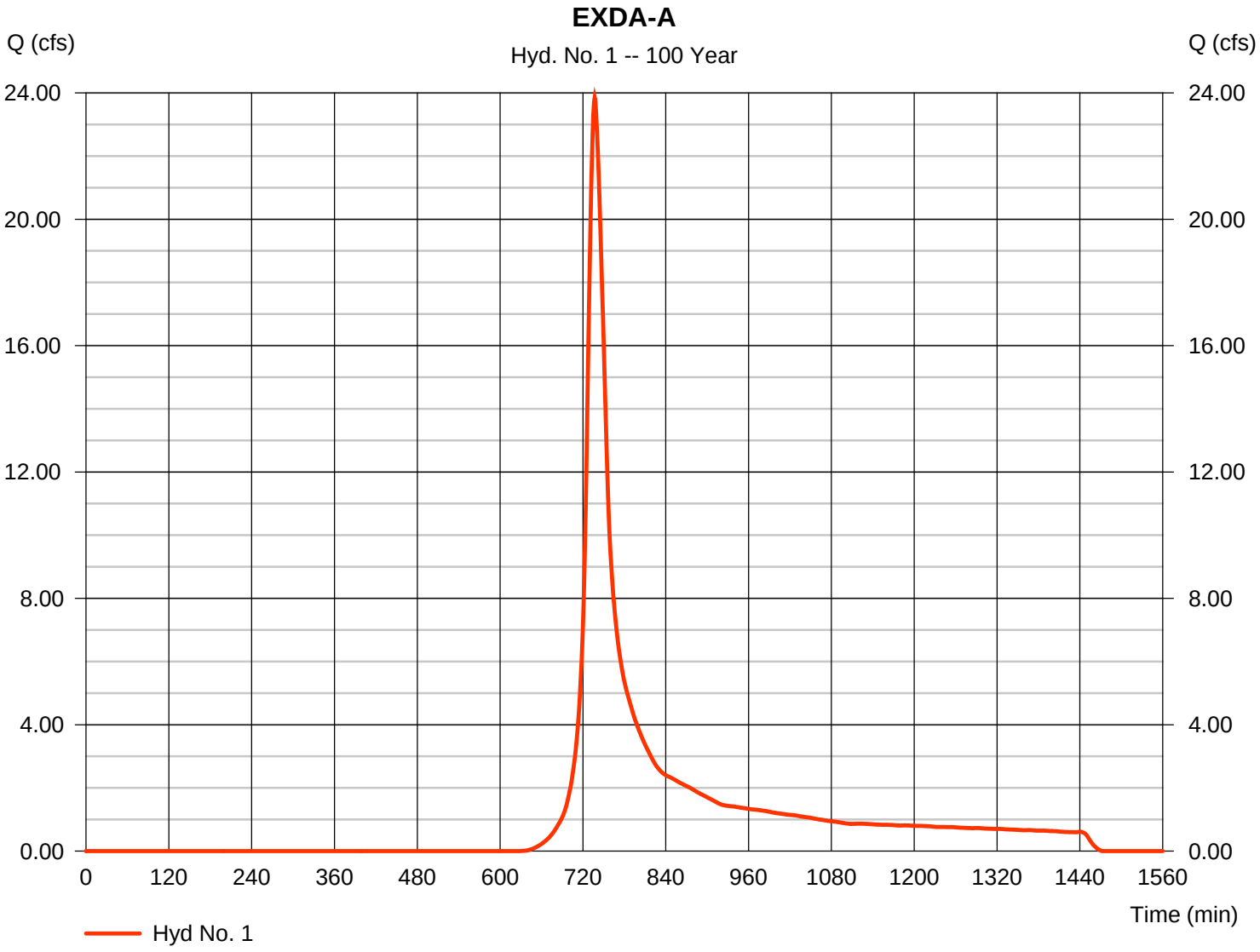
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.84 cfs
Storm frequency	=	100 yrs	Time to peak	=	737 min
Time interval	=	1 min	Hyd. volume	=	105,387 cuft
Drainage area	=	9.960 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	8.15 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rest of State Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



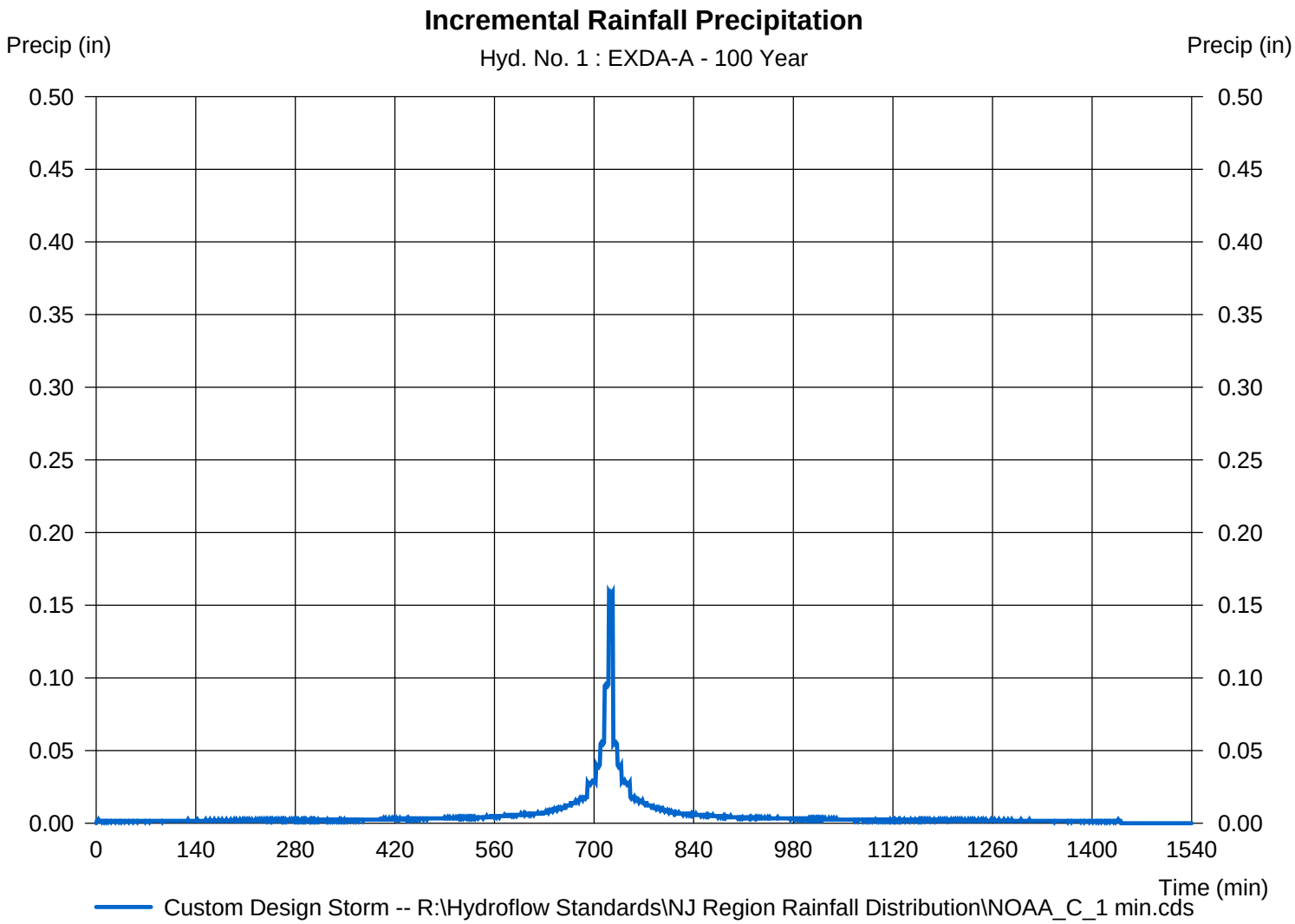
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 8.1500 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



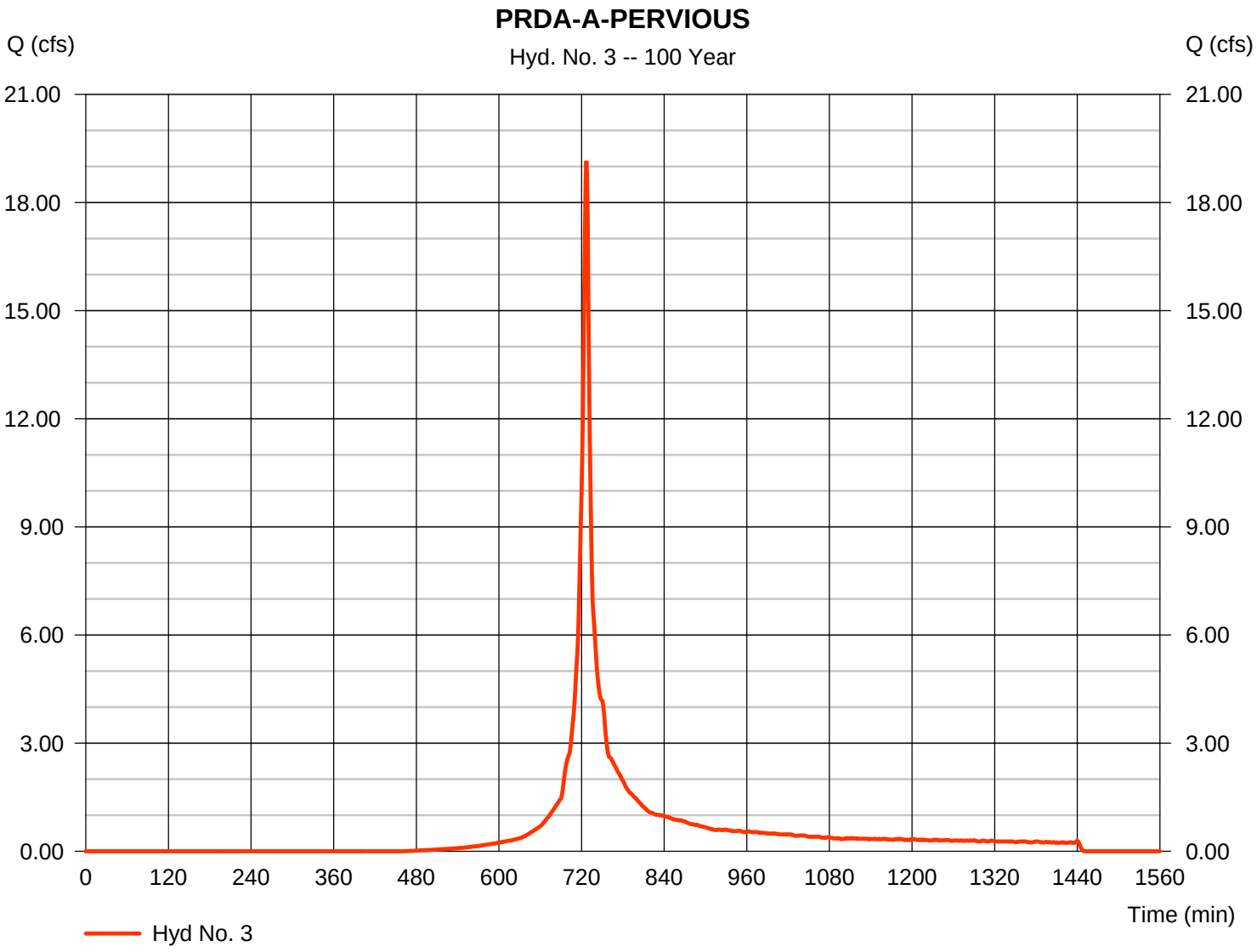
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 3

PRDA-A-PERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	52,964 cuft
Drainage area	=	3.160 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.15 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rest of State Rainfall Distribution\484A_C_1 min.cds	Shape factor	=	484



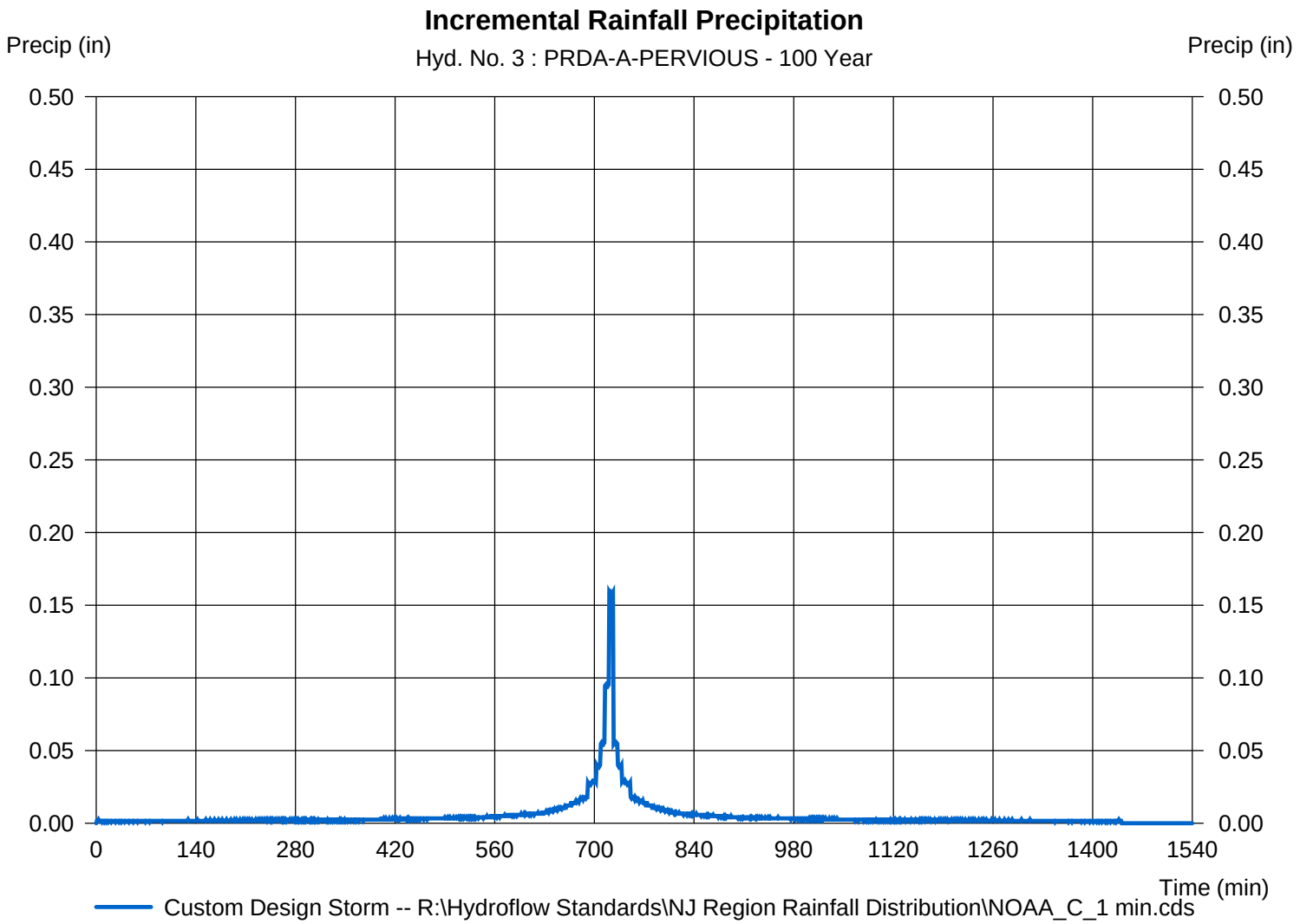
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 3

PRDA-A-PERVIOUS

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 8.1500 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



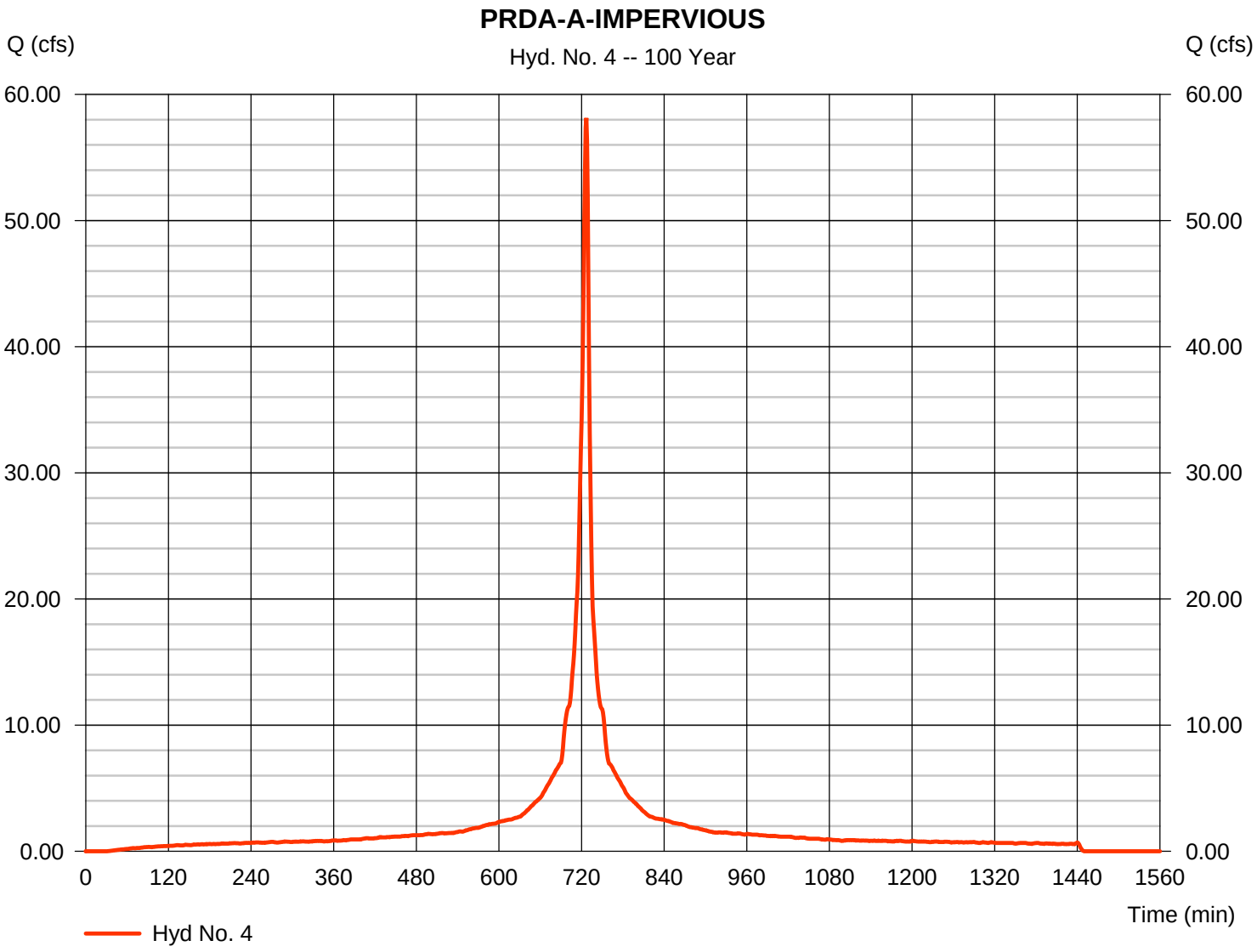
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	58.13 cfs
Storm frequency	=	100 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	192,175 cuft
Drainage area	=	6.490 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.15 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Region 2 Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



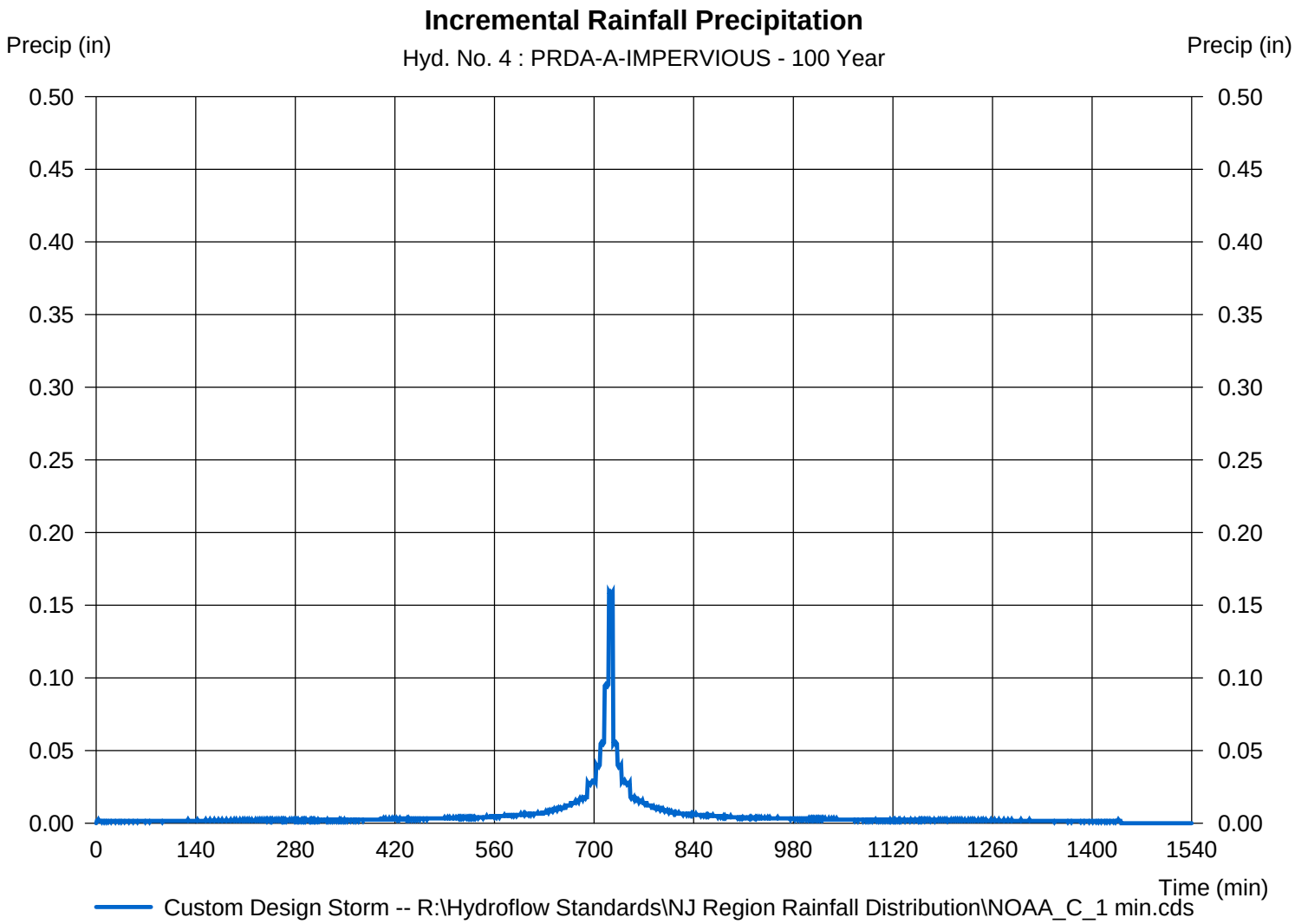
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 8.1500 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



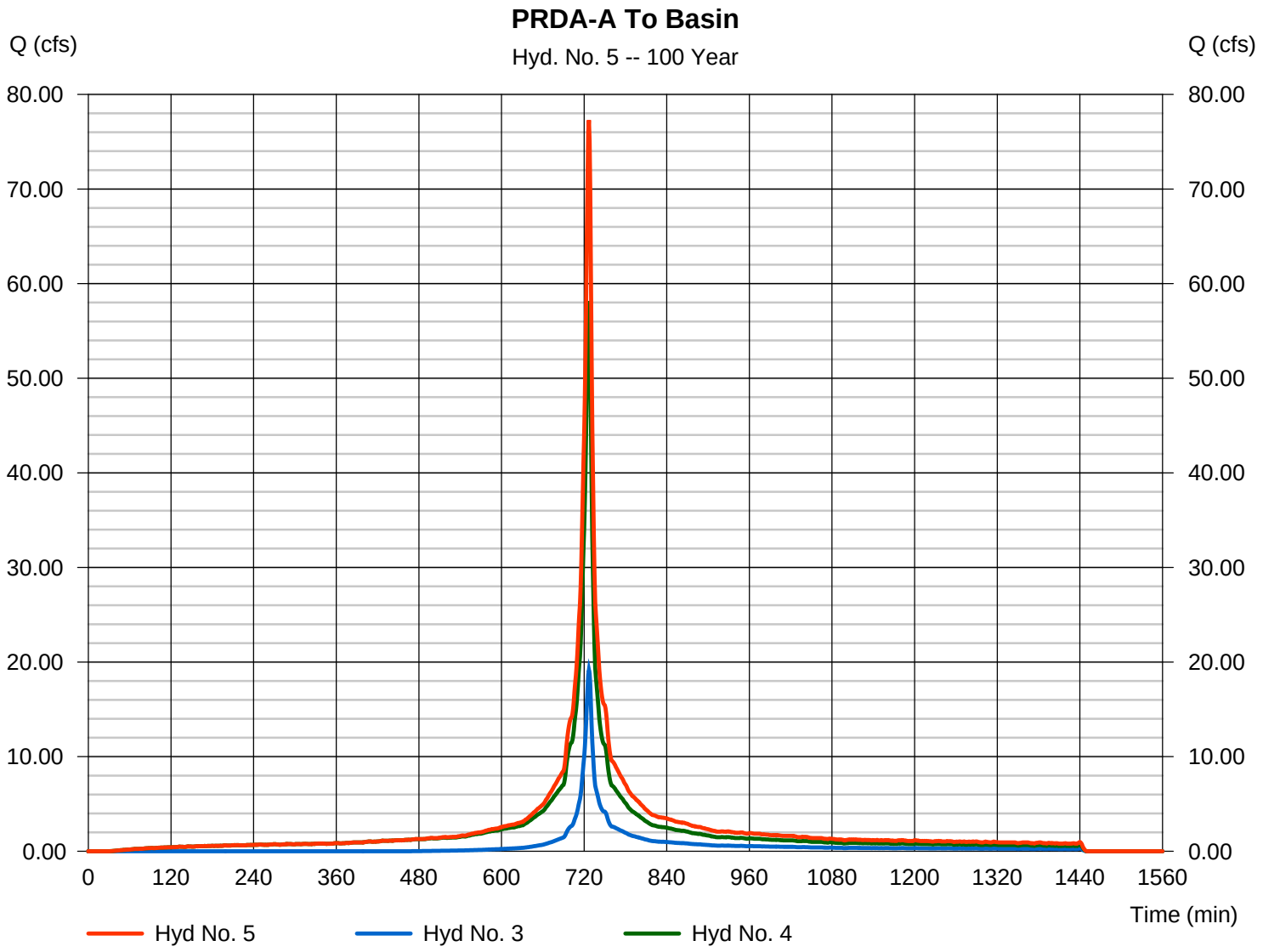
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 5

PRDA-A To Basin

Hydrograph type	=	Combine	Peak discharge	=	77.28 cfs
Storm frequency	=	100 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	245,140 cuft
Inflow hyds.	=	3, 4	Contrib. drain. area	=	9.650 ac



Hydrograph Report

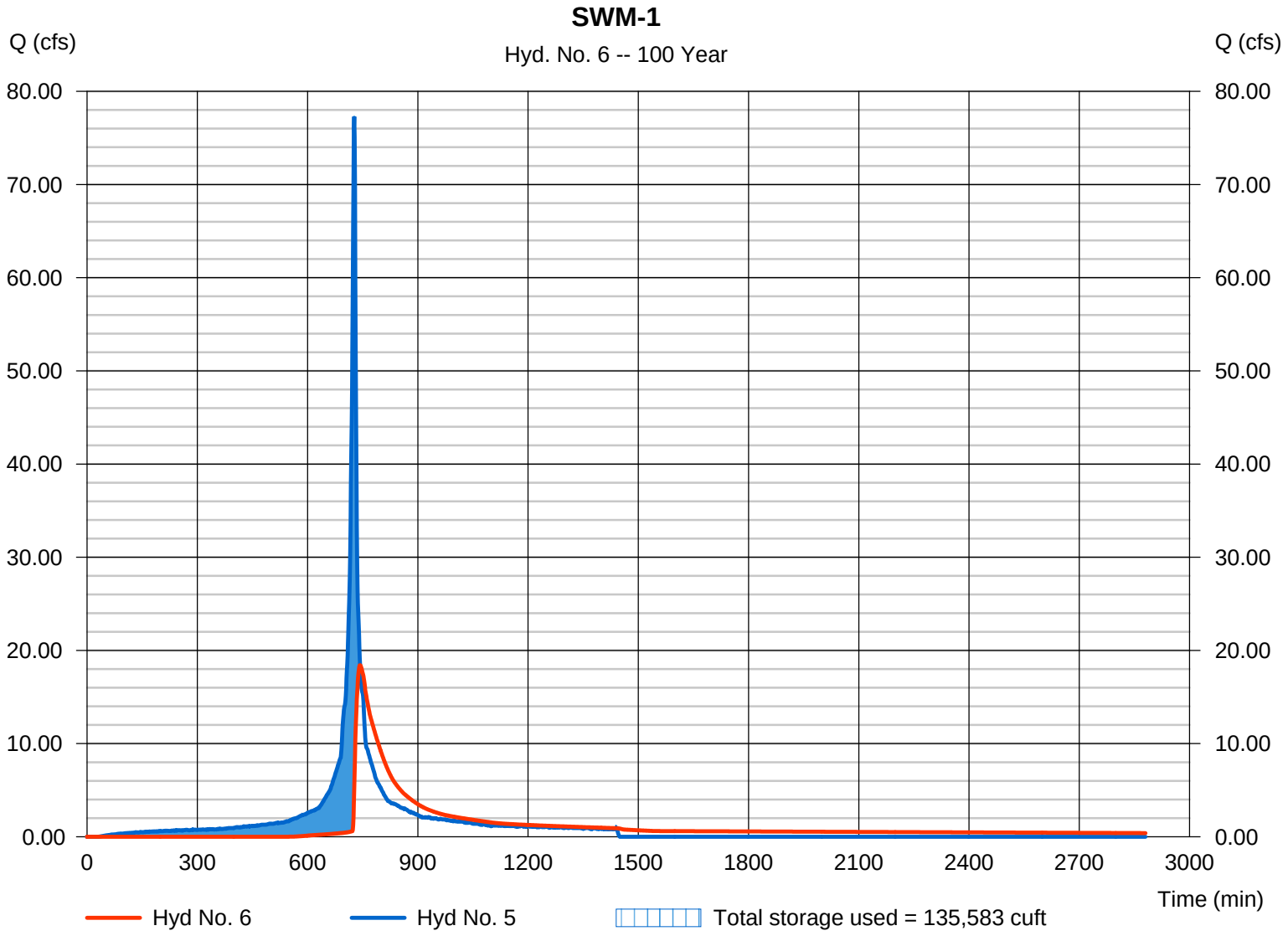
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 6

SWM-1

Hydrograph type	=	Reservoir	Peak discharge	=	18.41 cfs
Storm frequency	=	100 yrs	Time to peak	=	743 min
Time interval	=	1 min	Hyd. volume	=	191,517 cuft
Inflow hyd. No.	=	5 - PRDA-A To Basin	Max. Elevation	=	240.36 ft
Reservoir name	=	BIORETENTION BASIN	Max. Storage	=	135,583 cuft

Storage Indication method used.



