

STORMWATER MANAGEMENT REPORT

**THE REDWOOD
REDEVELOPMENT OF BLOCK 151 LOT 33
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY, NEW JERSEY**

PREPARED FOR:

REDWOOD, LLC
420 BOULEVARD, SUITE 201
MOUNTAIN LAKES, NJ 07046

PREPARED BY:

PETRY ENGINEERING, LLC
155 PASSAIC AVENUE
SUITE 350
FAIRFIELD, NEW JERSEY 07004



STORMWATER MANAGEMENT REPORT

**THE REDWOOD
REDEVELOPMENT OF BLOCK 151 LOT 33
TOWNSHIP OF WEST ORANGE
ESSEX COUNTY, NEW JERSEY**

PREPARED FOR:

REDWOOD, LLC
420 BOULEVARD, SUITE 201
MOUNTAIN LAKES, NJ 07046

PREPARED BY:

PETRY ENGINEERING, LLC
155 PASSAIC AVENUE
SUITE 350
FAIRFIELD, NEW JERSEY 07004



J. MICHAEL PETRY, PE, PP, AIA
NJ PROFESSIONAL ENGINEER #36662

December 15, 2016

Revised April 12, 2017

Revised October 9, 2019

Revised October 30, 2019

Revised February 28, 2020

Revised May 8, 2020

Revised March 7, 2023



Table of Contents

Introduction.....	1
Proposed Improvements	1
Methodology	2
Existing Conditions.....	2
Drainage Area 1 (DA-1)	2
Drainage Area 2 (DA-2)	2
Drainage Area 3 (DA-3)	3
Curve Numbers	3
Peak Flows	3
Post-Development Runoff Targets	3
Proposed Conditions	4
Drainage Area 1 (DA-1)	4
Drainage Area #2 (DA-2)	4
Drainage Area #3 (DA-3)	4
Drainage Area #4	4
Drainage Area #5	4
Curve Numbers	4
Water Quantity.....	5
Basin #1 – 3,832 cf	5
Basin #2 – 9,100 cf	5
Post Development Runoff.....	5
Drain Time	5
Water Quality.....	5
Groundwater Recharge	6
Storm Sewer Computations	6
Conclusion	6
Existing Conditions Hydrographs	
Proposed Conditions Hydrographs	
Appendix	
Table 2-2A	
Table 2-2B	
Table 2-2C	
Soils Map	
Hydrologic Soil Group Map	
Soil Description	



Rainfall Data
Planning Area
Pipe Sizing Calculations
Drainage Area Figure Maps



INTRODUCTION

The existing site to be developed is located at 200 Pleasant Valley Way, north-northeast of the intersection of Pleasant Valley Way and Woodland Avenue in the Township of West Orange, NJ. The property consists of 5.91 acres and is flag-like in shape. It is connected to the east side of the Pleasant Valley Way by a long driveway that abuts the Montclair Golf Club and the Marriot Assisted Living Facility. The Peckman River stream corridor runs along the western boundary of the site. The Montclair Golf Club property borders it on the north and east and the "Harper Ridge Subdivision" abuts the southwest property line. The Marriot Assisted Living Facility borders the entry drive to the south.

Historically, the site operated as the former JT's Complex. The property was the subject of a previous application to the West Orange Zoning Board, which was approved on July 20th 2006. Subsequent to that approval, the application was reviewed and approved by the NJDEP. Said approval included a replacement bridge structure including pedestrian access as well as utility crossings. During demolition, contamination was discovered. Remediation was performed on the site and has remained vacant since.

The majority of the property, in its existing conditions, generally slopes from southeast to northwest with slopes ranging between 0.5% to 8.0%, with slopes as steep as 40% nearest to the Peckman River. The driveway pitches from Pleasant Valley Way to the river. The NRCS websoil survey mapping indicates that this project is located on Hydrologic Group "D" soils (Urban land, Boonton Substratum, (URBONB) with Urban land). The stormwater analysis will take this soil group into consideration (*See attached Websoil Survey Mapping*).

In 2020, the current project was submitted to the NJDEP for both FHA and FWW permits. The DEP reviewed and approved the stormwater design, bridge, and utility crossings as well as the overall site plan under permit #0722-05-0004.1 LUP 190001 dated 9/21/2020.

PROPOSED IMPROVEMENTS

The project named 'The Redwood' involves the construction of a new four-story apartment building with one story of parking below. The building is generally rectangular in shape with a courtyard in the center and having a footprint of 82,900 square feet. Driveways, parking lots, and walkways surround the building on all sides. The southern and western portions of the site contain a nature walk along the stream and woods.

Additional improvements to the site will include a bridge replacement over the Peckman River which will serve as the main access to the site from the road off of Pleasant Valley Way. The bridge replacement work will be completed under the above-referenced permits obtained from the New Jersey DEP.

The site is considered a major development under the NJ Stormwater Management Rules as there will be more than 1 acre of onsite disturbance. Therefore, two underground detention systems are proposed to be located under portions of the parking lot. Stormwater management will comply



with both the New Jersey Department of Environmental Protection (NJDEP) and the Township of West Orange's Stormwater Management Rules for water quantity and quality.

METHODOLOGY

The USDA Natural Resources Conservation Service (NRCS) methodology described in the Technical Release 55 – Urban Hydrology for Small Water Sheds (TR-55) is used for computing stormwater runoff rates, volumes, and hydrographs for existing and proposed conditions. In computing stormwater runoff from all design storms, the relative stormwater runoff rates and volumes of pervious and impervious surfaces are analyzed separately. The rainfall-duration-frequency data was taken from the NOAA National Weather Service. (See attached.) A minimum time of concentration of 10 minutes was used to model overland flow paths, and the NRCS Type D Design Storm Rainfall Distribution was used to analyze pre- and post-conditions. Hydraflow Hydrographs Extension 2019 Modeling Software was used to compute the sites pre and post-development runoff of the site.

In accordance with the Township of West Orange Stormwater Management Ordinance, the runoff coefficients used on the site represent the land cover with the lowest runoff potential that has existing on-site for at least five years without interruption prior to the time of application. There is a presumption that the land cover is in good hydrologic condition.

EXISTING CONDITIONS

The site has undergone a partial demolition, with the two former buildings that occupied the site having been removed. Much of the site is presently covered by piles of concrete rubble, asphalt, and other fill material stored in stockpiles. All existing disturbed areas were considered impervious as the compacted crushed concrete and asphalt cover most of the ground.

The existing site was modeled using (3) three drainage areas totaling 7.15 acres (*See Figure 1, Existing Drainage Area Map*). An offsite area, associated with the Montclair Golf Club currently drains into the property and was considered in the 7.15-acre drainage area.

DRAINAGE AREA 1 (DA-1)

Drainage Area 1 consists of 1.47 acres of offsite pervious and impervious areas associated with the Montclair Golf Club. The pervious area, 1.40 acres, consists of lawn and wooded areas. The impervious area, 0.07 acres, includes the outer remains of the asphalt parking lot associated with the former JT's Complex. A Tc of 10 minutes was used for this drainage area.

DRAINAGE AREA 2 (DA-2)

Drainage Area 2 consists of 5.08 acres of onsite pervious and impervious surfaces. The pervious area, 0.41 acres, consists primarily of the vegetative buffers along the perimeter of the property. The impervious area, 4.67 acres, consists of demolished parking lots and



buildings. The remnants of the demolition remains on the site. A Tc of 10 minutes was used for this drainage area.

DRAINAGE AREA 3 (DA-3)

Drainage Area 3 consists of 0.60 acres of onsite pervious and impervious surfaces. The pervious area, 0.22 acres, consists of lawn and landscaped areas, which lines the driveway. A Tc of 10 minutes was used for this drainage area.

CURVE NUMBERS

The CN values used have been taken from the TR-55 Manual "Urban Hydrology for Small Watersheds," Table 2-2a & 2.2c based on land cover and hydrologic soil groups. These tables are attached within the Appendix of this report. For woods (good condition – CN 70 Grp C) & (good condition - CN 79 Grp D), Impervious Areas (CN 98 Grp D), Open space (good condition – CN 80 Grp D) & (good condition – CN 74 Grp C) & Brush-Brush-weed-grass mixture (good condition – CN 77 Grp D).

PEAK FLOWS

Using the information described above the peak flows during the 2-, 10-, and 100-year storm events were calculated. Table 1 below summarizes the peak flows during each storm event. (See attached Hydraflow Output for Existing Conditions Hydrographs, CN Values and Time of Concentration Calculations.)

Table 1 – Existing Peak Runoff Rates

Storm Event	Existing Site Runoff
2 Year	12.19 cfs
10 Year	19.00 cfs
100 Year	32.14 cfs

POST-DEVELOPMENT RUNOFF TARGETS

Since the improvements on the site are considered a major development, proposed runoff rates shall meet the NJDEP Stormwater regulations and reductions for the 2, 10 and 100-year storm events. NJ standards require that the pre-construction runoff rates are to be reduced by at least 50, 75 and 80, respectively, for the areas which are to be disturbed or developed. See Table 2 Below for the Post-Development Runoff Targets.

Table 2 – Post-Development Runoff Targets

Storm Event	Post-Development Runoff Target
2 Year	$12.19 \times 0.5 = 6.095$ cfs
10 Year	$19.00 \times 0.75 = 14.25$ cfs
100 Year	$32.14 \text{ cfs} \times 0.80 = 25.712$ cfs



PROPOSED CONDITIONS

The same 7.15-acre drainage area used for existing conditions was used to analyze the proposed conditions runoff. This area was divided into 5 drainage areas (See Figure 2, *Proposed Drainage Area Map*). The drainage areas are described below:

DRAINAGE AREA 1 (DA-1)

Drainage Area 1 consists of 1.15 acres of onsite pervious and impervious surfaces. The pervious area, 0.22 acres, consists of landscaped areas. The impervious area, 0.93 acres, consist of roofs, walkways, and parking lots. The entirety of the area will be collected and drained to Basin #1. A Tc of 10 minutes was used for this drainage area.

DRAINAGE AREA #2 (DA-2)

Drainage Area 2 consists of 2.64 acres of onsite pervious and impervious surfaces. The pervious area, 0.12 acres, consists of landscaped areas. The impervious area, 2.52 acres, consists of roofs, parking lots, the courtyard, and walkways. A Tc of 10 minutes was used for this drainage area.

DRAINAGE AREA #3 (DA-3)

Drainage Area 3 consists of 1.47 acres of offsite pervious and impervious areas associated with the Montclair Golf Club. The pervious area, 1.40 acres, consists of lawn and wooded areas. The impervious area, 0.07 acres, includes the outer remains of the asphalt parking lot associated with the former JT's Complex. A Tc of 10 minutes was used for this drainage area.

DRAINAGE AREA #4

Drainage Area 4 consists of 1.29 acres of onsite pervious and impervious areas. The pervious area, 1.01 acres, consists of landscaped areas surrounding the building as well as areas along the nature walk. The impervious area, 0.28 acres, consists of a small portion of the parking lot as well as the nature walk. A Tc of 10 minutes was used for this drainage area.

DRAINAGE AREA #5

Drainage Area #5 consists of 0.60 acres of onsite pervious and impervious areas. The pervious area, 0.16 acres, consists of landscaped areas along either side of the driveway. The impervious area, 0.44 acres, consists of the driveway leading from Pleasant Valley Way. A Tc of 10 minutes was used for this drainage area.

CURVE NUMBERS

The CN values used have been taken from the TR-55 Manual "Urban Hydrology for Small Watersheds," Table 2-2a and 2.2c based on land cover and hydrologic soil groups. These tables are attached within the Appendix of this report. For Impervious (CN 98 Grp D) and lawn (good condition – CN 80 Grp D) as well as woods (Good condition – CN 70



Grp C) & (good condition - CN 79 Grp D), Open space (good condition - CN 74 Grp C), & Brush-Brush-weed-grass mixture (good condition - CN 33 Grp D)

WATER QUANTITY

BASIN #1 – 4,185 CF

The proposed detention basin will contain 4,185 cubic feet of storage. The system consists of 5 rows of 3' diameter HDPE pipe, each 110 feet in length. The bottom of the basin will be at elevation 365.75 feet. A rectangular orifice measuring 4-inches high by 8-inches wide will also be placed at that elevation. Three 6-inch orifices will be placed at elevation 367.08, and a 4' rectangular weir will be placed at 368.58 feet.

BASIN #2 – 9,100 CF

The proposed detention basin will contain 9,100 cubic feet of storage. The system consists of 4 rows of 4' diameter HDPE pipe, each 170 feet in length. The bottom of the basin will be elevation 365.75 feet. A rectangular orifice measuring 4-inches high by 14-inches wide will also be placed at this elevation. Another rectangular orifice measuring 10-inches high by 26" wide will be placed at elevation 367.90, and a 4' rectangular weir will be placed at elevation 369.58 feet.

POST DEVELOPMENT RUNOFF

Table 2 – Post-Development Runoff Targets

Storm Event	Post-Development Runoff Target	Post-Development Runoff Actual
2 Year	6.095 cfs	6.058 cfs
10 Year	14.25 cfs	13.65 cfs
100 Year	25.712 cfs	25.680 cfs

DRAIN TIME

As shown by the Hydraflow Hydrographs attached to this report, the detention time of each system is below 72 hours and is broken down as follows:

Detention Basin #1 – 26 hrs

Detention Basin #2 – 26 hrs

See attached Elevation vs. Time Hydrographs for more information.

WATER QUALITY

Water quality is only required when there is an increase in more than one-quarter of an acre of impervious surface. Since the proposed developments do not result in the increase of more than one-quarter of an acre of impervious water quality measures are not required. This was the standard in place at the time of application to the NJDEP.



GROUNDWATER RECHARGE

The site is located within the Metropolitan Planning Area. No groundwater recharge is required for the site. A map from GeoWeb showing the site within this planning area can be found in the appendix of this report.

STORM SEWER COMPUTATIONS

A storm sewer system has been designed to collect the runoff associated with the proposed parking areas, roofs, drive aisles and lawn areas. The primary purpose of the system is to properly drain the proposed site and delivery the runoff to the proposed stormwater management systems for water quantity and quality. See attached Storm Sewer Computations. The pipes flowing into the systems were designed for a 25-year storm event in accordance with the Township of West Orange codes. The pipes flowing out of both Basin #1 & #2 were sized to handle the 100-year routed flows to ensure that during large storm events the basins can function properly and unrestrained (no buildup of water). The rational method was used to calculate runoff rates. The Manning's equation was used to determine the capacity of each system.

The majority of the site is mapped with soils considered Hydrologic Group D. For this analysis, it was assumed the entire site was Hydrologic Group D. Runoff coefficients (C values) for hydrologic soil group D were 0.65 and 0.99 for open spaces (lawn) - good conditions and Streets and roads - paved with curbs and storm sewers respectively, in accordance with Table 7.1 in RSIS. In addition, all areas were assumed to have a time of concentration of 10 minutes for a conservative model.

As shown, all pipes were designed with adequate capacity to handle the proposed flows.

Note: For Drainage Areas associated with the storm sewer computations, see attached Figure 3 – Proposed Tributary Area Map. Please also refer to the Storm Sewer Computation Chart attached to this report.

CONCLUSION

To summarize, a stormwater management strategy has been incorporated to satisfy both the structural and non-structural water quality and water quantity requirements. This is in keeping with the design and performance standards put forth in the West Orange Stormwater Management Ordinance and New Jersey DEP Regulations. As previously indicated, NJDEP issued a permit dated 9/21/2020.



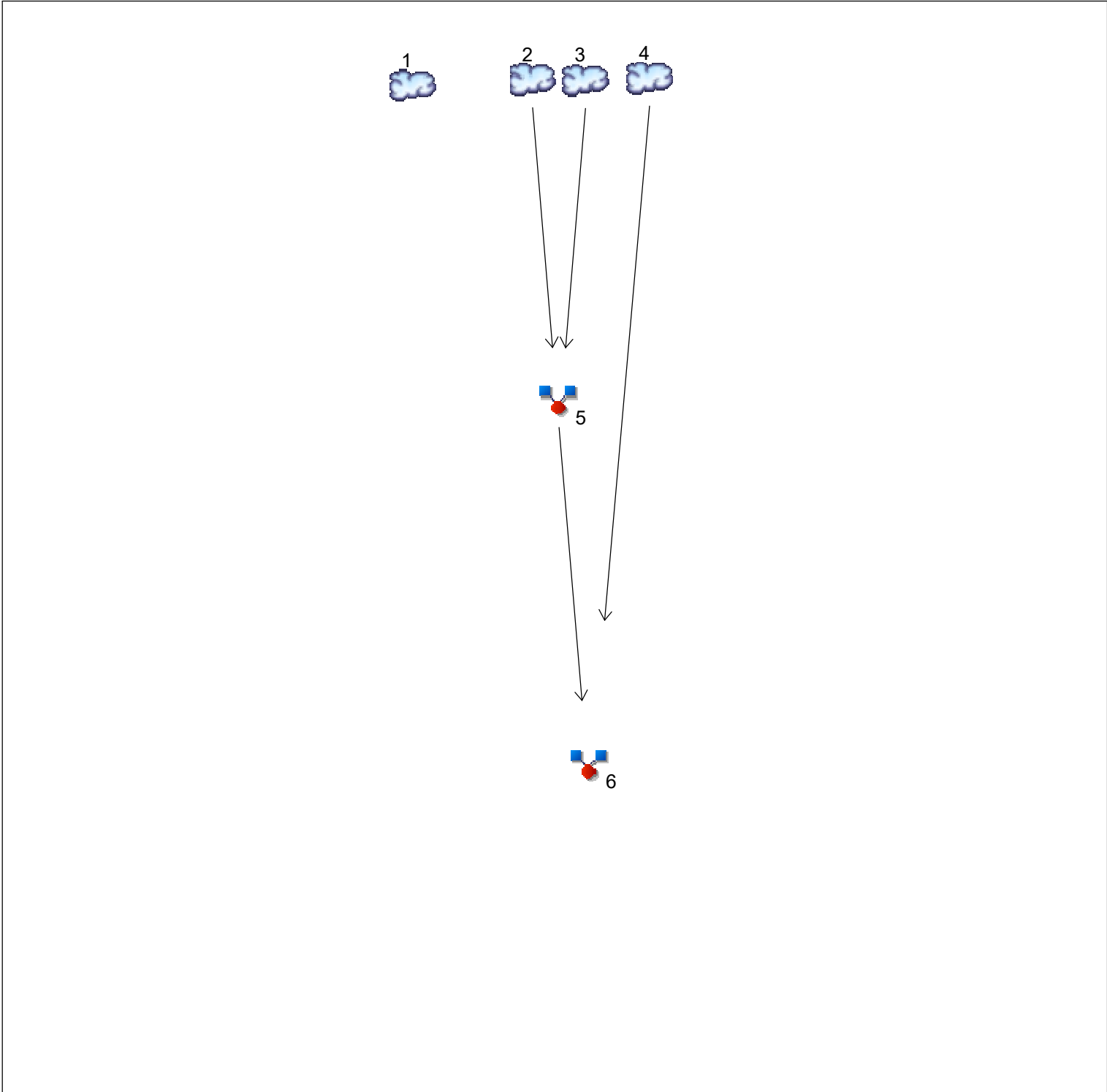
**EXISTING CONDITIONS
HYDROGRAPHS**



Watershed Model Schematic.....	1
Hydrograph Return Period Recap.....	2
2 - Year	
Summary Report.....	3
Hydrograph Reports.....	4
Hydrograph No. 1, SCS Runoff, DA-1 Offsite.....	4
Precipitation Report.....	5
Hydrograph No. 2, SCS Runoff, DA#2 (Impervious).....	6
Precipitation Report.....	7
Hydrograph No. 3, SCS Runoff, DA #2 (Pervious).....	8
Precipitation Report.....	9
Hydrograph No. 4, SCS Runoff, DA-3 Entry Drive.....	10
Precipitation Report.....	11
Hydrograph No. 5, Combine, DA-2.....	12
Hydrograph No. 6, Combine, Total On-Site.....	13
10 - Year	
Summary Report.....	14
Hydrograph Reports.....	15
Hydrograph No. 1, SCS Runoff, DA-1 Offsite.....	15
Precipitation Report.....	16
Hydrograph No. 2, SCS Runoff, DA#2 (Impervious).....	17
Precipitation Report.....	18
Hydrograph No. 3, SCS Runoff, DA #2 (Pervious).....	19
Precipitation Report.....	20
Hydrograph No. 4, SCS Runoff, DA-3 Entry Drive.....	21
Precipitation Report.....	22
Hydrograph No. 5, Combine, DA-2.....	23
Hydrograph No. 6, Combine, Total On-Site.....	24
100 - Year	
Summary Report.....	25
Hydrograph Reports.....	26
Hydrograph No. 1, SCS Runoff, DA-1 Offsite.....	26
Precipitation Report.....	27
Hydrograph No. 2, SCS Runoff, DA#2 (Impervious).....	28
Precipitation Report.....	29
Hydrograph No. 3, SCS Runoff, DA #2 (Pervious).....	30
Precipitation Report.....	31
Hydrograph No. 4, SCS Runoff, DA-3 Entry Drive.....	32
Precipitation Report.....	33
Hydrograph No. 5, Combine, DA-2.....	34
Hydrograph No. 6, Combine, Total On-Site.....	35
IDF Report.....	36

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023



Legend

Hyd.	Origin	Description
1	SCS Runoff	DA-1 Offsite
2	SCS Runoff	DA#2 (Impervious)
3	SCS Runoff	DA #2 (Pervious)
4	SCS Runoff	DA-3 Entry Drive
5	Combine	DA-2
6	Combine	Total On-Site

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	1.361	6	732	5,997	-----	-----	-----	DA-1 Offsite
2	SCS Runoff	10.58	6	732	50,962	-----	-----	-----	DA#2 (Impervious)
3	SCS Runoff	0.448	6	732	1,934	-----	-----	-----	DA #2 (Pervious)
4	SCS Runoff	1.164	6	732	5,073	-----	-----	-----	DA-3 Entry Drive
5	Combine	11.03	6	732	52,896	2, 3,	-----	-----	DA-2
6	Combine	12.19	6	732	57,969	4, 5	-----	-----	Total On-Site
Existing Conditions.gpw					Return Period: 2 Year			Wednesday, 03 / 8 / 2023	

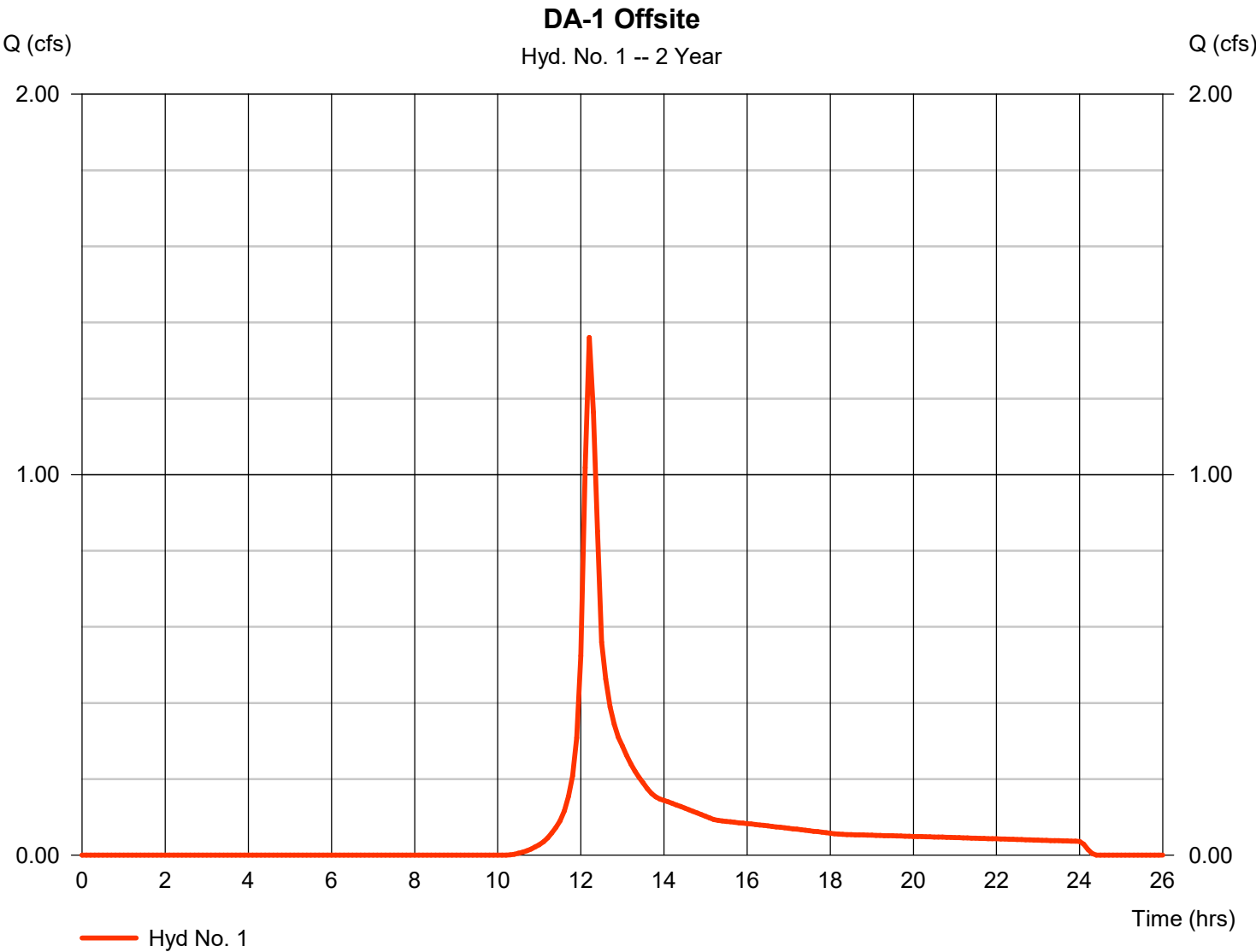
Hydrograph Report

Hyd. No. 1

DA-1 Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.361 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	5,997 cuft
Drainage area	=	1.470 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.44 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.070 x 98) + (0.840 x 74) + (0.480 x 70) + (0.080 x 79)] / 1.470



Precipitation Report

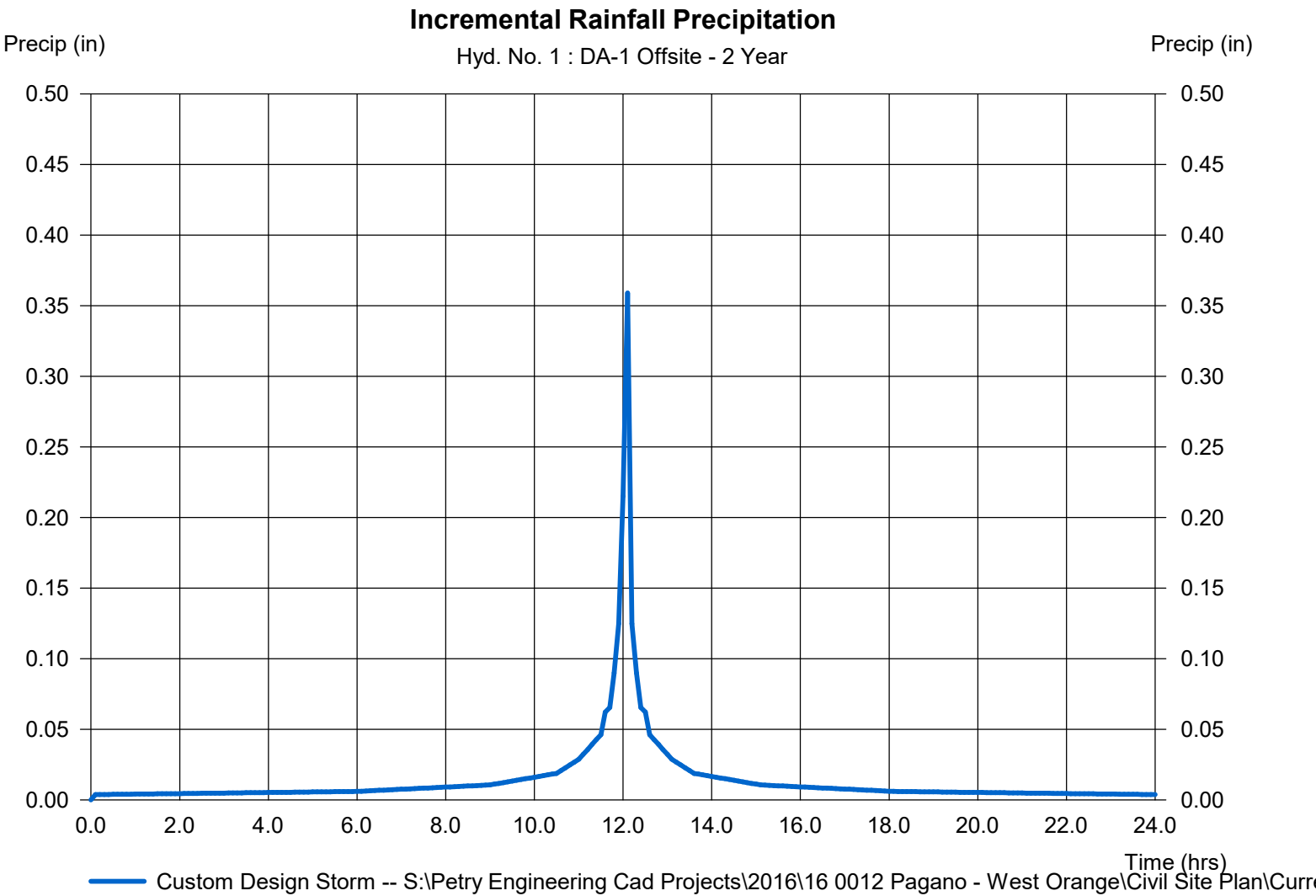
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 1

DA-1 Offsite

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

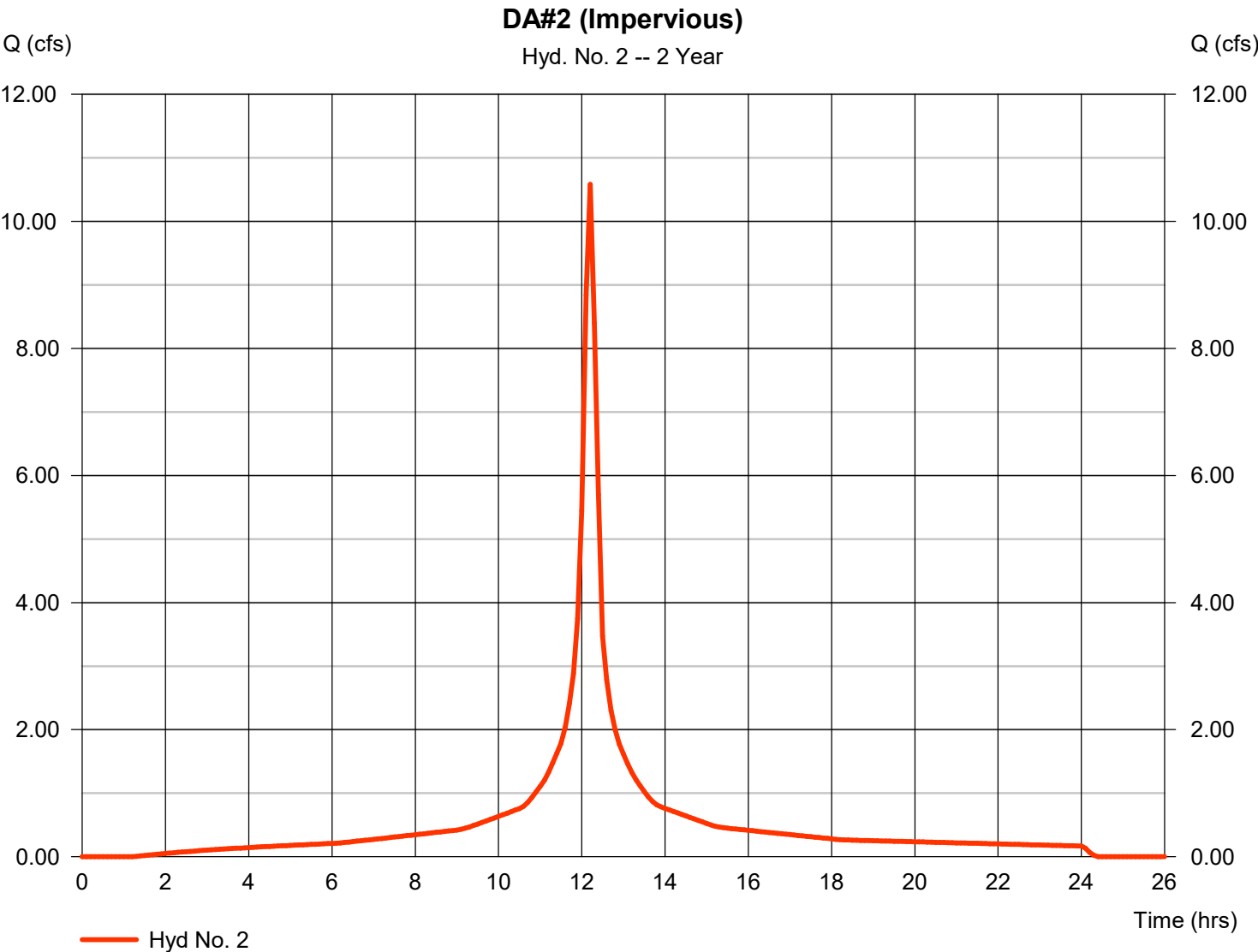


Hydrograph Report

Hyd. No. 2

DA#2 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 10.58 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 50,962 cuft
Drainage area	= 4.670 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.44 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site		



Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 2

DA#2 (Impervious)

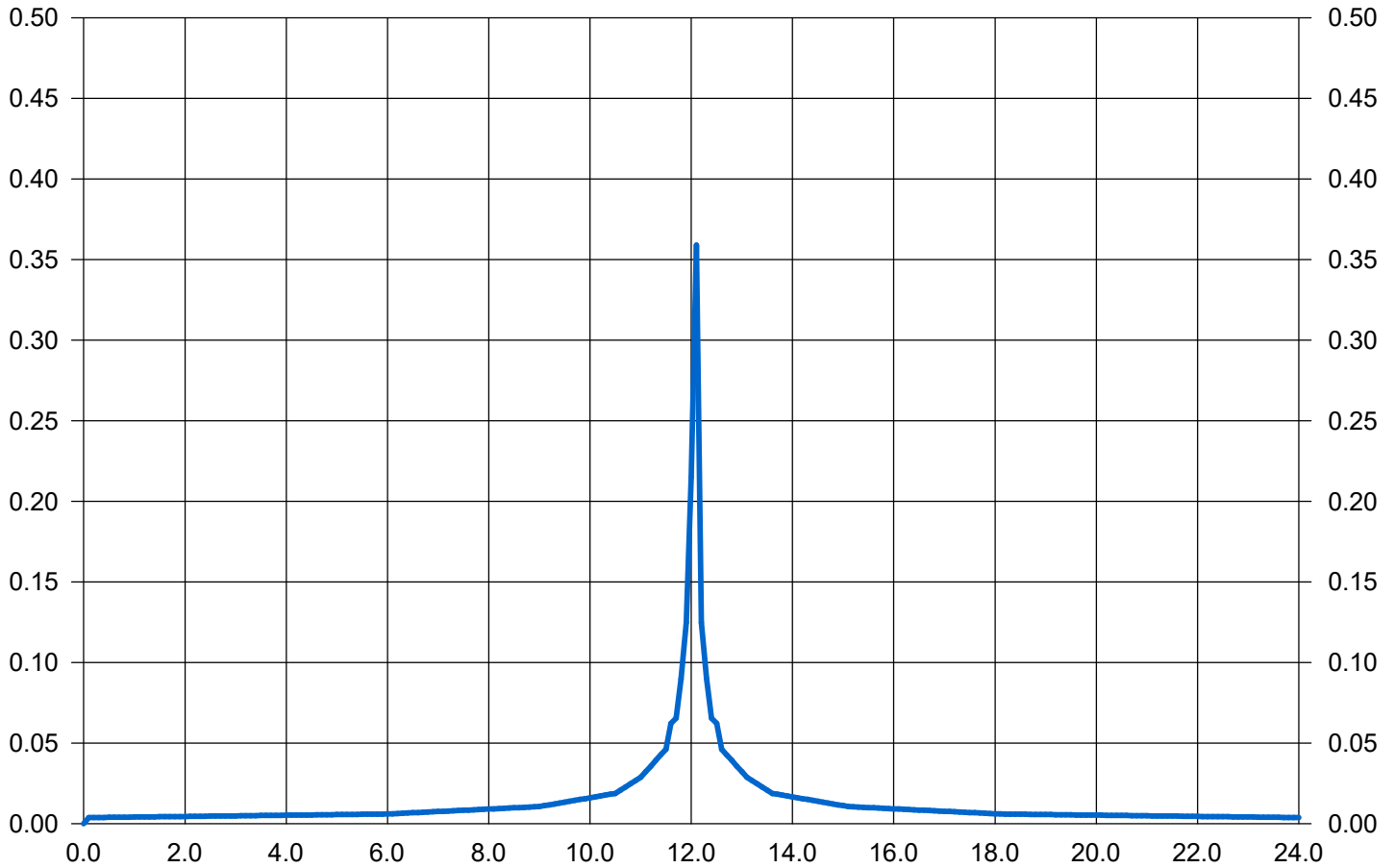
Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

Incremental Rainfall Precipitation

Hyd. No. 2 : DA#2 (Impervious) - 2 Year

Precip (in)

Precip (in)



— Custom Design Storm -- S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil Site Plan\Cur

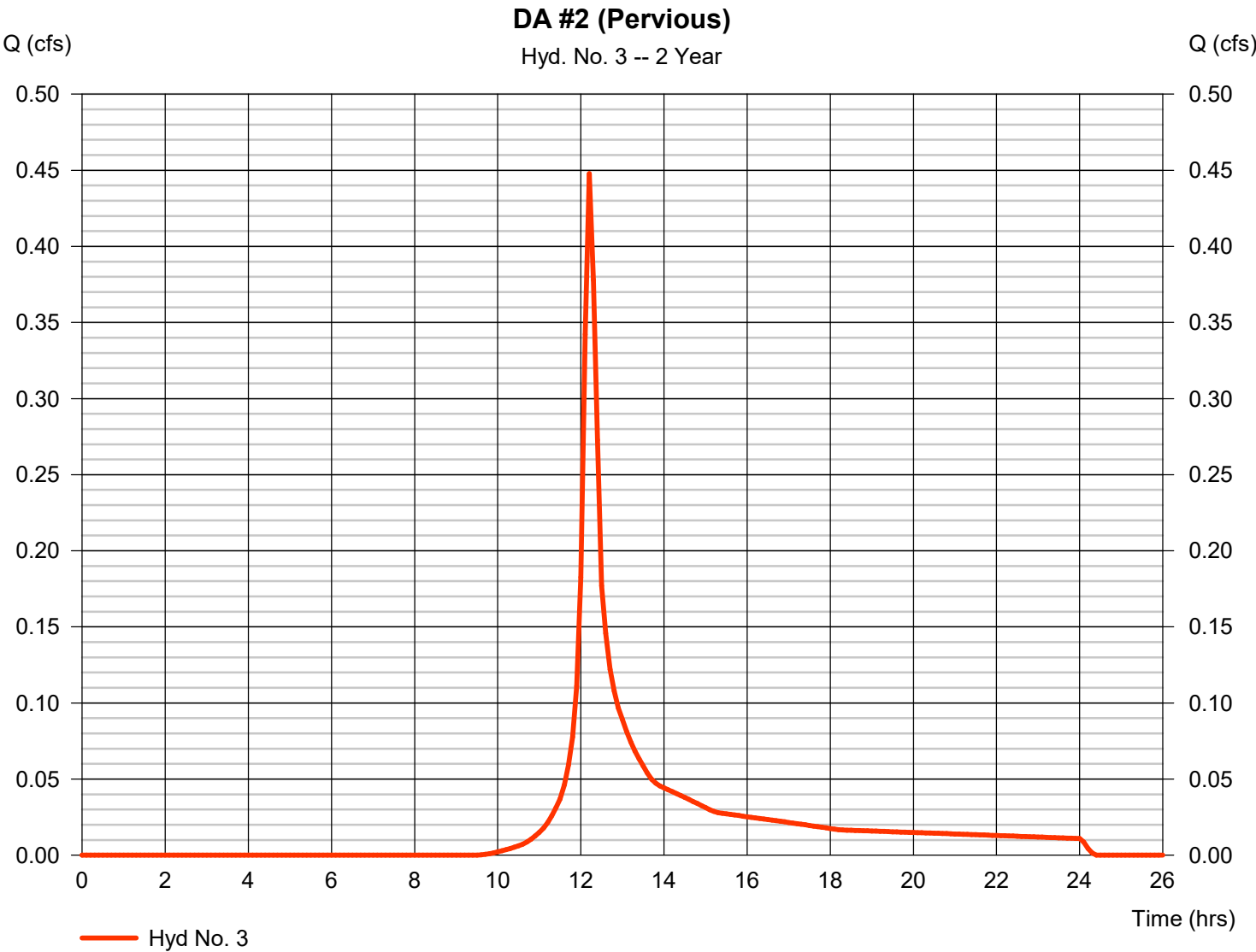
Hydrograph Report

Hyd. No. 3

DA #2 (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.448 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	1,934 cuft
Drainage area	=	0.410 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.44 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.410 x 77)] / 0.410

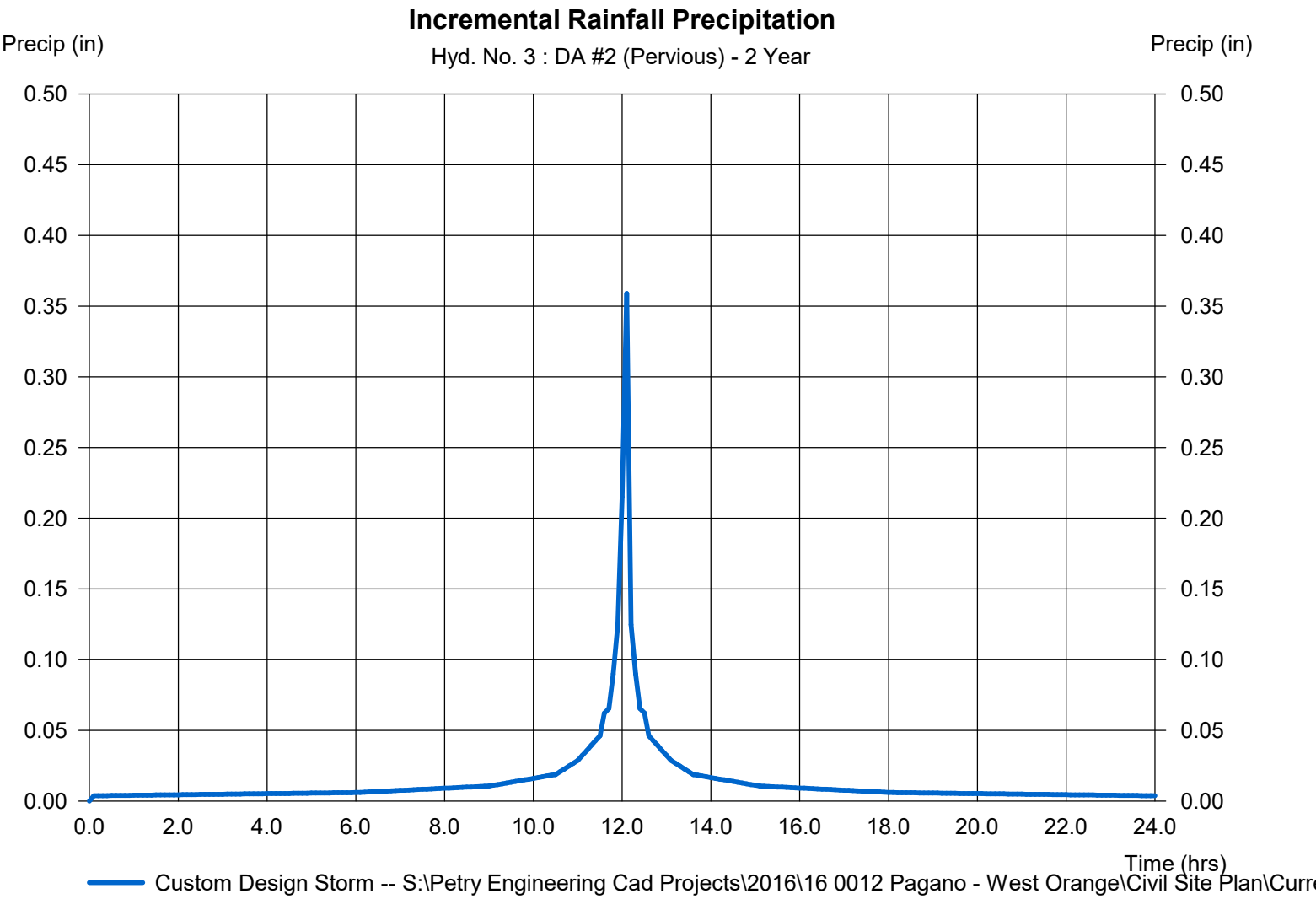


Precipitation Report

Hyd. No. 3

DA #2 (Pervious)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



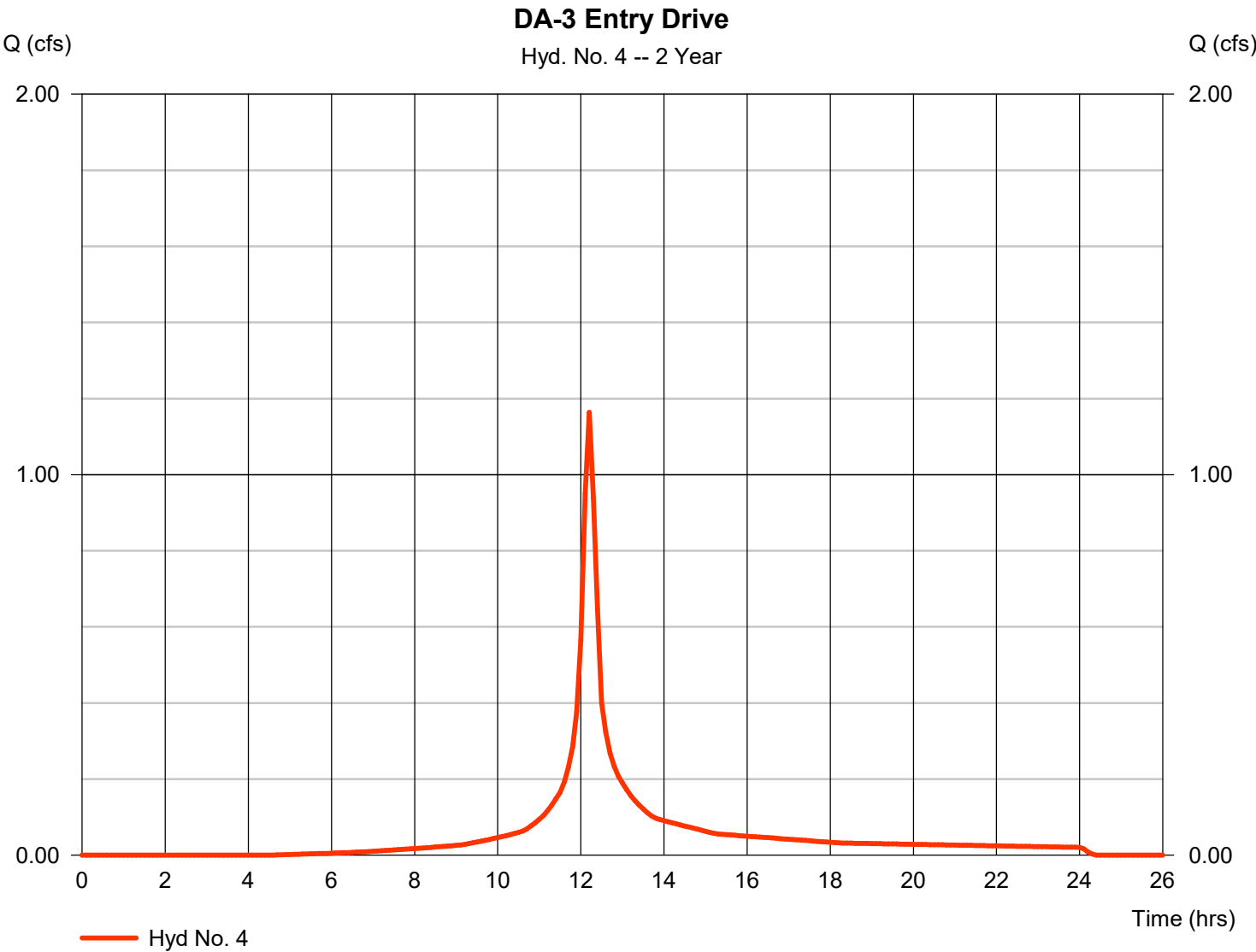
Hydrograph Report

Hyd. No. 4

DA-3 Entry Drive

Hydrograph type	= SCS Runoff	Peak discharge	= 1.164 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 5,073 cuft
Drainage area	= 0.600 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.44 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\1610-0012 Page 484 West Orange\Civil Site		

* Composite (Area/CN) = [(0.380 x 98) + (0.220 x 80)] / 0.600



Precipitation Report

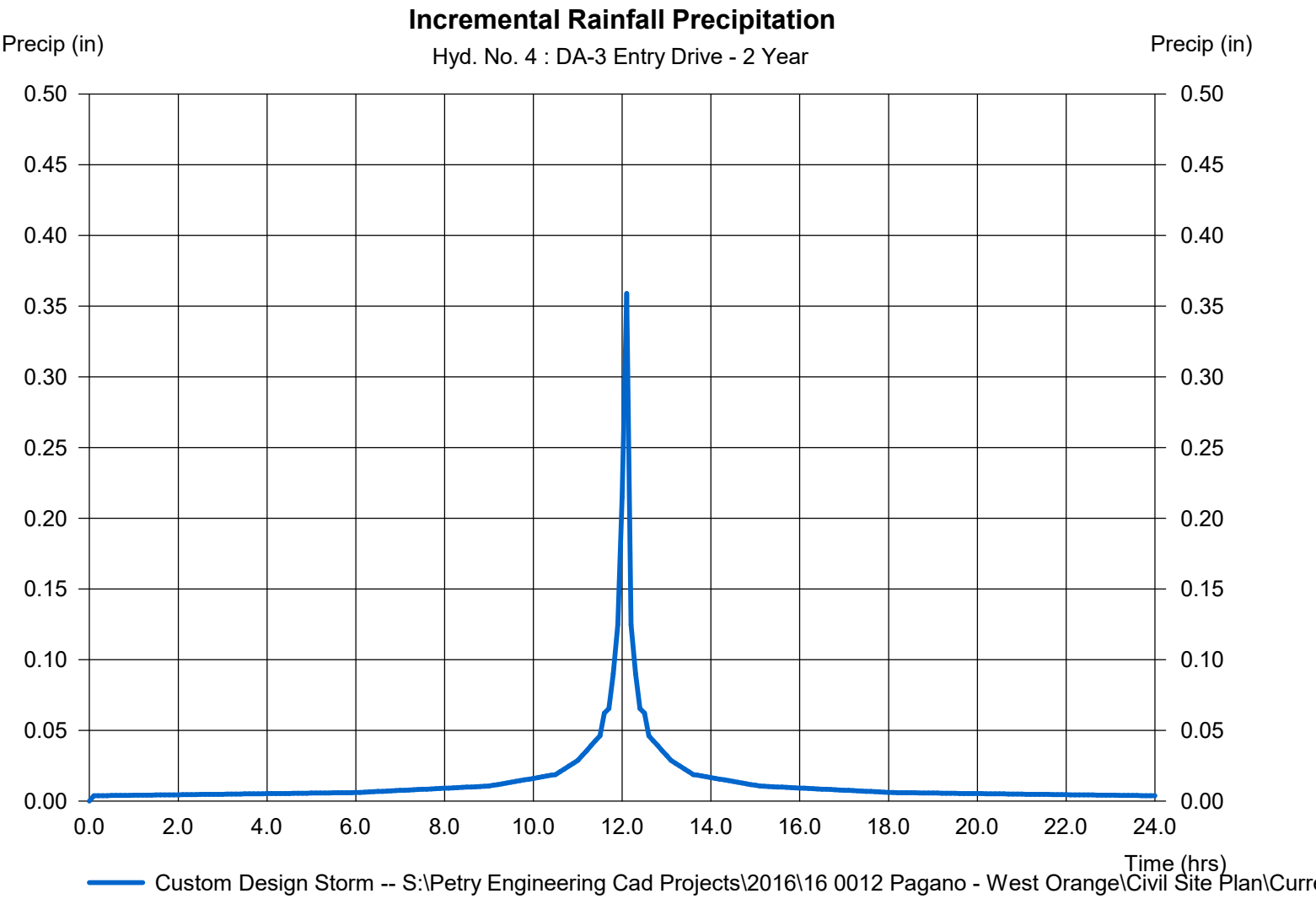
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 4

DA-3 Entry Drive

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

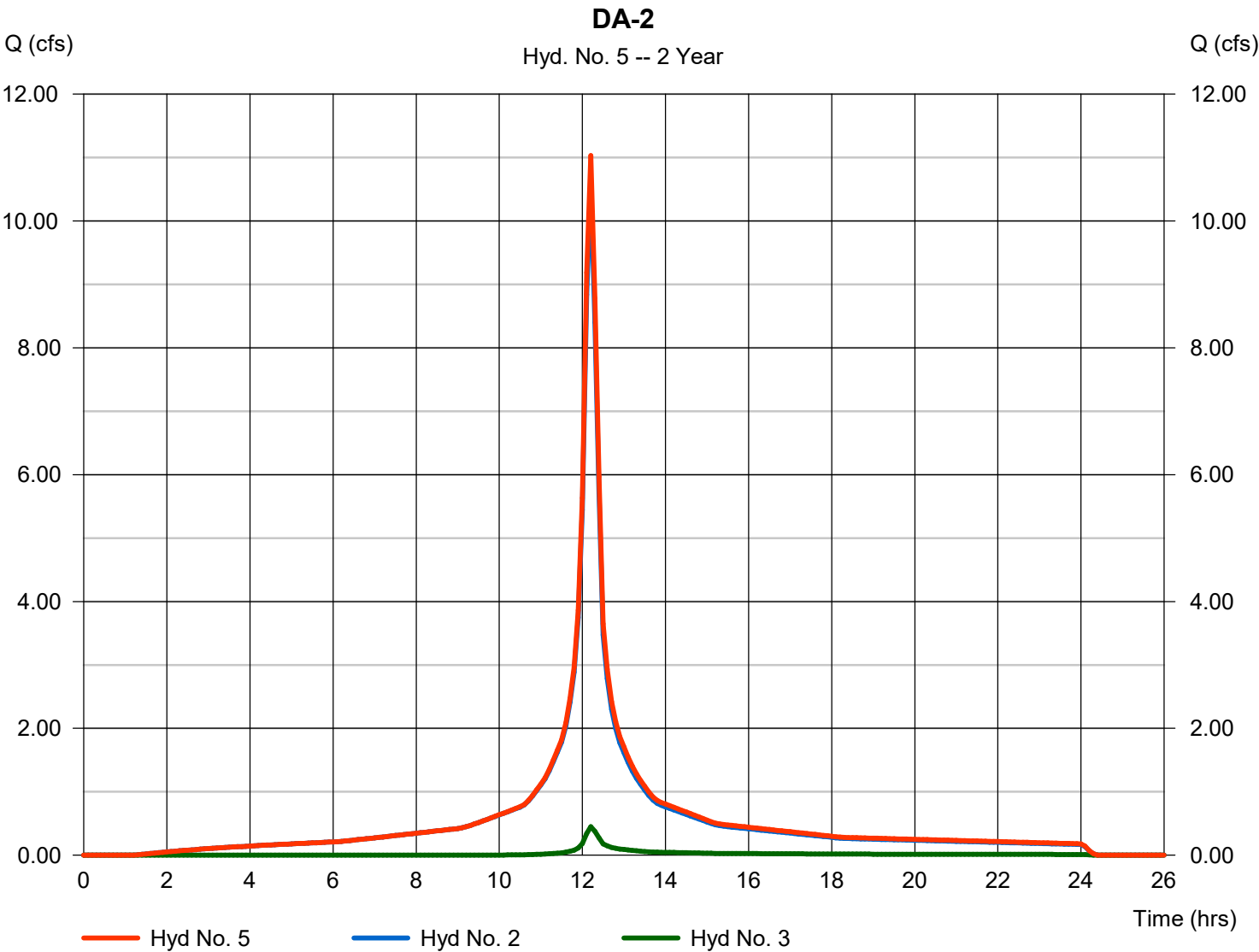
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 5

DA-2

Hydrograph type	= Combine	Peak discharge	= 11.03 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 52,896 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 5.080 ac

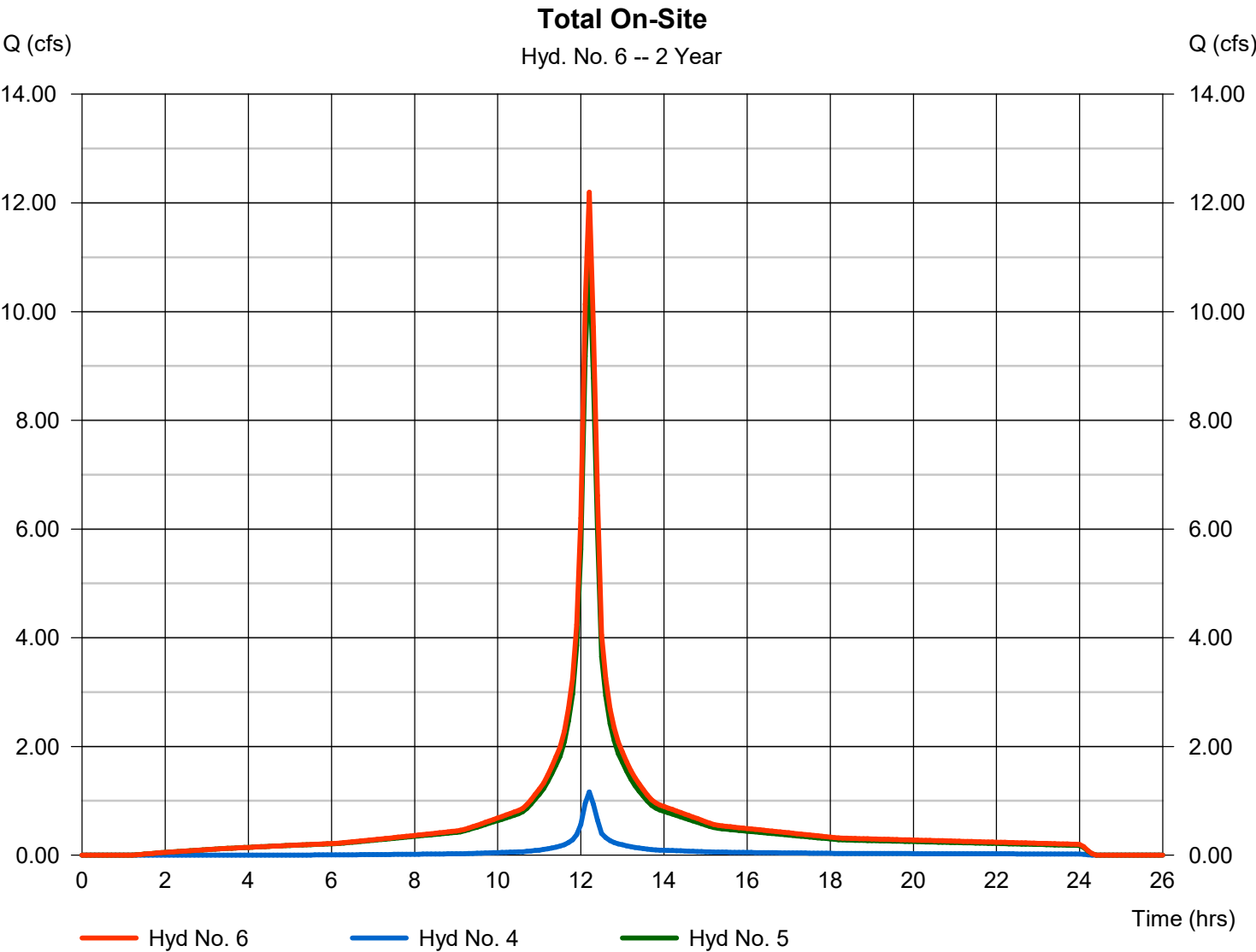


Hydrograph Report

Hyd. No. 6

Total On-Site

Hydrograph type	= Combine	Peak discharge	= 12.19 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 57,969 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 0.600 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.985	6	732	12,711	-----	-----	-----	DA-1 Offsite
2	SCS Runoff	16.16	6	732	79,190	-----	-----	-----	DA#2 (Impervious)
3	SCS Runoff	0.922	6	732	3,918	-----	-----	-----	DA #2 (Pervious)
4	SCS Runoff	1.912	6	732	8,568	-----	-----	-----	DA-3 Entry Drive
5	Combine	17.08	6	732	83,108	2, 3,	-----	-----	DA-2
6	Combine	19.00	6	732	91,676	4, 5	-----	-----	Total On-Site
Existing Conditions.gpw					Return Period: 10 Year			Wednesday, 03 / 8 / 2023	

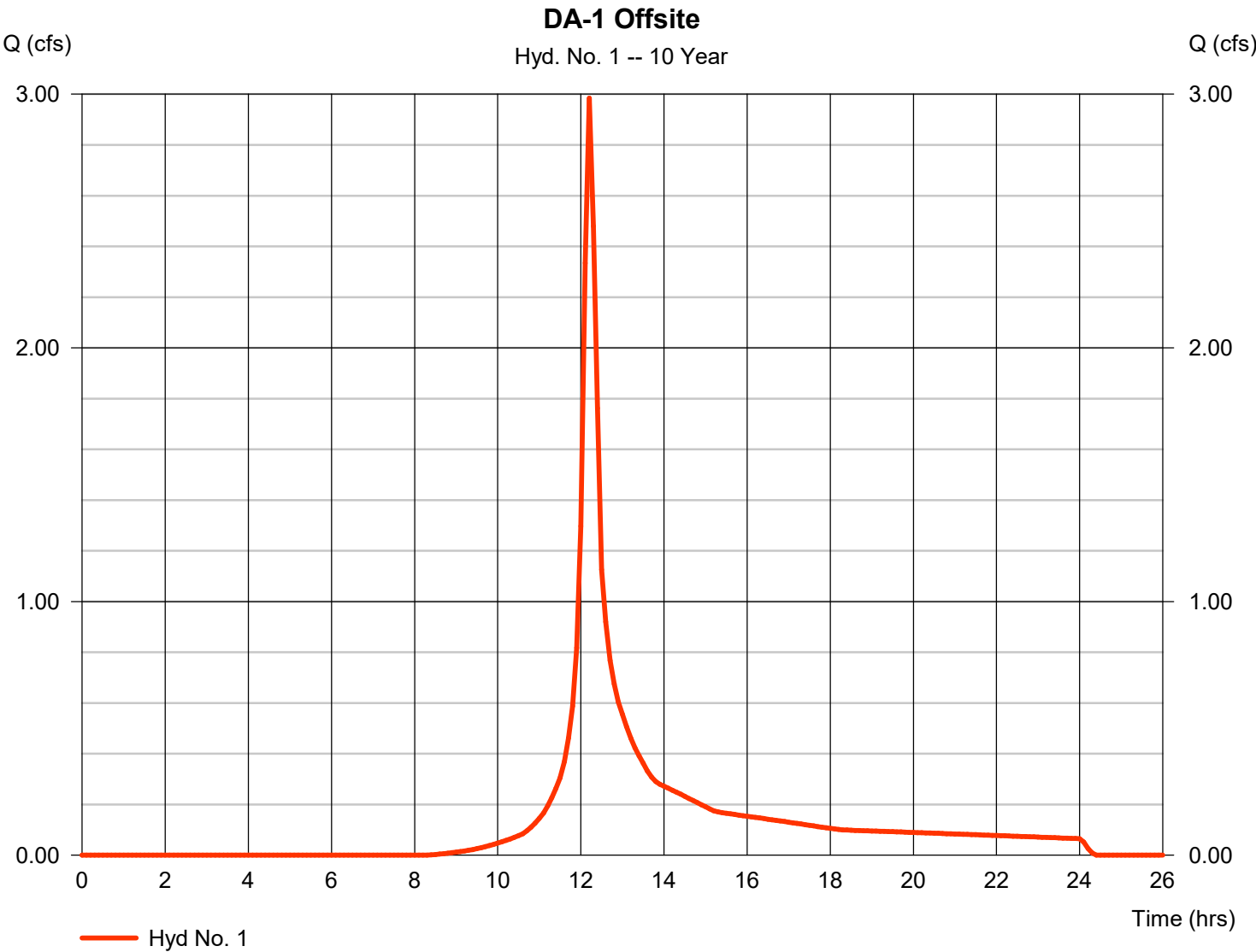
Hydrograph Report

Hyd. No. 1

DA-1 Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.985 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	12,711 cuft
Drainage area	=	1.470 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.070 x 98) + (0.840 x 74) + (0.480 x 70) + (0.080 x 79)] / 1.470

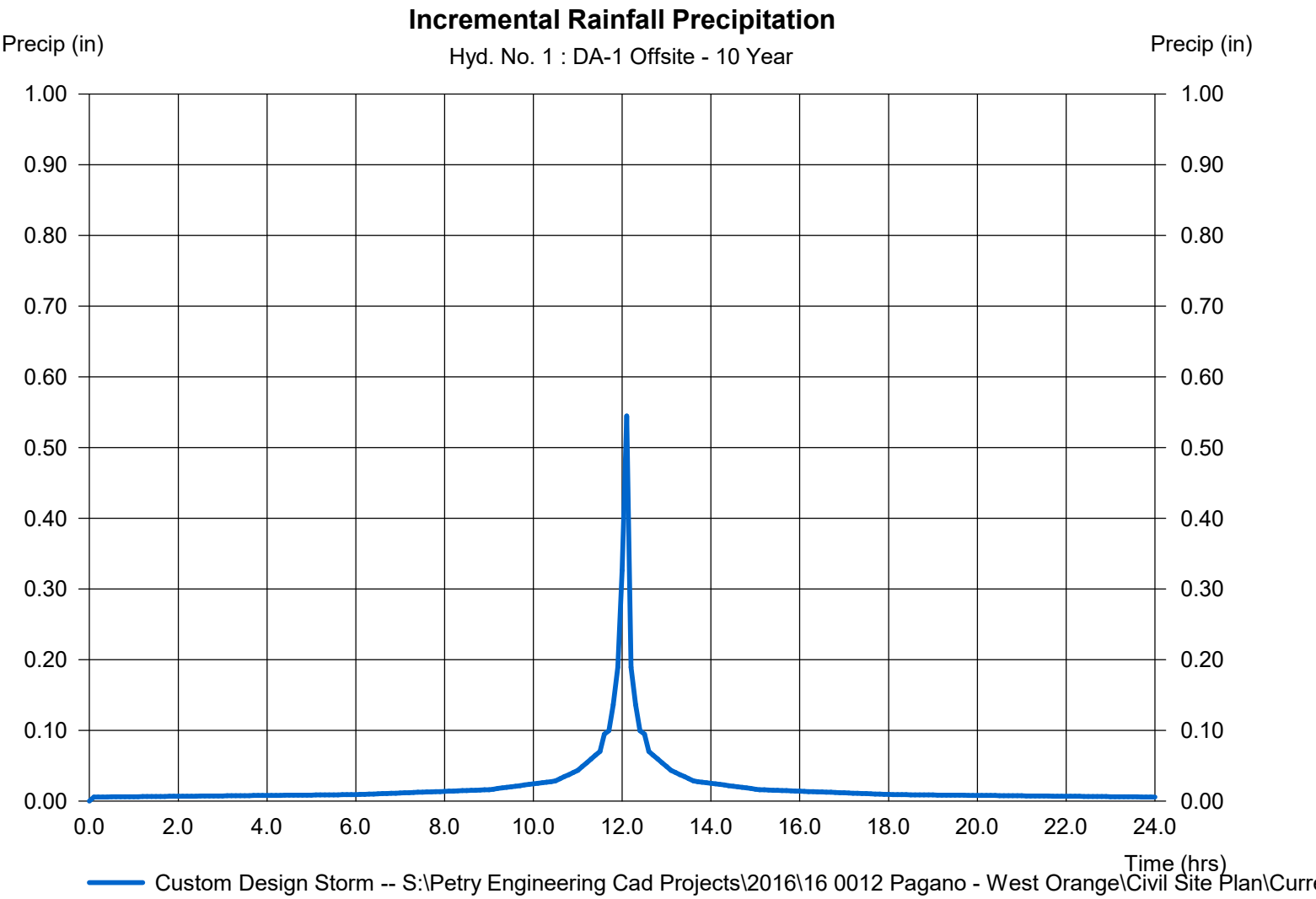


Precipitation Report

Hyd. No. 1

DA-1 Offsite

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

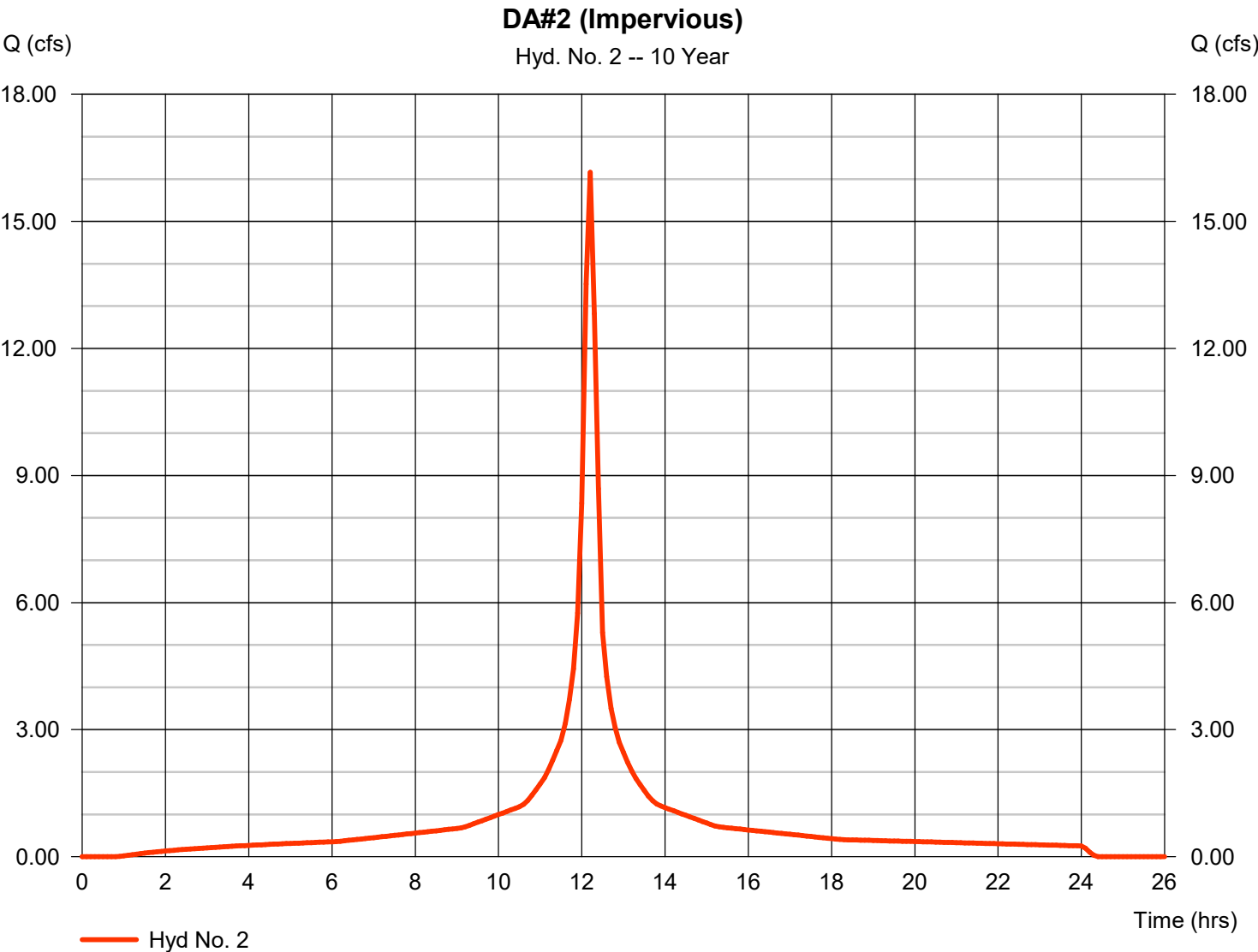


Hydrograph Report

Hyd. No. 2

DA#2 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 16.16 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 79,190 cuft
Drainage area	= 4.670 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.22 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\161012 Page 484		

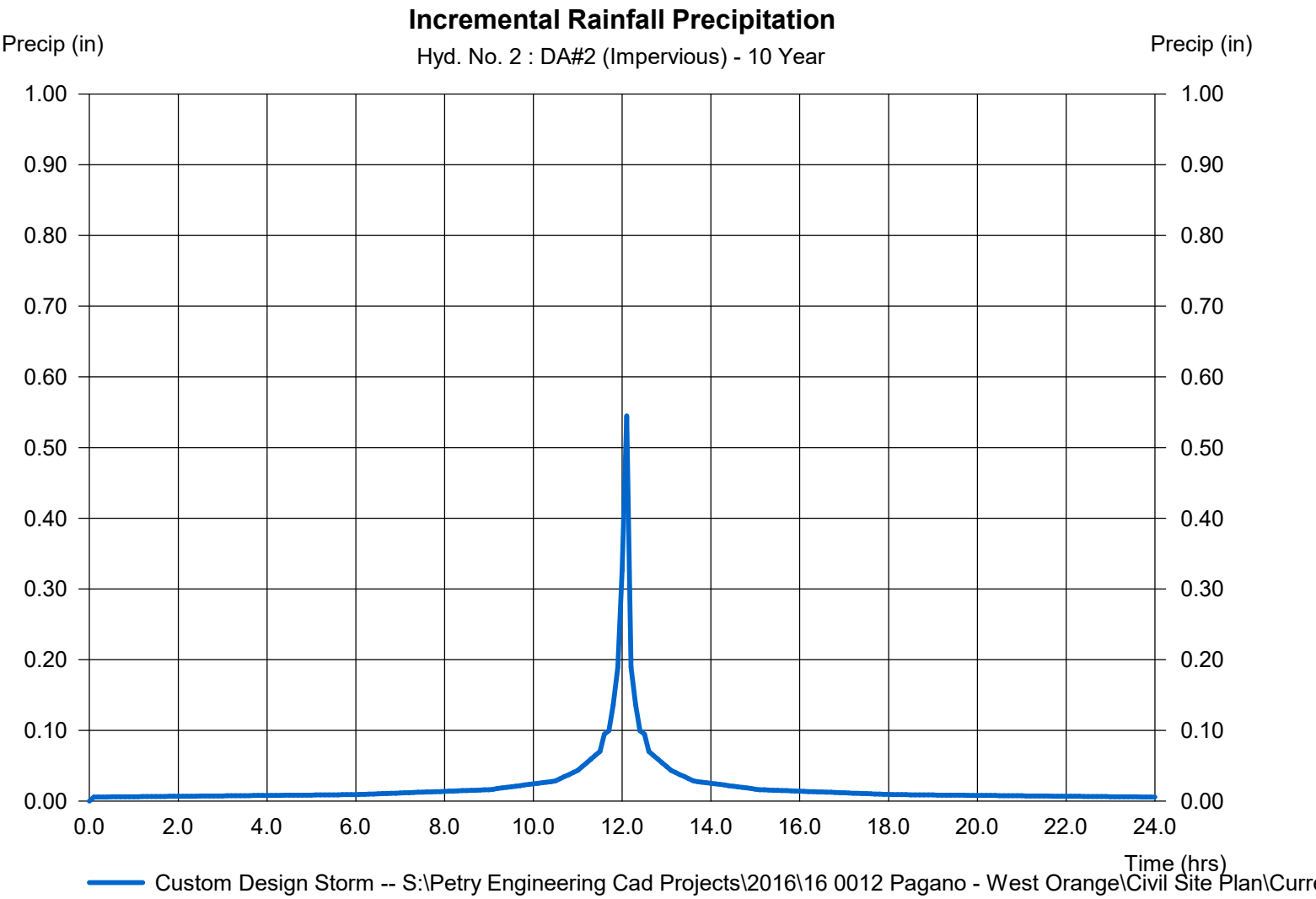


Precipitation Report

Hyd. No. 2

DA#2 (Impervious)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



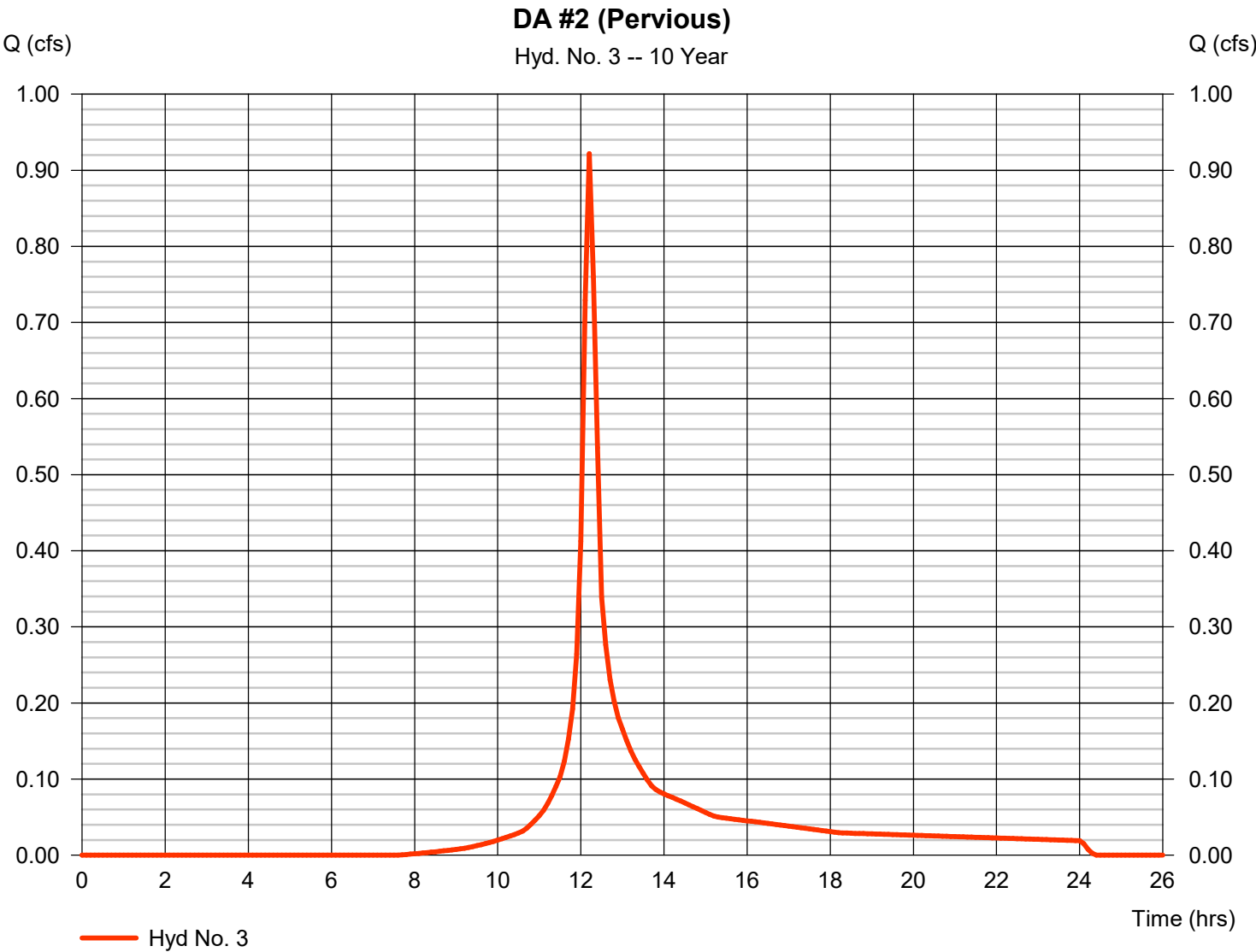
Hydrograph Report

Hyd. No. 3

DA #2 (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.922 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	3,918 cuft
Drainage area	=	0.410 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.410 x 77)] / 0.410

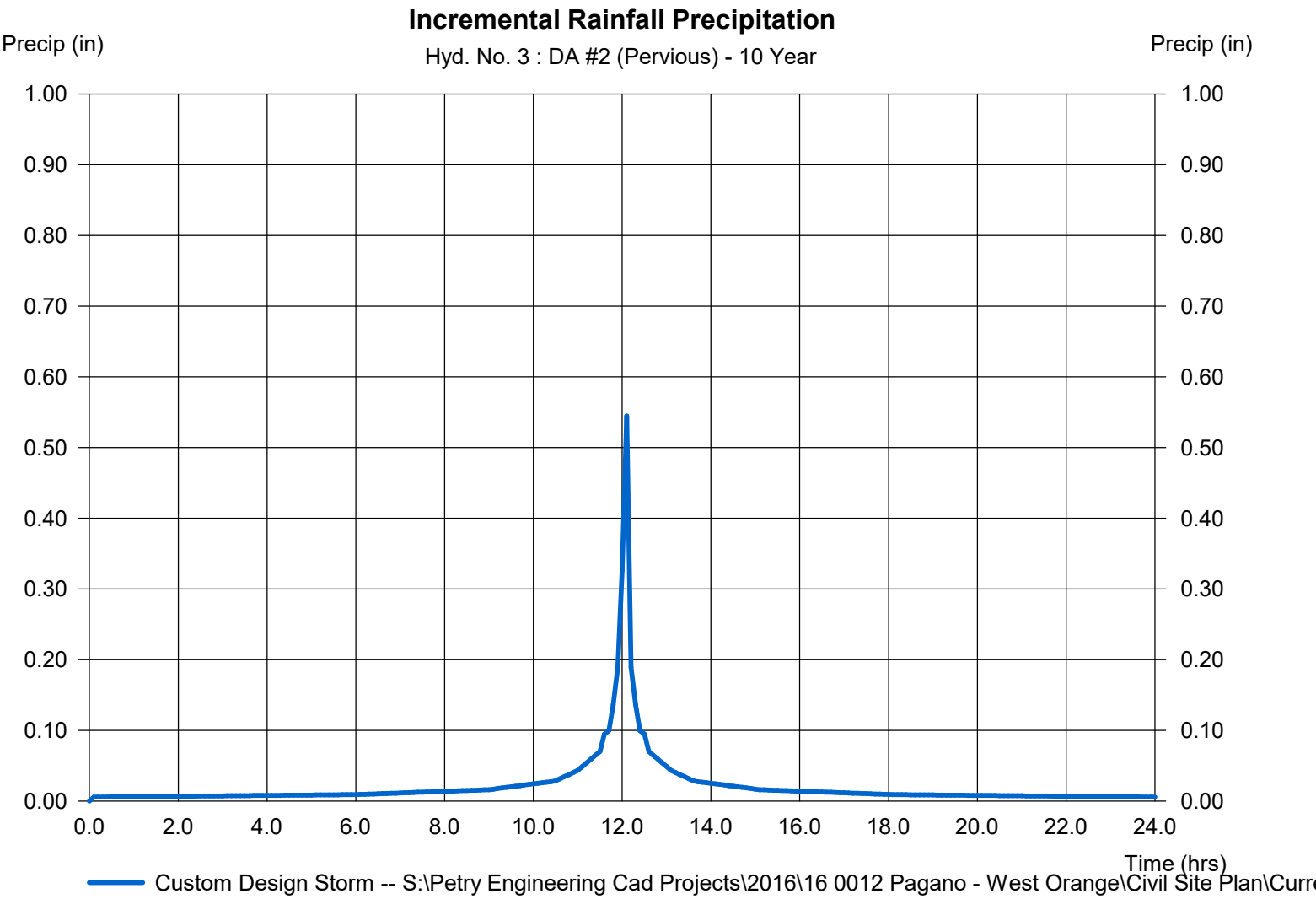


Precipitation Report

Hyd. No. 3

DA #2 (Pervious)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



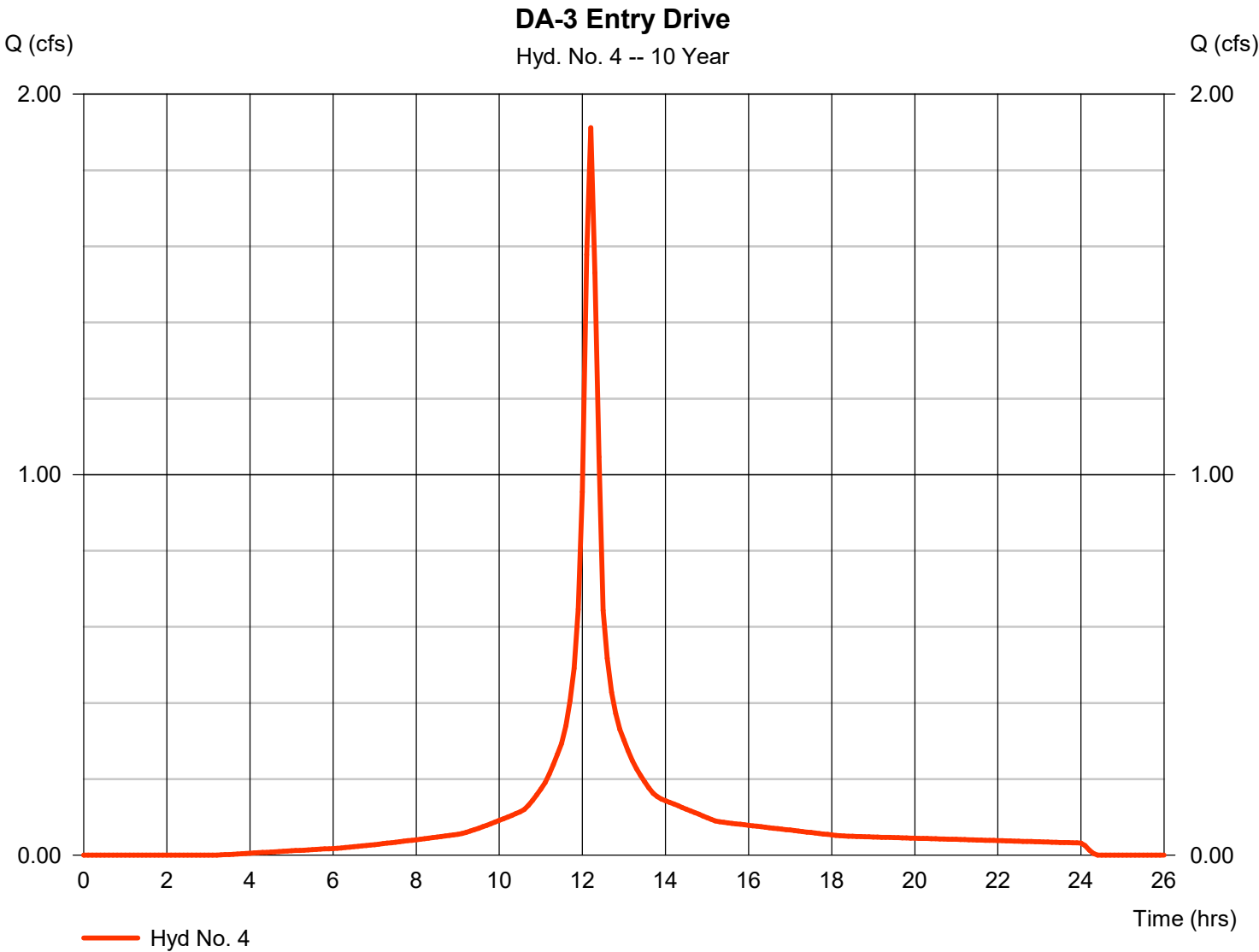
Hydrograph Report

Hyd. No. 4

DA-3 Entry Drive

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.912 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	8,568 cuft
Drainage area	=	0.600 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.380 x 98) + (0.220 x 80)] / 0.600



Precipitation Report

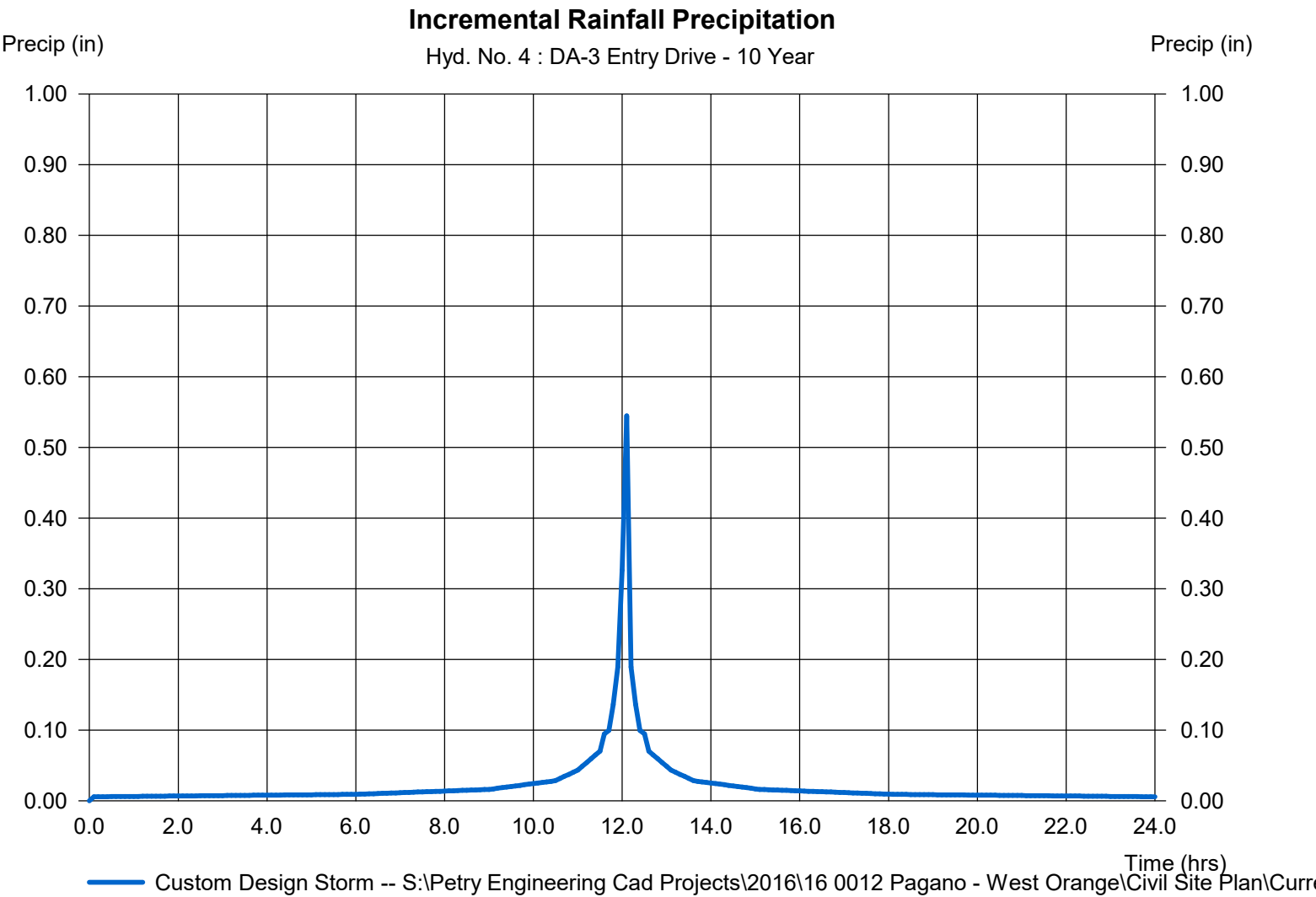
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 4

DA-3 Entry Drive

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

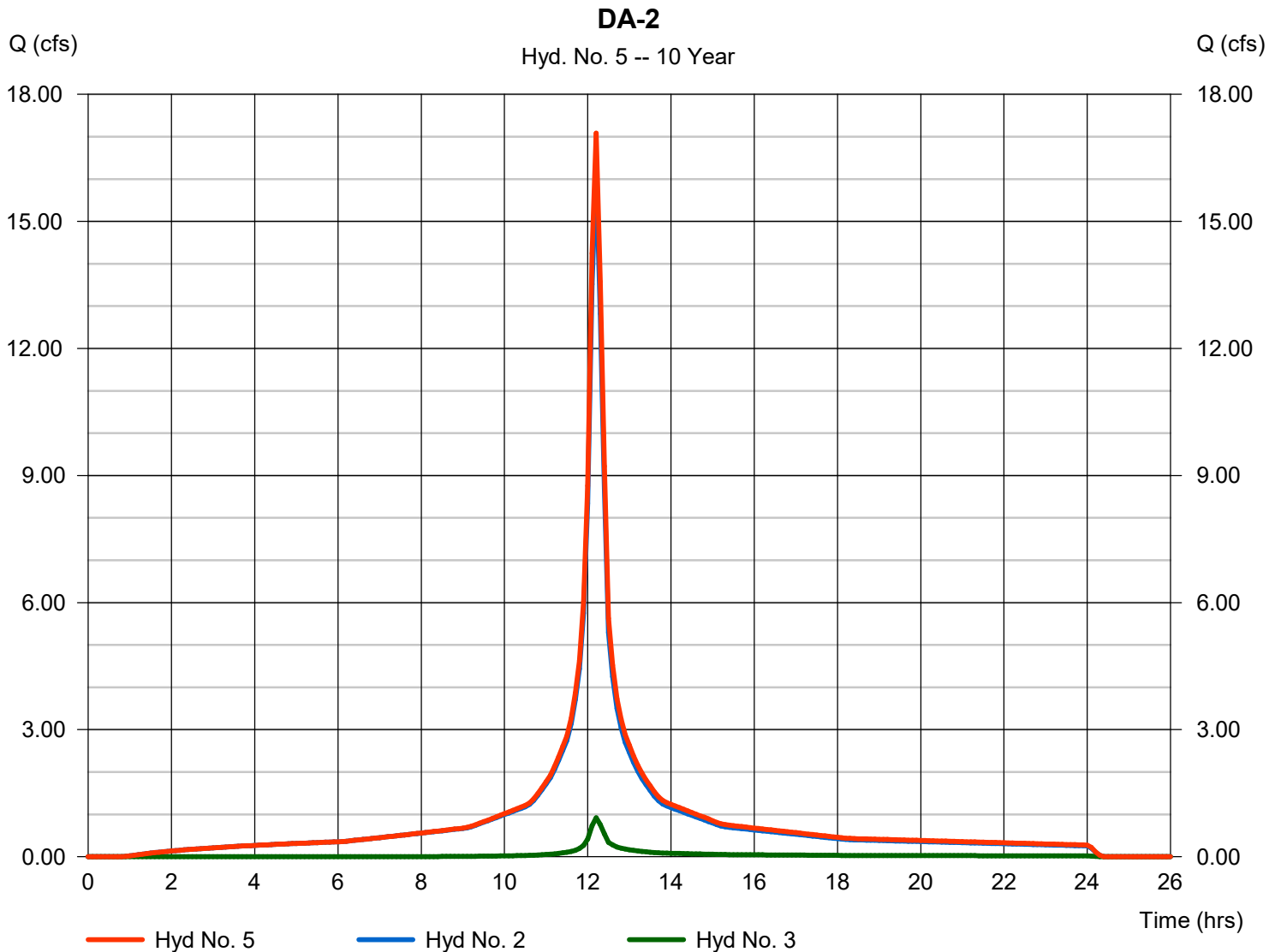
Wednesday, 03 / 8 / 2023

Hyd. No. 5

DA-2

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 6 min
Inflow hyds. = 2, 3

Peak discharge = 17.08 cfs
Time to peak = 12.20 hrs
Hyd. volume = 83,108 cuft
Contrib. drain. area = 5.080 ac

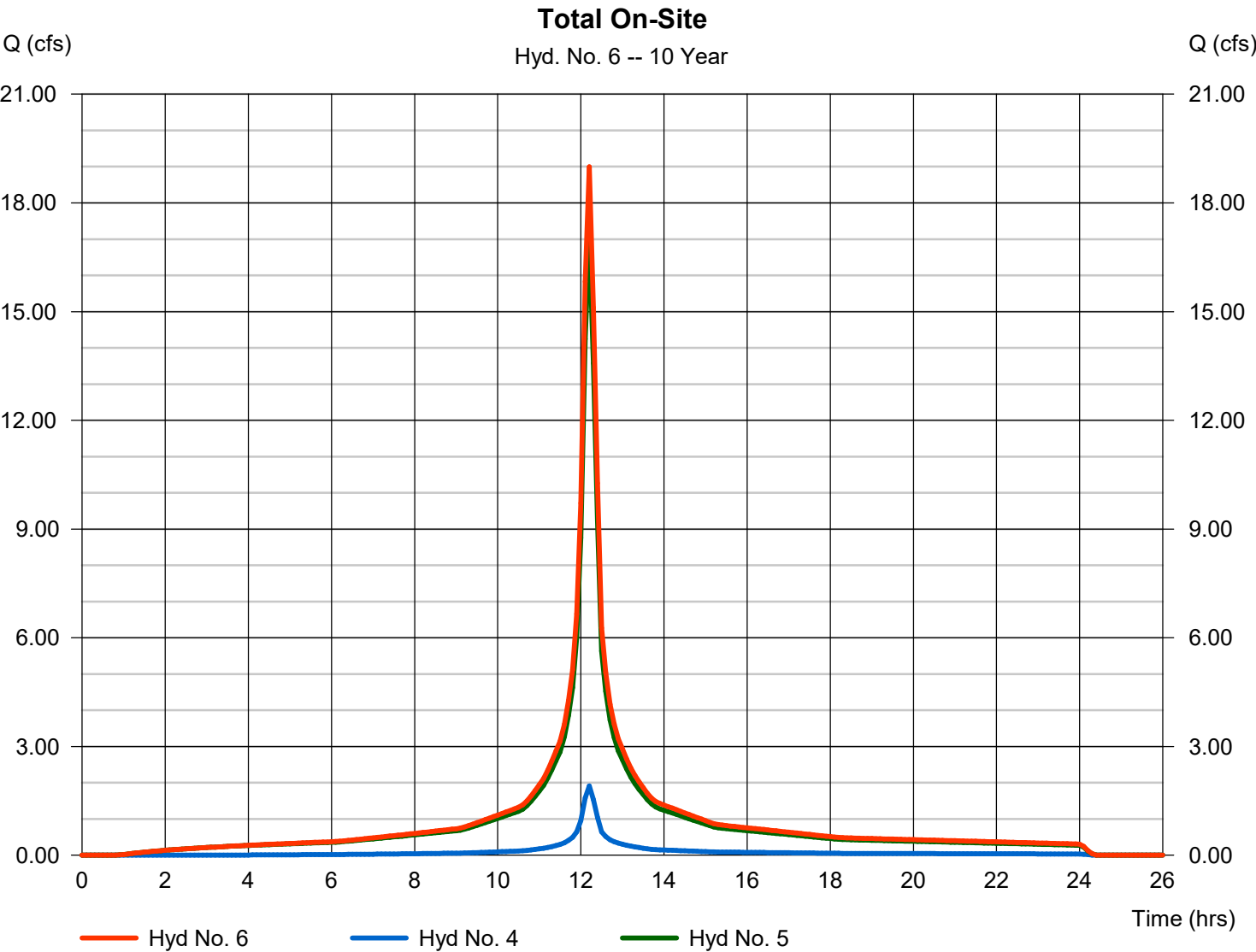


Hydrograph Report

Hyd. No. 6

Total On-Site

Hydrograph type	= Combine	Peak discharge	= 19.00 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 91,676 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 0.600 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	6.447	6	732	27,614	-----	-----	-----	DA-1 Offsite
2	SCS Runoff	26.90	6	732	133,812	-----	-----	-----	DA#2 (Impervious)
3	SCS Runoff	1.902	6	732	8,209	-----	-----	-----	DA #2 (Pervious)
4	SCS Runoff	3.335	6	732	15,471	-----	-----	-----	DA-3 Entry Drive
5	Combine	28.80	6	732	142,021	2, 3,	-----	-----	DA-2
6	Combine	32.14	6	732	157,492	4, 5	-----	-----	Total On-Site
Existing Conditions.gpw					Return Period: 100 Year			Wednesday, 03 / 8 / 2023	

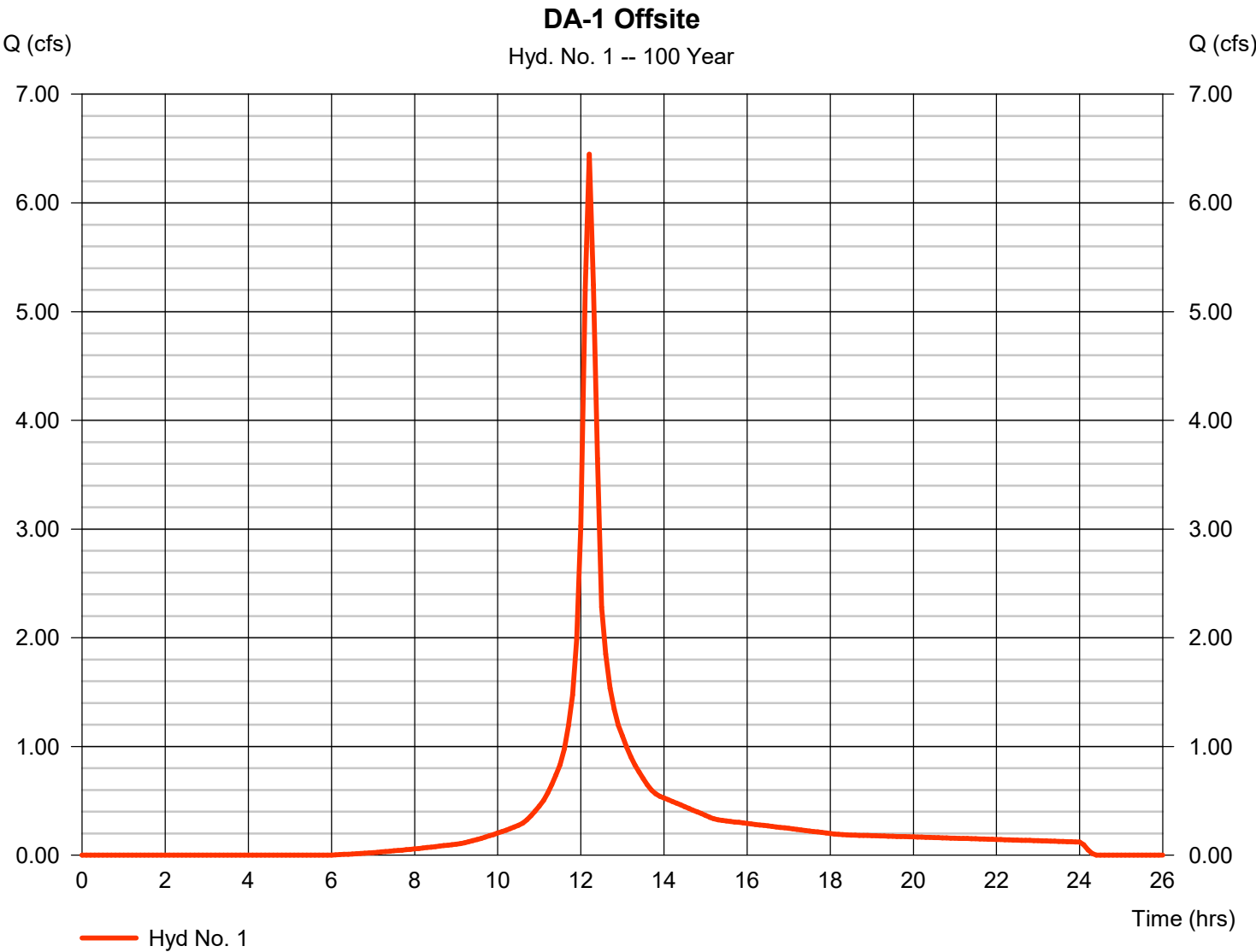
Hydrograph Report

Hyd. No. 1

DA-1 Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.447 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	27,614 cuft
Drainage area	=	1.470 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.66 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.070 x 98) + (0.840 x 74) + (0.480 x 70) + (0.080 x 79)] / 1.470

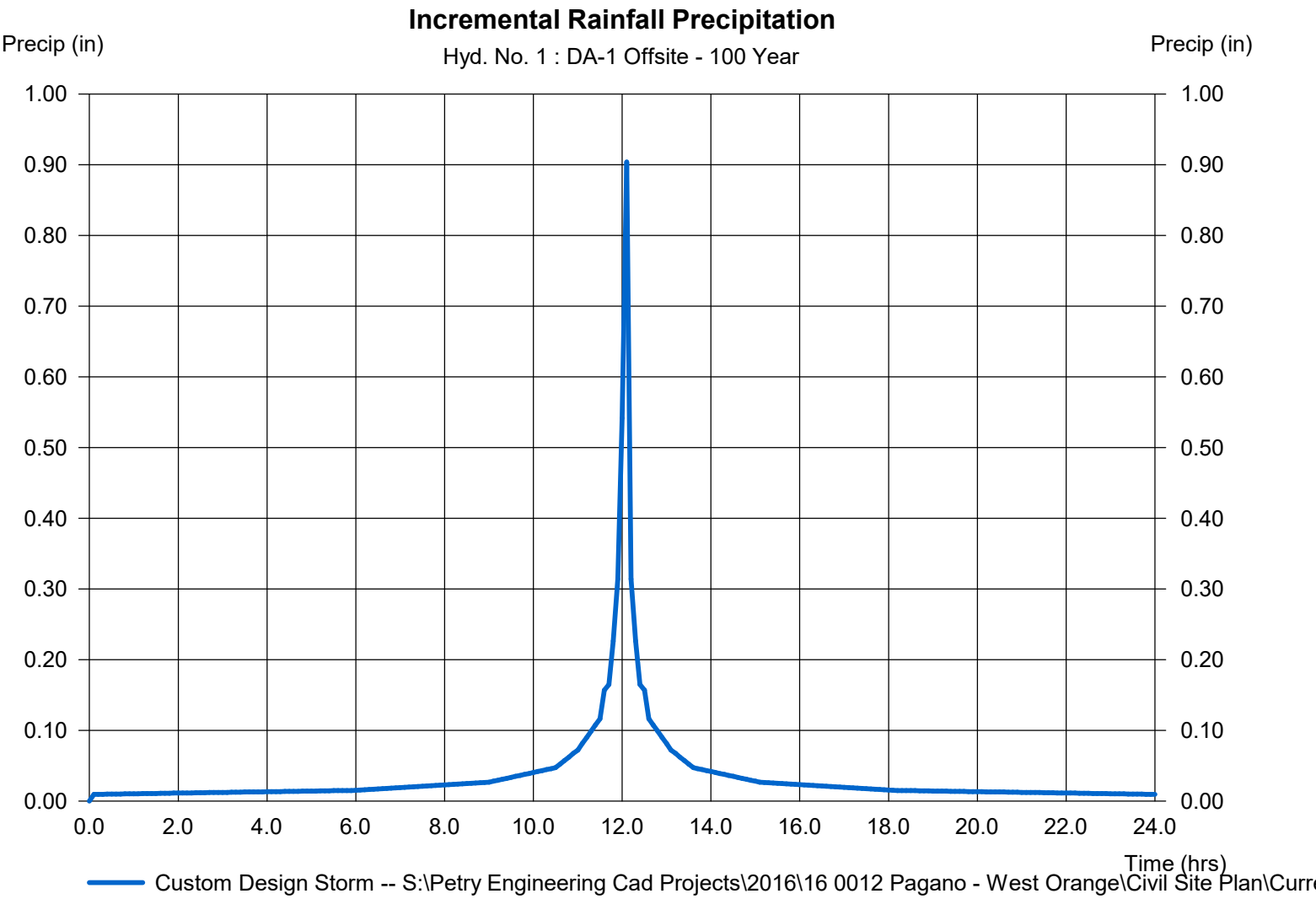


Precipitation Report

Hyd. No. 1

DA-1 Offsite

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

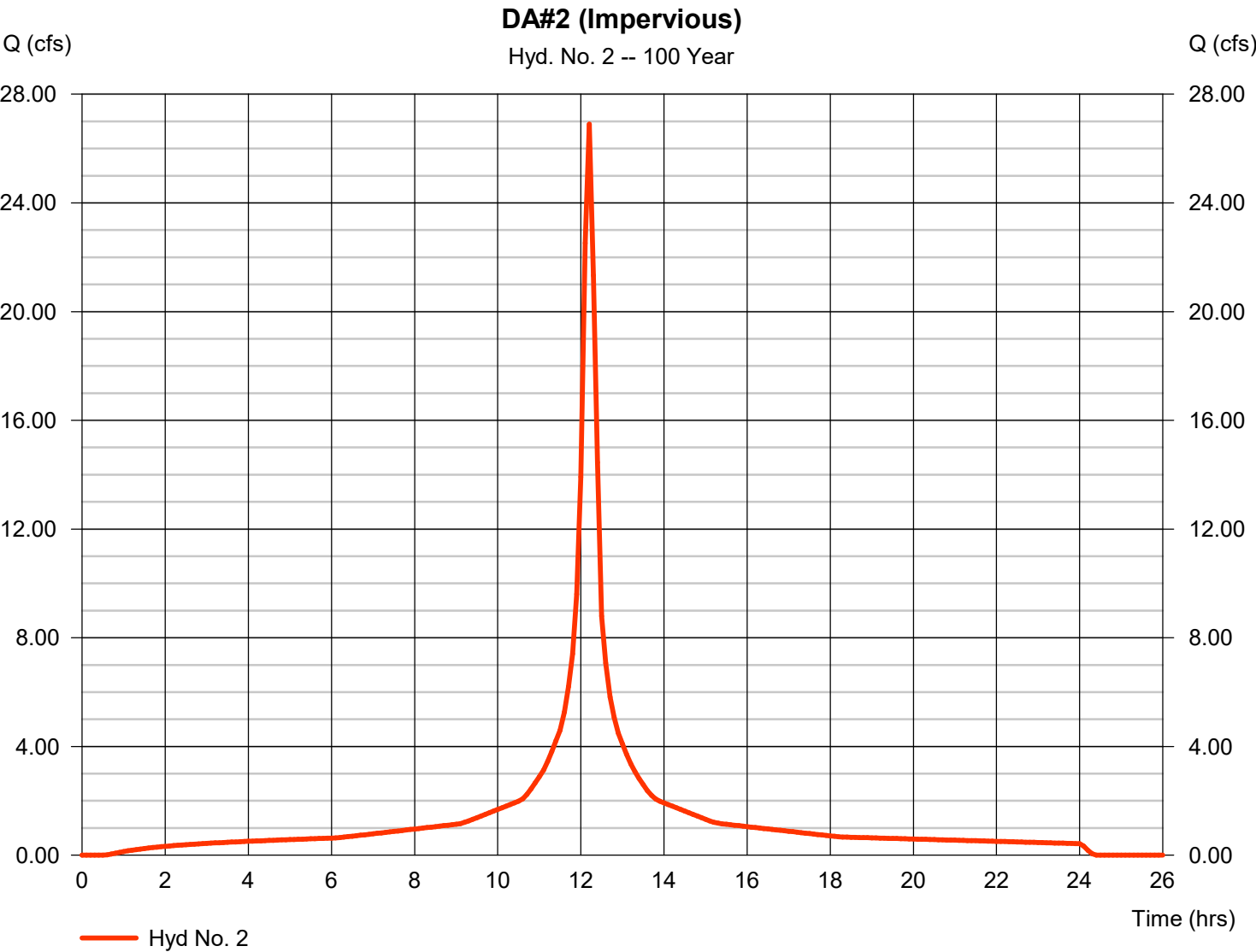


Hydrograph Report

Hyd. No. 2

DA#2 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 26.90 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 133,812 cuft
Drainage area	= 4.670 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.66 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\16100012 Page 484 West Orange\Civil Site		

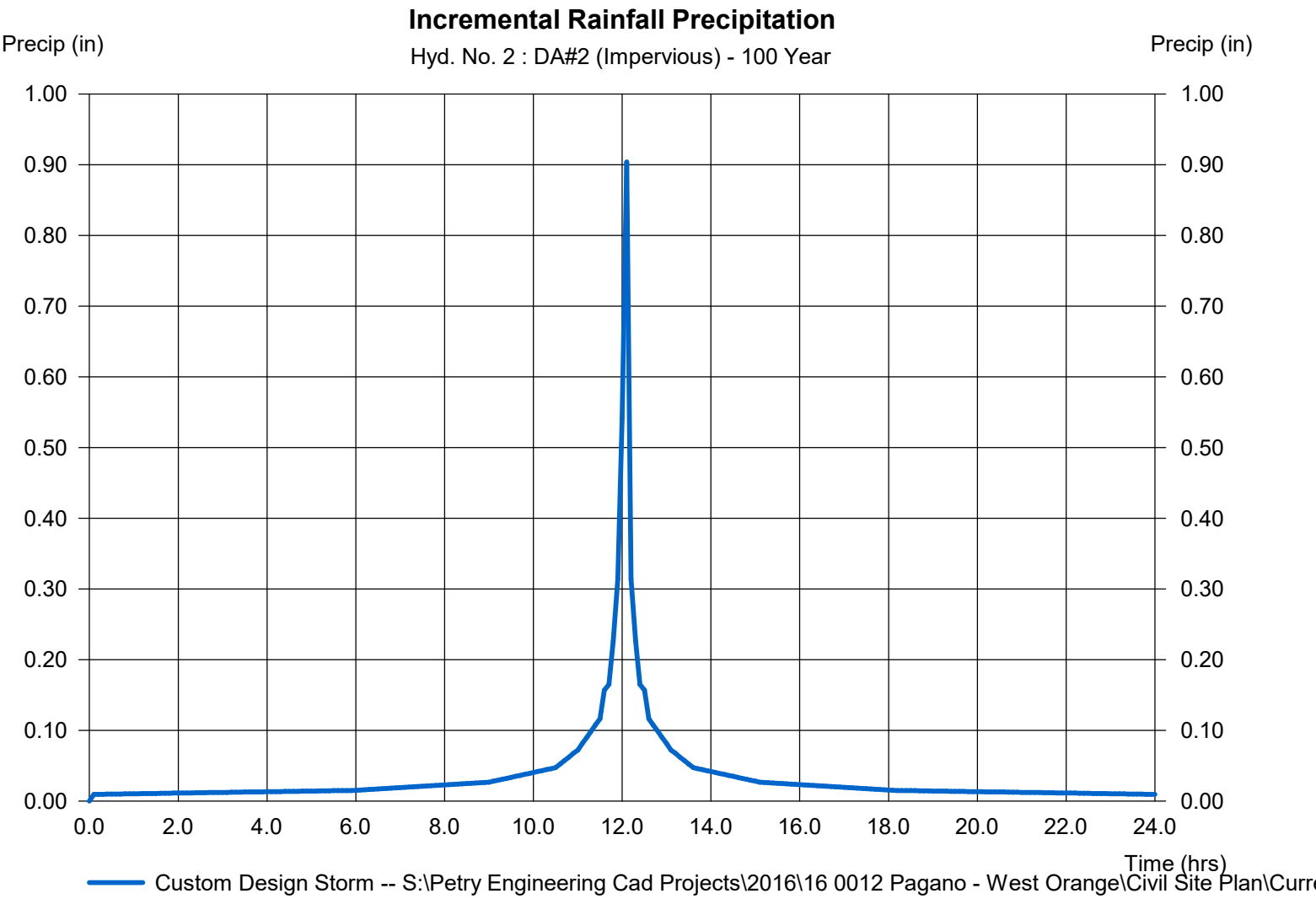


Precipitation Report

Hyd. No. 2

DA#2 (Impervious)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



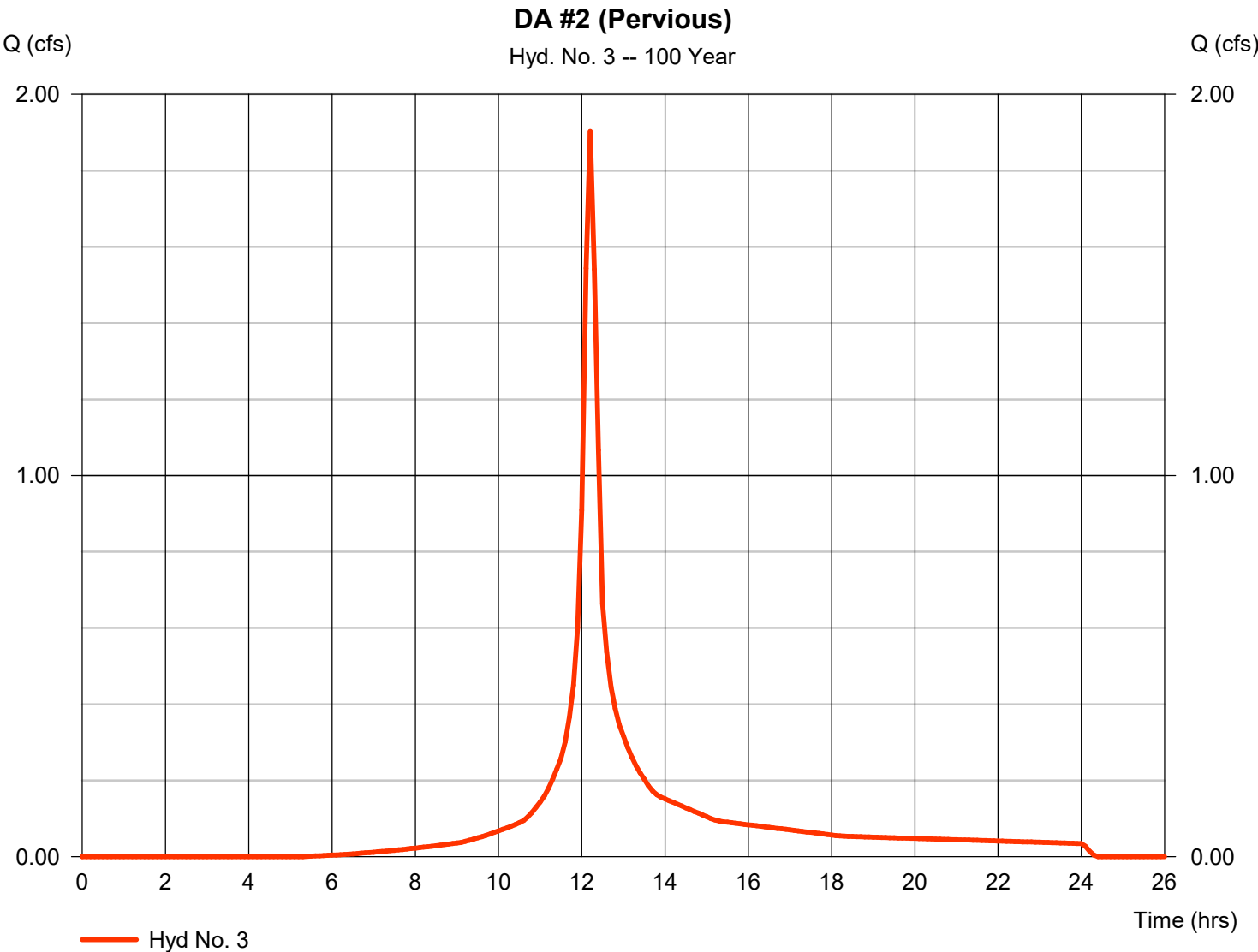
Hydrograph Report

Hyd. No. 3

DA #2 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.902 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 8,209 cuft
Drainage area	= 0.410 ac	Curve number	= 77*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.66 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\161010012 Page 484\West Orange\Civil Site		