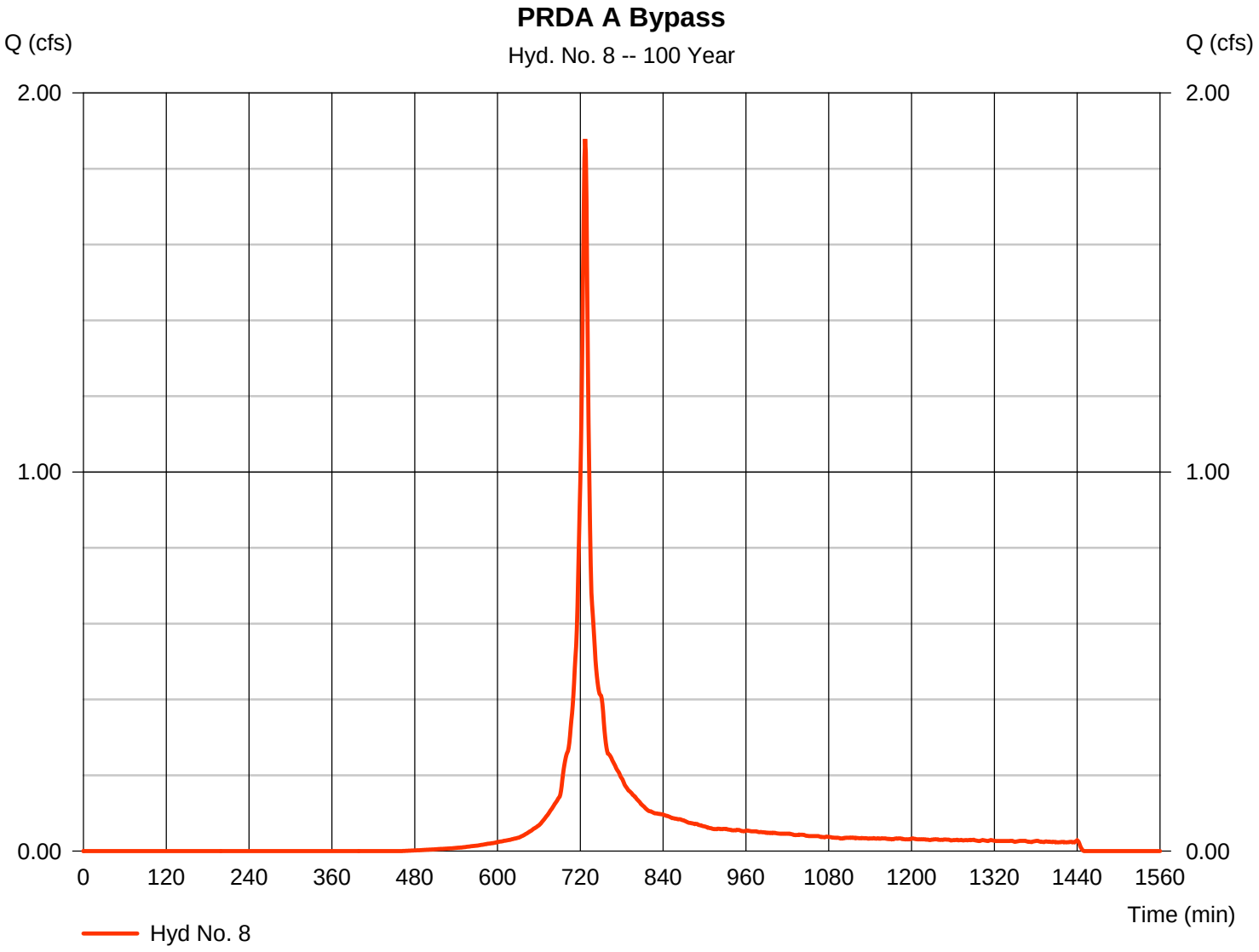
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 8

PRDA A Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.879 cfs
Storm frequency	=	100 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	5,196 cuft
Drainage area	=	0.310 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.15 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rest Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



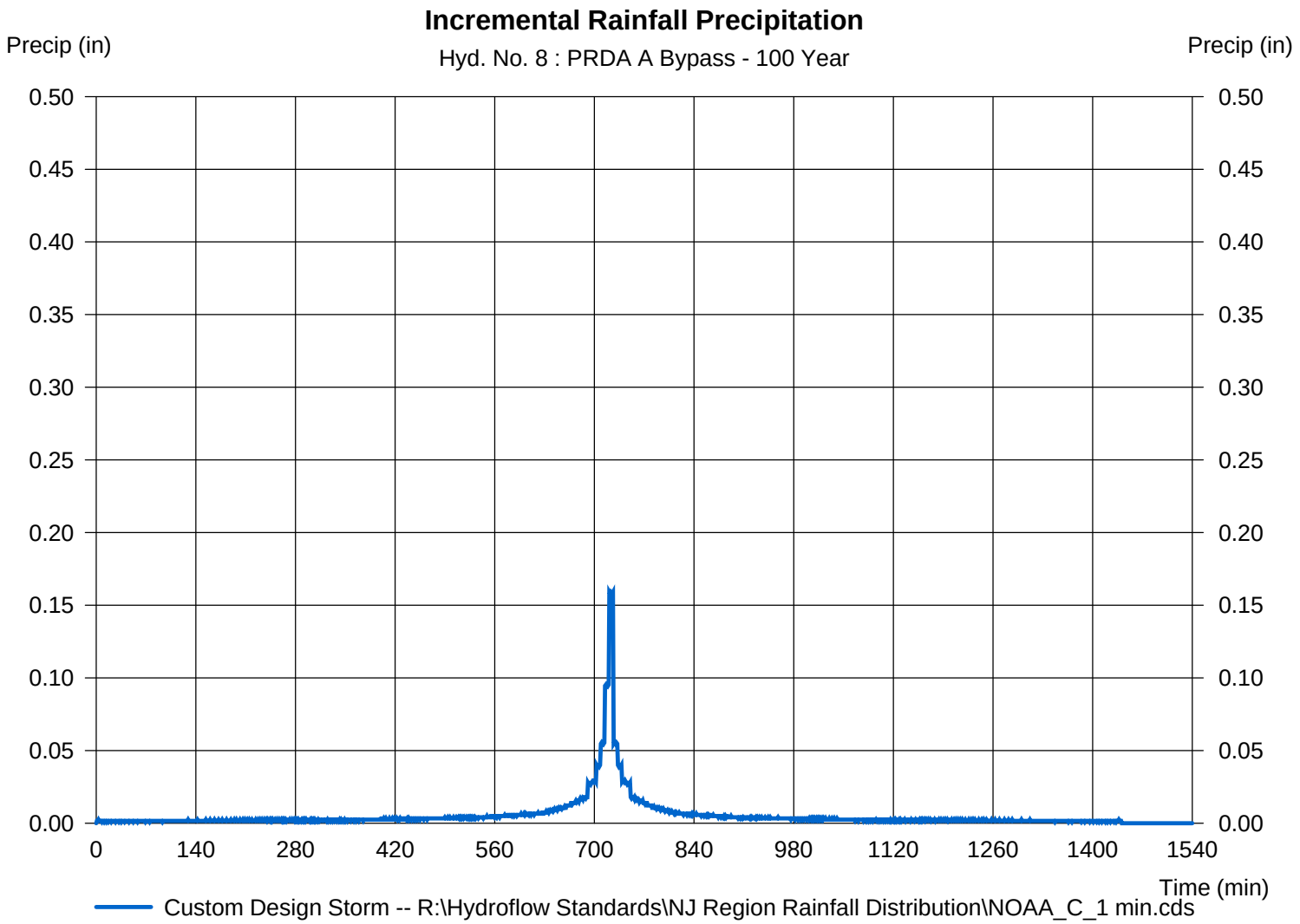
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 8

PRDA A Bypass

Storm Frequency	= 100 yrs	Time interval	= 1 min
Total precip.	= 8.1500 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



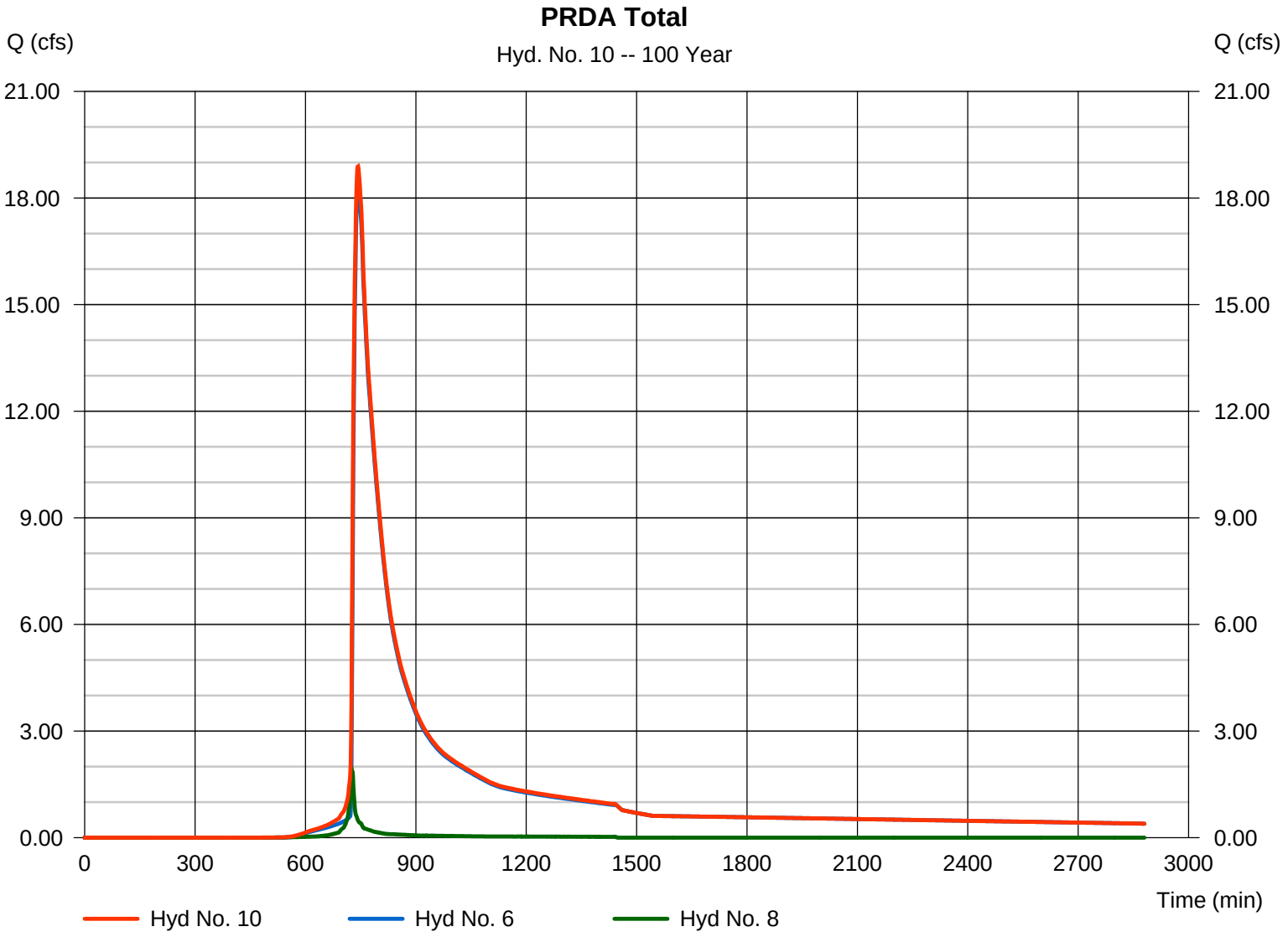
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 10

PRDA Total

Hydrograph type	= Combine	Peak discharge	= 18.89 cfs
Storm frequency	= 100 yrs	Time to peak	= 743 min
Time interval	= 1 min	Hyd. volume	= 196,713 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.310 ac



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

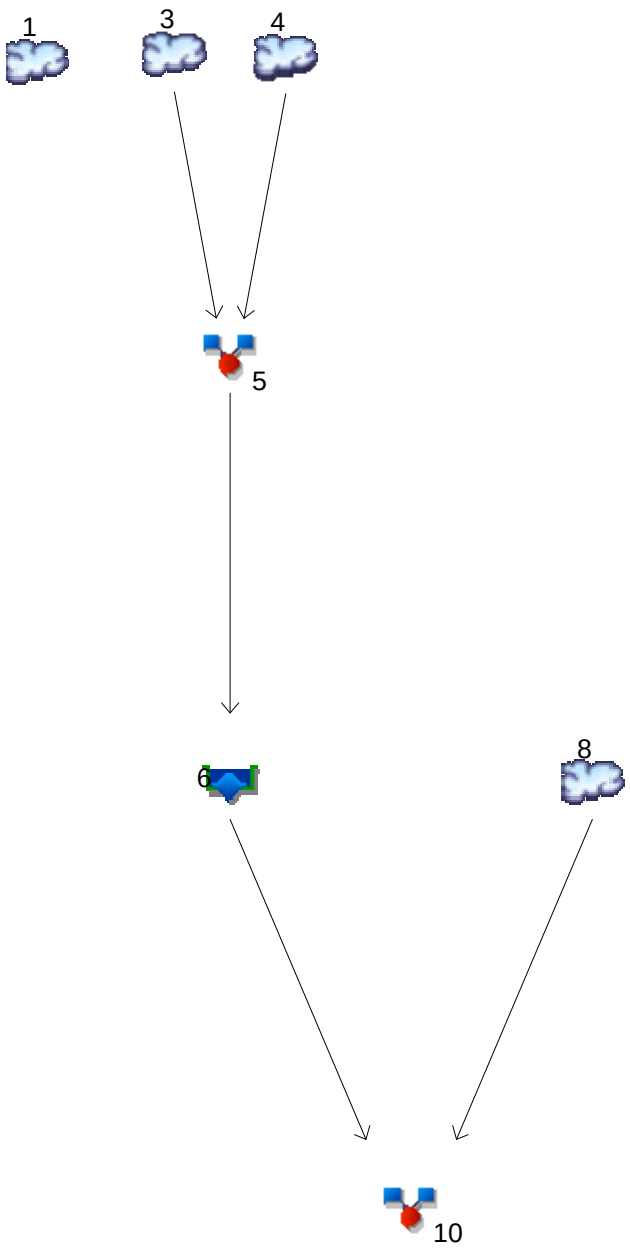
Tc = time in minutes. Values may exceed 60.

019\0119109 (01) - Green Care Farms - Hillsborough\Documents\Reports\SWM\Hydraflow\REsources\Hillsborough.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	3.43	0.00	0.00	5.08	0.00	0.00	8.15

APPENDIX G

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	EXDA-A
3	SCS Runoff	PRDA-A-PERVIOUS
4	SCS Runoff	PRDA-A-IMPERVIOUS
5	Combine	PRDA-A To Basin
6	Reservoir	SWM-1
8	SCS Runoff	PRDA A Bypass
10	Combine	PRDA Total

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	0.000	-------	-------	-------	-------	-------	-------	-------	EXDA-A
3	SCS Runoff	------	0.121	-------	-------	-------	-------	-------	-------	-------	PRDA-A-PERVIOUS
4	SCS Runoff	------	19.25	-------	-------	-------	-------	-------	-------	-------	PRDA-A-IMPERVIOUS
5	Combine	3, 4	19.25	-------	-------	-------	-------	-------	-------	-------	PRDA-A To Basin
6	Reservoir	5	0.016	-------	-------	-------	-------	-------	-------	-------	SWM-1
8	SCS Runoff	------	0.012	-------	-------	-------	-------	-------	-------	-------	PRDA A Bypass
10	Combine	6, 8,	0.019	-------	-------	-------	-------	-------	-------	-------	PRDA Total

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.000	1	n/a	0	------	------	------	EXDA-A
3	SCS Runoff	0.121	1	92	301	------	------	------	PRDA-A-PERVIOUS
4	SCS Runoff	19.25	1	65	25,135	------	------	------	PRDA-A-IMPERVIOUS
5	Combine	19.25	1	65	25,436	3, 4	------	------	PRDA-A To Basin
6	Reservoir	0.016	1	129	1,424	5	236.97	25,416	SWM-1
8	SCS Runoff	0.012	1	92	30	------	------	------	PRDA A Bypass
10	Combine	0.019	1	121	1,454	6, 8,	------	------	PRDA Total

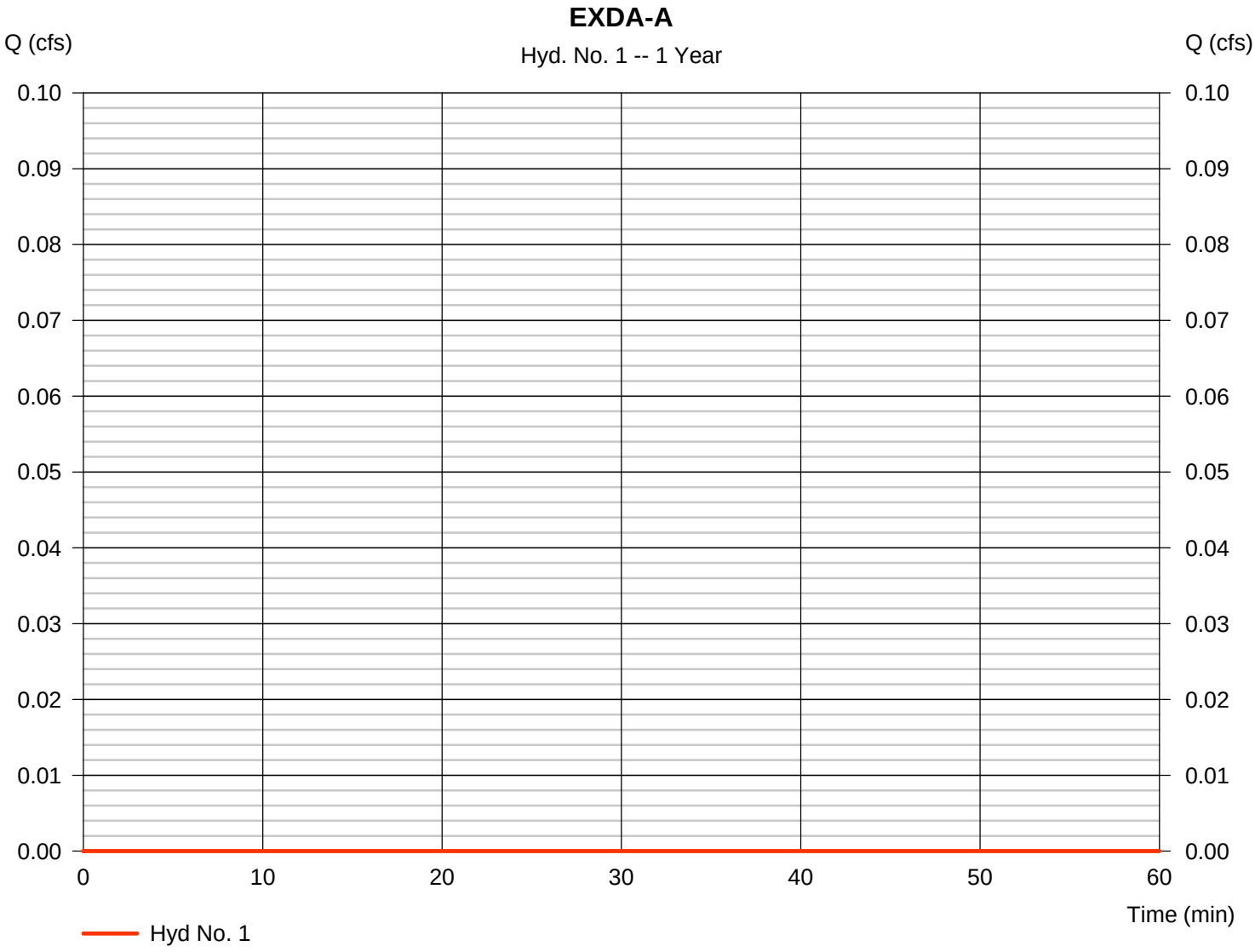
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.000 cfs
Storm frequency	=	1 yrs	Time to peak	=	n/a
Time interval	=	1 min	Hyd. volume	=	0 cuft
Drainage area	=	9.960 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\WaterShed\Rainfall Distribution\1.25in2hrstorm-1 MIN	Shape factor	=	484

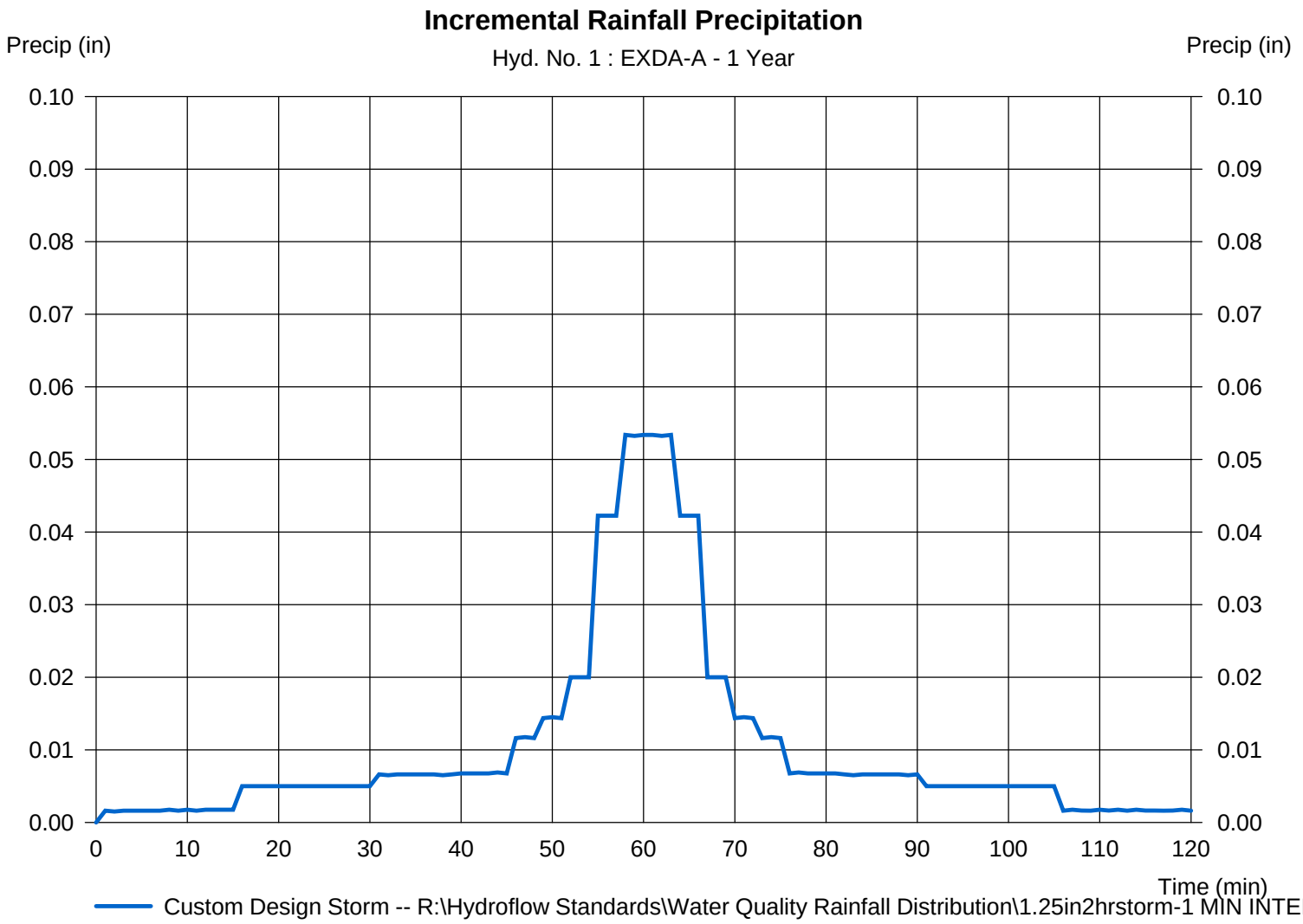


Precipitation Report

Hyd. No. 1

EXDA-A

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 1.2500 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\Water Quality Rainfall Distribution\1.25in2hrstorm-1 MI		



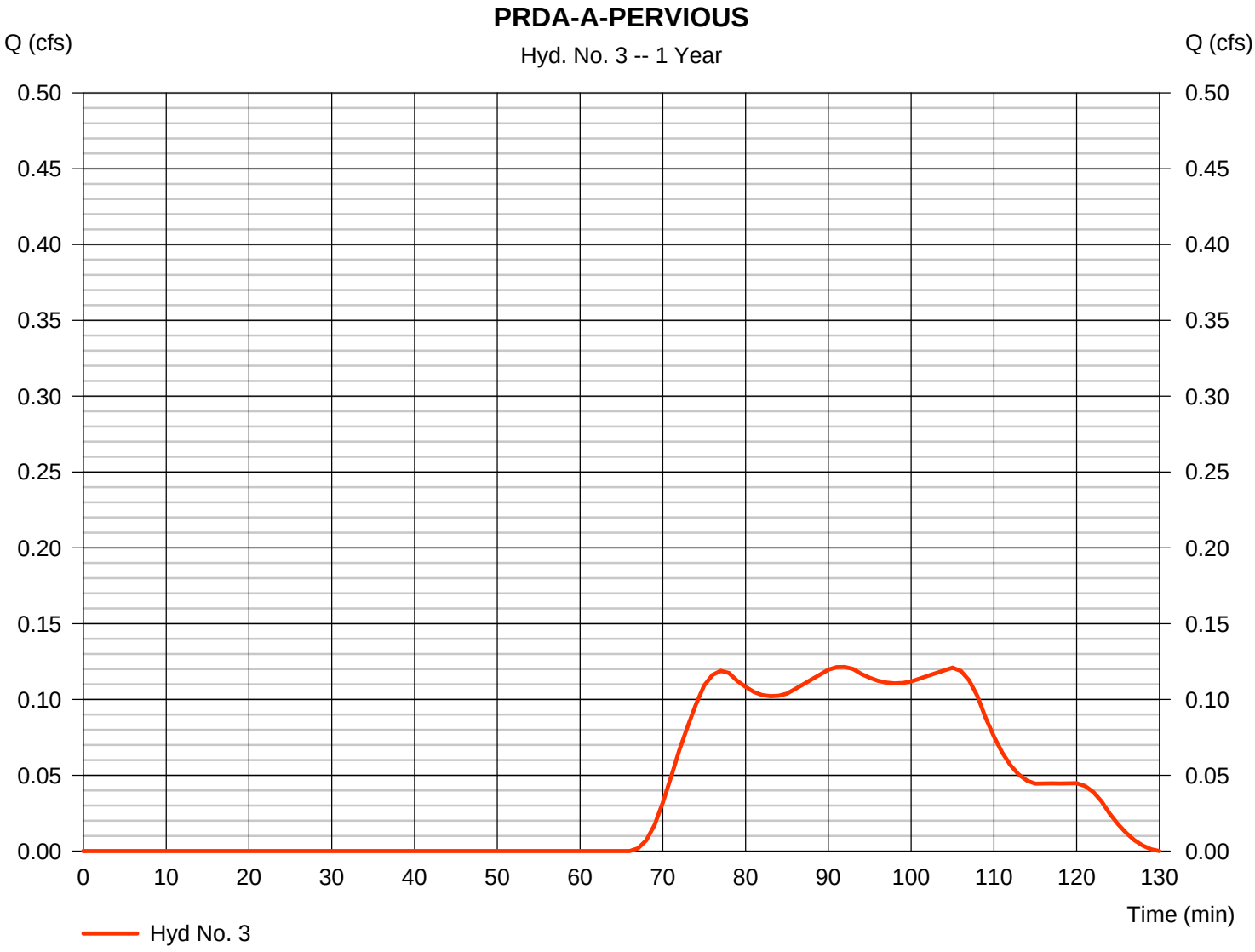
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 3

PRDA-A-PERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.121 cfs
Storm frequency	=	1 yrs	Time to peak	=	92 min
Time interval	=	1 min	Hyd. volume	=	301 cuft
Drainage area	=	3.160 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\Water Quality Rainfall Distributions\1.25in2hrstorm-1 MIN.csv	Shape factor	=	484

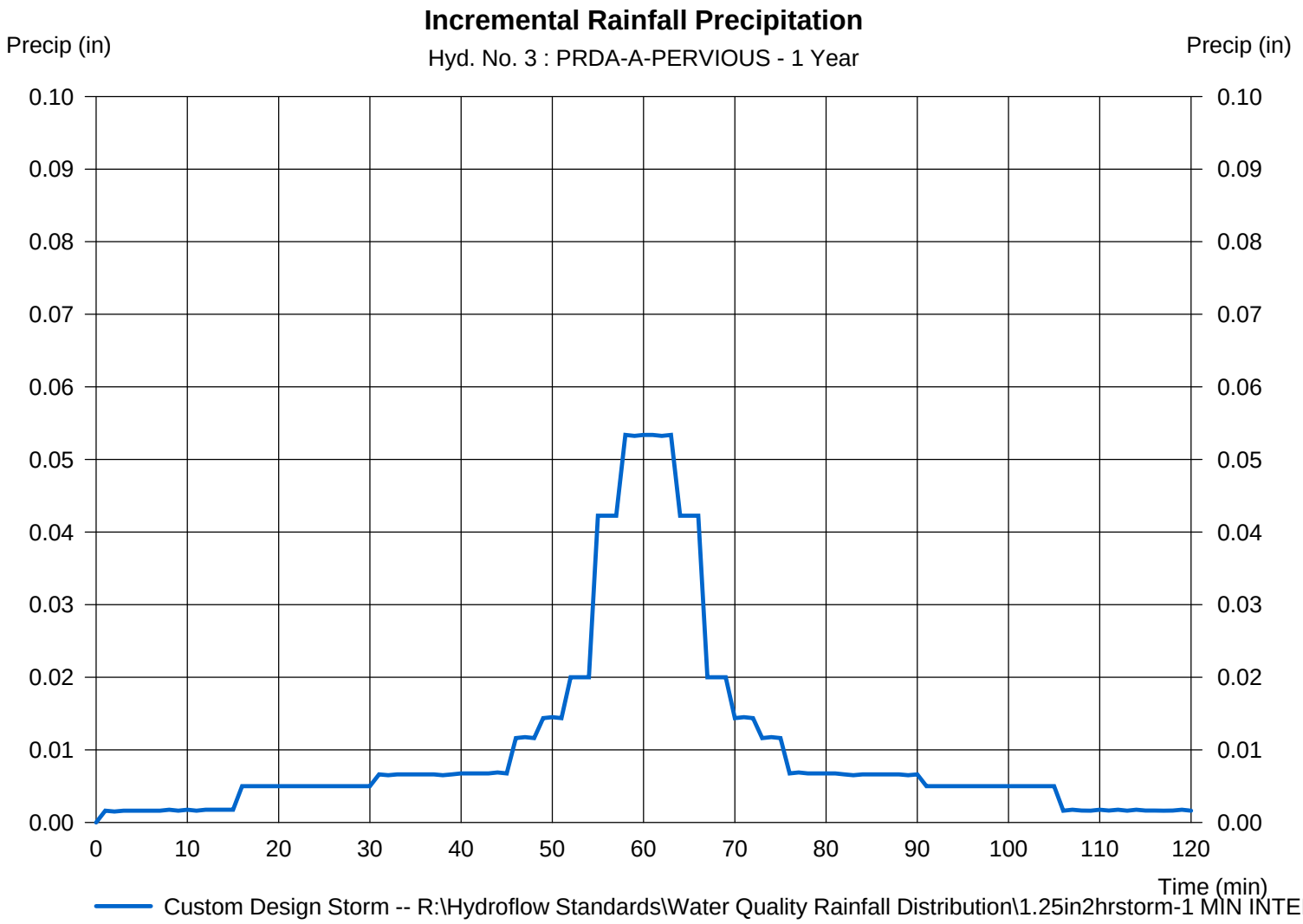


Precipitation Report

Hyd. No. 3

PRDA-A-PERVIOUS

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 1.2500 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\Water Quality Rainfall Distribution\1.25in2hrstorm-1 MI		



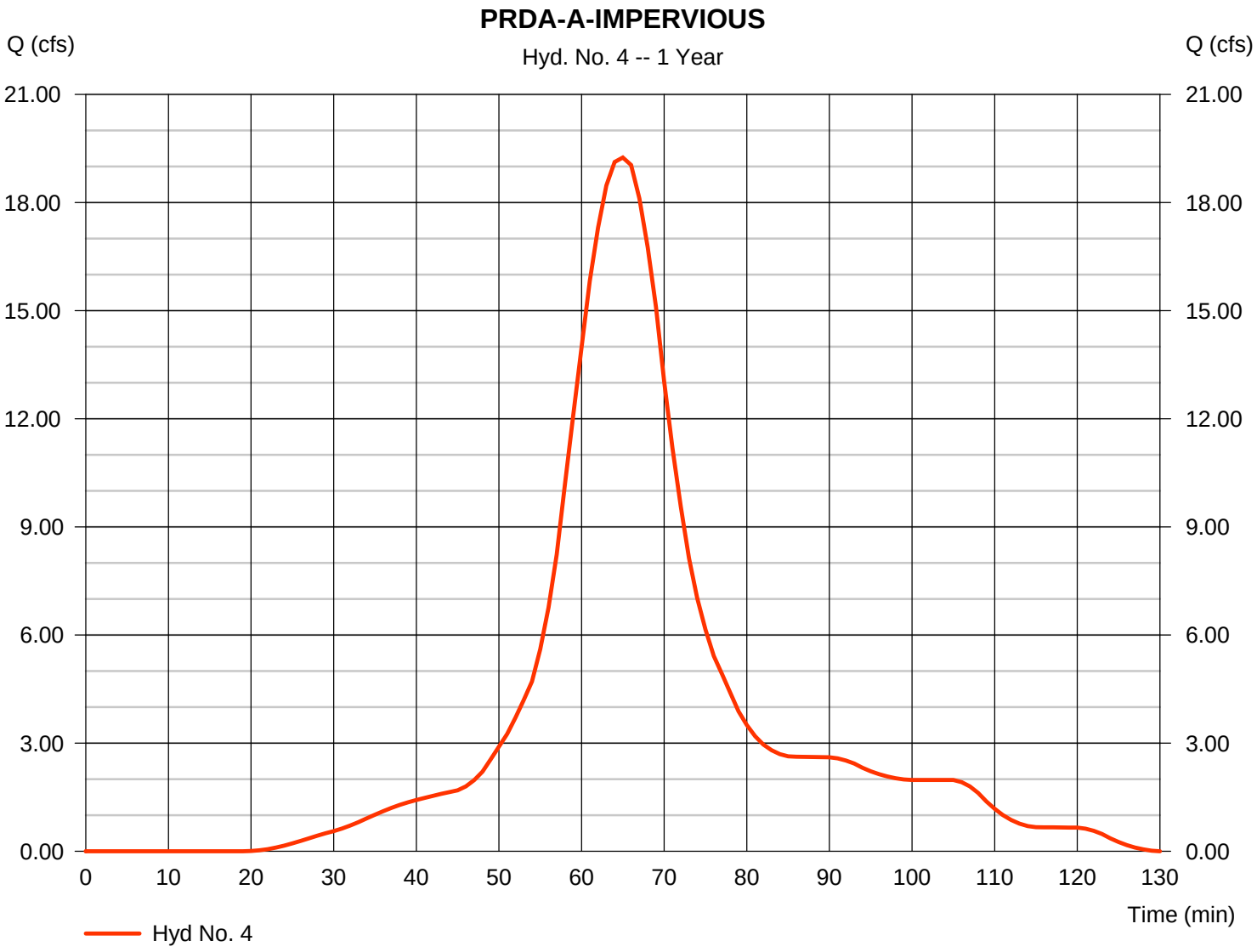
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.25 cfs
Storm frequency	=	1 yrs	Time to peak	=	65 min
Time interval	=	1 min	Hyd. volume	=	25,135 cuft
Drainage area	=	6.490 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\WaterShed\Rainfall Distribution\1.25in2hrstorm-1 MIN	Shape factor	=	484

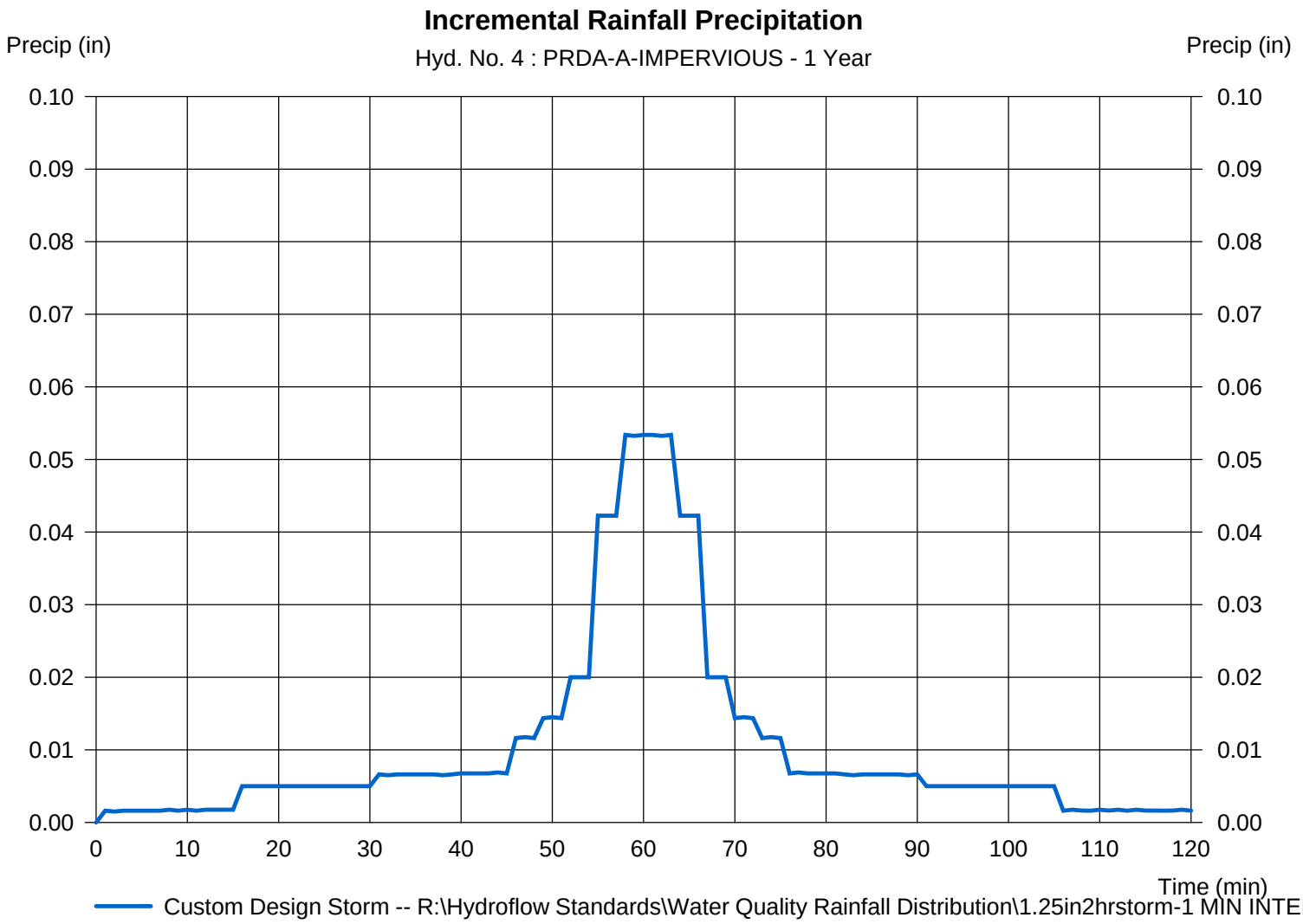


Precipitation Report

Hyd. No. 4

PRDA-A-IMPERVIOUS

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 1.2500 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\Water Quality Rainfall Distribution\1.25in2hrstorm-1 MI		



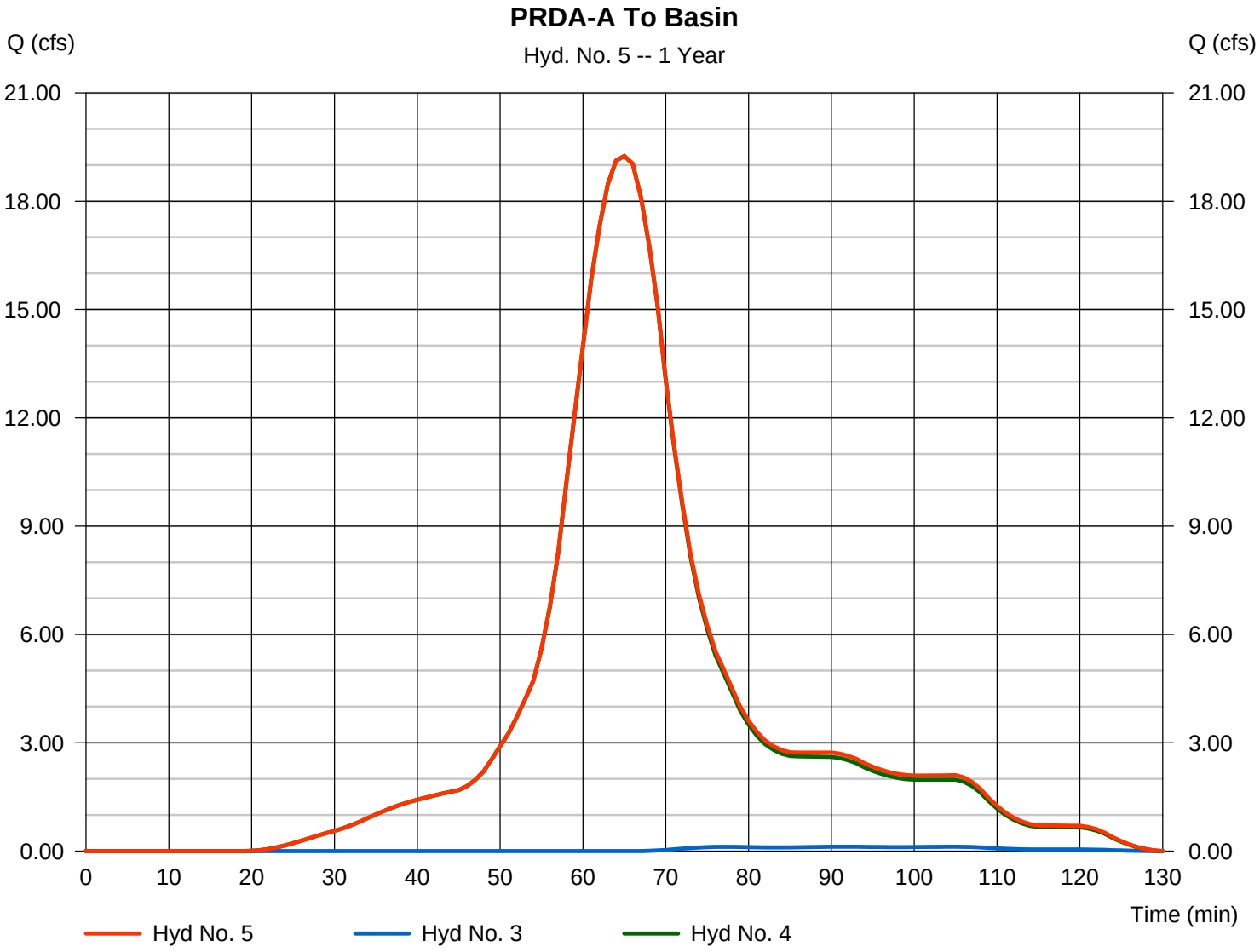
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 5

PRDA-A To Basin

Hydrograph type	= Combine	Peak discharge	= 19.25 cfs
Storm frequency	= 1 yrs	Time to peak	= 65 min
Time interval	= 1 min	Hyd. volume	= 25,436 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 9.650 ac



Hydrograph Report

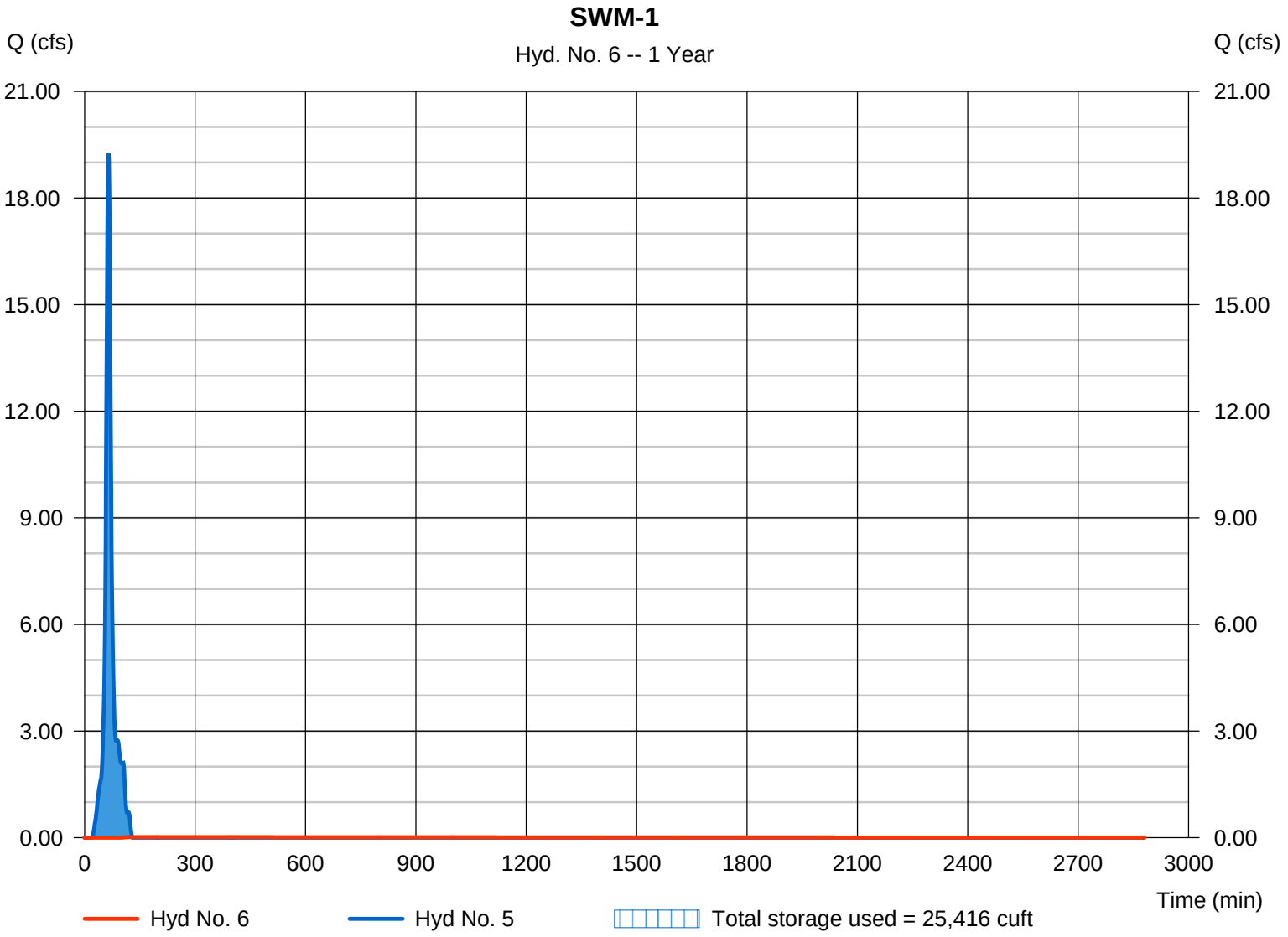
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 6

SWM-1

Hydrograph type	=	Reservoir	Peak discharge	=	0.016 cfs
Storm frequency	=	1 yrs	Time to peak	=	129 min
Time interval	=	1 min	Hyd. volume	=	1,424 cuft
Inflow hyd. No.	=	5 - PRDA-A To Basin	Max. Elevation	=	236.97 ft
Reservoir name	=	BIORETENTION BASIN	Max. Storage	=	25,416 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Pond No. 1 - BIORETENTION BASIN

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 236.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	236.00	24,863	0	0
1.00	237.00	27,631	26,232	26,232
2.00	238.00	30,462	29,032	55,264
3.00	239.00	33,357	31,895	87,160
4.00	240.00	36,316	34,823	121,982
5.00	241.00	39,338	37,813	159,795

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	4.00	0.00	0.00
Span (in)	= 18.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 231.00	236.90	0.00	0.00
Length (ft)	= 1.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

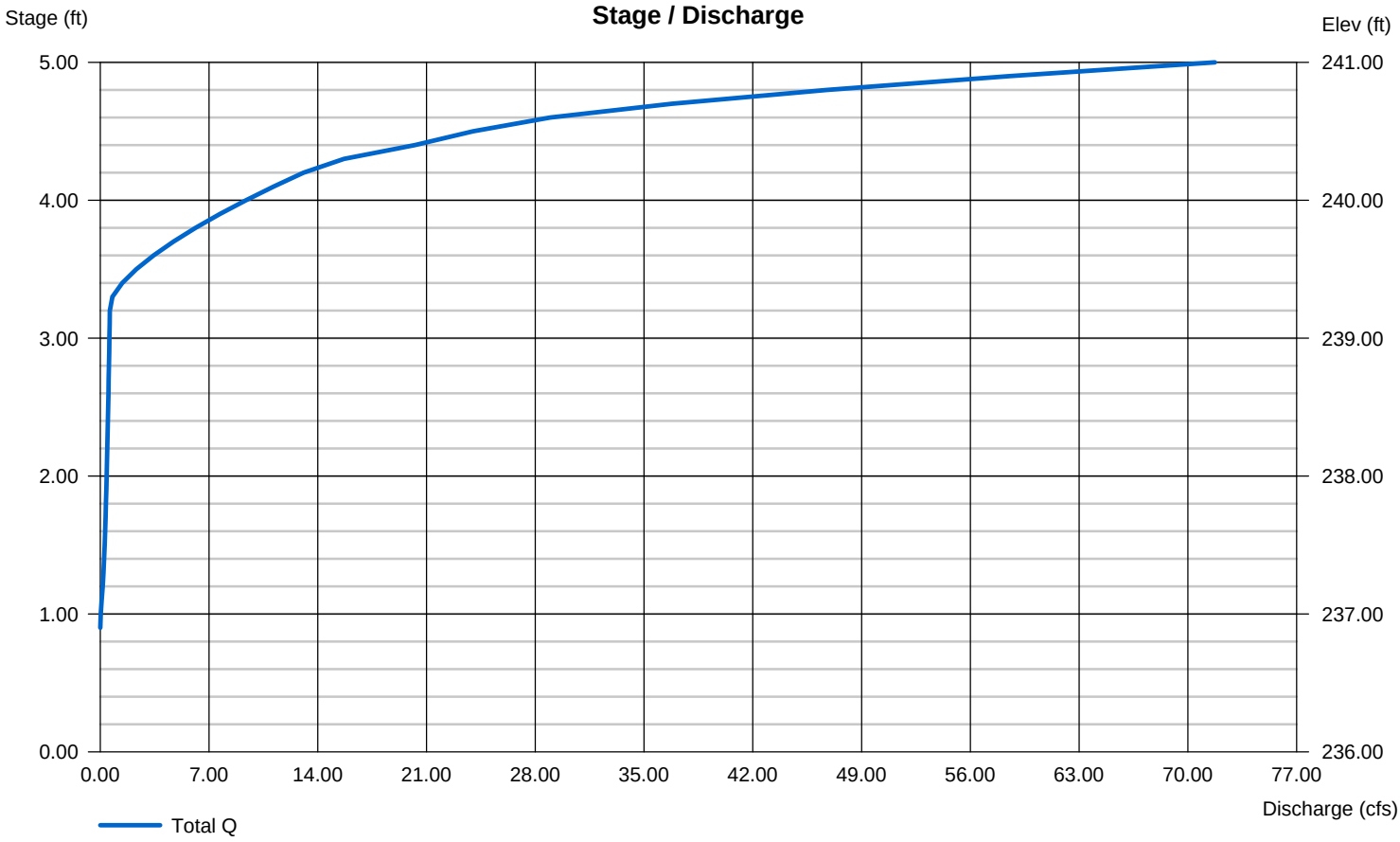
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	4.00	50.00	0.00
Crest El. (ft)	= 240.25	239.25	240.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