* Composite (Area/CN) = [(0.410 x 77)] / 0.410

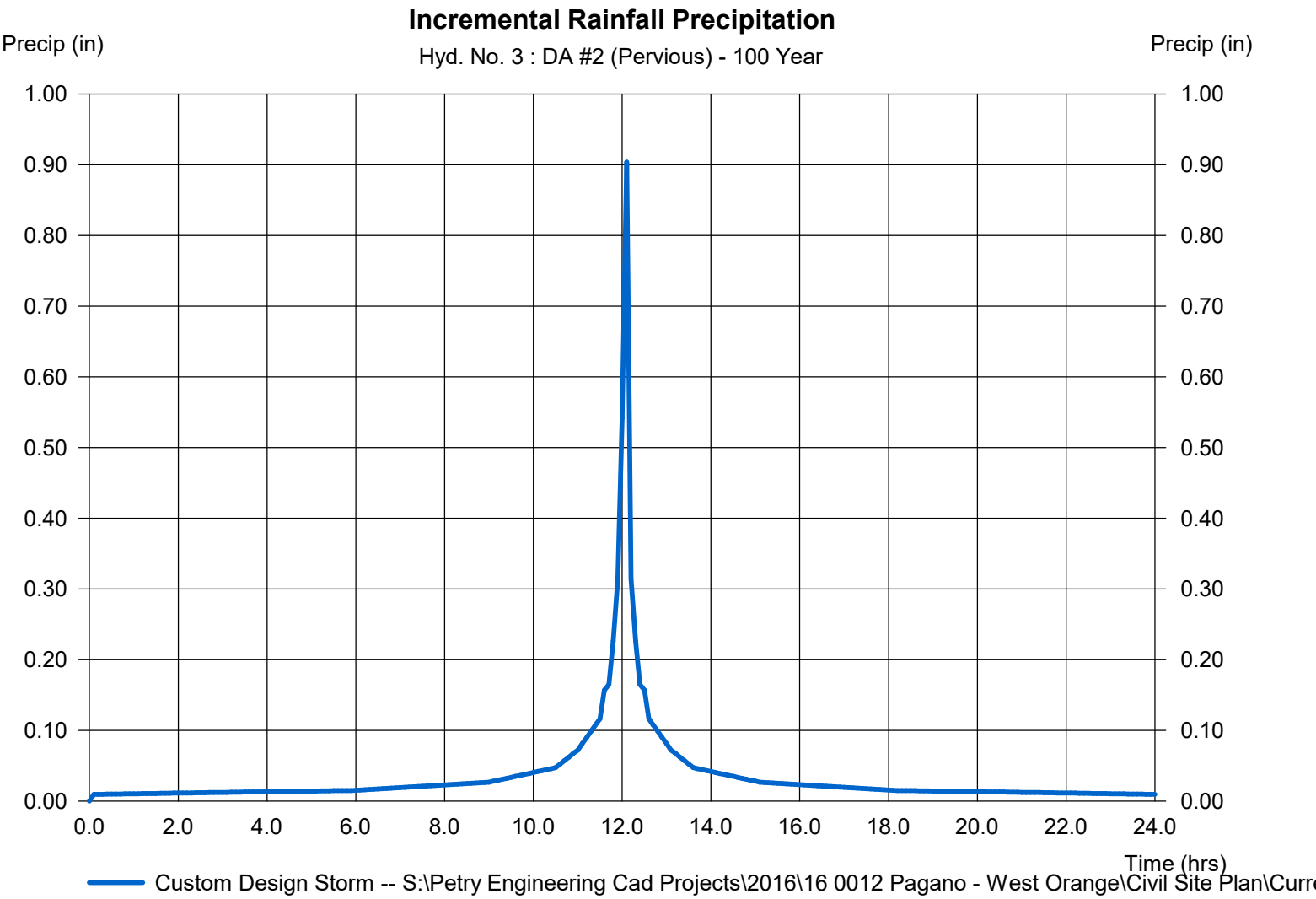


Precipitation Report

Hyd. No. 3

DA #2 (Pervious)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



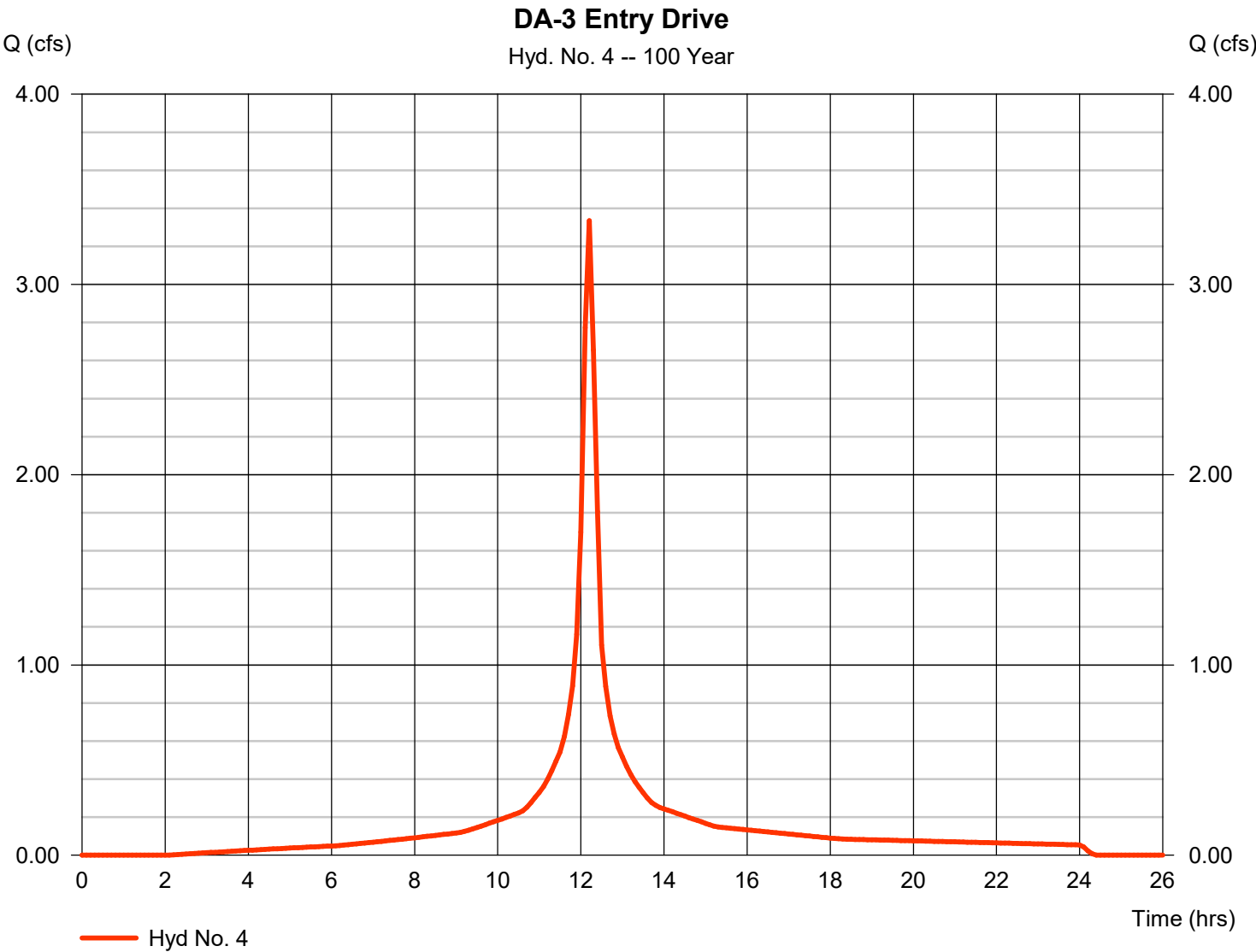
Hydrograph Report

Hyd. No. 4

DA-3 Entry Drive

Hydrograph type	= SCS Runoff	Peak discharge	= 3.335 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 15,471 cuft
Drainage area	= 0.600 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.66 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\1610-0012 Page 484 West Orange\Civil Site		

* Composite (Area/CN) = [(0.380 x 98) + (0.220 x 80)] / 0.600

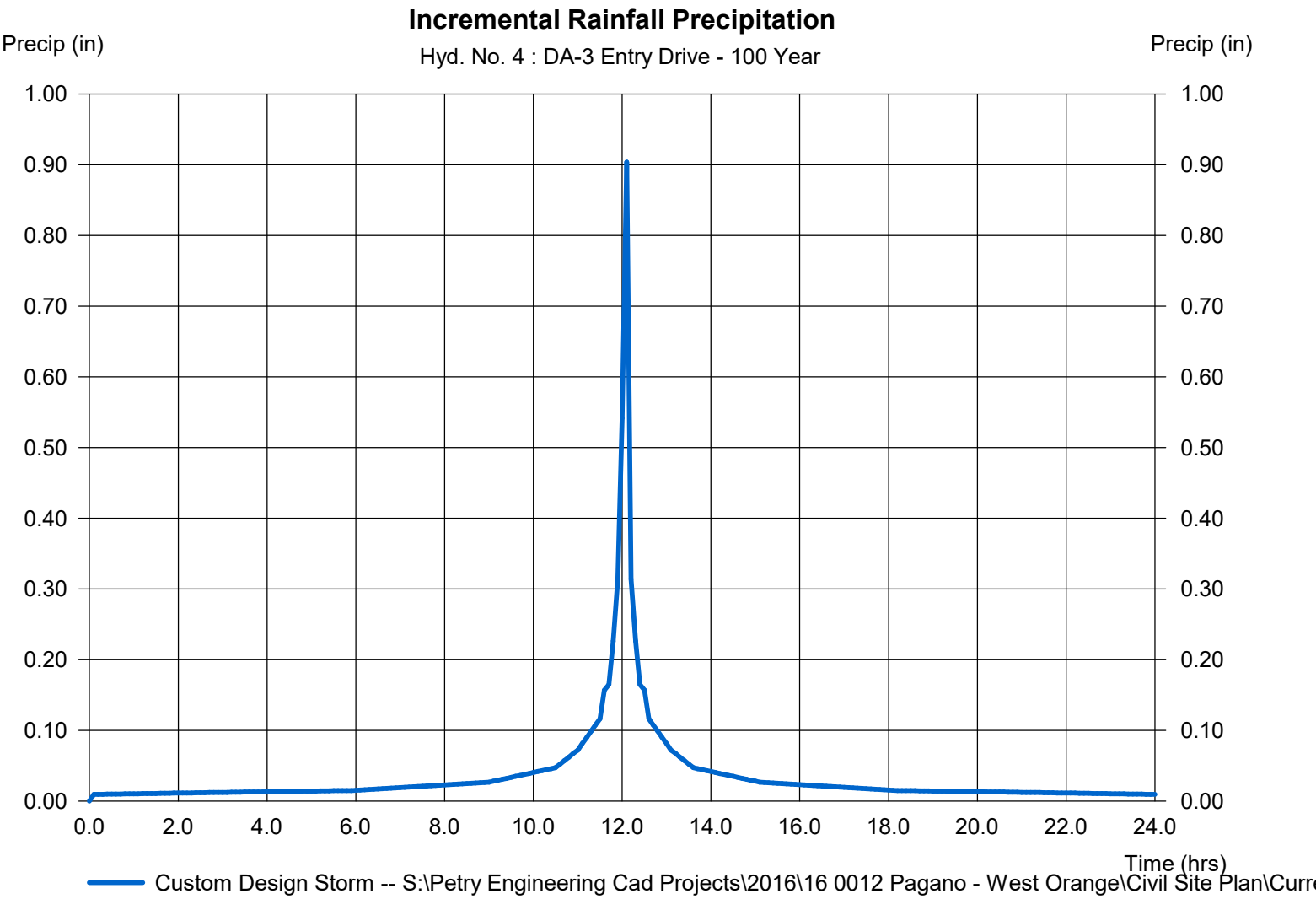


Precipitation Report

Hyd. No. 4

DA-3 Entry Drive

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

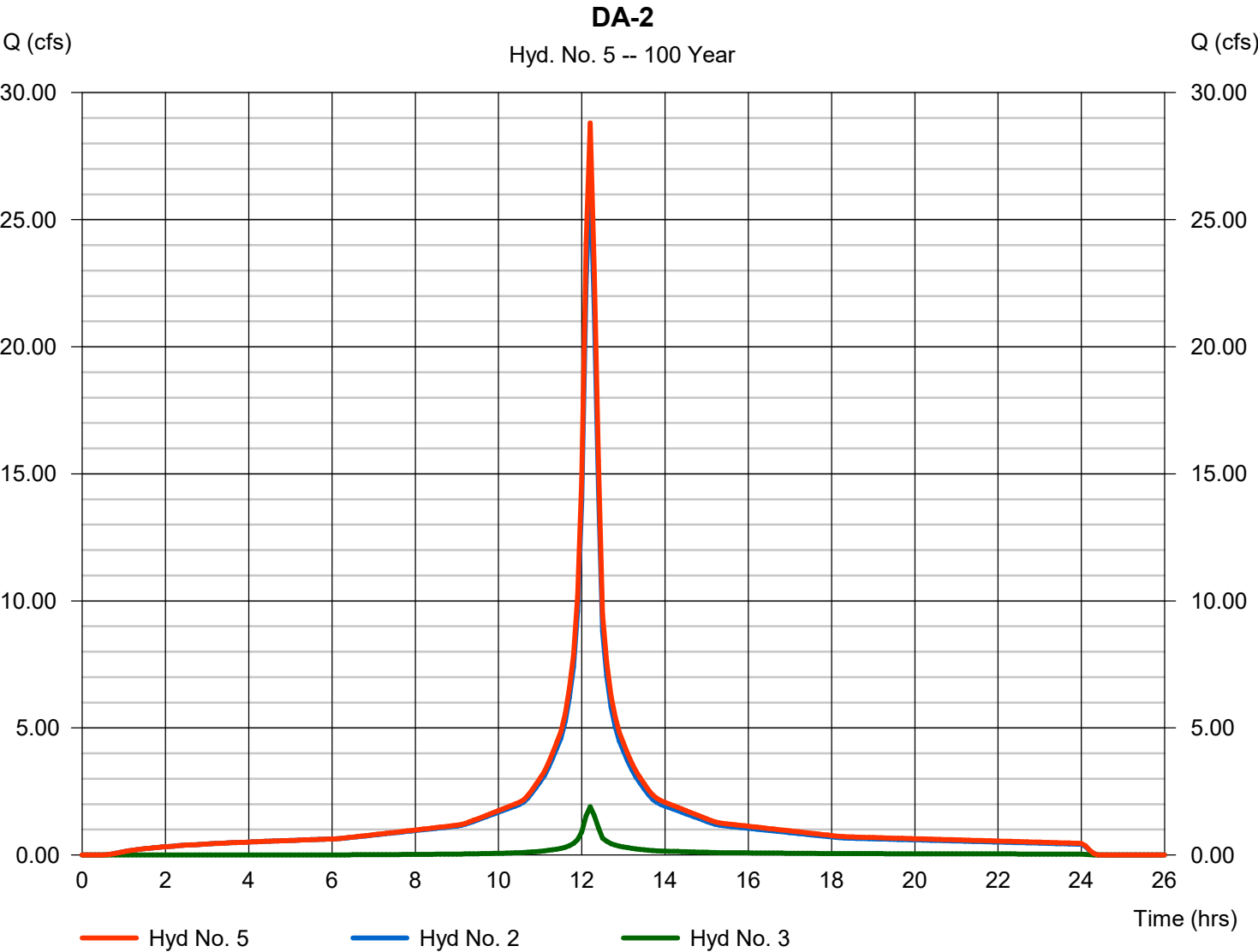
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 5

DA-2

Hydrograph type	= Combine	Peak discharge	= 28.80 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 142,021 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 5.080 ac

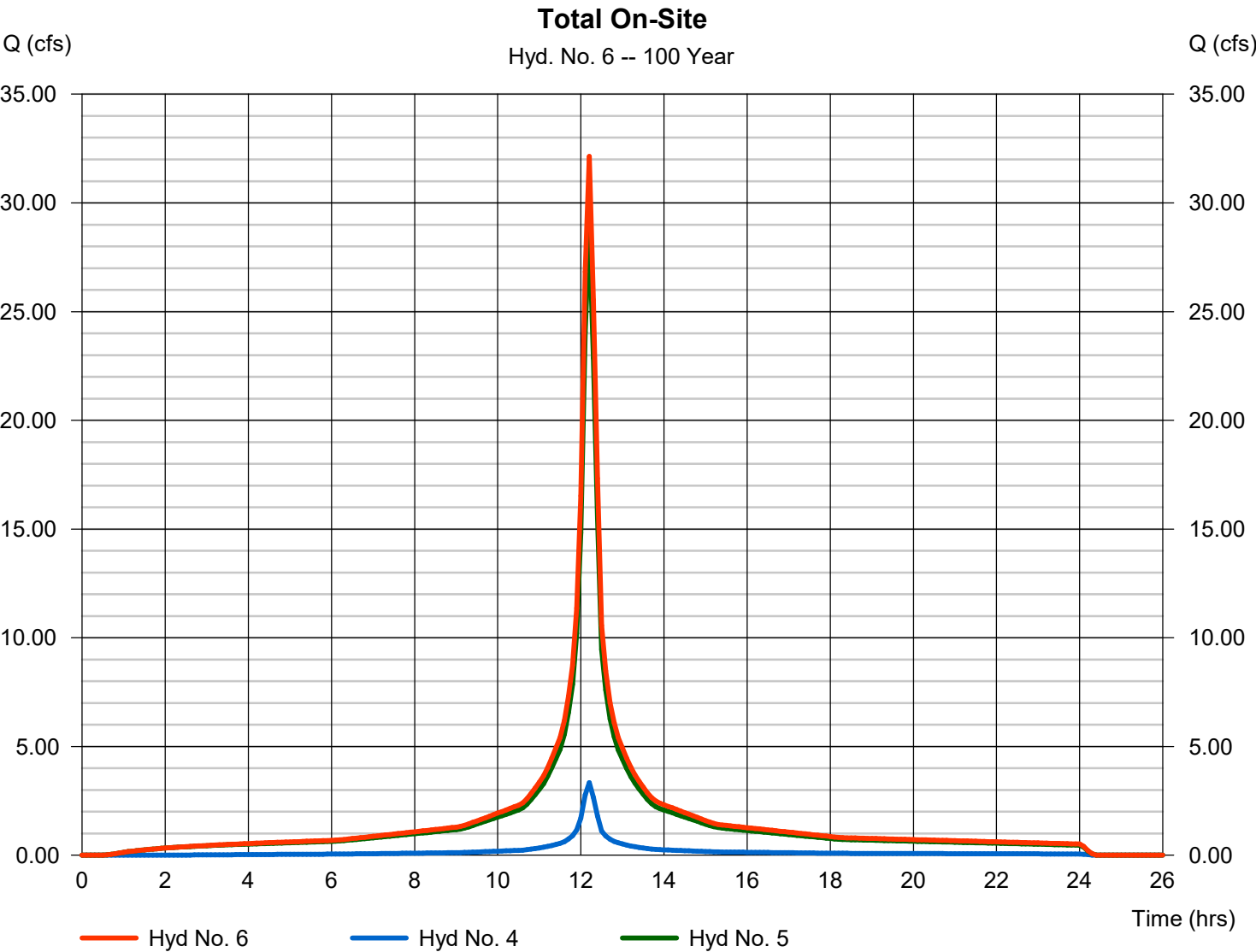


Hydrograph Report

Hyd. No. 6

Total On-Site

Hydrograph type	= Combine	Peak discharge	= 32.14 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 157,492 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 0.600 ac



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	50.5392	12.0000	0.8386	-----
3	0.0000	0.0000	0.0000	-----
5	204.3605	23.4000	1.0697	-----
10	1013.2900	37.4000	1.3601	-----
25	265.4848	25.2001	1.0587	-----
50	213.2009	22.0000	1.0000	-----
100	286.1444	24.7001	1.0268	-----

File name: Trenton.IDF

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

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	4.70	3.78	3.19	2.76	2.45	2.20	2.00	1.84	1.70	1.59	1.49	1.40
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	5.70	4.79	4.13	3.62	3.22	2.90	2.64	2.41	2.23	2.06	1.92	1.80
10	6.20	5.33	4.65	4.11	3.66	3.30	2.99	2.73	2.51	2.32	2.15	2.00
25	7.20	6.12	5.32	4.70	4.20	3.80	3.47	3.19	2.95	2.74	2.56	2.40
50	7.90	6.66	5.76	5.08	4.54	4.10	3.74	3.44	3.18	2.96	2.77	2.60
100	8.80	7.50	6.53	5.78	5.19	4.70	4.30	3.96	3.66	3.41	3.19	3.00

T_c = time in minutes. Values may exceed 60.

y Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil Site Plan\Current\Stormwater\Essex County.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	3.44	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	3.44	0.00	0.00	5.22	6.44	0.00	8.66

**PROPOSED CONDITIONS
HYDROGRAPHS**



Watershed Model Schematic.....	1
Hydrograph Return Period Recap.....	2
2 - Year	
Summary Report.....	3
Hydrograph Reports.....	4
Hydrograph No. 1, SCS Runoff, DA-1 (Pervious, To Basin #1).....	4
Precipitation Report.....	5
Hydrograph No. 2, SCS Runoff, DA-1 (Impervious, To Basin #1).....	6
Precipitation Report.....	7
Hydrograph No. 3, SCS Runoff, DA-2 (Pervious, To Basin #2).....	8
Precipitation Report.....	9
Hydrograph No. 4, SCS Runoff, DA-2 (Impervious, To Basin #2).....	10
Precipitation Report.....	11
Hydrograph No. 5, SCS Runoff, DA-3 (Offsite, Bypass).....	12
Precipitation Report.....	13
Hydrograph No. 6, SCS Runoff, DA-4 (Pervious - Onsite, Bypass).....	14
Precipitation Report.....	15
Hydrograph No. 7, SCS Runoff, DA-4 (Impervious - Onsite, Bypass).....	16
Precipitation Report.....	17
Hydrograph No. 8, Combine, DA-1.....	18
Hydrograph No. 9, Combine, DA-2.....	19
Hydrograph No. 10, Combine, DA-4.....	20
Hydrograph No. 12, Reservoir, Route Basin #1.....	21
Pond Report - Basin #1.....	22
Hydrograph No. 13, Reservoir, Route Basin #2.....	23
Pond Report - Basin #2.....	24
Hydrograph No. 14, SCS Runoff, DA-5 (Impervious).....	25
Precipitation Report.....	26
Hydrograph No. 15, SCS Runoff, DA-5 (Pervious).....	27
Precipitation Report.....	28
Hydrograph No. 16, Combine, DA-5 (Entry Drive).....	29
Hydrograph No. 17, Combine, Total Offsite.....	30
10 - Year	
Summary Report.....	31
Hydrograph Reports.....	32
Hydrograph No. 1, SCS Runoff, DA-1 (Pervious, To Basin #1).....	32
Precipitation Report.....	33
Hydrograph No. 2, SCS Runoff, DA-1 (Impervious, To Basin #1).....	34
Precipitation Report.....	35
Hydrograph No. 3, SCS Runoff, DA-2 (Pervious, To Basin #2).....	36
Precipitation Report.....	37
Hydrograph No. 4, SCS Runoff, DA-2 (Impervious, To Basin #2).....	38
Precipitation Report.....	39
Hydrograph No. 5, SCS Runoff, DA-3 (Offsite, Bypass).....	40
Precipitation Report.....	41

Hydrograph No. 6, SCS Runoff, DA-4 (Pervious - Onsite, Bypass).....	42
Precipitation Report.....	43
Hydrograph No. 7, SCS Runoff, DA-4 (Impervious - Onsite, Bypass).....	44
Precipitation Report.....	45
Hydrograph No. 8, Combine, DA-1.....	46
Hydrograph No. 9, Combine, DA-2.....	47
Hydrograph No. 10, Combine, DA-4.....	48
Hydrograph No. 12, Reservoir, Route Basin #1.....	49
Hydrograph No. 13, Reservoir, Route Basin #2.....	50
Hydrograph No. 14, SCS Runoff, DA-5 (Impervious).....	51
Precipitation Report.....	52
Hydrograph No. 15, SCS Runoff, DA-5 (Pervious).....	53
Precipitation Report.....	54
Hydrograph No. 16, Combine, DA-5 (Entry Drive).....	55
Hydrograph No. 17, Combine, Total Offsite.....	56

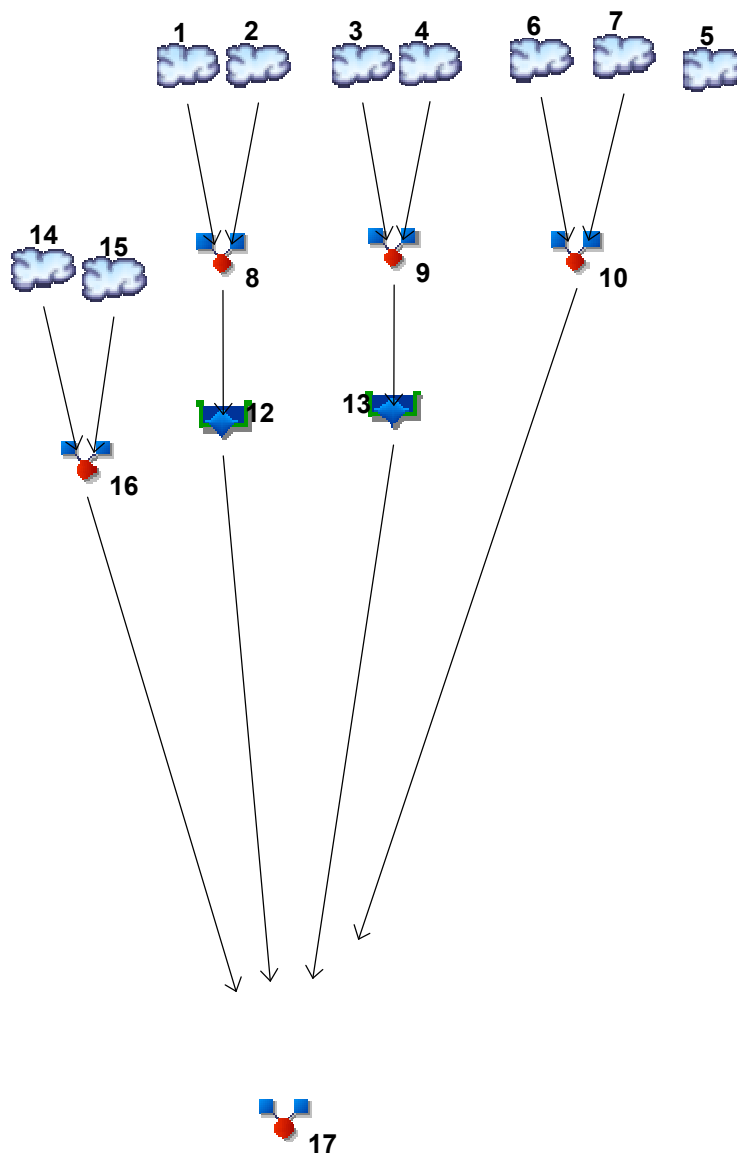
100 - Year

Summary Report.....	57
Hydrograph Reports.....	58
Hydrograph No. 1, SCS Runoff, DA-1 (Pervious, To Basin #1).....	58
Precipitation Report.....	59
Hydrograph No. 2, SCS Runoff, DA-1 (Impervious, To Basin #1).....	60
Precipitation Report.....	61
Hydrograph No. 3, SCS Runoff, DA-2 (Pervious, To Basin #2).....	62
Precipitation Report.....	63
Hydrograph No. 4, SCS Runoff, DA-2 (Impervious, To Basin #2).....	64
Precipitation Report.....	65
Hydrograph No. 5, SCS Runoff, DA-3 (Offsite, Bypass).....	66
Precipitation Report.....	67
Hydrograph No. 6, SCS Runoff, DA-4 (Pervious - Onsite, Bypass).....	68
Precipitation Report.....	69
Hydrograph No. 7, SCS Runoff, DA-4 (Impervious - Onsite, Bypass).....	70
Precipitation Report.....	71
Hydrograph No. 8, Combine, DA-1.....	72
Hydrograph No. 9, Combine, DA-2.....	73
Hydrograph No. 10, Combine, DA-4.....	74
Hydrograph No. 12, Reservoir, Route Basin #1.....	75
Hydrograph No. 13, Reservoir, Route Basin #2.....	76
Hydrograph No. 14, SCS Runoff, DA-5 (Impervious).....	77
Precipitation Report.....	78
Hydrograph No. 15, SCS Runoff, DA-5 (Pervious).....	79
Precipitation Report.....	80
Hydrograph No. 16, Combine, DA-5 (Entry Drive).....	81
Hydrograph No. 17, Combine, Total Offsite.....	82

IDF Report.....	83
------------------------	-----------

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023



Legend

Hyd.	Origin	Description
1	SCS Runoff	DA-1 (Pervious, To Basin #1)
2	SCS Runoff	DA-1 (Impervious, To Basin #1)
3	SCS Runoff	DA-2 (Pervious, To Basin #2)
4	SCS Runoff	DA-2 (Impervious, To Basin #2)
5	SCS Runoff	DA-3 (Offsite, Bypass)
6	SCS Runoff	DA-4 (Pervious - Onsite, Bypass)
7	SCS Runoff	DA-4 (Impervious - Onsite, Bypass)
8	Combine	DA-1
9	Combine	DA-2
10	Combine	DA-4
12	Reservoir	Route Basin #1
13	Reservoir	Route Basin #2
14	SCS Runoff	DA-5 (Impervious)
15	SCS Runoff	DA-5 (Pervious)
16	Combine	DA-5 (Entry Drive)
17	Combine	Total Offsite

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

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	-----	-----	0.279	-----	-----	0.542	0.729	-----	1.073	DA-1 (Pervious, To Basin #1)
2	SCS Runoff	-----	-----	2.107	-----	-----	3.218	3.978	-----	5.357	DA-1 (Impervious, To Basin #1)
3	SCS Runoff	-----	-----	0.152	-----	-----	0.296	0.398	-----	0.585	DA-2 (Pervious, To Basin #2)
4	SCS Runoff	-----	-----	5.711	-----	-----	8.721	10.78	-----	14.52	DA-2 (Impervious, To Basin #2)
5	SCS Runoff	-----	-----	1.361	-----	-----	2.985	4.186	-----	6.447	DA-3 (Offsite, Bypass)
6	SCS Runoff	-----	-----	0.990	-----	-----	2.124	2.957	-----	4.517	DA-4 (Pervious - Onsite, Bypass)
7	SCS Runoff	-----	-----	0.635	-----	-----	0.969	1.198	-----	1.613	DA-4 (Impervious - Onsite, Bypass)
8	Combine	1, 2,	-----	2.386	-----	-----	3.761	4.707	-----	6.431	DA-1
9	Combine	3, 4,	-----	5.863	-----	-----	9.017	11.18	-----	15.10	DA-2
10	Combine	6, 7,	-----	1.625	-----	-----	3.093	4.155	-----	6.130	DA-4
12	Reservoir	8	-----	1.177	-----	-----	2.754	3.556	-----	4.948	Route Basin #1
13	Reservoir	9	-----	2.619	-----	-----	6.836	9.503	-----	13.14	Route Basin #2
14	SCS Runoff	-----	-----	0.997	-----	-----	1.523	1.882	-----	2.535	DA-5 (Impervious)
15	SCS Runoff	-----	-----	0.203	-----	-----	0.394	0.530	-----	0.780	DA-5 (Pervious)
16	Combine	14, 15	-----	1.200	-----	-----	1.917	2.412	-----	3.315	DA-5 (Entry Drive)
17	Combine	10, 12, 13, 16	-----	6.058	-----	-----	13.65	18.36	-----	25.68	Total Offsite
Proj. file: Proposed Conditions.gpw										Wednesday, 03 / 8 / 2023	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

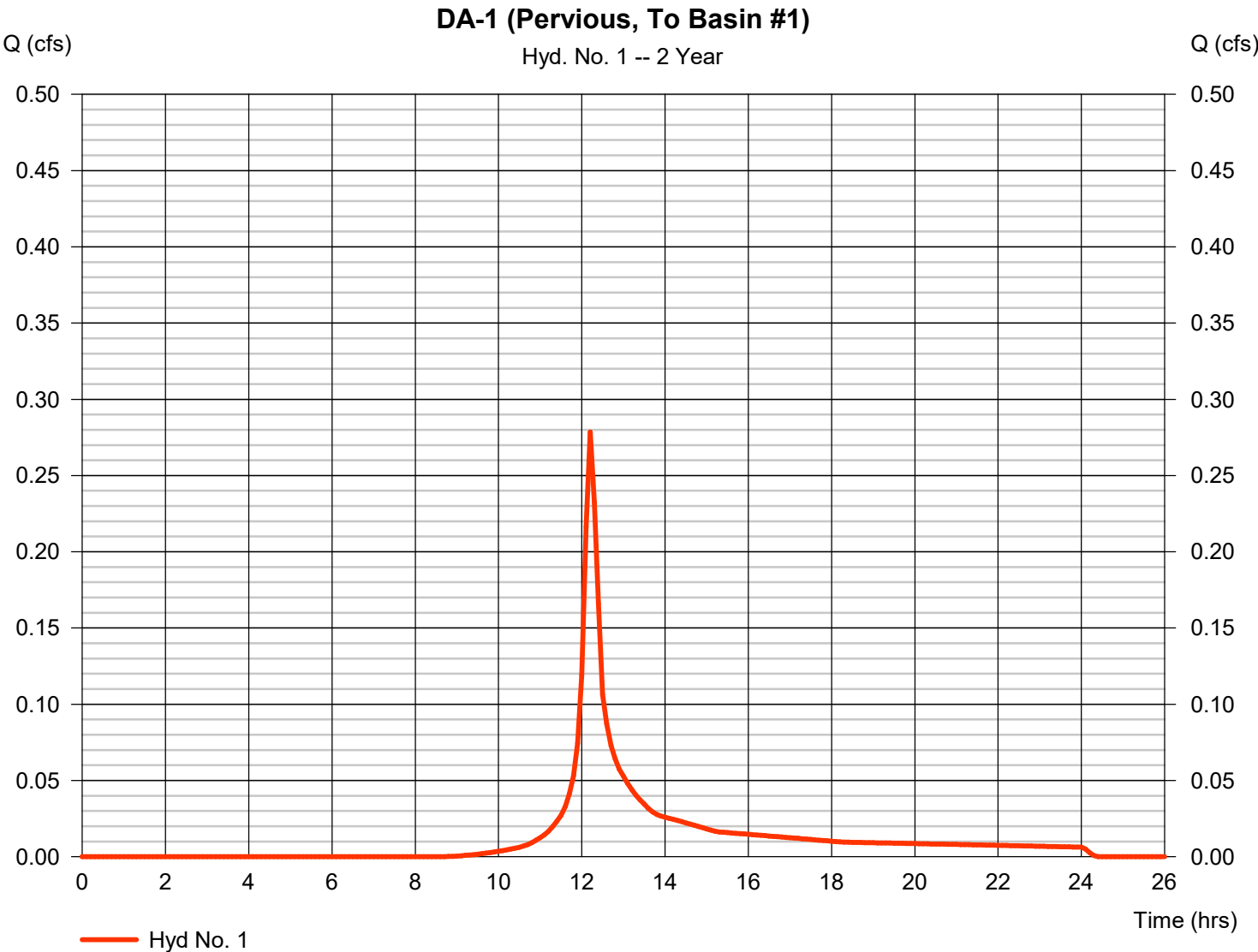
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.279	6	732	1,190	-----	-----	-----	DA-1 (Pervious, To Basin #1)
2	SCS Runoff	2.107	6	732	10,149	-----	-----	-----	DA-1 (Impervious, To Basin #1)
3	SCS Runoff	0.152	6	732	649	-----	-----	-----	DA-2 (Pervious, To Basin #2)
4	SCS Runoff	5.711	6	732	27,500	-----	-----	-----	DA-2 (Impervious, To Basin #2)
5	SCS Runoff	1.361	6	732	5,997	-----	-----	-----	DA-3 (Offsite, Bypass)
6	SCS Runoff	0.990	6	732	4,329	-----	-----	-----	DA-4 (Pervious - Onsite, Bypass)
7	SCS Runoff	0.635	6	732	3,056	-----	-----	-----	DA-4 (Impervious - Onsite, Bypass)
8	Combine	2.386	6	732	11,338	1, 2,	-----	-----	DA-1
9	Combine	5.863	6	732	28,149	3, 4,	-----	-----	DA-2
10	Combine	1.625	6	732	7,385	6, 7,	-----	-----	DA-4
12	Reservoir	1.177	6	744	11,336	8	367.11	1,843	Route Basin #1
13	Reservoir	2.619	6	744	28,147	9	367.87	4,904	Route Basin #2
14	SCS Runoff	0.997	6	732	4,802	-----	-----	-----	DA-5 (Impervious)
15	SCS Runoff	0.203	6	732	865	-----	-----	-----	DA-5 (Pervious)
16	Combine	1.200	6	732	5,667	14, 15	-----	-----	DA-5 (Entry Drive)
17	Combine	6.058	6	732	52,535	10, 12, 13, 16	-----	-----	Total Offsite
Proposed Conditions.gpw					Return Period: 2 Year			Wednesday, 03 / 8 / 2023	

Hydrograph Report

Hyd. No. 1

DA-1 (Pervious, To Basin #1)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.279 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	1,190 cuft
Drainage area	=	0.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.44 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

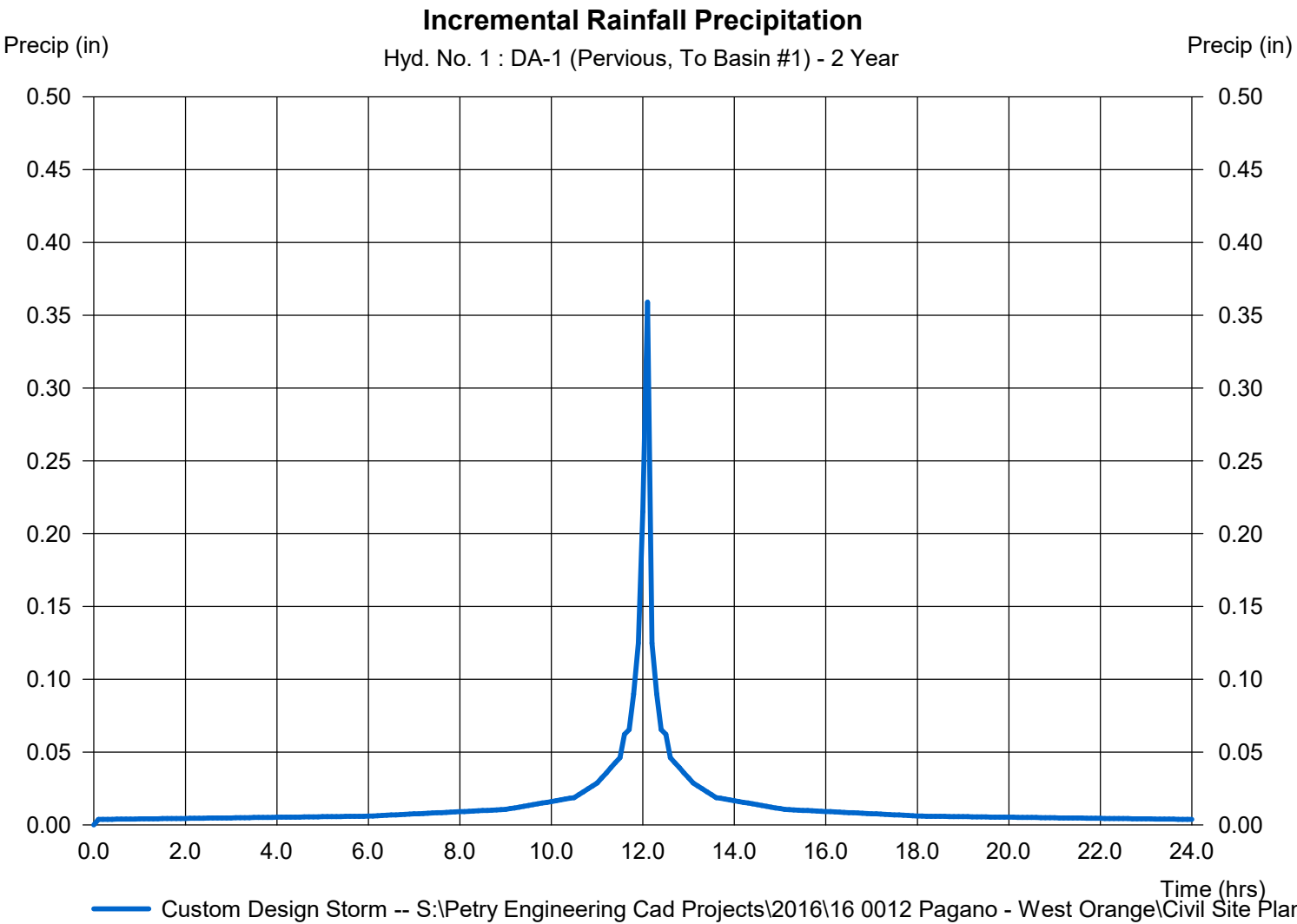


Precipitation Report

Hyd. No. 1

DA-1 (Pervious, To Basin #1)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

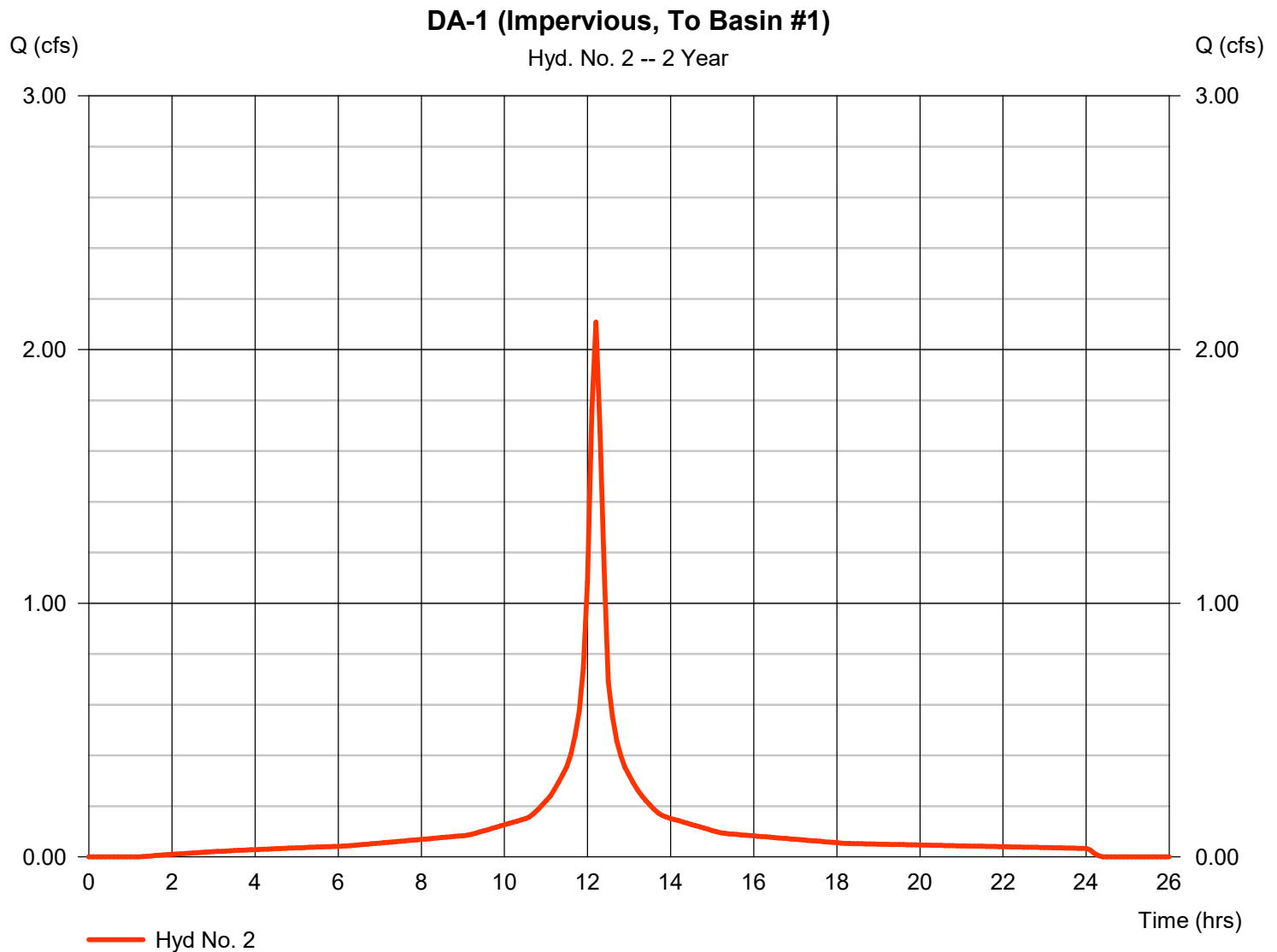
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 2

DA-1 (Impervious, To Basin #1)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.107 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 10,149 cuft
Drainage area	= 0.930 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.44 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\1610-0012 Page 484 West Orange\Civil Site		



Precipitation Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

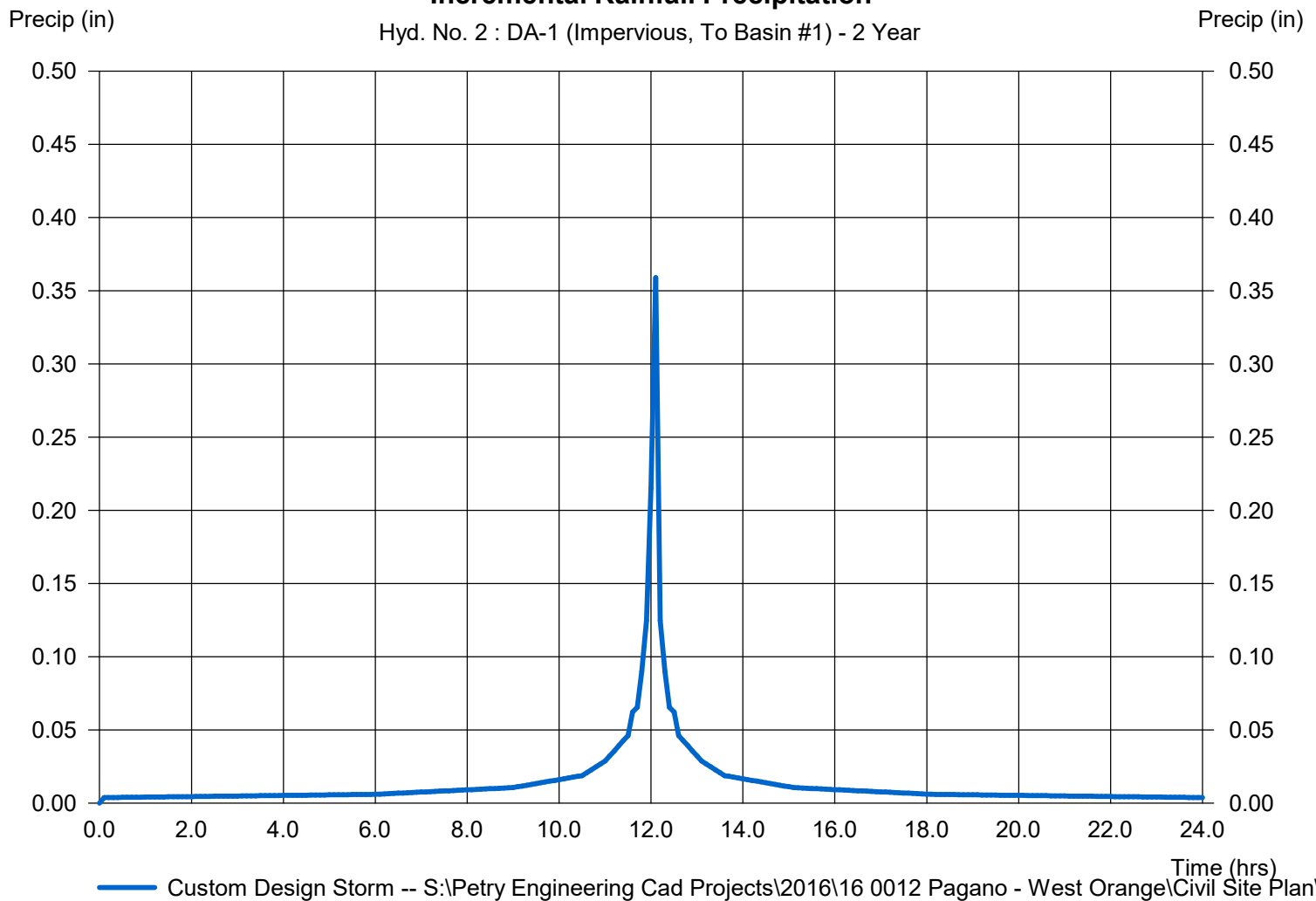
Hyd. No. 2

DA-1 (Impervious, To Basin #1)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

Incremental Rainfall Precipitation

Hyd. No. 2 : DA-1 (Impervious, To Basin #1) - 2 Year



Hydrograph Report

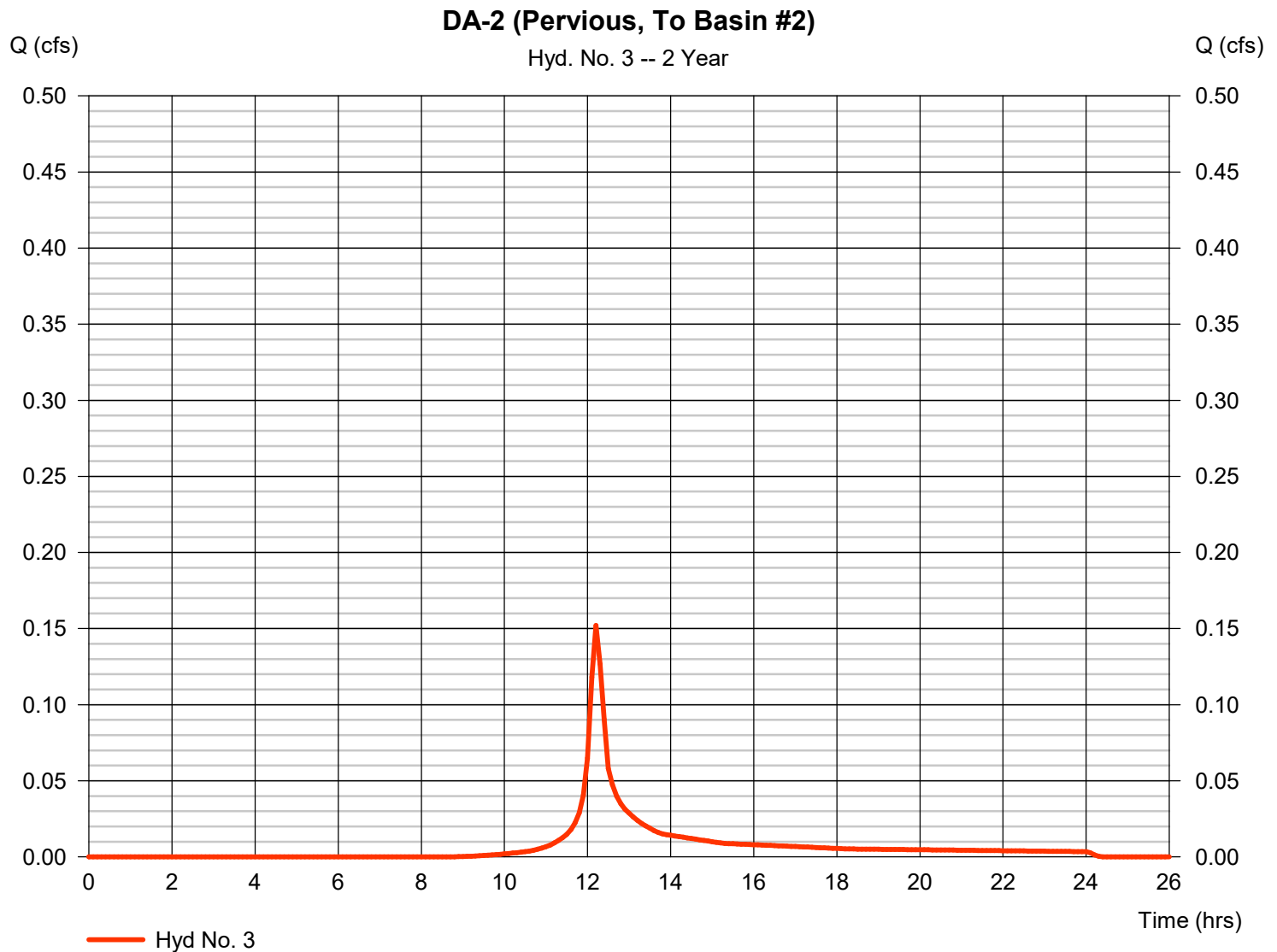
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 3

DA-2 (Pervious, To Basin #2)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.152 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 649 cuft
Drainage area	= 0.120 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.44 in	Distribution	= Custom
Storm duration	= S:\Petty Engineering Cad Projects\1610012 Page 484		

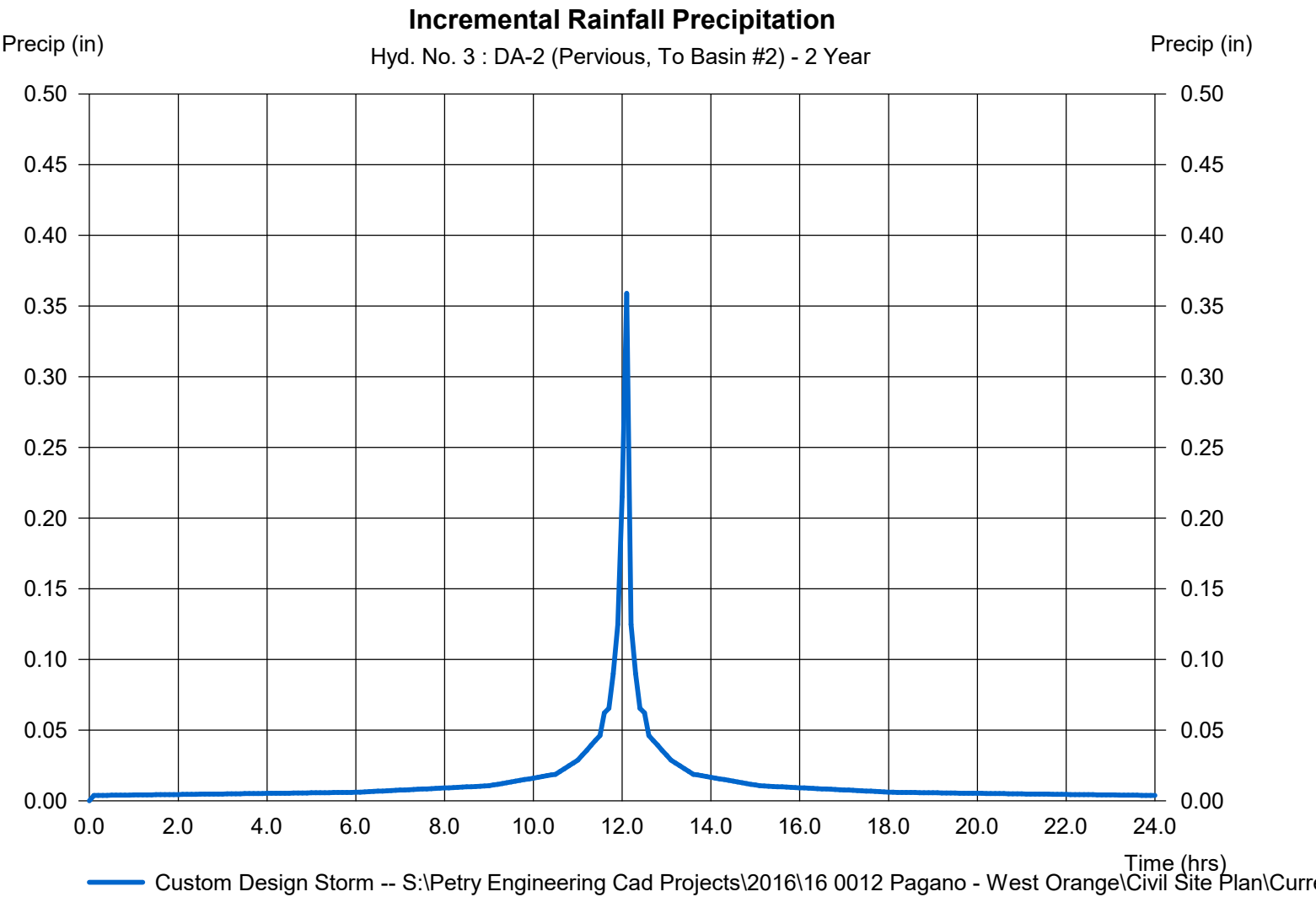


Precipitation Report

Hyd. No. 3

DA-2 (Pervious, To Basin #2)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

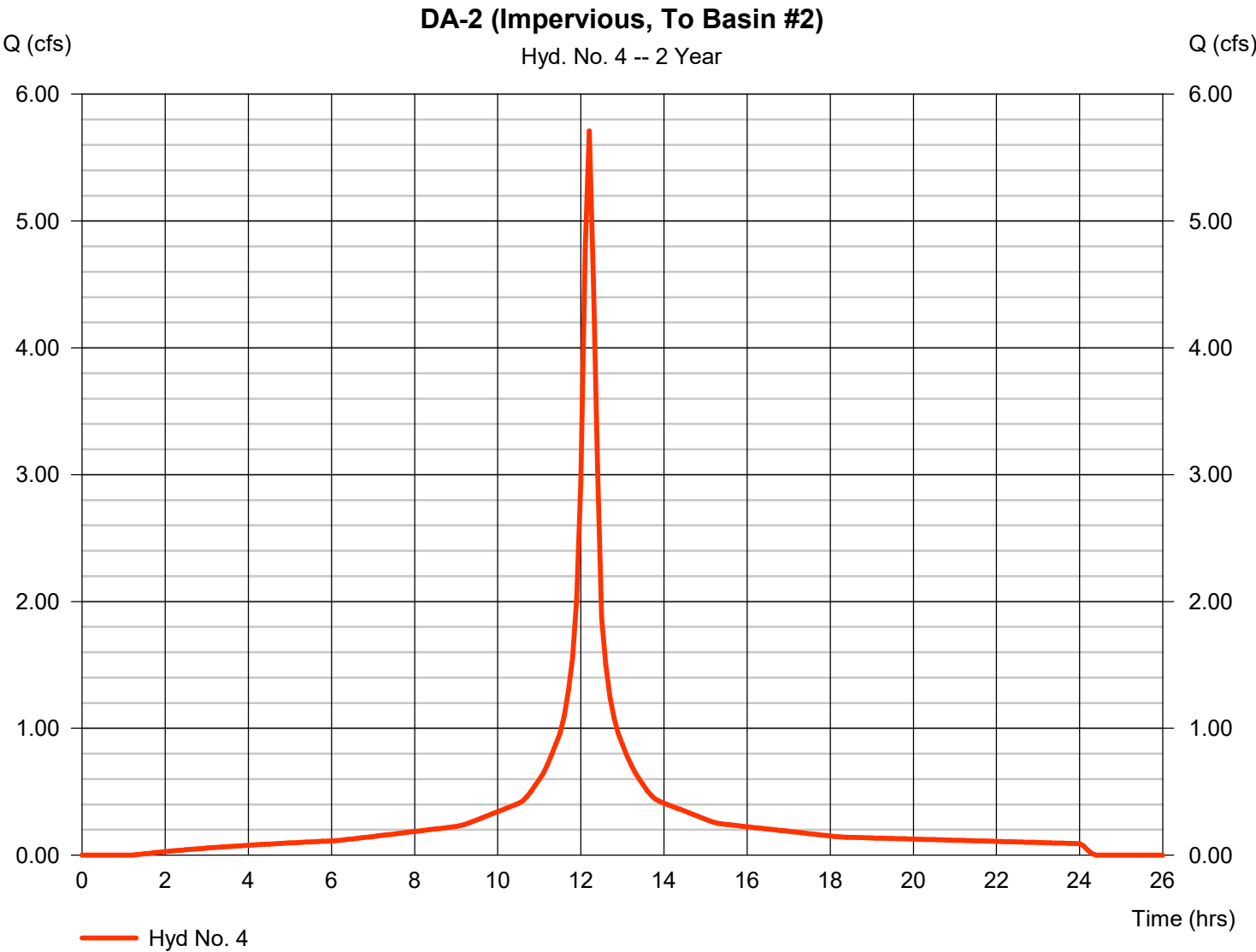


Hydrograph Report

Hyd. No. 4

DA-2 (Impervious, To Basin #2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.711 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	27,500 cuft
Drainage area	=	2.520 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.44 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

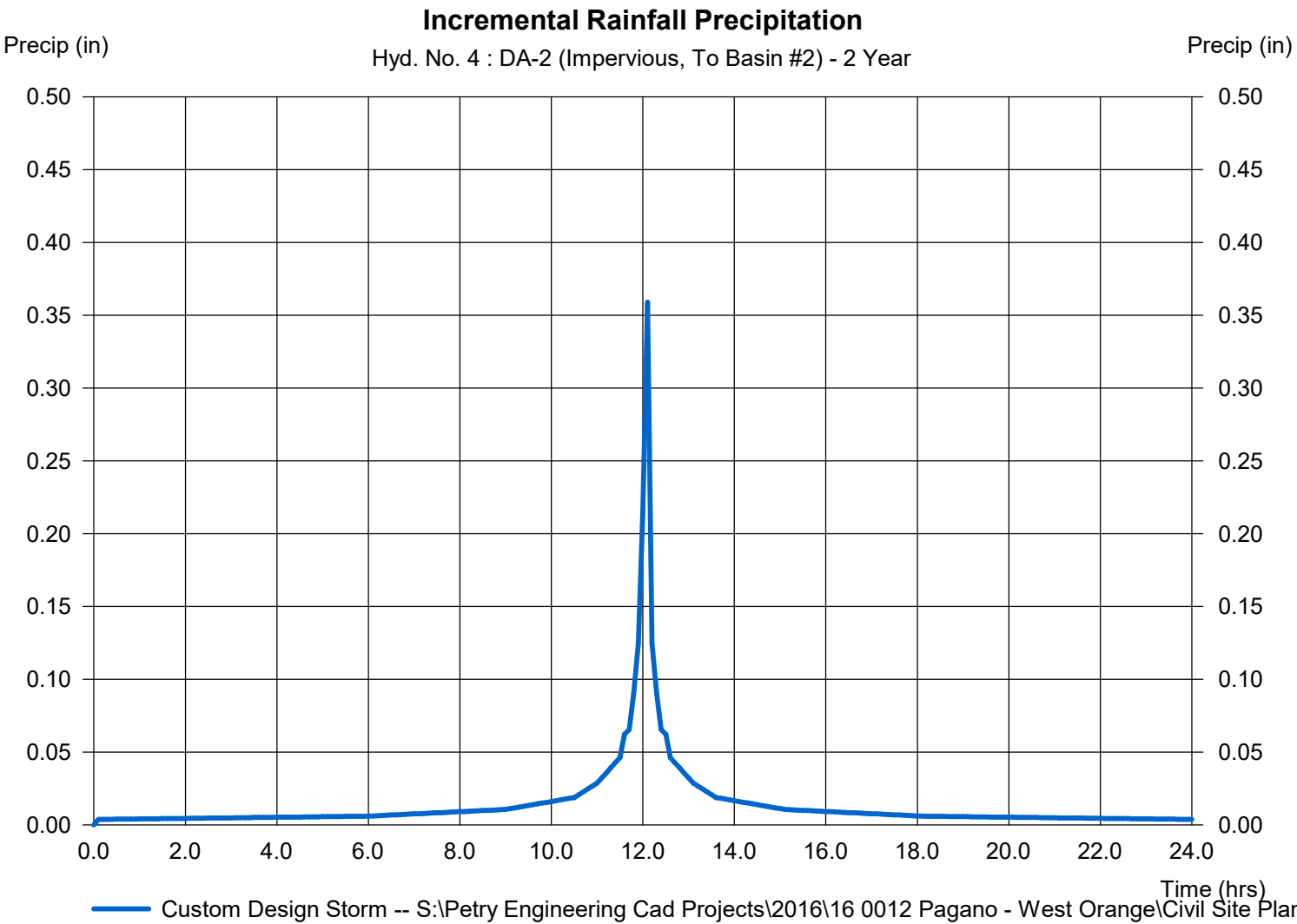


Precipitation Report

Hyd. No. 4

DA-2 (Impervious, To Basin #2)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