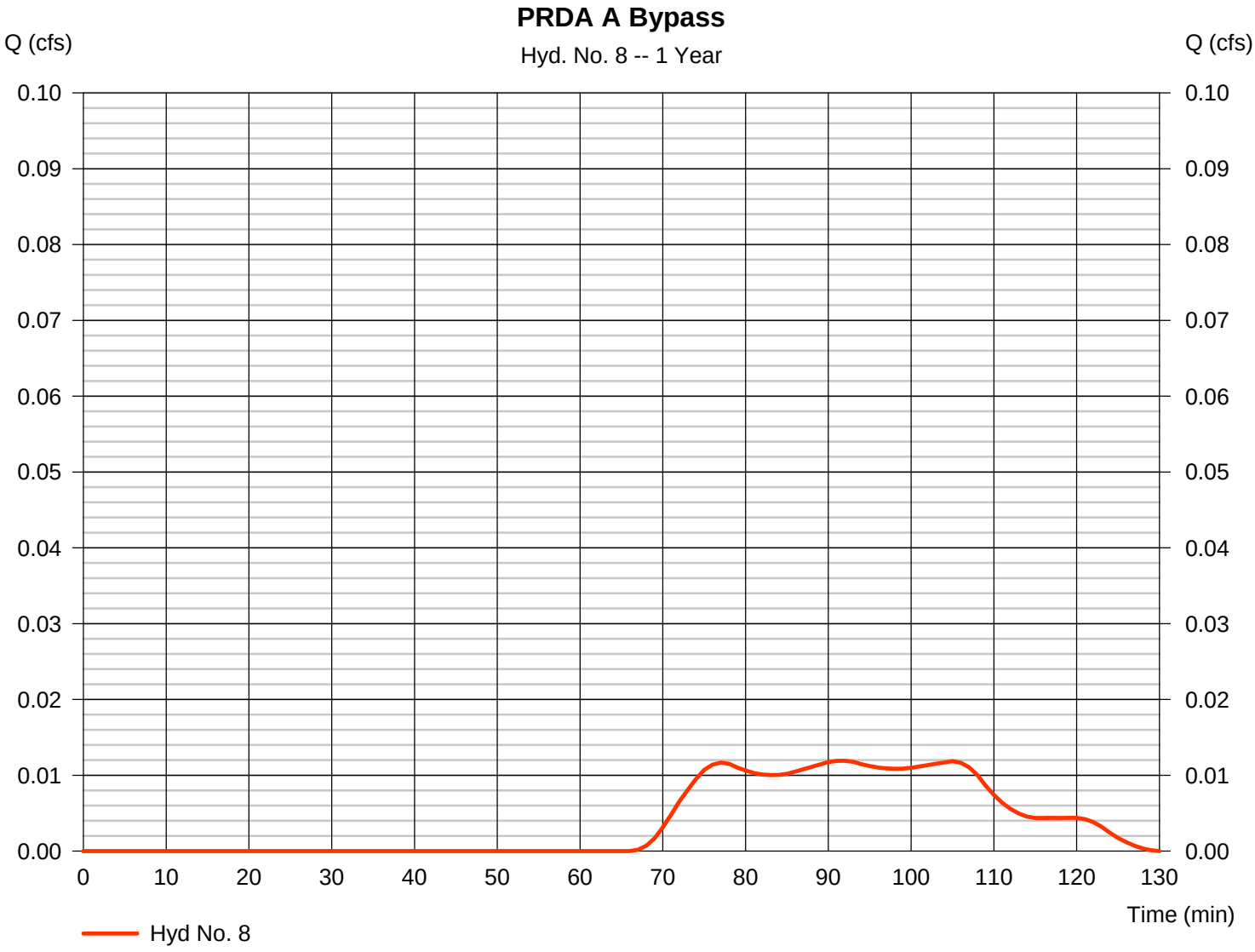
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 8

PRDA A Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.012 cfs
Storm frequency	=	1 yrs	Time to peak	=	92 min
Time interval	=	1 min	Hyd. volume	=	30 cuft
Drainage area	=	0.310 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\WaterShed\Rainfall Distribution\1.25in2hrstorm-1 MIN	Shape factor	=	484

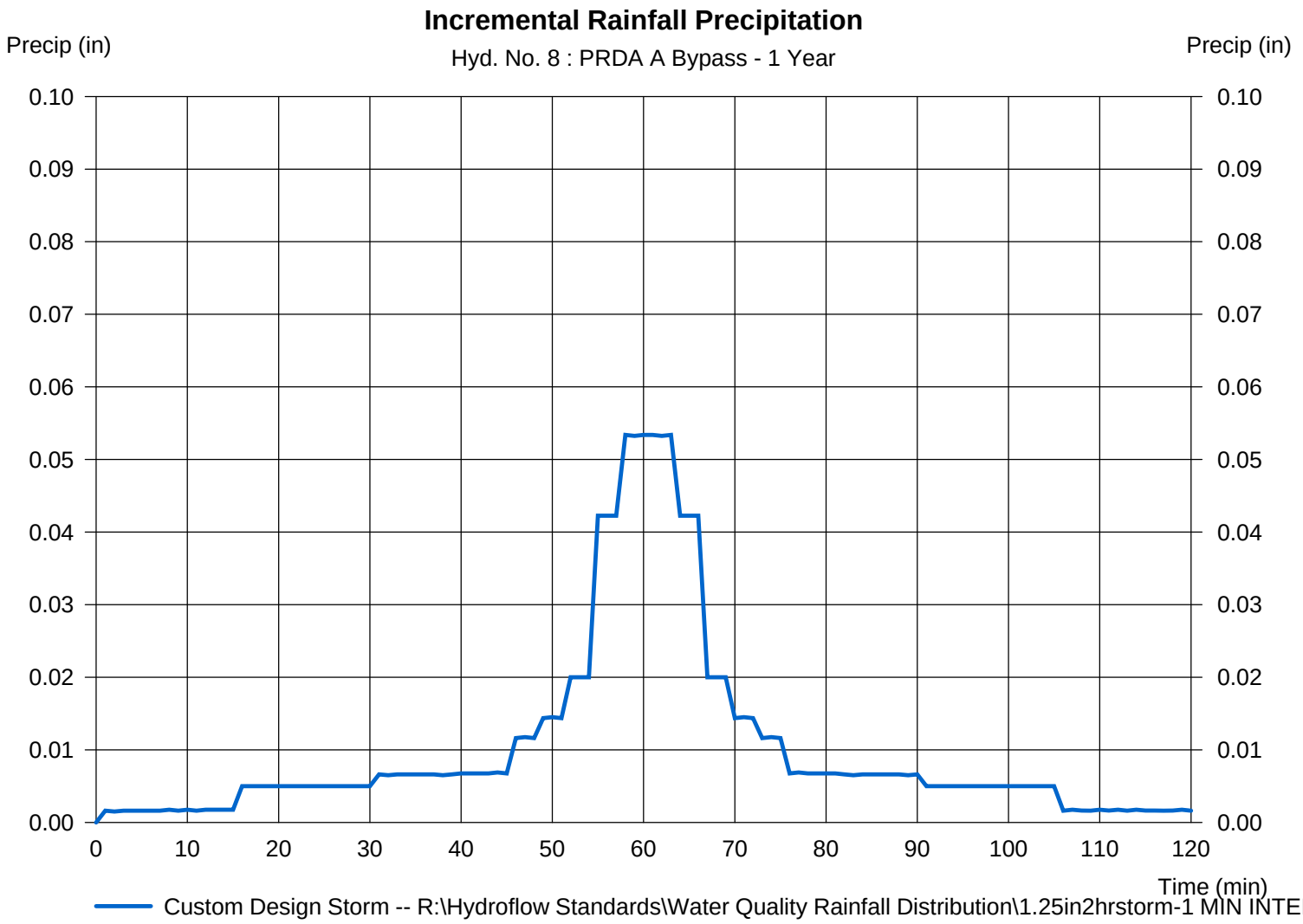


Precipitation Report

Hyd. No. 8

PRDA A Bypass

Storm Frequency	= 1 yrs	Time interval	= 1 min
Total precip.	= 1.2500 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\Water Quality Rainfall Distribution\1.25in2hrstorm-1 MI		

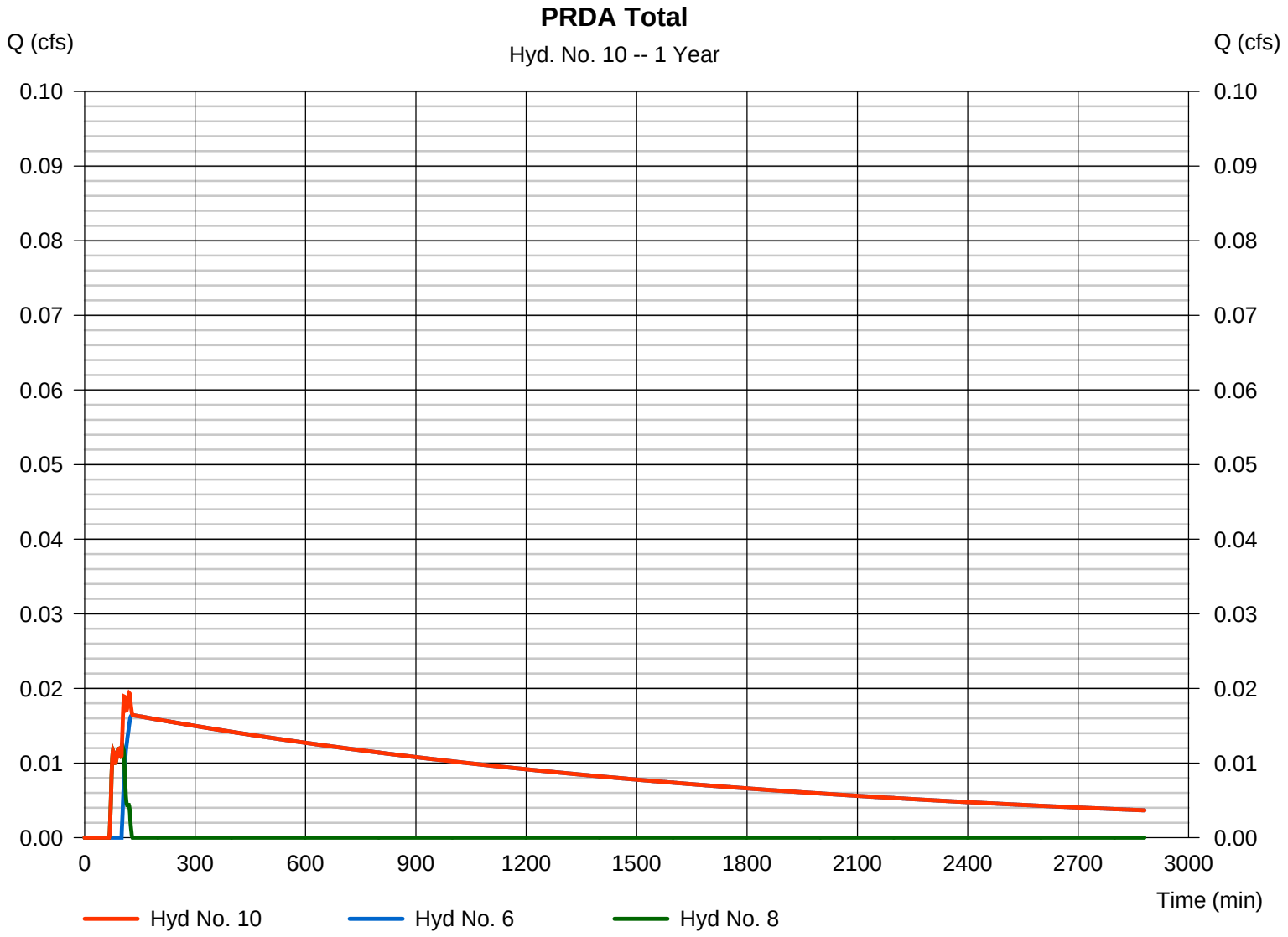


Hydrograph Report

Hyd. No. 10

PRDA Total

Hydrograph type	= Combine	Peak discharge	= 0.019 cfs
Storm frequency	= 1 yrs	Time to peak	= 121 min
Time interval	= 1 min	Hyd. volume	= 1,454 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.310 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

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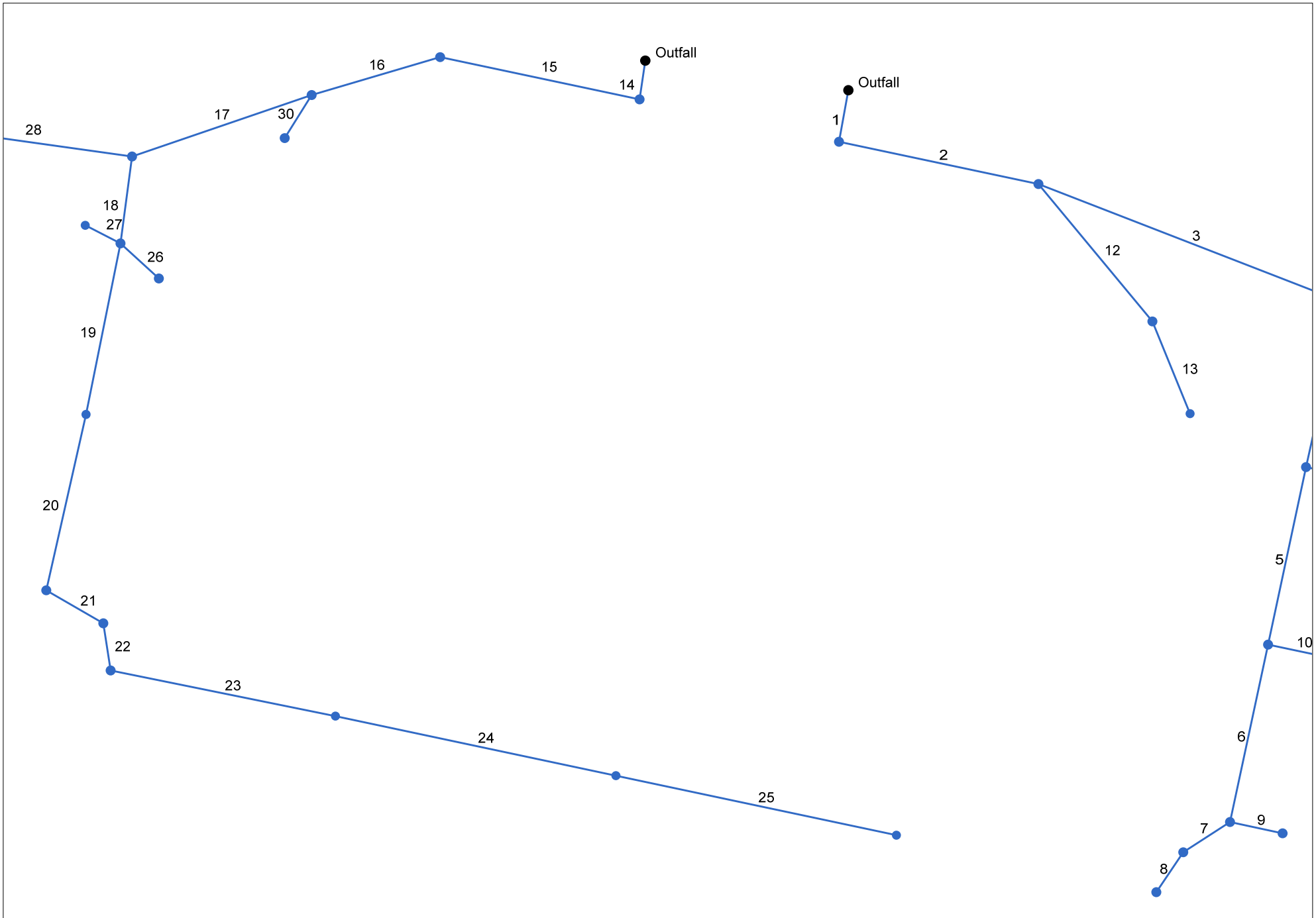
Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	1.25	3.43	0.00	0.00	5.08	6.19	0.00	8.15

APPENDIX H

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: Puleo.stm	Number of lines: 30	Date: 10/16/2020

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	Pipe - (30)	8.13	24	Cir	29.355	236.00	238.40	8.176	237.99	239.41	n/a	239.41 j	End	Manhole
2	Pipe - (17)	6.71	18	Cir	113.750	238.20	244.80	5.802	239.41	245.80	n/a	245.80 j	1	Manhole
3	Pipe - (19)	2.41	18	Cir	182.210	245.00	247.90	1.592	249.13*	252.03*	n/a	252.90	2	Manhole
4	Pipe - (20)	2.25	18	Cir	94.713	252.20	258.60	6.757	253.43	260.09	n/a	260.09	3	Manhole
5	Pipe - (38)	1.75	15	Cir	101.703	258.80	265.40	6.490	260.09	266.65	n/a	269.44	4	Manhole
6	Pipe - (21)	1.29	15	Cir	101.703	265.60	272.00	6.293	269.44*	275.85*	n/a	278.55	5	Manhole
7	Pipe - (22)	0.70	15	Cir	31.113	272.20	273.20	3.214	278.55*	279.56*	n/a	280.18	6	Manhole
8	Pipe - (23)	0.61	15	Cir	26.926	273.40	274.00	2.228	280.18*	280.78*	n/a	281.74	7	Manhole
9	Pipe - (25)	0.61	15	Cir	30.000	272.30	273.40	3.667	278.55*	279.66*	n/a	281.23	6	Manhole
10	Pipe - (37)	0.30	15	Cir	30.000	265.70	266.80	3.667	269.44*	270.54*	n/a	272.12	5	Manhole
11	Pipe - (24)	0.30	15	Cir	30.000	258.90	260.00	3.667	260.09	261.22	n/a	261.22	4	Manhole
12	Pipe - (18)	3.24	15	Cir	99.863	245.20	247.70	2.503	249.13*	251.63*	n/a	252.01	2	Manhole
13	Pipe - (36)	3.21	12	Cir	55.780	248.00	250.00	3.586	252.01*	254.01*	n/a	255.35	12	Manhole
14	Pipe - (44)	22.34	24	Cir	22.035	236.00	238.10	9.530	237.99	240.09	n/a	240.09	End	Manhole
15	Pipe - (15)	20.72	18	Cir	113.750	238.30	245.20	6.066	240.09*	247.00*	n/a	248.76	14	Manhole
16	Pipe - (14)	19.34	18	Cir	74.774	245.40	246.60	1.605	248.76*	249.96*	n/a	250.59	15	Manhole
17	Pipe - (12)	19.10	18	Cir	106.000	246.80	250.40	3.396	250.59*	254.19*	n/a	255.89	16	Manhole
18	Pipe - (10)	20.79	18	Cir	49.115	252.80	255.50	5.497	255.89*	258.59*	n/a	261.61	17	Manhole
19	Pipe - (42)	13.43	18	Cir	97.779	255.70	258.30	2.659	261.61*	264.21*	n/a	264.43	18	Manhole
20	Pipe - (5)	12.99	18	Cir	101.007	258.50	260.60	2.079	264.43*	266.53*	n/a	267.62	19	Manhole
21	Pipe - (4)	11.63	15	Cir	36.841	260.80	261.80	2.714	267.62*	268.62*	n/a	269.57	20	Manhole
22	Pipe - (3)	10.82	15	Cir	26.744	262.00	262.80	2.991	269.57*	270.37*	n/a	271.60	21	Manhole
23	Pipe - (41)	9.81	15	Cir	128.005	263.00	265.20	1.719	271.60*	273.80*	n/a	273.91	22	Manhole
24	Pipe - (40)	6.27	15	Cir	160.000	265.40	267.80	1.500	273.91*	276.31*	n/a	276.40	23	Manhole

Project File: Puleo.stm | Number of lines: 30 | Run Date: 10/16/2020

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	Pipe - (39)	2.72	15	Cir	160.000	268.00	270.50	1.563	276.40*	278.91*	n/a	279.58	24	Manhole
26	Pipe - (6)	0.30	15	Cir	29.038	255.80	257.60	6.199	261.61*	263.41*	n/a	266.08	18	Manhole
27	Pipe - (43)	1.94	12	Cir	22.158	255.80	256.80	4.513	261.61*	262.61*	n/a	264.30	18	Manhole
28	Pipe - (11)	0.56	15	Cir	120.649	250.60	253.10	2.072	255.89*	258.39*	n/a	259.28	17	Manhole
29	Pipe - (7)	0.30	15	Cir	26.290	253.30	254.00	2.663	259.28*	259.98*	n/a	261.13	28	Manhole
30	Pipe - (13)	0.12	15	Cir	28.446	248.70	249.40	2.461	250.59*	251.29*	n/a	252.35	16	Manhole

Project File: Puleo.stm | Number of lines: 30 | Run Date: 10/16/2020

NOTES: Return period = 25 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 10/16/2020
					C1 = 0.2 C2 = 0.5 C3 = 0.9							Total Flow		Elev of Crown			Span	Pipe	Full Flow		Frequency: 25 yrs
					Increment (ac)	Sub-Total (ac)	Sum CA					Q		Elev of Invert							Proj: Puleo.stm
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	Up (ft)	Down (ft)	Fall (ft)	Size (in)	Slope (%)	Vel (ft/s)	Cap (cfs)	Line description
1	End	MH	0.013	29.355	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	13.90	0.16	5.07	1.60	0.00 8.13	251.32	239.41 240.40 238.40	237.99 238.00 236.00	1.42 2.40	24 24 Cir	4.85 8.18	3.84 20.59	8.13 64.67	Pipe - (30)
2	1	MH	0.013	113.750	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	13.46	0.43	5.14	1.31	0.00 6.71	251.32	245.80 246.30 244.80	239.41 239.70 238.20	6.39 6.60	18 18 Cir	5.62 5.80	4.86 14.31	6.71 25.30	Pipe - (17)
3	2	MH	0.013	182.210	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	11.50	1.96	5.47	0.44	0.00 2.41	259.34	252.03 249.40 247.90	249.13 246.50 245.00	2.90 2.90	18 18 Cir	1.59 1.59	7.50 0.00	2.41 0.00	Pipe - (19)
4	3	MH	0.013	94.713	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	10.39	1.11	5.68	0.40	0.00 2.25	264.50	260.09 260.10 258.60	253.43 253.70 252.20	6.66 6.40	18 18 Cir	7.03 6.76	16.53 0.00	2.25 0.00	Pipe - (20)
5	4	MH	0.013	101.703	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	9.31	1.08	5.90	0.30	0.00 1.75	271.11	266.65 266.65 265.40	260.09 260.05 258.80	6.56 6.60	15 15 Cir	6.45 6.49	13.41 0.00	1.75 0.00	Pipe - (38)
6	5	MH	0.013	101.703	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	7.79	1.52	6.24	0.21	0.00 1.29	277.72	275.85 273.25 272.00	269.44 266.85 265.60	6.40 6.40	15 15 Cir	6.30 6.29	13.20 0.00	1.29 0.00	Pipe - (21)
7	6	MH	0.013	31.113	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.91	0.88	6.47	0.11	0.00 0.70	278.92	279.56 274.45 273.20	278.55 273.45 272.20	1.00 1.00	15 15 Cir	3.22 3.21	9.43 0.00	0.70 0.00	Pipe - (22)
8	7	MH	0.013	26.926	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.00	0.91	6.72	0.09	0.00 0.61	279.49	280.78 275.25 274.00	280.18 274.65 273.40	0.60 0.60	15 15 Cir	2.23 2.23	7.86 0.00	0.61 0.00	Pipe - (23)
9	6	MH	0.013	30.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.00	1.01	6.72	0.09	0.00 0.61	277.72	279.66 274.65 273.40	278.55 273.55 272.30	1.10 1.10	15 15 Cir	3.67 3.67	10.08 0.00	0.61 0.00	Pipe - (25)
10	5	MH	0.013	30.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.00	2.03	6.72	0.05	0.00 0.30	271.11	270.54 268.05 266.80	269.44 266.95 265.70	1.10 1.10	15 15 Cir	3.67 3.67	10.08 0.00	0.30 0.00	Pipe - (37)

NOTES: Intensity = 54.48 / (Inlet time + 11.00) ^ 0.74 (in/hr) ; Time of flow in section is based on full flow.