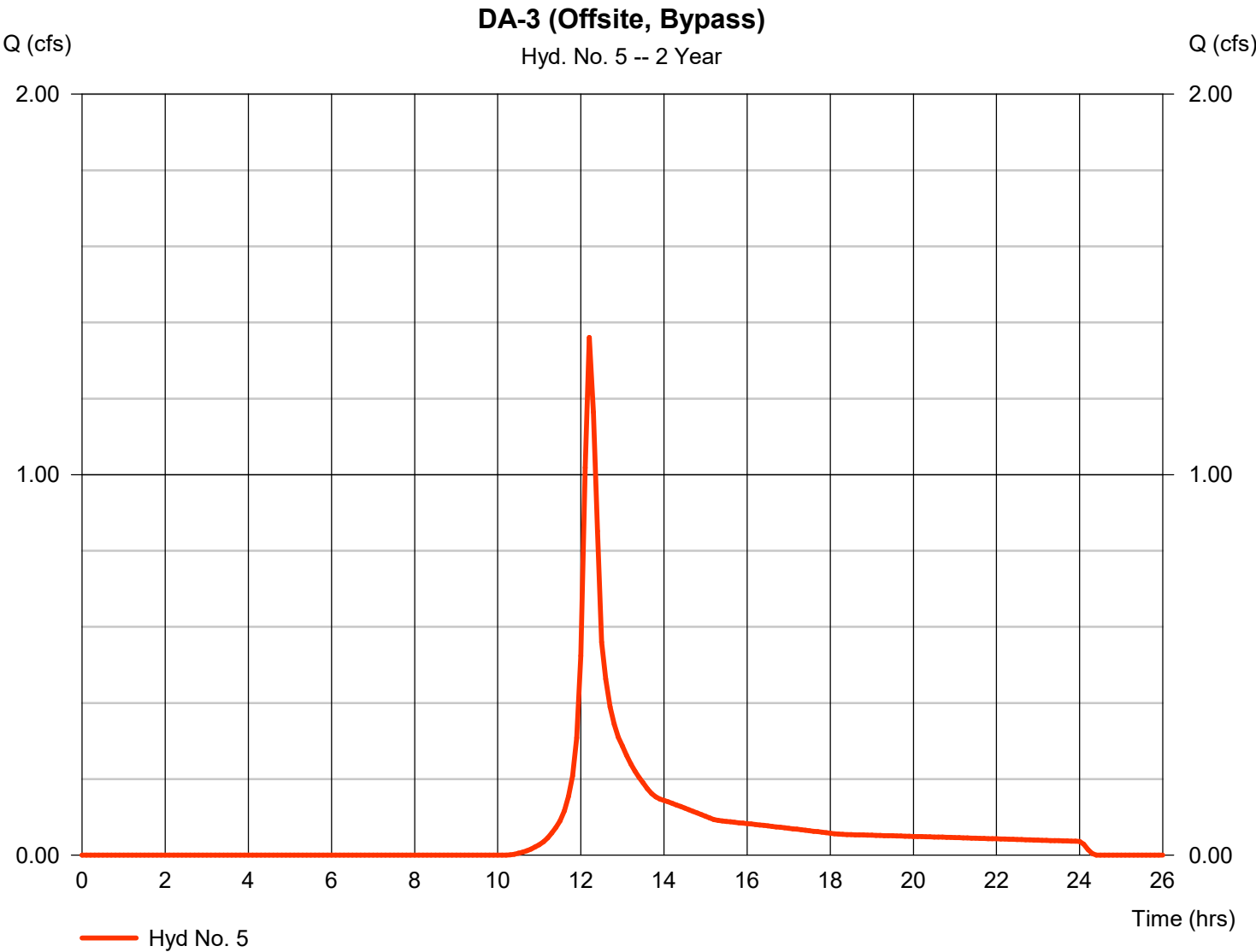
Hydrograph Report

Hyd. No. 5

DA-3 (Offsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.361 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	5,997 cuft
Drainage area	=	1.470 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.44 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\1610-0012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.070 x 98) + (0.840 x 74) + (0.480 x 70) + (0.080 x 79)] / 1.470



Precipitation Report

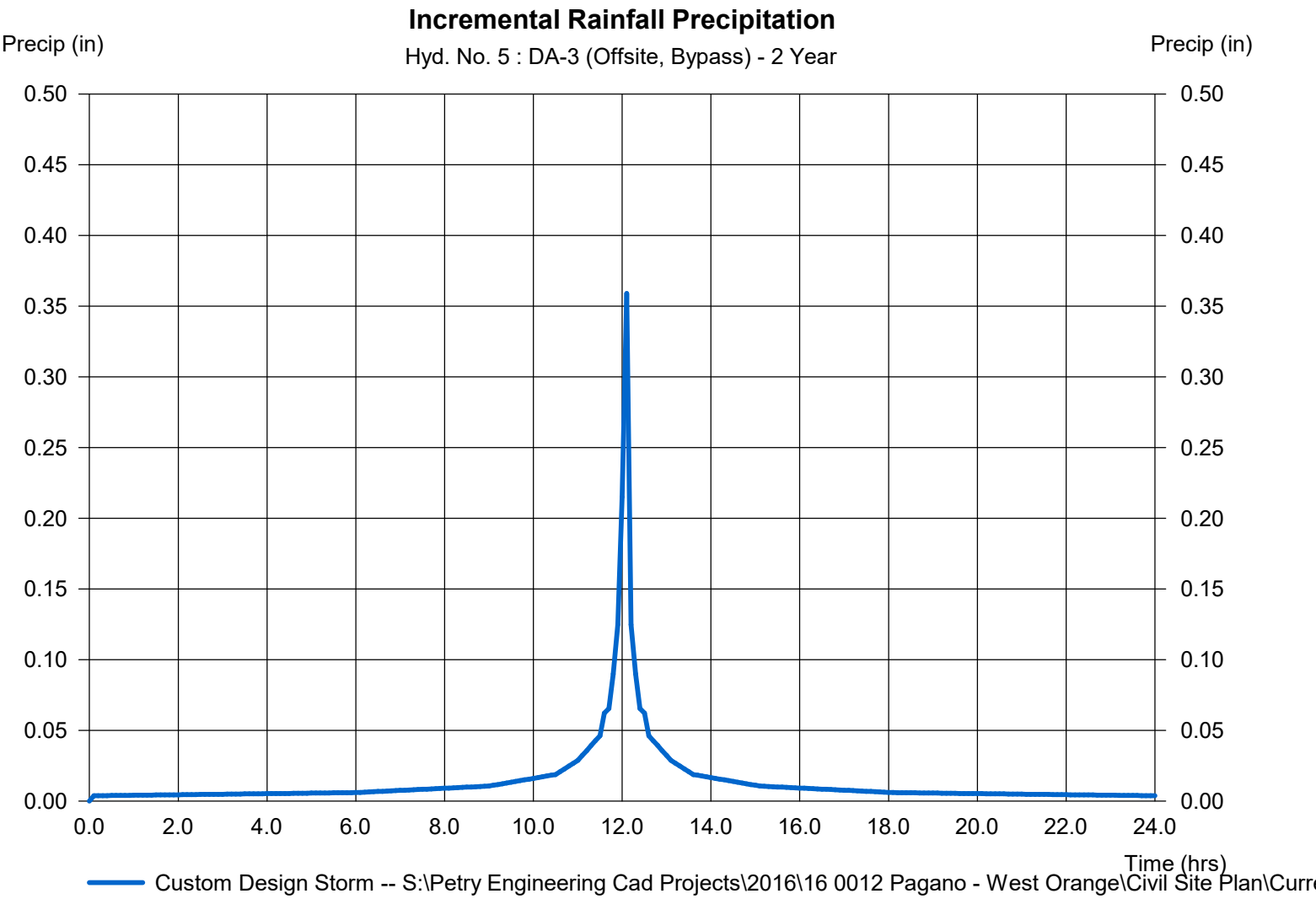
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 5

DA-3 (Offsite, Bypass)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



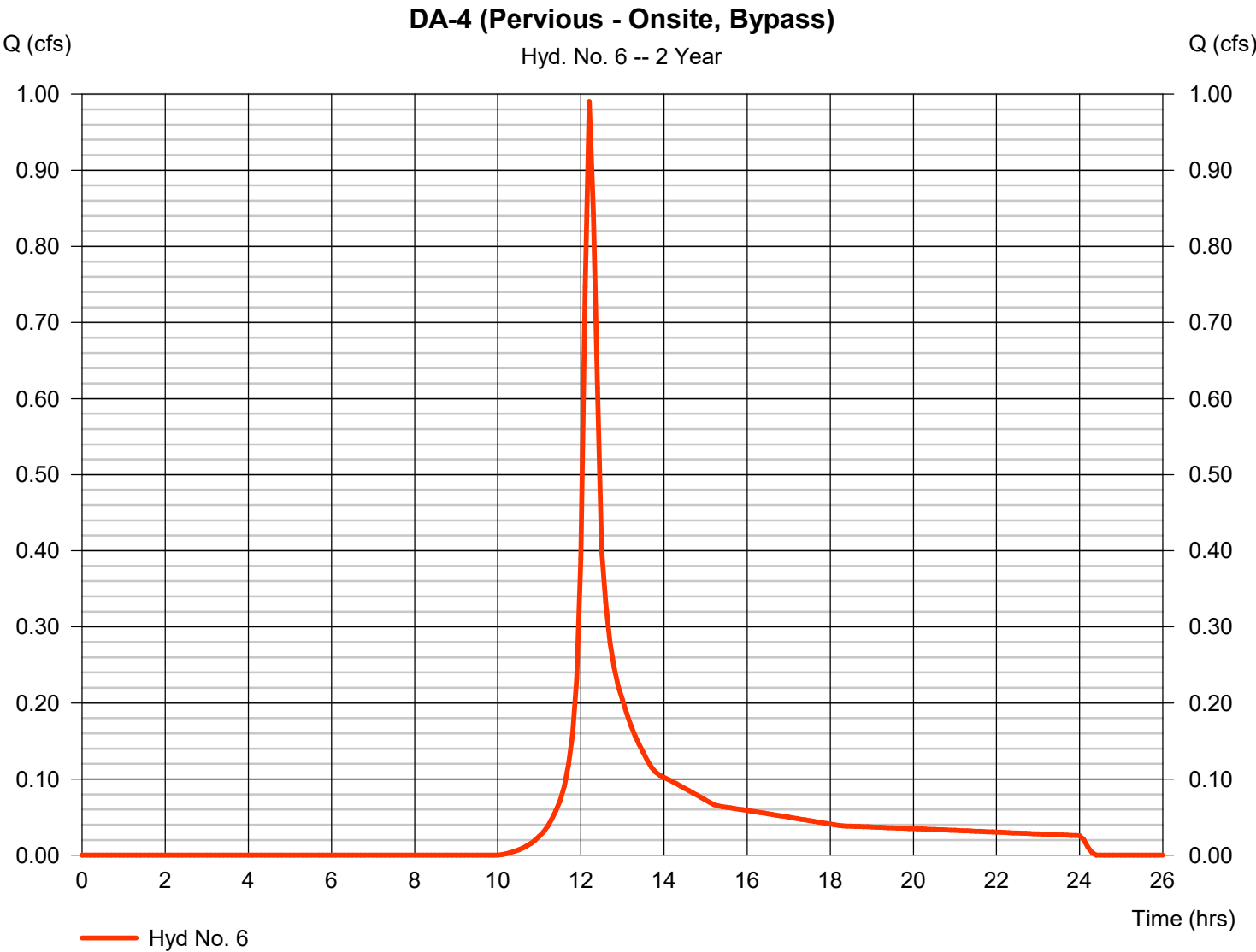
Hydrograph Report

Hyd. No. 6

DA-4 (Pervious - Onsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.990 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	4,329 cuft
Drainage area	=	1.010 ac	Curve number	=	75*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.44 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\1610012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.770 x 73) + (0.240 x 80)] / 1.010

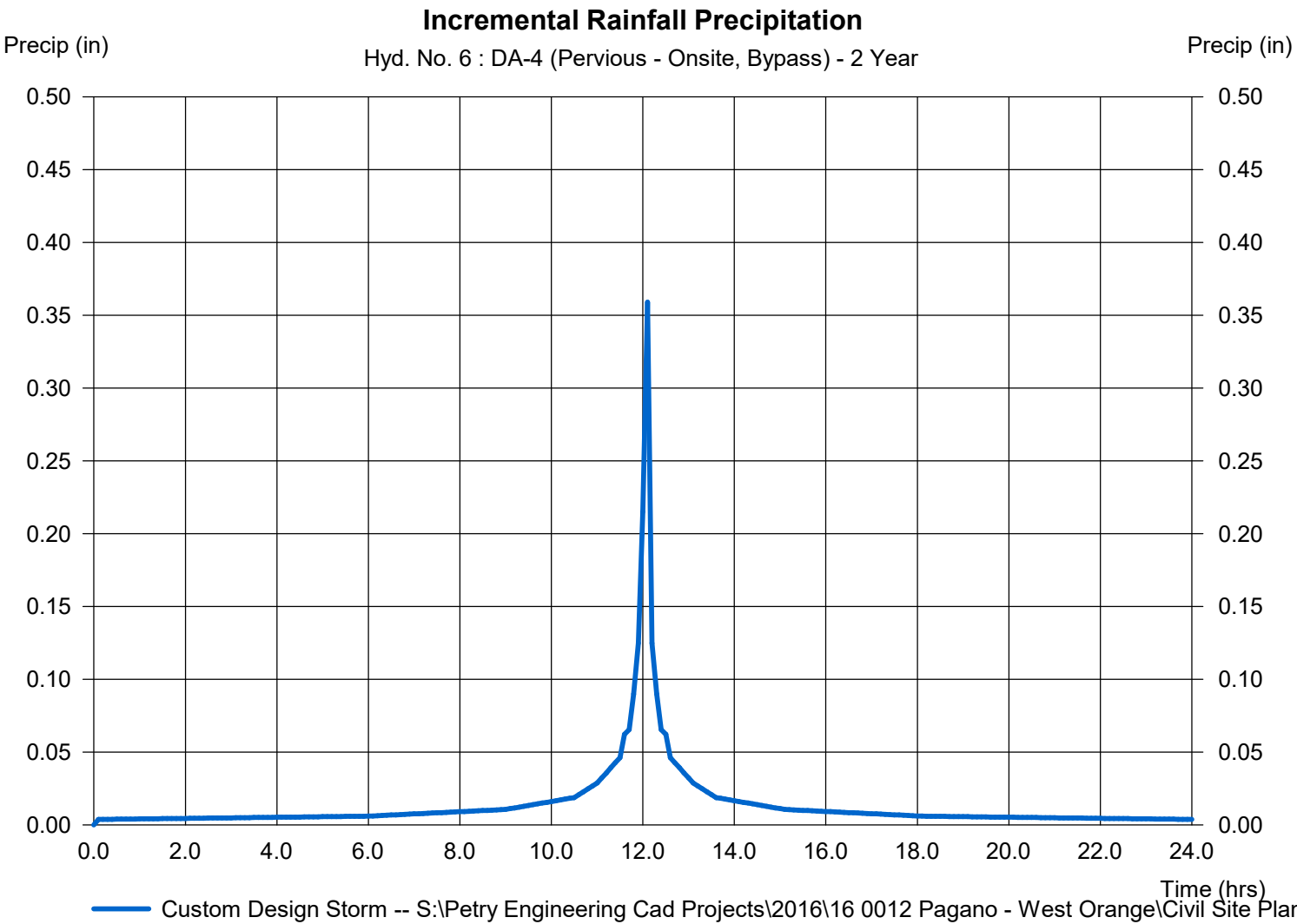


Precipitation Report

Hyd. No. 6

DA-4 (Pervious - Onsite, Bypass)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

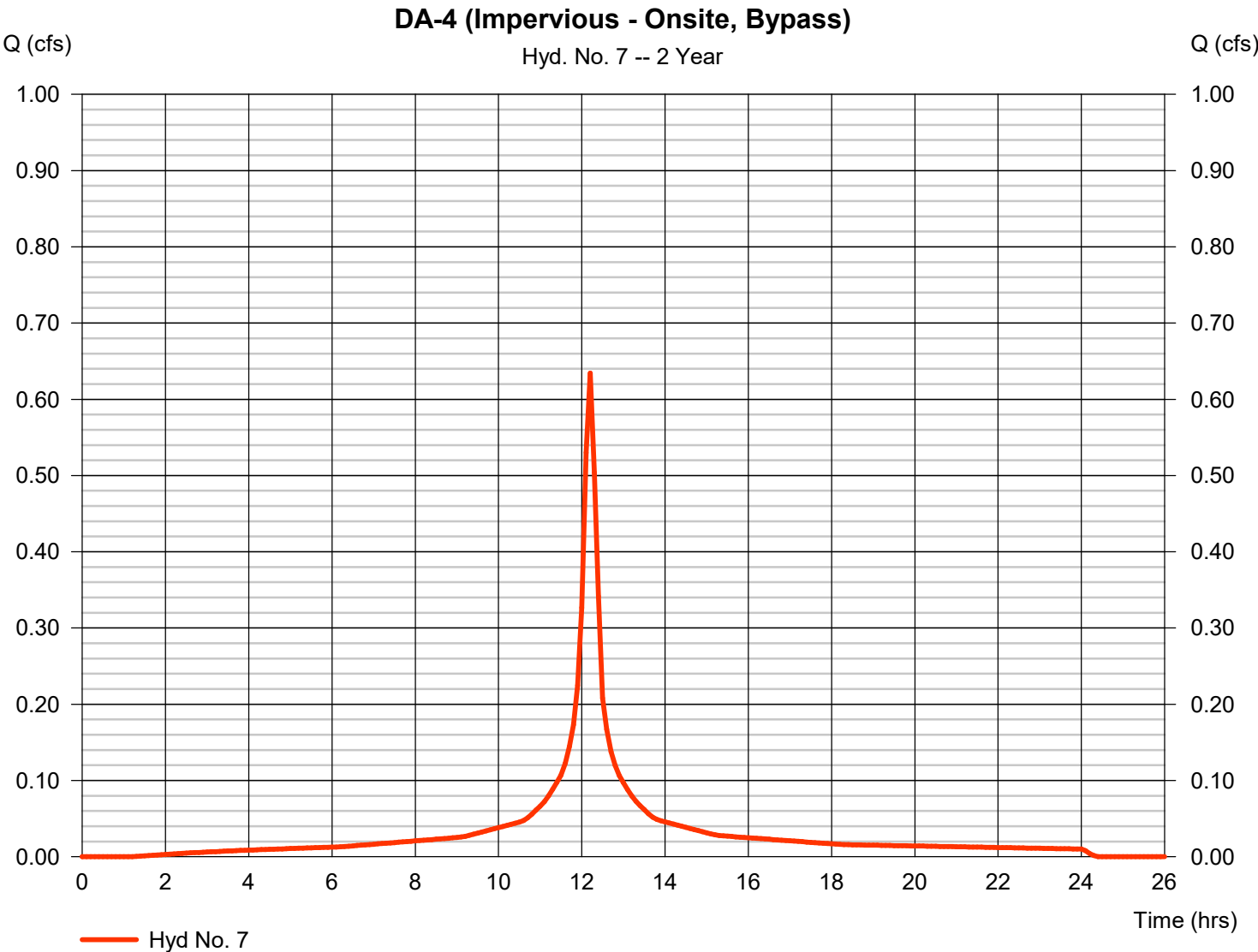


Hydrograph Report

Hyd. No. 7

DA-4 (Impervious - Onsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.635 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	3,056 cuft
Drainage area	=	0.280 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.44 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

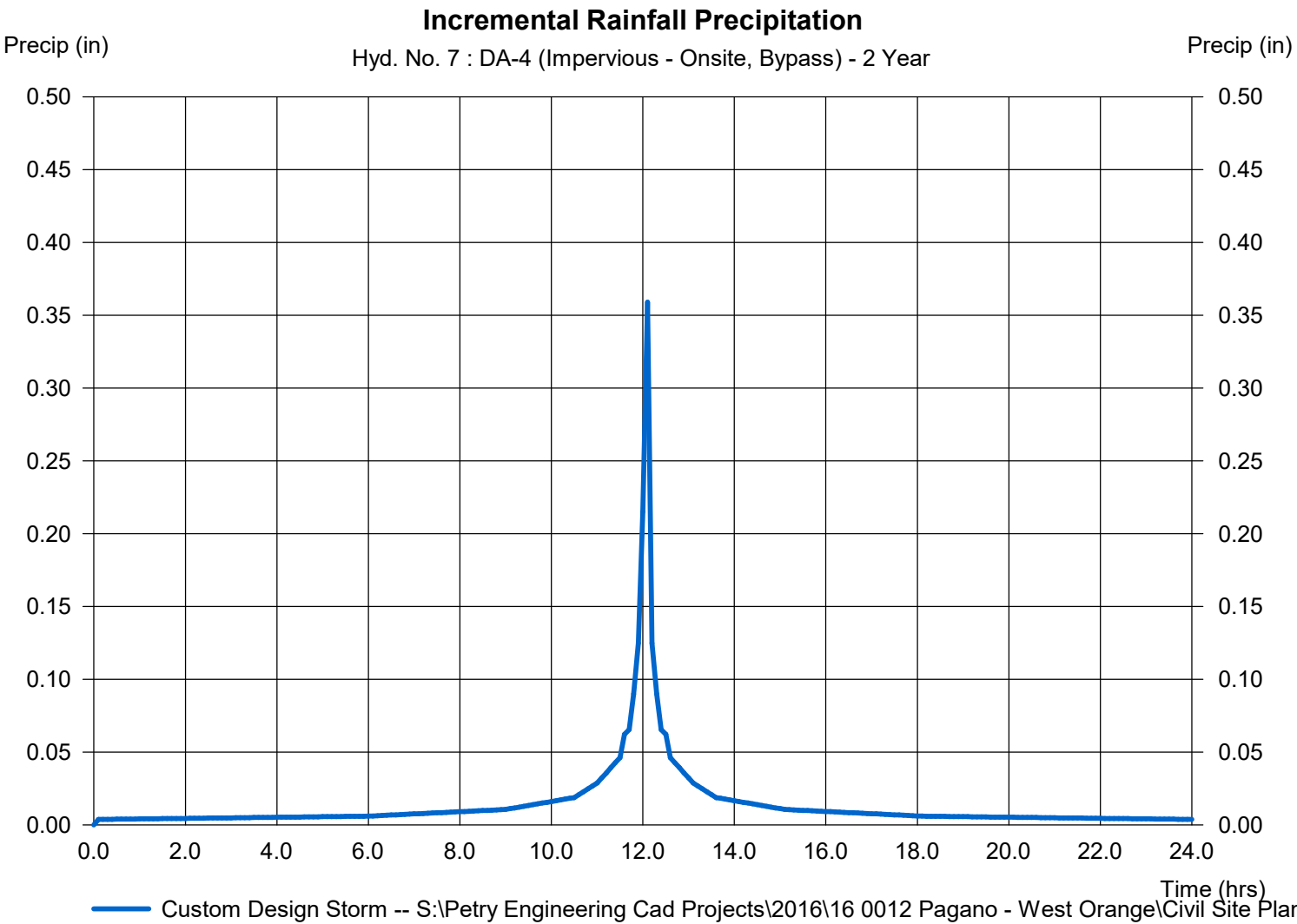


Precipitation Report

Hyd. No. 7

DA-4 (Impervious - Onsite, Bypass)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

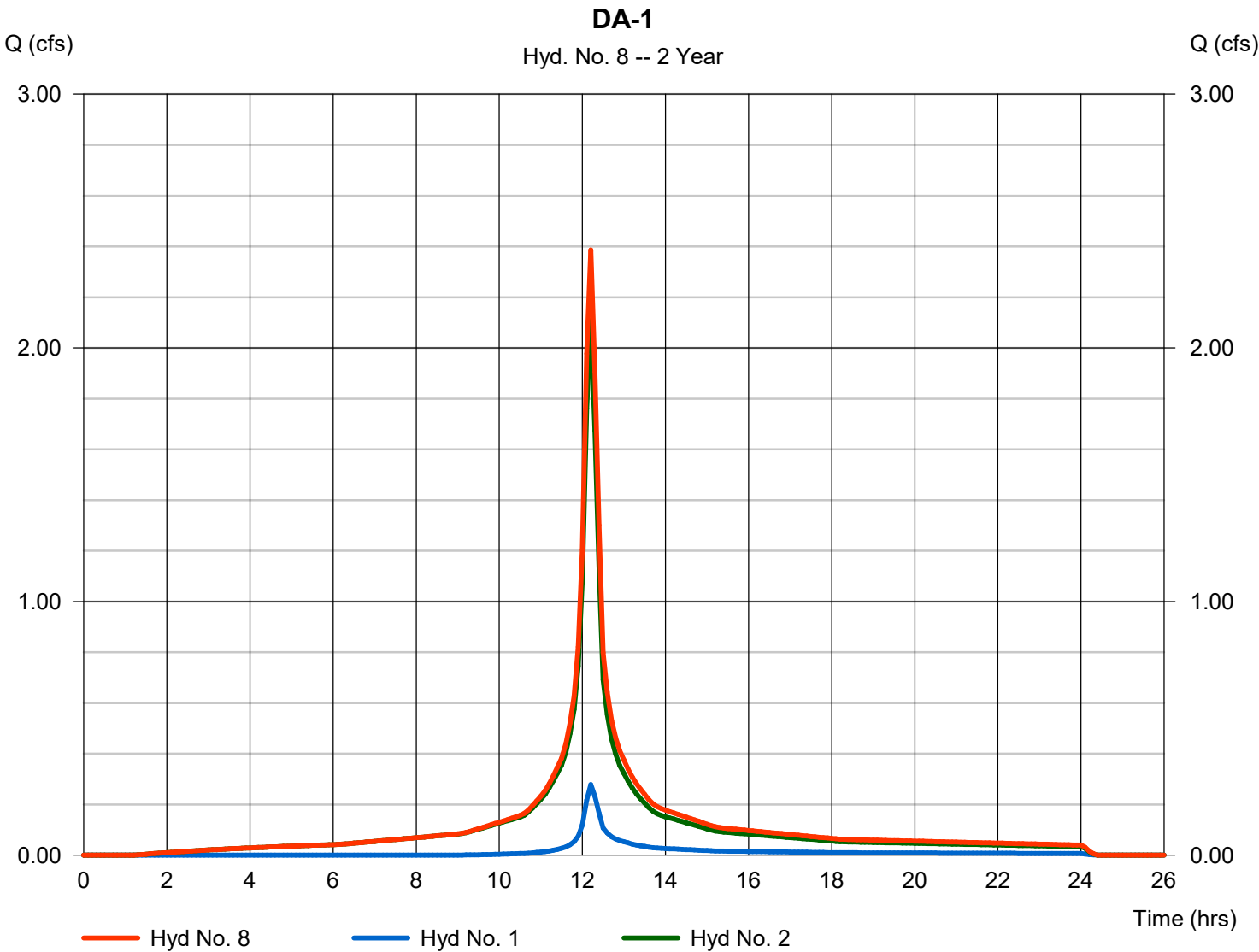
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 8

DA-1

Hydrograph type	= Combine	Peak discharge	= 2.386 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 11,338 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 1.150 ac



Hydrograph Report

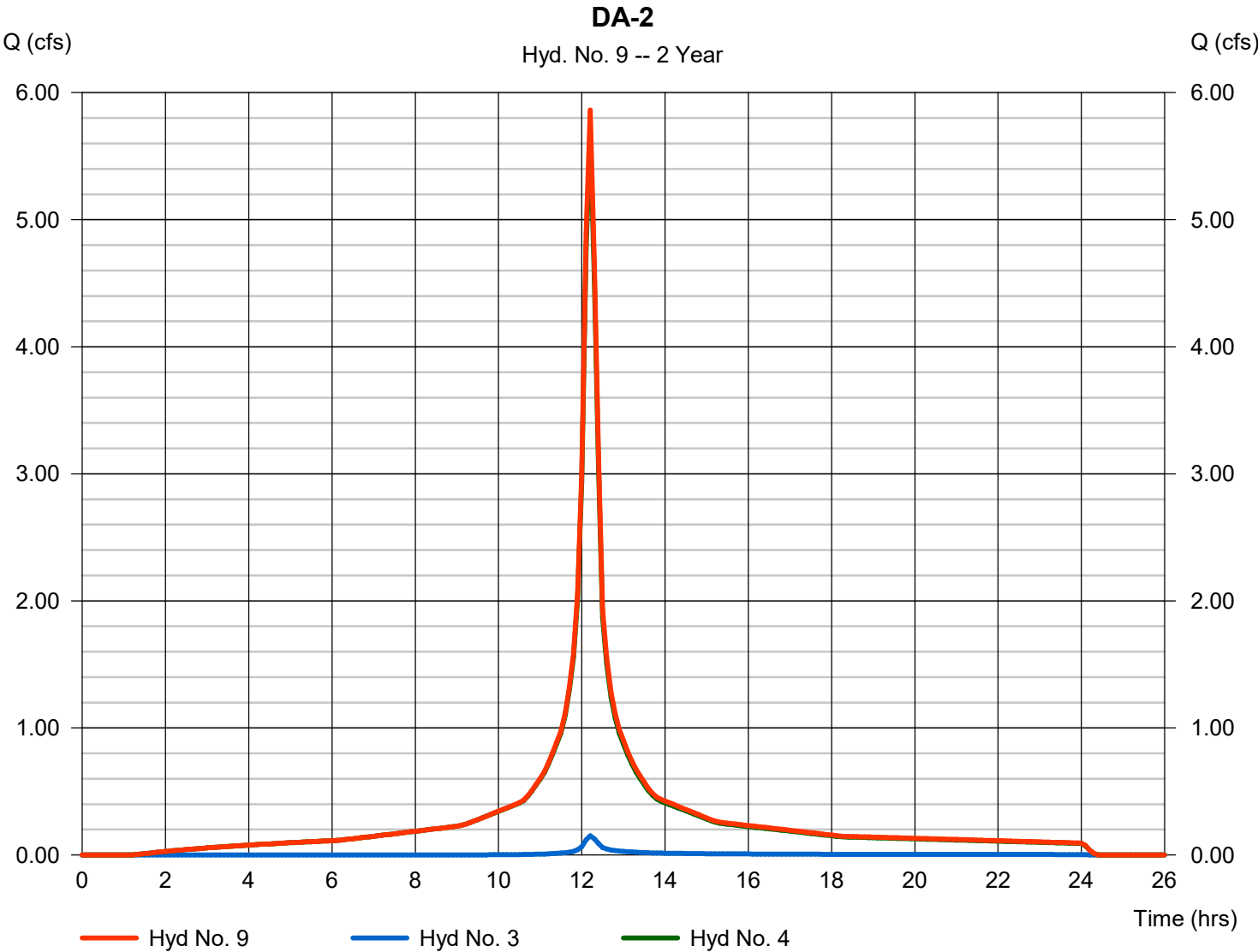
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 9

DA-2

Hydrograph type	= Combine	Peak discharge	= 5.863 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 28,149 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.640 ac



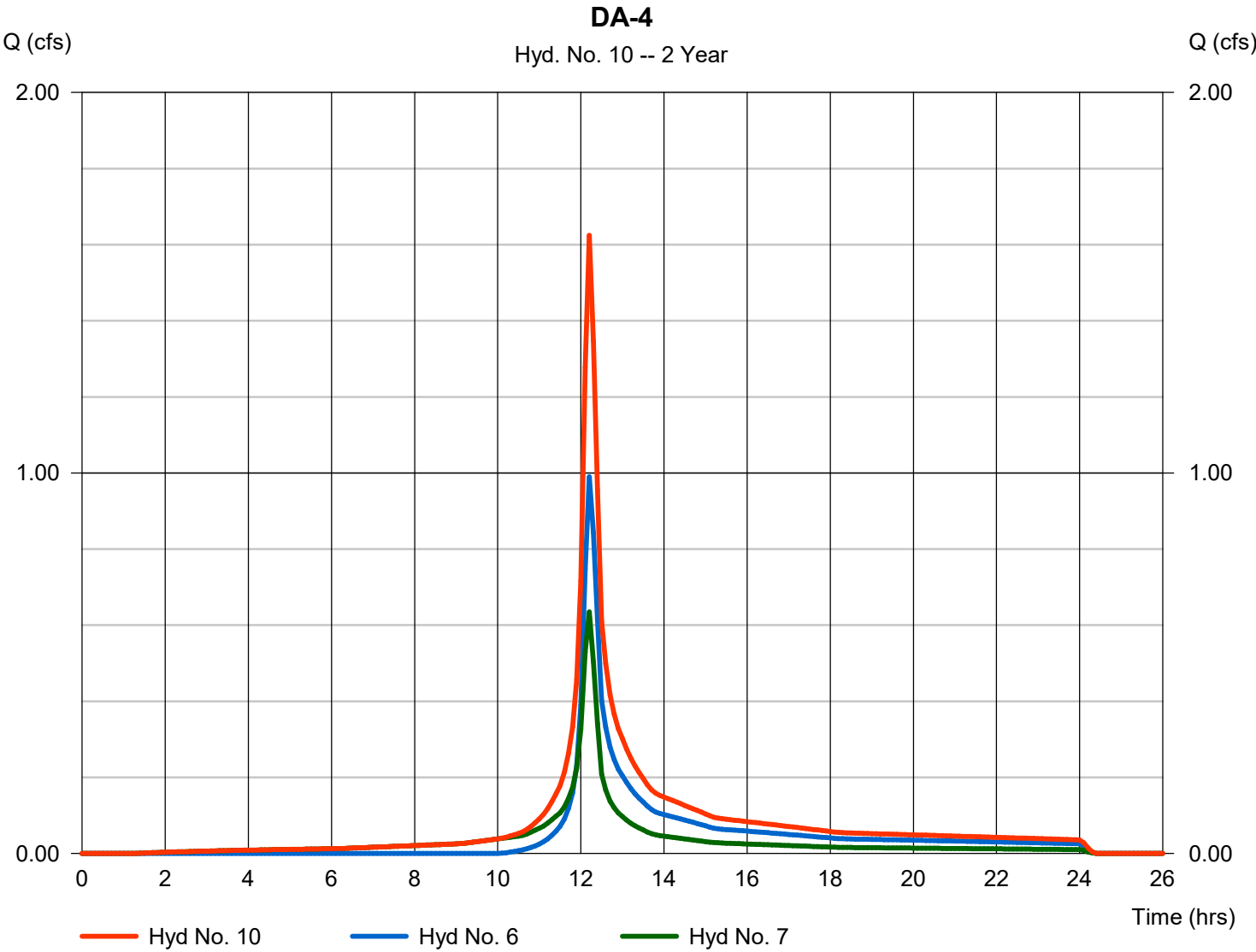
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 10

DA-4			
Hydrograph type	= Combine	Peak discharge	= 1.625 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 7,385 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 1.290 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

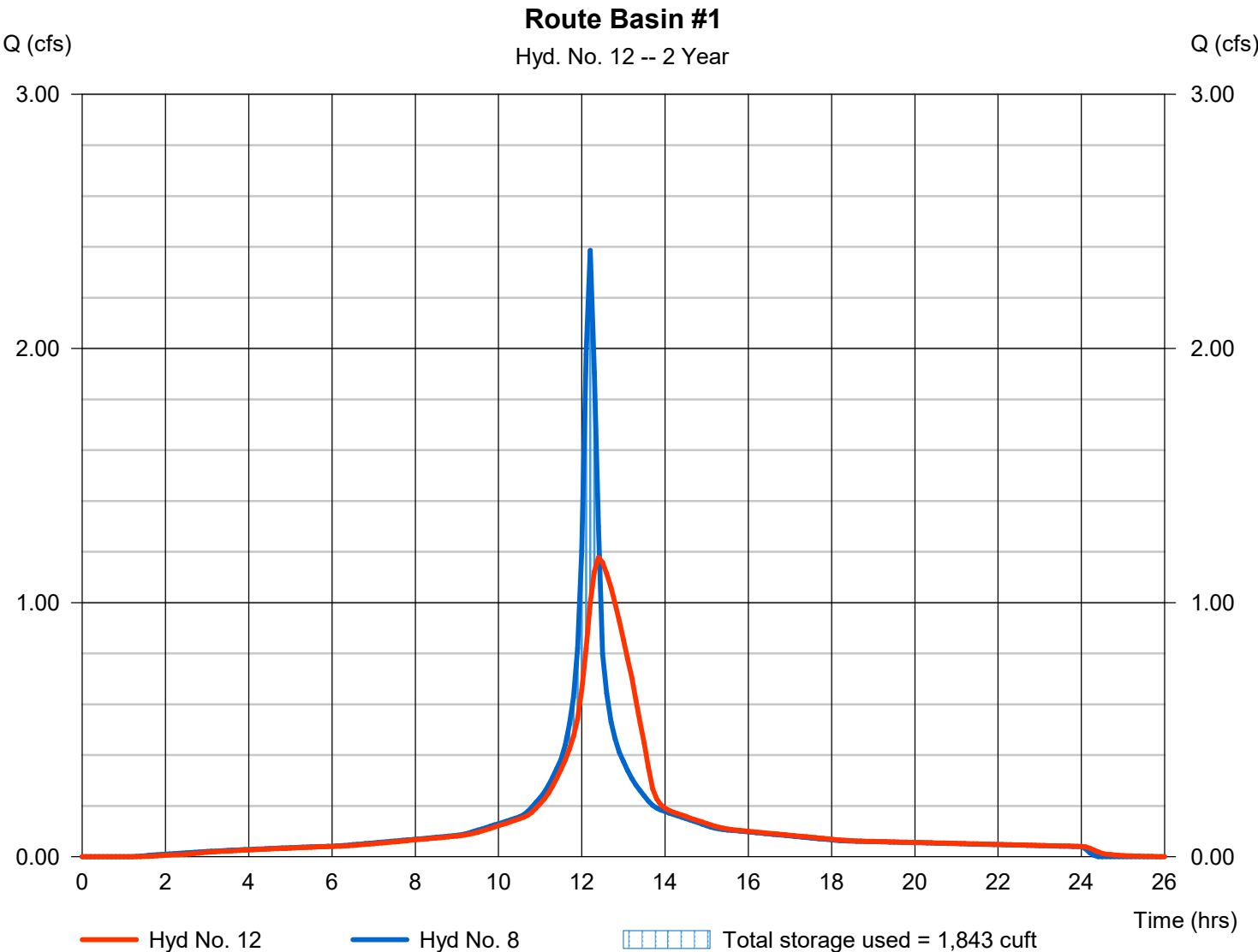
Wednesday, 03 / 8 / 2023

Hyd. No. 12

Route Basin #1

Hydrograph type	= Reservoir	Peak discharge	= 1.177 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.40 hrs
Time interval	= 6 min	Hyd. volume	= 11,336 cuft
Inflow hyd. No.	= 8 - DA-1	Max. Elevation	= 367.11 ft
Reservoir name	= Basin #1	Max. Storage	= 1,843 cuft

Storage Indication method used.



Pond Report

22

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Pond No. 1 - Basin #1

Pond Data

UG Chambers -Invert elev. = 365.75 ft, Rise x Span = 3.00 x 3.00 ft, Barrel Len = 110.00 ft, No. Barrels = 5, Slope = 0.00%, Headers = Yes

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	365.75	n/a	0	0
0.30	366.05	n/a	218	218
0.60	366.35	n/a	378	596
0.90	366.65	n/a	460	1,057
1.20	366.95	n/a	507	1,564
1.50	367.25	n/a	530	2,093
1.80	367.55	n/a	530	2,623
2.10	367.85	n/a	507	3,130
2.40	368.15	n/a	460	3,590
2.70	368.45	n/a	378	3,968
3.00	368.75	n/a	218	4,185

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 4.00	6.00	0.00	0.00
Span (in)	= 8.00	6.00	0.00	0.00
No. Barrels	= 1	3	0	0
Invert El. (ft)	= 365.75	367.08	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 368.58	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	365.75	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.30	218	366.05	0.37 ic	0.00	---	---	0.00	---	---	---	---	---	0.373
0.60	596	366.35	0.70 ic	0.00	---	---	0.00	---	---	---	---	---	0.704
0.90	1,057	366.65	0.92 ic	0.00	---	---	0.00	---	---	---	---	---	0.916
1.20	1,564	366.95	1.09 ic	0.00	---	---	0.00	---	---	---	---	---	1.088
1.50	2,093	367.25	1.24 ic	0.25 ic	---	---	0.00	---	---	---	---	---	1.484
1.80	2,623	367.55	1.37 ic	1.34 ic	---	---	0.00	---	---	---	---	---	2.709
2.10	3,130	367.85	1.49 ic	2.05 ic	---	---	0.00	---	---	---	---	---	3.533
2.40	3,590	368.15	1.60 ic	2.57 ic	---	---	0.00	---	---	---	---	---	4.167
2.70	3,968	368.45	1.70 ic	3.00 ic	---	---	0.00	---	---	---	---	---	4.704
3.00	4,185	368.75	1.80 ic	3.38 ic	---	---	0.93	---	---	---	---	---	6.114

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

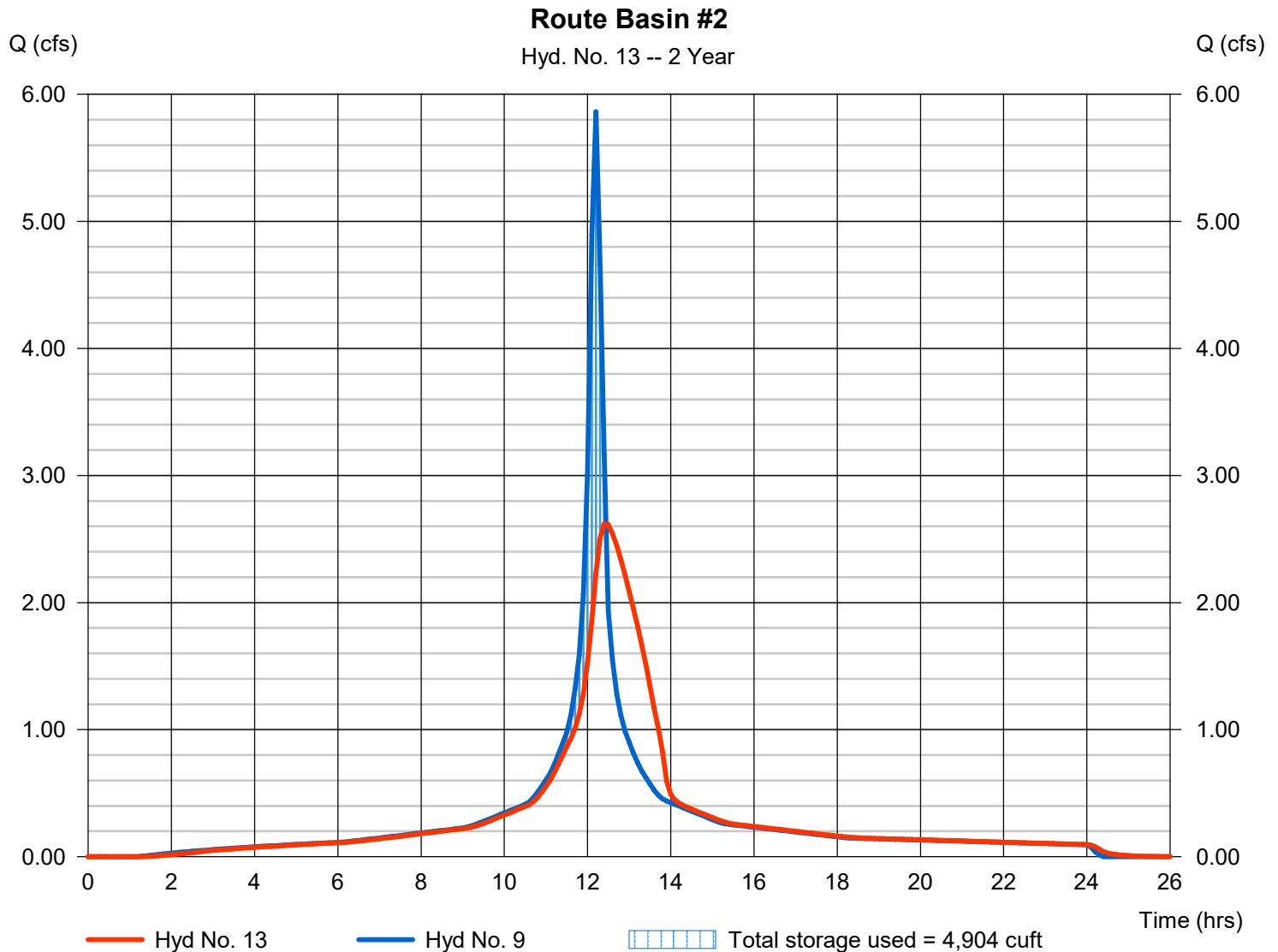
Hyd. No. 13

Route Basin #2

Hydrograph type = Reservoir
 Storm frequency = 2 yrs
 Time interval = 6 min
 Inflow hyd. No. = 9 - DA-2
 Reservoir name = Basin #2

Peak discharge = 2.619 cfs
 Time to peak = 12.40 hrs
 Hyd. volume = 28,147 cuft
 Max. Elevation = 367.87 ft
 Max. Storage = 4,904 cuft

Storage Indication method used.



Pond No. 2 - Basin #2

Pond Data

UG Chambers -Invert elev. = 365.75 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 170.00 ft, No. Barrels = 4, Slope = 0.00%, Headers = Yes

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	365.75	n/a	0	0
0.40	366.15	n/a	474	474
0.80	366.55	n/a	823	1,296
1.20	366.95	n/a	1,001	2,297
1.60	367.35	n/a	1,102	3,399
2.00	367.75	n/a	1,152	4,551
2.40	368.15	n/a	1,152	5,702
2.80	368.55	n/a	1,102	6,804
3.20	368.95	n/a	1,000	7,805
3.60	369.35	n/a	822	8,627
4.00	369.75	n/a	473	9,100

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 4.00	10.00	0.00	0.00
Span (in)	= 14.00	26.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 365.75	367.90	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 369.58	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	365.75	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.40	474	366.15	0.90 ic	0.00	---	---	0.00	---	---	---	---	---	0.904
0.80	1,296	366.55	1.49 ic	0.00	---	---	0.00	---	---	---	---	---	1.490
1.20	2,297	366.95	1.90 ic	0.00	---	---	0.00	---	---	---	---	---	1.903
1.60	3,399	367.35	2.24 ic	0.00	---	---	0.00	---	---	---	---	---	2.242
2.00	4,551	367.75	2.54 ic	0.00	---	---	0.00	---	---	---	---	---	2.535
2.40	5,702	368.15	2.80 ic	0.92 ic	---	---	0.00	---	---	---	---	---	3.720
2.80	6,804	368.55	3.04 ic	3.87 ic	---	---	0.00	---	---	---	---	---	6.904
3.20	7,805	368.95	3.26 ic	6.92 ic	---	---	0.00	---	---	---	---	---	10.18
3.60	8,627	369.35	3.47 ic	8.84 ic	---	---	0.00	---	---	---	---	---	12.31
4.00	9,100	369.75	3.67 ic	10.41 ic	---	---	0.93	---	---	---	---	---	15.01

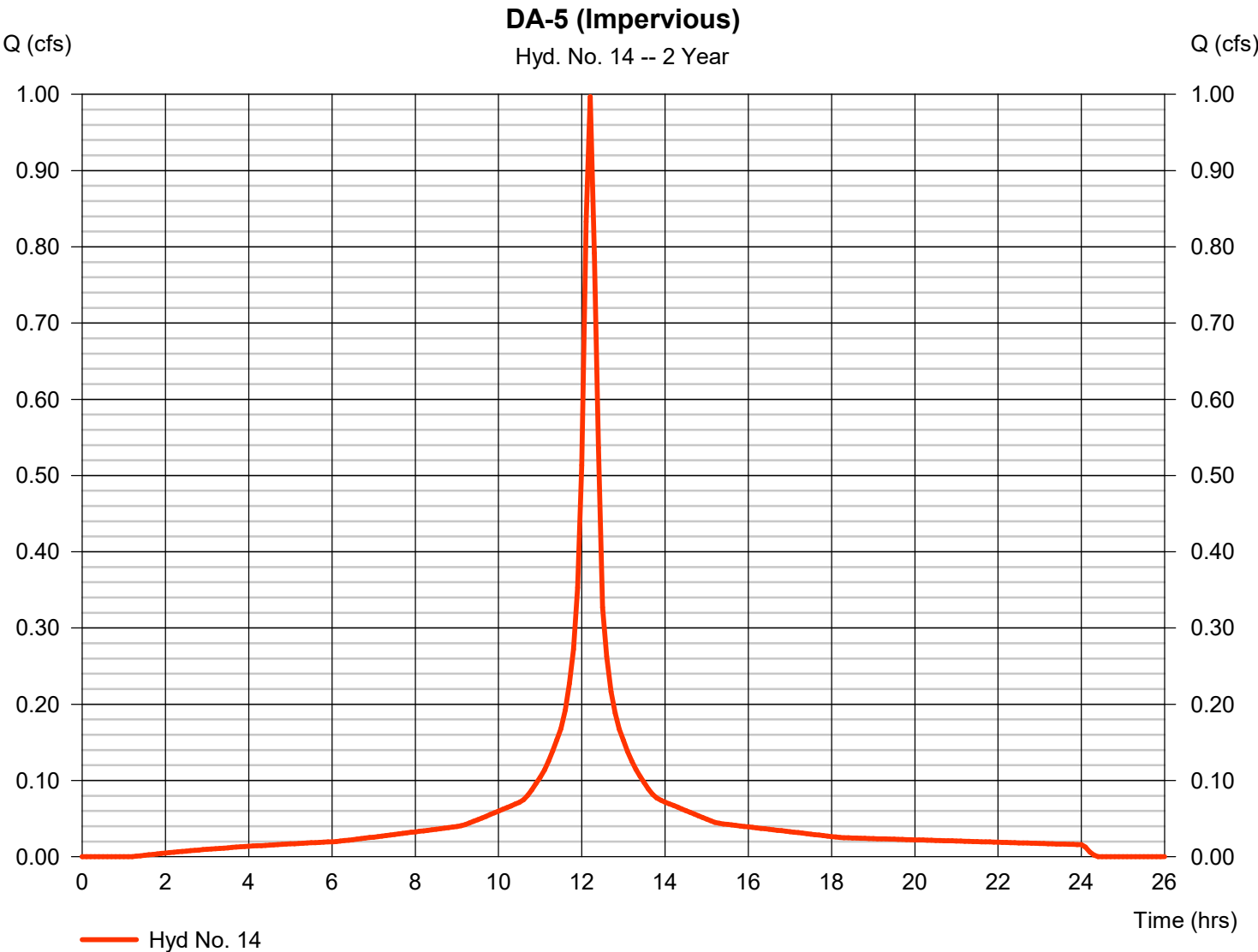
Hydrograph Report

Hyd. No. 14

DA-5 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.997 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 4,802 cuft
Drainage area	= 0.440 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.44 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\1610-0012 Page 484 West Orange\Civil Site		

* Composite (Area/CN) = [(0.440 x 98)] / 0.440

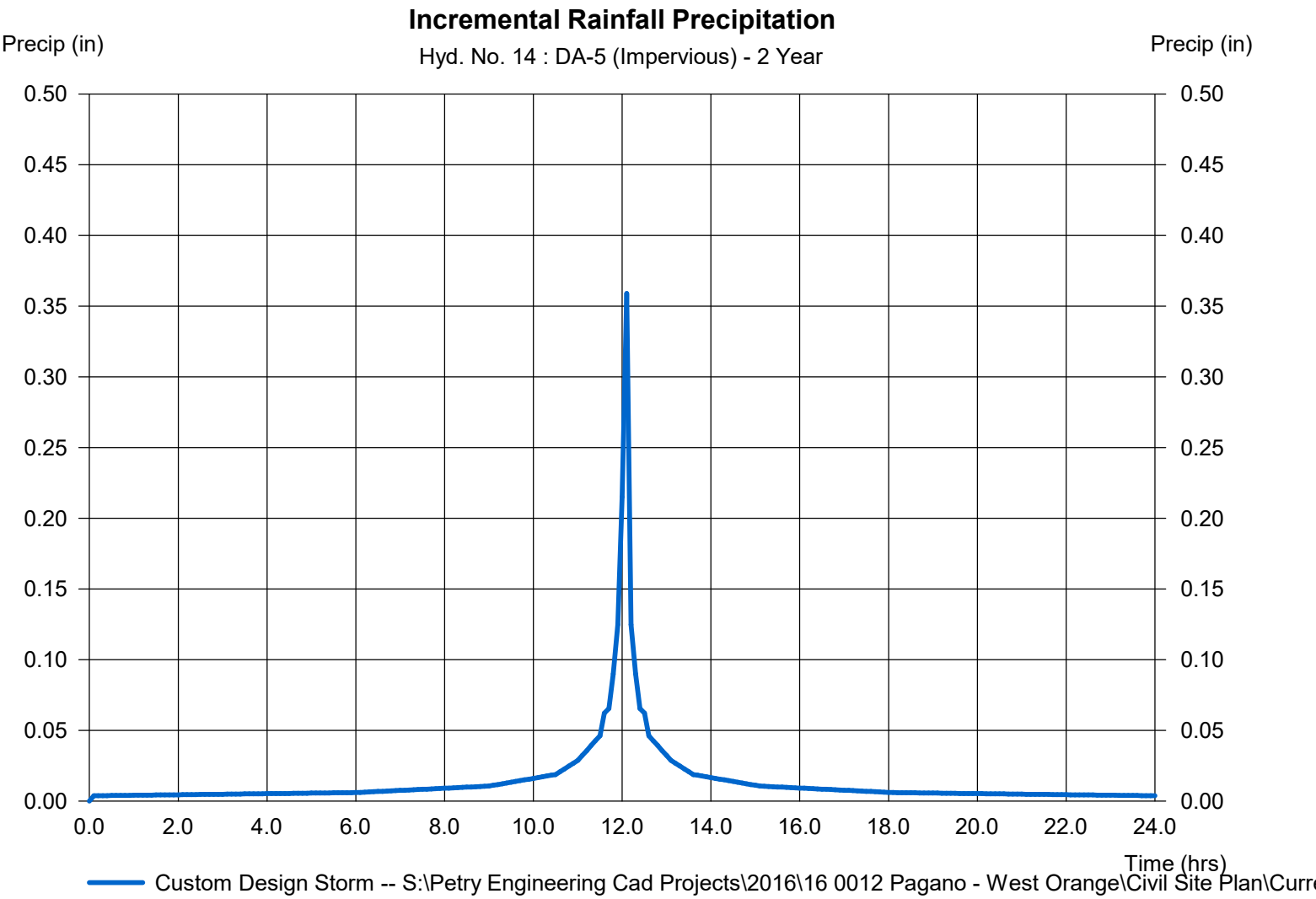


Precipitation Report

Hyd. No. 14

DA-5 (Impervious)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

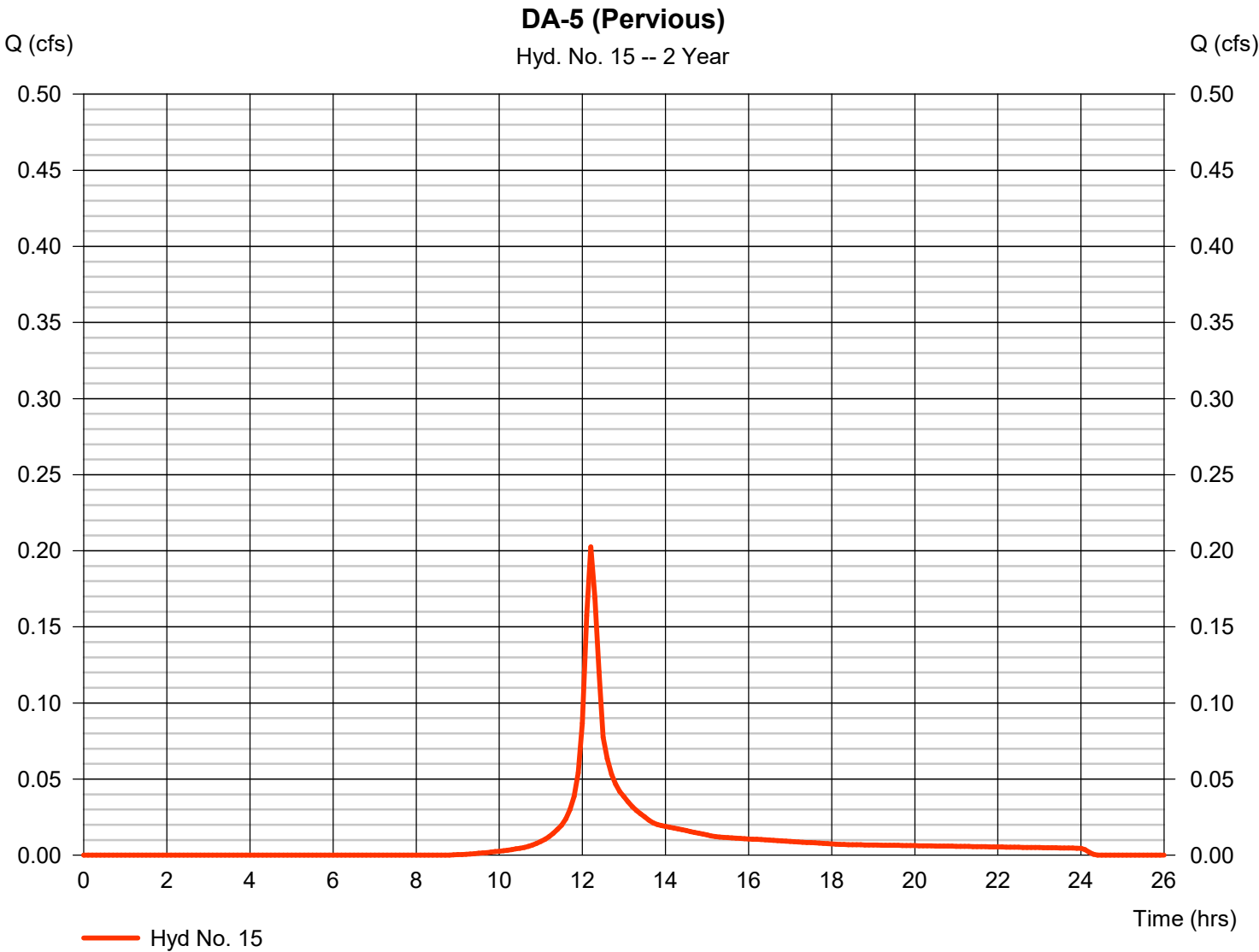
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 15

DA-5 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.203 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 865 cuft
Drainage area	= 0.160 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.44 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\1610012 Page 484		