Project File: Puleo.stm

FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 10/16/2020
					C1 = 0.2 C2 = 0.5 C3 = 0.9							Total Flow		Elev of Crown			Span	Pipe	Full Flow		Frequency: 25 yrs
														Elev of Invert							Proj: Puleo.stm
				(ft)	Increment (ac)	Sub-Total (ac)	Sum CA	(min)	(min)	(in/hr)		Q (cfs)	(ft)	Up (ft)	Down (ft)	Fall (ft)	Size (in)	Slope (%)	Vel (ft/s)	Cap (cfs)	Line description
11	4	MH	0.013	30.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.00	2.03	6.72	0.05	0.00 0.30	264.50	261.22 261.25 260.00	260.09 260.15 258.90	1.13 1.10	15 15 Cir	3.76 3.67	10.20 0.00	0.30 0.00	Pipe - (24)
12	2	MH	0.013	99.863	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.23	0.63	6.66	0.49	0.00 3.24	254.23	251.63 248.95 247.70	249.13 246.45 245.20	2.50 2.50	15 15 Cir	2.50 2.50	8.33 0.00	3.24 0.00	Pipe - (18)
13	12	MH	0.012	55.780	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	6.00	0.23	6.72	0.48	0.00 3.21	255.86	254.01 251.00 250.00	252.01 249.00 248.00	2.00 2.00	12 12 Cir	3.59 3.59	9.30 0.00	3.21 0.00	Pipe - (36)
14	End	MH	0.013	22.035	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	12.30	0.05	5.33	4.19	0.00 22.34	251.32	240.09 240.10 238.10	237.99 238.00 236.00	2.10 2.10	24 24 Cir	9.55 9.53	22.23 0.00	22.34 0.00	Pipe - (44)
15	14	MH	0.013	113.750	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	12.14	0.16	5.35	3.87	0.00 20.72	251.32	247.00 246.70 245.20	240.09 239.80 238.30	6.90 6.90	18 18 Cir	6.07 6.07	14.64 0.00	20.72 0.00	Pipe - (15)
16	15	MH	0.013	74.774	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	12.04	0.11	5.37	3.60	0.00 19.34	253.31	249.96 248.10 246.60	248.76 246.90 245.40	1.20 1.20	18 18 Cir	1.61 1.60	7.53 0.00	19.34 0.00	Pipe - (14)
17	16	MH	0.013	106.000	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	11.88	0.15	5.40	3.54	0.00 19.10	261.31	254.19 251.90 250.40	250.59 248.30 246.80	3.60 3.60	18 18 Cir	3.40 3.40	10.95 0.00	19.10 0.00	Pipe - (12)
18	17	MH	0.013	49.115	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	8.56	0.07	6.06	3.43	0.00 20.79	263.89	258.59 257.00 255.50	255.89 254.30 252.80	2.70 2.70	18 18 Cir	5.50 5.50	13.93 0.00	20.79 0.00	Pipe - (10)
19	18	MH	0.013	97.779	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	8.34	0.22	6.11	2.20	0.00 13.43	268.80	264.21 259.80 258.30	261.61 257.20 255.70	2.60 2.60	18 18 Cir	2.66 2.66	9.69 0.00	13.43 0.00	Pipe - (42)
20	19	MH	0.013	101.007	0.00 0.00 0.00	0.00 0.00 0.00	0.00 0.00 0.00	8.10	0.24	6.17	2.11	0.00 12.99	270.36	266.53 262.10 260.60	264.43 260.00 258.50	2.10 2.10	18 18 Cir	2.08 2.08	8.57 0.00	12.99 0.00	Pipe - (5)

NOTES: Intensity = 54.48 / (Inlet time + 11.00) ^ 0.74 (in/hr) ; Time of flow in section is based on full flow.

Project File: Puleo.stm

FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 10/16/2020
					C1 = 0.2 C2 = 0.5 C3 = 0.9							Total Flow		Elev of Crown			Span	Pipe	Full Flow		Frequency: 25 yrs
														Elev of Invert							Proj: Puleo.stm
					Increment (ac)	Sub-Total (ac)	Sum CA					Q		Up	Down	Fall	Size	Slope	Vel	Cap	
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
21	20	MH	0.013	36.841	0.00	0.00	0.00	8.04	0.07	6.19	1.88	0.00	271.09	268.62	267.62	1.00	15	2.72	8.67	11.63	Pipe - (4)
					0.00	0.00	0.00					11.63		263.05	262.05		15	2.71	0.00	0.00	
					0.00	0.00	0.00							261.80	260.80	1.00	Cir				
22	21	MH	0.013	26.744	0.00	0.00	0.00	7.98	0.05	6.20	1.75	0.00	270.55	270.37	269.57	0.80	15	2.99	9.10	10.82	Pipe - (3)
					0.00	0.00	0.00					10.82		264.05	263.25		15	2.99	0.00	0.00	
					0.00	0.00	0.00							262.80	262.00	0.80	Cir				
23	22	MH	0.013	128.005	0.00	0.00	0.00	7.72	0.27	6.26	1.57	0.00	270.93	273.80	271.60	2.20	15	1.72	6.90	9.81	Pipe - (41)
					0.00	0.00	0.00					9.81		266.45	264.25		15	1.72	0.00	0.00	
					0.00	0.00	0.00							265.20	263.00	2.20	Cir				
24	23	MH	0.013	160.000	0.00	0.00	0.00	7.20	0.52	6.39	0.98	0.00	273.44	276.31	273.91	2.40	15	1.50	6.45	6.27	Pipe - (40)
					0.00	0.00	0.00					6.27		269.05	266.65		15	1.50	0.00	0.00	
					0.00	0.00	0.00							267.80	265.40	2.40	Cir				
25	24	MH	0.013	160.000	0.00	0.00	0.00	6.00	1.20	6.72	0.41	0.00	275.95	278.91	276.40	2.50	15	1.56	6.58	2.72	Pipe - (39)
					0.00	0.00	0.00					2.72		271.75	269.25		15	1.56	0.00	0.00	
					0.00	0.00	0.00							270.50	268.00	2.50	Cir				
26	18	MH	0.013	29.038	0.00	0.00	0.00	6.00	1.96	6.72	0.05	0.00	265.13	263.41	261.61	1.80	15	6.20	13.10	0.30	Pipe - (6)
					0.00	0.00	0.00					0.30		258.85	257.05		15	6.20	0.00	0.00	
					0.00	0.00	0.00							257.60	255.80	1.80	Cir				
27	18	MH	0.012	22.158	0.00	0.00	0.00	6.00	0.15	6.72	0.29	0.00	0.60	262.61	261.61	1.00	12	4.52	10.44	1.94	Pipe - (43)
					0.00	0.00	0.00					1.94		257.80	256.80		12	4.51	0.00	0.00	
					0.00	0.00	0.00							256.80	255.80	1.00	Cir				
28	17	MH	0.013	120.649	0.00	0.00	0.00	7.78	4.10	6.25	0.09	0.00	258.50	258.39	255.89	2.50	15	2.07	7.58	0.56	Pipe - (11)
					0.00	0.00	0.00					0.56		254.35	251.85		15	2.07	0.00	0.00	
					0.00	0.00	0.00							253.10	250.60	2.50	Cir				
29	28	MH	0.013	26.290	0.00	0.00	0.00	6.00	1.78	6.72	0.05	0.00	259.00	259.98	259.28	0.70	15	2.67	8.59	0.30	Pipe - (7)
					0.00	0.00	0.00					0.30		255.25	254.55		15	2.66	0.00	0.00	
					0.00	0.00	0.00							254.00	253.30	0.70	Cir				
30	16	MH	0.013	28.446	0.00	0.00	0.00	6.00	4.81	6.72	0.02	0.00	254.96	251.29	250.59	0.70	15	2.46	8.26	0.12	Pipe - (13)
					0.00	0.00	0.00					0.12		250.65	249.95		15	2.46	0.00	0.00	
					0.00	0.00	0.00							249.40	248.70	0.70	Cir				

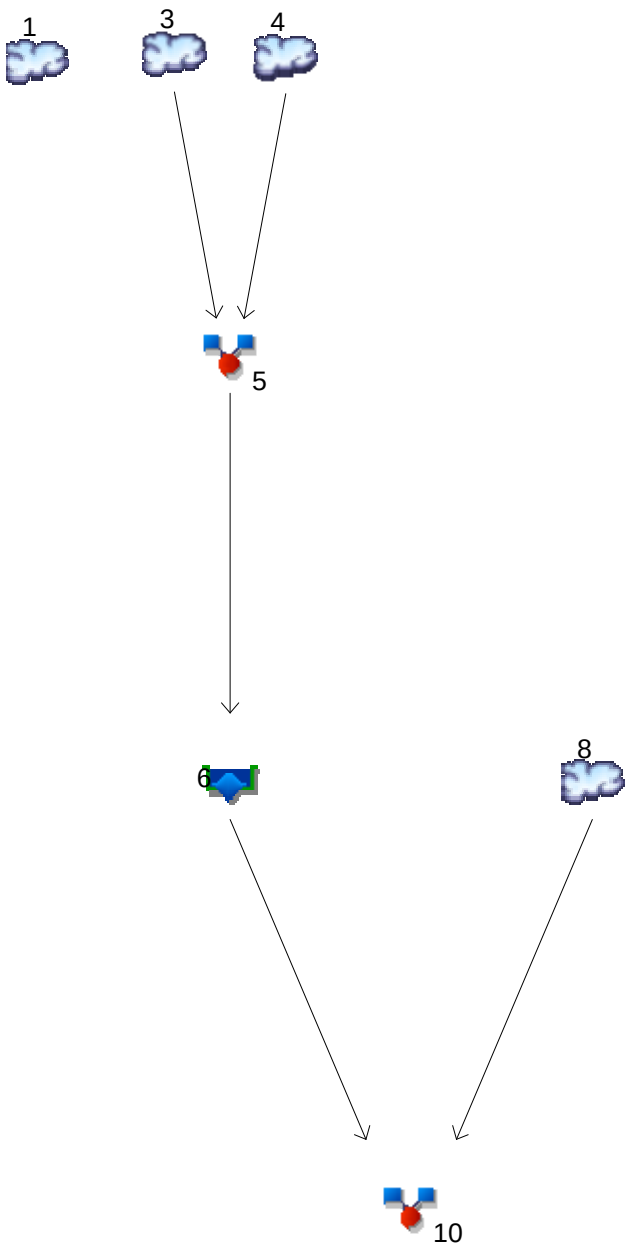
NOTES: Intensity = 54.48 / (Inlet time + 11.00) ^ 0.74 (in/hr) ; Time of flow in section is based on full flow.

Project File: Puleo.stm

APPENDIX I

Watershed Model Schematic

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



Legend

Hyd.	Origin	Description
1	SCS Runoff	EXDA-A
3	SCS Runoff	PRDA-A-PERVIOUS
4	SCS Runoff	PRDA-A-IMPERVIOUS
5	Combine	PRDA-A To Basin
6	Reservoir	SWM-1
8	SCS Runoff	PRDA A Bypass
10	Combine	PRDA Total

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	-------	-------	12.63	-------	-------	EXDA-A
3	SCS Runoff	------	-------	-------	-------	-------	-------	12.28	-------	-------	PRDA-A-PERVIOUS
4	SCS Runoff	------	-------	-------	-------	-------	-------	44.09	-------	-------	PRDA-A-IMPERVIOUS
5	Combine	3, 4	-------	-------	-------	-------	-------	56.37	-------	-------	PRDA-A To Basin
6	Reservoir	5	-------	-------	-------	-------	-------	5.667	-------	-------	SWM-1
8	SCS Runoff	------	-------	-------	-------	-------	-------	1.205	-------	-------	PRDA A Bypass
10	Combine	6, 8,	-------	-------	-------	-------	-------	5.809	-------	-------	PRDA Total

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	12.63	1	738	59,433	------	------	------	EXDA-A
3	SCS Runoff	12.28	1	727	33,852	------	------	------	PRDA-A-PERVIOUS
4	SCS Runoff	44.09	1	727	144,595	------	------	------	PRDA-A-IMPERVIOUS
5	Combine	56.37	1	727	178,447	3, 4	------	------	PRDA-A To Basin
6	Reservoir	5.667	1	775	125,541	5	239.77	113,891	SWM-1
8	SCS Runoff	1.205	1	727	3,321	------	------	------	PRDA A Bypass
10	Combine	5.809	1	775	128,862	6, 8,	------	------	PRDA Total

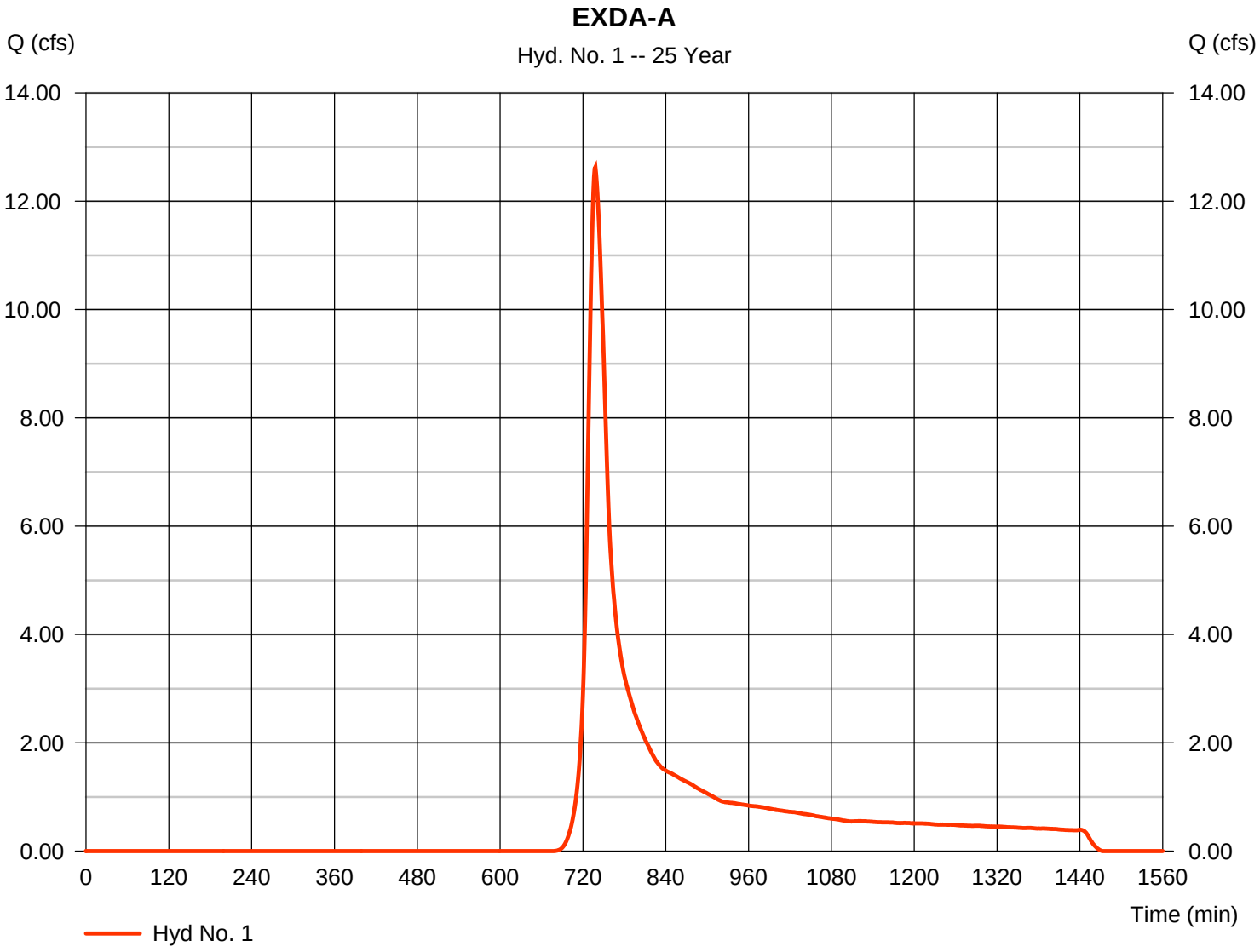
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.63 cfs
Storm frequency	=	25 yrs	Time to peak	=	738 min
Time interval	=	1 min	Hyd. volume	=	59,433 cuft
Drainage area	=	9.960 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	6.19 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rea Graphical Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



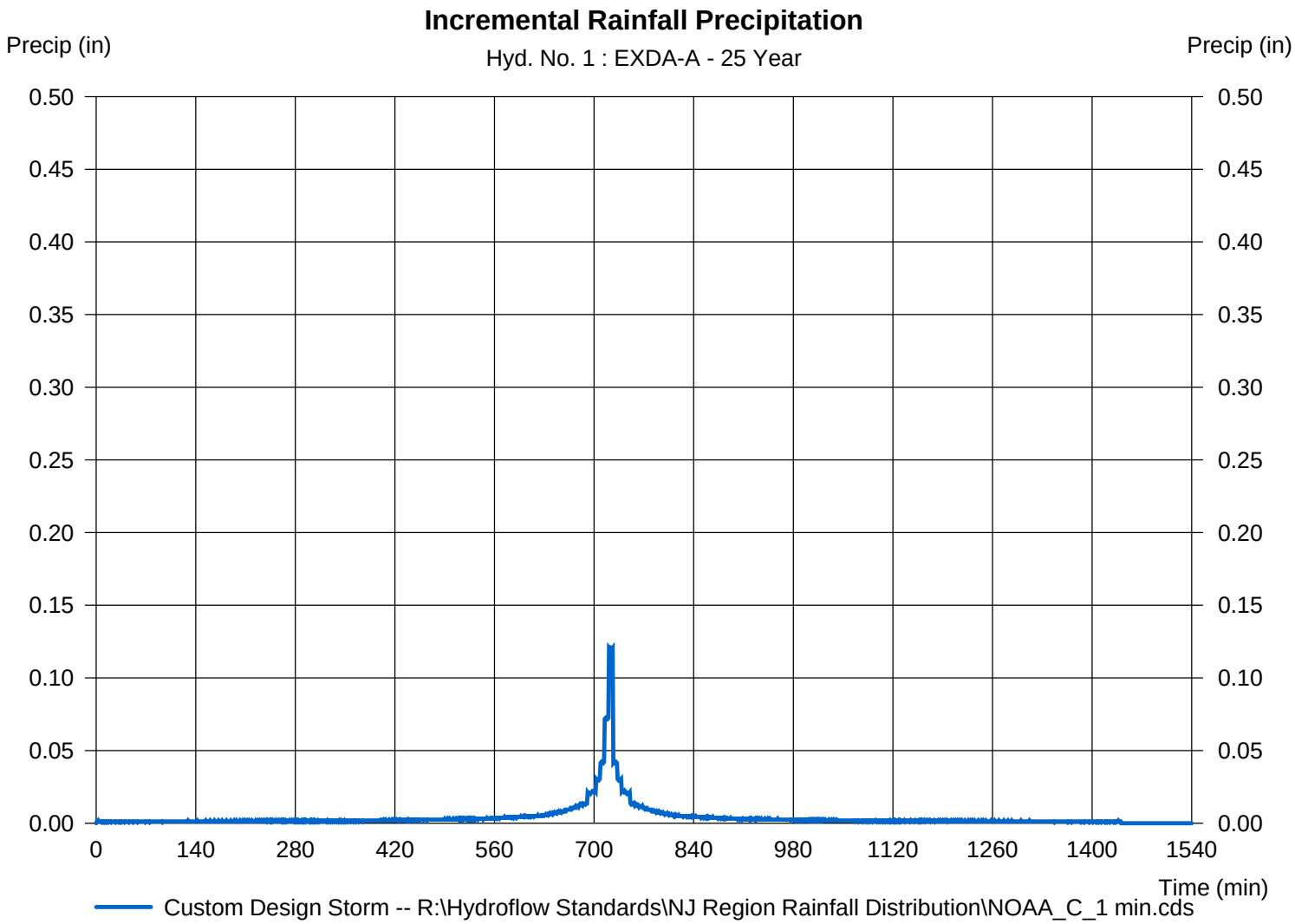
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 1

EXDA-A

Storm Frequency	= 25 yrs	Time interval	= 1 min
Total precip.	= 6.1900 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



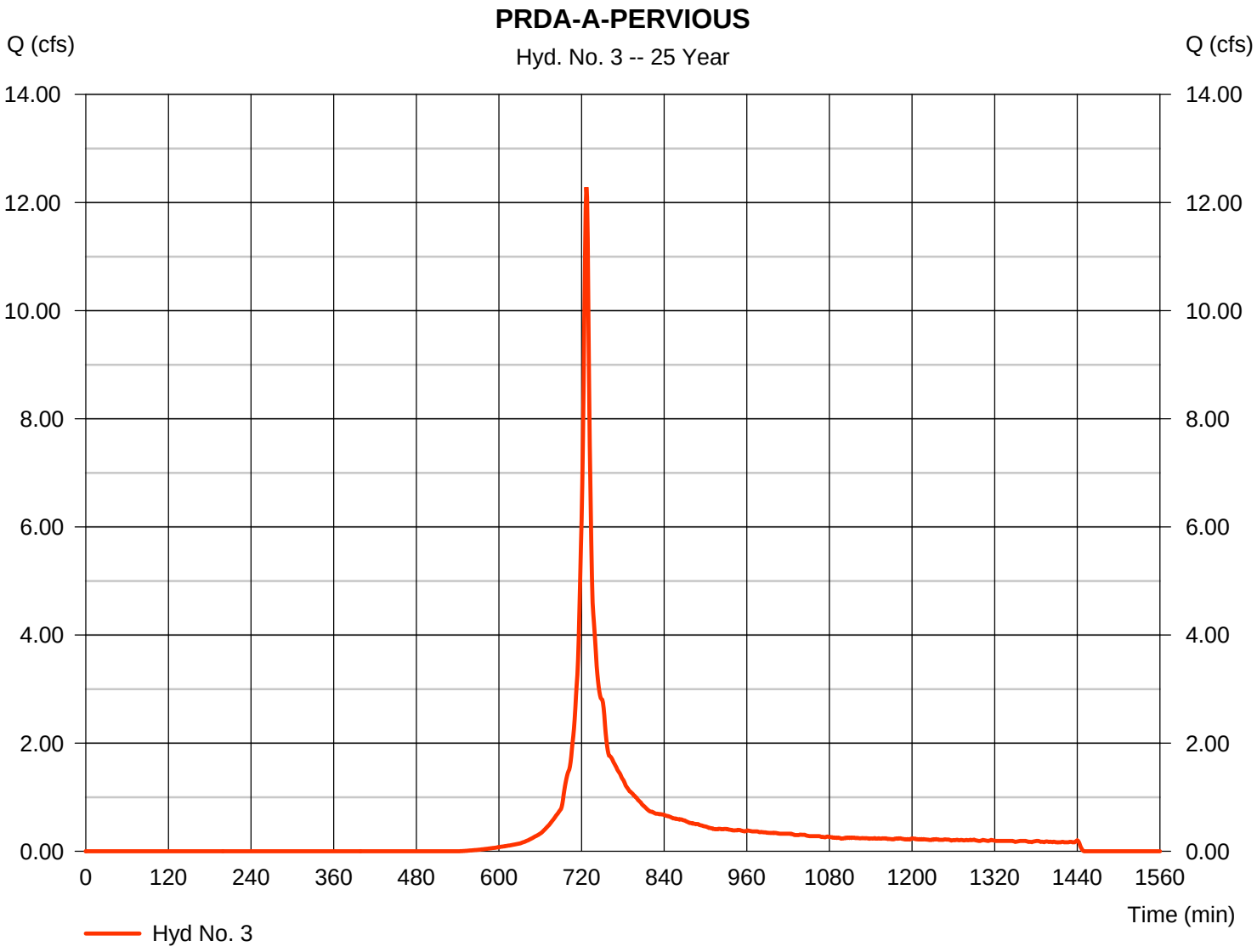
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 3

PRDA-A-PERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.28 cfs
Storm frequency	=	25 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	33,852 cuft
Drainage area	=	3.160 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.19 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rea Storm Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484

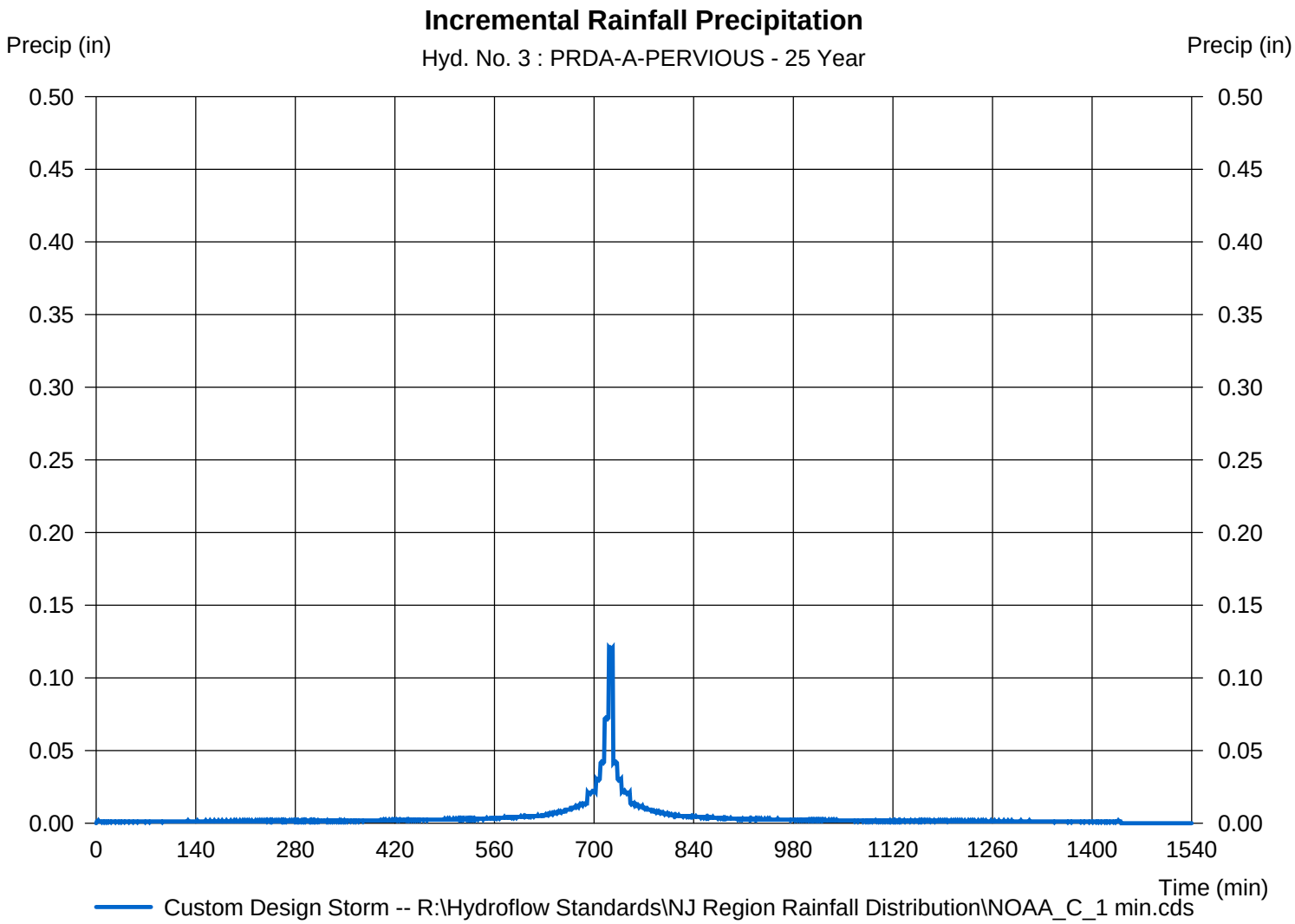


Precipitation Report

Hyd. No. 3

PRDA-A-PERVIOUS

Storm Frequency	= 25 yrs	Time interval	= 1 min
Total precip.	= 6.1900 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



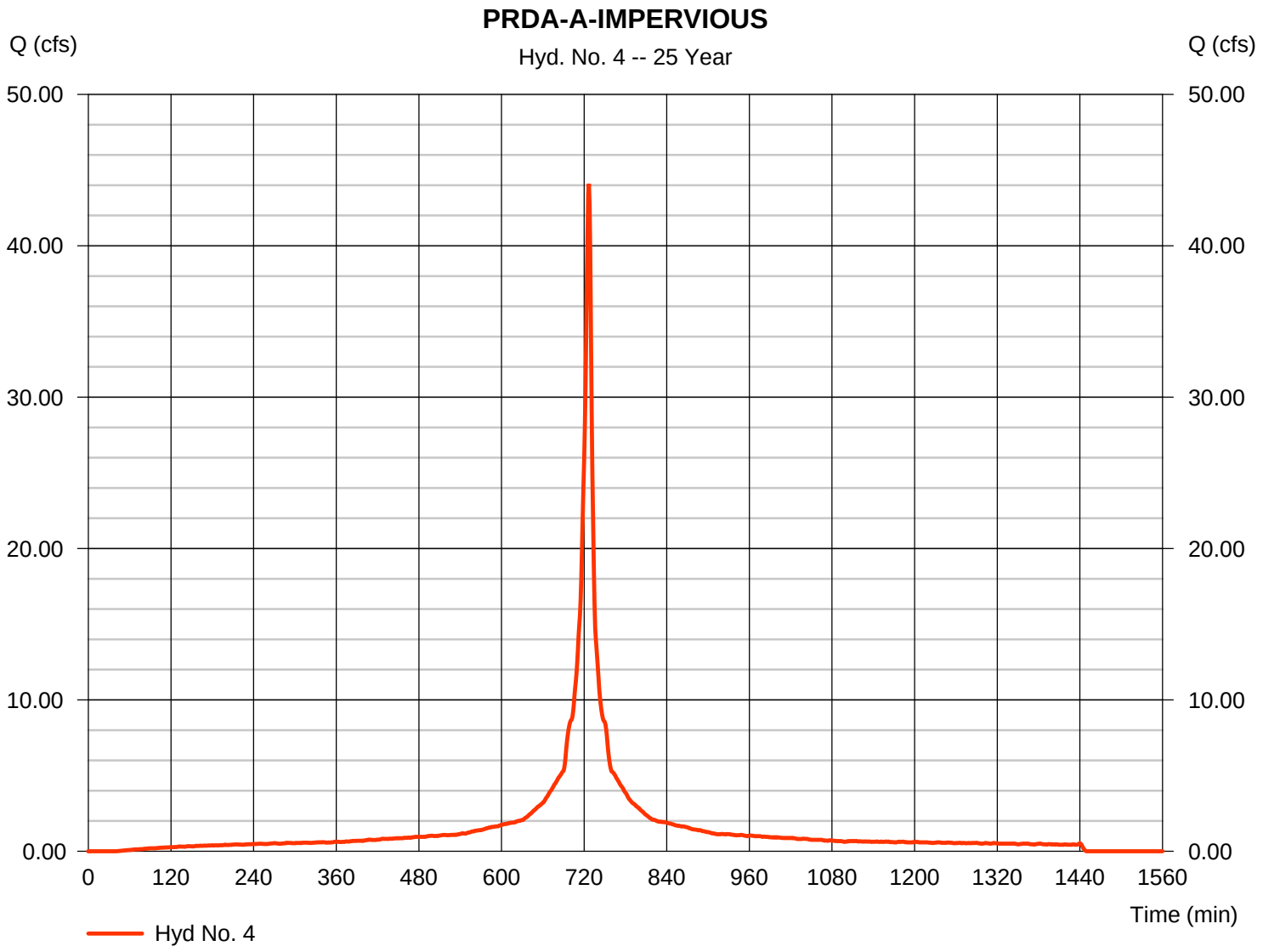
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Hydrograph type	=	SCS Runoff	Peak discharge	=	44.09 cfs
Storm frequency	=	25 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	144,595 cuft
Drainage area	=	6.490 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.19 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Rea	Storm Rainfall Distribution	=	484A_C_1 min.cds



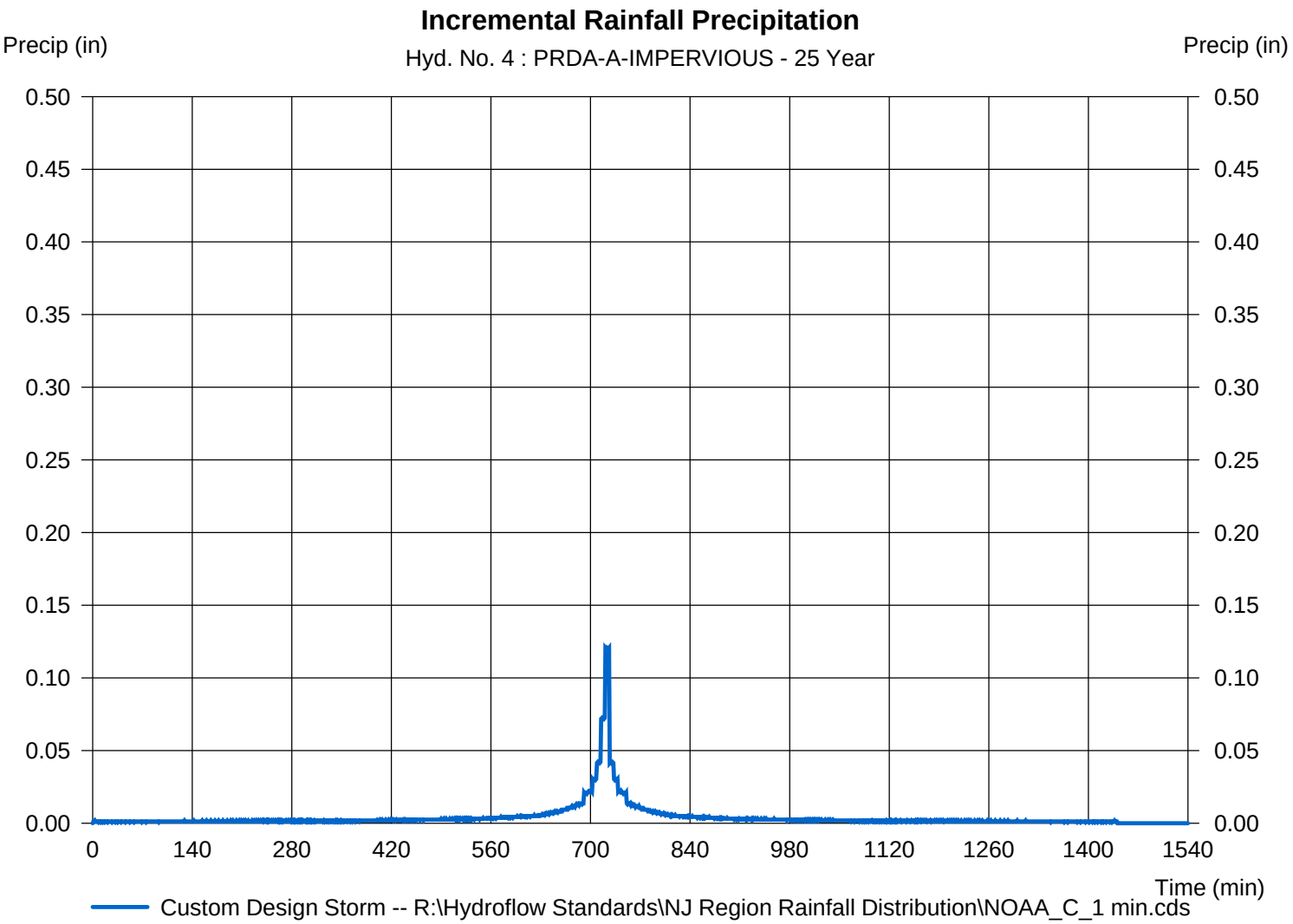
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 4

PRDA-A-IMPERVIOUS

Storm Frequency	= 25 yrs	Time interval	= 1 min
Total precip.	= 6.1900 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



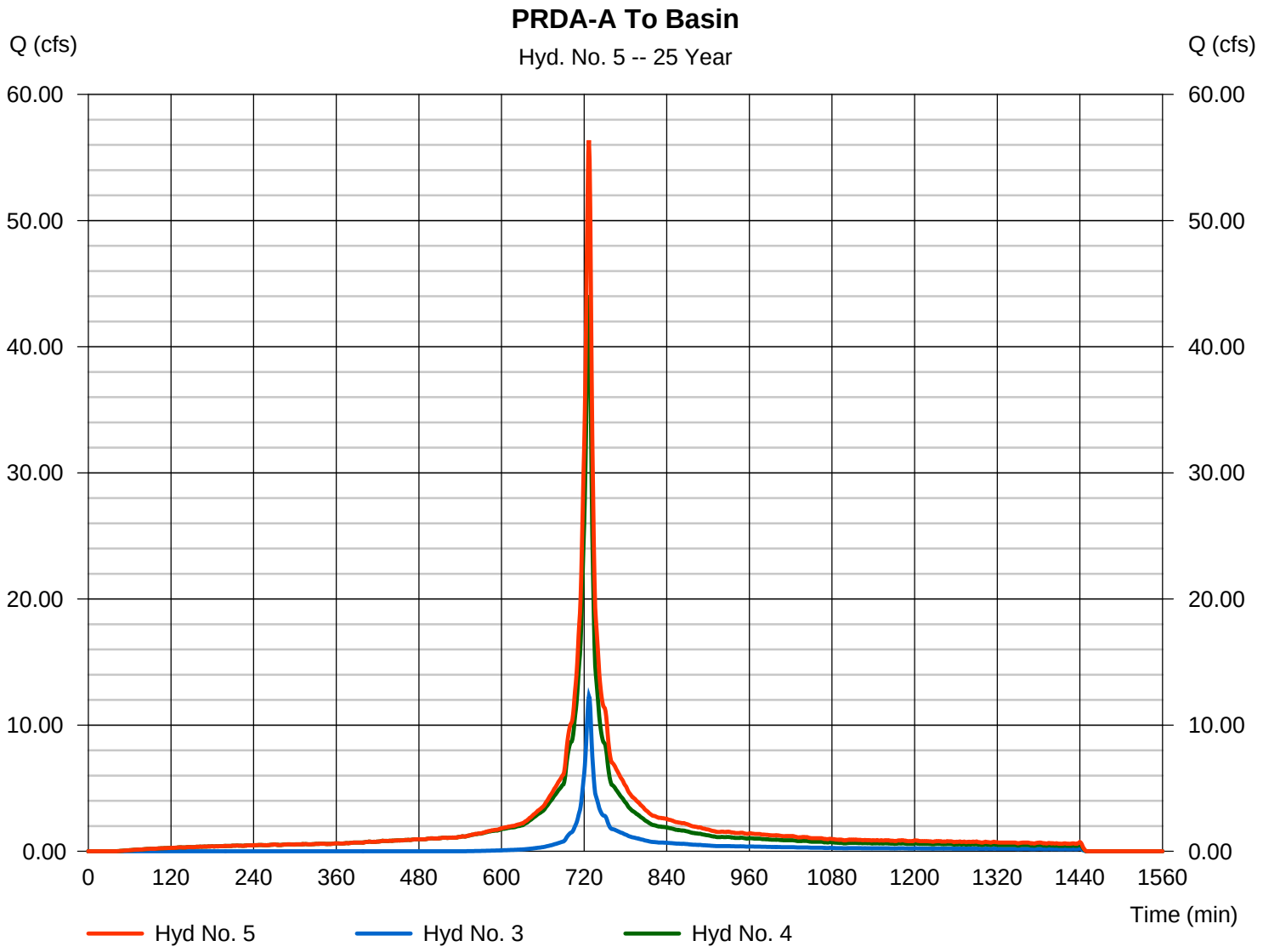
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 5

PRDA-A To Basin

Hydrograph type	=	Combine	Peak discharge	=	56.37 cfs
Storm frequency	=	25 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	178,447 cuft
Inflow hyds.	=	3, 4	Contrib. drain. area	=	9.650 ac



Hydrograph Report

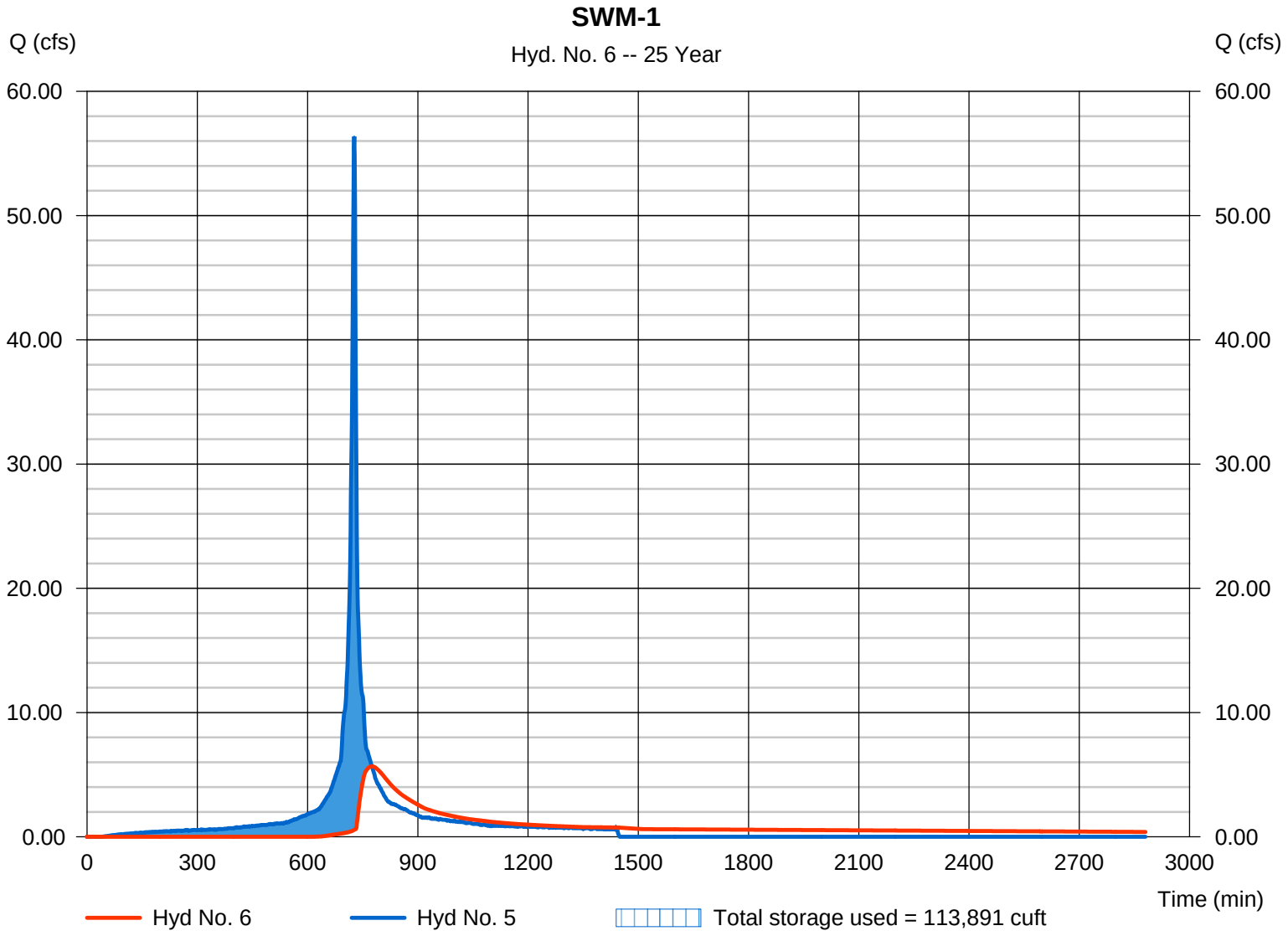
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 6

SWM-1

Hydrograph type	=	Reservoir	Peak discharge	=	5.667 cfs
Storm frequency	=	25 yrs	Time to peak	=	775 min
Time interval	=	1 min	Hyd. volume	=	125,541 cuft
Inflow hyd. No.	=	5 - PRDA-A To Basin	Max. Elevation	=	239.77 ft
Reservoir name	=	BIORETENTION BASIN	Max. Storage	=	113,891 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Pond No. 1 - BIORETENTION BASIN

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 236.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	236.00	24,863	0	0
1.00	237.00	27,631	26,232	26,232
2.00	238.00	30,462	29,032	55,264
3.00	239.00	33,357	31,895	87,160
4.00	240.00	36,316	34,823	121,982
5.00	241.00	39,338	37,813	159,795

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	4.00	0.00	0.00
Span (in)	= 18.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 231.00	236.90	0.00	0.00
Length (ft)	= 1.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

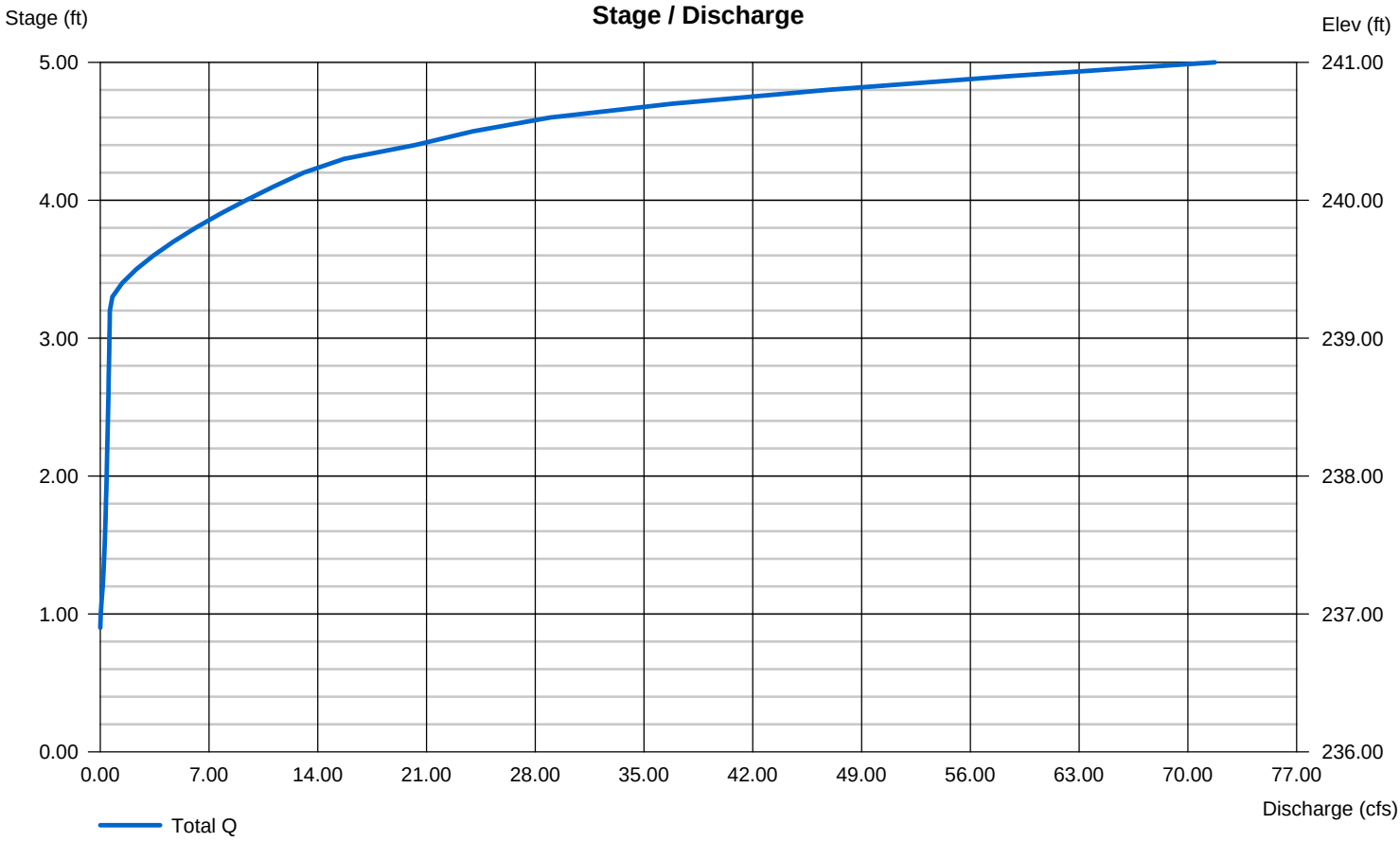
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	4.00	50.00	0.00
Crest El. (ft)	= 240.25	239.25	240.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



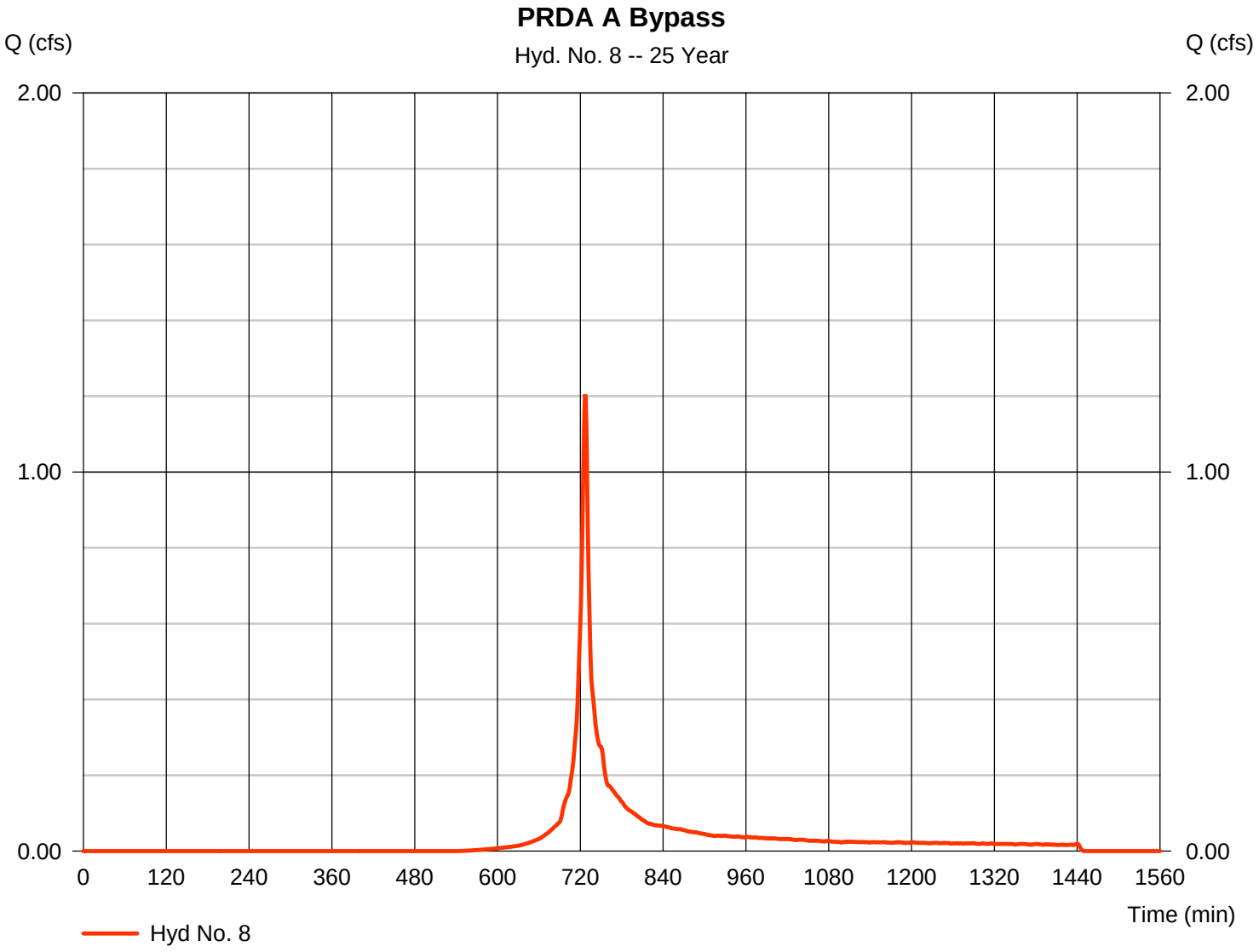
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 8

PRDA A Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.205 cfs
Storm frequency	=	25 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	3,321 cuft
Drainage area	=	0.310 ac	Curve number	=	69
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.19 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NJ Region 2 Rainfall Distribution\484AA_C_1 min.cds	Shape factor	=	484



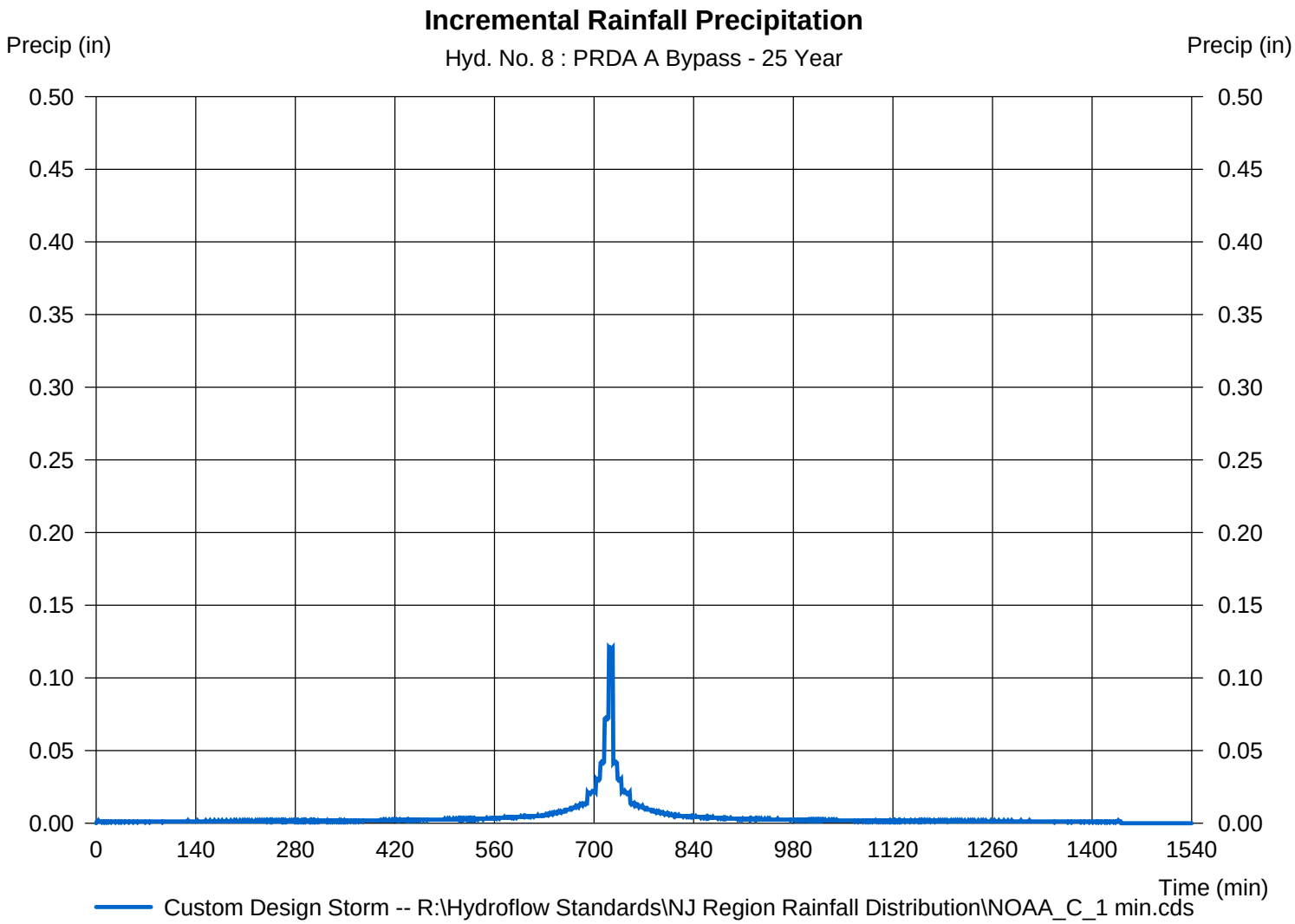
Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 8