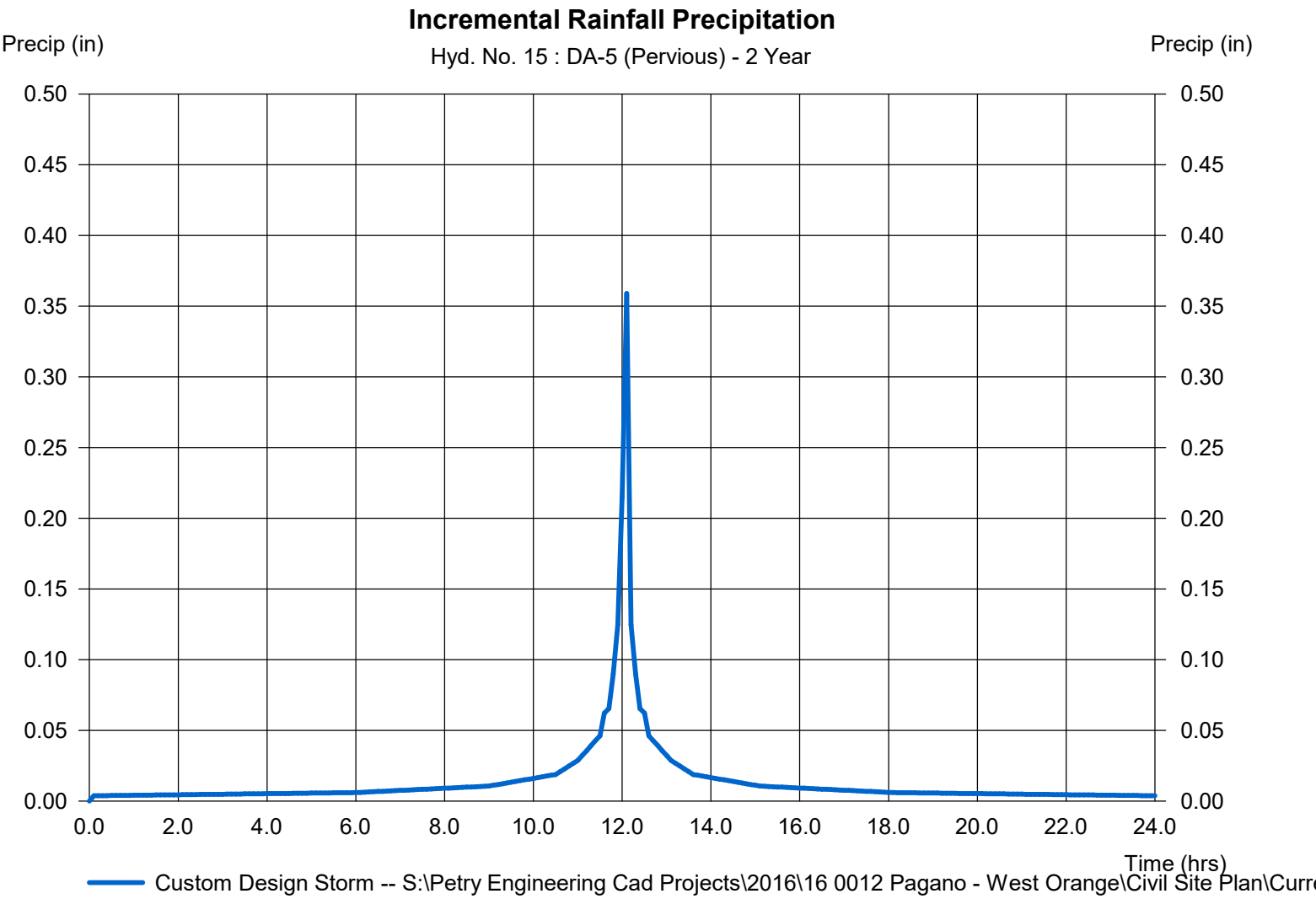


Precipitation Report

Hyd. No. 15

DA-5 (Pervious)

Storm Frequency	= 2 yrs	Time interval	= 6 min
Total precip.	= 3.4400 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

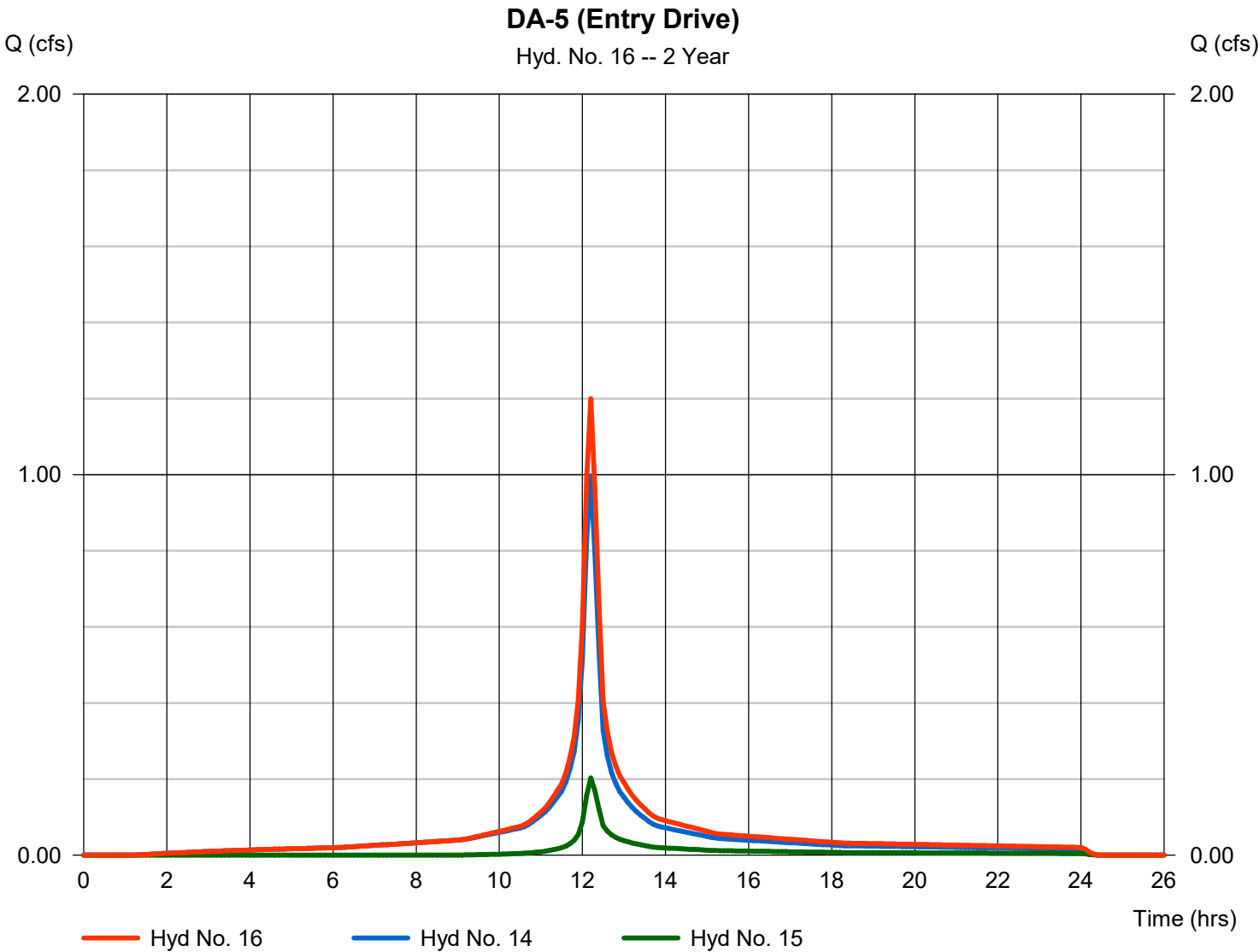
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 16

DA-5 (Entry Drive)

Hydrograph type	= Combine	Peak discharge	= 1.200 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 5,667 cuft
Inflow hyds.	= 14, 15	Contrib. drain. area	= 0.600 ac

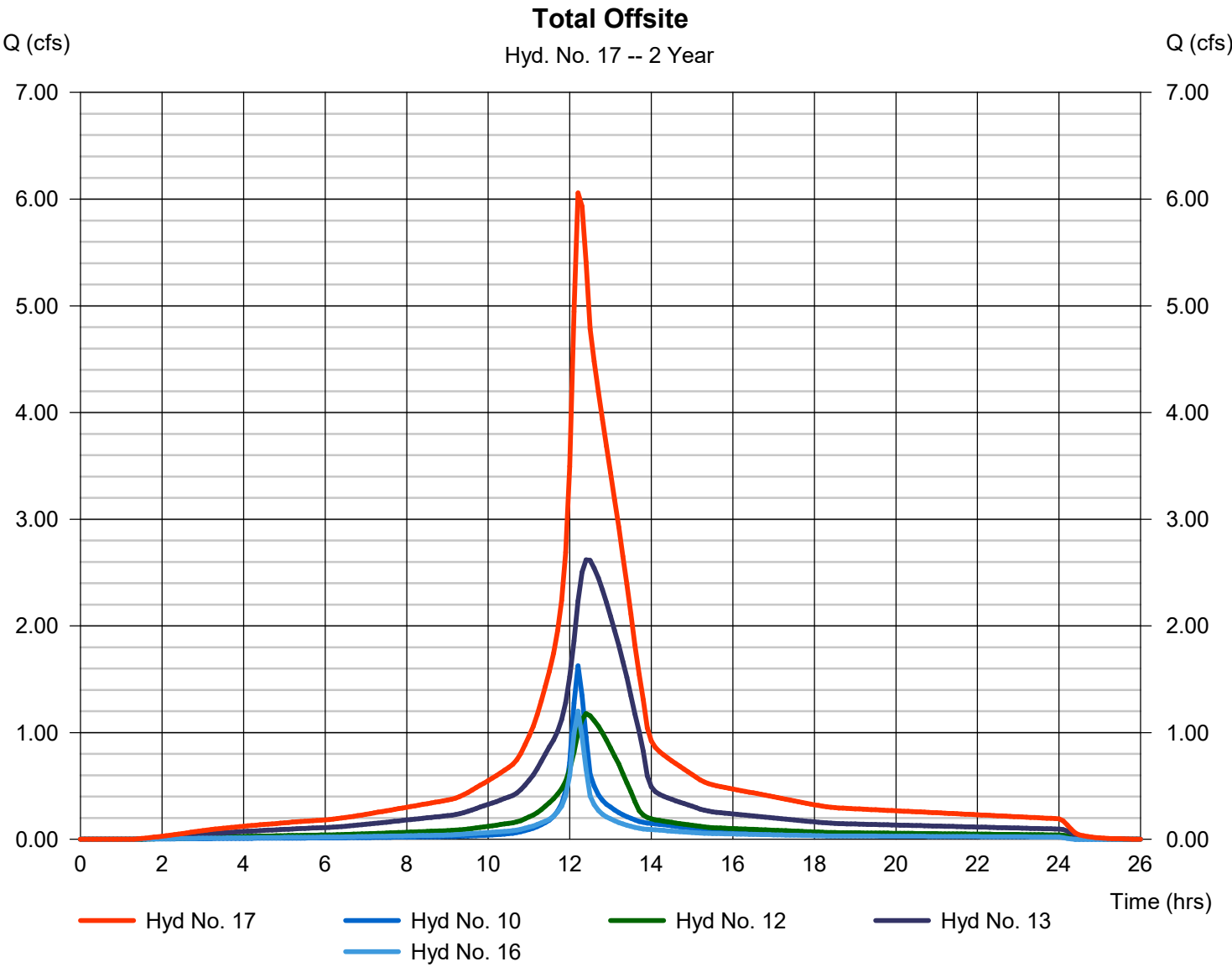


Hydrograph Report

Hyd. No. 17

Total Offsite

Hydrograph type	= Combine	Peak discharge	= 6.058 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 52,535 cuft
Inflow hyds.	= 10, 12, 13, 16	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

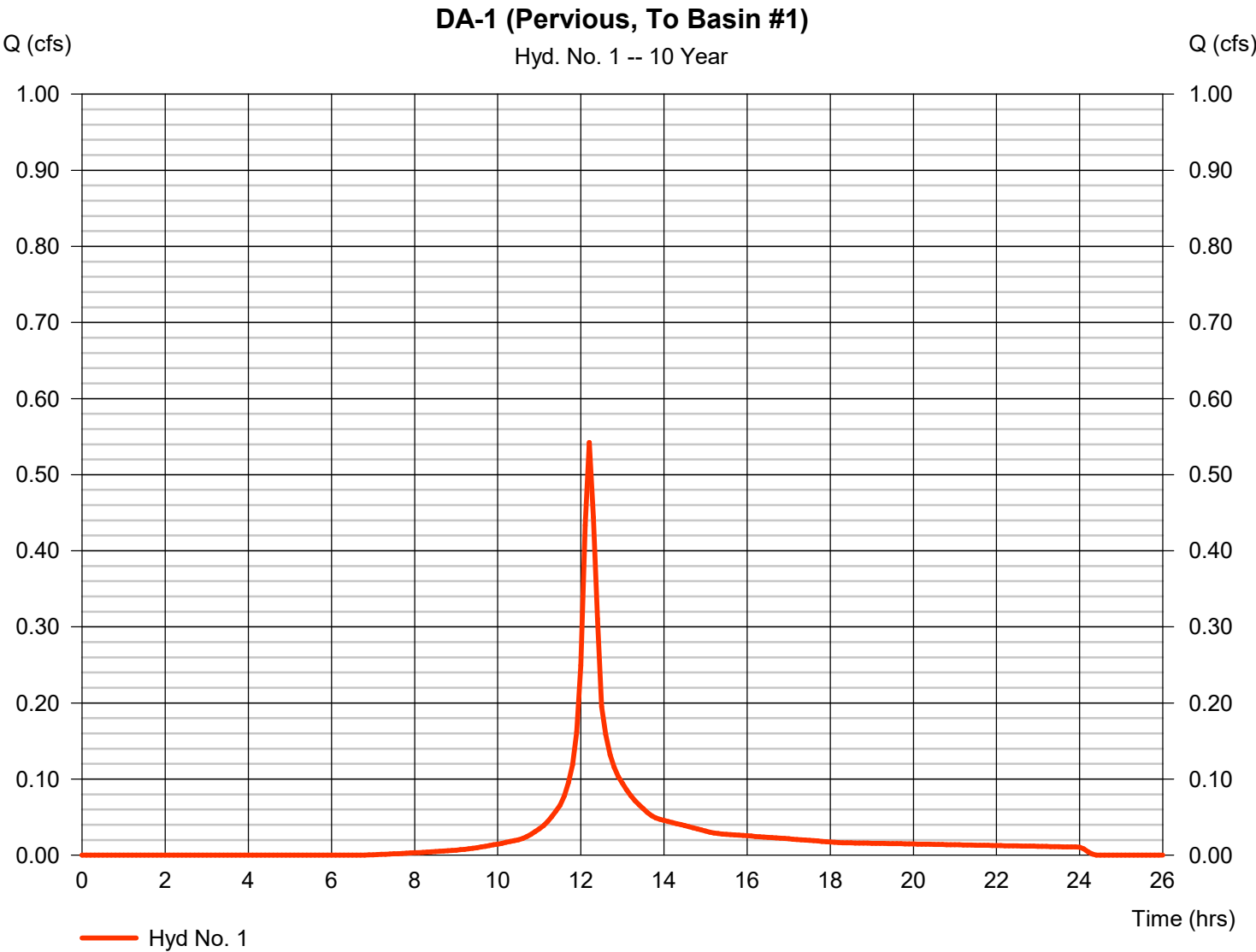
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.542	6	732	2,310	-----	-----	-----	DA-1 (Pervious, To Basin #1)
2	SCS Runoff	3.218	6	732	15,770	-----	-----	-----	DA-1 (Impervious, To Basin #1)
3	SCS Runoff	0.296	6	732	1,260	-----	-----	-----	DA-2 (Pervious, To Basin #2)
4	SCS Runoff	8.721	6	732	42,732	-----	-----	-----	DA-2 (Impervious, To Basin #2)
5	SCS Runoff	2.985	6	732	12,711	-----	-----	-----	DA-3 (Offsite, Bypass)
6	SCS Runoff	2.124	6	732	9,036	-----	-----	-----	DA-4 (Pervious - Onsite, Bypass)
7	SCS Runoff	0.969	6	732	4,748	-----	-----	-----	DA-4 (Impervious - Onsite, Bypass)
8	Combine	3.761	6	732	18,080	1, 2,	-----	-----	DA-1
9	Combine	9.017	6	732	43,992	3, 4,	-----	-----	DA-2
10	Combine	3.093	6	732	13,784	6, 7,	-----	-----	DA-4
12	Reservoir	2.754	6	738	18,078	8	367.57	2,649	Route Basin #1
13	Reservoir	6.836	6	738	43,991	9	368.54	6,784	Route Basin #2
14	SCS Runoff	1.523	6	732	7,461	-----	-----	-----	DA-5 (Impervious)
15	SCS Runoff	0.394	6	732	1,680	-----	-----	-----	DA-5 (Pervious)
16	Combine	1.917	6	732	9,141	14, 15	-----	-----	DA-5 (Entry Drive)
17	Combine	13.65	6	738	84,994	10, 12, 13, 16	-----	-----	Total Offsite
Proposed Conditions.gpw					Return Period: 10 Year			Wednesday, 03 / 8 / 2023	

Hydrograph Report

Hyd. No. 1

DA-1 (Pervious, To Basin #1)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.542 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	2,310 cuft
Drainage area	=	0.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\1610012 Page 484 West Orange\Civil Site			

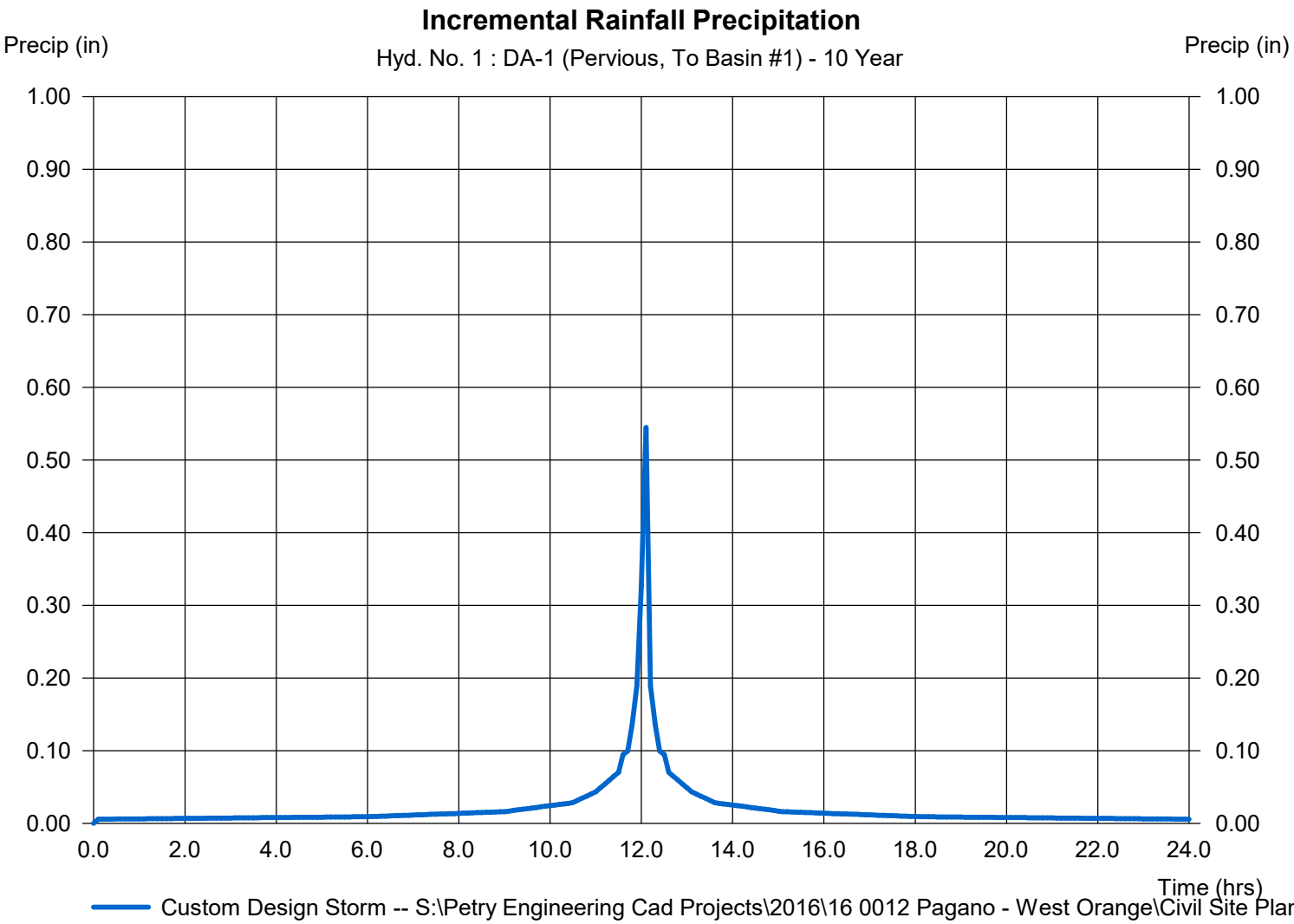


Precipitation Report

Hyd. No. 1

DA-1 (Pervious, To Basin #1)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

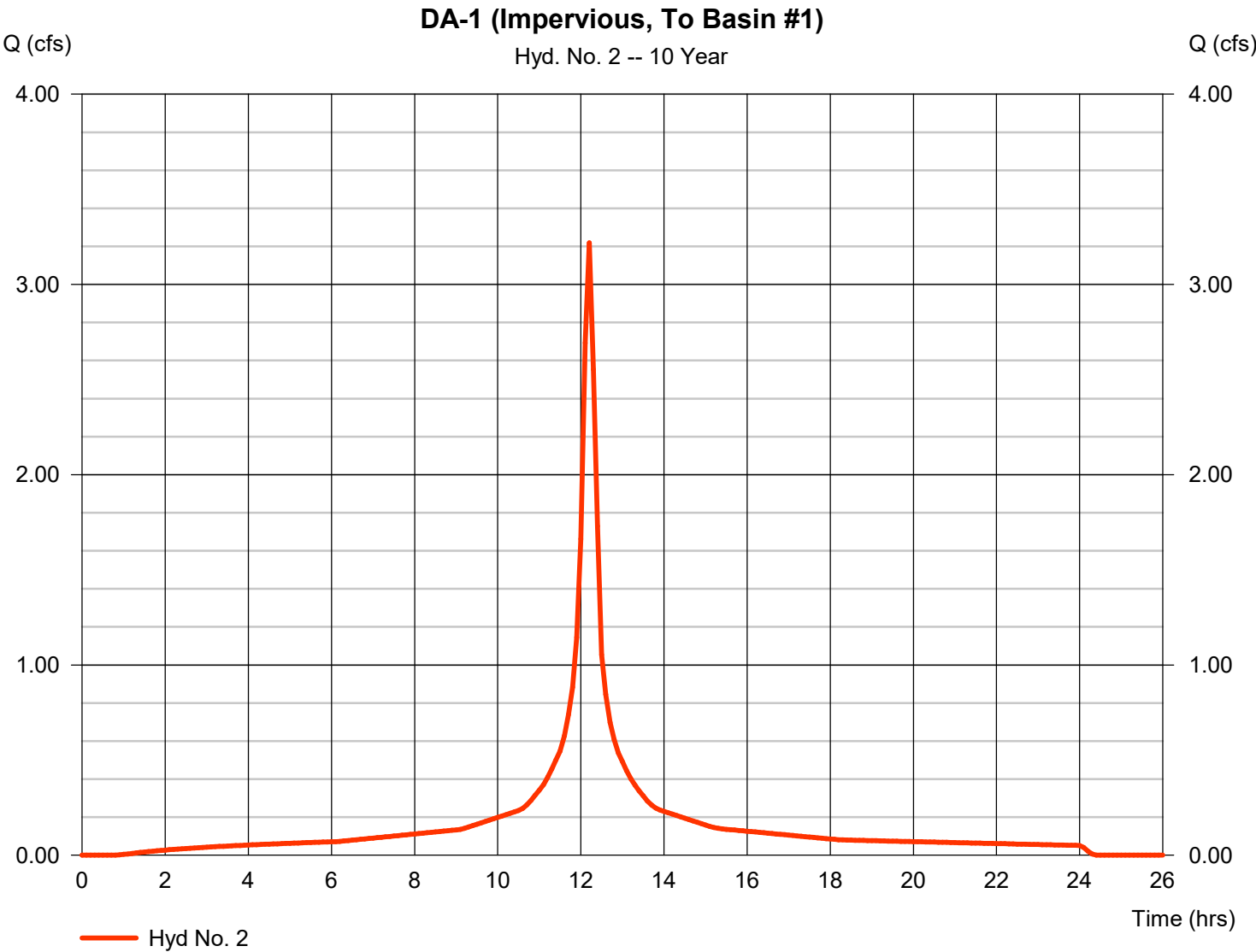


Hydrograph Report

Hyd. No. 2

DA-1 (Impervious, To Basin #1)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.218 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	15,770 cuft
Drainage area	=	0.930 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161012 Page 484 West Orange\Civil Site			



Precipitation Report

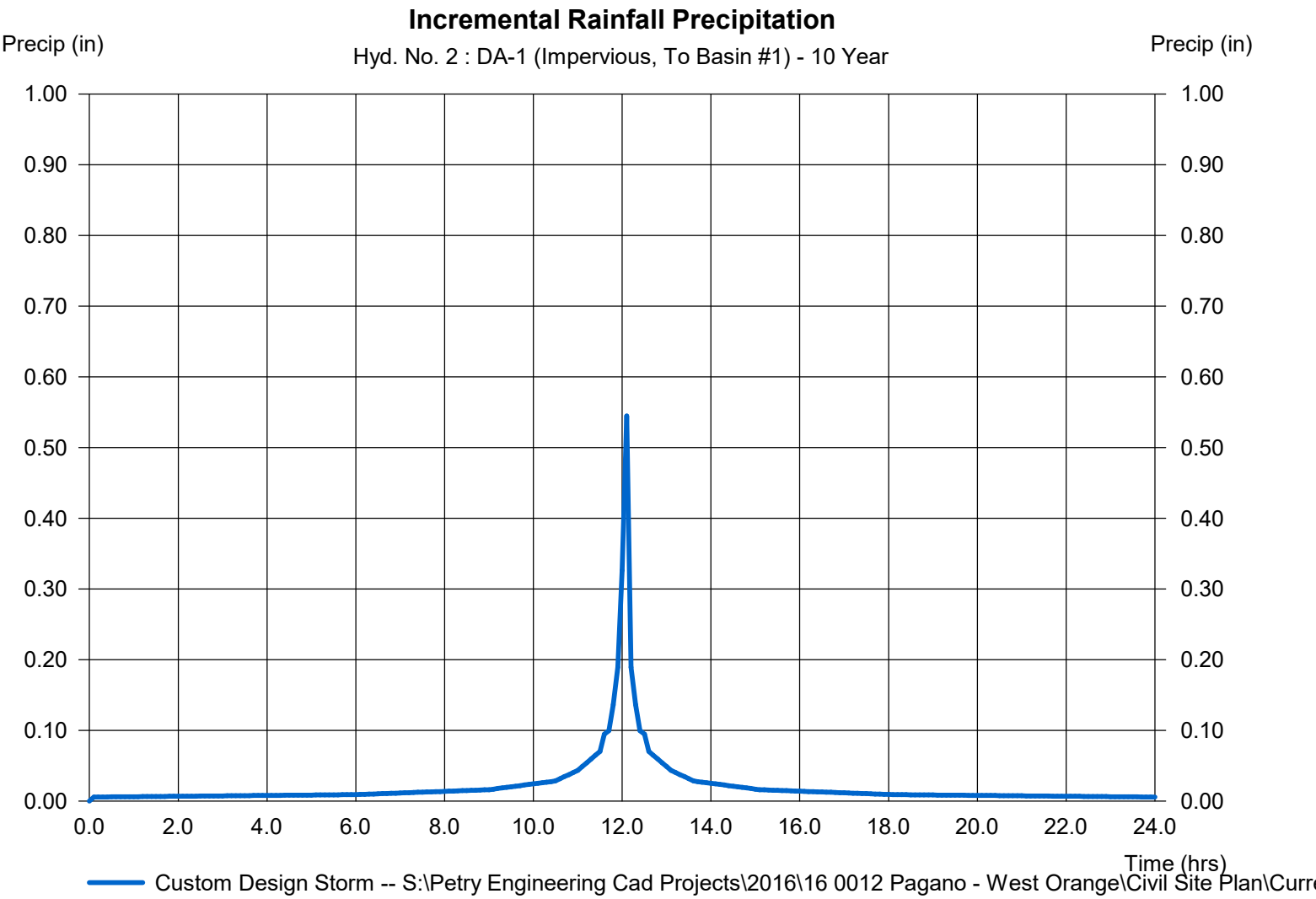
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 2

DA-1 (Impervious, To Basin #1)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

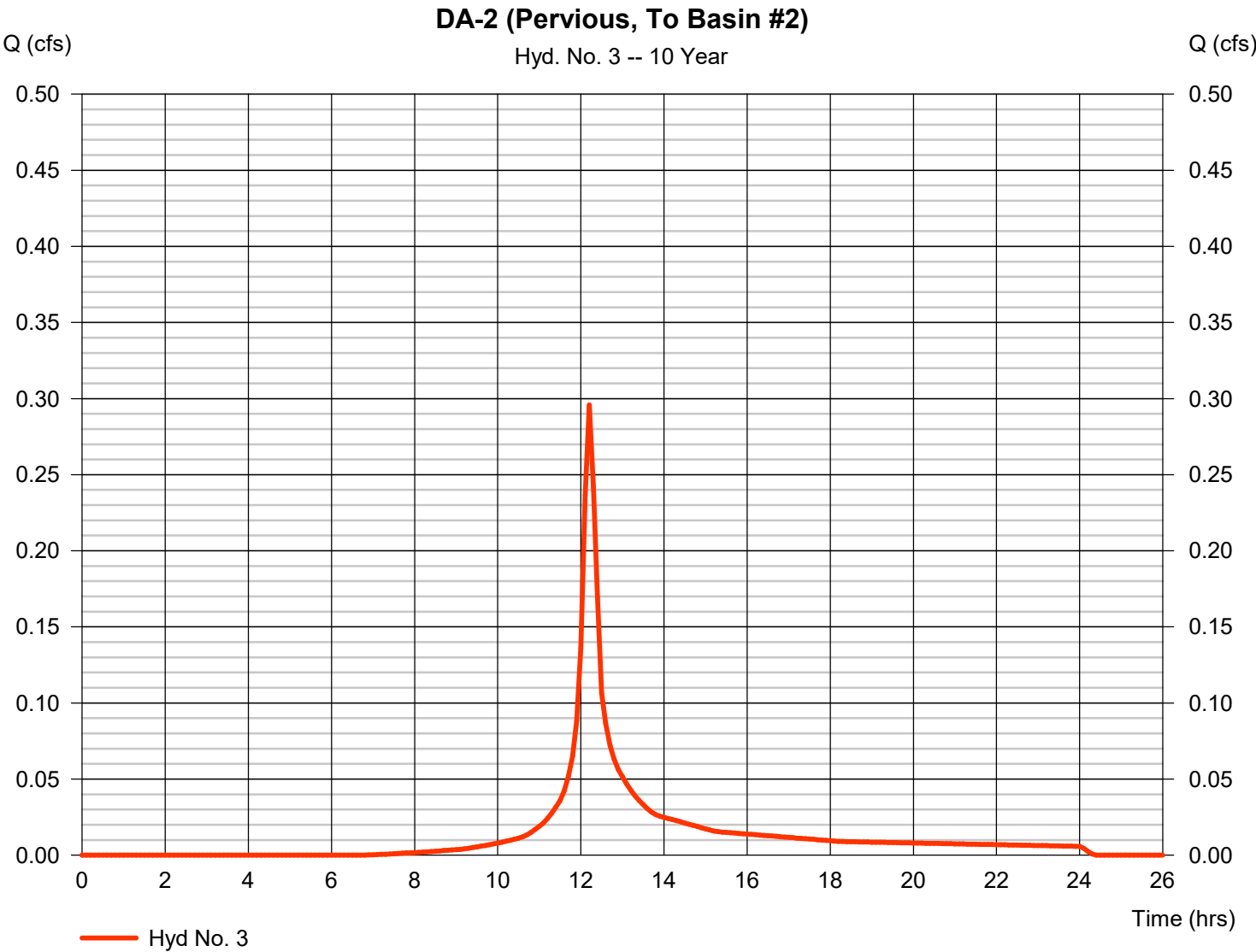


Hydrograph Report

Hyd. No. 3

DA-2 (Pervious, To Basin #2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.296 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	1,260 cuft
Drainage area	=	0.120 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\16101012 Page 484 West Orange\Civil Site			



Precipitation Report

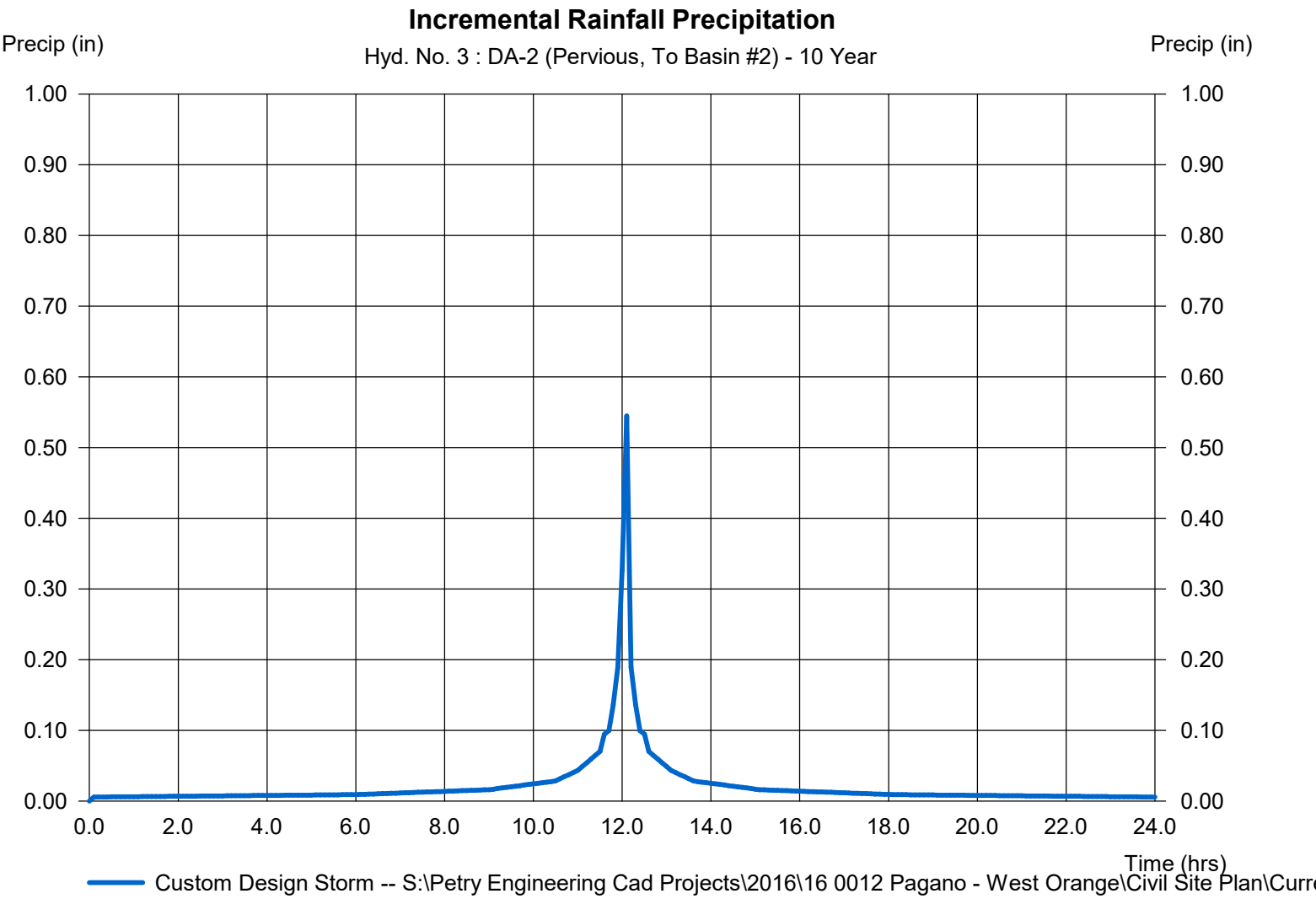
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 3

DA-2 (Pervious, To Basin #2)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

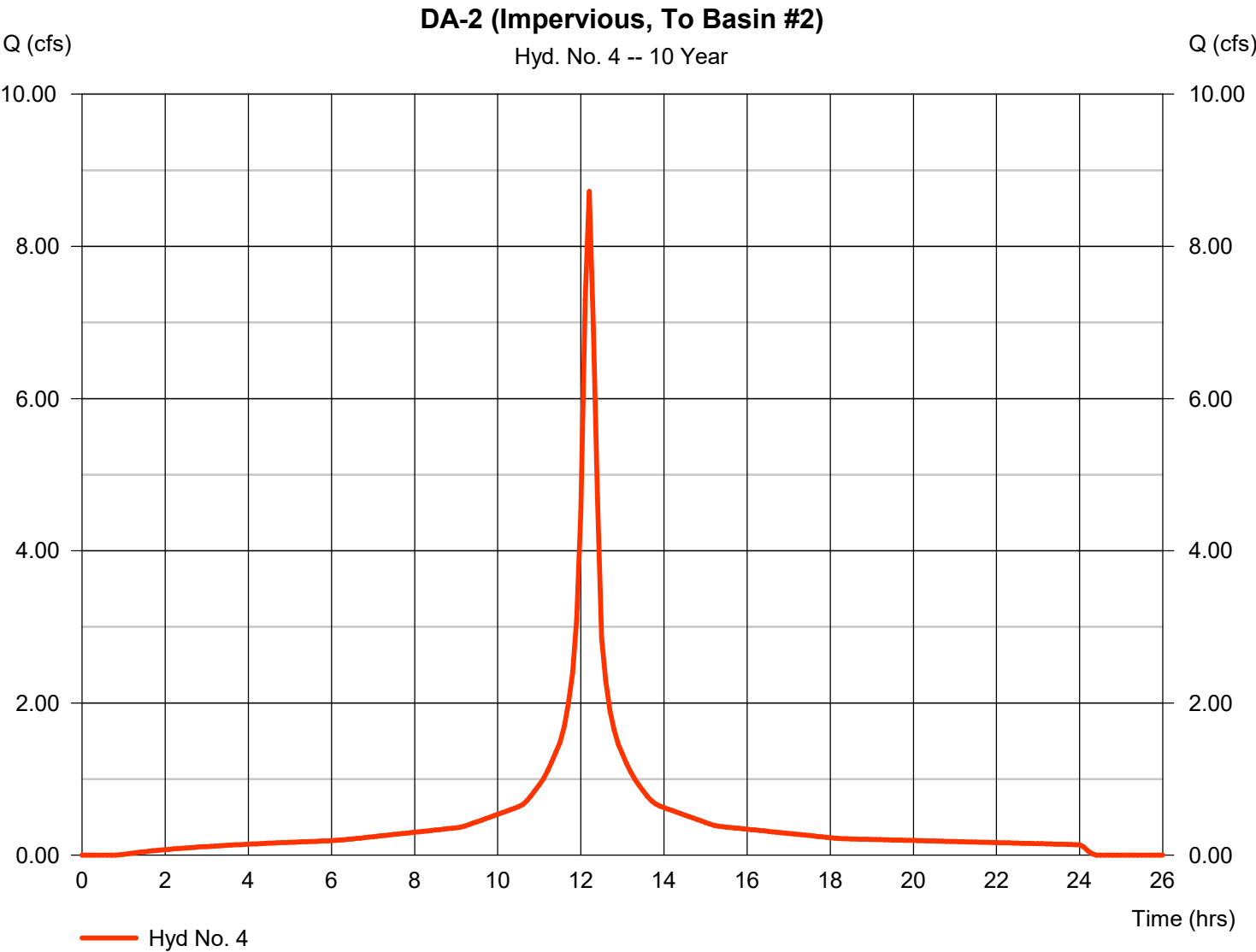


Hydrograph Report

Hyd. No. 4

DA-2 (Impervious, To Basin #2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.721 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	42,732 cuft
Drainage area	=	2.520 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161012 Page 484 West Orange\Civil Site			

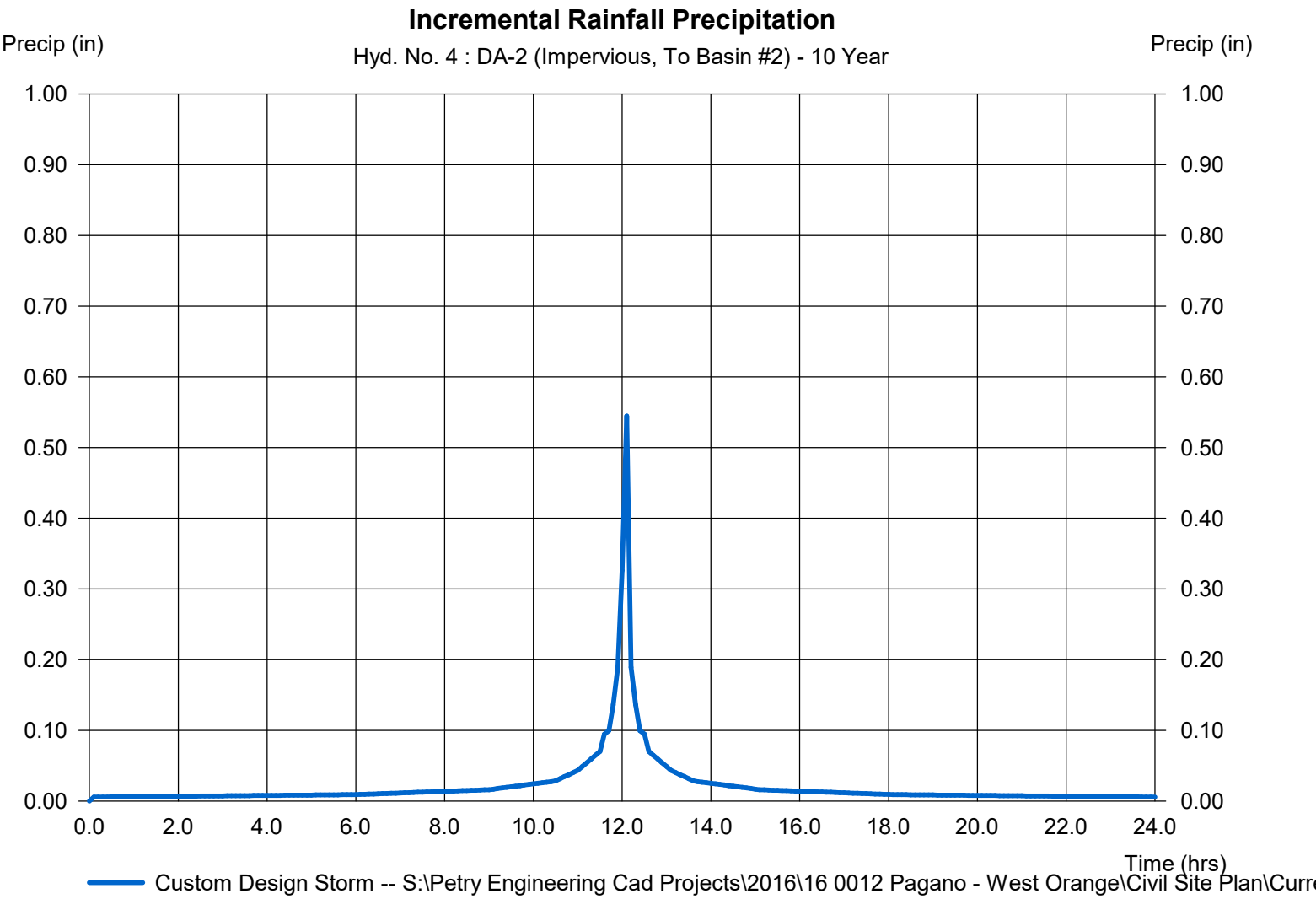


Precipitation Report

Hyd. No. 4

DA-2 (Impervious, To Basin #2)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



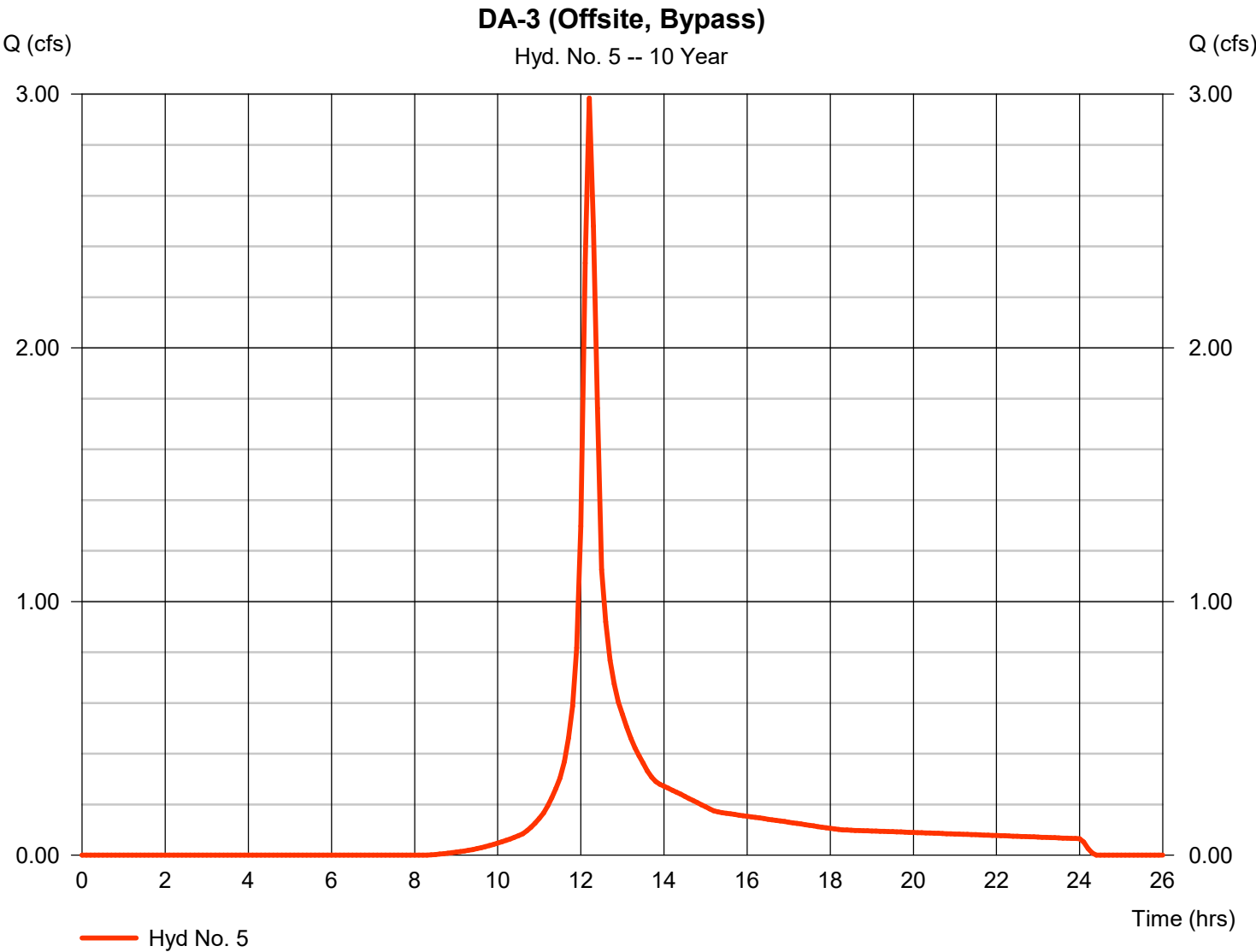
Hydrograph Report

Hyd. No. 5

DA-3 (Offsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.985 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	12,711 cuft
Drainage area	=	1.470 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\1610012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.070 x 98) + (0.840 x 74) + (0.480 x 70) + (0.080 x 79)] / 1.470

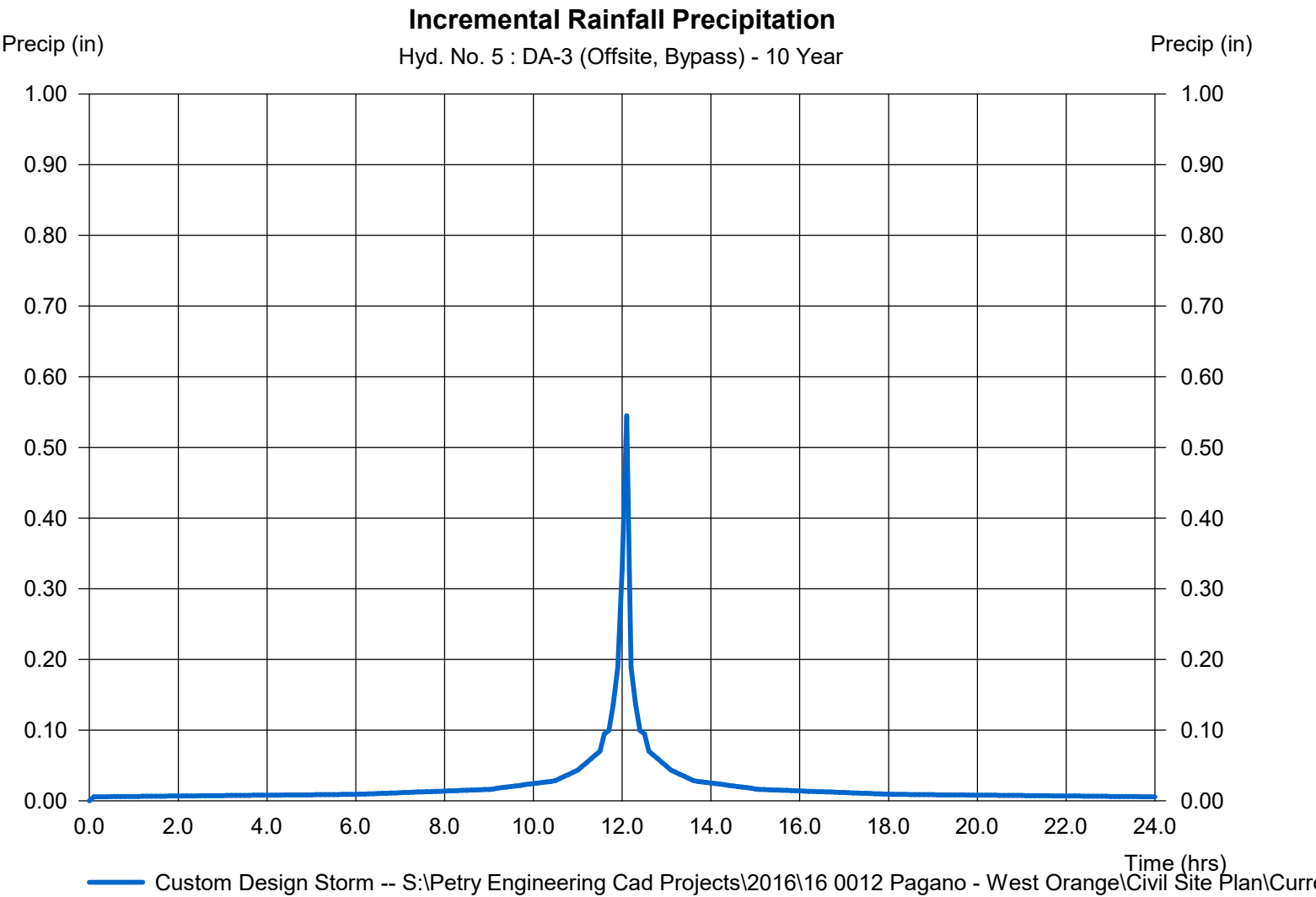


Precipitation Report

Hyd. No. 5

DA-3 (Offsite, Bypass)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



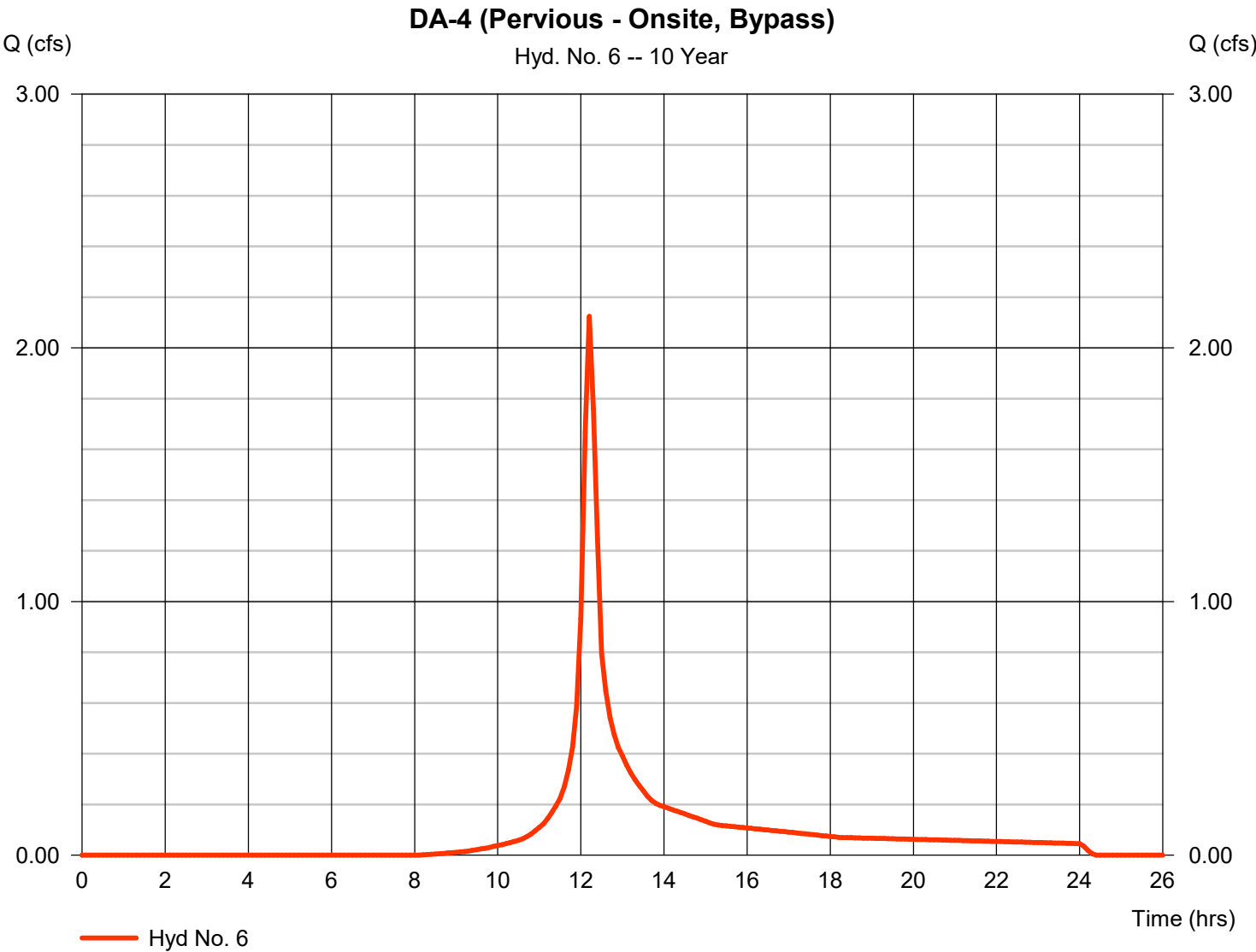
Hydrograph Report

Hyd. No. 6

DA-4 (Pervious - Onsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.124 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	9,036 cuft
Drainage area	=	1.010 ac	Curve number	=	75*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\160110012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.770 x 73) + (0.240 x 80)] / 1.010

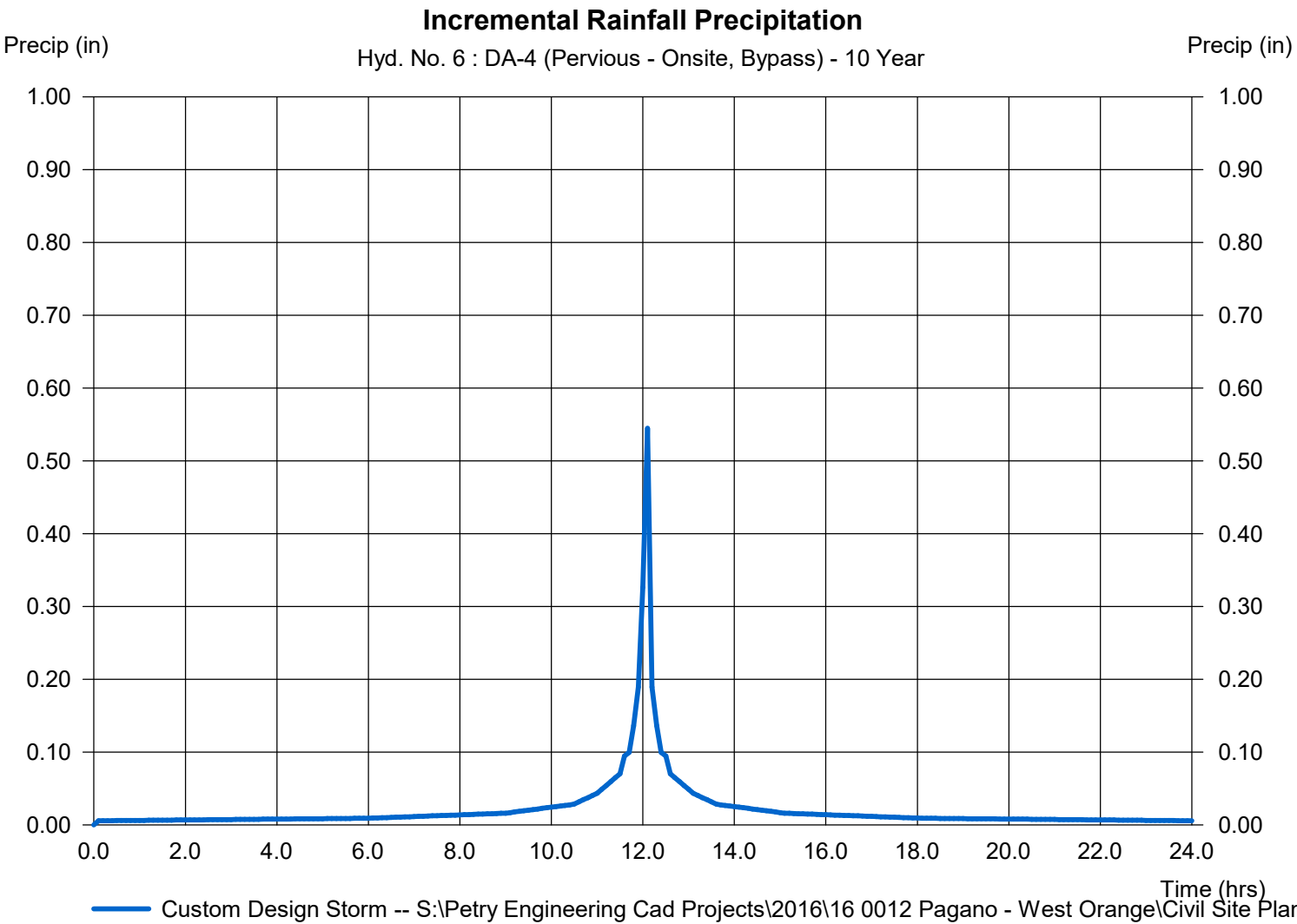


Precipitation Report

Hyd. No. 6

DA-4 (Pervious - Onsite, Bypass)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

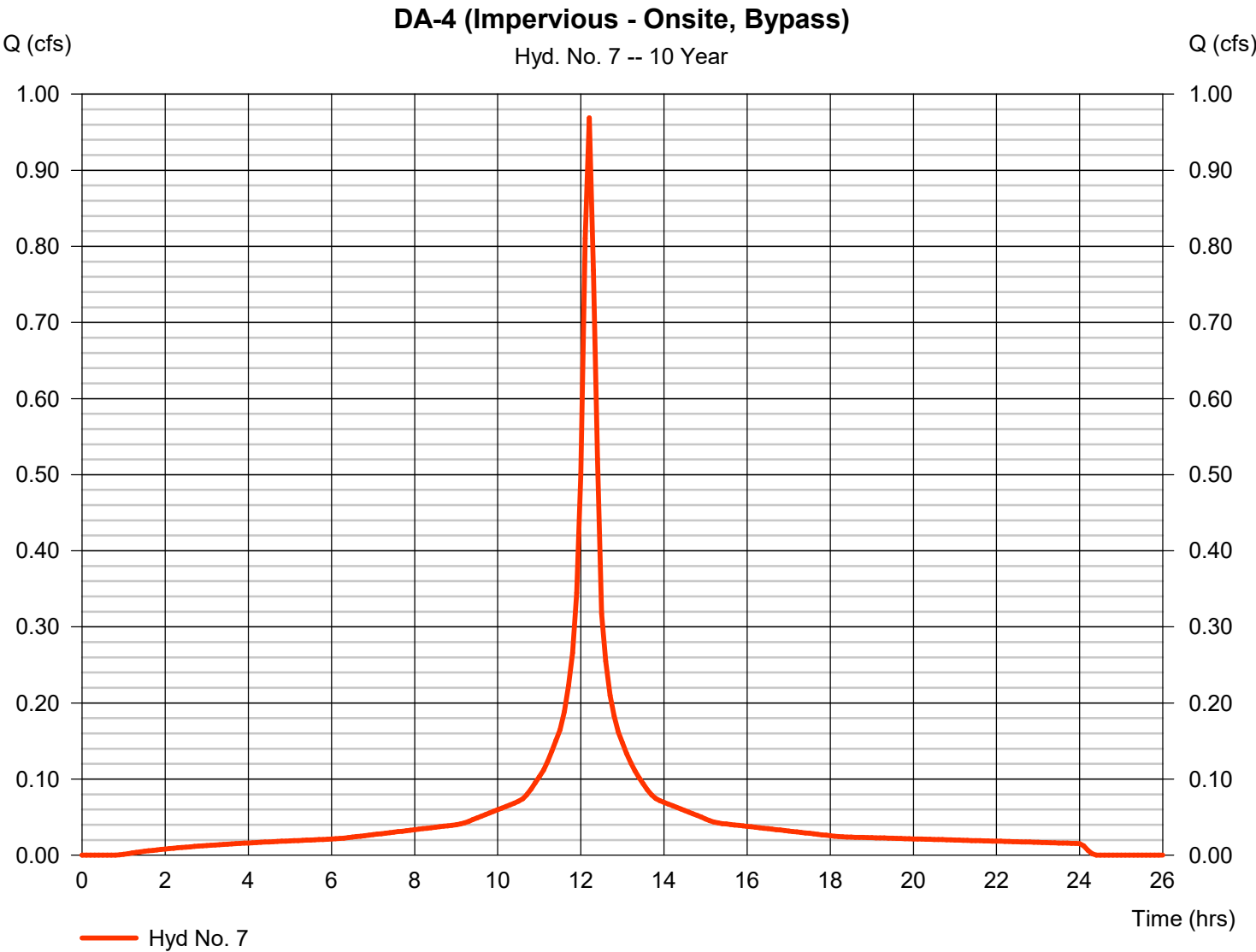


Hydrograph Report

Hyd. No. 7

DA-4 (Impervious - Onsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.969 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	4,748 cuft
Drainage area	=	0.280 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.22 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\1610012 Page 44 West Orange\Civil Site			