PRDA A Bypass

Storm Frequency	= 25 yrs	Time interval	= 1 min
Total precip.	= 6.1900 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NJ Region Rainfall Distribution\NOAA_C_1 min.cds		



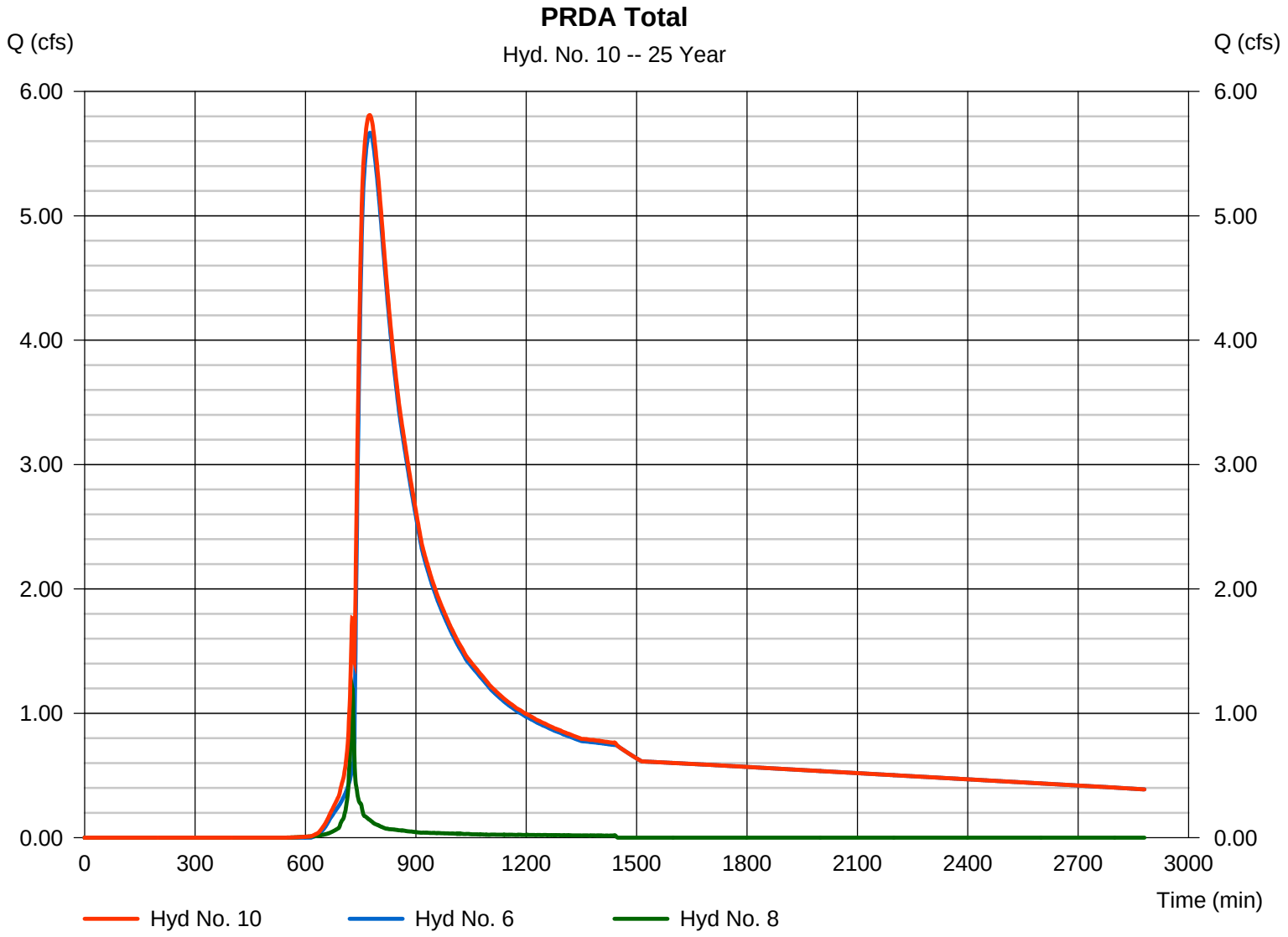
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 10 / 15 / 2020

Hyd. No. 10

PRDA Total

Hydrograph type	= Combine	Peak discharge	= 5.809 cfs
Storm frequency	= 25 yrs	Time to peak	= 775 min
Time interval	= 1 min	Hyd. volume	= 128,862 cuft
Inflow hyds.	= 6, 8	Contrib. drain. area	= 0.310 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

019\0119109 (01) - Green Care Farms - Hillsborough\Documents\Reports\SWM\Hydraflow\REsources\Hillsborough.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	3.43	0.00	0.00	5.08	6.19	0.00	8.15

Project: PULEO INTERNATIONAL **Date:** 10/10/20
Location: TOWN OF CLINTON, NJ **By:** KFO

Emergency Spillway

Basin 1

Emergency Spillway - NJDEP Criteria

Peak 100 Year Inflow to Basin = 77.28 cfs

100 Year Inflow Plus 50% = 115.92 cfs

Emergency Spillway = **200.00** LF Broad Crested Weir at Elev = **240.50**

Weir Equation: Q = CLH^1.5

Solving for = (Q/CL)^0.67

Where: Q 115.92 cfs
L = 200.00 feet
C = 2.60 (Discharge Coefficient)
H = Hydraulic Head over Spillway

Hydraulic Head H = 0.37 ft

Velocity Over Spillway : V = Q/A

Where: Q = 115.92 cfs
A = L x H = 73.16 sf

Velocity V= 1.58 fps

Emergency Water Surface Elevation = 240.50 + H = 240.87

Top of Berm = 240.87 + 1 ft (Freeboard)= 241.87

Set Top of Berm Elevation = 241.90

PROJECT- Puleo
NUMBER- 120176
BY- KFO
DATE- 10/10/2020

RIPRAP APRON CALCULATIONS

HW #1 BASIN 1 INFLOW

Do = 2.00
Wo = 2.00
TW = 0.40 (0.2 Do ASSUMED)
Q = 28.14 CFS MAX. FLOW VIA PIPE
Y = DEPTH OF SCOUR HOLE BELOW INVERT
q= 14.07 CFS/FT (Q/Wo)

CASE 1 - TW < 1/2 Do

La =	1.8 (q/(Do ^0.5)) + 7Do	=	31.91	FEET
		USE	32.0	FEET
Wa =	3Wo +La	=	38.0	FEET
		USE	38.0	FEET

CASE 2 - TW > 1/2 Do

La =	3*Do (q/(Do ^0.5))	=	59.69	FEET
		USE	60.0	FEET
Wa =	3Wo + 0.4La	=	24.0	FEET
		USE	24.0	FEET

RIPRAP SIZING

$$D50 = \frac{0.02}{Tw} q^{1.33} \times 12$$

= 20.20 INCHES

USE 21.0 INCHES

PROJECT- Puleo
NUMBER- 120176
BY- KFO
DATE- 10/10/2020

RIPRAP APRON CALCULATIONS

HW #2 BASIN 1 INFLOW

Do = 2.00
Wo = 2.00
TW = 0.40 (0.2 Do ASSUMED)
Q = 28.14 CFS MAX. FLOW VIA PIPE
Y = DEPTH OF SCOUR HOLE BELOW INVERT
q= 14.07 CFS/FT (Q/Wo)

CASE 1 - TW < 1/2 Do

La =	1.8 (q/(Do ^0.5)) + 7Do	=	31.91	FEET
		USE	32.0	FEET
Wa =	3Wo +La	=	38.0	FEET
		USE	38.0	FEET

CASE 2 - TW > 1/2 Do

La =	3*Do (q/(Do ^0.5))	=	59.68	FEET
		USE	60.0	FEET
Wa =	3Wo + 0.4La	=	24.0	FEET
		USE	24.0	FEET

RIPRAP SIZING

$$D50 = \frac{0.02}{Tw} q^{1.33} \times 12$$

=	20.20	INCHES	
USE	21.0	INCHES	

PROJECT- Puleo
NUMBER- 120176
BY- KFO
DATE- 10/10/2020

RIPRAP APRON CALCULATIONS

HW #3 BASIN 1 OUTFALL

Do = 1.50
Wo = 1.50
TW = 0.30 (0.2 Do ASSUMED)
Q = 18.41 CFS MAX. FLOW VIA PIPE
Y = DEPTH OF SCOUR HOLE BELOW INVERT
q= 12.27 CFS/FT (Q/Wo)

CASE 1 - TW < 1/2 Do

La =	1.8 (q/(Do ^0.5)) + 7Do	=	28.54	FEET
		USE	29.0	FEET
Wa =	3Wo +La	=	33.5	FEET
		USE	34.0	FEET

CASE 2 - TW > 1/2 Do

La =	3*Do (q/(Do ^0.5))	=	45.10	FEET
		USE	46.0	FEET
Wa =	3Wo + 0.4La	=	18.4	FEET
		USE	19.0	FEET

RIPRAP SIZING

D50 =	$\frac{0.02}{Tw} q^{1.33} \times 12$	=	22.46	INCHES
		USE	23.0	INCHES

APPENDIX J

Bioretention Draining Calculations:

Puleo International

Rate of Infiltration:

Q=KIA

Q: Rate of Infiltration (cfs)

K: Design Permeability (fps)

I: Hydraulic Gradient

A: Area of Infiltration (SF)

K	0.5	in/hr	per Permeability of Bioretention Media
	1.15741E-05	**fps**	

I=Davg/d

Davg=(D1+D2)/2

D1: Min Distance to Groundwater

D2: Max Distance to Groundwater

d: distance from bottom of BMP to Groundwater

D1	6.00	Ft
D2	7.00	Ft
Davg	**6.50**	Ft
d	6.00	Ft
I	**1.083333333**	

A: Bottom /	24863.00	SF

Q	**0.31175**	**CFS**
	1122.288	**CF/Hr**

Volume			**Drain Time:**	t=V/Q
WQV	**25416**	cf	**22.6 Hours**	<72 Hours

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
HUNTERDON CO., CLINTON TOWN	46.8	1.54

Project Name:	PULEO INTERNATIONAL
Description:	13 MOEBUS PLACE, TOWN OF CL
Analysis Date:	07/31/20

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	7.25	Woods	Gladstone	15.5	408,616
2	2.7	Woods	Duffield	15.5	151,633
3	0				
4	0				
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	10.0			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				15.5	560,249

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	5.24	Impervious areas	Gladstone	0.0	-
2	1.85	Impervious areas	Duffield	0.0	-
3	0.85	Open space	Duffield	15.3	47,128
4	2.01	Open space	Gladstone	15.3	111,292
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	10.0			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				4.4	158,420

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)	308,840
Post-Development Annual Recharge Deficit=	***401,829***	(cubic feet)	

Recharge Efficiency Parameters Calculations (area averages)

RWC=	4.09	(in)	DRWC=	2.18	(in)
ERWC =	0.94	(in)	EDRWC=	0.50	(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
PULEO INTERNATIONAL	13 MOEBUS PLACE, TOWN OF CLI	07/31/20	Bioretention Basin

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	**24863.0**	sq.ft
BMP Effective Depth, this is the design variable	dBMP	**4.6**	in
Upper level of the BMP surface (negative if above ground)	dBMPu	**-10.8**	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	**24.0**	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	**4**	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	**1.26**	in
ERWC Modified to consider dEXC	EDRWC	**0.88**	in
Empty Portion of RWC under Infilt. BMP	RERWC	**0.69**	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	**0.38**	in
Inches of Rainfall to capture	Pdesign	**0.49**	in
Recharge Provided Avg. over Imp. Area		**15.7**	in
Runoff Captured Avg. over imp. Area		**20.1**	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	**0.08**	unitless
BMP Volume	VBMP	**9,531**	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> **Solve Problem to satisfy Annual Recharge**
dBMP Check---> **OK**
dEXC Check---> **OK**
BMP Location---> **OK**

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	**401,829**	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	**308,840**	sq.ft
Root Zone Water Capacity	RWC	**5.48**	in
RWC Modified to consider dEXC	DRWC	**3.83**	in
Climatic Factor	C-factor	**1.54**	no units
Average Annual P	Pavg	**46.8**	in
Recharge Requirement over Imp. Area	dr	**15.6**	in

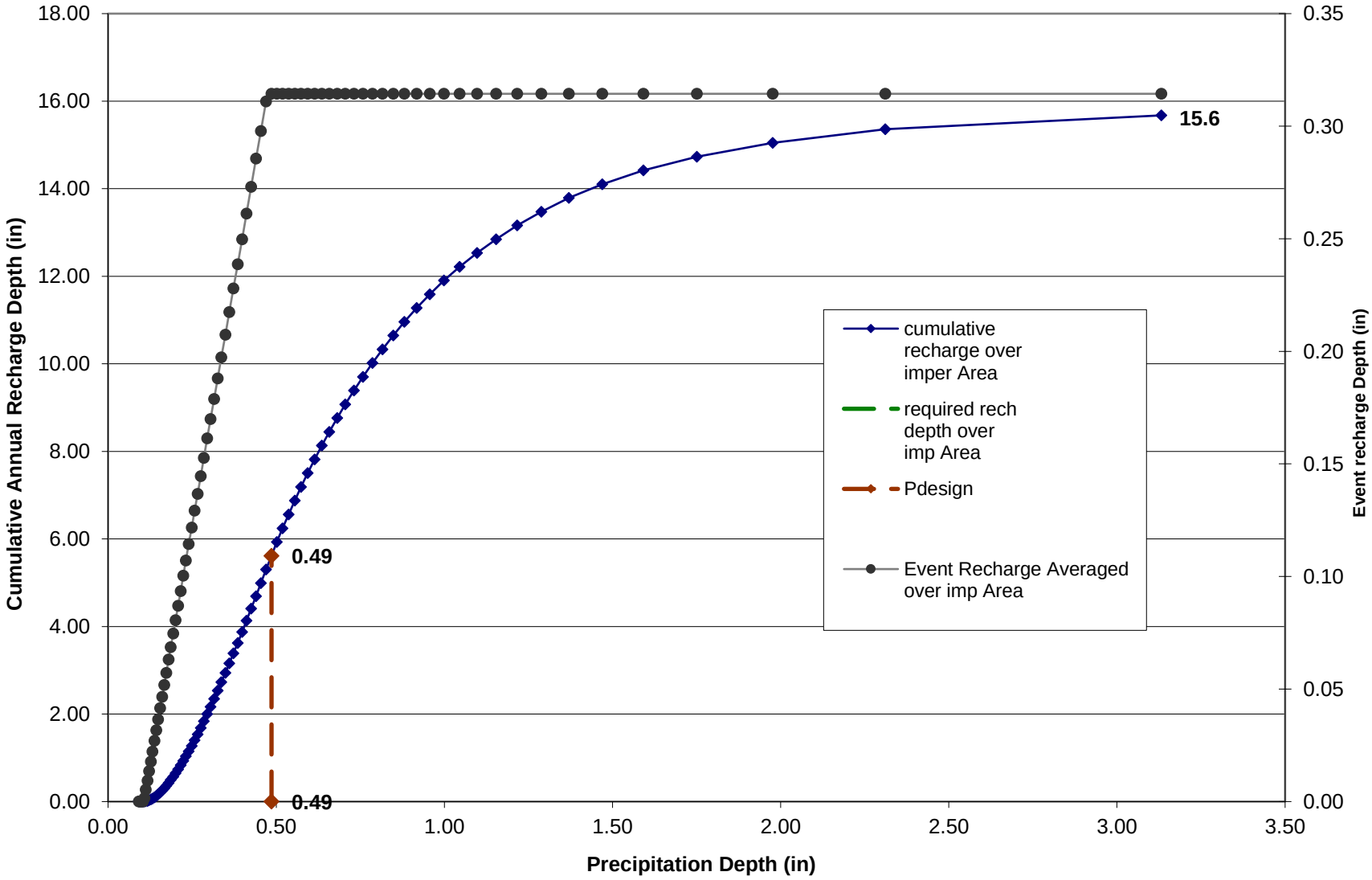
System Performance Calculated Parameters

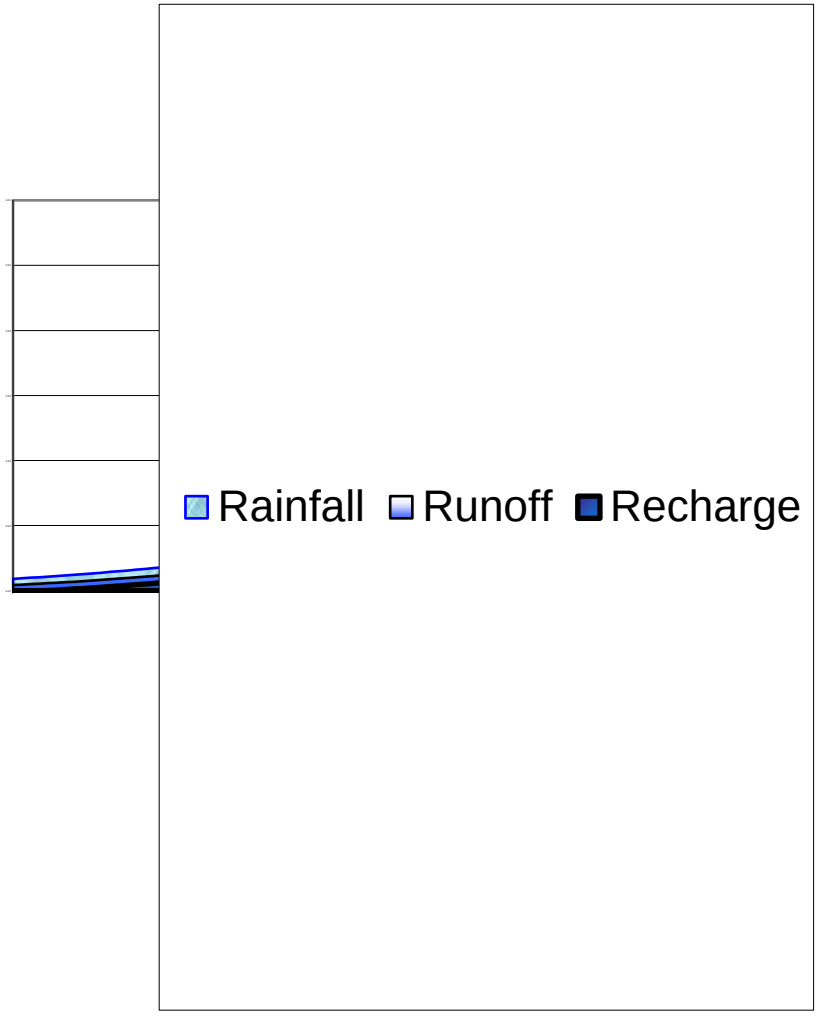
Annual BMP Recharge Volume		**403,452**	cu.ft
Avg BMP Recharge Efficiency		**78.1%**	Represents % Infiltration Recharged
%Rainfall became Runoff		**78.1%**	%
%Runoff Infiltrated		**54.9%**	%
%Runoff Recharged		**42.9%**	%
%Rainfall Recharged		**33.5%**	%

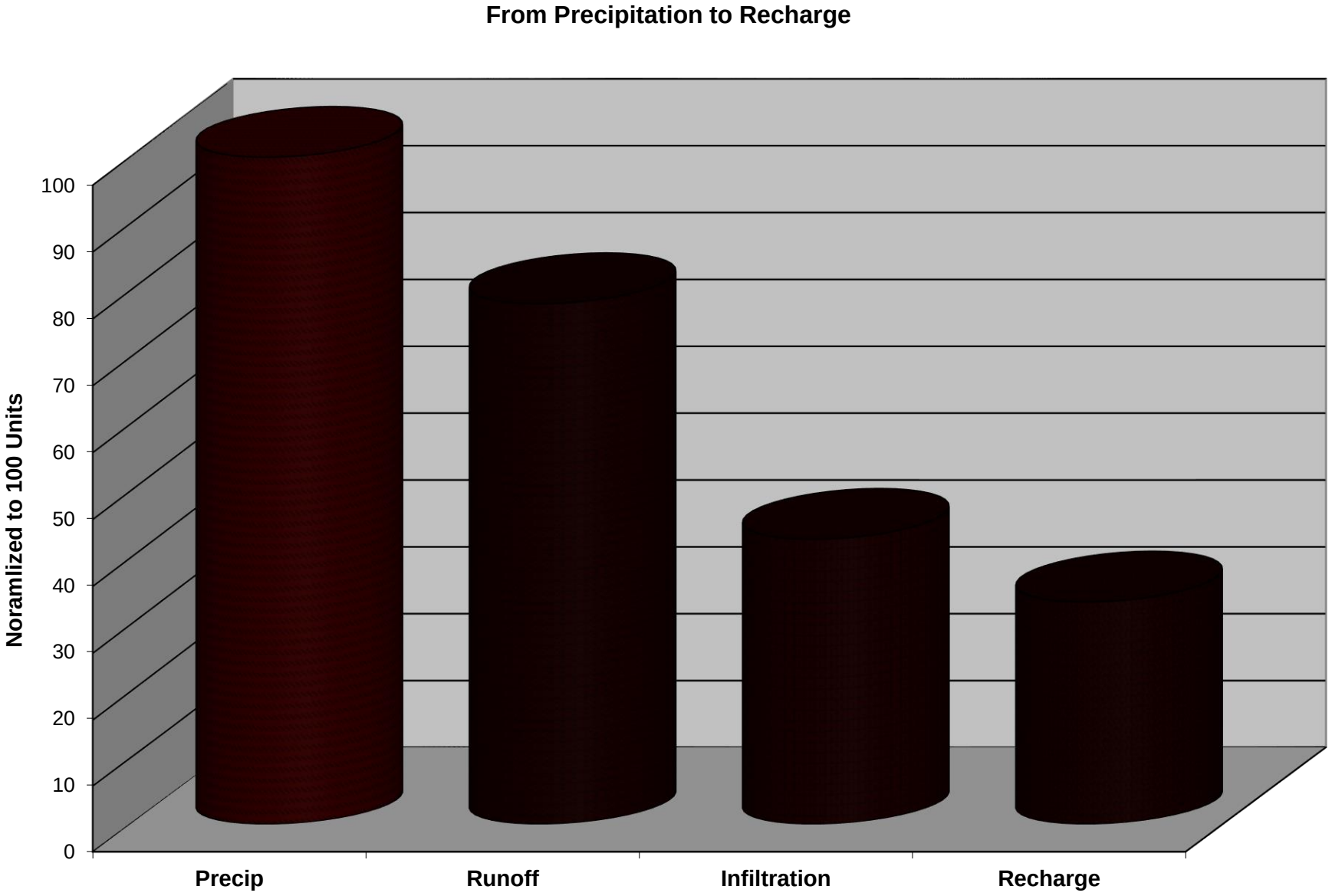
OTHER NOTES

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.


18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
Cumulative Annual Recharge Depth (in)
Event recharge Depth (in)
Precipitation Depth (in)
15.6
0.49
0.49
cumulative recharge over imper Area
required rech depth over imp Area
Pdesign
Event Recharge Averaged over imp Area


Rainfall
Runoff
Recharge


From Precipitation to Recharge
Noramlized to 100 Units
100
90
80
70
60
50
40
30
20
10
0
Precip
Runoff
Infiltration
Recharge

APPENDIX K

140 West Main Street
High Bridge, NJ 08829
T: 908.238.0544 F: 908.238.9572
Clinton | Asbury Park | Denville | Philadelphia

Municipality: Clinton Block: 18 Lot: 5

Soil Log and Interpretation

1 Soil Log #: SL-1 Date of Soil Log: 12/22/20 Method: Profile Pit

2 Log:

Depth (inches)	Munsell Color Name & Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragments; Structure; Consistence; Mottling Abundance, Size and Contrast
0 - 11"	Topsoil
11 - 48"	7.5YR 5/6; Loam Sand; 5% Gravel; Mottling @ 46-66" 7.5YR4/2 in Color, Many, Coarse, Prominent; SAB, Moist, Friable
48 - 120"	7.5YR 4/4; Sandy Clay Loam; 5% Gravel, 2% Cobble, 1% Stone; SAB, Moist, Friable

3 Ground Water Observations:

_____ Seepage Observed - Depth (inches): _____

_____ Pit Flooded - Depth (inches): _____ after _____ hours of observation

4 Soil Limiting Zones (Check ALL applicable categories):

_____ Fractured Rock Substratum - Depth to Top: _____

_____ Massive Rock Substratum - Depth to Top: _____

_____ Excessively Coarse Horizon - Depth Top to Bottom: _____

_____ Excessively Coarse Substratum - Depth to Top: _____

_____ Hydraulically Restrictive Horizon - Depth Top to Bottom: _____

_____ Hydraulically Restrictive Substratum - Depth to Top: _____

_____ Perched Zone of Saturation - Depth Top to Bottom: _____

_____ Regional Zone of Saturation - Depth to Top: _____

5 I hereby certify that the information furnished on this form is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator: _____ Date: 12/22/2020

Signature and Seal of Professional Engineer: _____

License #: 24GB04258200 Date: _____

140 West Main Street
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T: 908.238.0544 F: 908.238.9572
Clinton | Asbury Park | Denville | Philadelphia

Municipality: Clinton Block: 18 Lot: 5

Soil Log and Interpretation

1 Soil Log #: SL-2 Date of Soil Log: 12/22/20 Method: Profile Pit

2 Log:

Depth (inches)	Munsell Color Name & Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragments; Structure; Consistence; Mottling Abundance, Size and Contrast
0 - 7"	Topsoil
7 - 50"	7.5YR 4/4; Sandy Clay; 5% Gravel, 5% Cobble, 2% Stone; SAB, Moist, Friable
50 - 106"	7.5YR 3/4; Sandy Clay; 10% Gravel, 20% Cobble, 30% Stone; SAB, Saturated, Friable; Machine Refusal @ 106"

3 Ground Water Observations:

_____ Seepage Observed - Depth (inches): _____

_____ Pit Flooded - Depth (inches): _____ after _____ hours of observation

4 Soil Limiting Zones (Check ALL applicable categories):

✓	Fractured Rock Substratum - Depth to Top:	50"
_____	Massive Rock Substratum - Depth to Top:	_____
_____	Excessively Coarse Horizon - Depth Top to Bottom:	_____
_____	Excessively Coarse Substratum - Depth to Top:	_____
_____	Hydraulically Restrictive Horizon - Depth Top to Bottom:	_____
_____	Hydraulically Restrictive Substratum - Depth to Top:	_____
_____	Perched Zone of Saturation - Depth Top to Bottom:	_____
_____	Regional Zone of Saturation - Depth to Top:	_____

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Signature of Site Evaluator: _____ Date: 12/20/2020

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License #: 24GB04258200 Date: _____

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Municipality: Clinton Block: 18 Lot: 5

Soil Log and Interpretation

1 Soil Log #: SL-3 Date of Soil Log: 12/22/20 Method: Profile Pit

2 Log:

Depth (inches)	Munsell Color Name & Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragments; Structure; Consistence; Mottling Abundance, Size and Contrast
0 - 8"	Topsoil
8 - 68"	7.5YR 5/6; Sandy Loam; 2% Gravel; SAB, Moist, Friable; Seepage @ 33"
68 - 120"	7.5YR 4/4; Sandy Clay Loam; 5% Gravel, 5% Cobble, 2% Stone; Mottling @ 76-78 7.5YR 5/8 in Color, Common, Medium, Distinct; SAB, Moist, Friable