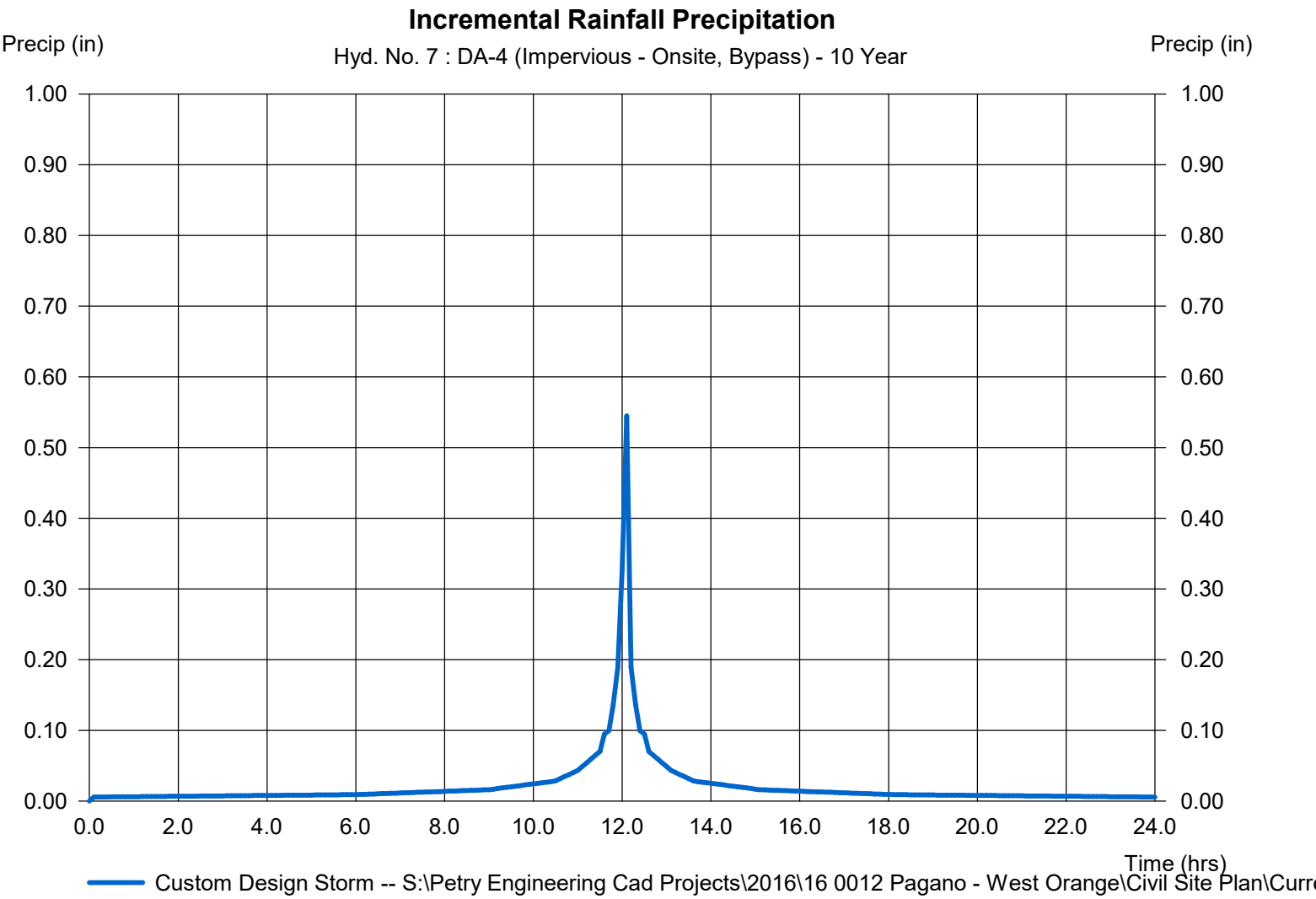


Precipitation Report

Hyd. No. 7

DA-4 (Impervious - Onsite, Bypass)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

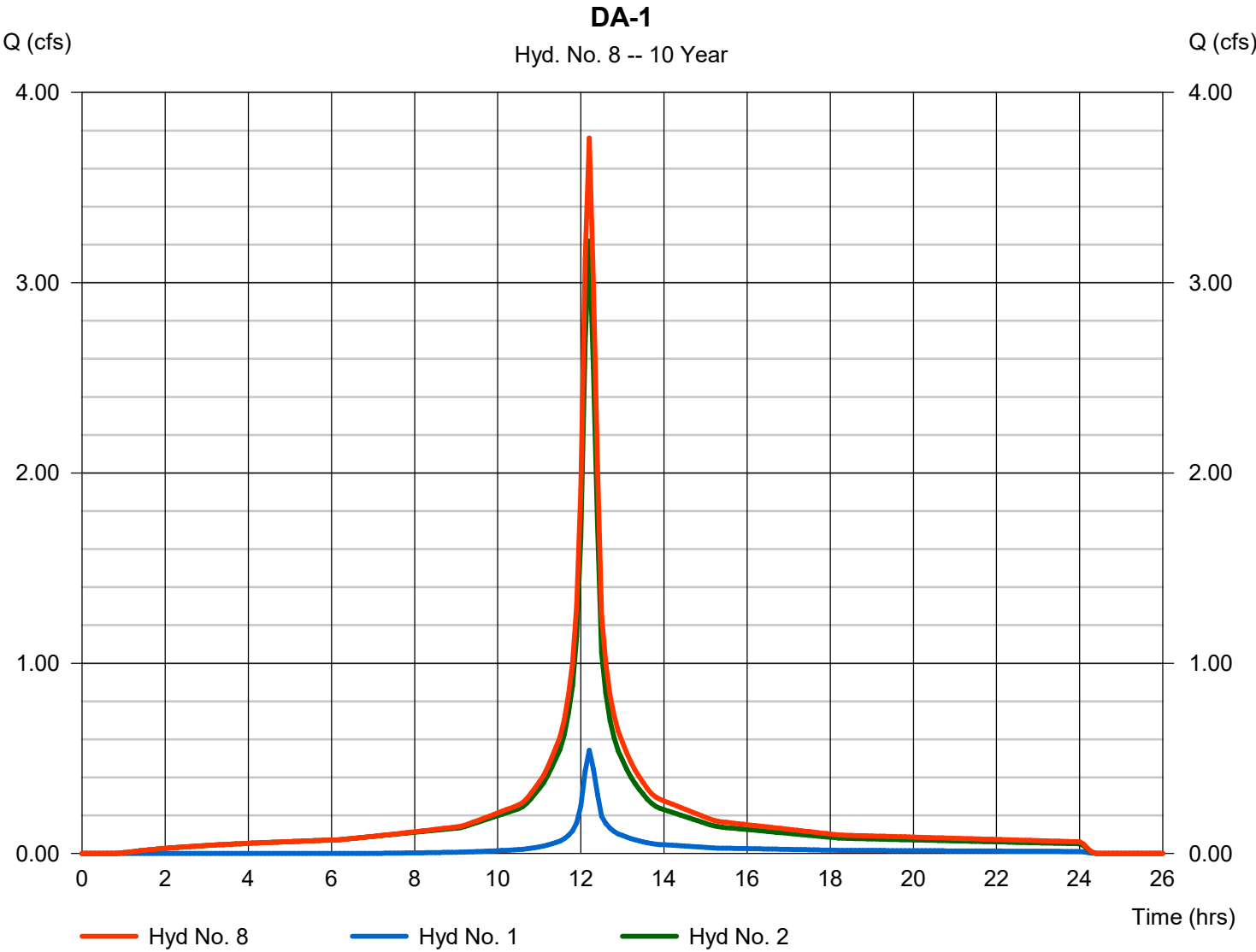


Hydrograph Report

Hyd. No. 8

DA-1

Hydrograph type	= Combine	Peak discharge	= 3.761 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 18,080 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 1.150 ac



Hydrograph Report

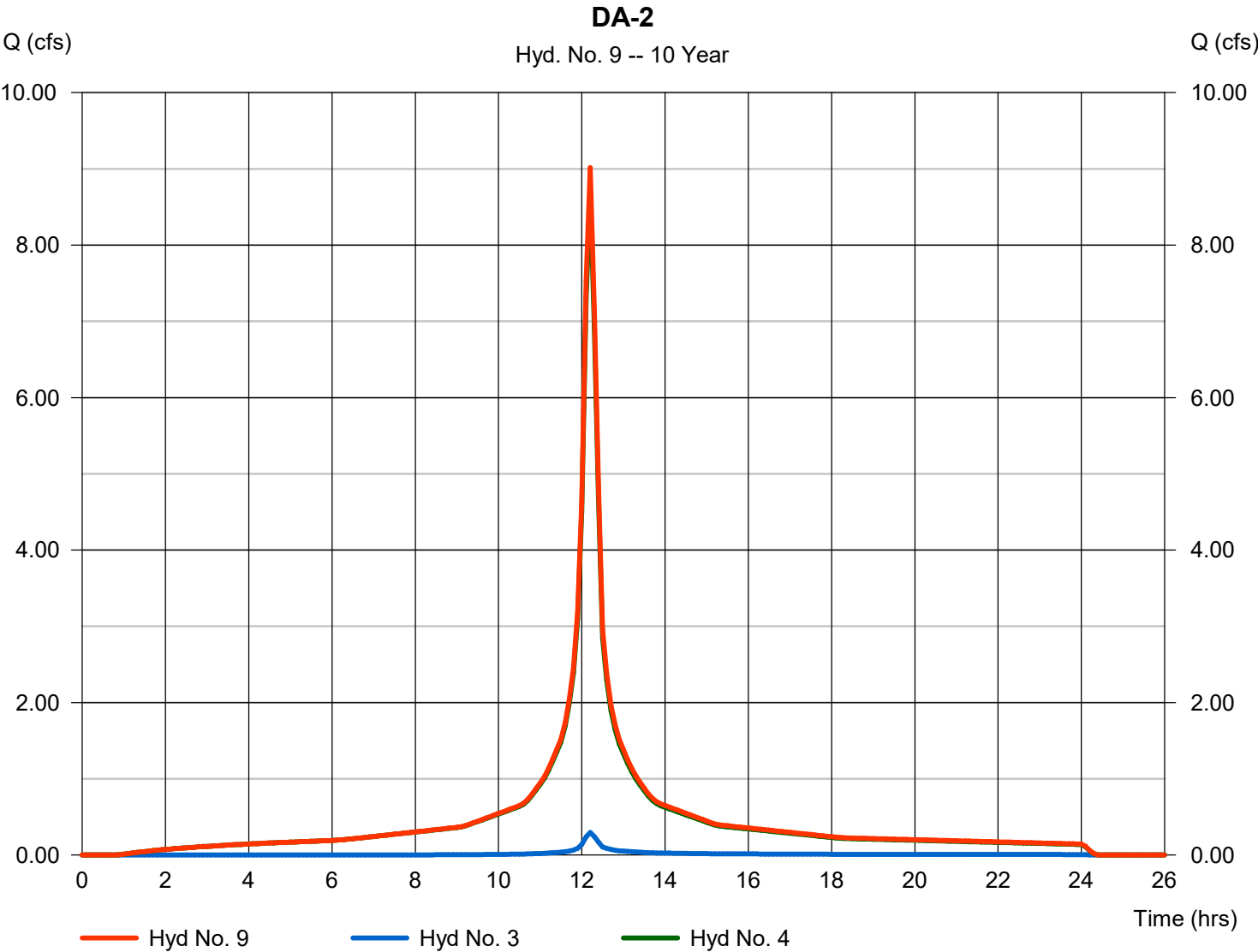
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 9

DA-2

Hydrograph type	= Combine	Peak discharge	= 9.017 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 43,992 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.640 ac



Hydrograph Report

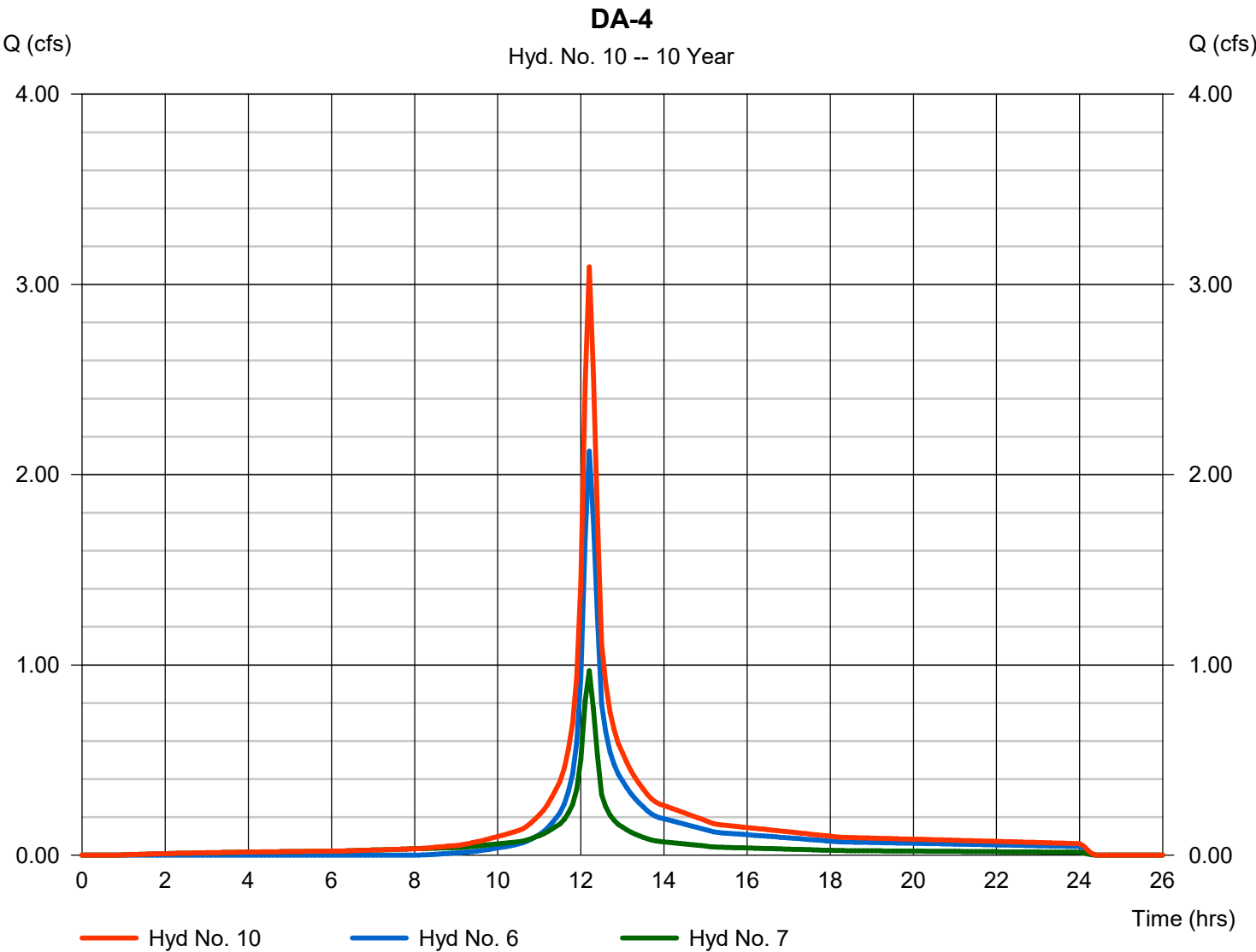
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 10

DA-4

Hydrograph type	= Combine	Peak discharge	= 3.093 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 13,784 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 1.290 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

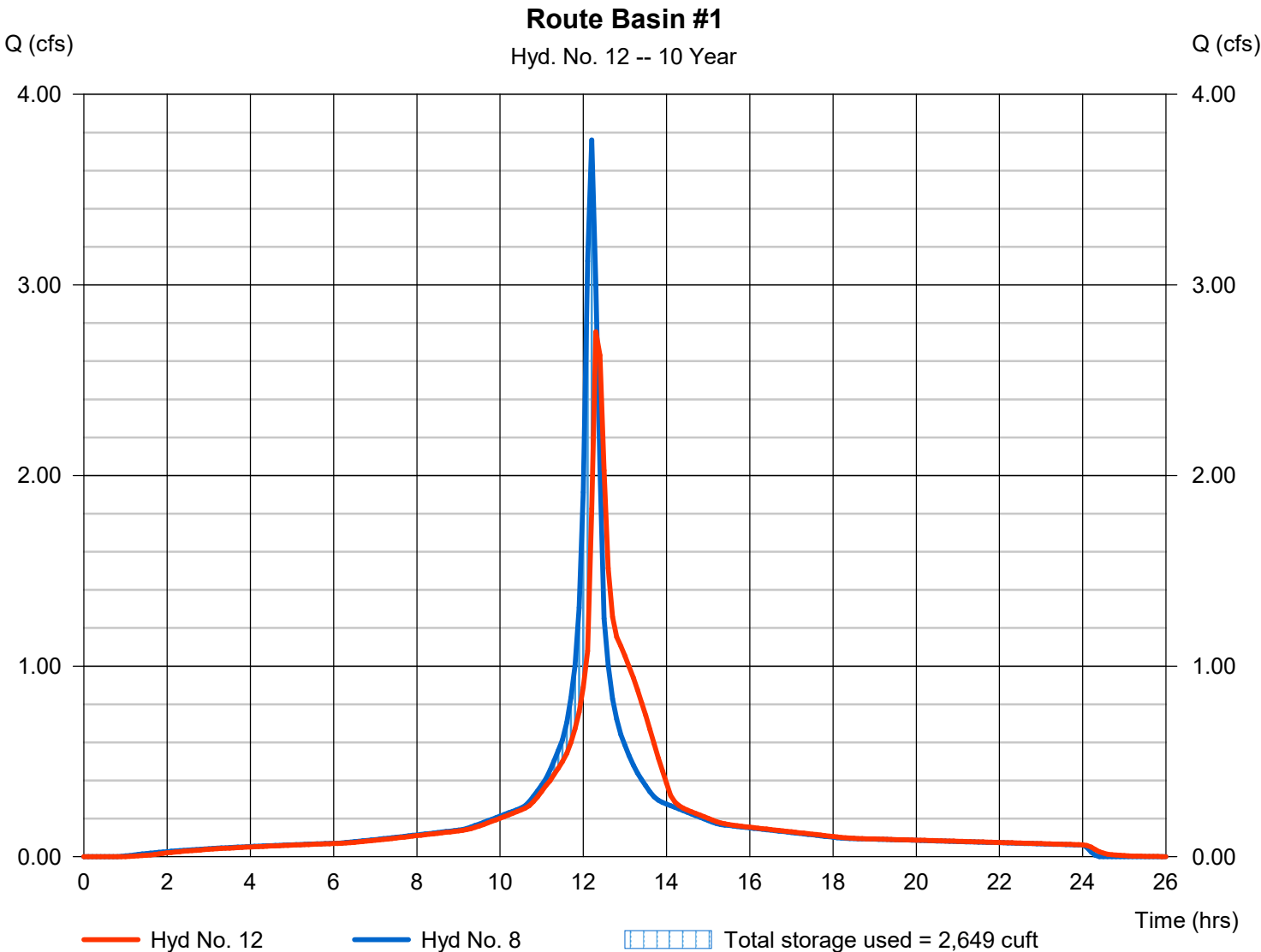
Wednesday, 03 / 8 / 2023

Hyd. No. 12

Route Basin #1

Hydrograph type	= Reservoir	Peak discharge	= 2.754 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.30 hrs
Time interval	= 6 min	Hyd. volume	= 18,078 cuft
Inflow hyd. No.	= 8 - DA-1	Max. Elevation	= 367.57 ft
Reservoir name	= Basin #1	Max. Storage	= 2,649 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

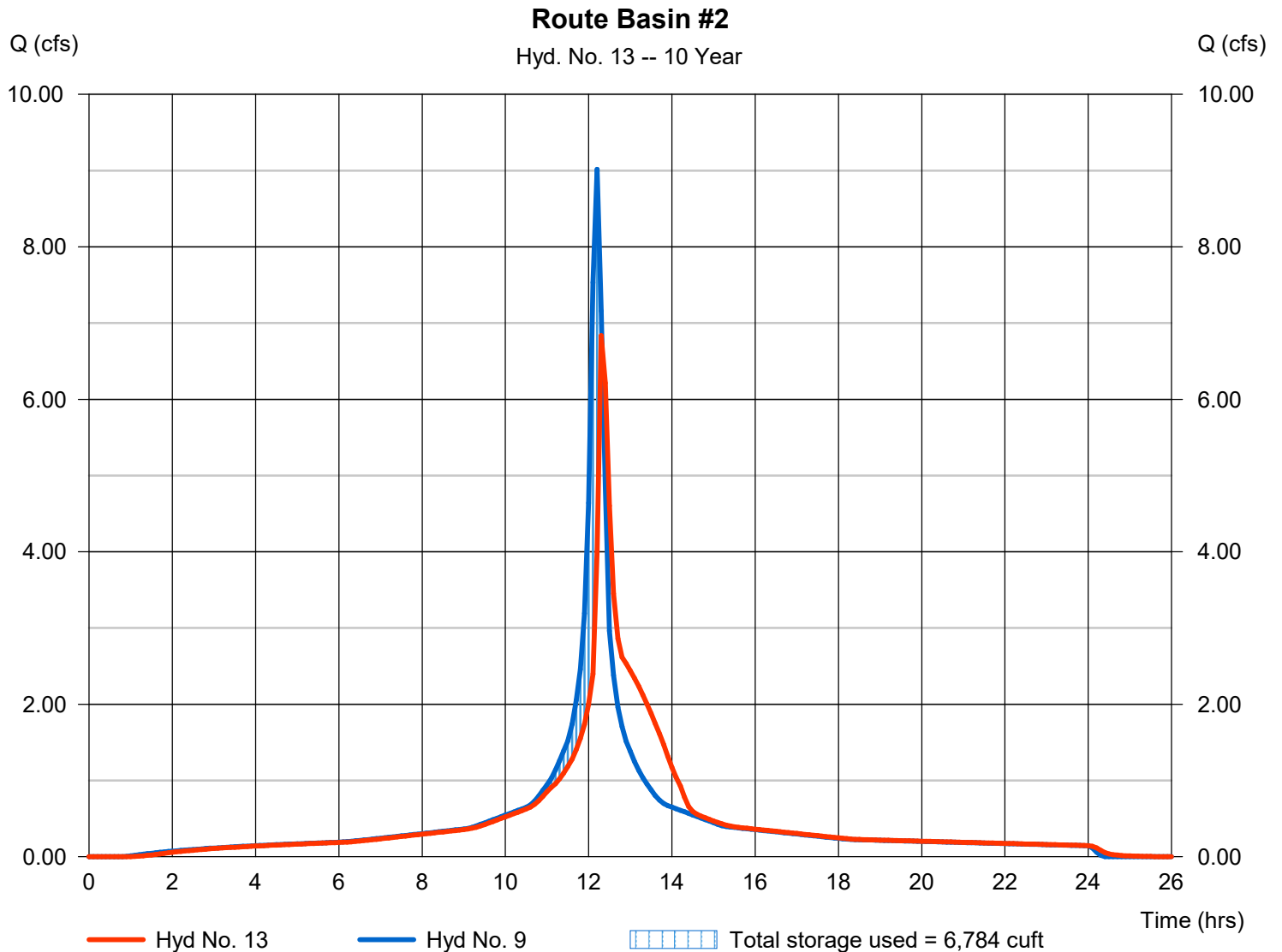
Hyd. No. 13

Route Basin #2

Hydrograph type = Reservoir
 Storm frequency = 10 yrs
 Time interval = 6 min
 Inflow hyd. No. = 9 - DA-2
 Reservoir name = Basin #2

Peak discharge = 6.836 cfs
 Time to peak = 12.30 hrs
 Hyd. volume = 43,991 cuft
 Max. Elevation = 368.54 ft
 Max. Storage = 6,784 cuft

Storage Indication method used.



Hydrograph Report

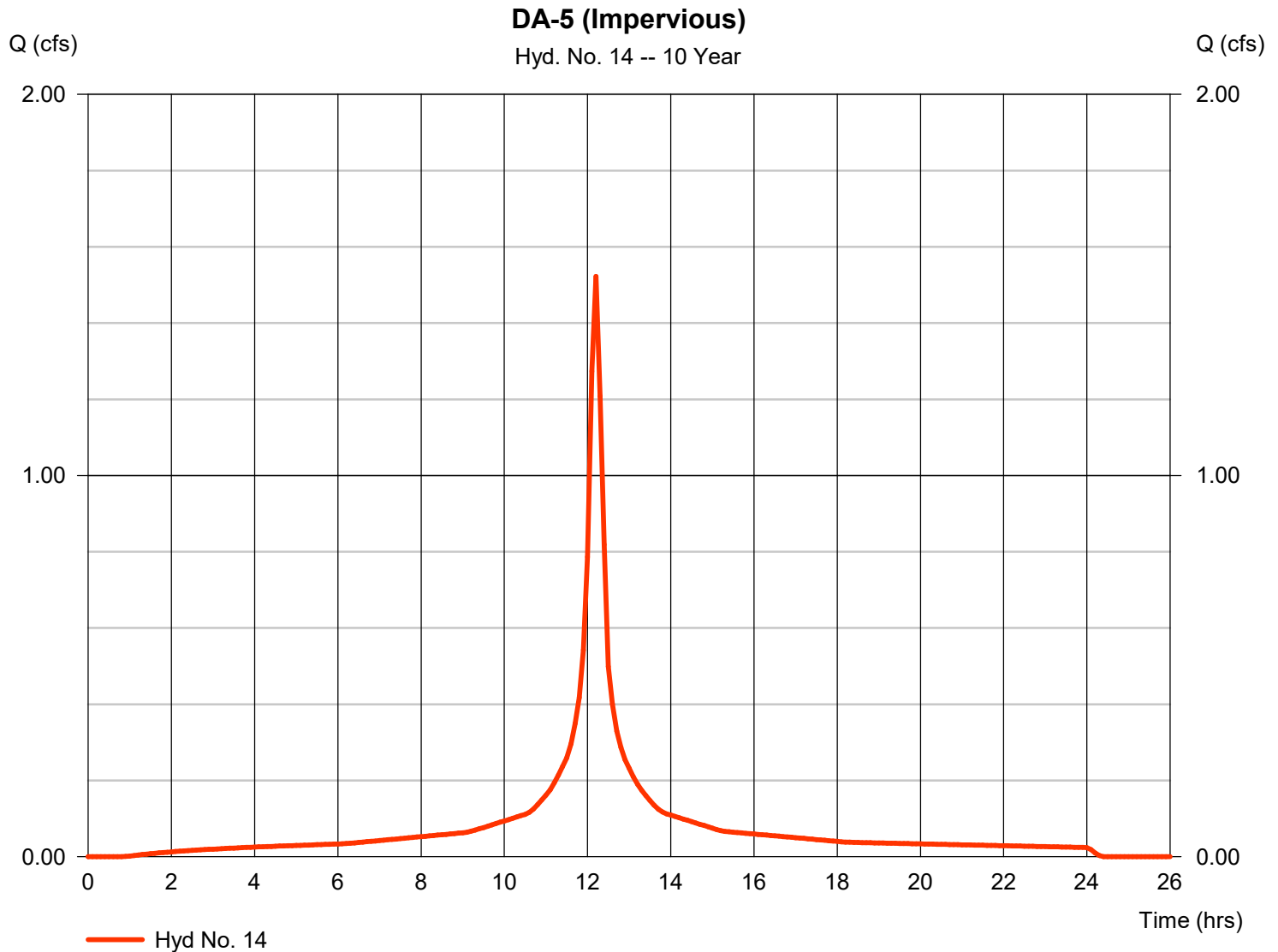
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 14

DA-5 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.523 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 7,461 cuft
Drainage area	= 0.440 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.22 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site		

* Composite (Area/CN) = $[(0.440 \times 98)] / 0.440$ 

Precipitation Report

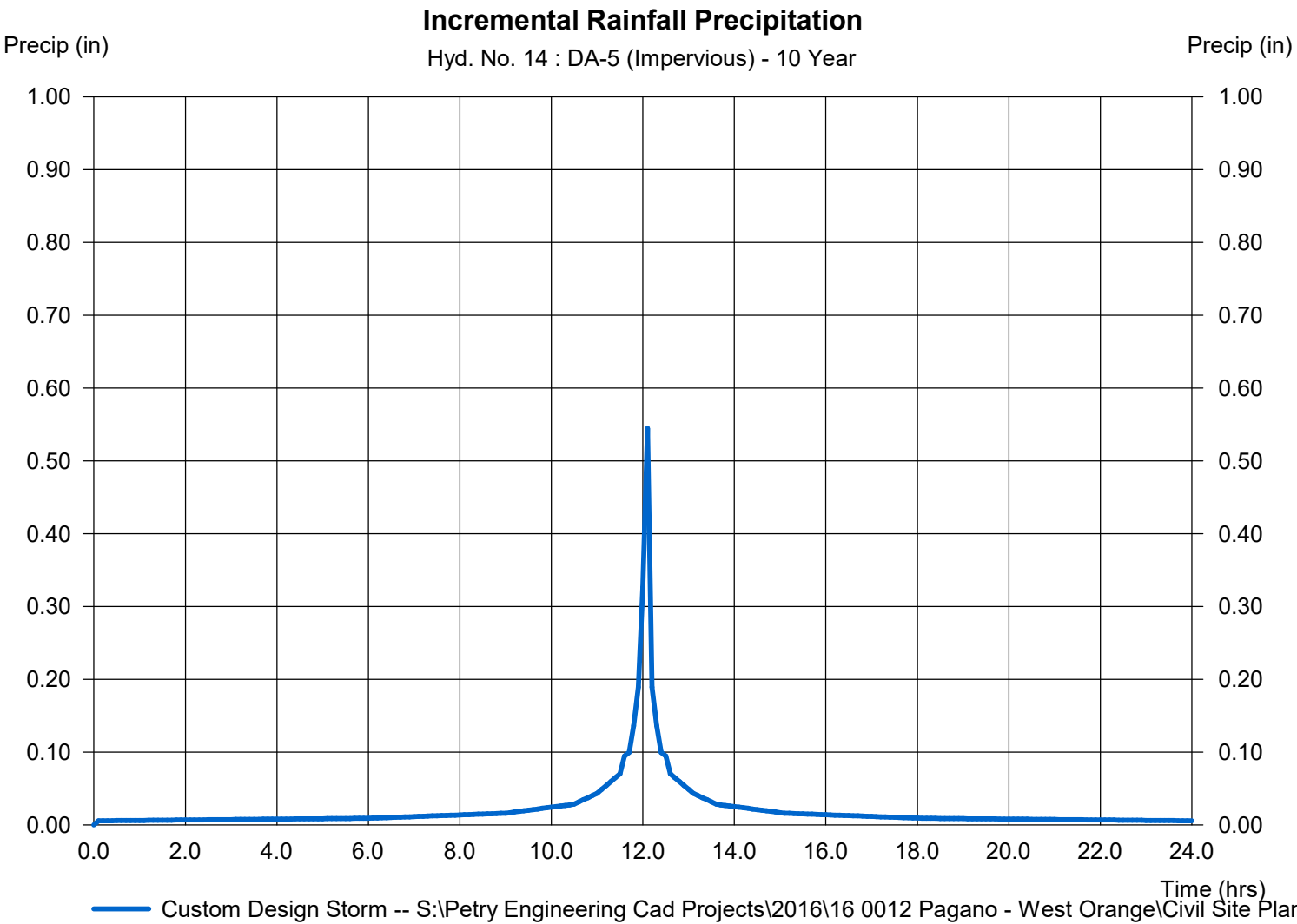
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 14

DA-5 (Impervious)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

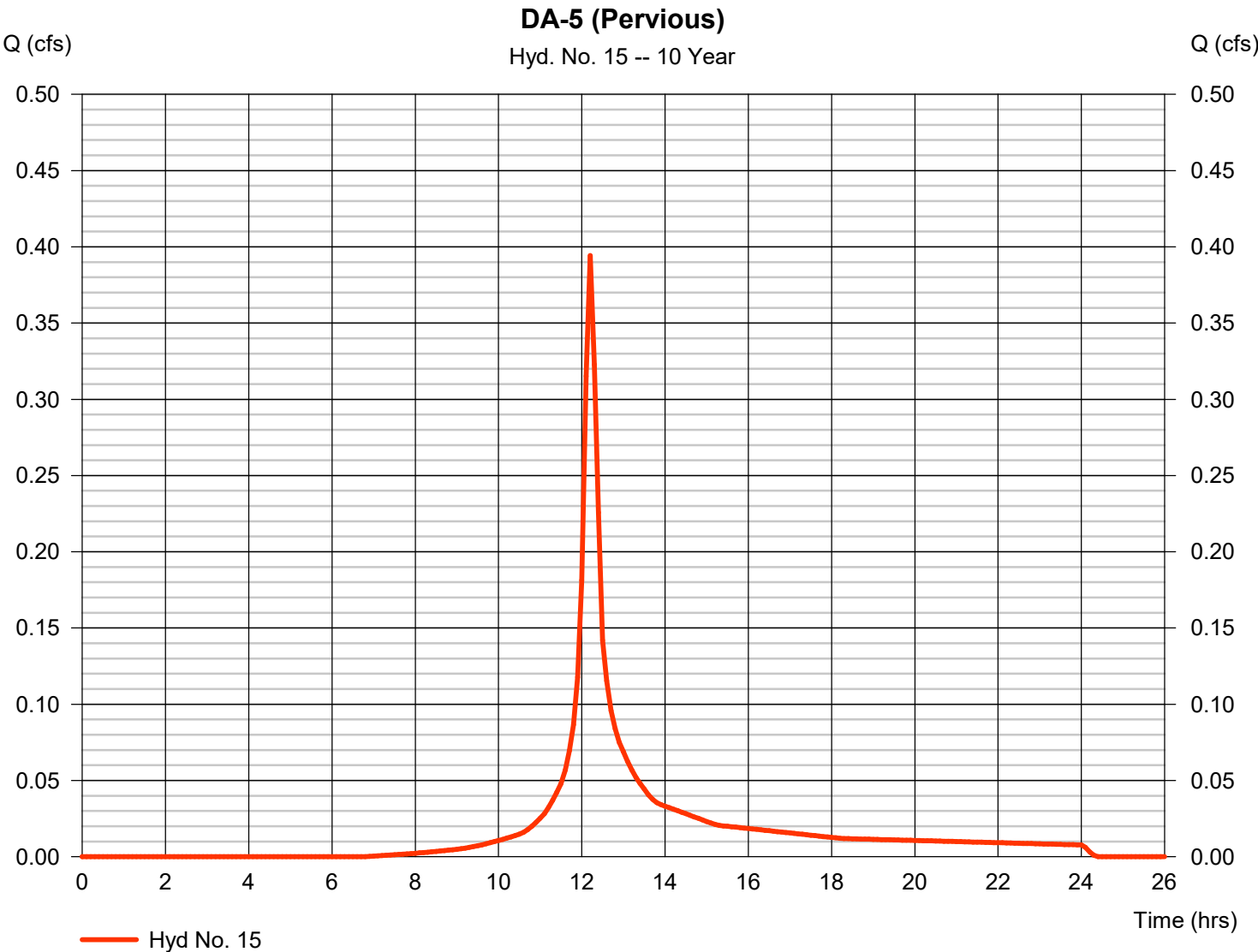


Hydrograph Report

Hyd. No. 15

DA-5 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.394 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 1,680 cuft
Drainage area	= 0.160 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.22 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\160110-0012 Page 484\West Orange\Civil Site		



Precipitation Report

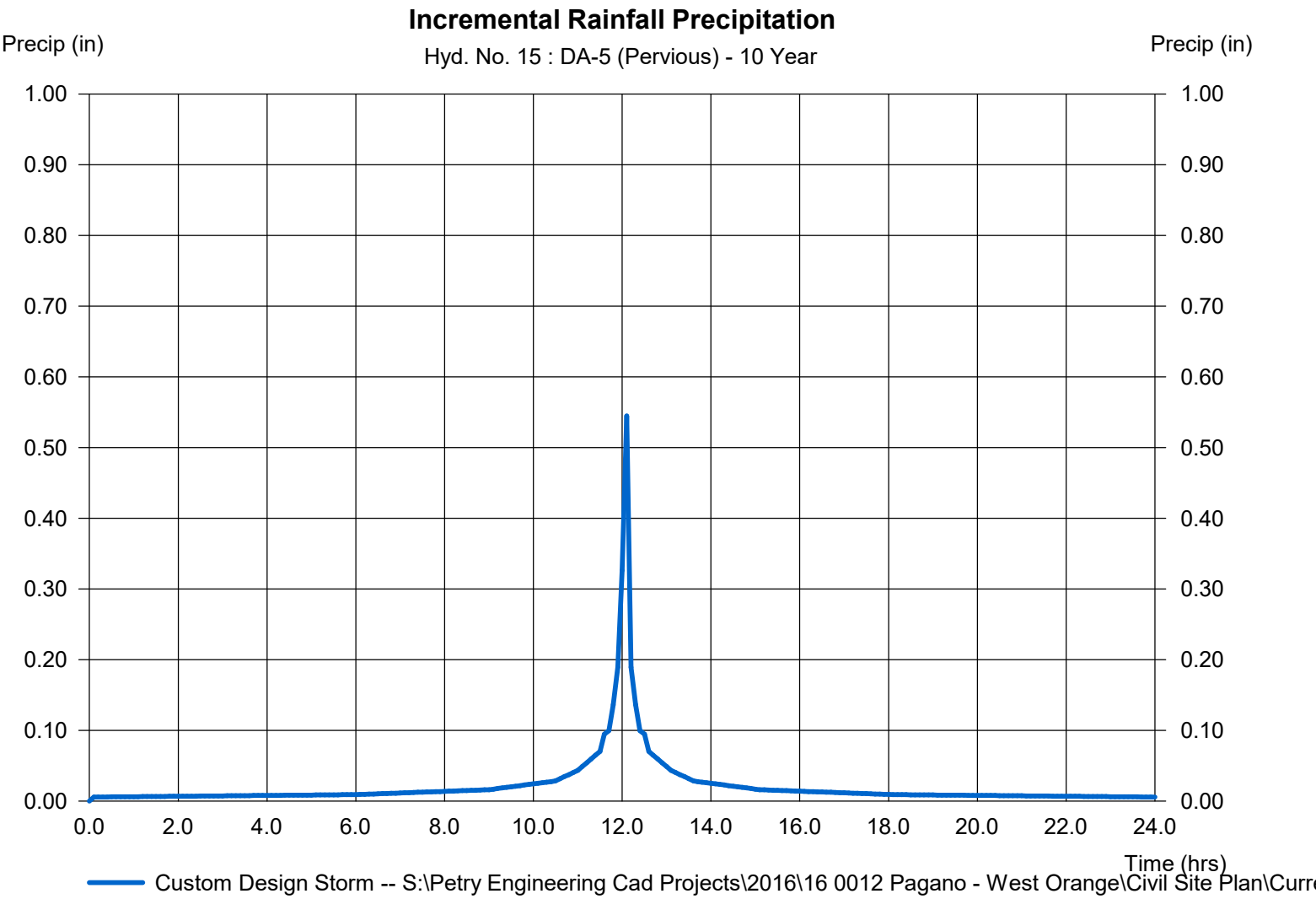
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 15

DA-5 (Pervious)

Storm Frequency	= 10 yrs	Time interval	= 6 min
Total precip.	= 5.2200 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

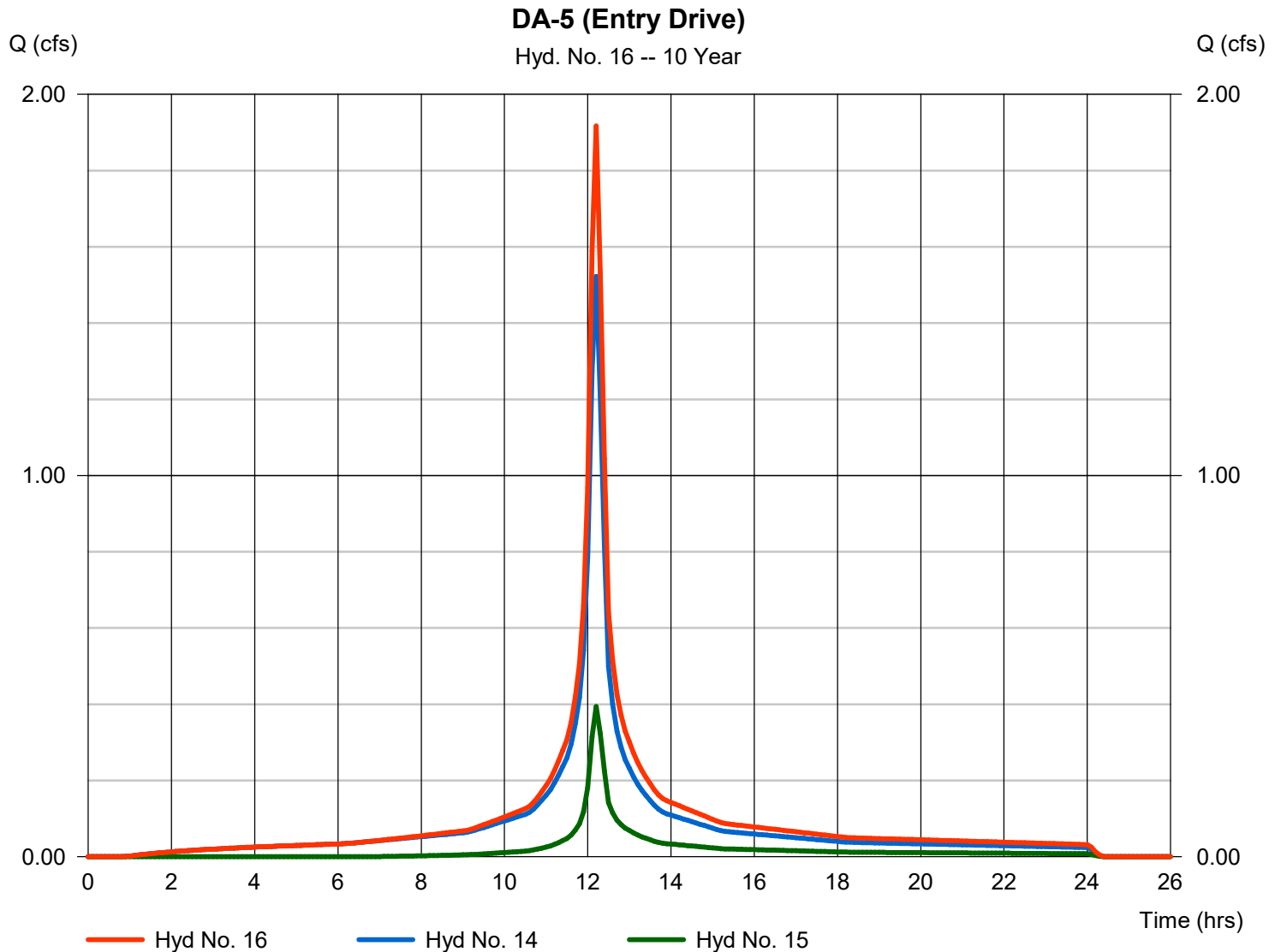
Wednesday, 03 / 8 / 2023

Hyd. No. 16

DA-5 (Entry Drive)

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 6 min
Inflow hyds. = 14, 15

Peak discharge = 1.917 cfs
Time to peak = 12.20 hrs
Hyd. volume = 9,141 cuft
Contrib. drain. area = 0.600 ac



Hydrograph Report

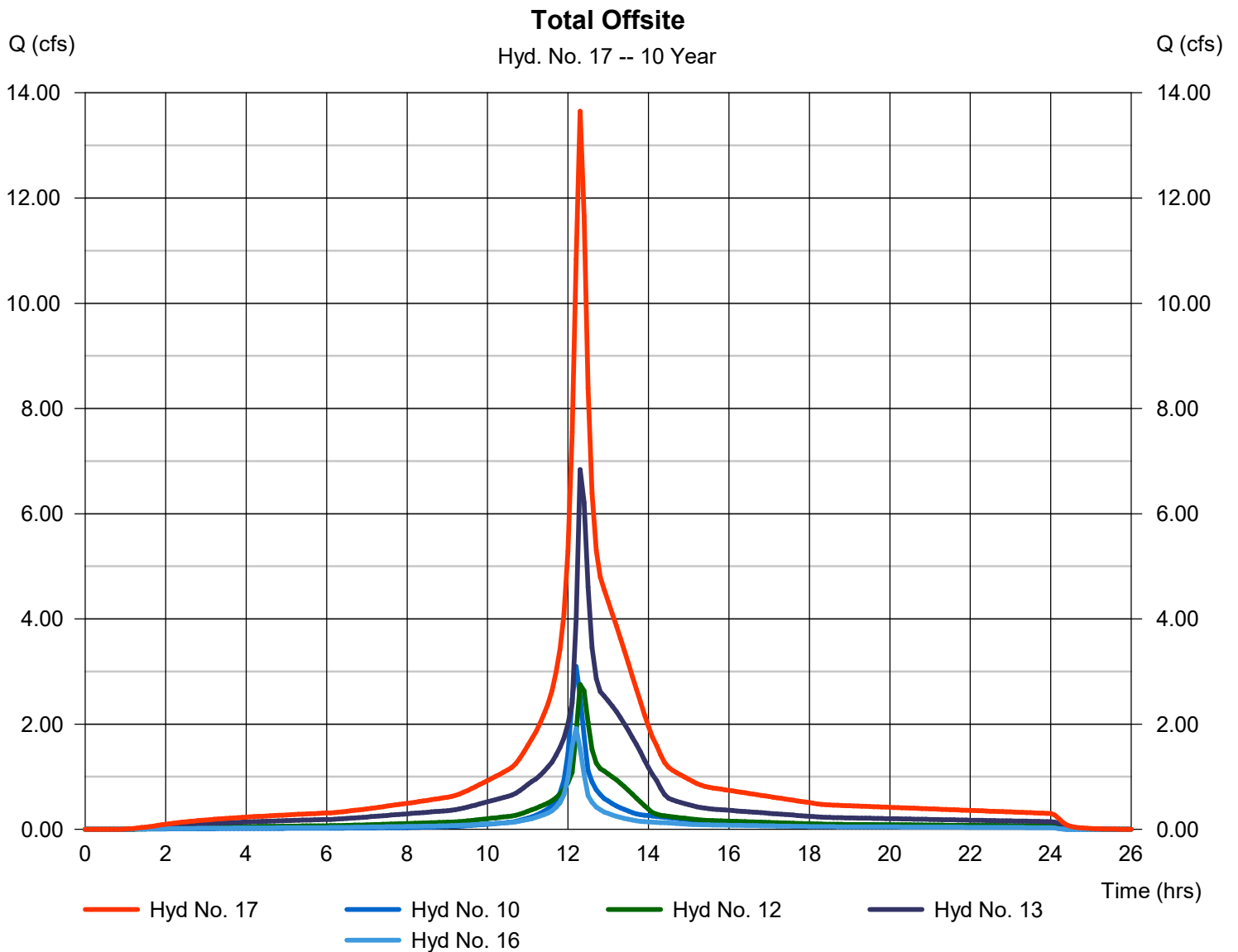
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 17

Total Offsite

Hydrograph type	= Combine	Peak discharge	= 13.65 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.30 hrs
Time interval	= 6 min	Hyd. volume	= 84,994 cuft
Inflow hyds.	= 10, 12, 13, 16	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

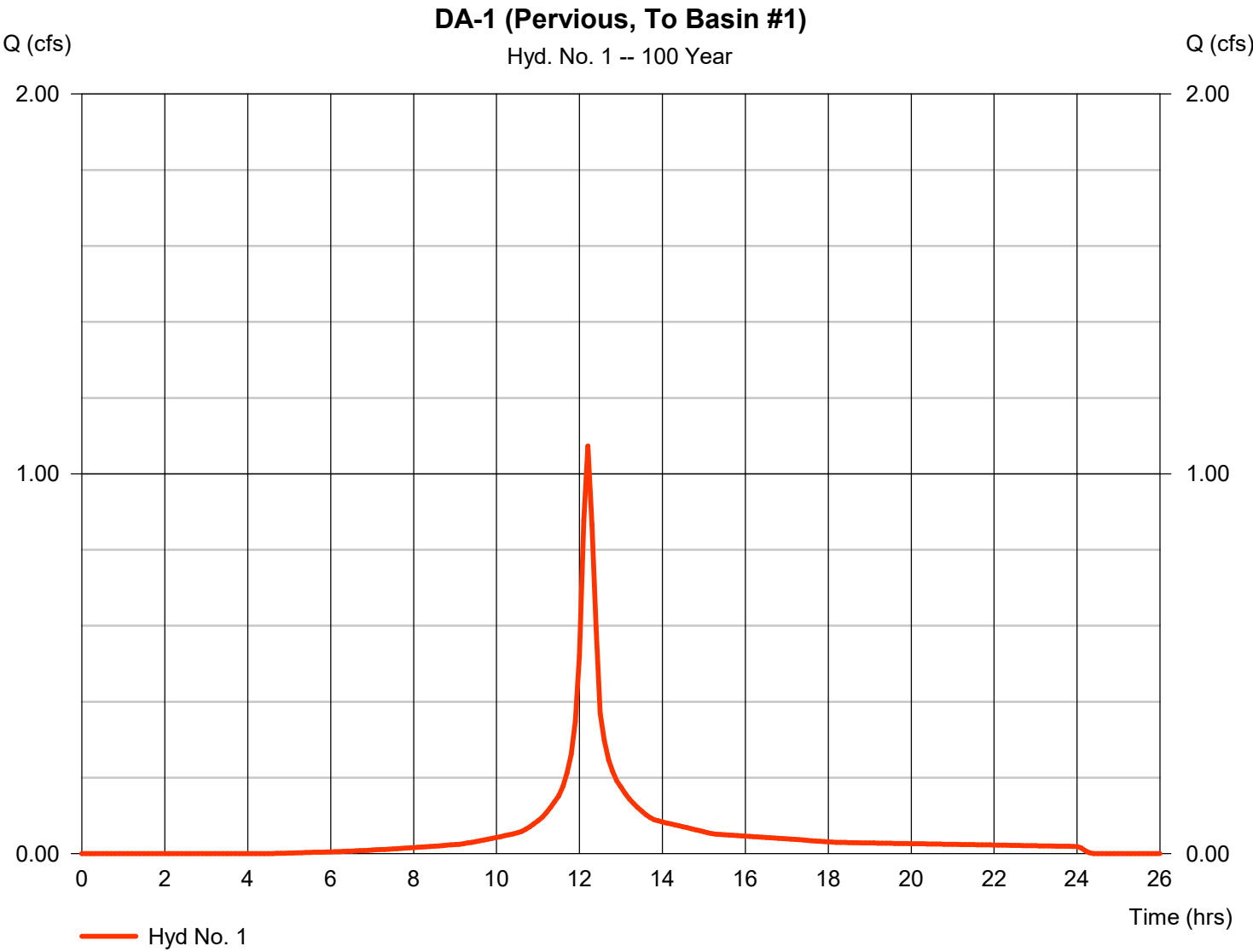
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.073	6	732	4,677	-----	-----	-----	DA-1 (Pervious, To Basin #1)
2	SCS Runoff	5.357	6	732	26,648	-----	-----	-----	DA-1 (Impervious, To Basin #1)
3	SCS Runoff	0.585	6	732	2,551	-----	-----	-----	DA-2 (Pervious, To Basin #2)
4	SCS Runoff	14.52	6	732	72,207	-----	-----	-----	DA-2 (Impervious, To Basin #2)
5	SCS Runoff	6.447	6	732	27,614	-----	-----	-----	DA-3 (Offsite, Bypass)
6	SCS Runoff	4.517	6	732	19,389	-----	-----	-----	DA-4 (Pervious - Onsite, Bypass)
7	SCS Runoff	1.613	6	732	8,023	-----	-----	-----	DA-4 (Impervious - Onsite, Bypass)
8	Combine	6.431	6	732	31,324	1, 2,	-----	-----	DA-1
9	Combine	15.10	6	732	74,758	3, 4,	-----	-----	DA-2
10	Combine	6.130	6	732	27,412	6, 7,	-----	-----	DA-4
12	Reservoir	4.948	6	738	31,322	8	368.59	4,067	Route Basin #1
13	Reservoir	13.14	6	738	74,757	9	369.53	8,841	Route Basin #2
14	SCS Runoff	2.535	6	732	12,608	-----	-----	-----	DA-5 (Impervious)
15	SCS Runoff	0.780	6	732	3,401	-----	-----	-----	DA-5 (Pervious)
16	Combine	3.315	6	732	16,009	14, 15	-----	-----	DA-5 (Entry Drive)
17	Combine	25.68	6	738	149,500	10, 12, 13, 16	-----	-----	Total Offsite
Proposed Conditions.gpw					Return Period: 100 Year			Wednesday, 03 / 8 / 2023	

Hydrograph Report

Hyd. No. 1

DA-1 (Pervious, To Basin #1)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.073 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	4,677 cuft
Drainage area	=	0.220 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.66 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\1610-0012 Page 484 West Orange\Civil Site			

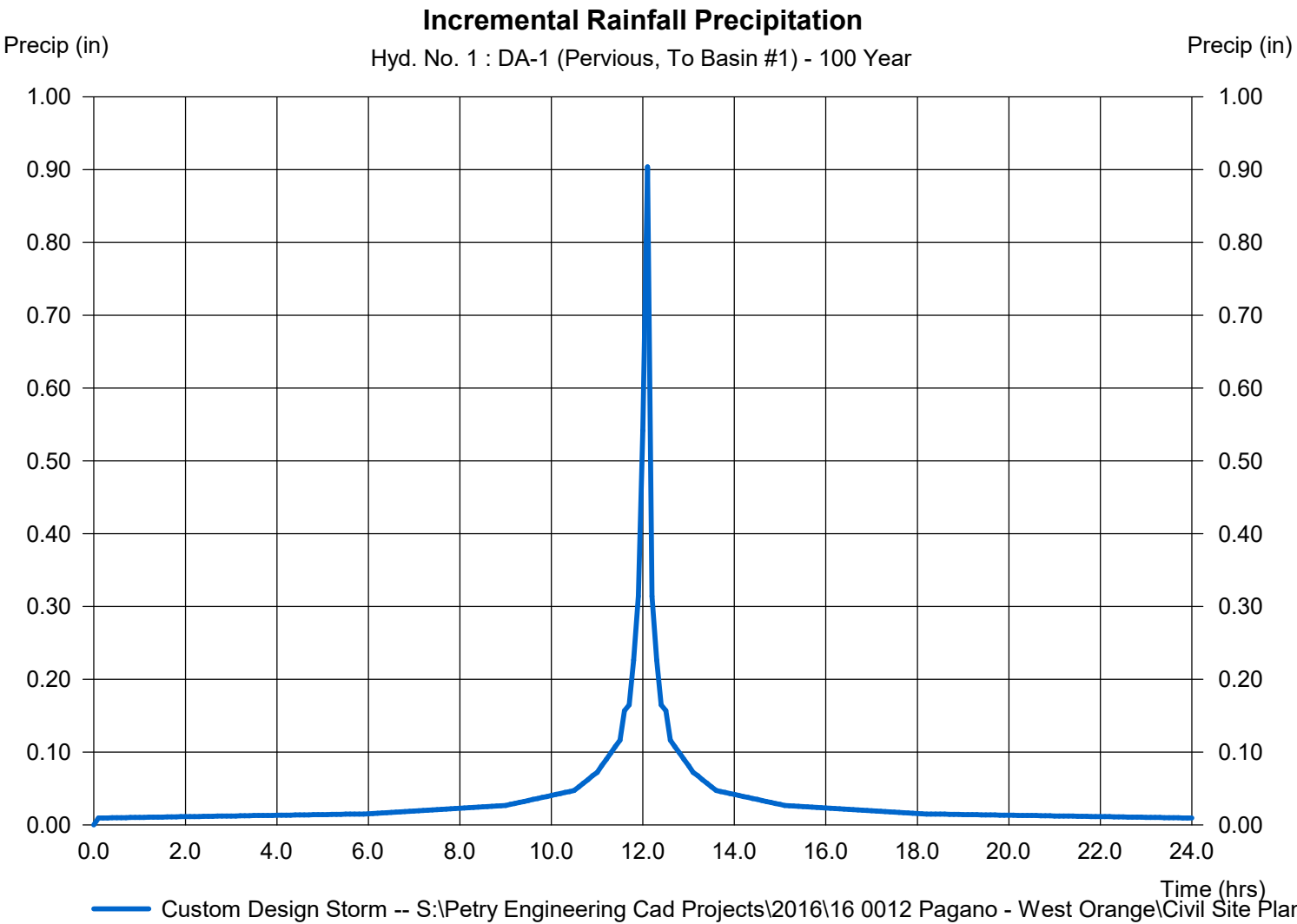


Precipitation Report

Hyd. No. 1

DA-1 (Pervious, To Basin #1)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

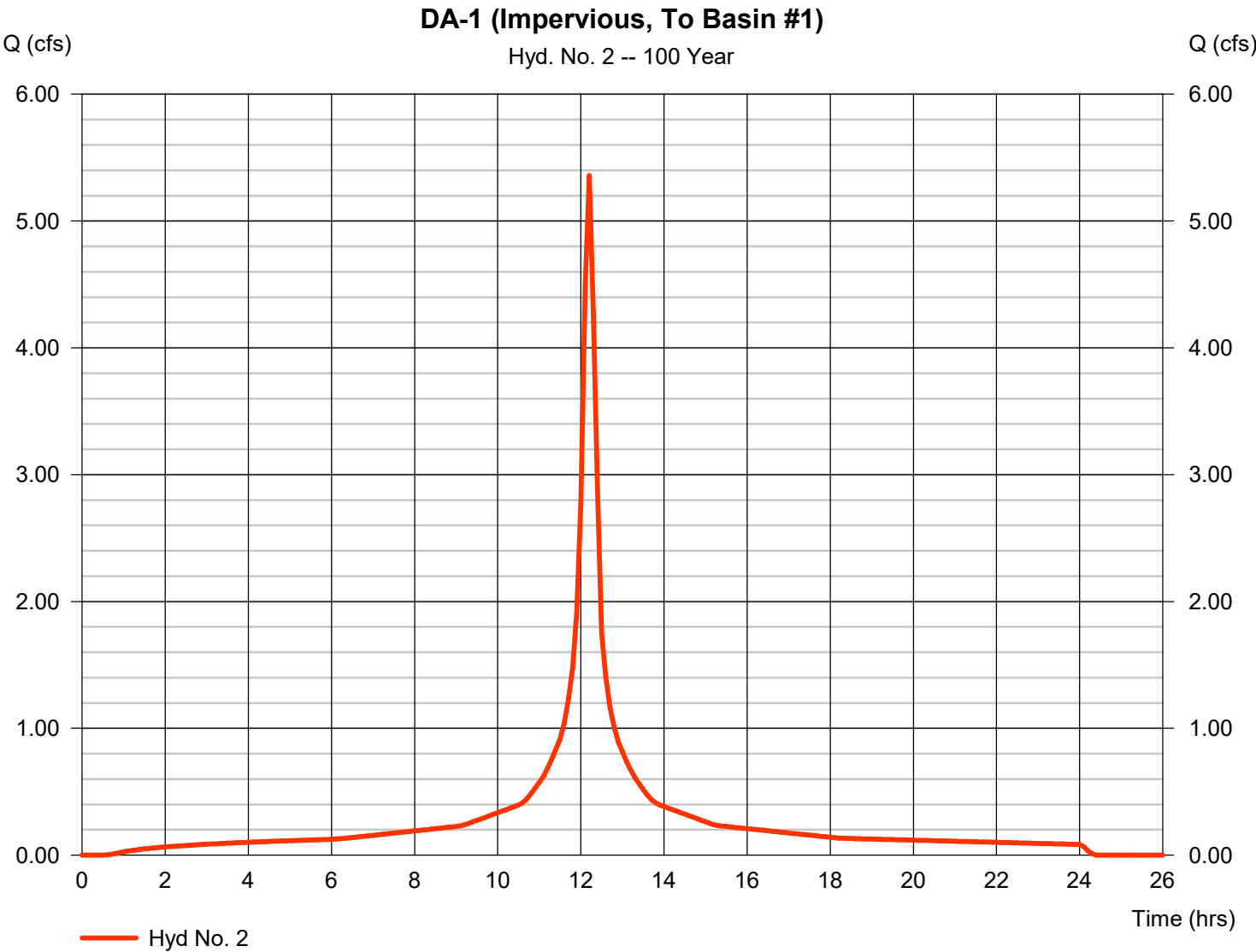


Hydrograph Report

Hyd. No. 2

DA-1 (Impervious, To Basin #1)