3 Ground Water Observations:

☑ Seepage Observed - Depth (inches): 33"

____ Pit Flooded - Depth (inches): ____ after ____ hours of observation

4 Soil Limiting Zones (Check ALL applicable categories):

____ Fractured Rock Substratum - Depth to Top: ____

____ Massive Rock Substratum - Depth to Top: ____

____ Excessively Coarse Horizon - Depth Top to Bottom: ____

____ Excessively Coarse Substratum - Depth to Top: ____

____ Hydraulically Restrictive Horizon - Depth Top to Bottom: ____

____ Hydraulically Restrictive Substratum - Depth to Top: ____

____ Perched Zone of Saturation - Depth Top to Bottom: ____

____ Regional Zone of Saturation - Depth to Top: ____

5 I hereby certify that the information furnished on this form is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator: _____ Date: 12/20/2020

Signature and Seal of Professional Engineer: _____

License #: 24GB04258200 Date: _____

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Clinton | Asbury Park | Denville | Philadelphia

Municipality: Clinton Block: 18 Lot: 5

Soil Log and Interpretation

1 Soil Log #: SL-4 Date of Soil Log: 12/22/20 Method: Profile Pit

2 Log:

Depth (inches)	Munsell Color Name & Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragments; Structure; Consistence; Mottling Abundance, Size and Contrast
0 - 7"	Topsoil
7 - 56"	7.5YR 5/6; Sandy Loam; 5% Gravel, 10% Cobble, 5% Stone; SAB, Moist, Friable
56 - 120"	7.5YR 5/8; Sandy Clay Loam; 10% Gravel, 20% Cobble, 15% Stone; Mottling @ 67-78 10YR 5/8 in Color, Many, Coarse, Prominent; SAB, Moist, Friable

3 Ground Water Observations:

_____ Seepage Observed - Depth (inches): _____

_____ Pit Flooded - Depth (inches): _____ after _____ hours of observation

4 Soil Limiting Zones (Check ALL applicable categories):

_____ Fractured Rock Substratum - Depth to Top: _____

_____ Massive Rock Substratum - Depth to Top: _____

_____ Excessively Coarse Horizon - Depth Top to Bottom: _____

_____ Excessively Coarse Substratum - Depth to Top: _____

_____ Hydraulically Restrictive Horizon - Depth Top to Bottom: _____

_____ Hydraulically Restrictive Substratum - Depth to Top: _____

_____ Perched Zone of Saturation - Depth Top to Bottom: _____

_____ Regional Zone of Saturation - Depth to Top: _____

5 I hereby certify that the information furnished on this form is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator: _____ Date: 12/20/2020

Signature and Seal of Professional Engineer: _____

License #: 24GB04258200 Date: _____

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High Bridge, NJ 08829
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Clinton | Asbury Park | Denville | Philadelphia

Municipality: Clinton Block: 18 Lot: 5

Soil Log and Interpretation

1 Soil Log #: SL-5 Date of Soil Log: 12/22/20 Method: Profile Pit

2 Log:

Depth (inches)	Munsell Color Name & Symbol; Estimated Textural Class; Estimated Volume % Coarse Fragments; Structure; Consistence; Mottling Abundance, Size and Contrast
0 - 7"	Topsoil
7 - 45"	7.5YR 4/4; Clay Loam; 10% Gravel; SAB, Moist, Friable
45 - 120"	7.5YR 5/4; Clay Loam; 15% Gravel, 10% Cobble, 5% Stone; SAB, Moist, Friable

3 Ground Water Observations:

_____ Seepage Observed - Depth (inches): _____

_____ Pit Flooded - Depth (inches): _____ after _____ hours of observation

4 Soil Limiting Zones (Check ALL applicable categories):

_____ Fractured Rock Substratum - Depth to Top: _____

_____ Massive Rock Substratum - Depth to Top: _____

_____ Excessively Coarse Horizon - Depth Top to Bottom: _____

_____ Excessively Coarse Substratum - Depth to Top: _____

_____ Hydraulically Restrictive Horizon - Depth Top to Bottom: _____

_____ Hydraulically Restrictive Substratum - Depth to Top: _____

_____ Perched Zone of Saturation - Depth Top to Bottom: _____

_____ Regional Zone of Saturation - Depth to Top: _____

5 I hereby certify that the information furnished on this form is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator: _____ Date: 12/20/2020

Signature and Seal of Professional Engineer: _____

License #: 24GB04258200 Date: _____

140 West Main Street
High Bridge, NJ 08829
T: 908.238.0544 F: 908.238.9572

E&LP

APPLICATION FOR PERMIT TO CONSTRUCT/ALTER AN INDIVIDUAL SUBSURFACE SEWAGE DISPOSAL SYSTEM

Municipality: Clinton Block: 18 Lot: 5

Form 3g - Basin Flooding Test Data

1 Test # BF-1 Reference Soil Log SL-2 Date Tested 12/22/20

2 Depth of Pit (ft) 8.83

3 Area of pit (ft^2) 50

4 Description of rock substratum within test zone:

Type of Rock Lime Stone

Name of Formation

Average Fracture Spacing

Type of Fractures

___ Open (wide), clean - width of openings (mm)

X Open (wide), infilled with fines - width of opening (mm)

___ Tight (closed)

Orientation of Fractures:

___ Horizontal (parallel to pit bottom) or nearly so

X Inclined

___ Vertical (parallel to sides of pit) or nearly so

Hardness of Rock:

___ Rippable with hand tools

X Not rippable with hand tools, rippable by machine

___ Not rippable by machine

5 Time/Date of 1st basin flooding 11:03 am 12/22 Volume of water added, gal. 375

6 Result of 1st basin flooding:

X Basin drained within 24 hours - indicate time/date 11:50 am 12/22

___ Basin not drained within 24 hours

7 Time/Date of 2nd basin flooding 12:00 pm 12/22 Volume of water added, gal. 375

8 Result of 2nd basin flooding:

X Basin drained within 24 hours - indicate time/date 12:45 pm 12/22

___ Basin not drained within 24 hours

9 I hereby certify that the information furnished on Form 3g of this application (and the attachments thereto) is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator Date

Signature and Seal of Professional Engineer

License # 24GB042582 Date

Engineering & Land Planning Associates

Project:	Puleo International	Date:	12/22/2020
Location:	13 Moebus Place, Clinton	Sample:	IN PLACE
Test By:	Joey McGinnis		SL-1 @ 48"

L=	6.000	T1=	186
H1=	6.000	T2=	187
H2=	5.000	T3=	186
r=	1.000	T4=	187
R=	1.000	T5=	188
		T(sec.)=	188
		T(min.)=	3.13

Soil Permeability: 20.95

Soil Class: K5

Disturbed	
Tube Weight	734
Gross Weight	1,074
Net Weight	340
Sample Vol. (in³)	18.84
(cm³)	308.7876
Bulk Density	1.101080484
	min. 1.2 gr/cm³

$$K(in/hr) = 60\,\text{min}/hr \times \frac{L(in)}{T(\text{min})} \times \frac{r^2}{R^2} \times \ln\left(\frac{H_1}{H_2}\right)$$ [Equation 4]

Where:

K = permeability of the soil sample, in inches per hour;
L = length of the soil core, in inches;
T = time required for the water level to drop from H_1 to H_2 during the final test interval, in minutes,;
r = radius of the standpipe, in centimeters or inches;
R = radius of the soil core, in the same units as "r";
H_1 = height of the water level above the rim of the test basin at the beginning of each test interval, in inches; and
H_2 = height of the water level above the rim of the test basin at the end of each test interval, in inches.

[Note: When the standpipe is not used, the term r^2/R^2 is omitted from the equation.]

Engineering & Land Planning Associates

Project:	Puleo International	Date:	12/22/2020
Location:	13 Moebus Place, Clinton	Sample:	IN PLACE
Test By:	Joey McGinnis		SL-1 @ 80"

L=	6.000	T1=	265
H1=	6.000	T2=	263
H2=	4.500	T3=	266
r=	1.000	T4=	264
R=	1.000	T5=	263
		T(sec.)=	263
		T(min.)=	4.38

Soil Permeability: 23.63

Soil Class: K5

Disturbed

Tube Weight	695
Gross Weight	1,036
Net Weight	341
Sample Vol. (in³)	18.84
(cm³)	308.7876
Bulk Density	1.104318956
	min. 1.2 gr/cm³

$$K(in/hr) = 60\,\text{min}/hr \times \frac{L(in)}{T(\text{min})} \times \frac{r^2}{R^2} \times \ln\left(\frac{H_1}{H_2}\right)$$ [Equation 4]

Where:

K = permeability of the soil sample, in inches per hour;
L = length of the soil core, in inches;
T = time required for the water level to drop from H_1 to H_2 during the final test interval, in minutes,;
r = radius of the standpipe, in centimeters or inches;
R = radius of the soil core, in the same units as "r";
H_1 = height of the water level above the rim of the test basin at the beginning of each test interval, in inches; and
H_2 = height of the water level above the rim of the test basin at the end of each test interval, in inches.

[Note: When the standpipe is not used, the term r^2/R^2 is omitted from the equation.]

Engineering & Land Planning Associates

Project:	Puleo International	Date:	12/22/2020
Location:	13 Moebus Place, Clinton	Sample:	IN PLACE
Test By:	Joey McGinnis		SL-3 @ 60"

L=	6.000	T1=	196
H1=	6.000	T2=	198
H2=	5.000	T3=	199
r=	1.000	T4=	202
R=	1.000	T5=	200
		T(sec.)=	200
		T(min.)=	3.33

Soil Permeability: 19.69

Soil Class: K5

Disturbed

Tube Weight	695
Gross Weight	1,154
Net Weight	459
Sample Vol. (in³)	18.84
(cm³)	308.7876
Bulk Density	1.486458653
	min. 1.2 gr/cm³

$$K(in/hr) = 60\,\text{min}/hr \times \frac{L(in)}{T(\text{min})} \times \frac{r^2}{R^2} \times \ln\left(\frac{H_1}{H_2}\right)$$ [Equation 4]

Where:

K = permeability of the soil sample, in inches per hour;
L = length of the soil core, in inches;
T = time required for the water level to drop from H_1 to H_2 during the final test interval, in minutes,;
r = radius of the standpipe, in centimeters or inches;
R = radius of the soil core, in the same units as "r";
H_1 = height of the water level above the rim of the test basin at the beginning of each test interval, in inches; and
H_2 = height of the water level above the rim of the test basin at the end of each test interval, in inches.

[Note: When the standpipe is not used, the term r^2/R^2 is omitted from the equation.]

Engineering & Land Planning Associates

Project:	Puleo International	Date:	12/22/2020
Location:	13 Moebus Place, Clinton	Sample:	IN PLACE
Test By:	Joey McGinnis		SL-3 @ 100"

L=	6.000	T1=	220
H1=	6.000	T2=	224
H2=	5.450	T3=	223
r=	1.000	T4=	223
R=	1.000	T5=	222
		T(sec.)=	222
		T(min.)=	3.70

Soil Permeability: 9.35

Soil Class: K4

Disturbed

Tube Weight	700
Gross Weight	1,152
Net Weight	452
Sample Vol. (in³)	18.84
(cm³)	308.7876
Bulk Density	1.463789349
	min. 1.2 gr/cm³

$$K(in/hr) = 60\,\text{min}/hr \times \frac{L(in)}{T(\text{min})} \times \frac{r^2}{R^2} \times \ln\left(\frac{H_1}{H_2}\right)$$ [Equation 4]

Where:

K = permeability of the soil sample, in inches per hour;
L = length of the soil core, in inches;
T = time required for the water level to drop from H_1 to H_2 during the final test interval, in minutes,;
r = radius of the standpipe, in centimeters or inches;
R = radius of the soil core, in the same units as "r";
H_1 = height of the water level above the rim of the test basin at the beginning of each test interval, in inches; and
H_2 = height of the water level above the rim of the test basin at the end of each test interval, in inches.

[Note: When the standpipe is not used, the term r^2/R^2 is omitted from the equation.]

Engineering & Land Planning Associates

Project:	Puleo International	Date:	12/22/2020
Location:	13 Moebus Place, Clinton	Sample:	IN PLACE
Test By:	Joey McGinnis		SL-4 @ 55"

L=	6.000	T1=	321
H1=	6.000	T2=	326
H2=	4.500	T3=	326
r=	1.000	T4=	323
R=	1.000	T5=	325
		T(sec.)=	325
		T(min.)=	5.42

Soil Permeability: 19.12

Soil Class: K4

Disturbed

Tube Weight	700
Gross Weight	1,140
Net Weight	440
Sample Vol. (in³)	18.84
(cm³)	308.7876
Bulk Density	1.424927685
	min. 1.2 gr/cm³

$$K(in/hr) = 60\,\text{min}/hr \times \frac{L(in)}{T(\text{min})} \times \frac{r^2}{R^2} \times \ln\left(\frac{H_1}{H_2}\right)$$ [Equation 4]

Where:

K = permeability of the soil sample, in inches per hour;
L = length of the soil core, in inches;
T = time required for the water level to drop from H_1 to H_2 during the final test interval, in minutes,;
r = radius of the standpipe, in centimeters or inches;
R = radius of the soil core, in the same units as "r";
H_1 = height of the water level above the rim of the test basin at the beginning of each test interval, in inches; and
H_2 = height of the water level above the rim of the test basin at the end of each test interval, in inches.

[Note: When the standpipe is not used, the term r^2/R^2 is omitted from the equation.]

Engineering & Land Planning Associates

Project:	Puleo International	Date:	12/22/2020
Location:	13 Moebus Place, Clinton	Sample:	IN PLACE
Test By:	Joey McGinnis		SL-4 @ 110"

L=	6.000	T1=	265
H1=	6.000	T2=	263
H2=	5.450	T3=	264
r=	1.000	T4=	266
R=	1.000	T5=	265
		T(sec.)=	265
		T(min.)=	4.42

Soil Permeability: 7.84

Soil Class: K4

Disturbed

Tube Weight	700
Gross Weight	1,109
Net Weight	409
Sample Vol. (in³)	18.84
(cm³)	308.7876
Bulk Density	1.324535053
	min. 1.2 gr/cm³

$$K(in/hr) = 60\,\text{min}/hr \times \frac{L(in)}{T(\text{min})} \times \frac{r^2}{R^2} \times \ln\left(\frac{H_1}{H_2}\right)$$ [Equation 4]

Where:

K = permeability of the soil sample, in inches per hour;
L = length of the soil core, in inches;
T = time required for the water level to drop from H_1 to H_2 during the final test interval, in minutes,;
r = radius of the standpipe, in centimeters or inches;
R = radius of the soil core, in the same units as "r";
H_1 = height of the water level above the rim of the test basin at the beginning of each test interval, in inches; and
H_2 = height of the water level above the rim of the test basin at the end of each test interval, in inches.

[Note: When the standpipe is not used, the term r^2/R^2 is omitted from the equation.]

Engineering & Land Planning Associates

Project:	Puleo International	Date:	12/22/2020
Location:	13 Moebus Place, Clinton	Sample:	IN PLACE
Test By:	Joey McGinnis		SL-5 @ 40"

L=	6.000	T1=	197
H1=	6.000	T2=	199
H2=	5.000	T3=	196
r=	1.000	T4=	198
R=	1.000	T5=	198
		T(sec.)=	198
		T(min.)=	3.30

Soil Permeability: 19.89

Soil Class: K4

Disturbed

Tube Weight	700
Gross Weight	1,144
Net Weight	444
Sample Vol. (in³)	18.84
(cm³)	308.7876
Bulk Density	1.437881573
	min. 1.2 gr/cm³

$$K(in/hr) = 60\,\text{min}/hr \times \frac{L(in)}{T(\text{min})} \times \frac{r^2}{R^2} \times \ln\left(\frac{H_1}{H_2}\right)$$ [Equation 4]

Where:

K = permeability of the soil sample, in inches per hour;
L = length of the soil core, in inches;
T = time required for the water level to drop from H_1 to H_2 during the final test interval, in minutes,;
r = radius of the standpipe, in centimeters or inches;
R = radius of the soil core, in the same units as "r";
H_1 = height of the water level above the rim of the test basin at the beginning of each test interval, in inches; and
H_2 = height of the water level above the rim of the test basin at the end of each test interval, in inches.

[Note: When the standpipe is not used, the term r^2/R^2 is omitted from the equation.]

Engineering & Land Planning Associates

Project:	Puleo International	Date:	12/22/2020
Location:	13 Moebus Place, Clinton	Sample:	IN PLACE
Test By:	Joey McGinnis		SL-5 @ 100"

L=	6.000	T1=	245
H1=	6.000	T2=	243
H2=	5.450	T3=	242
r=	1.000	T4=	245
R=	1.000	T5=	245
		T(sec.)=	245
		T(min.)=	4.08

Soil Permeability: 8.48

Soil Class: K4

Disturbed

Tube Weight	700
Gross Weight	1,145
Net Weight	445
Sample Vol. (in³)	18.84
(cm³)	308.7876
Bulk Density	1.441120045
	min. 1.2 gr/cm³

$$K(in/hr) = 60\,\text{min}/hr \times \frac{L(in)}{T(\text{min})} \times \frac{r^2}{R^2} \times \ln\left(\frac{H_1}{H_2}\right)$$ [Equation 4]

Where:

K = permeability of the soil sample, in inches per hour;
L = length of the soil core, in inches;
T = time required for the water level to drop from H_1 to H_2 during the final test interval, in minutes,;
r = radius of the standpipe, in centimeters or inches;
R = radius of the soil core, in the same units as "r";
H_1 = height of the water level above the rim of the test basin at the beginning of each test interval, in inches; and
H_2 = height of the water level above the rim of the test basin at the end of each test interval, in inches.

[Note: When the standpipe is not used, the term r^2/R^2 is omitted from the equation.]

APPENDIX L

New Jersey Stormwater Best Management Practices Manual

February 2004

APPENDIX A

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

According to the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the groundwater recharge, stormwater quality, and stormwater quantity standards established by the Rules for major land development projects must be met by incorporating nine specific nonstructural stormwater management strategies into the project's design to the maximum extent practicable.

To accomplish this, the Rules require an applicant seeking land development approval from a regulatory board or agency to identify those nonstructural strategies that have been incorporated into the project's design. In addition, if an applicant contends that it is not feasible to incorporate any of the specific strategies into the project's design, particularly for engineering, environmental, or safety reasons, the Rules further require that the applicant provide a basis for that contention.

This checklist has been prepared to assist applicants, site designers, and regulatory boards and agencies in ensuring that the nonstructural stormwater management requirements of the Rules are met. It provides an applicant with a means to identify both the nonstructural strategies incorporated into the development's design and the specific low impact development BMPs (LID-BMPs) that have been used to do so. It can also help an applicant explain the engineering, environmental, and/or safety reasons that a specific nonstructural strategy could not be incorporated into the development's design.

The checklist can also assist municipalities and other land development review agencies in the development of specific requirements for both nonstructural strategies and LID-BMPs in zoning and/or land use ordinances and regulations. As such, where requirements consistent with the Rules have been adopted, they may supersede this checklist.

Finally, the checklist can be used during a pre-design meeting between an applicant and pertinent review personnel to discuss local nonstructural strategies and LID-BMPs requirements in order to optimize the development's nonstructural stormwater management design.

Since this checklist is intended to promote the use of nonstructural stormwater management strategies and provide guidance in their incorporation in land development projects, municipalities are permitted to revise it as necessary to meet the goals and objectives of their specific stormwater management program and plan within the limits of N.J.A.C. 7:8.

Low Impact Development Checklist

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: Clinton Town

County: Hunterdon Date: 10/10/2020

Review board or agency:

Proposed land development name: Puleo International

Lot(s): 5 Block(s): 18

Project or application number:

Applicant's name: Puleo International

Applicant's address: 3614 Kennedy Road South Planinfield NJ 07080

Telephone: Fax:

Email address:

Designer's name: E&LP Associates, Inc. - Wayne Ingram

Designer's address: 140 West Main Street, High Bridge, NJ 08829

Telephone: 908-238-0544 Fax: 908-238-9572

Email address: wingram@elp-inc.com

Part 1: Description of Nonstructural Approach to Site Design

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

As per N.J.A.C. 7:8-53 requirements, different non-structural stormwater management strategies have been implemented to the design, namely:

1. The impervious surfaces are minimized on the project site in order to meet current codes. The runoff over the impervious surfaces flows into the proposed stormwater systems.

2. Natural drainage features and vegetation are maintained and maximized where possible.

3. While the majority of the improvements being proposed are located in areas that haven't been previously developed, the existing drainage pattern was maintained.

4. Some tree clearing will be required, but the improvements located in those areas are composed mostly of walkways and are being used to catch up to existing grade. No buildings are being proposed in areas that are being cleared.

5. Additional disturbance is being minimized by concentrating the development and all access to ancillary facilities while maintaining an adequate buffer between the remaining residential property and adjacent residential lots.

Part 2: Review of Local Stormwater Management Regulations

Title and date of stormwater management regulations used in development design:

N.J.A.C. 7:8 - June 20, 2016

Do regulations include nonstructural requirements? Yes: X No: _____

If yes, briefly describe: Protect areas that provide water quality benefits, minimize impervious surfaces, maximize the protection of natural drainage features and vegetation, minimize land disturbance and soil compaction (N.J.A.C. 7:8-5.3).

List LID-BMPs prohibited by local regulations: N/A

Pre-design meeting held? Yes: X Date: 7/2020 No: _____

Meeting held with: Municipal Engineer, R. Clerico

Pre-design site walk held? Yes: X Date: 9/2020 No: _____

Site walk held with: Design Engineer

Other agencies with stormwater review jurisdiction:

Name: Town of Clinton Land Use Board

Required approval: Preliminary and Final Major Site Plan

Name: Hunterdon County Soil Conservation District

Required approval: Soil Erosion & Sediment Control Plan Certification

Name: _____

Required approval: _____

Part 3: Nonstructural Strategies and LID-BMPs in Design

3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed? Yes: _____ No: X

If yes, was this inventory a factor in the site's layout and design? Yes: _____ No: _____

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes: X No: _____ If yes, specify % of site: 40% +/-

Native ground cover? Yes: X No: _____ If yes, specify % of site: 30% +/-

Vegetated buffers? Yes: X No: _____ If yes, specify % of site: 10% +/-

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: _____ No: X If yes, specify % of site: _____

Native ground cover? Yes: _____ No: X If yes, specify % of site: _____

Vegetated buffers? Yes: _____ No: X If yes, specify % of site: _____

D. If vegetated filter strips or buffers are utilized, specify their functions:

Reduce runoff volume increases through lower runoff coefficient: Yes: _____ No: X

Reduce runoff pollutant loads through runoff treatment: Yes: _____ No: X

Maintain groundwater recharge by preserving natural areas: Yes: _____ No: _____

3.2 Minimize Land Disturbance

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed? Yes: X No: _____

If yes, were these inventories factors in the site's layout and design? Yes: X No: _____

B. Does the development's design utilize any of the following nonstructural LID-BMPs?

Restrict permanent site disturbance by land owners? Yes: _____ No: X

If yes, how: _____

_____

Restrict temporary site disturbance during construction? Yes: X No: _____

If yes, how: Access to the property is limited to the construction entrance only. The limit of disturbance will be fenced to prevent encroachment by equipment or materials.

Consider soils and slopes in selecting disturbance limits? Yes: X No: _____

If yes, how: Slope disturbance was limited to the greatest extents possible, while also proposing a safe design.

C. Specify percentage of site to be cleared: 80% Regraded: 80%

D. Specify percentage of cleared areas done so for buildings: 40%

For driveways and parking: 20% For roadways: 20%

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above?

In order to reduce the percentages listed in C and D, the project slope would need to be significantly reduced.

F. Specify site's hydrologic soil group (HSG) percentages:

HSG A: _____ HSG B: 100% HSG C: _____ HSG D: _____

G. Specify percentage of each HSG that will be permanently disturbed:

HSG A: _____ HSG B: 55% HSG C: _____ HSG D: _____

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

The site is composed entirely of HSG B, site underlain by limestone and is in a known carbonate rock area, therefore no groundwater infiltration is proposed as part of this project.

I. Does the site include Karst topography? Yes: X No: _____

If yes, discuss measures taken to limit Karst impacts:

The site underlain by limestone and is in a known carbonate rock area, therefore no groundwater infiltration is proposed as part of this project. The proposed basin has an underdrain system and an impermeable synthetic liner beneath to limit infiltration.

3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 0 acres Proposed: 6.49 acres

B. Specify maximum site impervious coverage allowed by regulations: 50% (6.58 acres)

C. Compare proposed street cartway widths with those required by regulations:

Type of Street	Proposed Cartway Width (feet)	Required Cartway Width (feet)
Residential access – low intensity		
Residential access – medium intensity		
Residential access – high intensity with parking		
Residential access – high intensity without parking		
Neighborhood		
Minor collector – low intensity without parking		
Minor collector – with one parking lane		
Minor collector – with two parking lanes		
Minor collector – without parking		
Major collector		

D. Compare proposed parking space dimensions with those required by regulations:

Proposed: N/A Regulations: N/A

E. Compare proposed number of parking spaces with those required by regulations:

Proposed: N/A Regulations: N/A

F. Specify percentage of total site impervious cover created by buildings: 20%

By driveways and parking: N/A By roadways: N/A

G. What design criteria and/or site changes would be required to reduce the percentages in F above?

In order to reduce the total site impervious cover created by buildings, the entire scope of the project would need to be reduced.

H. Specify percentage of total impervious area that will be unconnected:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

I. Specify percentage of total impervious area that will be porous:

Total site: 0% Buildings: 0% Driveways and parking: 0% Roads: 0%

J. Specify percentage of total building roof area that will be vegetated: 0%

K. Specify percentage of total parking area located beneath buildings: N/A

L. Specify percentage of total parking located within multi-level parking deck: N/A

3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:

Storm sewer: 50% +/- Vegetated swale: 0% Natural channel: 0%

Stormwater management facility: 50% +/- Other: _____

Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?

In order to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages, the project would need to be significantly altered. Due to the existing topography, swales are unsuitable and were excluded from the design.

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: The project was designed in part to maintain accessibility, thus it would need need to be significantly modified in order to decrease overland flow slope.

Increase overland flow roughness: The project would need need to be significantly modified in order to increase overland flow roughness. Due to the proposed use, it is impractical to make any modifications without affecting the layout and usability of the facilities.

3.5 Preventative Source Controls

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: 1 large trash compactor/dumpster

Specify the spacing between the trash receptacles: N/A

Compare trash receptacles proposed with those required by regulations:

Proposed: N/A Regulations: N/A

B. Pet Waste Stations

Specify the number of pet waste stations provided: 0

Specify the spacing between the pet waste stations: N/A

Compare pet waste stations proposed with those required by regulations:

Proposed: N/A Regulations: N/A

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100%

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: N/A Regulations: N/A

Litter collection: Proposed: per township Regulations: N/A

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

Inlet silt sacks and NJDEPS-approved inlets grates.

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: N/A Location: N/A

Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

No.	Nonstructural Strategy	Yes	No
1.	Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.	X	
2.	Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.	X	
3.	Maximize the protection of natural drainage features and vegetation.	X	
4.	Minimize the decrease in the pre-construction time of concentration.	X	
5.	Minimize land disturbance including clearing and grading.	X	
6.	Minimize soil compaction.	X	
7.	Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.	X	
8.	Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.	X	
9.	Provide preventative source controls.	X	

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

All strategies have been incorporated into the proposed development's design.