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.357 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	26,648 cuft
Drainage area	=	0.930 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.66 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

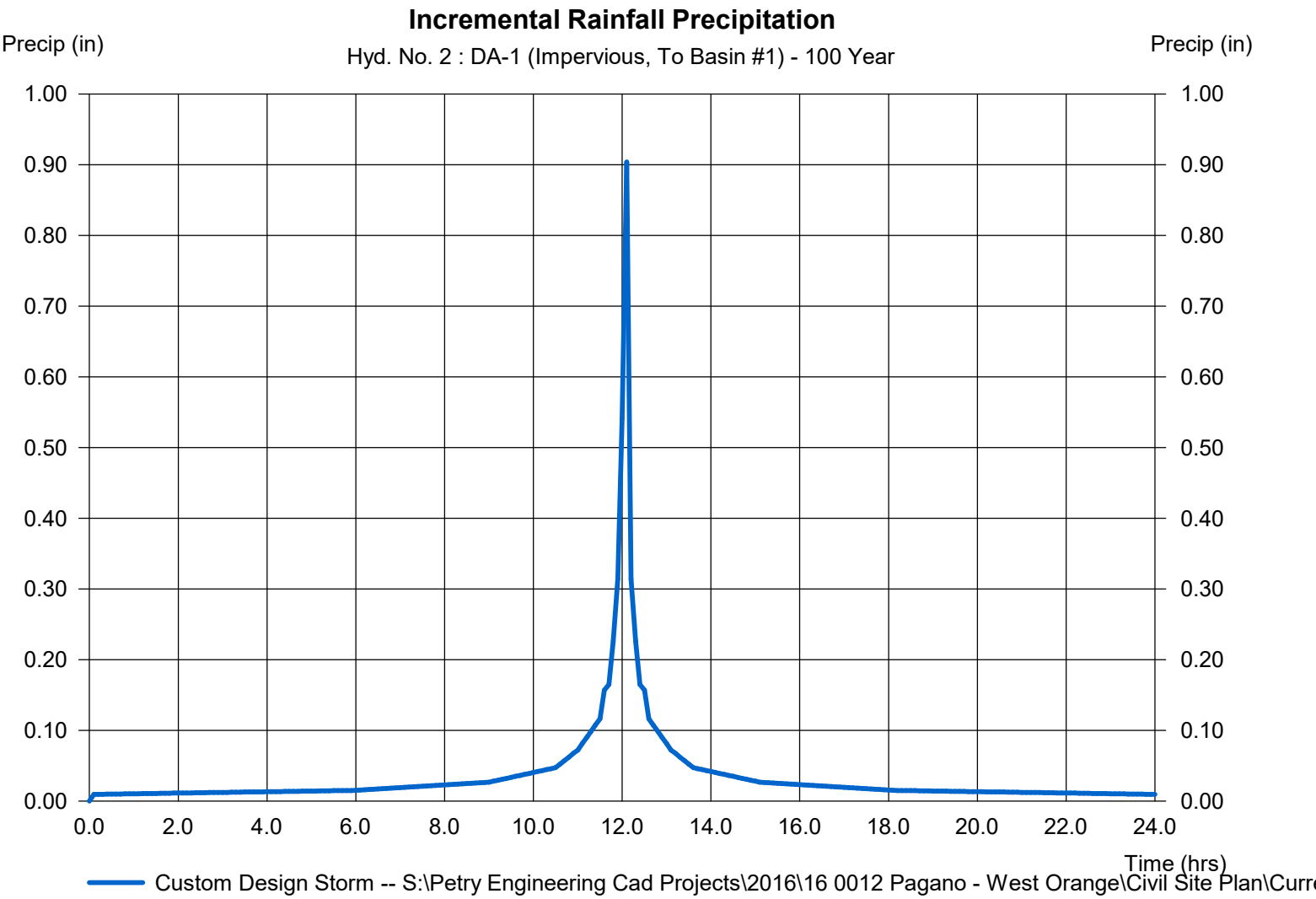


Precipitation Report

Hyd. No. 2

DA-1 (Impervious, To Basin #1)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

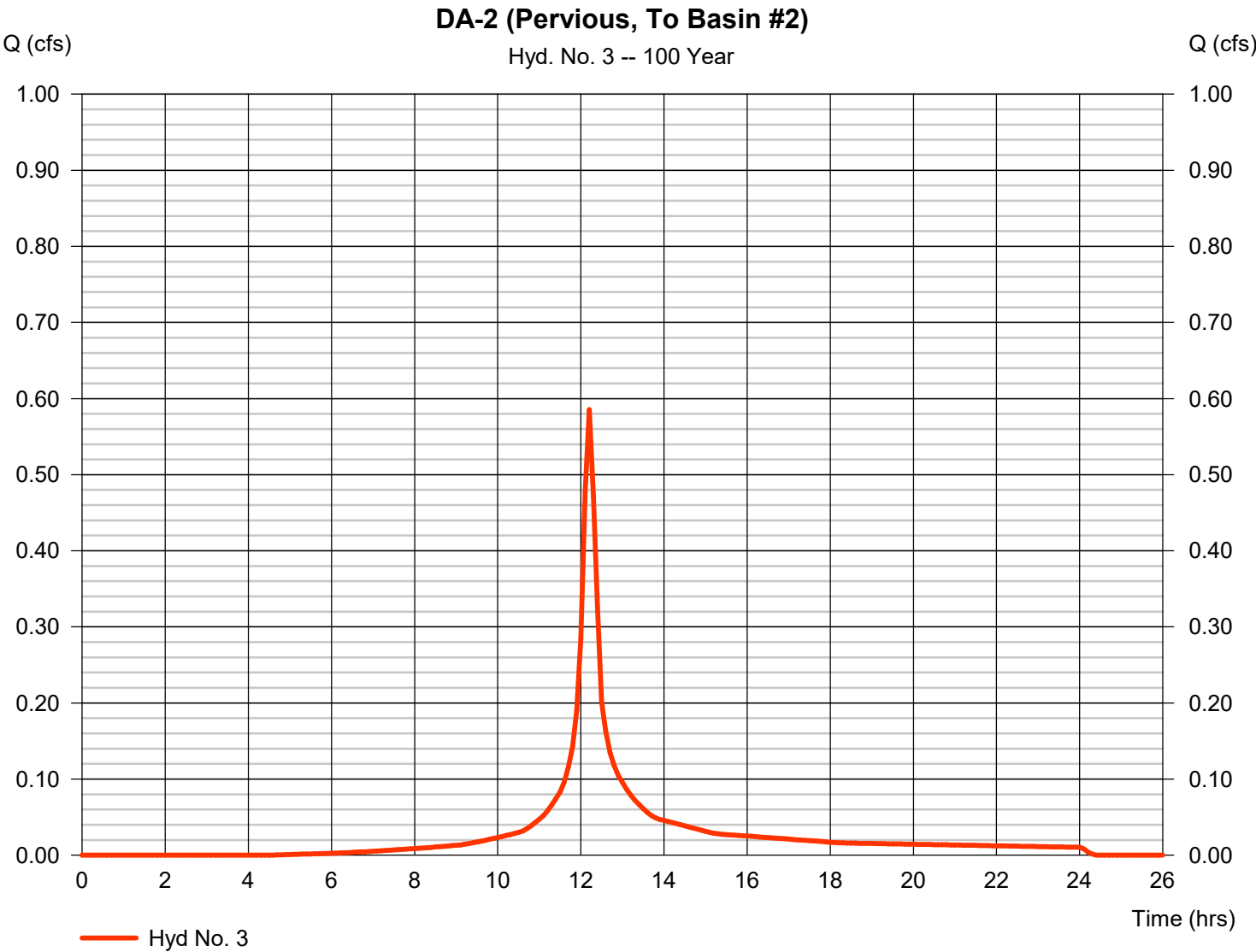


Hydrograph Report

Hyd. No. 3

DA-2 (Pervious, To Basin #2)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.585 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 2,551 cuft
Drainage area	= 0.120 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.66 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\160110012 Page 484 West Orange\Civil Site		



Precipitation Report

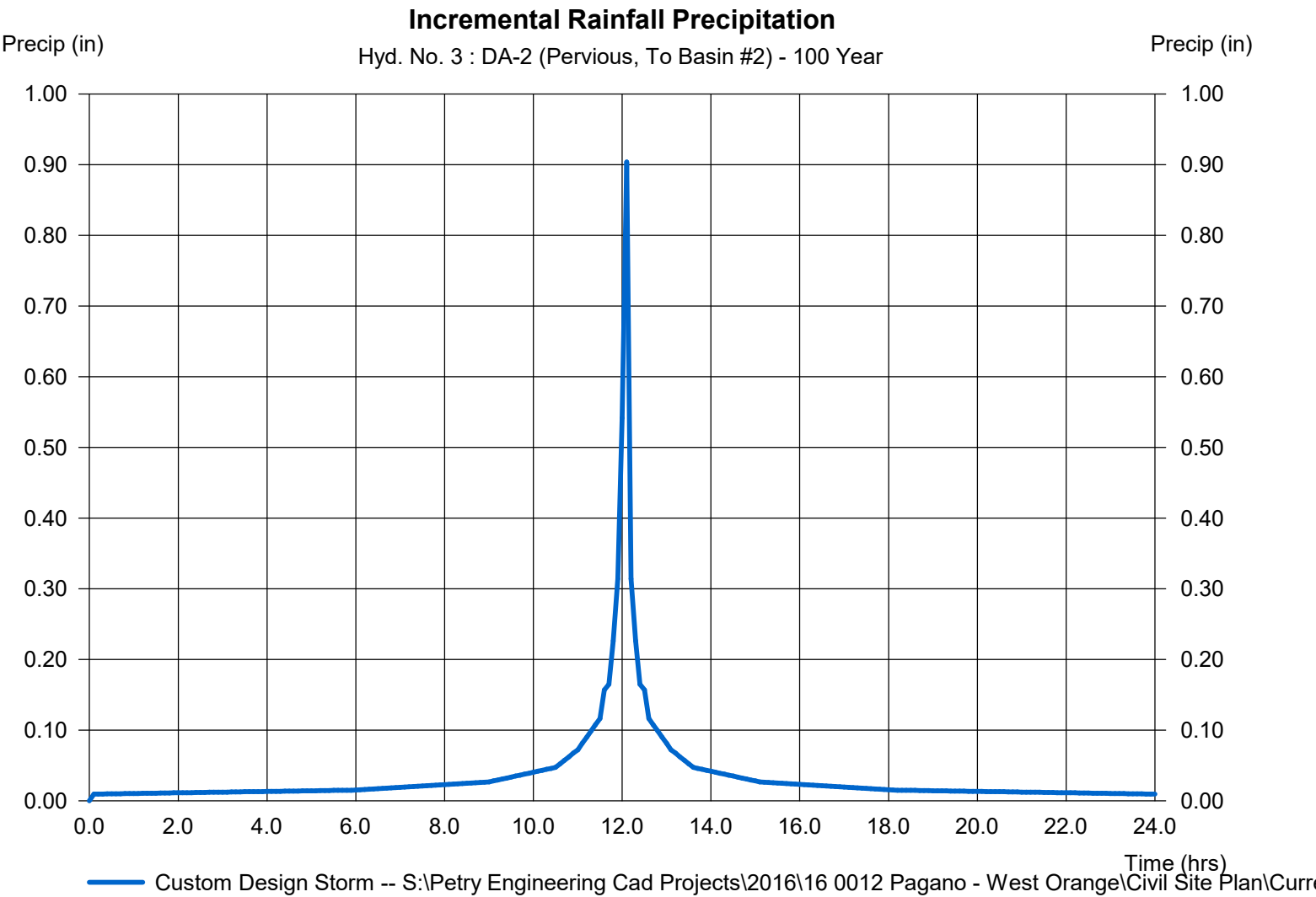
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 3

DA-2 (Pervious, To Basin #2)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

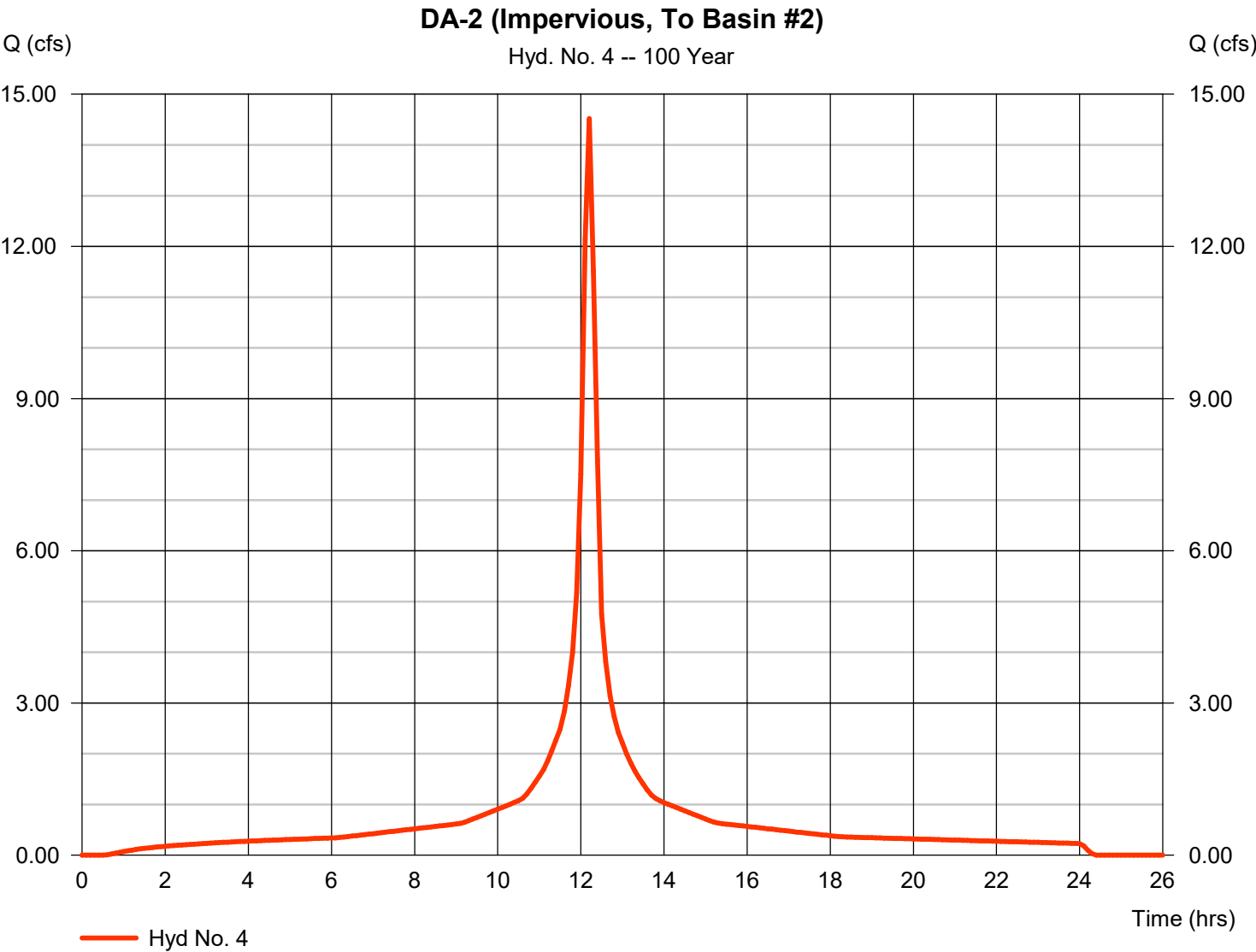


Hydrograph Report

Hyd. No. 4

DA-2 (Impervious, To Basin #2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.52 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	72,207 cuft
Drainage area	=	2.520 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.66 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

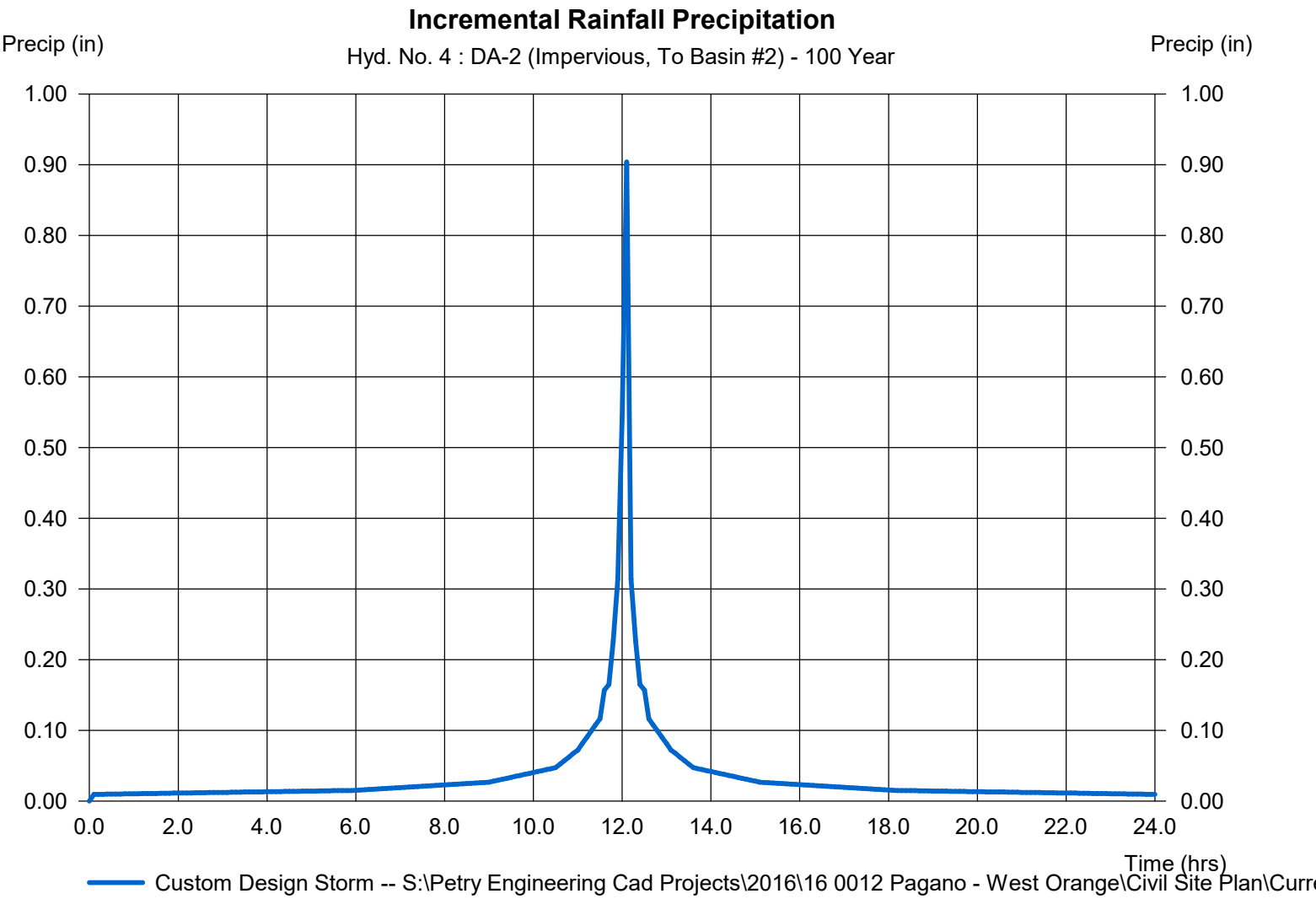


Precipitation Report

Hyd. No. 4

DA-2 (Impervious, To Basin #2)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



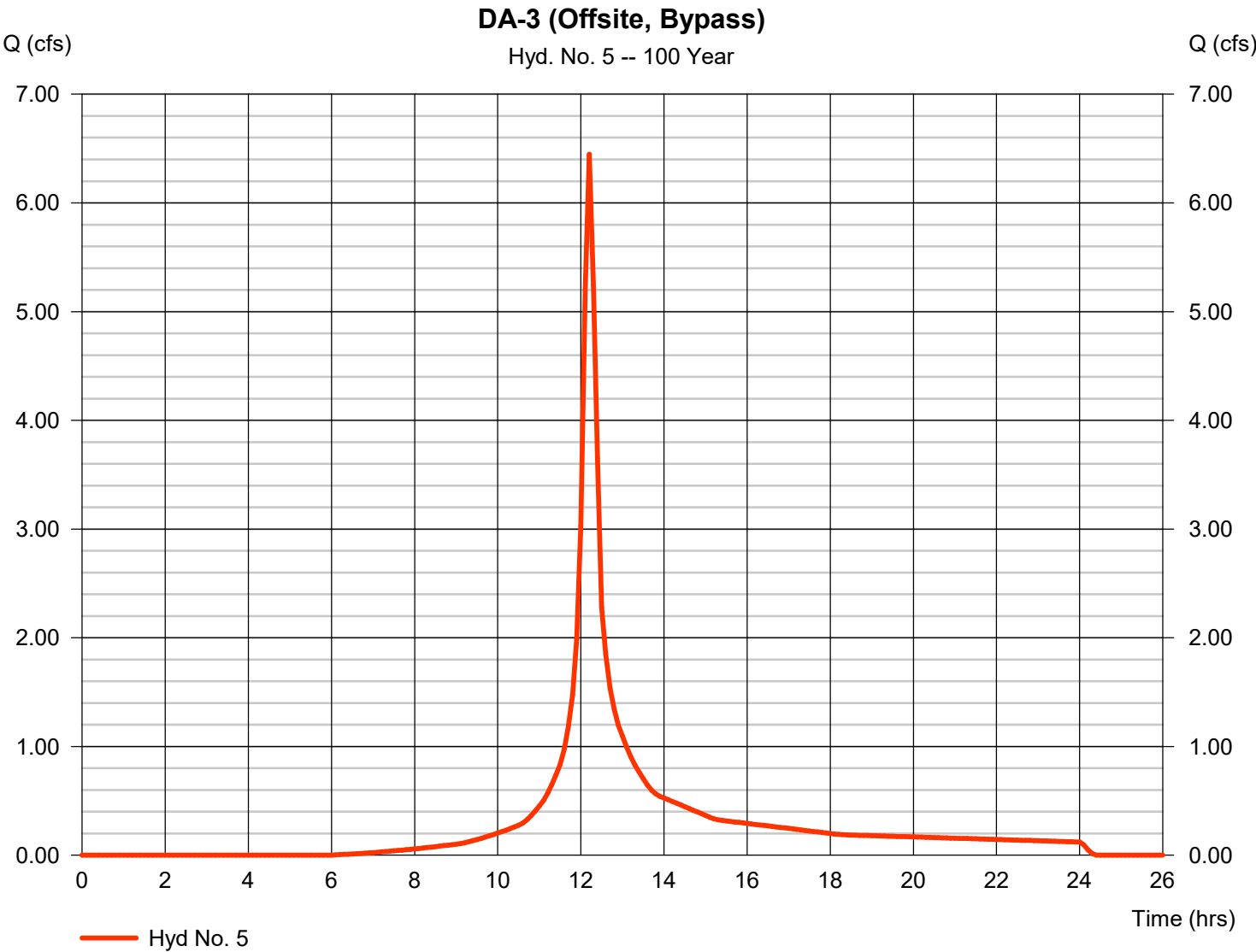
Hydrograph Report

Hyd. No. 5

DA-3 (Offsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.447 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	27,614 cuft
Drainage area	=	1.470 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.66 in	Distribution	=	Custom
Storm duration	=	S:\Petty Engineering Cad Projects\1610012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.070 x 98) + (0.840 x 74) + (0.480 x 70) + (0.080 x 79)] / 1.470

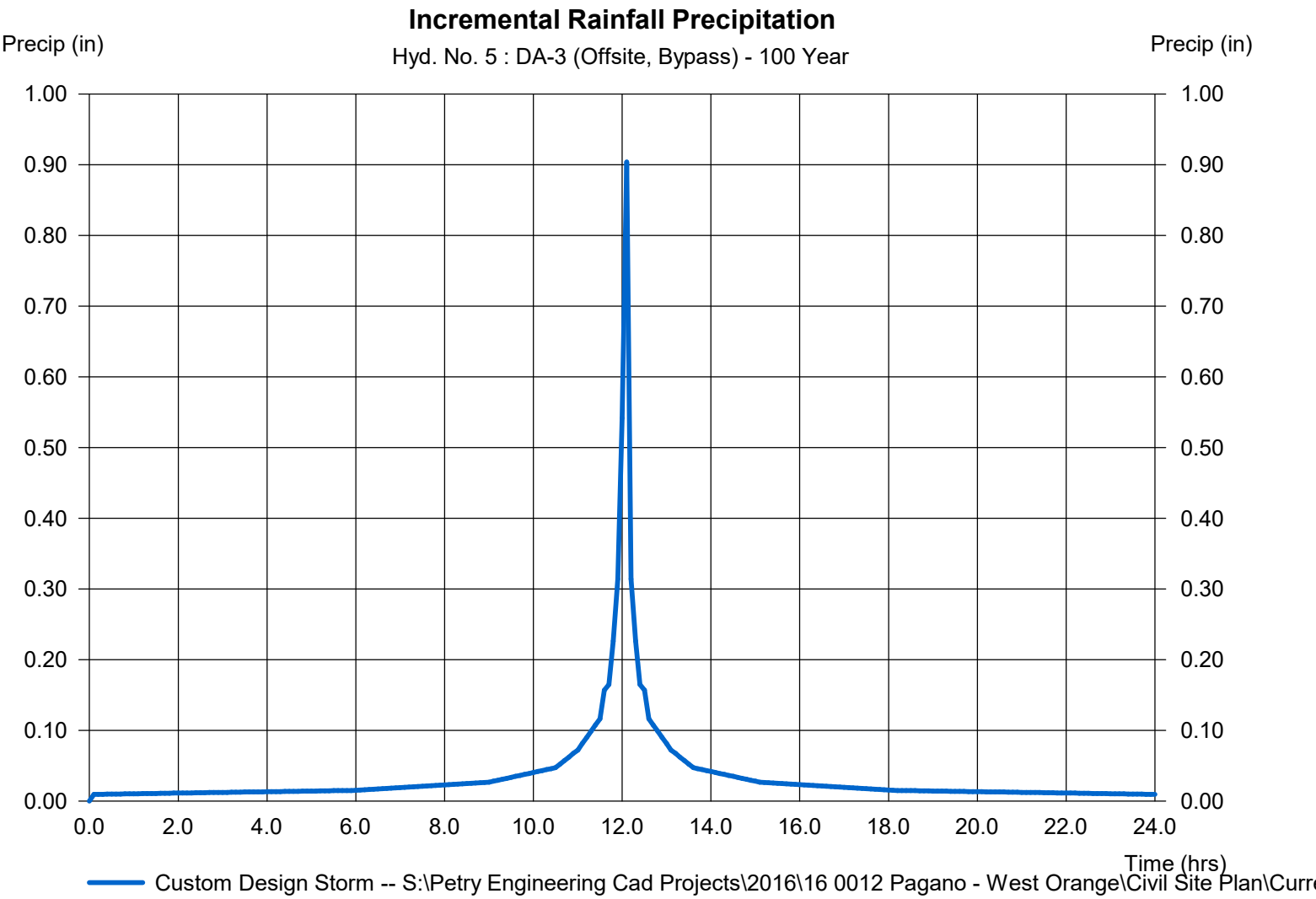


Precipitation Report

Hyd. No. 5

DA-3 (Offsite, Bypass)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



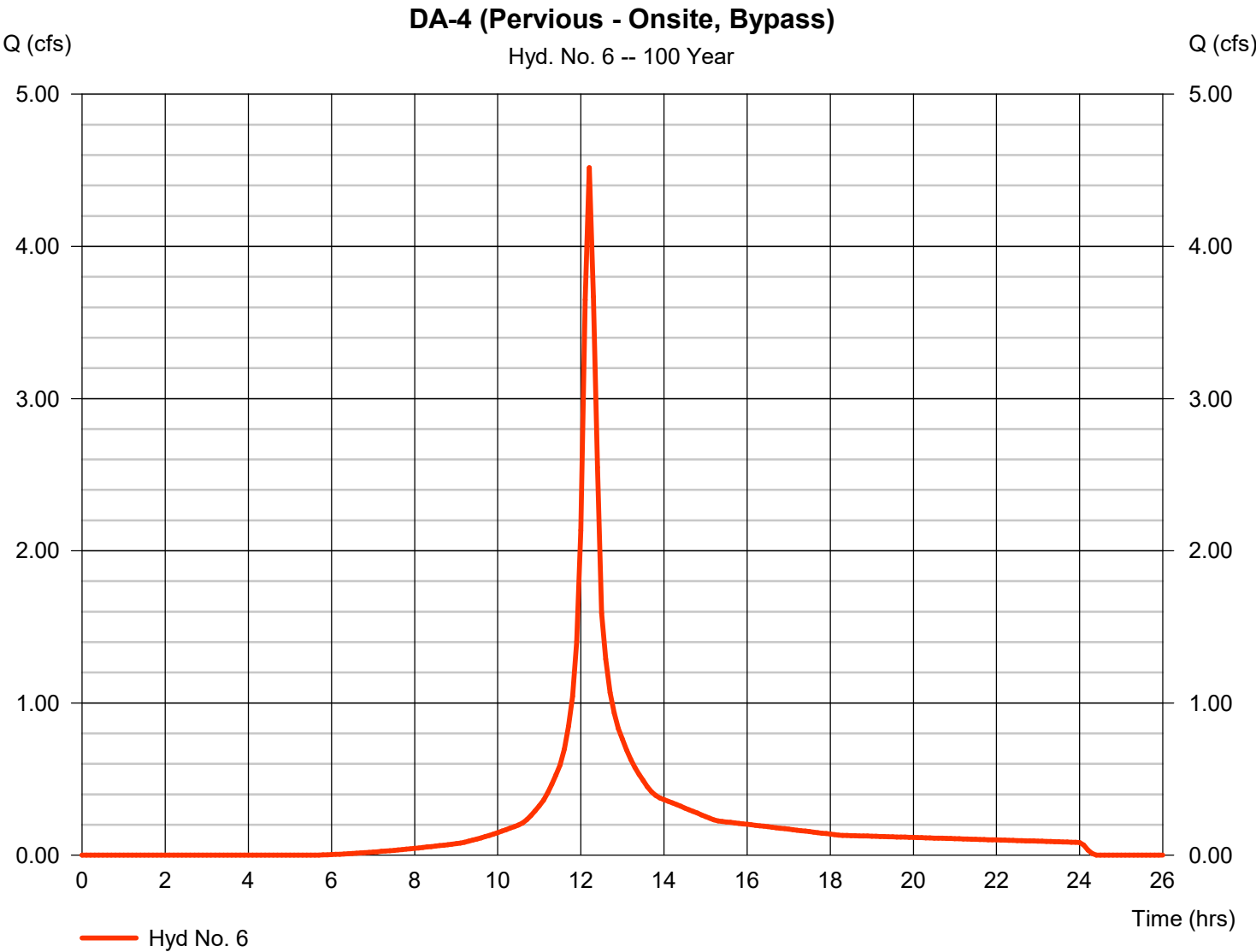
Hydrograph Report

Hyd. No. 6

DA-4 (Pervious - Onsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.517 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	19,389 cuft
Drainage area	=	1.010 ac	Curve number	=	75*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.66 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

* Composite (Area/CN) = [(0.770 x 73) + (0.240 x 80)] / 1.010

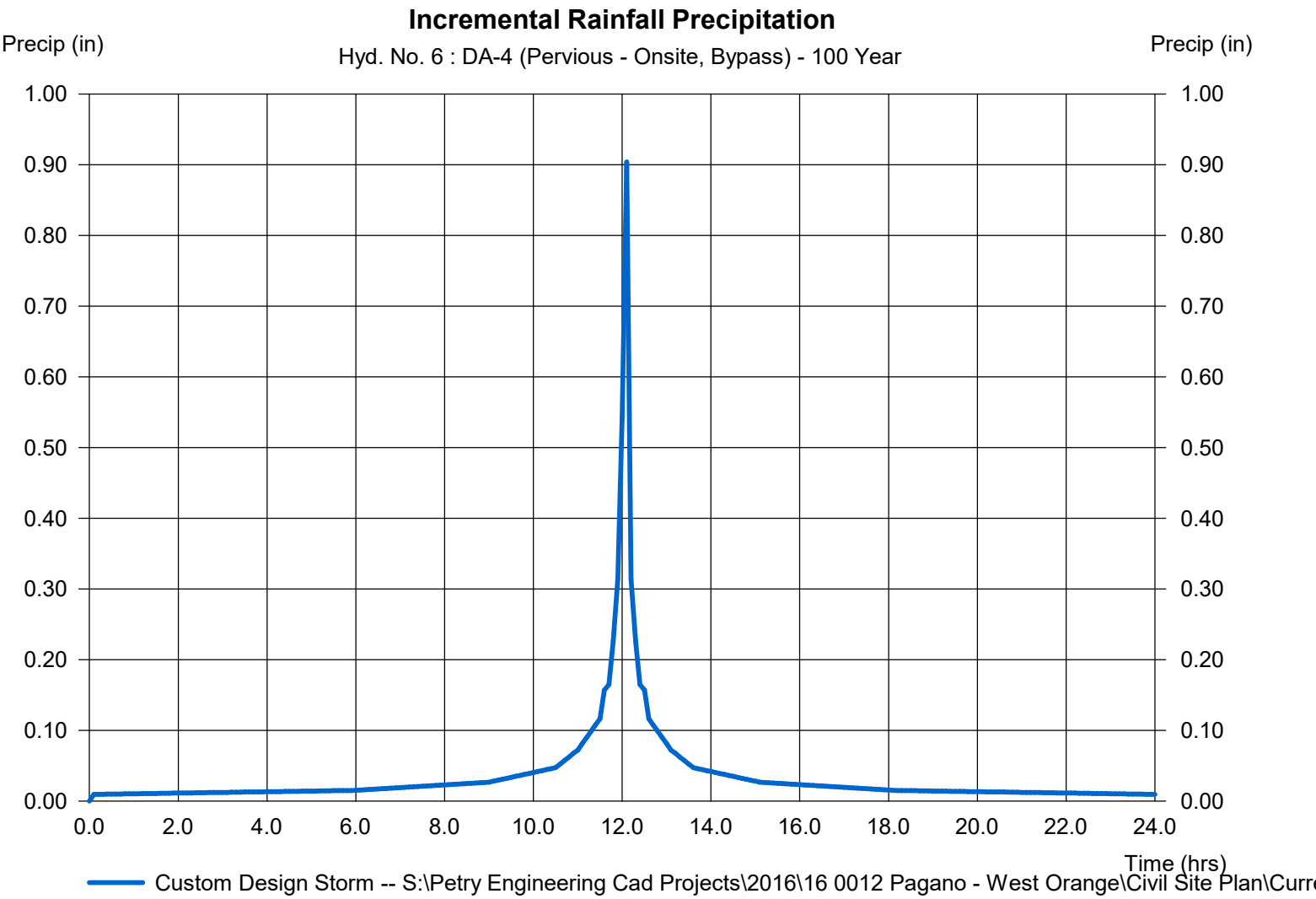


Precipitation Report

Hyd. No. 6

DA-4 (Pervious - Onsite, Bypass)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

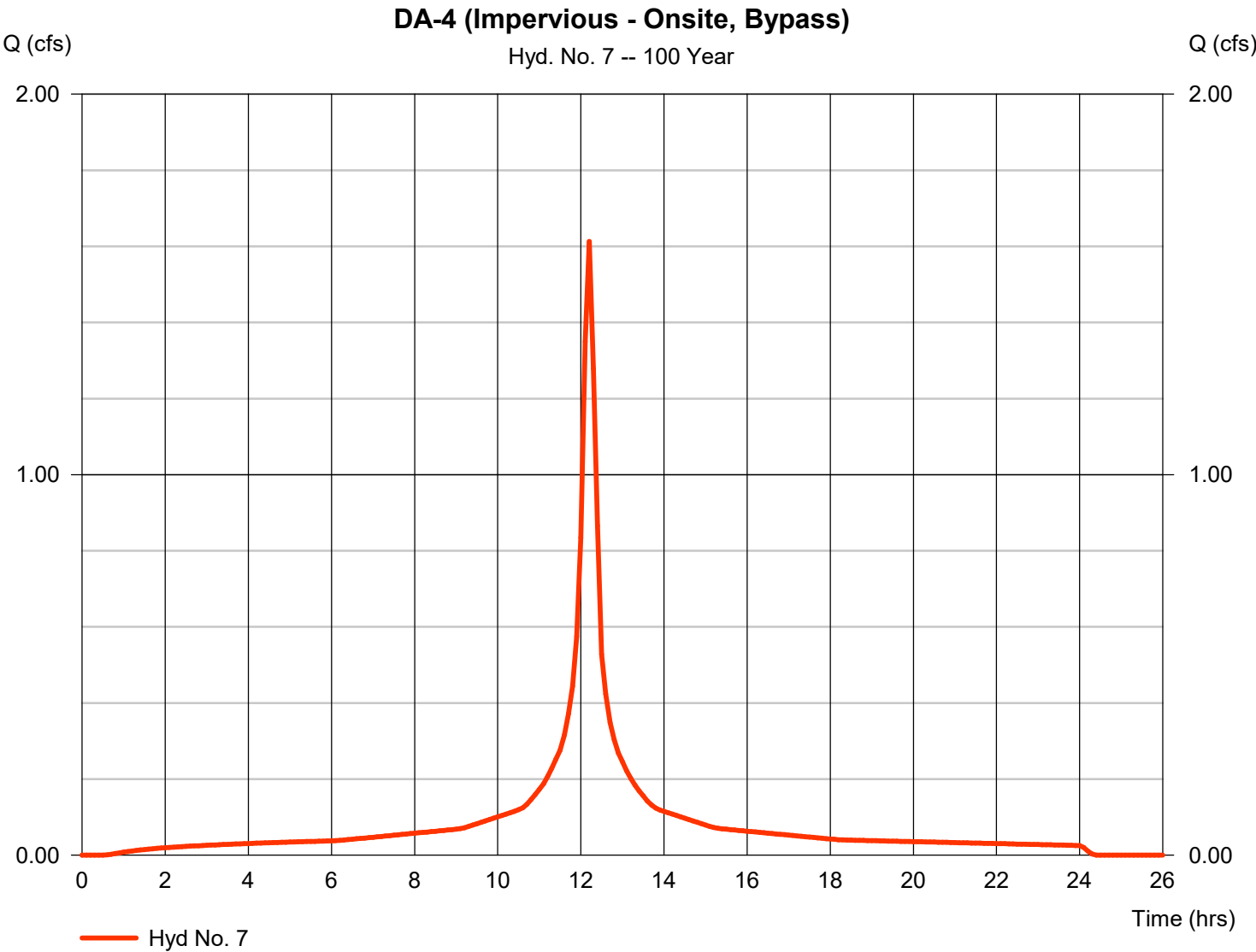


Hydrograph Report

Hyd. No. 7

DA-4 (Impervious - Onsite, Bypass)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.613 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	6 min	Hyd. volume	=	8,023 cuft
Drainage area	=	0.280 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.66 in	Distribution	=	Custom
Storm duration	=	S:\Petry Engineering Cad Projects\161010012 Page 484 West Orange\Civil Site			

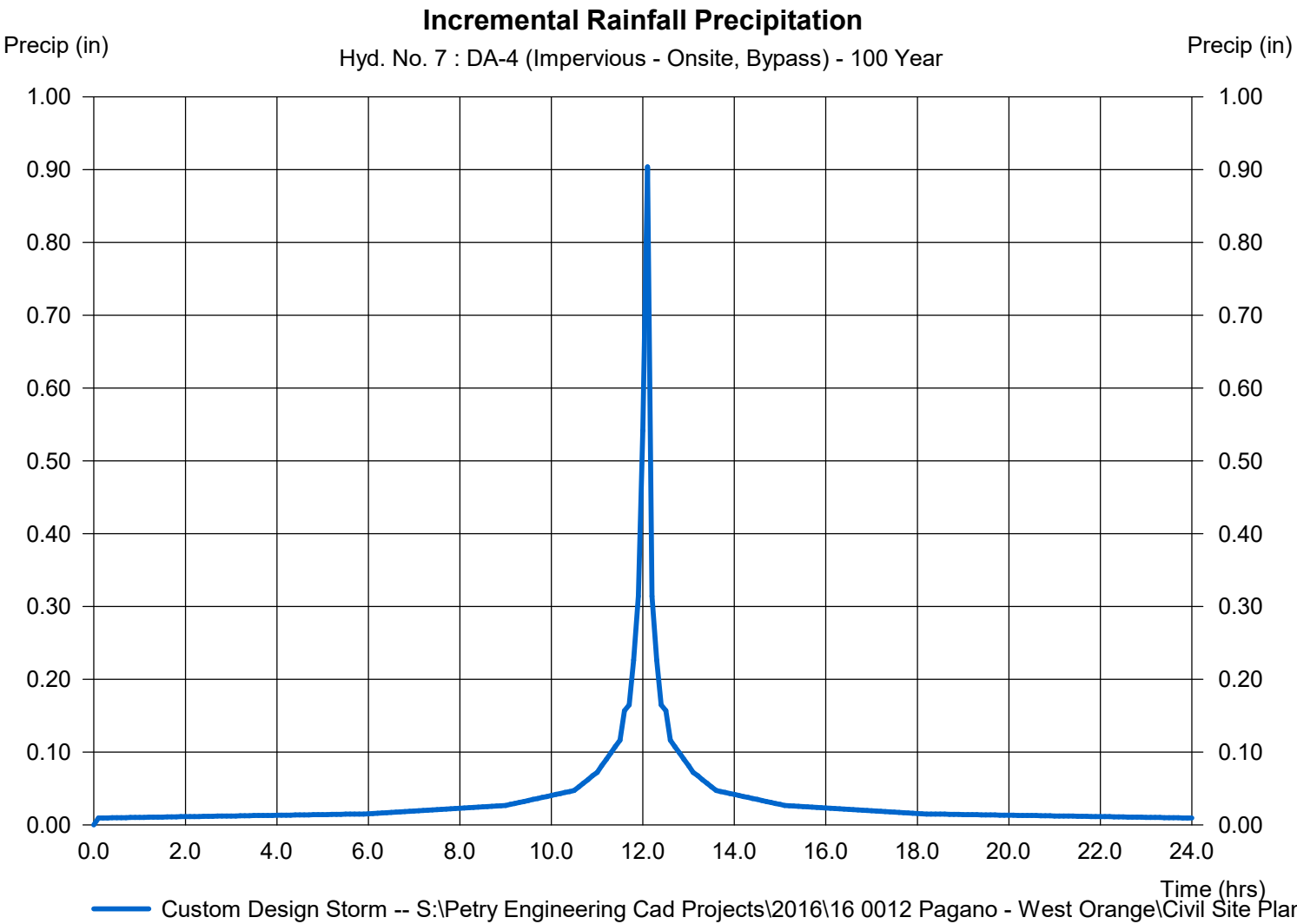


Precipitation Report

Hyd. No. 7

DA-4 (Impervious - Onsite, Bypass)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

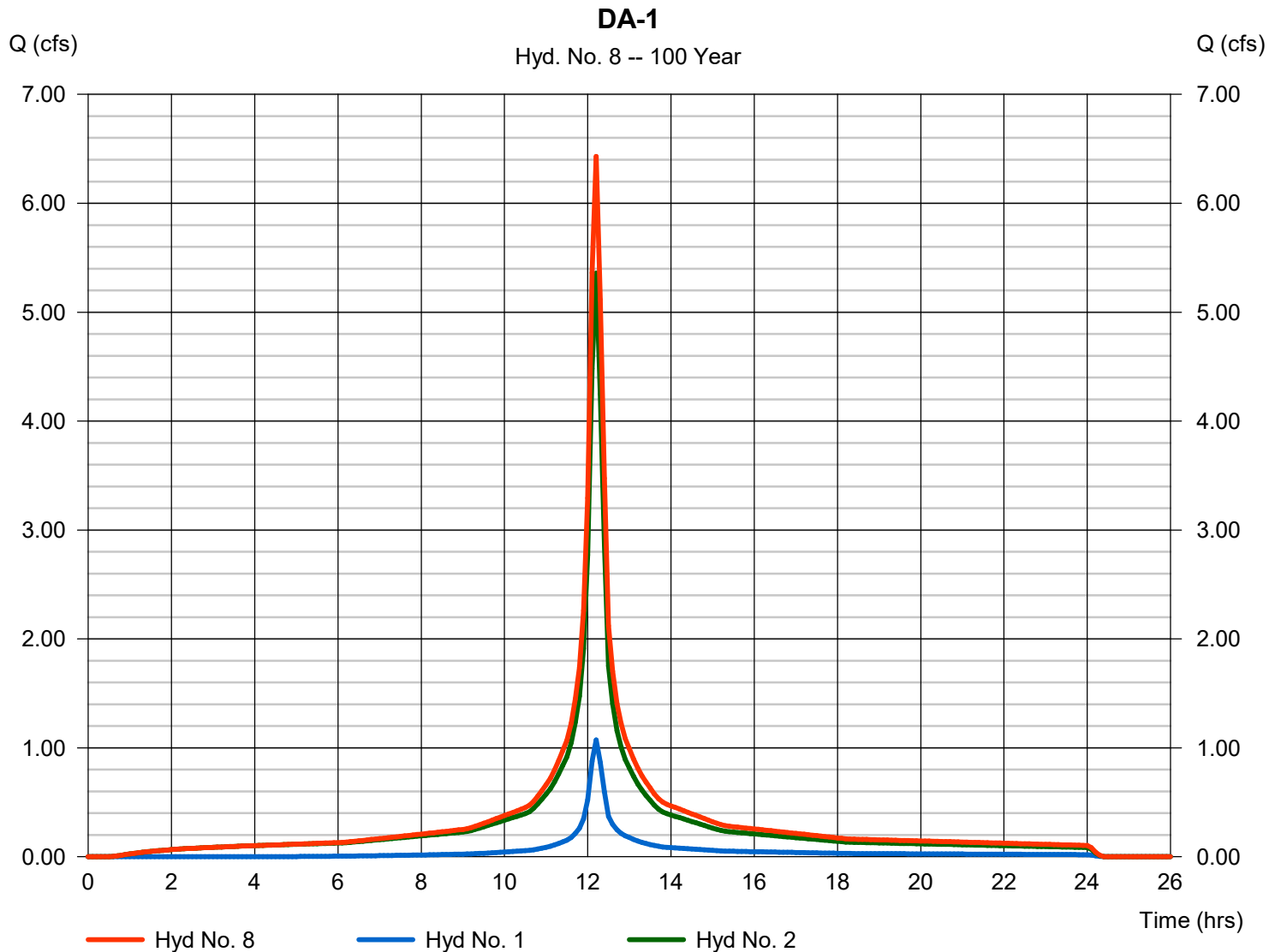
Wednesday, 03 / 8 / 2023

Hyd. No. 8

DA-1

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 6 min
 Inflow hyds. = 1, 2

Peak discharge = 6.431 cfs
 Time to peak = 12.20 hrs
 Hyd. volume = 31,324 cuft
 Contrib. drain. area = 1.150 ac

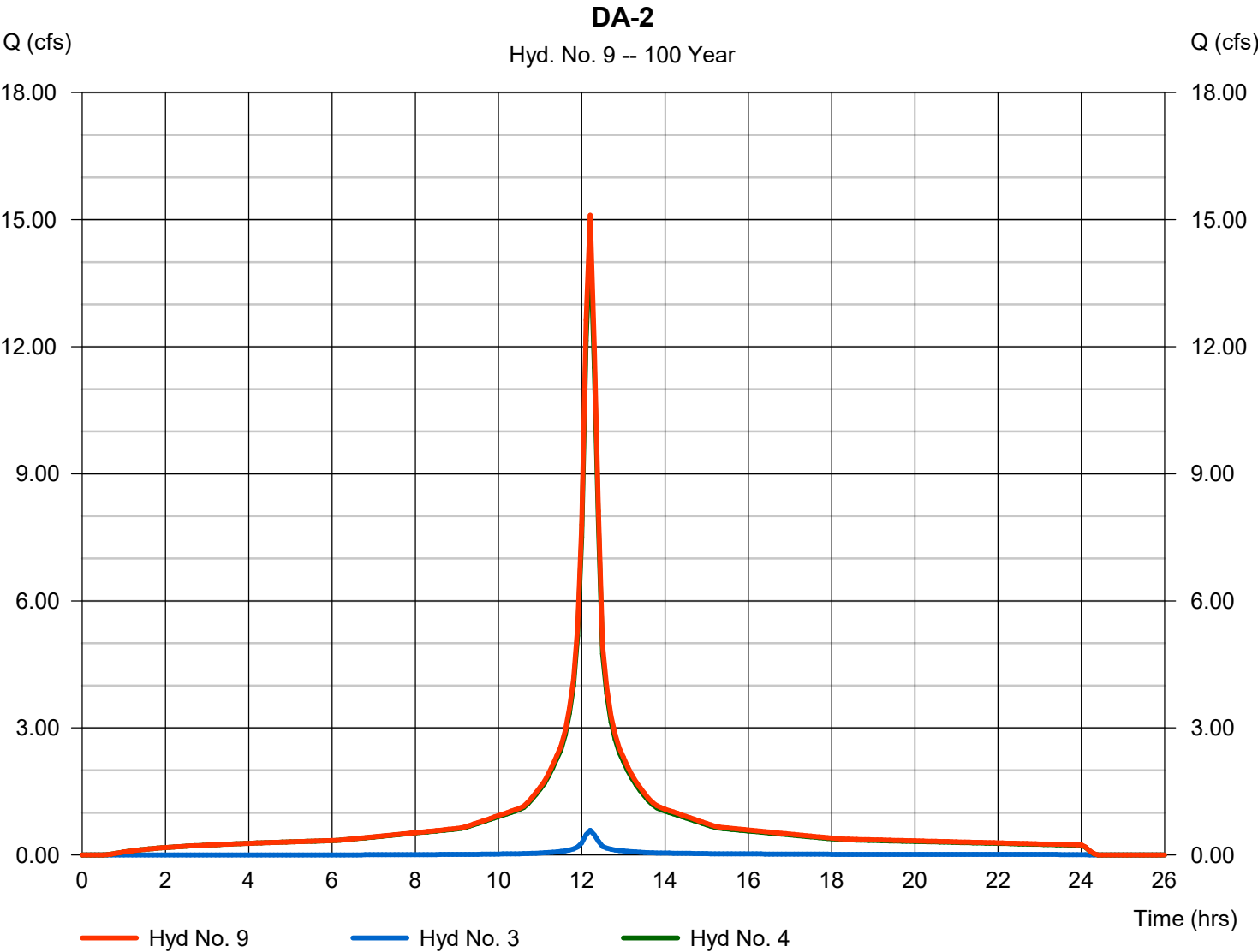


Hydrograph Report

Hyd. No. 9

DA-2

Hydrograph type	= Combine	Peak discharge	= 15.10 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 74,758 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 2.640 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

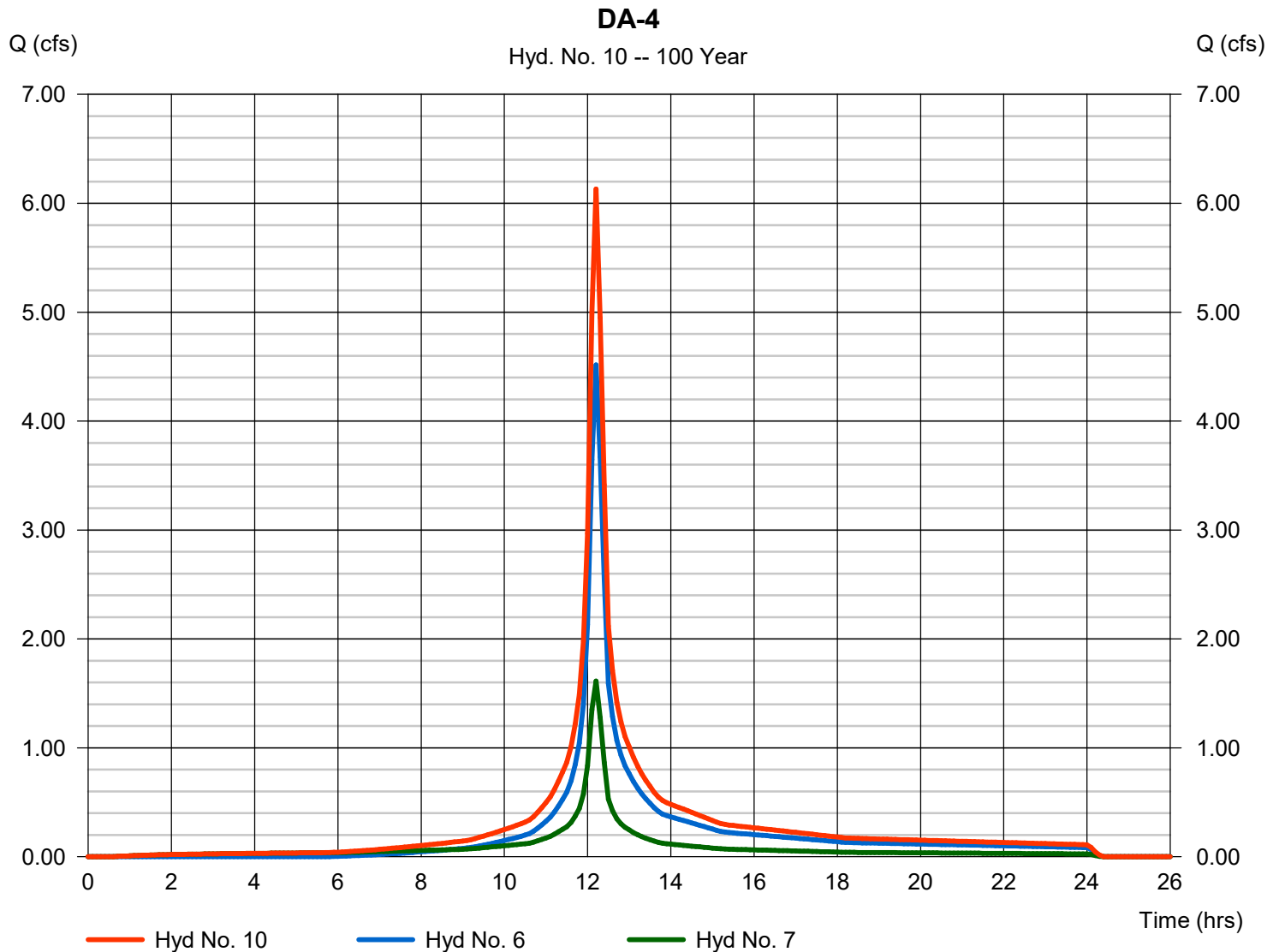
Wednesday, 03 / 8 / 2023

Hyd. No. 10

DA-4

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 6 min
 Inflow hyds. = 6, 7

Peak discharge = 6.130 cfs
 Time to peak = 12.20 hrs
 Hyd. volume = 27,412 cuft
 Contrib. drain. area = 1.290 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

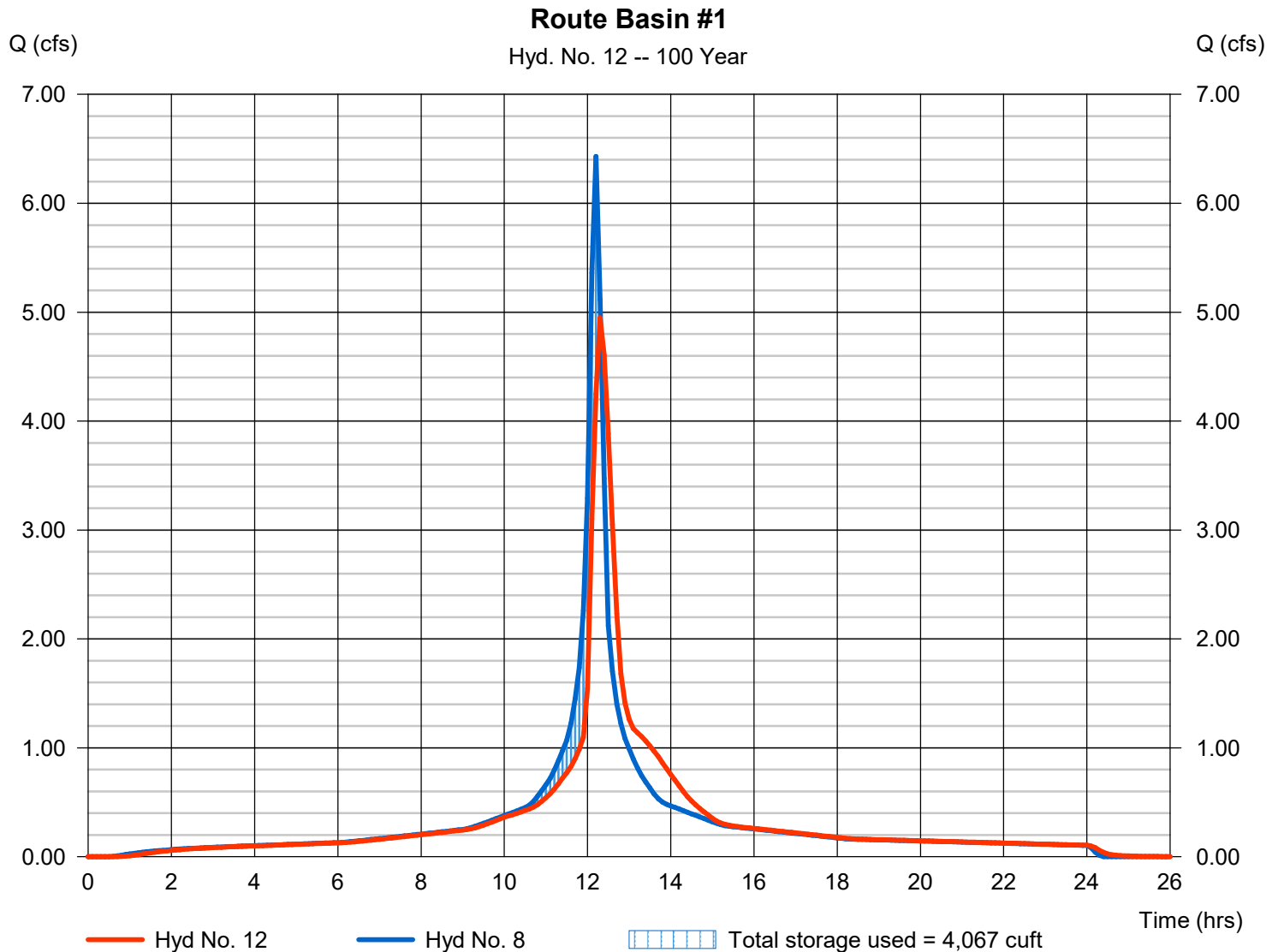
Hyd. No. 12

Route Basin #1

Hydrograph type = Reservoir
 Storm frequency = 100 yrs
 Time interval = 6 min
 Inflow hyd. No. = 8 - DA-1
 Reservoir name = Basin #1

Peak discharge = 4.948 cfs
 Time to peak = 12.30 hrs
 Hyd. volume = 31,322 cuft
 Max. Elevation = 368.59 ft
 Max. Storage = 4,067 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

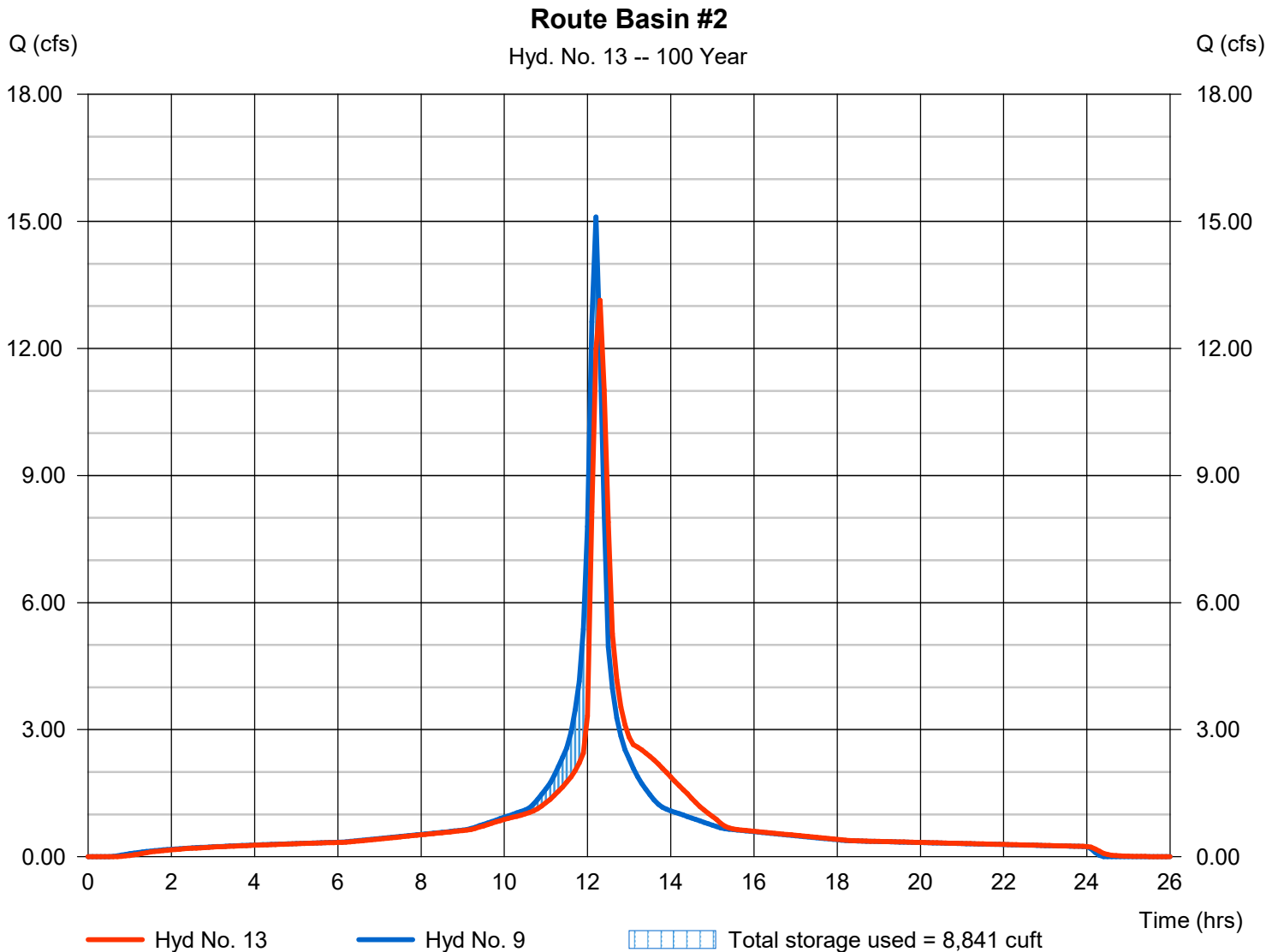
Hyd. No. 13

Route Basin #2

Hydrograph type = Reservoir
 Storm frequency = 100 yrs
 Time interval = 6 min
 Inflow hyd. No. = 9 - DA-2
 Reservoir name = Basin #2

Peak discharge = 13.14 cfs
 Time to peak = 12.30 hrs
 Hyd. volume = 74,757 cuft
 Max. Elevation = 369.53 ft
 Max. Storage = 8,841 cuft

Storage Indication method used.



Hydrograph Report

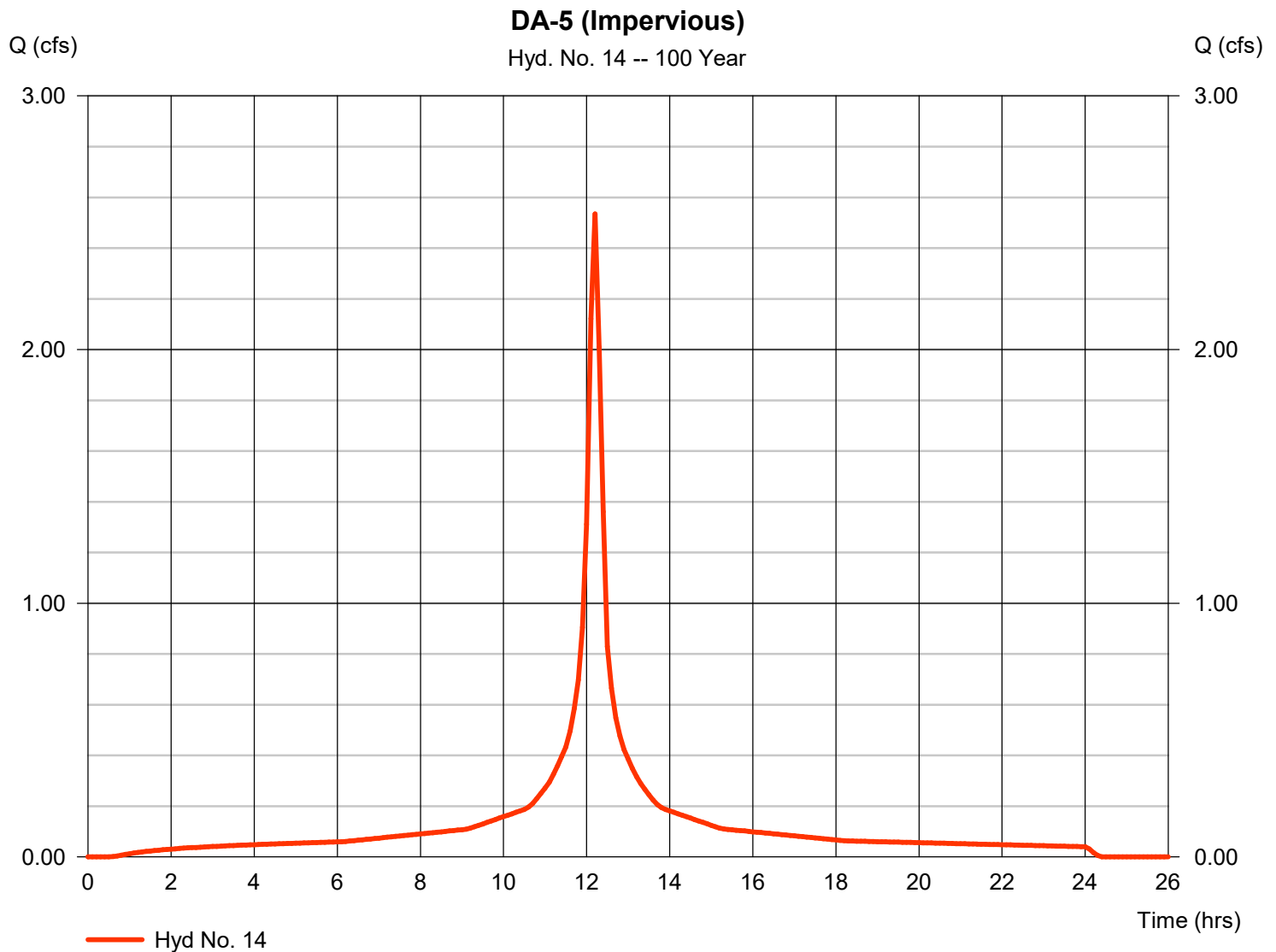
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 14

DA-5 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.535 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 12,608 cuft
Drainage area	= 0.440 ac	Curve number	= 98*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.66 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\1610012 Page 484		

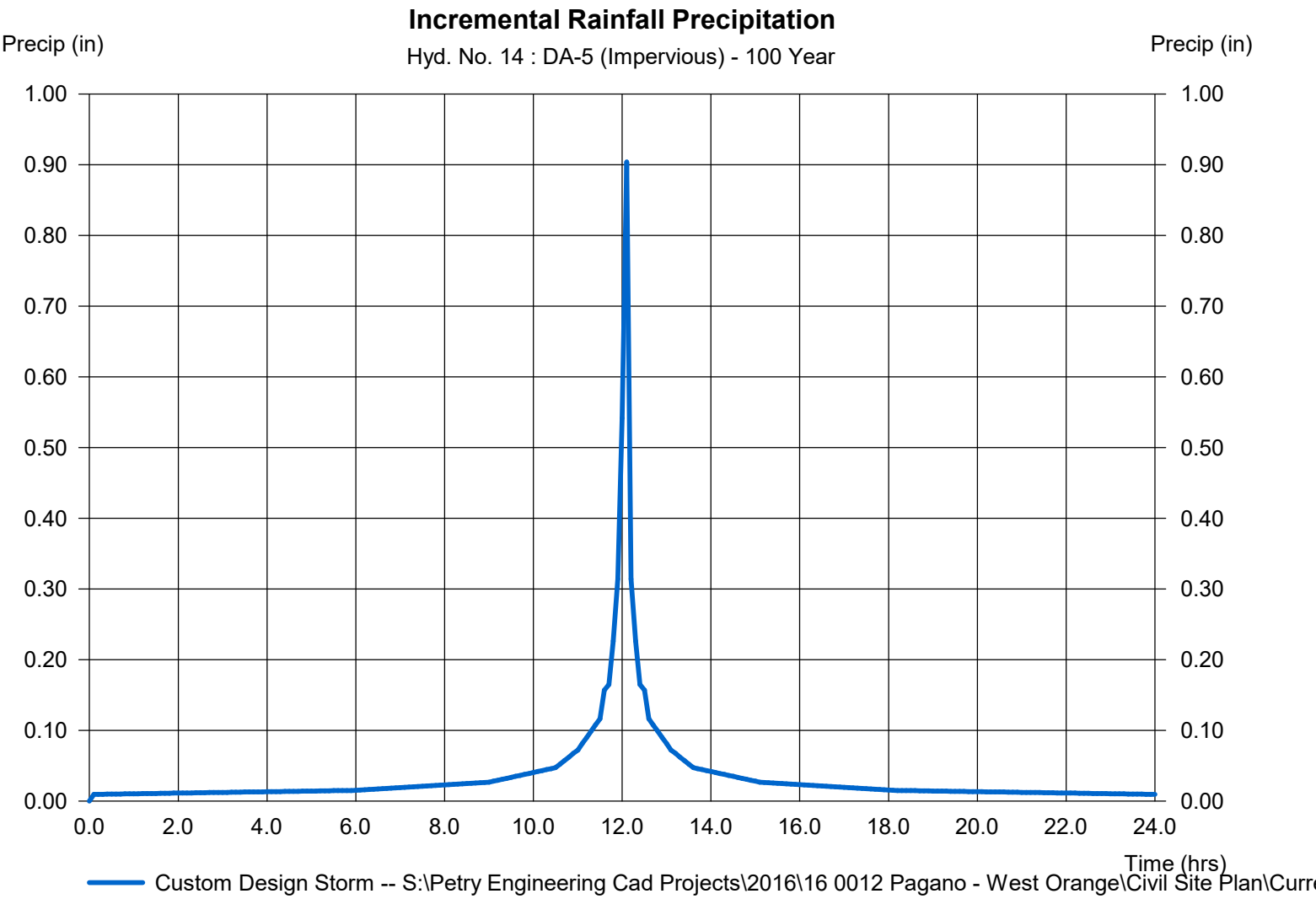
* Composite (Area/CN) = $[(0.440 \times 98)] / 0.440$ 

Precipitation Report

Hyd. No. 14

DA-5 (Impervious)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		

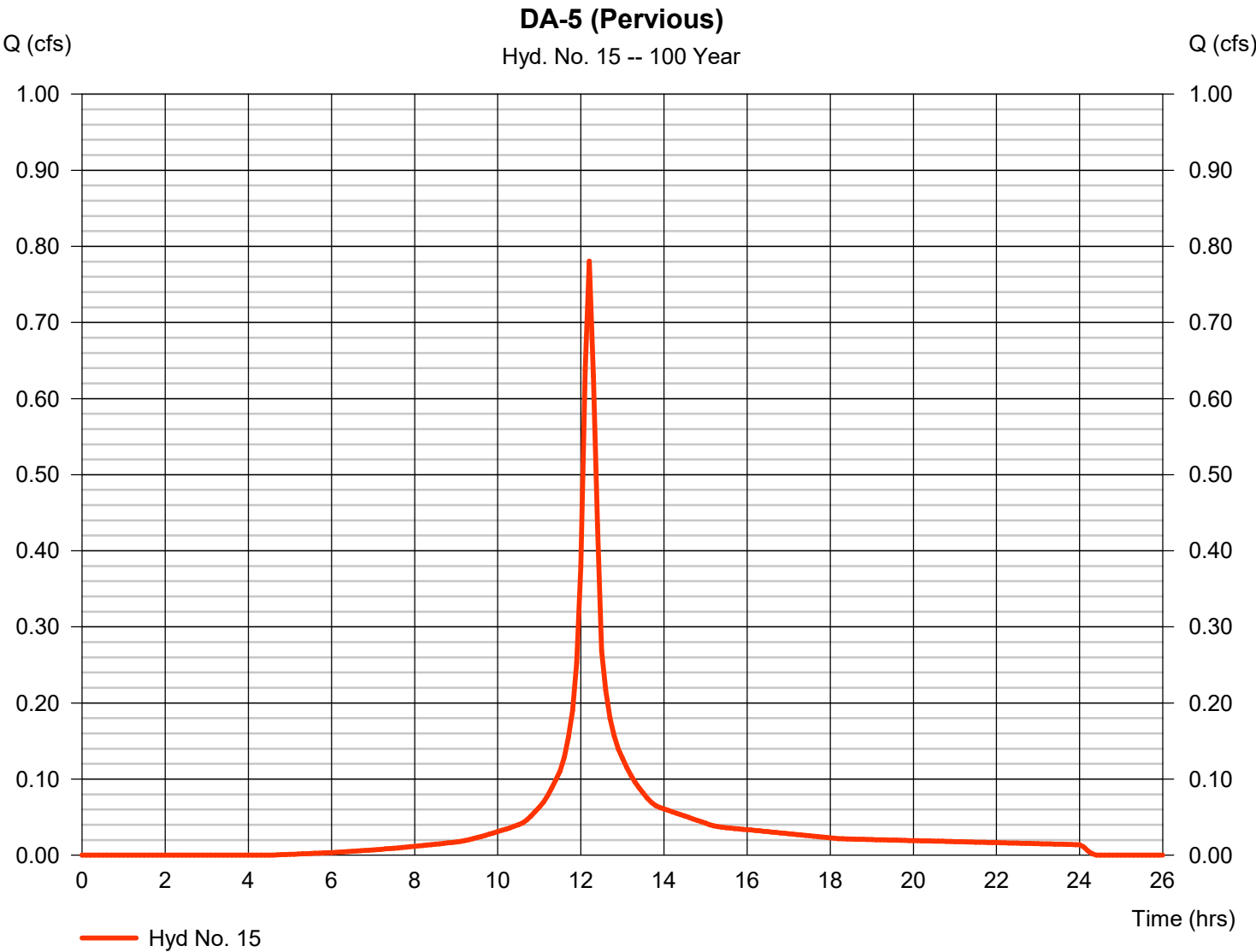


Hydrograph Report

Hyd. No. 15

DA-5 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.780 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 3,401 cuft
Drainage area	= 0.160 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.66 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\1610012 Page 484		

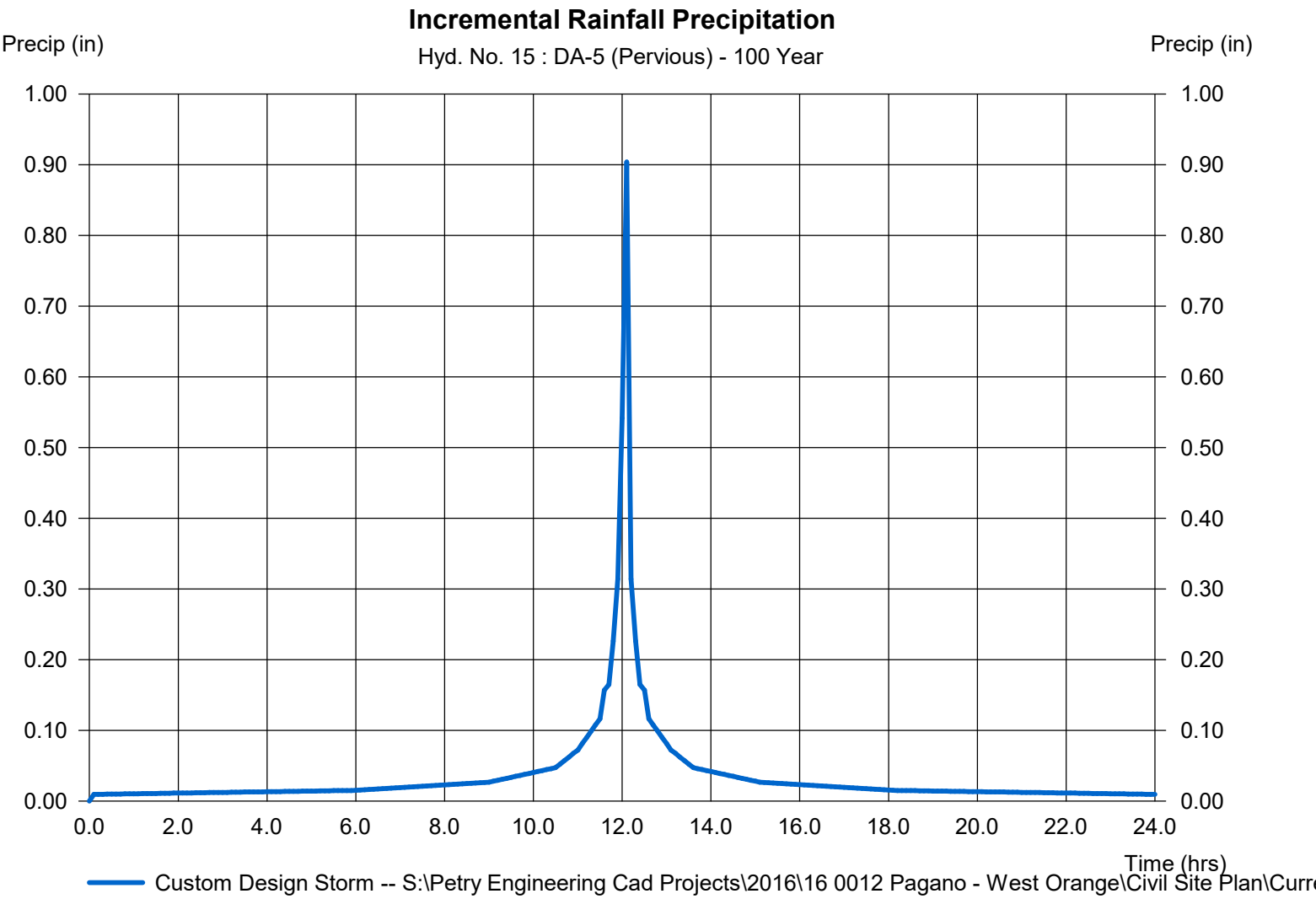


Precipitation Report

Hyd. No. 15

DA-5 (Pervious)

Storm Frequency	= 100 yrs	Time interval	= 6 min
Total precip.	= 8.6600 in	Distribution	= Custom
Storm duration	= S:\Petry Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil S		



Hydrograph Report

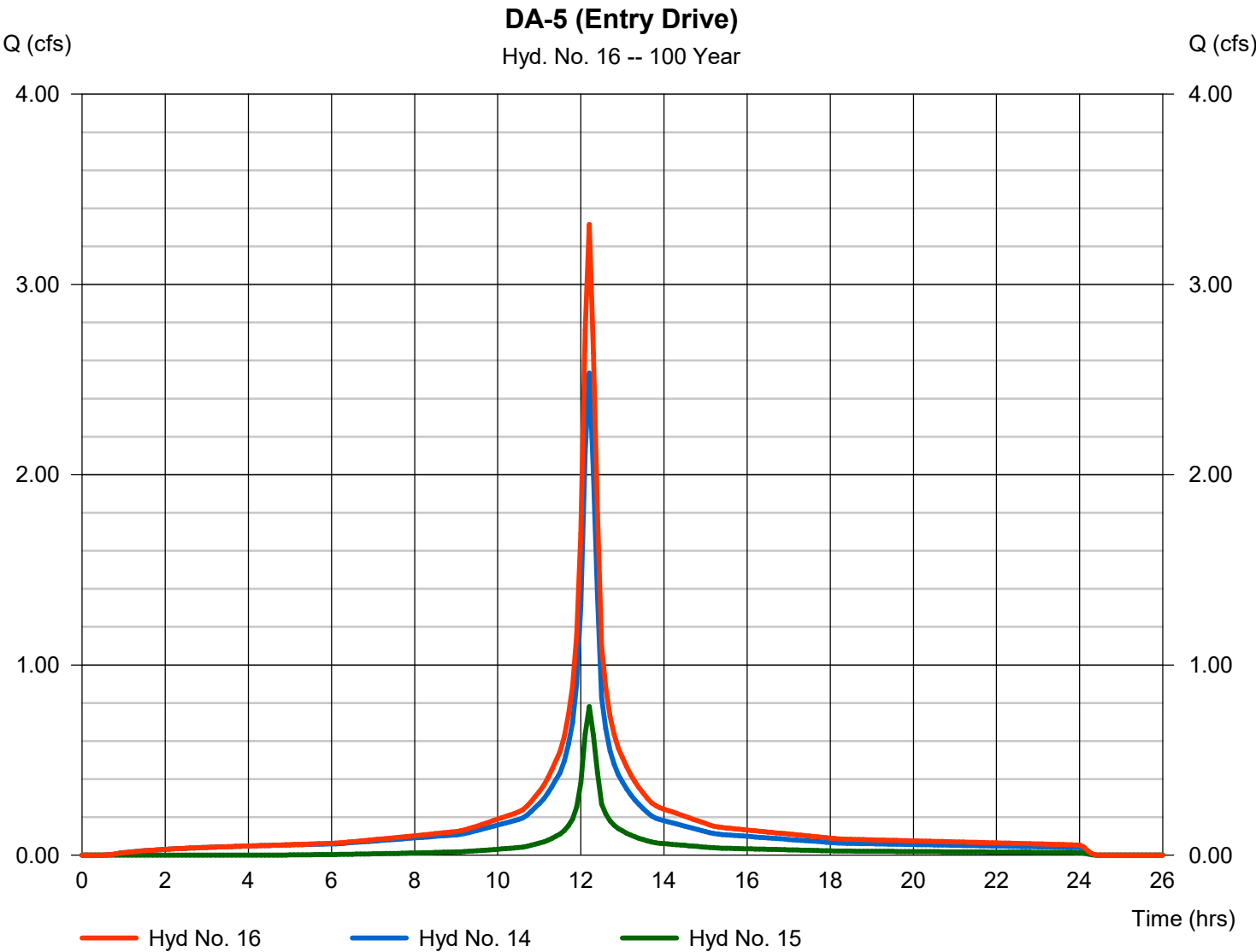
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

Hyd. No. 16

DA-5 (Entry Drive)

Hydrograph type	= Combine	Peak discharge	= 3.315 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 6 min	Hyd. volume	= 16,009 cuft
Inflow hyds.	= 14, 15	Contrib. drain. area	= 0.600 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

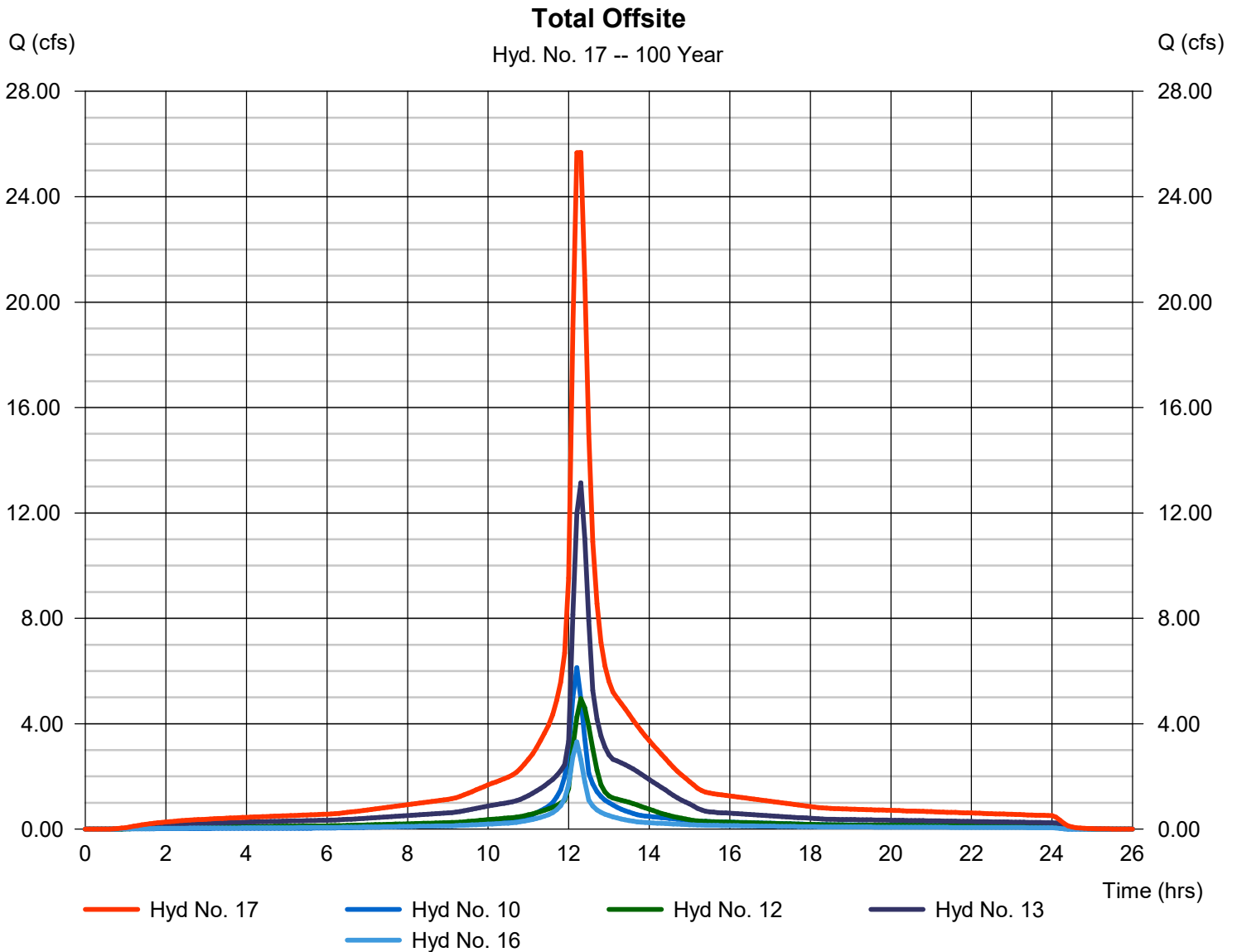
Wednesday, 03 / 8 / 2023

Hyd. No. 17

Total Offsite

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 6 min
 Inflow hyds. = 10, 12, 13, 16

Peak discharge = 25.68 cfs
 Time to peak = 12.30 hrs
 Hyd. volume = 149,500 cuft
 Contrib. drain. area = 0.000 ac



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Wednesday, 03 / 8 / 2023

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

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

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	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

T_c = time in minutes. Values may exceed 60.

y Engineering Cad Projects\2016\16 0012 Pagano - West Orange\Civil Site Plan\Current\Stormwater\Essex County.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	3.44	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	3.44	0.00	0.00	5.22	6.44	0.00	8.66

APPENDIX



Table 2-2a Runoff curve numbers for urban areas ^{1/}

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area ^{2/}	A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
Open space (lawns, parks, golf courses, cemeteries, etc.) ^{3/} :					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) ^{4/}		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
<i>Developing urban areas</i>					
Newly graded areas					
(pervious areas only, no vegetation) ^{5/}		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

^{1/} Average runoff condition, and $I_a = 0.25$.^{2/} The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.^{3/} CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.^{4/} Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.^{5/} Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2b Runoff curve numbers for cultivated agricultural lands ^{1/}

Cover description			Curve numbers for hydrologic soil group			
Cover type	Treatment ^{2/}	Hydrologic condition ^{3/}	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
	C&T+ CR	Poor	65	73	79	81
		Good	61	70	77	80
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

^{1/} Average runoff condition, and $I_p=0.25$ ^{2/} Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.^{3/} Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good $\geq 20\%$), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c Runoff curve numbers for other agricultural lands ^{1/}

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. ^{2/}	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. ^{3/}	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 ^{4/}	48	65	73
Woods—grass combination (orchard or tree farm). ^{5/}	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. ^{6/}	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 ^{4/}	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

^{1/} Average runoff condition, and $I_a = 0.2S$.^{2/} *Poor*: <50% ground cover or heavily grazed with no mulch.*Fair*: 50 to 75% ground cover and not heavily grazed.*Good*: > 75% ground cover and lightly or only occasionally grazed.^{3/} *Poor*: <50% ground cover.*Fair*: 50 to 75% ground cover.*Good*: >75% ground cover.^{4/} Actual curve number is less than 30; use CN = 30 for runoff computations.^{5/} CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.^{6/} *Poor*: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.*Fair*: Woods are grazed but not burned, and some forest litter covers the soil.*Good*: Woods are protected from grazing, and litter and brush adequately cover the soil.

Soil Map—Essex County, New Jersey



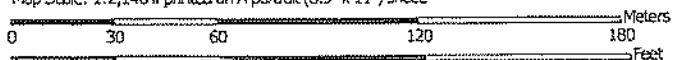
Map Unit Legend

Essex County, New Jersey (NJ013)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BogBc	Boonton loam, 0 to 8 percent slopes, extremely stony	3.0	18.7%
HanBc	Haledon silt loam, 0 to 8 percent slopes, extremely stony	2.7	17.3%
UdbonB	Udorthents, Boonton substratum, 0 to 8 percent slopes	2.9	18.5%
UdhorB	Udorthents, Horseneck substratum, 0 to 8 percent slopes	0.4	2.7%
URBONB	Urban land, Boonton substratum, 0 to 8 percent slopes	5.1	32.4%
URPECB	Urban land, Peckmantown substratum, 0 to 8 percent slopes	1.6	10.4%
Totals for Area of Interest		15.8	100.0%

Hydrologic Soil Group—Essex County, New Jersey



Map Scale: 1:2,140 if printed on A portrait (8.5" x 11") sheet



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

10/5/2016
Page 1 of 4

MAP LEGEND

	Area of Interest (AOI)		C
	Area of Interest (AOI)		C/D
	Area of Interest (AOI)		D
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available
	Area of Interest (AOI)		Not rated or not available

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Essex County, New Jersey
Survey Area Data: Version 11, Sep 18, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 25, 2014—Sep 27, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Essex County, New Jersey (NJ013)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BogBc	Boonton loam, 0 to 8 percent slopes, extremely stony	C	3.4	17.8%
HanBc	Haledon silt loam, 0 to 8 percent slopes, extremely stony	C	2.6	13.6%
UdbonB	Udorthents, Boonton substratum, 0 to 8 percent slopes	D	6.0	31.9%
UdhorB	Udorthents, Horseneck substratum, 0 to 8 percent slopes	D	0.5	2.4%
URBONB	Urban land, Boonton substratum, 0 to 8 percent slopes		5.1	27.1%
URPECB	Urban land, Peckmantown substratum, 0 to 8 percent slopes		1.4	7.2%
Totals for Area of Interest			18.9	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpretative Groups

Land Capability Classification (non-irrigated): 8s

Hydrologic Group: D

Minor Components

- Well drained Bigapple soils derived from clean sandy dredge material
- Loamy fill derived from fine dredge material with less than 10 percent construction debris

Use and Management

For further information about managing this map unit, see the following sections in this publication: Recreation, Wildlife Habitat, Engineering, and Soil Properties.

URBONB—Urban land, Boonton substratum, 0 to 8 percent slopes**Map Unit Setting**

Slope: Nearly level and gently sloping

Landscape: Till plain

Anthropogenic Feature: Urban land

Landform: Ground moraines

Map Unit Composition

Urban land, Boonton substratum and similar soils: 90 percent

Minor components: 10 percent

Major Component Descriptions**Urban land, Boonton substratum and similar soils**

The typical sequence, depth, and composition of the layers of the soil are as follows:

Surface layer:	H1 0 to 12 inches; impervious material
	H2 12 to 47 inches; silt loam
Substratum:	2CBt1 47 to 58 inches; loamy sand
	2CBt2 58 to 72 inches; loamy sand

Component Properties and Qualities

Parent Material: surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Permeability: moderate to moderately rapid beneath the surface layer

Available Water Capacity: moderate

Reaction: very strongly acid to moderately acid

Depth to High Water Table: greater than 6 feet

Interpretative Groups

Land Capability Classification (non-irrigated): 8s

Hydrologic Group: D

Minor Components

- Udorthents, Boonton substratum soils with some type of disturbance resulting from construction such as grading and/or the addition of fill material
- Well drained Boonton soils

Use and Management

For further information about managing this map unit, see the following sections in this publication: Recreation, Wildlife Habitat, Engineering, and Soil Properties.

URBOOB—Urban land, Boonton substratum, 0 to 8 percent slopes, red sandstone lowland

Map Unit Setting

Slope: Nearly level and gently sloping

Landscape: Till plain

Anthropogenic Feature: Urban land

Landform: Ground moraines

Map Unit Composition

Urban land, Boonton substratum and similar soils: 90 percent

Minor components: 10 percent

Major Component Descriptions

Urban land, Boonton substratum and similar soils

The typical sequence, depth, and composition of the layers of the soil are as follows:

Surface layer:	H1 0 to 12 inches; impervious material
	H2 12 to 67 inches; gravelly loam
Substratum:	2CB 67 to 83 inches; gravelly sandy loam

Component Properties and Qualities

Parent Material: surface covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil material

Permeability: slow to moderate beneath the surface layer

Available Water Capacity: high

Reaction: very strongly acid

Depth to High Water Table: greater than 6 feet

Interpretative Groups

Land Capability Classification (non-irrigated): 8s

Hydrologic Group: D

Minor Components

- Udorthents, Boonton red sandstone lowland substratum soils with some type of disturbance resulting from construction such as grading and/or the addition of fill material
- Well drained Boonton red sandstone lowland soils



NOAA Atlas 14, Volume 2, Version 3
 Location name: West Orange Twp, New Jersey,
 USA*
 Latitude: 40.8168°, Longitude: -74.2521°
 Elevation: 377.25 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 & arials](#)

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	0.337 (0.308-0.370)	0.402 (0.368-0.441)	0.476 (0.434-0.522)	0.530 (0.482-0.581)	0.596 (0.540-0.653)	0.641 (0.579-0.703)	0.687 (0.617-0.752)	0.730 (0.653-0.800)	0.782 (0.692-0.858)	0.818 (0.719-0.901)
10-min	0.536 (0.490-0.588)	0.640 (0.585-0.703)	0.758 (0.691-0.832)	0.841 (0.765-0.922)	0.941 (0.853-1.03)	1.01 (0.915-1.11)	1.08 (0.972-1.18)	1.15 (1.02-1.25)	1.22 (1.08-1.34)	1.27 (1.12-1.40)
15-min	0.667 (0.609-0.732)	0.801 (0.733-0.879)	0.955 (0.870-1.05)	1.06 (0.965-1.16)	1.19 (1.08-1.30)	1.28 (1.15-1.40)	1.36 (1.23-1.49)	1.44 (1.29-1.58)	1.54 (1.36-1.69)	1.60 (1.40-1.76)
30-min	0.910 (0.832-0.999)	1.10 (1.01-1.21)	1.35 (1.23-1.48)	1.53 (1.39-1.67)	1.75 (1.58-1.91)	1.91 (1.72-2.09)	2.07 (1.86-2.27)	2.22 (1.98-2.43)	2.41 (2.14-2.65)	2.55 (2.24-2.81)
60-min	1.13 (1.03-1.24)	1.38 (1.26-1.51)	1.72 (1.57-1.89)	1.96 (1.80-2.17)	2.32 (2.10-2.54)	2.58 (2.33-2.82)	2.84 (2.55-3.11)	3.10 (2.77-3.39)	3.44 (3.05-3.78)	3.70 (3.25-4.08)
2-hr	1.39 (1.26-1.52)	1.69 (1.54-1.85)	2.14 (1.95-2.35)	2.49 (2.26-2.73)	2.98 (2.69-3.26)	3.37 (3.03-3.69)	3.78 (3.37-4.14)	4.21 (3.73-4.61)	4.81 (4.21-5.27)	5.29 (4.58-5.80)
3-hr	1.55 (1.42-1.70)	1.89 (1.73-2.07)	2.39 (2.19-2.63)	2.79 (2.54-3.06)	3.33 (3.02-3.65)	3.78 (3.40-4.13)	4.24 (3.79-4.63)	4.72 (4.18-5.16)	5.39 (4.72-5.89)	5.92 (5.14-6.48)
6-hr	2.00 (1.84-2.19)	2.43 (2.23-2.66)	3.08 (2.81-3.36)	3.60 (3.28-3.92)	4.35 (3.93-4.73)	4.97 (4.47-5.40)	5.64 (5.02-6.12)	6.35 (5.60-6.89)	7.38 (6.41-8.02)	8.23 (7.07-8.95)
12-hr	2.50 (2.28-2.75)	3.03 (2.77-3.34)	3.86 (3.52-4.24)	4.55 (4.13-4.99)	5.57 (5.01-6.08)	6.44 (5.75-7.01)	7.39 (6.52-8.03)	8.43 (7.35-9.17)	9.98 (8.53-10.8)	11.3 (9.51-12.3)
24-hr	2.83 (2.62-3.08)	3.43 (3.17-3.73)	4.39 (4.06-4.77)	5.22 (4.80-5.67)	6.45 (5.90-6.99)	7.52 (6.83-8.15)	8.71 (7.83-9.45)	10.0 (8.92-10.9)	12.0 (10.5-13.1)	13.8 (11.8-15.0)
2-day	3.35 (3.09-3.64)	4.05 (3.75-4.41)	5.17 (4.78-5.62)	6.11 (5.62-6.63)	7.48 (6.84-8.12)	8.64 (7.86-9.39)	9.91 (8.94-10.8)	11.3 (10.1-12.3)	13.4 (11.7-14.7)	15.1 (13.1-16.6)
3-day	3.52 (3.26-3.81)	4.26 (3.94-4.62)	5.41 (5.00-5.87)	6.36 (5.87-6.90)	7.75 (7.11-8.40)	8.92 (8.13-9.67)	10.2 (9.21-11.1)	11.6 (10.4-12.6)	13.6 (12.0-14.8)	15.3 (13.3-16.8)
4-day	3.69 (3.43-3.99)	4.46 (4.14-4.83)	5.65 (5.24-6.11)	6.62 (6.13-7.16)	8.03 (7.36-8.67)	9.20 (8.40-9.95)	10.5 (9.48-11.3)	11.8 (10.6-12.8)	13.8 (12.2-15.0)	15.4 (13.5-16.9)
7-day	4.36 (4.06-4.70)	5.24 (4.88-5.65)	6.51 (6.06-7.01)	7.56 (7.02-8.14)	9.06 (8.36-9.75)	10.3 (9.45-11.1)	11.6 (10.6-12.6)	13.1 (11.8-14.1)	15.1 (13.4-16.4)	16.8 (14.7-18.3)
10-day	5.01 (4.69-5.38)	5.99 (5.60-6.42)	7.33 (6.84-7.86)	8.42 (7.85-9.03)	9.97 (9.25-10.7)	11.2 (10.4-12.1)	12.6 (11.5-13.5)	14.0 (12.7-15.1)	16.0 (14.3-17.3)	17.6 (15.6-19.2)
20-day	6.77 (6.37-7.21)	8.04 (7.56-8.56)	9.59 (9.01-10.2)	10.8 (10.1-11.5)	12.5 (11.6-13.3)	13.8 (12.8-14.7)	15.1 (13.9-16.1)	16.4 (15.1-17.5)	18.1 (16.6-19.5)	19.5 (17.7-21.1)
30-day	8.44 (7.98-8.92)	9.96 (9.42-10.5)	11.6 (11.0-12.3)	12.9 (12.2-13.7)	14.6 (13.7-15.5)	15.9 (14.9-16.8)	17.1 (16.0-18.2)	18.3 (17.1-19.5)	19.9 (18.4-21.2)	21.0 (19.4-22.5)
45-day	10.7 (10.2-11.3)	12.6 (11.9-13.3)	14.5 (13.8-15.3)	16.0 (15.1-16.8)	17.9 (16.9-18.8)	19.3 (18.2-20.3)	20.6 (19.4-21.8)	21.9 (20.5-23.2)	23.5 (21.9-25.0)	24.7 (22.9-26.3)
60-day	12.9 (12.2-13.5)	15.1 (14.3-15.9)	17.2 (16.4-18.1)	18.8 (17.9-19.8)	20.8 (19.7-21.9)	22.3 (21.1-23.5)	23.6 (22.3-24.9)	24.9 (23.5-26.3)	26.5 (24.8-28.0)	27.6 (25.7-29.3)

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.

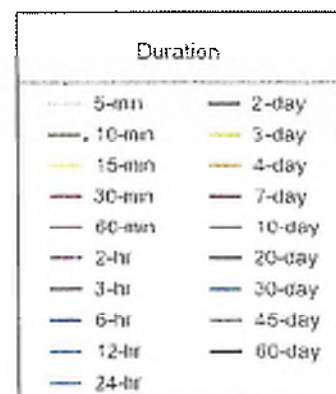
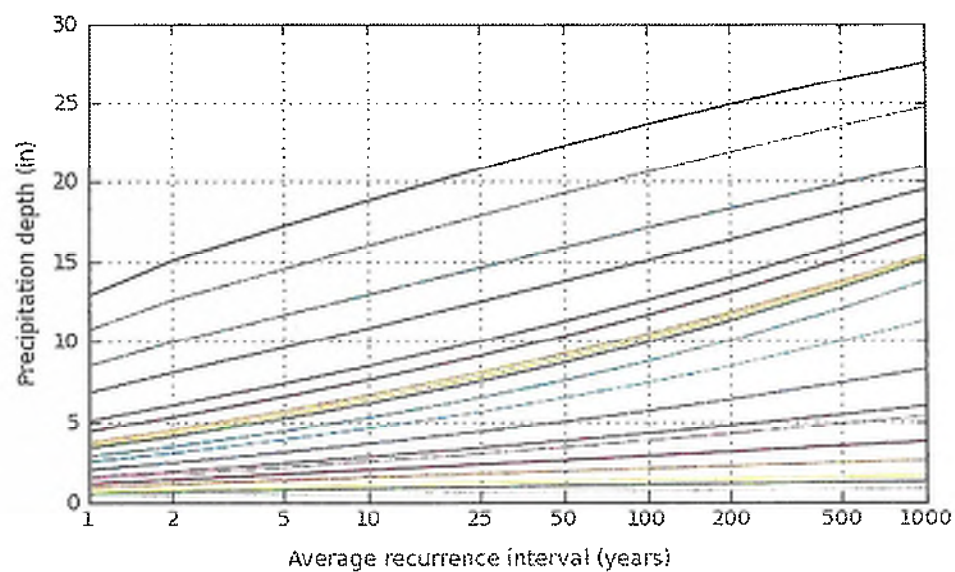
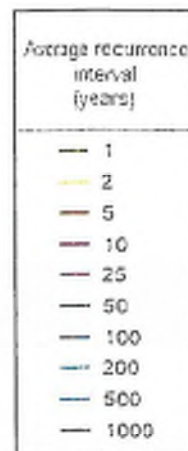
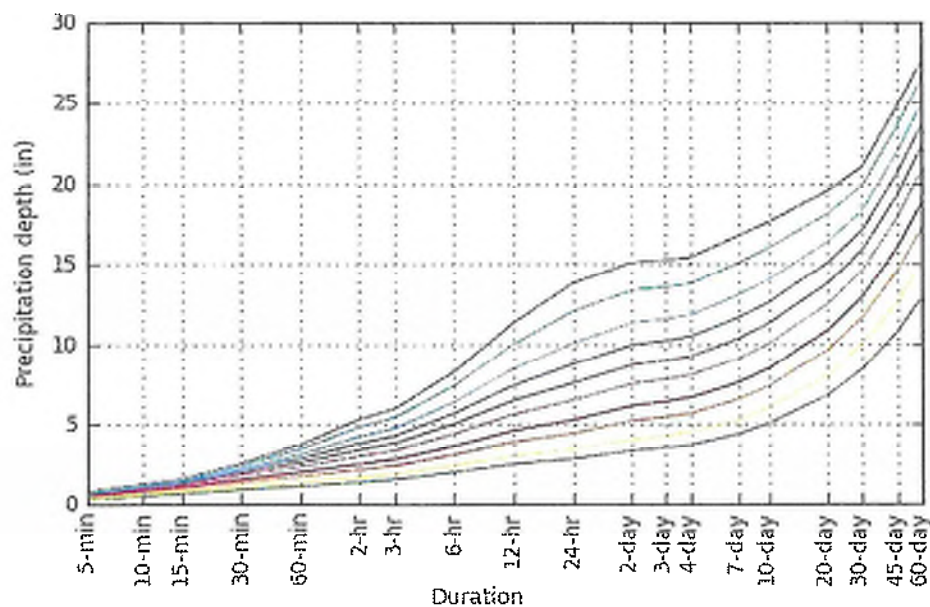
Please refer to NOAA Atlas 14 document for more information.

[Back to Top](#)

PF graphical

PDS-based depth-duration-frequency (DDF) curves

Latitude: 40.8168°, Longitude: -74.2521°



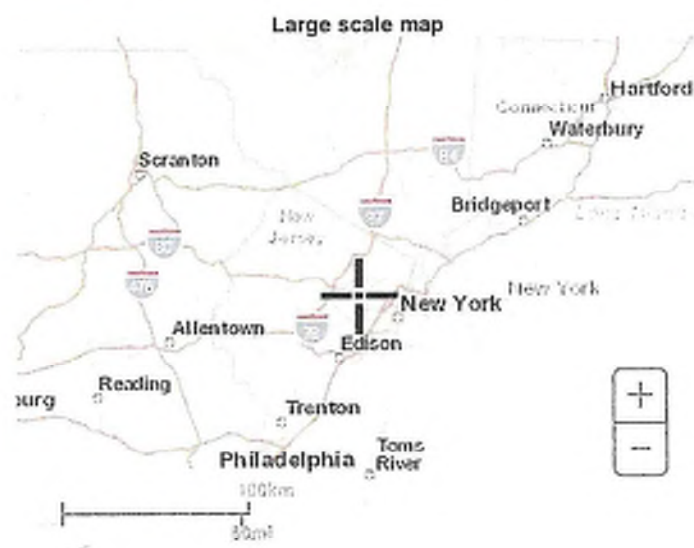
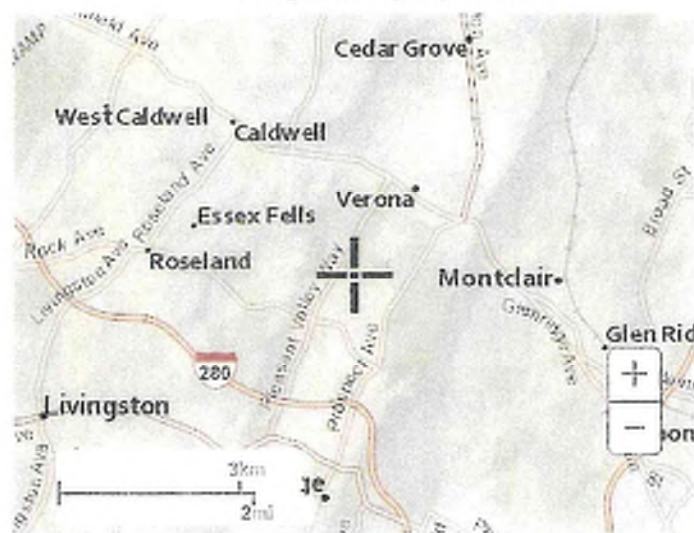
NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Wed Oct 5 19:52:19 2016

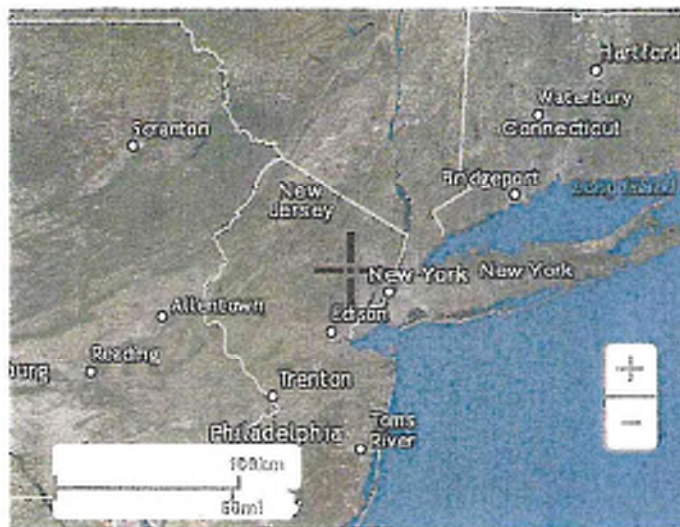
[Back to Top](#)

Maps & aeriels

Small scale terrain



Large scale aerial

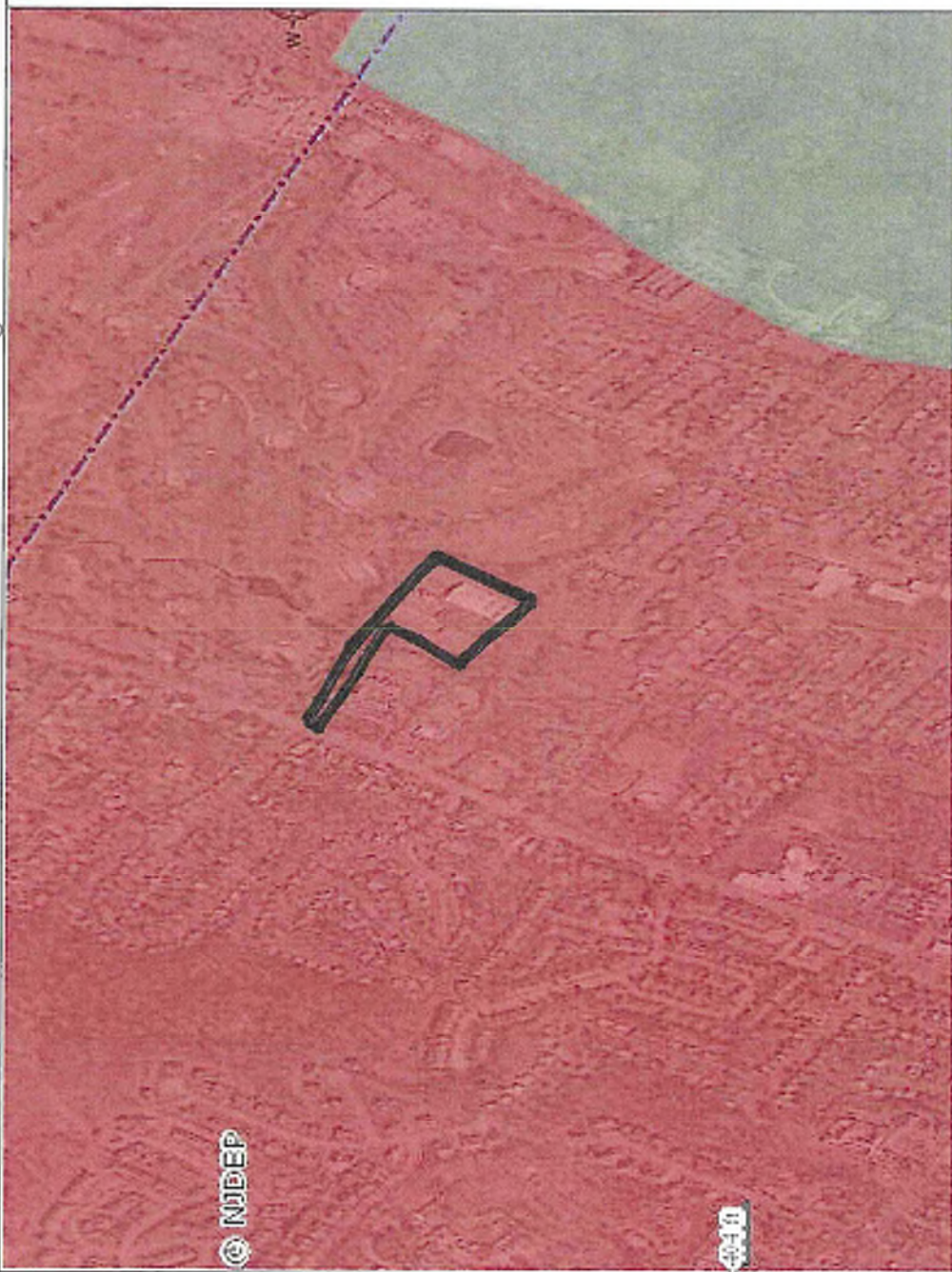
[Back to Top](#)

[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

[Disclaimer](#)

Pagano

Legend



© NIDEP

4040

Map Printed On {2016-08-02 12:00}

GeoWeb

State Planning Areas

ENVIRONMENTALLY SENSITIVE

FRINGE

RURAL

WATER

PARK 2ND PLAN

STATE PARK

ENV. SENSITIVE BARRIER IS

ELLIS ISLAND- NJ

NEW JERSEY MEADOWLANDS

COUNTY PARK

COUNTY PARK P2

PARK 1ST PLAN

MILITARY

ELLIS ISLAND- NY

RURAL ENV. SENSITIVE

METROPOLITAN Planning Area 1

SUBURBAN

NATIONAL PARK- CROSS ACC.

FED PARK- CROSS ACC.

PARK 1ST & 2ND PLAN

FEDERAL PARK

PINELANDS

HIGHLANDS PRESERVATION

LOCAL PARK - CROSS ACC3

LOCAL PARK - TWP OWNED

MUNICIPAL PARK ENDORSE

PARK

Municipalities

Counties

Mid-Atlantic States

New Jersey

Other Mid-Atlantic States

Conduit Outlet Protection (Outfall #1)

Soil Properties

Onsite Soils: Silt Loam (Also High Lime Clay), Loam

Allowable Velocity (fps): 3.0

Discharge Pipe

Length= 12

Size= 24" HDPE

D_0 = 2

W_0 = 2

Slope= 1.0%

Q= 18.12

Velocity= 7.82

Tailwater ($>0.5D_0$)= Yes

TW= 1.88

Rip Rap Apron:

$q=Q/W_0$: 9.06

L_a = 19.2

W_a = 13.7

D_{50} = 0.20

Conduit Outlet Protection (Outfall #2)

Soil Properties

Onsite Soils: Silt Loam (Also High Lime Clay), Loam

Allowable Velocity (fps): 3.0

Discharge Pipe

Length= 4

Size= 15" HDPE

D_0 = 1.25

W_0 = 1.25

Slope= 1.5%

Q = 6.45

Velocity= 7

Tailwater ($>0.5D_0$)= No

TW= 0.25

Rip Rap Apron:

$q=Q/W_0$: 5.16

L_a = 17.1

W_a = 20.8

D_{50} = 0.71

Conduit Outlet Protection (Outfall #3)

Soil Properties

Onsite Soils: Silt Loam (Also High Lime Clay), Loam

Allowable Velocity (fps): 3.0

Discharge Pipe

Length= 12

Size= 15" HDPE

D_0 = 1.25

W_0 = 1.25

Slope= 0.5%

Q = 3.42

Velocity= 4.04

Tailwater ($>0.5D_0$)= Yes

TW= 1.25

Rip Rap Apron:

$q=Q/W_0$: 2.74

L_a = 7.3

W_a = 6.7

D_{50} = 0.06

Conduit Outlet Protection (Outfall #4)

Soil Properties

Onsite Soils: Silt Loam (Also High Lime Clay), Loam

Allowable Velocity (fps): 3.0

Discharge Pipe

Length= 12

Size= 15" HDPE

D_0 = 1.25

W_0 = 1.25

Slope= 1.0%

Q = 0.82

Velocity= 5.72

Tailwater ($>0.5D_0$)= Yes

TW= 1.25

Rip Rap Apron:

$q=Q/W_0$: 0.66

L_a = 1.8

W_a = 4.5

D_{50} = 0.01

Project: Redwood LLC
By: SPD

[illegible]

RA-4	Type "B" #7-5	0.109	0.99	0.11	0.11	6.0	5.60	0.60	110	1.0%	12" HDPE	3.87	4.93	0.37	GOOD
Type "B" #7-5	Type "B" #7-4	0.15	0.99	0.15	0.26	6.0	5.60	1.44	74	0.5%	15" HDPE	4.96	4.04	0.31	GOOD
Type "B" #7-4	Type "B" #7-3	0.032	0.99	0.03	0.29	6.0	5.60	1.61	125	0.5%	15" HDPE	4.96	4.04	0.52	GOOD
Type "B" #7-3	MH #7-2	0.09	0.99	0.09	0.38	6.0	5.60	2.11	28	0.5%	15" HDPE	4.96	4.04	0.12	GOOD
RA-5	MH #7-2	0.135	0.99	0.13	0.13	6.0	5.60	0.75	128	1.0%	15" HDPE	7.02	5.72	0.37	GOOD
MH #7-2	MH #7-1				0.51	6.0	5.60	2.86	122	0.5%	15" HDPE	4.96	4.04	0.50	GOOD
RA-6	MH #7-1	0.084	0.99	0.08	0.08	6.0	5.60	0.47	98	1.0%	12" HDPE	3.87	4.93	0.33	GOOD
MH #7-1	Basin #2				0.59	6.0	5.60	3.33	42	0.5%	15" HDPE	4.96	4.04	0.17	GOOD
Type "B" #8-2	MH #8-1	0.323	0.99	0.32	0.32	6.0	5.60	1.79	132	0.5%	15" HDPE	4.96	4.04	0.54	GOOD
Type "B" #9-1	MH #8-1	0.15	0.99	0.15	0.15	6.0	5.60	0.83	39	1.9%	15" HDPE	9.67	7.88	0.08	GOOD
MH #8-1	Basin #2				0.47	6.0	5.60	2.62	42	0.5%	15" HDPE	4.96	4.04	0.17	GOOD
Type "B" #10-1	Basin #2	0.084	0.99	0.083	0.083	6.0	5.60	0.47	6	2.0%	24" HDPE	34.75	11.06	0.01	GOOD
Type "B" #11-2	Type "B" #11-1	0.095	0.99	0.094	0.094	6.0	5.60	0.53	52	0.5%	15" HDPE	4.96	4.04	0.21	GOOD
Type "B" #11-1	Basin #2	0.186	0.99	0.184	0.278	6.0	5.60	1.56	50	0.5%	15" HDPE	4.96	4.04	0.21	GOOD
Basin #2	MH #1-1							13.16	30	2.0%	18" HDPE	16.14	9.13	0.05	GOOD
MH #1-1	Outfall #1							18.82	37	1.0%	24" HDPE	24.57	7.82	0.08	GOOD
Type "A" #12-4	Nyloplast #12-3							6.45	56	1.5%	15" HDPE	8.59	7.00	0.13	GOOD
Nyloplast #12-3	Nyloplast #12-2							6.45	89	1.5%	15" HDPE	8.59	7.00	0.21	GOOD
Nyloplast #12-2	Nyloplast #12-1							6.45	85	1.5%	15" HDPE	8.59	7.00	0.20	GOOD
Nyloplast #12-1	Outfall #2							6.45	4	1.5%	15" HDPE	8.59	7.00	0.01	GOOD
Type "B" #13-2	Type "B" #13-1	0.027	0.99	0.027	0.027	6.0	5.60	0.15	63	2.0%	15" HDPE	9.92	8.09	0.13	GOOD
Type "B" #14-1	Type "B" #13-1	0.057	0.99	0.056	0.056	6.0	5.60	0.32	26	2.0%	15" HDPE	9.92	8.09	0.05	GOOD
Type "B" #13-1	Outfall #4	0.064	0.99	0.063	0.147	6.0	5.60	0.82	12	1.0%	15" HDPE	7.02	5.72	0.03	GOOD
Type "B" #15-4	Type "B" #15-3	0.132	0.99	0.131	0.131	6.0	5.60	0.73	24	2.0%	15" HDPE	9.92	8.09	0.05	GOOD
Type "B" #15-3	Type "B" #15-2	0.151	0.99	0.149	0.28	6.0	5.60	1.57	155	1.0%	15" HDPE	7.02	5.72	0.45	GOOD
Type "B" #17-1	Type "B" #15-2	0.125	0.99	0.124	0.124	6.0	5.60	0.69	28	2.0%	15" HDPE	9.92	8.09	0.06	GOOD
Type "B" #15-2	MH #15-1	0.126	0.99	0.125	0.529	6.0	5.60	2.96	65	0.5%	15" HDPE	4.96	4.04	0.27	GOOD

Type "B" #16-1	MH #15-1	0.082	0.99	0.081	0.081	6.0	5.60	0.45	48	2.0%	15" HDPE	9.92	8.09	0.10	GOOD
MH #15-1	Outfall #3				0.61	6.0	5.60	3.42	12	0.5%	15" HDPE	4.96	4.04	0.05	GOOD